STATUS REPORT ON THE MARINE ENVIRONMENT OF THE MERSING MARINE PARK ISLANDS AND INDICATIVE PROPOSAL FOR A MARINE PROTECTED AREA NETWORK

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First Printing: 2017

Citation: Ooi, J.L.S., Goh, H.C., Then, A.H.Y, Affendi, Y.A., Izarenah, M.R., Abu Muntalib, J. 2017. Status Report on the Marine Environment of the Mersing Marine Park Island, and Indicative Proposal for a Marine Protected Area Network. Department of Marine Park Malaysia.

Available from: Division of Research and Resource Inventory
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1.0 EXECUTIVE SUMMARY

Marine Parks in Peninsular Malaysia were established to arrest the decline in marine fish catch that first became evident in the early 1980s. Based on the understanding that coral reefs provide habitat for fish and can lead to spill-over fishery benefits, Marine Protected Areas (MPA) here were gazetted around islands with coral reefs. The Department of Marine Park Malaysia (DMPM) is now considering scaling up from individual island-based MPAs into an MPA network, with the Mersing Marine Park Islands selected as a pilot study in the establishment of the first MPA network in Malaysia. This report serves as a starting point for considering the prospects of such a network.

Section 2.0 shows all maps related to the study area. Section 3.0 states the objectives of this study which are to report on the status of the marine environment in the study area by drawing from the published literature, and to develop an indicative proposal for the establishment of an MPA network. One social survey was conducted on the islands and mainland to collect primary data on stakeholder perceptions towards the existing MPA. Section 4.0 explains the methodology used, which consisted of (1) a desktop literature survey, and (2) a social survey conducted on the islands and mainland in August and September 2016 to collect primary data on stakeholder perceptions towards the existing MPA. Where possible, locational information in the literature was used to construct distribution maps.

We begin Part 1 of this report by synthesizing information on the status of the marine environment in the study area. Section 5.0 addresses the current status of coral reefs, seagrass meadows and swamps. It begins with Section 5.1 on coral reefs, which in Johor waters, consist mainly of fringing reefs around offshore islands. However, the coral reefs of only 6 out of the 13 gazetted islands in the study area were documented scientifically between 2011 and 2016. The most recent survey by the Department of Marine Park Malaysia in 2013 reported 229 species in Pulau Aur, Pulau Pemanggil, Pulau Babi Besar, Pulau Tinggi and Pulau Sibu. When revised to reflect the recent coral taxonomical changes, there is now an estimated 249 hard coral species in 70 genera, 14 families, and 7 *incertae sedis* (of uncertain placement) in the study area. The main monitoring reports for habitat condition came from Reef Check Malaysia. However, there were no habitat condition reports for 7 of the gazetted marine park islands of Pulau Harimau, Pulau Mensirip, Pulau Guam, Pulau Rawa, Pulau Babi Hujong, Pulau Mentigi and Pulau Sibu Hujong in this timeframe.

In Section 5.2, we show that seagrass meadows occur on the leeward side of many of the islands in the study area, but published maps of meadows exist only for Pulau Tinggi and Pulau Sibu. These mapped references estimate the combined size of meadows around Pulau Tinggi and Pulau Sibu to be 7.06 km^2. The study area has 12 seagrass species, compared to the total 15 species recorded for Malaysia. Pulau Tinggi has the greatest number of species (11). Meadows in Pulau Tinggi were dominated by *Halophila ovalis* (1,870±937 shoots m^{-2}) and *Halodule uninervis* (1,455±795 shoots m^{-2}). In Pulau Sibu, the large *Enhalus acoroides* and *Cymodocea serrulata* dominated the community biomass wherever they occurred. However, meadow trends were unavailable because all studies were based on single season sampling events.

Section 5.3 addresses the status of swamps, which were less well-represented in the literature in comparison to coral reefs and seagrass meadows. Within the Mersing Marine Park Islands, mangrove swamps can be found on Pulau Sibu (Teluk Bakau) and Pulau Tinggi. One species of mangrove tree, *Rhizophora stylosa*, uncommon to Malaysian mangrove forests, has been recorded on both Pulau Sibu and Pulau Tinggi. It is hardly reported elsewhere, where muddy substrate is more common than on these islands.

Section 6.0 is dedicated to marine fauna of special interest such as dugongs and turtles that were relatively well-represented in the literature. When the distribution points of these two fauna were geocoded, a hotspot of sightings was identified in the west and southwest waters of the Sibu group of islands. Other charismatic fauna such as seahorses did not have fine-scale locational information, while giant clams, bumphead parrotfish and groupers were observed only intermittently and opportunistically in dive surveys. Thus, estimates of their population size and potential distribution patterns could not be made.

Section 7.0 addresses the issue of fisheries in the study area. No-take zones in MPAs are expected to bring spill-over benefits to the surrounding waters but because the condition of fishery resources in the study area prior to gazettement was unknown, it wasn't possible to assume spill-over benefits. A 2009 survey of catch composition in bottom trawlers yielded a total of 155 species, with trash fish comprising almost 50% (338.7 kg) of the total catch; while commercially important species contributed the other half (348.4 kg). Major families of fish recorded were Carangidae, Leiognathidae, Psettodidae, Dasyatidae, Clupeidae, Chirocentridae, Gerridae, Serranidae, Cynoglossidae, Bothidae, Sphyraenidae, Tetraodontidae, Mullidae, Carcharhinidae and Trichiuridae.

The marine environment of the study area is characterised in Section 8.0. Water quality in the study area appeared to be influenced by tourist loads on islands in the vicinity. This is reflected in the differentiation/clustering of islands based on water quality, whereby islands with higher tourist loads (Pulau Babi Besar, Pulau Tinggi, Pulau Rawa, Pulau Sibu Tengah and Pulau Sibu Besar) share similar water quality properties. In contrast, uninhabited islands or those with low populations such as Pulau Mensirip, Pulau Babi Tengah, Pulau Babi Hujong, Pulau Nanga Besar, Pulau Sibu Hujong, Pulau Pemanggil and Pulau Aur, are grouped together. This pattern indicates that tourist and local population size appear to have had an impact on water quality.

Section 9.0 highlights areas of biological significance, where threatened or endangered species occur. One such area was the hotspot in the west and southwest waters of the Sibu group of islands (for dugongs and turtles).

Section 10.0 provides information on the demography and socioeconomy in the study area. The most current data by the Mersing District Office in 2015 showed that Pulau Sibu is the most highly populated island, followed by Pulau Aur, and that the dominant socioeconomic sectors are fisheries and tourism, while agricultural activities are practiced at small local scales. Park gazettement appeared to be a major cause of depopulation in these islands, attributed to the lack of livelihood options because of MPA restrictions on extractive activities. However, data that was specific to the perceptions of communities on each island was lacking in the literature survey, leading the project team to conduct questionnaire surveys in Pulau Tinggi, Pulau Besar, Pulau Sibu, Mersing, Sedili and Endau. In Section 11.0, we explain the findings of this survey. A total of 416 samples were collected and analysed in August and September 2016. Out of the 368 local villagers sampled, 60% agreed with and supported the gazettement of the existing MPA. Those who disagreed were more likely to be fishermen, with a higher proportion of disagreement expressed by respondents in Pulau Tinggi. A perceived lack of MPA enforcement of the no-take ruling was the main source of dissatisfaction. Respondents were particularly worried about the encroachment of trawlers in park waters. Tour operators displayed a slightly different response: a higher percentage of this group expressed support

for the MPA in comparison to local communities, with tour operators on the mainland (Sedili and Endau) being more inclined to be supportive of the current MPA system. This group of respondents expressed concern over the existing implementation, monitoring, and control of the marine park.

In Part 2 of this report, an Indicative Proposal for an MPA network is presented to serve as a scoping guide to the key issues that should be considered when setting up an MPA network in the study area. Five focal areas are addressed in Sections 13.1 to 13.5, i.e. Ecological Considerations, Socioeconomic Considerations, Governance and Management Considerations, MPA Network Design Considerations and Monitoring, Research, and Education Considerations are presented, encompassing 15 proposed objectives and 30 strategies that are relevant to the idea of establishing an MPA network in the study area.

Finally, the idea of scaling up the proposed MPA network beyond that of the Mersing islands is introduced in Section 14.0. Should this idea be considered for the future, we suggest that the existing Marine Ecoregions of the World (MEOW) be used as a reference point for classifying bioregions, but that finer-level classification than that in the MEOW scheme be devised to develop regional MPA networks. Potentially, these are broad-scale MPA networks that extend beyond the immediate study area in Johor, to encompass all existing MPAs on the east coast of Peninsular Malaysia.