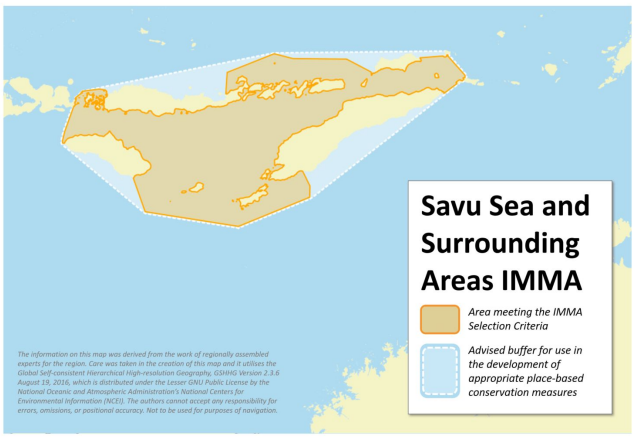

Area Size

160 512 km^2

Qualifying Species and Criteria

Sperm whale – *Physeter macrocephalus*

Criterion A; B (2); C (1)

Spinner dolphin – *Stenella longirostris*

Criterion B (1); C (1, 2)

Melon-headed whale – *Peponocephala electra*

Criterion B (1)

Fraser's dolphin – *Lagenodelphis hosei*

Criterion B (1)

Pygmy blue whale – *Balaenoptera musculus brevicauda*

Criterion A; B (2); C (2, 3)

Indo-Pacific bottlenose dolphin – *Tursiops aduncus*

Criterion B (1)

Marine Mammal Diversity

Criterion D (2)

Physeter macrocephalus, Stenella longirostris, Stenella attenuata, Peponocephala electra, Grampus griseus, Lagenodelphis hosei, Feresa attenuata, Balaenoptera musculus brevicauda, Tursiops aduncus, Kogia sima, Kogia breviceps, Globicephala macrorhynchus, Orcinus orca, Pseudorca crassidens, Steno bredanensis, Ziphius cavirostris, Balaenoptera edeni, Balaenoptera musculus, Megaptera novaeangliae, Tursiops truncatus, Dugong dugon

Savu Sea and Surrounding Areas IMMA

Summary

The Savu Sea and surrounding areas in the East Nusa Tenggara Province is an important area for marine mammals in Indonesia. The area provides critical habitat for these species, such as migratory corridors, feeding and nursery areas. The area supports a wide diversity of 24 species of marine mammal including vulnerable and endangered species such as blue whale and sperm whale. Ombai Strait and the Timor Sea are also contained within the IMMA boundary and have been identified as a migratory corridor for the pygmy blue whale. This corridor in the Savu Sea connects the migratory line between north-west Australia and the Banda-Seram Seas. All marine mammals in Indonesia have been fully protected since 1999 and this area was declared as the Savu Sea Marine National Park, of which one of the roles in the protection of marine mammals. However, traditional whaling communities are still identified as a threat to the cetacean population within the region, as well as illegal, unreported and unregulated fishing, marine debris, increasing marine traffic, and oil-gas exploration.

Description

The Savu Sea is situated in eastern Indonesia at the nexus of the open Indian Ocean and the Indonesian Seas, located in the Province of East Nusa Tenggara, Indonesia. It is characterised by the Indonesia Throughflow (ITF) from the Pacific Ocean to the Indian Ocean (and vice versa), with major seasonal upwelling zones (Moore and Marra, 2002). The corridor has exceptional cetacean species and

Figure 1: A pygmy blue whale passing through the Alor MPA corridor, heading north towards the Banda Sea, Indonesia. Photo: Benjamin Kahn

habitat diversity, consistent distribution of large cetaceans (e.g. blue and sperm whales) that are recorded relatively close to shore, and high degree of cetacean species interactions, as well as a critical habitat for foraging and nursery areas (Kahn, 2002, 2007, 2013; Adriani, 2010; Putra et al., 2017).

In total, 24 species of marine mammals including vulnerable and endangered species namely blue whale and sperm whale. However, their population also threatened by unsustainable fisheries, plastic waste, ship strikes, underwater noise pollution from shipping lanes, seismic and operational activities from the oil and gas industry, and large-scale coastal infrastructure development (ports and mining) (Mustika, 2006; Kahn, 2014). Whaling is one of the biggest conservation issues for cetacean populations in this region, as two whaling villages (Lamalera and Lamakera) have been hunting marine megafauna for decades in Solor Waters, including whale, dolphin, and mobulid rays (Mustika, 2006).

With support from the Ministry of Marine Affairs and Fisheries (MMAF), Provincial Government of NTT, TNC, APEX Environmental and relevant stakeholders, some part of Savu Sea waters which is 33,553 km^2 have been enacted as Marine National Park (MNP) with the Minister of Marine Affairs and Fisheries of Republic Indonesia's Decree No. KEP.5/MEN/2014 becoming the largest marine protected area (MPA) in the Coral Triangle and the first MPA for Cetaceans in Indonesia. TNC is working in this region since 2008 supporting to central government (MMAF) and local government to design the zoning plan and develop the management of Savu Sea Marine National Park (SSMNP).

In this area, there are also several existing MPA's namely Komodo National Park, East Flores local MPA, Selat Pantar local MPA, Maumere Bay Tourism Park, 17 Pulau Riung Tourism Park, and Kupang Bay Tourism Park. WWF and Misool Foundation are working in East Flores and Selat Pantar MPA to

support the provincial government to manage the MPA and safeguard the biodiversity in that area.

Several marine mammal's survey have been conducted in Komodo National Park in 2000 and 2001 (Kahn, 2000, 2001), in the Solor – Alor waters (Kahn, 2002, 2004a, 2004b, 2005; Putra et al., 2017) and Savu Sea area (Kahn and Fajariyanto, 2014; Kahn and Hennicke, 2017).

TNC with Savu Sea Marine National Park (SSMNP) authority conducted two Cetacean Rapid Ecological Assessment Surveys in 2013 and 2015. The first REA survey (2013) was a 16 day boat survey that focussed on gathering cetacean baseline data on habitat, tracking priority species, migratory corridors, and identifying threats, to inform the development of a management and zonation plan for the SSMNP (Kahn, 2013). Along with other data and survey information, the results are being used to develop the zoning plan of SSMNP.

Figure 2: A sperm whale breaches clear out of the water near Pantar, northern Savu Sea, Indonesia. Photo: Benjamin Kahn

TNC also conducted a 10-day boat survey in the East Flores – Alor Area (Kahn and Fajariyanto, 2014). The survey covered 780.67 km including East Flores, Adonara Island, Solor Island, Lembata, Pantar and Alor waters. Additional data were also collected using participatory mapping surveys in 2010, 2013 and 2015. Furthermore, Misool Foundation also conducted 263 days of marine mammal surveys from January 2016 until December 2017 in Solor waters in the northeast part of Savu Sea.

Criterion A: Species or Population Vulnerability

Blue whales (*Balaenoptera musculus*) were confirmed to be found across the Savu and Timor Seas (Kahn, 2007; Dethmers et al., 2009). The species has been assessed by the IUCN Red List as Endangered. In addition, pygmy blue whales (*Balaenoptera musculus brevicauda*) have also been confirmed to use this region as a migration corridor (Kahn, 2007, 2014; Double et al., 2014). However, the current global status of pygmy blue whale is very uncertain. Nevertheless, it is possible that commercial and small scale whaling has caused a decrease in the number of pygmy blue whales, with their recovery being slower than the Antarctic blue whale (Branch et al., 2007, 2009). From 2001-2008, 10-day boat-based surveys were conducted in the Solor-Area, with blue whales sighted frequently (i.e. Kahn, 2002, 2005). Initial satellite tagging efforts on blue whales identified the Banda Sea as the migratory destination, with the tagged whale spending over 60 days in this area. Furthermore, detailed diving data was consistent with diurnal foraging behaviour (Kahn 2007). In 2013 in an 18-day boat-based survey of a much broader area, blue whales were recorded in 5 separate sightings from the Savu Islands to northwest Timor (Kahn, 2013). In 2008 aerial and boat based surveys of Timor Leste waters observed blue whales, with two adults sighted in September and a group of two adults with a calf sighted in November in the north-western coastal waters offshore from the Dili and Liquisa districts (Dethmers et al., 2009). Field surveys in Solor waters during May-October 2017 also recorded 5 sightings of pygmy blue whale, including 7 individuals. Pygmy blue whales were further reported in October 2017 in Waihenga Bay-

Lembata (Putra et al., 2017). Double and colleagues further tracked 11 pygmy blue whales from Australia in April 2011, and 5 individuals were successfully tracked and entered Savu Sea waters in June 2011 and spent several days in this area before they moved into the Banda Sea and the Moluccas Sea (Double et al., 2014). Sperm whales (*Physeter macrocephalus*) have been assessed by the IUCN as a Vulnerable species. However, in Indonesia the hunters of Lamalera in the Savu Sea region have hunted sperm whales for more than 500 years, and there is an 80% decline in catch rates of sperm whale in Solor waters of the Savu Sea, that indicate a potential wider decrease of their population in this region (Mustika, 2006).

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

The Alor Strait (Between Lembata and Pantar and the area near Marisa Island which is located in the middle of a main migratory corridor (and shipping lane) is inhabited by residential pods of spinner dolphin (Kahn and Hennicke, 2017). Survey results indicate several areas with resident small cetaceans i.e. hundreds of spinner dolphin in Barate Bay which can be observed every morning and afternoon (Kahn and Fajariyanto, 2014). Pantar Strait (between Pantar and Alor), in particular the area around Pura Island, is inhabited by a residential pod of mixed cetaceans including melon-headed whales, Fraser's dolphins, and spinner dolphins. This mixed pod has been stable in group-composition and has been consistently sighted in this area for at least 4 years (Kahn, 2005; Kahn and Fajariyanto, 2014). Indo-Pacific bottlenose dolphin *Tursiops aduncus* has been assessed as Near Threatened on the IUCN Red List. A small pod of only 3-6 individual Indo-Pacific bottlenose dolphins can be consistently observed in Kalabahi Bay, while a further 6 individuals were also observed in the straits between Pantar and Lembata Island (Kahn and Hennicke, 2017). Furthermore, the spinner dolphin is the most frequently observed species in Solor waters of the Savu Sea (Putra and Topan, Forthcoming).

Figure 3: A blue whale flukes up near Lembata Island, northern Savu Sea, Indonesia. Photo: Benjamin Kahn

While, long-term rapid ecological assessment (REA) of the oceanic cetacean program in 2001-2005, also recorded that the spinner dolphin is relatively consistent as the most abundant species in this region (Kahn, 2002, 2004a, 2004b, 2005). The spinner dolphin that can be found year-round in this region and is likely to be a resident species.

Sub-criterion B2: Aggregations

Based upon the year-round monitoring program in Solor waters of the Savu Sea, the seasonal aggregations of oceanic dolphins peak in relative abundance during June to November, although they also can be found throughout the year (Putra and Topan, Forthcoming). The seasonal aggregation is strongly related to oceanographic features (i.e. upwelling current, mesoscale eddies, and thermal and chlorophyll-a front) that provide high primary productivity (Adriani, 2010). The upwelling current associated with eddies and internal waves in this region has increased the local productivity. The pygmy blue whale annually migrates through the area from western Australia to the Banda Sea through the Savu Sea, and is strongly-associated with the upwelling period in eastern Indonesia (Kahn, 2007; Double et al., 2014). One bull sperm whale (estimated length 18 m) was sighted in 2013 from a survey north of Timor Island (Kahn and Fajariyanto, 2014). Male sperm whales were seen on two occasions on the 2015 boat-based survey, as well as identified acoustically at several listening stations (Kahn and Hennicke, 2017). Many social behaviours as well as breaches were observed at close proximity to the boat. A recent study from Putra and Topan (Forthcoming) found the inter-annual variation on their aggregations was influenced by ENSO, where the oceanic dolphin relative abundance increased during positive El Niño, while the relative abundance of whales was decreased.

Criterion C: Key Life Cycle Activities
Sub-Criterion C1: Reproductive Areas

Young oceanic dolphins and calves (i.e. spinner dolphin, pan-tropical spotted dolphin, Fraser's dolphin etc.) have been recorded frequently in Solor waters, where they were seen together in big pods with adult dolphins (Putra et al., 2017). Solor waters are potentially used as a nursery ground for these dolphin species. Furthermore, Kahn and colleagues also observed a 3 meter humpback whale mother and calf pair in the south of Sabu Island, and calves of spinner dolphins in the southwest of Tuakau Cape, Timor Island (Kahn, 2013). While, in 2015 they also recorded both young spinner dolphins and sperm whales southeast of Pantar Island, south of Lembata, and west of Pantar Island (Kahn and Hennicke 2017).

Sub-criterion C2: Feeding Areas

The presence of important oceanographic features in this region (e.g. upwelling current, bathymetry slope, thermal front and meso-scale eddies) support high-densities of prey species. Studies have found that cetaceans aggregate close to frontal zones and eddies, which provide a high-density of prey. Their distribution is described the productivity hotspots (Putra et al., 2016), as well close to the transition zone of fronts and eddies that indicate their foraging (Adriani, 2010). In Solor waters, local fishermen also report that the spinner dolphins often interact with their fishing activity (e.g. gillnet and purse seine) during night hours, where they swim actively to access meso-pelagic prey, sometimes becoming trapped in the fisher's nets (Putra et al., 2017). During some sightings, pods of dolphins were associated with seabird aggregations, indicating further feeding/foraging behaviour in this area (MIH Putra personal observation). Furthermore, the several studies of pygmy blue whale describe that the movement pattern of this species is strongly

associated with the dynamics of local productivity that occurs in the Savu Sea, and the pygmy blue whale is likely utilizing this region for feeding (Kahn, 2005, 2007; Double et al., 2014).

Sub-criterion C3: Migration Areas

The Savu Sea appears to provide a critical migratory habitat for certain marine mammal species. Tagging of a blue whale off Alor in 2007 identified the Banda Sea as the migratory destination for blue whales passing through the Savu SEA (Kahn, 2007). Based on the tagging studies of Double and colleagues (2014), the Ombai Strait and Timor Sea has been observed to function as a migration corridor for pygmy blue whales, which migrate from western Australia to the eastern Indonesia Sea (Sunda-Banda-Halmahera ecoregion). This species was recorded arriving in the Savu Sea in the end of May, continuing their migration to the Banda Seram Sea through Solor-Alor waters, the Timor Sea, and Ombai Strait. More recently, a series of dedicated cetacean surveys have been conducted throughout the Banda Sea (2016-2018), to further investigate the cetacean habitat and possible development of MPAs (Kahn et al., 2019).

Figure 4: Melon-headed whale mother and calf pair surfaces near Atauro Island MPA, Timor-Leste. Photo: Benjamin Kahn

Criterion D: Special Attributes
Sub-Criterion D2: Diversity

The Savu Sea and Surrounding Areas IMMA provides a habitat for at least 24 recorded species of marine mammal, which includes beaked whales, blue whale, Bryde's whale, common bottlenose dolphin, Cuvier's beaked whale, dugong, dwarf sperm whale, false killer whale, Fraser's dolphin, humpback whale, Indo-Pacific bottlenose dolphin, melon-headed whale, orca, pantropical spotted dolphin, pygmy blue whale, pygmy killer whale, pygmy sperm whale, Risso's dolphin, rough-toothed dolphin, short-finned pilot whale, sperm whale, and spinner dolphin (Kahn, 2002, 2005; 2013, Kahn and Fajariyanto, 2014; Kahn and Hennicke, 2017; Putra et al., 2017).

Supporting Information

Adriani. 2010. Cetacean community and habitat characteristics in the Ombai Strait. Master thesis. Bogor Agricultural University.

Branch, T.A., Abubaker, E.M.N., Mkango, S. and Butterworth, D.S. 2007. Separating southern blue whale subspecies based on length frequencies of sexually mature females. Marine Mammal Science, 23(4), pp.803-833.

Branch, T.A., Mikhalev, Y.A. and Kato, H. 2009. Separating pygmy and Antarctic blue whales using long-forgotten ovarian data. Marine Mammal Science, 25(4), pp.833-854.

Dethmers, K., Chatto, R., Meekan, M., Amaral, A., de Cunha, C., de Carvalho, N. and Edyvane, K. 2009. Marine megafauna surveys in Timor Leste: identifying opportunities for potential ecotourism – Final Report. Ministry of Agriculture & Fisheries, Government of Timor Leste.

Double, M.C., Andrews-Goff, V., Jenner, K.C.S., Jenner, M.N., Laverick, S.M., Branch, T.A. and Gales, N.J., 2014. Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry. PLoS One, 9(4), p.e93578.

Kahn, B. and Fajariyanto, Y. 2014. Rapid Ecological Assessment (REA) for Cetaceans in the Savu Sea Marine National Park. The Nature Conservancy – Indonesia Coasts and Oceans Program.

Kahn, B. and Hennicke, J. 2017. A Business Plan for Responsible and Sustainable Whale Watching in the Alor Archipelago, Nusa Tenggara Timor (NTT), Indonesia: A best practice start-up guide for new whale watch operators and considerations for effective management of Indonesia's cetacean tourism development. Technical Report for The Nature Conservancy – Indonesia Coasts and Oceans Program.

Kahn, B. 2000. Komodo National Park Cetacean Surveys-A rapid ecological assessment of cetacean diversity, abundance and distribution: April 2000. Interim Report to The Nature Conservancy Indonesia Coastal and Marine Program. 24pp.

Kahn, B. 2001. Komodo National Park Cetacean surveys. Technical Report prepared for TNC Indonesia Coasts and Oceans Program.

Kahn, B. 2002. Alor Rapid Ecological Assessment–Visual and acoustic cetacean surveys and evaluation of traditional whaling practices, fisheries interactions and nature-based tourism potential: October 2001 and May 2002 Survey Periods. Technical Report prepared for WWF-Wallacea and TNC Coastal and Marine Program Indonesia.

Kahn, B. 2004. Indonesia oceanic cetacean program activity report: October-December 2003 survey period. Technical Report prepared for TNC Indonesia Coasts and Oceans Program.

Kahn, B. 2005. Indonesia oceanic cetacean program activity report: April–June 2005. Technical Report prepared for TNC Indonesia Coasts and Oceans Program.

Kahn, B. 2007. Blue whales of the Savu Sea, Indonesia. Paper presented at the 17th Biannual Marine Mammal Conference (MMS) - Blue Whale Technical Workshop. Cape Town, South Africa. 28 Nov - 3 Dec 2007.

Kahn, B. 2013. The Rapid Ecological Assessment (REA) for cetaceans and seabirds in the Savu Sea National Marine Park. APEX Environmental
Technical Report prepared for the Indonesian Ministry of Fisheries and Maritime Affairs and TNC Indonesia Program. 45pp.

Kahn, B. 2014. Satellite Telemetry of blue whales in the Indonesian Seas: Initial assessment of habitat use and potential threats. Paper presented at Pan Ocean Remote Sensing Conference (PORSEC) 2014 - 12th Biennial Conference: "Ocean Remote Sensing for Sustainable Resource". 4-7 Nov. 2014, Bali, Indonesia.

Kahn, B. and Vance-Borland, K. 2014. Marine Conservation Planning and the Offshore Oil & Gas and Deep-Sea Mining, and Shipping Industries in the Coral Triangle and South West Pacific: Large-Scale Spatial Analysis of the Overlap between Priority (p. 66). Technical Report prepared for WWF Australia.

Kahn, B., Djohani, R. and M. Welly. 2019. The pygmy blue whales (*Balaenoptera musculus brevicauda*) of

the Savu and Banda Seas, Indonesia: Conservation planning for a highly migratory species. Presentation at the International Congress for Conservation Biology (ICCB 2019): Conservation Beyond Boundaries. Society for Conservation Biology, Kuala Lumpur, Malaysia.

Moore, T.S. and Marra, J. 2002. Satellite observations of bloom events in the Strait of Ombai: Relationships to monsoons and ENSO. Geochemistry Geophysics Geosystems 3, 1017.

Mustika, P.L.K. 2006. Marine mammals in the Savu Sea (Indonesia): indigenous knowledge, threat analysis and management options. Master thesis. James Cook University.

Putra, M.I.H., Lewis, S.A., Kurniasih, E.M., Prabuning, D. and Faiqoh, E. 2016, November. Plankton Biomass Models Based on GIS and Remote Sensing Technique for Predicting Marine Megafauna Hotspots in the Solor Waters. In IOP Conference Series: Earth and Environmental Science, Vol. 47, No. 1, p. 012015. IOP Publishing.

Putra, M.I.H., Topan E. and Lewis, S. 2017. Technical report Marine Megafauna in Solor Waters, East Flores – East Nusa Tenggara, Indonesia 2016 – 2017. Misool Foundation, Savu Sea Program, Indonesia. 61 pp.

Putra, M.I.H. and Topan, E. Forthcoming. Key environmental in driving the temporal trends of cetacean abundance in Solor waters off Savu Sea, Indonesia.

Putra, M.I.H. and Mustika, P.L.K. Forthcoming. Incorporating prey distribution into foraging habitat modelling for marine megafauna in the Savu Sea, Indonesia. Aquatic conservation: marine and freshwater ecosystems.

Sahri, A., Putra, M.I.H., Mustika, P.L.K., Kreb, D. and Murk, T. Forthcoming. Cetacean habitat suitability modelling in Indonesia: An effort to provide their more detailed distributions for conservation.

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