

FINAL TECHNICAL REPORT

Cetacean species identification, distribution and relative abundance in the northern part of Derawan Islands Marine Park



Berau Cetacean Conservation Project

Photo by D. Krebs



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Rare Aquatic Species of Indonesia



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Preface and acknowledgements

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Abstract

A series of four cetacean monitoring surveys were conducted in mostly slope waters in the northern part of the Derawan Islands Marine Park in Berau, Indonesia between 2013 and 2014 covering a distance of 2235 km of survey effort. Within this marine park until now no zones or regulations are in place for the high abundance and diversity of cetaceans in this area. In the entire Berau District, 21 cetacean (sub)species and one dugong species were identified based on the current and earlier surveys and including reliable interviews, whereas during the 2013-2014 surveys nine (sub)species have been identified in the northern part of the park alone, including spinner dolphins (*Stenella longirostris*), dwarf spinner dolphins (*Stenella l. roseiventris*), spotted dolphins (*Stenella attenuata*), Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), common bottlenose dolphins (*Tursiops truncatus*), Risso's dolphins (*Grampus griseus*), Melon-headed whales (*Peponocephala electra*), Fraser's dolphins (*Lagenodelphis hosei*) and false killer whales (*Pseudorca crassidens*). The first five species mentioned have a year-round presence in the area and the presence of calves indicate their dependence on these areas. Different groups and individuals of Indo-Pacific bottlenose dolphins showed a particular site fidelity among different seasons and years for either Derawan Island or West Maratua and Kakaban Islands. Four zones of particular ecological relevance for cetaceans were identified totalling a water surface of 390 km². These zones are recommended as limited usage area with some limitations related to fisheries and boat traffic, whereas in the entire survey area including the four zones, other measures are recommended to control large ship traffic, underwater noise by seismic or sonar, reduce pollution, reduce any negative impacts of coastal development and tourism and provide effective protection for protected marine wildlife. Threats include fish depletion because of reef destruction through bombing and fishing with poisonous compounds as well as the use of reefs for construction of roads and runways. Other threats are direct catch and kill of dolphins by non-resident fishermen for oil and shark bait. Random patrols are needed to prevent illegal fishing techniques such as bombing, using poison and trawling and any killing of protected marine wildlife. Local awareness should be regularly increased and fishermen should be facilitated to engage in sustainable fishing practices and/or seaweed/seacucumber/fish cultivation. There is a good potential for ecotourism through responsible forms of dolphin and whale watching, which may benefit fishermen that are being limited in their fishing grounds inside the core zones of the marine park.

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 and Kreb *et al.*, (2013) at least 35 cetacean species. 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 was 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, 2007-2012) in identified important coastal dolphin areas in East Kalimantan, including the marine protected area of the Berau archipelago in East Kalimantan (Kreb *et al.*, 2005; 2008). Based on the overall analysis of these surveys the Berau MPA appeared to possess the highest species diversity and cetacean abundance compared to equally large-sized areas in East Kalimantan. The area encompasses a diversity of habitat (delta, reef, shelf and slope waters) and marine life and supposedly provides a migratory passage for larger whales between the Pacific and Indian Ocean. Surveys conducted in Berau in 2007 and 2008 indicated the presence of fifteen species of cetaceans.

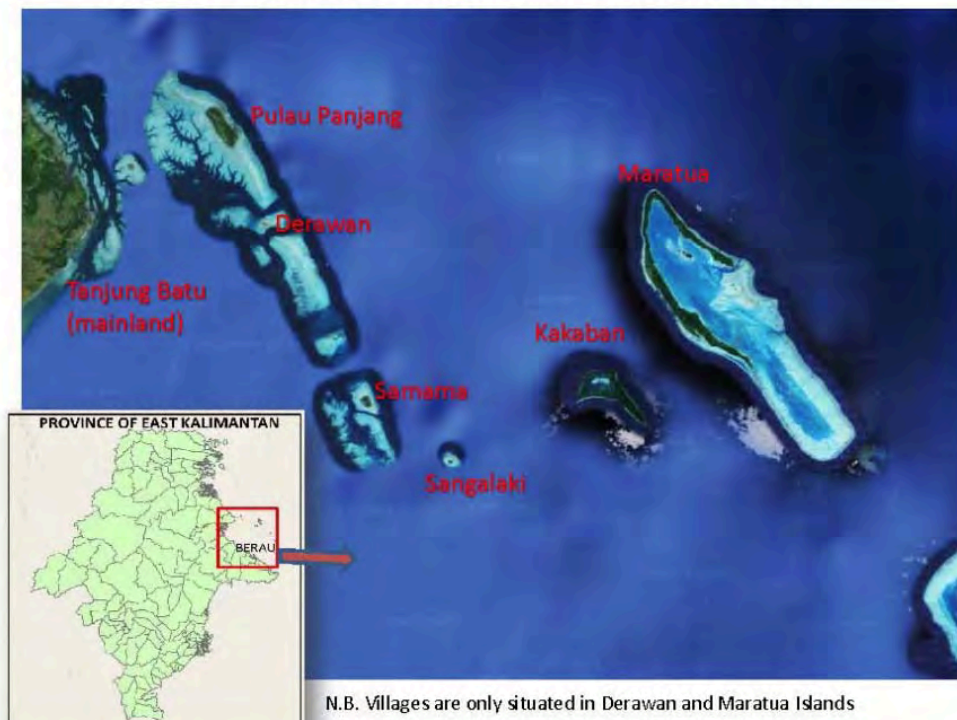
Threats involve illegal fishing practices, such as blasting, trawling, overfishing, by-catch and directed, illegal captures of dolphins for the international market and as shark bait, of which many activities are conducted by people from outside the area, which stresses the need for an intensified patrolling. Although Berau has a declared MPA and patrols nearshore have increased somewhat, the outer islands such as Maratua are less frequently patrolled and more susceptible to illegal fishing activities. Dugongs and turtles have traditionally been hunted by local residents using parts of bones and shell for several handicrafts, urging the need for increased awareness as well as improper waste disposal.

The project aims to protect a high diversity of cetaceans, dugongs and other large marine vertebrates in the Marine Protected Area of Berau for which currently no specific protection zones and management is in place. The surveys were designed to indicate important and sensitive dolphin habitat that will be recommended for increased management measures as well as estimate the relative abundance of different species of cetaceans and their specific threats. Besides providing recommendations to local park management authorities the collected data will also provide reliable spots for dolphin observing that will be shared with engaged, local fishermen that have been and will be trained to conducting a responsible form of eco-tourism.

Methods

Surveys were conducted in the northern islands part of the Derawan Islands Marine Park (Figure 1) during four periods between 24 June-8 July 2013 (period 1); 29 September- 10 October 2013 (period 2); 12-21 June 2014 (period 3); 10-20 October 2014 (period 4). The survey area encompassed the northern islands group within the MPA because a higher diversity of cetacean species was detected here during earlier surveys (Kreb & Budiono, 2008) because of the abundant availability of slope waters (>200m) whereas the southern islands within the MPA mostly represent shelf areas. It is planned to survey this part of the MPA in 2015-2016.

Figure 1. Northern islands of Derawan Archipelago, Berau District



Cetaceans were visually searched for during each period during 27 boat-days in total and 6-7 boat-days per period.

Pre-arranged survey transects were designed to cover mostly slope habitat and habitat surrounding a 10 km radius from islands covering a survey area of 3,028 km². The selection of this survey area was based on results of previous surveys conducted in 2007-2008 in the area, which obtained highest density records in slope habitat and habitat within 5 km radius of reefs. The transects did not follow traditional parallel-running or zig-zag line-transects but followed routes of which each route could be finished in one day and considered as one transect. During one survey period, three routes were followed and each route was repeated twice. 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. 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 15 m length and width of 3 m (12 ton weight estimation), and with an inboard diesel engine (Isuzu) of 40 hp and Yanmar engine (20 hp). The boat moved at an average speed of 14,5 km/ hour during all surveys combined. Observations were made from an observation platform at 4 m eye-height by four active front observers, of which two were scanning continuously within an 180° angle from the beam by aid of hand-held binoculars (Nikon, 7x50) attached to a pole. Two other front observers searched with the unaided eye. A fifth team member recorded all sighting effort data and environmental and geographical conditions using a GPS Garmin GPS Map 62s every 30 minutes, including speed, clouds, Beaufort, visibility, tide. The sixth observer observed with the unaided naked-eye facing backwards from the rear of the boat. 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 were also directly stored in the GPS. Positions changed every 30 minutes.

The total observation time during sightings for all four surveys was 31,0 hours, and the mean observation time per sighting was 20 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, passing boats 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.

Semi-structural (80 questionnaires) and informal interviews during the surveys were held with fishermen from the villages Teluk Harapan, Teluk Alulu, Payung-Payung, Bohe Silian on Maratua Island and Derawan Island about the species, distribution, threats and conservation of marine mammals and larger marine vertebrates in all four villages on Maratua island.

Analysis

In order to compare relative abundance between species, sighting rates and encounter rates were calculated per km linear transect per season. Because the 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.

Photographs of dorsal fins were analyzed and only those with very clear diagnostic shapes, notches, cuts were used to check for site fidelity of individual cetaceans among the four different surveys. The following number of fin pictures of the following species could be identified: spinner- (28) and dwarf spinner dolphins (4), Indo-Pacific-(90) and common bottlenose dolphins (6), melon-headed whales (17), Fraser's (4) and Risso's dolphins (34). Because only sufficiently enough good identifiable dorsal fin pictures were collected in different seasons of Indo-Pacific bottlenose dolphins, only the site fidelity for this species is discussed in the results.

In order to estimate core areas of cetacean sightings, relative abundance and in terms of behaviors, on effort tracks and all sightings for all four surveys were analyzed in ArcMap 10.2 and overlaid with a 2 km x 2 km grid. The number of on-effort Irrawaddy dolphin sightings plus the total number of individual dolphins in each grid cell was divided by the sum of on-effort survey tracks within each grid cell to generate an encounter rate for each cell. Cells with varying encounter rates (individuals/km) and sighting rates (sightings/km) from low to high were then colour-shaded to provide a graphic indication of high density areas per season. Dominant group behaviors of each sightings were also ranked from behaviors with low (fast travel), medium (milling, slow travel), high (play, mating) and top priority (feeding and resting) for area conservation per cell grid per season. Priority areas for conservation were also calculated by summing the different ranks scored for encounter and sighting rates (lowest scores 1-highest scores 4), as well as ranks scored for the different priorities assigned to different behaviors for each season per quadrant, where one quadrant area could score a maximum rank of 16. With regards to assigning ranks to behaviors, in case of mixed species sightings if different dominant behaviors were recorded then the behavior with the highest priority for area conservation was scored.

Results

Distribution and relative abundance

Four visual surveys, totalling 27 survey days were conducted in mostly slope waters in the northern part of the Derawan Islands Marine Park in the months of June/ July and October in 2013 and 2014. Total survey effort was 2235 km (151h), which included 1739 km (120 h) of search effort of all surveys combined and 496 km covered while following groups for observation (31 h) (Table 2; Appendix 1).

During the 2013-2014 surveys in the northern part of the Derawan Marine Park, a total number of 90, on-effort cetacean sightings with positive species identification were made comprising nine different cetacean species (Appendix 2). The total number of cetacean species that have been directly observed during these surveys include nine species. When including earlier surveys in the marine park, the total number of cetacean species directly observed are 18 species. Seasonal differences in species occurrence and diversity is shown in Table 1. When including reliable interviews, the total number of species inside the Derawan Islands Marine Park equals 20 species plus one sub-species and one dugong species (Appendix 3).

Resident species that are present in both northern and southern areas during different seasons include (dwarf) spinner dolphins, spotted dolphins, common and Indo-Pacific bottlenose dolphins. All five species plus melon-headed whales have been observed with calves. Species that were also encountered in two seasons but not consistently are melon-headed whales and Fraser's dolphins. Regular seasonal species are false killer whales, which were often found in the month October. Resident species in the delta and nearshore areas are Irrawaddy dolphins, Indo-Pacific humpback dolphins and finless porpoises. Rare visitors include long-beaked common dolphins, pygmy killer whales, short-finned pilot whales, striped dolphins, rough-toothed dolphins, Risso's dolphins, and Cuvier's beaked whales.

Table 1. Search effort and sightings from 2013-2014 sightings in northern Derawan Islands Area



Search effort and sightings	June 13	Oct 13	June 14	Oct 14	combined
Search effort (km)	426*	419	333	472	1650
Search effort (h)	29,4*	28,2	23,5	32,7	113,8
Sightings observation effort (h)	5,8	9,1	6,4	9,3	30,6
No of sightings (n)**	22	26	17	25	90
Total no. individual dolphins	1264	1799	1344	1549	5956
Sighting rate (sightings/km)	0,05	0,06	0,05	0,05	0,05
Encounter rate (dolphins/km)	2,97	4,29	4,03	3,28	3,65
Mean group sizes	57	69	79	62	66
Species encountered	5	6	7	8	9
Mixed species sightings	3	4	5	2	14
% mixed species sightings (of all n)	14%	15%	29%	8%	16%

*excluding delta and nearshore habitat because only surveyed in one survey and representing habitat with a lower density of sightings.

**including dependent sightings and mixed species sightings

Table 2. Seasonal/ annual occurrence of cetaceans in northern Derawan Islands Marine Park

Marine mammal Species (latin name)	Marine mammal Species (common name)	Oct 2003	Oct 2007	April 08	June 2013	Oct 2013	June 2014	Oct 2014
<i>Berau Northern Islands Survey Area</i> (Derawan, P. Panjang, P. Sangalaki, P. Kakaban, P. Maratua)								
<i>Delphinus capensis tropicalis</i>	Long-beaked common dolphin							
<i>Dugong dugon</i>	Dugong							
<i>Feresa attenuata</i>	Pygmy killer whale							
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale							
<i>Lagenodelphis hosei</i>	Fraser's dolphin							
<i>Peponocephala electra</i>	Melon-headed whale							
<i>Pseudorca crassidens</i>	False killer whale							
<i>Stenella attenuata</i>	Spotted dolphin							
<i>Stenella coeruleoalba</i>	Striped dolphin							
<i>Stenella longirostris</i>	Spinner dolphin							
<i>Stenella l. roseiventris</i>	Dwarf spinner dolphin							
<i>Steno bredanensis</i>	Rough-toothed dolphin							
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin							
<i>Tursiops truncatus</i>	Common bottlenose dolphin							
<i>Grampus griseus</i>	Risso's dolphin							
<i>Berau Delta Survey Area</i>								
<i>Neophocaena phocaenoides</i>	Finless porpoise	x				x	x	x
<i>Orcaella brevirostris</i>	Irrawaddy dolphin	x				x	x	x
<i>Sousa chinensis</i>	Indo-Pacific humpback dolphin	x				x	x	x
<i>Berau Southern Islands Survey Area</i> (Malalungun, Talisayan, Kep. Mataha, Bilang-bilangan, Kaniungan Besar, Tj. Mangkalihat)								
		April 08	May 12					
<i>Dugong dugon</i>	Dugong			x	x	x	x	x
<i>Peponocephala electra</i>	Melon-headed whale			x	x	x	x	x
<i>Stenella attenuata</i>	Spotted dolphin			x	x	x	x	x
<i>Stenella longirostris</i>	Spinner dolphin			x	x	x	x	x
<i>Stenella l. roseiventris</i>	Dwarf spinner dolphin			x	x	x	x	x
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin			x	x	x	x	x
<i>Tursiops truncatus</i>	Common bottlenose dolphin			x	x	x	x	x
<i>Ziphius cavirostris</i>	Cuvier's beaked whale			x	x	x	x	x

x = area not surveyed during that particular month;  = surveys before 2013;  = surveys in 2013 & 2014

The total number of sightings and dolphins per km search effort in the northern Derawan Islands Area per survey month were not significantly different and were considered high. Mixed species sightings were observed during all seasons and were rather high during June 2014, when also average group sizes observed were larger. Mixed species aggregations of melon-headed whales and Fraser's dolphins were observed during June and October 2014.

Spinner dolphins had consistently larger encounter rates (1,4-2,2 dolphins/km) due to their relatively larger group sizes and were more frequently encountered overall (Table 3). Second and third most abundant were spotted dolphins and dwarf spinner dolphins. Spotted dolphins were more often encountered in the month October than spinner dolphins but in lower group sizes. October is a month, with changing wind conditions where more rare transient species are encountered such as false killer whales, Risso's dolphins, long-beaked common dolphins, pygmy killer whales, short-finned pilot whales, striped dolphins.

Indo-Pacific bottlenose dolphins were encountered on average in lower depth areas than the other species encountered and mostly in shelf (<200m) or nearshelf habitat.

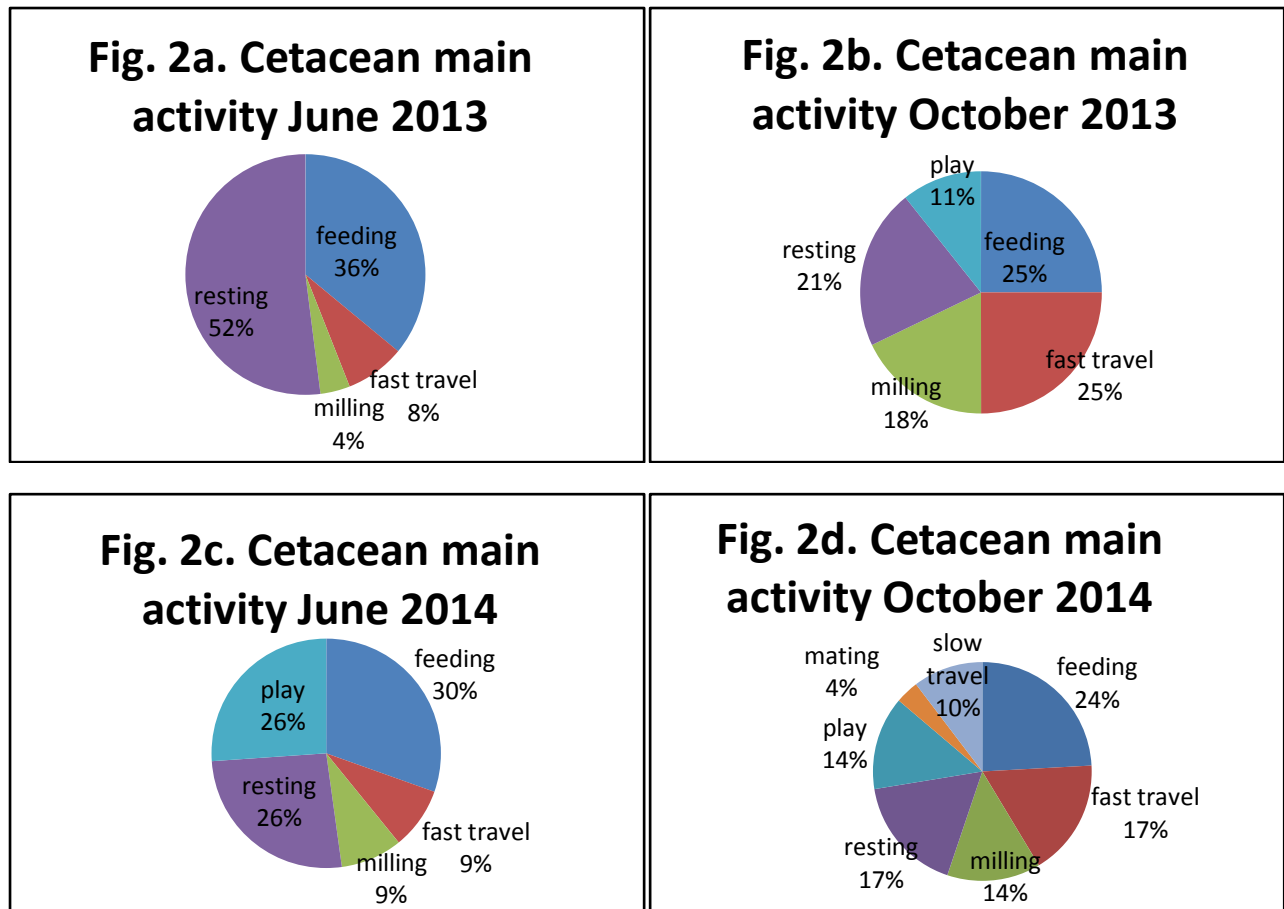
Table 3. Encounter and sighting rates of individual cetacean species in decreasing order of relative abundance per seasonal survey in northern Derawan Islands survey area

Species	mean depth (m)(min-max)	n sightings	N total indiv.	Mean best group size	min-max group size	Encounter rate (indiv/km*)	sighting rate (n/km*)
June/July 2013: search effort 426 km*							
<i>Stenella longirostris</i>	402 (210-1575)	10	743	74	14-170	1.744	0.023
<i>Stenella l. roseiventris</i>	278 (210-330)	3	278	93	18-170	1.451	0.007
<i>Stenella attenuata</i>	338 (210-630)	7	129	18	9-30	1.432	0.016
<i>Tursiops aduncus</i>	270 (251-293)	3	56	19	9-35	1.244	0.007
<i>Tursiops truncatus</i>	414 (210-618)	2	56	28	16-40	0.869	0.005
October 2013: search effort 515 km							
<i>Stenella longirostris</i>	462(202-1015)	6	840	140	2-650	1.631	0.012
<i>Stenella attenuata</i>	218 (210-250)	10	659	66	4-350	1.280	0.019
<i>Stenella l. roseiventris</i>	229 (210-247)	2	125	63	55-70	0.243	0.004
<i>Tursiops truncatus</i>	278 (205-447)	7	80	11	1-24	0.155	0.014
<i>Pseudorca crassidens</i>	208 (205-210)	2	48	24	13-35	0.093	0.004
<i>Tursiops aduncus</i>	247	2	40	20	20	0.078	0.004
<i>Tursiops spp</i>	210	1	6	6	6	0.012	0.002
June 2014: search effort 333 km							
<i>Stenella longirostris</i>	532 (201-1015)	10	711	71	5-325	2.135	0.030
<i>Stenella attenuata</i>	470 (210-1015)	4	205	51	25-90	0.616	0.012
<i>Tursiops truncatus</i>	447	3	128	43	9-105	0.384	0.009
<i>Stenella l. roseiventris</i>	447	1	120	120	120	0.360	0.003
<i>Peponocephala electra</i>	618	1	105	105	105	0.315	0.003
<i>Tursiops aduncus</i>	158 (15-210)	3	40	13	7-17	0.120	0.009
<i>Lagenodelphis hosei</i>	618	1	35	35	35	0.105	0.003
October 2014: search effort 472 km							
<i>Stenella longirostris</i>	633 (293-885)	5	1040	208	70-450	2.203	0.011
<i>Stenella l. roseiventris</i>	653 (210-1575)	4	145	36	15-55	0.307	0.008
<i>Stenella attenuata</i>	319 (210-685)	6	125	21	5-50	0.265	0.013
<i>Peponocephala electra</i>	885	1	100	100		0.212	0.002
<i>Tursiops truncatus</i>	232 (64-447)	4	64	16	6-30	0.136	0.008
<i>Lagenodelphis hosei</i>	885	1	35	35		0.074	0.002
<i>Tursiops aduncus</i>	121 (10-406)	4	29	29	1-10	0.061	0.008
<i>Grampus griseus</i>	1015	1	8	8	8	0.017	0.002
<i>Tursiops spp.</i>	885	1	3	3	3	0.006	0.002

*excluding delta and nearshore habitat because only surveyed in one survey and representing habitat with a lower density of sightings

Behaviors

Dominant general behaviors that were recorded during each sighting were plotted in a frequency pie chart per season (Figures 2a-2d).



In the months June, slightly more diurnal feeding behaviors were noted as in October. Individual and general behaviors are described in Appendix 6. An interesting observation was made of a mixed species aggregation in October 2014 of Fraser's dolphins and melon-headed whales. The first species was actively engaged in mating behavior and more or less encircling the group of melon-headed whales that spent most time logging and milling. Both species have been observed in an earlier survey in June 2014 together in a mixed aggregation, where both species were swimming together and performed bowriding. Probably the gathering in a large group may be mutually beneficial to both species.

Site fidelity

At least 24 different individuals of Indo-Pacific bottlenose dolphins could be identified based on their dorsal fin. Three different sightings in October 2013 and June and October 2014 revealed an overlap of individual dorsal fins in the area of West Maratua, West and Southwest Kakaban. In addition, two sightings in October 2013 and 2014 also showed overlap of similar dorsal fins in the area of Derawan island, which gives some preliminary indications about the site fidelity of different groups of Indo-Pacific bottlenose dolphins. No overlap of dorsal fins was made between the two different locations.

Core areal identification

The average depth at locations where cetaceans were observed was 280m and a maximum depth of 1575m. Indo-Pacific bottlenose dolphins were observed three times sightings at locations with depths not exceeding 20m. These locations were all reefs or near islands and/or reefs. The behaviors displayed at these shallow locations consisted of resting and feeding indicating the importance of reefs for this species. The importance of reefs as food chain and geo-physical presence of reefs creating counter currents and high fish densities was also found in the present study where median and average perpendicular distance of cetaceans' groups to reefs was 3,4 and 5,7 km, respectively. Seventy-five out of ninety sightings (83%) was made within 5 km distance to reefs. When corrected for km searched within and outside a 5km radius from islands and reefs, the number of sightings per km search effort (0,03) outside the 5km distance radius was more than twice lower than the number of sightings per km search effort (0,07) within a 5km radius from islands and reefs.

Identified areas with high sighting rates and encounter rates are indicated in Appendix 4a and 4b. Whereas priority areas for conservation in terms of habitat usage such as feeding, resting and socializing are indicated in Appendix 4c. It should be born in mind that while recoding behavior activities these are moment snapshots and while drawing larger kwadrant areas of 5x5km it becomes clear that areas have multipurposes habitat usages and one cannot indicate areas where dolphins only rest or feed or perform socializing activities. The final shapes of ecologically relevant cetacean core habitat combining high year-round abundance and dominant behaviors are presented in Appendix 4d.

Areas of high ecological relevance for cetaceans are illustrated in Figure 3 and include four zones totalling a water surface area of 390 km²:

Zone 1, 170km² - Corridor between North Kakaban and West Maratua to Southeast Kakaban and South Maratua: year-round feeding, resting, socializing habitat for mostly spinner-, spotted- and Indo-Pacific bottlenose dolphins and seasonal usage by false killer whales (October) and killer whales (the latter based on interviews, April-May & October). Larger whales have been observed by residents to either travel through the Maratua-Kakaban corridor and/or feed near the artificial fish shelter (rumpon) northwest off Maratua (months February-June and November-January at calm days only). Nb. Southeast Maratua was noted as mating habitat for Fraser's dolphins and resting habitat for melon-headed whales but is not included in the zone because it involved a one-time sighting and because of the low neighbouring cetacean densities and/or yearly occurrence.

Zone 2: 12km² – North Maratua: year-round cetacean feeding and resting habitat of dwarf-spinner- and spinner dolphins, common bottlenose dolphins, melon-headed and fraser's dolphins.

Zone 3: 60km² – South- Southwest Kakaban: year-round feeding, resting, socializing habitat for dwarf-spinner and spinner dolphins, common- and Indo-Pacific bottlenose dolphins

Zone 4: 156km² – Southeast Pulau Panjang until Southeast Derawan: year-round feeding, resting, socializing habitat of dwarf-spinner- and spinner dolphins, common bottlenose dolphins, spotted dolphins and seasonal habitat for Risso's dolphins (October).

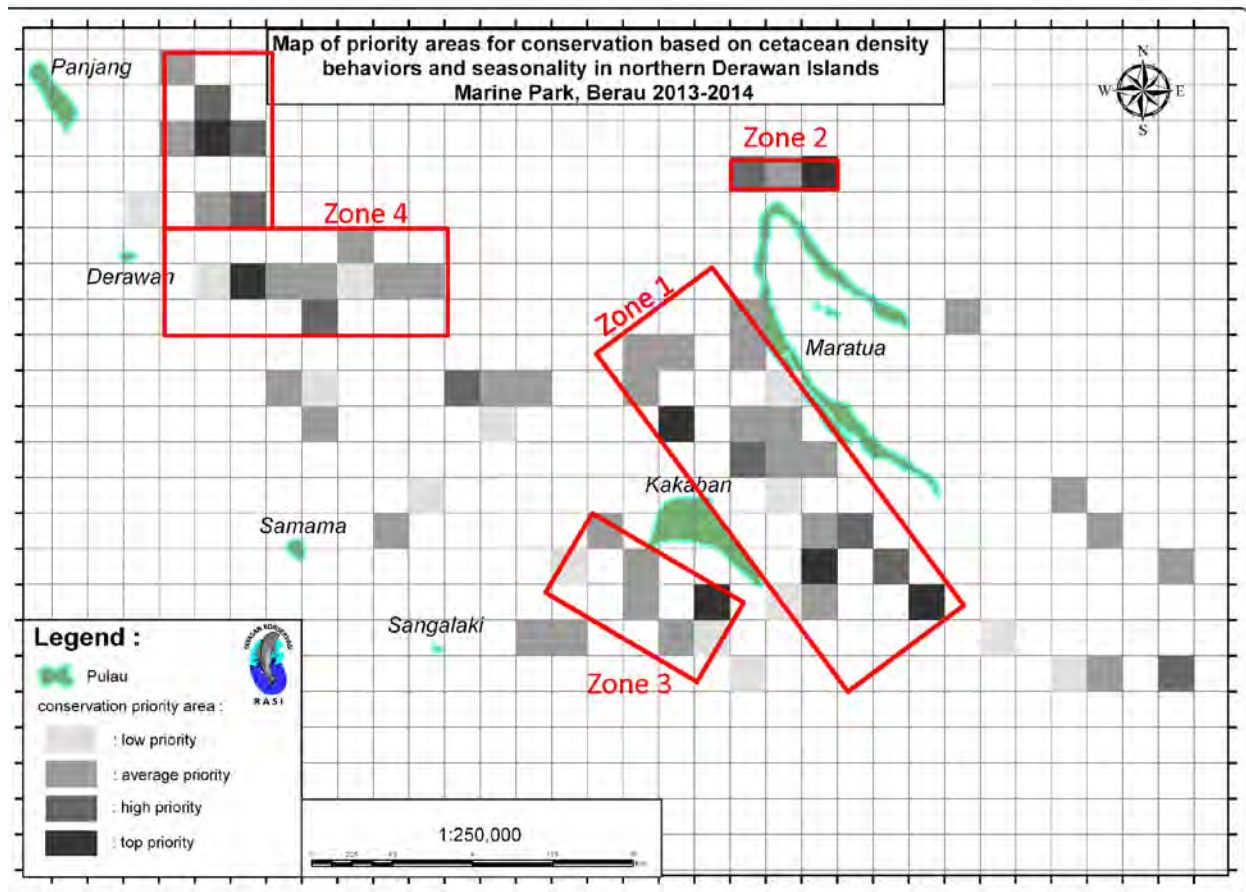


Figure 3. Map of areas designated as zones of high ecological relevance for cetaceans (with red boundaries).

These four zones are recommended as **limited usage area** with the following limitations:

- **Fishing:** Fishing gears that are allowed in the four zones include traditional fishing gear, and semi-active gear: Pole and Line (*Huhate*), Troll line (*Pancing Tonda*), Hand Line (*Pancing Ulur*), Fly fishing (*Pancing Layang-layang*), spear fishing, Artificial Fish House (*Rumpon*) lights,. No destructive fishing is allowed such as, but not limited to, trawling (*Pukat Harimau*), purse seine fishing (*Pukat Cincin Pelagis besar*) and shark long line fishing in deep areas and sodium, potassium cyanid, bom, detergent, Tuba root, Tobacco and other techniques that may impact negatively on the reefs ecosystem. Fishing can only done with one boat and below 5GT size.
- **Boat traffic:**
 - Boats with high-frequency generating engines such a speedboats should travel at reduced speed (max 20 km/h) when dolpins are observed within visual distance.

The following measures for cetaceans apply to **all** the four priority conservation zones as well as the entire marine park area:

- **Boat traffic/ tourism:**
 - No oceanic tanker ships allowed to pass through the entire marine park area
 - No major large-shipping lanes with frequent traffic in the entire marine park area

- Controlled dolphin & whale watching (Appendix 5) with limited number of boats/ restricted observation time and safe distance between boats and cetaceans.
- **Acoustic underwater impacting activities:**
 - No military sonar or seismic activities allowed in the entire marine park area
- **Pollution**
 - No non-organic waste disposal at sea or on the beach
 - No discarded nets thrown at sea
- **Wildlife protection:**
 - No taking, injuring, killing, disturbing of all protected animals including cetaceans, dugong, manta, sharks and turtles.
- **Coastal development:**
 - No major development that could violate the environment especially of the reefs in the four zones and inside the entire marine park through pollution, increase sedimentation, reef destruction.

General conservation recommendations that apply to the entire Derawan Islands Marine Park are:

- Enforce and socialize observation protocols for cetaceans with speedboat drivers that bring tourist and divers.
- Socialization of marine mammals stranding protocol (Appendix 6) and establishing and training of stranding response network
- Education on cetaceans and other protected marine species including field trips (local, industry, children, adults)
- Monitoring through community/ park or government rangers
- Help to engage and support local communities in sustainable livelihood (ecotourism, sustainable fisheries)
- Marine debris socialization (disposal, removal, recycling)
- Periodic scientific research of species populations, threats (for MPA evaluation over time)

Interview surveys

The results of the eighty questionnaires and informal interviews about the distribution and conservation of marine mammals and larger marine vertebrates were as follows: The results of the interview surveys indicated that the majority of fishermen are small-scale fishermen and conduct for between 95%-100% per village fishing by angling. Only 5% in some villages fish with nylon gillnets. No dolphins has ever been caught by any of the respondents. Communities' target fishes include: grouper, tuna, snapper, trevally, octopus, reef fish. Dolphins are encountered throughout the year near Maratua and Kakaban Island, whereas whales are usually seen during calm sea days during the northern wind season or months 1-6. Most whales observed are mostly large 70-90% of respondents in each village compared to medium sized whales. Orcas are occurring quite regularly in the area (April-May & October) in small group sizes up to 2-3 individuals and several anecdotal interactions exist.

The most unique authentic story was told by Mr Dervin, a senior villager who was saved by a group of dolphins after his ship capsized during a storm. Because of this story since 1998 no more dolphins are being hunted by the population of Maratua and Derawan, which used to be done for shark bait. The islanders identified two species of turtles, i.e. green and hawksbill turtle and also indicated turtle nesting sites in Sangalaki as well as in the southern islands of Belambangan, Bilang-bilangan,

Mataha, whereas turtle migration takes place all year-round. Turtle mating also takes place at least between May and October. Turtles feed on the west side of Maratua Island in front of the village of Payung-payung. All villagers were already aware that cetaceans, turtles and dugongs are protected. All respondents answered that dugongs' populations had decreased because of the boat traffic on feeding areas and the fact they are being hunted.

Discussion

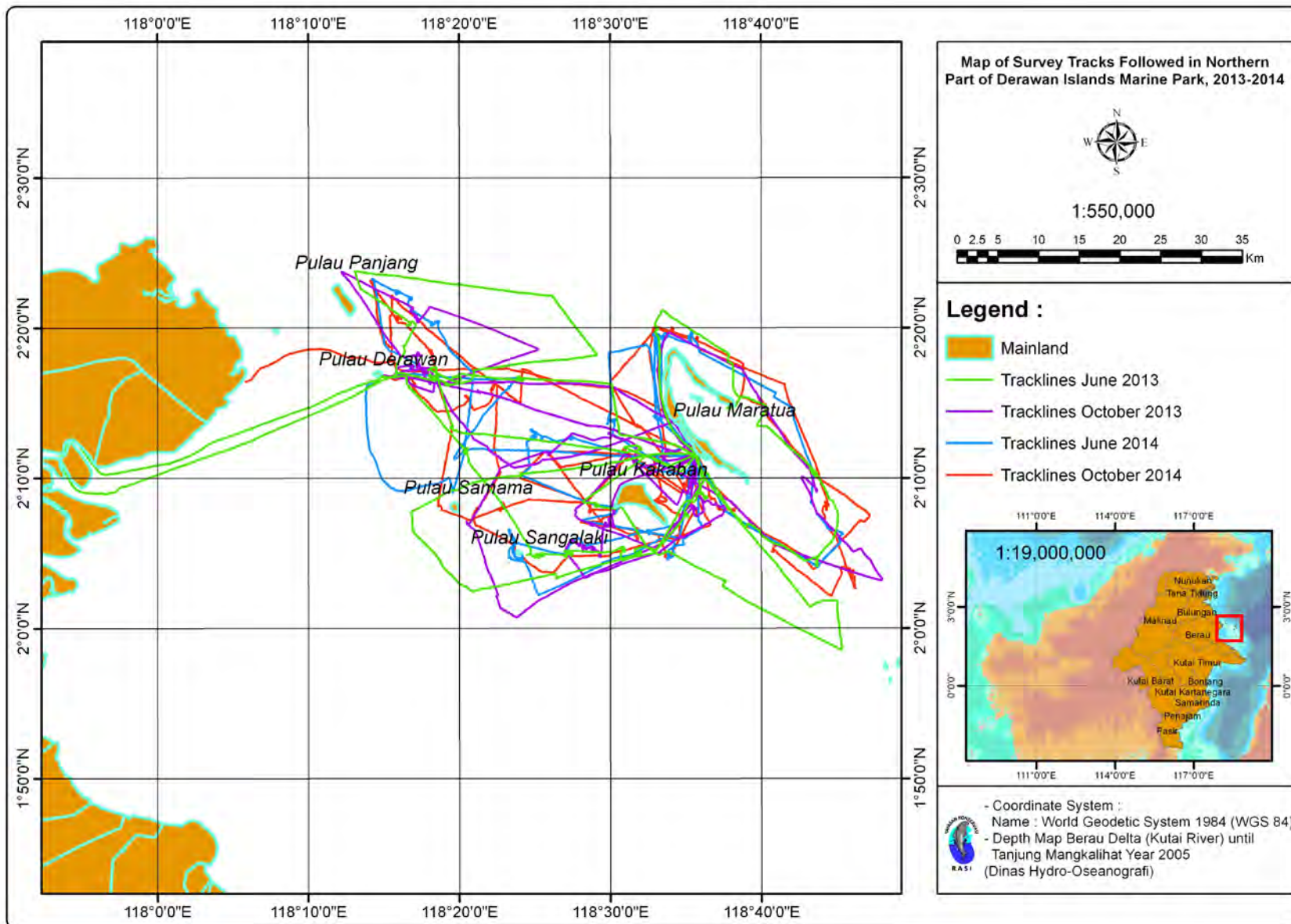
All species observed in the northern part of the Derawan Islands Marine Park were species that either were of least concern or species of which no sufficient data was available. However, because of their uncertain global status, their Indonesian protected species status and based on their overall high sighting rates (over 50% of all sightings scored a 'relative high' rank of more than 0,2 sightings/km until 0,7 sightings/km), the presence of caves and their dependence on specific areas near islands and/or reefs, we recommend the implementation of the four zones as explained earlier as limited-usage areas for cetaceans in the northern part of Derawan Marine Park. We also recommend the earlier described regulations and policies for the entire marine park area and some specific to the cetacean zones.

Moreover, species, which have a conservation dependent status according to IUCN Redlist criteria including the fin whale (observed in the southern part of the marine park in Teluk Sumbang), Irrawaddy dolphin, finless porpoise and Indo-Pacific Humpback dolphin, which were observed during earlier surveys in 2007 and 2008 in the Berau Delta. As such these areas deserve a high conservation priority too and may need zonation. In order to do so, more research is planned in these areas in 2015 and 2016 to provide more details on the populations inhabiting the Berau delta and on the locations and seasons of fin whale occurrence.

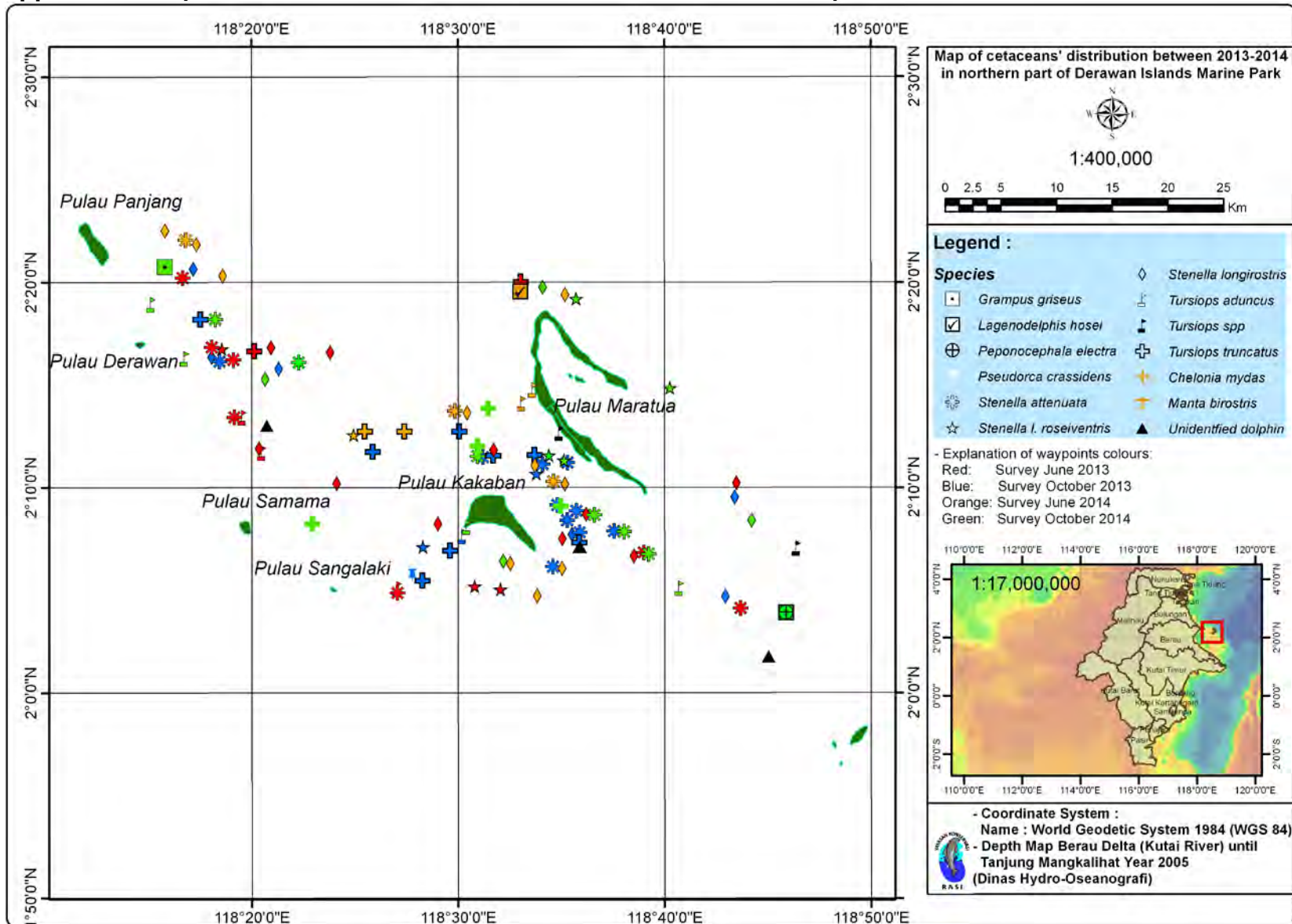
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Appendix 1. Map of survey tracks followed in northern part of Derawan Islands Marine Park, 2013-2014.



Appendix 2. Map of cetaceans' distribution between 2013-2014 in northern part of Derawan Islands Marine Park

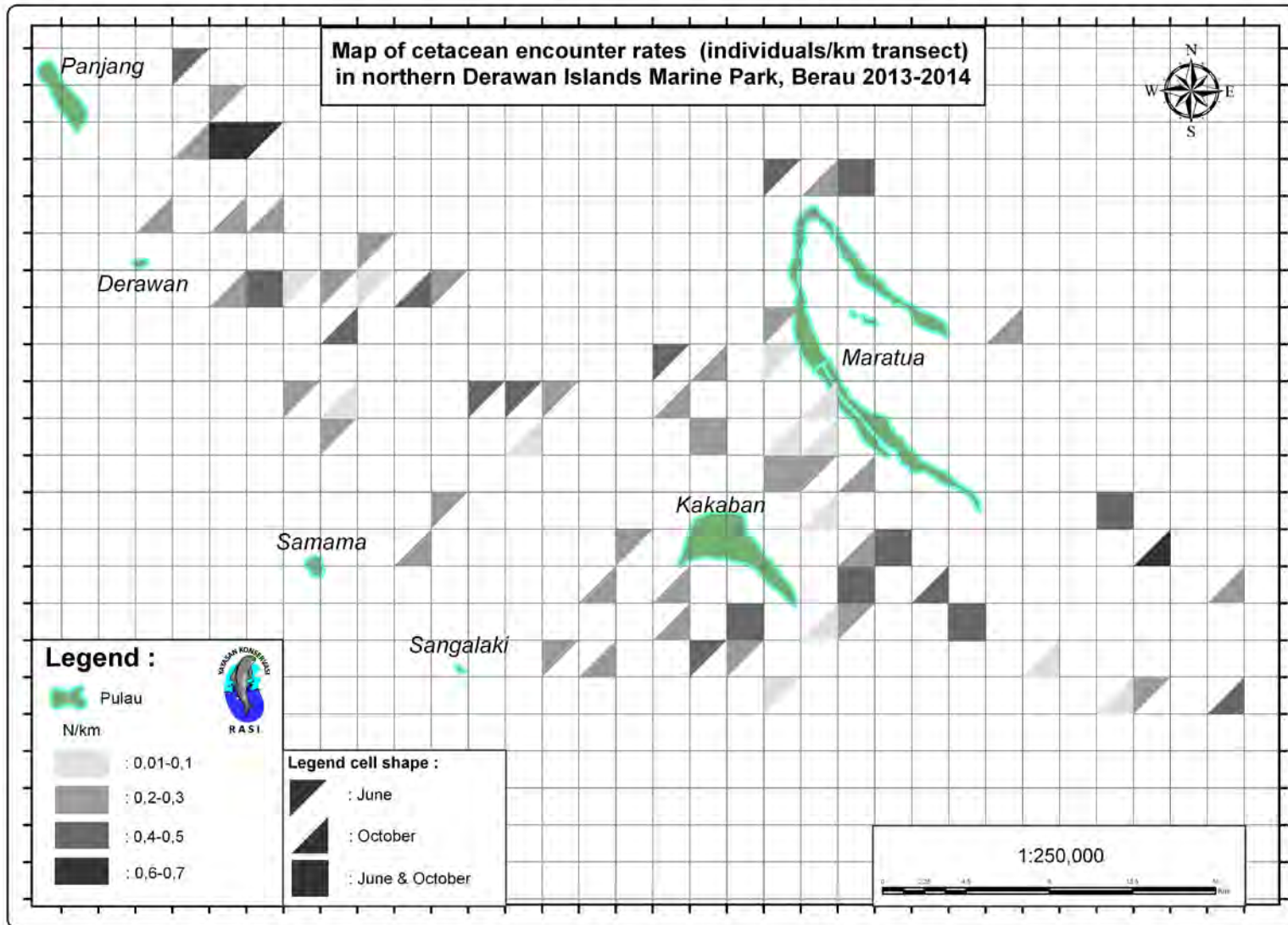


Appendix 3. Cetacean species identified in Berau and East Kalimantan and their IUCN Red List status

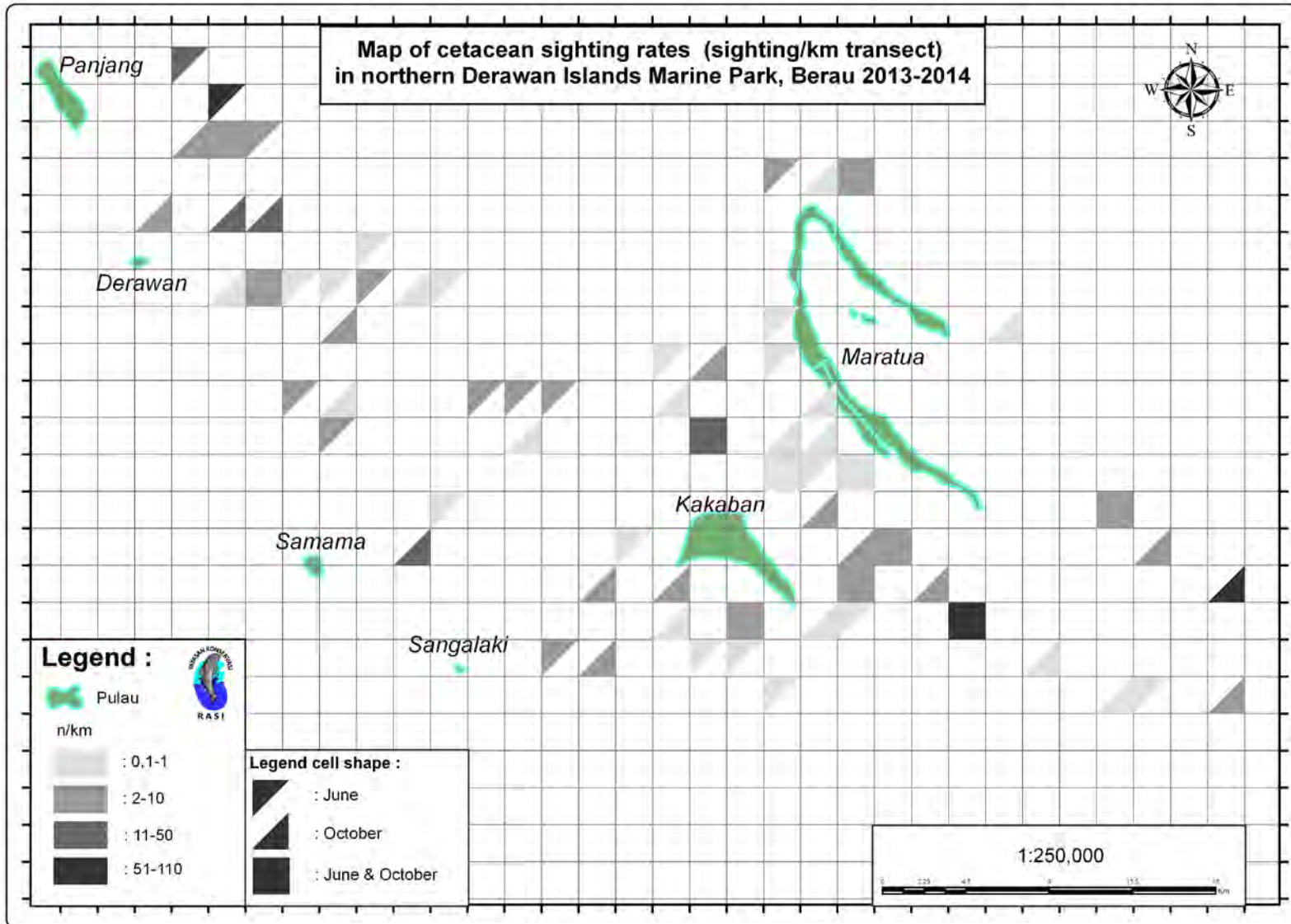
	Species Latin Name	Species Common Name	Coastal areas of positive occurrence	IUCN Red List status
1	<i>Balaenoptera physalus</i>	Fin whale	Berau, Bontang, East Kutai	Endangered
2	<i>Delphinus capensis tropicalis</i>	Long-beaked common dolphin	Berau	Data Deficient
3	<i>Delphinus delphis</i>	Short-beaked common dolphin	Berau	Least Concern
4	<i>Feresa attenuata</i>	Pygmy killer whale	Berau , East Kutai	Data Deficient
5	<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	Berau , East Kutai	Data Deficient
6	<i>Grampus griseus</i>	Risso's dolphin	Berau , East Kutai	Least Concern
7	<i>Lagenodelphis hosei</i>	Fraser's dolphin	Berau	Least Concern
8	<i>Megaptera novaeangliae</i>	Humpback whale	Bontang , East Kutai	Least Concern
9	<i>Neophocaena phocaenoides</i>	Finless porpoise	Berau, Balikpapan Bay	Vulnerable
10	<i>Orcaella brevirostris</i>	Irrawaddy dolphin	Berau & Mahakam Delta, Balikpapan Bay, Sesayap, Sangkulirang Bay	Vulnerable
11	<i>Orcinus orca</i>	Killer whale	Berau	Data Deficient
12	<i>Peponocephala electra</i>	Melon-headed whale	Berau & East Kutai	Least Concern
13	<i>Physeter macrocephalus</i>	Sperm whale	Berau, Bontang, East Kutai	Data Deficient
14	<i>Pseudorca crassidens</i>	False killer whale	Berau, Bontang & East Kutai	Data Deficient
15	<i>Sousa chinensis</i>	Indo-Pacific humpback dolphin	Berau Delta & Sesayap Delta	Near threatened
16	<i>Stenella longirostris</i>	Spinner dolphin	Berau, Bontang & East	Data Deficient

			Kutai	
17	<i>Stenella attenuata</i>	Pantropical spotted dolphin	Berau, Bontang, & East Kutai	Least Concern
18	<i>Stenella l. roseiventris</i>	Dwarf spinner dolphin	Berau, Bontang, & East Kutai	Not assessed
19	<i>Stenella coeruleoalba</i>	Striped dolphin	Bontang	Least Concern
20	<i>Steno bredanensis</i>	Rough-toothed dolphin	Berau	Least Concern
21	<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin	Berau, East Kutai, Bontang, Balikpapan Bay	Data Deficient
22	<i>Tursiops truncatus</i>	Common bottlenose dolphin	Berau, Bontang, & East Kutai	Least Concern
23	<i>Ziphius cavirostris</i>	Cuvier's beaked whale	Berau, East Kutai	Least Concern
24	<i>Dugong dugon</i>	Dugong	Berau, Balikpapan bay	Vulnerable

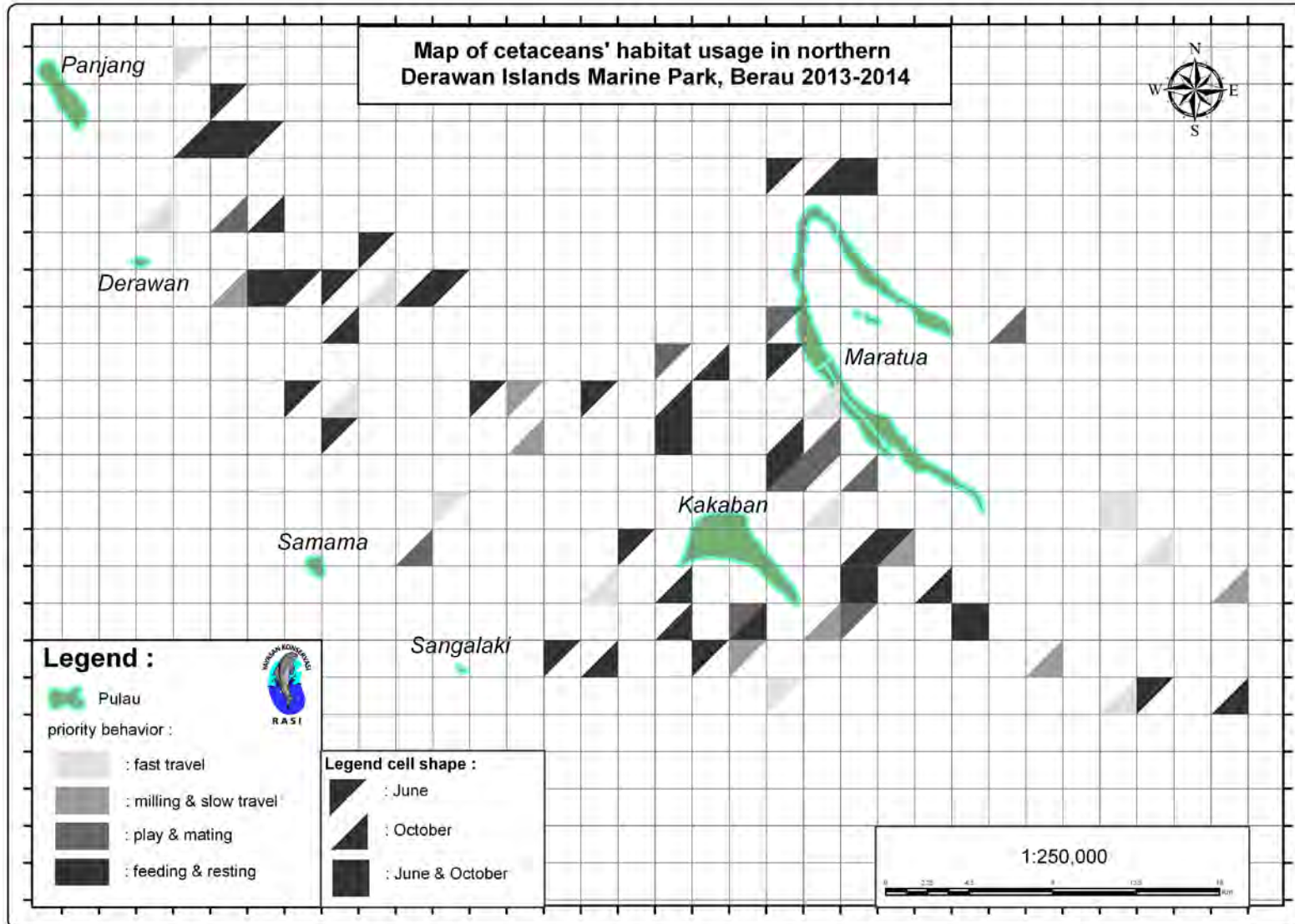
Appendix 4a. Map of cetacean encounter rates in northern Derawan Islands Marine Park, Berau 2013-2014



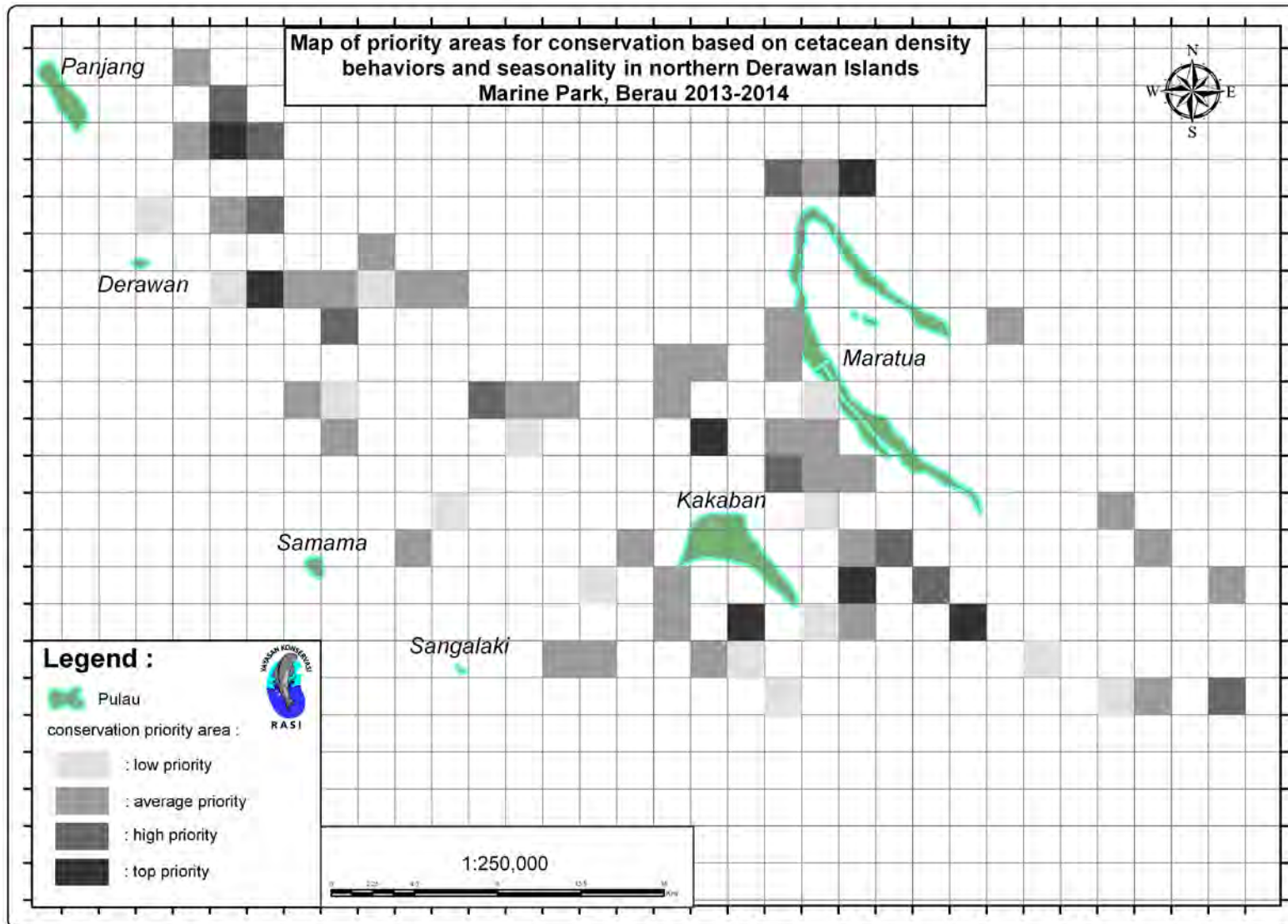
Appendix 4b. Map of cetacean sighting rates in northern Derawan Islands Marine Park, Berau 2013-2014



Appendix 4c. Map of cetacean's habitat usage in northern Derawan Islands Marine Park, Berau 2013-2014



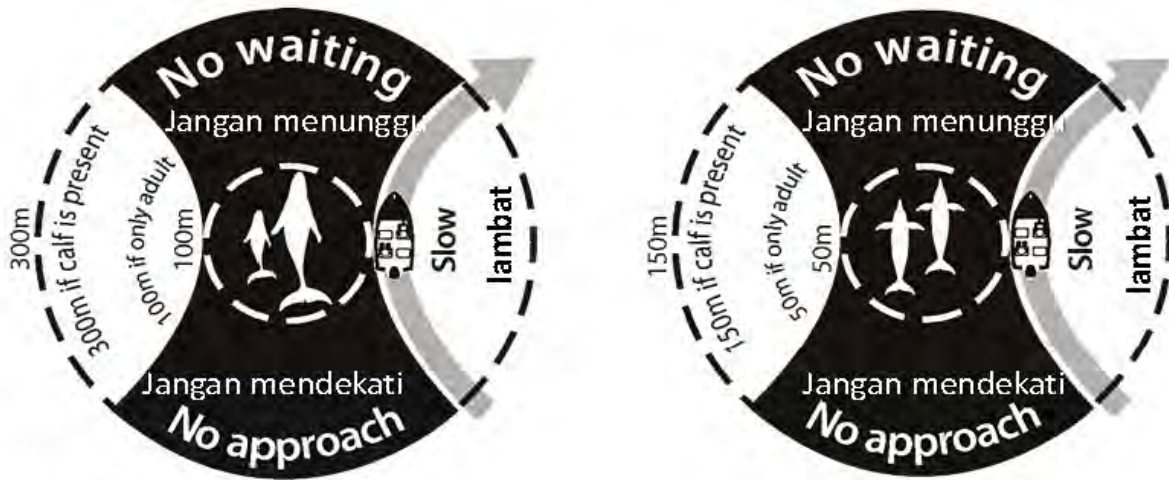
Appendix 4d. Map of cetacean conservation priority areas northern Derawan Islands Marine Park, Berau 2013-2014



Appendix 5. Protocol dolphin watching

- * Maintain a steady, slow speed (<8 knot) and keep parallel to the dolphins, minding the following caution zone while your engine is on: a distance of between 100 m and 300 m (with calves) from a whale and between 50 m and 150 m (with calves) from a dolphin.
- * Do not approach the dolphins from behind or chase dolphins
- * Some species like to approach the boat and bowride but the rule is: let the dolphins themselves approach and do not actively seek to approach the dolphins. Meanwhile maintain direction and steady speed.
- * Do never cut a dolphin's swimming path or move in between individuals
- * Maximum 2 observation boats at one time allowed during max. 30 minutes interaction while engine is on
- * Do not try to feed or swim with a dolphin

Dolphin safe zonation protocol:



Appendix 6. First aid for stranded whales and dolphins

Ten first-responder summary steps*:

1. Approach animal with care from aside and be aware of mouth and tail fluke
2. Place 2 people on each side of the animal and keep the animal in upright position with dorsal fin on top. If the animal is in the water keep it afloat and make sure the blowhole is above the surface
3. If the animal is on the beach try to place it on a matras or tarpaulin. If nothing is available try to dig sand underneath the body and pectoral flippers to reduce pressure.
4. Protect the animal from heat using an umbrella or tent, if it is not possible to directly release it because of the low tide or other circumstances, and try to place it in the shallow water.
5. Keep the body moist with water and wet towels but be careful not to put water in the blow hole and don't cover blowhole and dorsal fin with the towel
6. Minimize sound and people surrounding the animal to avoid stress
7. When releasement is possible, pull the matras or tarpaulin (do not pull tail or fin!) towards the water or if the animal is small, lift it with stretcher or directly. For larger animals it is easier to wait for high tide coming in.
8. Once in the water turn the animal slowly with its head facing the sea and release it to deeper waters. If there are more animals, release them together.
9. If there is coral reef, put the animal in a boat placed on a matras or on a stretcher attached to a boat and release in deeper waters
10. Report to local authority and for more help contact RASI (0541-744874)

* For more detailed instructions please refer to the protocol designed by the Ministry of Fisheries (at [kkji.kp3k.kkp.go.id/index.php/dokumen/publikasi/pedoman umum/Panduan Marmal Stranding](http://kkji.kp3k.kkp.go.id/index.php/dokumen/publikasi/pedoman_umum/Panduan_Marmal_Stranding))

Appendix 7. Sightings descriptions

Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species
29/06/2013	11:13-11:18	<i>Tursiops truncatus</i>	16	18	15	briefly bowriding then dissapeared	1 km
	15:52-16:17	<i>Stenella longirostris</i>	150	160	140	first resting then bowriding	
	16:51-17:05	<i>Stenella attenuata</i>	25	20	30	preferred bowriding speed 9,5 km/h, initially resting then approaching boat for bowriding	
	17:50-18:10	<i>Stenella attenuata</i>	20	15	25	alternating bowriding species (11,4km/h), groups spread out total range 2km, first resting, then	
		<i>Stenella longirostris</i>	90	80	100	approaching boat for bowriding, high leaps and spins	
30/06/2013	12:30-12:36	<i>Stenella longirostris</i>	28	22	25	briefly approaching boat and then dissapeared	
	16:50-17:00	<i>Stenella l. roseiventris</i>	18	16	20	briefy bowriding, milling behaviour	
	17:48-18:05	<i>Stenella longirostris</i>	170	150	200	Groups spread out within 2 km range, initially resting and then bowriding and resting again	
01/07/2013	16:28-16:40	<i>Stenella longirostris</i>	65	60	70	first resting in long formation, then briefly bowriding	
	11:11-11:25	<i>unidentified dolphin</i>	2	2	?	3 times jumping	
02/07/2013	12:28-12:45	<i>Stenella longirostris</i>	80	75	85	combination of resting, bowriding, slowly swimming	
	13:19-13:37	<i>Tursiops truncatus</i>	40	35	45	combination of resting, slowly swimming and bowriding for long time	
	15:29-15:48	<i>Tursiops aduncus</i> <i>Stenella attenuata</i>	35 10	30 10	40 15	aduncus: resting, very shy and only briefly bowriding, long formation	
	17:20-17:45	<i>Stenella longirostris</i>	16	15	18	rarily surfacing and often dissappearing, fast swimming and feeding	
03/07/2013	12:26-12:40	<i>Stenella longirostris</i>	75	70	80	resting first, then bowriding, no high leaps long-line formation, feeding in the current,	
	13:11-13:35	<i>Stenella l. roseiventris</i>	90	80	100	bowriding	
	13:58-14:10	<i>Tursiops aduncus</i>	12	10	15	shy, feeding in the current	
	14:10-14:20	<i>Stenella attenuata</i>	10	8	12	Slowly surfacing, resting	
	16:48-17:04	<i>Tursiops aduncus</i>	9	8	10	feeding, long diving intervals	

	17:05-17:10	<i>Stenella longirostris</i>	14	12	16	close to L17 location and shortly met after leaving group L17, feeding	1,5 km
Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species
04/07/2013	9:11-9:38	<i>Stenella l. roseiventris</i>	170	160	180	3 groups separated 1-2km apart, 1 group spotted, 2 spinner groups (80 & 90), only spinner bowriding. First long formation, feeding in current, high leaps, chasing movements	1-2km
		<i>Stenella attenuata</i>	30	25	35	3 groups separated 1-2km apart, 1 group spotted, 2 spinner groups (80 & 90), only spinner bowriding. First long formation, feeding in current, high leaps, chasing movements	
	9:41-9:50	<i>Stenella attenuata</i>	9	8	11	briefly bowriding, fast swimming and feeding	
	10:04-10:15	<i>Stenella longirostris</i>	55	50	60	bowriding, feeding, long formation swim	
	15:35-15:50	<i>Stenella attenuata</i>	25	20	30	dolphins resting and keeping distance of 500m to boat	
05/07/2013					delta survey without sightings		
03/10/2013	13:13-13:26	<i>Stenella attenuata</i> (P1)	15	14	16	(P1) Milling and resting	50-400m
	13:28-13:55	<i>Stenella attenuata</i> (P2)	350	300	400	P1 mixed with P2, groups covering area of 2-3 km width and 1km length, initially resting, milling	
	14:12-14:17	<i>Stenella attenuata</i>	8	6	8	milling	
	15:30-16:30	<i>Pseudorca crassidens</i>	35	30	40	2 groups of tursiops (1-3km apart), 3-4 groups of false killer whales (10 indiv each and spread out 1km of each other), initial behaviour of all species is logging	
		<i>Tursiops truncatus</i>	24	20	28		
	16:35-16:46	<i>Tursiops truncatus</i>	15	13	18	porpoising, resting	
	17:04-17:34	<i>Tursiops aduncus</i>	20	18	22	combination of slow swim, milling, resting	
	17:48-17:55	<i>Stenella l. roseiventris</i>	70	65	75	combination of fast swim and milling	
18:04-18:30	<i>Stenella attenuata</i>	25	20	30	milling and play		
04/10/2013	8:45-8:50	<i>Tursiops spp</i>	6	6	8	off effort no time to approach because of wave action	
	15:55-16:09	<i>Stenella longirostris</i>	2	2	2	fast swim	

Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species		
05/10/2013	13:53-14:12	<i>Pseudorca crassidens</i>	13	12	15	2 spotted dolphins bowriding 20m apart from false killer whale, new group of spotted dolphin joining and bowriding; general behaviors play (whale: fluke up and slap; logging in circle formation) and feeding (fish jumping)	20 m		
		<i>Stenella attenuata (P11)</i>	25	30	20				
	14:15-14:45	<i>Tursiops truncatus</i>	9	8	11			bowriding , slow swim, feeding, 100-400 m distance with P11	100-400m
	14:55-15:15	<i>Stenella attenuata</i>	25	20	30			2 sub groups, fast swim and milling	
	15:38-16:00	<i>Stenella l. roseiventris</i>	55	50	60			positive attraction toward our boat	
	17:00-17:08	<i>Stenella attenuata</i>	22	18	20			fast swim	
06/10/2013	11:21-11:35	<i>Stenella longirostris</i>	16	14	18	bowriding for long time, fast swim			
	15:00-15:10	<i>Stenella longirostris</i>	2	2	2	positive attraction toward our boat, fast swim			
07/10/2013	9:15-9:45	<i>Stenella longirostris</i>	150	120	175	3 mixed species. At first feeding, only fins visible, then starting bowriding. Fregat birds also feeding	0 m		
		<i>Stenella attenuata</i>	150	120	175				
		<i>Tursiops truncatus</i>	4	1	5				
	14:56-15:10	<i>Tursiops truncatus</i>	1	1	1			bowriding for short while; slow swim, milling	
	15:35-16:02	<i>Tursiops truncatus</i>	20	18	25			brief bowriding, sub groups (3+10+7) spanned out with 500m-1km distance	
	16:05-16:15	<i>Tursiops truncatus</i>	7	6	8			brief bowriding, slow swim, resting	
16:49-16:55	<i>Stenella attenuata</i>	4	4	5	positive attraction toward our boat, fast swim				
08/10/2013	15:29-15:33	<i>Unidentified</i>	1	1	?	observed at 1km distance , then dissappeared			
09/10/2013	10:52-12:36	<i>Stenella longirostris</i>	650	600	700	3 main groups, spread out c 500m distance of each other; initially long formation and feeding (fish jumping); slow swim, milling, feeding	0		
	14:06-14:43	<i>Tursiops aduncus</i>	20	18	22	play, resting, fluke slaps			
	14:37-15:31	<i>Stenella longirostris</i>	20	15	25	very active feeding, fast moving forward, leaps and			
		<i>Stenella attenuata</i>	35	30	40	many groups of fishes jumping in front			

Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species
13/06/2014	13:40-14:12	Tursiops aduncus	16	15	17	combination of milling/ feeding, curious towards boat	0
	15:41-16:10	Stenella attenuata Stenella longirostris	90 5	80 4	100 6	group spread out max 800 m, milling, playing, interaction with boat, jumping	
	16:55-17:05	Stenella attenuata Stenella longirostris	45 15	40 12	55 20	Both species bowriding, individuals spread out max 500m, feeding, many birds feeding, high spins & leaps	
14/06/2014	16:13-16:43	Stenella longirostris	150	140	160	resting and in line position. Some approach boat and bowriding, others pod formation, some jumping, spinning breaches	0-200m
	16:58-17:18	Peponocephala electra Lagenodelphis hosei	105 35	100 30	75 40	resting when spotted, first fraser approach boat then melonheaded whales, swimming together. Later only melon-headed remained bowriding combination of rest and play, some tail up & tail waves	
15/06/2014	18:03-18:12	Tursiops aduncus	17	15	19	milling and feeding on fish seen jumping out of water, most approached for bowriding, spotted c. 2km away subgroups < 1km distance radius from boat, first resting, play with our boat the bottlenose dolphins from IC 8 are probably part of the larger pod IC9, brief bowriding, milling individuals spaced out far from each other between 20-200m, resting mainly n brief check on the boat, one high leap first spotted alone, then saw spinner at 500m distance, within this group also spotted, young calf jumping n breaching, both species milling and playing, occasional leaps n tail slapping	0
	9:52-10:16	Stenella longirostris	60	50	65		
	15:36-16:20	Tursiops truncatus S. L. roseiventris	14 120	12 110	16 130		
	16:20-16:28	Tursiops truncatus	105	60	70		
	16:31-16:46	Tursiops truncatus	9	8	10		
	17:30-18:00	Stenella attenuata Stenella longirostris	45 80	40 75	50 85	0-600m (mean=500m)	

Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species
17/06/2014	11:29-11:42	Tursiops aduncus	7	5	10	observed first at distance resting but disappeared at approach	
	17:18-17:46	Stenella longirostris	40	35	45	first spread out at 500m radius, first fast swim, then milling, high leaps	
	17:47-17:56	Stenella longirostris	10	5	15	play, did not approach boat	
18/06/2014		no sightings					
19/06/2014	14:15-15:07	Stenella longirostris	325	300	350	mainly feeding, occasional fast travel with jumps, 1km radius spread out of groups	
	15:10-15:28	Stenella attenuata	25	20	30		
		Stenella longirostris	6	5	7	milling, feeding, little spaced out	
	15:29-15:43	Stenella longirostris	20	15	20	brief bowriding,	
12/10/2014	17:20-17:44	Tursiops truncatus	8	8	9	several time bowriding, some high dives, combination slow & fast swim	
	17:55-18:08	Stenella l. roseiventris	25	22	30	bowriding, fast swim, high leaps & spins	
13/10/2014	16:01-16:25	Tursiops truncatus	6	6	7	chasing fish, occasional fast swims, feeding, fluke slaps	
	18:07-18:20	Stenella l. roseiventris	15	14	16	play, fast swim, spinning, bowriding	
14/10/2014	9:03-9:25	Tursiops truncatus	30	25	35	bowriding, spread out small groups 500m radius, many swimming in pairs, milling, resting, porpoising	
	10:30-10:50	Stenella longirostris	70	65	75	first resting & spinning followed by slow swim, some feeding, high spins, tail slapping, breaches	
	14:15-14:40	Stenella l. roseiventris	55	50	60	fast swimming, play, bowriding, high leaps & spins	
	16:01-16:16	Tursiops spp.	3	3	3	slowly swimming, disappeared	
	17:12-17:21	Stenella attenuata	5	5	5	bowriding, feeding, some high arch dives	
	17:31-17:45	Stenella attenuata	25	20	30	feeding, some bowriding	
	18:01-18:09	Stenella attenuata	5	4	5	slow swim	

Sighting date	time	Cetacean species sighted	G best	G min	G max	General behaviours displayed	Distance among species
15/10/2014	9:28-9:42	Stenella attenuata	25	20	30	fast swim, play	
	9:42-9:55	Tursiops truncatus	20	18	22	bowriding, milling	
	11:58-12:08	Tursiops aduncus	10	9	11	feeding, loud blows, flukes waving, some porpoising	
	15:49-16:25	Stenella longirostris	450	400	500	long formation (<1km), bowriding for long time, resting initially, then combined with milling and play, high leaps	
16/10/2014	9:12-9:25	Tursiops aduncus	1	1	1	milling, making bubbles	
	10:18-11:11	Peponocephala electra	100	90	110	initially and mostly logging, bowriding, spy-hops, logging with face to face among 3 individuals	0-50
	10:18-11:11	Lagenodelphis hosei	35	30	40	several individuals mating, milling, belly up, high leaps, spy-hops, fluke up, fluke waves, fluke slaps, fin waves	0-50
	13:58-14:30	Stenella longirostris	200	190	220	initially fast swim, then slow swim, many bowriding, high leaps, breaches	
	16:26-16:42	Stenella l. roseiventris	50	40	60	milling, feeding, some high leaps, long dives	
17/10/2014		No sightings					
18/10/2014	8:47-9:00	Tursiops aduncus	9	8	10	combination milling, resting, slow swim	
	9:15-9:30	Stenella longirostris	160	150	175	initially resting/logging, then fast swimming upon approach and moving away from vessel, then slow swim and porpoising. All behaviors in long-line formation	
	09:36-10:35	Stenella attenuata	50	45	55	slow swim, fast swim, feeding, resting, high leaps,	0-50
		Stenella longirostris	160	150	175	mostly swimming, bowriding	0-50
	15:04-15:30	Stenella attenuata	15	12	17	group formation 500m radius, small sub-groups of 2-3 dolphins, feeding, tail slap, high dive	
	15:50-16:34	Grampus griseus	8	7	9	come to boat when boat stationary with engine on, resting (logging & porpoising) & slow swim	
	17:06-17:35	Tursiops aduncus	9	8	10	briefly bowriding	

APPENDIX 8. Pictures of species observed during the 2013-2014 surveys

***Tursiops aduncus*- Indo-Pacific bottlenose dolphin**



***Tursiops truncatus*- Common bottlenose dolphin**



***Stenella longirostris*- Spinner dolphin**



***Stenella attenuata*- spotted dolphin**



***Pseudorca crassidens*- False killer whale**



***Peponocephala electra*- Melon-headed whale**



***Lagenodelphis hosei*- Fraser's dolphin**



***Grampus griseus*- Risso's dolphin**



***Chelonia mydas* – Green turtle**





Picture (left), bowriding dolphins are carefully inspected to identify marks that allow for individual identification and check for site fidelity of individual dolphins. Pictures (right), survey team composed of RASI staff, volunteers and students (high school, university). Picture (right, below), two high schools students from Maratua being initiated in reefcheck datasheet for data collection to monitor the health of coral reefs in cetacean habitat.



Eighty interviews were held using a questionnaire about the distribution and conservation of marine mammals and larger marine vertebrates in all four villages on Maratua island.

The most impressive non-formal interview was held with Pak Dervin (right picture) from Payung-payung village on Maratua Island, who told us how he and his brother in law got rescued by a group of dolphins in 1998 after his boat capsized in a storm. We got permission to tell the story to children at schools during the school campaign. His story inspired many people and put a local ban on shark fishing using dolphin bait in Maratua and Derawan island.