REPORT OF THE THIRD SOUTHEAST ASIAN MARINE MAMMAL SYMPOSIUM (SEAMAM III)

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Introduction

This document is the report of the Third Workshop on the Biology and Conservation of Marine Mammals of Southeast Asia. The workshop was held in Malaysia at the Fave Hotel, Langkawi Island, 4-10 March, 2013. The first workshop was held in 1995, at Silliman University in Dumaguete City, Negros Oriental, in the Philippines; sponsored by the United Nations Environment Programme (Perrin et al. 1996). The second workshop was also held at Silliman University in July of 2002; sponsored by the Convention on Migratory Species of Wild Animals (CMS), also known as the Bonn Convention.

Support for this third workshop was provided by Ocean Park Conservation Foundation, the Convention on Migratory Species of Wild Animals, Humane Society International, Global Greengrants Fund, the US Marine Mammal Commission, Society for Conservation Biology Marine Section, Langkawi Development Authority (LADA) and an anonymous donor. Drs Hines and Ponnampalam received time and other support from San Francisco State Univeristy and the University of Malaya respectively. Travel and local arrangements were organized by Marecet Foundation, a non-profit organization in Malaysia. Content and participation were organized by a committee that contained Ellen Hines, Louisa Ponnampalam, Fairul Izmal Jamal Hisne, Samuel Hung, Louella Dolar, John Wang and Randy Reeves. Fifty-seven participants from seventeen countries attended the workshop. Our wonderful and patient note-takers were Tara Sayura Whitty, Justine Jackson-Ricketts, Vivian Kuit, and Ng Jol Ern. Katrina Ponnampalam did a wonderful job of administrating us all, organizing our travel, dealing with an overwhelmed hotel, finding incredible places for us to eat every night. Thank you!

Within Southeast Asia several populations of coastal, estuarine, riverine and pelagic marine mammals are suspected to be in serious trouble with threats generally increasing in intensity and variety. However, marine mammal research and conservation in many parts of Southeast Asia is still in its infancy, when compared to other parts of Asia and the western hemisphere. There is still a severe lack of knowledge and understanding of marine mammal biology, ecology and distribution in the region, due to a lack of skilled manpower and funding. This is turn leads to a decreased ability to take appropriate conservation actions and to convince governments to react proactively. However, in bringing together researchers from within the region as well as from more developed countries, our goal is to build a regional network that will allow for the growth of marine mammal research in the region, through exchange of knowledge, as well as training in research skills and methodology.

The Third Workshop on the Biology and Conservation of Marine Mammals of Southeast Asia, known as the Third Southeast Asian Marine Mammal Symposium (SEAMAM III) was a follow-up to the previous two workshops, which were held in the Philippines in 1995 and 2002 respectively. SEAMAM III was locally hosted by The MareCet Research Organization and The Institute of Ocean and Earth Sciences, University Malaya, with cooperation from the Hong Kong Dolphin Conservation Society. Since the last two SEAMAMs, much more research has been conducted on marine mammals in the region, the types of threats to these animals and their magnitudes have increased, and more conservation awareness and efforts have been planned and/or implemented. The symposium therefore aimed to bring researchers who are from and/or working around the Southeast Asian region together to discuss the various current issues on conservation and biology of coastal/inshore, estuarine and riverine marine mammals, update on issues discussed at SEAMAM I and II, share information about new research methodologies, approaches and technologies, and form research and conservation linkages to facilitate knowledge transfer and sharing. SEAMAM III was also intended to assist colleagues who are new to the field with developing robust survey methods, all of these of which are intended for the conservation and better management of marine mammals in the region.

This week-long symposium included status reports on marine mammals in each country, discussion sessions on specific topics (e.g., climate change, threats, research priorities, captivity), and interdisciplinary workshops on marine conservation and education, small-scale fisheries economics, effects of overfishing on marine mammals, the creation of protected areas, acoustic research methods, strandings and marine mammal bycatch.

Ellen Hines, PhD

Schedule

Time	March 3	March 4	March 5	March 6	March 7	March 8	March 9	March 10
8:30-10:00		**Registration 7:30-8:20AM** Welcome Intro speakers Keynote: Randy Reeves	Myanmar/ Philippines (Louella Dolar)	Climate change presentation & discussion	Country threats and research prioritizations (John Wang)	Field Trip Meet at 8am	Workshop presentations (Duc Hoang Minh)	Workshop presentations (Cindy Peter)
Morning tea								
10:30-12:30		Australia/Cambodia (Gerry Ryan)	Indonesia/ Thailand (Louella Dolar)	Species Summaries (Saifullah Jaaman)	Country threats and research prioritizations (Tint Tun)		Education (Zahangir Alam) & Small-scale fisheries economics (Lydia Teh)	Strandings (Lem Aragones, Putu Liza Mustika) (3 hours)
Lunch								
13:30-15:30	**Registration 15:00-19:00** Registration desk is on Level 3 of the Fave Hotel, outside the meeting room	China (HK)/Taiwan (Satoko Kimura)	Vietnam/ wrap-up (Samuel Hung)	Identification of common threats/issues/ needs (Putu Liza Mustika)	Regional threats and research prioritizations (Anouk Ilangakoon) SEALIFEBASE Presentation (Patricia Sorongon)		Marine Protected Areas (Phil Dearden) & Effects of overfishing on marine mammals (Patricia Sorongon)	Acoustics (Tom Akamatsu/Satoko Kimura) & Bycatch (Tara Whitty)
Afternoon tea								

15:45-17:30		Japan/Malaysia (Fairul Izmal)	Climate change vulnerability workshop (Louella Dolar)	Identification of common threats/issues/ needs (Jom Acebes)	Regional Summary & Asian Marine Mammal Meeting (2016) (Ellen Hines & Louisa Ponnampalam)	Free Time or batik tour 16:30		Final wrap-up (until 18:00) (Louisa Ponnampalam and Ellen Hines)
Dinner 18:15-19:45	Local restaurant	Local restaurant	Local restaurant	Local restaurant	Local restaurant	Banquet	Local restaurant	Local restaurant
Evening Activities 20:00-22:00			Freshwater Forum (Aung Myo Chit) & Baleen Whale Forum (Jom Acebes)	Captivity Forum (Randy Reeves)	Funding Forum (Peter Thomas) Panel: Suzanne Gendron, Jay Sweeney, Rae Stone-Allen, Louisa Ponnampalam			

Introduction by Mr. Nagulendran, a representative of the Malaysian Government

The 3rd Southeast Asian Marine Mammal Symposium was officially launched by Mr. Nagulendran Kangayatkarasu, the then Deputy Undersecretary of the Biodiversity and Forest Management of the Ministry of Natural Resources and Environment of Malaysia. In his opening presentation, Mr. Nagulendran stated the importance of science within the various global policy frameworks. During the World Summit on Sustainable Development in Johannesburg, South Africa in 2002 targets were set to reduce biodiversity loss by 2010 and agreed on by member countries of the United Nations. In the Conference of Parties for the Convention on Biological Diversity in 2010, it was agreed that the 2010 targets were not met and that biodiversity is declining at a rapid rate. These targets were subsequently revised and the Aichi Targets were introduced and adopted by the CBD member countries with a target date of completion by 2020. The Aichi Targets were introduced to include resource mobilization to complement implementation. Concerns regarding the rapid biodiversity loss worldwide have instigated the establishment of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) in 2013. One of the main aims of IPBES is to strengthen capacity for the effective use of science in decision-making at all levels.

Mr. Nagulendran further spoke about the need to manage and strengthen capacity for the effective use of science at all levels. He discussed the need for training students in areas of importance such as taxonomy and rejuvenating interest in basic sciences. Regulation and enforcement are insufficient to conserve biodiversity and there is a pressing need for a change in people's behaviour and attitude in relation to the importance of biodiversity conservation. Speaking from his governmental experience in environmental management, he emphasized the fact that the biggest problem in dealing with conservation issues is communication. The biggest challenge is not implementing conservation activities but in communicating the importance of biodiversity to various members of the community.

Keynote address of the IUCN Species Survival Commission, Cetacean Specialist Group Chair, Dr. Randy Reeves

The keynote address at SEAMAM III titled "Are we making progress or spinning our wheels? Cetacean conservation – A global perspective" was given by Dr Randall Reeves, Chair of the IUCN Species Survival Commission's Cetacean Specialist Group. The keynote was delivered on the first day of the symposium, prior to SEAMAM III delegates commencing their presentations and discussions as per the planned agenda of the event. The keynote covered three main topics: endemism as an important criteria to consider in conservation, diagnosis of cetacean conservation problems and the issue of cetacean bycatch.

The current official global listing of marine mammals is maintained by the Society for Marine Mammalogy (SMM). Under this list, there are currently 14 mysticete species in four families (five of the species subdivided into two to four species), and 75 odontocete species in 10 families (15 of the species subdivided into two to four species).

Endemism is important when considering conservation approaches for cetacean species. The term endemism is defined as "the ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat". Examples of endemic cetaceans are the Yangtze river dolphin (*Lipotes vexilifer*), found only in China and only in the Yangtze River, the vaquita (*Phocoena sinus*) found only in the Gulf of Mexico and numbering less than 200 individuals, and the Hector's dolphin (*Cephalorhychus hectori*) found only in New Zealand.

A large-scale RedList workshop was held several years ago to assess the status of species. A total of 87 cetacean species were assessed, however it was not up to date. The assessment is expected to be conducted every five years, however in reality, scientists and managers are far from meeting this expectation. In terms of species, the status listing is as follows: 2 CR (Baiji, Vaquita), 7 EN, 6 VU, 5 NT, 22 LC, 45 DD, and in terms of infra-species, the status listing is as follows; 15 CR, 10 EN, 6 VU, 0 NT, 0 LC, 2 LCcd and 4 DD. In present times, it is becoming more important to consider extending the concept of endemism to include infra-species units. For example, in Canada, killer whales (*Orcinus orca*) are legally split into "designatable units". In the United States, humpback whales (*Megaptera novaeangliae*) are legally considered a "distinct population segment" and listed as endangered, although globally the species' status has been down-listed to least concern. Therefore, individual populations should be assessed independently as the IUCN Red List of Threatened Species does not have legal bearing on a species' overall status.

Taxonomy also plays an important role in cetacean conservation, although cetacean taxonomy has been ultra-conservative to date. In 2004, a workshop on cetacean taxonomy was held to identify species and groups of species for which clarified taxonomy has potential value. There has been some progress since the workshop, wherein new species and sub-species have been identified. For example, in Taiwan, John Wang and colleagues updated the taxonomic status of finless porpoises, recognising the group as having two species (*Neophocaena phocaenoides* and *N. asiaorientalis)*. Another development is in the "resurrection" of Deraniyagala's beaked whale (*Mesoplodon hotaula*) and the recognition of the Bolivian river dolphin (*Inia boliviensis*). New research is likely to shed new light on the taxonomic status of more species groups, which is likely to result in more species of Mesoplodonts, Tursiops and Inias being recognised. However, the question remains, in that, should politics influence taxonomy?

A diagnosis of the conservation issue is needed before we react. Translating our science into action is essential, but at first, we have to recognise the problem at hand, followed by getting people to accept that there is a problem, and finally figuring out the cause of that problem. However, diagnosis of causation is often hugely challenging. For example, we still cannot be certain of the actual cause of the baiji's extinction, but it is possible that the species was extirpated from the effects of cumulative threats. In conservation, it is difficult to obtain the support of governments, communities and individuals in making unpleasant choices unless there is compelling evidence in favour of the "victims" of that issue. However, reducing and/or eliminating human-induced mortality of animals is also a good first defensible step.

The threats faced by cetaceans can be divided into 'intentional' and 'unintentional'. Intentional threats include killing for body parts, killing to "control a population", capture for captive display and/or research. Unintentional threats include entanglement in fishing gear, vessel strikes, underwater noise pollution, prey depletion, underwater pollution and environmental change. Do scientists want to regard non-anthropogenic (i.e., 'natural') threats such as diseases, regime shifts, harmful algal blooms and excessive predation as a legitimate third category of threats facing cetaceans?

Bycatch is an issue plaguing cetaceans worldwide. By definition, bycatch refers to captures that are unintentional, inadvertent and accidental. However, bycatch in the true sense refers to unintentional catches that are discarded. Those that are retained for sale and consumption are in fact better regarded as non-targeted catch. The literature rarely makes a distinction between non-targeted catches and unintentional catches. There remains many grey areas pertaining to the issue of bycatch. For example, in Peru and Sri Lanka, large-mesh drift net fisheries are still in operation resulting in many species of cetaceans caught; does one consider such as 'deliberate' bycatch? In certain parts of the world, marine mammals are still valued for their meat and oil, for use as fish bait, thus usage of their remains in bycatch persists. There is also the issue of cryptic bycatch, wherein cetaceans get entangled in discarded fishing gear but are able to swim away, only to eventually die as the gear hinders their movements and activity. Based on Read et al. (2006), which analysed data to estimate global bycatch numbers of cetaceans and pinnipeds, it was reported that approximately 306,000 cetaceans and 346,000 pinnipeds are bycaught annually. The issue of bycatch is likely to be increasing rather than receding, and is aptly summed by Reeves et al. (2013; 92) as, "Perhaps the most important finding of this study is that, some 20-plus years after the landmark IWC workshop (Perrin et al. 1994), the threat of bycatch in passive fishing gear is far from resolved and is likely growing rather than receding. The remarkable shortage of rigorous, comprehensive bycatch accounting (e.g. long time series of annual estimates by species, stock, area, or fishery) was an unexpected and disappointing finding. There is a danger that other ongoing or looming threats, including bycatch in other types of fishing gear (e.g. trawls, purse seines, longlines), as well as habitat deterioration, vessel strikes, novel disease outbreaks, ingestion of plastic debris, overfishing of prey species, and the intractable effects of global climate change, will be allowed to overshadow the nagging, persistent threat of marine mammal bycatch in passive fishing gear, particularly for already threatened coastal species and small populations."

Looking back on the issue of cetacean conservation, a few final thoughts come to mind. There is a tendency to focus on questionable targets because they are 'soft' (i.e. visible, small-scaled). For example, there's often a focus on the impacts of whale watching, however, there are much larger problems out there such as unregulated marine shipping, bycatch, etc. We also need to realise that not all conservation problems can be solved with more money, and that governance issues need to be resolved before a fix is feasible. As scientists, studying the matter does not mean fixing. Moreover, for conservation to be effective, certain political and economic systems need to be changed, as does human demography, issues that are also beyond the workings of scientists. There is an inherently growing need for inter-, cross- and trans-disciplinary work when studying and/or tackling conservation topics, in order to manage such issues comprehensively. Conservation needs to be inclusive, reasonable and practical, however there remains the challenges of purism versus pragmatism and conservation scientists stand on both sides of the divide. In the end, it is important to avoid incessant negativity; it is much more effective to acknowledge improvements in conservation, celebrate the successes and continue to encourage young people to carry the torch for this field.

Country Reports

List of Country Reports

SEAMAM III Report - Australia

Presentation by Guido Parra

Australian waters in Southeast Asia extend from Northwest Cape in the west (21º 47' S, 114º 09' E) to the tip of Cape York Peninsula in the east (10º 47', 142º 30' E), excluding Torres Strait. These waters extend across three different states (Western Australia, Northern Territory and Queensland) and cover both state and Commonwealth waters. The Commonwealth marine area extends beyond the outer edge of state/territory waters, generally some 3 nautical miles (or 5.5 km) from the coast, to the boundary of Australia's exclusive economic zone, generally around 200 nm (or 370 km) from shore.

These waters are considered the Northwest (1.07 million km2) and North (625, 689 km2) Marine Bioregions, in which cetaceans and dugongs are considered of conservation value. In 2005 the Australian Government brought its programme of regional marine planning directly under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) – one of the most comprehensive pieces of environmental legislation in operation anywhere in the world. Marine bioregional plans have been developed for four of Australia's marine regions: 1) South-West, 2) North-West, 3) North and 4) Temperate East. Marine Bioregional Plans seek to improve decision-making processes under the EPBC Act 1999, especially in relation to the protection of marine biodiversity and the sustainable use of marine resources (http://www.environment.gov.au/coasts/marineplans/index.html).

The preparation of marine bioregional plans represents an important step towards a genuine "ecosystem approach" to biodiversity conservation and marine resource management. The plans provide a basis for the recognition and valuation of the many essential and largely irreplaceable ecosystem services provided by the Australian marine environment, including food production, recycling of nutrients and waste, climate stabilisation and recreation. The plans were developed in consultation with scientists and stakeholders and social and economic information were used to describe the bio-physical environment and socio-economic characteristics of the marine region. This information was used to identify conservation values within each region, including key ecological features, protected places and species, and species groups protected by the EPBC Act. Cetaceans and dugongs (Dugong dugon) are considered as conservation values of these marine bioregions (i.e. species listed under Part 13 of the EPBC Act that live in the Commonwealth marine area or for which the Commonwealth marine area is necessary for a part of their life cycle). As part of the marine bioregional planning, a National Representative System of Marine Protected Areas for commonwealth waters was established (see above).

The North-West Marine Region (NWMR) covers Commonwealth marine waters from the Western Australian–Northern Territory border to Kalbarri, south of Shark Bay in Western Australia. The North Marine Region (NMR) extends from west Cape York Peninsula to the Northern Territory–Western Australia border. By global standards, the marine environment of these regions is known for its high diversity of tropical species but relatively low endemism.

Species and Distribution

A total of 39 species of marine mammals are known to occur in the Southeast Asian waters of Australia (38 species of cetaceans and one of sirenia). Out of these 39 species, 30 species occur regularly in the waters of the NWMR and 10 in the NMR. A further nine species are thought to be irregular visitors to the NWMR and 15 to the NMR. Most of the species found across both regions are pelagic species found in deep offshore waters over the continental shelf with only a few species inhabiting shallow coastal estuarine waters. Most of the cetaceans are delphinids, followed by beaked whales, then physeteridae.

Population Status

At an international level, the IUCN lists five species as threatened: the sperm whale, *Physeter macrocephalus* (Vulnerable), the blue whale, *Balaenoptera musculus* (Endangered), the fin whale, *B. physalus* (Endangered), the sei whale, *B. borealis* (Endangered) and the dugong (Vulnerable). Australian snubfin (*Orcaella heinsohni*) and Australian humpback dolphins (*Sousa sahulensis*) are considered Near Threatened. At a national level, only four species have been scheduled as threatened under the EPBC Act: the humpback whale, *Megaptera novaeangliae* (Vulnerable), the fin whale (Vulnerable); the blue whale (Endangered) and the southern right whale, Eubalaena australis (Endangered). In addition, dugongs, and a number of cetaceans, including Australian snubfin, Australian humpback, pantropical spotted (*Stenella attenuata*), long-snouted spinner (*S. longirostris*), and Indo-Pacific bottlenose dolphins (T*ursiops aduncus*), are listed as migratory species under the EPBC Act, offering them some protection as 'matters of national environmental significance'. Several species are listed under the relevant state or territory legislation. For example, the snubfin, Australian humpback and Indo-Pacific bottlenose dolphins are listed as Near Threatened in Queensland (Nature Conservation Act 1992), and Data Deficient in the Northern Territory (Northern Territory Threatened Species List). All cetaceans and dugongs are identified as conservation values (i.e. species listed under Part 13 of the EPBC Act that live in the Commonwealth marine area or for which the Commonwealth marine area is necessary for a part of their life cycle) in the NWMR and NMR Bioregional Plans.

Population Size and Trends: Overall abundance and population trends are not known for most species. Abundance estimates are mainly available for inshore species over small local areas. This precludes conservation and impact assessments. Inshore species are considered the most threatened marine mammals in Australia at the moment, and there is upcoming evidence that some of these species are genetically distinct from populations elsewhere. Of the cetaceans and sirenians known to occur in the North-West Marine Region, this report focuses on inshore dolphins and dugongs. These species were selected following consideration of their distribution and population structure within the region, conservation status, the increasing threats they are facing, and potential for the populations in the region to be genetically distinct from populations elsewhere.

The extent of occurrence of the Australian snubfin dolphin is from the southernmost resident population in the Fitzroy River and Keppel Bay region in central Queensland, north along the Queensland coast and across the Northern Territory, south to Roebuck Bay, Western Australia (Parra et al. 2002, Robertson and Arnold 2009, Thiele 2010, Palmer et al. 2011, Allen et al. 2012, Cagnazzi et al. 2013). 2 local estimates of population abundance include the Coubourg Peninsula (136-200 dolphins) and the Western Gulf of Carpentaria (227 dolphins). This estimate is questioned by many people, mainly due to difficulty of determining species from aerial surveys in turbid waters. There are < 100 on the east coast of Queensland.

Within Australia, the Australian humpback and Indo-Pacific bottlenose dolphins occur in coastal northern waters from approximately the Queensland-New South Wales border in the south-east, to the western Gulf of Shark Bay in Western Australia (Corkeron et al. 1997, Hale 1997, Preen et al. 1997, Parra et al. 2004, Hodgson 2007, Allen et al. 2012). Humpback dolphins are estimated at between 48-207 in number in the Coubourg Peninsula. The only other estimates are outside SE Asian waters in Queensland.

For the bottlenose dolphin, abundance estimates include the Coubourg Peninsula (34-78) and Pilbara (183), although the dataset is limited. They are more abundant in the south.

Dugongs are found throughout coastal waters of the NWMR and NMR. In north Australian waters dugong distribution extends from Shark Bay, Western Australia, in the west to Moreton Bay, Queensland, in the east (Marsh et al. 2002). There have been many more surveys throughout Australia than are listed here. Please see the presentation for figures. The dugong is considered the most endangered marine mammal in Australia. Even so, Northern Australia is considered the stronghold of dugong populations; two of the largest populations in the world are in the Gulf of Carpinteria and Northern Arnhem Land and there is a large population in Shark Bay.

Habitat Status

The coastline encompassing the Australian waters of Southeast Asia is remote and largely uninhabited. Most of Australia's population is concentrated in coastal regions along the southeast and east coast of southern Queensland, New South Wales and Victoria and the south west of Western Australia. Nevertheless, coastal developments across northern Australia are rapidly increasing through the expansion and development of the mineral, petroleum and natural gas industries and the concurrent infrastructure and activities associated with these developments. This increase in industry involves: construction of residential areas, ports and marinas, reclamation of tidal flats and estuarine habitats, dredging, dumping of spoils, seismic surveys, drilling, blasting, pile driving, boating, resource extraction, and tourism. Many of these activities are likely to result in local-scale change in the composition, structure and function of the coastal and estuarine habitats, and increase the potential for a wide range of threats.

Nevertheless, coastal developments across northern Australia are rapidly increasing through the expansion and development of the mineral, petroleum and natural gas industries and the concurrent infrastructure and activities associated with these developments. The bulk of Australia's mineral exploration activity occurs in Western Australia, the nation's premier petroleum producer: 62% natural gas (including LNG feedstock but excluding coal seam methane) and 77% of crude oil and condensate production in 2011–12. All piers/harbors are undergoing major expansion due to oil and gas exploration.This increase in industry involves: construction of residential areas, ports and marinas, reclamation of tidal flats and estuarine habitats, dredging, dumping of spoils, seismic surveys, drilling, blasting, pile driving, boating, resource extraction, and tourism. Oil exploration and gas exploration is concentrated along northwest cape north of Exmouth.

Many of these activities are likely to result in local-scale change in the composition, structure and function of the coastal and estuarine habitats, and increase the potential for a wide range of threats including:

- Dirrect removal of habitat (seagrass, mangrove)
- Physical disturbance and displacement as a result of:
- Increasing commercial and recreational vessel traffic
- Increasing noise from construction activities
- Chemical pollution
- Boat strikes from commercial and recreational vessel traffic
- Introduction of viral and bacterial pathogens

All inshore dolphin species (snubfin, Australian humpback and Indo-Pacific bottlenose) can be found in in nearshore coastal waters associated with mangroves and estuarine waters (Parra et al. 2002, Parra 2006, Parra et al. 2006, Parra and Jedensjö 2009, Allen et al. 2012). Recent workshops in 2010 (Townsville, 4-5 May) and 2012 (Melbourne; 10-11 December) on the status of tropical inshore dolphins in Australian waters identified coastal zone development as the major threat to inshore dolphins in northern Australian waters. Thus, the individual, as well as cumulative, effects of the above threats are cause for concern for the conservation and management of inshore dolphins as well as dugongs.

Directed Catch

As noted in the 2002 SEAMAM report (Perrin et al. 2005), direct killing of any cetacean species in Australian waters is prohibited under the EPBC Act. This prohibition also applies to all Australian nationals and Australian-registered vessels outside the Australian Exclusive Economic Zone (EEZ).There is no evidence of direct killing of whales and dolphins in Australian waters and the catching of wild marine mammals for display.

Aboriginal and Torres Strait Islander peoples, who are recognized as Native Title right holders, are permitted to hunt dugongs. The legal situation is less clear for indigenous people who are not Native Title holders. In the Australian waters of the Southeast Asian region, dugong hunting mainly occurs in the vicinity of isolated Aboriginal communities between Cape York and Broome in Western Australia (Marsh et al., 2002). There are no records of the catches of most communities.

By-catch in Fisheries

Incidental capture of marine mammals occurs in some of the Commonwealth and state fisheries operating in the Australian waters of Southeast Asia. Gillnets, demersal trawling and longlines have been implicated but there are few estimates available on the levels of bycatch. Most inshore commercial fisheries are the subject of regular assessments under the EPBC Act 1999.

As noted in the 2002 SEAMAM report (Perrin et al. 2005) there are unquantified catches of small marine mammals (e.g. snubfin dolphins, Australian humpback dolphins, bottlenose dolphins and dugongs) in inshore gill-nets fisheries mainly set for barramundi (Lates calcarifer Bloch, 1970) and threadfin salmon (Polynemus sheridani Macleay, 1884 and Eleutheronema tetradactylum Shaw, 1804) in the shallow coastal waters of the Gulf of Carpentaria in Queensland and along the northern coastlines of the Northern Territory and Western Australia (Hale 1997, Parra et al. 2002).

The incidental capture of common bottlenose dolphins (T. truncatus) is an on-going wildlife management problem in the Pilbara Trawl Fishery, Western Australia. The fishery was first assessed in 2002 by the Department of Fisheries Western Australia (DoFWA). An estimated 20 to 50 dolphins are captured annually in the fishery, depending on whether skipper logbooks or independent observer data is used (Allen et al. 2012). However, underwater video footage indicates that the actual bycatch rate may be considerably higher, since some dolphins are caught and fall out of the nets during trawling and before being landed on deck (Allen et al. 2012, Jaiteh et al. 2013). The impact this level of bycatch has on this dolphin population remains unknown (Simon Allen pers. comm., February 2013). In July of 2011, evidence of bycatch was found to be hidden by tying animals to cement blocks.

The Pilbarra Fish Trawl Interim Managed Fishery (PFTIMF) is the most productive scale-fish fishery in Western Australia (WA), with recent annual catches of 2-3,000 tons, currently all for consumption within Australia and making up some 75% of the scale-fish on the Western Australian market. There are currently four vessels that conduct 5-6000 trawl 'shots' per annum. It is a year-round, demersal, single otter-trawling operation with reduced effort

Underwater Footage from 36 trawls across the fishery was analyzed to determine the extent of dolphin-gear interactions and the behavior of dolphins inside the nets. Interaction rates were high, with dolphins present inside and outside the nets during 29 and 34 trawls, respectively, and for up to 99% of the trawl duration.

Types of Fisheries and Information on Scale

No information.

Other Threats of Concern

Climate change is a seemingly over-arching and pervasive threat to inshore dolphins and their habitat. Climate change impacts (e.g. high rainfall, increased catchment run off from storms and floods) will likely increase the exposure of dolphins to bio-accumulated toxins and infectious diseases, as well as indirectly impacting on the productivity of the ecosystems upon which they depend (Lawler et al. 2007). Climate change and its associated pressures (sea level rise, change in sea surface temperature and ocean acidification) are expected to have long-term impacts on the habitats and prey of local populations of inshore dolphins and dugongs.

Various pollutants enter coastal and estuarine waters along Australia's coastline (e.g. heavy metals, pesticides, herbicides, nutrients and sediments) from many different sources (e.g. industrial and sewage discharges, catchment runoff and groundwater infiltration) (Kemper et al. 1994, Cosser 1997, Hale 1997, Haynes and Johnson 2000). The adverse effects of these pollutants on marine mammal health are not fully understood. The concentration and rapid growth of the mining and petroleum industry across the NWMR and NMR is likely to increase pollution in these regions.

Research has also indicated that four (of five) humpback dolphins recovered along the QLD coast (three from Townsville and one from Gladstone) in 2000 and 2001 were infected with Toxoplasmosis gondii (Bowater et al. 2003). T. gondii is a terrestrial parasite that can be fatal or have deleterious effects on the health of marine mammals (e.g., infection with T. gondii is one of the leading causes of mortality of southern sea otters along the California coast (Kreuder et al. 2003)). It was hypothesized the humpback dolphins could have become infected by T. gondii through ingestion of water or sediment with T. gondii oocysts (i.e. sewage discharge or floods that carry contaminated sediments into creeks and rivers); or by direct ingestion of feline faeces discarded from recreational vessels or feral cats around ports (Bowater et al. 2003).

Disturbance through vessel activity is often associated with coastal development, recreational fishing and tourism activities. This can result in displacement of inshore dolphins from important habitats (e.g. foraging or resting sites) and can have more direct impacts through vessel noise and collision. Evidence of vessel strikes exist in Roebuck Bay, Western Australia: In Roebuck Bay, 42% of 124 identified individuals available for assessment had marks/scarring from fishing gear, 10% had vessel strike marks, and 11% had marks indicative of both fishing gear and vessel strike (Thiele 2010). At least 45 dugongs were struck by boats, and most killed, in Queensland between 1996 and 2010 (Biddle et al. 2011). This number likely under-represents the scale of this problem as it only accounts for those that are found stranded and injured.

Legal Status and Current Management Arrangements

National and state legislation specifically related to marine mammals

As noted in 2002 SEAMAM report, in Australian Commonwealth waters (which extend from 3nm offshore to the edge of the continental shelf or the Australian Fishing Zone, whichever is greater) marine mammals are protected under the EPBC Act. The Act provides for the protection of critical habitat, the identification of key threatening processes and the preparation of recovery plans, threat abatement plans, the issuing of conservation orders and wildlife conservation plans. Under the EPBC Act the Australian Whale Sanctuary has been established to protect all whales and dolphins found in Australian waters. The Australian Whale Sanctuary comprises all Commonwealth marine waters including all of Australia's Exclusive Economic Zone (i.e. out to 200 nautical miles and further in some places). Within the Sanctuary it is an offence to kill, injure or interfere with a cetacean.

In state waters (to 3 nm from the coastline) it is the responsibility of the state and territory governments to protect whales and dolphins. In Western Australia, marine mammals are protected under the Wildlife Conservation Act 1950. Interactions between humans and marine mammals in state waters that may injure, disturb, molest or otherwise interfere with, or result in the taking of marine mammals, are regulated by the Wildlife Conservation (Close Season for Marine Mammals) Notice 1998 issued under the Wildlife Conservation Act 1950. In the Northern Territory, whales, dolphins and the dugong are protected under the Northern Territory Parks and Wildlife Conservation Act 2000. In Queensland the Nature Conservation Act 1992 protects all marine mammals in Queensland waters. The Nature Conservation (Whales and Dolphins) Plan 1997and the Nature Conservation (Dugong) Plan 1997 outline measures to protect these marine mammals in Queensland waters.

National and state legislation related to fisheries

No information.

International Agreements ratified by nation

Australia is also signatory to several international conservation conventions related to marine mammal protection in this region including the International Convention for the Regulation of Whaling (Washington, 1946); the Convention on Biological Diversity (Rio de Janeiro, 1992); the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, Washington, 1973); and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979).

Regional Marine Protected Area planning

Conservation in Commonwealth waters is governed within marine reserves declared in November 2012, which were under transitional arrangements until management plans came into effect in July 2014. Transitional arrangements involved no changes on the water for marine users. The North-West Commonwealth Marine Reserves Network will include 335,437 km2 of Australia's marine area through 13 separate reserves. The North Marine Bioregion network protects 157,483 km2 through eight separate reserves.

Australia has the largest marine reserve network in the world. The reserves will be managed for the primary purpose of conserving the biodiversity found in them, while also allowing for the sustainable use of natural resources in some areas. The reserves include a vast range of ecosystems, habitats and biological communities representative of the North-west region. The reserves will help ensure our marine environment remains healthy and is more resilient to the effects of climate change and other pressures. Some people see these reserves as a step forward, some a step backward because people believe locations are not targeting high biodiversity areas, but preserving human use of marine resources.

At a state level, the Marine Parks and Reserves Authority (MPRA) is the vesting authority for Western Australian marine protected areas (MPA's) reserved under the provisions of the Conservation and Land Management Act 1984. There are three types of marine reserves in Western Australia (http://www.dec.wa.gov.au/management-and-protection/marine-environment):1) Marine parks (multiple use areas; recreational and commercial uses are allowed), 2) Marine nature reserves (no recreational or commercial extraction) and 3) Marine management areas (managed for prescribed conservation, recreational, scientific and commercial uses). Marine parks are multiple use areas created to protect natural features and aesthetic values while allowing recreational and commercial uses that do not compromise conservation values. There are 12 marine parks, one marine reserve and two marine management areas in Western Australia. Additional marine parks and reserves are currently been planned including: four marine parks in the Kimberley region (Camden Sound, Roebuck Bay, North Kimberleyand Ngari Capes) and a marine park and marine management area in the Pilbara Region at Dampier Archipelago and Regnard, respectively.

The Parks and Wildlife Commission of the Northern Territory is responsible for the management of land and marine protected areas across the Territory. There are only two marine parks in the northern Territory state waters (http://www.parksandwildlife.nt.gov.au/parks): 1) Cobourg Marine Park (2290km 2) in the waters surrounding Cobourg Peninsula and the Limmen Bight Marine Park in the western Gulf of Carpentaria (880 km2). However, a number of other parks in the NT (Charles Darwin National Park, Berry Springs Nature Park, Casuarina Coastal Reserve, Shoal Bay Coastal Reserve, Tree Point Conservation Area and Kakadu National Park) include marine and coastal areas.

In summary, there is good legal basis for the protection and management of marine mammals in Australia.

Conservation and Education Programs

No information.

Folk Attitudes and Interactions with Marine Mammals

No information.

Description of Existing and Past Research and Training Programs

Existing groups and agencies that conduct marine mammal research in SE Asian Australia include:

- Flinders University Cetacean Ecology, Behaviour and Evolution Lab (CEBEL)
- Murdoch University Cetacean Research Unit (MUCRU)
- James Cook University (JCU)
- Australian National University (ANU)
- Curtin University Centre for Marine Science and Technology (CMST)
- Northern Territory Government Department of Land Resource Management (DLRM)
- Western Australia Centre for Whale Research

Ongoing research (CEBEL)

- Population genetics and phylogeography of snubfin and humpback dolphins
  - Population structure and identification of management units
  - Genetic connectivity at national level
- Ecology of humpback dolphins in the Northwest Cape region, Western Australia
  - Abundance, habitat use, movement patterns, social and population structure
  - Comparative studies of the impact of the oil and gas exploration boom (before, during and after)

Ongoing research (MUCRU)

- Ecology of snubfin and humpback dolphins in Kimberley region
  - Abundance, habitat use, movement patterns, social and population structure, passive acoustics
- Bycatch in the Pilbara trawling fishery
  - Assessments of bycatch rates, subsurface behavior, abundance and genetic connectivity
  - Chevron Dugong research program
  - Distribution, abundance, habitat use, movement patterns
  - Unmanned aerial vehicles (for surveying marine mammal populations)
  - Determine capabilities; assess detection probability, compare manned versus unmanned surveys

Ongoing research (ANU)

- Roebuck Bay inshore dolphin project
- Distribution, abundance, habitat use, behavior
- Not much published yet
- Aggregation point for snubfin

Ongoing research (DLRM)

- Darwin coastal dolphin monitoring program
- Population dynamics, behavior, habitat use
- In relation to oil and gas
- Satellite tagging of false killer whales
- Movements, habitat use
- Coubourg coastal dolphin monitoring program
- Distribution, abundance, behavior, habitat use

Ongoing research (JCU)

- Status of inshore dolphins in Gulf of Carpentaria
  - Distribution, abundance, behavior, habitat use
- Spatial population models of dugong distribution and relative abundance
  - Spatial distribution and density modeling, spatial risk assessment
- Socio-economic studies of dugong harvest
  - Assessment of social and economic impact of dugong harvest

Ongoing collaborative research

- Passive acoustic monitoring of coastal dolphins (MUCRU, CMST, and ANU)
  - Develop a method for conducting passive acoustic surveys of inshore dolphins

Needs for additional Research and Training

Information on the ecology and conservation biology of most of the marine mammals occurring in this region is practically non-existent. Research efforts are sporadic and uncoordinated—many are commissioned to determine potential adverse effects of proposed mining developments and their associated port facilities, but consider each development on a case-by-case basis, and ignore the potential cumulative impacts. The development of a strategic plan for marine mammal research in the region should be a high priority, particularly for inshore dolphins and dugongs that are the species most at risk from the rapid industrial development currently happening across northern Australia.

The following research should be considered high priority in northern Australia for inshore dolphins and dugongs:

1. Undertake a broad-scale assessment of their distribution, abundance and genetic population structure
2. Investigate their behavioural ecology and habitat preferences
3. Develop spatially explicit models of their distribution and density at a regional level
4. Conduct spatial risk assessment of the threatening processes

Such research has the potential to provide relevant, accessible and evidence-based information to support species conservation assessments as well as improved decision making with respect to environmental impact assessments.

Present and Potential Marine Mammal Watching Operations

The Commonwealth has developed The Australian National Guidelines for Whale and Dolphin Watching 2005, to minimize potential disturbance to marine mammals from boats, planes and helicopters. The guidelines were developed jointly by the Australian and all state and territory governments through the Natural Resource Management Ministerial Council. They provide a consistent national policy and outline the standards that allow people to observe and interact with whales and dolphins while ensuring the safety of both animals and humans.

Currently there are no marine mammal watching operations in in Australian waters of SE Asia. Due to the remote and largely uninhabited nature of this area the potential for development of such an industry is low. However, as tourism expands, there is growing potential for marine mammal watching operations in the Kimberley region between Broome and Wyndham and in Ningaloo Reef Marine Park and Exmouth Gulf, in Western Australia.

Australian cetacean tourism has been increasing rapidly with an annual growth rate of 8.3% in the last 10 years (O'Connor et al. 2009). Australia takes at least 30% of global cetacean tourism revenus. In 2008, more than 1.6 million tourists participated in whale and dolphin watching activities in the country, which were provided by 137 operators (O'Connor et al. 2009).

Questions after the Presentation

Phil Dearden: Any particular research needs related to MPAs?

- Response (Guido): Much work in Australia trying to establish important areas for these species are being captured in the MPAs; guesses that most of the important areas for inshore species are not being captured.
- Phil: If Australia can't do it, how will less developed countries be able to do it?
- Response (Guido): Marine reserves are expanding, but biodiversity is still declining…so something is wrong, perhaps the location of these areas; decisions based on politics as well as natural science

Ellen Hines: Spatial risk mapping – need good information on distribution of human use.

- Response (Guido): Trying to develop in scale of Australia; refers to 2 papers from Duke – Global scale of human impacts on cetaceans; Australia appears as one of the hotspots for potential cetacean extinction (of 13 hotspots).
- Ellen: Low resolution models can be counterintuitive.
- Response (Guido): Tropical inshore dolphin workshop for Australia; Wrote draft – recommendations include that data on anthropogenic threats is available, but hasn't been put into models; hoping to get together with people to effectively map at scale of Australia (e.g., including mining, residential coastal development, shipping traffic) – just needs to be collated.

Randy Reeves: What about the endemism of Snubfin dolphin as they are also found in Papua New Guinea, and why it is said that it's endemic to Australia?

- Response (Guido): Still questions about whether O. heinsohni occur in PNG; researchers conducting interviews with fishers and surveys.

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SEAMAM III Report - Brunei

Report written by Gin Swen Ham and Fairul Izmal Jamal Hisne

Species and Distribution

A review of records obtained from various sources (primary literature, museum records, local media reports, anecdotal accounts and third party reports) found that a total of 15 species of marine mammals, including both confirmed and unconfirmed sightings, have been recorded to occur in Bruneian waters. Out of these, cetaceans comprised 14 species, while the 15th species is a sirenian, the dugong (*Dugong dugon*). Only 12 of the 14 cetacean species are confirmed records, including Bryde's whale (*Balaenoptera edeni*), Blainville's beaked whale (*Mesoplodon densirostris*), pygmy sperm whale (*Kogia breviceps*), pygmy killer whale (*Feresa attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), bottlenose dolphin (*Tursiops sp.*), spinner dolphin (*Stenella longirostris*), rough-toothed dolphin (*Steno bredanensis*), Indo-Pacific humpback dolphin (*Sousa chinensis*), Irrawaddy dolphin (*Orcaella brevirostris*), pantropical spotted dolphin (*S. attenuata*) and Indo-Pacific finless porpoise (*Neophocaena phocaenoides*). There have also been unconfirmed records of minke whales (*B. acutorostrata*), and Risso's Dolphin (*Grampus griseus*).

All marine mammal species recorded in Bruneian waters are known from either live sightings, or stranding records, or both, as shown in Table 1. Bottlenose dolphins, humpback dolphins, Irrawaddy dolphins, pantropical spotted dolphins and Risso's dolphins have only been observed in the wild, with no stranding records. On the other hand, Blainville's beaked whales, pygmy killer whales, pygmy sperm whales and rough-toothed dolphins are only known from stranding records. Dugongs, Bryde's whales, short-finned pilot whales, spinner dolphins and Indo-Pacific finless porpoises are known from both live sightings and stranding records. The origin of the skeletal remains of a minke whale held at the Brunei Museum is unknown.

(1) Dugong (*Dugong dugon*)

There were a total of four sightings of dugongs, including 3 live sightings and 1 dead animal found in the water. Only three of the sightings were positively identified. The first sighting in October 1989 was of two individuals swimming together near the water surface at Muara (PNHS, pers. comm). The second sighting in February 1990 was made by aerial observers offshore, who could not positively identify the animals (PNHS, pers. comm.). The third sighting was a 1.75m individual found entangled in fishing nets on 15 May 1996, which was later escorted back to sea by divers from Fisheries Department (Wong & Ahmad, 1996). The last sighting was a 1m juvenile found dead in the water near the Navy Base in Muara (Wong & Ahmad, 1996).

(2) Bryde's Whale (*Balaenoptera edeni*)

There were a total of five sightings of Bryde's whales. Four of the sightings were from aerial observations made offshore in April and May 1991. Group compositions included mother-calf pairs, single individuals and small groups of two to three individuals (Elkin, 1991). It was noted that these groups were moving in a north-easterly or easterly direction (Elkin, 1991). The most recent sighting was of an individual stranded in shallow waters and trapped in a fish farm near Pulau Pelompong in May 2003 (Anwar, 2003b). The individual was injured and had a partially severed fluke (presumably a result of entanglement in the fish farm's nets). It was later rescued and freed.

All sightings have been positively identified. Observers of the 1991 sightings were able to see the three head ridges characteristic of this species. Photographs of the stranded animal at Pulau Pelompong in 2003 clearly showed the three head ridges. Skeletal remains of a B.edeni are held at the Brunei Museum, but no information was available of its origin.

(3) Minke Whale (*Balaenoptera acutorostrata*)

One of the whale skeletal remains held in the Brunei Museum was labelled as Balaenoptera acutorostrata. However, no additional information was available. Anwar (2003a) reported that B. acutorostrata has been found in Brunei in the past, but no other details were given.

(4) Blainville's Beaked Whale (*Mesoplodon densirostris*)

In 1996, a single marine mammal was found stranded alive on a beach at Panaga E10, Belait district. Efforts were made to push the individual back to sea, but the attempt was unsuccessful and the animal later died. The animal had a large, crescent-shaped, possibly fresh open wound, and tooth puncture-like marks, on the ventral side of its peduncle/tail stock area. The animal was first wrongly identified to be a Cuvier's beaked whale (Ziphius cavirostris) (McIlroy & Dols, 2009), but was later re-identified to be a Blainville's beaked whale (W, Bachara, pers. comm.). It was determined to be a female as its teeth did not penetrate the gum. The skeletal remains of this individual are now being held at the Brunei Museum. However, the museum is still labelling the specimen as a Z. cavirostris.

(5) Pygmy Sperm Whale (*Kogia breviceps*)

On 19 April 1996,two individuals were found stranded on a beach near the Anduki airstrip, Belait district. One of the animals was reported to be injured but no descriptions of the injury were given. Attempts were made to rescue the animals and push them back out to sea. Only one of the animals was successfully rescued and it swam back out to sea. The second animal later died. The animals were described as having "a low dorsal fin, a black upper body, and a reddish body" (PNHS, pers. comm.), and were identified to be pygmy sperm whale.

(6) Short-finned Pilot Whale (*Globicephala macrorhynchus*)

There were two aerial observations of short-finned pilot whales

Species	Confirmed record	Unconfirmed record	Live sighting	Stranding
Family *Dugongidae*				
Dugong (*Dugong dugon*)	×		×	×
Family *Balaenopteridae*				
Bryde's Whale (*Balaenoptera edeni*)	×		×	×
Minke Whale (*Balaenoptera acutorostrata*)		×	?	?
Family *Ziiphidae*				
Blainville's Beaked Whale (*Mesoplodon densirostris*)	×			×
Family *Kogiidae*				
Pygmy Sperm Whale (*Kogia breviceps*)	×			×
Family *Delphinidae*				
Short-finned Pilot Whale (*Globicephala macrorhynchus*)	×		×	×
Bottlenose Dolphin (*Tursiops sp.*)	×		×	
Spinner Dolphin (*Stenella longirostris*)	×		×	×
Rough-toothed Dolphin (*Steno bredanensis*)	×			×
Indo-Pacific Humpback Dolphin (*Sousa chinensis*)	×		×	
Irrawaddy Dolphin (*Orcaella brevirostris*)	×		×	
Finless Porpoise (*Neophocaena phocaenoides*)	×		×	×
Risso's Dolphin (*Grampus griseus*)		×	×	
Pygmy Killer Whale (*Feresa attenuata*)	×			×

Species	Confirmed record	Unconfirmed record	Live sighting	Stranding
Pantropical Spotted Dolphin (*Stenella attenuata*)	×		×	

Table 1: Checklist of marine mammal species in Bruneian waters, based on live sightings and stranding records, including both confirmed and unconfirmed sightings.

in offshore Brunei waters. The first sighting, in February 1990, was of a single individual swimming just below the surface (Elkin, 1991). The second sighting, in October 1990, was of a group of 10 individuals (average 6m in length), including a relatively larger individual of approximately 8m in length, and a calf of approximately 4m in length. Behaviour of the group was described as slow swimming. The adults demonstrated protective behaviour by "moving in and over the calf" when the helicopter carrying the observers hovered above the group (Elkin, 1991).

Two strandings of short-finned pilot whales have been recorded in recent years. The first one, in March 2006, was of an individual of less than 2m in length found stranded alive on Panaga beach (PNHS, pers. comm.). It was reported to have non-life threatening wounds but no photographs or descriptions of the injury were available (McIlroy & Dols, 2009). Successful attempts were made to rescue and release the animal back out to sea. The second stranding occurred on a beach in the W4 area along Jalan Maulana in Kuala Belait in January 2010. The animal was reported to be approximately 6 feet in length, and was rescued (PNHS, pers. comm.).

The most recent sighting was of a group of seven to ten individuals sighted in offshore waters on 25 May 2013 (Fairul Izmal et al., in prep) while on an environmental baseline survey. When first sighted, the animals were displaying surface-active behaviour and seemed to be staying in the same general area. As the survey vessel approached, the animals slowly moved away. A few individuals appeared to be larger in size compared to other members of the pod.

(7) Bottlenose Dolphin (*Tursiops sp.*)

There were four unconfirmed sightings of Tursiops sp., mostly in offshore waters. Identification of these sightings was tentative. Elkin (1991) reported 29 boat-based and aerial observations of T. truncatus in offshore waters. However, Beasley & Jefferson (1997) stated that the photographs of these observations showed "characteristics of aduncus-type bottlenose dolphins".

(8) Spinner Dolphin (*Stenella longirostris*)

There were six confirmed sightings of spinner dolphins in Bruneian waters, including three stranding incidents and three live sightings. The first stranding incident, in March 1989, was of an individual stranded on a beach near Panaga E7 area, Belait district. The animal was cared for for three days and then euthanized (PNHS, pers. comm.). The second stranding occurred in June 1989, on a Panaga beach. The animal was found alive, but died later. The third stranding was of a dead animal on a beach near Panaga F4 area. There were two live sightings observed in offshore waters near oil fields (PNHS, pers. comm). The first sighting, in May 1990, was of two large groups of dolphins. The second sighting, in Aug 1990, was of a small group of five individuals. The most recent sighting was a group of approximately 30 animals sighted in offshore waters (Fairul Izmal et al, in prep) while on an environmental baseline survey. The group was travelling fast and close to the survey vessel as the vessel was moving. Approximately 10 individuals approached the vessel to bow-ride.

(9) Rough-toothed Dolphin (*Steno bredanensis*)

There had been only two confirmed sightings of rough-toothed dolphins in Bruneian waters. The first was a stranding record in 1989 (Beasley & Jefferson, 1997). The skull of the stranded animal is held at a British museum. The second sighting was a stranding incident that occurred recently on 2 September 2013. The animal was found to have stranded alive on Seri Kenangan beach in Tutong district, and was pushed back to sea by two passer-bys. The incident was reported in the local media and video obtained of the incident clearly showed the characteristics of S. bredanensis.

(10) Indo-Pacific Humpback Dolphin (*Sousa chinensis*)

There were only three sightings of Indo-Pacific humpback dolphins in Bruneian waters. The first was an unconfirmed sighting of a group of 10 individuals made by observers from a dive boat in March 1990, who based their identification on size and "very light colour" of the animals (Elkin, 1991). Observers on an oil barge offshore sighted two small groups of five and two individuals, on 14 and 15 April 1990, respectively. The animals were described as "ivory white" (PNHS, pers. comm.).

(11) Irrawaddy Dolphin (*Orcaella brevirostris*)

There were only two sightings of Irrawaddy dolphins. In October 1990, an unconfirmed sighting of a group of five individuals "circling slowly in muddy water very close to shore" was made from aerial observations (Elkin, 1991). In February 2008, a group of five individuals was sighted between Pulau Baru Baru and Pulau Berambang in very murky water (PNHS, pers. comm). There were earlier confirmed sightings made by other researchers at the mouth of Brunei River and near Muara Island (Beasley & Jefferson, 1997).

(12) Indo-Pacific Finless Porpoise (*Neophocaena phocaenoides*)

There were a total of 10 confirmed sightings of Indo-Pacific finless porpoises in Bruneian waters between 1990 and 2012. All sightings were made along the Belait coast. Seven of these sightings were stranding incidents of single individuals which were already dead when found. In two particular incidents, the observers described the animals "appeared as if they died while giving birth, with the membranes and what looked like an unborn young halfway out of the mother's body", but no photographs were available to verify these sightings (H. Dols, PNHS, pers. comm.). Live sightings of this species were observed close to shore (PHNS, pers. comm.).

(13) Risso's Dolphin (*Grampus griseus*)

There was only one unconfirmed sighting of Risso's dolphins in Bruneian waters. Elkin (1991) reported a group of 14 individuals sighted offshore, moving in a north-easterly direction, and displaying active behaviour ("rolling and diving around"). The animals were described as approximately 4 m in length, with the adults appearing white in colour, and younger animals light grey in colour.

(14) Pygmy Killer Whale (*Feresa attenuata*)

A marine mammal was found stranded on a beach in Kuala Belait on 17 October 2013. It was alive when found, but later died. The Wildlife Department responded to the stranding, and the Panaga Natural History Society (PNHS, a local social club which has been documenting Brunei wildlife) was notified. The animal measured approximately 3m in length, and was described as having "a rounded forehead, long slender tail, dark grey to black in colour, a paler colour on the ventral side, with white around the jaw and chin" (H. Dols, PNHS, pers. comm.). Photographs and tissue samples were taken. The animal was buried at the beach, and the skeletal remains were later retrieved by Brunei Museum officials. The animal was identified as a pygmy killer whale by whale expert Wojtek Bachara (H, Dols, PNHS, pers. comm.).

(15) Pantropical Spotted Dolphin (*Stenella attenuata*)

On 27 May 2013, a pod of 10 – 15 pantropical spotted dolphins was sighted while on an environmental baseline survey (Fairul Izmal et al., in prep). At the time of sighting, the survey vessel had stopped and was drifting in the direction of the animals. Initially, the group was milling in a general area with a few surface-active individuals. As the vessel drifted towards them, approximately six to eight individuals approached the vessel and started bowriding. Other members of the pod swam away.

Population Status

No information.

Habitat Status

No information.

Directed Catch

There are no known fishing activities in Brunei that target marine mammals.

By-catch in Fisheries

No information.

Types of Fisheries and Information on Scale

No information.

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

All marine mammal species are protected under the Fisheries Order 2009, under the management of the Department of Fisheries. The 2009 Order states that it is an offence for any person to "fish for, disturb, harass, catch, sell or otherwise dispose of or take any aquatic mammal which is found in Brunei Darussalam waters".

Only the dugong is listed as a protected species under the 1978 Wildlife Act. The 1978 Wildlife Act is the predominant environmental legislation relating to biodiversity conservation and management.

National and state legislation related to fisheries

No information.

International Agreements ratified by nation

No information.

Regional Marine Protected Area planning

No information.

Conservation and Education Programs

No information.

Folk Attitudes and Interactions with Marine Mammals

No systematic surveys have been carried out to study folk attitude and interactions with marine mammals. Conversations with members of the general public reveal that Bruneians are generally not aware of the existence of marine mammals in Bruneian waters. Others, such as fishermen or oil and gas workers, mentioned encounters with marine mammals while working offshore.

Description of Existing and past Research and Training Programs

At present, there is no active research effort being undertaken on marine mammals in Brunei. Panaga Natural History Society (PNHS), a local social club based in Panaga, Belait district, conducted a project known as "SEAWATCH" over a period of 17 months from November 1989 to June 1991, which aimed at documenting marine life in Brunei (Elkin, 1991). They were able to record a number of marine mammal sightings, among other marine animals. Since then, PNHS has been continually documenting opportunistic sightings of marine mammals. However, PNHS members are not trained observers or marine mammal experts with little or no background in marine mammal identification. They depended on personal experiences (through opportunistic sightings over the years) and consultation with marine mammal experts to identify any marine mammal sightings.

The local oil and gas industry employs dedicated Marine Mammal Observers onboard its offshore surveys in Brunei waters. Marine mammal sightings data obtained from some of these surveys has been added to the marine mammal sighting record of Brunei.

Needs for additional Research and Training

There is an urgent need for research as the status of marine mammals in Bruneian waters is poorly understood. There has never been any dedicated research on marine mammals in Bruneian waters and no current research efforts exist. Most information is obtained from opportunistic sightings by the general public. The number of species, number of sightings and abundance may have been underestimated. The population and habitat status of each species are not known. There is also no information on marine mammal bycatch in the local fishing industries.

Present and Potential Marine Mammal Watching Operations

There is no whale and dolphin watching operations in Brunei at present. The viability of such operations in Brunei remains to be seen as more studies need to be undertaken.

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SEAMAM III Report - Cambodia

Presentation by Gerry Ryan and Phay Somany

Species and Distribution

Before 2001, only Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) and Irrawaddy dolphins (*Orcaella brevirostris*) were formally recorded and unconfirmed local reports of Indo-Pacific humpback dolphins (Sousa chinensis) were received during the coastal surveys for coral and sea grass (Nelson 1999).

Dugongs (*Dugong dugon*) were reported to be abundant along parts of the coast until approximately 1975 (Nelson 1999). Eleven species of marine mammals were formally recorded in 2001; eight of them were identified based on sightings from boat-based survey and three species were identified based on carcass and skeleton collection.

Population Status

The 11 species of marine mammals are determined as fishery endangered species and fully protected under the Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009. Quantitative estimate of each species is not available yet. Sixty-eight carcasses of marine mammals have been recorded formally since 2002.

Irrawaddy dolphins in the Mekong are Critically Endangered according to the IUCN Red List, and in immediate danger of extirpation due to low numbers and high, ongoing mortality. In 2007, there were 93 dolphins. By 2010, just 85 dolphins remain.A new population update is forthcoming.. From 2003-2012, there were 119 mortalities. 61% of those were young calves.

Habitat Status

There is no large scale modification, but there is ongoing small-scale degradation, overfishing, and cutting of flooded forest. One major threat to habitat is hydropower development on the mainstream. Three hydropower dam proposals are directly in or beside core habitat.

Directed Catch

There is deliberate killing and capture of marine mammals. Dugong tusks and meat are valuable in markets. In 1993, 11 Irrawaddy dolphins were captured by villagers using surrounding nets. Seven were eventually released, four were sold to Safari World in Bangkok, and two of those animals were sent to Japan. In 2002, local villagers were hired by a casino near the Thai border to catch Irrawaddy and Indo-Pacific hump-backed dolphins. Most of them were released, but the casino ended up keeping four dolphins. Due to oldage, six Indo-Pacific humpback dolphins were released from the Koh Kong Safari in early 2012 and dolphin shows have not been performed since.

By-catch in Fisheries

Gillnets, particularly Spanish mackerel nets, are the main causes of marine mammal entanglement. Physical surrounding nets are strongly impacting the feeding activities of dugongs in sea grass beds. Sixty-eight carcasses of marine mammals have been collected since 2002 by members of the marine mammal stranding network and the four marine fishery cantonments, including 47 carcasses of Irrawaddy dolphins, three carcasses of finless porpoise, nine carcasses of humpback dolphins, one live stranding of short-finned pilot whale (*Globicephala macrorhynchus*), two carcasses of unidentified whales and six dugongs.

Types of Fisheries and Information on Scale

The main gear types commonly used in Cambodia's marine waters are mackerel purse seines, anchovy purse seines, mantis shrimp gillnet, crab gillnet, shrimp gillnet, fish gillnet, push net, stow nets, beach seine, crab trap, squid trap, hook line, and trawl. Trawling boats are not allowed to fish in areas where the depth of waters is less than 20 m. 7,226 fishing vessels are currently used in Cambodian marine waters (data 2012).

A total of 43% of households in Kratie and 77% of households in Stung Treng fish with gillnets. Fishery is worth ~USD5M annually. Fishing is primarily for family food and then supplementary income.

Other Threats

Habitat degradation is a problem. Sea grass beds are destroyed by motorized trawlers. There were two cases of live capture for show, from1993 and 2002. Sand dredging is happening at Koh Kong and the bay of Preah Sihanouk.

There is high calf mortality of Irrawaddy dolphins, with very little evidence of fisheries involved.

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

- Commission of Dolphin Conservation and Development of Mekong River Dolphin Ecotourism Zone: Sub-Decree No. 15 Or Nor Kror/Bor Kor, 17/02/2006
- Determination of Types of Fisheries and Endangered

Fisheries Products: Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
- Creation of the Mekong River Dolphin's Managerial Protection Zones: Sub-Decree No. 155 Or Nor Kror/Bor Kor dated 25 September 2012

National and state legislation related to fisheries

- Law on Fisheries: Royal Decree Nor Sar/Ror Kor Mor 0506/011, 21/05/2006
- Management of Community Fisheries: Sub-Decree No. 25 Or Nor Kror/Bor Kor, 20/03/2007
- Determination of Types of Fisheries and Endangered Fisheries Products: Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
- Proclamation No. 571 Bro Kor – Kor Sor Kor dated September 06, 2010 on the Protection Measures for the Endangered Fisheries Product
- Proclamation No. 005 Bro Kor – Kor Sor Kor dated January 11, 2010 on the Technicality of Measuring the Size of all types of Gillnets and Dragnet in the fishing zone of the Kingdom of Cambodia

International Agreements ratified by nation

- International Convention for the Regulation of Whaling
- United Nations Convention on Biological Diversity: Party to the Convention
- The Convention of Wetlands of International Importance Especially as Waterfowl (Ramsar Convention)
- Convention on the Conservation of Migratory Species of Wild Animals: Not party to the Convention, however agreed to MoU on marine turtle protection.
- Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES): Ratified
- United Nations Convention on Fishing and Conservation of the Living Resources of the High Seas: Accessed to the Convention
- Stockholm Convention on Persistent Organic Pollutants: Ratified of the Living Resources of the High Seas: Accessed to the Convention
- Stockholm Convention on Persistent Organic Pollutants: Ratified

Regional Marine Protected Area planning

There are four marine protected areas in Cambodia: Peam Krosop Wildlife Sanctuary (25,897 hectares with rich biodiversity), Ream National Park (15,00 hectares of land and 6,000 hectares of marine habitats with significant coral reef resources), Botum Sakor National Park covers 171,250 ha and Dong Peng Multiple Use Area covers 27, 700 ha. The 32,492 ha of seagrass beds in Cambodian waters is proposed as a seagrass conservation and management area. The areas around Koh Rong and Koh Rong Samloem in Kampong Som Province is proposed to be marine fisheries management area.

Conservation and Education Programs

Training on marine mammal stranding protocol was provided to members of the marine mammal stranding network at the end of 2004. A workshop to present survey results to responsible Government agency was organized in 2002. A number of marine mammal conservation awareness meetings and workshops were conducted in 2005. Disseminations of Sub-Decree on the determination of types of fisheries and endangered fisheries products are currently conducted in key fishing villages and communities.

Outreach and education by working with Buddhists monks to disseminate marine conservation measures and working with local rural development group to change livelihood (e.g., from gillnet fisheries to pond aquaculture and chicken farms.

To enforce policy, river guards patrol the waters to prevent gillnet fishing in core habitats.To increase the recognition of this bycatch problem, The Government signed a declaration about the conservation of Mekong river dolphins.

Folk Attitudes and Interactions with Marine Mammals

No information.

Description of existing and past Research and Training Programs

There is no research on marine mammals conducted before 2001. The first boat–based survey on marine mammals was conducted by the Department of Fisheries, James Cook University and WCS in 2001. Eight species of marine mammals were formally recorded from the survey. Then, aerial survey of dugongs was conducted in 2004. Due to low tide during the survey time, no dugong were found. A number of interview surveys on abundance, distribution and threats were conducted in key fishing villages. No survey on marine mammals has been conducted since the first quarter of 2004. Only activities of marine mammal stranding network have been recorded. This network was created in 2005 with the main support from Ocean Park Conservation Foundation (OPCF).

Needs for additional Research and Training

Additional surveys need to be conducted to assess current abundance, distribution, threats and hot spot habitats.

Present and potential Marine Mammal Watching Operations

- Dolphin watching "eco"-tourism: Dolphins as pillar for tourism (for economy).

Questions after the Presentation

Ellen Hines: Was there a case in 2002 where villagers said that about 20-22 animals were captured and some of them died?

- Response (Phay Somany): Could not remember.

Louella Dolar: Are there plans to decrease boat-based ecotourism and concentrate more on land-based survey during dry season?

- Response (Gerry Ryan): There are no plans to decrease boat-based ecotourism. There are two deep pools, one exclusively in Cambodia and one on Cambodia-Laos border, and there is not much engagement from Laos in the boat-based ecotourism in Laos-Cambodia. The local community supports the tourism because they get paid as boat drivers.
- Response (Phay): Need to look at two different places, one in Cambodia, and one on border. Used to have regulations for tourism management, but no longer in year 2006. Based on Kratie declaration, it is agreed that tourism management is one of key things that WWF and FA need to draft regulations to Dolphin Commission. It would be good to have land-based observation, and limit boats in dry season.

Putu Liza Mustika: The term "ecotourism" should be used carefully because ecotourism has to be sustainable, benefit the locals, and contains educational components. It is more suitable to use the terms "nature-based tourism", "dolphin tourism" or "wildlife tourism" instead. And is there any rehabilitation for the Indo-Pacific humpback dolphins before they are released?

- Response (Phay Somany): Don't know as very limited information was received.

Guido Parra: In regards to calf mortality, there are many hypotheses. Behavioural habitat hypothesis?

- Response (Gerry Ryan): High concentration of animals in deep pools in dry season, and also the peak calving season. Aggressive interactions observed among calves particularly newborn and perhaps aggregation or other stressors are causing aggression. Adult mortality is caused by gillnets, but no cause determined for calf mortality.

Zhou Kaiya: About the release of Indo-Pacific humpback dolphins due to old age, do they have the ability to survive?

- Response (Phay Somany): Not sure, only get information that the dolphins were released. It happened in the beginning of year 2012, and not involved so do not know the fate of the animals.

Md. Zahangir Alom: Any further information about the consumption of dolphin?

- Response (Gerry Ryan): It is a case where the dolphin was found by a Buddhist fishermen. Muslims (Cham people) are okay with it, so it was taken to the village and the dolphin meat was distributed in the village. There are no interview surveys in that area, but there are ongoing community meetings with people, and lots of interviews within dolphin habitat.
- Response (Phay Somany): The belief of Cambodian people is that they do not eat dolphin meat. Anyway, small ethnic (Cham people) along the river are still confused and could not differentiate between dolphin and fish. After education and outreach, they are now fully aware of that.

Tara: Time-scale of habitat decline?

- Response: In 1950s: clear that there are still some dolphins down into Mekong and into Tonle Sap. In early 2000s, interviews done by Isabelle show that there are no dolphins found in Tonle Sap or delta; at some point between 1950s and late 90s; contraction occurred. During 1980s, probably last time seen there. Lots of internal political turmoil and people are displaced.

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SEAMAM III Report - Cetaceans in Chinese waters

Presentation by Kaiya Zhou, Samuel K Hung and Qian Zhu

Species and Distribution

The Chinese marine mammals include representatives in three mammalian orders: Cetartiodactyla, Carnivora and Sirenia (Table 1). Since the pinnipeds in Chinese waters spend most of their time in cold-waters and the dugong has been extirpated from China for years, the present report will focus on cetaceans only.

The Chinese cetacean fauna contains nine of the world's 14 cetacean families and 25 of the 40 genera, among which Lipotidae is endemic (Table 1). Thirty-eight of cetaceans have been reported from Chinese waters (Table 2, the baiji is also included, though it is believed to have gone extinct in 2006). There are six species from the Bohai Sea, 17 from the Yellow Sea, 36 from the East China Sea, 25 from the South China Sea and five from the Yangtze River (two resident and three vagrants).

The present report briefly introduces population status of baiji (*Lipotes vexillifer*), Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*) and Chinese populations of Indo-Pacific humpback dolphin (*Sousa chinensis*).

Family	Number of genera	Number of species
Balaenidae	1	1
Eschrichtiidae	1	1
Balaenopteridae	2	7
Physeteridae	1	1
Kogiidae	1	2
Ziphiidae	4	6
Lipotidae	1	1
Delphinidae	13	17
Phocoenidae	1	2
Otariidae	2	2
Phocidae	3	3
Dugongidae	1	1
Total	31	44

Table 1: Number of genera and species in the families of Chinese marine mammals

Family	YTR	BHS	YLS	ECS	SCS
1. *Eubalaena japonica*			C	C	
2. *Eschrichtius robustus*		C	C	C	C
3. *Megaptera novaeangliae*			C	C	C
4. *Balaenoptera acutorostrata*		C	C	C	C
5. *Balaenoptera edeni*			C	C	C
6. *Balaenoptera omurai*				C	C
7. *Balaenoptera borealis*			C	C	C
8. *Balaenoptera physalus*		C	C	C	C
9. *Balaenoptera musculus*				C	
10. *Physeter macrocephalus*			C	C	C
11. *Kogia breviceps*				C	C
12. *Kogia sima*				C	C
13. *Ziphius cavirostris*			C	C	C

Family	YTR	BHS	YLS	ECS	SCS
14. *Berardius bairdii*				C	
15. *Indopacetus pacificus*				C	
16. *Mesoplodon ginkgodens*				C	
17. *Mesoplodon densirostris*			C	C	
18. *Mesoplodon peruvianus*				C	
19. *Lipotes vexillifer*	EX			C	
20. *Steno bredanensis*				C	C
21. *Sousa chinensis*	S		O	C	C
22. *Tursiops truncates*	S		C	C	C
23. *Tursiops aduncus*				C	C
24. *Stenella attenuata*				C	C
25. *Stenella longirostris*				C	C
26. *Stenella coeruleoalba*				C	C
27. *Delphinus delphis*			C		
28. *Delphinus capensis*				C	C
29. *Lagenodelphis hosei*				C	C
30. *Lagenorhynchus obliquidens*				C	
31. *Grampus griseus*			C	C	C
32. *Peponocephala electra*				C	C
33. *Feresa attenuata*				C	
34. *Pseudorca crassidens*	S	C	C	C	C
35. *Orcinus orca*		C	C	C	
36. *Globicephala macrorhynchus*				C	C
37. *Neophocaena asiaeorientalis*	C	C	C	C	
38. *Neophocaena phocaenoides*				C	C
Number of species	5	6	17	36	25

YTR = Yangtze River, BHS = Bohai Sea, YLS = Yellow Sea, ECS = East China Sea, SCS = South China Sea, C = confirmed, O = occasionally, S = stranding, EX = functionally extinct

Table 2: Occurrence of cetaceans in Chinese waters

Population Status

Functional extinction of Yangtze river dolphin (baiji)

The baiji, or Yangtze river dolphin (*Lipotes vexillifer*), is endemic to the middle and lower reaches of the Yangtze River in China. It is a relict species that once thrived in their only habitat, the Yangtze River, and the only living representative of the family *Lipotidae* (Zhou, Qian and Li 1978). It was described early in the ancient dictionary, Erh Ya, published as long ago as 200 BC. In the 1940s, the uppermost records in the Yangtze River were at Huanglingmiao and Liantuo in the Three Gorges area, approximately 50 km upstream of the Gezhouba Dam near Yichang. Baiji could be found up to Yichang in the 1960s, which is about 1700 km up from the mouth of the river. However, the range was no further upstream than Zhicheng in the 1970s, and than Jingzhou (formerly called Shashi) in the 1990s, the latter is approximately 170 km downstream of the dam site. At the lower part of the river, specimens of baiji were obtained at the Yangtze estuary, off the eastern end of Chongming Island, Shanghai, in the 1950s and 1960s. Some individuals were seen in the Fuchun River, immediately south of the Yangtze, during the great flood of 1955, but disappeared from that river after the construction of Xinanjiang Hydropower Station in 1957 (Zhou et al. 1977).

The baiji is a flagship species for the conservation of aquatic animals and ecosystems worldwide. Unfortunately, the baiji population declined due to the following threats to the species: a period of hunting by humans during the Great Leap Forward, entanglement in fishing gear, the illegal practice of electric fishing, collisions with boats and ships, habitat loss, and pollution. As China developed economically, ship traffic multiplied and the size of the boats grew. Underwater noise pollution made the nearly blind animal prone to collisions with propellers. Propeller strikes have killed and injured baiji (Zhou and Zhang 1991; Chen et al. 1997; Zhou et al. 1998; Smith et al. 2008). Water development has transformed the baiji's habitat by dredged riverbeds, concrete reinforcements and by interrupting their movements upstream of dams, eliminating their access to tributaries and appended lakes, and reducing fish productivity (Liu et al. 2000).

The first rough estimate of baiji abundance based on quantitative survey data (1979-81) was only about 400 animals. Zhou (1982) warned based on this fact: if not properly protected, the baiji may be extinct in half a century. Although it is listed as Grade 1 National Key Protected Animal under the Wild Animal Protection Law in China and great efforts have been made to conserve the baiji since 1980s, the population declined drastically in decades as China industrialized and made heavy use of the river for transportation, fishing and hydroelectricity. The estimated numbers declined from about 400 animals in 1980 (Zhou 1982) to 300 or so in 1986 (Chen and Hua 1989), to about 100 in 1991 (Zhou et al. 1998a), and to a few dozen by the end of 20st century (Zhou 2002). Despite efforts to save this species, anthropogenic impacts have led to its functional extinction in the beginning of 21st century. The internationally organized survey, conducted in late 2006, failed to find any living individuals (Turvey et al. 2007). Considerable sequence variation at the adaptive MHC genes suggests that the functional extinction of baiji is not related to population genetic collapse (Xu et al. 2012).

The critically endangered Yangtze finless porpoises

The Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*) is found exclusively in the middle and lower reaches of the Yangtze River from Yichang to Shanghai, and adjoining Dongting and Poyang lakes in China. Of the six extant species of porpoise (*Phocoenidae*), this is the only porpoise population found in fresh water (Gao and Zhou 1995; Jefferson and Wang 2011). It was described early in Xu Shen's Motivations of the Characters, an ancient book published in Eastern Han dynasty (AD 25-220) (Zhou 2004). It has shared the habitat in the middle and lower reaches of Yangtze River with the baiji for more than 10 000 years. Yangtze finless porpoise and baiji groups feed together occasionally. A photograph showing baiji and Yangtze finless porpoise feeding together in the Anqing section of the Yangtze River in March 1990 was reported by Zhou et al (1998a). After the baiji was declared "functionally extinct" in 2007, the finless porpoise became the only surviving cetacean in the river.

The first range-wide estimate of finless porpoise abundance in the Yangtze River system, including two lakes, is based on many small-scale surveys conducted between 1984 and 1991 was 2700 porpoises (Zhang et al. 1993). About 697 Yangtze finless porpoises were estimated to inhabit the 421 km river section from Nanjing to Hukou, based on surveys conducted between 1989 and 1992 (Zhou et al. 1998b). The population dynamics of the Yangtze finless porpoises that live in Tongding and Boyang lakes fluctuates in different seasons, water levels, and fish resources when individuals enter and exit. The estimated population size was around 100~150 individuals in the Dongting Lake, and around 200~300 or 100~400 individuals in the Boyang Lake based on surveys conducted in the late 1990s (Yang et al. 2000; Xia and Zhang, 2000; 2002). A survey conducted over the main stream of the Yangtze River in November and December, 2006, indicated that the population of the Yangtze finless porpoise in the main stream was approximately 1000-1200. The estimate in the main river is slightly less than half the estimate from surveys between 1984 and 1991 and indicated the decline of the population in the last decades of the twentieth century (Zhao et al. 2008).

The Yangtze finless porpoise deaths soared in spring 2012. In April, WWF China expressed "deep concern" over the deaths of 32 porpoises in Dongting and Poyang lakes. To our knowledge, never before have so many dead finless porpoises have been found in such a short period. Also in April, one and eight finless porpoise corpses have been found in the Pengze and Anqing sections of the lower reaches of the Yangtze River, respectively. A line transect survey of porpoises was conducted in the middle and lower reaches of the Yangtze River in 2012. It was estimated that there were only 505 (95% CI = 348–662, CV = 15.86%) finless porpoises inhabiting the middle and lower reaches of the Yangtze River. There were approximately 450 porpoises in Poyang Lake, and 90 porpoises in Dongting Lake (Wang Ding et al., unpublished data). So, total population abundance of the Yangtze finless porpoise could be estimated as 1040 (Mei et al., 2014). The Yangtze finless porpoise is on the verge of extinction.

The Yangtze finless porpoises should be protected in three ways: conservation in its natural habitat, off-site conservation and captive breeding. Seven natural reserves have so far been established. Since the ecological environment of Yangtze Basin can hardly have any distinct improvement in a relatively short period of time, ex-situ conservation is still one of the most effective measures to save the Yangtze finless porpoises.

Chinese populations of Indo-Pacific humpback dolphin

The Indo-Pacific humpback dolphin (*Sousa chinensis*) populations (also known as Chinese white dolphins) in Chinese waters, historically distributed in near shore coastal waters south of the Yangtze River, has declined drastically and fragmented due to anthropogenic factors since 1960s. Based on focused surveys conducted on several populations in Chinese waters, five small populations of this dolphin were reported to be surviving in the East China Sea and South China Sea. The population in Xiamen waters was estimated to be 60-76 individuals in size (Liu and Huang 2000; Chen et al. 2008). Wang et al. (2012) estimated 99 individuals for population off the west coast of Taiwan based on mark-recapture analysis. The Pearl River Estuary/Hong Kong is habitat of the largest humpback dolphin population in Chinese waters. Jefferson and Hung (2004) estimated 1504 and Chen T et al (2010) estimated 2517-2555 dolphins for PRE/HK population based on line-transect analysis. The Zhanjiang population was estimated to be 237 and 268 individuals in size (Zhou et al. 2007; Xu et al. 2012). The Beibu Gulf population was estimated to be 153 individuals in size (Chen et al. 2009).

The coastal waters of Fujian Province are a main distribution area of humpback dolphins, but little is known about its distribution and population size in this area except in Xiamen waters. Based on fishermen interviews along Fujian coast, Sousa chinensis was distributed continuously along the coastal waters of Fujian Province 35-45 years ago. Now, except for Xiamen waters, there are still sporadic sightings of Sousa chinensis in Ningde waters, Quanzhou Bay and Dongshan Gulf by fishermen. Furthermore, field surveys were conducted in Ningde waters, Quanzhou Bay and Dongshan Gulf, and confirmed that there were still small resident humpback dolphin populations in these three areas (Wu et al, 2014).

One of the Indo-Pacific humpback dolphin populations is centered around the mouth of the Pearl River (Zhujiang River). The minimum estimate of the local population of Indo-Pacific finless porpoises occurred in Hong Kong waters was 217 animals in spring and summer (Jefferson et al. 2002). In the past decade, a significant decline in annual abundance of local Chinese white dolphins in Hong Kong (as part of the Pearl River Estuary) was also detected from 158 dolphins in 2003 to only 61 dolphins in 2012 (Hung 2013).

Thirty-eight individuals were photographically identified and cataloged during 51 boat-based exploratory surveys from June to September 2005. The preliminary mark–recapture estimate of the size of the humpback dolphin population in Leizhou Bay, Zhanjiang, was about 237 (95% CI=189–318) individuals (Zhou et al. 2007). Abundance estimates based on survey data between June 2005 and June 2007 was about 268 (95% CI=189–413) dolphins (Xu et al. 2012).

Cumulative number of humpback dolphins increased throughout the long-term monitoring study of the Zhanjiang population. By the end of October 2012, a total of 492 humpback dolphins were identified. The population size was estimated assuming an open population, using photo-ID data and a mark-recapture method. The abundance estimate based on the model was 1485 dolphins (95% CI = 1371-1629) (Xu et al., 2015). This result indicates thatonly two of the five Chinese populations, PRE/HK population and Zhanjiang population, are more than one thousand individuals in size. The other three populations are around or less than one hundred and are critically endangered.

The estimated population size of the Zhanjiang population is second only to the Pearl River Estuary population among the five Chinese populations. A review of all available data indicates that based on what is currently known, the Zhanjiang Chinese humpback dolphin population is the second largest of the species and genus in the world. The current status of the Zhanjiang humpback dolphin population is much better than that of the other small populations in Chinese waters. However, the recent industrial boom along the Zhanjiang coast has increased concerns regarding the conservation of the Zhanjiang humpback dolphin population. The Zhanjiang population of humpback dolphins and its habitat deserves the highest degree of attention and protection efforts.

Habitat Status

The Yangtze River is one of the chief river systems of the world, next only to the Nile and Amazon in length. The Yangtze drains one-fifth of the land area of China and its river basin is home to one-third of the Chinese population. The prosperous Yangtze River Delta generates as much as 20% of China's GDP.

In Zhanjiang, the waters are not heavily polluted and the coastal area is not highly industrialized. It is obvious that the waters along the Zhanjiang coast are important habitat for Chinese white dolphins in Chinese waters. However, the current Zhanjiang water conditions may soon begin to deteriorate. Construction work for two large industrial facilities on the northern coast of Donghai Island is underway.

In the past few years, the construction of a 40-km long Hong Kong-Zhuhai-Macau bridge has commenced, which will pass through the core area of Chinese white dolphin habitats in the Pearl River Estuary. This large infrastructure project will undoubtedly exert additional pressure on the plight of the local Chinese white dolphin population.

Directed Catch

No information.

By-catch in Fisheries

Three species of baleen whales and 11 species of toothed whales were known to be captured in the coastal fisheries (Table 3). Dazhe net is a kind of pound net in Jinxian, Liaoning with the panel about 377 m in length (see Zhou and Wang, 1994). According to local fishermen, the common minke whale (*Balaenoptera acutorostrata*) has been taken by this kind of net (Mu, personal communication). One common Bryde's whale (B. brydei) was also entangled in a set net in Fujian in 1977 (Li, 1997). A calf of fin whale (*B. physalus*) about 7 m long was found floating on the East China Sea near Wenling, Zhejiang on 13 March 2002. Drift gillnet was found on tail fluke of the carcass, suggested that the fin whale was probably entangled by drift gillnet.

A 20 m long sperm whale (*Physeter macrocephalus*) was found floating in the Qiongzhou Strait in May 2002. The head and tail fluke of the whale were entangled with drift gillnet. It kept breathing when it was found and died not long after.

The finless porpoise has the highest by-catch rate among the nine species of coastal smaller toothed whales. Based on the data presented in Table 3, the number of the finless porpoise (*Neophocaena phocaenoides*) taken is up to 79.2 % of the total (Yangtze finless porpoise excluded), the percentage for the other species is 4.8 % for Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), 4.2 % for striped dolphin (*Stenella coeruleoalba*), 3.7 % for long-beaked common dolphin (*Delphinus capensis*), 2.8 % for common bottlenose dolphin (*Tursiops truncatus*), 2.0 % for pantropical spotted dolphin (*S. attenuata*), 1.7 % for false killer whale (*Pseudorca crassidens*), and 0.8 % for Chinese white dolphin and Risso's dolphin *(Grampus griseus*) respectively. However, the very low by-catch rate for the Chinese white dolphin may not reflect the real situation. Since they are listed as Grade I in the List of wildlife Under National Key Protection, fishermen usually threw them into the sea when they were caught to avoid prosecution. The fishing gears responsible for incidental catches in Chinese coastal waters were predominantly trawl nets, gillnets and stow nets.

A survey on incidental catches of smaller cetaceans in coastal waters was conducted in 1994 and 1995 in Shandong, Zhejiang, Fujian, Guangdong, Hainan and Guangxi Provinces (Yang et al, 1999). The total incidental catches of cetaceans in 1994 in the five provinces were estimated using the following formula: N = R x G., where

N = number of smaller cetaceans taken

R = incidental catch rate per fishing effort, or individual/kW (power)

G = total power (kW)

Based on the data obtained by questionnaire surveys, the annual incidental catches of smaller cetaceans in the five provinces were estimated about 3,045 ± 2,100 individuals in 1994, and those of finless porpoise were about 2,132 ± 1,484.

Types of Fisheries and Information on Scale

No information.

Other Threats

There have been massive human activities along the Chinese coast for several decades during China's rapid economic rise, which have involved port construction, explosion, reclamation, dredging, merchant shipping, over fishing, water pollution, etc. Simultaneously, the water quality of China's coast has been decreasing with each passing year (Zhou 2005). The Chinese white dolphins and the coastal populations of Indo-Pacific finless porpoise (*N. p. phocaenoides* and *N. p. sunameri*) are particularly susceptible to the effects of human activities in the coastal waters.

The Yangtze River has been greatly altered by human activities that have made it much less suitable as habitat for cetaceans during China's rapid economic rise. The Yangtze finless porpoise population has decreased remarkably during the last several decades due to the heavy impact of human activities. This includes overfishing of prey species, water development projects and dredging works that cause habitat loss and degradation and water pollution. Accidental deaths are caused by harmful fishing gear, especially electro-fishing, and collisions with motorized vessels.

The reasons behind the baiji's extinction mirror those threatening the Yangtze finless porpoise. The Yangtze River and adjoining lakes are crowded with container ships, sand dredgers and speedboats. Sand dredging disturbs feeding ground. Snaring and long-line fishing are in common use, as is the illegal practice of electrofishing. Industrialization and the spread of modern agricultural practices have led to an increase of pollutant loads in the Yangtze River and adjoining lakes. Food for the Yangtze finless porpoise is becoming scarcer. The Yangtze finless porpoises are often propeller killed or entangled by fishing gear. Some of the porpoise die directly from the electric shock. Immediate and extreme measures are necessary to prevent the extinction of the critically endangered cetacean subspecies.

In Hong Kong, the Chinese white dolphins and Indo-Pacific finless porpoises are threatened by development of large infrastructure projects that have resulted in land-reclamation, dredging and dumping of soils, pipe and cable laying, percussive and bored piling work, large increases in vessel traffic, and serious water pollution (summarized in Jefferson et al. 2009). Frequent high-speed ferry traffic has large sound contributions to dolphin habitats, and may have induced masking effects of dolphin sounds at close distances (Sims et al. 2012). Recent shore-based theodolite tracking work inicates that short-term changes in dolphin movement occur in the presence of different vessel types in Hong Kong, including fishing boat and dolphin-watching vessels (Piwetz et al. 2012).

Legal Status and Present Management Arrangements

The Chinese government, at various levels, has enacted a series of laws and provisions to protect wildlife, including cetaceans. The baiji and Chinese white dolphin are listed as Grade I and all other cetaceans as Grade II in the List of Wildlife Under National Key Protection. The capture, killing, selling, or buying of the national key protected animals, including cetaceans, is strictly prohibited. Most of the provinces along the coast and in the Yangtze River have issued either their own laws or regulations for the implementation of the national laws and regulations.

In the Yangtze River, one natural (Xinluo) and two semi-natural (Tianezhou and Tongling) reserves have been set up to save the baiji and Yangtze finless porpoise. In Xiamen, Fujian Province, a natural reserve has been set up for the Chinese white dolphin. In the Pearl River Estuary, a national reserve in Lingding Bay and a state reserve in Jiangmen were established for the protection of Chinese white dolphin. The laws and regulations dealing with wildlife however, have not been strictly enforced in some areas. The conservation efforts are inadequate in terms of energy and funds, and the endangered species and populations still suffer from habitat degradation.

In Hong Kong, the Sha Chau and Lung Kwu Chau marine park was established in 1996 to specifically protect the Chinese white dolphins, and they are protected under the Wild Animals Protection Ordinance. Three more protected areas will be established for Chinese white dolphin conservation in the next five years. In the Pearl River Estuary, a national reserve and a provincial reserve were also established for the conservation of Chinese white dolphin population.

Conservation and Education Programs

Action plans for conservation of the dolphins in the Yangtze River, and for conservation of the Chinese white dolphin were drafted by the Ministry of Agriculture, People's Republic of China. The Chinese White Dolphin Conservation Programme has been implemented by the Hong Kong SAR Government since 2000.

Folk Attitudes and Interactions with Marine Mammals

Cetaceans are not considered a food item in China. By-catches are frequently used for livestock feed rather than consumed by humans in some areas. The smaller cetaceans captured usually were abandoned or sold at low price at sea. Usually the by-catches were not brought back to the fishing port unless they were ordered.

Description of Existing and Past Research and Training Programs

A longitudinal study on Chinese white dolphins and Indo-Pacific finless porpoises has been conducted in Hong Kong and the Pearl River Delta region since 1995. The multi-disciplinary research programme aims at providing scientific information to the local government to formulate sound management and conservation strategies. Results from this programme have been used to estimate population size, to monitor trends in abundance, distribution, habitat use and behaviour over time, and to keep track of levels and changes in mortality of the two local species.

The study of the Zhanjiang population of humpback dolphins was initiated in 2005. The study area comprised the coastal waters off the east Leizhou Peninsula, an area approximately 1,500 km2 around the Donghai Island.

Needs for Additional Research and Training

The humpback dolphin population in Zhanjiang waters deserves high priority for conservation. A long-term monitoring program of Zhanjiang population is underway in order to estimate population trends and understand their causative factors.

Present and Potential Marine Mammal Watching Operations

Several dolphin-watching operators in Hong Kong regularly bring local and overseas tourists as well as chartered groups to observe humpback dolphins in Lantau waters. Eight to 10 small motorized vessels also operate from the fishing village at Tai O to escort tourists to see the dolphins.

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SEAMAM III Report - Indonesia

Presentation by Danielle Kreb, Putu Liza Mustika, Benjamin Kahn, Ahmad Yanuar, Muhajir and Purwanto

Species and Distribution

The Indonesian Archipelago contains some 5 million km^2 of territory (including water and land), of which 62% consists of seas within the 12-mile coastal limit (Polunin 1983). At least 35 cetacean species were reported to occur in the seas of Indonesia; 25 of them are small odontocete cetaceans (Barnes 1996; Rudolph et al. 1997; Kahn 2003; Reeves et al. 2003; Kreb & Budiono 2005a, Mustika 2006; Kreb et al. 2008; Kreb et al. 2012 a; Muhajir et al. 2012). However, only a few dedicated studies have been conducted on the diversity, relative abundance, distribution and conservation of cetaceans in Indonesia. These studies include Rapid Ecological Assessments for marine mammals (visual and acoustic) in North Sulawesi (Kahn 1999), Komodo National Park (Kahn and Pet 2001 2003), the Solor-Alor archipelago (Kahn 2002a; 2005), Derawan Islands in Kalimantan (Kahn 2003a), Raja Ampat, Papua (Kahn 2007), Kaimana and Triton Bay, Papua (Kahn 2008a). Apart from these assessments, long-term research has been conducted on several cetacean species in Komodo National Park waters, Kahn et al. (2001) on the pygmy Bryde's whales (Omura's whale, *Balaenoptera omurai*) including genetic species identifications, Lovina (Bali), coast of East Kalimantan, Raja Ampat (Papua), Wakatobi (Southeast Sulawesi) as well as on the freshwater Irrawaddy dolphin, *Orcaella brevirostris* in the Mahakam River and coastal populations in Balikpapan Bay in East Kalimantan, Kubu Raya and Kayong Utara mangove estuaries in West Kalimantan and Kofiau, Misool and Raja Marine Protected Areas (Kahn 2007, Mustika 2011; Kreb 2004a, b & c; Kreb & Budiono 2005 a & b; Kreb et al. 2008; Kreb & Lim 2009; Kreb et al. 2012 a & b; Yanuar et al. 2011; Yanuar 2012; Muhajir et al. 2012; Purwanto et al. 2009) as well as sperm (*Physeter macrocephalus*) and pygmy blue whales (*B. musculus brevicauda*) in the Savu and Banda Seas (Kahn 2005; 2009a) and initial photo identification studies on orcas (*Orcinus orca*) in Raja Ampat (Kahn unpublished data).

Impacts	Habitats affected		
	Riverine	Shelf	Slope
Habitat destruction – Forest logging and subsequent sedimentation causing decrease of fish resources.	×	×	-
Habitat destruction – Coastal development	×	×	-
Habitat destruction – Conversion of fish spawning areas (freshwater swamps and mangroves) for large-scale oilpalm plantations or shrimp ponds reducing fish resources and causing pollution.	×	×	×
Industrialization of islands (stock piles for coal).		×	
Chemical pollution – Industrial, agricultural and urban wastes, terrestrial run-off.	×	×	×
Chemical pollution – The discharge of mining wastes at sea. The disposal of toxins via a procedure termed submarine tailings placement (STP) is of special relevance to Indonesian marine life.	-	×	×
Acoustic pollution – Destructive fishing practices such as reef bombing. This illegal fishing method can have regional impacts, especially in the vicinity of sensitive marine areas for cetaceans such as preferred feeding and breeding areas as well as migration passages.	-	×	×
Acoustic pollution – Military and scientific experiments	-	×	×
Acoustic pollution – Seismic surveying and blasting for oil and gas by offshore industries.	×	×	×
Acoustic pollution – Oceanic large ship transport in river systems, coal barge transport and speedboats in tributaries and confluences causing disturbance, habitat displacement and collisions with dolphins.	×	-	-
Gill netting in sensitive areas for cetaceans. Especially dangerous when unattended, in feeding areas and when blocking water ways.	×	×	×
Unsustainable and illegal fishing techniques (electro-fishing, use of poison, reef bombing and trawling) causing danger of eating poisoned prey, danger for calves of electro-shocks when generators are used and reduced fish resources through over-fishing.	×	×	-
Traditional hunting, especially in the waters of the East Flores islands. While dugongs are hunted wherever they occur.	-	×	×

Impacts	Habitats affected		
	Riverine	Shelf	Slope
Discarded plastics and fishing gear.	×	×	×
By-catch in local and regional fisheries.	×	×	×

Table 1: Overview of environmental impacts of relevance to Indonesia's marine mammals (as adapted from Kahn 2003 and www.apex-environmental.com).

Dugongs (*Dugong dugon*) show wide spread and scattered distribution in Indonesian coastal waters. Scientific data on dugong observations is available from Bali, Papua, Kalimantan, Moluccas, Sulawesi and Java. Anecdotal data is available from almost the entire Indonesian Archipelago. Dugong population estimates have been made locally including Bunaken Marine National Park (North Sulawesi), the Lease Islands (Maluku), Raja Ampat Islands (Papua) and in Balikpapan Bay (East Kalimantan) (De Iongh et al. 2009).

Population Status

Except for Irrawaddy dolphins (locally named pesut in the Mahakam River and Balikpapan Bay in East Kalimantan), no absolute abundance population estimates exist for the cetacean species of Indonesia.

The freshwater Irrawaddy dolphins of the Mahakam River were listed as "critically endangered" in 2000. Thirteen extensive abundance monitoring surveys in the entire distribution range of the Mahakam dolphins were conducted between 1999 and 2012 (Kreb et al. 2012 b). Data collected yearly between 1999 and 2001 were only used for distribution ranges, whereas data collected in 2005, 2007, 2010 and 2012 were also used for detecting population abundance trends using similar techniques (such as Petersen Mark Recapture Analysis using photo-identification of dorsal fins). In addition, during the surveys informal interviews were conducted with fishermen to obtain new information on threats, mortality and distribution patterns. The results show a stable population with no increasing or decreasing trend between 2005 and 2012 with best estimates varying between 87 and 91 dolphins based on photo-identified individuals. Between 1995 and 2012, a total of 77 dolphins died with yearly average of four dolphins, 66% caused by gillnet entanglement. Decreasing mortality trends were noted in years (b= -0.22, df=16, t=-2,16, p< 0.05) with mean numbers of 6,4 and 3 dead dolphins between 1995-2000, 2001-2006 and 2007-2012 respectively. Average annual birth rates of five dolphins were observed. Although the population seems stable for the moment, since 2009 dolphins in the Mahakam have made significant shifts in their high density distribution area and have also declining habitat ranges (see habitat status).

Distribution and abundance of a coastal population of Irrawaddy dolphins in Balikpapan Bay was studied between 2000-2002, 2008 and 2011, with densities of 0.625 dolphins/km2 in 2011,0.692 dolphins /km2in 2008, 0.738 dolphins /km2 in 2001 and 0.727 dolphins /km2in 2000 during similar month surveys with total estimates of 68, 70, 79 and 78 dolphins respectively. Almost 50% (N= 25) of the photo-identified individuals in 2011 were already identified in 2008, which indicates that this is a resident population. In 2008, three photo-identification surveys that were conducted at different seasonal conditions provided a best estimate of 67 individuals (95%CL = 59 – 74) using Burnham & Overton method (selected based on heterogeneity in capture probability and because of the high overlap of individuals in each survey assuming a more or less closed population model). No significant changes in densities were observed in eleven years time but changes in their distribution were significant, where dolphins in the 2008 and 2011 surveys were either absent and at least significantly less often occurring in more downstream areas of the bay or outside but near the bay (see habitat status).

Marsh et al. (2002) describe dugongs as rare or depleted throughout their original range in the Indonesian archipelago, with a rough population estimate of perhaps 1,000 animals in 1994. In Indonesia, declines in dugong abundance and distribution, including extirpation of local populations, are likely to continue and may even accelerate (see habitat status).

Dugong population estimates have been made locally. In North Sulawesi, dugong population estimates have been made of around 1,000 dugongs in Bunaken Marine National Park (Kelolal 1994 in Marsh et al. 2002). In the Lease Islands, Maluku, the presence of a small population of, at most, 37 dugongs was confirmed (De Iongh et al. 1995). In Balikpapan Bay a population of, at most, 12 dugongs and a carrying capacity of available seagrass beds for 16 dugongs was calculated (De Iongh et al. 2007). In the Raja Ampat Islands, 14 (WWF 1981) and 24 (WCS 2008 pers comm.) dugongs were counted. This information is valuable although difficult to extrapolate to the total dugong population and distribution in Indonesia.

Habitat Status

Indonesia's marine mammal habitats include major rivers and mangroves as well as coastal, reef and open-ocean environments. These diverse habitats are often in close proximity to one another because of Indonesia's narrow continental shelf, abundant oceanic islands and extreme depth gradients (Kahn 2001; 2009b). Large scale habitat mapping of such deep-sea yet near-shore habitas have been mapped for the Lesser Sunda Ecoregion (Kahn 2008) which aso included oceanic cetaceans. This study has been integrated with MPA Network planning on an ecoregional scale (Wilson et al. 2011; see also Fortes et al. 2003 for regional initiatives). Threats to Indonesia's marine mammals are manyfold yet for the most part unquantified. Since the 10 years of decentralization and regional autonomy there has been a significant increase in the rates of extraction of natural resources, including rampant and uncontrolled logging, large- and small-scale mineral mining, expanded coastal developments and industrialization, and increased mariculture, together with ever-growing coastal and pelagic fisheries, which are all impacting on coastal and estuarine marine mammal populations. Therefore, we predict that many marine mammal populations that inhabit Indonesia's estuaries and coastal waters may be in decline. In Balikpapan Bay, East Kalimantan for example, a dramatic shift in habit use by Irrawady dolphins was found where dolphin densities shifted from a more or less equal distribution within the bay area to increased densities in the upstream parts of the bay away from the increasing industrial activities, noise of large ships and sedimentation (Kreb & Lim 2009). Government plans for extending the industrial activities to more upstream parts in the bay will pose an even larger threats to the dolphins because of their dependance on the intact mangrove ecosystem that provides them with fish prey. In the delta area of Kubu Raya, West Kalimantan, similar reduction in food sources for the Irrawaddy dolphins and local residents have been marked as a result of conversion and looging of mangove forest (Yanuar 2012).

Similar changes in distribution of the pesut have occurred in the Mahakam River. Previous dolphin core areas until at least 2007, are now abandoned by the dolphins because of the recent large-scale conversion of riparian swamps, which function as fish spawning areas, into large-scale mono-cultivation plantations, especially oil palm plantations (Kreb et al. 2010; 2013). The impacts are many-fold; firstly, the opening of swamps is causing increased sedimentation and pollution from fertilzers and herbicides through man-made channels that connect with existing tributaries and lakes and negatively impact local fish resources. Secondly, the dams put up to prevent floods from entering the plantation effectively prevents further fish spawning activities in the area. The loss of fish resources results in an increase of unsustainable fishing techniques such as electro-fishing and use of poison in these areas, resulting in further fish decreases. Most of the freshwater dolphin population since 2010 is now concentrating in a stretch of approximately 80 km of main river and 45 km of tributary, where fish resources still occur in higher densities, and left an area of approx. 100 km of main river, that used to be part of their normal habitat range. Previous habitat displacements were noted from a narrow, core-distribution tributary caused by the loud underwater noises generated by coal barges through the tributary (Kreb and Rahadi 2004b) and sedimentation of lakes (Kreb and Budiono 2005b).

Other future impacts on coastal marine mammals are the proposed changed function of small islands. Before, only fisheries, tourism and defense were allowed. Now, industrial activities are allowed to take place and may damage nearby reefs. An example is Miang Island in East Kutai, East Kalimantan, for which environmental approval has already been given for the construction of a coal stock pile and coal terminal. This will no doubt do major damage to the surrounding mangroves, corals and local fish stocks on which a high density of cetaceans around the island depend. Also, intensified shipping lanes will form a disturbance to the many marine vertebrate species in East Kalimantan (Kreb et al. 2012b) as in several other regions where sea lanes and high vessel densities overlap with migratory corridors (Kahn 2009b, Kahn and Vance-Borland 2012).

For Indonesia's oceanic cetacean species, fishery by-catch has probably caused significant reductions in abundance, especially for small cetaceans, but this remains unquantified (Kahn 2003b, see Kahn and Fauzi 2001 for a fisheries review for the Sulu-Sulawesi Seas). The effects of by-catch are possibly felt by large cetaceans, such as sperm whales and blue whales in the eastern provinces as well (Kahn 2005; 2009a). Fisheries interactions may have a potentialy high impact on the population level of pygmy blue whales in critical habitats such as the inter-island migration corridors in east Indonesia (Kahn 2003c; 2005; 2006; 2009a, b). An overview of environmental impacts of relevance to Indonesia's marine mammals is given in Table 1.

Habitat degradation from the rapidly expanding oil and gas industry pose additional threats. A recent study investigating the overlap between oil, gas and deep-sea mining blocks and marine priority conservation areas has documented the significant overlap between the two (Kahn and Vance-Borland 2012). In certain areas, negotiations have been successful to reduce this overlap. For example, Conservation International has renegotiated the Triton Bay MPA boundaries to exclude oil and gas blocks. The local population of Bryde's whales (B. edeni) (Kahn 2008a) was an important justifcation for this approach. Best practices for seismic surveys have been reviewed and adapted for operations in extremely bio-diverse waters of Indonesia (Kahn 2010). Near-shore infrastructure for the energy sector is also increasing, often in previously prinstine areas. In Papua's Bintuni Bay, some efforts have been made to reduce impacts of a large scale LNG operation on marine mammals including significant diversions for long term shipping routes (avoiding sensitive habitats), and local measures to reduce impacts on common species (Kahn et al. 2007). Coastal mining is an emerging threat in parts of east Indonesia. Batu Hijau, in Sumbawa, is the largest copper mine is the world and also has the largest volume of waste being dumped in the nearby seas (120-160 tonnes per 24 hours). Kahn (2003) has outlined the potential risks of Submarine Tailing Disposal (STD) to cetaceans and other marine industries such as fisheries and tourism during Extractive Industries Reviews by the World Bank as well as other fora.

A downward trend was observed in the number of whales and dolphins sighted in Kofiau and Misool MPs and other locations in Raja Ampat. This is thought to be due to the persistent use of explosives by fishers to catch fish. In 2010-2011, five fishers were detected using explosives in Kofiau MPA, and in February 2012, fishers were arrested by local villagers and the police in Kofiau MPA (Muhajir 2012). Seismic surveys around Kofiau and Misool MPAs in 2009-2010 (Muhajir, personal observation) are also thought to be a factor in the decrease in the number of whale and dolphin in Kofiau and Misool MPAs.

Directed Catch

Directed catches of several species are known to occur in the whaling villages of Lamalera on Lembata and to a lesser extent Lamakera on Solor (Barnes 1996, Kahn 2002b, Kahn Mustika 2006). The extent and impact of directed takes of cetaceans and dugongs by artisanal and commercial coastal and pelagic fisheries in Indonesian waters are largely unknown — as they are for other cetacean-fishery interactions. However, it is important to note that Indonesia has the largest shark fishery in the world and catches more sharks than Malaysia, Philippines and Thailand combined (see review by Kahn & Fauzi 2001). In addition, Indonesia's fisheries are conducted by tens of 1000s of multispecies, multi-gear vessels, and the retention of by-catch or deliberately captured small cetaceans for consumption and/or bait in long-line operations is thought to be widespread but as yet unquantified (Kahn 2003b).

Limited interviews at sea indicate that artisanal fishermen and small-scale long-line vessels (i.e.,< 400 hooks/set) in eastern Indonesia regularly use harpoons to catch small cetaceans (Kahn 2002a). Dolphins are harpooned opportunistically, mostly during bow-riding activities by the animals or during active pursuit by the long-line vessels, especially when long-line bait supplies for fisheries targeting pelagic sharks and other elasmobranchs are low. In recent years (2010-2012) the use of dolphin bleeds at sea to attract sharks and meat for bait within the small-scale shark long-line fishery has become more common place (Kahn, unpublished data). This practice has been further documented through fishermen interviews on video in 2012 (by Earth Island Institute) and seems especially prevalent in Lombok and Sumbawa areas. The size of the directed catches by large-scale long-line fishing operations (e.g. > 400 hooks/set) and the large pelagic drif tnet fleet are unknown. In the MPA of Berau District, East Kalimantan, before its establishment, informal information was obtained that dolphins were regularly hunted by a small group of hunters (national immigrants to the resident island) and used as bait to catch sharks (Kreb et al. 2008). Because shark fishing had dropped due to a decrease in sharks numbers and increased patrols for dolphins, hunting also stopped on this local scale. However, illegal hunting of dolphins by other nationalities in the MPA is still ongoing. During a patrol in June 2007, a ship from Taiwan was detained by the Marine Police and 70 dolphins, one whale species and many turtles were found dead onboard. A number of speed-boats, used to hunt dolphins, were confiscated. Currently, no new reports exist for this area. However, these practices are still ongoing outside and South off the marine protected area of Berau in the area of East Kutai, which is not well patrolled, according to the local islands villagers (Kreb et al. 2012a) Complaints were made about boats coming from other provinces fishing in the area and killing dolphins with spears for their oil and shark fishing. The local villagers have a positive attitude towards the whales and dolphins and do not like them to be harmed.

An opportunistic killing of a juvenile humpback whale (*Megaptera novaeangliae*) was reported in August 2010 in Bontang coastal waters, East Kalimantan by a group of fishermen involving at least seven boats using dynamite and harpoons. They initially set out to bomb the reefs and collect fish.

Small cetaceans are taken deliberately in Indonesia in "tiger nets". Also called "experimental nets," these are large-mesh nets set in migratory corridors or island passages that specifically target large migratory marine life (Kahn 2002b). Tiger nets are sophisticated structures, often kept in place with a permanent buoyed frame that may span hundreds of meters. Once in place, the nets can result in immensely high catch rates of large marine life (e.g. Lembeh Strait, North Sulawesi – see also below). Specific characteristics of tiger nets that qualify as a destructive fishing practice (DFP) include (from Kahn 2002b):

1. They are strategically positioned to catch extremely high numbers of large migratory and/or vulnerable marine species.
2. Populations can be over-exploited in very short time spans (1-2 migratory seasons) yet take decades to recover, if they recover at all.
3. Local fishing practices have major and regional ecological and socio-economic impacts (see below).

Catch data are available for two sets of a Taiwanese tiger net in the pelagic migratory channel at Tangkoko, Manado area, NE Sulawesi. The tiger net was positioned at the entrance of Lembeh Strait, a narrow corridor at the eastern tip of north Sulawesi. The net was in place from March 1996- February 1997. All marine life killed in this net was processed locally in Bitung, mostly as petfood for export. Because of this net's particular design and position, the catch included a high species diversity and abundance of large marine life: 1,424 manta rays (exact species composition unknown), 18 whale sharks, 312 other, unidentified sharks, 577 pilot whales (may include other *globicephalines*), four baleen whales (reportedly minke but likely Bryde's whales), 326 dolphins of unknown species, 789 marlin (species unknown), 84 turtles (species unknown) and nine dugongs. Sightings of the more heavily impacted species have been minimal after the removal of the net (as reported by the marine tourism industry in Lembeh and Bunaken National Park, NSWSA unpublished data). Indications are that previously common species in the area, such as manta rays and pilot whales, had not recovered as of 2002. Unsubstantiated reports mention that permits have been issued to the same Taiwanese company responsible for the Lembeh Strait tiger nets for at least 10 other identical 'experimental fish traps' in remote areas of the Moluccas. It is possible that these nets are currently in operation and resulting in high landings of large migratory marine life. Despite numerous reports indicating widespread over-exploitation of marine resources in Indonesia, the nation's fishing effort is considered by policymakers to be below that to obtain maximum sustainable yields (MSY). As a result, Indonesia's national fisheries policies continue to strive towards increasing fishing licenses and achieving higher overall catches, rather than towards management to achieve sustainability, including restricted or closed areas, improved catch handling and other measures to add value to the catch.

Indonesia has several dolphinaria, the most famous being Jaya Ancol Oceanarium and Sea World, both located in Jakarta, and Dolphin Lodge on Batam Island near Singapore. Jaya Ancol Oceanarium opened in 1974 and has held six species: Irrawaddy, Indo-Pacific bottlenose (*Tursiops aduncus*) and spinner dolphins

(Stenella longirostris), false killer whales (*Pseudorca crassidens*), finless porpoises (*Neophocaena phocaenoides*) and dugongs. These were all captured in Indonesian waters and included over the years at least 22 Irrawaddy dolphins from the critically endangered Mahakam River population. At present, only Indo-Pacific bottlenose dolphins remain at the facility. Dolphin Lodge opened in 2001 with 24 Indo-Pacific bottlenose dolphins from Indonesian waters. There are indications that survivorship is poor. Live-captures in Indonesian waters for export to recently established oceanaria in other SE Asian countries (including China and Thailand) has also occurred. The extent of this trade is unknown.

In recent years, Bali has become another hub for live-capture display. Several temporary dolphin circuses performed at various places in Denpasar. A dolphin pen in Serangan Island in south Bali has attracted continued visitors. Nine bottlenose dolphins (*Tursiops sp.*) are displayed in a sea pen off Serangan Island. Visitors may interact with the dolphins for 40 minutes for USD 79 (swim) or USD 39.50 (watch only). Melka Hotel in Lovina (Buleleng Regency at north Bali) publicly advertised their swim-with dolphins (bottlenose dolphins). In 2007, Mustika (pers comm) observed two common bottlenose dolphins (Tursiops truncatus) displayed at the hotel pond, particularly with the pretext of autism treatment. The dolphins had crooked dorsal fins, possibly due to the insufficient depth of the display pond (less than 2 m deep). In 2008 onwards, visits to Melka are strictly for paid-visitors. No additional survey was made after 2007. In 2009, two captive dolphins supposedly died after the onset of the rainy season. This facility is located in Serangan estuary which is part of the sewage outlet of Denpasar City (populations 2 million). The water in the holding patterns was of extremely poor quality.

By-catch in Fisheries

By-catch is considered the major threat to all marine mammals in Indonesian waters, and especially to small cetaceans and the dugong. The level of marine cetacean by-catch is likely to have increased significantly due to the greatly expanded national and foreign fishing fleets in Indonesian waters - both long-range longliners and drift netters. No by-catch monitoring system is operational, and fisheries data on sharks and marine mammal species are particularly poor (i.e. Kahn 2003b).

Only for the Mahakam River reliable reports collected over the years between 1995 and 2012 revealed that 77 dolphins have died and of those deaths, 66% were from gill net entanglement (Kreb et al. 2012b).

There are accidental catches of dugongs in shark nets, gillnets or tidal traps (DeIongh et al. 2009). Some tuna distribution companies have now requested assitance for their ETP species programs (endangered, threathened, protected) to better understand the cetacean species diversity and potential fisheries interactions within the industry, which is moslty based around FADs - Fishing Aggregation Devices (Kahn unpublished data). These companies aim to abide by the Marine Stewardship Council (MSC) and other sustainable fisheries programs. Such market driven initiatives are to be appaluded and promoted, in addition to futher commitments to monitoring of by-catch by the relevant government agencies.

Types of Fisheries and Information on Scale

For coastal and marine fisheries, the following types of fishing gear, and the amount of gear used within Indonesia were distinguished based on the report of the Ministry of Fisheries (KKP 2011): jaring insang (gillnet) (280,594), jaring angkat (liftnet) (51,089), pukat cincin (purse seine) (31,424), pukat kantong (seine net) (66,078), pukat tarik (trawl) (17,777). Full-time fishermen include 1,024,738 individuals, part-time fishermen (major second income source) 879,993 individuals and spare-time fishermen (additional income source, 3rd or more) 360,482 individuals. Types and numbers of boats are distinguished as follows: Boats without motor 170,938 (jukung and wooden boats), boats with outboard engines 225,786, boats with inboard engines include 192,700 boats with up to a maximum 500-1000 GT (only 27 boats) and mainly below (128,105 boats) or between 5-10 GT (38,149 boats).

For the Mahakam River, most open water fisheries are done on an artisanal basis by private fishermen (Kreb 2012, pers. comm.). Small motorized canoes are being used for direct fishing: collecting fish from set or floating gillnets, fish traps or fish hooks at fixed locations or fishermen are using drift nets or throw nets. Also, illegal fishing methods are being employed, such as electro-fishing and poison. According to data from the Provincial Fisheries Department (DKP 2009) in the Mahakam River, the number of floating gillnets are 4,595, fixed gillnets 18,614, large lift net 4,576, small lift net 16,177, multiple hooks lines 13,669, single hook fishing 5,210, fish traps 23,708, throw net 11,899. The number and types of fishing boats are as follows (DKP 2009); non-powered boats 4,789, outboard engine boats 15,192.

Other Threats

Threats facing marine and aquatic mammals in Indonesia are diverse, but largely unquantified.

Habitat impacts: Coastal development activities include: forest and mangrove logging, exacerbating sedimentation and erosion; general coastal development, particularly near big cities; conversion of coastal land habitat; terrestrial run-off, including agricultural and mining waste; expanding mariculture; and near-shore infrastructure built for energy exploration and production. Anthropogenic activities of concern in Indonesian waters include heavy vessel traffic, as well as mining and gas exploration (including seismic surveys). Mining and gas exploration activities overlap with priority areas for marine conservation (Kahn and Vance-Borland 2012). For riverine habitat, the damming of rivers, in addition to general development along river banks and added sedimentation, are of concern.

Fisheries Interactions: The magnitude of bycatch is unknown, as it is likely that many incidents go unrecorded. Current fisheries policy in Indonesia promotes further growth of the industry, without necessarily prioritizing sustainability. Dugongs have been incidentally captured in shark nets, gillnets, and tidal traps. Bycatch has been reliably recorded for Irrawaddy dolphins in the Mahakam River, with 66% of recorded mortalities from 1995 to 2012 being attributed to bycatch. Bycatch of marine mammals also occurs in tuna fishing operations. There might also be incidental mortality of Irrawaddy dolphins in the Mahakam River due to electrofishing. Depletion of fish stocks due to overfishing and habitat degradation is also problematic.

Direct Capture: As with bycatch, the magnitude of directed captures is unknown. Whale and dolphin hunting has occurred in Lamalera and Lamakera, historically through to the present. In Lamalera, where such hunting is mainly for subsistence rather than export, sperm whales have been the main target, though baleen whales are now also targeted due to the irregular capture of sperm whales. In Lamakera, baleen whales are targeted and exported to other parts of the region. Dugong hunting occurs throughout the country. It is unclear whether the marine mammal take in Lombok is incidental or directed. Interviews with small-scale fishers in eastern Indonesia suggest that small cetaceans are regularly harpooned (Kahn 2002a). Dolphin blood and meat have been used as bait for the small-scale shark longline fishery (Kahn, unpublished data). Small cetaceans, including pilot whales, small baleen whales, and dugongs, are taken in "tiger nets", which capture manta rays, whale sharks, sharks, and marine turtles. Several of these nets are operated by a Taiwanese company. In 2007, a ship from Taiwan was apprehended, with dead dolphins, whales, and marine turtles on board.

Marine mammals, mainly bottlenose and Irrawaddy dolphins, are also captured for captive display. A number of oceanarium facilities, including several in Bali, display dolphins (Jaya Ancol, Dolphin Lodge, Melka Hotel, Serangan, Akame Dolphin Bay Restaurant), in addition to various traveling dolphin circuses in Bali and Java.

Unregulated in-situ tourism: Dolphin-watching is not yet regulated by the government. It can contribute significantly to local economies, as in Lovina (Mustika 2011). This might incentivize further growth of dolphin-watching operations. As such, some sort of regulations to ensure that such operations do not adversely affect the dolphins and whales is needed.

Cetacean watching has emerged in Indonesia since the late 1980s when foreign backpackers in Lovina (Buleleng Regency, Bali) asked local boatmen to take them to see dolphins that were predictably found near-shore. Ever since, the dolphin watching industry in Lovina has grown, such that it has become the main biodiversity icon for Buleleng and contributed at least USD 4.5 million per annum of direct tourist expenditures to the local economy (data 2008/9, Mustika et al. 2012a). However, Lovina is a classic example of community-based tourism going awry, which supports Hardin's notion of the Tragedy of the Commons (Hardin 1968). The lucrative nature of this industry has triggered unsustainable conducts of the local boatmen. More than 180 traditional boats (jukung, 4-passengers capacity) are currently available to take tourists to view the dolphins. During high visitation months (June-October), up to 100 tour boats can be seen searching for the dolphins between 6 to 8 am every day, not missing an opportunity to speed towards the dolphins or cut through the animal's route if need be (Mustika 2011). Tourists have expressed their concerns of such conduct; indeed, their satisfaction levels were largely correlated with the way the boatmen managed the dolphin encounters (Mustika et al. 2012b). More importantly, unsatisfied tourists were unlikely to recommend the Lovina trip to others (Mustika et al. 2012a), which might be detrimental to the contribution of this industry to the local economy. On the southern coast off Bali Bukit, open ocean dolphin watching has also grown rapidly. Target species are large pods of spinner and spotted dolphins (*S. attenuata*) 3-4km offshore in high seas conditions. Because of this harsh environment the operators are marine tourism and dive companies. This may be a natural limit to the operators in these waters, but increasingly small boats enter this industry and the safety features on board are minimal. Tourism workshops (ecology and interpretation, boat handling, ship safety and Codes of Conduct to Wild Cetacean Watching training days) have been conducted in 2005 and 2007 (Kahn 2005) with very limited impact since then, as boat staff and operators change. A more regular effort is needed to engage with the whale watch industry on Bali's south coast (i.e., 1- 2 regular training workshops per year).

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

This section is based on Kahn 2002b, which included a comprehensive overview of the legal status of marine mammals in Indonesia: All land and water natural resources are controlled by the state, in accordance with Article 33(3) of the 1945 Constitution. The state (the central government) thus has responsibility for protecting species. The National House of Representatives—Dewan Perwakilan Rakyat (DPR) —has enacted several laws (undang-undang) that relate, either specifically or generally, to the protection of marine mammals. Taken together, these laws (1) confirm state authority and responsibility for management of living marine resources, including marine mammals, and their habitats; and (2) establish a loose and amorphous legal framework through which living marine resources, including marine mammals, are to be protected and conserved for their intrinsic value and for the benefit of Indonesians, present and future; and (3) can provide specific protections for certain marine mammals that are listed as endangered or threatened. Several national laws include references to the fact that marine mammals are protected throughout Indonesian waters. Nevertheless, the legal status of cetaceans and the dugong in Indonesian waters is unclear. Existing legislation is inadequate in several respects, not least of which is that it lacks implementation and enforcement mechanisms. Laws relating to marine mammals are vague, with few specific requirements. Terms, such as 'protection,' are not well defined, and the protected status does not address the traditional (sperm) whaling activities in Lamalera, Lembata and the continued directed takes of small cetaceans in eastern Indonesia and elsewhere, nor does it recognize the numerous environmental threats faced by cetaceans and dugongs in Indonesia's waters or recognize important international conventions and specific management needs for endangered and vulnerable marine mammal species and populations. In addition, laws relating to marine mammals are confused by secondary fisheries laws, some of which classify marine mammals as fish and seek to promote and regulate fish harvest. In some regions the protected status of cetaceans and dugongs is unknown or ignored. Habitat destruction and directed catches of small cetaceans especially are widespread.

Since 2007, marine mammals have increasingly fallen under the mandate of the Ministry of Fisheres and Marine Afairs (where the species group are listed under "fish" and "marine resources"). Both the Ministry of Forestry and Ministry of Fisheries and Marine Affairs have initiated programs to improve marine mammal management and conservation at both national and site-specific levels. A national strategy for the conservation of migratory marine life was completed in 2001 and includes descriptions of marine mammals and management recommendations (DKP/ IPB 2001). Marine mammal conservation and management measures have been specifically included in the Protected Area management plans for Komodo, Alor, Kaimana, Raja Ampat and Derawan. MPA boundaries have been adjusted specifically to include important cetacean habitats in Raja Ampat (3 fold expansion of Dampier Strait MPA), Kaimana MPA, Alor (Kahn, pers.comm). For Savu Sea NP, whale habitat protection has been an important driver for its declaration and subsequent zonations (Kahn and Subijanto 2009). Furthermore, the Bali MPA Network is under development to include cetacean habitats on both the North and South coasts (Mustika and Kahn, pers.comm). In addition, marine mammal issues are increasingly being considered inprotected areas such as Bunaken Marine Park and more recently in Berau Marine Park, where during 2007 and 2008 systematic cetacean surveys were conducted and specific recommendations handed to the local government. In the Komodo Park, extensions to the park's boundaries and additional buffer zones have been adopted by the management authorities and have been incorporated into a 25-year management plan, in order to protect sensitive marine areas, such as migration corridors, for cetaceans (Kahn and Pet 2003). In response to the target of the National Fisheries Department to expand its Marine Protected Areas (MPA) in Indonesia with two million hectares between 2010 and 2014, a survey in collaboration with the Fisheries Departments identified part of Balikapan Bay, East Kalimantan as a potential MPA (YK-RASI 2011), and new potential MPAs have also been identified in East Kutai District in East Kalimantan based on fours years of systematic surveys conducted by a Yayasan Konservasi RASI(YK-RASI) (Kreb et al. 2012).

In 2009, a decree from regent of West Kutai SK 522.5.51/K.471/2009 declared the sub-district of Muara Pahu in the Mahakam River as Protected Area (PA) for the need of the freshwater pesut dolphins with full community approval. A second PA is underway for the Central Kutai District. The management plans and regulations are still in the process of legalization. The Directorate of Nature Conservation under the Ministry Forestry also is currently developing the National Conservation Strategy and Action Plan for the freshwater pesut dolphin population in the Mahakam River with management strategies included. The NGO YK-RASI has been working on the conservation of the pesut since 2000 and its program is ongoing. Collaboration has also been undertaken with other NGOs, such as WWF, between 2010 and 2011. Strong and continued government and non-government commitment is is urgently needed to avoid extirpation of this population in the near future.

In addition, the 3.5 million hectare Savu Sea National Park was declared at the World Ocean Congress in 2009. It includes significant waters between Flores Sumba Savu Rote and Timor islands. The Savu Sea NP has been designed to include a major marine mammal component and includes numerous important pelagic habitats for oceanic cetaceans including corridors and upwelling zones as well as a vast coastal habitat component (Kahn 2008; 2009b; 2012; Kahn and Subijanto 2009). Detailed zonation plans are currently under development. The effective implementation of these government and non-government marine mammal conservation initiatives will greatly improve the status of Indonesia's marine mammals.

Marine mammal stranding is a particular phenomenon that raised many concerns, particularly from the Indonesian government. Regarding the many occurrence of stranding cases in the Archipelago (see for example, Mustika et al. 2009), the Indonesian government has formed a task force to write the national Standard Operational Procedures (SOP) for stranded cetaceans (including river dolphins) and dugongs. The task force consists of divisions within the Ministry of Marine Affairs and Fisheries (MMAF), the Indonesian Institute of Science and several NGOs (including the Jakarta Animal Aid Network, YK-RASI, WWF Indonesia, Conservation International Indonesia, APEX Environmental). The document currently contains procedures to handle alive and disoriented animals, alive and stranded animals, and dead and stranded animals (including post mortem investigation and skeleton retrieval). The SOP also contains contact persons and departments for rapid responses. The Directorate of Species and Area Conservation has pledged tactical budget for marine mammal stranding events of 2013 onwards. To provide better information of stranding events in the country, an online stranding database website (www.whalestrandingindonesia.com) has been launched in early January 2013. This website is approved by the Directorate of Species and Area Conservation of the MMAF.

The National Conservation Strategy and Action Plan for the dugong in Indonesia was finalized in 2009 (De Iongh et al. 2009) and provides recommendations for future research but not for practical management of the known dugong populations.

National and state legislation related to fisheries

No information.

International Agreements ratified by nation

No information.

Regional Marine Protected Area planning

No information.

Conservation and Education Programs

In the coastal areas of East Kalimantan YK-RASI has conducted several awareness raising campaigns at elementary and junior high-schools, including field trips to the islands of Berau District, Bontang and Balikapan as well as in fishing villages using posters for species identification and stranding procedures (YK-RASI,2009; Kreb et al. 2012a).

In the Mahakam River, between 2000 and 2012, YK-RASI has conducted many campaigns at schools and with fishermen and local villagers for the protection of the dolphins and their habitat. YK-RASI also developed local curriculum, environmental education books and teacher training courses, which are used at 25 high-schools and 33 elementary schools. An additional 10 schools are waiting for the second edition. An environmental education center was established along the river in 2006. The other conservation activities include monitoring, alternative fisheries forms aid, ecotourism, proper waste disposal and recycling, demarcation of important areas and PA establishment to prevent further conversion of fish spawning areas and reduce impact of industries on the water quality as well as multiple stakeholder workshop at several levels (village, district, province, national and international) (Kreb et al. 2010). The program of YK-RASI is in collaboration with local district governments.

For East Indonesia, and especially in the Lesser Sundas, the Flores Banda Seas, and Papua APEX Environmental has conducted numerous programs including oceanic whale and dolphin surveys, cetacean ecology research, conservation, management, policy development and training. Particular emphasis has been on "deep-sea yet near-shore" habitats such as migration corridors, seamounts, pinnacles and persistent upwelling zones, and how such habitats can be integrated with Marine Protected Area networks. Focus species include Bryde's, blue, sperm whales and more recently orcas. APEX also assists with numerous regional marine conservation programs such as eco-regional Marine Spatial Planning, Marine Protected Area (MPA) Network development and design, MPA management plans and zonations, national fisheries reviews, capacity building assessments, best practice reviews for offshore industries (in particular the energy sector: seismic surveys, oil and gas exploration), shipping and marine tourism development.

Folk Attitudes and Interactions with Marine Mammals

No new information was available. Cetaceans are generally perceived as competitors for fish. However, in a country as vast and ethnically diverse as Indonesia, folk attitudes to marine mammals are likely to be different for each province, coastal district and community. In some parts of Indonesia such as West Timor and North Sulawesi, dugongs are protected because they are thought to bring luck. In contrast in other areas "sea gypsie"s catch dugongs because of their magical powers. These kills are generally opportunistic (see Marsh et al. 2002 for details). Many anecdotes exist in Indonesia on dolphins aiding humans at sea and even in the Mahakam River. The pesut in the Mahakam River is generally revered and a local legend about its presumed human origin exists and is still being told to the younger generation. According to many fishermen the pesut also aids thriving fish in their nets and indicates good fishing spots as well as indicator for prolonged dry or flood water conditions. Based on 258 interviews in 2005, 80% mentioned that the pesut brought luck and 40% mentioned as benefit that the dolphins were entertainment for them, whereas 99% felt that the pesut should be protected and 97% agreeing upon establishment of conservation areas (Kreb et al. 2009).

In Indonesia, some mythological stories still exist about the origin of the dugongs. They usually con¬sist of a woman transforming into a dugong. On the island of Sumba the story is told of a mother transforming into a dugong after she has disobeyed her husband (Forth 1988). Similar stories are known from Sulawesi and the Moluccas.

Description of Existing and Past Research and Training Programs

Research conducted since the last SEAMAMM II in 2002 include the following:

Occasional observations of whale, dolphin and other megafauna were carried out in Kofiau, Misool Raja Ampat Marine Protected Areas and other areas in Raja Ampat between 2006 and 2011 with the aim of determining the distribution of these fauna. The monitoring team took note of species, number, behavior and location of whales, dolphins and other large fauna sighted when carrying out primary monitoring activities such as reef health monitoring, resource use monitoring, security patrols, and other activities (Muhajir et al. 2012). Occasional observations using a similar protocol were conducted in Wakatobi National Park, Southeast Sulawesi by TNC-WWF Join Program and Wakatobi National Park (Purwanto et al. 2009)

In East Kalimantan, two three-week cetacean surveys were conducted between 2007-2008 in the MPA of Berau Ditsrict, whereas six monitoring surveys lasting 10 days each were conducted between 2009 and 2012 in East Kutai District with the aim to provide information on densities and diversity for extension of the MPA in Berau. In addition, three seasonal surveys were conducted in Sesayap River, Northeast Kalimantan to assess the density and distribution patterns of Irrawaddy dolphins in the delta, river and coastal area (Kreb and Rukman 2010).

In the Mahakam river, after initial Ph.D research between 1999-2003 while studying a variety of issues related to social ecology and conservation (Kreb 2004a), the following systematic bi-annual monitoring surveys are being undertaken by YK-RASI since 2005 onwards with the aim to: (1) Monitor threats, mortality, birth rates and population size (using direct counts and mark-recapture analysis methods) to detect long-term trends; (2) Updating the photo-identification catalogue to identify site fidelity and social ecology with specific reference to breeding; (3) Assessing the long-term fidelity to previously identified core habitat areas; 4) Collecting tissues from recovered carcasses to assess the genetic variation and demographic connectivity between the coastal and riverine populations. Training was also provided to the provincial conservation authority (BKSDA) to monitor the dolphin population using mark-recapture analysis based on photo-identification because the BKSDA also conducts monitoring surveys using direct counts every few years. Several national and international master and Ph.D students' studies are being conducted related to the pesut and fisheries as well as an underwater acoustic monitoring program in collaboration with Tokyo University in a daily dolphin migration passage.

Research to investigate the sustainability status of dolphin watching tourism in Lovina and the Peninsula (Bali) was conducted from 2007 to 2010 (Mustika 2011). The research gives way to the designation of Lovina and the whole southern peninsula of Bali as new MPAs. Lovina MPA is mainly dedicated to the conservation of cetaceans, while the Peninsula (Badung Regency) MPA is designed as such to accommodate the migratory routes of marine mammals in the southern waters of Bali.

Needs for Additional Research and Training

Raja Ampat, Papua: To determine the temporal and geographical patterns of the sightings of whale and dolphin more accurately, routine, consistent monitoring should be carried out. These data could be used as input in decision-making about tourism development. Because Kofiau and Misool MPAs are important locations and habitats for whale and dolphin, the zoning and management plans for these MPAs should take into account the existence and conservation of these mammals.

East Kalimantan Coast: Continue investigating cetaceans in the areas we already surveyed to understand long-term, local distribution patterns, relative species and seasonal abundance and obtain biopsy samples for species for which the taxonomic status is still unclear. In particular, more studies are needed to increase knowledge on the fin whales that were observed in the study area and focus on their migration pattern, daily behaviour, site fidelity, group composition, population structure, sex and age group. Finally, local education/ awareness campaigns should be continued to increase the knowledge and sense of belonging/ care of the local communities for natural resources and cetaceans in particular.

Balikpapan Bay, East Kalimantan: Due to increasing industrial planning for upstream parts of Balikpapan Bay, it is important to conduct yet another year of at least 3 seasonal monitoring surveys to assess the current situation and to provide most update recommendations to rthe local government.

Mahakam River: Continue the bi-annual monitoring and underwater acoustic monitoring surveys with the aims as described in the section above.

Kubu Raya and Kayong Utara Waters, West Kalimantan: Repeating the monitoring surveys at different seasons to be able to describe the survey population size of this species so that the results of this report can be discussed scientifically.

More research is required in Lovina and adjacent waters in north Bali to understand site fidelity of the small cetaceans in Lovina and their population connectivity with the neighbouring Tejakula District (50 km eastwards) which is developing dolphin watching tourism. Additional socio-economic surveys for both Lovina and Tejakula are required to update such information for the former and to understand the extent of dolphin watching tourism in the latter. Funding permitted, research on site fidelity and population connectivity should be extended to south Bali (the Badung Peninsula) to provide information for management arrangement between the three places.

Low survival rate of the animals during stranding is a typical concern for Indonesia, in addition to the difficulties in species identification. Responding to more exposures on stranding events (www.whalestrandingindonesia.com records more than 100 stranding events from 1987 to January 2013), several stranding-related trainings must be conducted, including but not limited to species identification, in-situ stranding rescue effort and post-mortem investigation. Rigorous data collection on stranding events must be continued to assist the government and related stakeholders in decreasing mortality rate of stranded animals.

Continued surveys, seasonal monitoring and ecological research on the large whales of Indonesia (blue, Bryde's sperm, fin, humpback and orca) especially in the eastern Provinces of Bali, Kaltim, NTB,NTT, Maluku, Papua.

Exploratory surveys and rapid ecological assessments for Sumatra, to start to address a major data gap for marine mammals on this vast Indian Ocean coast line and it's offshore island chains. Increased educational activities and capacity building for all levels of government, NGOs, industry and interest groups.

Further activities as specified in the IUCN SSC Cetacean Action Plan's section for Indonesia and projects promoting the goals of the 2010 IOCS Maldives Declaration.

Regular meetings for cetacean experts active and based in Indonesia (2 times per year), as well as any interested students, to enhance collaborations and ensure that recent results are effectively geared towards species and habitat conservation.

Dugong research needs include:
1) Study the impact of community based conservation of dugong core areas, during a mid-term study of five years.
2) Implement aerial surveys and ground surveys (based on interviews and snorkeling surveys) nationwide in areas where dugongs are known to occur, and later in areas where dug¬ongs are suspected to occur.
3) A mid-term study of five years using satellite telemetry on dugongs in the following areas:
a) Bintan Island
b) Ujung Kulon and Mis¬kam Bay
c) East Kalimantan
d) North Sulawesi
e) Papua.
4) Initiate a mid-term study of five years to investigate the mechanism behind the creation of grazing trails by dugongs in Indone¬sian coastal waters.
5) Trans-boundary research on shared dugong populations between Indonesia and Malaysia, Indonesia and Australia, and Indo¬nesia and the Philippines, to be integrated in project 1, 2, 3 and 4.
6) Projects which support the research recommendations of the IUCN SSC Dugong Action Plan for SE Asia.

Research and Conservation Priorities

General Research Needs: General research priorities, as listed before the "species summaries,"are relevant to all marine mammal species in Indonesian waters. In particular, delegates identified the need to better understand habitat use and how it might change over time, MPA connectivity, bycatch magnitude, species composition and patterns of strandings, potential impacts of mining activities and tourism, potential impacts of climate change, and socioeconomics related to anthropogenic activities impacting marine mammals.

More specific research priorities include: studying the distribution of whales and dolphins in Raja Ampat to inform zoning decisions in local MPAs; continued monitoring of cetaceans along the East Kalimantan coast for long-term trends and patterns and to collect biopsy samples for taxonomic studies; increased understanding of fin whale (*B. physalus*) movement and biological parameters in East Kalimantan; continued monitoring of cetaceans in Balikpapan Bay, East Kalimantan, due to planned industrial development; continued monitoring of the Mahakam River O. brevirostris; population estimates of marine mammals in West Kalimantan; spatial behavior of dolphins in Lovina to inform sustainable dolphin-watching operations; rigorous collection of strandings data; continued monitoring of large whales; preliminary surveys in Sumatra, identified as particularly data deficient. Dugong-specific priorities included studying the impact of community-based conservation efforts, aerial and ground surveys nationwide, use of satellite telemetry, and transboundary efforts with Malaysia, Australia, and the Philippines.

Understanding Impact of Threats: There are not a lot of data on the magnitude of bycatch. Tuna companies have requested assistance in reducing bycatch. WWF aims to improve the reporting of bycatch incidents. The Whale Strandings Indonesia (whalestrandingindonesia.com), a recently-launched national network, is working to coordinate stranding response and data collection, through training workshops and a national database.

Mitigation: As yet, there is no legal framework for regulating traditional hunting, captive display, or tourism, though whale and dolphin-watching is a growing industry in the country. Though marine mammals are protected by law nation-wide, the legal status of marine mammals is unclear, and implementation and enforcement are limited. Four MPAs include marine mammal habitat: Bunakan National Park, Bird's Head Network, the Bali MPA Network, and the Savu Sea Network. A number of conservation education efforts exist, including school programs, stranding trainings, and meetings on best practices for dolphin-watching.

Priorities for improving mitigation of threats include research and activities that strengthen use of a "landscape and seascape" approach, sustainable fisheries, sustainable tourism, alternative livelihoods, and the national stranding network, in addition of education programs.
Present and potential marine mammal watching operations
Small-scale dolphin watching of pesut dolphins in the Mahakam River and Balikpapan occurs very irregularly. The potential is expanding, with better exchanges of NGOs with travel and tourism departments who also have tours on offer. Boatmen and guides have been informed of the existing dolphin watching and approach guidelines.

Dolphin watching in the MPA of Berau is not intentional yet but more an additional entertainment when visiting other islands or snorkeling or diving sites. It has a good potential to become an attraction on its own. Also, here a project is in progress to train local boats and guides in dolphin watching codes.

Bali seems to be the hub for dolphin watching activities in Indonesia, most likely due to its exposure to local and international visitors. As previously explained above, cetacean watching tourism in Indonesia started at Lovina (Hoyt 2001; Mustika 2011). In early 1990s, Bali Hai Cruises and other companies in south Bali started to market their own dolphin trips (Hoyt 2001). In the last five years, fishers of the Tejakula District in Buleleng Regency have started taking tourists to view the dolphins offshore their villages; endorsing the need to have such industry regulated at national level.

Questions after the Presentation

Ellen Hines: Artisanal fisheries included in non-motorized vessels?

- Response (Putu Liza Mustika): No. Don't have data on large fisheries here.

Guido Parra: As part of whale watching studies in Lovina, any ecological information about Spinner dolphins and behavioral impact of whale watching?

- Response (Putu Liza Mustika): Difficult to address (shifting baselines). Spinner dolphins tend to travel more when there are more boats. Never seen spinners resting when boats are around: either moving slow or fast. It does have an impact on population but do not know how much the impact is. Unlike Australia, in Indonesia, the boats stop at 1 m or 0 m near the dolphin (not 100m like in Australia) and have ten boats in the no-go zone.

Guido Parra: How spread out is the impact? Is it localized in Lovina or widespread coastline problem?
- Response (Putu Liza Mustika): It is quite big, covers about 9-10 km of the coast.

Phay Somany: Where does the revenue from dolphin watching goes to?

- Response (Putu Liza Mustika): It is spent on accommodation, meal, transport, and Internet. The money not only goes to boatmen, but to locals and shop owners, so leakage is quite small.

Jay Sweeney: For Spinner dolphins, they are feeding at night and resting at day. In Hawaii, dolphin watching is very big at the resting areas. There are two projects which are looking at movement of Stenella in relation to dolphin watching. The projects are funded by US government to determine if the impact of dolphin watching is strong enough that we should move them, and this information would be hopeful for those concerned with dolphin watching.

- Response (Putu Liza Mustika): Did not observe that the Spinner dolphins are resting in morning as they are active and feeding, probably the Spinner dolphins in the Indonesia have different behavior than those in Hawaii.
- Suzanne: Also observed that Spinner dolphins in Solomon are also very active in the daytime.

Zhu Qian: Samples from hunted whales?

- Response (Putu Liza Mustika): Yes
- Zhu Qian: China signed cooperative arrangement with Indonesia to set up 2 marine research stations with priority on whales and other marine mammals. Together, can try to get more funding and collaborate.

Randall Reeves: Mining work?

- Response (Putu Liza Mustika): Deep sea mining, and oil and gas exploration.

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SEAMAM III Report - Japan

Presentation by Satoko Kimura

Japanese waters have one of the richest fisheries in the world due to the extremely high nutrient content from Oyashio and Kuroshio currents.

Species and Distribution

There are 39 cetaceans, 1 sirenian and 8 pinniped species in Japan's waters.

Cetaceans

1. Common Minke whale *(Balaenoptera acutorostrata)* - (South-East of Japan during winter and North-East during summer)
2. Bryde's whale (*Balaenoptera edeni*) - (South of Japan)
3. Omura's whale (*Balaenoptera omurai*)
4. Blue whale (*Balaenoptera musculus*)
5. Cuvier's beaked whale (*Ziphius cavirostris*)
6. Baird's beaked whale (*Berardius bairdii*) - (North of Japan)
7. Stejneger's beaked whale (*Mesoplodon stejnegeri*)
8. Hubbs' beaked whale (*Mesoplodon carlhubbsi*)
9. Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*)
10. Blainville's beaked whale (*Mesoplodon densirostris*)
11. Andrews' beaked whale (*Mesoplodon bowdoini*)
12. Sperm whale (*Physeter macrocephalus*)
13. Pygmy sperm whale (*Kogia breviceps*)
14. Dwarf sperm whale (*Kogia sima*)
15. Gray whale (*Eschrichtius robustus*) - (Russia during summer and migrating for winter)
16. Humpback whale (*Megaptera novaeangliae*) - (Russia during summer and South of Japan during winter)
17. Sei whale (*Balaenoptera borealis*) - (Northeast area)
18. Fin whale (*Balaenoptera physalus*)
19. North Pacific right whale (*Eubalaena japonica*)
20. Narrow-ridged finless porpoise (*Neophocaena asiaoreantalis sunameri*)
21. Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) - (at least 6 populations in Noto-Island, Amakusa, Kagoshima-bay, Amami-islands, Ogasawara and Mikura-island).
22. Common bottlenose dolphin (*Tursiops truncatus*)
23. Risso's dolphin (*Grampus griseus*)
24. Striped dolphin (*Stenella coeruleoalba*)
25. Pantropical spotted dolphin (*Stenella attenuata*)
26. Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) - (Northeast Japan)
27. Short-beaked common dolphin (*Delphinus delphis*)
28. Long-beaked common dolphin (*Delphinus capensis*)
29. Spinner dolphin (*Stenella longirostris*)
30. Northern right whale dolphin (*Lissodelphis borealis*)
31. Rough-toothed dolphin (*Steno bredanensis*)
32. Fraser's dolphin (*Lagenodelphis hosei*)
33. Harbor porpoise (*Phocoena phocoena*) - (North of Japan)
34. Dall's porpoise (*Phocoenoides dalli*) - (North of Japan)
35. Short-finned pilot whale (*Globicephala macrorhynchus*)
36. False killer whale (*Pseudorca crassidens*)
37. Pygmy killer whale (*Feresa attenuata*)
38. Melon-headed whale (*Peponocephala electra*)
39. Killer whale (*Orcinus orca*) – (mainly North of Japan)

Sirenian

1. Dugong (*Dugong dugon*) – (Henoko in Okinawa)

Pinnipeds

1. Japanese sea lion (*Zalophus japonicus*)
2. Steller sea lion (*Eumetopias jubatus*)
3. Northern fur seal (*Callorhinus ursinus*) - (North of Japan)
4. Harbor seal/Common seal (*Phoca vitulina*) - (North of Japan)
5. Spotted seal (*Phoca largha*) - (North of Japan)
6. Ribbon seal (*Histriophoca fasciata*) - (North of Japan)
7. Bearded seal (*Erignathus barbatus*) - (North of Japan)
8. Ringed seal (*Pusa hispida*) - (North of Japan)

Population Status (Using Red List Designations)

Cetaceans

The Omura's whale (*Balaenoptera omurai*) is a newly discovered species of living baleen whale (scientific description in Nature by Wada et al. 2003). The Omura's whale looks like a fin whale but it is much smaller. It has a unique 21 base in mtDNA. The body size is less than 12m, and mature when around 10m in length. The skull is relatively broad and flat. The baleen plates are quite different compared with those of fin whale in size, shape, colour and number. There are approximately 200 baleen plates on one side, which is the smallest number among all of its congeners. The ecology of Omura's whales is unknown, and they possibly migrate to South-East Asia.

The blue whale (*B. musculus*) is listed as Endangered. There are no studies of blue whales in Japan, and there is no record of bycatch or strandings of blue whales.

The gray whale (*Eschrichtius robustus*) is listed as Critically Endangered. It was estimated that there were 100-150 individuals of gray whales in the North-West Pacific population. One gray whale (~10-12m) was found in Mikawa Bay, where maximum water depth is 9m. A comparison of photos taken in 2010 and 2012 suggests that it is possibly the same individual.

Narrow-ridged finless porpoises (*Neophocoena asiaorientalis sunameri*) are estimated to be ~19,000 in total of five isolated populations in Japan. There are differences in terms of mitochondrial DNA (Yoshida et al. 2001), narrower skull of Ise-Mikawa population, and larger body size in Setouchi population (max male 207 cm; female 180 cm) (Nakamura & Akamatsu, 2003; Kasuya, 1999), compared to Kyushu population (max male 175 cm; female 165 cm) (Shirakihara et al. 1993).

Dall's porpoises (*Phocoenoides dalli*) are estimated to be

173,638 (Dalli type) and 178,157 (Truei type) in 2007 (Miyashita et al. 2007).

Pinnipeds

The Japanese sea lion (*Zalophus japonicus*) is thought to have become extinct. The last sighting was reported in 1970s. The Steller sea lion (*Eumetopias jubatus*) is listed as Endangered. Northern fur seals (*Callorhinus ursinus*) and ribbon seals (*Histriophoca fasciata*) are listed as Vulnerable. Harbor seals/common seals (*Phoca vitulina*), bearded seals (*Erignathus barbatus*) and ringed seals (*Pusa hispida*) are listed as Least concern, while spotted seals (P. *largha*) are listed as Data Deficient.

Sirenia

The dugong (*Dugong dugon*) is listed as Endangered. There are only 3 individuals since year 2005 in Henoko, Okinawa.

Habitat Status

No information.

Directed Catch

There are catches of toothed whales and dolphins, including Baird's beaked whale (*Berardius bairdii*), short-finned pilot whale (*Globicephala macrorhynchus*) (North and South type), Risso's dolphin (*Grampus griseus*), false killer whale (*Pseudorca crassidens*), bottlenose dolphin (*Tursiops truncatus*) and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), striped dolphin (Stenella coeruleoalba), pantropical spotted dolphin (*S. attenuata*), Dall's porpoise (Dalli and Truei type) and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*). The number of catches is under government control, however, it was uncertain what the numbers are after the Tohoku disaster in year 2011.

Area	Species	Abundance	Catches	Ratio	References
Northwest Pacific	Sei	21,612	100	0.46%	Hakamada (2009)
	Bryde's	20,501	50	0.24%	Kitakado et al. (2008)
	Common minke	42,257	220	0.52%	Hakamada et al. (2009)
	Sperm	102,112	10	0.01%	Kato & Miyashita (1998)
Antarctic	Antarctic minke	761,000	850	0.11%	IWC (1991)
	Fin	11,755	50	0.43%	Matsuoka et al. (2006)

Table 1: Catches of whale species

By-catch in Fisheries

The official number of by-catch was 53 during 2000-2004. By-catch has appeared to have been reduced with a change in the way of fishing (1970s). There were more gillnets in the past and now there is high-tech trawling. Due to the Act on the Protection of Fishery Resources, fishermen were reluctant to report bycatch due to paperwork. Thus, the number of bycatch may be higher than the 53 cases reported.

Types of Fisheries and Information on Scale

No information.

Other Threats

Overfishing and sand dredging are possible threats to finless porpoises. Low level of nutrient at some area (water that is too clean) is also a possible threat. Due to too much effluent regulation (one-third of the effluent limit in 1980s), the nitrogen concentration has been decreasing especially since year 2000 (Shirakihara et al. 2007).

Possibly an effect of global warming, a group of eight bottlenose dolphins has moved from Amakusa to Noto. Since 200, two groups of long-beaked common dolphins (*Delphinus capensis*) have moved to the other side of the country. Additionally, some rays and fishes have appeared more northward and eastward.

A major threat to dugongs is the US Navy base that has moved to Henoko (which is the habitat of dugongs in Japan).

Overhunting for oil and skin, cull and decreasing fish stocks have caused Japanese sea lions to go extinct.

The Tohoku disaster on 11 March 2011 had caused bathymetry changes to more than 600kms. The damage to fishing industry was estimated to be $20-30 billion. It may also have caused effects on coastal species such as finless porpoise. Due to the Fukushima nuclear disaster, high levels of radiation were found in local fish.

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

Since 1993, bowhead whales, blue whales, finless porpoises and dugongs are protected by national law (The Act on the Protection of Fishery Resources).

National and state legislation related to fisheries

No information.

International Agreements ratified by nation

Humpback whales (*Megaptera novaeangliae*), gray whales and right whales (*Eubalaena japonica*) are protected under CITES.

Regional Marine Protected Area planning

No information.

Conservation and Education Programs

No information.

Folk attitudes and interactions with marine mammals

No information.

Description of existing and past research and training programs

The population of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in Mikura is the most studied population of bottlenose dolphins in Japan. There were 222 individuals identified through photo-identification from year 1994 to 2009. There were many studies about DNA, ethology, socializing behavior (e.g. rubbing), migration, sound change etc. There is at least one natural hybrid of *T. truncatus* and *T. aduncus*.

Other studies include the distribution of Stellar sea lions, diving behavior of northern fur seals and tracking of spotted seals.

Needs for additional research and training

No information.

Present and potential marine mammal watching operations

There is a famous whale-watching place off Shikoku, Okata-town to watch Bryde's whales (*B. edeni*), sperm whales (*Physeter macrocephalus)* (by chance), bottlenose dolphins, Risso's dolphin, long beaked common dolphins and short beaked common dolphins (*D. delphis*). It is good for education, as most Japanese do not know that marine mammals live in Japanese waters.

There are no government regulations, however, there are self-regulations, with a limit of distance of more than 30m from the animals, and a slow speed limit within 200m. Matsuda et al. (2011) reported behaviour changes with number of boats for Indo-Pacific bottlenose dolphins *(T. aduncus*) in Kyushu.

Questions after the Presentation

Jom Acebes: The current status of humpback whales in Japan?

- Response: They are not legally protected, but they are protected under CITES, so there is no catching of humpback whales in Japan.

John Wang: How has CITES affected the fishermen?

- Response: Not sure, but after the CITES adoption, they did not catch the endangered species.

Ellen Hines: In which month was the gray whale seen?

- Response: It was in March.

Saifullah Arifin Jaaman: Are finless porpoises eaten in Japan?

- Response: No, finless porpoises are not eaten in Japan.

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SEAMAM III Report - Malaysia

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Species and Distribution

Based on recent published literature (Ponnampalam, 2012), a total of 27 species of marine mammals have been recorded in Malaysia, either from live sighting or stranding records. This count contains an addition of 10 new species from the list that was reported in the SEAMAM II Malaysia Country Report in 2005. Malaysia is separated into two distinct regions by the South China Sea, which are Peninsular Malaysia in the west (18 known species), and East Malaysia which includes the states of Sarawak (17 known species) and Sabah (19 known species) (Ponnampalam, 2012). For ease of identifying species records, the list of species was prepared to indicate in which region each species are known to occur. The list of species and the region in which they are known to occur is presented in Table 1.

Species	Peninsular Malaysia		Sarawak		Sabah		Reference no.
	LS	ST	LS	ST	LS	ST	
Family Dugongidae Dugong (*Dugong dugon*) - Dd	x	x	x	x	x	x	1, 16, 21, 23, 25, 27, 28, 29, 30, 31
Family Balaenopteridae Omura's whale (*Balaenoptera omurai*) - Bo		x					29
Bryde's whale (*Balaenoptera edeni*) - Be	x	x	x	x	x	x	9, 6, 16, 24, 27, 28, 29
Blue whale (*Balaenoptera musculus*) - Bm						x	28
Fin whale (*Balaenoptera physalus*) - Bp					x		18
Humpback whale (*Megaptera novaeangliae*) - Mn			x				25
Family Ziphiidae Cuvier's beaked whale (*Ziphius cavirostris*) - Zc						x	20
Ginkgo-toothed whale (*Mesoplodon ginkgodens*) - Mg		x					13
Family Physeteridae Sperm whale (*Physeter macrocephalus*) - Pm				x	x	x	16, 18, 24
Family Kogiidae Pygmy sperm whale (*Kogia breviceps*) - Kb		x		x			6, 28
Family Delphinidae Indo-Pacific humpback dolphin (*Sousa chinensis*) - Sch	x	x	x	x	x		4, 5, 8, 9, 16, 17, 22, 25, 26, 27, 28
Irrawaddy dolphin (*Orcaella brevirostris*) - Ob	x	x	x		x		1, 2, 3, 4, 7, 11, 16, 17, 22, 24, 25, 26, 27, 28, 29

Species	Peninsular Malaysia		Sarawak		Sabah		Reference no.
	LS	ST	LS	ST	LS	ST	
Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) - Ta	x	x	x	x	x	x	20, 22, 24, 25, 27, 28, 29
Common bottlenose dolphin (*Tursiops truncatus*) - Tt					x		24
Long-beaked common dolphin (*Delphinus capensis*) - Dc	x	x					3, 12, 27, 29
Spinner dolphin (*Stenella longirostris*) - Sl	x		x		x	x	18, 22, 24, 25, 29
Pantropical spotted dolphin (*Stenella attenuata*) - Sa		x	x		x		18, 20, 24, 27, 29
Striped dolphin (Stenella coeruleoalba) - Sc		x					27
Fraser's dolphins (*Lagenodelphis hosei*) - Lh			x	x			5, 24
False killer whale (*Pseudorca crassidens*) - Pc	x	x			x	x	18, 22, 24, 27, 29
Pygmy killer whale (*Feresa attenuata*) - Fa		x	x				18, 29
Melon-headed whale (*Peponocephala electra*) - Pe		x	x		x		18, 24
Rough-toothed dolphin (*Steno bredanensis*) - Sb				x	x		24, 27
Killer whale (*Orcinus orca*) - Oo				x	x		4, 24
Risso's dolphin (*Grampus griseus*) - Gg				x			16, 24
Short-finned pilot whale (*Globicephala macrorhynchus*) - Gm		x			x	x	2, 3, 24
Family Phocoenidae Finless porpoise (*Neophocaena phocaenoides*) - Np	x	x	x	x	x		1, 2, 3, 14, 15, 16, 20, 22, 24, 25, 26, 27, 28, 29

Table 1. Checklist of marine mammal species known to occur/have occurred in Malaysian waters based on sighting and stranding records. Two-letter abbreviations at the end of each species name denote species codes in Fig. 1 and 2. LS = Live sighting record; ST = Stranding record. Table adapted from Ponnampalam (2012).

References: (1) Bank 1931; (2) Chasen 1940; (3) Gibson-Hill 1949; (4) Gibson-Hill 1950; (5) Fraser 1956; (6) Harrison & Jamuh 1958; (7) Lewin 1958; (8) Harrison 1960; (9) Mörzer-Bruyns 1971; (10) Berry et al. 1973; (11) Ratnam 1982; (12) Abdul 1986; (13) Mead 1989; (14) Duckworth 1995; (15) Durville & Taylor 1996; (16) Beasley & Jefferson 1997; (17) Dolar et al. 1997; (18) De Boer, 2000; (19) Jaaman et al., 2000; (20) Jaaman et al., 2001; (21) Jaaman & Lah-Anyi, 2003; (22) Nadarajah, 2000; (23) Mansor et al., 2000; (24) Jaaman, 2004; (25) Bali et al., 2008; (26) Minton et al., 2011; (27) Confirmed third party report; (28) Newspaper report; (29) Recent survey by LSP; (30) Rajamani and Marsh, 2010; (31) Rajamani, 2009

Peninsular Malaysia

Coastal cetacean species found in Peninsular Malaysia are the Indo-Pacific humpback dolphin (*Sousa chinensis*), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), Irrawaddy dolphin (*Orcaella brevirostris*), and Indo-Pacific finless porpoise (*Neophocaena phocaenoides*), all of which are present on both the east and west coasts of the peninsula. Indo-Pacific humpback dolphins are commonly sighted around Langkawi Island (Ponnampalam & Jamal Hisne, 2011), Matang and Kuala Sepetang in Perak (Jaaman et al., 2010; Ponnampalam, in prep). There are also confirmed third party and newspaper reports of dead stranded Indo-Pacific humpback dolphins on the northern and northeastern shores of Penang Island and on the east coast state of Terengganu (Ponnampalam, 2012). Irrawaddy dolphins are commonly seen around the estuarine waters of Penang Island (Rajamani et al., submitted chapter) and is believed to have a wide distribution around the island. There have been several newspaper and anecdotal reports of strandings of Irrawaddy dolphins in various parts of Penang Island, including Monkey Beach in the north. Other areas where sightings of this species have been made include the Perlis, Perak, Melaka and Johor coastlines (Ponnampalam, 2012). Indo-Pacific bottlenose dolphins are known to be present as far as the offshore east coast island of Tioman (Jamal Hisne & Ponnampalam, 2011). Strandings of this species have also been recorded in Butterworth, Penang, and in Bagan Lalang, Selangor (Ponnampalam, 2012), while live sightings have been recorded around Langkawi and Tioman Islands (Jamal Hisne & Ponnampalam, 2011) and Penang (Rajamani et al., submitted chapter). Indo-Pacific finless porpoises are regularly sighted around Langkawi Island (Ponnampalam & Jamal Hisne, 2011) and are also recorded from the east and west coasts of Johor (Ponnampalam, 2012).

Long-beaked common dolphins (*Delphinus capensis*) are known to occur off the east coast of Peninsular Malaysia, with confirmed sightings around Tioman Island (Pahang), Pemanggil Island (Johor) and parts of Terengganu waters (Ponnampalam, 2012). False killer whales (*Pseudorca crassidens*) and spinner dolphins (*Stenella longirostris*) have been sighted in the South China Sea, off the east coast of Peninsular Malaysia. Stranding records of pygmy killer whale (*Feresa attenuata*) at Tioman Island and pygmy sperm whale (*Kogia breviceps*) at Terengganu suggest that the two species may also be present in east coast Peninsular Malaysian waters (Jamal Hisne & Ponnampalam, 2011; Ponnampalam, 2012). New stranding records of pantropical spotted dolphin (*Stenella attenuata*) and striped dolphin (*Stenella coeruleoalba*) at the northwestern coast of Peninsular Malaysia indicate that these oceanic species are likely to occur further offshore but may occasionally stray into Malaysian coastal waters.

The only balaenopterid species found in Peninsular Malaysia appears to be the Bryde's whale (*Balaenoptera edeni)* and Omura's whale (*B. omurai*) (Ponnampalam, 2012). Bryde's whales are known to occur in waters surrounding Peninsular Malaysia, with confirmed sightings around Perak Island, in the northern end of the Straits of Malacca (Jaaman et al., 2010), around Langkawi Island and off Tanjung Dawai, Kedah, (Ponnampalam & Jamal Hisne, 2011; Ponnampalam, 2012) and stranding incidents in Nenasi, Pahang, in 2008, and in Pantai Merdeka, in 2010 (DOFM, unpublished). In 2008, the partial carcass of an Omura's whale had stranded in Cherating, Pahang, and appears to be the first confirmed record of this species for Peninsular Malaysia. It is possible that some previous records of Bryde's whales from Malaysia also represent misidentifications of this species, which at the time had not yet been described (Ponnampalam, 2012).

Dugongs (*Dugong dugon*) are found primarily in the southern part of Peninsular Malaysia, in the waters surrounding the state of Johor. Dugongs were recorded in many of Johor's estuaries – in the Pulai and Johor rivers, Mersing Bay and the islands of Sibu, Tinggi, Besar, Tengah, Hujung, Seribuat and Rawa (Marsh et al., 2002; Yang Amri et al., 2005; Choo & Ponnampalam, 2011; Ponnampalam, 2011; Ponnampalam et al., in review; Rajamani, 2012b). Isolated stranding incidents and anecdotal reports of live sightings are known from other areas such as Langkawi and Kapas islands, Terengganu (Ponnampalam, 2012).

East Malaysia

The Irrawaddy dolphin is the most common inshore cetacean species found in large estuaries and bays of East Malaysia (Jaaman, 2010; 2008; Minton et al., 2011). The species can be found in the Brunei, Sandakan, Labuk and Cowie bays, near Jambongan, Berhala, and Silumpat islands, and in Beluran, Segaliud, Kinabatangan, Kalabakan and Marumar rivers in Sabah. In Sarawak, Irrawaddy dolphins occur in the Sarawak, Rajang, Sematan, Bako, Muara Tebas, Saribas and Igan rivers, and in the waters of Miri, Similajau, and Kuching regions (Minton et al., 2011) with high densities occurring at the mouth of Salak estuary, along the western shore of the Bako peninsula and offshore from the Sibu Laut river (Peter, 2012; Minton et al. 2011; Minton et al., 2013).

Indo-Pacific humpback dolphins are sighted occasionally in the Kuching Bay and are sighted irregularly in Similajau. Indo-Pacific humpback dolphins are also known to occur in Datu Bay, and the Rajang and Baram Rivers in Sarawak, and near Jambongan and Sipadan Islands, Cowie Bay and Sandakan Bay in Sabah (Jaaman 2010). Sightings of mixed-groups of Indo-Pacific humpback dolphins and Irrawaddy dolphins are confirmed in Cowie Bay (Jaaman 2010; Kamaruzzan 2011), Brunei Bay (Lim & Kamaruzzan 2012) and Sandakan Bay (L. Porter, pers. obs.).

The Indo-Pacific finless porpoise is another cetacean species that can be found in the coastal waters of Sabah and Sarawak in shallow water of less than 10 m depth (Jaaman 2010). It is the second most frequently encountered species during boat surveys in the Kuching Bay and offshore of Miri (Minton et al. 2011) and a sighting of 10 animals including a mother and calf pair was also made in 2010 in the Saribas River (Jaaman 2010). Analysis on the habitat characteristics of finless porpoise revealed that they prefer areas with higher salinity and pH compared to Irrawaddy dolphins (Zulkifli Poh et al. 2012).

Indo-Pacific bottlenose dolphins were the least frequently encountered during surveys in coastal waters of East Malaysia with only one sighting in the Kuching Bay recorded during boat surveys in 2012 and one in 2008. Surveys conducted in the

Miri region between 2008 and 2009 yielded three bottlenose dolphin sightings offshore (Minton et al. 2011). Anecdotal reports, however, indicate that they are frequently encountered by fishermen and divers further offshore in Kuching (particularly Talang Talang Island), Similajau, and Miri regions. In Sabah, mixed groups of Indo-Pacific bottlenose and spinner dolphins have been recorded at the northern tip of Sabah, in the Straits which join South China Sea and Sulu Sea (Porter 2013). These observations of mixed species groups of Irrawaddy dolphin and Indo-Pacific humpback dolphin and spinner dolphin, pantropical spotted dolphin and Indo-Pacific bottlenose dolphin were perhaps the first reported for the species within their known range in the country (Jaaman 2010). An opportunistic survey of cetaceans in the offshore waters of the South China, Sulu and Sulawesi seas of Malaysia yielded sightings of spinner dolphins, pantropical spotted dolphins and bottlenose dolphins (like Indo-Pacific bottlenose dolphins) (Ponnampalam 2012). Spinner dolphins were the most frequently encountered during the surveys, and were sighted around the Layang-Layang Atoll, and offshore of the Sabah and Sarawak coasts (Ponnampalam 2012). Other oceanic species reported from East Malaysia waters are the killer whale, sperm whale, rough-toothed dolphin, melon-headed whale, false killer whale and fin whale (Ponnampalam 2012). Overall, sighting rate and density were significantly higher in the East Malaysian South China Sea than the Sulu Sea and Celebes Sea (Jaaman 2010). Jaaman (2010) also reported that the presence of oceanic cetaceans was widespread, with spinner dolphin as the most common and abundant species while in coastal waters, the Irrawaddy dolphin was the most frequently sighted and the only species found upstream.

There are numerous records of Bryde's whales in East Malaysia. It is likely that the whale, which is primarily a tropical/subtropical species (Kato 2002), will prove to be the most common species of baleen whale in Malaysian waters. In 2006, a blue whale (B. musculus) had stranded in Kota Kinabalu while another species found in Sabah is the fin whale (B. physalus) from a sighting in 2000 and a more recent live stranding of an individual at Kuala Penyu, Sabah, in 2012 (DOFM, unpublished). In Sarawak, aside from Bryde's whale records, Bali et al. (2008) reports of a sighting of the humpback whale (Megaptera novaeangliae) off the coast of Miri during an aerial survey in 2007.

Jaaman (2004) summarised the current knowledge of dugong existence in East Malaysia which suggests that distinct populations in Sabah occur in Kudat, Kota Kinabalu and the Brunei Bay. In 2000 and 2001, Jaaman and Lah-Anyi (2003) conducted aerial, boat and interview surveys on the coast of Sabah and Sarawak, respectively. They did not find any dugongs during boat surveys and stated that they believed the shy and evasive nature of the dugong is the factor behind this finding. However, the result from aerial surveys was more fruitful with a total of 18 dugongs sighted in a total of 7 sightings. Fourteen dugongs from the study were found in Brunei Bay near Sipitang, Sabah and Lawas, Sarawak. Other areas where dugong sightings occurred were in Kota Kinabalu and near Banggi, Balambangan and Malawali Islands in Kudat.

In Sarawak, a marine mammal aerial survey along the coastal areas of Sarawak was conducted in 2007 (Bali et al. 2008). Among others, five sightings involving 14 dugongs were recorded in the Lawas area. In 2010, 31 dugongs, including three pairs of mother and calf, were recorded during an aerial survey in Lawas (Jaaman et al. 2010) while a 1.8 m juvenile dugong was found dead on the beach of Kg Loknunuk, Tuaran, Sabah, in 2007 (Jaaman, pers comms.).

Population Status

Peninsular Malaysia

The status for all cetacean species in Peninsular Malaysia is currently unknown, due to a lack of scientific research effort and research projects that are newly established and therefore still in the stages of primary data collection. In Langkawi, research on the ecology and abundance of coastal cetaceans, particularly on the Indo-Pacific humpback dolphin and Indo-Pacific finless porpoise has been ongoing since 2010. Analyses on population abundance estimation within Langkawi waters for both species is still underway, however to date, >120 individuals of Indo-Pacific humpback dolphins have been photo-identified and catalogued based on the animals' left and right sides of their dorsal fins (Ponnampalam & Jamal Hisne 2011; Ponnampalam, pers. comm.).

The dugong population status in Peninsular Malaysia remains unknown, as estimations on population abundance have not been made, to date. Around the Johor islands in the south of Peninsular Malaysia, at least 26 dugongs have been observed based on aerial surveys in the east coast at Kota Tinggi, Mersing, Pulau Sibu and Pulau Tinggi (Yang Amri et al. 2005). Recent aerial surveys conducted around the Johor east coast islands of Pulau Sibu, Tinggi, Besar, Rawa and Pulau Seribuat in Pahang in 2010 have revealed that the maximum count of dugongs during the 8-day survey period was 20 individuals, while the maximum count of mother-calf pairs was four. The daily mean of dugongs sighted was 11.6 dugongs d-1 while the encounter rate of dugongs was 3.01 dugongs km-1 and 7.01 dugongs h-1 respectively (Ponnampalam 2011; Ponnampalam et al., in review). The dugong population in Langkawi is believed to be a shared population with Southern Thailand (Mohd Lazim et al. 2007) while the calf found stranded in Pulau Kapas, Terengganu in 2008 is believed to have lost its mother during migration (DOFM, unpublished).

East Malaysia

Only certain areas in East Malaysia have been surveyed where the status of the cetacean and dugong populations present in the areas are relatively known. These areas include Cowie Bay in Sabah and Kuching Bay in Sarawak for cetaceans and Brunei Bay and Lawas, Sarawak for dugongs.

In Cowie Bay, it was found that the dolphins were not distributed evenly in the area and all sightings were made in the inner part of the Bay. Neither survey effort nor environmental parameters (season, daylight and tidal periods, depth, SST, salinity and turbidity) had significant effects on the occurrence of dolphins. The pattern of distribution is more likely to be influenced by the abundance of prey and the presence of many estuaries and mangroves in the area. CAPTURE within Program MARK 6.1 estimated the population size of Irrawaddy dolphins in Cowei Bay to be small (N=31, 95%CI=28 – 34; CV=0.06) (Teoh et al. 2013).

Photo-identification surveys in the Kinabatangan River indicate that there are two distinct populations of Irrawaddy dolphins; one in Sandakan bay which appears to extend to the north to Beluran and another near Tundun Bohangin, some 70km southeast and downriver from Sandakan (Swee & Porter, in prep). As yet, insufficient photo-identification data exists to make population estimates with any certainty, however, both areas appear to have small populations numbering less than 30 individuals.

Population numbers are currently available for three species of cetaceans in the Kuching Bay. For the Irrawaddy dolphins, this was achieved by using mark-recapture techniques on photo-identified individuals as well as line transect surveys conducted between April 2010 and September 2011. Mark recapture methods yielded a best estimate of the Irrawaddy dolphin population in Kuching Bay of 233 dolphins (CV = 22.5%, 95% CI 151-360) (Minton et al. 2013). Line-transect methods yielded an estimate for this species of 149 individuals (CV=28%, 95% confidence interval 87-255). Indo-Pacific finless porpoises were estimated to be 135 (CV= 31.3%; 95% CI 87-255) based on line-transect/DISTANCE methods (Minton et al., 2013). More detailed information on population parameters such as birth and survival rates is still lacking for all species studied in the Kuching Bay and Similajau.

In Brunei Bay and Lawas, Sarawak, dugongs were sighted feeding and swimming slowly during each aerial survey conducted (Bali et al. 2008; Jaaman & Lah-Anyi 2003; Jaaman et al. 2001). The mean group size was 2.4 ± 3.13 (min = 1, max = 8) (Jaaman, unpublished data). Results of these aerial surveys indicate that there is a small breeding population of dugongs in Lawas waters. The population is perhaps residential and undergoes local movements within Brunei Bay. Feeding trails of dugong on seagrass beds have been regularly found during seagrass monitoring conducted periodically in the area. This suggests that Lawas waters are a crucial nursery, feeding and transient ground for dugongs (and sea turtles). The increase in the number of sightings and individuals in subsequent aerial surveys may suggest the addition of new offspring or migration of individual dugongs from other areas of the Brunei Bay and/or Sabah which migrated or moved to Lawas (Bali et al. 2008).

Aerial surveys were conducted for the whole of Sabah except Tawau in July 2003, Dec 2005, and Sept 2006 (Rajamani & Marsh 2010). Fifty-three dugongs including nine calves were observed at an average of 1.81 + 1.13 dugongs per survey hour. Seventeen sightings of 43 animals were made in September 2006; at other times dugongs were mainly observed as solitary animals or in groups of two. Twenty-six dugongs including nine cow-calf pairs were seen apparently feeding in seagrass areas at depths of 5 – 7 m in Terusan Timur (Timur Strait) between Labuan and mainland Sabah (Rajamani & Marsh 2010). The surveys suggest that Labuan Island (29 dugongs) and adjacent Brunei Bay (6 dugongs) supported the largest population in Sabah.

Habitat Status

Peninsular Malaysia

In Peninsular Malaysia, areas of already high human population and intensive coastal development (such as the south coast of Johor, Klang, and Penang), direct impacts from sedimentation and pollution, untreated waste disposal and other human activities have severely degraded important marine habitats (e.g., seagrass beds, coral reefs, and mangroves) that many marine organisms are directly or indirectly dependent upon (Jaaman et al. 2002).

Many coastal areas that are currently under-developed have been earmarked for large-scale development within designated 'development regions' including the coastlines of Kelantan, Terengganu, Pahang, and the district of Mersing in Johor that come under the East Coast Economic Region (ECER), and the coastline of the Johor Straits which will be developed under the Iskandar Development Region (IDR). Planned projects within the ECER that could potentially affect marine mammal habitats along the east coast include the construction of petrochemical and port facilities and the construction of integrated tourism hubs on reclaimed coastline and artificial islands. These development projects could severely affect the ecology of marine mammals through habitat degradation and destruction due to land reclamation, dredging, deforestation of mangrove forests, coastal erosion, pollution (water and noise) and reduction of prey. For example, under the now-halted Mersing Laguna Reclamation project, large areas of seagrass beds (approximately 23%) within the shallow tidal flats of Mersing Bay and vicinity of Selantai Island will be destroyed permanently (Firdauz et al. 2008). Recent surveys in July 2010 conducted by the Institute of Ocean and Earth Sciences, University Malaya found that the seagrass beds in the aforementioned areas are feeding grounds for the dugong (Ponnampalam 2011; Ponnampalam et al., in review).

Similarly, under the IDR plans, dugong and dolphin habitats in the Johor Straits are at high risk of disappearing due to intense coastal development of heavy industrial hubs (biofuel and petrochemical), residential areas, ports and marinas, all of which will involve land reclamation, dredging, pollution (water and noise) and clearing of vast tracts of mangrove forests. Elsewhere in Peninsular Malaysia, marine mammal habitats are threatened by pollution from siltation and sedimentation due to oil palm plantations near the coast and riverbanks, pollution from areas of high human habitation (e.g. Penang, Klang Valley) and pollution from oil spills. In May 2010, two tankers collided in the Singapore Straits causing an oil spill which eventually reached the southeastern shores of Johor. While quick measures were taken to clean up the oil that washed ashore, it is not known the extent to which toxic dissolved compounds from the spilled oil had affected and will affect the marine environment and its organisms in the long-term.

East Malaysia

In the last decade, many riparian areas of bays and rivers in Sabah has been converted into agricultural or urban areas which has caused degradation of marine mammal habitats from effluent discharges, increased nutrient and sedimentation load, and pollution (Jaaman 2008; 2010). The rapid development of Sandakan, Tawau, Tanjung Manis and Muara Tebas into major ports and industrialised towns might affect the natural habitat and behaviour of the Irrawaddy dolphin populations in the areas (Jaaman 2010). In addition, a causeway that runs across the Santubong River, which completely cuts flow to the ocean, and a barrage in Pending that limits the flow of the Sarawak River to the ocean (through Muara Tebas) is a problem to the natural migration routes of inshore cetaceans in and out of the Kuching river systems.

The seagrass meadow in Lawas, Sarawak is believed to be the largest seagrass habitat present in the whole of Malaysia. The majority of dugong and marine turtle sightings during aerial surveys conducted in East Malaysia is off Lawas indicating that Lawas is an important feeding and nursery ground for the two totally protected animals. A proposal has been submitted under the 10th Malaysia Plan (2011-2015) to gazette the entire coastal waters of Lawas as a Marine Protected Area (MPA) to protect the seagrass habitat. At present, this remains a proposal and the seagrass habitat is still unprotected from any anthropogenic influences. During aerial surveys of the coastal waters of Sabah (Sipitang and Menumbuk), Labuan and Brunei were found to be murky when compared to Lawas, Sarawak (Bali et al., 2008; Jaaman and Bali, 2011). This may be due to high human population and intensive coastal development activities, which are evident along the coastline of these three areas. Direct impacts from sedimentation and pollution (from Sipitang and Labuan industrial areas), untreated waste disposal and other human activities may have severely degraded seagrass beds in these areas, and which dugongs (and sea turtles) are directly dependent upon.

The Salak-Santubong Bay and the Bako-Buntal Bay, with interconnecting portions of the Telaga Air and Salak River, are bordered by terrestrial protected areas. In Similajau, most of the area studied is offshore from the Similajau National Park, but is bordered by a Liquid Natural Gas (LNG) plant in the south, and the development of a large coastal industrial park, deep water port and aluminium smelter plant in the center of the study area. In Kuching, areas include the Kuching Wetlands National Park, the Satang island portion of the Talang/Satang turtle islands, Mount Santubong National Park, and Bako National Park. Coastal developments that threaten the quality of cetacean habitat in these areas include an active artisanal gillnet fishing industry, increasing aquaculture initiatives, a number of new coastal resorts and housing developments, and a planned flood mitigation channel that will divert millions of cubic meters of silt-laden fresh water from the city of Kuching into the Salak estuary. The ongoing construction of an 8km-long flood mitigation channel will see flood water from the Sarawak River upper catchment area diverted to River Salak in an effort to solve persistent flooding problems in Kuching. Once operational, the channel will have the potential to divert 392 million cubic meters of fresh, silt-laden water at maximum flow rates of two meter per second from the Sarawak River basin into the Salak River (Mah et al. 2010). Meanwhile in Bintulu, coastal developments in the Similajau study area include extensive dredging for ports and wharves and the construction of a large industrial park near Tanjung Similajau (Minton et al. 2011).

Directed Catch

Peninsular Malaysia

Although some coastal communities in Johor traditionally hunted dugongs in the past, there is currently no directed catches of marine mammals within Peninsular Malaysia, whether for trade or personal consumption. However, there have been two reported incidents in which a stranded animal was rehabilitated and subsequently kept in captivity. The first incident was of a dugong calf which stranded in Johor and kept in a cage for five months. The calf was found dead three days later following its release (Mansor et al., 2000; Jaaman et al., 2002). The second incident occurred in 2006 in Terengganu involving a stranded dugong calf. The calf was kept in captivity and died seven days after it was initially found based on newspaper reports of the incident (The Star, 7 September 2006).

East Malaysia

In Sarawak, dugongs are known to have been hunted in Limbang, Lawas and Sematan areas by local people. Fishermen hunted cetaceans solely for their meat in most parts of Sarawak before the 1980. However, in 1985, new laws came into effect at both the federal and state levels which prohibited the direct killing of cetaceans. Marine mammal meat is considered a delicacy that these local communities still eat whenever incidental catch occurs. At present, there is no evidence of direct cetacean catches occurring in Kuching, Miri and Similajau where an active cetacean research project is ongoing. However, a few interviews with local fishermen revealed that direct hunting occurs in the fishing district of Sebuyau where Irrawaddy dolphin meat is used as bait for puffer fish, although no concrete evidence of direct hunting was observed in that area.

Marine mammals have been hunted traditionally in Sabah (Jaaman 2010; 2008). One species that is highly sought after is the dugong, particularly among the Bajau Laut community (Jaaman and Lah-Anyi 2003; 2002; Jaaman et al. 2008). A three- to five-inch piece or a kilogram of dugong meat is reported to fetch between RM5 and RM10 (US$1.50-3.00), and a whole dugong can be sold for up to RM400 (US$125), depending on its weight. Dolphins, on the other hand, are reportedly hunted for food only by the Bajau Pelauh in Semporna, Sabah (Jaaman and Lah-Anyi 2002; Jaaman et al. 2008). Two species, the “Bung Saelo” (bottlenose dolphin) and “Bung Saeso” (spinner dolphin), are hunted and traded at RM2 (US$0.50) for about a two-inch piece of meat. Dugong and dolphin hunting and trading activities are believed to continue in present times, especially during certain months in some remote areas on the east coast of Sabah (e.g. Kudat, Sandakan, Semporna and Lahad Datu.

Dugongs are also hunted opportunistically and deliberately whilst blast fishing (Rajamani et al. 2006). Dugongs may sometimes be in the vicinity when fishermen throw bombs to kill fish, and once fishermen are aware that dugongs are in the vicinity they may throw two to three bombs in the water to kill the animals. When dugongs are caught, they are either consumed locally or sold to merchants on other islands near Banggi or in the Philippines, where their meat is considered a delicacy, particularly for special occasions such as wedding feasts. Informants reported two cases of dugong hunting near Banggi islands in 2002. The animals were caught during an illegal fish bombing exercise. In both incidents the entire dugong was sold on Mangsee Island in the Philippines, and on Sibogo Island (Banggi). The dugong at Sibogo was sold at a price of US$105.00. All parts of the animal were used, including its intestines and organs (Rajamani et al. 2006).

Based on the interview surveys conducted between March 1997 and December 2004 in Sabah, 25% (294) of the total 1,186 interviewees said they have hunted marine mammals or reported the hunting activities of their fathers and/or grandfathers in the past. Two hundred and thirty-one (79%) caught dugongs, 14 (5%) caught dolphins and 49 (17%) caught both groups of marine mammal (Jaaman et al. 2008). The magnitude of dugong catches in the past was similar throughout Sabah, but significantly greater for dolphins in the Celebes and Sulu Seas than in the South China Sea. Overall, fishermen who use pump boats and/or gillnets are much more involved in hunting, as compared to fishermen using other types of boats or fishing gear. The harpoon or spear is the main gear used for hunting (Jaaman 2010; Jaaman et al. 2008). A much smaller scale series of interviews conducted with the Orang Sungai of the Kinabatangan River indicate that less than 3% of the fishermen there have hunted, or heard of other fishermen hunting, dolphins (presumably Irrawaddy) in the riverine area (Swee & Porter, in prep).

About 326 dolphins and 796 dugongs were estimated to be taken annually with a mean catch of 5.2 dolphins (95% CI = 4.01 – 6.34) and 2.8 dugongs (95% CI = 2.47 – 3.21) per hunter. The bootstrapped estimates of animals taken annually in each fishing region and for each boat-type were extremely high and unsustainable. Two hundred and sixty-two (89%) hunters had stopped hunting in the 1980's and only 32 (11%) said they still hunt the animals, at least occasionally or opportunistically during fishing trips. Nine hundred and sixty-one (81%) respondents and 23 (72%) hunters interviewed were aware of the government regulations on fisheries, and 994 (84%) respondents admitted that the animals' numbers have dropped significantly in the past few decades (Jaaman 2010; Jaaman et al. 2008). However, given that low numbers of dugongs sighted during aerial surveys in the area (Refer Section 1), these numbers should be used as a guide and further assessment be made to ascertain actual bycatch rates of marine mammals in the area.

By-catch in Fisheries

Peninsular Malaysia

The nature and magnitude of marine mammal incidental catches are unknown in Peninsular Malaysia, and there has been no formal and detailed research or monitoring programme conducted on this. However, based on anecdotal reports and behavioural observations during more recent surveys, it appears that dolphins in certain parts of Peninsular Malaysia are being caught incidentally in both artisanal and commercial fishing gears. As for stranding incidents, according to official records from the Department of Fisheries Malaysia, a total of 61 stranding incidents had been reported in Peninsular Malaysia between 1905 and 2012, and of these, 17 involved dolphins, five whales, and 39 dugongs (DOFM, unpublished). Based on external injuries sustained by the stranded individuals there is a probability that their deaths were caused by entanglement in various fishing nets, with trammel and gill nets being the most probable sources.

East Malaysia

In East Malaysia, the use of gillnets and kelongs (fish corrals) are found to be the main factor for the incidental catches of dugongs and inshore cetaceans, particularly the Irrawaddy dolphins and Indo-Pacific finless porpoises, while trawl nets are involved to a lesser extent (Jaaman and Lah-Anyi 2003; Jaaman 2010; Jaaman et al. 2009). Gillnets are usually set at night, so it is likely that if dugongs and small cetaceans become entangled, the animals will die before being detected. Since 1996, there has been a considerable number of such cases reported annually, and usually the caught animals either died or, in the case of dugongs in Sabah, were slaughtered for local consumption (Jaaman and Lah-Anyi 2003; Rajamani et al. 2006; Rajamani 2009; Jaaman 2010)

Live-caught dolphins, however, were usually released back to sea, although besides the Bajau Pelauh in Sabah, some Melanau and Malay fishermen in Sarawak are known to bring back incidentally caught dolphins and finless porpoises for family consumption (Jaaman and Lah-Anyi 2002). Some fishermen in Kuching have reported selling incidentally caught dolphin meat for RM2 to RM6 (US$0.50-1.50) per kilogram to local buyers (Jaaman and Lah-Anyi 2002; Jaaman 2008; 2010).

Based on the interview surveys conducted between March 1997 and December 2004, incidental catches of marine mammals were reported by fishermen from 310 (41%) and 99 (28%) of the total 753 and 358 fishing boats sampled in Sabah and Sarawak respectively. Gill-netters, trawlers and fish stakes were reported to catch cetaceans and dugongs, while purse seiners caught only cetaceans. Irrawaddy dolphin, bottlenose dolphin, spinner dolphin and other Stenella spp., Indo-Pacific humpback dolphin and Indo-Pacific finless porpoise are the cetacean species known to be taken (Jaaman et al. 2009; Jaaman 2010).

Overall, the magnitude of incidental catches is greatest in gillnets. No marine mammals were caught during observed fishing trips. A total of 306 cetaceans (95% CI = 250 – 369) and 479 dugongs (95% CI = 434 – 528) were estimated to be accidentally caught annually by fishing fleets in Sabah. The Sarawak fishing fleet is estimated to incidentally catch 221 cetaceans per year (95% CI = 189 – 258) and in the Northern region, 14 dugongs (95% CI = 2 – 30) were estimated to be accidentally caught annually. The bootstrapped estimated number of by-catches, particularly in gillnets, may be unsustainably high (Jaaman et al. 2009; Jaaman 2010). However, these numbers present preliminary estimates and further assessment be made to ascertain actual bycatch rates of marine mammals in the area.

Through interviews, community workshops, the distribution of stranding/bycatch posters and boat surveys in the Bintulu and Kuching areas, fishermen in both places are well aware that cetaceans are totally protected and therefore should not be harmed in any way. Most fishermen in these focused areas also knew how to response appropriately to cetaceans stranding or bycatch by informing the research team or government authorities, compared to fishermen in other places such as Sebuyau fishing district where interviews were conducted opportunistically. Most recent bycatches in Kuching waters were related to set gillnets with 4-7 inch stretched mesh size and minimum length of 100m that were left unattended for a long period. They are almost always set in areas with high cetacean density (Minton et al. 2013).

Types of Fisheries and Information on Scale

The fisheries sector continues to be an important sector for the Malaysian economy with a 1.1% contribution to the country's gross domestic product (GDP) in the year 2011. Marine capture fisheries produced a total of 1,373,105 tonnes in the year 2011 constituting approximately 83% of the total catch for that year, an increase of nearly 4% from 2010. Based on the 2011 landings, inshore fisheries (less than 30 nautical miles from shore) remain the biggest contributor of fish landings for the country with 65% of the total landings for the year (DOF 2012).

The fishing sector consisted of 134,110 fishermen in 2011 (DOF 2012). Forty percent of fishermen worked on board commercial fishing vessels using trawl and purse seine nets while the remaining 60% worked on board traditional fishing gear vessels (ie. gill nets, traps, cast nets, etc.). A total of 53,002 units of licensed fishing vessels were operating throughout the country in 2011 with 60% in Peninsular Malaysia and 40% in East Malaysia. Of these, around 5.5% were categorized as commercial fishing vessels with a gross registered tonnage (GRT) of above 40 (DOF 2012).

Other Threats

Other threats to marine mammals present within Malaysia include the following:

Oil and gas explorations and development: As oil and gas remain one of the most profitable sectors in Malaysia's economy, an increasing number of exploration (including seismic) and offshore development projects are being undertaken in the country. For example, companies are moving into previously unexplored areas such as the Brunei Bay and western Sabah coastal waters to explore and develop oil and gas fields. The bay harbours large seagrass, mangrove and mudflat habitats which are important feeding and possible breeding grounds for dugongs and other biodiversity.

Typically, oil and gas exploration and development activities involve the generation of underwater noise and discharge of petrochemical/hydrocarbon wastes into the sea. Impacts of the activities may directly affect marine mammal population in the country unless proper and effective measures are taken to mitigate them. To date, no regulation exists for any mitigation measure (ie use of Marine Mammal Observers (MMO) and airgun soft start during seismic exploration activities) to be implemented to reduce any impact that may arise from oil and gas activities. Companies that do implement any mitigation measures does so voluntarily and with no formal guideline or monitoring.

Ship strike: As a maritime country, Malaysia typically hosts a significant number of ocean-going vessels per year. With the establishment of new port facilities and expansion of existing facilities, the country is well-placed to attract an increasing amount of vessel traffic in the years to come. As it is, there have been numerous reports of stranded animals showing signs of strikes from ship propellers causing injury to death, especially in areas with high vessel traffic density (ie. near ports).

Pollution: In Malaysian waters, pollution typically originates from land-based sources although there are some caused from sea-based sources. Commercial, residential and industrial developments found along the coast are known to discharge wastes into the waterways which end up into the sea causing further degradation to marine mammals' habitats, and in some cases to the animals themselves. Sea-based sources of pollution include solid and liquid wastes discharged by vessels and offshore facilities as well as recreational users of the sea. In 2008, a necropsy conducted on a stranded Bryde's whale revealed waste such as rope and plastic bags contained within its stomach (Gunalan et al. 2013).

Illegal, Unreported and Unregulated (IUU) Fishing: IUU fishing practices, such as fish bombing, is still prevalent in parts of Sabah, and is a major cause of dugong mortality. However, due to the lack of any official system in place to monitor fishing effort at sea, the extent of IUU fishing and their impact to marine mammals in Malaysian waters remain undetermined.

Lack of awareness: Many people in the country do not know that cetaceans are present in Malaysian waters. Most believe that these animals are only found in temperate waters and could not survive the higher temperatures of tropical waters. Many people also believe that these animals are intelligent enough not to warrant any conservation as they can take care of their own selves (Ponnampalam & Jamal Hisne, unpublished). The lack of awareness and understanding on the animals' needs, even at the governmental levels, is increasingly threatening marine mammals in Malaysian waters as many of their needs are not being considered when activities such as coastal development, boating, shipping, etc. are being planned and implemented. Cetacean monitoring programmes have been initiated in various parts of the country with mixed success in generating sustained interest and participation of local communities (Rodriguez & Rajamani, unpublished; Ponnampalam & Jamal Hisne, unpublished).

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

All marine mammals are protected species in Malaysian waters, and Federal Laws apply within the 200-nautical mile Exclusive Economic Zone (EEZ). Federal legislation concerning marine mammals includes the Fisheries Act 1985 (Part VI - Aquatic Mammals in Malaysian EEZ) together with the Fisheries Regulations 1999 (Control of Endangered Species of Fish). Related State laws reflect the federal legislation and include specific regulations for management of wildlife within State jurisdiction (i.e.Wildlife Conservation Enactment 1997 [Sabah] and Wild Life Protection Ordinance 1998 [Sarawak]). Additionally, the Department of Fisheries Malaysia has published the National Plan of Action for Conservation and Management of Dugongs in 2011 where several actions were proposed for the protection of dugong populations in the country, including the establishment of a National Task Force/ Working Committee on Dugongs. Furthermore, the Department of Fisheries Malaysia has also established the Task Force Group on the National Marine Mammals Stranding Network in July 2012.

In general, these laws and regulations prohibit any person from fishing, catching, disturbing, harassing, taking, hunting, killing, possessing, selling, buying, transporting, consuming, exporting and importing any marine mammal (including parts of the animal) that is found in Malaysia. The provisions of the relevant State law apply to all marine mammals that are found within a state's jurisdiction. Where any marine mammal is caught or taken unavoidably during fishing, such animal, if it is alive, must be released immediately or, if it is dead, the catching or taking thereof shall be reported to the authority. Any person who is guilty of killing a totally protected species (e.g. Dugong dugon) shall be liable to a maximum fine not exceeding RM25,000 (US$7,850) and a term of imprisonment for not less than six months but not exceeding five years (Sarawak Wild Life Protection Ordinance 1998 and Sabah Wildlife Conservation Enactment 1997).

In addition to the Royal Malaysian Marine Police (RMMP), Royal Malaysian Navy (RMN) and the Malaysian Maritime Enforcement Agency (MMEA) that have the authority to enforce laws and regulations in the waters of Malaysia, several government departments are given the responsibility to manage and conserve all marine mammals. In Peninsular Malaysia and the Federal Territory of Labuan, it is the responsibility of the Department of Fisheries Malaysia and Department of Marine Parks Malaysia. In Sarawak, the Protected Areas and Biodiversity Conservation Division of Sarawak Forestry Corporation, Natural Resources and Environment Board, and Department of Marine Fisheries Sarawak are the responsible authorities. The Department of Wildlife, Department of Fisheries, and Sabah Parks hold the jurisdiction to protect and manage marine mammals in Sabah waters.

National and state legislation related to fisheries

Marine capture fisheries are governed by the Fisheries Act 1985 (Amended 1993) in tandem with the Constitutional provision that fish and fisheries (except for turtles) are Federal subjects. The Constitution does not confer clear management or ownership rights on marine resources. The word "fisheries" is an economic term and "fisheries management" implies resource management. If the organisms that are caught have biodiversity value, the beneficiary of that value is unclear.

Furthermore, even for the management of fishing there are gaps. The Fisheries Act 1985 (Amended 1993) specifically exempts rod and lines using less than 3 hooks, cast nets and collection. If marine organisms are to be harvested using these methods, the Act then does not apply.

International Agreements ratified by nation

Malaysia is a party to a number of international agreements and those that are relevant to marine mammal conservation include the Convention on Biological Diversity (CBD), Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), Kyoto Protocol to the United Nations Framework Convention on Climate Change, Cartagena Protocol on Biosafety, Ramsar Convention, Basel Convention, Montreal Protocol, and is also a member country of the Coral Triangle Initiative (CTI).

Regional Marine Protected Area planning

Marine Parks are established under a subsidiary legislation of the Fisheries Act i.e. the Establishment of Marine Parks Malaysia Order 1994. It currently has no Act of its own.

Although there is currently no MPA that is specifically established to reduce threats to marine mammals in Malaysia, MPAs in Malaysia generally have been established with the primary objective to conserve coral reefs and turtle habitats but also to allow some traditional fishing and recreational activities to take place. These MPAs are scattered throughout Peninsular Malaysia, Sarawak and Sabah. MPAs established under the Federal-law (ie. Marine Parks Order 1994) are managed by the Department of Marine Parks Malaysia under the Federal Government while those established under the state law is managed by the respective state's government.

It has been suggested by Jaaman (2010) that the inner Cowie Bay is a suitable area to be established as an MPA for marine mammals (where there exists resident populations of Irrawaddy and Indo-Pacific humpback dolphins), which can be an extension to the existing Kalabakan and Brantian Mangrove Forest Reserves. Other areas that Jaaman (2010) suggested for marine mammal MPAs include Muara Tebas, the Beluran and Kinabatangan Estuaries, Brunei and Sandakan Bays, Layang-Layang Atoll, and Sipadan Islands in Sabah, and parts of the Rajang (at Tanjung Manis) and Saribas (at Beladin) rivers in Sarawak for the conservation of Irrawaddy dolphins.

Additionally, the Johor islands, especially the area off the southwest of Pulau Sibu, have been identified as a critical seagrass habitat for dugongs and would be one potential MPA for marine mammals in Malaysia (Ponnampalam 2011; Ponnampalam et al., in review) where fisheries and wildlife protection regulations, such as to prohibit illegal and destructive fishing activities or limit speed and boat traffic passing through the area, could be implemented and enforced efficiently.

Conservation and Education Programs

Previous and ongoing conservation initiatives in the country which have indirect impacts on marine mammals or their habitats are as follows:

Conservation Programs:

(a) The Coral Triangle Initiative and Sulu-Sulawesi Marine Eco-Region Programmes include multi-stakeholder eco-regional based conservation activities initiated and developed in collaboration with various stakeholders from Indonesia, Malaysia and the Philippines.

(b) Gazetting the area around Sibu and Tinggi Islands off the Johor east coast as a Special Area of Conservation (SAC) for dugongs and sea turtles.

(c) The establishment of a National Marine Mammal Stranding Response Network involving a collaboration of multiple government agencies, non-governmental organizations, universities and private companies to provide effective response to stranding incidents around the country and standardized sample collection repository and protocols for all researchers (Ponnampalam et al. 2010).

(d) Monitoring of seagrass distribution and dugong feeding trails in selected sites in the country specifically focused in areas around Sabah and Sarawak.

(e) Interview surveys to study the local knowledge and perspectives of the community on marine mammal population, ecology, human interaction, and degree of local commitment to conservation in various areas around the country.

Education Programs:

(f) Community-based project involving local community (school, resorts, local community members) engagement and educational activities to raise awareness and stakeholder participation with regards to marine mammal conservation at various sites around the country.

(g) Engagement with media platforms (ie. tv stations, radio stations, newspapers, magazines, and internet portals) to raise public awareness and participation with regards to marine mammal conservation in the country.

Folk Attitudes and Interactions with Marine Mammals

Peninsular Malaysia

There does not appear to be a large interest on marine mammals among people residing in Peninsular Malaysia, be it in urban or rural areas. Most people residing in large cities and town areas are highly unaware of the presence of marine mammals in Malaysian waters. Many are under the impression that one needs to travel overseas to countries such as Australia and the United States to have the opportunity to see marine mammals. If they have any knowledge on marine mammals in Malaysia, most of them only identify with the dugong, after the case of the dugong calf in Pasir Putih, Johor, fondly named Si Tenang brought dugongs to national attention in the media in 1999. The majority of people living in coastal communities are aware of the presence of marine mammals, however there does not appear to be a great interest or enthusiasm among them for these animals. During informal interviews with fishermen in Johor, some even regarded the dolphins as pests, as the animals often depredated their nets and subsequently caused damage to their net. When asked about the significance or importance of marine mammals, many fishermen were neutral, saying that the animals have no benefit to them in terms of income and livelihood (Jaaman et al. 2010; Jamal Hisne & Ponnampalam, unpublished).

Elsewhere in more tourism-driven places such as Tioman and Langkawi islands, boatmen and tour operators that were interviewed showed positive responses towards cetaceans. They regarded the animals as a tourism resource that could attract more tourists to the island and help their businesses boom. In Langkawi and Penang, the fishermen and tourist operators provided important insights regarding the species, status and distribution of marine mammals (Jamal Hisne & Ponnampalam, unpublished; Rajamani et al., submitted chapter). This information is now being used as a qualitative baseline for scientific research. Local fishermen also believed that sightings of dolphins near shore indicate that a storm is near (Rajamani & Rodriguez, unpublished).

Interview surveys in the past and present indicate that there is some cultural significance to dugongs in Peninsular Malaysia (Affendi et al. 2005; Ponnampalam et al. 2009; Rajamani 2012b). In Johor, the indigenous Seletar (former sea gypsies of the Johor Straits) used to hunt the dugong for its meat, tusks and 'tears' (which is actually the mucus secretion from the eyes). The meat used to be a main source of protein for the Seletar, while the tusks were made into smoking pipes and sold in Singapore. The 'tears' were believed to be a love potion, and also used by the Seletar to aid in navigation in rough seas (Ponnampalam et al. 2009). According to Mansor et al. (2000), dugongs were hunted in the Johor Straits until the 1970's. However, due to the law as well as the low numbers of dugongs in present times, the Seletar no longer hunt these animals. In fact, only the older Seletar folk have knowledge of the dugongs while many of the younger Seletar and other younger fisherfolk living along the Johor Straits have never sighted dugongs (Ponnampalam et al. 2009).

East Malaysia

Many fishermen believe that dolphins are baby whales, while others believe all marine mammals are fish alike. Some Bugis fishermen in Tawau believe that dolphins originated from a human who was cursed because of trying to steal Prophet Sulaiman's ring. Some Malay and Melanau fishermen in Kuching believe that it is a bad omen when a "white dolphin" (Indo-Pacific humpback dolphin) is found at sea while fishing. They think that when a white dolphin leaps out of water, it portends rain and thunderstorms. "Masap" refers to times when dolphins swim around their boats and frighten them. Bottlenose and spinner dolphins are reported hunted for food only by the Bajau Pelauh (sea nomads) in Sabah (Jaaman and Lah-Anyi 2002). Coconut shells are used to "call" the dolphins out to the surface and later speared when the animals came to bowride their boats. Some Bajau Pelauh village headmen confirmed that it is part of their old tradition for an adult to go out and hunt a dugong, dolphin, or a whale, at least once to demonstrate his manhood. Nevertheless, many other fishermen in East Malaysia believe that dolphins are friends of man and should not be harmed in any way. In addition, they regard dolphins as an indicator of the presence of many fish in the area and will reward the dolphins by feeding trash fish to animals that come near their boats during hauling of nets. Many local villagers along the main estuaries believe that there could be crocodiles in the water if they have not seen Irrawaddy dolphins entering rivers for quite some time. Fishermen and local villagers usually refrain from disturbing or utilising incidentally caught Irrawaddy and Indo-Pacific humpback dolphins. There is a general belief among them that these would bring bad luck or omen to them or their family members (Jaaman and Lah-Anyi 2002; Jaaman 2010).

A lot of fishermen in Kuching waters were observed setting their net just a few meters from cetacean groups. They believe that the animals are smart enough to escape their net. They report that whenever incidental catch occurs, the fishing gear was considered "bad luck" and therefore should not be used anymore. The fishermen in Kuching also believe that Irrawaddy dolphin presence indicates a high abundance of fish and that when dolphins begin to engage in surface active behaviour, it indicates incoming storm.

In contrast, fishermen in the Miri and Bintulu areas won't set their net or move their net if they observe a group of cetaceans nearby. Apparently this is because they were told by their ancestors to respect the animal by not disturbing their feeding grounds. In the Sebuyau fishing district, fishermen were not aware of the legally protected status of cetaceans even though government posters of protected wildlife were displayed in most villages. Fishermen in this region also reported high numbers of direct hunting of cetaceans. However, the fishermen in Sebuyau expressed a positive view towards supporting conservation of cetaceans. Most fishermen in Sarawak agreed that cetaceans should be left alone or released if accidentally caught in fishing gear.

In East Malaysia, the dugong is locally known as duyung, which means mermaid. The Bajau Ubian who lives in the small islands off the east coast of Sabah has another name for dugong, which is bungdaing. Many older folks believe that the animal originated from human beings (Jaaman & Anyi 2002). Sometimes, it is also known as babi laut (sea pig) or lembu laut (sea cow). The majority of the Bajau Laut in Sabah reported that landed dugongs are primarily slaughtered for their meat. Hunts are often conducted with the help of traditional medicine men called pawang. Historically, cooked or grilled dugong meat was a necessity for their important celebrations, such as weddings. Besides the economic importance of dugong meat, older people in Sabah and in Limbang Division, Sarawak, commonly believe that certain parts of the dugong can be used for other purposes. The "teardrops" reportedly may be used as a love potion (phugai) to win a woman's heart. Apparently, when a client approaches a pawang for a love potion he will go to the sea and use a fish net to catch a dugong. When a dugong is caught in the net it sheds tears, which the pawang soaks up with cotton wool and then stores them in a vial. After the tears have been collected, the pawang must free the dugong. The pawang reads a spell, but the love potion will work only if the suitor is sincerely interested in pursuing a serious relationship with their beloved (Rajamani et al. 2006). The tusks and bones have been used by the pawang to treat asthma, high fever, internal pain, and eyesight deficiency, and as amulets to guard fruit orchards and other crops against wild boars.

Description of Existing and Past Research and Training programs

Past research programs: Research on species occurrence, species distribution, population relative abundance, population structure, community perception, threat identification and assessments of various species including the Irrawaddy dolphin, Indo-Pacific humpback dolphin, Indo-Pacific bottlenose dolphin, Indo-Pacific finless porpoise and dugong in the waters surrounding Tioman Island, Pahang, proposed Tun Mustapha Park area in Kudat and Cowie Bay, Sabah, and Lawas, Batang Saribas, and Batang Rajang in Sarawak.

Research on dugong distribution and community perception using a variety of methodologies including interview surveys, aerial surveys, seagrass mapping and monitoring, and aerial fixed camera in Johor and Sabah.

Past training programs: Past training sessions and programs conducted involved general awareness workshops, environmental education workshops, and technical workshops relating to survey techniques, stranding response, and species management which were provided to stakeholders particularly government agencies, academic institutions, non-governmental organizations, private businesses and the general public.

Research and conservation projects also utilized volunteers and provided on-the-job training to those that participated in data collection and analysis methods as well as increased their awareness on issues relating to marine mammals.

Existing research programs: Existing research programs include studies on the occurrence, distribution and abundance of marine mammals in Malaysian waters particularly focusing on South

China Sea and parts of the Straits of Malacca and Andaman Sea. These studies include research on population structure, life histories, genetic identities, movement ranges, habitat preferences, and threat assessments of marine mammal species present. Other research activities relating to marine mammals include analysis of the physical environment and its influence on marine mammal populations in Malaysian waters and management or policy-focused research to identify an effective method for environmental education and local community participation in improving environmental awareness, conservation and management. Specific sites where these research are currently focused include the Langkawi archipelago, Matang Mangrove Forest Reserve, Penang Island, and Johor Marine Park in Peninsular Malaysia, Kuching, Similajau, Miri, and Lawas in Sarawak, and Brunei Bay, Sandakan Bay and the Kinabatangan River in Sabah.

Needs for Additional Research and Training

Most importantly, there is a general lack of trained personnel, researchers, funds and facilities that significantly limit research and conservation of marine mammals in Malaysia. Therefore, capacity building, education and collaboration with international bodies and various areas of expertise should be a priority if long-term research and conservation initiatives are to be undertaken in the country.

While the knowledge base of marine mammals inhabiting Malaysian waters remains small, the urgency of the animals' conservation needs is ever increasing in tandem with continued development and threats surrounding their habitats. Sound scientific research in the areas of ecology, biology and human-linked interactions is of high priority in order to understand this group of animals' conservation needs, and design subsequent relevant conservation measures. The following research recommendations are in line with existing strategies and action plans with emphasis on the requirements for marine mammals in both Peninsular and East Malaysia:

(i) Baseline studies on the diversity and distribution of marine mammals – this is particularly needed where research efforts have either not yet started or have been sparse. This includes large portions of the offshore waters in the South China Sea, Celebes (Sulawesi) Sea and the Straits of Malacca. It is also important that detailed assessments and mapping of seagrass beds be done in areas of dugong presence.

(ii) Assessment of population size and status through dedicated line-transect and photo-identification studies – it is of top priority that the size of the dugong populations inhabiting Malaysian waters be estimated, so that an official status can be designated. Such designation would allow all parties to better understand the urgency of conserving the dugongs through the protection of their core habitats and regulation of fishing activities in areas where they occur. It is also important that the current assessment of cetacean populations that occur along key areas of Malaysia's coastlines be made through continuations of said line-transect and photo-identification surveys.

(iii) Studies on behaviour, habitat use and movements of marine mammal populations – it is important that such studies are undertaken to enable the identification of critical habitats (i.e. areas that are deemed important for feeding, calving, nursing, socializing, resting), and to develop our understanding of the continuum of a marine mammal population's habitat that might encompass different areas within a larger region. This in turn enables researchers to determine multiple areas that may be important to various populations across the different species, particularly for coastal species that share their habitats closely with human beings.

(iv) Continued monitoring of cetacean relative abundance – measures of relative abundance are essential in identifying cetacean 'hotspots' and providing an idea of the relative importance of different habitats for different species. As such this approach is key to monitoring possible impacts on cetacean populations in areas undergoing or slated for major coastal development, as well as areas of intense human activity.

(v) Study of population structure and genetic diversity – molecular biology is an essential tool for assessing the status of marine mammal populations, in particular small populations that are on the decline. Of high relevance here is the assessment of the structure and genetic diversity of the dugong populations in the country. If a population is small, it is likely that the population will be faced with reduced genetic diversity. As a result, the population is in danger of going extinct either through the complications of inbreeding, reduced resistance to diseases, reduction in growth rates, and reduced ability to respond to changes in their marine environment. The study of genetics is also relevant in tracking any potential inter-country movement or exchange between coastal populations of marine mammals (e.g. Indo-Pacific humpback dolphins and Irrawaddy dolphins), and to identify whether Malaysia's populations are genetically distinct from their regional con-specifics (i.e. assessment of taxonomic status).

(vi) Collection and curation of tissue samples – in order to facilitate the research as recommended in (v), it is imperative that tissue samples be collected, whenever possible, from stranded or bycaught marine mammals. These can be utilized in ongoing genetic studies, or stored for future studies. Animal-friendly biopsy methods should also be considered for targeted genetic sampling, particularly in the case of populations that may face the threat of (local) extinction.

(vii) Impacts of fishing activities and directed catch – there is an urgent need to assess quantitatively the magnitude of marine mammal bycatch and hunting within Malaysian waters, and to investigate its sustainability. The current annual levels of marine mammals taken incidentally in fishing gear is currently unknown, unchecked and unmonitored, therefore it is not known whether the fishing industry is impacting marine mammal populations beyond sustainable levels. However fishermen in Malaysia are known to be operating fishing gears (e.g. purse-seine nets, gillnets, trawl nets) that also pose major threats and are the main source of decline in marine mammal populations elsewhere around the world. A study should be undertaken not only to assess the magnitude of catches, but to determine which gear types are the most prone to causing incidental capture of marine mammals, the results of which should be used to consider the introduction of regulatory measures, such as time-area closures, gear restrictions, or gear modifications in areas of high marine mammal density or areas known to provide key habitat for particularly threatened populations. Studies should focus on the economics, tradition and culture, political, and sociological factors related to the marine mammals, people and area involved. A multi-disciplinary approach should be used, which involves both natural and social scientists.

(viii) Involving local communities in research/conservation/education - Local communities and stakeholders play important roles in determining the success of conservation for marine mammal species as they share the same resources as those utilized by these animals. Therefore it is of essence to engage communities in further education of marine mammals and related biodiversity, and to learn of the animals' importance ecologically and possibly economically. In turn local communities have centuries of experience and understanding of their own environment and this local traditional knowledge can be shared with scientists.

(ix) In areas of intensive use by human, the effects of boat traffic and acoustic disturbance on local marine mammal populations need to be studied in detail - Research should focus on determining the magnitude and significance of these disturbances to the inshore populations and to find a strategy to minimise them. So far there has been no control of boat speed or traffic implemented in Malaysian waters except in harbours because of human safety considerations.

(x) Acoustic surveys – Passive acoustic survey programmes are required for many areas to understand the distribution and habitat use of marine mammals on a finer scale, especially during seasons and at times of day when visual surveys are not practical.

(xi) A network to systematically record, rescue and gather scientific information from stranded or incidentally caught marine mammals is urgently needed – It should be established in conjunction with a fisheries by-catch reporting/monitoring program, with technical support from marine mammal biologists and veterinarians. Carcasses can be used not only to determine the cause of death, but also contain very important information regarding the biology and life history of the animals and the status of populations. Among others, data and various samples collected from the carcasses can be analysed to determine age, reproductive biology, feeding habits, molecular genetics, histopathology, and chemical contaminants of marine mammals. Results are also important to understand the levels of interactions between marine mammals and humans or their environment.

Present and Potential Marine Mammal Watching Operations

Peninsular Malaysia

Dedicated marine mammal watching operations do not currently exist in Peninsular Malaysia. The current practice is to conduct dolphin-watching on an opportunistic basis while undertaking mangrove tours, snorkelling or diving trips, or island hopping tours in various parts of Peninsular Malaysia, such as Langkawi Island and the east coast islands, where such leisure holiday packages are currently offered. In Matang, Perak, a small-scale dolphin watching industry has been slowly developing in the area although many tours combine dolphin watching with other existing tours (eg. mangrove tours). In Langkawi Island, there is a growing interest to establish a dolphin-watching industry, however, given the patchy distribution of cetaceans (i.e. Indo-Pacific humpback dolphins) in the area, such an industry may not be viable.

East Malaysia

At present, there is one dolphin- watching enterprise in Malaysia, operating out of Kuching, Sarawak in the Salak and Santubong Rivers where the target species for this industry is the Irrawaddy dolphin. There are currently close to 10 full-time and part-time operators. This lucrative industry is known to generate an estimated US $308,000 per year in Sarawak (O'Connor et al. 2009).

Additionally, dive operators, particularly at Layang-Layang Atoll and Semporna Archipelago, usually take their guests to watch dolphins and whales whenever they encounter them during diving trips. In the Santubung and Bako (Kuching River System), Beladin and Pusa (Saribas River) and Tanjung Manis (Rajang River) in Sarawak, and in Beluran and Kinbatangan Rivers and Cowie Bay in Sabah, where Irrawaddy dolphins are known to reside, there is a potential for establishment of "reserve areas" where regulated dolphin watching activities would be feasible. Any such developments should be for the purpose of improving understanding and awareness of these animals and their environment.

Questions after the Presentation

Ellen Hines: Has Malaysia ratified the CMS Dugong agreement?

- Response (Fairul Jamal): Malaysia has not ratified it.

Ellen Hines: What is the difference between licensed and unlicensed fishing?

- Response (Cindy Peter and Fairul Jamal): There are 3 types of license: A, B and C, each with certain distance from the shore and using certain gear. There are still unlicensed, which is mostly not commercially operated and for own livelihood.

Leela Rajamani: Suggestion to add blast-fishing as threats in

Sabah.

Samuel Hung: ‘Tears’ as love potion?

- Response (Louisa Ponnampalam): For sea-faring.

Randall Reeves: Referring about dugong bycatch in Sabah, where it is said that there are nearly 500 dugongs were bycaught annually, are there so much dugongs to sustain in Sabah?

- Response (Saifullah Jaaman): Data from interview surveys, it could have a lot of bias, and definitely not much dugongs to sustain if the number is accurate.

Tara Whitty: What kind of bycatch fishing gears?

- Response: Mostly gillnets. No official bycatch records in Peninsular Malaysia, so no data, but unofficially, mostly gillnets and trammel nets.

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SEAMAM III Report - Myanmar

Presentation by Aung Myo Chit & Tint Tun, Report compiled by Ellen Hines

Myanmar borders Bangladesh, India and China and has four major river systems: The Ayeyarwady, the Chindwin, the Sittaung and the Thanlwin, all flowing towards the Andaman Sea. Of these rivers, only the Ayeyarwady supports freshwater Irrawaddy dolphins (*Orcaella brevirostris*). Indo-Pacific finless porpoises *(Neophocaena phocaenoides*) have been seen far upstream in the Sittaung.

Species and Distribution

Irrawaddy dolphins are found along the Ayeyarwady River, in three different segments: three between Mandalay and Bhamo: Linbaing Kyinn Sin Thay, Shwegu township, and a protected area near Kyaukmayung, eight kilometers north of Mandalay.

Other species seen in Myanmar include:

Bryde's whales (*Balaenoptera edeni*)
False killer whales (*Pseudorca crassidens*)
Indo-Pacific finless porpoise (*Neophocaena phocaenoides*)
Indo-Pacific humpback dolphins (*Sousa chinensis*)
Spinner dolphin (*Stenella longirostris*)
Indo-Pacific bottlenose dolphins (*Tursiops aduncus*)
Dugong (*Dugong dugon*)

There have been little to no in-depth surveys in the coastal regions of Myanmar that are thought to have marine mammals so far, which include the Ayeyarwady, Rakhine and Tanintharyi coasts, including the Myeik Archipelago. There have been some preliminary surveys of dolphins in Rakhine, some interview surveys for dugongs in Rakhine (Tun and Ilangakoon 2006; Ilangakoon and Tun 2007), and several surveys in the Myeik Archipelago (Hines 2007; Smith and Tun 2008).

Dugongs can be found in three areas, two in Rakhine state, and in the Tanintharyi region (Myeik Archipelago. Habitat for dugongs, especially in Rakhine, is in good condition at surveyed sites but survey efforts are low.

In the Ayeyarwady River between 2002 and 2011, a joint patrol team (Wildlife Conservation Society and the Department of Fisheries) surveyed the rivers, recording a total of 131 sightings of dolphin groups with 79 calves. Various surveys were also conducted in sections of the River.

In the Ayeyarwady River protected area, the management plan includes the following goals:

- Eliminate illegal fishing
- Sustainability of the human-dolphin cooperative fisheries
- Protect habitat
- Promote sustainable fisheries
- Support and train a protected area management team and infrastructure
- Monitor Irrawaddy dolphins and support them as flagship species in local communities.

Irrawaddy dolphins along the Ayeyarwady River and coastal regions are estimated to be about 50 dolphins each in the Rakhine, Delta and Myeik areas, with an estimated total of 300 dolphins along the coast of Myanmar. This estimate is not from systematic surveys.

Directed Catch

There is no direct catch of Irrawaddy dolphins, however there is a captive facility for tourism in in Salone Kyun, near Kawthaung, with three bottlenose dolphins and a train for swim with dolphin program. Currently the dolphins have been released by the Department of Fisheries. In 1996, a dugong was captured for display at the Rangoon Zoo, but it died. No further captures are recorded.

Bycatch

Between 2001 and 2013 in the Ayeyarwady River, there are records of 26 dead dolphins, 12 killed by being trapped in gillnets, the cause of death for the other 14 are not known. Some animals were found 8km below protected area, beyond the known range of dolphins. 2011-2013: lost more than 10 dolphins in gillnets

Coastal animals are often seen with scarswhich may be caused by the many types of fishing gear in the area, and shark hunting. In the Rakhine, three fishermen noted bycatch in gill nets during interviews (Tun and Ilangakoon 2006; Ilangakoon and Tun 2007). From interviews in the Myeik Archipelago, several interview respondents told of catching dolphins in nets, 37% of the respondents had used dolphin body parts for medicine, 7% for food (Hines 2007). A bycaught dugong was seen in the Chaungtha region of the Ayeyarwady Delta.

Types of Fisheries and Information on Scale

There are two types of fisheries: inshore and offshore. In 2009-2010, there were a total of 30,843 boats, with 13,788 engine powered, and 17,054 without an engine.

Most of the off-shore fishing vessels were trawlers, with set nets, purse seines, and drift nets, fish traps, squid nets and longlines (see Appendix XX). The number of foreign tuna longline fishing vessels in Myanmar waters have been increasing, from 4 in 2003, to 109 in 2010-2011.

Other Threats

Further threats to marine mammals and their habitats in Myanmar include gold mining and electrofishing along the Ayeyarwady River, and in the future, a dam will be built on the River near the confluence of Mayhka and Malihka in Kachin. Research on mercury contamination is being conducted on fish tissues along the River with results being unavailable at this time.

Offshore energy exploration, a gas pipeline across the country and the expansion and construction of deep sea ports in in Dawei, just north of the Tanintharyi coast (Myeik Archipelago) are emerging threats.

Currently, there are 14 offshore oil companies with 28 offshore blocks for possible oil exploration and extraction off the coast of Myanmar.

Legal Status

Currently there is no national or state legislation specifically for marine mammals. However, there do exist several national and state laws related to fisheries, wildlife, protected areas and water/riverine conservation. Myanmar has ratified the Memorandum of Understanding on the Conservation and Management of Dugongs under the Convention of Migratory Species. There is also a Memorandum of Understanding between the Department of Fisheries and the Wildlife Conservation Society on the Conservation and Management of Irrawaddy dolphins.

Scientists try to educate monks and schoolchildren about marine mammal conservation. Monks are quite powerful in Myanmar, so in many cases monks are approached rather than city officials.

Medicinal Uses

Skin and bone of dugong can cure diarrhea and illness. The tusk of the dugong is strong medicinally, more so than the bones. Blood of dugongs can be used to cure fish eye. Dugong meat is delicious but not good for pregnant women. Irrawaddy dolphin oil is good for muscle relaxation.

Existing Research

There are currently no running research programs. Brian Smith, for the Wildlife Conservation Society, created and directed a survey in the Ayeyarwady River.(Smith et al 2009).

Research Needs

- Need proper methods for population estimate
- Better designed program for identifying activity priorities and long-term conservation strategy
- Need stranding network along coastal region
- Need to collect tissues for coastal animals – e.g., are there 2 different forms of Sousa?
- Seagrass and dugong surveys
- SCUBA and underwater survey training

Dolphin Watching

Guidelines were set up by Aung Myo Chit in 2008, but there is no proper management of tourism facilities in Myanmar, despite the rapid growth of tourism.

Questions

Peter Thomas: How widespread is electrofishing reported as disrupting feeding behavior and cooperative fishing behavior?

- Aung: Yes, true – did regular patrol 14 days in field, night patrol and confiscated some boats, sometimes went straight to villages and explained it's illegal and some people changed behavior after meeting (even to alternative jobs); confiscated 20+ boats in area; but now that he's not there, no night patrol, so people are returning to old fishing behavior
- During dry season, deep pools higher up, but this year, saw more dolphins further downstream; lots of illegal fishing going on near key deep pools; now lack of personnel, so can't control the fisheries
- Electrofishing indirectly effects by depleting prey source.

Putu Icha Mustika: Are there any conservation programs in Myanmar that include the greater Mekong region?

- Aung: There is no integration or conservation planning for the greater Mekong region in Myanmar.

Randy Reeves: Foreign fishing effort in marine waters is growing rapidly, correct? Why? Any management? Any monitoring of bycatch?

- Aung: Yes, mostly long-liners;
- Tint: Myanmar allows other countries to fish in their waters; latest news…no more permission for foreign vessels to fish in waters; in past, neighboring countries trawling were allowed; authority to enforce this is at the state level.
- Ellen Hines: I saw a lot of illegal Thai Purse seine fisheries in the Myeik Archipelago
- Tint: yes, has seen close to shore, even though trawlers can only fish in offshore waters, enforcement is weak.

Tara Whitty: What's being doen to monitor small scale fisheries?

- Tint: we don't know much about that.
- John Wang: Electrofishing kills large fish, but that's not what Irrawaddy dolphins eat, is that correct?
- Aung: yes, they eat a variety of sizes, there are over 50 species in the protected area.

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SEAMAM III Report - Philippines

Presentation by Jo Marie Acebes, Theresa Aquino, Edna Sabater, Ma. Louella Dolar and Alessandro Ponzo

Species and Distribution

Cetaceans

To date, there are 25 species of cetaceans confirmed to occur in the Philippines, consisting of four mysticetes and 21 odontocetes (See Appendix 1). This is an increase of eight species known since the 2002 SEAMAM II Conference, when only 17 species of small cetaceans were reported (Perrin et al. 2005). Four species and one subspecies have been added to that list since: Gingko-toothed beaked whale (*Mesoplodon gingkodens*), pygmy sperm whale (*Kogia breviceps*), Longman's beaked whale (*Indopacetus pacificus*), Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), and the dwarf spinner dolphin (*Stenella longirostris roseiventris*) (Acebes et al. 2005, Heaney et al. 2011, Lapeña 2011, Perrin 2007.). The occurrence of the Indo-Pacific humpback dolphin (*Sousa chinensis*) remains unconfirmed. The only record of the species, that of a stranding at Taganak, Turtle Islands in the southern Philippines was considered to be most likely from a population off of Borneo (Perrin et al. 2005).

Large whales were not included in the previous two SEAMAM workshops in 1996 and 2002 owing to the fact that those workshops only dealt with small cetaceans and dugongs (*Dugong dugon*). In 2002 four large whale species were known to occur in the Philippines: the fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), Bryde's whale (*B. edeni*) and the sperm whale (*Physeter macrocephalus*). Among the baleen whales, two new species have been added to the list, the blue whale (*B. musculus*) (Sabater 2005) and the Omura's whale (*B. omurai*) (Yamada et al. 2008) while the fin whale has been removed from the list during the Red List assessment on 2009 due to lack of strong evidence to confirm the occurrence of the species in the country.

Among the baleen whales, the humpback whale has been the most studied in the country. The only confirmed breeding area of humpbacks in the Philippines is in the waters of the Babuyan Islands, northern Luzon and extending south along the northern Sierra Madre coasts (Acebes et al. 2007). The occurrence of Blue whales and the Bryde's-like species have recently been documented in the Bohol Sea (Sabater 2005; Acebes et al. 2011; Acebes et al., In prep.).

New sites of occurrences of Irrawaddy dolphins (*Orcaella brevirostris*), rough-toothed dolphins (*Steno bredanensis*), dwarf sperm whales (*K. sima*), melon-headed whales (*Peponocephala electra*), Risso's dolphins (*Grampus griseus*), false killer whales (*Pseudorca crassidens*), pygmy killer whales (*Feresa attenuata*) and killer whales (*Orcinus orca*) have been reported (Alava et al. 2013, Dolar et al. 2009, Ponzo et al. 2011, Silberg et al. 2011).

In 2002, it was estimated that 40% of Philippine waters have been surveyed for cetaceans (Perrin et al. 2005). Although there are no current estimates based only on an increase in research sites and research groups since then, it can be deduced that there has also been an increase in survey coverage. Sites recently explored for cetacean occurrence are: Lubang and Looc coasts, Occidental Mindoro; Verde Island Passage; Cagayan Ridge Marine Corridor; Balabac Strait, southern Palawan; Sarangani Bay, Sarangani Province; Siargao coast, Surigao del Norte; northern Bohol Sea; Guimaras and Iloilo Straits; Pujada and Mayo Bay in Davao Oriental.

Dugongs

Historically found all over the Philippines, dugong populations are now fragmented with the greater bulk of the species seen in the province of Palawan and parts of the Mindanao region. Over the recent years, reported sightings and strandings have been infrequent and sporadic in most islands, often occurring in the same areas. Based on the recorded sightings and strandings, the extent of occurrence of the animal in the country is estimated to have been reduced by about 63% (Aquino et al. 2012).

Population Status

Cetaceans

Estimates of population abundance have only been done for several cetacean species in a few areas: the spinner dolphin, pantropical spotted dolphin, Fraser's dolphin, common bottlenose dolphin, Risso's dolphin, short-finned pilot whale, melon-headed whale and dwarf sperm whale (Perrin et al. 2005). More recently, there have been estimates made for Indo-Pacific bottlenose dolphins in Balabac Strait (Dolar et al. 2007) and the Irrawaddy dolphins in the Visayas (Dolar et al. 2011). Although an abundance estimate for the humpback whales in the Babuyan Islands has not been possible due to the nature of this stock, a minimum number of animals visiting this breeding ground have been estimated through photo-identification (Silberg et al., 2013.).

Species reviews: (*conservation status was based on Philippines Red List designations)

1. *Balaenoptera musculus* Blue whale (EN)
2. *Balaenoptera edeni* Bryde's whale (DD)
3. *Balaenoptera omurai* Omura's whale (DD)
4. *Megaptera novaeangliae* Humpback whale (VU)
5. *Physeter macrocephalus* Sperm whale (VU)
6. *Feresa attenuata* (DD)
7. *Globicephala macrorhynchus* (DD)
8. *Grampus griseus* (DD)
9. *Indopacetus pacificus* (DD)
10. *Kogia breviceps* (DD)
11. *Kogia sima* (DD)
12. *Lagenodelphis hosei* (VU)
13. *Mesoplodon densirostris* (DD)
14. *Mesoplodon gingkodens* (NA)
15. *Orcaella brevirostris* (VU)
16. *Orcinus orca* (DD)
17. *Peponocephala electra* (DD)

18. *Pseudorca crassidens* (DD)
19. *Stenella attenuata* (DD)
20. *Stenella coeruleoalba* (DD)
21. *Stenella longirostris longirostris* (VU)
22. *Stenella longirostris roseiventris* (DD)
23. *Steno bredanensis* (DD)
24. *Tursiops aduncus* (DD)
25. *Tursiops truncatus* (DD)
26. *Ziphius cavirostris* (DD)
27. *Dugong dugon* (VU)

Dugongs

There are not enough data available on population abundance of dugongs in the country. Department of Environment and Natural Resources (DENR)-Protected Areas and Wildlife Bureau (PAWB) conducted a dugong survey following the interview method prescribed by CMS in 2012. Processing and analysis of the data is still on-going.

Habitat Status

Cetaceans

Marine mammal habitats in the Philippines have been increasingly subjected to a host of various stressors. Most of the known marine mammal habitats are also the most heavily exploited by fisheries, thus, exposing the animals to threats of by-catch, habitat degradation (i.e. overfishing, destructive fishing, pollution) and even opportunistic directed catch. With increased coastal development, these habitats are also subjected to increased pollution from improper waste and garbage disposal, agricultural run-off, and increased boat and ship traffic. Cetacean habitat studies are not common in the country. SU-IEMS is investigating the status (physical parameters and biological biodiversity) of the Irrawaddy dolphin habitat in Guimaras and Iloilo Straits.

Dugongs

Based on the UNEP-GEF Report (Pernatta 2009), the Philippines has lost about 30-50% of its seagrass habitat over a span of several decades due to natural and man-made threats. These include habitat degradation and conversion. Foreshore development has also affected nearshore seagrass beds. Resorts have been known to clear seagrass beds near them to make way for swimming areas for guests. Storms such as Typhoon Pablo (International name: Bopha) have also caused severe damage to the seagrass habitat.

Directed Catch

Cetaceans

Among previously reported areas, southern Palawan is believed to still have directed fishery of dolphins where dolphin meat is used as bait for chambered nautilus (*Nautilus pompilius*). The fishery was observed in Balabac Strait, but most of the fishermen were from Brookes Point, Palawan (Dolar et al. 2007).

Since 2002, only two new areas were identified with directed small cetacean catches: Laiya Batangas in Verde Island Passage (Dolar, 2006) which stopped in 2004 and Sitangkai in Tawi-Tawi, the current status of which is unknown (Acebes, 2006).

Historical hunting for Bryde's whales in the Bohol Sea has been previously documented (Dolar et al. 1994). Sperm whaling was conducted in the country in the late 19th century by the Americans and the British (Acebes, 2005 and 2009). Historical local hunting for sperm whales from Limasawa Island and unidentified baleen whales from Panaon Island have been recently documented (Acebes, 2014.). Both fisheries ceased in the late 1990s.

There is an emerging concern over directed capture for oceanaria in the country. In Sarangani Island, two dolphin holding facilities were observed in the cove with "Protected Area" sign on the entrance. Interviews revealed that this facility was going to be a 'captive breeding facility'- similar to that in Misamis Occidental. Local fishermen have been told that an investor will pay them for marine mammals they can capture (i.e. dolphins, killer whales and dugongs) (Dolar pers comm).

There are currently three known captive marine mammal facilities in operation in the Philippines: Ocean Adventure (OA), Misamis Occidental Aquamarine Park (MOAP) and Manila Ocean Park (MOP). The MOP currently holds South American sea lions (Otaria flavescens), but they have expressed plans of bringing in beluga whales (Delphinapterus leucas) and other species of dolphins for their expansion in 2013 (see Yaptinchay 2012). Although primarily established for the purpose of marine mammal exhibitions or shows, the OA and MOAP also claim to be rescue and rehabilitation centers for stranded cetaceans. Since 2010, there have been rumors of another dolphin facility to be established in the province of Bohol.

Dugongs

Directed catch of dugongs in the Philippines is difficult to pin down. Because of the enactment of DAO 55 and the Wildlife Act of the Philippines, directed catch of dugongs has been outlawed in the country. This, however, does not rule out the occurrence of such activities. It likely happens albeit covertly (Aquino et al. 2012), making documentation of such activities difficult. The study conducted by Quimpo et al. (2012) was nevertheless lucky enough to have interviewed fishermen who recounted cases of dugongs being hunted in several areas in Mindanao. A few unsupported reports have been received from other known dugong habitats in the country but were never verified much less prosecuted. To date, only one violation of the Wildlife Act involving the dugong has reached the prosecution stage (Roxas, Palawan). The case is still under litigation and some of the accused are still at large.

By-catch in Fisheries

Cetaceans

By-catch is still a concern in many areas in the Philippines. Since 2002 there have been very few studies done on by-catch (Perrin et al. 2005). Currently, there is one grad student from Scripps Institution of Oceanography doing socio-economic studies on by-catch in Iloilo and Guimaras Straits and in Malampaya Sound.

There are five new sites not reported in 2002:

1. Verde Island Passage (Dolar 2006, Tagarino et al. 2007) - major gear threats are from driftnets, surface set gillnets for small pelagic and purse seines that use light to attract fish.
2. Balabac Strait (Dolar 2006) – threat is very minor; from surface set gill net. But there is rampant dynamite fishing. A 2008 survey witnessed blast fishing near an Indo-Pacific bottlenose dolphin pod.
3. Iloilo and Guimaras Straits (Bagarinao 2005, Dolar et al. 2009, Dolar et al. 2011) - threat from surface set gill net, fish stakes or fish filter ("tangab") which accidentally catch Irrawaddy dolphins.
4. Reports of small cetacean by-catches in the Bohol Sea still persist albeit less frequently. A fishing village in Southern Bohol is known to accidentally catch small cetaceans in their drift gill net (pamo) fishery for flying fish and various fish from the family Scombridae (i.e. mackerel, tuna, bonito).
5. Spinner dolphin meat is reportedly sold at the market at San Jose de Buenavista, Antique. Dolphins were by-caught from the tuna fishery from Antique fishing in Cuyo, Palawan (A. Ponzo, pers comm.)

Old sites revisited (e.g. driftnet fishery in Siaton, Bonawon, Basay on Negros island) in 2012 still have by-catch but in a much smaller scale. By-caught dolphins are sold secretly, or thrown at sea. Purse seiners that use lights fishing in the Sulu Sea still catch dolphins incidentally (Dolar 2012). One incident of a baleen whale entangled in a fish net in Ticao, Masbate was reported in 2008. The animal was successfully cut-free. It was identified as a Bryde's whale.

Dugongs

Fish corrals, oto-shiami, beach seine, purse seine, Danish seine, bottom-set gillnets for crabs, longline, cyanide, and dynamite fishing have been implicated in many dugong mortalities (Aquino et al. 2012). In a study done by Dolar (2006), the author estimated an average of one dugong trapped in fish pens in Bancalaan Island, Balabac, Palawan every year. In Davao Oriental, the local DENR office noted six dugong mortalities in 2011 and two in 2012 – all of which were suspected to be fisheries-related (DENR XI Report, 2012). Quimpo et al. (2012) further noted in their study that Mati, Davao Oriental recorded the highest number of by-catch incidence (n=22) than all their five other survey sites combined (n=10).

The incidence of fish corral by-catch is also high in the country. However, the chances of successfully releasing the dugong from this type of fishing gear have been relatively higher especially in areas where rescue networks are operating.

Types of Fisheries and Information on Scale

Cetaceans

The estimated total number of commercial fishing vessels (>3 gross tons) as of 2009 were 6,371 and the number of fishing operators was 2,358 (Bureau of Fisheries Statistics: http://www.bfar.da.gov.ph/pages/AboutUs/maintabs/commfishprod.html). Breakdown on the types of commercial fishing types/gears is not available. Estimates of municipal fishing boats (bancas which are <3g tons) was 469, 807 in 2009, but information on the types of fishing gears are not available.

There is a general lack of information on the types of fishing gear that are being used in the Philippines. This is even more pronounced for the artisanal fishery making it very difficult to assess fishery by-catch of any kind. Although some municipalities have fishery profiles on their websites or in offices, many of these numbers have not been updated and vary greatly from the actual numbers.

Types of fishing gear used in the country are: purse seine, ring net, Danish seine, trawl, baby trawl, bag net, driftnet, hook and line, gill net (surface and bottom-set), beach seine, fish corral, long line, spear fishing, fish/crab pot, fish traps, crab/fish lift net, fish stakes, troll line, squid jigger, drift-filter net, round-haul seine, push-net, and drive-in net. Of these gear, drift gillnets, surface and bottom set gillnets, ring nets and Danish seine pose the greatest threat of accidentally catching dolphins. Purse seiners that use lights to gather fish are also of great concern.

Dugongs

Data on by-catch implicated fisheries are limited from a national perspective. The National Fisheries Research Development Institute (NFRDI) of BFAR has substantial data on this but it is not yet fully analyzed. On the provincial level, only Roxas (WWF-Philippines 2008a) and Balabac (Dolar 2006) in Palawan, the coastal waters of the Visayan Seas (Dolar et al. 2005), Zamboanga, Surigao del Sur, Davao and Davao Oriental (Quimpo et al.. 2012) provide data for their respective localities.

Other Threats

Habitat impacts: Anthropogenic impacts to marine mammal habitat are continually increasing. Key impacts of concern include increased pollution, solid waste (with plastics being of particular concern due to risk of ingestion), agricultural runoff, siltation, land reclamation, seismic exploration and drilling, boat and ship traffic, and impacts of climate change for freshwater and estuarine species.

Studies on cetacean habitat are not common; as such, specific description of habitat impacts is limited. For dugongs, an estimated 30 to 50% of seagrass habitat has been lost in the country over the past several decades. Threats to seagrass beds include coastal habitat conversion and foreshore development, pollution, storms, and possibly climate change.

Fisheries Interactions: Since 2002, there have been few studies done on bycatch. New locations where bycatch is of concern include: Verde Island Passage, with driftnets, surface set gillnets, and purse seines that use lights; Balabac Strait, with surface set gillnets and dynamite fishing; Iloilo and Guimaras Straits, with surface set gillnets and fixed fishing nets; Bohol Sea, with drift gillnets; and Cuyo, Palawan, where the tuna fishery from Antique accidentally captures spinner dolphins, the meat of which is sold in a market at San Jose de Buenavista, Antique. Sites previously known to be of bycatch concern continue to have bycatch, but apparently on a smaller scale. There has been one recorded entanglement of a Bryde's whale in Ticao, which was successful released. There is also concern that, with overfishing, food sources of cetaceans are declining.

Direct Capture: Direct capture of cetaceans is believed to still occur in southern Palawan, with the dolphin meat used as bait for chambered nautilus. Since 2002, Laiya Batangas in Verde Island Passage was identified as having directed catch of small cetaceans; however, this capture ceased in 2004 (Dolar 2006). Additionally, Sitangkai in Tawi-Tawi was identified as having some capture of small cetaceans (Acebes 2006). Hunting for Bryde's whales, sperm whales, and unidentified baleen whales has been historically documented, but ceased in the 1990s. Though capture of dugong has been outlawed, the practice likely continues. Only one violation of the Wildlife Act related to dugong hunting has been prosecuted.

Live capture for display is cause for concern, with three known captive marine mammal facilities in addition to a number of emerging or rumored facilities. For example, a facility was observed by Dolar in Sarangani Island, where local fishers were told they would be paid for captured marine mammals.

Other: Although national guidelines exist for whale and dolphin watching, there is a general lack of implementation, with low awareness of and compliance with regulations. Harassment of marine mammals and even propeller strikes have been witnessed by researchers and tourists.

Pollution and habitat degradation are the greatest threats to cetaceans and their habitats in the Philippines. These two occur in various forms and most often in tandem.

Solid waste pollution especially plastics: Plastic waste ingestion has been attributed to be the cause of cetacean deaths in at least two known cases (Aquino 1996; Doyola, pers. comm.). In addition, finding various forms of plastics in the digested tracts of stranded dead cetaceans has been reported in many areas.. When degraded plastics leach, they release potentially toxic substances which can affect reproductive cycles and produce other by-products which could potentially cause cancer (Barry 2009).

Pollution from runoffs, siltation and decreasing river flow: The combination of pollution brought about by run-offs, siltation and decreasing freshwater input pose a threat to many of the coastal and estuarine cetacean populations. A study being conducted by Silliman University is investigating pollution coming from land (i.e. agricultural, industrial and aquaculture run-offs, siltation, construction of dams, rerouting of rivers) that affect the Irrawaddy dolphin habitats in Central Visayas.

Seismic Explorations, Drilling and Noise Pollution: Search for oil reserves in Philippine marine areas have been increasing in the past years. The Department of Energy is determined to make the country 60% self-sufficient in energy by 2024. Explorations have been made or planned to be carried out in several areas of the Philippines to meet this goal.

1. Exploration of the Benham Rise, a recently awarded underwater territory to the Philippines found east of northern Luzon near Aurora with an area about 13 million hectares. Explorations could start in 2013. As of Sept 2012 four exploration companies have already expressed interest (http://www.rappler.com/business/12159-benham-rise-has-oil-and-gas). Humpback whales and other dolphins recorded present in the coastal waters near this area (Acebes et al. 2007) and could be adversely affected by the explorations.
2. Southwest Palawan – 3D exploration was carried out in 2009-2011 by Otto Energy and significant deposits may result (if have not already) into drilling (http://www.ottoenergy.com/IRM/Company/ShowPage.aspx?CPID=1679&EID=51946190).
3. Northwest Palawan (near Malampaya), East Palawan, Sulu Sea, Mindoro-Cuyo, Cagayan, Central Luzon, and Cotabato – overall, 15 areas in the Philippines (each between 400,000 to 900,000 hectares) have been up for bidding to drill as of July 2011 to several petroleum companies (http://www.offshore-mag.com/articles/print/volume-71/issue-11/frontier-exploration-update/the-philippines-targets-7-5-billion-exploration-investment.html).
4. Central Visayan Basin – Otto Energy conducted a 3D Seismic oil exploration in this area in 2011 under Service Contract (SC) 69. SC 69 covers about 5,280 km2 (http://www.pennenergy.com/articles/pennenergy/2011/06/otto-energy-commences.html).

Unregulated Whale and dolphin watching: There is a general lack of regulation in popular whale and dolphin watching spots resulting to harassment of animals and probably long-lasting effects on their general health and reproductive potential (Sorongon 2010; Sorongon et al. 2010).

Ship Traffic: Many of these ship and ferry lanes are found in straits and corridors which are also important habitats or migration corridors for cetaceans. For example, the Verde Island Passage, Balabac Strait, Iloilo Strait, and the Babuyan channel (Dolar et al. 2007, Tagarino et al. 2007, Dolar et al., 2009, Acebes et al. 2007). There has been one documented ship strike of a baleen whale in the country (2008).

Declining Food Sources for cetaceans: This is becoming a major concern in many areas especially in countries where there is overfishing. Fishery resources are rapidly being depleted in almost all areas in the Philippines as evidenced by decreasing fish catch. Most cetaceans are fish eaters, and since almost all species and sizes of fish are now being exploited and habitats are being destroyed it follows that food for cetaceans are becoming scarce more than ever. This is in addition to ecosystem effects of overfishing that compound threats to cetaceans. So far, very little attention has been given to this issue.

Climate Change: Particularly relevant to freshwater and estuarine species.

Storm surges: The recent typhoon Bopha that hit Davao Oriental in December 2012 caused major damage (not yet quantified) to the seagrass bed and possibly to the dugong population occurring along the east coast of the province. Dugong mortality was reported three days after Typhoon Bopha passed through the province and its cause of death was attributed by the authorities to the storm (DENR XI Report 2012).

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

Cetaceans

The Bureau of Fisheries and Aquatic Resources (BFAR) is the agency mandated to protect and manage cetaceans in the Philippines. All species of cetaceans in the Philippines are currently protected with some exceptions for takes for the purpose of exhibition or show (see FAO 185) and breeding (see FAO 233).

- Fisheries Administrative Order (FAO) 185 series of 1992: Ban on the taking or catching, selling, purchasing, possessing, transporting and exporting of dolphins.
- FAO 185-1 series of 1997: Amending FAO 185 by adding whales. Although FAO 185 and FAO 185-1 prohibit the transporting and exporting of cetaceans, the Secretary of Agriculture, upon the recommendation of the Director of BFAR, "may issue a special permit in favour of any government or private agency or institution engaged in research work on dolphins, including those to be used for exhibition or show purposes subject."
- FAO 233 series of 2010: Aquatic Wildlife Conservation defines the requirements for the use of aquatic wildlife for show or exhibition purposes, among others.
- FAO 233-1 series of 2011: amending FAO 233.
- FAO 208 series of 2001: Conservation of rare, threatened and endangered fishery species.
- DOT and DA Joint Administrative Order No. 1: Guidelines to Govern the Conduct of People Interaction with Cetaceans. This is a joint AO by the Department of Tourism and the Department of Agriculture setting the national guidelines on cetacean-human interactions.
- Provincial Ordinance No. 09-2003: Ordinance declaring the Humpback whales as protected species within the territorial jurisdiction in the province of Cagayan.
- Republic Act (RA) 9147: "Wildlife Resources Conservation and Protection Act." Provides for the conservation and protection of wildlife resources and their habitats, appropriating funds thereof and for other purposes.
- In progress: Executive Order and eventually a municipal ordinance on the protection and conservation of the Irrawaddy dolphins in Bago-Pulupandan, Negros Occidental; Buenavista, Guimaras; Leganes, Zarraga and Dumangas in Iloilo.
- In progress: the ICRMP-DENR Region 2 has proposed the declaration of a Humpback Whale Marine Protected and Conservation Area in Camiguin Island, in the Municipality of Calayan (Babuyan Islands).

Dugongs

National and local laws have been enacted for the protection of the dugong with the DENR as the government office mandated to spearhead the conservation of the said species. Enforcement of laws in the Philippines is mostly devolved to local government units, e.g., provincial government and municipal government units. Local ordinances and resolutions appear to have more impact, being local initiatives and that much closer to the ground.

National and state legislation:

- DAO 55 (DENR) – This administrative order from DENR declared the dugong as a protected marine mammal of the Philippines in 1991. It identified illegal acts and concomitant penalties as well as identifying the Protected Area and Wildlife Bureau (PAWB) through its Pawikan Conservation Project (PCP) as the implementing DENR unit.
- Wildlife Act of the Philippines (RA No. 9147) (DENR) – This national law which was enacted in 2001 categorizes the dugong as a critically endangered species and provides stiffer penalties for the killing of the animal as well as for possession of its by-products.

- DAO 2004-15 – this Administrative Order establishes the list of threatened species to be protected under the Wildlife Act which includes the dugong as one of the critically endangered species.

- PCSD Resolution 03-216 – this deals with the implementation and regulation of RA 9147 in Palawan. It also identifies the dugong in its threatened species list.

- PCSD Resolution 04-226 – this resolution officially establishes the list of threatened terrestrial and marine wildlife to be protected in the province of Palawan pursuant to the Wildlife Act and classifies the dugong as critically endangered.

- PCSD Resolution 10-413 – updates the list of endangered species and reiterates the critically endangered status of dugongs in Palawan.

Local Government Legislations:

Municipal Resolutions established five dugong feeding habitats as marine reserves/protected areas in Roxas, Palawan (WWF-Philippines 2008b). However, only one (Caramay fish reserve) is currently functional while the others are at varying levels of development.

National and state legislation related to fisheries

Fisheries Code of the Philippines – Its implementing rules and regulations are still not complete.

- Strategic Environmental Plan for Palawan – This law establishes the authority of the Palawan Council for Sustainable Development in Palawan over that of DENR and the BFAR in relation to the management and protection of terrestrial and marine wildlife.
- See FAO 185 and 185-1 above.

International Agreements ratified by nation

The Philippines is signatory to the following international agreements:

- Convention on Biological Diversity (CBD)
- Convention on Migratory Species (CMS)
- CITES
- Coral Triangle Initiative (CTI) – the Red List Data Book for Marine Mammals in the Philippines was developed through the CTI.
- IOSEA

Regional Marine Protected Area planning

Protected Areas (PA) are considered an important tool in protecting marine mammals and their habitats. Most existing protected areas in the Philippines were established for more general habitat protection reasons. However, some areas do encompass known habitats of cetaceans thus, affording them protection as well. Such PA's are: the Malampaya Sound Protected Area in Palawan; the Tañon Strait Protected Seascape; the Northern Sierra Madre Natural Park and the Tubbataha Reefs Natural Park.

Plans are underway for designating marine protected areas for cetaceans in other areas in the country. The Silliman University in partnership with the local government units of Negros Occidental, Iloilo and Guimaras are planning to establish a MPA for the protection of the newly discovered Irrawaddy dolphin population and its habitat in the Visayas under the ACCOAST (Adaptation to Climate Change in Coastal Areas) program of GIZ.

The ICRMP of DENR have proposed the establishment of the Humpback whale Marine Protected and Conservation Area on the western coast of Camiguin Island, Calayaan Municipality in northern Luzon.

Sulu-Sulawesi Marine Ecoregion (SSME) – A Tri-national MOU between the Philippines, Malaysia and Indonesia. Under the SSME Ecoregion Conservation Plan, comprehensive plans for 2010-2012 were developed and implemented by the subcommittees on Migratory and Threatened Species, Marine Protected Areas and Networks, and Sustainable Fisheries.

Conservation and Education Programs

Cetaceans

- Silliman University (SU) - The SU-Institute of Environmental and Marine Sciences (formerly the Marine Lab) primarily conducts conservation and educational programs for the conservation of marine mammals in general. At present, it is working with the local government units of Negros Occidental, Iloilo and Guimaras toward integration into the local governance the protection of the Irrawaddy dolphins and its habitat in the Visayas through fishery and boat speed regulation and establishment of marine protected areas in the dolphin's core habitat. A cetacean program mainly focused on research is in place for the NW Bohol Sea. For the purpose of education, a section in the website has been established (http://su.edu.ph/iems/projects.shtml).
- The City of Pulupandan in Negros has posted local signs prohibiting harassment of Irrawaddy dolphins. On the provincial level the province of Negros Occidental is in the process of drafting an Ordinance to establish the dolphin core habitat as a marine protected area.
- Tropical Marine Research for Conservation (TMRC), LLC (Louella Dolar)– shared results of its study on Irrawaddy dolphins in the Visayas to local stakeholders in the form of a symposium and workshop, and conducted stranding and rescue training in collaboration with the De La Salle University in Bacolod City, Marine Wildlife Watch of the Philippines and Silliman University. It also mentored the marine mammal research project of Guimaras State College.
- Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau (DENR-PAWB) - launched in November 2012 the Biodiversity Protection Program for Malampaya Sound with the Irrawaddy Dolphin as their banner species. The whole program involves IEC, law enforcement, livelihood development, marine resource use zoning, as well as community organizing for resource management. A sizable portion of the budget is dedicated for Irrawaddy dolphin data enhancement (M. Matillano pers com).
- Balyena.org - a local NGO has been conducting environmental education outreach activities in the Babuyan Islands, Cagayan Province since 2009. An informal education program has been conducted in primary and secondary schools on the island of Camiguin. Several educational print materials regarding cetaceans, including a brochure on whale and dolphin watching guidelines have been produced and distributed in the Province. Balyena.org has partnered with the DENR Region 2 – ICRMP to assist in the establishment of the Humpback Whale Marine Protected and Conservation Area in Camiguin. From their base in Bohol, Balyena.org has also implemented similar environmental outreach

activities in the municipality of Jagna. A newly established website is also being used to disseminate information on cetacean species, research and conservation work in the Philippines (www.balyena.org.ph). On 2012, Balyena.org signed a MOA with the Ateneo de Manila University that provides for undergraduate biology students to participate in the annual humpback whale research survey as part of their field practicum.

- Physalus - Large Marine Vertebrates Project Philippines (LAMAVE), an international NGO has been conducting environmental education outreach activities in Region 7 and 8 since 2010. An informal education program has been conducted in primary schools on the island of Bohol and Cebu including 7 municipalities, including approximately 7,000 students. Several educational print materials regarding cetaceans, including a brochure on whale and dolphin watching guidelines, education booklets for students and posters about the Bohol Sea cetacean biodiversity have been produced and distributed in the Provinces. Physalus in collaboration with MWWP and DENR have organized stranding rescue training and network set up in the province of Antique (Feb-2012) and Davao, Mati Area (Dec-12). In collaboration with Provincial Veterinary Office of Cebu and part of the ICRMP Reg-7 the Cebu Marine Animal Stranding Network (CMARNET) has been created and 5 of the 7 provincial clusters have been trained in 2011-12. In Bohol in collaboration with the Bohol Environmental Management Office, BFAR and DENR Reg. 7 a series of trainings (12) have been conducted to re-establish the Bohol Rescue Unit for Marine Mammals and an amendment have been filed (2012) to update the list of the members and include whale shark and sea turtles in its mandate, transforming BRUMM into the Bohol Rescue Unit for Marine Wildlife. Rescue trainings have been also organized in Reg. 8 (Southern Leyte University, Baybay) and Reg. 9 (Pilar, Siargao Island) in collaboration with local Universities and Local Government Units. In collaboration with Balyena.org, Silliman University and BEMO, Physalus have established and organized the Bohol Dolphin Festival in Tagbilaran City and the town of Baclayon in 2011 and 2012 to raise awareness about cetaceans in the Bohol Sea.
- WWF-Philippines - is helping the Protected Areas Management Board (PAMB) of the Malampaya Sound Protected Seascape carry through the conservation of Irrawaddy dolphins in Malampaya Sound, Palawan.
- Conservation International-Philippines – through the Sulu-Sulawesi Seascape Project has conducted marine mammal stranding trainings, IUCN Redlist trainings and assessments, funded cetacean surveys and produced a marine mammal field guide and other educational materials (i.e. story book).
- Marine Wildlife Watch Philippines (MWWP) – MWWP together with Balyena.org and Physalus have conducted several marine wildlife stranding response trainings all over the country.
- University of the Philippines, Diliman (UP-Diliman) – has been working on forming a stranding network, since 2005 through the PHL Marine Mammal Stranding Network (PMMSN). Results of the study covering data gathered by NGOs and LGUs from 1998-2009 have been published in Aquatic Mammals (Aragones et al. 2010). Two graduate students have been working on stranding–related problems such as diseases and contaminant levels in stranded animals. UP has also worked on the effects of ecotourism on marine mammals in Tañon Strat.

Dugongs

There used to be a dugong project implemented by WWF-Philippines in Roxas, Palawan. The project ended in 2009. The DENR-PAWB continues its information campaign at the provincial levels through their local offices but these are opportunistic at best. Marine mammal rescue networks in the country conduct rescue and salvaging operations which, at times, involve dugongs.

Community Centered Conservation (C3), a non-government organization based in England, recently started their conservation program for dugongs in the country, focusing their attention on the population in Palawan. Their current program is more predominantly on information, education, and communications campaign.

Folk Attitudes and Interactions with Marine Mammals

Cetaceans

In islands where dolphins used to be hunted, fishermen attribute some supernatural powers to them by putting the skulls in the backyard to ward off evil spirits.

In Mangsee Island in Palawan, stranded dolphins or whales were buried deep in the sand because they believe that carcasses left to rot on the beach will be bad for fishing. In other places, seeing dolphins coming close to shore is a warning of incoming bad weather (Dolar pers comm).

In Iloilo and Guimaras Straits in the Visayas, fishermen take the occurrence of Irrawaddy dolphins in their locality as an indication that the krill (Acetes sp.) season has begun (Dolar pers comm). Some however consider them as competitors and drive them away when seen close to fishing structures.

In some coastal communities in the Sulu-Sulawesi Sea, certain beliefs and perceptions of marine animals either instil fear or command respect from people (Acebes 2010). Some perceptions are rooted in their religious beliefs. Dolphins are traditionally perceived as 'unclean', therefore unfit for eating because of similarity in characteristics with other land animals that are considered taboo. While other beliefs, such as the contact with whales can cause physical discomfort or, that eating a dugong will cause severe bleeding, persisted until recently in some communities.

Dugongs

Dugong bones have been historically used for its supposed medicinal purposes but the meat is more commonly eaten. Even to this date, people still covertly consume dugong meat. In Palawan, a few old fishermen believe it is a bad omen if a dugong is killed or dies in their fish corral. They believe that it will put a curse on their gear and no fish will be caught in it again.

Description of Existing and Past Research and Training Programs

Cetaceans

- Humpback whales in the Babuyan Islands: Research, Education & Conservation (Jan 2013 - Jan 2014; May 2011- May 2012 by Balyena.org)
- SU- IEMS Development of a conservation program for the Irrawaddy dolphins (*Orcaella brevirostris*) in the Visayas in line with the Coral Triangle Initiative National Plan of Action. (2012-2014).
- Whale Shark and Marine Mammals in the Northern Bohol Sea, Philippines: Status Assessment and Conservation (2012-2013; 2011-2012; 2010-2011 by Physalus)
- NFRDI - FISHCODES-Genetic Barcoding of CITES listed and Regulated Aquatic Species Applied Biotech Research (2011-2013)
- Habitat use of the newly discovered population of Irrawaddy dolphins (*Orcaella brevirostris*) in the coastal waters of Bago and Pulupandan, Negros Occidental, Philippines. (Manuel Eduardo de La Paz. MSc Thesis. Silliman University. 2012)
- 'Big fish' and fishers of the Bohol Sea: changing ecology, culture, economics and conservation. (JMV Acebes. PhD dissertation. Murdoch University, WA., 2014)
- Photo-Identification of CetaceanS: PICS Project in the NW Bohol Sea (2011 – 2012). SU-Condura Inc.-Ayala Foundation Inc.
- Movement, Range, and Population Size Estimate: Aspects in Cetacean Conservation in the North-Western Mindanao Sea, Philippines (June 2010 – June 2011)
- Assessment of the Irrawaddy Dolphin Population and its Habitat in Western Negros and Documentation of Other Occurrences in the Visayas and Mindanao (2010-2011)- by TMRC.
- Cetacean and seabird surveys in Ticao Pass, a collaborative project with SU-IEMS, DENR-ICRM Project, and United Board for Christian Higher Education in Asia (UBCHEA) from 2009-2011.
- Insight to the chemical burden among stranded cetaceans (SMM 2011 poster presentation by Edna Sabater) funded by SMM Grants-in-Aid and PADI Foundation.
- Marine mammal training: how to conduct surveys and identify animals. A training program given to selected members of the regional ICRM centers (Masbate, Cebu, and Davao Oriental) under the SU-DENR-ICRM Project from 2009-2011.
- Socioeconomic issues in marine mammal by-catch in Malampaya Sound, Iloilo and Guimaras Straits (Tara Whitty. Scripps Institute of Oceanography)
- Philippine Red List Data Book for the marine mammals of the Philippines- a multi- agency project.- CI-Philippines, TMRC, MWWP, SU-IEMS.
- Human-cetacean interaction in Bohol, Philippines: an evaluation of compliance to code of conduct during whale watching and its effects to cetacean behavior. (PME Sorongon. MSc Thesis, University of the Philippines, Los Baños. October 2010).
- Science and Community-based Conservation of Humpback Whales and other Cetaceans in the Babuyan Islands, Philippines – Phase 1 & 2 (2007-2008; 2008-2009).
- Residence patterns and range characteristics of Indo-Pacific bottlenose dolphins (Tursiops aduncus) and other Small Cetaceans in the Southern Tañon Strait, Central Visayas, Philippines (2009 Master's Thesis- Leslie Callanta).
- Ecology and Conservation of Two Coastal Cetacean Species: Tursiops Aduncus and Stenella longirostris roseinventris in Balabac, Palawan, Philippines. (2007-2008 by TMRC, OPCFHK)
- Workshop on Developing a Rapid Response and Recovery Plan to Incidental Catch and Stranding of Irrawaddy Dolphin in Malampaya, Palawan, Philippines (2006-2007)
- CI-Philippines and TMRC initiated and funded researches under the Sulu-Sulawesi Seascape Project (areas: Verde Island Passage, Balabac Strait, Cagayan Ridge corridor). Cetacean surveys, stranding response trainings and production of a Field guide to marine mammals and sea turtles in Palawan, Philippines.
- Relative Abundance, Distribution, and Species Association of Cetaceans in the Bohol Marine Triangle, Philippines (2008 Master's Thesis, Edna Sabater, SU-IEMS)
- Marine Threatened Species – Fisheries Interaction in the Verde Passage Marine Biodiversity conservation corridor – CI-Philippines
- Biodiversity Conservation and Management of the Bohol Marine Triangle Project (BMTP). 2002-2006. SU-IEMS funded through UNDP-GEF-FPE-BMTP.
- Historical whaling in the Philippines: origins of 'indigenous subsistence whaling', mapping whaling grounds and comparison with current known distribution. (JMV Acebes. MSc dissertation. University of Oxford, UK. September 2005.)
- Cetacean surveys in the Northern Sierra Madre Natural Park through the WWF-Philippines project (2004-2005) and Plan International – Philippines (2000).
- Documentation of Irrawaddy dolphin (Orcaella brevirostris) occurrences in the Visayas and Mindanao. 2010-2011. TMRC in collaboration with Silliman University, Institute of Environmental and Marine Sciences (SU-IEMS). Sponsored by Ocean Park Conservation Foundation, Hong Kong (OPCFHK) and Mohammad Bin Zayed Conservation Foundation.
- Stranding response trainings and education programs in collaboration with other NGOs, local government units in Regions VII and VIII, and other regional offices.
- Cetacean species inventory in the northwestern waters of Palawan, Philippines. Nagao Environmental Foundation Newsletter, 2006.
- 2005 population abundance estimate of Irrawaddy dolphins in Malampaya Sound, Taytay, Palawan.
- Perception and knowledge of cetaceans in some fisher folk

communities in Puerto Princesa City.

- Species inventory of cetacean populations in the waters surrounding Tubbataha Reefs
- Preliminary survey for cetacean populations in San Antonio Bay, Bataraza, Palawan. In Assessment of mangroves and associated fauna in Bataraza and Balabac, Palawan. Conservation International Philippine Technical Report, 2003.
- UP- Diliman- Marine Mammal Stranding Network in the Philippines (PMMSN). Strandings that occurred between 1998-2009 were published in Aquatic Mammals (Aragones et al. 2010); Graduate students are working on strandings-related issues, i.e. diseases and pollutant load on stranded animals. Ecotourism: M.Sc. thesis on the effects of dolphin watching boats on the surfacing behavior of dolphins in Tañon Strait; impacts of dolphin watching on cetacean populations. Population studies: abundance estimates of cetaceans in Tañon Strait (2004-2010).

Past research projects reported in SEAMAM II in 2002:

- Cetacean Research and Conservation Project (WWF-Philippines)
- Humpback Whale Research and Conservation Project (WWF-Philippines)
- Malampaya Sound Research and Conservation Project (WWF-Philippines)
- Marine mammal Stranding program 1999-2002 (WWF-Philippines)
- Cetacean By-catch Fisheries Assessment Project (WWF-Philippines)
- Tañon Strait Initiative Project (WWF-Philippines)
- Silliman University (SU) initiated surveys
- The University of the Philippines Institute of Biological Sciences (UP) initiated surveys

Dugongs

The CMS funded a perception study on dugongs and fisheries interaction in 2012 in selected sites all over the country. Using an interview form, local partners were trained to conduct the interview survey stopping short of the analysis of the data.

Locally DENR offices keep records of dugong by-catch and strandings within their respective jurisdictions. These data are submitted to the DENR-PAWB but, to date, neither processing nor analysis has been conducted recently.

The Silliman University conducted a dugong and habitat survey in the Iloilo Strait and the Negros and Panay areas in 2004 and 2007. SEAFDEC likewise keeps records of stranded and fisheries-related dugong mortalities in the Panay area. It was in this vicinity where the first real dugong stranding case occurred in Barangay Duyong, Antique. Most dugong strandings prior to this were actually victims of by-catch. The stranded dugong calf which was severely emaciated and suffering from fungal infection, was later taken to the SEAFDEC facilities for treatment and rehabilitation where it eventually died.

The University of the Philippines, Diliman has collaborated in the status assessment of dugongs that was published recently (Hines et al. 2012).

Needs for Additional Research and Training

Research and Conservation Priorities

General Research Needs: Many areas still need to be explored and surveys, particularly the eastern coast of the Philippines, the southern island of Mindanao, the northwestern coast of Luzon, and the west coast of Palawan. Population estimates have been made for only a few areas thus far, and little is known of movement patterns of cetaceans; studies to address these gaps are a priority, including potential utilization of acoustics to assist in movement studies. In particular, very little is known of the population abundance and distribution of large whales in the country. There is also a need for more dugong-dedicated research to determine baseline population data and other basic biological parameters. Genetics studies are also needed. Additionally, ecosystem-based studies that address habitats and general diversity of marine mammal ecosystems are needed. To address these needs, training is needed in methods for genetics, biopsies, acoustics, abundance, necropsies, GIS, behavior, satellite tags, and ecosystem modeling.

Impact of Threats: More information is needed on fishing effort, particularly for small-scale and artisanal fisheries, as current official records are not accurate. This is necessary to assist in estimates of bycatch magnitude, which are limited thus far. Of particular concern is the purse seine fishery that uses bright lights to attract fish at night. General cetacean-fishery interactions should be more thoroughly studied, as should strandings. Potential impacts of cetacean-based tourism also need to be studied. Thus far, very limited attention has been paid to studying heavy metal concentrations in marine mammals.

Mitigation: A number of national regulations and international agreements exist to protect marine mammals, and several government, NGO and academic initiatives relate to marine mammal conservation and awareness-raising education efforts. Although there are many MPAs in the country, none have been designed specifically for cetaceans. However, some of these MPAs do include cetacean habitat. Unfortunately, effective enforcement is problematic. There are several plans to designate cetacean-specific MPAs, e.g. for O. brevirostris in Negros Occidental and M. novaeangliae in the north. To better inform mitigation approaches, training in socioeconomics was identified as a top need.

Cetaceans

Surveys - There are still many areas in the Philippines that need to be surveyed for cetacean occurrence. For example, very little survey effort has been conducted in the eastern coast of the Philippines facing the Pacific Ocean, the southern island of Mindanao, the northwestern coast of Luzon and the western coast of Palawan. There is also a big gap on the knowledge on the distribution of large whales.

By-catch - There is a need to investigate marine mammal by-catch issues in the many parts of the country as well as document fishing gears used in areas where by-catch is found prevalent. By-catch in purse seine fishery using intense lights to attract fish also needs to be investigated.

Cetacean-human interaction studies - With the increased awareness on the economic potential of cetacean-based tourism activities, several areas have established or plan to establish dolphin or whale watching tourism outfits. Research on the potential effects of dolphin & whale watching activities on cetacean populations must be conducted. Other cetacean-human interaction studies should be conducted such as, fishery interactions and strandings.

Population estimation - Population estimations have only been made in very few areas, and mostly only include small cetaceans. There is a need to estimate population sizes of large whales.

Investigating movement patterns – There is very little information on the movement patterns of cetaceans in the Philippines, especially of large whales. It is important to know important corridors and feeding grounds for these animals. Acoustic monitoring of coastal cetacean populations like the Irrawaddy dolphins will be an important means of determining their movement patterns especially when they move between islands/estuaries.

Heavy metal content - Investigations on the heavy metal content in cetaceans has received very little attention so far.

Ecosystem-based studies - When studying cetacean populations, it will be important to include in the investigation the status of the habitats and when possible the general biodiversity found in the area.

Genetics studies – It will be important to know the genetic identity of several cetacean species in the country, particularly the Blue whale, Bryde's whale, and beaked whales.

Training needs:

- Genetics and Biopsy techniques
- Acoustic monitoring and data analysis
- Abundance survey techniques such as DISTANCE-based line transect surveys; photo-ID
- Necropsy of stranded cetaceans
- GIS
- Socio-economic evaluations of ecotourism problems and feasibilities
- Cetacean behavioral studies
- Satellite tagging
- Ecosystems modeling

Dugongs

Very little data is available on the population abundance, dynamics, and life history. Although seagrass habitats may be extensively surveyed in the country, it is not often done so with dugong conservation in mind. Thus seagrass habitat decline can be quantified but dugong population declines can only be inferred. There is a need for more dugong-dedicated research to establish baseline population data, fill in information gaps on the species, and satisfy its conservation needs.

Present and Potential Marine Mammal Watching Operations

Cetaceans

- Bais, Negros Oriental – existing (LGU)
- Pamilacan Island, Baclayon, Bohol – existing (local coop; private groups; LGU)
- Panglao Island, Panglao, Bohol – existing (private groups and people's organization (2))
- Honda Bay and Puerto Princesa, Palawan – existing (LGU and private groups)
- Anda, Bohol – existing (private groups/resorts)
- Sogod bay, Southern Leyte – existing (private groups/resorts at Padre Burgos, Pintuyan and Limasawa)
- Batangas Bay, Batangas - potential
- Lubang Islands, Occidental Mindoro - potential
- Sarangani Bay, Sarangani Province - potential
- Camiguin Island, Babuyan Islands, Cagayan Province – potential small-scale for humpbacks
- Malampaya Sound – potential small-scale for Irrawaddy
- Bago, Pulupandan – potential land-based only for Irrawaddy

Dugongs

Marine mammal watching operations are present in the country although dugongs are only incidental and not the highlight of these enterprises. The dolphin watching enterprises in Puerto Princesa, Palawan guarantee sightings of dolphins and whales. The boat operators, however, take advantage of the potential for dugong sightings when their boats pass through the dugong feeding habitat en route to feeding areas of cetaceans.

There is one resort in Busuanga, Palawan that offer diving in seagrass habitats near it to watch dugongs feed. The attraction was dropped for a while when no dugongs were encountered. Over the past two years, however, divers have observed dugongs coming back to feed and noted a maximum of 3 adults feeding in the area.

In Mati, Davao Oriental, the provincial government had plans to develop a dugong watching program. However, this was derailed when Typhoon Bopha devastated the eastern coastal towns of the province last December 2012.

During the Philippine dugong convention in Davao City in 2001, participants noted that dugong watching as an ecotourism enterprise may not be feasible because of the cryptic surfacing behavior and the scarcity of dugong sightings in most known habitats. It was generally acknowledged at the time that only the resort in Busuanga, Palawan could actually have a viable dugong watching program because of the proximity of the feeding area to the resort and the frequency of sightings were comparatively high. They also targeted divers whose time underwater increased the potential for and quality of encounters/sightings.

Questions after the Presentation

Peter Thomas: For the oil & gas development, is there any regulation of seismic activity?

- Response (Jo Marie Acebes): No regulations. The government doesn't require observers to be onboard.

Peter Thomas: About purse seines at night, what evidence exists as to entanglement and capture?

- Response (Louella Dolar): Seismic exploration allowed in the protected area for cetaceans (Tañon Strait). For tuna boats with lights, based on interviews in 1992, it was estimated that 500 dolphins were killed/year based on 2 months of observation. In 2012, purse seines that use intense light still have bycatch.

John Wang: For the dugongs, the data of the past record looks much better than present?

- Response (Teri Aquino): No, it was based on anecdotal reports.

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Appendix 1: List of Odontocete Species Recorded to Occur in the Philippine Waters. *Alava et al. 2013

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
1	*Physeter macrocephalus*	Occurs throughout the region but commonly observed in the Bohol, Sulu, South China, and Sulawesi Seas	No estimates available	VU	unknown	None reported since 2002	No information	Stranding occurrences have been common across the country. At least 5 have been reported.
2	*Kogia breviceps*	Only one record from Davao Area as of 2002 but recent standings reported this species in Zambales (Sept.2012) and Davao Gulf (Sept.2011)	No estimates available	DD	unknown	None reported since 2002	No information	No information
3	*Kogia sima*	Fairly common in the Tañon Strait, Bohol Sea, Davao Gulf, and Sarangani Bay	No recent estimates available except those reported by Dolar et al. (2006) in Tañon Strait (670; CV=62%) and in the eastern Sulu Sea (326; CV=58%)	DD	unknown	None reported since 2002	No information	No information
4	*Indopacetus pacificus*	Initially identified from a stranded animal in Davao City; Observed in the Sulu Sea	Uncommon hence no estimates available	DD	unknown	None reported since 2002	No information	No information

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
5	*Mesoplodon densirostris*	Rare. Sighted in the Bohol and Sulu Seas, and Panay Gulf. Strandings reported in Davao Gulf and northern Luzon area (Aragones et al.2010).	No information	DD	unknown	None reported since 2002	No information	No information
6	Mesoplodon gingkodens (now re-identified as *M. hotaula*)	Very rare. Temporarily identified from a stranded animal in Davao Gulf.	No information; not assessed	NA	unknown	No information	No information	No information
7	*Ziphius cavirostris*	Also seen in Puerto Princesa Bay (Torres et al. 2008; Aquino 2009) apart from the Sulu Sea as initially reported by Dolar et al. (1997)	No information	DD	unknown	No information	No information	Due to limited information on its biology, threats cannot be identified. Causes of mortality based on rare stranding occurrences were undetermined.
8	*Feresa attenuata*	Occurs in the Bohol and Sulu Seas as well as the Balabac and Tañon Straits (Dolar 2006), and waters adjacent to the Babuyan and Lubang Islands (Acebes pers. Comm.)	No information	DD	unknown	No information	No information	Plastic material ingestion based on necropsy findings by Aquino (1996); Reported to strand quite frequently (5 animals from 2005-2007) in Cagayan, Luzon areas (Aragones et al. 2010)

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
9	*Globicephala macrorhynchus*	Widely distributed with reported stranding occurrences throughout the region	Eastern Sulu Sea = 7492; CV=29% and Tañon Strait = 179; CV=96% (Dolar et al. 2006)	DD	No new information; Observed to be associated with other delphinids.	No information	Purse seine with super- light, entanglement in materials used in pearl farms, and dynamite fishing (PCSDS 2008)	Susceptible to acoustic disturbance such as seismic-related activities
10	*Grampus griseus*	Widely distributed in the region. Observed in small pods in the NW Bohol Sea	Eastern Sulu Sea = 1514; CV=47% (Dolar et al. 2006); NW Bohol Sea = 47; CV=28.30% (Sabater et al. 2012)	DD	No new information	No information	Possibly from cyanide and dynamite fishing (PCSDS 2006)	Plastic material ingestion based on necropsy findings conducted by SEAFDEC in 2006
11	*Lagenodelphis hosei*	Wide distribution across the archipelago. Observed to associate with other dolphin species	Eastern Sulu Sea = 13,518; CV=27% (Dolar et al. 2006); NW Bohol Sea = 234; CV=23.41% (Sabater et al. 2012)	VU	No information	No new information	No new information	Unsustainable dolphin tour operations

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
12	*Orcaella breviceps*	Two populations or subpopulations are found in the Philippines which are located in Malampaya Sound (Smith et al. 2004) and the coastal shores of Buenavista, Guimaras, Bago-Pulupandan in Negros Occidental, and south eastern Panay Island (Bagarinao 2005; Dolar 2009, 2011). There is fragmentation in its occurrence and highly associated with freshwater input.	Photo-identification study in 2005 by Matillano & Austria (2009) showed 50% decrease in abundance from the previous estimate of 77 (CV=0.27) (Smith et al. 2004). Assessment of the Visayas population is still on-going but so far photo-identified 13 animals (Dolar 2010, Dolar et al. 2011).	VU	Coastal and estuarine are degraded due to urban development pollution and heavy silt load from the river systems.	No information	Different fishing gear types are associated with incidental catches such as tangab or fish stakes, fish corrals, gill net, and drift net (Dolar 2009; Smith et al 2004)	Ship strikes. Agricultural dam construction. Pollution from river systems
13	*Orcinus orca*	Rare. Recent sighting was in Saranggani Bay (Dolar unpubl data) and the Bohol Sea near Apo Island. The latter was seen in May 31 2010 and identified from a video a posted by a tourist consisting of at about 4 animals.	No estimate available.	DD	unknown	No information	No information	No information

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
14	*Peponocephala electra*	Fairly common in the Philippines. Often seen in big group and associated with other small delphinid species. Two mass strandings occurred in 2009 within a 3-week period approximately 350 km apart	Eastern Sulu Sea: 921; CV=80% (Dolar et al. 2006). NW Bohol Sea: 243; CV=31.68% (Sabater and Aquino 2012). Silber et al (2011) have catalogued 187 individuals from 2010 to 2011.	DD	No information	No new information	No information	Pollution such as plastic materials. Susceptible to loud acoustic sounds related to sonar or seismic activities.
15	*Pseudorca crassidens*	Fairly common in the region.	No new information.	DD	No information	No information	No information	Five individuals were initially reported held in captivity at the Ocean Adventure facility in Subic. At present, only one animal is left (EII/MWWP data)
16	*Stenella attenuata*	Abundant and widely distributed	Eastern Sulu Sea: 14,930; CV=14% while Tañon Strait has 640; CV=26% (Dolar et al. 2006).	DD	No information	No new information	Entanglement with long line in pearl farms in Coron (Alava et al. 2013)	Captivity in oceanaria post-stranding incidence (Ocean Adventure website)
17	*Stenella coeruleoalba*	Very rare. First identified from a bycatch in Albay Gulf (Bautista 2002)	No information	DD	No information	No information	No information	No information

No.	Species	Distribution	Population status	Conservation status - PHL*	Habitat status	Directed catch (including live-captures)	By-catch in fisheries	Other threats
18a	*Stenella longirostris longirostris*	Very common in the Philippines	According to Dolar et al. (2006), eastern Sulu Sea has 31,512; CV=27% while Tañon Strait has 3,489; CV=26%. NW Bohol Sea has 335; CV=28.13% (Sabater & Aquino 2012).	VU	No new information	No new information	No new information	Unregulated cetacean interaction activities in Bohol Islands (Sorongon 2010)
18b	*Stenella longirostris roseiventris*	Found only in Balabac Strait along the 30-50 m isobath of the reef area adjacent to Bugsuk Island (Perrin et al. 2007)	No information	DD	Philippine coral reef cover (greater than 25% cover) has experienced 62% decline within 20 years (Bruno & Selig 2007)	No information	No information	No information
19	*Steno bredanensis*	Uncommon in the Philippines but often associated with humpback whales in the Babuyan group of islands (Acebes & Lesaca 2003)	No information	DD	No information	No information	Drift net and gill net fisheries	Captivity in oceanaria post-stranding incidence (Ocean Adventure website)
20	*Tursiops aduncus*	This species is newly recognized, separately distinct from Tursiops truncatus, hence information is scarce	No information	DD	No information	Indication of possible directed fishery in Balabac Strait (Dolar 2006).	Blast fishing possible to cause mortality (Dolar 2009)	None
21	*Tursiops truncatus*	Common throughout the archipelago and may be mixing with Tursiops aduncus.	Estimates from Dolar et al (2006) are available in the eastern Sulu Sea (2,628; CV=40%) and the Tañon Strait (269; CV=105%) as Tursiops sp.	DD	No information	No new information	No new information	IUU (illegal unregulated unreported) Live capture for oceanaria

SEAMAM III Report - Taiwan

Presentation by John Y. Wang, Shih Chu Yang and Chen Yi Kan

Since the 2002 SEAMAM II meeting, the main development in marine mammal research and conservation was the discovery in 2002 of a small distinct population of Indo-Pacific humpback dolphins (*Sousa chinensis*) in the eastern Taiwan Strait (ETS) along the west coast of Taiwan (Wang et al. 2004a). Since its discovery, the population has been studied annually and the data revealed the population was in serious trouble. In 2008, it was assessed by the IUCN Red List of Threatened Species criteria as Critically Endangered (Reeves et al. 2008). This population has since become the main focus of conservation attention in Taiwan.

Other major developments include:

1. The revision of the taxonomy of finless porpoises (*genus Neophocaena*) from the widely-accepted, single species of finless porpoise to the official recognition of a two species arrangement in this genus by the Society for Marine Mammalogy (http://www.marinemammalscience.org/index.php?option=com_content&view=article&id=645&Itemid=340) after considerable review. The taxonomy study leading to this revision was focused on finless porpoise specimens from Taiwanese waters (Wang et al. 2008a);
2. Several unusual stranding events that were possibly related to military or other anthropogenic noise sources were documented (see Wang and Yang 2006, Yang et al. 2008);
3. The great expansion of cetacean-watch tourism, which peaked and may have stabilized at a lower level in visitors;
4. A detailed guide to species identification of delphinids and other small cetaceans in Taiwanese waters was published (Wang and Yang 2007).

This paper begins with an update of the cetacean fauna and summary of the species distribution in the waters of Taiwan (see figure 1 for locations and place names) as well as known and suspected threats to the species. Population and habitat status are discussed, followed by information on direct and indirect catches of cetaceans as well as the fisheries in Taiwan. The local legal status and management of marine mammals, folk and public attitudes, existing research programmes and the most urgent research needs are also summarized. The final section deals with cetacean-based tourism development and future potential in Taiwan. In addition, a chronological list of the scientific publications on marine mammals in Taiwan is provided to help facilitate future research. The materials presented in this paper were collected opportunistically during research in Taiwan and should not be considered complete but hopefully useful.

Species and Distribution

One sirenian species is unlikely to have been an inhabitant of Taiwanese waters. If it was, it was hunted to extinction fairly early. There are confirmed records for two species of phocoenids, 15 delphinids (of which one has an endemic population, the ETS *Sousa chinensis*), four ziphiids, two *Kogia spp*. (*K. breviceps* and *K. sima*), the sperm whale (*Physeter macrocephalus*) and six or seven species of mysticetes (although recent records of baleen whales have been quite rare).

The total number of marine mammals recorded from Taiwanese waters (including the dugong) is 31 or 32. Thus far, there is no evidence supporting the existence of the following species in Taiwan waters even though they have been included in other lists: Harbor porpoise (*Phocoena phocoena*), Irrawaddy dolphin (*Orcaella brevirostris*), short-beaked common dolphin (*Delphinus delphis*), Baird's beaked whale (*Berardius bairdii*), Hubbs' beaked whale (*Mesoplodon carlhubbsi*) and gray whale (*Eschrichtius robustus*). These species should be omitted from the list of cetaceans occurring in Taiwanese waters until there is solid evidence showing otherwise.

Dugong

Several published distributions for the dugong (*Dugong dugon*) include the waters of Taiwan (e.g., Nishiwaki and Marsh 1985, Marsh et al. 2002). However, the recent IUCN Red List assessment no longer includes Taiwanese waters as part of the species range and states that the species is regionally extinct in Taiwan (Marsh 2008). All previous reports of the presence of dugongs in Taiwanese waters can be traced back to a single confirmed specimen that was reportedly captured in western Taiwan near the village of Tai-jyu-bo (N21°56'40"/ E120°45'30") on 18 January 1932 (possibly 1931, but this could not be confirmed in the information provided). This specimen was first reported by Hirasaka (1932) with photographs of the skull of this specimen. Hirasaka (1932) also stated that a young male and an adult male were reported to have been captured in April (1931 or 1932) and June 1931 from "Haikau" (near "Kaoshun") but no specimens were examined. Even though Hirasaka (1932) claimed that the capture location was along western Taiwan, the coordinates provided were for a location at the most southern tip of Taiwan. Furthermore, from the information provided, it could not be ascertained that the capture location was actually from Taiwanese waters even though the landing site of this specimen was in Taiwan.

Since marine mammal research in Taiwan really began in 1990, there have been no reports of dugongs by researchers, fishermen or the general public. One specimen (skeleton) exists in the collection of the Department of Zoology, National Taiwan University. However, no one seems to know from where the specimen originated. It is just as probable that this specimen was brought to Taiwan from elsewhere as it is to have been collected from Taiwanese waters. It is not known if the specimen of Hirasaka (1932) represented a vagrant individual or a member of a small and declining Taiwanese population. If this species was once native to this region, it almost certainly has been extirpated.

Distribution Summary: No known distribution.

Toothed Whales

The distributions of the delphinids, Kogia species and finless porpoises in Taiwanese waters were described in detail by Wang and Yang (2007). A short summary of their distributions are provided below. Although two species of finless porpoises are now recognized (Wang et al. 2008a, Jefferson and Wang 2011), these species are treated in one account for comparative purposes. Beaked whales, sperm whale and baleen whales are neither frequently observed nor recorded from Taiwan but there is some evidence that suggests beaked and sperm whales are more common than reflected by the paucity of data.

1. & 2. Indo-Pacific finless porpoise (*Neophocaena phocaenoides*) and Narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*)

Distribution Summary: Most of the west coast should have suitable habitat for these species (with the exception of the hard coral reef bottom found southof southwest Taiwan). It is highly unlikely that either finless porpoise species will be found along the east coast of Taiwan where only a narrow strip of continental shelf exists (there is a slight possibility that animals may be found in the larger shelf areas of the northeast coasts). How far the distribution of Indo-Pacific finless porpoises extend east across northern Taiwan is unknown. In the waters along western Taiwan, the predominant species appears to be *N. phocaenoides* but there are two confirmed records of *N. asiaeorientalis* (one was a beach cast carcass and the other was a live by-caught individual that was released). In the waters of both the Matsu and Chinmen Islands, which are situated very close to the mainland of China, carcasses of both species have been recorded and both species have been observed alive in waters of the Matsu Islands (see Wang et al. 2010). The Taiwan Strait (especially the western side) is clearly an area of sympatry for these two cryptic species. The extent of the sympatric area beyond the Taiwan Strait is not well known. However, only one species, N. phocaenoides, has been found in the waters of Hong Kong even though hundreds of finless porpoises have been examined (as stranded or bycaught carcasses) or observed during boat-based surveys.

Main Threats: Incidental mortality in all drifting gillnets, sink gillnets, trammel nets, purse seines, fixed fish traps (such as stow nets) and possibly trawl (especially pair trawl) nets is likely responsible for most of the mortality caused by fisheries; they are unlikely to be taken by harpoon. Coastal development, industrial and human waste, vessel traffic, ocean noise and military exercises are all potential serious threats.

3. Long-beaked common dolphin (*Delphinus capensis*)

Distribution Summary: This species is likely found mainly in the coastal waters of western Taiwan with extensions into the shallower waters of the south, north and northeast coasts. The presence of the “tropicalis” subspecies may be uncommon and likely only in the coastal waters of western and southern Taiwan. There is no confirmed record of the short-beaked species in the inshore waters of Taiwan.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for at least some of the mortality caused by fisheries; this species is also a small component of the harpooned cetaceans at the Nanfang Ao fishing port.

4. Pantropical spotted dolphin (*Stenella attenuata*)

Distribution Summary: Likely to be associated with the warm waters of the Kuroshio Current and thus, in the waters of the entire eastern, southern and southwestern coasts (the occurrence of pantropical spotted dolphins in the waters of the west coast may be due to occasional intrusions of considerable amounts of warm Kuroshio waters into the Taiwan Strait or a coastal form may inhabit the shallow waters of the Taiwan Strait). This is one of the most commonly observed cetaceans by whale-watchers.

Main Threats: This species comprises the largest component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports; incidental entanglement in all drifting gillnets and purse seines is also responsible for many deaths.

5. Striped dolphin (*Stenella coeruleoalba*)

Distribution Summary: Appears to be associated with the edges of the warm Kuroshio Current and therefore should be found in oceanic waters along the entire eastern, southern and southwestern coasts but it is not commonly seen. A live mass stranding in central western Taiwan was likely an unusual event.

Main Threats: Incidental entanglement in longlines and large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for most of the mortality caused by fisheries. This species is also a small component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports. Intense anthropogenic sources of noise (such as naval exercises) may also cause some mortality of this species (e.g., Wang and Yang 2006, Yang et al. 2008).

6. Spinner dolphin – Gray’s and dwarf subspecies (*Stenella longirostris*)

Distribution Summary: The Gray’s subspecies is likely to be found in the waters along the entire eastern, southern and southwestern coasts where deep water is near shelf water. The dwarf subspecies may exist in southern Taiwan and Hualien waters but identification of this subspecies remains tentative. This is one of the most frequently encountered species in the waters of eastern Taiwan.

Main Threats: The Gray’s subspecies is a large component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports; incidental entanglement in all drifting gillnets is likely responsible for a large proportion of the mortality caused by fisheries.

7. Fraser’s dolphin (*Lagenodelphis hosei*)

Distribution Summary: This species is most likely found near or beyond the continental shelf and in the warm, clear waters of the Kuroshio Current (the entire eastern, southern and southwestern coasts of Taiwan). This species is unlikely to inhabit the waters of the west coast (except the waters south of the Taiwan Strait). Along eastern Taiwan, it is common to see during whale-watching tours.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for a large proportion of the mortality caused by fisheries; this species is also a small component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports.

8. Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)

Distribution Summary: An inhabitant of shallow waters of the Taiwan Strait, it should be found in the waters of the entire western coast of Taiwan, the Penghu Archipelago, and Kinmen and Matsu Islands. It is almost certainly not an inhabitant of most of the east coast where a very narrow continental shelf and very deep waters exist. This species has been observed in waters of the southern tip of Taiwan - Nan Wan Bay at as well as the adjacent shallow waters to the east and west of Nan Wan Bay. The shallow bay of the northeast coast of Taiwan also appears to be possible habitat for this species but thus far, there is no evidence of occurrence in this region.

Main Threats: Large-mesh, drifting gillnets (for large pelagic fish), sink gillnets and trammel nets and possibly trawl (especially pair trawl) nets are likely responsible for most of the mortality caused by fisheries. It is unknown if any are taken by harpoon at present but were likely in the past. Unregulated and unmonitored dolphin drive fishery (for food and to supply local and foreign captive display facilities) operations of the Penghu islands prior to the 1990s likely depleted the local population. Coastal development, industrial and human waste, vessel traffic and noise pollution are all potential serious threats.

9. Common bottlenose dolphin (*Tursiops truncatus*)

Distribution Summary: This species appears to be an inhabitant of all Taiwanese waters.

Main Threats: This species comprises a very large component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports; incidental entanglement in all drifting gillnets is likely responsible for a large proportion of the mortality caused by fisheries; incidental capture in sink gillnet, trammel nets and purse seines also take considerable numbers in some regions; also animals are killed as a result of being hooked by tuna or shark longlines.

10. Rough-toothed dolphin (*Steno bredanensis*)

Distribution Summary: The preferred habitat of this species (i.e., deep, warm waters) is present along eastern and southern Taiwan and strandings and catch records support its presence in Taiwan waters. However, the lack of sightings and all strandings being on beaches of northern and western Taiwan is puzzling. Presently, no sightings of this species have been reported.

Main Threats: Incidental entanglement in all drifting gillnets is likely responsible for some of the mortality caused by fisheries; animals occasionally die as a result of being hooked by tuna or shark longlines; this species is a small component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports.

11. Indo-Pacific humpback dolphin (*Sousa chinensis*)

Status: In 2008, this distinct population was assessed by the IUCN Red List and was classified as Critically Endangered C2a(ii). Recent precise abundance estimates (Wang et al. 2012) suggested that a slight revision to the assessment to CR C2a(ii),D was needed.

Distribution Summary: Restricted to the shallow waters on either side of the Taiwan Strait (west coast of Taiwan – eastern Taiwan Strait (ETS) and Kinmen and Matsu islands – western Taiwan Strait). Although there have been some anecdotal reports of white dolphins from the waters of the Penghu Islands, there is no evidence these are humpback dolphins. Other species such as Risso's dolphins (*Grampus griseus*) and bottlenose dolphins (*Tursiops spp*.), can appear quite 'white' depending on age and lighting.

In 2002, a small population of humpback dolphins were found in the coastal waters of western Taiwan (eastern Taiwan Strait) (Wang et al. 2004a). Continued research on these animals showed them to be genetically distinct and geographically isolated from others in adjacent waters of mainland China (Wang et al. 2008b). This population is primarily found in the waters of Miaoli, Taichung, Changhua, Yunlin, Chiayi and Tainan counties (along central western Taiwan) spanning about 200 linear km of coastal waters and within 3 km of shore (defined as any dry land at high tide) (figure 2, Wang et al. 2007a,b, Ross et al. 2010) and appears to be a year-round resident of these waters (Wang and Yang 2011). Habitat preferred by the species appears to exist further north of this region but it is unknown why these waters are not used as frequently, if at all, presently (Wang et al. 2007a,b, Ross et al. 2010, Dungan et al. 2011)

Main Threats: For the ETS population, five major threats have been identified: fisheries bycatch, habitat loss due to reclamation projects (for heavy industry and power generation), loss of freshwater to estuaries, pollution (both air and water from industrial, agricultural and residential/municipal sources) and noise. Incidental mortality in large-mesh, drifting gillnets (for large pelagic fish), sink gillnets and trammel nets and possibly trawl (especially pair trawl) nets is likely responsible for most of the mortality caused by fisheries. It is unlikely to be harpooned for food presently because the local fishermen believe they are highly contaminated and the ETS population is a very high profile species of conservation concern in Taiwan. Continuing coastal development and the lack of mitigation measures to eliminate mortality due to fisheries, for the decreasing freshwater input to estuaries, large loads of pollution and anthropogenic noise in the coastal waters of western Taiwan are serious concerns for the ETS population. Without immediate reduction of these threats, the population is unlikely to persist.

12. Risso's dolphin (*Grampus griseus*)

Distribution Summary: Appears to inhabit most of Taiwan's waters but most commonly observed in waters where the continental slope is steep (e.g., eastern and southern coasts). It is one of the most frequently encountered species during whale-watching tours along eastern Taiwan.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is responsible for most of the mortality caused by fisheries; ingestion of longline bait and becoming hooked may also occur but are rare events; this species is also a small component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports.

13. Pygmy killer whale (*Feresa attenuata*)

Distribution Summary: Tend to be found in the waters of the southern half of Taiwan where water temperatures maybe slightly higher. Several mass stranding events have occurred along the west (especially southwest) coast of Taiwan.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is responsible for most of the mortality caused by fisheries; this species is also a very small component of the harpooned cetaceans at the Nanfang Ao fishing port. Intense anthropogenic sources of noise are likely another threat to this species (Wang and Yang 2006).

14. Melon-headed whale (*Peponocephala electra*)

Distribution Summary: Most likely found along the continental shelf edge of the waters of the entire eastern, southern and southwestern coasts of Taiwan.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for some of the fisheries-induced mortality; this species is also a small component of the harpooned cetaceans at Nanfang Ao and Tungkang fishing ports.

15. Killer whale (*Orcinus orca*)

Distribution Summary: Likely distributed along the entire east and south coasts of Taiwan but do not seem to be common. There are no records for the west coast but there are anecdotal reports of sightings in southwestern Taiwan in the deeper waters southwest of Xiao Liuchiu Island. In general, only two to three sightings of killer whales are reported by whale-watching tour operators each year.

Main Threats: Due to its rarity in Taiwan's waters, it is difficult to determine threats to this species; however, parts of two killer whales were found amongst the cetacean meat confiscated by police recently – they were likely the victims of the illegal harpoon fishery that continues covertly; incidental capture in large-mesh, drifting gillnets (for large pelagic fish) may account for some mortality.

16. False killer whale (*Pseudorca crassidens*)

Distribution Summary: This is one of the most widely distributed species in Taiwan. It is likely found in all waters of Taiwan, including the surrounding islands (sightings have been made in the waters of the Matsu islands).

4Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for most of the mortality caused by fisheries; this species is also a very small component of the harpooned cetaceans at the Nanfang Ao fishing port; because it is infamous for stealing longline caught fish, fishermen may harpoon animals to prevent theft rather than for consumption.

17. Short-finned pilot whale (*Globicephala macrorhynchus*)

Distribution Summary: Likely found in deep waters of the entire eastern, southern and southwestern coasts. Strandings along western Taiwan and on the mainland side of the Taiwan Strait may be unusual events for this deep water species. Unusual mass stranding events occurred in 2004.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is responsible for most of the mortality caused by fisheries. Intense anthropogenic sources of noise are likely another threat to this species (Wang and Yang 2006).

18. Cuvier's beaked whale (*Ziphius cavirostris*)

Distribution Summary: Likely exists in waters of the entire eastern, southern and southwestern coasts.

Main Threats: Poorly known. Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) may cause some mortality. Intense anthropogenic sources of noise (such as naval exercises) have been linked to mortality of beaked whales in many parts of the world, including Taiwan (e.g., Wang and Yang 2006, Yang et al. 2008). Some animals were also harpooned occasionally in the past.

19. Longman's beaked whale (*Indopacetus pacificus*)

Status: Tropical bottlenose whales ascribed as possibly belonging to the genus Hyperoodon (see Miyashita and Balcomb 1988) was included in the 2002 SEAMAM II working report for Taiwan (Wang and Yang 2002). At the time, it was still unclear to which species these "tropical bottlenose whales" belonged and it was suggested that they continued to be called tropical bottlenose whales to avoid further confusion (Pitman et al. 1999). Since then, it has become clearer that the tropical bottlenose whales are Indopacetus pacificus and do not belong to the genus Hyperoodon (Dalebout et al. 2003); this regional update reflects this nomenclatural clarification.

Distribution Summary: Sightings of this species was reported in 2000 east of the southern tip of Taiwan and a possible, unconfirmed sighting was made in the waters of Green Island (southeast Taiwan). In 2005, at least 23 oceanic, deep water odontocetes stranded over about three weeks in an unusual mortality event (see Wang and Yang 2006, Yang et al. 2008) that was possibly linked to military exercises (see Yang et al. 2008).

Among these specimens were two (likely mother-calf) Longman's beaked whales that stranded alive on a beach of Ilan County (northeast Taiwan) and subsequently died. The eastern, southern and southwestern waters of Taiwan have the deep waters generally preferred by beaked whales and may be inhabited by this and other beaked whale species.

Main Threats: Poorly known. Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) may cause some mortality. Intense anthropogenic sources of noise (such as naval exercises) have been linked to mortality of beaked whales in many parts of the world, including Taiwan (e.g., Wang and Yang 2006, Yang et al. 2008).

20. Blainville's beaked whale (*Mesoplodon densirostris*)

Distribution Summary: Likely exists in deep waters of the entire eastern, southern and southwestern coasts.

Main Threats: Poorly known. Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) may cause some mortality. Intense anthropogenic sources of noise (such as naval exercises) have been linked to mortality of beaked whales in many parts of the world, including Taiwan (e.g., Wang and Yang 2006, Yang et al. 2008). Some animals were also harpooned occasionally in the past.

21. Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*)

Distribution Summary: Likely exists in deep waters of the entire eastern, southern and southwestern coasts.

Main Threats: Poorly known. Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) may cause some mortality. Intense anthropogenic sources of noise (such as naval exercises) have been linked to mortality of beaked whales in many parts of the world, including Taiwan (e.g., Wang and Yang 2006, Yang et al. 2008). Some animals were also harpooned occasionally in the past.

22. Sperm whale (*Physeter macrocephalus*)

Distribution Summary: Likely to be found in the waters of the entire eastern coast of Taiwan and in or around the deep troughs of southwestern Taiwan.

Main Threats: Small individuals may be taken by harpoon but presently, this species does not seem to be a target of illegal direct hunting in Taiwanese waters; incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) may cause some mortality.

23. Pygmy sperm whale (*Kogia breviceps*)

Distribution Summary: Appears to exist in the deep waters of eastern and southern Taiwan

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for most of the mortality caused by fisheries; this species is also a very small component of the harpooned cetaceans at the Nanfang Ao fishing port. Intense anthropogenic sources of noise (such as naval exercises) may also cause some mortality of this species (e.g., Wang and Yang 2006, Yang et al. 2008).

24. Dwarf sperm whale (*Kogia sima*)

Distribution Summary: Appears to be common in deep waters of eastern, southern and southwestern Taiwan. It may also be found in shallower waters of southwest Taiwan in regions where deep water is nearby.

Main Threats: Incidental entanglement in large-mesh, drifting gillnets (for large pelagic fish) is likely responsible for most of the mortality caused by fisheries; this species is also a very small component of the harpooned cetaceans at the Nanfang Ao fishing port. Intense anthropogenic sources of noise (such as naval exercises) may also cause some mortality of this species (e.g., Wang and Yang 2006, Yang et al. 2008).

Baleen Whales

Overall, baleen whale sightings and records from Taiwanese waters in recent times have been rare. Records show that they were more common in the past when they were taken in large numbers. Over-hunting of baleen whales is probably the reason for the present paucity and almost certainly the reason for the extirpated wintering population of humpback whales from southern Taiwan.

25. Humpback whale (*Megaptera novaeangliae*)

Status: The population that once wintered in southern Taiwan is almost certainly extirpated due to past whaling; first by Japanese operations and then later by Taiwanese whalers.

Distribution Summary: Very recent sightings have been reported from the waters of Orchid Island, Green Island, Taitung County and Hualien County. These are most likely animals migrating between the islands of the northern Philippines and Japan as there is no known area of seasonal, or other, concentration in Taiwanese waters.

Main Threats: Incidental catch by driftnets and large fixed set-traps (a weir type trap) along eastern Taiwan has resulted in the deaths of a few individuals.

26. Minke whale (*Balaenoptera acutorostrata*)
27. Bryde's whale (*Balaenoptera edeni*) or Omura's whale (*B. omurai*)
28. Sei whale (*Balaenoptera borealis*)
29. Fin whale (*Balaenoptera physalus*)
30. Blue whale (*Balaenoptera musculus*)

Very little is known of any of these species. A few (between 10 and 15) small, stranded balaenopterids have been reported and the skeletons kept in various collections in Taiwan. Presently, the species identities of these specimens have not been published. A Bryde's-type or Omura's-type whale was harpooned and landed a

Houbihu Harbour in southern Taiwan in 1990 but it is unknown to which species the small ~4-4.5m long whale belonged. The western North Pacific population of blue whales has likely been extirpated.

Population Status

If dugongs once existed in Taiwanese waters, they were extirpated long ago as there have been no confirmed records since the single specimen reported in Hirasaka (1932). With the exception of the ETS humpback dolphin, nothing is known about the population status of any cetaceans in the waters of Taiwan. The ETS humpack dolphin population was demonstrated to be a genetically distinct and geographically isolated population from adjacent populations in the waters of mainland China (Wang et al. 2008b). This population is also almost certainly resident year-round to the ETS (Wang et al. 2011). Abundance estimates based on line-transect surveys resulted in a preliminary point estimate of 99 individuals with a CV of 51.6% (Wang et al. 2007a). Assessment of this population using the IUCN Red List resulted in a status of Critically Endangered CR C2a(ii) (Reeves et al. 2000). Recent mark-recapture analyses of photo-ID data produced higher precision estimates with the highest annual point estimate of 74 individuals (CV=4%) in 2010 (Wang et al. 2012). These results further supported the population to be Critically Endangered under another criterion (D) so the status should be revised slightly to Critically Endangered C2a(ii),D.

Although a small group of Indo-Pacific bottlenose dolphins found in Nan Wan and adjacent waters of southern Taiwan were monitored for a few years in the early 2000s, a rigorous estimate of this group was not possible due to a lack of data. However, this group was unlikely to have numbered more than the low tens at the most. A follow-up study of these dolphins in 2010 resulted in no sightings at sea and only two sightings from land-based observation sites. This was suggestive that the number of dolphins has either declined or the dolphins are using the area less frequently. It is unfortunate that given the lack of observations, continuing research on these animals may not be an efficient use of limited resources.

It is uncertain if there are any other populations of cetacean that are endemic to Taiwanese waters. For most species, Taiwan's waters likely represent only a small part of the distributions of cetacean populations. Much more research is needed to understand the population structure and abundance of cetaceans that occur in Taiwanese waters with respect the larger western Pacific region.

Habitat Status

The development of the shoreline of western Taiwan continues at a rapid pace with several reclamation projects being proposed for new, and expansions of existing, industrial sites. Most of the proposed development sites are within the known distribution of the ETS humpback dolphin. In early 2011, plans to construct a massive (4000 ha) petrochemical project in the middle of the distribution of the ETS humpback dolphin was halted after major public protests. Although this cancellation provided the ETS humpback dolphin an important reprieve from certain extinction, the existing serious threats to this population are still causing the population to decline, albeit at a slower rate. Unfortunately, this project was only cancelled in Taiwan and the developers are presently considering a site in Johor, Malaysia.

All major rivers draining into the eastern Taiwan Strait have been dammed or diverted for human usage and there are more (and larger) river alteration projects being proposed, primarily for industrial development and purposes. The impacts of the reduction of freshwater influx into estuaries and on the ETS humpback dolphin are poorly unknown. However, impacts due to the loss of freshwater are likely to include the degradation of the estuarine ecosystem and hence the production of the quality and quantity of prey. There is still limited treatment of sewage before discharge and the adequacy of water quality and fish contamination monitoring programs are questionable. Pollutant concentrations in cetacean tissues have not been investigated adequately. However, the results from modelling exposure of prey to the ETS humpback dolphin predicted that 68% of the population would have PCB levels that would place them at risk of immunotoxicity (Riehl 2012).

Fish stocks in the coastal waters of western Taiwan are overfished under the present management system of more or less open access (i.e., catch quotas existing for a very few fisheries) with regulations on entry into fisheries (e.g., Huang and Chuang 2010, Tseng and Ou 2010, Chen 2012). Bottom trawling by single and tandem vessels (pair trawls) are commonly seen even inshore or 3 nautical miles where traveling is banned. Although the Penghu (Pescadores Islands) County government has banned the use of trammel nets, this type of fishing gear is still being used widely in coastal waters of western Taiwan and other regions. In fact, trammel nets and other types of gillnets are overwhelmingly the most abundantly-used fishing gear in Taiwanese waters. Fishing vessels from mainland China also contribute great fishing pressure on the fish stocks of the region. Illegal fishing methods (e.g., explosives, electricity and toxins) are still being reported but are much reduced occurrences. However, complaints by Taiwanese fishermen of mainland Chinese vessels using such destructive fishing methods (especially around the waters of the Chinmen and Matsu islands) are increasing.

In the waters of eastern Taiwan, the main problem for oceanic species is incidental catch in drifting gillnets (see below), illegal harpooning (see below) and possibly the depletion of fish stocks that inhabit the narrow continental shelf. The latter problem may only affect one or two species that might use this resource. More recently, intense sounds generated by anthropogenic activities (e.g., seismic research, resource exploration, naval exercises) have become a more serious problem and concerns are growing as several unusual mortality events have been reported. The increasing shipping volume for the movement of commercial goods from raw resources to the massive manufacturing centres of the world (eastern Asia) is also a growing threat for some species in this region.

Directed Catch

The intentional harpooning of cetaceans continues even though illegal. Since the last update of Wang and Yang (2002), more arrests have been made of illegal harvesting, handling and sales of cetacean parts. Such periodic enforcement is proof that there is still substantial illegal harpooning of cetaceans. The frequency of such events appears to have declined. It is uncertain if the illegal activities have declined, the infractions are being better kept from enforcement, if enforcement has become more complacent or such events no longer attract the same interest in the news media. Direct hunting of cetaceans has decreased but present enforcement and penalties do not appear to be sufficient to stop illegal hunting. The acquittals of the people involved in several cases of possession of cetacean parts in freezers with a minimal penalty of confiscation of the illegal material may actually encourage more future activities to compensate for any loss income cause by enforcement. It is clear that Taiwan's Wildlife Conservation Law requires amendment.

Since 2002, no systematic information has been collected at the main fishing ports which land cetaceans: Nanfang Ao and Tungkang. Cetaceans are still landed at both ports (based on personal observations and reports from reliable fishermen and fish wholesalers) but much of the illegal trade has become even more difficult to observe as they have sunken deeper into covert markets. Cetaceans are no longer landed as whole animals or even just gutted. Instead, they are now butchered at sea and landed in pieces that are usually bagged. These bags of cetaceans are transferred quickly and quietly from boat to weighing balance to truck (one of the authors witnessed this process one night while sampling fish at Nanfang Ao). Anecdotal information suggests that the illegal trade of cetacean meat involves organized criminals.

The main domestic markets are found in Yunlin and Chiayi counties with smaller local markets at Nanfang Ao and Tungkang. In the past, cetacean meat was consumed because of the medicinal properties that was said to be beneficial to postpartum women and for anemia. Now, cetacean meat has taken on more of a traditional food that is generally consumed by the older generation. Much of the cetacean meat is sold fresh or frozen.

By-catch in Fisheries

Even before 2002, observations of cetacean landings at fishing ports began to decline as a result of increased enforcement so fewer fishermen were willing to take the risks associated with conducting illegal activities. But those who continued in the illegal trade in cetaceans conducted their business more covertly. As a consequence, almost no new data on the level of catches (direct or incidental) of cetaceans has accumulated since the last SEAMAM meeting.

Because fisheries continue to operate more or less as before with no changes in regulations or fishing effort, this remains a very serious concern throughout Taiwanese waters, especially regions in which any kind of gillnet (drifting, bottom-set, and trammel) is being used. As in the report of 2002, it is still believed that an alarmingly large number of cetaceans are killed incidentally each year. The collapse of the cetacean-watch industry in Taitung County due to the difficulties of locating cetaceans for tourists even though this was not a problem a few years earlier when tours began, may be an indication that bycatch has had an impact on the local abundance of cetaceans. Some data on fishing effort by the large-mesh pelagic driftnet fishery operating off eastern Taiwan have been collected and would help to estimate bycatch levels. However, these data are still awaiting analyses. Still nothing is known of cetaceans and their interactions with fisheries in northern Taiwan where a large number of fishing vessels operate. Given the size of the fishing fleet, the level of by-catch is likely considerable. For the critically endangered ETS humpback dolphin population, bycatch is one of the most serious threats to the continued existence of these dolphins. Even though most fisherman may never catch an ETS humpback dolphin, several thousand gillnet (in this region, trammel nets predominate) fishermen work these waters. With such a tiny population, the mortality of even a single individual every seven years was determined to be beyond the Potential Biological Removal rate (Slooten et al. in review). Although fishermen have said that they do not catch white dolphins, grey-coloured dolphins were more commonly encountered in their nets. This information is concerning because it may indicate that young (grey) humpback dolphin are being killed but not identified properly. Furthermore, more than 30% of the individuals in a photo-identification catalogue that has been maintained by the Research and Conservation Group since 2002 possessed scars that were consistent with interactions with fishing gear. With recent sightings of new scars on individuals and animals dragging fishing lines (some of which continue to slice into their bodies), it is clear that fishing gear interactions are continuing and potentially increasing.

Thus far, there has been absolutely no progress on mitigating the harmful incidental cetacean entanglements in fishing equipment. The lack of action is particularly concerning for the critically endangered population of the ETS humpback dolphin. The total number of other cetaceans being killed by other types of gillnets around Taiwan is still suspected to be alarmingly high because nothing has been done to reduce the problem even though several thousand cetaceans were estimated to be killed each year.

Types of Fisheries and Information on Scale

Although there is a serious lack of information about the fishing gear used by fishermen, it is clear that the kind of gear employed is quite diverse. There are no reliable data on fishing effort for the plethora of fishing gear used in Taiwan (even the most basic information such fishing effort for each fishery). Although the fisheries agency in Taiwan produces year-books of fisheries statistics (see Chen 2012), the information is highly questionable. The data are not accurate for various reasons and have been consistently inconsistent with the limited data that have been collected directly by scientists. Some fishing effort data was collected on the large-mesh pelagic driftnet fishery off eastern Taiwan by FormosaCetus Research and Conservation Group that are awaiting analyses.

Other Threats

Legal status and present management arrangements

Nothing has changed with regards to the legal status of cetaceans since 1995. All cetaceans are under legal protection (Wildlife Conservation Act of Taiwan) so harming, killing, harassing and possessing of the animals (or their parts) is prohibited unless permitted by the authorities in charge of conservation. Other marine mammals (found locally or not) are also provided legal protection mainly for the regulation of importation and exportation of wildlife and their products. However, since 2002, the local conservation authorities have not made any real progress in reducing existing threats to local cetaceans, but rather the threats appear to be growing.

Illegal hunting and trade in cetacean parts continues at an unknown level. Better inspection of fishing vessels by the port authority (coast guard) during the registration procedure for all boats upon entering a harbour is still needed. Searches should not only be for contraband, stowaways, etc. but more effort in searching for the illegal possession of cetaceans and other protected marine species is needed. To facilitate identification by agents of the port authority, fishermen should be required to land all of their catch intact or at most just gutted. Keeping all catch intact should not reduce but rather increase the value of their fish so there is no need to butcher anything into smaller pieces (unless it is to obstruct enforcement).

Impacts on the ETS humpback dolphin by proposed development projects along western Taiwan have been included into the EIA process. As a result, the proposed 4000 ha Kuokuang petrochemical project of the state-owned Chinese Petroleum Company was halted because the environmental impacts would have been too great to this critically endangered population as well as the surrounding environment and human health.

As a result of two international workshops on the biology and conservation of the ETS humpback dolphin, which were held in 2004 and 2007 (see Wang et al. 2004b, 2007b), an international panel of experts (the Eastern Taiwan Strait Sousa Technical Advisory Working Group, ETSSTAWG) was established to provide guidance on the science and conservation of this population. This group, comprising many highly respected cetacean scientists from six countries, is chaired by Dr. Peter S. Ross. This group has been pivotal in conducting two other workshops on the ETS Sousa chinensis (in 2009 and 2011), which has resulted in two publications (Ross et al. 2010, 2011) and one manuscript that is currently under review. The ETSSTAWG continues to be active in working with local conservation groups and government agencies towards the conservation of this population.

National and state legislation specifically related to marine mammals

The laws listed below do not solely pertain to marine mammals but include provisions that are related to marine mammal conservation and trade:

- Wildlife Conservation Act; articles 24 and 40 were also amended recently to limit importation of living marine mammals and related products (Forest Bureau, Council of Agriculture, Executive Yuan)
- Enforcement Rules of the Wildlife Conservation Act
- Marine Pollution Control Act (Environmental Protection Administration, Executive Yuan)
- Enforcement Rules of Marine Pollution Control Act
- National Park Law (Construction and Planning Agency, Ministry of the Interior)
- Enforcement Rules of National Park Law

National and state legislation related to fisheries

- Fisheries Act of Taiwan (Fisheries Agency, Council of Agriculture, Executive Yuan)
- The Enforcement Rules of Fisheries Act

International Agreements ratified by nation

Due to its uncertain state status, Taiwan has no official international agreements on marine mammals. However, it can follow the rules of international conservation conventions (e.g., CITES).

Regional Marine Protected Area planning

Kenting National Park (southern Taiwan) was the first national park established in Taiwan. It includes a small marine component in which marine mammals are also offered protection. However, the marine area is very small and surprisingly, enforcement is quite limited in such a small area. This is a multi-use park that is visited by several million tourists each year to participate in a myriad of human recreational activities. Because of years of exploitation (e.g., shore-based whaling stations, unregulated harpooning of cetaceans) and continued disturbance from recreational activities (e.g., jet-skis) within the park's (and adjacent) waters, marine mammals have become nearly non-existent. The only consistently-occurring cetacean within the park's main marine area (a small group of Indo-Pacific bottlenose dolphins) appears to have become even scarcer (evidenced by a lack of sightings during a 2010 survey of these waters - J.Y. Wang, unpublished data). Only surveys in the waters just beyond the eastern boundaries of the park resulted in consistent sightings of cetaceans; coincidentally, the waters east of Kenting National Park are also sparsely used for human recreation.

The establishment of Major Wildlife Habitat for the ETS humpback dolphin in the coastal waters along western Taiwan is under consideration. However, a suggestion to establish only two small 'postage stamp'-sized marine protected areas to encompass areas where a questionable study claimed to be dolphin "hotspots" has been dismissed as ineffective for such a small and critically endangered population (see Ross et al. 2010).

Marine and reef protection areas are managed by the

Fisheries Agency of the Council of Agriculture and more information can be obtained online at: http://www.fa.gov.tw/cht/ResourceConservation/index.aspx ; http://erarc.epa.gov.tw/136/201011150105/archive/econgis_/FisheryResource/index.htm (for marine protection areas) and http://www.fa.gov.tw/cht/ResourceOtherZones/content.aspx?id=1&chk=8e65c2e0-2071-4da9-aad9-6e892409febc&param=pn%3d1 (for reef protection areas).

Conservation and Education Programs

The following educational programs that have been organized by local government agencies include:

- cetacean summer camp for kids
- cetacean conservation and education program for elementary schools
- fund and produce cetacean ecology documentaries
- funding for cetacean stranding rescue and rehabilitation
- cetacean conservation workshops
- cetacean teaching material design workshops

The Matsu Fish Conservation Union is a local non-governmental organization that organizes land-based observation and narrative volunteer training sessions for the ETS humpback dolphin and other cetacean and environmental conservation activities to raise public awareness of the state of Taiwan's marine ecosystems. Various other local groups also conduct public activities to raise the profile of cetaceans such as the Taiwan Cetacean Society and the Kuroshio Ocean Education Foundation.

Folk Attitudes and Interactions with Marine Mammals

Interest in marine mammals in Taiwan has been growing steadily since 2002. The attitudes of most people (especially the younger generation) toward cetaceans continue to move from a consumptive to a more non-consumptive view. More people have become involved with cetacean research, rescues and conservation. Although cetaceans have gained much more attention, publicity and resources, misinformation continues to hamper real progress in conserving these animals. The cetacean-watch industry along eastern Taiwan is probably the largest reason for the rapid rise in public awareness towards the existence of cetaceans. Campaigns by the Matsu Fish Conservation Union (a consortium of several local conservation groups), research information provided by scientists of the FormosaCetus Research and Conservation Group, and four major international workshops on the ETS Sousa chinensis resulted in this population gaining very high media profile. Most people in Taiwan are now aware that many cetacean species inhabit the waters of Taiwan including the critically endangered population of humpback dolphins. In recent protests against the proposed construction of the 4000 ha petrochemical plant in the middle of the ETS humpback dolphin distribution, young elementary school children lobbied in front of the Presidential office to save the dolphins from the impending harm.

Many volunteers continue to help in the rescuing and rehabilitation of stranded cetaceans with well- meaning but misguided intentions. There is clear interest in cetaceans and their conservation. However, this interest is not being reflected in government policy or efforts to implement real and effective conservation actions to save any of the cetaceans that live in Taiwanese waters from the threats that exist. Much effort and limited resources are still being squandered on rescue and rehabilitation programmes that have failed to demonstrate the successful release of a healthy individual back to the wild. Precious resources continue to be wasted on a research program to confirm published studies on the ETS humpback dolphin rather than allocating them to other important studies and actual conservation actions.

In Taiwan, there are three facilities with live-captive cetaceans on display to capitalize on the relatively-newly gained interest in cetaceans: Yehliu's Ocean World near Keelung City (northern Taiwan) is the oldest facility, National Museum of Marine Biology and Aquarium in Pingtung County (southern Taiwan), and Farglory Ocean Park (formerly known as Hualien Ocean Park) in Hualien City (central eastern Taiwan). Capture of cetaceans in local waters for live display has not been permitted since the early1990s but Yehliu's Ocean World may still have 10 bottlenose dolphins (maybe both species but mostly Indo-Pacific bottlenose dolphins). A young false killer whale that was captured from the waters of the Penghu Island prior to the ban on the area's drive fishery, may have been exported out of Taiwan but to which location is unknown. It is unclear how many cetaceans remain in this facility at present. The two newer facilities with cetaceans on display imported from Japan (common bottlenose dolphins and Risso's dolphin – Farglory Ocean Park) and Russia (beluga whales, Delphinapterus leucas – National Museum of Marine Biology and Aquarium). As of 2012, of the 10 D. leucas that were imported in two events, four were still alive. In the Farglory Ocean Park facility, there are seven common bottlenose dolphins and one Risso's dolphin (17 dolphins were imported in total but nine were known to have died between 2002 and 2012). A recent request by this facility for the importation of Pacific white-sided dolphins (Lagenorhynchus obliquidens) from Japan was denied by the local authorities because it did not fulfill a certain minimum standard of educational material.

Description of Existing and Past Research and Training Programs

Since 1995, an enormous amount of resources has been spent on cetacean research and conservation by conservation groups and the local government. This has resulted in a sharp increase in the number of papers that have been published in scientific journals over the last two decades. Many of these papers resulted from studies supported by non-government agencies. Basic exploratory surveys of the western (primarily waters within 10 km of shore), eastern and southern coasts have been conducted.

The FormosaCetus Research and Conservation Group has been studying the ETS humpback dolphin since 2002, when it first discovered the existence of this distinct population. This is a long-term project with the aim of understanding the basic biological parameters of this population and to monitor its status on an annual basis. Other research projects to address some of the high priority issues (see below) are continuing as research funding allows. Most of the funding for this group is from non-governmental organizations and primarily from sources outside Taiwan.

Another research group is based locally and widely-ranging in Taiwan being involved in every organization and everything related to cetaceans. This group is led by Dr. L.-S. Chou (National Taiwan University and the Taiwan Cetacean Society) and receives most of its funding from local government and industrial sources. Almost all stranding cases are handled by this group and all government and industrial funding for researching the critically endangered ETS humpback dolphin population is provided to this group. This group also raises funds from a certification programme for cetacean-watch tour operators. Other smaller groups involved with cetaceans also exist but all have roots or connections to this primary group.

The National Museum of Marine Biology and Aquarium (in southern Taiwan) no longer handles stranded cetaceans (live or dead) due to a steadily reduction of funding over the year from government sources. In 2010/2011, funding for cetacean strandings ended completely.

Needs for Additional Research and Training

The following section is separated into research needs for the ETS humpback dolphin and all other species because of the different level of understanding of these animals.

ETS humpback dolphin

There is little doubt that this distinct population is seriously threatened (see Reeves et al. 2008). This population was demonstrated to be genetically distinct and isolated from those in adjacent waters (Wang et al. 2008b), restricted in range (Wang et al. 2007a) and numbering less than 100 (Wang et al. 2007a, 2012). The social structure of the ETS population also appears to be quite different from the population inhabiting the Pearl River Estuary (Dungan 2011). This population also seems to be at a very high risk of immunotoxicity due to predicted PCB loads (Riehl 2012). These dolphins are facing several major threats (Wang et al. 2007b, Ross et al. 2010, Dungan et al. 2011) that have not been reduced or addressed at all. Long-term monitoring of this population is continuing but it is clear that the implementation of conservation actions does not require any more additional information and should not be delayed any further by the 'need' for more research. All public resources need to be allocated to effective conservation actions for these dolphins immediately.

Other cetaceans in Taiwan

Although a considerable number of surveys have been conducted in Taiwanese waters, only those conducted in the waters of western Taiwan, Hualien and southern Taiwan have been published in scientific journals. Much more effort is needed to make public the data from other surveys. There are some waters that still lack even exploratory surveys and should be the focus of some boat-based and land-based survey effort. The high priority information needs have changed little since SEAMAM II. Little progress has been made on most of these needs for almost all species living in Taiwanese waters. Several high priority research needs that require attention include:

Correct Identification – Correct species identification is critical for understanding the biology of the local fauna. Although, there continues to be species identification errors by local cetacean researchers, errors appear to have decreased greatly and generally isolated the more difficult species (e.g., Kogia spp., beaked whales). A detailed guide (written by FormosaCetus Research and Conservation Group) for identifying dolphins and other small cetaceans as living specimens, carcasses and osteological specimens was produced since SEAMAM II (see Wang and Yang 2007).

Level of incidental catches – There is no doubt that fisheries known to catch cetaceans incidentally require study, especially in the waters of eastern and western Taiwan. Information about northern Taiwan is also likely needed. Outlying islands (e.g., the Matsu and Chinmen islands and the Penghu archipelago), where fishing is fairly intense and coastal small cetaceans exist, are areas where even small numbers of bycatch can have a large impact on local populations. The level of cetacean bycatch experienced by fisheries in Taiwan is very poorly understood.

Fishing effort – In order to understand the level of fisheries interaction, fishing effort for each fishery known to be harmful to cetaceans is needed. Although usually the responsibility of governmental agencies to monitor, accurate fishing effort data for almost all fisheries is lacking in Taiwan. It is possible for researchers to monitor certain fisheries by visiting fishing ports to understand the fisheries and to collect data. Some data have been collected but await analyses. Other fisheries, which are known or suspected to experience cetacean bycatch, need to be studied.

Abundance estimates – With the high levels of by-catch estimated in fisheries operating in Taiwanese waters, there is clearly an urgent need to obtain abundance estimates for as many species of cetaceans as possible. With the exception of the ETS humpback dolphin population, there are no reliable abundance estimates for any species or populations in Taiwanese waters.

Population structure– In order for estimates of abundance to make biological sense and for the conservation status of populations to be assessed, population structure needs to be understood. With the exception of the ETS humpback dolphin population, very little is known about most species living in Taiwanese waters.

Basic biology of cetaceans– A very important and often overlooked task is to understand the basic biology of the cetaceans in the region (e.g., distribution, reproductive biology, home range, seasonal movements, etc.). For most species living in Taiwanese waters, almost nothing is known.

Although many basic biological research needs still exists, the main problem with research in Taiwan is that the publication of information in international or domestic, peer-reviewed, scientific journals is quite low relative to the number of stranded specimens that have been examined, the number of surveys conducted and the amount of resources spent. Without publishing the information, the studies are of little use to science and conservation and thus a waste of important resources. It is a very positive sign that newly-trained marine mammal researchers have increased the number of publications on marine mammals in Taiwanese waters considerably over the last few years; hopefully, this pattern will continue.

Present and Potential Marine Mammal Watching Operations

As a result of shipboard surveys conducted along the coast of Hualien County (central eastern Taiwan) in 1996 and 1997 (Yang et al.1999), the first cetacean-watch tour was established at Shih-ti Harbour, Hualien County in 1997. The cetacean-watch tours exploded to 25 vessels (Chen 2011) spread across three counties (Ilan, Hualien and Taitung) along the east coast of Taiwan in 2008 with the highest concentration being 10 vessels in Hualien Harbour. The number of tourists partaking in cetacean watch tours in 1997 was about 8,500 (Hoyt 2001; note that Chen 2011 reported 10,000). The number grew rapidly to 30,000 people in 1998 (Hoyt 2001), to more than 70,000 people in 1999 (Hoyt 2001) and to 230,000 in 2008 (Chen 2011). This industry resulted in a gross income for the tour companies of about 70 million NTD (~2 million USD) in 2000. It was the fastest growing cetacean-watch industry in the world for a period but the number of tourists participating in this activity appears to have peaked, declined and may have stabilized at a lower (hopefully sustainable) annual level. In one county (Taitung), whale-watch tours are no longer economically viable because the reliability of finding cetaceans has declined greatly over the years.

Prior to the attention on the ETS Sousa chinensis, a harbour tour located in Taichung Harbour (central western Taiwan) promoted itself as a dolphin watch tour but really did not offer tourists a reasonable probability of seeing dolphins because of the tour route that was taken. Tour operators at this port started to capitalize on the dolphins' popularity in the late 2000s by offering tours that specifically targeted the few humpback dolphins in nearby waters. Recognizing the educational benefits of fostering emotional connections between the general public and the dolphins, their habitat and adjacent coastal environment while not impacting the animals further, an international panel of dolphin experts specifically recommended that tourism should be limited to land-based activities only (see Wang et al. 2007b). However, this recommendation was ignored and boat-based dolphin watching was permitted adding further stress to this tiny critically endangered population.

Although presently the cetacean-watch tours are heavily focused on the cetacean in the waters of eastern Taiwan, other regions (e.g., northern, southwestern, southeastern and some offshore islands) of Taiwan may also be feasible. However, good systematic surveys are required to determine their potential first and to obtain some basic baseline information prior to any tours are initiated so that the impacts of tourism can be better understood to help guide management of the activity.

Questions after the Presentation

Tara Sayuri Whitty: What is the cause of mass mortality of 32 Yangtze finless porpoises found dead in Dongting Lake and Poyang Lake, China?

- Response (Zhou Kaiya): There are many causes, e.g. Not enough food (decline in resources and animals are hungry), propeller hits, illegal fishing.

Suwat Jutapruet: EIA to aid the control of seismic survey?

- Response (John Wang): Seismic surveys not done by Taiwanese companies, but by multinational companies. Doesn't believe in EIA work: Some surveys were done poorly. Companies tend to hire people that they like, so there's a bit of conflict of interest.

Putu Liza Mustika: Taiwan's government response on military exercise?

- Response (John Wang): The government does not really care, as there is still military exercise the next day after the government is told by them about the impacts. The government doesn't really listen to scientists. Public involvement is more effective. School group with signs saying "don't kill our dolphins" got them to decrease activity. Need lobbyists, as soon as lobbyists get involved, military stops exercises.

Randall Reeves: The decline of Pearl River Estuary Sousa, is that a good index of population level trend or being displaced?

- Response (Samuel Hung): Have some time series data, population decline for Pearl River Estuary Sousa maybe ~50%, but broad CV, so need more survey effort. Habitat degradation is not only limited to HK.

Randall Reeves: Illegal fishing cited as contributing to mortality, but doesn't legal methods contribute to mortality as well?

- Response (Zhou Kaiya): There is no direct evidence of legal fishing practices causing deaths of finless porpoise and baiji. Generally, illegal fishing practices (e.g., stow net, electrofishing, blast fishing). Legal fishing maybe contribute only a little.

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SEAMAM III Report - Thailand

Presentation by Chalatip Junchompoo, Surasak Thongsukdee and Suwat Jutapruet

Species and Distribution

There are 27 cetacean species and one sirenian species recorded both from strandings and live sightings. Marine mammals are protected by the Wildlife Preservation and Protection Act, B.E.2535 (A.D. 1992).

In the Andaman Sea, nine species of cetaceans have been recorded: humpback whales (*Megaptera novaeangliae*), ginkgo-toothed beaked whales (*Mesoplodon gikgodens*), Cuvier's beaked whales (*Ziphius cavirostris*), Blainville's beaked whales (*Mesoplodon densirostris*), dwarf sperm whales (*Kogia sima*), Fraser's dolphins (*Lagenodelphis hosei*), sperm whales (*Physeter macrocephalus*) and blue whales *(Balaenoptera musculus*) (a new record in January 2013). Most dugongs (*Dugong dugon*) are in Trang Province, with approximately 200 individuals in the area. This may be the largest population of dugongs in Southeast Asia.

In both the Andaman Sea and the Gulf of Thailand, 17 species have been recorded, including Bryde's whales (*B. edeni*), Omura's whale (*B. omurai*), killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidens*), short-finned pilot whales (*Globicephala macrorhynchus*), pygmy killer whales (*Feresa attenuata*), pygmy sperm whales (*Kogia breviceps*), Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), Indo-Pacific finless porpoises (*Neophocaena phocaenoides*), Indo-Pacific humpback dolphins (*Sousa chinensis*), Irrawaddy dolphins (*Orcaella brevirostris*), long-beaked common dolphins (*Delphinus capensis*), rough toothed dolphins (Steno bredanensis), spinner dolphins (*Stenella longirostris*), pantropical spotted dolphins (*S. attenuata*) and Risso's dolphins (*Grampus griseus*).

In the Gulf of Thailand, fin whales (*B. physalus*) and melon-headed whales (*Peponocephala electra*) have been recorded. Dugongs, Irrawaddy dolphins, Indo-Pacific bottlenose dolphins, Indo-Pacific finless porpoises, Indo-Pacific humpback dolphins and Bryde's whales are also recorded. Most Indo-Pacific humpback dolphins are found in the central Gulf of Thailand, while most Bryde's whales are found in the northern Gulf of Thailand, where about 50 individuals have been identified based on photo-identification. The east coast of the Gulf of Thailand is where most Irrawaddy dolphins are found.

Population Status

Sixty-eight Indo-Pacific humpback dolphins were estimated using photo-identification in Donsak, Surat Thani Province in the western Gulf of Thailand. A boat-based survey was conducted along coastal areas one kilometer from shore three times a month from January 2012 – December 2012.

Irrawaddy dolphins are found in fresh and salt water in Songkhla Lake, in Songkla and Phatthalung Provinces in the western Gulf of Thailand. Fresh water dolphins are critically endangered from habitat degradation, shallow water, pollution, and bycatch from giant cat fish gillnets. Irrawaddy dolphins in Songkhla Lake were categorized as "Critically Endangered" in the IUCN Red List in 2004. The extremely low numbers of dolphin groups detected during the 2001 and 2002 surveys and the absence of sightings during the 2003 survey indicate that the population in Songkhla Lake is certainly fewer than 50 mature individuals (Smith et al. 2004). Although the Department of Marine and Coastal Resources Research Center (DMCR) has conducted boat-based surveys for Irrawaddy dolphins in Songkhla Lake twice a month and aerial surveys once a year, they have seen very few dolphins. On the contrary, from community interviews, fishermen said that they see the dolphins three to five times a month.

Country-wide stranding information collected between 2002-2012 shows that there were 683 dolphins and whales stranded in total, of which 483 animals were from the Gulf of Thailand and 200 from the Andaman Sea (Adulyanukosol et al 2012). Sixty-one dugongs stranded from year 2008 to 2012. It is likely that many more stranding events were not reported. The species found stranded most often are Irrawaddy dolphins, Indo-Pacific finless porpoises, Bryde's whales, Indo-Pacific humpback dolphins and Indo-Pacific bottlenose dolphins. Out of the 683 cases, 75.62% of the causes of death of dolphins and whales in the Gulf of Thailand and the Andaman Sea are unknown, followed by fishing gears (12.48%), various illnesses (11.16%), and trash inside the stomach (0.59%). Out of 14 dugong necropsies of dugongs in 2012, 65% of the causes of deaths are fisheries and human activities, 23% are due to diseases and 12% are other causes of death. There were cases of entanglement by crab trap and shark attack. In November 2010, there was a 4m Bryde's whale calf that was found dead in Trang Province. Its head was entangled in fishing net so that it could not eat and eventually died. A boat strike was the cause of death of a 2.67m female dugong on 6 November 2012 in Phuket. A parasitic infection was also found in the stomach & intestine of a dugong. A false killer whale was stranded in February 2012 in the Gulf of Thailand, and 1.6kg of marine garbage was found in its stomach. Table 2 shows the list of stranded cetacean species from Prochuap Kiri Khan to Pattani Province.

Habitat Status

In Chai Ya, Surat Thani, in the western Gulf of Thailand, there are 48 000 m2 of seagrass. We found dugong feeding trails but have not seen live dugongs.

Indo-Pacific humpback dolphins are threatened by human activities at Don-Sak, in Surat Thani and Khanom, in Nakorn Si Thammarat Provinces. These activities include ferries, dolphin-watching tourism and bycatch from commercial trawlers and small-scale fisheries.

Cetacean Species	2004	2005	2006	2007	2008	2009	2010	2011	2012
Dugong						1	1		
Indo-Pacific Humpback Dolphin			4	10	7	7	12	14	14
Spinner Dolphin								1	
Bottlenose Dolphin		2		2	2	1	6	2	3
Risso Dolphin							1	1	
Finless Porpoise		2	2	7	8	14	22	39	24
Irrawaddy Dolphin			6	13	8	6	19	12	14
Short Fin Pilot Whale							1		
Bryde's Whale	1		1	1		2	1	3	1
False Killer Whale			3						
Pygmy Sperm Whale				1					
unidentified					2				

Table 1. Stranded cetacean species from Prochuap Kiri Khan to Pattani Province in the central and upper Gulf of Thailand.

Directed Catch

No information.

By-catch in Fisheries

In 2002, giant catfish were released into Songkhla Lake to increase the fisheries resources to support the fishermen communities around Songkhla Lake. After that, Irrawaddy dolphins were bycaught by 15cm giant catfish gillnets especially catching calves with a diameter of 15.27cm. Although they have stopped releasing catfish into Songkhla Lake, the dolphins in Songkhla Lake are still being caught in other nets.

Other Threats

Threats-General

Within Thailand, marine mammal food resources as well as biodiversity in general have been degraded. This is due in large part to overfishing by small-scale and commercial fisheries, both of which use unselective fishing practices. Interviews with small-scale and commercial fishers have shown that many captured species are not that fishery's target species. The main fisheries of concern are trawlers, push netz, and lunar light boat operations. The latter is a fishing practice aimed at attracting squid and anchovies, but it also catches a great number of other, unidentified small fish species.

Marine debris has also been implicated in several marine mammal stranding events, garbage having been found in the stomachs of many stranded animals. Of further concern, marine debris maynot kill quickly, but rather may accumulate within animals over time, causing long-term suffering before death.

While there is no evidence of direct marine mammal capture in Thailand, bycatch is a major problem, specifically in gillnets, trawls, longlines, and squid traps.

Pollution from large rivers poses a significant threat, specifically for the Gulf of Thailand, which receives input from many rivers. The river that poses the largest threat from pollution is the Chao Phraya.

Tourism in such areas as Khanom and Nakorn Si Thammarat in the southwestern Gulf of Thailand threatens cetacean populations. Khanom (in the southern part of Thailand), is a hotspot for Indo-Pacific humpback dolphins. Tour boats in this area approach very close to dolphins and tourists feed the animals. This practice has the potential to change dolphin behavior, possibly leading to boat strikes or bycatch.

In Songkhla Lake, marine mammals face threats from bycatch in gillnets, habitat loss, human coastal activities, increasingly shallow water, and pollution. Songkhla Lake is currently no more than two meters deep, and is becoming shallower each year due to sedimentation and river closures for agriculture. Between 1990 and 2012, Irrawaddy dolphins were increasingly killed in gillnets, specifically giant catfish gillnets. From 2002 to 2012, the use of giant catfish gillnets grew, causing the deaths of many Irrawaddy dolphin calves because giant catfish and Irrawaddy dolphin calves are roughly the same size. There is a marine protected area in the center of the lake, however there is no enforcement, and as such, it does not function to protect animals. Gillnets are still used within the marine protected area.

Threats-Specific

In 20 days between January and February of 2013, 20 animals were found stranded in the eastern Gulf of Thailand (17 Irrawaddy dolphins and 3 Indo-Pacific finless porpoises). The majority of these individuals were significantly decomposed. As such, it was difficult to identify the cause of death. Researchers from the Department of Marine and Coastal Resources collected teeth and tissue samples for heavy metal analysis and DNA work and examined the stomach contents of some of the stranded cetaceans. In some Irrawaddy dolphin stomachs, only one species was found, either shrimp or mackerel, not fully digested. It was thought that these animals may have been accidentally taken by fishermen while trying to feed on fish or shrimp in trawl nets. Another Irrawaddy dolphin had mixed food in its stomach, and it was thought that it may have been feeding naturally rather than following fishing boats. It was later determined that one fisherman with a large surrounding net was responsible for the deaths of most, if not all, of the Irrawaddy dolphins. This individual has since been arrested and jailed. In the stomachs of the finless porpoises, researchers found parasites and very little food. Due to the fact that finless porpoises are often heavily parasitized, researchers have concluded that the finless porpoise deaths were unrelated to the Irrawaddy dolphin bycatch deaths.

Between 2008 and 2012, 61 dugongs stranded, both alive and dead. Many more dugongs were found dead than alive. The live-stranded dugongs were rehabilitated and released. In 2012, 65% of dugong stranding events were due to fisheries and other human activities and 23% were due to disease. Further dugong strandings were caused by gillnets, ropes, crab traps, shark bites, and boat strikes. In the Andaman Sea, officials have recorded cases of boat strikes of dugongs and cetaceans. Dugongs are struck by boats more often than cetaceans. In Phuket in November 2012, a female dugong was struck by a boat and sustained a very large wound. For two months, officials attempted to rehabilitate the animal, but it eventually died. Upon necropsy, it was discovered that the animal was pregnant and also had a parasite infection, which may have caused, or at least contributed to, its eventual death.

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammals

Due to the problem of bycatch of freshwater Irrawaddy dolphins, various government organizations: Department of Fisheries, Department of National Parks, Wildlife and Plant Conservation, Department of Marine and Coastal Resources, and the Provincial Office of Natural Resources and Environmental Policy and Planning in Songkhla Province and Phatthalung Province created a Memorandum of Understanding for freshwater Irrawaddy dolphin conservation that created seven measures:

1. The control of fishing gears that threaten Irrawaddy dolphins in Songkhla Lake
2. Sustainable aquaculture replacement
3. Habitat enhancement for Irrawaddy dolphin s
4. Improve knowledge about freshwater Irrawaddy dolphins
5. Encourage non-governmental, business sector and other organizations support Irrawaddy dolphin conservation
6. Strengthening of Irrawaddy dolphin conservation network
7. Monitoring and assessment

National and state legislation related to fisheries

No information

International Agreements ratified by nation

No information

Regional Marine Protected Area planning

In Songkhla Lake, MCRC4 created a 100 km2 of marine protected area in Songkhla Lake for conservation of Irrawaddy dolphin by using 100 buoys to mark the boundary of the area. The fishermen would avoid leaving their giant catfish nets in that area.

Conservation and Education Programs

In Khanom district of Nakorn Si Thammarat Province, in the western Gulf of Thailand the Department of Marine and Coastal Resources (DMCR) and Petroleum Authority of Thailand (PTT) often support community activities such as dolphin watching exchange programs between Bang Pra Kong River, Cha Cherng Sao Province and Khanom District, Nakorn Si Thammarat Province and PTT Kids Marine Camps in 2009-2012. There is also an Irrawaddy dolphin club by a teacher, Mr. Somsem Choorak in Sattree Phattalung School with activities such as a colouring competition.

Folk Attitudes and Interactions with Marine Mammals

In the past, some fishermen villagers from the Andaman coast of southern Thailand created love potions from dugong's "tears" and amulets from dugong's tusks. They also created medicines from dugong oil and bones. Dugongs were routinely eaten.

The people around Songkhla Lake believe that those who eat dolphin meat (Irrawaddy dolphins) will be unlucky.

Description of Existing and Past Research and Training Programs

The research institutes in Thailand include four research centers in The Gulf of Thailand, one research center in the Andaman Sea (PMBC) and six conservation units. There is collaboration with many universities in Thailand, including Chulalongkorn University (DNA STD of dolphins), Khon Kaen University (chromosome database), Mahidol University (heavy metals in dugongs), Prince of Songkla University (digestion analysis) and Burapha University (DNA).

Needs for Additional Research and Training

Research Prioritization

Research is needed to establish marine protected areas for marine mammals in Thailand. There are ten marine protected areas within Thailand for sea turtle nesting, corals, and fishes, but none are specific to marine mammals. There is a non-hunting area for dugongs, but nothing more.

Researchers need training and a guidebook to help them respond to stranded animals. Researchers working in the area of the January 2013 stranding event did not have the proper training and only one in the group had necropsy training. The nearest veterinarian lived hours away and happened to be on vacation when the stranding took place. Such training and guidebooks would include first aid, rescue and stabilization before officials arrive, and necropsy skills. Collaboration with other countries and with veterinarians would greatly aid in this endeavor.

Abundance and population estimation for marine mammals in Thailand is needed. Researchers should be trained in the use of programs such as Mark and Distance. There is a need to gather tissue and tooth samples from stranded cetaceans in order to perform DNA analysis for such purposes as more detailed taxonomy, population structure determination, age determination, and life history investigations.

Acoustic research also needs to be done in Thai waters, to learn about the vocalizations of cetaceans and their responses to introduced noise from boats.

Morphological research, especially in Songkhla Lake, is lacking. There is speculation that there may be morphological differences between fresh and saltwater Irrawaddy dolphin populations; perhaps fresh and saltwater dolphins display different morphological adaptations.

There is a need for more information about the demography of Thailand's marine mammals. In particular, data on migration, mortality, and distribution are lacking. Current research projects need to be integrated in order to understand animal movements throughout the country. Due to the aforementioned threats to Thailand's marine mammals, an estimate of potential biological removal (PBR) should be derived as well.

Socio-economic research needs to be conducted. Specifically, integrated coastal zone management (ICZM) is required. Researchers and government officials need to understand people's needs in order to reach specific solutions for each region.

Specifically, research is lacking along the eastern coast of the Gulf of Thailand and within the inner Gulf, along with Songkhla Lake and the Andaman Sea Coast. Trang Province is known to have the largest number of dugongs in Thailand, however research on dugongs in Thailand is sparse. A memorandum of understanding (MOU) drawn up between Thailand and Myanmar in 2007 included an agreement to collaborate on dugong research. This has been difficult to coordinate and there is a need to establish a directed patrol to survey dugongs along the coast joining Thailand and Myanmar. The other problem faced by these countries is that high tides complicate work in seagrass beds, the known habitat of dugongs. Researchers have no training in SCUBA diving; thus, either SCUBA training or an alternative way to survey seagrass is needed.

Present and Potential Marine Mammal Watching Operations

The Khanom district of Nakorn Si Thammarat Province area is the area with the most potential for dolphin watching tours in Thailand. Irrawaddy dolphin, Indo-Pacific humpback dolphin and Finless porpoises are found in this area. The average income of the whole community was estimated to be 1.5 million Thai baht/year (approximately USD46,000). The fishermen use their own fishing boats as tour boats to serve the tourists.

Questions after the Presentation

Zhou Kaiya: In one slide about the Indo-Pacific humpback dolphin population size, are the populations connected to each other or separate?

- Response (Chalatip Junchompoo): They are separate populations.

Tara Sayuri Whitty: Has the catfish gillnet buyback program started, and how much do they pay per net, and is most of the community supportive?

- Response (Suwat Jutapruet): About 30,000 baht was paid for each gillnet. Each gillnet length is between 1.5 to 3km. In the Songkhla Province, there are only 20 gillnets, while at the Phatthalung Province, there are about 70 gill net. However, there is no buyback in the Phatthalung yet, but it will start later.

Alessandro: More information about the Melon-headed whales? How many animals in the area?

- Response (Chalatip Junchompoo): There was only one record which was a stranding in the Gulf of Thailand.

Randall Reeves: The Sousa study and Songkhla Lake study look promising. The Songkhla Lake population was believed to be gone, and it's good to know that they are there and reseasrch is being carried out, it is a pretty impressive study program.

Edna Sabater: Do the Irrawaddy dolphins leave the Songkhla Lake?

- Response (Suwat Jutapruet): No, it is a closed population.

Phay Somany: About the population estimate of about 30 individuals in Songkhla, is the data based on current or older surveys?

- Response (Suwat Jutapruet): DMCR used many methods including boat-based survey, aerial survey and acoustic survey. However, for aerial survey, only one individual was found. Seven to ten individuals die annually.

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SEAMAM III Report - Vietnam

Presentation by Hoang Minh Duc and Vu Long

Vietnam is located in Southeast Asia with a coastline of about 3,200km, stretching over 13 latitudes from Mong Cai (Quang Ninh) to Ha Tien (Kien Giang Province). Total area of the shelf to 200m depth is about 3,279,000 km2 (WRI 1994) and an Exclusive Economic Zone (EEZ) of Viet Nam is ca. 1,000,000km2. The Vietnamese coastal waters can be divided into four regions, Gulf of Tonkin, shared with China; Central Vietnam; South-eastern Vietnam; and South-western Vietnam (part of Gulf of Thailand), shared with Cambodia and Thailand.

Species and Distribution

Until the present, there are very few surveys on marine mammals of Vietnam. The first detailed survey on marine mammals of Vietnam was conducted by Smith et al. in 1995. The authors provided a preliminary list of marine mammals of Vietnam with 31 species, of which 16 cetaceans and one sirenian were confirmed to occur in the Vietnamese waters based on living animals and specimens (primarily bone) from various whale temples along the coastline of the country; four cetaceans were tentatively recorded and 10 species that were not recorded are expected to be in the region (see also Smith et al. 1997). Doan et al. (2001) conducted a cetacean survey in the Gulf of Tonkin in 1999 and 2000 and recorded five species including the Indo-Pacific humpback dolphin (*Sousa chinensis*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), bottlenose dolphin (*Tursiops sp.*) and Indo-Pacific finless porpoise (*Neophocaena phocaenoides*). Two other species that were added to the species list from the 1995 report are the Fraser's dolphin (*Lagenodelphis hosei*), striped dolphin (*S. coeruleoalba*) and spotted seal (*Phoca largha*) (Perrin et al. 2002).

In the last 10 years, several surveys have been conducted in Vietnam. Vo Si Tuan et al. (2002) listed 11 species in the Nha Trang Bay and stated that all are migratory except the Indo-Pacific humpback dolphin. Smith et al. (2003) recorded six species in the gulf of Tonkin during their survey in Oct. 1999 and Apr. 2000. Dao Tan Ho et al. (2003) recorded six species from 10 individuals caught in nets or stranded on the coast of Vietnam between January 2001 and 2003. In 2006, Beasley et al. conducted a survey along the Mekong River within Vietnam but did not record any Irrawaddy dolphin (*Orcaella brevirostris*) (the target of their survey). Nguyen et al. (2009) recorded 12 dolphins species, of which eight species were recorded off the coast of Binh Thuan and five were recorded off the coast of Kien Giang , including the first confirmation of the short-beaked common dolphin (*Delphinus delphis*) in Vietnam waters. The status and distribution of small cetaceans and dugongs in Vietnamese waters are shown in Table 1. The Irrawaddy dolphin was confirmed in several places in the

No.	Scientific name	Distribution				Remark
		Gulf of Tonkin	Central Vietnam	South-eastern Vietnam	Gulf of Thailand	
	Fam. BALAENOPTERIDAE					
1	*Balaenoptera acutorostrata*			C		Vo et al. 2002
2	*Balaenoptera musculus*			Q		Smith et al. 1995
3	*Balaenoptera edeni*			P		Smith et al. 1995
4	*Megaptera novaeangliae*	C				Smith et al. 1995
	Fam. PHYSETERIDAE					
	Physeter macrocephalus				Vu 2014	Vu 2014
	Fam. KOGIIDAE					
5	*Kogia breviceps*			C	C	Smith et al. 1995 Hoang per.obs. Vu 2014
6	*Kogia sima*			C		Smith et al. 1995
	Fam. ZIPHIIDAE					
7	*Ziphius cavirostris*			P		Smith et al. 1995, Vo et al., 2002
	Fam. DELPHINIDAE					
8	*Globicephala macrorhynchus*			C		Smith et al. 1995
9	*Pseudorca crassidens*			C		Vo et al. 2002, Nguyen et al. 2009
10	*Feresa attenuata*			C		Smith et al. 1995

No.	Scientific name	Distribution				Remark
		Gulf of Tonkin	Central Vietnam	South-eastern Vietnam	Gulf of Thailand	
11	*Peponocephala electra*			C		Smith et al. 1995, Dao et al. 2003, Vu et al. 2011, Nguyen et al. 2009
12	*Steno bredanensis*			C		Vo et al. 2002, Nguyen et al. 2009
13	*Sousa chinensis*	C		C	C	Vo et al. 2002, Smith et al. 1995, 2003, Nguyen et al. 2009
14	*Tursiops truncatus*	C		C	C	Vo et al. 2002, Smith et al. 1995, Nguyen et al. 2009
15	*Tursiops aduncus*	C		C	C	Smith et al. 1995, Dao et al. 2003, Nguyen et al. 2009
16	*Stenella attenuata*	C		S		Vo et al. 2002, Smith et al. 1995, 2003, Nguyen et al. 2009
17	*Stenella longirostris*	C	C	C	C	Vo et al. 2002, Smith et al. 2003, Nguyen et al. 2009
18	*Stenella coeruleoalba*			C	C	Nguyen et al. 2009
19	*Delphinus capensis*	C		C		Vo et al., 2002, Vu per. obs
20	*Delphinus delphis*			C		Nguyen et al. 2009
21	*Lagenodelphis hosei*	C		C		Nguyen et al. 2009
22	*Grampus griseus*	C	**C**	C		Smith et al. 1995, Vu per. obs.
23	*Orcaella brevirostris*			C	C	Smith et al. 1995, Dao et al. 2003, Vu et al. 2011, Nguyen et al. 2009
	PHOCOENIDAE					
24	*Neophocaena phocaenoides*	C		C	C	Vo et al. 2002, Smith et al. 1995, 2003, Vu et al. 2011
	DUGONIDAE					
25	*Dugong dugon*	C		C	C	Vo et al. 2002, Smith et al. 1995

Table 1. Status and distribution of marine mammals in Vietnam
Note: C: Confirmed, P: Provisional, Q: Questionable

Southeastern region and the Gulf of Thailand in recent years. Beasley et al. (2002) also recorded nine skulls from a temple in Vung Tau City. In 2005, one Irrawaddy dolphin was killed in Can Gio Biosphere Reserve (Hoang pers. obs.). Staff of Con Dao National Park also reported occurrence of Irrawaddy dolphins in the sea surrounding the Con Dao Islands between January and March of the year. In the Mekong River, two Irrawaddy dolphins were caught in a fishing net in An Giang Province, one in March 2002 (Bui and Dao 2002) and one in October 2005 (Beasley et al. 2005). This was the first confirmed record from this region of the Vietnamese Mekong since 1973. Irrawaddy dolphins were also found in Ba Lua Archipelago in the Gulf of Thailand (Nguyen et al. 2009, Vu et al. 2011).

There have been no direct sighting of dugongs (*Dugong dugon*) recently in Vietnamese waters even though staff of Con Dao National Park still report that there were several individuals near the Islands. In Phu Quoc Island, two dugong were killed, one on 24th August 2009 and another in August 2012. Bull tracing of dugong in Phu Quoc was observed in 2006 (Nguyen Xuan Hoa pers. comm.). Hines et al. (2008) reported that at least six dugong skulls were observed at one dugong hunter's home in Phu Quoc Island during their survey in 2002 and 2004. A team from the Geology Museum of Hanoi observed two dugongs south of Phu Quoc Island in October of 2001 (Covert pers. comm.).

Nguyen et al. (2011) reported the first sighting of short-beaked common dolphins off of the coast of Binh Thuan Province but did not provide any detailed information or photographs.

Population Status

Since the second workshop on small cetaceans and dugongs in 2002, few marine mammal surveys were conducted, however there are no abundance estimates for any species in Vietnamese waters. Vo et al. (2002) reported only two sightings, a group of three Indo-Pacific humpback dolphins in Binh Cang Lagoon, Khanh Hoa Province and a rough-toothed dolphin (*Steno bredanensis*) in Nha Trang Bay. Nguyen et al. (2007) reported that eight dolphin species found off the coast of Binh Thuan Province and five species off the coast of Kien Giang (Gulf of Thailand) but did not provide detailed information of encounter rates or group sizes of any species. Vu et al. (2011) recorded three groups of Irrawaddy dolphin with at least 30 individuals several times during surveys in September 2011 and March 2012 around Ba Lua Archipelago in the Gulf of Thailand. A group of about 40 individuals of pantropical spotted dolphins was observed off of the coast of Khanh Hoa Province on 19 August 2012.

Habitat Status

Marine pollution is a big issue in most inshore areas of Vietnam. Mangrove forest, sea grass beds and coral reef are degraded due to over-exploitation of aqua-products. Because of low investment in offshore fishing, most fishermen in Vietnam concentrate on inshore fishing and cause the depletion of fishes and other aquatic animals. Illegal fishing using dynamite and cyanide still occur in Vietnam, even in the coral reef of Phu Quoc MPA. Overfishing from trawlers, gillnetters, and longliners appears to be a serious problem and may be affecting the availability of prey for cetaceans (Perry et al. 2002). There has been a serious decline in the extent and quality of sea grass beds in many places. Hines et al. (2008) reported an increasing use and degradation of sea grass beds around Phu Quoc Island. The Australian Research Council Centre of Excellence for Coral Reef Studies and the South China Sea Institute of Oceanology reported that "On offshore atolls and archipelagos claimed by six countries in the South China Sea, coral cover has declined from an average of greater than 60 percent to around 20 percent within the past 10-15 years."

Directed Catch

Directed catches of cetaceans are rare in Vietnam due to the animals' venerated status among fishermen. However, local people from Tien Giang and Kien Giang Provinces reported that fishermen from Ben Tre Province tend to catch Irrawaddy dolphin for sale. Two Irrawaddy dolphin were killed, one in Can Gio Biosphere Reserve (BR) in October 2005 and one in Ca Mau BR in January 2011 when they travelled up river. 24 individual Irrawaddy dolphins were caught, four in 2008 and 20 in 2010 in the sea off the coast of Kien Giang Province for training purposes (Nguyen et al. 2008, 2011). Some individuals later died in captivity during training in Dai Nam, Binh Duong Province. Phu Quoc provincial officers found 12 animals killed in 2002, five in 2003, and four in 2004 (Hines et al. 2008). Four dugongs were caught and slaughtered in Phu Quoc in August and September 2009 and another one in August 2012.

By-catch in Fisheries

No surveys on marine mammal by-catch levels have been conducted in the last 10 years in Vietnam. Vo et al. (2002) reported four dugongs were caught in fishing nets in south of Nha Trang Bay. Fishermen in Kien Giang reported that Irrawaddy dolphins were most often caught in bottom trawls and gillnets but were always released by fishermen. However, some dolphins died of serious wounds and were stranded on small islands in Ba Lua Archipelago (Vu Long et al. 2011). Nguyen et al. (2008) also reported that the number of dolphins in the sea of Binh Thuan and Kien Giang has sharply decreased due to depletion of food and by-catch in gillnet and bottom trawls. Recently on 19 August 2012, 29 individuals of pantropical spotted dolphins were caught in trawler in the sea of Khanh Hoa Province but were successfully released by fishermen. Smith et al. (1997) reported that dolphins living along the coast of Vietnam have been subjected to high mortality from accidental entanglement in fishing nets or that there has been a depletion in their food base that has reduced dolphin survival or reproduction.

Types of Fisheries and Information on Scale

According to the Blue Ocean Institute's recent evaluation, the marine fishery resources potential has been estimated at 4.2 million tonnes of which the annual allowable catch is 1.7 million tonnes, including 850 000 tonnes of demersal fish; 700 000 tonnes of small pelagics; and 120 000 tonnes of oceanographic pelagic fish. Both inshore and offshore fisheries are recorded in Vietnam.

Inshore fishery depends on a fleet of about 28 000 non-mechanized canoes and boats and approximately 45 000 smaller mechanized boats with attached long-trailer or stationary 1-cylinder diesel engines up to approximately 20 HP, mainly of Chinese and Japanese make. All of these vessels operate directly from the beach without using harbour facilities. The most popular fishing gear are gillnet, longline, lift-net, push-net and traps. The yield of these activities provides a substantial amount of protein to the coastal population. Due to the increase in human population, there is an enormous pressure on these resources (Blue Ocean Institute).

In the shallow-water offshore fisheries, small trawlers are primarily used, and they also deploy many types of fishing gear, such as purse seines, longlines and various traps. The offshore fisheries supply about 90% of the commercial landings, but less than 60% of estimated marine capture landings. The total fleet consists of approximately 20 000 vessels, almost all made of wood. Total engine power is approximately 1 000 000 HP, an average of 50 HP per boat. Most vessels are equipped with second hand truck engines. Among these, 6675 vessels were fitted with engines of 90 HP or above, with a total capacity of 1,000,000 HP (on average 166.5 HP/unit). These form the offshore fleet. Only about 100 vessels (400-500 HP) have the capacity for deep-sea fishing. This fleet comprises either trawlers or purse seiners. Trawlers are used in waters 35-80 m deep in south-eastern waters, whereas purse seiners fish pelagic species in deep waters, mainly off the central region (Blue Ocean Institute).

The estimated percentage of the total catch from major types of fishing gear are; trawling 30%, purse seine 26%, gillnet 18%, lift net 5%, long line 6% and others (fixed net, push net etc.) 15%. Among the main trawling (both pair and single) predominates in the south with around 40% of vessels (Blue Ocean Institute).

Other Threats

No information.

Legal Status and Present Management Arrangements

National and state legislation specifically related to marine mammal

Marine mammals in general, and cetaceans in particular, are currently protected by Law on Fisheries issued on 26 November 2003 and enforced by the Decree 31/2010/ND-CP on regulations on penalizing administrative violations in the fisheries field issued on 29th March 2010. The Directorate of Fisheries of Ministry of Agriculture and Rural Development (MARD) is the governmental body that manages activities in planning, conservation and exploitation of fisheries. Under the Decree 31/2010, habitats and aquatic animals listed in the IUCN threatened species, in CITES appendices and Red Data Book of Vietnam are protected and any action violating these regulations will be fined from 20 million to 25 million VND and the boat/ship or fishing tools will be confiscated. The Decision 2008/QĐ-BNN contained 17 marine mammals in the list of threatened aquatic species, including one as CR (Dugong dugon), one as EN (Sousa chinensis) and 15 species as VU.

Regional Marine Protected Area Planning

The Vietnam government also ratified CITES in 1994 and approved a national biodiversity action plan in 1995 that included improved provisions for the establishment of marine protected areas (MPA). Until 2010, Vietnam had five MPAs covering 549 km2 of water. In 2010, the Prime Minister of Vietnam signed a Decision number 742/2010/QD-TTg approving planning of marine protected area systems of Vietnam to 2020. Under this decision a system of 16 MPAs will be established by 2015 covering 1500km2 of sea area. Other national park (NP) including Con Dao NP (Ba Ria – Vung Tau Province), Bai Tu Long NP (Quang Ninh Province), Cat Ba NP (Hai Phong Province) and Mui Ca Mau NP (Ca Mau Province) also have marine portions that provide protection for a range of endangered species, including the dugong and dolphins.

Conservation and Education Programs

In recent years, several projects on marine diversity conservation have been carried out in some of the important MPAs in Vietnam. In Con Dao Island, a project on Coastal and Marine Biodiversity Conservation and Sustainable Use in the Con Dao Islands Region was conducted for two years, from April 2007 to March 2009. The project was funded by UNDP aimed at protection, management and sustainable financing of globally significant coastal and marine biodiversity in the Con Dao Islands Region, with increased participation of local communities. In Phu Quoc Island, DANIDA – Denmark provided funding for a 4-year project on environmental protection of Phu Quoc and the creation of the Kien Giang Biosphere Reserve. The project focused on improvement of livelihood and awareness of local people and the protection of marine environments. Other projects were also implemented in Nha Trang Bay MPA and Cu Lao Cham MPA, focusing on habitat protection and capacity building in general.

Most Vietnamese people do not know about marine mammals and their important role in the ecosystem. Even though three species of marine mammals are listed in the Red Data Book of

Vietnam and 14 others listed in the list of threatened aquatic species, marine mammals are killed, especially in the north of Vietnam. Education programs to improve awareness of local people along the coast are sorely needed. Wildlife At Risk (WAR), a NGO based in Ho Chi Minh City has published a brochure on dugongs in an effort to protect this species on Phu Quoc Island. At the moment, the General Consulate of the United States plans to launch a program titled “Save the Dugong”.

Folk Attitudes and Interactions with Marine Mammals

Vietnamese fishermen from Quang Binh Province to the south (including Phu Quoc Island) worship cetaceans because they believe the animals will aid them in distress at sea and help them catch more fish. Every year, fishermen from these provinces hold a ‘whale festival’ and venerate whale and dolphin. Fishermen often tell stories of cetaceans pushing people and vessels ashore after their boat had sunk or been blown out to sea in a storm and if a whale or dolphin died in the net/trawls they will have a year of bad luck. However, fishermen in Phu Quoc tend to catch dugongs for food and tusks, and fishermen from Ben Tre Province often catch Irrawaddy dolphin for sale. Dugong tusks and bones are believed to treat children’s fever on Phu Quoc Island (Hines et al. 2008).

Description of Existing and Past Research and Training Programs

Since 2002, there have been only a few research programs on marine mammals in Vietnam. The Vietnam-Russia Tropical Center have conducted cetacean surveys off the coasts of Binh Thuan and Kien Giang Provinces to document the species diversity and more specifically, to find and catch species for training purposes. They caught 24 Irrawaddy dolphins in the waters of Kien Giang and plan to continue this work. This capture program, supported by the Vietnam Ministry of National Defense, will push the Irrawaddy dolphin in the area to the brink of extinction. The Southern Institute of Ecology is carrying out surveys on small cetaceans in inshore areas of Kien Giang and plan to expand survey areas to the sea around Phu Quoc and Con Dao Islands.

In September 2012, with financial support from WWF, a six-day training on marine mammal conservation and management was held in H⊣ Phòng by the Institute of Resource and Marine Environment and Technology and Taiwan National History Museum. Twenty trainees from research institutions, parks and federal agencies were instructed by professional marine mammalogists from Japan and Taiwan.

Needs for Additional Research and Training

There are hundreds of whale temples located along the coast of Vietnam with thousands of skulls/skeletons of whales and dolphins. Therefore, a comprehensive inventory and morphometrics study on skeletal materials stored at whale temples could yield valuable information on species occurrence and the population structure of cetaceans in SE Asia. Dedicated research programs are needed to investigate the status of Irrawaddy dolphin in the Vietnamese water of Gulf of Thailand (from Ha Tien to Cape of Ca Mau), humpback dolphins in the Nam Trieu River mouth and dugong in Con Dao Island and Phu Quoc Island, especially the area near Ham Ninh Village.

Present and Potential Marine Mammal Watching Operations

The low density of cetaceans in most Vietnamese waters, with the possible exception of humpback dolphins in the Nam Trieu River mouth, make the potential for dolphin and whale watching poor (Perry et al., 2002). Recent surveys showed that Ba Lua Archipelago in the sea of Kien Giang is a good place for Irrawaddy dolphin watching. It is possible to see this species between November and April every year.

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Species Summaries

List of Species

Dugong, *Dugong dugon*

Odontocetes

- Baiji, *Lipotes vexillifer*
- Irrawaddy dolphin, *Orcaella brevirostris*
- Snubfin dolphin, *Orcaella heinsohni*
- Indo-Pacific humpback dolphin, *Sousa chinensis*
- Indo-Pacific bottlenose dolphin, *Tursiops aduncus*
- Atlantic bottlenose dolphin, *Tursiops truncatus*
- Striped dolphin, *Stenella coeruleoalba*
- Risso's dolphin, *Grampus griseus*
- Pacific white-sided dolphin, *Lagenorhynchus obliquidens*
- Pantropical spotted dolphin, *Stenella attenuata*
- Spotted dolphin, *Stenella sp.*
- Short beaked common dolphin, *Delphinus delphis*
- Long beaked common dolphin, *Delphinus capensis*
- Spinner dolphin, *Stenella longirostris*
- Dwarf spinner dolphin, *S. l. roseiventris*
- Rough toothed dolphin, *Steno bredanensis*
- Fraser's dolphin, *Lagenodelphis hosei*
- Indo-Pacific finless porpoise, *Neophocaena phocaenoides*
- Narrow-ridged finless porpoise, *Neophocaena asiaeorientalis*
- East Asian finless porpoise, *N. a. sunameri*
- Yangtze River finless porpoise, *N. a. asiaeorientalis*
- Harbor porpoise, *Phocoena phocoena*
- Dall's porpoise, *Phocoenoides dalli*
- Baird's beaked whale, *Berardius bairdii*
- Blainville's beaked whale, *Mesoplodon densirostris*
- Cuvier's beaked whale, *Ziphius cavirostris*
- Ginkgo toothed beaked whale, *Mesoplodon ginkgodens*
- Longman's beaked whale (Tropical bottlenose whale), *Indopacetus pacificus*
- Short-finned pilot whale, *Globicephala macrorhynchus*
- Melon headed whale, *Peponocephala electra*
- Killer whale, *Orcinus orca*
- False killer whale, *Pseudorca crassidens*
- Pygmy killer whale, *Feresa attenuata*
- Sperm whale, *Physeter macrocephalus*
- Dwarf sperm whale, *Kogia sima*
- Pygmy sperm whale, *Kogia breviceps*

Mysticetes

- Blue whale, *Balaenoptera musculus*
- Sei whale, *Balaenoptera borealis*
- Gray whale, *Eschrichtius robustus*
- Fin whale, *Balaenoptera physalus*
- Humpback whale, *Megaptera novaeangliae*
- Minke whale, *Balaenoptera sp.*
- Common minke whale, *Balaenoptera acutorostrata*
- Black minke whale, *Balaenoptera sp.* ?
- Right whale, *Eubalaena sp.*
- Southern right whale, *Eubalaena australis*
- Omura's whale, *Balaenoptera omurai*
- Bowhead whale, *Balaena mysticetus*
- Bryde's whale, *Balaenoptera edeni*

Pinnipeds

- Japanese sea lion, *Zalophus japonicus*
- Steller sea lion, *Eumetopias jubatus*
- Sea lion, unspecified
- Northern fur seal, *Callorhinus ursinus*
- Harbor seal, *Phoca vitulina*
- Spotted seal, *Phoca largha*
- Ribbon seal, *Histriophoca fasciata*

New species suggested for next meeting

- Australian humpback, *Sousa plumbea*
- Spinner dolphin, *Stenella longirostris*
- Sperm whale, *Physeter macrocephalus*
- River otter (Oriental small-clawed otter), *Aonyx cinerea*
- Western gray whale, *Eschrichtius robustus*
- Snubfin dolphin, *Orcaella heinsohni*
- Spotted seal, *Phoca largha*
- Blue whale, *Balaenoptera musculus*

Species Summaries

General Priorities for Research

Given the high degree of data deficiency for most species in Southeast Asia, several general research priorities are common across species in the region:

- Baseline studies on distribution, including areas that have not previously been surveyed;
- Initial and repeated abundance estimates through dedicated line-transect and photo-identification studies;
- Habitat use and identification of critical habitat;
- Population structure;
- Collection and curation of tissue samples;
- Magnitude and impacts of fishing activities and directed catch;
- Magnitude and impacts of other threats (including habitat degradation, ship traffic, pollution, etc.);
- Broad-scale assessments across species ranges

Dugong (*Dugong dugon*)

Distribution and Abundance: The dugong is found throughout Southeast Asia in coastal seagrass areas.

Australia: There is a stronghold of dugong population in northern Australia. Many surveys have been carried out on Australia's dugong populations. Northern Aubernland has a population of 1,763. In Carpenteria, a population of 12,438 dugongs has been estimated. On Ningaloo Reef, there are 968 dugongs. Evemouth Gulf holds a population of 704 dugongs. 930 dugongs have been counted at Dampier Peninsula. Finally, there is a large population in Shark Bay, but population numbers were not reported.

Vietnam: Dugongs are found in the waters off Phu Quoc Island in Vietnam. The population of dugongs in Phu Quoc is known to cross the border into Cambodia.

Cambodia: Cambodia shares its dugong population with Phu Quoc Island, Vietnam. Dugongs were reported to have been abundant along parts of the Cambodian coast until around 1975.

Thailand: Dugongs are found in the Gulf of Thailand and the Andaman Sea. They are most abundant in Trang Province on the Andaman Sea. There is speculation that the population around Muk Island in Trang Province could be the largest population of dugongs in Southeast Asia at approximately 150 individuals.

Malaysia, Singapore, and Brunei: In Johor, Malaysia, there are four distinct populations, around Pulau Sibu, Pulau Tinggi, Pulau Besar, and Pulau Rawa. In Brunei Bay and Lawas, the mean group size is 2.4. The population estimate for Sabah (except Tawau) is fifty-three individuals. In Singapore, there have been more sightings and strandings in recent years. Further, there is speculation that Singapore may share its dugong population with Malaysia and Indonesia. In Brunei, dugong sightings have been made near Muara district, in Brunei Bay.

Indonesia: The population previously recorded around Banya Island, Indonesia, has likely been lost. However, dugongs are found in other parts of Aceh. There is speculation that the population may have relocated.

Japan: Only three dugongs have been recorded in Japanese waters since 2005.

Philippines: Little data exist on the population in the Philippines. Historically, dugongs covered the whole Philippine coastline, a total of 36,289 kilometers. Currently, they are fragmented in 13,288 km, representing a 63% decrease in occurrence. Most of the remaining population occurs in Mindanao and Palawan, but even that area has stretches with no sightings in the past few years, suggesting that the estimate of 13,288 km is optimistic.

China: Dugongs are no longer found in Chinese waters.

Population/stock identity: No updates presented.

Population status: In Australia, dugongs are considered Vulnerable. In Vietnam, they are considered Critically Endangered. Approximately ten individuals are believed to occur in Con Dao National Park (they are seen along the coastline in the dry season). Between 1979 and 2002, a total of approximately ten dugongs were stranded on Con Dao Island. Hines reported the rapid decline of dugongs in Vietnamese waters over the thirty years between 1978 and 2008. Between 2008 and 2012 in Thailand, sixty-one dugongs stranded. Of the strandings, much more were deceased than alive. However, the live-stranded animals were rehabilitated and released. In Peninsular Malaysia, there were thirty-nine stranding reports between 1905 and 2012. In Indonesia, dugongs are considered Vulnerable, though there is not much data on the populations. The largest population is around Bunakan Island and is estimated at 1000 individuals. The smallest population has twelve individuals. In Japan, dugongs are Endangered, but the population seems stable. In the Philippines, dugongs are considered Critically Endangered, however there is not enough data to determine its population status for the entire country, though there have been several attempts in small areas. In Taiwan, there has only been one confirmed record of a dugong by Hirasaka (1932). This leads to speculation that it could have been a transient individual or that the population has been extirpated.

Habitat status: In Australia, potential dugong habitat is remote and largely uninhabited. There is speculation that dugongs are more concentrated in the southeast and southwest. In Kampot Province, Cambodia, a seaweed farm has been expanded into a seagrass area and many seagrass beds are destroyed by motorized trawlers. In parts of the Andaman coast of Thailand, seagrass destruction has driven dugongs out. In Henoko, Okinawa, Japan, there is a large abundance of seagrass. In 2009, the United Nations Environment Programme estimated a 30-40% loss of seagrass in the Philippines. Threats to Philippine dugong include habitat degradation, conversion, and loss, as well as pollution, siltation, foreshore development (i.e. resorts clearing seagrass to create swimming areas), and storms. Dugong habitat in Myanmar seems to be in good condition, but survey effort has been low. There is high seagrass density in the Rakhine area.

Directed catch: In Australia, aboriginals are permitted to hunt dugongs. This hunting primarily occurs in isolated areas between Cape York and Broome in Western Australia. There are no records for most communities. In Phu Quoc, Vietnam, fishermen catch dugongs for food and to harvest their tusks. On Phu Quoc Island, at least six skulls were observed in a dugong hunter's home during surveys in 2002 and 2004. Four dugongs were reported caught and killed in Phu Quoc in August and September of 2009 and one in August of 2012. In Cambodia, dugong meat and tusks get a high price at the market. In Malaysia, dugongs are targeted by the Bajau Laut. Dugongs are hunted in Indonesia. Historically, dugongs were consumed in Aceh, but following tsunami reduction of a seagrass meadow in Pulau Banyak, dugong consumption in Aceh declined. In the Philippines, fishermen deny harvesting dugongs, but officials know that spear fishermen target dugongs. In 1996 in Myanmar, dugongs were captured for the Rangoon Zoo, but have not been directly caught since then.

Bycatch: Delegates reported dugong bycatch in Vietnam and Myanmar.

Research Priorities for Conservation Action and Associated Research: General research priorities (see above), plus: Generally, more dedicated dugong research is needed in the region. More specifically, in Myanmar and Thailand, directed seagrass surveys are needed to assess dugong habitat and population. Establishment of such surveys has been hindered by high tides in the area that complicate seagrass work due to the lack of SCUBA training among researchers. For these surveys to be possible, either SCUBA training or an alternative way to survey seagrass areas in high tides is needed. In the Philippines, work needs to be done to re-establish fish sanctuaries in seagrass habitats. A Fisheries Code municipal ordinance declared seagrass habitats as fish sanctuaries in Roxas, Palawan, but of the five established, only one is still functional.

ODONTOCETES

Neophocaena spp.

Neophocaena is now considered to comprise two species, *Neophocaena phocaenoides* and *N. asiaeorientalis*, based on external morphology (e.g., ridge on the back) and microsatellite DNA (with few shared alleles between species, consistent with morphological classification). No intermediate forms have been observed. Within N. asiaeorientalis, there are subspecies: East Asian (*N.a. sunameri*) and Yangtze River (*N.a. asiaeorientalis*). Population structure within these species is unclear.

Finless porpoise (*Neophocaena phocaenoides*)

Distribution: *N. phocaenoides* and *N. asiaeorientalis* are both present in China, Hong Kong, and Taiwan. Sightings of N. phocaenoides have been confirmed along the Belait coast of Brunei, east and west coast of Peninsular Malaysia and East Malaysia.

Population/Stock Structure:

Population Status: Fewer than 300 individuals are estimated for Kuching Bay, Malaysia (135, CV =0.31). In Thailand, reported estimates include 30 to 40 individuals in the East Coast, with the same numbers estimated for the Upper Gulf and Lower Gulf, and 40 to 50 estimated for the Central Gulf and also for the Andaman Sea; however, these are preliminary. The local population in Hong Kong waters was estimated to be 217 (Jefferson et al. 2002).

Habitat: Habitat impacts in Kuching Bay, Malaysia, include a flood mitigation channel and other major coastal development as part of the Sarawak Corridor of Renewable Energy, including a planned aluminum smelting plant. *N. phocaenoides* habitat is heavily industrialized in Hong Kong and Taiwan, with accompanying coastal development (including land reclamation, dredging and dumping, pipe and cable laying, pile boring), industrial waste, vessel traffic, acoustic disturbance, and military exercises.

Directed Catch: No updates presented.

Bycatch: There are various, but not coordinated, studies of bycatch in Malaysia. In Kuching, two incidents of bycatch were reported by fishers to the local research project. Bycatch has been documented in Kalimantan Timur (Indonesia). In Taiwan, bycatch is suspected to be high, particularly in drift gillnets, sink gillnets, trammel nets, purse seines, fixed fish traps, and possibly trawl nets. However, bycatch in Taiwan has not yet been quantified.

Strandings and Mortalities: In Cambodia, three stranded carcasses have been collected since 2002; two were found near Koh Kong Province (information from the Fisheries Department). Strandings recorded in Thailand include 118 reported from 2002 to 2012.

Other Issues: There is apparent displacement and potential acoustic disturbance related to high-speed ferries in Hong Kong.

Needs for Additional Research: Taxonomy; general research priorities (see above).

Narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*)
Distribution: *N. a. asiaeorientalis* (Yangtze River) is the only freshwater population of this genus. It occurs exclusively in the middle and lower reaches of the Yangtze River and Donging and Poyan lakes. In Japan, particularly large groups of *N. a. sunameri* (25-30 individuals) have been observed around Kansia airport, which might be related to the elevated water temperatures from the thermal power plant. The populations in Japan appear to be very isolated from each other.

Population/Stock Structure: Aside from the species designation of *N. asiaeorientalis*, no updates were presented.

Population Status: The population estimate for *N. a. sunameri* in Hong Kong is 152 animals.
N. a. asiaeorientalis have declined drastically since the 1980s (~2700 individuals to ~1200). In Inland Sea areas of Japan, some populations of N. a. sunameri are in steep decline. In Japan,

estimates of N. a. sunameri populations from five areas are: 300 animals, 3800, 3400, 7500, and 3800, for an estimated total of 19,000.

Habitat: The Yangtze River is heavily impacted by heavy boat traffic, damming, dredging, water pollution, reduction of fisheries resources, and illegal fishing (including electrofishing). *N. a. sunameri* habitat is heavily industrialized in Hong Kong and Taiwan, with accompanying coastal development, industrial waste, vessel traffic, acoustic disturbance, and military exercises. Overfishing and sand dredging occur in N.a.sunameri habitat in Japan, in addition to a marked decrease in nitrogen content in the water since 2000 due to efforts to control effluent, which is thought to be compromising the survival of algae (with possible ecosystem effects).

Directed Catch: No updates presented.

Bycatch: Bycatch, particularly in gillnets, is a major problem for N. a. sunameri in Hong Kong. In Taiwan, bycatch is suspected to be high, particularly in drift gillnets, sink gillnets, trammel nets, purse seines, fixed fish traps, and possibly trawl nets. However, bycatch in Taiwan has not yet been quantified. From 2000 to 2004 in Japan, 53 bycatch incidents have been officially reported. This appears to be a reduction since the 1970s, perhaps due to the transition from predominantly gillnets to trawling and other gears in that time. Fishers might be reluctant to officially report bycatch in Japan, as it requires submitting paperwork under the Act on Protection of Fishery Resources.

Strandings and Mortalities: Mortalities recorded on the Yangtze River include 32 mortalities in March-April 2012 in Dongting and Poyang Lakes, one in April in the Pengze section of the river, eight from January-April 2012 in Anquing, and three in Jiangu. Some of the carcasses showed signs of insufficient food, propeller marks, and marks potentially linked to illegal fishing. This represents a drastic increase in recorded strandings in the Yangtze. From 2000 to 2004, 438 strandings (live and mortalities) were reported in Japan, including 251 in Ise-Mikawa, where there is cooperation between the local aquarium, university, and fishers.

Other Issues: In Hong Kong, heavy contaminant levels were found in some sampled carcasses. There is apparent displacement and potential acoustic disturbance related to high-speed ferries in Hong Kong. For N.a.asiaeorientalis, ship strike effects might be even more important than bycatch. Prey depletion might also be problematic for *N. a. asiaeorientalis.*

Needs for Additional Research: Taxonomy; general research priorities (see above); for *N. a. asiaeorientalis*, priorities for conservation action include off-site conservation and captive breeding efforts, as conservation of natural habitat is unlikely.

Yangtze River dolphin (*Lipotes vexillifer*)

Distribution: The relict Baiji, or Yangtze River dolphin, once inhabited the Yangtze River of China. Historically, this species could be found around Hunan (Three Gorges) and spread out in the Yangtze and neighboring water bodies nearly to the Yellow Sea. Surveys conducted along the Yangtze River using three vessels between 1997 and 1999 found no individuals upstream of Sizhou or downstream of Zengyang, indicating restriction of their distribution by the end of the 20th century.

Population/stock structure: Unknown.

Population status: In the 1950s, a hydropower station was established in the Yangtze River, causing the Baiji to disappear in parts of its range. There followed a sharp decline in population between 1980 and 2006. In 1980, 400 individuals were counted. By 1986, that number had dropped to 300. A survey conducted in 1991 found 100 individuals. Eight years later, in 1999, there were only half as many. Finally, a survey conducted in 2006 failed to find a single Baiji in the Yangtze River and the species is now considered functionally extinct.

Habitat status: Unknown.

Directed catch: In the 1940s, fishermen in the Three Gorges area targeted the species.

Bycatch: Unknown.

Needs for additional research: None specified.

Irrawaddy dolphin (*Orcaella brevirostris*)

Distribution: Parra reported that this species is no longer considered to occur in Australia due to the discovery in 2005 that the strong supposed population of Irrawaddy dolphins in Australian waters is actually a closely related species, dubbed the snubfin dolphin, Orcaella heinsohnii. Wang reported that the Irrawaddy dolphin is no longer found in Chinese waters.

There is possible transborder movement of some populations between Thailand and Cambodia, Cambodia and Laos, and between Thailand, Cambodia, and Vietnam. Peters reported that in Malaysia, this species is distributed along the coast of both Peninsular and East Malaysia. In East Malaysia, Irrawaddy dolphins can be found in Cowie Bay and Kinabatangan, Sabah. They are also found in Kuching, Sarawak. Chit reported that Irrawaddy dolphins can be found in Rakhine coastal waters and three segments of the Irrawaddy River in Myanmar: in Kyaukmayung from the end of the third defile to Mingun – 8 km above Mandalay (this location is also the location of a protected area), 165 km along the banks of the Shwegu Township, and 54 km along Linbaing Kyinn Sin Thay. In the Philippines, it was previously thought that Irrawaddy dolphins only occurred in Malampaya Sound, but Acebes reported their occurrence in an additional area. They are known to congregate in the less saline portion and high turbidity areas in Guimaras and Iloilo Straits. In Indonesia, Mustika reported one distinct population in the Mahakam River. Junchompoo and Jutapruet reported that the species is found in both seas of Thailand, Songkhla Lake, and the Gulf of Thailand. Duc reported that Irrawaddy dolphins were recorded in the Mekong River of Vietnam in 1973, but there were no updates presented about this population. Specifically, in Vietnam, they occur in An Giang Province on the Mekong, the

Ba Lua Archipelago in the Gulf of Thailand, and the Can Gio Biosphere Reserve outside of Ho Chi Minh City. In Brunei, sightings have been made at the mouth of Brunei River and near Muara Island.

Population/stock structure: No updates presented.

Population status: The species is listed as Vulnerable over its entire range by the IUCN.

In East Malaysia, the Cowie Bay population is believed to be comprised of thirty-one individuals. In Kinabatangan, there are two separate populations. In Myanmar, 131 groups with seventy-nine calves were estimated between 2002 and 2011. In the north part of Rakhine, fifteen dolphins have been recorded. Along the Irrawaddy River of Myanmar, there are an estimated fifty dolphins in each surveyed area, the Irrawaddy Delta, and the Mergui Archipelago and there is a record of 300 dolphins along the country's coastal areas. Throughout Indonesia, Irrawaddy dolphins are considered to be Critically Endangered. Three areas in Indonesia have been surveyed: the Mahakam River, Balikpapan Bay, and Kubu Raya. In the Mahakam River, surveys conducted between 1999 and 2012 found a stable population of eighty-seven to ninety-one individuals. Average birth rates were calculated to be five births per year. Between 1995 and 2012, a total of seventy-seven animals were killed in gillnets. Surveys in Balikpapan Bay were conducted between 2000 and 2002, and in 2008 and 2011. Irrawaddy dolphin density was estimated between 0.625 and 0.738 individuals per square kilometer. The total population was estimated to be between sixty-eight and seventy-nine individuals with a best estimate of seventy-seven. In Kubu Raya, surveys conducted between 2011 and 2012 estimated a population between sixteen and fifty-two individuals with a density of between 0.08 and 0.26 individuals per square kilometer. In Thailand, photo identification studies have yielded an estimate of 200-300 individuals on the east coast of the Gulf of Thailand, indicating that this area is a hotspot for this species. Preliminary results from a line-transect survey in the Gulf of Thailand suggest a total population of approximately 1500 individuals. The population in Songkhla Lake is estimated to be less than thirty individuals, with increasing deaths in recent years of both adults and calves. Though a marine protected area (MPA) has been established in the center of the lake, there is no enforcement of MPA regulations. Irrawaddy dolphins are the most commonly stranded cetacean in Thailand. Studies in Vietnam have found three distinct groups, each with at least thirty individuals. The population in the Mekong River of Cambodia is Critically Endangered and declining, with low numbers and high ongoing mortality. In 2007, the population was estimated at ninety-three individuals. In 2010, it had been reduced to eighty-five. Between 2003 and 2012, 119 mortalities were recorded, 61% of which were young calves. With respect to the high calf mortality, there is little evidence of fisheries involvement and the carcasses commonly present with unusual neck lesions. The investigation is ongoing. Wang expressed concern that this population could soon become extinct.

Habitat status: Since 2009, there has been a significant shift in habitat use in the Mahakam River due to decreased habitat range precipitated by such anthropogenic activities as coastal development and logging between the upper and lower catchment areas. In Songkhla Lake, fishing gear is decreasing the amount of available habitat for Irrawaddy dolphins. In addition, the water in the lake is extremely shallow (no more than 2 meters) and becoming shallower each year due to sedimentation and river closures for agriculture. Pollution is an ongoing problem in the lake as well. The habitat status of the Mekong River in Cambodia is fairly positive, notwithstanding the negative population status. Irrawaddy dolphins tend to use fairly deep water areas in the dry season and move more widely and in shallower water in the wet season. There is relatively little riverbank degradation and no major infrastructure changes. Small-scale degradation is ongoing in such forms as overfishing and logging of the flooded forest. Of greatest concern are three proposed hydropower dams on the main part of the river directly in or beside core Irrawaddy dolphin habitat.

Directed catch: In East Malaysia, Irrawaddy dolphin meat is used as pufferfish bait. In Indonesia, Irrawaddy dolphins were captured and are currently held at the Jaya Ancol Oceanarium. Irrawaddy dolphins are hunted and eaten in some parts of Vietnam, namely Ben Tre Province on the Mekong Delta. In addition, four dolphins were captured in 2008 and 20 in 2010. Some were captured for a tropical center under a permit from the Minister of Defense. The others were sold to a circus. In the Mekong River of Cambodia, fishermen in the latter part of the 20th century caught Irrawaddy dolphins in the Great Lake area because the animals were viewed as competitors for fish. Both during and after the Pol Pot regime, soldiers shot and killed Irrawaddy dolphins as target practice and for their blubber to be used as engine oil. Currently, there is no direct take in the Mekong River. In coastal Cambodia in 1993, eleven Irrawaddy dolphins were captured by villagers, four of which were sold to Safari World in Bangkok, two to Japan, and the remaining seven were eventually released. In 2002, local villagers in coastal Cambodia were hired by a casino near the Thai border to catch Irrawaddy dolphins and Indo-Pacific humpback dolphins. Most of the dolphins the villagers caught were released, but the casino kept four individuals.

Bycatch: In the Ayeyarwady River of Myanmar, gillnets pose a significant bycatch threat to Irrawaddy dolphins. Between 2001 and 2013, twelve of twenty-six dolphin deaths were attributed to gillnets (the cause of the remaining fourteen deaths was not determined). In coastal Myanmar, many dolphins have been observed with scars and fishing gear is prevalent in the area. In Thailand's Songkhla Lake, giant catfish gillnets present a danger to Irrawaddy dolphin calves, which are roughly the same size as giant catfish. These gillnets are used within the MPA in Songkhla Lake. In Vietnam, gillnets and bottom trawls in the Mekong are responsible for bycatch of Irrawaddy dolphins. In the Mekong River of Cambodia, gillnets have been responsible for approximately three quarters of Irrawaddy deaths for which the cause could be identified. Electrofishing and explosives fishing are often suggested as a cause of Mekong River Irrawaddy dolphin deaths when the cause cannot be easily determined. In only one case in 2006 has explosive fishing been proven to have caused a dolphin's death. It is unsure how these two destructive fishing practices are contributing to overall Irrawaddy dolphin mortality in the area.

Needs for additional research: General research priorities (see above), plus: The taxonomy for this species in both riverine and marine habitats needs further work. Little is known about the population structure of Irrawaddy dolphins. There may be border movement between Borneo, Indonesia, and Malaysia, but there has been no confirmation as yet between West Kalimantan and Sarawak. This potential needs to be further explored. In addition, no studies have been conducted on the population in Borneo. A large problem for research on this species is that it is split into a large number of small populations. Researchers need to determine if there is connectivity between these populations and if so, how to maintain that connectivity in the long term. In Myanmar, there is a need to study the Irrawaddy Delta area specifically. Further, a DNA analysis of the populations in Myanmar needs to be conducted and compared to that of populations in other countries. A high priority for Thailand is to quantify the population within Songkhla Lake. A dedicated program is needed to study the status of the species in the Vietnamese portion of the Gulf of Thailand.

Indo-Pacific humpback dolphin (*Sousa chinensis*)

Distribution: In the East and South China Seas, there are five recorded populations of S. chinensis found in the west coast of Taiwan (ETS), Xiamen (Fujian), Pearl River Estuary (PRE; extending to Hong Kong), Zhanjiang, Beibu Gulf. Since 2002, surveys in Vietnam have confirmed the species in the Gulf of Tonkin, southeastern Vietnam, and the Gulf of Thailand in Vietnam (Vo et al. 2002, Smith et al. 2003, Nguyen et al. 2009). In Myanmar, S. chinensis have been observed near the sea sanctuary at the Thamehla Wildlife Sanctuary. Surveys in Indonesia have recorded the species in East Kalimantan, Northeast Kalimantan, West Kalimantan, Maluku, Papua, Nusa Tenggara, and Timor. It has been removed from the species list for the Philippines due to insufficient information. There have only been three recorded sightings of the species in Bruneian waters. Dedicated surveys and incidental reports have confirmed presence of the species along both the east and west coast of Peninsular Malaysia and the coast of East Malaysia.

Population/Stock Structure: As reported in the SEAMAM II report (Perrin et al. 2002), taxonomy needs major work. One example of population structure ambiguity is the Andaman Sea and Gulf of Thailand populations, which might be the same and might also extend to Singapore. A number of projects in Australia are studying population genetics, phylogeography, and general population structure.

Population Status: Delegates from China reported drastic declines since the 1960s. For the ETS, population estimates include 99 individuals estimated based on line-transect survey and 75 estimated from photo-ID mark recapture off the west coast of Taiwan (Wang et al. 2007). Fewer than 100 animals have been estimated for Fujian (Liu and Huang 2000, Chen et al. 2009) and 60 to 76 in Xiamen (Liu and Huang 2000, Chen BY et al. 2008); 1228 in Zhanjiang (unpublished data); and around 153 in Beibu Gulf (Chen BY et al. 2009). The estimated abundance for PRE Estuary ranges from 1500 (Jefferson and Hung 2004) to 2517-2555 individuals (Chen et al. 2010); it is the largest population in Chinese waters. A significant decline in annual abundance from 2003-2011 was also reported for three main study areas in Hong Kong (as part of PRE; Hung 2012). The ETS population is Critically Endangered (C2a(ii), to be updated to D), and country delegates reported that the Fujian and Beibu populations should also be considered critically endangered.

In Malaysia, status is unknown due to a lack of research effort. At least 100 individuals have been photo-identified in Peninsular Malaysia (Ponnampalam and Jamal Hisne, 2011). S. chinensis is listed as endangered on the list of threatened aquatic species in Vietnam. In Khanom Sea, Gulf of Thailand, 90 fins have been catalogued using photo-identification. Few surveys have been conducted in Vietnam or Cambodia since 2002, with no abundance estimates thus far. S. chinensis is listed as "near threatened" under Australia's Environmental Protection and Biodiversity Conservation Act. Overall abundance and population trends are not known for Australian waters, though estimates from specific study sites exist in the Northern Territory and Queensland, with additional planned and ongoing abundance surveys.

Habitat: Habitat degradation continues in China and Hong Kong, where much of S. chinensis habitat is heavily industrialized, with high levels of shipping traffic (including two major traffic lanes from Hong Kong to the mainland and Macau), ongoing and proposed land reclamation projects (e.g., Hong Kong airport plans for another runway, and a 40+ km bridge in the middle of the PR nature reserve) (Jefferson et al. 2009, Sims et al. 2012). There are three National Nature Reserves in Chinese waters, in the PRE, Xiamen, and Hepu, with two Provincial Nature Reserves and three City Nature Reserves, including the Leizhou Bay Chinese White Dolphin City Nature Reserve in Zhanjiang. Zhanjiang, in contrast to much of S. chinensis habitat in China, is not heavily polluted, and the coastal areas are not heavily industrialized. As such, the Leizhou Bay Chinese White Dolphin City Nature Reserve should be considered a high-priority site for conservation, and should be upgraded from a City Reserve to a Provincial or National Reserve.

In eastern Kalimantan, Indonesia, coastal development and sedimentation impact coastal habitat. Sand dredging occurs near Koh Kong, Cambodia, where S. chinensis have been observed. In Vietnam, general impacts on habitat include pollution and degradation of mangrove forests, seagrass, and coral reefs. General anthropogenic impacts of coastal habitat in Indonesia and Malaysia include shipping lanes, coastal development and degradation due to deforestation, oil and gas exploration, and industrial activity. Australian waters in Southeast Asia are experiencing rapid expansion of coastal development and mineral, petroleum, and natural industries. These activities include impacts such as coastal reclamation, dredging and dumping, drilling, blasting, boating, and resource extraction.

Directed Catch: In Cambodia, near the Thai border, villagers were hired in 2002 by a casino to capture S. chinensis as well as O.brevirostris (previously reported in Perrin et al. 2002). Most animals were released, but four were kept.

Bycatch: Bycatch remains a major problem for *S. chinensis* in Hong Kong (particularly in gillnets), ETS (with individuals often observed swimming among 3-layered trammel nets), Kalimantan Timur, and Malaysia. Bycatch has been observed in local small-scale fisheries in Khanom Sea, Thailand, where industrial trawlers also operate. No detailed surveys on bycatch have been conducted in Vietnam since the previous SEAMAM meeting. There is evidence, from net marks on animals, for entanglements of these dolphins in gillnets, demersal trawling and longlines in Australia. However, there are few estimates available. As noted in 2002 SEAMAM report (Perrin et al. 2005) there are unquantified catch of small marine mammals (e.g. snubfin dolphins, Indo-Pacific humpback dolphins, bottlenose dolphins and dugongs) in inshore gill-net fisheries in the shallow coastal waters of the Gulf of Carpentaria in Queensland and along the northern coastlines of the Northern Territory and Western Australia (Hale 1997, Parra et al. 2002, Parra et al. 2004b).

Strandings and Mortalities: In 2009, 22 mortalities were recorded in the PRE; between 2003 and 2009, 105 mortalities were recorded in the same area (Xu et al. 2012). High calf mortality has been noted in Hong Kong. From 2006 to 2012, 68 strandings were recorded in Prachaub Kiri Khan, Pattani, Thailand.

Other Issues: Captive S. chinensis in Sentosa (Singapore) were reported as coming from a Thai facility. In some sampled carcasses from Hong Kong, contaminant levels (heavy metals and organochlorines) were high. There is potential for ship strikes and acoustic disturbance from high-speed ferries in Hong Kong, with apparent displacement of animals in response to boat traffic observed. Overfishing in Hong Kong is also thought to be potentially problematic, though the government implemented a trawl ban in 2013, which might lead to a recovery of fisheries stocks (though it might also prompt gear-switching to gillnets, etc.). For the ETS population, modeled immunotoxicity risk demonstrated high predicted PCB loads (Riehl 2012). Noise from shipping, seismic research, and construction are also concerns for the ETS population, in addition to ship strikes, with 45% of animals showing serious scars. In the Khanom Sea area in Thailand, human activities overlapping with dolphin habitat include ferries and dolphin-watching tours. In Malaysia, other issues of concern include oil and gas exploration, ship strikes, pollution, lack of conservation-related awareness, and blast fishing in Sabah. Research has also indicated that four (of five) humpback dolphins recovered along the QLD coast (three from Townsville and one from Gladstone) in 2000 and 2001 were infected with Toxoplasmosis gondii (Bowater et al. 2003).

Needs for Additional Research: Resolving taxonomy; general priorities for research (see above), particularly for baseline information for Malaysia, Myanmar, Cambodia, and Vietnam; further investigation of sightings along the Thai/Cambodia border; finding the western extent of the PRE population.

Tursiops spp.

Differentiating between T. aduncus and T. truncatus is a major challenge, particularly in Australia. At least one individual deemed a natural hybrid between T. aduncus and T. Tursiops has been recorded in Japan, and there may be mixing between the two species in the Philippines. Tursiops were reported as captured in Japan.

Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)

Distribution: T. aduncus have been reported in the Ayeyarwady delta along the coast of Myanmar, Peninsular and East Malaysia, Brunei, Indonesia (East Kalimantan), Philippines, Cambodia, Vietnam, Japan, China, and Hong Kong, in addition to the northern coast of Australia, Taiwan, and Thailand as reported in Perrin et al. (2005). At least six populations are found in Japan (Noto Island, Amakusa, Kagoshima Bay, Amami Islands, Ogasawara, and Mikura Island).

Population/Stock Structure: A number of projects in Australia are studying population genetics, phylogeography, and general population structure. For the Mikura Island (Japan) population, genetics research is underway (Morisaka et al., Sakai et al.).

Population Status: There are local abundance estimates from Pilbara (183 +/- 11) and Coubourg Peninsula (N = 34, 95% CI = 14-83, to N = 75, 95% CI = 14-83), Australia, with several ongoing and planned abundance studies. The population of T. aduncus in Taiwan seems to be depleted relative to previous abundance. Previously, there had been substantial live-capture for aquariums from Taiwan's waters; recently, not many individuals have been seen. In Mikura Island, 222 individuals have been identified using photo-ID from 1994-2009. For the Philippines, Dolar et al. (2006) estimate 269 (CV = 105%) Tursiops sp. in the Tañon Strait.

Habitat: Extensive habitat degradation continues in China, Hong Kong, and Taiwan. In Vietnam, general impacts on habitat include pollution and degradation of mangrove forests, seagrass, and coral reefs. In eastern Kalimantan, Indonesia, coastal development and sedimentation impact coastal habitat. General anthropogenic impacts of coastal habitat in Indonesia and Malaysia include shipping lanes, coastal development and degradation due to deforestation, oil and gas exploration, and industrial activity. Australian waters in Southeast Asia are experiencing rapid expansion of coastal development and mineral, petroleum, and natural industries. These activities include impacts such as coastal reclamation, dredging and dumping, drilling, blasting, boating, and resource extraction.

Directed Catch: Prior to the 1990s, there was a drive fishery for dolphins in Taiwan, for food and for captive display. T. aduncus are captured in Indonesian waters for oceanaria within Indonesia and for export abroad. Indications of possible direct catch in Balabac Strait, Philippines, have been noted (Dolar 2006).

Bycatch: In Taiwan, bycatch is thought to occur largely in large-mesh, drifting gillnets, sink gillnets, trammel nets, and trawls (particularly pair trawls). There are unquantified catch of small marine mammals, including T. aduncus, in inshore gill-net fisheries in the shallow coastal waters of the Gulf of Carpentaria in Queensland and along the northern coastline of the Northern Territory and Western Australia (Hale 1997, Parra et al. 2002, Parra et al. 2004b). In the Philippines, particularly in Balabac Strait, Palawan, blast fishing might cause mortality (Dolar 2009).

Strandings and Mortalities: From 2005 to 2012, 18 mortalities were recorded in Prachaub Kirikhan – Pattani, Thailand.

Other Issues: Three individuals were on captive display in Myanmar, but were released by the Department of Fisheries. In Indonesia, this species is increasingly a target of traveling circuses. Dolphin-watching operations in Indonesia are unregulated. In Japan, a group of T.aduncus shifted its location from Amakusa to Noto. The drivers of this move are unknown, but climate or oceanographic changes may have played a role. Similar movements have been recently observed for D. capensis and some rays in fishes in Japanese waters, as well.

Needs for Additional Research: Improving differentiation between T. aduncus and T. truncatus; general research priorities (see above).

Bottlenose dolphin (*Tursiops truncatus*)

Distribution: This species has been recorded in Indonesia, from East Kalimantan, Java, Maluku, Papua, Nusa Tenggara, Sulawesi, Sumatra, and Timor. It has been confirmed to be common throughout the Philippines.

Population/Stock Structure: A number of projects in Australia are studying population genetics, phylogeography, and general population structure.

Population Status: For the Philippines, Dolar et al. (2006) estimate 2628 (CV = 40%) individuals in the eastern Sulu Sea and 269 (CV = 105%) *Tursiops sp.* in the Tañon Strait.

Habitat: Extensive habitat degradation continues in China, Hong Kong, and Taiwan. In eastern Kalimantan, Indonesia, coastal development and sedimentation impact coastal habitat. General anthropogenic impacts of coastal habitat in Indonesia include shipping lanes, coastal development and degradation due to deforestation, oil and gas exploration, and industrial activity.

Directed Catch: *T. truncatus* are captured in Indonesian waters for oceanaria within Indonesia and for export abroad, and in the Philippines through illegal/unregulated/unreported take. They are harpooned in Taiwan, as observed at Nanfang Ao and Tungkang fishing ports (Wang et al. 2013).

Bycatch: As noted in 2002 SEAMAM report (Perrin et al. 2005) there are unquantified catch of small marine mammals, including T.truncatus, in inshore gill-nets fisheries in the shallow coastal waters of the Gulf of Carpentaria in Queensland and along the northern coastlines of the Northern Territory and Western Australia (Hale 1997, Parra et al. 2002, Parra et al. 2004b). The incidental capture of common bottlenose dolphins (*Tursiops truncatus*) is an on-going wildlife management problem in the Pilbara Trawl Fishery, Western Australia. The population-level impact of bycatch in these trawls is unknown (Simon Allen, pers. comm, 2013). Bycatch in drifting gillnets is thought to be the main fishery-related source of mortality in Taiwan, in addition to accidental entanglement in sink gillnets, trammel nets, purse seines, and longlines (Wang et al. 2013).

Other Issues: In Indonesia, there are a number of captive display facilities, including Ancol (with 22 dolphins, including *Orcaella brevirostris*), Dolphin Lodge in Batam (24 *T. tursiops*), Melka Hotel in Bali (2), Serangan in Bali (9), and Akame Dolphin Bay Restaurant in Bali, as well as various dolphin circuses in Bali and Java

Needs for Additional Research: Improved differentiation between *T.aduncus* and *T.truncatus*; coordinated research; general research priorities (see above).

Short-beaked common dolphin (*Delphinus delphis*)

Distribution: *D. delphis* occurrence in Vietnam was confirmed in 2009. They also occur in Japanese and Chinese waters.

Population/Stock Structure: No updates presented.

Population Status: No updates presented.

Habitat: No updates presented.

Directed Catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: No updates presented.

Other Issues: No updates presented.

Needs for Additional Research: General research priorities (see above).

Long-beaked common dolphin (*Delphinus capensis*)

Distribution: Sightings of *D. capensis* have been made in Malaysian South China Sea off the both Peninsular and East Malaysia.

Population/Stock Structure: No updates provided.

Population Status: No updates provided.

Habitat: No updates provided.

Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.

Bycatch: There is likely bycatch in large-mesh drift gillnets in Taiwan.

Strandings and Mortalities: No updates provided.
Other Issues: In Japan, there is a famous whale- and dolphin-watching town, Shikoku in Okata-town, where there are resident Delphinus; there are no government regulations for these dolphin-watching activities, but there is some degree of self-regulation.

Also in Japan, two groups of D. capensis have moved to the other side of the country since 2000, which might be a result of changing oceanographic conditions, possibly linked to climate change.

Needs for Additional Research: General research priorities (see above).

Pantropical Spotted dolphin (*Stenella attenuata*)

Distribution: Country delegates from Japan, Malaysia, Brunei, the Philippines, Thailand, and Vietnam reported occurrence of the pantropical spotted dolphin in their waters. In Thailand, this species is found in both seas.

Population/stock structure: No updates presented.

Population status: Duc reported forty individuals chasing trawlers observed off the coast of Kahn Hoa Province, Vietnam on 19 August 2012.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: Of the forty observed off the coast of Kahn Hoa Province on 19 August 2012, twenty-nine were caught in trawls. They were successfully released by fishermen.

Needs for additional research: None specified.

Spinner dolphin (*Stenella longirostris*)

Distribution: The spinner dolphin occurs in the Philippines, Brunei, Malaysia, Indonesia, coastal Myanmar, and both seas of Thailand. Ponnampalam reported that they are one of the more commonly encountered species in the South China Sea.

Population/stock structure: No updates presented.

Population status: No updates presented.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: Both live and dead strandings have been recorded in Brunei.

Needs for additional research: Delegates relayed that there is a need for more research, but did not specify in which areas this research is needed.

Striped dolphin (*Stenella coeruleoalba*)

Distribution: The striped dolphin was reported to occur in Taiwan, Japan, and Vietnam by country delegates.

Population/stock structure: No updates presented
Population status: Wang reported one stranded on 1 March 2004 following a joint US-Philippines live-action naval exercise on 23 February of the same year.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: There is a stranding record of a *S. coeruleoalba* at the northwestern coast of Peninsular Malaysia.

Needs for additional research: None specified.

Rough-toothed dolphin (*Steno bredanensis*)

Distribution: New sites of occurrence have been observed in the Philippines and Brunei since SEAMAM2. One group was observed in Vietnam (Vo et al. 2012).

Population/Stock Structure: No updates presented.

Population Status: No updates presented.

Habitat: No updates presented.

Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.

Bycatch: Bycatch is suspected in drift net and gillnet fisheries in the Philippines. There is likely bycatch in large-mesh drift gillnets in Taiwan, as well as tuna and shark longlines.

Strandings and Mortalities: There is a record of S. bredanensis kept in captivity following a stranding incident in the Philippines. Two stranding records exists in Brunei from a stranding in 1989 (Beasley & Jefferson, 1997) and a live-stranding incident in 2013.

Other Issues: No updates presented.

Needs for Additional Research: Interactions with humpback whales; general research priorities (see above).

Fraser's dolphin (*Lagenodelphis hosei*)

Distribution: No updates presented.

Population/Stock Structure: No updates presented.

Population Status: In the Philippines, the abundance estimate for the Eastern Sulu Sea is 13,518 (CV = 27%) (Dolar et al. 2006), while that for the northwest Bohol Sea is 234 (CV = 23%) (Sabater et al. 2012).
Habitat: No updates presented.
Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.
Bycatch: There is likely bycatch in large-mesh drift gillnets in

Taiwan, as well as tuna and shark longlines.

Strandings and Mortalities: No updates presented.

Other Issues: Dolphin tour operations in the Philippines for this species might be unsustainable.

Needs for Additional Research: Biopsy sampling to identify stock population; stomach content analysis to study diet; general research priorities (see above).

Risso's dolphin (*Grampus griseus*)

Distribution: Risso's dolphins are found in Taiwan, Japan, the Philippines, Indonesia, and in both seas of Thailand, according to delegates from each region.

Population/stock structure: No updates presented.

Population status: No updates presented.
Habitat status: No updates presented.

Directed catch: No updates presented

Bycatch: No updates presented

Strandings and mortalities: Wang reported two Risso's dolphins found stranded in March of 2005 in Taiwan.

Needs for additional research: None specified.

Short-finned pilot whale (*Globicephala macrorhynchus*)

Distribution: Presence of this species has been recorded in the South China Sea in both Peninsular and East Malaysia, and Brunei waters.

Population/Stock Structure: No updates presented.

Population Status: In the East Japan Sea, the abundance estimate for the northern form is 1500 (95% CI 310-1000). For the southern form in the Pacific Ocean waters of Japan, the estimate is 5300 (CV = 43%). Estimates from the Philippines include an estimate of 7492 (CV = 29%) from the eastern Sulu Sea, and 179 (CV = 96%) from Tañon Strait (Dolar et al. 2006).

Habitat: No updates presented.

Directed Catch: The species is recorded as captured in Japan.

Bycatch: There is likely bycatch in large-mesh drift gillnets in Taiwan. In the Philippines, bycatch has been reported in purse seines using lights, as well as in materials used for pearl farms, in addition to incidental injury/mortality from dynamite fishing.
Strandings and Mortalities: One individual has been recorded live-stranded in Cambodia since 2002, and one was recorded as a mortality in Thailand in 2010. In Taiwan, a number of G. macrorhynchus stranded in 2004 following a joint US-Philippines large-scale military exercise: 9 to 10 animals live-stranded the next day, with another group stranded some days later, followed by one mortality. This mortality had no external injuries, but unusual and severe acute injuries to the head and thoracic region were observed. Other species also stranded during this time. Two live-strandings have also been recorded in recent years (2006 and 2010) in Brunei.

Other Issues: The species is likely vulnerable to intense acoustic disturbance (e.g., sonar or seismic activities).

Needs for Additional Research: Impacts of acoustic disturbance; biopsy sampling to identify stock population; stomach content analysis for diet information; general research priorities (see above).

Melon-headed whale (*Peponocephala electra*)

Distribution: New sites of occurrence have been recorded in the Philippines. In Thailand, the only information for P. electra comes from strandings in the Gulf of Thailand. Sightings of P. electra have also been made in East Malaysian waters.

Population/Stock Structure: No updates presented.

Population Status: Estimates of abundance from sites in the Philippines include: Eastern Sulu Sea: 921; CV=80% (Dolar et al. 2006). NW Bohol Sea: 243; CV=31.68% (Sabater and Aquino 2012).

Habitat: No updates presented.

Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.

Bycatch: There is likely bycatch in large-mesh drift gillnets in Taiwan.

Strandings and Mortalities: In 2009, there were two mass strandings within three weeks in the Philippines, with about 350km between the stranding sites.

Other Issues: The species is likely vulnerable to intense acoustic disturbance (e.g., sonar or seismic activities).

Needs for Additional Research: Impacts of acoustic disturbance; behavior related to its high association rate with Fraser's dolphin; general research priorities (see above).

Killer whale (*Orcinus orca*)

Distribution: New sites of occurrence have been recorded in the Philippines.

Population/Stock Structure: No updates presented.

Population Status: No updates presented.

Habitat: No updates presented.
Directed Catch: In Taiwan, two killer whales were recently found

among confiscated cetacean meat, and were probably caught in an illegal harpoon fishery.

Bycatch: There may be bycatch in large-mesh drift gillnets in Taiwan.

Strandings and Mortalities: No updates presented.

Other Issues: No updates presented.

Needs for Additional Research: Opportunistic photo-identification; description of potential ecotypes; general research priorities (see above).

Pygmy Killer whale (*Feresa attenuata*)

Distribution: Delegates reported occurrence of the pygmy killer whale in Taiwan, the Philippines, and both seas of Thailand.

Population/stock structure: No updates presented.

Population status: Wang reported approximately thirty animals stranded in Taiwan in 2005. Between July and August of that year, researchers gained access to one carcass with a thin line hemorrhage along its melon.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: There is a record of an animal stranded in Brunei in 2013 which was later identified as F. attenuata. The only record of the species in Peninsular Malaysian waters is from skeletal remains found in Tioman Island (Jamal Hisne & Ponnampalam, 2011).

Needs for additional research: None specified.

False killer whale (*Pseudorca crassidens*)

Distribution: The species has been recorded in the Gulf of Thailand and Myanmar, in addition to its previously recorded presence in Japan, China and Hong Kong, Taiwan, Malaysia, the Philippines, and Australia.

Population/Stock Structure: No updates presented.

Population Status: A population estimate exists for Japan, with N = 40,392, CV = 55%.
Habitat: No updates presented.

Directed Catch: Direct capture has been recorded in Japan. In the past, five individuals were reported as held in captivity in the Philippines (Ocean Adventure, Subic); presently, only one animal remains. There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port; they might be targeted to reduce theft of fish from longlines.

Bycatch: In Taiwan, entanglement has been recorded in large-mesh drift gillnets.

Strandings and Mortalities: Three strandings were reported in Thailand in 2006.

Other Issues: No updates presented.

Needs for Additional Research: General research priorities (see above).

Sperm whale (*Physeter macrocephalus*)

Distribution: Delegates reported the occurrence of sperm whales in Australia, the Philippines, the Andaman Sea of Thailand, Japan, East Malaysia, Indonesia, and Vietnam.

Population/stock structure: No updates presented.

Population status: This species is considered Vulnerable by the IUCN.

Habitat status: No updates presented.

Directed catch: Sperm whales are currently the target of whaling operations in Japan and Lamalera, Indonesia. In the late 19th century, the Americans and British hunted sperm whales in the Philippines. All local sperm whale hunting in the Philippines ceased in the late 1990s.

Bycatch: No updates presented.

Needs for additional research: None specified.

Kogia species

Distinguishing between the two Kogia species is highly challenging in the field. Unidentified Kogia were reported in a three-week, multi-species stranding in Taiwan from July to August 2005. Most were live-stranded; bubble-like lesions were observed in carcasses (Yang et al. 2008).

Dwarf sperm whale (*Kogia sima*)

Distribution: Multiple sites of occurrence have been recorded in the Philippines (Tañon Strait, Bohol Sea, Davao Gulf, Sarangani Bay). K. sima have also been recorded in the Andaman Sea, Thailand.

Population/Stock Structure: No updates presented.

Population Status: Estimates are available from two sites in the Philippines, Tañon Strait (670, CV = 62%, Dolar et al. 2006) and the eastern Sulu Sea (326, CV = 58%, Dolar et al. 2006).

Habitat: No updates presented.

Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.

Bycatch: In Taiwan, entanglement has been recorded in large-mesh drift gillnets.

Strandings and Mortalities: No updates presented.

Other Issues: Intense anthropogenic noises might cause some mortality.

Needs for Additional Research: Impacts of anthropogenic sound; general research priorities (see above).

Pygmy sperm whale (*Kogia breviceps*)

Distribution: New sites of occurrence have been recorded in the Philippines (Zambales and Davao Gulf), in addition to a previous record in Davao.

Population/Stock Structure: No updates presented.

Population Status: No updates presented.

Habitat: No updates presented.

Directed Catch: There is some directed take by harpooning in Taiwan, landed at the Nanfang Ao fishing port.

Bycatch: In Taiwan, entanglement has been recorded in large-mesh drift gillnets.

Strandings and Mortalities: The new records of this species in the Philippines come from strandings. One stranding has been recorded in Thailand since 2002 (2007). In 1996, two individuals were found stranded alive on a beach in Brunei. One of the animals was successfully redirected to sea while the other died due to unspecified injuries. In 2009, a stranding involving one dead individual was recorded in the east coast of Peninsular Malaysia.

Other Issues: Intense anthropogenic noises might cause some mortality.

Needs for Additional Research: Impacts of anthropogenic sound; general research priorities (see above).

Mesoplodon sp.

Distribution: Delegates reported the occurrence of M. densirostris and M. ginkgodens in Taiwan, Brunei and the Andaman Sea of Thailand. In addition, M. ginkgodens has newly been recorded in the Philippines.
Population/stock structure: No updates presented.

Population status: On 29 February 2004, following a joint US-Philippines live-action naval exercise on 23 February, one individual M. ginkgodens stranded in Taiwan. It was found that the whale had suffered from internal hemorrhaging, there were many blood clots inside the skin, the tympanic bones (bones in the ear) were shattered, and the pterygoid bones (bones that help regulate pressure inside the head) were cracked. Over a three-week period between July and August 2005, individuals of M. densirostris were stranded in Taiwan, and bubble-like lesions were found on their skin.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Needs for additional research: None specified.

Cuvier's beaked whale (*Ziphius cavirostris*)

Distribution: Delegates reported the occurrence of Cuvier's beaked whales in Vietnam and the Andaman Sea of Thailand.

Population/stock structure: No updates presented.

Population status: No updates presented.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Needs for additional research: None specified.

Baird's beaked whale (*Berardius bairdii*)

Distribution: Among the countries represented at SEAMAMIII, this species has only been confirmed in China and Japan.

Population/Stock Structure: No updates presented.

Population Status: Abundance is estimated to be 660 (95% CI = 310 to 1000) in the East Japan Sea, and 5500 (95% CI = 2500 to 10,000) in the Pacific Ocean south of the Okhotsk.

Habitat: No updates presented.

Directed Catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: No updates presented.

Other Issues: No updates presented.

Needs for Additional Research: General research priorities (see above).

Longman's beaked whale (*Indopacetus pacificus*)

Distribution: Occurrence of this species in Taiwan and the Philippines has been confirmed.

Population/Stock Structure: No updates presented.
Population Status: No updates presented.

Habitat: No updates presented.

Directed Catch: No updates presented.

Bycatch: No updates presented.

Strandings and Mortalities: In Taiwan, I. pacificus was recorded as stranded along with other species during a three week stranding event from July to August 2005 (most animals live-stranded), with bubble-like lesions observed in carcasses (Yang et al. 2008). A stranding in Davao City provided confirmation of presence in the Philippines.

Other Issues: No updates presented.

Needs for Additional Research: General research priorities (see above).

BALEEN WHALES

Gray whale (*Eschrichtius robustus*)

Distribution: Among the countries represented at SEAMAMIII, the gray whale has been recorded only in China and Japan. Its occurrence has not yet been confirmed in Taiwanese waters. One was recorded in Mikawa Bay, Japan, in 2010 and 2012.

Population/Stock Structure: No update presented.

Population Status: The estimate for the northwest Pacific is around 100-150; they are Critically Endangered.

Habitat: No update presented.

Directed Catch: No update presented.

Bycatch: Bycatch in a set net was recorded in China, 2011. Bycatch is potentially a serious issue in China.

Strandings and Mortalities: No update presented.

Other Issues: No update presented.

Needs for Additional Research: General research priorities (see above)

Right whale (*Eubalaena spp.*)

Distribution: Among the countries represented at SEAMAMIII, only Japan and China have reported occurrences of the North Pacific Right whale (E. japonica), and only Australia has recorded occurrences of the Southern Right whale (E. australis). No updates were presented.

Blue whale (*Balaenoptera musculus*)

Distribution: The blue whale occurs in Australia, Japan, Indonesia, and Vietnam. It has newly been confirmed in the Bohol Sea of the Philippines and in January 2013 was first recorded in the Andaman Sea of Thailand.

Population/stock structure: No updates presented.

Population status: Blue whales are endangered over their entire range. Australia's Environment Protection and Biodiversity Conservation Act (EPBC) also considers them endangered in Australian waters. In Japan, their numbers are estimated at 2280 and the population is increasing at a rate of 6.4%. However, the population is still at only 0.9% of its pre-whaling numbers.

Habitat status: No updates presented.

Directed catch: No updates presented.

Bycatch: No updates presented.

Needs for additional research: Delegates conveyed the need for more general knowledge on this species, but no specific research goals were proposed.

Sei whale (*Balaenoptera borealis*)

Distribution: The Sei whale is found in Australia, Japan, and Indonesia.

Population/stock structure: No updates presented.

Population status: Sei whales are endangered over their entire range.

Habitat status: No updates presented.

Directed catch: In Japan's Northwest Pacific, Sei whales are targeted by whalers.

Bycatch: No updates presented.

Needs for additional research: None specified.

Common & Black Minke whales (*Balaenoptera acutorostrata*)

Distribution: Kimura reported the occurrence of minke whales (common – B. acutorostrata – and black) in Japan. There are two separate populations of common minke whales. The J-population inhabits the Japan, Yellow, and East China Seas, while the O-population lives in the Okhotsk Sea and Northwest Pacific Ocean.

Population/stock structure: No updates presented.

Population status: No updates presented.

Habitat status: No updates presented.

Directed catch: In the Northwest Pacific Ocean, common minke whales are targeted by whalers. The annual catch of common minke whales in the Northwest Pacific is between 119 and 207, or 0.5% of their abundance in this area. Black minke whales are hunted in the Antarctic.

Bycatch: No updates presented.

Needs for additional research: Skeletal remains held in the Brunei Museum have been labelled as B. acutorostrata. Further study of the remains is required to confirm the species identification.

Omura's whale (*Balaenoptera omurai*)

This species was described in 2003. Its ecology is largely unknown; they may migrate from east to southeast Asia.

Distribution: The species has been recorded in Malaysia, the Philippines, Thailand, China, Hong Kong, Taiwan, and Japan

Population/Stock Structure: No updates provided.

Population Status: No updates provided.

Habitat: No updates provided.

Directed Catch: There is evidence for historical hunting of B. omurai in the Bohol Sea, Philippines, as identified from skeletal remains.

Bycatch: No updates provided.

Strandings and Mortalities: A stranding was recorded in Fujian Province, China (2004), and in Manila Bay (2008).

Other Issues: There is the potential for ship strikes with increased ship traffic, and potential impacts from seismic exploration, pollution, and unregulated tourism.

Needs for Additional Research: Differentiating from B. edeni; general research priorities (see above).

Bryde's whale (*Balaenoptera edeni*)

Distribution: The upper Gulf of Thailand is a year-round "hotspot" for Bryde's whales, with foraging and breeding observed. There are two resident populations in Japan, and populations in the China Sea and the Western North Pacific. Its presence has also been documented in Myanmar and provisionally in Vietnam, in addition to the Philippines, Malaysia, Brunei and Indonesia as described in Perrin et al. (2005). However, within the countries, the distribution tends to be poorly known.

Population/Stock Structure: No updates provided.

Population Status: In the upper Gulf of Thailand, ~50 individuals have been identified using photo-identification methods. For the Northwest Pacific, the estimate is ~20,500 individuals.

Habitat: No updates provided.

Directed Catch: Annually, around 50 are captured in Japan. There was historical directed capture in Bohol, Philippines.

Bycatch: One calf was reported entangled in a net in the Gulf of Thailand. There is one noted incident of bycatch (and successful release) in Ticao.

Strandings and Mortalities: 10 strandings were recorded from 2004-2012 in the Gulf of Thailand.

Other Issues: There is the potential for ship strikes with increased ship traffic, and potential impacts from seismic exploration, pollution, and unregulated tourism.

Needs for Additional Research: Taxonomy; differentiation from Omura's whale (B. omurai) ; general research priorities (see above).

Humpback whale (*Megaptera novaeangliae*)

Distribution: Humpback whales have been previously found in Australia, Taiwan, Japan, Indonesia, and the South China Sea of Malaysia. Recently, a breeding ground of the Babuyan Islands in the Philippines was confirmed. This breeding ground is used by a unique Asian stock of humpback whales shared with Japan. The first sighting of humpback whales in the Andaman Sea of Thailand also occurred recently.

Population/stock structure: No updates presented.

Population status: In Australia, humpback whales are considered vulnerable under the EPBC Act. The southern wintering population in Taiwan is believed to have been extirpated, as no individuals have been seen in the area for between forty and fifty years. The minimum total population estimate in the Philippines is 160 individuals, however these numbers are difficult to estimate due to the openness of the population and the fact that researchers are only consistently able to study a small area. They are considered endangered under a provincial ordinance in the Philippines.

Habitat status: No updates presented.

Directed catch: In the Antarctic ocean of Japan, humpback whales are targeted by whalers.

Bycatch: No updates presented.

Needs for additional research: In general, more information is required about stock relations. More specifically, where are the breeding, calving, and feeding grounds in Southeast Asia and what are the movements of this species in the region? It is unknown whether humpback whales migrate between Indonesia, the Philippines, and Malaysia and there is a need to determine if the animals in each of these countries are from the same stock. Oil and gas exploration in Indonesia needs to be studied in relation to this species as it may pose a significant threat to the population.

Bowhead whale (*Balaena mysticetus*)

Of the countries represented at SEAMAMIII, only Japan has recorded occurrences of the Bowhead whale. No updates were presented for this species.

PINNIPEDS

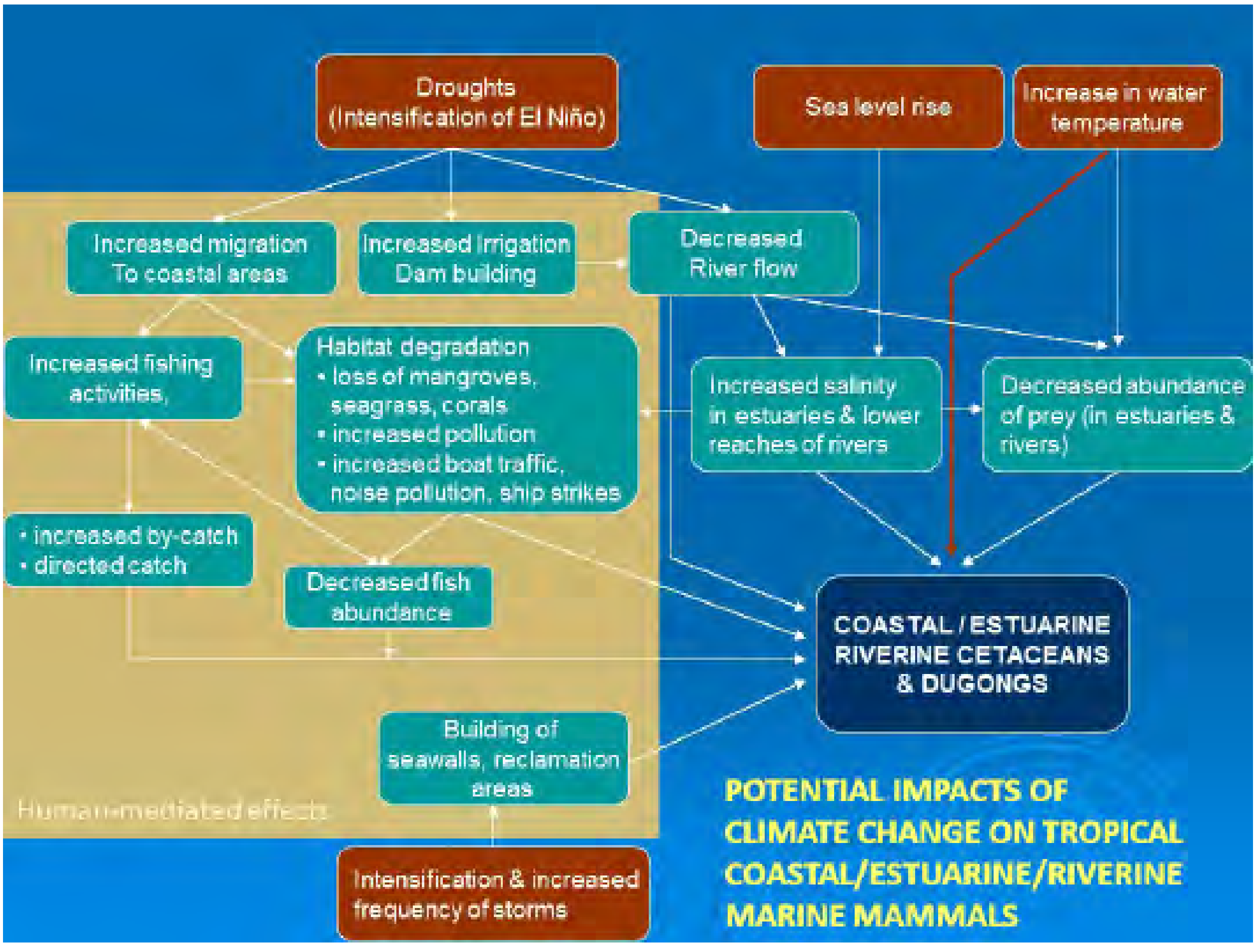
Records of pinnipeds in Japan include the Northern fur seal *(Callorhinus ursinus)*, Harbor seal (*Phoca vitulina*), Spotted seal (*Phoca larga*), and Ribbon seal (*Histriophoca fasciata*). One spotted seal was caught along the central coast of Vietnam, August 2011, and was kept for 2 months before dying. The Japanese sea lion (*Zalophus japonicus*) is considered likely extinct due to the fact that its occurrence has not been reported in Japanese waters since 1970. Historically, the Japanese sea lion was overhunted and subjected to regular culls. There is speculation, however, that it may still occur in Russian and/or Chinese waters.

Discussions

Climate change - Southeast Asia

Discussion led by Louella Dolar

This discussion was on the vulnerability of marine mammals in Southeast Asia from changes in climate. We began with a presentation and a list of species and their vulnerabilities to climate change that served as background information (Dolar and Sabater 2011). After that, we asked for delegates to gather in country groups to determine what would best be used as criteria for important ideas about climate vulnerability. Using the example of a previously developed flow chart, each country group came up with their own flowcharts.



Picture 1. Example Climate Change Flowchart

Species	Habitat	Distribution	IUCN	CC Impacts		
				ML	LL	Alter
CETACEA (Whales, Dolphins and Porpoises)						
MYSTICETI (Baleen Whales)						
Family Balaenopteridae - Rorquals						
Balaenoptera musculus (Blue whale)	P	W	EN	un	?	3
Balaenoptera physalus (Fin whale)	P	W	EN	un	?	3
Balaenoptera edeni (Bryde's whale)	P	WTE, TR	DD	f	?	1
Balaenoptera omurai (Omura's whale)	C	TR	DD	no info	?	no info
Balaenoptera acutorostrata (Minke whale)		W	VU	un	?	3
Balaenoptera borealis (Sei whale)	P	CTE, TR	EN	no info	?	2
Megaptera novaeangliae (Humpback whale)	P	W	LC	un	?	7
ODONTOCETI (Toothed Whales)						
Family Delphinidae - Ocean Dolphins						
Delphinus capensis (Long-beaked common dolphin)	O	STR	DD	f	↑	no info
Delphinus delphis (Common dolphin)	O	TE, TR	LC	f	↑	8
Feresa attenuata (Pygmy killer whale)	O	TR, WTE	DD	f	↑	0
Globicephala macrorhychus (Short-finned pilot whale)	O	TR, STR	DD	f	↑	0
Grampus griseus (Risso's dolphin)	O	CTE, TR	LC	f	?	1
Lagenodelphis hosei (Fraser's dolphin)	O	WTE, TR	LC	f	↑	0
Orcaella brevirostris (Irrawaddy dolphin)	C,R,E	TR	VU, CR	f	↓	8
Orcinus orca (Killer whale)	O	W	DD	un	?	2
Peponocephala electra (Melon-headed whale)	O	TR	LC	f	↑	0
Peponocephala crassidens (False killer whale)	O	WTE, TR	DD	f	↑	0
Sousa chinesis (Indo-Pacific humpback dolphin)	C	TR	NT	f	?	8
Stenella attenuata (Pantropical spotted dolphin)	O	W	LC	f	↑	0
Stenella coeruleoalba (Striped dolphin)	O	CTE, TR	LC	f	↑	1

Species	Habitat	Distribution	IUCN	CC Impacts		
				ML	LL	Alter
Stenella longirostris longirostris (Gray's spinner dolphin)	O	TR	DD	f	↑	1
Stenella longirostris roseivenris (Dwarf spinner dolphin)	C	TR	DD	no info	↑	no info
Steno bredanensis (Rough-toothed dolphin)	O	WTE, TR	LC	no info	?	0
Tursiops aduncus (Indo-Pacific bottlenose dolphin)	C	TR	DD	no info	?	8
Tursiops truncatus (Bottlenose dolphin)	O	W	DD	f	↑	8
Family Kogiidae - Pygmy and Dwarf Sperm Whales						
Kogia breviceps (Pygmy sperm whale)	O	WTE, TR	DD	f	↑	0
Kogia sima (Dwarf sperm whale)	O	WTE, TR	DD	f	↑	0
Family Physeteridae - Sperm Whale						
Physeter macrocephalus (Sperm whale)		W	VU	un	?	3
Family Ziphiidae - Beaked Whales						
Ziphius cavirostris (Cuvier's beaked whale)	O	W	LC	f	?	0
Mesoplodon densirostris (Blainville's beaked whale)	O	WTE, TR	DD	f	?	0
Indopacetus pacificus (Longman's beaked whale)	O	TR	DD	f	?	0
Family Phocaenidae						
Neophocaena phocaenoides (Indo-Pacific finless porpoise)	C	WTE, TR	VU	f	?	8
SIRENIA (Manatees and dugongs)						
Family Dungongidae - Dugong						
Dugong dugon (Dugong)	C	TR	VU	no info	?	no info

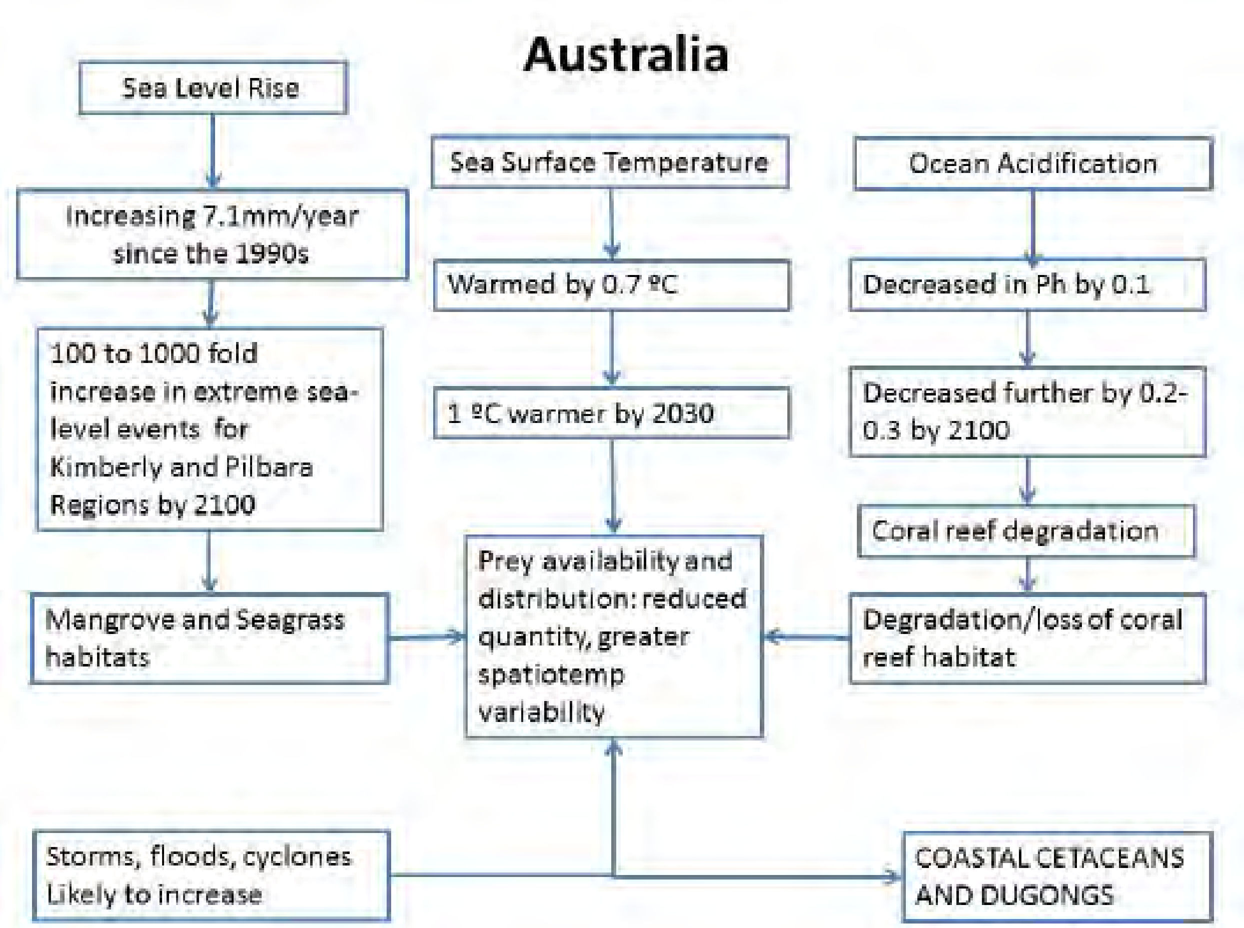
Table 1. Predicted impacts of climate change on marine mammal species in Southeast Asia. (Habitat: C=coastal, P=pelagic; Distribution: W=worldwide, WTE=warm temperate, CTE=cold temperate, TE=temperate, TR=tropical; STR= subtropical; IUCN conservation status: CR=critically Endangered, EN=Endangered, VU= Vulnerable, NT= Near Threatened, DD=Data Deficient; LC=Least Concern; CC (Climate change) Impacts: ML (MacLeod 2009): un=unchanged, f=favorable; L= Learmonth et al. 2006: ↑=range increase, ↓= range decrease, ?=not known; Alter et al. 2010, numbers represent impact scores. High score means more impact.

Climate Change - Australia

Discussion led by Guido Parra

Main pressures coming out of climate change: sea level rise (SLR)/ sea surface temperature (SST)/ocean acidification (OA)/Storms/ floods/cyclones

- SLR affecting area already
  - 100 to 1000 fold increase in extreme SL events (SLR and cyclone activity) – particularly effect Kimberly and Pilbara
  - Mangrove and seagrass habitat impacts – linked to prey impacts
  - Hard to predict impact on prey; perhaps decline in abundance and quality, and greater spatiotemporal variability
- Not a lot of evidence about how cetaceans will be affected; obviously coastal (Snubfin, IP HP, aduncus, dugong) would be more affected given dependence on specific resources [this applies to all these other pressures]
- SST: warmed by 0.7C now, predicted 1C warmer by 2030; and impacts on prey
- OA: decrease in pH by 0.1, project decrease further by 0.2-0.3 by 2100; impacts on corals
- Storms/Floods/Cyclones – already variability; will likely increase in intensity, but unknown how quantity will change
  - Direct impacts on strandings
  - And impacts on prey availability and distribution; cases already of huge storm floods eradicating hectares in seagrass, with die-offs of dugongs



Picture 2. Australia Climate Change Flowchart

Climate Change - Cambodia

Discussion led by Gerry Ryan

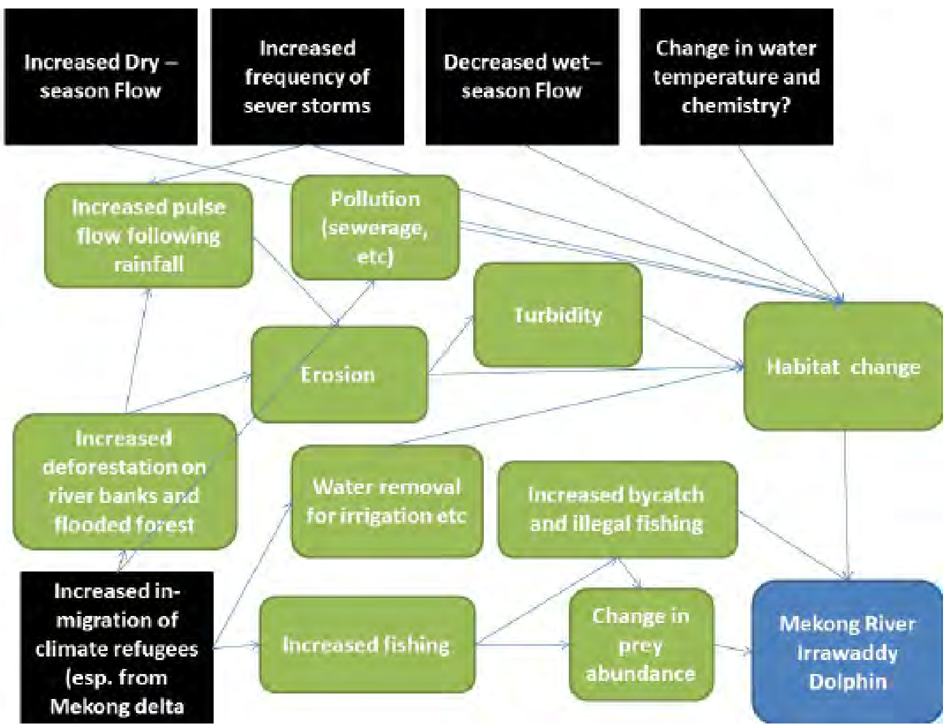
Mekong River: Flow chart

- Black: best knowledge for climate science for that part of the river, based on IPCC
  - CSIRO: has done detailed predictions for Mekong River basin
  - Increased dry-season flow; overall increased flow (though impacts of pulses of flow more important)
  - Decreased wet-season flow
  - Increase in water temp
  - Increase frequency of storms
  - A lot of people predicted to leave Mekong delta and move inland
- Green: Potential impacts
  - Change in habitats around river – deforestation as people move in – and increase in fishing

- Increase in erosion
- Habitat change
- Increase turbidity, but might not impact the dolphins who exist in turbid water, but might impact vegetation and prey
- Increased fishing and increased illegal fishing – may directly or indirectly impact dolphins
- Water removal for irrigation; might increase with more droughts in future
- Direct sewage/pollution going into river – no quantification

Impacts of Climate Change on Mekong River Irrawaddy Dolphins

- Increased dry season flow
- Decreased wet season flow
- Increased incidence of severe storms
- Rapidly increasing migration of "climate refugees" into habitat areas, esp from Mekong delta
- Change in abundance of some prey species?
- Erosion due to deforestation – likely to increase due to increased migration
- Increased fishing due to increased migration
- Increased water removal for irrigation due to increased migration
- Changes in flow and turbidity due to forest removal – increased runoff and pulse effect after rainfall



Picture 3. Cambodia Climate Change Flowchart

Climate Change - China and Taiwan

Discussion led by Samuel Hung and John Wang

And a lot of other problems going on at faster rate than climate change impacts

Focused on two coastal cetaceans:

Sousa chinensis:

- Drought (intensification of El Nino)
- Increased frequency of storms
- Habitat linked to river mouth, so any impact on river outflow will influence the nature of the habitat
- Increase flow
- Positive: maybe if more outflow, might increase prey available (WRT Pearl River Estuary Sousa prey shortage with low flow)
  - Maybe more available habitat, might also induce more connectivity between populations
- Negative: if increase flow, increase pollutants and sewage going into habitat; and impacts of SLR, might impact their movement
- Drought
- Less prey available
- Fewer contaminants
- Population will become more isolated
- ETS Sousa tend to be concentrated in larger groups during dry times, so more vulnerable to impacts like chemical spills, etc.; and more construction of dikes, breakwaters, etc. to stop erosion

Neophocaena phocaenoides:

- Yangtze River would have very serious impacts; but probably the population will go extinct before major impacts from Climate change (refers to condition of other species in river)
- Coastal:
- Very little known about them; hard to study
- What might be good for Sousa, might be bad for finless (speculations based on what he's seen) – competitive exclusion in PR
- Can always speculate about fishing – decrease if out of business, or increase effort
- And if waters warm up, might impact cold-water species

Maybe also Aduncus, but very little info for them; used to be targeted for aquarium industry in past, but don't see on survey

Not many baleen whales visiting area, so no info on that

Climate Change - Indonesia

Discussion led by Putu Liza Mustika

Five phenomena most likely to happen:

- Drought/Rainfall:
- And impact on river Orcaella
- Humans building more dams to deal with water shortage
- Disturb migration/habitats into upper streams
- More and stronger storms
- May cause building of sea walls
- Disruption of movement along shore
- SLR
- Impact salinity
- Also impact riverine habitat
- And tidal change?
- Don't really understand impact to coastal species
- SST rise
- Ocean circulation?
- OA

Indonesia has a lot of nearshore oceanic habitat; from IPCC, Pacific part of Papua would impact circulation, might impact oceanic species (Indonesian through flow pattern – creates upwelling, fronts, etc) (e.g., humpback whales, sperm whales, blackfish, spinner, Fraser's)

- And shift in fishing areas
- OA could also impact baleen whales
- Homework for Indonesia team: to understand more about impact to oceanic species

Questions: Where would you put impacts on seagrasses and corals?

- Mangroves and seagrass habitats as nursery grounds for fish

Climate Change - Malaysia

Discussion led by Fairul Izmal

Drought might not impact Malaysia as much as increased precipitation and storms/surges

Main concern of group was more on shift of human behavior

- E.g., fishing: a lot of fisheries influenced by changes in monsoon seasons – would possibly change range of fishing grounds, maybe more pelagic fisheries?, and shifts in fishing gears used/seasons in which gear (e.g., gillnets) are used
- And impacts on bycatch (e.g., gillnets untended, while trammel nets are tended)
- A lot of projects looking at climate change impacts predicted, and reacting immediately – e.g., dams being built to reduce emissions; and coastal protection efforts (e.g., sea walls) in expectation of SLR
- Impacts on river flow, sedimentation

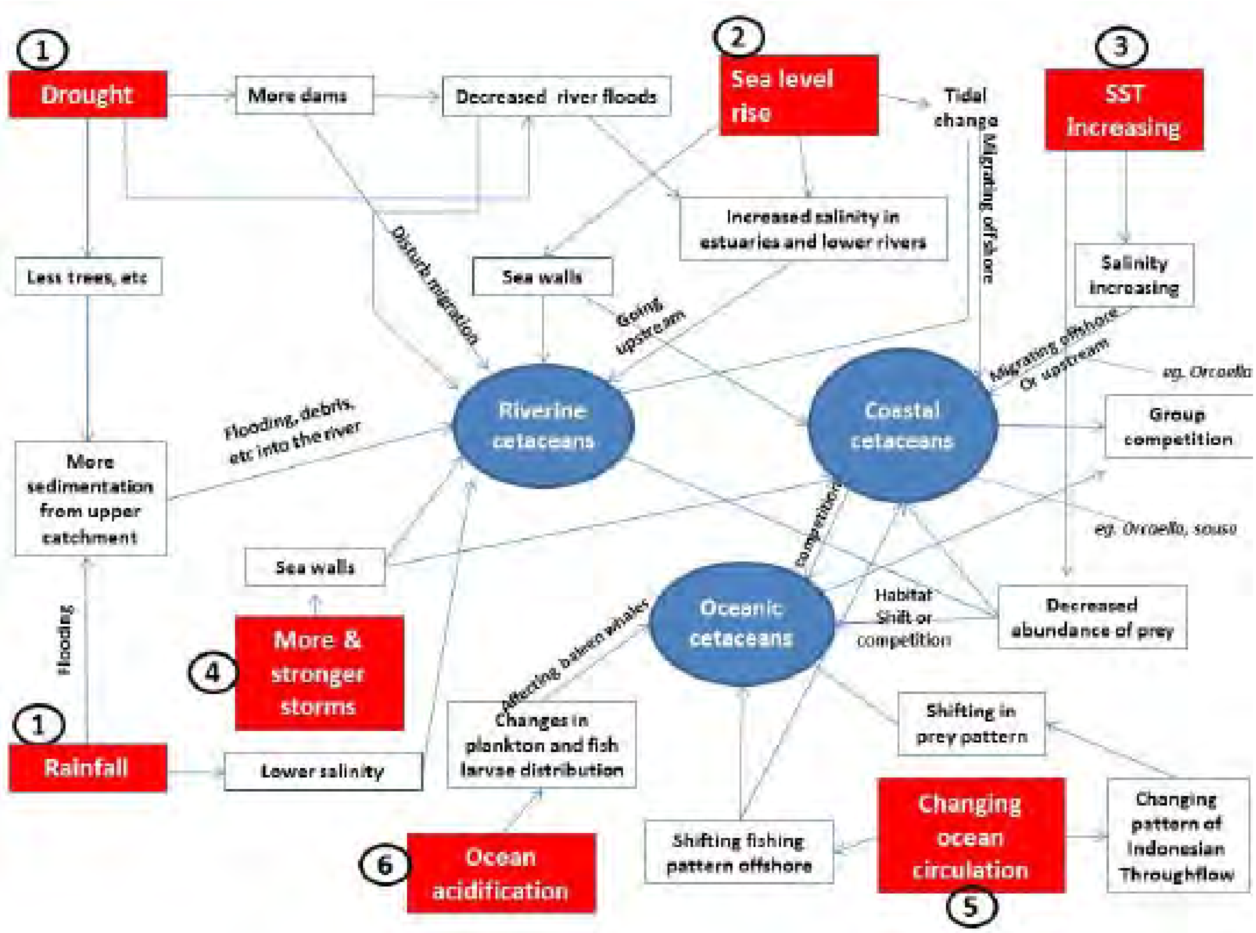
Questions:

- Ellen Hines: what about positive impacts?
- Fairul: promoting talks about MPAs for vulnerable habitat (corals, seagrasses) – but what could MPAs do?

Climate Change - Myanmar

Discussion led by Aung Myo Chit

Focus on Irrawaddy dolphin:



Picture 4. Indonesia Climate Change Flowchart

- Droughts: less place for dolphins
- For now, no dam along river, but if so, increased concentration of fishing activity
- Increased pollution and traffic
- Storms: More habitat for dolphins, but a lot of bycatch issues into tributaries
- Rest is the same as Louella's

Questions:
Peter Thomas – when visited Mahakam, seemed like channelization reduced habitat for dolphins
- Aung: in dry season, deep pool area

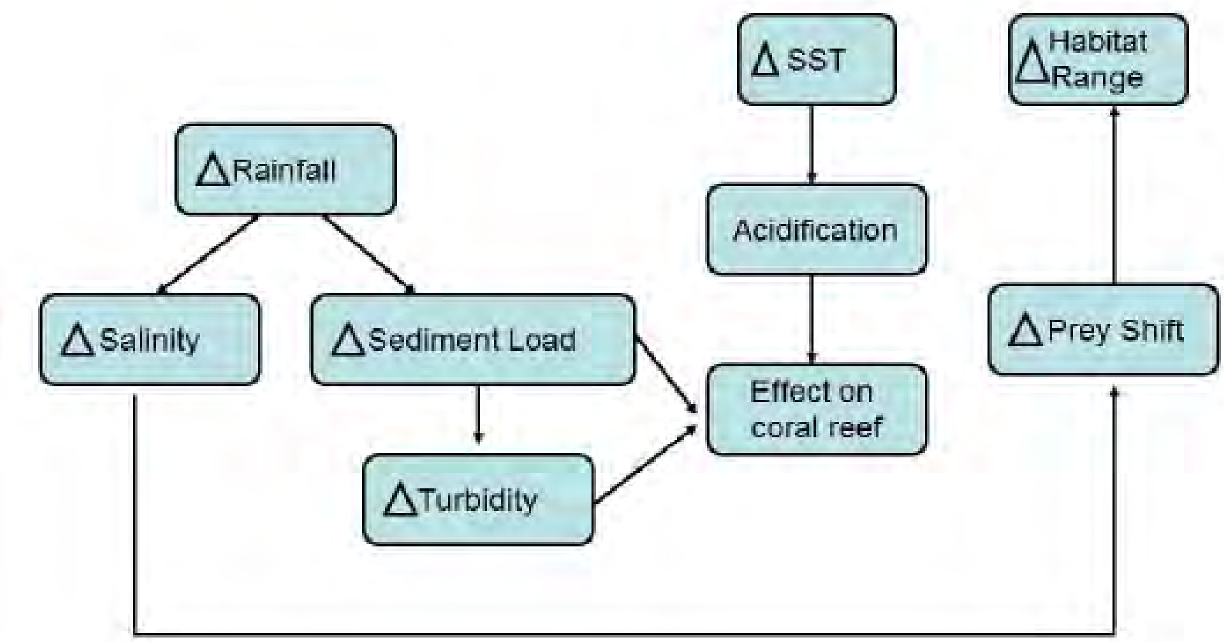
Guido Para: questions for geographers in general – increased migration to coastal areas seems counterintuitive?
- Peter doesn't agree – large scale migration from interior to the coast
- People still dependent on coastal resources, cities gathered on coastal resources
- Ellen: and SSF as free-and-open resource as alternative
- People might leave deltas to cities farther inland; may see increase in factory work
- Louella: Some papers say most people will move inland, but other papers say otherwise due to drought (e.g.), people might just move to new coastline
- John: example in Taiwan – concentration follows the moving coastline
- Suzanne: coastal habitat quality was seen as mitigating 2005 tsunami's effect in Myanmar, so impacts on that habitat might worsen impacts in the future

Climate Change - The Philippines
Discussion led by Edna Sabater

Summarized flow charts seen earlier, and indicated change (with no particular direction of that change)
- Chart summarizing priorities for species (Habitat and Bycatch impacts); and priority areas for those species
- Irrawaddy most susceptible
- Dwarf spinner dolphin: attached to reef areas
- Aduncus
- Truncatus
- Megaptera: because unique Asian stock, change in distribution might have big impact

Randy Reeves: In ranking, are you thinking only of amounts/ numbers of animals caught, or incorporating in something about inferred population level impact of that threat factor
- Edna: For some species, just number; main consideration – not enough info on population estimates

Species	Habitat	Bycatch	High Priority Areas
Orcaella brevirostris	1	2	Guimaras, Iloilo Strait and Malampaya Sound
Stenella longirostris roseiventris	2	3	Balabac Strait
Tursiops aduncus	3	1	Sierra Madre, Balabac, Tanon Strait
Tursiops truncatus	4	1	Balabac and Tanon Straits
Megaptera novaeangliae	5	3	Babuyan group of Islands



Picture 5. Philippines Climate Change Flowchart (1= highest concern, 5= least concern)

Climate Change - Thailand

Discussion led by Suwat Jutapret

In the past 20 years, the Department of Fisheries has been concerned with marine affairs, but 10 years ago, when the Department of Marine and Coastal Resources began, they needed older data to think of impacts, but there is not really any scientific data on marine mammals from before 10 years ago.

Included something similar to original model:

- Drought
- SLR
- SST increase
- Stronger and more storms
- • And nutrient load, pollution input, turbidity – impacts to corals and seagrasses
- Coastal erosion and development, land utilization
- And impacts on Coastal/Estuarine/Riverine cetaceans and dugongs

Not sure about impacts on cetaceans

Climate Change - Vietnam

Discussion led by Duc Hoang Minh

Current situation in Vietnam:

- One of 5 countries to be most influenced by climate change and SLR, considerable impact projected
- If 1.5 m by 2050, 1/5 of country submerged, 1/3 population impacted
- Not much info on marine mammals
- • Gulf of Tonkin
- Mangrove areas: about 1000km^2, but about 80% were cleared in 1990s
- • Govt has plan to react to mitigate impacts…

Following Louella's model:

- SST and habitat change, impacting food chain
- Drought and rainfall: dry season lasting longer than usual, wet shorter but with increased rainfall and river flooding is big problem (plus deforestation and erosion, already big problem now)
  - Sedimentation will be increased, increased turbidity – impact mangrove, seagrass, corals
- SLR and estuaries – seagrass have chance to expand, but gov't trying to build concrete sea dike along coastline, so coral and seagrass can't expand; habitat decreased
- Human activities:
  - Government intends to build dike along coastline
  - Migration of people to coastline; but not sure, might move up as well rather than concentrate around coastal areas
  - Hydropower impacts
  - Water pollution increased
- At moment, govt has program for mangrove rehab along Mekong delta; integrated; replant mangroves outside, and inside, build concrete sea dike
- And Distribution, Behavior, Decrease?
  - Maybe Irrawaddy's can travel upriver, but don't know about Sousa, Np, dugong – may change behavior of species

- Peter Thomas: One of first to mention habitat change as consequence of rising SST and nutrients; definitely an emerging problem in the US; other countries should think about that

- Guido Parra: Parasites and disease

- Gerry: and dam building clarification
  - Need to be careful about oversimplifying impacts
  - Difference between dikes, water removal for irrigation, hydropower
  - There will be big impacts, but will not quite be so simple
- Duc: more on the current impacts of hydropower dams and water removal on river and communities
  - In some areas, seawater can go up river about 50km in dry season – lots of problems for agriculture
  - Ong: In Thailand, same problem; in Gulf, rivers – saltwater can go 100km upriver; made dam to prevent – doesn't work, so now open dam all the time because when close dam, make erosion upstream, doesn't work so open all the time
  - Duc: in Vietnam, do similar, gate on small rivers to regulate water flow
  - Saifullah: also have one in Kuching, he believes; will close to maintain water inside river

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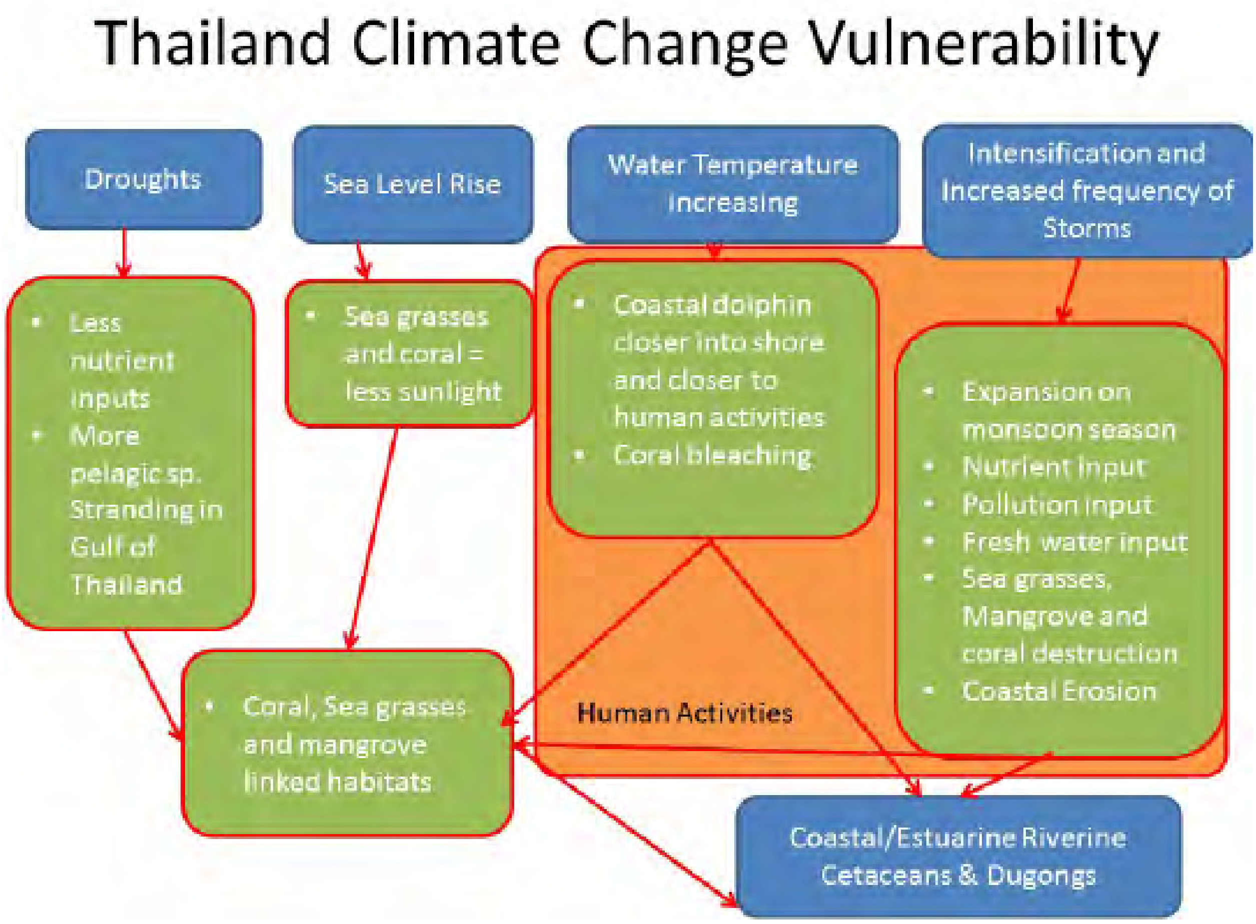
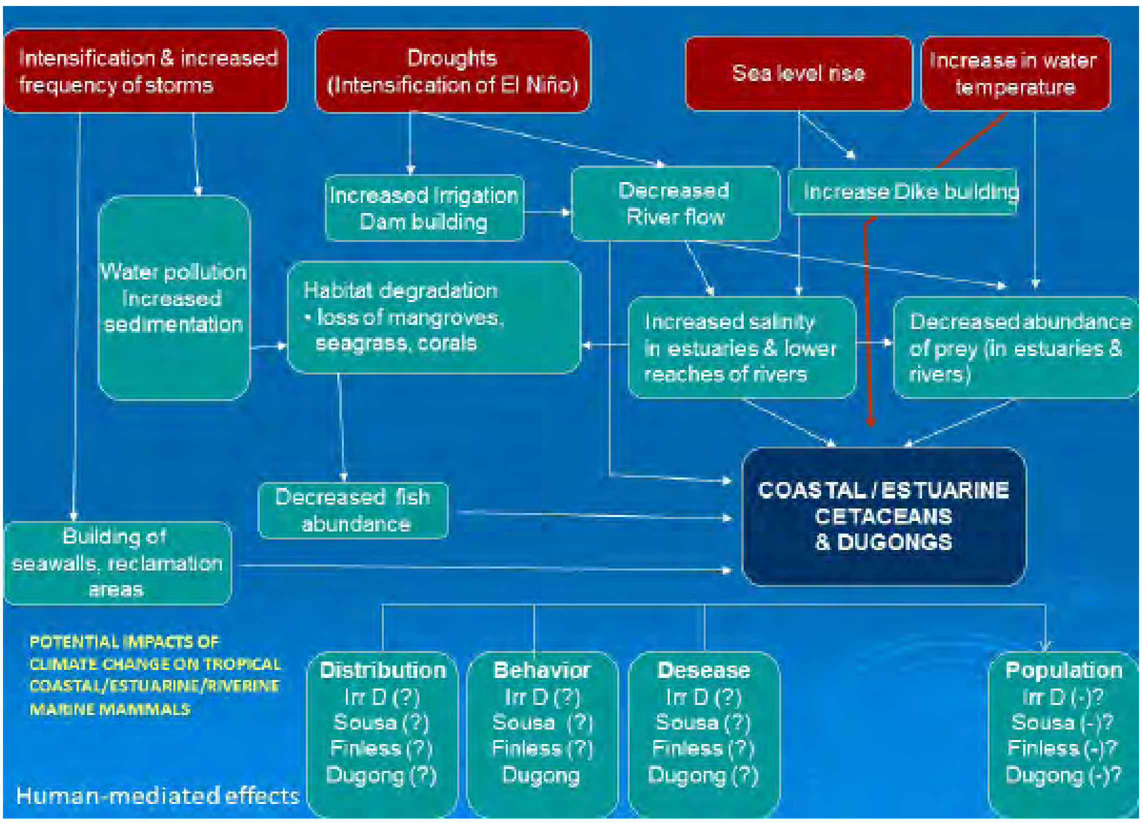


Picture 6. Thailand Climate Change Flowchart



Picture 7. Vietnam Climate Change Flowchart

Country Research Priority Summaries

Discussion led by John Wang

On March 7th, we asked each country, based on discussions throughout the week, to summarize their current research needs and prioritizations. Each country group deliberated and put together a presentation or document.

Country Presentations

Australia

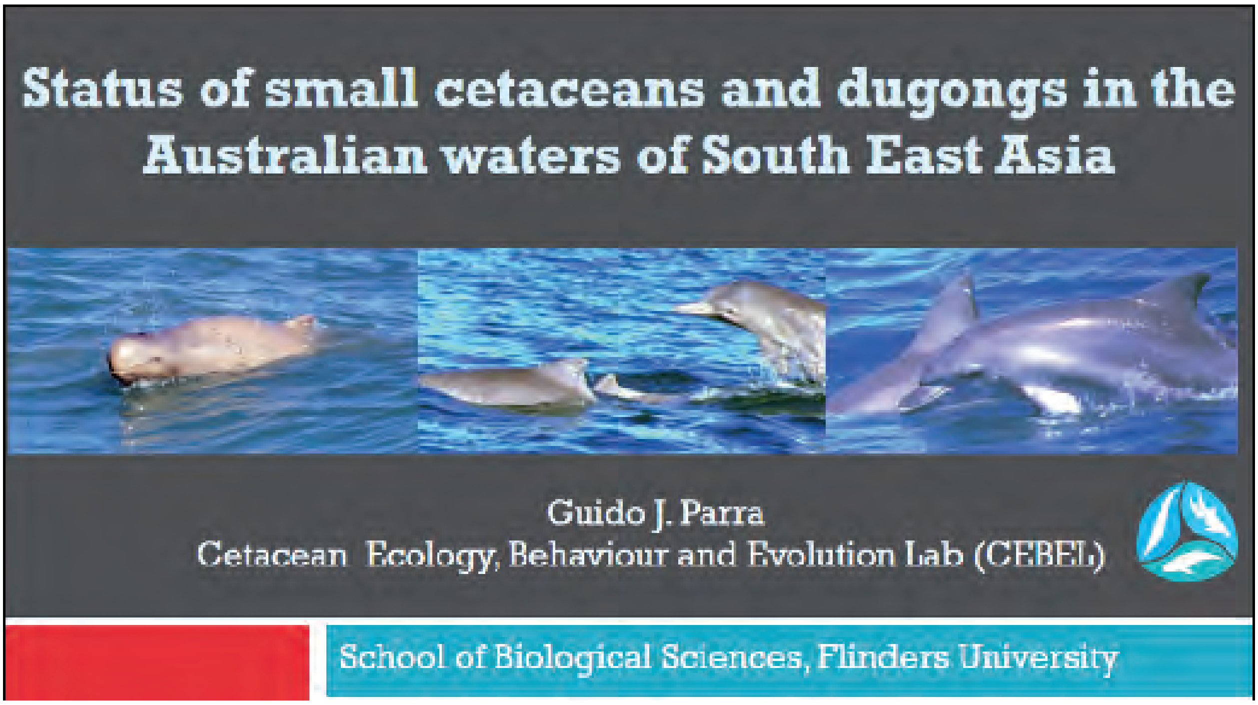
Nevertheless, coastal developments across northern Australia are rapidly increasing through the expansion and development of the mineral, petroleum and natural gas industries and the concurrent infrastructure and activities associated with these developments. The bulk of Australia's mineral exploration activity occurs in Western Australia and WA nation's premier petroleum producer, Western Australia a for 62 per cent of conventional natural gas (including LNG feedstock but excluding coal seam methane) and 77 per cent of crude oil and condensate production in 2011–12.This increase in industry involves: construction of residential areas, ports and marinas, reclamation of tidal flats and estuarine habitats, dredging, dumping of spoils, seismic surveys, drilling, blasting, pile driving, boating, resource extraction, and tourism. Many of these activities are likely to result in local-scale change in the composition, structure and function of the coastal and estuarine habitats, and increase the potential for a wide range of threats including:

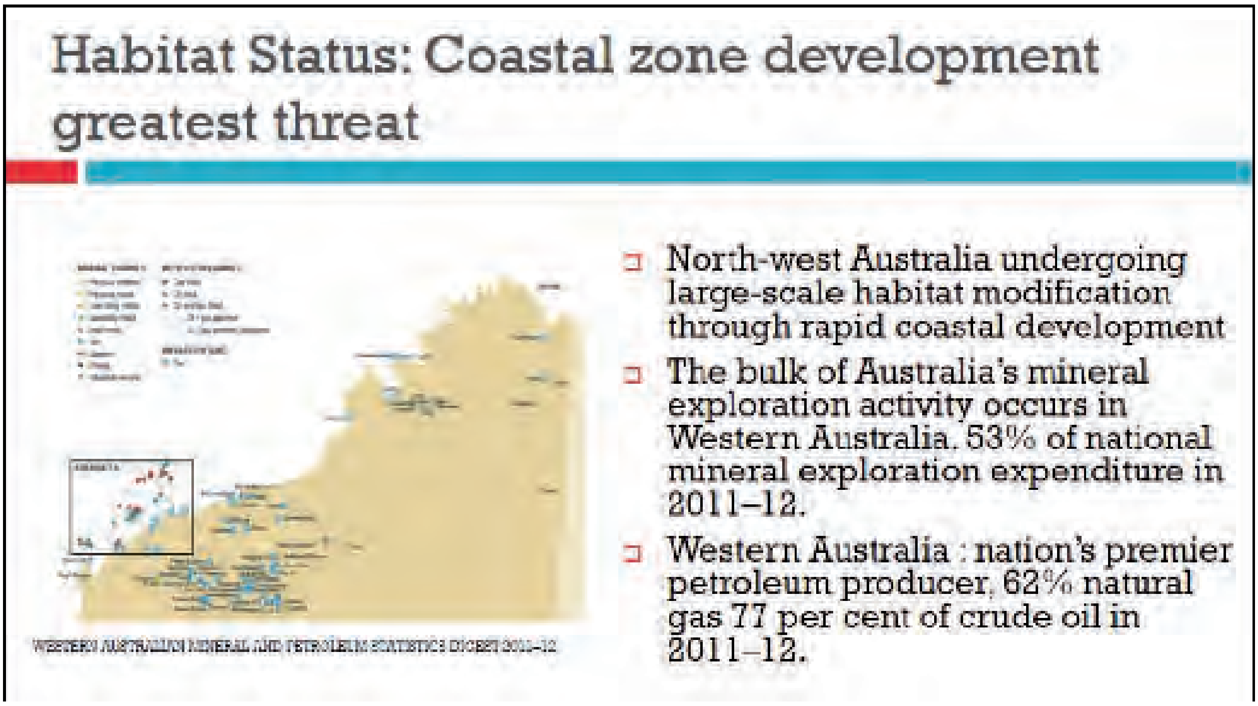
- Direct removal of habitat (seagrass, mangroves)
- Physical disturbance and displacement as a result of:
- Increasing commercial and recreational vessel traffic
- Increasing noise from construction activities
- Chemical pollution
- Boat strikes from commercial and recreational vessel traffic
- Introduction of viral and bacterial pathogens

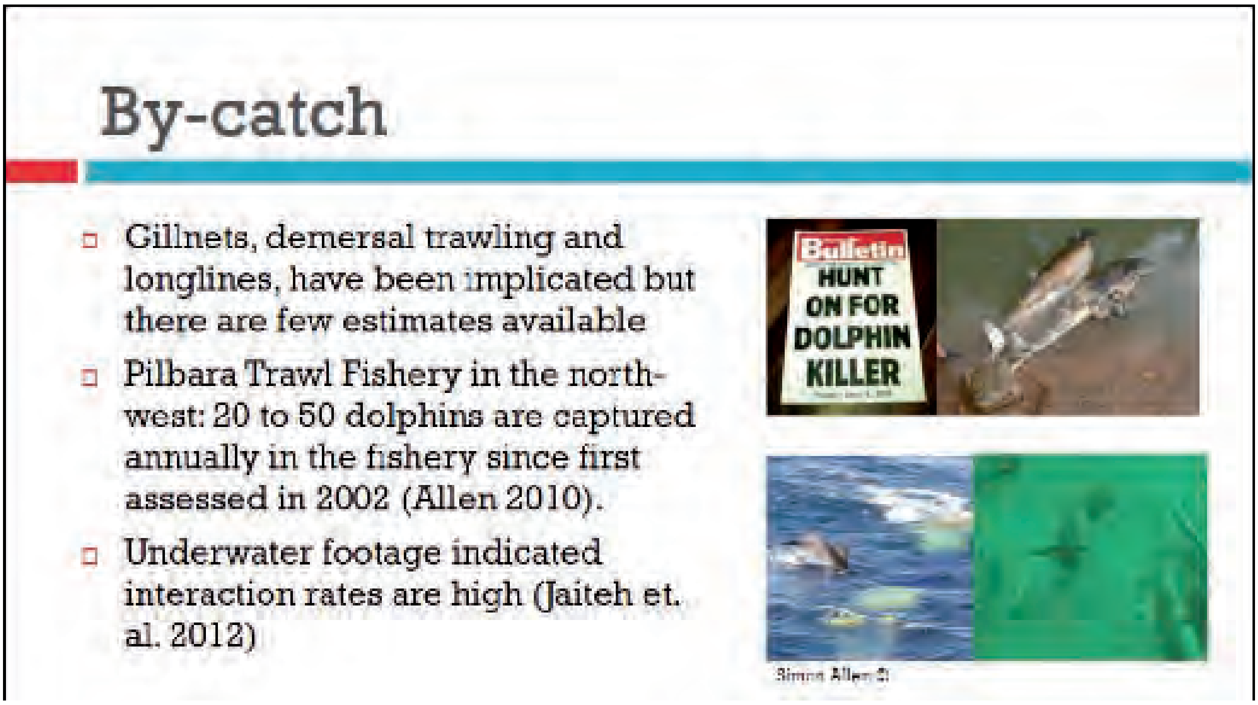
All inshore dolphin species (snubfin, Indo-Pacific humpback and Indo-Pacific bottlenose) can be found in in nearshore coastal waters associated with mangroves and estuarine waters (Parra et al. 2002, Parra et al. 2004b, Parra 2006, Parra et al. 2006b, Parra and Jedensjö 2009, Allen et al. 2012). Recent workshops by in 2010 (Townsville, 4-5 May) and 2012 (Melbourne; 10-11 December) on the status of tropical inshore dolphins in Australian waters identified coastal zone development as the major threat to inshore dolphins in northern Australian waters. Thus, the individual, as well as cumulative, effects of the above threats are cause for concern for the conservation and management of inshore dolphins as well as dugongs.

Incidental capture of marine mammals occurs in some of the Commonwealth and state fisheries operating in the Australian waters of Southeast Asia (Appendix 2). Gillnets, demersal trawling and longlines, have been implicated but there are few estimates available on the levels of bycatch. Most inshore commercial fisheries are the subject of regular assessments under the EPBC Act 1999.

As noted in 2002 SEAMAM report (Perrin et al. 2005) there are unquantified catches of small marine mammals (e.g. snubfin dolphins, Indo-Pacific humpback dolphins, bottlenose dolphins and dugongs) in inshore gill-nets fisheries mainly set for barramundi (Lates calcarifer Bloch, 1970) and threadfin salmon (Polynemus sheridani Macleay, 1884 and Eleutheronema tetradactylum Shaw, 1804) in the shallow coastal waters of the Gulf of Carpentaria in Queensland and along the northern





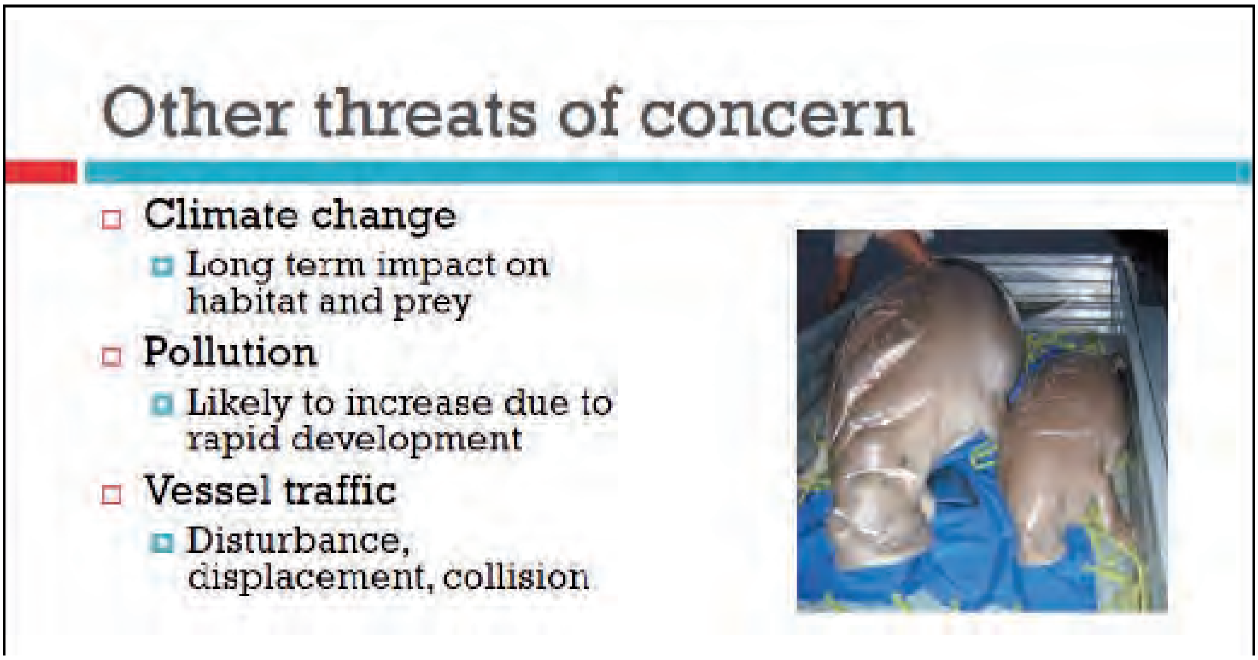


deck (Allen et al. 2012, Jaiteh et al. 2012). The impact this level of bycatch has on this dolphin population remains unknown (Simon Allen personal communication, February 2013).

The PFTIMF is the most productive scale-fish fishery in Western Australia (WA), with recent annual catches of 2-3,000 tons, currently all for consumption within Australia and making up some 75% of the scale-fish on the Western Australian market. There are currently four vessels that conduct 5-6000 trawl 'shots' per annum. It is a year-round, demersal, single otter-trawling operation with reduced effort

Footage from 36 trawls across the fishery was analyzed to determine the extent of dolphin-gear interactions and the behavior of dolphins inside the nets. Interaction rates were high, with dolphins present inside and outside the nets during 29 and 34 trawls, respectively, and for up to 99% of the trawl duration.

The conservation status of a marine mammal species and its subsequent listing as a threatened species is a function of its risk of



extinction, which is influenced primarily by population dynamics (population size and trends, population structure) and the key biological and environmental factors influencing those dynamics (distribution, behaviour, life history, habitat use, and the effects of human activities; Figure 1).

Through our reviews of the current state of knowledge, past species nominations for listing; and feedback provided by researchers and the Threatened Species Scientific Committee (TSSC) it is clear that any future attempt towards updating the current conservation status of inshore dolphins in Australia will require: 1) comprehensive information on population dynamics, but also on important factors affecting those dynamics such as their distribution and habitat and threats.

Information on the ecology and conservation biology of most of the marine mammals occurring in this region is practically non- existent. Research efforts are sporadic and uncoordinated—many are commissioned to determine potential adverse effects of proposed mining developments and their associated port facilities, but consider each development on a case-by-case basis, and ignore the potential cumulative impacts. The development of a strategic plan for marine mammal research in the region should be a high priority, particularly for inshore dolphins and dugongs that are the species most at risk from the rapid industrial development currently happening across northern Australia.

In our opinion, the following research should be considered high priority in northern Australia for inshore dolphins and dugongs:

1. Undertake a broad-scale assessment of their distribution, abundance and genetic population structure
2. Investigate their behavioural ecology and habitat preferences
3. Develop spatially explicit models of their distribution and density at a regional level
4. Conduct spatial risk assessment of the threatening processes

Such research has the potential to provide relevant, accessible and evidence-based information to support species conservation assessments as well as improved decision-making with respect to environmental impact assessments.

Climate change is a seemingly over-arching and pervasive threat to inshore dolphins and their habitat. Climate change impacts (e.g. high rainfall, increased catchment run off from storms and floods) will likely increase the exposure of dolphins to bio-accumulated toxins and infectious diseases, as well as indirectly impacting on the productivity of the ecosystems upon which they depend (Lawler et al. 2007). Climate change and its associated pressures (sea level rise, change in sea surface temperature and ocean acidification) are expected to have long-term impacts on the habitats and prey of local populations of inshore dolphins and dugongs.

Pollution

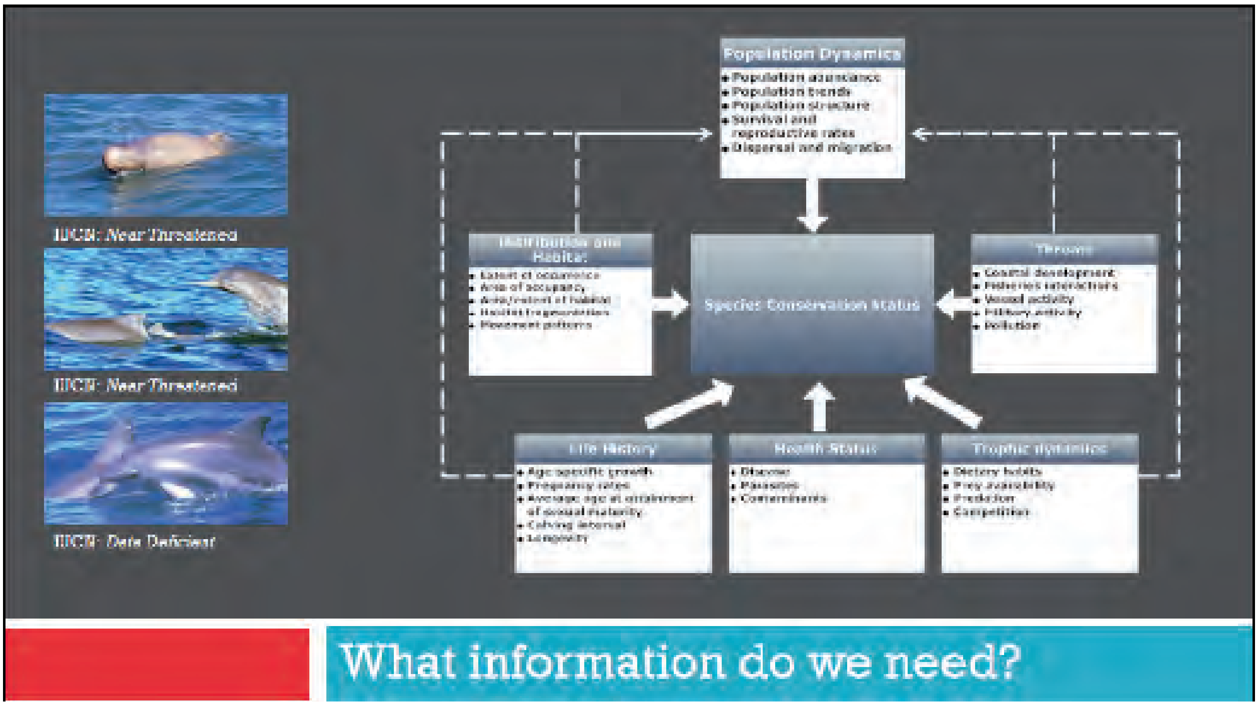
Various pollutants enter coastal and estuarine waters along Australia's coastline (e.g. heavy metals, pesticides, herbicides, nutrients and sediments) from many different sources (e.g. industrial and sewage discharges, catchment runoff and groundwater infiltration) (Kemper et al. 1994, Cosser 1997, Hale

1997, Haynes and Johnson 2000). The adverse effects of these pollutants on marine mammal health are not fully understood, but their toxic properties. The concentration and rapid growth of the mining and petroleum industry across the NWMR and NMR is likely to increase pollution in these regions.

Research has also indicated that four (of five) humpback dolphins recovered along the QLD coast (three from Townsville and one from Gladstone) in 2000 and 2001 were infected with Toxoplasmosis gondii (Bowater et al. 2003). T. gondii is a terrestrial parasite that can be fatal or have deleterious effects on the health of marine mammals (e.g., infection with T. gondii is one of the leading causes of mortality of southern sea otters along the California coast: Kreuder et al., 2003(Kreuder et al. 2003)). It was hypothesized the humpback dolphins could have become infected by T. gondii through ingestion of water or sediment with T. gondii oocysts (i.e. sewage discharge or floods that carry contaminated sediments into creeks and rivers); or by direct ingestion of feline faeces discarded from recreational vessels or feral cats around ports (Bowater et al. 2003).

Vessel traffic and noise pollution

Disturbance through vessel activity is often associated with



coastal development, recreational fishing and tourism activities. This can result in displacement of inshore dolphins from important habitats (eg. foraging or resting sites) and can have more direct impacts through vessel noise and collision. Evidence of vessel strikes exist in Roebuck Bay, Western Australia: In Roebuck Bay, 42% of 124 identified individuals available for assessment had marks/scarring from fishing gear, 10% had vessel strike marks, and 11% had marks indicative of both fishing gear and vessel strike (Thiele 2010). At least 45 dugongs were struck by boats, and most killed, in Queensland between 1996 and 2010 (Biddle et al. 2011). This number likely under-represents the scale of this problem as it only accounts for those that are found stranded and injured.

Cambodia

Cambodia Research needs: Mekong R I

Research Needs for Irrawaddy dolphins in the Mekong River are extracted from the recommendations in the "Kratie Declaration"

Mortality

- The necropsy protocol should be reviewed and updated. Attention to asepsis and minimizing cross contamination of samples should be undertaken during post mortem examinations, and broader samples retained.
- Live animal studies should be integrated with necropsy studies to determine if a mother of a dead calf is still alive.

Cambodia Research needs: Mekong R II

- **Neck Marks**
- Determine the association between characteristics of neck mark and stage of decomposition by reviewing photographs and coding both.
- Continue detailed necropsy examinations of perinatal animals to further characterize developmental stage and nutritional status of calves, and other lesions.
- **Contaminants**
- Samples should continue to be collected and archived from stranded animals for toxicological analyses.
- Samples that have already been analysed should be inventoried and preserved rather than disposed of by collaborating with institutions that can archive them for no cost.

Cambodia Research needs: Mekong R III

- **Population Dynamics & Demography**
- Current photo-ID surveys should be continued to provide data which can be used to estimate abundance and vital rates.
- The Beasley photo-ID catalog (2003-2007) should be combined with the WWF catalog, explicitly to look at recruitment to and losses from the population over a longer historical time period.
- Estimate ages from all specimens for which teeth are available to generate an age and sex distribution of dead animals and develop and age-length curve.
- Use laser photogrammetry of live animals in the field to obtain information on the distribution of size (age) classes in the population.
- Use remote biopsy sampling of live animals to obtain population-level information on: sex ratio; genetics; contaminant levels; reproductive hormones; stress hormones; and lipid levels.
- An individual-based demographic model should be constructed to guide future management efforts.

Cambodia Research needs: Mekong R IV

- **Behaviour & Ecology**
- Future field research should pay particular attention to the identity of females accompanied by calves, so that reproductive histories of individual females can be constructed.
- A behavioral study should be conducted during the calving season to describe interactions between mothers and calves.
- Although there is no published evidence that electro-fishing is a lethal threat to dolphins in the Mekong, this type of fishing cannot be ruled out as a source of calf mortality (either fetal or newborn). Concerted enforcement to reduce illegal electro- fishing is required as a precautionary measure, even while further efforts are made to understand the frequency with which this technique is used in the Mekong, how (and if) it affects dolphins, and whether the practice is increasing in extent or frequency.

Cambodia Research needs: Marine I

- General information on distribution and abundance of coastal cetaceans and sirenians
- Distribution and abundance of offshore marine mammals
- Direct catch:
  - Continuing for dugongs?
  - And direct catch for cetaceans?
  - Illegal trade in live animals and/or body parts
  - Interview surveys

Cambodia Research needs: Marine II

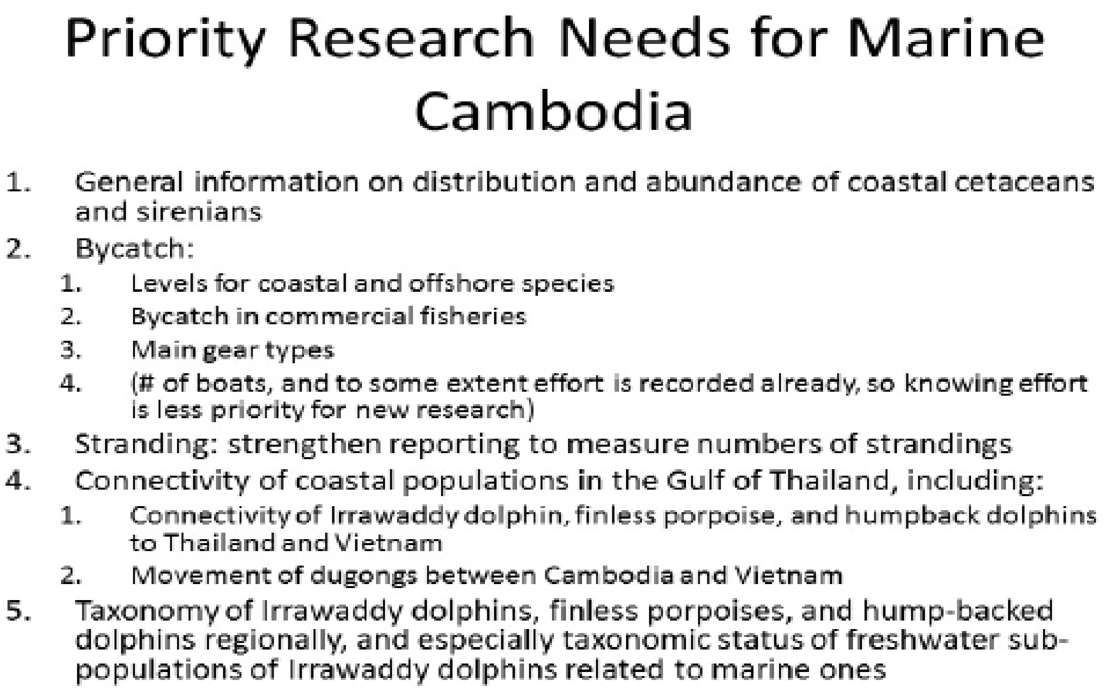
- Bycatch:
  - Levels for coastal and offshore species
  - Bycatch in commercial fisheries
  - Main gear types
  - (# of boats, and to some extent effort is recorded already, so knowing effort is less priority for new research)

Cambodia Research needs: Marine III

- Stranding
  - Strengthen reporting to measure numbers of strandings
- Perceptions of local fishers on:
  - Laws on endangered fisheries species
  - Importance of marine mammals and protected areas

Cambodia Research needs: Marine IV

- Specific research topics:
  - Connectivity of coastal populations in the Gulf of Thailand, including:
    - Connectivity of Irrawaddy dolphin, finless porpoise, and humpback dolphins toThailand and Vietnam
    - Movement of dugongs between Cambodia and Vietnam
  - Taxonomy of Irrawaddy dolphins, finless porpoises, and hump-backed dolphins regionally
    - Taxonomic status of freshwater sub-populations of Irrawaddy dolphins related to marine
  - Use of Cambodian waters by offshore species
  - Impacts of oil and gas exploration and extraction on Cambodian marine mammals (likely to increase in the next decade)



Chinese Waters

Sousa chinensis

- Long-term monitoring of abundance and distributions
- Population structure and distinctiveness
- Identification of most serious threats

Neophocaena

- Understand relative abundance and trends
- Bycatch numbers and trends
- Population structure

Western Gray Whale

Wintering grounds??

All cetaceans (dugong extirpated and not dealing with cold water species – i.e., spotted seal)

- Understanding bycatch levels for all species
- Basic data related to status assessments: population structure, distribution, abundance, seasonality

Indonesia

Five threats identified:

- Coastal and riverine development
- Pollution/debris (inc. noise pollution)
- Oil and gas exploration
- By catch
- Boat traffic and tourism
- Adding for ID: whale hunting

Additional issues/questions: Climate change, MPA connectivity

Population status and distribution

- Population status and distribution (including pop structure): sperm whales of Lamalera, *Orcaella brevirostris* & *Sousa chinensis* at West Kalimantan, *Stenella longirostris* & *Lagenodelphis hosei* at north Bali, *Dugong dugon* at Aceh and adjacent waters)

Addressing what threat or question: coastal & riverine development, tourism & boat traffic, whale hunting, MPA connectivity, climate change (in the long run)

Habitat use and habitat threat analyses

- Species & place: *Orcaella* etc at West Kalimantan, continuation of *Orcaella* etc at East Kalimantan, *Stenella longirostris* etc in south Bali, dugong at TBA
- Addressing what threat or question: coastal and riverine development, pollution/debris, oil and gas exploration, boat traffic/tourism, by-catch, climate change, indigenous hunting (dugong)

By catch analyses

- Identify fishing efforts
- By catch estimation and mitigation
- Something about socio-economic research on by-catch (the importance of fishing to communities? Any alternative livelihoods? Community perception, fisheries mgt)
- Site: TBA
- Addressing what threat or question : by-catch, pollution (particularly debris)

Impacts of oil and gas establishment

- Threat analyses (including seismic intensity, behavioral and/or migration changes
- Site: everywhere, particularly nearby MPAs (particularly eastern Indonesia)
- Addressing what threat or question: oil and gas exploration, coastal & riverine development

Impacts of cetacean watching industries

- Impact of tour boats to local cetacean populations (including their aggregation sites, behaviour, or migratory patterns)
- Socio-economic analyses of the tourism
- Site: Bali, Lampung (Sumatra), West Papua
- Addressing what threat or question : boat traffic & tourism

Water quality & noise analyses

- Analyses of water quality and noise level at marine mammal hotspots adjacent to or at polluted or 'loud' coastal/riverine areas
- Sites: TBA
- Addressing what threat or question : pollution & debris, oil & gas explorations, coastal development, boat traffic

Stranding analysis (incl. post mortem)

- Live-stranding medical analyses
- Dead stranding necropsy and post mortem analyses
- Addressing what threat or question : pollution & debris, oil & gas explorations, coastal development, boat traffic, by-catch


Research priorities
1. Population status and distribution
2. Habitat use and habitat threat analyses
3. By-catch analyses
4. Impacts of oil & gas establishment
5. Impacts of cetacean watching industries
6. Stranding analyses
7. Water quality & noise analyses

Malaysia


Malaysia
Research Priorities

Species – Research Priorities

Sousa chinensis / Orcaella brevirostris / Neophocaena phocaenoides + Tursiops

- Population estimates and monitoring (+ Passive Acoustics Monitoring)
- Movement and range (including transboundary)
- Identification of critical habitats
- Local knowledge / Community involvement
- Biological unit assessment
- Physical oceanographic effects/interaction
- Bycatch / Stranding info

- Sites
  - Penang
  - Langkawi and adjacent coast of Kedah & Perlis
  - Matang (Perak)
  - Brunei Bay & Cowie Bay
  - Kuching & Bintulu

Species – Research Priorities

Dugong dugon

- Seasonal distribution
- Seagrass wage
- Bycatch/strandings
- Population estimate + Monitoring
- Community involvement
- Genetics

- Sites
  - Johor islands
  - Brunei Bay
  - Sandakan
  - Kudat

Species – Research Priorities

Pelagic species + *Tursiops*

• Threats (Identify and quantify)
• Species composition and distribution
 	
• Sites
  • South China Sea
  • Andaman Sea

Needs

- General needs
  - MMO for Oil and Gas / Offshore / coastal development
  - Bycatch observer program
  - Stranding Network
  - Capacity building relevant government agencies
- Specific needs
  - Genetic analysis
  - Spatial analysis

Myanmar

Threats	Research Needs
• Gill-net • River Golding mining • Destructive fishing (Esp: electric fishing) • Dam • Offshore Oil and gas (EMP) • Deep sea port • Coastal Development • **Direct catch**	• Irrawaddy dolphin, Bryde's Whale, Indo-pacific Hump-backed Dolphin Genetic study • Cetaceans Survey training methods • Coastal surveys • Seagrass and dugong surveys. • Identification of seagrass user groups. • Scuba diving and underwater survey training. • Field equipment • Capacity building • Stranding network, Species ID

Philippines

Population studies/characterization

- Specific studies
  - Population size
  - Population stock
  - Population structure
  - Habitat range
  - Other behavioral studies
- Priority Areas
  - Cetaceans
    - Babuyan Islands
    - Palawan
    - Ticao
    - Bohol Sea
    - Guimaras and Iloilo Straits
    - Tanon Strait

Population studies/characterization

- Dugongs
  - Hinatuan
  - Southern Mindanao-Davao Gulf
  - Davao Oriental
  - Palawan
  - Guimaras

By-catch/Pollutants

- Priority Areas
  - Bohol Sea
  - Palawan
  - Panay Island
  - Tawi-tawi group of islands

*pollutants except noise

Human-cetacean interaction related to tourism

- Priority areas
  - Bohol Sea
  - Tanon Strait
  - Palawan

Investigation of new areas

- Priority areas
  - Eastern coast of the Philippines
  - Western Palawan
  - Mindanao
- Specific studies
  - Interviews
  - Actual surveys

Ecosystem-based studies

- Priority species
  - Irrawaddy dolphin
  - *Tursiops spp.*
  - dugong

Oil and gas exploration

- Priority areas
  - Palawan
  - Northern Luzon
  - Bohol Sea

Trainings

- Abundance surveys
  - Distance
  - Photo-ID
  - Acoustic
- GIS including modeling knowledge
- Biopsy, genetics & satellite tagging
- Necropsy
- Socio-economic
- Behavioral

Collaborations

- Japan (humpback)
- Malaysia (genetics)
- China
- Indonesia
- Australia
- Thailand
- USA (genetic-tissue banking, behavioral)

Thailand

Thailand threats

- Food resources & biodiversity degradation
  - Both small scale fishery and commercial boat(Unselective target species)
  - Trawler boat
  - Push net boat
  - Luna light boat/attract squid & anchovies

- Marine debris
- By-Catch (Gillnet, Trawler, Long-line hook, Squid trap)
- Boat strike on a Dugong(Andaman Sea)
- Pollution from Chao Phra Ya river
- Tourism(Khanom, Nakorn Si Thammarat)

Research Prioritization

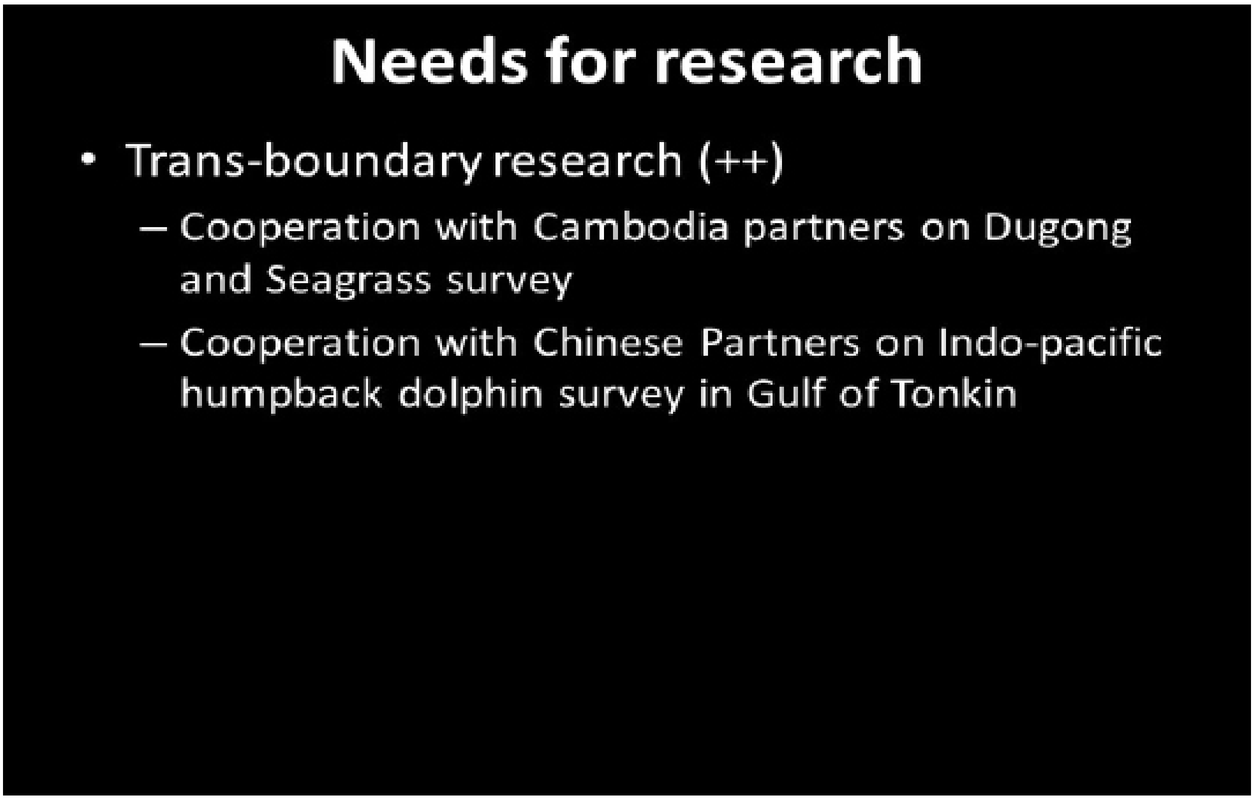
- Guide book and Training of stranding cetacean, First aid, Rescue and Management etc.
- Abundance & Population estimation
  - Mark & Distance SW Training
  - Stranded cetacean population estimation
    - Age/ Gender/ Size
      - Age investigation (teeth)
      - Taxonomy and DNA Analysis
- Acoustic research
- Morphology (Songkla lake)
- Demography
  - PBR, Migration, Mortality, Distribution etc.
- Socio-Economic research
  - Integrated Coastal Zone Management Research(ICZM)

Vietnam


Vietnam
Research and training: Needs and Priority


Needs for Training
• Training on species identification: (+++)
– Live animals (+++)
– Morpho-metrical method on skeletal/skull materials (+++)
– DNA analysis (protocols) (++)
• Population estimation (++)
– Line transect (Distance) (++)
– Photo ID (Mark) (++)
• Habitat assessment (++)
• Substantial training (+)
– Scuba diving
❖ Ideally, training is held in Vietnam to support more trainees and get attention of public awareness. Otherwise, we would like to send young scientist to other countries for training


Needs for research
• Species inventory (+++)
– Stranded marine mammals (based on morphology and DNA) (+++)
– Inshore survey (+++)
– Offshore survey (+)
• By-catch assessment (++)
– Interview fishermen
• Population estimate (++)
– Focal species: Irr. Dolphin, Dugong, *Sousa*
• Habitat assessment (++)
– Physical features
– Seagrass assessment (for Dugong)
❖ *Need to establish National Stranding Response Network*


Needs for research
• Trans-boundary research (++)
– Cooperation with Cambodia partners on Dugong and Seagrass survey
– Cooperation with Chinese Partners on Indo-pacific humpback dolphin survey in Gulf of Tonkin

Identification of Common Threats and Issues

Discussion led by Jo Marie Acebes

The main threats to cetaceans and dugongs in the region were identified by delegates to be i) coastal and riverine developments, ii) bycatch in fisheries, iii) oil and gas development, iv) boat traffic and tourism and v) pollution. These were discussed in breakout groups in terms of the source of each threat, impacts to cetaceans, and actions necessary to mitigate, reduce or eliminate the threat. Each of these groups also prepared a summary document or presentation to bring back to the assemblage as a whole. Also listed as threats or issues but not identified as major at this time were:

- More need for MPA's
- Climate change
- Scientific capacity
  - Inadequate funding
- Governance issues
- Lack of awareness of conservation
- Military activity
- Boat traffic (collisions)
- Transboundary collaboration

(i) Coastal and riverine developments

Species identified as most at risk from coastal and riverine developments are the Indo-Pacific humpback dolphin, Irrawaddy dolphin, finless porpoises (*N. phocaenoides* and *N. asiaorientalis*), bottlenose dolphins (*T. aduncus* and *T. truncatus*), dugong and offshore/deep water species (for countries such as Indonesia and the Philippines that have deep water close to shore). Pollution from industrial and developmental runoff as well as heat pollution was indicated as one of the main impacts of coastal and riverine developments. Delegates identified that the threats of such pollution to marine mammals were many and included reduced survival rate of neonates, ingestion of debris (especially plastics), degradation of habitat due to eutrophication (which can lead to toxic algal blooms) and decreased fecundity. The other main impact that was identified was habitat loss to marine mammals due to sedimentation and soil erosion which subsequently causes a depletion or loss of food resources. Habitat loss also causes population fragmentation, and furthermore, coastal developments cause encroachment of anthropogenic activities (e.g., vessel traffic, jetties, and anchorages) in areas that are important habitats to marine mammals. These cause noise pollution and can bring about behavioral changes and shifts in the home ranges of animals, increased strandings as well as increase the risk of human-induced injuries to the animals. When dealing with developments, delegates agreed that there remained a lack of linkage and engagement between scientists, government and other stakeholders in the community. Recommended actions to account for the welfare of marine mammals affected by coastal and riverine developments were emphasized on stronger engagement with policy makers and stakeholders for responsible and sustainable development. There is also a need for better outreach to stakeholders, and scientists should work closely with educators and non-governmental organizations that have capacity to conduct awareness campaigns on the importance of marine mammals and sustainable development.

(ii) Bycatch in fisheries: Catch, destructive fishing, live captures & medicinal use

The delegates agreed that the issue of cetacean bycatch in fisheries remained more or less status quo since the last SEAMAM. Both incidental and directed catches of cetaceans and dugongs are still occurring. However, the issue of live captures of cetaceans was not discussed. Time is of the essence and realistically, the issue of bycatch should not await further research before any management and conservation actions take place. While we know that the issue of cetacean bycatch is pressing, in general, there remains many unknowns. Little is still understood about the magnitude and extent of fishing effort and status of fisheries and issues associated with fishers' livelihoods and cultures, let alone the quantification of bycatch numbers. Additionally, much of the efforts involved in assessing cetacean bycatch in fisheries involve gillnet fisheries, and less on other types of fisheries. For directed catch of cetaceans, new information on target species and locations is emerging, as a result of increased monitoring. The meat of animals that are caught are usually consumed, used as shark bait or in traditional medicines. However, the trend in directed catches of cetaceans is unclear, however in some cases, the activity may not be passed down to the next generation, while in other cases, the value of such meat will increase due to its rarity, causing a market for it to grow. Additionally, directed catch of cetaceans may continue due to the decline of other food resources.

Given the status quo of the bycatch issue, pro-active measures were identified and recommended to effectively try to reduce bycatch. There should be dedicated forums for cross-site and regional exchange of gear solutions and information exchange to better understanding of fishing effort and fisheries management. These forums should not be limited to researchers and include fisheries managers. There is also a need to gain a better understanding of the status of cetacean stocks in this region so that the magnitude of impacts from being bycaught in fisheries can be better assessed. In some parts of SE Asia, there are new developments in awareness/efforts for reducing bycatch. For example, in Myanmar, a bycatch report was made in 2005 while in Sarawak, Malaysia, a fisherman surrendered the tail of a bycaught cetacean to researchers (its body had been sold). In Vietnam, efforts are made to reduce bycatch by emphasizing the cultural significance of cetaceans to the coastal communities and to try regulating the use of untended gillnets (rather than imposing a total ban on their usage). In Taiwan, a new fishery for sunfish (Mola mola) is emerging, using nets with 1m mesh size. This fishery has resulted in a high number of cetacean bycatch, and as a mitigative measure, CDs are now used as net reflectors to try and keep the animals away. In Songkhla Lake, Thailand, efforts to reduce bycatch include buy-back of catfish nets from the fishers. Even so, the status of the issue of bycatch in fisheries in SE Asia has not changed much since the last SEAMAM. Much of what was discussed in the call for a draft action plan is still ongoing. Efforts to address problems have stalled in many places, and there is a need to revisit these.

(iii) Oil and gas development

The delegates find that oil and gas development is becoming a significant threat due to the increase in oil and gas activities around the region. Threats from the oil and gas industry to marine mammal populations vary according to the stage of development from exploration to extraction to production. All countries within SEAMAM are affected by oil and gas development with Philippines, Malaysia, Thailand, Vietnam, Indonesia and northwestern Australia particularly susceptible due to the rapid increase in oil and gas activities within their maritime boundaries.

Delegates stated that issues relating to oil and gas activities have currently expanded to include all marine areas (from nearshore to deep water) with the advent of deep water oil and gas exploration and production in the region. Threats differ depending on the location in which activities are conducted as well as the species affected. Common impacts include physical injuries, health and physiological effects, and habitat loss.

Exploration methods are currently advancing at a rapid rate and include utilization of seismic sources (e.g. air guns and explosives), multi-beam sonar, and exploration drilling. Such activities generate a variety of impacts, such as the generation of underwater noise, hazardous waste, and entanglement risk. Although activities are governed by international policies (e.g. MARPOL and the Basel Convention), it remains unclear if operations in every country within SEAMAM are abiding by these regulations.

As activities proceed to extraction and production stages, other issues arise, including the generation of continuous underwater noise, increase in vessel traffic and pollution. Associated activities also pose a problem. Development of ports and receiving facilities onshore contribute to a project footprint that causes impacts to the marine environment. There currently exists broad variation in regulation and standards across the region with many countries having little or no apparent environmental impact assessment (EIA) process or regulation of impacts. EIA processes remain inadequate and non-transparent in many parts of the region, although some countries have established good EIA mechanisms, such as Australia. However, some multi-national oil corporations follow industry best practices in areas they operate as part of their corporate commitments, based on obligations to their home country regulations.

In light of the rapid expansion of oil and gas development, delegates suggested on a number of recommendations to mitigate impacts of such activities to marine mammal populations in the region. Recommendations include the implementation of transparent EIA processes incorporating measures such as advance notice and public consultation, which should include consideration of marine mammals and associated habitats. Additionally, requirements for mitigation and monitoring of impacts of such activities should be made available throughout a project life cycle from design, execution, to decommissioning. Specific requirements to mitigate impacts on marine mammals (mandatory provision of marine mammal observers, passive acoustic monitoring operators, ramp up of seismic source, etc.) should also be incorporated in activities deemed to pose significant risk to marine mammals (e.g. seismic exploration, sonar and construction of offshore facilities).

(iv) Boat traffic and tourism/stakeholder involvement in management & conservation

Increases in boat traffic and tourism activities in SE Asian waters was identified as a common issue and threat for the region. Most tourism activities in the region relating to cetaceans were year round, and usually started at sunrise, with trips going as late as 1900 hours. Three main issues stemming from tourism were singled out: unregulated tourism (i.e., not regulated, loosely regulated, not enforced), number of boats, and transboundary tourism (e.g., operators in Laos go into Cambodia for tours to watch Indo-Pacific humpback dolphins, and each guest only pays USD1 per entry). It was established that most countries within SE Asia did not have tourism regulations specifically pertaining to dolphin-watching and swim-with activities. These include lack of regulation on the number of permitted tour boats, ownership of the tour boats, number of passengers per boat, and the number of boats permitted around a dolphin group. The highest number of tour boats reported following a group of dolphins was 350, in the Philippines. However, in some tourism areas that involve cetaceans, marine protected areas are already established. In such places, it was suggested that the protected status of the area serve as an enforcement tool for responsible dolphin watching. There was also a consensus that boat traffic and speed limit zones are necessary in areas with intense dolphin-watching activities.

The needs for cetacean tourism in this region was also discussed. It was concluded that legal dolphin watching guidelines needed to be developed, accompanied by a sound and strong enforcement system. Training and outreach for tour operators on guidelines compliance can further enhance the management of cetacean tourism in the relevant countries. Additionally, it was suggested that an accreditation system for responsible tourism could be developed and implemented, whereby tour operators have to fulfill certain criteria to become accredited, which in turn can boost their businesses while ensuring that their tours are sensitive to the needs of the target species. The SEAMAM III delegation also strongly supported the development of educational materials for tourists and local community where cetacean tourism exists. Educating both groups on basic cetacean ecology, sensitivities related to the animals' welfare in relation to tourism, and the benefits of choosing responsible and/or accredited tour operators would serve to improve the status of the cetacean tourism industry in this region. The local community itself could take on a more active role in ensuring that the tourism industry is well-managed; peer pressure may be advantageous in seeing more tour operators adopting good dolphin watching practices.

Finally, with increasing cetacean tourism in the region, the SEAMAM III delegation agreed that scientific research on the target animals is crucial for better management of the industry itself. More research to gather baseline population estimates and distribution patterns, preferably at the onset of an industry in any area, will serve to allow for monitoring of trends within the target cetacean population(s). The study of behavioral ecology of the animals is also important, for assessing the impacts of the tourism industry on the population. It was mentioned that in some places such as New Zealand, research has shown that dolphins were leaving their habitats due to intense dolphin-watching activities. There were suggestions for land-based cetacean tourism in suitable areas to reduce the stress brought upon the animals by boat-based tourism.

(v) Pollution/debris

Pollution remains as a critical issue within the region, with impacts categorized into marine debris, chemical, biological and noise pollution. Marine debris include solid waste found floating in the ocean with items such as plastic-based materials, lost or abandoned fishing gear, and other materials. Delegates stated that there have been multiple cases around the region where marine mammals were found to be affected by the debris through ingestion and entanglement. Such cases typically result in physical injuries with some leading to the eventual death of the animals. It was agreed that there is a pressing need for a change in community attitude and perception through education throughout the region. Additionally, implementation of proper garbage disposal systems in developed areas on both land and sea is urgently required to reduce waste being introduced into the marine environment.

Chemical pollution arises from various sources including hydrocarbons from vessels, industrial waste and agricultural runoff. Marine traffic density is increasing within the region and vessels plying the region's waters have been found to have low or non-compliance to maritime laws regulating waste disposal (e.g. MARPOL). It was agreed that there is a need for stricter port regulations and enforcement relating to waste disposal, especially at a local level involving small vessels. Alternatives for waste disposal should be explored and education provided to stakeholders on the importance of proper waste handling and disposal. Agricultural runoffs and industrial waste typically contain high contaminant loads which may potentially cause health impacts to marine mammals. Such impacts may include reduced prey availability, reduced neonate survival rate, and physical injuries. Introduction of contaminants into the marine environment have been shown to cause eutrophication, toxic algal blooms, and reduced oxygen availability in the affected areas. Increasing water quality monitoring efforts in the region and introducing sustainable agricultural practices with less reliance to chemicals (e.g. pesticides) should be undertaken. In addition, more studies on the effects of chemical pollution to marine mammals should be conducted throughout the region.

Biological pollution involves the proliferation of organisms which can cause infectious diseases to marine mammals such as certain species of parasites, fungi and bacteria. In many cases, these organisms are introduced or reproduce rapidly due to the improper disposal or waste or inadequacy of sewage systems currently in place. Delegates agreed that there is currently a need to educate stakeholders on the issue and to implement programs to monitor disease prevalence in marine mammals throughout the region. There is a need to build capacity on disease identification and management in the region and international assistance is likely to be required.

Noise pollution arises from various sources including oil and gas exploration, military activities such as use of sonar, vessel traffic and underwater construction activities. Impacts of noise pollution are known to cause reduced echolocation range and communication impairment to marine mammals. Marine mammals are also known to suffer from permanent or temporary threshold shift in their hearing as well as behavioral changes due to exposure to excessive noise. In certain circumstances, exposure to noise can cause bends and embolism, which leads to an increase in stranding events and mortality. It was agreed that more noise monitoring efforts are needed in the region to further understand the extent of the problem to assist in the design of effective mitigation measures.

Coastal and Riverine Developments

Species

- Sousa chinensis
- Orcaella brevirostris/heinsohnii
- Tursiops aduncus
- Neophocaena phocaenoides
- Dugong dugon
- Pelagics

Pollution

- Impacts
  - Neonate survival
  - Ingestion of debris (mostly plastics)
  - Reduced fitness
  - Increased stranding (noise)
  - Entanglement
  - Eutrophication
    - Prey availability
    - Oxygen
    - Toxic algal blooms

Pollution

- Action
  - Community education
    - Provide information to organizations with better capacity for educating
  - Provision of environmental education information to supplement business studies
  - Advocacy to politicians/policy
  - Science ambassador
  - Models?

Habitat Loss

- List of habitats
  - River
  - Mangrove
  - Sea grass
  - Coral
  - Mudflats

Habitat Loss

- Impacts
  - Food availability
    - Reduced fitness (e.g. Dugong dugon)
  - Population fragmentation
- Action
  - Advocacy to policymakers
  - Appropriate MPA designation
  - Off-site mitigation including restoration
  - Research to understand effects of population fragmentation

Encroachment

- Impacts
  - Noise pollution
  - Injury/mortality
  - Home range shift
  - Behavioral change
    - Feeding
    - Surfacing
    - Compromises natural behavior
- Action
  - Research to understand and define impacts
  - Coastal zone planning – Advocacy to policymakers
  - Community/stakeholder education

Resource Depletion

- Impacts
  - Competition
    - Food availability->reduced fitness
  - Water extraction
    - Heat pollution
- Action
  - Advocacy
  - Socio-economic study to improve women's livelihood and health in coastal communities

Concluding Statements

- Advocate for responsible and sustainable coastal development through strong engagement with policymakers and other stakeholders
- Will supplement this with success stories/case studies (plastic bags-Penang)

Bycatch in fisheries: Catch, destructive fishing, live captures & medical use

Bycatch	Directed	Live
Unknown fishing effort Incomplete understanding of magnitude and extent Livelihood issues Consider gears beyond gillnets?	Incomplete understanding of magnitude and extent Livelihood issues – consumption Cultural issues	Someone else!

- Realistically – can't wait for thorough research
- What can we do with the information we have?

Needs

- Cross-site (and regional) exchange re: solutions
- Gear solutions
- Linking in to understanding of fishing effort and fisheries management
- Better understanding of stocks so can assess impacts

Bycatch/Non-target catch

Points to consider/Updates:
- 2005: Report on bycatch in Myanmar
- Sarawak: Fisher gave bycaught
- Vietnam: try to reduce bycatch by emphasizing cultural role
- Try regulating unmanned gillnets rather than complete ban
- New fishery for sunfish in Taiwan, 1m mesh, midwater
- CDs as reflectors
- Looking to efforts like buyback (e.g., Songkla Lake)

Direct (Lethal) Catch

- PI: New information emerging – species and locations, as a result of more monitoring
- Use as consumption, bait, medicine
- Trends: Generational process, decline of other resources, value of rareness

Live Capture

- Stay tuned!

Oil and gas development

OIL and Gas Development

From exploration to extraction and transport

A. Region

- Australia, Philippines, Malaysia, Thailand, Vietnam, etc. All Countries

B. Problems:

Oil and gas development from deepwater to the cast – involves a lot of different threats

1. Exploration

Seismic, vessel traffic, multi-beam sonar, explosives, drilling, waste

2. Extraction/development

Noise, vessel traffic, pollution
Port development

Broad variation in regulation and standards across the region. Many countries have little or no apparent EIA processeses or regulation of impacts. EIA processes are inadequate and non-transparent.

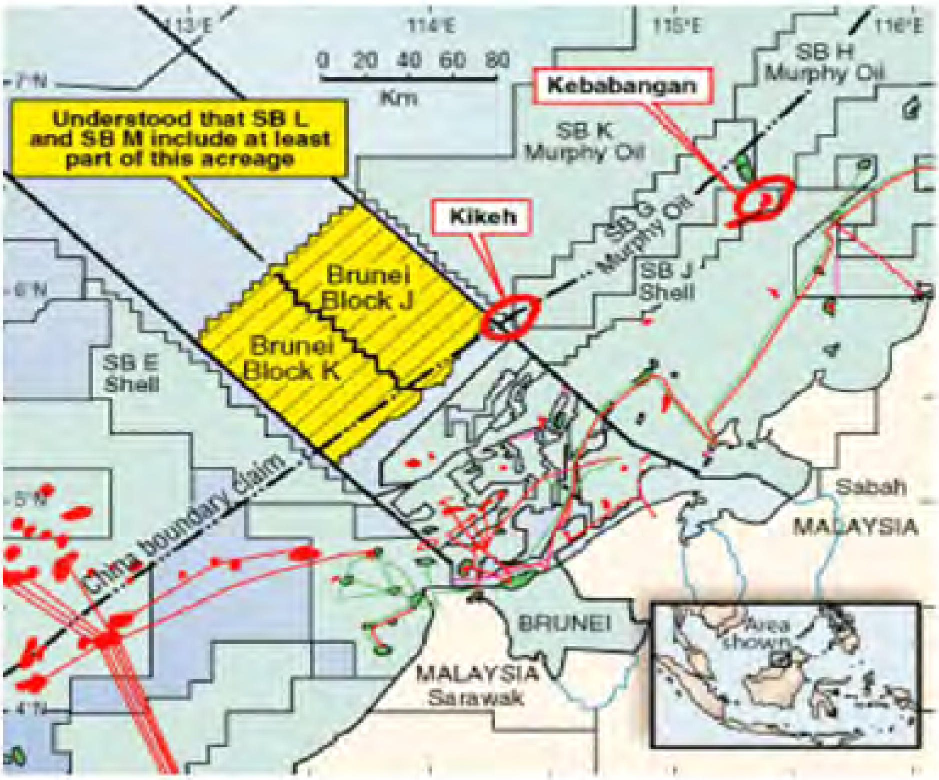
Best practices and standard regulation does exist and is implemented elsewhere – some multi-national oil companies follow industry best practices wherever they operate

C. Recommendations:

1. Implement transparent eia and advance notice and public consultation processes, including consideration of marine mammals and associated habitats.

2.Implement requirements for mitigation and monitoring of impacts of exploration and development activities throughout the activity cycle from design to execution to decommissioning. Implement specific requirements to reduce impacts on marine mammals (e.g., marine mammal observers, shutdown, ramp up)


PHILIPPINES
PETROLEUM SERVICE CONTRACTS
LUZON
SOUTH CHINA SEA
PHILIPPINE SEA
SULU SEA
MINDANAO
BORNEO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Murphy Oil
SB J
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SB E
Shell
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Sabah
MALAYSIA
BRUNEI
MALAYSIA
Sarawak
Area
shown

Boat traffic and Tourism/Stakeholder Involvement in Management & Conservation

Malaysia

- Dolphin watching in Sarawak, 10 boat operators, Irrawaddy dolphin, community and company based connected to a travel agent. They don't work together.170-180 RM per person/per trip. 6-7 boats. Year-round. Peninsula, opportunistic. Regulations: no dolphin watching regulations in Sarawak. There are informal guidelines by the information board, but mostly on the practice. Feed small fish to attract the fish. No guarantee that dolphins will be seen in Sarawak. 9am-12pm, 5-7pm. Full-time tour guides, with plans to help the community for times where wildlife watching is not possible. No swimming. 8-12 people. 2-5 boats maximum surrounding. 3 pods maximum. Existing MPA may cover the waters (?)
- Non-tourism

Heavy boat traffic areas in the country:

Thailand

- Sousa chinensis, 50 boats from 3 communities, coastal area. Company and community. Year-round, except Nov-Dec. Unknown number of boats per community. Part-time fishers. 8am-12pm. Guidelines for the approach that is voluntary and not from the government. Some communities do dolphin feedings. Buy fish from communities. No swimming. Likelihood, 50% chance of seeing them. 1000Baht per boat per trip, 8 persons. Also sees finless and Irrawaddy. 1 million baht per year, estimate from boat trips. 1-12 boats surrounding the pods. After trips fishermen give the 50 Baht to fishers for the collaborative.

3 transportations reported for boat traffic. Surat Thani

Cambodia

Irrawaddy in freshwater. Kampi (27 boats, locals, government manages the area) local communities benefit from tourism because they own the boats, year-round, peak season is dry season. Cheuteal (? Laos to Cambodia, transboundary tourism), year-round, peak season is dry season. No regulations. Boats from Laos Pay 1usd per person for the border police to do wildlife watching in Cambodia (private company). No regulations. No feeding, swimming. Both are located in an MPA. They always see dolphins. 9usd per 1 person, 1.2usd for locals, includes entrance fee and boats. Morning to 5pm. 1-15 number of boats maximum, person per boat. Mekong rive. 20,000 people per annum for foreigners, about 60,000 for locals.

Commercial boats to be determined.

China

- *Sousa chinensis*, Mainland China, HongKong. Pearl river. Guangxi province, San Niang Bay. 20 boats, community, company and the government. 8-20 people per boat. Season all year-round. 8am-7pm. Regulations none. No guidelines. No feeding, no swimming. >50%. 130 chinese yuen, per person per trip. Only area not MPA in China. 1-8 boats per pod observed. 1-2 pods during the activity. 110,000 in 7 days, boat count unknown which involves fisher boats.
- Boat traffic is coastal traffic.

Philippines

Stenella longirostris, Tursiops, two islands (Pamilacan and Balicasag), both are protected areas. P=100 boats, regulated, not all operate in one day. Well spread within a week, tourism office exists with video before the tourists depart. Legal regulation: Regulated distance, type of approach is defined. Max time per viewing 15 min per pod, no underwater noise, no swimming, no feeding, max allowable boat per pod=5, NGOs work with this former whale watchers.
Panglao: 350 boats; max 90 boats around a pod. Boat strikes recorded. High avoidance behaviours.

1-40 people per boats, privates and villagers own boat. Privates 20 boats. 800 pesos per person per trip (including lunch). Whale watching starts at 4:30am to 2pm.likelihood very high.

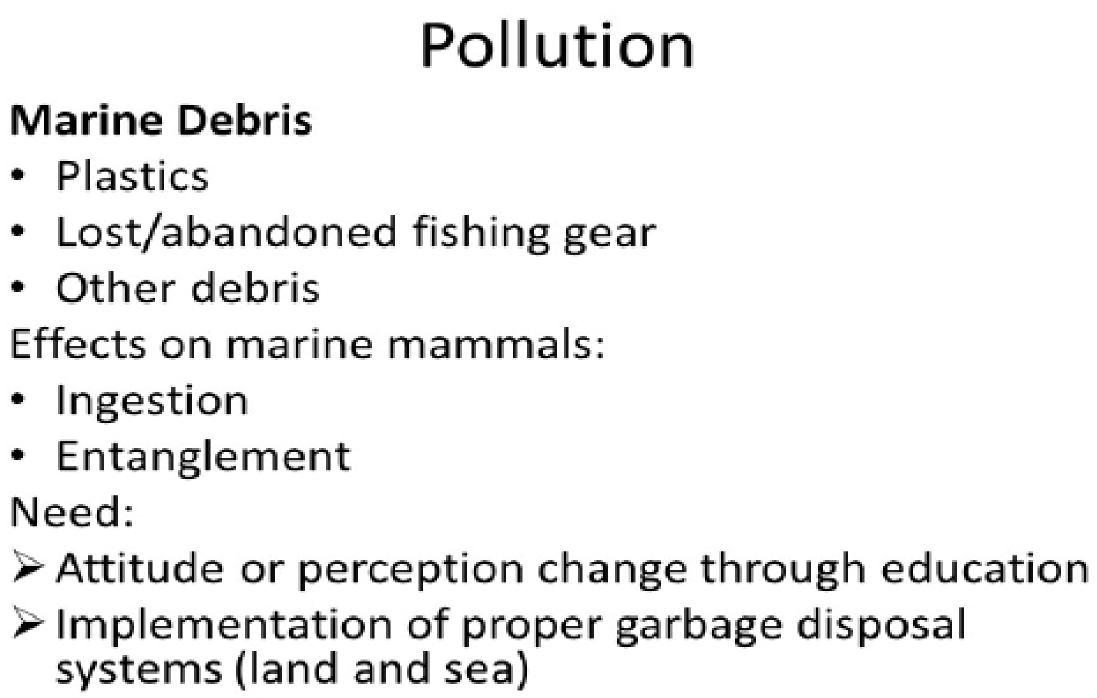
Boat traffic: Gimaras and Ilolas

Indonesia

Spinner dolphin and Fraser's, 180 boats Lovina. 98 boats per pod. All community owned boats. 1 sustainable boat (north of Bali) All year-round. No regulations for code of practice. No feeding and no swimming. High likelihood. 6-7usd per person per trip, 6-8:30am. MPA is set, they are taking dolphin watching into consideration of the zoning. 37,000 annual tourists, (60% westerners). 1 boat is 4 pax.
South Bali, 1 dedicated tour boat promoting the tours and some small boats. Not many tourists go there because of the location. 50 usd per person per trip. 7:30-9:30am.
Boat traffic is at East Nusa Tenggara

Issues	Needs
Unregulated tourism “NO REGULATION”	Legal guidelines with strong enforcement
Number of boats	Training them for guidelines with accreditation
Trans-boundary tourism	Local should take part in the development of code of conduct
	Educational materials
	Community involvement
	Baseline population of the marine mammals (number of individuals, species involved, behavior)
	Socio-economic research for improvement of tourism practices.
	Consideration for land-based tourism
	Develop a trans-boundary committee to manage on-site
BOAT TRAFFIC	BOAT TRAFFIC
Unregulated zones for boat traffic	Regulation and monitoring

Pollution



Pollution

Chemicals: Oil from shipping (Commercial liners, Military, Small boats)

Effects on marine mammals:

- High contaminant loads with potential health effects
- Chemical burns

Problem:

- Low or non-compliance with regulations (e.g. MARPOL)
- Increase in density of vessels

Need:

- ➢ Port regulation and implementation
- ➢ Education
- ➢ Regulation at local level (e.g. for fishing boats)
- ➢ Providing alternatives for disposal of waste

Pollution

Chemicals: Agricultural Runoff (e.g. N-P-K, DDT, other pesticides)

Effects on marine mammals:

- High contaminant loads with potential health effects

Need:

- ➢ Introduction of sustainable farming techniques
- ➢ Education to achieve attitude change
- ➢ Monitoring of water quality in headwaters and coastal areas

Pollution

Chemicals: Industrial Runoff (incl. Nuclear, POPs, heavy metals, PCBs)

Effects on marine mammals:

- High contaminant loads with potential health effects

Need:

- ➢ Effluent monitoring for standard compliance
- ➢ Studies on effects on marine mammals (individuals and populations)

Pollution

Biological

Effects on marine mammals:

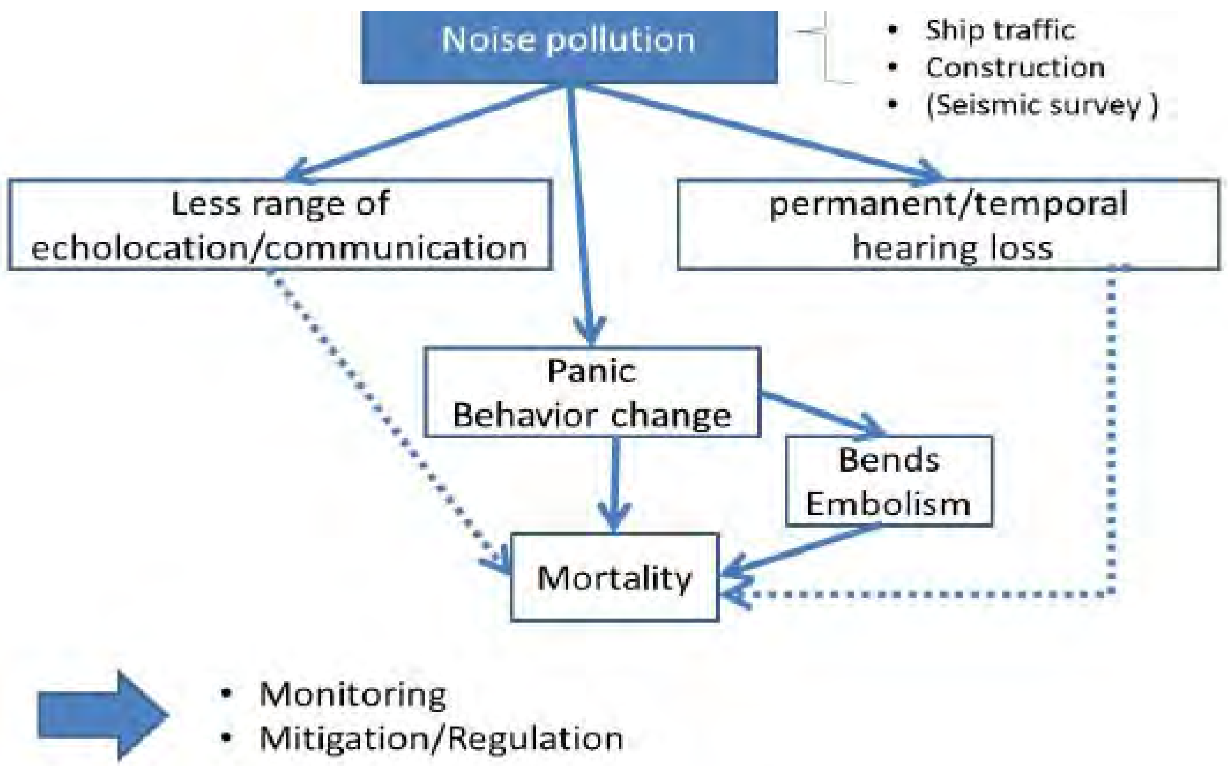
- Infectious disease (parasites, fungi, bacteria)

Problem:

- Improper disposal or inadequate sewage systems

Need:

- ➢ Education
- ➢ Monitoring of disease prevalence
- ➢ Capacity-building and international assistance



Summary of Regional Threats and Research Priorities

Discussion led by Anouk Ilangakoon

For this discussion, Anouk picked out cross-cutting themes from country presentations and other discussions throughout the week. The research needs that she chose to prioritize were:

- Population assessments, distribution, habitat
- Fisheries related mortality
- Oil, gas and minerals exploration (wasn't such a concern at last SEAMAM)
- Tourism impacts
- The need for regional collaboration

Anouk chose four of these for the delegates to discuss in further detail: 1) fisheries related mortality, 2) oil, gas and minerals exploration, 3) tourism impacts and 4) the need for regional collaboration. Notes was taken and added to the accompanying presentation. This report documents the discussion among delegates as we looked at these four threats and issues.

1. Fisheries related mortality

- Bycatch assessment is inadequate in most countries
- Even where assessments have been done in the past, no updates
- Can we think about a regional mechanism to help all countries fill these gaps?
  - Louisa Ponnampalam: Idea – wonder if we can link up with SEAFDEC – they are regional and look at fisheries development
  - Tara Whitty: There are trainings (Too Big to Ignore, SAFRN group at Scripps) for interview-based methods. There are definitely guidelines for rapid characterization.
  - John Wang: we might want to pick out a few potential high catch fisheries and talk with fishers to see if can go on boats and watch
  - Began observer program in Bay of Fundy in 80s, early 90s; looked in phone book and looked up fishers who had gillnet licenses and got someone to agree to take him out. If have even one fisherman, that's empirical data. Have to start somewhere. Selected a port, learned type of boat/gear, and counted. There are ways to get fishing effort data.
  - Aung Myo Chit: In the Ayeyarwady River in 2010, we found four dead dolphins caught in fixed gillnets. The Department of Fisheries worked very hard to confiscate unattended fixed gillnets.
  - Anouk Ilangakoon: a big problem is larger gillnet fisheries that operate everywhere – how to monitor that? How possible to implement?

- Louella Dolar: Look at satellite picture of lights and look at water, not land. Many water areas have lots of light. Purse seiners use lights. Put together prey and predator at these congregation sites. A place to start looking at bycatch.

- Ellen Hines: CMS dugong interviewing tools available to everyone
  - What can be done next?
  - Marine mammal observer training
- Phil Dearden: If we get back to Louella's point, bycatch is not randomly distributed, there are areas where it is more focused and concentrated; place-based conservation methods come into play, such as marine protected areas.
- Tara: Louella has done great work monitoring commercial fisheries, and everyone could learn a lot from her papers and

methods.

- Louella Dolar: Our work is community-based. Trained fishermen in data collection methods: photographs, etc. Help identify, measure, and count. Employed whole families. Later, when protection passed, it was hard to get bycatch data. Fishermen changed fishing areas, cut up dolphins and took them up into the mountains. We revisited then and asked the same fishermen if there was bycatch in driftnets and purse seine. They said that there wasn't because there's no market for them anymore. Now, when they see dolphins, the let them get out of the net. Some positives have come out of the changing market.
- John Wang: We should get data from a country where enforcement is not strong or unlikely to change behavior of fishers. We can likely get good data now before people hide the bycatch
- Anouk Ilangakoon: I had the same experience – as soon as laws came into place, bycatch went underground.

2. Oil/Gas/Mineral Exploration

- No Environmental Impact Analysis (EIA), monitoring, Marine Mammal Observer (MMO) requirements or implementation
- Research needs: when/where it's happening; monitoring programs and mitigation
- Data on which to base recommendations
- MMO training
- What other ideas do we have to take this forward throughout the region?
  - MMO certification and training is available in Hong Kong
  - Tom Akamatsu: EIA processes need robust research and local expertise
  - Randy Reeves: There are two types of MMO's:
- Seismic vessels: but just insisting that a vessel have MMO's doesn't matter unless the observer has some authority to shut down/respond to observations, and there is a well-designed exclusion/safety zone
- Someone simply on a transport/construction vessel to observe/ensure that when something loud other than seismic happens in a place, nothing bad happens to animals
- What is it that you envision for the roles and skills of MMC?
  - Lindsay Porter: both of the above; there is that structure lacking in Asia, and the companies are not keen and not required to have MMOs; but because of global commitments by some companies, there are now requirements to use home country rules in other countries
  - Reason ships have MMOs in Hong Kong is when they are asked for them by oil company who must have them on board
- Doesn't know if will become more structured as more companies need to comply
- No idea how effective it will be for establishing exclusion zones, etc.
  - Fairul Izmal: Yes, companies follow home country regulations; most exploration following International Finance Corporation standards and World Bank criteria, usually follow Joint Nature Conservation Committee guidelines, but what is lacking is that reports only go to the company – not to any regulatory body within any country, not in Malaysia at least; we don't know how effective MMO's are because no one sees the report.
  - Anouk Ilangakoon: because countries don't have requirements?
  - Fairul Izmal: yes. Also, actual extraction is another big issue; having a lot more development that don't use platforms
  - Saifullah Jaaman: I received MMO training when doing my PhD and conducted two MMO jobs in Malaysian waters; the procedure is quite straightforward – can get guidelines from MMO website, but data just go back to company.
  - John Wang: Just because there are not EIA's here, doesn't mean we have to follow what's done outside; EIA's are flawed anyway, with clear conflict of interest with consultants as contractors to companies; might want to set up process where some other body decides who is selected for work
- Companies get to hire their favorite consultants – a clear conflict of interest
  - Ellen Hines: Was asked by Daniel Pauly to join a group to look at every aspect of Belizean waters; got together for 2-day meeting, and had to go do interviews and talk to the press; Belizean people voted down permission for offshore drilling in Belize as a result of the meeting.
  - John Wang: need to identify what can/can't do in given country with media

3. Tourism

- Monitoring of marine mammal watching activities from their inception is mostly absent
- Regulatory mechanisms are mostly absent or where they exist inadequately enforced.
- Research needs: Research on all aspects of marine mammal watching activities including direct and indirect impacts
  a. Mechanisms by which such activities can be made more sustainable
- *Is the development and adoption of a regional marine mammal watching best practice guideline or code of conduct a possible solution to some of the problems or any other ideas?
  - In most places, there hasn't been much research
  - Is it possible to develop/adopt regional guidelines?
  - We need best practices guidelines for MPA's, so they can be a good tool for tourism guidelines; most countries don't have guidelines or regulations.
- Putu Liza Mustika: in Indonesia there are no requirements; e.g., In Lovina, they used an MPA as good tool to regulate industry
- Guido Parra: are there any permitting processes for whale watching?
  - Putu Liza: yes because there is an MPA framework
  - Edna Sabater: In the Philippines, anyone can do this without regulations of numbers
  - Tara Whitty: What about regulations for Donsol Bay in the Philippines?
- Jom Acebes: they have regulations for practices, but not about limits for number of tourists; have boat registration

requirements, but no limits to the numbers of boats.

- Alesandro Ponzo: In one site, they just made a local ordinance where there is a process of accreditation and training and guidelines; it took a long time, and is not great, but it's there; percentage of revenue goes to research team
- In Donsol Bay: they have an ordinance and a protected area for whale sharks, but it's not enforced
- Randy Reeves: Using animal watching platforms as research/data gathering platforms can be a positive aspect of tourism.
- Phil Dearden: We've published this re: similar work in Thailand, calling the whole thing "tourism management" – but how to manage this effectively? Because wider a context includes assessing impacts.
- Ellen Hines: Suggested interviews for tourist satisfaction
- Putu Liza: Could come out with papers from this meeting.
- Ellen Hines: Propose symposium at SMM meeting in New Zealand.
- Putu Liza: Need to analyze general regulations to see if there are things that could be re-provisioned into whale watching regulations
- Leela Rajamani: Such as educating tourists themselves
- Phil Dearden: Awareness builds compliance
- Putu Liza: On the Great Barrier Reef, there is a swim with minke whales program. Each company has to brief all the guests regarding what they can and cannot do. If they don't brief, license can be revoked.
- Zhou Kaiya: There is well developed whale watching on the east coast of Taiwan. Don't have details.
- Guido Parra: if you want to develop marine mammal guidelines you need robust studies on the impact of marine mammal watching programs on marine mammals in the area.
- Putu Liza: Hard to do when there are 50+ boats around.

4. Need for shared collaboration

- Transboundary research where shared populations exist
- Collaboration on training and sharing of expertise
- Other areas that we can collaborate on as a region?
- John Wang: Cut SEAMAM intermeeting interval down. We need more SEAMAMs which will help engender natural collaborations
- Fairul Izmal: Collaborate in approaching industries and governments as a region. Look at threats and mitigations measures that the region as a whole can adopt for all species and habitats
- John Wang: including fisheries?
- Fairul Izmal: yes, some of these fisheries are transboundary, it makes sense to collaborate
- Phay Somany: Talking about trans-boundary collaboration, this meeting may not be enough. Need mechanism at the area. Need more than recommendations on paper, need things happening on the ground.
- E.g., Cambodia and Laos – long time ago, done a lot of work; need activity on the ground
- Phil Dearden: MPAs – must be functional networks, usually regional/international. Transboundary MPA's are a good idea in that regard, moving us forward in terms of conservation.
- Leela Rajamani: Developing countries face funding issues and we shouldn't do research that has already been done by developed countries and copy their methods. Should develop own research methods that are regionally appropriate and practical.
- Putu Liza: Stranding workshops will elaborate on trans-boundary collaboration
- Lindsay Porter: We have already set up collaborative projects through stranding
- Zhu Qian: We have had training workshops in China, and let government and media know; let people in charge of fishery know about what they're doing. We asked media, governor and the mayor to attend international meetings
- Tara Whitty: simple websites with links for basic guidelines would be pretty easy to set up. Can start with a free blog. And online websites – already have several online, would be good to link; e.g., lots already organized by Lindsay et al.
- Philippines:
  - www.lamave.org
  - www.balyena.org
  - www.su.edu.ph (IEMS – check on this)
- Teri Aquino: There are already-existing collaborating mechanisms, e.g. Coral Triangle Initiative (CTI), not enough use being made of it
- Putu Liza: CTI's is six countries with five goals;
  - Seascape
  - Fisheries management
  - Marine MPA network
  - Climate change adaptation
  - Species
  - Species is the weakest link of all 5, at risk of being removed and put under 4 other goals
- Teri Aquino: I was in the last workshop for CTI – has regional plan of action, and each member country needs national plan of action; goals and actions identified, but in last workshop, no one wanted to propose a marine mammal survey – no one would agree with her. We need to look more deeply into these organizations and take advantage of them: Sulawesi Seas Marine Ecoregion (SSME), Convention on Migratory Species (CMS), various MoU's.
- Fairul Izma: lots of platforms available, e.g., Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) will work with CBD to push biodiversity agenda back to forefront; its structured like IPCC; Malaysia chosen as chair; can try to work with the government to get input.
- Hoang Minh Duc: If an Asian-specific group of scientists could send letter to Vietnamese government? Did same with some private companies, and successful; might help to have a regional voice. The Russian military did live captures in Vietnam, Irrawaddy dolphins died in captivity, and now they are turning to Asian bottlenose dolphins, who come close to shore in Vietnam.

Summary of Regional Threats and Research Priorities

Research Needs

- Population assessments, distribution, habitat assessments.
- Fisheries catches
- Oil, gas and mineral exploration
- Tourism Impacts
- Collaborative research

Fisheries related mortality

- Bycatch
- Directed takes

Research needs:

- Bycatch assessments inadequate in most countries
- Even where some assessments have been done in the past there have been no updates

Can we think about a regional mechanism to help all countries fill these gaps?

Can we think about a regional mechanism to help all countries fill these gaps?

- SEAFDEC collaboration?
- More training in interview methods
  - CMS dugong interviewing tools
- Too Big to Ignore (toobigtoignore.net) global small-scale fisheries network
- Scripps group
  - Tara will look into trainings
- Pick out representative fishers
- look in representative fisheries in detail
- Satellite pictures at night to find torchfishing
- Marine mammal observer training in region
- Place-based conservation methods (e.g. mpa's)
- See Louella's work (community-based training)
  - Bycatch vs direct catch (market-based source of income)
- Getting bycatch and interview data is important (while still done openly before legislation

Oil, gas and mineral exploration

- No EIA procedures
- No monitoring, MMO requirements or mitigation

Research Needs:

- Research on when and where it is happening
- Monitoring programmes and mitigation
- Data that will assist in helping regional governments realize the need for such mechanisms
- MMO Training

***What other ideas do we have on taking this forward throughout the region?**

What other ideas do we have on taking this forward throughout the region?

- MMO certification needed (training in Hong Kong)
  - With enforcement a/or appropriate response
  - Vessels follow home-country guidelines
  - Reports only go to the company
- EIA process needs robust research and local expertise and objective scientists
- Production facilities/vessels
- When applicable work with media
- mpas

Tourism impacts

- Monitoring of marine mammal watching activities from their inception is mostly absent
- Regulatory mechanisms are mostly absent or where they exist inadequately enforced.

Research Needs:
- Research on all aspects of marine mammal watching activities including direct and indirect impacts
- Mechanisms by which such activities can be made more sustainable

***Is the development and adoption of a regional marine mammal watching best practice guideline or code of conduct a possible solution to some of the problems or any other ideas ?**

Is the development and adoption of a regional marine mammal watching best practice guideline or code of conduct a possible solution to some of the problems or any other ideas ? (tourism management)

- Some countries have national guidelines, can they be more widely adapted/suggested?
- Permitting system? Regulations: who gets to?
- Both guidelines and permitting are needed
- Training, accreditation, monitoring
- Some of tourism revenue towards monitoring
- Animal-watching platforms (can also be used for research)(Phil's paper on whale sharks)
- Interviews on tourism satisfaction
- Tourism education as compliance requirement for permitting
- Interested participants work on more detailed document (in reports, publish, SMM symposia)
- East coast of Taiwan most developed whale watching in China (Erich Hoyt paper) and Samuel's work in Hong Kong
- Robust studies of the impact of the industry on the animals and their environment as well as socio-economic studies
- More background knowledge is needed on the animals, behavior and their habitat use

The need for regional collaboration

- Trans-boundary research where shared populations exist
- Collaboration on training and sharing of expertise

- ***Other areas that we can collaborate in as a region?**

Other areas that we can collaborate in as a region or transboundary?

- More of these meetings, natural interactions and collaborations will be born!
- Approaching industries and governments together as a region, suggesting mitigation measures and management of species and habitat.
  - IPBS will work with the CBD, might be a good avenue for funding in our region…Fairul will follow up
- Discussion not enough, need to create mechanism for action
- Transboundary MPA networks, how can we move things forward in a functional way?
- Develop, train and fund repeatable and practical regionally appropriate research methods
- Regional stranding network trainings, more in Lem and Icha's workshop on Sunday. Some collaborative projects have already been set up.
- Online databases good way to communicate about strandings in the region
- Make sure the media knows, local agencies, and dignitaries know about stranding efforts
- Websites to communicate basic research methods (photo guidelines for samples, seagrass methods), Tara will begin as a blog, and link with the strandings network websites (maybe many of these are already online). Lindsay and Ale will send links to Tara. Other ideas and resources? Send to the seamam secretariat
- There are some mechanisms in place that could be further explored and developed between relevant countries: Coral Triangle Initiative, national plans of action, SSME (Sulu Suluwasi Marine Ecoregion, CMS. Relevant countries should position themselves to apply for funding and then share these skills with the rest of the region.
  - Should include other marine megafauna
- Letters to governments (SMM chapter? also SMM conservation and international committees)
- Case in point: Vietnam

Forums

SEAMAM Baleen Whale Forum

Discussion led by Jo Marie Acebes

During the SEAMAM meeting on 4 to 10 March 2013 in Langkawi, it was agreed upon by the participants that since large whales were not included in the discussions and in most of the country reports, it was necessary to conduct a forum to discuss the large whale species that are known to occur in the waters of SEAMAM countries. Representatives from the following countries participated: China, Indonesia, Japan, Malaysia, Philippines, and Thailand. The species discussed were: blue whale, Fin whale, Sei, Bryde's, Omura's, Humpbacks, Gray, Common minke, northern right whale, and the sperm whale. Each country representative was asked to give a brief report on each species based on available information to them at that time. The tables below show data on historical occurrence, sightings, strandings and other relevant information per species discussed. On-going and planned researches were also briefly described for each species.

General and species-specific research needs were also identified. For most species discussed wherein the status or genetic identity is unclear or undetermined, it was recommended that aside from increasing the survey efforts, other techniques should be employed, such as acoustics and biopsy sampling during field surveys and tissue sampling from stranded animals or skeleton specimens in museums. However, it must be taken into consideration that in certain countries, it is very difficult to do any sampling or research due to permitting constraints (e.g. Japan). Other techniques that can be explored are the use of remote sensing, habitat modelling and using unmanned aerial vehicles (UAV). Examining whaling records from within or outside the country of interest should also be explored. In the case of China and Japan for example, where they have extensive whaling records, it may be worth looking into for countries where they used to hunt. The main problem with this is the translation from Chinese and Japanese.

The problem of inaccessibility and high costs of conducting offshore surveys, it was suggested that adjacent or neighboring countries conduct joint surveys, such as a Malaysia-Thailand-Myanmar survey. This kind of collaborative survey has been conducted between Malaysia and the Philippines and between Singapore to the Straits of Malacca to the Andaman Sea to the Bay of Bengal. Other identified areas that have not surveyed are apparently areas of conflict, such as the Spratly Islands, southern and eastern Mindanao in the Philippines.

In order to expand our knowledge on baleen whales, in particular their historical and recent distribution, it was suggested that scientists from Japan like Dr. Kasuya, Kato and Ohsumi be invited. They have extensive knowledge and experience based on surveys and whaling. Other experts identified, who were unfortunately unable to attend the SEAMAM were Dr. Danielle Krebb and Dr. Benjamin Khan.

It was evident during the forum that much research is needed for large whales in the SEAMAM countries. Although some species were relatively well-studied in certain countries, such as the Bryde's whales in Thailand and the common minke whale in Japan and humpback whales in the Philippines, sparse data are available for the seven other species discussed. There is increasing interest in large whales in the SEAMAM countries and in order to foster this interest, it is recommended that efforts be made to facilitate the sharing of information and expertise between these countries through more formal and extensive discussions or workshops and formation of collaborative research projects.

Species	Blue whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	1960s records from whaling	-----	-----	No specimens/ skeleton	-----
Indonesia	-----	Eastern Indonesia (Papua, East Nusa Tenggara)	-----	Benjamin Kahn might have information or published reports	-----
Japan	None at the moment	None at the moment	None at the moment	Tom Akamatsu has info on dive intervals of blue whales	-----
Malaysia	-----	-----	Live stranding on 2006 in Pulau Gaya (near Kota Kinabalu); re-stranded dead	-----	-----

Species	Blue whale				
Philippines	From whaling ships in the Sulu-Sulawesi Sea	4 recorded sightings in the Bohol Sea	-----	1 animal photo-identified in 2012	Determine stock identity through biopsy sampling; acoustics; and more surveys in the Bohol Sea
Thailand	-----	Live stranding in January 2002 in Trang province; was able to swim back out to sea	-----	Believed to be pygmy blue whale	-----

Species	Fin whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	Whaling records in the 1960s to 80s	-----	Stranding records in the 1960s to 80s	-----	-----
Indonesia	*info in the country report	-----	-----	-----	-----
Japan	-----	-----	-----	Acoustic detection in south Hokkaido in November 2012	-----
Malaysia	*unconfirmed	-----	A photo of live stranding in Brunei between oil tanker and port showed animal with a white jaw; whale was able to swim back out to sea	-----	-----
Philippines	*removed from list because of only one sighting in the Sulu Sea	1 record in the Sulu Sea	-----	-----	-----
Thailand	-----	-----	2 records in the Gulf of Thailand; 1 skeleton dug up while building a house (skeleton kept in the village); 1 stranded in east coast of Thailand; No record in the Andaman Sea	-----	-----

Species	Bryde's whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	Whaling records	No recent sightings	-----	----	-----
Indonesia	-----	2-3 animals sighted off northern Bali	-----	-----	-----

Species	Bryde's whale				
Japan	-----	-----	-----	2 northwest Pacific population; 2 East China Sea population; 2 resident populations.	-----
Malaysia	-----	2 sightings in Langkawi; interviews confirmed sightings in Pulau Pawi Marine Park; unconfirmed sightings in the East coast (Tioman)	2 strandings in Brunei Bay; 2-3 strandings on Cenang beach; vandalized carcass of a stranded baleen whale off the mainland in 2011.	Suspect a breeding ground in South of Langkawi	Surveys planned; proposed survey in Pulau Paya
Philippines	Small-scale indigenous whaling records in the Bohol Sea	3 confirmed sightings in the Bohol Sea; several other unconfirmed sightings around the country	Live entanglement in Masbate (released)	-----	Surveys in northwestern Bohol Sea
Thailand	-----	-----	-----	Breeding and foraging ground in the Gulf of Thailand; some stay in the upper Gulf year-round;	Satellite tagging; photoID;

Species	Omura's whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	No records from whaling	-----	3 records from Zhe Jiang province (one from Fu Jiang)	Vertebrae in Guang Zhou	-----
Indonesia	-----	-----	-----	-----	-----
Japan	None at the moment	None at the moment	None at the moment	-----	
Malaysia					
Philippines			Unconfirmed	From skeleton from whaling	
Thailand		4 sightings in southern part near Phuket	Skeleton found in southern part but none in the upper Gulf		

Species	Humpback whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	-----	-----	-----	1 acoustic record from a student	-----
Indonesia	-----	Sighting in East Kalimantan	In Bali and south of West Java	Caught in 2005 in Lamalera	-----

Species	Humpback whale				
Japan	-----	-----	-----	Known breeding grounds in Ogasawara and Okinawa	-----
Malaysia	-----	1 sighting off Sarawak in 2004/5 (*unconfirmed)	-----	-----	-----
Philippines	Historically sighted in the northern and southern Philippines	-----	2 strandings in northern Luzon	Breeding ground in the Babuyan Islands, northern Luzon	Surveys, photoID and acoustic studies since 2000
Thailand	-----	1 sighting in Phuket province in 2010	-----	-----	-----

Species	Gray whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	-----	-----	1 record of 13m long female stranded in Piang Tan in Fujian province	Estimated population is 130 animals; believed to be breeding somewhere in China based on historical records of a mother and calf specimens in the 1950-60s (displayed in a park in Guang Zhou province)	-----
Indonesia	-----	-----	-----	-----	-----
Japan	-----	-----	1 record of entanglement in a net (dead juvenile, year unknown)	-----	-----
Malaysia	-----	-----	-----	-----	-----
Philippines	-----	-----	-----	-----	-----
Thailand	-----	-----	-----	-----	-----

Species	Common Minke whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	Whaling records	-----	-----	Believed to be breeding somewhere in China	Surveys needed
Indonesia	-----	-----	-----	-----	-----
Japan	Whaling records	-----	-----	Believed to have 2 populations (J & O); different breeding seasons and possibly grounds	Surveys needed
Malaysia	-----	-----	-----	-----	-----

Species	Common Minke whale				
Philippines	-----	-----	-----	-----	-----
Thailand	-----	-----	-----	-----	-----

Species	Northern Right whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	-----	1 record	-----	-----	-----
Indonesia	-----	-----	-----	-----	-----
Japan	-----	-----	-----	-----	-----
Malaysia	-----	-----	-----	-----	-----
Philippines	-----	-----	-----	-----	-----
Thailand	-----	-----	-----	-----	-----

Species	Sperm whale				
COUNTRY	HISTORICAL OCCURRENCE	SIGHTING	STRANDING	OTHERS	ON-GOING &/ PLANNED RESEARCH
China	Whaling records	East Taiwan has whale watching for sperm whales	3 live strandings in Jiang Shu province in 2012; stranding of 10 animals in the past few years; HK stranding	-----	-----
Indonesia	Whaling records (indigenous and foreign)	Lamalera; East Nusa Tenggara; Bird's Head region; Java	Bali; 2 records of dead animals in south of Simeulue Islands	-----	-----
Japan	-----	-----	-----	Tagging data from Ogasawara and Kumanonnada(?), south of Osaka/ Kyoto; have diving profile and behavior data	-----
Malaysia	-----	Sighting in the Borneo side from aerial survey	-----	Few records	-----
Philippines	Whaling records (American and British)	All over the country	All over the country	-----	-----
Thailand	-----	-----	1 record in the Andaman Sea; none in the Gulf of Thailand	-----	-----

Participants:

Jo Marie V. Acebes
Tomonari Akamatsu
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Fairul Izmal Jamal Hisne
Anouk Ilangakoon
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Surasak Thongsukdee
Zhu Qian

CAPTIVITY FORUM

Moderator: Randall Reeves, Chair, IUCN Species Survival Commission, Cetacean Specialist Group

A forum was held to discuss issues related to keeping marine mammals in captivity and the relevance of captive facilities to the conservation of marine mammals in the wild. The forum was moderated by Randall Reeves, Chairman of the Cetacean Specialist Group (CSG) of the IUCN Species Survival Commission.

The forum began with brief statements by delegates representing captive facilities who summarized some of the ways in which well-managed facilities can contribute to marine mammal conservation efforts worldwide, e.g. through public education programs, assistance with animal rescue and rehabilitation, research collaborations, and specialized training programs for conservation practitioners. Such facilities typically involve professionals – biologists, veterinarians, educators, non-profit organizations, etc. - who share an interest in improving understanding and conservation of marine mammals. Many of the more established facilities subscribe to industry standards, such as those set by the Alliance of Marine Mammal Parks and Aquariums (AMMPA), and regulate their operations accordingly. Although the AMMPA standards are not explicitly recognized and enforced under any national legislation (at least in the SE Asia region), all members of the AMMPA are required to adhere to its standards.

Some forum participants expressed skepticism about whether the stated benefits of keeping marine mammals in captivity truly lead to positive conservation outcomes. Problems arise mainly due to differing perceptions of marine mammals and the value attached to these animals in communities within various nations and cultures throughout the region. Many delegates pointed out that although good facilities can, theoretically, provide some assistance to conservation efforts, in many cases the facilities in Southeast Asia do not achieve, or even aspire to, standards equivalent to those established and promoted by the AMMPA.

Three key issues were discussed in detail and those discussions are summarized below:

Issue 1: Benefits of keeping marine mammals in captivity

Delegates acknowledged that many well-established captive facilities do provide funds for research on and conservation of wild marine mammal populations. Some of these facilities are also useful for rescue and rehabilitation of marine mammals. However, some delegates suggested that at least some of the benefit of providing funds for research and conservation is offset by the way such funds are raised. Additionally, it was suggested that because facilities often make use of rescued and rehabilitated animals for display, this constitutes a conflict of interest. Questions were also raised concerning returning rescued or rehabilitated animals to the wild and how doing so affects the animals themselves as well as the populations into which they are returned. Delegates acknowledged that some captive facilities provide educational benefits but some delegates suggested that increasingly such facilities compete directly with dolphin watch programs and therefore affect the livelihoods of local communities. The forum concluded that most facilities in Southeast Asia, such as the traveling circuses found in many countries, do not provide educational value to visitors.

Issue 2: Sourcing of animals

Delegates agreed that any captures of marine mammals in Southeast Asia are likely to be detrimental to the wild source populations. It was also acknowledged that within the region, there is a paucity of population-level information on marine mammals and of data on removals. Some populations for which good information is available are known to be in critical danger of extirpation. Many populations across the region suffer from incidental mortality in fisheries (bycatch) and any additional removals would put them at greater risk.

Besides the demand for marine mammals, particularly small cetaceans, to supply captive facilities within the region, demand for some species such as Irrawaddy dolphins and Indo-Pacific bottlenose dolphins comes from facilities in Russia, China, Japan and elsewhere.

There was brief discussion of criteria to determine whether a given population would be able to sustain some level of live-capture removals and it was generally agreed that the Potential Biological Removal (PBR) approached developed in the United States, or a similar approach, is becoming a global standard. However, adoption of any criteria should be considered carefully because it could provide justification for authorizing captures of animals from the wild.

Issue 3: Enforcement of existing regulations

Regulations governing the capture, handling and keeping of marine mammals in captivity are already in place in many countries throughout the region. However, delegates pointed out that in most countries, enforcement is poor due to a variety of factors including lack of expertise, political and economic circumstances, and cultural or societal values. Although industry self-regulation as practiced by AMMPA members may be useful, many delegates felt that due to the aforementioned factors it would not be effective in much of the region at present. This may change if nations establish standard accreditation requirements for captive facilities.

After much discussion and exchange of opinions, the SEAMAM III delegates agreed on the following statement with regards to marine mammals in captivity in this region:

SEAMAM III participants unanimously agreed that given the largely unknown status of SE Asian marine mammal populations and the known or suspected threats faced by these animals, live captures should not be allowed in the region.

There were differing views from participants on the necessity and acceptable role of captive facilities as a contributor to marine mammal conservation given the varying geopolitical, socio-economic and cultural realities in the region. However, it was agreed that any establishment of new facilities should be undertaken with extreme care and due consideration should be given to the sustainability of animal procurement, animal care, education, conservation and other matters in accordance with existing, well-established, internationally recognized institutional standards (voluntary or mandatory) that govern or guide the operations of captive facilities. It was noted that many currently existing facilities within the region do not uphold any such standards in their operations and thus their contribution to marine mammal conservation efforts are minimal to non-existent.

Delegates compiled a comprehensive spreadsheet with captive facilities that included marine mammals in the region. Access this spreadsheet at http://www.cms.int/manage/sites/default/files/publication/Captive%20cetacean%20facilities.pdf

Forum on Freshwater Dolphins

Moderator: Peter Thomas

Electrofishing

Thomas opened the forum with a presentation on electrofishing and freshwater cetaceans.

In this presentation, he cited examples where electrofishing had been identified, or at least discussed, as a threat to freshwater cetacean populations – e.g. Yangtze, Ayeyarwady, and Mekong rivers. In consultations with marine mammal biologists and veterinarians, Thomas and his collaborators found it difficult to find cases where electrocution could be definitively confirmed as the cause of death. This prompted them to look more deeply into electrofishing as a threat to cetaceans.

Thomas's presentation included an overview of electrofishing: what it is, how it works and the potential impacts on freshwater cetaceans. The presentation outlined the effects of electric fields on fish and how this method is used legally in fisheries research. As an illegal fishing practice, electrofishing is an indiscriminate, destructive fishing practice, banned in most Asian rivers.

Indirectly, electrofishing impacts cetacean prey and their ecosystems. There is speculation that more directly, electrofishing could affect cetacean behavior and perhaps cause injury or death. More research is needed to further explore these matters as electrofishing becomes more widespread. In the Ayeyarwady River, there is concern that electrofishing could cause dolphins to develop an aversion to fishing boats and disrupt the longstanding cooperative fishing relationship between fishermen and dolphins. Aung Myo Chit commented that cooperative fishing is declining and is now rare.

Research on the sensitivity of marine mammals to electrical fields has shown that Guiana dolphins (Sotalia guianensis) can detect even low-strength electric fields. Pinnipeds are highly reactive to electricity and can be deterred by weak fields. Direct contact with electrodes can cause death, although electrocution has not been documented

Identifying the cause of death for stranded marine mammals is difficult, although a high percentage of adult freshwater cetaceans that strand show evidence of gillnet bycatch. Electrofishing has been inferred to be the cause of death in cases where animals are unmarked or no apparent trauma is found, such as in the Yangtze River where, based on lack of external marks on carcasses, scientists concluded that 40% of all dead baijis that were found and examined in the 1990s had been killed by electrofishing. More recently the deaths of some finless porpoises in China have been attributed to electrofishing

Thomas provided a quick overview of electrofishing activities in each of the major Asian rivers: 1) In the Mekong, there is widespread electrofishing in small-scale fisheries. 2) In the Mahakam River, there are reports that some deaths of dolphins in narrow channels of the upper reaches were possibly caused by electrofishing. However, dolphins in the Mahakam have also been seen foraging, with no apparent harm, near electrofishing. 3) In the Ayeyarwady River, organized gangs operate electrofishing gear in the 74 km protected area, disrupting cooperative fishing and degrading the prey base for dolphins. 4) Electrofishing is widespread in the Yangtze River, and is thought to have been a contributing factor in the extinction of the baiji, and to be an ongoing threat to finless porpoises in Dongting and Poyang Lakes.

Thomas presented several possible scenarios of dolphin encounters with electrofishing, including avoidance, entrapment, incidental corralling, intentionally or passively using cooperative fishing cues to get dolphins to herd fish towards electrofishing apparatus, and dolphins being attracted to fish immobilized by electric shock. He concluded that electrofishing is an illegal, destructive and nonselective fishing activity on these rivers. Strengthening enforcement against illegal electrofishing should be considered a priority.

Discussion of freshwater dolphins in captivity

There was a discussion of the subject of capturing freshwater dolphins for public display. It was noted that the government of Myanmar had considered the idea of keeping Irrawaddy dolphins in captivity for display in the capital city but, based on advice from scientists, it decided against the idea. Among the major points raised against the idea were the small size of the Irrawaddy dolphin population in the Ayeyarwady River (best estimate of 77 animals), the reportedly high mortality rates in captivity, and the expense of constructing adequate facilities. Instead, the government encouraged the watching of dolphins in nature and gaining income from tourism. The Forest Department's wildlife law of 1994 includes a list of animals in three categories – complete protection, seasonal protection and routine protection. Dugongs and Irrawaddy dolphins are "completely" protected.

It was noted that scientific advice similar to that given in Myanmar had averted the capture and public display of bottlenose dolphins in Taiwan. In Cambodia, endangered species, which includes Irrawaddy dolphins and most cetaceans known in Cambodian waters are fully protected from capture, but it would be important to have a sub decree clearly stating that all cetacean species need to be protected to prevent captures in the future. The Bangladesh government is very active in species protection with a long list of protected species, even insects, under the Wildlife Act (2012).

Concern was expressed that proposals to capture individuals from small freshwater cetacean populations were likely to continue. In the Ayeyarwady, the proposed captures (see above) were for display, not for captive breeding, while in the Mekong, some of the capture initiatives discussed in the past were for captive breeding for conservation. A paper by Curry et al. (2013) was published in response to one of these initiatives and it is a useful source for discussions of the problems associated with removals from small freshwater cetacean populations for captive breeding.

In further discussion of possible captive breeding of Irrawaddy dolphins and when (if ever) that might be appropriate, it was noted that losses (deaths) are to be expected during the process of learning how to keep animals alive, let alone breed successfully over multiple generations. When down to just a few animals, the idea of removing animals from their natural habitat with the intention of breeding them in captivity for reintroduction or restocking becomes more risky and less feasible. The attempt to do this with baijis in China provides an instructive example of the difficulty.

Discussion Topic: Mekong River planning for research

Ryan gave an overview of research initiatives proposed at a conservation workshop for Mekong River Irrawaddy dolphins in 2012. Efforts were aimed at moving from mortality-based work to understanding population structure in the remaining live individuals. Methods proposed included remote biopsy, laser photogrammetry, and behavioural focal-follow studies. Updating the workshop on early efforts at these studies, Ryan noted that a small number of biopsy samples had been collected with collaborators from NOAA, however the method was not proving as effective as had been hoped. Laser-photogrammetry to estimate body size was also proving ineffective, though photographs were yet to be thoroughly examined. Some concerns were raised about the use of powerful lasers in riverine environments when people are frequently found on banks or in fishing boats. Recommendations were made to turn lasers off in such circumstances. Focal-follow work was proposed for 2014, to investigate possible adult aggression causing or contributing to calf mortality.

Hydropower development was seen as a key emerging threat to dolphins in the Mekong River. Little documented evidence was known of the effect of hydropower on river dolphins, though some lessons may be available from the Amazon Basin; and suggestion made to follow-up efforts to combine knowledge of hydropower and river dolphins across Asia and South America.

Curry, BE, Ralls, K, and RL Brownell, Jr. 2013. Prospects for captive breeding of poorly known small cetacean species. Endangered Species Research 19:223-243.

Forum on Funding Mechanisms and Resources

Panel: Randy Reeves, Peter Thomas, Suzanne Gendron, Jay Sweeney

A short evening forum was held for SEAMAM III participants to express their views on current funding mechanisms for cetacean research and to learn of available options to consider during a search for funding opportunities.

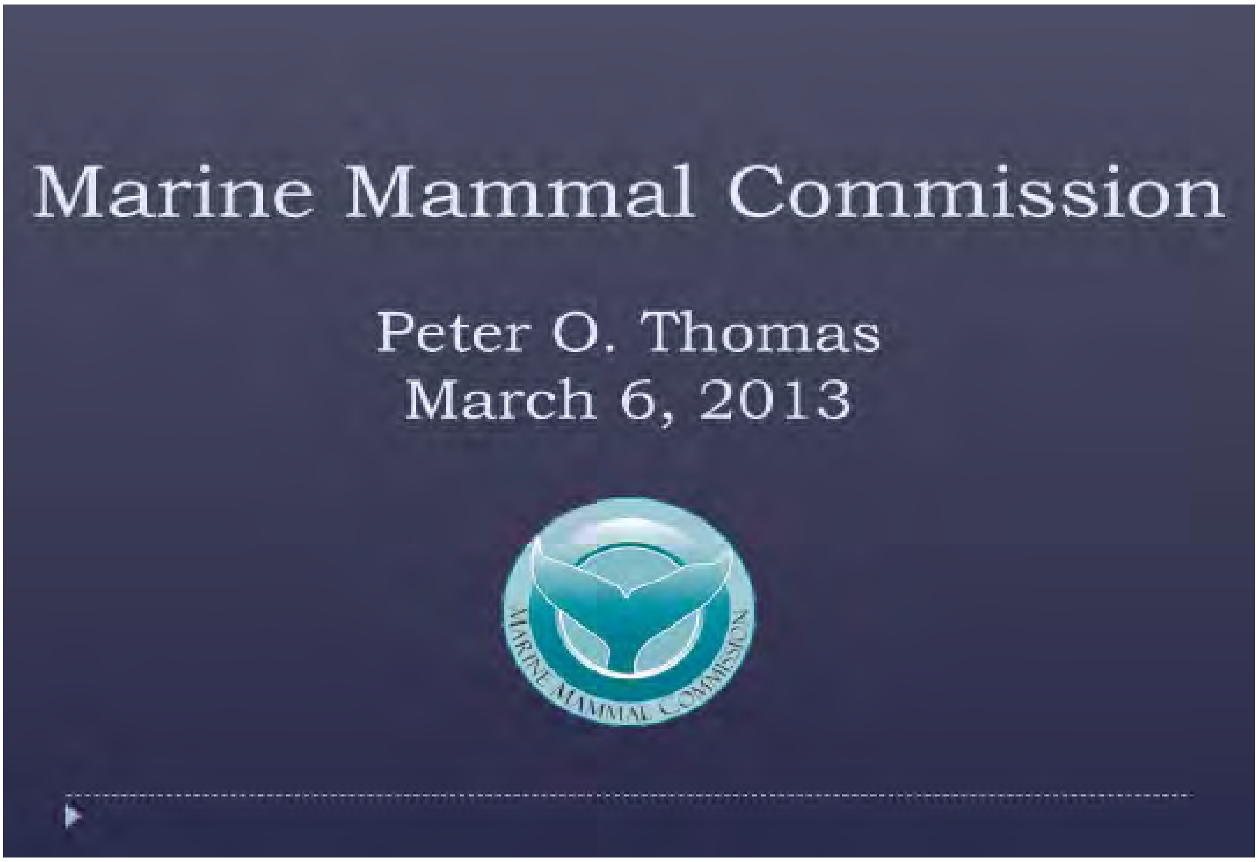
The forum began with a brief overview of the roles of the Marine Mammal Commission (MMC) and the funding opportunities that are available from time to time. The MMC was established in 1972 under the U.S. Marine Mammal Protection Act. Its primary roles are to protect marine mammals (sirenians, pinnipeds, cetaceans, marine otters and polar bears), maintain the health and stability of marine ecosystem upon which these animals depend and have a strong international focus on research and conservation. The MMC is an independent federal oversight agency that reports to the U.S. Congress on action and policies to protect and conserve marine mammals. There are three main concerns coming out of the U.S. Congress with regards to marine mammals, and those are (1) commercial whaling, which had decimated many large whale populations around the world, (2) hunt of seals in Canada and the infamous issue with clubbing of seals for fur and (3) the catching dolphins in purse seines in tuna fishery in the Eastern Tropical Pacific. The MMC occasionally has funding to devote to research programs within the U.S. and beyond, however at present there aren't any funds available. Nonetheless, the MMC is a resource for funding in the future and is presently a good platform for sharing of ideas about marine mammals and issues relating to them and their environment all over the world.

The Ocean Park Conservation Foundation Hong Kong (OPCFHK) is one of the most popular grant options for most, if not all SEAMAM III participants. The Foundation has been central to many marine mammal conservation projects in Asia for many decades. A brainchild of Dr Derek Chou, the charity trust was established in 1993 by the late Dr. Stephen Leatherwood. The OPCFHK functions as the conservation arm of Ocean Park, and aims to ensure the sustainability of wildlife and biodiversity in Asia. There is an annual funding application that opens in December and with a deadline in January of the following year. The details can be obtained online at www.opcf.org.hk. The funding focuses on (1) conservation research and management and (2) community education and capacity building. The funding limit is typically HKD100,000 – 200,000 for 1 year. The selection criteria for the "conservation research and management" category are (i) conservation impact, significance and urgency, (ii) applicant's background, qualifications and experience, (iii) effective methodology to achieve expected outcomes and (iv) local capacity building and (v) the potential to develop a long-term conservation plan. The selection criteria for the "community education and capacity building" leans on item (ii) above and also on the potential for the proposed project to increase conservation knowledge and enhance skills for promoting effective conservation and management. The OPCFHK has supported 290 scientific research and education projects in the Asian region with a total of over HKD34 million since 2005, 108 projects of which are marine mammal projects. An emphasis is usually given to Ocean Park's focal marine mammal species, which is the Chinese white dolphin/Indo-Pacific humpback dolphin (*Sousa chinensis*).

During the panel discussion of this forum, SEAMAM III participants discussed general funding needs, priorities and gaps. One of the most prominent subject that was brought up and agreed upon by many was the fact that most available grant opportunities do not allow for provision of salary for the principal investigators. The field of marine mammal conservation therefore often loses many good researchers because many are usually funded during their doctoral studies but find it difficult to sustain themselves thereafter through non-salaried research grants. However this issue appeared to be a double-edged sword, as one of the forum members pointed out that if grants also included the salaries of principal investigators, then there would be insufficient funds for the research itself, as most of them have qualifications that require higher salaries. The other prominent issue that was put forward with regards to funding resources was the short-term durations (i.e. 1 year) that grants usually have, which many-a-time prevents conservation projects from continuity to achieve their desired conservation goals, which are usually only achievable in the mid to long-terms. Another issue some researchers face in their home countries is that governmental grants do not specifically fund ecological and conservation-based research, rather are more inclined towards biotechnology projects.

Various short-term recommendations were put forth to help ease the burden of researchers looking for funding for their conservation projects. These are captured in the table below.

	Recommendation	Advantage
1	Collaboration with researchers from various organizations (universities, governmental agencies, corporations)	Increased manpower, contribution of different expertise (including analysis of data), availability of select research equipment (i.e. borrowed from collaborators, eliminates cost of purchasing), possibility of training opportunities for project team members
2	Provide more opportunities to postgraduate students	More work can be accomplished, lessen the burden of getting grants as students have the opportunity to be funded for their studies and related work
3	Look towards the online market for funds	Can target film makers / web series producers (they may be looking for a good conservation story to feature and may be willing to provide support for the research project)

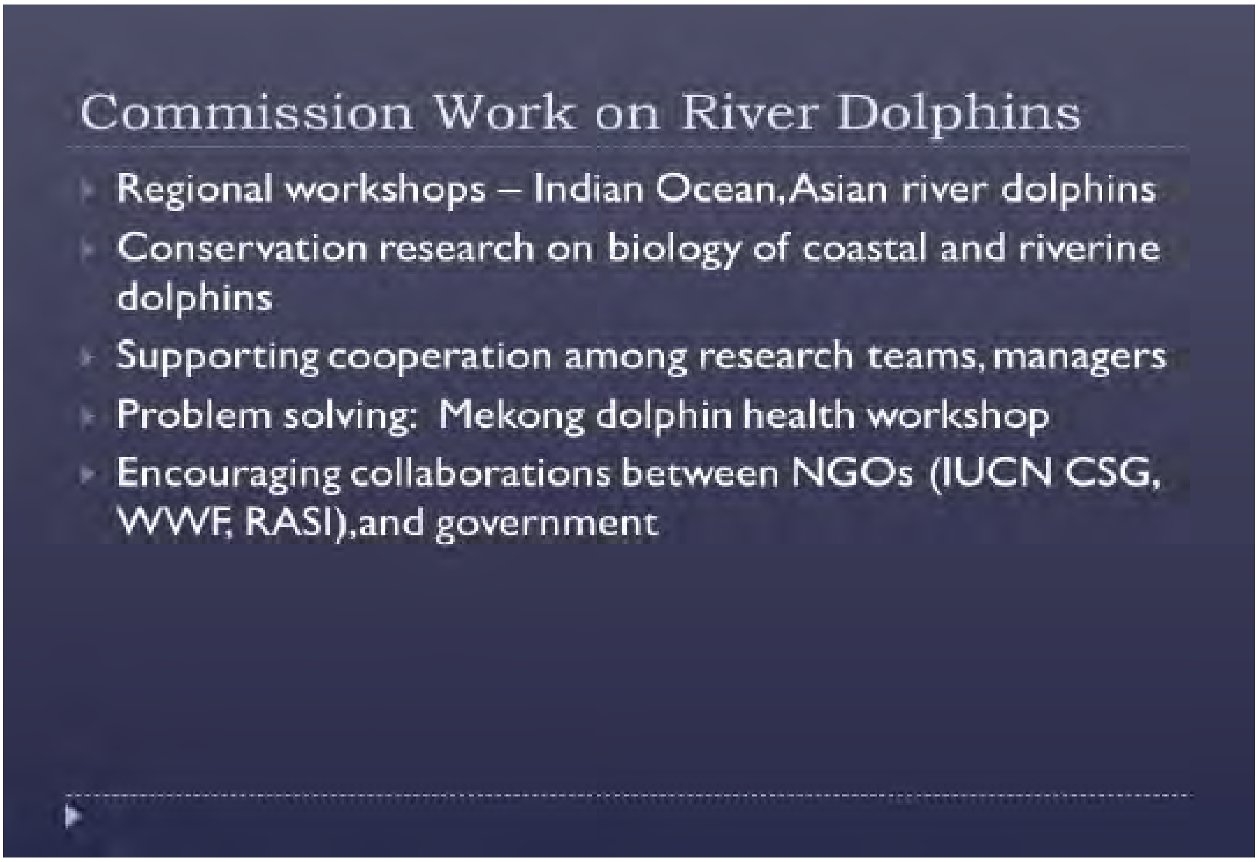


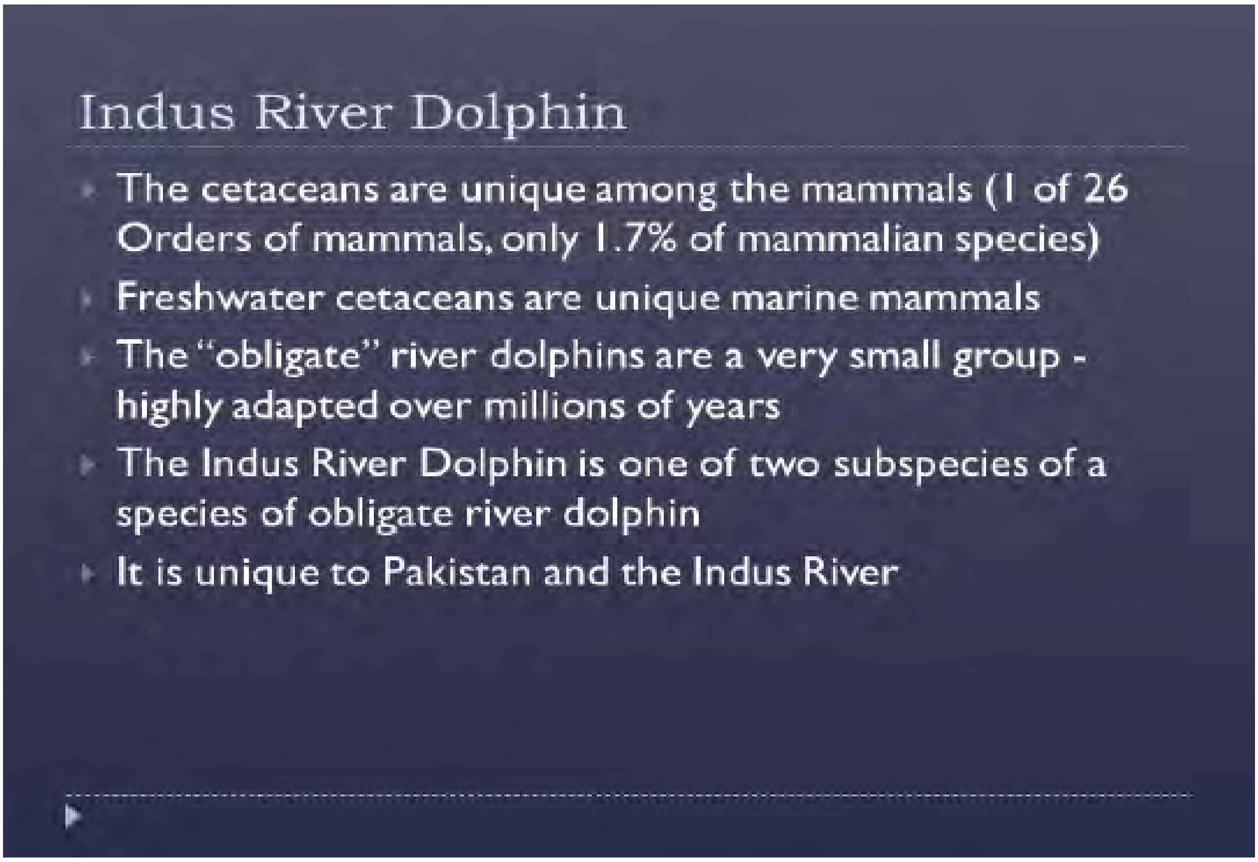

United States Marine Mammal Protection Act of 1972 (MMPA)
Protects Marine Mammals: Sirenians, pinnipeds, cetaceans, marine otters and polar bears
"maintain the health and stability of the marine ecosystem."
Strong international focus on research and conservation


The U.S. Marine Mammal Commission
Established under the Marine Mammal Protection Act of 1972
Independent Federal oversight agency that reports to the U.S. Congress on actions and policies to protect and conserve marine mammals
www.mmc.gov
Marine Mammal COMMISSION


Work of the Marine Mammal Commission
• The Daily Grind
– Review permits, federal actions, environmental impact assessments, U.S. policy, international treaty developments
• Special Projects (international applicability)
– Marine mammals and noise
– Marine mammals and persistent ocean contaminants
– Marine debris, bycatch, and entanglement
– Review condition of marine mammal stocks
– Small endangered cetaceans (vaquita, freshwater cetaceans)
– Support of IUCN specialist groups and assessments
• Small research program
– Support conservation and protection goals of the MMPA


Endangered Species Act of 1973 (ESA)
Purpose: to conserve endangered and threatened species and the ecosystems on which they depend
Species are listed according to 5 threat criteria
Once a species is listed
• Prohibits taking of listed species
• Prohibits federal actions from destroying critical habitat
• Requires development of recovery plans or designation of critical habitat
• Requires interagency consultation on all Federal actions
All Marine mammals are protected by the MMPA, not all by the ESA


Commission Work on River Dolphins
Regional workshops – Indian Ocean, Asian river dolphins
Conservation research on biology of coastal and riverine dolphins
Supporting cooperation among research teams, managers
Problem solving: Mekong dolphin health workshop
Encouraging collaborations between NGOs (IUCN CSG, WWF, RASI), and government


Indus River Dolphin
The cetaceans are unique among the mammals (1 of 26 Orders of mammals, only 1.7% of mammalian species)
Freshwater cetaceans are unique marine mammals
The "obligate" river dolphins are a very small group - highly adapted over millions of years
The Indus River Dolphin is one of two subspecies of a species of obligate river dolphin
It is unique to Pakistan and the Indus River

River Dolphins are Unique

- Of the 40 cetacean genera only three are "obligate" River dolphins
- Yangtze dolphin (*Lipotes vexillifer*);
- Indus River and Ganges River dolphins (*Platanista gangetica*)*;
- Boto (*Inia geoffrenis*)*

*May turn out to be multiple species

Highly Adapted to Life in Rivers

- their form and function adapted to life in rivers.
- extreme characteristics in their morphology and sensory systems
- Small size, nearly blind, sophisticated sonar system, large flippers, flexible bodies.
- These traits have arisen independently, in different river systems around the world

Vulnerable to Human Activities

- Family: Lipotidae
- Genus and species: *Lipotes vexillifer*
- Baiji, or Yangtze River dolphin, China
- has been driven to extinction by human activities in the past few decades.
- Lost a species, a genus, and an entire family from the mammalian evolutionary tree

Vulnerable to Human Activities

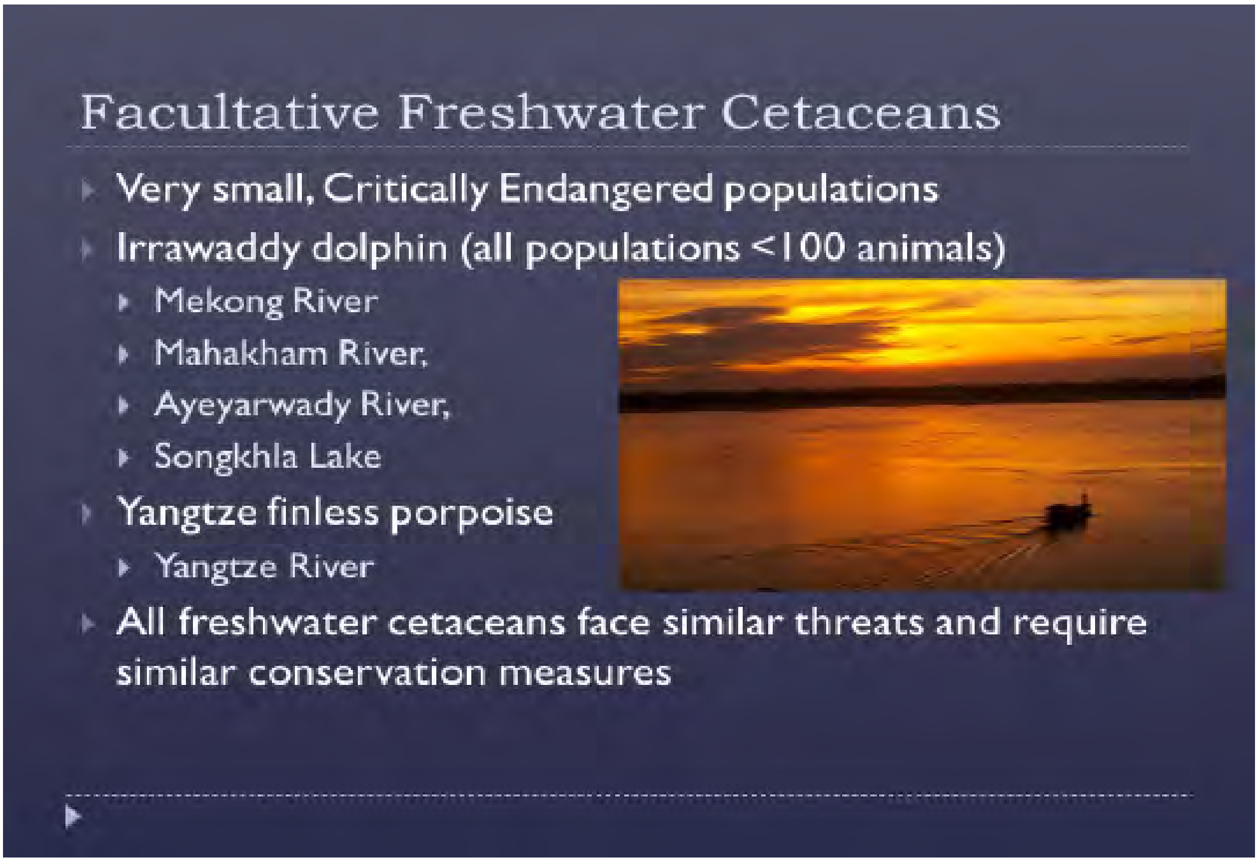
- Family: Iniidae
- Genus and species: *Inia geoffrensis*
- Three subspecies: *I.g. geoffrensis, I.g. boliviensis, I.g. humboldtiana*
- Boto, Amazon River dolphin, South America
- Listed as Data Deficient by IUCN
- Vulnerable to variety of threats (bycatch, use as bait, contaminants, etc.)

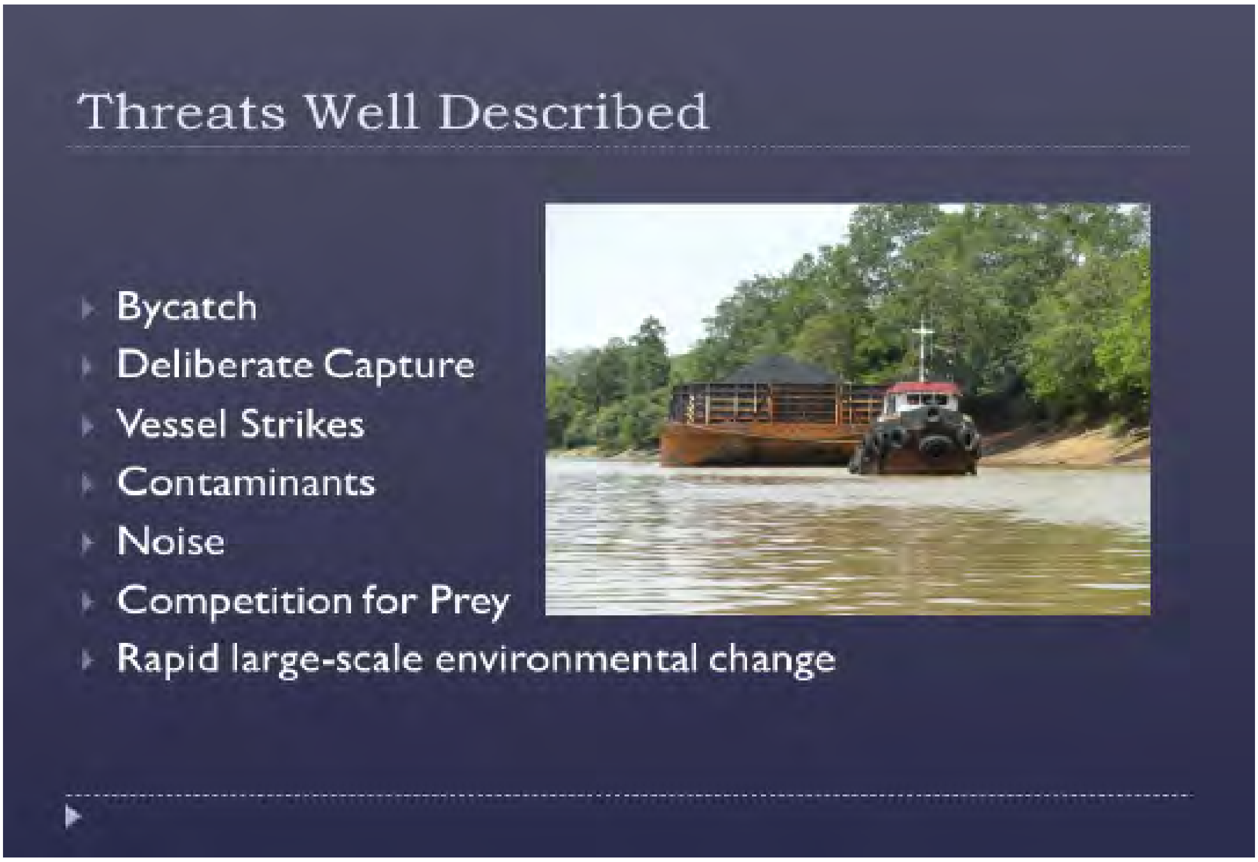
Vulnerable to Human Activities

- Family: Platanistidae
- Genus and species: *Platanista gangetica*
- Two subspecies:
  - *P.g. minor*, Indus River dolphin, Pakistan
  - *P.g. gangetica*, Ganges River Dolphin, India
- listed as Endangered by IUCN
- Like Baiji: share their ranges with large human populations which depend on these rivers for their livelihoods

Facultative Freshwater Cetaceans

- More closely related to marine conspecifics
- Delphinidae: Irrawaddy dolphin (*Orcaella brevirostris*), Tucuxi (*Sotalia fluviatilis*)
- Phocoenidae: Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*)


Facultative Freshwater Cetaceans
Very small, Critically Endangered populations
Irrawaddy dolphin (all populations <100 animals)
Mekong River
Mahakham River,
Ayeyarwady River,
Songkhla Lake
Yangtze finless porpoise
Yangtze River
All freshwater cetaceans face similar threats and require similar conservation measures

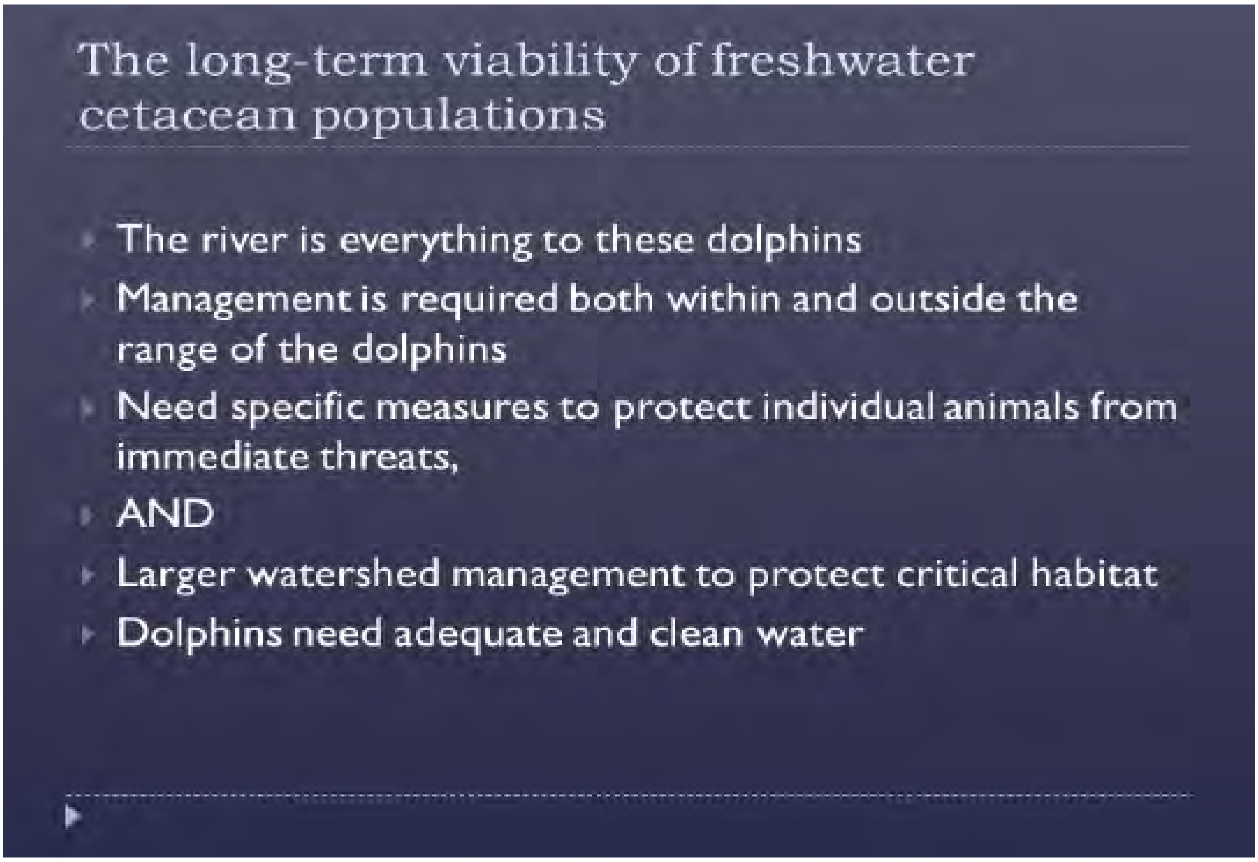

Threats Well Described
Bycatch
Deliberate Capture
Vessel Strikes
Contaminants
Noise
Competition for Prey
Rapid large-scale environmental change

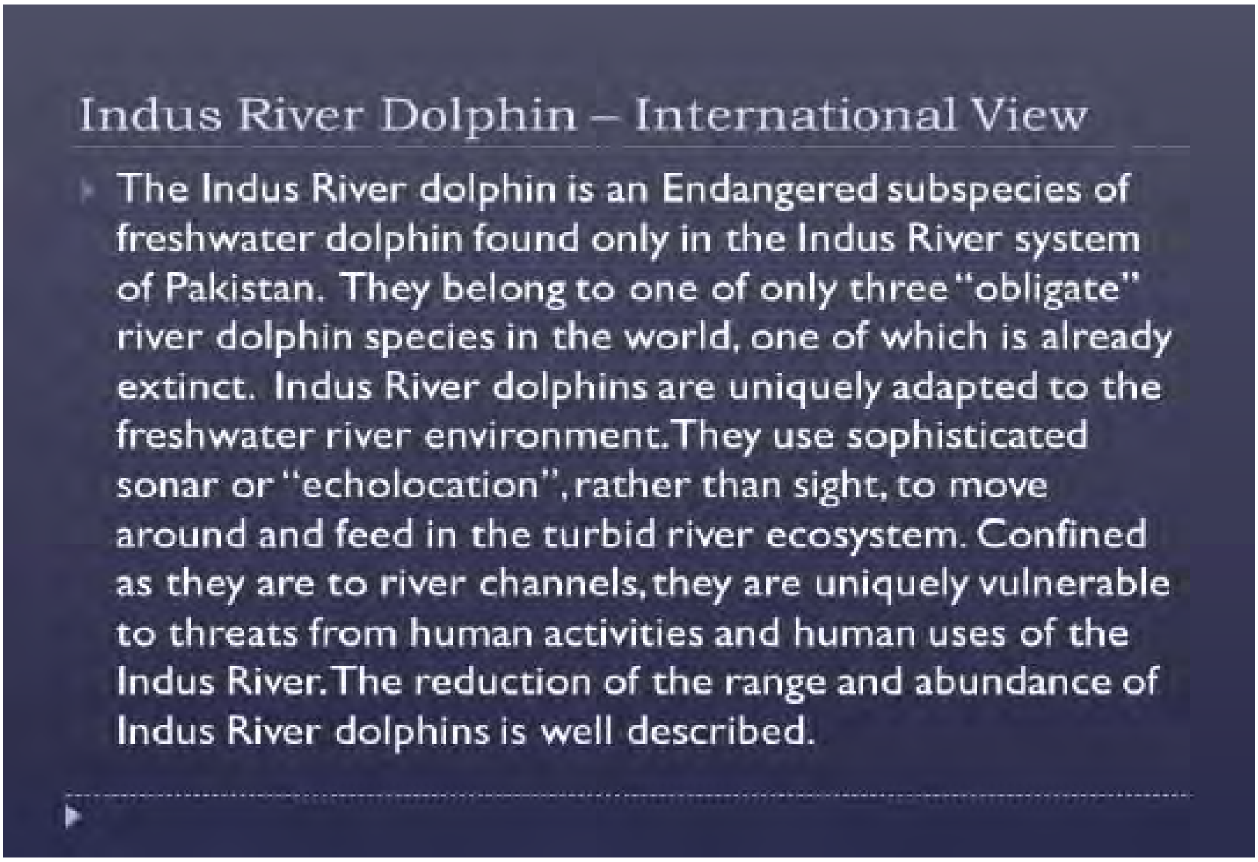
International Attention to River Dolphins

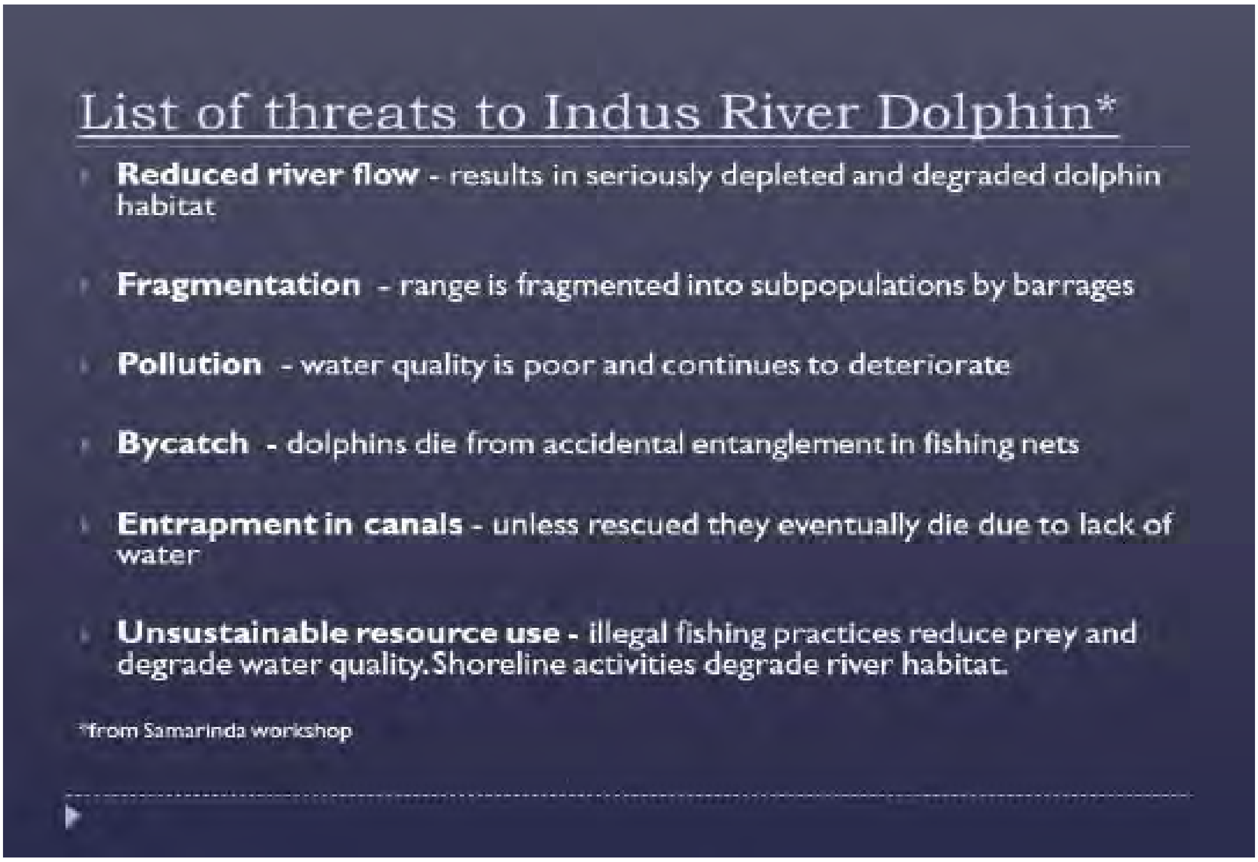
- IUCN Species Survival Commission raised concerns in 1980's
- Several international workshops and reports have developed priorities for Asian river dolphins
- Global cetacean conservation strategies place Asian river dolphins high among the most pressing conservation priorities for cetaceans and endangered mammals.

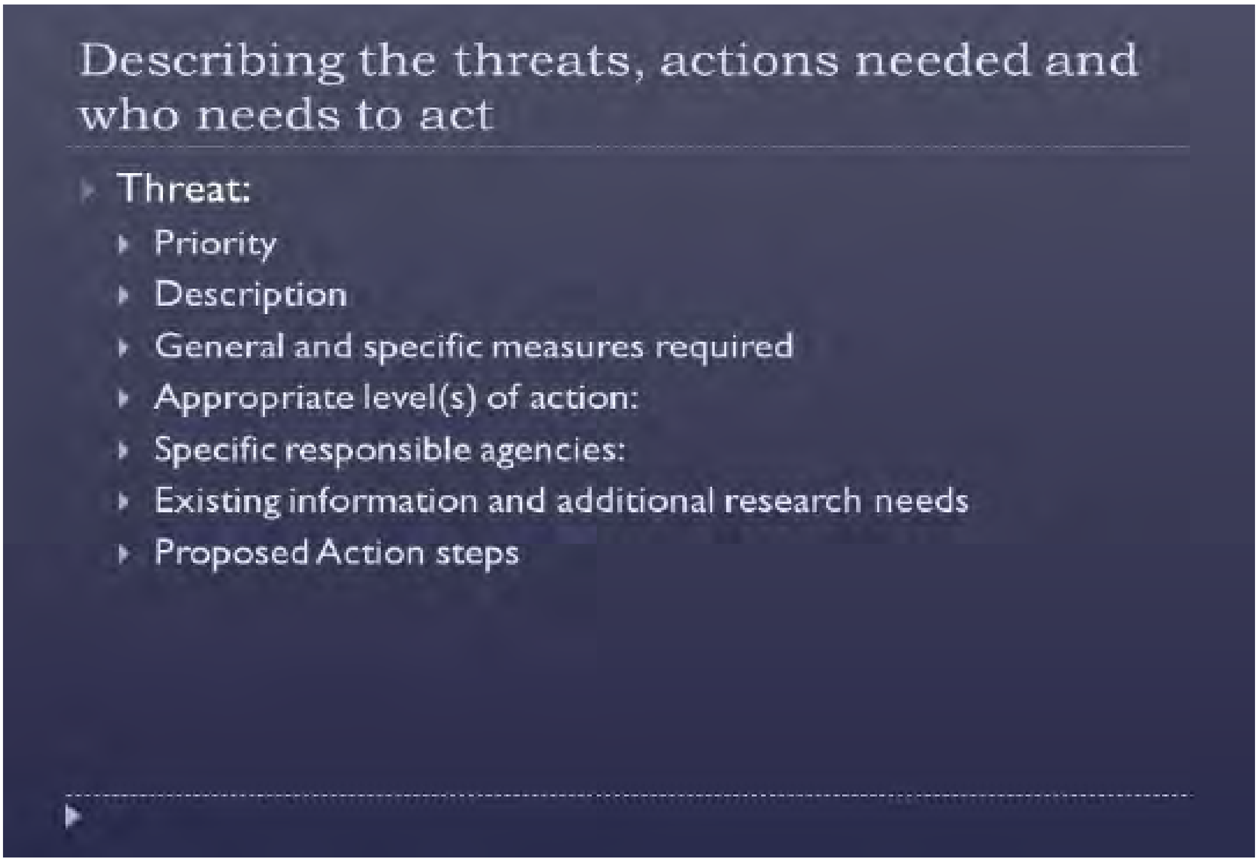
IUCN Cetacean Specialist Group 2002-2010 Action Plan for the World's Cetaceans

- Expand assessment for blind dolphins throughout their ranges
- Evaluate impacts of reduced freshwater levels
- provide advice to governments, NGOs, and IGOs on the potential ecological effects of water development and on approaches to mitigation.


The long-term viability of freshwater cetacean populations
The river is everything to these dolphins
Management is required both within and outside the range of the dolphins
Need specific measures to protect individual animals from immediate threats,
AND
Larger watershed management to protect critical habitat
Dolphins need adequate and clean water


Indus River Dolphin – International View
The Indus River dolphin is an Endangered subspecies of freshwater dolphin found only in the Indus River system of Pakistan. They belong to one of only three "obligate" river dolphin species in the world, one of which is already extinct. Indus River dolphins are uniquely adapted to the freshwater river environment. They use sophisticated sonar or "echolocation", rather than sight, to move around and feed in the turbid river ecosystem. Confined as they are to river channels, they are uniquely vulnerable to threats from human activities and human uses of the Indus River. The reduction of the range and abundance of Indus River dolphins is well described.


List of threats to Indus River Dolphin*
Reduced river flow - results in seriously depleted and degraded dolphin habitat
Fragmentation - range is fragmented into subpopulations by barrages
Pollution - water quality is poor and continues to deteriorate
Bycatch - dolphins die from accidental entanglement in fishing nets
Entrapment in canals - unless rescued they eventually die due to lack of water
Unsustainable resource use - illegal fishing practices reduce prey and degrade water quality. Shoreline activities degrade river habitat.
*from Samarinda workshop


Describing the threats, actions needed and who needs to act
Threat:
Priority
Description
General and specific measures required
Appropriate level(s) of action:
Specific responsible agencies:
Existing information and additional research needs
Proposed Action steps

Threat: Reduced river flow and volume

- Priority: High
- Description: Lack of water, especially in dry season reduces and fragments small remaining range of Indus River dolphin.
- General measures required: basin-wide water management policies to protect dolphin critical habitat
- Specific measures required: water levels in critical habitat need to be maintained as part of seasonal water releases.
- Appropriate level(s) of action: National, Provincial
- Specific responsible agencies: ???
- Existing information and additional research needs: critical dry season habitat parameters are described, ???
- Specific action steps:

Final Thoughts

- There is little or no disagreement on the threats or the urgency of action
- Use current the knowledge of abundance, range and critical habitat to guide large-scale planning and environmental impact assessment
- be strategic in deciding on additional research
- Continue and strengthen efforts to help local communities protect dolphins from bycatch and stranding.

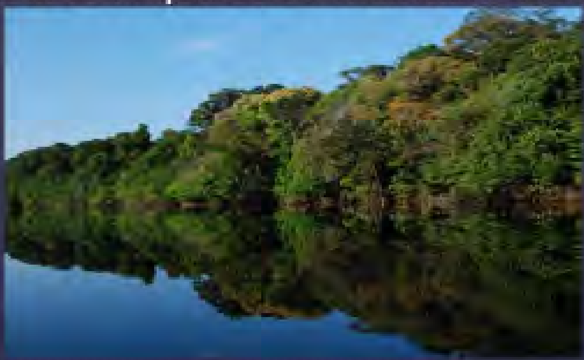
Thank You

Conservation Research: Document causes of mortality

- Are there differential effects with implications for reproduction and recruitment.
  - (e.g., Mekong River – adults caught in gillnets, but large number of unexplained calf deaths)
- Are threats different in different river sections
  - (e.g., Mekong gillnet census, inhabited vs. uninhabited stretches)
- Sampling program for stranded animals
  - health, contaminants, reproductive condition, genetics, etc.

Conservation Research: Identify critical habitats

- Identify those areas and conditions that if lost would reduce or eliminate a subpopulation
- Conditions required for each subpopulation to persist and increase
- Identify measures required to maintain critical habitat

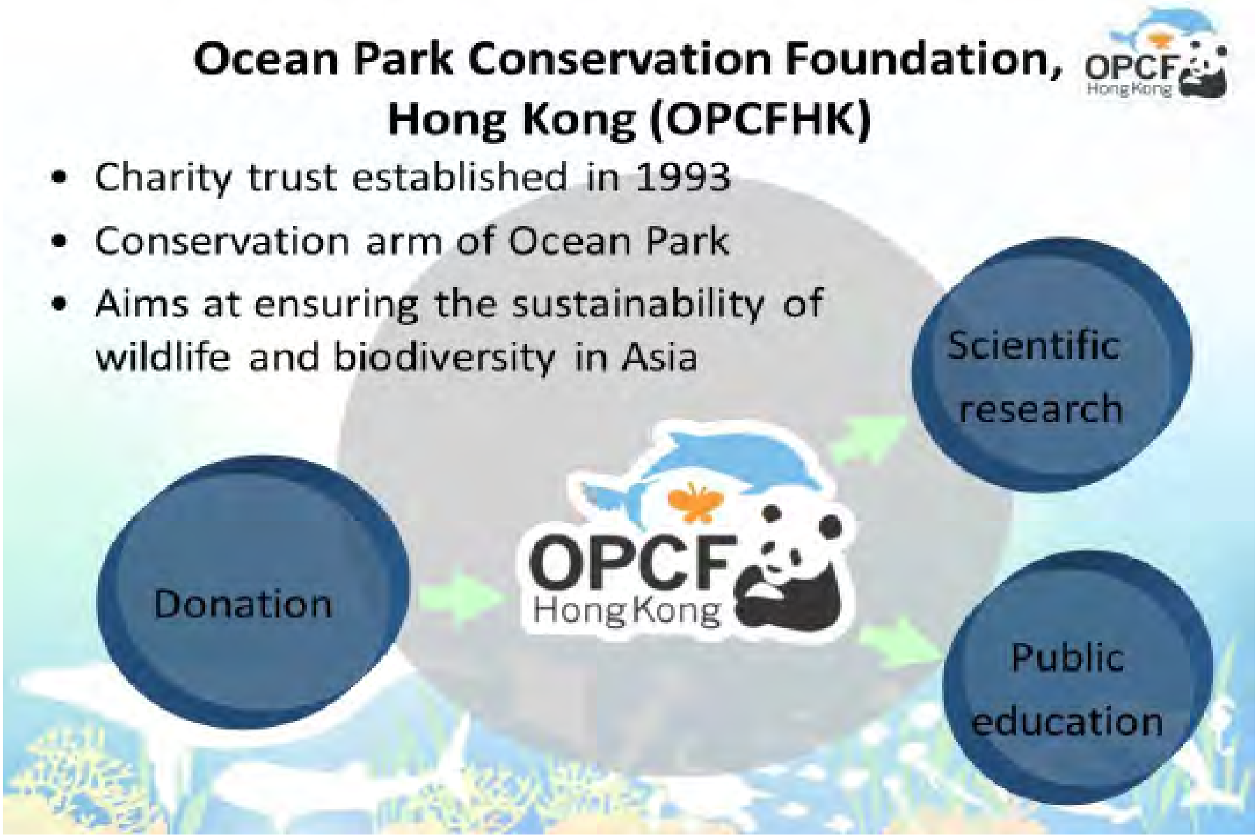


Conservation Research: targeted studies?

- Targeted research to understand how threats operate, demographics, and habitat requirements, etc.
- Behavioral research – e.g., behavior near nets, barrages, and irrigation outflows, seasonal movement patterns
  - (in Mekong River a priority is to observe neonatal behavior)
- Genetic research
  - (in Mekong River – sub group age and sex composition unknown in widely separated dry-season pools)
- What is needed here?


Conservation Research: Assess population size and distribution
Standardized Surveys on a periodic basis – decide how frequently required?
Surveys are expensive in funds and personnel
Balance effort on surveys with other required research
Develop alternative monitoring measures and indicators to supplement full surveys


OPCF Hong Kong
OPCFHK Funding to Marine Mammal Conservation in Asia
Ms. Suzanne Gendron
Foundation Director
SEAMAM III
4-10th March 2013
Langkawi, Malaysia


Ocean Park Conservation Foundation, Hong Kong (OPCFHK)
• Charity trust established in 1993
• Conservation arm of Ocean Park
• Aims at ensuring the sustainability of wildlife and biodiversity in Asia
Donation
OPCF Hong Kong
Scientific research
Public education


Annual Funding Application
OPCF Hong Kong
• www.opcf.org.hk
• Jan: application deadline
• Feb-Mar: external Scientific Advisory Committee (SAC) review
• April: applicant supplement information, SAC 2nd review
• May-Jun: internal approval
• Jul: agreement settlement and transfer of 1st installment
Funding Application

Funding Focus and Theme

OPCF Hong Kong

- A) **Conservation Research and Management**
  - Conduct *in-situ* field studies to enhance the understanding of the target species population, the condition of their habitats and the threats they face in the wild.
  - Collaborate with local communities, institutes and the government to formulate effective conservation management plans for preserving the threatened animal species and their habitats.
  - Conduct *ex-situ* studies on the target species to promote in-situ conservation efforts.
  - Include relevant, specific conservation targets and measureable milestones.
- B) **Community Education and Capacity Building**
  - Design and organize *in-situ* and *ex-situ* conservation education programmes to raise local communities' awareness of wildlife conservation to engage them to change their daily activities and behaviour in support of conservation efforts.
  - Conduct capacity-building programmes to advance the nature reserve and conservation education teams' knowledge and skills for effective conservation action.
  - Evaluate the programme's effectiveness with specific and quantifiable indicators.
- Theme for 2012/13 and 2013/14: **Climate Change**

Annual Funding Application

OPCF Hong Kong

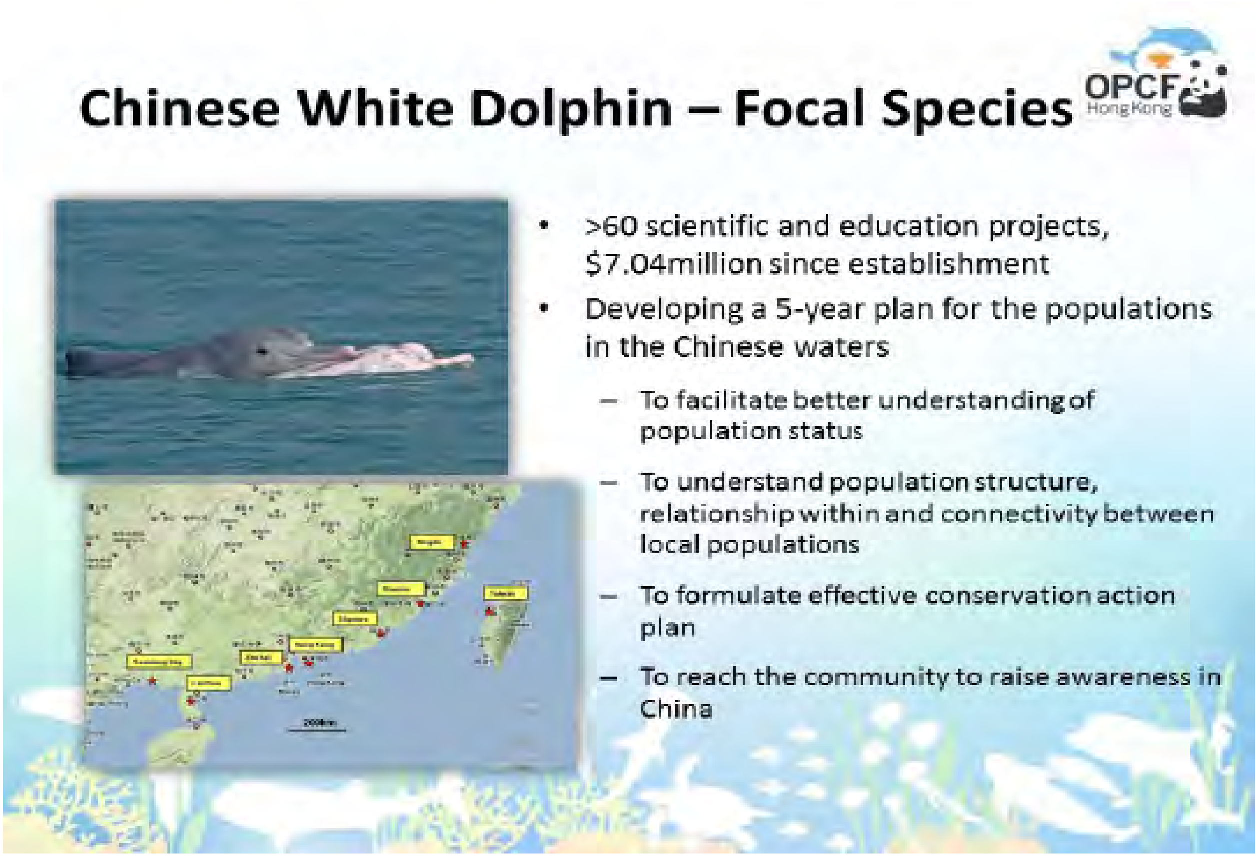
Year	No. of application	No. of funding project	Requested amount (in million HKD)	Committed amount (in million HKD)
2007/08	54	29	13.95	3.24
2008/09	71	24	15.19	3.97
2009/10	79	31	14.82	3.45
2010/11	100	25	17.89	2.83
2011/12	108	42	18.82	4.90
2012/13	102	41	17.14	6.34
2013/14	132	TBC	20.5	TBC


Selection Criteria
OPCF
Hong Kong
• A) Conservation Research and Management
– Conservation impact, significance and urgency
– Applicant's background, qualification and experience
– Effective methodology to achieve expected outcome
– Local capacity building
– Develop long term conservation plan
• B) Community Education and Capacity Building
– Knowledge and skills enhancement
– Applicant's background, qualification and experience
– Effective methodology to achieve expected outcome
– Positive impact on target species conservation
– Evaluation of effectiveness


OPCF
Hong Kong
Scientific research
• Since 2005, supported over 290 scientific research and education projects in the Asian region, with a total of over $34 million.


Marine Mammal Projects in Asia
OPCF
Hong Kong
• Over 290 projects funded since 2005
– 108 projects on marine mammals, at least 14 marine mammal species
Humpback whale (CR)
ARKive
Blue whale (EN)
Western gray whale (CR)
Spotted seal (DD)
Baiji (CR)
Irrawaddy dolphin (CR, VU)
Finless porpoise (CR, VU)
Ganges river dolphin (EN)
Chinese white dolphin (CR, NT)
Dugong (VU)
Beaked whale (DD)


Our Project locations since 2005
Western gray whale
Humpback whale
Blue whale
Ganges river dolphin
Irrawaddy dolphin
Dugong
Chinese white dolphin
Finless porpoise
Baiji
Spotted seal
Beaked whales
Pakistan
India
Sri Lanka
Thailand
Vietnam
Cambodia
Malaysia
Philippines
Indonesia
Japan


Chinese White Dolphin – Focal Species
OPCF
Hong Kong
• >60 scientific and education projects, $7.04million since establishment
• Developing a 5-year plan for the populations in the Chinese waters
– To facilitate better understanding of population status
– To understand population structure, relationship within and connectivity between local populations
– To formulate effective conservation action plan
– To reach the community to raise awareness in China


Thank You!
OPCF
Hong Kong
For any enquiries, please contact us at:
Website: www.opcf.org.hk
Tel: (852)3923 2704
Email: opcf@oceanpark.com.hk

Workshops

Workshop on Communication, Education and Public Awareness (CEPA)

Workshop leader: Zahangir Alom, Bangladesh Cetacean Diversity Project

A workshop on communication, education and public awareness (CEPA) was held during SEAMAM III to allow delegates to learn and share their experiences on working to foster support among local communities, resource managers, partner organizations, and the institution for effective cetacean conservation. The workshop was led by Zahangir Alom from the Bangladesh Cetacean Diversity Project (BCDP). The BCDP has a well-established CEPA programme and Zahangir conducted the workshop by sharing pointers about the programme and encouraged workshop participants to share and discuss issues related to community outreach efforts and approaches for effective community participation in conservation.

The workshop opened with a presentation by Zahangir on challenges to cetacean conservation and how community outreach and education are being used to complement conservation efforts using BDCP's experiences in Bangladesh as a case study. The workshop continued to gather information from participants on education initiatives in their respective countries especially on the following:

- What has been done to date?
- Which methods were successful, and which were not?
- What challenges do they face in implementing a CEPA program?

From the experiences shared by various workshop participants, it was found that in many countries, CEPA programs are fairly well developed. Many programs have been conducted in the past or are currently ongoing using diverse methodologies targeted to a wide range of audiences. All the programs share similar objectives which are mainly to use education as a tool to give the target audience information on the existence of marine mammals in their area, share research findings, and enhance their understanding on the importance of the conservation of marine mammals and their habitats. Table 1 summarizes the type of CEPA programs conducted throughout the region and their effectiveness in fulfilling their intended objectives.

Program	Effectiveness
Mobile awareness programs (e.g. talks, workshops)	Effective in providing platform for information sharing directly to target audience (e.g. roving education to schools, colleges and universities in the Philippines).
Printed materials	Effective in wide-distribution of information (e.g. posters) and able to encourage active participation from target audience (e.g. calendar).
Videos/ Documentaries	Effective in increasing awareness and providing customized information on specific issues to be addressed.
Performing arts	Effective in promoting participation and using creative outlets to address conservation issues.
Exhibition	Effective in sharing information to multiple target audiences as a variety of activities and exhibits can be incorporated to cater to specific issues and/ or audience expectations.

Table 1. Summary of CEPA programs in Southeast Asia and their effectiveness

As with many aspects of conservation, there exist many challenges in undertaking effective education programs. The challenges shared by delegates show striking similarities throughout the region. One of the main challenges is the lack of political will and receiving support from relevant authorities in the course of implementing these education programs. Environmental conservation typically ranks low on the list of national priorities across the region. Thus, officials tend to underfund conservation programs. In addition, target communities are usually poor, thus livelihood and income generation are given higher priority than participating in any conservation and education programs. These communities generally have limited access to good quality education. Literacy and analytical skills often lacking, making it harder for scientific information to be fully understood. Furthermore, there is a general lack of financial resources among academic institutions and NGOs, making it hard to retain trained scientists and educators to sustain a long-term education program.

In some instances, these challenges were able to be overcome. Early identification of a particular target audience's needs is critical in getting their buy-in into a project. For example, BDCP managed to get deep sea fishermen to participate in conservation efforts by providing GPS units so they are able to safely navigate themselves back home in adverse weather and directly reducing the risk they face of being caught from accidentally crossing into a neighboring country's border. Projects in the region have interacted with students through university seminars and courses to recruit skilled personnel necessary in the successful implementation of a particular project. Workshop participants stated that partnering with universities and private organizations, such as those involved in nature-based tourism, have shown to be a successful means of acquiring and retaining of much-needed skilled project personnel. Such partnerships often involve provision of long-term mentoring and technical support to students and business employees so that they are able to interact with local communities in a more informed and efficient manner.

A number of recommendations were made based on the discussions by the workshop participants for the education programs to be effective and complementary of conservation efforts. Development of a conservation strategy using up-to-date information is crucial and should be adaptable to changing environment and community expectations. Programs should utilize existing networks and create new partnerships to encourage multi-stakeholder participation. Such collaborations will also benefit immensely from the sharing of information to encourage innovative solutions to conservation issues and challenges. Programs should be participatory, science-based and sensitive to stakeholders by respecting the target audience's needs and incorporating local knowledge and ideas. To maximize participation, programs should also generate trust with local communities, ideally through long-term engagement and consultation. The effectiveness of education programs should be evaluated regularly and assessment methods ideally developed at the program's design stage and incorporated into the overall program design.

Third International Conference on Marine Mammals of South East Asia (SEAMAM III) March 4-10, 2013, Langkawi Island, Malaysia

-ZahangirAlom

Educational Solutions - Working with Local Communities

Goal: Capacity building and information exchange

10:30-11:30 Introduction

A. Round Table:

Brief introduction of participants and the places they work plus Why did you choose this workshop and how are communities involved currently in your conservation work?

B. Introductory Session:

Why is working with communities a topic at a conservation conference?
a. e.g. Conservation at gunpoint has not proven successful; only if local communities/stakeholders are involved can conservation efforts be effective.
b. Goal of working with communities> exchange of information (all involved are learning), encourage open communication (transparency), develop innovative solutions that are science-based, community informed.

C. Quick look at 'traditional' awareness campaigns – why effectiveness is relatively low (teach & preach vs. information sharing, focusing on tools rather than on content & messages, short-term vs. long-term outlook)

D. Examples from Participants

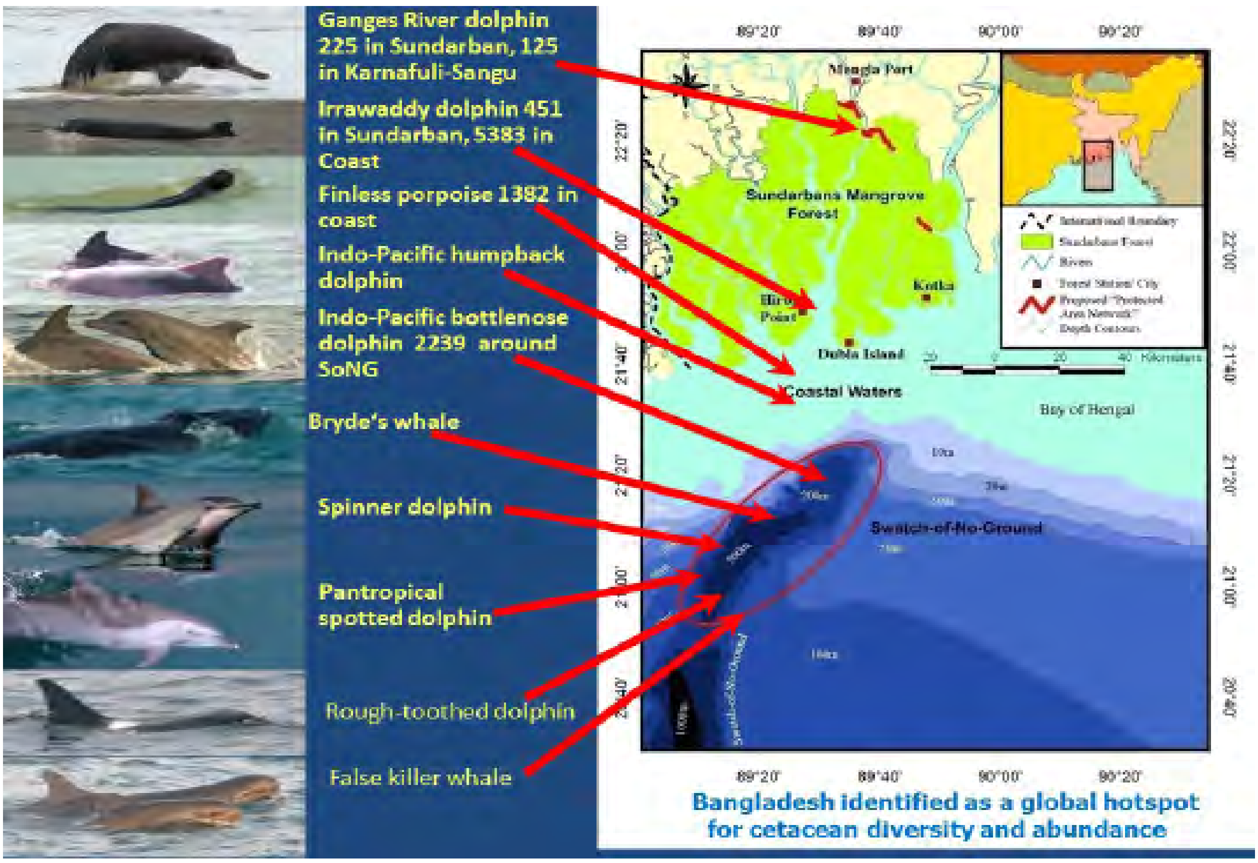
11:30-12:30 Developing effective educational solutions that integrate/involve communities in conservation solutions – Using the Example from BCDP/WCS Bangladesh

A. Strategic process for educational outreach
1. Learn about and select your target audience - use socio-economic information, develop relationships and informally consult
2. Formulate key messages
3. Develop locally appropriate tools for message sharing
4. Amplify impact through networking (NGO/ fisher/student/ gov't/nature tourism, mortality monitoring, dolphin & fishermen safety network)
5. Evaluate impact (knowledge, attitude and practice survey)

13:30-14:30Reflection/Discussion/Resources

1. Personal Reflection:
   a. Next steps required to increase the effectiveness of our (participants) community outreach program
   b. Necessary considerations
   c. Useful Resources – Educational Outreach, Environmental Education, Communication Strategies


Community Outreach and Education in Bangladesh – Partners in Conservation
WILDLIFE CONSERVATION SOCIETY
BCDP
m.robards


Ganges River dolphin 225 in Sundarban, 125 in Karnafuli-Sangu
Irrawaddy dolphin 451 in Sundarban, 5383 in Coast
Finless porpoise 1382 in coast
Indo-Pacific humpback dolphin
Indo-Pacific bottlenose dolphin 2239 around SoNG
Bryde's whale
Spinner dolphin
Pantropical spotted dolphin
Rough-toothed dolphin
False killer whale
Mongla Port
Sundarbans Mangrove Forest
Kotka
Hiron Point
Dubla Island
Coastal Waters
Bay of Bengal
Swatch-of-No-Ground
Bangladesh identified as a global hotspot for cetacean diversity and abundance

The Wildlife Conservation Society's Bangladesh Cetacean Diversity Project (BCDP) works to conserve cetacean diversity and abundance in Bangladesh with local communities and institutions.

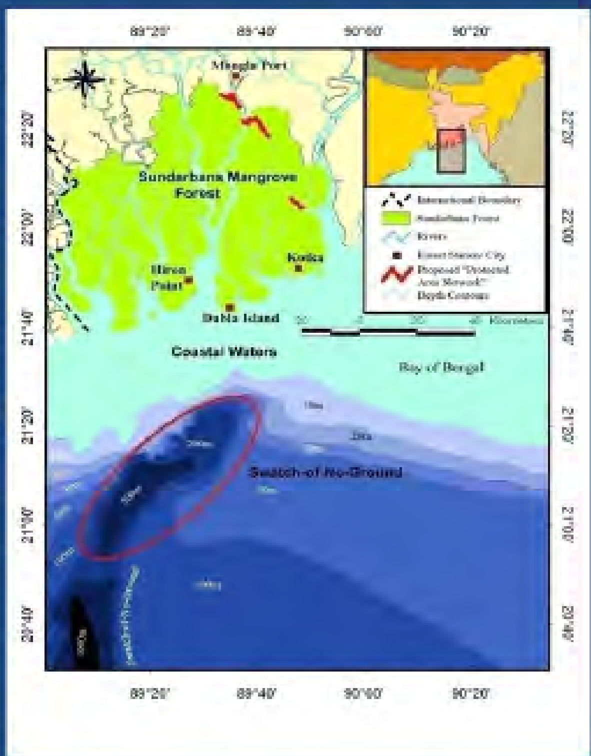
The Educational Outreach Program aims to foster support among local communities, resource managers, partner organizations and institutions for effective cetacean conservation.

Background

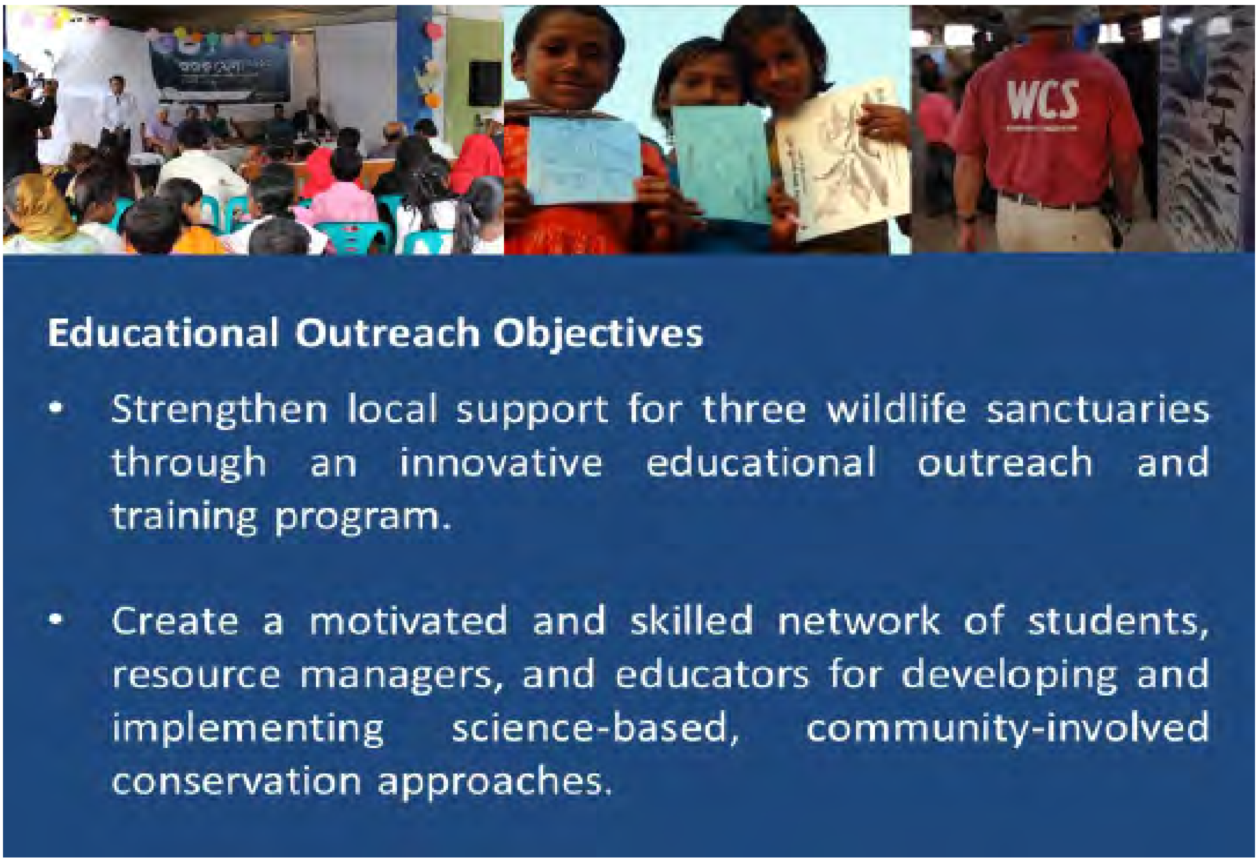
Our conservation approach is participatory, science-based, and sensitive to the needs of local stakeholders.

We are currently focusing on preparing a management plan for three newly declared wildlife sanctuaries for freshwater dolphins.

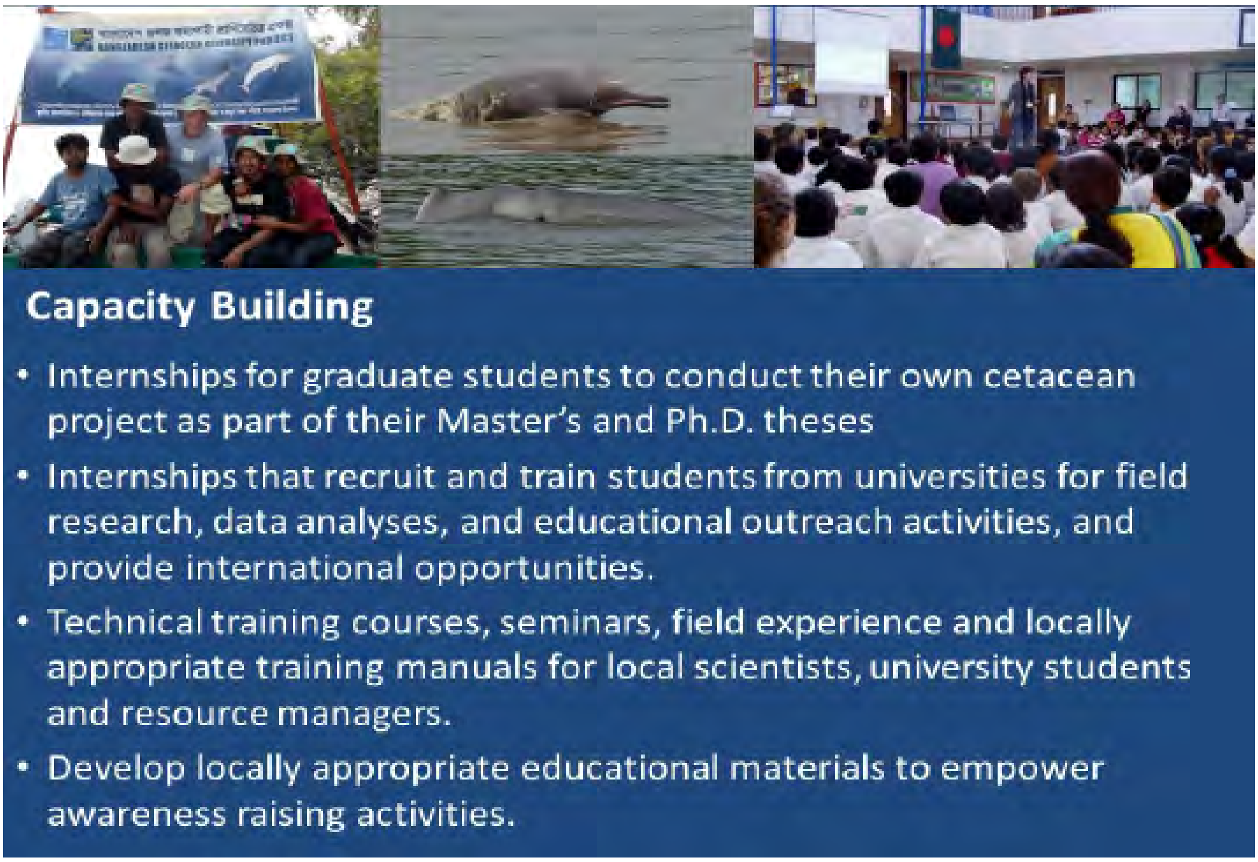
We are also working to establish a protected area network for cetacean diversity in the Bay of Bengal.

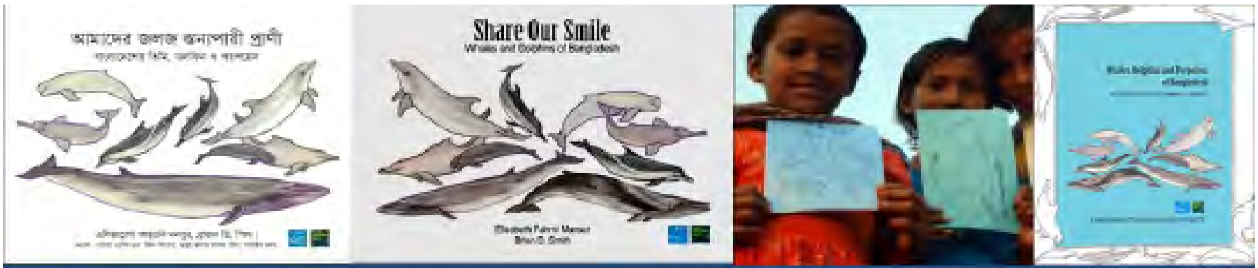



Our project builds local constituencies through educational outreach.
We communicate and consult with local people about cetacean conservation and sustainable fisheries through a network of trained educators and using culturally appropriate and innovative education tools.


WCS
Educational Outreach Objectives
• Strengthen local support for three wildlife sanctuaries through an innovative educational outreach and training program.
• Create a motivated and skilled network of students, resource managers, and educators for developing and implementing science-based, community-involved conservation approaches.


Our Educational outreach has 3 components
• Building local capacity and strengthening local partnerships through training and participation of university students, community members, local NGOs and government officers for cetacean research and conservation.
• Vessel-based cetacean exhibition (*Shushuk Mela*) that emphasizes interactive learning and provides a platform for consultation.
• Network of local social-service NGO partners trained and equipped to integrate cetacean education, sustainable fisheries and climate change adaptation into their outreach activities.

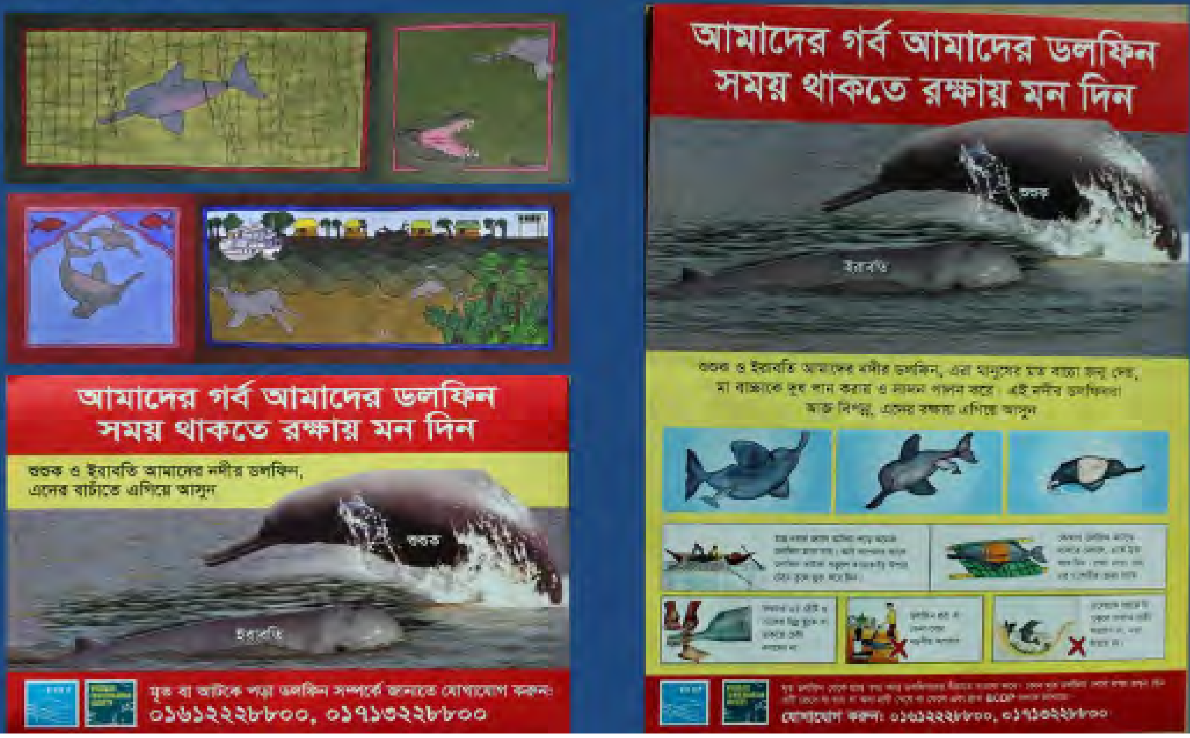

Capacity Building
• Internships for graduate students to conduct their own cetacean project as part of their Master's and Ph.D. theses
• Internships that recruit and train students from universities for field research, data analyses, and educational outreach activities, and provide international opportunities.
• Technical training courses, seminars, field experience and locally appropriate training manuals for local scientists, university students and resource managers.
• Develop locally appropriate educational materials to empower awareness raising activities.



Educational Materials

- "Share our Smile: Whales and Dolphins of Bangladesh" (in both Bengali and English)
- Coloring books on Ganges River dolphins and cetacean diversity
- "Whales, Dolphins and Porpoises of Bangladesh: A Toolkit for Educators"
- A children's story book featuring a Ganges River dolphin

- Poster and Sticker for mortality and stranded dolphin response






Challenges

- Enlisting the support of academic and NGO supervisors who generally know very little about cetaceans.
- Retaining trained scientists and educators in conservation biology due to uncertain employment opportunities.
- English, analytical, and interactive education skills are often poor.

Solutions

- University seminars with students and faculty used as a platform for recruiting students.
- Provide incentives through small stipends and academic, professional and field experience opportunities.
- Provide long-term mentoring and technical support.



Capacity Building Outcome

- Supported and mentored 60 Local university students, 7 International Student, 8 internships with the Conservation Leadership Programme, 1 fellowship with the Zoological Society of London, and 3 Master's students and 1 Ph.D. student.
- Increased the capacity of local scientists as evidenced by first-authored and co-authored publications.
- Increased leadership capacity as evidenced by the increase in local-led field activities and policy initiatives.


Shushuk Mela 2008 Dhaka
Celebrating Cetacean Diversity through an interactive exhibition
• Life-size models
• Simple texts & illustrations in Bengali and English
• Interactive games and interpretation
• Local film documentary
• Comments for improvement
Seeing With Sound


Shushuk Mela 2011, 12 and 13
Sharing the challenge of conserving cetacean diversity and abundance with local communities

Challenges

- Low literacy of target audience
- Local logistics
- Training, supporting and retaining trained team of 10-12 interpreters
- Addressing livelihood issues

Solutions

- Interactive approach
- Partner with nature tourism
- Benefit from existing network of trained and experienced students and government staff
- Exhibition provides ideas for alternative livelihoods and a forum for discussion.

Shushuk Mela Outcomes

- Exhibition and film show reached almost 40,000 villagers living close to dolphin sanctuaries (35 % adult, 40% female).
- About 50 student interns trained and gained experience as interpreters.
- Pre- and post-exhibition interview surveys indicated a substantial improvement in knowledge, attitude and practice regarding cetaceans and their conservation.

NGO Partnership Network

Outreach network among grass-root level NGOs strengthened to increase the impact of the Educational Outreach activities for making local Constituencies

Readily build foundation of NGO's among local communities is appropriate for dissemination of information on cetacean conservation and sustainable fisheries.

Challenges

- Recruitment of appropriate NGOs who are willing to incorporate cetacean issue in their monthly agenda
- Frequent changes in the positions due to lake of financial security
- Consistent of communication

Solutions

- Broaden contact network and increase number of involved NGOs and frequency of training programs.
- Maintain regular communication and update of NGO worker and activity data base
- Monthly visit to NGO offices

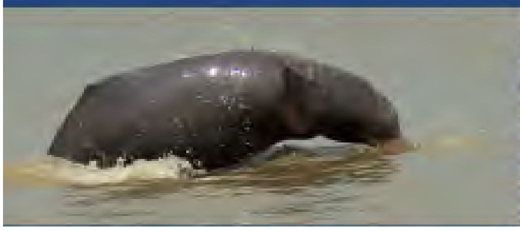

Outcome from NGO partnership Network
• More than 30 participants from 11 NGOs integrated cetacean conservation and sustainable fisheries as part of their normal community meetings in villages near the three new wildlife sanctuaries.
• About 6,000 booklets, posters and stickers provided to communities.
• Increase in the number of reports of mortality and entanglements over our dolphin hotline number.


Strategic process for educational outreach
• Learn about and select your target audience - use socio-economic information, develop relationships and informally consult
• Formulate key messages
• Develop locally appropriate tools for message sharing
• Amplify impact through networking (NGO/ fisher/student/gov't/nature tourism, mortality monitoring, dolphin & fishermen safety network)
• Evaluate impact (knowledge, attitude and practice survey)

Measuring conservation progress through Knowledge, Attitude and Practice (KAP) surveys

Objective

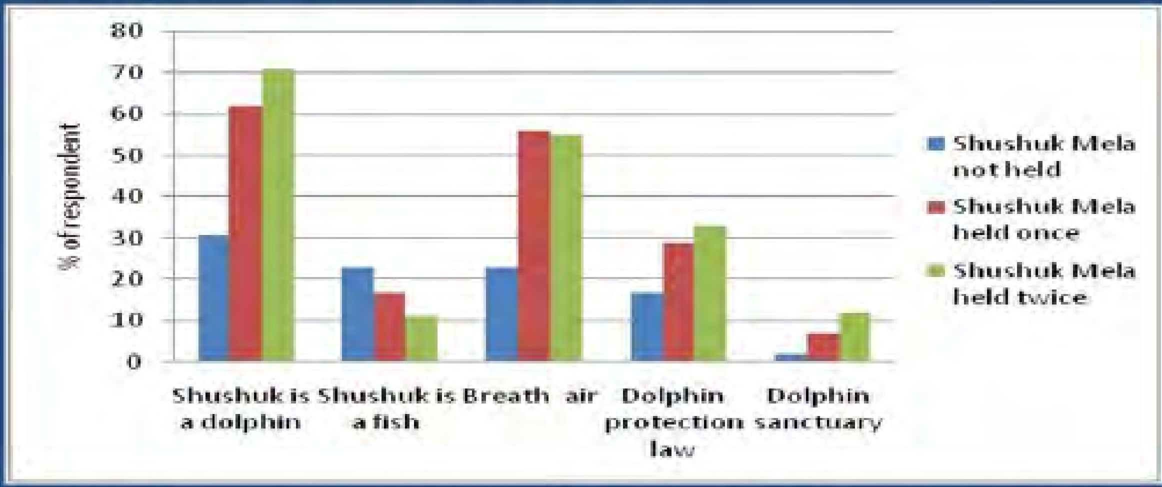
- Assess effectiveness of the Shushuk Mela using KAP surveys on freshwater dolphins, resource use and the dolphin sanctuaries.
- Document and analyze practices affecting the river ecosystem to inform conservation management.



Post-impact interview survey was conducted with 50 people from six villages: 2 where *Shushuk Mela* was held twice, 2 where they were held once, and 2 where the exhibition did not visit.

Map showing three sanctuaries and six interviewed villages

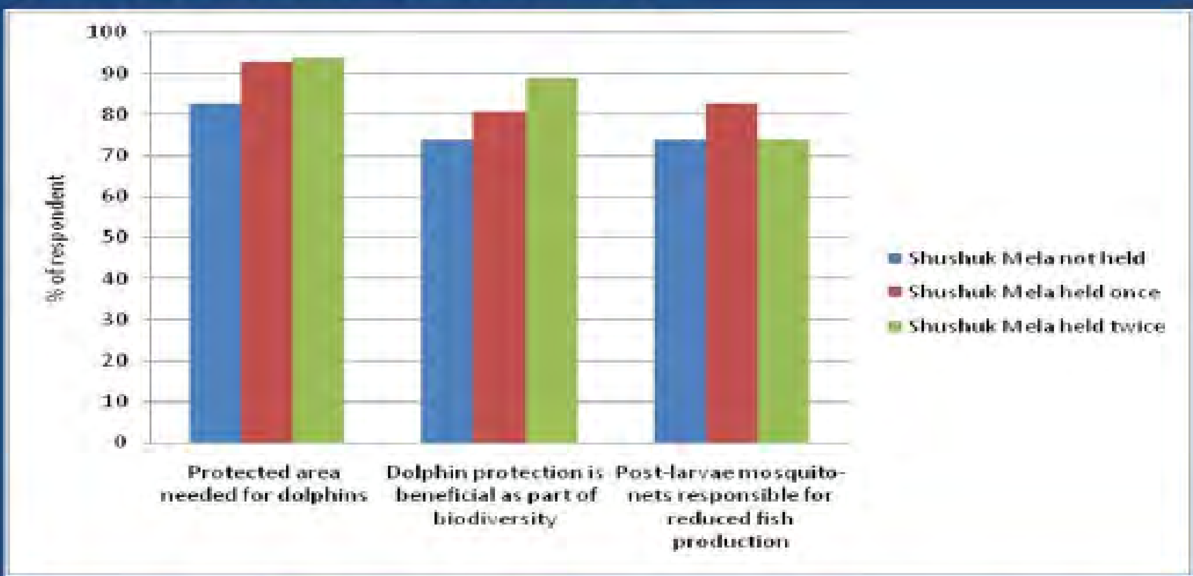
Visited versus non-visited villages.



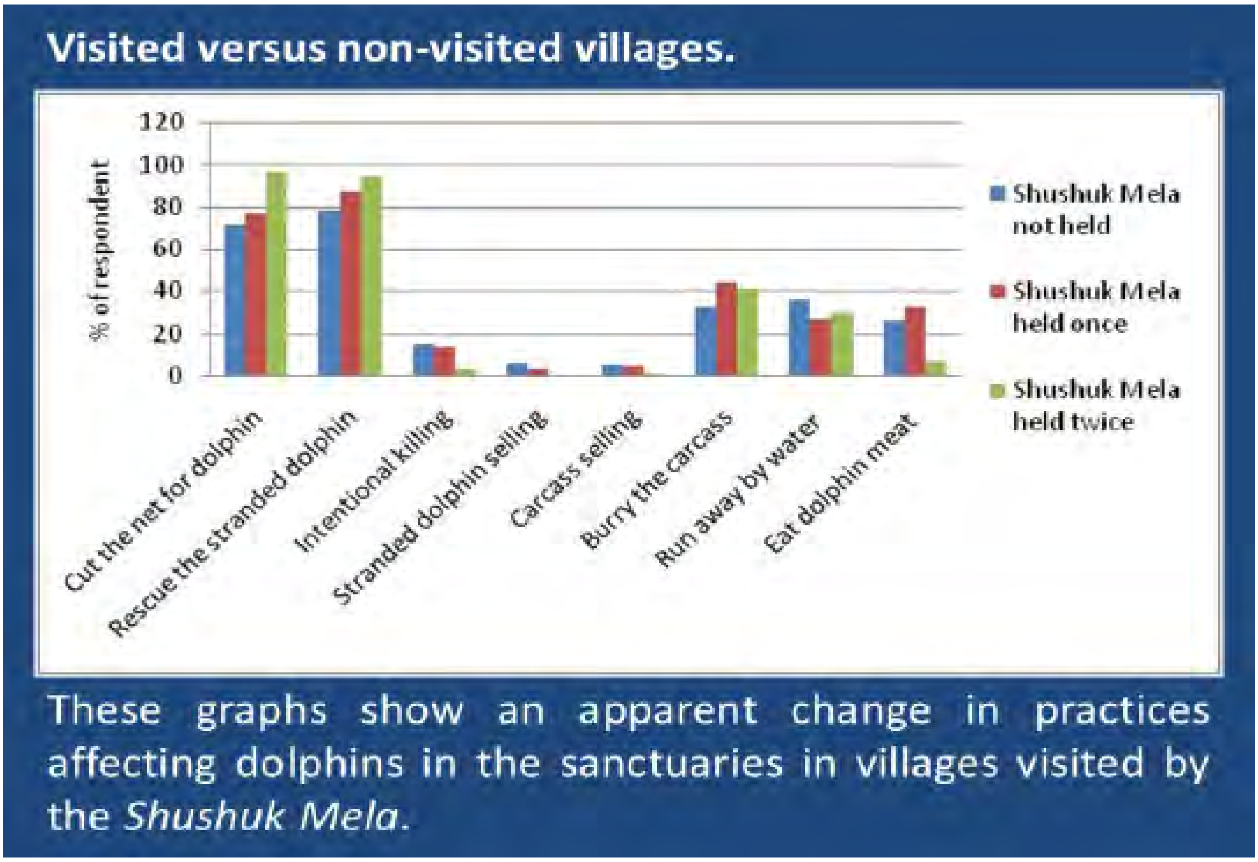
- 45% of interviewees learned about dolphin protection law
- 26% of the interviewees learned about the dolphin sanctuaries

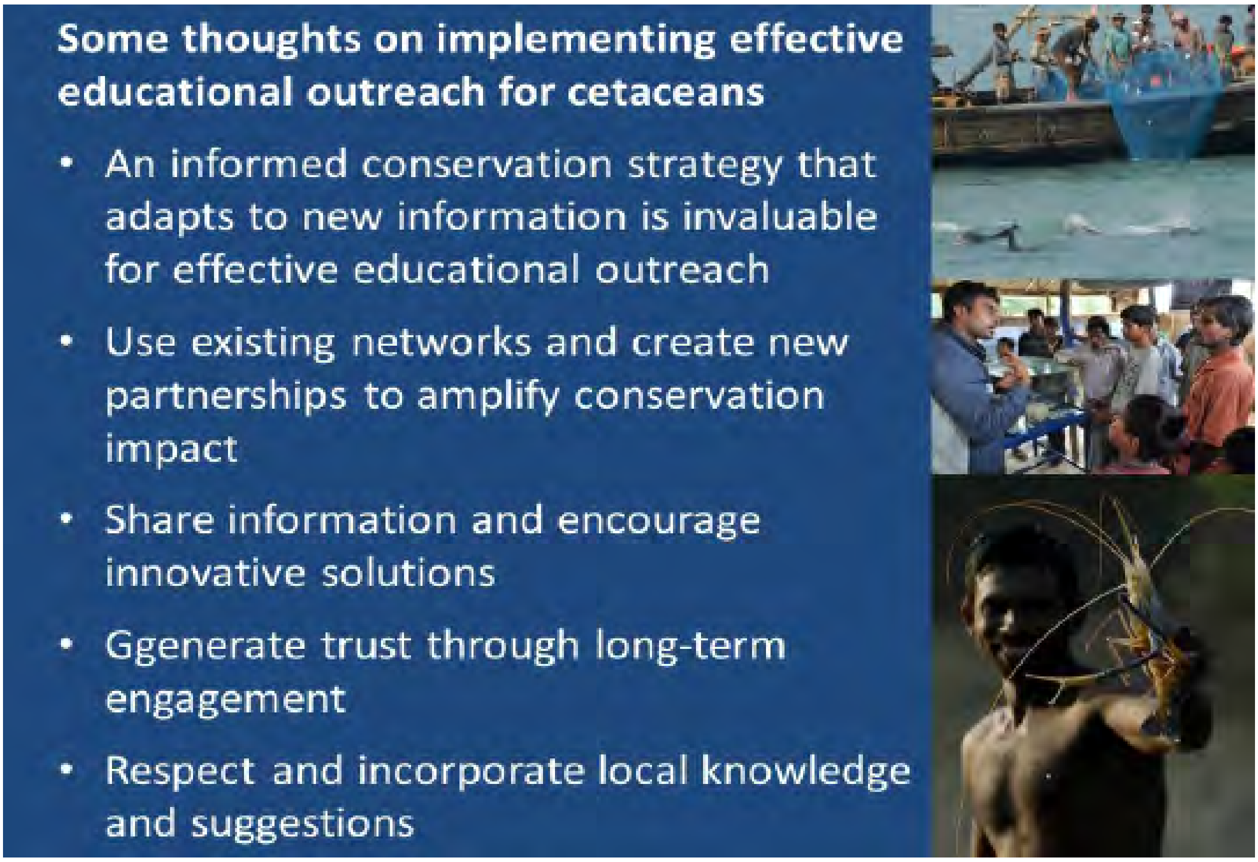
from the *Shushuk Mela*.

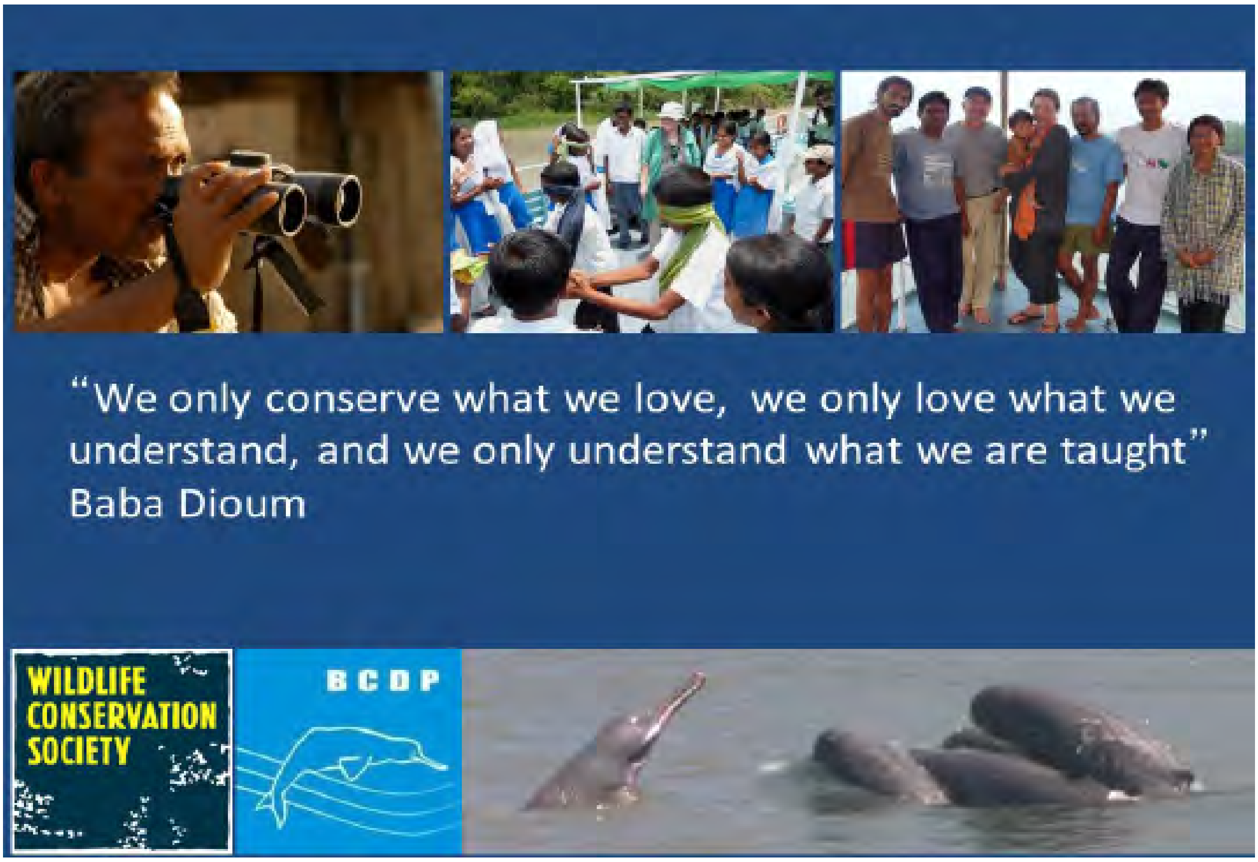
Visited versus non-visited villages.



These graphs indicate an apparent increase in the awareness of the need for protecting dolphins, fisheries and other aquatic biodiversity through the *Shushuk Mela*.


Visited versus non-visited villages.
% of respondent
120
100
80
60
40
20
0
Cut the net for dolphin
Rescue the stranded dolphin
Intentional killing
Stranded dolphin selling
Carcass selling
Burry the carcass
Run away by water
Eat dolphin meat
Shushuk Mela not held
Shushuk Mela held once
Shushuk Mela held twice
These graphs show an apparent change in practices affecting dolphins in the sanctuaries in villages visited by the Shushuk Mela.


Some thoughts on implementing effective educational outreach for cetaceans
• An informed conservation strategy that adapts to new information is invaluable for effective educational outreach
• Use existing networks and create new partnerships to amplify conservation impact
• Share information and encourage innovative solutions
• Ggenerate trust through long-term engagement
• Respect and incorporate local knowledge and suggestions



Economics of Small-scale Fisheries Workshop

Workshop led by Lydia Teh

The objective of this workshop was to help participants gain a better understanding of how to apply socio-economic framework/ methods to analyze issues in small-scale fisheries and marine conservation. About 20 people, mainly biologists, participated in the workshop. A short video featuring a proposed sustainable tuna fishery in Sabah, Malaysia initiated discussion on how to approach socio-economic analyses. Issues that were brought up included financial benefits and costs, market supply and demand, social capital, and governance, among others. Many of the participants were interested in learning about interview methods, especially questionnaire design. A fair number of people had experience conducting interviews with fishers and other marine resource users, and shared valuable insights for designing scientifically rigorous survey questions that are at the same time easily understood (by interviewees) and administered. Cost-benefit analysis (CBA) was also briefly introduced and a short exercise got everyone thinking about the multiple details and ambiguities involved in conducting a thorough CBA. Interest in this workshop showed that many marine mammal researchers are enthusiastic about interdisciplinary work. This is a good sign for marine conservation in Southeast Asia, where the well-being of the sea and people is so often closely interconnected.

Outline

Why economics matters

1. Socio-economic drivers of small-scale fisheries
2. Socio-economic analysis for management needs

Small scale fisheries

Socio-economic dynamics in fisheries exploitation

- Low cost of entry
- Open access fishing grounds
- Low opportunity cost of fishing

High # of entrants

Fishing effort

Fish catch

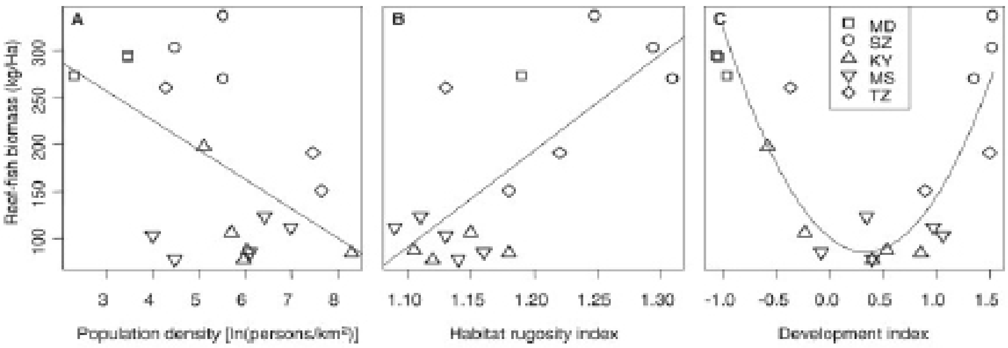
Destructive Fishing

"Malthusian overfishing"

Socio-Economic Drivers

- Broad scale: population density, population growth, socioeconomic development

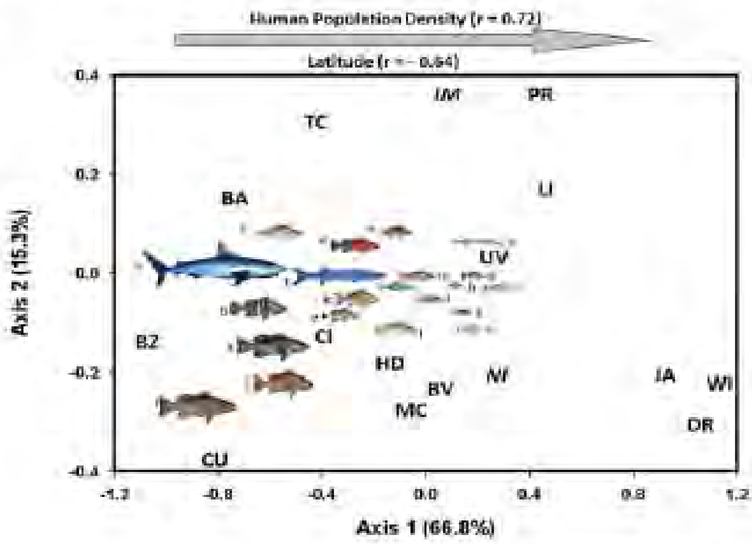
Broad scale socio-economic drivers



Source: Cinner et al. 2009 Current Biology

Fish biomass negatively related to human population size

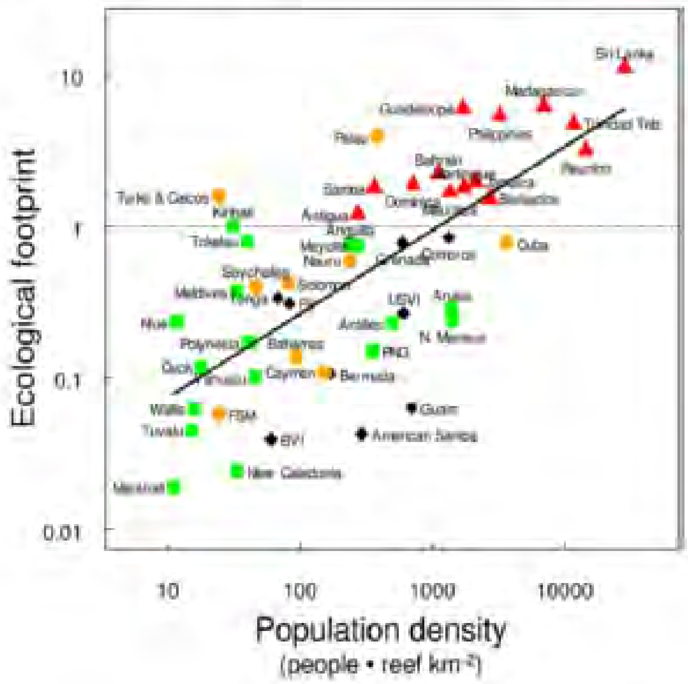
Broad scale socio-economic drivers



Source: Stallings 2009 PLoS ONE

Human population density explains distribution of reef fish size and species

Broad scale socio-economic drivers



Source: Newton et al. 2007 Current Biology

More economic drivers of SSF ...

- Labour mobility
  - poverty, lack of livelihood options decrease opportunity cost of labour
- Subsidies
  - Incentive to remain in fishery

Markets and trade

- International demand for live reef food fish, aquarium, beche de mer, seahorse trades provide monetary incentives to target these species
  - Motivates 'roving bandit' style of fishing
- Proximity to markets negatively linked to biomass of targeted species (Brewer et al. 2009)

Fishers' behaviour

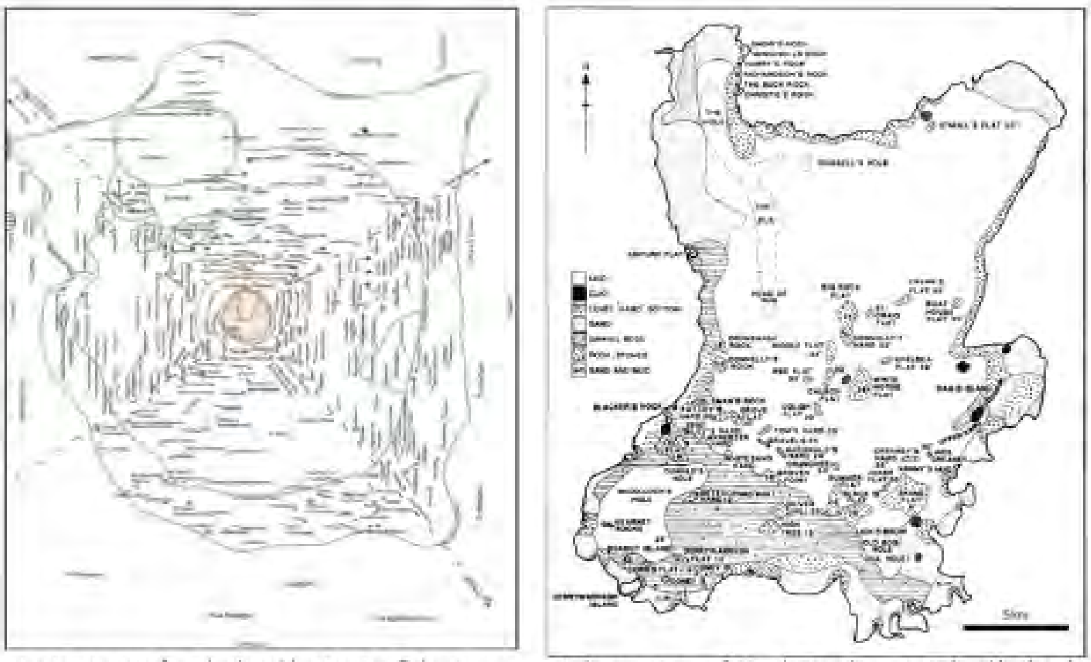
- Fishers constantly make trade-offs
  - Where, when, what, how do fishers fish?
- Profit maximization theory
  - Fishers are rational decision-makers
- Profit alone does not fully explain observed behaviour

Fishers' behaviour

Other factors influencing fisher behaviour

- Knowledge, mental maps
- Attitudes and preferences
- Social/cultural drivers

Mental maps



An Anutan reef as depicted by Anutan fishermen (Feinberg et al. 2003)

Substrate map of Lough Neagh as perceived by local fishermen (McKenna 2008)

Fishers' behaviour

Other factors influencing fisher behaviour

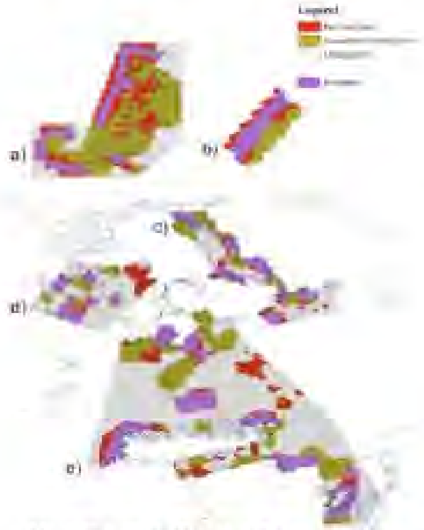
- Knowledge, mental maps
- Attitudes and preferences
- Social/cultural drivers

Small-scale fishers don't always exhibit rational behaviour

Time Preference

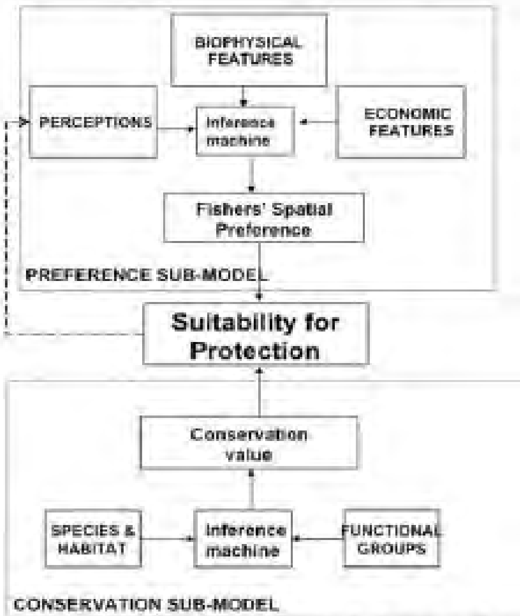
- Willingness to delay gratification
- Inter-temporal choice - making decisions about trade-offs among costs and benefits that occur at different points in time
- Measured by discount rate
  - Higher discount rate → more short-term oriented

Incorporating socio-economic data into MPA zoning



Grantham & Possingham (2010)

Marxan- minimise fishing revenue losses, identify village fishing grounds



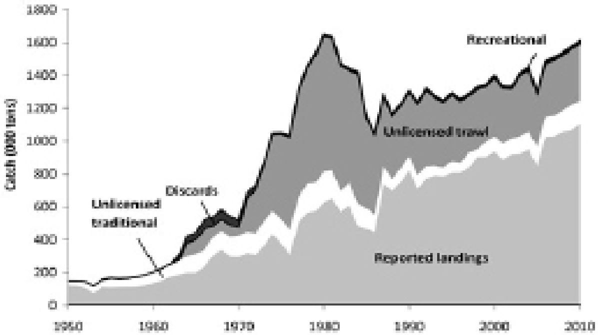
Protected Area Suitability Index

Teh and Teh, 2011

Contribution of small-scale fisheries to society

- Small-scale fisheries support
  - food security
  - Social networks
  - Economic livelihoods: primary & ancillary jobs
- Small-scale fish catches are largely unknown
  - Reconstruct catches from small-scale sector

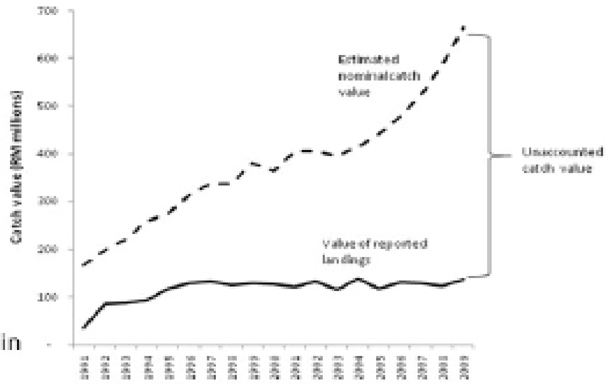
Fish catch reconstruction



Peninsular Malaysia reconstructed landings 1950-2010

From 1950-2010, additional 1.97 million unlicensed traditional fishers, who contributed 6.4 million tons of fish.

Small-scale fish catches in Sabah undervalued by up to 225% from 1950-2010.



Annual Sabah catch value unreported for in reported statistics (*Teh et al. 2011).*

Summary

- Broad scale socio-economic factors can drive small-scale fisheries in different trajectories
- Small-scale fishers are not simply profit maximizers
  - Full understanding of fishers' behaviour necessary if we want to change behaviour
- Economics is useful for small-scale fisheries management

Eliciting discount rates

Do you prefer to receive $100 now or $105 in one month?

Now	1 month
100	105
100	110
100	115
100	120
100	125
100	130
100	145
100	150
100	155

Sabah: 3 series

- A: now vs. 1 month
- B: now vs. 6 months
- C: 1 yr vs. 1 yr + 1 month

Estimating Discount Rates

Continuous exponential discounting:
$y = x \cdot e^{-rt}$

Discount rate
$\boldsymbol{r = \ln (x/y)/t}$

y = present value
x = future value
t = time delay

Estimating Discount Rates

Now	1 month	Rate at indifference
100	105	4.9
100	110	9.5
100	115	[illegible]
100	120	18.2
100	125	22.3
100	130	26.2
100	135	30.0
100	140	33.6
100	145	37.2

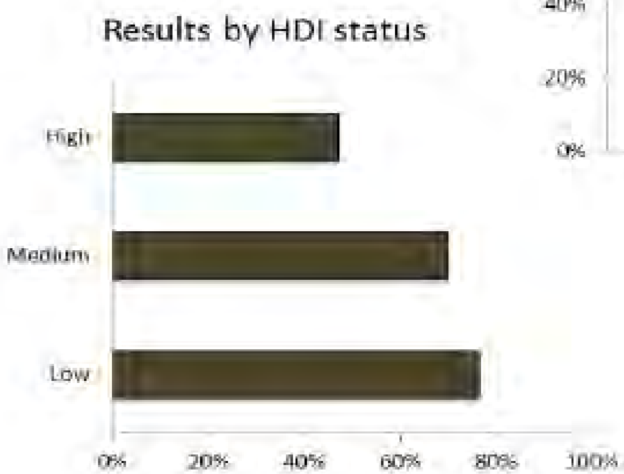
$9.5 < r < 14.0$

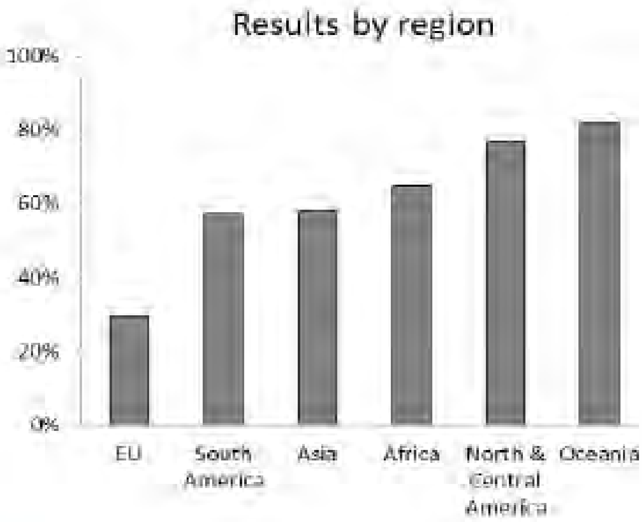
Total marine fisheries jobs

- 260 million marine fisheries jobs worldwide
- 20 million jobs in direct sector, 210 million jobs in indirect sector
- 203 million full time equivalent jobs

FAO region	Millions of jobs	Fishing jobs per capita ($*10^{-3}$)
EU	2.5±0.23	0.76
Asia	230 ± 18	6.9
Africa	1.7± 0.91	8.5
South America	5.6± 0.71	12
Oceania	0.87± 0.13	7.8
N & Ctrl America	5.3± 0.4	6.5

Small-scale fishers as proportion of direct sector workers





Discussion

- Number of marine fisheries jobs
  - At least 1.75 times higher than existing estimate
  - Addition of small-scale fishing jobs increased direct fisheries sector participants by about 40%
- The approach
  - Small scale direct sector estimate based on proportion of rural coastal population that fishes
  - Captures unlicensed fishers, women, and children
  - Monte Carlo method: input data are publicly accessible, overcome reliance on 'official' statistics

Discussion

- Small-scale fishing is important in specific regions
  - Small-scale sector as proportion of total direct employment is ~80% in Oceania, ~75% in other small island developing countries
- Quantifying small-scale sector provides insight to fisheries' characteristics
  - In Europe, small-scale sector to total direct fisheries employment is ~25%
    - Suggests sizable unlicensed segment
    - May reflect existence of culturally based subsistence fishing

Conclusion

- Inclusion of small-scale sector jobs indicates level of informal employment
  - Also can be interpreted to reflect existence of illegal or unlicensed fishing activities
- More complete knowledge of number of fisheries jobs crucial for quantifying fishing effort
  - More accurate projections of fisheries stock assessments, socio-economic cost-benefit analysis
  - Underestimating fishing effort can lead to fisheries overexploitation

Compliance

•An individual's expected utility from illegal activity (rule violation) is EU(V)

• Can be expressed as a function of the anticipated monetary return Y and the subjective probability p of incurring an expected monetary penalty F if caught and sanctioned.

•The expected utility function is formulated in terms of deviations from an existing level of wealth W_o.

$$EU(V)=(1-p)U(W_o+Y)+pU(W_o-F)$$

Village	Zone	Trip frequency (%)	Average net revenue (MYR trip^{-1})	Net revenue to distance (NRD) (MYR trip^{-1})
Damaran	B	5	7	0.3
	E	82	31	2.4
	D	13	34	2.4
Kaligau	A	65	33	7.0
	E	3	82	2.5
Kobong	C	1	40	11
	D	46	41	15
	E	24	69	2.4
Lok Tohog	E	86	13	0.6
	D	4	34	11
	B	11	40	3.9
Maliangin	B	96	26	5.8
	D	2	44	5.9
	C	1	72	23
Perpaduan	B	33	27	2.6
	A	47	53	12
	D	4	84	11
	F	8	95	4.6
Singgahmata	C	12	24	4.2
	B	65	27	3.0
	F	3	42	2.9

Teh et al. 2012 Human Ecology

What influences fishing ground preference?

* Fishers' preferred zones are where NRD is maximised

* Distance reflects hidden dimension

Economics of small scale fisheries

- Conservation is about changing behaviour
- Economics seeks to understand human behaviour - how humans maximise productivity, create wealth, etc.
- Understanding economics of small-scale fisheries informs about appropriate policy incentives for management.

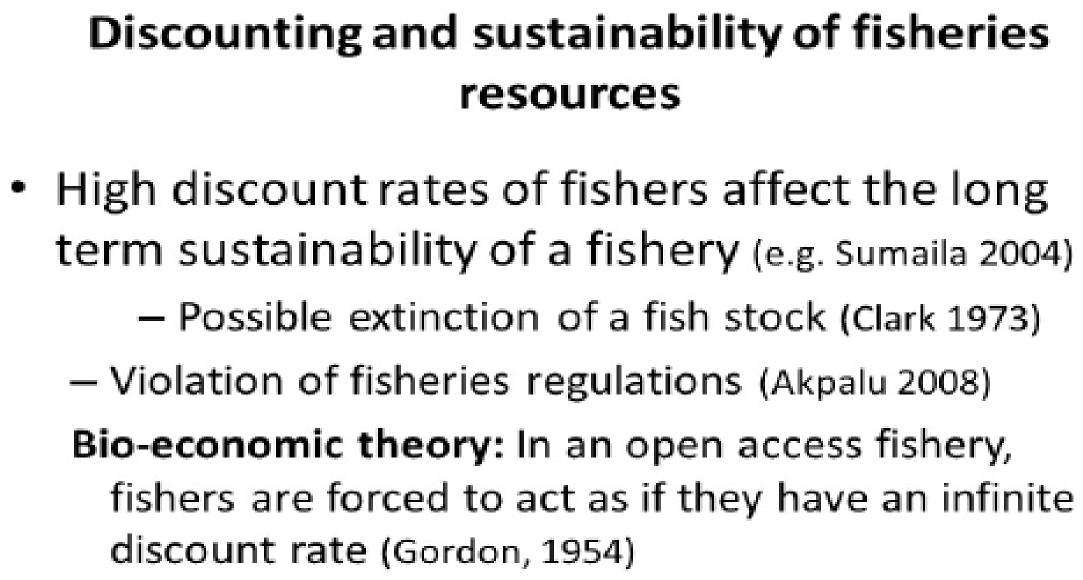
Socio-Economic Drivers at Different Scales- Background

- National scale : GDP, Population growth etc – put up studies that have found connection between these factors and fishing
- Community scale: market access, livelihoods
- Individual scale: profits, private discount rates

Outline

Why economics matters

- Economics can be used to understand the motivation for fishing (behaviour)
- Understanding the motivators can help inform what incentives to use for management (changing behaviour)



Workshop on Marine Protected Areas (MPAs)

Workshop leader: Philip Dearden

A workshop discussing marine protected areas (MPAs) was conducted to enable SEAMAM III participants to gain a better understanding of the concept of MPAs and how it can be applied to marine mammals in this region. Two of the most common mistakes that scientists and managers make with regard to MPAs is the misconception that (i) MPAS will solve all environmental and conservation problems, and (ii) MPAs will not solve any environmental and conservation problems. MPAs are a very useful tool for marine conservation but there remain various challenges associated with their establishment including: a lack of experience in developing functional MPAs compared to the long terrestrial experience; lack of support from certain parties (e.g., doubts from fisheries scientists about effectiveness); slow speed of establishment (i.e. only 1% of the world's marine environments gazetted as MPAs versus 15% of terrestrial environments); and the complexities of managing MPAs (most of which are multiple-use, resulting in challenges in management, stakeholder involvement and compliance). At the global level, the Convention on Biological Diversity (CBD) has given attention to the seas and oceans, and set a target that 10% of the world's important marine areas are to be designated as MPAs by 2020, extended from the previous timeline of 2012. The overarching goal of a MPA is therefore to mitigate threats to species by defining critical habitats and developing measures to protect such habitats. This includes prohibition of direct take of food resources within the MPA and exploitative activity such as mining, reducing bycatch of marine mammal/megafauna species in the area, and ensuring that areas of MPAs within a region form a functional network. Examples of marine mammal MPAs that are functional are the Glacier Bay National Park in Alaska, El Vizcaíno Biosphere Reserve in Mexico, and the Pelagos Sanctuary for Mediterranean Marine Mammals in the Mediterranean Sea which was established for transboundary protection of marine mammals, the high seas in the area and important krill aggregation sites.

In this workshop, SEAMAM III participants discussed MPAs in the Southeast Asian context; how and if MPAs would be effective for marine mammal conservation in a socio-ecological-culturally complex landscape.

The concept of place-based conservation as an additional conservation mechanism appropriate for marine mammals in SE Asia was put forth as a first point of discussion. Some SEAMAM III delegates pointed out that certain areas already have place-based conservation for marine mammals, however other threats such as the issue of bycatch ar not addressed. It was then pointed out that MPAs work for some species of marine mammals and for some areas but do not provide a solution for every species and/or situation. One delegate then asked whether place-based conservation meant MPAs to be specifically designed for marine mammals or whether it was how one would get marine mammals to be an important component of MPAs. The answer given was that MPAs could be established so that it would benefit marine mammals but also that it would enhance the value of the MPA itself by including them into the design and establishment seeing as how the taxa make good flagship species.

The delegates therefore agreed to explore the notion of place-based conservation for marine mammals focusing on the following objective: "Establish a functional and effectively managed network of MPAs that will assist in the long-term conservation of marine mammals in SE Asia through mitigation of threats and protection of critical habitat and restoration of old habitat while building societal awareness of the beauty, ecological role, and conservation needs of these animals." While some delegates debated about the terminology for MPA, the facilitator (P. Dearden) noted that the phrase "marine protected areas" is an internationally accepted terminology and is used by the Convention of Biological Diversity

(CBD) and the International Union for Conservation of Nature (IUCN). A gap analysis is needed to enable a regional synthesis about the current state of MPAs in the various countries in the region, so as to better direct the efforts of trying to establish a network of MPAs. Additionally, habitat modelling is important to assess the status of marine mammal habitats and to identify areas that would be of future importance and concern for place-based conservation.

In terms of implementation, the delegates agreed that in order for marine mammal MPAs to be successful, all relevant stakeholders need to be involved in the process of establishment. These include government agencies, local communities, non-governmental organisations, and scientists working hand-in-hand. At the moment, governments are under pressure to create more MPAs due to CBD requirements, which bodes well for those on the side of conservation, however as scientists working in this field, we need to help our respective governments develop a conservation agenda for marine mammals. The computer decision-making tool Marxan was suggested as a means of conducting spatial planning for marine mammal conservation, and with involvement of government agencies. Using t Marxan would result in better planning for marine mammal MPAs rather than solely placing animal distribution data on a map. Other useful and important information to consider and include in MPA design and planning are data on life history of marine mammal species in question, migration patterns (if any) and behaviour. Subsequently, it was noted that as more data is acquired, the goals of the MPA should develop further and evolve. One delegate also suggested that researchers should band together to accrue various datasets that would be central to successful spatial planning and implementation. However, most delegates agreed that it is almost certain that all said information on many species would not be acquired by 2020 due to current lack of manpower and resources in the region.

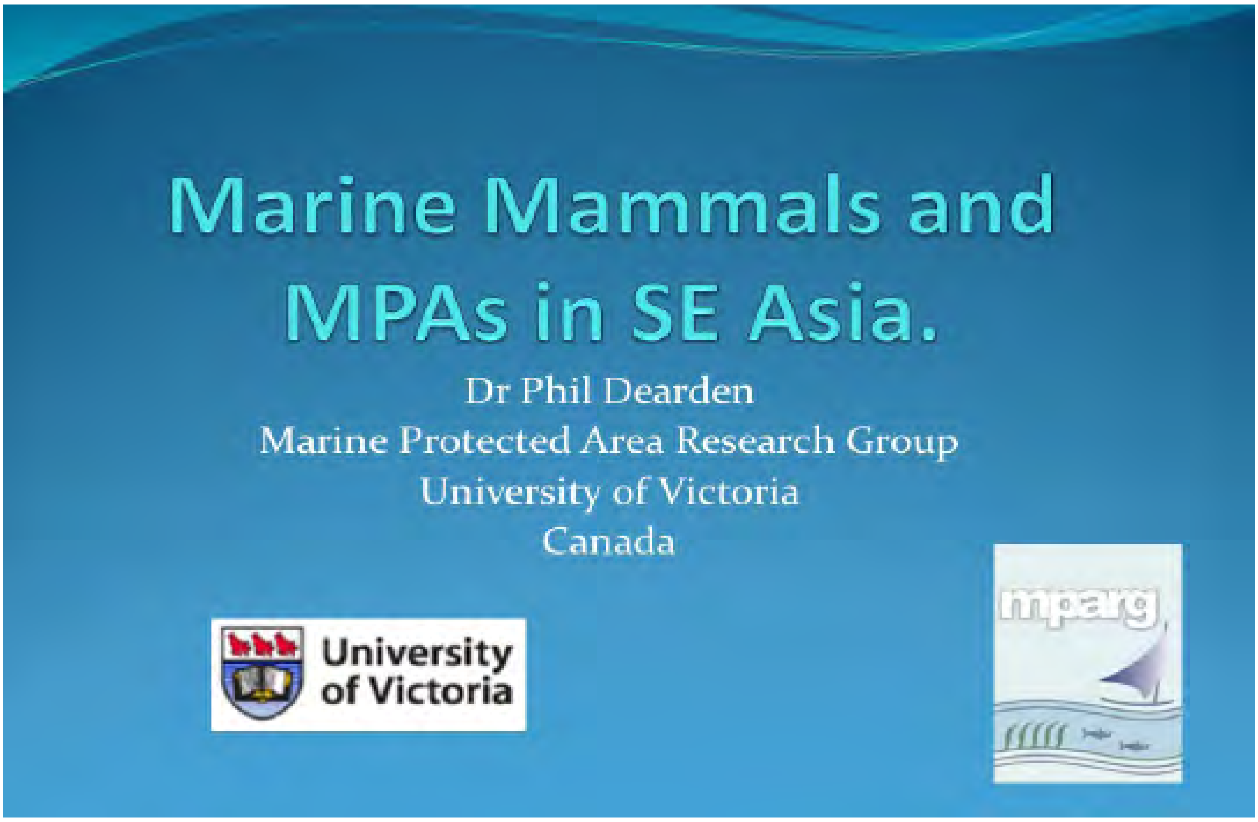
In terms of management of (existing) MPAs, an enforcement mechanism is needed to ensure effectiveness and success, while outreach efforts to relevant stakeholders would aid in compliance of MPA regulations. All delegates agreed that education is a critical component in enabling effective management of MPAs The terms and regulations governing a MPA should also be revised, as almost all MPAs are related to limiting or prohibition of fisheries activities but do not take marine mammal (and other megafauna) threat factors into account, e.g., boat traffic, gear types (where fishing is permitted within the MPA). Some delegates suggested that a tourism management plan could be a plausible strategy for enabling good management of a MPA, whereby tourism could replace income lost to fishermen from being unable to fish. However some other delegates noted that such a strategy does not fit across the board and that it has to be looked at on a case-by-case basis.

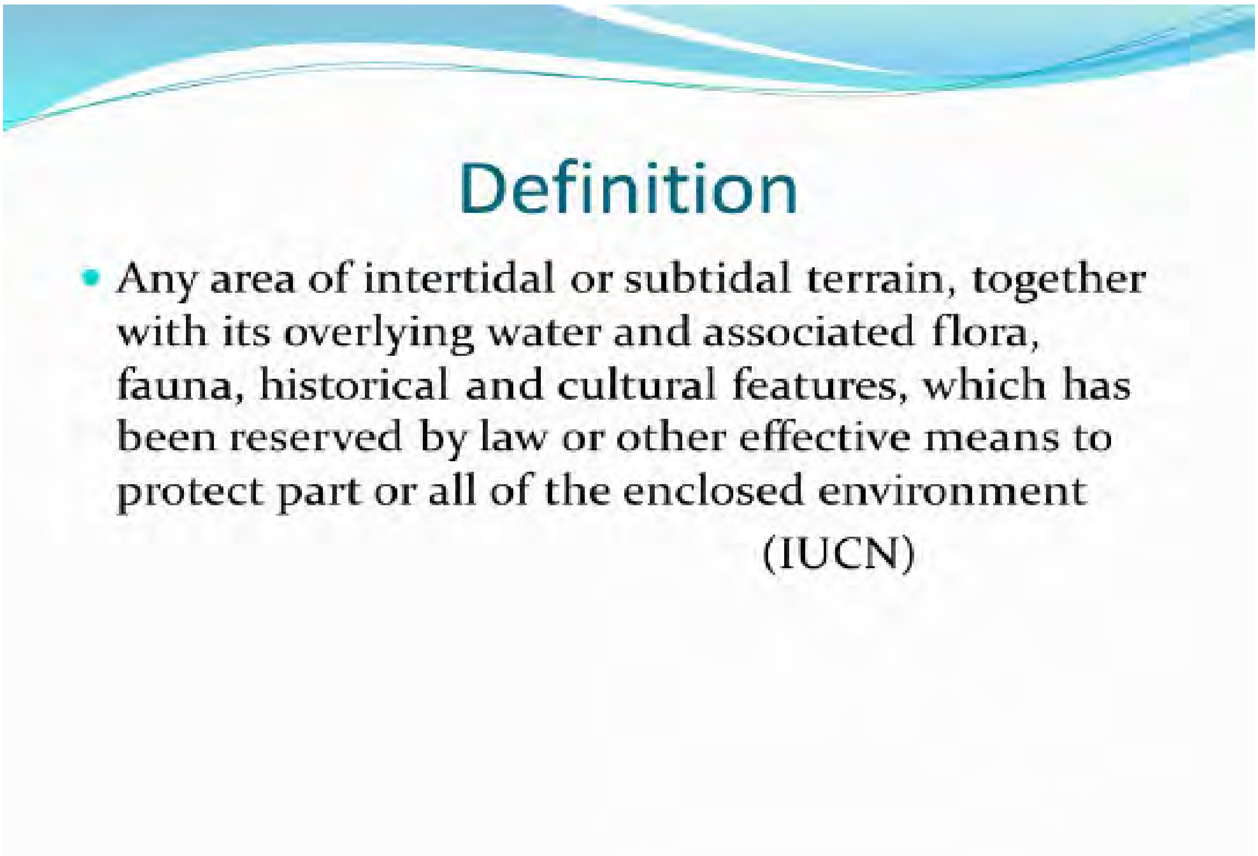
In summary, the delegates developed a generic marine mammal MPA action plan for the Southeast Asia region. The details are found in the following table.

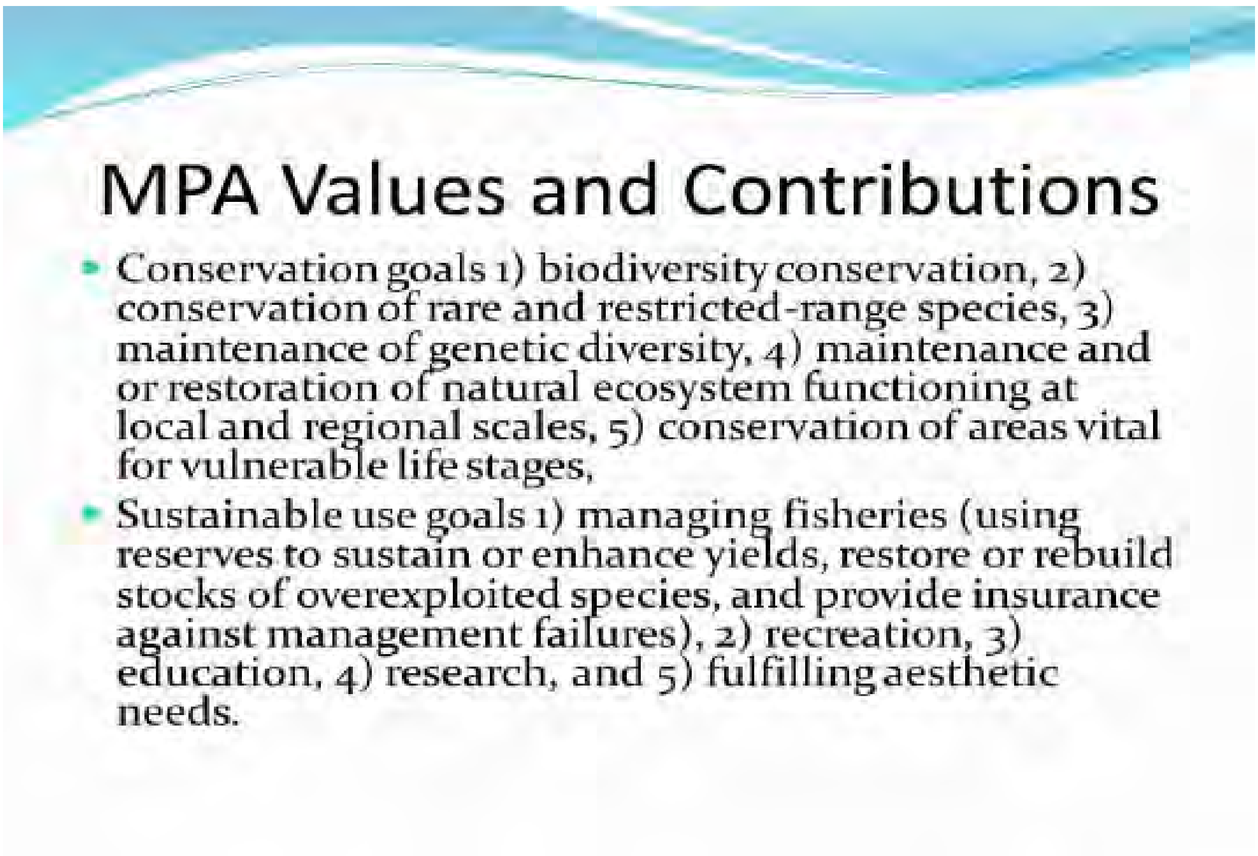
Overarching MPA objective: Establish a functional and effectively managed network of MPAs that will assist in the long-term conservation of marine mammals in SE Asia through mitigation of threats and protection of critical habitat and restoration of old habitat while building societal awareness of the beauty, ecological role, and conservation needs of these animals.

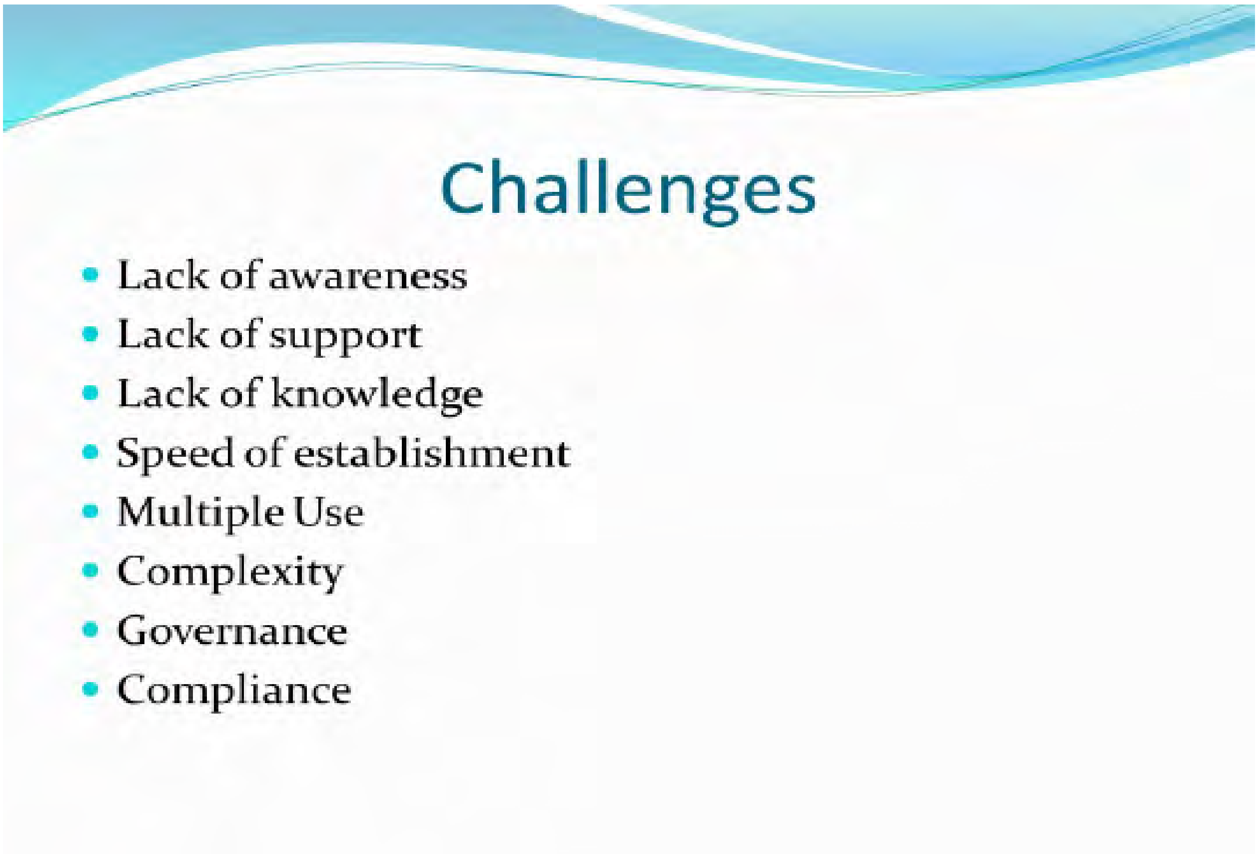
Objective	Action	Timeline	Needs
1. Current status of marine mammals (MM) and MPAs	• Country assessment of every MPA and role for MMs • Importance/performance assessment • Regional synthesis	2013	• Country cooperation • Focal point
2. New area identification	• Threats assessment • Critical habitat assessment • Ecology/population structure • Spatial exercise/collation of existing knowledge	2014	• Funding – proposal(s) • Knowledge acquisition • Methodology agreement • Partnerships between relevant stakeholders

Objective	Action	Timeline	Needs
3. Gap analysis	• MPA proposals/other mechanisms • Functional networks plan (CTs) • Priorities • Regional synthesis	2015 – 2020	• Government involvement • Community involvements • Multi-component data pooling (collaboration between researchers)
4. Implementation	• Current MPAs • New MPAs	2015 – 2020	• Government involvement • Community involvements • Spatial planning using tools such as Marxan • Expanding beyond animal distribution data (life history, movements, etc.)
5. Management	• Management Plans (CTs) • Zoning • Prohibitions • Compliance (via outreach) • Education • Regulated tourism within MPA • Alternative livelihoods	2016 – 2020	• Training for government personnel • Considerations for other conservation measures (e.g. regulation of boat traffic) • Education and outreach programmes • Tourism management plans
6. Monitoring and evaluation	• Monitoring process against CTs • Adaptive management	2015 – 2020	




Definition
• Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment
(IUCN)


MPA Values and Contributions
• Conservation goals 1) biodiversity conservation, 2) conservation of rare and restricted-range species, 3) maintenance of genetic diversity, 4) maintenance and or restoration of natural ecosystem functioning at local and regional scales, 5) conservation of areas vital for vulnerable life stages,
• Sustainable use goals 1) managing fisheries (using reserves to sustain or enhance yields, restore or rebuild stocks of overexploited species, and provide insurance against management failures), 2) recreation, 3) education, 4) research, and 5) fulfilling aesthetic needs.


Challenges
Lack of awareness
Lack of support
Lack of knowledge
Speed of establishment
Multiple Use
Complexity
Governance
Compliance


Opportunity
Planet Ocean, your time has come
Marine Spatial Planning
High Seas
Global agenda – 10% by 2020
CBD requirements

MPAs and Marine Mammals Why? Threat Mitigation

- Threat mitigation
  - Direct take
  - By catch
  - Boat strikes
  - Pollution
  - Mining etc
  - Tourism management

Why? Habitat Protection

- Critical habitat
  - Feeding, including trophic considerations
  - Mating, calving, nursing, rearing
  - Socialising, resting
  - Travelling
  - Functional networks


International Examples
Glacier Bay (Alaska, 1925)
El Vizcaino Biosphere Reserve (Mexico, 1972, 1979)
Robson Bight Ecological Reserve (Canada, 1982)
Pelagos Sanctuary for Mediterranean Marine Mammals (Italy, France, Monaco 2002)

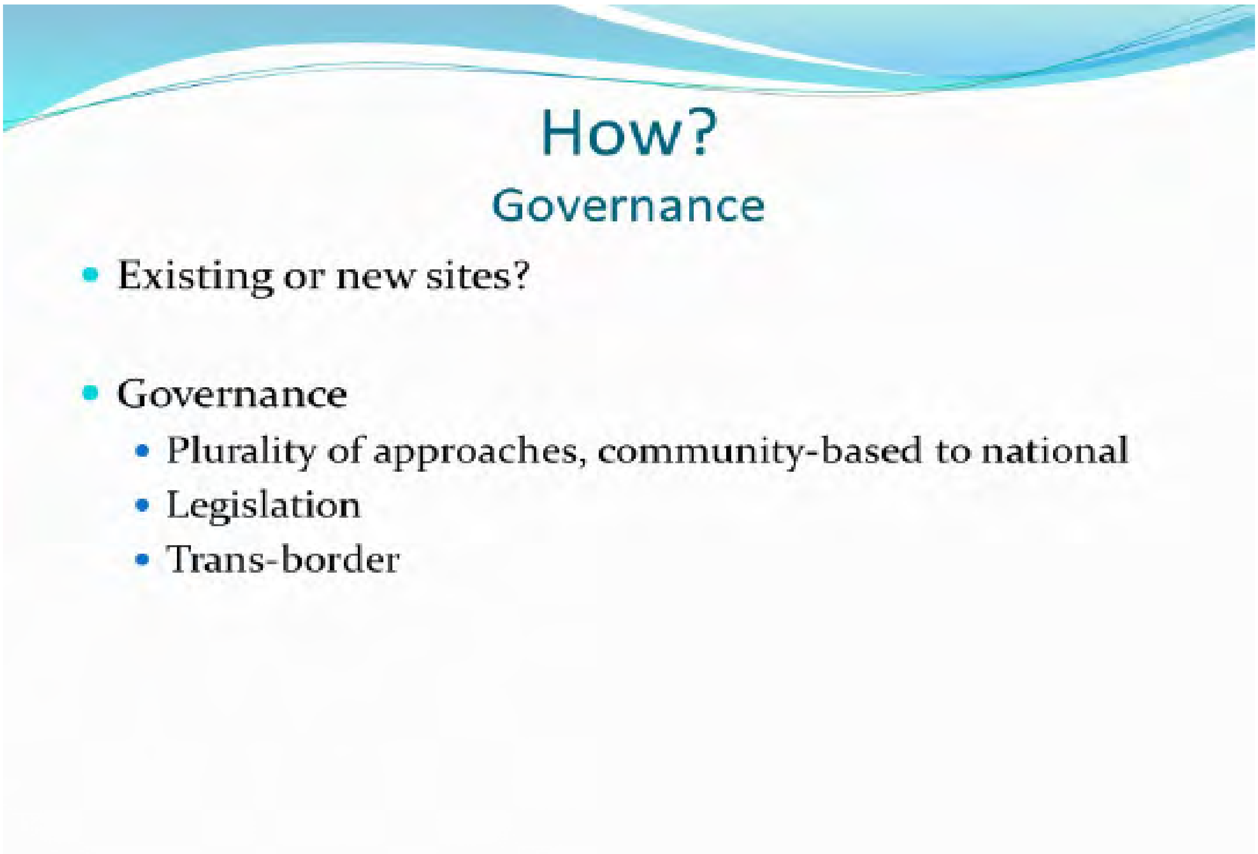

IS PLACE-BASED CONSERVATION AN ADDITIONAL CONSERVATION MECHANISM APPPROPRIATE FOR MARINE MAMMALS IN SOUTHEAST ASIA?

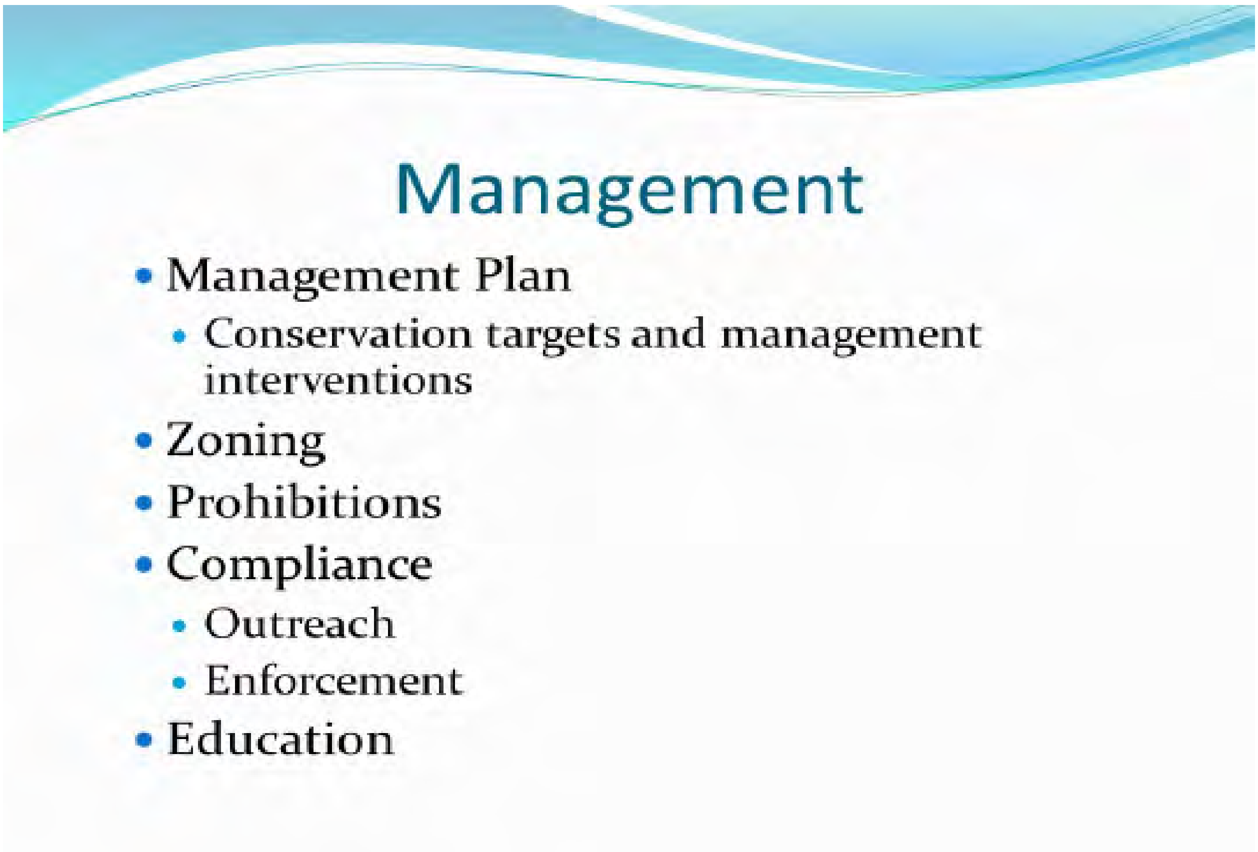
Goal

- Establish a functional and effectively managed network of MPAs that will assist in the long term conservation of marine mammals in SE Asia through mitigation of threats and protection of critical habitat while building societal awareness of the beauty and conservation needs of these animals .

Where?

- Identify critical habitat, major threats
- What do we have?
- What do we need?
- Gap analysis
- Network design
- Prioritisation
- Research needs

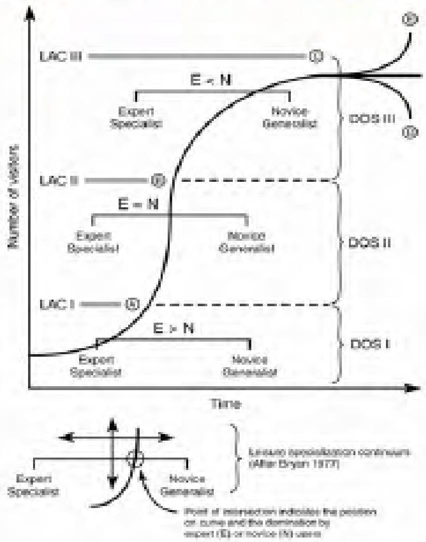

How?
Governance
Existing or new sites?
Governance
Plurality of approaches, community-based to national
Legislation
Trans-border


Management
Management Plan
Conservation targets and management interventions
Zoning
Prohibitions
Compliance
Outreach
Enforcement
Education

Tourism: the Good, the Bad, the Ugly?

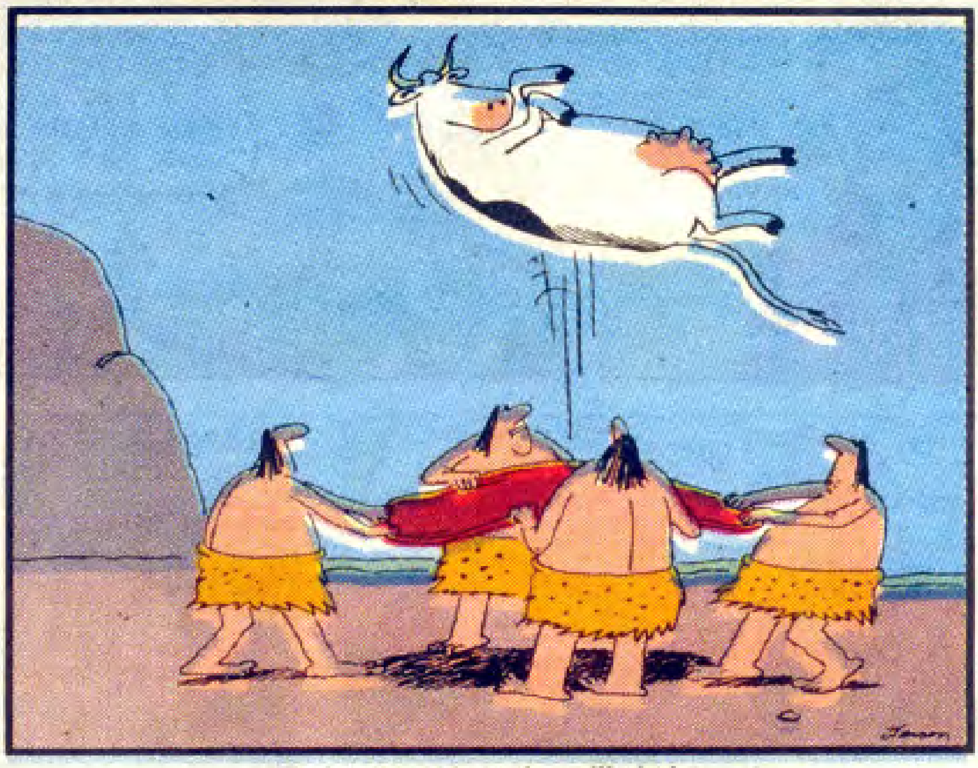
- The negatives
- The positives
- The challenge: How can marine tourism benefit cetacean conservation?
- Management

Tourism Management



Workshop

- How important are MPAs for MM in SE Asia?
- Discuss Goal statement
- Short term agenda
- Long term agenda
- Research
- Funding
- Priorities
- Next meeting?



Early attempts at the milkshake

Workshop on SeaLifeBase and Overfishing

Workshop leader: Patricia M. Sorongon

This presentation had the objective of informing delegates about SeaLifeBase, an online biodiversity information system that targets non-fish marine organisms. SeaLifeBase, (www.sealifebase.org), a project of the Sea Around Us group at the University of British Columbia, is patterned after FishBase and is formatted to be easily used by researchers and managers. Information is available about distribution, biology, conservation status, threats, mapped habitat for the species globally and points of data. At this time, there were 125,435 valid species. Delegates were encouraged to contribute their data to SeaLifeBase and use the website as a regional resource. Questions were based on the longevity and accuracy of SeaLifeBase entries. Patricia mentioned that they have seven years of funding and are always looking for funding to continue. SeaLifeBase personnel will contact the contributors of data to confirm accuracy.

Dr. Zhou Kaiya asked if there were Chinese scientists in the group as there is much information on Chinese marine species. Patricia responded that Chinese people come to the Philippines (where the compilation takes place) regularly to translate Chinese entries.

Effect of Overfishing on Marine Mammals

This presentation gave an overview of the impact of fisheries on marine mammal populations in the Philippines. Thirty-two out of 124 marine mammals worldwide are found in Southeast Asia. In the Philippines, there are 26 species, including baleen whales, toothed whales, and the dugong. Available occurrence data implies that many are in the Sulu Sea. Much of this information can be found on sealifebase.org. In the Philippines, marine mammals are protected by nine pieces of legislation (see presentation and country report). Patricia spoke about the history of marine mammals and fisheries in the Philippines.

Whale hunting first began in Lila, Bohol in the 1800's. There were usually six crewmen to a boat. Whaling by indigenous people in the Philippines was rare, but Chinese, European and British whalers hunted in the islands, so Filipino whalers probably learned from outsiders. By 1936, whalers from Lila were plentiful, and they extended their whaling grounds to other islands. In 1941, the Americans brought Filipino whalers to Hawaii to teach them whaling techniques, such as harpooning and spear gunning. By the 1980's, whale catches started to decline. In 1992 and 1997, hunting dolphins, whales and porpoises was banning in the Philippines.

Bycatch of marine mammals in the Philippines is large, estimated at approximately 700 dolphins per year. As well, 35% of finfish and cephalopod species targeted by fisheries are also prey for marine mammals. There are 29 national marine protected areas (MPA's) in the Philippines, and over 1000 local MPA's. One solution is to find bycatch areas that overlap with MPA's and target important places to increase enforcement.

Questions:

- Putu Liza Mustika : First recorded whaling was in the 1800's? The earliest whaling recorded in Lamalera in Indonesia was in the 1600's.
  - Jom Acebes: In terms of historical whaling from archival data, there is a lot of information on American and British whaling in Philippines, but it focuses on sperm whales. No evidence from whaling log books mentions that they actually caught baleen whales. The first documented publication on local whaling in the Philippines was Louella's paper in 1994 (Dolar 1994). From this, we were able to trace at least when whaling started. This is estimated to be around the beginning of the 20th century. But from other archival data, it seems that Filipinos have been hunting marine mammals, but whales specifically more opportunistically for a longer time. Through oral history, we have learned that this whaling began late 19th century. Be careful of assuming that similar gear to Americans means it's not local. No evidence that Americans taught locals. Nobody remembers elders saying that they were taught.

Dolar, M.L.L. (1994). Incidental takes of small cetaceans in fisheries in Palawan, central Visayas and northern Mindanao in the Philippines. Reports of the International Whaling Commission, Special Issue. 15, 355-363.

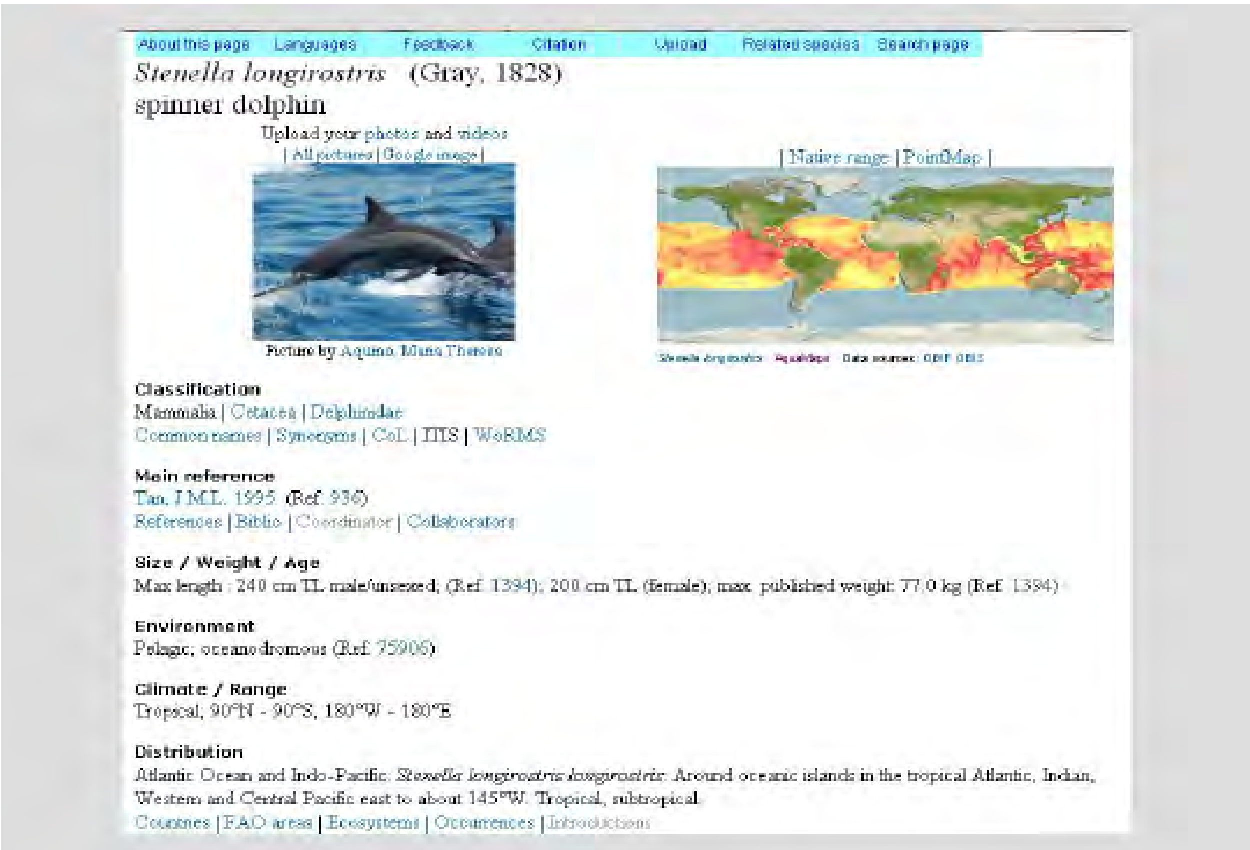

SeaLifeBase
07 March 2013
Patricia Marjorie Sorongon-Yap
FishBase Information & Research Group, Inc.
FiN


FishBase
SeaLifeBase
Covering the world's marine resources
Biodiversity information systems like FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org), global databases on finfish and non-finfish, respectively, are created to ease documentation of the data needed to manage and conserve marine resources. Both online information systems aim to provide valid names (and synonyms), status of the species where these occur in the literature and museum records. These are important prerequisites for assembling biological and ecological information needed for biodiversity studies and fisheries management.
FishBase and SeaLifeBase contains...
Biology
Taxonomy
Common names
Ecology
Depth range
Other tables
Maximum sizes
Distribution
Population dynamics
Photos
Online biodiversity information system
• SeaLifeBase
www.sealifebase.org


SeaLifeBase follows a successful model …
• SeaLifeBase is patterned after FishBase, the popular online database on fish (see www.fishbase.org);
• SeaLifeBase, however, incorporates fields specific to non-fish vertebrates and invertebrates;
• The SeaLifeBase Internet interface also follows the FishBase interface.
FiN
SeaLifeBase


Taxonomic backbone
Species 2000
ITIS
Catalogue of Life: 2009 Annual Checklist
indexing the world's known species
www.catalogueoflife.org
Enhanced by…
WoRMS
World Register of Marine Species
www.marinespecies.org
SeaLifeBase


Find us on Facebook
SeaLifeBase
ver. (02/2013)
(115100 Species, 27000 Common names, 11100 Pictures, 17700 References, 240 Collaborators)
Home | Collaborators
Common Name
contains
spinner dolphin
Search
(e.g. turtle)
Scientific Name
Genus
is
Search
(e.g. Caretta)
Species
is
(e.g. caretta)
Scientific name
(e.g. Caretta caretta)
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
To search without Genus, change Genus option from 'is' to 'contains'.
Glossary
Search
(e.g. cnidaria)
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Information by Country / Island
Species Groupings
Biodiversity
Uses
Tools
Miscellaneous


About this page
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Citation
Upload
Related species
Search page
Stenella longirostris (Gray, 1828)
spinner dolphin
Upload your photos and videos
| All pictures | Google image |
| Native range | PointMap |
Picture by Aquino, Maria Theresa
Classification
Mammalia | Cetacea | Delphinidae
Common names | Synonyms | CoL | ITIS | WoRMS
Main reference
Tan, J.M.L. 1995. (Ref. 936)
References | Biblio | Coordinator | Collaborators
Size / Weight / Age
Max length : 240 cm TL male/unsexed; (Ref. 1394); 200 cm TL (female); max. published weight: 77.0 kg (Ref. 1394)
Environment
Pelagic; oceanodromous (Ref. 75906)
Climate / Range
Tropical; 90°N - 90°S, 180°W - 180°E
Distribution
Atlantic Ocean and Indo-Pacific: Stenella longirostris longirostris. Around oceanic islands in the tropical Atlantic, Indian, Western and Central Pacific east to about 145°W. Tropical, subtropical.
Countries | FAO areas | Ecosystems | Occurrences | Introductions

Short description

Spinner dolphins have various forms depending on their geographical locations. Commonly, these are small and slender animals that have a relatively long slender beak. It has a tripartite coloration which consists of a dark grey dorsal cape, lighter grey lateral field and a white or very light ventral field. A dark band runs from the eye to the flipper, bordered above by a thin line. It has a clearly discernible contrast of cape with the lateral field and a smooth curve on the ventral margin of cape over the eye. The ventral white field extends dorsal variably nearly to level of eye; margin speckled; genital and axillary areas confluent. It also has a high to medium contrast between flipper band and gular region wherein variable spots are visible. Its flippers are dark or speckled. In adult males the dorsal fin is falcate to triangular and has a small to medium protuberant ventral keel.

Biology **Glossary** Search (e.g. epibenthic)

Feeds predominantly at night, on mid-water fish and squid, and rest during much of the day (Ref. 1394). Dolphins are directly caught for use as shark-bait in Sta. Ana and Aparri, Philippines (Ref. 77119). Feeds predominantly at night, on mid-water fish and squid, and rest during much of the day (Ref. 1394). Sometimes seeks shelter in shallow sandy bottoms to protect themselves from predators (Ref. 80498). Sexual maturity attained between 4 to 7 years (females, 165-170 cm) and 7 to 10 years (males, 160-180 cm). Promiscuous, with observable courtship display. Gestation period averages 10 months, produces only one calf. Born at 3-year intervals, calves are nursed for at least a year and weaned between 1 to 3 years (Ref. 80521). Common birth length: 77 cm (Ref. 75826).

IUCN Red List Status (Ref. 90363)

Data deficient (DD)

Threat to humans

Human uses

Fisheries: commercial

| FisheriesWiki | Sea Around Us |

More information

Countries	Common names	Age/Size	References	Collaborators
FAO areas	Synonyms	Growth	Mass conversion	Pictures
Ecosystems	Predators	Length-weight		Stamps
Occurrences	Reproduction	Length-length		
Introductions	Maturity	Morphology		
Ecology	Spawning	Larvae		
Diet	Eggs	Abundance		
Food items	Egg development			

Internet sources

BHL | BOLD Systems | Check for other websites | Check FishWatcher | CISTI | DiscoverLife | FAO(Publication : search) | GenBank (genome, nucleotide) | GOBASE | Google Books | Google Scholar | Google | ispecies | National databases | PubMed | Scirus | Sea Around Us | FishBase | Tree of Life | uBio | uBio RSS | Wikipedia (Go, Search) | Zoological Record

Estimation of some characteristics with mathematical models

Resilience (Ref. 69278)

Vulnerability (Ref. 71543)

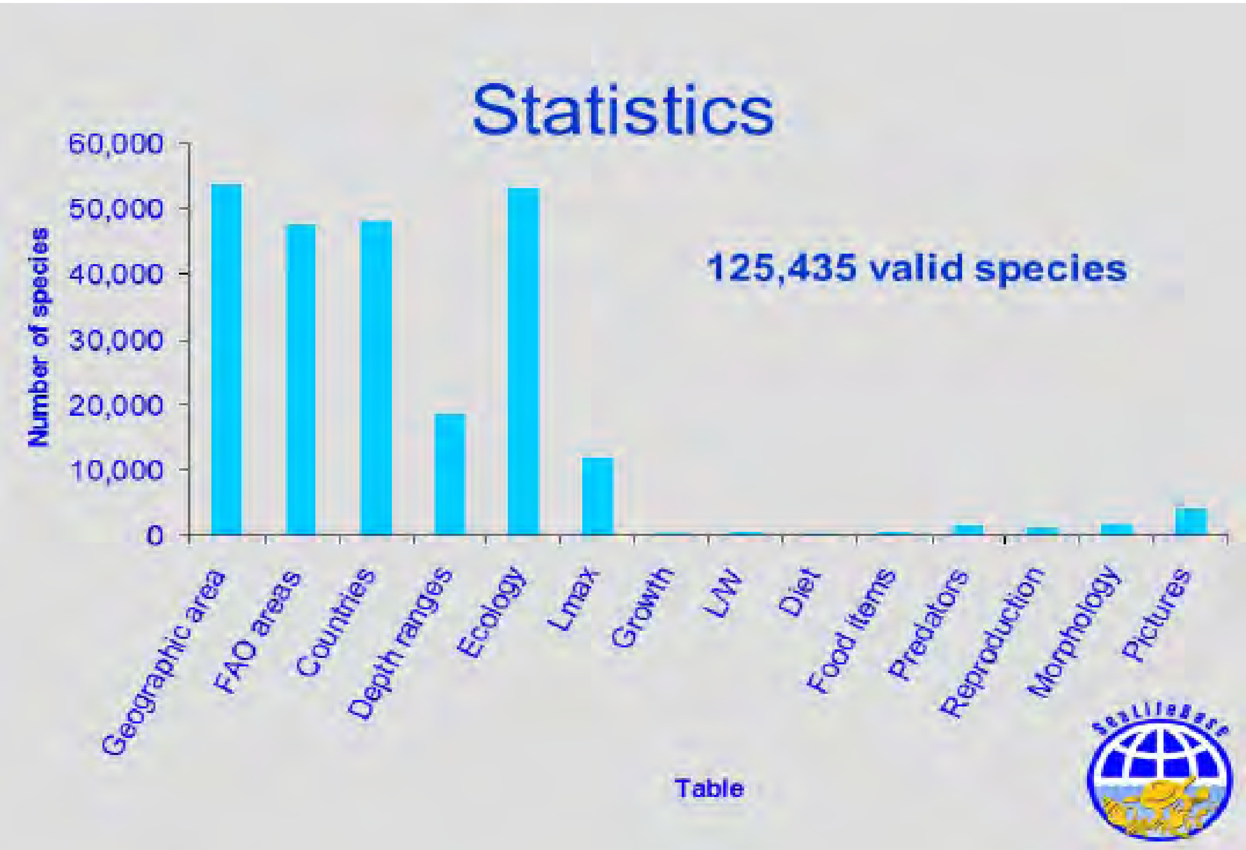
High to very high vulnerability (75 of 100)

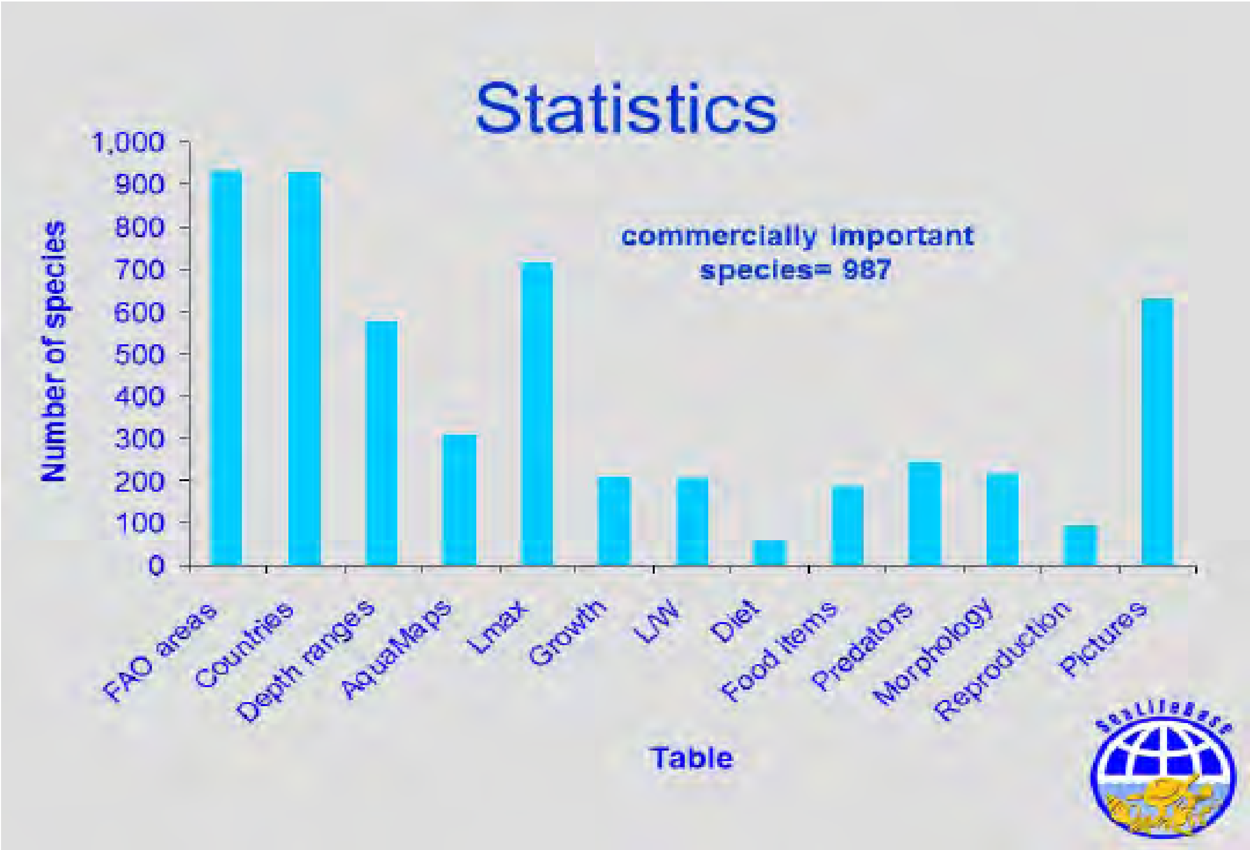
Price category (Ref. 80766)

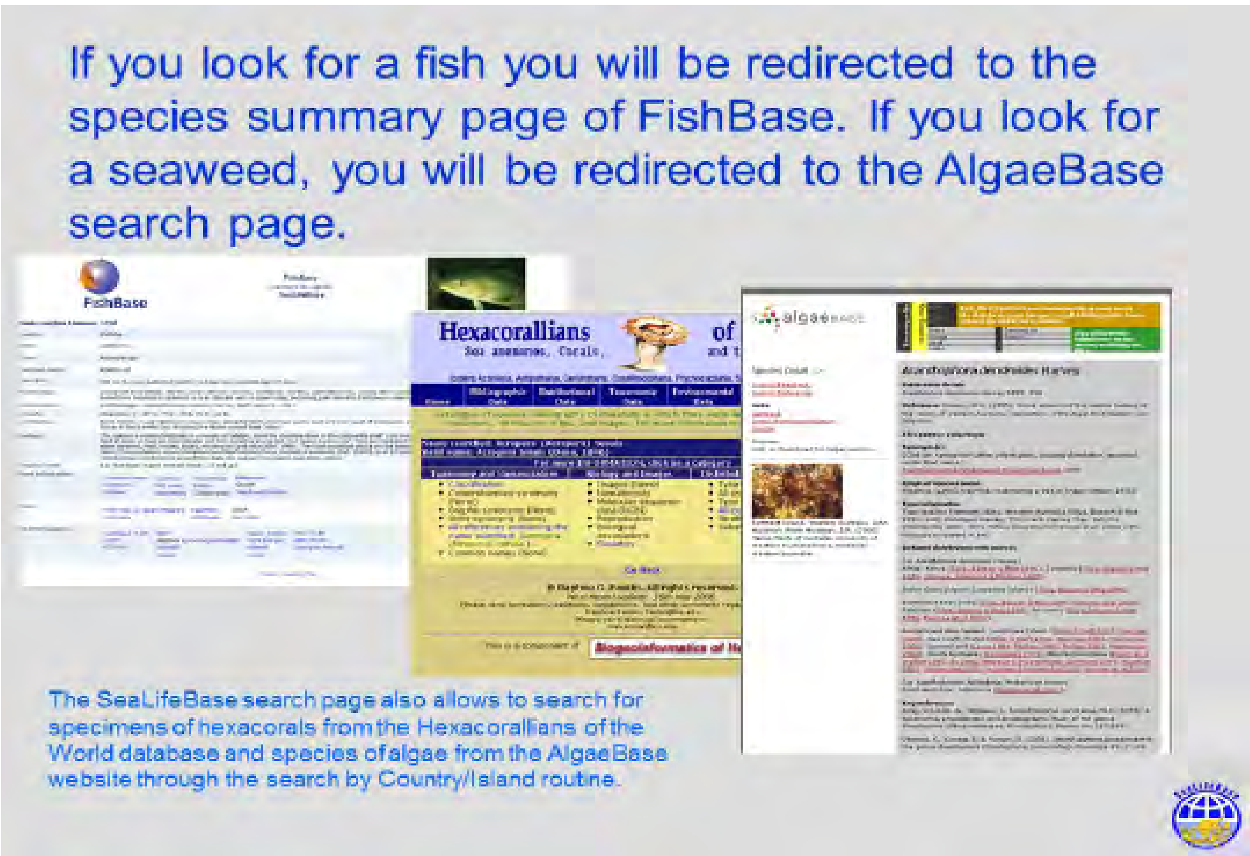
Unknown

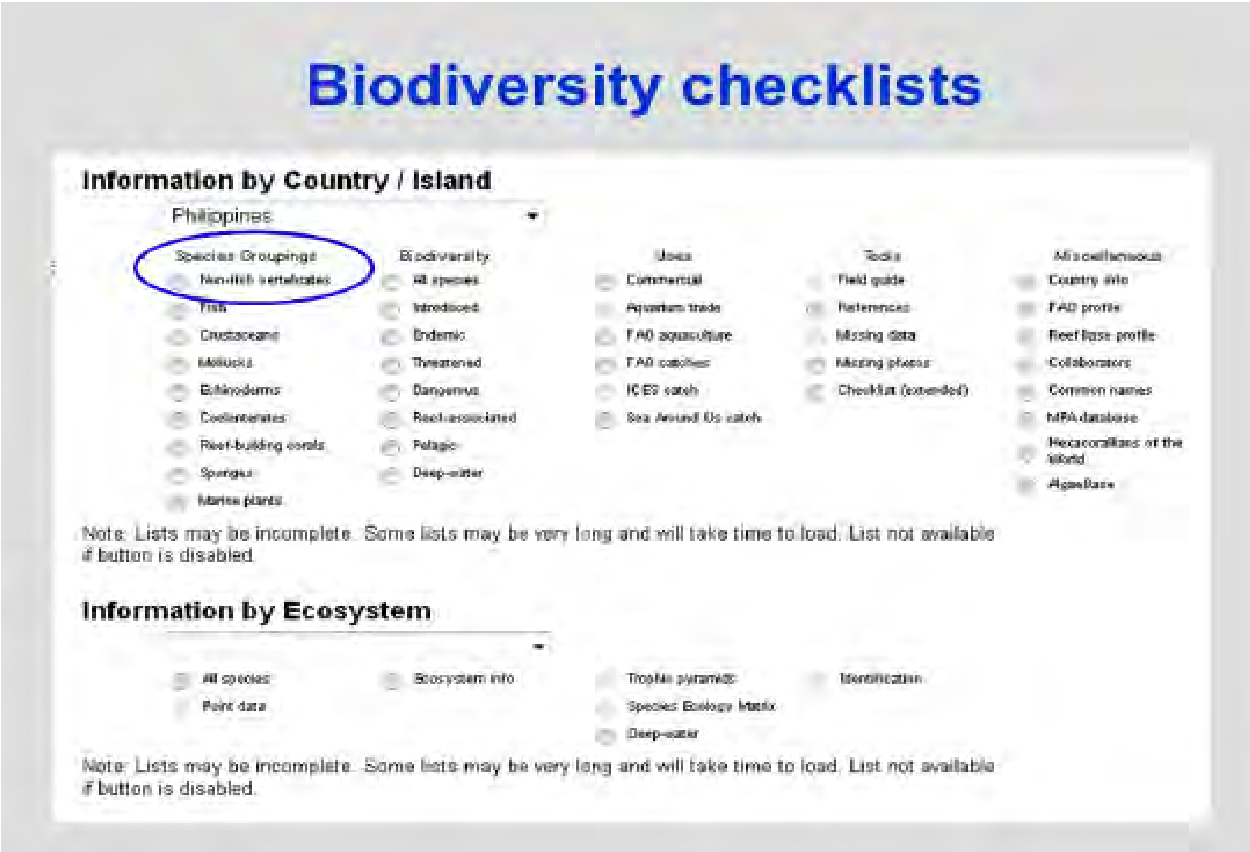
Data are encoded from …

- Revisions, monographs, species catalogues, checklists and guides;
- Journal articles, reports, proceedings and other gray literature (e.g., theses);
- Internet sources, i.e., national and regional species databases.

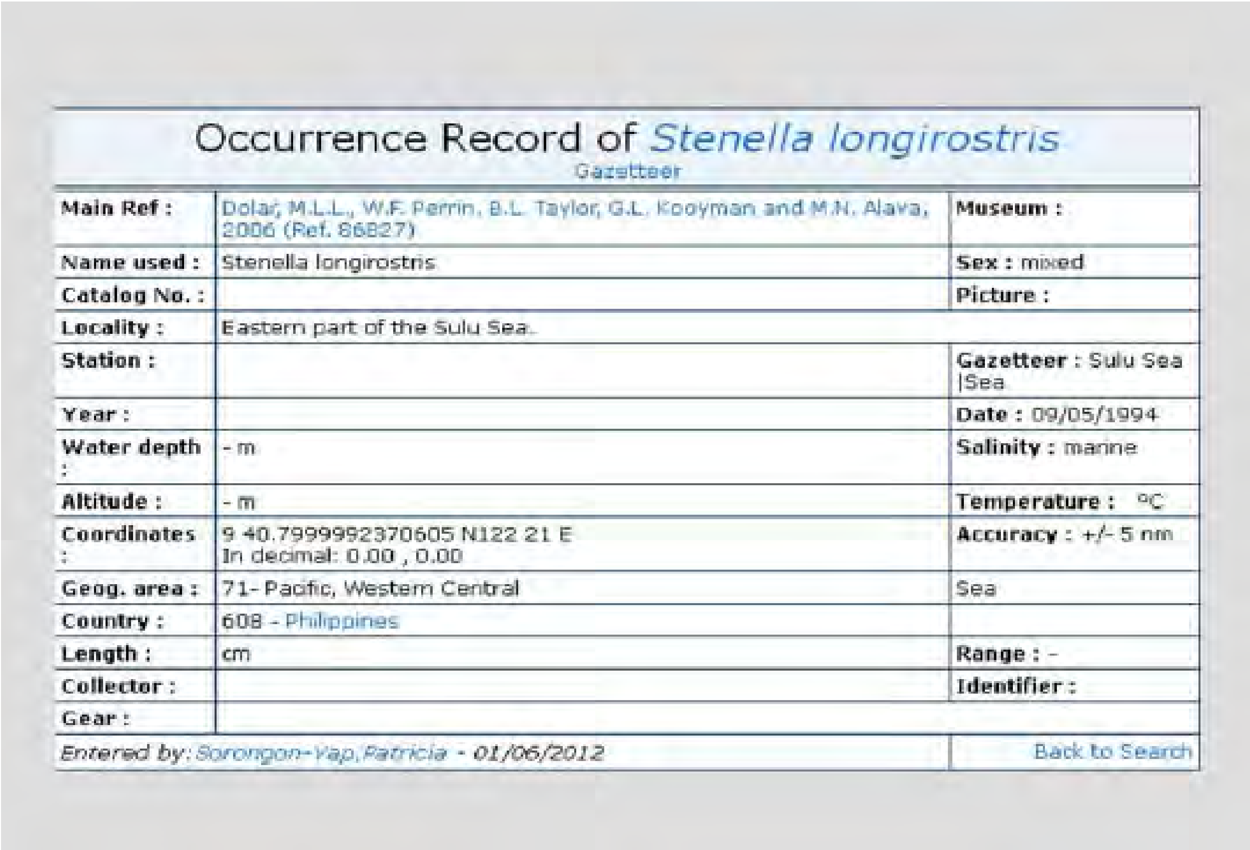



Statistics
Number of species
1,000
900
800
700
600
500
400
300
200
100
0
commercially important
species= 987
FAO areas
Countries
Depth ranges
AquaMaps
Lmax
Growth
L/W
Diet
Food items
Predators
Morphology
Reproduction
Pictures
Table
SeaLifeBase


If you look for a fish you will be redirected to the species summary page of FishBase. If you look for a seaweed, you will be redirected to the AlgaeBase search page.
FishBase
Hexacorallians
algaebase
The SeaLifeBase search page also allows to search for specimens of hexacorals from the Hexacorallians of the World database and species of algae from the AlgaeBase website through the search by Country/Island routine.



Neophocaena phocaenoides	Chordata	Mammalia	Cetacea	Phocoenidae	error
Orcaella brevirostris	Chordata	Mammalia	Cetacea	Delphinidae	native
Orcinus orca	Chordata	Mammalia	Cetacea	Delphinidae	native
Peponocephala electra	Chordata	Mammalia	Cetacea	Delphinidae	native
Physeter macrocephalus	Chordata	Mammalia	Cetacea	Physeteridae	native
Pseudorca crassidens	Chordata	Mammalia	Cetacea	Delphinidae	native
Sousa chinensis	Chordata	Mammalia	Cetacea	Delphinidae	error
Stenella attenuata	Chordata	Mammalia	Cetacea	Delphinidae	native
Stenella coeruleoalba	Chordata	Mammalia	Cetacea	Delphinidae	native
Stenella longirostris	Chordata	Mammalia	Cetacea	Delphinidae	native
Stenella longirostris	Chordata	Mammalia	Cetacea	Delphinidae	native
Steno bredanensis	Chordata	Mammalia	Cetacea	Delphinidae	native
Tursiops aduncus	Chordata	Mammalia	Cetacea	Delphinidae	native
Tursiops truncatus	Chordata	Mammalia	Cetacea	Delphinidae	native



Occurrence Record of *Stenella longirostris*

Gazetteer

Main Ref :	Dolar, M.L.L., W.F. Perrin, B.L. Taylor, G.L. Kooyman and M.N. Alava, 2006 (Ref. 86827)	**Museum :**	
Name used :	Stenella longirostris	**Sex :** mixed	
Catalog No. :		**Picture :**	
Locality :	Eastern part of the Sulu Sea.		
Station :		**Gazetteer :** Sulu Sea |Sea	
Year :		**Date :** 09/05/1994	
Water depth :	- m	**Salinity :** marine	
Altitude :	- m	**Temperature :** °C	
Coordinates :	9 40.7999992370605 N122 21 E In decimal: 0.00 , 0.00	**Accuracy :** +/- 5 nm	
Geog. area :	71- Pacific, Western Central	Sea	
Country :	608 - Philippines		
Length :	cm	**Range :** -	
Collector :		**Identifier :**	
Gear :			
Entered by: Sorongon-Yap, Patricia - 01/06/2012		Back to Search	

Collaborators = 246

Collaborators for species - *Stenella longirostris*

n = 18

Code No.	Name	Country	Institute
69	Acebes, Jo Marie	Philippines	HMAP (History of Marine Animal Populations)
228	Amerga, Ace Kevin	Philippines	FishBase Information and Research Group, Inc.
58	Aquino, Maria Theresa	Philippines	
2	Bailly, Nicolas	Philippines	WorldFish Center
84	Chon, Arlene	Philippines	FishBase Information and Research Group, Inc.
11	Conejar - Espedido, Jeniffer	Philippines	FishBase Information and Research Group, Inc.
3	Dar, Christine	Philippines	FishBase Information and Research Group, Inc.
59	Dolar, M. Louella L.	USA	

Collaborator Profile

Name	Dolar, M. Louella L.
Code No.	59
E-Mail	[illegible]
Web Page	
Fax	
Institute	
Address	Lakewood St., San Diego, California 92122
Country	USA
Comments	Research interests include marine mammal ecology and natural history, marine mammal-fishery interactions, fish biology and fishery assessments. Has experience in environmental impact assessments, community-based conservation programs and conservation education. Most of my studies were conducted in Southeast Asia, mainly the Philippines.
Keywords	marine mammal
Since	2008

Special projects

- South China Sea – Philippines & China; Mediterranean, Chile, and Puerto Rico (Sea Around Us Project)
- Caribbean;
  - Belize (funding from Oak Foundation Belize);
- French Antarctic Territories (TAAF)
  - Kerguelen, Crozet, Terre Adélie (funding from MNHN, Paris).
  - Southern Ocean (Marisla Foundation)
- Kermadec, Pitcairn and Easter Island (PEW)

SeaLifeBase


Acknowledgements
GLOBAL GREENGRANTS FUND
THE PEW CHARITABLE TRUSTS
OCEANA
SEA AROUND US PROJECT
OAK FOUNDATION
MUSEUM NATIONAL D'HISTOIRE NATURELLE


Thank you …
SeaLifeBase
www.sealifebase.org

Stranding Workshop

Presenters and Moderators: Lemnuel Aragones, Putu Liza Mustika and Lindsay Porter

In this workshop, each of these three scientists presented on various aspects of marine mammal strandings.

1. Lemnuel Aragones first gave an overview on strandings and a currently developing regional stranding network.
2. Lindsay Porter then spoke on the importance of collaborative research within and between stranding networks.
3. Lemnuel Aragones then spoke about capacity building and public education about strandings.
4. Putu Liza Mustika presented more specifically about goals and steps for education and outreach.
5. Lindsay Porter then gave information on animal care, health and veterinary issues.
6. Lastly Putu Liza Mustika gave a summary of stranding activities by country.

1. Overview: Lemnuel Aragones:

Historically, stranding events of single or multiple animals were almost exclusively natural, due to climate change, seismic events, natural predator-prey relationships, natural aging effects, disease and simple cases of being off-course (wayward). Stranded animals were a food source in some cases. Pictures of stranded animals depicted fearful looking creatures. Skeletal remains of some species begin to be held in natural history museums of Europe, which has helped societies begin to understand what the animals are (demystified).

In the mid- to late 20th century, scientists were still learning about species and speciation. Public awareness and empathy have been strong drivers for coordinated responses to strandings. Better tools were developed to collect data, treat treatable animals, and understand causes. In the mid-20th century, aquaria began to work with stranded marine mammals. A new empathy for marine mammals started to develop, with research into formulas and more resources put into strandings and rescues. We began to see trends of strandings and scientists started collaborations with governments.

With the creation of protocols and manuals, responses evolved with changing events, the variety of species encountered, mass strandings vs single, changing site conditions, and access. As accurate information to first responders became more critical, more equipment and resources were needed. Scientists began to look at anthropogenic reasons for strandings vs natural causes.

Today, causes of strandings have expanded exponentially, parallel with the expansion of human societies globally and society's exploitation of marine resources. Anthropogenic impacts are numerous and global, and today are the primary cause of strandings. We now see marine mammals as sentinels, used to gain early warning about current or potential negative trends and impacts. Such warnings will enable us to better characterize and potentially manage negative impacts on human and animal health associated with our oceans. Sentinels could indicate ecosystem change, infectious and emerging diseases, chemical and noise pollution and fishing pressure (Reddy et al 2001; Bossart 2006; Grosell & Walsh 2006). As part of the idea of advancing health care for the 21st century, advances in stranding science can contribute to regional/global veterinary and husbandry care, and create popular and scientific strategies for expanding interdisciplinary collaborations for health care for humans, animals and the environment.

Challenges to marine mammals include human food security and cultural practices (Robard & Reeves 2011). Since 1990, people in at least 114 countries have consumed one or more of at least 87 marine mammal species. In regions where hunger and poverty are causing new consumption patterns that result in greater use of marine mammal parts, measures are needed to reduce bycatch in fisheries or prevent the deliberate hunting of marine mammals.

A stranding network can be a community resource towards changing values towards marine mammals from consumptive to non-consumptive, changing hearts and minds toward environmental conservation, and providing for the welfare of live animals and minimizing risks to public health.

The 1st SE Asian Marine Mammal Stranding Network Symposium and Workshop was held at Subic Bay, in the Philippines on February 4-9th, 2013. There was first a symposium and workshop, then a hands-on training session. There were 57 participants from 9 countries:

Indonesia, Thailand, Malaysia, Singapore, Cambodia, Taiwan, HK, and Philippines. The Mission Statement of the Regional Stranding Network founded is to form:

"A non-political science-based network dedicated to promoting the best practice for marine mammal stranding response and management through the open and free exchange of information, data, materials, methods, and protocols in order to conserve marine mammals and their habitat in the Southeast Asian region."

The objectives are to:

- Share knowledge and experience in marine mammal stranding activities from all over region
- Serve as a forum to discuss plans for a regional marine mammal stranding network whose purpose would be to disseminate knowledge, promote best practices, and shared experience of marine mammal strandings
- Promote best practices for regional marine mammal stranding response and rehabilitation
- Provide assistance to establish and develop in situ regional country stranding network

Structure of organization:
- Steering committee (can be expanded if other countries want to join)
- Capacity building: Bianca Espinso
- Education: Putu Liza Mustika
- Veterinarinan care: Reimi Kinoshita and Tiger Bradley

- Research and collaboration: Lindsay Porter
- 4 committees: capacity building, education, vet care, research collaboration

2. Research and Collaboration: Lindsay Porter

How do research and collaboration fit into the general framework of a stranding network? Using the rationale of 'waste not, want not', every stranded marine mammal dead or alive presents many opportunities to increase our knowledge. The research and collaboration group has several objectives: 1) list current research initiatives for the region, 2) list laboratories and skills, 3) establish research questions, and 4) establish databases, identify existing or develop.

Existing Collaborations:

- Baleen whale taxonomy
  - o Japan, Taiwan, Thailand, India, Vietnam
  - o Taxonomy, molecular and morphological analyses
  - o No formal agreement as such
- South China Sea
  - o Chinese government organized five main institutes to look at Sousa chinensis. This national network was established to consolidate information, centralize research fields of expertise and collaborate on Sousa chinensis ecology, biology, and conservation
  - o Each institute should become central depository for data and expertise to consolidate info on Sousa in China
  - o 3-year cycle; now, no agreement to extend outside China, but interested in being formally involved in other projects
  - o Molecular ecology, habitat survey, morphology, disease and toxicology
- Malaysia, Indonesia, India, Bangladesh
  - o O. brevirostris skin condition and implications this has for health
- Hong Kong
  - o Hong Kong Government, Ocean Park and Hong Kong University: Neophocaena phocaenoides: To try to establish what increased mortality is being caused by
- Philippines
  - o Government, Japan and Taiwan – broad range of MOUs and various projects between these countries. May be possible to develop programs specifically for marine mammals.
  - o Concern: difficulty in getting samples outside of the Philippines. Easier if existing collaborations or if experts can come to country
- Indonesia
  - o Small ad hoc projects, no formal process in place

Below is a list of what countries in the region already do, what they want, and how they could contribute to a regional effort:

- Indonesia
  - o Already collecting samples
  - o Want assistance to analyze strandings data to better understand mortality events
  - o Can help by provisioning data
- Taiwan
  - o Well-developed stranding program, already does molecular analyses, life history, physiology, and more
  - o Want to collaborate
  - o Can help by doing or training in molecular analyses, tooth sectioning, practical skills (necropsy, field identification)
- China
  - o Long history of studying strandings: molecular analyses, life history/taxonomy, distribution (line transect/photo identification)
  - o Wants to share samples in the future
  - o Can help with development of practical skills (field surveys)
- Philippines (academics)
  - o Do disease, eco-toxicology, histopathology, genetics (tissues)
  - o Sample sharing, validation of results
  - o Can help with their chemistry lab (toxins/contaminants), pathology lab (upgrade of equipment).
- Philippines (government)
  - o Does strandings, data collection
  - o Want to share samples as do not currently process all of them.
  - o Can help with socio-economic skills related to stranding networks
- Hong Kong
  - o Long history of programs, does health assessment, establish status
  - o Exchange students and programs to transfer skills and engender interest in strandings and necropsies
  - o Can help by holding workshops: habitat modeling (spatial, predictive)

A basic question to ask through strandings research: How healthy are regional cetaceans?

Disease is a concern, as are ecosystem health, and contaminant loads within ecosystem and animals. A better understanding of how the life history of species or populations in question would help us to understand more about long term implications for disease and health. We need more historical data on mortality, then what we collect now can better inform trends. Geographical influences on strandings is difficult to do on a country by country basis, with consolidated datasets, this could be possible. Fisheries status is not often looked at in tandem with marine strandings. What gaps in knowledge?

One possible solution is more effective utilization of strandings data. Research is needed that represents combined studies focused on products of strandings and broader research aims. For example: How can strandings data assist in informing other types of research? More research is needed in disease diagnosis and ability to navigate; mortality implications, stomach contents; feeding; reproductive organs; life history. Are there regional focus species? For example, the Yangtze finless porpoise, Indo-Pacific humpback dolphin, Irrawaddy dolphin, humpback whale, or dugong. Habitat mapping based on data from stranding may even present additional opportunities for research to fill in gaps.

There are several strandings databases that are accessible online:

- Indonesia (English/Indonesian)
- China (in Chinese)
- Taiwan (in Chinese)
- Philippines (in English)
- HK (English/Chinese)

What kind of information do we want online for regional collaboration?

- Expertise
  - o Who does what in the region?
- Facilities
  - o Equipment, labs (mobile)
- Identification guide
  - o On-line key (support person)
- Workshops
  - o Who can offer what?
  - o Who needs what?
  - o Online identification of needs?
- Proper protocols/guides for strandings
  - o 100s of online resources from basic first aid to very complex manuals
  - o Rather than devise database saying this is how you should do it, the website can link in to all the existing material

Actions needed:

- Compile summary of research institutes/programs
- Compile larger database of facilities within region to provide skills and equipment
- Research linkages; broad question of health, stranding information
- Database enhancement/cross linkage
- Find funding to kick-start this effort
- Forum for experts to be involved, identify what skills are and if willing to participate

Next steps include creating a strandings network as a platform from which collaborations, information and assistance can be sought. An open invitation will be sent out to contribute information. A website upload will be available soon. The next strandings workshop will be in Sabah, Malaysia. A goal would be to have regional strandings network meetings on a yearly basis.

Questions:

- Jay Sweeney: the concept of regional stranding network is very important. The results need to be standardized so that they are comparable. The problem now is that there is no standard procedure on stranding response. It is also important to have standardized lab for sample analysis.

- Phil Dearden: Really important work; speaking from strong base of ignorance here:

- Objectives are all very reactive
- Should ultimate goal be to try to minimize strandings?
- Do we understand what causes strandings enough to establish best practices to decrease strandings?
  - o Lem Aragones: That's a question that needs to be answered worldwide, there are such variable threats. In this part of the world, causes of strandings are pretty much all over the place. Could be bycatch, illegal fishing and fisheries interactions are what the research will be addressing.
  - o Lindsay Porter: Particularly with bycatch in the region, it can be tricky to identify the signs of a bycaught individual when it strands on the beach. A few of us know the signs. So having a combination of experience with stranded animals and a database that encompasses a larger area, can say perhaps there's a fishery here that is contributing to the problem. Cross-linkage currently lacking.

- Louella Dolar: Clarify one of the missions "to conserve habitat." How would a stranding program be able to help with that?

- Lem Aragones: Eventually the ultimate goal will be to conserve critical areas and hopefully be able to lessen threats. In general, just a collective idea.
- Lindsay Porter: Stemmed from knowing that some coastal habitats are polluted. So while it's difficult to define cause of death, if we have animals with a high contaminant load, or certain pathogens, or evidence that it is a contaminated habitat causing effects, might give weight to conservation or habitat protection.
- Ellen Hines: We are looking for ways to create risk surfaces for bycatch in my lab using GIS. Perhaps such habitat modeling could be applied to strandings as risk analysis using spatial analysis.

3. Capacity Building: Lemnuel Aragones

Effective capacity building needs an awareness of training requirements and needs, building a matrix of different things that the committee discussed in workshop. Objectives:

- Identify resource persons for training and develop a stranding response training manual
- Stranding response training (Hong Kong and Taiwan are willing to provide training)
- Develop forum where modules are available to the network
- Trainer's module
- Public education during stranding response

Questions:

- Jay Sweeney: Those who have established stranding networks, how have they managed facilities and resources? There needs to be a network of communication, then have to pick up the animal, transport it to a facility with a refrigerator/freezer if in a remote location.

- Lem Aragones: Those associated with marine parks have much more advanced stranding networks/facilities/transport option (e.g. Hong Kong, Ocean Adventure). Very much of a national policy; each country is very different. Laws, cultures, etc vary. For the rest of the region, the question is begging to be answered. That's why stranding network symposium workshop came about.
- Putu Liza Mustika: The policy in Indonesia is immediate

release of stranded animals. They cannot take responsibility as they don't have the facilities and don't euthanize. Every country is different.

- Alessandro Ponzo: Apart from marine park area, where animals are taken for rehabilitation, immediate release is the goal if alive, necropsy if dead. Better to invest money directly in conservation. 12 stranding networks in Philippines. Most for immediate release because no facility (7000 islands, most with no power, so no ice). Put samples in ethanol and send to national government. When we can, keep sample and send to university. Depends upon resources in each country.
- Rae Stone-Allen: Is there interest or discussion about developing capacity for live sampling? Training for blood sampling, biopsy, genetic sampling, acoustic recording before released? To build capacity, knowledge toward rehabilitation effort. Increasing scientific knowledge in process.
- Lindsay Porter: This was discussed in the veterinarian subcommittee. Some challenges. One topic that was mentioned: there should be training for people in response teams to take live samples and store them in an appropriate way. There is so much information about an animal's health from a sample. No implications for animal ethics provided you know how to do it. A video on the website for this may be an option. OPCF is happy to have people come to their facility for training.

4. Education/outreach, Putu Liza Mustika

First Putu Liza identified five stakeholder groups needing to be involved in education and outreach about strandings:

1. Government
    a. Setting up hotlines (should be easy to remember)
    b. Involve relevant government agencies
    c. Local curriculum on marine mammal conservation
    d. Teacher training
    e. Media training

2. School/students
    a. Local curriculum developed with government
    b. Teacher training/workshops
    c. Usage of teaching packages
    d. Science fairs

3. Local villages
    a. Posters
    b. Local contact points

4. General public
    a. TV programs
    b. Use of social media
    c. Use press, newspaper and educate journalists
    d. Online database
    e. Umbrella website for online database

5. Private sector

    a. Define coastal businesses: hotels, parks, restaurants, tourism operators, mining companies, commercial fishers, shipping companies
        i. Help during strandings (offer place to stay, water, etc to rescuers)
    b. Donation box
    c. Sponsored facilities, temporary holdings
    d. Tax incentives?
    e. Engage with at least one company
    f. Dolphin-friendly hotels promoted (rooms, water for researchers)

6. Education

    a. Every country should have hotlines and involve their government agencies.
    b. Training for media press confrences. (e.g. if you don't know species, don't guess)
    c. Teacher training: package developed for coastal schools
    d. Posters for local communities
    e. Debate on marine mammal consumption: do we say something or not?
        i. General idea of group: better if they don't eat it.
        ii. Group should probably say something.

Questions:

- Vu Long: How do we get governments to be more sympathetic to cause?
    - Putu Liza (Icha): Indonesia is lucky to have a good relationship with government. Doesn't happen overnight, 20 years ago this wasn't the case. Government became more moderate in 1996 when the Ministry of Marine Affairs and Fisheries opened. Many of Icha's generation graduated and had the chance to work with the government. Around 2000, a large influx of marine conservationists were hired into the Ministry. Now have many like minds in department. First step: building friendships.
- Jay Sweeney: The U.S. Government doesn't provide much money for funding, strandings are mostly supported by private donations. There is a unusual mortality event program in the States to identify stranding events outside of the norm (must establish norm first), then the government does provide support for intervention, lab work, etc. Many stranded dolphins are consumed here in Asia. Not to be advised. A number of zoonautic diseases potentially able to infect humans. Particularly meliadosis in SE Asia: acute in animals; spread throughout organs; if eat organs, will be exposed; fatal in humans. Need to educate people not to eat dolphins.
    - Icha: hard to reach everyone. 13,000 islands in Indonesia.
- Ellen Hines: How identify what to do when unusual number of strandings? Either in education or as call for funding or as way to get vets to area quickly?
    - Lem Aragones: We will discuss this later.

5. Animal care, health and veterinary issues: Lindsay Porter

A List of participants at the recent workshop in the Philippines:

- Dr. Reimi E. Kinoshita (Hong Kong)
- Dr. Mariel Flores (Philippines)
- Dr. Tiger Bradley (Hong Kong)
- Dr. Thanida Haetrakul (Thailand)
- Dr. Jomer Lucanas (Singapore)
- Dr. Leo Suarez (Philippines)
- Dr. Jefferson Soriano (Philippines)
- Dr. Jennefe Cabarubias (Philippines)
- Dr. Chin Sisaket (Cambodia)
- Apple Amor (Philippines)

Comment: Few countries (except Thailand, Philippines) have vets present from beginning of stranding event to end. Stranding events are often attended and completed by biologist groups.

Not many vets are available or people didn't know how to contact them. Overarching question: how can vets contribute to stranding programs?

Issues discussed at the workshop:

- Regulatory
- Human health and safety when dealing with stranded animals
- Stranding site issues
- Rehabilitation issues
- Release issues
- Vet medical issues
- Euthanasia (ethical issues)
- Research on stranded animals in holding facilities
- Information, specimen collection, dissemination
- Additional resources

Discussion centered specifically on:

- Beaches or stranding sites
  - Information collection (standardized)
  - First responders and their assessments (i.e. animal condition, environment, circumstance, logistic support)
    - o Minimum information needed from first responders: animal size, health condition, species, photo, GPS
    - o Standardized form
- Vet arrival
  - Train more local vets
  - Online community for vets to facilitate support and sharing of information or a stranding network website where all forms will be uploaded in English and/or local language
  - Human control and safety
    - o Delegate crowd control to key people in community
    - o Involvement of community especially in coordination
  - Be aware of national and local laws and regulations
- Health assessment
  - Vets give recommendations
  - Get approval from regulatory body particularly for euthanasia and rehabilitation
  - Consider logistics for rehabilitation
  - Animal welfare considerations
  - Common guidelines for network: what to bring e.g. equipment, medical supplies, etc
    - o Educate decision makers before event
  - Decision Making
    - o Decision-making flowchart/decision tree
    - o Immediate release
- Monitoring through
  - Tags – more practical?
  - Microchip?
  - Photo ID?
- Share information (online community or through an egroup)
- Get samples
  - Serum (as much as you can get; freeze for bank)
  - How to (in the common guidelines and online)
- Euthanasia
  - Issues vary by country
  - More appropriate that vets had contribution to that type of discussion when foremost concern in animal welfare and safety of community
- Rehabilitation
  - Flotation device
  - Nutrition
  - Sampling
  - Milk formula
  - A database for reference range of normal values
  - Resources (potential rehabilitation sites)
  - Medications
  - Coordination with labs for tests
- Dead animals
  - Necropsy
    - o Standardized protocols for examination and sampling
    - o Provide other necropsy protocols for information
  - Coding by Smithsonian institute agreed upon
  - Samples - prioritize
    - o E.g. microbiology, parasitology, cytology, histopathology, virology, toxicology, life history, samples?
  - What and how to store? Locally? Resources?
    - o Where to send samples
    - o Duplicate samples
    - o Identify and recommend labs or research facilities to send the samples
    - o Centralized database
- Human interaction form
  - Initial assessment and post mortem
  - Get and record information
  - Action Plan is needed by the vet community including who will lead each activity/output

Questions:

- Ellen Hines: For sirenians, her book has series of chapters on all of these things, including lists, forms, what test tube to use, how to find vein. Might be good to use as basis for dugongs.
- Guido Parra: Great to hear vets are showing such an interest to be involved. A lot of stranding networks fail because get to point where they just store samples and it stops. Not because vets aren't interested in analyzing, but there's no process or funding in place to process samples. Are vets involved in research universities or government and how is vet community in SE Asia thinking about how we're going to deal with this?
  - Lindsay Porter: We have discussed it. This meeting was only

4 weeks ago. In ideal world, places like Hong Kong and southern China and the Philippines that already have storage, expertise, etc, could serve as focal centers, but we need more than this. Not even thinking about CITES permits and how to move pieces of animals around region. Group permits. Funding is an issue. In long term, yes, we hope there will be areas with storage facilities and willingness to keep and look at with some regional standard.s

- Jay Sweeney: The Foundation that we talked about in Malaysia will have stranding focus. Funding will be made available for developing a stranding network in Malaysia. Now that there's regional stranding network there can be funding to support overall network.

- Lindsay Porter: Vet schools proposed around region. Places for storage. Archiving samples for batch analysis feasible for the information we're trying to find.

- Jay Sweeney: Idea of developing stranding centers has a lot of spin-off benefits. Also education centers. E.g. marine mammal center in Sausalito: embodies every aspect of stranding center and educational resource (displays, open viewing into rehabilitation process). Literally thousands of school kids and adults learning about marine environment through actions derived around strandings. Long time coming. Lots of money and focus, private donations. Very important role.

- Alessandro Ponzo: agree with Jay. MM Center one of best examples in world. All education they do there, don't have to train animals
- Lindsay Porter: don't hold animals long-term.
- Jay Sweeney: Now 6 individuals from region going to San Francisco to International Association of Aquatic Animal Medicine Conference spending a week after at The Marine Mammal Center.

6. Stranding: summary of country reports, Putu Liza Mustika

China
- 5 stranded species
- 166 stranding cases
- Network: yes

Hong Kong
- 17 stranded species
- 541 stranding cases
- Network: yes
- Protocol: yes

Indonesia
- 13 stranded species
- 108 stranding cases
- Network: yes
- Protocol: in the making
- Online database:

Malaysia
- 25 stranded species
- 12 stranding cases (2005-2012)
- Network: yes
- Protocol: no
- Online database: no

Taiwan
- 17 stranded species
- 778 stranding cases (2008-2012)
- Network: yes
- Protocol: yes
- Online database: yes

Thailand
- 28 stranded species
- 378 stranding cases
- Network: yes
- Protocol: no
- Online database: no

Philippines
- 24 stranded species
- 363 stranding cases (1998-2012)
- Network: yes
- Protocol: yes
- Online database: yes (not yet updated)

Update on marine mammal stranding in Indonesian archipelago: progress and challenges:

- Add sperm whale into species of concern
- Think data presented are just tip of iceberg
- 1987-2013: 108 stranding cases
  - o Effort only focused since 2001 onwards, ones before not reflecting reality
  - o 2012 has maximum of 20 cases
- Mostly single strandings (~80%)
- Majority of stranding events resulted in death (if even 1 individual dead)
- Half cases unidentified species. Mostly not good photo taken.
- Sperm whales and short-finned pilot whales more frequently stranding
- National stranding data 1987-2013: pattern with Bali as central point.
- Don't know how many unreported cases
- 5 working nodes around country
  - o Bali
  - o Java
  - o Kalimantan
  - o Nusa Tenggara
  - o Papua
- Late last year after stranding of 47 short-finned pilot whales in east Indonesia, government established a national task force to create a protocol for strandings and rescues
- Meetings with NGOs and vets
  - o Bogor (10 participants)
  - o Bali (5 participants)
  - o Jakarta (20 participants)
- Database
  - o Difficulties pinpointing GPS locations; much of old data doesn't have GPS
- Facebook page
- Whale stranding Indonesia
  - o Collaboration between international scientists
  - o Volunteer based
  - o Great start, but needs improvement
  - o Encourages knowledge sharing

- Displaying online shows people status of stranding response
- Future

  - o Have received emails from other countries about helping establish own or add to Indonesia's
- Homework for Indonesia
  - o Need to consolidate rescue efforts in many provinces

Questions:

- Lem Aragones: We are working on producing proceedings from the workshop in the Philippines
- Lindsay Porter: In process of getting website online, if anyone thinks of anything that would be useful, please let me know. Website should be the focal point for stranding network. Closed site but open access.
- Guido Parra: Some sort of video training how to collect samples, extract blood, etc.
- Lindsay Porter: could be useful for situations where vets aren't available
- Guido Parra: be careful of what gets put out there. Wouldn't want someone from the general public to try to extract blood after seeing a youtube video
- Jay Sweeney: Ample training of vet technicians, first responders, second responders, 'nurses,' who do all these things (blood sampling, biopsies, necropsies). Can't rely on vets to be there at every stage, even though some would advocate that they do so. Are plenty of people who are fully expert in specific activities who aren't vets. Workshops are a good thing in this situation. Simple things like blood sampling can be done in workshops or videos.

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Workshop on Use of Acoustic Methods in Marine Mammals Research

Workshop Leaders: Tomonari Akamatsu & Satoko Kimura

A workshop on the use of acoustic methods in marine mammal research was conducted to provide SEAMAM III participants the option of exploring new research methodology in their research areas. As acoustical methods are often viewed as costly, high-tech and complicated, this workshop sought to introduce the basics to participants and to demonstrate how certain acoustics technology can be applied to cetacean research in this region.

During acoustic surveys, line transects are often surveyed using boats and towed hydrophones for comprehensive coverage of the survey area. Alternatively, buoys, underwater gliders or other platforms may also be used for conducting acoustic surveys. Such methods are similar to visual line transect sampling, and the acoustics method can act as an independent observer (if visual and acoustic line transects surveyed simultaneously). For example, in China, the hydrophone is towed by two or three people in a small boat and with other observers searching for cetaceans visually. Therefore the acoustic detection system functions as an independent observer to estimate the detection probability of the focal species. Acoustic methods can also be applied to long-term monitoring projects to study the presence and sometimes migration direction of animals within a small area. For example, acoustic detection systems fixed in a narrow passage are effective in monitoring the movement and presence of animals moving through the area. Such equipment is usually effective up to several hundred meters, and in the case of blue whales, sound may be detected up to several kilometers. This method is also suitable for use in areas where the construction of wind farms may affect the migration route of cetacean species.

Acoustic methods can assist researchers in determining the species of cetaceans present. The differences in sounds can tell us the family and sometimes species that is heard vocalizing. Generally, it is also possible to tell delphinids apart from phocoenids as their sounds can be differentiated. Acoustics can also be used to identify local breeding groups within a population in an area. For example, research conducted on orcas in Iceland showed that their vocalization patterns were shared within the population. An orca calf had learned its parents' vocalization patterns throughout the duration of one year; its initial calls were different from that of its parents, but over time changed and resembled the calls of its parents.

Dolphins and porpoises use high frequency sound to find prey items, beyond the hearing range of human beings. As a result, these animals are able to receive the echo that is reflected from solid objects. The animals are able to deduce where sounds heard are coming from by the angle change in the sound as it approaches them. A change in angle as small as 1 – 2 degrees is detectable by the animals. Some examples of sound frequencies were mentioned to illustrate their differences. These included the following sound decibals:

- 4 kHz and 8 kHz often used for health check
- 1 - 18 kHz, which is the approximate range for humans, but is higher in children
- < 1 kHz, which is the decibel at which humans communicate
- Dolphins can hear up to 150 kHz

Additionally, the echolocation sounds of the finless porpoise and Yangtze river dolphin was slowed down 100 and 200 times respectively to demonstrate the extent of their high frequency ranges. Research has been conducted using a sonar data logger to confirm the frequency of sound emission in dolphins and porpoises. Dolphins and porpoises produce sonar sounds frequently enough (every 5-10 seconds) to be used for passive acoustic monitoring.

Passive acoustic monitoring (PAM) was introduced to workshop participants by Satoko, using her research on Yangtze finless porpoises in China as a case study. The equipment used was a custom-made hydrophone called the A-tag, which receives the sound pressure and bearing angles of two hydrophones. The sound detection range for the A-tag is 60-220 kHz. There are two types of PAM method used, the first being stationary and the second being towed PAM. Stationary PAM refers to the equipment fixed in one location and deployed for recording over a certain duration of time. Towing PAM refers to the equipment deployed in the water and towed 50 – 100 m astern along a transect line. The comprehensive characteristics, advantages and disadvantages of using both PAM methods are summarized in the tables below.

	Fixed PAM	Towed PAM
Advantage	• Long-term monitoring of animals • Assessment of diurnal patterns, seasonal changes	• Wide range • Study of distribution, abundance, monitoring for a population
Disadvantage	• Small monitoring range (300m) • Not suitable for study of entire population • Limitations in placement locations (depending on site) • Permits needed for placement	• Higher costs due to need for research vessel • Observations limited to daylight hours

	Fixed PAM	Towed PAM
Comparison of visual-acoustic observations	• Visual: 13% of observation time - Surfacing every 1-2 min • Acoustic: 82% of observation time - Sound every 3-10 seconds	• Higher rate of detections via acoustic method (e.g., finless porpoises in Yangtze River)
Comparison of visual-acoustic group size	• Visual: Can detect > 6 animals simultaneously • Acoustic: Usually detects less than 6 individuals at any one time	• Visual: Can detect > 6 animals simultaneously • Acoustic: Usually detects less than 6 individuals at any one time
Examples of research findings	• Finless porpoises in the Yangtze River showed seasonal change in detection of echolocation signals; more in July vs March and May	• Seventy-seven kilometers of towed acoustics survey from May 2007 to August 2010 in the Yangtze River in search of finless porpoise (Kimura et al., 2012) revealed: - Critical season distribution pattern - May and August: found in river and not much in lake - November and February: many go into oxbow lake • A 1100 km survey using Budweiser ship as moving platform from Uhon to Shanghai in search of finless porpoises (Dong et al. 2011) revealed: - Some areas where no porpoises were detected. - Many found in middle part, but not in lower reaches of river

The following questions were raised during the discussion session of this workshop, and these were the answers provided by the workshop facilitators:

Q: How far can Sousa communicate using sound?
A: Tom: whistle can travel up to 10km in very low noise level waters

Q: Why is it that the A-tag cannot detect more than 6 individual animals at the same time?
A: It is due to the resolution of angle; the human eye is quite precise, but acoustics cannot detect such a small change of the bearing angle of the sound.

Q: If more hydrophones are used, would it increase the resolution?
A: Yes. Another limitation is that the data can have wavelength error in the computer. The angles change as the animals are swimming, therefore in some instances, it is difficult to ascertain whether the data is showing an error or if it is due to the behaviour of the animal that's vocalizing.

Q: Have acoustic studies been conducted in a captivity setting?
A: Yes, but acoustic behavior differs in captivity as animals tend to produce lower and shorter range sounds.

Q: How does one separate sounds from boats and other human activities?
A: The A-tag detects ship noise, which is different from dolphin sound. Ship sounds mainly come from bubbles, not the engine. A ship's sound is almost produced randomly while sounds from sonar signals are more regular in terms of frequency and interval.

Q: Have you detected some form of sound mimicry for frequently associated species?
A: No. Bottlenose dolphins, Tursiops truncatus in Florida have individual signature whistles, and have ability to mimic sounds. Individuals within this species use almost identical wave forms of high frequency whistle.

Q: How does one differentiate sounds produced from different behaviors?
A: There is limited information on this matter at present. There are approximately only 4 - 5 categories of sonar sounds. A "clear" category is regarded as the "approach phase". When an animal is approaching its prey or other target, the interval of the sound production becomes increasingly shorter as it is adjusting the distance of the target. The approach phase only happens in small odontocetes, but also in bats (acoustical evolutionary convergence). Other "clear" category include long range sonar, likely used to "see" over long distances. Other=3+1 sequence observed in Mediterranean in sperm whale coda, which appears to be the species' mode of communication. Only change detectable

in coda sound production is in the interval difference.

EXERCISE : How to implement acoustics in each country?

Case study: Cast net Fishing with the Help of Irrawaddy dolphins in Myanmar – Tint Tun

Cast net cooperative fishing with Irrawaddy dolphins is a fishing practice in a section of the Ayeyarwady River that has existed for more than 100 years. In 2002, a survey was conducted along the whole stretch of the Ayeyarwady River. It was found that approximately 38 dolphins were present in the stretch between Bhamo and Mandalay. It was also discovered that only dolphins within the 72km segment of river between Mingun and Kyaukmyaung knew how to cooperatively fish with fishermen, and only using cast nets. However, in present times, this practice is threatened with extinction due to the rise in electric fishing and also gillnet fishing. Therefore it would be important to study the communication between the fishermen and the dolphins, before this practice goes extinct.

Current understanding and interpretation of this ancient practice is as follows:

1. The fisherman send signals to dolphins by tapping the side of his boat with a special wooden tool. This first signal is a sign of invitation to the dolphins to cooperate. When the dolphins hear the signal, it is possible that the animals communicate among themselves to decide on whether to help or not.
2. The dolphins may slap the water with their flippers to indicate to the fisherman that the area is not good for fishing, and to signal the fisherman to follow them to another area.
3. Once at the area deemed appropriate by the dolphins, the animals will signal the fisherman to indicate that they are ready to fish.
4. The fisherman then casts his blank net to attract the dolphins closer to the net. The dolphins subsequently spy hop to ascertain the boat that they will be assisting.
5. The dolphins swim closer and herds the fishes into the net. They also proceed to consume some of the fishes for themselves (i.e., rewarded with fishes that escape the nets and also given some fish by the fishermen while hauling in the catch).

There was a suggestion that the cast net cooperative fishing's acoustic mechanisms are a good topic of study as this practice has well-defined behaviours. Acoustic recorders could be placed on the fishing net at the commencement of the fishing and recovered when the nets are hauled in, in order to study the underwater coordination of the dolphins during the cooperative fishing. If in the event that there was not any budgetary constraints, then placing an acoustic recorder along every 600 m of the 72 km river segment would be ideal to study the acoustic mechanisms of this cooperative fishery. For example, in the case of the vaquita in the Gulf of California, tens to hundreds of acoustic recorders were installed in the area to help researchers identify the core areas of occurrence of the porpoise, and to study the animals' movements in detail.

Tomonari Akamatsu responded that if budget is not a problem, it will be quite nice to install every 600m. For vaquita, they installed tens to hundreds to identify hot spot. And can be used to study if they go out protected area and if yes, when do they go out of protected area.

The following questions were raised during the discussion session of this case study, and these were the answers provided by the workshop facilitators:

Q: What is the maximum speed of towing the A-tag?
A: It is 10 knots (18km/h). Higher speeds mask the detection range, so on average the research vessel would move at 6-7 knots when towing the hydrophones. In a river, it is better to move downstream rather than upstream, as the latter takes longer for the vessel to move and the drag produces more noise in the data.

Q: What is the operating depth for the hydrophones?
A: The operating depth is dependent on the platform that is used. A midwater column deployment is preferred, usually 0.5-1 m depth.

Q: What is the detection range?
A: It is 300 m maximum, and if there is high level of snapping shrimp noise, it will mask low density sound and cause shorter detection distances. The shortest detection distance caused by snapping shrimp is 60 m.

Q: What is the battery lifespan and cost for the A-tag?
A: One month and USD7,000 respectively.

Q: How can one ascertain sounds associated with socializing behaviour?
A: Socializing sound is loud and the animals produce clicks and whistles when they are active. The animals probably use sonar sound for detecting direction and distance of their target.

Q: What are ship movements like in areas where acoustics have been used to study cetaceans?
A: An example is in Kyushu, Japan, where ship traffic is usually heavier during the night than in the day. It is possible that the finless porpoises are affected by ship noise during the day, or that their diurnal pattern is that they prefer to be present in the area more during the night to forage.

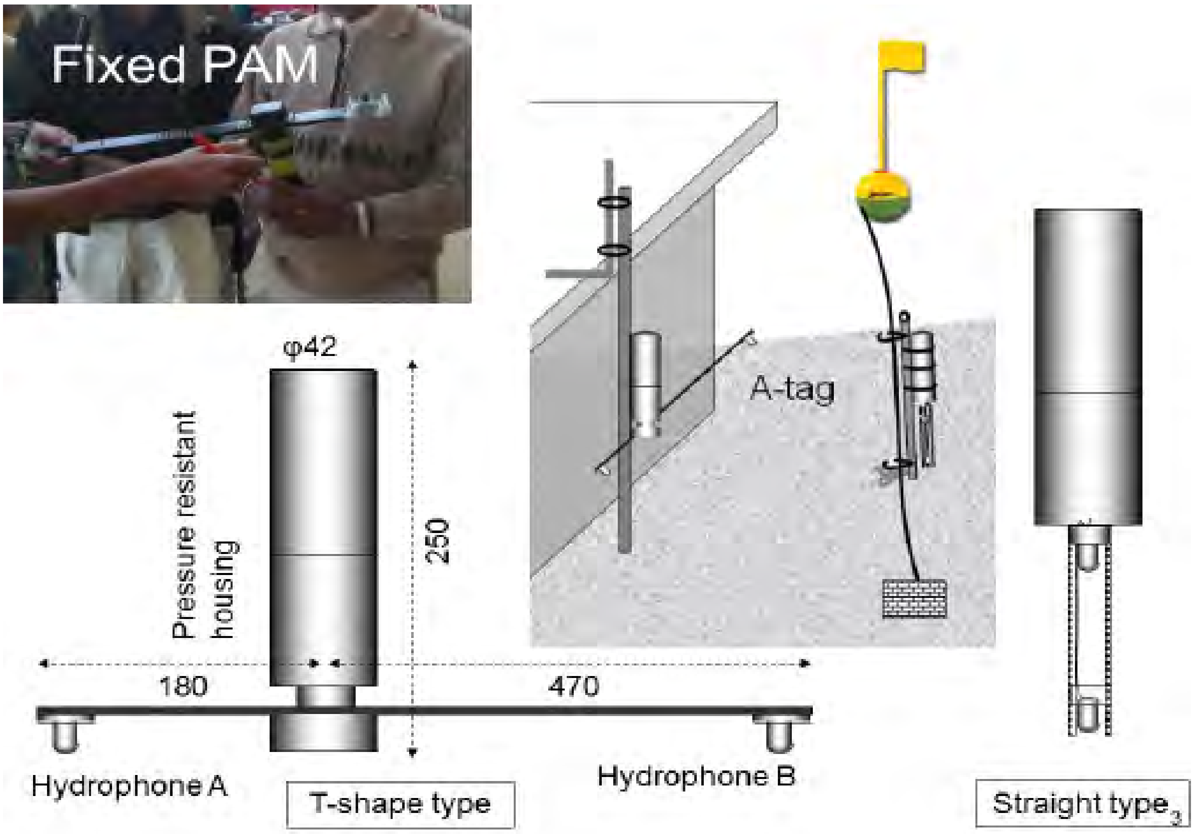
Q: Is it easy for one with relatively little background on acoustics to process the data on their own or are acousticians required for data analysis?
A: A software is being developed which will enable the researcher to analyse his/her own acoustics data. It is available at http://cse.fra.affrc.go.jp/akamatsu/en/index.htm. However the software is still in the early stages of its development, therefore collaboration with acousticians is recommended at present.

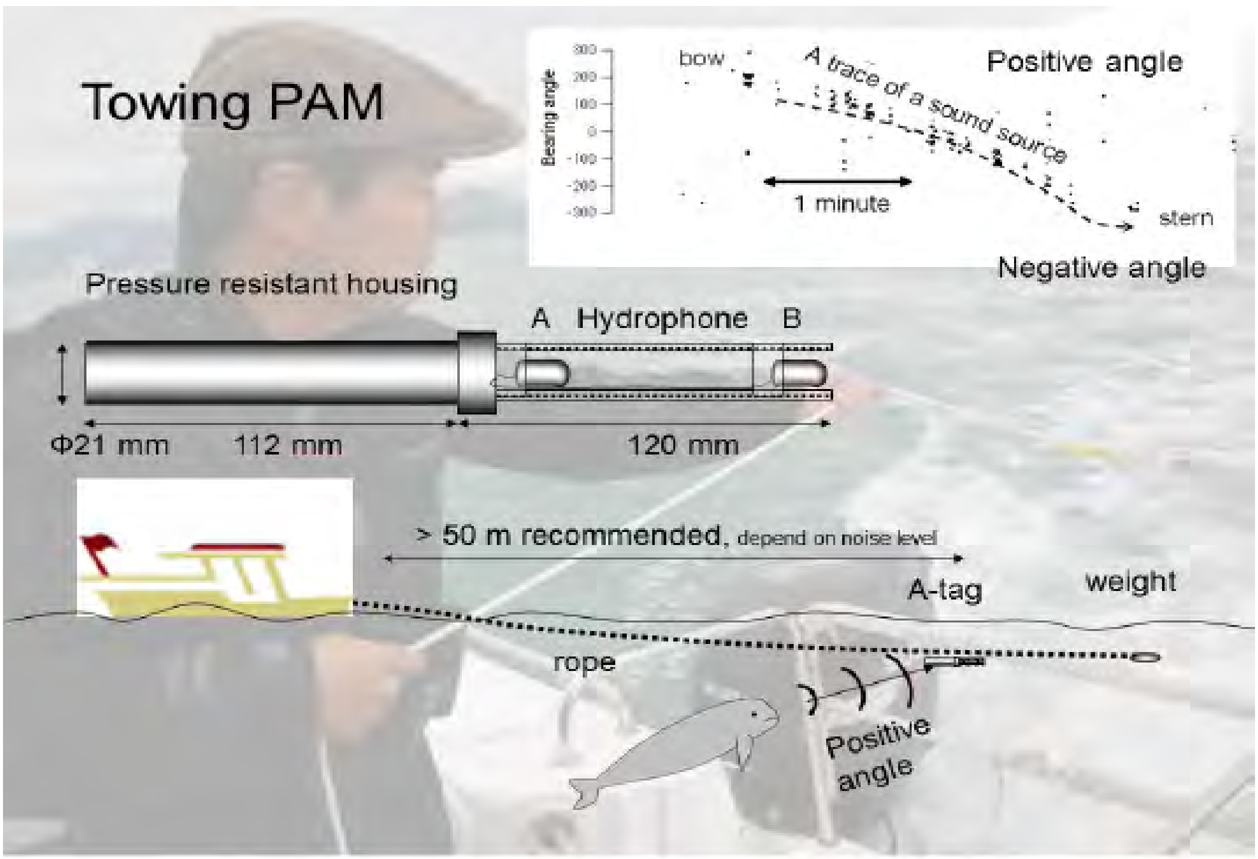
Q: How does one safeguard the hydrophones deployed at a fixed

station from theft? For example, in the case of the vaquita, many hydrophones were taken by illegal trawlers.
A: Theft of hydrophones is a common problem worldwide. One suggestion is to hire a person overnight to guard the equipment. Alternatively, the equipment may be deployed (if possible) at navigation booths or a property that belongs to an institution, whereby there is a certain distance limit for approach.

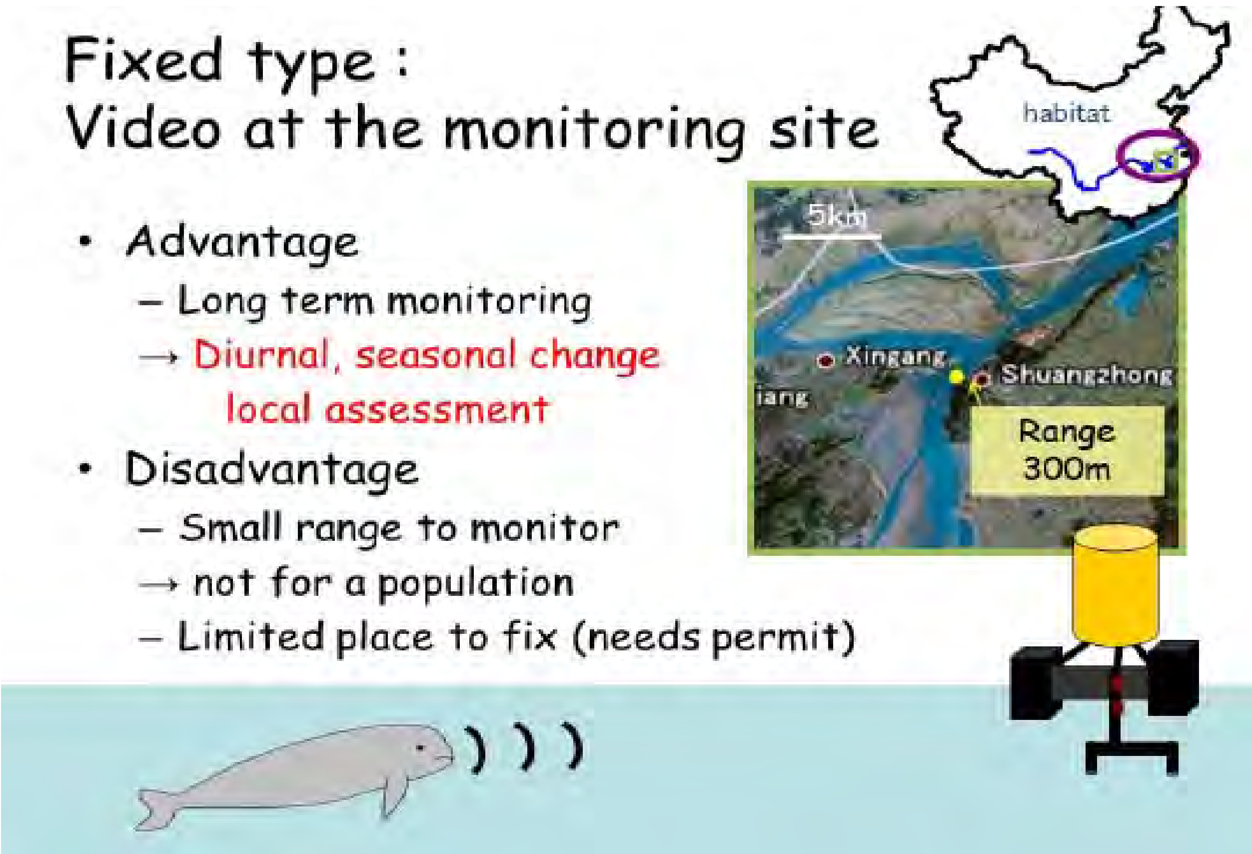
A-tag (Marine Micro Technology, Japan)
-the time, received sound pressure and bearing angle of two hydrophones
-60-220 kHz

About Atag; see Tom's website, http://cse.fra.affrc.go.jp/akamatsu/


Fixed PAM
A-tag
φ42
Pressure resistant housing
250
180
470
Hydrophone A
T-shape type
Hydrophone B
Straight type

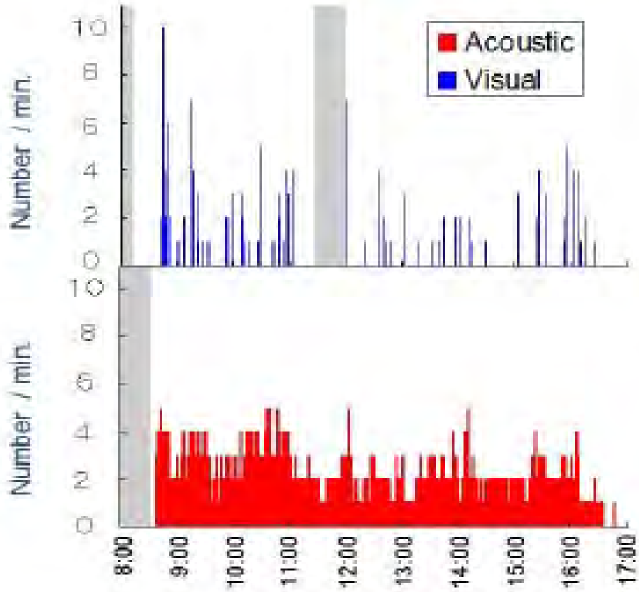

Towing PAM
bow
A trace of a sound source
Positive angle
1 minute
stern
Negative angle
Bearing angle
Pressure resistant housing
A Hydrophone B
Φ21 mm
112 mm
120 mm
> 50 m recommended, depend on noise level
A-tag
weight
rope
Positive angle


Fixed PAM
2007
Visual observation...of ship?
In the Yangtze River


Fixed type :
Video at the monitoring site
• Advantage
– Long term monitoring
→ Diurnal, seasonal change
local assessment
• Disadvantage
– Small range to monitor
→ not for a population
– Limited place to fix (needs permit)
habitat
5km
Xingang
Shuangzhong
Range
300m

Stationary

Comparison of visual-acoustic observation at station



Visual 13%

→surfacing every 1-2min

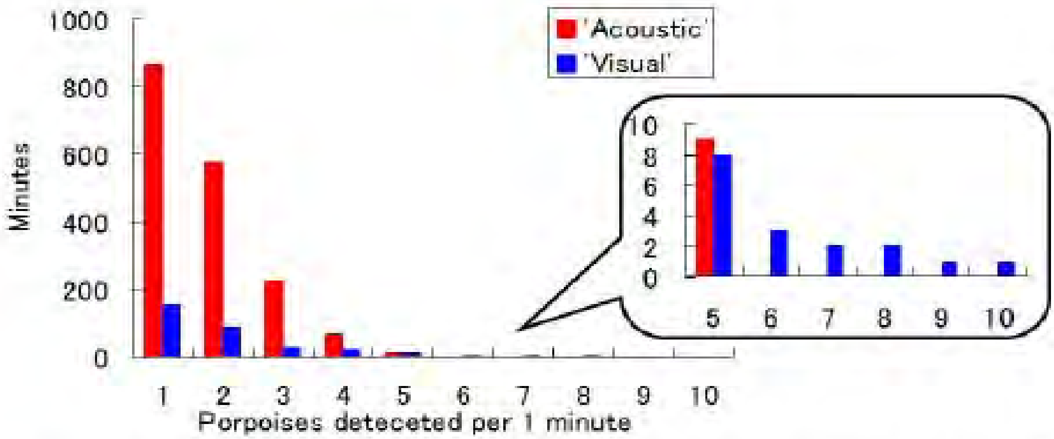
Acoustic 82%

→sound every 3-10 sec

Kimura et al. 2009. *J. A. S. A.*, 125, 547-553.

Stationary

Group size

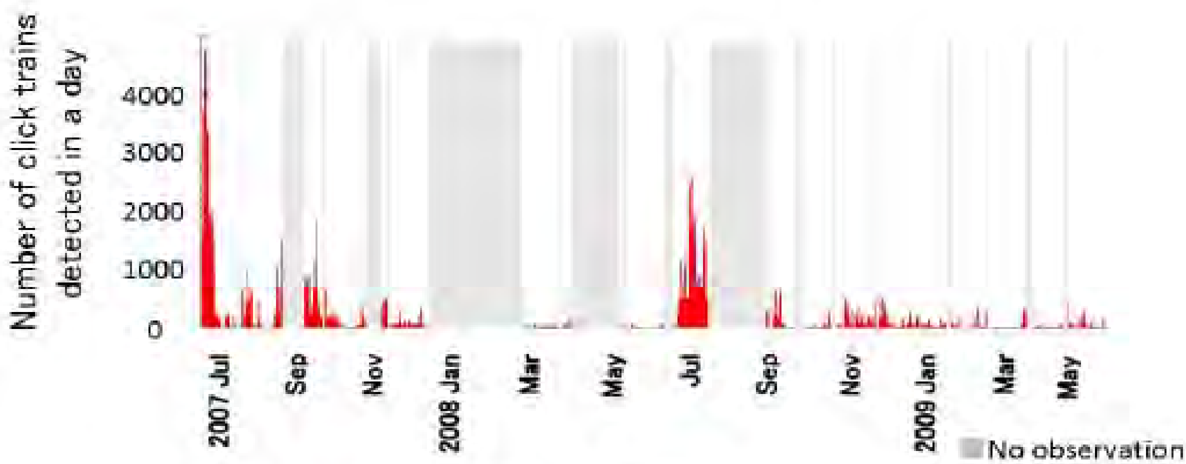


- 96.5% time of 2184min : acoustic detected more animals than visual
- Acoustic = Less than 6 individuals / Visual = over 6 simultaneously

→acoustic for finless, visual for *sousa*??

Kimura et al. 2009. *J. A. S. A.*, 125, 547-553.

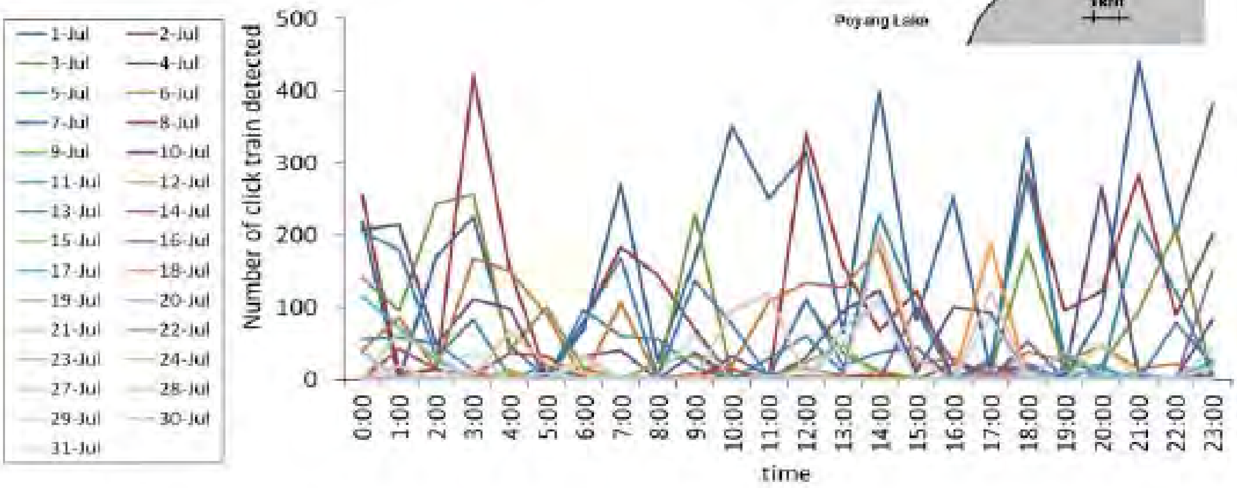
Seasonal change in the detection of the echolocation signals



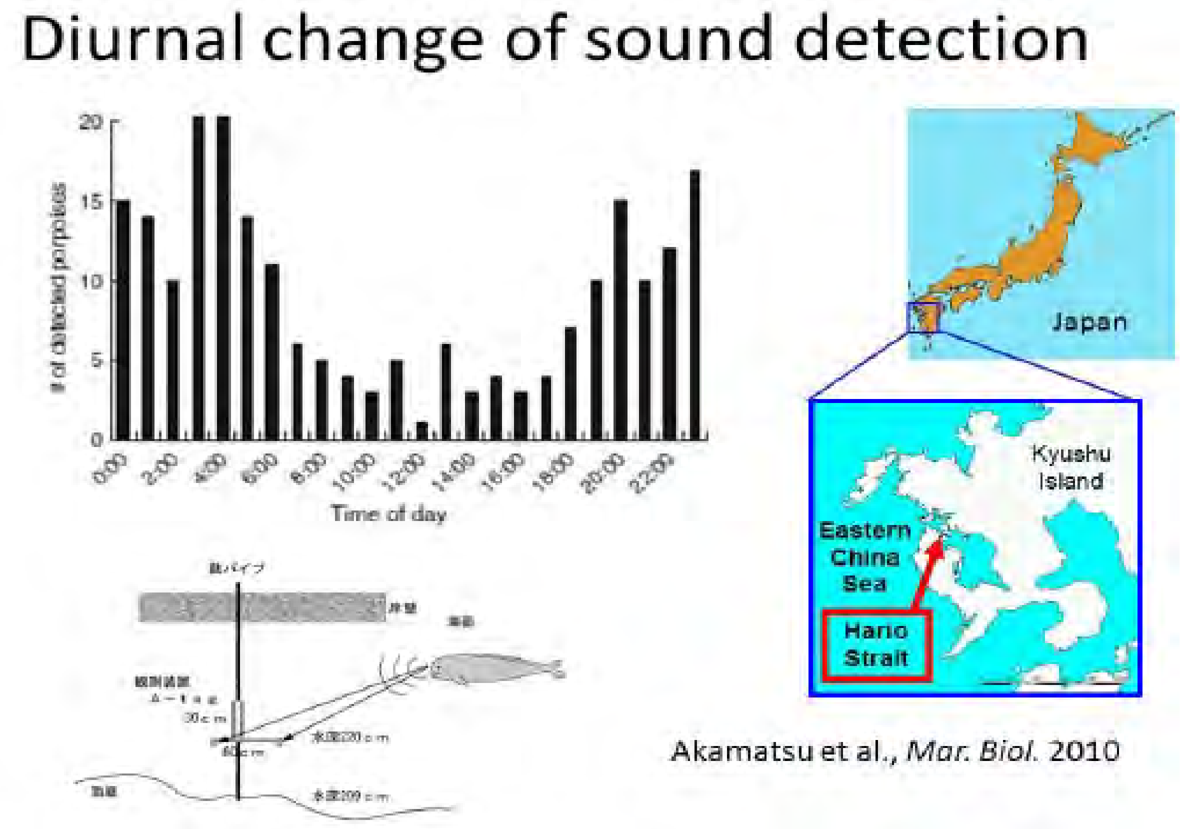
0～ 4650 click train (average 240)

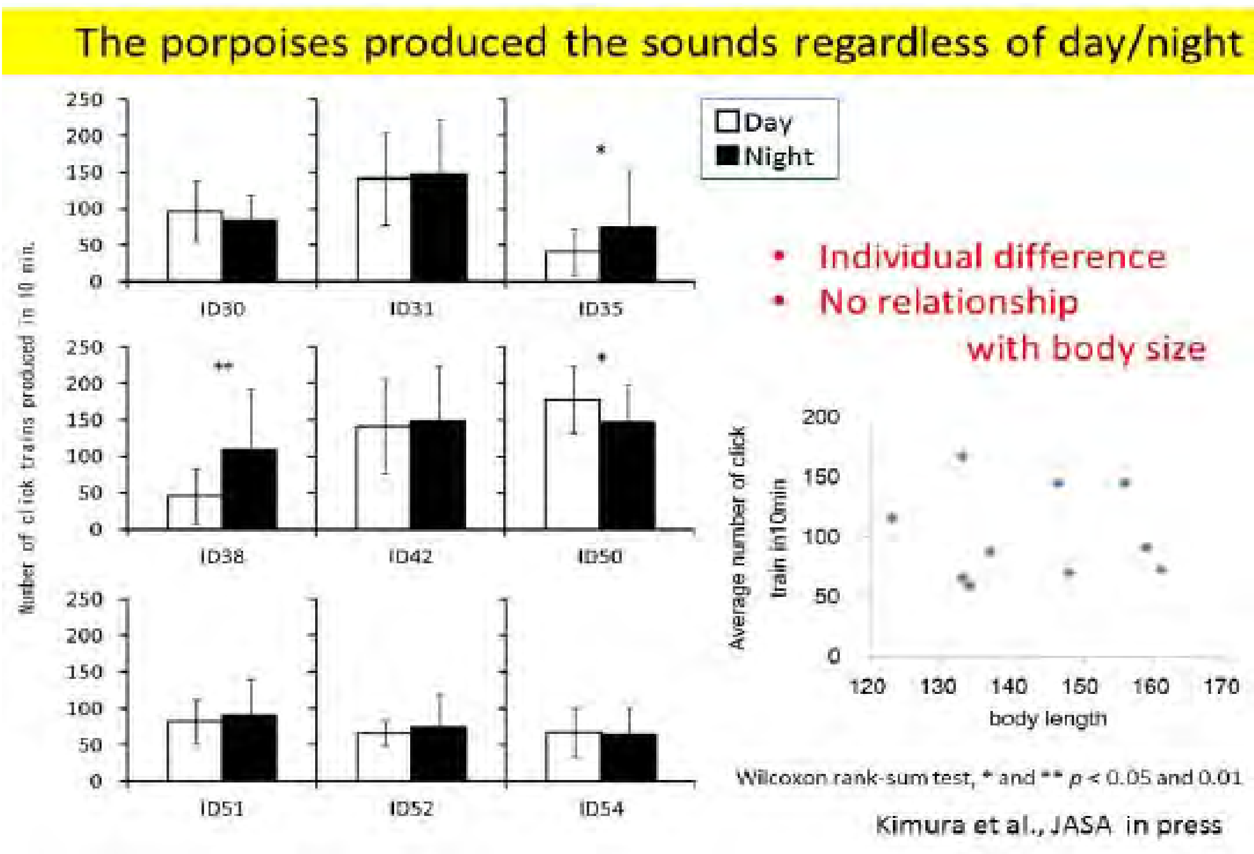
Kimura et al. 2010, *J. Acoust. Soc. Am.*

No diurnal rhythm of appearances?



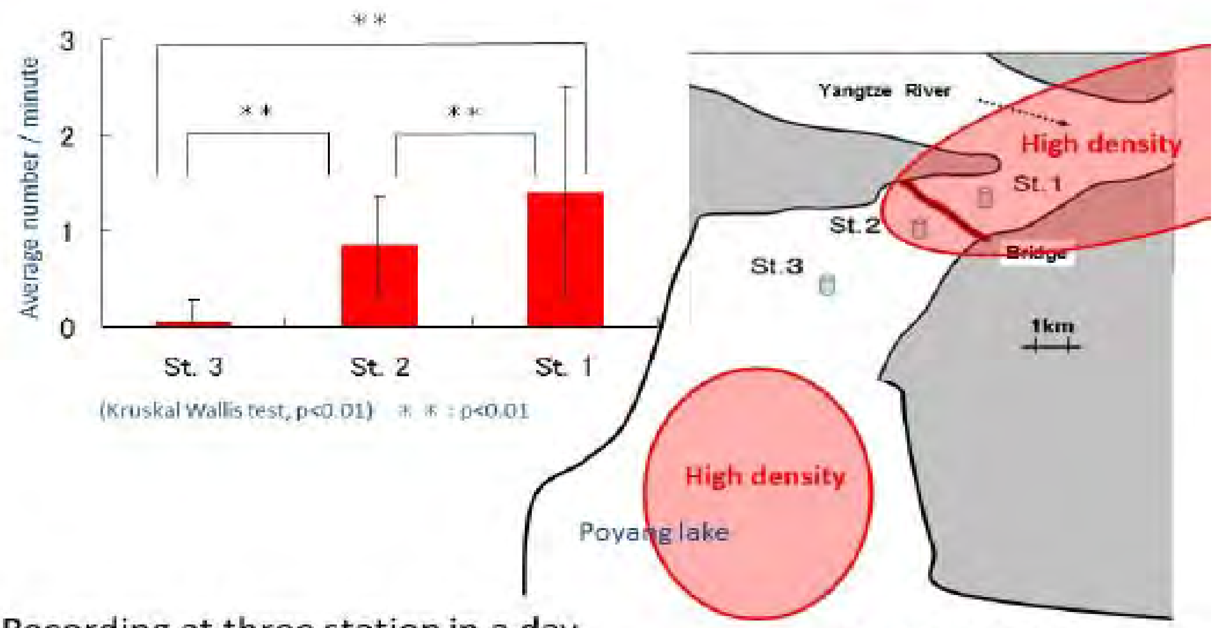
- July 1st to 31st in 2007


Diurnal change of sound detection
# of detected porpoises
20
15
10
5
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Time of day
Japan
Kyushu Island
Eastern China Sea
Hario Strait
Akamatsu et al., *Mar. Biol.* 2010


The porpoises produced the sounds regardless of day/night
Number of click trains produced in 10 min.
250
200
150
100
50
0
ID30
ID31
ID35
ID38
ID42
ID50
ID51
ID52
ID54
*
**
Day
Night
• Individual difference
• No relationship with body size
Average number of click train in10min
200
150
100
50
0
120
130
140
150
160
170
body length
Wilcoxon rank-sum test, * and ** p < 0.05 and 0.01
Kimura et al., JASA in press

Stationary

Distribution trend from multiple stations



Recording at three station in a day

Kimura et al. 2009. *J. A. S. A.*, 125, 547-553.

Density estimation

$$\boxed{D = \frac{N_d(1-F)\alpha}{\pi w^2 RCP}}$$

F.......*False alarm rate*

C.......Correct detection rate

α.......*Effect of group size on production rate*

R.......Production rate

πw^2....Detection range

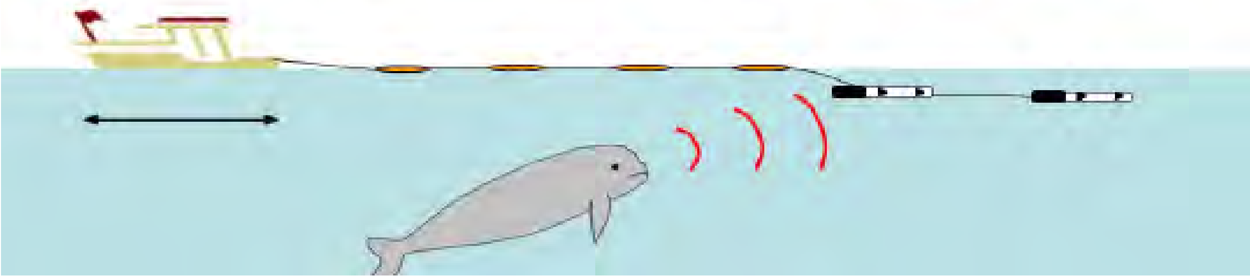
P.......Detection probability based on propagation model

N_d......Number of the sound detected in a time window

See Kimura et al., 2010 *Journal of Acoustic Society of America*, 128, p1435-1445

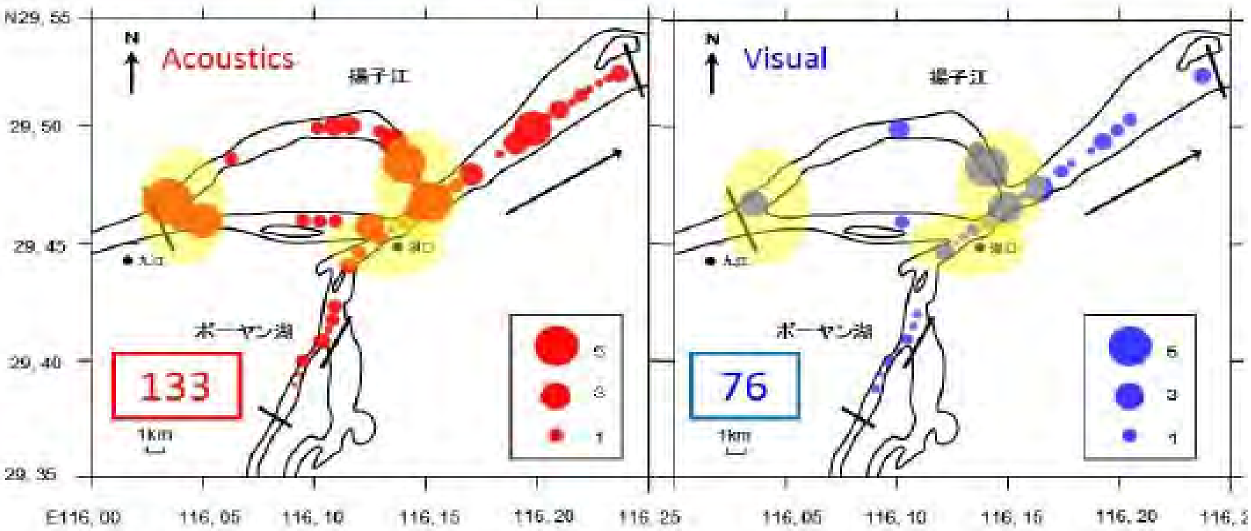
Towed type : Snap shot of local population

- Advantage
  - Wide range
  - → distribution, abundance monitoring for a population
- Disadvantage
  - Cost for boat
  - Only daytime



Towing

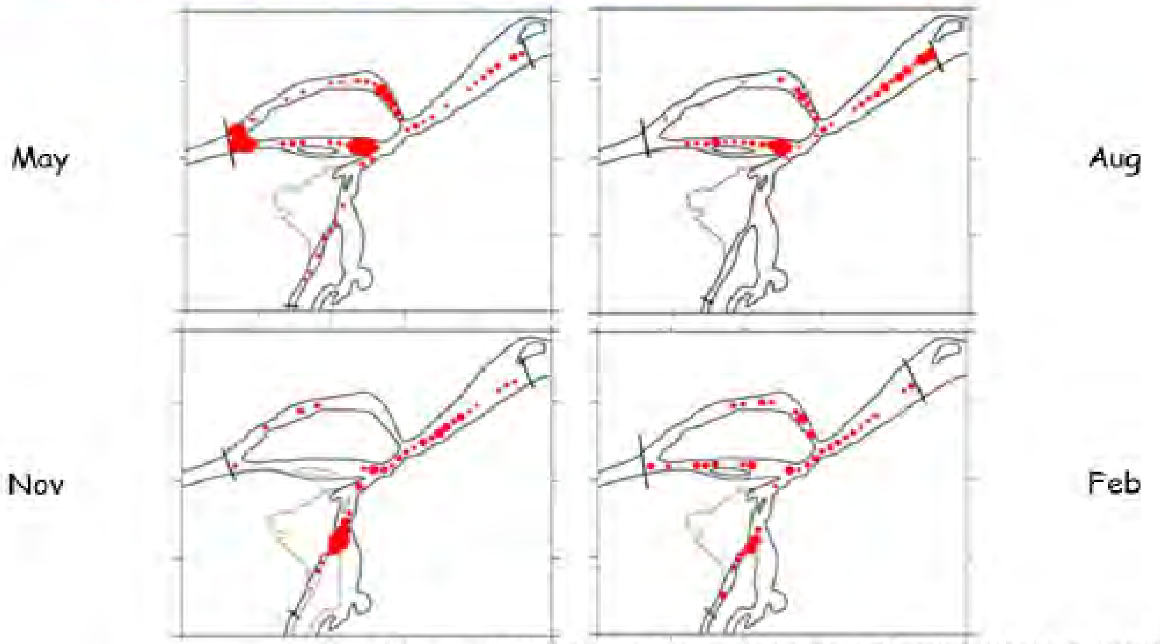
Comparison of acoustic-visual



- Observation in May 2007
- Acoustics detected twice as much as visual due to small group size of finless

Seasonal distribution change

77km towing survey From May 2007 to August 2010

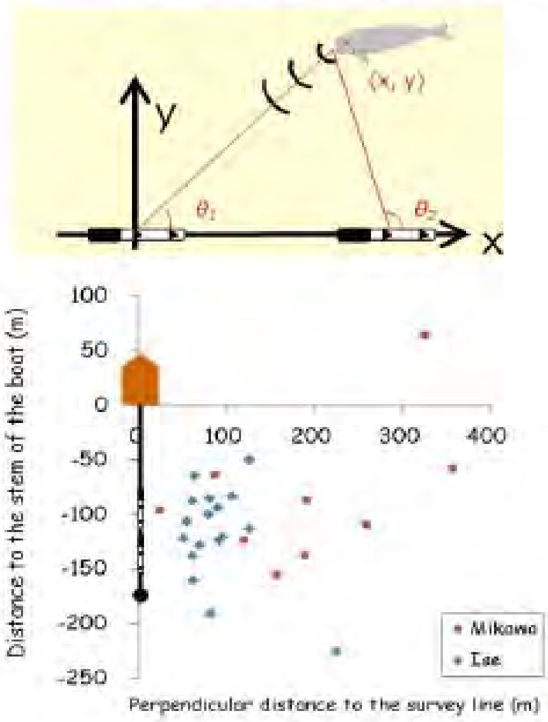


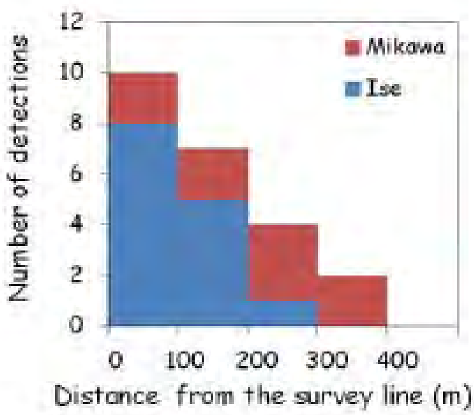
Kimura et al., *Marine Mammal Science*. 28(2), p308-324. 2012

1100 km survey using a Budweiser ship as a moving platform

Dong et al., JASA 130, p2285-2292, 2011

Localization of the animals



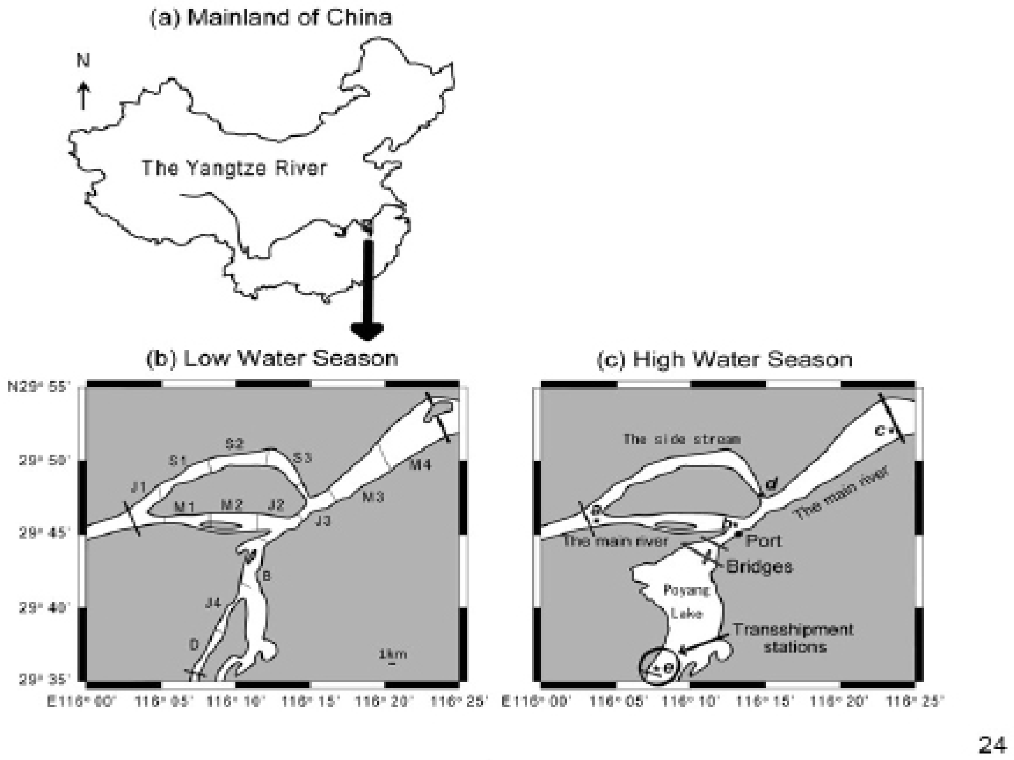


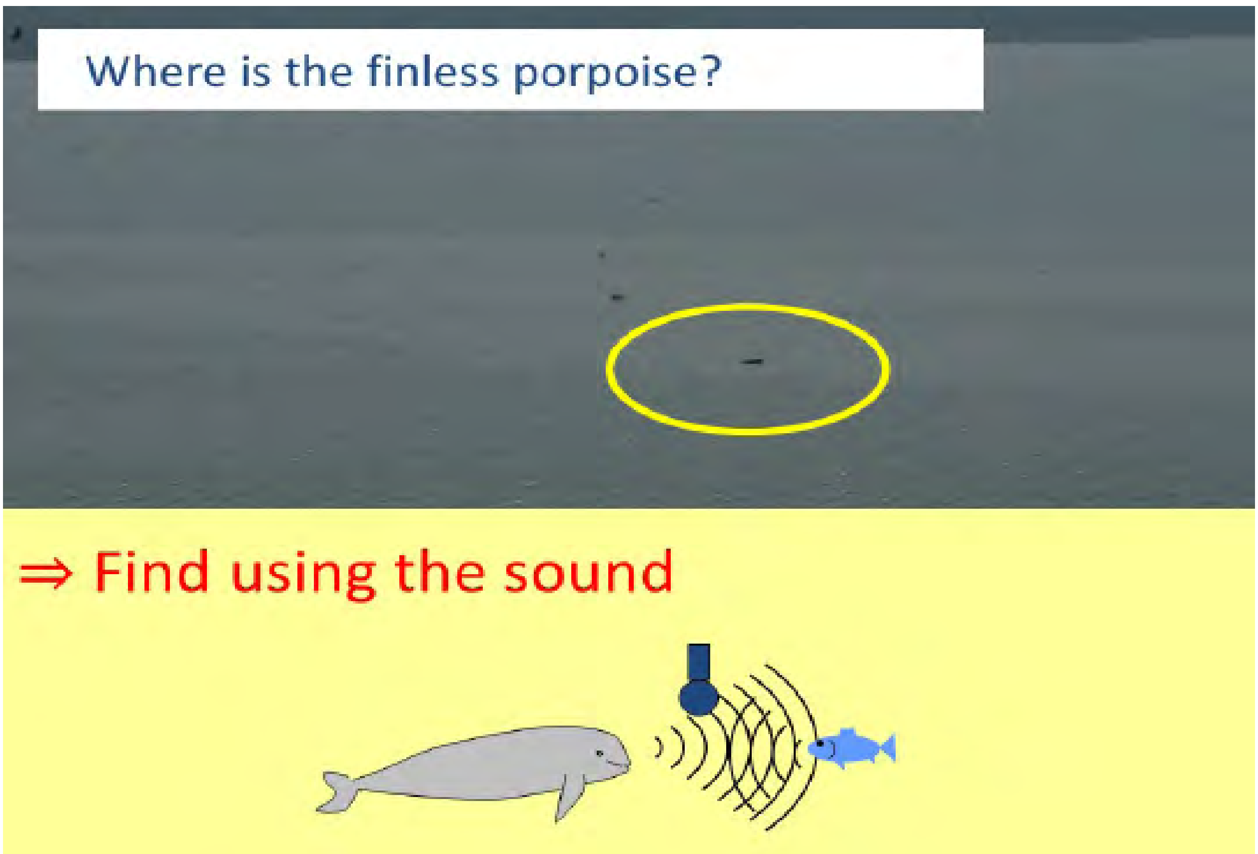
↓
Abundance

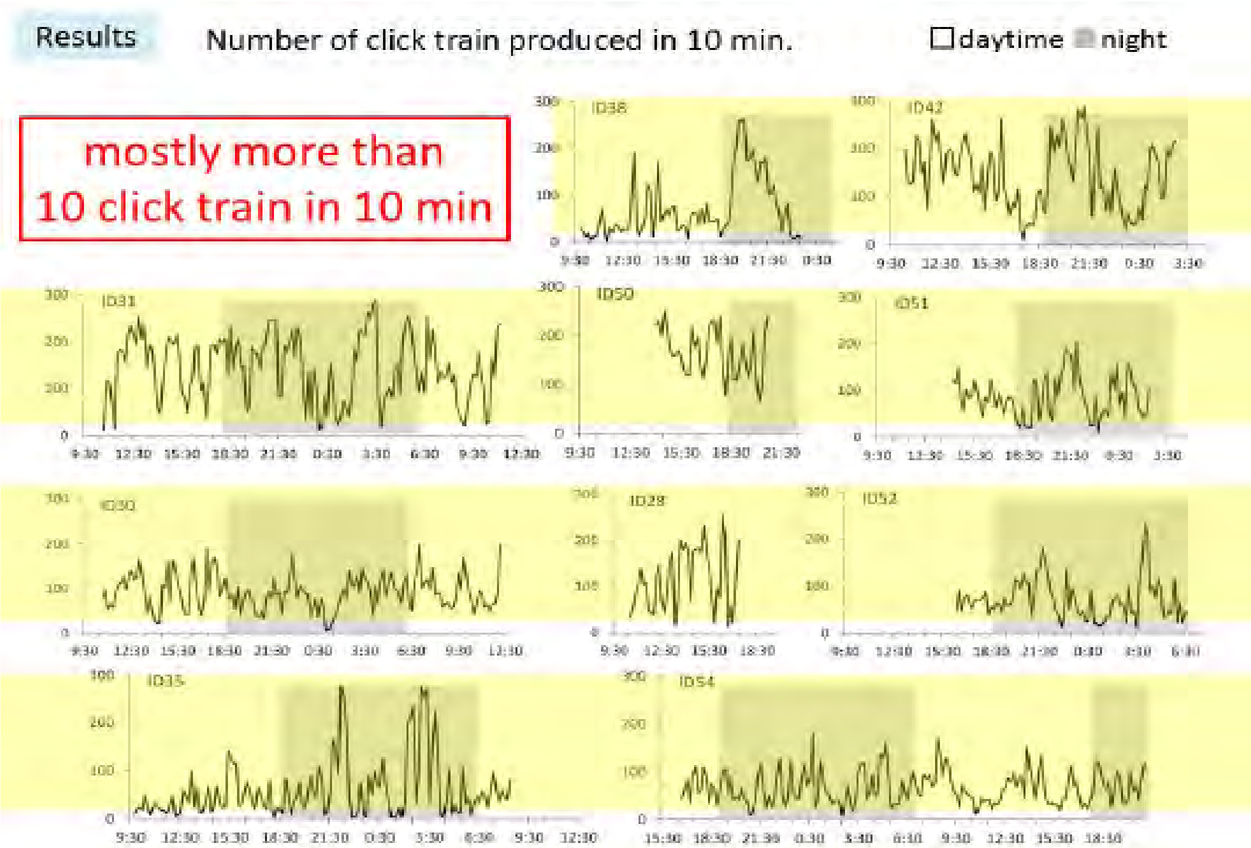
Kimura et al., in prep.
See also; Li et al., 2009 JASA

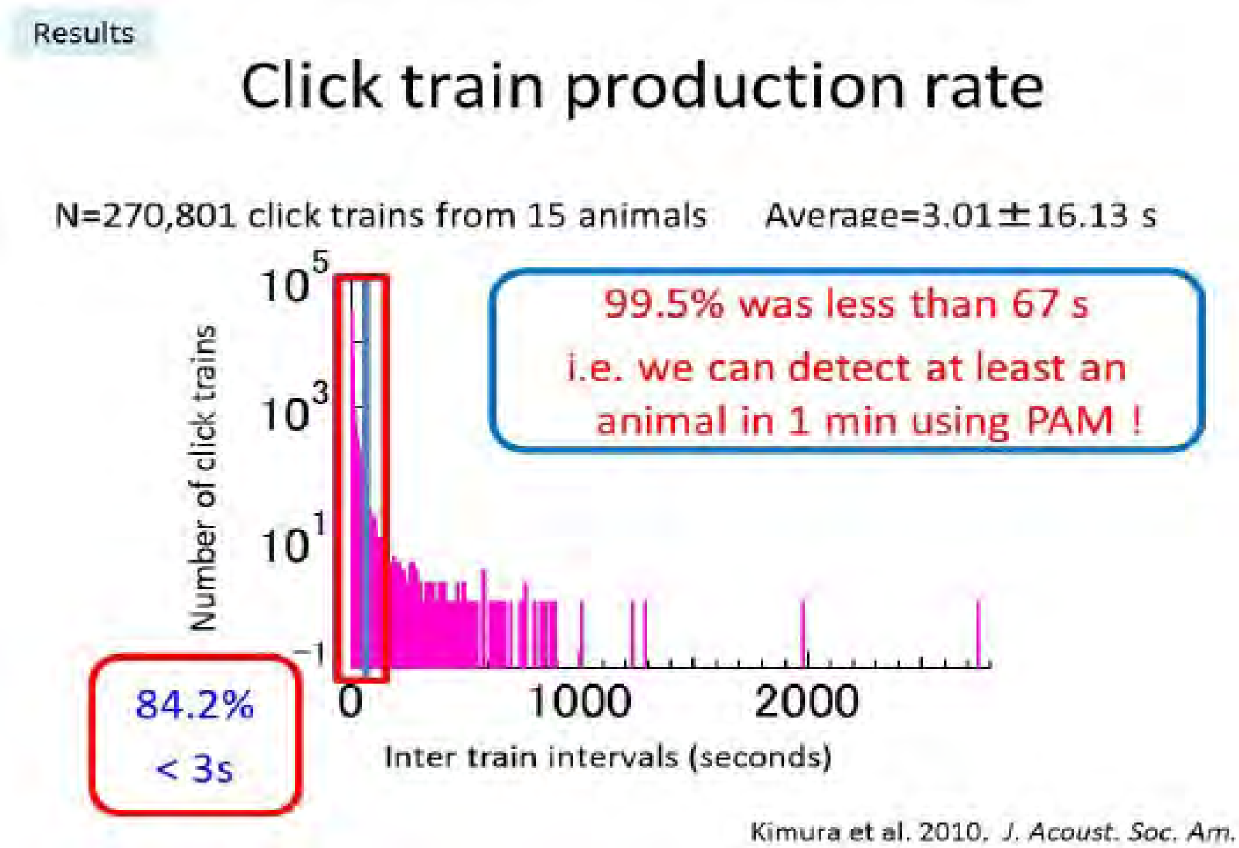

References; See our web sites
Tom's HP
http://cse.fra.affrc.go.jp/akamatsu/
(or search by "Tomonari Akamatsu")
Satoko's HP
http://satoko-kimura.sakura.ne.jp
(be careful! A lot of "Satoko Kimura")
Sousa in SanNiang-wan, China

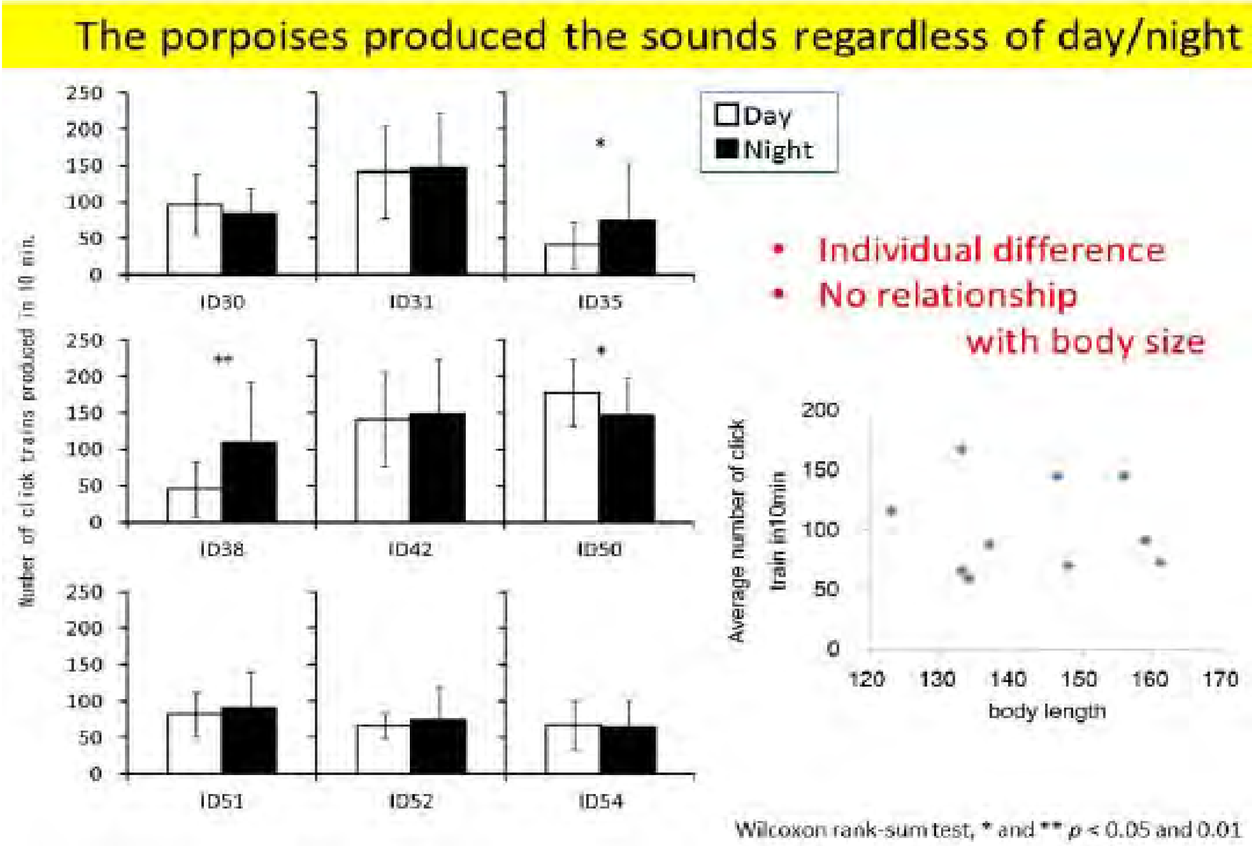

Acknowledgement
We thank all members of
• the Laboratory of Conservation Biology of Aquatic Animals at the Institute of Hydrobiology, Chinese Academy of Sciences
• the National Research Institute of Fisheries Engineering, the Japan Fisheries Resource Conservation Association
• Biosphere Informatics, Graduate School of Informatics, Kyoto University
• the Fisheries Administration Bureau of Hukou Jiangxi Province
This study was partly supported by
• a Grant-in-aid for Scientific Research (B) 19405005 from the Japanese Research and Development Program for New Bio-industry Initiatives
• the National Natural Science Foundation of China (30730018, 30570233)
• the Chinese Academy of Science (Present Fund)
• the Ocean Park Conservation Foundation of Hong Kong
• the Sasagawa Scientific Research Grant from The Japan Science Society (19-740M, 20-747MK).
Towing boat in Yangtze River, China

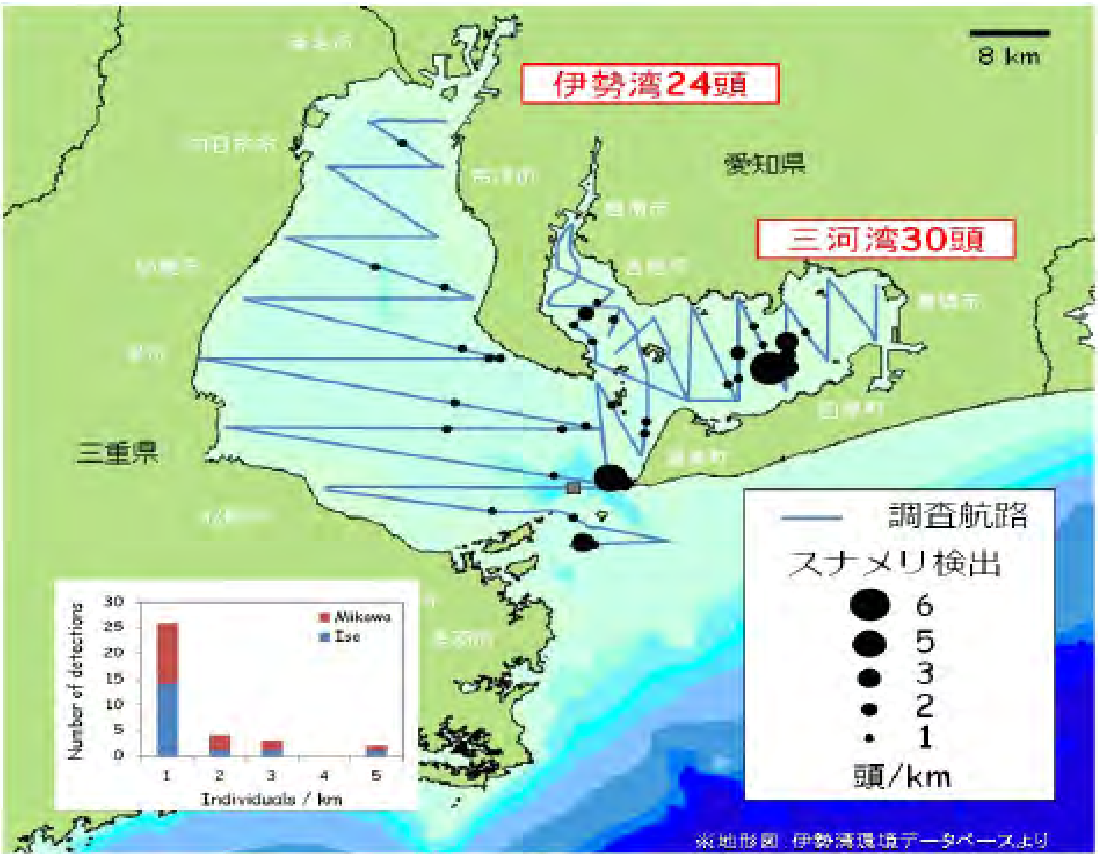

(a) Mainland of China
N
The Yangtze River
(b) Low Water Season
(c) High Water Season
N29° 55'
29° 50'
29° 45'
29° 40'
29° 35'
E116° 00'
116° 05'
116° 10'
116° 15'
116° 20'
116° 25'
S1
S2
S3
J1
M1
M2
J2
J3
M3
M4
J4
B
D
1km
The side stream
The main river
The main river
Port
Bridges
Poyang
Lake
Transshipment
stations
24


Where is the finless porpoise?
⇒ Find using the sound


Results
Number of click train produced in 10 min.
daytime night
mostly more than
10 click train in 10 min
ID38
ID42
ID31
ID50
ID51
ID30
ID28
ID52
ID35
ID54


Results
Click train production rate
N=270,801 click trains from 15 animals
Average=3.01±16.13 s
99.5% was less than 67 s
i.e. we can detect at least an
animal in 1 min using PAM !
Number of click trains
Inter train intervals (seconds)
84.2%
< 3s
Kimura et al. 2010. J. Acoust. Soc. Am.


The porpoises produced the sounds regardless of day/night
Day
Night
Number of click trains produced in 10 min.
ID30
ID31
ID35
ID38
ID42
ID50
ID51
ID52
ID54
• Individual difference
• No relationship with body size
Average number of click train in10min
body length
Wilcoxon rank-sum test, * and ** p < 0.05 and 0.01


8 km
伊勢湾24頭
愛知県
三河湾30頭
三重県
調査航路
スナメリ検出
6
5
3
2
1
頭/km
Number of detections
Mikawa
Ise
Individuals / km
※地形図 伊勢湾環境データベースより

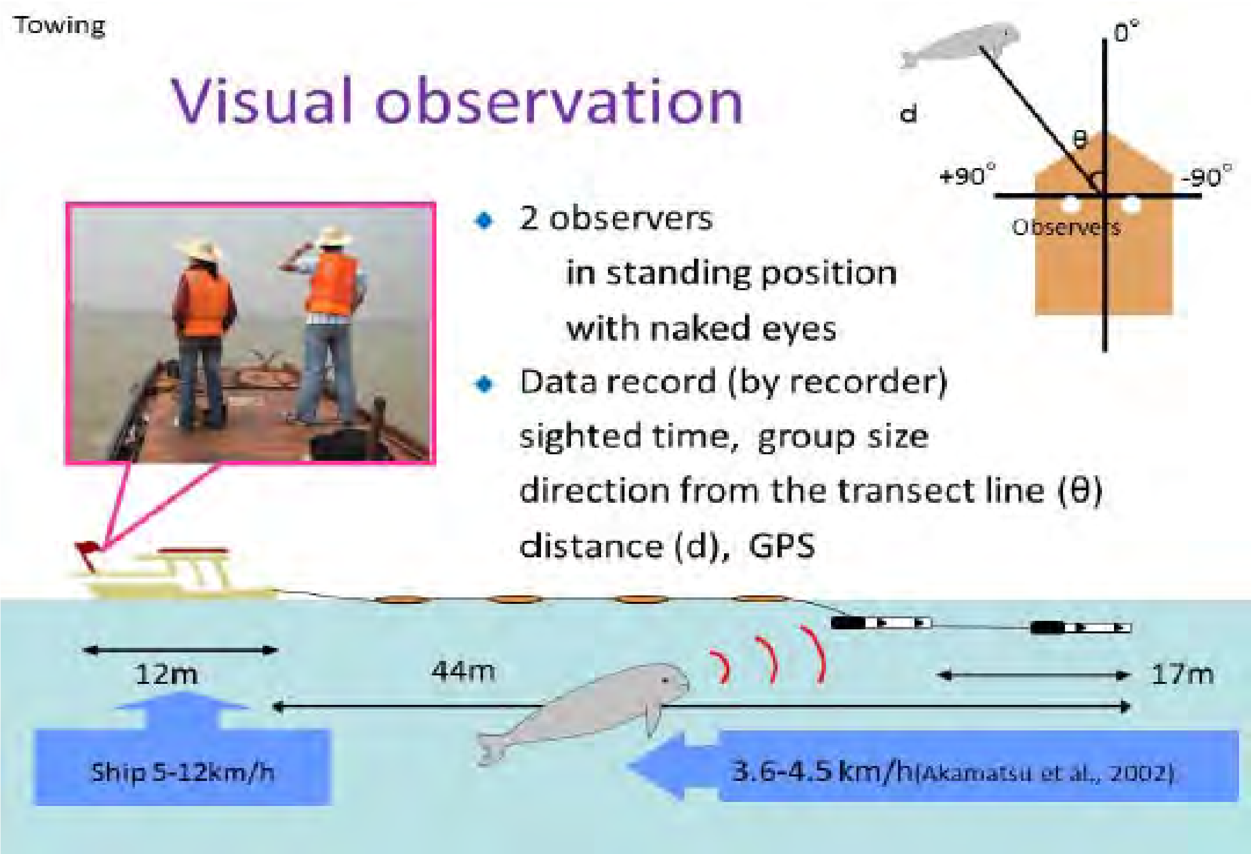
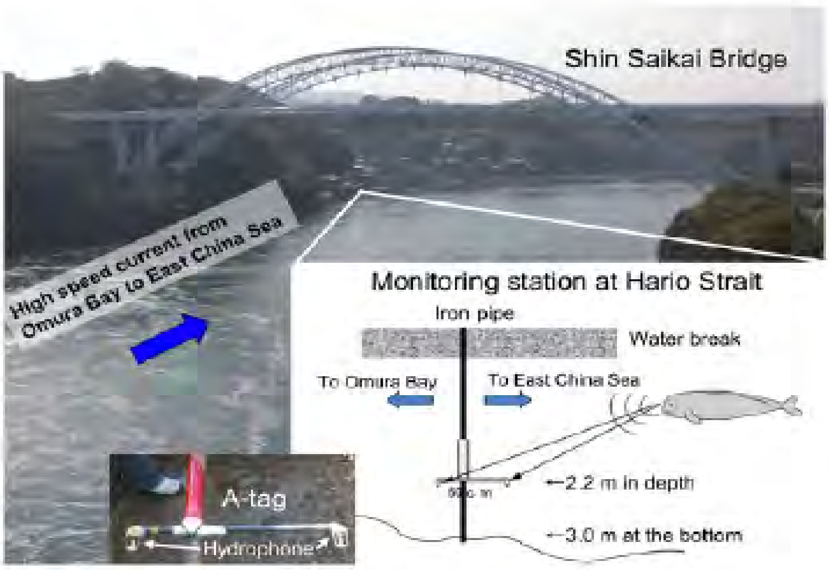


Fig. 2 Overview of the Hario Strait from the Omura Bay side looking out in the direction of the East China Sea direction. The monitoring station was at the southern bank of the strait. The acoustic monitoring system (A-tag) was fixed on an iron pipe and lowered 2.2 m below the surface. In this image, the tidal current is running out of Omura Bay



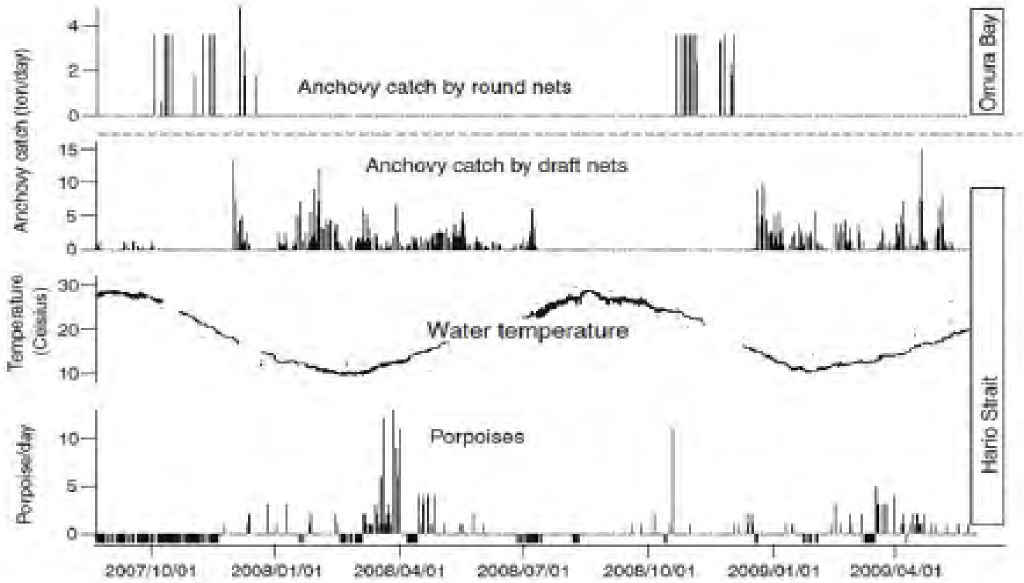


Fig. 4 Seasonal change in fisheries capture, water temperature, and number of porpoises detected. The total catch of Japanese anchovy per day inside Omura Bay (*top*) and the Hario Strait (*second row*) showed seasonal highlights. The water temperature in the Hario Strait dropped below 10°C only in February. Detections of porpoises in the Hario Strait were most common in March and early April. Negative black bars indicate the period without passive acoustic monitoring of porpoises due to system maintenance

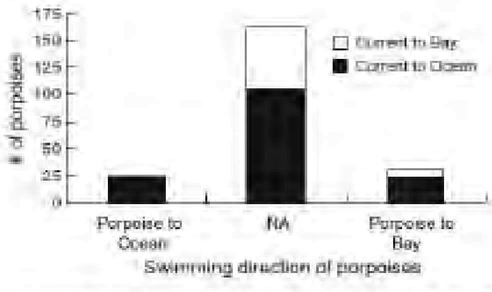
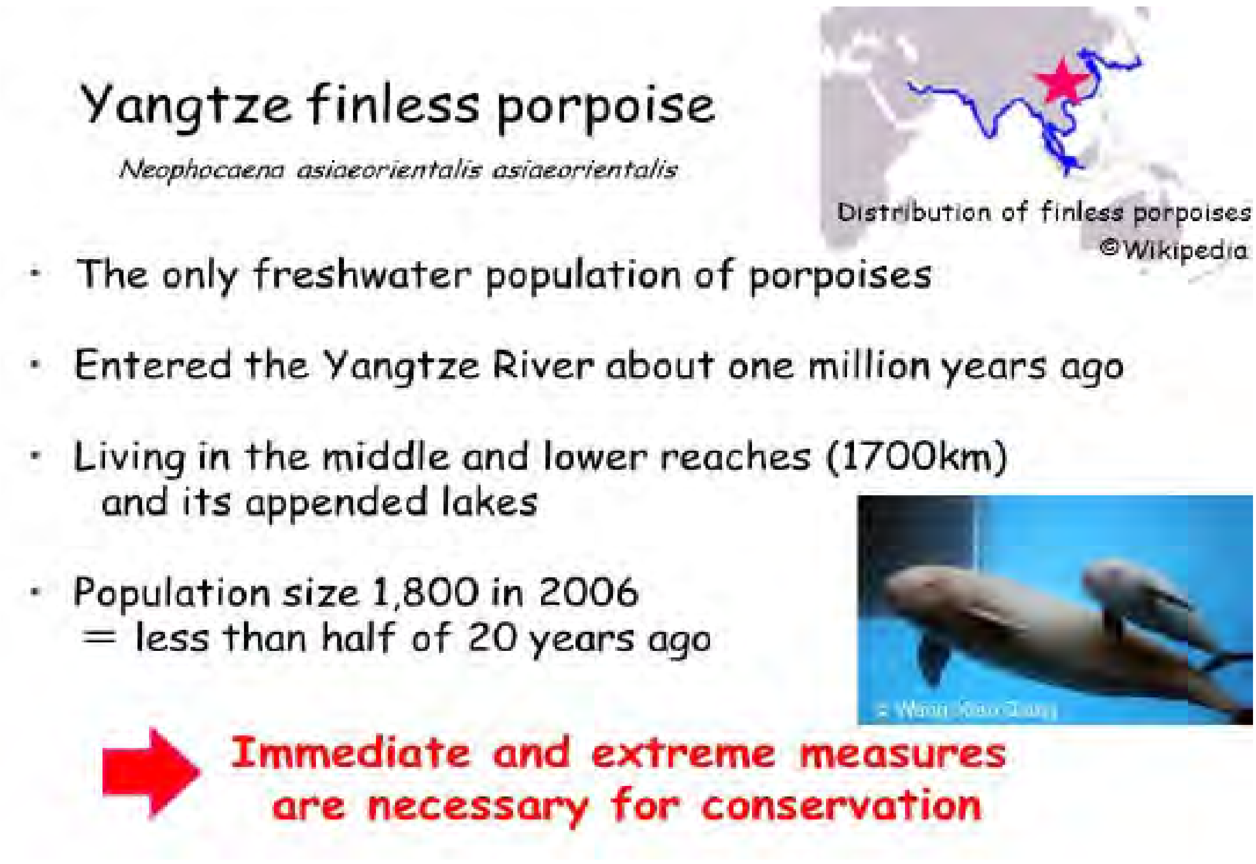
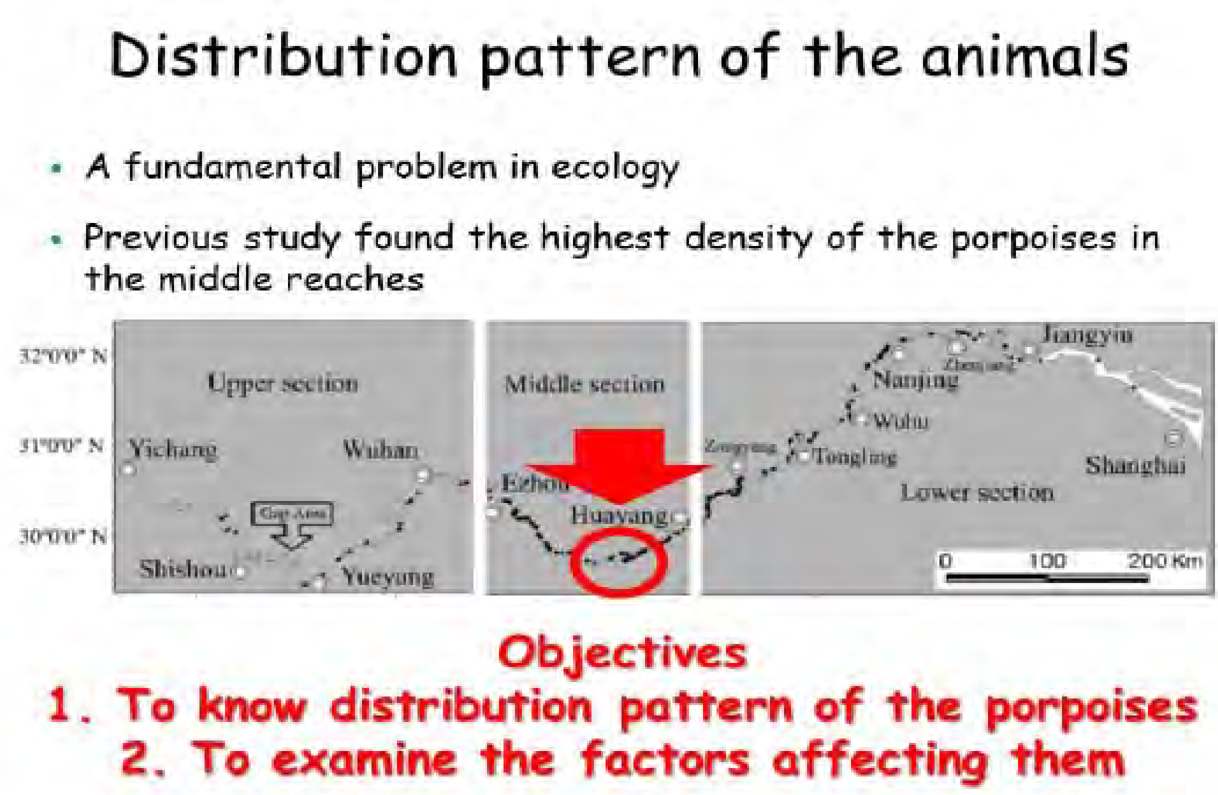
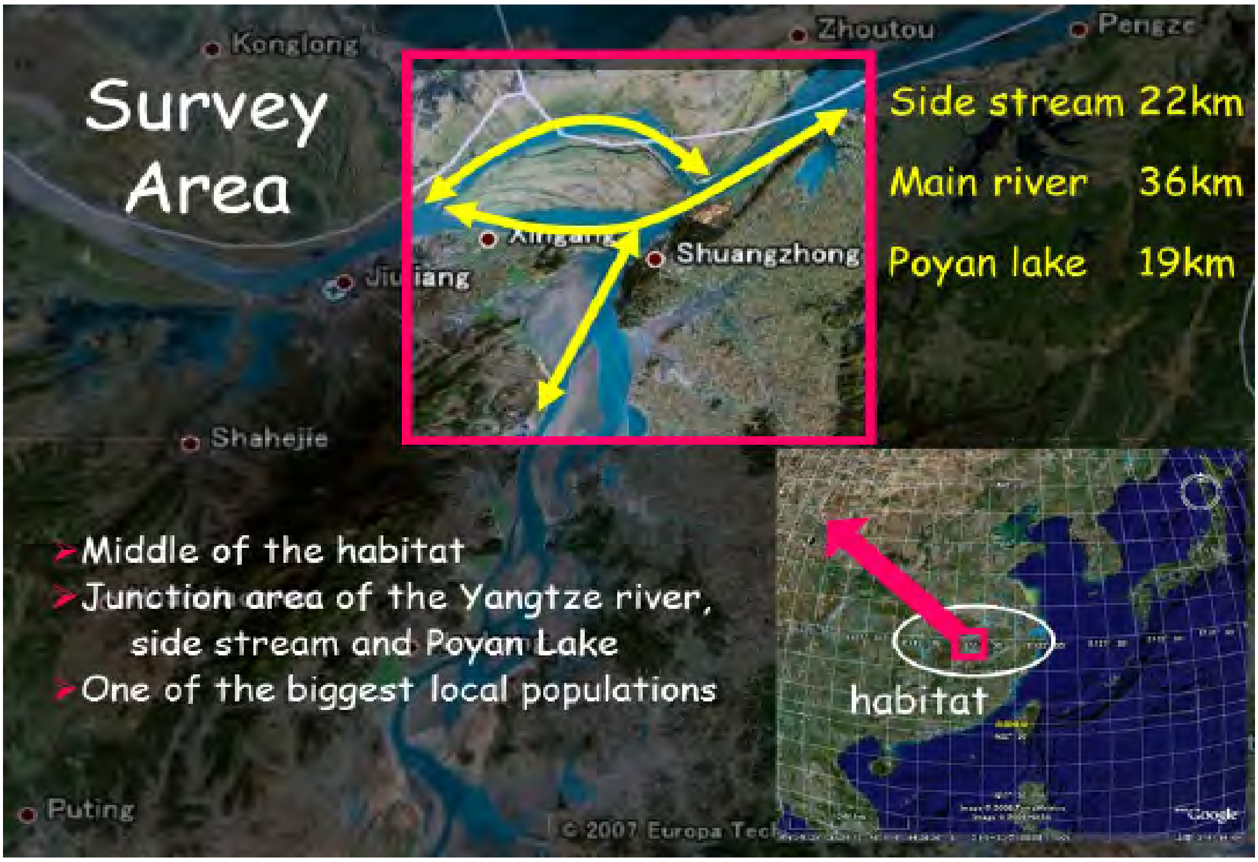
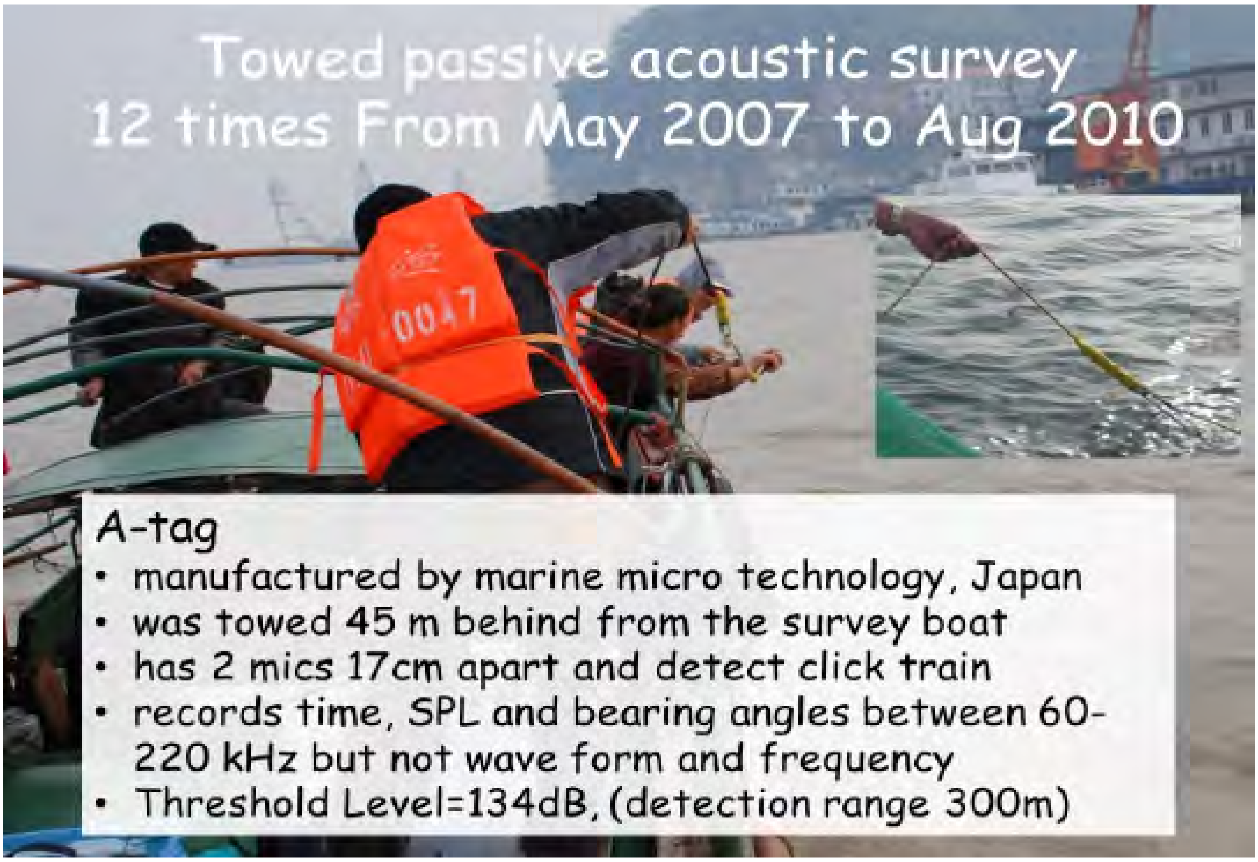


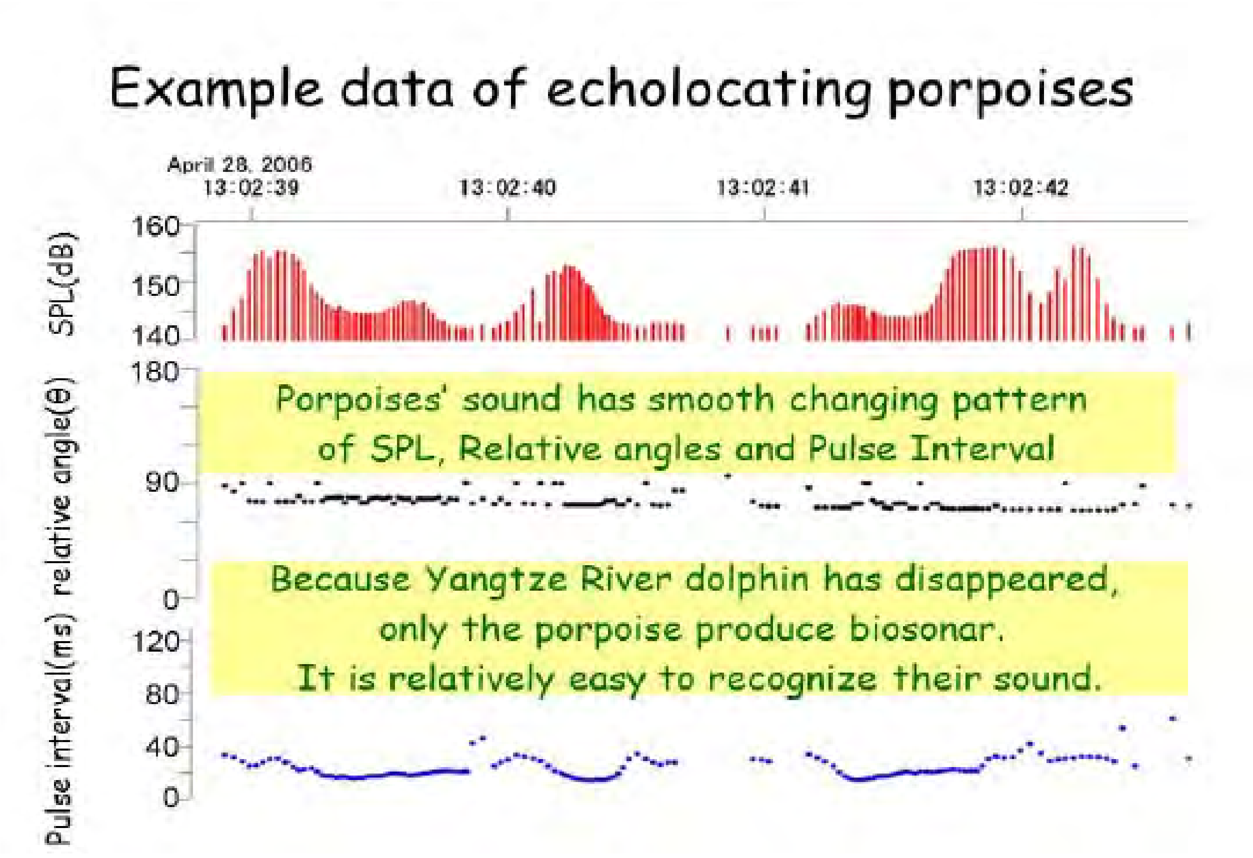
Fig. 6 Swimming direction and direction of the tide when the animal was detected by the A-tag. The direction of movement could not be identified for 75% of the animals, who made only a single-click train or did not move much during the production of multiple click trains that means the animal remained same direction from the A-tag. Porpoises appeared in the Hario Strait as the tidal current moved out of Omura Bay as indicated by the *black bars*

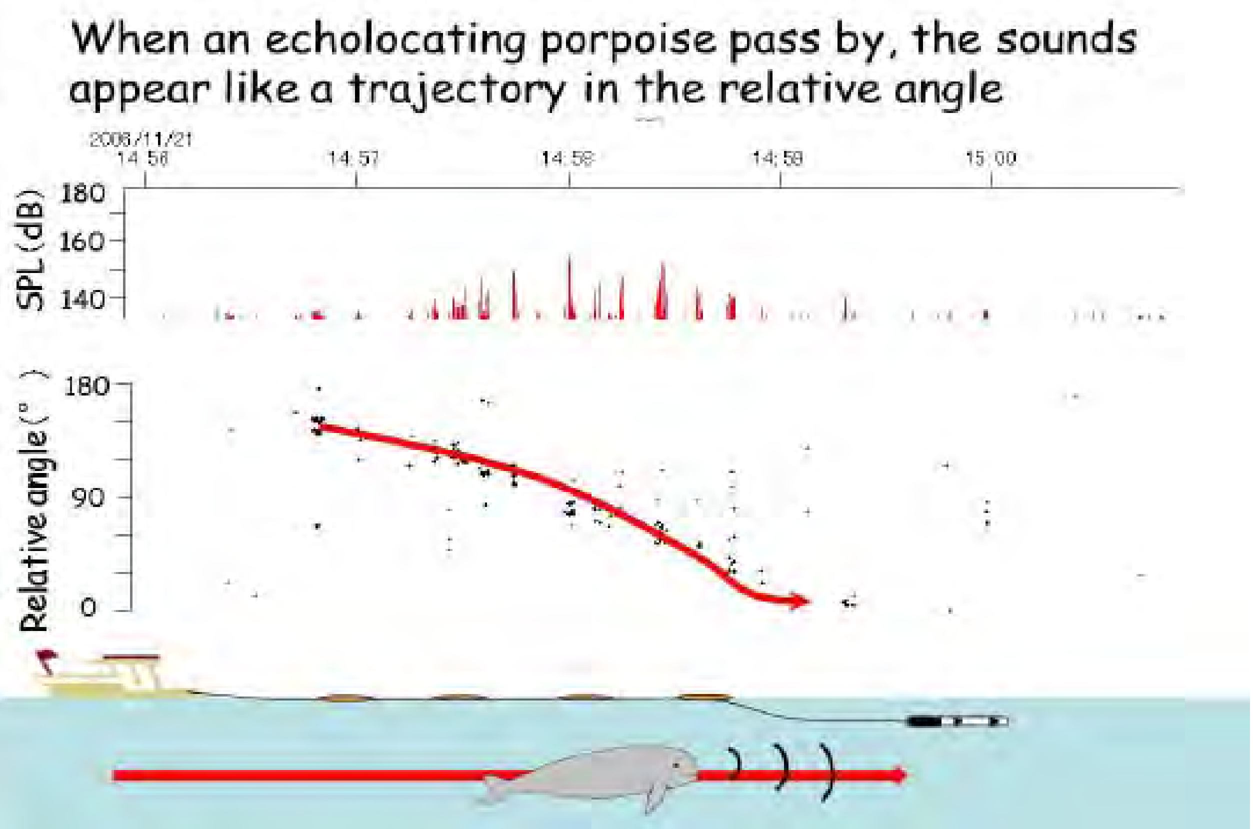

Yangtze finless porpoise
Neophocaena asiaeorientalis asiaeorientalis
Distribution of finless porpoises
©Wikipedia
• The only freshwater population of porpoises
• Entered the Yangtze River about one million years ago
• Living in the middle and lower reaches (1700km) and its appended lakes
• Population size 1,800 in 2006
= less than half of 20 years ago
Immediate and extreme measures are necessary for conservation


Distribution pattern of the animals
• A fundamental problem in ecology
• Previous study found the highest density of the porpoises in the middle reaches
32°0'0" N
31°0'0" N
30°0'0" N
Upper section
Middle section
Lower section
Yichang
Wuhan
Shishou
Yueyang
Ezhou
Huayang
Nanjing
Wuhu
Tongling
Jiangyin
Shanghai
0
100
200 Km
Objectives
1. To know distribution pattern of the porpoises
2. To examine the factors affecting them

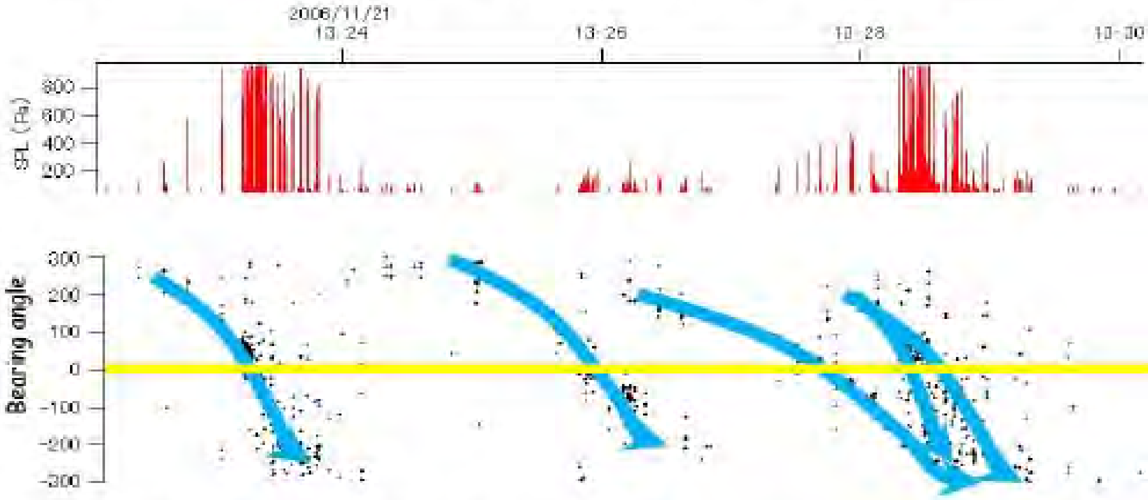

Survey Area
Side stream 22km
Main river 36km
Poyan lake 19km
Konglong
Zhoutou
Pengze
Shuangzhong
Jiujiang
Shahejie
Puting
➢Middle of the habitat
➢Junction area of the Yangtze river, side stream and Poyan Lake
➢One of the biggest local populations
habitat
© 2007 Europa Tech


Towed passive acoustic survey
12 times From May 2007 to Aug 2010
A-tag
• manufactured by marine micro technology, Japan
• was towed 45 m behind from the survey boat
• has 2 mics 17cm apart and detect click train
• records time, SPL and bearing angles between 60-220 kHz but not wave form and frequency
• Threshold Level=134dB, (detection range 300m)


Example data of echolocating porpoises
April 28, 2006
13:02:39
13:02:40
13:02:41
13:02:42
SPL(dB)
relative angle(θ)
Pulse interval(ms)
Porpoises' sound has smooth changing pattern of SPL, Relative angles and Pulse Interval
Because Yangtze River dolphin has disappeared, only the porpoise produce biosonar.
It is relatively easy to recognize their sound.


When an echolocating porpoise pass by, the sounds appear like a trajectory in the relative angle
2006/11/21
14:56
14:57
14:58
14:59
15:00
SPL (dB)
Relative angle(°)

How to count the number of animals



- Speed: survey boat > porpoises
  i.e. trajectories of bearing angles move + → –
- Assigned the detection time as zero crossing point and the numbers of the animals were plotted on the map per a km

Possible factors affecting the porpoise presence

In our survey area...

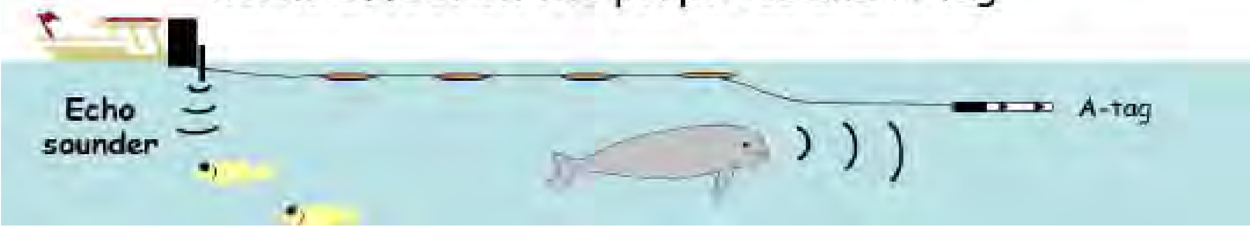
- Heavy ship traffic but no big ship in the side stream
- Two bridges in the mouth of the lake

- From 2007 to 2010, dredging was stopped in 2008

Fish presence

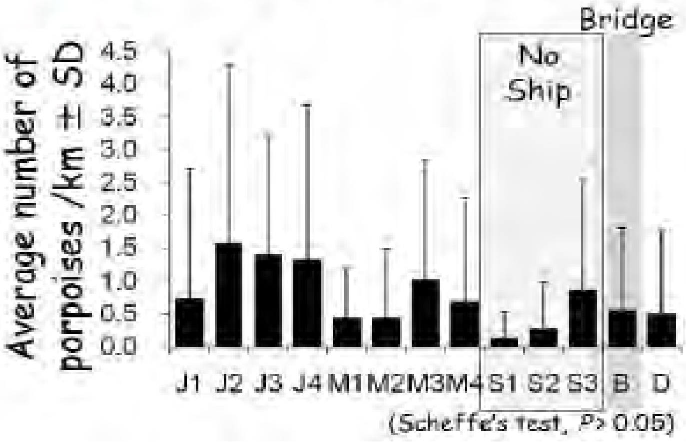
Echo sounder (HE-6100, Hondex)

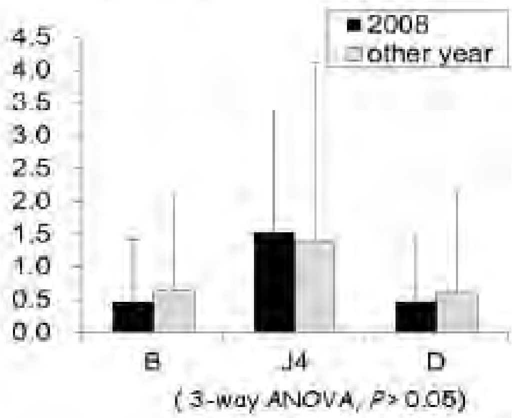
- -46.8dB (TS) = detect more than 10.8 cm fish
- The porpoises are opportunistic eater, so we could not examine fish species.
- A camera photographed the echogram every 30 s
  -> Ratios of porpoise detection in areas where fish were present and absent were compared
- Transmitted pulses 200 kHz, beam bandwidth 7 degree
  i.e. no effect on the porpoises and A-tag

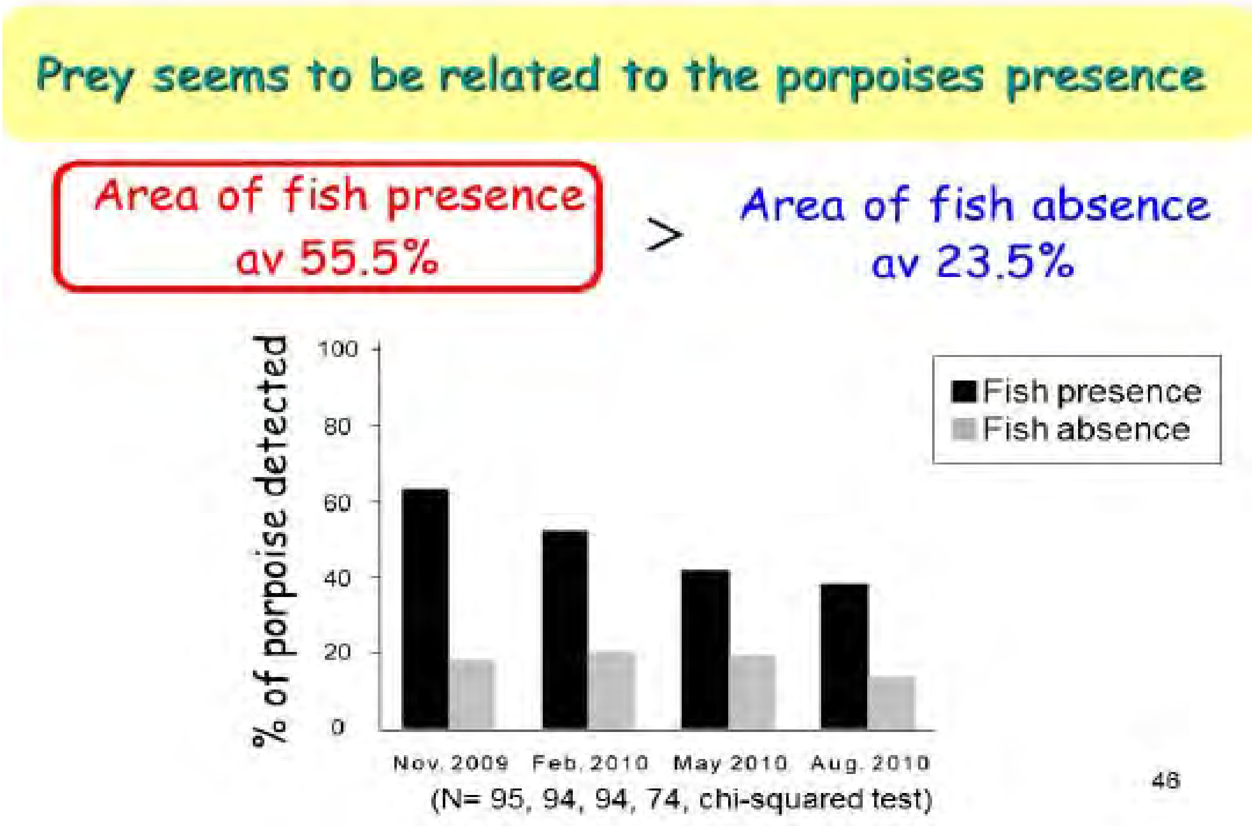


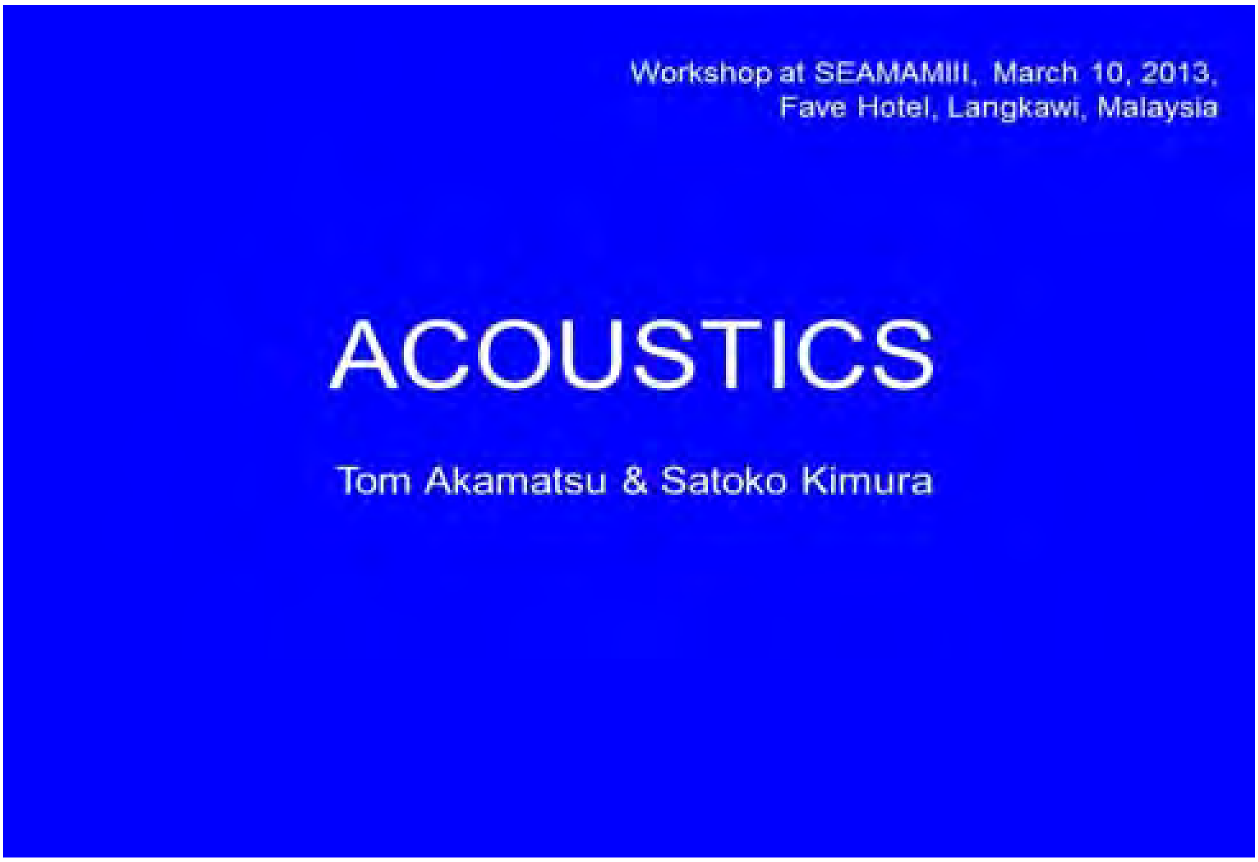
Effects of ship traffic, bridges, dredging

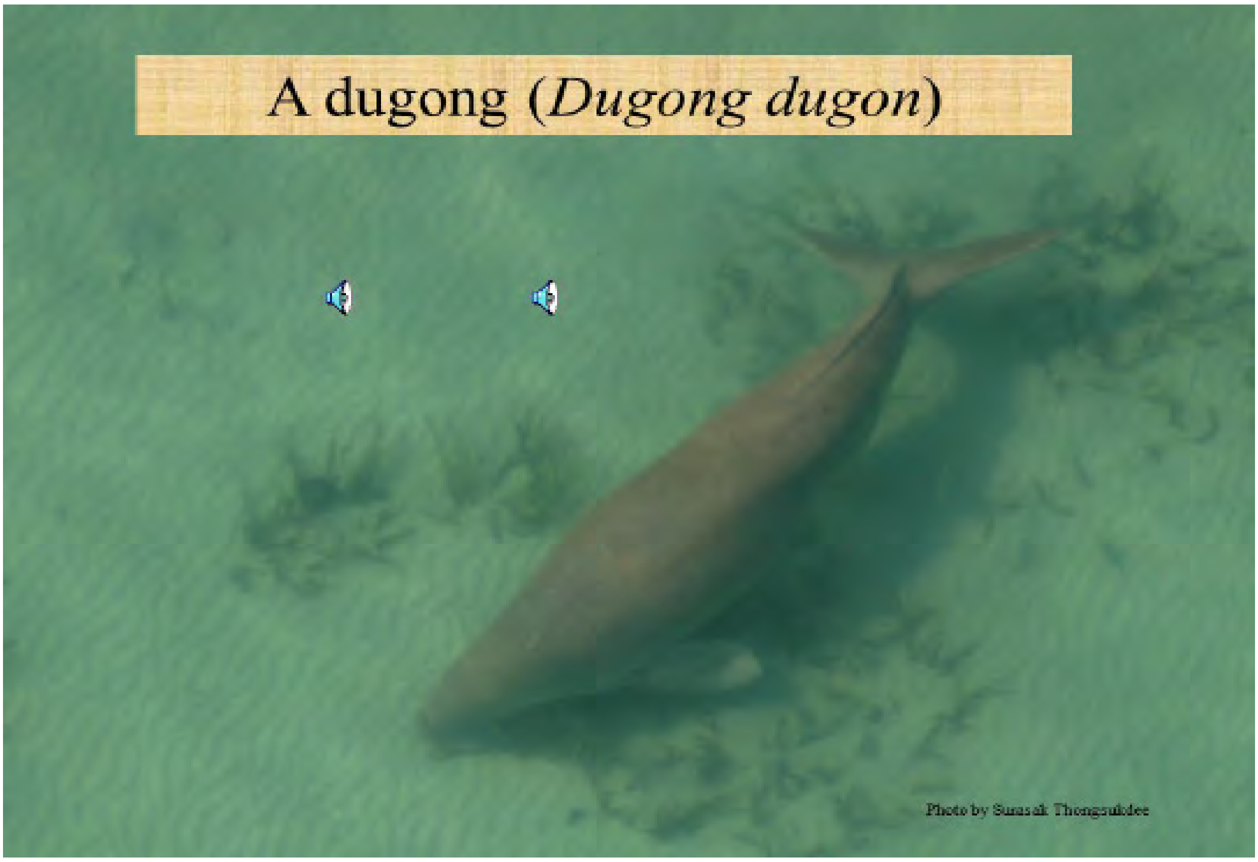
- The detection was small in no-ship traffic and bridges area
- did not increase in 2008 at dredging area



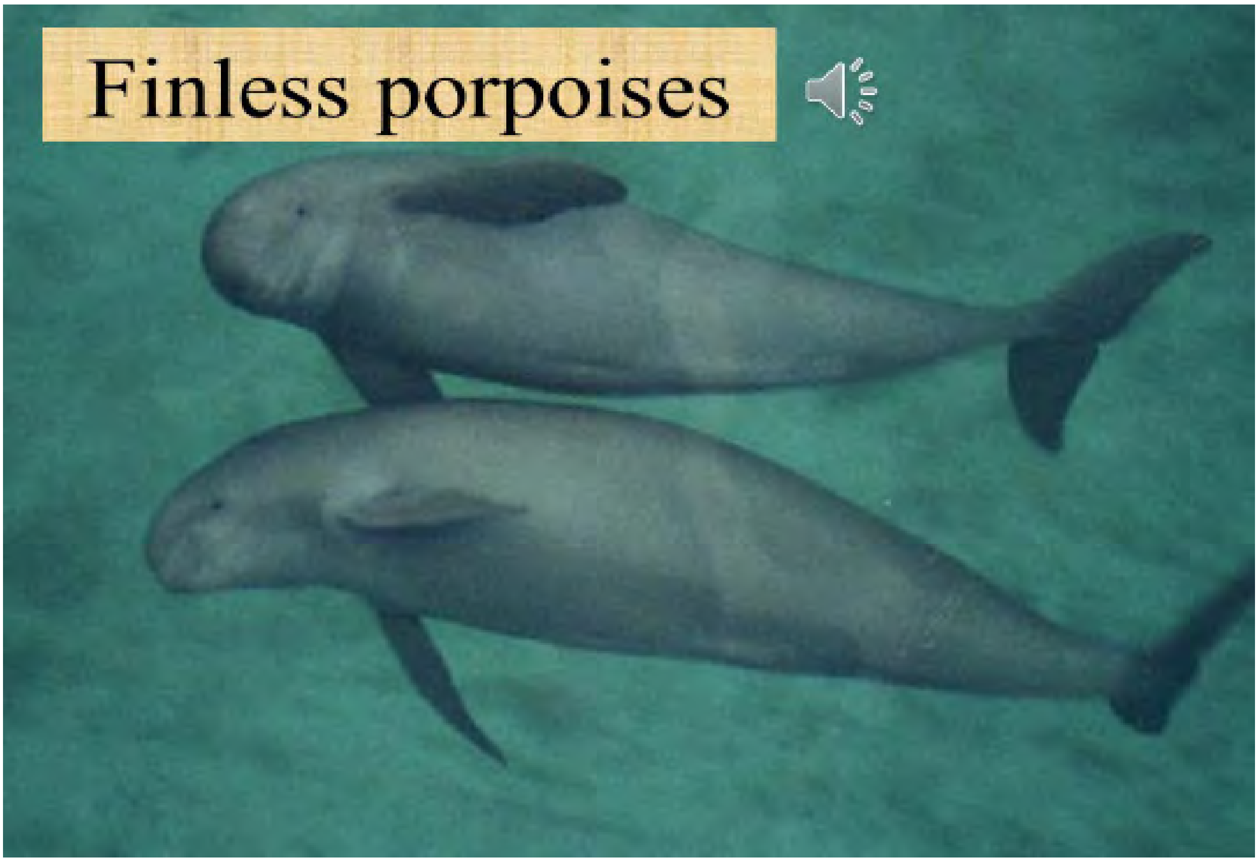


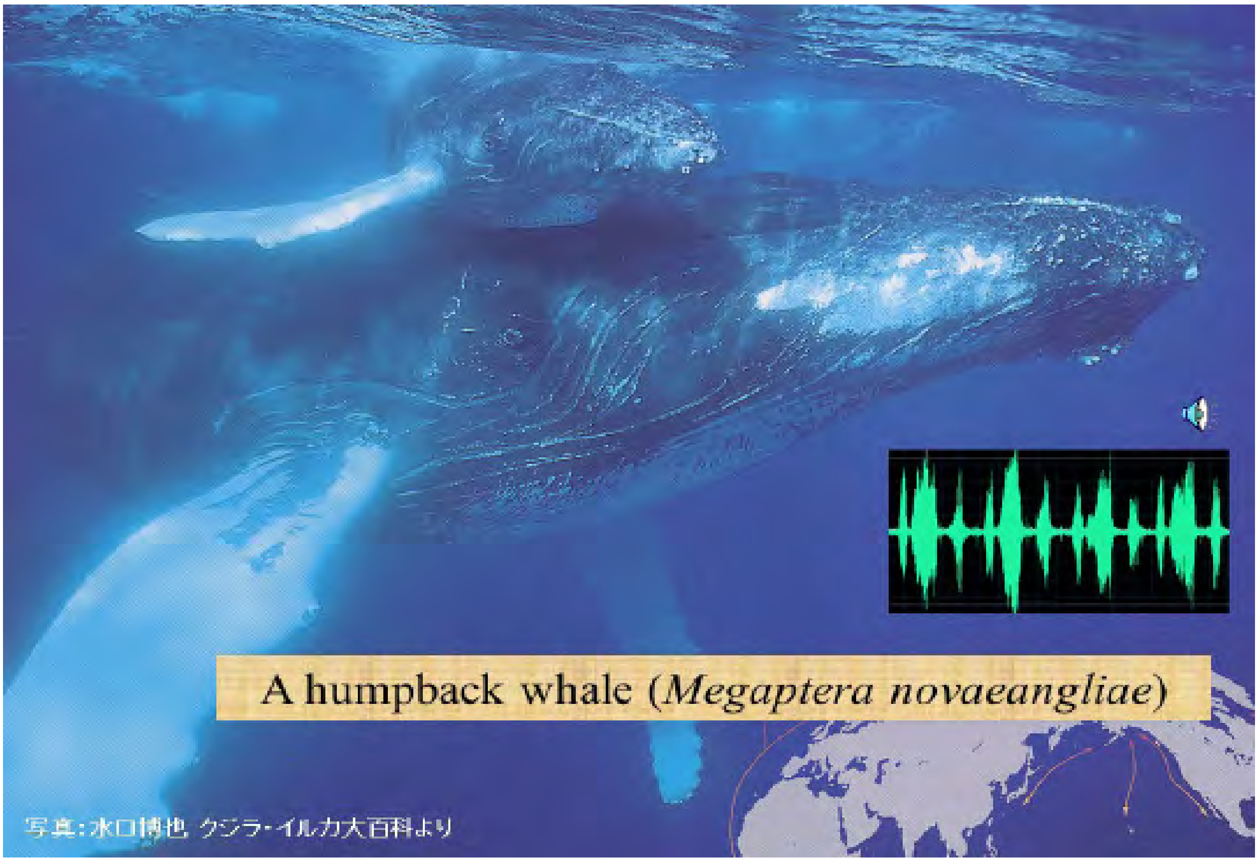

Prey seems to be related to the porpoises presence
Area of fish presence
av 55.5%
>
Area of fish absence
av 23.5%
% of porpoise detected
100
80
60
40
20
0
Fish presence
Fish absence
Nov. 2009
Feb. 2010
May 2010
Aug. 2010
(N= 95, 94, 94, 74, chi-squared test)
46


Workshop at SEAMAMIII, March 10, 2013,
Fave Hotel, Langkawi, Malaysia
ACOUSTICS
Tom Akamatsu & Satoko Kimura


A dugong (*Dugong dugon*)
Photo by Surasak Thongsukdee


http://www.aquabio.com/sousa-chinensis.html


Finless porpoises

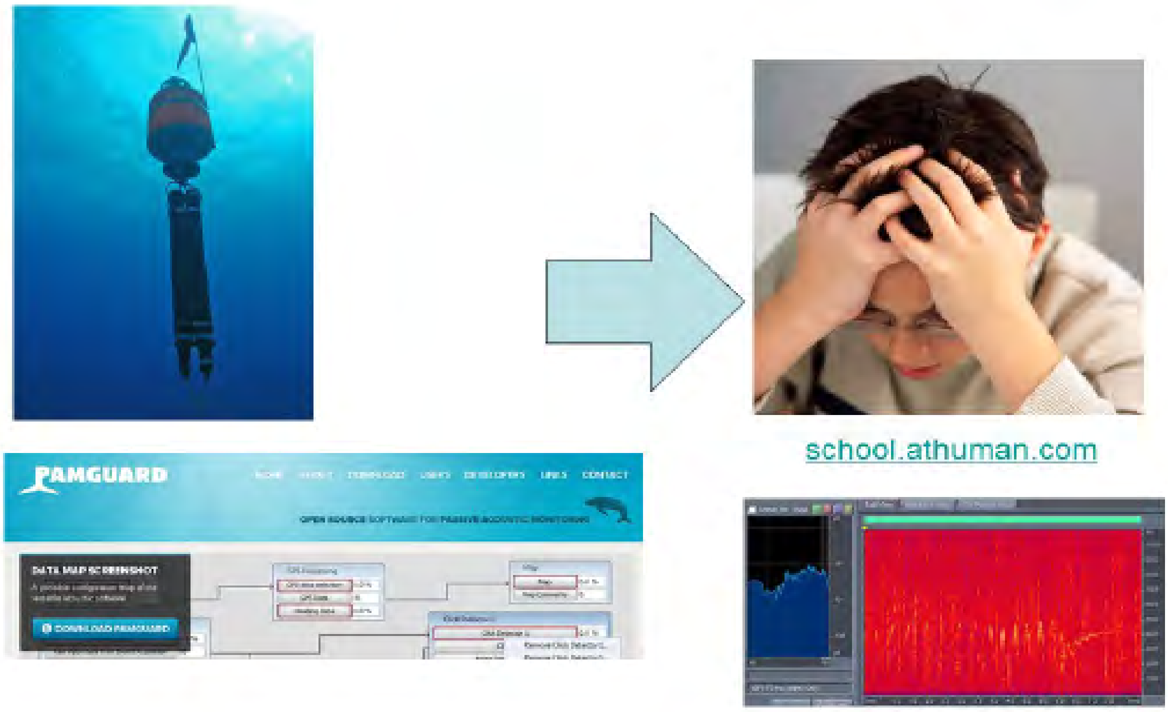

A humpback whale (*Megaptera novaeangliae*)
写真:水口博也 クジラ・イルカ大百科より


Iceland 2012
A blue whale

Sounds from aquatic mammals could be used for the field observation

Marine mammals produce species specific sounds which are quite different from ambient noise. The vocalization is presumably detected away from the animal.

But, how?



Tentative

Agenda of Acoustics Workshop

What acoustics can and cannot do?

Part 1 Introduction, Case studies

1-1. Sound of marine mammal (TA)

Echolocation and communication sound, especially IP bottlenose dolphin, Sousa, Irrawady dolphin, finless, dugong, humpback whale etc

1-2. Method of acoustic monitoring; fixed and towed system with comparison of visual observation (SK)

1-3.Case study; Seasonal and diurnal presence using fixed system and local distribution using towed system (SK)

Part 2 Designing acoustic monitoring

potential candidates of species/areas

2-1 Irrawaddy dolphins in Myanmar, Vietnam, Indonesia,,,

2-2 Dugong in Malaysia, Thailand, Cambodia, Philippine,,,

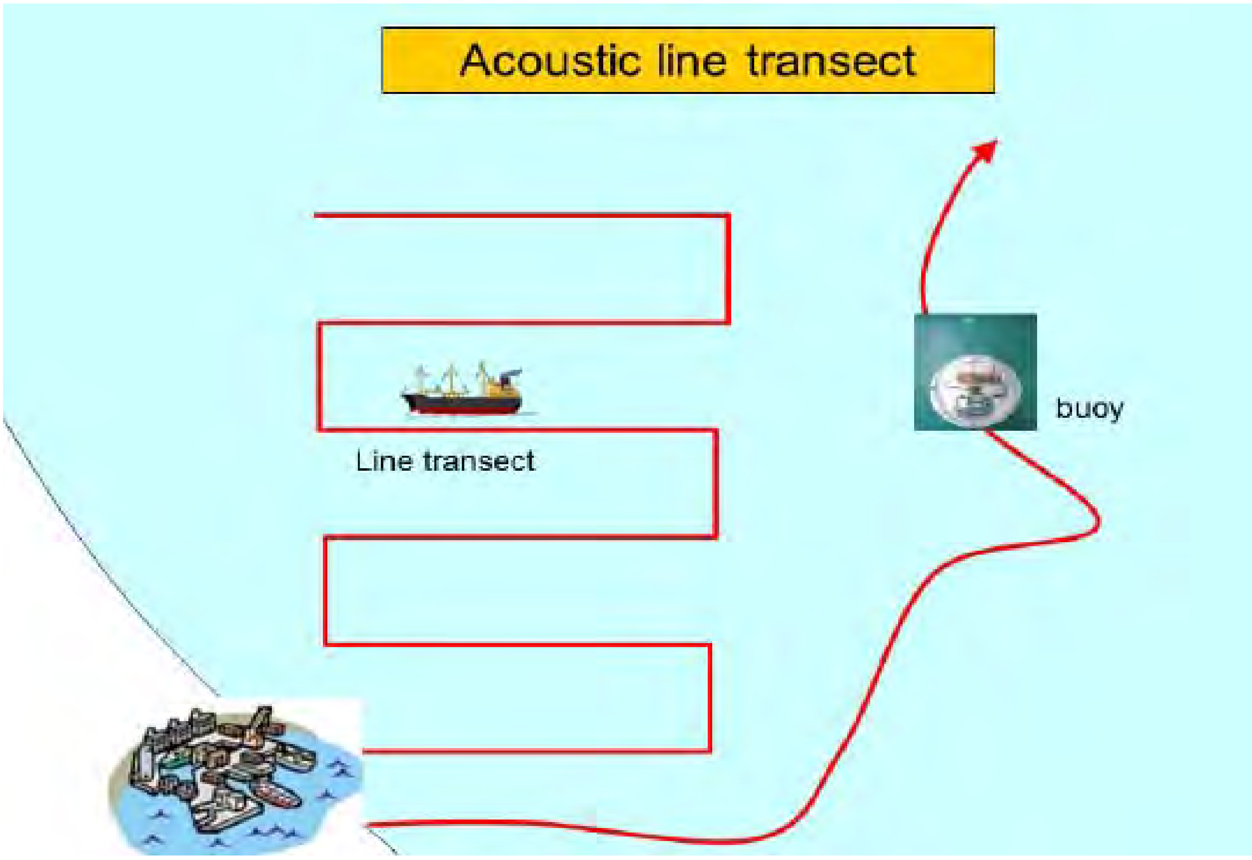
2-3 Sousa and finless porpoises in SE Asian coast and the Yangtze River

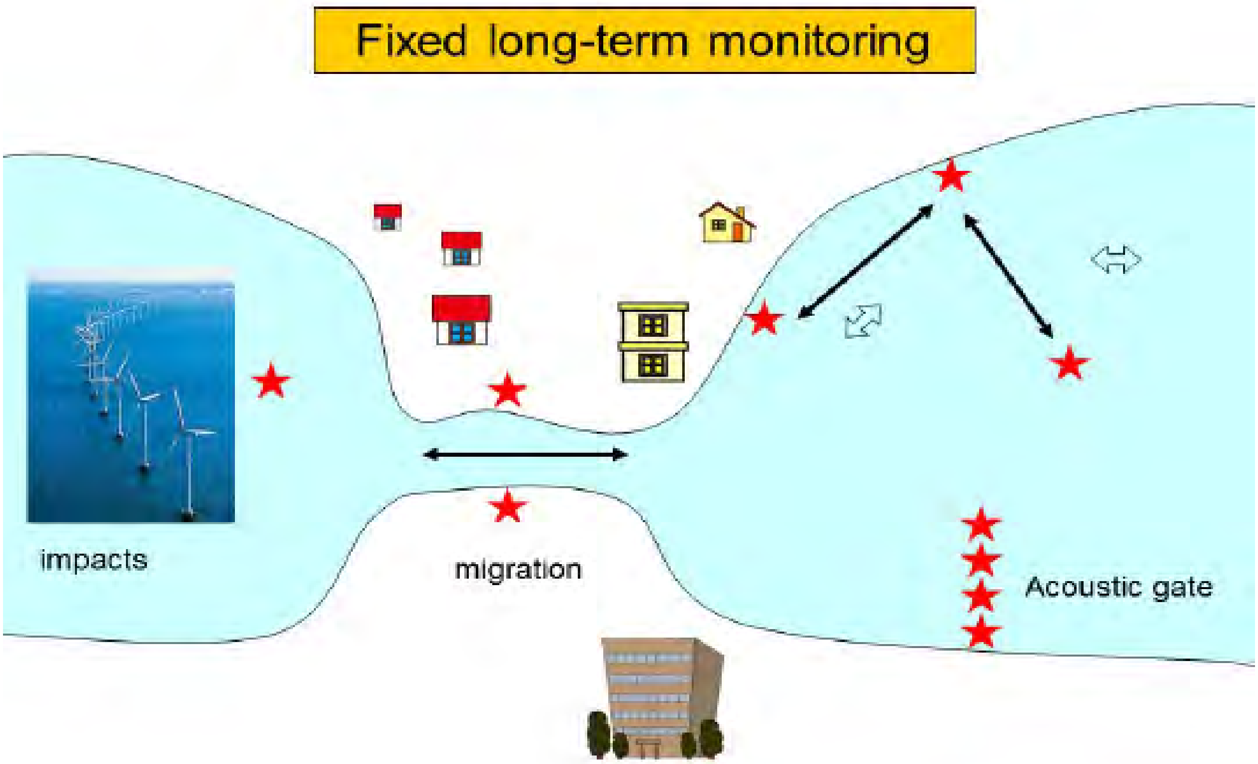
2-4 Ganges River dolphins in Bangladesh, India,,,

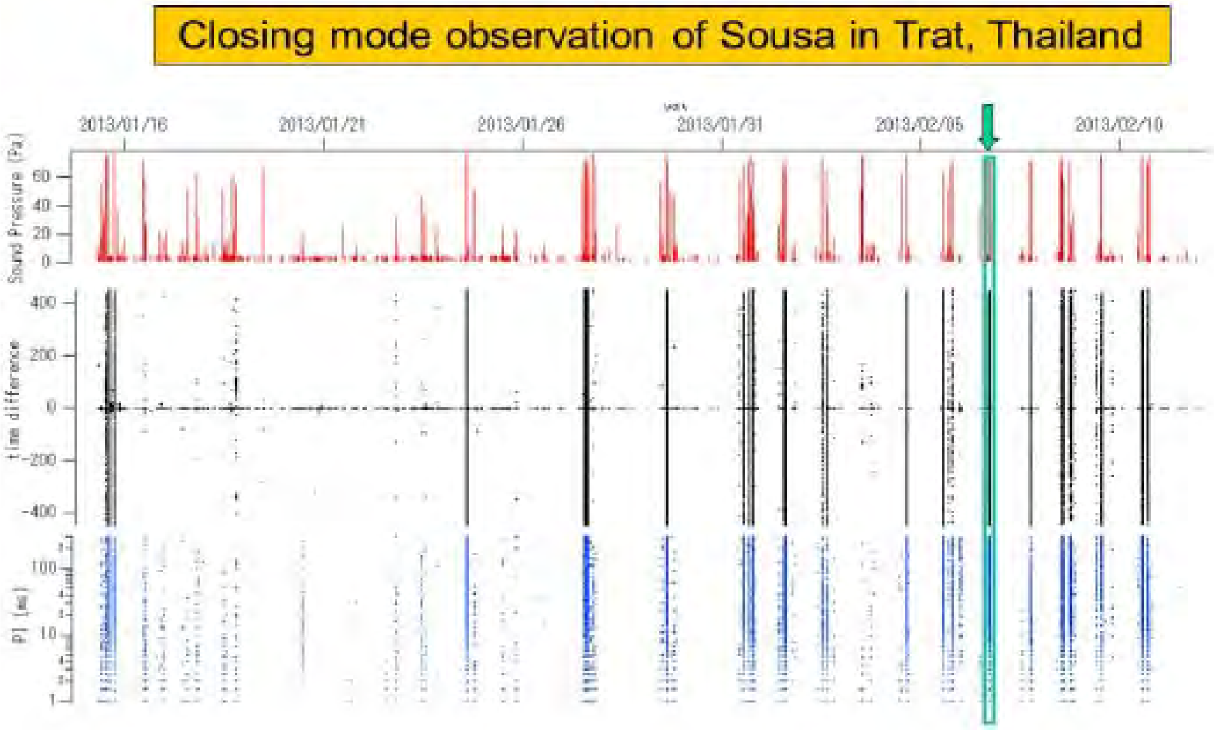
2-4 Baleen whales in Sri Lanka, Thailand,,,

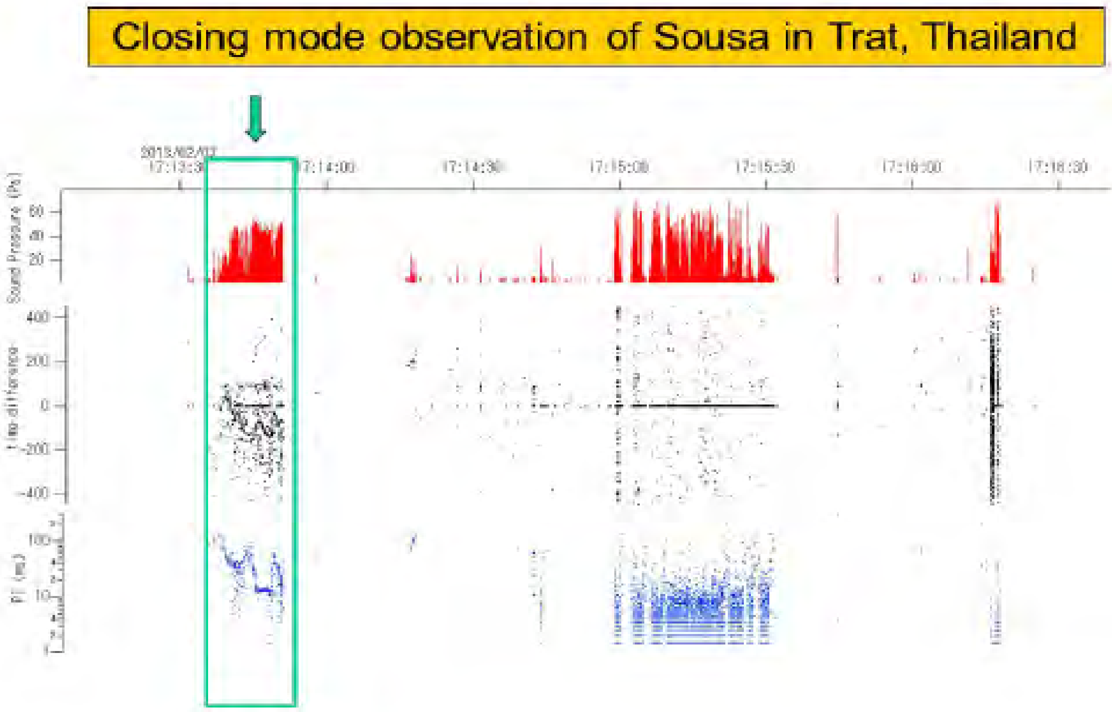
2-5 Any species in any area

Customize acoustic methods for your interest

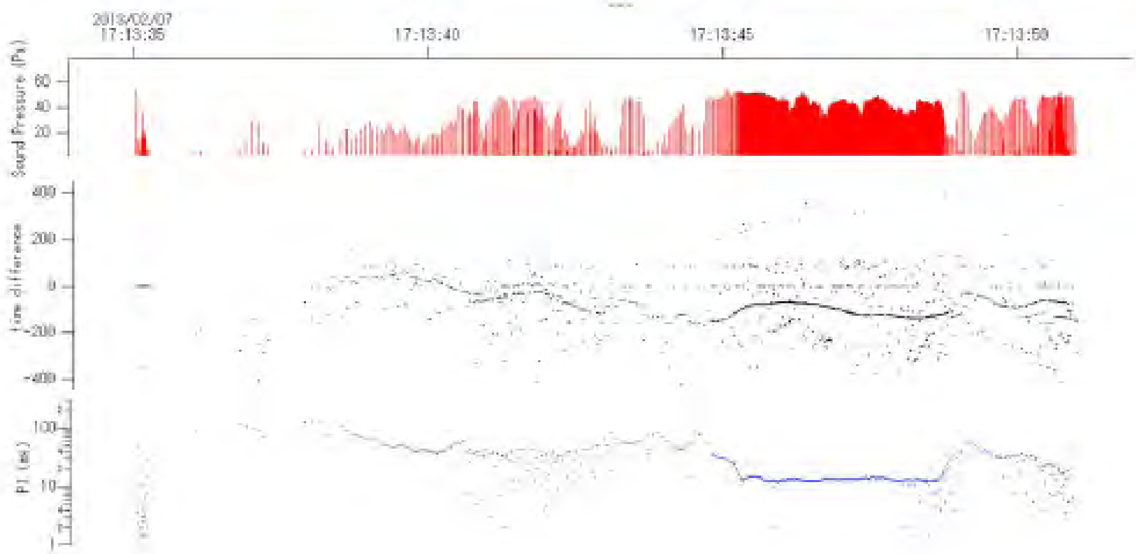

Acoustic line transect
Line transect
buoy


Fixed long-term monitoring
impacts
migration
Acoustic gate


Closing mode observation of Sousa in Trat, Thailand
2013/01/16
2013/01/21
2013/01/26
2013/01/31
2013/02/05
2013/02/10
Sound Pressure (Pa)
time difference
PI (ms)


Closing mode observation of Sousa in Trat, Thailand
17:14:00
17:14:30
17:15:00
17:15:30
17:16:00
17:16:30
Sound Pressure (Pa)
time difference
PI (ms)

Closing mode observation of Sousa in Trat, Thailand



Tentative

Agenda of Acoustics Workshop

What acoustics can and cannot do?

Part 1 Introduction, Case studies

1-1. Sound of marine mammal (TA)

Echolocation and communication sound, especially IP bottlenose dolphin, Sousa, Irrawady dolphin, finless, dugong, humpback whale etc

1-2. Method of acoustic monitoring; fixed and towed system with comparison of visual observation (SK)

1-3.Case study; Seasonal and diurnal presence using fixed system and local distribution using towed system (SK)

Part 2 Designing acoustic monitoring

potential candidates of species/areas

2-1 Irrawaddy dolphins in Myanmar, Vietnam, Indonesia,,,

2-2 Dugong in Malaysia, Thailand, Cambodia, Philippine,,,

2-3 Sousa and finless porpoises in SE Asian coast and the Yangtze River

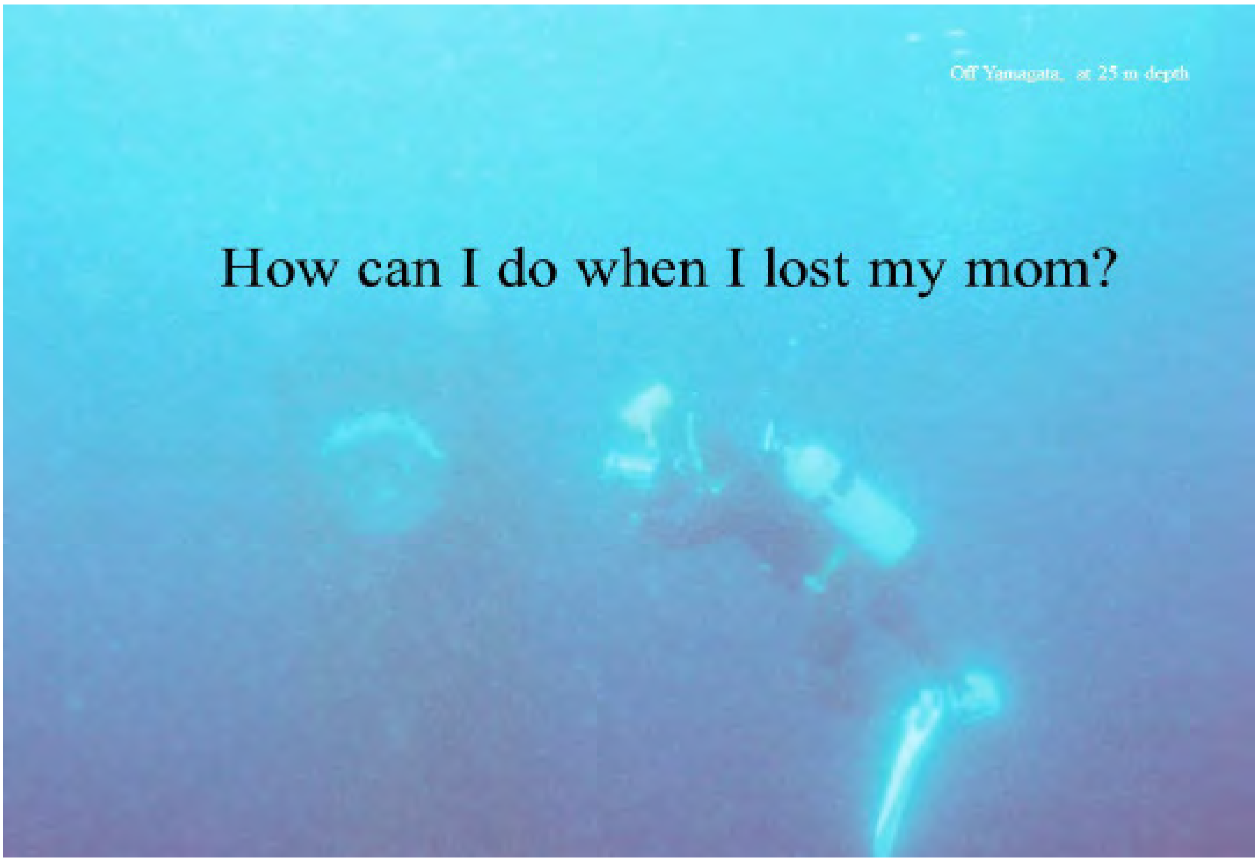
2-4 Ganges River dolphins in Bangladesh, India,,,

2-4 Baleen whales in Sri Lanka, Thailand

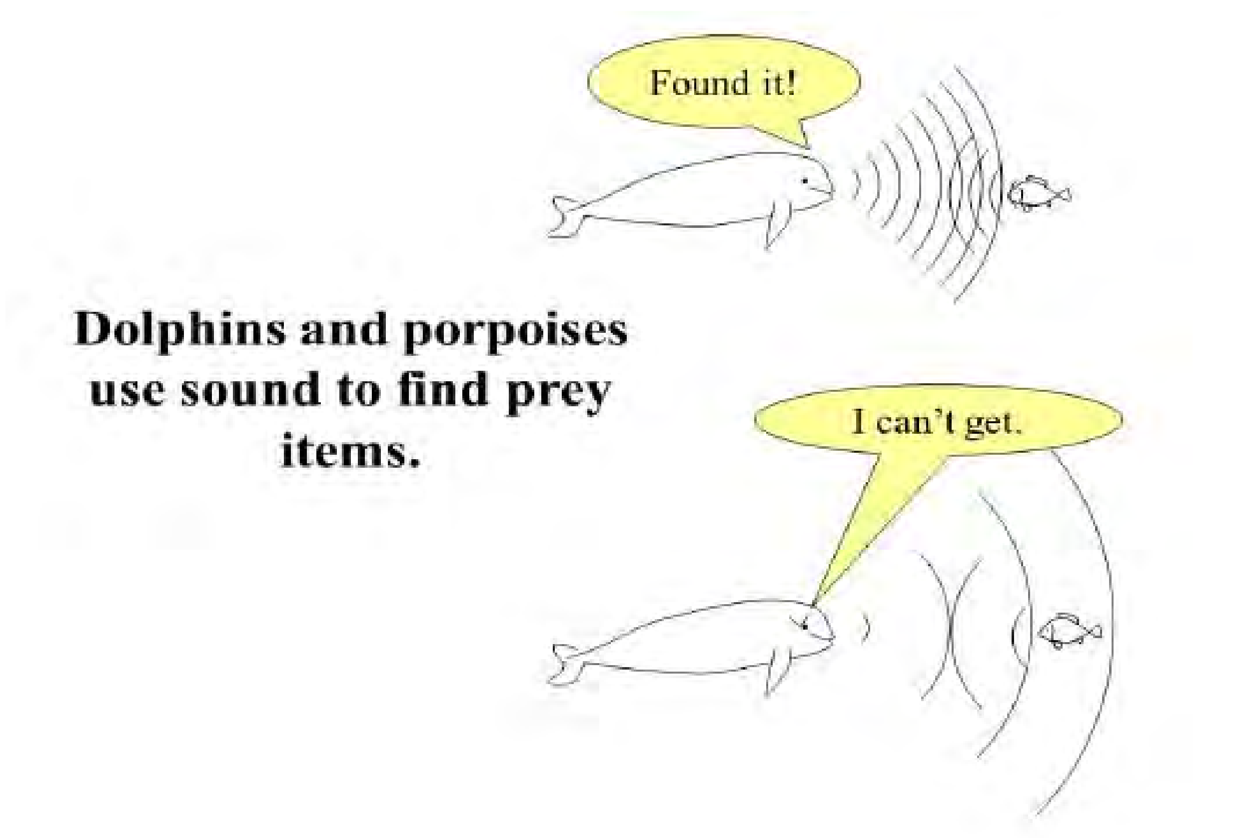
2-5 Any species in any area

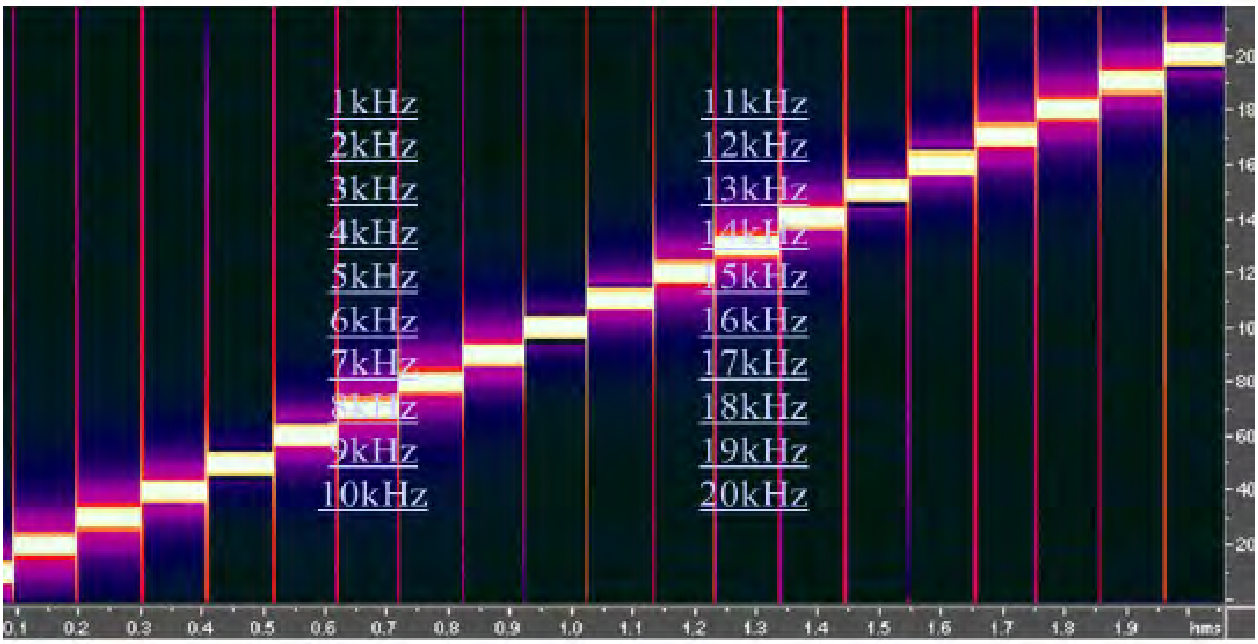
Let us know your focal research field and discuss how acoustics can be implemented.

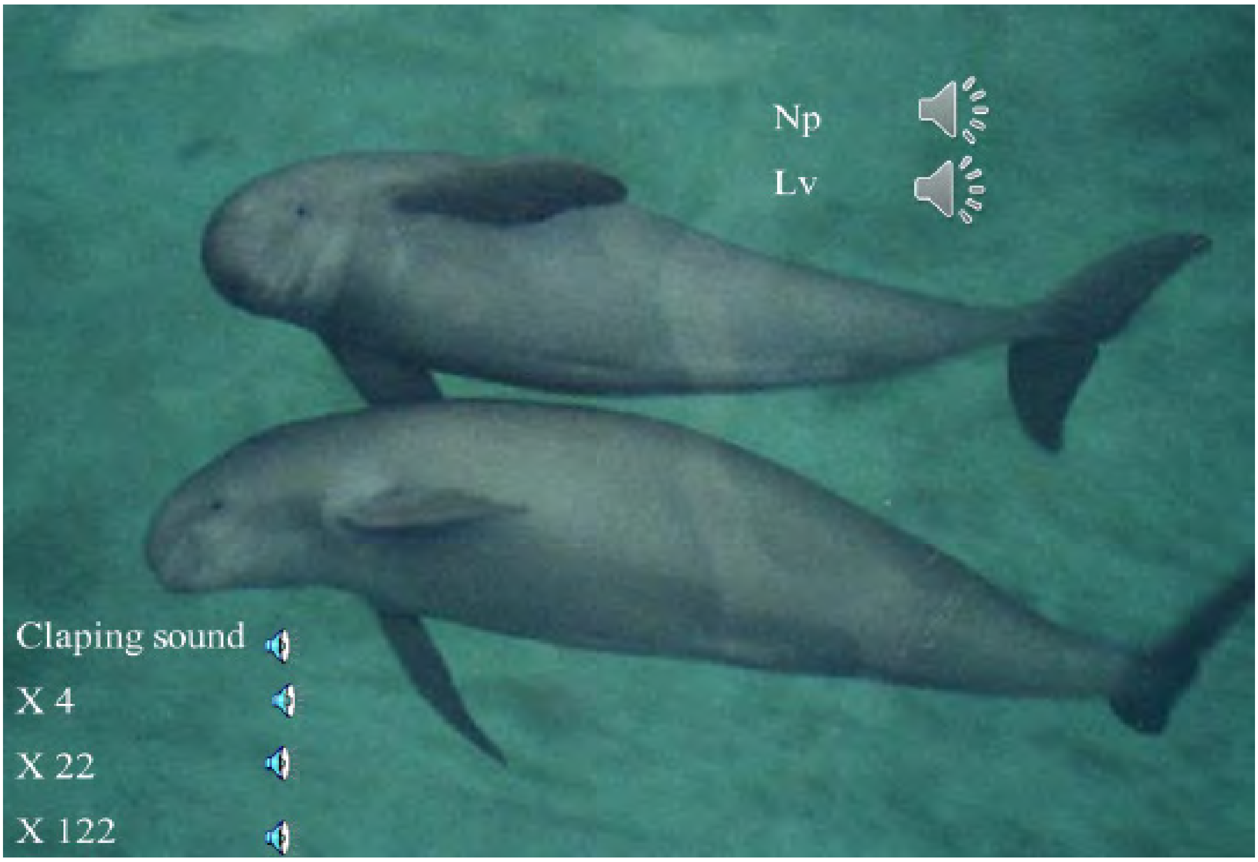
Photo by Wang Xiao Qiang, July 7, 2005, 3 days and half after the birth


Off Yamagata, at 25 m depth
How can I do when I lost my mom?


Baby voice
6 days (January 17, 1999) a thick voice
43 days (February 21, 1999) relatively pure voice
74 days (March 26, 1999) some intonation
149 days (June 9, 1999) clear intonation
394 days (February 9, 2000) same as parents
Parents' voice
Bingo (father)
Stella (mother)
Oscar (adult male)
Killer
我很喜欢妈！
'98 2 12
Kamogawa Sea World


Found it!
Dolphins and porpoises use sound to find prey items.
I can't get.

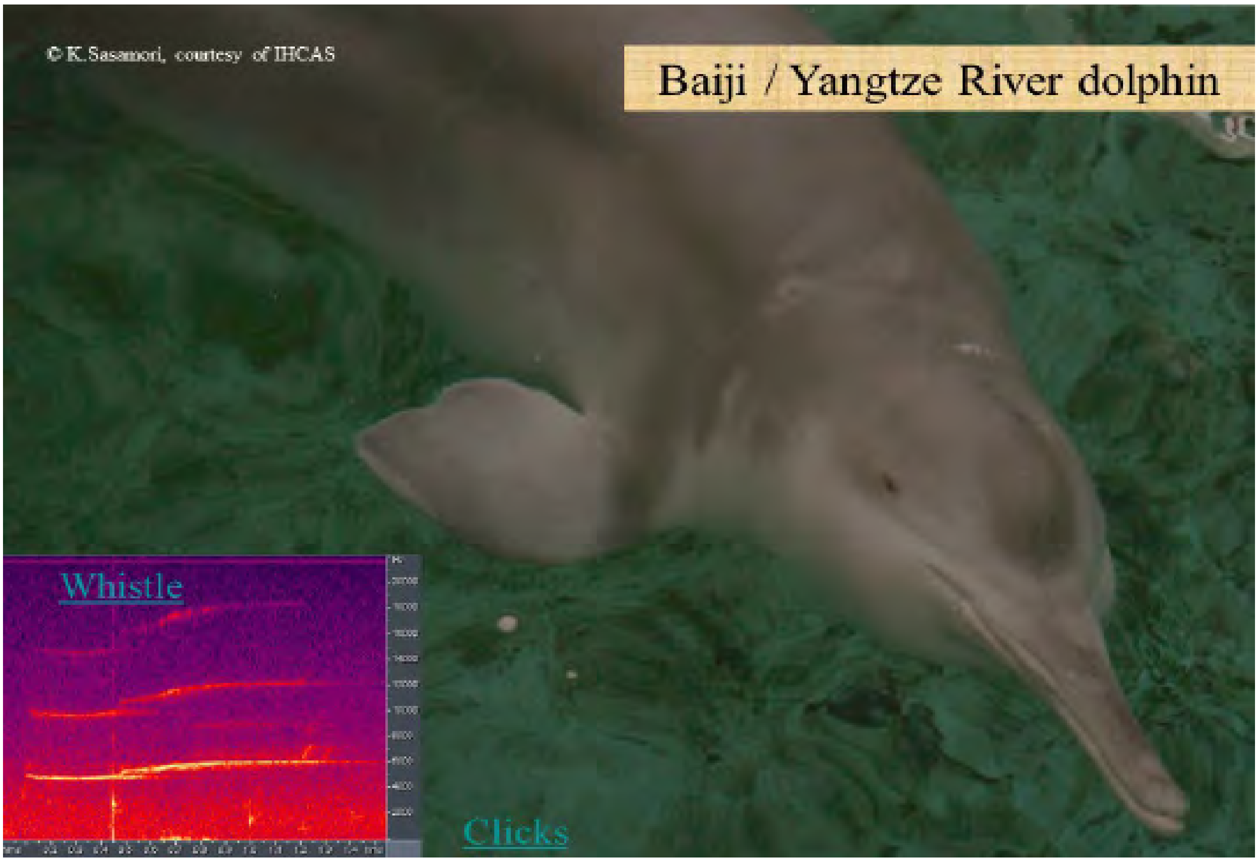

1kHz
2kHz
3kHz
4kHz
5kHz
6kHz
7kHz
9kHz
10kHz
11kHz
12kHz
13kHz
15kHz
16kHz
17kHz
18kHz
19kHz
20kHz
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 hms

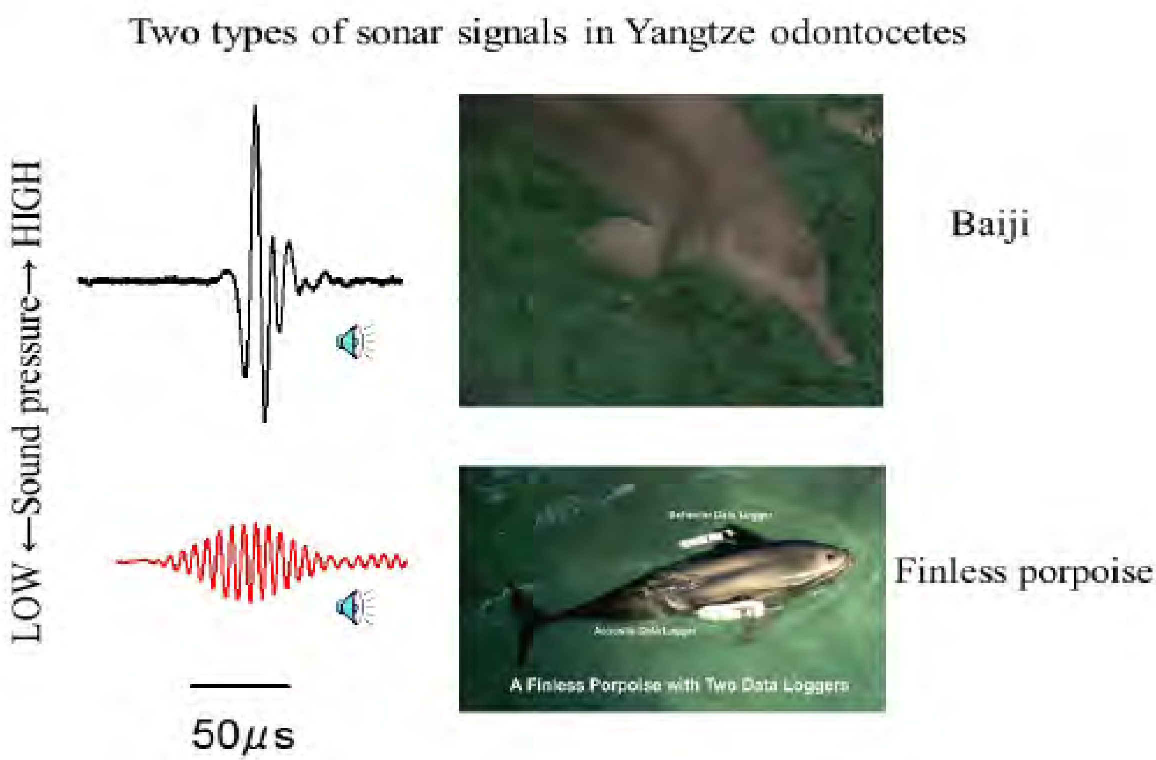


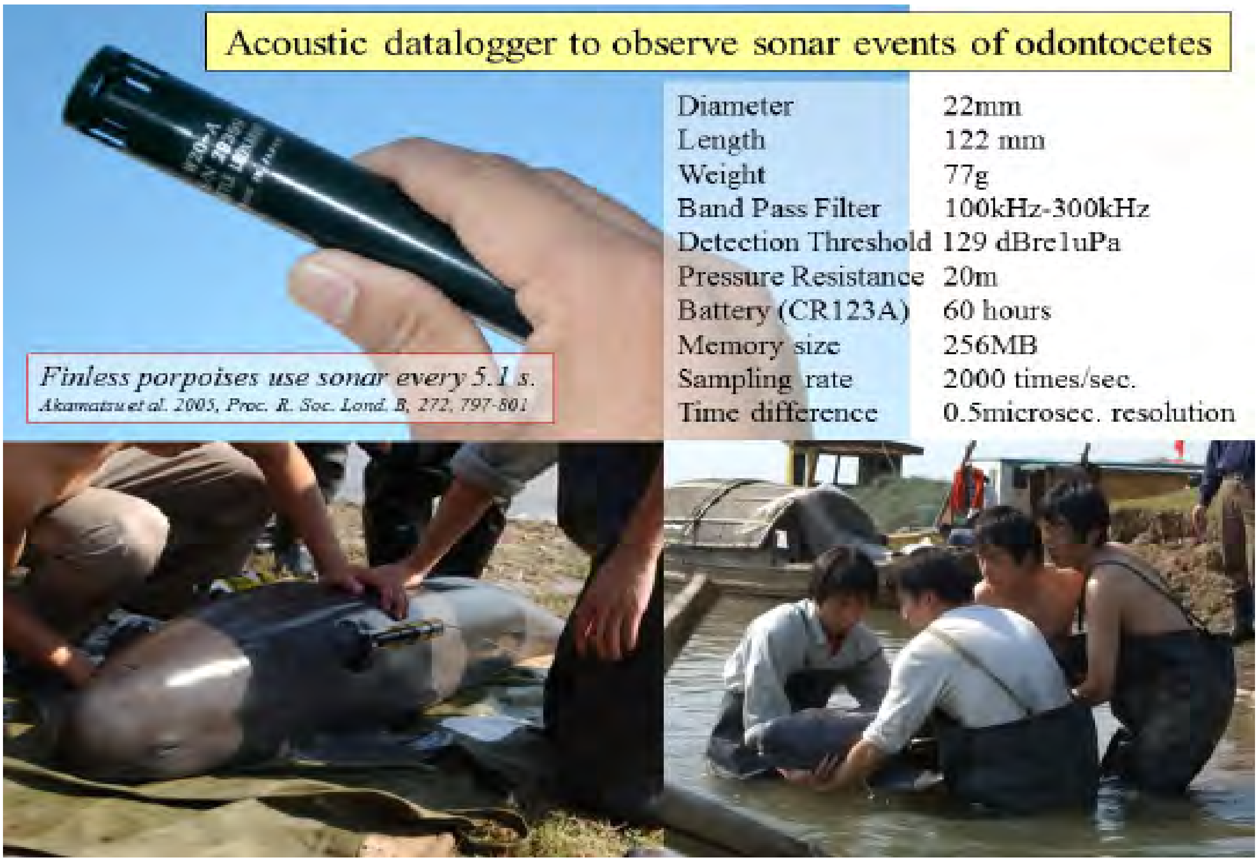
You can echolocate.

① Yes

② No


© K.Sasamori, courtesy of IHCAS
Baiji / Yangtze River dolphin
Whistle
Clicks


Two types of sonar signals in Yangtze odontocetes
LOW ←Sound pressure→ HIGH
50μs
Baiji
A Finless Porpoise with Two Data Loggers
Finless porpoise


Acoustic datalogger to observe sonar events of odontocetes
Diameter 22mm
Length 122 mm
Weight 77g
Band Pass Filter 100kHz-300kHz
Detection Threshold 129 dBre1uPa
Pressure Resistance 20m
Battery (CR123A) 60 hours
Memory size 256MB
Sampling rate 2000 times/sec.
Time difference 0.5microsec. resolution
Finless porpoises use sonar every 5.1 s.
Akamatsu et al. 2005, Proc. R. Soc. Lond. B, 272, 797-801


Study Site ; Semi-Natural Reserve, Hubei, China
Released 8 animals, 2,425,095 pulses, 49,470 pulse trains and 5,113 dive events were obtained in total.
China
Study Area: Semi-Natural Reserve
1km
Yangtze River


White-beaked dolphin
Miller et al. 13:30 Friday, Acoustics II
Finless porpoise
Proc. Roy. Soc. B, 272, 797-801
Dolphins and porpoises produce sonar sound frequently that is suitable for PAM
Ganges river dolphin
Yamamoto et al. 13:30, Sunday, Behaviour I
Harbor porpoise
Linnenschmidt et al. Poster, Sunday, Acoustics / Deep-Sea Research II, 54,290-297

Workshop on Bycatch

Workshop leader: Tara Sayura Whitty

Bycatch, the incidental take or non-target catch of marine mammals in fisheries, is one of the most serious threats to marine mammals and the need for solutions is urgent. Since SEAMAM II, the amount of bycatch of cetaceans and dugongs has grown. This workshop included a presentation that reviewed the SEAMAM II bycatch and draft action plan, examined how to assess bycatch, and explored potential solutions and approaches. The discussion after the presentation included discussion groups that outlined the status of knowledge about bycatch in each of the SEAMAM III countries. Tara concluded her workshop by looking at ways of moving forward: the importance of training in socio-economics and small-scale fisheries research, collaboration and communication about solutions, and the idea of a regional bycatch action plan. Within this regional framework, suggestions included:

- Regional training courses on:
  - o Methods for collecting bycatch data
  - o Methods for assessing impacts of bycatch
- Pooled regional database
- Develop draft regional action plan
- Establish regional email discussion
- Educate public and stakeholders
- Work toward wider regional membership in CMS

Methods were presented for the assessment of the impacts of bycatch in a 4-step continuum that outlined when action should be taken. In larger fisheries, observer programs and interviews can be used, while in small-scale fisheries, interviews are more common, with some examples of questionnaires that have been developed, such as Project Global and the Dugong interview forms from the Convention on Migratory Species (http://www.cms.int/en/publication/revised-survey-questionnaire-project-manual-and-upload-file-available-1). For small-scale fisheries, a formula was presented that multiplied the rate of bycatch by fishing effort to calculate total bycatch with the caveat that uncertainty is quite high and assumptions can bias results. Tara then discussed methodologies for interviewing, including key questions and issues that increase uncertainty in interview results.

Potential solutions and actions to reduce bycatch were then presented (see presentation). Then delegates were divided into four groups to discuss the following points for different countries:

- Where each site fits on continuum of knowledge status? (1-4)
- Which sites need more research?
- Which sites can go to action?
- What are priority sites for research and action?
- Status of knowledge
  - o What information do you have for bycatch and fisheries at your sites?
    - How did you collect information
    - What were problems you encountered while collecting information? How did you work with problems?
  - o Do you think you have enough information at your site to show that bycatch is a serious problem for marine mammals there?
  - o Do you have enough evidence to convince local communities and government officials that bycatch of marine mammals is a serious problem?
  - o What progress has been made in past 10 years

- Group presentations:
  - o Group 1 (Guido Parra)
    - Representatives from Malaysia, Indonesia, Cambodia, China, and Japan.
    - Information for bycatch and fisheries at your sites?
- Mainly through interviews
  - o No examples on any other methodology
  - o Except Australia: Skipper logbooks and observer programs
    - Fishers have to manage bycatch
- Problems encountered while collecting
  - o Main problem with interviews is building bridge of trust with community. Some communities have been bombarded with interviews. Tired of answering questions about how they are dealing with resources. Resistance from communities to actually share knowledge. Also fear of implementations put in place that could threaten livelihood. Not everywhere. Has happened in Malaysia. Has taken a long time to build trust in community. Lots of time talking with them.
    - Enough information to show bycatch a serious problem?
- No, in majority. Varies from case to case, but general feeling is that there isn't much information.
    - Enough evidence to convince local communities/gov ernment officials?
- No.
- Need more?
  - o Not necessarily
  - o Cambodia: no point collecting bycatch data. Any impact on animals, even just a couple dying per year, will have big impact on population.
- Gerry Ryan: What action and with whom?
  - o If working with high level agency, need more examples of problem.
  - o If working with community, need more fine-scale evidence
- Tara Whitty: thinking about localized sites.
  - o Group 2 (Long Vu)
  - o Group 3 (Teri Aquino)

  See Group 3 bycatch exercise presentation.
  - o Group 4 (Jenny Ngeian Machau)
    - Thailand
      - Songkhla Lake net buy-back reduced Irrawaddy dolphin bycatch. Only at this site did they feel like they had enough information to say that bycatch is a problem.
      - In upper Gulf of Thailand, Bryde's whale doesn't seem to have problem with bycatch because most fishermen are gillnetters, with small gillnets. Seem to be finless porpoise and Irrawaddy dolphin bycatch (dead ones without tail and flippers floating in mangroves)
      - East coast: High density of fishing nets. Some left

	Indonesia	Vietnam	Philippine	Myanmar
•What information do you have for bycatch and fisheries at your sites?		Very little information available about small scale fisheries. One case of by-catch by commercial vessel (trawler).	site-specific information on some species caught and type of gear implicated. Number of boat per areas	site-specific information on some species caught and type of gear implicated.
•*How did you collect this information?*	Direct observation and Interview	Collected by multimedia	direct observation and interviews	Observation at local markets and interviews.
•*What were problems you encountered while collecting this information? How did you work with these problems?*	Some fishermen sharing information regarding Irrawaddy dolphin catch by net in the Mahakam river and they knew that species strictly protected by government	Unreliable information	in some areas fishers are not open to sharing info because of the ban; by establishing trust and rapport with fishers; doing actual counts of fishing boats & gears	No so willing to give info. Built trust; did not go with fisheries/government officer; try to speak and live as local
•Do you think you have enough information at your site to show that bycatch is a serious problem for marine mammals there?	In Mahakam river yes but no in west Kalimantan waters	NO, only few cases	in some areas, yes, i.e. Malampaya sound for Irrawaddy dolphins; most areas, no	Yes.
•Do you have enough evidence to convince local communities and government officials that bycatch of marine mammals is a serious problem?	Yes in Mahakam river, and no in West Kalimantan for Irrawaddy dolphin	NO	in some areas yes; in most areas no	Yes.
What progress has been made in the past 10 years?	In Mahakam there is local fishermen initiative	Nothing has been made so far	mainly none except in select sites there is some local initiatives	No more selling at the markets.

floating for days
- Malaysia:
  - Sarawak Dolphin Project and MareCet finished interviews and still processing results
  - Language problems with some interviews where deep sea boat operators are Thai or Burmese
  - Langkawi: Part-time fishermen: Does not appear that from small-scale fisheries that bycatch is a problem. Most nets are tended. A lot of trawlers operate, but they are more closed and not willing to talk. Medium sized gill net - come out late at night – untended gillnet might have bycatch. Anchovy purse seiner may catch porpoise, but fishermen say they release the porpoise – Problem: Thai or Burmese crew (language problem). Malay fishermen are more willing to talk than Chinese fishermen (on larger vessels). It is difficult to know what's really happening in large scale fisheries.
  - In Sarawak, bycatch seems to be seasonal: before and after monsoon
    - o After monsoon (April and March), most fishermen use tended trammel nets that are set for at most 20 minutes. Have bycatch, but let them go
    - o Before (August and September), mostly gillnets. Have problems.
    - o Serious gap is commercial/industrial fisheries.

Next potential solutions were discussed for each country:

- What solutions have you tried at your sites?
  - o Have you heard of any solutions at other sites?
- Do you know about any successful bycatch solutions?
  - o If yes, why successful?
- Do you know about any bycatch solutions that are stalled/ have failed?
  - o If yes, why failed?
- What potential solutions would work and would not work at your sites?
- Examples
  - o Gear restrictions
  - o Gear buy-back programs
  - o Closed/protected areas
  - o Gear modification

Discussion:

Thailand:
- Aung Myo Chit: Is a gear buy-back program a possible solution? How did it work in Thailand in 2010? What are the alternative livelihoods for fishers in Songkhla Lake?
  - o Suwat Jutapret: the buy-back program was just this year and last year, but not now. There was some education for fishers to learn about shrimp and fish aquaculture.

- Ellen Hines asked if there are push net buy-backs in the Thai Andaman Sea?

o Surasak Thongsukdee stated that in 2002, the Department of Fisheries had set up the Department of Marine and Coastal Resources. They launched the push net buy-back program and were successful in the Andaman Sea, but in the upper Gulf of Thailand, the push nets still catch anchovies, krill and small fish. He added that there is no government organization that wants to solve this problem. There was a combination of a few organizations that held some meetings in the past 3 years. After dolphin entanglement from giant catfish net, they then created a marine protected area in Songkhla Lake but it didn't work.

o Chalatip Junchompoo stated that all areas in Talibong Island in Trang province are protected areas for no hunting but there are still some fishermen fishing at the border area. The dugongs are not living inside the marine protected area as they will be travelling in and out of the area. The push net is not illegal if it is used 3000m from shore. They are now trying to expand the regulation to 5500m from shore, but there is conflict between the small scale fisheries and the commercial fisheries.

o Tara Sayuri Whitty stated that there is high community engagement at her other study site in Thailand, Trat province. Most of the communities have fisher associations.

Philippines:

- Theresa Aquino: In Malampaya Sound the local government did a buy-back program. Everyone got new nets, sold them on the side to buy materials for old gear. Push nets. So, didn't work. World Wildlife Fund came in and recorded bycatch every year. Crab gillnets/traps implicated. Community banned it and switched to something else with a bigger eye. Turns out it's not gear-related, but pressure-related. Tried to intervene at local level by various methods (putting ceiling on fishing effort, reducing density). Still bycatch is increasing.

- Tara Whitty: I've seen news stories that bycatch is decreasing in Malampaya Sound since 2007, but not believable. Soak time very important as well. Is it feasible to ask fishers to reduce soak time?

- Theresa Aquino: Before the project closed, we tried to go into the village and help with family planning issues.

- Louella Dolar: Looking at remnant populations of dugongs on islands. One fisher said they have decreased the height of bottom set gillnet because it was #1 gear catching dugongs. Depth of gillnet was 4 m at one site and 2 at the other. Because dugong always got tangled, they cut depth to 2 m. Crab catches more or less not affected. Fishermen themselves did this. Negros Island (net 4 m). Neighboring island of Dumangas: net 2 m reduced from 4.

Cambodia:
- Phay Somany: that the priority solution is to establish protected areas, and classify the areas into core and buffer zones. He proposed banning gillnets in the core zone in the dry season. He also mentioned that enforcement is crucial for the management of the protected areas. However, the problem they might face is that there are no alternative livelihoods for the local communities after the ban of gillnet use. Education and public awareness are also needed.
- Gerry Ryan: the government has banned gillnets in all dolphin habitat, and this was enforced by river guards. This action had a short term success, but it failed after a few years because the government does not provide any other alternative livelihood for the local communities.

Tara concluded that the best potential solutions for bycatch would probably be the buy-back net programs and gear modification instead of total bans of gillnet.. She suggested that researchers should also consider consulting social scientists and learning more about social sciences for their research.

NEED FOR SOLUTIONS IS URGENT

Don't have time for a lot "more research"

"BYCATCH" "INCIDENTAL TAKE" "NON-TARGET CATCH"

- Primary
- Secondary
- Discarded
- Catch interactions with gear

"There was considerable discussion of the problem of terminology …"


T.S.Whitty

OVERVIEW

Presentation: (20 minutes)

1. SEAMAM 2 REVIEW OF BYCATCH & **DRAFT ACTION PLAN**
2. HOW TO ASSESS BYCATCH
3. POTENTIAL SOLUTIONS/APPROACHES

Discussion:

1. STATUS OF KNOWLEDGE AT SITES (30 + 10 minutes)
2. SOLUTIONS (45 + 15 minutes)

Conclusion: Moving Forward (1 hour)

1. TRAININGS IN SOCIOECONOMICS/SSF RESEARCH
2. COMMUNICATION ABOUT SOLUTIONS
3. **REGIONAL ACTION PLAN**

SEAMAM II

"Research in SE Asia since the 1995 workshop have revealed that the by-catch of cetaceans and dugongs in fisheries is even greater than previously supposed, and there is no indication that this problem has been addressed in a meaningful or satisfactory way anywhere in the region."

Table 10. Outline of draft regional action plan on by-catch of small cetaceans and dugongs in SE Asia - Phase 1: Raising awareness.

I. Background
II. Objectives
III. Proposed actions (not necessarily in this order)
   A. Identify fisheries with small cetacean by-catch.
      1. For each nation, identify coordinating national institution.
      2 Identify national coordinator and academic/NGO collaborators.
      3. Develop catalog of fisheries for each nation (using GIS?)
      4. Identify regional coordinating institution and coordinator.
      5. Exchange information on fisheries with by-catch, and compile regional catalog of fisheries affecting shared cetacean populations.
   B. In regional consultation, prioritize fisheries to identify those with likely greatest impacts.
   C. Conduct regional training courses on:
      1. Methods for collecting by-catch data (field people)
      2. Methods for assessing impacts of by-catches (analysts)
      3. Development of standardized data forms.
   D. Develop pooled regional databases.
   E. Develop draft regional action plan for assessment and mitigation of by-catch.
   F. Establish regional email discussion group/list
   G. Educate public and stakeholders.
      1. Establish information center for fishermen and other stakeholders (interactive website)
      2. Develop community-based education programs in fishing communities.
      3. Produce popular articles/films
      4. Develop information packages for decision makers (legislators, administrators, executives)
   H. Work toward wider regional membership in CMS.
IV. List of specific projects/fisheries (based on present information and proposals).
V. References
Appendix - List of species
Appendix - List of potential range states and states with adjacent waters

SEAMAM II

A. IDENTIFY FISHERIES WITH SMALL CETACEAN BYCATCH

1. For each nation, identify coordinating national institution
2. Identify national coordinator and academic/NGO collaborators
3. Develop catalog of fisheries for each nation
4. Identify regional coordinating institution and coordinator
5. Exchange information on fisheries with bycatch, and compile regional catalog of fisheries affecting shared cetacean populations

B. IN REGIONAL CONSULTATION, PRIORITIZE FISHERIES TO IDENTIFY THOSE WITH LIKELY GREATEST IMPACTS

C. CONDUCT REGIONAL TRAINING COURSES ON:

1. Methods for collecting bycatch data
2. Methods for assessing impacts of bycatches
3. Development of standardized data forms

D. DEVELOP POOLED REGIONAL DATABASES

SEAMAM II

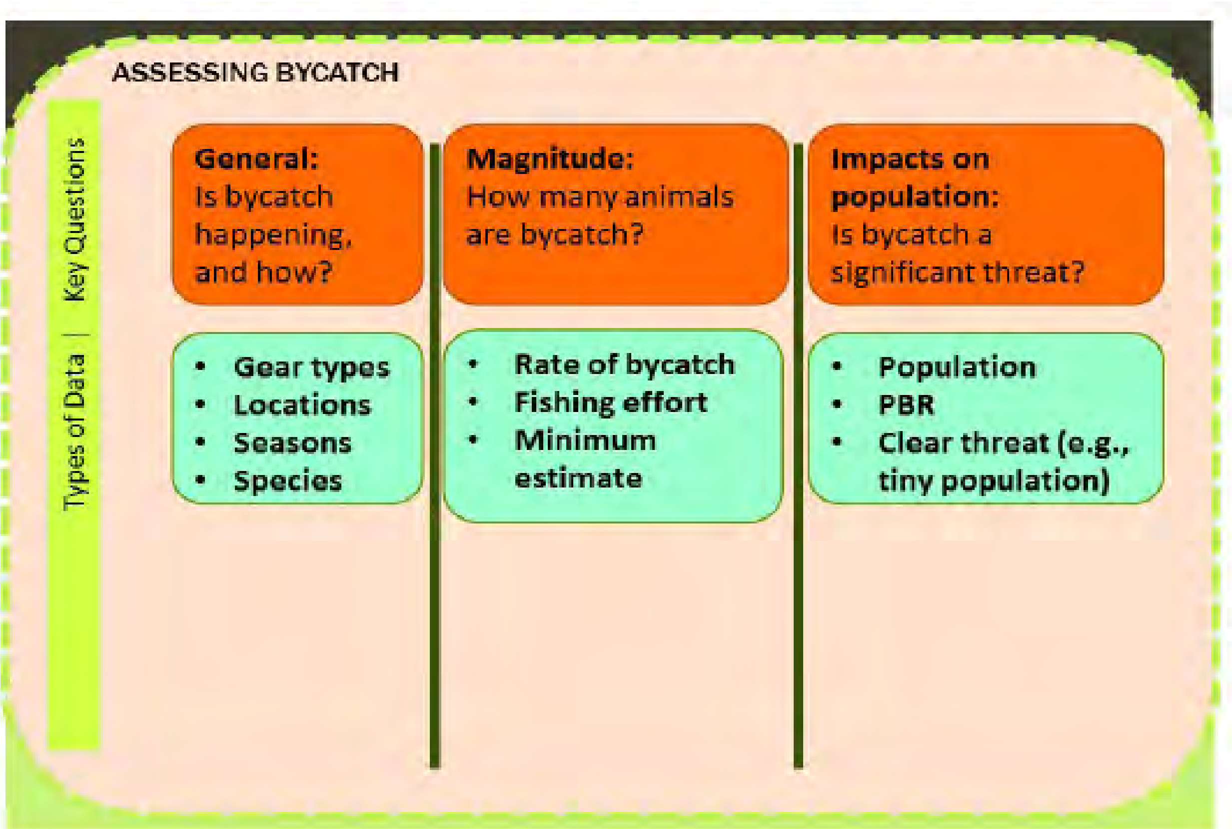
E. DEVELOP DRAFT REGIONAL ACTION PLAN FOR ASSESSMENT AND MITIGATION OF BYCATCH

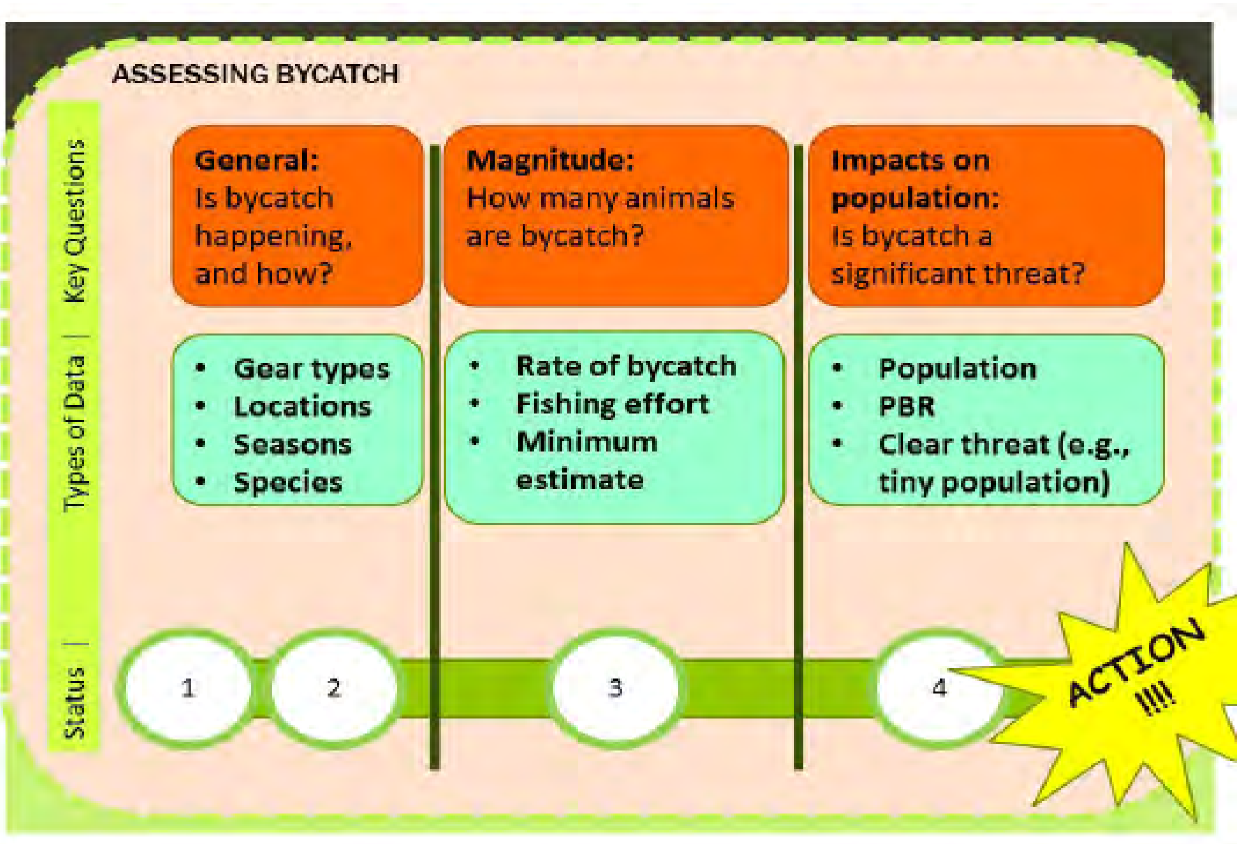
F. ESTABLISH REGIONAL EMAIL DISCUSSION GROUP/LIST

G. EDUCATE PUBLIC AND STAKEHOLDERS

1. Establish information center for fishermen and other stakeholders
2. Develop community-based education programs in fishing communities
3. Produce popular articles/films
4. Develop information packages for decision makers

H. WORK TOWARD WIDER REGIONAL MEMBERSHIP IN CMS


ASSESSING BYCATCH
Key Questions
Types of Data
General:
Is bycatch happening, and how?
Magnitude:
How many animals are bycatch?
Impacts on population:
Is bycatch a significant threat?
• Gear types
• Locations
• Seasons
• Species
• Rate of bycatch
• Fishing effort
• Minimum estimate
• Population
• PBR
• Clear threat (e.g., tiny population)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1
2
3
4
ACTION !!!!

HOW TO ASSESS BYCATCH

LARGE-SCALE FISHERIES

- OBSERVER PROGRAMS
- INTERVIEWS

AUDIENCE PARTICIPATION!!!

HOW TO ASSESS BYCATCH

SMALL-SCALE FISHERIES

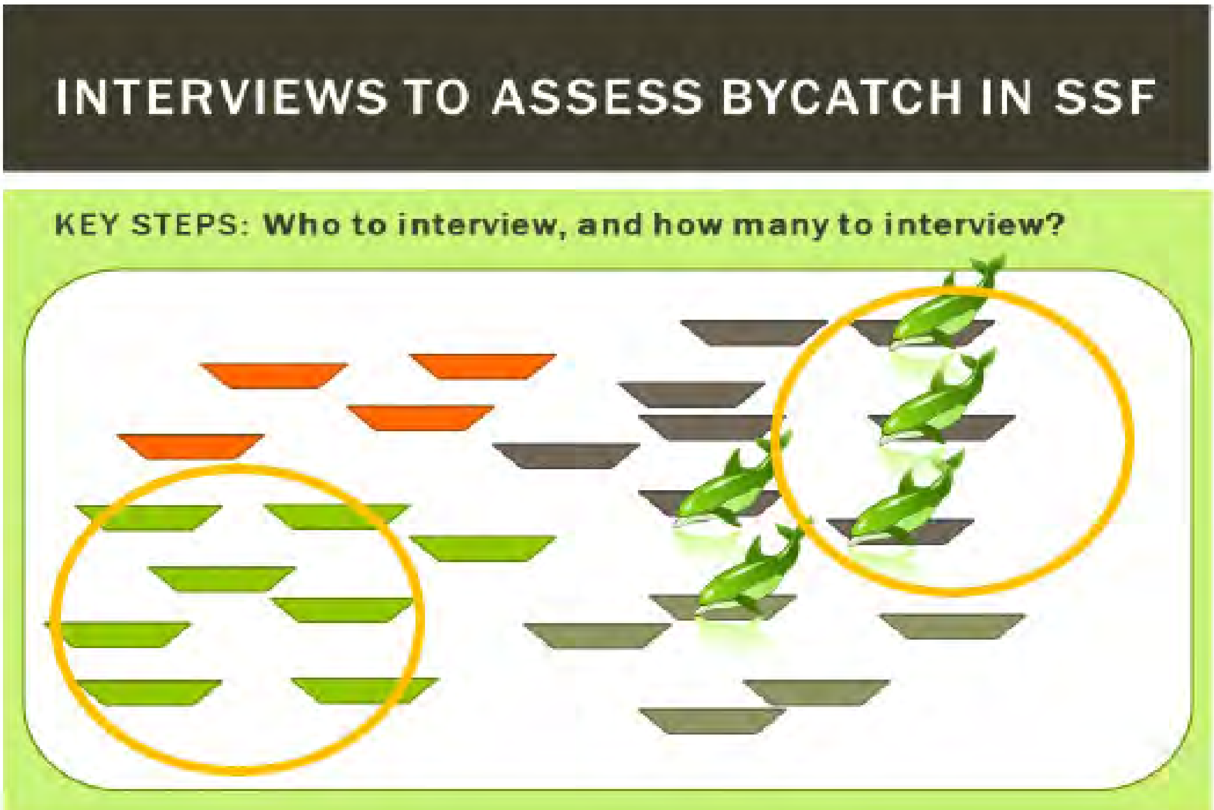
- INTERVIEWS
  - PROJECT GloBAL (Moore et al. 2010)
  - CMS Dugong Forms

Rate of bycatch x Fishing Effort = Total Bycatch

1 dolphin bycatch for every 100 gillnet sets (per year) = 1/100	1000 gillnet sets per year	~10 dolphins as bycatch per year

VERY IMPORTANT: A lot of uncertainty is involved! Be careful about assumptions you make in any extrapolation!


INTERVIEWS TO ASSESS BYCATCH IN SSF
KEY STEPS: Who to interview, and how many to interview?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INTERVIEWS TO ASSESS BYCATCH IN SSF

KEY STEPS: **Who to interview, and how many to interview?**

INTERVIEWS TO ASSESS BYCATCH IN SSF

KEY STEPS:
Who to interview, and how many to interview?

1. HOW MANY FISHERS IN AREA?
2. HOW MANY OF EACH GEAR TYPE?
3. WHERE DO THEY FISH?
4. DISTRIBUTION OF FISHER EXPERIENCE, AGE, FISHING GROUNDS?

INTERVIEWS TO ASSESS BYCATCH IN SSF

One way to pick your sample size:

Population	Sample Sizes
100	25
200	40
300	60
400	60
500	80
1000	100

(From GCRMN)

GEAR	# FISHERS	TARGET
Crab Gillnet	200	40
Crab Trap	300	60
Longline	100	25

INTERVIEWS TO ASSESS BYCATCH IN SSF

TO CONSIDER:

- Interviews are not perfect tools
  - Memory decay
  - Bias/dishonesty
  - Unwillingness to talk

  THESE ISSUES VARY FROM SITE TO SITE

- Can be difficult to get accurate species ID in interviews

- Official data on # of fishers and gears is often inaccurate/out of date – double check!

POTENTIAL SOLUTIONS

FROM SEAMAM II REPORT:

Approaches to mitigation (top 7)

- EDUCATION/AWARENESS
- ENFORCEMENT INCENTIVES
- MONITORING AND ASSESSMENT
- GEAR RESEARCH
- ALTERNATIVE LIVELIHOODS
- IDENTIFY KEY AREAS AND CLOSURE OF FISHERIES
- LAWS AND REGULATIONS TO REDUCE BYCATCH

ACTION!!!!

REDUCE MARINE MAMMAL/GEAR OVERLAP

GET THE GEAR OUT OF THE WATER/CHANGE FISHING PRACTICES

ACTION!!!!

REDUCE MARINE MAMMAL/GEAR OVERLAP

GET THE GEAR OUT OF THE WATER/CHANGE FISHING PRACTICES

- REDUCE SOAK TIME
- CHANGE LOCATION OF GEAR
- MODIFY GEAR
- SWITCH TO DIFFERENT GEAR
- REDUCE THE # OF GEARS/FISHERS ALLOWED
- REDUCE FISHING THROUGH ALTERNATIVE LIVELIHOODS

1. WOULD IT ADDRESS THE BYCATCH PROBLEM?
2. HOW TO IMPLEMENT?
   - Top-down regulations? Community-based management?
   - Align with MPAs?
   - Challenges and opportunities?
   - What approach is appropriate for the site?

POTENTIAL SOLUTIONS

PLAYING SOCIAL SCIENTIST - CONSIDER:

- TIES TO FISHING – HOW WILLING TO CHANGE?
  - ECONOMIC, SOCIAL, CULTURAL
- WHAT DO PEOPLE NEED/WANT/VALUE?
- WHAT IS THE COST OF IMPLEMENTATION?
- HOW DOES DOLPHIN CONSERVATION/BYCATCH REDUCTION ALIGN WITH OTHER ENVIRONMENTAL/SOCIAL GOALS?
- GOVERNANCE – WHAT FRAMEWORKS EXIST FOR MANAGEMENT?
  - Capacity for enforcement
  - Role of top-down versus bottom-up
  - Regulations in place already?

POTENTIAL SOLUTIONS

COMMUNICATION!

- Fisheries management approaches
- Sea turtle bycatch solutions
- Other marine mammal bycatch situations at other sites/other regions

OVERVIEW

Presentation:

1. BYCATCH ISSUES & SEAMAM 2
2. HOW TO ASSESS BYCATCH
3. POTENTIAL SOLUTIONS/APPROACHES

Discussion:

1. STATUS OF KNOWLEDGE AT SITES
2. SOLUTIONS

Conclusion: Moving Forward

1. TRAININGS IN SOCIOECONOMICS/SSF RESEARCH
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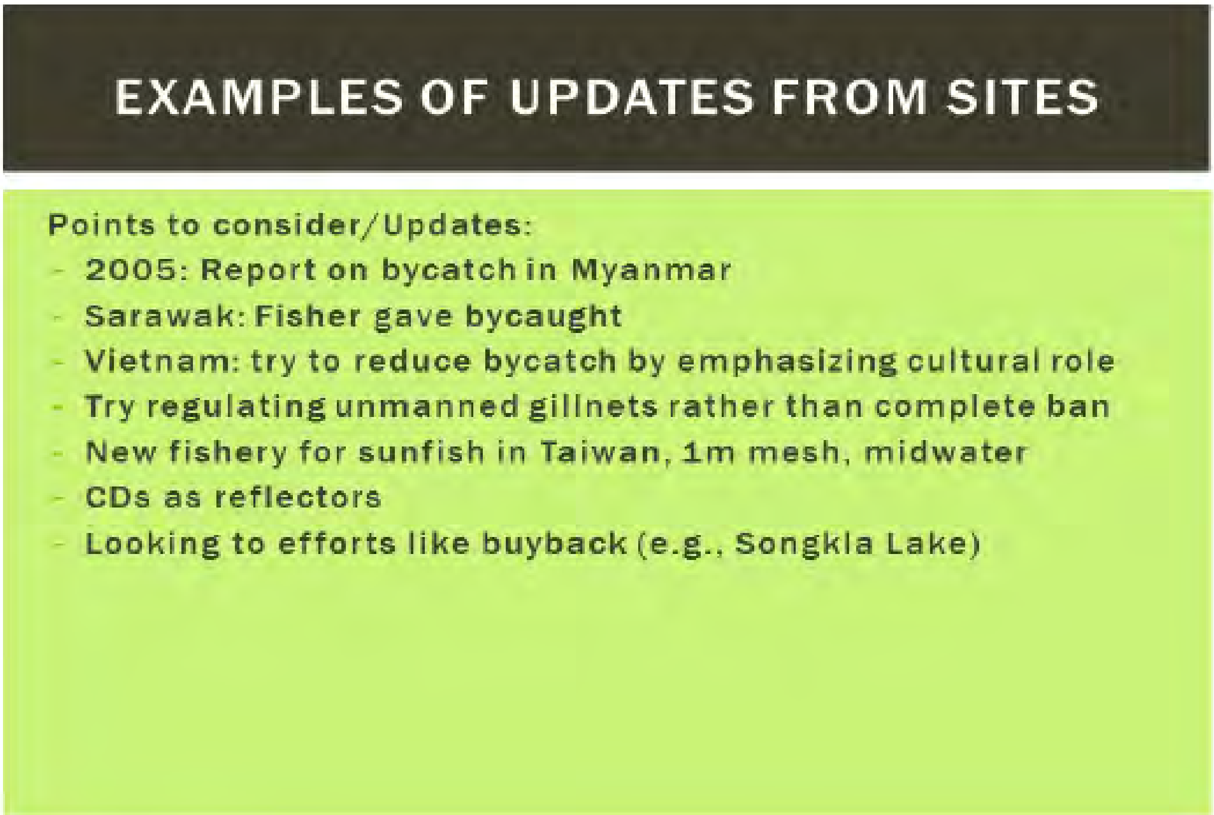
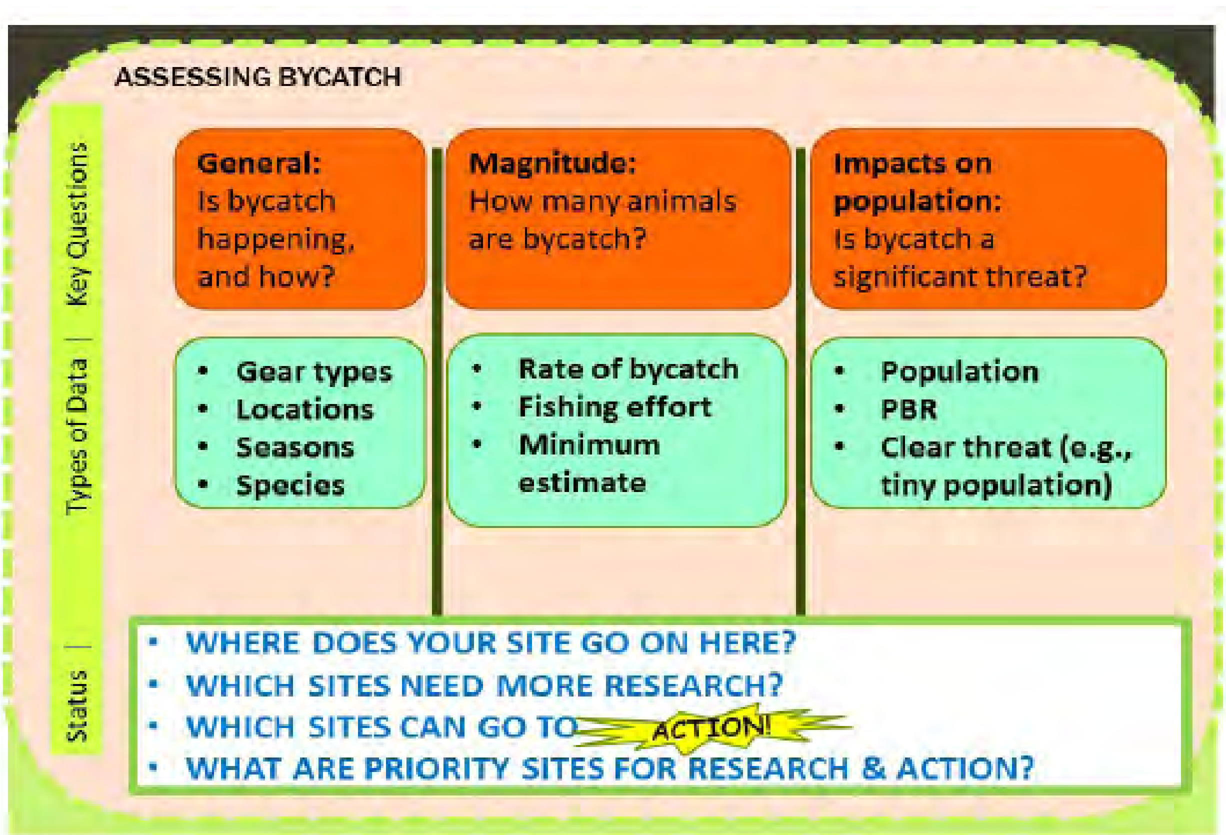

EXAMPLES OF UPDATES FROM SITES
Points to consider/Updates:
- 2005: Report on bycatch in Myanmar
- Sarawak: Fisher gave bycaught
- Vietnam: try to reduce bycatch by emphasizing cultural role
- Try regulating unmanned gillnets rather than complete ban
- New fishery for sunfish in Taiwan, 1m mesh, midwater
- CDs as reflectors
- Looking to efforts like buyback (e.g., Songkla Lake)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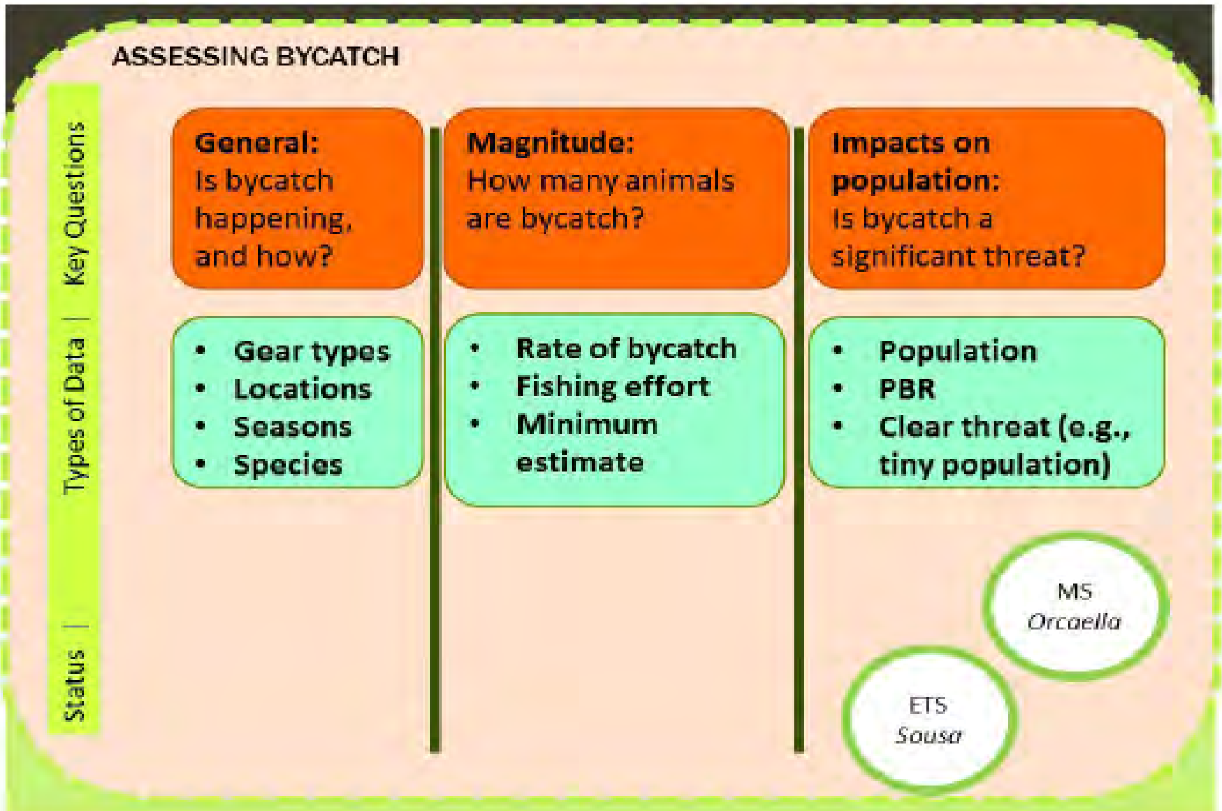
General: Is bycatch happening, and how?
Magnitude: How many animals are bycatch?
Impacts on population: Is bycatch a significant threat?
• Gear types
• Locations
• Seasons
• Species
• Rate of bycatch
• Fishing effort
• Minimum estimate
• Population
• PBR
• Clear threat (e.g., tiny population)
• WHERE DOES YOUR SITE GO ON HERE?
• WHICH SITES NEED MORE RESEARCH?
• WHICH SITES CAN GO TO ACTION!
• WHAT ARE PRIORITY SITES FOR RESEARCH & ACTION?

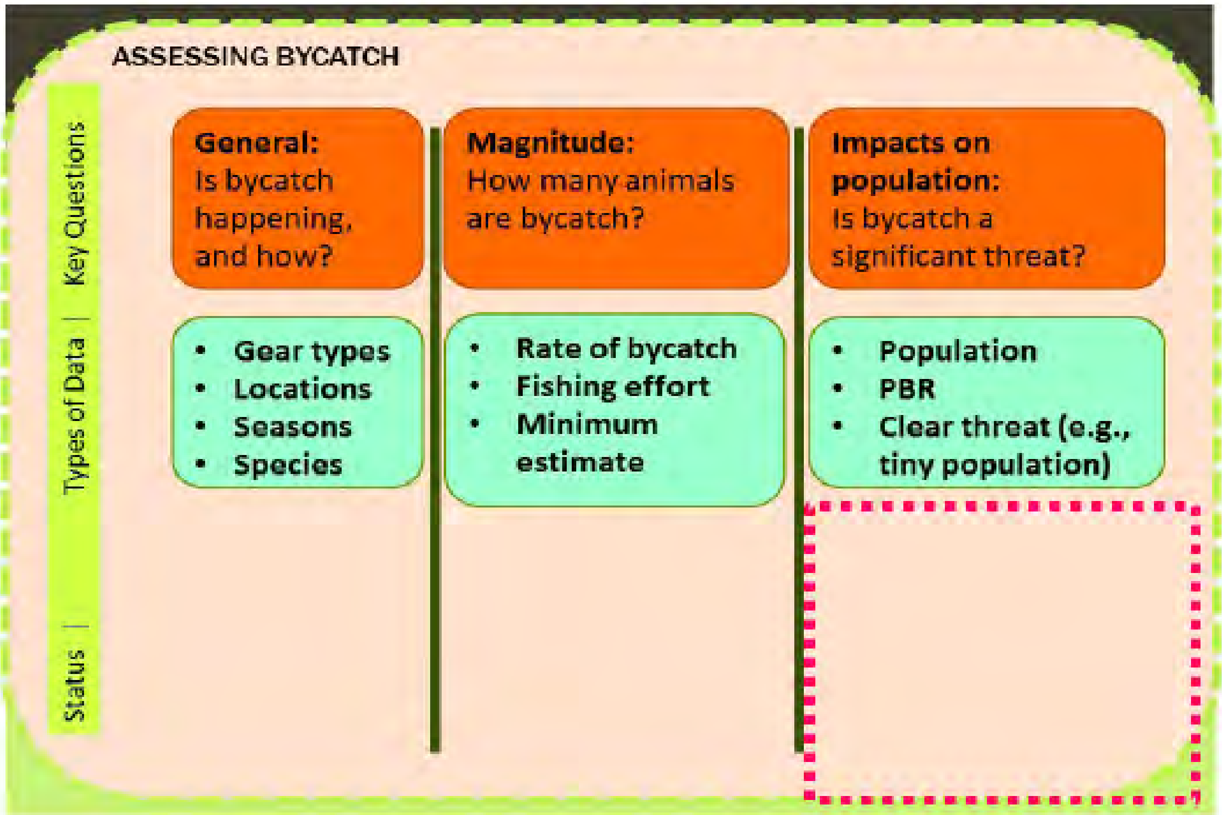


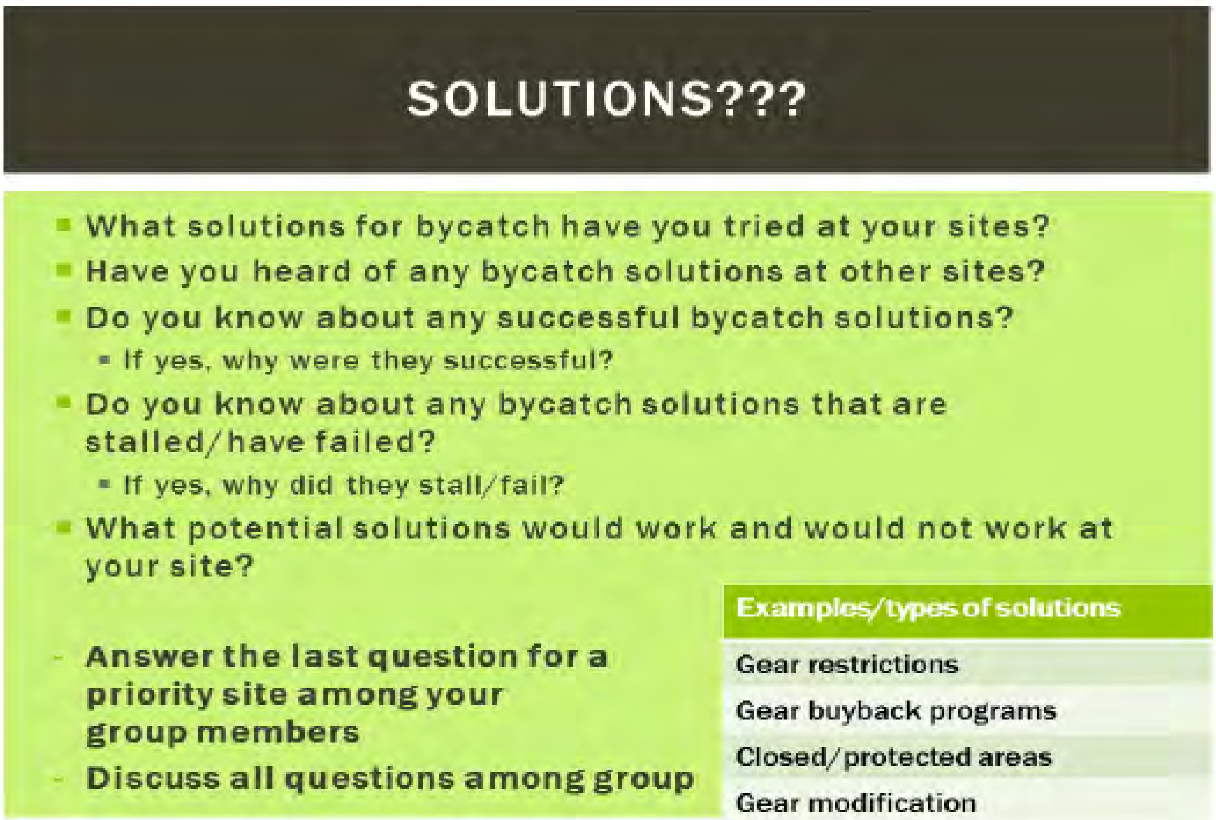
STATUS OF KNOWLEDGE

- What information do you have for bycatch and fisheries at your sites?
  - How did you collect this information?
  - What were problems you encountered while collecting this information? How did you work with these problems?
- Do you think you have enough information at your site to show that bycatch is a serious problem for marine mammals there?
- Do you have enough evidence to convince local communities and government officials that bycatch of marine mammals is a serious problem?
- What progress has been made in the past 10 years?

SPLIT INTO GROUPS:

- **ANSWER THESE QUESTIONS**
- **ASSESS THE STATUS OF KNOWLEDGE AT YOUR SITE**


ASSESSING BYCATCH
Status | Types of Data | Key Questions
General:
Is bycatch happening, and how?
Magnitude:
How many animals are bycatch?
Impacts on population:
Is bycatch a significant threat?
• Gear types
• Locations
• Seasons
• Species
• Rate of bycatch
• Fishing effort
• Minimum estimate
• Population
• PBR
• Clear threat (e.g., tiny population)


SOLUTIONS???
▪ What solutions for bycatch have you tried at your sites?
▪ Have you heard of any bycatch solutions at other sites?
▪ Do you know about any successful bycatch solutions?
▪ If yes, why were they successful?
▪ Do you know about any bycatch solutions that are stalled/have failed?
▪ If yes, why did they stall/fail?
▪ What potential solutions would work and would not work at your site?
- Answer the last question for a priority site among your group members
- Discuss all questions among group
Examples/types of solutions
Gear restrictions
Gear buyback programs
Closed/protected areas
Gear modification

OVERVIEW

Presentation:
1. BYCATCH ISSUES & SEAMAM 2
2. HOW TO ASSESS BYCATCH
3. POTENTIAL SOLUTIONS/APPROACHES

Discussion:
1. STATUS OF KNOWLEDGE AT SITES
2. SOLUTIONS

Conclusion: Moving Forward
1. TRAININGS IN SOCIOECONOMICS/SSF RESEARCH
2. COMMUNICATION ABOUT SOLUTIONS
3. REGIONAL ACTION PLAN

SMALL-SCALE FISHERIES RESEARCH

Ask social scientists!!! (cautionary tale: Moore et al. 2010)

* And remember –
BE RIGOROUS IN YOUR SOCIAL SCIENCE EFFORTS! *

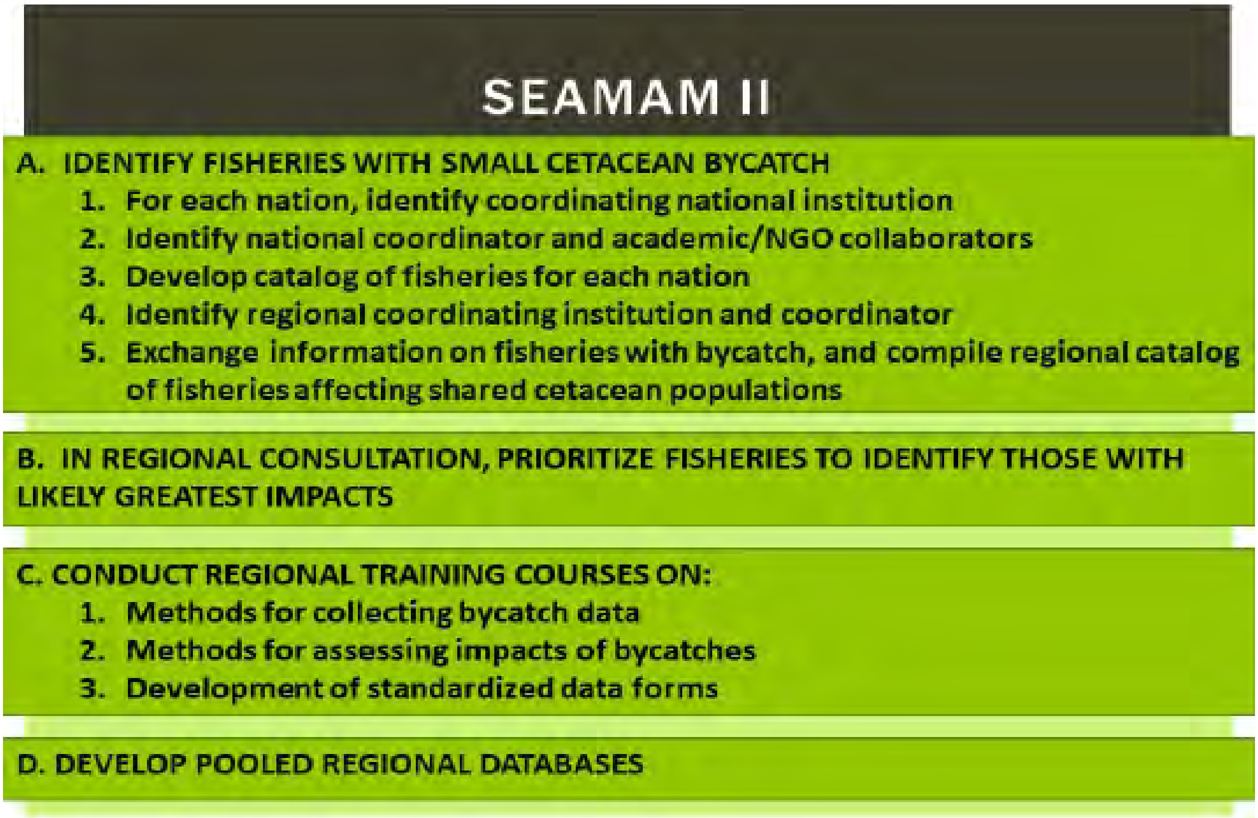
Examples of resources:
- TOO BIG TO IGNORE (TBTI; toobigtoignore.net)
- SMALL-SCALE & ARTISANAL FISHERIES RESEARCH NETWORK (SAFRN; artisanalfisheries.ucsd.edu)
- Other resources to be put on temporary website:
seamamrefs.wordpress.com

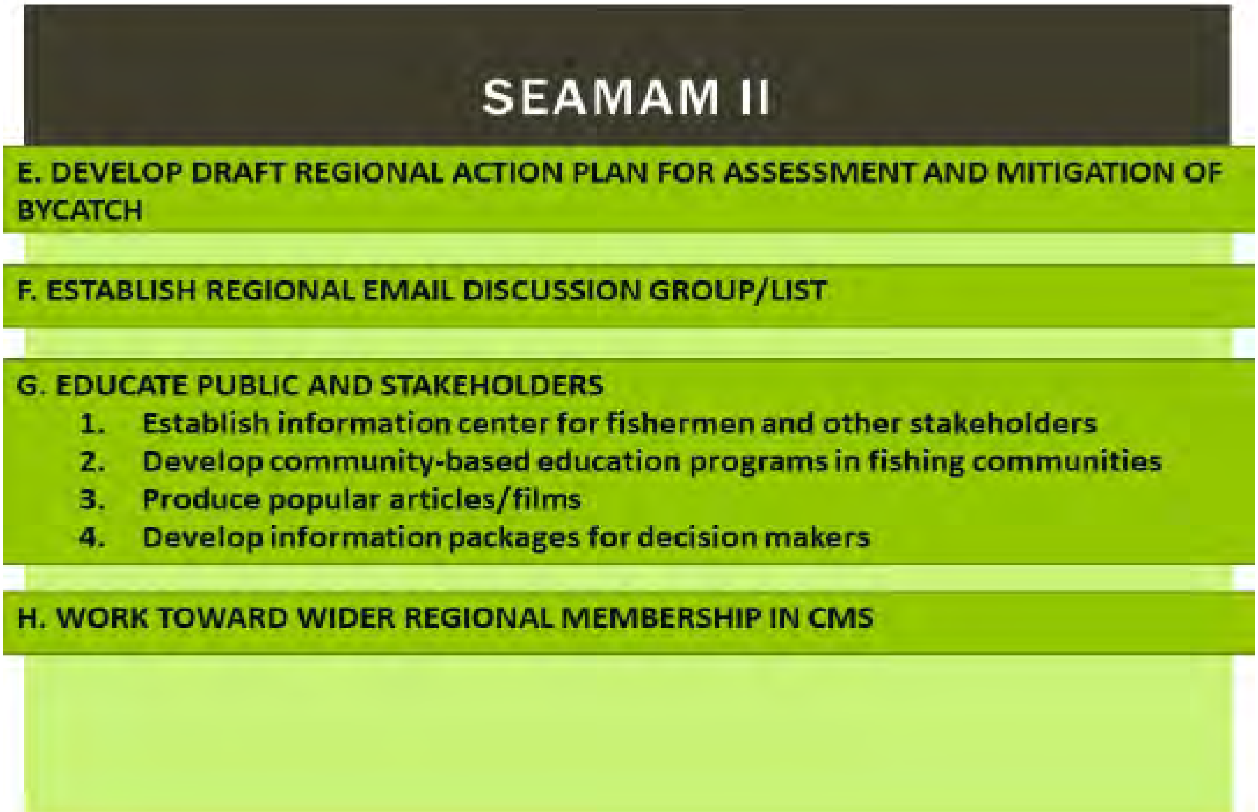
COMMUNICATING ABOUT SOLUTIONS

- DO WE WANT TO DO THIS? (I think we should...)
- HOW?
- & Learning from the vaquita, and other examples

REGIONAL ACTION PLAN?

- Do we need one?


SEAMAM II
A. IDENTIFY FISHERIES WITH SMALL CETACEAN BYCATCH
1. For each nation, identify coordinating national institution
2. Identify national coordinator and academic/NGO collaborators
3. Develop catalog of fisheries for each nation
4. Identify regional coordinating institution and coordinator
5. Exchange information on fisheries with bycatch, and compile regional catalog of fisheries affecting shared cetacean populations
B. IN REGIONAL CONSULTATION, PRIORITIZE FISHERIES TO IDENTIFY THOSE WITH LIKELY GREATEST IMPACTS
C. CONDUCT REGIONAL TRAINING COURSES ON:
1. Methods for collecting bycatch data
2. Methods for assessing impacts of bycatches
3. Development of standardized data forms
D. DEVELOP POOLED REGIONAL DATABASES


SEAMAM II
E. DEVELOP DRAFT REGIONAL ACTION PLAN FOR ASSESSMENT AND MITIGATION OF BYCATCH
F. ESTABLISH REGIONAL EMAIL DISCUSSION GROUP/LIST
G. EDUCATE PUBLIC AND STAKEHOLDERS
1. Establish information center for fishermen and other stakeholders
2. Develop community-based education programs in fishing communities
3. Produce popular articles/films
4. Develop information packages for decision makers
H. WORK TOWARD WIDER REGIONAL MEMBERSHIP IN CMS

GROUP 3 bycatch exercise

Country	Info availability	Method of Collection	Problems Encountered
Aceh	No info	Pilot study to start soon	
Myanmar	Yes (Ayeyarwady River – 2009 & coastal region – to start soon)	Education program started off data collection	No
Cambodia	Yes	via network (for marine and fresh); carcass collection	No
Philippines	Yes	Onboard monitoring of some commercial fisheries, landing sites monitoring & interviews	Yes
Malaysia	Yes	Combined interview & onboard verification (Sabah)	No
Brunei	No info	1990s interest in reporting by-catch in museum; 1 live dugong bycatch in 1996 released back to sea	-

Do you think you have enough info at your site to show that by-catch is a serious problem for marmam?

Country	
Aceh	No
Myanmar	Yes
Cambodia	Yes
Philippines	Yes
Malaysia	No
Brunei	No

Do you have enough evidence to convince local communities and govt officials that by catch of marmam is a serious problem?

Country	
Aceh	No
Myanmar	Yes – Priority areas: Ayeyarwady River, coastal areas
Cambodia	Yes – Priority area: Mekong
Philippines	Yes – Priority Areas: Malampaya Sound, Guimaras and Iloilo Strait
Malaysia	No -
Brunei	No

What progress has been made in the past 10 years?

Country	
Aceh	Pilot project in initial phase, MPAs established in 2010 onwards
Myanmar	Yes Rules and regulations in place Dugongs and Irrawaddy only species protected in country PAs established
Cambodia	Yes; freshwater = policies, database, stranding records, enforcement, PAs established, by-catch research conducted, education campaign, stranding network = decrease in freshwater dolphin carcasses collected Marine = policies, stranding records ALL SPECIES IN CAMBODIA PROTECTED
Philippines	Continued monitoring and rescue in some area, satellite stranding network in areas with high dugong by-catch, MPA establishment
Malaysia	More by-catch research, MARECET
Brunei	Signatory to dugong MOU, more research planned, MPAs planned

Final Wrap-Up

Convention on Migratory Species/ Society for Marine Mammalogy/ Wrap-up

Led by Heidrun Frisch

Heidrun Frisch, the Marine Mammals Officer from the UNEP/CMS Secretariat, was asked to speak to the delegates on the following two questions. The following is based on her presentation and discussion with SEAMAM III delegates.

1. What happened to the Memorandum of Understanding (MoU) idea from SEAMAM II?
2. What other assistance can the Convention on Migratory Species (CMS) provide?

- Please explain a CMS MoU on marine mammals in Southeast Asia?
  - o A MoU is an agreement between governments, not legally binding, not necessarily a big difference because the government either wants to support it or doesn't.
    - - An MoU is a mechanism to get people to get together to establish joint priorities
    - - Purpose: support cooperation between governments and set regional priorities for addressing threats
    - - Science is the basis, but is really about governments in the end
  - o In 2002, the CMS Science Council 11 endorsed the idea of a Southeast Asian cetacean MoU.
    - - Shortly after, at the conference of parties, where decisions get made:
- "If the reaction from Range States is positive, and the allocation of sufficient resources for this purpose was ensured" – here's the snag
- Similar recommendation repeated twice by COP 8 and COP9, recommendation to consider all cetaceans and Indian Ocean
- COP10 (2011) Res.10.15 on Global Programme of Work for Cetaceans
    - - CMS is still happy with the idea, though nothing has really happened
  - o COP10 set criteria for development of new MOUs
    - - Particularly attention to (a) and (f)
  - o Is there still an interest in a CMS MOU for small cetaceans in SE Asia, and scope?
    - - If yes, need to make case for new instrument, and whether a CMS instrument is the only option, or whether same outcomes could be achieved by delivery through partner organizations, or other means?
  - o Process needs to be government-led
  - o Scientific Council Workspace: centralized online platform designed for progressing the intercessional work of the Scientific Council; launched a few weeks ago
    - - Option to invite external experts
    - - Translate science into policy; facilitate communication between science and policy
    - - Workspace.cms.int (can't see a lot without user account)
    - - Aquatic mammals working group (Bill Perrin as chair)
- Work structured in 12 ocean regions
- Discussion thread
  - o E.g., re: regional agreement for cetaceans
  - o Could offer this to us as a way to facilitate discussion
  - o Another working group on Bycatch, chaired by Barry Baker from Australia, working with Regional Fisheries Management Organizations, discussion about mitigation techniques
  - o At the moment: Philippines and Australia are the only CMS parties in the region; wouldn't necessarily need to be a party to take the lead, though obviously much easier if leader is a party to CMS
- Randy Reeves: How are the existing agreements and MOUs working?
  - o Heidrun Frisch:
    - - Meeting frequency depends on funding; at meetings they communicate updates and set priorities for next steps
- E.g., one in the Pacific area meets every few years
    - - The dugong MOU is a great example – running pretty independently, others here better qualified to answer
- Has big budget and own staff; better than others, because can actually do things
    - - West Africa has inquired re: Cetaceans, but since then, nothing has happened simply because there are no resources to put into it
- MOU has helped for getting project money as reference for funding proposals, establishes needs
    - - MOU is just a piece of paper, and it's what the countries in the region make of it, and the time/money that can be put into it
  - o John Wang: Can a non-UN entity push this forward?
- Heidrun: I would imagine not. No strict rules for MOU, but…
- John: E.g., Hong Kong as having resources to push this forward
- Heidi: no idea, but worth looking into
  - o Putu Liza: What is the benefit to Indonesia in signing this MOU?
    - - Heidrun: as species are moving across national boundaries, there is no point for countries doing things separately. It is better to collaborate, sharing and coordinating among countries. It would be easier to get help and support with the involvement of more countries when involving transboundary projects.
    - - Also easier to get support and help for multi-national efforts
    - - Pooling expertise in slightly more formal way
    - - Easier if want to do transboundary projects if both projects have signed; point of entry in both ministries/ whoever needs to give permission for research, as governments have already committed
  - o Putu Liza: If collaborations can happen anyway without MOU, what is the importance of MOU? And coming back to CTI discussion – can CMS help us push the CTI species focus forward, related to migratory species? Might be better prospect because CTI is stronger, more established
- Heidi: Yes, MOUs can be great, but might not add a lot of value in all cases, so need to look into whether this is best value for this region – spend energy elsewhere, or would it be helpful and worth years of negotiation and work?

- Ellen Hines: CTI isn't permanent, and finite funding; first phase is ending, and so is funding; while UNEP will hopefully be around for longer
  - Ellen Hines: is someone here from 2002 who remembers the impetus behind recommendation for initial MOU?
- Randy Reeves: If remembers correctly, Bill Perrin was the driving force behind SEAMAM I, and is involved with CMS
- John Wang: there was a consensus agreement that they all wanted the draft action plan; probably just died in the process; wasn't picked up and championed
  - o Heidrun: those that have come through depended on a government taking it up and working on it, and if it happens, CMS secretariat will do what can to support, but impetus needs to come from region
    - Peter Thomas: I would be interested in an analysis of how MOUs have worked? Is there a critical mass for such an agreement? What does it take? And US has pushed some forward, though not a party?
- Heidrun: there is no systematic assessment. e.g., the Sharks MOU pushed hard by the US; one of the countries concerned needs to really take the lead once gets to political side of things
  - Louella Dolar: Re: what happened – I will ask Bill what happened, maybe he could send an email
  - o Ellen Hines: Thailand took the lead in developing the dugong – was the first country expressing interest in dugong MOU; at first mtg in BKK, CMS sent someone who took people through steps needed and gave cool comparison to CMS marine turtle agreement
- Louisa Ponnampalam: Asked to take vote of confidence whether organizing committee should explore this further.
  - o Gerry Ryan : Remember to consider whether this is the only option, and if not, is it worth pursuing if hard to push through
  - o Leela Rajamani: has CMS conducted an assessment of MOU effectiveness?
    - Heidrun: The evaluation of effectiveness is done by each government body. They have to say on their own if the agreement is effective or not.
    - There are 19 MOUs and 7 Binding Regional Agreements
- Binding Regional Agreements have their own budgets, staff, parties need to pay subscription fee
- MOU's generally don't have all that, with some exceptions (Marine Turtle and Bird of Prey, with voluntary contributions); bit more shaky
- Doesn't think MOU is at any disadvantage in terms of effectiveness compared to BRA, except for funding

PLEASE NOTE: A vote was taken by delegates to support exploring a CMS agreement on Southeast Asia cetaceans. The results were: Yes – 17, No – 0, On the fence – 1

Discussion on Creating a Society for Marine Mammalogy (SMM) Asian Regional Chapter

Led by Ellen Hines

- 2013 Biennial Conference in New Zealand, abstracts due May 1
  - o Would like to see if groups of people interested in putting together symposia based on topics raised here
- 2015 Biennial will be in San Francisco
- Some benefits of membership:
  - o Free subscription for the libraries
  - o Grants-in-aid programme: there have been no proposals from Southeast Asia in the past 3 years. More information available on the website.
  - o There are some grants to bring international scientists to biennials
  - o Thinks we'd get a lot of support from the Society; seem eager to be truly international
  - o Negatives: couldn't think of any; pretty loose, can whatever we want
    - Student chapters do hold regional meetings
    - Possibility for regional meeting in Sri Lanka in 2016
  - o Guido: might make SEAMAM more accountable
    - John: how this meeting came about was in Quebec (SMM 2009); someone has to take over locally
- Louella Dolar asked if the Southeast Asia members of SMM have to have membership?
  - Ellen: No membership is needed to attend the biennials, but more expensive. If a region, there are benefits (above) to membership.
- Putu Liza Mustika stated that she felt SMM is more biological-based. Socio-economic issues from Southeast Asia were not really addressed in the previous SMM meeting in Tampa.
- Patricia M. Sorongon asked what is the goal of this chapter? What do we want to achieve in this goal?
- Alessandro Ponzo suggested registering SEAMAM in the SMM regional chapter.
- Ellen Hines asked are the people in the region just want to have SEAMAM or having SEAMAM in SMM chapter? Either one is fine.
- Alessandro Ponzo commented that shifting SEAMAM into SMM regional chapter, we will have more pressure to have more meeting, updates, follow ups.

NOTE: there was no clear vote for this, it was decided to talk with SMM for further information.

Wrap-up and Closing Discussion

Led by Ellen Hines and Louisa Ponnampalam

Ellen:

- No updates on CMS – some discussion about having it as Asian Cetacean MOU rather than SE Asian Small Cetacean MOU, but emails/conversation will continue
- There will be a few symposiums on climate change and marine mammals and a meeting to discuss marine mammal MPA's. We should show the Society and others that Southeast Asia has a strong scientific community.
- Captivity statement
  - o Randy rewrote, went through organizing committee
  - o Just in report; not going to be sent to any government; just a summary of what most of us think
  - o Debate over use of world "strongly"
  - o The finalized statement will be included in the captivity forum section of the SEAMAM III report.

- Re next meetings
  - o John Wang stated that all the people are willing to help but not to organize the meeting. Somebody in the region should take the responsibility to do so or to take over to do it.
  - o Putu Liza Mustika mentioned that we are ready to do it for the next SEAMAM. There are many young passionate young scientists here.
  - o John Wang recommended Louella Dolar to lead the effort for the next SEAMAM.
  - o Louella Dolar suggested that we should form a committee. The committee is not to make the decision right now, but to lead the discussion on what we should/can do for the next meeting.
  - o John Wang stated that it is easier to apply for funding by forming a group instead of personally. Not many people would be willing to sacrifice one of their research proposals for the meeting proposal.
  - o Putu Liza: Let's agree to form an organization that will enable us to voice concerns and have more collaborative research. We will try to meet in New Zealand in December about how to proceed.

We formed a continuing SEAMAMS (now SEAMAMA) committee with two teams, the advisors (superwackers): Ellen Hines, Lindsay Porter, and Louella Dolar, and the organizing committee (wackers): Putu Liza Mustika, Jo Marie Acebes, Guido Para, Fairul Izmal, Chalatip Junchompoo, Aung Myo Chit, and Louisa Ponnampalam.

Immediate tasks:
- Draft a document of goals and objectives
- Meet in New Zealand to decide whether to be a chapter in SMM
- Define geographic range: should we include China, Hong Kong, Japan, Korea, Bangladesh India.
- Alessandro Ponzo suggested to move SEAMAM to end of the year (October-November).
- We will work to hold the next SEAMAM in 2016.

Louisa S. Ponnampalam stated we had fun doing this first conference. Come visit us again. Keep in touch. See you at the next whatever MAM.

Subsequent discussions by delegates have resulted in the following draft statements about the mission and objectives of SEAMAMa and geographic range:

Mission of Statement:

The SEAMAM mission is to create a welcoming and supportive environment for students, researchers, and local stakeholders to discuss and foster research and conservation of marine mammals across South East Asia and adjacent seas.

Objectives:

1. To promote and organize a triennial meeting in which to gather and disseminate among members current research and conservation issues across the South East Asian region.
2. To promote advances in the research, conservation, management and education of marine mammals across South East Asia
3. To promote and organize seminars, courses, and workshops to build up research capacity in marine mammal science across the South East Asian region.

Geographic Range:

'Southeast Asia and associated seas' (Myanmar, Thailand, Malaysia, Singapore, Indonesia, East Timor, Philippines, Brunei, Cambodia, Vietnam, Laos, China, Hong Kong, Taiwan and Australia) and depending on interest and participation from other "associated sea countries" involve them as well initially as observers (Sri Lanka, India, Bangladesh, Japan, Korea, and Papua New Guinea).


UNEP CMS
ASCOBANS
CMS & SEAMAM
What happened to the MOU idea?
What other assistance can CMS provide to the region?

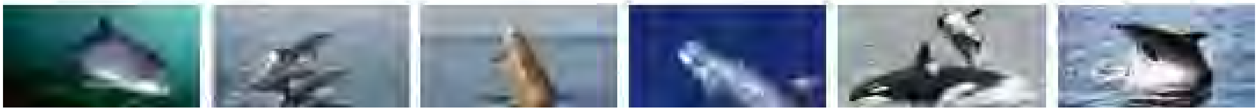

UNEP CMS
CMS MOU
ASCOBANS
• SEAMAM II reviewed a draft CMS MOU on Small Cetacean Conservation in SE Asia
• Recommended to extend scope to include dugongs
• Purpose:
✓ Support cooperation between governments in the region
✓ Set regional priorities for addressing threats, support governments in addressing these

UNEP CMS

CMS MOU

ASCOBANS

- CMS Scientific Council 11 (2002) endorsed the recommendation for an MOU
- CMS Conference of the Parties (COP7, 2002), Res.7.7:
  Supports the development of an appropriate CMS instrument on small cetaceans and dugongs in South-East Asia ..., if the reaction from Range States is positive, and the allocation of sufficient resources for this purpose
- Similar wording repeated by COP8 (2005) and COP9 (2008), recommendation to consider including all cetaceans and Indian Ocean
- COP10 (2011) Res.10.15 on Global Programme of Work for Cetaceans



UNEP CMS

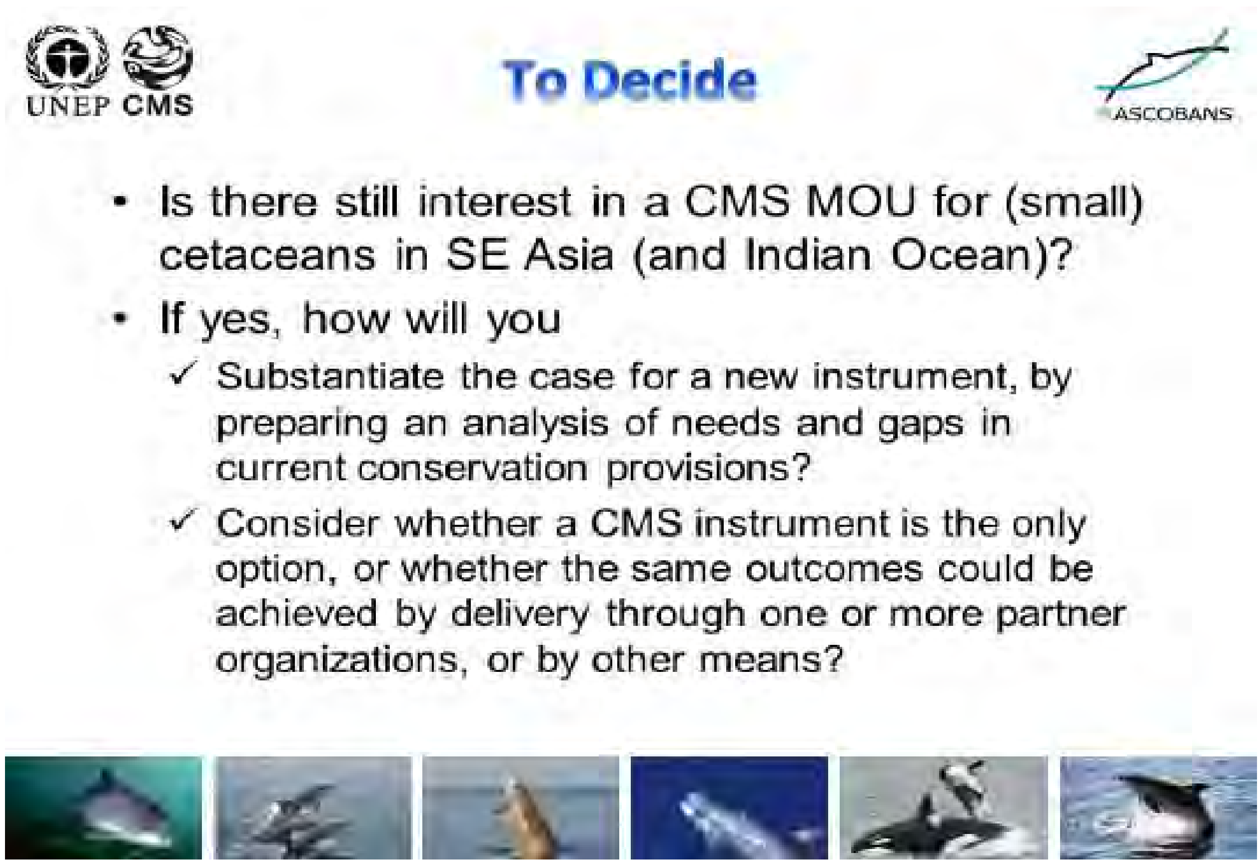
CMS MOU

ASCOBANS

- COP10 (2011, Res.10.16) set criteria for development of MOUs:

6. *Decides* that the following considerations must be addressed when making any new proposals in the meantime:

(a) substantiation of the case for a new instrument, based on an analysis of needs and gaps in current conservation provisions;
(b) whether the proposal helps to deliver a specific existing CMS COP mandate or other existing CMS initiative;
(c) the financial implications of the proposal, and what plan for financing the instrument is in view;
(d) the extent to which the financing plan is sustainable in the long term;
(e) whether a new instrument is the only option, or whether alternative options exist, such as extending an existing instrument;
(f) whether a CMS instrument is the only option, or whether the same outcomes could be achieved by delivery through one or more partner organizations, or by other means;
(g) what other synergies and efficient ways of working can be foreseen; and
(h) whether an organization or (preferably) a country has committed to leading the development process; and


UNEP CMS
To Decide
ASCOBANS
• Is there still interest in a CMS MOU for (small) cetaceans in SE Asia (and Indian Ocean)?
• If yes, how will you
✓ Substantiate the case for a new instrument, by preparing an analysis of needs and gaps in current conservation provisions?
✓ Consider whether a CMS instrument is the only option, or whether the same outcomes could be achieved by delivery through one or more partner organizations, or by other means?


UNEP CMS
Scientific Council Workspace
ASCOBANS
• A centralized online platform designed for progressing the intersessional work of the ScC
• Provides an innovative and powerful tool for participation, communication and goal-driven work
• Structured in line with the Council's Work Plan and the working groups
• System foresees inviting of external experts
• Goal: provide policy advice to COP


UNEP CMS
Scientific Council Workspace
ASCOBANS
CMS Scientific Council Workspace
Home
Working Groups
Discussion
Members
Resources
Wiki
Public Area
Scientific Council (ScC)
Links and Resources
Workspace
Welcome to the CMS Scientific Council Workspace
View
Edit
Translate
The CMS Scientific Council Workspace (ScC Workspace) is the electronic, web-based communication space and working area for the CMS Scientific Council (ScC). Its aim is to provide a central platform for online collaboration and to support the work and the communication of the Scientific Council between meetings. The platform consists of a public and a restricted area, the latter being accessible only to the current members and observers of the CMS Scientific Council. It includes the following sections:
WORKING GROUPS - An area where the Scientific Council does its technical work during
Search
New forum topics
More
New comments
14 hours 51 min ago
Submission of requests to IPBES
New content
http://workspace.cms.int/


UNEP CMS
Scientific Council Workspace
ASCOBANS
CMS Scientific Council Workspace
English
Español
Home
Home » Taxonomic Working Groups » Aquatic Mammals
Working Groups
Taxonomic Working Groups
Aquatic Mammals
Global actions 2012-2017
Regional actions 2012-2017
Species listing proposals
Birds
Fish
Marine Turtles
Terrestrial Mammals
Thematic Working
Aquatic Mammals
Group:
Request group membership
Welcome to the CMS Working Group on Aquatic Mammals!
Cetaceans
Appendix I
Scientific Name
Common Name
Concerted Action
Physeter macrocephalus
Sperm Whale
X
Ganges River Dolphin
X
La Plata Dolphin
X
• Councillor for Aquatic Mammals: Bill Perrin

UNEP CMS

Scientific Council Workspace

ASCOBANS

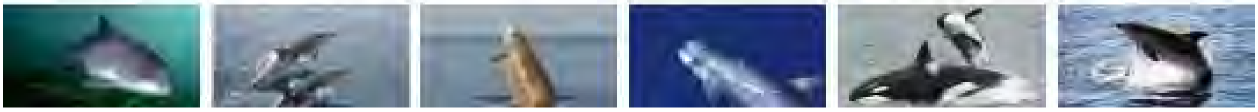
- Work of AMWG mainly structured through Res.10.15 Global Programme of Work for Cetaceans (with 12 defined ocean regions)

CENTRAL AND NORTH WEST PACIFIC OCEAN (EAST AND SOUTH EAST ASIA) ACTIONS

42. Central and North West Pacific Ocean collaborative action to address entanglement and bycatch and marine bushmeat, pollution and habitat and feeding ground degradation are weighted as high priorities; ship strikes and marine noise as medium priorities; climate change as lower.

43. Nineteen species and populations are listed on the CMS Appendices for this region, and these are

a) Australian snubfin dolphin (*Orcaella heinsohni*) Appendix II
b) Baird's beaked whale (*Berardius bairdii*) Appendix II
c) Blue whale (*Balaenoptera musculus*) Appendix I + Concerted/Cooperative Action

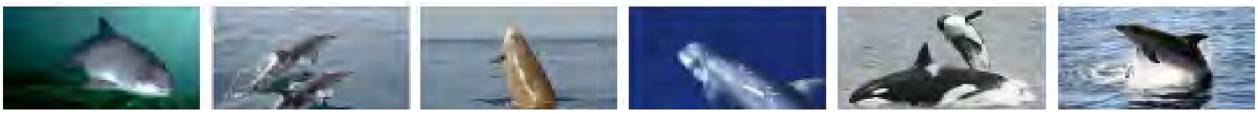


UNEP CMS

Scientific Council Workspace

ASCOBANS

- Use as discussion area?




UNEP CMS
Scientific Council Workspace
ASCOBANS
Working Groups
Taxonomic Working Groups
Thematic Working Groups
Bird poisoning
Bycatch
Results of bycatch risk assessments or mitigation research
Collaboration with RFMOs and other international fora
Develop ToR for studies on gillnet fisheries
Collaboration with CMS daughter agreements and others
Bycatch
View
Edit
Group
Group:
You are the group manager
Welcome to the CMS Working Group on Bycatch!
Attachment
Size
Res_10_14_bycatch_e.pdf
50.79 KB
Res_9_18_ByCatch_En.pdf
51.53 KB
ScC17_Annex_VII_WG_Report_Bycatch_E.pdf
Subscribe
Search
New forum topics
Announcements
More
New content
IPBES
Members of the Landbirds WG
Members of the Minimising Poisoning WG
test by charles
Structured by Res. 10.14 and 9.18 and Bycatch Councillor's Work Programme


UNEP CMS
ASCOBANS
CMS & SEAMAM
Comments?
Questions?
Next Steps?

Participants

THIRD SOUTHEAST ASIAN MARINE MAMMAL SYMPOSIUM (SEAMAM III) 4 – 10 MARCH 2013, FAVE HOTEL, LANGKAWI, MALAYSIA

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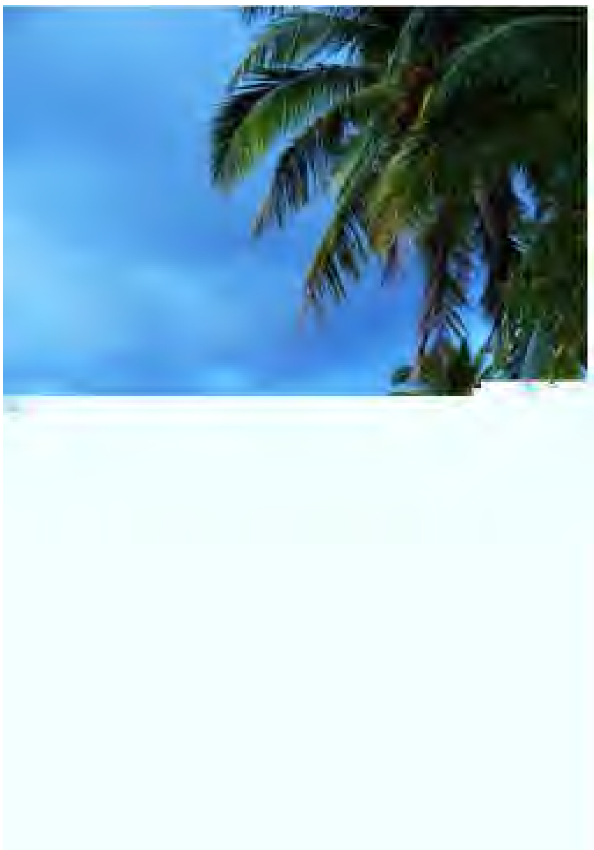
Annex 1
Key Note
Presentation

Nagulendran
Kangayatkarasu

SEAMAM III

4th March 2013
Langkawi, Malaysia



2010 Biodiversity Target

"to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth"

"Current trends are bringing us closer to a number of ***potential tipping points*** *that would catastrophically reduce the capacity of ecosystems to provide these essential services.*

At stake are the principal objectives outlined in the Millennium Development Goals: ***food security, poverty eradication and a healthier population."***

UN SG

The information behind GBO-3:

- 110 National Reports
- Biodiversity Indicators Partnership
- Biodiversity Futures Study
- 500 scientific papers
- Open review process

The 2010 Biodiversity Target has not been met

- No sub-target completely achieved
- Most indicators negative
- No government claims success
- Direct pressures constant or increasing

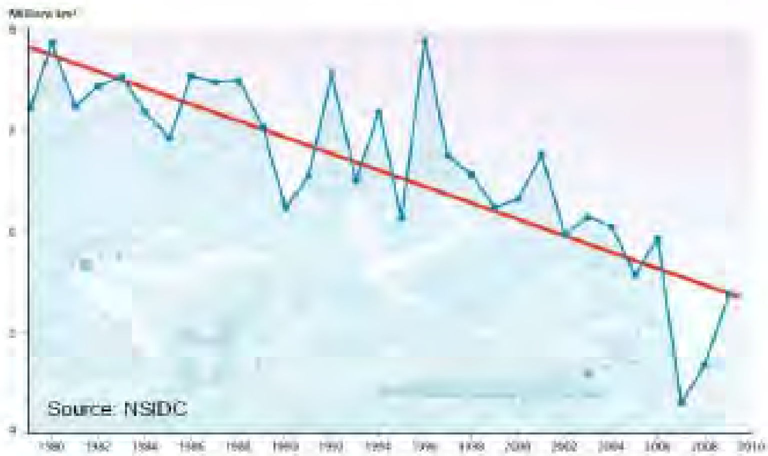
Trends in habitats are varied but show declines over all:

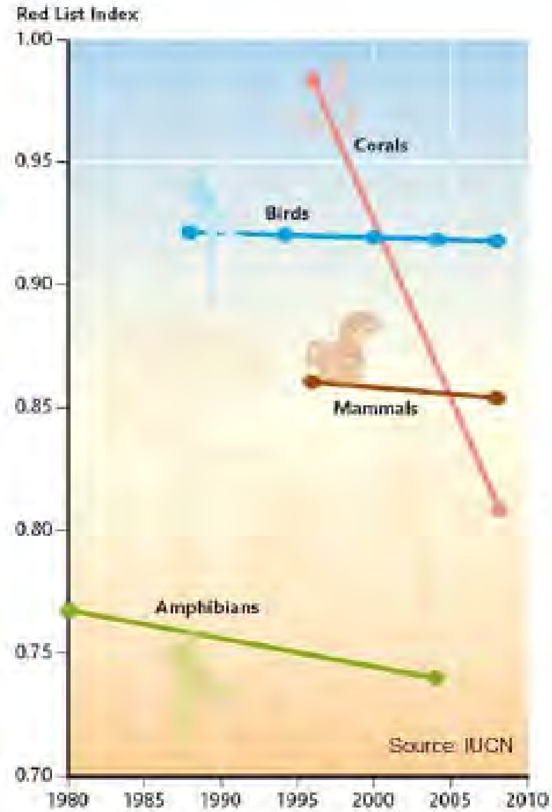
•Wetlands, salt marshes, coral reefs, seagrass beds and sea ice continue to decline

•Extensive fragmentation of forests and rivers

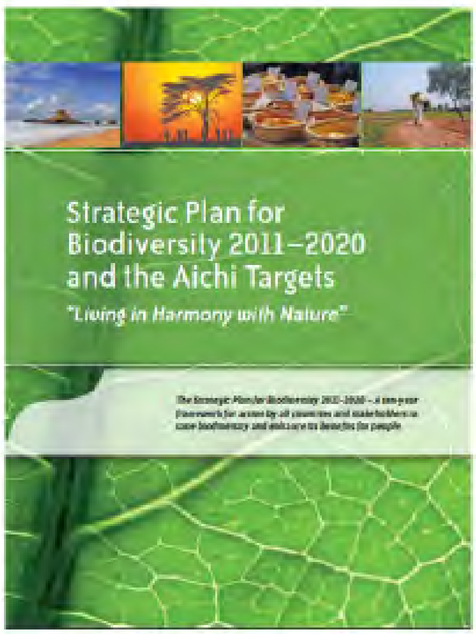
• Mangrove decline slowing (except in Asia)

•The condition of many terrestrial habitats is deteriorating (degrading)





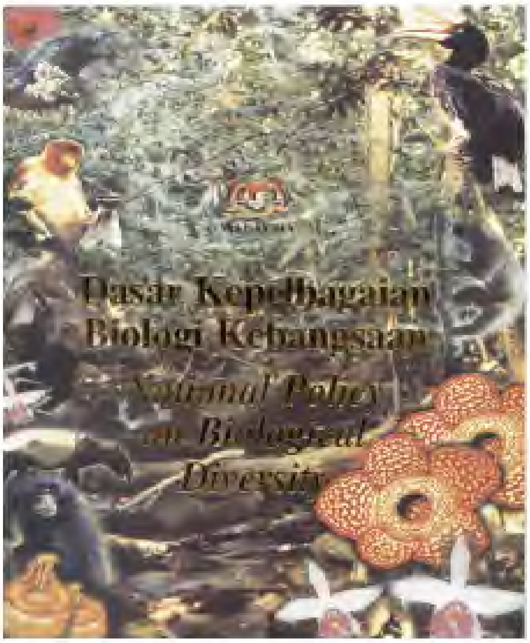
- The Red List Index (RLI) for all these species groups is decreasing.
- Coral species are moving most rapidly towards greater extinction risk
- Amphibians are, on average, the group most threatened.



- Adopted at COP10, CBD 2010
- Resource mobilisation to complement implementation


Aichi Nagoya Targets
Strategic goal A. Address the underlying causes of biodiversity loss
Target 1: By 2020, People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
Target 2: By 2020, Biodiversity values are integrated into national and local development and poverty reduction strategies and planning processes and national accounts…
Target 3: By 2020, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed……
Target 4: By 2020, Governments, business and stakeholders have plans for sustainable production and consumption and keep the impacts resource use within safe ecological limits.
Strategic goal B. Reduce the direct pressures on biodiversity and promote sustainable use
Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
Target 6: By 2020 all stocks managed and harvested sustainably, so that overfishing is avoided……
Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.
Strategic goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
Target 11: By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas are conserved through systems of protected areas……
Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives is maintained.
Strategic goal D: Enhance the benefits to all from biodiversity and ecosystem services
Target 14: By 2020, ecosystems that provide essential services, including services are restored and safeguarded.
Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems.
Target 16: By 2015, the Nagoya Protocol on Access and Benefits Sharing is in force and operational
Strategic goal E. Enhance implementation through participatory planning, knowledge management and capacity building
Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated NBSAP.
Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities and their customary use, are respected
Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.
Target 20: By 2020, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, should increase substantially.


Intergovernmental Platform on Biodiversity & Ecosystem Services
ipbes
Science and Policy for People and Nature
• aim to strengthen capacity for the effective use of science in decision-making at all levels



- To conserve Malaysia's biological diversity and to ensure that its components are utilised in a sustainable manner for the continued progress and socio-economic development of the nation

Available on line at
www.chm.frim.gov.my

myBioD
life•heritage•future

Thank You

Key Note Presentation

Randall Reeves

Are We Making Progress or Spinning our Wheels? Cetacean Conservation – A Global Perspective

Randall Reeves

Outline of Talk

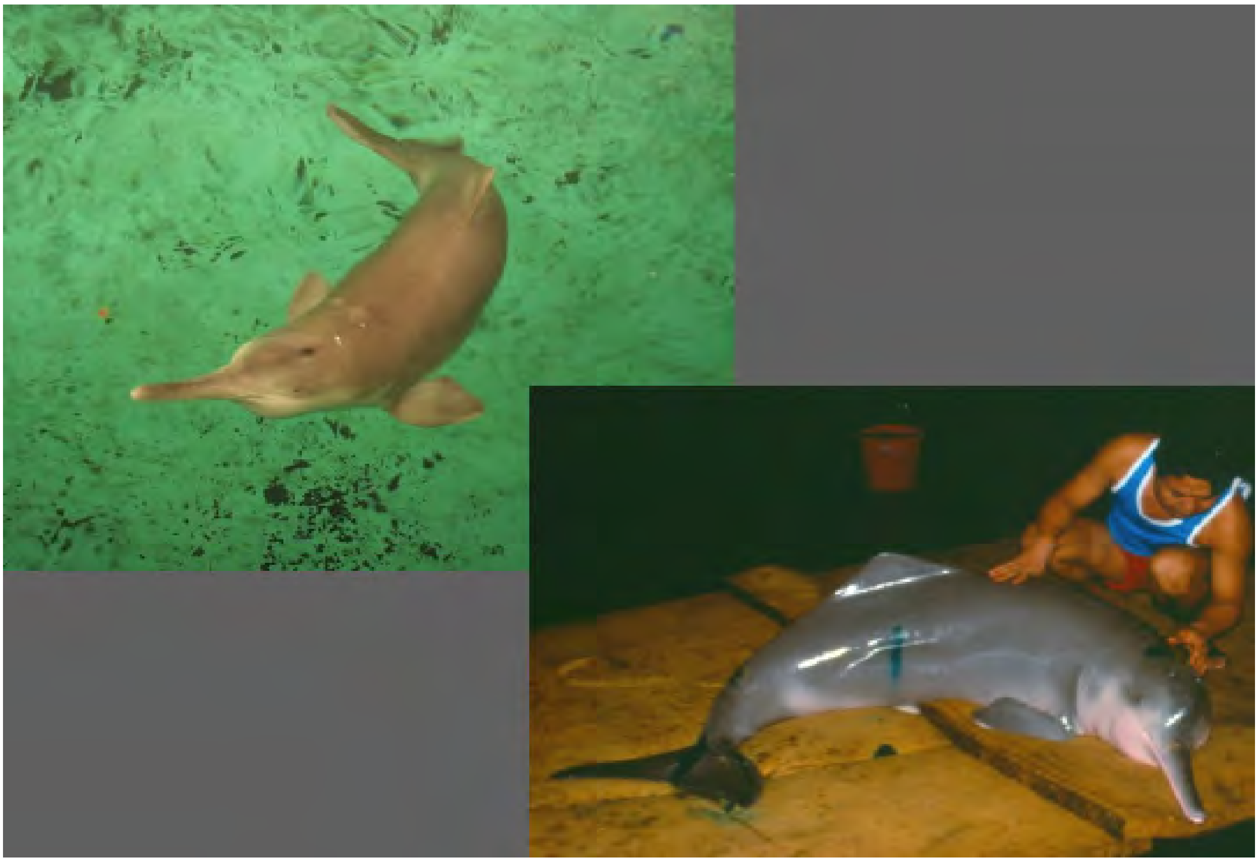
- Endemism
  - Red List
  - Taxonomy (e.g. subspecies)
- Diagnosis
  - Examples (Mekong, Argentina)
- Bycatch
  - 1990 to present
- Final thoughts

Current SMM List

- 14 mysticete species in 4 families (5 of the species subdivided into 2-4 subspecies)
- 75 odontocete species in 10 families (15 of the species subdivided into 2-4 subspecies)

Endemism

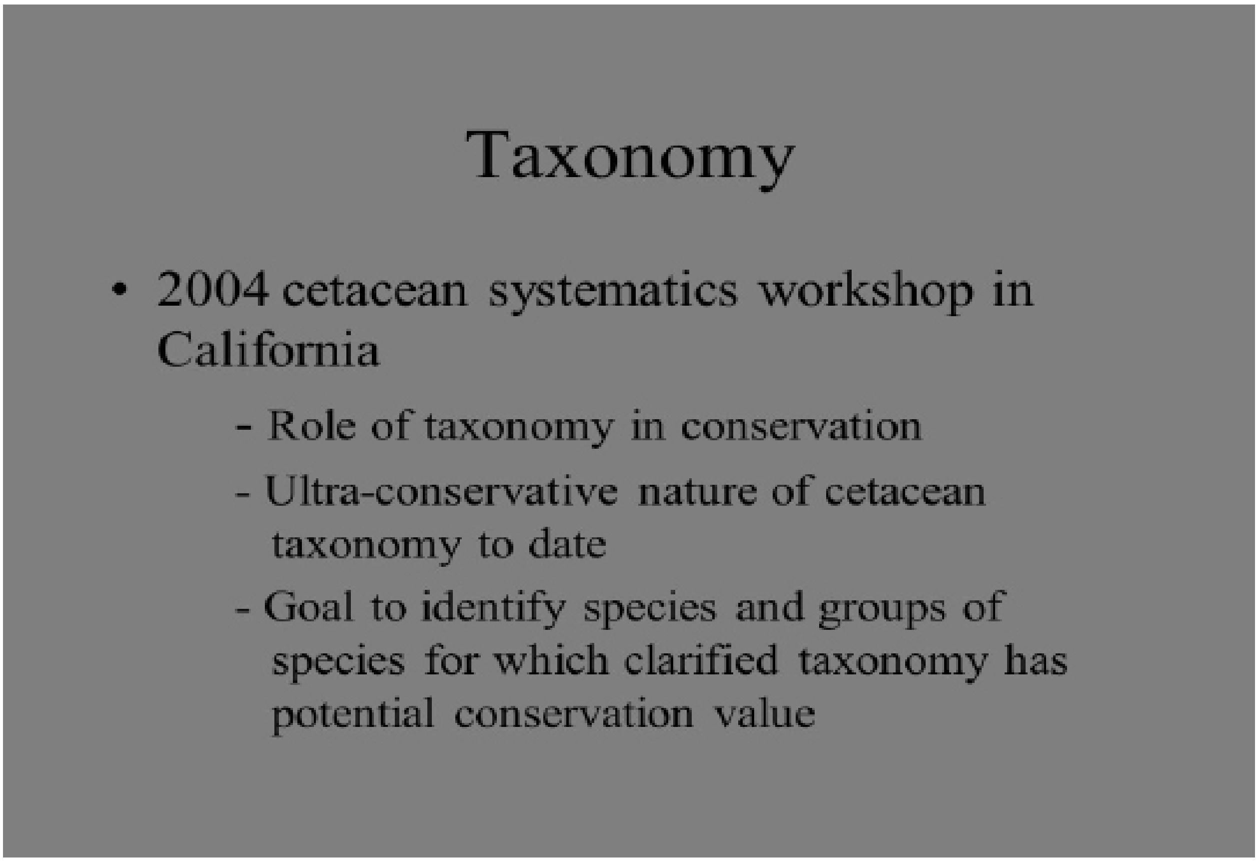
- the ecological state of being unique to a defined geographic location, such as an island, nation or other defined zone, or habitat type (*Wikipedia*)

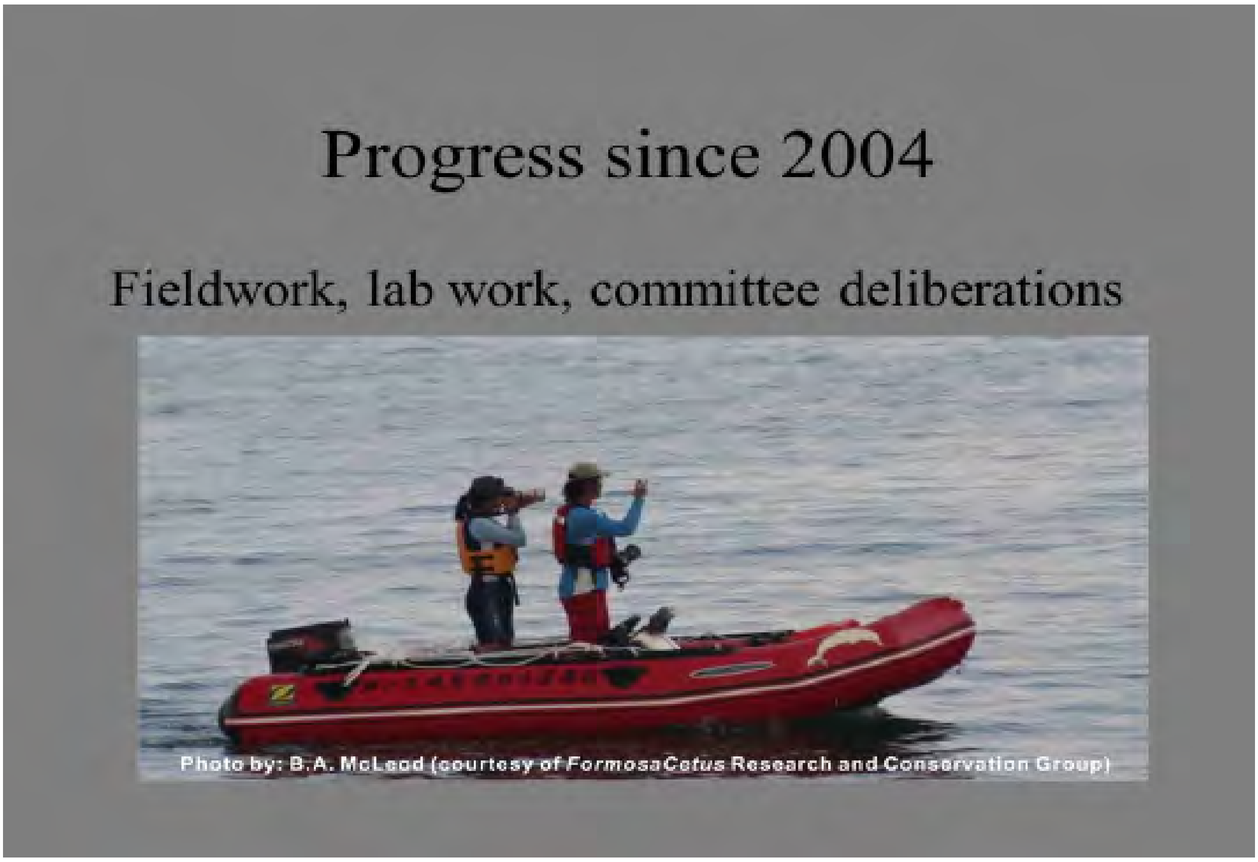


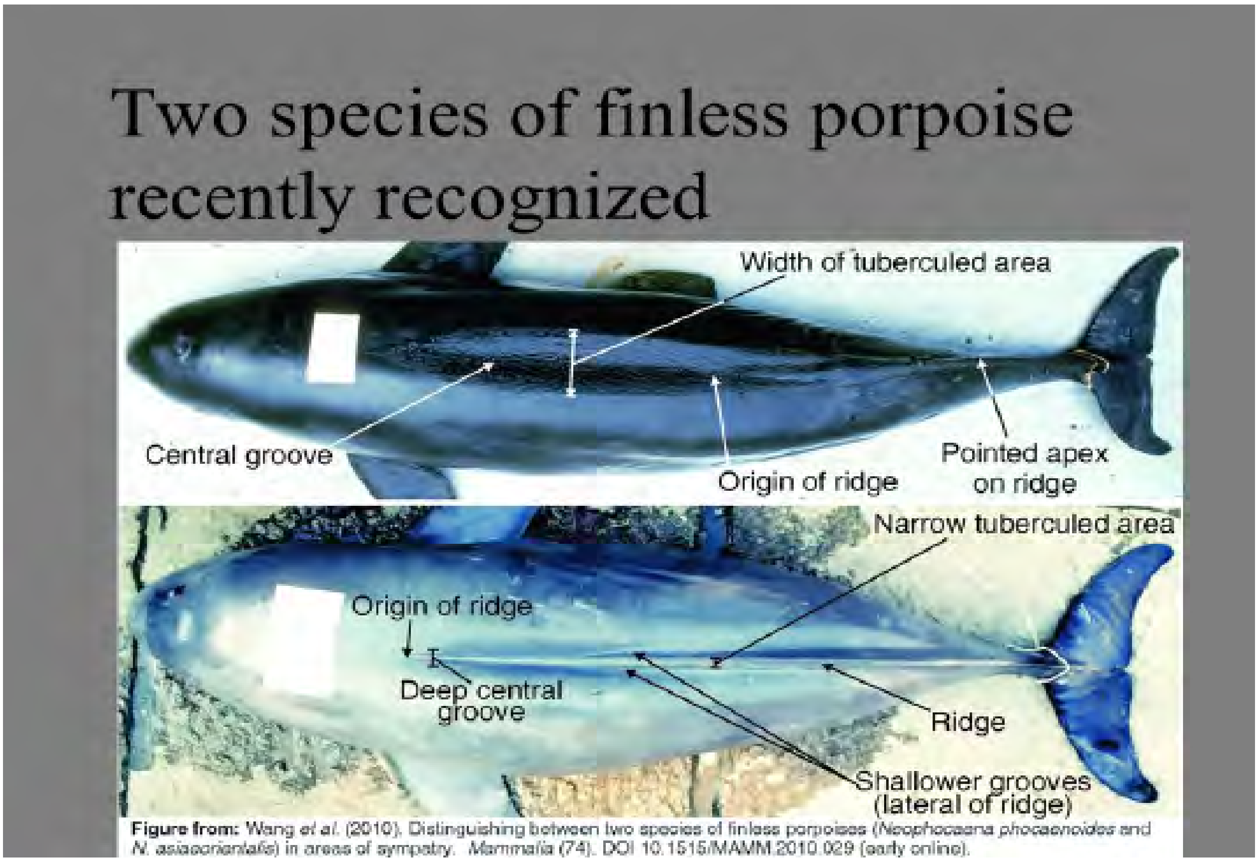
Redlisting

- Species-level and infra-species accounting
  - 87 species assessed but not up to date
  - 37 subspecies and regional/geographical populations ('subpopulations') assessed but far from complete
  - Species: 2 CR, 7 EN, 6 VU, 5 NT, 22 LC, 45 DD
  - Infra-species: 15 CR, 10 EN, 6 VU, 0 NT, 0 LC, 2 LRcd, 4 DD


Redlisting (continued)
- Can/should we extend concept of endemism to infra-species units?
- Examples of legal splitting of this kind
- Canada ('designatable unit' – *Orcinus*)
- US ('distinct population segment' – *Megaptera*)


Taxonomy
• 2004 cetacean systematics workshop in California
- Role of taxonomy in conservation
- Ultra-conservative nature of cetacean taxonomy to date
- Goal to identify species and groups of species for which clarified taxonomy has potential conservation value


Progress since 2004
Fieldwork, lab work, committee deliberations
Photo by: B.A. McLeod (courtesy of *FormosaCetus* Research and Conservation Group)


Two species of finless porpoise recently recognized
Width of tuberculed area
Central groove
Origin of ridge
Pointed apex on ridge
Narrow tuberculed area
Origin of ridge
Deep central groove
Ridge
Shallower grooves (lateral of ridge)
Figure from: Wang *et al.* (2010). Distinguishing between two species of finless porpoises (*Neophocaena phocaenoides* and *N. asiaeorientalis*) in areas of sympatry. *Mammalia* (74). DOI 10.1515/MAMM.2010.029 (early online).

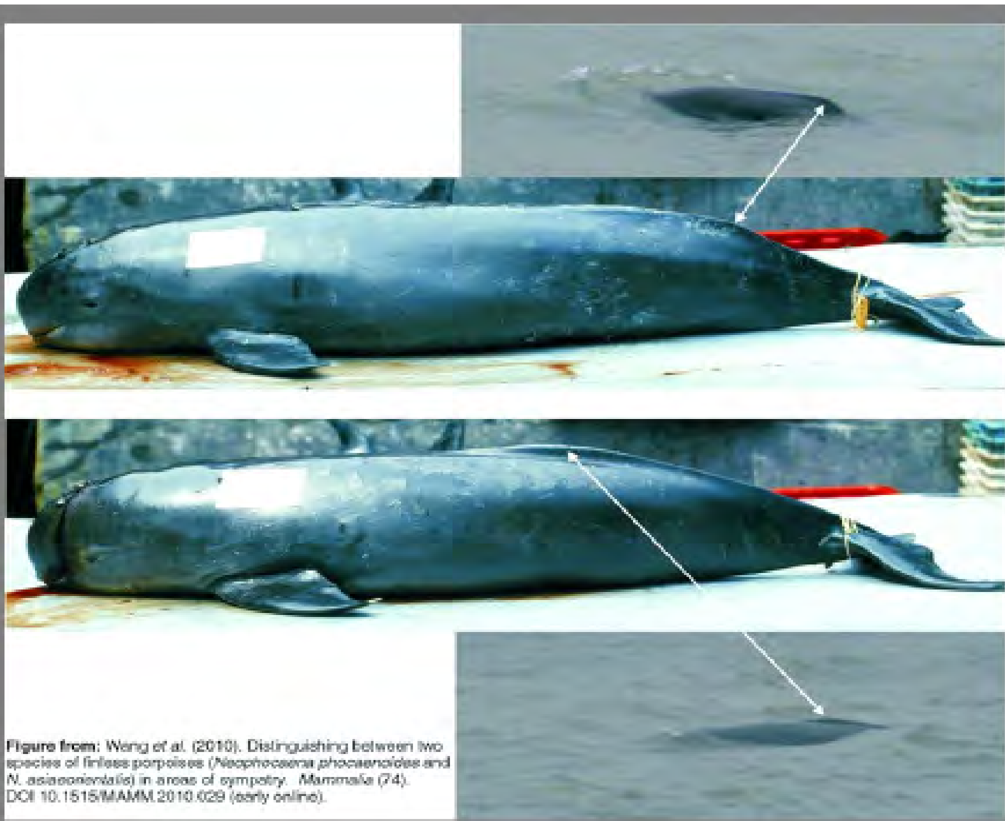


Figure from: Wang *et al.* (2010). Distinguishing between two species of finless porpoises (*Neophocaena phocaenoides* and *N. asiaeorientalis*) in areas of sympatry. *Mammalia* (74). DOI 10.1515/MAMM.2010.029 (early online).

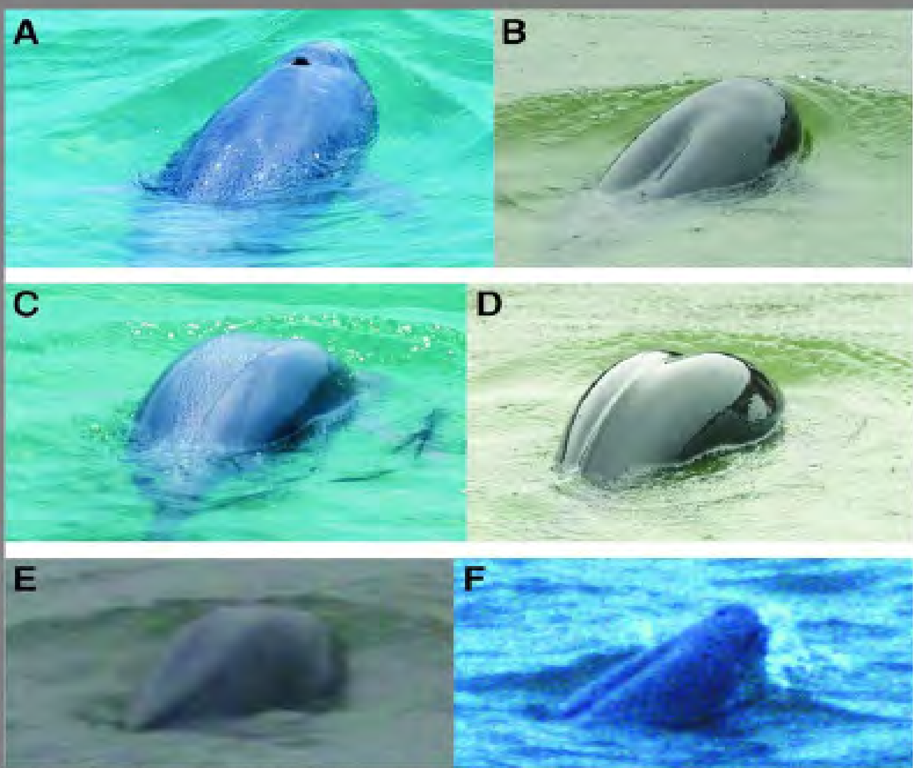


Figure from: Wang *et al.* (2010). Distinguishing between two species of finless porpoises (*Neophocaena phocaenoides* and *N. asiaeorientalis*) in areas of sympatry. *Mammalia* (74). DOI 10.1515/MAMM.2010.029 (early online).

Other New Developments

- *Mesoplodon hotuala* (Deraniyagala's beaked whale) – not yet published
- *Inia boliviensis* (Bolivian river dolphin)
- Additional species of *Inia*, *Tursiops*, probably more mesoplodonts

But should 'politics' influence taxonomy?

- This issue is being discussed in the literature – 'species inflation'
- Suggestion that cetaceans are 'handicapped' by difficulty of sampling – compared e.g. to birds, rodents
- Workshop on subspecies at 2009 biennial conference of SMM– follow-up to 2004 workshop
- Edited monograph under way


Nationalistic taxonomy? (Note orange T-shirts)


SAR

Diagnosis

Striped dolphin mass stranding in October 2007 in Iran. Photograph by Department of Environment, Iran.

After problem identification, diagnosis of causation is vital but often hugely challenging

- Rarely is a single factor clearly responsible for endangerment (but in case of vaquita…)
- In the case of the baiji, we still don't really know what the true culprit was – cumulative effects?
- Very hard to get governments, communities, or individuals to make unpleasant choices unless we have compelling evidence
- However, mortality reduction/elimination is always a defensible first step

Threats Dichotomy

Intentional

- Killing to obtain products
- Killing to 'control' (exterminate?)
- Catching for captive display/research

Unintentional

- Entanglement (bycatch)
- Vessel strikes
- Underwater noise
- Chemical contamination
- Prey depletion
- Environmental change

'Natural' threats a third category? (excessive predation, HABs, regime shifts)

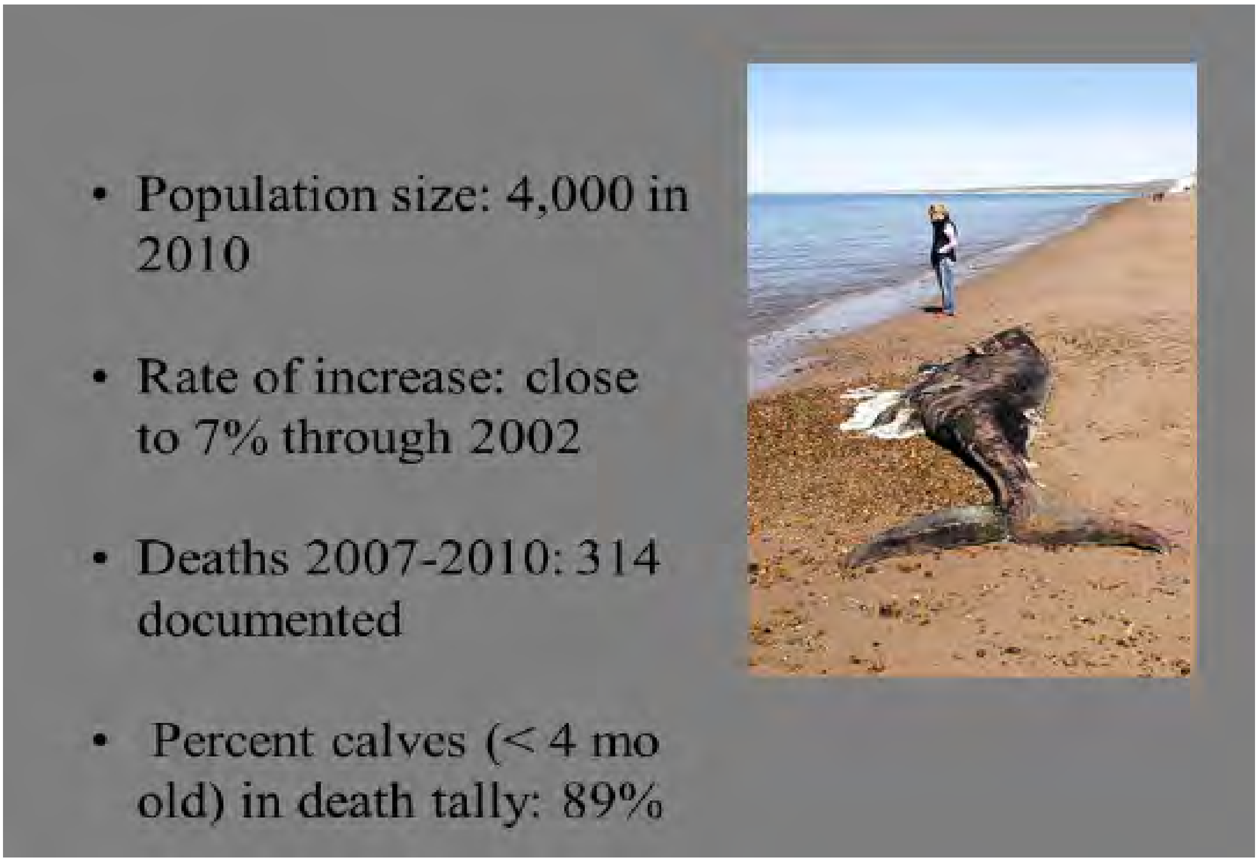
Mekong Dolphins

Why are so many calves dying?

The Evidence

- Population size: 85 (all ages)
- Nearly total recruitment failure
- No evidence to support disease, contaminants, or inbreeding as factors in high calf mortality
- Other factors to consider include: electro-fishing, disturbance by tourism, social or demographic problems – always bycatch


Southern Right Whales in Argentina


• Population size: 4,000 in 2010
• Rate of increase: close to 7% through 2002
• Deaths 2007-2010: 314 documented
• Percent calves (< 4 mo old) in death tally: 89%

Hypotheses

- Decreased food availability (krill) due to climate change?
- Biotoxins from harmful algal blooms
- Disease, possibly linked to gull-peck lesions
- Density-dependent effects of approaching K?

Bycatch

- Captures that are non-intentional, inadvertent, accidental

BUT

- Unintentional catch that is *discarded* is true bycatch
- Unintentional catch that is *retained* for consumption or sale is better described as non-targeted catch

(Literature often does not distinguish between discarded and retained)

Gray Areas

Large-mesh driftnet fisheries (e.g. Peru, Sri Lanka) Is this 'deliberate' bycatch?

Sirenians and cetaceans are valued in some areas for food, oil, bait

Fishermen use dolphin oil and body parts as an attractant for the fish species *C. gaura* (Smith et al 1998)

Special Cases

Marine debris (often lost or abandoned fishing gear)

Animals that are able to swim away with gear only to die later (cryptic bycatch)

Harbor porpoises in salmon driftnets in West Greenland

Dall's porpoises in Japanese N. Pacific salmon driftnets

Franciscanas in Uruguay in shark gillnets

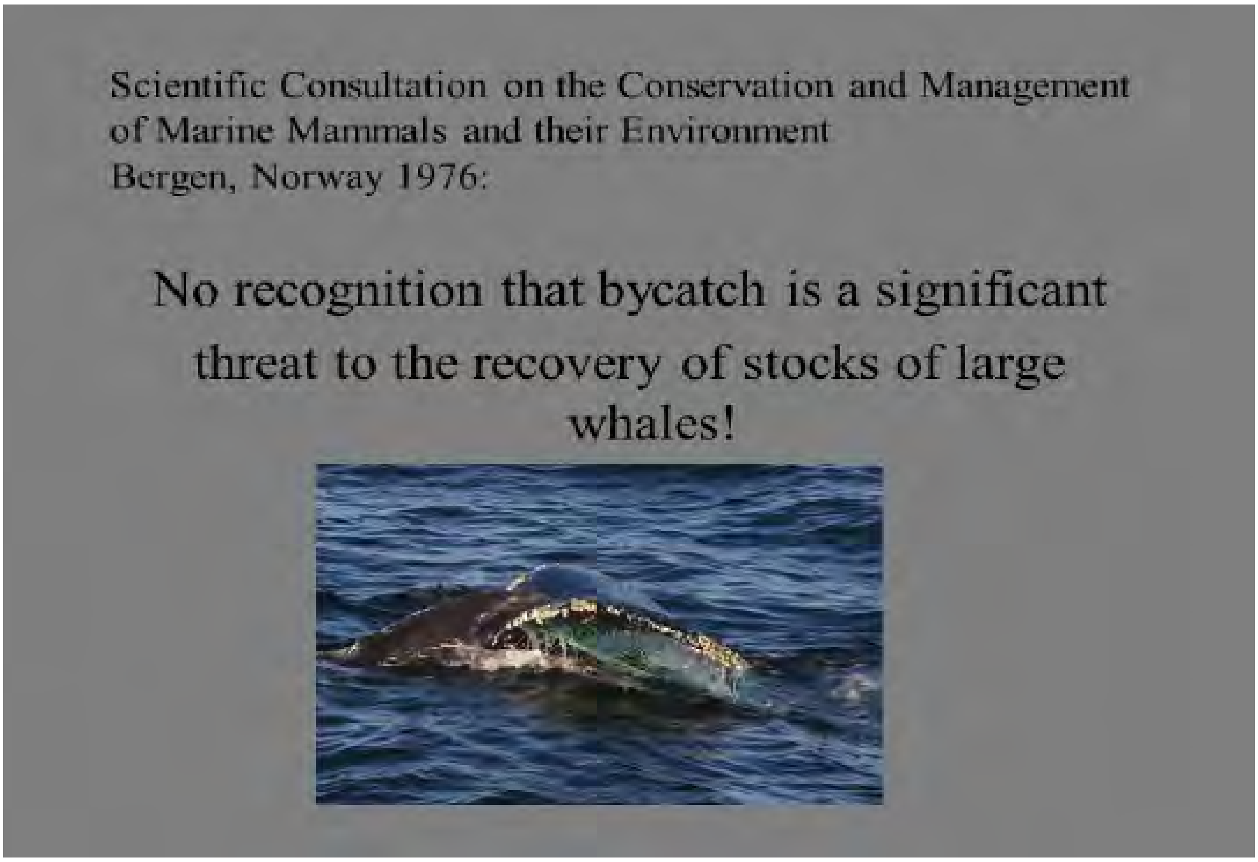
Small cetaceans in Chile

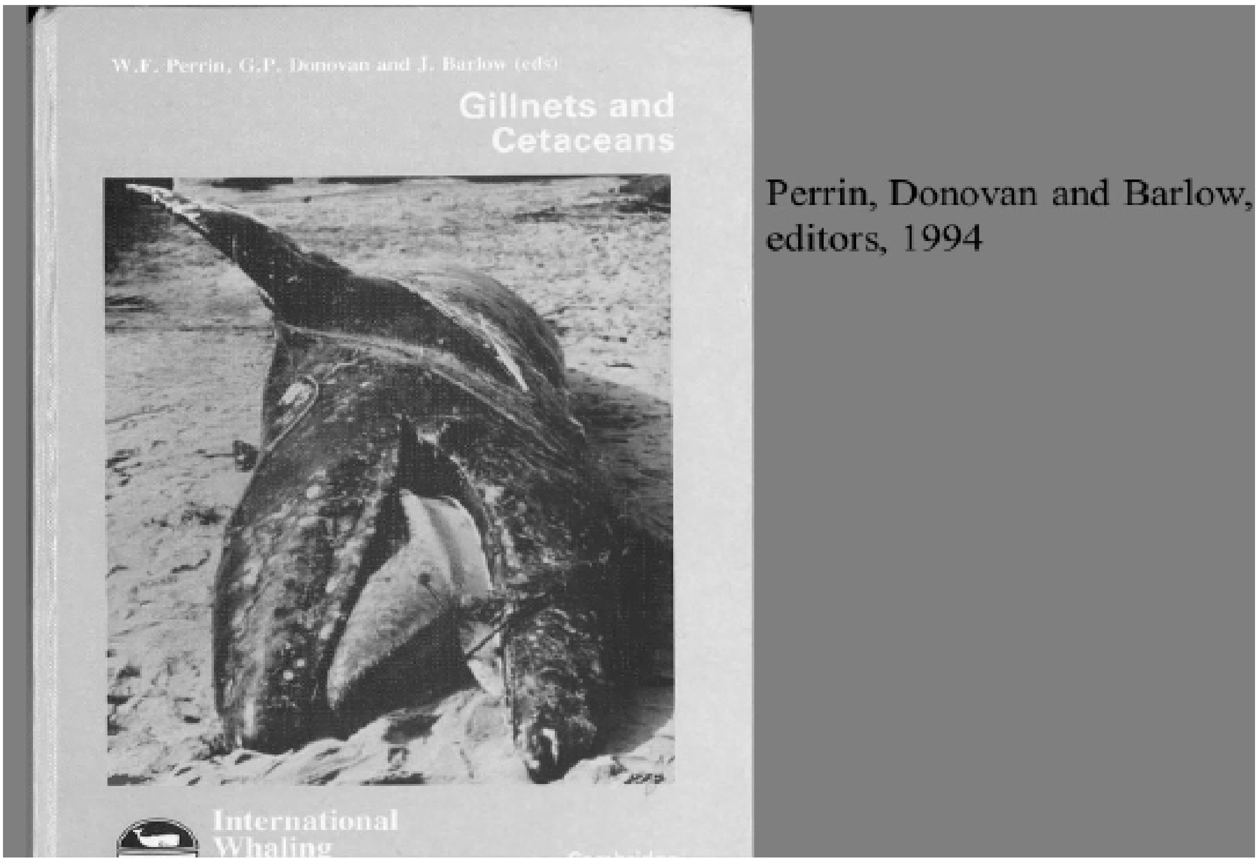
Burmeister's porpoise "fishery" in Peru

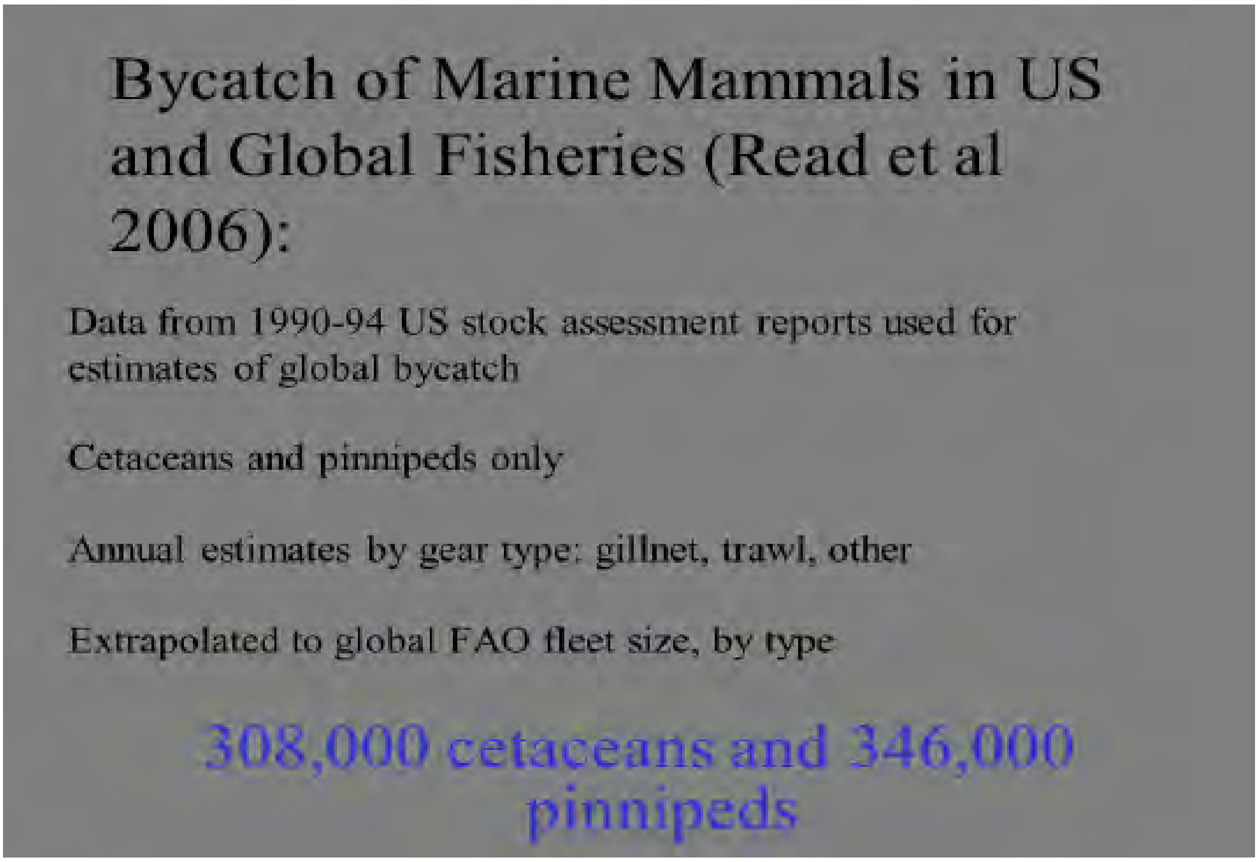
Scientific Consultation on the Conservation and Management of Marine Mammals and their Environment
Bergen, Norway 1976:

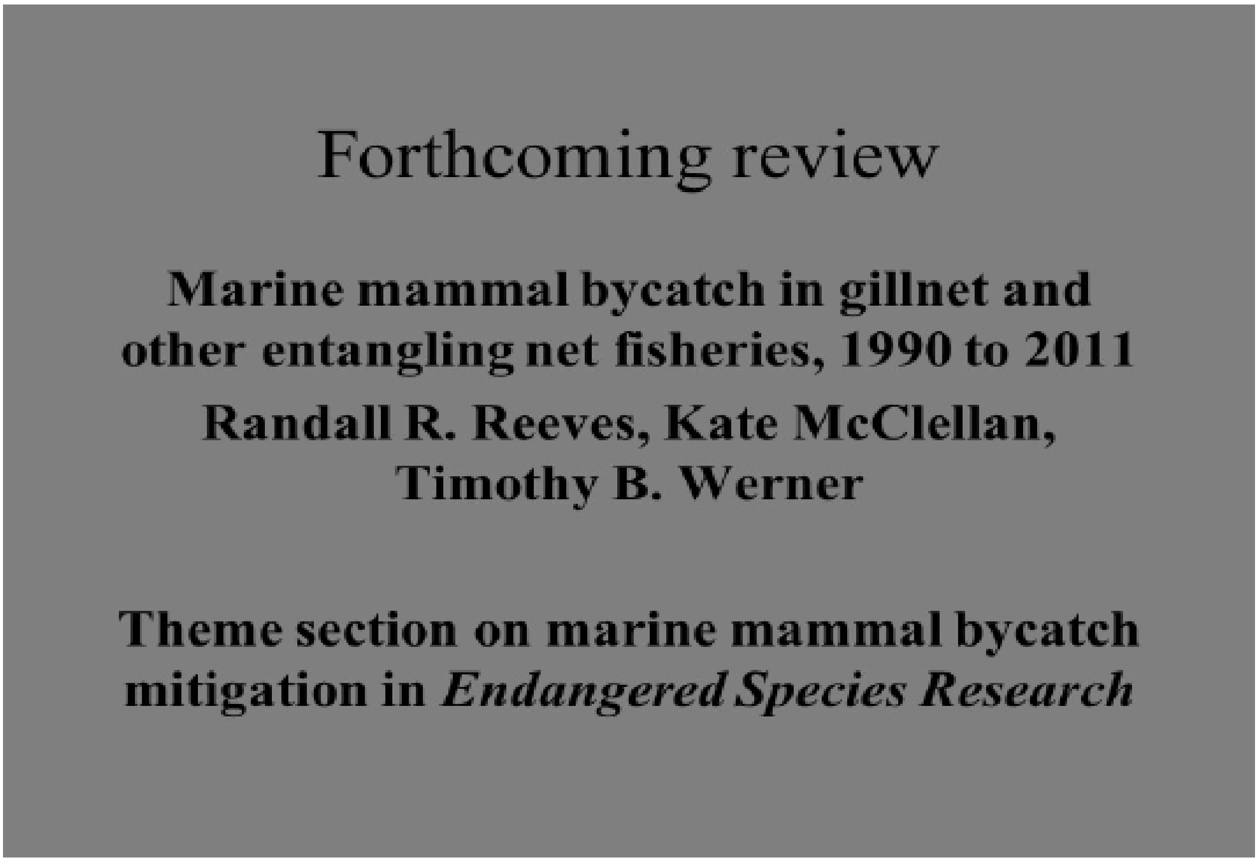
Small Cetaceans

"Study is needed to document the distribution of gill-net fisheries relative to that of small cetaceans, the extent of mortality resulting from incidental capture and the impact of this mortality on the populations involved."


Scientific Consultation on the Conservation and Management of Marine Mammals and their Environment
Bergen, Norway 1976:
No recognition that bycatch is a significant threat to the recovery of stocks of large whales!


W.F. Perrin, G.P. Donovan and J. Barlow (eds)
Gillnets and Cetaceans
International
Perrin, Donovan and Barlow, editors, 1994


Bycatch of Marine Mammals in US and Global Fisheries (Read et al 2006):
Data from 1990-94 US stock assessment reports used for estimates of global bycatch
Cetaceans and pinnipeds only
Annual estimates by gear type: gillnet, trawl, other
Extrapolated to global FAO fleet size, by type
308,000 cetaceans and 346,000 pinnipeds


Forthcoming review
Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011
Randall R. Reeves, Kate McClellan, Timothy B. Werner
Theme section on marine mammal bycatch mitigation in Endangered Species Research

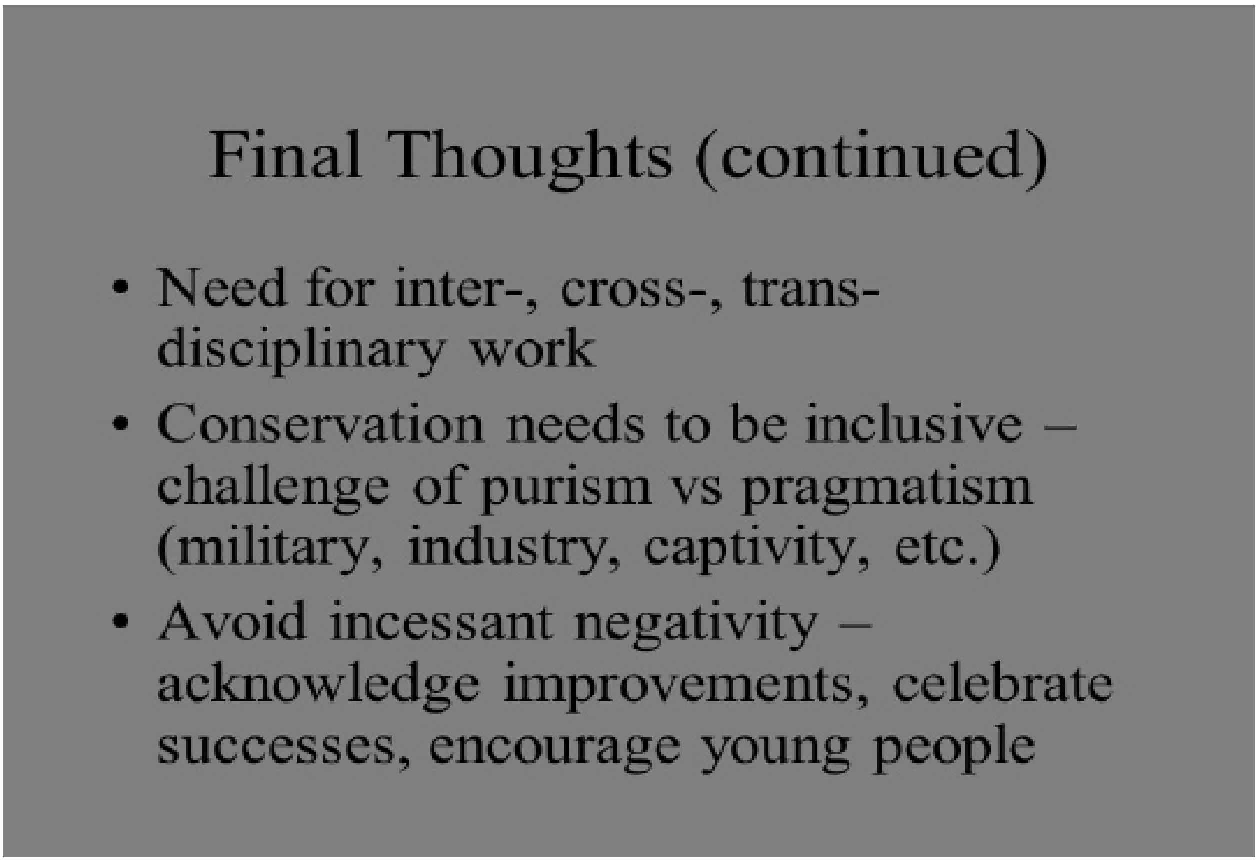
"The bycatch literature suggests a frequent pattern of problem discovery, followed by intense investigation and building of awareness, followed by a dropping-off of interest or focus as either (1) funding stops, (2) the researcher's interest or ability to pursue the topic recedes (e.g. after his/her academic degree work has been completed), (3) other priorities emerge and overtake this one, or (4) authorities manage to rationalize or conceal the problem."

"It is clear that a major data gap exists in the northern Indian Ocean and that improved marine mammal bycatch reporting from gillnet fisheries in that region should be a global priority." (N.B: annual catch levels by tuna gillnetting fleets from Indonesia, India, Pakistan, Oman, and Yemen are all greater than 20,000 tonnes)

"Perhaps the most important finding of this study is that, some 20-plus years after the landmark IWC workshop (Perrin et al. 1994), the threat of bycatch in passive fishing gear is far from resolved and is likely growing rather than receding. The remarkable shortage of rigorous, comprehensive bycatch accounting (e.g. long time series of annual estimates by species, stock, area, or fishery) was an unexpected and disappointing finding. There is a danger that other ongoing or looming threats, including bycatch in other types of fishing gear (e.g. trawls, purse seines, longlines), as well as habitat deterioration, vessel strikes, novel disease outbreaks, ingestion of plastic debris, overfishing of prey species, and the intractable effects of global climate change, will be allowed to overshadow the nagging, persistent threat of marine mammal bycatch in passive fishing gear, particularly for already threatened coastal species and small populations."

Final Thoughts

- Tendency to focus on questionable targets because they are relatively 'soft'
- Not all problems can be fixed with just more money
- Governance issues (security, stability, institutions, etc.) may need to be resolved before a fix is feasible (scientists can't do)
- Political and economic systems may need to be changed (scientists can't do)
- Human demography (scientists can't do)


Final Thoughts (continued)
• Need for inter-, cross-, trans-disciplinary work
• Conservation needs to be inclusive – challenge of purism vs pragmatism (military, industry, captivity, etc.)
• Avoid incessant negativity – acknowledge improvements, celebrate successes, encourage young people

Annex 2

Country Report Presentations

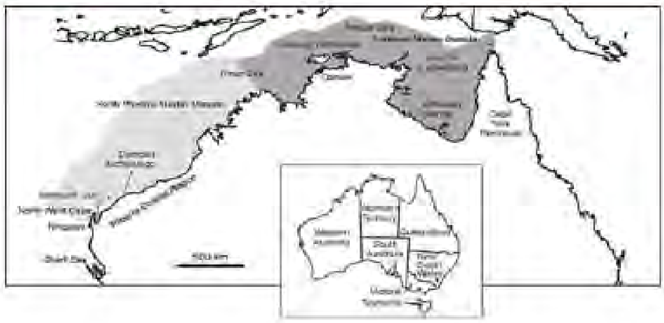
Australia

Status of small cetaceans and dugongs in the Australian waters of South East Asia

Guido J. Parra
Cetacean Ecology, Behaviour and Evolution Lab (CEBEL)

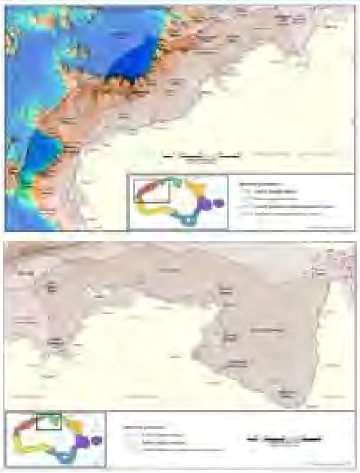
School of Biological Sciences, Flinders University

Australian waters in South East Asia



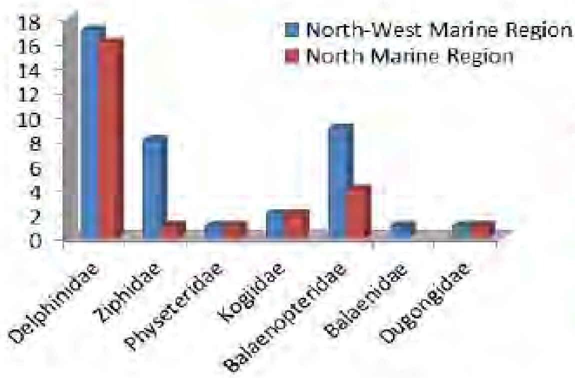
- Northwest Cape in the west to the tip of Cape York Peninsula in the east (15,000 km of coastline)
- Includes state (3nm from coast) Commonwealth waters (from state waters edge to 200 nautical miles from shore)

Australian waters in South East Asia



- North-West (1.07 million km^2) and North marine bioregions (625,689 km^2)
- Cetaceans and dugongs are considered conservation values of these marine bioregions
- All marine mammals in Commonwealth waters are protected under EPBC Act; Australian Whale Sanctuary

Marine mammals species known present



- Total: 39 species
  - 38 Cetaceans
  - 1 Sirenia
  - Mostly pelagic species

Population status

International Level-IUCN

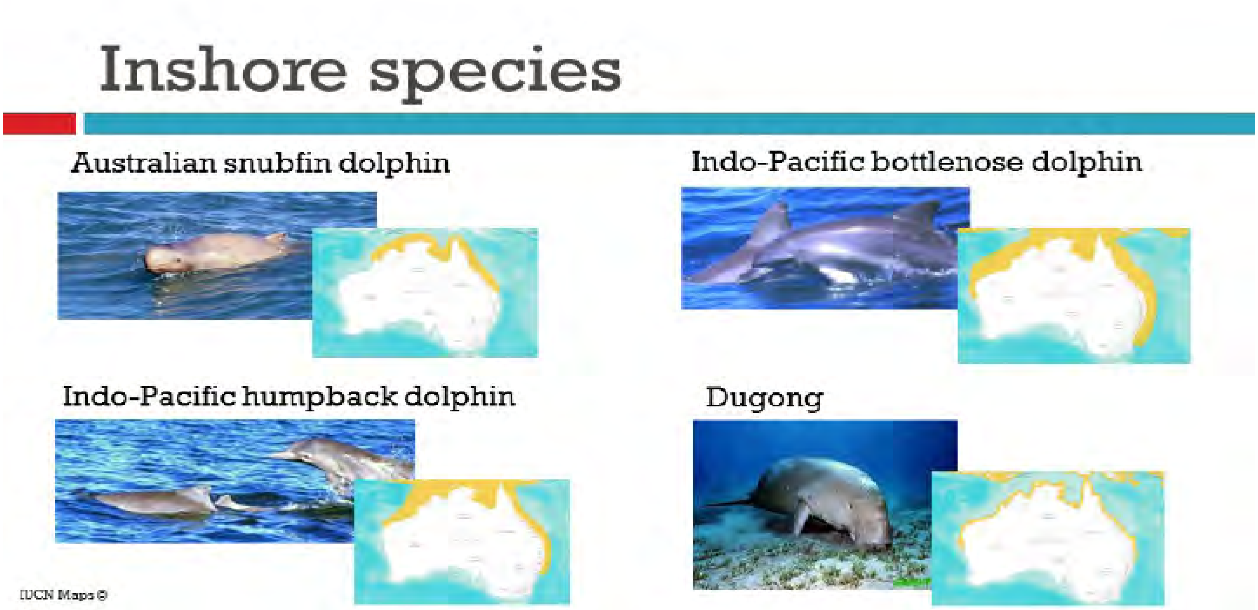
- Threatened
  - Sperm whale: *Vulnerable*
  - Blue whale: *Endangered*
  - Fin whale: *Endangered*
  - Sei Whale: *Endangered*
  - Dugong: *Vulnerable*
- Near Threatened
  - Australian snubfin dolphin
  - Indo-Pacific humpback dolphin

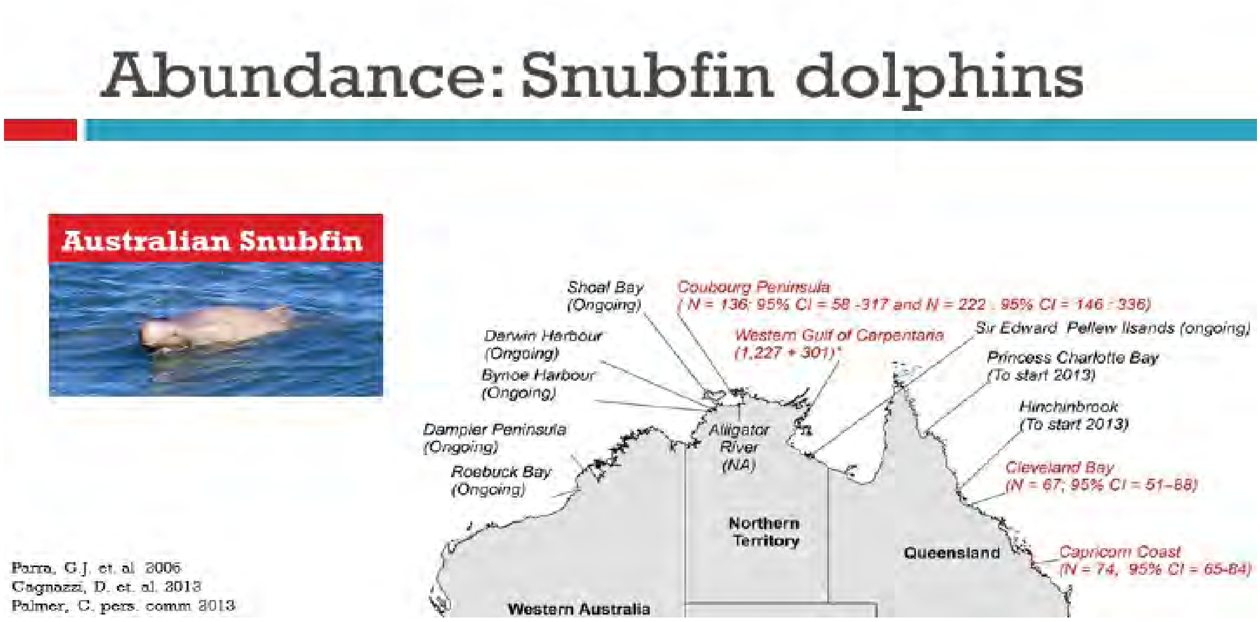
National Level-EPBC Act

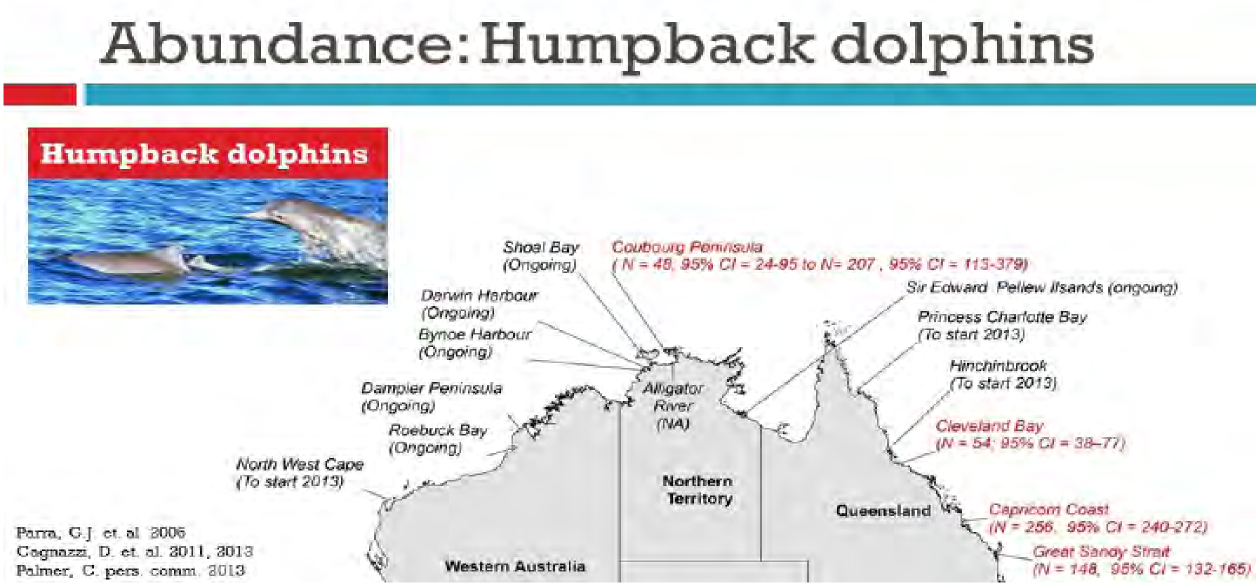
- Threatened
  - Humpback whale: *Vulnerable*
  - Fin whale: *Vulnerable*
  - Blue whale: *Endangered*
  - Southern Right whale: *Endangered*
- State level (QLD)
  - Snubfin dolphin: Near Threatened
  - Humpback dolphin: *Near Threatened*
  - Dugong: *Vulnerable*

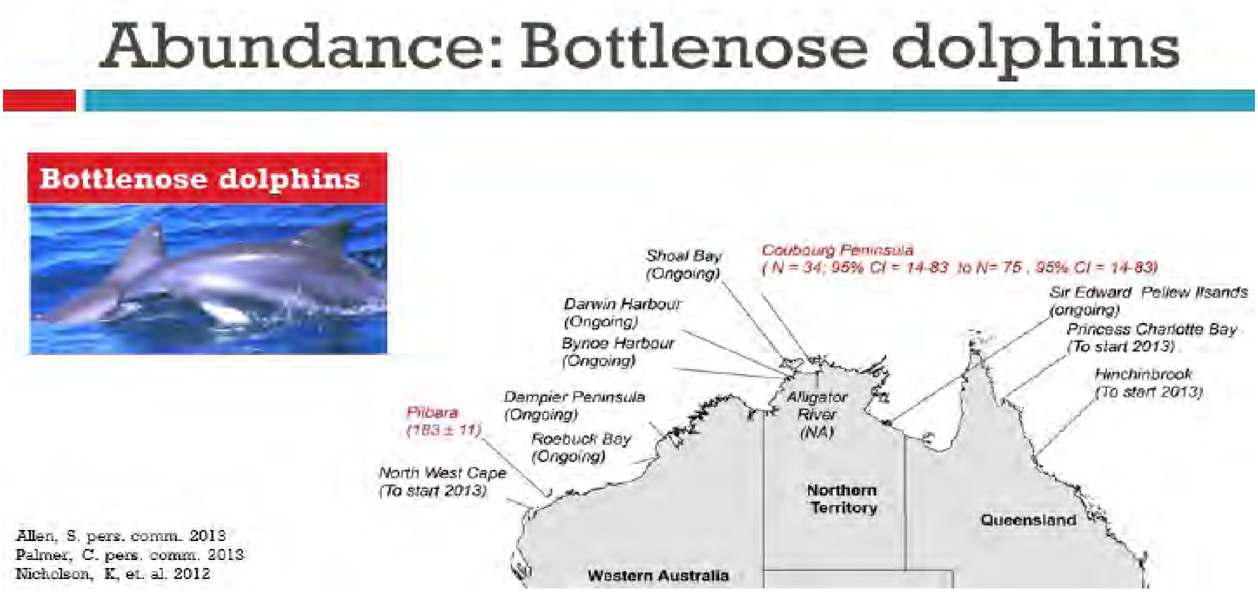
Population size and trends

- Overall abundance and population trends are not known for most species.
- Abundance estimates mainly available for inshore species over small local areas.
- Precludes conservation and impact assessments.

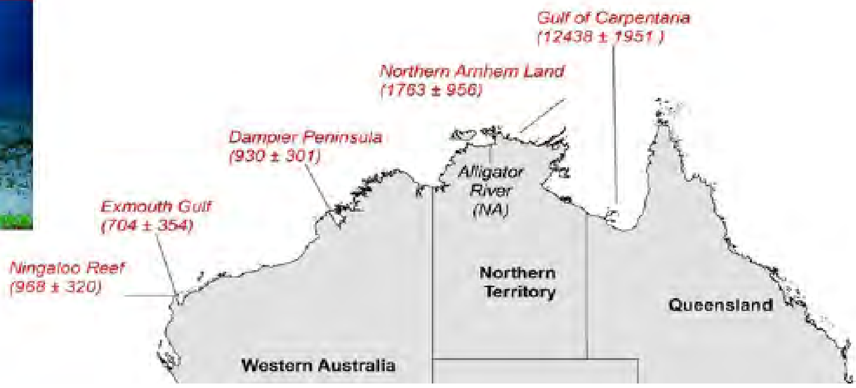

Inshore species
Australian snubfin dolphin
Indo-Pacific bottlenose dolphin
Indo-Pacific humpback dolphin
Dugong
IUCN Maps ©


Abundance: Snubfin dolphins
Australian Snubfin
Shoal Bay (Ongoing)
Coubourg Peninsula
(N = 136; 95% CI = 58 -317 and N = 222 . 95% CI = 146 - 336)
Darwin Harbour (Ongoing)
Bynoe Harbour (Ongoing)
Western Gulf of Carpentaria (1,227 ± 301)*
Sir Edward Pellew Ilsands (ongoing)
Princess Charlotte Bay (To start 2013)
Hinchinbrook (To start 2013)
Dampier Peninsula (Ongoing)
Roebuck Bay (Ongoing)
Alligator River (NA)
Cleveland Bay (N = 67; 95% CI = 51–88)
Northern Territory
Queensland
Capricorn Coast (N = 74, 95% CI = 65-84)
Western Australia
Parra, G.J. et. al. 2006
Cagnazzi, D. et. al. 2013
Palmer, C. pers. comm 2013


Abundance: Humpback dolphins
Humpback dolphins
Shoal Bay (Ongoing)
Coubourg Peninsula (N = 48, 95% CI = 24-95 to N= 207 , 95% CI = 115-379)
Sir Edward Pellew Ilsands (ongoing)
Darwin Harbour (Ongoing)
Bynoe Harbour (Ongoing)
Princess Charlotte Bay (To start 2013)
Hinchinbrook (To start 2013)
Dampier Peninsula (Ongoing)
Alligator River (NA)
Roebuck Bay (Ongoing)
Cleveland Bay (N = 54; 95% CI = 38–77)
North West Cape (To start 2013)
Northern Territory
Queensland
Capricorn Coast (N = 256, 95% CI = 240-272)
Great Sandy Strait (N = 148, 95% CI = 132-165)
Western Australia
Parra, G.J. et. al. 2006
Cagnazzi, D. et. al. 2011, 2013
Palmer, C. pers. comm. 2013

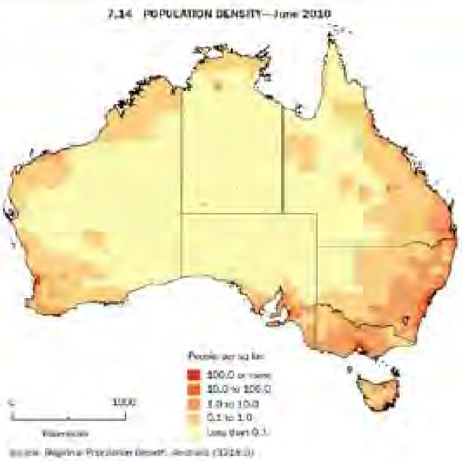

Abundance: Bottlenose dolphins
Bottlenose dolphins
Shoal Bay (Ongoing)
Coubourg Peninsula (N = 34; 95% CI = 14-83 to N= 75 , 95% CI = 14-83)
Sir Edward Pellew Ilsands (ongoing)
Darwin Harbour (Ongoing)
Princess Charlotte Bay (To start 2013)
Bynoe Harbour (Ongoing)
Hinchinbrook (To start 2013)
Dampier Peninsula (Ongoing)
Pilbara (183 ± 11)
Alligator River (NA)
Roebuck Bay (Ongoing)
North West Cape (To start 2013)
Northern Territory
Queensland
Western Australia
Allen, S. pers. comm. 2013
Palmer, C. pers. comm. 2013
Nicholson, K, et. al. 2012

Abundance: Dugongs



Marsh, H, et. al. 2008
Saalfeld, W.K. 2000
Hodgson, A. 2007

Habitat status



- Australian coast of Southeast Asia is remote and largely uninhabited
- Most of Australia's population is concentrated in coastal regions along the southeast and the southwest
- Nevertheless….

Habitat Status: Coastal zone development greatest threat

WESTERN AUSTRALIAN MINERAL AND PETROLEUM STATISTICS DIGEST 2011–12

- North-west Australia undergoing large-scale habitat modification through rapid coastal development
- The bulk of Australia's mineral exploration activity occurs in Western Australia. 53% of national mineral exploration expenditure in 2011–12.
- Western Australia : nation's premier petroleum producer, 62% natural gas 77 per cent of crude oil in 2011–12.

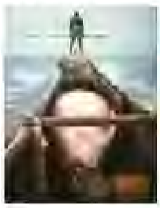
Directed catches

Cetaceans

- Direct killing of any cetacean is prohibited under the EPBC Act
- No evidence of direct killing

Dugongs

- Aboriginals are permitted to hunt dugongs
- Hunting mainly occurs in isolated areas between Cape York and Broome in Western Australia
- No records for most communities



By-catches

- Gillnets, demersal trawling and longlines, have been implicated but there are few estimates available
- Pilbara Trawl Fishery in the north-west: 20 to 50 dolphins are captured annually in the fishery since first assessed in 2002 (Allen 2010).
- Underwater footage indicated interaction rates are high (Jaiteh et. al. 2012)

Simon Allen ©

Other threats of concern

- Climate change
  - Long term impact on habitat and prey
- Pollution
  - Likely to increase due to rapid development
- Vessel traffic
  - Disturbance, displacement, collision

Present and potential marine mammal watching operations

- No marine mammal watching operations in Australian waters of SE Asia
- Cetacean tourism in Australia has been increasing rapidly with an annual growth rate of 8.3% in the last 10 yr (O'Connor et al. 2009).
- As tourism increases, potential grows for:
  - Ningaloo Reef
  - Kimberly region

Legal status and current management arrangements

Commonwealth Waters

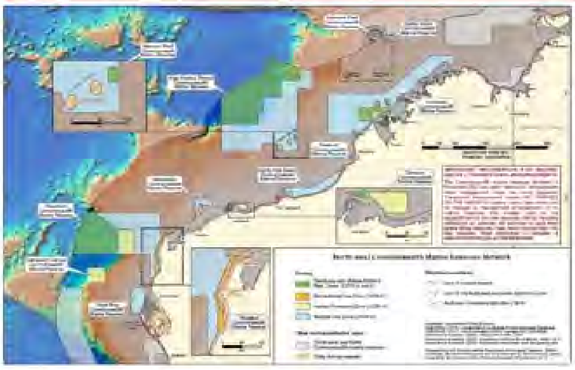
- *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- *Australian Whale Sanctuary*

State Waters

- WA
  - *Wildlife Conservation Act 1950.*
- NT
  - *Northern Territory Parks and Wildlife Conservation Act 2000.*
- QLD
  - *Nature Conservation Act 1992*
  - *Nat Conserv. (Whales, Dolphins and Dugong) Plan 1997*
  - *GBRMP Whale and Dolphin Conservation Policy 2000*

Conservation: Commonwealth waters

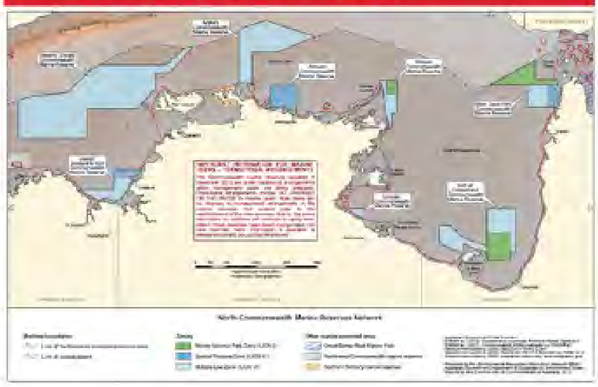
North-West Marine Bioregion



- Commonwealth marine reserves declared in November 2012
- Management plans come into effect in July 2014
- Primary purpose is biodiversity conservation, while allowing sustainable use of natural resources
- NW: 335,437 km^2, thirteen separate reserves

Conservation: Commonwealth waters

North Marine Bioregion



- Network protects 157,483 km^2 through eight separate reserves

Conservation: State waters

- North West
  - 4 Marine Parks
  - 2 Marine Reserves
  - Several MPAs proposed for Kimberly, Pilbara and Dampier region
- North
  - 2 marine parks

Existing research groups

CEBEL Flinders University
Cetacean Ecology, Behaviour and Evolution Lab

Murdoch University | CETACEAN RESEARCH UNIT

JAMES COOK UNIVERSITY AUSTRALIA

Australian National University

Centre for Marine Science and Technology (CMST)
Curtin University

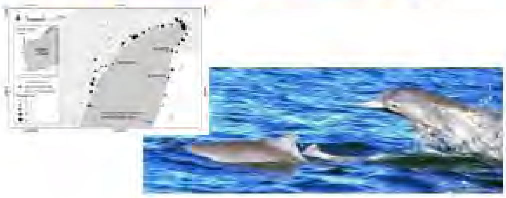
Northern Territory Government DEPARTMENT OF LAND RESOURCE MANAGEMENT

Centre for WHALE RESEARCH WESTERN AUSTRALIA

Ongoing research

CEBEL Flinders
Cetacean Ecology, Behaviour and Evolution Lab

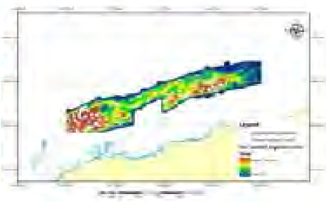
- Population genetics and phylogeography of Australian snubfin and humpback dolphins
  - Population structure and identification of MUs
- Ecology of humpback dolphins in the North west Cape region, WA
  - Abundance, habitat use, movement patterns, social and pop. structure



Ongoing research

Murdoch UNIVERSITY | CETACEAN RESEARCH UNIT

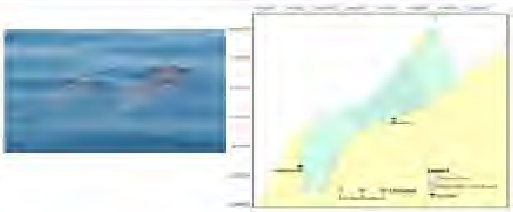
- Ecology of snubfin and humpback dolphins in the Kimberley region
  - Abundance, habitat use, movement patterns, social and pop. structure, passive acoustics
- Bycatch Pilbara Trawling Fishery
  - Assessments of bycatch rates, subsurface behaviour, abundance and genetic connectivity.

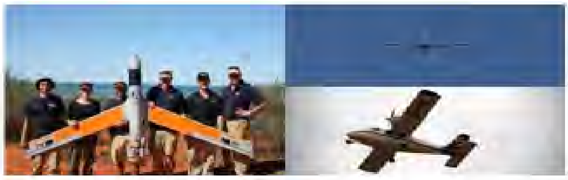


Ongoing research

Murdoch University | Cetacean Research Unit

- Chevron Dugong Research Program
  - Distribution, abundance, habitat use, movement patterns
- Unmanned Aerial Vehicles (for surveying marine mammal populations
  - Determine capabilities; assess detection probability; compare manned vs. UAV





Ongoing research

Australian National University | Centre for Marine Science and Technology (CMST) Curtin University | Murdoch University | Cetacean Research Unit

- Passive acoustic monitoring of coastal dolphins (MUCRU, CU, and ANU)
  - Develop a method for conducting passive acoustic surveys of inshore dolphins
- Roebuck bay inshore dolphin Project (ANU)
  - Distribution, abundance, habitat use, behaviour

Ongoing research

Northern Territory Government
DEPARTMENT OF LAND RESOURCE MANAGEMENT

- Darwin coastal dolphin monitoring program
  - Population dynamics, behaviour, habitat use
- Satellite Tagging of false killer whales
  - Movements, habitat use
- Cobourg Coastal dolphin monitoring program
  - Distribution, abundance, behaviour, habitat use

Ongoing research

JAMES COOK UNIVERSITY
AUSTRALIA

- Status of inshore dolphins in the Gulf of Carpentaria
  - Distribution, abundance, behaviour, habitat use
- Spatial population models of dugong distribution and relative
  - Spatial distribution and density modelling, spatial risk assessment
- Socio–economic studies of dugong harvest
  - Assessment of social and economic impact of dugong harvest

Research needs

- Rapidly developing region
  - Strong need for coordinated research strategy
  - Undertake a broad-scale assessment of their distribution, abundance and genetic population structure
  - Investigate their behavioural ecology and habitat preferences
  - Develop spatially explicit models of their distribution and density at a regional level
  - Conduct spatial risk assessment of the threatening processes

Acknowledgements

- Organizing committee for arranging sponsorship to attend the SEAMAM III conference.
- Many thanks to Amanda Hodgson, Simon Allen, Lars Bejder, Carol Palmer, Isabel Beasley, Helen Penrose, Chandra Salgado and Helene Marsh for providing valuable information, photos, maps for this report and presentation.

Baleen Whales in China

Baleen Whales in the Coastal Waters of China

Qian ZHU Ph. D Professor
Third Institute of Oceanography
State Oceanic Administration
Daxue Road 178, Xiamen 361005
People's Republic of China

Species and distribution of baleen whale in the Chinese coastal waters

Common name	Scientific name	Bohai Sea	Yellow Sea	East Sea	South China Sea
Suborder Mysticeti					
Family Balaenidae					
North Pacific right whale	*Eubalaena japonica*		+		
Family Eschrichtiidae					
gray whale	*Eschrichtius robustus*		+	+	+
Family					
Common minke whale	*Balaenoptera acutorostrata*	+	+	+	+
sei whale	*Balaenoptera borealis*		+	+	+
Bryde's whale	*Balaenoptera edeni* *		+	+	+
Omura's whale	*Balaenoptera omurai*			+	+
blue whale	*Balaenoptera musculus*		+	+	+
fin whale	*Balaenoptera physalus*	+	+	+	+
humpback whale	*Megaptera novaeangliae*		+	+	+

* includes more than one species, bur nomenclature still unsettled

Bowhead Whale

In total, baleen whale in the Chinese coastal waters contains 3 families, 4 genera, 9 species.

1 Population status: Unknown

2 Habitat status: Unknown

3 By-catch: Yes

4 Legal status: Order II

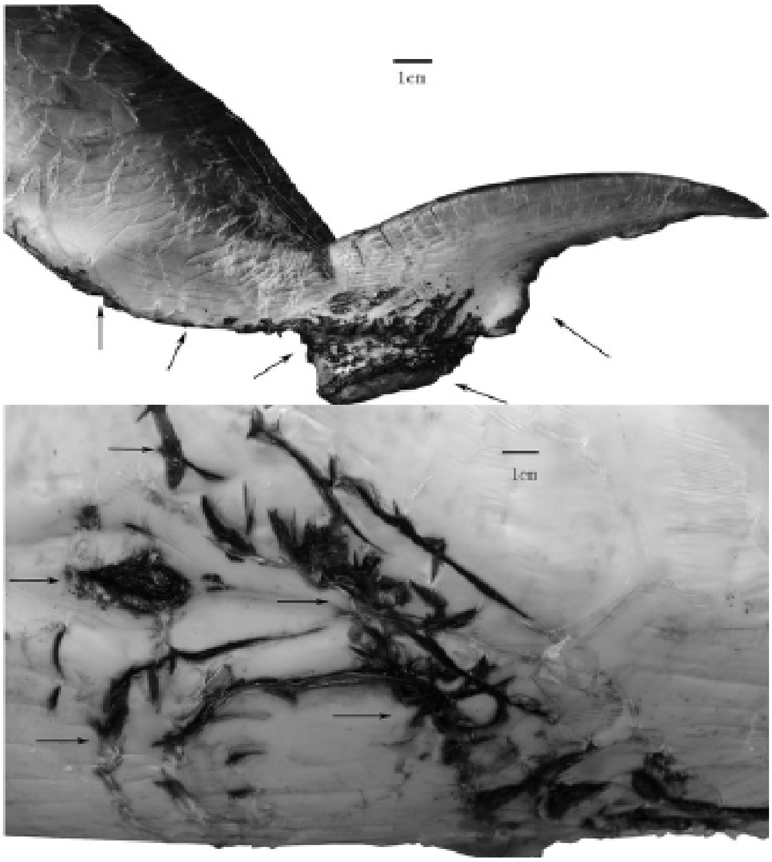
5 Fork attitudes:

6 Research programmes: None

Website: www.strandingnetchina.org


Common minke whale

Minke whale calf with body length 2.43m is bitten by shark, then bycaught on June 15, 2007 in Shidao, Weihai, suggesting its breeding ground is in China.



平潭搁浅的灰鲸

Gray Whale (By-catch, Set Net) in Pingtan, Fujian Province, PRC. Nov. 5, 2011

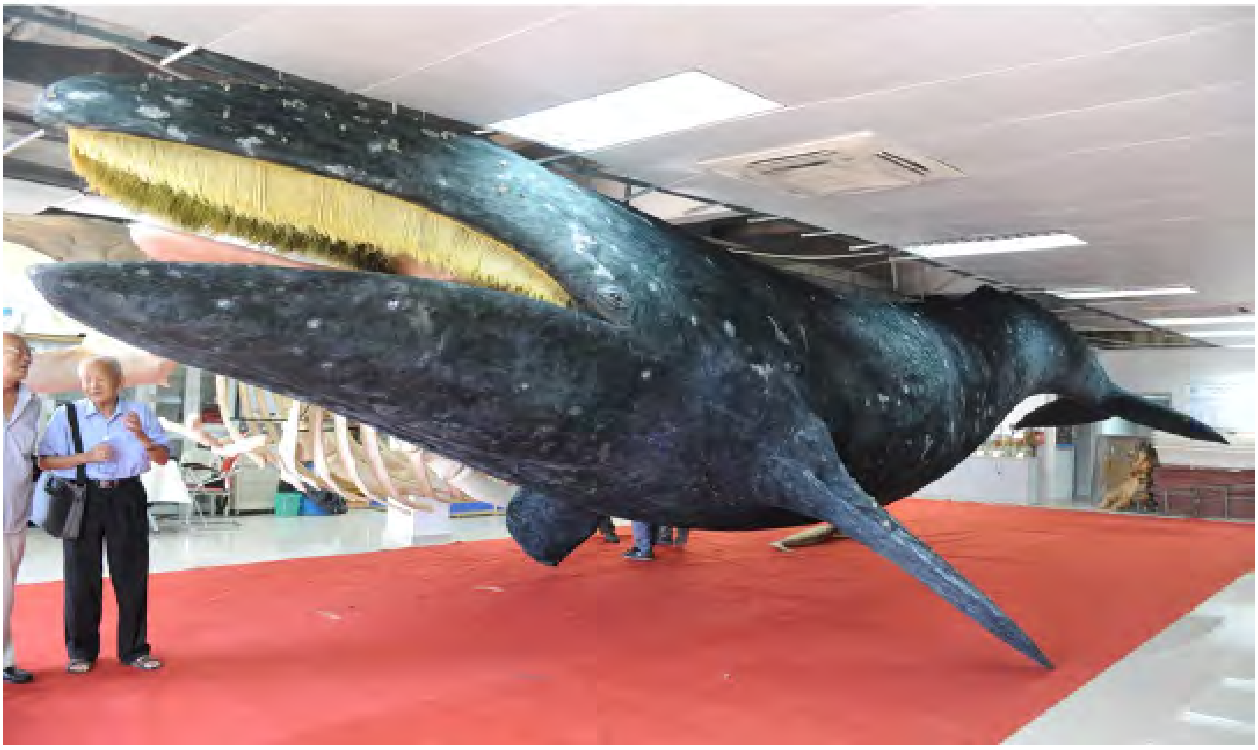
2011年11月5日，福建省平潭岛白青乡青峰村渔民出海做业时发现一头误撞定置网死亡的大型鲸类，将其拖至青峰村海滩，经鉴定为极其珍稀濒危的西太平洋灰鲸。为福建省的首次灰鲸搁浅案例，也是本世纪以来我国海域的首次灰鲸搁浅记录。

November 5, 2011, Pingtan, Fujian

灰鲸标本运输、制作过程
Transportation and Process of Skeleton and Skin

受福建省海洋与渔业局委托，国家海洋局第三海洋研究所负责该灰鲸标本的制作和保存，经厦门市水陆生物制品研究所制作成剥制标本和骨骼标本各一具。

Skin

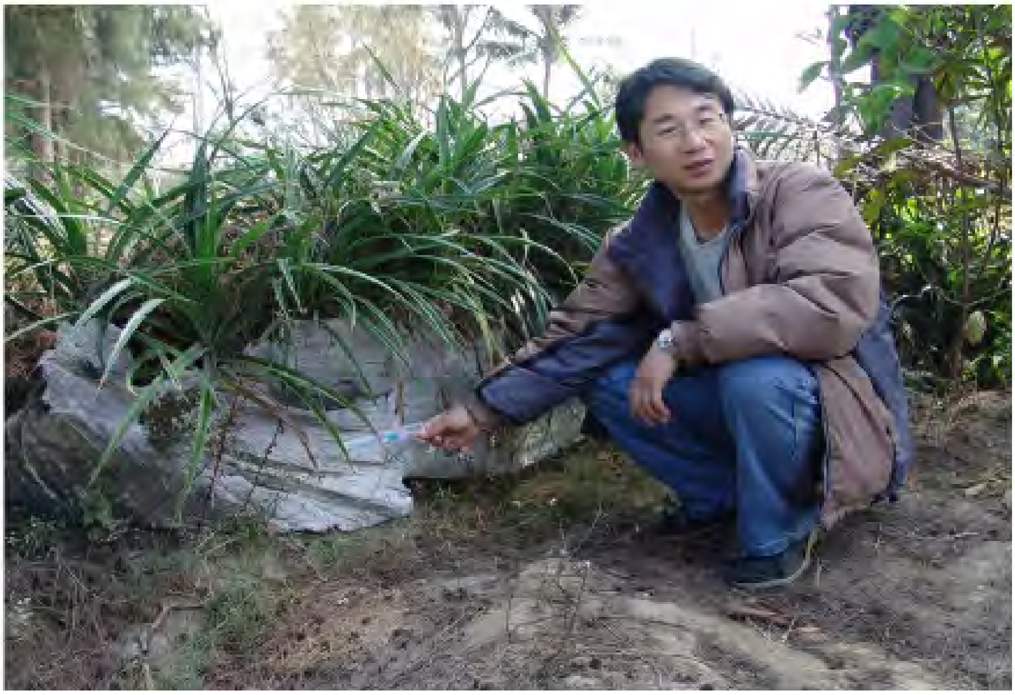


- Cyt b gene: as long as 526bp.
- The result in Genbank shows that this gray whale has the same sequence with *Eschrichtius robustus* （accession AP006471.1， AJ554053.1 ） in Japan.

Sequences producing significant alignments:

Accession	Description	Max score	Total score	Query coverage	E value	Max ident
AP006471.1	Eschrichtius robustus mitochondrial DNA, complete genome	972	972	100%	0.0	100%
AJ554053.1	Eschrichtius robustus complete mitochondrial genome	972	972	100%	0.0	100%
[illegible]	E.robustus mitochondrial gene for cytochrome b	883	883	90%	0.0	100%
AP006467.1	Megaptera novaeangliae mitochondrial DNA, complete genome	800	800	100%	0.0	94%
X72204.1	Balaenoptera musculus mitochondrial DNA complete genome	784	784	100%	0.0	94%
X61145.1	Balaenoptera physalus mitochondrial complete genome	784	784	100%	0.0	94%
AP006466.1	Balaenoptera bonaerensis mitochondrial DNA, complete genome	782	782	99%	0.0	94%
AP006470.1	Balaenoptera borealis mitochondrial DNA, complete genome	778	778	100%	0.0	93%
[illegible]	Eschrichtius robustus mitochondrion cytochrome b gene, partial cds	778	778	80%	0.0	99%
[illegible]	Balaenoptera edeni mitochondrial DNA, complete genome, isolate:NSI	773	773	100%	0.0	93%
AP006469.1	Balaenoptera brydei mitochondrial DNA, complete genome	756	756	100%	0.0	93%
[illegible]	Balaenoptera omurai cytochrome b (Cytb) gene, partial cds; mitochol	750	750	100%	0.0	92%
[illegible]	Balaenoptera brydei mitochondrial DNA, complete genome, isolate:NS	750	750	100%	0.0	92%
[illegible]	Balaenoptera omurai mitochondrial DNA, complete genome, isolate:NS	750	750	100%	0.0	92%
[illegible]	Balaenoptera omurai mitochondrial DNA, complete genome, isolate: N	745	745	100%	0.0	92%
AP006468.1	Balaenoptera acutorostrata mitochondrial DNA, complete genome	738	738	99%	0.0	92%
AJ554054.1	Balaenoptera acutorostrata complete mitochondrial genome	738	738	99%	0.0	93%

Whale Bone Collection



Omura’s whale

兽类学报，2007，27（3）：288－292
Acta Theriologica Sinica

利用 Cyt b 基因由未知鲸骨鉴定出大村鲸

马牧 祝茜[*] 李响 孙玉苗 刘莹莹 刘亚楠 陶翠花
（山东大学威海分校海洋学院，威海 264209）

关键词：鲸类脊椎骨；细胞色素 b 基因；分子进化树；种类鉴定；大村鲸
中图分类号：Q754 文献标识码：A 文章编号：1000－1050（2007）03－0288－05

Identification of *Balaenoptera omurai* from an unknown whale vertebra based on Cyt b gene sequence

MA Mu, ZHU Qian[*], LI Xiang, SUN Yumiao, LIU Yingying, LIU Yanan, TAO Cuihua
(*Ocean College, Shandong University at Weihai, Weihai 264209, China*)

Abstract: In order to identify an unknown whale vertebra's species, genomic DNA is extracted from the bone powder by proteinase K and phenol/chloroform, and a partial Cyt b gene sequence as long as 565 bp is amplified by PCR (Polymerase Chain Reaction). The blasting result in GenBank shows that the vertebra sample has maximal similarity with *Balaenoptera omurai*, it is 99%. It indicates that the vertebra is *Balaenoptera omurai*. The phylogenetic tree based on UPGMA is consistent with the blasting result. Analysis of software MEGA shows that the Cyt b gene sequence of the vertebra sample has 1－2 nucleotides which are different from the homologous sequence of *B. omurai* (accession AB201257, AB201256), thus, the sequence is a new haplotype. This is the first record of *B. omurai* which distributes in the South China Sea.
Key words: *Balaenoptera omurai*; Cytochrome b gene; Phylogenetic tree; Species identification; Whale vertebra

2011年12月27日，搁浅在平潭县东庠乡海滩的须鲸。
从外部形态特征和鲸须判断，该须鲸可能为长须鲸或者大村鲸。

1 Cyt b gene: as long as 526bp.

The result in Genbank shows that this whale has the same sequence with *Omura's whale*（accession **EF103940.1，AB201257.1**).

2 COI gene: as long as 659bp.

The result in Genbank shows that this whale has the same sequence with *Omura's whale*（accession **AB201256.1**).

Cetaceans in China

Status Reports on Marine Mammals in Chinese waters

Kaiya Zhou[a], Samuel K Hung[b], Qian Zhu[c]

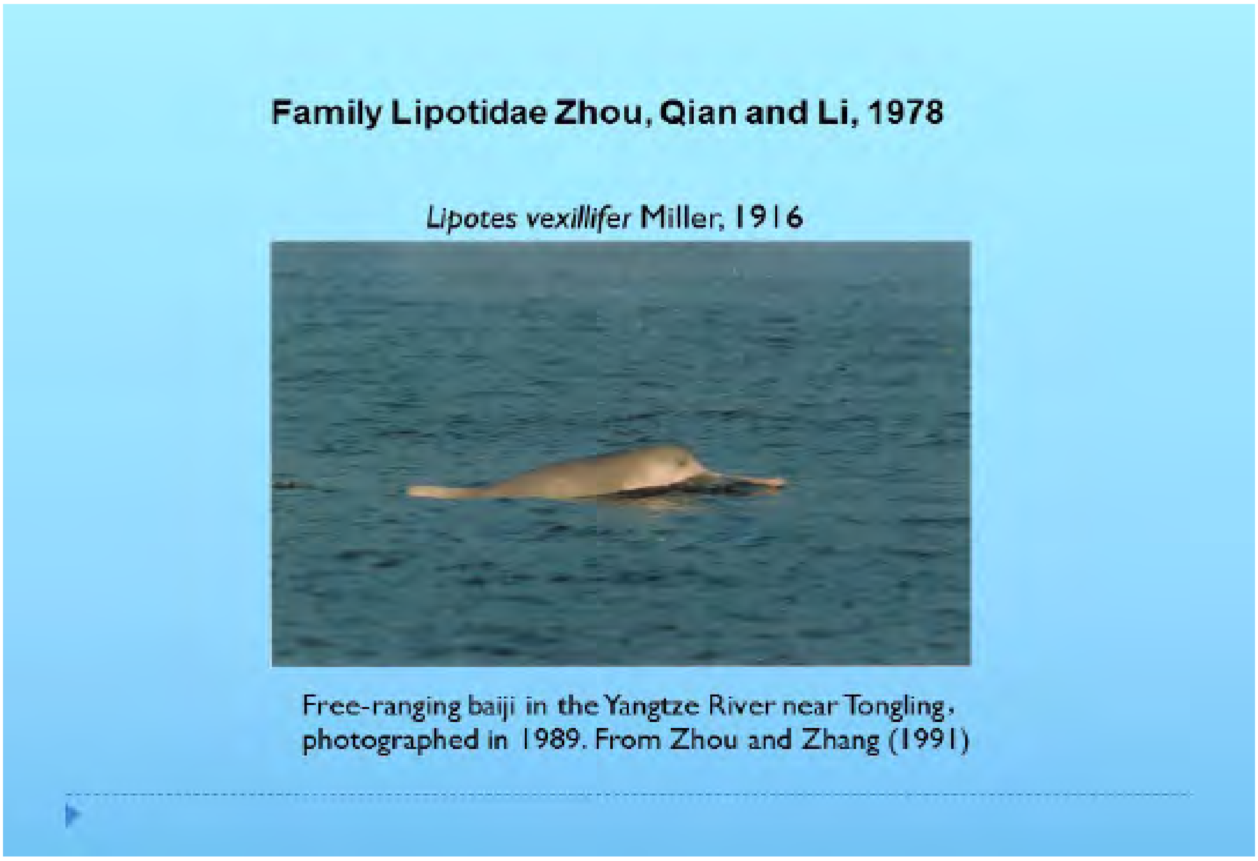
[a] College of Life Sciences, Nanjing Normal University, Nanjing, China
[b] Hong Kong Cetacean Research Project, Lam Tin, Kowloon, Hong Kong SAR, China
[c] The Third Marine Research Institute of the State Oceanic Administration, Xiamen, China

The Chinese marine mammals include representatives in three mammalian orders, Cetartiodactyla, Carnivora and Sirenia.

Table 1. Number of genera and species in the families of Chinese marine mammals

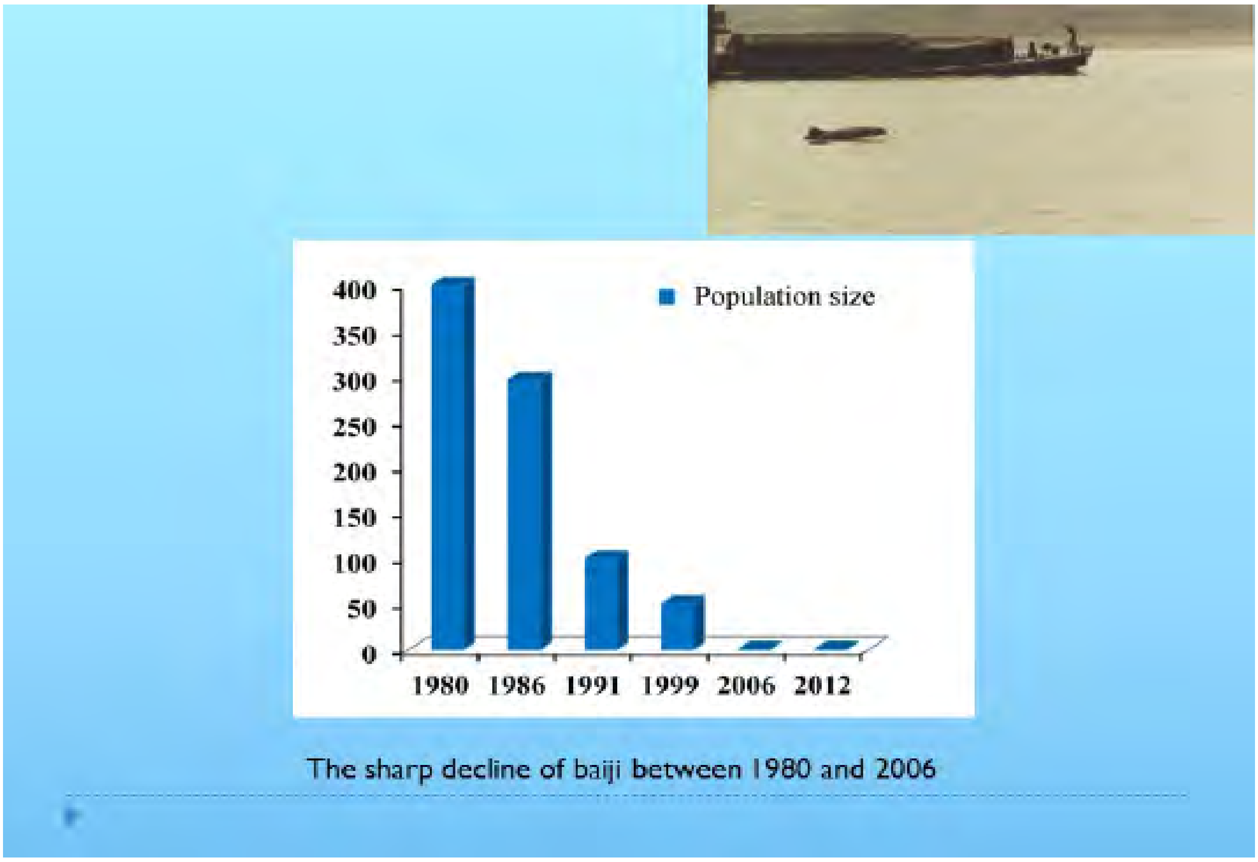
Family	Number of genera	Number of species
Balaenidae	1	1
Eschrichtiidae	1	1
Balaenopteridae	2	7
Physeteridae	1	1
Kogiidae	1	2
Ziphiidae	4	6
Lipotidae	1	1
Delphinidae	13	17
Phocoenidae	1	2
Otariidae	2	2
Phocidae	3	3
Dugongidae	1	1
Total	31	44

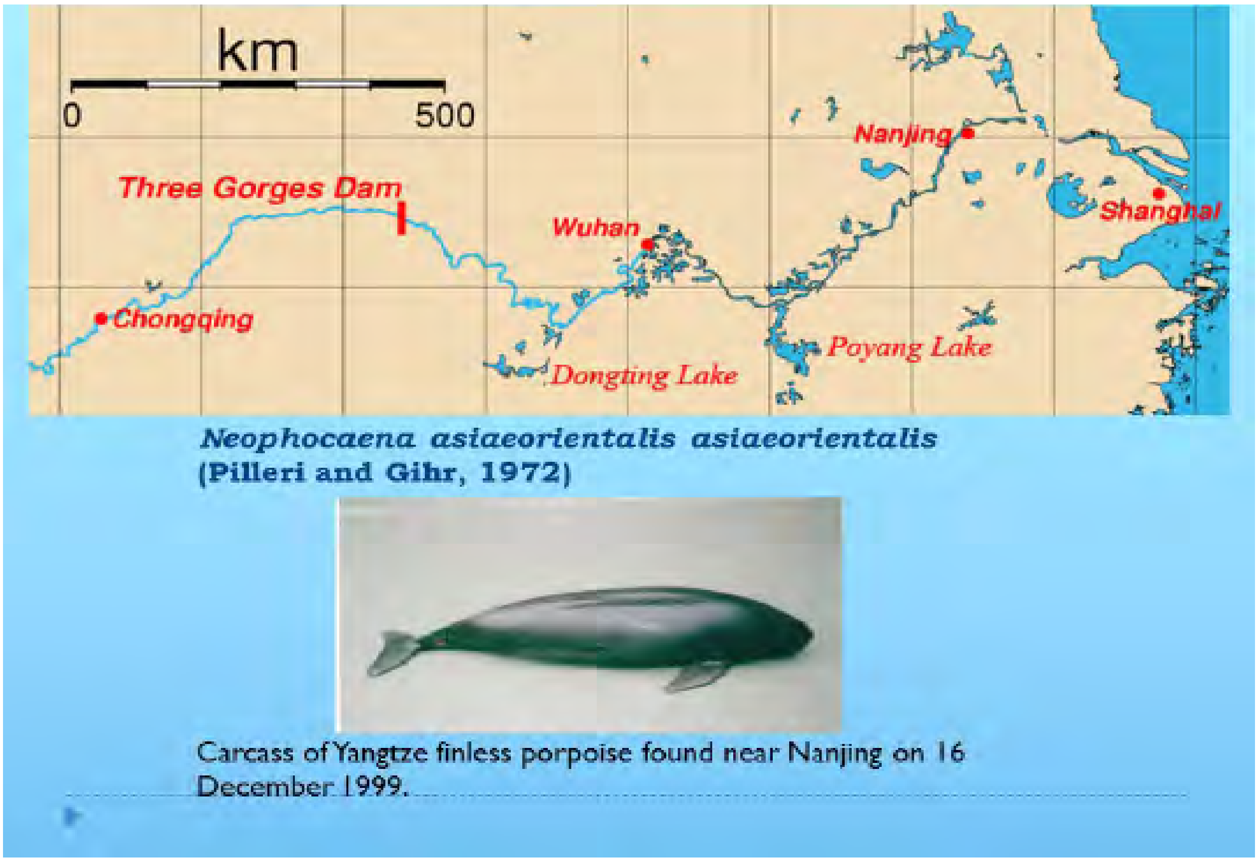

Harmful effects of the human activities on three of the cetaceans are especially serious : Baiji or Yangtze river dolphin, Yangtze finless porpoise and Chinese populations of Indo-Pacific humpback dolphins.
CHINA SHIPPING LINE
There have been massive human activities in major rivers and along the Chinese coast for several decades during China's rapid economic rise. The cetaceans historically distributed in the Yangtze River and near shore coastal waters have declined drastically due to anthropogenic factors since the 1980s.


Family Lipotidae Zhou, Qian and Li, 1978
Lipotes vexillifer Miller, 1916
Free-ranging baiji in the Yangtze River near Tongling, photographed in 1989. From Zhou and Zhang (1991)

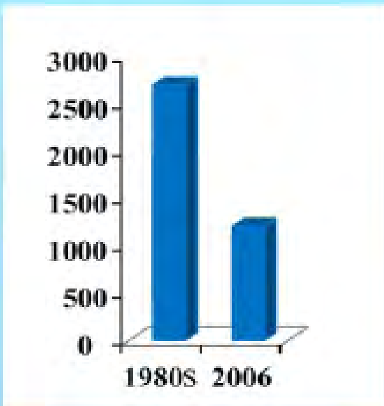
Baiji carcass of 2.45 m adult female with a notch on dorsal fin; found drifting down river near Jiangyin on 15 January 1996. From Zhou et al, 1998a

Historical distribution of the baiji in main Yangtze River and neighbouring water bodies. The blue dot indicates baiji distribution by 1940s; the green dot indicates baiji distribution by 1970s; the yellow square indicates the remnant habitat of the baiji inferred from three surveys conducted in 1997-1999.


Population size
400
350
300
250
200
150
100
50
0
1980 1986 1991 1999 2006 2012
The sharp decline of baiji between 1980 and 2006


km
0
500
Three Gorges Dam
Chongqing
Wuhan
Dongting Lake
Poyang Lake
Nanjing
Shanghai
Neophocaena asiaeorientalis asiaeorientalis
(Pilleri and Gihr, 1972)
Carcass of Yangtze finless porpoise found near Nanjing on 16 December 1999.

Baiji and Yangtze finless porpoise feeding together, black-headed gulls feeding in the same spot. Photograph taken on 17 March 1990 in Anqing section of the Yangtze River.



The sharp decline of Yangtze finless porpoise between 1980S and 2006.

Yangtze finless porpoises deaths in 2012

Carcass of Yangtze finless porpoise found near Nanjing on 21 May 2012 (Photograph Wu Sheng).
Two additional cases of finless porpoises death were found in the Jiangsu section of the Yangtze River in May 2012.

Thirty-two porpoises were found dead in March and April, 2012, in Dongting and Poyang Lakes;

One porpoise was found dead on 23 April at Pengze section of the Yangtze River, Jiangxi province;

Eight porpoises were found dead until the end of April 2012 in Anqing section of the river, Anhui province.

The Yangtze finless porpoise is on the verge of extinction

- Only 380 Yangtze finless porpoises were sighted during a 44 days survey of the Yangtze River's middle and lower stretches conducted in November and December 2012.
- Spike in deaths last spring raising concerns that the freshwater population of finless porpoise is being pushed closer to extinction.
- Yangtze finless porpoises may die out within 15 to 20 years.

The threats to the Yangtze finless porpoises:

- Heavy river traffic;
- Damming;
- Sand dredging;
- Water pollution;
- Reduction of fisheries resources;
- Illegal fishing practice including electrofishing;

The Yangtze finless porpoises should be protected in three ways

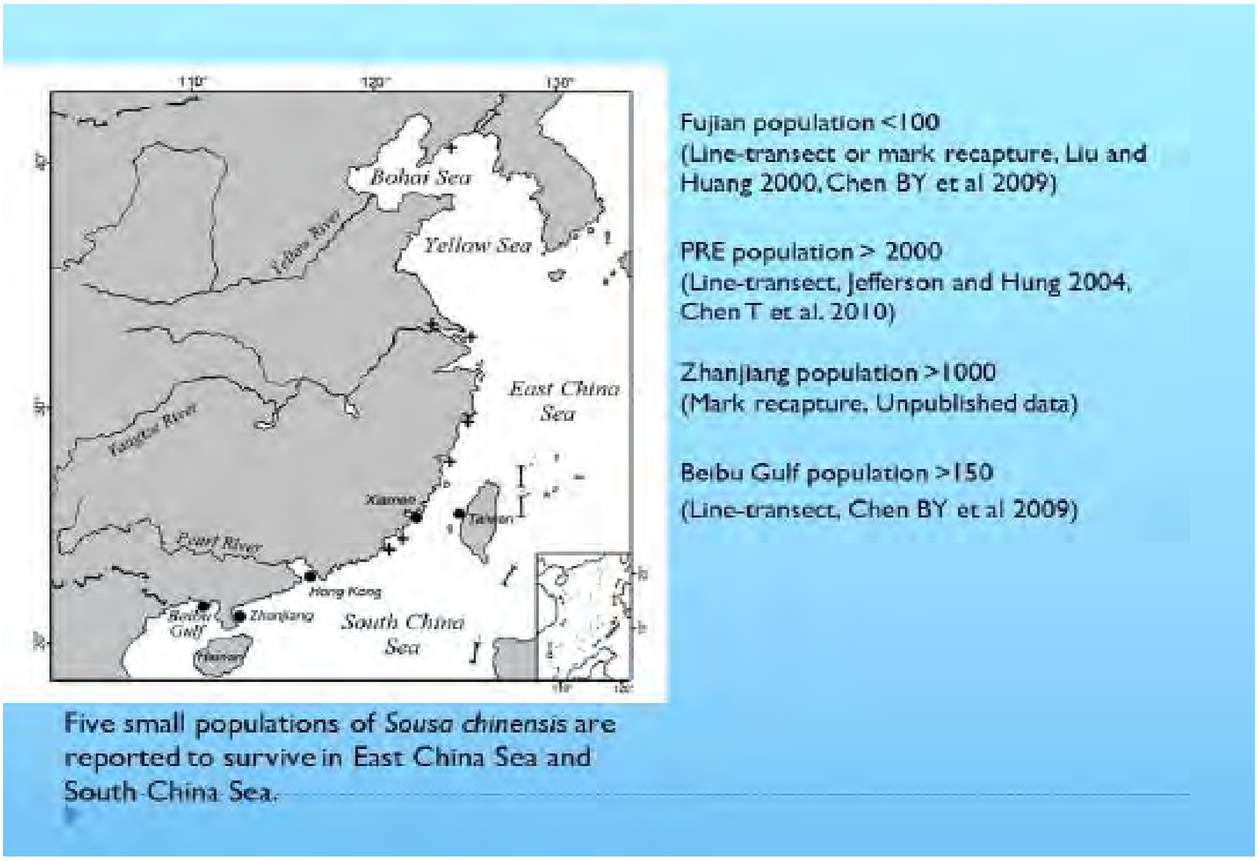
- Conservation in its natural habitat.
- Off-site conservation.
- Captive breeding.

Sousa chinensis (Osbeck, 1765)


图例


Several Indo-Pacific humpback dolphins
very close to the beach
Indo-Pacific humpback dolphins inhabit in shallow, coastal waters. They can be found in waters only a few meters from the land and therefore are vulnerable to near shore human activities.


Threats to Indo-Pacific humpback dolphins in Chinese waters
Port construction
Reclamation
Explosion
Busy sea traffic
Over fishing
Water pollution
Habitat degradation


Bohai Sea
Yellow Sea
Yellow River
East China Sea
Yangtze River
Xiamen
Taiwan
Pearl River
Hong Kong
Zhanjiang
South China Sea
Beibu Gulf
Fujian population <100
(Line-transect or mark recapture, Liu and Huang 2000, Chen BY et al 2009)
PRE population > 2000
(Line-transect, Jefferson and Hung 2004, Chen T et al. 2010)
Zhanjiang population >1000
(Mark recapture, Unpublished data)
Beibu Gulf population >150
(Line-transect, Chen BY et al 2009)
Five small populations of *Sousa chinensis* are reported to survive in East China Sea and South China Sea.

Sousa chinensis in Zhanjiang waters

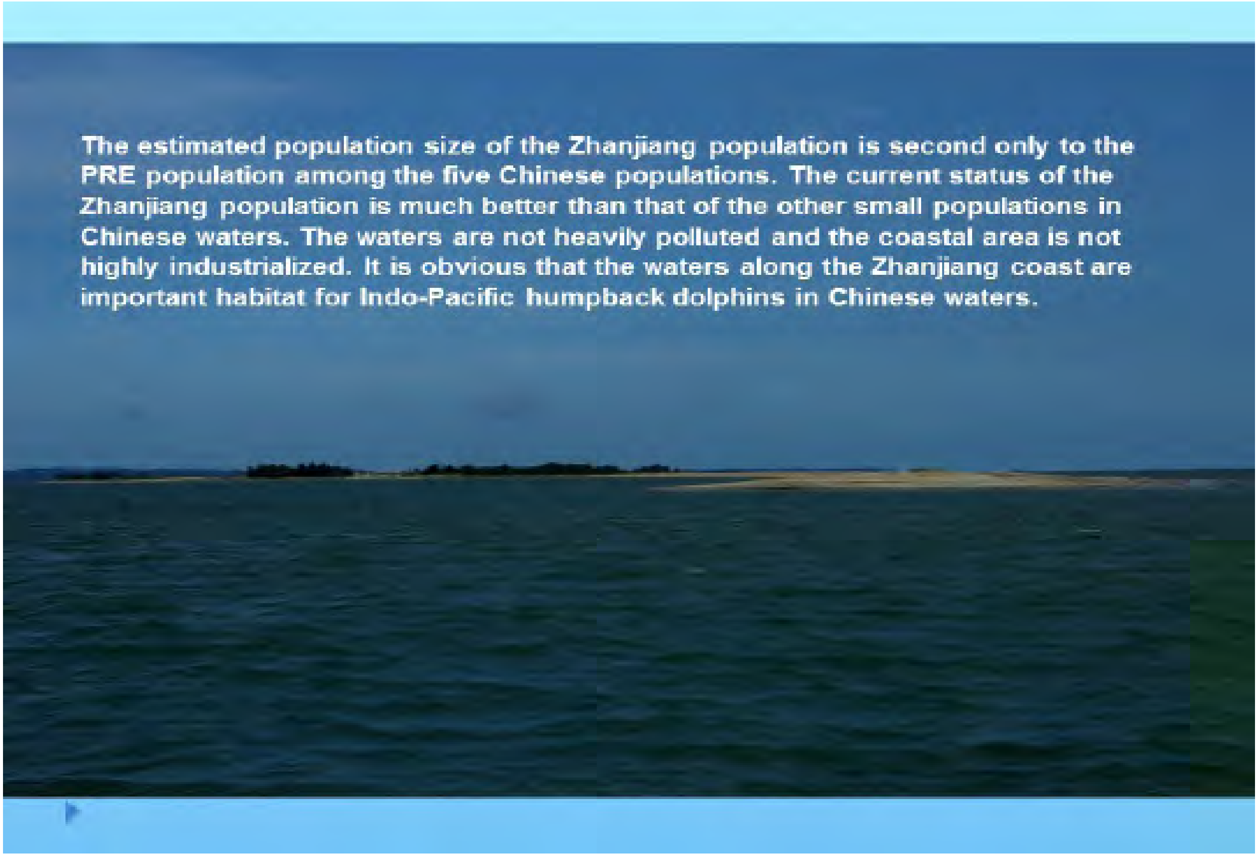
Near threatened category in the IUCN Red List of Threatened Species 2012.
Grade I National Key Protected Animal under the Wild Animal Protection Law in mainland China.
Under the Wild Animals Protection Ordinance and Wildlife Conservation Law in Hong Kong.

Three National Nature Reserves, two Provincial Nature Reserves and three City Nature Reserves were established in China

- Pearl River Estuary Chinese White Dolphin National Nature Reserve (2003)
- Xiamen Rare Species Marine National Nature Reserve (2004)
- Hepu Dugongs National Nature Reserve (1992)
- South Peng Islands Marine Ecosystem Provincial Nature Reserve (2003)
- Jiangmen Chinese White Dolphin Provincial Nature Reserve (2007)
- Chenghai Laiwu Chinese White Dolphin City Nature Reserve (2003)
- Chaoyang Longtouwan Chinese White Dolphin City Nature Reserve (2003)
- Leizhou Bay Chinese White Dolphin City Nature Reserve (2007)


Jefferson and Hung 2004: 1504 dolphins
Chen T et al. 2010: 2517-2555 dolphins
Twenty-two humpback dolphins were found dead in the PRE in 2009. One hundred and five cases of humpback dolphin death were recorded in the PRE between 2003 and 2009 (Xu et al. 2012). A significant decline in annual abundance of local humpback dolphins in Hong Kong (as part of the Pearl River Estuary) was detected between 2003 and 2011 (Hung, 2012).
Pearl Rvier Estuary/Hong Kong
Habitat of the largest population of Indo-Pacific humpback dolphins in Chinese Waters. This region is one of the fastest growing economic regions in the world.


Estimated population size 1228 (95% CI = 1032-1487)
Guangzhou Bay
Donghai Island
Leizhou Bay
Naozhou Island


The estimated population size of the Zhanjiang population is second only to the PRE population among the five Chinese populations. The current status of the Zhanjiang population is much better than that of the other small populations in Chinese waters. The waters are not heavily polluted and the coastal area is not highly industrialized. It is obvious that the waters along the Zhanjiang coast are important habitat for Indo-Pacific humpback dolphins in Chinese waters.

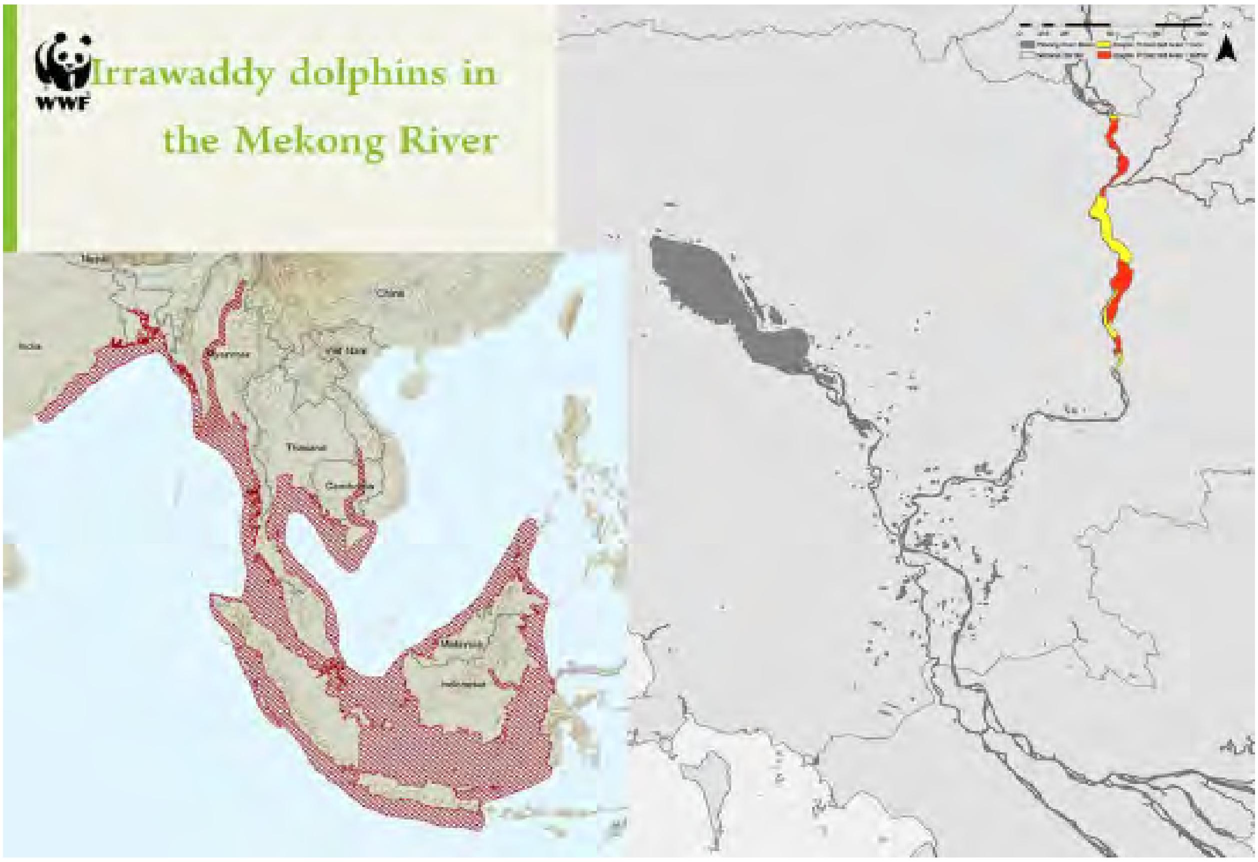

The Indo-Pacific humpback dolphin population in Zhanjiang waters deserves high priority for conservation. The Leizhou Bay Chinese White Dolphin City Nature Reserve should be upgraded to a provincial or national nature reserve as soon as possible.
A long-term Zhanjiang humpback dolphin population monitoring program is underway in order to estimate population trends and understand their causative factors.


Thank you !

Cambodia


SEAMAMIII – Cambodia
The Mekong River (incl. Lao PDR)
Gerry Ryan
Coastal Cambodia
Phay Somany
4th of March, 2013, Langkawi, Malaysia


WWF
Talk in 2 parts
All photos Phay Somany, Isabel Beasly, Gerry Ryan, Nou Chanveasna, Lor Kimsan, Hang Sereyvuth, Jesus de la Fuente & WWF-Cambodia + illustration by Stanley 'Hec' Goodall
19 October, 2016 - 2


WWF
Irrawaddy dolphins in
the Mekong River


Population status

WWF

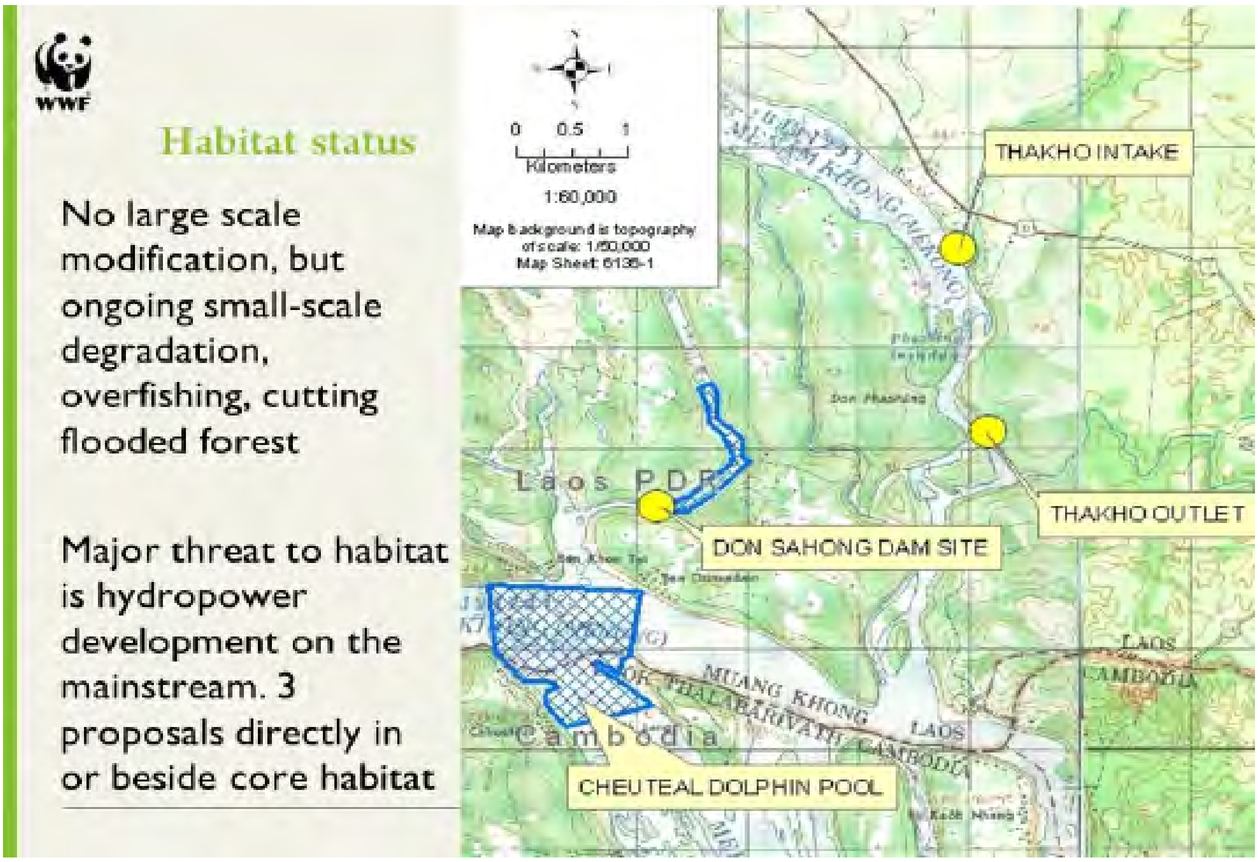
Status of Irrawaddy dolphins in the Mekong

The Mekong's dolphins are Critically Endangered, & in ***immediate danger of extirpation*** due to low numbers and high, ongoing mortality.

In 2007, 93 dolphins. By 2010, just 85 remain. New population update *soon*.

From 2003-2012, there were 119 mortalities. 61% of those are young calves.


Habitat status


WWF
Habitat status
No large scale modification, but ongoing small-scale degradation, overfishing, cutting flooded forest
Major threat to habitat is hydropower development on the mainstream. 3 proposals directly in or beside core habitat
0 0.5 1
Kilometers
1:60,000
Map background is topography of scale: 1/50,000
Map Sheet 6136-1
THAKHO INTAKE
THAKHO OUTLET
DON SAHONG DAM SITE
Laos PDR
Cambodia
CHEUTEAL DOLPHIN POOL
LAOS
CAMBODIA


Direct take


Bycatch:
gillnet


Bycatch:
electrofishing &
explosives?


Fisheries
43% of households in Kratie and 77% of households in Stung Treng fish with gillnets
Fishery worth ~USD5M annually
Fishing primarily for family food and then supplementary income

National Legislation!!!

National and state legislation specifically related to marine mammals

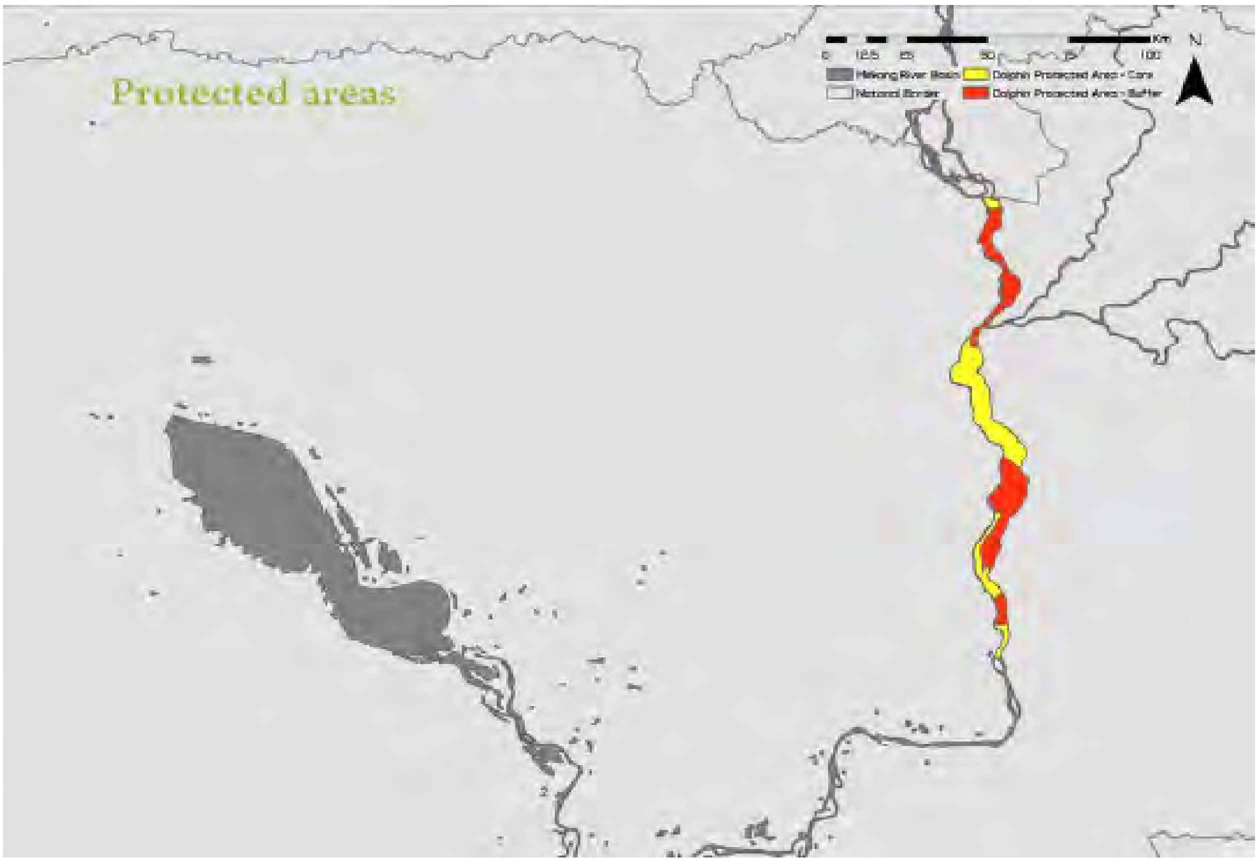
- Commission of Dolphin Conservation and Development of Mekong River Dolphin Ecotourism Zone: Sub-Decree No. 15 Or Nor Kror/Bor Kor, 17/02/2006
- Determination of Types of Fisheries and Endangered Fisheries Products: Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
- Creation of the Mekong River Dolphin's Managerial Protection Zones: Sub-Decree No. 155 Or Nor Kror/Bor Kor dated 25 September 2012

National and state legislation related to fisheries

- Law on Fisheries: Royal Decree Nor Sar/Ror Kor Mor 0506/011, 21/05/2006.
- Management of Community Fisheries: Sub-Decree No. 25 Or Nor Kror/Bor Kor, 20/03/2007
- Determination of Types of Fisheries and Endangered Fisheries Products: Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
- Proclamation No. 571 Bro Kor – Kor Sor Kor dated September 06, 2010 on the Protection Measures for the Endangered Fisheries Product
- Proclamation No. 005 Bro Kor – Kor Sor Kor dated January 11, 2010 on the Technicality of Measuring the Size of all types of Gillnets and Dragnet in the fishing zone of the Kingdom of Cambodia

19 October, 2015 | 11


WWF
International agreements
- International Convention for the Regulation of Whaling.
- United Nations Convention on Biological Diversity: Party to the Convention
- The Convention of Wetlands of International Importance Especially as Waterfowl (Ramsar Convention)
- Convention on the Conservation of Migratory Species of Wild Animals: Not party to the Convention, however agreed to MoU on marine turtle protection.
- Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES): Ratified.
- United Nations Convention on Fishing and Conservation of the Living Resources of the High Seas: Accessed to the Convention
- Stockholm Convention on Persistent Organic Pollutants: Ratified
19 October, 2015


Protected areas


Conservation:
Outreach & education


Conservation:
Enforcement & policy


Community attitudes
& folklore


Research
& training

WWF

Part II: Coastal Cambodia

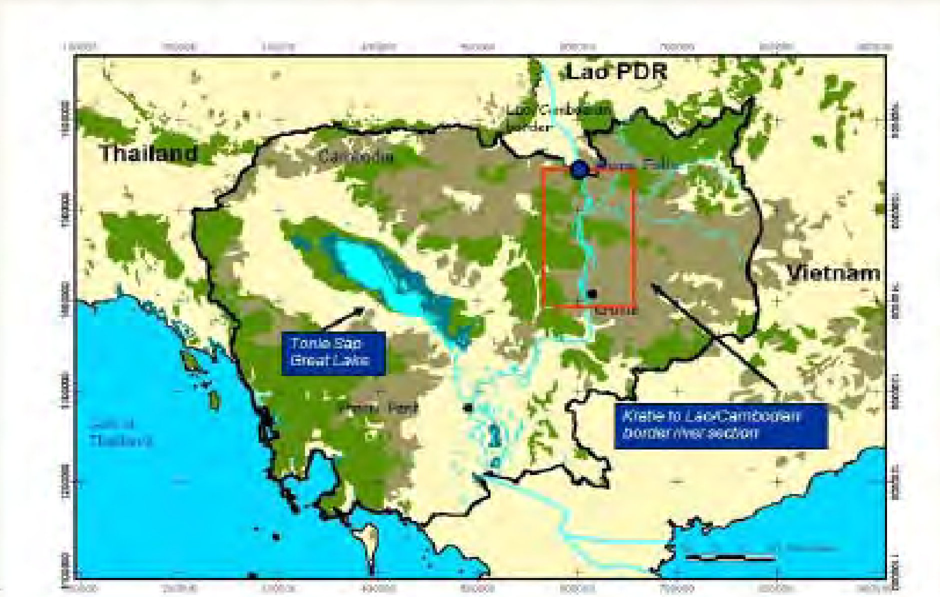
Phay Somany

19 October, 2015 – 22

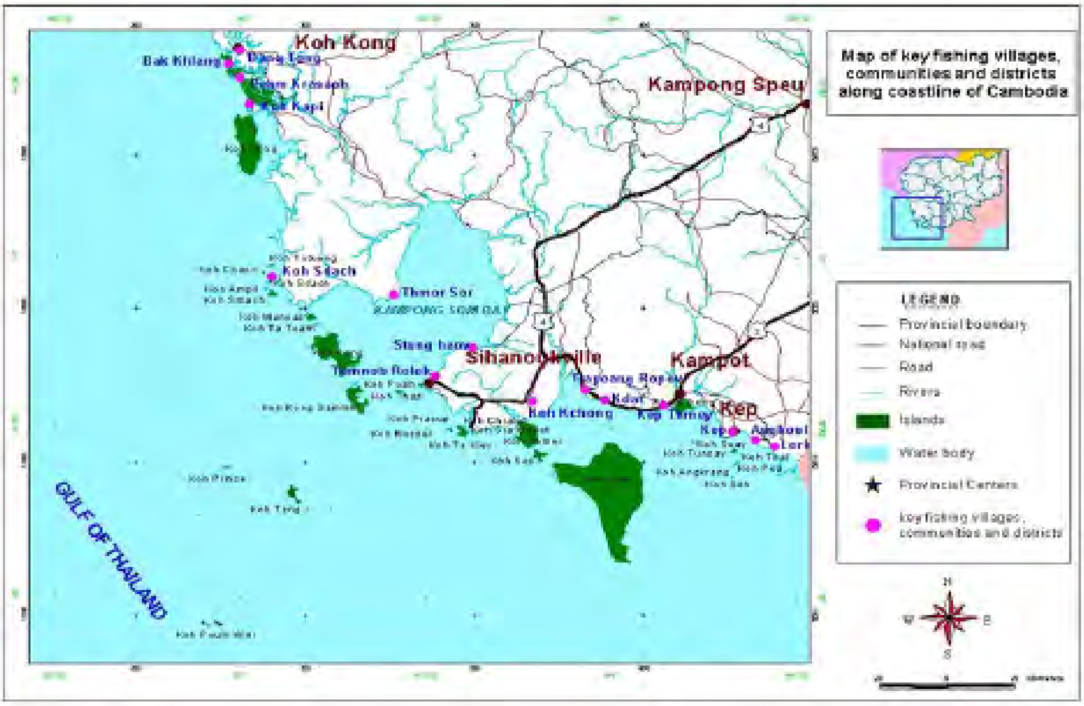
Conservation Status and Management of Marine Mammals along the Cambodian coastline

Status

- Used to be distributed throughout the Mekong, its three tributaries (Sekong, Se San and Srepok), and rivers including the Tone Sap Great Lake



Map of Cambodia's coastline



Status of marine mammals in Cambodia

- The 11 species are determined as fishery endangered species and fully protected under the Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
- Quantitative estimate of each species hasn't been available yet
- 68 carcasses of marine mammals have formally been recorded since 2002.

Status of marine mammals in Cambodia

- The 11 species are determined as fishery endangered species and fully protected under the Sub-Decree No. 123 Or Nor Kror/Bor Kor, 12/08/2009
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- 68 carcasses of marine mammals have formally been recorded since 2002.

Threats

- By-catch in gillnet, particularly Spanish Mackerel nets and surrounding nets
- Deliberate killing, in particular for Dugong because tusks and meat are in high price at market
- Habitat degradation (many places of sea grass beds destroyed by motorized trawlers)
- Live capture for showing (two cases happened in 1993 and 2002)
- Sand dredging (happening at Koh Kong and the bay of Preah Sihanouk)

Education

- Training on marine mammal stranding protocol was provided to members of marine mammal stranding network at the end of 2004
- Workshop to present survey result to responsible Government agency was organized in 2002
- A number of marine mammal conservation awareness meetings and workshops were conducted in 2005
- Disseminations of Sub-Decree on the determination of types of fisheries and endangered fisheries products are currently conducted in key fishing villages and communities.

Research

- No research on marine mammals conducted before 2001
- First boat – based survey on marine mammals was conducted by the DoF, James Cook University and WCS in 2001. Eight species of marine mammals were formally recorded from the survey
- Then aerial survey on Dugong was conducted in 2004. Due to low tide during the survey time, no single dugong was found
- A number of interview surveys on abundance, distribution and threats were conducted in key fishing villages.

Research (Cont')

- No survey on marine mammal has been conducted since the first quarter of 2004
- Additional surveys need to be conducted to assess current abundance, distribution, threats and hot spot habitats
- Only activities of marine mammal stranding network have been implementing. This network was created in 2005 with the main support from Ocean Park Conservation Foundation (OPCF).

By-catch in fisheries

- Gillnets, particularly Spanish Mackerel nets are the main causes of marine mammal entanglement. A number of by-catch animals have been relating to these kinds of nets
- Power and physical surrounding nets are strongly impacting the feeding activities of Dugong at sea grass beds
- 68 carcasses of marine mammals have been collected since 2002 by member of marine mammal stranding network and the four marine fishery cantonments, including 47 carcasses of Irrawaddy dolphins, three carcasses of Finless porpoise, 9 carcasses of Humpback dolphins, one live stranding of Short-finned pilot whale, two carcasses of unidentified whales and 6 Dugongs.

Live capture for showing and trade

- In 1993, 11 Irrawaddy dolphins were captured by villagers using surrounding nets. Seven were released eventually, 4 were sold to Safari World in Bangkok, and 2 of those animals were sent to Japan
- In 2002, local villagers were hired by a casino near the Thai border to catch Irrawaddy and Indo-Pacific hump-backed dolphins. Most of them were released, but the casino ended up keeping 4 dolphins
- Due to old ages, six Indo-pacific humpback dolphins were released from the Koh Kong Safari earlier 2012 and dolphin show hasn't been performed since then.

Fishing gear types and vessels

- The main gear types commonly used in Cambodia's marine waters are mackerel purse seines, anchovy purse seines, mantis shrimp gillnet, crab gillnet, shrimp gillnet, fish gillnet, push net, stow nets, beach seine, crab trap, squid trap, hook line, and trawl
- Trawling boats are not allowed to do fishing at areas where the depth of waters is less than 20m.

Fishing gear types and vessels

- 7,226 fishing vessels are currently used in Cambodian Marine Waters (data 2012):

N°	Types of boats	Koh Kong	Preah Sihanouk	Kampot and Kep	Total
1	Non-motorized boat	215	560	507	1282
2	Motorized boat<10hp	2241	397	646	3324
3	Motorized boat<33hp	595	1251	226	2072
4	Motorized boat>33hp	248	298	2	548
Total		3,299	2,506	1,421	7,226

Marine protected areas in Cambodia

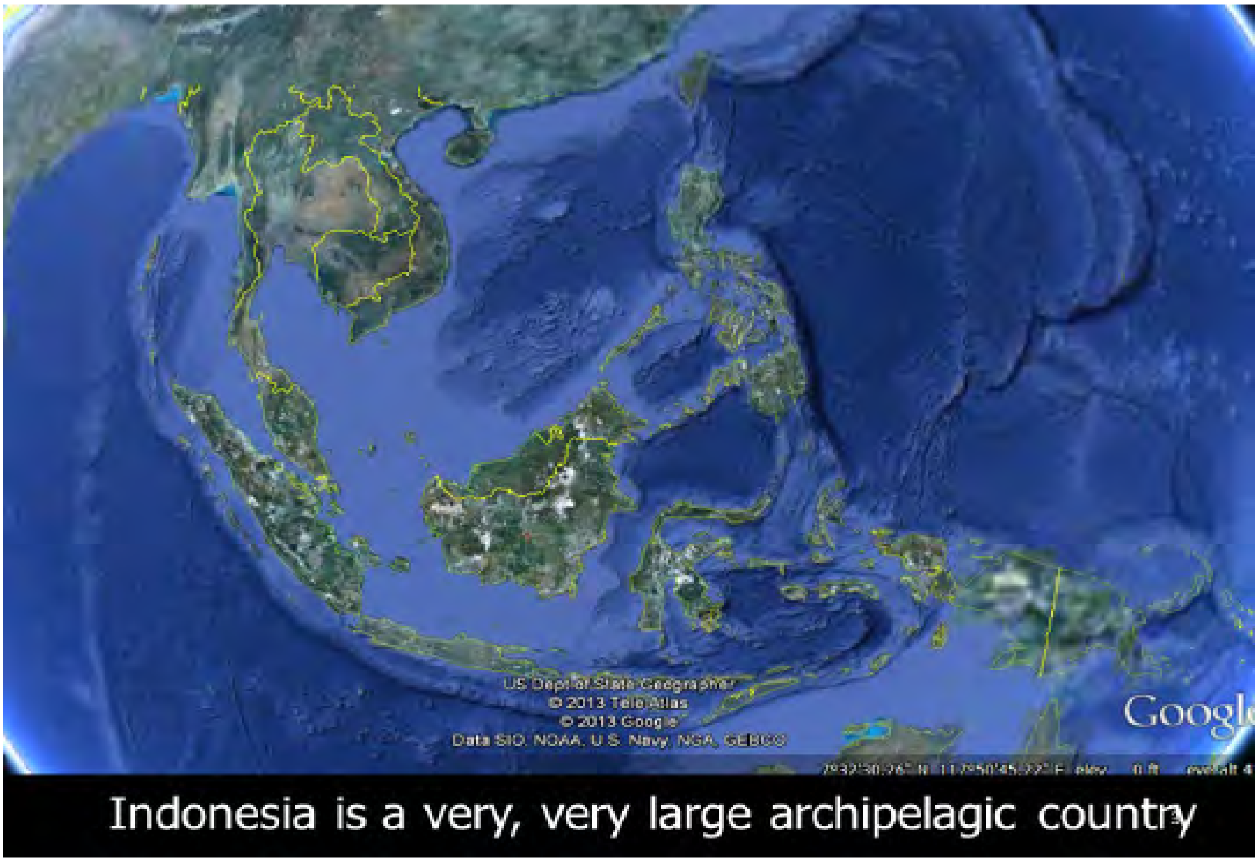
- Four marine protected areas in Cambodia including: Peam Krosop Wildlife Sanctuary (25,897 hectares with rich biodiversity), Ream National Park (15,00 hectares of land and 6,000 hectares of marine habitats with significant coral reef resources), Botum Sakor National Park covers 171,250 ha and Dong Peng Multiple Use Area covers 27, 700 ha.
- The 32,492 ha of sea grasses in Cambodian waters is proposed as a sea grass conservation and management area
- The areas around Koh Rong and Koh Rong Samloem in Kampong Som Province is proposed to be marine fisheries management area.


WWF
Thank you
www.panda.org
Presentation to Company Name

Indonesia


National Reviews of Status, Research, Catch, By-catch, Conservation and Legislation: Indonesia
Dr Danielle Kreb, Dr Putu Liza Kusuma Mustika, Benjamin Kahn, Dr Achmad Yanuar, Muhajir, Purwanto
Nugraheni
Lazuardi
1


Presentation layout
1. Species, distribution, & pop status
2. Habitat status and threat
3. OT: Directed catch (hunting & live capture)
4. OT: unregulated in-situ tourism
5. By-catch & fisheries-related info
6. Legal status & management arrangement
7. Conservation & education program
8. Current research and training
9. Future research and training
10. Suggested strategies & take home message
Contact:
danielle.kreb1@gmail.com
putu.liza@my.jcu.edu.au
kahn.benjamin@gmail.com
Nugraheni
Lazuardi
2


US Dept of State Geographer
© 2013 Tele Atlas
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Indonesia is a very, very large archipelagic country


INTRODUCTION
• Indonesia has 36 cetacean species (and sub-species) and 1 sirenian species (the dugongs)
• Over 13,000 islands
• Many unique near-shore oceanic habitats
• At least one distinct pop of *Orcaella brevirostris*
• Many unsustainable anthropogenic activities: unsustainable fisheries, unsustainable tourism, mining, captivity, unsustainable coastal development, inter-island shipping lanes, etc
• Indonesia west to east ~ USA west to east

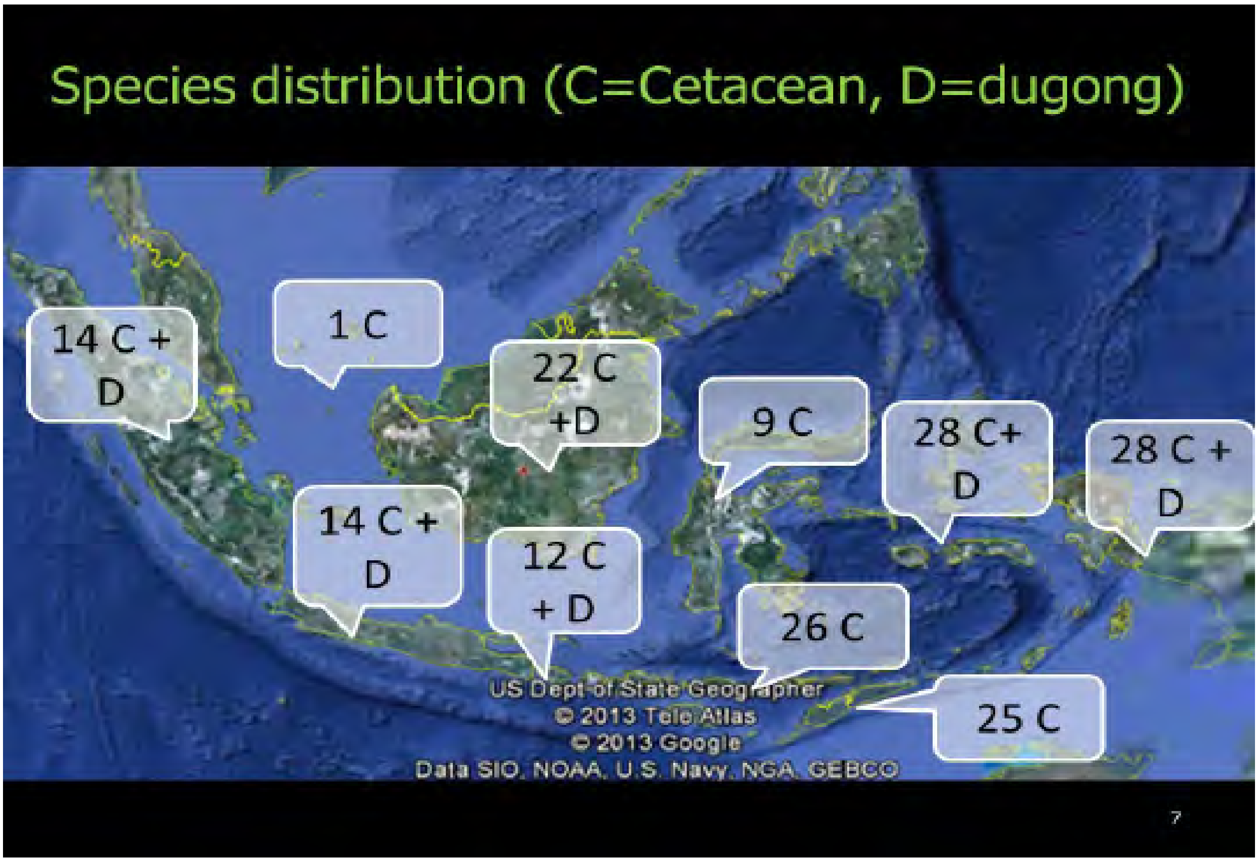
SPECIES, DISTRIBUTION & POPULATION STATUS

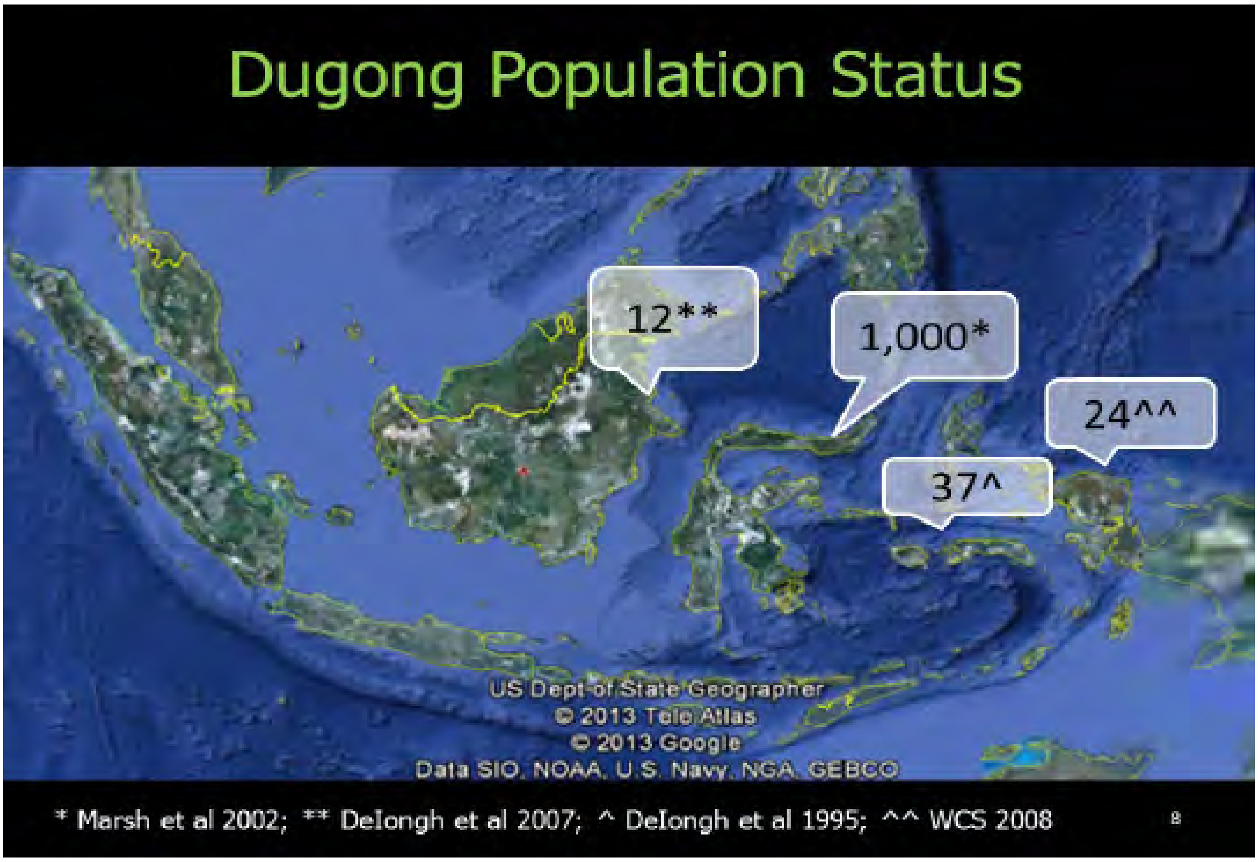
Species list & IUCN status

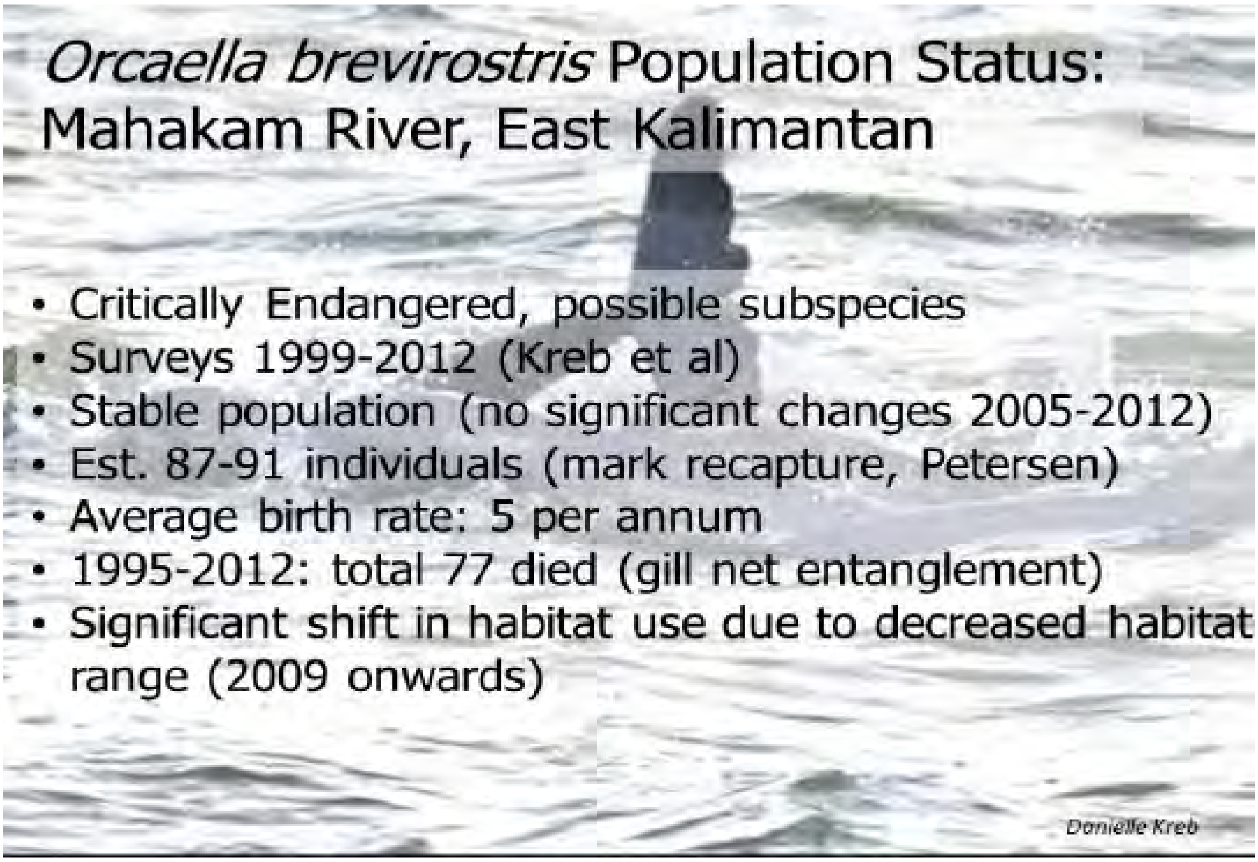
- 36 cetaceans (incl sub-species) and 1 sirenian (dugong)
- Critically endangered: 1 (pesut Mahakam *Orcaella brevirostris*)
- Endangered: 3 (sei, blue, fin whales)
- Vulnerable: 2 (finless porpoise, sperm whale, dugong)
- Near threatened: 1 (*Sousa chinensis*)
- Data deficient: 11 species
- Least concern: 12 species
- N.a.: *B. brydei, B. omurai, B.m. brevicauda, S.l. longirostris, S.l. roseiventris, D.c. tropicalis*

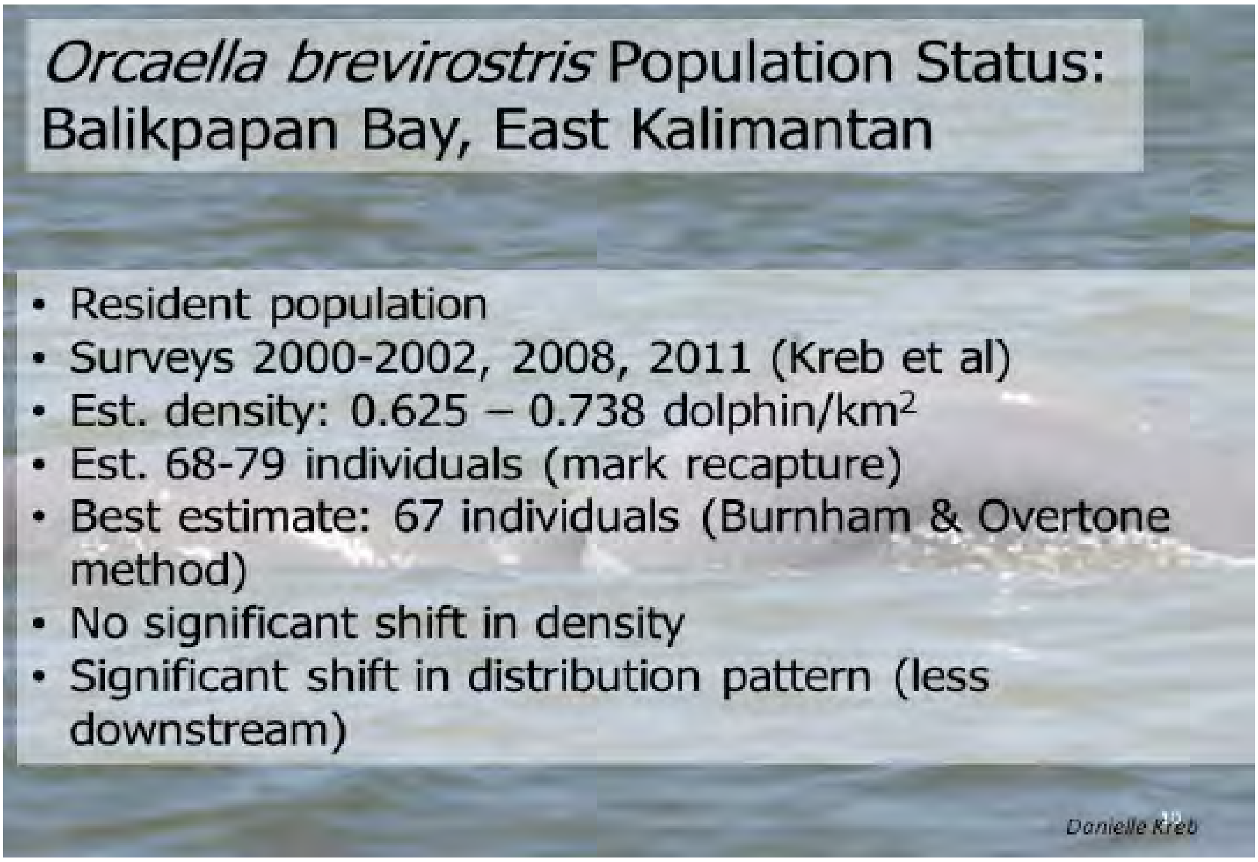
Pic: Mustika

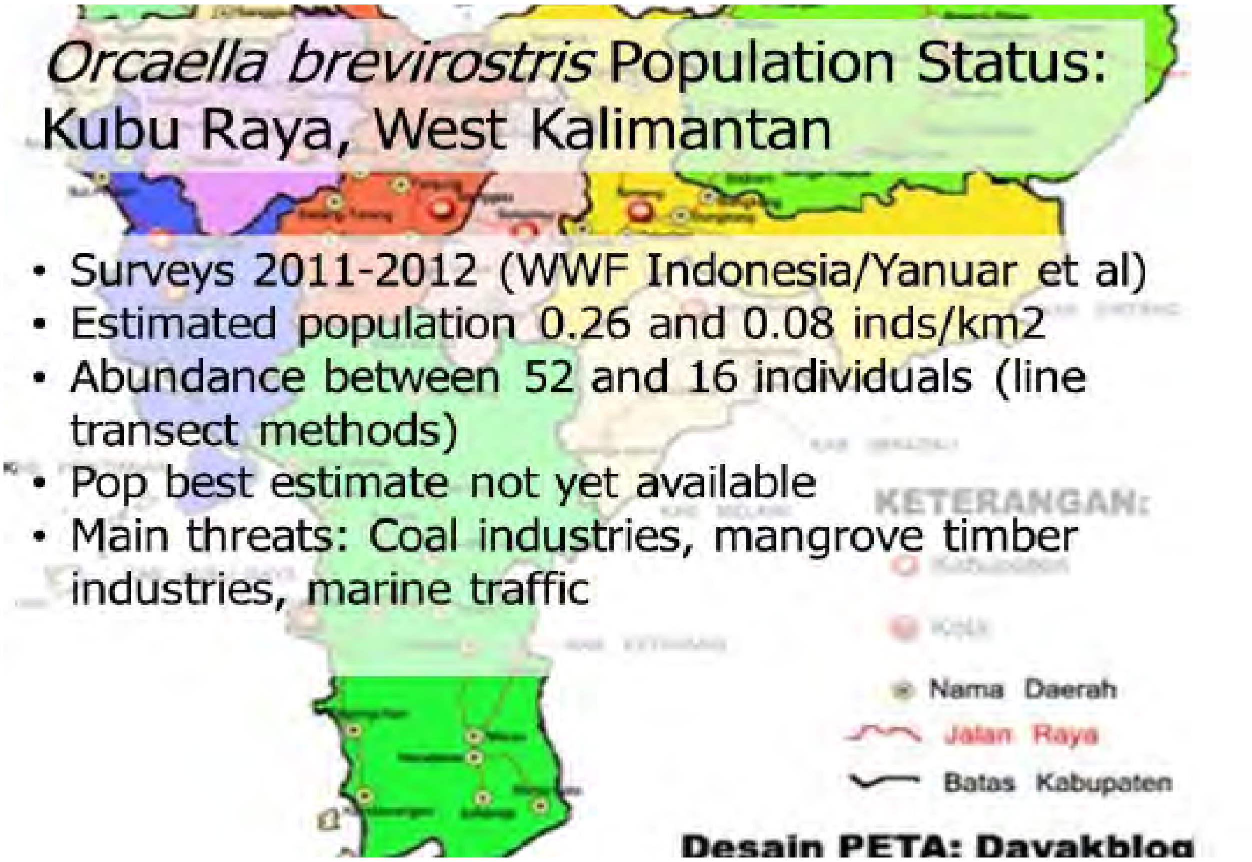
6


Species distribution (C=Cetacean, D=dugong)
14 C + D
1 C
22 C +D
9 C
28 C+ D
28 C + D
14 C + D
12 C + D
26 C
25 C
US Dept of State Geographer
© 2013 Tele Atlas
© 2013 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
7


Dugong Population Status
12**
1,000*
24^^
37^
US Dept of State Geographer
© 2013 Tele Atlas
© 2013 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
* Marsh et al 2002; ** DeIongh et al 2007; ^ DeIongh et al 1995; ^^ WCS 2008
8

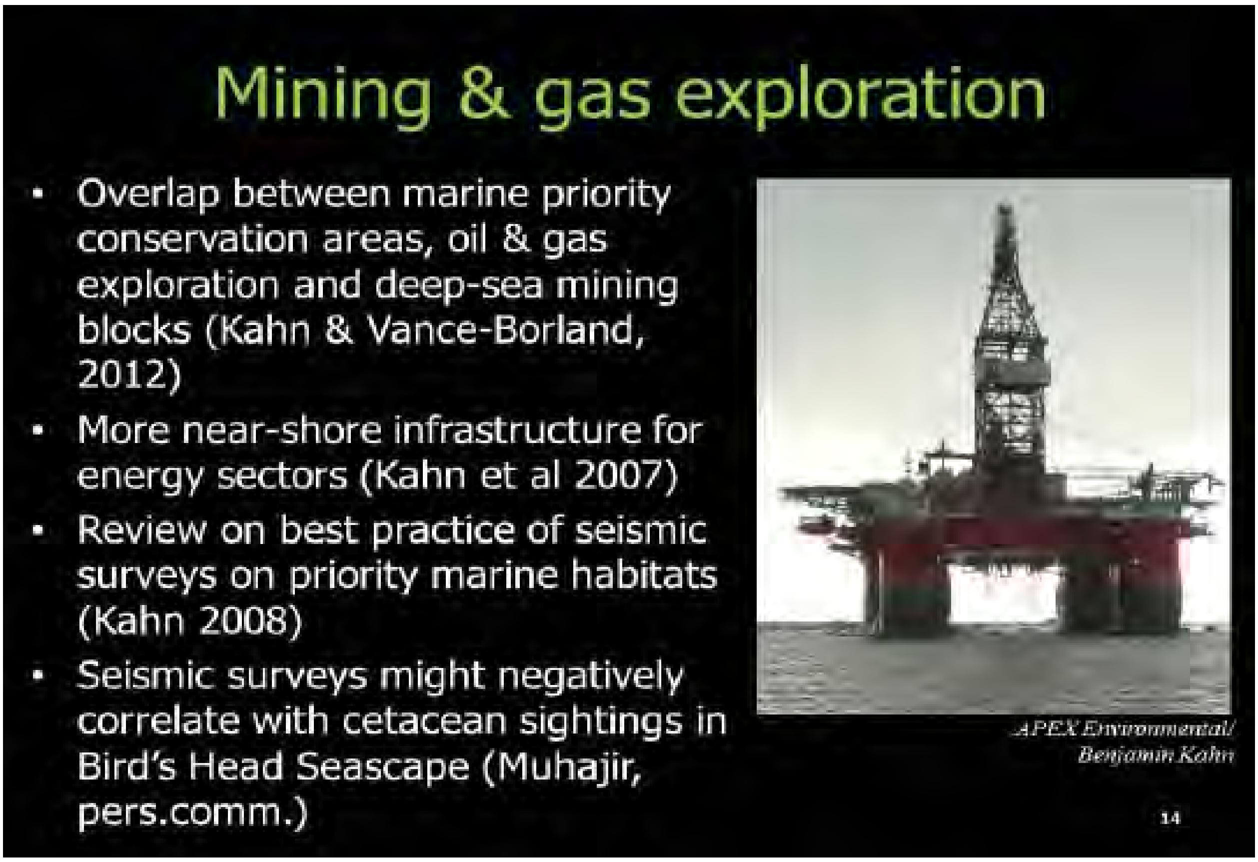

Orcaella brevirostris Population Status: Mahakam River, East Kalimantan
• Critically Endangered, possible subspecies
• Surveys 1999-2012 (Kreb et al)
• Stable population (no significant changes 2005-2012)
• Est. 87-91 individuals (mark recapture, Petersen)
• Average birth rate: 5 per annum
• 1995-2012: total 77 died (gill net entanglement)
• Significant shift in habitat use due to decreased habitat range (2009 onwards)
Danielle Kreb


Orcaella brevirostris Population Status: Balikpapan Bay, East Kalimantan
• Resident population
• Surveys 2000-2002, 2008, 2011 (Kreb et al)
• Est. density: 0.625 – 0.738 dolphin/km^2
• Est. 68-79 individuals (mark recapture)
• Best estimate: 67 individuals (Burnham & Overtone method)
• No significant shift in density
• Significant shift in distribution pattern (less downstream)
Danielle Kreb

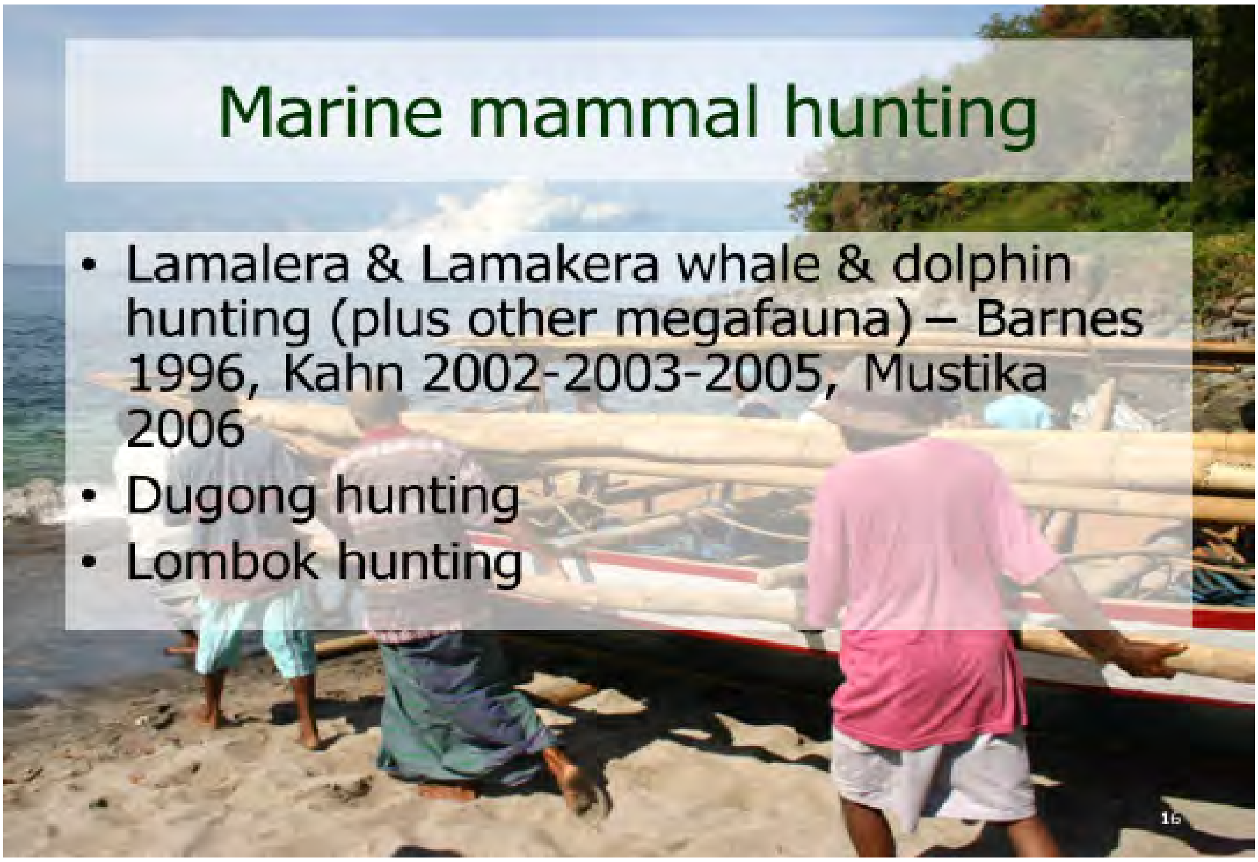

Orcaella brevirostris Population Status:
Kubu Raya, West Kalimantan
• Surveys 2011-2012 (WWF Indonesia/Yanuar et al)
• Estimated population 0.26 and 0.08 inds/km2
• Abundance between 52 and 16 individuals (line transect methods)
• Pop best estimate not yet available
• Main threats: Coal industries, mangrove timber industries, marine traffic
KETERANGAN:
Nama Daerah
Jalan Raya
Batas Kabupaten
Desain PETA: Dayakblog


HABITAT STATUS
AND THREAT

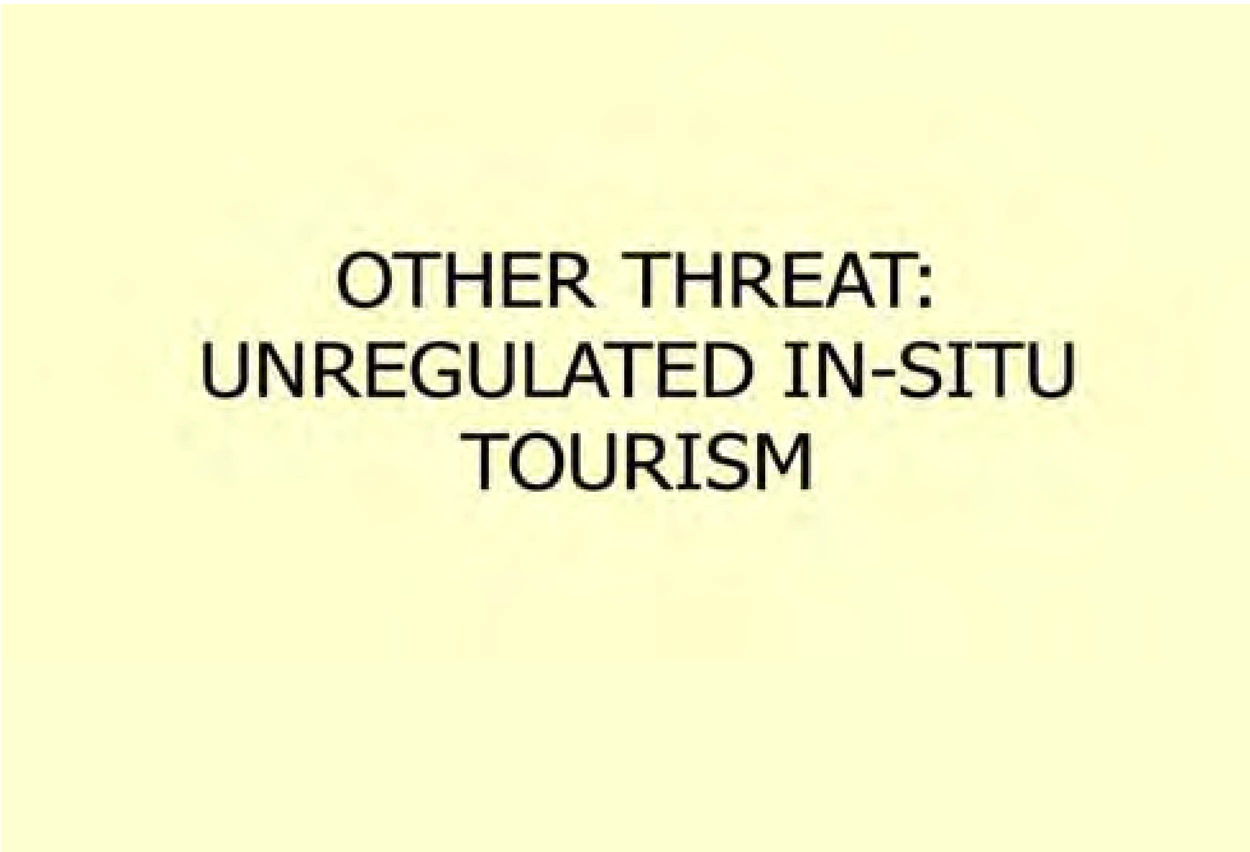

Various habitat threats
• Forest & mangrove logging, sedimentation, erosion
• Unsustainable coastal development
• Land conversion
• Terrestrial run-offs (incl. agriculture and discard of mining waste to the ocean)
• Mining and gas exploration
• Seismic & noise pollution
• Marine traffic (& collision)
Danielle Kreb
13


Mining & gas exploration
• Overlap between marine priority conservation areas, oil & gas exploration and deep-sea mining blocks (Kahn & Vance-Borland, 2012)
• More near-shore infrastructure for energy sectors (Kahn et al 2007)
• Review on best practice of seismic surveys on priority marine habitats (Kahn 2008)
• Seismic surveys might negatively correlate with cetacean sightings in Bird's Head Seascape (Muhajir, pers.comm.)
APEX Environmental/ Benjamin Kahn
14

OTHER THREAT: DIRECT CATCH & LIVE CAPTURE




Live-capture
• Jaya Ancol: at least 6 species so far, 22 Orcaella and BTN
• SeaWorld: Once held a dugong
• Dolphin Lodge (Batam): 24 BTN
• Melka Hotel (Bali): 2 BTN
• Serangan (Bali): 9 BTN
Zul Trio Anggono@The Jakarta Post
• Akame Dolphin Bay Restaurant (Bali): BTN (was supposed to be confiscated) ~ credit Jakarta Animal Aid Network (JAAN)
• Various dolphin circuses in Bali and Java
17


OTHER THREAT:
UNREGULATED IN-SITU
TOURISM

Lovina facts:

(Mustika 2011)

- 37,000 visitors p.a. (>65% Westerners)
- Since 1987, ± 180 small-scale dolphin guides
- Contributes USD 4.5 million p.a. to local economy
- Max boat counts: 98 around a pod, high season
- Tourist satisfaction low to medium, related to the way the boatmen drove the boat
- Unsatisfied tourists unlikely to recommend the tour to others
- Boatmen willing to change, need assistance

20

BY-CATCH & FISHERIES-RELATED INFO

By-catch records

- Total 77 *Orcaella* death in EK; 66% was due to by-catch (Kreb, 1995-2012)
- 3 Kuburaya *Orcaella* died due to entanglement
- Dugong death: shark nets, gillnets, tidal traps (DeIongh)
- Tuna fishing companies requested assistance in by catch reduction (Kahn)
- Likely many unrecorded cases

22

National fisheries information (MMAF 2009, 2011)

- Gillnet ~ 280,600
- Liftnet ~ 51,000
- Purse seine ~ 31,400
- Seine net ~ 66,000
- Trawl ~ 17,800
- Full-time fishers > 1,000,000 individuals
- Part-time fishers ~ 880,000 individuals
- Spare-time fishers ($\geq$3rd alt. income ~360,500)

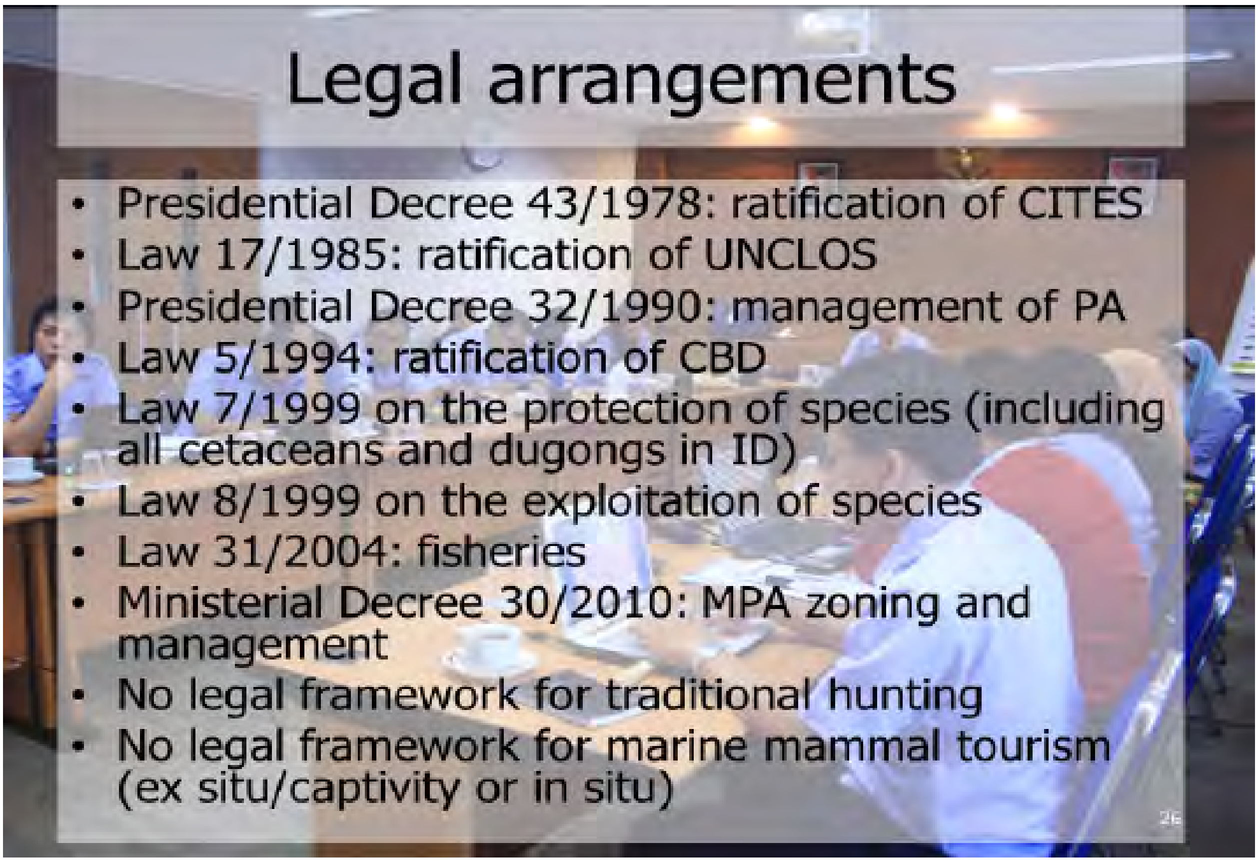
23

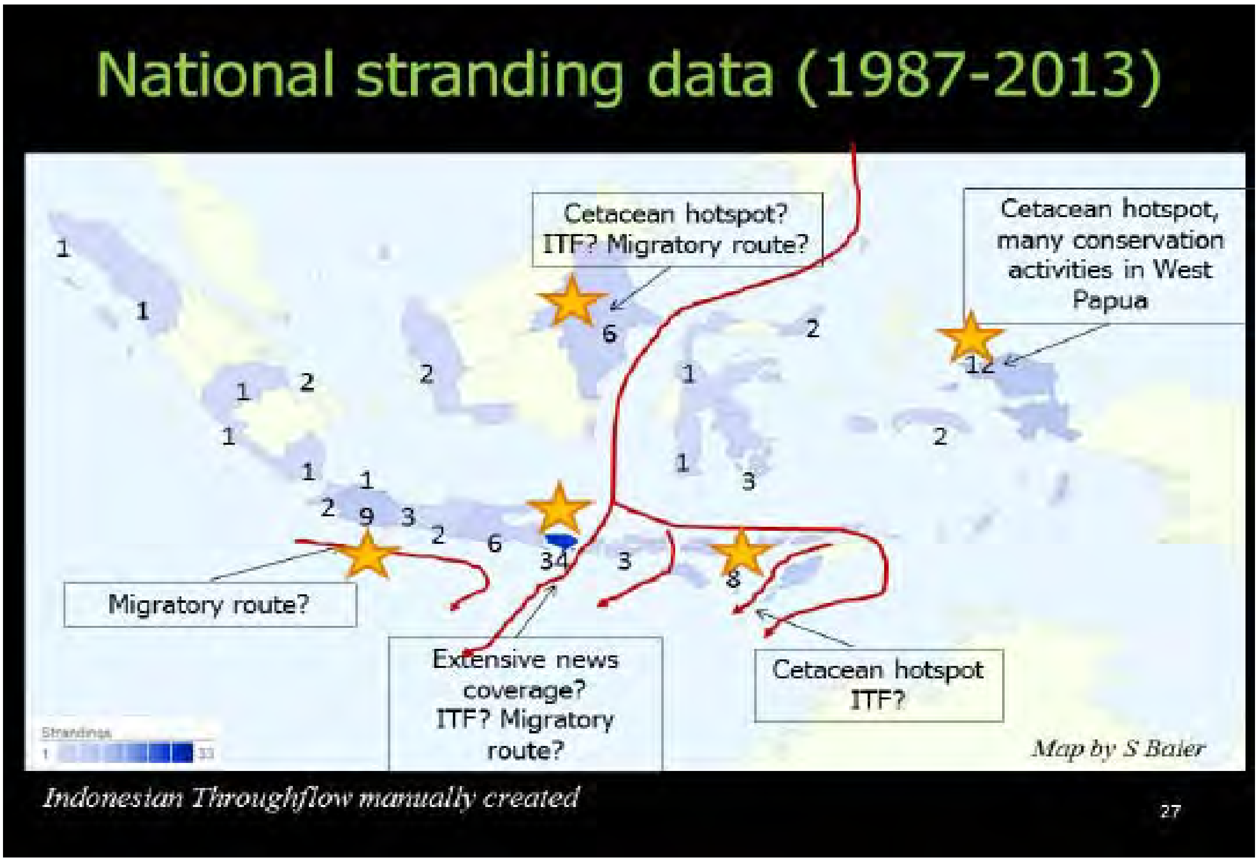
Boat information

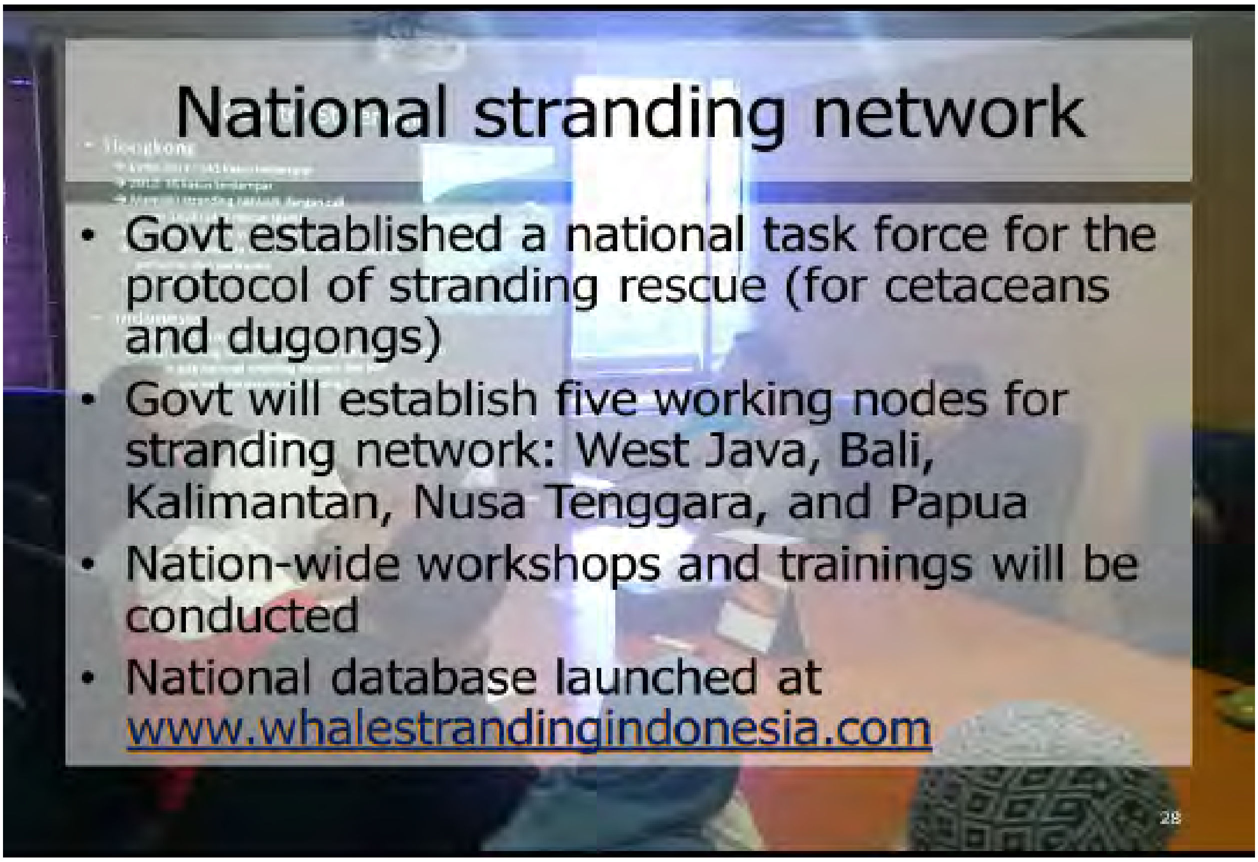
- Non-motorised boats ~ 170,900
- Boats with outboard engines ~ 225,700
- Boats with inboard engines ~ 192,700
- Artisanal fishers usually use wooden plank canoes, sometimes with outriggers ('jukung' in Bali)

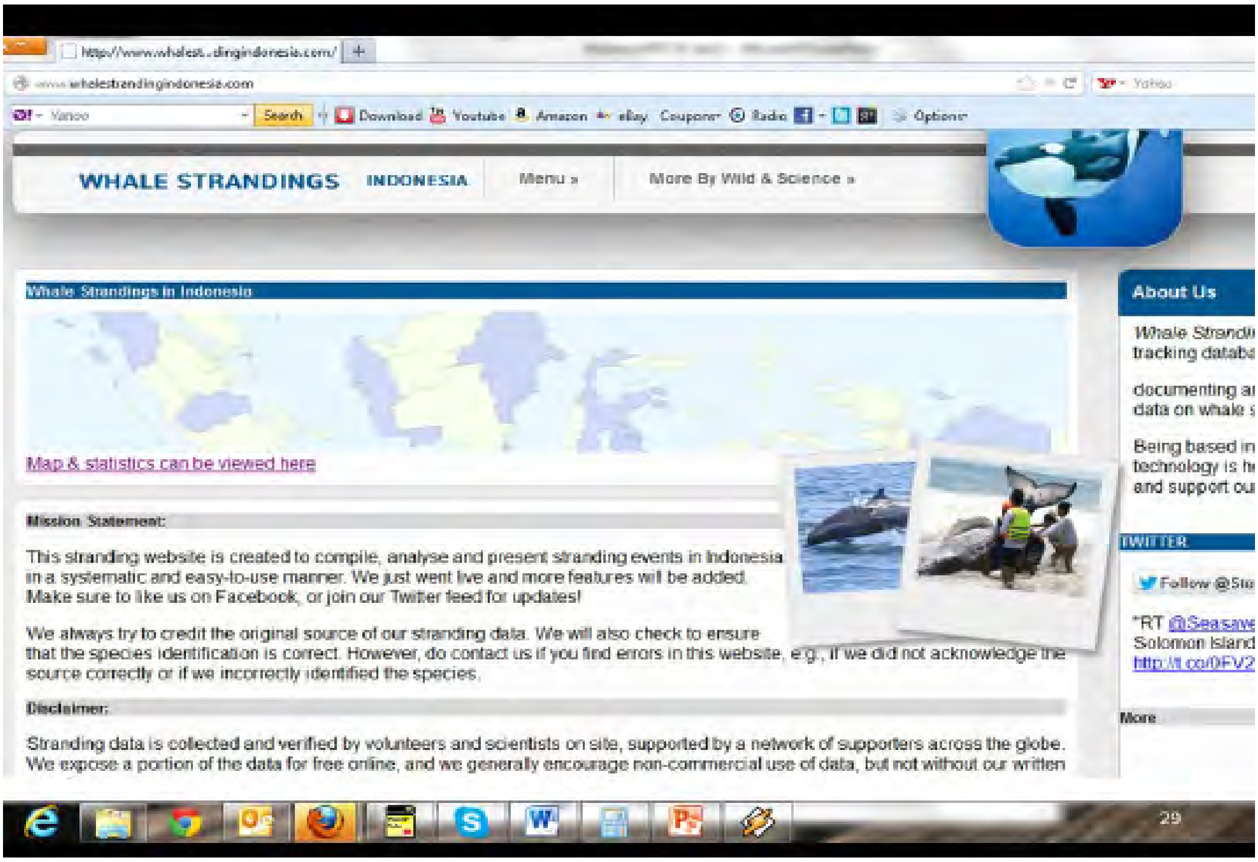
24

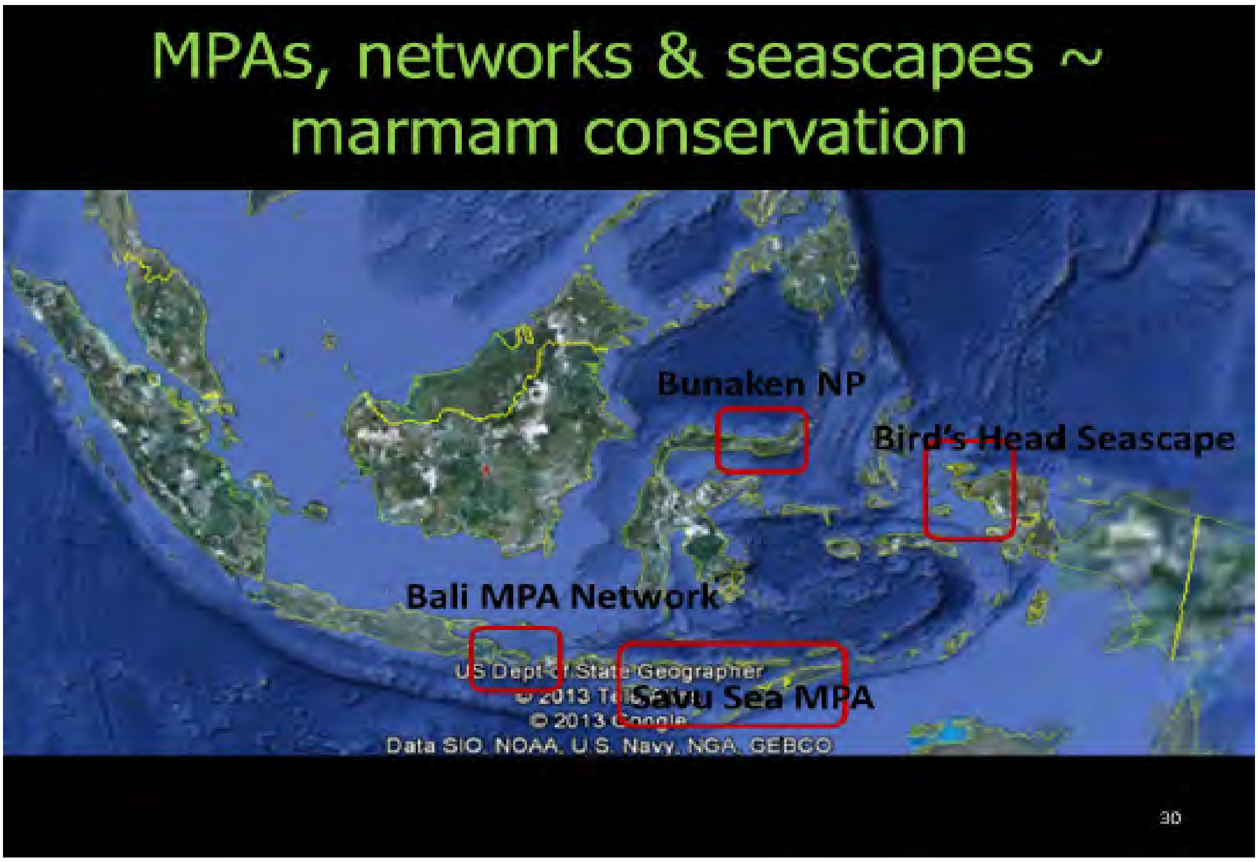
LEGAL STATUS & MANAGEMENT ARRANGEMENT

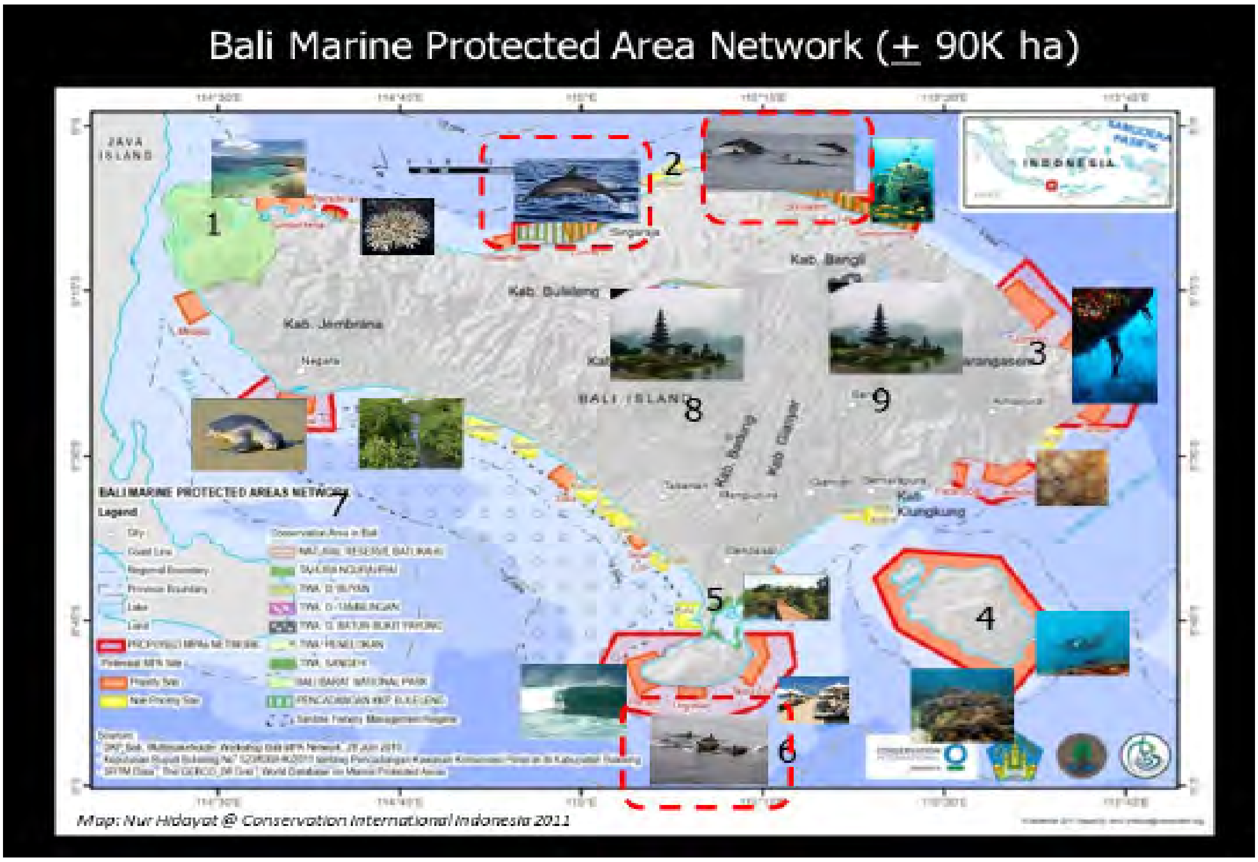


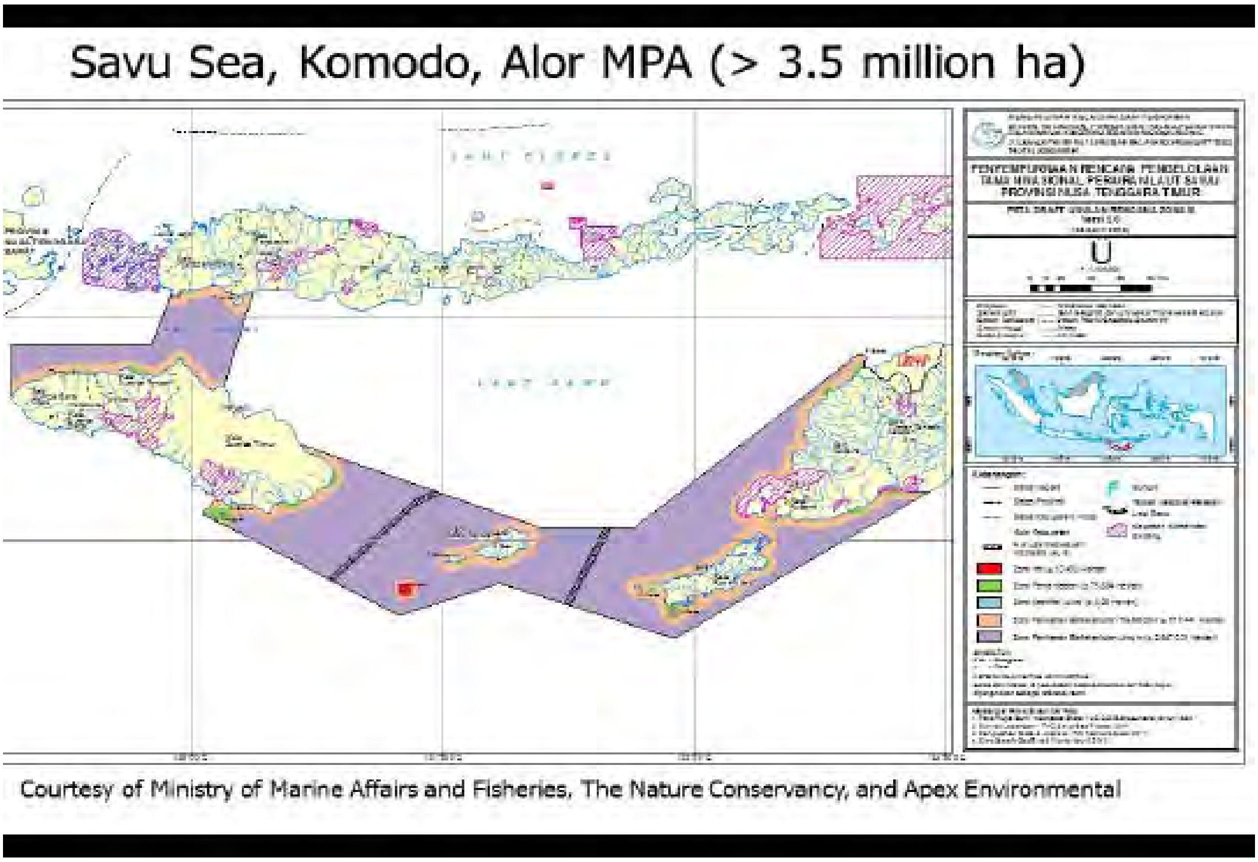

National stranding data (1987-2013)
Cetacean hotspot?
ITF? Migratory route?
Cetacean hotspot,
many conservation
activities in West
Papua
Migratory route?
Extensive news
coverage?
ITF? Migratory
route?
Cetacean hotspot
ITF?
Map by S Baier
Indonesian Throughflow manually created
27

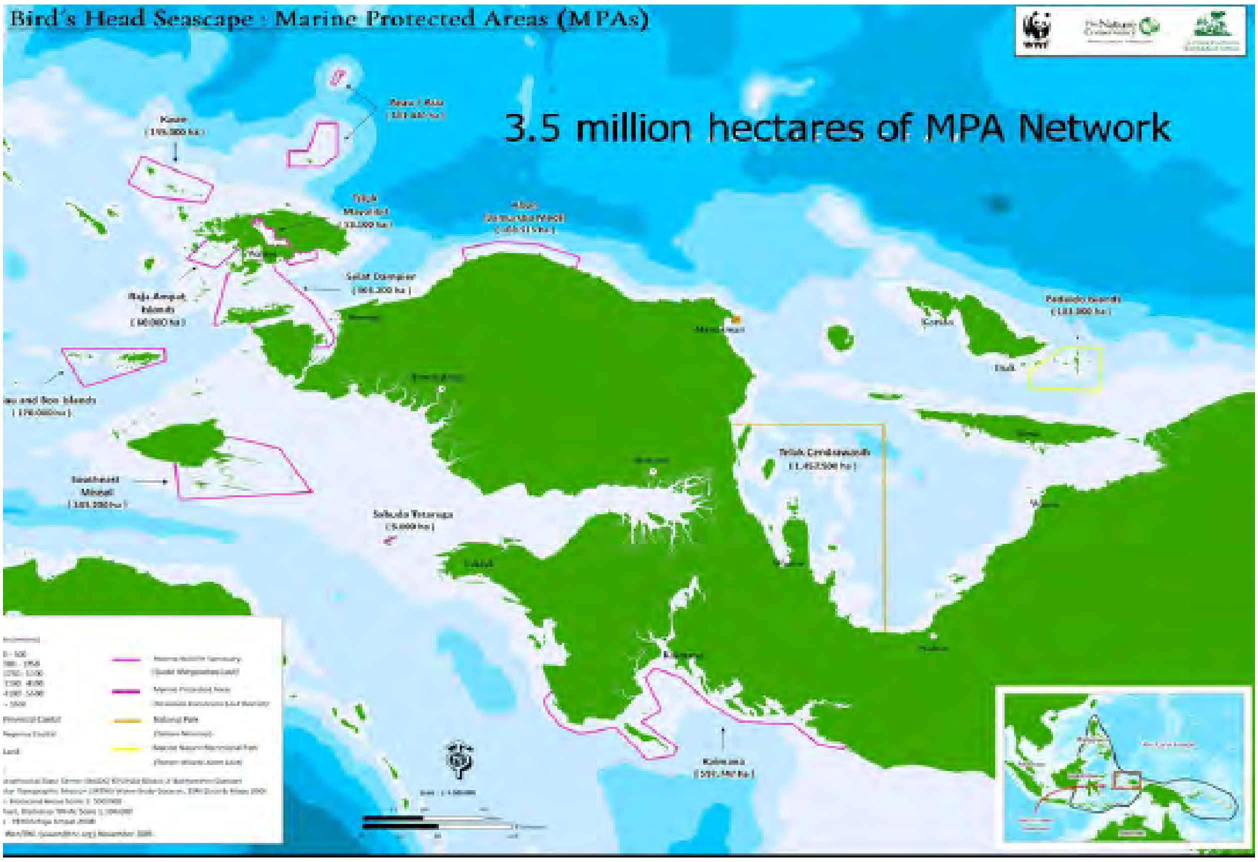

National stranding network
• Govt established a national task force for the protocol of stranding rescue (for cetaceans and dugongs)
• Govt will establish five working nodes for stranding network: West Java, Bali, Kalimantan, Nusa Tenggara, and Papua
• Nation-wide workshops and trainings will be conducted
• National database launched at www.whalestrandingindonesia.com
28


WHALE STRANDINGS INDONESIA
Menu »
More By Wild & Science »
Whale Strandings in Indonesia
Map & statistics can be viewed here
Mission Statement:
This stranding website is created to compile, analyse and present stranding events in Indonesia in a systematic and easy-to-use manner. We just went live and more features will be added. Make sure to like us on Facebook, or join our Twitter feed for updates!
We always try to credit the original source of our stranding data. We will also check to ensure that the species identification is correct. However, do contact us if you find errors in this website, e.g., if we did not acknowledge the source correctly or if we incorrectly identified the species.
Disclaimer:
Stranding data is collected and verified by volunteers and scientists on site, supported by a network of supporters across the globe. We expose a portion of the data for free online, and we generally encourage non-commercial use of data, but not without our written
About Us
TWITTER
More
29


MPAs, networks & seascapes ~ marmam conservation
Bunaken NP
Bird's Head Seascape
Bali MPA Network
Savu Sea MPA
US Dept of State Geographer
© 2013 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
30


Bali Marine Protected Area Network (+ 90K ha)
JAVA ISLAND
INDONESIA
Kab. Buleleng
Kab. Bangli
Kab. Jembrana
BALI ISLAND
Kab. Klungkung
BALI MARINE PROTECTED AREAS NETWORK
Legend
1
2
3
4
5
6
7
8
9
Map: Nur Hidayat @ Conservation International Indonesia 2011


Savu Sea, Komodo, Alor MPA (> 3.5 million ha)
PENYEMPURNAAN RENCANA PENGELOLAAN TAMAN NASIONAL PERAIRAN LAUT SAWU PROVINSI NUSA TENGGARA TIMUR
Courtesy of Ministry of Marine Affairs and Fisheries, The Nature Conservancy, and Apex Environmental



CONSERVATION & EDUCATION

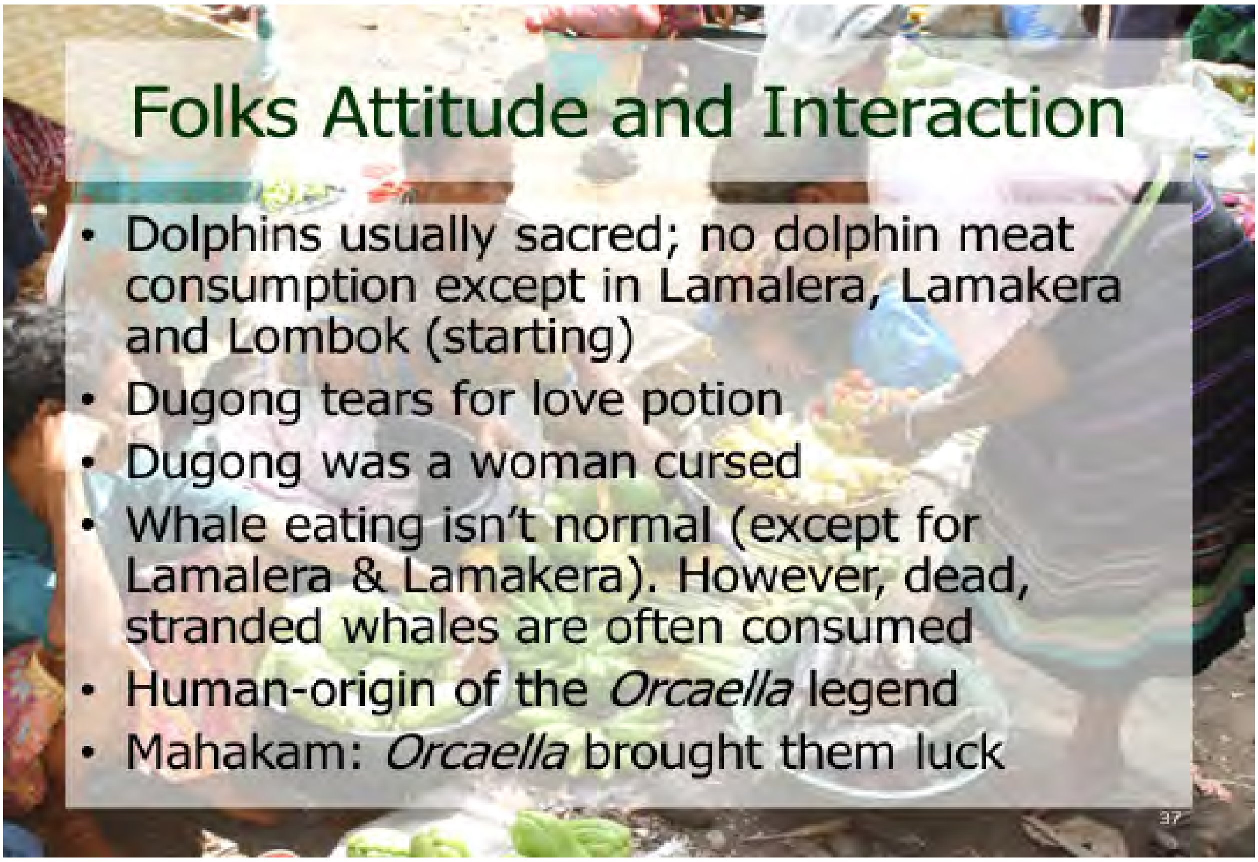
Conservation & Education

- Education programs to school kids at Lamalera (East Nusa Tenggara), Balikpapan etc (East Kalimantan) and Lovina (Bali)

- Meetings to improve the practices of dolphin boatmen in Lovina (Bali)
- Stranding-related trainings by WWF, TNC and Apex Env.

35

FOLK ATTITUDES & INTERACTIONS WITH MARMAM



RECENT AND CURRENT RESEARCH & TRAINING


Recent & current research
• Kalimantan: pop estimation of Orcaella etc (Kreb ongoing, Yanuar 2012)
• East Nusa Tenggara: migratory routes, genetic, mining (Kahn ongoing); social aspect of whaling (Mustika 2006)
• Bali: sustainability of dolphin watching tourism (Kahn 2005, Mustika 2011)
• Papua: migratory routes, genetic, mining (Kahn, Mahardika); opportunistic recordings (TNC, WWF, CII)
• Wakatobi (SE Sulawesi): opportunistic recordings (TNC, WWF)
• Lesser Sunda: deep-sea GIS based habitat mapping and initial Marine Spatial Planning (Kahn)
39


Recent & current trainings
• First responder stranding training (Bali, East Nusa Tenggara ~ WWF, TNC, CTC, Apex Env)
• Line transect and photo identification (East Kalimantan)
• Socio-economics of dolphin tourism with uni students (Bali, Mustika)
APEX Environmental/Benjamin Kah

FUTURE RESEARCH & TRAINING

Future research

- Population estimation (e.g. sperm whales of Lamalera, *Orcaella* at West Kalimantan)
- Habitat use and its changes
- MPA connectivity (e.g. Bali)
- By catch estimation
- Mining-related studies (e.g. NT, Papua)
- Cetacean-watching studies

- Climate change impacts (particularly dugongs & river dolphins)
- Socio-economic impacts
- Stranding analysis (incl. post mortem)

42

MARMAM WATCHING

ID's cetacean watching industries

- Bali: Lovina, Tejakula, South Bali
- East Kalimantan: Mahakam
- Papua: Raja Ampat, Kaimana
- East Nusa Tenggara : Alor, Komodo

- No national guidelines on cetacean watching
- The duty of Ministry of Marine Affairs or Ministry of Tourism?

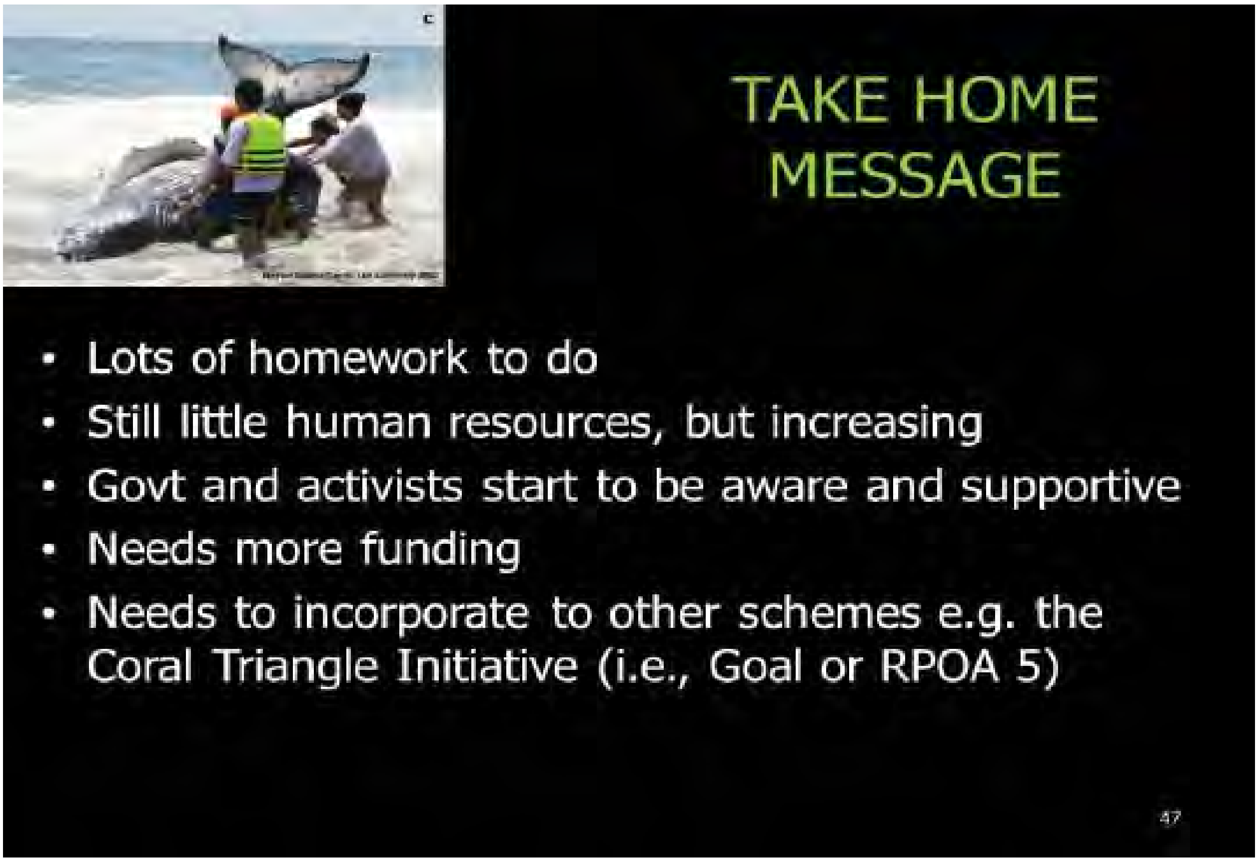
44

SUGGESTED STRATEGIES & TAKE HOME MESSAGE

SUGGESTED CONSERVATION STRATEGIES

- Landscape & seascape approach (MPA, seascape, ridge-to-reef, Coral Triangle)
- Sustainable fisheries (incl. by-catch and marine debris mitigation)
- Sustainable tourism & alternative livelihood
- Empowering national stranding network (to understand possible cause of stranding and or death)

46


TAKE HOME MESSAGE
• Lots of homework to do
• Still little human resources, but increasing
• Govt and activists start to be aware and supportive
• Needs more funding
• Needs to incorporate to other schemes e.g. the Coral Triangle Initiative (i.e., Goal or RPOA 5)
47


Acknowledgements
Ministry of Marine and Fisheries Affairs Republic of Indonesia
LIPI
Indonesian Institute of Science
WWF
RASI
APEX
JAMES COOK UNIVERSITY AUSTRALIA
The Nature Conservancy
Protecting nature. Preserving life.
CORAL TRIANGLE CENTER
Ensuring Coral Reefs for Life
OPCF Hong Kong
Ocean Park Conservation Foundation Hong Kong
CONSERVATION INTERNATIONAL
Indonesia
48

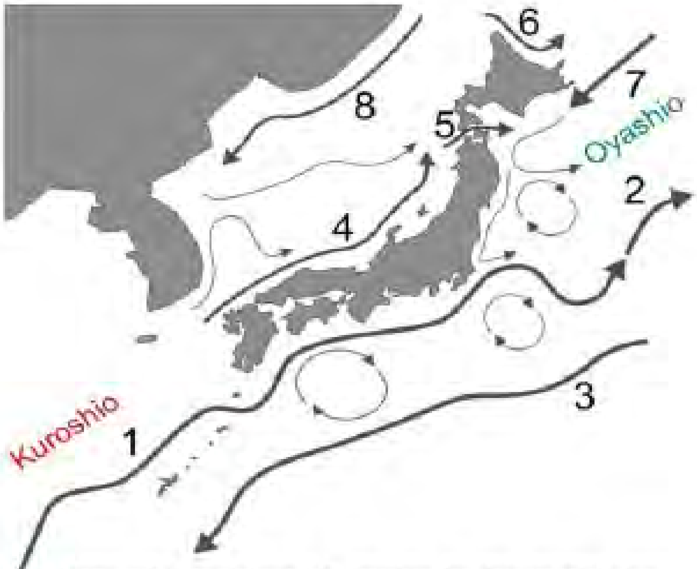
Japan


© Kamogawa city aquarium
Country report of Japan
©Mai Sakai
Satoko Kimura
JSPS post-doc, Nagoya Univ.
©TOBA AQUARIUM


Towing
音響記録計
調査船
Station
航路用ブイ
音響記録計
China
Monitoring in the wild
Tagging in the oxbow

Marine mammals in Japan water

- 39 cetaceans
- 1 Sirenia
- 8 pinnipeds



One of the richest fisheries in the world due to the extremely high nutrient content from Oyashio and Kuroshio

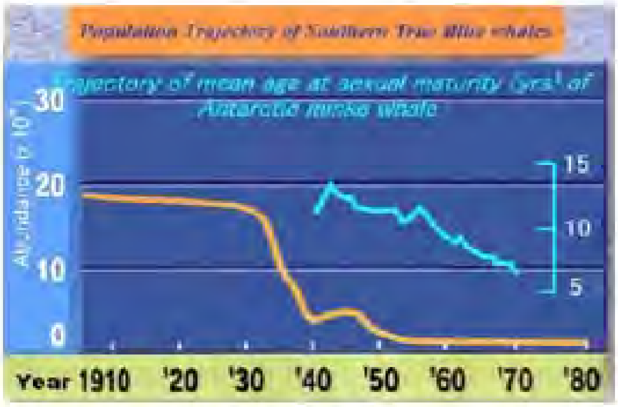
39 cetaceans

- Common mink whale
- Bryde'swhale
- Omura's whale
- Blue whale
- Cuvier's Beaked Whale
- Baird's beaked whale
- Stejneger's Beaked Whale
- Hubbs' Beaked Whale
- Ginkgo-toothed Beaked Whale
- Blainville's Beaked Whale
- Andrews' Beaked Whale
- Sperm whale
- Pygmy Sperm Whale
- Dwarf Sperm Whale
- Gray whale
- Humpback whale
- Sei whale
- Fin whale
- Right whale
- finless porpoise
- indo-Pacific bottlenose dolphin
- Bottlenose dolphin
- Riso's dolphin
- striped dolphim
- pantropical spotted dolphin
- Pacific white-sided dolphin
- short-beaked common dolphin
- long-beaked common dolphin
- spinner dolphin
- northern right whale dolphin
- rough-toothed dolphin
- Fraser's dolphin
- horbour porpoise
- Dall's porpoise (Dalli type and Truei type)
- short-fin pilot whale (north type and south type)
- false killer whale
- pygmy killer whale
- melon-headed whale
- killer whale

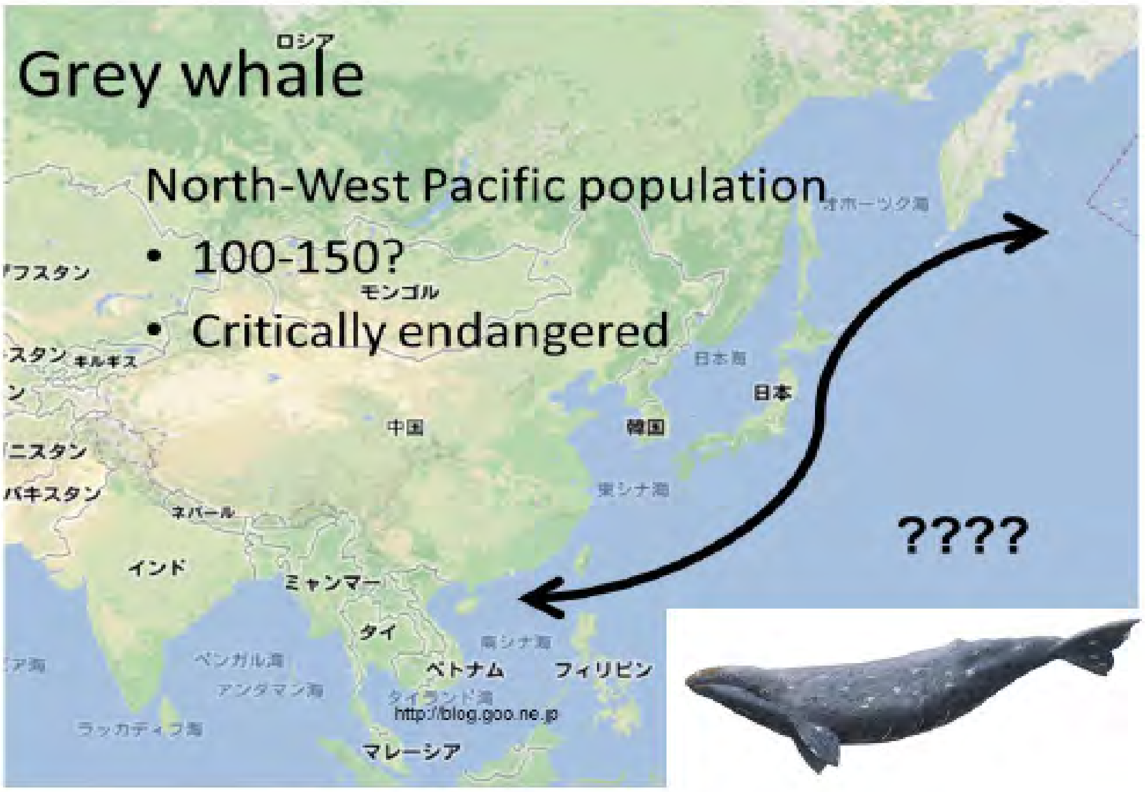
Blue whale : endangered

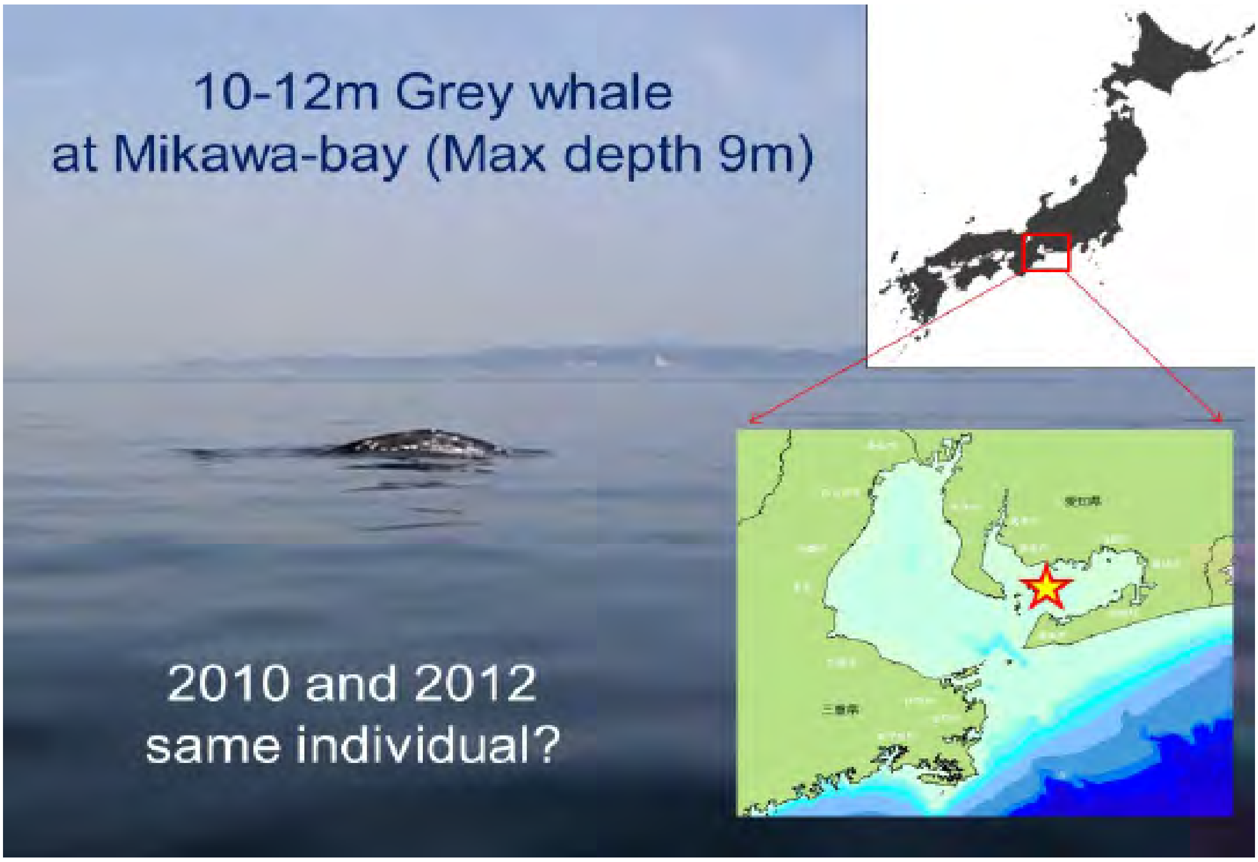
- Abundance : 2280 (95%CI1160-4500, IWC 2008)
- Annual increasing rate 6.4%
- Still 0.9% of before starting whaling（95%CI; 0.7～1.0%）

- No study in Japan?
- No record of bycatch or stranding?



Abundance of Blue in Antarctic





The Act on the Protection of Fishery Resources

Since 1993

- Bowhead whale
- Blue whale
- Finless porpoise
- Dugong

- Humpback, Grey and Right whale (CITES)

39 cetaceans

- Common mink whale
- Bryde'swhale
- Omura's whale
- Blue whale
- ~~Cuvier's Beaked Whale~~
- Baird's beaked whale
- ~~Stejneger's Beaked Whale~~
- Hubbs' Beaked Whale
- Ginkgo-toothed Beaked Whale
- Blainville's Beaked Whale
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- Dwarf Sperm Whale
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- Sei whale
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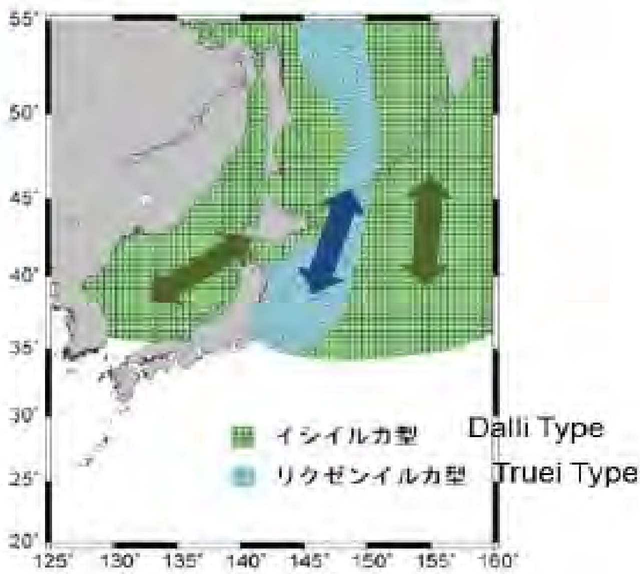
- Right whale
- finless porpoise
- Indo-Pacific bottlenose dolphin
- Bottlenose dolphin
- Riso's dolphin
- striped dolphim
- ~~pantropical spotted dolphin~~
- Pacific white-sided dolphin
- ~~short-beaked common dolphin~~
- long-beaked common dolphin
- spinner dolphin
- northern right whale dolphin
- rough-toothed dolphin
- ~~Fraser's dolphin~~
- horbour porpoise
- Dall's porpoise (Dalli type and Truei type)
- short-fin pilot whale (north type and south type)
- ~~false killer whale~~
- pygmy killer whale
- melon-headed whale
- killer whale

Well studied species but live in north Japan

Dall's porpoise, Baird's Beaked Whale, Pacific white-sided dolphin, short-finned pilot whale (north, south types)

Dalli Type	Truei Type
173,638	178,157

- Abundance
- Population structure
- Food habit
- Life history
- Migration pattern



39 cetaceans

- Common mink whale
- Bryde'swhale
- Omura's whale
- Blue whale
- Cuvier's Beaked Whale
- Baird's beaked whale
- Stejneger's Beaked Whale
- Hubbs' Beaked Whale
- Ginkgo-toothed Beaked Whale
- Blainville's Beaked Whale
- Andrews' Beaked Whale
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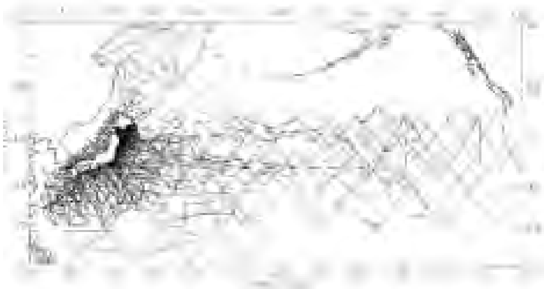
- short-fin pilot whale (north type and south type)
- false killer whale
- pygmy killer whale
- melon-headed whale
- killer whale

Whaling



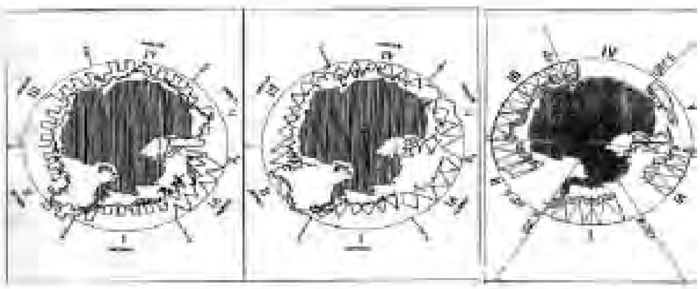
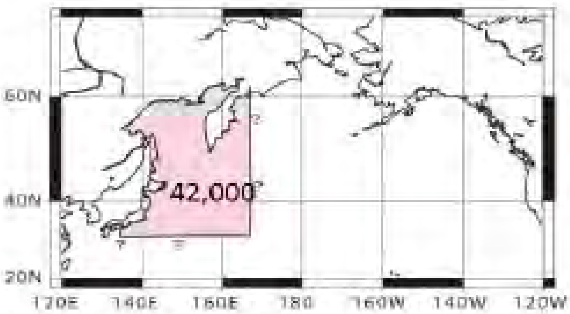


表１．調査対象鯨種の資源量推定値と計画捕獲頭数

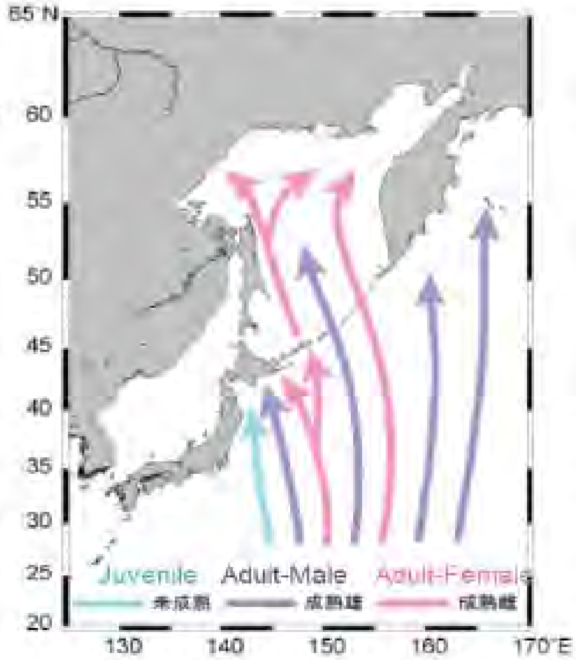
	鯨種	Abundance	Catches	Ratio	文献
NW Pacific	Sei	21,612	100	0.46%	Hakamada (2009)
	Bryds	20,501	50	0.24%	Kitakado *et al.* (2008)
	Common minke	42,257	220	0.52%	Hakamada *et al.* (2009)
	Sperm	102,112	10	0.01%	Kato and Miyashita (1998)
Antarctic	Black minke	761,000	850	0.11%	IWC (1991)
	Fin	11,755	50	0.43%	Matsuoka *et al.* (2006)

Common minke whale

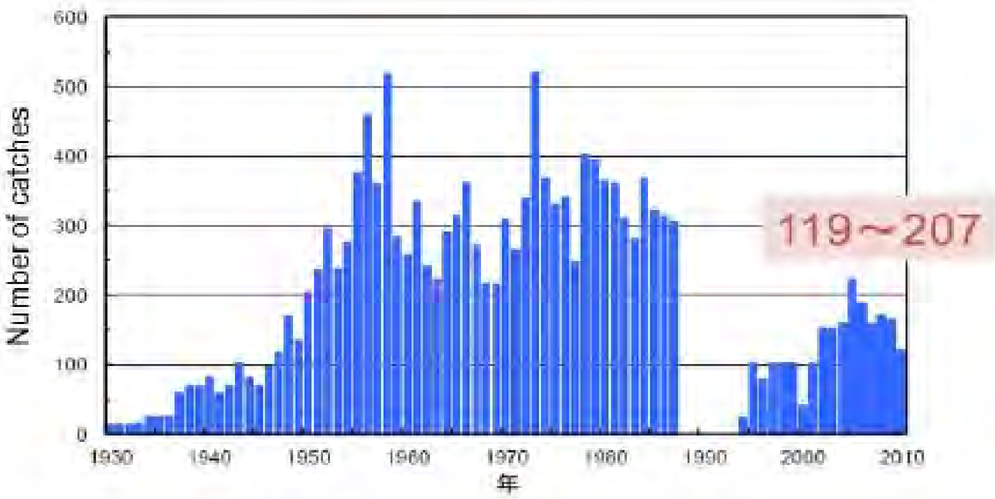
- J-population
  Japan-Yellow-East China sea
- O-population
  Okhotsk-NW Pacific



Sources: Kato 1992, Anon. 1992, Miyashita and Shimada 1994, IWC 1997, Tamura and Kato 2003



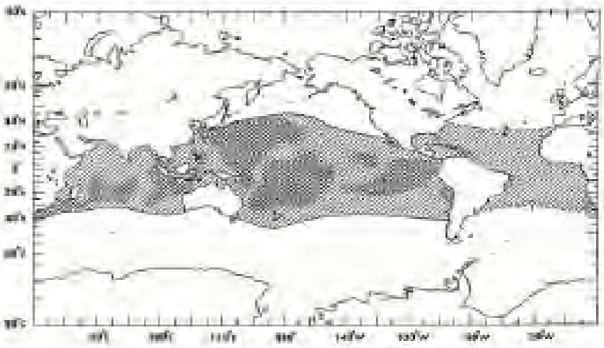
Number of annual catch of common minke whale at NW-PAcific

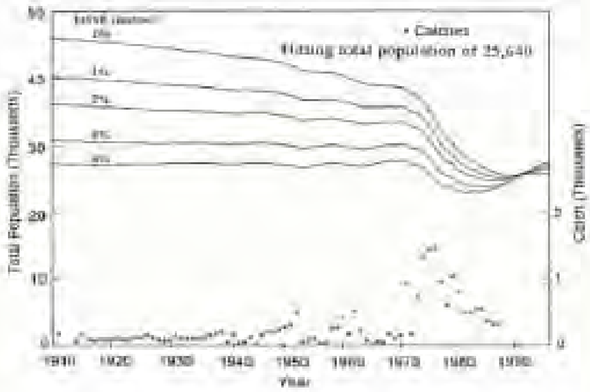


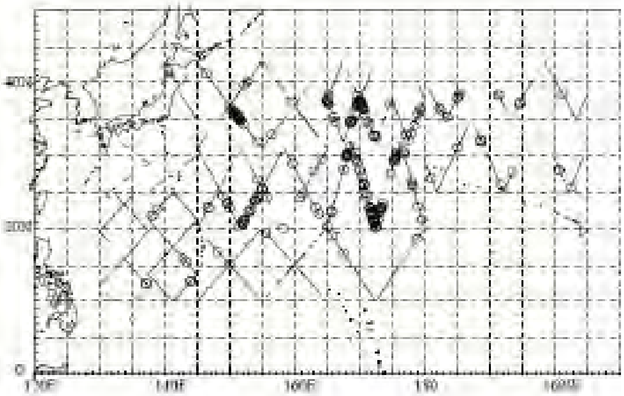
- 0.5% of abundance

Bryde's whale

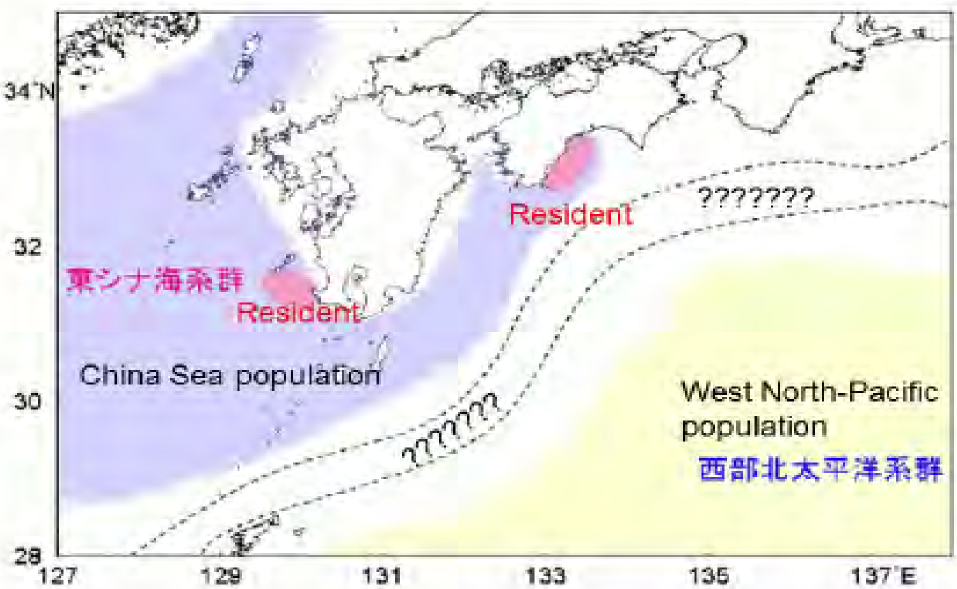
- 20,501 individuals in NW Pacific
- annually 50 catches



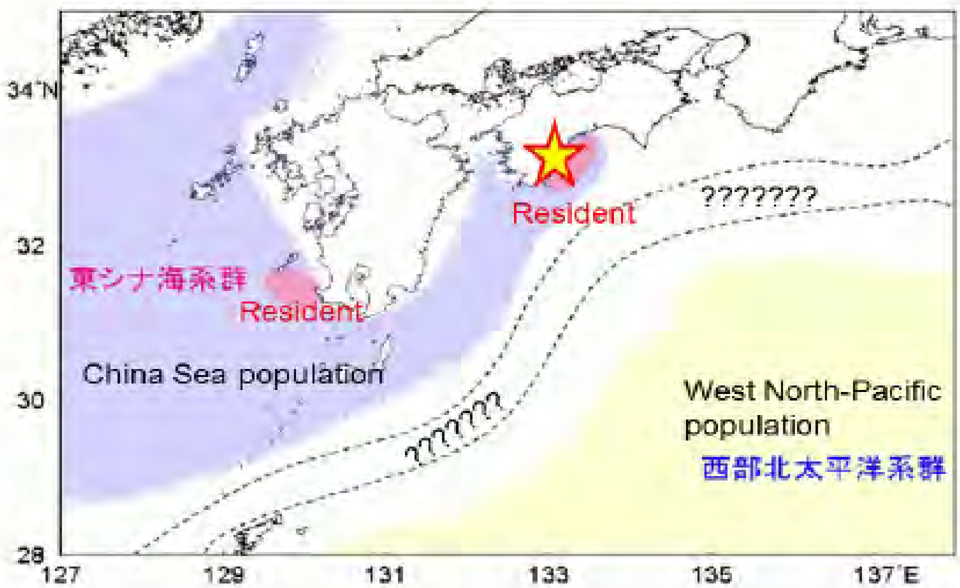




Four populations of Bryde's whale



Whale watching

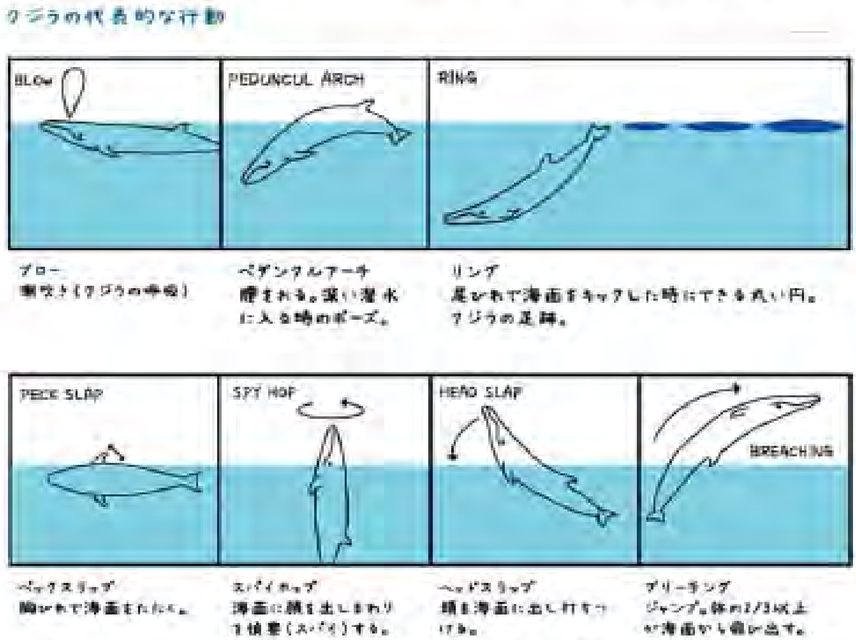


Whale watching from Okata-town

- Bryde's whale
- (Sperm whale by chance)
- Bottlenose dolphin
- Riso's dolphin
- Long beaked common dolphin
- Short beaked common dolphin

Good for education

Most Japanese doesn't know marine mammal live in Japanese water



From website of Whale watching

Effect on animals

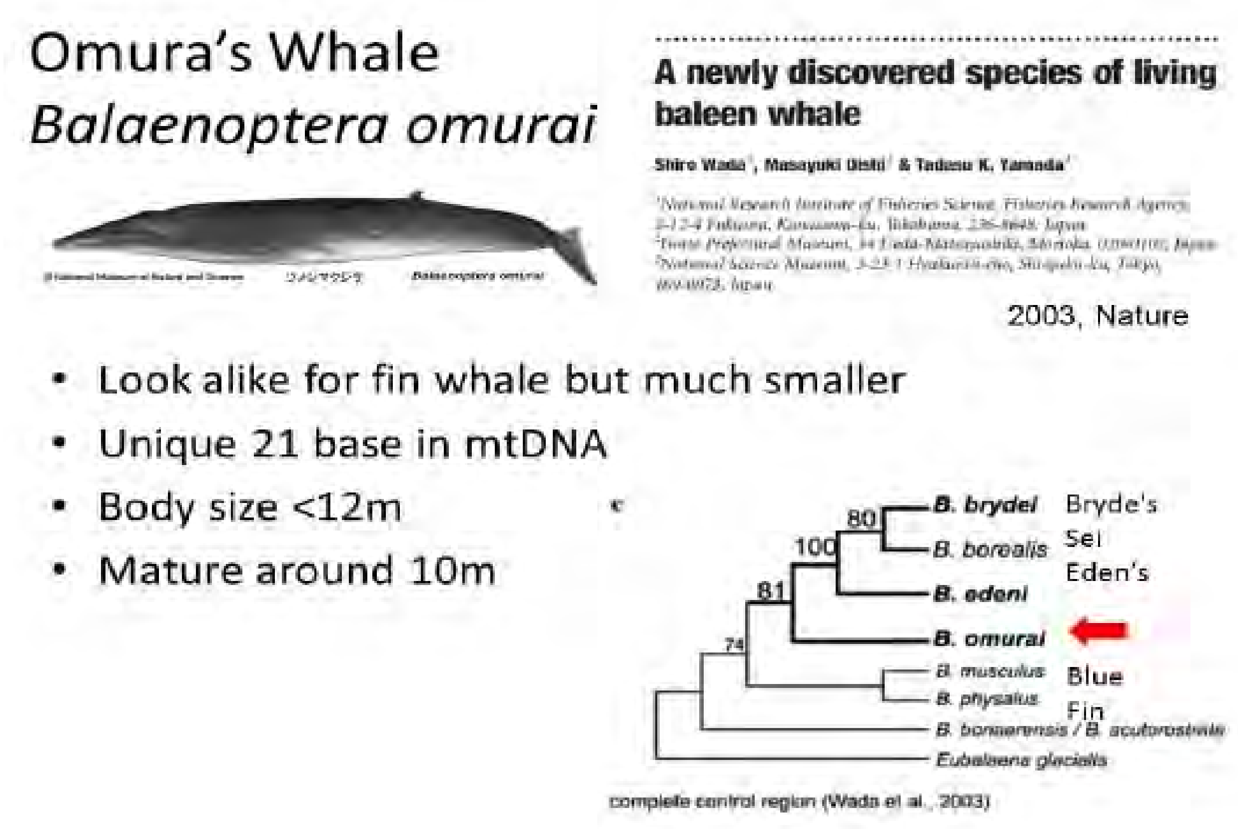
Self-regulation

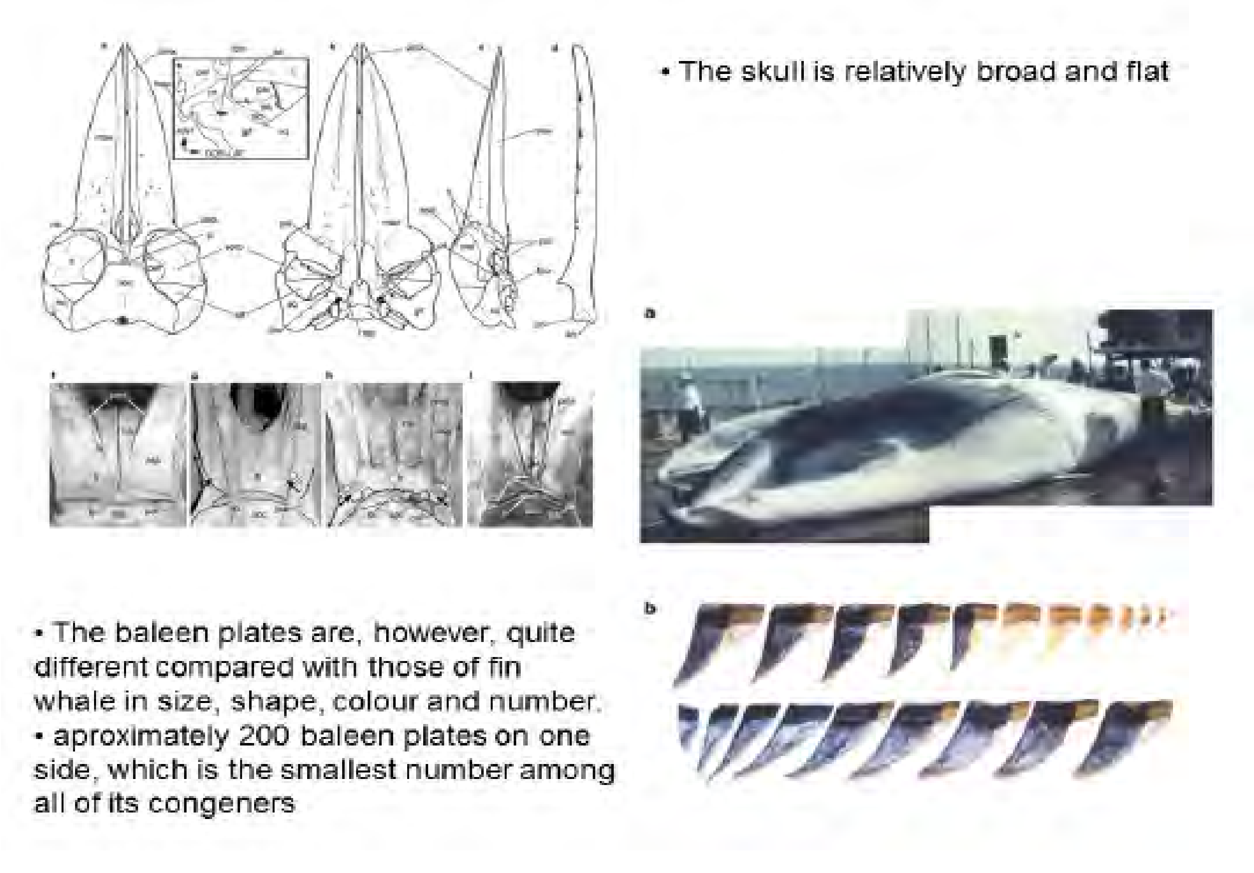
– > 30m distance

– Slow speed within 200m

→ behavior changes with # of boats

Matsuda et al., 2011 For *Turshiops aduncas* in Kyushu


Omura's Whale
Balaenoptera omurai
Balaenoptera omurai
A newly discovered species of living baleen whale
Shiro Wada, Masayuki Oishi & Tadasu K. Yamada
2003, Nature
• Look alike for fin whale but much smaller
• Unique 21 base in mtDNA
• Body size <12m
• Mature around 10m
80
100
81
74
B. brydei
B. borealis
B. edeni
B. omurai
B. musculus
B. physalus
B. bonaerensis / B. acutorostrata
Eubalaena glacialis
Bryde's
Sei
Eden's
Blue
Fin
complete control region (Wada et al., 2003)


• The skull is relatively broad and flat
a
b
• The baleen plates are, however, quite different compared with those of fin whale in size, shape, colour and number.
• aproximately 200 baleen plates on one side, which is the smallest number among all of its congeners

Omura's Whale

Balaenoptera omurai

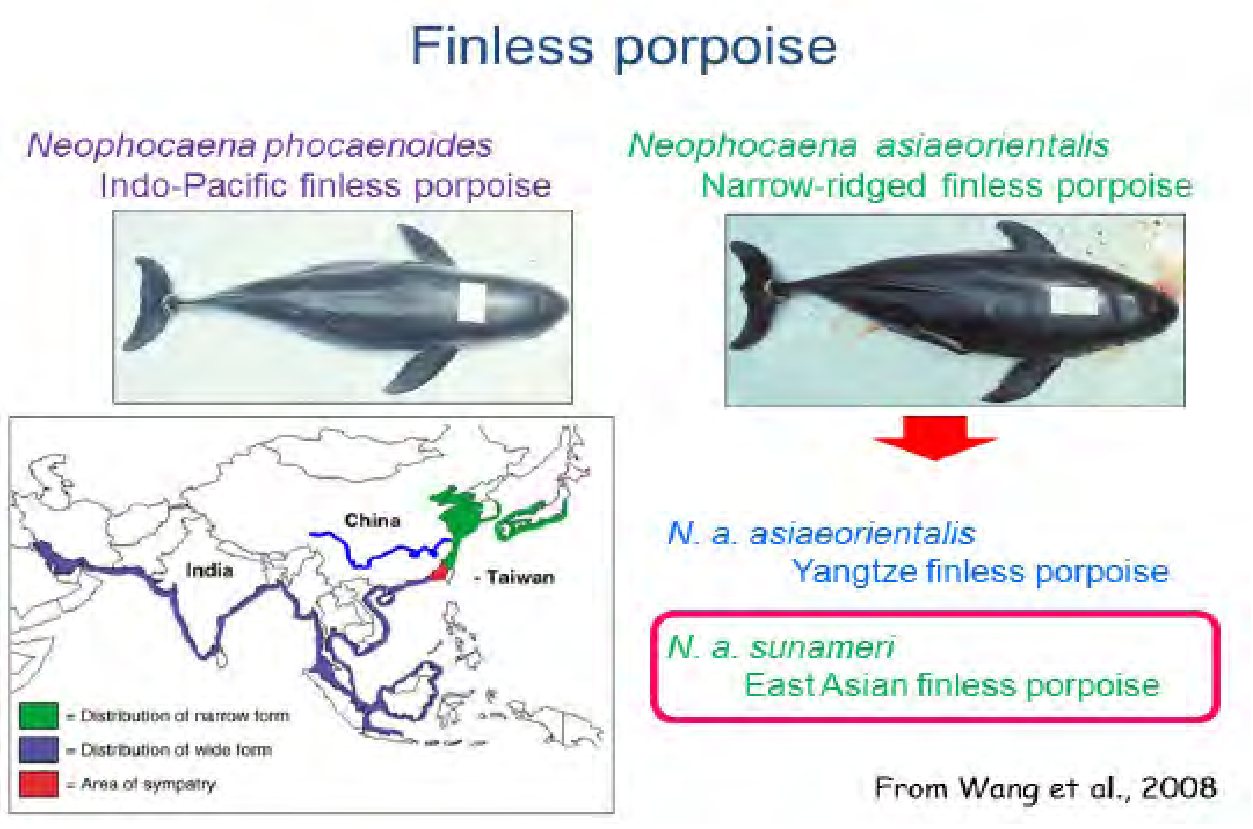
Unknown ecology

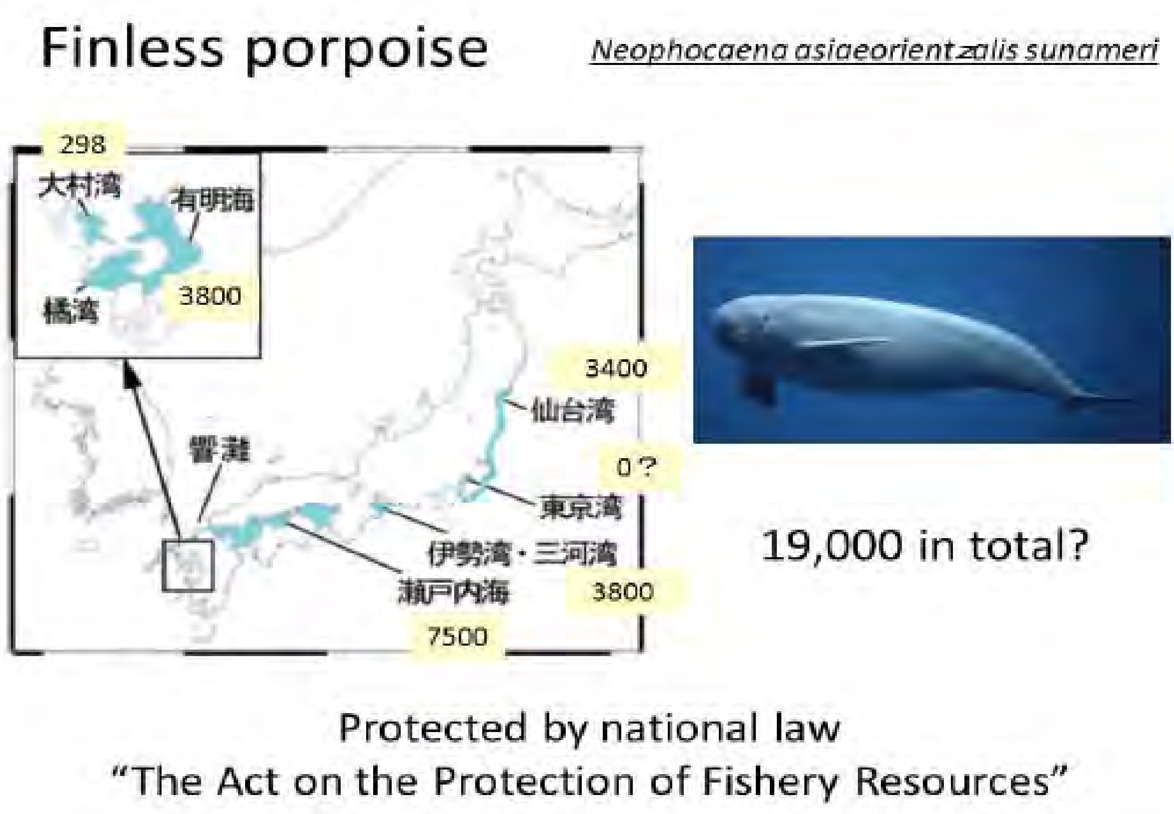
They may migrate South-East Asia....?

Catches of toothed whale and dolphin

鯨種	Area	Abundance	95%CI or CV	出典
Baird's Beaked Whale	Pacific ocean	5,000	2,500~10,000	Miyashita and Kato 1993
	South of Okhotsk	660	310~1,000	Miyashita 1990
	East Japan-sea	1,500	370~2,600	Miyashita 1990
Short fin pilot whale (north type)	Pacific ocean	5,300	CV=0.43	Anon. 1992
Short fin pilot whale (south type)	North west of N10° E180°	15,057	CV=0.71	南川ほか(2007)
Riso's dolphin	North west of N30° E180°	32,864	CV=0.45	南川ほか(2007)
False killer whale	North west of N10° E180°	40,392	CV=0.55	南川ほか(2007)
Bottlenose dolphin	North west of N10° E180°	38,829	CV=0.63	南川ほか(2007)
Striped Dolphin	North west of N30° E180°	504,334	CV=0.55	南川ほか(2007)
Pantropical Spotted Dolphin	North west of N10° E180°	397,515	CV=0.42	南川ほか(2007)
Dall's porpoise (Dalli Type)	South Okhotsk	173,638	CV=0.212	宮下ほか(2007a)
Dall's porpoise (Truei Type)	South Okhotsk	178,157	CV=0.232	宮下ほか(2007a)
Pacific white-sided dolphin	North west of N30° E145°	36,764	CV=0.80	宮下ほか (2007b)

Number of catches, which is under government control, is not sure after Tohoku disaster


Finless porpoise
Neophocaena phocaenoides
Indo-Pacific finless porpoise
Neophocaena asiaeorientalis
Narrow-ridged finless porpoise
China
India
- Taiwan
= Distribution of narrow form
= Distribution of wide form
= Area of sympatry
N. a. asiaeorientalis
Yangtze finless porpoise
N. a. sunameri
East Asian finless porpoise
From Wang et al., 2008


Finless porpoise
Neophocaena asiaeorientzalis sunameri
298
大村湾
有明海
橘湾
3800
3400
仙台湾
響灘
0 ?
東京湾
伊勢湾・三河湾
瀬戸内海
3800
7500
19,000 in total?
Protected by national law
"The Act on the Protection of Fishery Resources"

5 isolated population

- Difference of mtDNA (Yoshida et al., 2001)
- Narrower skull of Ise-Mikawa population ④
- Different Body size
  - Setouchi population ③
    max male 207 cm
    female 180 cm
  - Kyushu population ②
    male 175 cm
    female 165 cm

(Shirakihara et al. 1993)

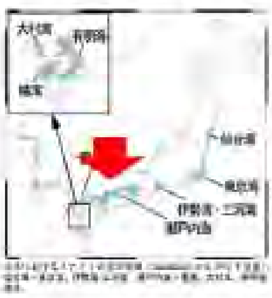
変異型	a	b	c	d	e	f
①大村湾	0	0	0	3	0	0
②橘湾・有明海	0	9	0	9	0	46
③瀬戸内海・響灘	0	0	0	27	3	0
④伊勢湾・三河湾	0	4	52	0	0	0
⑤東京湾〜仙台湾	7	7	0	0	0	0

mtDNE (Yoshida et al. 2001)

Age (years)

Distribution in Setouchi-inland sea

- Aerial survey in 2000
- 60 north-south lines, 2,218 km in total
- Av. group size 1.56 individuals, Abundance 7,572 individuals
- 0.506 individuals/km2 (CV = 17.3%)
  - Western density of 1.31 / Eastern density of 0.208



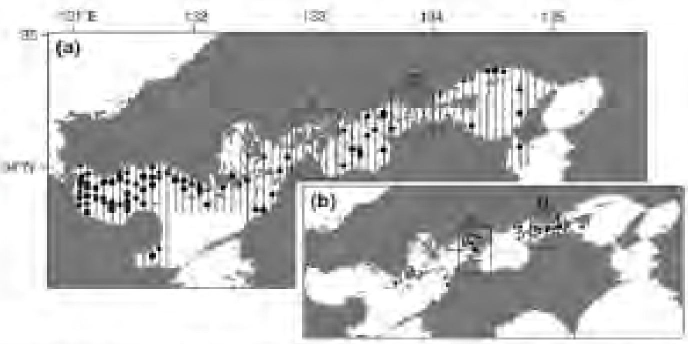


Fig. 3 a Transects for the aerial surveys and sighting positions of finless porpoise groups. Rectangles of A ([illegible]) and B ([illegible]) show waters where no finless porpoises were sighted in adjacent transects. b Locations of sand dredging in the Inland Sea of Japan based on the data from the Ministry of the Environment ([illegible])

Threats; overfishing and sand dredging

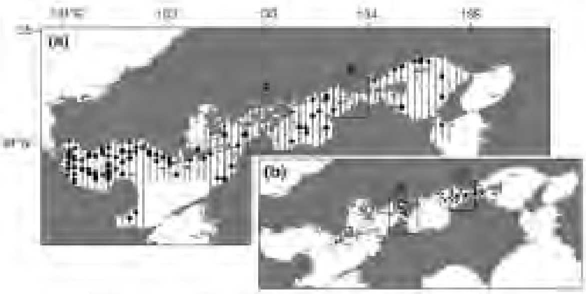
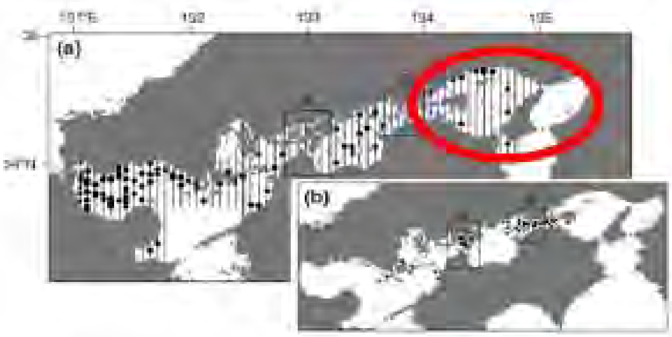


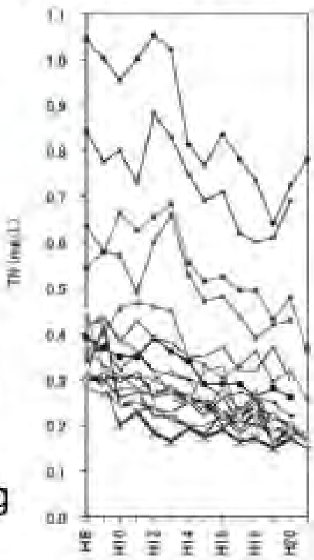
Table 2 Yearly averages of five factors for the period of 1976–2000. For comparisons, the value of each factor was divided by stratum area. The western stratum and Beppu Bay were pooled into a stratum, taking account of the differences in area definition used in the data of each factor

	Stratum	
	Western +Beppu Bay	Central-eastern
(1) Fishing days (days/km^2)	56.1	51.9*
(2) Commercial catch of potential preys (ton/km^2)	4.23	7.48*
(3) Frequency of red tides (number/km^2)	0.00565	0.00612
(4) Area of reclamation (ha/km^2)	0.0245	0.0331
(5) Amount of sand removed (10^{3}m^3/km^2)	0.416	2.01*
Area (km^2)	4,852	9,097

*P < 0.05

Threat: Too clean water
Low level of nutrient at some area

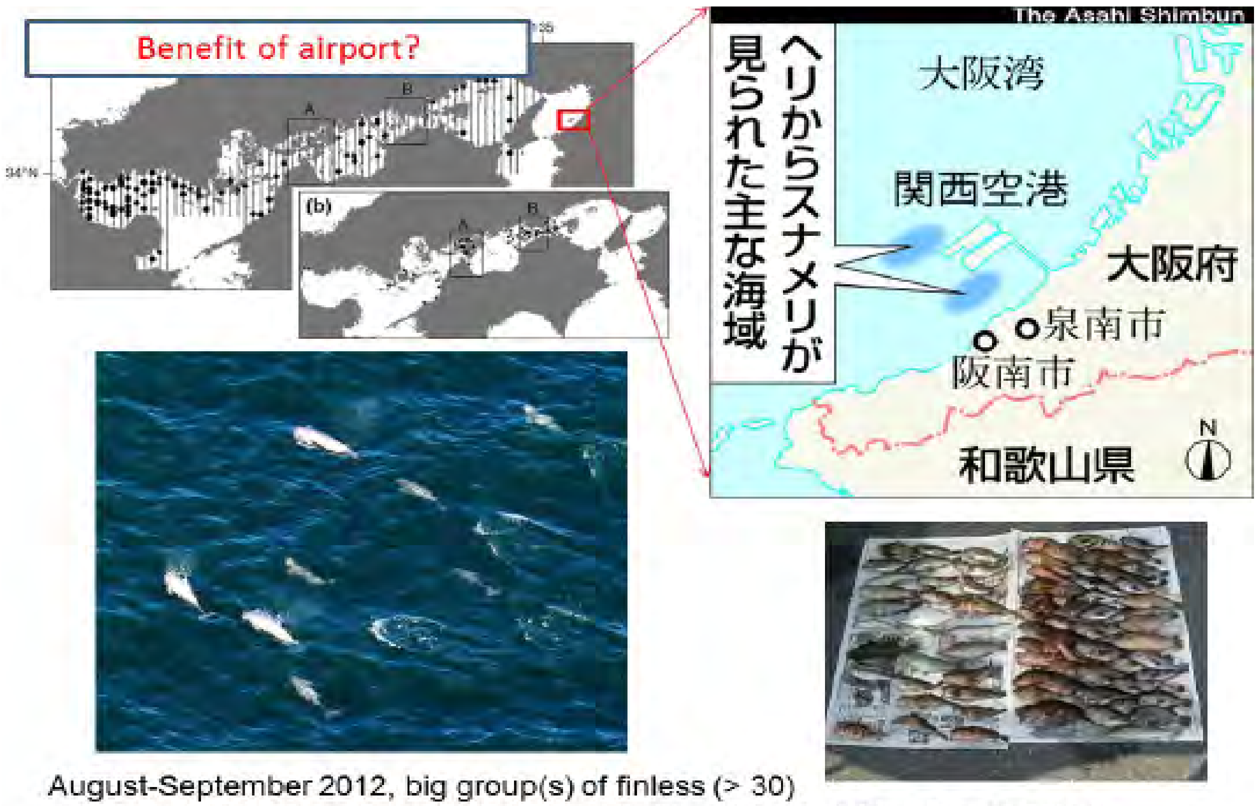




- Nitrogen concentration has been decreasing especially since 2000
- 1/3 of 1980s

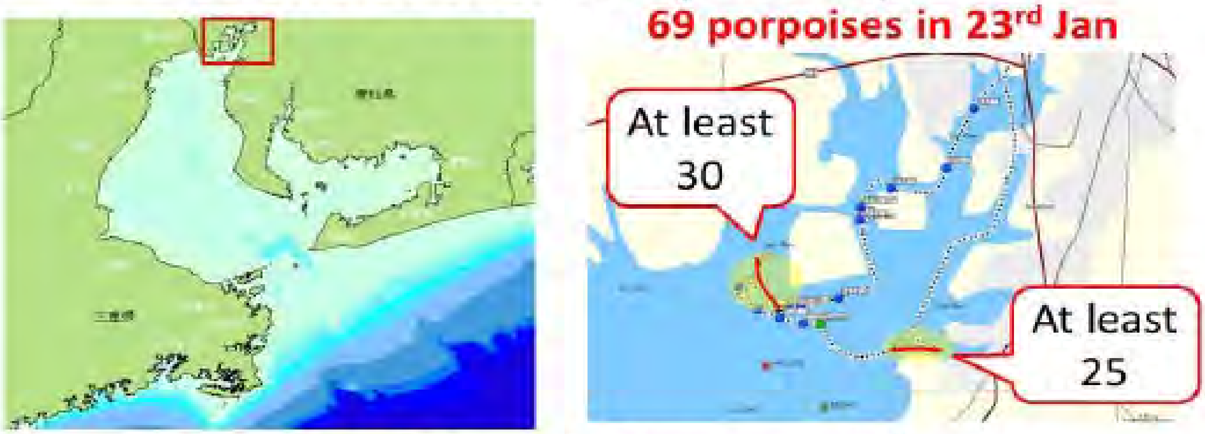
・・・too much effluent regulation?

Shirakihara et al., 2007



August-September 2012, big group(s) of finless (> 30) was founded close to Kansai International airport where fishing is prohibited

Human activity effects; Benefit of thermal power plant?

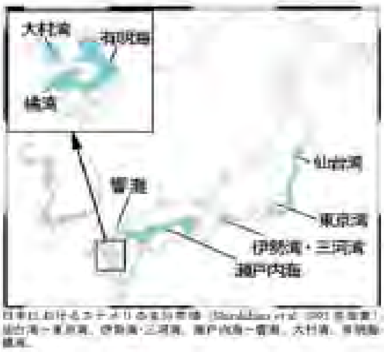


- Water tem 20° at sighting area > 10°
- Warm water from thermal power plant
  ← Fish ← Finless ??
- This was reported in other areas

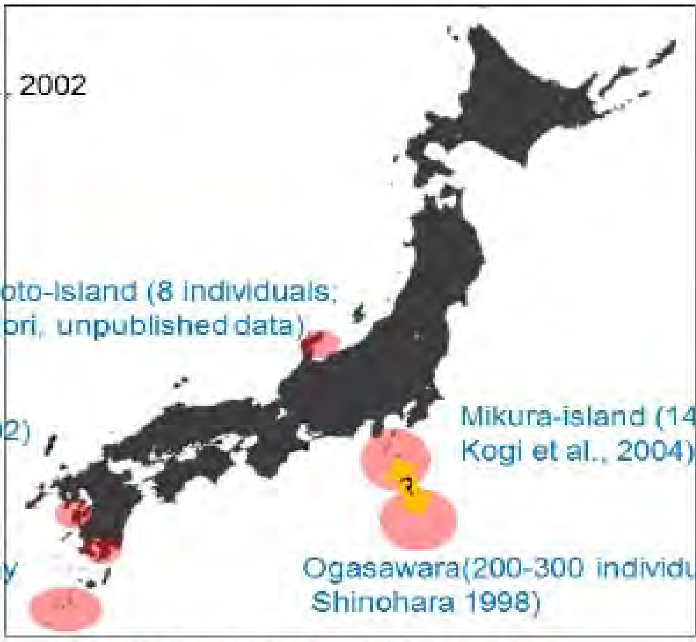
Kimura, unpublished data

Number of by catches and stranding

- Officially 53 during 2000-2004, which has reduced with the change of the way of fishing (1970s?)
- Because of the the Act on the Protection of Fishery Resources, fishermen do not want to report
- Stranding 438 during 2000-2004
  - 251 in Ise-Mikawa because of aquarium and univ.

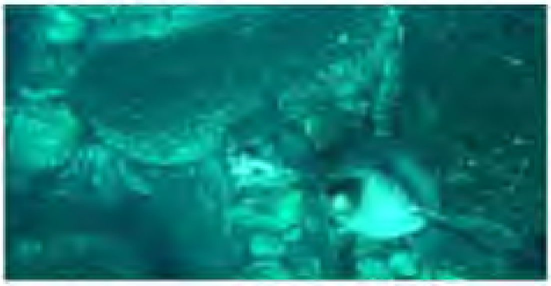


Indo-Pacific bottlenose dolphin

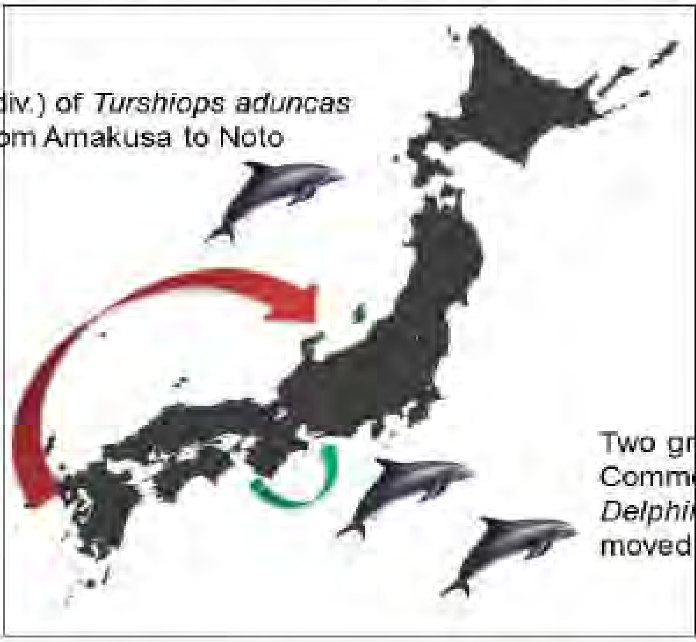


Indo-Pacific bottlenose @ Mikura

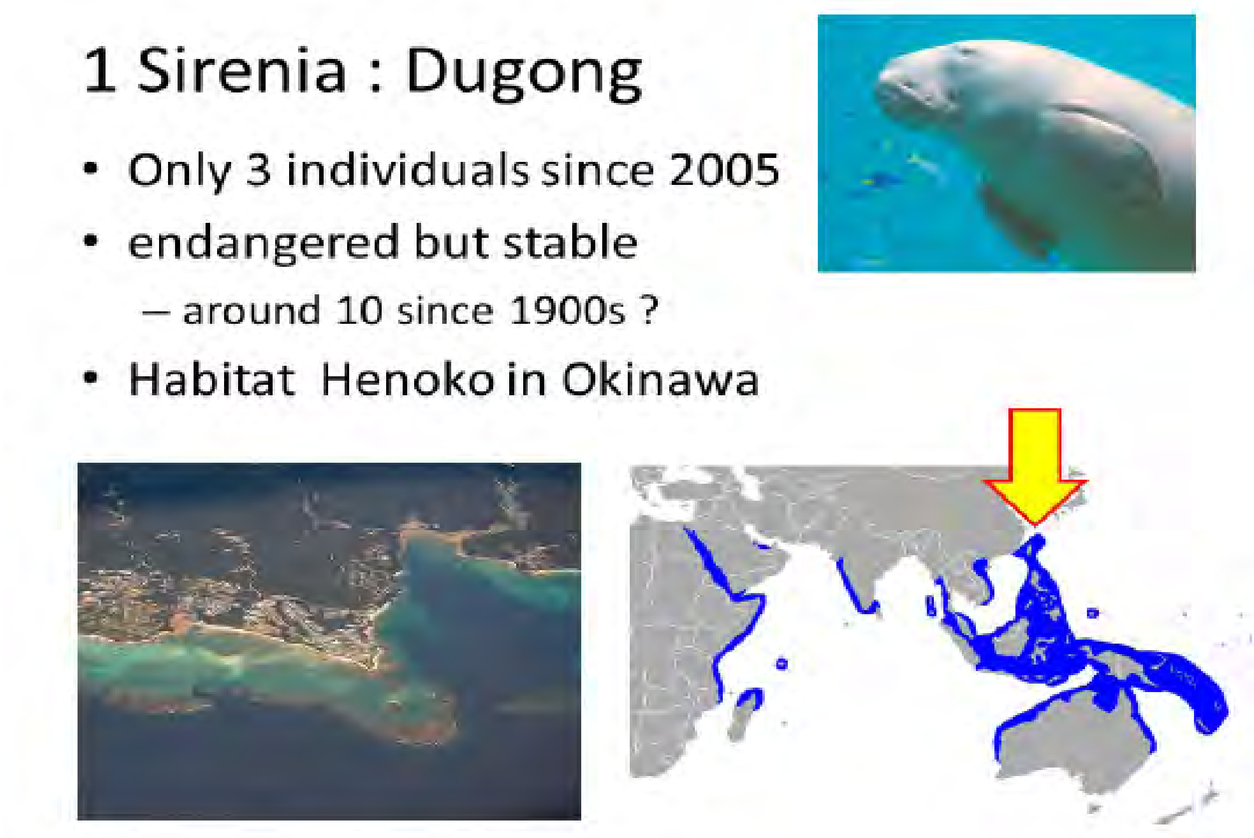
- 222 individuals of photo ID 1994-2009
- Watching & swimming with dolphin
- Many studies about DNA, ethology, socializing behavior (e.g. rubbing), migration sound change etc (Morisaka et al, Sakai et al)
  - Natural hybrid of truncatus and aduncas



Possible effect of global warming?



Some rays and fishes have appeared at more North and East.



Cymodocea serrulata

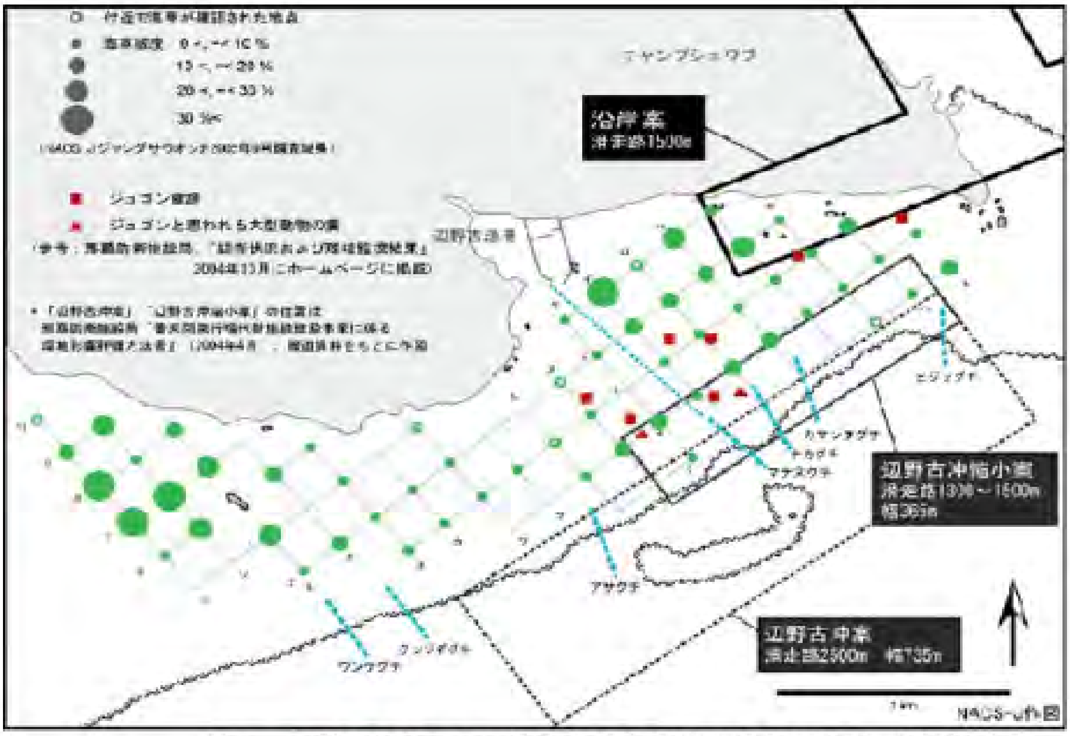
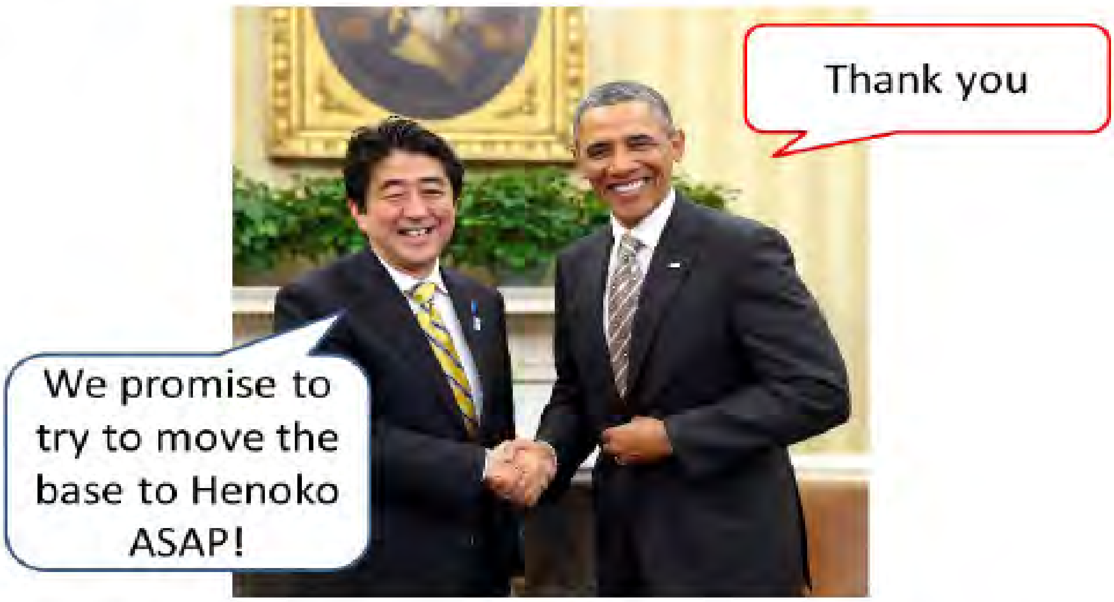


図２　辺野古海域における飛行場計画案と海草の分布（2005年9月）、ジュゴンの痕跡確認位置

Meeting in Feb 22nd



Because our primarily party changed, the plan has re-started

8 pinnipeds

- Japanese sea lion/probably extinction
- Steller sea lion/endangered
- Northern fur seal / vulnerable
- Harbour [common] seal / least consern
- Spotted seal / data defieicnt
- Ribbon seal / vulnerable
- Bearded seal / least consern
- Ringed seal / least consern

- Asian sea otter/endangered

Otariids in Japan

Steller sea lion

Northern fur seal

Japanese sea lion

Yoko Mitani
(Hokkaido University)

Japanese sea lion

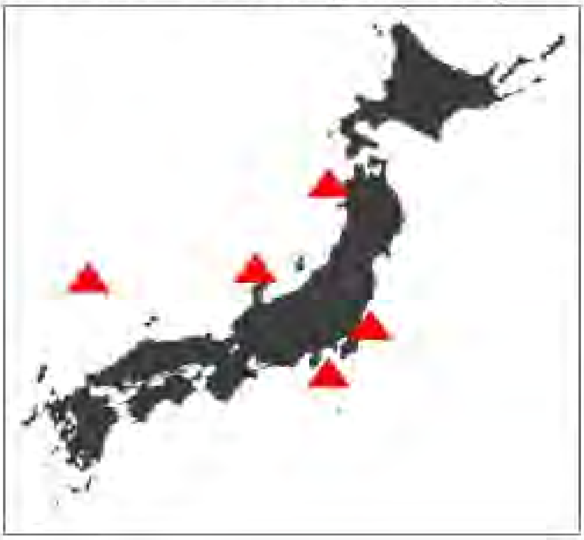
Zalophus japonicus

- Body length
  - M: 230–250 cm
  - F: 160–180cm
- Body weight
  - M: 450–560 kg
  - F: 120 kg
- Status
  - IUCN: EX

Slide by Yoko Mitani, Hokkaido Univ.

Extinct···?

Former breeding rookery



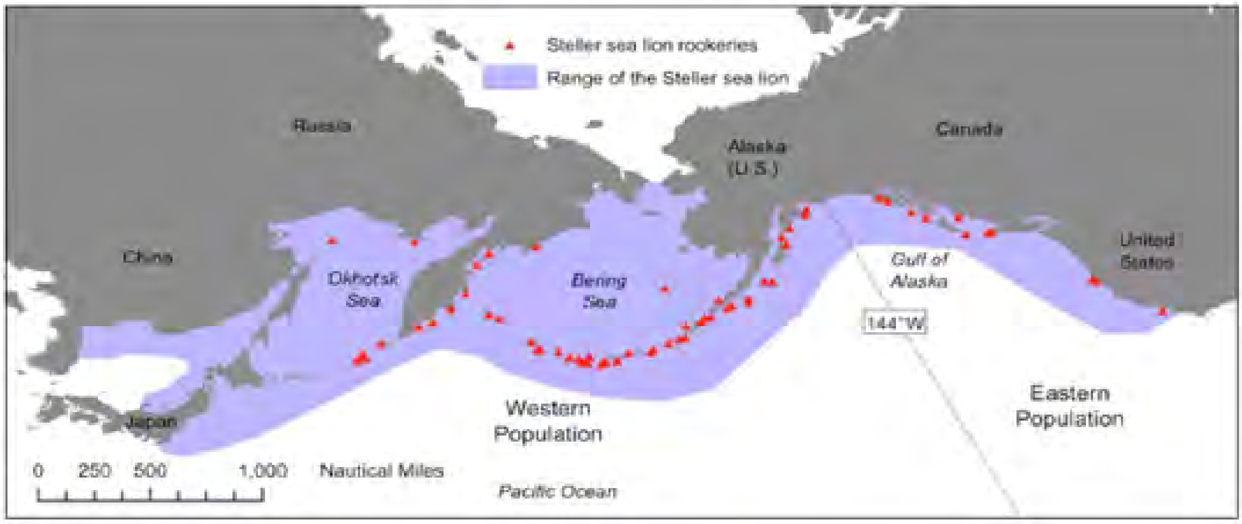
- Causes
  - Overhunting for oil and skin
  - Cull
  - Decreasing fish stocks
- Sightings reported 1970s
- Still alive in Russian/Chinese waters?

Slide by Yoko Mitani, Hokkaido Univ.

Steller sea lion
Eumetopias jubatus

- Body length
  - M: 280–320 cm
  - F: 230–250 cm
- Body weight
  - M: 600–1100 kg
  - F: 270–300 kg
- Status
  - IUCN: EN

Distributions of SSL

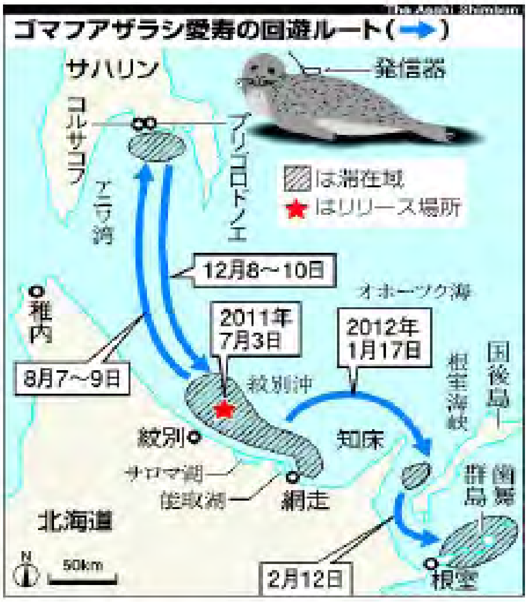


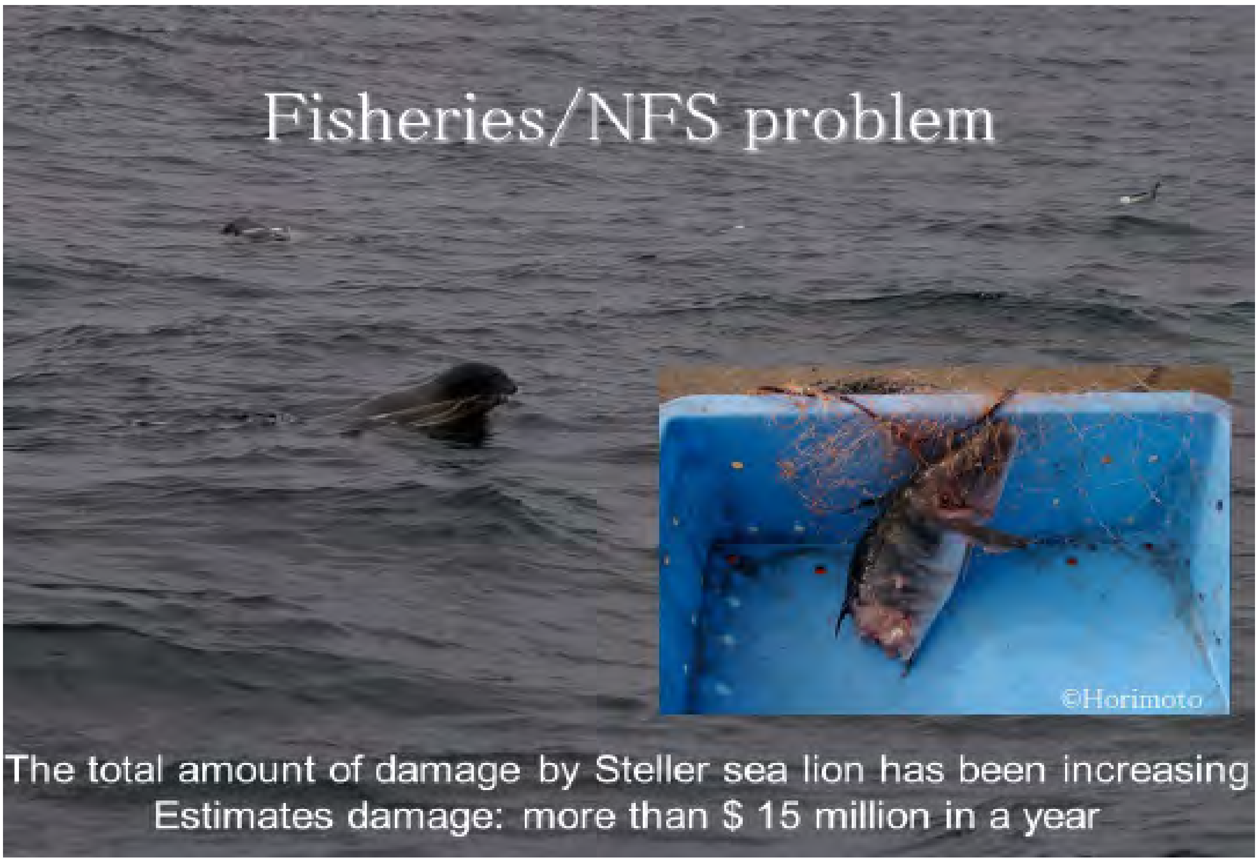
©NOAA

Diving behavior of NFS

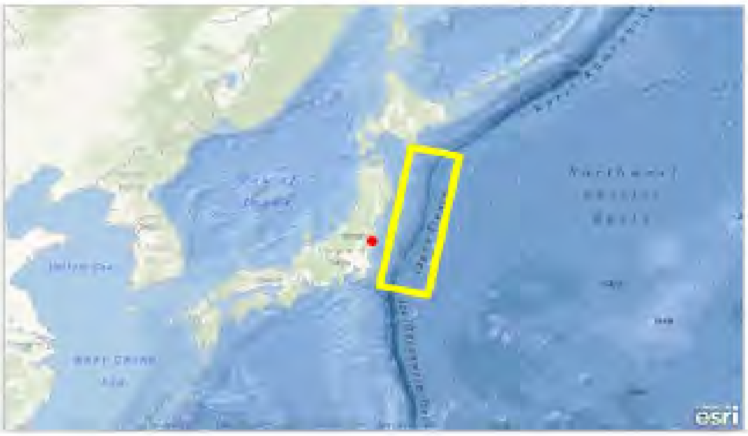
3D logger: dive paths

Tracking of Spotted Seal





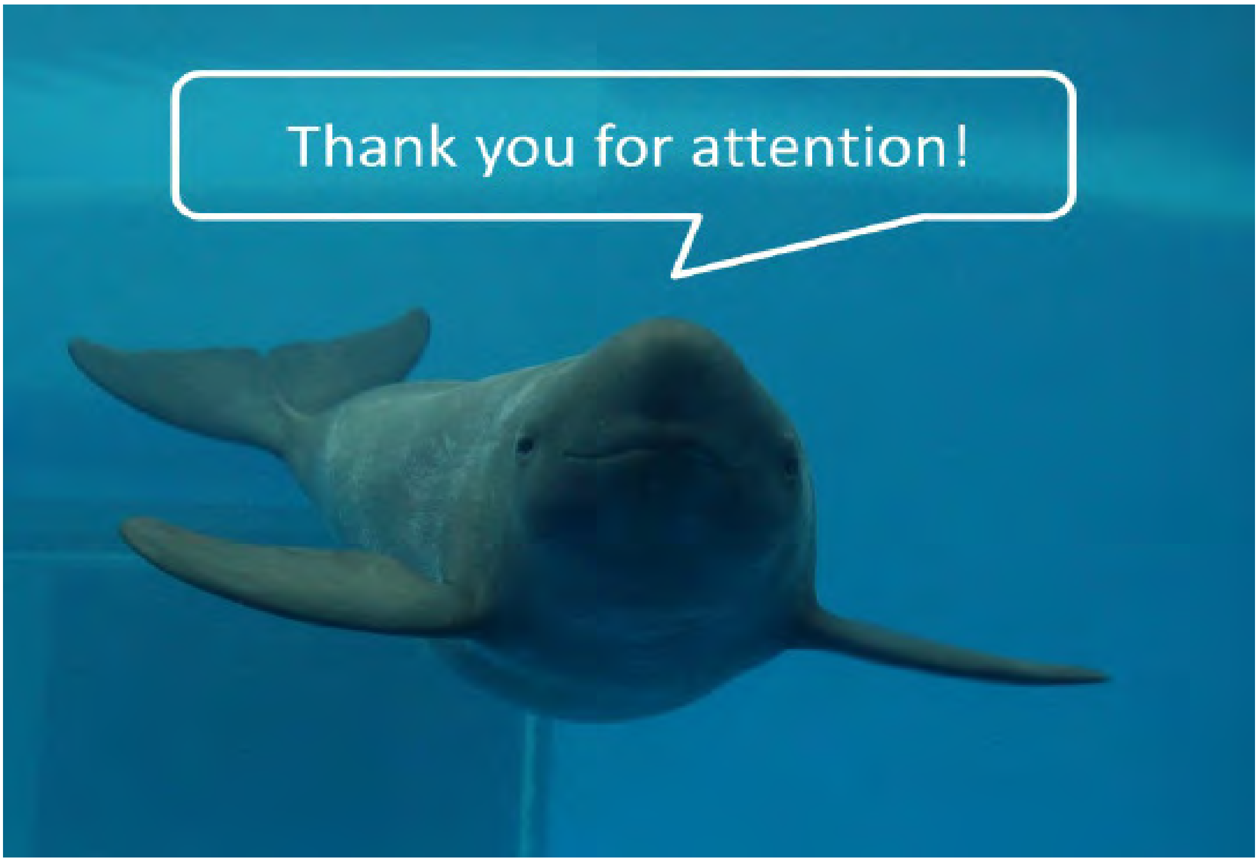
Concern after 3.11



- Bathymetry change in more than 600km
- Damage to fishing industry $20-30 billion
  - Effect on coastal species: finless and...?
- Effect of Fukushima
  - High level of radioactive found in local fish

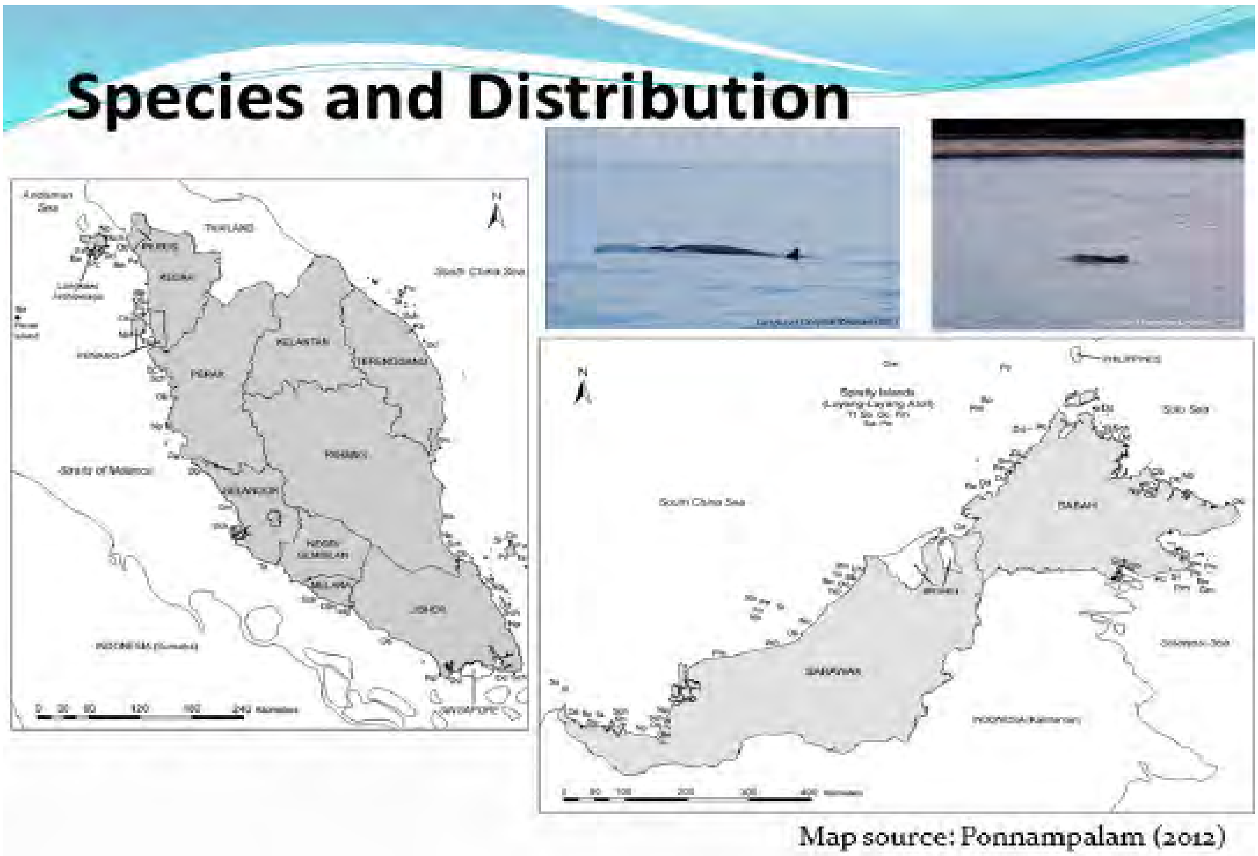
Summary

- Many species : 39 cetaceans, 1 Sirenia, 8 pinnipeds
  - Inshore species; finless, Indo-Pacific bottlenose etc
  - Less info about pelagic species
- Situation is a bit different from SE Asia
  - Whaling and dolphin catch
  - Less by-catch since 1970s (probably)
  - Lower level of nutrient
  - Conflict between fisheries
  - Concern after Tohoku disaster
- Possible effect of global warming??
- Needs more education
  - we are living with lots of marine mammals!!


Thank you for attention!

Malaysia


SEAMAMS III: MALAYSIA
© Sarawak Dolphin Project
Cindy Peter


Species and Distribution
Map source: Ponnampalam (2012)

Population status

- Peninsular Malaysia (PM)
  - status is unknown for all cetacean species due to a severe lack of scientific research effort.
  - 2010: Langkawi Dolphin Research established.
  - So far, >100 individuals of Indo-Pacific humpback dolphins have been photo-identified and catalogued based on the animals' left and right sides of their dorsal fins (Ponnampalam & Jamal Hisne, 2011).
  - CEMACS since 2012
  - Dugong: Pulau Sibu, Tinggi, Besar, Rawa in Johor and Pulau Seribuat in Pahang.

- East Malaysia (EM), (for **Irrawaddy dolphins**)
  - Cowie Bay, Sabah: Program CAPTURE estimated population size to be **N=31** (95% CI=28 – 34; CV=0.06) (Teoh et al., In press).
  - Kinabatangan River: **two distinct populations**; Sandakan bay and another near Tundun Bohangin.
  - In Kuching Bay, Sarawak: Mark-recapture method yielded **233 dolphins** (95% CI 151-360, CV = 22.5%) where as line-transect methods yielded estimate **of 149 individuals** (95% CI 87-255, CV=28%) (Minton et al., in press).

- East Malaysia
  - In Kuching Bay, Sarawak: Finless porpoise estimated to be fewer than 300 individuals (95% CI 74-246) based on line-transect/DISTANCE methods (Minton et al., in press).
  - Dugong: in Brunei Bay and Lawas, the mean group size was 2.4 ± 3.13 (min = 1, max = 8) (Jaaman, unpublished data).
  - 53 dugongs in Sabah except Tawau. Key areas, Brunei Bay, Labuan.

Habitat status

East Coast Economic Region (ECER) in Kelantan, Terengganu, Pahang and Mersing

Iskandar Malaysia, Johor

Continued..

Sarawak Corridor of Renewable Energy, Bintulu

Flood mitigation channel, Kuching Bay

Directed catch (including live-captures)

- Peninsular Malaysia
  - currently no directed catches of marine mammals whether dead or alive
  - stranded dugongs was rehabilitated and subsequently kept in captivity twice
- East Malaysia
  - direct hunting occurs in the fishing district of Sebuyau, Sarawak where Irrawaddy dolphin meat is used as bait for puffer fish

- In Sabah, marine mammals have been hunted traditionally.
- dugong targeted by Bajau Laut; RM400 (US$125) for whole whereas Bajau Pelauh in Semporna targets dolphins (Jaaman and Lah-Anyi, 2002; Jaaman et al., 2008).

By-catch in fisheries

- Various projects in different parts of the country – data not centralized

Peninsular Malaysia	Sabah	Sarawak (reported to SDP)
61 stranding incidents between 1905-2012; 17 involved dolphins, five whales, and 39 dugongs (DOFM, unpublished)	A total of 306 (95% CI =	4 Irrawaddy dolphins,

Types of fisheries and information on scale

- Small scale artisanal fisheries.
- Contributes 1.1% to the country's gross domestic product (GDP) in 2011.
- Consists of 134,110 fishermen; 53,002 units of licensed fishing vessels of which 60% in PM and 40% in EM (DOF, 2012).

Other threats

1. Oil and gas explorations and development
   - increasing number of exploration and offshore development projects
2. Ship strikes
3. Pollution
   - Land-based and sea-based sources
4. Lack of awareness

Legal status and present management arrangements

Federal Laws (covers PM and EM)

- Fisheries Act 1985
- Fisheries Regulations 1999

→ Apply in the Exclusive Economic Zone (EEZ) and Territorial Waters (TW)

PM
- same as above

Sabah
- Wildlife Conservation Enactment 1997

Sarawak
- Wild Life Protection Ordinance 1998

→ Apply in Territorial Waters (TW) only

- International agreements ratified by M'sia

Convention on Biological Diversity (CBD)
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
Kyoto Protocol to the United Nations Framework Convention on Climate Change
Cartagena Protocol on Biosafety
Ramsar Convention
Basel Convention
Montreal Protocol
Also a member country of the Coral Triangle Initiative (CTI)

- No MPA specifically established to address threats to marine mammals in Malaysia.

Conservation and Education Programs

- National Marine Mammal Stranding Response Network
- SDP conducted community workshops in six coastal areas in Sarawak. Target group.
- USM on dugong in Johor.
- MareCet - Langkawi Dolphin Floating Exhibition (FLEX) in April/May 2013
- More mainstream media coverage in newspaper as well as TV (LP on The Star newspaper, SDP on Simfoni Alam)

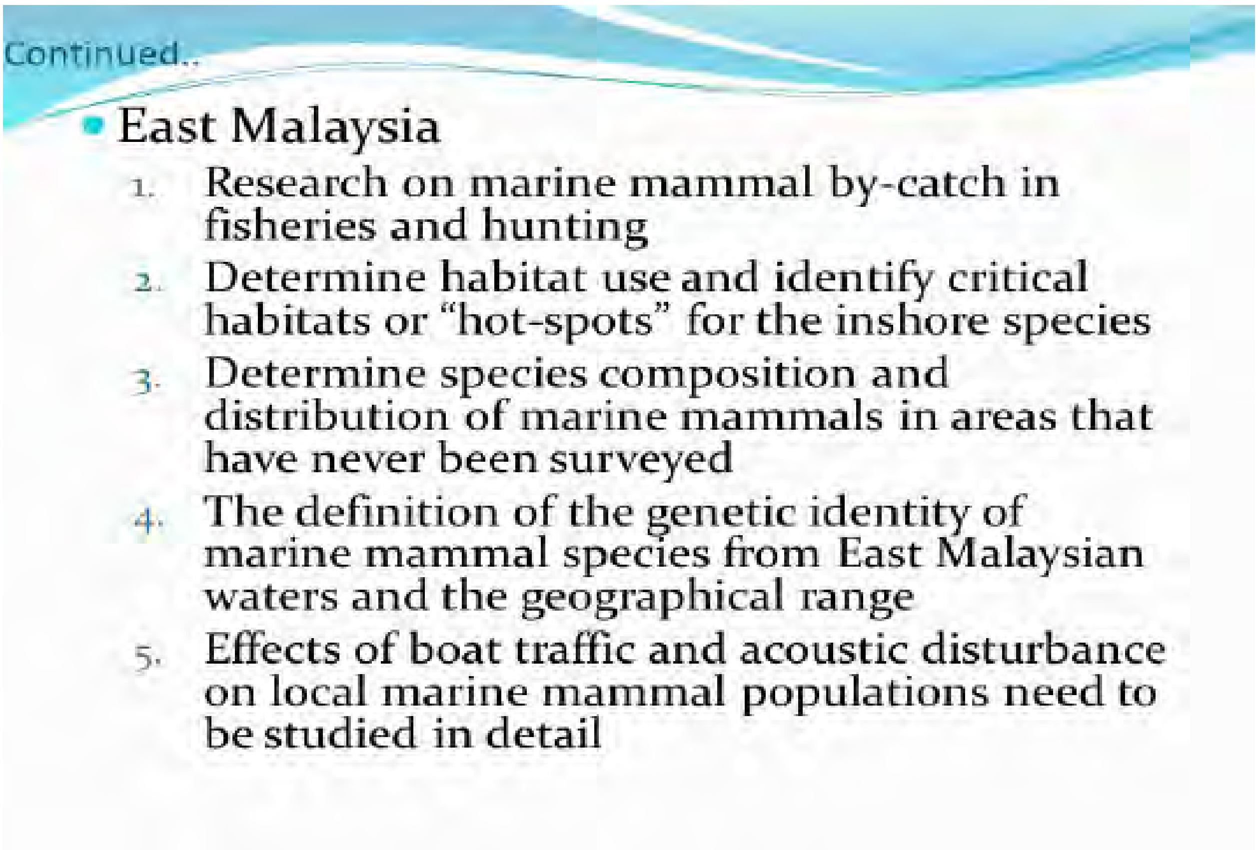
Folk attitudes and interactions with marine mammals

- Not much interest on marine mammals. Neutral vs pest.
- Positive response in tourism-driven places.
- 'Tears' of dugong believed to be a love potion, used by the Seletar to aid in navigation in rough seas (Ponnampalam et al., 2009) or win a woman's heart.
- Dolphins originated from a human who was cursed because of trying to steal Prophet Sulaiman's ring.
- In Sarawak, leaping dolphins portends rain and thunderstorms.


Description of existing and past research and training programs
Pulau Langkawi
Pulau Pinang
Malaysia
Kuala Lumpur
Ongoing research
Past research


Continued..
Bandar Seri Begawan
Brunei
Pulau Tarakan


Needs for additional research and training
Peninsular Malaysia
1. Baseline studies on the diversity and distribution of marine mammals
2. Assessment of population size and status through dedicated line-transect and photo-identification studies
3. Studies on behaviour, habitat use and movements of marine mammal populations
4. Continued monitoring of cetacean relative abundance
5. Study of population structure and genetic diversity
6. Collection and curation of tissue samples
7. Impacts of fishing activities and directed catch


Continued..
East Malaysia
1. Research on marine mammal by-catch in fisheries and hunting
2. Determine habitat use and identify critical habitats or "hot-spots" for the inshore species
3. Determine species composition and distribution of marine mammals in areas that have never been surveyed
4. The definition of the genetic identity of marine mammal species from East Malaysian waters and the geographical range
5. Effects of boat traffic and acoustic disturbance on local marine mammal populations need to be studied in detail

Present and potential marine mammal watching operations

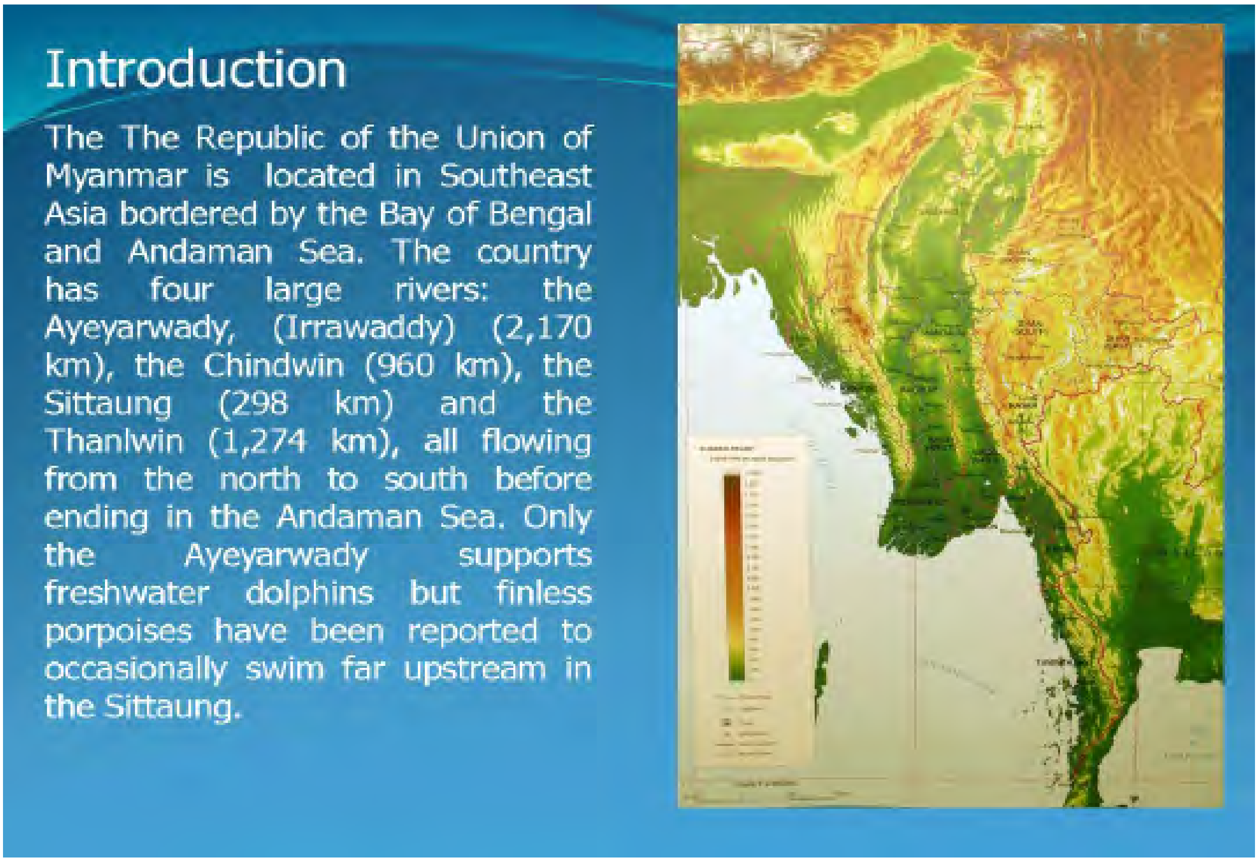
- Peninsular Malaysia
  - conduct dolphin-watching on an opportunistic basis while undertaking mangrove tours, snorkelling or diving trips, or island hopping tours.
- East Malaysia
  - In Kuching Bay, Sarawak there are currently close to ten full-time and part-time boat operators
  - Layang-Layang Atoll and Semporna Archipelago, take guests to watch dolphins and whales whenever encountered during diving trips
  - Potentials: Beladin, Pusa and Tanjung Manis in Sarawak, and in Beluran and Kinabatangan Rivers and Cowei Bay in Sabah.

Acknowledgement

- MareCet Research Organization
- Inst. Of Ocean and Earth Sciences, Universiti Malaya
- Sarawak Dolphin Project, Universiti Malaysia Sarawak
- Centre for Marine and Coastal Studies (Universiti Sains Malaysia)
- LEAP, St Andrew's University, Scotland
- Universiti Malaysia Terengganu
- Department of Fisheries Malaysia

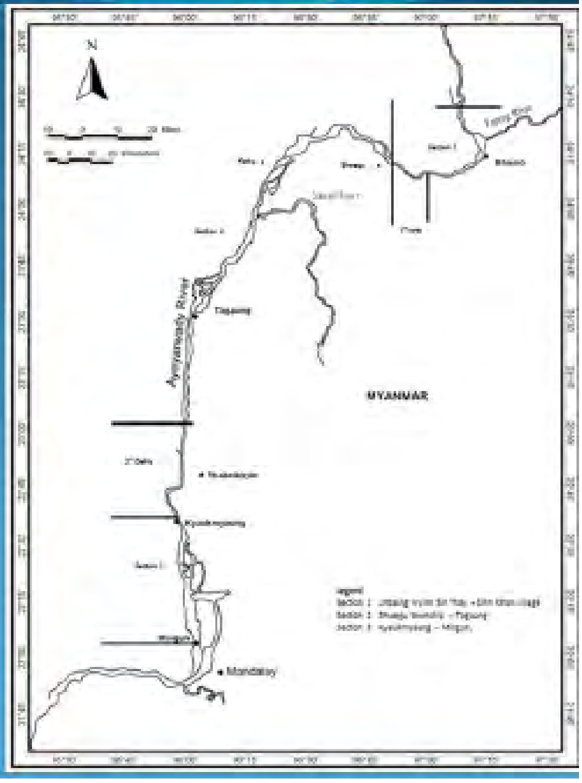
Myanmar


DEPARTMENT OF FISHERIES
YANGON - MYANMAR
Third South Asian Marine Mammal Symposium (SEAMAM III)
WILDLIFE CONSERVATION SOCIETY
MSAM
Prepared and presented by Aung Myo Chit - Irrawaddy Dolphin Project Coordinator, Wildlife Conservation Society, Tint Tun (Marine Science Association)


Introduction
The The Republic of the Union of Myanmar is located in Southeast Asia bordered by the Bay of Bengal and Andaman Sea. The country has four large rivers: the Ayeyarwady, (Irrawaddy) (2,170 km), the Chindwin (960 km), the Sittaung (298 km) and the Thanlwin (1,274 km), all flowing from the north to south before ending in the Andaman Sea. Only the Ayeyarwady supports freshwater dolphins but finless porpoises have been reported to occasionally swim far upstream in the Sittaung.

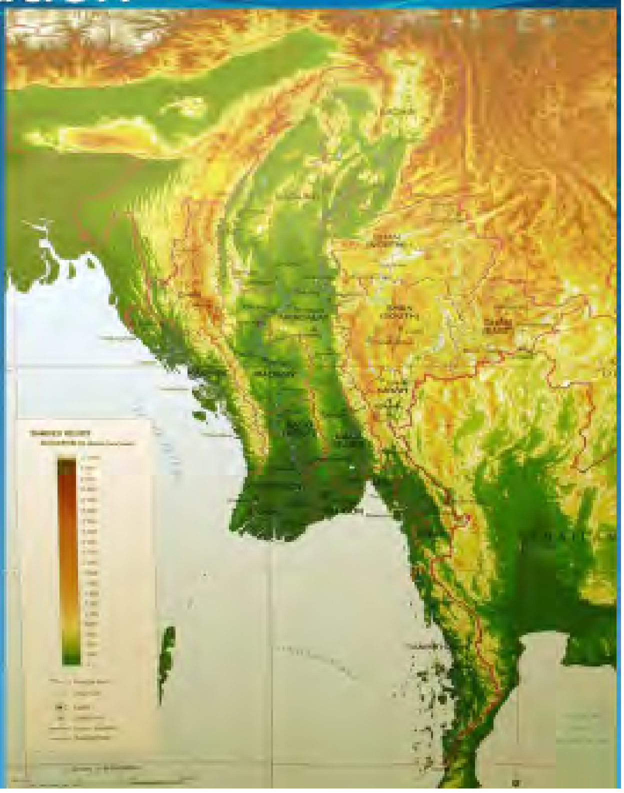
Species and Distribution

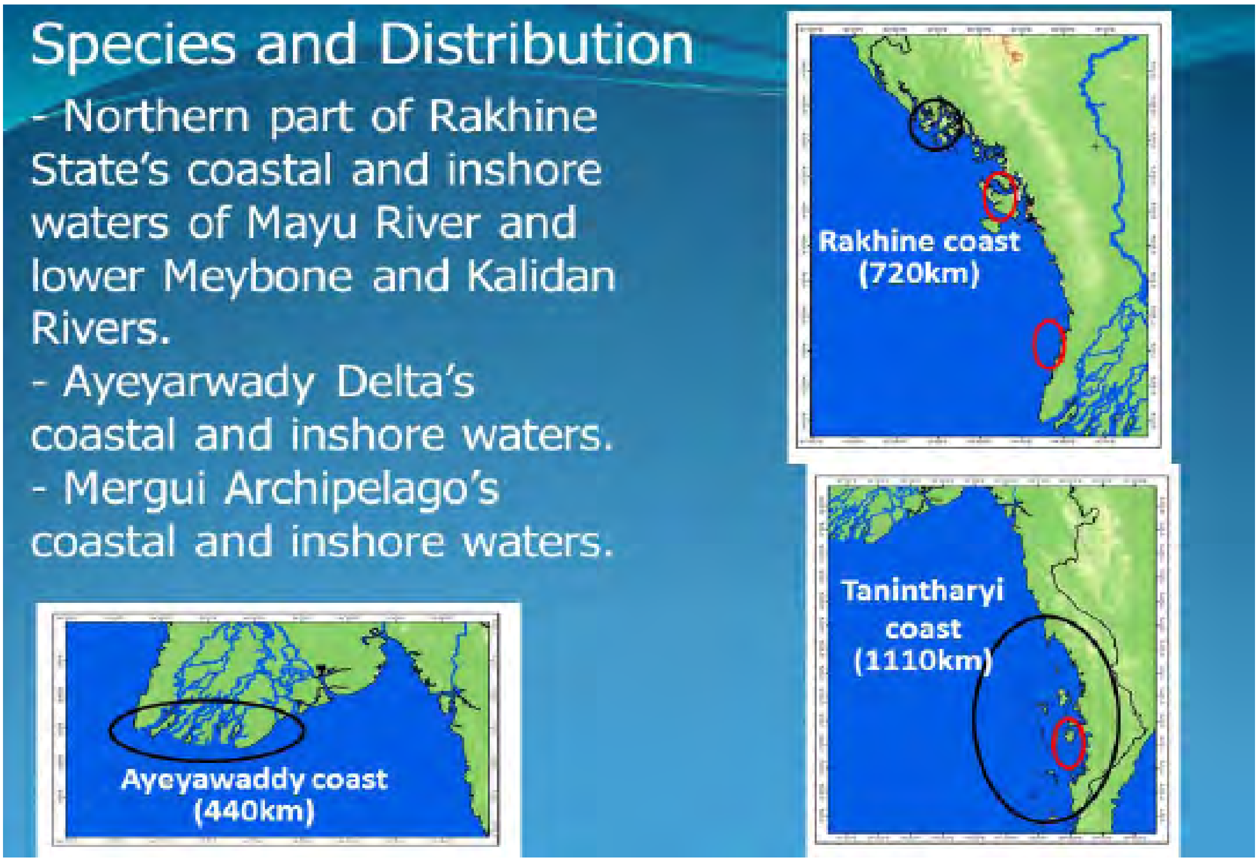
- Linbaing Kyinn Sin Thay - the end of the first defile to Sinn Khan village at the start of second defile (54km)
- Section 2 - Shwegu township - the end of the second defile to Tagaung at the start of the third defile (165km)
- Section 3 - Kyaukmyaung – the end of third defile to Mingun, 8km upstream from Mandalay (74km)



Species and Distribution

Coastal region of Myanmar: the Rakhine coast, the Ayeyarwady delta and the Mergui Archipelago provide Bryde's Whale (Balaenoptera edeni), false killer whale (Pseudorca crassidens), Finless Porpoise (Neophocaena phocaenoides), Indo-pacific Hump-backed Dolphin (Sousa chinensis), Spinner Dolphin (Stenella longirostris), Indo-pacific Bottlenose Dolphin (Tursiops aduncus), Irrawaddy Dolphin (Orcaella brevirostris), Dugong (Dugong dugon).
However little or no in-depth systematic survey on these species except the Irrawaddy dolphin survey in northern part of Rakhine State, Ayeyarwady delta and the Mergui Archipelago region for preliminary survey.

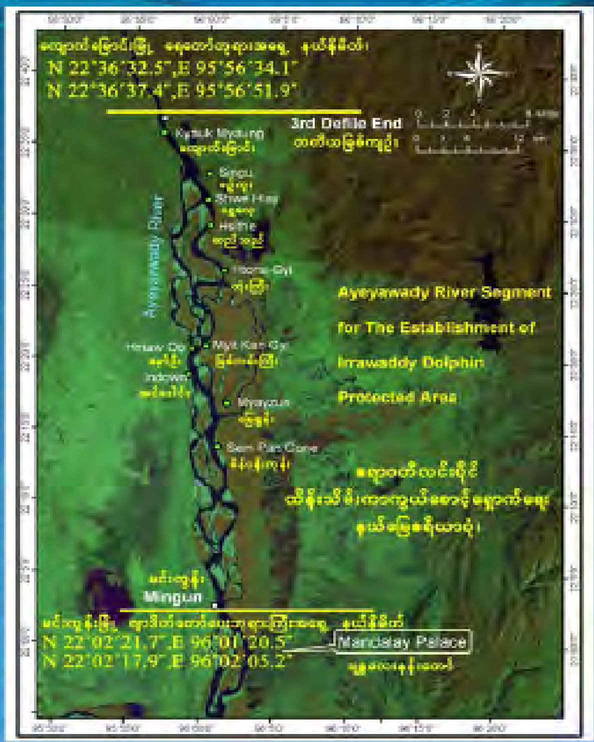



Species and Distribution
- Northern part of Rakhine State's coastal and inshore waters of Mayu River and lower Meybone and Kalidan Rivers.
- Ayeyarwady Delta's coastal and inshore waters.
- Mergui Archipelago's coastal and inshore waters.
Rakhine coast (720km)
Tanintharyi coast (1110km)
Ayeyawaddy coast (440km)


Species and Distribution
Dugong dugon sighting in the Rakhine State and the Tanintharyi Region
Laos
Thailand
Google

Population status

During the study period 2002 – 2011, the joint patrol team recorded a total of 131 dolphin groups with 79 calves, the percentage juvenile and calves of the Irrawaddy dolphin population along the Ayeyarwady River between Mandalay to Bhamo was 8.1% in 2002 and 20.5 % in 2011 and the average percentage of juvenile and calves was 13%. In 2006 and 2011, in the Protected Area (Minngun and Kyaukmyaung, 74km segment), a total of 172 dolphin groups with 87 calves were encountered during the twice a monthly regular direct count survey and the minimum percentage of juvenile and calves was 0.8 in 2002 and 17.6 in 2008, the average percentage of calves was 12.9%.



The management plan includes the following objectives:

- Dramatically reduce or eliminate illegal fishing activities.
- Promote the sustainability of the human-dolphin cooperative cast-net fishery.
- Protect aquatic habitat.
- Promote sustainable fisheries.
- Strengthen the protected area management team and infrastructure.
- Monitor the status of dolphins.

Population Status

Little or no systematic survey on Dugong species except in the Rakhine State: Man Aung Island.
Tanintharyi Region : Lampi Island Mergui Archipelago region for preliminary survey.

Habitat status Irrawaddy dolphin along the Ayeyarwady and coastal region

- Section 1 - Linbaing Kyinn Sin Thay - the end of the first defile to Sinn Khan village at the start of second defile (54km)
- Section 2 - Shwegu township - the end of the second defile to Tagaung at the start of the third defile (165km)
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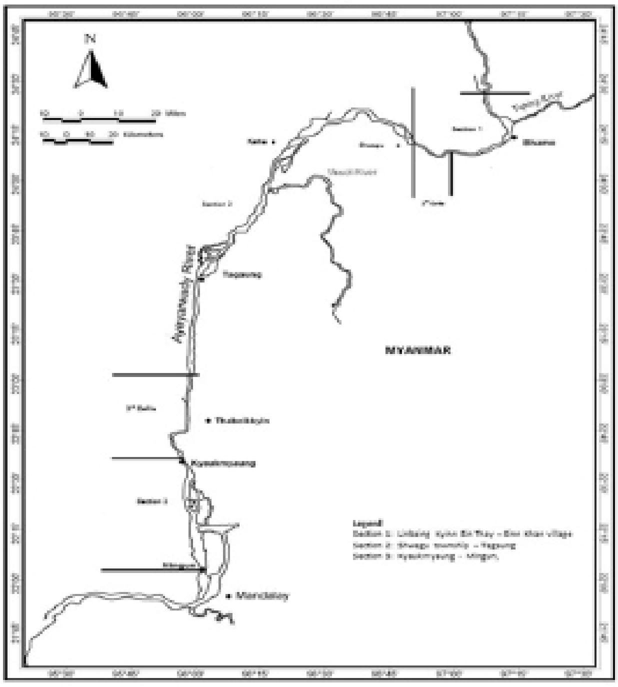

Habitat status Irrawaddy dolphin along the Ayeyarwady and coastal region

- Northern part of Rakhine State's coastal and inshore waters of Mayu River and lower Meybone and Kalidan Rivers.
- Ayeyarwady Delta's coastal and inshore waters.
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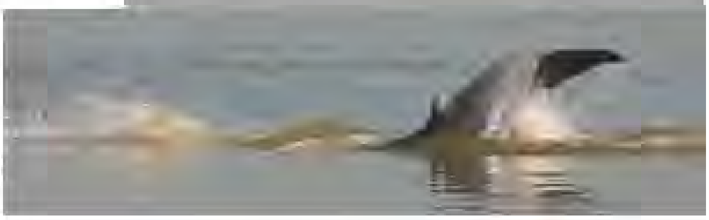


Directed catch (including live-captures)

- No activities on direct catch and live-capture of Irrawaddy dolphin.
- Captive-display for tourism in Salone Kyun, Kawthaung. They captured three bottle-nose dolphin and trained for swim with dolphin program however department of fisheries released all dolphin.

DUGONG. *Dugong dugong* Müller.

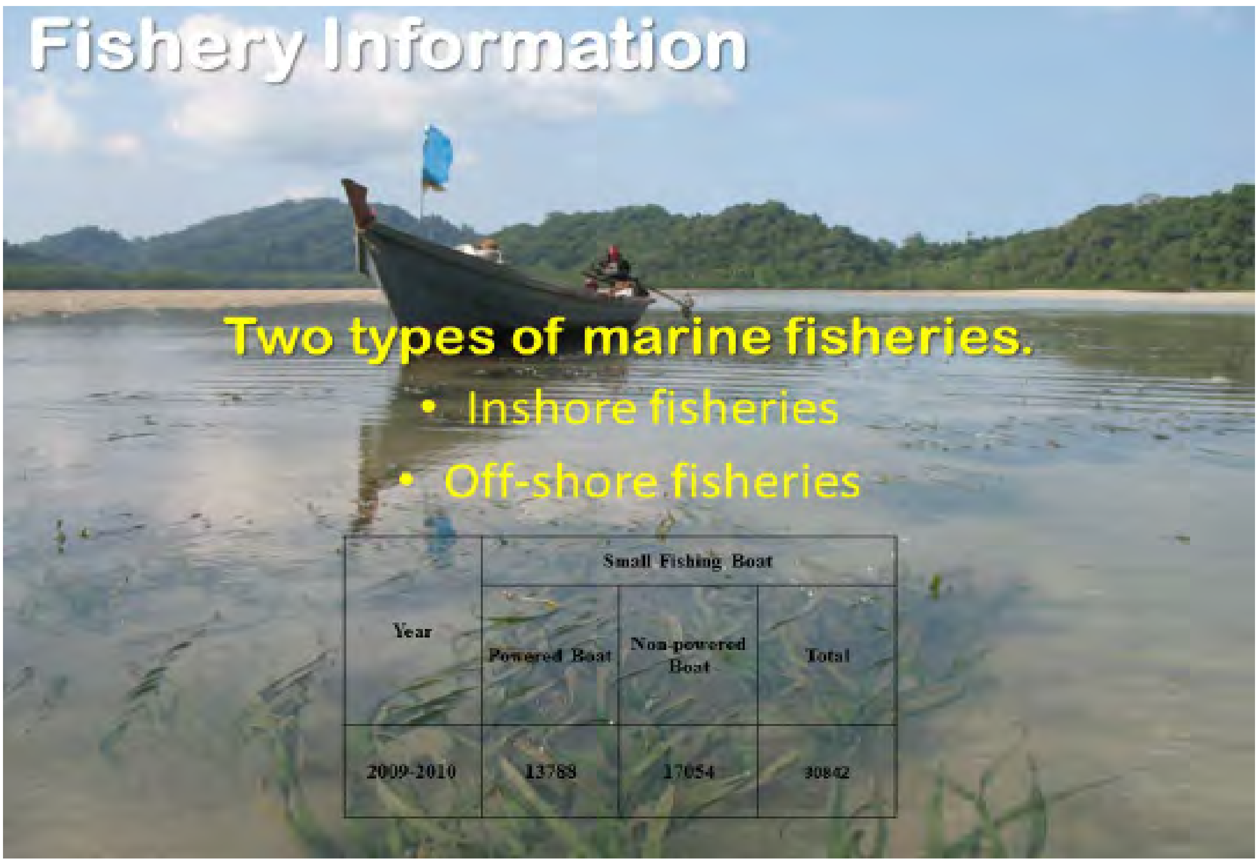
A female Dugong caught by fishermen of the Arakan coast between Lahpetkyun Light House and Kanthaya and presented to the Zoological Gardens, Rangoon. Seen on arrival at the Zoological Gardens on November 2, 1966.

By-catch in gill-nets

A total of 26 dead dolphins was received from officials, and fishermen between 2001-2013. The cause of death of 14 animals could not be determined. 12 individuals were confirmed caught in fixed gill nets; some carcasses were found 8km below Mingun, thus beyond the known range of dolphins in the river.

By-catch in gill-nets

- The interview survey result from Rakhine coastal survey, three fishermen noted by-catch by the gilled net.
- Interview result from Mergui-Archipelago, fishermen said that most of the dolphins were caught in fishing net. There were some hunting in their region reportedly for meat and oil



Year	Small Fishing Boat		
	Powered Boat	Non-powered Boat	Total
2009-2010	13788	17054	30842

Total number of National off-shore fishing vessels in Myanmar (2009-2010)

No.	Type of Gear	Number of vessels
1	Trawl	895
2	Purse seine	163
3	Strow nets (Set Bag Net)	458
4	Drift Net	148
5	Long Line	3
6	Squid Cast Net	35
7	Fish Trap	112

Number of Foreign Tuna Long-line Fishing Vessel Engage in Myanmar Water and production (2000 – 2011)

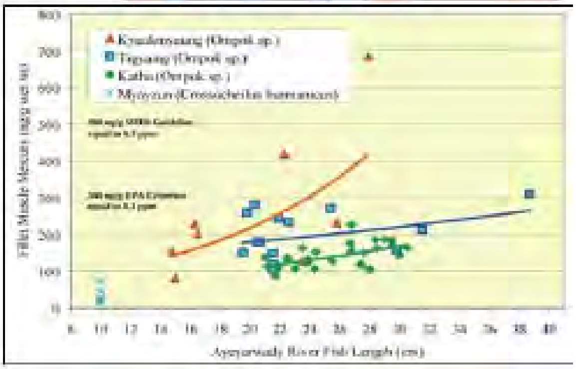
No	Year	No. of Vessels	Porduction		
			Tuna (YF)	Other	Total
1	2003-2004	4	39.5	16.5	56
2	2004-2005	15	87.5	30.5	118
3	2005-2006	34	310.15	103	413.15
4	2006-2007	47	195.78	65.2	261.04
5	2007-2008	11	47.48	15.8	63.28
6	2008-2009	36	91.6	25.5	117.1
7	2009-2010	49	561.75	150	711.75
8	2010-2011	109	1123.5	648.5	1772


Other threats
• Gold mining
• Electric fishing


Electric fishing

Future threat

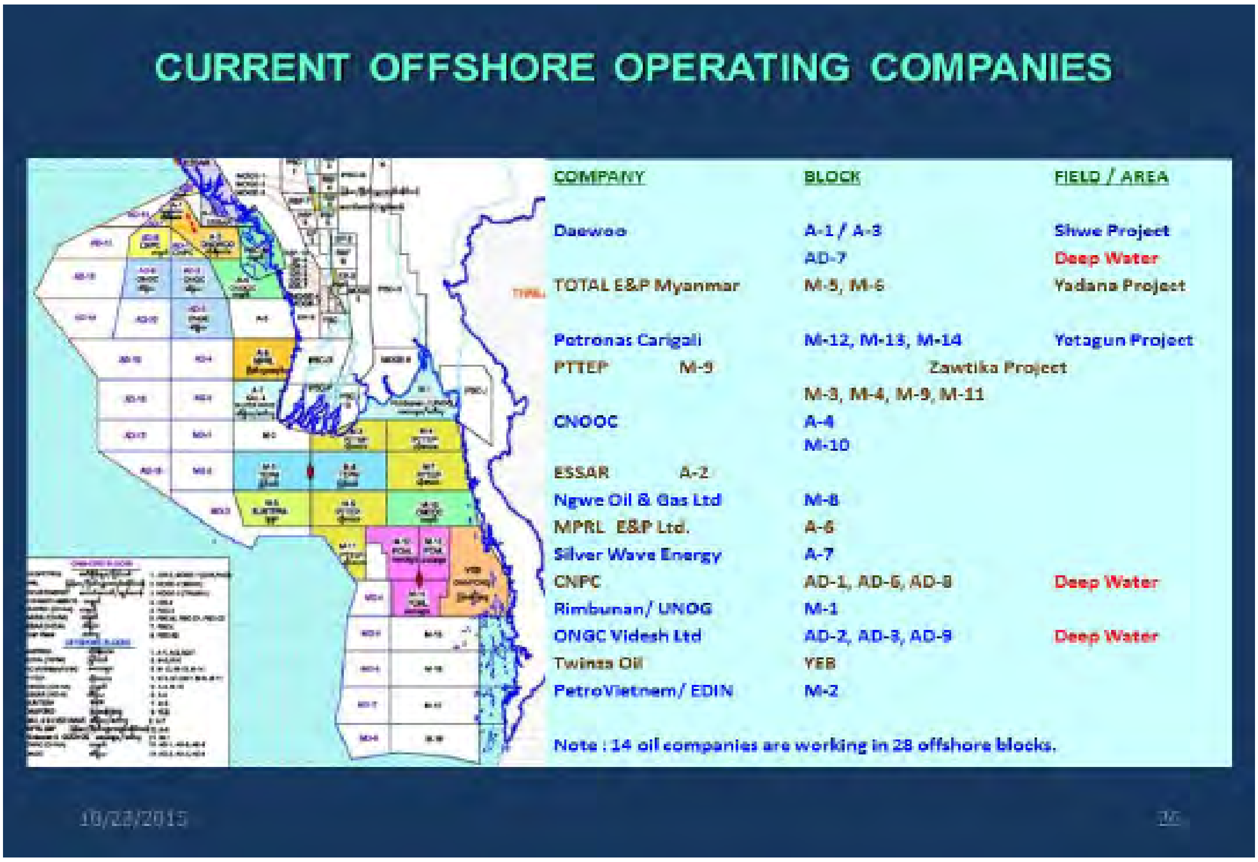
Damming on Ayeyarwady River near the confluence of Mayhka and Malihka in Kachin state. The mercury concentration in fish tissue level was still conducting by other NGO along the river and hasn't finished the study and the result was under the process



Offshore Energy Exploration

The coastal region: Kyaukpyu deep sea port, Sittwe deep sea port and oil and gas terminal project is being implemented in the northern Rakhine coast. Dawei special economic zone project which includes deep sea port and industrial zone is being implemented on the Tanintharyi Coast in southern Myanmar.

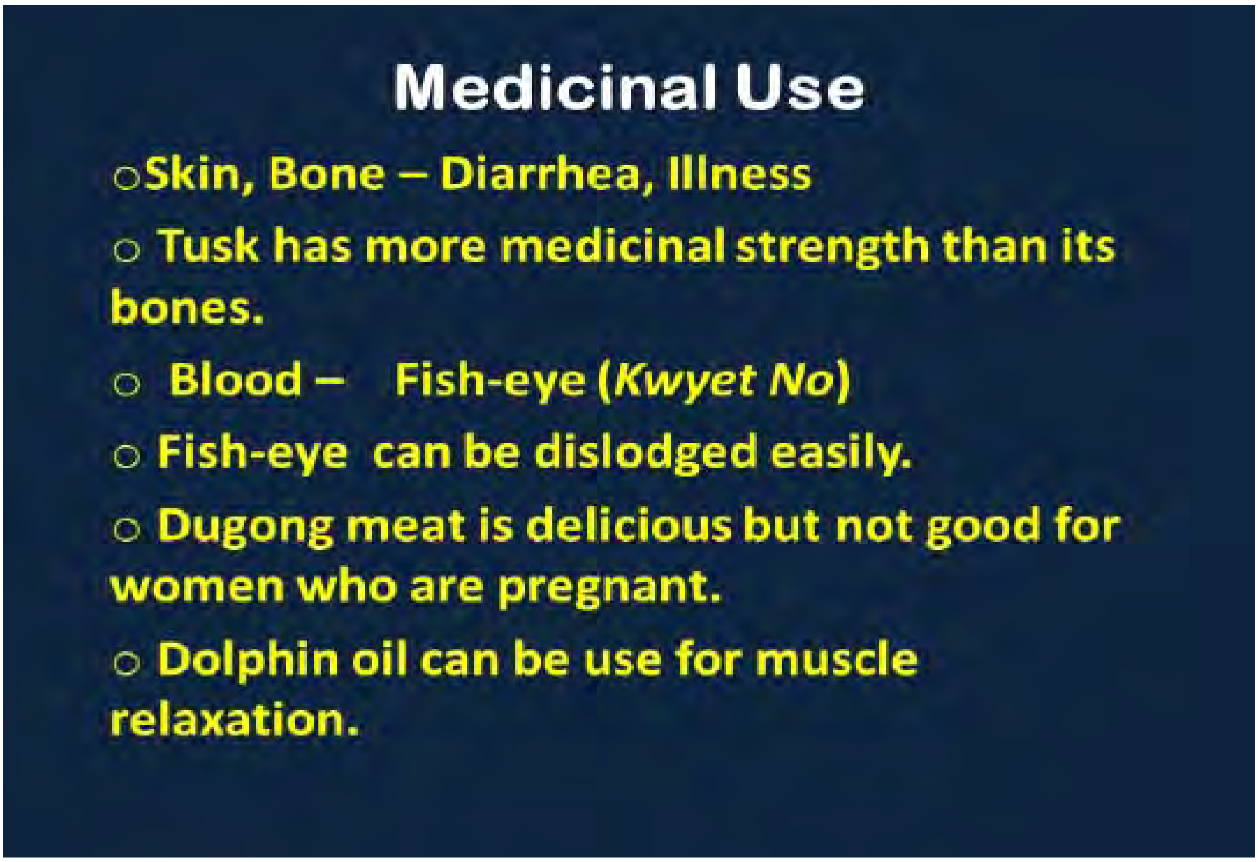

Deep Sea Ports
Sittwe
Kyaukphyu
Kalagote
Dawei
Laos
Thailand
N21°
N19°
N17°
N13°
E 89°
E 91°
E 93°
E 95°
E 97°
E 99°
E101°
E103°
Google

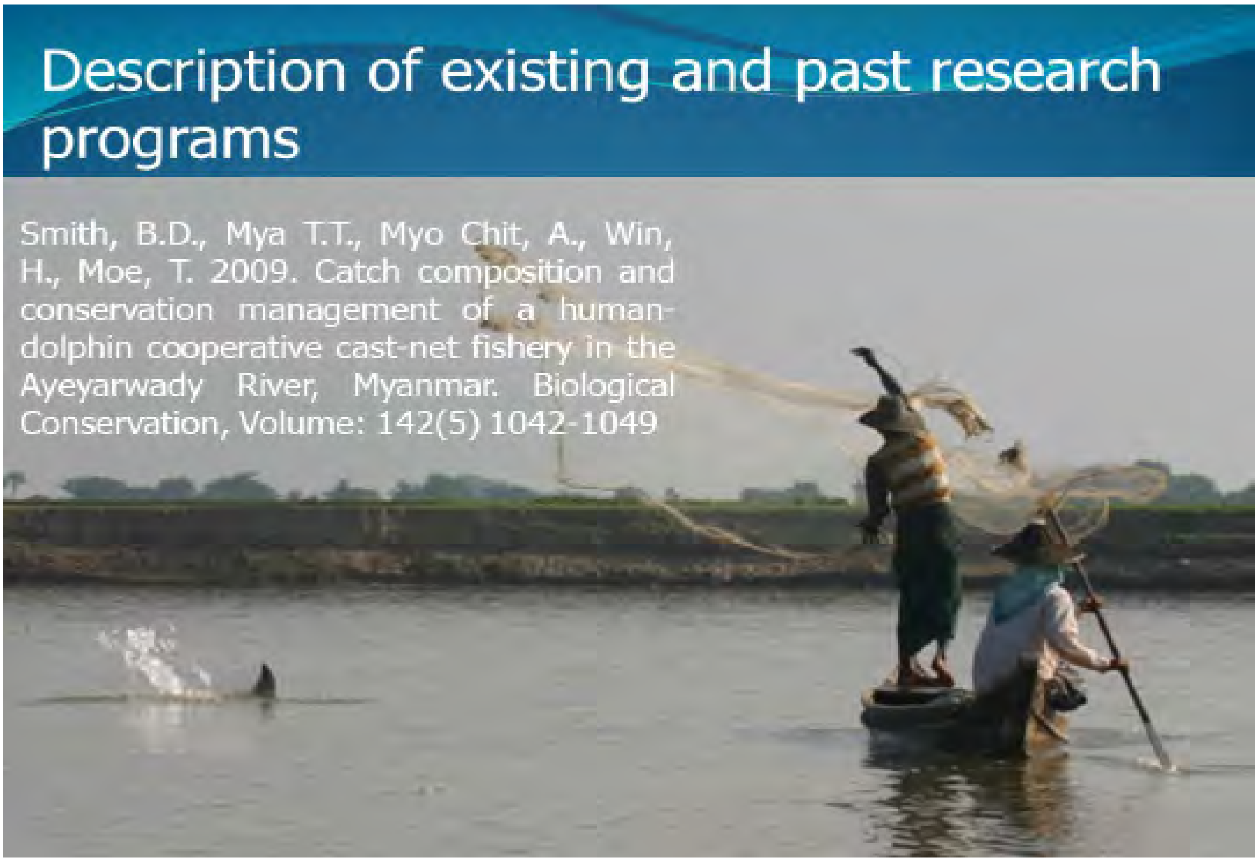

CURRENT OFFSHORE OPERATING COMPANIES
COMPANY
BLOCK
FIELD / AREA
Daewoo
A-1 / A-3
Shwe Project
AD-7
Deep Water
TOTAL E&P Myanmar
M-5, M-6
Yadana Project
Petronas Carigali
M-12, M-13, M-14
Yetagun Project
PTTEP
M-9
Zawtika Project
M-3, M-4, M-9, M-11
CNOOC
A-4
M-10
ESSAR
A-2
Ngwe Oil & Gas Ltd
M-8
MPRL E&P Ltd.
A-6
Silver Wave Energy
A-7
CNPC
AD-1, AD-6, AD-8
Deep Water
Rimbunan/ UNOG
M-1
ONGC Videsh Ltd
AD-2, AD-3, AD-9
Deep Water
Twinza Oil
YEB
PetroVietnam/ EDIN
M-2
Note : 14 oil companies are working in 28 offshore blocks.
10/23/2015

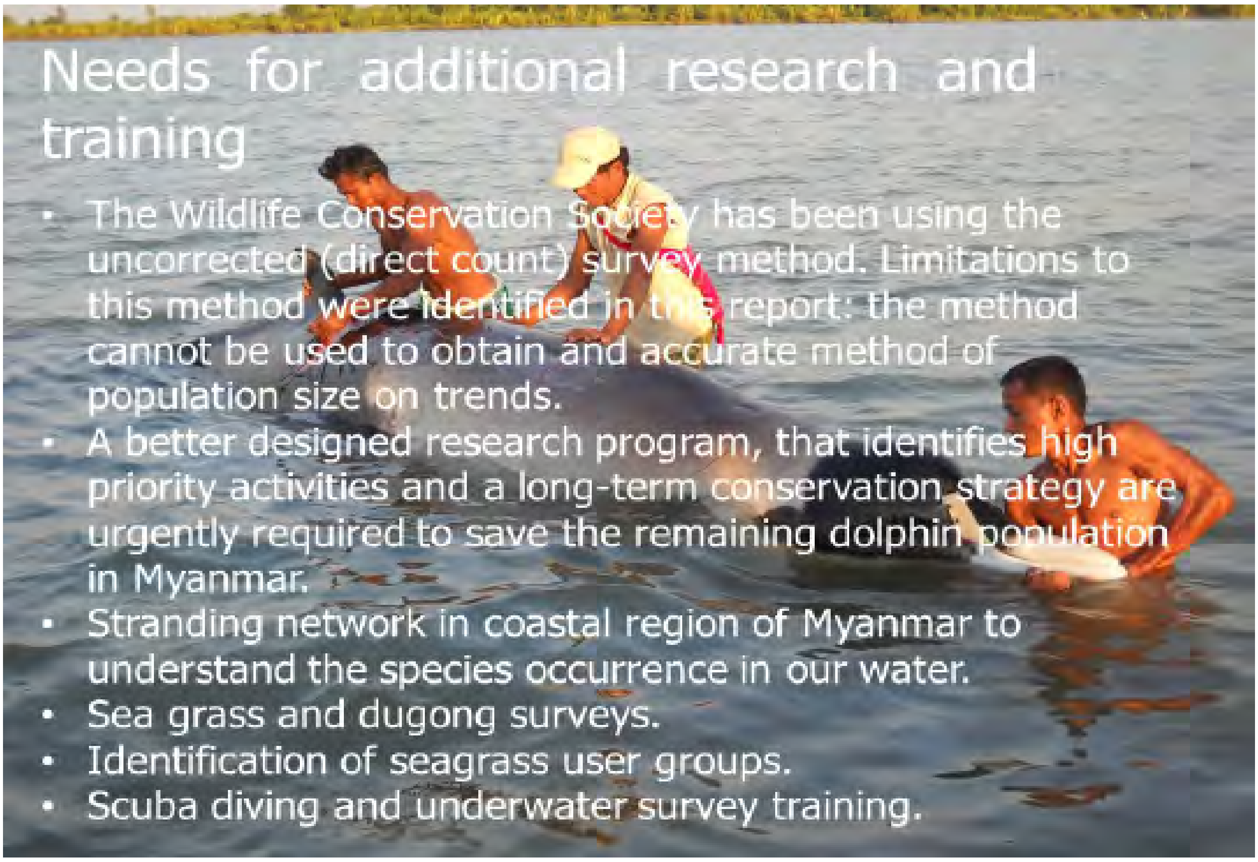

Legal Status
National and state legislation specifically related to marine mammals
Nil.
National and state legislation related to fisheries
•The Fish Culture Law (1986)
•The Law Relating to the Fishing Rights of Foreign Fishing Vessels (1989)
•The Myanmar Marine Fisheries Law (1990)
•The Freshwater Fisheries Law (1991)
•The Protection of Wildlife and Protected Areas Law (1994)
•The Conservation of Water Resources and Rivers Law (2006)
International Agreements ratified by nation
Memorandum of Understanding on the Conservation and Management of Dugongs and their Habitats throughout their Range.


Awareness Talks


International Agreement
Memorandum of Understanding on the Conservation and Management of Dugongs and their Habitats throughout their Range.
Memorandum of Understanding between Department of Fishery and Wildlife Conservation Society on the Conservation and Management for Irrawaddy dolphin and marine program.


Medicinal Use
○Skin, Bone – Diarrhea, Illness
○ Tusk has more medicinal strength than its bones.
○ Blood – Fish-eye (*Kwyet No*)
○ Fish-eye can be dislodged easily.
○ Dugong meat is delicious but not good for women who are pregnant.
○ Dolphin oil can be use for muscle relaxation.


Description of existing and past research programs
Smith, B.D., Mya T.T., Myo Chit, A., Win, H., Moe, T. 2009. Catch composition and conservation management of a human-dolphin cooperative cast-net fishery in the Ayeyarwady River, Myanmar. Biological Conservation, Volume: 142(5) 1042-1049


Needs for additional research and training
• The Wildlife Conservation Society has been using the uncorrected (direct count) survey method. Limitations to this method were identified in this report: the method cannot be used to obtain and accurate method of population size on trends.
• A better designed research program, that identifies high priority activities and a long-term conservation strategy are urgently required to save the remaining dolphin population in Myanmar.
• Stranding network in coastal region of Myanmar to understand the species occurrence in our water.
• Sea grass and dugong surveys.
• Identification of seagrass user groups.
• Scuba diving and underwater survey training.

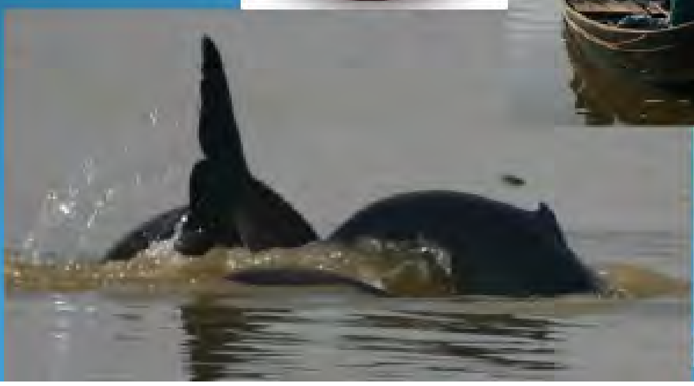
Present and potential marine mammal watching operations

- Dolphin watching guide line was established in 2008 by the Department of Fisheries.
- No proper management on tourism facilities in Myanmar.

Conservation of dolphins, livelihoods, and a vital cultural tradition of Myanmar

A win-win situation for all!

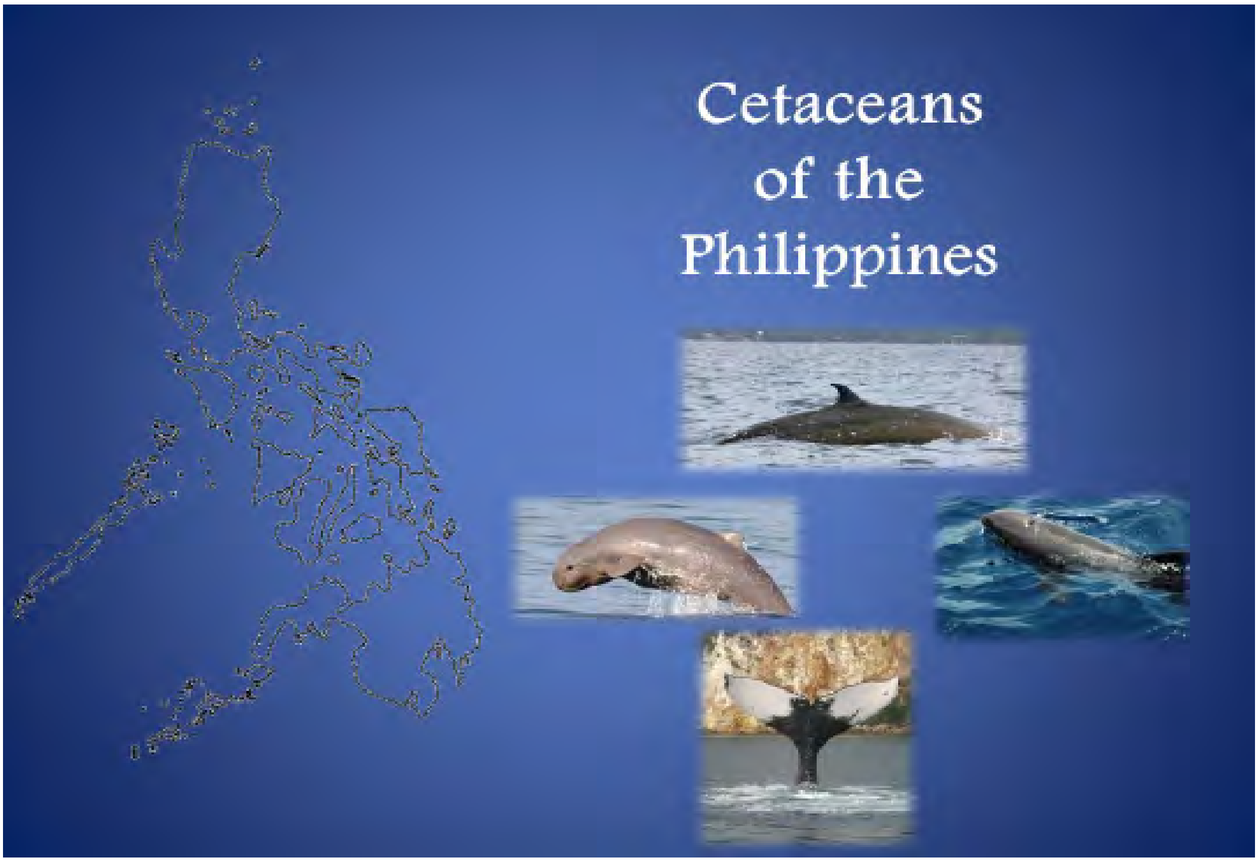
DEPARTMENT OF FISHERIES YANGON - MYANMAR



WILDLIFE CONSERVATION SOCIETY


Thank you.
We look forward to seeing
you.

Philippines


Cetaceans
of the
Philippines


Species & distribution
• 25 species of cetaceans confirmed to occur in the Philippines to date
4 baleen whale species and 21 odontocete species
• 4 species and 1 subspecies have been added to that list since 2002:
Gingko-toothed beaked whale (*Mesoplodon gingkodens*)
Pygmy sperm whale (*Kogia breviceps*)
Longman's beaked whale (*Indopacetus pacificus*)
Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)
dwarf spinner dolphin (*Stenella longirostris roseiventris)*
• Indo-Pacific humpback dolphin (*Sousa chinensis*) remains unconfirmed

Species & distribution

- Large whales were not included in the 2002 SEAMAM Workshop
  *Fin whale (*Balaenoptera physalus*)
  Humpback whale (*Megaptera novaeangliae*),
  Bryde's whale (*Balaenoptera edeni*)
  Sperm whale (*Physeter macrocephalus*)
- 2 new species have been added to the list since:
  Blue whale (*Balaenoptera musculus*)
  Omura's whale (*Balaenoptera omurai*)

Species & distribution

- New sites of occurrences:

Irrawaddy dolphins (*Orcaella brevirostris*)
rough-toothed dolphins (*Steno bredanensis*)
dwarf sperm whales (*Kogia sima*)
melon-headed whales (*Peponocephala electra*)
Risso's dolphins (*Grampus griseus*)
false killer whales (*Pseudorca crassidens*)
pygmy killer whales (*Feresa attenuata*)
killer whales (*Orcinus orca*)

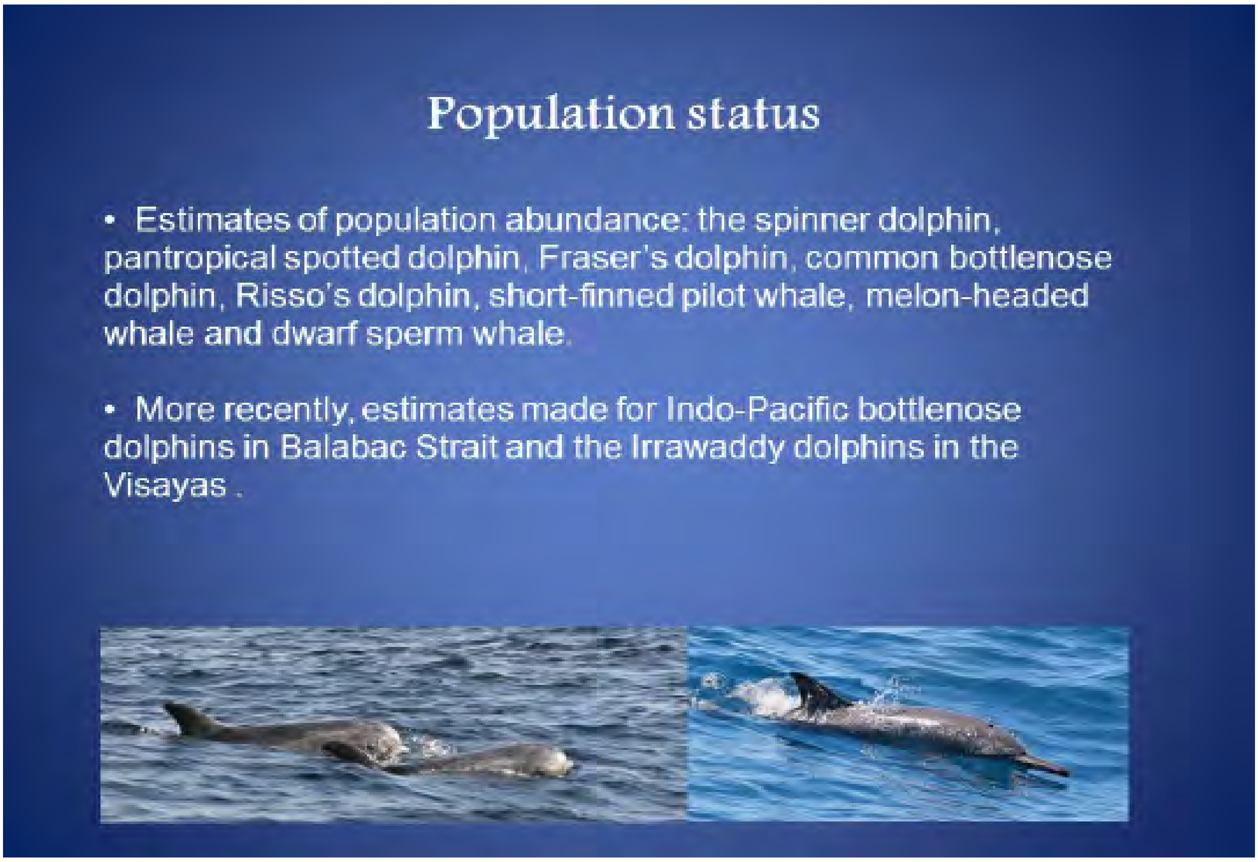
Species & distribution

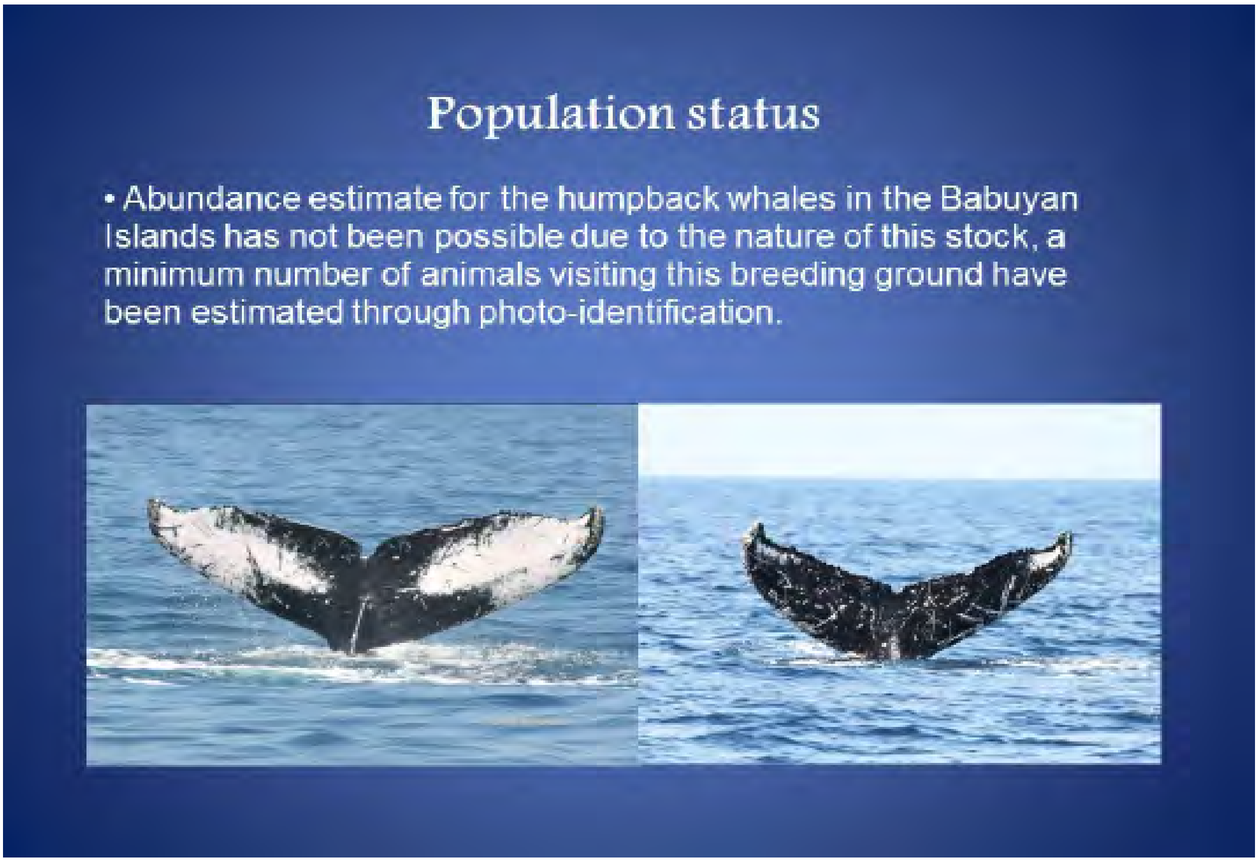
- Confirmed breeding area of humpbacks in the waters of the Babuyan Islands, northern Luzon and extending south along the northern Sierra Madre coasts.
- Occurrence of Blue whales and the Bryde's-like species have recently been documented in the Bohol Sea.

Species & distribution

- In 2002: estimated 40% of Philippine waters have been surveyed for cetaceans
- There has been an increase in survey coverage since

- Sites recently explored:
  eastern coast of Northern Sierra Madre
  Lubang and Looc coasts
  Verde Island Passage
  Cagayan Ridge Marine Corridor
  Balabac Strait
  Sarangani Bay
  Siargao coast
  Northern Bohol Sea
  Guimaras and Iloilo Straits
  Pujada and Mayo Bay


Population status
• Estimates of population abundance: the spinner dolphin, pantropical spotted dolphin, Fraser's dolphin, common bottlenose dolphin, Risso's dolphin, short-finned pilot whale, melon-headed whale and dwarf sperm whale.
• More recently, estimates made for Indo-Pacific bottlenose dolphins in Balabac Strait and the Irrawaddy dolphins in the Visayas .


Population status
• Abundance estimate for the humpback whales in the Babuyan Islands has not been possible due to the nature of this stock, a minimum number of animals visiting this breeding ground have been estimated through photo-identification.

Habitat status

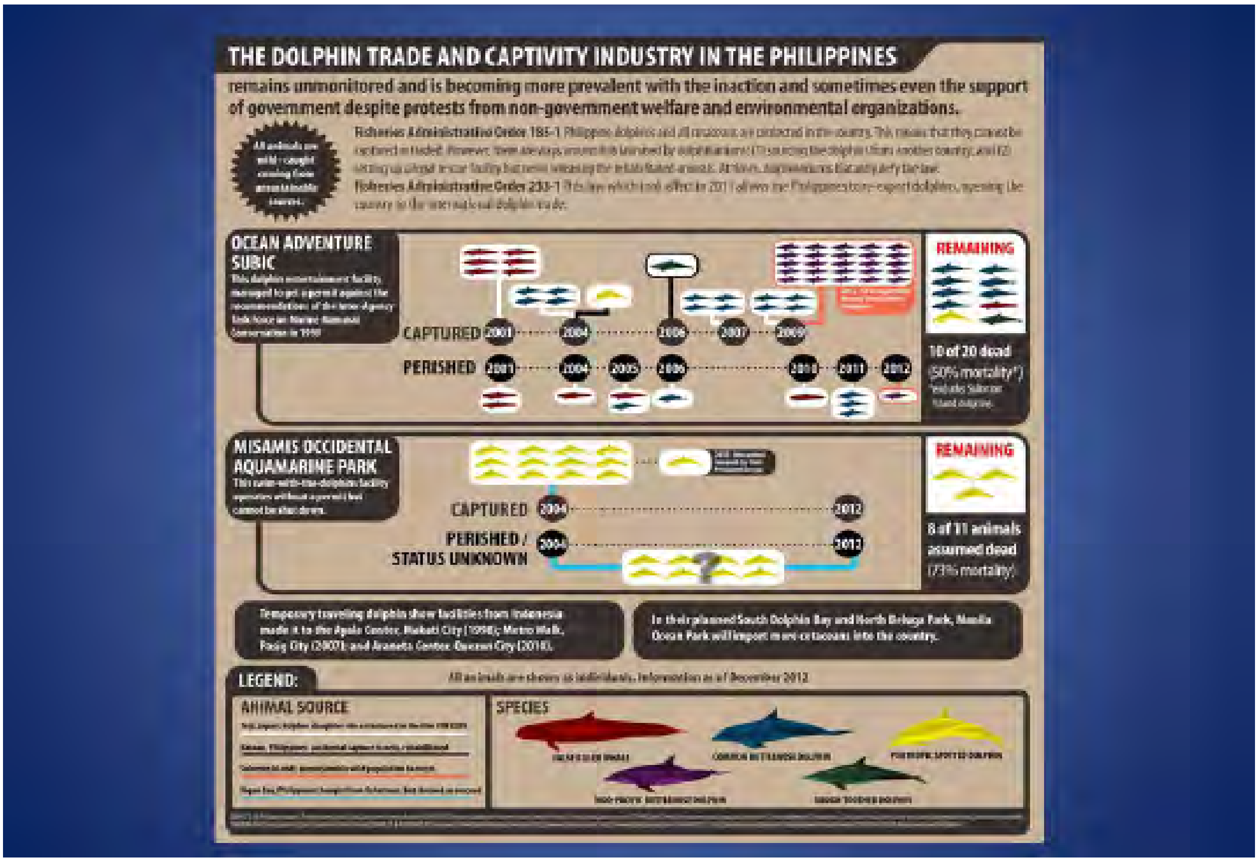
- Habitats heavily exploited by fisheries thus, exposing the animals to threats of by-catch, habitat degradation (i.e. overfishing, destructive fishing, pollution) and even opportunistic directed catch.
- Increased pollution from improper waste and garbage disposals, agricultural run-offs, increased boat and ship traffic.
- Cetacean habitat studies are not common in the country. SU-IEMS is investigating the status of the Irrawaddy dolphin habitat in Guimaras and Iloilo Straits.

Directed catch

- Southern Palawan, Balabac strait - directed fishery of dolphins where dolphin meat is used as bait for chambered nautilus
- Two new areas were identified with directed small cetacean catches:
    - Laiya Batangas in Verde Island Passage
    - Sitangkai in Tawi-Tawi

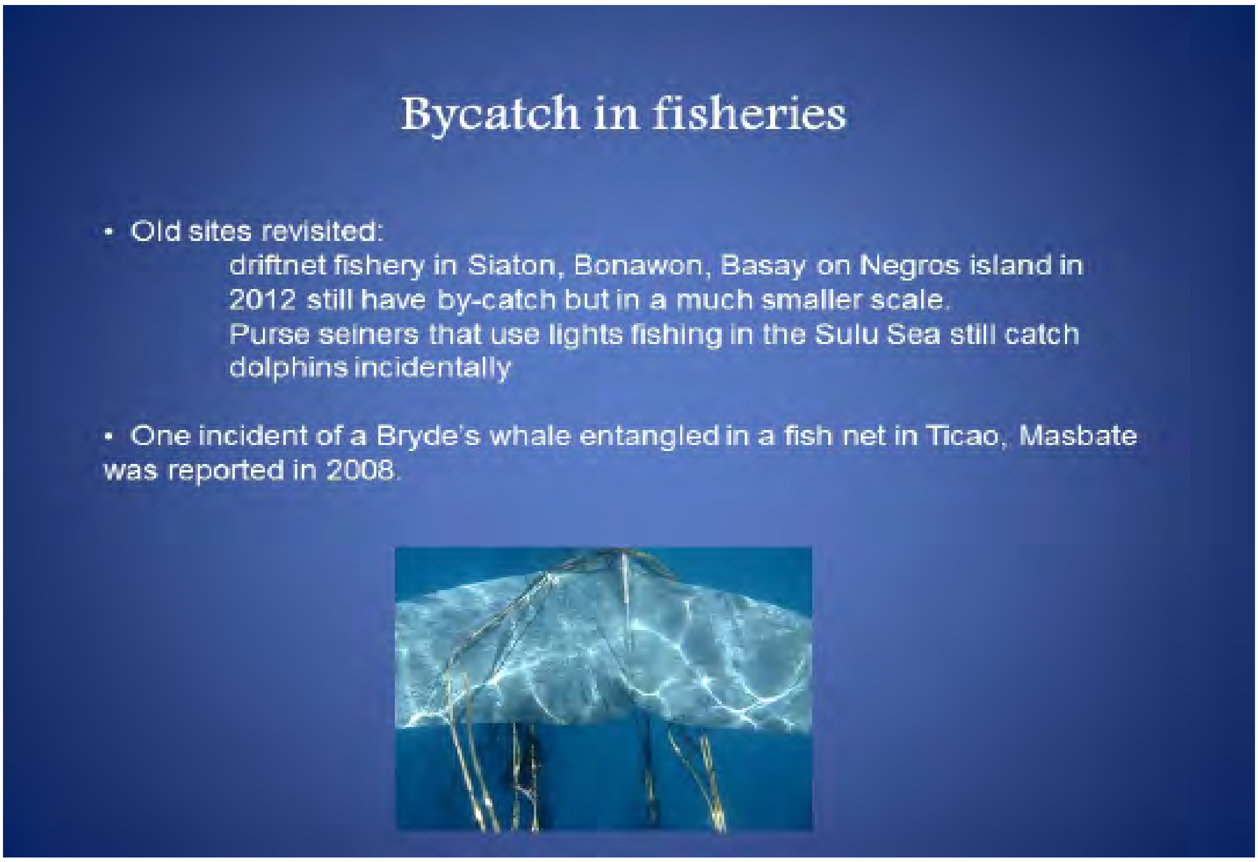

Directed catch
• Historical hunting for Bryde's whales in the Bohol Sea has been previously documented
• Sperm whaling was conducted in the country in the late 19th century by the Americans and the British
• local hunting for sperm whales from Limasawa Island and unidentified baleen whales from Panaon Island have been recently document. Both fisheries ceased in the late 1990s.


Directed catch
• In Sarangani Island, two dolphin holding facilities were observed
• There are currently three known captive marine mammal facilities in operation in the Philippines:
Ocean Adventure (OA)
Misamis Occidental Aquamarine Park (MOAP)
Manila Ocean Park (MOP)
• Since 2010, there have been rumors of another dolphin facility to be established in the province of Bohol.
Ocean Adventure
SUBIC BAY
PHILIPPINES
MISAMIS OCCIDENTAL AQUAMARINE PARK
MOAP


THE DOLPHIN TRADE AND CAPTIVITY INDUSTRY IN THE PHILIPPINES
remains unmonitored and is becoming more prevalent with the inaction and sometimes even the support of government despite protests from non-government welfare and environmental organizations.
OCEAN ADVENTURE SUBIC
CAPTURED 2001 2004 2006 2007 2009
PERISHED 2001 2004 2005 2006 2010 2011 2012
REMAINING
10 of 20 dead
(50% mortality*)
MISAMIS OCCIDENTAL AQUAMARINE PARK
CAPTURED 2004 2012
PERISHED / STATUS UNKNOWN 2004 2012
REMAINING
8 of 11 animals assumed dead
(73% mortality)
Temporary traveling dolphin show facilities from Indonesia made it to the Ayala Center, Makati City (1998); Metro Walk, Pasig City (2007); and Araneta Center, Quezon City (2010).
In their planned South Dolphin Bay and North Beluga Park, Manila Ocean Park will import more cetaceans into the country.
LEGEND:
ANIMAL SOURCE
SPECIES

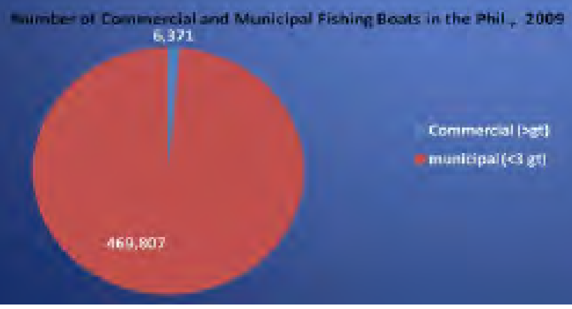

Bycatch in fisheries
• By-catch is still a concern in many areas in the Philippines.
• Since 2002 there has only been very few studies done on by-catch
• Currently, there is one grad student research on socio-economic studies on by-catch in Iloilo and Guimaras Straits and in Malampaya Sound


Bycatch in fisheries
• 5 new sites not reported in 2002:
1. Verde Island Passage - from driftnets, surface set gillnets; purse seines that use light to attract fish.
2. Balabac Strait – threat is very minor; from surface set gill net. But there is rampant dynamite fishing
3. Iloilo and Guimaras Straits - threat from surface set gill net, fish stakes or fish filter ("tangab")
4. Bohol Sea - drift gill net (pamo) fishery
5. Cuyo, Palawan - from the tuna fishery from Antique
046


Bycatch in fisheries
• Old sites revisited:
driftnet fishery in Siaton, Bonawon, Basay on Negros island in 2012 still have by-catch but in a much smaller scale.
Purse seiners that use lights fishing in the Sulu Sea still catch dolphins incidentally
• One incident of a Bryde's whale entangled in a fish net in Ticao, Masbate was reported in 2008.

Types of fisheries

- Lack of information on the types of fishing gear used
- Esp. for the artisanal fishery making it very difficult to assess fishery by-catch of any kind.
- There are over 23 types of fishing gear used in the country
- Implicated in non-targeted catch of cetaceans:
    - drift gillnets, surface and bottom set gillnets, ring nets, Danish seine
    - lift nets, fish corrals and fish stakes for *Orcaella*
    - Purse seiners that use lights to gather fish is also of great concern.



Other threats

- Pollution and habitat degradation probably pose the greatest threats to cetaceans and their habitats in the Philippines.

Solid waste pollution especially plastics
- Plastic waste ingestion attributed to be the cause of cetacean deaths in at least two cases
- Several cetacean stranding cases have reported finding various forms of plastics in the digestive tracts of carcasses.

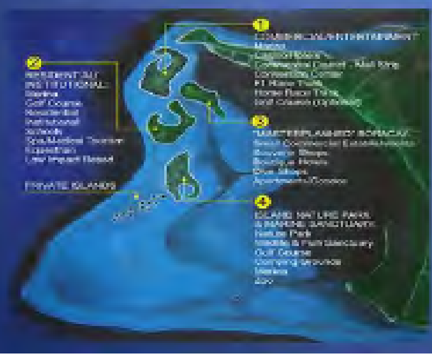
Other threats

Pollution from runoffs, siltation and Habitat destruction

-combination of pollution brought about by run-offs, siltation and decreasing freshwater input pose a threat to many of the coastal and estuarine cetacean populations.

- Silliman University is investigating pollution coming from land (i.e. agricultural, industrial and aquaculture run-offs, siltation, construction of dams, rerouting of rivers) that affect the Irrawaddy dolphin habitats in Central Visayas.

- Several proposed reclamation and coastal development

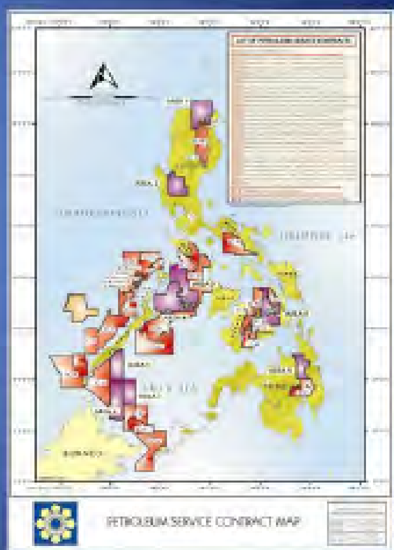


Other threats

Seismic Explorations, Drilling and Noise Pollution

• Search for oil reserves in Philippine marine areas have been increasing in the past years.

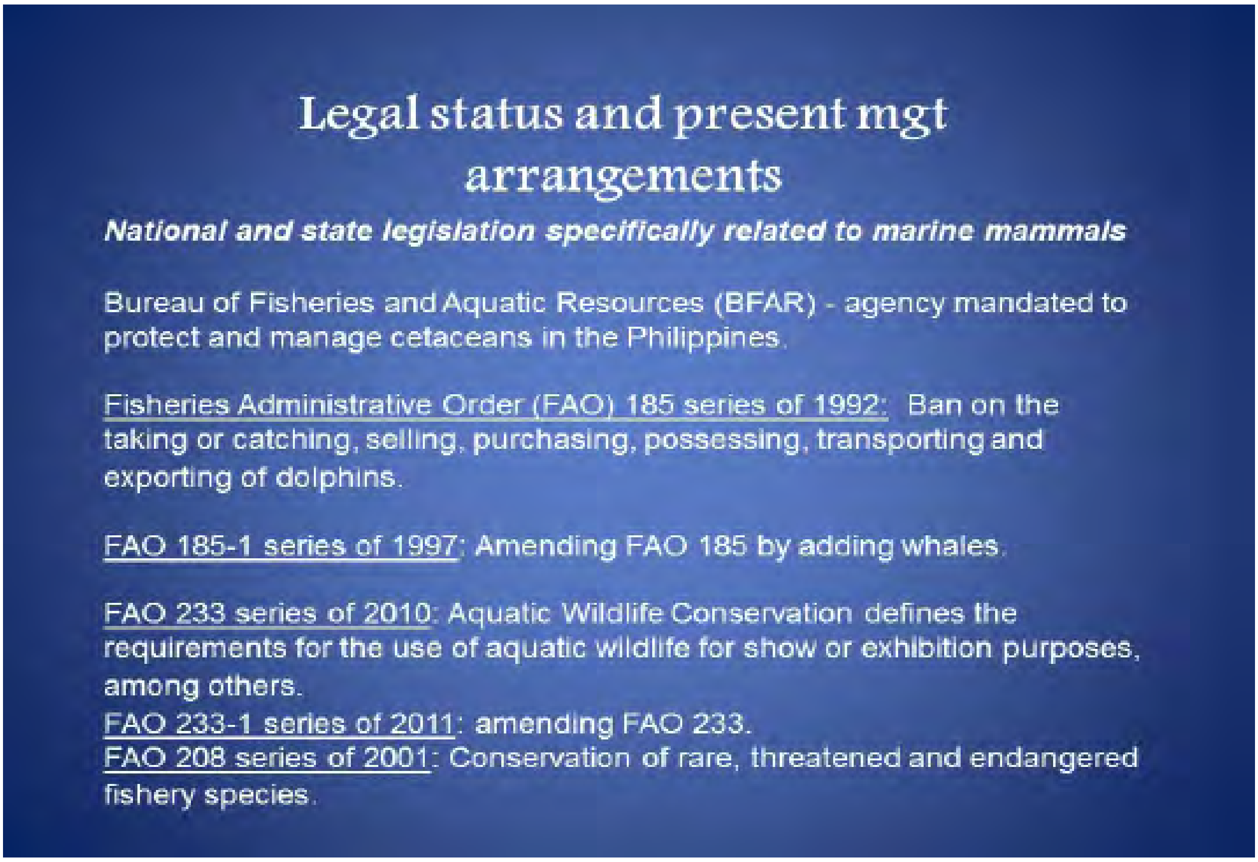
1. Exploration of the Benham Rise - east of northern Luzon near Aurora; about 13 million hectares; Explorations could start in 2013.
2. Southwest Palawan
3. Northwest Palawan (near Malampaya), East Palawan, Sulu Sea, Mindoro-Cuyo, Cagayan, Central Luzon, and Cotabato – overall, 15 areas in the Philippines (each between 400,000 to 900,000 hectares); up for bidding to drill as of July 2011
4. Central Visayan Basin – exploration conducted in 2011; about 5,280 km^2




Other threats
Unregulated Whale and dolphin watching
• There is a general lack of regulation in popular whale and dolphin watching spots resulting to harassment of animals and probably long-lasting effects on their general health and reproductive potential.


Other threats
Ship Traffic
Many ship and ferry lanes are found in straits and corridors which are important habitats or migration corridors for cetaceans. E.g. the Verde Island Passage, Balabac Strait, Iloilo Strait, and the Babuyan channel


Other threats
Declining Food Sources for cetaceans
• Fishery resources are rapidly being depleted in almost all over the country
• almost all species and sizes of fish are now being exploited and habitats are being destroyed
• food for cetaceans are becoming scarce more than ever.
• in addition to ecosystem effects of overfishing
Climate Change
Particularly relevant to freshwater and estuarine species.


Legal status and present mgt arrangements
National and state legislation specifically related to marine mammals
Bureau of Fisheries and Aquatic Resources (BFAR) - agency mandated to protect and manage cetaceans in the Philippines.
Fisheries Administrative Order (FAO) 185 series of 1992: Ban on the taking or catching, selling, purchasing, possessing, transporting and exporting of dolphins.
FAO 185-1 series of 1997: Amending FAO 185 by adding whales.
FAO 233 series of 2010: Aquatic Wildlife Conservation defines the requirements for the use of aquatic wildlife for show or exhibition purposes, among others.
FAO 233-1 series of 2011: amending FAO 233.
FAO 208 series of 2001: Conservation of rare, threatened and endangered fishery species.

Legal status and present mgt arrangements

DOT and DA Joint Administrative Order No. 1: Guidelines to Govern the Conduct of People Interaction with Cetaceans.
Provincial Ordinance No. 09-2003: Ordinance declaring the Humpback whales as protected species within the territorial jurisdiction in the province of Cagayan.
Republic Act (RA) 9147: "Wildlife Resources Conservation and Protection Act." Provides for the conservation and protection of wildlife resources and their habitats, appropriating funds thereof and for other purposes.

- In progress: Executive Order and eventually a municipal ordinance on the protection and conservation of the Irrawaddy dolphins in Bago-Pulupandan, Negros Occidental; Buenavista, Guimaras; Leganes, Zarraga and Dumangas in Iloilo.
- In progress: the ICRMP-DENR Region 2 has proposed the declaration of a Humpback Whale Marine Protected and Conservation Area in Camiguin Island, in the Municipality of Calayan (Babuyan Islands).

Legal status and present mgt arrangements

National and state legislation related to fisheries

See FAO 185 and 185-1 above.

International Agreements ratified by nation

The Philippines is signatory to the following international agreements:

CORAL TRIANGLE INITIATIVE

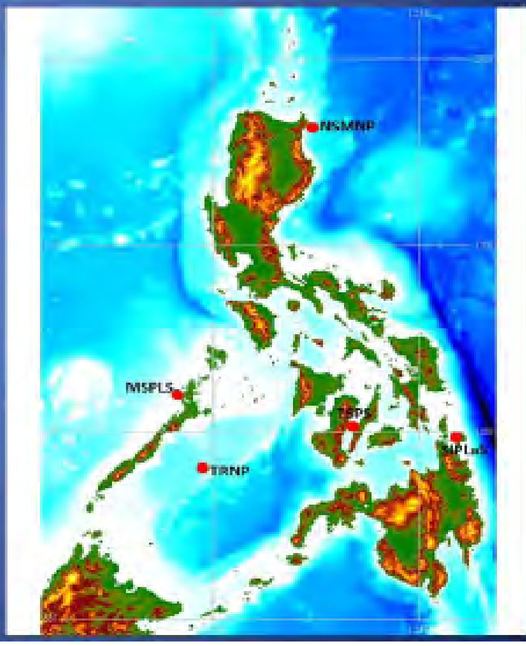
CMS

CBD

Legal status and present mgt arrangements

Regional Marine Protected Area planning

Most existing protected areas in the Philippines were established for more general habitat protection reasons however, some areas do encompass known habitats of cetaceans thus, affording them protection as well.



Legal status and present mgt arrangements

Regional Marine Protected Area planning

Plans are underway for designating marine protected areas for cetaceans in other areas in the country.

- Iloilo and Guimaras, MPA for the newly discovered Irrawaddy dolphin population

- Proposed Humpback whale Marine Protected and Conservation Area on the western coast of Camiguin Island, Calayan Municipality in northern Luzon.

• Sulu-Sulawesi Marine Ecoregion (SSME) – A Tri-national MOU between the Philippines, Malaysia and Indonesia. Under the SSME Ecoregion Conservation Plan, comprehensive plans for 2010-2012 were developed and implemented by the subcommittees on Migratory and Threatened Species, Marine Protected Areas and Networks, and Sustainable Fisheries.


Conservation & Education programs
MARINE LAb
BE WHALE WISE
Ang mga Marine Mammals ng Balabac
BALYENA.ORG


Conservation & Education programs
I ♥ OCEAN
Dolphins Love Freedom
BOHOL DOLPHIN Festival

Folk attitudes & interactions with marine mammals

- Fishermen attribute some supernatural powers to them by putting the skulls in the backyard to ward off evil spirits.

- In Mangsee Island in Palawan, stranded dolphins or whales were buried deep in the sand because they believe that carcasses left to rot on the beach will be bad for fishing.

- In other places, seeing dolphins coming close to shore is a warning of incoming bad weather.

- In Iloilo and Guimaras Straits in the Visayas, fishermen take the occurrence of Irrawaddy dolphins in their locality as an indication that the krill season has begun

Folk attitudes & interactions with marine mammals

- In some coastal communities in the Sulu-Sulawesi Sea, certain beliefs and perceptions of marine animals either instil fear or command respect from people
- Dolphins are traditionally perceived as 'unclean', therefore unfit for eating because of similarity in characteristics with other land animals that are considered taboo.
- other beliefs: contact with whales can cause physical discomfort or, eating a dugong will cause severe bleeding


Existing & past research and training programs
Past research projects reported in SEAMAM II in 2002:
• Cetacean Research and Conservation Project (WWF-Philippines)
• Humpback Whale Research and Conservation Project (WWF-Philippines)
• Malampaya Sound Research and Conservation Project (WWF-Philippines)
• Marine mammal Stranding program 1999-2002 (WWF-Philippines)
• Cetacean By-catch Fisheries Assessment Project (WWF-Philippines)
• Tañon Strait Initiative Project (WWF-Philippines)
• Silliman University (SU) initiated surveys
• The University of the Philippines (UP) initiated surveys
WWF


Existing & past research and training programs
Species-specific research and conservation projects
General cetacean research projects
NFRDI - FISHCODES-Genetic Barcoding of CITES listed and Regulated Aquatic Species
TMRC
BALYENA.ORG
Physalus
LA.MA.VE. PROJECT
FiN
Humpback whale
Irrawaddy dolphin


Existing & past research and training programs
Post-graduate researches:
• Habitat use of the newly discovered population of Irrawaddy dolphins (Orcaella brevirostris) in the coastal waters of Bago and Pulupandan, Negros Occidental (Manuel Eduardo de La Paz. MSc Thesis. Silliman University. 2012)
• Relative Abundance, Distribution, and Species Association of Cetaceans in the Bohol Marine Triangle (2008 Master's Thesis, Edna Sabater)
• Residence patterns and range characteristics of Indo-Pacific bottlenose dolphins (Tursiops aduncus) and other Small Cetaceans in the Southern Tañon Strait, Central Visayas (2009 Master's Thesis- Leslie Callanta).
• Human-cetacean interaction in Bohol, Philippines: an evaluation of compliance to code of conduct during whale watching and its effects to cetacean behavior. (PME Sorongon. MSc Thesis, University of the Philippines, Los Baños. 2010).


Existing & past research and training programs
Post-graduate researches:
• Historical whaling in the Philippines: origins of 'indigenous subsistence whaling', mapping whaling grounds and comparison with current known distribution. (JMV Acebes. MSc dissertation. University of Oxford, UK. 2005.)
• Socioeconomic issues in marine mammal by-catch in Malampaya Sound, Iloilo and Guimaras Straits (Tara Whitty. PhD diss. Scripps Institute of Oceanography)
• 'Hunting Big fish' : An environmental history of a contested fishery. JMV Acebes, PhD diss. (In prep.) Murdoch university , WA

Existing & past research and training programs

Trainings:

- Philippine Red List assessment on marine mammals of the Philippines - CI-Philippines
- Marine mammal training: how to conduct surveys and identify animals. SU-DENR-ICRM Project
- Stranding response trainings and education programs in collaboration with other NGOs, local government units and other regional offices.
- Marine mammal strandings in the Philippines- UP-IEMS

Needs for additional research & training

1. Surveys - eastern coast of the Philippines facing the Pacific Ocean, the southern island of Mindanao, the northwestern coast of Luzon and the western coast of Palawan.
2. By-catch and other fishery interactions
3. Drivers of fishery for cetaceans (where they exist)
4. Cetacean-human interaction studies
5. Population estimation
6. Investigating movement patterns –especially of large whales. Acoustic monitoring of coastal cetacean populations like the Irrawaddy dolphins will be an important means of determining their movement patterns especially when they move between islands/estuaries.
7. Heavy metal content
8. Ecosystem-based studies
9. Genetics studies –Blue whale, Bryde's whale, and beaked whales.

Needs for additional research & training

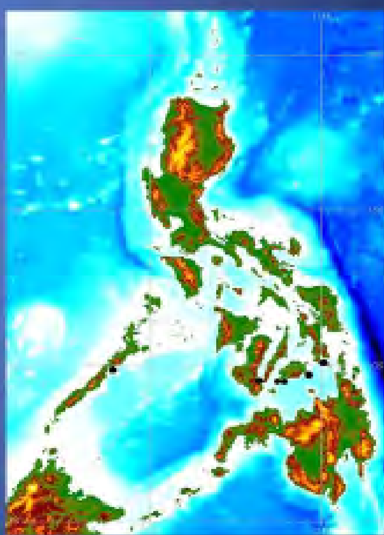
Training needs

1. Genetics and Biopsy techniques
2. Acoustic monitoring and data analysis
3. Abundance survey techniques such as DISTANCE-based line transect surveys; photo-ID
4. Necropsy of stranded cetaceans
5. GIS
6. Socio-economic evaluations of cetacean-based tourism problems and feasibilities
7. Cetacean behavioral studies
8. Satellite tagging
9. Ecosystems modeling

Present & potential marine mammal watching operations

Existing:

1. Bais, Negros Oriental
2. Pamilacan Island, Baclayon, Bohol
3. Panglao Island, Panglao, Bohol
4. Honda Bay and Puerto Princesa, Palawan
5. Anda, Bohol
6. Sogod bay, Southern Leyte

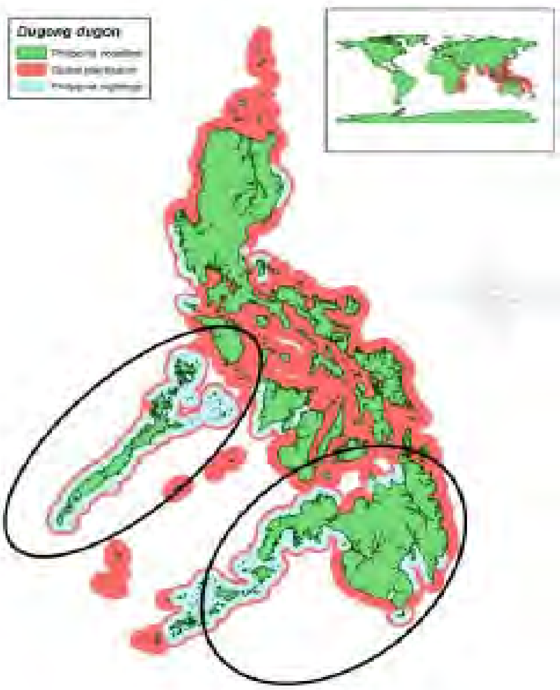



Present & potential marine mammal watching operations
Potential:
1. Batangas Bay, Batangas
2. Lubang Islands, Occidental Mindoro
3. Sarangani Bay, Sarangani Province
4. Camiguin Island, Babuyan Islands
5. Malampaya Sound
6. Bago,Pulupandan


MARAMING SALAMAT PO!
DAGHANG SALAMAT!
Jo Marie V. Acebes
Ma. Theresa Aquino
Ma. Louella L. Dolar
Edna Sabater
Alessandro Ponzo
Manuel Eduardo De La Paz
Angelico Jose Tiongson
Patricia Sorongon-Yap
Lemnuel Aragones
MareCet
SU-IEMS
University of St. La Salle
Physalus

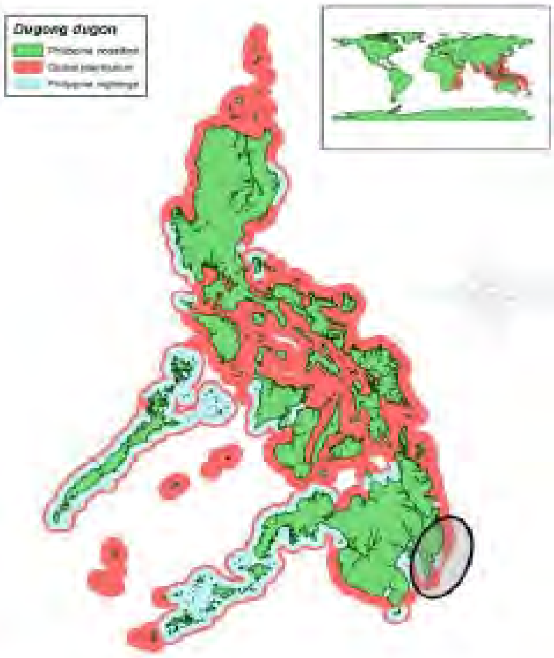
Dugong Country Report

Philippines



Distribution, Occurrence, & Population Status

- Historically covering the whole coastline (36,289 km)
- Current: fragmented in 13,288 km (63% ↓ in occurrence)
- Most of remaining population in Palawan and Mindanao
- Not enough data to determine population status for the country



Habitat Status

- 30-50% loss of seagrass habitat (UNEP 2009 Report)
- Threats: habitat degradation, conversion, loss, pollution, foreshore development, storms

Threats to Dugong Population

- Habitat loss/destruction
- Directed catch
- Accidental takes
- Storms/CC (?)

Legal Instruments

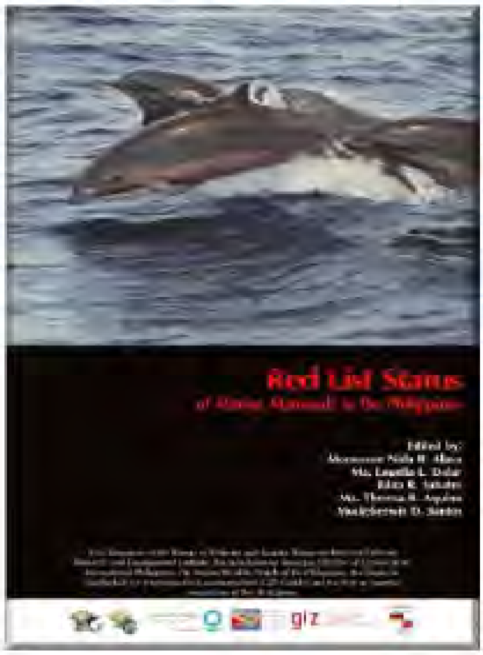
- Department Administrative Order (DAO) 55
- National Integrated Protected Areas System (NIPAS) Act of the Philippines
- Wildlife Act of the Philippines
- Fisheries Code of the Philippines = Municipal Ordinances declaring seagrass habitats as fish sanctuaries in Roxas, Palawan

International Agreements

- Convention on Migratory Species
- Convention on Biodiversity
- Sulu-Sulawesi Marine Ecoregion
- Coral Triangle Initiative – National Plan of Action Goal #5 (Threatened species status improving)

Regional Red List Assessment

- Conducted in 2009 by CI-Phils and BFAR in collaboration with marine mammal researchers in the country
- Published by BFAR-NFRDI
- Dugong: CR



Dugong Research in the Past 10 years

- Byrne *2005* –Hinatuan, Surigao del Sur, Mindanao
- Dolar et al. *2005* – southern Visayan Sea
- Lucero *2005* – Malita, Davao del Sur, Mindanao
- Aragones *2006* – northern Guimaras, Visayas
- Dolar *2006* – Marine Biodiversity Conservation Corridors (Verde Passage, Cagayan Ridge, Balabac)
- PCSDS *2006* – ECAN survey in northern Palawan
- WWF-Phils *2008* – coastal resource profiling and monitoring in Roxas, northern Palawan
- Lucero *2009* – foraging in Davao Gulf
- Quimpo et al. *2012* – distribution, habitats, fisheries interaction in selected areas in Mindanao (CMS dugong survey format)
- Fortes et al. 2013 – ongoing study in Malita, Davao del Sur


Other Conservation Strategies
• IEC and Advocacy
• Rescue and salvaging
• Dugong watching

Taiwan

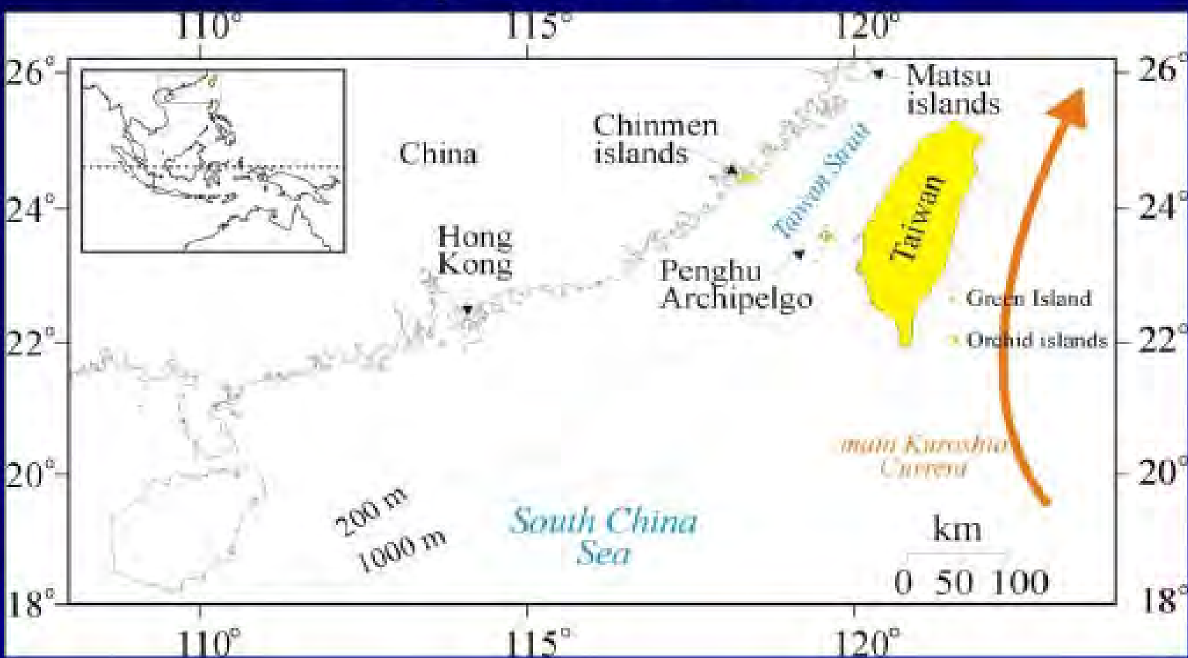
Taiwan (2002-2012)

John Y. Wang
FormosaCetus Research and Conservation Group (Canada)
Department of Biology, Trent University (Canada)
National Museum of Marine Biology and Aquarium (Taiwan)

Shih Chu Yang
FormosaCetus Research and Conservation Group (Taiwan)

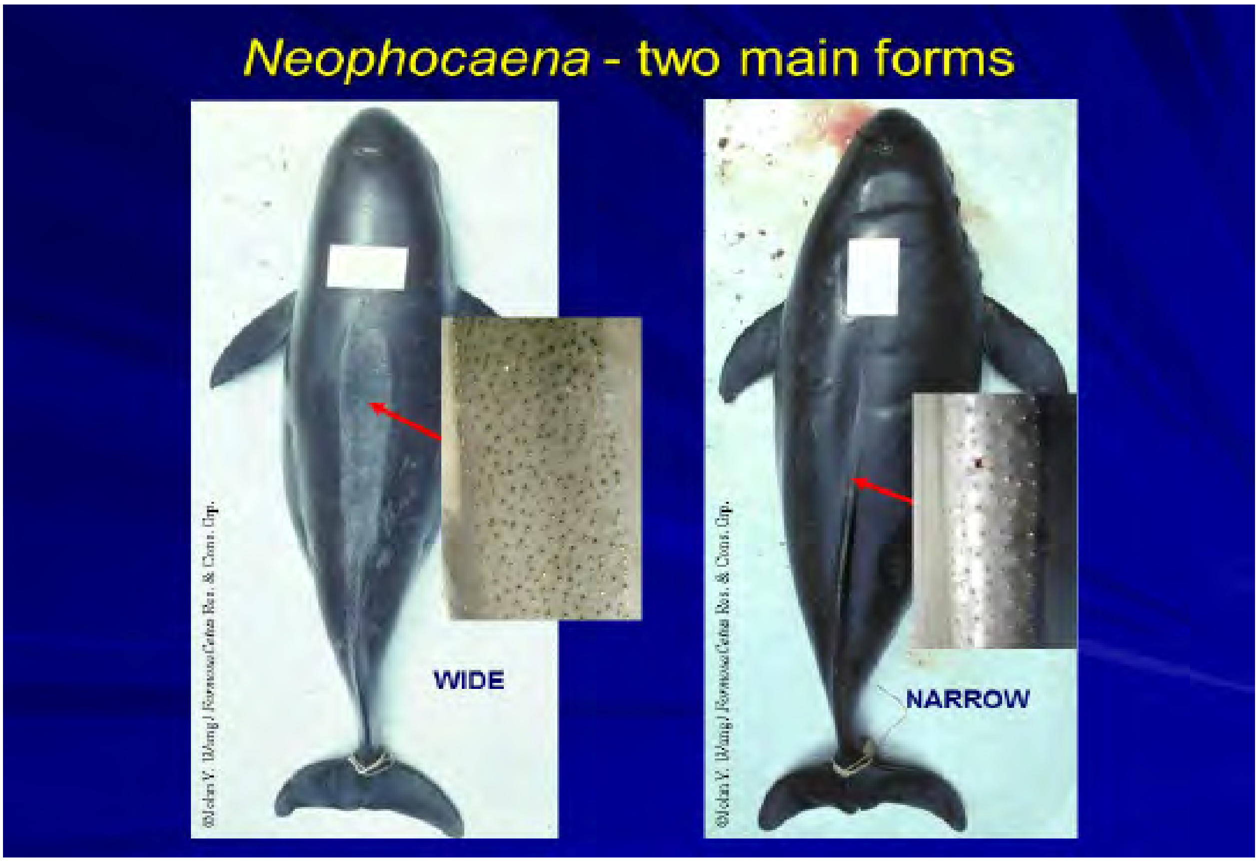
Chen Yi Kan
Matsu Fish Conservation Union (Taiwan)

Map of the area



Marine Mammal Species

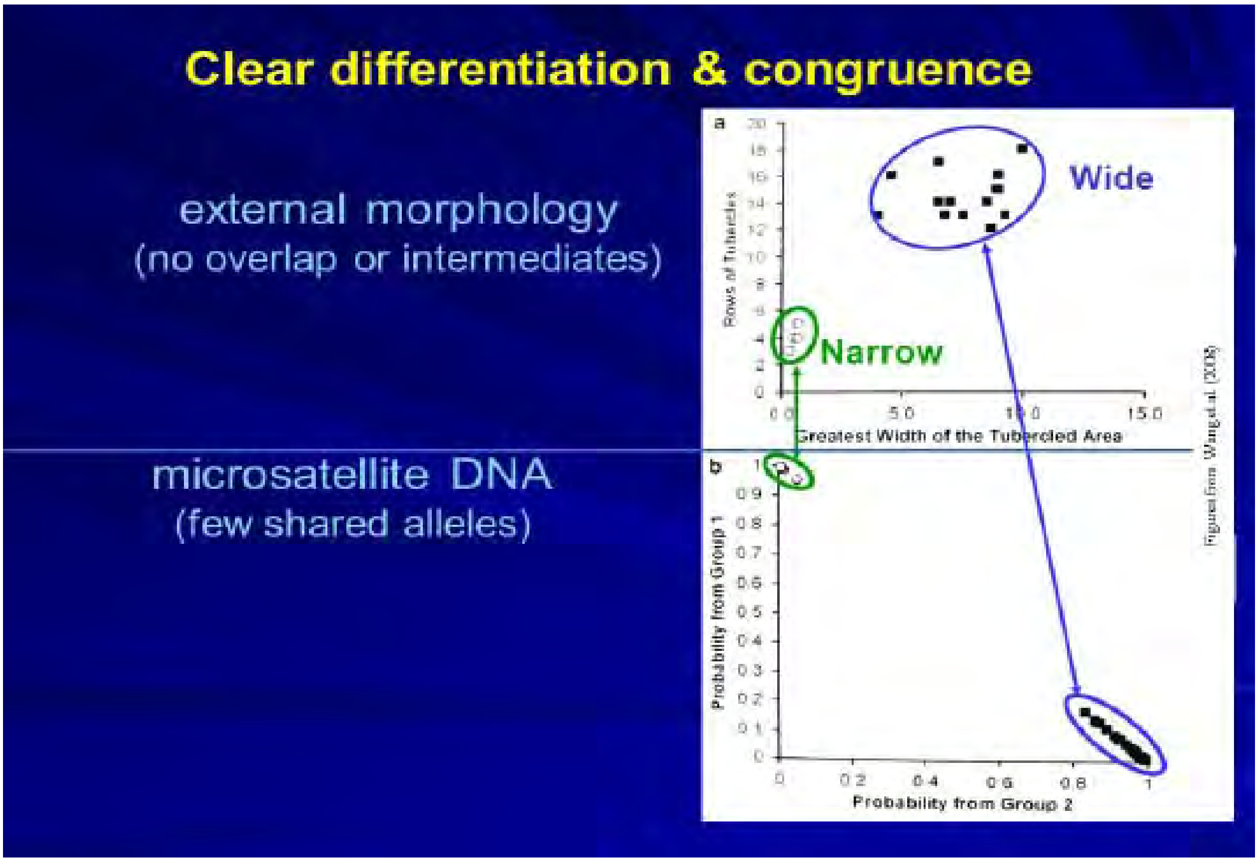
- *Dugong dugon*
  - Only one confirmed record (Hirasaka 1932) - transient or extirpated?
- *Indopacetus pacificus* - stranding in 2005 (= "*Hyperoodon* – tropical bottlenose whale" of 2002)

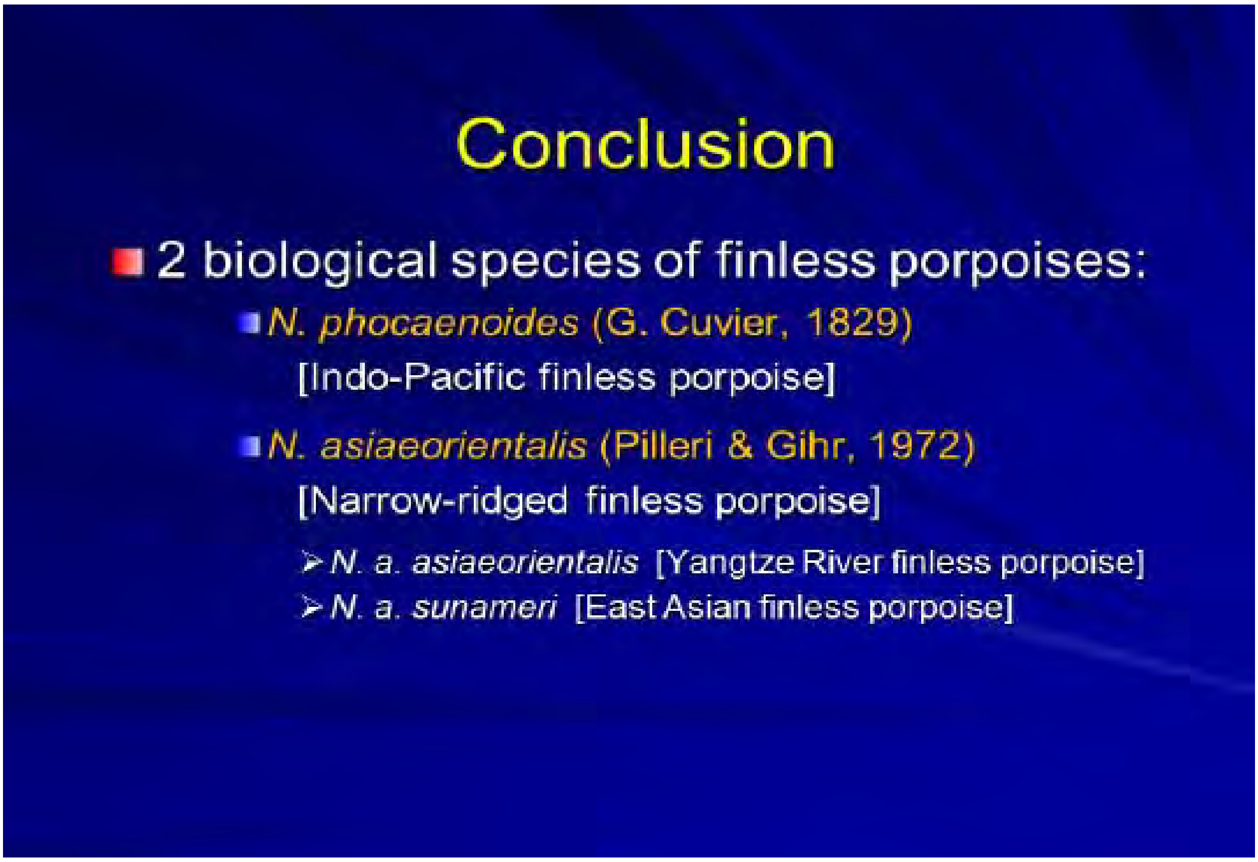


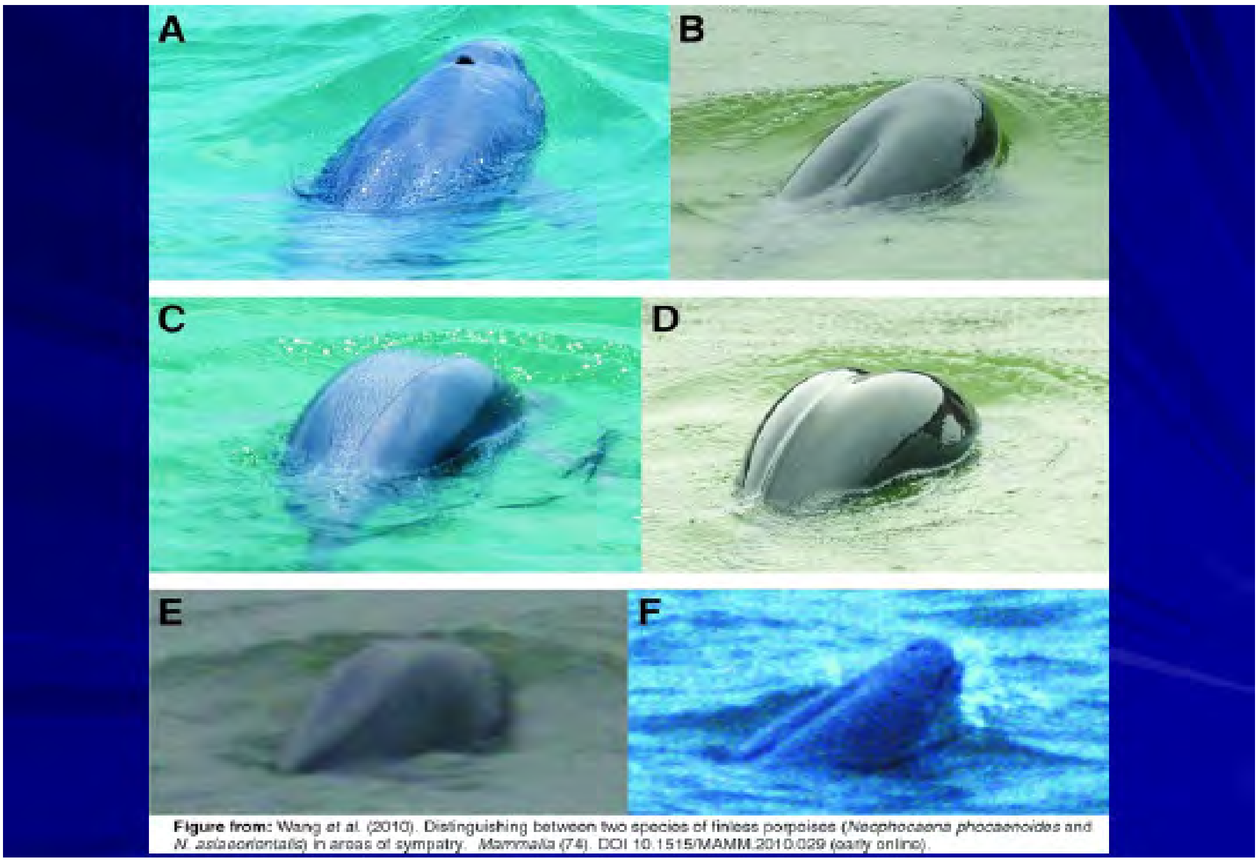

Suspected high bycatch levels
Photos © John Y. Wang / FormosaCetus Res. & Cons. Grp.


Yangtze River finless porpoise
Photogrpha © John Y. Wang / FormosaCetus Res. & Cons. Grp.
IUCN Red List status: Endangered


Taiwan Strait:
two forms are sympatric
China
India
- Taiwan
= Distribution of narrow form
= Distribution of wide form
= Area of sympatry
Map from Wang et al. (2008)


Clear differentiation & congruence
external morphology
(no overlap or intermediates)
microsatellite DNA
(few shared alleles)
Wide
Narrow
Rows of Tubercles
Greatest Width of the Tubercled Area
Probability from Group 1
Probability from Group 2
Figure from Wang et al. (2008)


Conclusion
2 biological species of finless porpoises:
N. phocaenoides (G. Cuvier, 1829)
[Indo-Pacific finless porpoise]
N. asiaeorientalis (Pilleri & Gihr, 1972)
[Narrow-ridged finless porpoise]
N. a. asiaeorientalis [Yangtze River finless porpoise]
N. a. sunameri [East Asian finless porpoise]


A
B
C
D
E
F
Figure from: Wang et al. (2010). Distinguishing between two species of finless porpoises (Neophocaena phocaenoides and N. asiaeorientalis) in areas of sympatry. Mammalia (74). DOI 10.1515/MAMM.2010.029 (early online).

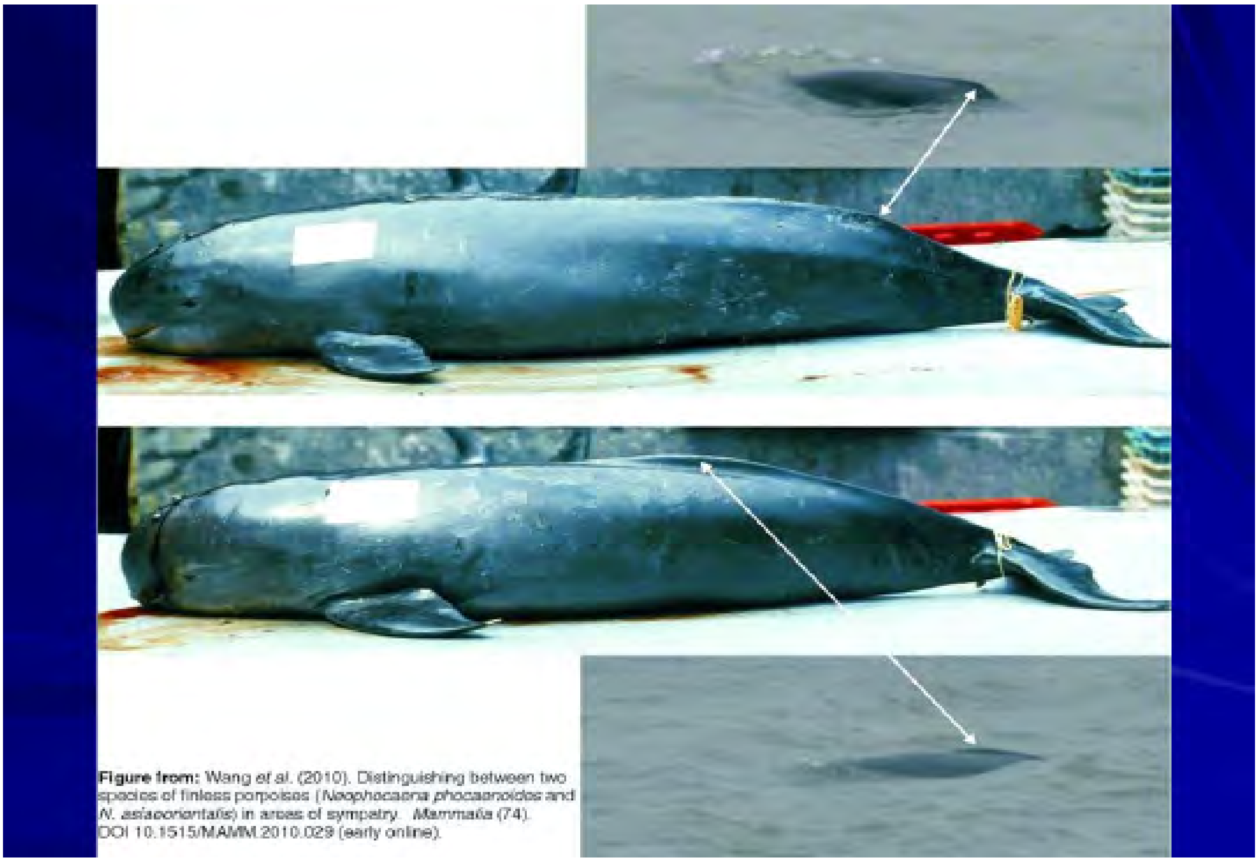
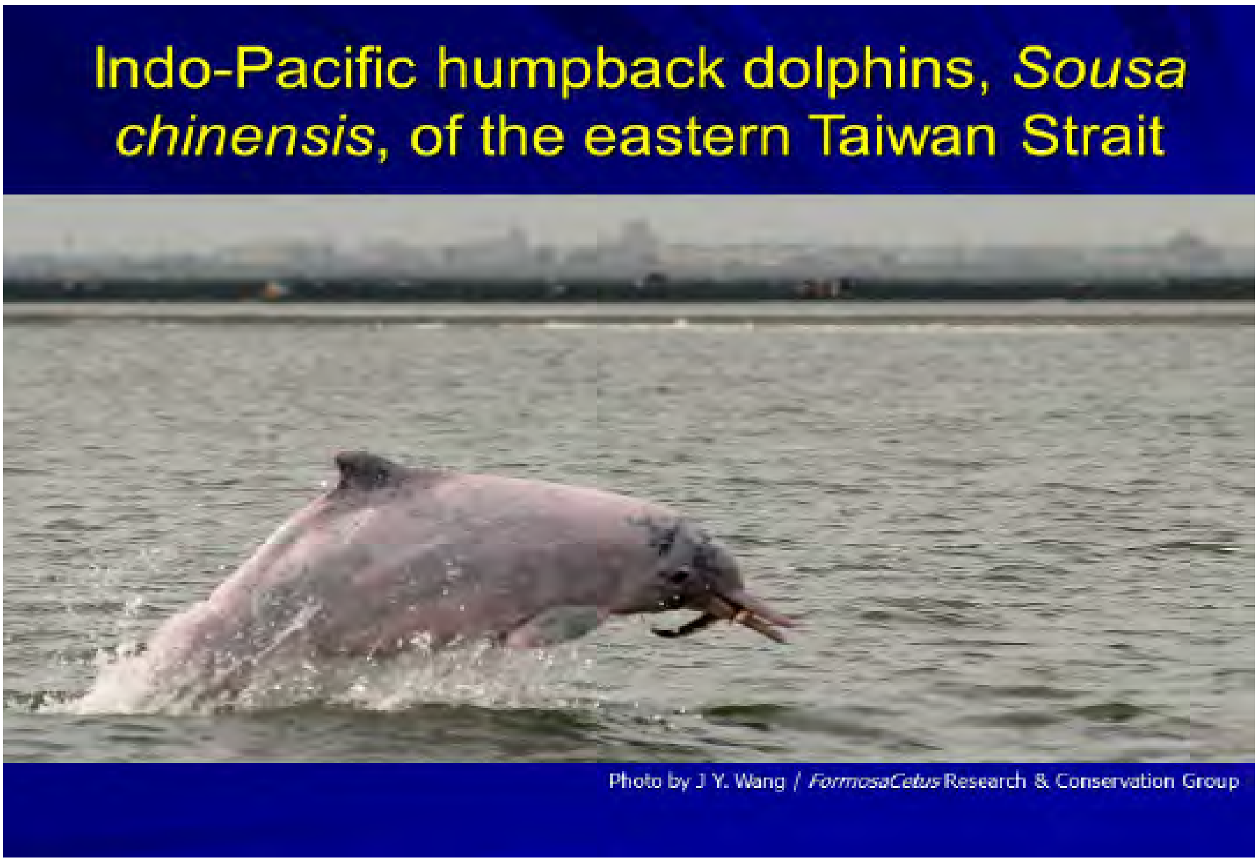
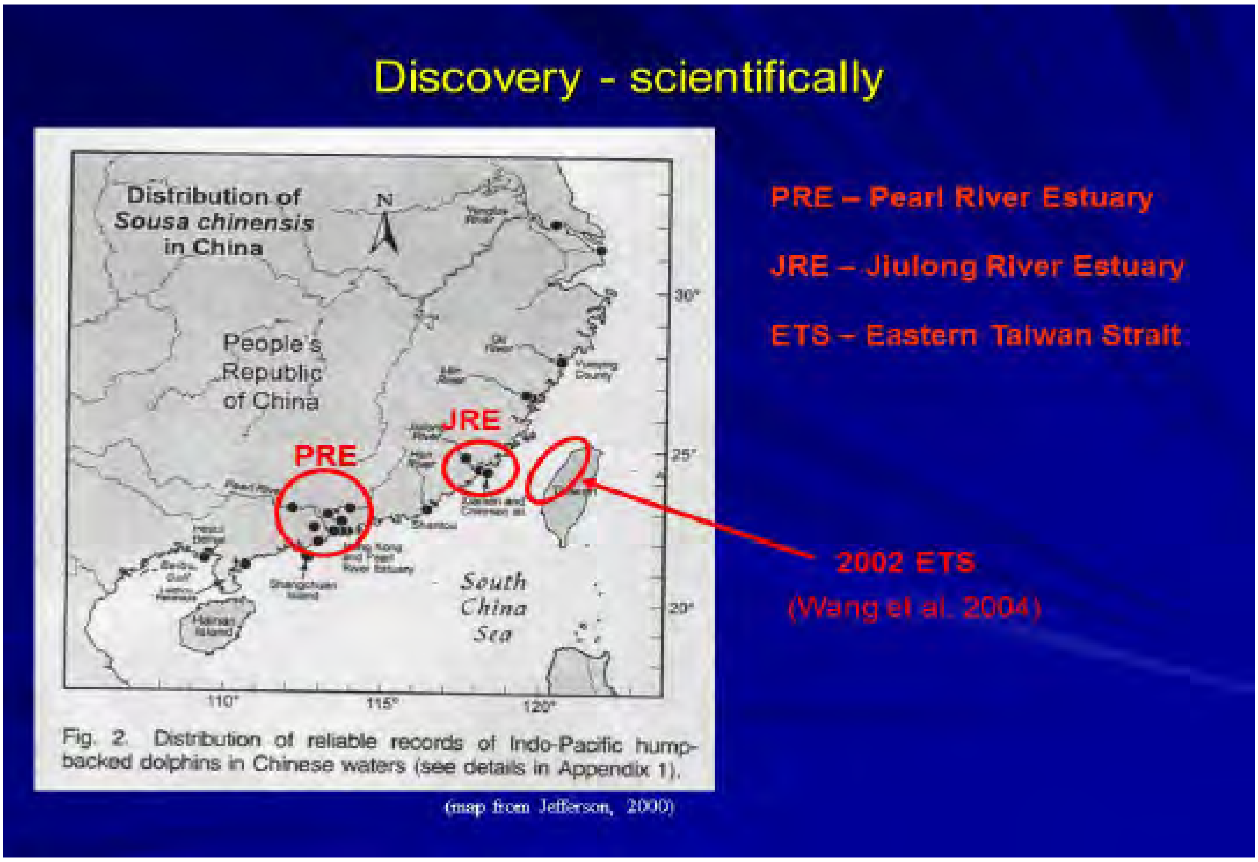
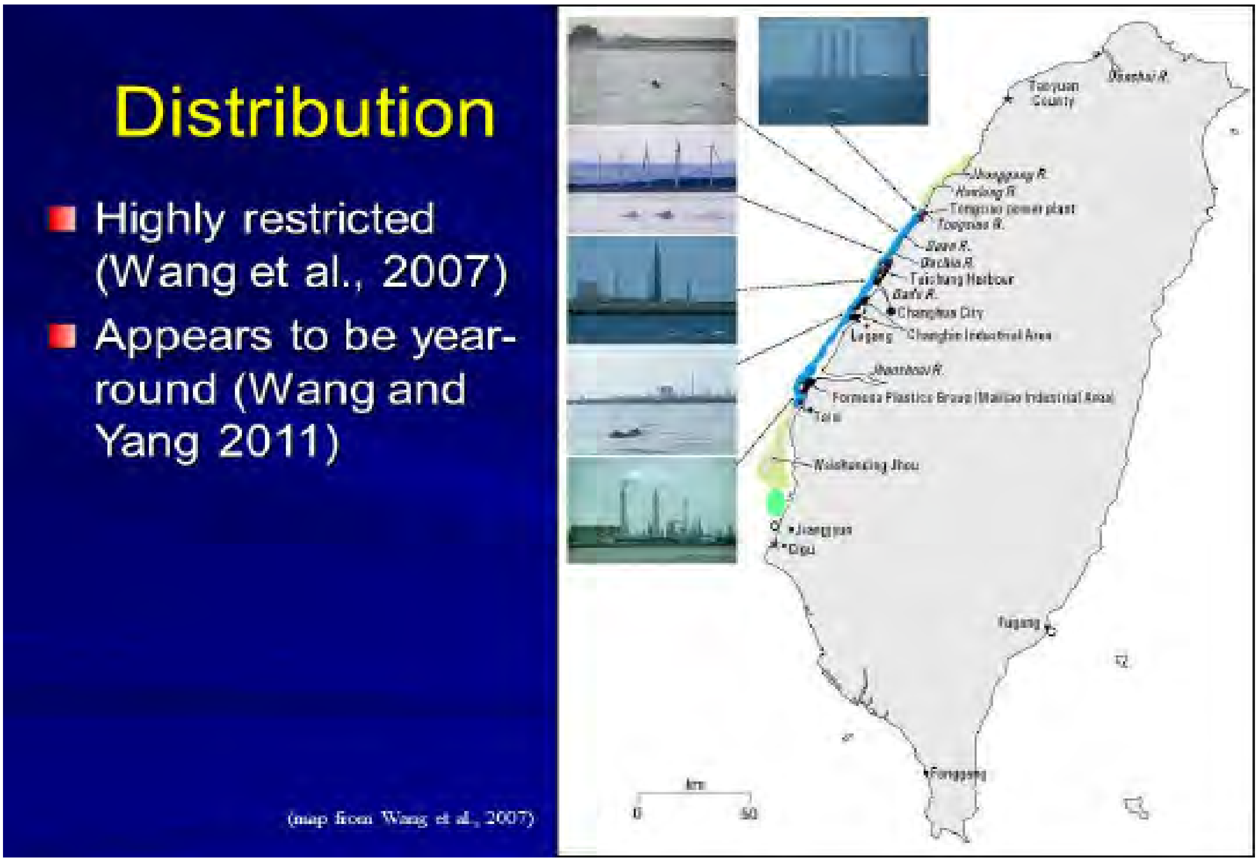
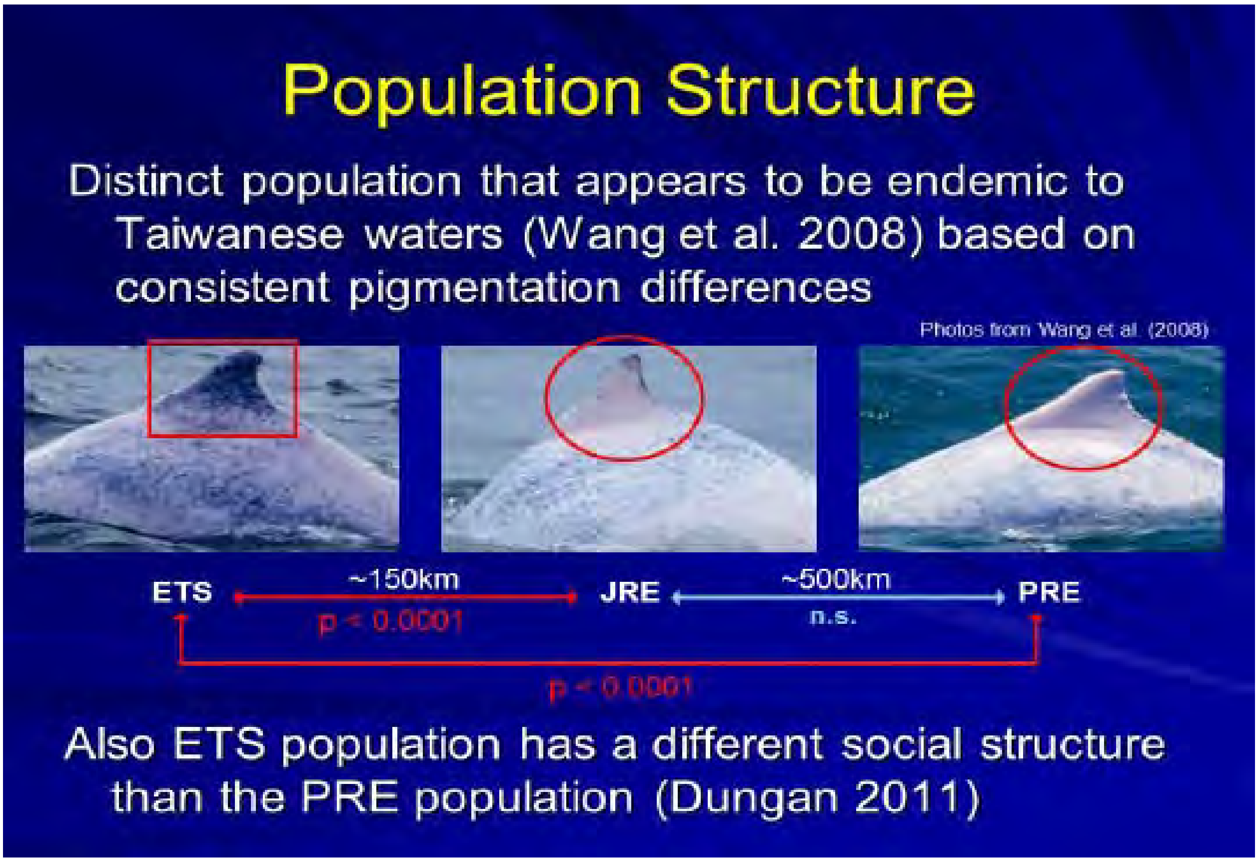


Figure from: Wang et al. (2010). Distinguishing between two species of finless porpoises (Neophocaena phocaenoides and N. asiaeorientalis) in areas of sympatry. Mammalia (74). DOI 10.1515/MAMM.2010.029 (early online).


Indo-Pacific humpback dolphins, Sousa chinensis, of the eastern Taiwan Strait
Photo by J Y. Wang / FormosaCetus Research & Conservation Group


Discovery - scientifically
Distribution of
Sousa chinensis
in China
People's
Republic
of China
PRE
JRE
South
China
Sea
110°
115°
120°
30°
25°
20°
Fig. 2. Distribution of reliable records of Indo-Pacific hump-backed dolphins in Chinese waters (see details in Appendix 1).
(map from Jefferson, 2000)
PRE – Pearl River Estuary
JRE – Jiulong River Estuary
ETS – Eastern Taiwan Strait
2002 ETS
(Wang et al. 2004)


Distribution
Highly restricted (Wang et al., 2007)
Appears to be year-round (Wang and Yang 2011)
(map from Wang et al., 2007)
Taichung Harbour
Changhua City
Formosa Plastics Group (Mailiao Industrial Area)
km
0
50



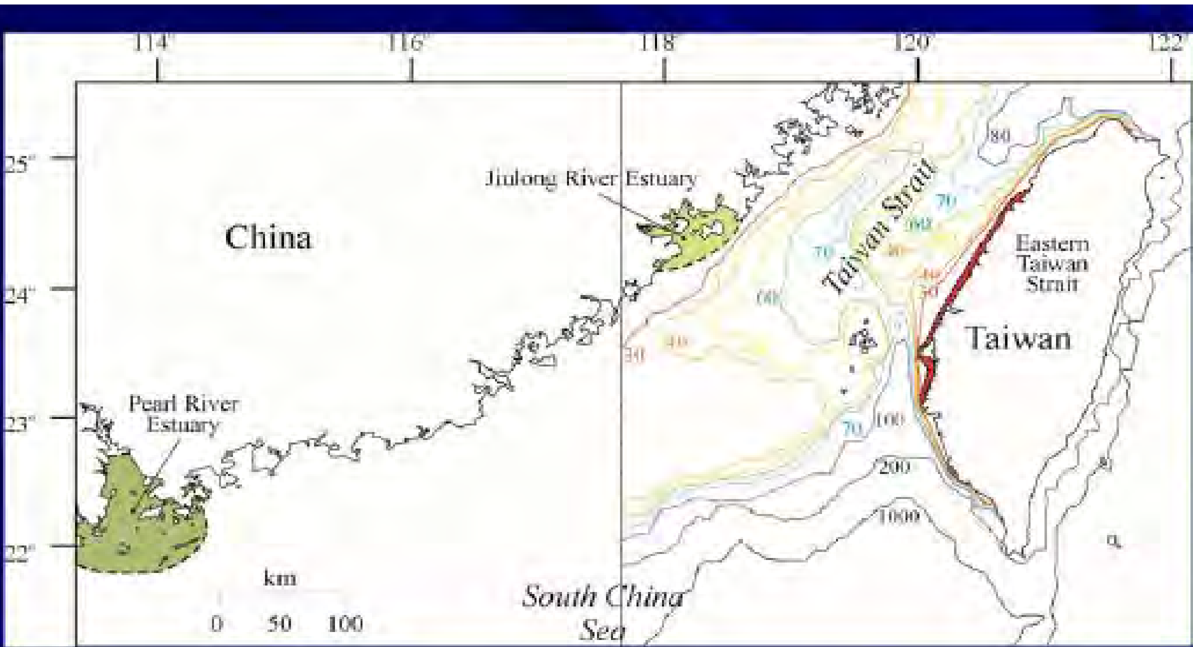


Figure 2. Bathymetric map (shown in colour and in metres) of the Taiwan Strait and adjacent waters showing the general distribution of well-known *Sousa chinensis* populations: eastern Taiwan Strait (red), Jiulong River Estuary and Pearl river Estuary (green shades).

Population Abundance Estimate

- Line transect = 99 (CV=51.6%; 95% CI = 37 to 266 - Wang et al. 2007)
- Mark-recapture of photo-ID data ~75 (with high precision - Wang et al. 2012).

RED LIST

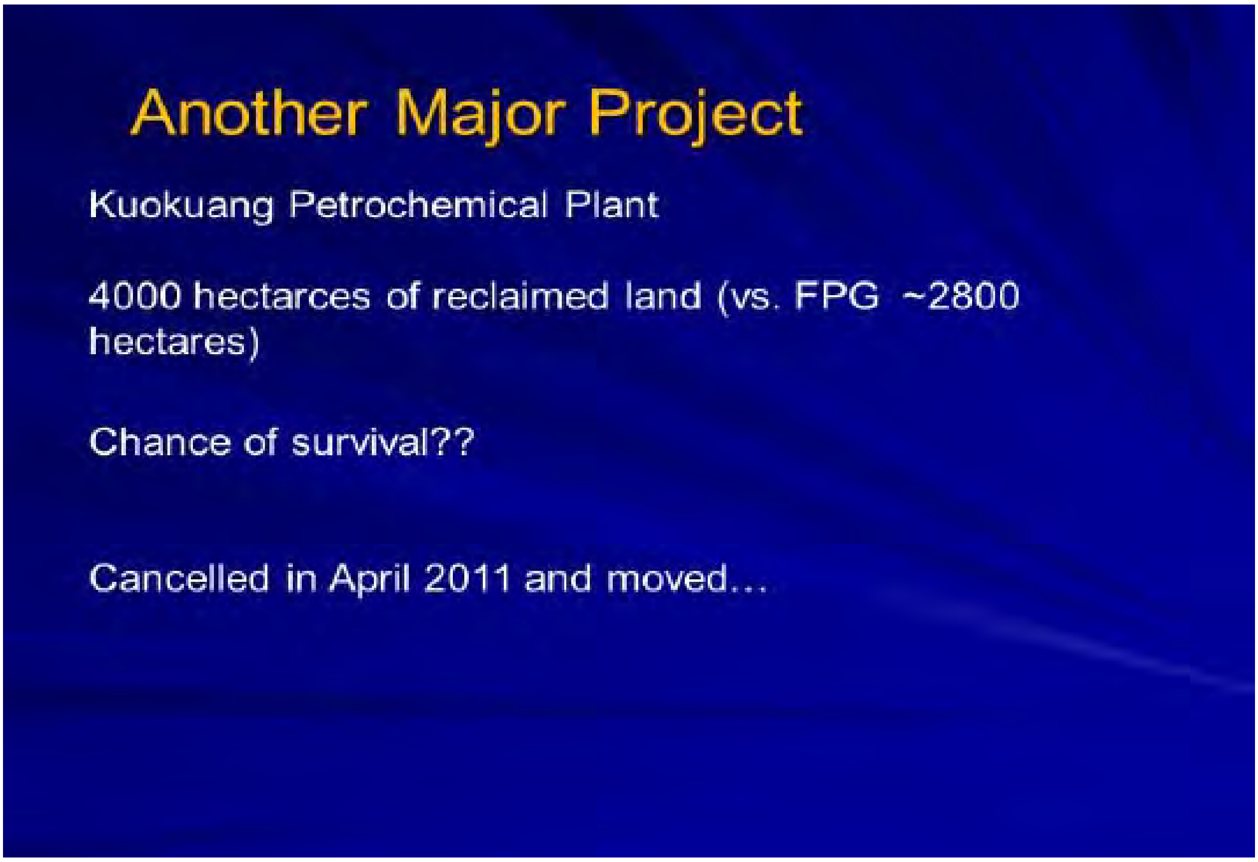
THE IUCN RED LIST OF THREATENED SPECIES

IUCN Red List Status

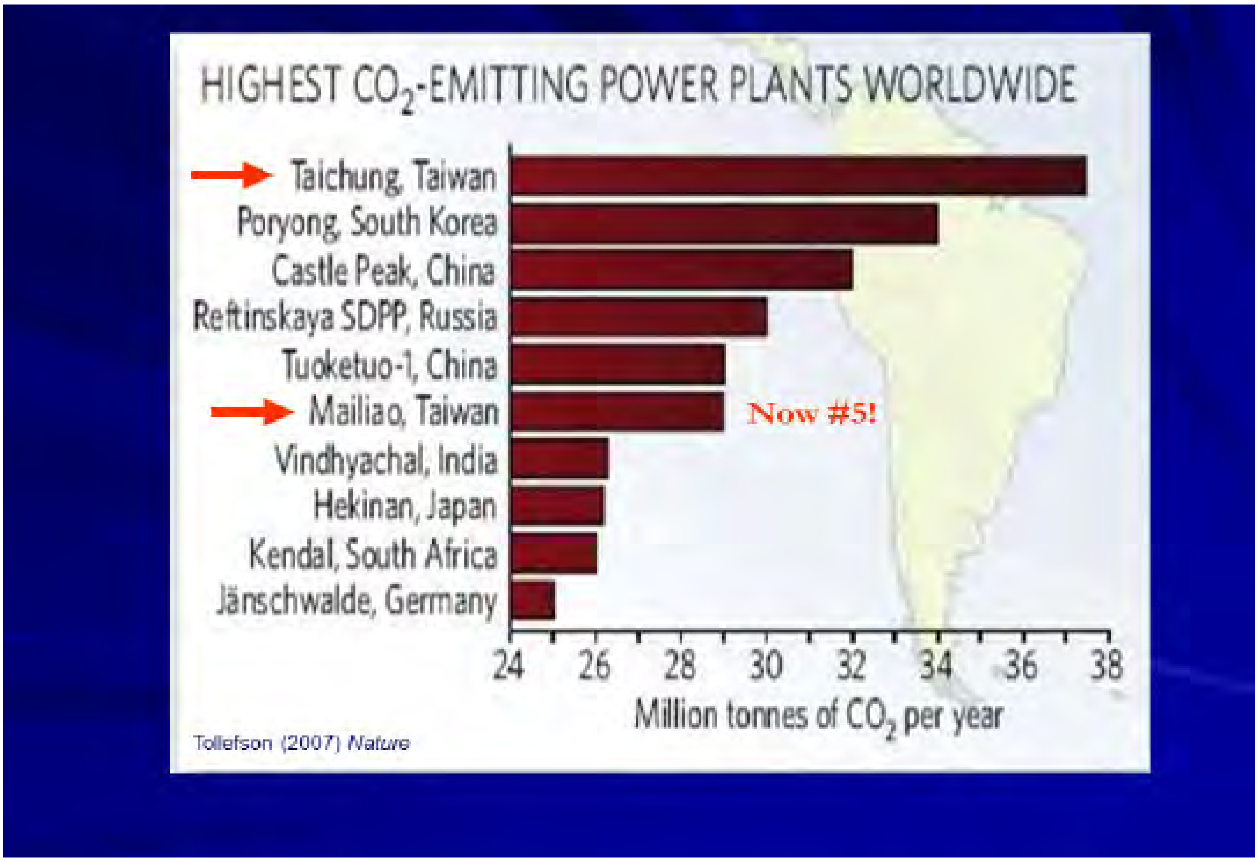
(Reeves et al. 2008)

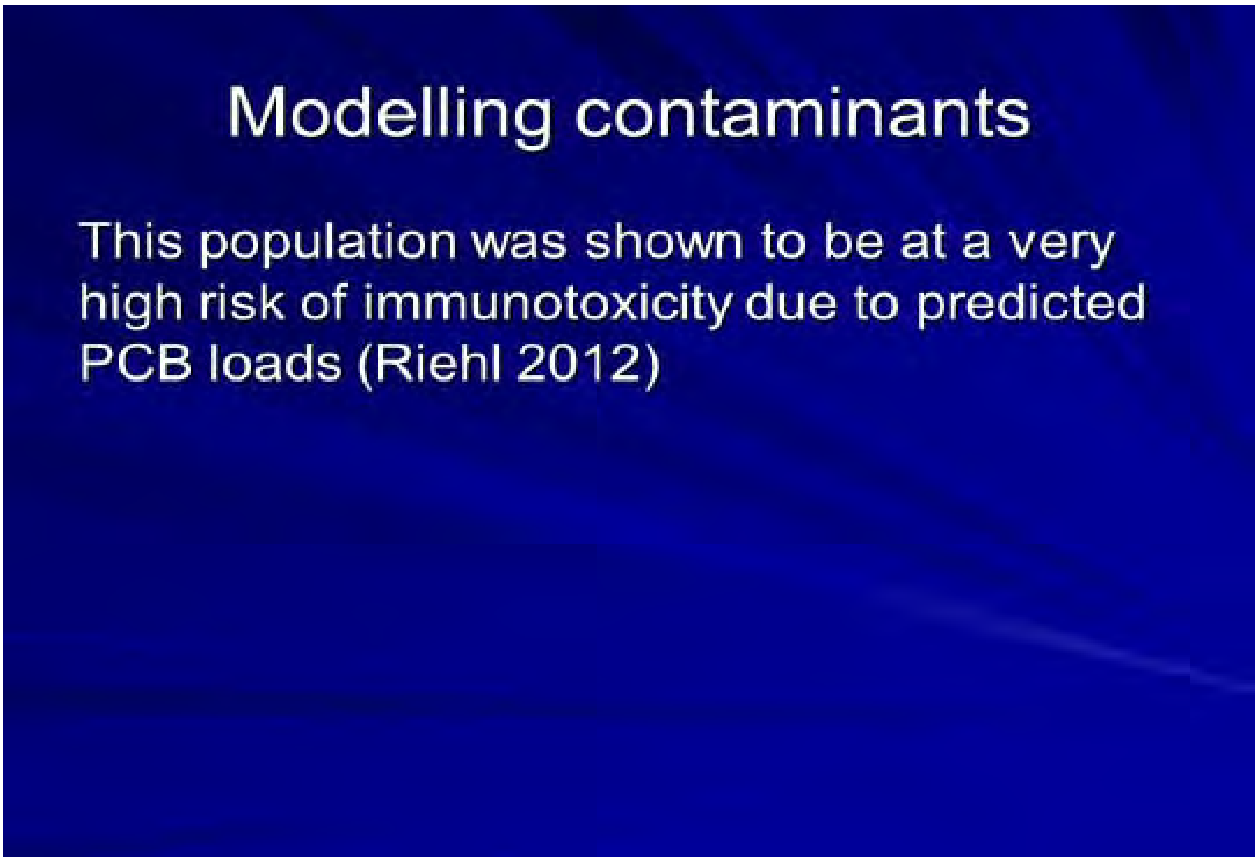

Five Main Threats
Loss of freshwater to estuaries (dolphins depend upon estuaries)
Loss of habitat (due to land reclamation)
Pollution
Fisheries interactions
Noise


Mailiao Industrial Park
(Formosa Plastics Group)
2007
2008
2011
Photo by: John Y. Wang / FormosaCetus Research & Conservation Group


Another Major Project
Kuokuang Petrochemical Plant
4000 hectarces of reclaimed land (vs. FPG ~2800 hectares)
Chance of survival??
Cancelled in April 2011 and moved…

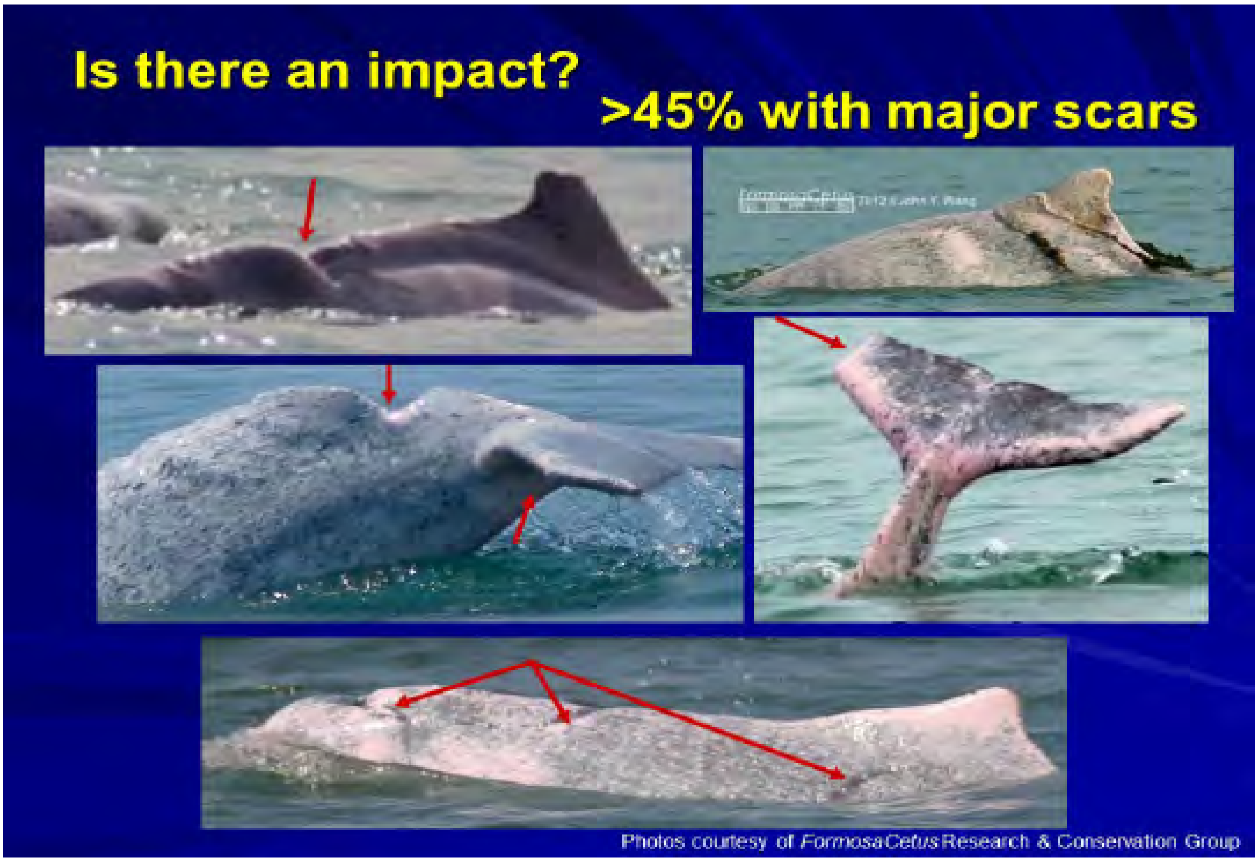

Pollution (Air, water, etc.)


HIGHEST CO_2-EMITTING POWER PLANTS WORLDWIDE
Taichung, Taiwan
Poryong, South Korea
Castle Peak, China
Reftinskaya SDPP, Russia
Tuoketuo-1, China
Mailiao, Taiwan
Now #5!
Vindhyachal, India
Hekinan, Japan
Kendal, South Africa
Jänschwalde, Germany
24 26 28 30 32 34 36 38
Million tonnes of CO_2 per year
Tollefson (2007) *Nature*


Modelling contaminants
This population was shown to be at a very high risk of immunotoxicity due to predicted PCB loads (Riehl 2012)

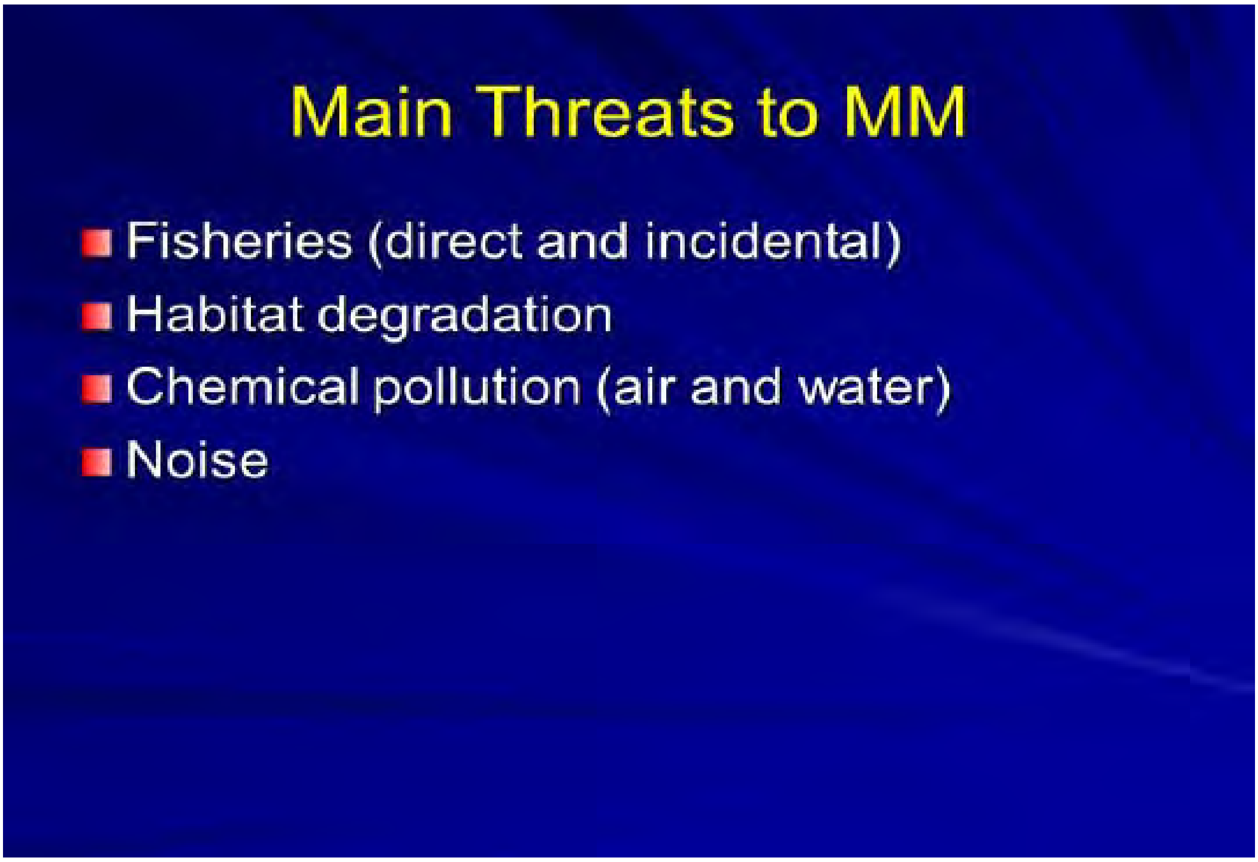

Net fisheries
©Pedro F. Fruet / FormosaCetus Research & Conservation Group

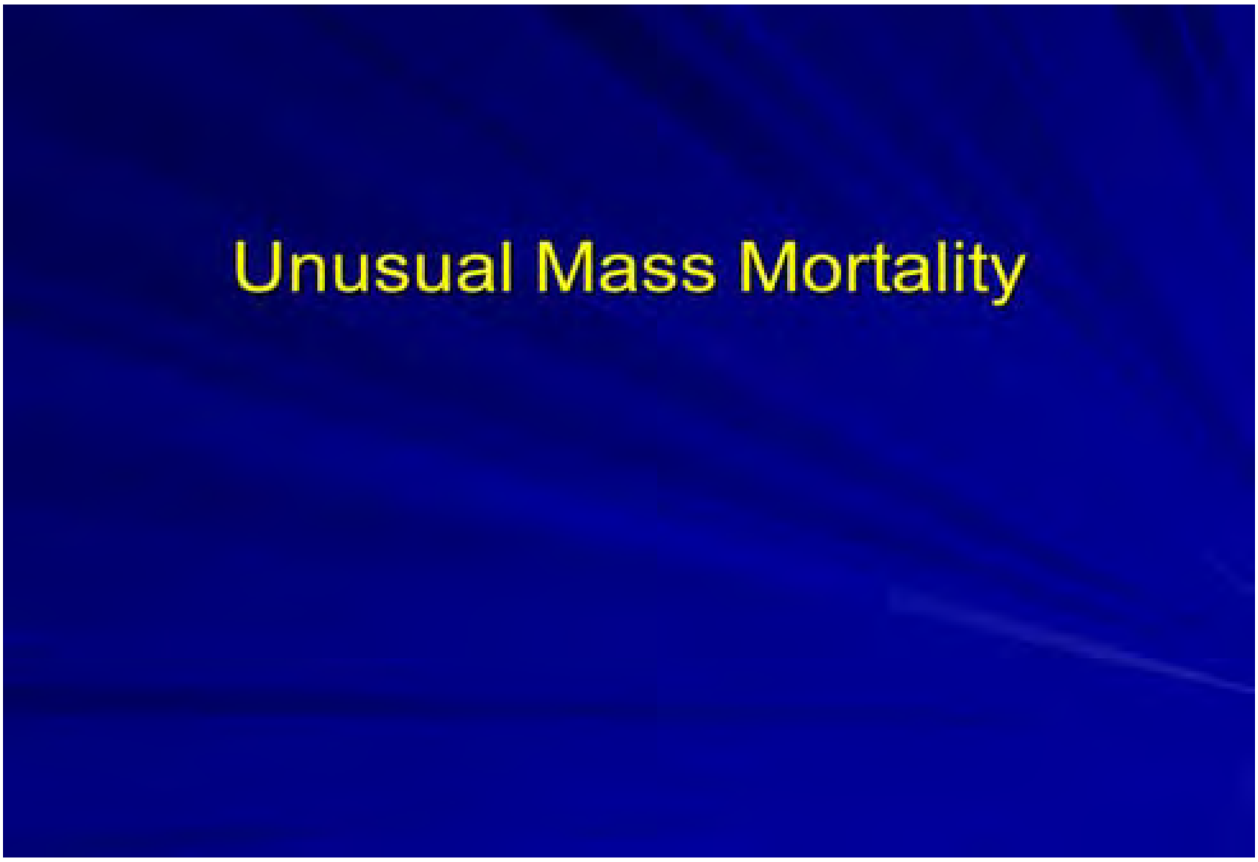

Noise (shipping, seismic research, construction, etc.)
Photo by J.Y. Wang / FormosaCetus Research & Conservation Group

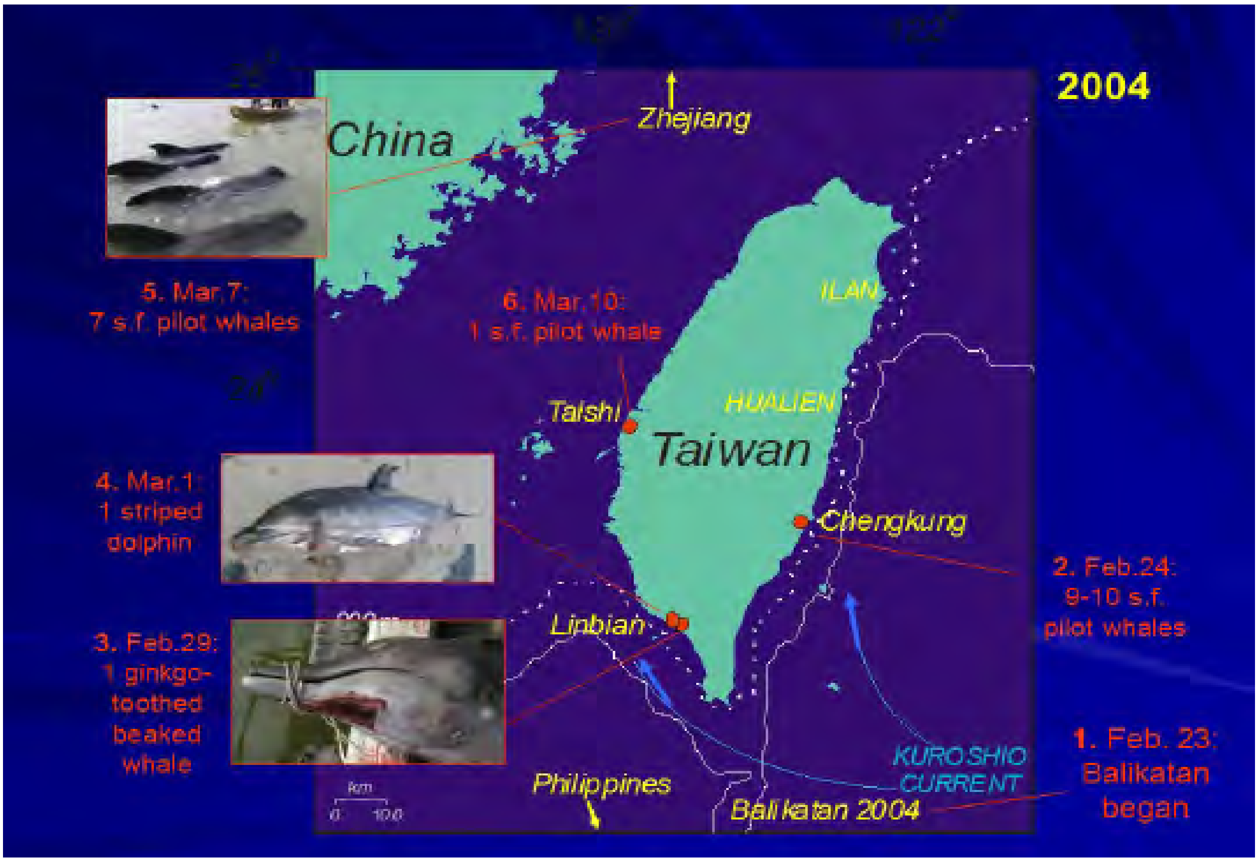


MM Population Status

- *Dugong dugon* (transient or extirpated?)
- *Megaptera novaeangliae* - southern Taiwan wintering population (extirpated)
- *Tursiops aduncus* (depleted?)
- ETS *Sousa chinensis* (IUCN RL – CR)

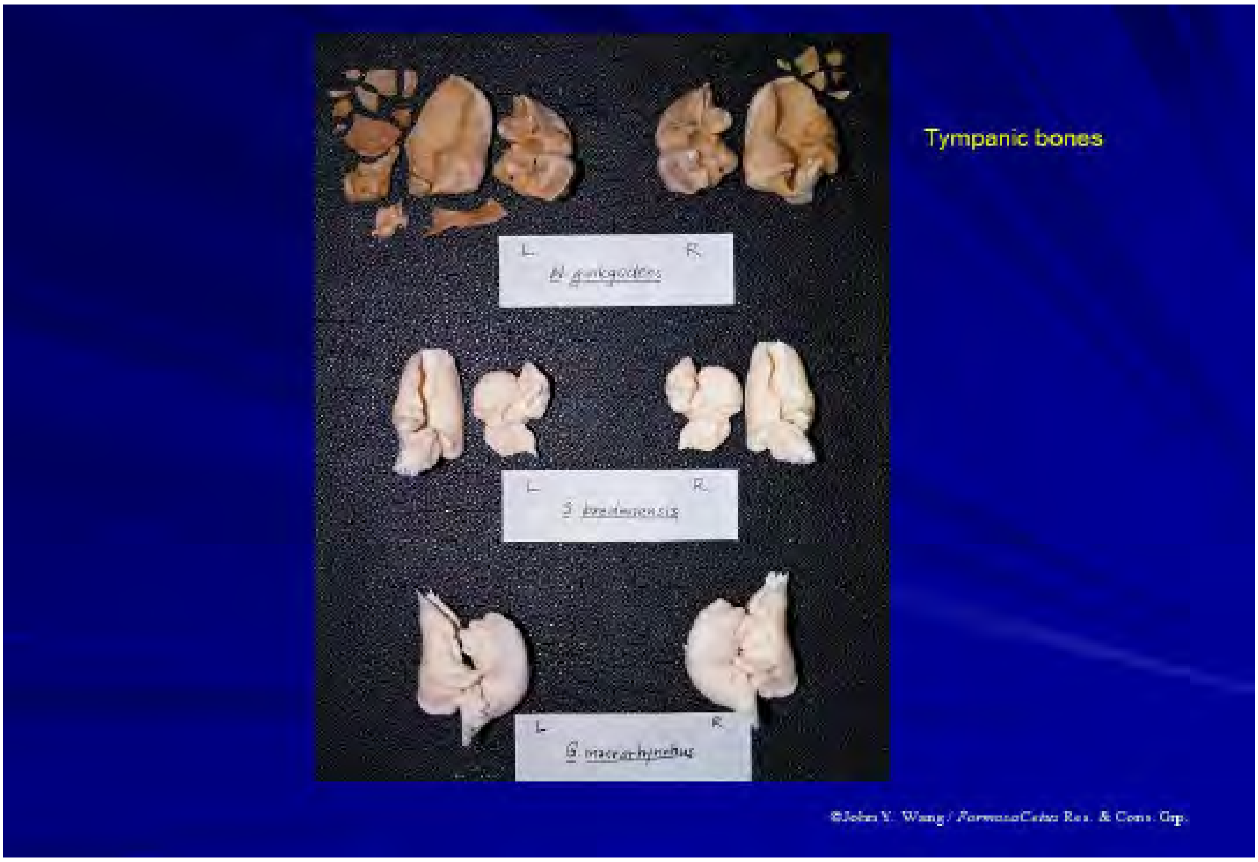

Main Threats to MM
Fisheries (direct and incidental)
Habitat degradation
Chemical pollution (air and water)
Noise

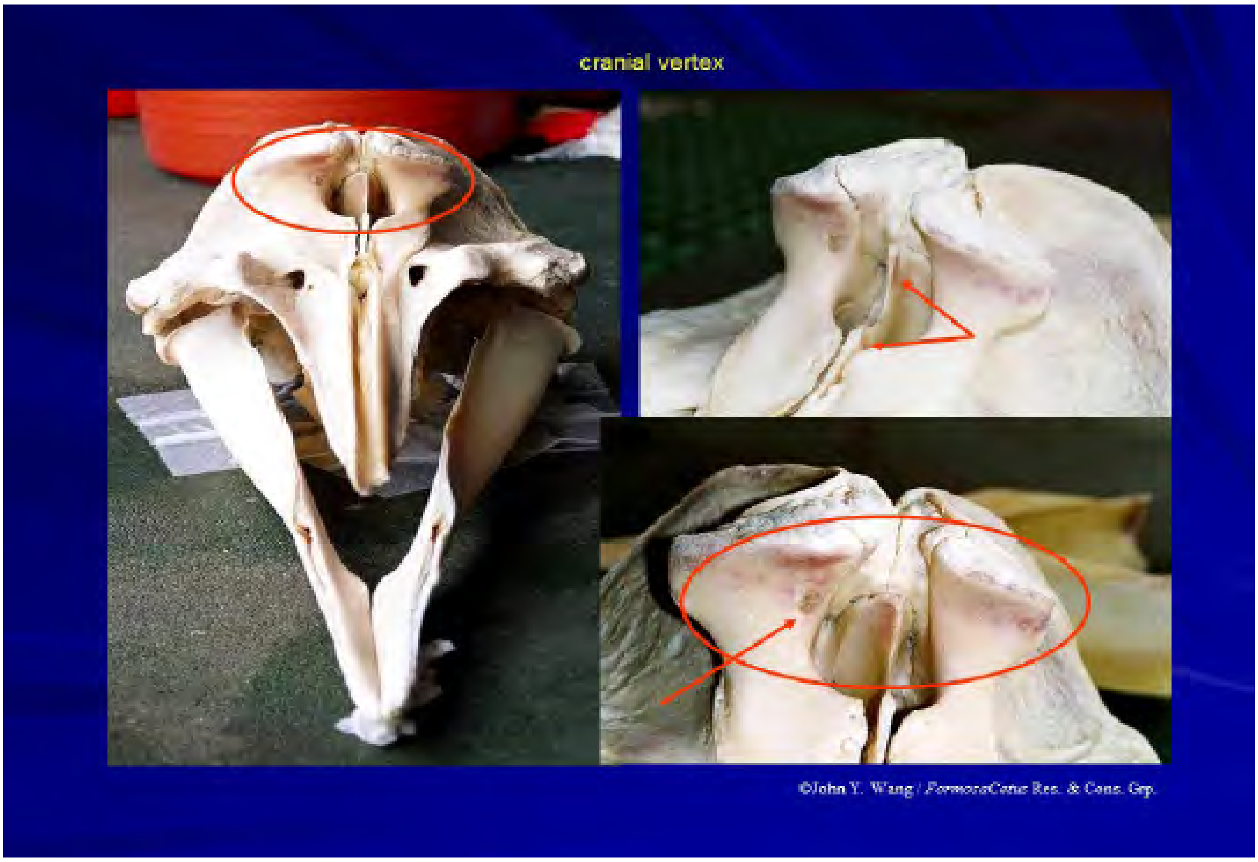

Unusual Mass Mortality

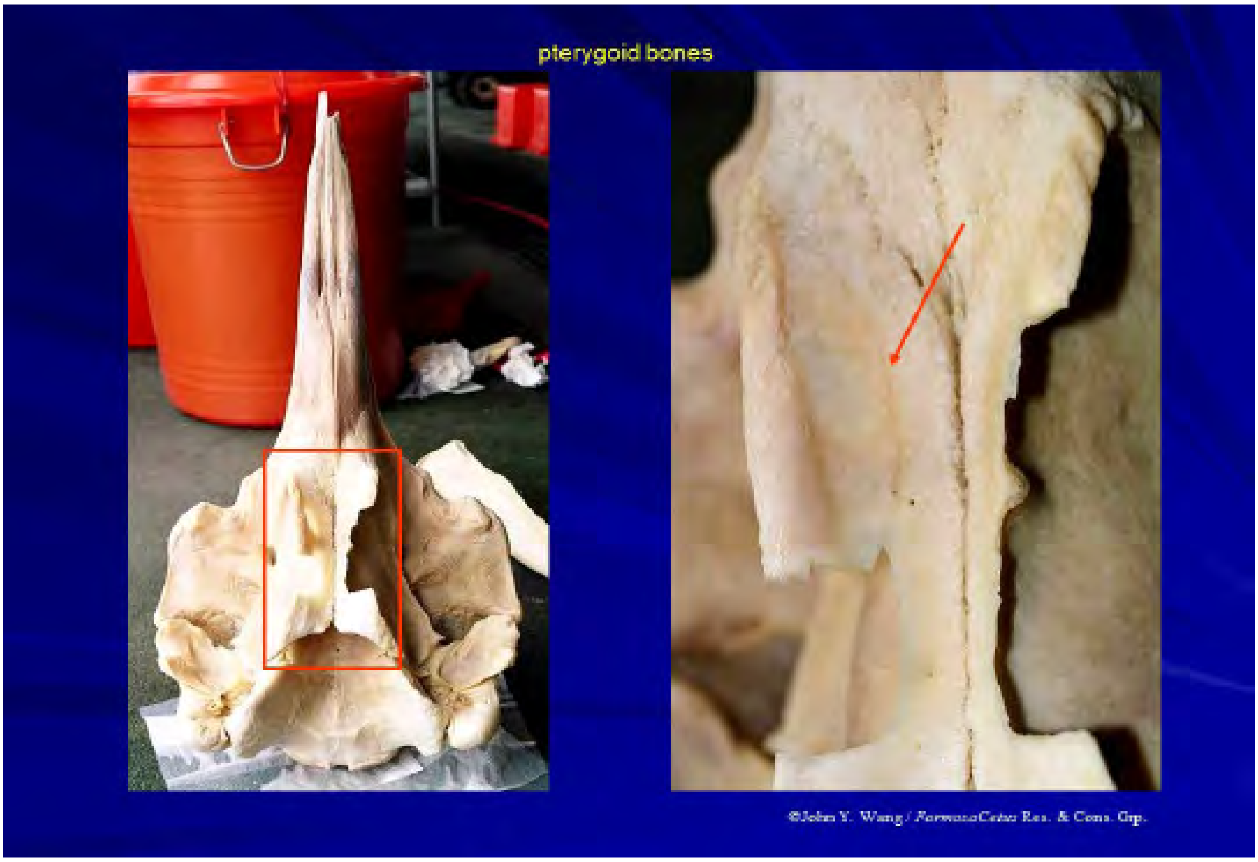

2004
China
Zhejiang
5. Mar.7:
7 s.f. pilot whales
6. Mar.10:
1 s.f. pilot whale
ILAN
Taishi
HUALIEN
Taiwan
4. Mar.1:
1 striped
dolphin
Chengkung
2. Feb.24:
9-10 s.f.
pilot whales
3. Feb.29:
1 ginkgo-
toothed
beaked
whale
Linbian
KUROSHIO
CURRENT
1. Feb. 23:
Balikatan
began
Philippines
Balikatan 2004
km
0 100


M. ginkgodens – only
carcass available
melon
©John Y. Wang / FormosaCetus Res. & Cons. Grp.


nasal septum
©John Y. Wang / FormosaCetus Res. & Cons. Grp.


Tympanic bones
L
R
N. ginkgodens
L
R
S. bredanensis
L
R
G. macrorhynchus
©John Y. Wang / FormosaCetus Res. & Cons. Grp.


cranial vertex
©John Y. Wang / FormosaCetus Res. & Cons. Grp.


pterygoid bones
©John Y. Wang / FormosaCetus Res. & Cons. Grp.

2005

February: ~30 *Feresa*

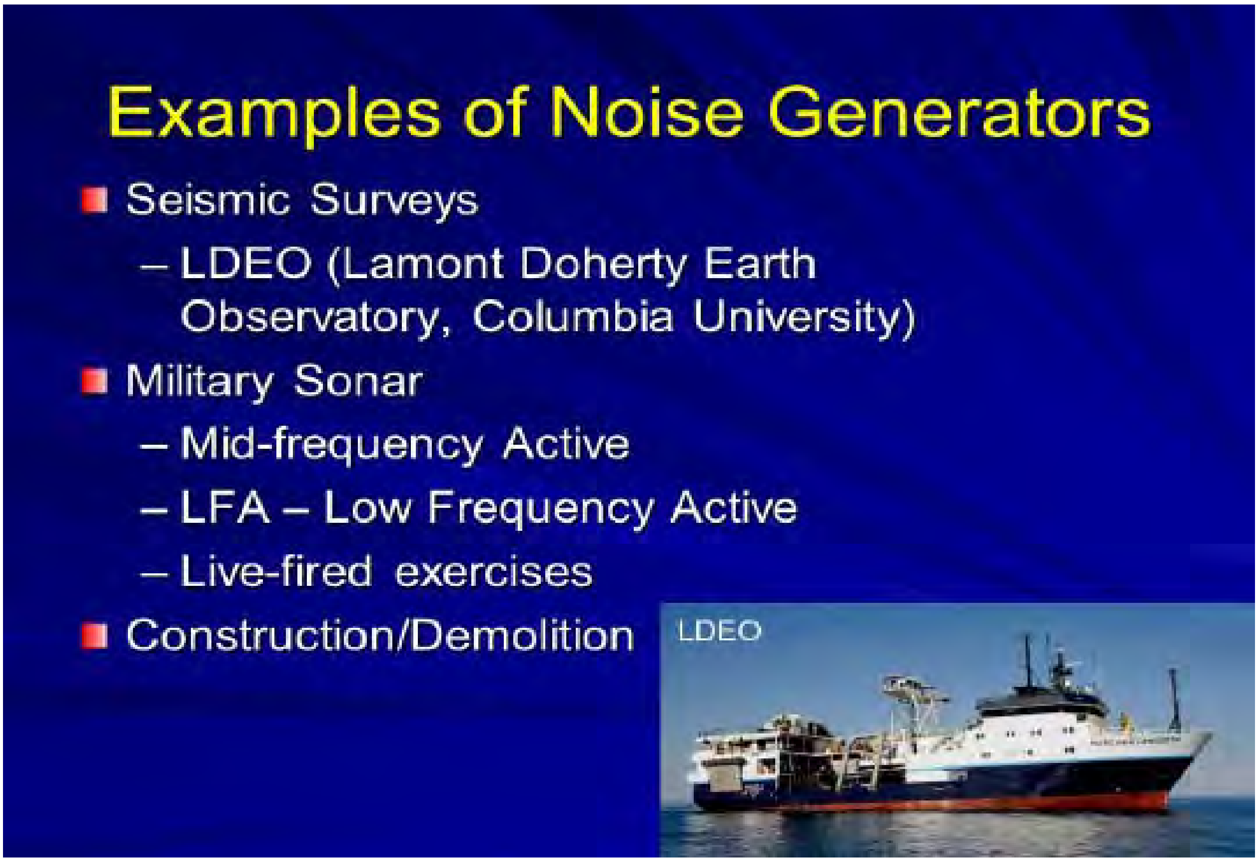
March: 2 *Grampus*

July-Aug. (3 weeks): min. 7 spp. and 25 individuals (*Kogia* spp., *M. densirostris*, *I. pacificus*, *S. coeruleoalba*) – "bubble-like" lesions were reported (Yang et al. 2008)

F. attenuata – only carcass available

Summary and Conclusion

- Unusual and deep water species involved
- 2004 events coincided with large-scale military exercises in nearby waters
- Unusual internal injuries (with no associated, externally-visible injuries)
- Earthquakes, typhoons and seismic research are unlikely factors for most strandings (no patterns found)
- CAUSE OF DEATH? Severe acute internal injuries to the head and thoracic region. The origin of the energy source that caused the injuries can not be determined at this time



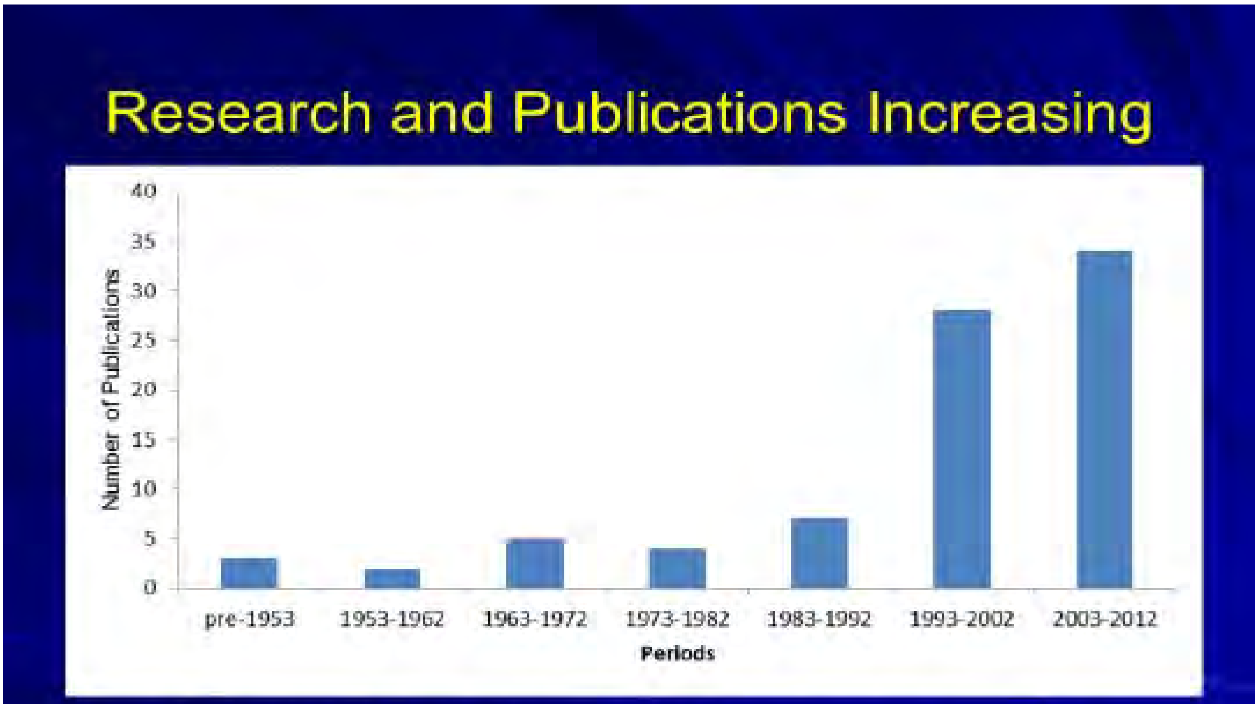
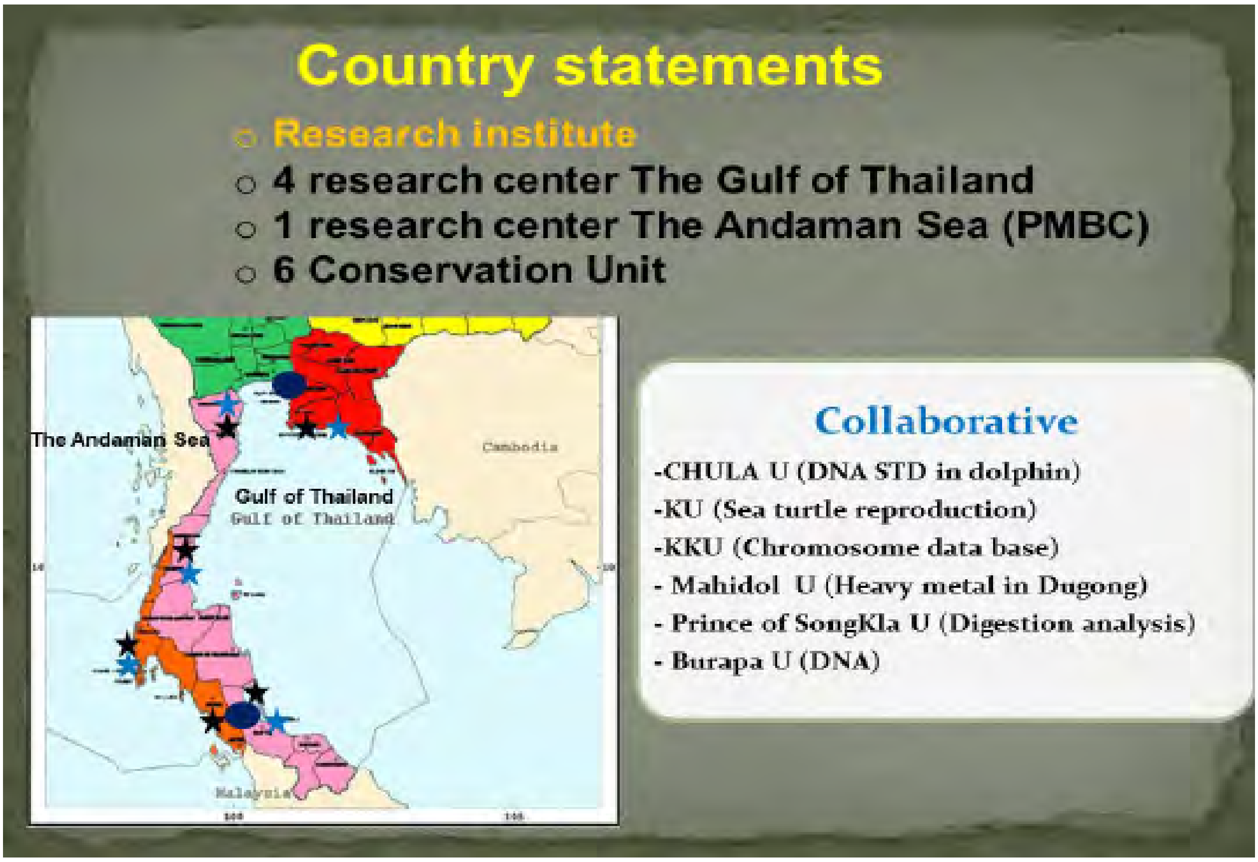


Figure 3. Number of scientific journal publications on marine mammals in Taiwanese waters.

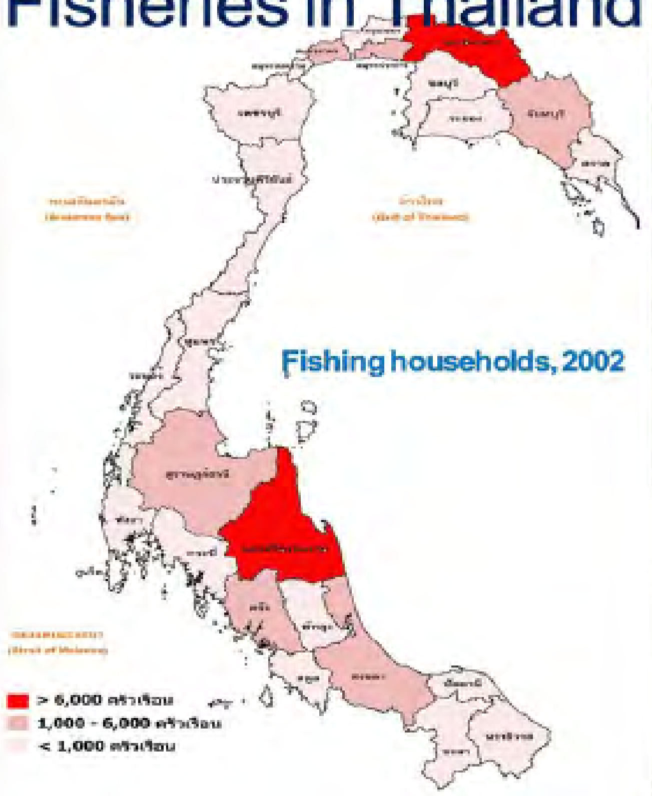

Research Needs
ETS *Sousa*
Long-term monitoring
Other species
Correct species ID (most species getting better but ziphiids, *Tursiops* and *Neophocaena* can be very difficult)
Fisheries catches (direct and incidental)
Fishing effort
Population structure
Abundance
Basic biological parameters for all species

Thailand


COUNTRY STATEMENTS
Marine Mammal in Thailand
Chalatip Junchompoo , M.Sc.(Fisheries)
Surasak Thongsukdee , B.Sc.(Fisheries)
Marine Endangered Species Unit (Research Institute)
Department of marine and coastal resources
Suwat Jutapruat,Ph.D candidate
Prince of Songkla University
Prince of Songkla University


Country statements
Research institute
4 research center The Gulf of Thailand
1 research center The Andaman Sea (PMBC)
6 Conservation Unit
The Andaman Sea
Gulf of Thailand
Gulf of Thailand
Cambodia
Malaysia
Collaborative
-CHULA U (DNA STD in dolphin)
-KU (Sea turtle reproduction)
-KKU (Chromosome data base)
- Mahidol U (Heavy metal in Dugong)
- Prince of SongKla U (Digestion analysis)
- Burapa U (DNA)

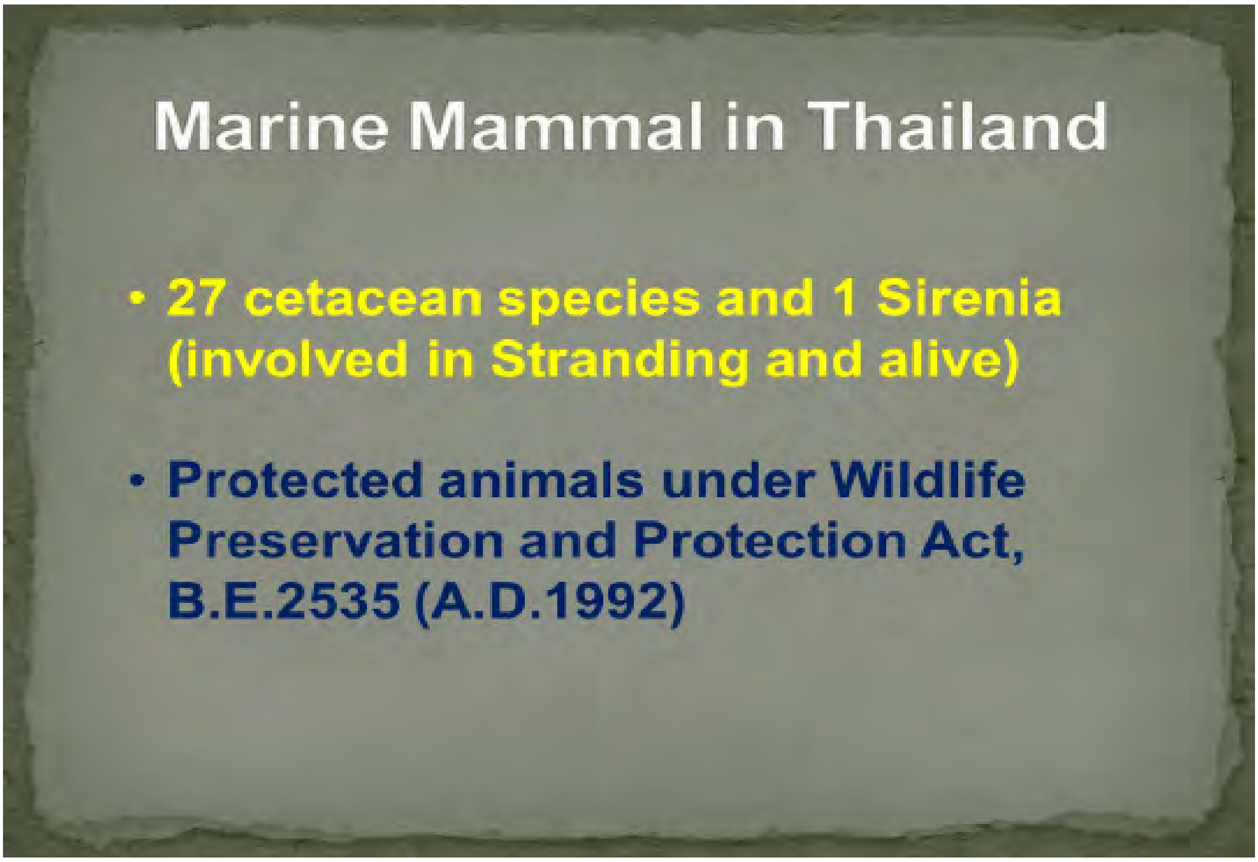
Fisheries in Thailand

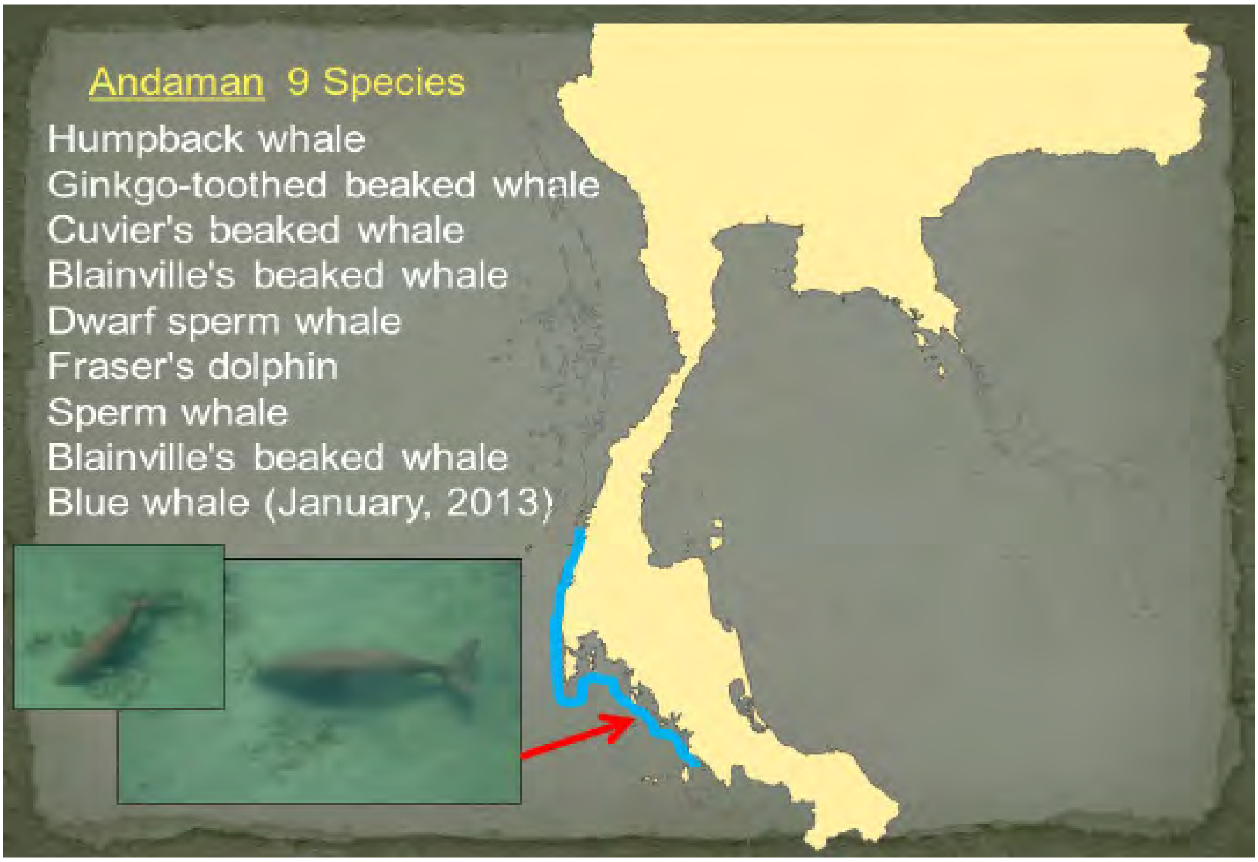


- In year 1980 , Overfishing
- Fisheries product in year 1996-2004
between 2.6 to 2.8 million tons
- Artisanal Fisheries, Commercial Fisheries
- Intensive Culture Technologies

Topics;

- Marine Mammals Status
- Stranding record in Thailand
- Research and data base
- Education activities

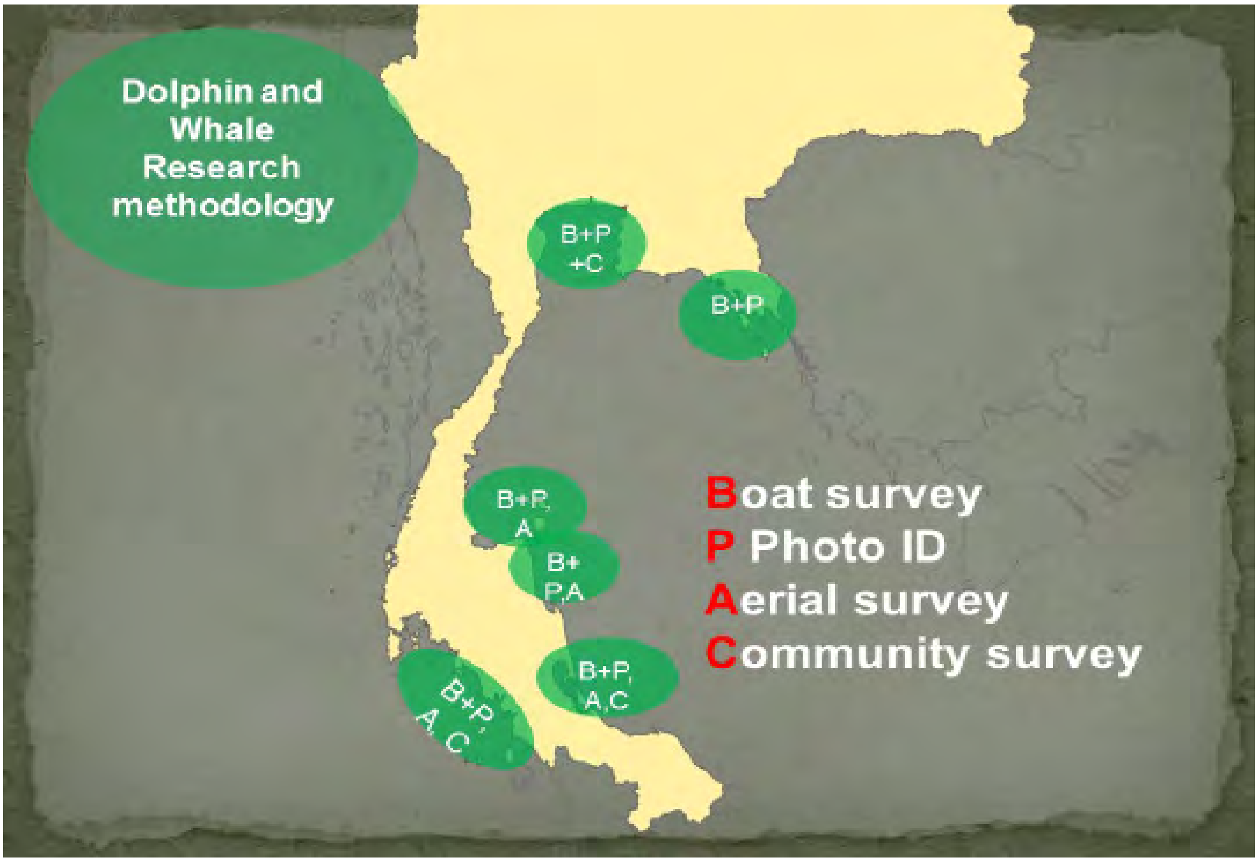

Marine Mammal in Thailand
• 27 cetacean species and 1 Sirenia (involved in Stranding and alive)
• Protected animals under Wildlife Preservation and Protection Act, B.E.2535 (A.D.1992)

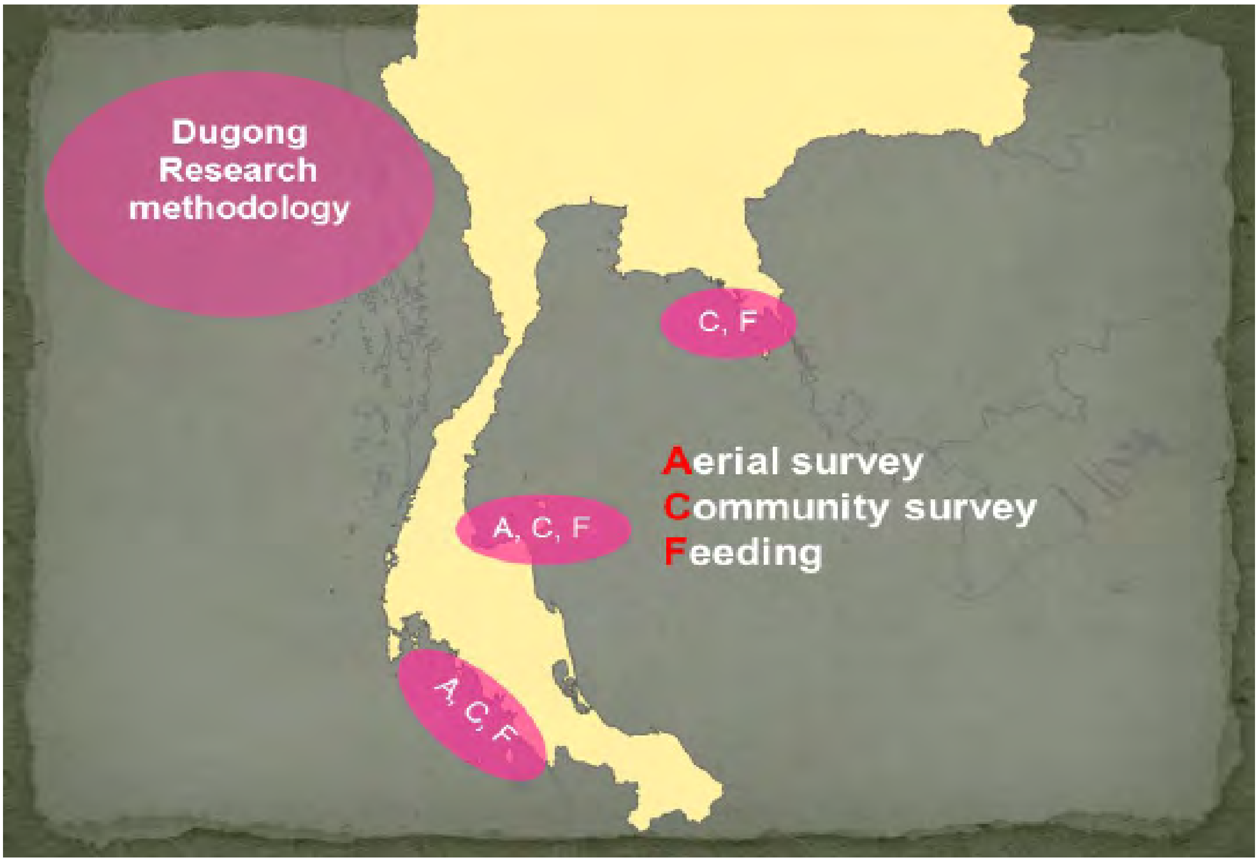

Andaman 9 Species
Humpback whale
Ginkgo-toothed beaked whale
Cuvier's beaked whale
Blainville's beaked whale
Dwarf sperm whale
Fraser's dolphin
Sperm whale
Blainville's beaked whale
Blue whale (January, 2013)


Both seas 17 Species
Bryde's whale
Omura's whale
Killer whale
False killer whale
Short-finned pilot whale
Pygmy killer whale
Pygmy sperm whale
Bottlenose dolphin
Finless porpoise
Hump-backed dolphin
Irrawaddy dolphin
Long-beaked common dolphin
Rough-toothed dolphin
Spinner dolphin
Spotted dolphin
Risso's dolphin


Gulf of Thailand 2 Species
Fin whale
Melon-headed whale

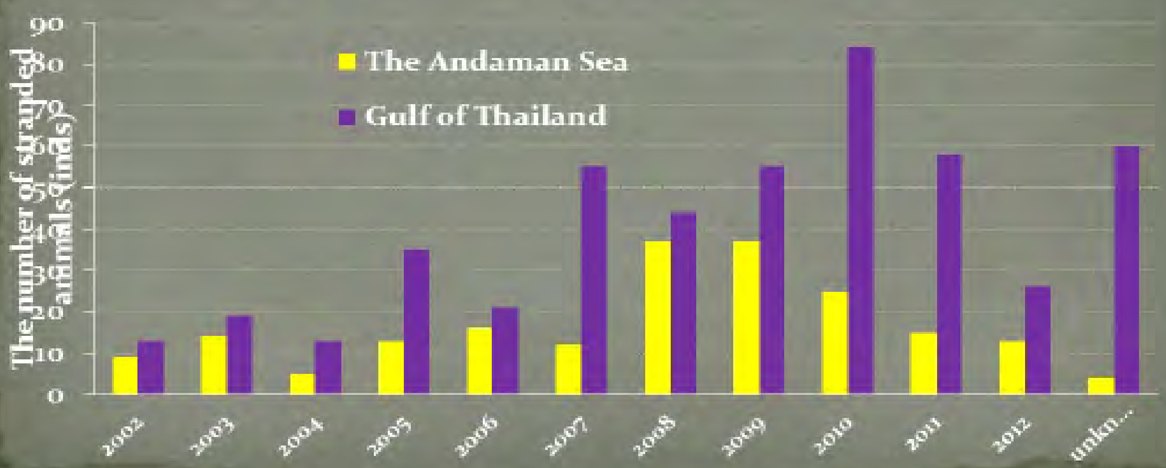
Species/number (inds.)	The Gulf of Thailand				
	The East Coast	The Upper Gulf	The Central	The Lower Gulf	The Andaman Sea
Dugong	20	4-6	-	1-2	200
Irrawaddy dolphin	100-250	100-120	30-50	10-20	20-30
Indo-Pacific Bottlenose dolphin	5-40	-	1-10	-	30-40
Finless porpoises	30-40	30-40	40-50	30-40	40-50
Indo-Pacific Humpback dolphin	30-40	1-10	80-100	5-10	60-80
Bryde's whale	1-2	40-50	5-10	1-5	1-5

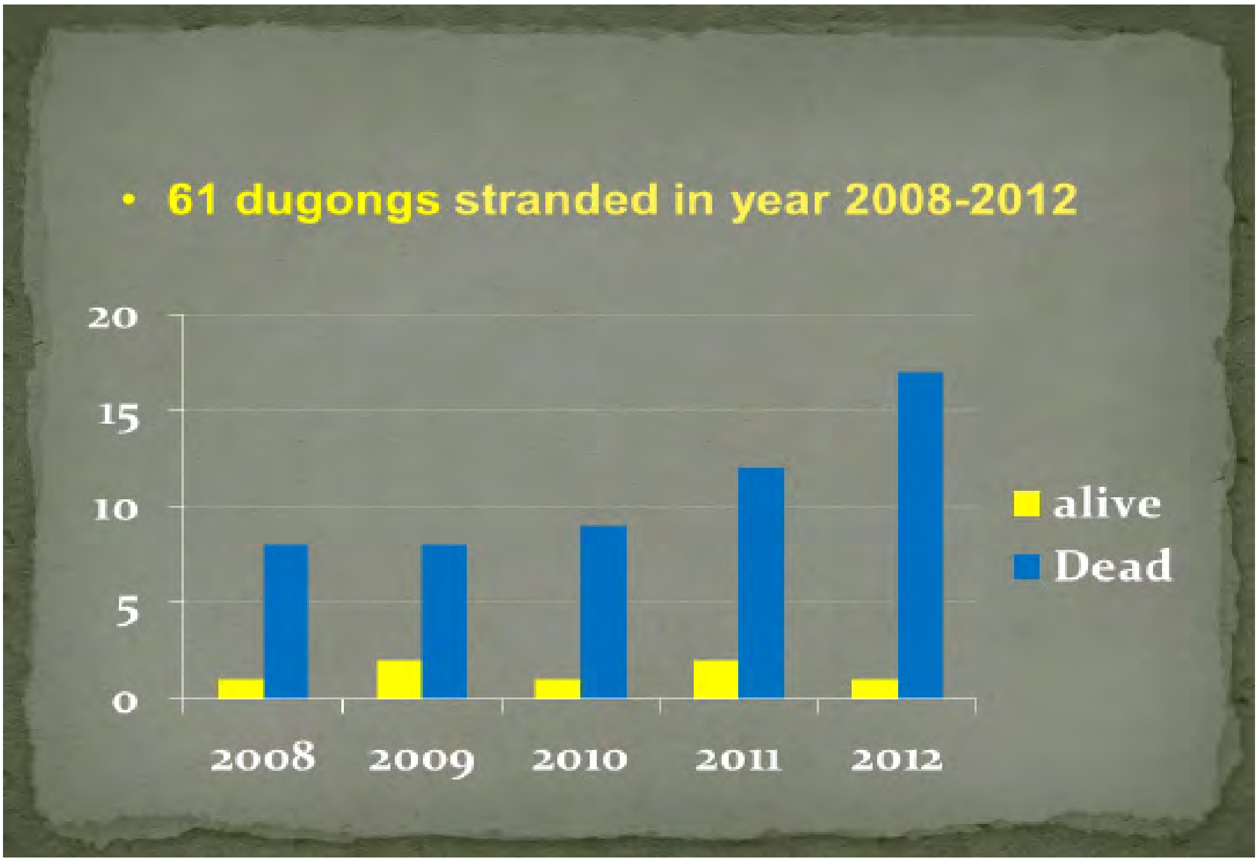




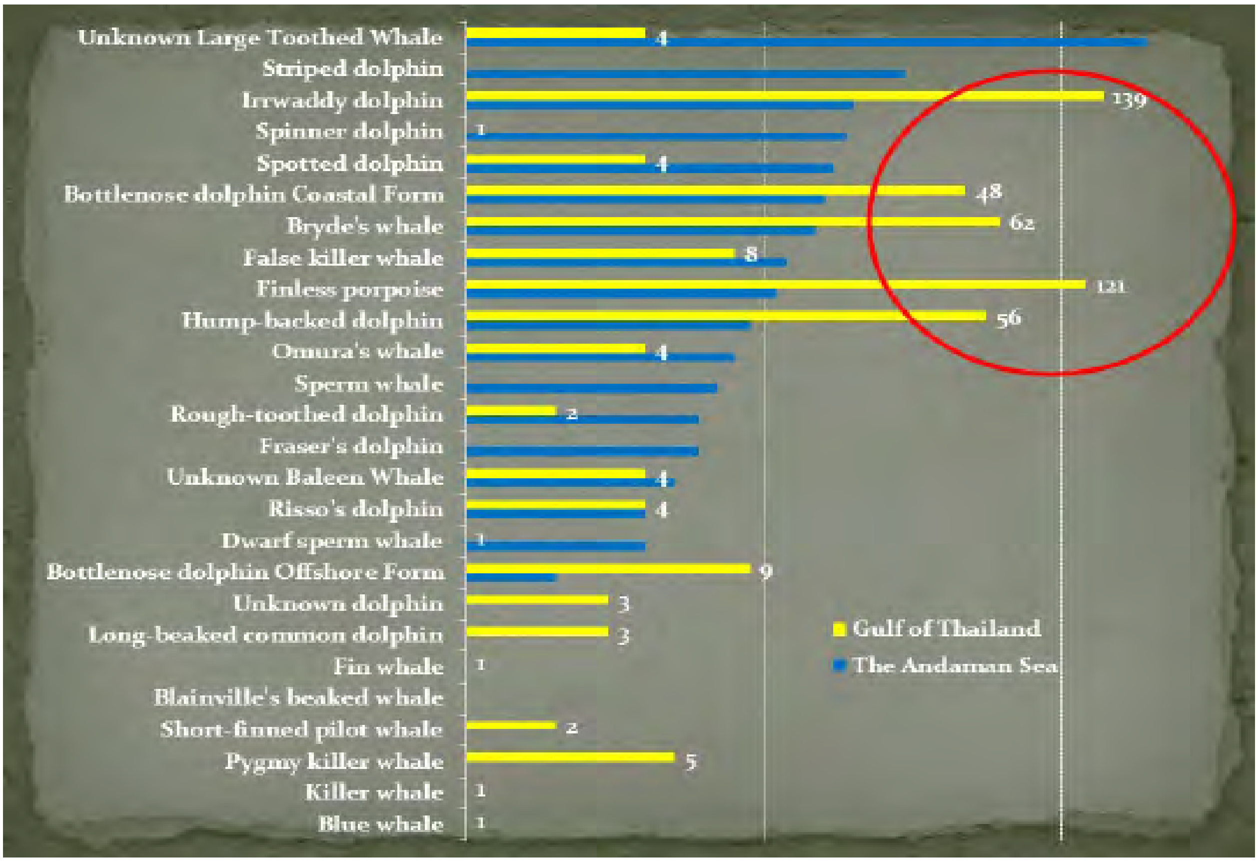
Stranding record in Thailand

- The stranding information, collected during the year 2002-2012, showed that there were 683 dolphins and whales stranded in total.
- The stranding numbers were 483 and 200 animals in the Gulf of Thailand and the Andaman Sea, respectively

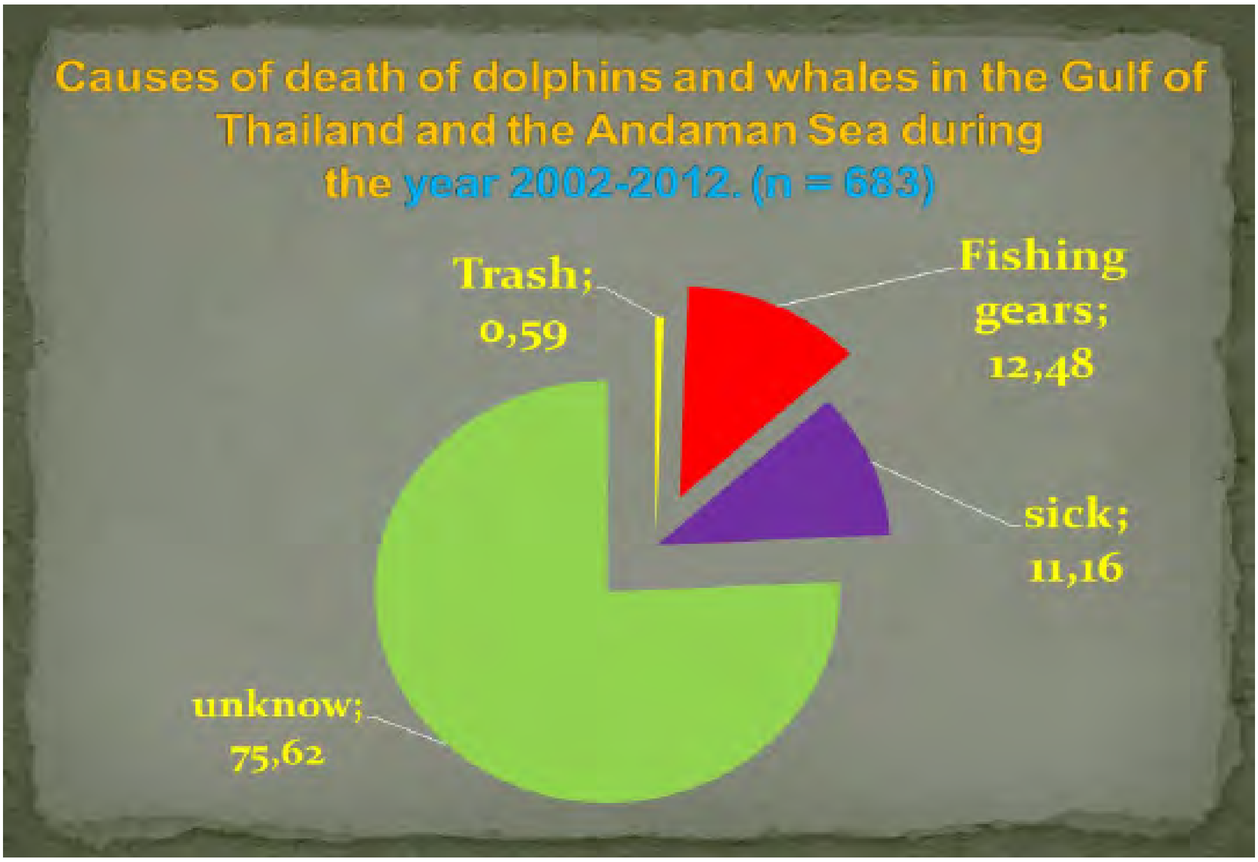


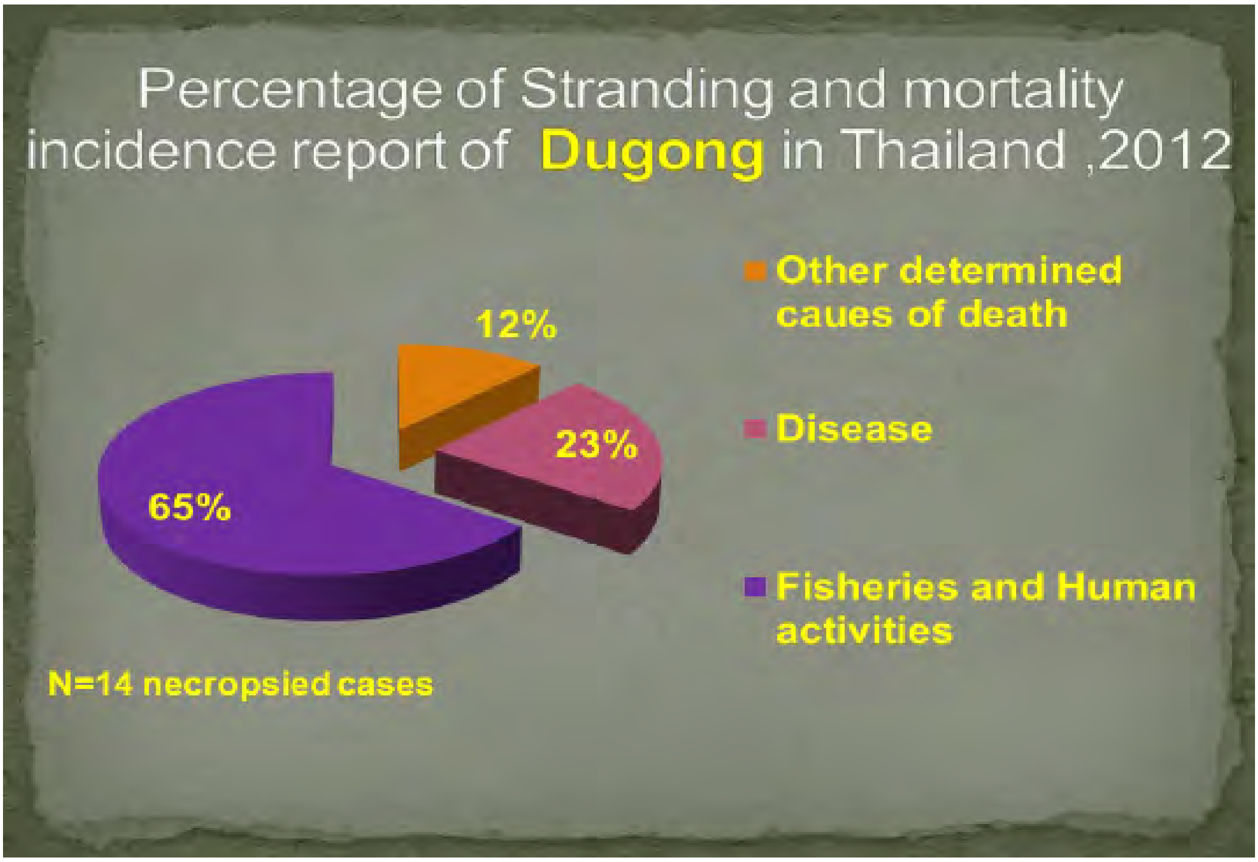


• 61 dugongs stranded in year 2008-2012
20
15
10
5
0
2008
2009
2010
2011
2012
alive
Dead



Unknown Large Toothed Whale
Striped dolphin
Irrwaddy dolphin
Spinner dolphin
Spotted dolphin
Bottlenose dolphin Coastal Form
Bryde's whale
False killer whale
Finless porpoise
Hump-backed dolphin
Omura's whale
Sperm whale
Rough-toothed dolphin
Fraser's dolphin
Unknown Baleen Whale
Risso's dolphin
Dwarf sperm whale
Bottlenose dolphin Offshore Form
Unknown dolphin
Long-beaked common dolphin
Fin whale
Blainville's beaked whale
Short-finned pilot whale
Pygmy killer whale
Killer whale
Blue whale
4
139
1
4
48
62
8
121
56
4
2
4
4
1
9
3
3
1
2
5
1
1
Gulf of Thailand
The Andaman Sea


Causes of death of dolphins and whales in the Gulf of Thailand and the Andaman Sea during the year 2002-2012. (n = 683)
Trash; 0,59
Fishing gears; 12,48
sick; 11,16
unknow; 75,62


Percentage of Stranding and mortality incidence report of Dugong in Thailand ,2012
12%
23%
65%
Other determined caues of death
Disease
Fisheries and Human activities
N=14 necropsied cases


Stranded by fishing gears.
Gill nets


Rare cases:
entangle by crab trap
shark attack


Cause from fisheries.
A 4 m. Bryde's whale calf found dead at Trang on November ,2010 . The head was entangled in fishing net that the calf couldn't eat and eventually died.


Boat strike
2.67 m. female dugong On November 6,2012 At Phuket.


Cause from infection
Parasitic infection

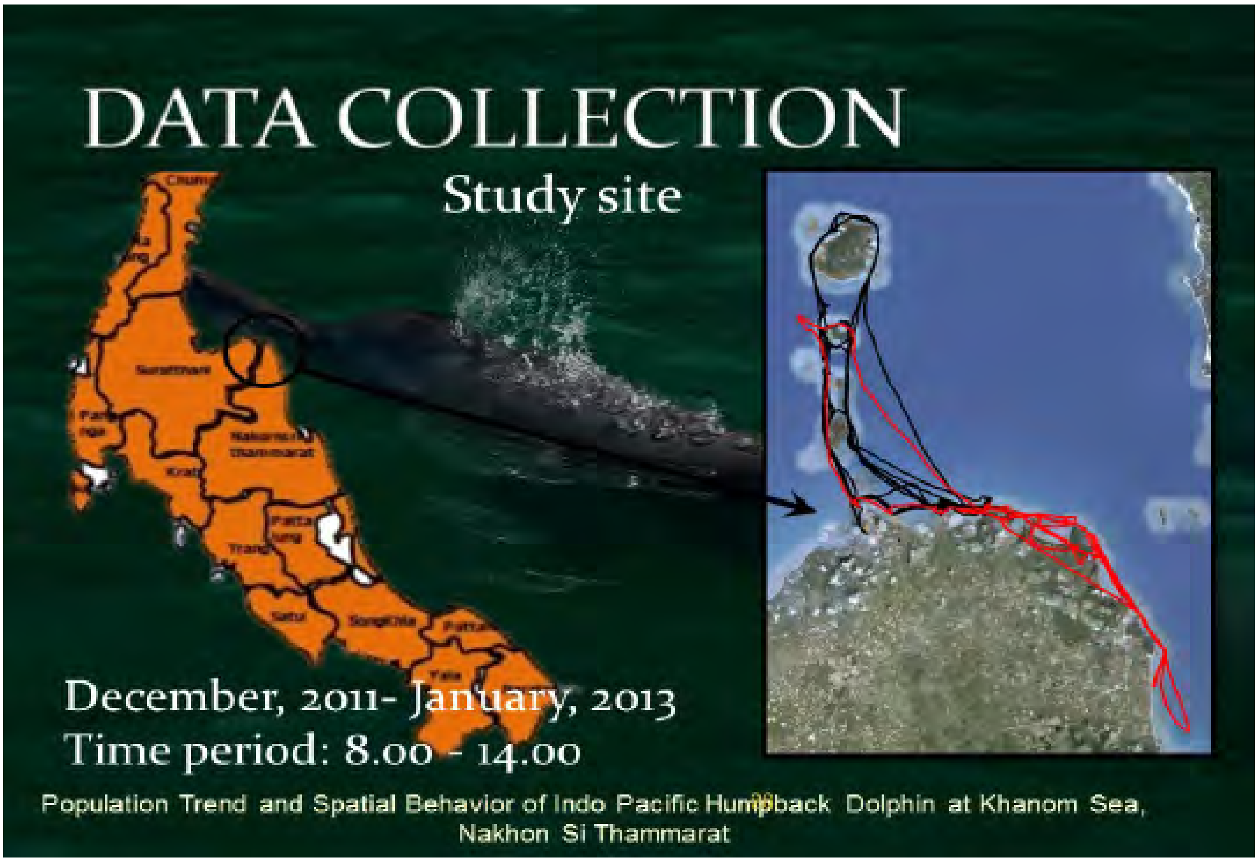

30


Stranding in The gulf of Thailand
False killer whale
February,2011
The gulf of Thailand

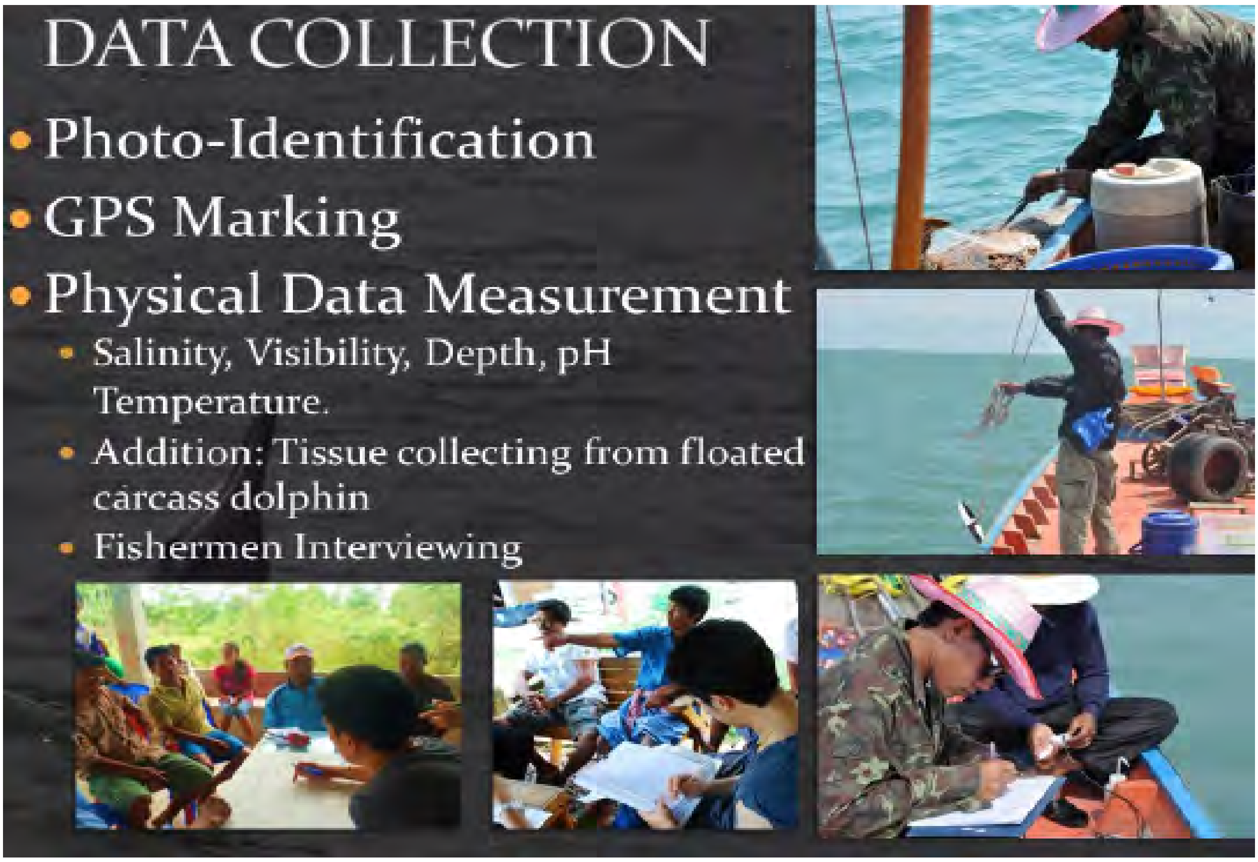

Marine garbage among 1.6 kg was found in stomach.

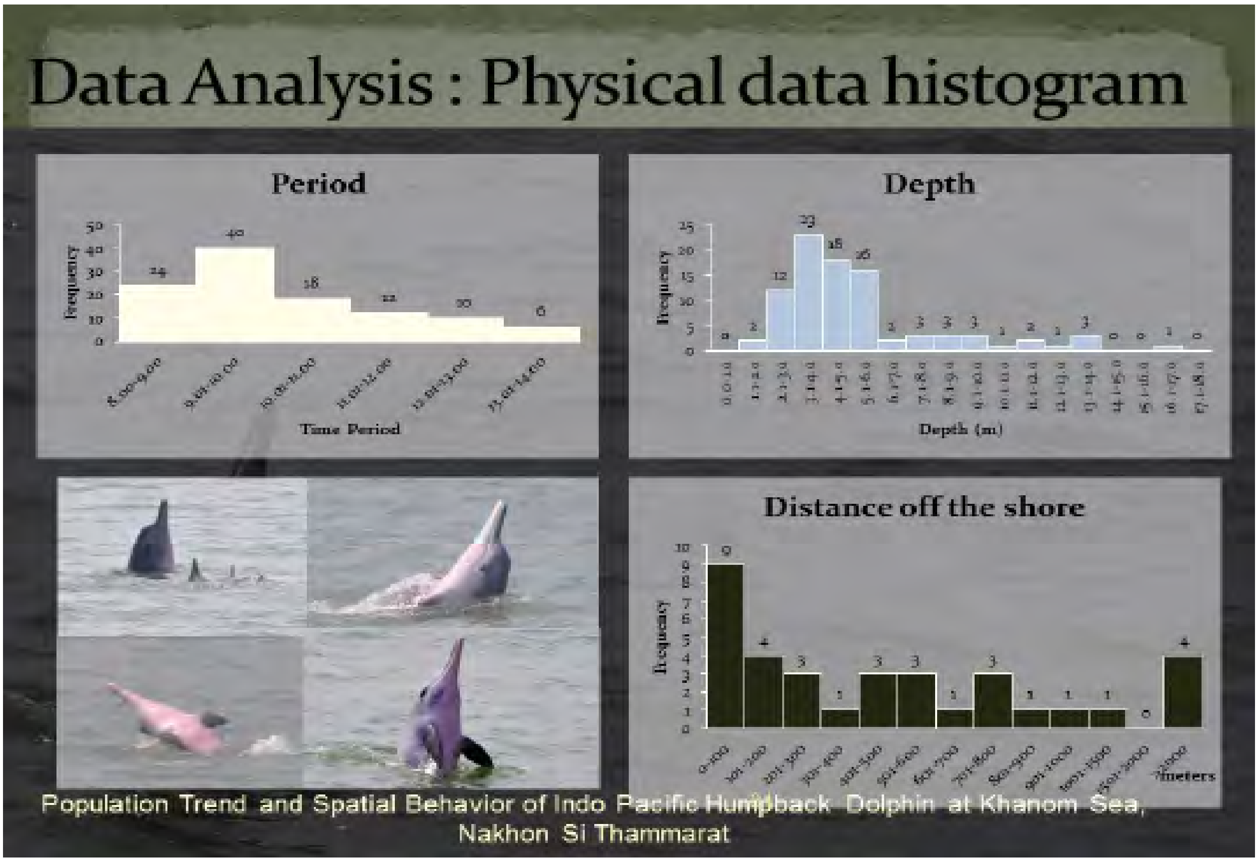

Thank you for your attention

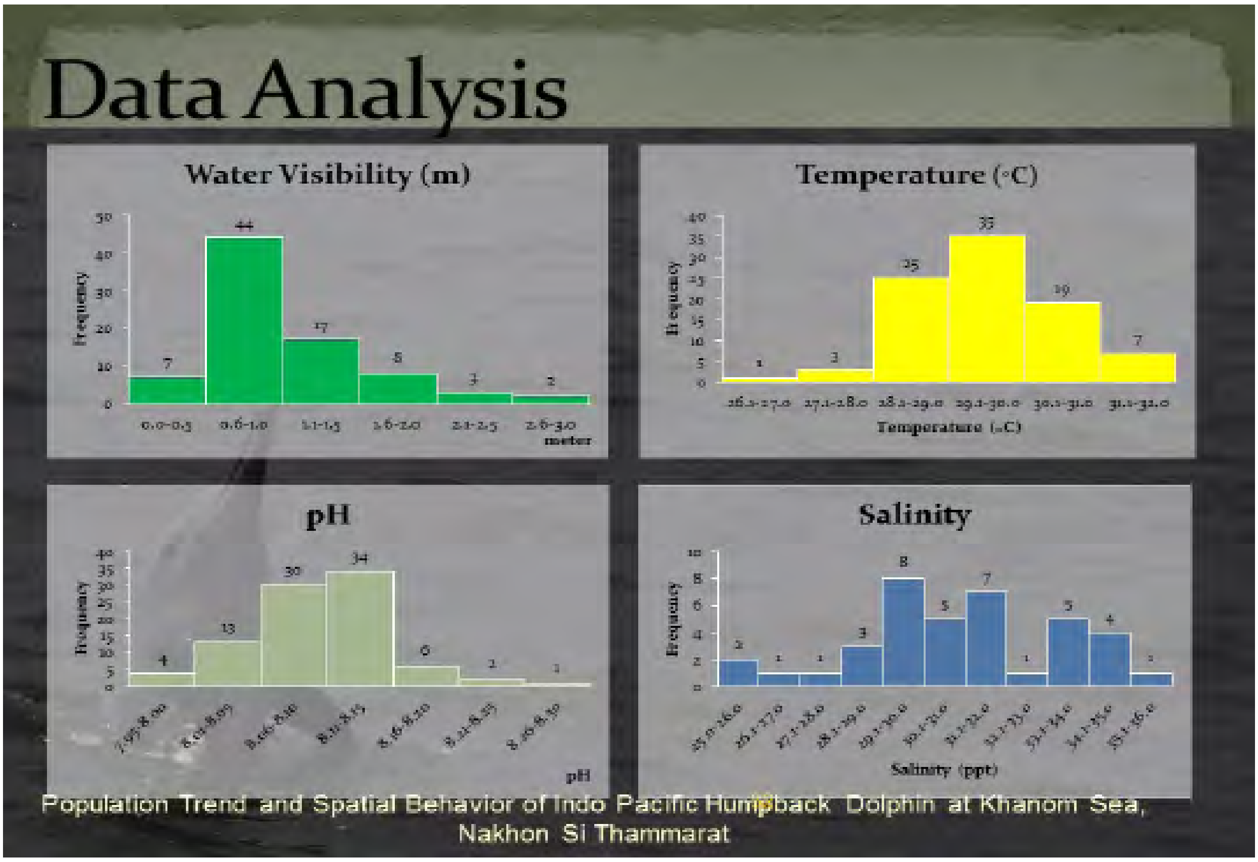

Mammal Marine Threats and
Conservation in Thailand
Case study : Lower Gulf of Thailand
Mr. Suwat Jutapruet
Thailand

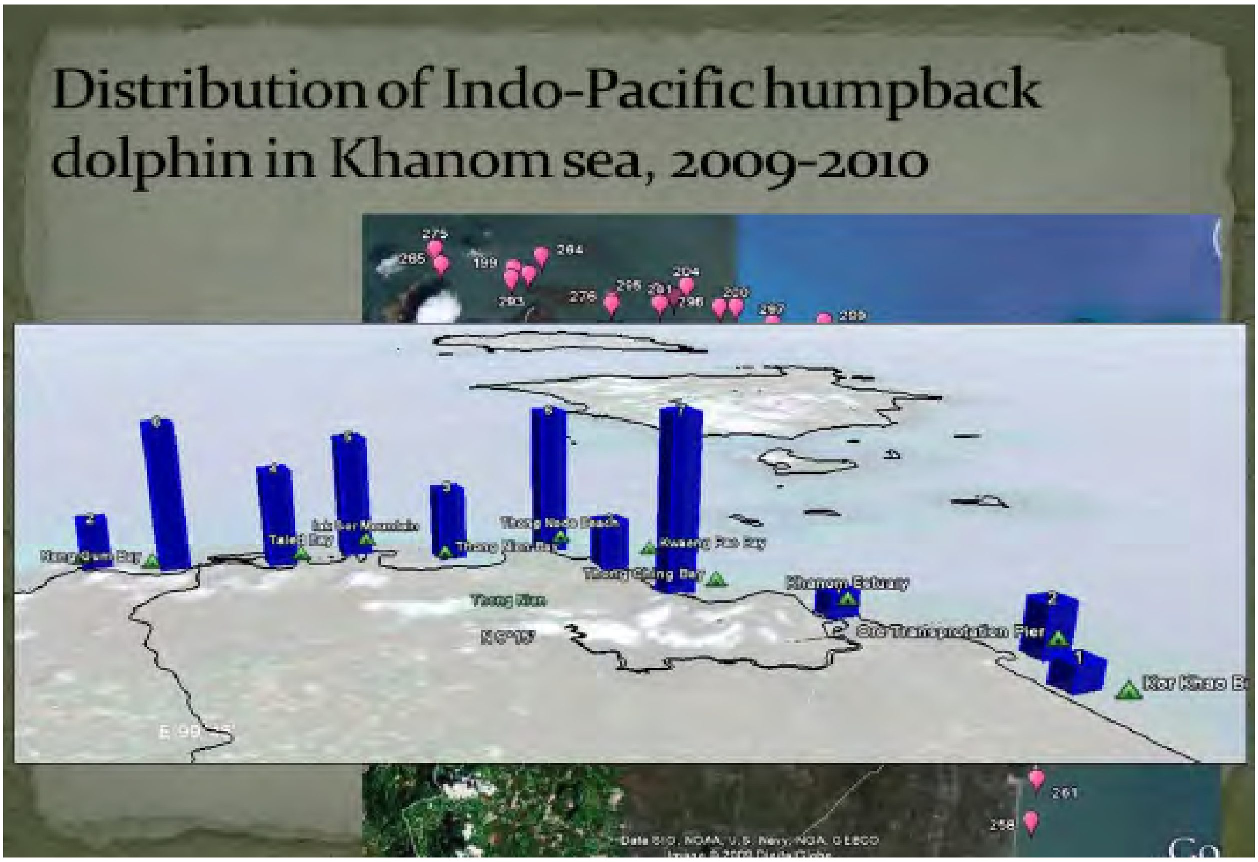

DATA COLLECTION
Study site
December, 2011- January, 2013
Time period: 8.00 - 14.00
Population Trend and Spatial Behavior of Indo Pacific Humpback Dolphin at Khanom Sea,
Nakhon Si Thammarat

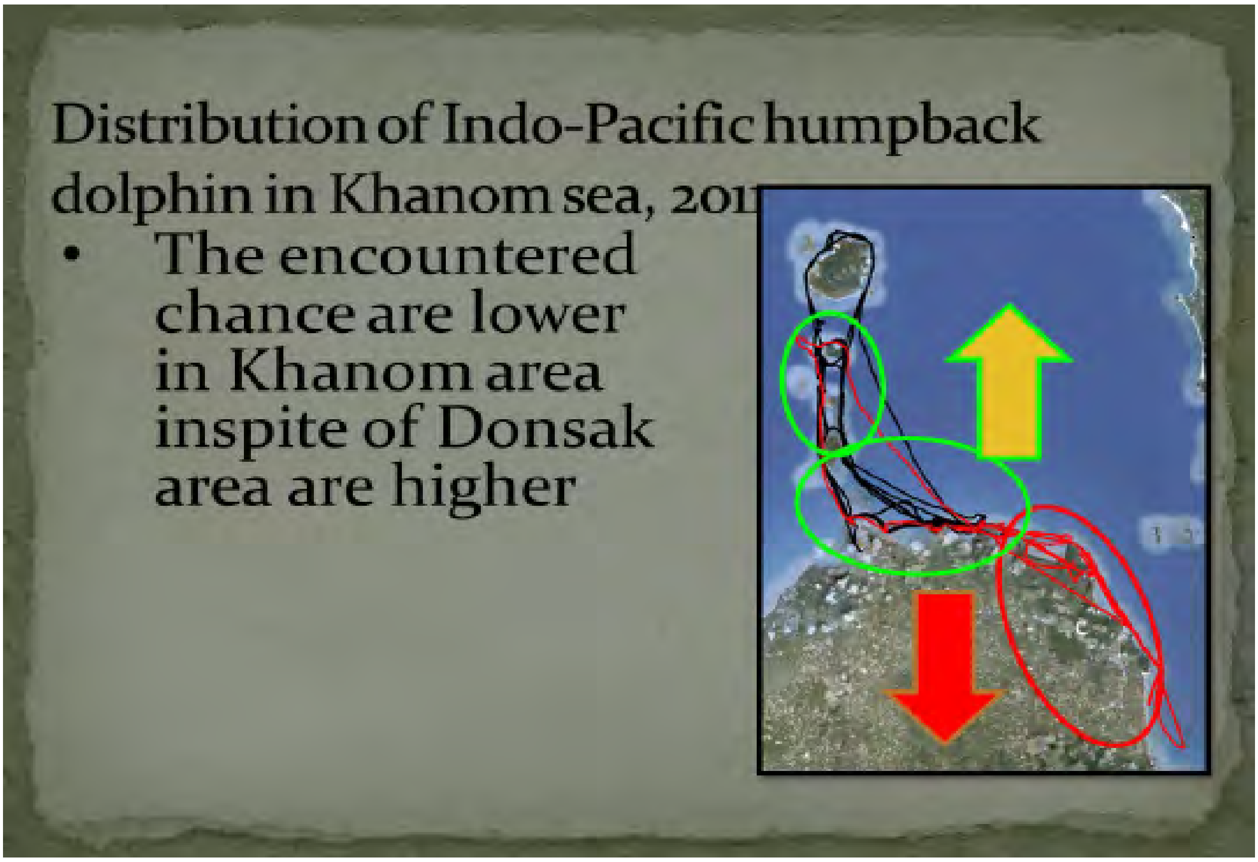

IPHD in Khanom, Nakorn Si Thammarat

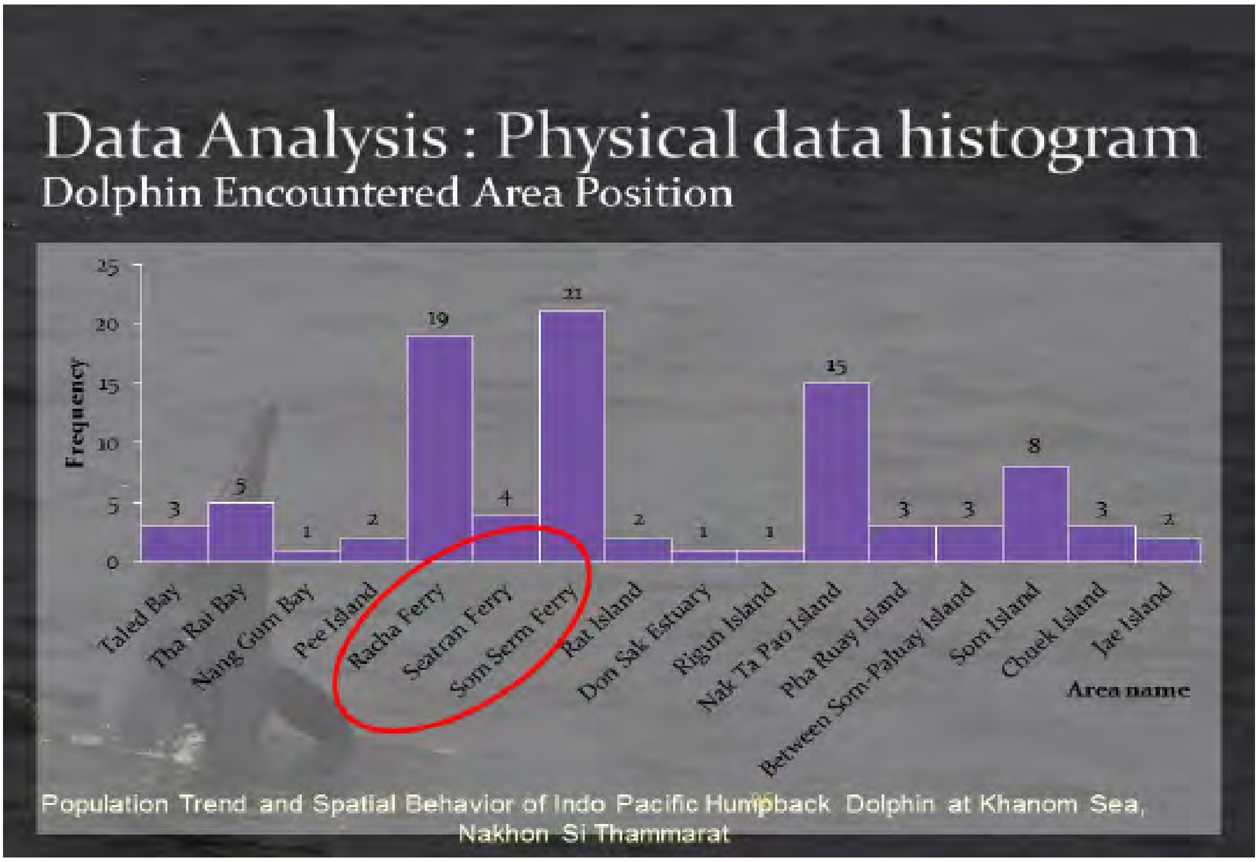

DATA COLLECTION
• Photo-Identification
• GPS Marking
• Physical Data Measurement
• Salinity, Visibility, Depth, pH Temperature.
• Addition: Tissue collecting from floated carcass dolphin
• Fishermen Interviewing


Data Analysis : Physical data histogram
Period
Frequency
Time Period
Depth
Depth (m)
Distance off the shore
meters
Population Trend and Spatial Behavior of Indo Pacific Humpback Dolphin at Khanom Sea, Nakhon Si Thammarat


Data Analysis
Water Visibility (m)
meter
Temperature (◦C)
Temperature (◦C)
pH
Salinity
Salinity (ppt)
Population Trend and Spatial Behavior of Indo Pacific Humpback Dolphin at Khanom Sea, Nakhon Si Thammarat

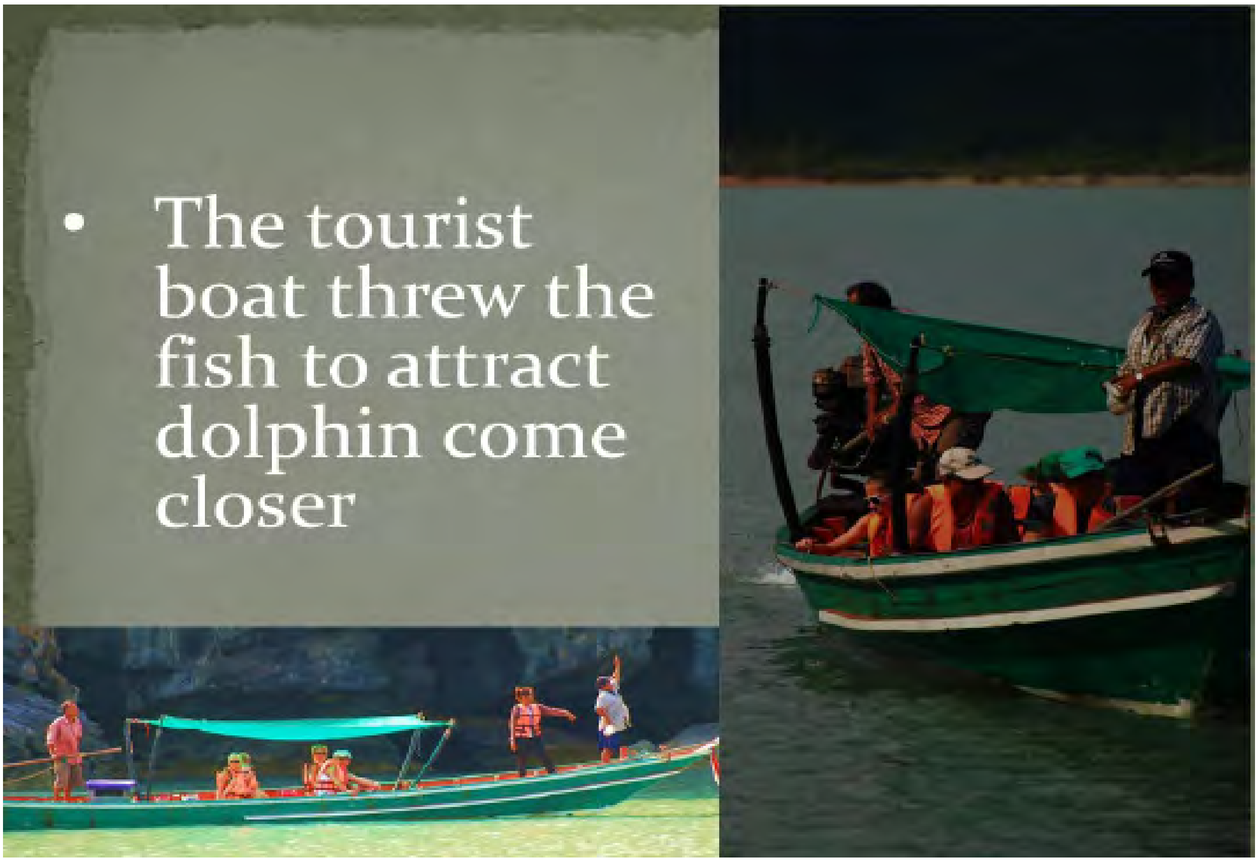

Distribution of Indo-Pacific humpback dolphin in Khanom sea, 2009-2010
Khanom Estuary
Data SIO, NOAA, U.S. Navy, NGA, GEBCO


Distribution of Indo-Pacific humpback dolphin in Khanom sea, 201
• The encountered chance are lower in Khanom area inspite of Donsak area are higher


Data Analysis : Physical data histogram
Dolphin Encountered Area Position
Frequency
25
20
15
10
5
0
3
5
1
2
19
4
21
2
1
1
15
3
3
8
3
2
Taled Bay
Tha Rai Bay
Nang Gum Bay
Pee Island
Racha Ferry
Seatran Ferry
Som Serm Ferry
Rat Island
Don Sak Estuary
Rigun Island
Nak Ta Pao Island
Pha Ruay Island
Between Som-Paluay Island
Som Island
Chuek Island
Jae Island
Area name
Population Trend and Spatial Behavior of Indo Pacific Humpback Dolphin at Khanom Sea,
Nakhon Si Thammarat

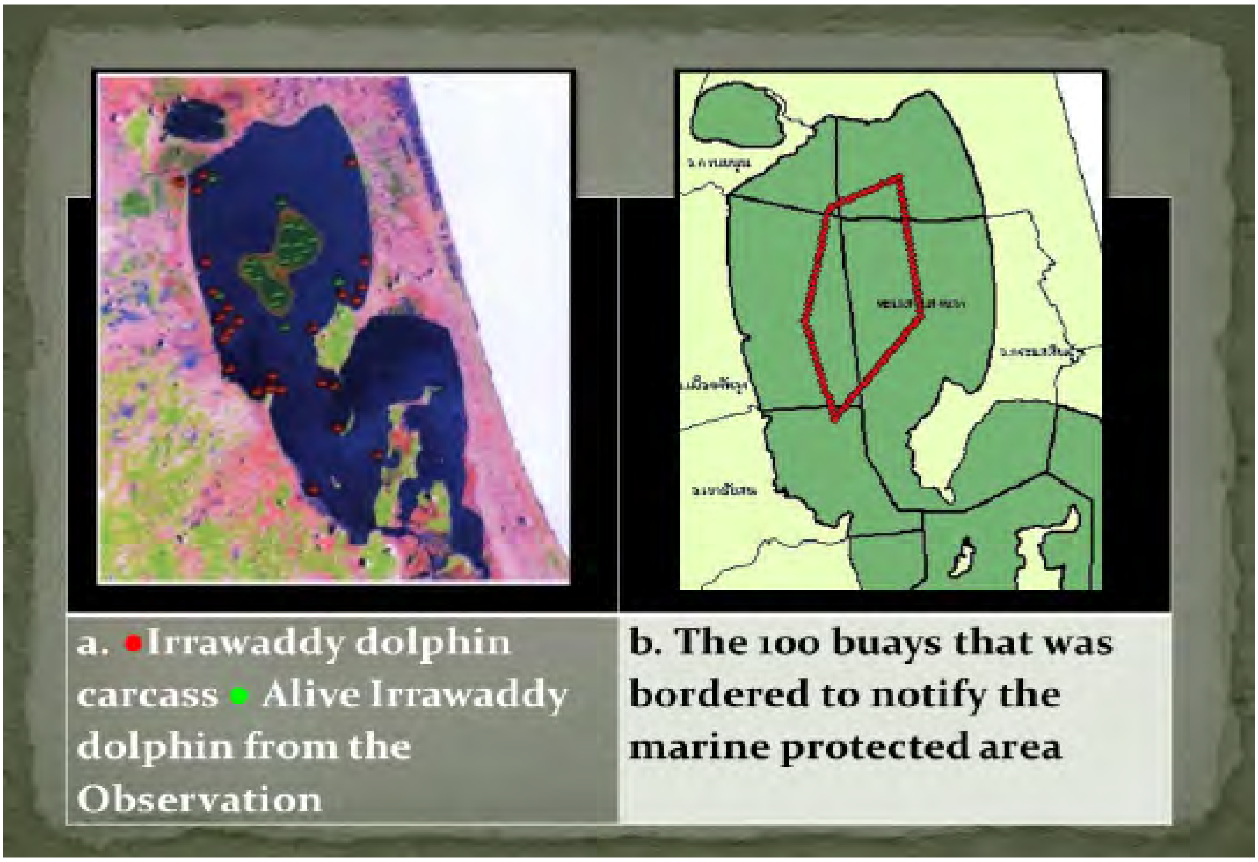

Population Trend and Spatial Behavior of Indo Pacific Hu
Nakhon Si Thammarat

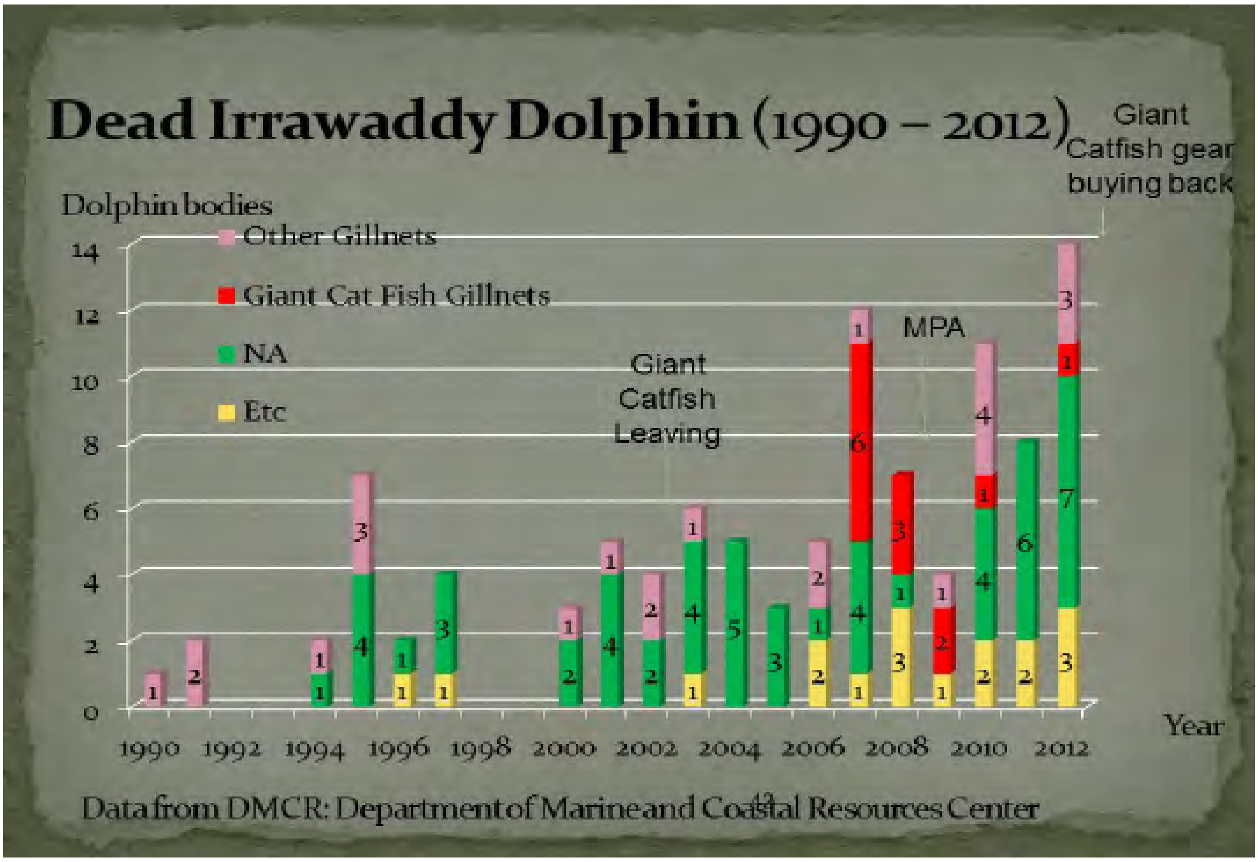

Habitat use near coast area.

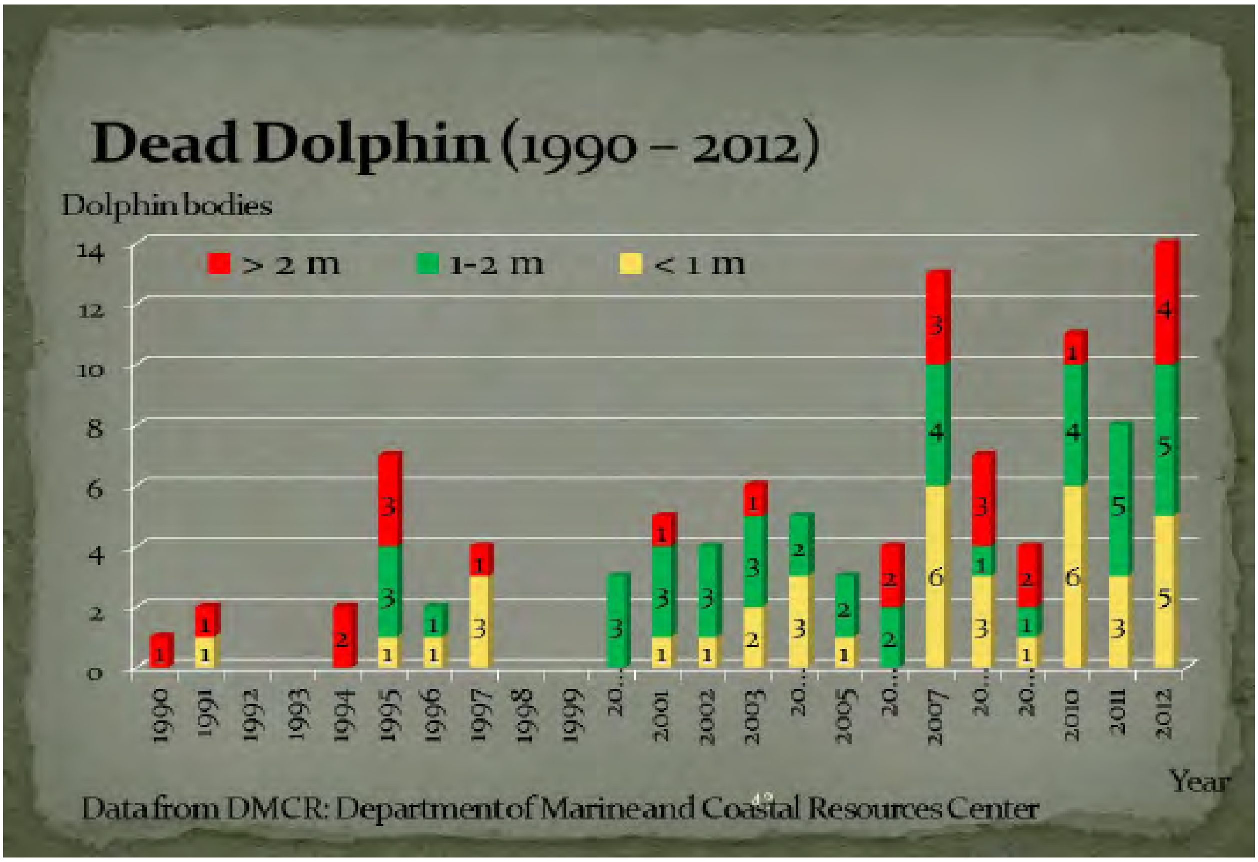

• The tourist boat threw the fish to attract dolphin come closer


Irrawaddy dolphin in Songkhla lake status
Irrawaddy dolphin in fresh water
39


Irrawaddy dolphin in songkhla lake situation
1 Bycatch by gillnets.
2 Habitats loss
4 Shallow water
5 Pollutions
3 Coastal activities


a. Irrawaddy dolphin carcass Alive Irrawaddy dolphin from the Observation
b. The 100 buays that was bordered to notify the marine protected area


Dead Irrawaddy Dolphin (1990 – 2012)
Giant Catfish gear buying back
Dolphin bodies
Other Gillnets
Giant Cat Fish Gillnets
NA
Etc
Giant Catfish Leaving
MPA
Year
0
2
4
6
8
10
12
14
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
Data from DMCR: Department of Marine and Coastal Resources Center



Dead Dolphin (1990 – 2012)
Dolphin bodies
> 2 m
1-2 m
< 1 m
Year
Data from DMCR: Department of Marine and Coastal Resources Center

Giant Cat Fish Gillnet
15 cm
15 cm
15.27 cm
Irrawaddy dolphin
Giant Catfish
Striped catfish

RESULTS

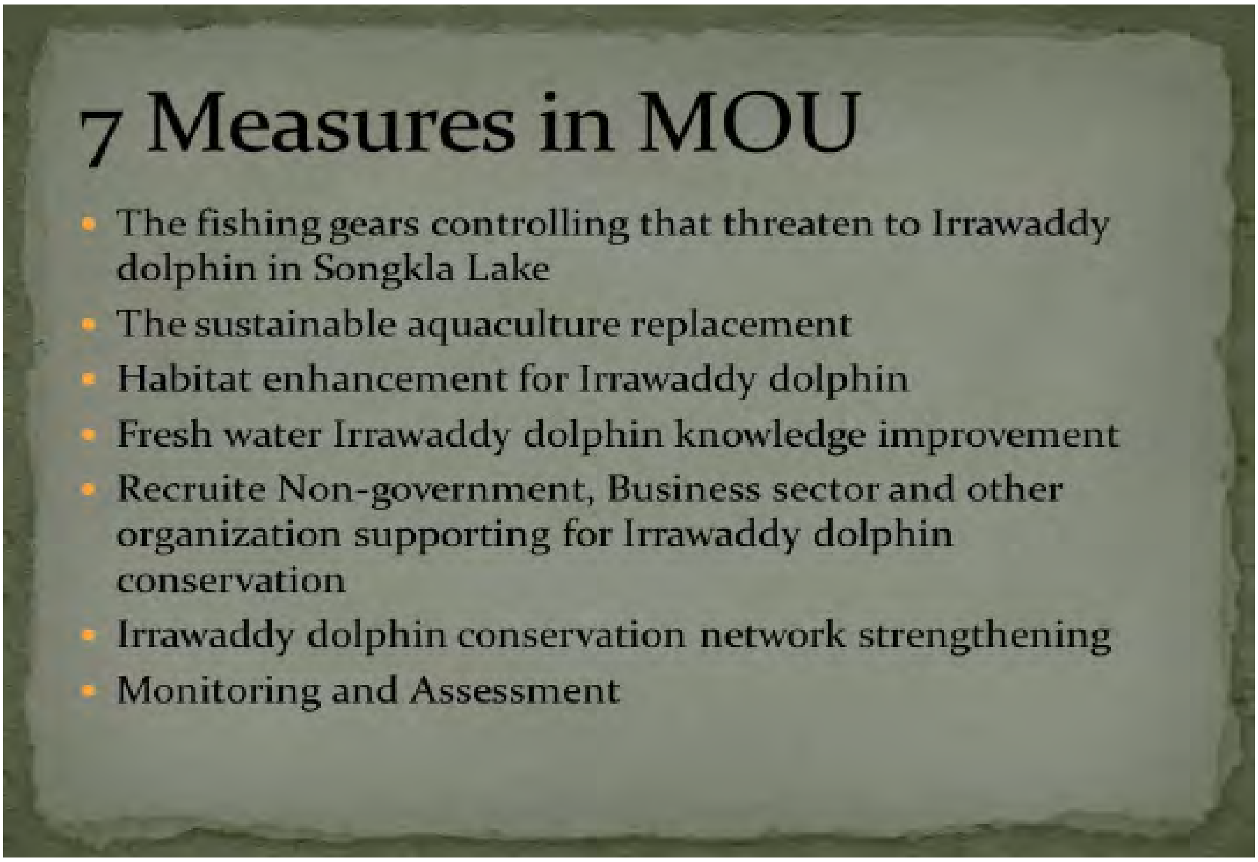
- 55 years deeply relationship between Irrawaddy dolphin and coastal community is positive
- The motivation of changing in negative way is Giant Cat Fish and inbreeding is an indirect effect that are not related to the fishermen, etc.
- The important factors that response to the community acceptance are joining the researcher or governors to observe Irrawaddy dolphin, A Pair of Mother and calve dolphin, meeting, the basic knowledge of marine mammal, Alive dolphin encounter and fishery

RESULTS

- Many factors show the relation of alive dolphin are more important than the carcass and stranded dolphin to motivate the perception and awareness to conserve dolphin
- The stakeholder who related to the dolphin conservation should present the surviving dolphin to the public such as video, poster, multimedia, facebook, etc
- Don't find the defendant for stranded dolphin and support the conducting of all factors above that will help the overall image of the Coastal Community in response to Irrawaddy dolphin conservation

MOU FOR IRRAWADDY DOLPHIN

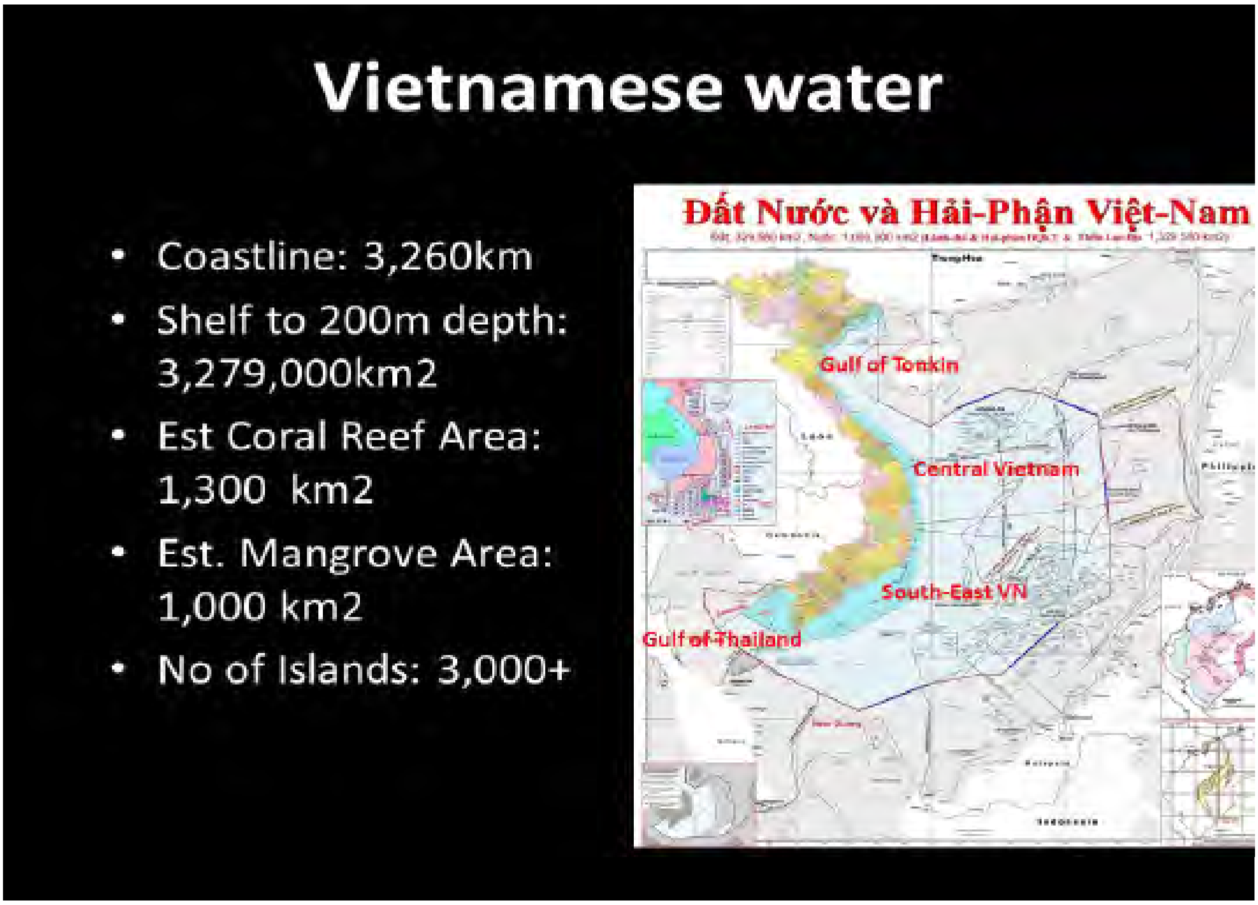
SONGKLA LAKE

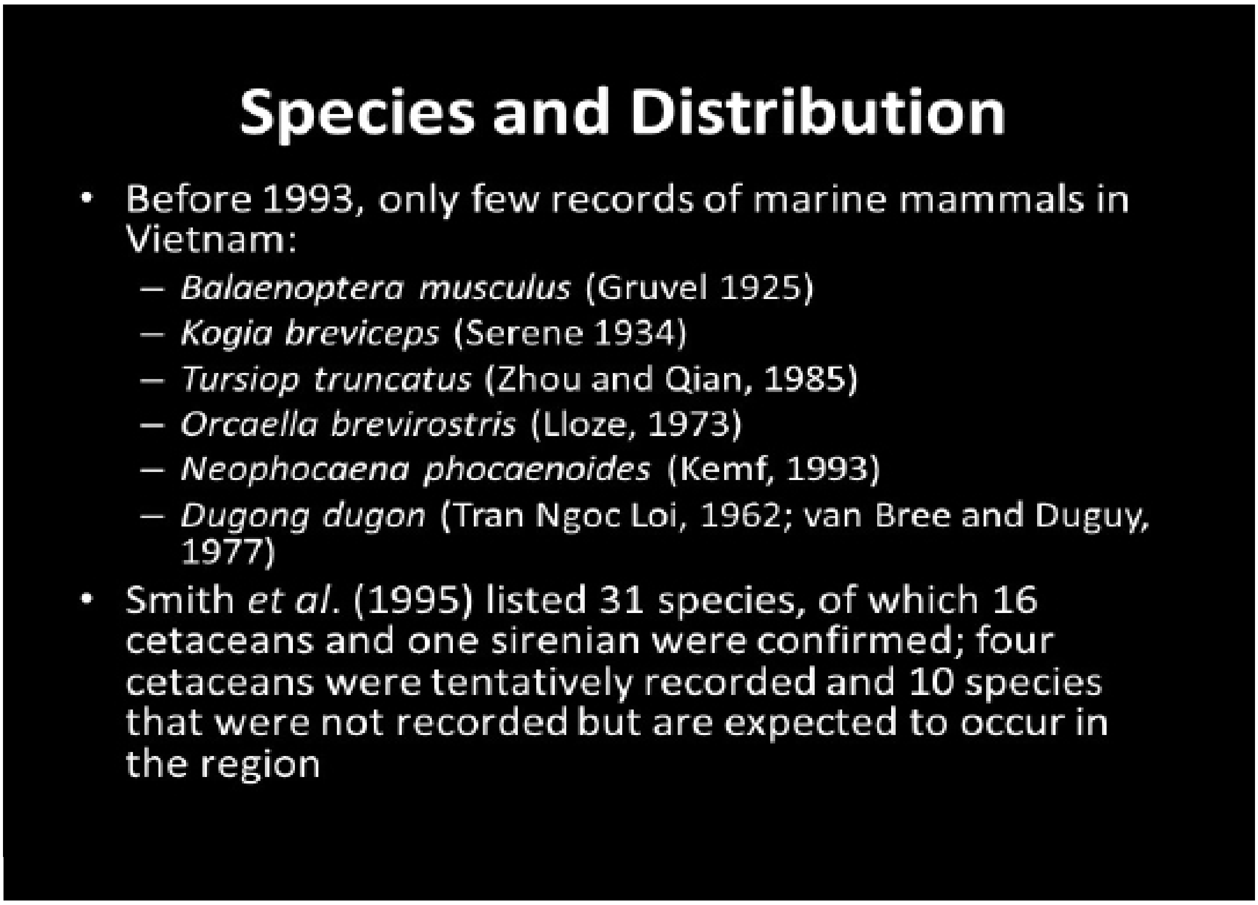

7 Measures in MOU
The fishing gears controlling that threaten to Irrawaddy dolphin in Songkla Lake
The sustainable aquaculture replacement
Habitat enhancement for Irrawaddy dolphin
Fresh water Irrawaddy dolphin knowledge improvement
Recruite Non-government, Business sector and other organization supporting for Irrawaddy dolphin conservation
Irrawaddy dolphin conservation network strengthening
Monitoring and Assessment

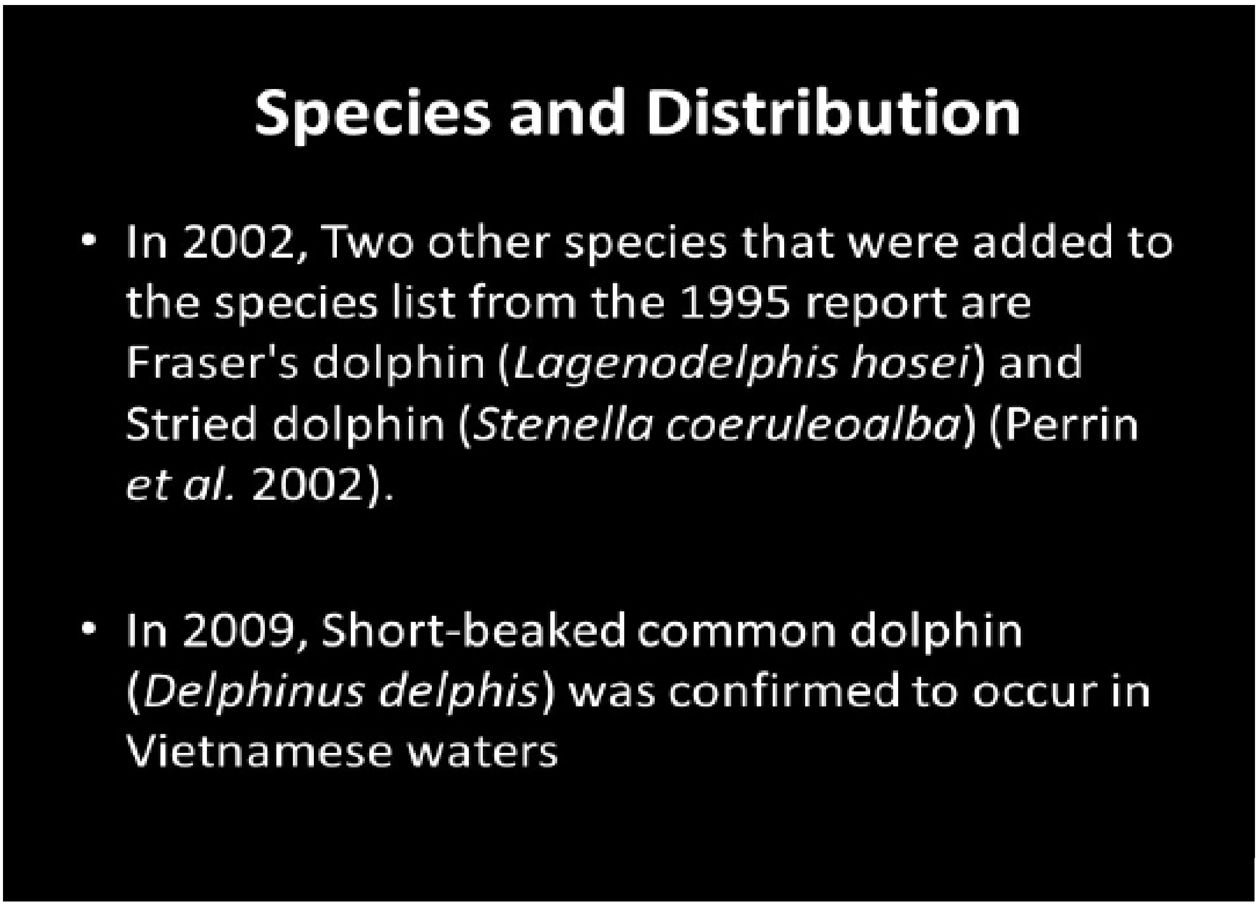

Dolphin for Education Activities
PTT Kids Marine Camp
2009 -2012
Supported by PTT
Group

Vietnam


Third Southeast Asian Marine Mammal Symposium
Vietnam: Marine Mammal Reviews
Hoang Minh Duc & Vu Long
Department of Zoology
Southern Institute of Ecology
SOUTHERN INSTITUTE OF ECOLOGY


Vietnamese water
• Coastline: 3,260km
• Shelf to 200m depth: 3,279,000km2
• Est Coral Reef Area: 1,300 km2
• Est. Mangrove Area: 1,000 km2
• No of Islands: 3,000+
Đất Nước và Hải-Phận Việt-Nam
Gulf of Tonkin
Central Vietnam
South-East VN
Gulf of Thailand


Species and Distribution
• Before 1993, only few records of marine mammals in Vietnam:
– *Balaenoptera musculus* (Gruvel 1925)
– *Kogia breviceps* (Serene 1934)
– *Tursiop truncatus* (Zhou and Qian, 1985)
– *Orcaella brevirostris* (Lloze, 1973)
– *Neophocaena phocaenoides* (Kemf, 1993)
– *Dugong dugon* (Tran Ngoc Loi, 1962; van Bree and Duguy, 1977)
• Smith *et al.* (1995) listed 31 species, of which 16 cetaceans and one sirenian were confirmed; four cetaceans were tentatively recorded and 10 species that were not recorded but are expected to occur in the region


Species and Distribution
• In 2002, Two other species that were added to the species list from the 1995 report are Fraser's dolphin (*Lagenodelphis hosei*) and Stried dolphin (*Stenella coeruleoalba*) (Perrin *et al.* 2002).
• In 2009, Short-beaked common dolphin (*Delphinus delphis*) was confirmed to occur in Vietnamese waters

Species and Distribution

- Until now, there are 25 marine mammals occurring in Vietnamese water
  - 22 species are confirmed
  - Two species is provisional (Pygmy Bryde's whale and Cuvier's beaked whale)
  - One species is questionable (Blue whale)

Species and Distribution

- Species composition and distribution
  - Balaenopteridae: 4 species
  - Kogiidae: 2 species
  - Ziphiidae: 1 species
  - Phocoenidae: 1 species
  - Delphinidae: 16 species
  - Dugonidae: 1 species

Species and Distribution

❖ **Recent records of Irrawaddy Dolphin in Vietnam**

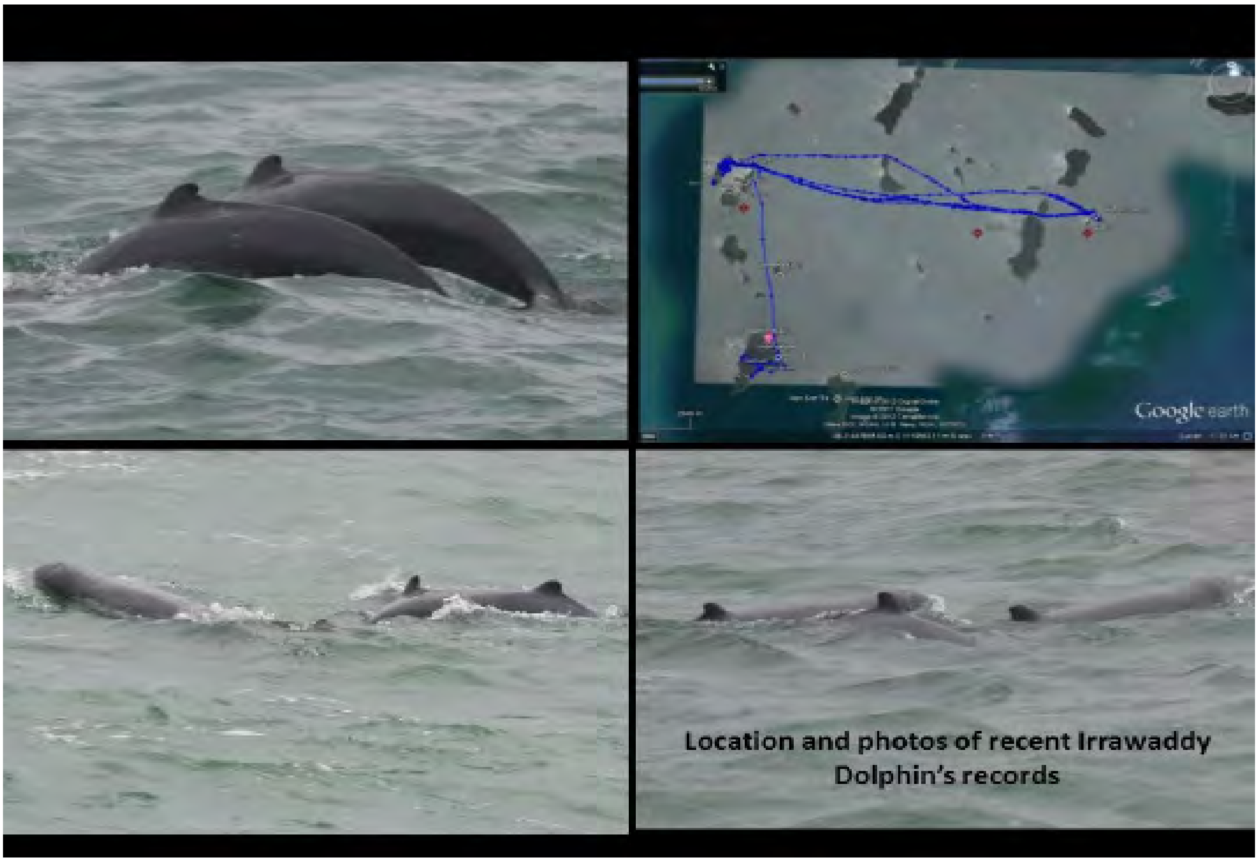
- 9 skulls were recorded from a temple in Vung Tau City (Beasley *et al.* 2002)
- In the Mekong River, two Irrawaddy dolphins were caught in a fishing net in An Giang Province, one in March 2002 (Bui and Dao 2002) and one in October 2005 (Beasley *et al.* 2005)
- Some groups of Irr. Dolphin were recorded in the Ba Lua Archipelago in the Gulf of Thailand (Nguyen *et al.* 2009; Vu *et al.* 2011)

Species and Distribution

❖ Recent records of Irrawaddy Dolphin in Vietnam

- 10/2005: one individual was killed in Can Gio District, HCMC
- 12/2009: one individual was caught in an unknown location
- 5/2010: one was strangled into the beach of Ha Tien Town, Kien Giang Province, near Gulf of Thailand
- 1/2011: one individual was killed in Thoi Binh District, Ca Mau Province (about 30km from the river mouth)

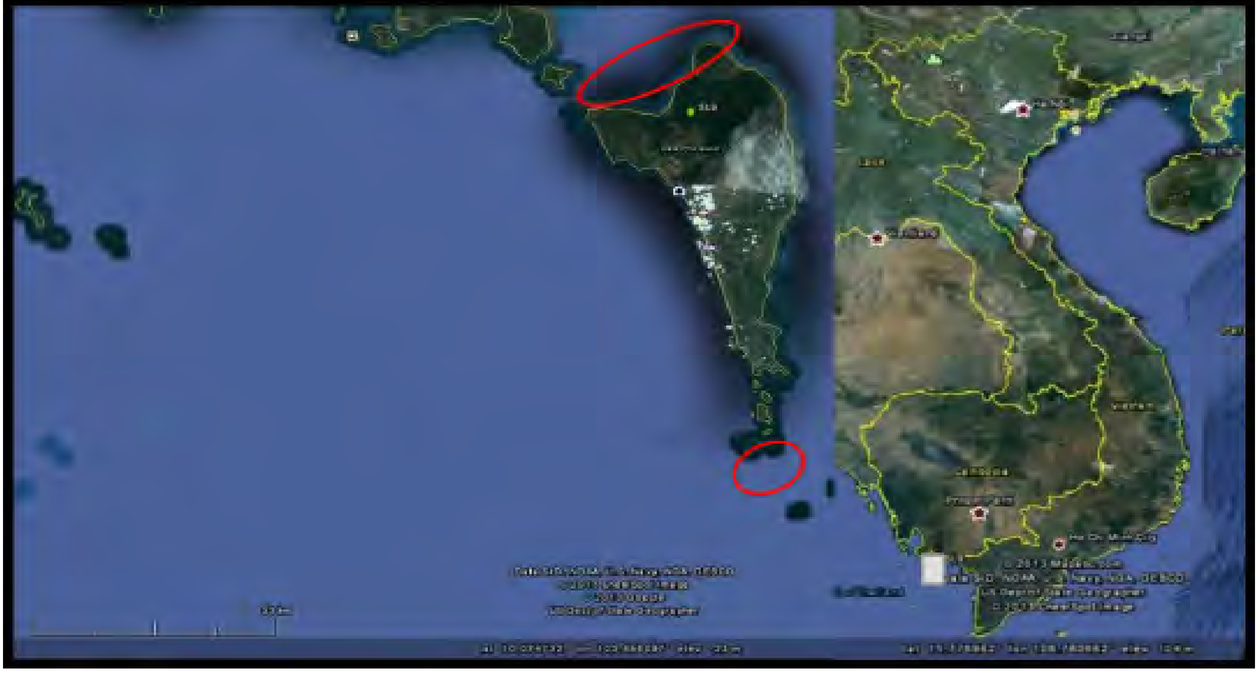

Species and Distribution
Location of recent Irrawaddy Dolphin's records
Google earth
Dong Thap
An Giang
Long An
Ho Chi Minh City
Tien Giang
My Tho
Go Cong
Rach Gia
Kien Giang
Can Tho
Vinh Long
Ben Tre
Hau Giang
Tra Vinh
Soc Trang
Bac Lieu
Ca Mau
Ba Ria


Google earth
Location and photos of recent Irrawaddy Dolphin's records


Species and Distribution
❖Recent records of Dugong in Vietnam
• A team from the Geology Museum of Hanoi observed two dugongs south of Phu Quoc Island in October of 2001 (Covert pers. com.).
• Bull tracing of dugong in Phu Quoc was observed in 2006 (Nguyen Xuan Hoa pers.com.).
• At least six dugong skulls were observed at one dugong hunter's home in Phu Quoc Island during their survey in 2002 and 2004 (Hines et al. 2008) .
• About 10 Dugongs are believed to occur in Con Dao National Park (Hins et al. 2012).


Potential distribution of Dugong around Con Dao Islands

Potential distribution area of Dugong around Phu Quoc Island and Gulf of Thailand

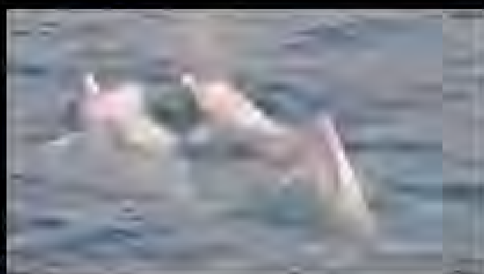


Population status

- Since 2002, there are only few marine mammals survey conducted but no abundance estimates for any species in Vietnamese waters.

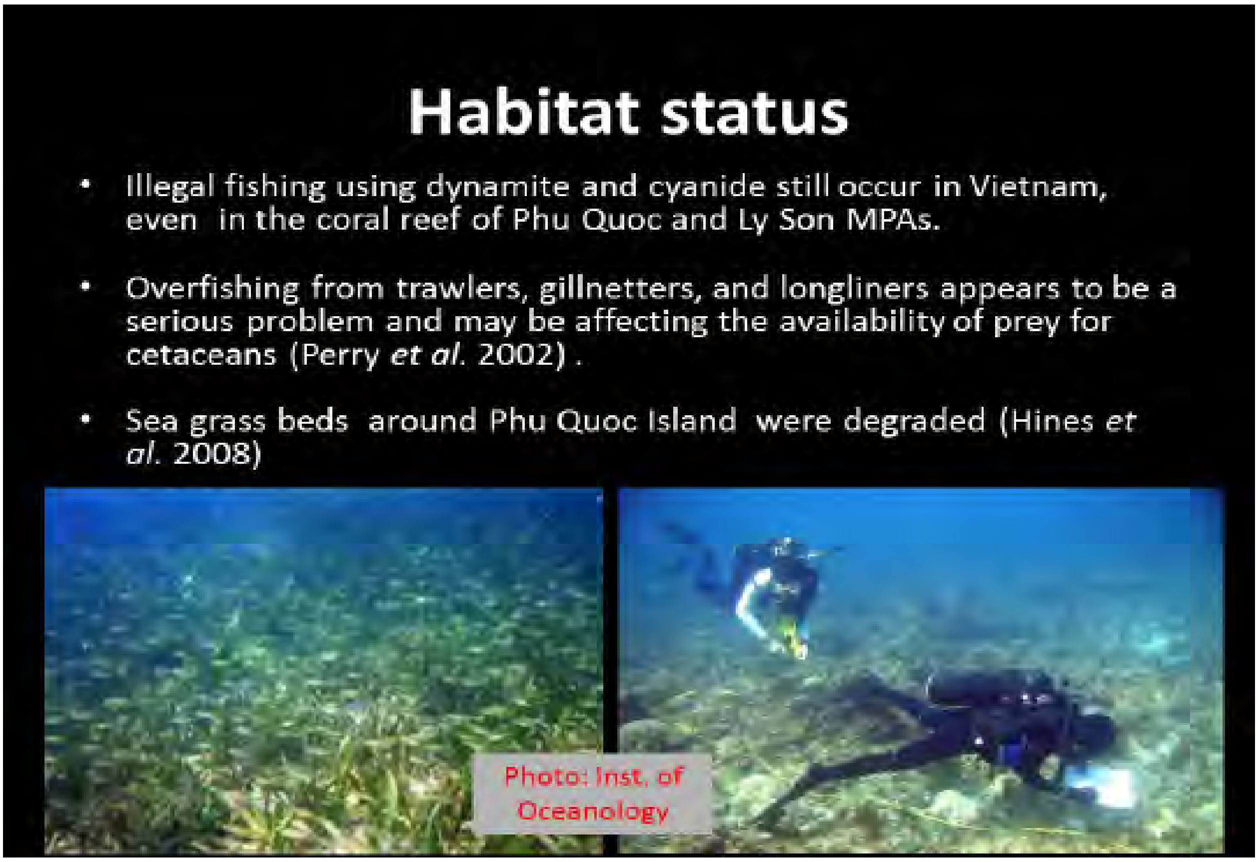
- Vo *et al.* (2002) reported only two sightings, a group of three Indo-Pacific humpback dolphin and a Rough-toothed dolphin in Nha Trang Bay.

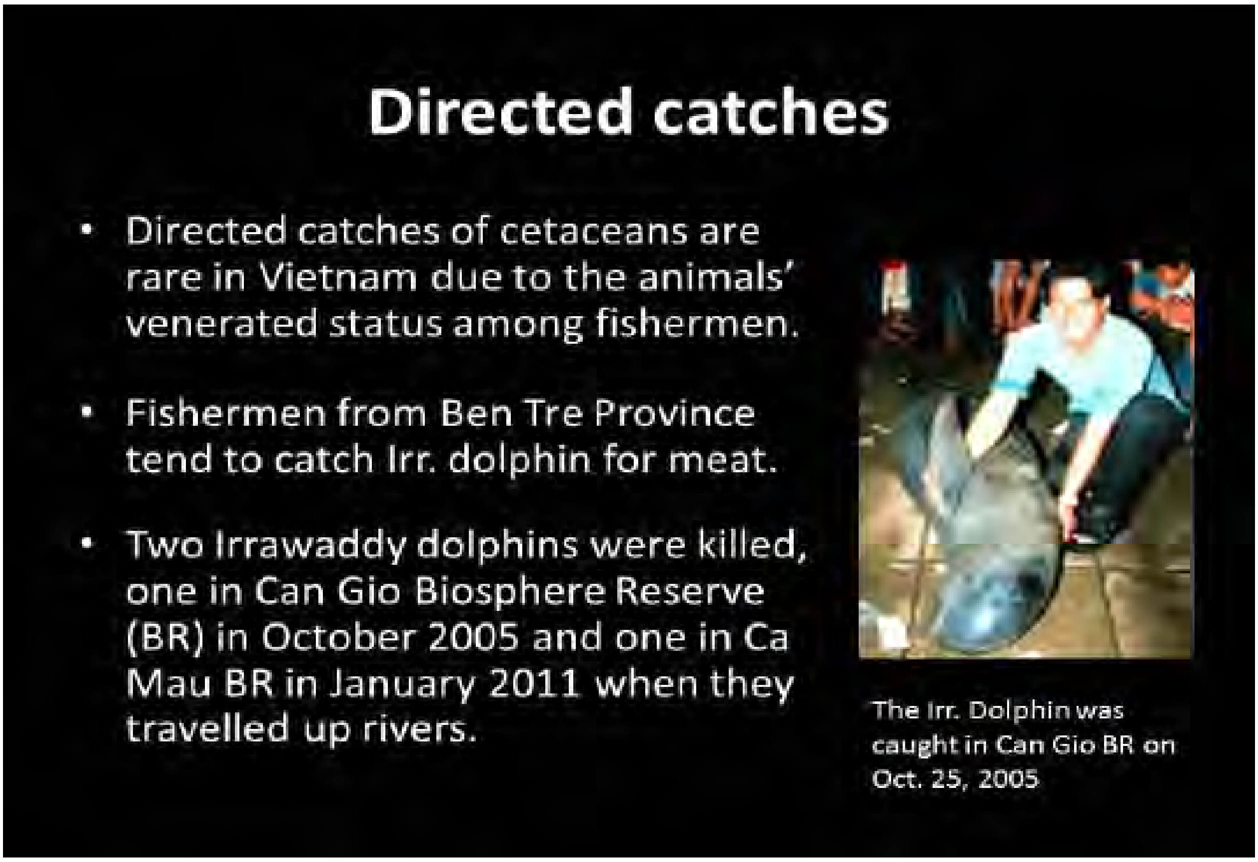
- Nguyen *et al.* (2009) reported that eight dolphin species found in off of the coast of Binh Thuan Province and five species off of the coast of Kien Giang (Gulf of Thailand) but did not provide detail information of encounter rate or group size of any species.




Population status
• Vu et al. (2011) recorded three groups of Irrawaddy dolphin with at least 30 individuals several times during surveys in September 2011 and March 2012 around Ba Lua Archipelago in the Gulf of Thailand.
• A group about 40 individuals of Pantropical Spotted Dolphin was observed off of the coast of Khanh Hoa Province (South-Eastern VN) on 19 August 2012


Habitat status
• Lack of studies to identify habitat status of marine mammals in Vietnam waters
– Marine pollution is a big issue in most inshore areas of Vietnam.
– Mangrove forest, sea grass beds and coral reef are degraded due to over-exploitation of aqua-products,
– High concentration on inshore fishing that causes the depletion of fishes and other aquatic animals.


Habitat status
• Illegal fishing using dynamite and cyanide still occur in Vietnam, even in the coral reef of Phu Quoc and Ly Son MPAs.
• Overfishing from trawlers, gillnetters, and longliners appears to be a serious problem and may be affecting the availability of prey for cetaceans (Perry et al. 2002) .
• Sea grass beds around Phu Quoc Island were degraded (Hines et al. 2008)
Photo: Inst. of Oceanology


Directed catches
• Directed catches of cetaceans are rare in Vietnam due to the animals' venerated status among fishermen.
• Fishermen from Ben Tre Province tend to catch Irr. dolphin for meat.
• Two Irrawaddy dolphins were killed, one in Can Gio Biosphere Reserve (BR) in October 2005 and one in Ca Mau BR in January 2011 when they travelled up rivers.
The Irr. Dolphin was caught in Can Gio BR on Oct. 25, 2005

Directed catches (Live catch)

- 24 individuals of Irrawaddy dolphin were caught, four in 2008 and 20 individuals in 2010 in the sea off the coast of Kien Giang Province for training purposes (Nguyen *et al.* 2009, 2011). Some individuals later died in captivity during training in Dai Nam, Binh Duong Province.

Photo: Nguyen *et al.* 2011

Directed catches

- Phu Quoc provincial officers found 12 animals killed in 2002, five in 2003, and four in 2004 (Hines *et al.* 2008).

- Four dugongs were caught and slaughtered in Phu Quoc in August and September 2009 and another one in August 2012.

Photo: WAR


Directed catches
A spotted seal was caught in August 2011 in the Central Vietnam


By-catches
• No detail survey on marine mammal by-catch levels was conducted in the last 10 years in Vietnam.
– four dugongs were caught in fishing net in south of Nha Trang Bay (Vo et al. 2002) and about 10 stranded into Con Dao Islands between 1979 and 2002 (Hines et al., 2012).
– Irrawaddy dolphins were most often caught in bottom trawls and gillnet. Some dolphins died of serious wounds and were stranded on small islands in Ba Lua Archipelago (Long et al. 2011)

By-catches

- Number of dolphins in the sea of Binh Thuan and Kien Giang has sharply decreased due to by-catch in gillnet and bottom trawls (Nguyen *et al.* 2009).
- Recently on 19 August 2012, 29 individuals of Pantropical Spotted Dolphin were caught in trawls in the sea of Khanh Hoa Province but were successfully released by fishermen.

Types of fisheries and information on scale

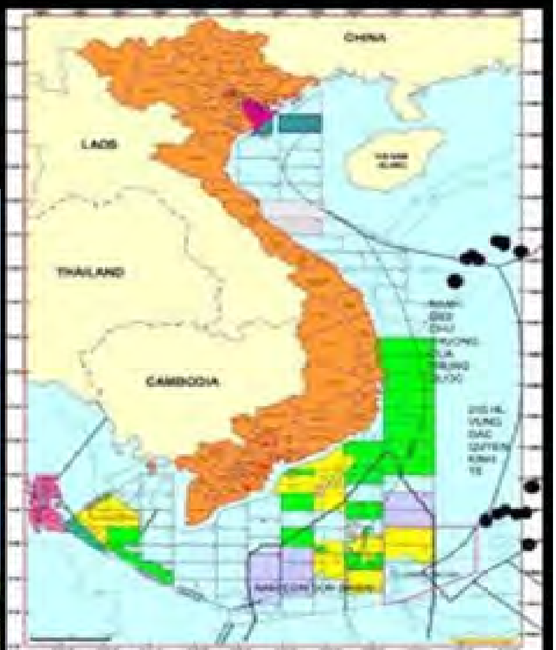
- Both inshore and offshore fisheries are recorded in Vietnam
- Total fishing boats is about 124,500 (2012)
  - Inshore fishery depends on a fleet of about 98,000 non-mechanized boats and smaller mechanized boats with diesel engines up to approximately 50hp
  - The most popular fishing gear are gillnet, longline, lift-net, push-net and traps

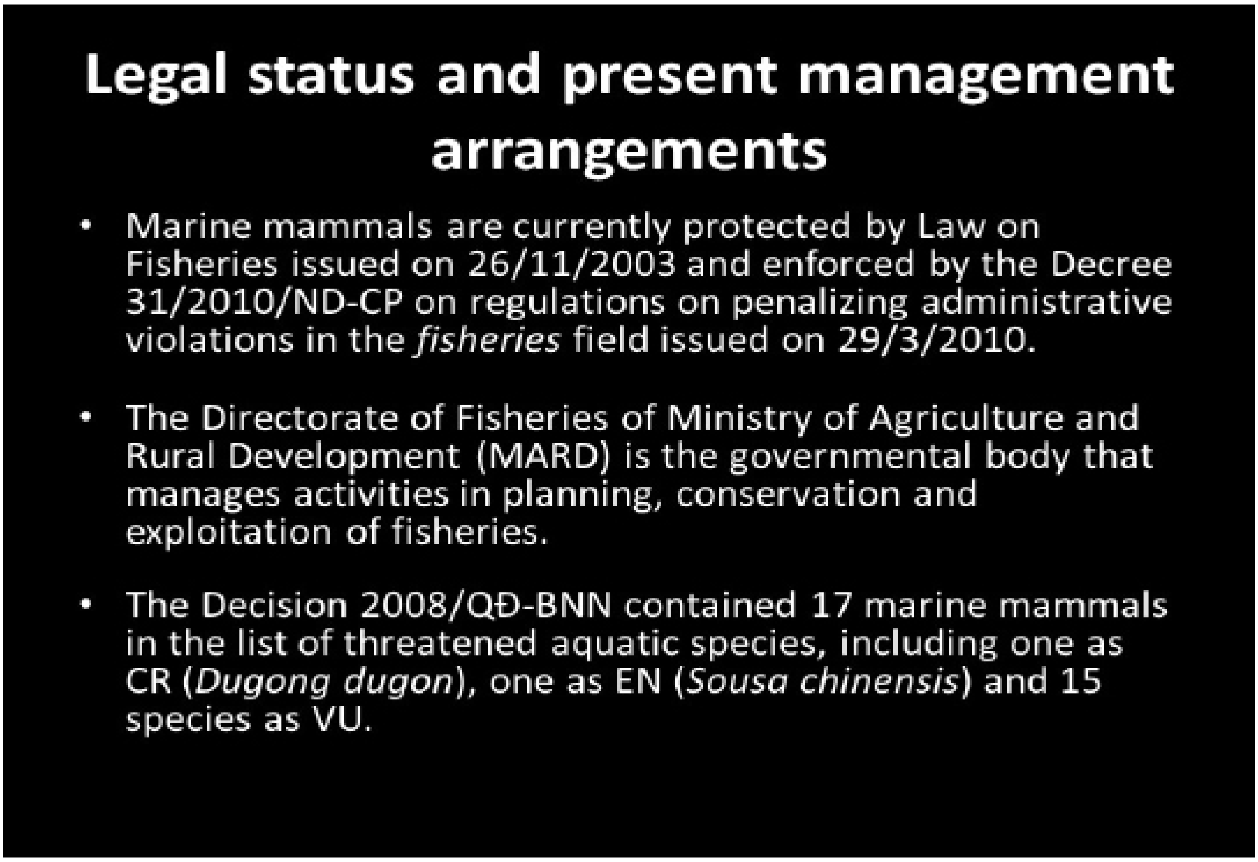
Types of fisheries and information on scale

- The total offshore fleet consists of approximately 26,500 vessels, almost all made of wood (99%).
  - These vessels are fitted with engines of 90 hp or above, with a total capacity of 2,400,000 hp.
  - Only about 300 vessels (400-500 hp, 24m long) have the capacity for deep-sea fishing. This fleet comprises either trawlers or purse seiners.
  - Trawlers are used in waters 35-80 m deep in south-eastern waters, whereas purse seiners fish pelagic species in deep waters, mainly off the central region (Vietnam Directorate of Fisheries 2012).

Other threats

- Coastal development
- Offshore gas & oil exploration
- Gas pipeline construction




Legal status and present management arrangements
• Marine mammals are currently protected by Law on Fisheries issued on 26/11/2003 and enforced by the Decree 31/2010/ND-CP on regulations on penalizing administrative violations in the *fisheries* field issued on 29/3/2010.
• The Directorate of Fisheries of Ministry of Agriculture and Rural Development (MARD) is the governmental body that manages activities in planning, conservation and exploitation of fisheries.
• The Decision 2008/QĐ-BNN contained 17 marine mammals in the list of threatened aquatic species, including one as CR (*Dugong dugon*), one as EN (*Sousa chinensis*) and 15 species as VU.

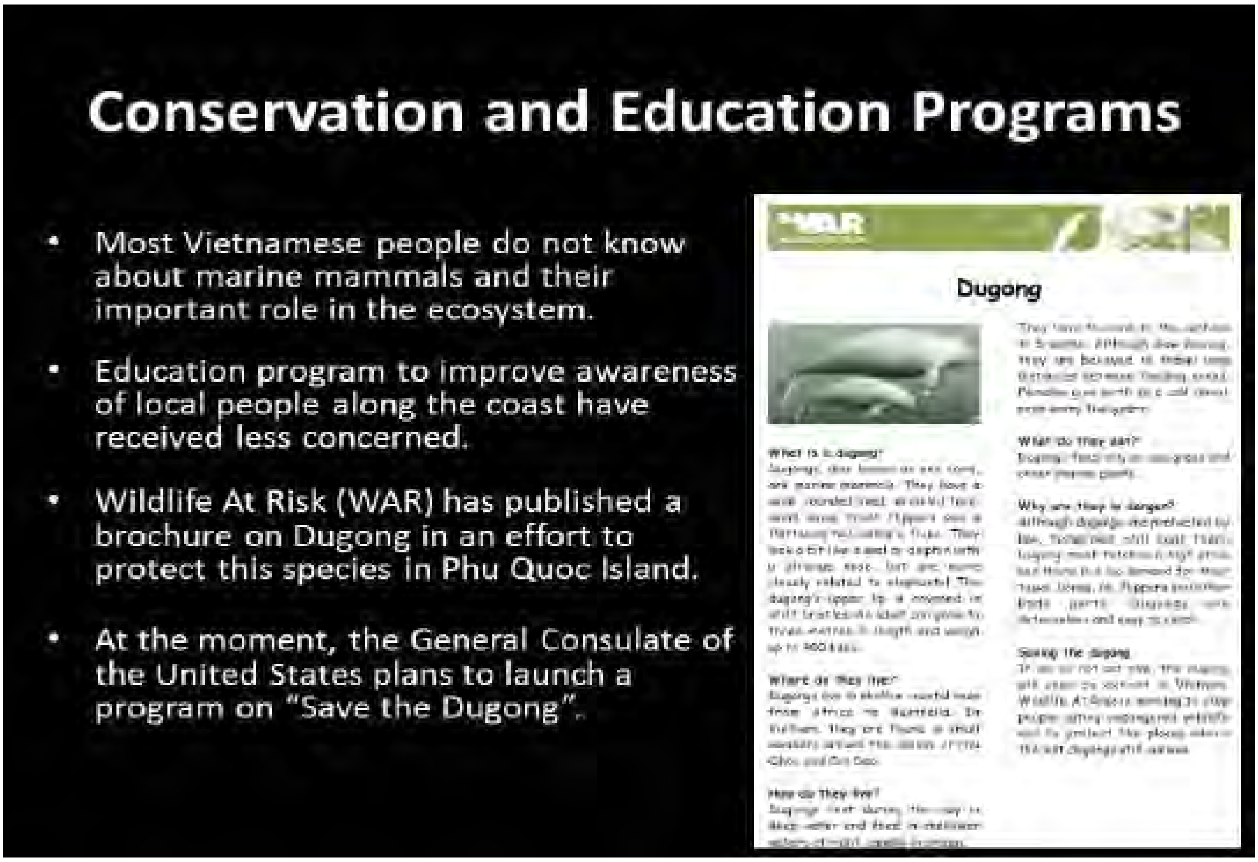

Legal status and present management arrangements
• The Vietnam government also ratified :
– CITES in 1994
– Convention on Biodiversity, and
– UNCLOS
• The Gov. approved a national biodiversity action plan in 1995 that included improved provisions for the establishment of marine protected areas (MPA).
• Until 2010, Vietnam had five MPAs covering 549 km2 of water.
• In 2010, the Prime Minister of Vietnam signed a Decision number 742/2010/QD-TTg approving planning on marine protected area system of Vietnam to 2020.

Legal status and present management arrangements

- Under this decision a system of 16 MPAs will be established by 2015 covering 1,500km2 of sea area.
- Other national park (NP) including Con Dao NP, Bai Tu Long NP, Cat Ba NP, and Mui Ca Mau NP also have marine portions that provide protection for a range of endangered species, including the dugong and dolphins.

Conservation and Education Programs

- In Con Dao Island, a project on Coastal and Marine Biodiversity Conservation and Sustainable Use in the Con Dao Islands Region was conducted for two years, from April 2007 to March 2009. The project was aimed at protection, management and sustainable financing of globally significant coastal and marine biodiversity in the Con Dao Islands Region.
- In Phu Quoc Island, DANIDA – Denmark provided funding for a 4-year project on environmental protection of Phu Quoc. The project focused on improvement of livelihood and awareness of local people and protection of marine environment.
- Other projects were also implemented in Nha Trang Bay MPA and Cu Lao Cham MPA but focusing on habitat protection and capacity building in general.


Conservation and Education Programs
• Most Vietnamese people do not know about marine mammals and their important role in the ecosystem.
• Education program to improve awareness of local people along the coast have received less concerned.
• Wildlife At Risk (WAR) has published a brochure on Dugong in an effort to protect this species in Phu Quoc Island.
• At the moment, the General Consulate of the United States plans to launch a program on "Save the Dugong".
WAR
Dugong


Folk attitudes and interactions with marine mammals
• Vietnamese fishermen from Quang Binh Province to the south (including Phu Quoc Island) worship cetaceans because they believe the animals will aid them in distress at sea and help them catch more fish.
• Every year, fishermen from these provinces hold a 'whale festival' and venerate whale and dolphin.

Folk attitudes and interactions with marine mammals

Folk attitudes and interactions with marine mammals

- However, fishermen in Phu Quoc tend to catch Dugongs for food and tusks, and fishermen from Ben Tre Province and often catch Irrawaddy dolphin for sale.
- Fishermen from northern country also catch dolphin for shark fishing
- Dugong tusks and bones are believed to treat children's fever in Phu Quoc (Hines *et al.* 2008).

Photo: Tienphong.net

Researches & Training

- Previous researches
  - Smith et al (1995) conducted cetacean surveys in Gulf of Tonkin, Nha Trang Bay and arounf Phu Quoc Island
  - Doan *et al.* (2001) conducted a cetacean survey in Gulf of Tonkin in 1999 and 2000 and recorded five species including *Sousa chinensis, Stenella longirostris, S. attenuata,Tursiops* sp. and *Neophocaena phocaenoides*
  - Vo Si Tuan *et al.* (2002) listed 11 species in the Nha Trang Bay (two sightings and 9 species based on specimen caught in net or stranded into the coast).
  - Smith *et al.* (2003) recorded 6 species in the gulf of Tonkin in Oct. 1999 and Apr. 2000

Researches & Training

- Recent and existing researches:
  - Dao Tan Ho *et al.* (2003) recorded 6 species from 10 individuals caught in net or stranded to the coast between Jan.2001 and 2003
  - Beasley *et al.* (2005) conducted survey along the Mekong River within Vietnam but did not recorded any Irrawaddy Dolphin
  - Hines *et al.* (2008) reported a rapid decline of Dugong in the Vietnamese water around Phu Quoc Island for the last 30 years
  - Nguyen *et al.* (2009) recorded 12 dolphins, of which 5 were recorded in Kien Giang water and 8 species were recorded in Binh Thuan water.
  - Vu et al. (2011) recorded Irrawaddy dolphin and finless porpoise in the Ba Lua Archipelago

Researches & Training

- Recent and existing researches
  - Vietnam-Russia Tropical Center have conducted cetacean surveys in the sea off of the coasts of Binh Thuan and Kien Giang Provinces to document the species diversity and more focally, to find and catch species for training purpose.
  - The Southern Institute of Ecology is carrying out survey on small cetaceans in inshore areas of Kien Giang and plan to expand to the sea around Phu Quoc and Con Dao Islands.

Researches & Training

- In Sep. 2012, with a financial support from WWF, a 6-day training on marine mammal conservation and management was held in Hải Phòng by the Institute of Resource and Marine Environment and Technology, and Taiwan National History Museum. 20 trainees from research institutions, MPA and other were instructed by professional marine mammalogists from Japan and Taiwan.


Needs for additional research & Training
• Morphometrics study on skeletal materials stored at whale temples


Needs for additional research & Training
• Inventory and analysis of DNA samples from stranded whales and dolphins
All photos from news papers


Needs for additional research & Training
All photos from news papers


Needs for additional research & Training
All photos from news papers


Needs for additional research & Training
• Dedicated research programs are needed to investigate the status of:
– Irrawaddy dolphin in the Vietnamese water of Gulf of Thailand (from Ha Tien to Cape of Ca Mau),
– Humpback dolphins in the Nam Trieu River mouth, and Nha Trang Bay
– Dugong in Con Dao Islands and Phu Quoc Islands.
• Population estimation and spatial distribution
• By-catch estimation


Needs for additional research & Training
✓ Some Institutions in Vietnam that are capable to study marine biodiversity
– Institute of Oceanography, Nha Trang City
– Institute of Resource and Marine Environment and Technology, Hai Phong City
– Research Institute of Marine Products
– Institute of Aquaculture of Southern Vietnam
➢ These institutions mainly focus on fishes, crustaceans and corals

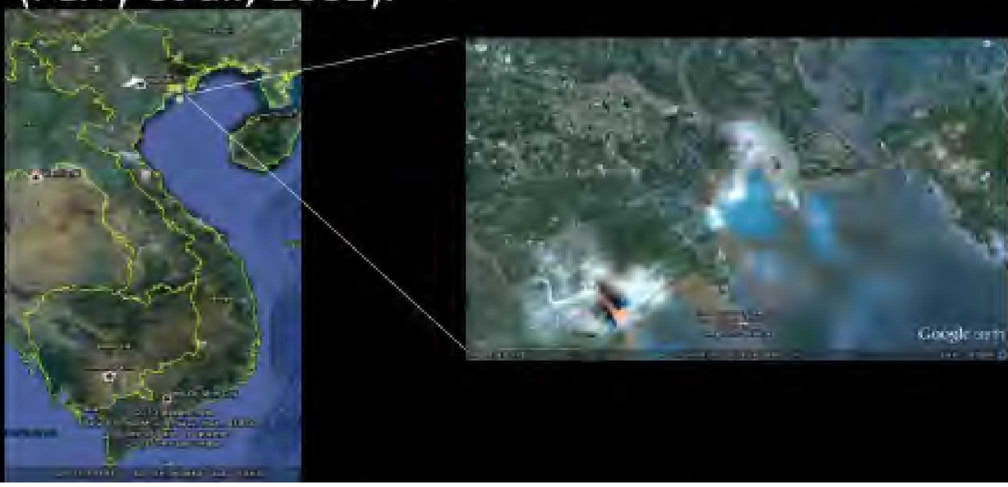
Needs for additional research & Training

✓ Capacity building is an issue that is needed for Vietnamese Institutions

- Training on species identification
- Population estimation
- Establish national stranding response network

Present and potential marine mammal watching operations

- possible marine mammal watching sites:
  – humpback dolphins in the Nam Trieu River mouth (Perry *et al.*, 2002).



Present and potential marine mammal watching operations

- possible marine mammal watching sites:
  - Irrawaddy dolphin in Ba Lua Archipelago in the sea of Kien Giang. It is possible to see this species within 3-4 day survey between November and April every year.

Acknowledgment

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Appendix

Status and distribution of marine mammals in Vietnam

No	Scientific name	Distribution: Gulf of Tonkin	Distribution: Central Vietnam	Distribution: S_E Vietnam	Distribution: Gulf of Thailand	Remark
	Fam. BALAENOPTERIDAE					
1	*Balaenoptera acutorostrata*			C		Vo *et al.* 2002
2	*Balaenoptera musculus*			Q		Smith *et al.* 1995
3	*Balaenoptera edeni*			P		Smith *et al.* 1995
4	*Megaptera novaeangliae*	C				Smith *et al.* 1995
	Fam. PHYSETERIDAE					
5	*Kogia breviceps*			C		Smith *et al.* 1995 Hoang per.obs.
6	*Kogia sima*			C		Smith *et al.* 1995
	Fam. Ziphiidae					
7	*Ziphius cavirostris*			P		Smith *et al.* 1995
	DELPHINIDAE					Vo *et al.*, 2002
8	*Globicephala macrorhynchus*			C		Smith *et al.* 1995
9	*Pseudorca crassidens*			C		Vo *et al.* 2002,

Appendix

Status and distribution of marine mammals in Vietnam

No	Scientific name	Distribution				Remark
		Gulf of Tonkin	Central Vietnam	S-E Vietnam	Gulf of Thailand	
10	*Feresa attenuata*			C		Smith *et al.* 1995
11	*Peponocephala electra*			C		Smith *et al.* 1995, Dao *et al.* 2003, Vu *et al.* 2011, Nguyen *et al.* 2009
12	*Steno bredanensis*			C		Vo *et al.* 2002, Nguyen *et al.* 2009
13	*Sousa chinensis*	C		C	C	Vo *et al.* 2002, Smith *et al.* 1995, 2003, Nguyen *et al.* 2009
14	*Tursiops truncatus*	C		C	C	Vo *et al.* 2002, Smith *et al.* 1995, Nguyen *et al.* 2009
15	*Tursiops aduncus*	C		C		Smith *et al.* 1995 Dao *et al.* 2003, Nguyen *et al.* 2009
16	*Stenella attenuata*	C		S		Vo *et al.* 2002, Smith *et al.* 1995, 2003, Nguyen *et al.* 2009

Appendix

Status and distribution of marine mammals in Vietnam

No	Scientific name	Distribution				Remark
		Gulf of Tonkin	Central Vietnam	S_E Vietnam	Gulf of Thailand	
17	*Stenella longirostris*	C	C	C	C	Vo *et al.* 2002, Smith *et al.* 2003, Nguyen *et al.* 2009
18	*Stenella coeruleoalba*			C	C	Nguyen *et al.* 2009
19	*Delphinus capensis*	C		C		Vo *et al.*, 2002; Vu per.obs
20	*Delphinus delphis*			C		Nguyen *et al.* 2009
21	*Lagenodelphis hosei*	C		C		Nguyen *et al.* 2009; Hoang per.obs
22	*Grampus griseus*	C	C	C		Smith *et al.* 1995, Vu per.obs.
23	*Orcaella brevirostris*			C	C	Smith *et al.* 1995, Dao *et al.* 2003, Vu *et al.* 2011, Nguyen *et al.* 2009
	PHOCOENIDAE					
24	*Neophocaena phocaenoides*	C		C	C	Vo *et al.* 2002, Smith *et al.* 1995, 2003, Vu *et al.* 2011
	DUGONIDAE					
25	*Dugong dugon*	C		C	C	Vo *et al.* 2002, Smith *et al.* 1995

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