

FINAL TECHNICAL REPORT

East Kalimantan Cetacean Conservation Project 2009-2012. Conservation and diversity of cetaceans within a new potential MPA in East Kalimantan, Indonesia



Photo by Budiono



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Preface and acknowledgements

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Abstract

A series of six cetacean monitoring surveys were conducted in the coastal waters off Bontang and East Kutai District, East Kalimantan, Indonesia, between 2009 and 2012 covering a distance of 3433 km of on effort searching. These surveys were conducted in response to the fact that the assessment of cetacean species in Indonesia was described as a priority project within the "IUCN 2002-2010 Conservation Action Plan for the World's Cetaceans" and the target of the National Fisheries Department to expand its Marine Protected Areas (MPA) in Indonesia with two million hectares between 2010 and 2014. Ninety-eight cetacean sightings with positive species identification were made of fourteen different cetacean species and additional sightings of dugongs and whale sharks including dolphin species *Stenella longirostris*, *Stenella l. roseiventris*, *Stenella attenuata*, *Stenella coeruleoalba*, *Tursiops aduncus*, *Tursiops truncatus*, *Grampus griseus*, *Orcaella brevirostris*, two small whale species *Peponocephala electra*, *Feresa attenuata*, as well as the medium-sized whale *Pseudorca crassidens* and *Ziphius cavirostris* and the large whale species *Physeter macrocephalus*, *Balaenoptera omurai* and *Balaenoptera physalus*, which latter species has become very rare in the Southern Hemisphere and endangered but according to local residents daily occur from November to May in the coastal area East Kutai and Bontang district indicating the importance of this area. Threats include fish depletion because of reef destruction through bombing and fishing with poisonous compounds as well as direct catch and kill of dolphins by non-resident fishermen for oil and shark bait. An isolated case of whale killing occurred in August 2010 off Bontang of a juvenile humpback whale, *Megaptera novaeangliae*. Because of the isolation of the area where most whales and dolphins were observed, i.e. from Tanjung Magkalihat to Miang Island, we propose to extend the Marine Protected Area of Berau to this area South of and including the Mangkalihat Peninsula until Miang Island or Bontang with 500m depth cline to the shore. These areas should have special attention in terms of law-enforcement of destructive and unsustainable fishing techniques, i.e. bombing, fishing with poison, trawling. Patrolling in this area should be intensified to prevent these illegal fishing techniques and any further illegal attempts to kill cetaceans. The current fin whale observations and the occurrence of humpback whales in this area, requiring further study about their seasonal or year-round distribution patterns. Local awareness should be regularly increased and fishermen should be facilitated to engage in sustainable fishing practices and/or seaweed culturing. There is a good potential for ecotourism through responsible forms of dolphin and whale watching, which may benefit isolated areas with mostly poor fishing communities such as Miang Island, which is now being proposed to be converted into a coal stock pile and coal terminal that will deplete local fish resources through mangrove and coral reef destruction and run-off pollution.

Introduction

The Indonesian Archipelago contains some 5 million km² of territory (including water and land), of which 62% consists of seas within the 12-mile coastal limit (Polunin, 1983). However, in spite of this extensive water mass only few reports on cetaceans are available. Rudolph *et al.* (1997) reported at least 29 species of cetaceans to occur in the seas of the Indonesian Archipelago but only a few dedicated studies have been conducted on the abundance, distribution and conservation of cetaceans in Indonesia such as long-term research conducted on several cetacean species in Komodo National Park waters and in Lovina, Bali as well as on the Irrawaddy dolphin, *Orcaella brevirostris* in the Mahakam River and coastline in East Kalimantan (Kahn *et al.*, 2000; Mustika *et al.* 2012; Krebs, 2004, Krebs & Budiono 2005, Krebs *et al.*, 2008; 2011, Krebs & Lim, 2008). Cetaceans are threatened with local extinction in many parts of the world, but nowhere more obviously than in Asia. Growing human populations are putting an increasing pressure on natural resources and rivers, estuaries and coastal marine waters are becoming increasingly unhealthy ecosystems for wildlife. Modification and

degradation of the habitats of dolphins and porpoises have often resulted in dramatic declines in their abundance and range (Reeves *et al.*, 1997). Hunting is largely unregulated throughout most of Indonesia, and environmental degradation proceeds unchecked. Investigation of the status of cetaceans in the Indonesian archipelago is one of the research projects recommended in the 2002-2010 Action Plan by the IUCN/SSC/Cetacean Specialist Group (Reeves *et al.*, 2003). In response to this need, several surveys were conducted (2003, 2007 & 2008) in identified important coastal dolphin areas in East Kalimantan, such as the marine protected area of the Berau archipelago in East Kalimantan where fifteen different cetacean species were observed as well as dugongs (Kreb *et al.*, 2008). Another coastal area of importance involved Balikpapan Bay, which hosts a significant population of Irrawaddy dolphins (Kreb & Lim, 2009). In both areas, research results have been incorporated in the management planning for the area.

Based on preliminary surveys and interviews another area of importance for marine mammals was identified coastal waters east and north of Bontang including East Kutai District until the Mangkalihah Peninsula (Kreb & Budiono, 2005). This area is supposed to form a migration corridor from the Pacific to the Indian Ocean through the Sulu-Sulawesi Seas and Makassar Straits but also represents a calf-rearing and feeding area for large whales such as fin whales and humpback whales, of which the first species can be found according to local reports for a large part of the year between October-May, whereas humpback whales have been observed between June and September in the more southwards situated Bontang District. In August 2012 a juvenile humpback whale was killed by local fishermen in Bontang district urging the need for raising local awareness and conducting more dedicated surveys that will aid to identify important cetacean habitat and propose a new MPA for East Kutai/Bontang district.

The current research project aimed to collect data on cetacean diversity hotspots, relative abundance and distribution patterns of cetaceans, based on which important recommendations can be provided for the design of the MPA in question, for sustainable eco-tourism activities and, if required necessary, for additional patrolling in core areas. Moreover, the project aimed to analyze threats and provide recommendations for the conservation of marine mammals in this area. These results will form the basis for the preparation of a conservation action plan for threatened or vulnerable cetacean species and habitats that will be shared with the Indonesian Directorate of Conservation and National Marine Parks under the Ministry of Fisheries. A spatial design will be prepared related to marine cetaceans and recommended to be included in the management design of a Marine Protected Area based on the identification of priority areas for conservation. Reports will be directly handed with a local management recommendations for MPA district status to the East Kutai and Bontang district government.

The other component of this research focused on raising local awareness on the diversity and protected status of locally occurring cetaceans both during and after the fieldwork through school and fishermen villages visits, a fieldtrip as well as formal visits to relevant departments. Posters were produced and distributed with the locally occurring cetaceans and information about their protected status, conservation and how to report and act in stranding events.

Field methods

Cetaceans were visually searched for in shelf and slope waters up to 500m depth cline in the area east and north of Bontang along the East Kutai district until 50 km north of Mangkalihah Peninsula during six vessel-based surveys in May 2009, May 2010, October and December 2011 and March/ April and May 2012 totalling 45 ship-days (Figure 1). Total search effort of all

surveys combined was 3453 km (250.7 h), whereas reduced effort due to wavy sea conditions was performed during an additional 271 km (18.7 h).

Pre-arranged survey transects were designed to provide representative survey coverage of various habitats but the factual course of each transect was adjusted according to the field conditions, i.e. wind, current and wave conditions. Searches were conducted from a wooden boat of 18.5 m length and width of 3 m, and with an inboard diesel engine of 120 hp, which moved at an average speed of 13.8 km/ hour during all surveys combined. Observations were made from an observation platform at 4 m eye-height by three active front observers, of which two were scanning continuously within an 180° angle from the beam by aid of hand-held binoculars attached to a pole. One additional front observer searched with the unaided eye and a fourth team member recorded all sighting effort data and environmental and geographical conditions using a GPS every 30 minutes, including speed, clouds, Beaufort, visibility, tide. In addition, each day we also recorded the moon positions referred to as *sorong*, which counts from 1 to 28 after each new moon and influences tidal height, current speed and duration length between low and high tide. The track-line and effort data was also directly stored in the Garmin eTrex Vista CX. Positions changed every 30 minutes.

The total observation time during sightings for all four surveys was 50.5 hours, and the mean observation time per sighting was 29 min. Upon making a sighting, the radial distance between boat and dolphins was estimated, and compass bearing of the boat and of the dolphins and coordinates of the sighting location were recorded. Distance estimation and 'calibration' among observers was exercised by regularly estimating distance to fixed waypoints (light beacons etc) and check with the distance estimated by the GPS to this waypoint. Sightings were identified to species level. If more than one species was observed, it was recorded whether these species mixed. Groups were considered to mix if the distance between different species was less than 30 m. If the species did not mix, the mean distance between the single-species groups was recorded. Minimum, maximum and best estimates were made of group size and of the number of calves and juveniles. We attempted to photograph each sighting for confirmation of species identification and photo-identification of conspicuous dorsal fins. In addition, video footage was made. Depth at sighting locations with a depth less than 100m was measured with a fish finder and the depth for deeper locations was determined after the survey by plotting the sighting coordinates on an official sea map of the area with bathymetrical data.

One transect was surveyed in one day, and double sightings on the same transect were avoided by 1) assuming groups to be different if the age-class composition was different in combination with large differences in group size, 2) in addition to which sightings of groups composed of individuals with characteristic marks that were identified during earlier sightings, were assumed similar.

Informal interviews during the surveys were held with fishermen from the villages Beras Basah, Miang Besar, Birahbirahan and Kaniungan Islands to find out the current status and occurrence of dolphins, species and threats.

Acoustic recordings were made at locations of whale sightings including fin whales, melon-headed whales and false killer whales.

Analysis

In order to compare relative abundance between species, sighting rates and encounter rates were calculated per km linear transect per year and habitat type. To define the habitat type for each sighting location and the amount of effort conducted in a certain habitat type, the sightings and track-lines were plotted on an official sea map with bathymetrical data. Reduced survey effort tracklines were not included in the calculation of relative abundance per habitat type. The following habitat types were defined: shelf waters (0-200 m depth) and slope waters

(>200 m depth). Because total number of sightings per species was very low, we did not calculate densities per species. Instead we calculated encounter rates. Only on-effort sightings with positive species identification were used for analysis.

Results

Observation surveys

Two surveys were conducted in shelf and slope waters up to 500m depth cline covering the area off Bontang District and East Kutai District until Miang Island , between 23 and 29 May 2009 and 4 and 7 October 2011 covering 750 km (55 h) and 347 km (25 h) respectively (Appendix 1). In addition, four surveys were conducted in shelf and slope waters up to 500m depth cline covering the area off Bontang District and East Kutai district until c. 50 km North of the tip of Mangkalihat Peninsula between 2-7 May 2010, 2 and 11 December 2011, 26 March to 4 April and 20 to 29 May 2012 covering 570 km (38 hr), . 580 km (41.4 h), 578 km (46.9 h) and 608 km (44.4 h), respectively , whereas additional reduced search effort was made during the last three surveys covered 107 km (6.7 h), 50 km (3.4 h) and 114 km (8.6 h). Total group observation effort during the four respective surveys was 21.1 h, 9.1 h, 14.5 h, 6h.

A total number of 96 on-effort cetacean sightings with positive species identification were made of fourteen different cetacean species and additional sighting of a dugong, three sightings of whale sharks and seventeen sightings of unidentified cetaceans (Appendix 2). Seasonal differences in species occurrence and diversity is shown in Table 1). Species with a stable presence in the area involved Irrawaddy dolphins, which were always present although limited to Sangkulirang Bay where their distribution range was surveyed in 2011-2012. Other species that at least were found during all four extensive surveys (May 2010, Dec 2011, March and May 2012) included melon-headed whale and spotted dolphins, whereas dwarf spinner dolphin, spinner dolphin, false killer whales, Indo-Pacific bottlenose dolphin and common bottlenose dolphin were found during three of the four extensive surveys. Larger whale observations such as Balaenopterids (fin whales and Omura's whales) and sperm whales were found between the months March and May, whereas a juvenile humpback whale was killed in the month August of 2010.

During all five extensive surveys(excluding October 2011 which focused on Bontang District) with more or less equal survey effort (May 2009, May 2010, December 2011, March and May 2012) in Bontang and East Kutai Districts, the largest number of sightings per km transect were found in general during the December and March surveys, in comparison to the May surveys (2009, 2010, 2012), although the May 2010 survey had a higher number of dolphins per km due to large groupsize of spotted and spinner dolphins. The May 2012 survey was dominated by an early onset of southern wind season with a strong current from South to North, which caused most dolphin species to migrate to the northern part of the Mangkalihat peninsula (Northeast Kalimantan). This was confirmed by interviews with fishermen near the peninsula, which reported large groups of dolphins with tuna schools.

Search effort was distributed within two different depth clines, i.e. shelf waters (0 < 200m) and slope waters (>200m-1000m) (Table 2). When comparing shelf and slope waters we found that the number of species, sighting rates and encounter rates were consistently larger for slope waters (200m-1000m). Species that were mostly associated with shelf waters include Indo-Pacific bottlenose dolphins, Irrawaddy dolphins, but also fin and sperm whales.

Table 1. Seasonal/ annual occurrence of cetaceans in survey areas

Cetacean Species	Common name	May 2009*	May 2010	Oct 2011*	Dec 2011	March 2012	May 2012
<i>Balaenoptera physalus</i>	Fin whale						
<i>Balaenoptera omurai</i>	Omura's whale						
<i>Feresa attenuata</i>	Pygmy killer whale						
<i>Grampus griseus</i>	Risso's dolphin						
<i>Orcaella brevirostris</i>	Irrawaddy dolphin						
<i>Peponocephala electra</i>	Melon-headed whale						
<i>Physeter macrocephalus</i>	Sperm whale						
<i>Pseudorca crassidens</i>	False killer whale						
<i>Stenella L. roseiventris</i>	Dwarf spinner dolphin						
<i>Stenella attenuata</i>	Spotted dolphin						
<i>Stenella coeruleoalba</i>	Striped dolphin						
<i>Stenella longirostris</i>	Spinner dolphin						
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin						
<i>Tursiops truncatus</i>	Common bottlenose dolphin						
<i>Ziphius cavirostris</i>	Cuvier's beaked whale						

* Survey area only covered Bontang District; NB. wind conditions in May 2012 were more similar to June-August seasonal conditions with dominant southern wind and high waves.

Table 2. Number of cetacean sightings made, species and individuals encountered in different depth habitats

Depth (m)	Search effort (km) *						No of sightings (n)**						Total no.individual cetaceans**						Sighting rate (sightings/km)**						Encounter rate (dolphins/km)**					
	May 09	May 10	Oct 11	Dec 11	Mar 11	May 12	May 09	May 10	Oct 11	Dec 11	Mar 11	May 12	May 09	May 10	Oct 11	Dec 11	Mar 11	May 12	May 09	May 10	Oct 11	Dec 11	Mar 11	May 12	May 09	May 10	Oct 11	Dec 11	Mar 11	May 12
0- 200	556	338	263	487	330	386	11	9	6	8	8	5	546	105	148	107	408	41	0,02	0,03	0	0	0,02	0,01	0,98	0,31	0,6	0,22	1,24	0,11
> 200	194	231	84	91	250	222	7	6	6	10	13	7	419	211	182	482	726	290	0,036	0,03	0,1	0,1	0,05	0,03	2,16	0,91	2,2	5,3	2,9	1,31
Total/ mean	750	569	347	578	580	608	18	13**	12	18	21	12	965	304**	330	589	1134	331	0,024	0,023**	0	0	0,04	0,02	1,29	0,534**	1	1,02	1,96	0,54

* excluding reduced effort;** double sightings on the same trackline were included in the depth preference analysis but excluded from the total number of sightings/ individuals and mean sighting/ encounter rate for all depths combined;

Table 3. Encounter rates of individual cetacean species by habitat type and habitats combined in decreasing order of relative abundance per seasonal survey.

Species	Sighting habitat	Min-max depth of sightings (m)	n ^a	Mean best group size ^b (min-max)	Search effort ^b (km)	Encounter Rate ^b (indiv./km)	Mean encounter rate ^c
May 2009 survey							
<i>Stenella attenuata</i>	SHELF	135-142	2	150 (80-220)	556	0.54	0.65
	SLOPE	477	1	190	194	0.98	
<i>Stenella l. roseiventris</i>	SHELF	50-135	3	19 (10-30)	556	0.10	0.37
	SLOPE	200-378	5	43 (15-90)	194	1.11	
<i>Stenella longirostris</i>	SHELF	135	1	70	556	0.12	0.11
	SLOPE	348	1	12	194	0.06	
<i>Tursiops aduncus</i>	SHELF	15-150	6	10 (6-16)	556	0.10	0.10
<i>Physeter macrocephalus</i>	SHELF	48	1	1	556	0.002	0.002
May 2010 survey							
<i>Stenella longirostris</i>	SHELF	176	2	15 (10-20)	339	0.09	0.26
	SLOPE	375	2	59 (8-110)	231	0.51	
<i>Peponocephala electra</i>	SLOPE	266	1	60	231	0.259	0.26
<i>Stenella attenuata</i>	SHELF	90	1	25	339	0.07	0.09
	SLOPE	281-381	2	12 (6-18)	231	0.10	
<i>Tursiops aduncus</i> *	SHELF	129	3	11 (6-17)	339	0.09	0.06
	SLOPE	259	1	9	231	0.04	
<i>Pseudorca crassidens</i>	SHELF	150	1	13	339	0.04	0.04
<i>Balaenoptera omurai</i> **	SHELF	82-160	1	4	339	0.01	0.01
October 2011 survey							
<i>Stenella l. roseiventris</i>	SHELF	101-461	1	90	263	0.34	0.50
	SLOPE		3	37 (18-65)	84	0.99	
<i>Stenella coeruleoalba</i>	SLOPE	500	1	25	84	0.30	0.30
<i>Stenella attenuata</i>	SHELF	150-408	1	12	263	0.05	0.24
	SLOPE		1	70	84	0.83	
<i>Tursiops truncatus</i>	SLOPE	296	1	18	84	0.21	0.21
<i>Tursiops aduncus</i>	SHELF	53-329	3	9 (5-18)	263	0.11	0.09
	SLOPE		1	2	84	0.02	
<i>Peponocephala electra</i>	SLOPE	517	1	2	263	0.008	0.008
December 2011 survey							
<i>Stenella attenuata</i>	SLOPE	372-692	3	110 (40-160)	91	3.62	3.62
<i>Grampus griseus</i>	SLOPE	405-562	2	13 (8-18)	91	0.29	0.29
<i>Stenella l. roseiventris</i>	SHELF		1	24	487	0.05	0.13
	SLOPE	70-311	3	28 (15-35)	91	0.55	
<i>Tursiops aduncus</i>	SHELF	20-20	5	9 (1-34)	487	0.09	0.09
<i>Orcaella brevirostris</i>	SHELF	13	1	12	487	0.02	0.02
<i>Pseudorca crassidens</i>	SHELF		1	25	487	0.15	0.02
	SLOPE	74-562	1	14	91		
<i>Stenella longirostris</i>	SLOPE	710	1	60	91	0.02	0.02
<i>Ziphius cavirostris</i>	SLOPE	880	1	2	91	0.02	0.02
March/ April 2012 survey							
<i>Stenella attenuata</i>	SLOPE	392-440	3	132 (70-250)	250	1.58	1.58

<i>Stenella longirostris</i>	SHELF SLOPE	56-710	2 1	188 (25-350) 100	330 250	1.14 0.4	0.81
<i>Tursiops truncatus</i>	SLOPE	254-407	3	25 (1-40)	250	0.30	0.30
<i>Stenella l. roseiventris</i>	SHELF SLOPE	34-838	1 3	2 33 (8-65)	330 250	0.006 0.39	0.17
<i>Peponocephala electra</i>	SLOPE	1051	1	2	250	0.15	0.15
<i>Pseudorca crassidens</i>	SLOPE	500	1	20	250	0.08	0.08
<i>Tursiops aduncus</i>	SHELF	5-6	3	8 (7-9)	330	0.07	0.07
<i>Orcaella brevirostris</i>	SHELF	17	1	3	330	0.009	0.009
<i>Balaenoptera physalus</i>	SHELF	50	1	2	330	0.006	0.006
May 2012 survey							
<i>Peponocephala electra</i>	SLOPE	706	1	130	222	0.59	0.59
<i>Stenella l. roseiventris</i>	SHELF SLOPE	75-350	1 2	22 63 (6-120)	386 222	0.06 0.57	0.24
<i>Feresa attenuata</i>	SLOPE	269	1	11	222	0.05	0.05
<i>Stenella attenuata</i>	SLOPE	947	1	8	222	0.04	0.04
<i>Orcaella brevirostris</i>	SHELF	12-25	2	6 (1-11)	386	0.03	0.03
<i>Tursiops aduncus</i>	SHELF	20-200	2	7 (2-11)	386	0.03	0.03

*= One of the 3 sightings made in shelf waters involved a double sighting of an earlier sighting made in slope waters on the same trackline day. However, the sighting is included for calculation of encounter rates for shelf waters but excluded from calculation of mean encounter rates (habitats combined); **= One of the sightings made in slope waters involved a double sighting of an earlier sighting made in slope waters on the same trackline day and is not included for calculation of sightings and encounter rates. Also, during the sighting, positions of 4 individual whales were between 82 m and 160 m. ^a = number of groups sighted; ^b = habitat specific; SLOPE = > 200 m depth coastal contour line; SHELF = ≤ 200 m depth coastal contour line; ^c = habitat combined for those species that occur both in shelf and slope waters

During the May 2010 survey four Omura's whales, a species, were observed feeding between 80-160m deep shelf areas, whereas during April 2011 two fin whales (adult and juvenile) were observed in 50 m deep shelf water, which most likely also represented fin whales. The whales looked skinny and presumably had just undergone a long migration to this feeding area, which is very rich in plankton including krill.

Spotted dolphins were the most abundant species in May 2009, December 2011, March/ April 2012, whereas in May 2010 and May 2012 melonheaded whales were most abundant. Dwarf spinner dolphins were second abundant in the May 2010 survey and were most abundant in the Bontang area during the December 2011 survey while maintaining a relatively high presence during the next surveys in the entire survey area. The presence of Gray's spinner dolphins was more fluctuative per season and were besides the May 2010 survey, where it was most abundant, only abundant in the March/ April 2012 survey.

Informal interview surveys

Informal interviews were held with resident fishermen from Sandaran village and Miang island as well as with fishermen from Bontang. Sandaran village is situated along an inlet with steep shelf and slope waters, where we made the sightings of four fin whales. Interviews were held with the official and ceremonial head of the village and several senior fishermen. Apparently, the first people came to live here around 1970 and according to these men, the whales have always been here since their arrival. Whales occur in or near the inlet daily during the northern and eastern wind seasons, which is from November to May. They are usually not seen

between June and September during the southern wind. This may also be related to the fact that waves are very high and fishermen do not go out fishing. Most fishermen use only a canoe made of a hollow tree, *jukung*, and they get very close to the whales. Although they are sometimes scared especially at night if they hear nearby blows, there never has been an incident that a canoe was overturned by a whale. Dugongs, *Dugon Dugong* were also occasionally observed near the mangroves near the villages. Complaints were made about boats coming from Madura fishing in the area and killing dolphins with spears for their oil and shark fishing. Although the intensity has decreased since patrols have increased in the Berau area, but these practices are still ongoing outside the marine protected area of Berau. The villagers have a positive attitude towards the whales and dolphins and do not wish them any harm.

In August 2010, a juvenile humpback whale was killed in Bontang waters whereas the occurrence of a mother and calf had been reported two years earlier in this area during the souther wind season (June-August). They were usually observed at calm weather conditions after southern wind and at a steep depth slope of 75-400m.

Information was obtained from Miang Island fishermen that during southern wind and full moon, often whales can be seen nearby the island. Several dolphin species (not identified at species level by fishermen) occur off the island as well as whale sharks that often enter in the large fishing pens, *bagangs*, and are released with great effort. The island is under threat because 'outsiders' use POTAS (a poison) at night for coral reef fishing and it bleaches the reef and causes harvest failures of locally cultured seaweed. The villagers used to harvest hundreds of tons seaweed per month, but this year no harvest succeeded. Other threats include the proposed building of a coal stock pile on the island and coal terminal. This will no doubt do major damage to the surrounding mangroves, corals and fish stocks, which is prey for the dolphins. Also intensified shipping lanes will form a disturbance to the many marine vertebrate species there. Reports have been submitted by Yayasan Konservasi RASI to the Provincial Environmental department to halt the construction of a coal terminal and stock pile.

Discussion

Species diversity

When combining our observation results in East Kutai and Bontang waters with our surveys conducted in Berau (Kreb & Budiono 2005; Kreb *et al.* 2008), the total number of species of cetaceans observed in East Kalimantan waters is 23 species as well as one dugong species (Appendix 2), which is 66% of the total number of cetacean species know to occur in Indonesia (Rudolph *et al.*, 1997). Within Bontang and East Kutai Districts during previous and current surveys at least 15 cetacean species were observed, which is 65% of total species observed in East Kalimantan and 43% of Indonesia's estimated number of cetacean species.

Conservation

Four large whale species encountered in Bontang and East Kutai waters, i.e. sperm whale, humpback whale, Omura's whale and fin whale of which the first two have a vulnerable Red List status and the latter an endangered Red List status, and therefore deserve a great deal of attention towards their conservation. Especially fin whales in the southern hemisphere are quite rare and the fact that they may spend a great deal of the year (at least 7 months or more) in the area of East Kutai and Bontang, indicates the importance of providing adequate habitat protection. Most other species have a data deficient Red List status or have not been

evaluated yet such as the dwarf spinner dolphin, which has the most restricted range of occurrence being confined to shallow inner waters of South East Asia (Rudolph & Smeenk, 2002) although in this study the species also occurred in deepwater habitat. Therefore, conclusively, all these species may deserve equal attention with regards to their conservation.

Based on the relatively high species richness and presence of species with a restricted range and a globally conservation dependent status, the waters off Bontang and East Kutai District have both a local and global biodiversity importance. The observation of calves for several species during both surveys indicates that this area may also be of significance in terms of breeding area.

East Kalimantan currently has one Marine Protected Area (MPA) in East Kalimantan water in Berau District of 12.700 km² in size and currently under revision. We propose to extend the MPA to at least include the areas of importance to whales, starting from the northern tip of East kutai district, Tanjung Mangkalihah to Miang island, because of the high presence of dolphin and whale species and high fish abundance including reefs off Birah birahan and Miang Island within the 500m depth cline to the shore (Appendix 3). Another area of importance extends from Miang Island to Bontang within 500m depth cline to the shore (Appendix 4). These areas should have special attention in terms of law-enforcement of destructive and unsustainable fishing techniques, i.e. bombing, fishing with poison, trawling. Patrolling in this area should be intensified to prevent these illegal fishing techniques and any further illegal attempts to kill cetaceans, which has been reported to be practiced by some non-resident fishermen from outside East Kalimantan.

In terms of ecotourism, the area between Miang Island and Tanjung Mangkalihah are very attractive for sustainable recreational fishing and offers a high potential for a responsible and controlled form of dolphin and whale watching using instructed and responsible local boats drivers.

Future project planning

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, we would like to increase our 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, we aim to continue conducting local education/ awareness campaigns to increase the knowledge and sense of belonging/ care of the local communities for natural resources and cetaceans in particular.

Community Education and Capacity Building

School campaigns

Community education with fishermen, local government and at schools were conducted between 4 and 14 October 2011. The goal was to increase the awareness and understanding of local communities and school children from elementary and high schools on the importance of protection of the marine environment and its resources with special reference to marine mammals.

In total, three islands and 18 fishermen kampongs were visited. The team was received by the official representative of each kampong, which called for senior fishermen or heads of fishermen groups to gather. During the gathering, information was provided on protective status of marine mammals and information obtained on the presence and threats of locally occurring cetaceans. Posters were distributed in each kampong, schools, fishery department, education department, environmental department.

Between 10th and 14th of October, 4 senior high schools, 4 junior high schools and one elementary school was visited at one island for the awareness campaign. The campaign took about 2.5 hours and both presentations on coastal habitats including mangroves, coral reefs, wildlife species and on cetaceans were presented. During the presentations quiz questions were asked and rewarded by pins and a final short essay contest with questions was conducted at the junior and senior high school, whereas at the elementary school a drawing competition was made. All winners received t-shirts, pins and booklets on cetaceans. The winners of the senior high schools essay contest will be invited to join a one day survey trip in the vicinity of Bontang waters and will be learning observation skills. There was a great response and enthusiasm during the campaign and the schools hope that these kinds of campaigns may be performed more often in the future.

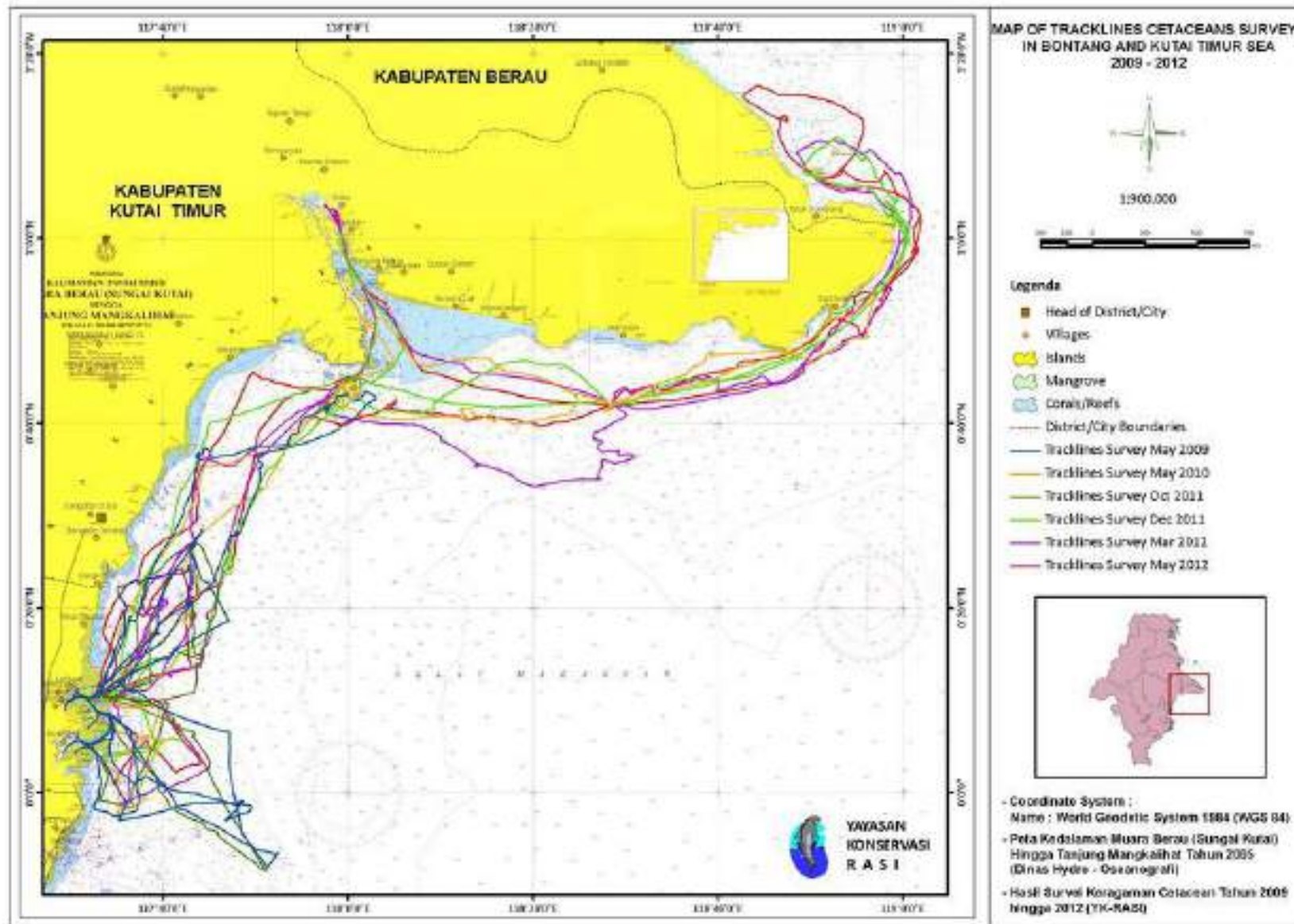
Education fieldtrip

Four winners of the senior high schools essay contest with their teachers and members of the local environment NGO BIKAL were invited to join a one day survey trip in the coastal waters off Bontang on the second of December 2012. During this trip, they were trained to be part of the observation survey team. Secondly, on one of the islands the entire group cleaned up inorganic waste on the island and some environmental information was forwarded by BIKAL and RASI. During the surveys, two cetacean sightings were made: firstly of dwarf spinner dolphins and secondly of a group of false killer whales. This was for all students their first direct experience of observing marine mammals and they were very positively impressed and surprised as they did not expect to find these mammals so close to their city. Especially the teachers hope that the fieldtrips can become a reoccurring event.

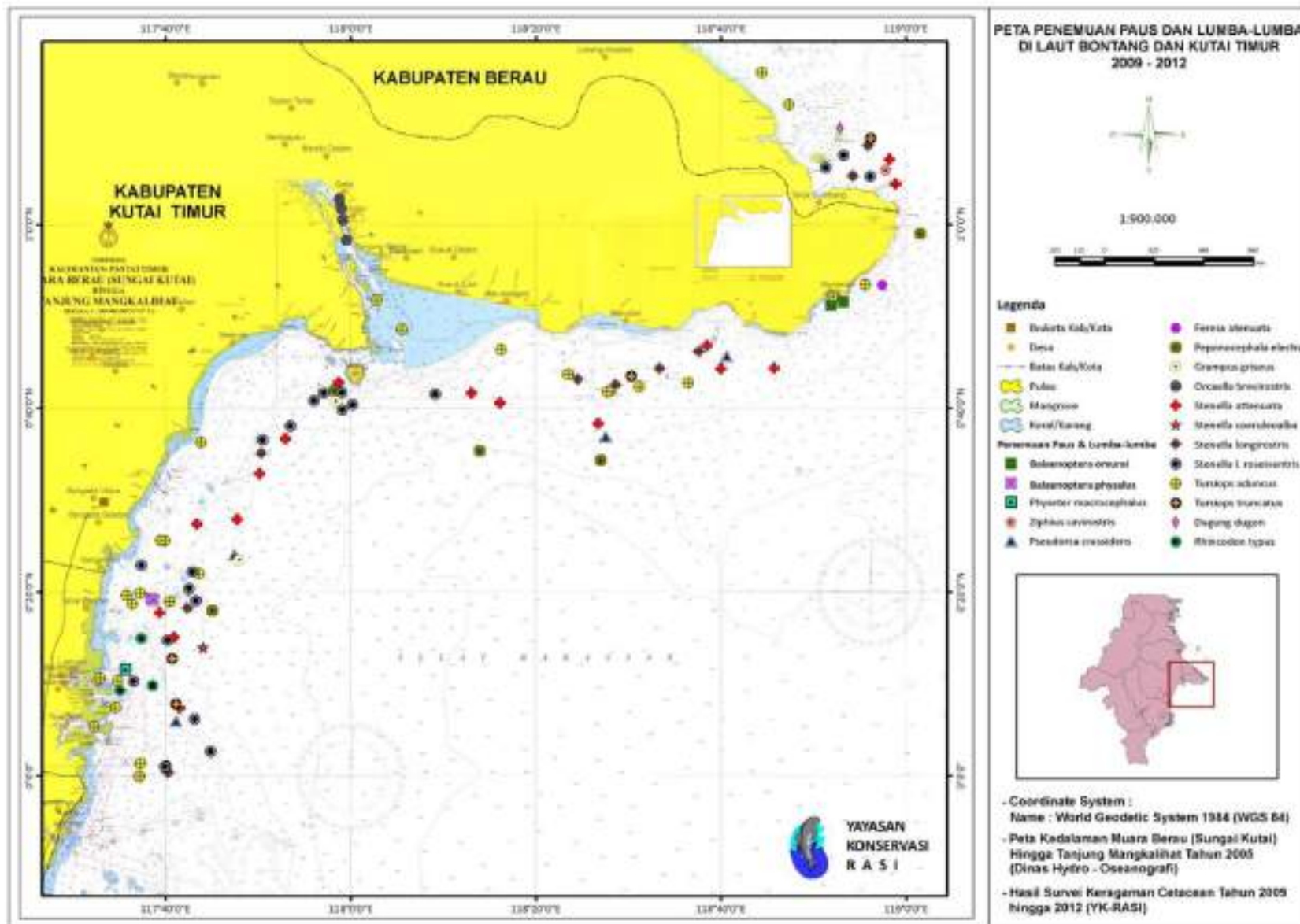
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APPENDIX 1. Map with observations of marine vertebrate species in 2009-2012



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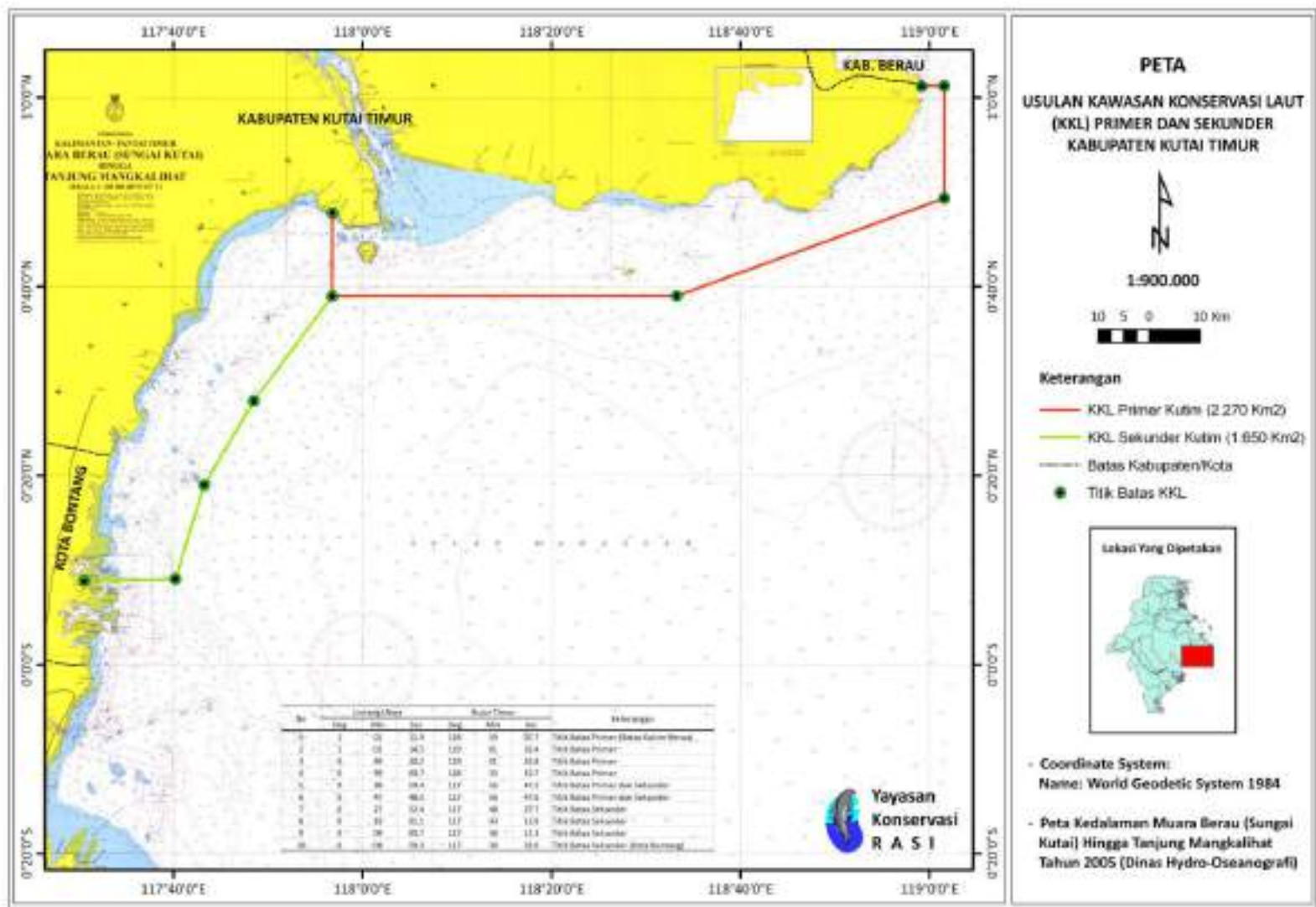


APPENDIX 2. Marine mammal species positive occurrence in East Kalimantan waters

	Species Latin Name	Species Common Name	Coastal areas of positive occurrence	Observation*/ interview
1	<i>Balaenoptera physalus</i>	Fin whale	East Kutai	observation
2	<i>Balaenoptera omurai</i>	Omura's whale	Bontang, East Kutai	observation
3	<i>Delphinus capensis tropicalis</i>	Long-beaked common dolphin	Berau	observation
4	<i>Delphinus delphis</i>	Short-beaked common dolphin	Berau	interview
5	<i>Feresa attenuata</i>	Pygmy killer whale	Berau, East Kutai	observation
6	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	Berau	observation
7	<i>Megaptera novaeangliae</i>	Humpback whale	Bontang , East Kutai	Interview, stranding
8	<i>Neophocaena phocaenoides</i>	Finless porpoise	Berau, Balikpapan Bay	observation
9	<i>Orcaella brevirostris</i>	Irrawaddy dolphin	Berau & Mahakam Delta, Balikpapan Bay, Sesayap, Sangkulirang Bay	observation
10	<i>Orcinus orca</i>	Killer whale	Berau	interview
11	<i>Peponocephala electra</i>	Melon-headed whale	Berau & East Kutai	observation
12	<i>Physeter macrocephalus</i>	Sperm whale	Bontang, East Kutai	observation
13	<i>Pseudorca crassidens</i>	False killer whale	Berau, Bontang & East Kutai	observation
14	<i>Sousa chinensis</i>	Indo-Pacific humpback dolphin	Berau Delta & Sesayap Delta	observation
15	<i>Stenella longirostris</i>	Spinner dolphin	Bontang, Berau & East Kutai	observation
16	<i>Stenella attenuata</i>	Pantropical spotted dolphin	Bontang, Berau & East Kutai	observation
17	<i>Stenella l. roseiventris</i>	Dwarf spinner dolphin	Bontang, Berau & East Kutai	observation
18	<i>Stenella coeruleoalba</i>	Striped dolphin	Bontang, Berau	observation
19	<i>Steno bredanensis</i>	Rough-toothed dolphin	Berau	observation
20	<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin	Berau, East Kutai, Bontang, Balikpapan Bay	observation
21	<i>Tursiops truncatus</i>	Common bottlenose dolphin	Bontang, East Kutai, Berau	observation
22	<i>Grampus griseus</i>	Risso's dolphin	East Kutai	observation
23	<i>Ziphius cavirostris</i>	Cuvier's beaked whale	East Kutai, Berau	observation
24	<i>Dugong dugon</i>	Dugong	Berau, Balikpapan bay	observation

*= Observations made during marine mammals surveys conducted in 2000-2003; 2007-2008; 2009; 2010; 2011;2012 in Berau district, East Kutai District, Bontang, Mahakam delta and Balikpapan Bay

APPENDIX 3. Map with proposed marine protected areas based on their primary and secondary importance for cetaceans, indicated with red and green borders, respectively. In these areas extra patrols is required to stop destructive and unsustainable fishing techniques and dolphin hunting.



PICTURES

All pictures were taken in Bontang and East Kutai © Danielle Krebs (YK-RASI) unless stated otherwise

Ziphius cavirostris- Cuvier's beaked whale



Balaenoptera physalus- Fin whale



Balaenoptera omurai- Omura's whale



Stenella longirostris - Gray's spinner dolphin



Stenella l. roseiventris – Dwarf spinner dolphin



Stenella attenuata-Pantropical spotted dolphin



by Innal Rahman (© YK-RASI)

Stenella coeruleoalba



Melon-headed whale – *Peponocephala electra*



Orcaella brevirostris – Irrawaddy dolphin



Pseudorca crassidens- False killer whale



Feresa attenuata- Pygmy killer whale



Grampus griseus – Risso's dolphin



By syachraini (© YK-RASI)



Tursiops aduncus- Indo-Pacific bottlenose dolphin



Tursiops truncatus- Common bottlenose dolphin



by Syachraini (© YK-RASI)

Other marine species

Rhincodon typus – whale shark



Coral reefs at Miang, Birah Birahan and Kaniungan Islands are still in good condition and should be well protected

Survey procedures (© YK-RASI)



Survey effort was performed on top of a boat at c. 4m eye-height

Interviews (© YK-RASI)



Miang Island



Sandaran Village



Birah Birahan Island



Beras basah Island

Campaign pictures (© YK-RASI)

Poster distribution in fishermen villages and kampongs in Bontang



Campaign at junior, senior and elementary schools



Survey trip with winners of high-school essay writing competition



Cleaning waste at Beras Basah Island



volunteership (© YK-RASI)

Volunteers making a valuable contribution to the research team

