

# STATUS OF THE CORAL REEFS OF THE SEMBILAN ISLANDS



**Results of Reef Check Surveys and Rapid Biodiversity Assessment**

**January 2012**

## SUMMARY

1. Reef Check Malaysia (RCM) is part of the worldwide Reef Check network, working to conserve coral reefs. Registered as a non-profit company in 2007, RCM has since established survey, education, community and reef rehabilitation programmes.
2. Since 2008, RCM has been working with stakeholders in Pangkor Island to improve marine resources there. Awareness and education programmes have been followed by coral reef rehabilitation efforts to improve local snorkelling sites.
3. Success in coral reef conservation at Pangkor must consider the wider picture. The nearby Sembilan Islands are one of the last significant areas of coral reef on Malaysia's West coast, and potentially important as a biological corridor, connecting adjacent reef areas and allowing flow of juvenile forms to repopulate damaged areas. Coral reefs at the islands are heavily impacted by development and shipping.
4. Reef Check surveys at the Sembilan Islands show that the coral reefs are in "fair" condition. Major impacts include over-fishing and land-based development, causing siltation. Abundance of Reef Check fish and invertebrate indicator species is low, though there are indications that populations of these key coral reef species could recover with better management.
5. Although the surveys do not directly measure the biodiversity of the reefs, the results of Reef Check surveys and rapid assessments conducted at the same time support initial observations that the reefs around the islands do have high biological diversity value.
6. It is recommended that a Marine Managed Area be established at the islands to protect the biodiversity and enhance aesthetic value. A flexible approach is recommended to ensure that the views and needs of all local stakeholders are taken into account at early planning stages.

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## 1. Introduction

Reef Check was established in the USA in 1996 in response to the growing recognition of the problems facing coral reefs. Coral reefs are an ecologically important and economically valuable marine ecosystem, and many of the impacts on them result from badly planned, managed and unregulated human activities.

In 2001, the Reef Check Foundation appointed a National Coordinator for Malaysia, to promote Reef Check and carry out training and surveys. In 2007, Reef Check Malaysia (RCM) was registered as a non-profit company. Since that time, RCM has established a national coral reef monitoring programme, implemented education programmes for schools, and worked with communities to raise awareness of the importance of coral reefs and encourage wider participation in conservation efforts.

Since 2008, RCM has been working with local stakeholders around Pulau Pangkor, Perak, to improve the marine environment there. Starting with simple beach clean ups and other awareness programmes, RCM has subsequently established a coral reef rehabilitation programme at Pangkor, the goal of which is to assist local snorkelling guides to improve local snorkelling sites. As part of this programme, we worked with the snorkelling guides to establish possibly the first small-scale privately managed marine sanctuary in Malaysia, by closing off a "Safe Snorkelling Zone", giving coral reefs an opportunity to re-establish. Local guides are now managing this site.

The nearby Sembilan Islands are considered to be one of the last remaining significant coral reef areas on the West coast of Peninsular Malaysia. In addition to their potential biodiversity value, their location suggests that they could also be important in maintaining biological connectivity between reef areas on the West coast. They are therefore considered to be a suitable site for protection and conservation, perhaps as a Marine Managed Area. Such a move would not only protect the biodiversity of the islands' reefs, but could also enhance the tourism potential.

In the past, the islands have been a popular tourism destination, for snorkelling and diving as well as recreational fishing. However, more recently their popularity has declined as the quality of the reefs has declined, impacted by development of tourism facilities on Pangkor and industrial facilities on the mainland nearby, as well as shipping in the Straits of Malacca. Continued development, if not well managed, could have serious implications for the future health of coral reefs around the islands, threatening their ecological value and economical potential. In particular, proposed industrial developments at Teluk Rubiah (iron ore plant) and Lumut (LNG terminal), as well as further tourism development on Pangkor (Teluk Segadas) could have significant impacts on the islands if construction and operations are not managed in order to minimise environmental impacts.

Before a decision can be made to establish protected areas around the Sembilan Islands, however, more information on the status of marine resources at the islands is required, to allow an informed assessment of the current situation at the islands. With this in mind, RCM has conducted a programme of Reef Check surveys at the Sembilan Islands to assess the health of coral reefs there. This report presents the results of the surveys, together with a brief biodiversity assessment of invertebrates and hard corals.

## 2. Background & Methodology

The Sembilan Islands consist of a cluster of nine islands (Pulau Agas, Pulau Payong, Pulau Nipis, Pulau Rumbia, Pulau Lalang, Pulau Saga, Pulau Buluh, Black Rock and White Rock) which are located some 20km from the coast of Perak (Lumut) and 15km south of Pulau Pangkor off the west coast of Peninsular Malaysia, in the Straits of Malacca.

The islands are uninhabited and the only structures on the islands are small rest areas on Pulau Saga, constructed for the use of tourists and fishermen.

The islands are a favourite fishing spot among sport and commercial fishermen. They are also occasionally visited by snorkelers and divers from Pangkor and Lumut. They have no protected status; hence tourist and fishing pressure are not controlled or monitored.

In addition to impacts from fishing (lines, nets, anchors, etc.), other impacts to the coral reefs around the islands include:

- Shipping: fuel pollution; ballast pollution; waste disposal
- Land-based development: pollution and siltation from commercial activities and land-use changes
- Sedimentation: rivers flowing into the sea on the West coast carry heavy silt loads, and it is clear that this carries to the Sembilan islands, reducing water quality and causing reefs to be smothered as silt settles
- Trash: floating marine debris is a common sight around the islands, and it is inevitable that some of this will tangle on coral reefs, causing physical damage.

From 9-13 January 2012, RCM conducted a series of coral reef surveys at nine sites around the islands (see map in appendix 1), using the standard Reef Check methodology. Reef Check surveys are based on the philosophy of "Indicator Species". These are marine organisms that:

- Are widely distributed on coral reefs
- Are easy for non-scientists to identify
- Provide information about the health of a coral reef.

Four types of data are collected:

- Fish survey, which is carried out by swimming slowly along the transect line counting the indicator fish within each of the four 20m long x 5m wide x 5m high corridors
- Invertebrate survey, during which divers count the indicator invertebrates along the same four 20m x 5m belts
- Impact survey, which involves an assessment of damage to coral within the transect area from bleaching, anchoring, destructive fishing, corallivores such as *Drupella* snails or crown-of-thorns starfish, and trash.
- Substrate data are collected by the Point Intercept method whereby the substrate category, such as live coral, is noted every 0.5m.

In addition to Reef Check surveys, at each site we conducted:

- An overview assessment of the diversity of hard corals
- A detailed assessment of the biodiversity of invertebrates (surveyed by Kee Alfian from UKM).

### 3. Survey Results

#### 3.1 Substrate

According to widely accepted Coral Reef Health Criteria, the reefs around the Sembilan Islands were, on average, in “fair” condition, with an average live coral cover (hard coral (HC) cover + soft coral (SC) cover) of 29% (average for Malaysia in 2010: 44%). Nineteen different coral Genera were observed during the rapid surveys, which were Porites, Goniopora, Montastrea, Astreopora, Acropora, Anacropora Pocillopora, Hydnohpora, Tubastrea, Symphyllia, Diploastrea, Turbinaria, Fungia, Millepora, Favites, Favia, Pavona, Oulophyllia and Echinophyllia.

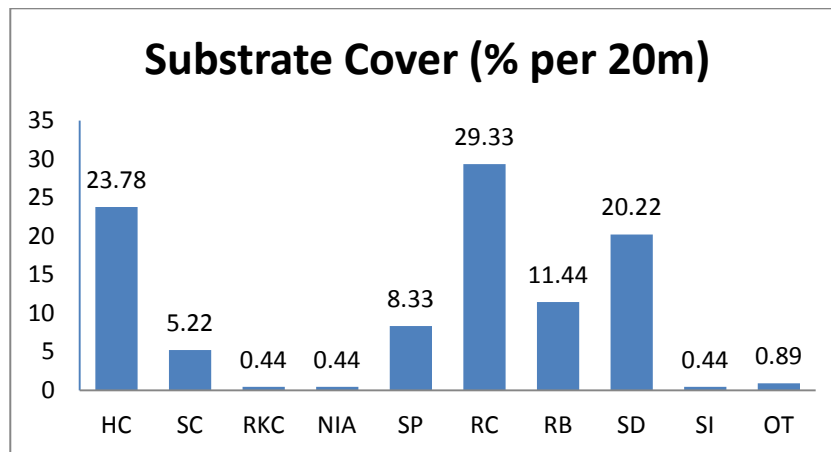


Chart 1: Substrate Cover

Rock (RC), at 29%, was also a common substrate type. This is a positive finding because it suggests there are large surface areas available for new growth by settlement of coral recruits, which require hard, sturdy surfaces to settle on and grow. Recruits were observed growing on rocks at numerous locations both within and outside the surveyed areas.

It was encouraging to see that the incidence of both recently killed corals (RKC) and nutrient indicating algae (NIA) were low, both at 0.44%. Low levels of RKC indicate few recent disturbances and low abundance of coral predators. Further, low NIA levels indicate that sewage runoff from the mainland and Pulau Pangkor is not having significant effects at the Sembilan Islands.



Figure 1: Abandoned anchor

The relatively high amount of rubble (RB) is indicative of some physical disturbance at the site over time. Abandoned anchors (Figure 1) were observed in numerous locations during the surveys, along with discarded fishing nets, and these are likely to be a significant cause of coral damage to the reefs surrounding the islands. Discarded fishing nets can sink to the bottom (Figure 2) and smother corals or stay afloat acting as ghost nets (Figure 3) trapping fish for many years to come.



**Figure 2:** Discarded net smothering corals

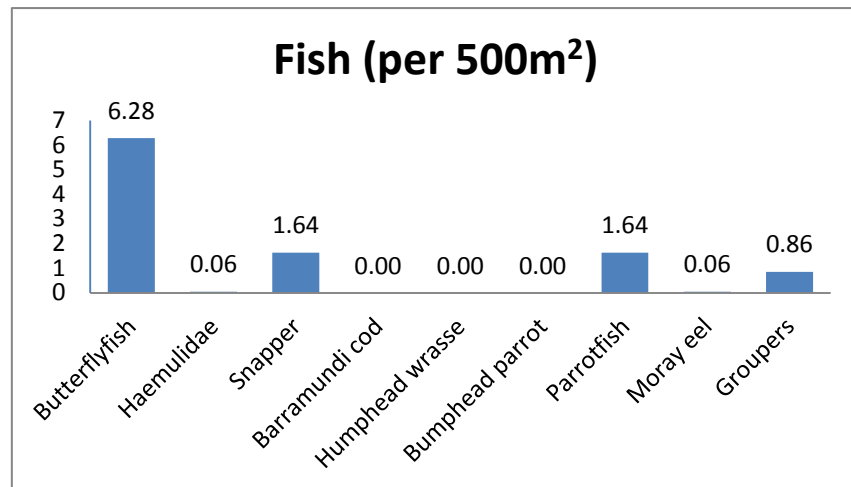


**Figure 3:** Ghost net

Given the poor water quality experienced during some survey dives (average visibility was 5-8m, at some sites only 2-3m), the level of silt (SI) detected during the surveys is surprisingly low at 0.44%. However, strong currents noted in the area may prevent high silt settlement rates, so even though sunlight penetration is poor due to suspended silt (leading to low coral growth rates), low settlement rates prevent build up and smothering of corals, reducing the overall impact of silt.

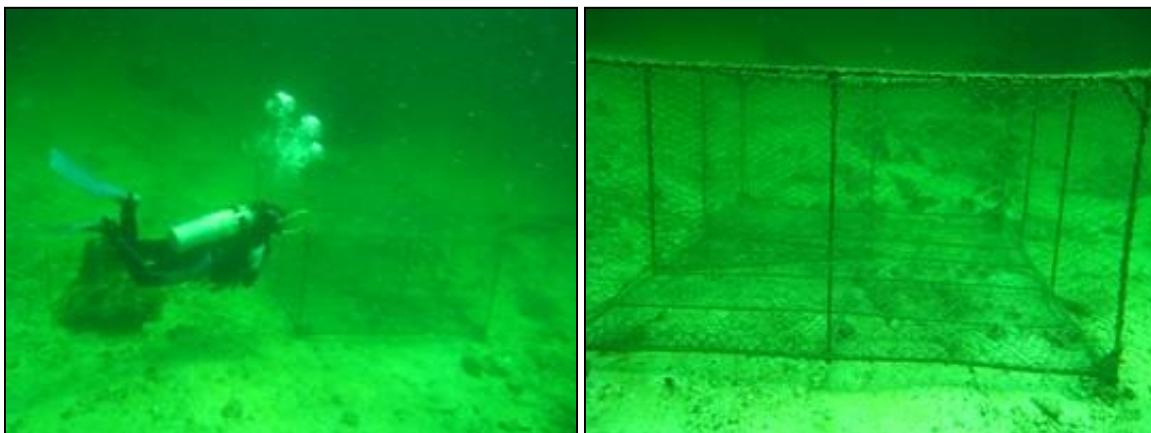
### 3.2 Fish

Highly prized food fish such as Barramundi Cod, Humphead Wrasse and Bumphead Parrotfish were not seen during any of the surveys. Other food fish such as Snappers and Sweetlips were rare and very few Groupers observed were above 30 cm in length (adult size).



**Chart 2:** Fish Abundance

The rarity of these indicator fishes suggests that they have been over-harvested for the food fish trade. The Sembilan Islands have been heavily fished historically, and fishing effort continues to be high, as evidenced by the large number of fishing boats noted in the area during survey trips, and the presence of a large fish trap (over 1.5m in length – see figure 4) at one site.



**Figure 4:** Fish trap

It is encouraging that the abundance of Butterflyfish in the Sembilan Islands is similar to that of the protected islands in Malaysia, as this indicates that fishing for the aquarium trade is not a problem in the Sembilan Islands.

Similarly, the large number of juvenile Groupers observed (but not counted) on the reefs is also encouraging as it suggests that the population of this important coral reef predator fish could recover if reef-based fishing effort is managed.

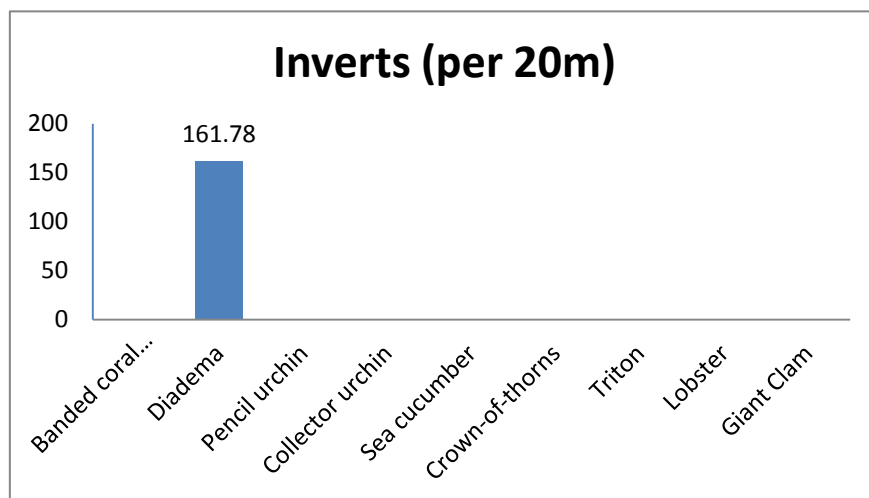
Several notable sightings, while not counted during Reef Check surveys, are important as an indicator of the biodiversity of the coral reefs around the islands. These included:

- Frogfish: usually found around Semporna in Sabah and very rarely in Peninsular Malaysia, one was observed during our survey. We are unaware of reports of these in the West coast

- Seahorses (and to a lesser degree, pipefish): usually found in seagrass beds and relatively uncommon in Peninsular Malaysia. Several were noted on the reefs during survey dives, these are known to be a feature of the Sembilan Islands
- A small coral reef fish with striking blue gill markings was noted several times. It remains unidentified at the time of writing.

### 3.3 Invertebrates

Among the nine species of invertebrates that Reef Check surveys count, only the sea urchin, *Diadema*, was found in the Sembilan Islands.



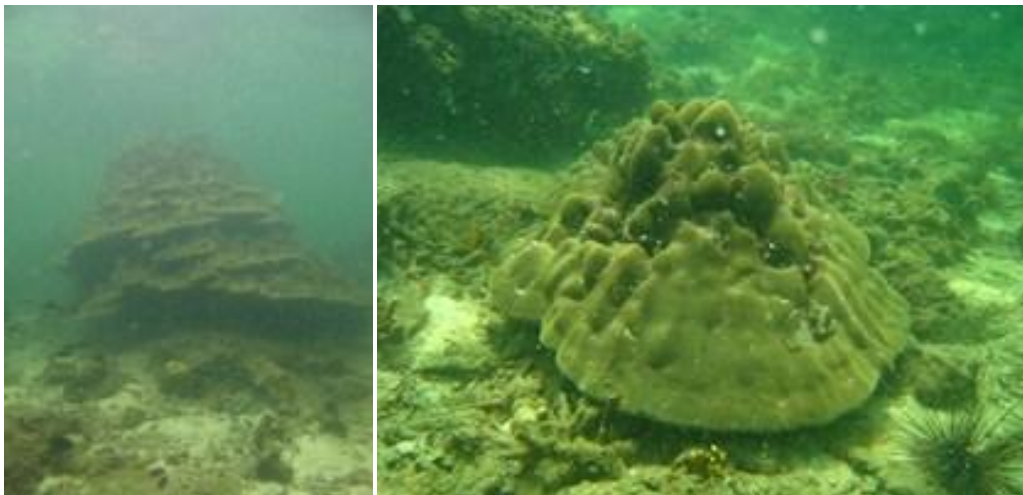
**Chart 3: Invertebrates Abundance**

Despite this, the invertebrate diversity assessment conducted during the surveys indicated that there is a wide variety of invertebrates at the islands. 28 different species were observed during the surveys, including flatworms, nudibranchs, molluscs and bivalves.

## 4. Conclusions

The coral reefs around the Sembilan Islands are considered to be in relatively good condition, given that there are significant local impacts (pollution, sedimentation, etc), and that they are not gazetted as protected areas, so activities posing significant threats to reefs (such as collection of corals, fish and reef fauna, trawling and anchoring on reefs) are not prohibited.

Corals in the Sembilan Islands appear to be growing and reproducing well despite the turbid waters in the area. They have adapted to the turbid water by developing unique growth forms, with corals that usually grow in rounded boulder forms taking mound and conical forms instead (Figure 5) in order to get maximum sunlight and prevent sediments from settling on them.



**Figure 5.** Conical growth forms.

In reefs with clear water, most corals only extend their tentacles at night to feed, because during the day they get their nutrition from photosynthetic algae living in the coral's tissue. In the Sembilan Islands, the water is very turbid and corals receive less sunlight, thus lower nutrition from photosynthesis. It appears that many corals have adapted to this situation by altering their feeding habits, with most of the corals extending their tentacles to catch food during the day (Figure 6). This increases the resilience of the reefs.



**Figure 6.** Mushroom coral with extended tentacles

Fishing has a major impact on coral reefs around the Sembilan Islands. Most adult indicator species were not observed during the surveys, though juveniles and grazers such as parrotfish were common. The absence of edible invertebrate indicators such as lobsters and sea cucumbers also suggests that they too are being/have been collected. In addition, fishing has a significant physical impact on the reefs, with numerous fishing nets of various ages encountered during surveys.

Three factors suggest that the Sembilan islands do not currently have a high aesthetic value:

- The rating of live coral cover around the islands as only "fair"
- The low abundance of Reef Check's fish and invertebrates indicators
- Poor water quality.

However, the following factors indicate that the coral reefs around the islands have high biodiversity value:

- Relatively high number of coral Genera (19 Genera)
- Relatively high number of invertebrate species (28 species)
- Presence of some rare animals such as frogfish, seahorses, pipefish and some molluscs.

Furthermore, the presence of large schools of (non-indicator) fish in the waters near the reefs, and the abundance of juvenile populations of some indicator species (particularly Grouper), suggest that there is potential for recovery in terms of fish populations, and therefore the area could be of interest to tourists (divers and snorkelers).

Taken together it can be concluded that with management, the aesthetic value of the reefs could be improved and the biodiversity value protected.

## 5. Recommendations

We recommend that the Sembilan Islands be gazetted as a Marine Protected Area. However, the usual approach to establishing Marine Parks in Malaysia is not suitable for the current situation at the Sembilan Islands, and a novel approach will be required if this effort is to be successful.

### Current Model

The current model in Malaysia for gazetting Marine Parks establishes a protected area two nautical miles from the shore at lowest low tide, within which fishing, anchoring, collecting, extraction and construction are prohibited. This approach is not considered suitable for the Sembilan Islands for the following reasons:

- Proximity of the islands: The Sembilan Islands is a cluster of islands close to each other and the two nautical mile distance would mean that protected areas around each island will overlap one another. This will make it impossible for fishing vessels to travel around the islands without violating park rules, and will close off substantial parts of existing fishing grounds.
- Vast area to patrol: A two nautical mile barrier surrounding the Sembilan Islands would create an area too large for Marine Park Officers efficiently to patrol and enforcement would prove costly and time consuming.
- Local compliance: The Sembilan Islands have been an important commercial fishing ground for many generations of fisherman and a sudden 100% restriction is likely to be ignored.
- Lack of suitable infrastructure: There is no infrastructure on any of the Sembilan Islands that would accommodate Marine Park Officers. If officers were effectively to enforce Marine Park rules, they would need to be on the islands daily thus require accommodation and basic utilities such as electricity and fresh water.

To overcome these drawbacks, we recommend adopting a more flexible approach that takes into account the needs of local stakeholders.

### Marine Managed Areas

One approach to the development of better coastal and marine policy and management is the concept of marine managed areas (MMAs). An MMA is an area of ocean, or a combination of land and ocean, where all human activities are managed toward common goals. MMAs can be defined as multi-use, ocean zoning schemes that encompass several types of sub-areas such as No-Take Zones, buffer zones with particular restrictions (eg. No trawling) or areas dedicated to specific uses (eg. Fishing, diving).

MMAs are a form of ecosystem-based management, where all elements – biophysical, human, and institutional – of a particular system are considered together. There are several overarching principles under which MMAs should be developed:

- All human uses and their subsequent impacts on the defined area should be considered and their management integrated.
- Policy and management should be based on the best natural and social science available.
- All stakeholders in the defined area should be consulted and fully involved in the policy and management development and implementation processes concerning the MMA's conditions and uses.

We therefore recommend that the Sembilan Islands be established as a Managed Marine Area with a number of zones that could include:

- Commercial fishing zones: to allow the current fisheries industry to continue to operate, but with some restrictions on fishing area to protect coral reefs and recreational areas
- Artisanal/Sport fishing zones: to allow current small scale fishing to continue, but with some restrictions on fishing area to protect coral reefs and recreational areas

- Recreational zones: adjacent to beaches, to provide for tourism activities
- No Take Zones: areas in which no extractive activities are allowed. These could also be areas in which reef rehabilitation activities are carried out.

### **Key Participants**

Such a zoning system is expected to reduce immediate, local anthropogenic pressures on significant coral reef areas. Key participants in the establishment of the MMA are:

- Local communities, particularly the fishing industry, must be involved at all stages of analysis and establishment of the MMA to ensure the greatest possible buy-in and acceptance of the management system devised.
- Government agencies (eg. Department of Marine Parks, Department of Fisheries, Ministry of Tourism) must set policy and regulation systems, and invest in the limited infrastructure necessary for tourist visitors, research and management.
- Local tourism operators (resorts, snorkelling guides, dive operators) may be able to introduce a user fee to fund some of the management costs. This should be directed to improving the condition of the marine environment around the islands, to further enhance tourism potential, leading to further growth in visitor numbers and therefore increased revenue for improving management.
- NGOs and universities will need to be engaged to conduct relevant awareness programmes with local communities and tourists, as well as research on biological aspects of the MMA.

Key to the success of this approach is local community consultation. If the managed area is established in such a way that, as far as possible it takes into account the needs of the current users, then there is a greater chance of compliance, as all users understand the need for an benefits of the MMA. This in turn reduces the need for, and cost of, enforcement.

### **Wider Benefits**

The remoteness of the Sembilan Islands has, to some extent, helped to preserve its marine life, despite receiving no legal protection. Its location also gives it the potential to play a role in connectivity between the islands in the north (Pulau Langkawi, Pulau Payar, Pulau Bidan, Pulau Song-song and Pulau Teloh in Kedah), and the islands to the south (Pulau Pangkor, Pulau Pangkor Laut, Pulau Giam and Pulau Mentagor in Perak, and Pulau Besar & Pulau Upeh in Melaka). The connectivity between these islands is important as they act as biological corridors allowing the movement of larvae and organisms from one island to another.

In the Straits of Malacca, only four small islands in Kedah are protected. The spill over from that one cluster of protected islands will not be able to sustain marine life in the entire Straits. The Sembilan Islands are suitable candidates for protection due to their location in the middle of the Straits of Malacca and their abundance of marine life. Spill over from the Sembilan Islands will be able to supply the surrounding islands with larvae and fisheries stocks thus assuring sustainability of fisheries in the Straits.

Protecting the Sembilan Islands will also promote ecotourism, shifting the interest from sports fishing to SCUBA diving, bird watching, and snorkelling. Currently only one dive operator dives the Sembilan Islands and very seldom do snorkel operators visit the islands.

Finally, establishing an MMA at the Sembilan Islands would also contribute to Malaysia's commitment under the Convention on Biodiversity to protect 10% of its marine resources. This would show the world that Malaysia is serious when it comes to protecting its coral reefs.

Appendix 1. Map of surveyed sites

