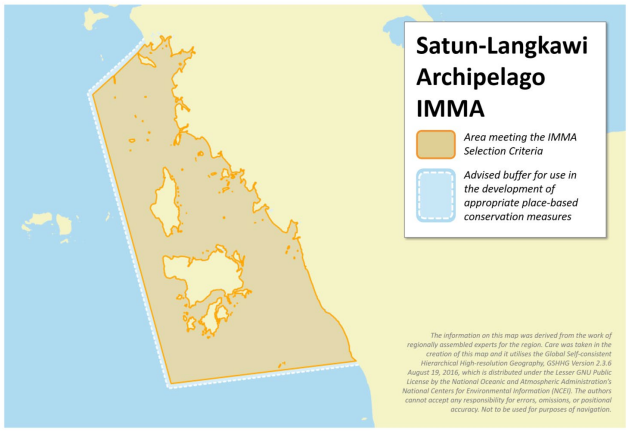

Area Size

5,493 km²

Qualifying Species and Criteria

Indo-Pacific finless porpoise – *Neophocaena phocaenoides*

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

Indo-Pacific humpback dolphin – *Sousa chinensis*

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

Irrawaddy dolphin – *Orcaella brevirostris*

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

Other Marine Mammal Species Documented

Balaenoptera edeni, Dugong dugon, Stenella longirostris, Tursiops aduncus

Summary

The Satun-Langkawi Archipelago is an area that straddles the Thailand-Malaysia border in the Straits of Malacca-Andaman Sea interface region. These two separate but adjacent areas are recognized as UNESCO Global Geoparks, having been granted this status in 2018 and 2006 respectively. Both areas boast a diverse range of topography and landscape of significant geological uniqueness and importance dating back to the Palaeozoic Era more than 500 million years ago. The shallow tropical waters of this area are considered important for aggregations

Satun-Langkawi Archipelago IMMA

Summary, continued.

Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) , Indo-Pacific humpback dolphins (*Sousa chinensis*) and Irrawaddy dolphins (*Orcaella brevirostris*). Boat-based surveys have documented the occurrence of some of the largest known groups of Indo-Pacific humpback dolphins across its global range, with group sizes of more than 200 individuals. Research has also found that the area - especially around the Langkawi Archipelago - hosts one of the most significant areas of occurrence of Indo-Pacific finless porpoises in the Southeast Asian region.

Description

The Langkawi Archipelago is a cluster of 104 tropical islands off the north-western coast of Peninsular Malaysia. The archipelago is located in the northern Straits of Malacca, close to the border with Satun Province in southern Thailand, and is approximately 25 - 28 km offshore from the mainland coast of Perlis and Kedah states. Langkawi is listed as a UNESCO Global Geopark since 2006 due to its unique and significant geological formations and history. The waters surrounding the archipelago are mostly shallow, ranging from 2 - 25 m in the eastern and northern sides with deeper depths (>30 m depth) on the western and southern sides. The adjacent mainland coasts of Perlis and northern Kedah states comprise shallow muddy intertidal flats and sandy bottom habitat, fringed along the coast by mangroves, rocky shores, sandy beaches and estuaries. A similar landscape and seascape occur in southern Satun Province in Thailand, which was granted as a UNESCO Global Geopark in April 2018. Langkawi Island is highly populated and is one of Malaysia's top tourism destinations, receiving up to

3.6 million domestic, regional and international tourist arrivals annually (Langkawi Development Authority, 2017), prior to the COVID-19 pandemic. The booming tourism industry in the last two decades has seen a rapid rise in coastal development and environmental loss and degradation around Langkawi Island, and an increase in heavy vessel traffic. Langkawi's marine seascape includes shallow intertidal mud flats, rocky shores, sandy beaches, mangrove coasts and coral reefs (predominantly soft corals) adapted to low light conditions. The adjacent Perlis and northern Kedah mainland costs are also highly populated, dominated by fishing and agricultural villages, small towns, ferry terminals and a power plant. The ferry terminals at Kuala Perlis and Kuala Kedah have high speed ferries and vehicle ferries that ply the routes between the jetties and Langkawi, and also serves as docking and fish landing sites for commercial trawlers and large purse-seiners. The coast of southern Satun Province just across the international Malaysia-Thai border from Langkawi is much less populated, and most of it is presently uninhabited. The Thai island of Koh Tarutao just north of Langkawi Island is designated as a national park and is uninhabited.

Research since 2010 (Ponnampalam and Jamal Hisne, 2011; Ponnampalam et al., 2014; Kimura et al., 2022) has found that the waters surrounding the Langkawi archipelago host a significant and locally occurring population of Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) (hereafter referred as finless porpoises) (Figure 1), likely to be one of the most ideal locations in southeast Asia to observe the species (Ponnampalam pers comm in Wang and Reeves, 2017). Initial abundance estimates for the Indo-Pacific finless porpoises in Langkawi are 900 – 2000 individuals (CV = 24%) (Ponnampalam, unpublished data). Similarly, Ponnampalam and Jamal Hisne (2011) have found that the Langkawi Archipelago also hosts a significant population of Indo-Pacific humpback dolphins (*Sousa chinensis*) (hereafter referred as humpback dolphins) with some of the largest group sizes (120 – 160 individuals) for the species that have ever been recorded across its range globally (Figure 1). In 2020, a superpod of humpback dolphins numbering 204 animals was observed in the coastal waters of Perlis (MareCet, unpublished data). These humpback dolphins are highly likely to be a trans-boundary population shared with Satun Province, southern Thailand. Research since 2016 has recorded movements of humpback dolphins between Langkawi and the adjacent mainland coast of Perlis state, and discovered that the Perlis-northern Kedah mainland coast also hosts Irrawaddy dolphins (which are absent in Langkawi) (Figure 1) (Teoh, 2018). The overall area is a known feeding, socialising and breeding grounds for the humpback dolphins and finless porpoises, and most likely also for Irrawaddy dolphins (Ponnampalam and Jamal Hisne, 2011; Ponnampalam et al., 2014; Teoh, 2018; MareCet, unpublished data). In Satun, Thailand, the Department of Marine and Coastal Resources have been conducting boat-based surveys on coastal cetaceans since 2012 (Cherdsukjai and Kittiwattanawong, 2013; Kittiwattanawong, 2015, 2016, 2017; Figure 2).

Taxonomic revision of the genus *Sousa* (Jefferson and Rosenbaum, 2014) suggested the need for a new species assessment for the taxonomic/genetic clarification of *Sousa* in Asia, especially from Bangladesh and eastwards including individuals within this Satun-Langkawi Archipelago IMMA. Research suggests that the humpback dolphins in this Satun-Langkawi Archipelago IMMA have localised ecological traits. For example, Hoffman et al. (2015) found that the whistle characteristics between humpback dolphins in Langkawi and of those in the Matang mangroves and coastal waters IMMA (~200 km south of Langkawi) differed significantly on all parameters except one. Even

within this IMMA, the whistle rates of humpback dolphins between Langkawi and adjacent mainland waters were found to be different, suggesting the presence of local acoustical adaptations (Bono et al., 2022).

Figure 1: Indo-Pacific finless porpoises (top) and an Indo-Pacific humpback dolphin (middle) in the coastal waters of the Langkawi Archipelago, and an Irrawaddy dolphin (bottom) in the coastal waters of Perlis, Malaysia. Photo: MareCet Research Organization

Criterion A: Species or Population Vulnerability

Indo-Pacific humpback dolphins (*Sousa chinensis*) and Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) are listed as VU on the IUCN Red List of Threatened Species (Jefferson et al., 2017; Wang and Reeves, 2017), while Irrawaddy dolphins (*Orcaella brevirostris*) are listed as EN (Minton et al., 2017). However, in Malaysia all three species are listed as Marine Endangered Species and protected under the Fisheries Act 1985 and Fisheries (Control of Endangered Species) Regulation (Amendment) 2008. In Thailand, the three species are all protected under the Wild Animal Reservation and Protection Act, B.E. 2535, and are listed as Endangered on the Thailand Red Data 2017. Research by Ponnampalam et al. (2019) showed that finless porpoises around Langkawi are at highest risk of bycatch from trawl nets and gillnets.

Criterion B: Distribution and Abundance Sub-criterion B2: Aggregations

Indo-Pacific finless porpoises and Indo-Pacific humpback dolphins have overlapping habitat around the Langkawi archipelago, however the latter species' distribution is primarily along the eastern part of the Langkawi Archipelago and across to the adjacent Perlis-Kedah mainland coast (Figure 3). Both cetacean species have some of the largest recorded groups known for these species – up to 30 and 204 individuals respectively (Ponnampalam and Jamal Hisne, 2011; Ponnampalam et al., 2014; MareCet, unpublished data). In Satun, Thailand, there appears to be two aggregations of coastal cetaceans segregated to the north and south of Satun respectively (Figure 2). The northern aggregation is mainly comprised of Indo-Pacific humpback dolphins that have a wider distribution as compared to Irrawaddy dolphins that are more confined within a limited area closer to the river mouths. The southern aggregation is mainly comprised of a mix of Irrawaddy dolphins, humpback dolphins and Indo-Pacific finless porpoises (Kittiwattanawong, 2015, 2016, 2017). Estimates of humpback dolphins in Satun are reported to be 29-52 individuals (Cherdsukjai and

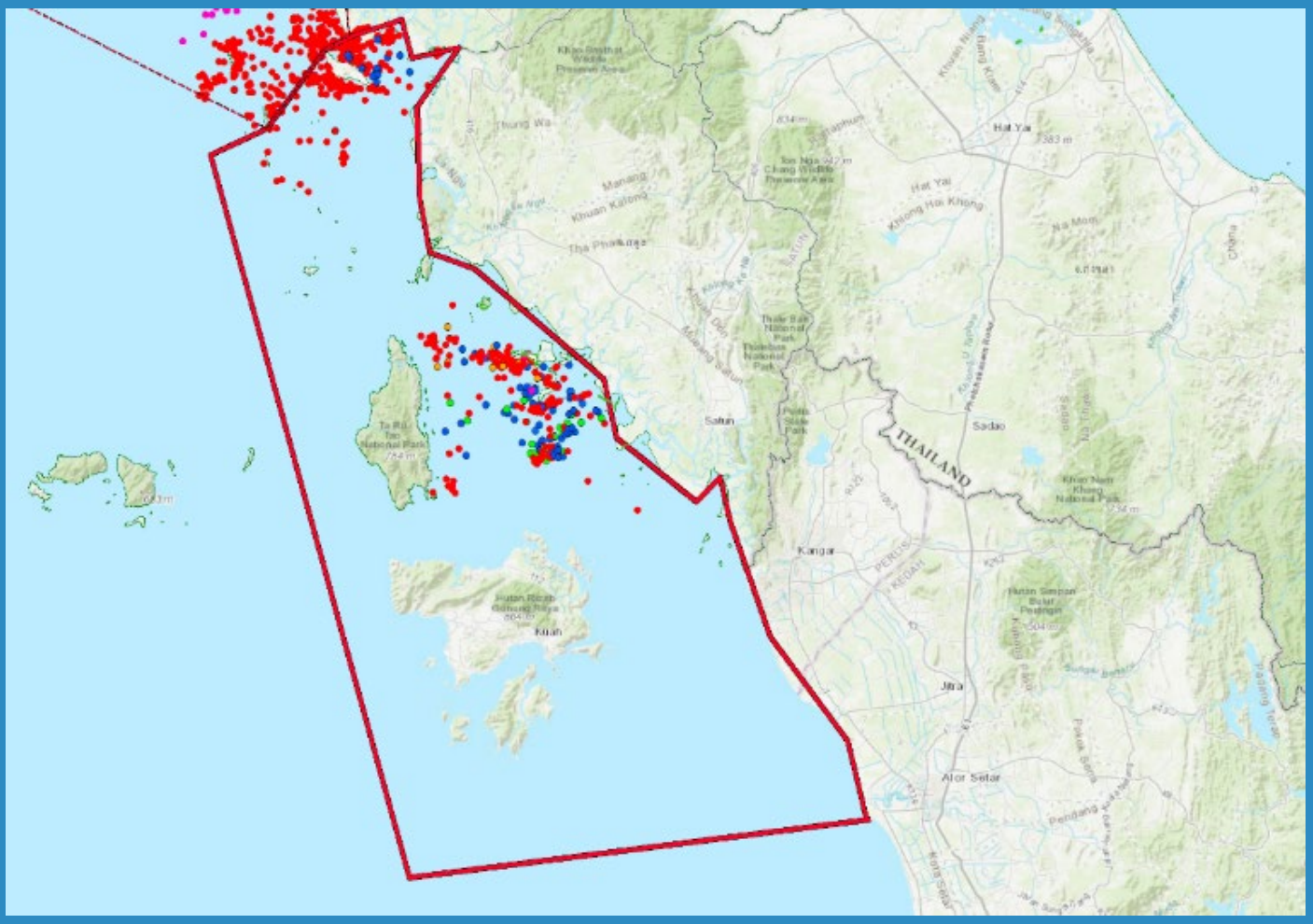

Figure 2: Distribution of Indo-Pacific humpback dolphins (red dots), Irrawaddy dolphins (blue dots) and Indo-Pacific finless porpoises (green dots) during boat-based surveys in Satun, Thailand during 2014 and 2016 (Kittiwattanawong, 2015, 2016, 2017). The red polygon denotes the Satun-Langkawi Archipelago transboundary IMMA.

Kittiwattanawong, 2013). Data available from interview surveys and boat-based surveys indicate that the coastal cetaceans occur year-round in Satun, Thailand.

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

Systematic research by The MareCet Research Organization totaling 187 survey days across 22 surveys between 2010 – 2018 (11682 km and 895 h of search effort), in the Langkawi Archipelago and adjacent coastal waters, recorded numerous observations of cetacean sightings with calves and a few observations of sexual behaviour (Ponnampalam and Jamal Hisne, 2011; Ponnampalam et al., 2014; MareCet, unpublished data). A total of 34.6% (n = 120) of finless porpoise sightings (N = 347) in Langkawi were of groups containing calves, while 71.2% (n = 99) of humpback dolphin sightings (N = 139) included calves. Irrawaddy dolphin sightings that contained calves made up 55.6% (n = 10) of the species' total sightings (N = 18) recorded from the mainland coast of Kuala Perlis-Kuala Kedah (MareCet, unpublished data). These suggest the area to be important for the cetaceans' calving and nursing. In June 2016, a local Langkawi netizen had encountered a dead pregnant finless porpoise whose near-term foetus was found protruding halfway out of the adult animal's genital opening. A stranded finless porpoise neonate bearing foetal folds was also observed in the area in May 2018 (MareCet, unpublished data). These records imply the occurrence of calving and mating within this IMMA. Groups of humpback dolphins containing

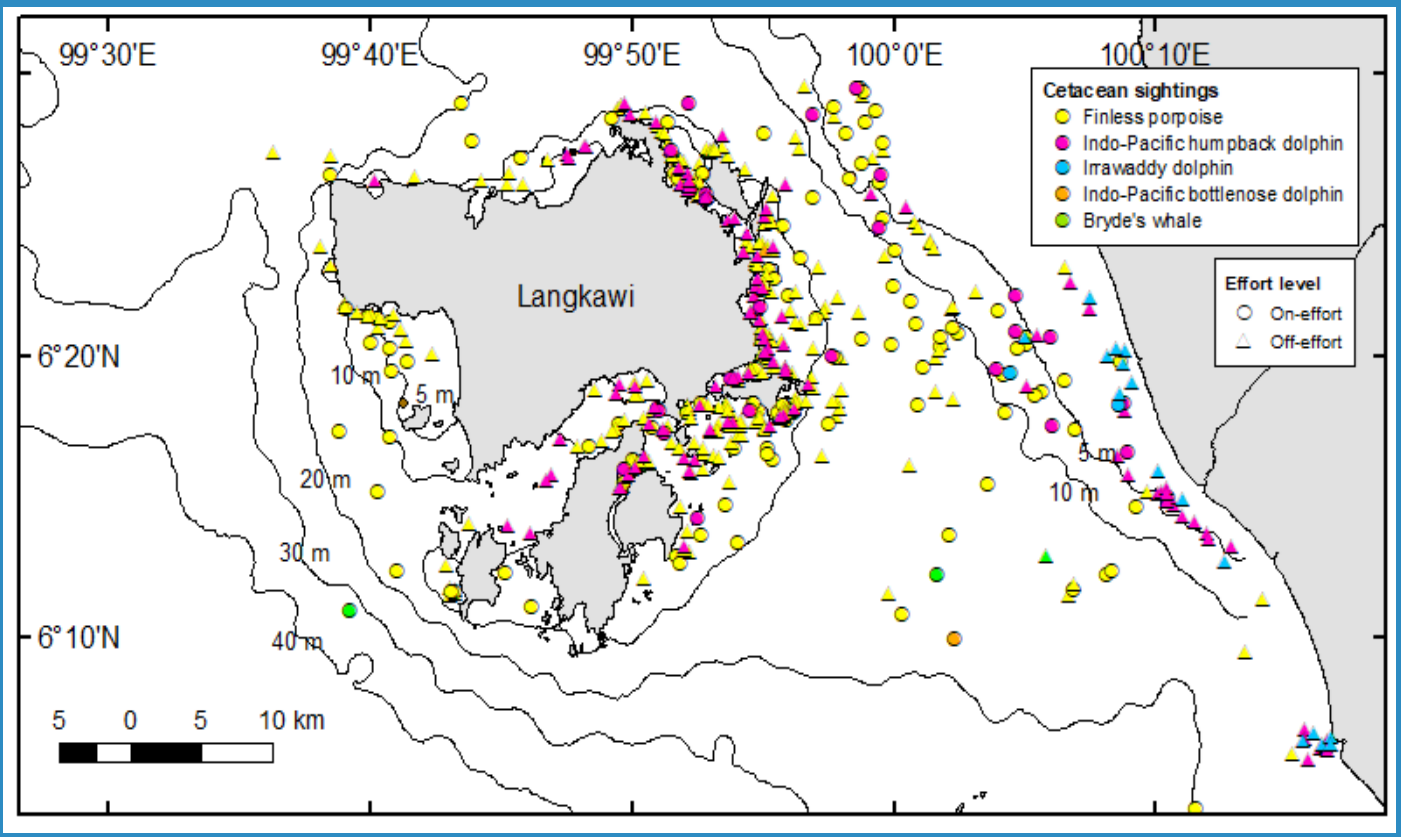

Figure 3. Distribution of cetaceans recorded during boat-based line transect and non-line transect cetacean surveys from 2010 – 2014 and 2016 – 2018 respectively in the Langkawi Archipelago and surrounding waters, Malaysia (Extracted from Ponnampalam & Jamal Hisne, 2011; Ponnampalam et al. 2014; MareCet, unpublished data)

neonates made up 7.1% (n = 10) of the species' total sightings in Langkawi (N = 139). Additionally, humpback dolphins mating or engaging in sexual behaviour were observed in the area and comprised 9.3% (n = 13) of the species' total sightings (N = 139) (MareCet, unpublished data).

Sub-criterion C2: Feeding Areas

Research by The MareCet Research Organization amounting to 187 survey days across 22 surveys between 2010 – 2018 (11682 km and 895 h of search effort) in the Langkawi archipelago and adjacent coastal waters recorded numerous observations of cetaceans preying on various types of prey such as marine catfish, garfish and octopus. Finless porpoises recorded as feeding or engaging in probable feeding behaviour constituted 28.8% (n = 100) of the total species' sightings in Langkawi and adjacent waters (N = 347). This species has been observed feeding on cephalopods, as evidenced by the presence of squid ink during sightings and cephalopod beaks found in the stomach contents of dead stranded animals (MareCet, unpublished data). Humpback dolphins observed feeding or engaging in probable feeding behaviour constituted 56.8% (n = 79) of the total species' sightings (N = 139), while 50.0% (n = 9) of the total Irrawaddy dolphin sightings (N = 18) were of feeding or probable feeding groups (Ponnampalam and Jamal Hisne, 2011; Ponnampalam et al. 2014; MareCet, unpublished data).

Supporting Information

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