



**Reef Check**  
**MALAYSIA**



**2024**



# Status of Coral Reefs in Malaysia

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## Executive Summary

1. This report presents data from coral reef surveys conducted in Malaysia during 2024 using the Reef Check survey protocol. Reef Check is a coral reef monitoring methodology used to assess the health of coral reefs in over 95 countries and territories worldwide, and in Malaysia since 2007. Surveys were carried out by trained volunteers – members of the public, dive operators, non-profit organisations and government officials from Department of Fisheries Malaysia and Sabah Parks. The participation of the latter is evidence of the continuing commitment of the Government in further improving management of Malaysia's coral reefs.
2. A total of 315 sites were surveyed in 2024 (2023: 326): 157 in Sunda Shelf eco-region; 22 in Malacca Strait eco-region; and 136 in North Borneo eco-region. The surveys are a continuation of a successful National Reef Check Survey Programme that has now run for 18 years. Survey sites, mainly near islands, include both established Marine Protected Areas (MPAs) and non-protected areas.
3. The results indicate that, on average, the coral reefs surveyed have a “fair” level of living coral, at 44.65%. This is a slight decrease compared to 2023 (45.87%). This deterioration can be attributed to a number of factors, key among which are unsustainable tourism, pollution and fishing activities. An additional impact this year was the large-scale coral bleaching event, the 4<sup>th</sup> Global Coral Bleaching Event, which affected coral reefs around the world. Bleaching was documented at nearly 90% of the islands/areas surveyed. Further surveys in 2025 will be required to fully assess mortality or recovery from the bleaching event.
4. Abundance of most indicator fish and invertebrates remains low. Historical over-harvesting and low natural populations might be reasons for this, but many of the sites surveyed, particularly in Sunda Shelf region, are in marine protected areas, where protection might be expected to encourage populations to grow.
5. Indicators of disturbance have increased in many reef areas – approximately 83% of the islands/areas surveyed are heavily impacted by discarded fishing nets and trash and 56% are impacted by boat anchor damage. In Sabah, 64% of the reefs recorded dynamite fishing damage. These result from human activities and there is a need to address these local impacts to protect reefs from unsustainable human practices.
6. The report recommends taking action to **improve management of marine resources** by addressing local impacts and **strengthening the role of local communities** in management. This gives local stakeholders a stronger voice in decisions that affect their livelihoods, and numerous studies exist to suggest that this can lead to **improved conservation outcomes**.
7. Particular emphasis is given to **building resilience** – both ecological and economic. Resilient reefs are more likely to **withstand or bounce back** from the growing threats of climate change. Resilient communities have **diversified economies** and do not rely entirely on coral reefs for their livelihoods. This reduces human pressures on reefs, particularly from tourism.
8. The government is asked to consider introducing a more **sustainable tourism model**, moving away from the “mass” tourism model to a more environmentally friendly tourism industry. The government is also asked to consider establishing a **joint management body** to integrate local communities into the management of Malaysia's marine protected areas.

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With the deterioration in Live Coral Cover, we urge the government to intensify efforts to protect coral reefs and other marine habitats. These ecosystems provide food and jobs for many coastal communities in Malaysia and are an important tourism product. Simple steps such as reducing unsustainable fishing, eliminating physical impacts from tourism and other human activities, and improving sewage treatment, can be achieved easily and locally, and can contribute significantly to improving the resilience and health of marine ecosystems.

Given the emerging global crisis in biodiversity, it is rapidly becoming critical for Malaysia to take urgent steps to protect coral reefs and the mangrove and seagrass ecosystems that are closely linked to them. Doing so has real economic benefits – protecting the livelihoods of small-scale fishers, sustaining tourism markets and contributing to national food security. The time for action is now.

Each Annual Survey Report is written as a stand-alone document that can be read without having to refer to previous reports. As such, much of this and the following section, which remains valid and relevant, is a repetition from previous reports, copied here to provide the reader with an uninterrupted flow of argument and rationale.

## 1. Introduction

Coral reefs are an important ecological and economic resource in many countries around the world, providing a range of valuable ecosystem services to millions of people. Coral reefs provide jobs, food and coastal protection, among other benefits, to hundreds of millions of people (Status of Coral Reefs of the World, 2020). They are the most diverse marine ecosystems on earth. Despite being recognised for their economic and aesthetic value, coral reefs are being damaged by a variety of both local and global threats.

- Between 2009 and 2018, there was a progressive loss of about 14% of world's coral reefs (Status of Coral Reefs of the World, 2020).

The loss was mainly due to frequent large-scale coral bleaching events, combined with other local threats. The local threats are:

- Unsustainable fishing
- Coastal development
- Land-based and marine pollution
- Tropical storms

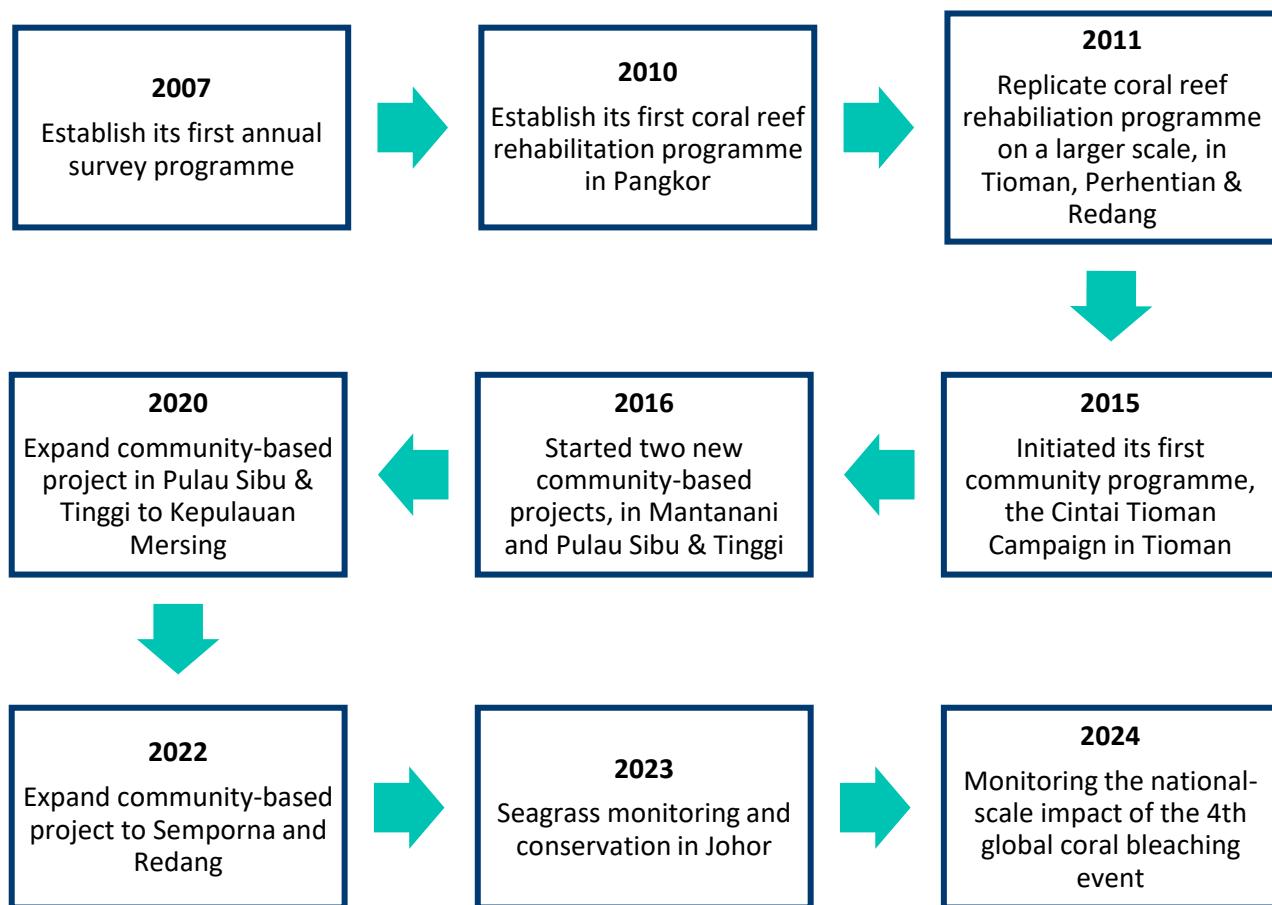
In Malaysia, the Department of Fisheries Malaysia, Sabah Parks and Sarawak Forestry are tasked with managing these local threats to their protected reef areas. Meanwhile, Reef Check Malaysia (RCM) works with various stakeholders to conserve coral reefs. Since it was registered in 2007, RCM has established an annual, national coral reef monitoring programme. This report presents the results of coral reef surveys conducted in Malaysia during 2024, the 18<sup>th</sup> year of surveys.

## 2. Reef Check

### Background

Reef Check Malaysia (RCM) is part of the world-wide Reef Check network. Established in 1997 in the USA, Reef Check now has Coordinators in over 95 countries worldwide. Reef Check was established by a group of scientists who developed a simple, rapid method of surveying coral reefs. It is the name of the organisation and the survey methodology.

RCM was registered in Malaysia as a non-profit company in 2007, and since then has established an annual survey programme to assess the health of coral reefs around Malaysia (reports are available for download from the website: [www.reefcheck.org.my](http://www.reefcheck.org.my)). Since 2007, RCM has trained over 1000 divers to conduct reef surveys at over 250 permanent monitoring sites on coral reefs off the coast of Peninsular Malaysia and at sites around East Malaysia. RCM is also active in education and awareness programmes.



This report is the 18<sup>th</sup> annual Malaysia coral reef survey report and details the results of Reef Check surveys carried out during 2024. It represents a continuation of the reef monitoring effort started by RCM in 2007. The information shown highlights key concerns and identifies steps that need to be taken to contribute to the conservation of Malaysia's coral reefs.

## Survey Sites

A total of 315 sites were surveyed, 157 of which were in Sunda Shelf region, 22 in Malacca Strait region and 136 in North Borneo region. As far as possible, the same sites are visited each year to provide consistent data over time. In Sunda Shelf and Malacca Strait regions, a large percentage of the surveys were conducted by RCM together with Department of Fisheries Malaysia (DoFM), RCM's volunteers and non-profit organisations. In North Borneo region, a large percentage of the surveys were conducted by RCM together with Sabah Parks, RCM's volunteers, non-profit organisations and a few dive operators. This is one of the success stories of getting local stakeholders to be involved in monitoring and management of their own local reefs. The list of sites surveyed is shown in Appendix 1.

## 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, and
- provide information about the health of a coral reef.

Using a standardized methodology, data from surveys in different sites can be compared, whether it be on an island, regional, national, or international basis (see [www.reefcheck.org](http://www.reefcheck.org) for more details).

The Reef Check monitoring methodology allows scientists and managers to track changes to coral reefs over time. By surveying reefs on a regular basis, deleterious changes can be highlighted early, before they become problems. This gives managers the opportunity to intervene, carry out additional more detailed studies and/or initiate management actions to try to reverse the change before permanent damage is done to the reef.

A 100m transect line is deployed and along it four 20m transects are surveyed, each separated by 5m, which provides 4 replicates per transect for statistical analysis (see figure below).

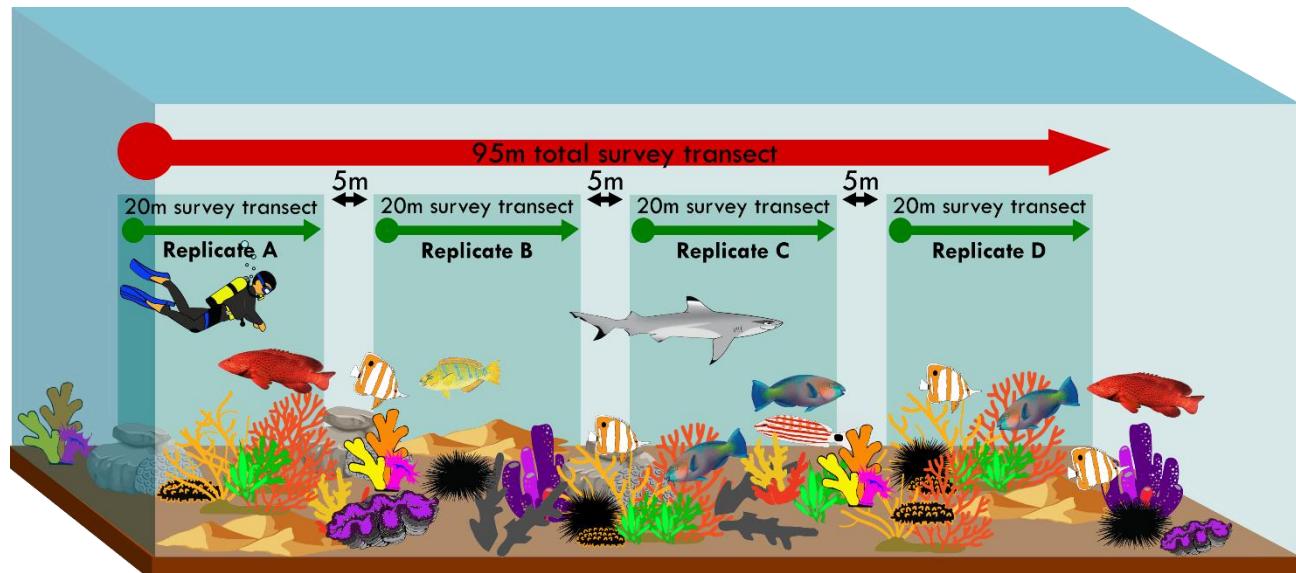


Figure showing the transect – the basic idea of the Reef Check protocol is to swim along a 100m measuring tape (transect) and count organisms in four 20m long transect.

Four types of data are collected:



Fish

Divers count the indicator fish along the four 20m long x 5m wide x 5m high corridors by swimming slowly.

Reef Check indicator fish species were chosen on the basis of targeted demand for:

- Aquarium trade: Butterflyfish (BF)
- Food fish: Sweetlips (SL), Snapper (SN), Barramundi Cod (BC), Parrotfish (PF), Moray Eel (ME), Grouper (GR)
- Live-food fish trade: Humphead Wrasse (HW), Bumphead Parrotfish (BP)



Invertebrate

Divers count the indicator invertebrates along the four 20m x 5m belts.

The invertebrate indicators are targeted for different reasons:

- Collected for Curio trade: Banded Coral Shrimp (BCS), Pencil Urchin (PU), Triton Shell (TR)
- Collected for Food: Collector Urchin (CU), Sea Cucumber (SC), Lobster (LO), Giant Clam (GC)
- Ecological Imbalance/Predator Outbreaks: *Diadema* Urchin (DU), Crown of Thorns (COT)



Substrate

Using Point Intercept method, substrate category is noted at every 0.5m.

The categories are: hard coral (HC), soft coral (SC), sponge (SP), nutrient indicator algae (NIA), recently killed coral (RKC), coral rubble (RB), rock (RC), sand (SD), silt (SI) and other (OT). These are divided into categories that reflect their impact on reef health:

Live Coral Cover: HC + SC

Other: OT

Available Substrate: RC

Sand: SD

Disturbance Indicators: RKC + RB + SI

Pollution Indicators: NIA + SP



Impact

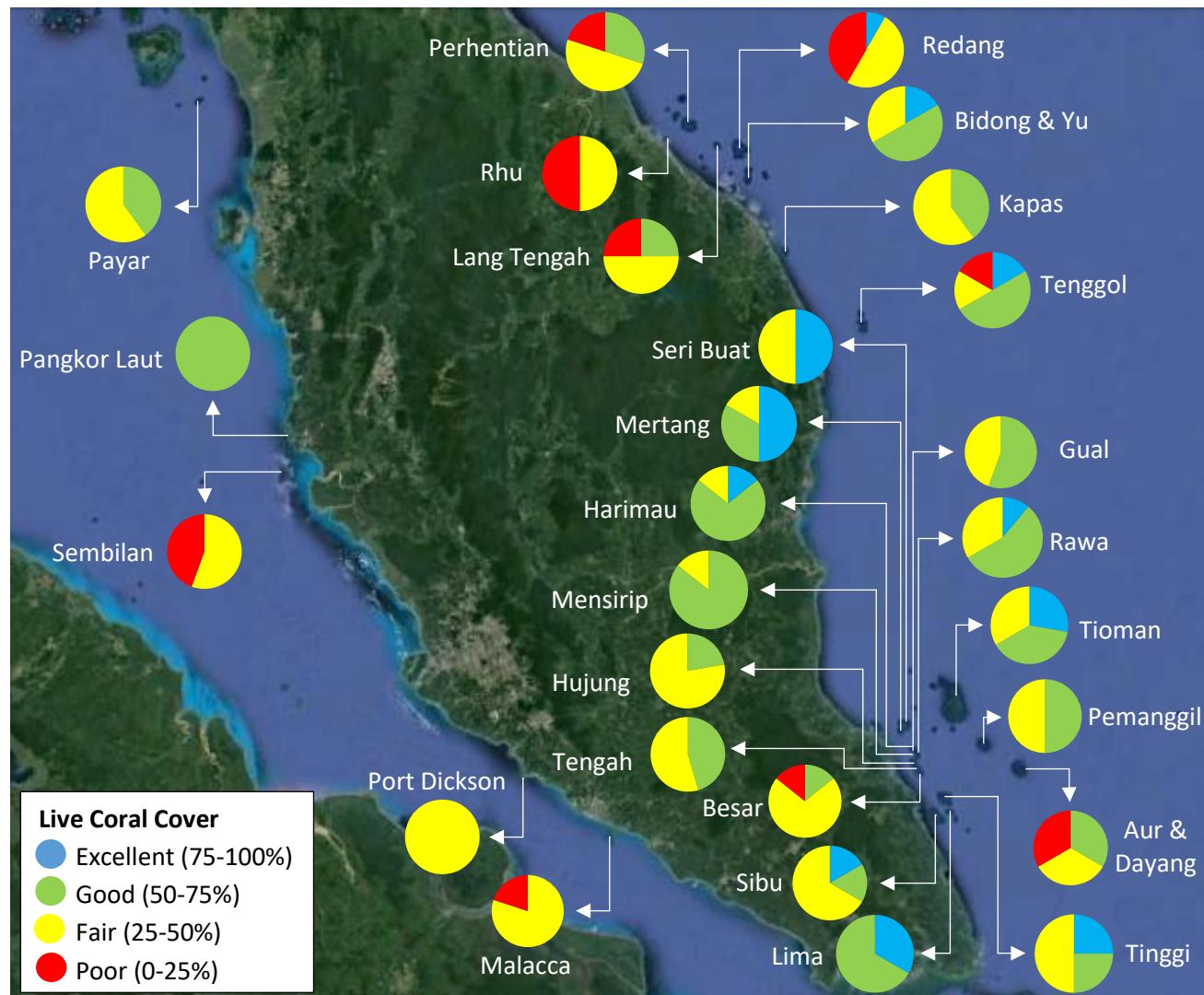
Assess the damage to coral from bleaching, anchoring, destructive fishing, corallivores (such as *Drupella* snail or Crown-of-Thorns starfish), and trash.

### 3. Survey Results & Analysis

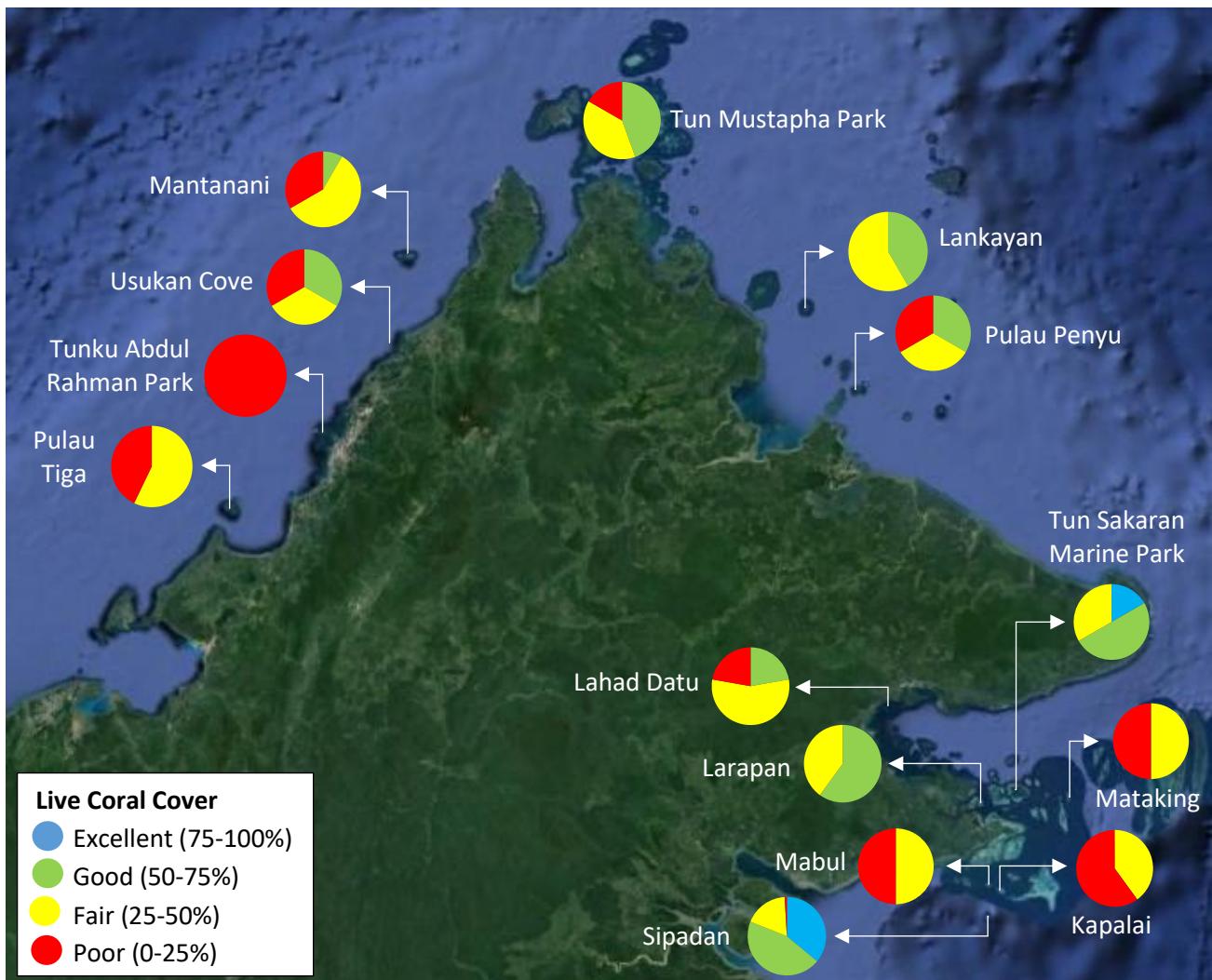
This section presents the results from surveys conducted in 2024, providing an overview of the condition of coral reefs in Malaysia as a whole, and a detailed analysis of the health of reefs in areas surveyed.

#### Malaysia

The results from all 315 surveys were compiled to provide an overview of the status of coral reefs around Malaysia. Sites surveyed off Peninsular Malaysia are mostly islands which are important tourist destinations while the islands and reefs off Sabah are less frequently visited but face other problems such as destructive fishing practices.



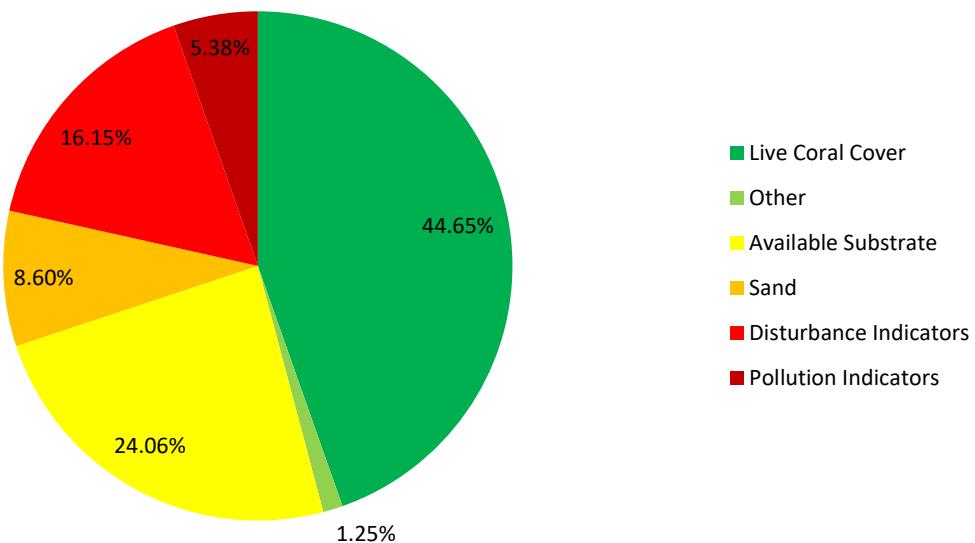
Map showing the reef health composition of each survey location in Peninsular Malaysia based on Live Coral Cover.



Map showing the reef health composition of each survey location in Sabah based on Live Coral Cover.

## Coral Cover and Health

Reef Health in Malaysia



- On average, reefs in Malaysia are in ‘Fair’ condition.
- Mean hard coral (reef builder) cover is 41.85%.
- Available substrate for coral recruits to attach is high.
- Indicators for disturbance are high.

### INDICATORS FOR DISTURBANCE

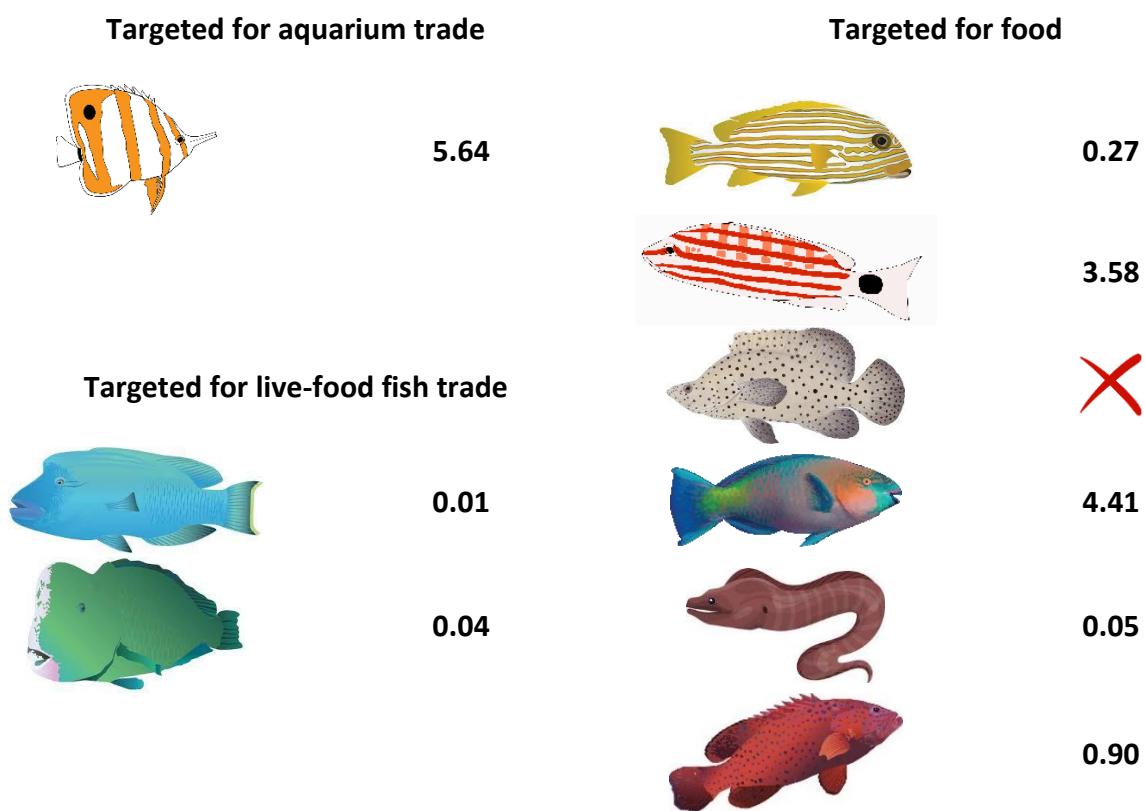
- In all regions.
- Over 50% recorded in Tunku Abdul Rahman Park and over 40% in Redang.
- 20% to 30% recorded in Pangkor, Malacca, Port Dickson, Mantanani, Mataking, Penyu, Sipadan and Tun Sakaran Marine Park.

### INDICATORS FOR POLLUTION

- Mainly in Malacca Strait and Sunda Shelf regions.
- Over 10% recorded in Pulau Sembilan, Port Dickson, Lang Tengah, Aur & Dayang, Pulau Besar, Pemanggil, Sibu and Larapan.

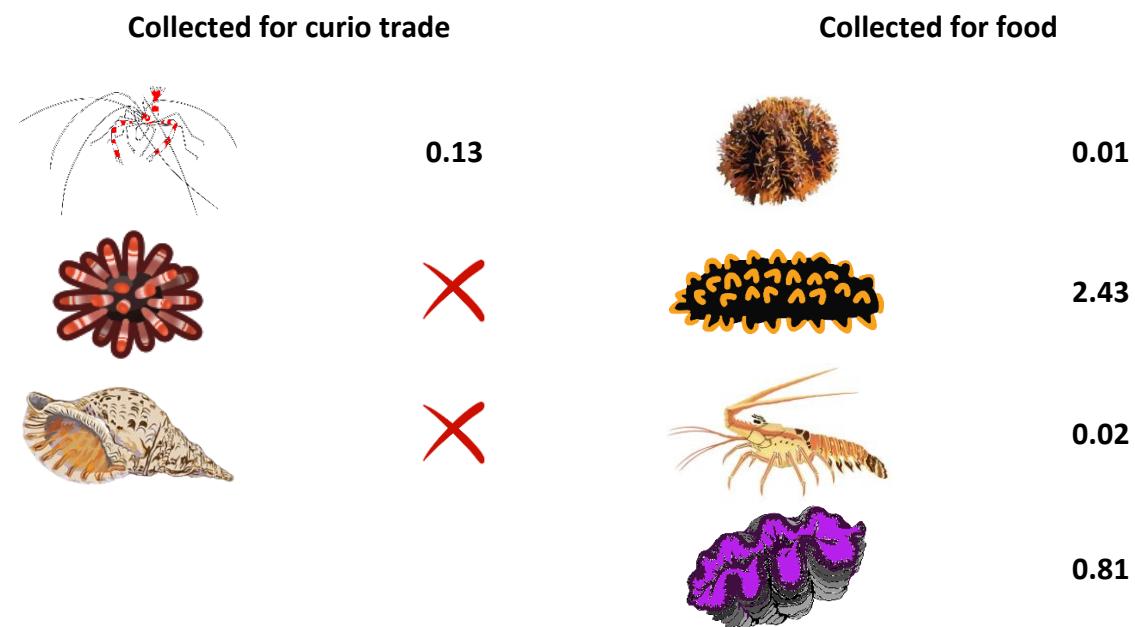
## Fish Abundance in Malaysia

(Individuals per 500m<sup>3</sup>)

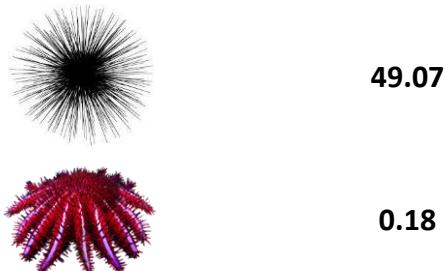


- All types of fish except barramundi cod are recorded but their abundance is very low, except for butterflyfish, snapper and parrotfish.

## Invertebrate Abundance in Malaysia (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



- Banded coral shrimp, invertebrate targeted for curio trade, is recorded.
- All types of invertebrates targeted for food are recorded but the abundance is very low, except for sea cucumber.
- On average, crown-of-thorns are not an issue in Malaysia, but they are a problem in some individual locations.

### CROWN-OF-THORNS



- Tioman, Bidong and Yu, Pemanggil and Lahad Datu are facing crown-of-thorns issues.

## Eco-regions in Malaysia

The data below provide an overview of the health of coral reefs surveyed in three Eco-regions in Malaysia. An Eco-region is defined as an area of relatively identical species composition, clearly distinct from adjacent regions. The marine eco-regions relevant to Malaysia are based on the “Marine Eco-regions of the World” system (Spalding et al, 2007). They are:

- Sunda Shelf (East coast of Peninsular Malaysia and Sarawak, Eco-region 117)
- Malacca Strait (West coast of Peninsular Malaysia, Eco-region 118)
- North Borneo (Sabah, Eco-region 126)

Focusing management efforts at an eco-region level can provide benefits as reefs in each region are similar; therefore, the results of this report have been delineated into these three eco-regions. The results highlight the different problems each island/area is facing. Islands/regions covered in each eco-region are shown in table below.



Eco-regions of Malaysia; 117 = Sunda Shelf, 118 = Malacca Strait and 126 = North Borneo

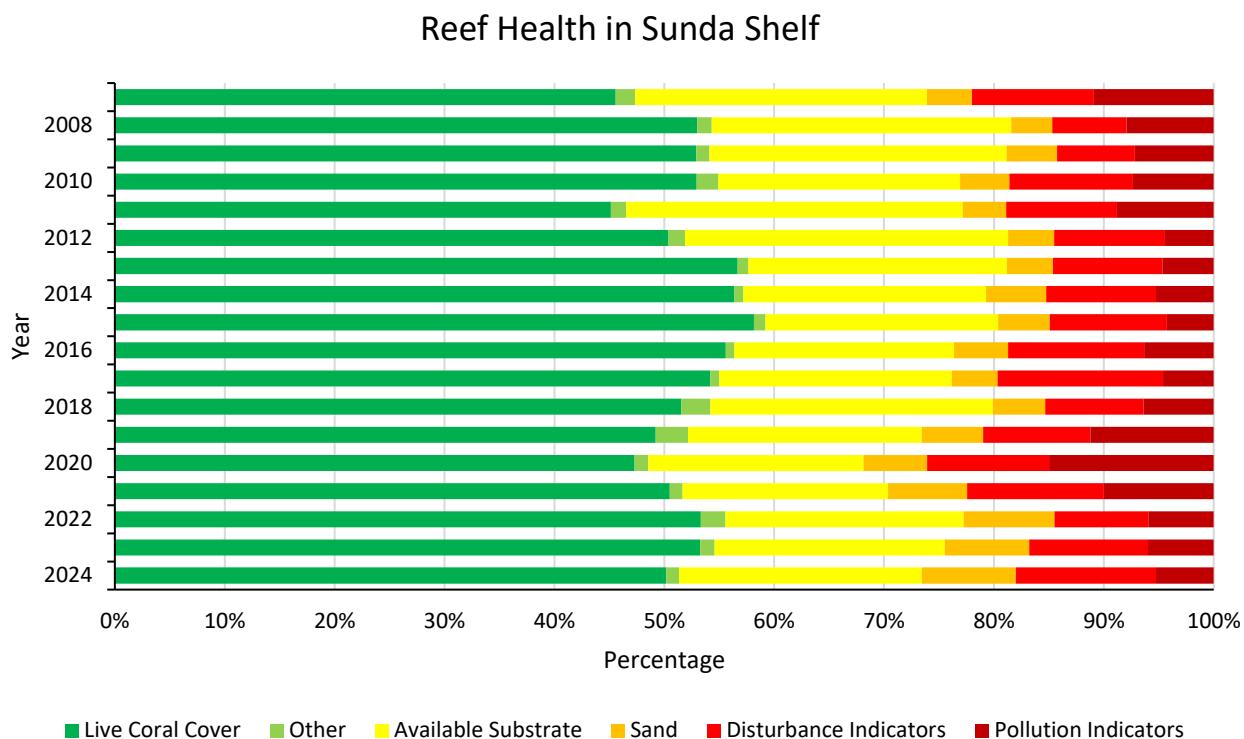
Site Coverage by Ecoregion

Eco-region	State	Islands/Areas	No. of sites	Protection Status	LCC (%)	Average (%)
Sunda Shelf	Pahang	Seri Buat	4	Marine Park	62.50	50.21
	Pahang	Tioman	18	Marine Park	58.37	
	Terengganu	Bidong & Yu	6	Marine Park (Yu only)	59.27	
	Terengganu	Kapas	5	Marine Park	47.80	
	Terengganu	Lang Tengah	4	Marine Park	36.72	
	Terengganu	Perhentian	10	Marine Park	39.19	
	Terengganu	Redang	12	Marine Park	29.17	
	Terengganu	Rhu	4	No protection	28.50	
	Terengganu	Tenggol	6	Marine Park	57.08	
	Johor	Aur & Dayang	6	Marine Park	38.02	
	Johor	Besar	7	Marine Park	42.41	
	Johor	Gual	9	Marine Park	55.76	
	Johor	Harimau	7	Marine Park	60.27	
	Johor	Hujung	9	Marine Park	46.60	
	Johor	Lima	3	Marine Park	62.67	
	Johor	Mensirip	7	Marine Park	58.84	
	Johor	Mertang	6	Marine Park	69.58	
	Johor	Pemanggil	4	Marine Park	47.50	
	Johor	Rawa	9	Marine Park	56.53	
	Johor	Sibu	6	Marine Park	50.73	
	Johor	Tengah	11	Marine Park	47.95	
	Johor	Tinggi	4	Marine Park	56.72	

Eco-region	State	Islands/Areas	No. of sites	Protection Status	LCC (%)	Average (%)
Malacca Strait	Kedah	Payar	5	Marine Park	49.13	36.36
	Perak	Pangkor Laut	1	No protection	51.88	
	Perak	Sembilan	9	No protection	27.99	
	Malacca	Malacca	5	Marine Park	33.13	
	Ng. Sembilan	Port Dickson	2	Fisheries Prohibited Area	42.50	
North Borneo	Sabah	Kapalai	5	No protection	20.50	39.56
	Sabah	Lahad Datu	18	No protection	35.69	
	Sabah	Lankayan	12	SIMCA	49.53	
	Sabah	Larapan	5	No protection	58.50	
	Sabah	Mabul	6	No protection	22.29	
	Sabah	Mantanani	12	No protection	33.00	
	Sabah	Mataking	6	No protection	26.88	
	Sabah	Pulau Penyu	9	Sabah Parks	39.31	
	Sabah	Pulau Tiga	7	Sabah Parks	22.86	
	Sabah	Sipadan	12	Sabah Parks	63.28	
	Sabah	TARP	8	Sabah Parks	13.98	
	Sabah	TMP	18	Sabah Parks	44.83	
	Sabah	TSMP	12	Sabah Parks	55.78	
	Sabah	Usukan Cove	6	No protection	32.67	

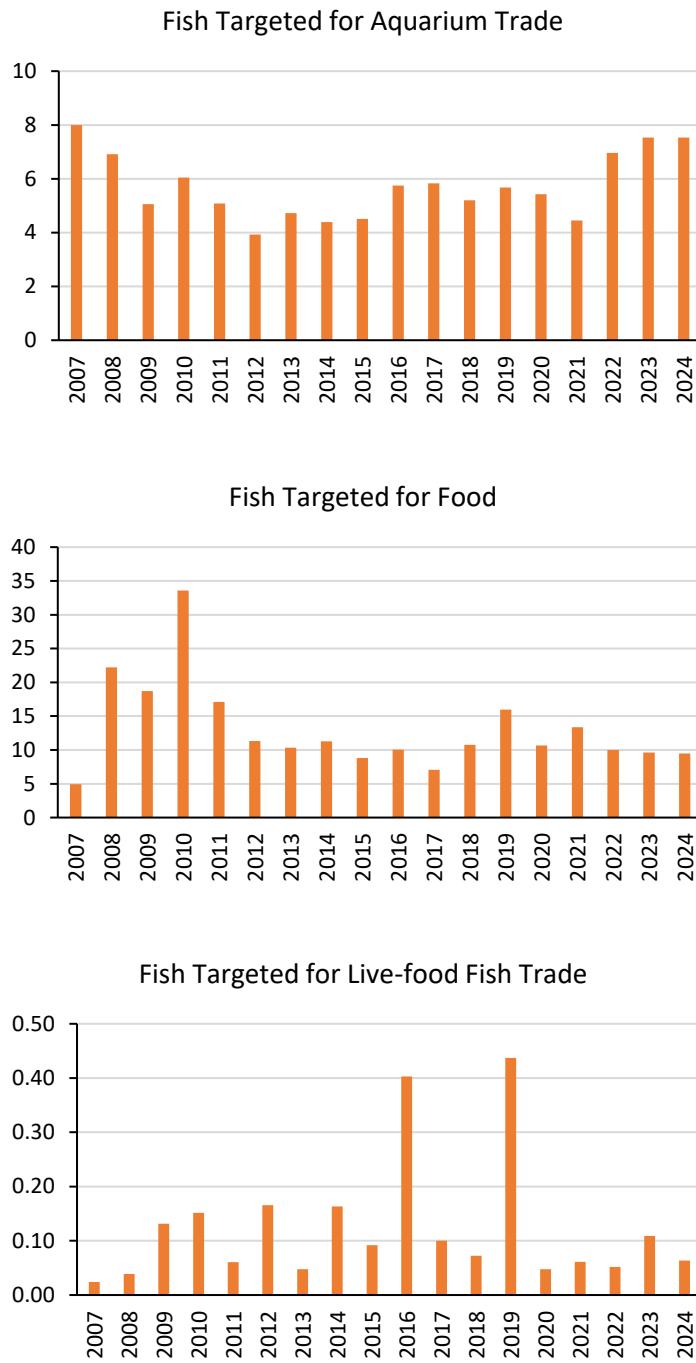
## Sunda Shelf

### Coral Cover and Health



- The deterioration of Sunda Shelf reefs in 2011 is probably due to 2010 Mass Coral Bleaching Event. From 2012 onwards, the reefs showed improvement.
- From 2016 to 2020, the reefs deteriorated, due to raised level of nutrient in the waters. In 2019, the Tropical Storm Pabuk contributed to the deterioration, particularly reefs in Bidong & Yu, Perhentian, Redang and Tenggol.
- In 2021, reefs health showed improvement. The improvement was mainly attributed to recovery of Terengganu reefs. In 2022, reefs health continued to improve. One reason for this could be the restrictions on tourism during the Covid-19 pandemic, pointing to a possible management measure that would see reef areas closed temporarily to allow them to recover.
- In 2023, reefs health deteriorated. The deterioration was likely due to physical damage caused by human activities and/or storm. Another reason for this could be resumption of tourism.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach to is very high, indicating possible chance of reef recovery if human impacts are dealt with.

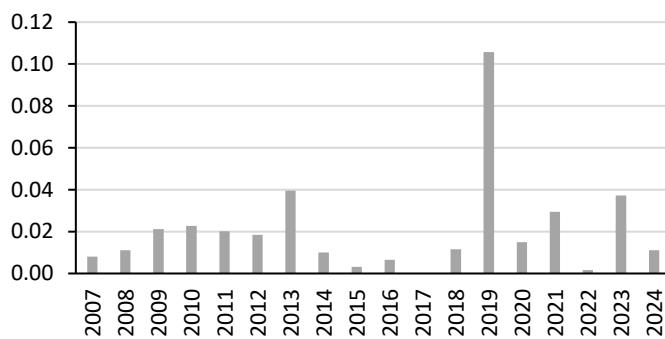
## Fish



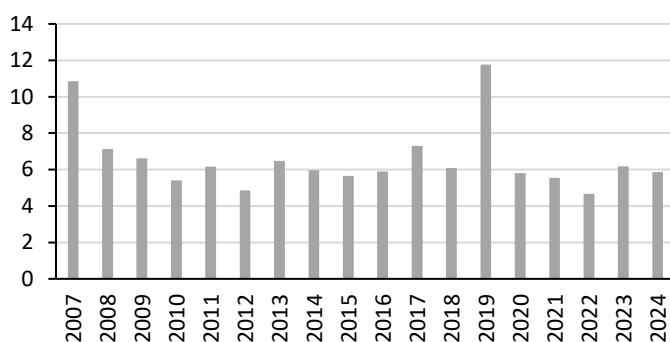
- The abundance of fish targeted for aquarium trade and food does not change much. The high abundance fish targeted for food from 2008 to 2011 was contributed by snappers.
- Very low abundance of fish targeted for life-food fish trade, with spikes in 2016 and 2019 which were attributed to non-resident bumphead parrotfish communities.

## Invertebrate

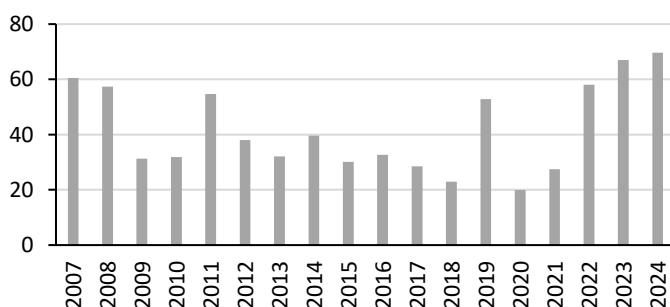
Invertebrates Targeted for Curio Trade



Invertebrates Targeted for Food



Ecological imbalance/predator outbreak  
Indicators



- Very low abundance of invertebrates targeted for curio trade.
- Abundance of indicators targeted for food have remained similar over the years.
- Indicators for ecological imbalance/predator outbreaks have been increasing since 2021.
- Since 2022, the abundance of crown-of-thorns has reduced and is within what a healthy reef can support (0.2-0.3 individual per 100m<sup>2</sup>).

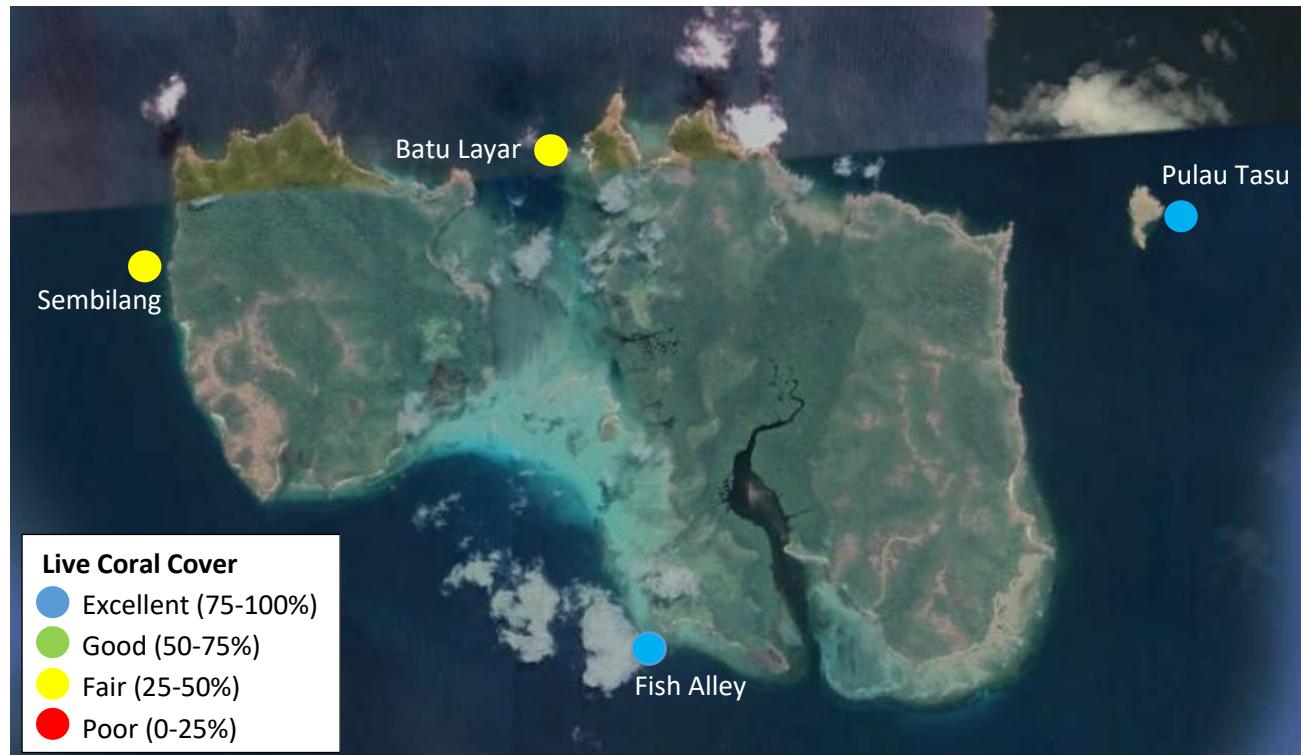
CROWN-OF-THORNS IN SUNDA SHELF



## Pahang – Seri Buat

Seri Buat Island is located off the East coast of Pahang, Malaysia. It is part of a group of nine islands that form the Tioman Island Marine Park. The island archipelago and its surrounding waters are gazetted as Marine Park under the Fisheries Act 1985.

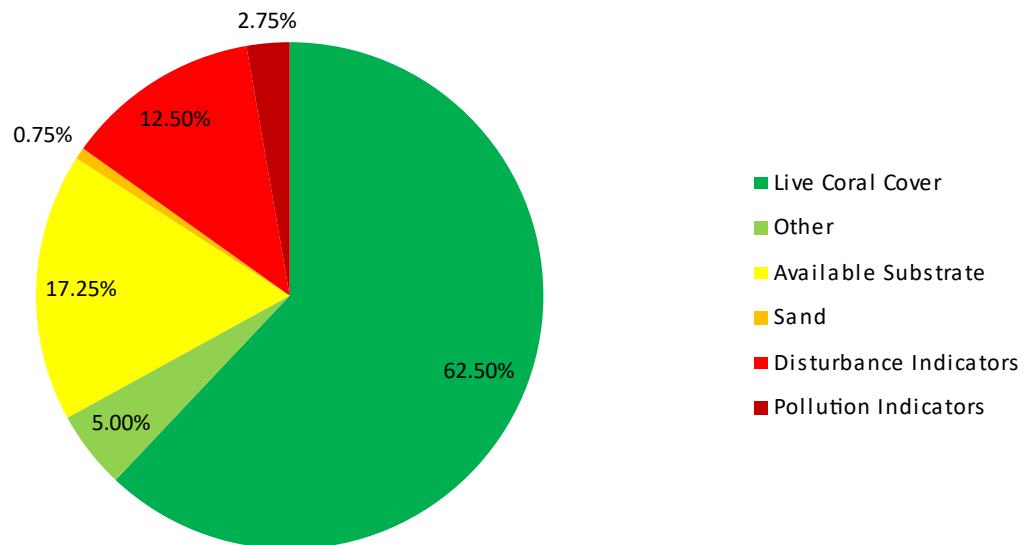
Seri Buat Island is uninhabited, the nearest accommodation is on Tioman Island. The reefs around the island are idyllic for snorkelling and diving. Apart from water activities, tourists can hike the peak of the island. However, the island is not popular among tourists.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Excellent' coral cover and 2 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Seri Buat



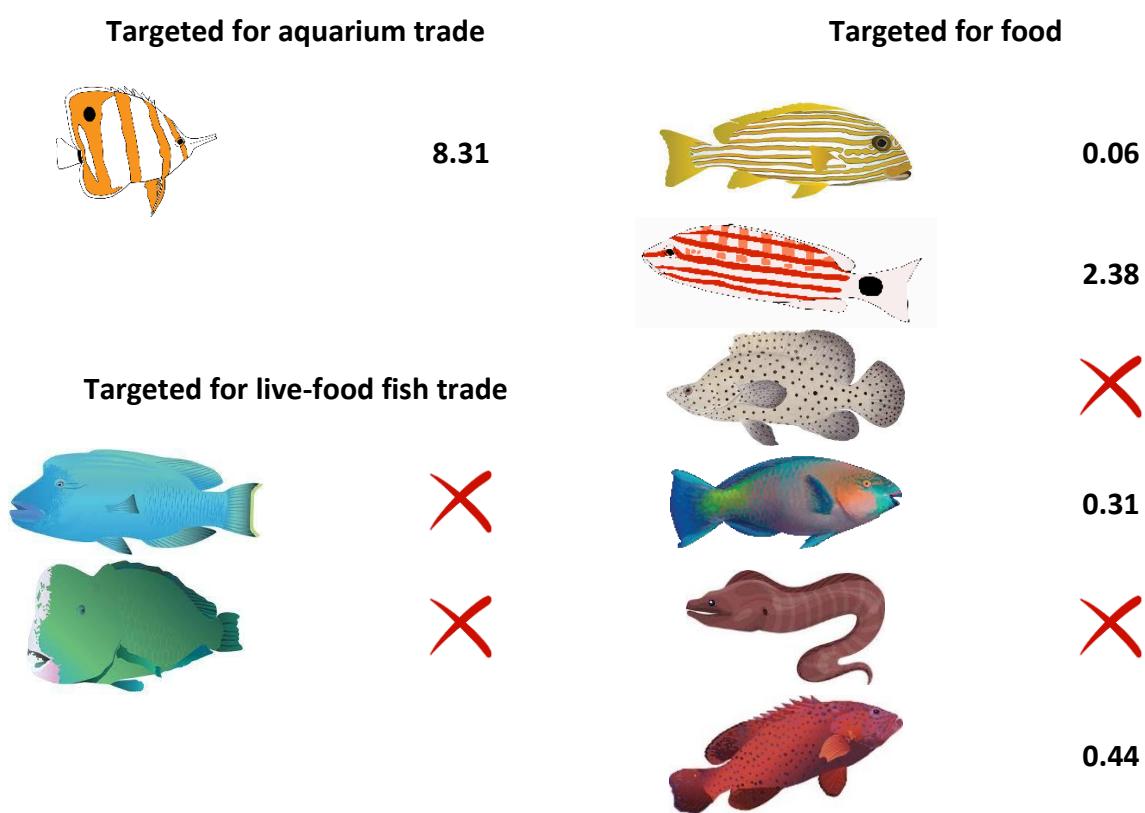
- Seri Buat reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 61%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Disturbance indicators are high.
- Rubble level is especially high at Batu Layar (25%) and Sembilang (13%).

### CORAL IMPACTS

- Boat anchor damage and discarded fishing nets were recorded at many sites.
- All sites, with an average 32% of the reefs, were impacted by warm water bleaching.

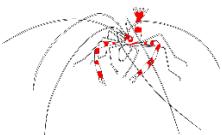


### Fish Abundance at Seri Buat (Individuals per 500m<sup>3</sup>)

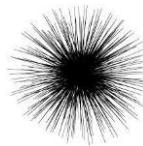


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Fish targeted for live-food fish trade are absent.
- Fish targeted for food are very low in abundance.

## Invertebrate Abundance at Seri Buat (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	✗		✗
	✗		0.31
	✗		✗
			0.38

### Ecological Imbalance/Predator Outbreaks

	42.25
	0.06

- Indicators for curio trade are absent
- Crown-of-thorns is not an issue in Seri Buat.
- Invertebrates targeted for food are very low in abundance.

### RARE ANIMALS

- Shark was recorded.

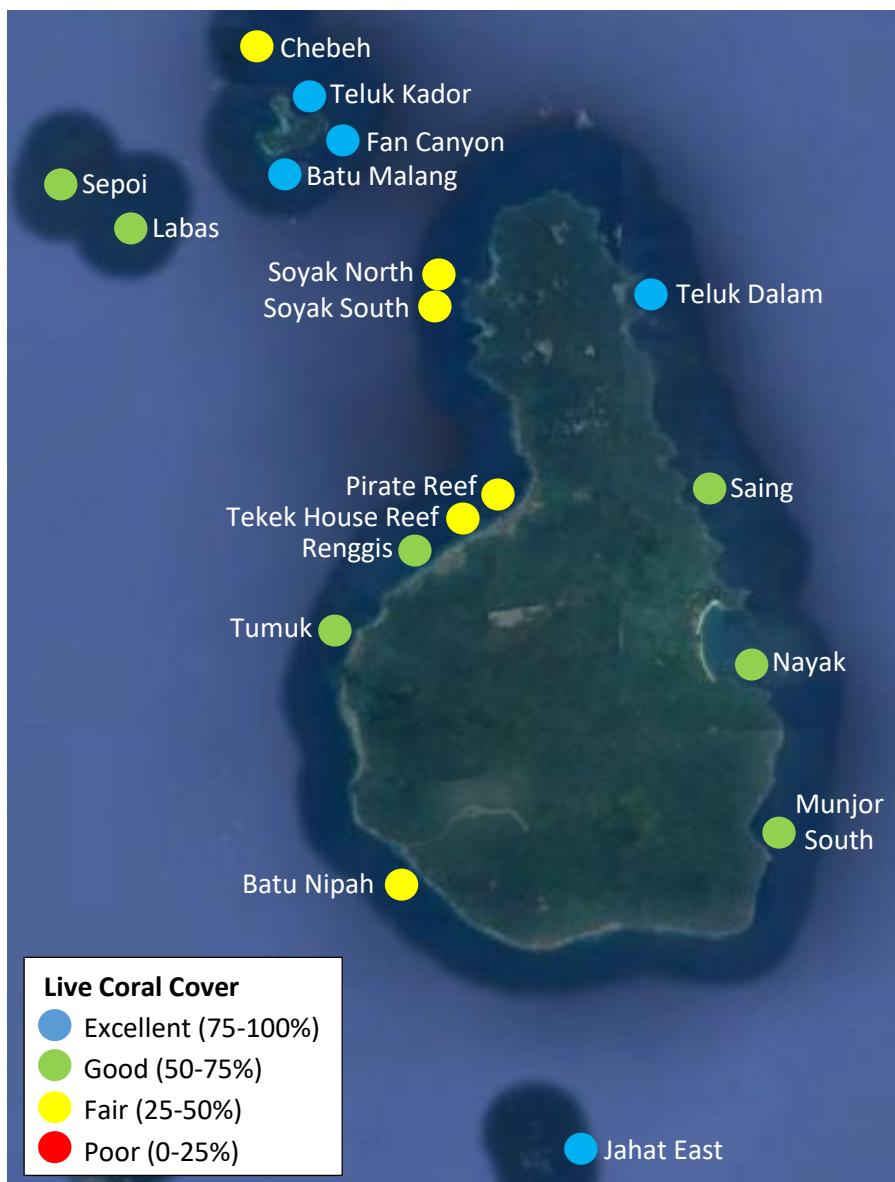


## Pahang – Tioman

Tioman Island is located some 50km from Mersing, off the East coast of Pahang. It is the largest island off the East coast of Peninsular Malaysia. The island has seven villages, with a total population of approximately 3,700 most of whom work in the tourism industry, the main industry on the island. The island has been gazetted as a Marine Park since 1994. Reefs are mainly fringing offshore reefs with some submerged reefs.

Diving and snorkelling are the main tourist activities. The island has long been a popular tourist destination, though at one point it was eclipsed by other destinations (particularly Redang and Perhentian). However, in recent years, tourism on Tioman Island has picked up again and now there are over 100 resorts and 40 dive operators on the island.

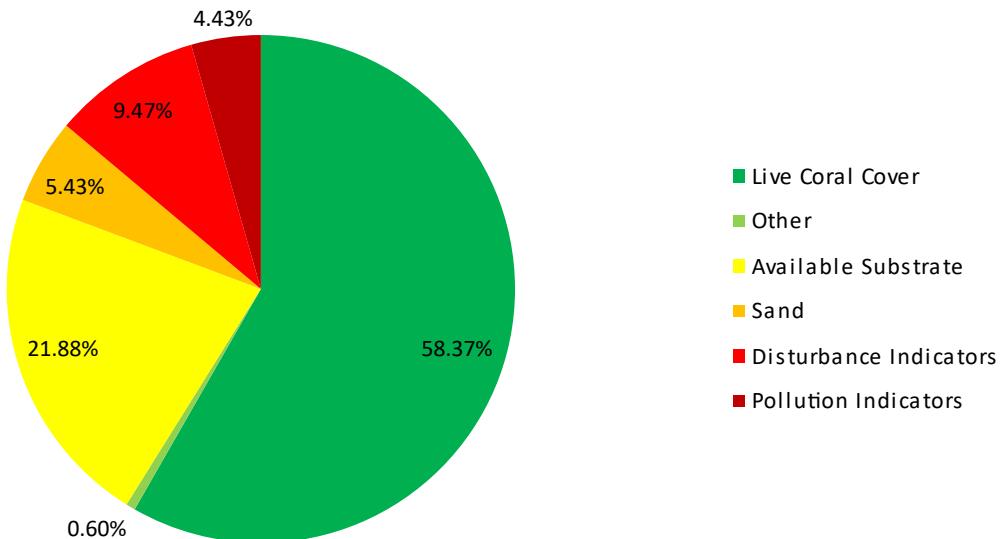
There is a small power generation station on the island, supplying electricity to all areas. Freshwater on the island depends mainly on several river systems coming from the hilly forested areas. A municipal incinerator was constructed some years ago. The island is served by an airport as well as ferry services from the mainland.



Map showing the health categories of each survey site based on Live Coral Cover: 5 sites have 'Excellent' coral cover, 7 are in 'Good' condition and 6 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Tioman



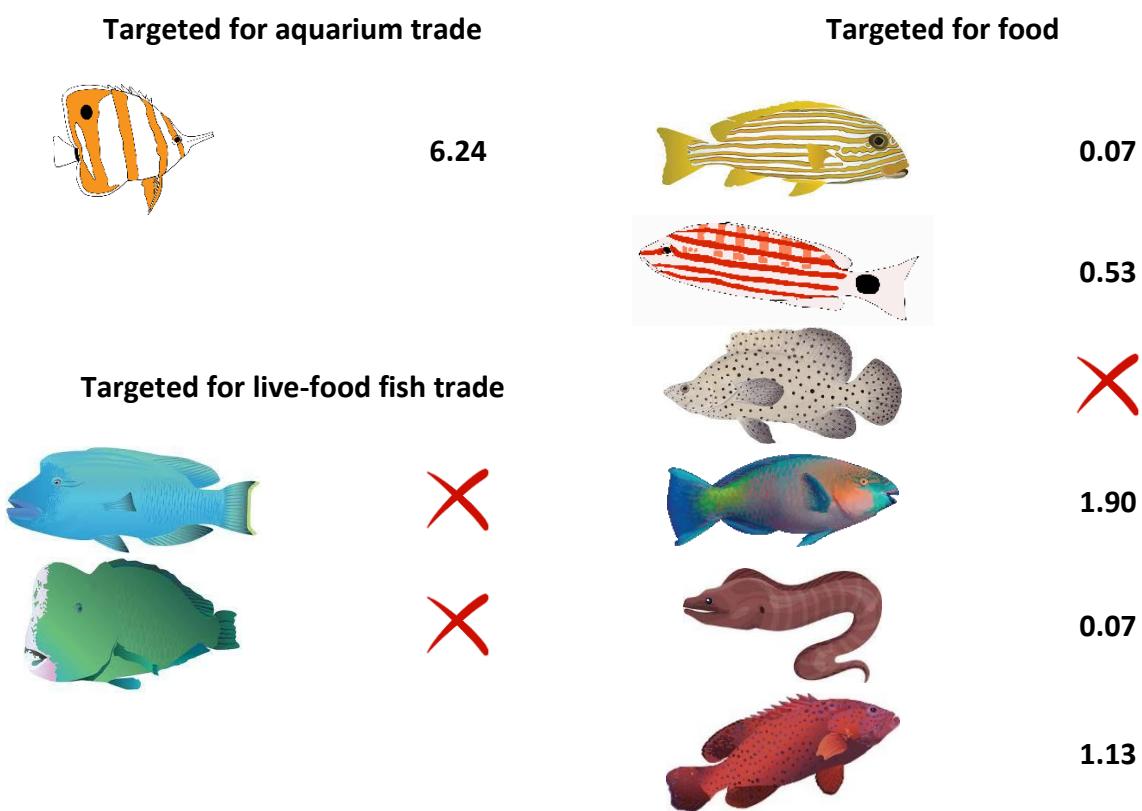
- Tioman reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 55.43%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are quite high.
- Rubble level is high at many sites, ranging from 11% to 22%.
- Pollution indicators are not high in Tioman in general, but the level of nutrient indicator algae is high at Batu Nipah (11%) and the level of sponge is very high at Renggis (22.50%).

### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded.
- Crown-of-thorns predation was recorded at many sites.
- Many sites, with an average 4% of the reefs, were impacted by warm water bleaching.



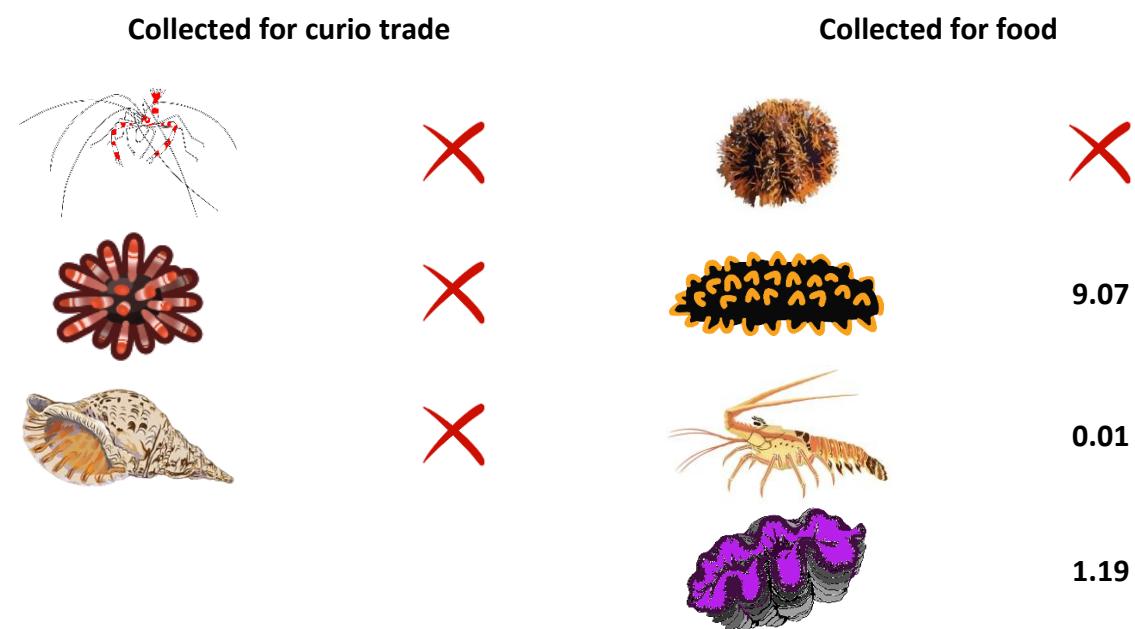
### Fish Abundance at Tioman (Individuals per 500m<sup>3</sup>)



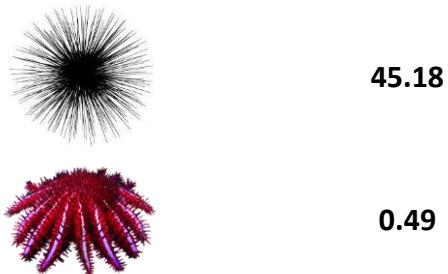
- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of fish targeted for live-food fish trade.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food are very low.

## Invertebrate Abundance at Tioman

(Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



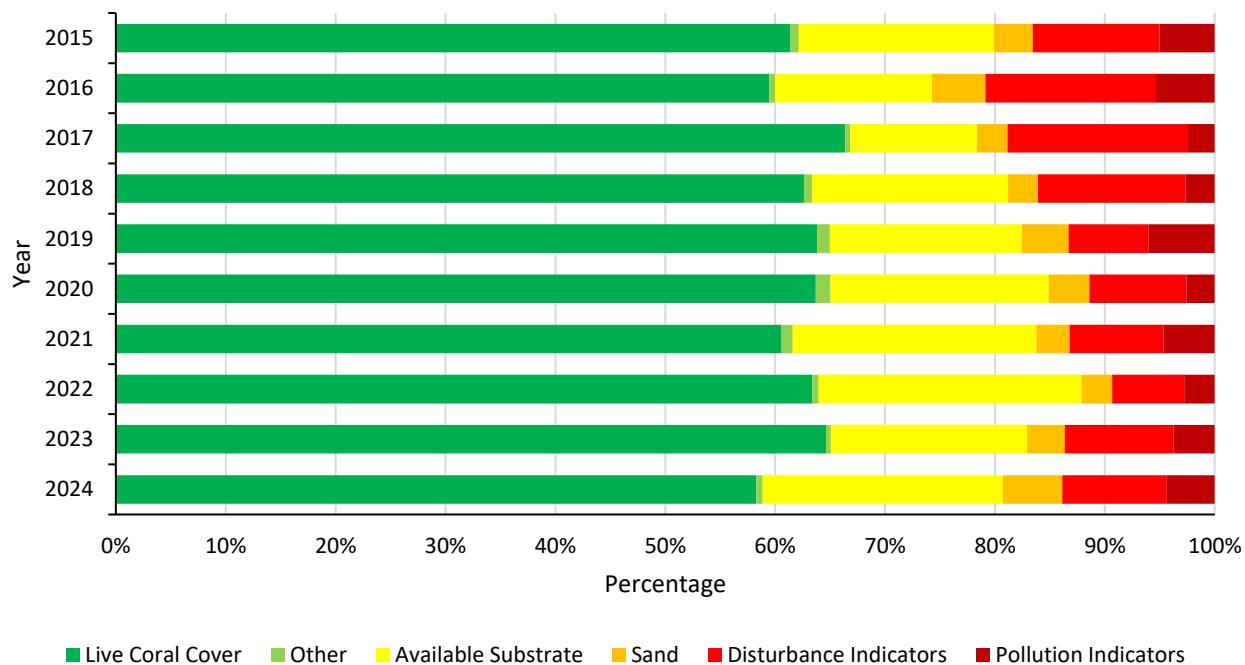
- Absent of invertebrates collected for curio trade.
- Crown-of-thorns is an issue in Tioman. A healthy coral reef can support a population of 0.2-0.3 individuals per 100m<sup>2</sup>, Tioman recorded 0.49.
- Invertebrates targeted for food are low in abundance, except for sea cucumber.
- Sea cucumber abundance in Tioman is high.

### RARE ANIMALS

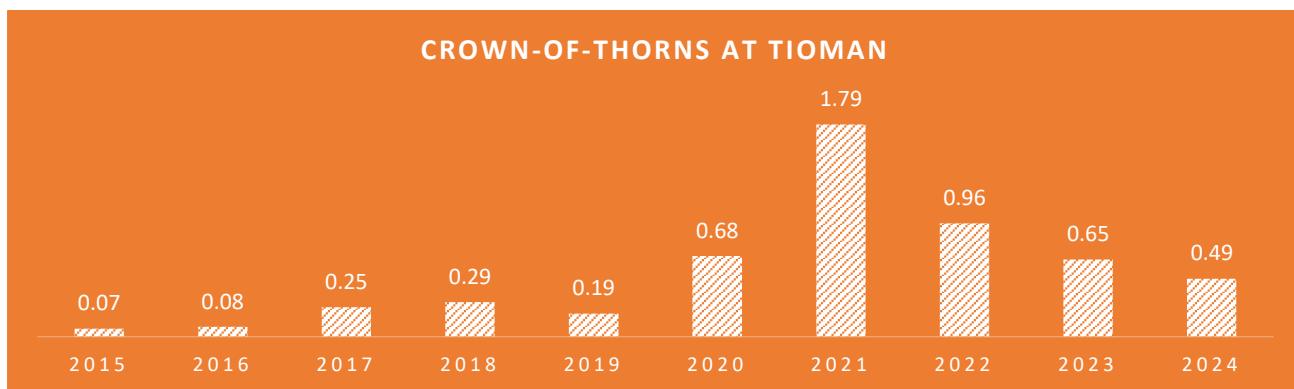
- Sharks and turtles were recorded at few sites.



### Reef Health at Tioman



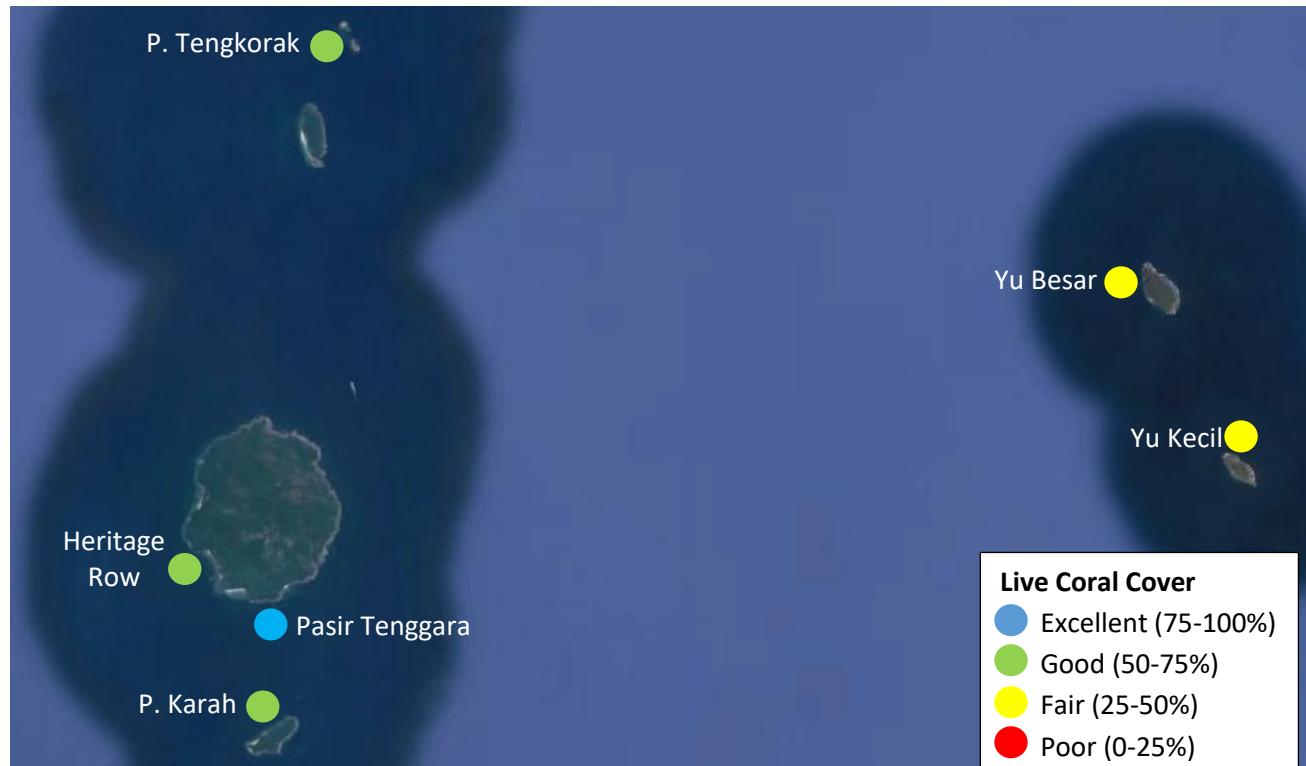
- Tioman reefs have maintained in ‘good’ condition.
- In 2024, the reefs had deteriorated. The deterioration was due to a combination of raised level of nutrient in the waters and the 4<sup>th</sup> Global Coral Bleaching Event.
- In 2020, the population of crown-of-thorns was above what a healthy reef can support (0.2-0.3 individual per 100m<sup>2</sup>). The increase in crown-of-thorns abundance was probably due to Covid-19 pandemic which hampered culling efforts – local Movement Control Order prohibited all diving activities. In October 2021, the Movement Control Order was lifted and crown-of-thorns culling efforts were resumed. Since 2022, the abundance of crown-of-thorns has reduced. Nevertheless, the abundance is still a cause for concern and existing efforts by reef managers to control the population need to be heightened.



## Terengganu – Bidong & Yu

The Bidong and Yu archipelago comprises several small islands, located 15-25km from Marang, off the East coast of Terengganu, Malaysia. The islands are unpopulated, though from 1978 to 1991 Bidong was a centre for Vietnamese refugees. Yu islands are gazetted as a Marine Park under the Fisheries Act 1985 and Bidong is in the process of being gazetted as State Park.

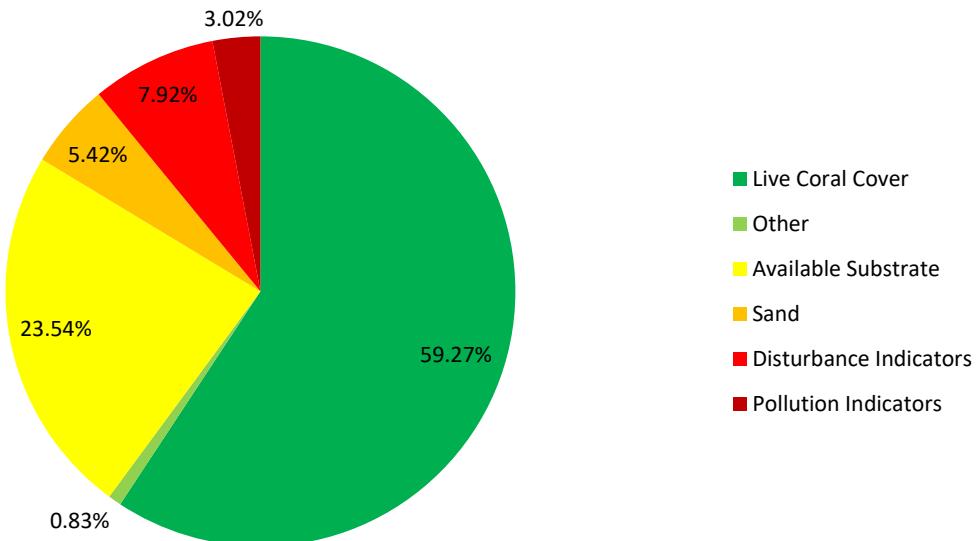
Bidong has mainly been used as a research base for University Malaysia Terengganu but has recently grown in popularity as a diving destination. Bidong has some sandy beaches and fringing reefs while Pulau Yu Besar and Kecil are mainly small rocky islands, with boulder slopes dropping to 25-30m, with some coral reef areas.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 3 are in 'Good' condition and 2 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Bidong & Yu



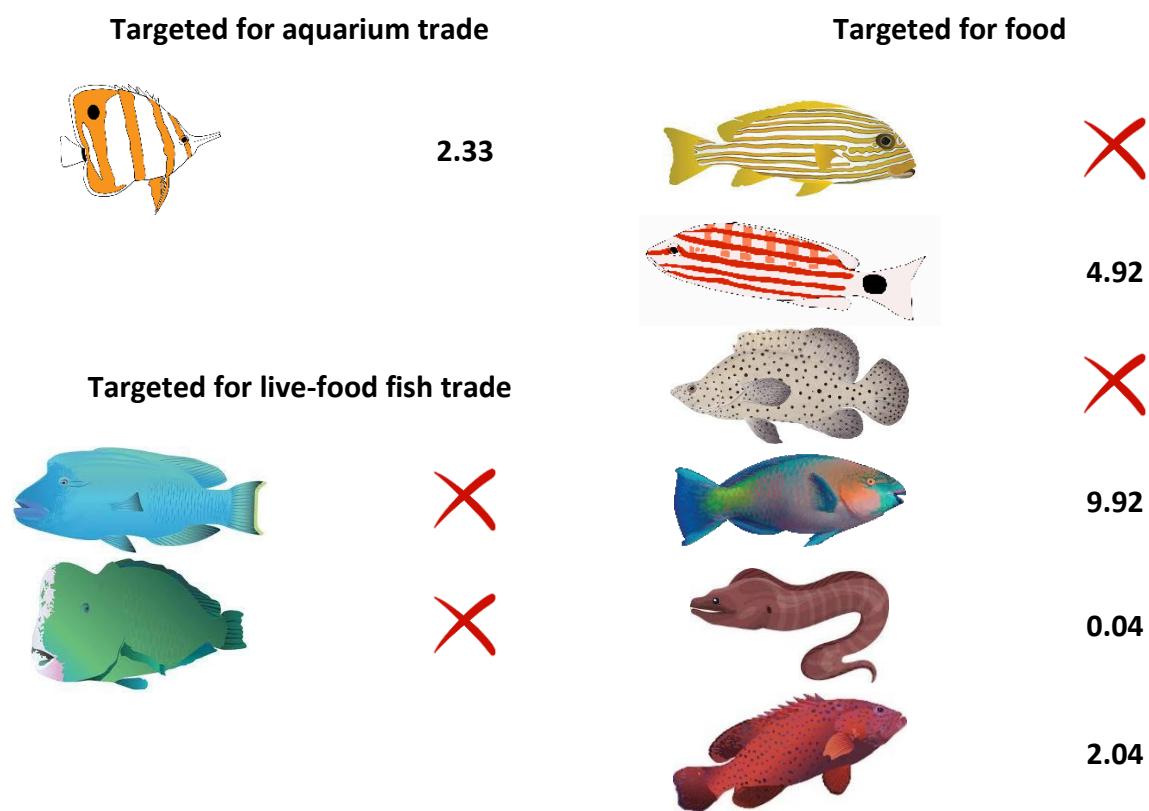
- Bidong and Yu reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 45.42%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are high.
- Rubble level is especially high at Pulau Tengkorak and Yu Kecil, both recorded over 10%.
- Although the site Pasir Tenggara has 'Excellent' coral cover, the high percentage of live coral cover is mainly attributed by soft coral (zoanthid), which recorded 78.75%. Hard coral cover is only 1.88%. Zoanthid appears to colonise the reef. While the category appears "healthy," the reef is undergoing a significant shift to a less stable state.

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded at one site.
- All sites, with an average 15% of the reefs, were impacted by warm water bleaching.

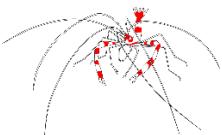


### Fish Abundance at Bidong & Yu (Individuals per 500m<sup>3</sup>)

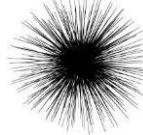


- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of fish targeted for live-food fish trade.
- The abundance of fish targeted for food is good.
- Parrotfish abundance in Bidong & Yu is high.

## Invertebrate Abundance at Bidong & Yu (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	X		X
	X		2.92
	X		X
			1.08

### Ecological Imbalance/Predator Outbreaks

	4.25
	0.50

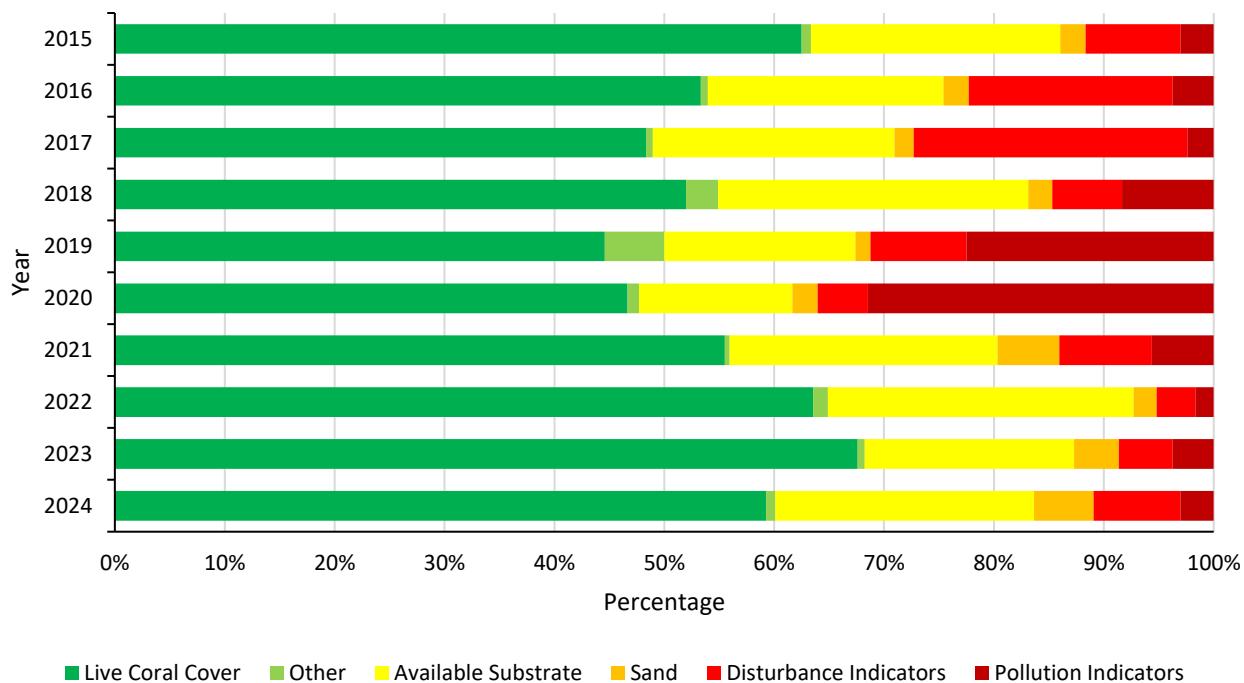
- Indicators for curio trade are absent.
- Crown-of-thorns is an issue in Bidong and Yu. A healthy coral reef can support a population of 0.2-0.3 individuals per 100m<sup>2</sup>, Bidong and Yu recorded 0.50.
- Invertebrates targeted for food are low in abundance.

### RARE ANIMALS

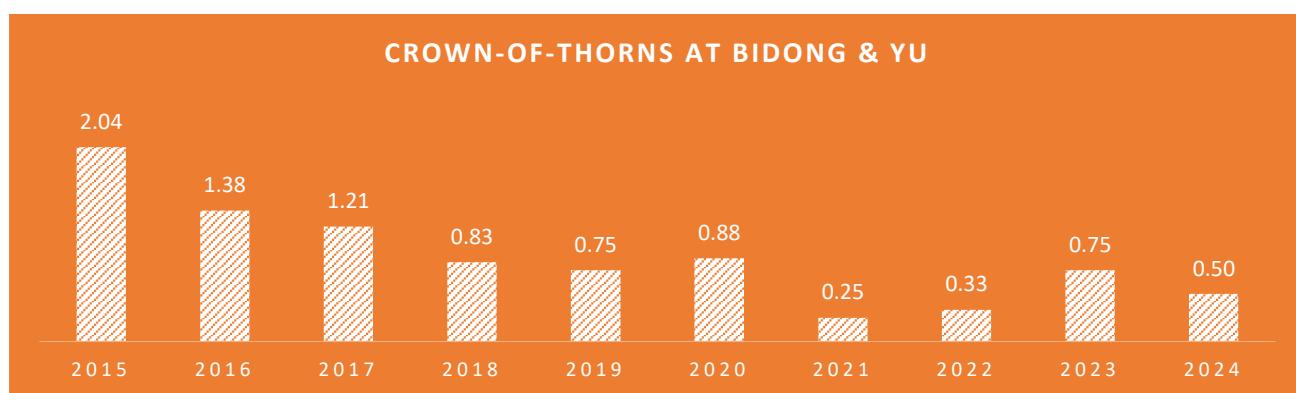
- Turtles were recorded at few sites.



## Reef Health at Bidong & Yu



- From 2015 to 2019, the declining reefs health in Bidong & Yu were due to physical damage caused by human activities and/or storm.
- The deterioration in 2019 was due to Tropical Storm Pabuk which struck Bidong and Yu in January that year, causing major physical damage to shallow reefs and sharp increase in pollution indicators in 2019 and 2020. Storm brings high rainfall and watershed runoff which increase external nutrient loads. It also causes sediment resuspension contributing to increase internal nutrient loads.
- Disturbance indicators had reduced significantly since 2018 and pollution indicators since 2021. Reduced disturbance and pollution indicators allow Bidong and Yu reefs to recover.
- In 2024, the reefs had deteriorated. The deterioration was due to a combination of physical damage caused by human activities and/or storm and the 4<sup>th</sup> Global Coral Bleaching Event.
- The abundance of crown-of-thorns is still above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>). Existing efforts by reef managers to control the population need to be heightened.



## Terengganu – Kapas

Kapas is a small island located just 6km from Marang, off the East coast of Terengganu, Malaysia. There is no resident local population, but several resorts provide accommodation for tourists. The island is gazetted as a Marine Park since 1994 under the Fisheries Act 1985 (Amended 1993).

The island is not a major tourism destination due to its small size, but does have an established tourist market, with less than ten resorts and one dive operator. Diving and snorkelling are the main tourist activities. Electricity on the island is supplied by a hybrid solar station which was built in 2010. Groundwater supplies are limited and there is no centralised sewage treatment, each resort having its own sewage treatment facilities.

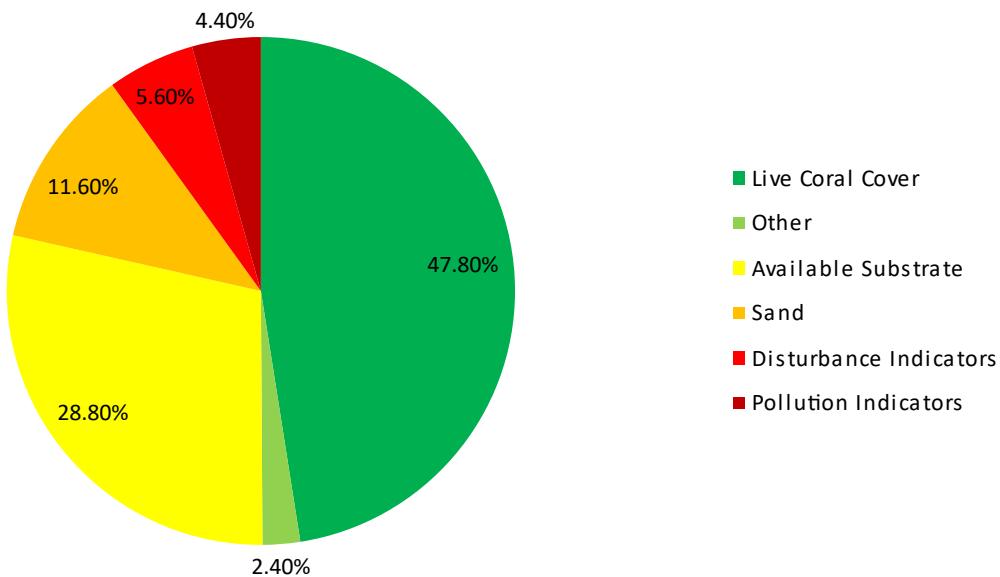
Reefs are mainly fringing offshore reefs, with some submerged reefs.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Good' coral cover and 3 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Kapas



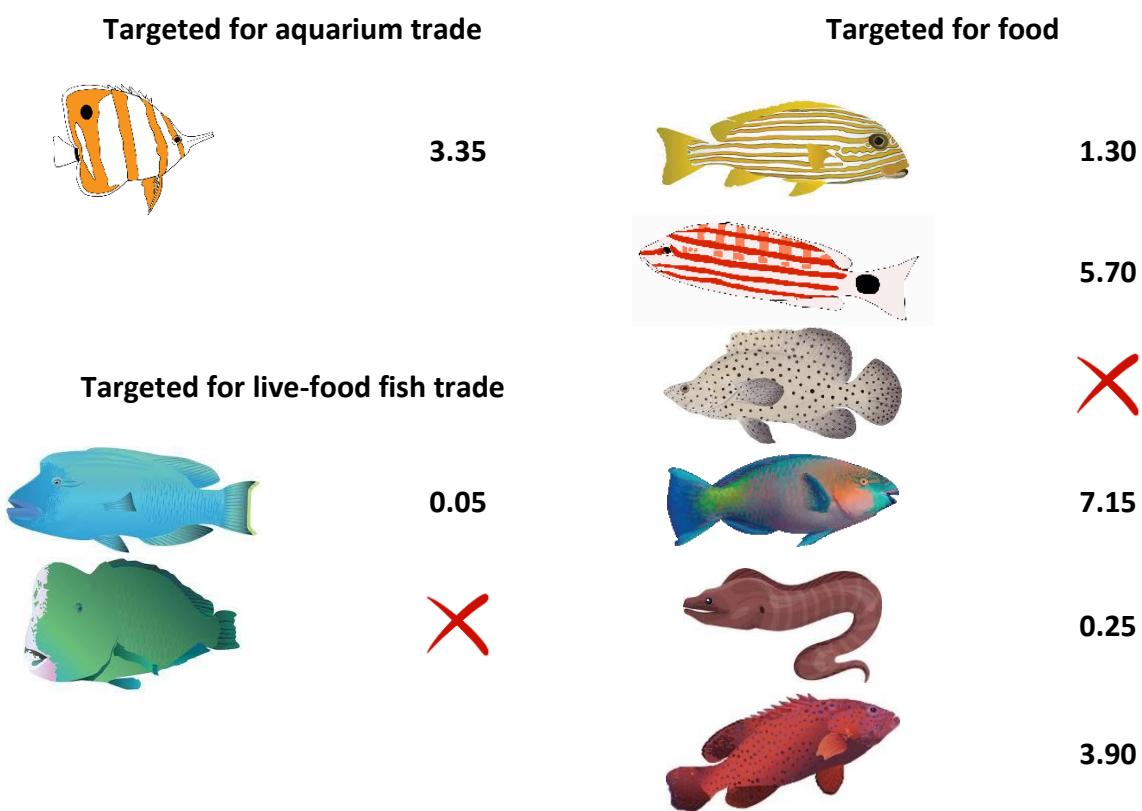
- Kapas reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 47.40%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. The level is especially high at Batu Payong (26%) and Coral Garden 3 (16%).
- Disturbance indicators are not high in Kapas in general, but the level of rubble is especially high at Coral Garden 1 (9%).

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded at few sites.
- Some sites, with an average 2% of the reefs, were impacted by warm water bleaching.

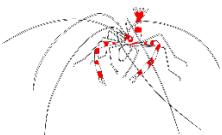


### Fish Abundance at Kapas (Individuals per 500m<sup>3</sup>)

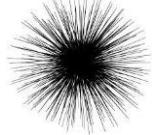


- Butterflyfish, indicator for aquarium trade, is recorded.
- Humphead wrasse, indicator targeted for live-food fish trade, is recorded.
- For fish targeted for food, only barramundi cod is absent. Good abundance of fish targeted for food.

## Invertebrate Abundance at Kapas (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food
	0.10	 X
	X	 5.25
	X	 X
		 0.10

### Ecological Imbalance/Predator Outbreaks

	19.00
	0.05

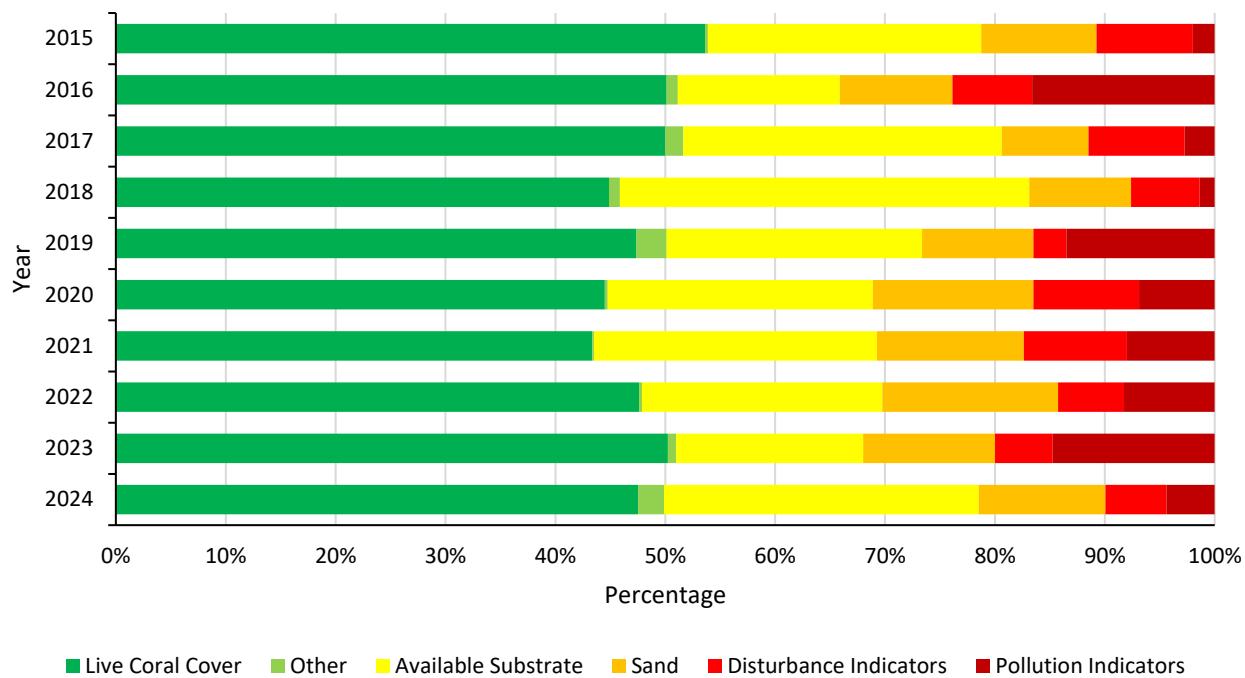
- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not an issue in Kapas.
- Invertebrates targeted for food are very low in abundance, except for sea cucumber.

### RARE ANIMALS

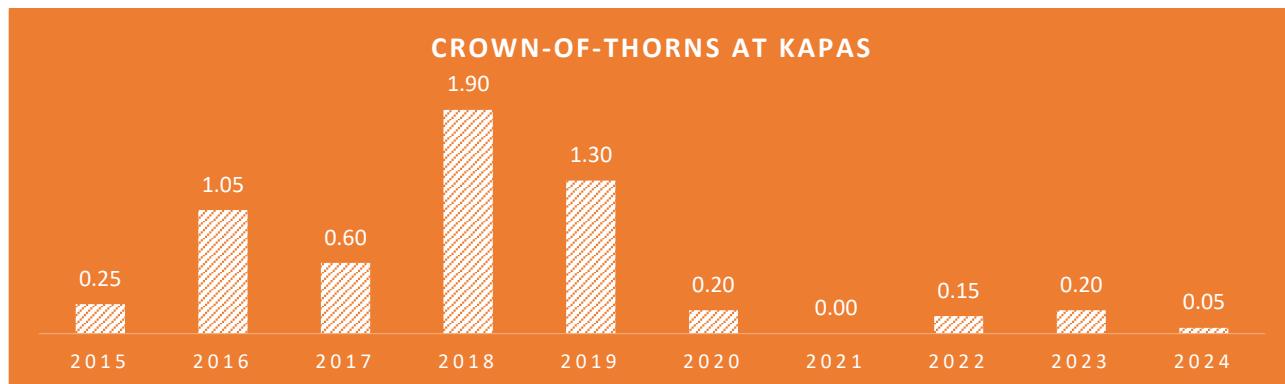
- Shark was recorded.



### Reef Health at Kapas



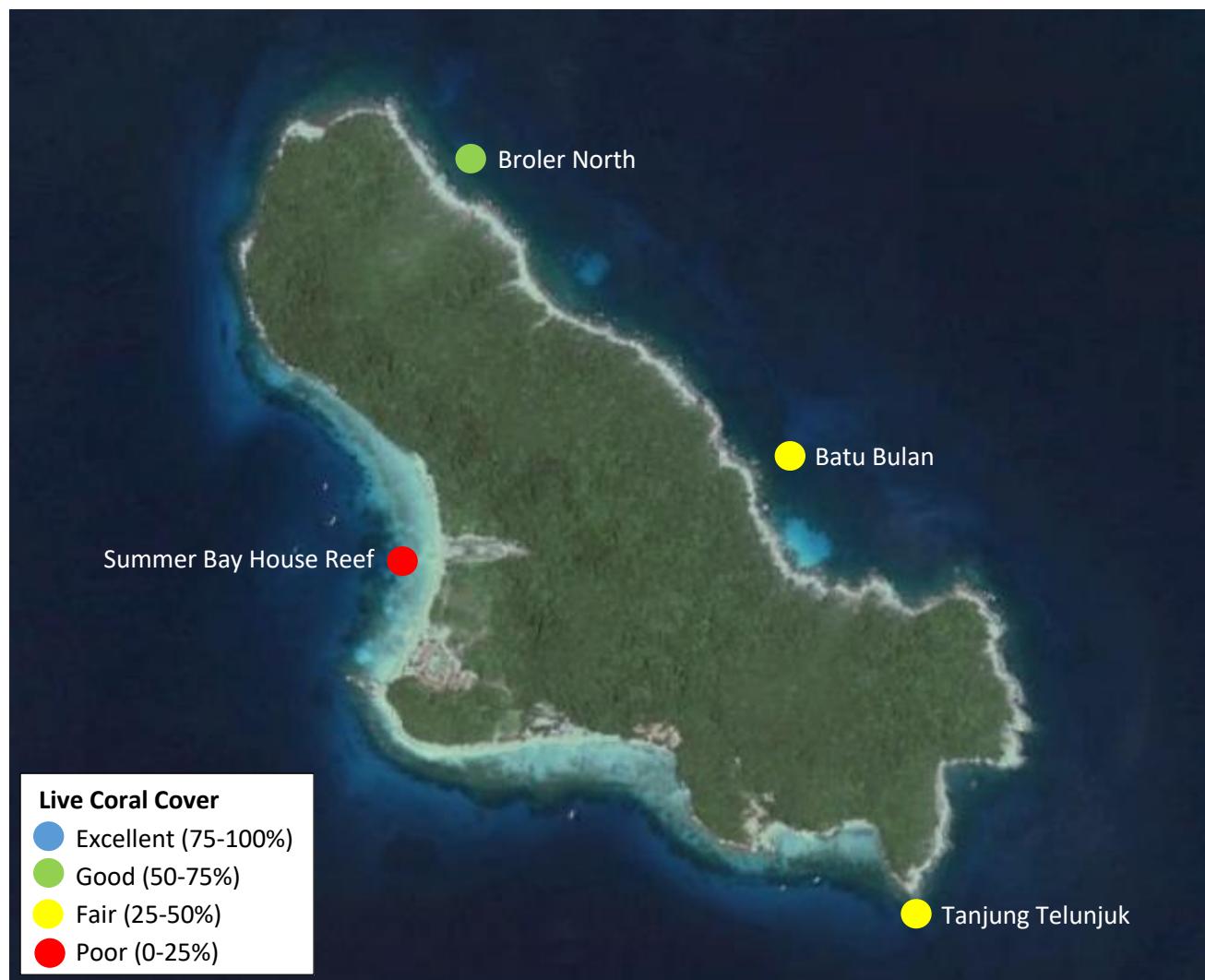
- From 2015 to 2021, the declining reefs health in Kapas were due to raised level of nutrient in the waters around the island, as reflected by the increase in pollution indicators and crown-of-thorns outbreak.
- In 2022 and 2023, the reefs improved.
- In 2024, the reefs deteriorated again. The deterioration was due to the 4<sup>th</sup> Global Coral Bleaching Event.
- The abundance of crown-of-thorns has decreased over the years and the population is now within what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>).



## Terengganu – Lang Tengah

Lang Tengah is located about 40km northeast of Kuala Terengganu on the east coast of peninsular Malaysia. It was gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993). It is connected to the mainland by ferries to Merang. Lang Tengah appeals to holiday goers who are looking for a quiet tropical island getaway. Lang Tengah is much quieter, with less development, compared to nearby islands. There are 3 resorts and 1 camp site located on the island.

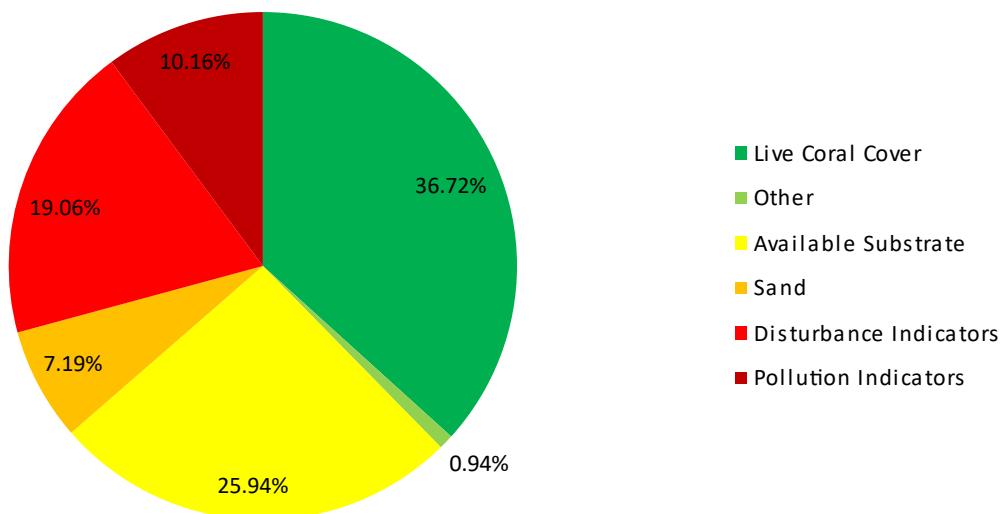
Coral reefs on Lang Tengah are teeming with fish life and occasional sharks and rays. The island has nesting green turtle from April to October. Occasionally, hawksbill turtle will also nest on Lang Tengah. The island is also covered with primary forest and has a wide variety of flora and fauna.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Good' coral cover, 2 are in 'Fair' condition and 1 show 'Poor' health.

## Coral Cover and Health

### Substrate Composition at Lang Tengah



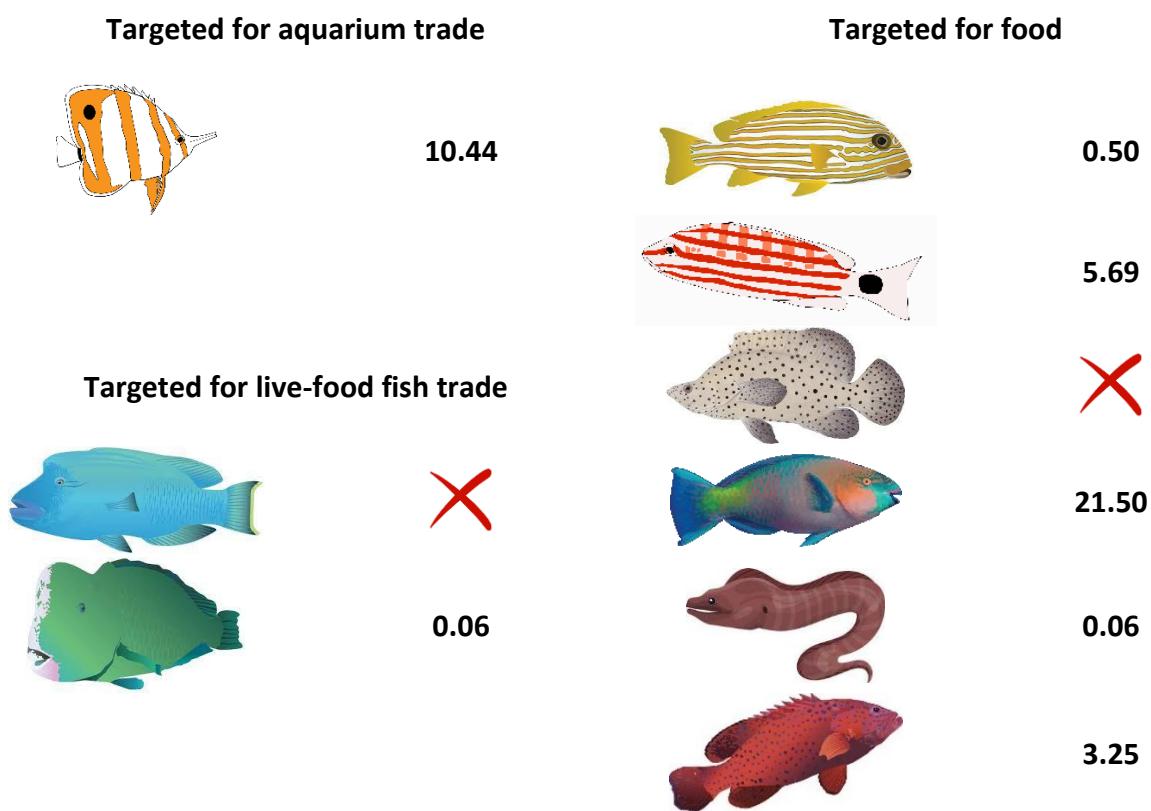
- Lang Tengah reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 34.84%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is quite high. It is especially high at Summer Bay House Reef which recorded 13.75%.
- Disturbance indicators are high.
- The level of recently killed coral is high at Batu Bulan (10%) and Broler North (12.50%).
- Rubble level is very high at Summer Bay House Reef (32.50%) and Tanjung Telunjuk (10.63%).
- Pollution indicators are high.
- Nutrient indicator algae level is high at Batu Bulan (16.25%).

#### CORAL IMPACTS

- Discarded fishing nets and trash were recorded at many sites.
- All sites, with an average 28% of the reefs, were impacted by warm water bleaching.

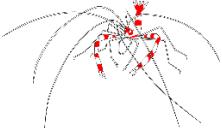


### Fish Abundance at Lang Tengah (Individuals per 500m<sup>3</sup>)

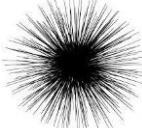


- Butterflyfish, indicator for aquarium trade, abundance is very high.
- Bumphead parrotfish, indicator targeted for live-food fish trade, is recorded.
- For fish targeted for food, only barramundi cod is absent. Good abundance of fish targeted for food.
- Parrotfish abundance in Lang Tengah is high.

### Invertebrate Abundance at Lang Tengah (Individuals per 100m<sup>2</sup>)

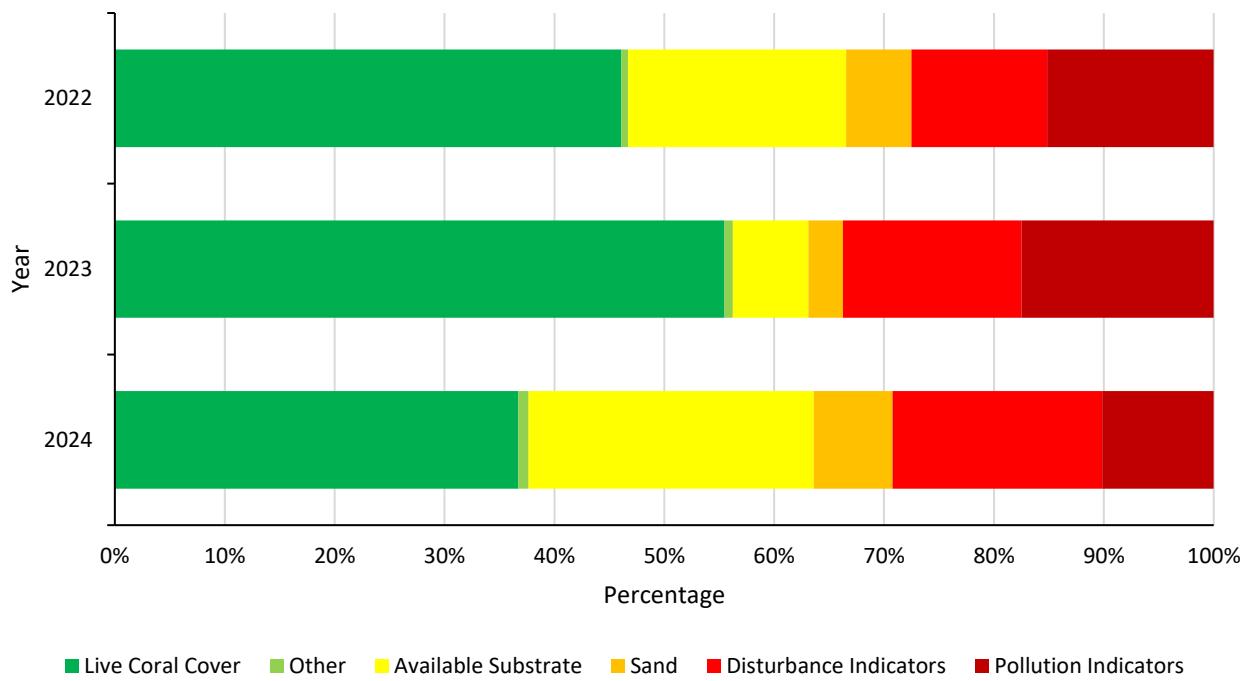
Collected for curio trade		Collected for food	
	✗		✗
	✗		58.19
	✗		✗
			19.56

### Ecological Imbalance/Predator Outbreaks

	5.25
	✗

- Indicators for curio trade are absent.
- Sea cucumber and giant clam, invertebrates targeted for food, are very high in abundance.

### Reef Health at Lang Tengah



- Lang Tengah reefs showed variation over the years.
- Disturbance indicators had increased.

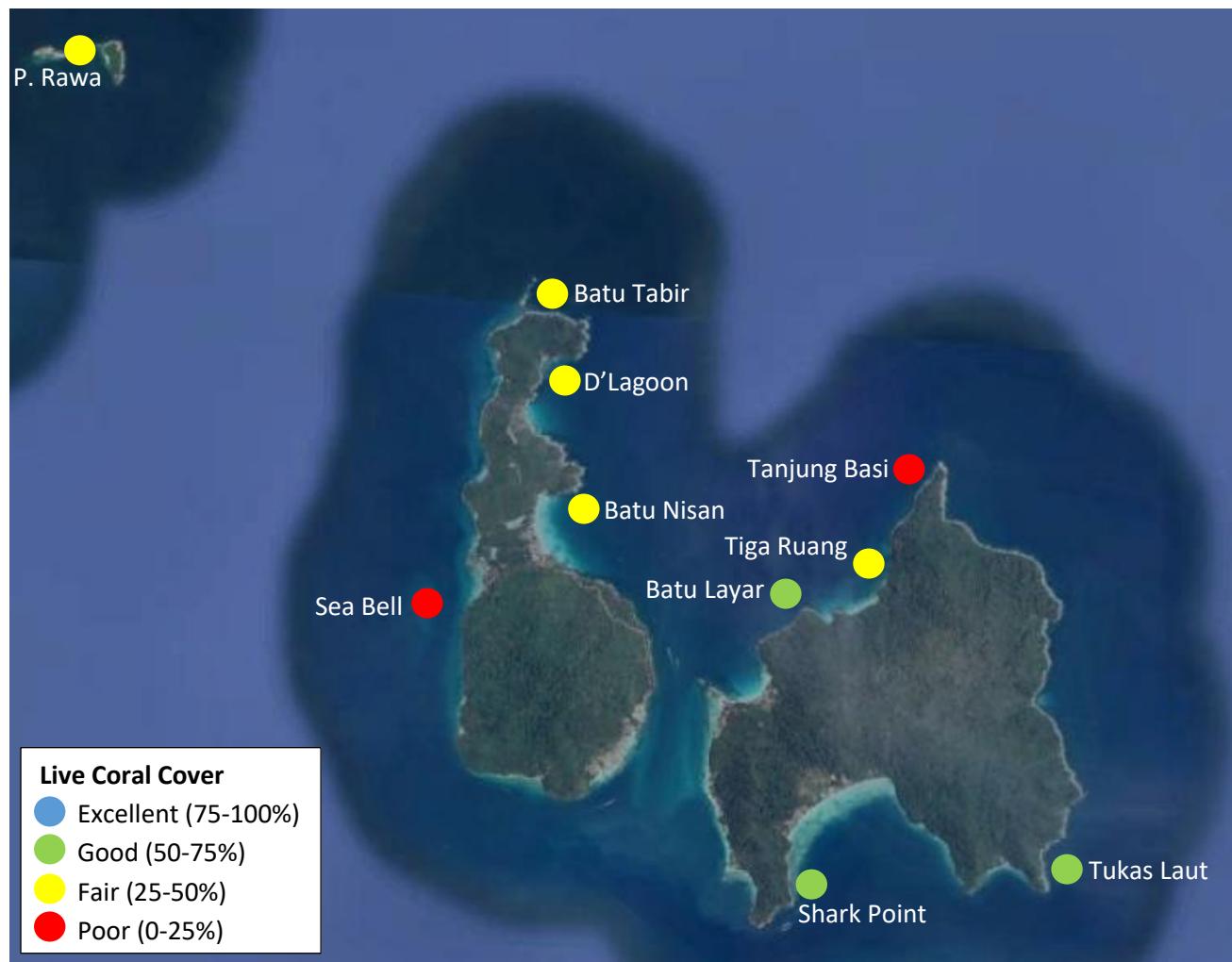
## Terengganu – Perhentian

The Perhentian islands are located some 20km from Kuala Besut off the East coast of Terengganu, Malaysia. The islands have one village with a population of approximately 2,300, most of whom work in tourism, the main industry on the islands. The islands are gazetted as a Marine Park since 1994.

A popular tourist destination, particularly among backpackers, there are over 40 resorts, mainly small, family run chalets with a growing number of large resorts to cater for a changing tourist market. There are now over 20 dive operators, spread around the two main islands. Diving and snorkelling are the main tourist activities.

Growth in tourism has been rapid on the islands, and resort development continues. There is no grid-supplied electricity, nor centralised sewage treatment; groundwater supplies are limited in Perhentian and fresh water is supplied from the mainland.

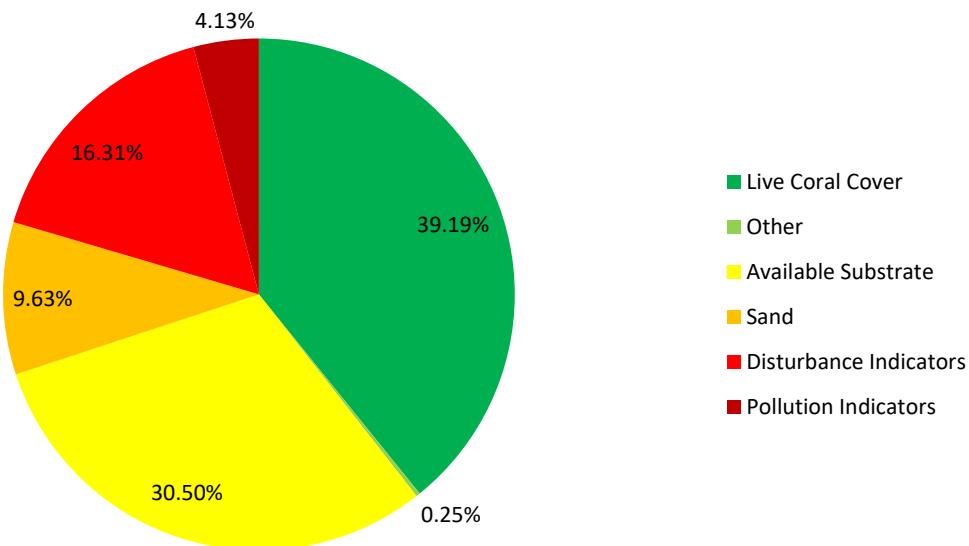
Reefs are mainly fringing offshore reefs, with some submerged reefs.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Good' coral cover, 5 are in 'Fair' condition and 2 show 'Poor' health.

## Coral Cover and Health

### Substrate Composition at Perhentian



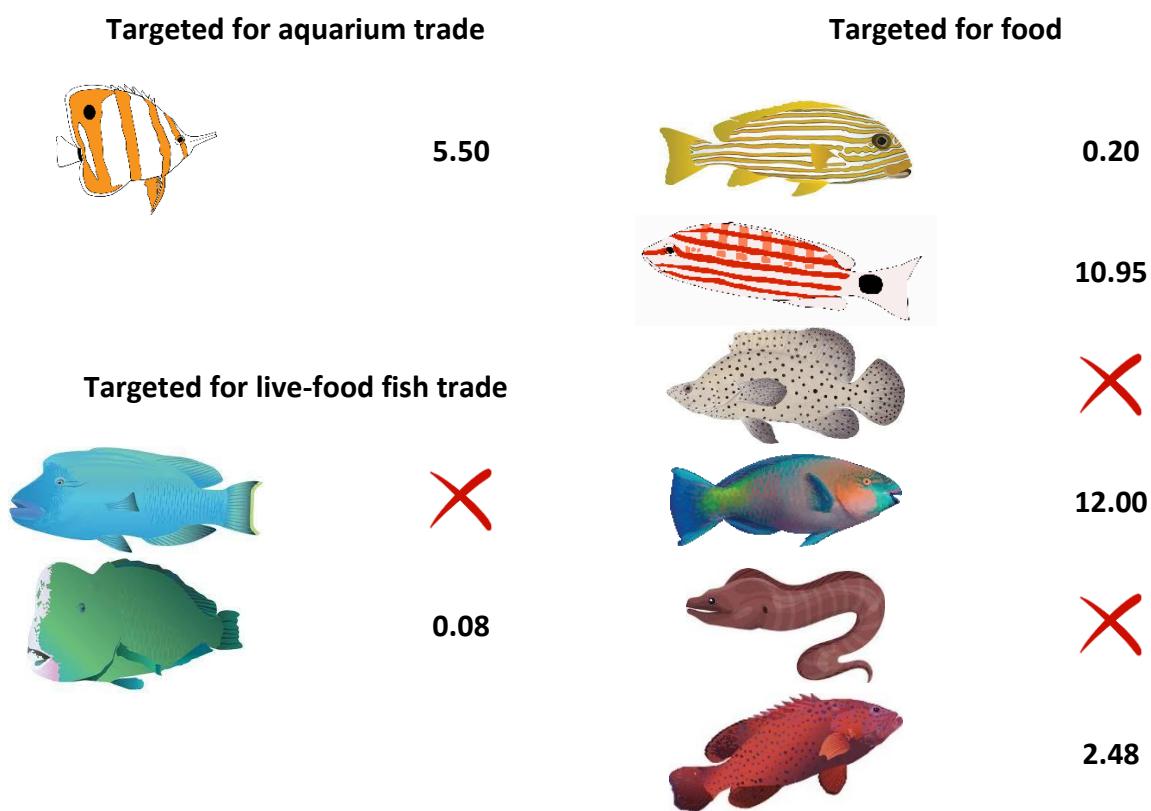
- Perhentian reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 38.13%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is extremely high.
- Sand level is high. The level ranges from 11% to 28% at Batu Nisan, D' Lagoon, Sea Bell and Tiga Ruang.
- Disturbance indicators are high.
- Rubble level ranges from 25% to 37% at Batu Nisan, Sea Bell, Tanjung Besi and Tiga Ruang.
- Silt level is high at Batu Layar which recorded 15.63%.
- Pollution indicators are not high in Perhentian in general, but the level of nutrient indicator algae is high at Batu Layar (8.75%) and the level of sponge is high at Tiga Ruang (8.13%).

#### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded at few sites.
- Many sites, with an average 2% of the reefs, were impacted by warm water bleaching.

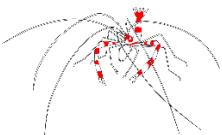


### Fish Abundance at Perhentian (Individuals per 500m<sup>3</sup>)

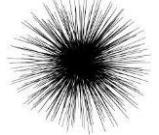


- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, indicator targeted for live-food fish trade, is recorded.
- High abundance of snapper and parrotfish, fish targeted for food. Other fish targeted for food are low in abundance.

## Invertebrate Abundance at Perhentian (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food
	0.03	 
		 8.60
		 
		 3.00

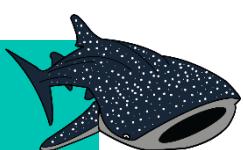
### Ecological Imbalance/Predator Outbreaks

	8.13
	0.08

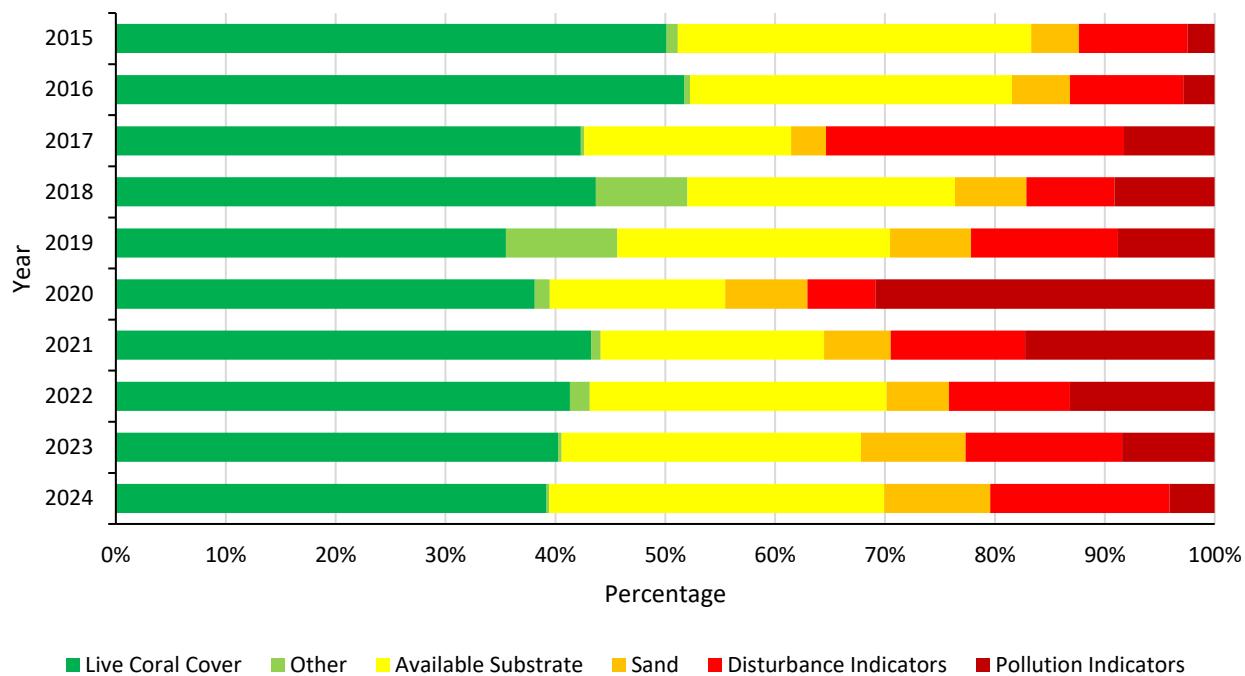
- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not a concern in Perhentian.
- High abundance of sea cucumber and giant clam, invertebrates targeted for food.

### RARE ANIMALS

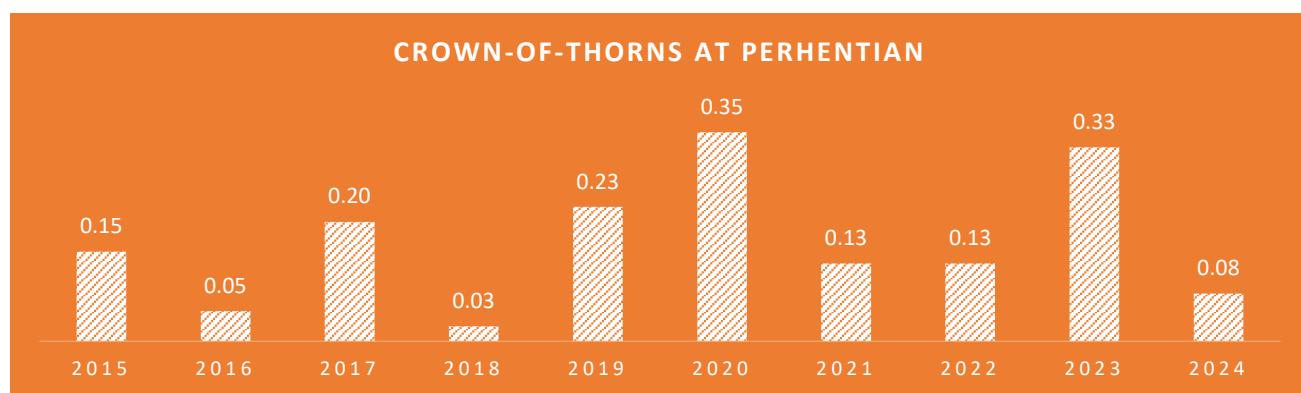
- Shark was recorded.



### Reef Health at Perhentian



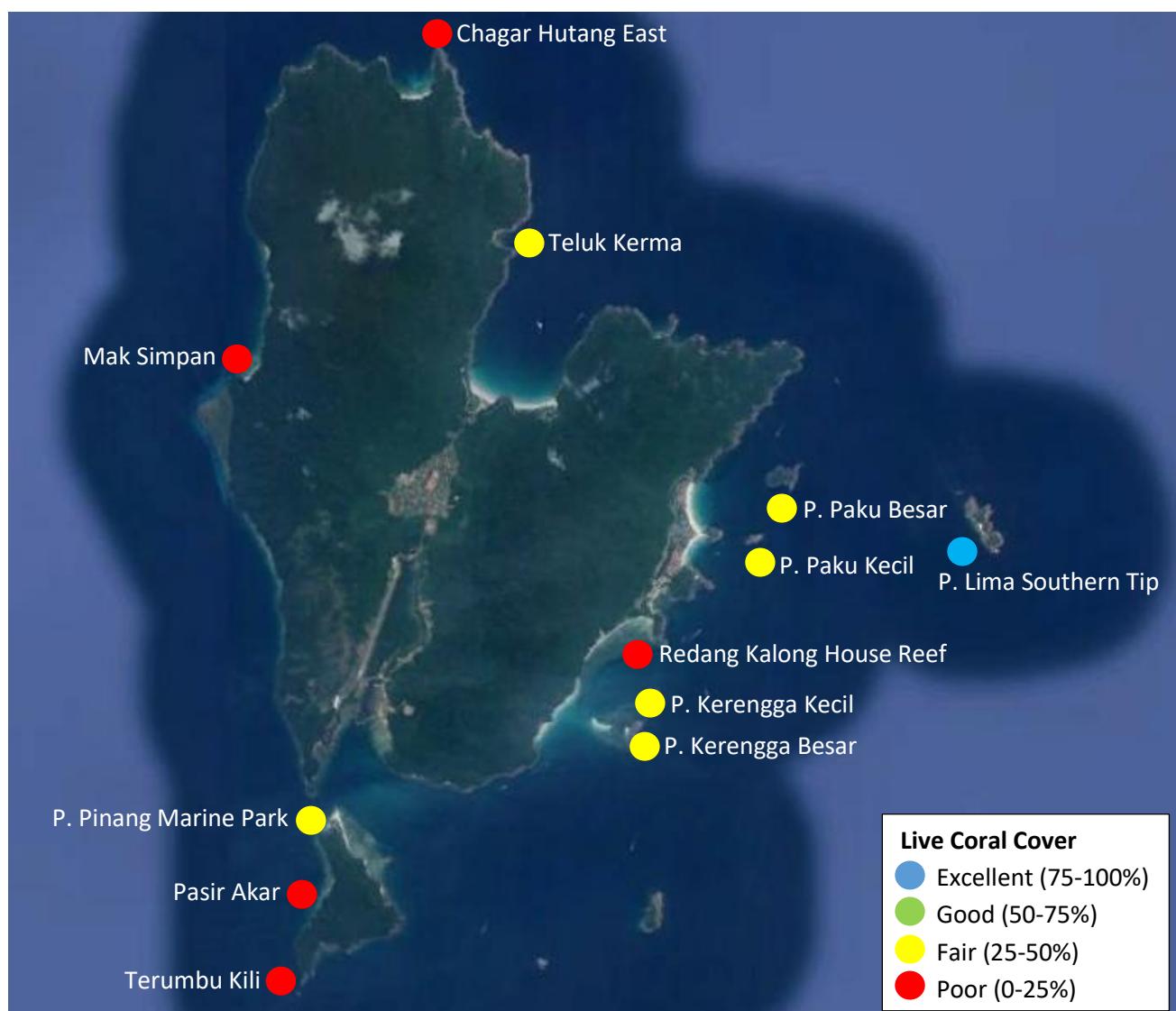
- Perhentian reefs have deteriorated from ‘good’ to ‘fair’ condition.
- The deterioration in 2017 was likely due to physical damage caused by human activities and the deterioration in 2019 was due to Tropical Storm Pabuk which struck Perhentian in January that year, causing major physical damage to shallow reefs. Both were reflected by the increase in disturbance indicators.
- In 2020 and 2021, the reefs improved.
- However, starting in 2022, the reefs deteriorated again.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Crown-of-thorns abundance remained around what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>).
- Available substrate for coral recruits to attach is very high, indicating possible chance of reef recovery if human impacts are in check.



## Terengganu – Redang

Redang Island is located some 25km from Merang, off the East coast of Terengganu, Malaysia. The island has a population of approximately 2,500, only a small proportion of whom work in tourism, the main industry on the islands. The islands are gazetted as a Marine Park since 1994 under the Fisheries Act 1985 (Amended 1993). Both fringing offshore reefs and submerged reefs can be found in Redang Island.

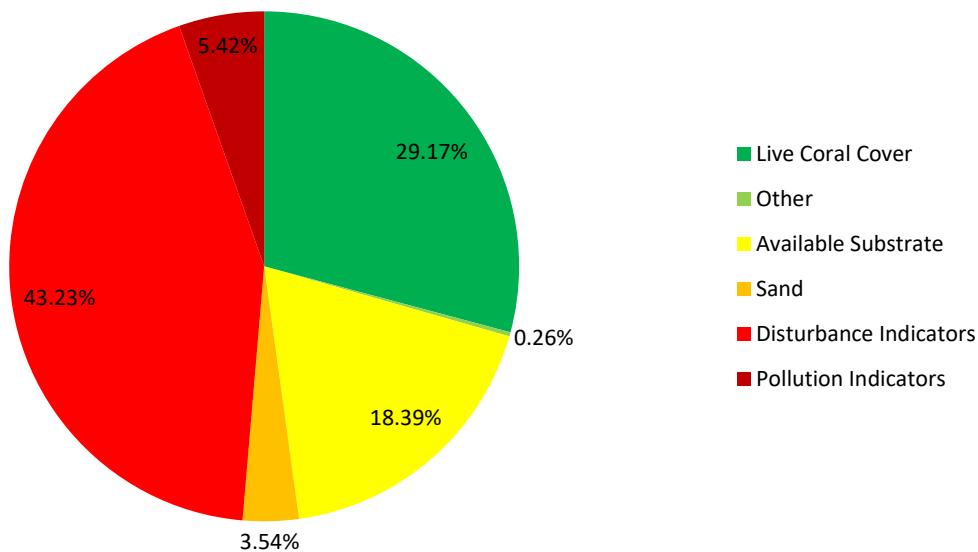
The island is a popular tourist destination. Diving and snorkelling are the main tourist activities. There are 13 medium-large size resorts, mainly on Pasir Panjang, and 1 campsite at Teluk Kalong. Most resorts have an in-house dive operator. There is only centralised electricity supply in the village, in Pasir Panjang resorts operate their own generators for power. Water is supplied either by tube well, spring or pipeline from the mainland and each resort has its own sewage treatment facilities. The island is served by an airport as well as boat services from the mainland.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 6 are in 'Fair' condition and 5 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Redang



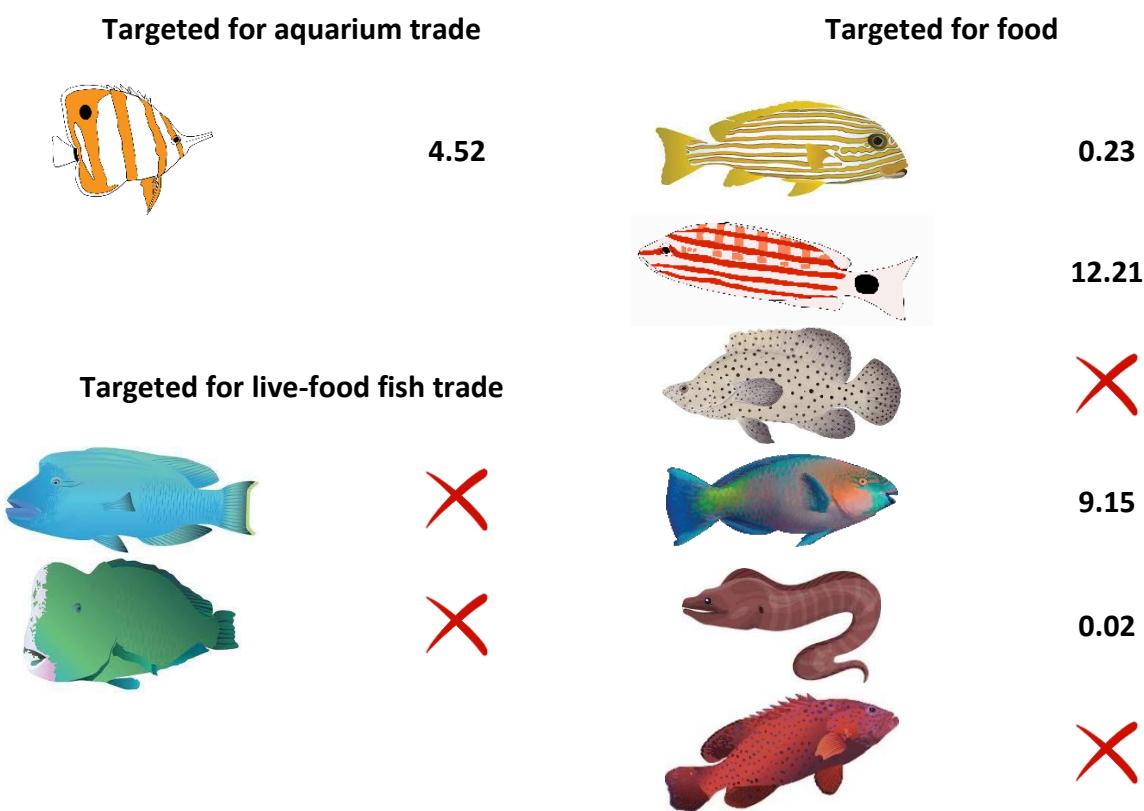
- Redang reefs are dominated by disturbance indicators.
- Rubble level is very high at most of the sites. Only Pulau Lima Southern Tip and Pulau Paku Kecil recorded less than 9% rubble. Rubble level at the rest of the sites ranges from 11% to 84%.
- The level of recently killed coral is high at Pulau Kerengga Kecil (8.13%) and Pulau Pinang Marine Park (7.50%).
- Mean hard coral (reef builder) cover is 22.40%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Pollution indicators are not high in Redang in general, but the level of nutrient indicator algae is high at Pulau Kerengga Kecil (6.88%) and the level of sponge is high at Pasir Akar (16.88%).
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is high, high level of disturbance indicators may deter coral growth if they are not dealt with.

### CORAL IMPACTS

- Trash was recorded at many sites.
- All sites, with an average 39% of the reefs, were impacted by warm water bleaching.

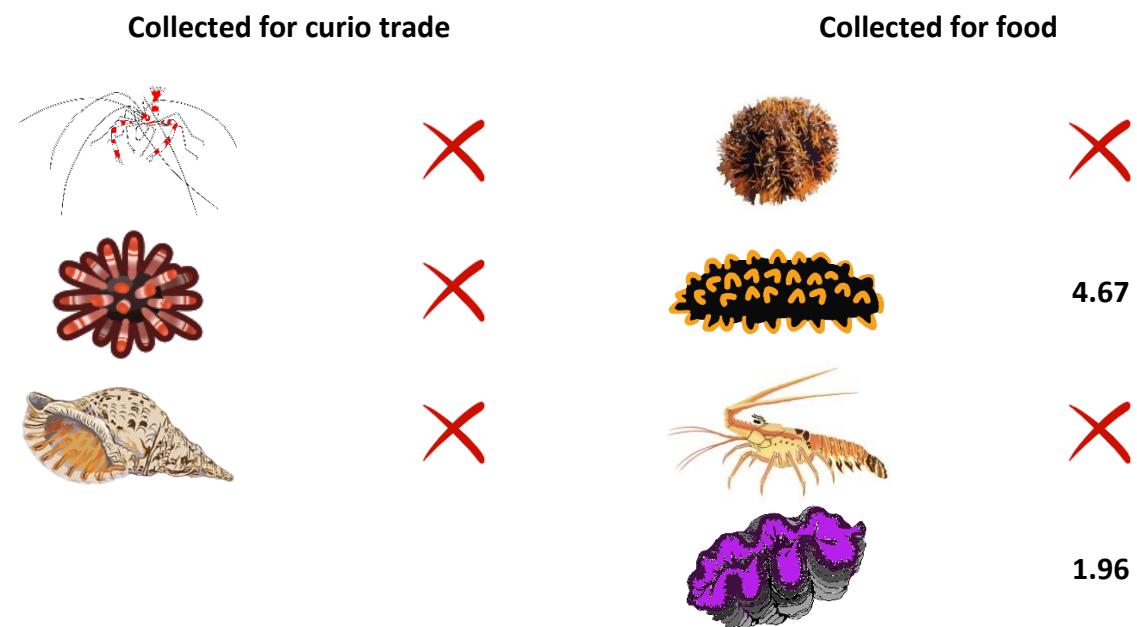


### Fish Abundance at Redang (Individuals per 500m<sup>3</sup>)

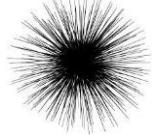


- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of indicator targeted for live-food fish trade.
- High abundance of snapper and parrotfish, fish targeted for food. The rest of the fish targeted for food is very low in abundance.

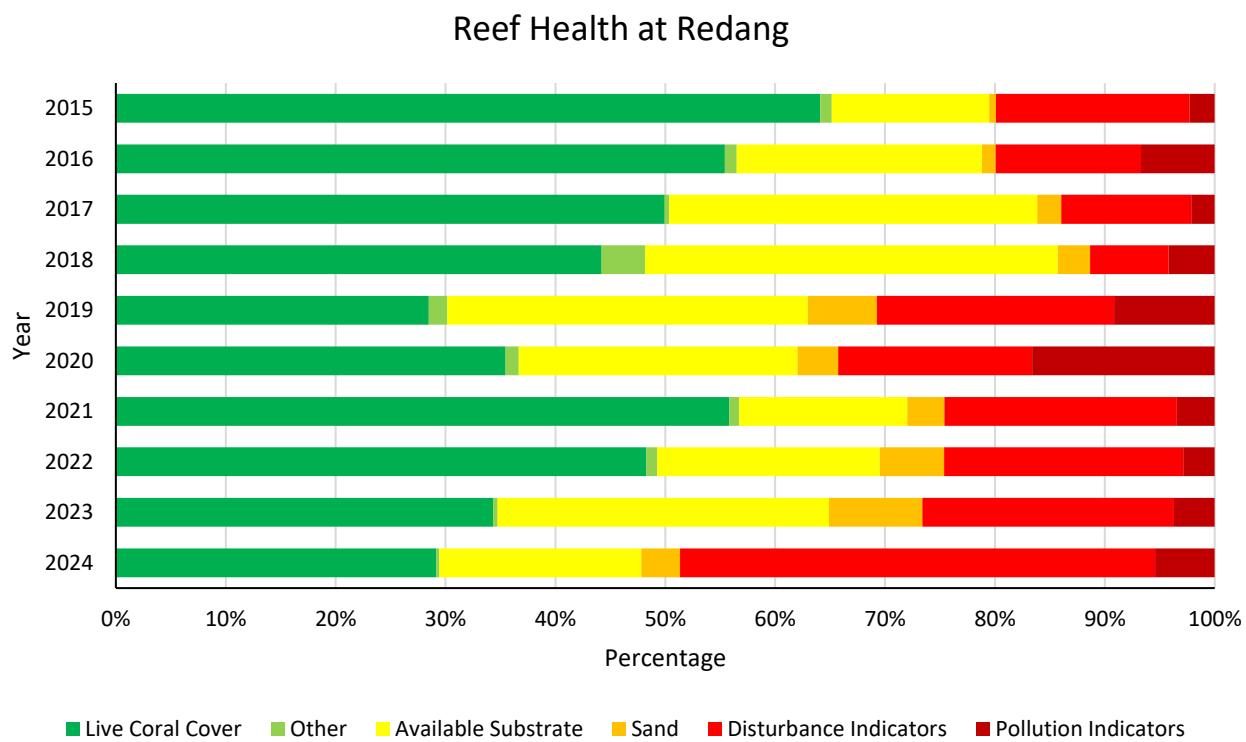
## Invertebrate Abundance at Redang (Individuals per 100m<sup>2</sup>)



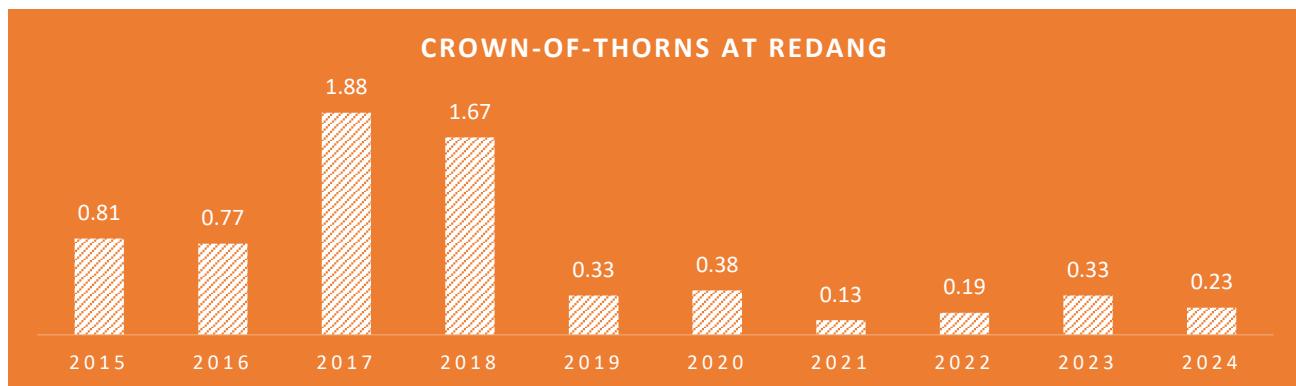
### Ecological Imbalance/Predator Outbreaks

	5.83
	0.23

- Absent of indicator for curio trade.
- Crown-of-thorns is not a concern in Redang.
- Good abundance of sea cucumber and giant clam, invertebrates targeted for food.



- Redang reefs have deteriorated from ‘good’ to ‘fair’ condition.
- The deterioration from 2016 to 2018 was likely due to very high abundance of crown-of-thorns, which was above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>).
- The deterioration in 2019 was due to Tropical Storm Pabuk which struck Redang in January that year, causing major physical damage to shallow reefs and increase in pollution indicators. Storm brings high rainfall and water-shed runoff which increase external nutrient loads. It also causes sediment resuspension contributing to increase internal nutrient loads.
- Since 2019, the abundance of crown-of-thorns had decreased significantly and remained around what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>).
- Reduced abundance of crown-of-thorns allow Redang reefs to recover. This is reflected by the increase in live coral cover in 2020 and 2021.
- In 2022 and 2023, the reefs deteriorated significantly.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach is high, indicating possible chance of reef recovery if human impacts are in check.

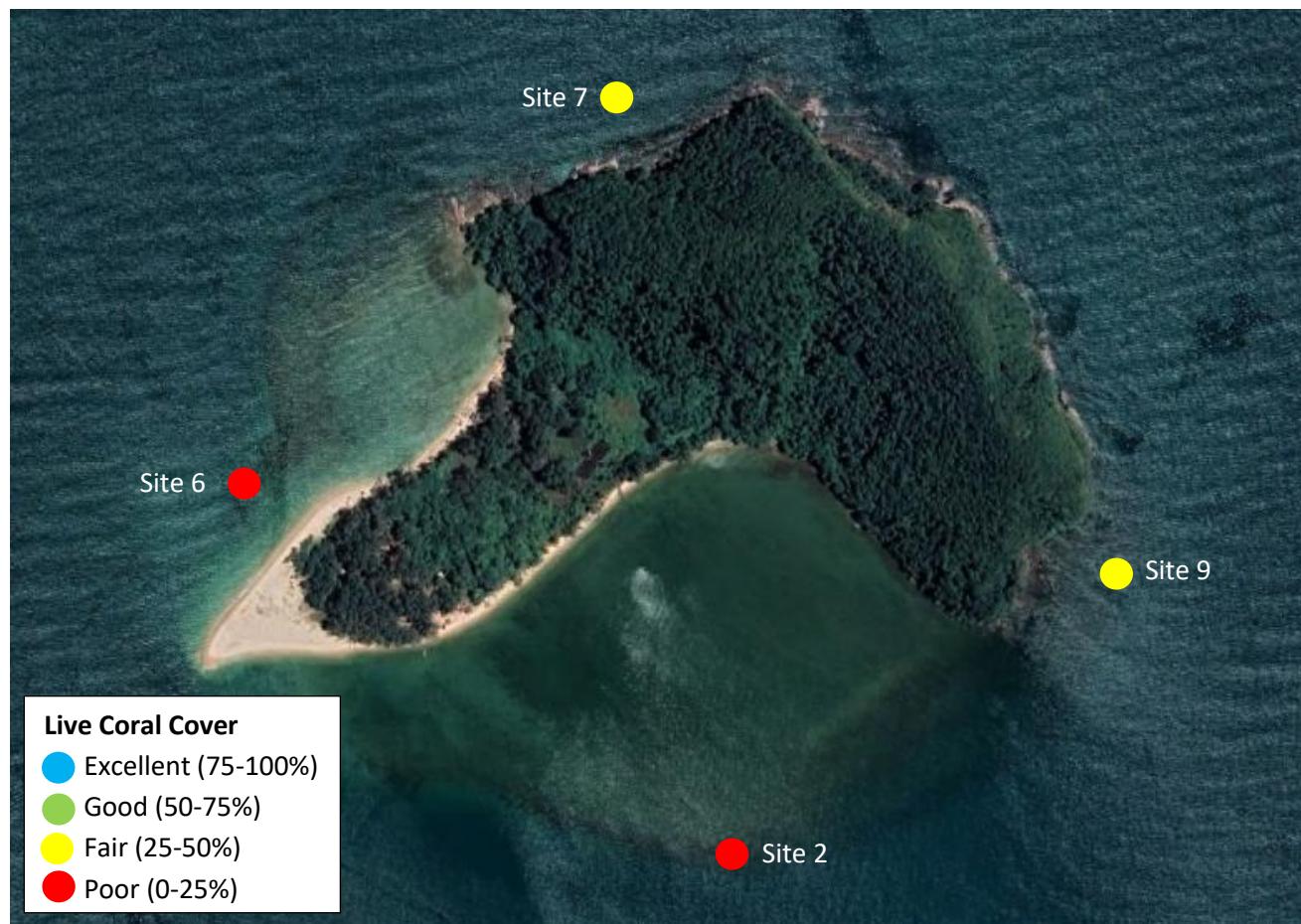


## Terengganu – Pulau Rhu

Pulau Rhu is a small, heavily wooded island located approximately 6km south of Kuala Besut, and just 3km off the East coast of Terengganu, Malaysia. Measuring some 0.8 x 0.65km, the island is uninhabited.

Pulau Rhu has fringing reefs and is a moderately popular tourism destination, due to its proximity to the mainland and Kuala Besut. It is also an important habitat for endangered flying foxes, which roost on the island. While it is not as popular as the more distant Perhentian islands, it is visited by island-hopping trips, snorkelers, recreational anglers and water sports operators such as banana boats, operating from the mainland.

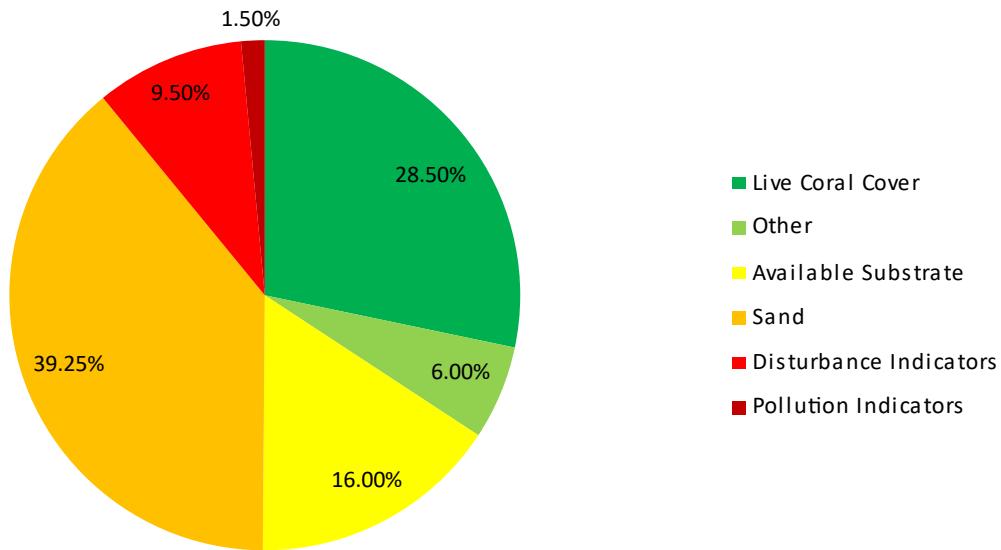
The island has no protected status and is a popular fishing ground for local small scale, artisanal fishermen who lay nets and fish traps close to the island. Though there is no resort on the island, there is a camp site with toilet and shower facilities. No data are available on either the number of fishermen regularly using the area and their catches, nor the number of tourists visiting the island.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Fair' coral cover and 2 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Rhu



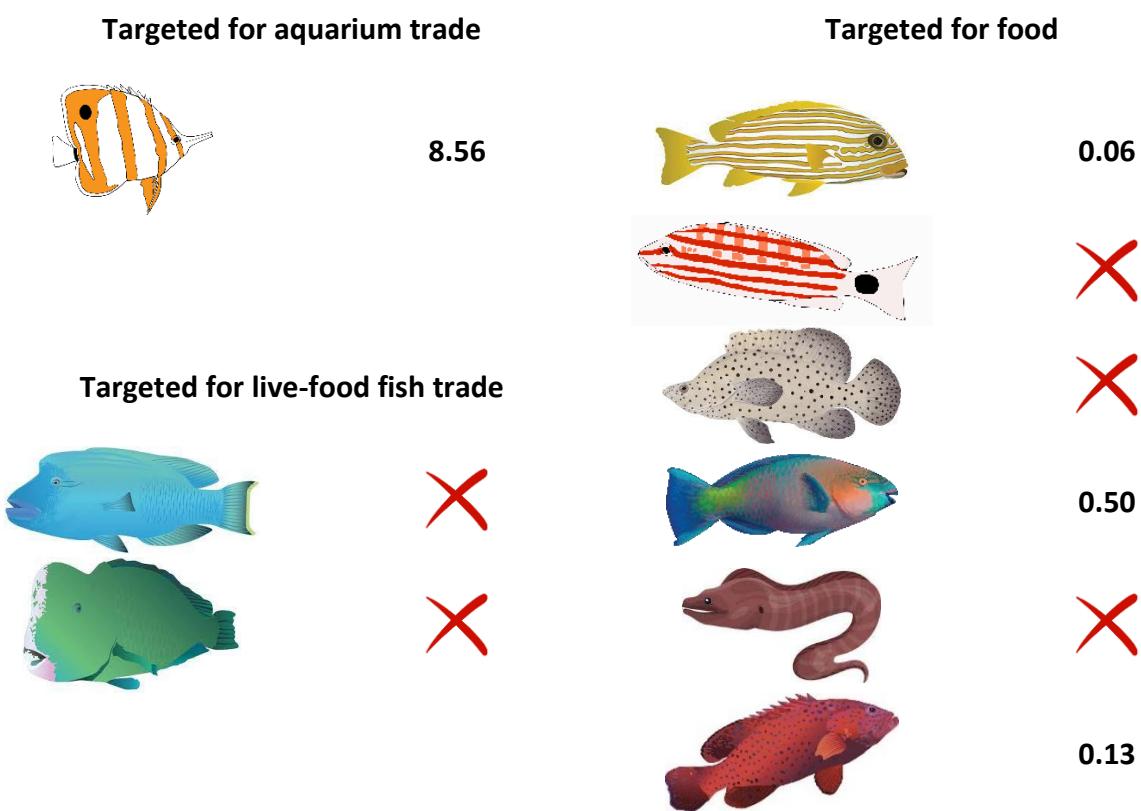
- Pulau Rhu are dominated by sand.
- Sand level is especially high at Site 2 (60%) and 6 (58%).
- Mean hard coral (reef builder) cover is 28.50%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- The level of Other is mainly attributed by anemone.
- Disturbance indicators are high.
- Silt level ranges from 7% to 9% at all sites except for Site 2 which recorded 0%.
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is high, high level of disturbance indicators may deter coral growth if they are not dealt with.

### CORAL IMPACTS

- All sites, with an average 46% of the reefs, were impacted by warm water bleaching.

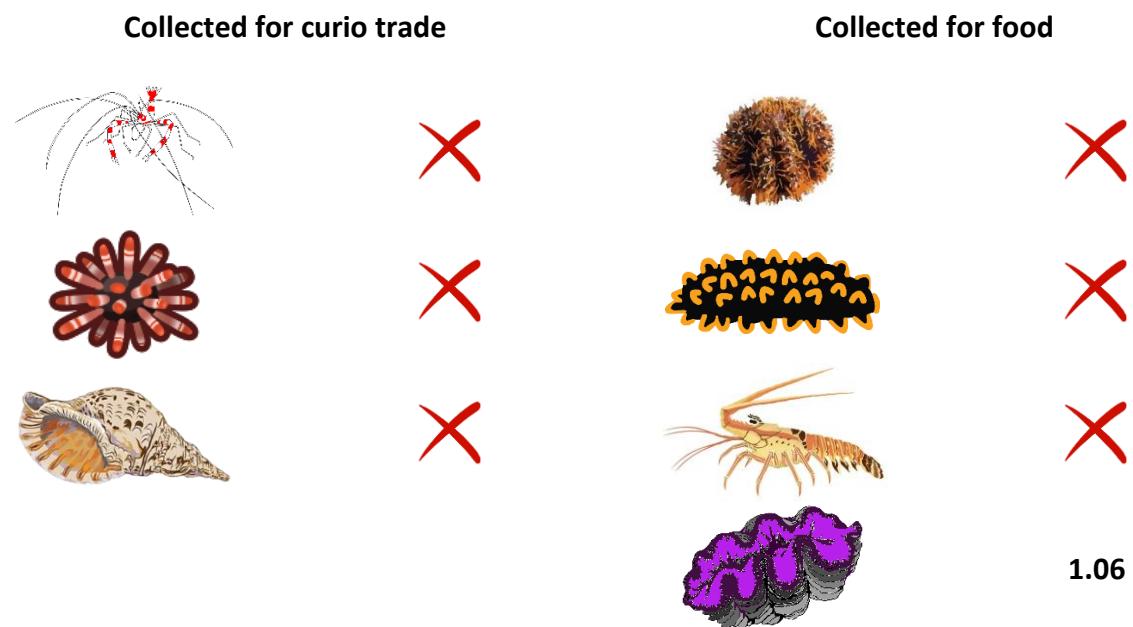


### Fish Abundance at Rhu (Individuals per 500m<sup>3</sup>)

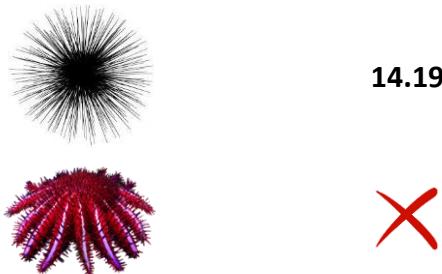


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Fish targeted for live-food fish trade are absent.
- Fish targeted for food are very low in abundance.

### Invertebrate Abundance at Rhu (Individuals per 100m<sup>2</sup>)

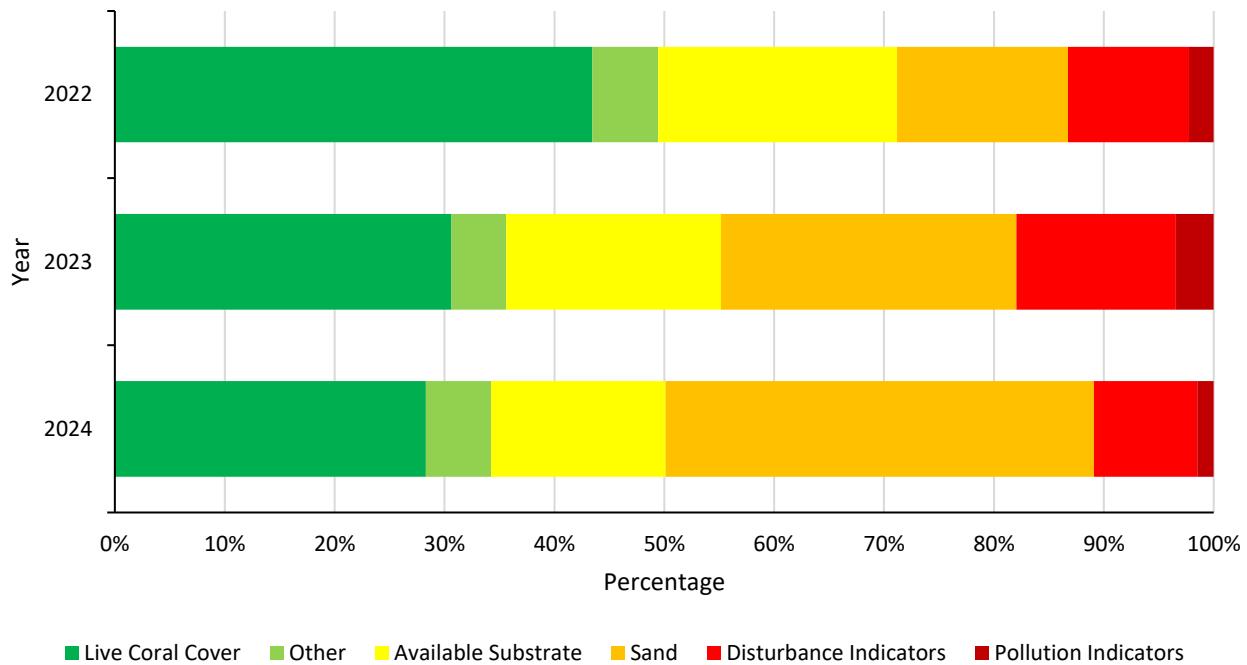


### Ecological Imbalance/Predator Outbreaks



- Only diadema urchin and giant clam are recorded.

### Reef Health at Rhu



- Rhu reefs have maintained in 'fair' condition.
- The decrease in live coral cover in 2023 is considered to reflect the elimination of 6 sites, rather than an actual decrease in live coral cover.
- In 2024, the reefs had deteriorated. The deterioration was due to the 4<sup>th</sup> Global Coral Bleaching Event.
- Sand level has increased. Increasing amount of sand can be an indication of increasing disturbance.

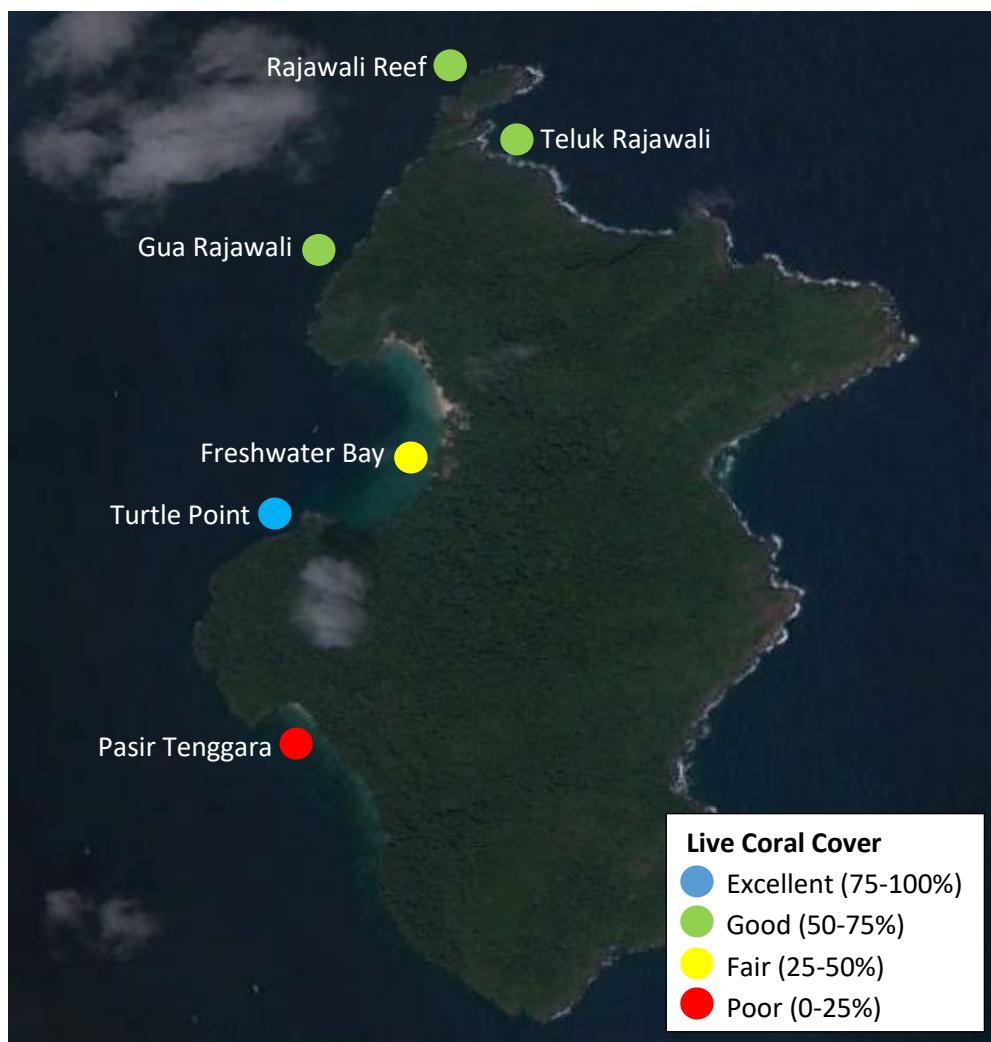
## Terengganu – Tenggol

Tenggol Island is located approximately 30km from Dungun, off the East coast of Terengganu, Malaysia. This small island has no local population. The island is gazetted as a Marine Park since 1994.

The island is a popular diving destination due to the surrounding deep water which attracts more megafauna than other islands (whale sharks are common around the island). There are four resorts on the island, each with its own dive operator. There is no centralised electricity supply, resorts operate their own generators for power. Groundwater supplies are limited and there is no centralised sewage treatment, each resort having its own sewage treatment facility.

Tenggol Island has gained in popularity over the last few years and many dive and snorkel operators have started to operate from Dungun, the nearest town on the mainland, offering day trip packages to divers and snorkelers alike.

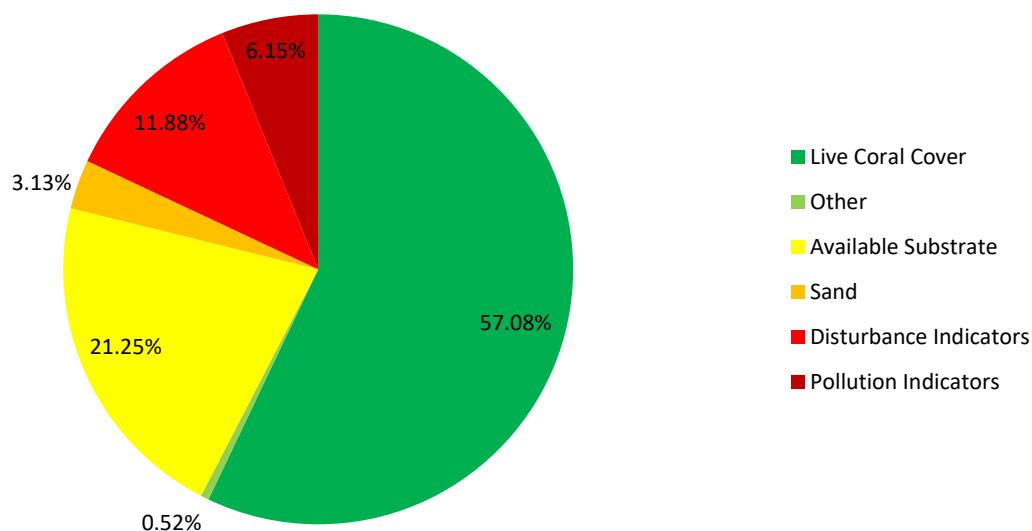
Much of the island's coastline is rocky, besides a couple of sandy beaches. The reefs are mainly fringing reefs and rocky reefs.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 3 are in 'Good' condition, 1 show 'Fair' health and 1 in 'Poor' state.

## Coral Cover and Health

Substrate Composition at Tenggol



- Tenggol reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 46.56%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are high.
- Rubble level is especially high at Pasir Tenggara (44.38%).
- Pollution indicators are slightly high.
- 23.75% of Freshwater Bay consists of nutrient indicator algae.

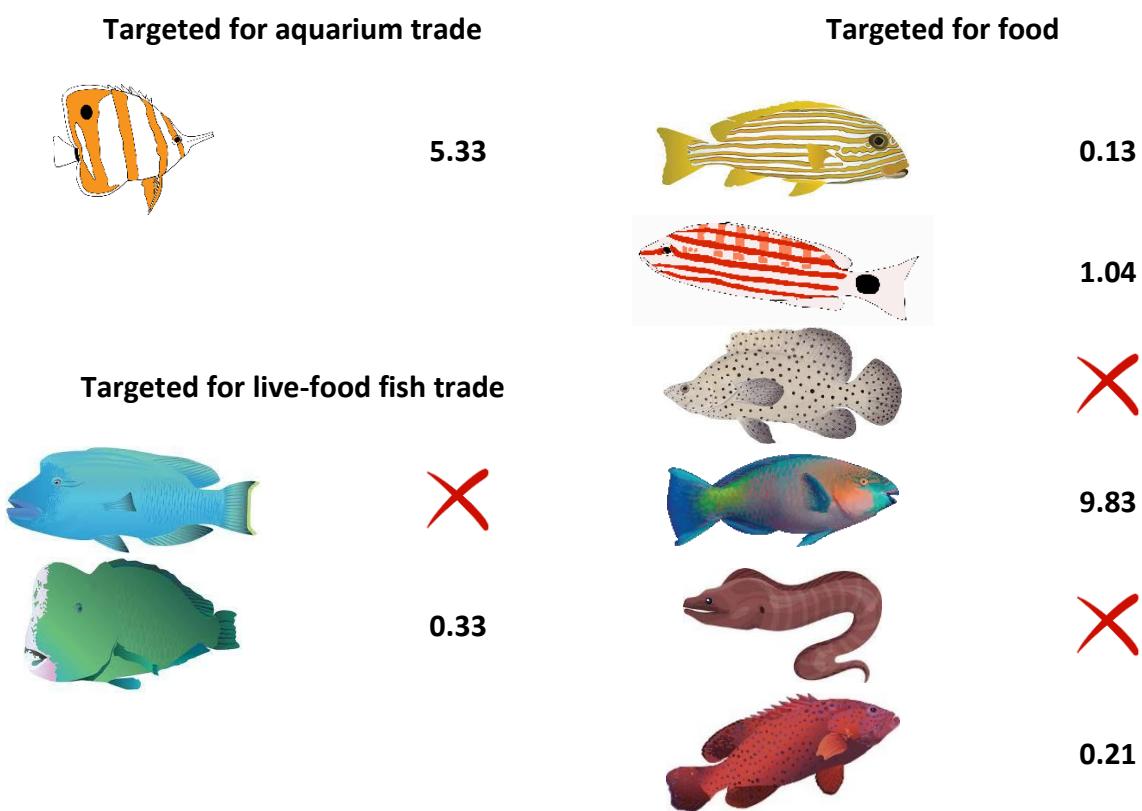
### CORAL IMPACTS

- Boat anchor damage and discarded fishing nets were recorded at some sites.
- Trash was recorded at many sites.
- All sites, with an average 31% of the reefs, were impacted by warm water bleaching.



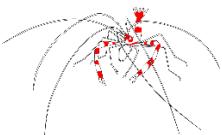
## Fish Abundance at Tenggol

(Individuals per 500m<sup>3</sup>)

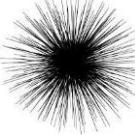


- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, indicators targeted for live-food fish trade, is recorded.
- The abundance of parrotfish, fish targeted for food, is high. Other fish targeted for food are low in abundance.

## Invertebrate Abundance at Tenggol (Individuals per 100m<sup>2</sup>)

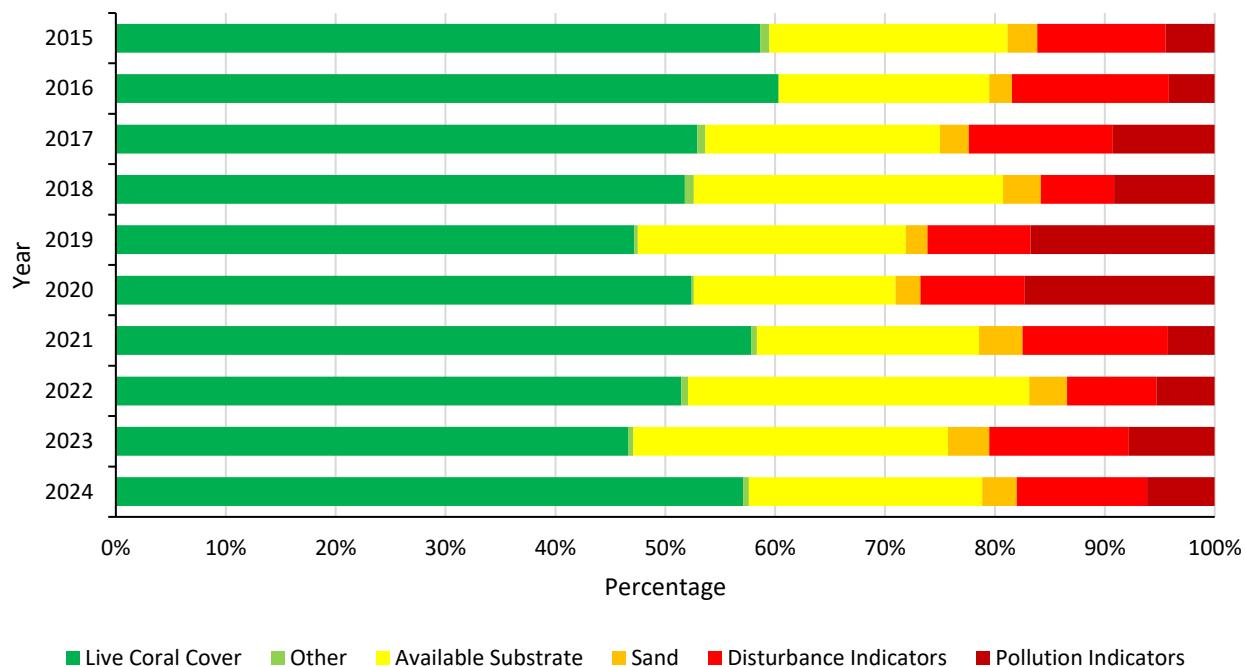
Collected for curio trade	Collected for food
	 X
	 X 4.13
	 X 0.04
	 0.42

### Ecological Imbalance/Predator Outbreaks

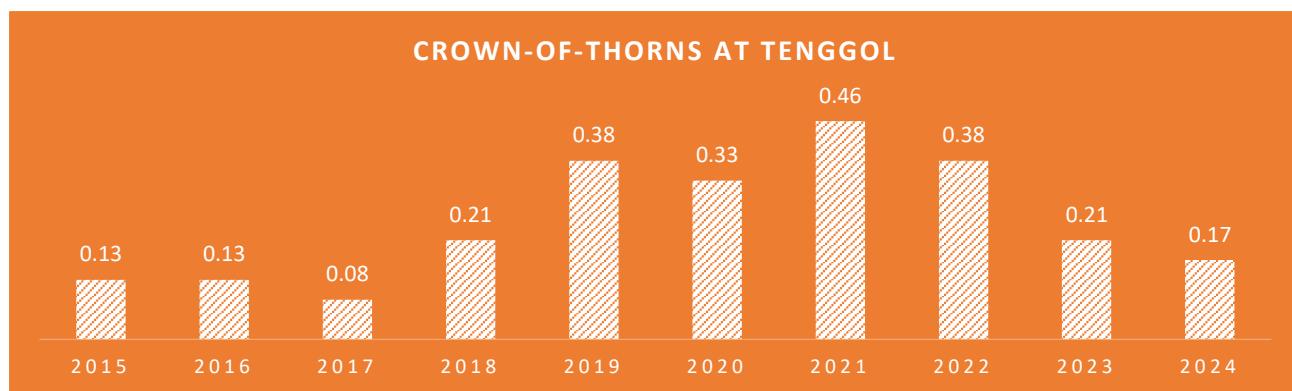
	0.13
	0.17

- Indicators for curio trade are absent.
- Crown-of-thorns is not an issue in Tenggol.
- Invertebrates targeted for food are very low in abundance, except for sea cucumber.

### Reef Health at Tenggol



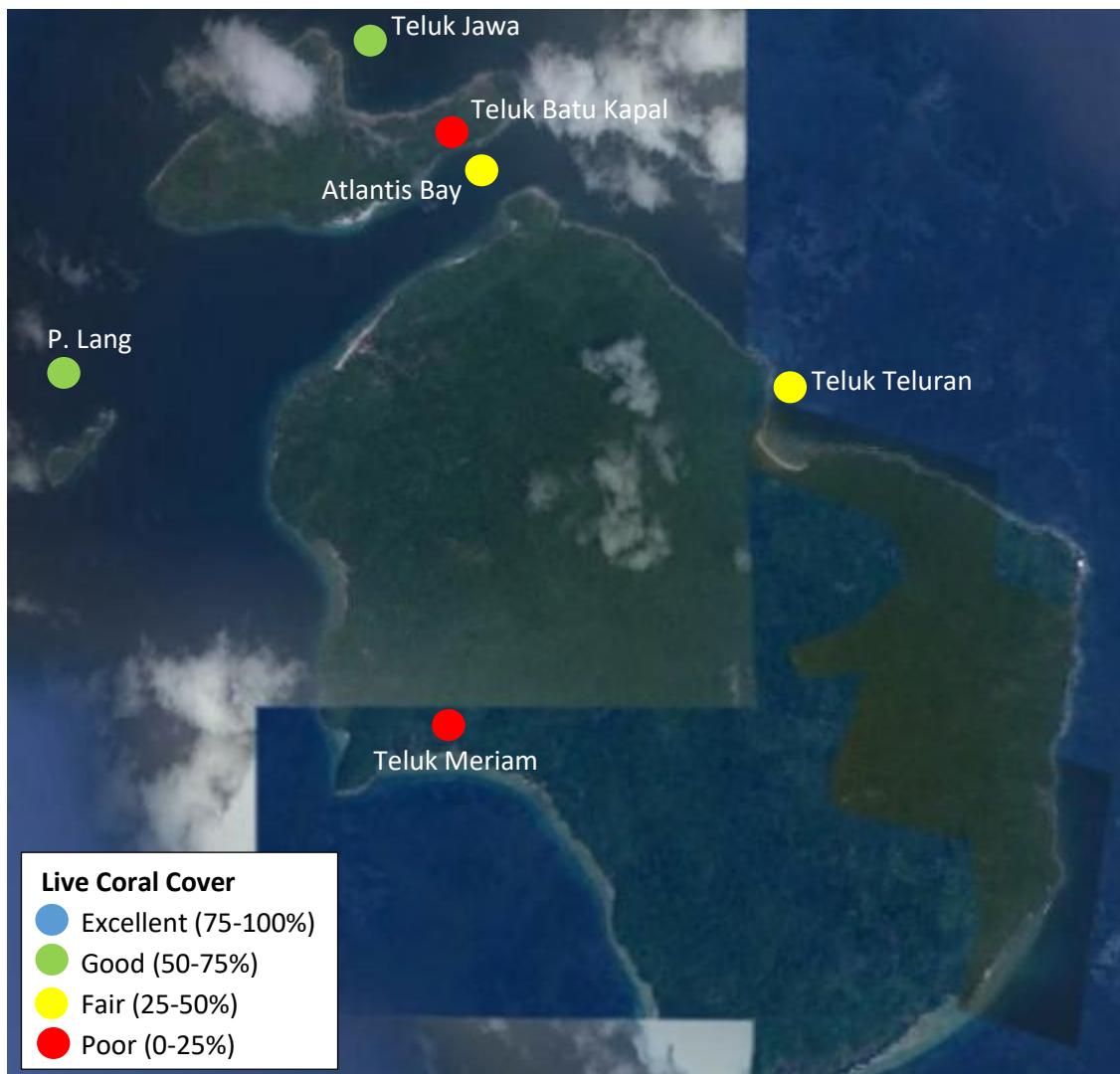
- Tenggol reefs showed variation over the years.
- The deterioration in 2017 and 2018 was due to raised level of nutrient in the waters around the island. The deterioration in 2018 was also contributed by the increase in crown-of-thorns abundance.
- The deterioration in 2019 was due to Tropical Storm Pabuk which struck Tenggol in January that year, causing major physical damage to shallow reefs and sharp increase in pollution indicators. Storm brings high rainfall and water-shed runoff which increase external nutrient loads. It also causes sediment resuspension contributing to increase internal nutrient loads.
- In 2020 and 2021, the reefs recovered but deteriorated again in 2022 and 2023.
- In 2024, the reefs had improved.
- From 2019 to 2022, the abundance of crown-of-thorns was above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>). Since 2023, the abundance had decreased to within the acceptable limit.



## Johor – Aur & Dayang

Pulau Aur and Pulau Dayang are adjacent islands in Mersing District, Johor. They lie about 76km east of Mersing off the East coast of Peninsular Malaysia and were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).

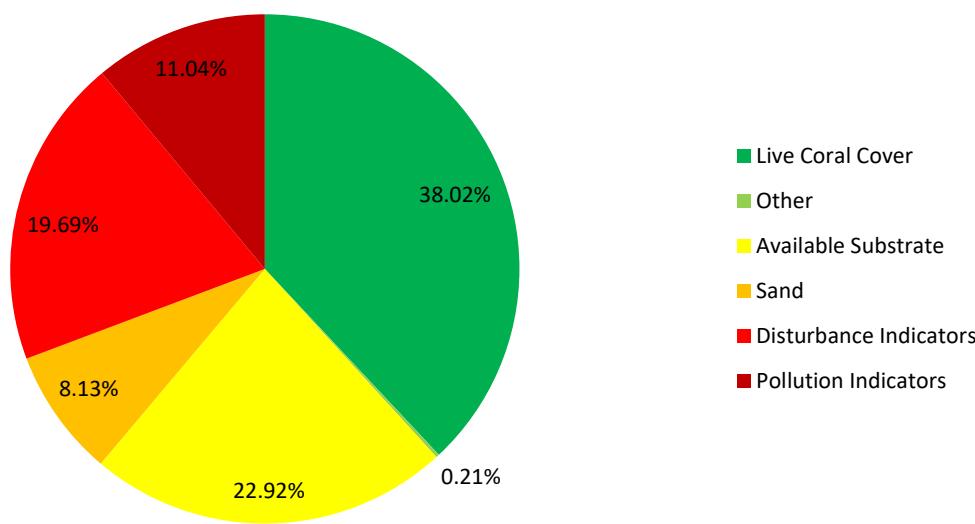
Their corals, lagoons and offshore pools make these islands a tourist attraction. The islands are sparsely populated with few villages and have for many years been a frequent stopover point for fishermen. Pulau Aur and Pulau Dayang used to be a popular diving destination among tourists from Singapore.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Good' coral cover, 2 are in 'Fair' condition and 2 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Aur & Dayang



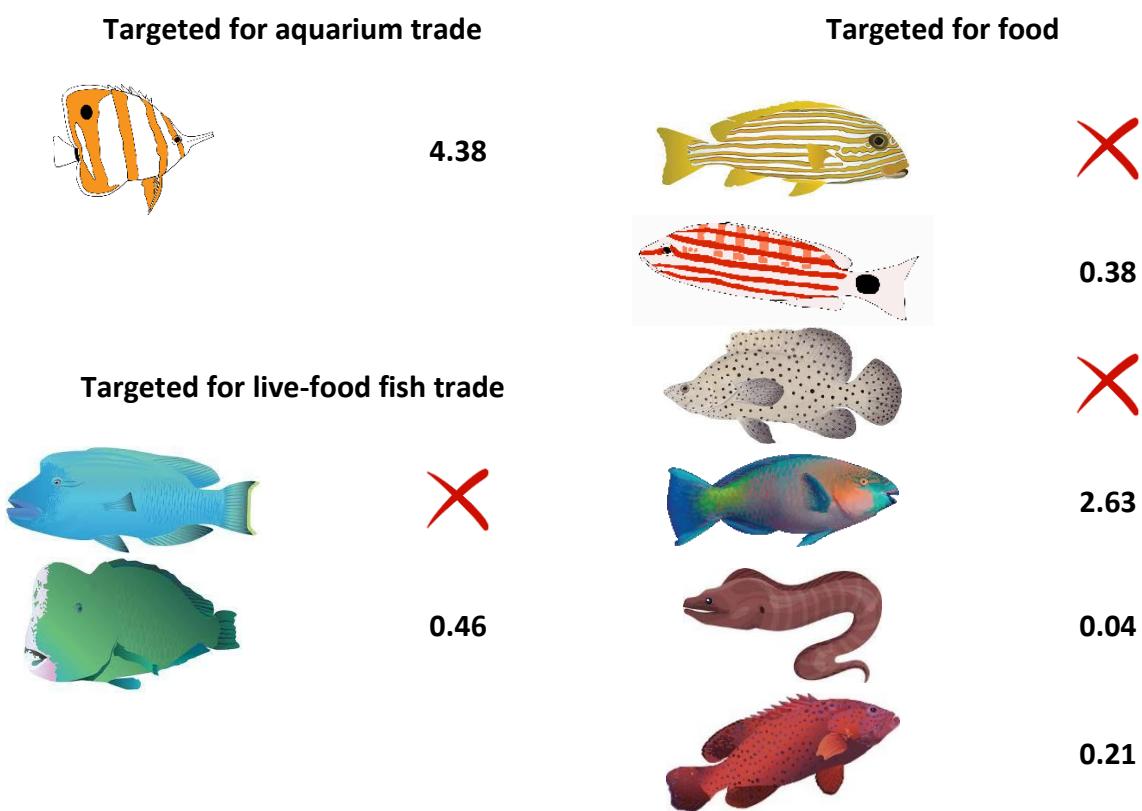
- Aur and Dayang reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 36.67%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is quite high. The level is especially high at Teluk Meriam which recorded 27.50%.
- Disturbance indicators are high.
- Over 30% of Pulau Lang and Teluk Batu Kapal consist of rubble. The level ranges from 11% to 20% at Atlantis Bay, Teluk Jawa and Teluk Meriam.
- Pollution indicators are high.
- Nutrient indicator algae level ranges from 8% to 17% at Teluk Batu Kapal, Teluk Jawa, Teluk Meriam and Teluk Teluran.

### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded at many sites.
- Drupella predation was recorded.
- All sites, with an average 2% of the reefs, were impacted by warm water bleaching.

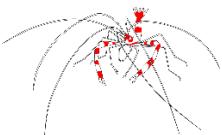


## Fish Abundance at Aur & Dayang (Individuals per 500m<sup>3</sup>)

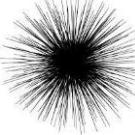


- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, indicator targeted for live-food fish trade, is recorded.
- The abundance of fish targeted for food is very low, except for parrotfish.

### Invertebrate Abundance at Aur & Dayang (Individuals per 100m<sup>2</sup>)

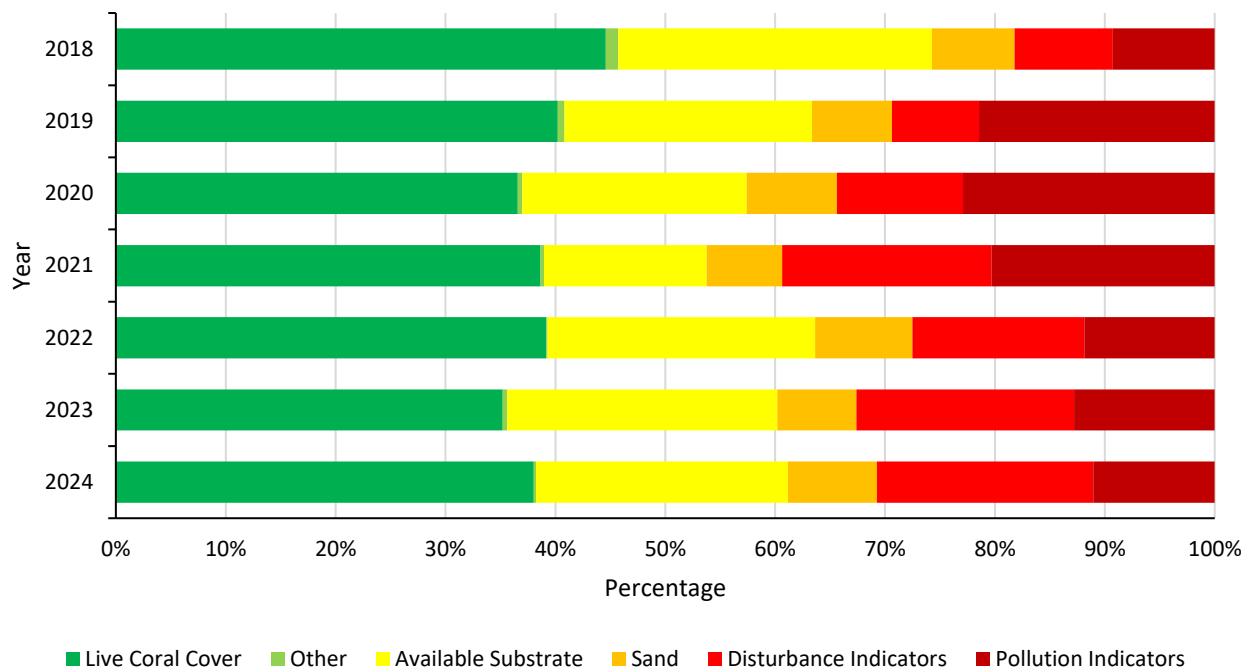
Collected for curio trade		Collected for food	
	✗		✗
	✗		2.63
	✗		✗
			0.54

### Ecological Imbalance/Predator Outbreaks

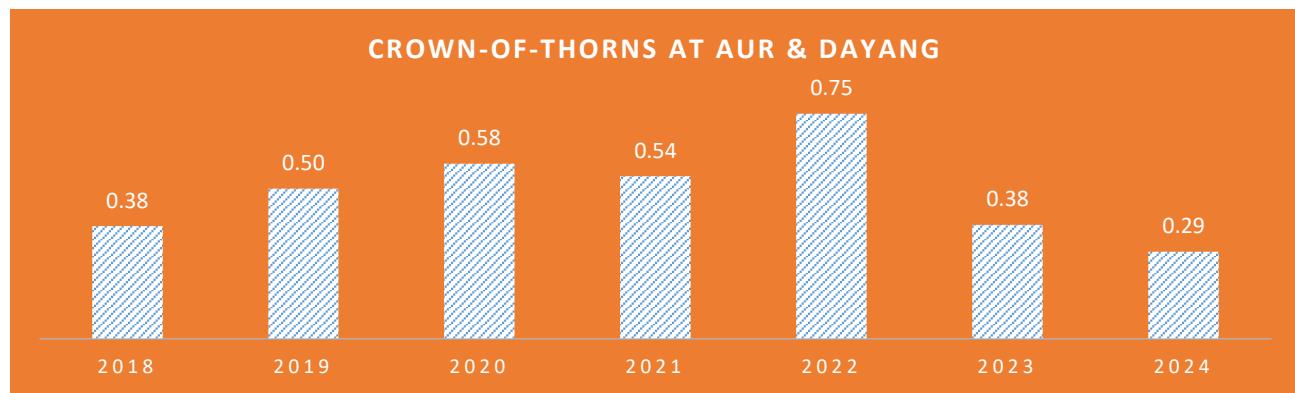
	3.96
	0.29

- Indicators for curio trade are absent.
- Crown-of-thorns is not a concern in Aur and Dayang.
- Invertebrates targeted for food are very low in abundance, except for sea cucumber.

### Reef Health at Aur & Dayang

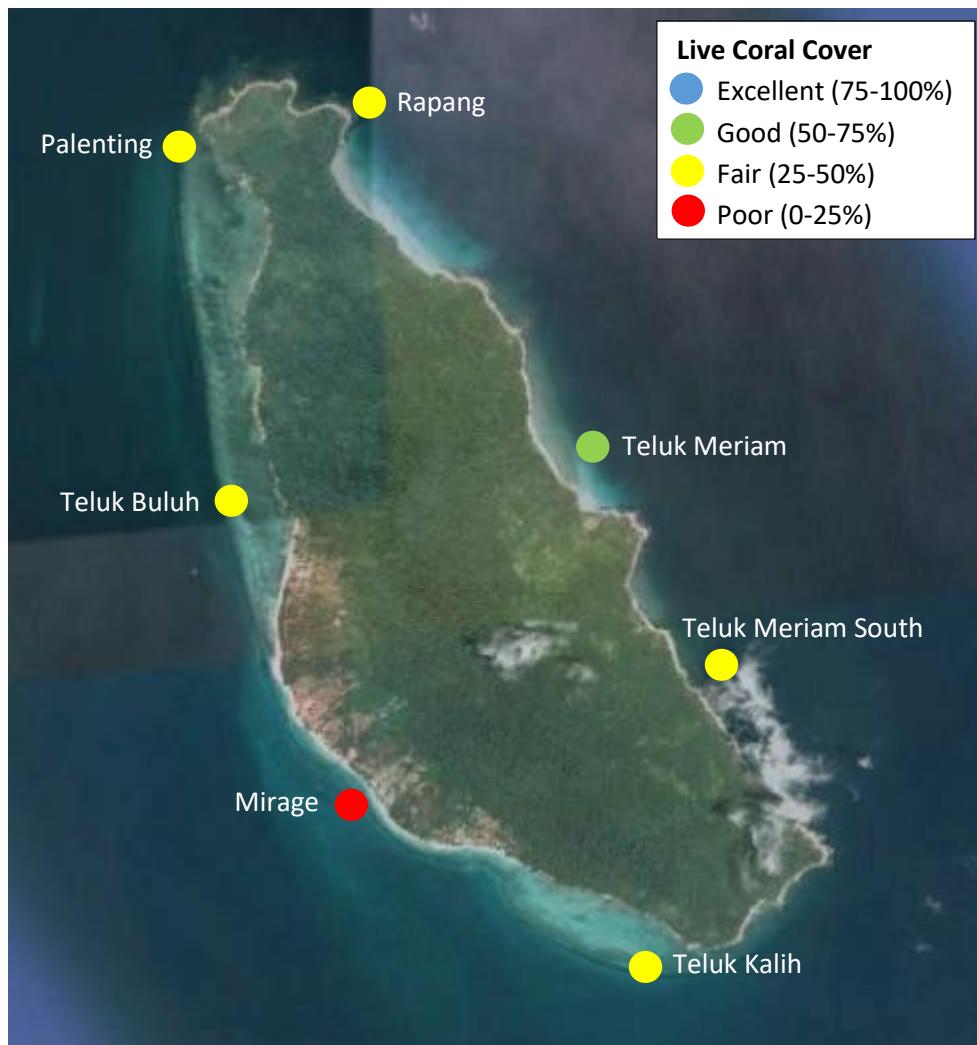


- From 2018 to 2020, Aur and Dayang reefs had deteriorated. The deterioration was likely due to physical damage caused by human activities and/or storm, raised level of nutrient in the waters around the island and crown-of-thorns outbreak.
- From 2020 onwards, the reefs have remained more or less the same.
- The abundance of crown-of-thorns has decreased over the years and the population is now within what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>).
- Available substrate for coral recruits to attach is high, possible chance of reef recovery if human impacts and crown-of-thorns outbreak are dealt with.



## Johor – Besar

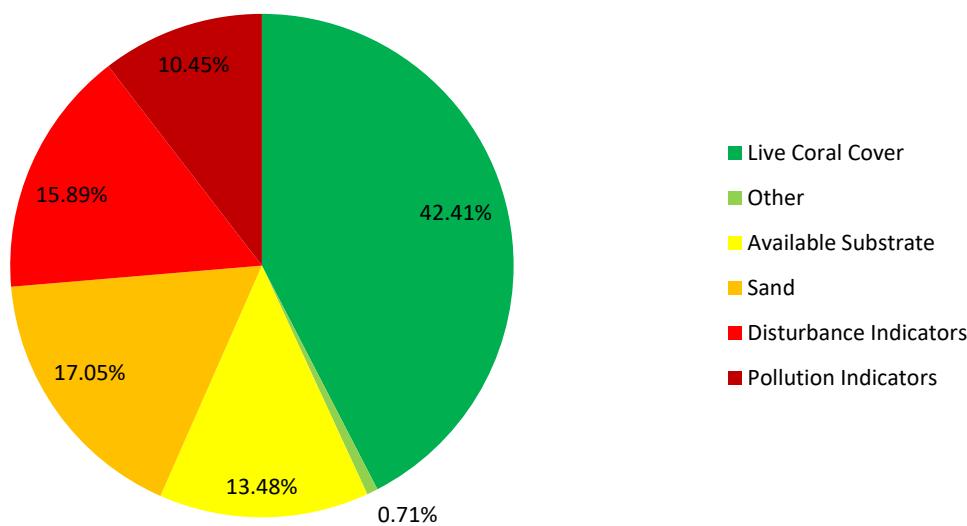
Pulau Besar is an island in Mersing District, Johor. The island is surrounded by Pulau Rawa, Pulau Sibu and Pulau Tinggi. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Good' coral cover, 5 are in 'Fair' condition and 1 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Besar



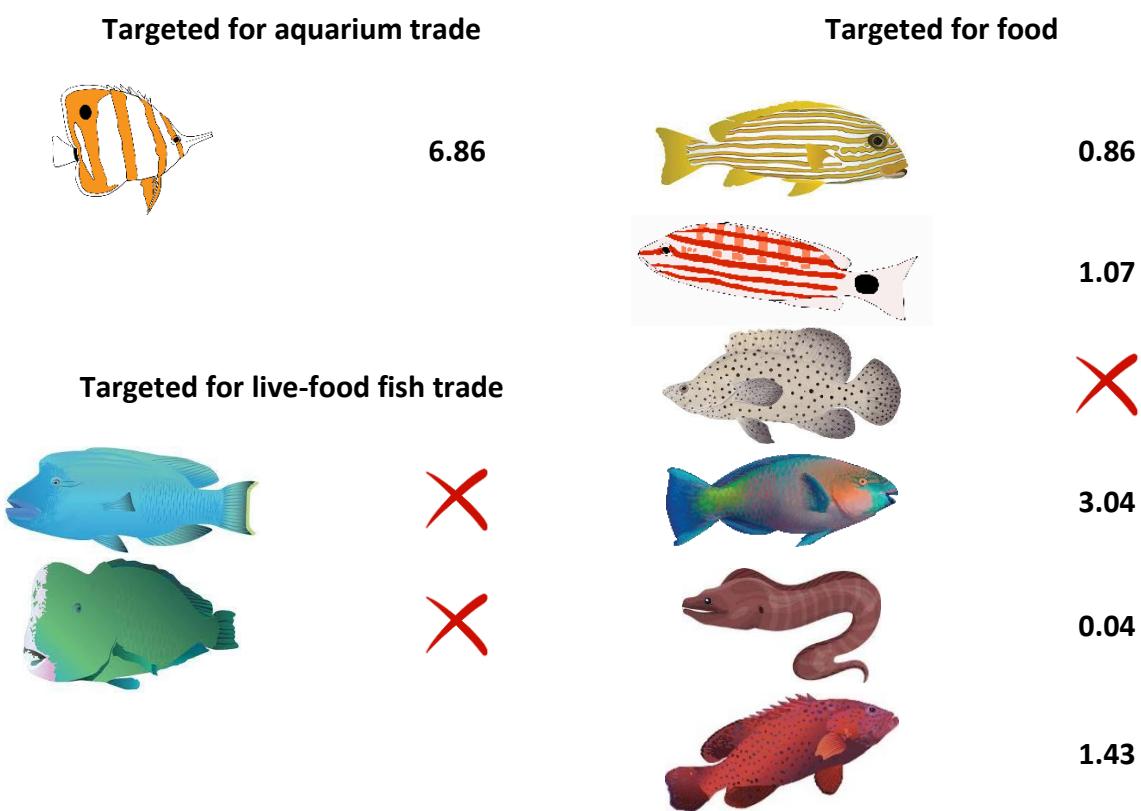
- Pulau Besar reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 41.16%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Sand level is high. It is especially high at Mirage (33.75%). The level ranges from 14% to 25% at Palenting, Rapang, Teluk Buluh and Teluk Kalih.
- Disturbance indicators are high.
- Rubble level is high at Rapang which recorded 8.75%.
- Silt level is high at all sites, ranging from 10% to 19%.
- Pollution indicators are high.
- The level of nutrient indicator algae is especially high at Teluk Meriam South (18.75%) and Teluk Kalih (15%).

### CORAL IMPACTS

- Boat anchor damage and trash were recorded at one site.
- Discarded fishing nets and drupella predation were recorded at many sites.
- All sites, with an average 4% of the reefs, were impacted by warm water bleaching.

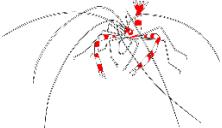


### Fish Abundance at Besar (Individuals per 500m<sup>3</sup>)

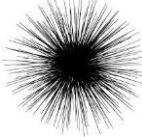


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is low.

### Invertebrate Abundance at Besar (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	X		X
	X		X
	X		X
			0.04

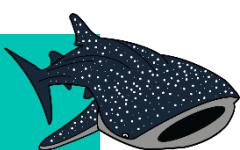
### Ecological Imbalance/Predator Outbreaks

	31.29
	X

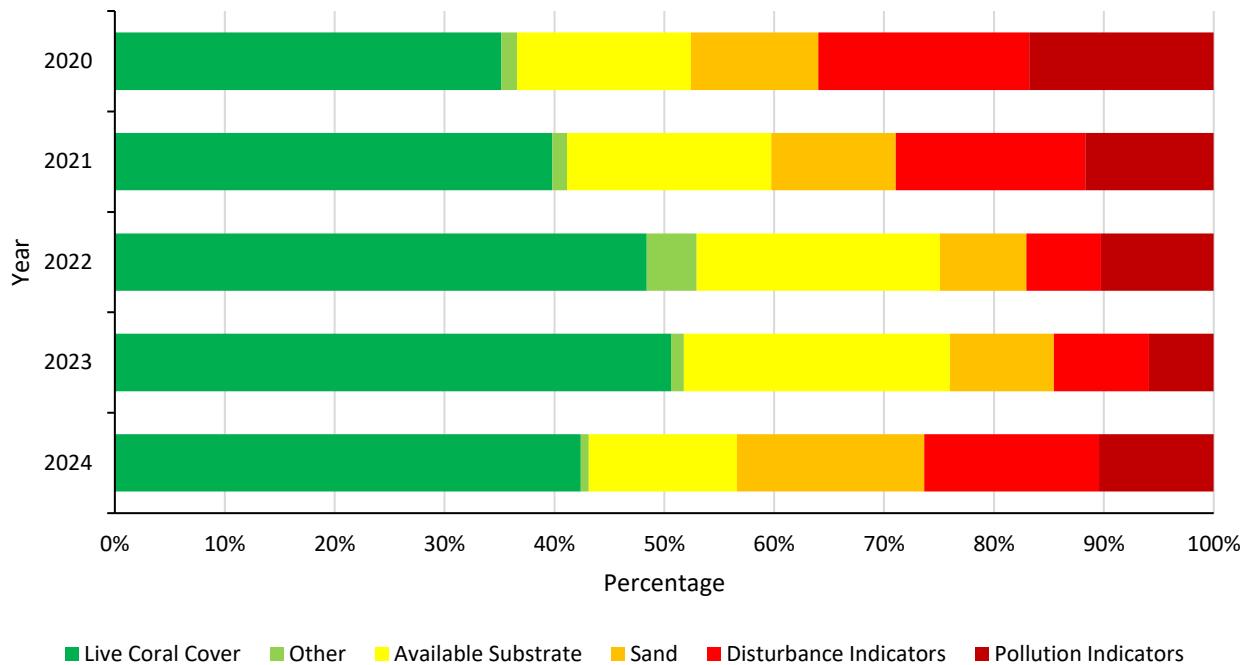
- Only diadema urchin and giant clam are recorded.
- The abundance of giant clam, invertebrate collected for food, is low.

### RARE ANIMALS

- Turtle was recorded.



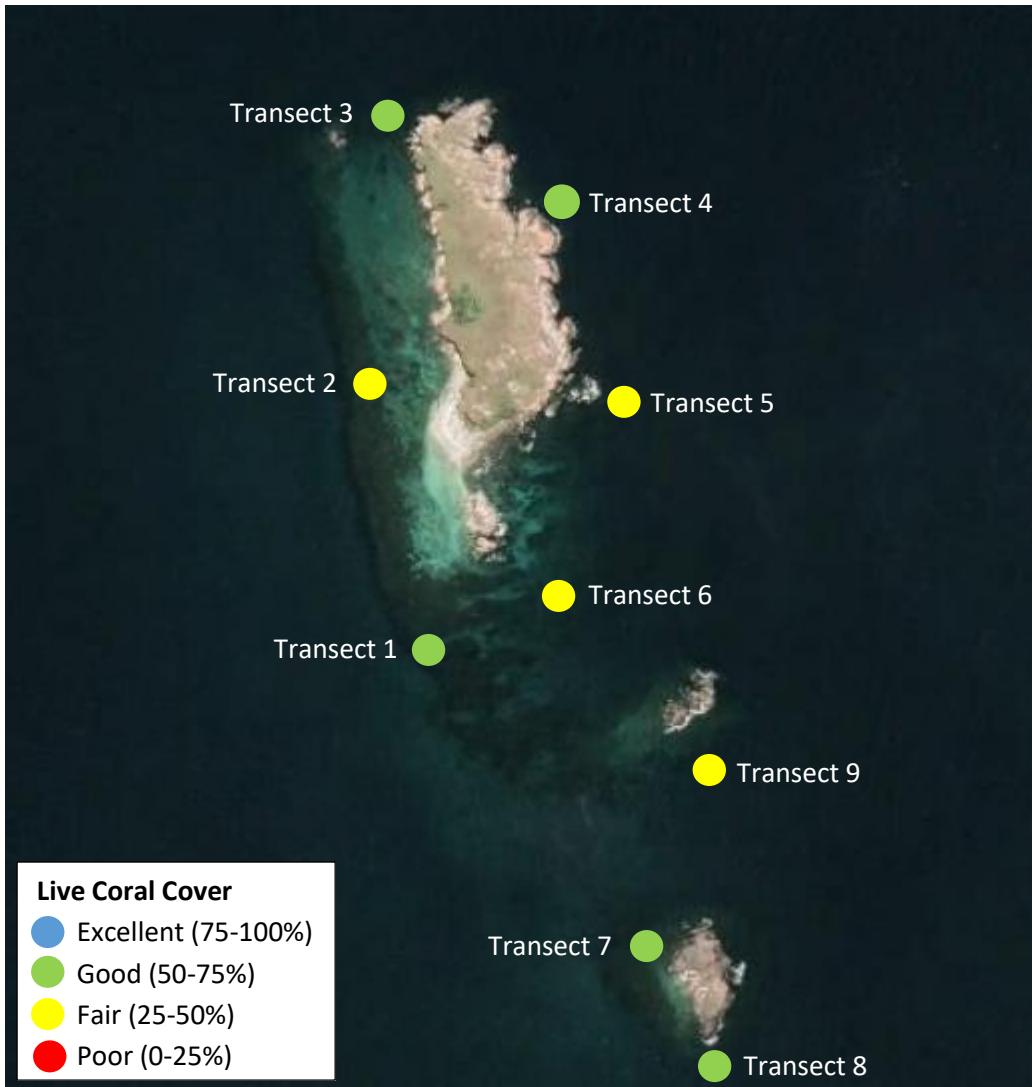
### Reef Health at Besar



- From 2020 to 2023, Pulau Besar reefs have improved from 'fair' to 'good' condition.
- In 2024, the reefs deteriorated. The deterioration was due to a combination of physical damage caused by human activities and/or storm, raised level of nutrient in the waters around the island and the 4<sup>th</sup> Global Coral Bleaching Event.
- Available substrate for coral recruits to attach is high, possible chance of recovery if human impacts are dealt with.

## Johor – Gual

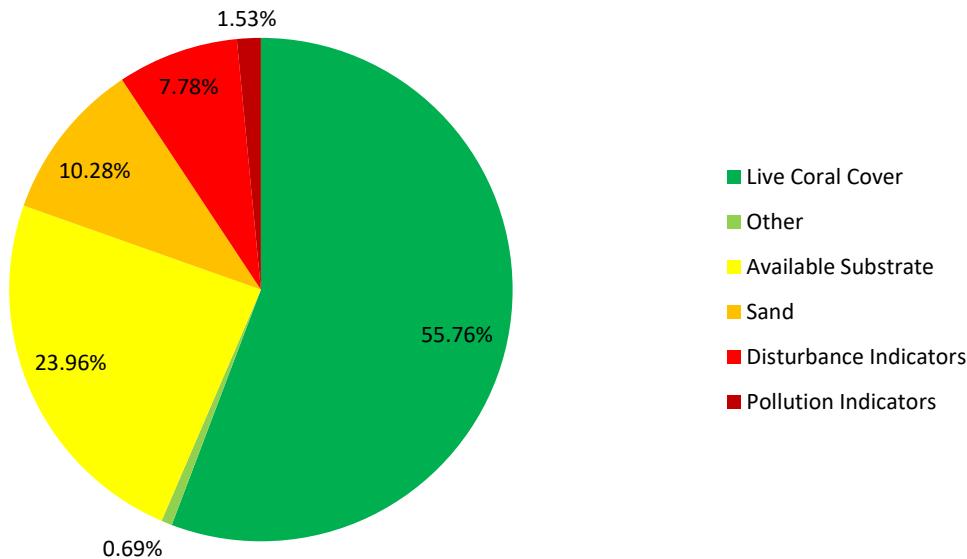
Pulau Gual is an island in Mersing District, Johor. The island is not populated and surrounded by Pulau Harimau, Pulau Mensirip and Pulau Rawa. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).



Map showing the health categories of each survey site based on Live Coral Cover: 5 sites have 'Good' coral cover and 4 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Gual



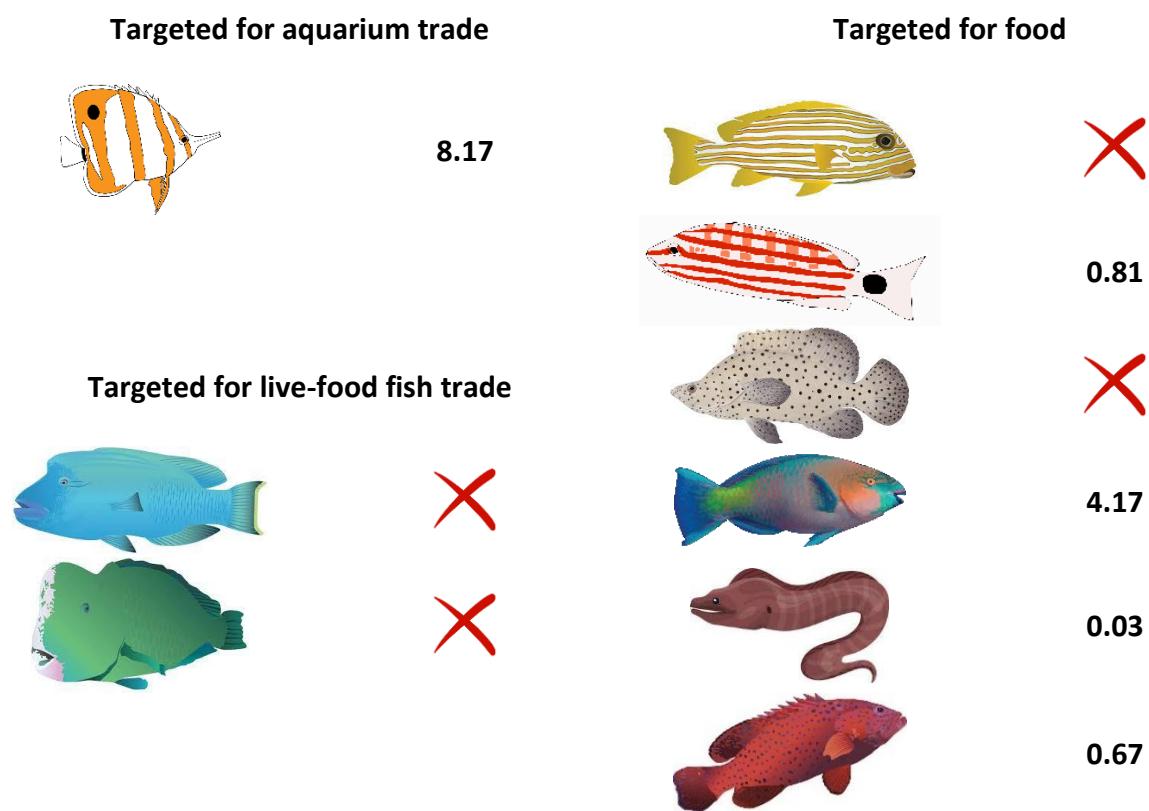
- Pulau Gual reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 54.72%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. It is especially high at Transect 5 (20.63%), 6 (15%) and 9 (38.13%).
- Disturbance indicators are slightly high.
- Rubble level is especially high at Transect 2 which recorded 32.50%.

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded.
- Black band disease was recorded.
- All sites, with an average 4% of the reefs, were impacted by warm water bleaching.

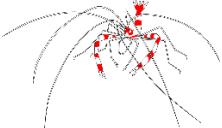


### Fish Abundance at Gual (Individuals per 500m<sup>3</sup>)

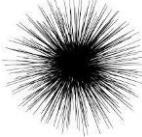


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Absent of indicator targeted for live-food fish trade.
- The abundance of fish targeted for food is very low, except for parrotfish.

### Invertebrate Abundance at Gual (Individuals per 100m<sup>2</sup>)

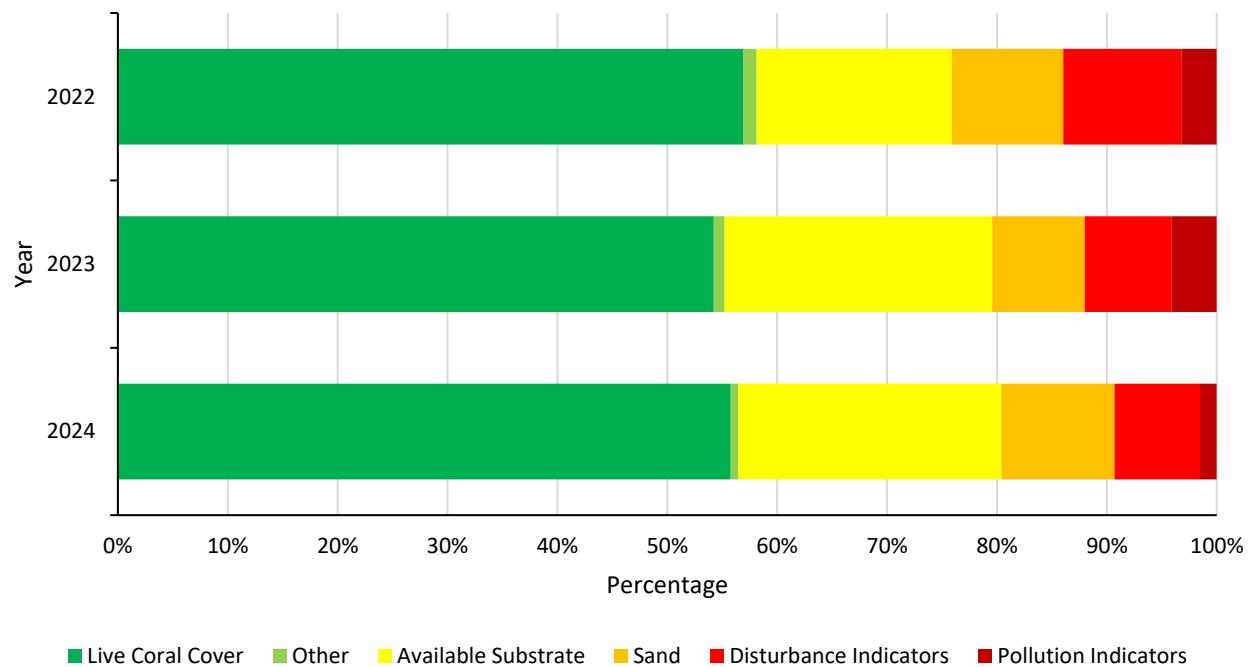
Collected for curio trade		Collected for food	
	✗		0.06
	✗		✗
	✗		✗
			✗

### Ecological Imbalance/Predator Outbreaks

	67.31
	✗

- Only diadema urchin and collector urchin are recorded.
- The abundance of collector urchin, invertebrate collected for food, is low.

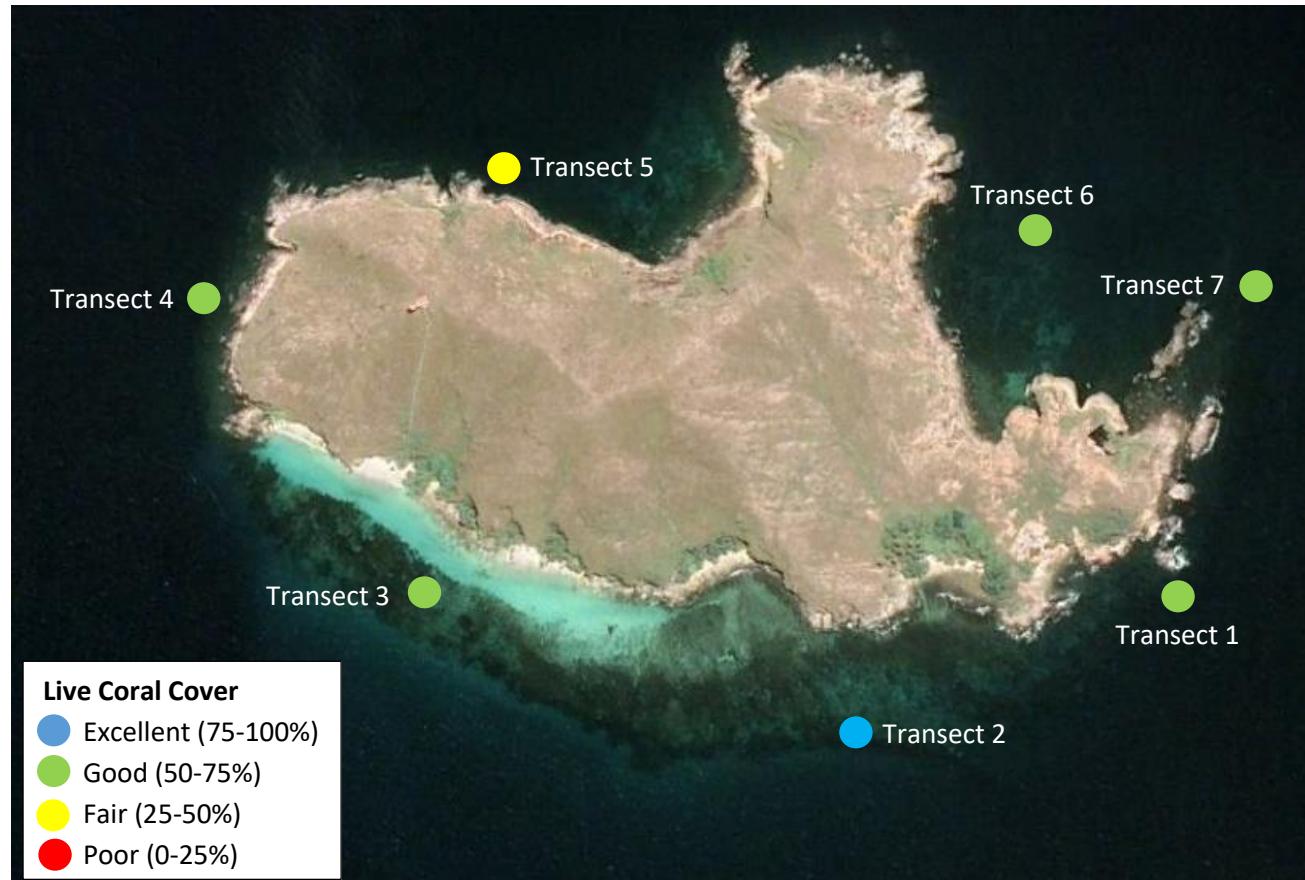
### Reef Health at Gual



- Gual reefs have maintained in 'good' condition.
- Disturbance and pollution indicators had reduced.

## Johor – Harimau

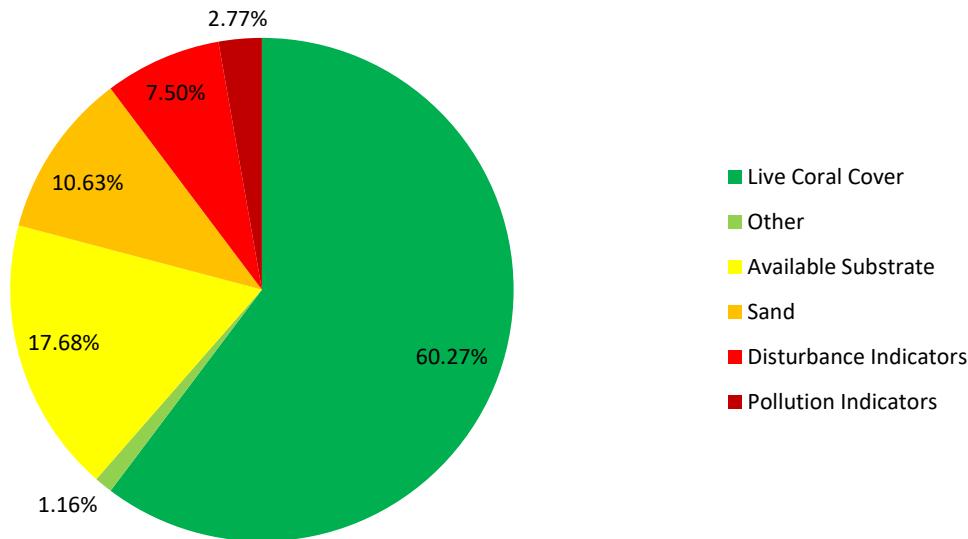
Pulau Harimau is an island in Mersing District, Johor. The island is not populated and surrounded by Pulau Mertang, Pulau Mensirip, Pulau Gual and Pulau Rawa. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 5 are in 'Good' condition and 1 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Harimau



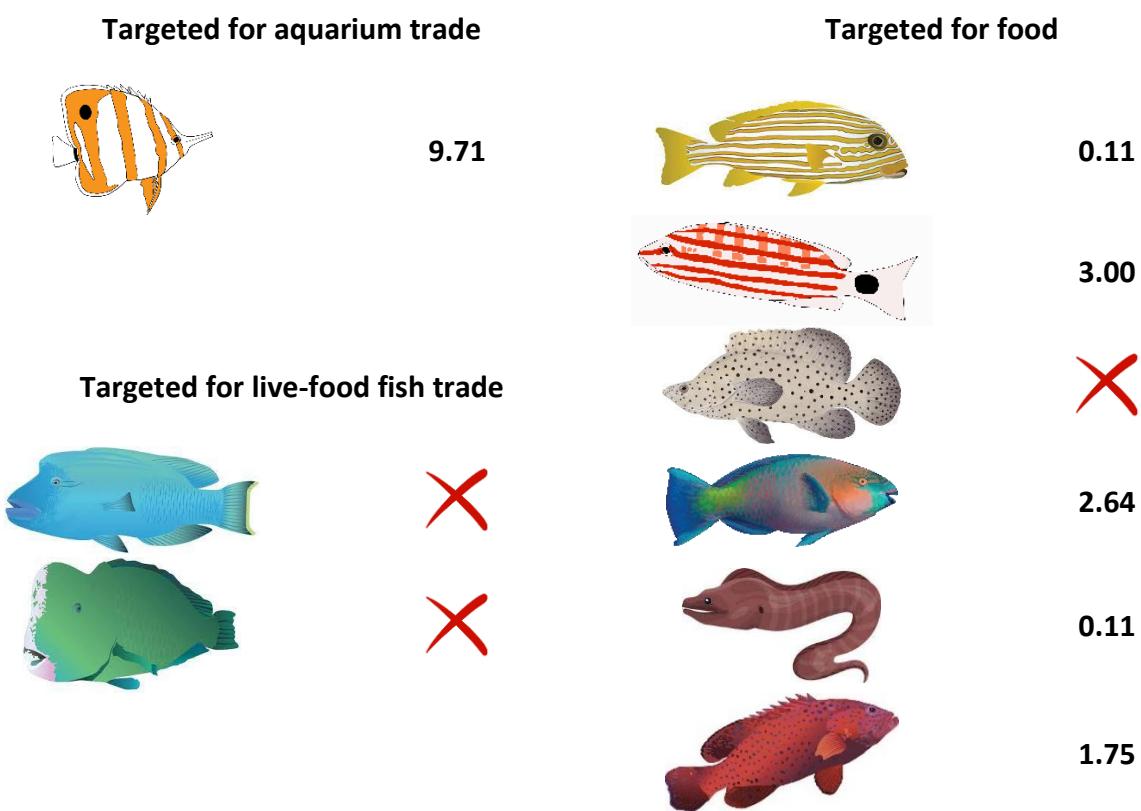
- Pulau Harimau reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 59.91%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Sand level is high. Transect 4, 5, 6 and 7 recorded 13% to 25% sand.
- Disturbance indicators are slightly high.
- Rubble level is especially high at Transect 1 (12.50%) and 5 (13.75%).
- Pollution indicators are not high in Pulau Harimau in general, but the level of sponge is especially high at Transect 4 (8.75%).

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded at many sites.
- Boat anchor damage and white band disease were recorded.
- All sites except one, with an average 13% of the reefs, were impacted by warm water bleaching.

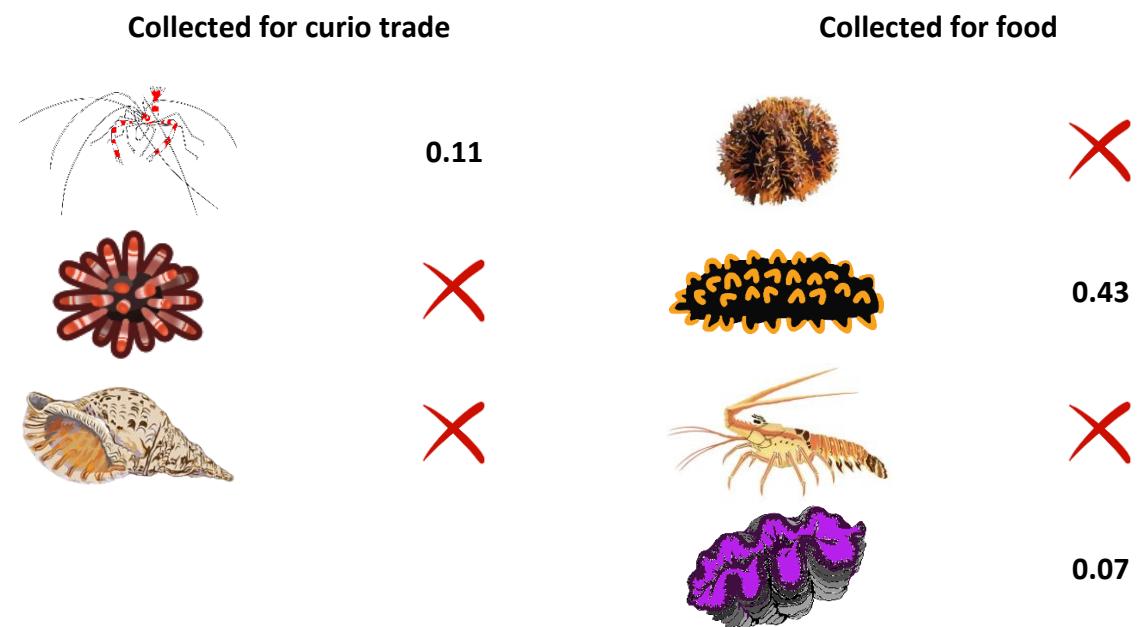


### Fish Abundance at Harimau (Individuals per 500m<sup>3</sup>)

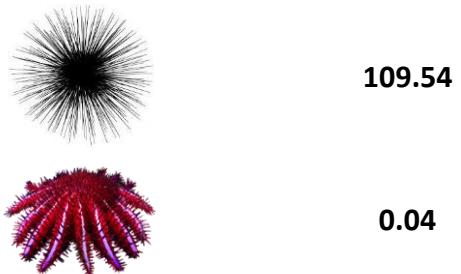


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is low.

## Invertebrate Abundance at Harimau (Individuals per 100m<sup>2</sup>)

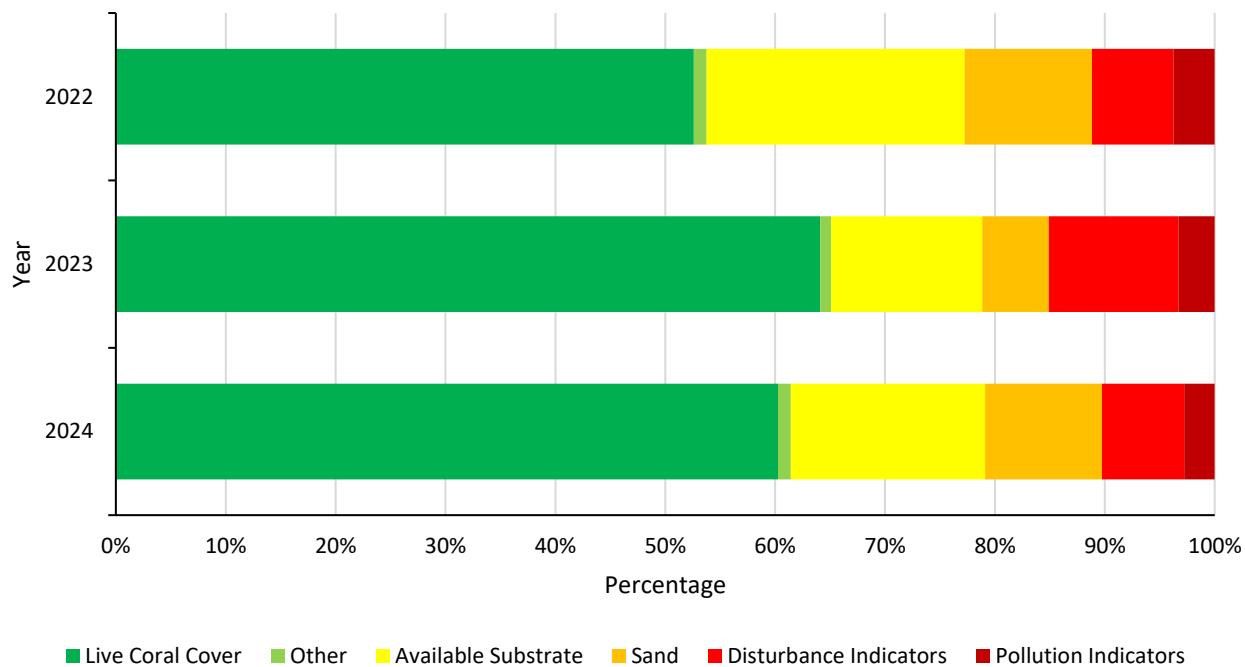


### Ecological Imbalance/Predator Outbreaks



- Banded coral shrimp, indicator for curio trade, is recorded.
- Diadema urchin abundance is high.
- Crown-of-thorns is not an issue in Harimau.
- The abundance of invertebrates collected for food is very low.

### Reef Health at Harimau



- Harimau reefs have maintained in 'good' condition.
- In 2024, the reefs had deteriorated. The deterioration was due to the 4<sup>th</sup> Global Coral Bleaching Event.
- Pollution indicators have decreased.

## Johor – Hujung

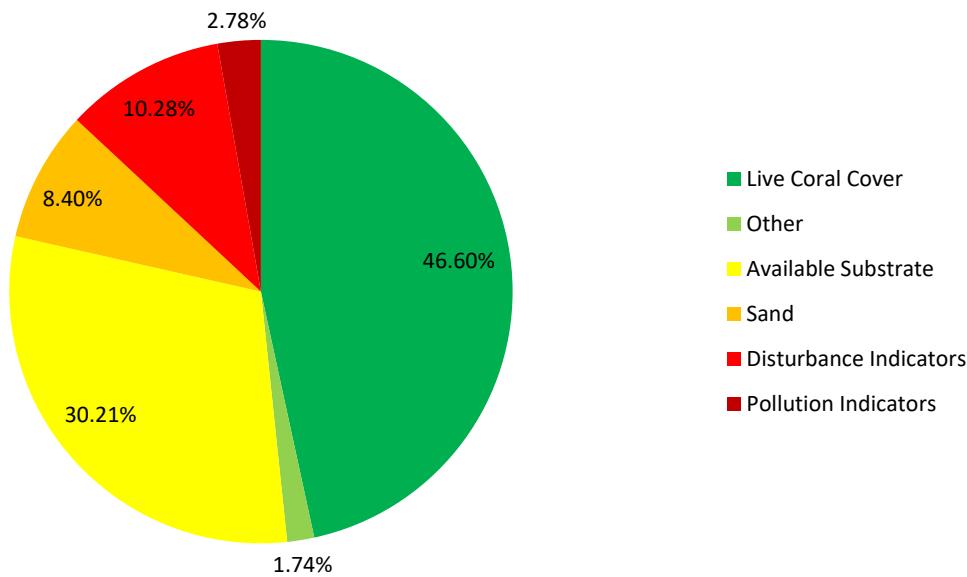
Pulau Hujung is an island in Mersing District, Johor. The island is not populated and surrounded by Pulau Rawa, Pulau Sibu and Pulau Tinggi. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993)



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Good' coral cover and 7 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Hujung



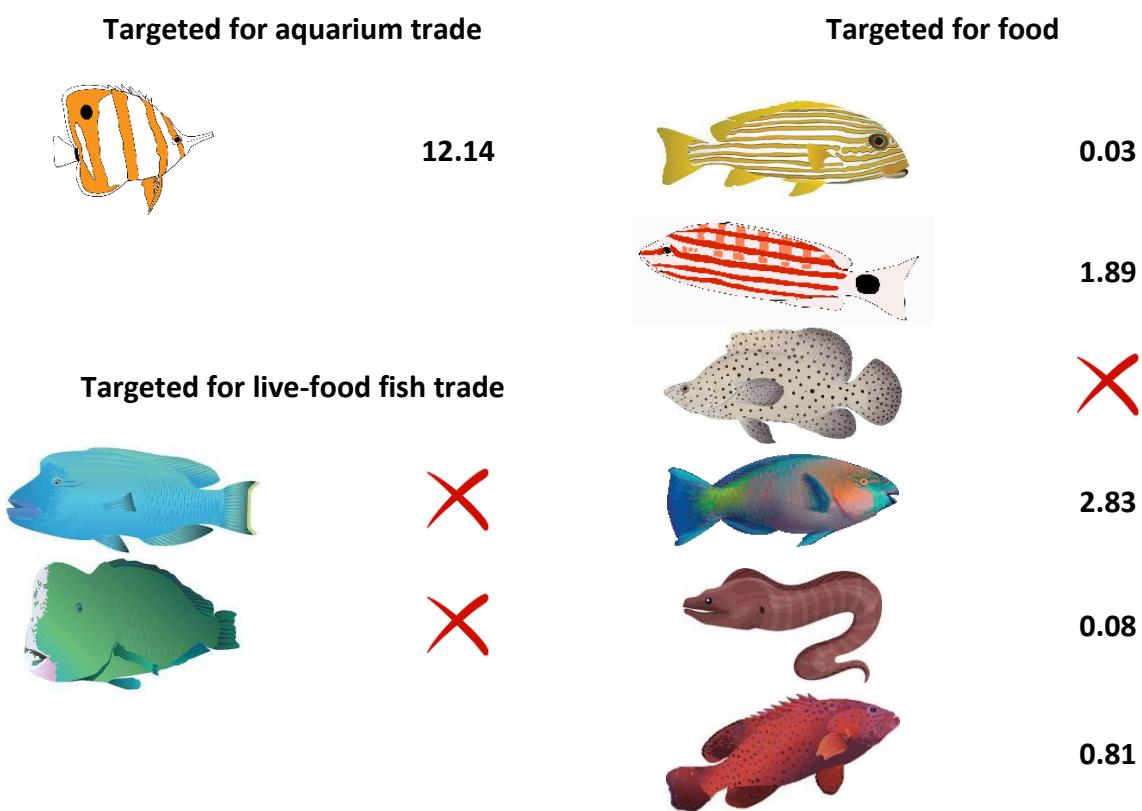
- Pulau Hujung reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 45.14%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. The level is high at many sites and ranges from 11% to 16%.
- Disturbance indicators are high.
- Rubble level is high at many sites, ranging from 10% to 21%.
- Silt level is high at Transect 3 (8.13%).

### CORAL IMPACTS

- Boat anchor damage was recorded at some sites.
- Discarded fishing nets and trash were recorded at many sites.
- All sites, with an average 21% of the reefs, were impacted by warm water bleaching.

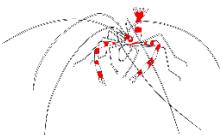


### Fish Abundance at Hujung (Individuals per 500m<sup>3</sup>)

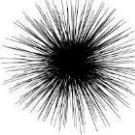


- Butterflyfish, indicator for aquarium trade, abundance is very high.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only barramundi cod is absent. The abundance of the rest of the indicators is low.

## Invertebrate Abundance at Hujung (Individuals per 100m<sup>2</sup>)

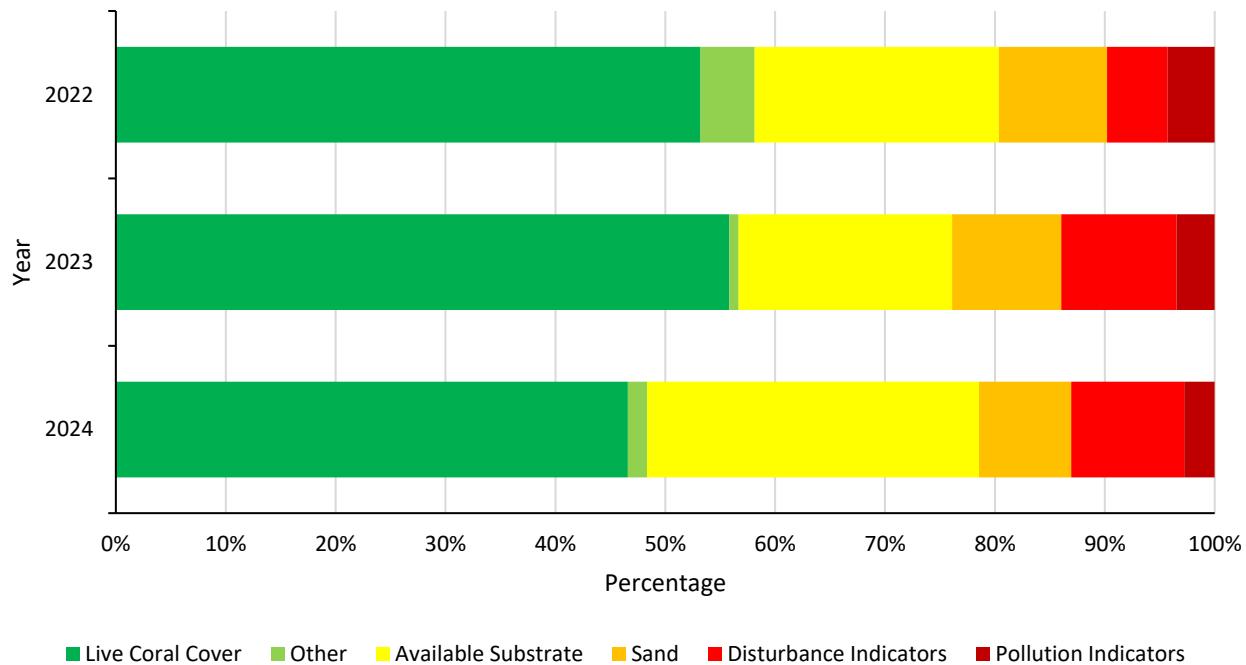
Collected for curio trade		Collected for food	
	X		X
	X		0.56
	X		X
			0.14

### Ecological Imbalance/Predator Outbreaks

	218.06
	X

- Indicators for curio trade are absent.
- Diadema urchin abundance is high.
- The abundance of invertebrates collected for food is very low.

### Reef Health at Hujung



- Hujung reefs showed variation over the years.
- While pollution indicators had decreased, disturbance indicators had increased.

## Johor – Lima

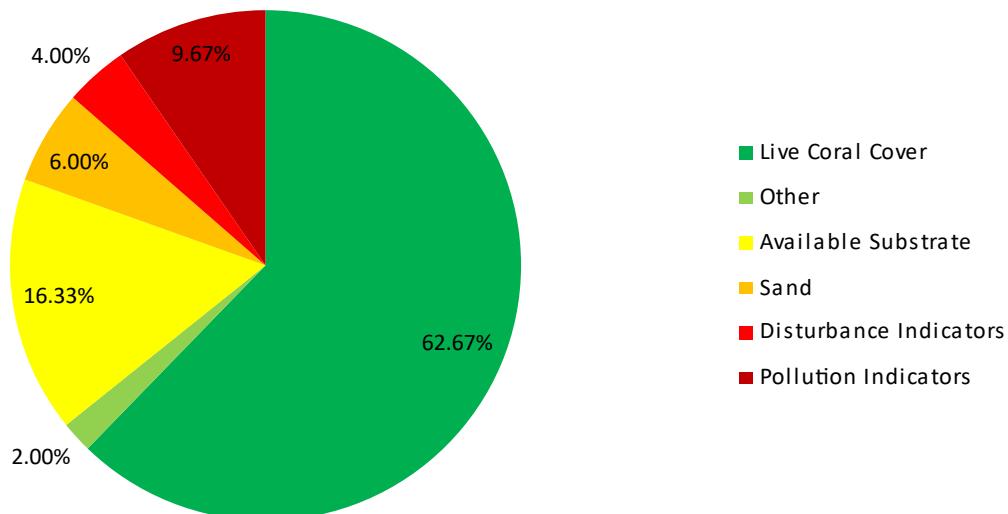
Pulau Lima is an island in Mersing District, Johor. The island is surrounded by Pulau Sibu and Pulau Tinggi and frequented by snorkelers and divers from the nearby Pulau Sibu and Pulau Tinggi. The island is not populated. The natural ecosystem hosts diverse marine life, has high aesthetic value and is a national heritage. The waters surrounding the island group were gazetted as a Marine Park in 2023 under the Fisheries Act 1985.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover and 2 are in 'Good' condition.

## Coral Cover and Health

Substrate Composition at Lima



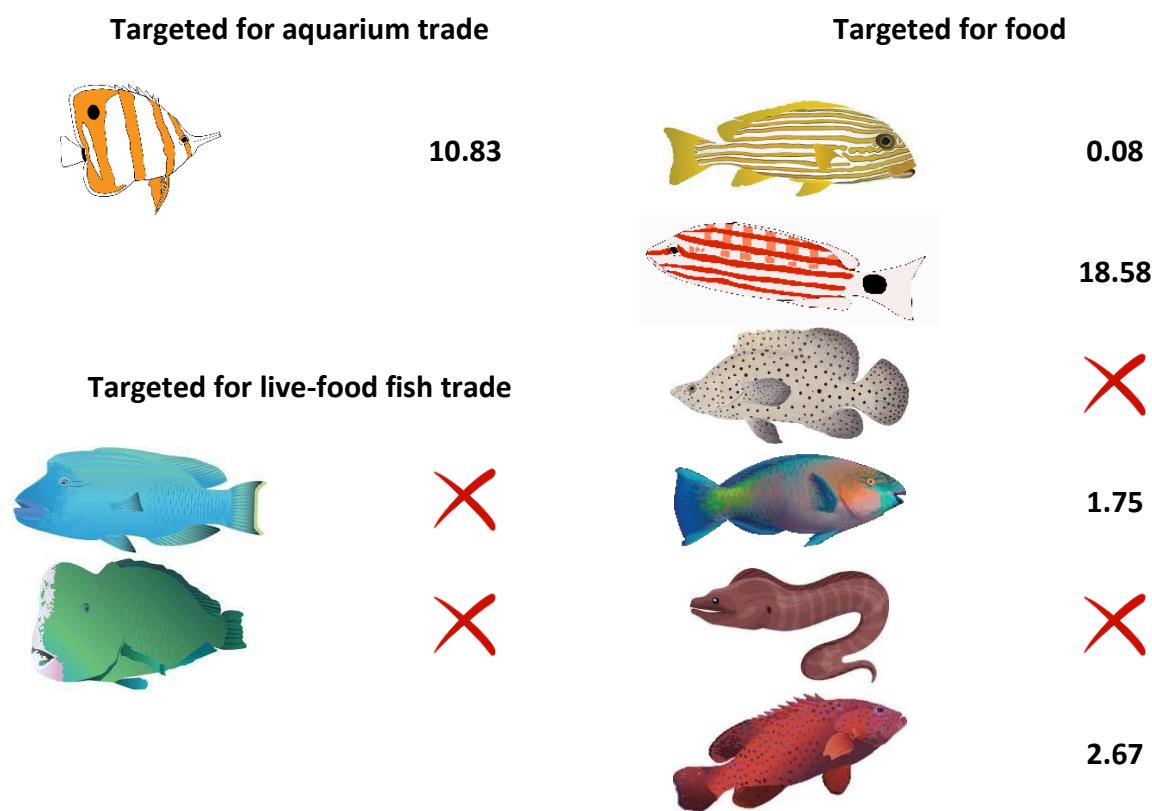
- Pulau Lima reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 54%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Pollution indicators are quite high.
- The level of sponge is especially high at Tokong Sanggul (15%) and Pulau Lima Kecil (11%).

### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded at many sites.

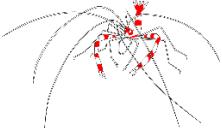


### Fish Abundance at Lima (Individuals per 500m<sup>3</sup>)

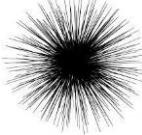


- Butterflyfish, indicator for aquarium trade, abundance is very high.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is low, except for snapper.
- Snapper abundance in Pulau Lima is high.

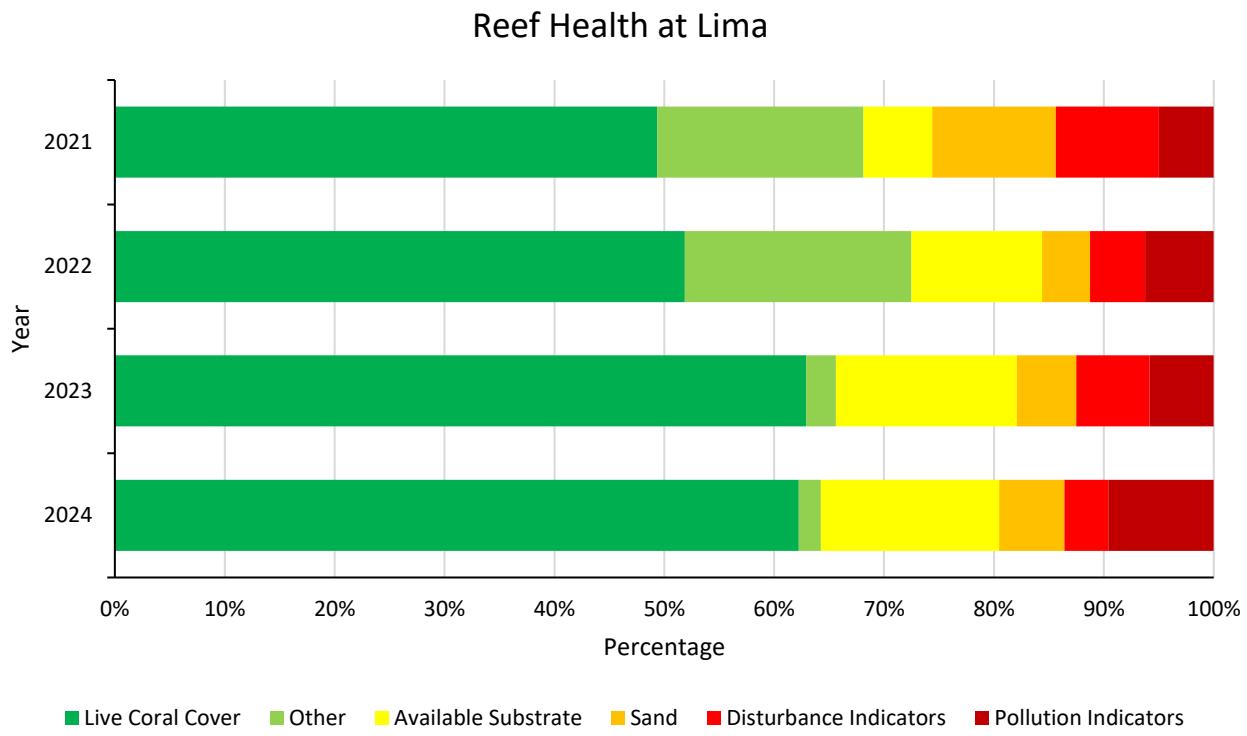
### Invertebrate Abundance at Lima (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	X		X
	X		0.25
	X		X
			X

### Ecological Imbalance/Predator Outbreaks

	249.42
	X

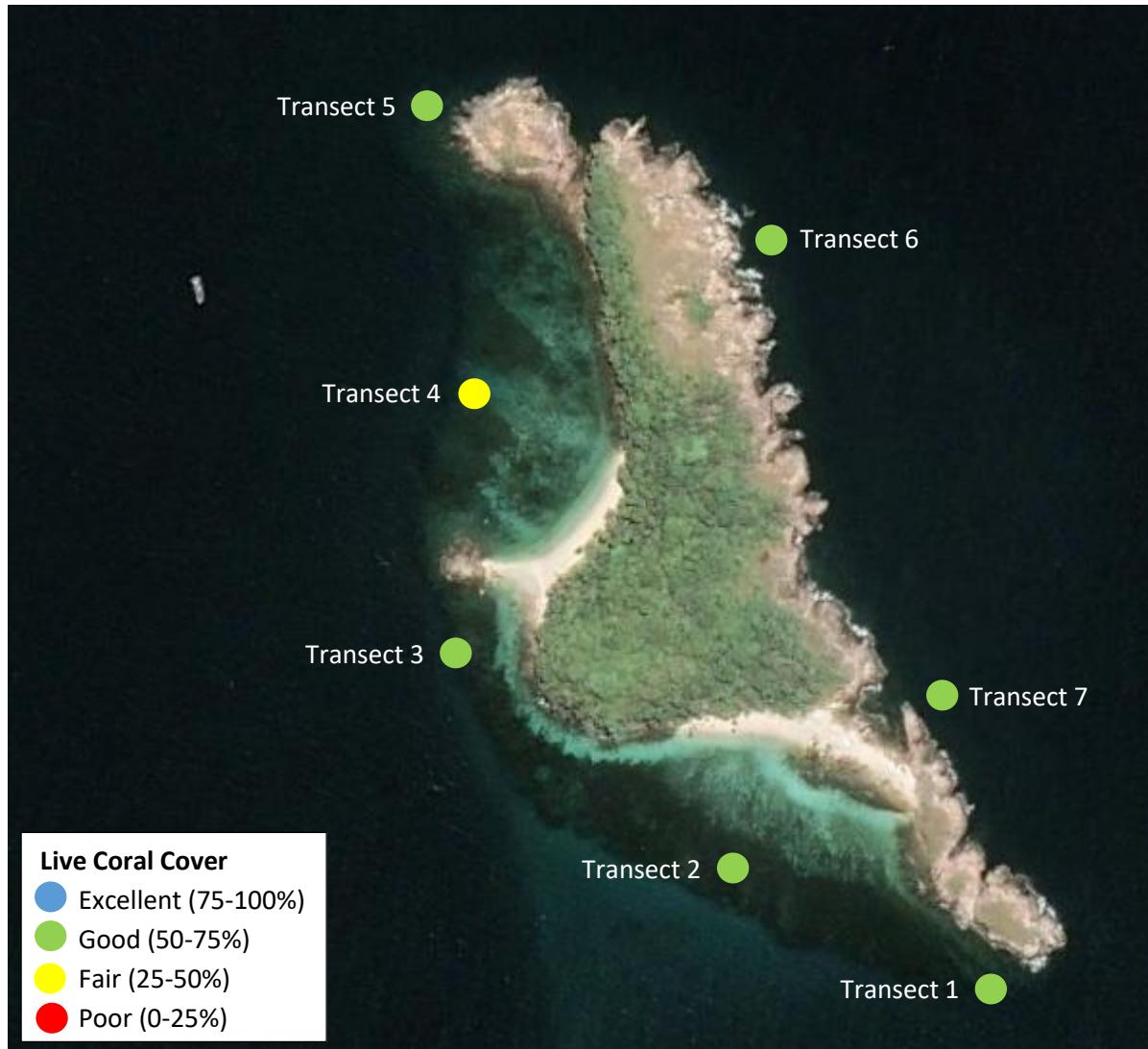
- Only diadema urchin and sea cucumber are recorded.
- Diadema urchin abundance is high.



- Pulau Lima reefs have maintained in 'good' condition.
- The significant improvement in 2023 is considered to reflect the addition of 1 new site, rather than an actual significant increase in live coral cover.
- While disturbance indicators have decreased, pollution indicators have increased.

## Johor – Mensirip

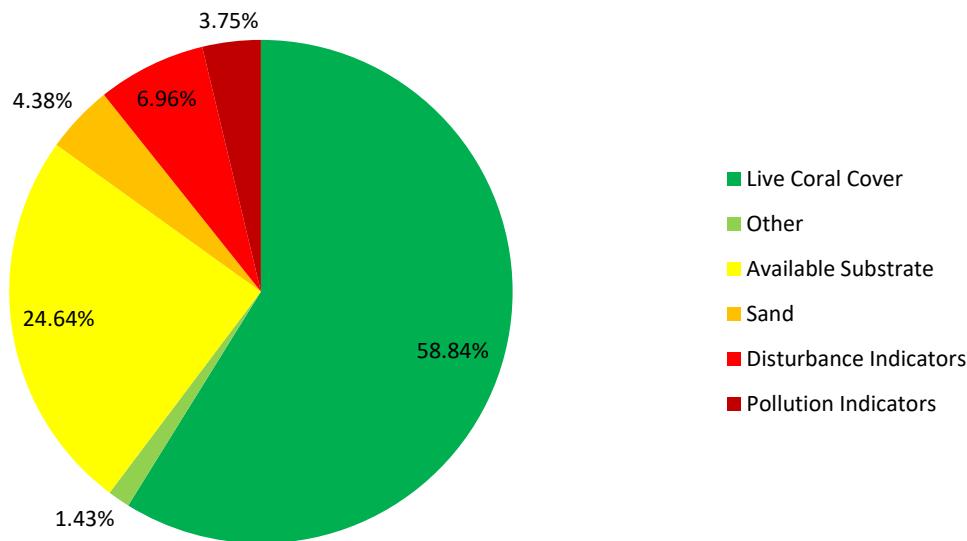
Pulau Mensirip is an island in Mersing District, Johor. The island is not populated and surrounded by Pulau Harimau, Pulau Gual and Pulau Rawa. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).



Map showing the health categories of each survey site based on Live Coral Cover: 6 sites have 'Good' coral cover and 1 is in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Mensirip



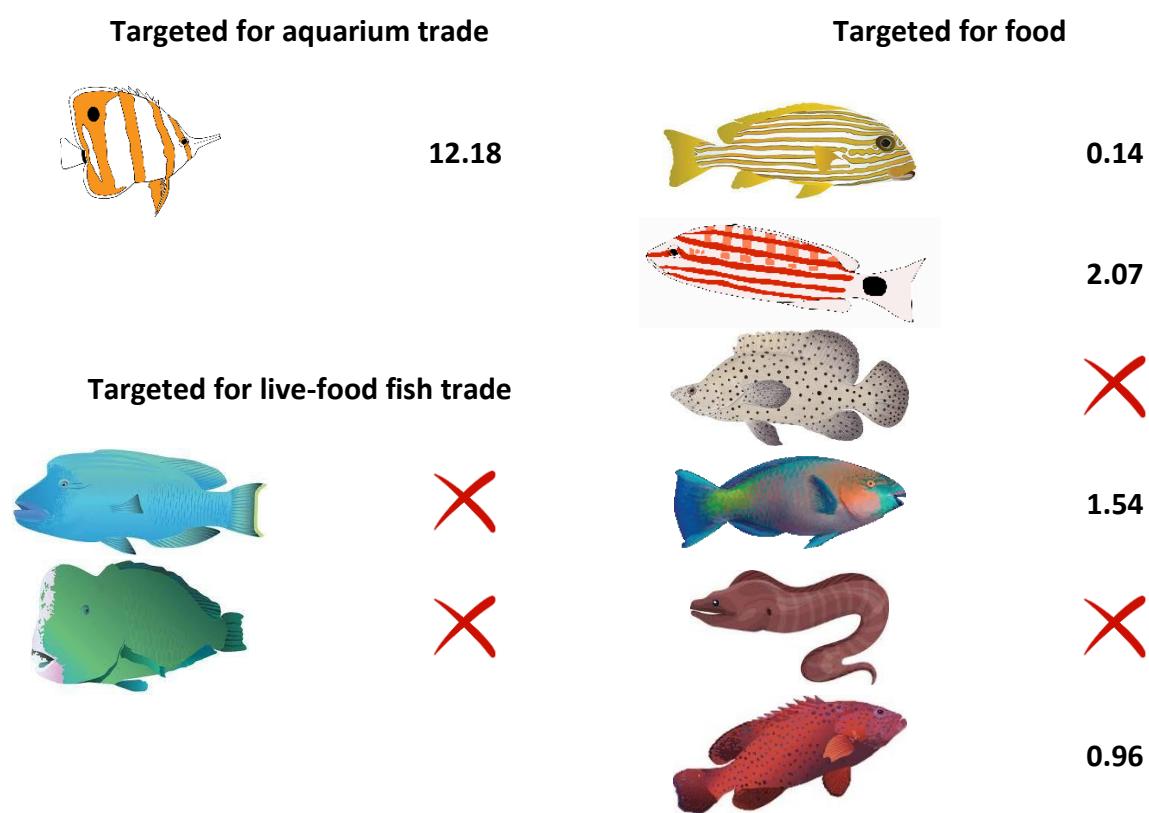
- Pulau Mensirip reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 49.82%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are not high in Mensirip in general, but the level of rubble is especially high at Transect 3 (19.38%).
- Same goes to pollution indicators, the level is not high in general, but the level of sponge is especially high at Transect 4 (18.13%)

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded.
- All sites, with an average 7% of the reefs, were impacted by warm water bleaching.

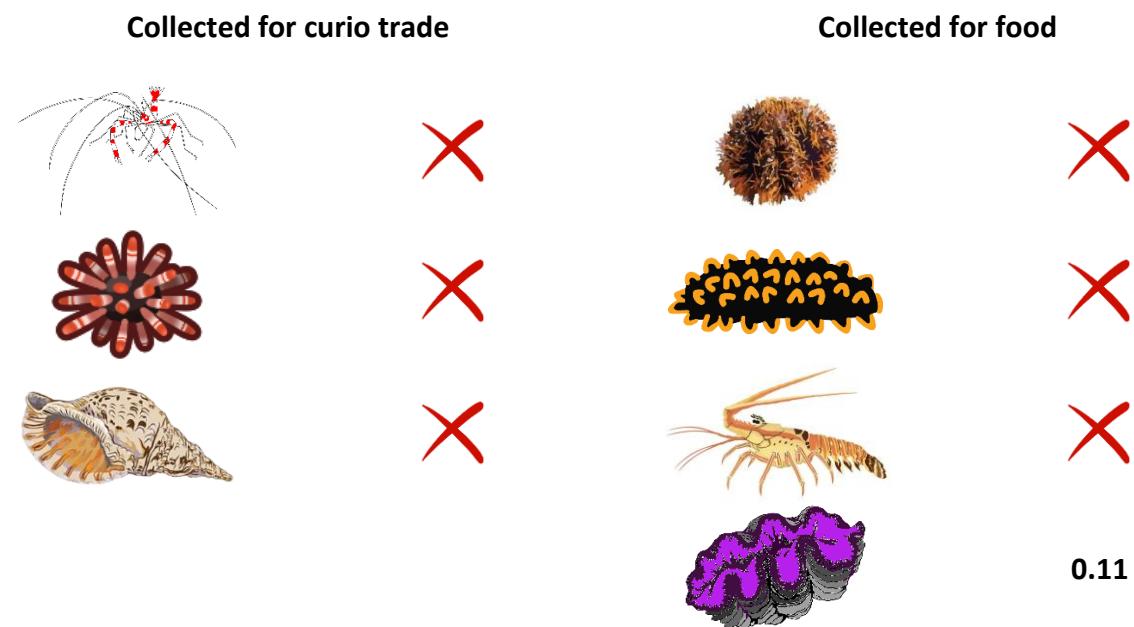


### Fish Abundance at Mensirip (Individuals per 500m<sup>3</sup>)

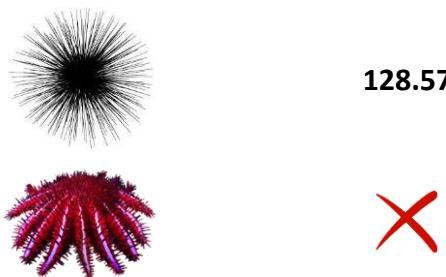


- Butterflyfish, indicator for aquarium trade, abundance is very high.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is low.

## Invertebrate Abundance at Mensirip (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



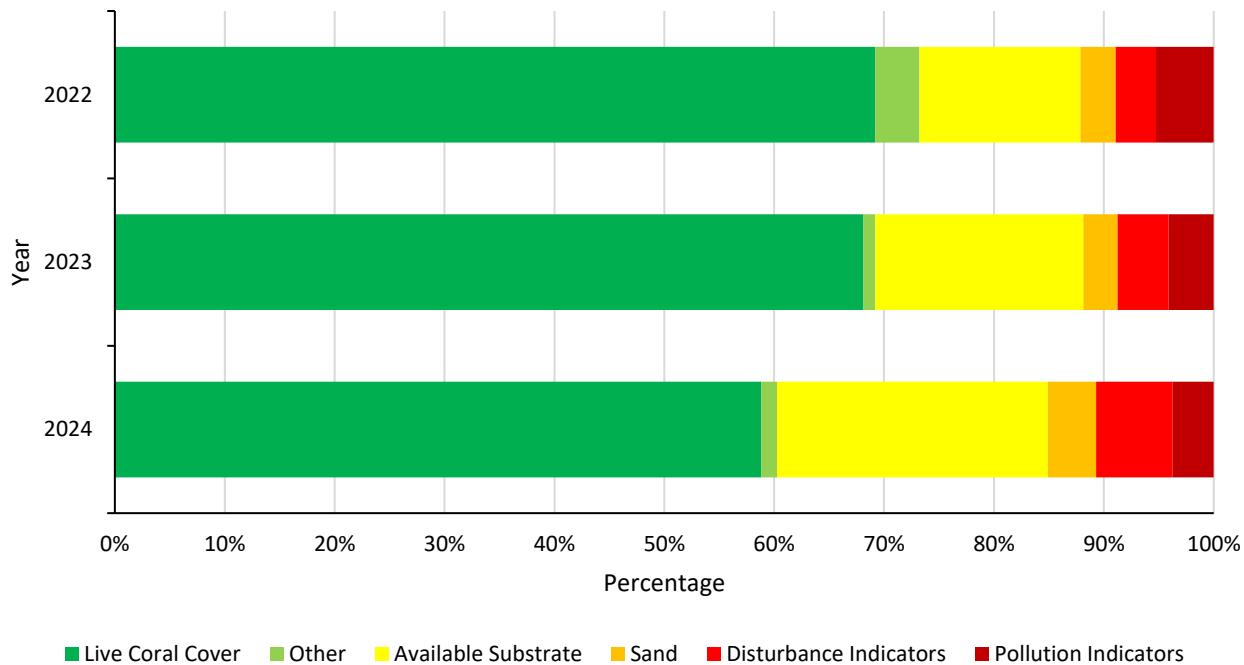
- Only diadema urchin and giant clam are recorded.
- Diadema urchin abundance is high.
- Giant clam, invertebrates collected for food, abundance is very low.

### RARE ANIMALS

- Turtle was recorded.



### Reef Health at Mensirip



- Mensirip reefs have deteriorated over the years.
- The deterioration is likely due to physical damage caused by human activities and/or storm.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach to is high, indicating possible chance of reef recovery if human impacts are dealt with.

## Johor – Mertang

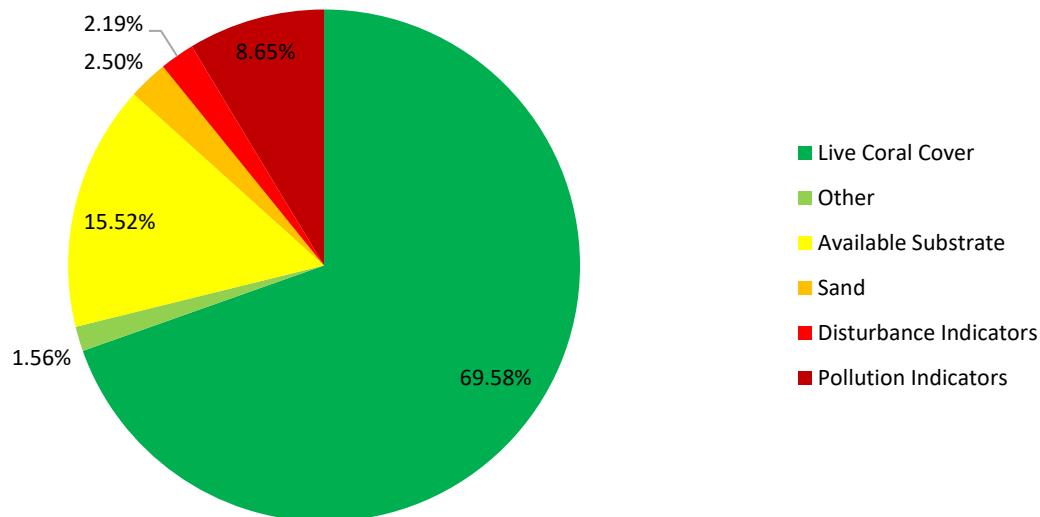
Mertang is an island in Mersing District, Johor and is approximately 11km off mainland. The island is near to Pulau Sembilang and Pulau Seri Buat. The island is not populated and is an important turtle nesting site. The waters surrounding the island group were gazetted as a Marine Park in 2023 under the Fisheries Act 1985.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Excellent' coral cover, 2 are in 'Good' condition and 1 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Mertang



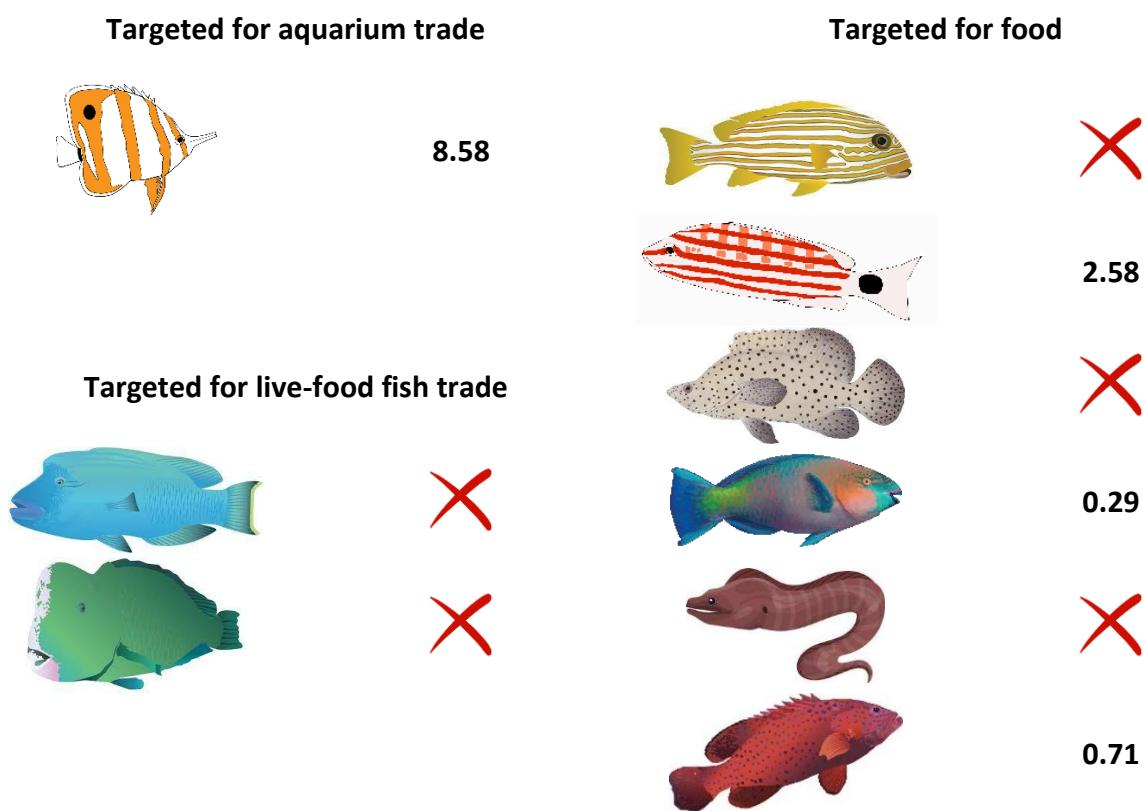
- Mertang reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 69.58%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Pollution indicators are quite high.
- Nutrient indicator algae level is especially high at Mertang Timur 2 (10.63%).
- The level of sponge is especially high at Mertang Barat (9.38%).

### CORAL IMPACTS

- Boat anchor damage, trash and drupella predation were recorded at some sites.
- Discarded fishing nets were recorded at many sites.
- All sites, with an average 5% of the reefs, were impacted by warm water bleaching.

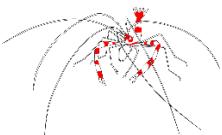


### Fish Abundance at Mertang (Individuals per 500m<sup>3</sup>)

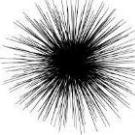


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Absent of indicator targeted for live-food fish trade.
- The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Mertang (Individuals per 100m<sup>2</sup>)

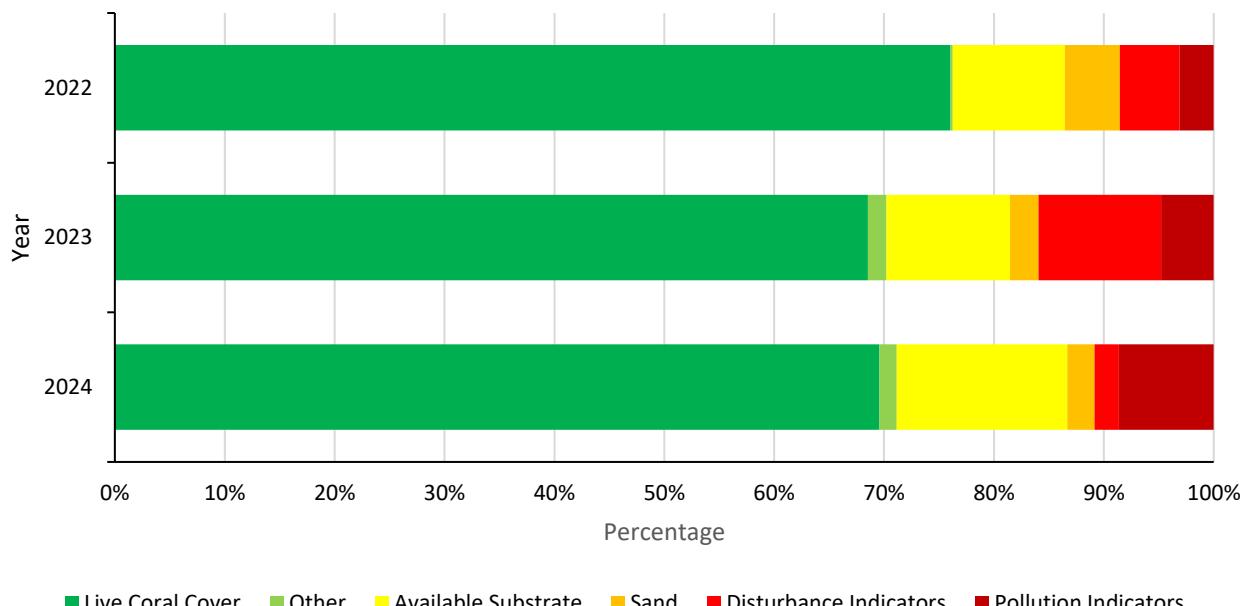
Collected for curio trade		Collected for food	
	<b>X</b>		<b>X</b>
	<b>X</b>		0.04
	<b>X</b>		<b>X</b>
			<b>X</b>

### Ecological Imbalance/Predator Outbreaks

	<b>148.29</b>
	0.04

- Indicators for curio trade are absent.
- Diadema urchin abundance is high.
- Crown-of-thorns is not an issue in Mertang.
- For invertebrates collected for food, only sea cucumber is recorded and the abundance is very low.

### Reef Health at Mertang

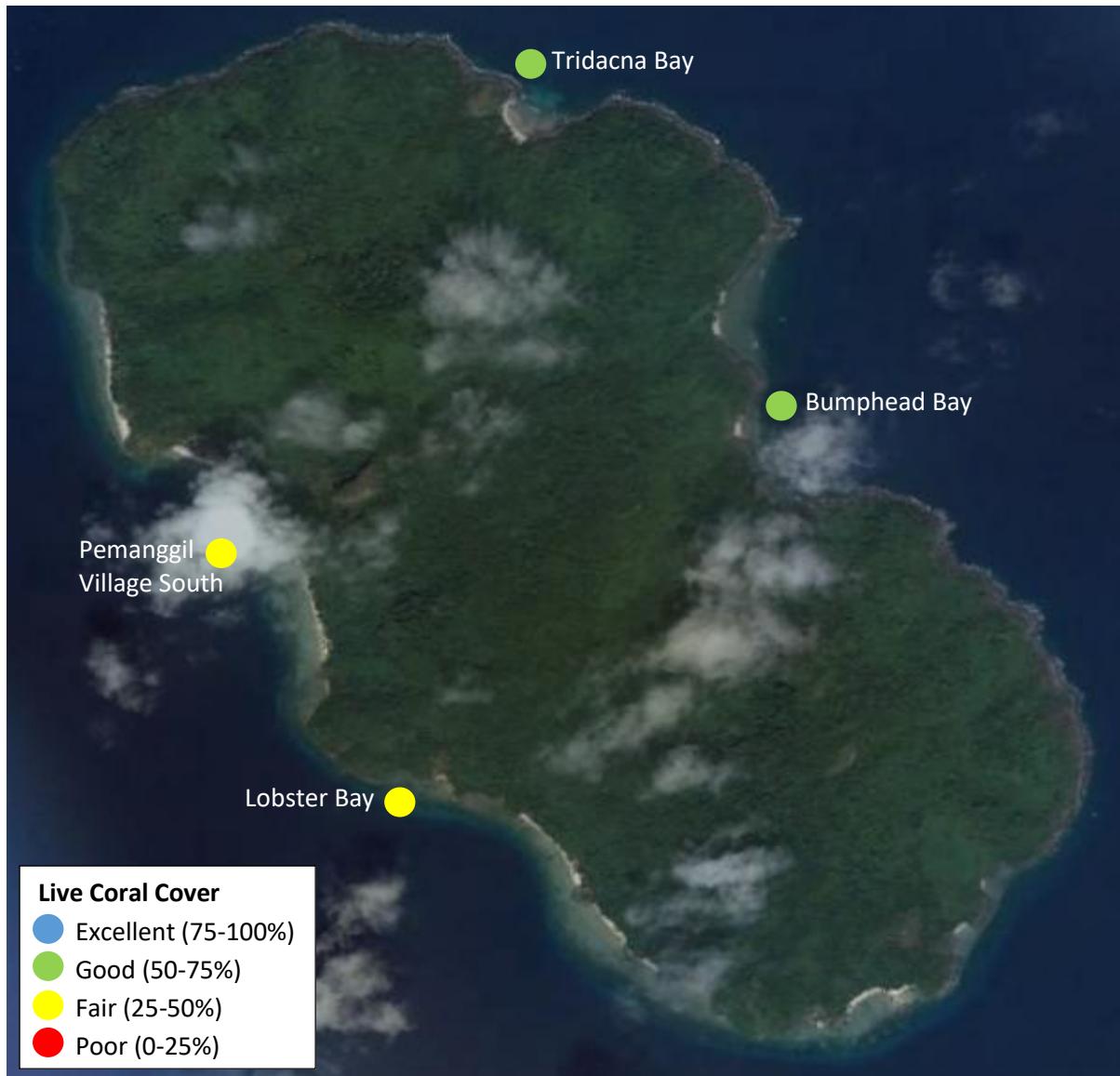


- Pulau Mertang reefs have maintained in 'good' condition.
- The decrease in live coral cover in 2023 is considered to reflect the addition of 3 new sites, rather than an actual decrease in live coral cover.
- While disturbance indicators had reduced, pollution indicators had increased.

## Johor – Pemanggil

Pemanggil Island is approximately 45km east of Mersing off the East coast of Peninsular Malaysia. The island and its surrounding waters were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).

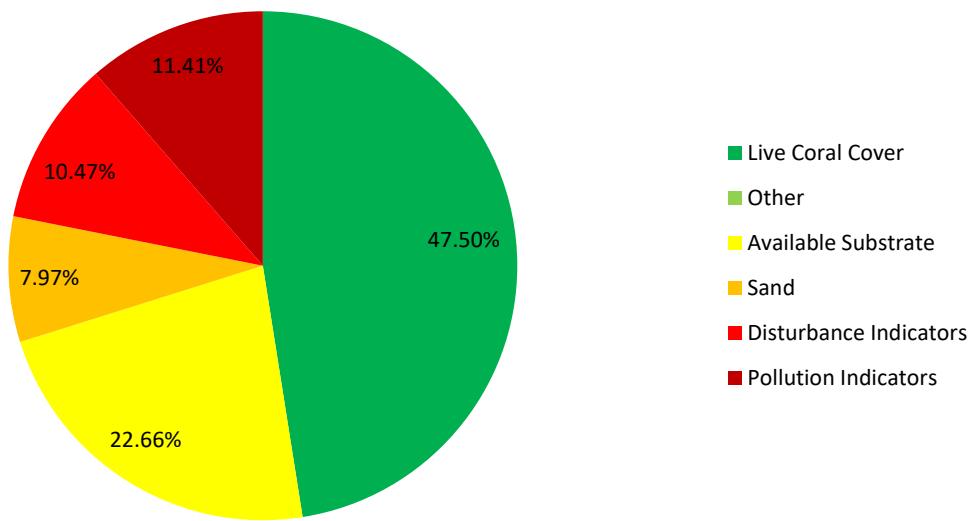
The island is sparsely populated and has for many years been a frequent stopover point for fishermen.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Good' coral cover and 2 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Pemanggil



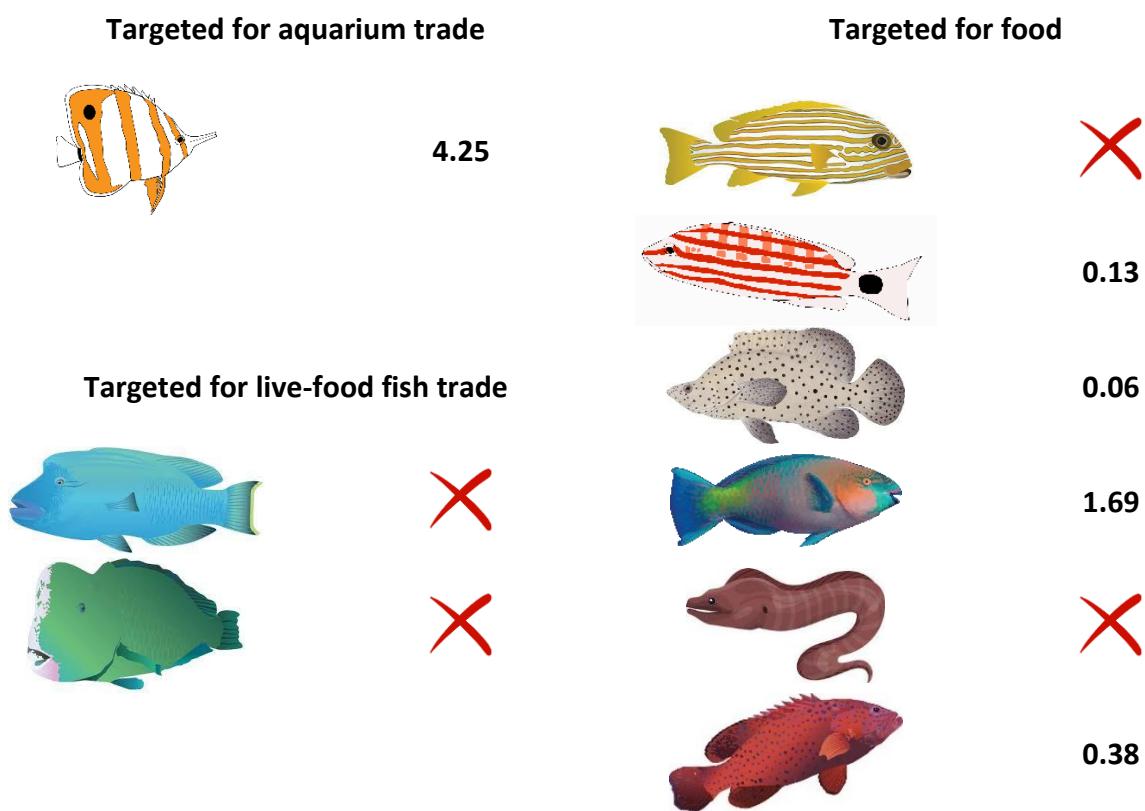
- Pemanggil reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 45%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is especially high at Bumphead Bay (14.38%).
- Disturbance indicators are high.
- Rubble level is especially high at Lobster Bay (10%) and Pemanggil Village South (23.13%).
- Pollution indicators are high.
- Nutrient indicator algae level is high at all sites, ranging from 11-15%, except for Lobster Bay which recorded 3.13%.

### CORAL IMPACTS

- Discarded fishing net and trash were recorded.
- All sites, with an average 36% of the reefs, were impacted by warm water bleaching.

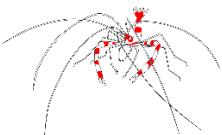


### Fish Abundance at Pemanggil (Individuals per 500m<sup>3</sup>)

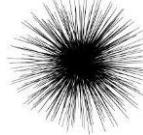


- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of indicator targeted for live-food fish trade.
- The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Pemanggil (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	X		X
	X		27.63
	X		X
			0.06

### Ecological Imbalance/Predator Outbreaks

	4.00
	0.56

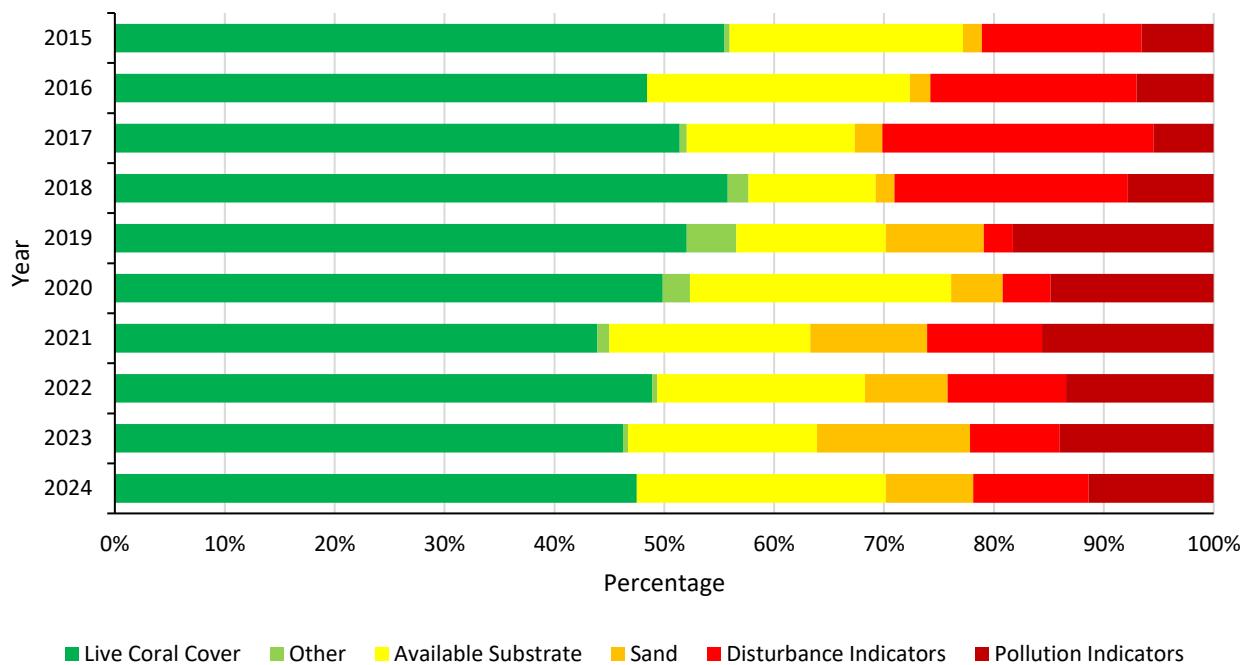
- Indicator for curio trade is absent.
- Crown-of-thorns is an issue in Pemanggil. A healthy coral reef can support a population of 0.2-0.3 individuals per 100m<sup>2</sup>, Pemanggil recorded 0.56.
- The abundance of sea cucumber, invertebrate collected for food, is very high.

### RARE ANIMALS

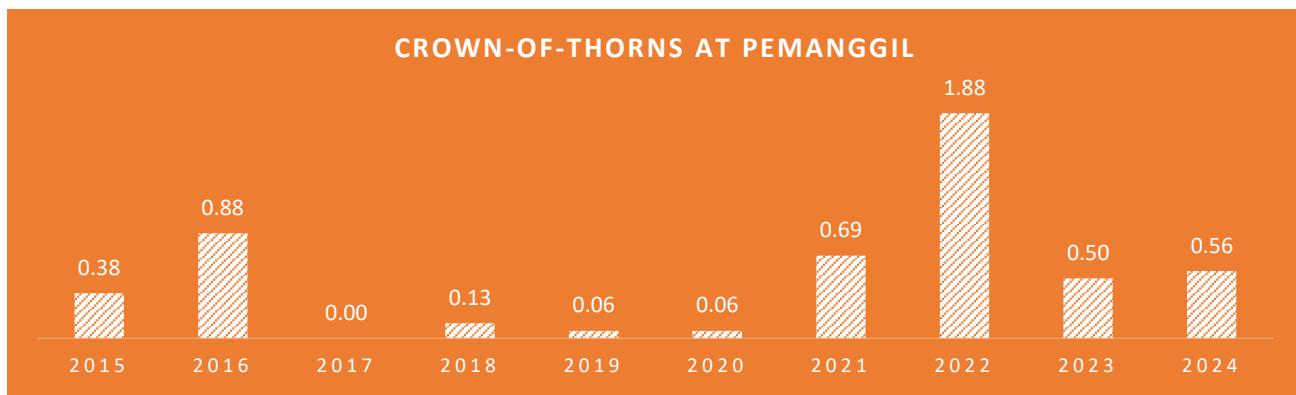
- Turtle was recorded.



### Reef Health at Pemanggil

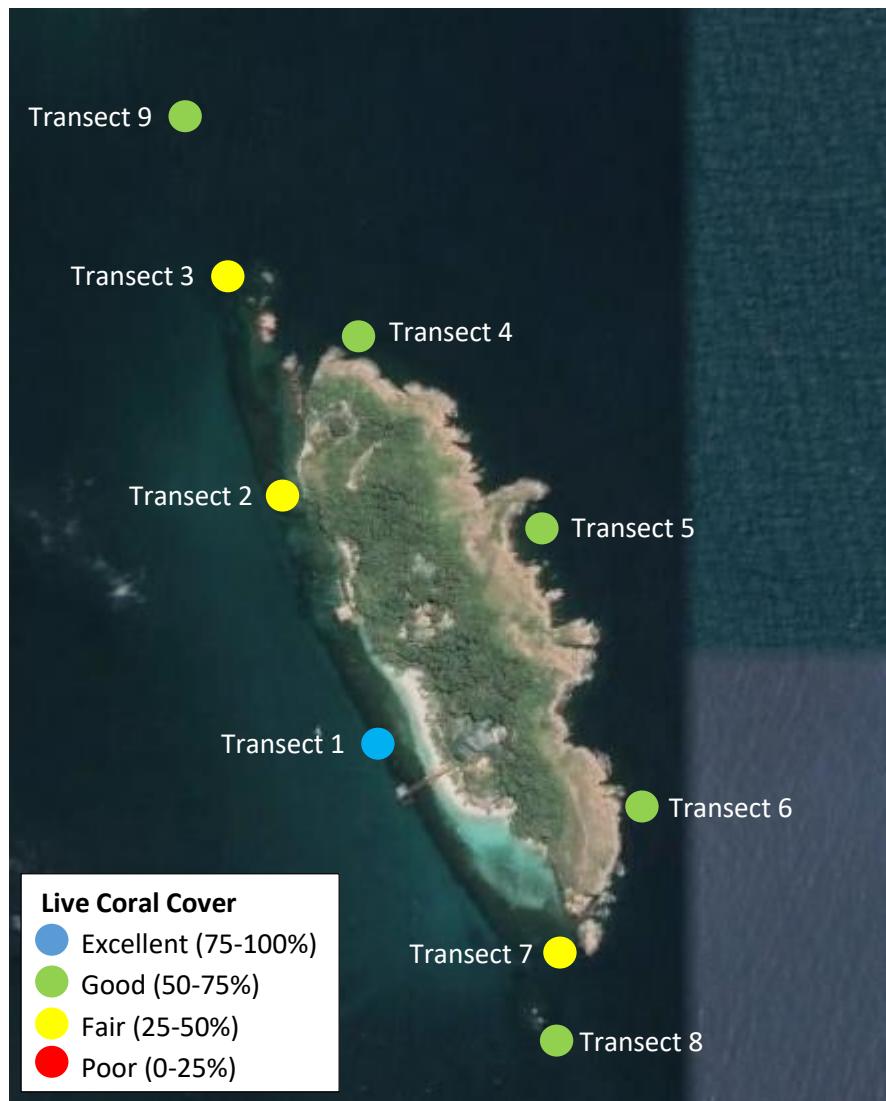


- Pemanggil reefs have deteriorated from 'good' to 'fair' condition.
- The deterioration in 2016 was likely due to the significant increase in crown-of-thorns abundance.
- The deterioration from 2019 to 2021 was probably due to raised level of nutrient in the waters around the island.
- Since 2022, the reefs showed improvement.
- Since 2021, the abundance of crown-of-thorns has increased significantly to above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>). This is a cause for concern and efforts need to be taken by reef managers to control the population.



## Johor – Rawa

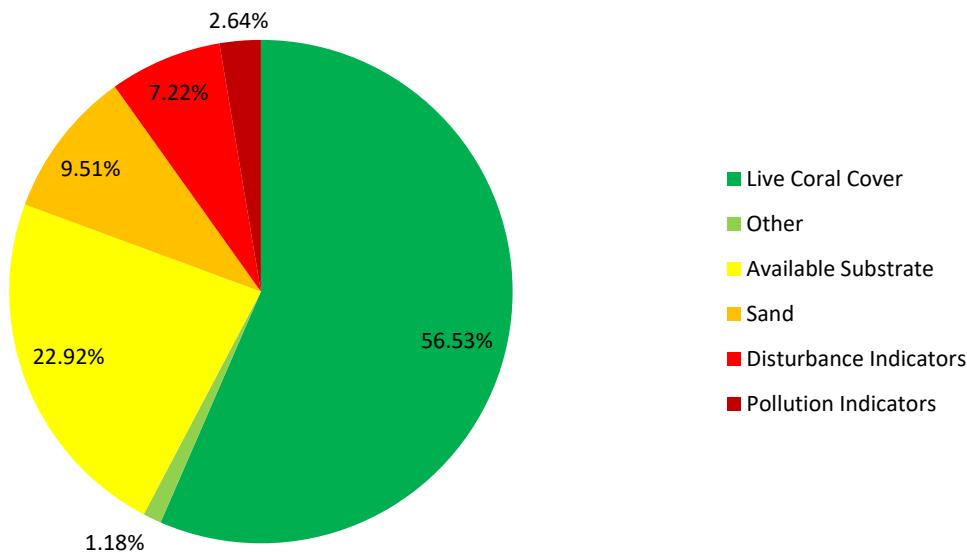
Pulau Rawa is under Mersing District, Johor and is accessible by speedboat from Mersing (20-30 minutes boat ride). Rawa is the local term for white doves, which are abundant on the island. Pulau Rawa is a small island and there are no proper roads, only a few walkways. There are two resorts on the island. One side of the island is a beach covered with white sand and the other side is a rocky vertical cliff. The island and its surrounding waters were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 5 are in 'Good' condition and 3 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Rawa



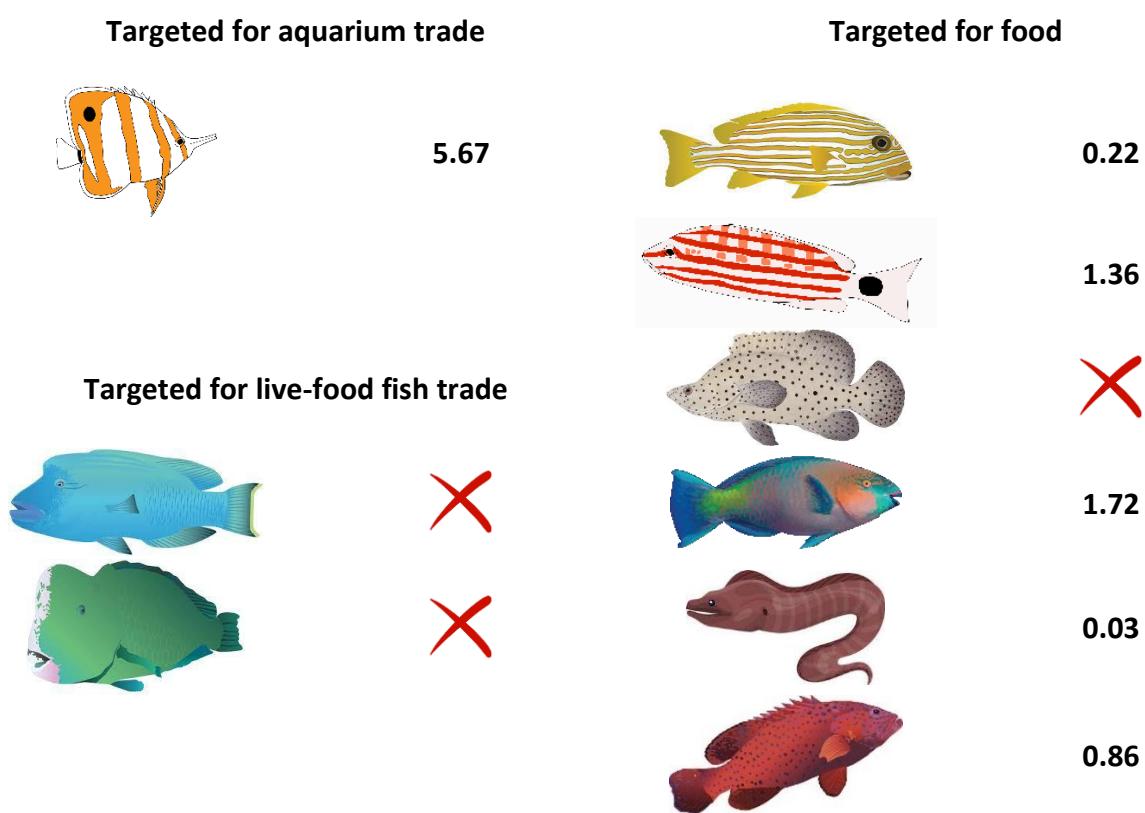
- Rawa reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 55.83%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. It is especially high at Transect 3 (28.13%) and Transect 7 (36.25%).
- Disturbance indicators are not high in Rawa in general, but the level of silt is especially high at Transect 9 (31.88%).

### CORAL IMPACTS

- Discarded fishing nets were recorded at many sites.
- Boat anchor damage was recorded at one site.
- Many sites, with an average 2% of the reefs, were impacted by warm water bleaching.

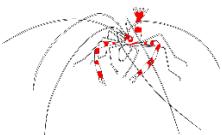


### Fish Abundance at Rawa (Individuals per 500m<sup>3</sup>)

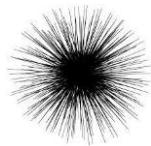


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is low.

### Invertebrate Abundance at Rawa (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	✗		✗
	✗		✗
	✗		✗
			0.03

### Ecological Imbalance/Predator Outbreaks

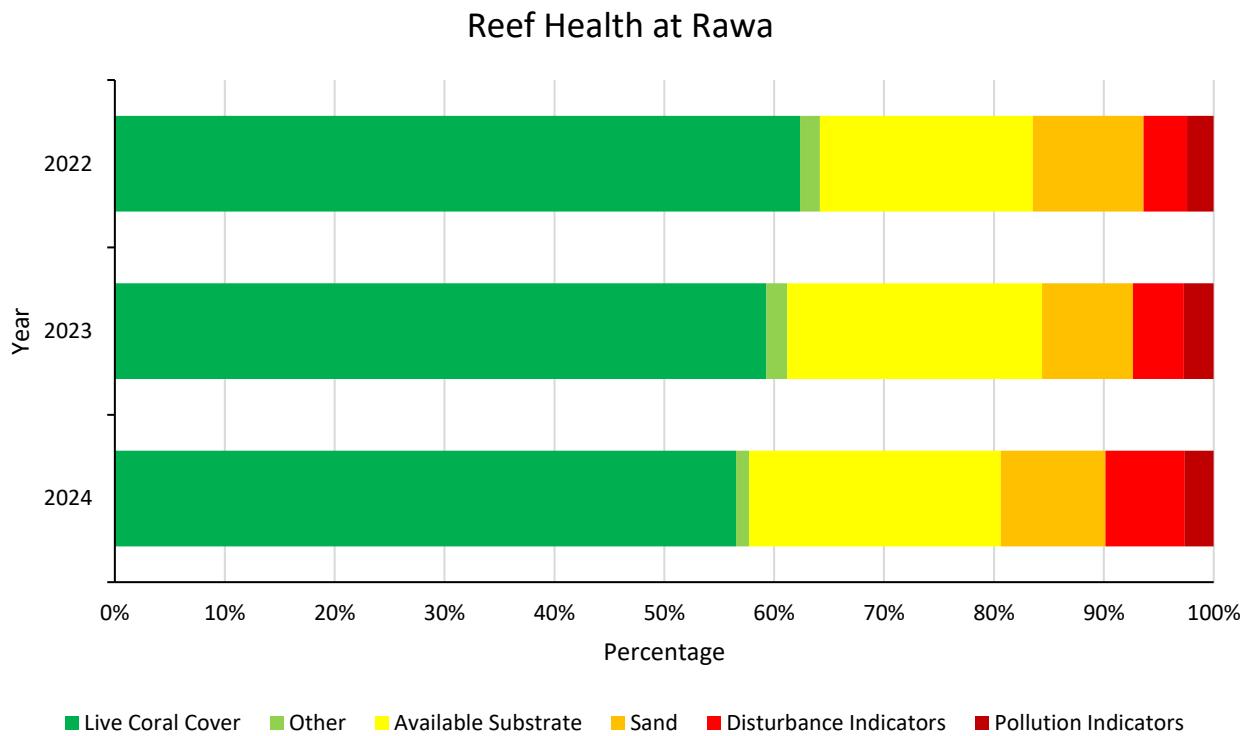


**71.19**



**0.03**

- Indicators for curio trade are absent.
- Crown-of-thorns is not a concern in Rawa.
- For invertebrates collected for food, only giant clam is recorded and the abundance is very low.

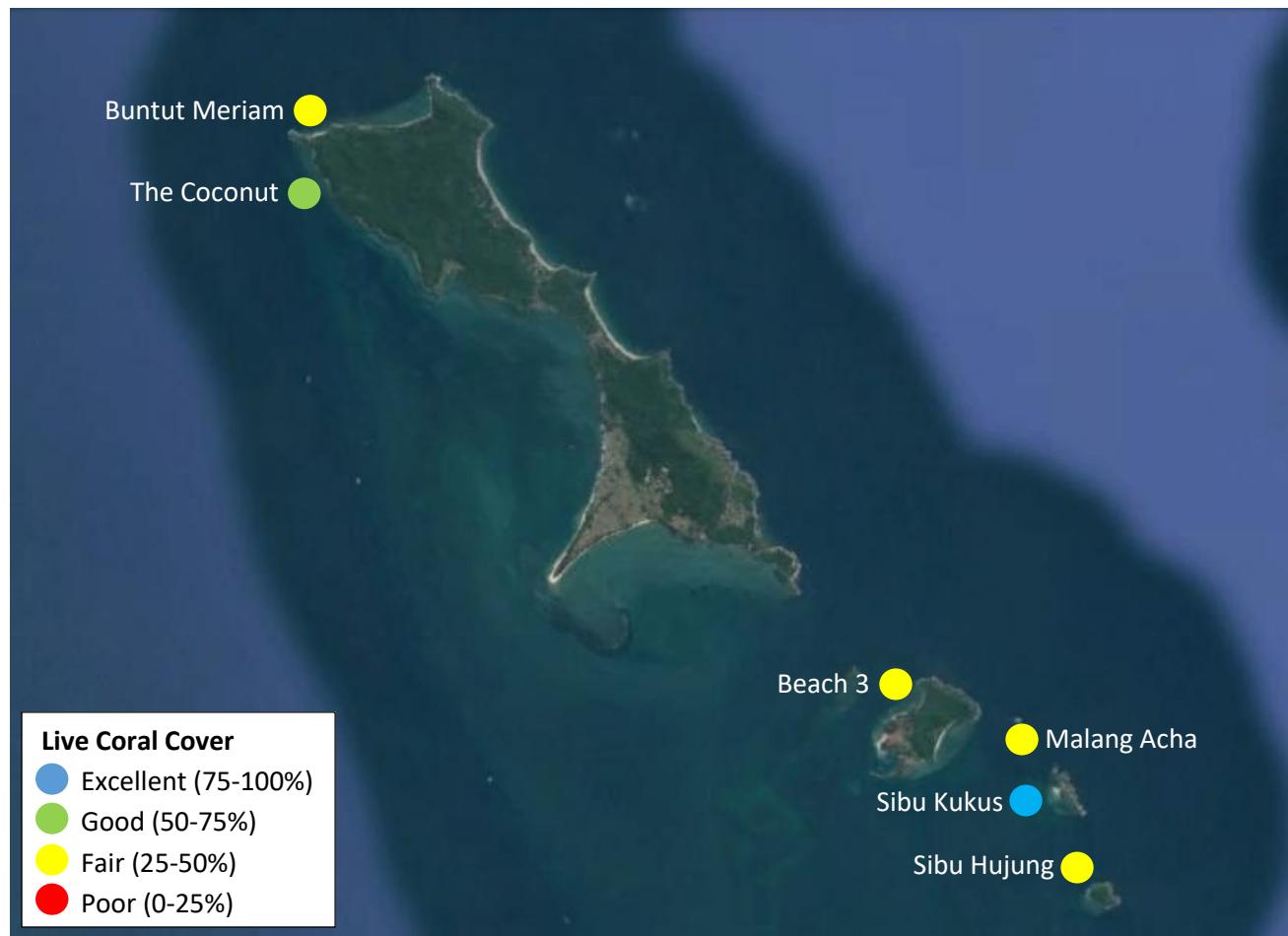


- Rawa reefs have deteriorated.
- The deterioration is likely due to physical damage caused by human activities and/or storm, as reflected by the increase in disturbance indicators.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach to is high, indicating possible chance of reef recovery if human impacts are dealt with.

## Johor – Sibu

The Sibu archipelago, known locally by the name of the largest island, Sibu, is located less than 10km off the East coast of mainland Peninsular Malaysia. The waters surrounding the island group were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).

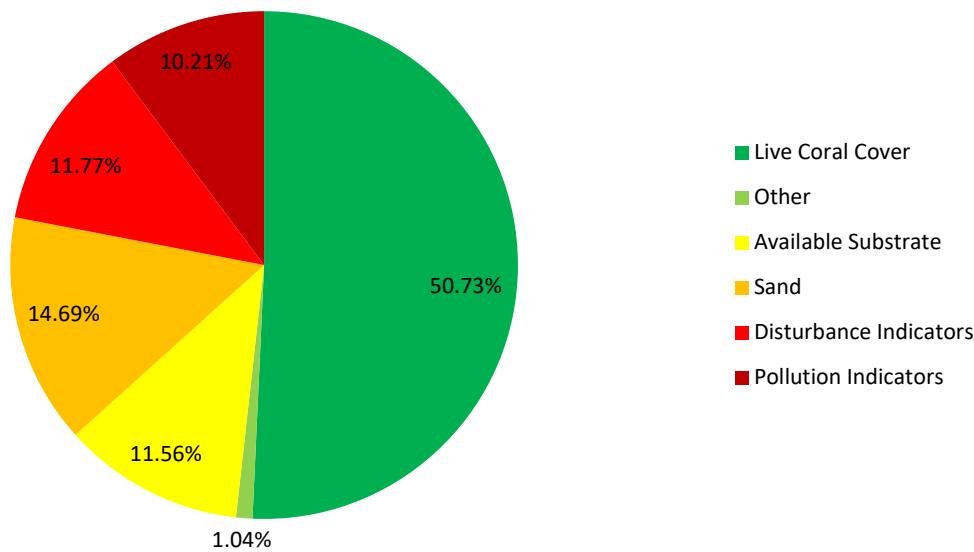
Sibu island is not as popular among tourists as other islands off the East coast, but the tourism industry here is growing. The island is sparsely populated with few villages and several small resorts.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 1 is in 'Good' condition and 4 show 'Fair' health.

## Coral Cover and Health

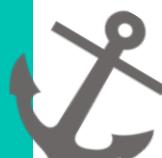
Substrate Composition at Sibu



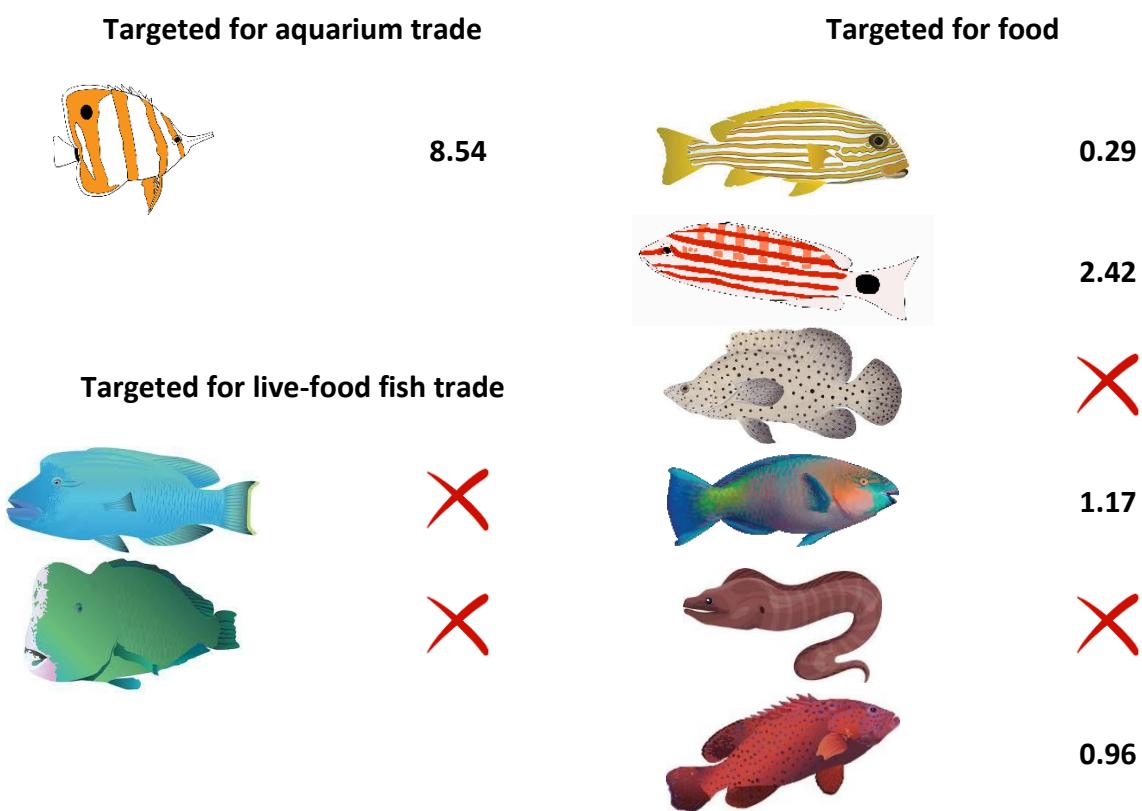
- Sibu reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 49.06%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is high.
- Sand level is high. It is especially high at Buntut Meriam (27.50%) and ranges from 10% to 20% at Beach 3, Malang Acha and The Coconut.
- Disturbance indicators are high.
- Rubble level is high at Sibu Hujung (10%).
- Silt level is very high at Beach 3 (23.13%) and high at The Coconut (10.63%).
- Pollution indicators are high.
- The level of sponge is especially high at Malang Acha and Sibu Hujung, both recorded 13.75%.

### CORAL IMPACTS

- Discarded fishing nets were recorded at many sites.
- Drupella predation was recorded at one site.
- All sites, with an average 5% of the reefs, were impacted by warm water bleaching.



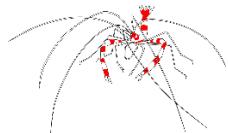
### Fish Abundance at Sibu (Individuals per 500m<sup>3</sup>)



- Butterflyfish, indicator for aquarium trade, abundance is high.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is low.

## Invertebrate Abundance at Sibu (Individuals per 100m<sup>2</sup>)

Collected for curio trade



✗



✗



✗

Collected for food



✗



✗

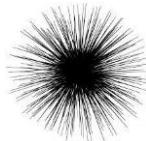


✗



✗

### Ecological Imbalance/Predator Outbreaks



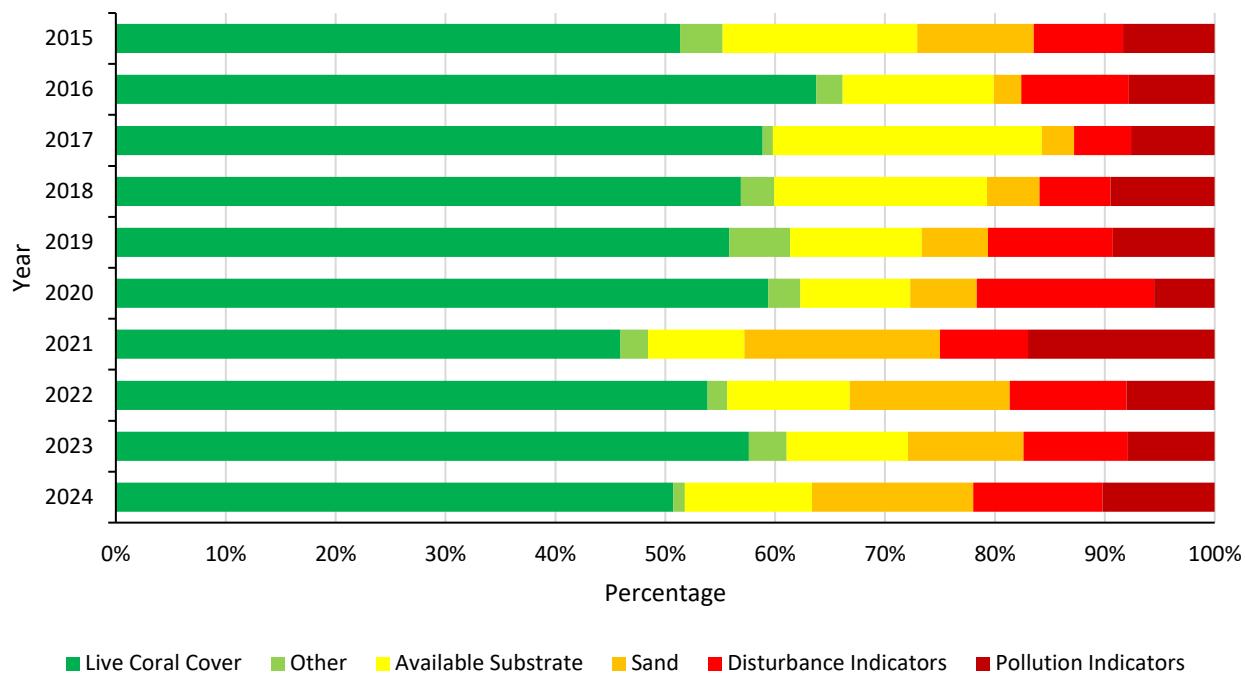
**91.04**



✗

- Only diadema urchin is recorded and the abundance is high.

### Reef Health at Sibu

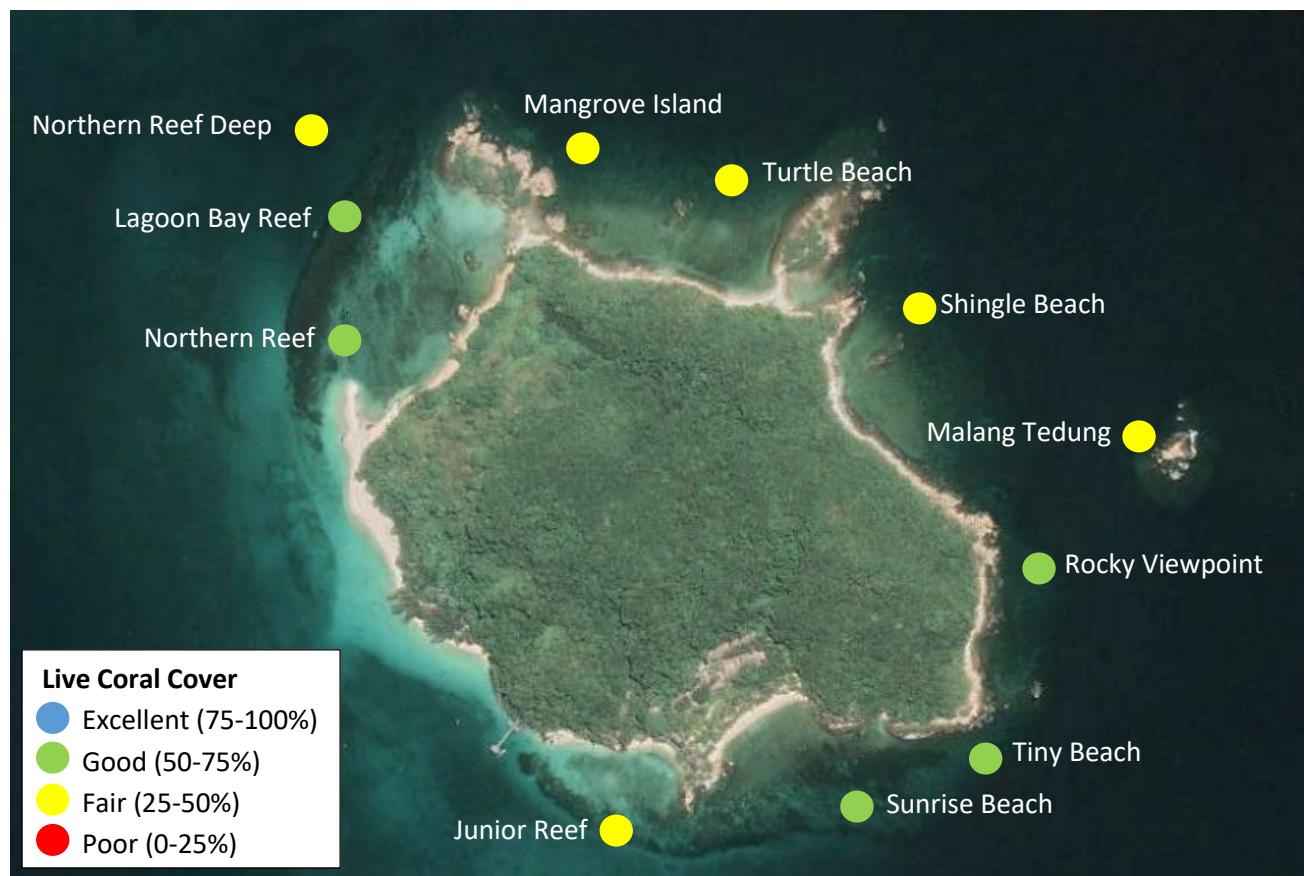


- Sibu reefs have maintained in ‘good’ condition over the years.
- In 2021, the reefs have deteriorated. The deterioration was probably due to raised level of nutrient in the waters around the island.
- In 2022 and 2023, the reefs showed improvement. Pollution indicators have reduced since 2022. The reduction in nutrient level in the waters allows the reefs to improve.
- In 2024, the reefs deteriorated again. The deterioration was due to a combination of physical damage caused by human activities and/or storm, raised level of nutrient in the waters around the island and the 4<sup>th</sup> Global Coral Bleaching Event.
- Available substrate for coral recruits to attach is high, possible chance of reef recovery if human impacts are dealt with.

## Johor – Tengah

Pulau Tengah, meaning ‘middle island’, is a privately owned island and is located approximately 15km off the coast of Mersing, Johor. From 1975 to 1981, the island was home to over 100,000 Vietnamese ‘boat people’ when it was a United Nation Refugee Counsel Transit Camp for refugees waiting to start their new lives in Europe, Australia and North America. In 1985, it was one of the few islands gazetted as Marine Park under the Fisheries Act 1985 due to its abundant marine life and rare species of fish and coral.

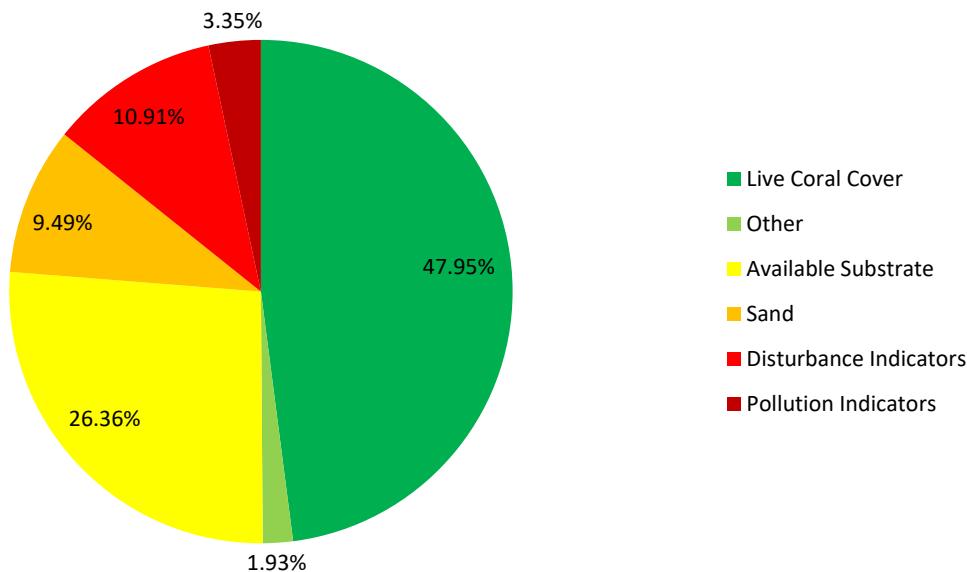
The uninhabited island is home to an upscale resort and is accessible by the resort’s private speedboat from the coastal town of Mersing. The speedboat ride takes about 20-30 minutes in good weather. Pulau Tengah’s natural environment is rich with sightings of over 100 species of bird, over 300 species of flora, Pacific bottle-nose dolphins, blacktip reef shark, green and hawksbill turtles, otters and dugong.



Map showing the health categories of each survey site based on Live Coral Cover: 5 sites have 'Good' coral cover and 6 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Tengah



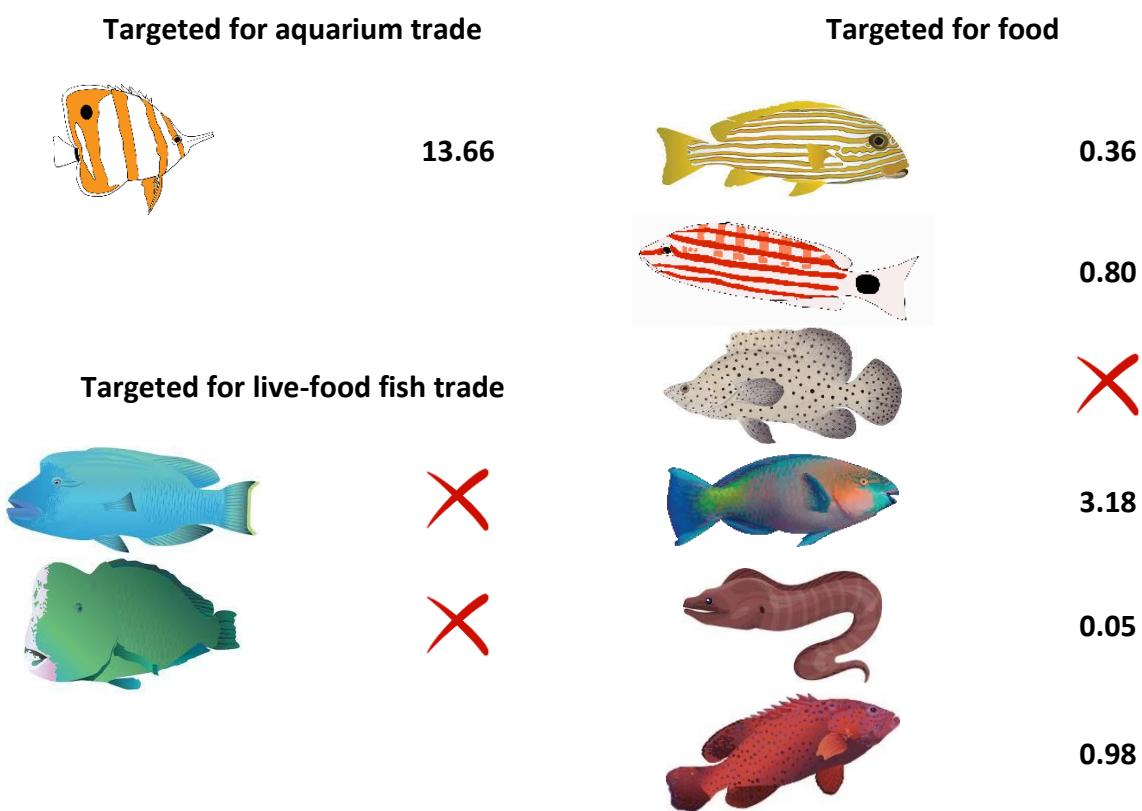
- Pulau Tengah reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 47.33%.
- In 'Fair' condition and below the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. The level is high at many sites, ranging from 13% to 19%.
- Disturbance indicators are high.
- Rubble level is high at many sites.
- Silt level is high at Junior Reef (12.50%) and Northern Reef Deep (15.63%).

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded at many sites.
- Boat anchor damage and black and white band diseases were recorded at some sites.
- All sites, with an average 13% of the reefs, were impacted by warm water bleaching.

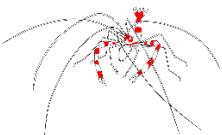


### Fish Abundance at Tengah (Individuals per 500m<sup>3</sup>)

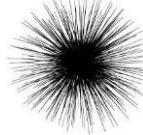


- Butterflyfish, indicator for aquarium trade, abundance is very high.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is very low, except for parrotfish.

### Invertebrate Abundance at Tengah (Individuals per 100m<sup>2</sup>)

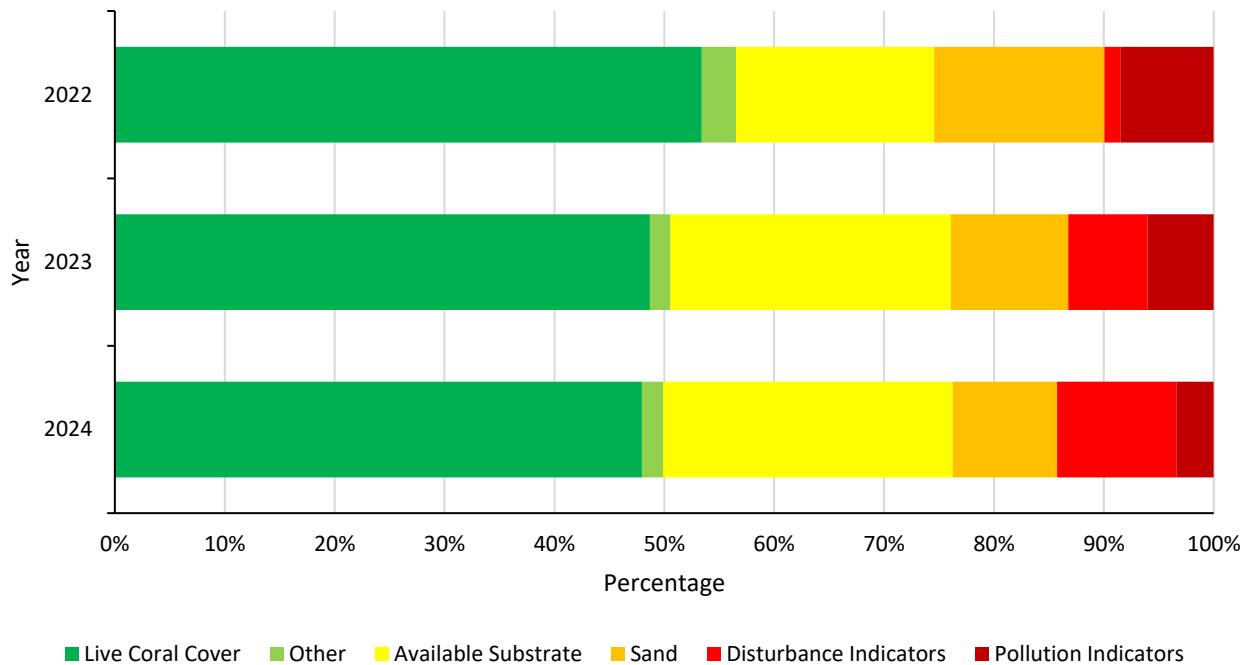
Collected for curio trade		Collected for food	
	✗		0.09
	✗		0.02
	0.02		✗
			0.14

### Ecological Imbalance/Predator Outbreaks

	145.02
	✗

- Triton, indicator for curio trade, is recorded.
- Diadema urchin abundance is high.
- For invertebrates collected for food, only lobster is absent. The abundance of invertebrates collected for food is very low.

### Reef Health at Tengah

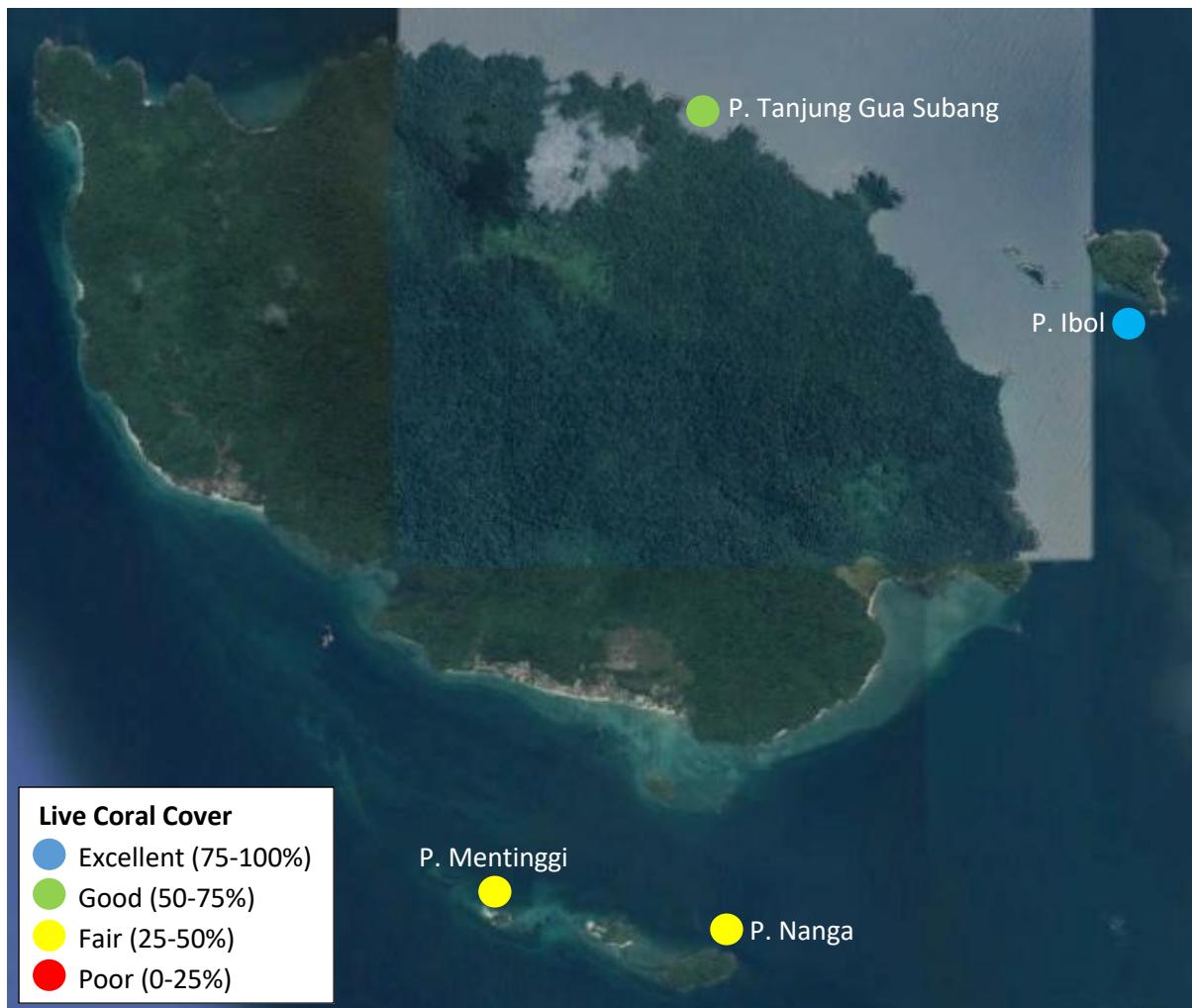


- Tengah reefs have deteriorated from ‘good’ to ‘fair’ condition.
- The deterioration is likely due to physical damage caused by human activities and/or storm, as reflected by the increase in disturbance indicators.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach to is high, indicating possible chance of reef recovery if human impacts are dealt with.

## Johor – Tinggi

Tinggi Island is located less than 15km off the East coast of mainland Peninsular Malaysia. The island and its surrounding waters were gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1993).

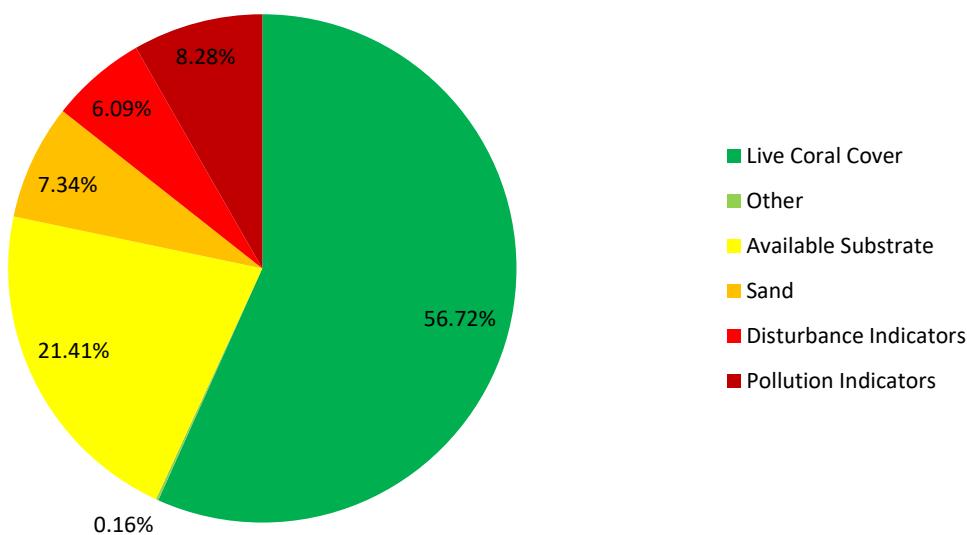
The island is not as popular among tourists as other islands off the East coast, but the tourism industry here is growing. There are two dive operators on Tinggi Island.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Excellent' coral cover, 1 is in 'Good' condition and 2 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Tinggi



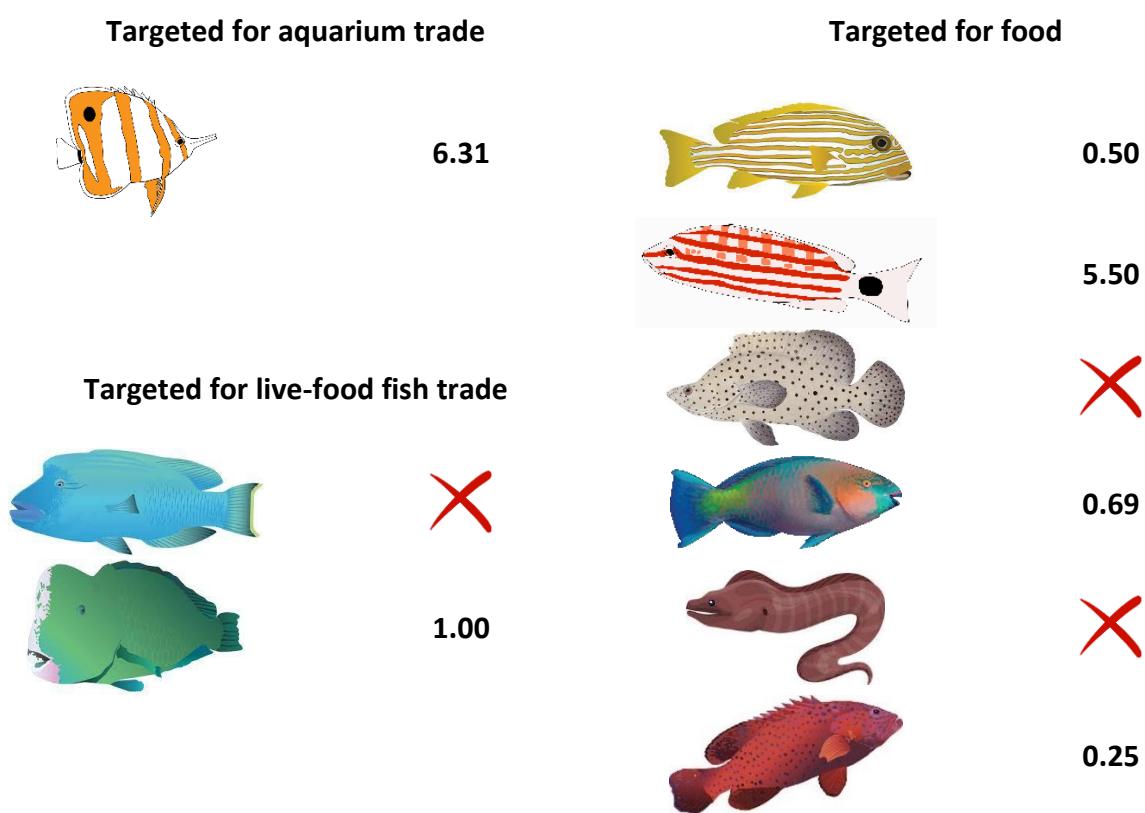
- Tinggi reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 45.94%.
- In 'Good' condition and above the Sunda Shelf region average (50.21%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high at Pulau Nanga (15.63%) and Pulau Tanjung Gua Subang (11.88%).
- Disturbance indicators are not high in Tinggi in general, but the level of rubble is especially high at Pulau Nanga (9.38%).
- Same goes to pollution indicators, the level is not high in general, but the level of nutrient indicator algae level is especially high at Pulau Mentinggi and Pulau Tanjung Gua Subang (both recorded 7.50%) and sponge level is high at Pulau Mentinggi (8.13%).

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded.
- All sites, with an average 4% of the reefs, were impacted by warm water bleaching.



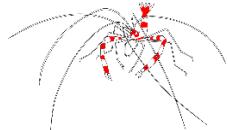
## Fish Abundance at Tinggi (Individuals per 500m<sup>3</sup>)



- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, fish targeted for live-food fish trade, is recorded.
- The abundance of fish targeted for food is very low, except for snapper.

## Invertebrate Abundance at Tinggi (Individuals per 100m<sup>2</sup>)

Collected for curio trade



✗



✗



✗

Collected for food



✗



✗

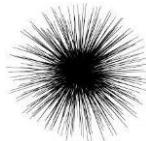


✗



✗

### Ecological Imbalance/Predator Outbreaks



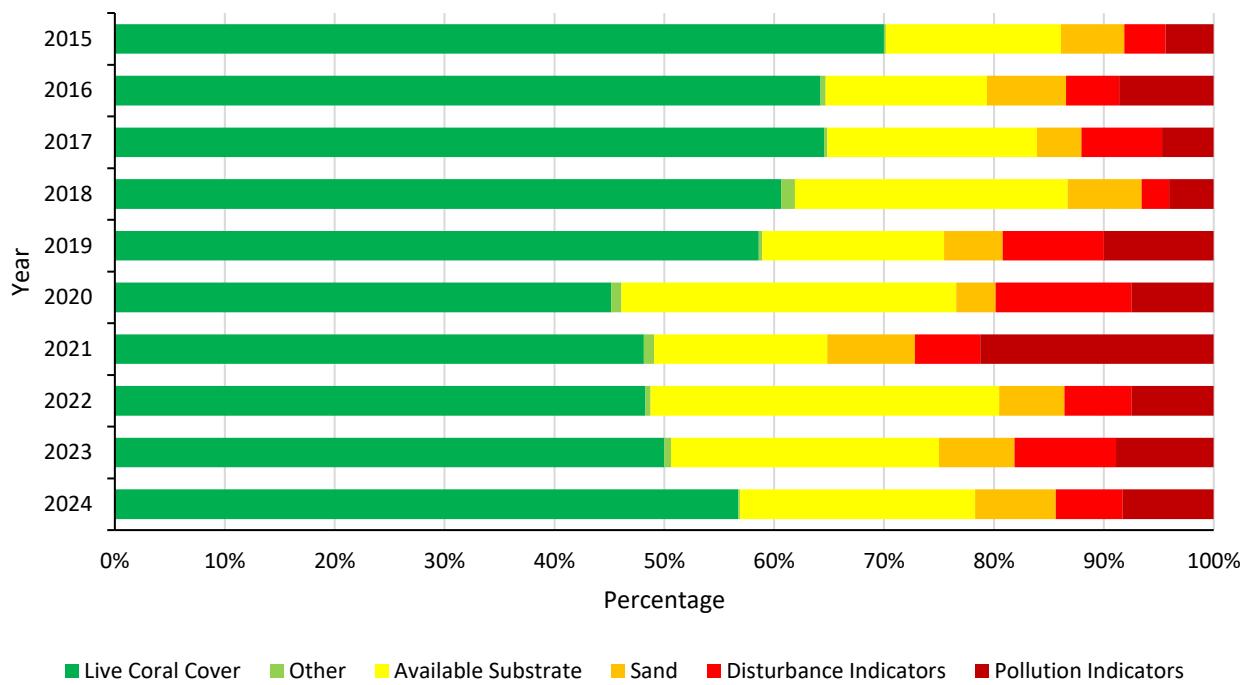
166.69



✗

- Only diadema urchin is recorded and the abundance is high.

### Reef Health at Tinggi

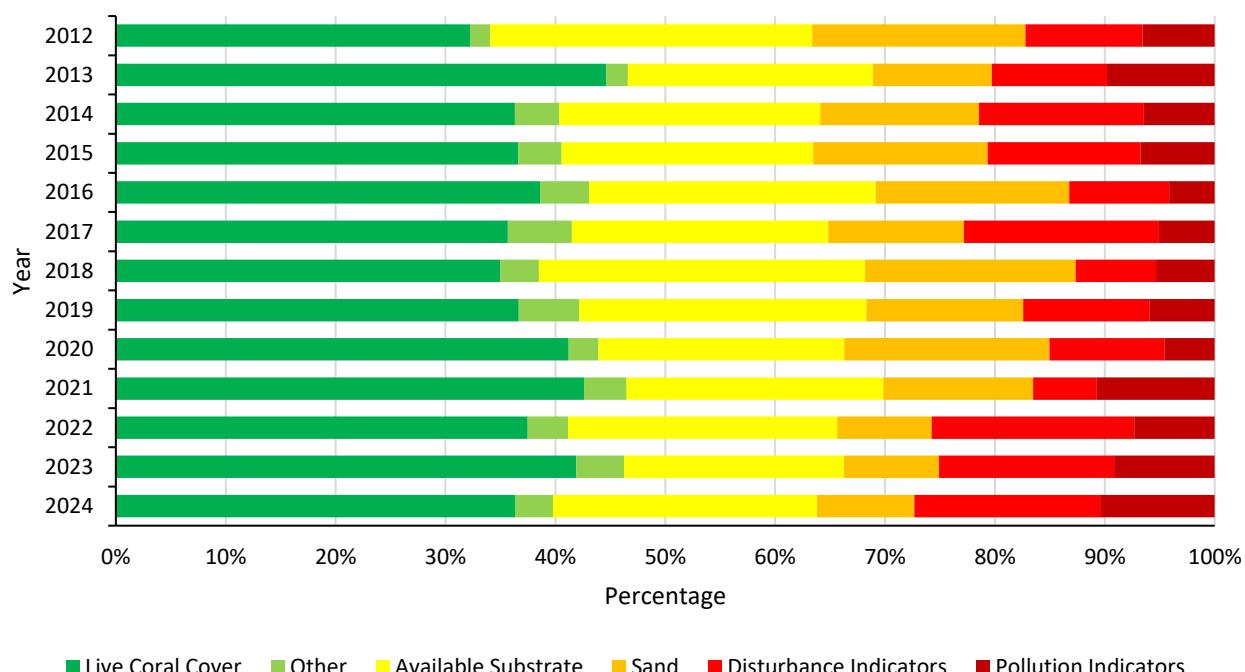


- From 2015 to 2020, Tinggi reefs had deteriorated.
- The deterioration was likely due to physical damage caused by human activities and/or storm and raised level of nutrient in the waters around the island.
- From 2021 onwards, the reefs showed improvement.
- Available substrate for coral recruits to attach is high, possible chance of further reef recovery if human impacts are dealt with.

## Malacca Strait

### Coral Cover and Health

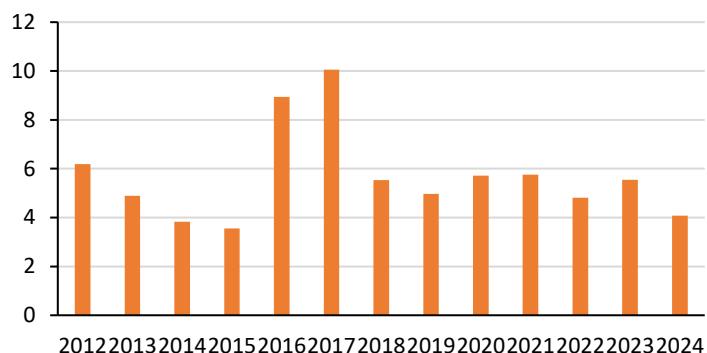
Reef Health in Malacca Strait



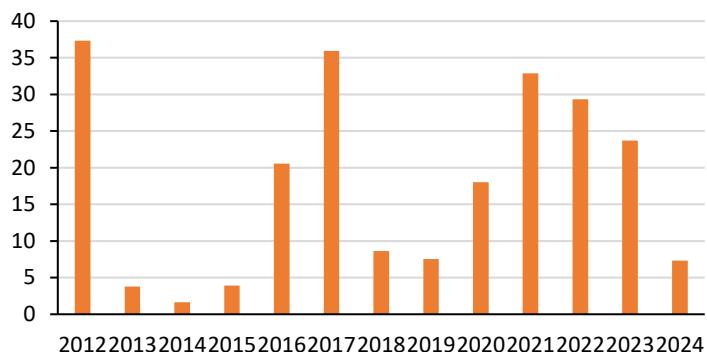
- The reefs in Malacca Strait have maintained more or less the same.
- From 2019 to 2021, the reefs showed improvement. The improvement was likely due to reduced physical damage caused by human activities and/or storm.
- Since 2022, the reefs had deteriorated. The deterioration is probably due to a combination of several factors – increased disturbance and pollution indicators, elimination of some survey sites and addition of new survey sites.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.

## Fish

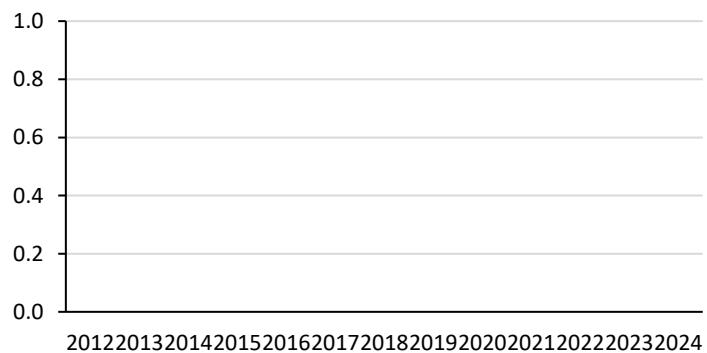
Fish Targeted for Aquarium Trade



Fish Targeted for Food



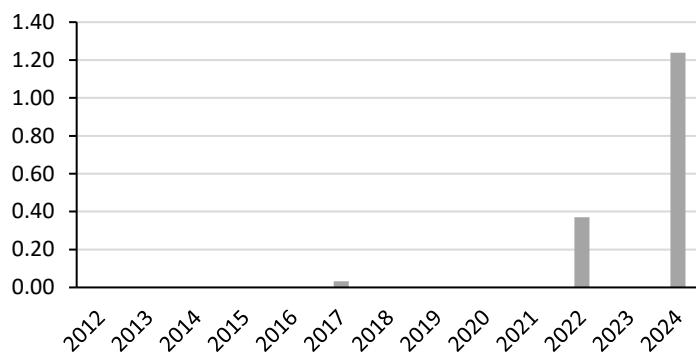
Fish Targeted for Live-food Fish Trade



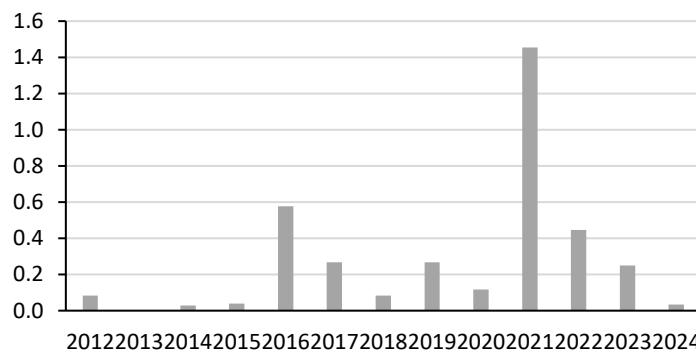
- Fish targeted for live-food fish trade is never observed and recorded.
- The abundance of fish targeted for aquarium trade is more or less the same over the years.
- Fish targeted for food is mainly comprised of snappers and is showing a declining trend in the last four years.

## Invertebrate

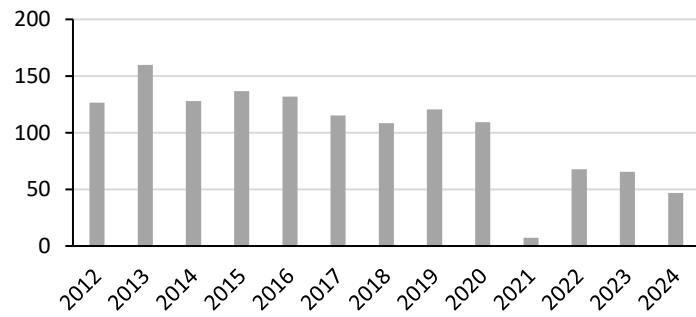
Invertebrates Targeted for Curio Trade



Invertebrates Targeted for Food



Ecological imbalance/predator outbreak  
Indicators



- Invertebrates targeted for curio trade are only observed and recorded thrice, in 2017, 2022 and 2024.
- Very low abundance of invertebrates targeted for food. The spike in 2021 was considered to reflect the addition of Malacca and Port Dickson that year, rather than an actual increase in the abundance of invertebrates targeted for food. Invertebrates targeted for food is showing a declining trend in the last four years.
- Ecological imbalance/predator outbreak indicators are attributed solely to diadema urchin and the abundance is declining. The reduction in 2021 was considered to reflect the elimination of Pulau Sembilan and Pangkor Laut that year, rather than an actual decrease in the abundance of ecological imbalance/predator outbreak indicators.

## Kedah – Payar

Payar is one of many islands off the West coast of mainland Kedah. It is situated 35km south of Langkawi, 59km north of Penang and 28km west of Kuala Kedah. It was gazetted as a Marine Park in 1994 under the Fisheries Act 1985 (Amended 1991).

The island is a popular destination for tourists (mainly from Langkawi) famous for its corals and reef fishes. Measuring 2km long and 0.25km wide, its sheltered waters are ideal for snorkelling, diving and swimming.

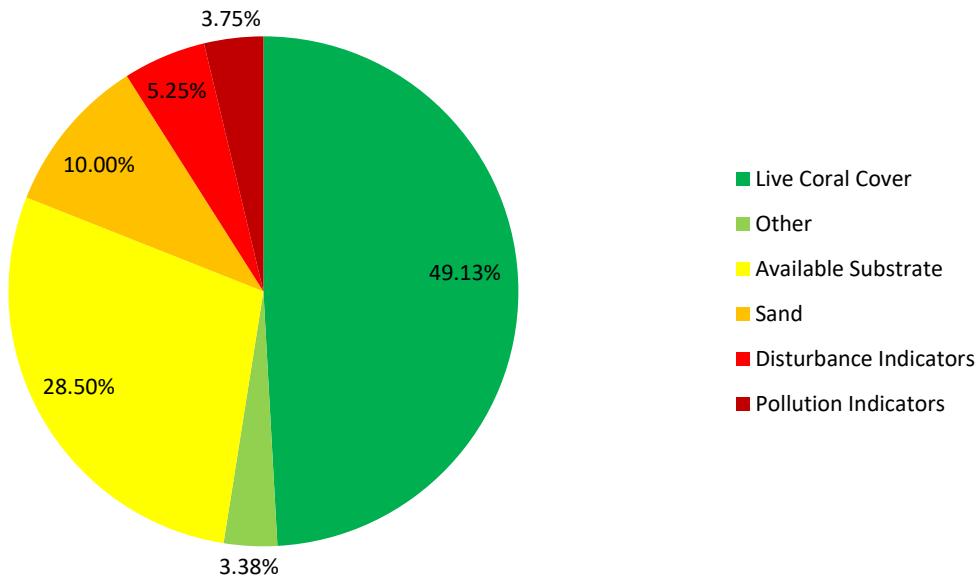
The island is uninhabited and the only operating structures on the island are the Marine Park centre with facilities for day trip visitors such as gazebos, picnic tables and restroom facilities at selected areas. There is also an old, abandoned resort. A floating platform moored just off Payar serves as a restaurant and dive platform for tourists.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Good' coral cover and 3 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Payar



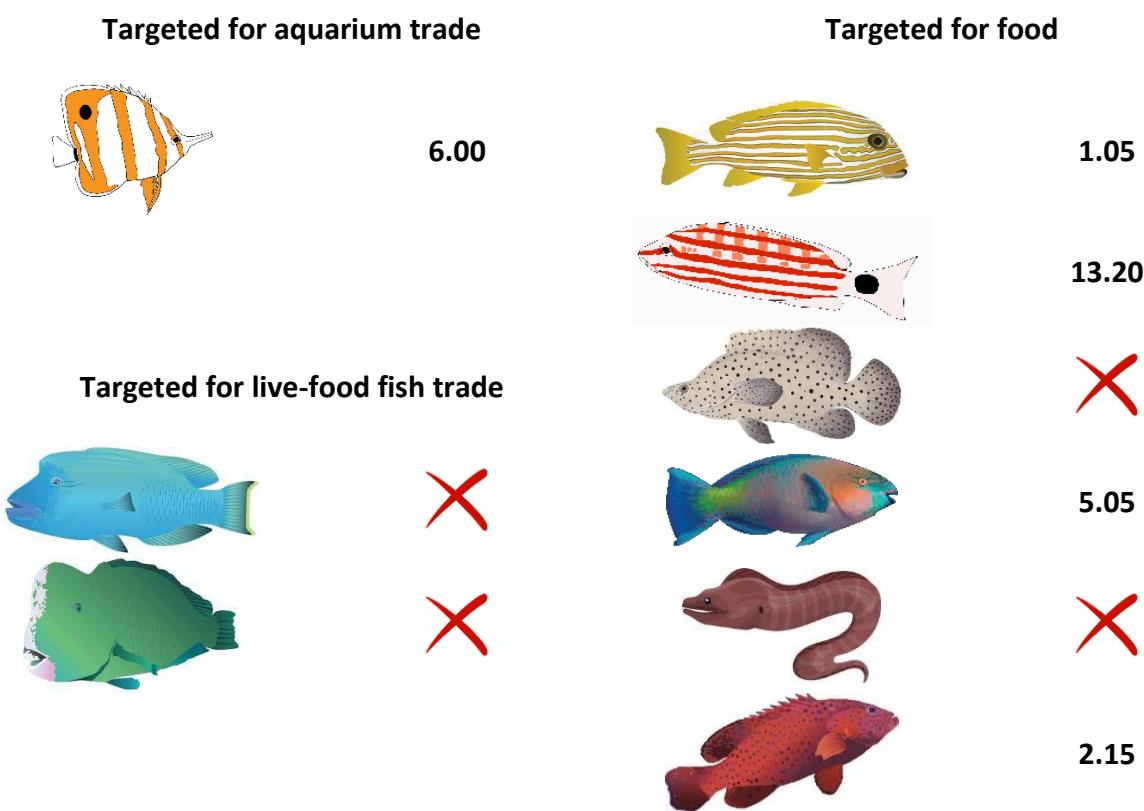
- Payar reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 49.13%.
- In 'Fair' condition and above the Malacca Strait region average (36.36%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high. It is especially high at Langkawi Coral (23.13%) and Singapore Bay (17.50%).
- Disturbance and pollution indicators are not high in Payar in general, but the level of rubble is high at Singapore Bay (10.63%) and the level of nutrient indicator algae is high Lembu (8.13%).

### CORAL IMPACTS

- All sites, with an average 70% of the reefs, were impacted by warm water bleaching.

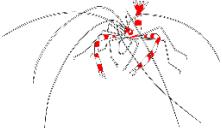


### Fish Abundance at Payar (Individuals per 500m<sup>3</sup>)

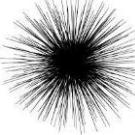


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- Good abundance of fish targeted for food.

### Invertebrate Abundance at Payar (Individuals per 100m<sup>2</sup>)

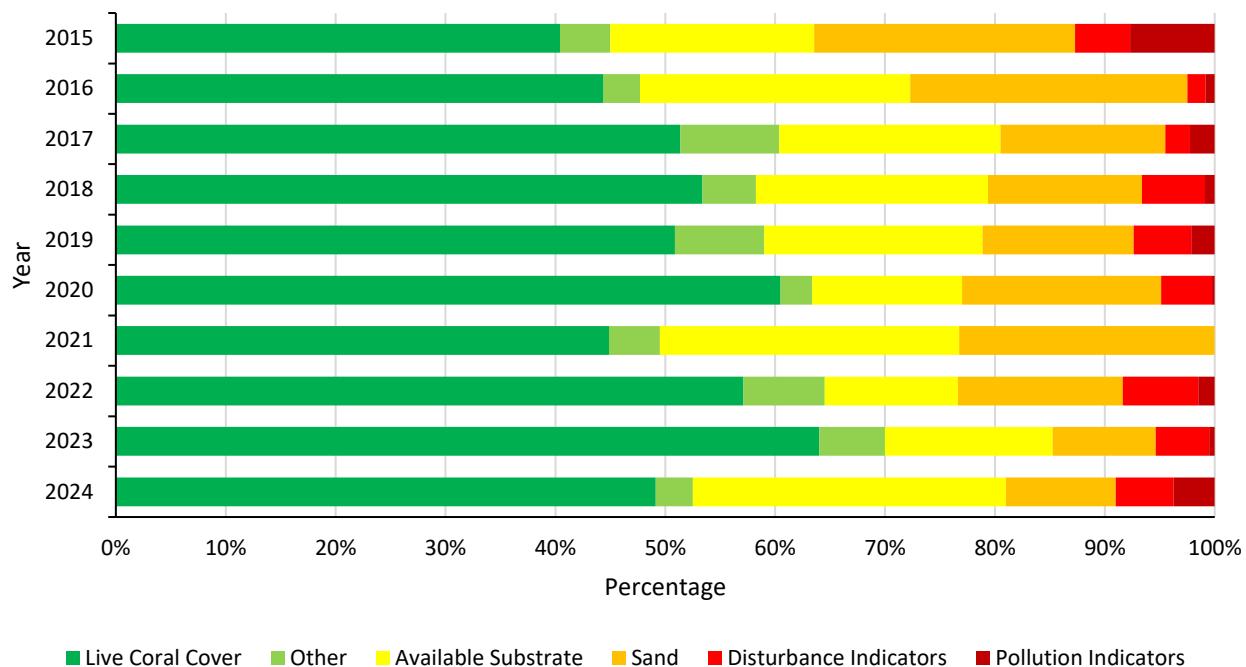
Collected for curio trade		Collected for food	
	✗		✗
	✗		✗
	✗		✗
			0.05

### Ecological Imbalance/Predator Outbreaks

	10.80
	✗

- Only diadema urchin and giant clam are recorded.
- The abundance of giant clam, invertebrate collected for food, is very low.

### Reef Health at Payar



- The health of Payar reefs shows variation over the years.
- The cause of the drastic deterioration in 2021 was not known.
- The deterioration in 2024 was due to a combination of physical damage caused by human activities and/or storm, raised level of nutrient in the waters around the island and the 4<sup>th</sup> Global Coral Bleaching Event.

## Perak – Pangkor Laut

Pangkor Laut Island is a small island, privately owned and located 3 miles off the coast of Perak, along the Straits of Malacca. Of the island's 300 acres, a fraction has been developed to house a premier resort.

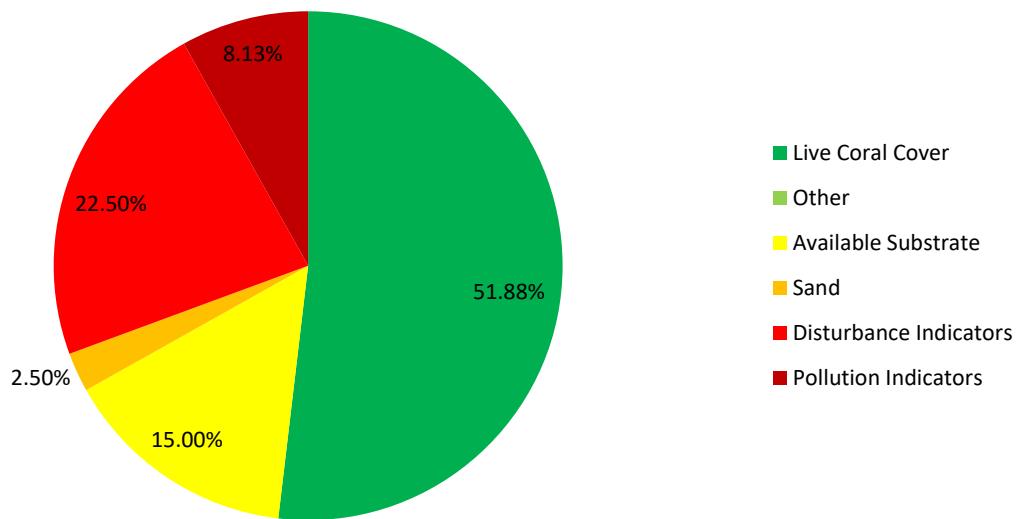
Only one site has been surveyed at Pulau Pangkor Laut, a very limited sample.



Map showing the health categories of each survey site based on their live coral cover: the site has 'Good' coral cover.

## Coral Cover and Health

### Substrate Composition at Pangkor Laut



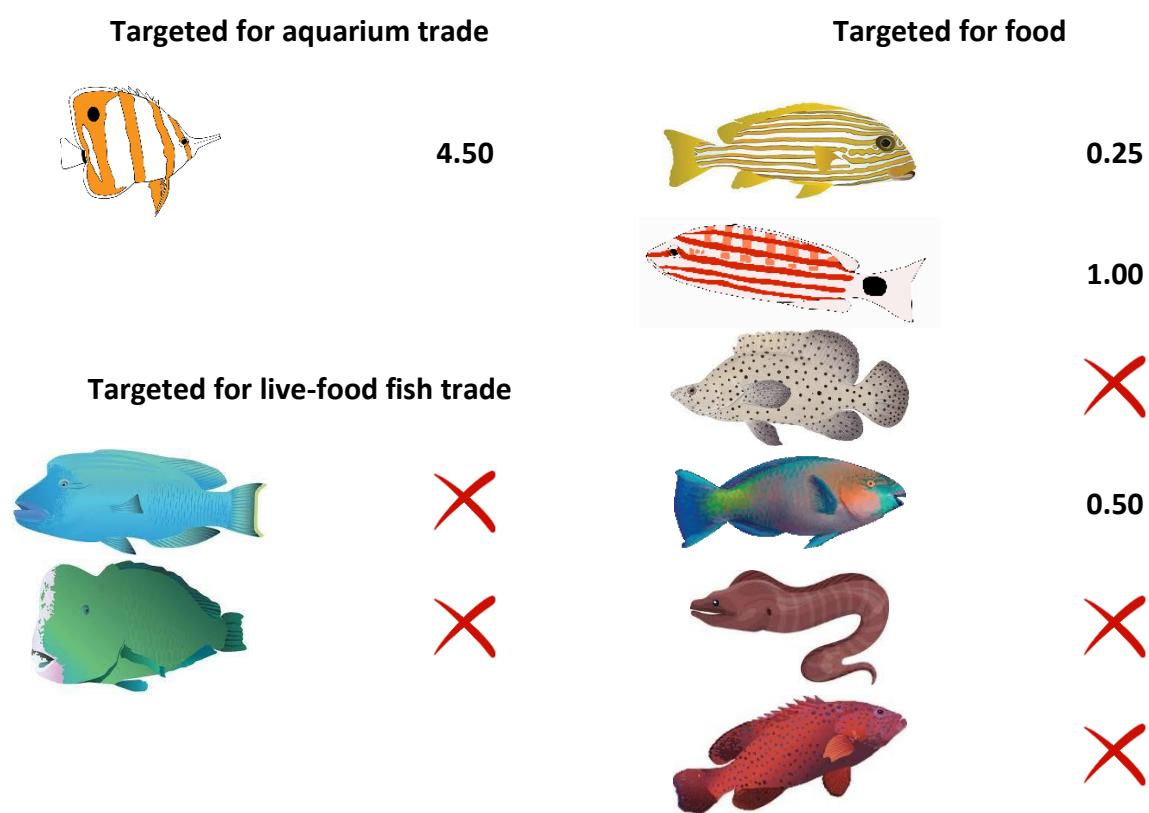
- Pangkor Laut is dominated by live coral cover, which is mainly hard coral.
- Mean hard coral, reef builder, cover is 51.25%.
- In 'Good' condition and above the Malacca Strait region average (36.36%).
- Available substrate for coral recruits to attach is high.
- Disturbance indicators are extremely high, mainly attributed by rubble.
- Pollution indicators are slightly high, attributed by sponge.

#### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded.

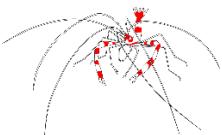


### Fish Abundance at Pangkor Laut (Individuals per 500m<sup>3</sup>)

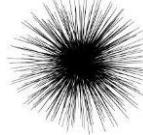


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Pangkor Laut (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food
	5.25	 X
	X	 X
	X	 X
		 X

### Ecological Imbalance/Predator Outbreaks

	88.25
	X

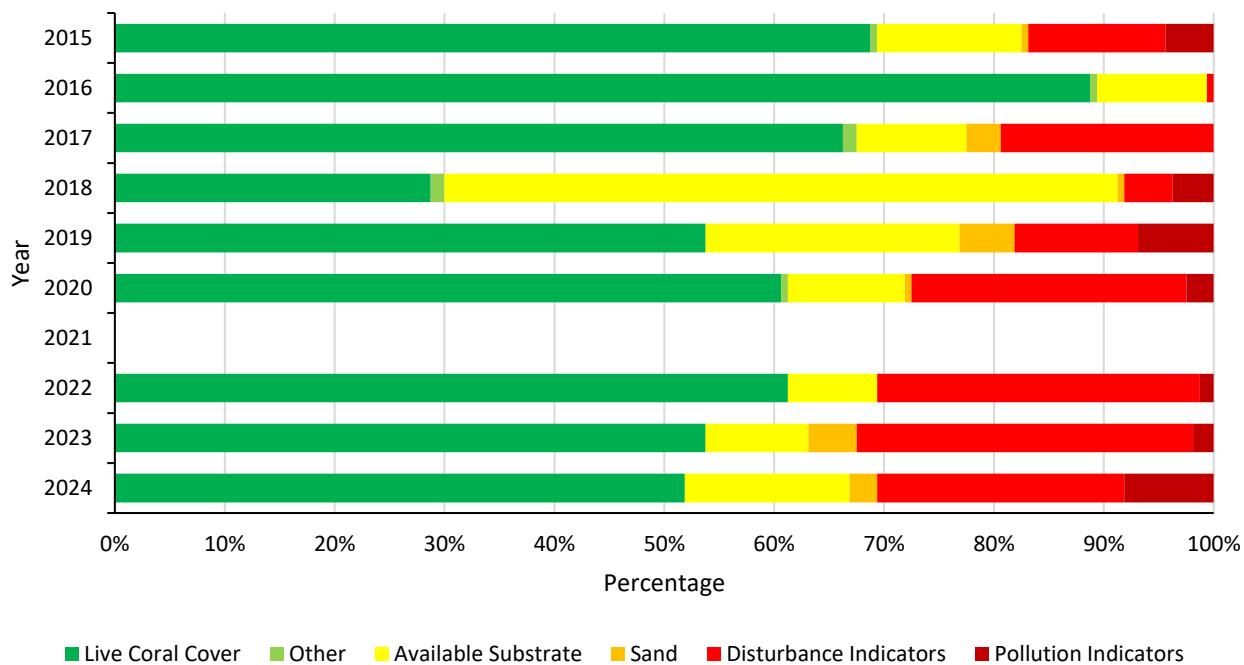
- Banded coral shrimp, indicator for curio trade, abundance is high.
- Indicators collected for food are absent.
- Diadema urchin abundance is high.

### RARE ANIMALS

- Seahorses were recorded.



### Reef Health at Pangkor Laut

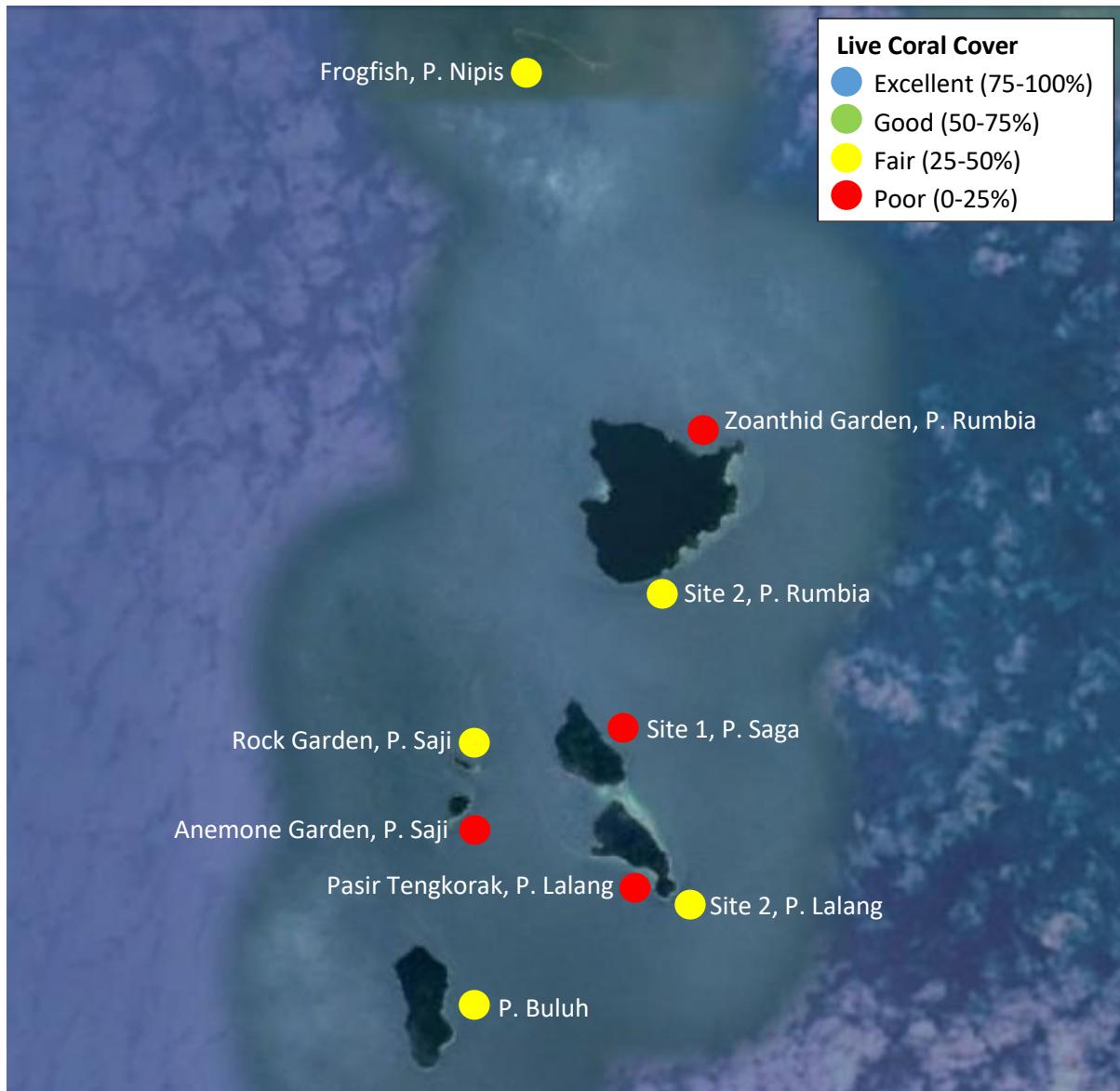


- Pangkor Laut reefs had deteriorated from ‘excellent’ to ‘good’ condition.
- The deterioration was likely due to physical damage caused by human activities and/or storm and raised level of nutrient in the waters around the island.
- Available substrate for coral recruits to attach to is high, indicating possible chance of reef recovery if human impacts are dealt with.

## Perak – Sembilan

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), off the west coast of Peninsular Malaysia, in the Straits of Malacca.

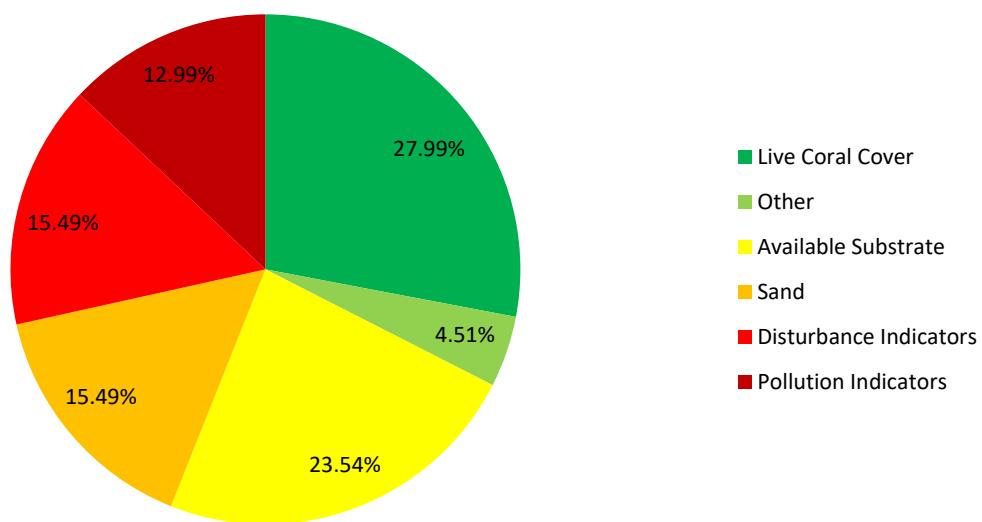
The islands are uninhabited and the only structures on the islands are small rest areas on Pulau Saga, constructed for the use of tourists and fishermen. The islands are a favourite fishing spot among sport and commercial fishermen. They are also occasionally visited by snorkelers and divers from Pangkor and Lumut. They have no protection status; hence tourism and fishing pressure are neither controlled nor monitored.



Map showing the health categories of each survey site based on their live coral cover: 5 sites have 'Fair' coral cover and 4 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Sembilan



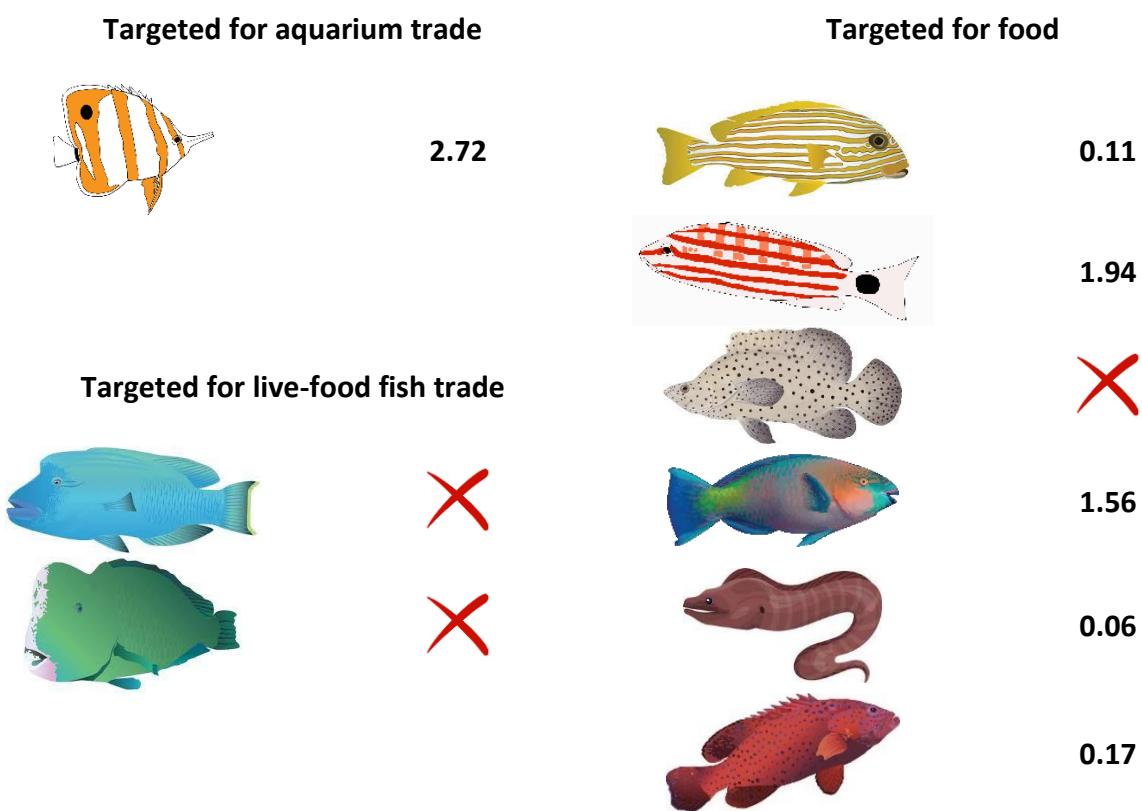
- Sembilan is dominated by live coral cover, which is mainly hard coral.
- Mean hard coral, reef builder, cover is 26.39%.
- In 'Fair' condition and below the Malacca Strait region average (36.36%).
- Available substrate for coral recruits to attach is very high.
- Sand level is high at many sites. The level is especially high at Zoanthid Garden, P. Rumbia (40.63%) and Pasir Tengkorak, P. Lalang (35.63%).
- Disturbance indicators are high.
- Rubble level is high at many sites and is especially high at Pasir Tengkorak, Pulau Lalang (33.13%). Rubble level ranges from 11% to 20% at all sites, except Frogfish, P. Nipis and Rock Garden, P. Saji North.
- Nutrient indicators are high.
- Sponge level is high at many sites, ranging from 11% to 27%.

### CORAL IMPACTS

- Boat anchor damage and trash were recorded at some sites.
- Discarded fishing nets were recorded at all sites.

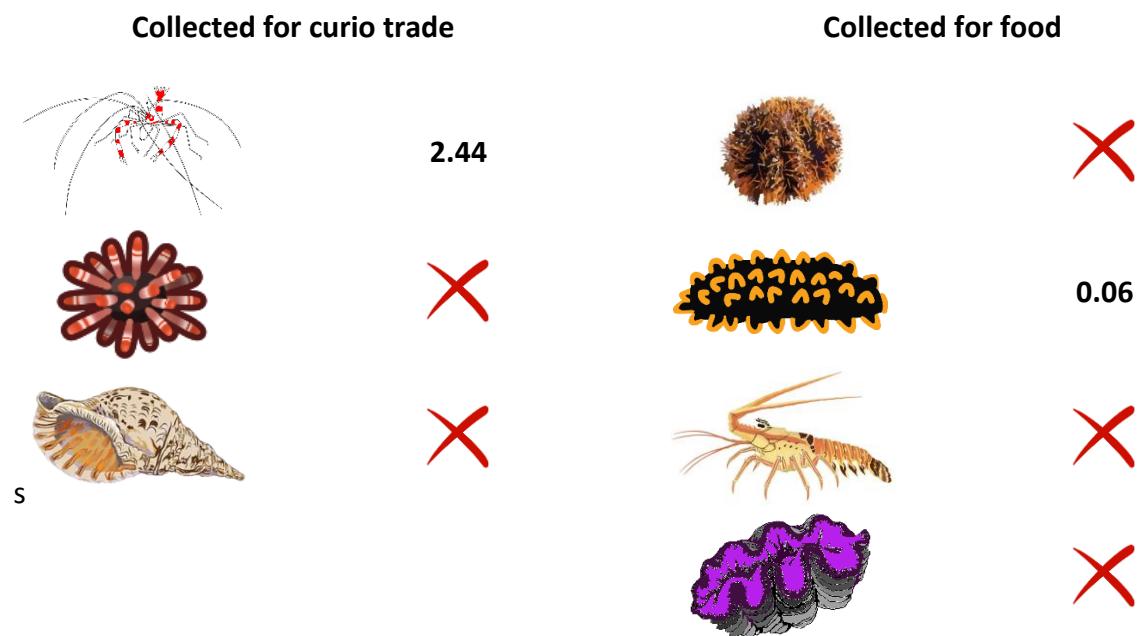


### Fish Abundance at Sembilan (Individuals per 500m<sup>3</sup>)

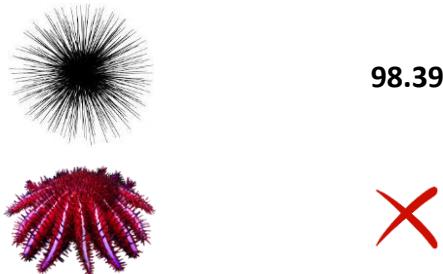


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is low.

## Invertebrate Abundance at Sembilan (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



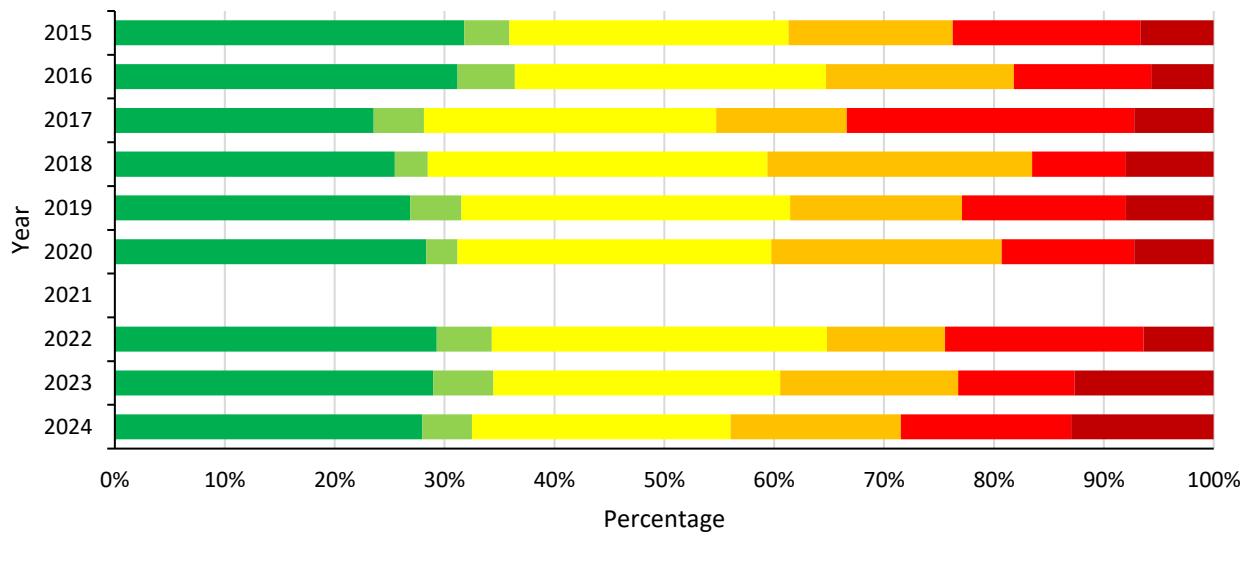
- Banded coral shrimp, indicator for curio trade, abundance is high.
- Diadema urchin abundance is high.
- For invertebrates collected for food, only sea cucumber is recorded and the abundance is very low.

### RARE ANIMALS

- Seahorses were recorded at many sites.



### Reef Health at Sembilan

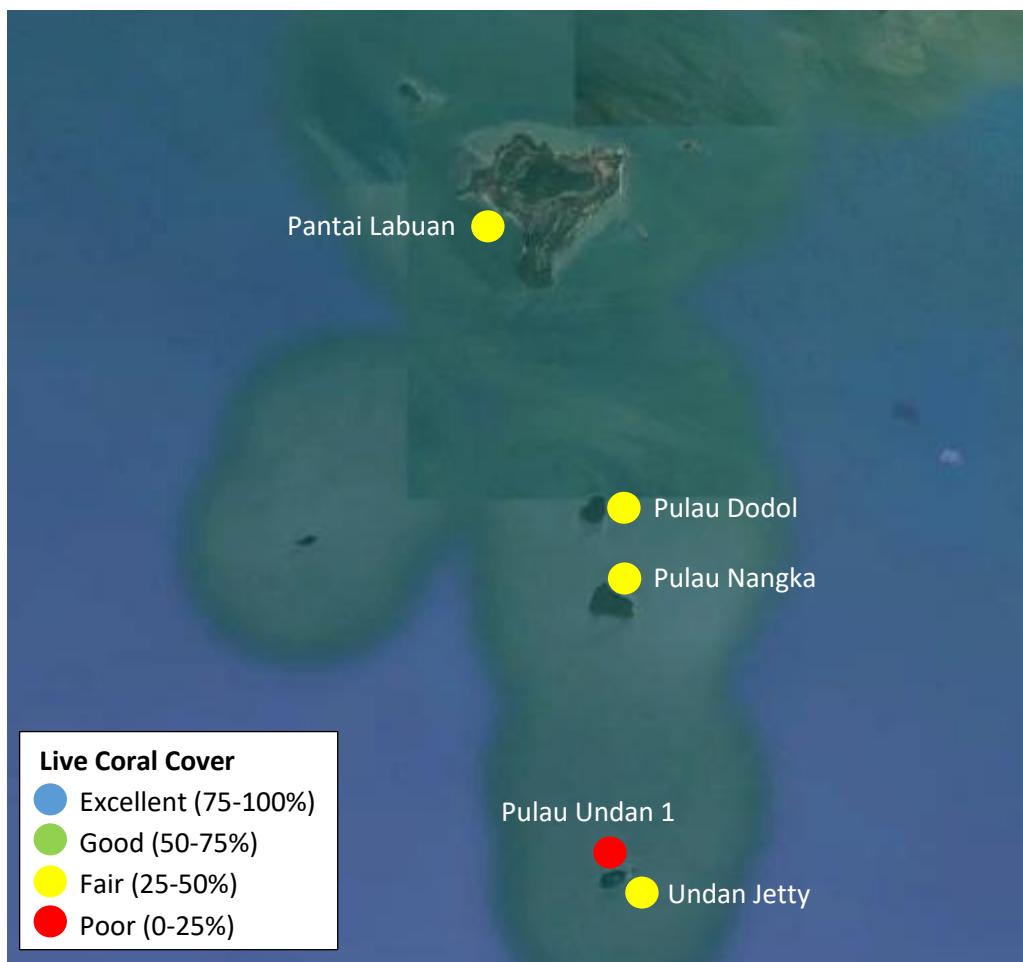


- Sembilan reefs have maintained in ‘fair’ condition.
- The deterioration in 2017 was most likely due to physical damage caused by human activities. In 2017, there was a massive construction on the beach at Pulau Lalang. Under the directive of Perak state government, structures built on the beach were removed later that year and the island is closed for boat landing until today.
- From 2018 to 2022, the reefs showed recovery.
- Since 2023, the reefs had deteriorated. The deterioration was likely due to raised level of nutrient in the waters and damages from discarded fishing nets which were found at all survey sites.
- No survey data was collected in 2021 due to Covid-19 pandemic which hampered survey efforts.
- Available substrate for new coral recruits to attach to is very high, possible chance of reef recovery if human impacts are in check.

## Malacca – Malacca

There are several islands off the state of Malacca. The waters surrounding the island group were gazetted as a Marine Park in 2022 under the Fisheries Act 1985. Pulau Besar is the largest island. It is popular for its ancient graves, tombs and mausoleums which are scattered around the island. The island has several other attractions such as old wells, uniquely shaped rocks, village of elves, elves' palace, cave and museum.

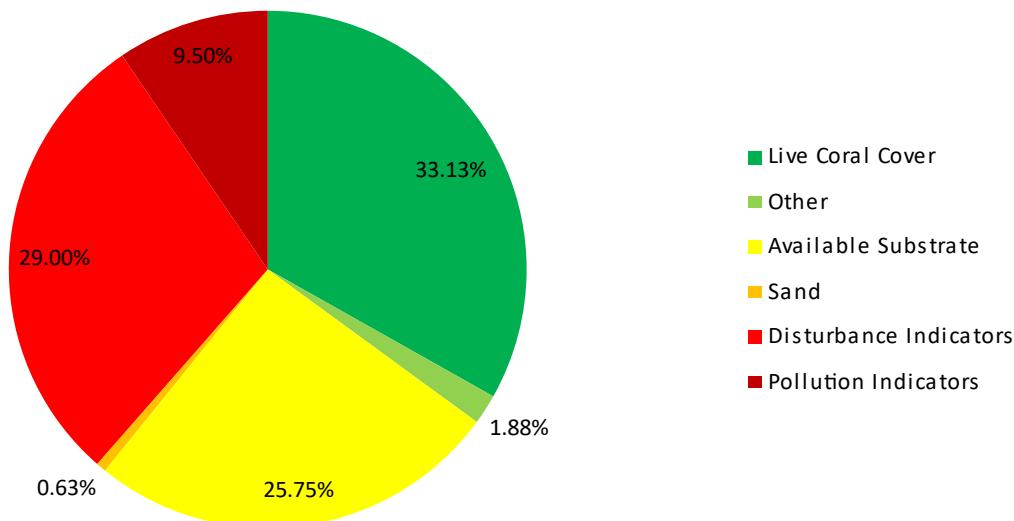
Pulau Undan is located furthest away from the mainland. The name is said to have come from a seabird that used to be abundant on the island and its surrounding, as there were many food sources including fish and snails. The island is not populated but there is a lighthouse to ensure the safety of ships passing through Malacca Strait. Boat trip from mainland to the island takes approximately 35 minutes.



Map showing the health categories of each survey site based on Live Coral Cover: 4 sites have 'Fair' coral cover and 1 is in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Malacca



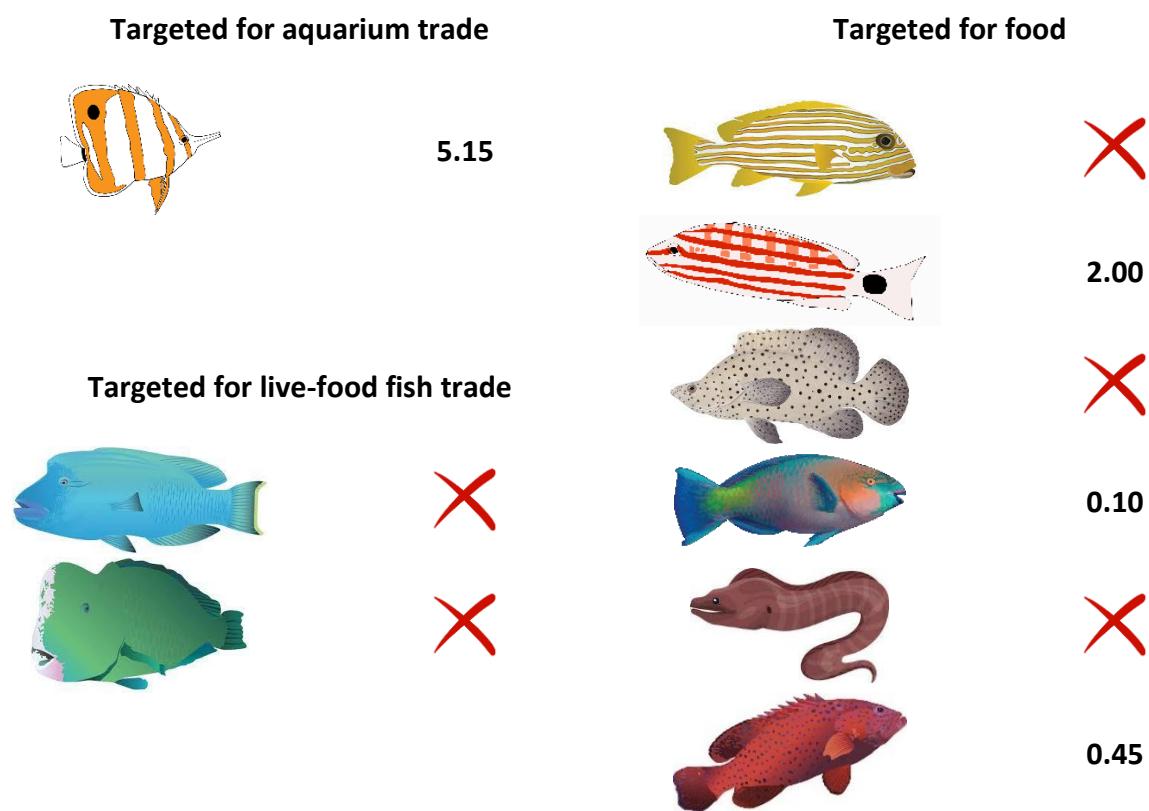
- Malacca reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 32.88%.
- In 'Fair' condition and below the Malacca Strait region average (36.36%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are very high.
- Rubble level is especially high at Pulau Dodol which recorded 22.50%.
- Silt level is very high at many sites, ranging from 21% to 50%.
- Pollution indicators are slightly high.
- The level of nutrient indicator algae is especially high at Pantai Labuan (16.88%).
- Sponge level is especially high at Undan Jetty (11.88%).

### CORAL IMPACTS

- Many sites recorded microbial mats on the reefs
- One, with an average 3% of the reef, was impacted by warm water bleaching.



### Fish Abundance at Malacca (Individuals per 500m<sup>3</sup>)

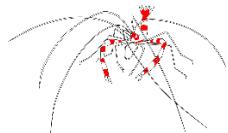


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food are very low.

## Invertebrate Abundance at Malacca

(Individuals per 100m<sup>2</sup>)

Collected for curio trade



✗



✗



✗

Collected for food



✗



✗

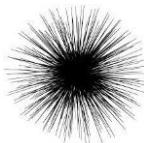


✗



✗

### Ecological Imbalance/Predator Outbreaks



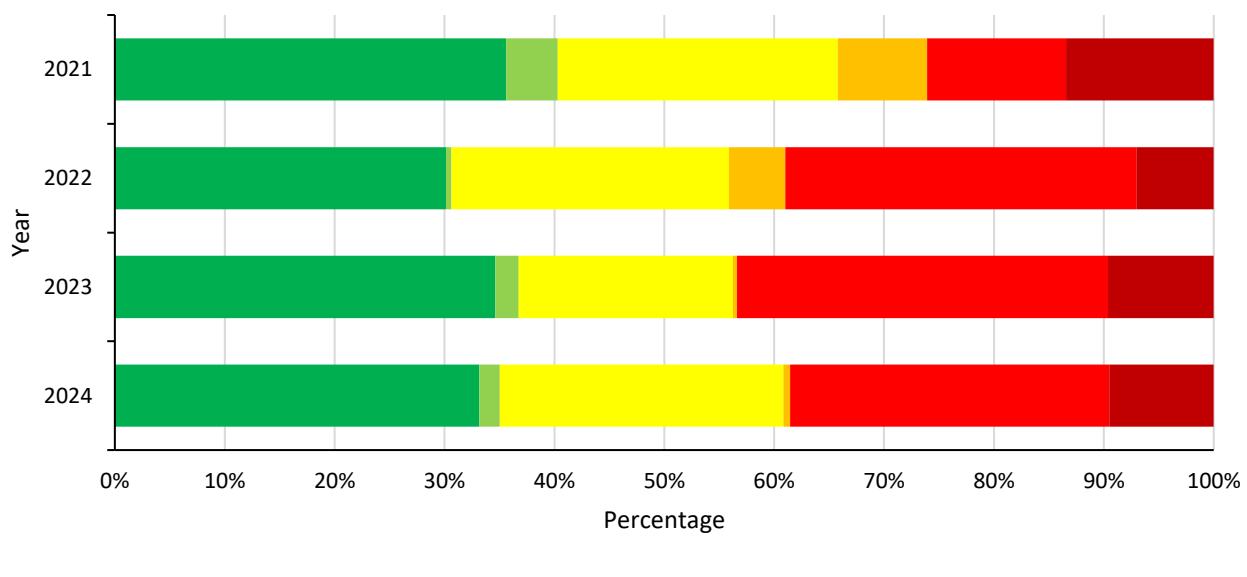
✗



✗

- Complete absence of indicator invertebrates.

### Reef Health at Malacca

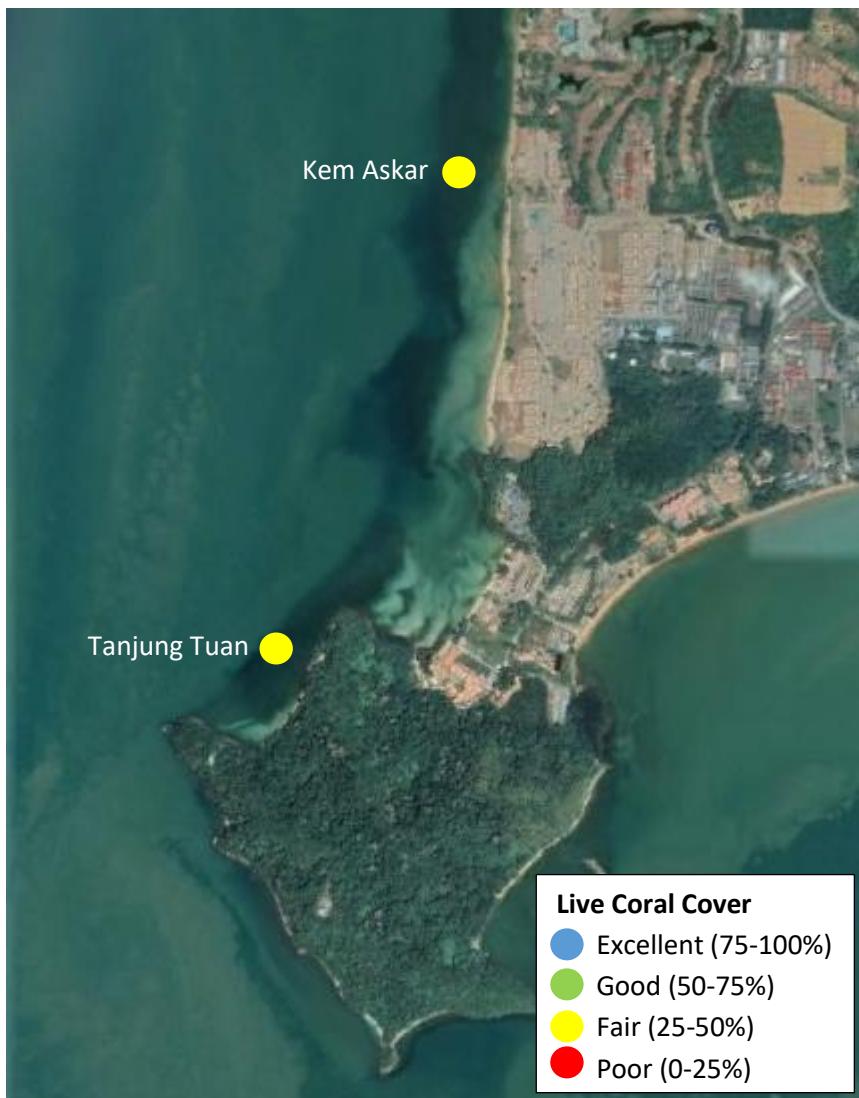


- Malacca reefs have maintained in 'fair' condition.
- Disturbance indicators have increased.

## Negeri Sembilan – Port Dickson

Port Dickson is a coastal town in Port Dickson district, Negeri Sembilan. Historically, the small town used to produce charcoal and tin ore. Over the years, Port Dickson evolved into a busy trading centre and has two oil and gas refineries, as well as home to many army camps. The beach of Port Dickson is a popular holiday destination for local visitors. In the 1990s, Port Dickson is boomed with hotels and resorts. Port Dickson provides sports and activities such as go-karts, paint ball target shooting, archery and ATV riding.

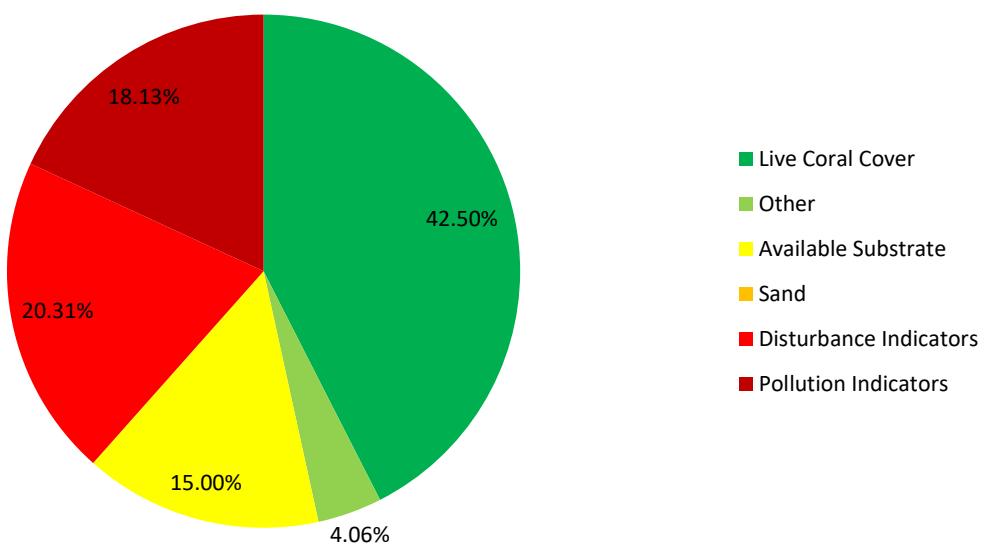
The area is gazetted as a prohibited fishing area under the Fisheries (Prohibited Areas) Regulations 1994, Fisheries Act 1985, which stipulated that any fishing activities within one nautical mile of the beach is strictly prohibited.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Fair' coral cover.

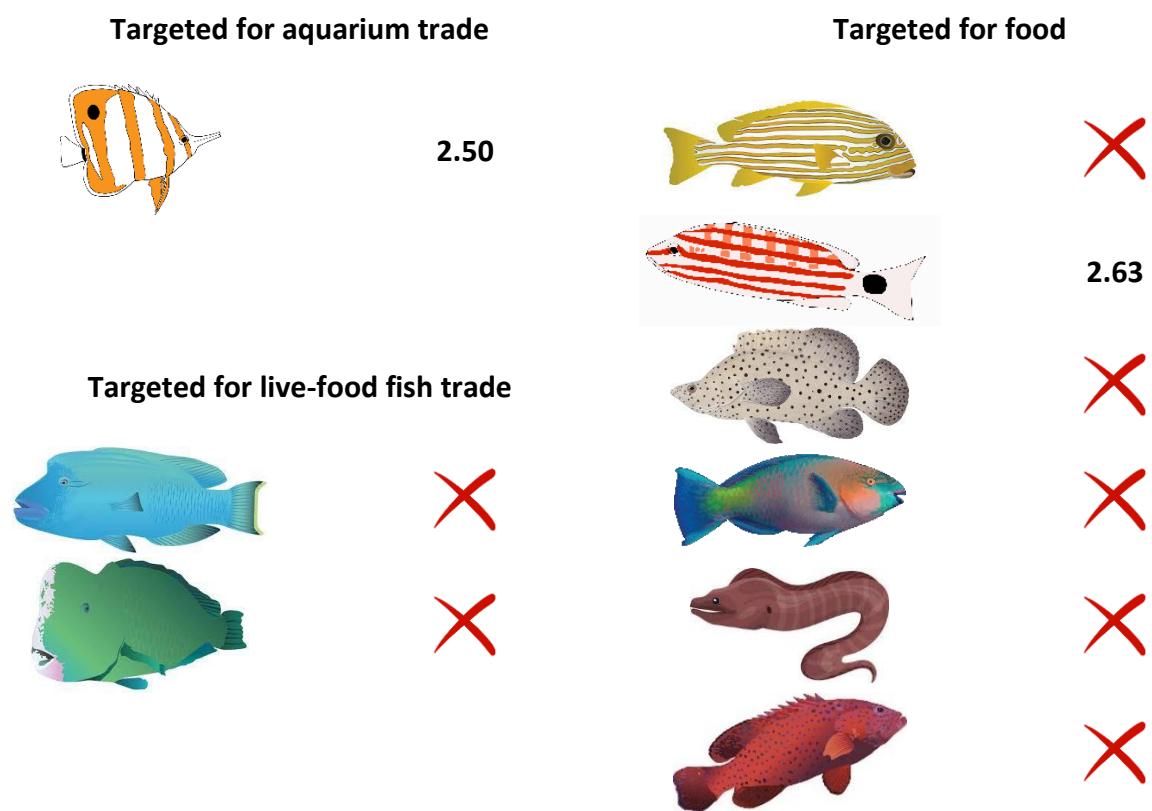
## Coral Cover and Health

Substrate Composition at Port Dickson



- Port Dickson reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 40%.
- In 'Fair' condition and above the Malacca Strait region average (36.36%).
- Available substrate for coral recruits to attach is high.
- Disturbance indicators are very high.
- Silt level is very high at both sites, above 18%.
- Pollution indicators are high.
- Nutrient indicator algae level is very high at both sites, above 13%.

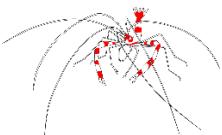
### Fish Abundance at Port Dickson (Individuals per 500m<sup>3</sup>)



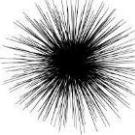
- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- For fish targeted for food, only snapper is recorded and the abundance is low.

## Invertebrate Abundance at Port Dickson

(Individuals per 100m<sup>2</sup>)

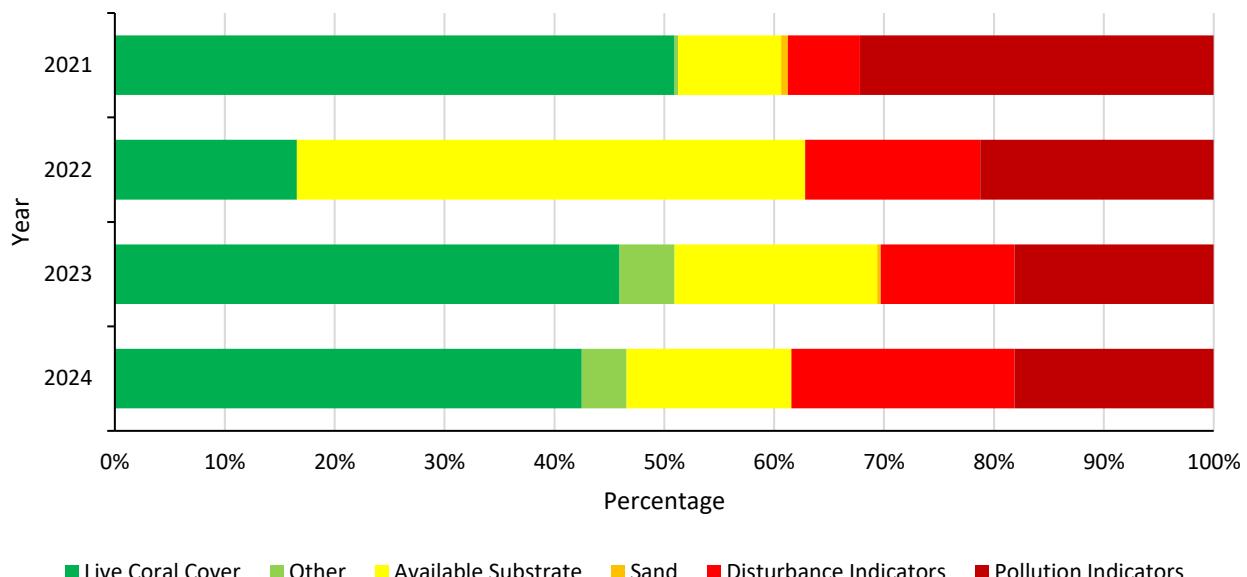
Collected for curio trade		Collected for food	
	X		X
	X		X
	X		X
			X

### Ecological Imbalance/Predator Outbreaks

	2.00
	X

- Only diadema urchins are recorded.

### Reef Health at Port Dickson

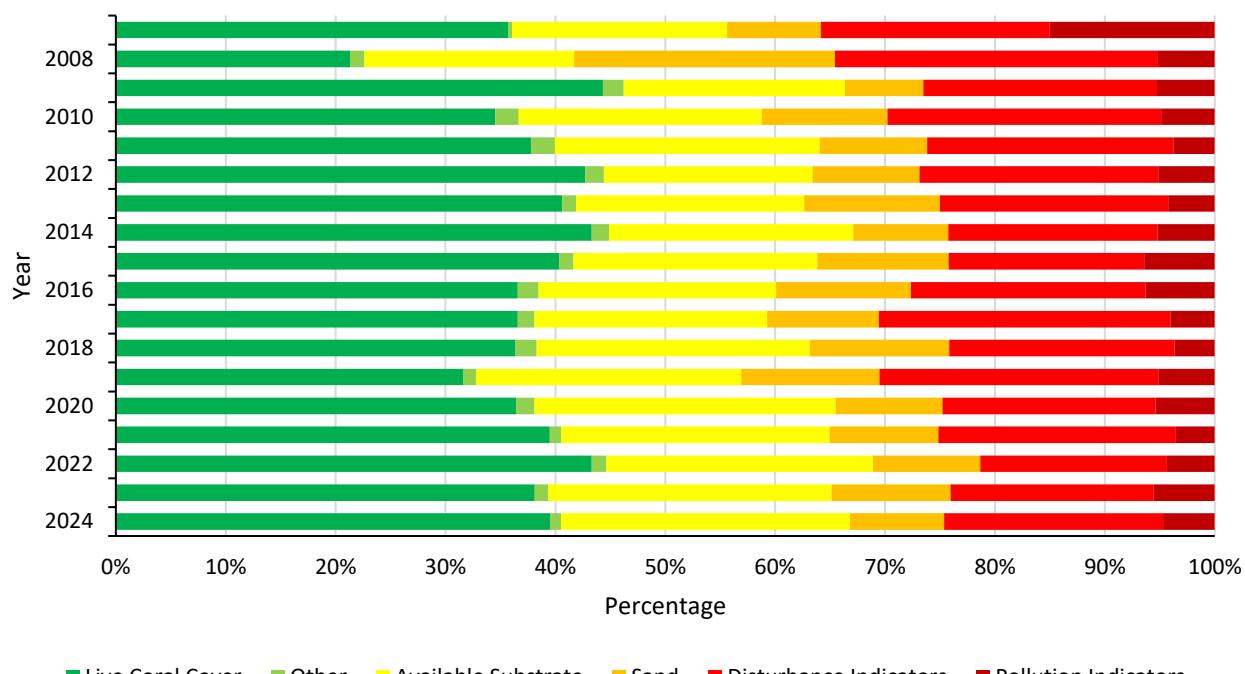


- Port Dickson reefs have deteriorated from 'good' to 'fair' condition.
- The deterioration was due to physical damage caused by human activities and/or storm.
- Available substrate for coral recruits to attach is high, possible chance of recovery if human impacts are dealt with.

## North Borneo

### Coral Cover and Health

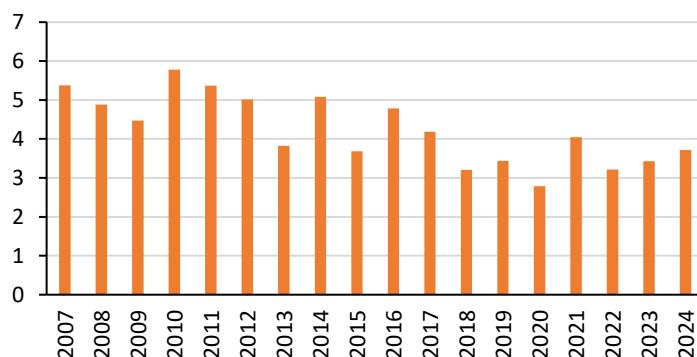
Reef Health in North Borneo



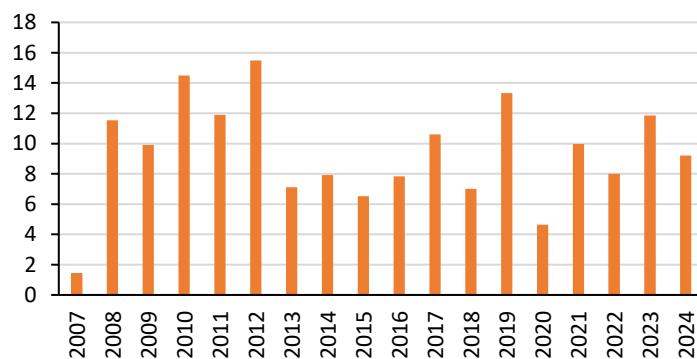
- From 2007 to 2014, reefs health in North Borneo showed improvement.
- From 2015 to 2019, the reefs deteriorated.
- From 2020 to 2022, reefs health showed improvement. One reason for this could be the restrictions on tourism during the Covid-19 pandemic, pointing to a possible management measure that would see reef areas closed temporarily to allow them to recover.
- In 2023, reefs health had deteriorated. The deterioration was likely due to physical damage caused by human activities and/or storm and raised level of nutrient in the waters. Another reason for this could be resumption of tourism.
- In 2024, the reefs showed improvement.
- Available substrate for coral recruits to attach to is high, indicating possible chance of reef recovery if human impacts are dealt with.

## Fish

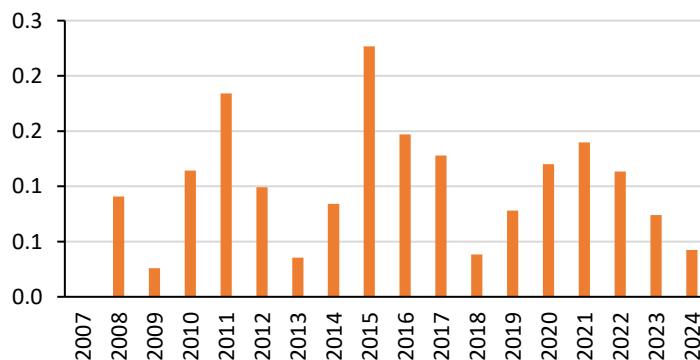
Fish Targeted for Aquarium Trade



Fish Targeted for Food



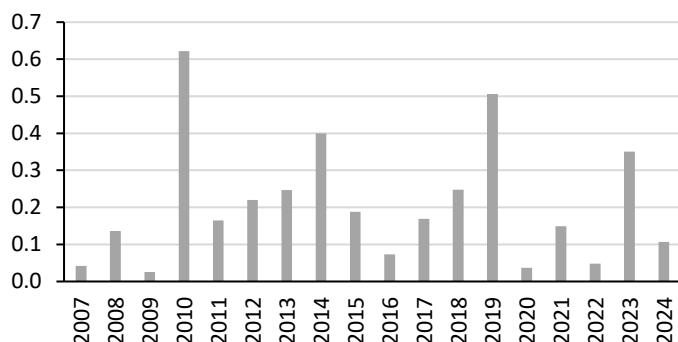
Fish Targeted for Live-food Fish Trade



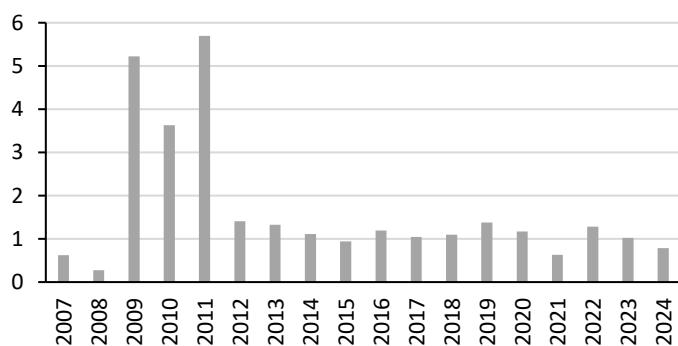
- The abundance of fish targeted for aquarium trade and food is inconsistent over the years.
- Fish targeted for live-food fish trade is showing a declining trend over the last few years.

## Invertebrate

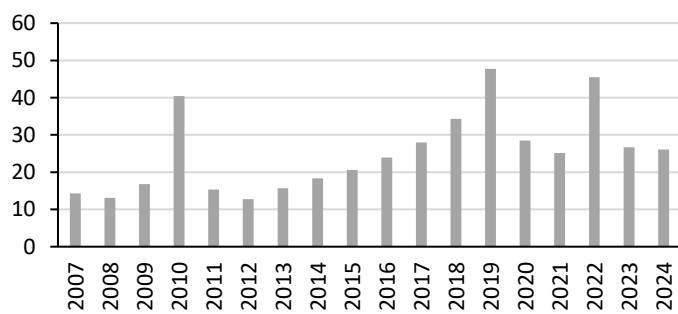
Invertebrates Targeted for Curio Trade



Invertebrates Targeted for Food

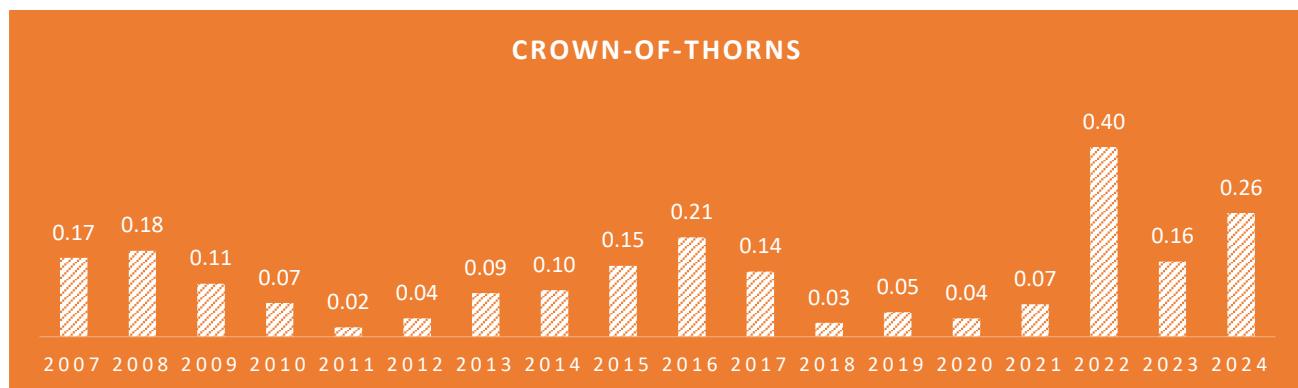


Ecological imbalance/predator outbreak  
Indicators



- The abundance of invertebrates targeted for curio trade and indicators for ecological imbalance/predator outbreak is inconsistent over the years.
- Very low abundance of invertebrates targeted for food.
- In 2022 and 2024, the abundance of crown-of-thorns had increased to above what a healthy reef can support (0.2-0.3 individual per 100m<sup>2</sup>).

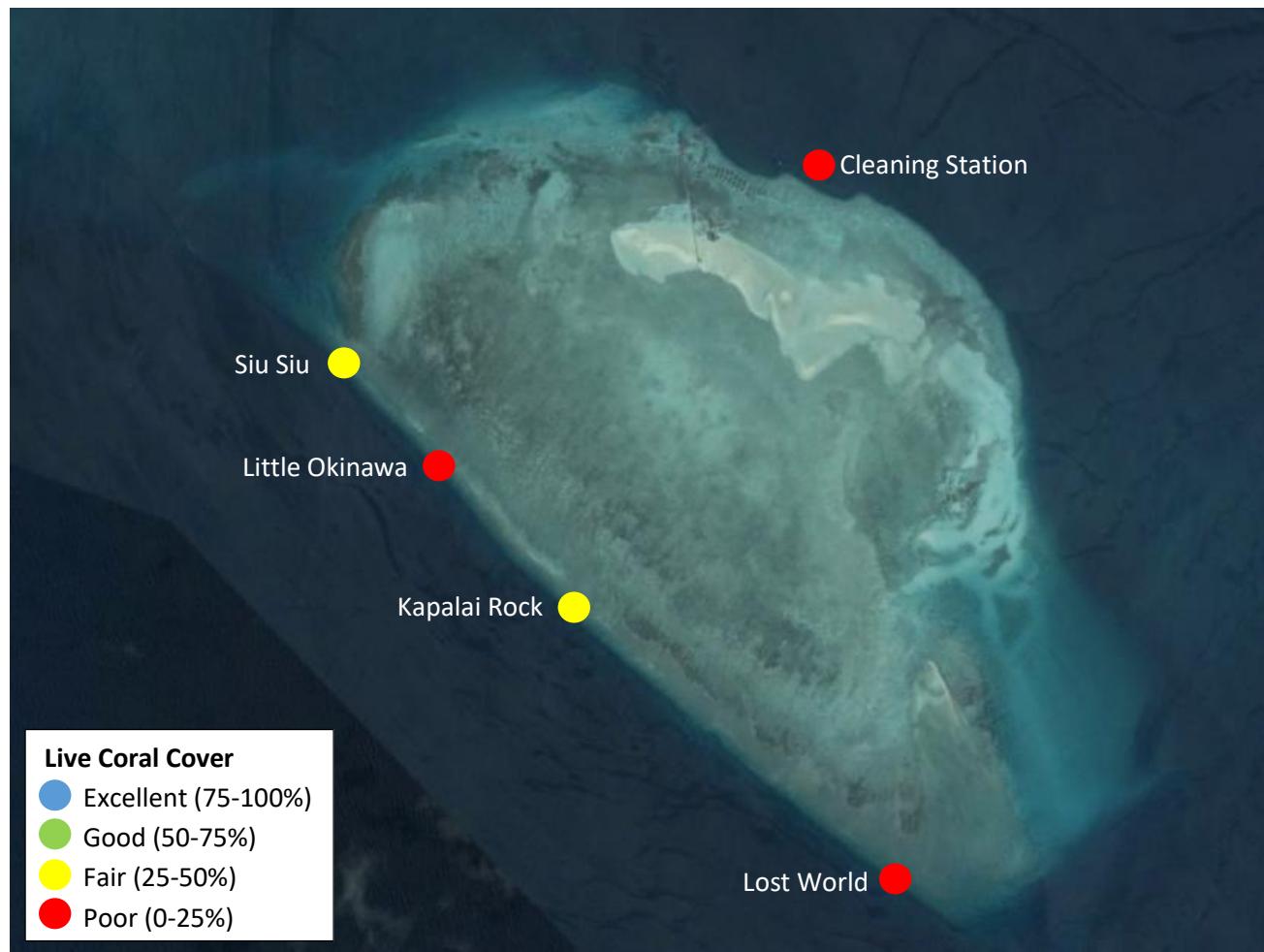
### CROWN-OF-THORNS



## Sabah – Kapalai

Kapalai Island is located near Semporna, Sabah and is 15 kilometres from Sipadan Island. Though it is called an island, it is a sandbar situated on Ligitan Reef. Kapalai used to be a real island with vegetation but erosion over the last few hundred years has reduced the island to sea level. All buildings are on stilts resting on the reef.

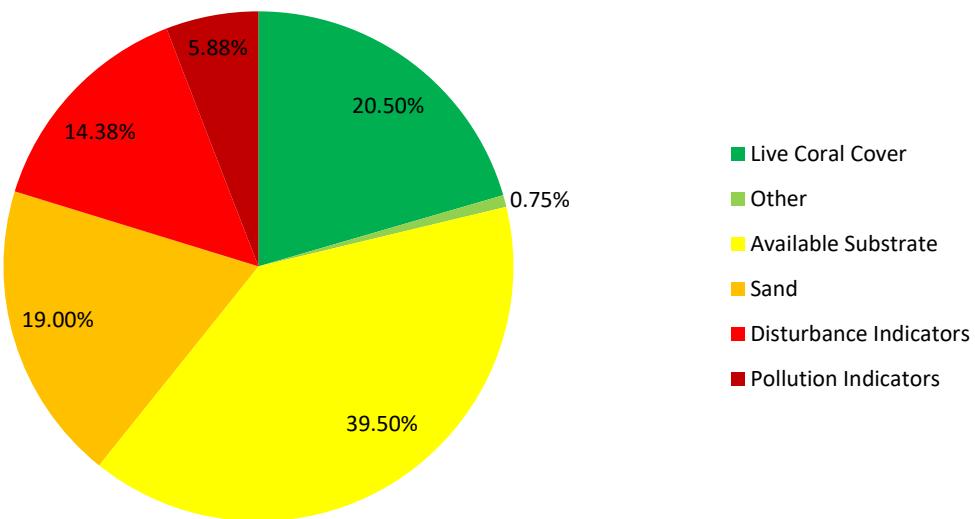
Kapalai is mostly known for its scuba diving. There is only one private resort on the island while the rest of the island is uninhabited.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Fair' coral cover and 3 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Kapalai



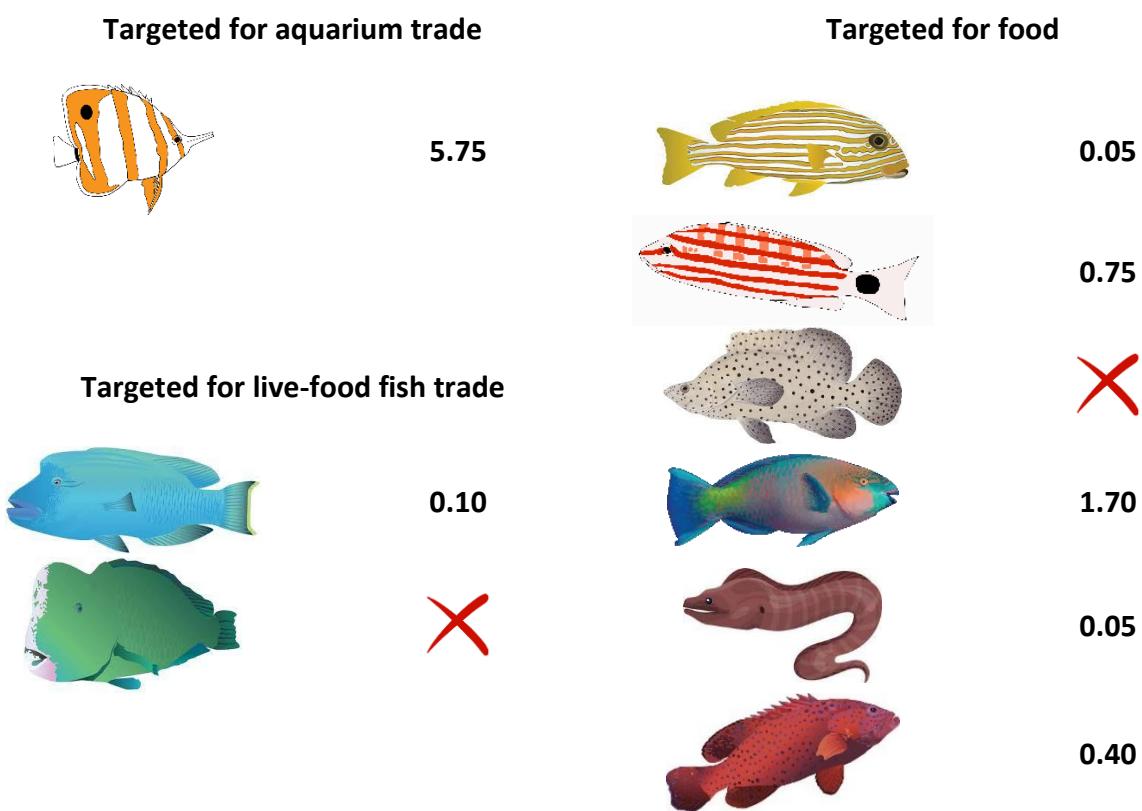
- Kapalai reefs are dominated by available substrate, which is rock, for coral recruits to attach.
- Mean hard coral (reef builder) cover is 19.63%.
- In 'Poor' condition and below the North Borneo region average (39.56%).
- Sand level is high at all sites, ranging from 14% to 27%.
- Disturbance indicators are high.
- Rubble level is high at many sites, ranging from 16% to 22%.
- Pollution indicators are not high in Kapalai in general, but the level of nutrient indicator algae is high at Siu Siu (13.13%).
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is extremely high, high level of disturbance indicators may deter coral growth if they are not dealt with.

### CORAL IMPACTS

- Boat anchor damage, dynamite fishing, discarded fishing nets and trash were recorded.
- Many sites, with an average 2% of the reefs, were impacted by warm water bleaching.

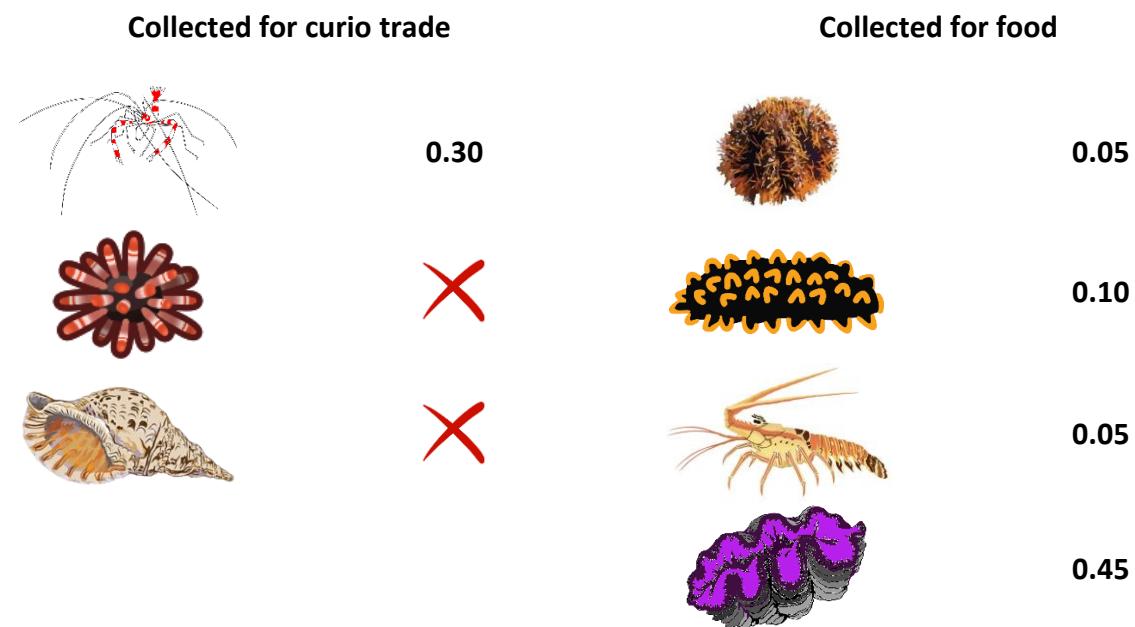


### Fish Abundance at Kapalai (Individuals per 500m<sup>3</sup>)

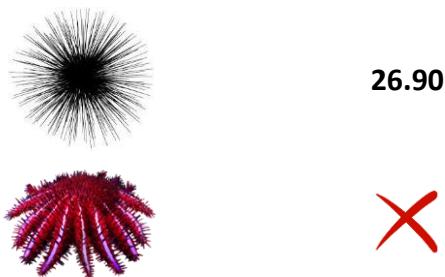


- Butterflyfish, indicator for aquarium trade, is recorded.
- Humphead wrasse, fish targeted for live-food fish trade, is recorded.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Kapalai (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



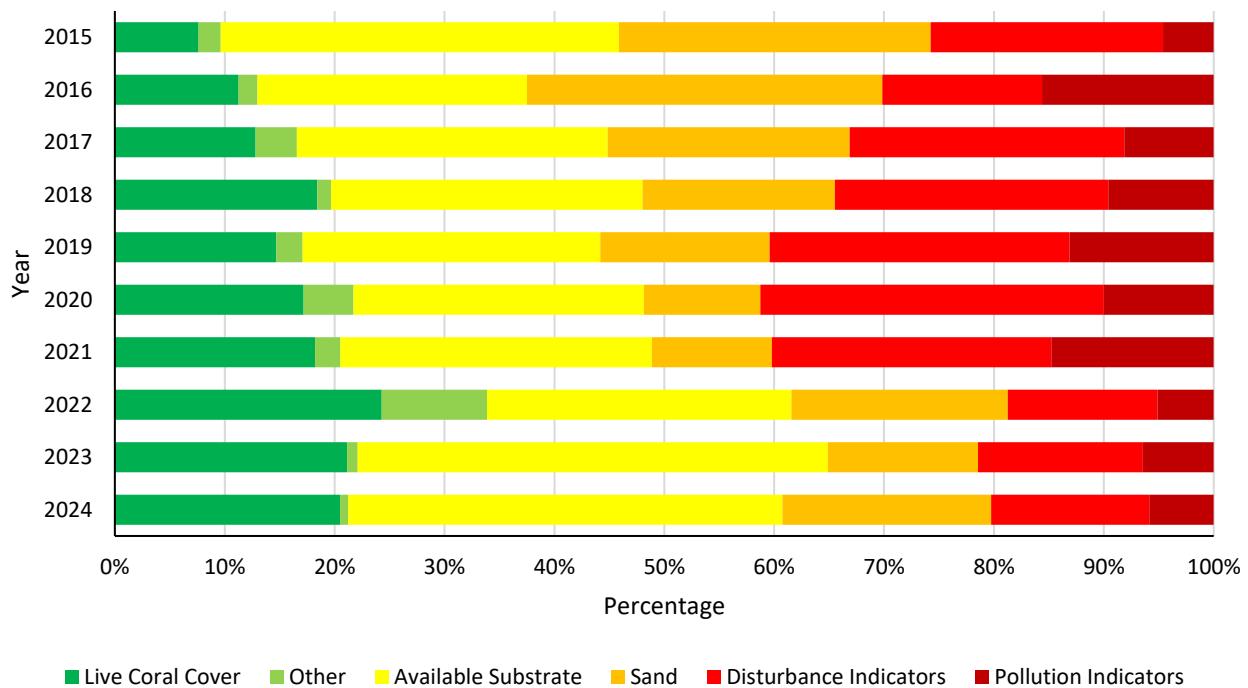
- Banded coral shrimp, indicator for curio trade, is recorded.
- All types of invertebrates collected for food are recorded, however their abundance is very low.

### RARE ANIMALS

- Shark and turtles were recorded.



### Reef Health at Kapalai



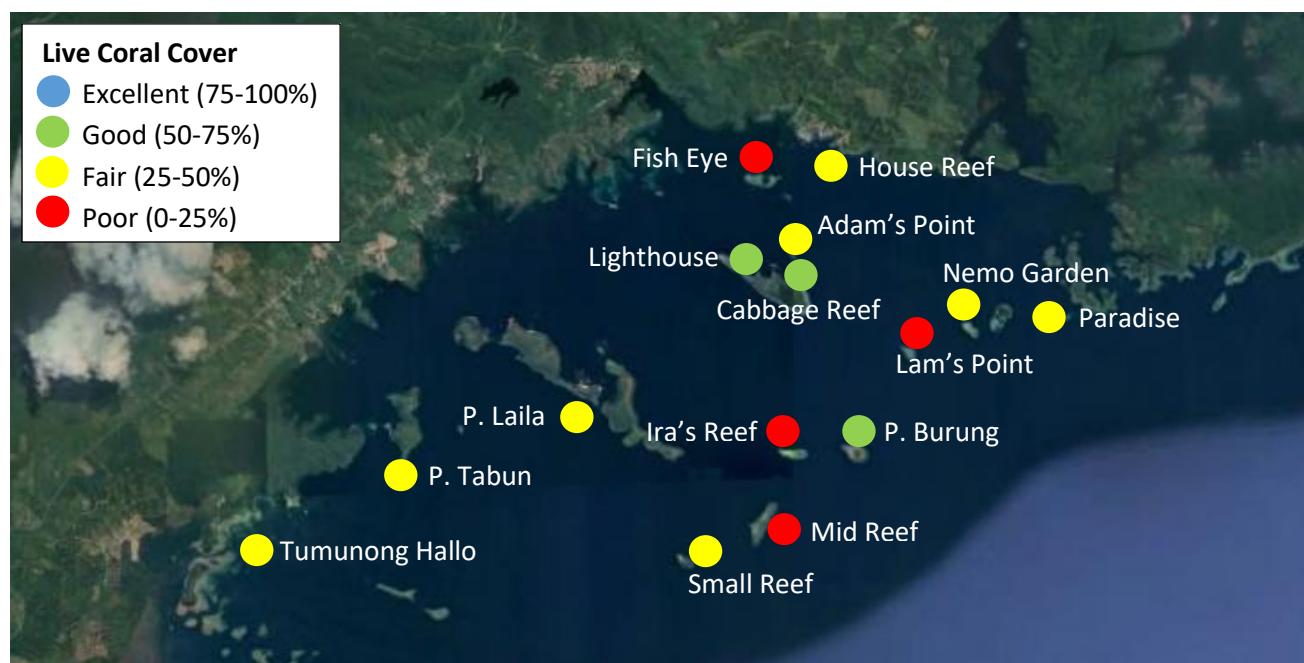
- From 2015 to 2022, Kapalai reefs were improving.
- Since 2023, the reefs had deteriorated
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Available substrate for coral recruits to attach is very high, possible chance of improvement of reefs health if human impacts are dealt with.

## Sabah – Lahad Datu

Lahad Datu is a town located in the east of Sabah, Malaysia, on the island of Borneo. It occupies the peninsula on the north side of Darvel Bay – the largest semi-enclosed bay on the east coast of Borneo islands. Administratively, it falls within the Tawau Division and is estimated to have a population of over 156,000 (2000 census).

Currently, there is little development along the coastal areas of Lahad Datu. In Lahad Datu itself, tourism is still limited, though Sabah Urban Development Corporation is trying to promote greater investment in infrastructure. There are two well-known nature-based tourism attractions near to Lahad Datu: Tabin Wildlife Reserve and the Danum Valley Conservation Area, and the wider Kinabatangan River basin is also nearby.

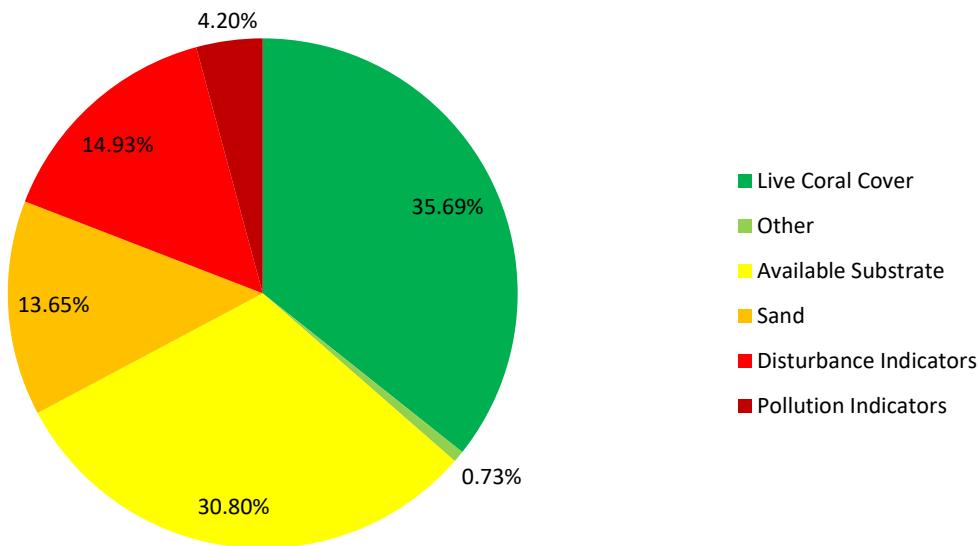
Darvel Bay has yet to become established as a popular diving destination. The area includes both fringing and submerged reefs.



Maps showing the health categories of each survey site based on Live Coral Cover: 4 sites have 'Good' coral cover, 10 are in 'Fair' condition and 4 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Lahad Datu



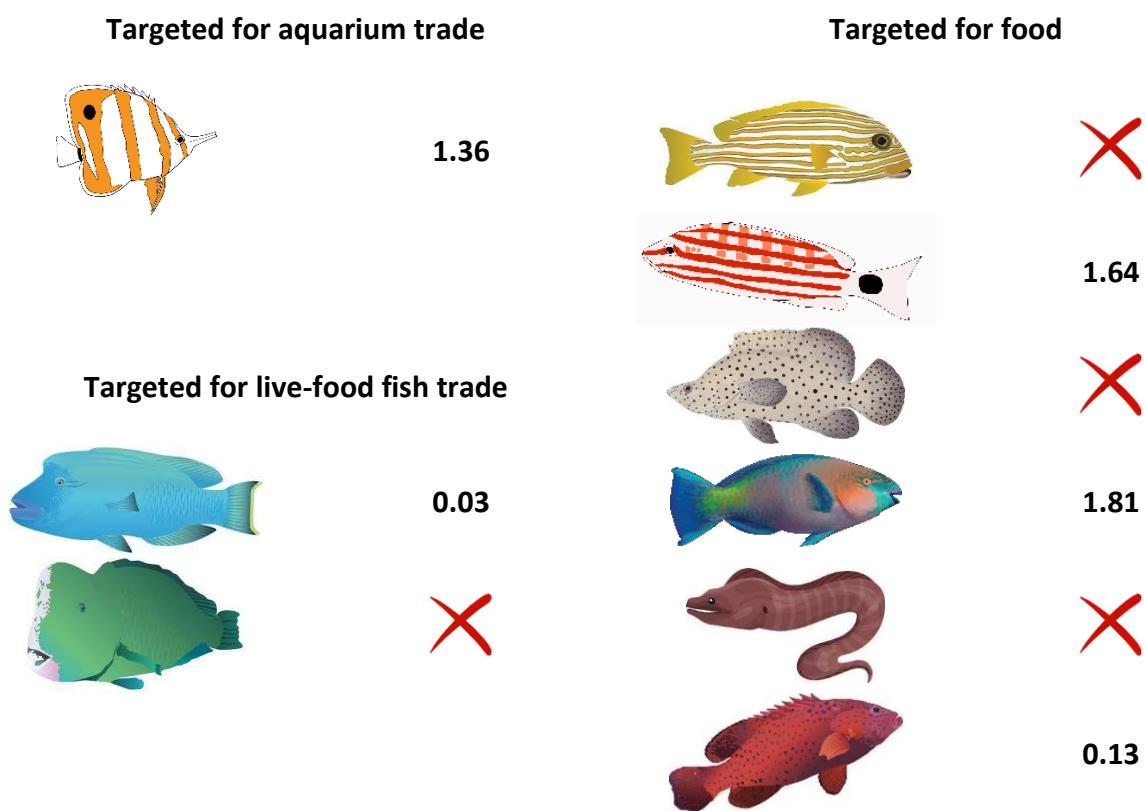
- Lahad Datu reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 34.79%.
- In 'Fair' condition and below the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is extremely high.
- Sand level is high. The level is especially high at Ira's Reef (53.75%) and Lam's Point (38.13%). Many sites recorded between 10% to 27% sand.
- Disturbance indicators are high.
- Rubble level is high at many sites. It is especially high at Small Reef (25.63%). Many sites recorded between 10% to 20%.
- Silt level is especially high at Nemo Garden (14.38%) and Light House (10%).

### CORAL IMPACTS

- Boat anchor damage, discarded fishing net and trash were recorded at many sites.
- Impacts from dynamite fishing were recorded and blasts were heard during surveys.
- Crown-of-thorns predations were recorded.
- All sites, with an average 7% of the reefs, were impacted by warm water bleaching.

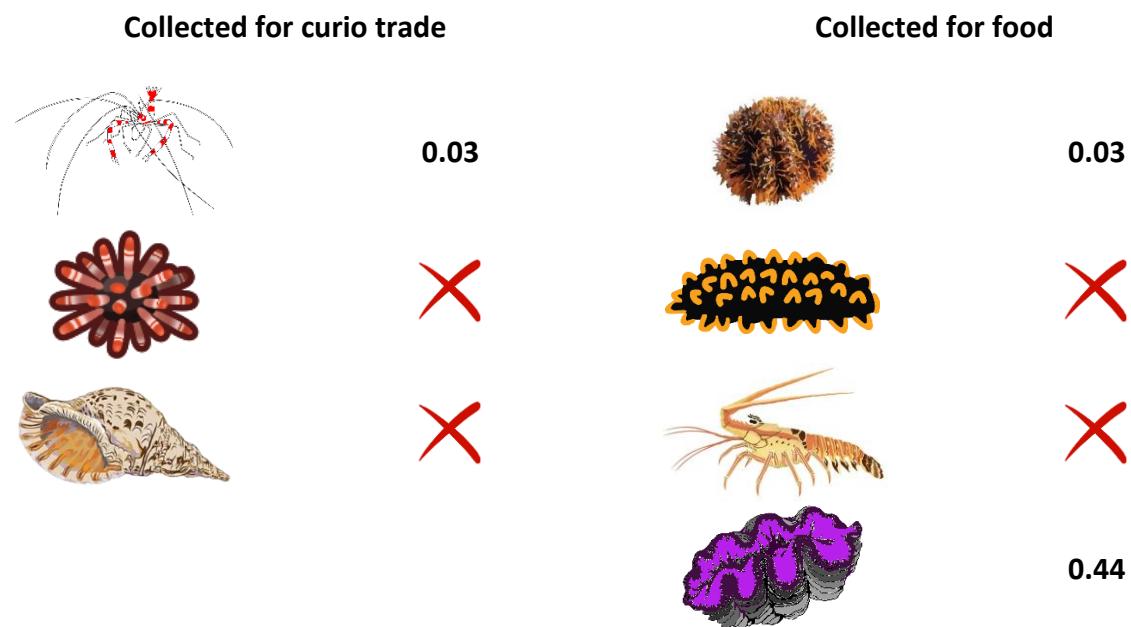


### Fish Abundance at Lahad Datu (Individuals per 500m<sup>3</sup>)

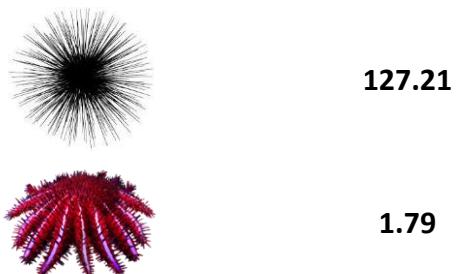


- Butterflyfish, indicator for aquarium trade, is recorded.
- Humphead wrasse, fish targeted for live-food fish trade, is recorded.
- The abundance of fish targeted for food is low.

## Invertebrate Abundance at Lahad Datu (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



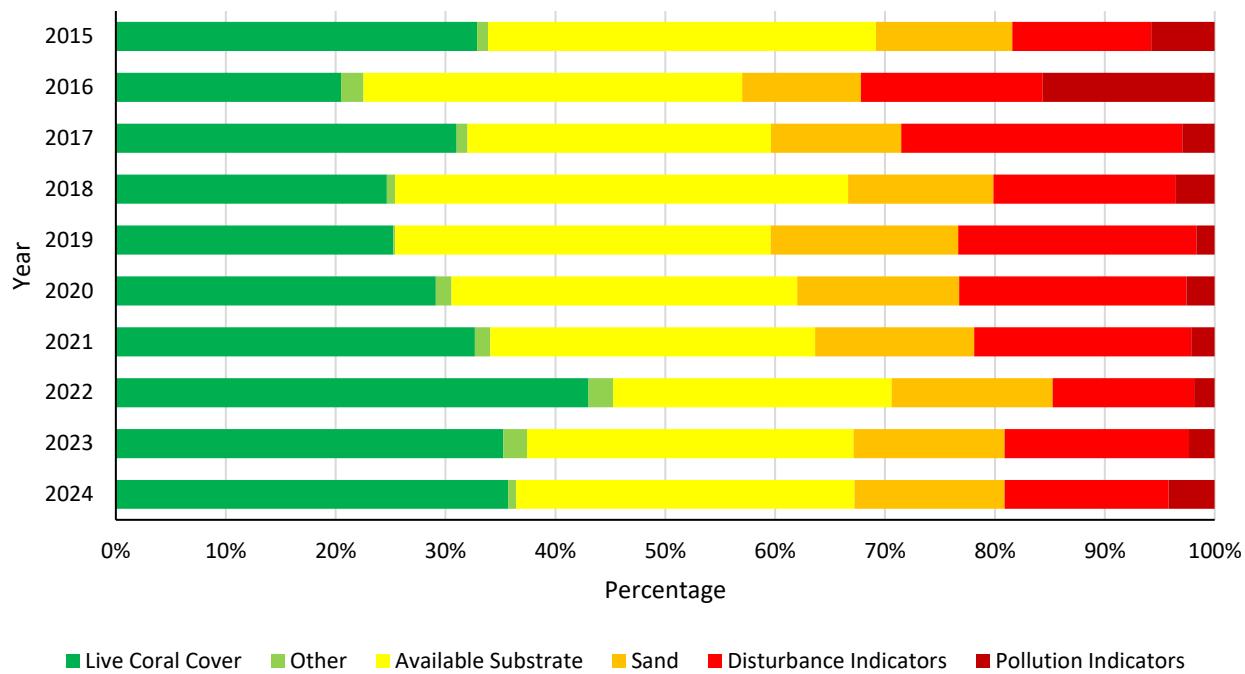
- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is an issue in Lahad Datu. A healthy coral reef can support a population of 0.2-0.3 individuals per 100m<sup>2</sup>, Lahad Datu recorded 1.79. Many were also recorded outside the survey area.
- The abundance for invertebrates collected for food is very low.

### RARE ANIMALS

- Turtle was recorded.



### Reef Health at Lahad Datu



- Generally, Lahad Datu reefs are improving.
- Disturbance indicators have decreased. Reduced disturbance indicators allow Lahad Datu reefs to improve.
- Since 2022, the abundance of crown-of-thorns had increased significantly, above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>). This is a cause for concern and existing efforts by reef managers to control the population need to be heightened.

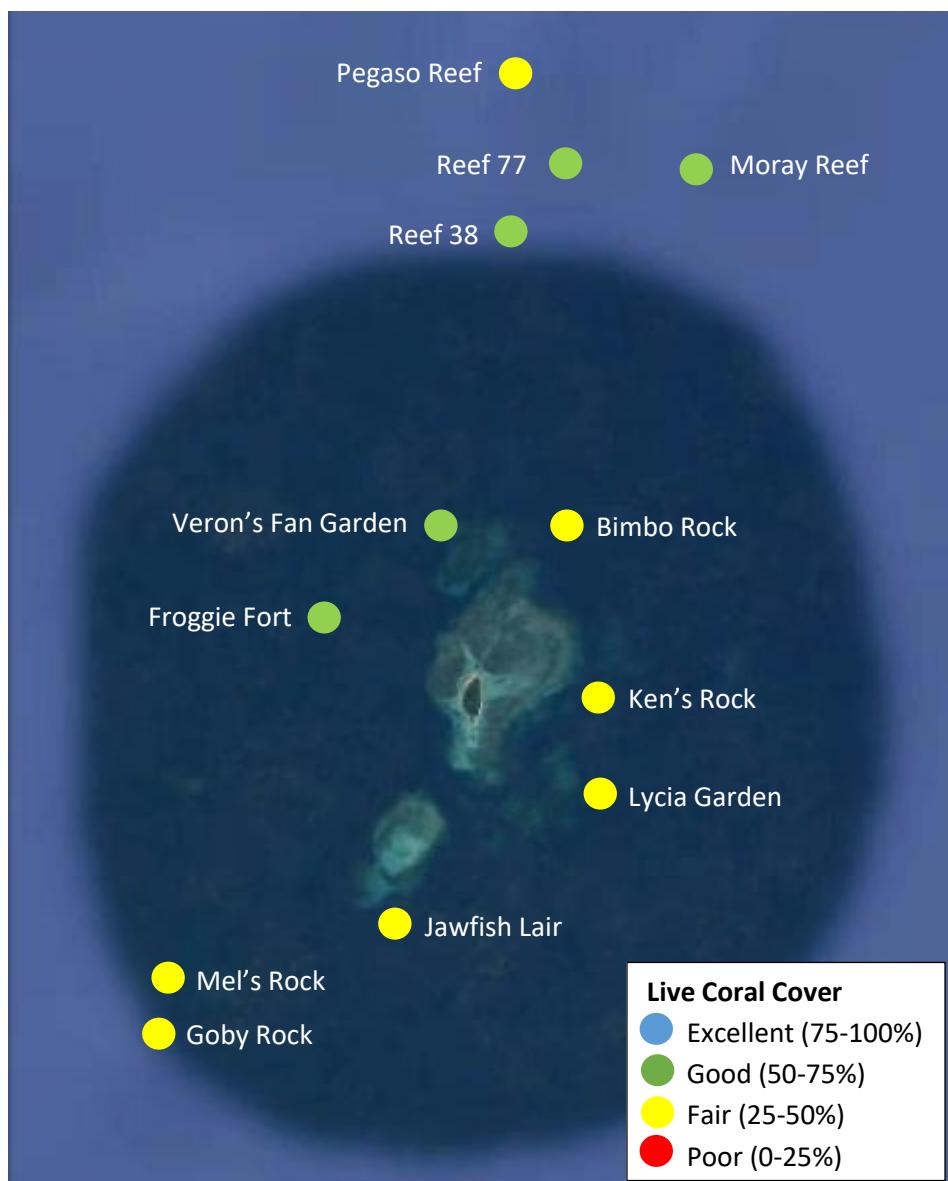


## Sabah – Lankayan

Lankayan is a small island in the Sulu Sea, a 1.5hour boat ride north of Sandakan. A resort island, Lankayan is part of the Sugud Islands Marine Conservation Area (SIMCA), a large, privately managed MPA off the East coast of Sabah.

SIMCA is remote and distant from populated areas and no communities exist on the islands within the protected area. However, the SIMCA area is known to be a traditional fishing ground and is fished by both artisanal and commercial fishers from Sandakan, Kudat and the Philippines.

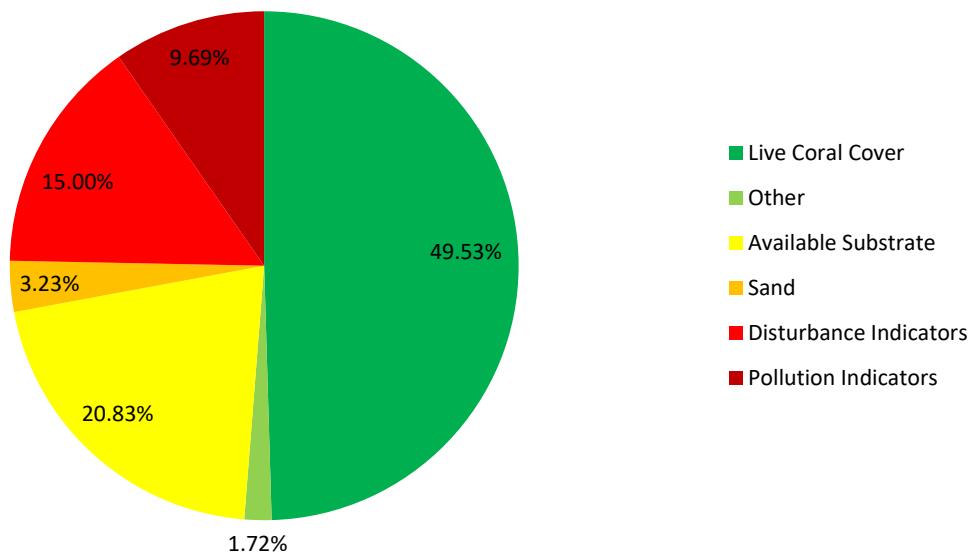
Before the creation of SIMCA, blast fishing was a constant problem, and turtle eggs were poached on a regular basis. Lankayan Island is the only developed island within SIMCA. The 0.05 km<sup>2</sup> island is the site of the Lankayan Island Dive Resort (LIDR), which is the only structure on the otherwise uninhabited island.



Map showing the health categories of each survey site based on their live coral cover: 5 sites have 'Good' coral cover and 7 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Lankayan



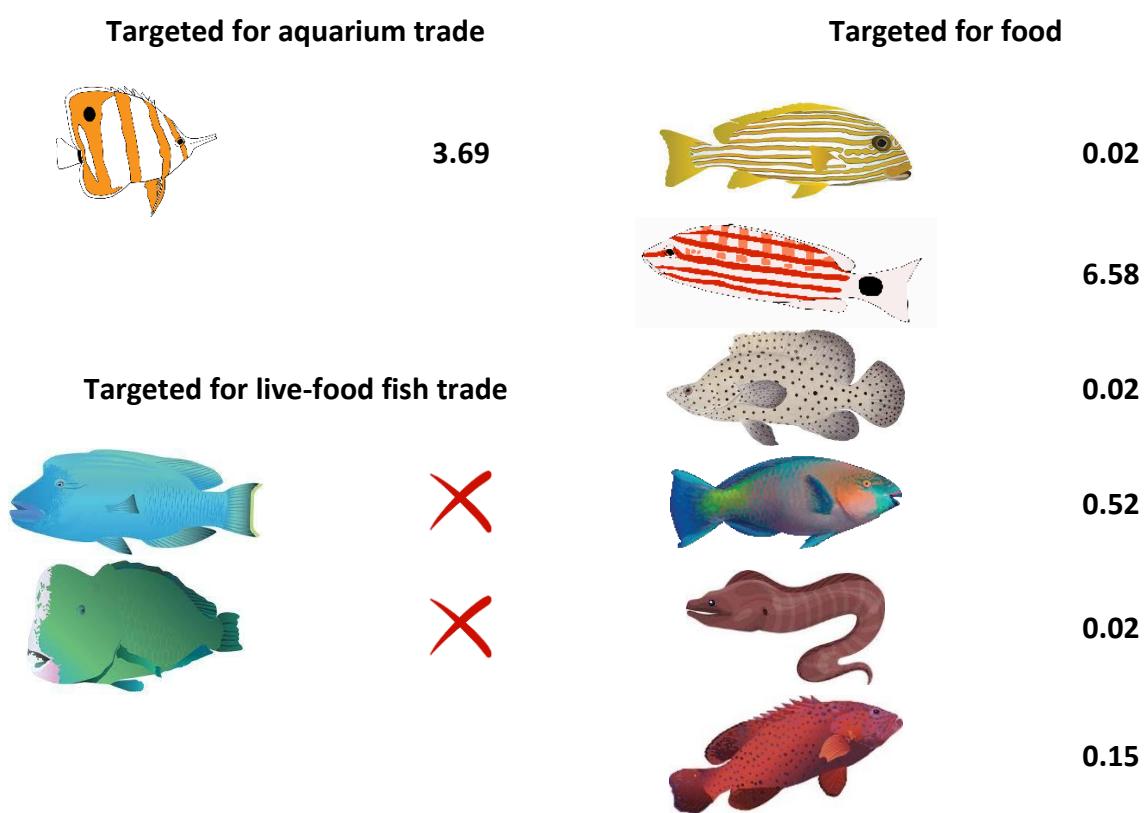
- Lankayan reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 45.42%.
- In 'Fair' condition and above the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are high.
- Rubble level is high at many sites, ranging from 11% to 23%.
- Pollution indicators are quite high.
- Nutrient indicator algae level is especially high Mel's Rock and Reef 77, both recorded 16.25%.
- Sponge level is high at Bimbo Rock and Goby Rock, both recorded over 13%.

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded.
- Many reefs, with an average 2% of the reefs, were impacted by warm water bleaching.

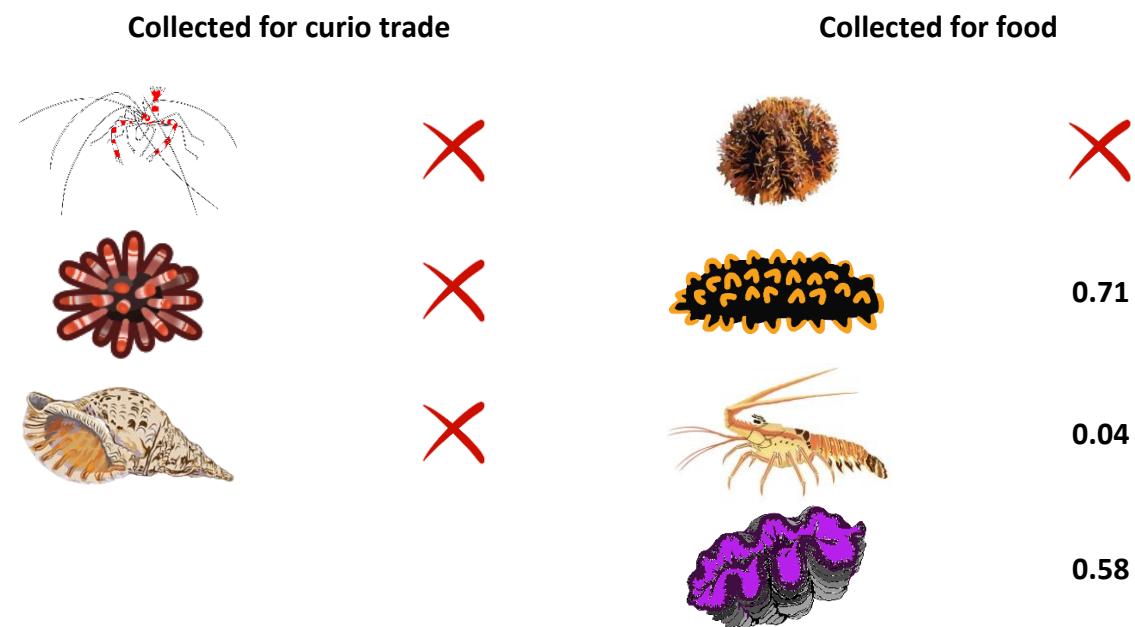


### Fish Abundance at Lankayan (Individuals per 500m<sup>3</sup>)

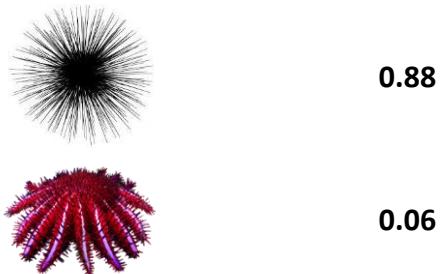


- Butterflyfish, indicator for aquarium trade, is recorded.
- Fish targeted for live-food fish trade is absent.
- All type of fish targeted for food is recorded. The abundance of fish targeted for food is very low except for snapper.

## Invertebrate Abundance at Lankayan (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



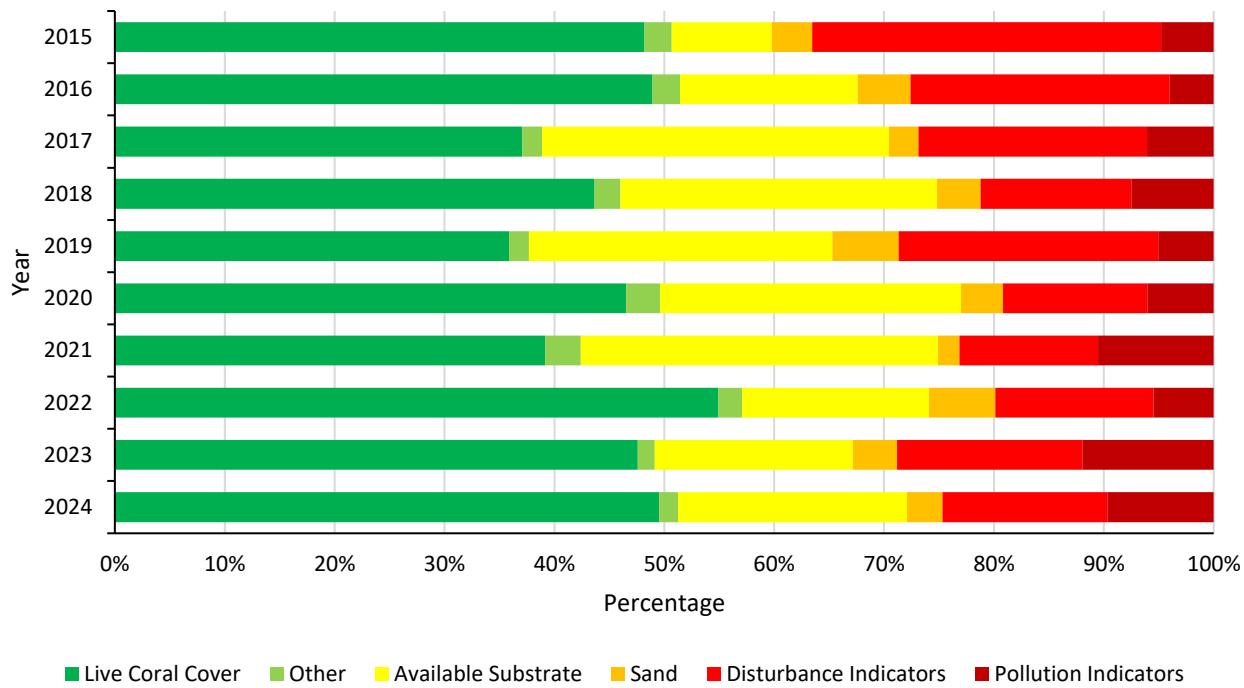
- Indicators for curio trade are absent.
- Crown-of-thorns is not an issue in Lankayan.
- The abundance of invertebrates collected for food is very low.

### RARE ANIMALS

- Shark and turtle were recorded.



### Reef Health at Lankayan



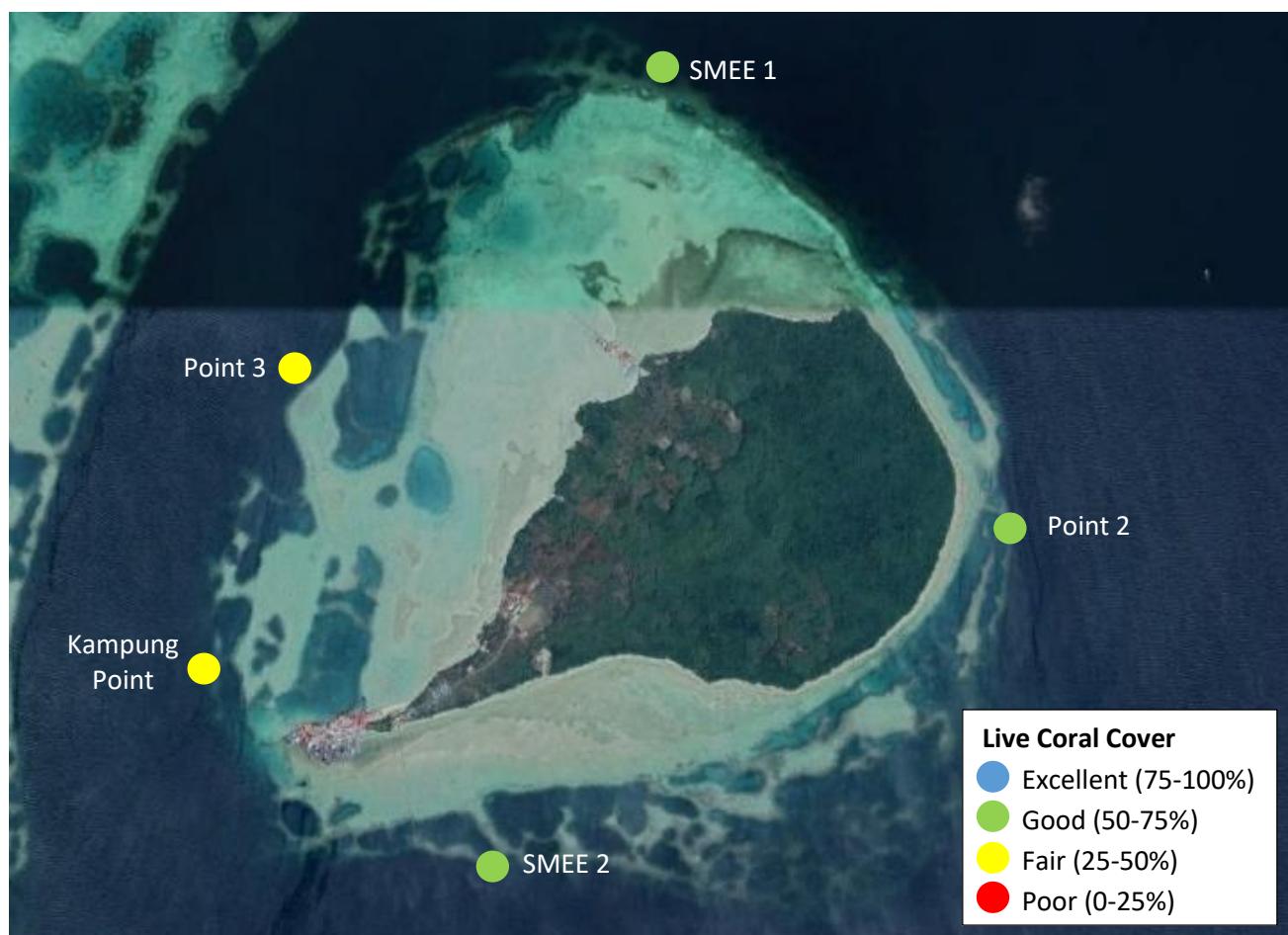
- The health of Lankayan reefs shows variation over the years. Overall, the reefs are improving.
- The decrease in live coral cover in 2021 was considered to reflect the elimination of 9 sites that year (due to Covid-19 pandemic which hampered survey efforts).
- The decrease in 2024 was considered to reflect the elimination of 3 sites that year.
- Disturbance and pollution indicators are showing an increasing trend over the last few years.
- Available substrate for coral recruits to attach is high, possible chance of reef improvement if human impacts are dealt with.

## Sabah – Larapan

Larapan Island is located in the Sulu Sea off the south-eastern coast of Sabah. The island has two villages with a small population of just over 1200 people and basic infrastructures such as primary school, kindergarten, mosque, community hall, and solar and saltwater desalination systems. There are no proper sewage and municipal waste management systems.

The island is a fishing village and a hotspot for fish bombing. Gleaning activities are popular amongst the locals. It is not a popular diving or snorkelling site. In terms of natural resources, the island has rich marine biodiversity, especially its coral reefs.

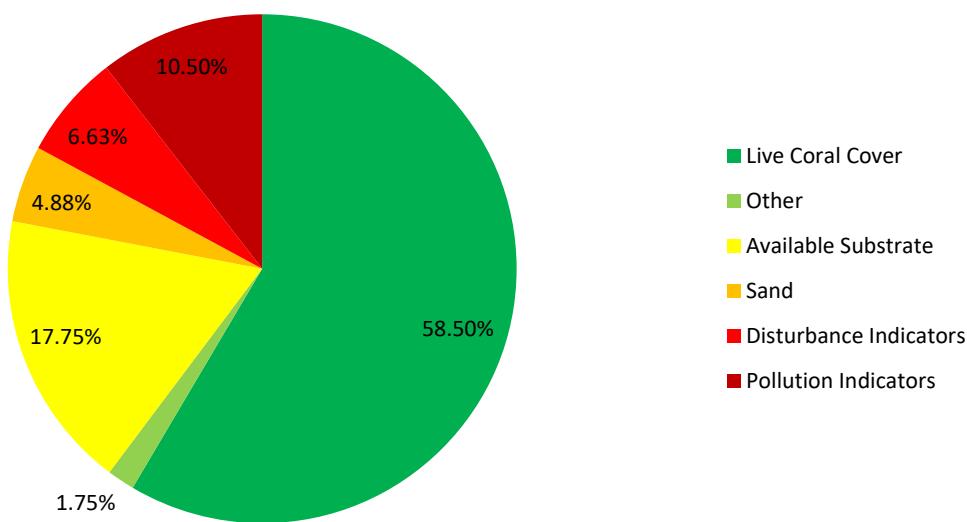
Recently, a small group of people from the community has taken it upon themselves to patrol the areas to prevent encroachments and destructive fishing activities. They also conduct surveys to monitor the reefs.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Good' coral cover and 2 are in 'Fair' condition.

## Coral Cover and Health

Substrate Composition at Larapan



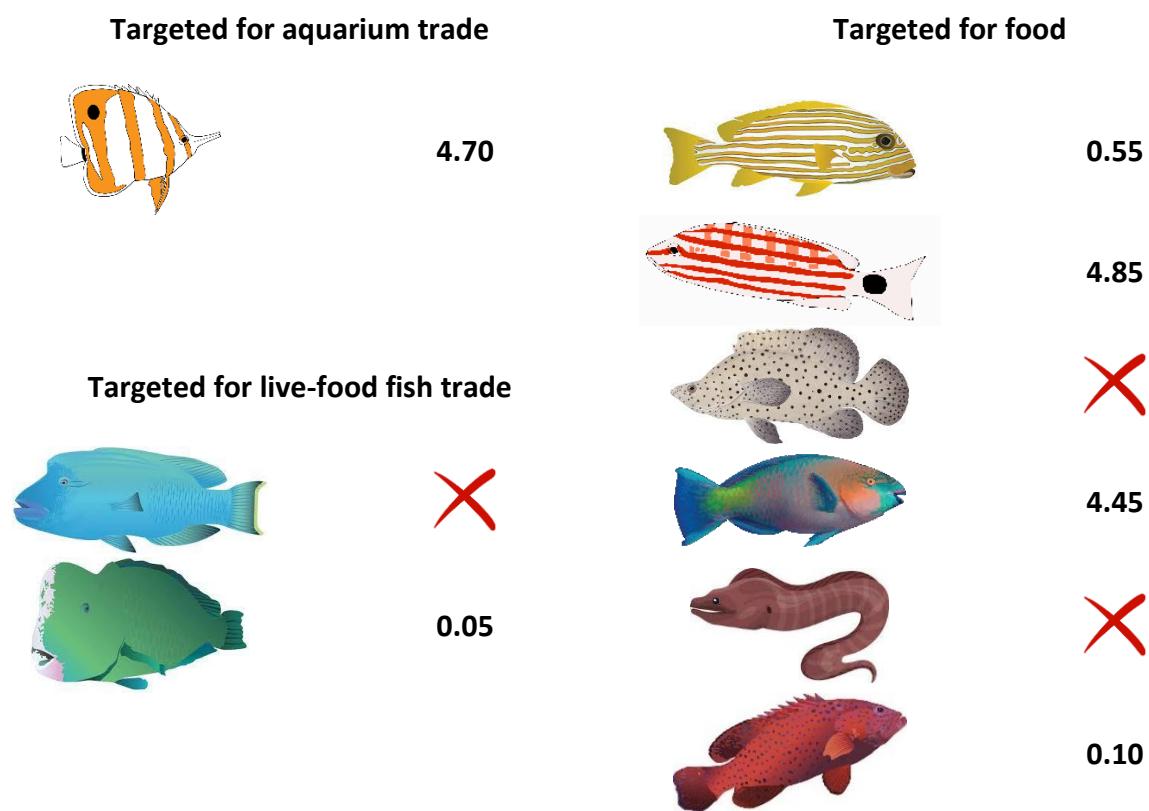
- Larapan reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 56%.
- In 'Good' condition and above the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is high.
- Disturbance indicators are not high in Larapan in general, but the level of rubble is especially high at Kampung Point and Point 3, both recorded over 11%.
- Pollution indicators are high.
- The level of nutrient indicator algae is especially high at SMEE 1 (15.63%) and SMEE 2 (10%).
- Sponge level is quite high at Kampung Point, Point 2 and Point 3, ranging from 4% to 7%.

### CORAL IMPACTS

- Boat anchor damage, discarded fishing nets and trash were recorded at many sites.
- Dynamite fishing, drupella predation and development were observed.
- All sites, with an average 3% of the reefs, were impacted by warm water bleaching.



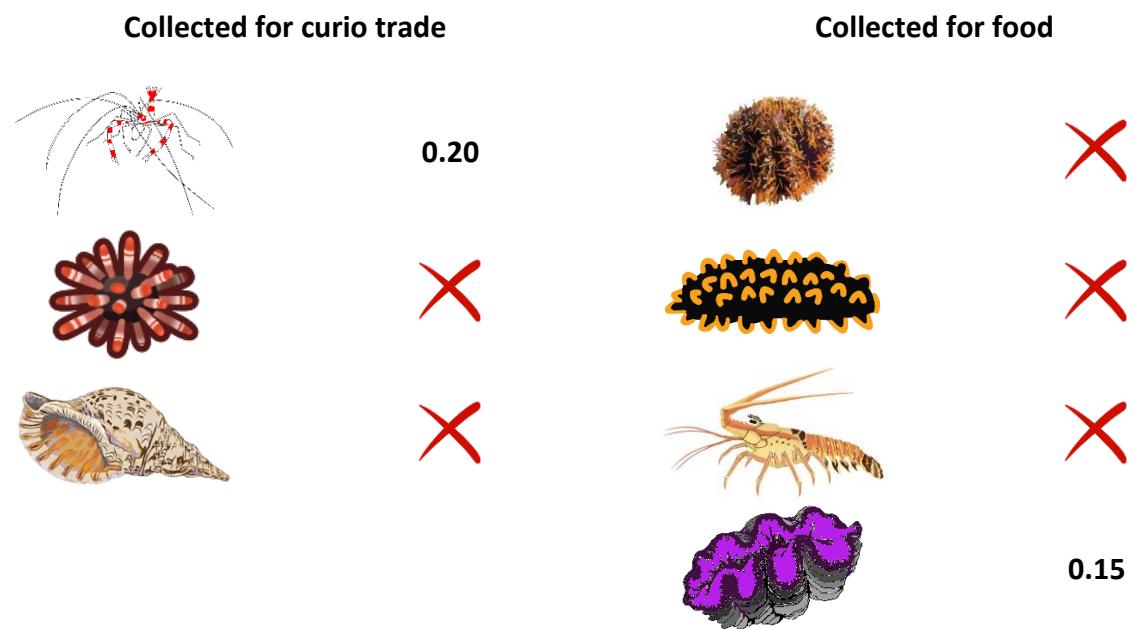
### Fish Abundance at Larapan (Individuals per 500m<sup>3</sup>)



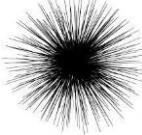
- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, fish targeted for live-food fish trade, is recorded.
- The abundance of fish targeted for food is low, except for snapper and parrotfish.

## Invertebrate Abundance at Larapan

(Individuals per 100m<sup>2</sup>)

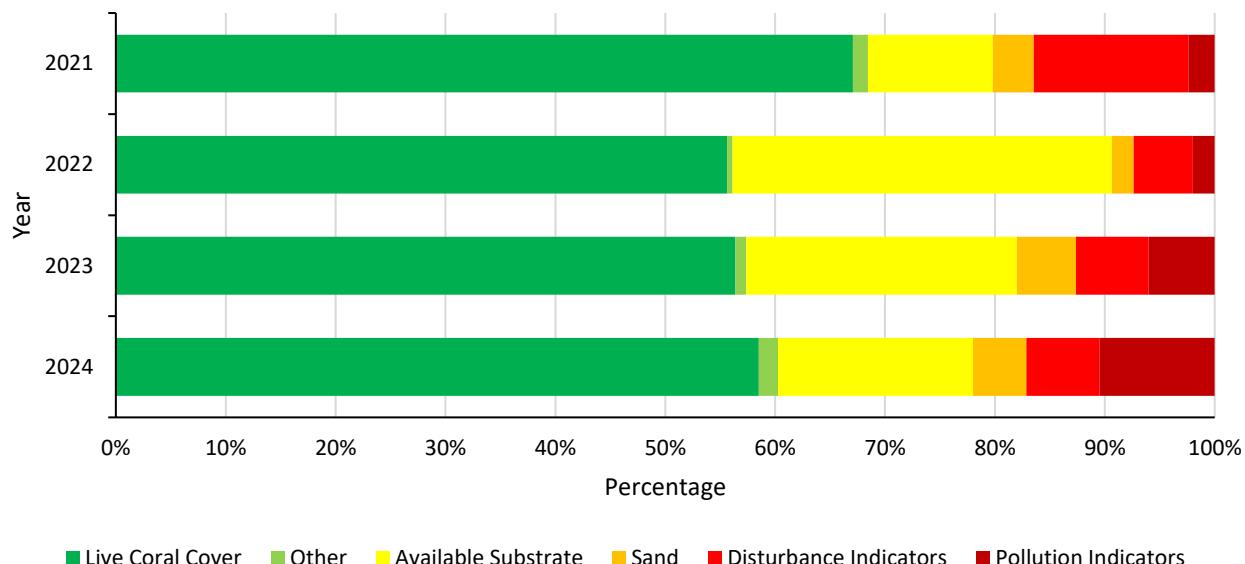


### Ecological Imbalance/Predator Outbreaks

	0.35
	0.10

- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not an issue in Larapan.
- For invertebrates targeted for food, only giant clam is recorded and the abundance is low.

### Reef Health at Larapan

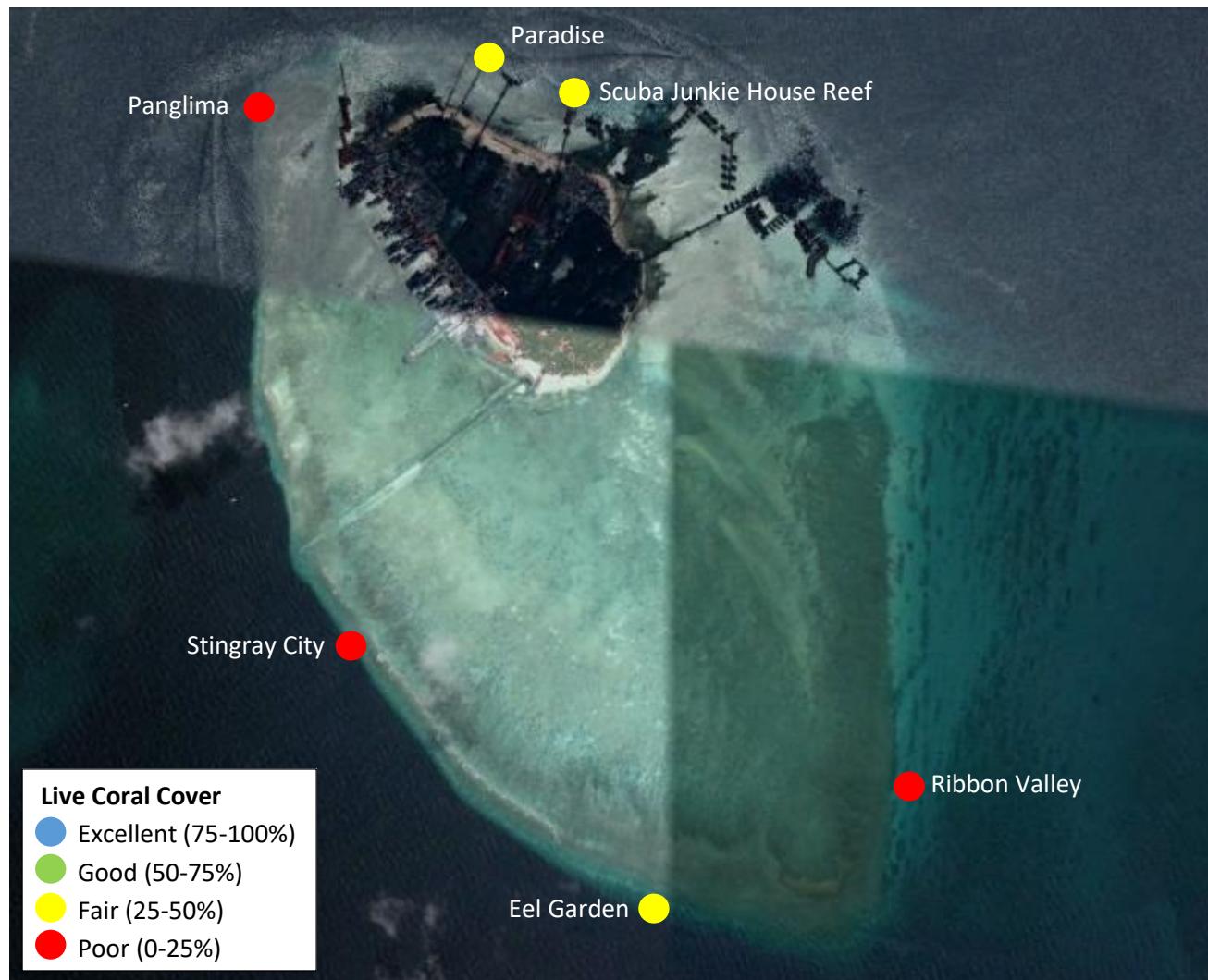


- Larapan reefs have maintained in 'good' condition.
- The decrease in live coral cover in 2022 is considered to reflect the elimination of 1 site, rather than an actual decrease in live coral cover.
- Disturbance indicators had decreased while pollution indicators had increased.

## Sabah – Mabul

Mabul is a small island off the south-eastern coast of Sabah. The island has been a fishing village since the 1970s. In the 1990s, it first became popular to divers due to its proximity to Sipadan Island, 15km away. This 20-hectare piece of land surfaces 2–3 m above sea level, consists mostly of flat ground and the aerial view is oval-shaped. Surrounding it are sandy beaches, perched on the northwest corner of a larger 2 km<sup>2</sup> reef. The reef is on the edge of the continental shelf and the seabed surrounding the reef slopes out to 25 to 30 m deep.

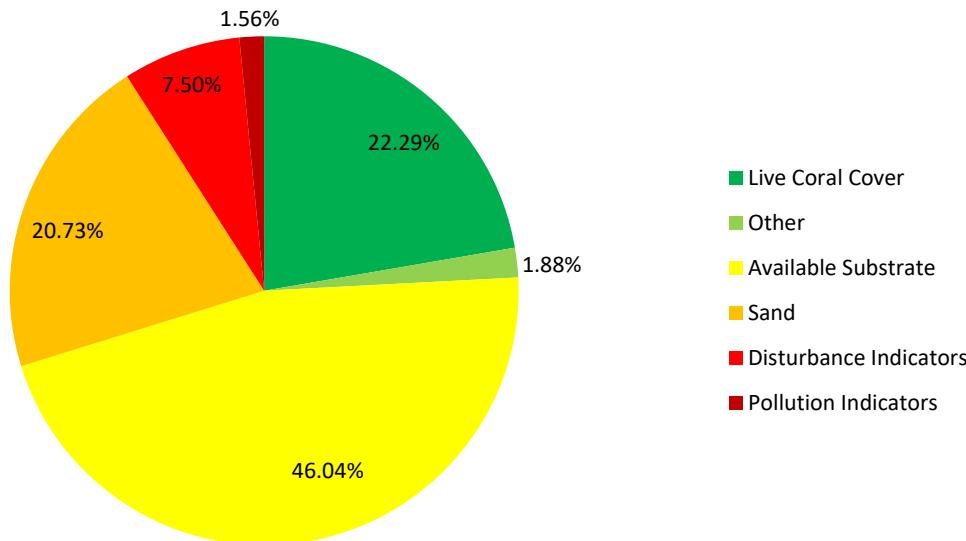
There are several dive resorts operating on Mabul Island, which provide accommodation for scuba divers – most are located on the island or on stilts over the water, while one is on a converted oil platform about 500 meters from the beach. There are also several home stay and backpacker accommodations that also arrange diving trips.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Fair' coral cover and 3 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Mabul



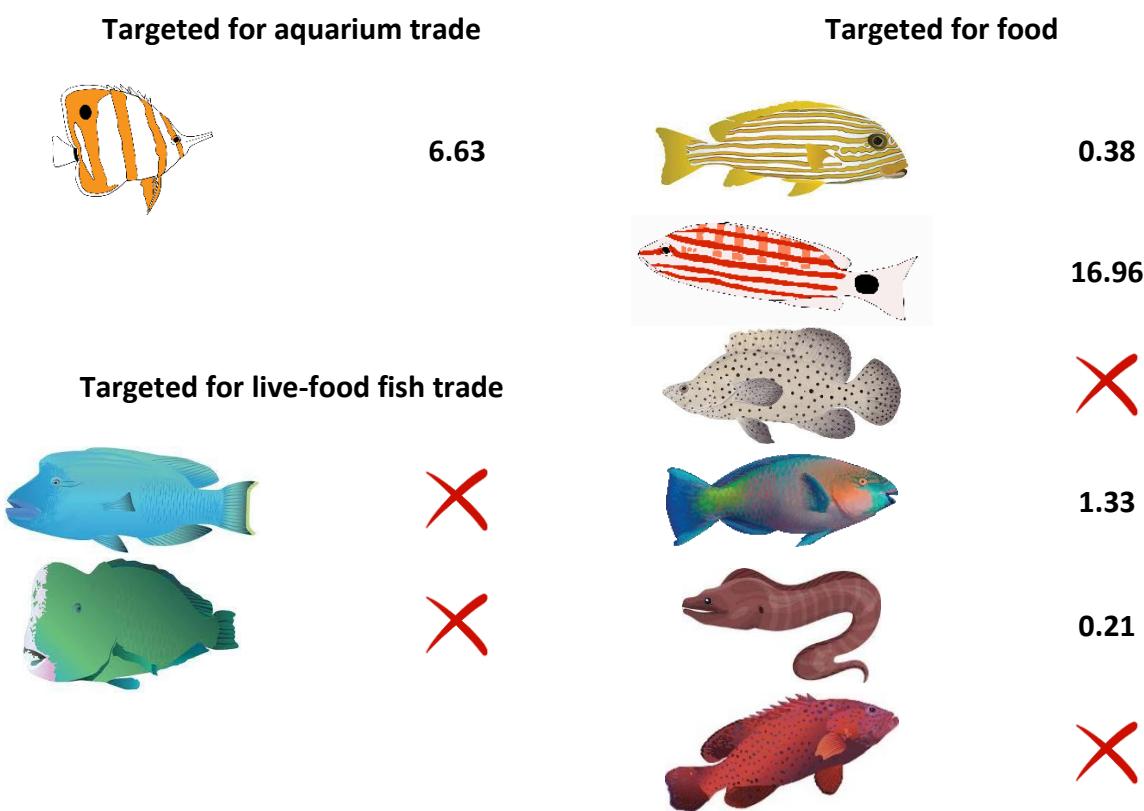
- Mabul reefs are dominated by available substrate, which is rock, for coral recruits to attach.
- Mean hard coral (reef builder) cover is 17.50%.
- In 'Poor' condition and below the North Borneo region average (39.56%).
- Sand level is very high. The level is especially high at Ribbon Valley and Scuba Junkie House Reef, both recorded 35.63%. Paradise recorded 26.25% and Panglima recorded 15.63%.
- Disturbance indicators are slightly high.
- Rubble level is especially high at Ribbon Valley (11.25%) and Scuba Junkie House Reef (13.75%).
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is very high, high level of disturbance indicators may deter coral growth if they are not dealt with.

### CORAL IMPACTS

- Boat anchor damage, dynamite fishing, discarded fishing nets and trash were recorded.
- All sites except one, with an average 1% of the reefs, were impacted by warm water bleaching.

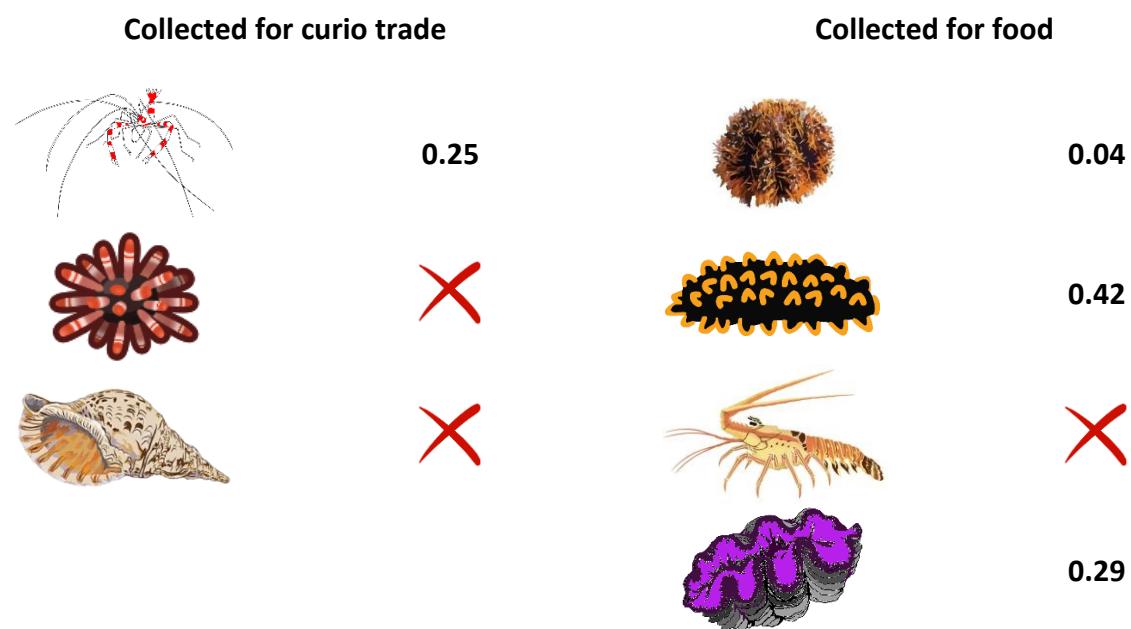


### Fish Abundance at Mabul (Individuals per 500m<sup>3</sup>)

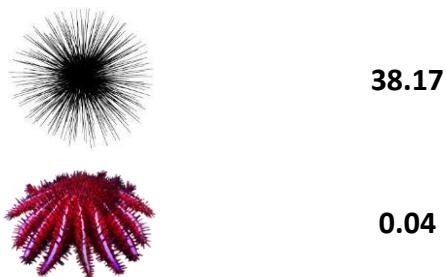


- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of fish targeted for live-food fish trade.
- The abundance of fish targeted for food is very low, except for snapper.
- Snapper abundance in Mabul is high.

## Invertebrate Abundance at Mabul (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



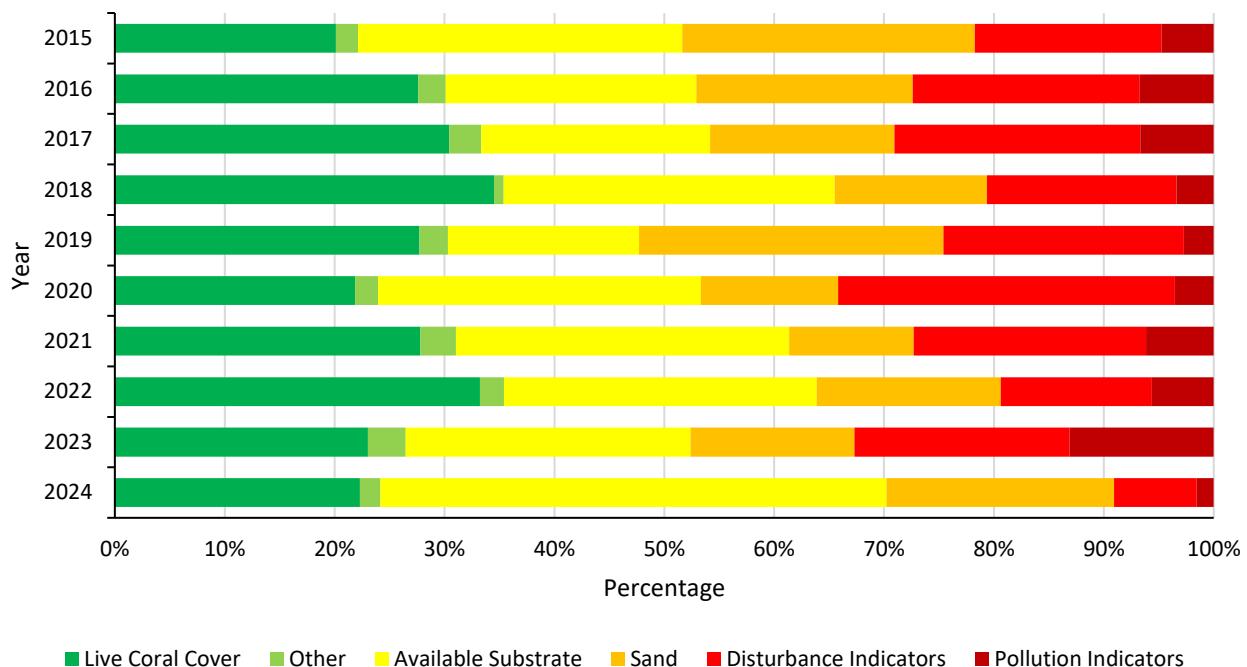
- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not an issue in Mabul.
- The abundance of invertebrates collected for food is very low.

### RARE ANIMALS

- All sites recorded green turtles, and one site recorded eagle ray.



### Reef Health at Mabul



- From 2015 to 2018, the health of Mabul reefs showed improvement. Sand level decreased during that period. Decreasing amount of sand can be an indication of decreasing disturbance. Reduced disturbance allows the reefs to improve.
- From 2018 to 2020, Mabul reefs deteriorated. The deterioration was likely due to physical damage caused by human activities and/or storm.
- The decrease in 2020 was also due to elimination of 3 sites that year because of Covid-19 pandemic which hampered survey efforts.
- From 2021 until 2022, Mabul reefs showed improvement. The improvement was likely due to reduced physical damage.
- In 2023 and 2024, the reefs deteriorated. The deterioration was due to various human-induced threats such as solid waste pollution, direct sewage discharge, and increasing level of tourism activities and fish bombing, as reported by the local youth divers. Although the 4<sup>th</sup> Global Coral Bleaching Event impacted the reefs around Mabul, it was not severe.
- Available substrate for coral recruits to attach is very high, possible chance of reef recovery if human impacts are dealt with.

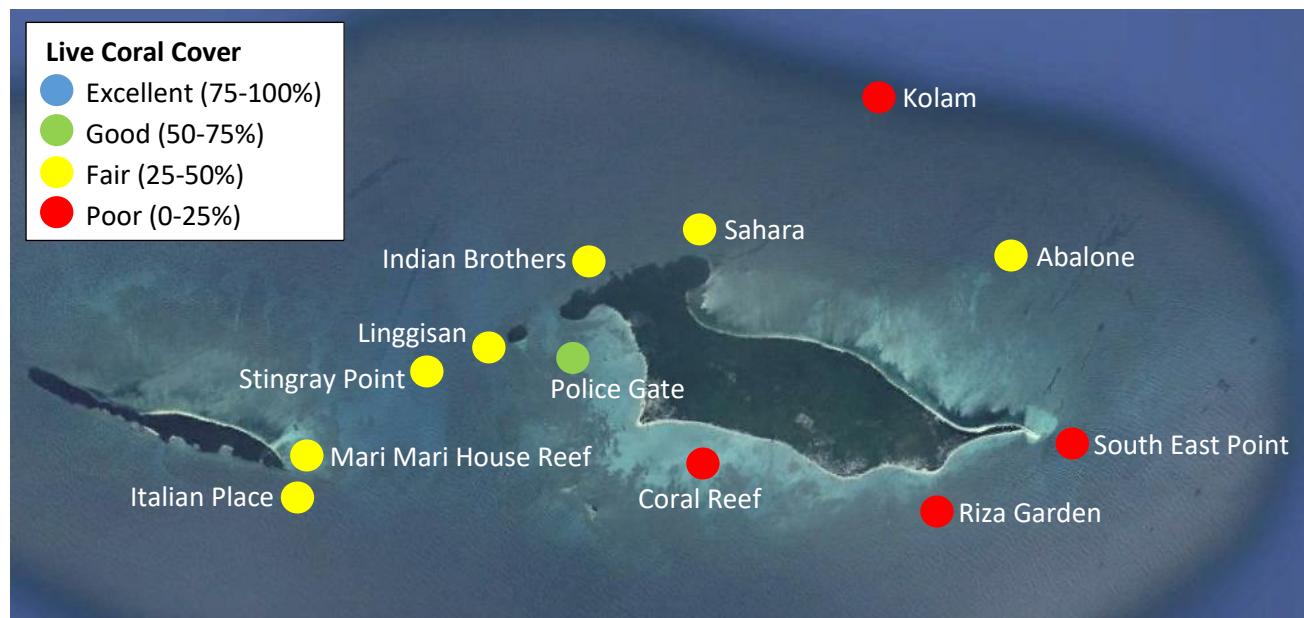
## Sabah – Mantanani

The Mantanani archipelago is located some 30km off the north-west coast of Sabah, off the town of Kota Belud. The largest island is Mantanani Besar; the other two are Mantanani Kecil and Linggisan.

Mantanani is mainly populated by Bajau Ubian, with a small population of about 1,000 in two villages. The two main economic activities are fisheries and tourism.

Mantanani is an increasingly popular snorkelling and diving destination, and tourist numbers have grown ten-fold in the last eight years, mainly day trippers from Kota Kinabalu. The number of tourism operators is increasing and there are plans for further development.

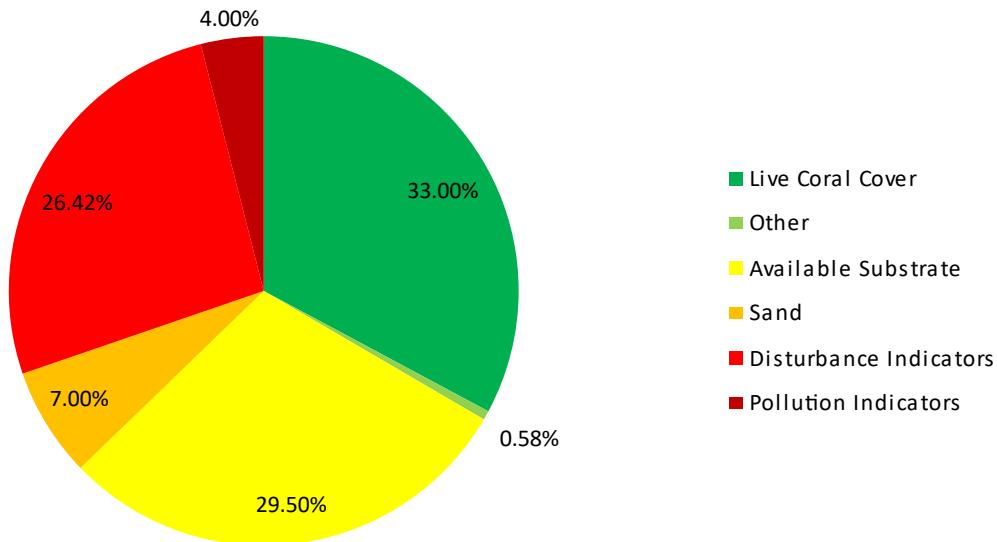
Fish bombing is a major problem in the area. This destructive fishing method has damaged large areas of reef around the islands. Blast detector data showed that a total of 2832 blasts were recorded from June 2014 until February 2020. The blasts were recorded within 5km radius of Mantanani.



Map showing the health categories of each survey site based on Live Coral Cover: 1 site has 'Good' coral cover, 7 are in 'Fair' condition and 4 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Mantanani



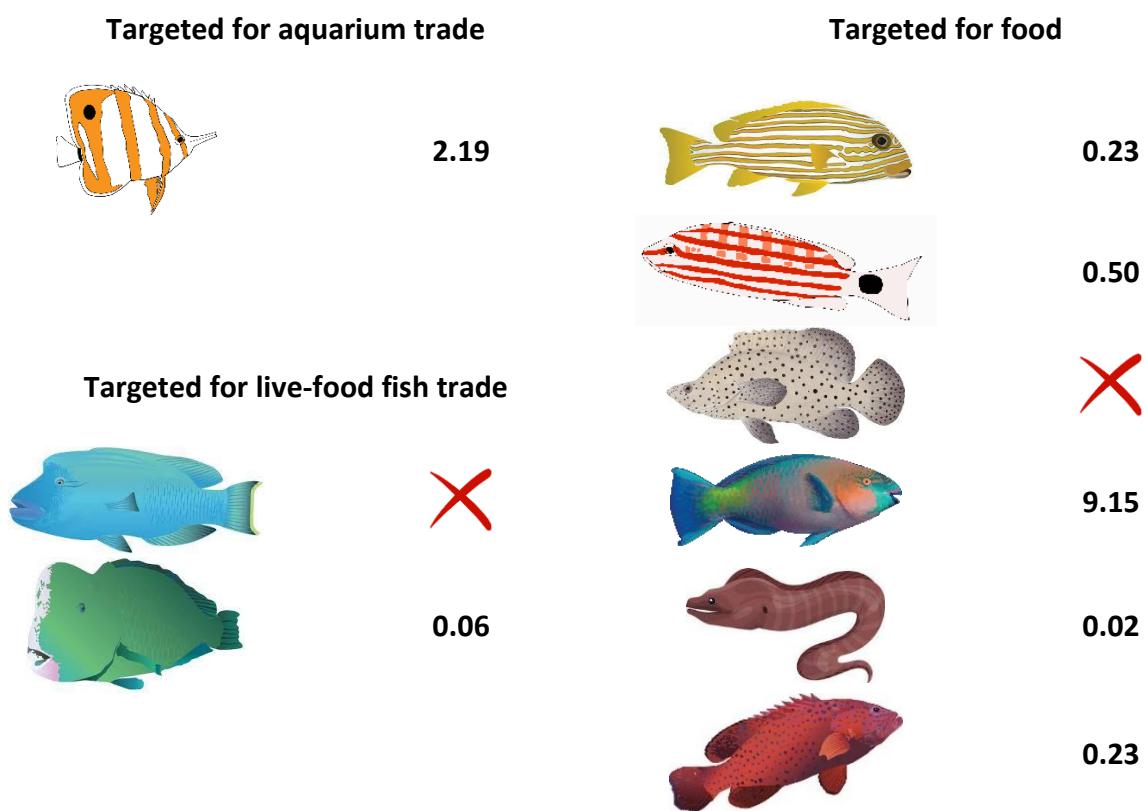
- Mantanani reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 32%.
- In 'Fair' condition and below the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is very high.
- Disturbance indicators are very high.
- Rubble level is very high at many sites. The level is especially high at Coral Reef (65%), Italian Place (43%) and Riza Garden (41%). Rubble level at the rest of the sites ranges from 10% to 29%. Only Kolam and Stingray Point recorded below 9%.

### CORAL IMPACTS

- Boat anchor damage, dynamite fishing, discarded fishing nets and trash were recorded at many sites.
- Based on local knowledge, gleaning and spearfishing activities are active.
- Many sites, with an average 2% of the reefs, were impacted by warm water bleaching.

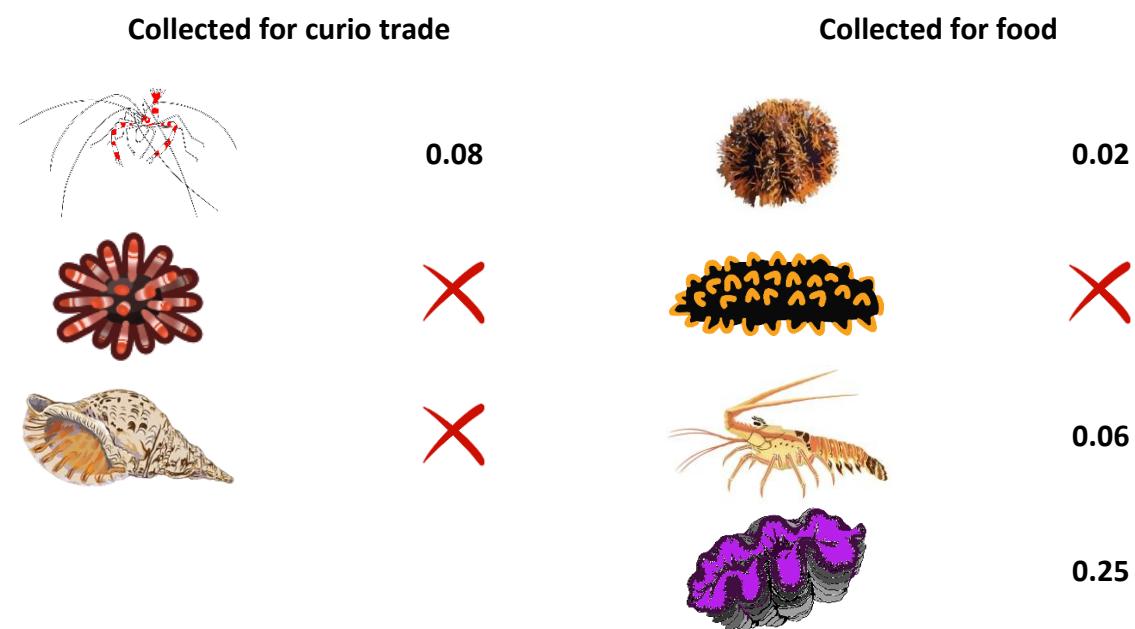


### Fish Abundance at Mantanani (Individuals per 500m<sup>3</sup>)

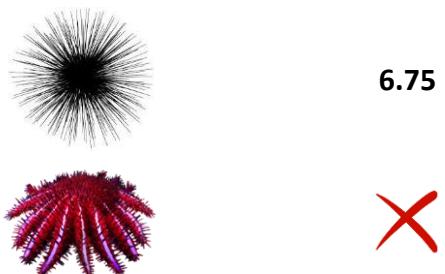


- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, indicators targeted for live-food fish trade, is recorded.
- For fish targeted for food, only barramundi cod is absent. Parrotfish abundance is high but the abundance of the rest of the indicators is very low.

## Invertebrate Abundance at Mantanani (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



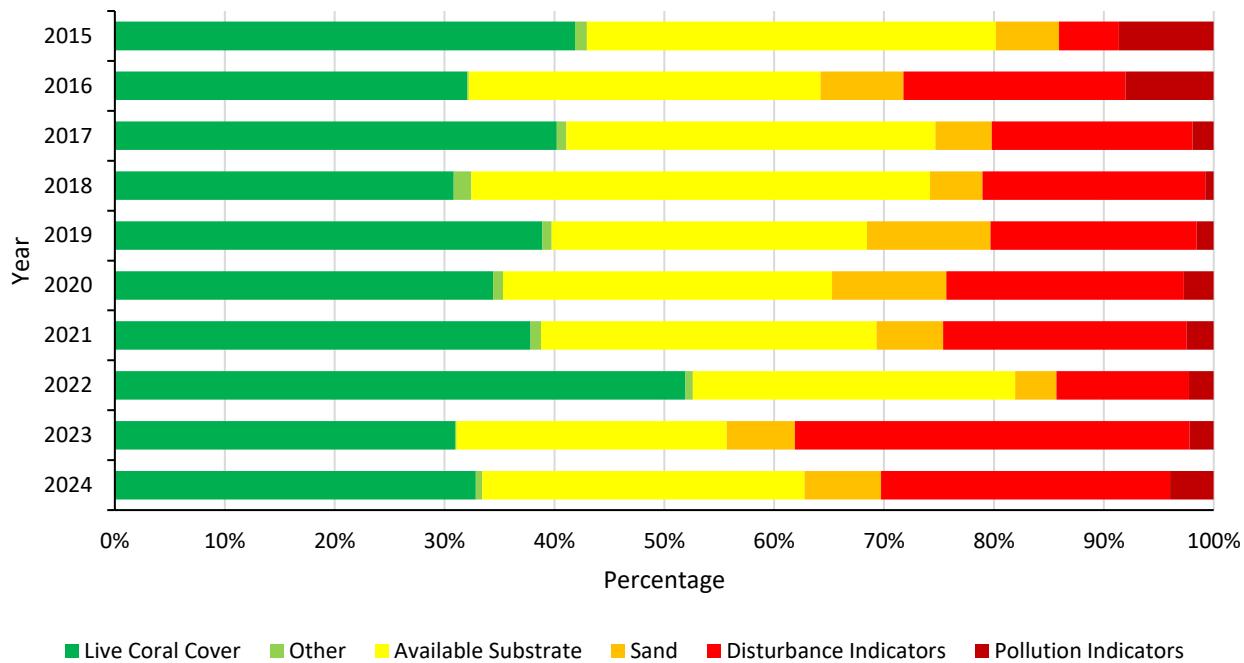
- Banded coral shrimp, indicator for curio trade, is recorded.
- Invertebrates targeted for food are very low in abundance.

### RARE ANIMALS

- Turtles were recorded.



### Reef Health at Mantanani



- The health of Mantanani reefs shows variation over the years. Overall, the reefs have deteriorated.
- The deterioration was likely due to physical damage caused by human activities and/or storm.
- Available substrate for coral recruits to attach is very high, possible chance of reef recovery if human impacts are dealt with.

## Sabah – Mataking

Mataking Island is approximately 35km east from the major town of Semporna in the South of Sabah. It is a well-known tourist spot and has one resort. Diving and snorkelling are the main activities on the island.

While the island has no legal protected status, the presence of the resort has effectively created a small, protected area, keeping fishermen (including fish bombers) away from parts of the reefs surrounding the island.

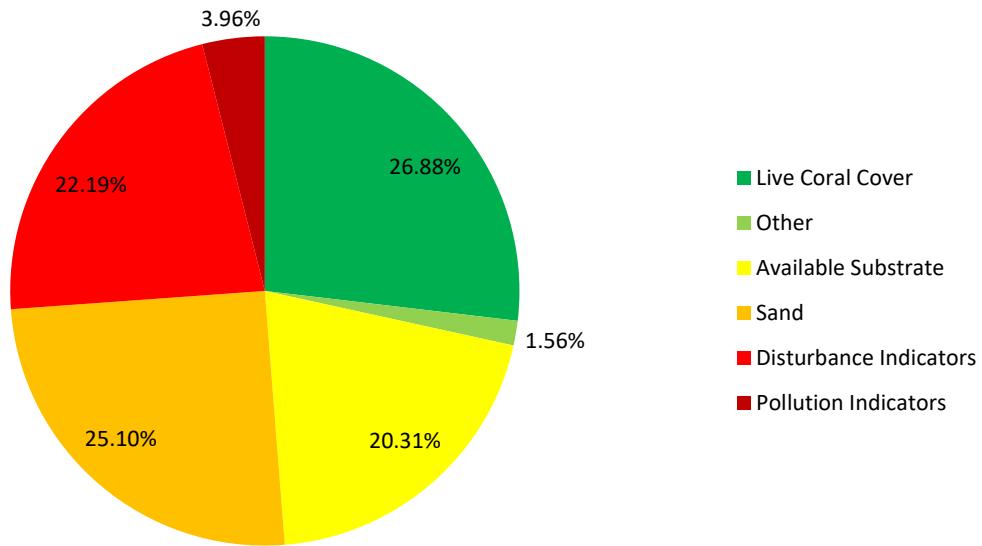
The island has fringing reefs, and coral extends down to almost 30m. Coral reefs around this, and surrounding islands have been extensively damaged by fish bombing in the past, and fish bombing continues in some areas nearby.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Fair' coral cover and 3 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Mataking



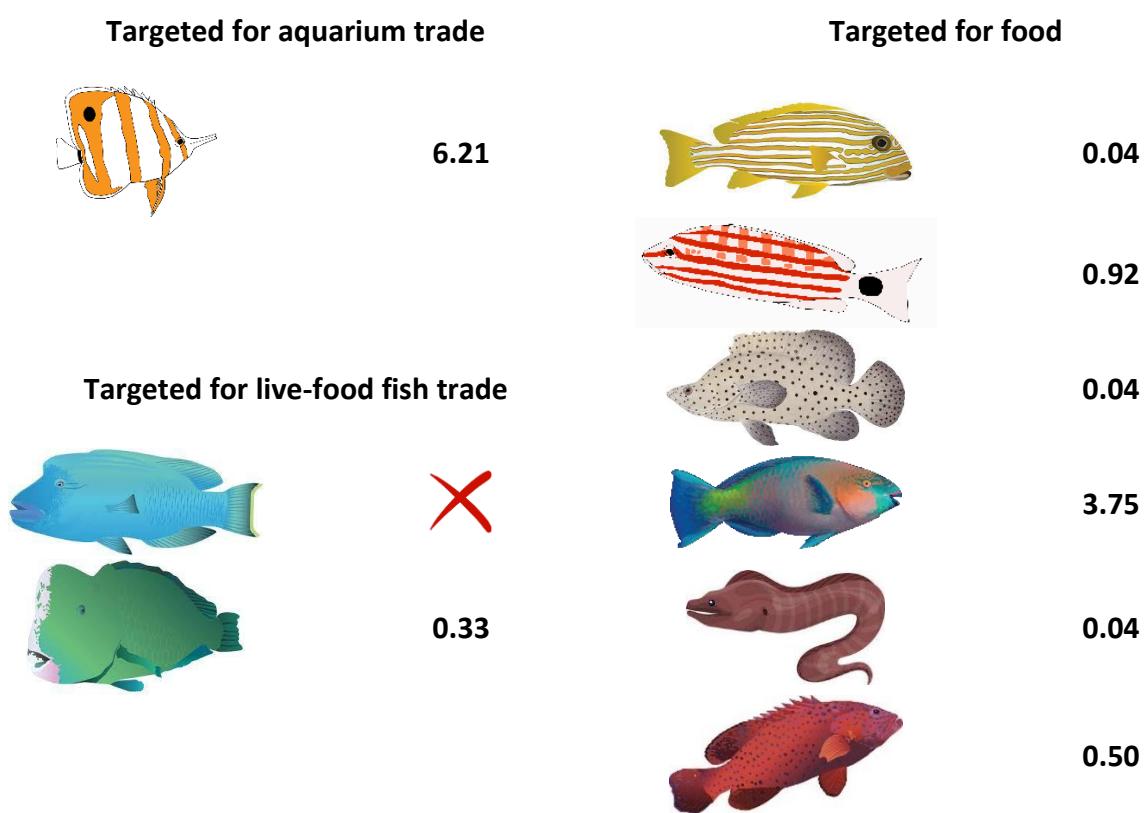
- Mataking reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 25.52%.
- In 'Fair' condition and below the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is very high.
- Sand level is very high. It is especially high at Mataking House Reef (51.25%), Pandanan Bay (35.63%) and Sweetlips Rock (32.50%).
- Disturbance indicators are very high.
- Rubble level is high at all sites. Cahaya Way and Coral Garden recorded over 35% rubble. The rest of the sites recorded 9% to 24% rubble.

### CORAL IMPACTS

- Boat anchor damage and trash were recorded at many sites.
- Some sites were impacted by discarded fishing net and warm water bleaching, with an average 1% of the reefs were bleached.

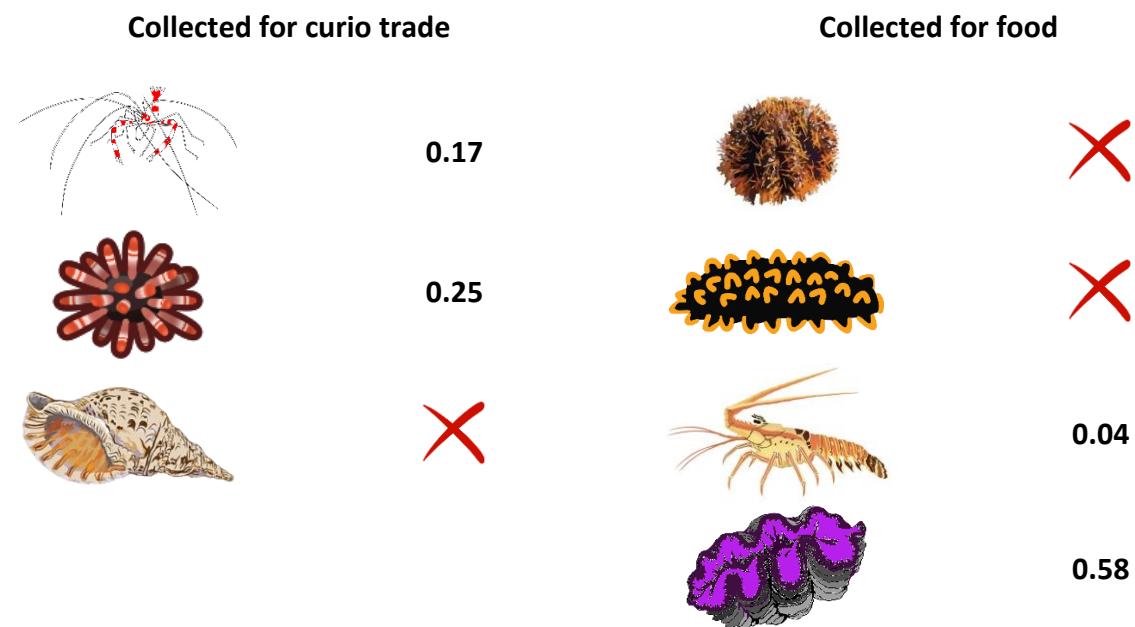


### Fish Abundance at Mataking (Individuals per 500m<sup>3</sup>)

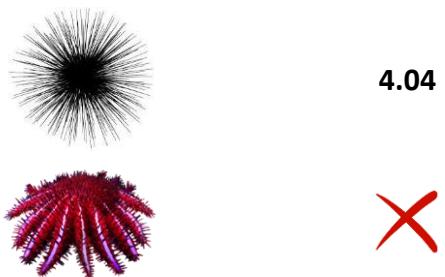


- Butterflyfish, indicator for aquarium trade, is recorded.
- Bumphead parrotfish, indicators targeted for live-food fish trade, is recorded.
- All fish targeted for food is recorded, however the abundance is very low except for parrotfish.

## Invertebrate Abundance at Mataking (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



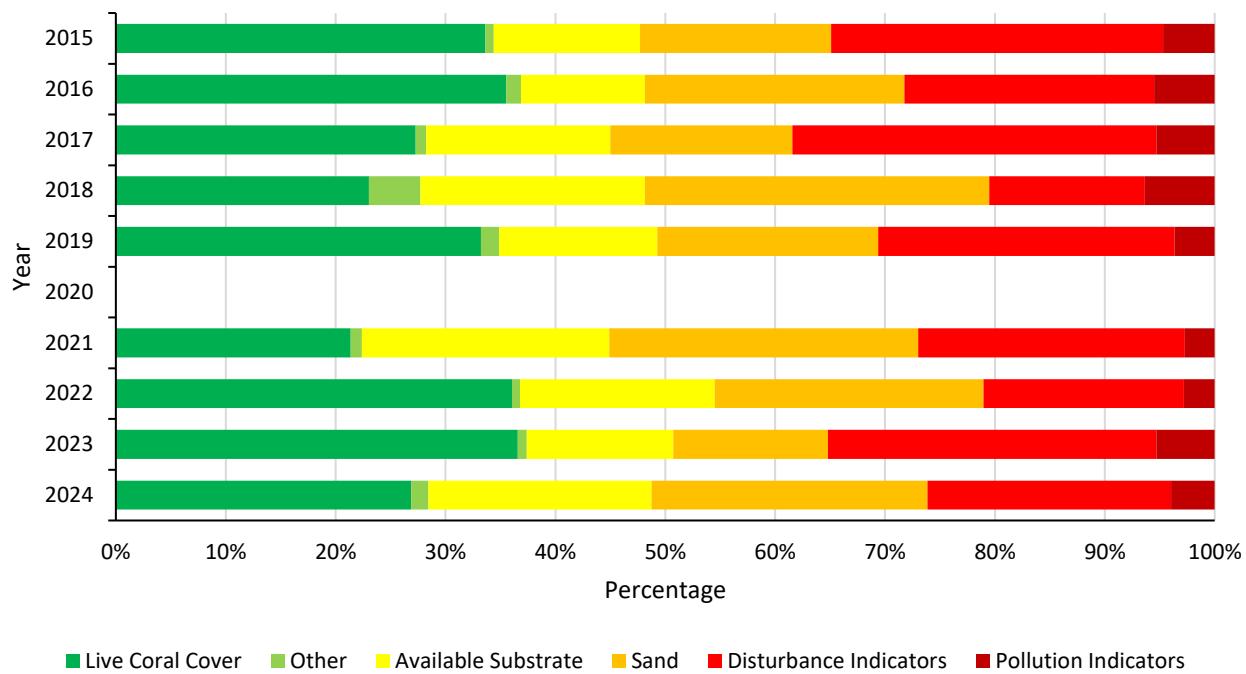
- Banded coral shrimp and pencil urchin, indicators for curio trade, are recorded.
- Invertebrates targeted for food are very low in abundance.

### RARE ANIMALS

- Turtles were recorded.



### Reef Health at Mataking



- The health of Mataking reefs shows variation over the years.
- No survey data was collected in 2020 due to Covid-19 pandemic which hampered survey efforts.

## Sabah – Pulau Penyu

Pulau Penyu lies in the Sulu Sea some 40km north of Sandakan, Sabah. It comprises of three islands: Pulau Selingan, Pulau Bakungan Kecil and Pulau Gulisan. The park gained its popularity from the green and hawksbill turtles which lay their eggs on the beaches of the islands. All the three islands are protected within marine parks on both sides of the Malaysian and Philippine borders. The park covers an area of 17.4km<sup>2</sup> and administered by Sabah Parks.

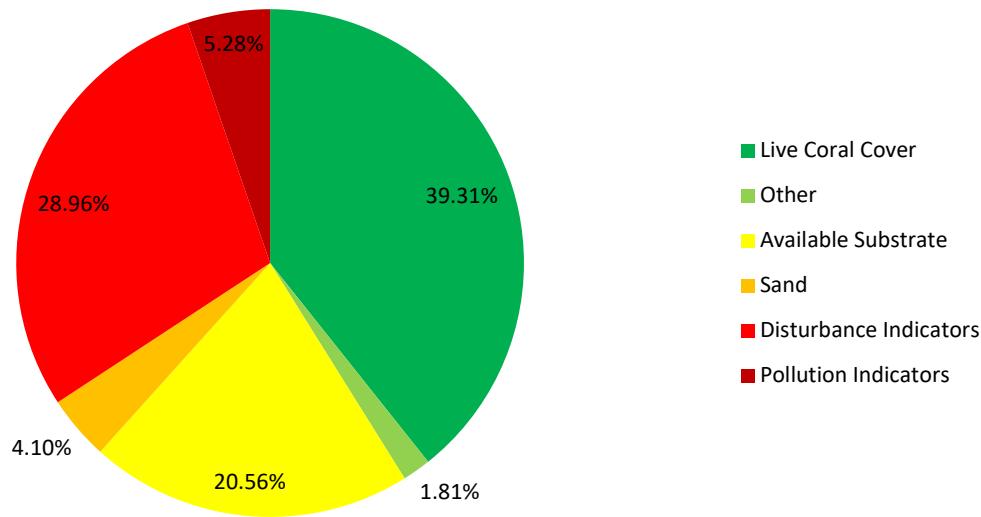
Only on Selingan are there chalets for overnight visitors, and those who wish to see the turtles laying egg must stay overnight. However, park rules and regulations are strictly enforced, and visitors are not allowed on the beach from sunset to sunrise so as not to disturb the turtles. A ranger will call all visitors to observe only one turtle laying eggs per night.



Map showing the health categories of each survey site based on Live Coral Cover: 3 sites have 'Good' coral cover, 3 are in 'Fair' condition and 3 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Pulau Penyu



- Pulau Penyu reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 37.50%.
- In 'Fair' condition and below the North Borneo region average (39.56%).
- Disturbance indicators are very high.
- Rubble level is especially high at Pulau Bakungan 1, 5m (11.88%) and 10m (21.25%).
- Silt level is especially high at Pulau Bakungan 2 (10m) which recorded 58.75% and Pulau Gulisan which recorded 70%.

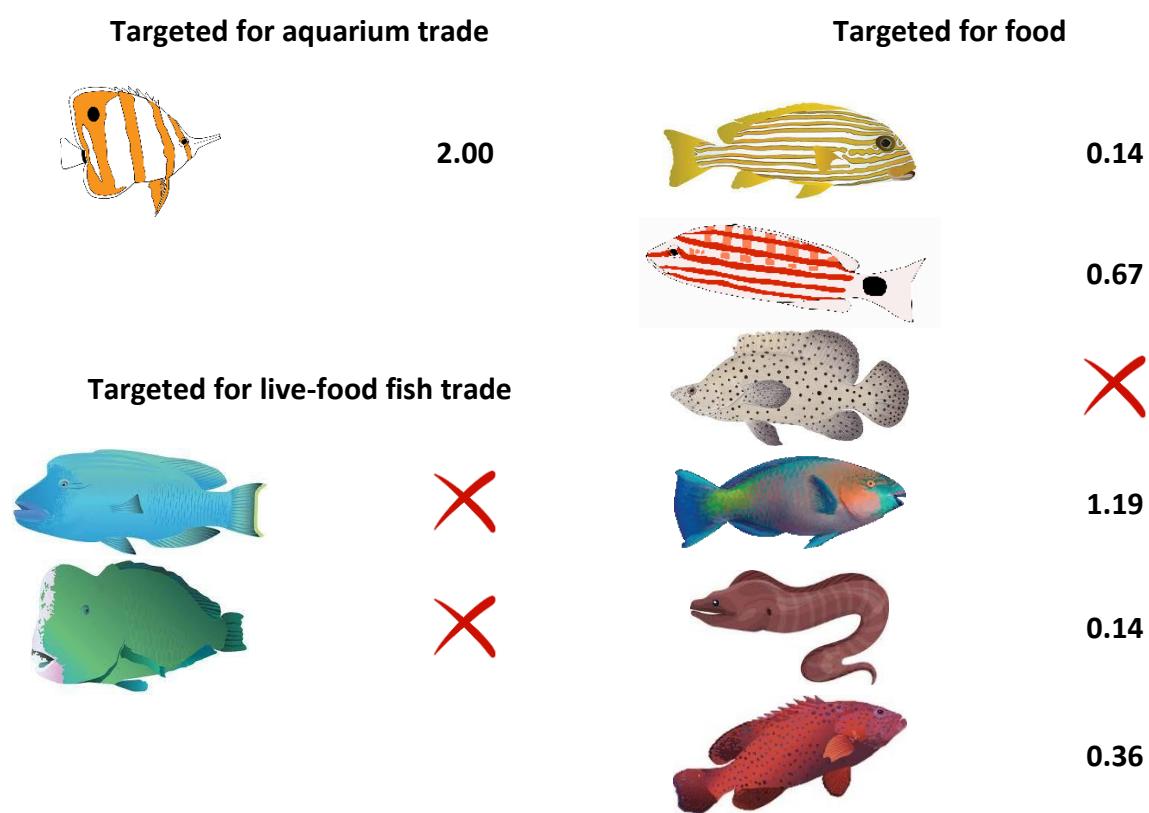
### CORAL IMPACTS

- Discarded fishing net and trash were recorded.
- Some sites, with an average 1% of the reefs, were impacted by warm water bleaching.



### Fish Abundance at Pulau Penyu

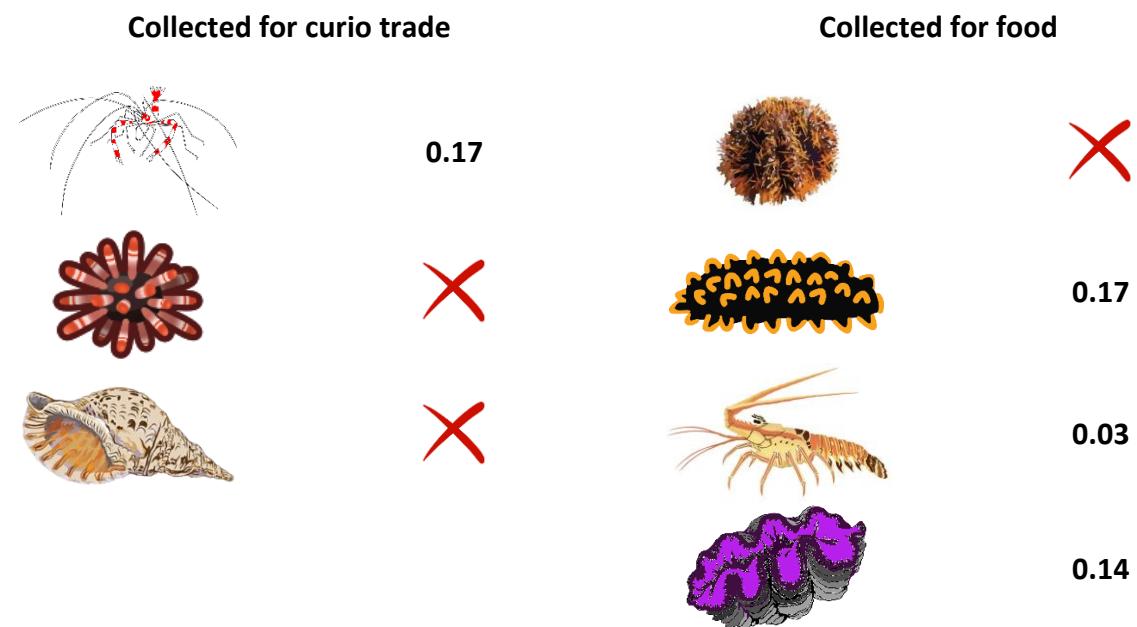
(Individuals per 500m<sup>3</sup>)



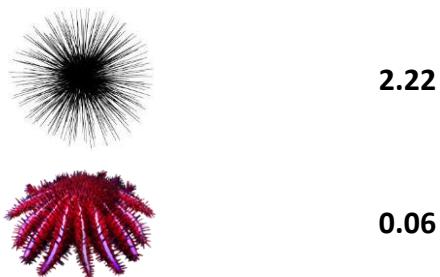
- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Pulau Penyu

(Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



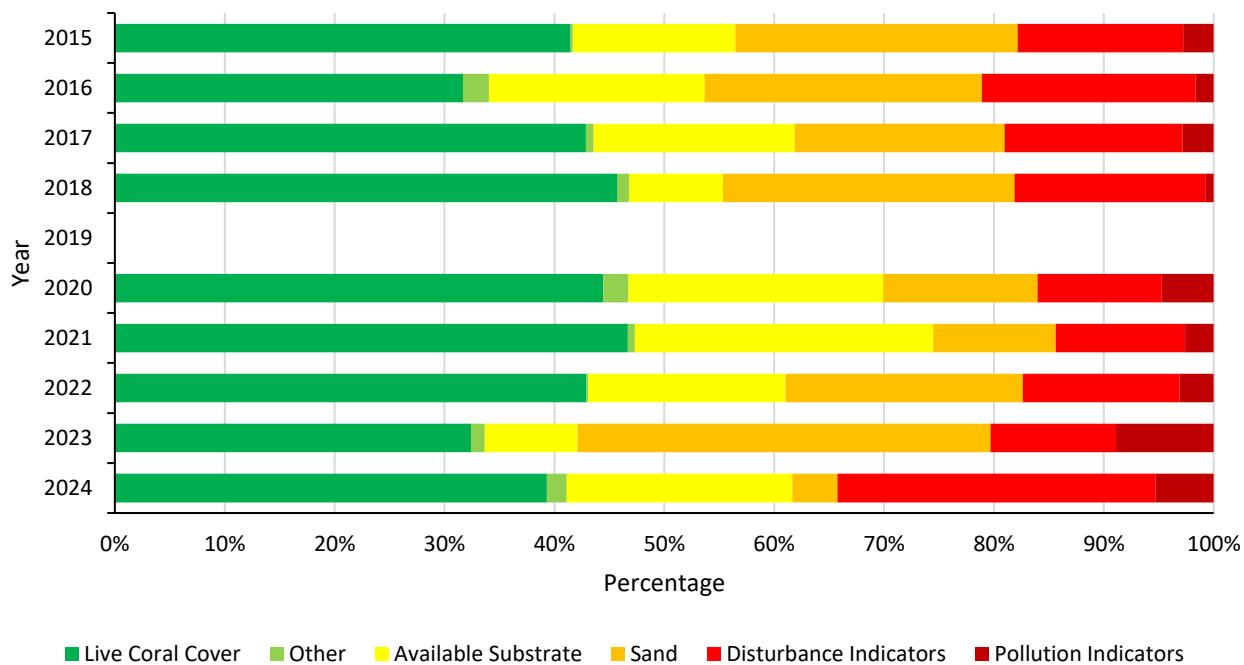
- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not an issue in Pulau Penyu.
- The abundance of invertebrates collected for food is very low.

### RARE ANIMALS

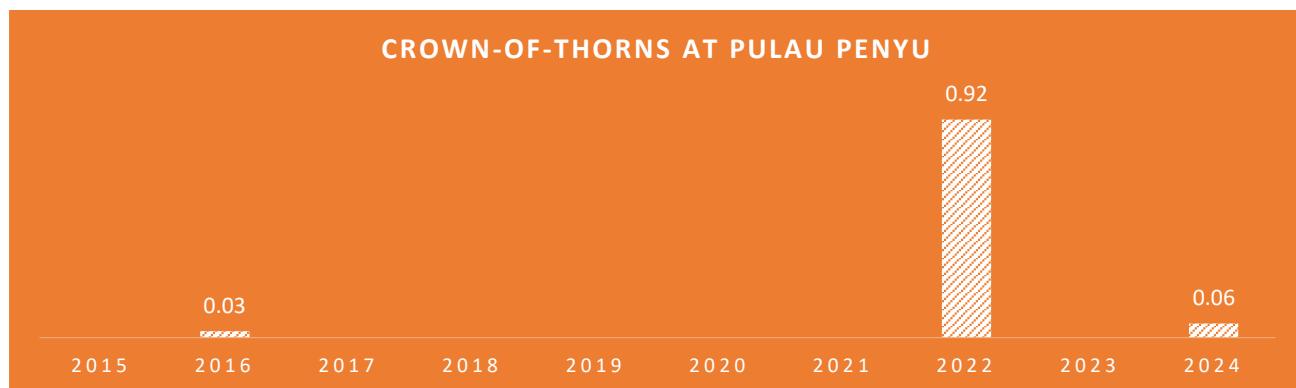
- Turtles were recorded.



## Reef Health at Pulau Penyu

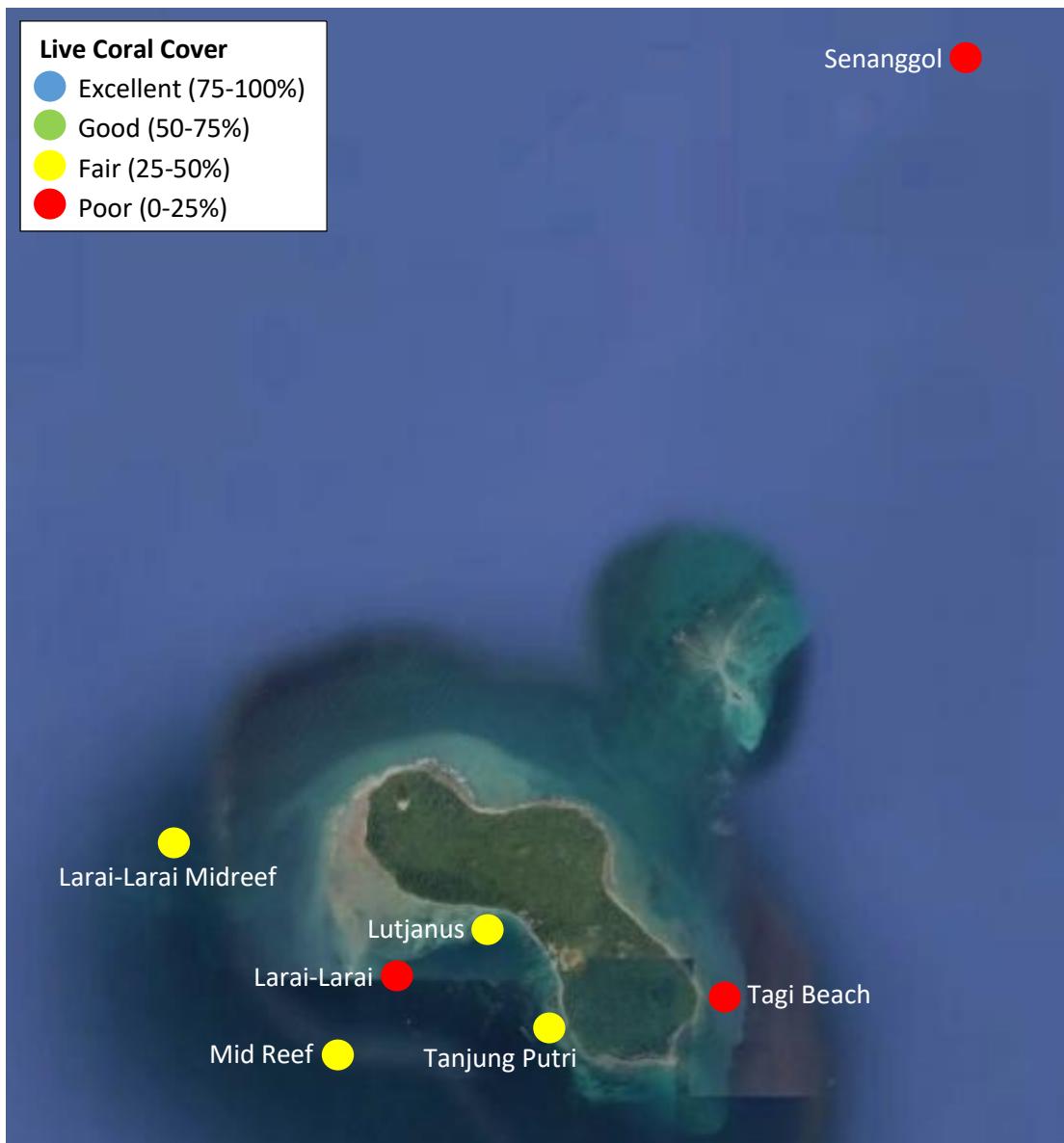


- Pulau Penyu reefs are showing a declining trend over the last 4 years.
- The deterioration is likely due to physical damage caused by human activities and/or storm and raised level of nutrient in the waters around the island.
- In 2022, the abundance of crown-of-thorns had increased drastically and was above what a healthy reef can sustain (0.2-0.3 individual per 100m<sup>2</sup>). Since 2023, it is no longer a concern in Pulau Penyu.



## Sabah – Pulau Tiga

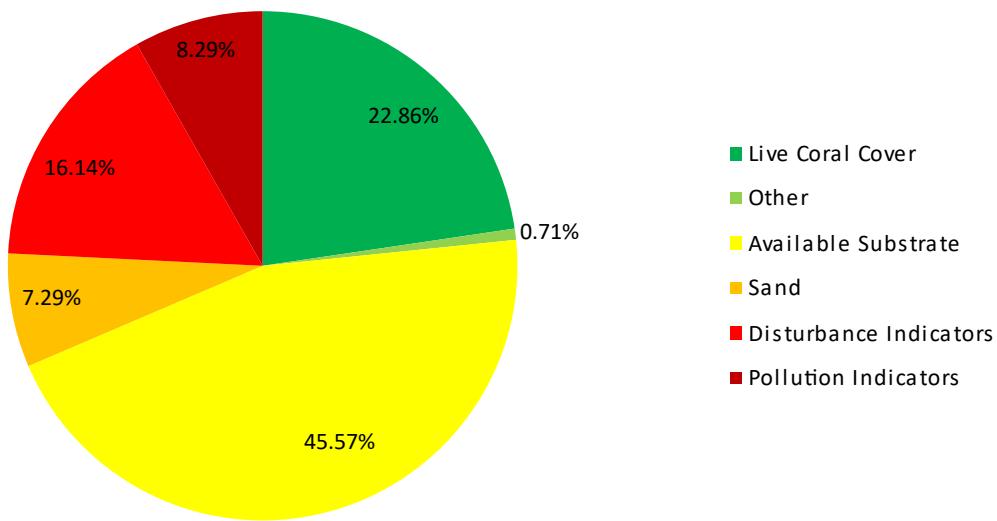
Pulau Tiga is one of a group of small uninhabited islands in Kimanis Bay off the western coast of Sabah. The islands were formed on 21 September 1897, when an earthquake on Mindanao caused a volcanic eruption near Borneo. The island is 607 hectares in size and has a couple of active mud volcanoes at the highest part of the island. Pulau Tiga is one of the three islands that make up Tiga Island Park. The Park Headquarters are on the island, comprising an office complex and accommodation for the park staff and visiting scientists.



Map showing the health categories of each survey site based on Live Coral Cover: 4 sites have 'Fair' coral cover and 3 are in 'Poor' condition.

## Coral Cover and Health

Substrate Composition at Pulau Tiga



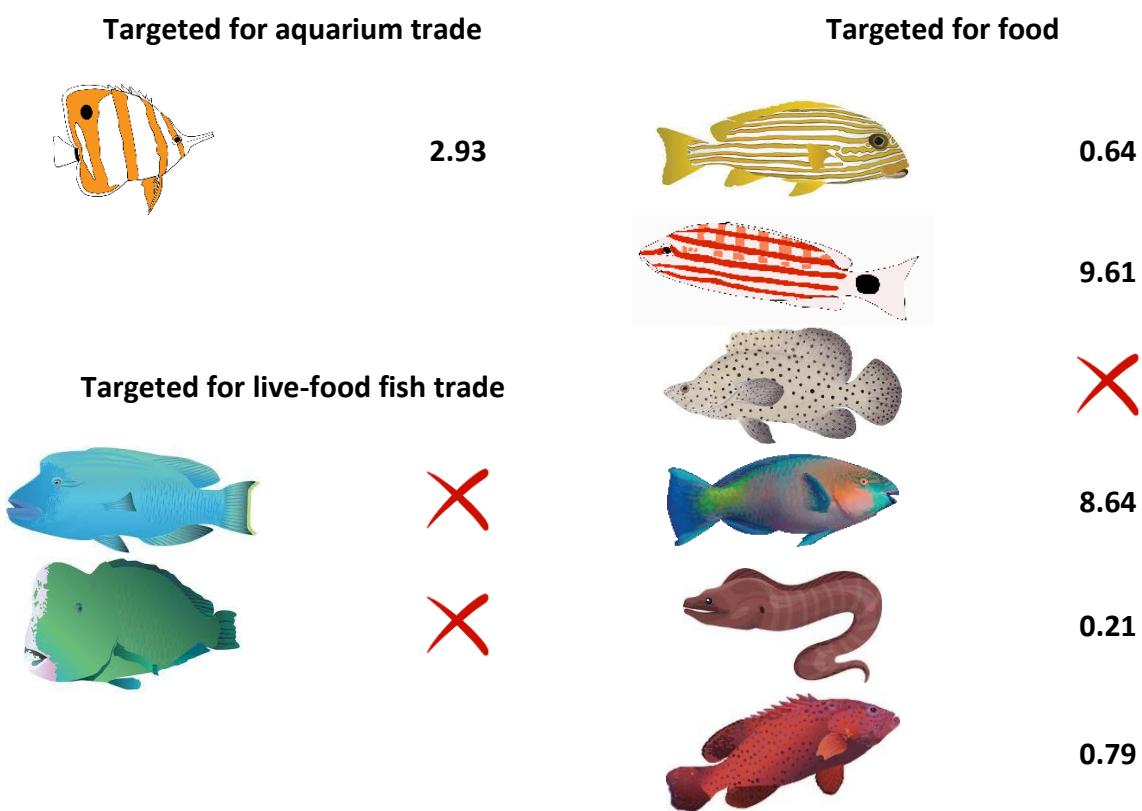
- Pulau Tiga reefs are dominated by available substrate, which is rock, for coral recruits to attach.
- Mean hard coral (reef builder) cover is 22.14%.
- In 'Poor' condition and below the North Borneo region average (39.56%).
- Sand level is slightly high. The level is especially high at Tanjung Putri (16%)
- Disturbance indicators are high.
- Rubble level is especially high at Larai-Larai (34%) and Senanggol (36%).
- Pollution indicators are slightly high.
- The level of nutrient indicator algae is especially high at Larai-Larai Midreef (10%) and Tagi Beach (16%).
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is very high, high level of disturbance indicators may deter corals growth if they are not dealt with.

### CORAL IMPACTS

- Trash was recorded.
- All sites, with an average 4% of the reefs, were impacted by warm water bleaching.

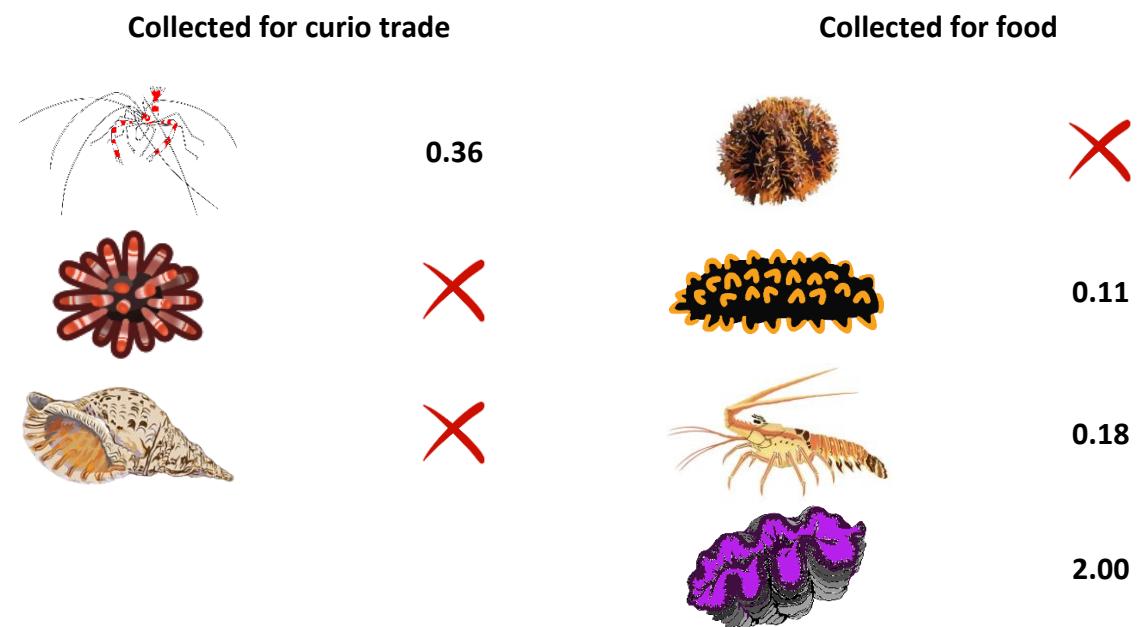


## Fish Abundance at Pulau Tiga (Individuals per 500m<sup>3</sup>)

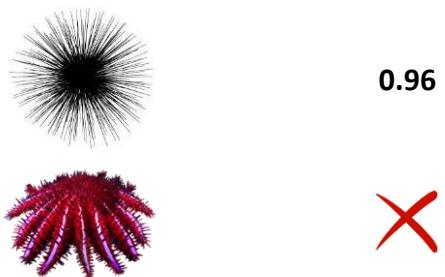


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of snapper and parrotfish, fish targeted for food, is high. The abundance of the rest of the indicators targeted for food is very low.

## Invertebrate Abundance at Pulau Tiga (Individuals per 100m<sup>2</sup>)



### Ecological Imbalance/Predator Outbreaks



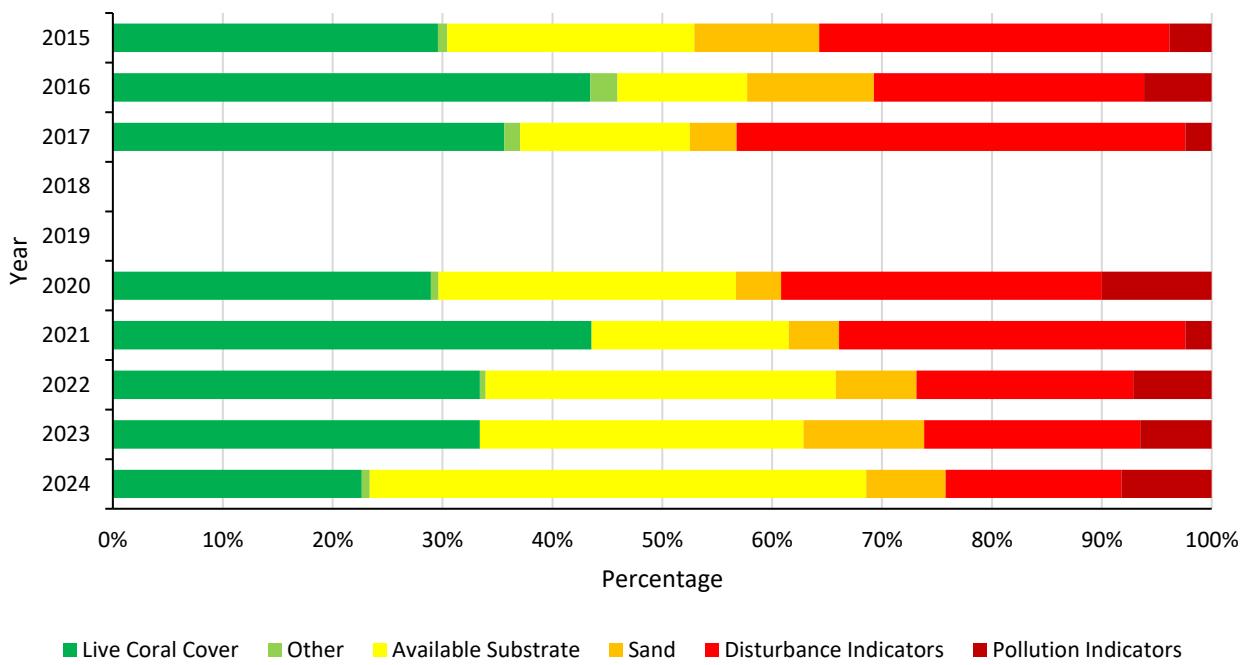
- Banded coral shrimp, indicator for curio trade, is recorded.
- Invertebrates targeted for food are low in abundance.

### RARE ANIMALS

- Turtle, mangrove whipray and great barracuda were recorded.



### Reef Health at Pulau Tiga

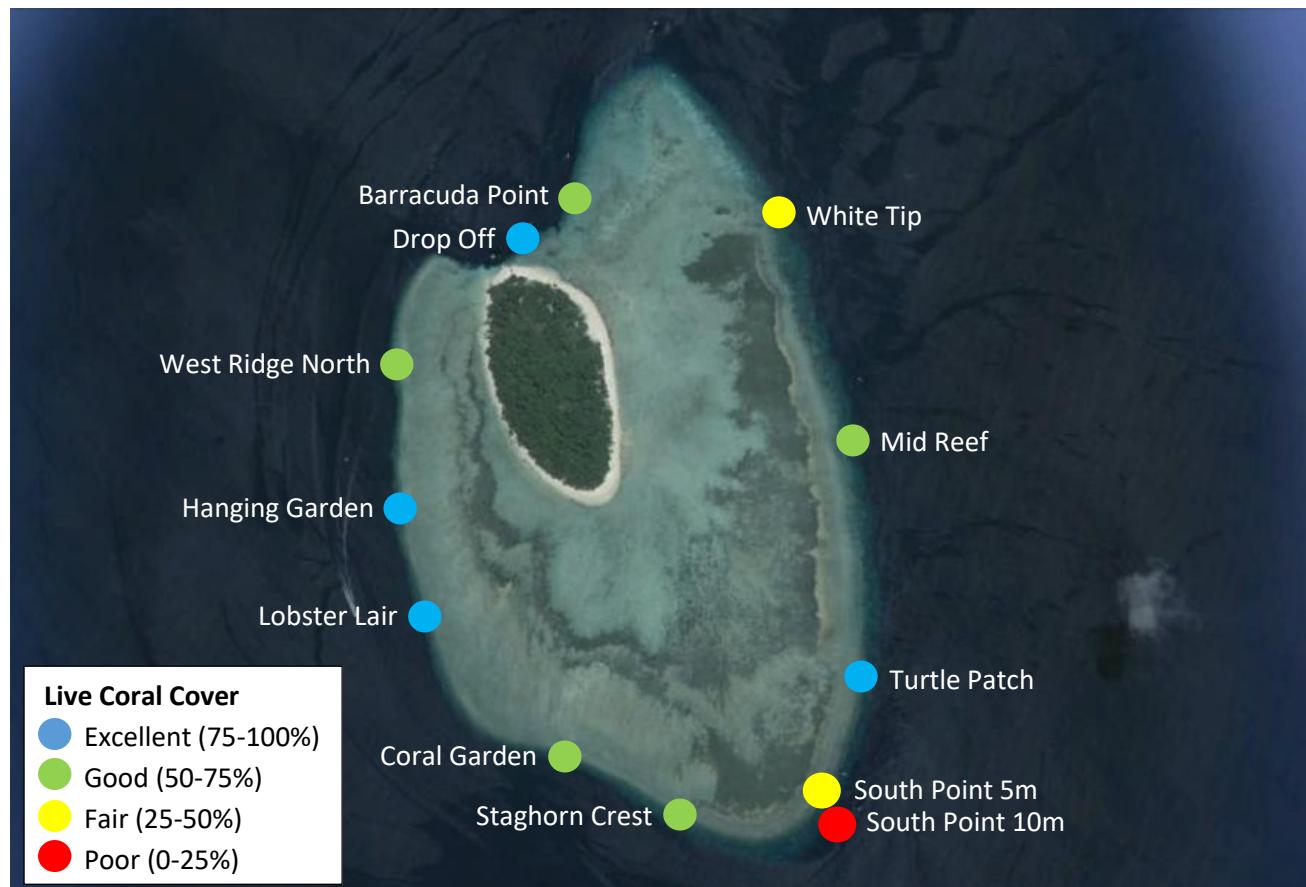


- From 2015 to 2021, the health of Pulau Tiga reefs showed variation.
- Starting from 2022, the reefs showed deterioration. The deterioration was likely due to raised level of nutrient in the waters.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.

## Sabah – Sipadan

Sipadan is the only oceanic island in Malaysia, rising 600 metres from the seabed and rated by many dive journals as one of the top destinations for diving in the world. Sipadan is located in the Celebes Sea off the east coast of Sabah. It was formed by living corals growing on top of an extinct volcanic cone that took thousands of years to develop.

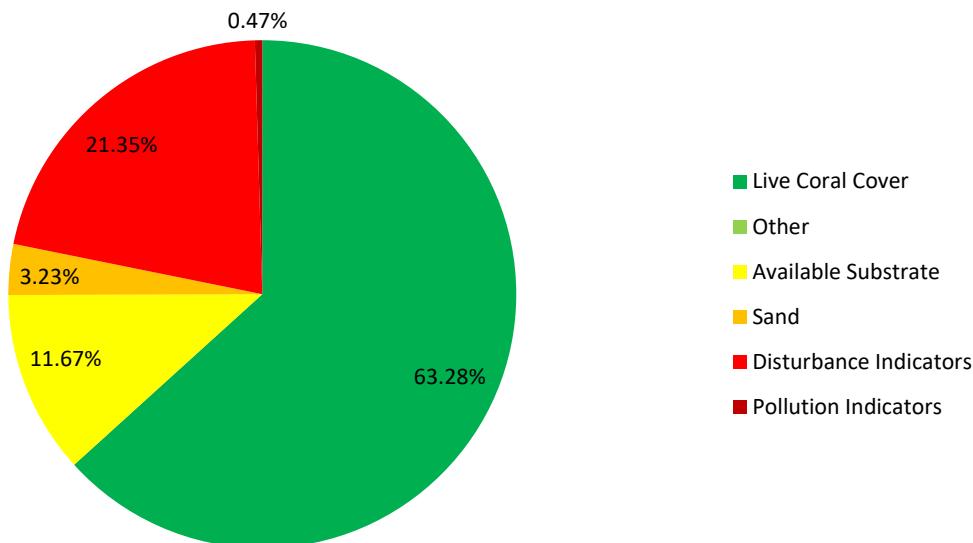
Sipadan is located at the heart of the Indo-Pacific basin, the centre of one of the richest marine habitats in the world. More than 3,000 species of fish and hundreds of coral species have been classified in this ecosystem. Visiting Sipadan requires a permit issued by Sabah Parks. Since 2019, there are 178 permits available each day.



Map showing the health categories of each survey site based on Live Coral Cover: 4 sites have 'Excellent' coral cover, 5 are in 'Good' condition, 2 show 'Fair' health and 1 is in 'Poor' state.

## Coral Cover and Health

Substrate Composition at Sipadan



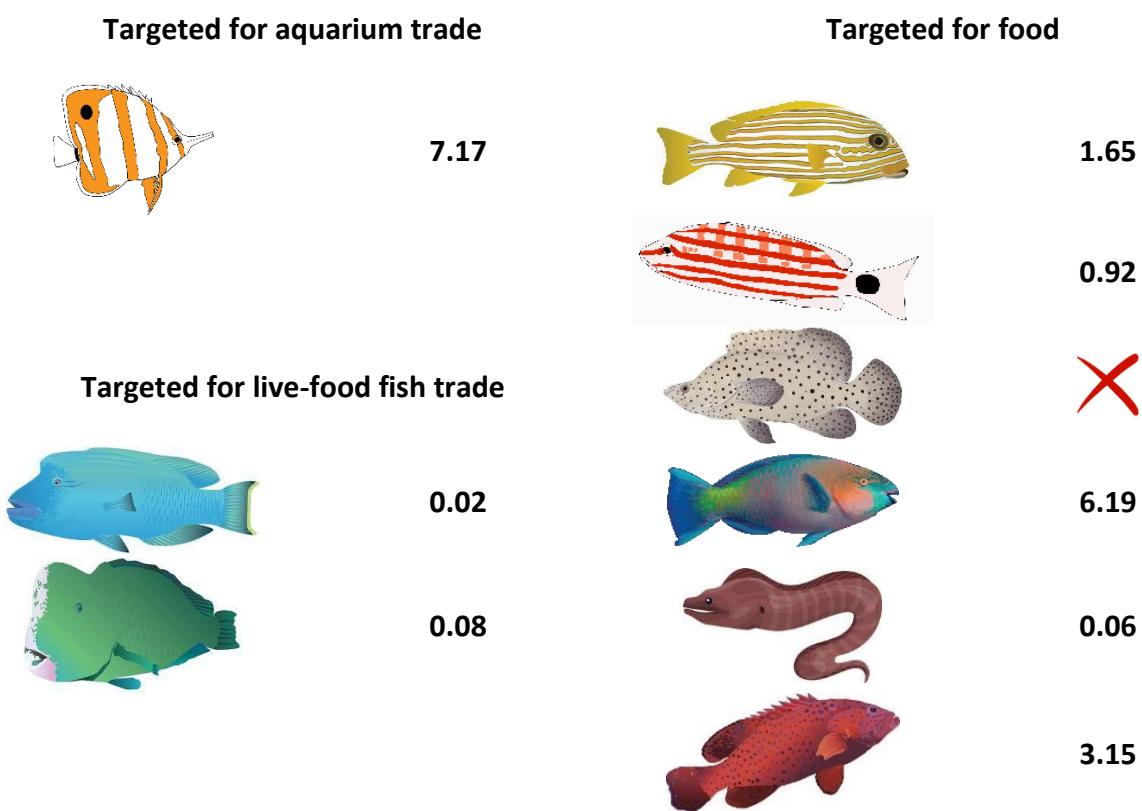
- Sipadan reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 55.26%.
- In 'Good' condition and above the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is high.
- Disturbance indicators are very high.
- Rubble level is very high at many sites. The level is especially high at South Point 10m (64.38%) and White Tip (40%). Rubble level ranges from 15% to 35% at Coral Garden, Mid Reef, South Point 5m, Staghorn Crest and Turtle Patch.

### CORAL IMPACTS

- Discarded fishing nets and trash were recorded.

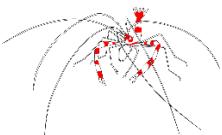


## Fish Abundance at Sipadan (Individuals per 500m<sup>3</sup>)

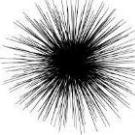


- Butterflyfish, indicator for aquarium trade, abundance is high.
- Humphead wrasse and bumphead parrotfish, fish targeted for live-food fish trade, are recorded.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is low, except for parrotfish and grouper.

## Invertebrate Abundance at Sipadan (Individuals per 100m<sup>2</sup>)

Collected for curio trade	Collected for food
	 X
	 X 0.33
	 X 0.02
	 0.38

### Ecological Imbalance/Predator Outbreaks

	0.25
	X

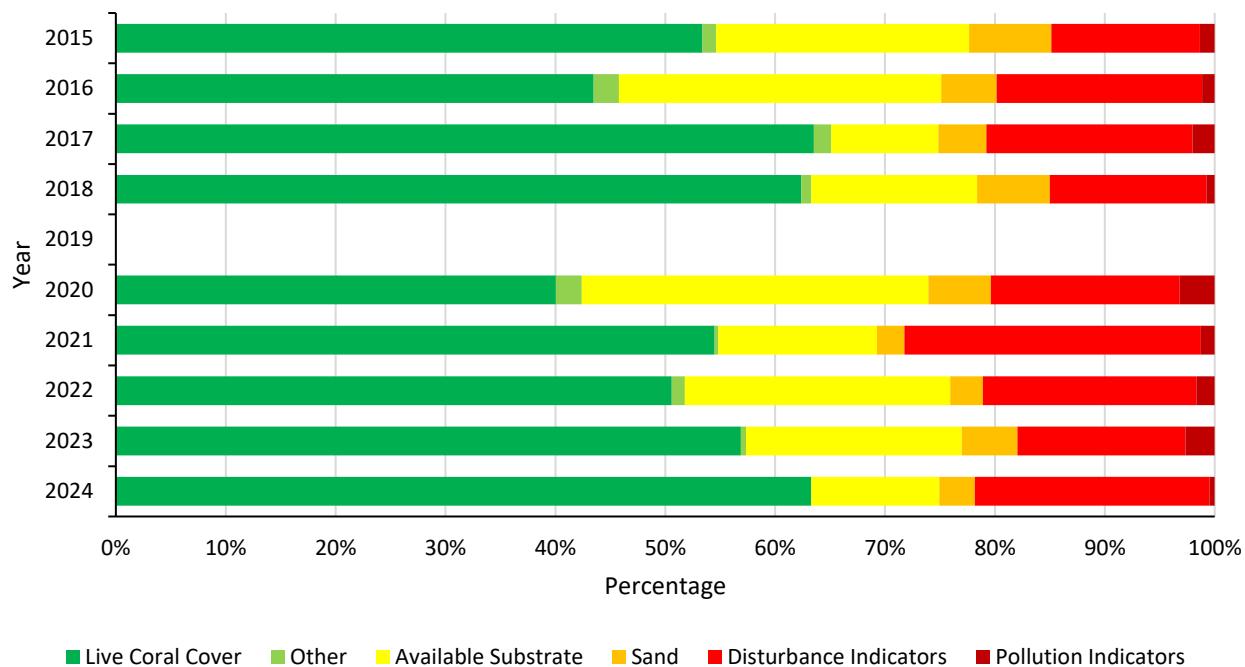
- Indicators for curio trade are absent
- Invertebrates targeted for food are very low in abundance.

### RARE ANIMALS

- Turtles were recorded.



### Reef Health at Sipadan

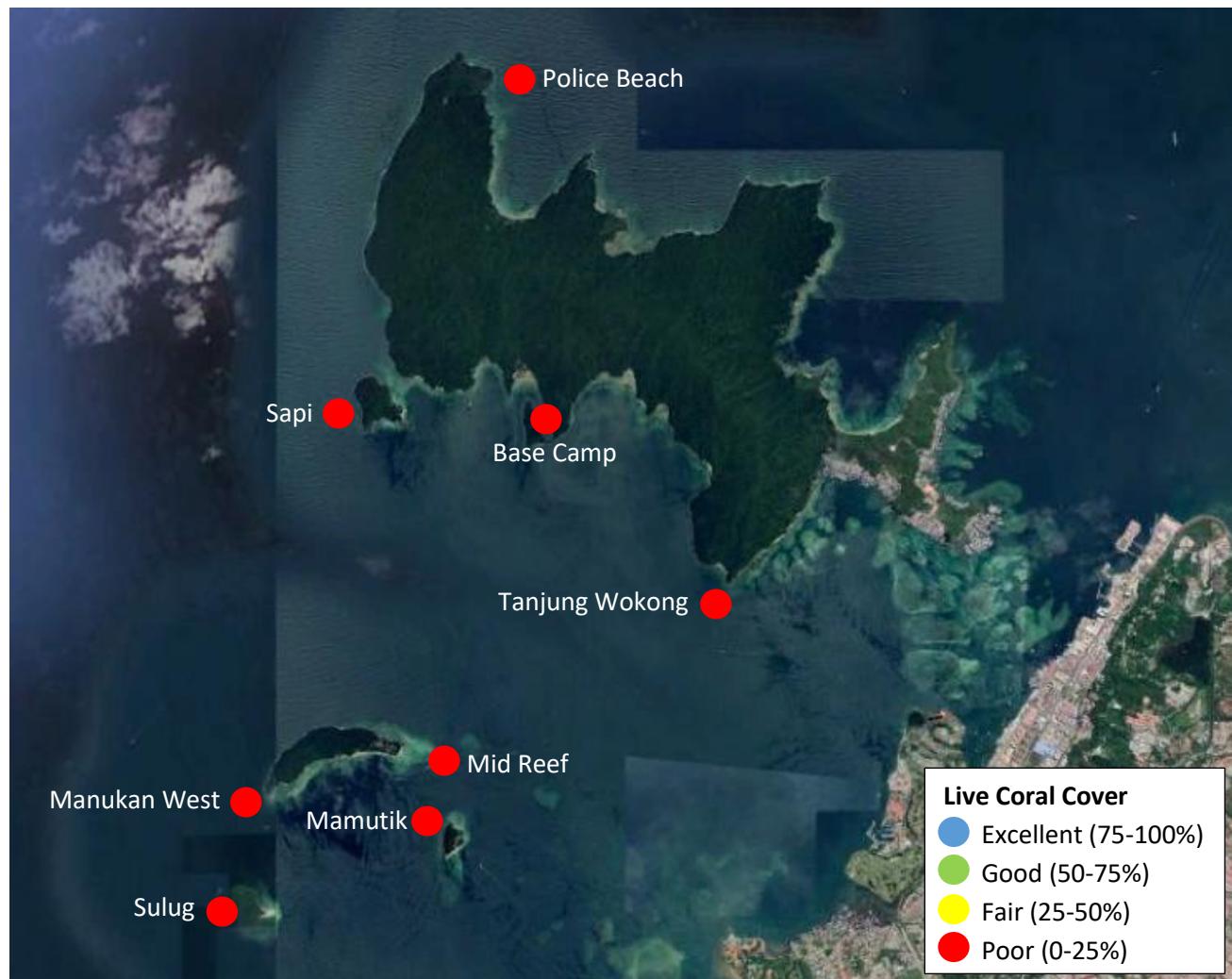


- The health of Sipadan reefs shows variation over the years. Generally, from 2020 to 2024, the reefs showed improvement.
- Pollution indicators remain low.
- The spike in live coral cover in 2017 is considered to reflect the elimination of 4 sites that year, rather than an actual increase in live coral cover.

## Sabah – Tunku Abdul Rahman Park

Tunku Abdul Rahman Park is located between 3 to 8 km off Kota Kinabalu, the capital of Sabah, and covers an area over 4,929 hectares, two thirds of which covers the sea. There is a cluster of islands in the Park comprising Pulau Gaya, Pulau Sapi, Pulau Manukan, Pulau Mamutik and Pulau Sulug. The reefs generally lie in shallow water with little current.

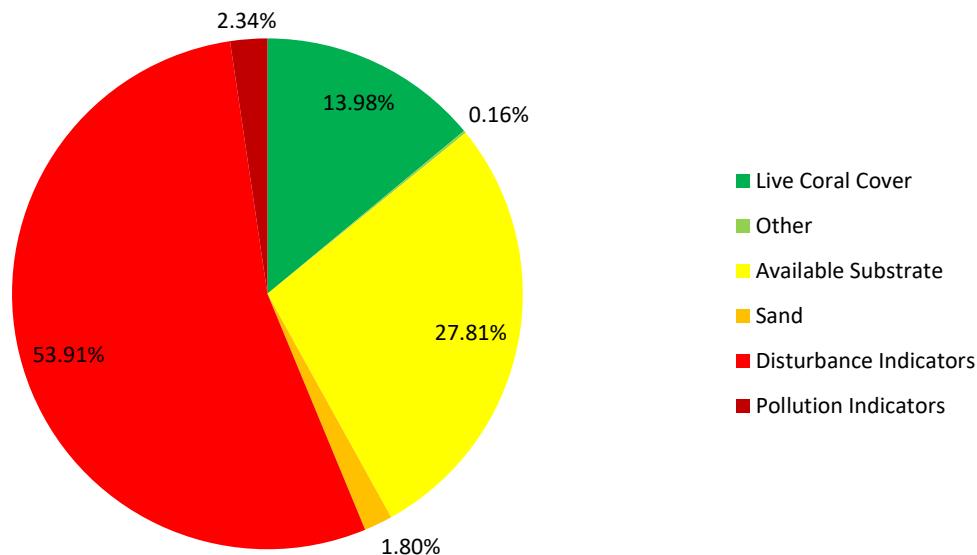
All five islands have tourist facilities such as chalets/rest house, jetty, picnic shelters, barbecue pits, tables, changing rooms and toilets, except for Pulau Sulug which is relatively untouched and undeveloped. The islands receive large numbers of day tourists from Kota Kinabalu.



Map showing the health categories of each survey site based on Live Coral Cover: 8 sites have 'Poor' coral cover.

## Coral Cover and Health

Substrate Composition at Tunku Abdul Rahman Park



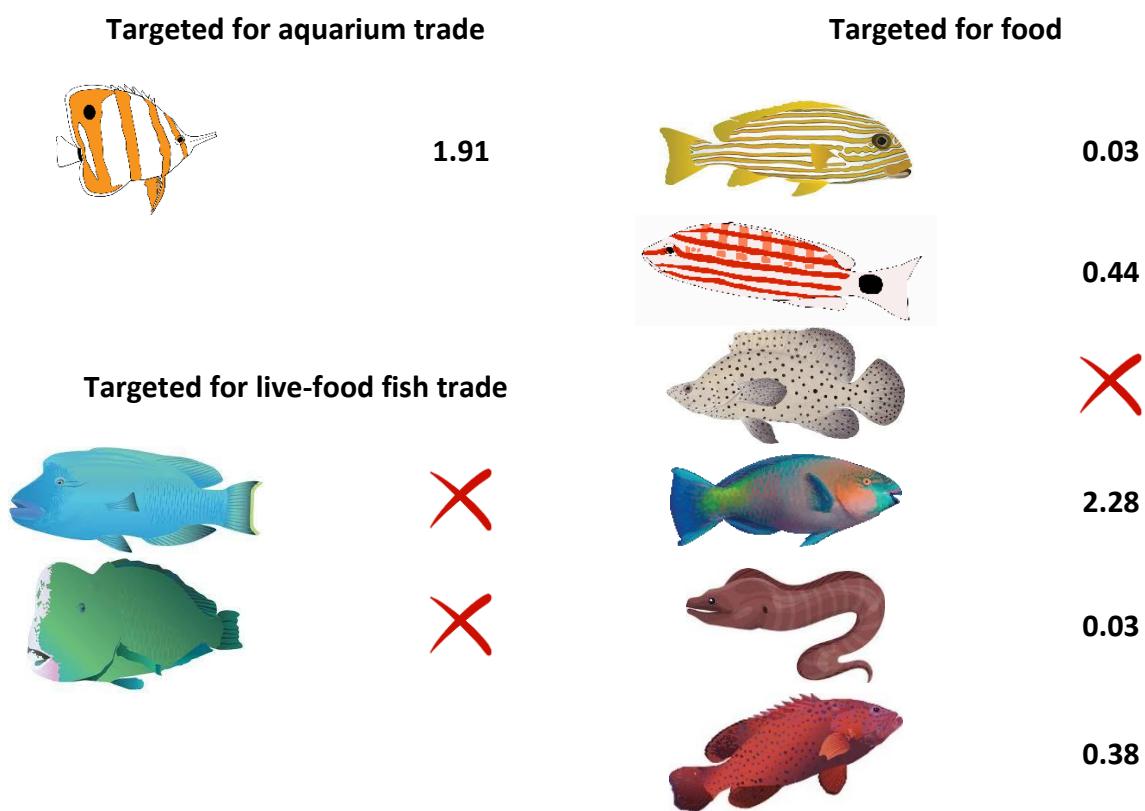
- Tunku Abdul Rahman Park reefs are dominated by disturbance indicators.
- Rubble level is extremely high at many sites, ranging from 40% to 74%.
- Tunku Abdul Rahman Park reefs are in 'Poor' condition and below the North Borneo region average (39.56%).
- Mean hard coral (reef builder) cover is 13.75%.
- Available substrate for coral recruits to attach is very high.
- All the above are considered signs of unhealthy reefs. While available substrate for coral recruits to attach is very high, high level of disturbance indicators may deter corals growth if they are not dealt with.

### CORAL IMPACTS

- Discarded fishing nets, trash and storms were recorded at many sites.
- Boat anchor damage was recorded at one site.
- All sites, with an average 4% of the reefs, were impacted by warm water bleaching.

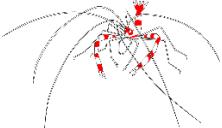


## Fish Abundance at Tunku Abdul Rahman Park (Individuals per 500m<sup>3</sup>)

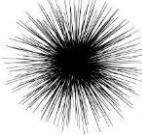


- Butterflyfish, indicator for aquarium trade, is recorded.
- Absent of indicator targeted for live-food fish trade.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is very low except for parrotfish.

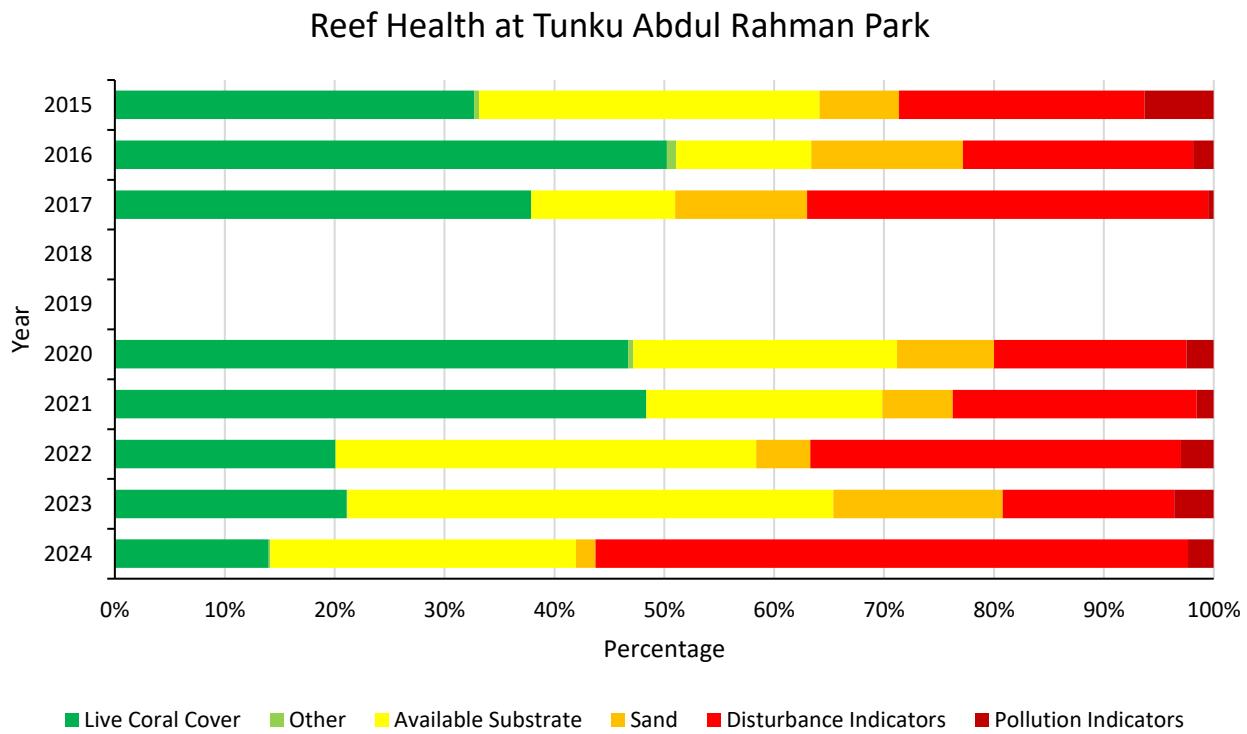
## Invertebrate Abundance at Tunku Abdul Rahman Park (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food
	0.06	 X
	X	 X
	X	 0.09
		 1.50

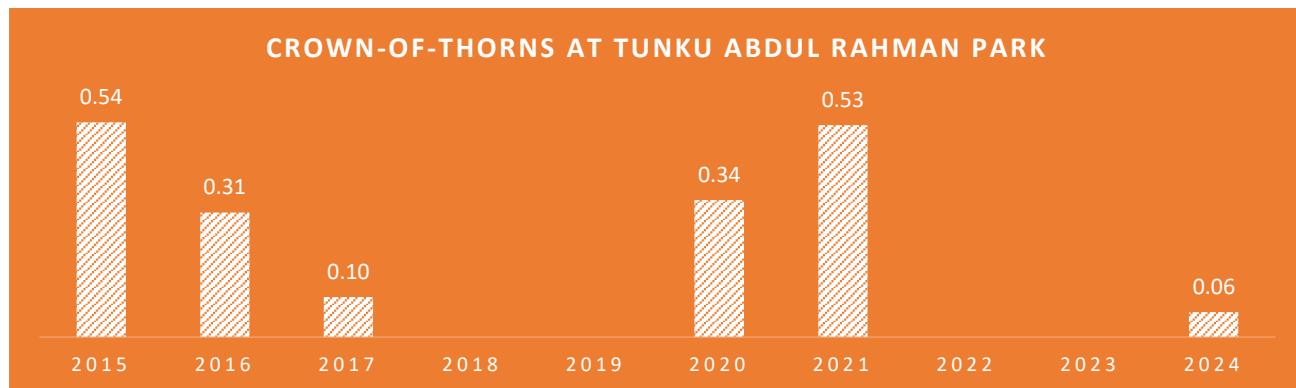
### Ecological Imbalance/Predator Outbreaks

	48.72
	0.06

- Banded coral shrimp, indicator for curio trade, is recorded.
- Crown-of-thorns is not a concern in Tunku Abdul Rahman Park.
- The abundance of invertebrates collected for food is very low.



- In 2022, the reefs had deteriorated drastically. The deterioration was likely due to physical damage caused by human activities and/or storm.
- In 2024, the 4<sup>th</sup> Global Coral Bleaching Event further deteriorated the reefs.
- Since 2022, crown-of-thorns are no longer an issue in Tunku Abdul Rahman Park.
- Available substrate for coral recruits to attach is very high, possible chance of reef recovery if human impacts are dealt with.

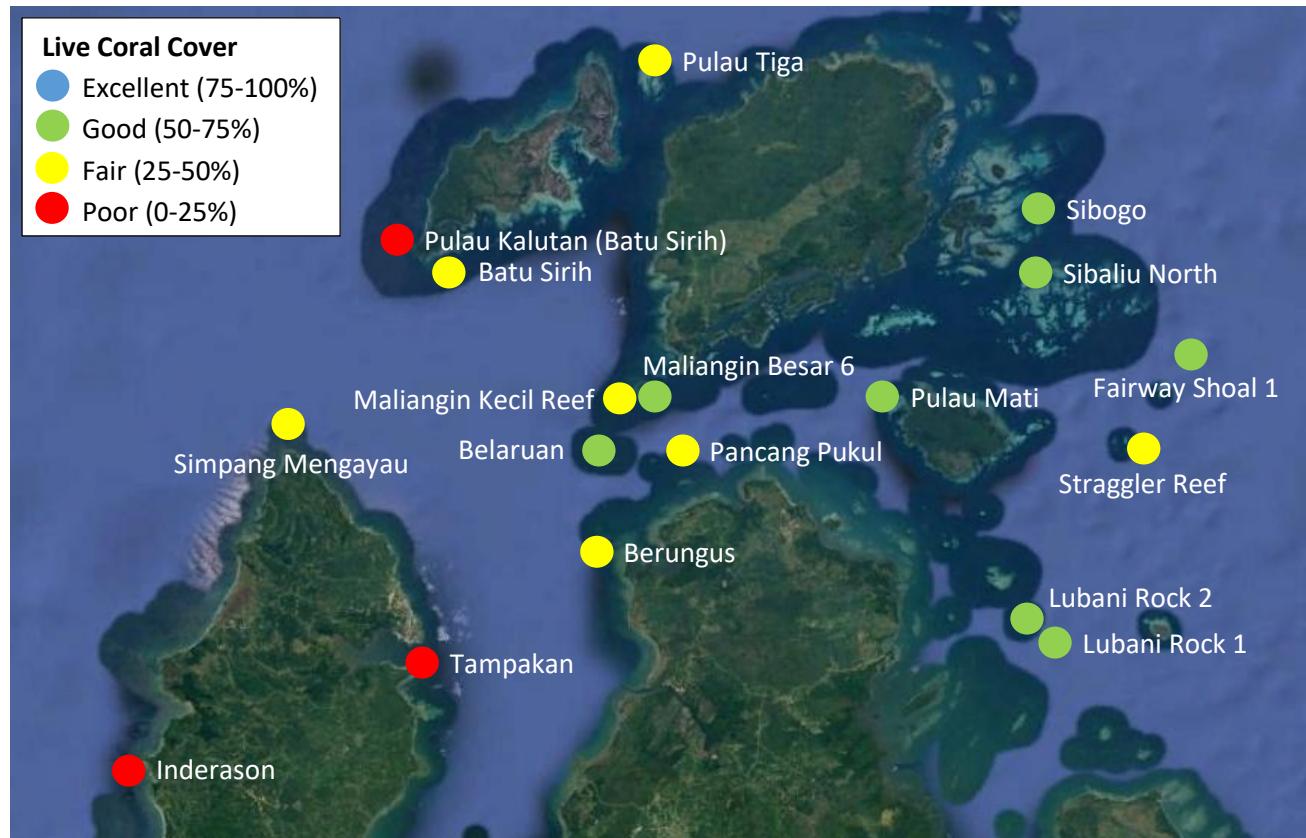


## Sabah – Tun Mustapha Park

Tun Mustapha Park is a marine park located off the north coast of the state of Sabah, Malaysia. It comprises an area of 898,762.76 hectares with more than 50 islands and islets located across Kudat, Pitas and Kota Marudu districts. The park received Cabinet in March 2003 under Parks Enactment 1984. Formally established on 19 May 2016, the park safeguards globally important marine ecosystems that are threatened with overexploitation.

Tun Mustapha Park is the largest multiuse marine protected area in Malaysia and one of the richest marine flora and fauna complexes in the world. It is home to mangrove, seagrass and coral reef habitats which are critical breeding sites and habitats for various marine species and also migratory animals such as turtles, marine mammals and whale shark.

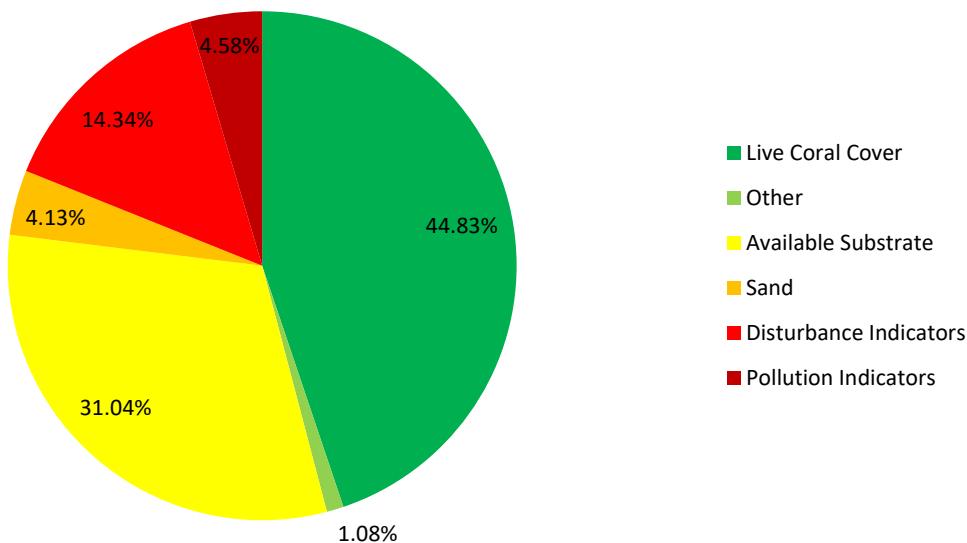
Tun Mustapha Park also provides source of livelihood for over 80,000 coastal inhabitants of diverse ethnic groups. The concept for the park is to be a multiple use, managed area which includes areas for strict protection, tourism, artisanal fishing and commercial fishing among others. A multi-stakeholder group made up of government agencies and the local communities had worked to realise the gazetttement of the park.



Map showing the health categories of each survey site based on Live Coral Cover: 8 sites have 'Good' coral cover, 7 are in 'Fair' condition and 3 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Tun Mustapha Park



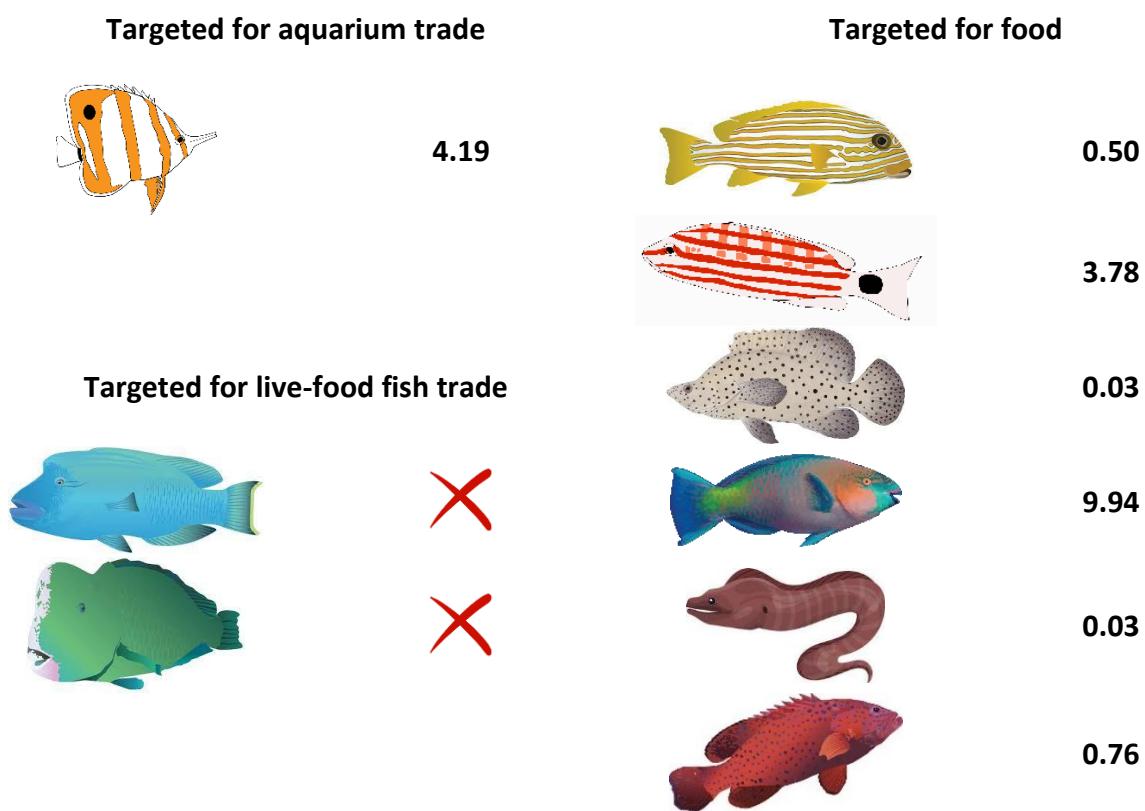
- Tun Mustapha Park reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 42.43%.
- In 'Fair' condition and above the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is extremely high.
- Disturbance indicators are high.
- Rubble level is high at many sites, ranging from 11% to 32%.
- Silt level is very high at Tampakan (35.63%).

### CORAL IMPACTS

- Boat anchor damage and dynamite fishing were recorded at many sites.
- Discarded fishing nets and trash were recorded.
- Many sites, with an average 1% of the reefs, were impacted by warm water bleaching.

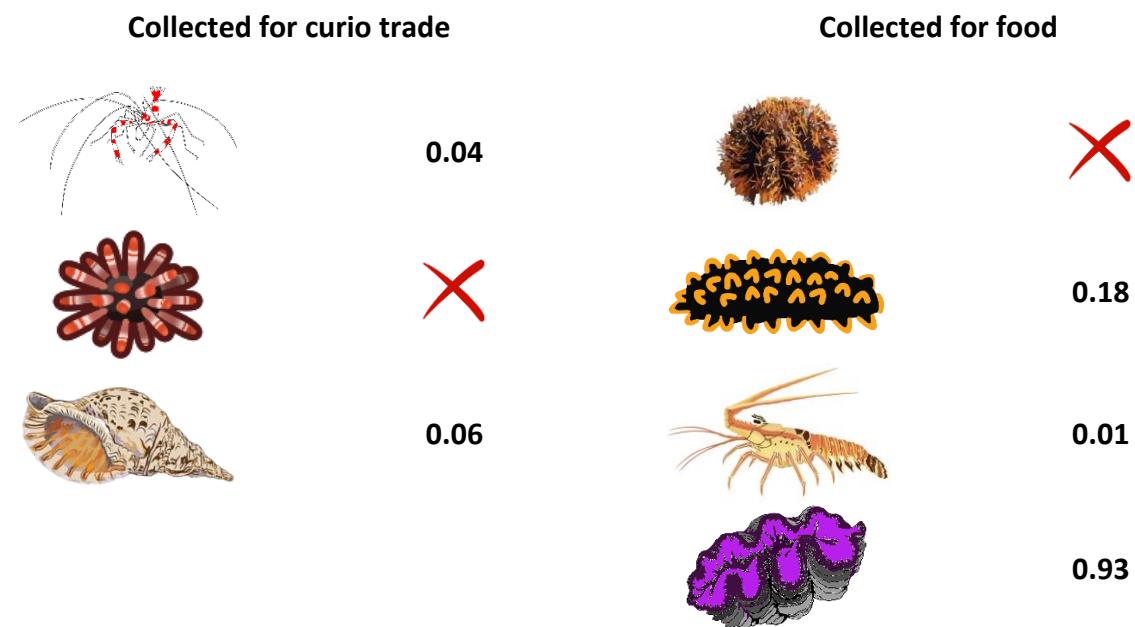


## Fish Abundance at Tun Mustapha Park (Individuals per 500m<sup>3</sup>)

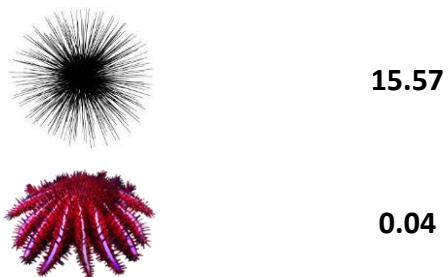


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- All types of fish targeted for food are recorded. The abundance of fish targeted for food is very low except for snapper and parrotfish.
- Parrotfish abundance in Tun Mustapha Park is high.

## Invertebrate Abundance at Tun Mustapha Park (Individuals per 100m<sup>2</sup>)

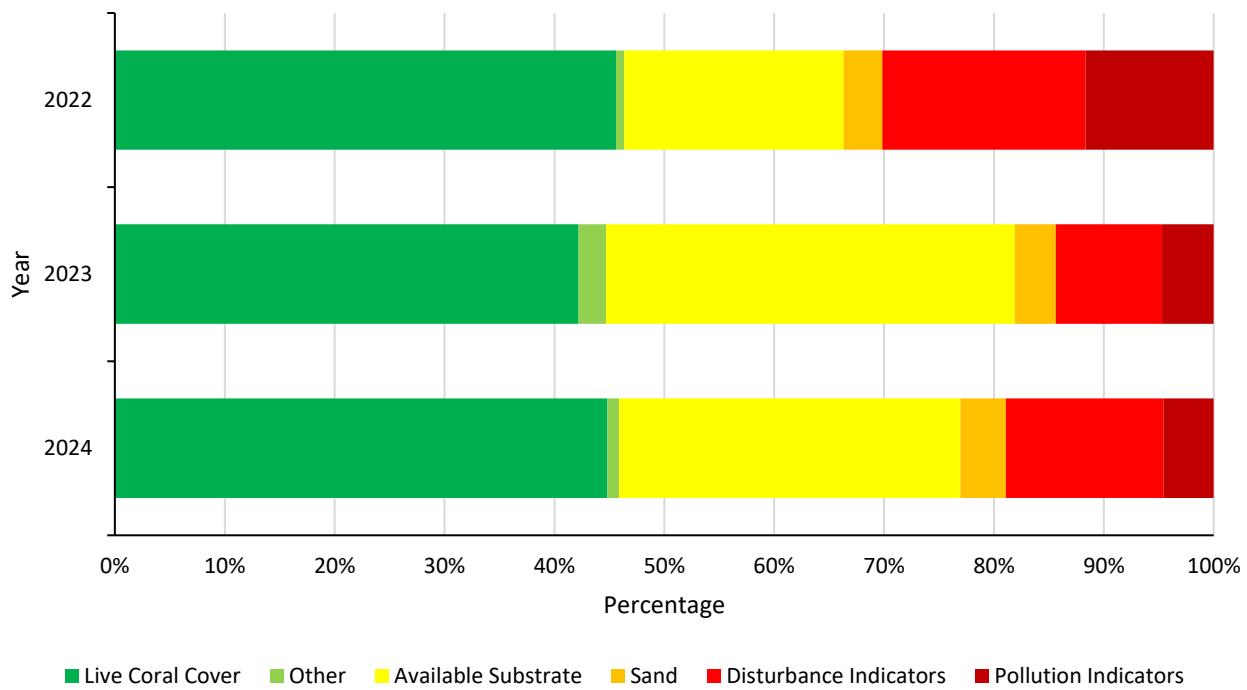


### Ecological Imbalance/Predator Outbreaks



- Banded coral shrimp and triton, invertebrates collected for curio trade, are recorded.
- Crown-of-thorns is not an issue in Tun Mustapha Park.
- The abundance of invertebrates collected for food is very low.

### Reef Health at Tun Mustapha Park

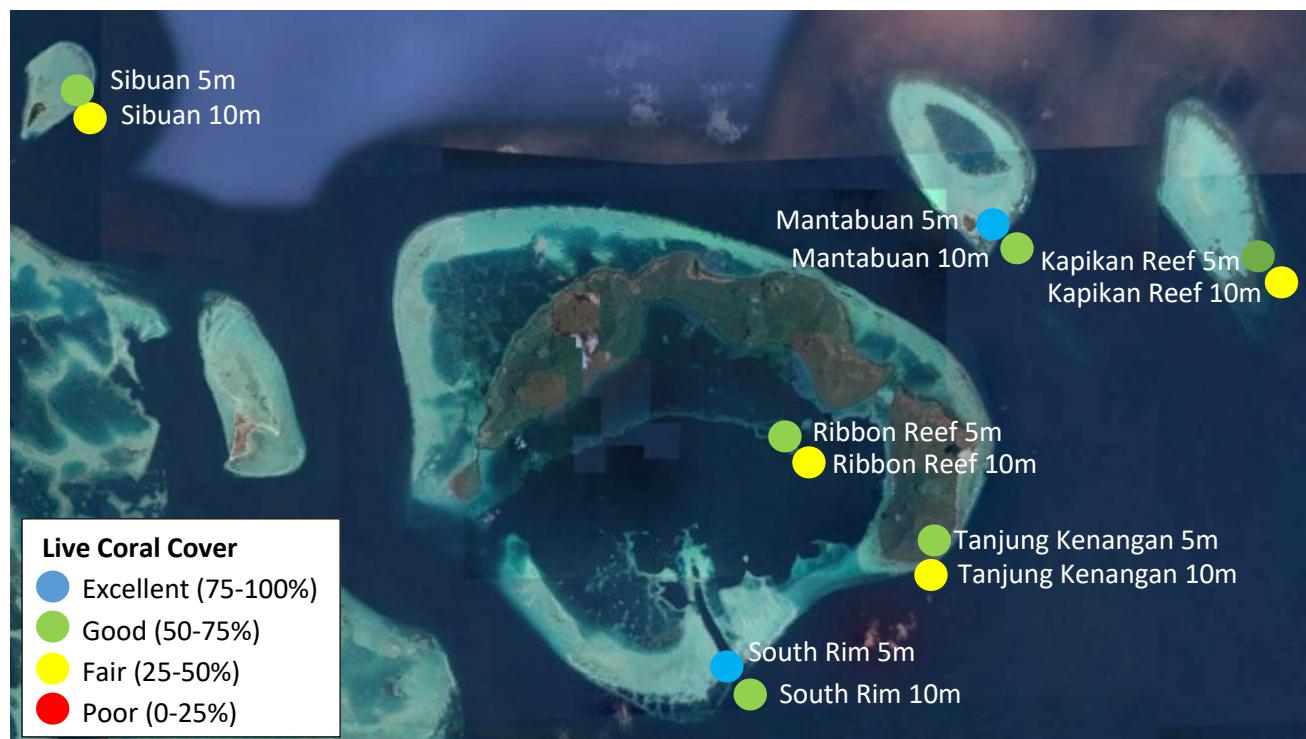


- Tun Mustapha Park reefs have maintained in 'fair' condition.
- Pollution indicators had decreased.

## Sabah – Tun Sakaran Marine Park

Tun Sakaran Marine Park is a marine park located off the east coast of the state of Sabah in Malaysia. It consists of the islands of Bodgaya, Boheydulang, Sabangkat, and Salakan, the sand cays of Maiga, Sibuan, and Mantabuan, and the patch reefs of Church and Kapikan.

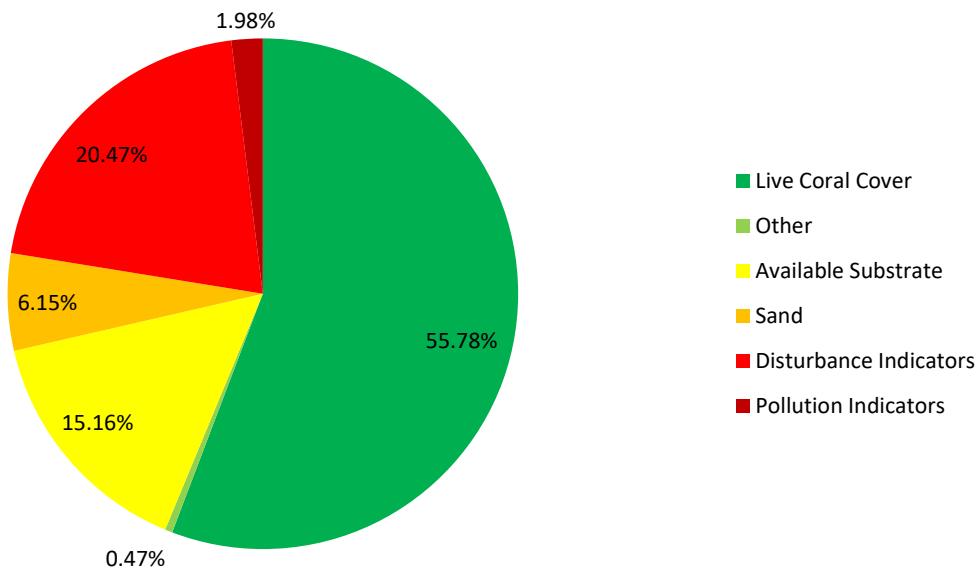
In 2004, the park became the seventh gazetted area under Sabah Parks with a total area of 100.8 km<sup>2</sup>. There are approximately 2,000 people living within the park.



Map showing the health categories of each survey site based on Live Coral Cover: 2 sites have 'Excellent' coral cover, 6 are in 'Good' condition and 4 show 'Fair' health.

## Coral Cover and Health

Substrate Composition at Tun Sakaran Marine Park



- Tun Sakaran Marine Park reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 51.98%.
- In 'Good' condition and above the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is high.
- Sand level is slightly high. The level ranges from 10% to 16% at Mantabuan 10m, Ribbon Reef 10m and Tanjung Kenangan 5 & 10m.
- Disturbance indicators are very high.
- Rubble level is high at many sites. The level ranges from 34% to 49% at Kapikan Reef 5 & 10m and Sibuan 5 & 10m, and ranges from 10% to 27% at Mantabuan 5 & 10m and Tanjung Kenangan 5 & 10m.

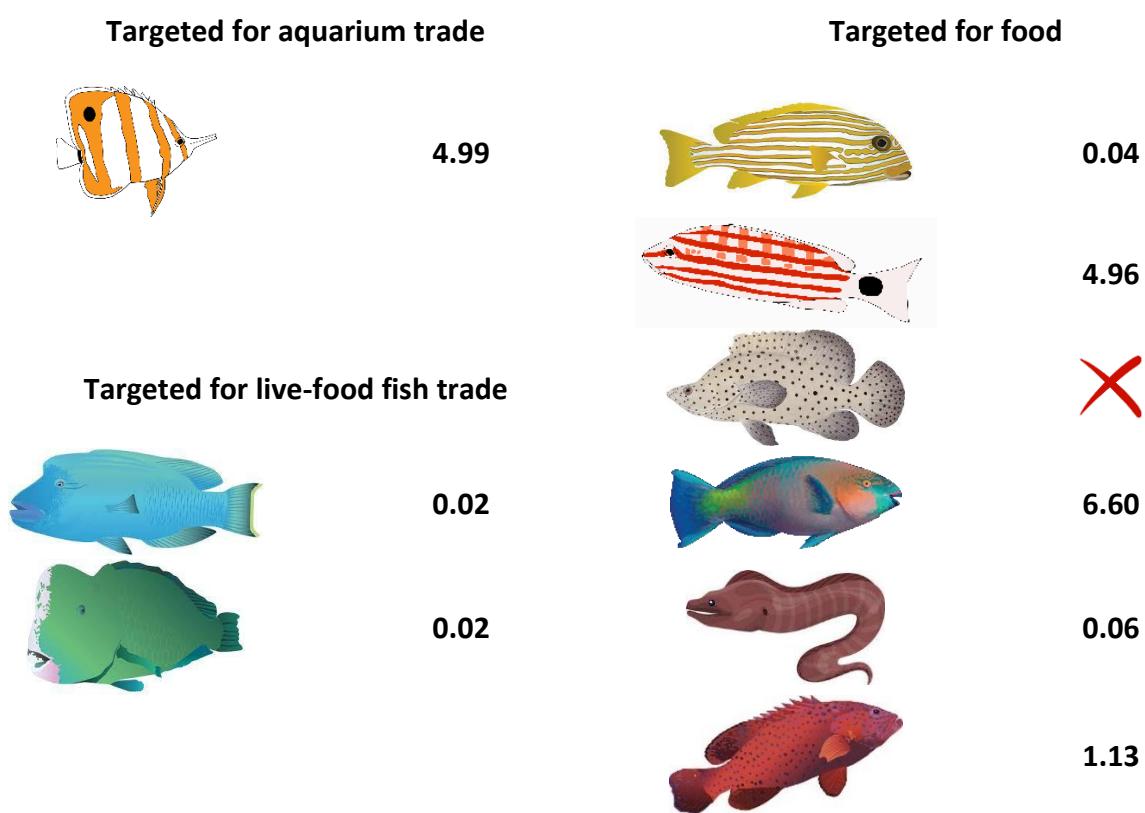
### CORAL IMPACTS

- Boat anchor damage, dynamite fishing, discarded fishing nets and trash were recorded.
- Some sites, with an average 1% of the reefs, were impacted by warm water bleaching.



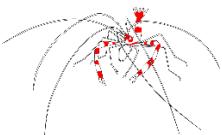
## Fish Abundance at Tun Sakaran Marine Park

(Individuals per 500m<sup>3</sup>)

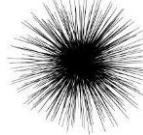


- Butterflyfish, indicator for aquarium trade, is recorded.
- Humphead wrasse and bumphead parrotfish, indicators targeted for live-food fish trade, are recorded.
- For fish targeted for food, only barramundi cod is absent. The abundance of fish targeted for food is low except for snapper and parrotfish.

## Invertebrate Abundance at Tun Sakaran Marine Park (Individuals per 100m<sup>2</sup>)

Collected for curio trade		Collected for food	
	✗		✗
	✗		0.02
	✗		✗
			0.38

### Ecological Imbalance/Predator Outbreaks

	3.00
	✗

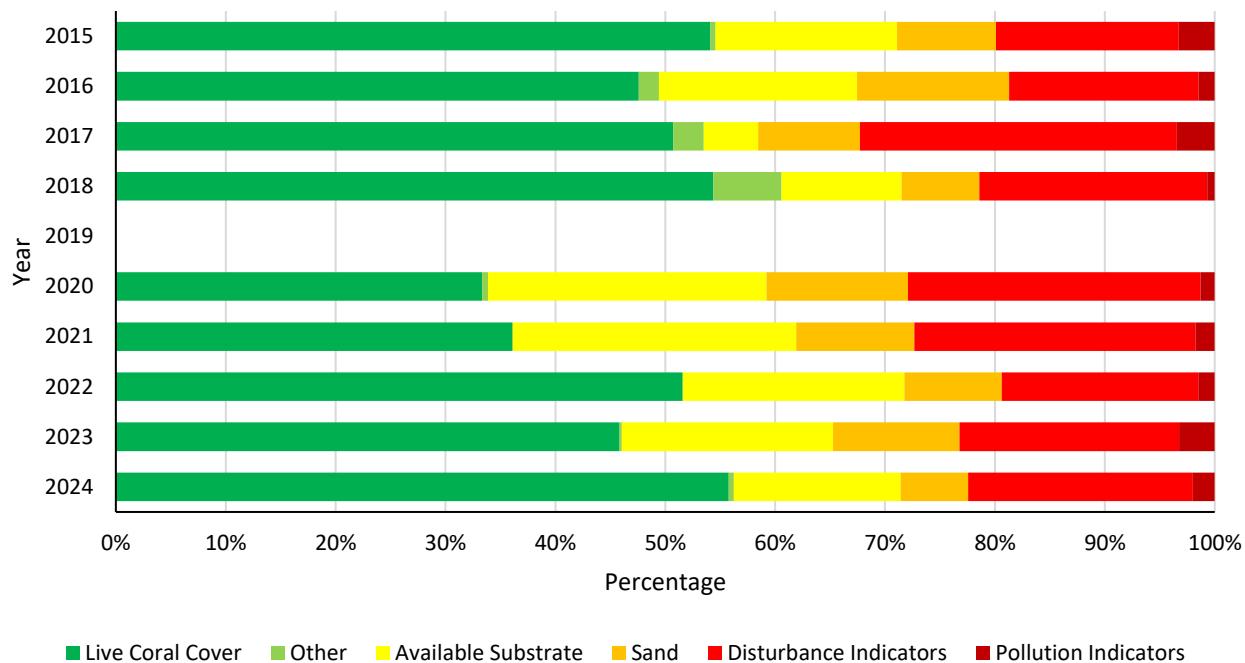
- Indicators for curio trade are absent.
- The abundance of invertebrates collected for food is very low.

### RARE ANIMALS

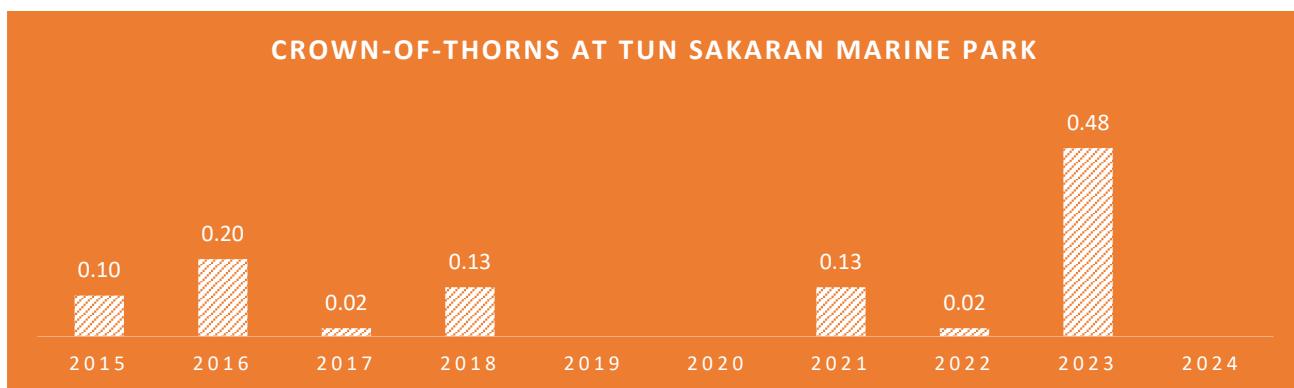
- Hawksbill and green turtles were recorded.



### Reef Health at Tun Sakaran Marine Park

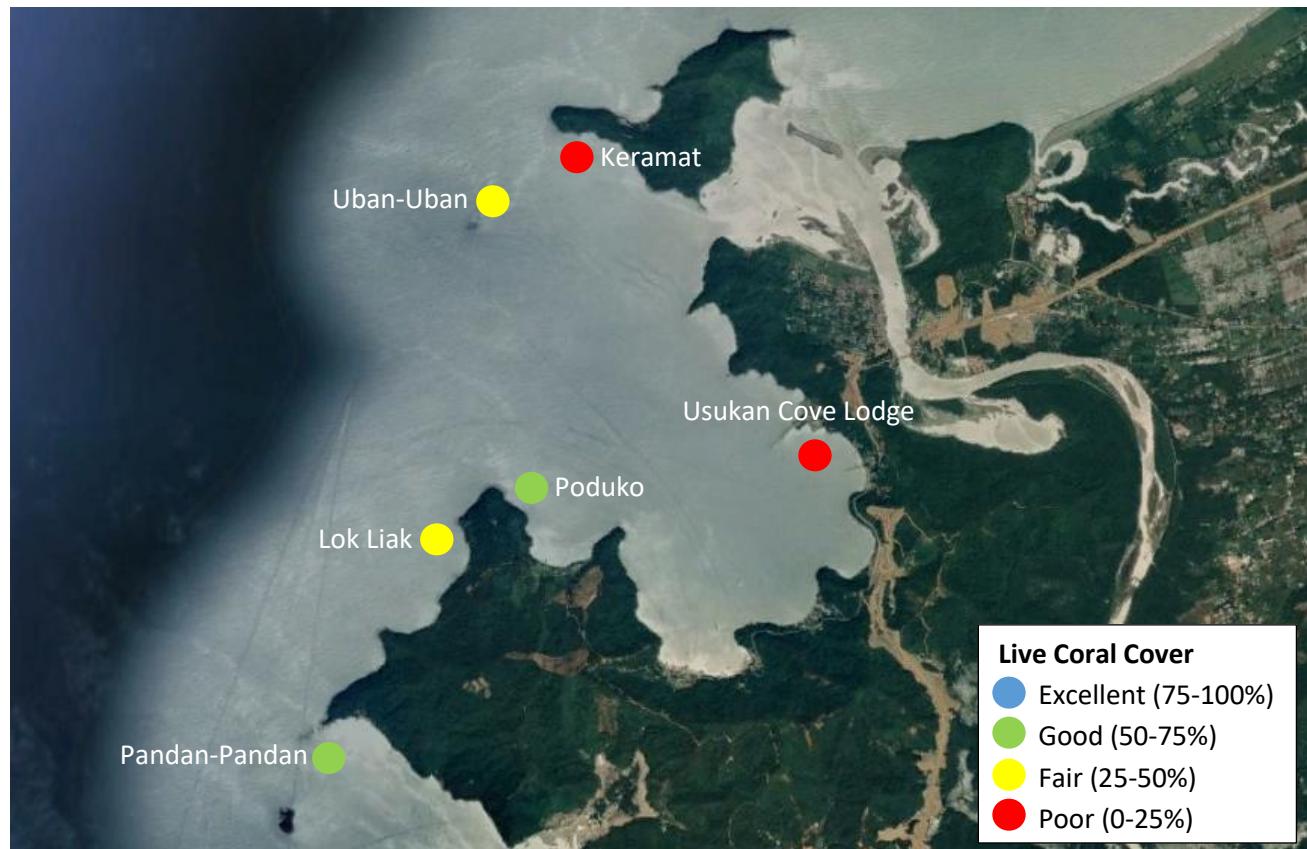


- In 2020, Tun Sakaran Marine Park reefs had deteriorated from 'good' to 'fair' condition.
- The deterioration was likely due to physical damage caused by human activities and/or storm.
- From 2021 onwards, the reefs showed improvement.
- In 2023, the population of crown-of-thorns was above what a healthy reef can support (0.2-0.3 individual per 100m<sup>2</sup>). However, this is no longer a not cause for concerns.
- Available substrate for coral recruits to attach is very high, possible chance of further reef recovery if human impacts are dealt with.



## Sabah – Usukan Cove

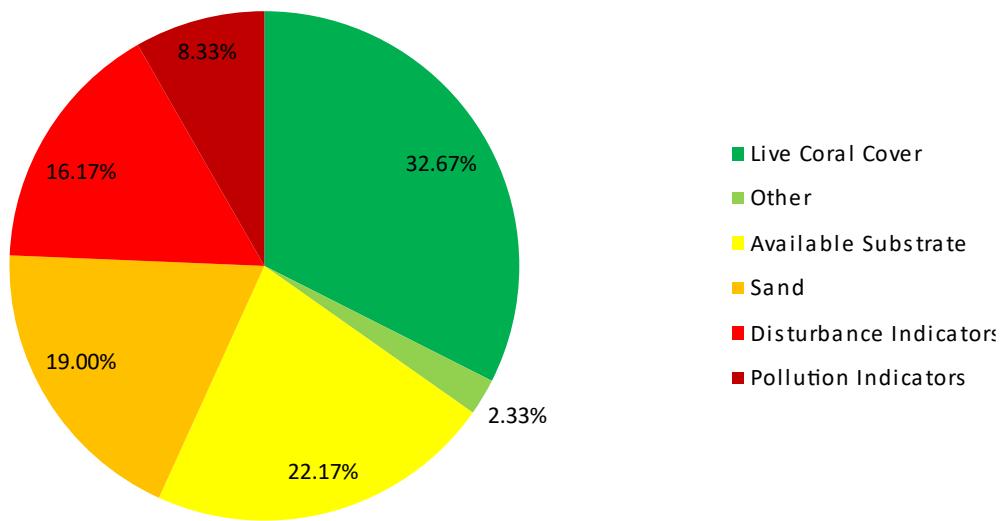
Usukan Cove is located on the Northwest coast of Sabah approximately halfway between Kota Kinabalu and Kudat, in a district called Kota Belud, just beside Kampung Kuala Abai where the jetty to Mantanani Island is situated. Diving and snorkelling as well as fishing are the main activities offered in Usukan Cove.



Map showing the health categories of each survey site based on Live Coral Cover: 2 site have 'Good' coral cover, 2 are in 'Fair' condition and 2 show 'Poor' health.

## Coral Cover and Health

Substrate Composition at Usukan Cove



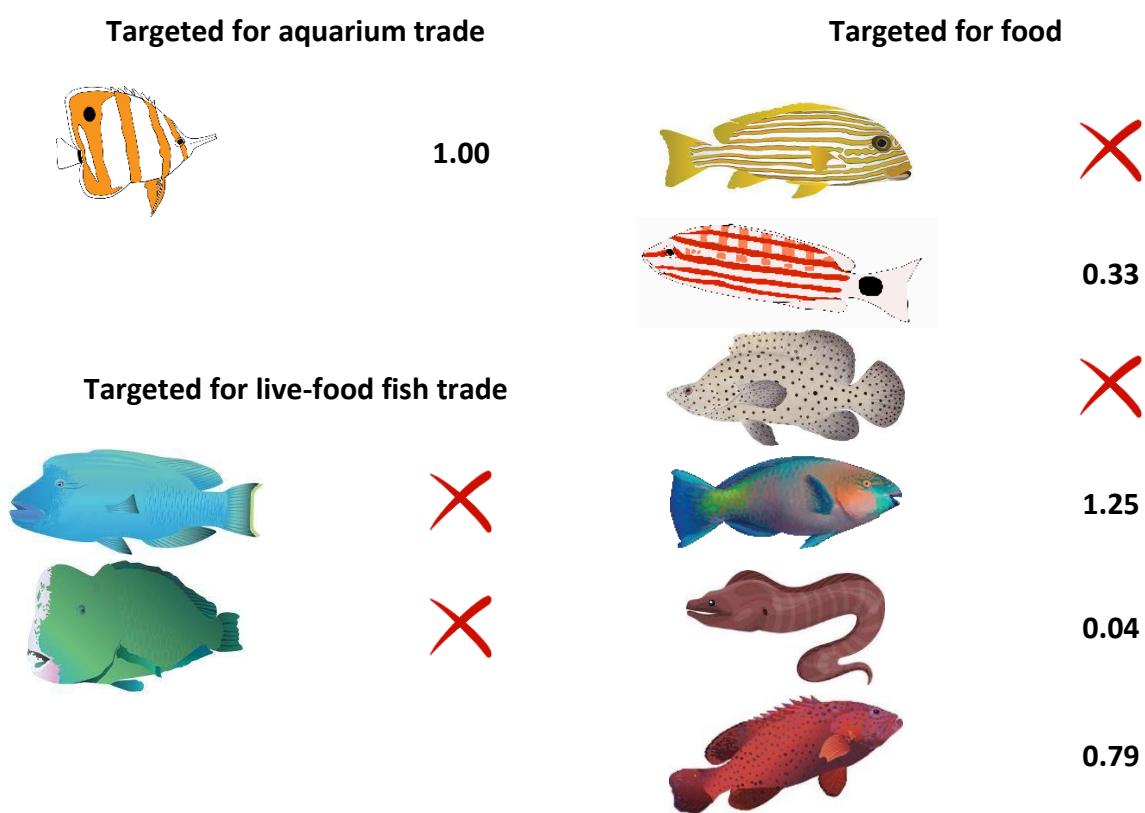
- Usukan Cove reefs are dominated by live coral cover, which is mainly hard coral.
- Mean hard coral (reef builder) cover is 31.83%.
- In 'Fair' condition and below the North Borneo region average (39.56%).
- Available substrate for coral recruits to attach is very high.
- Sand level is very high. It ranges from 8% to 36%.
- Disturbance indicators are high.
- Rubble level is high at many sites. The level is especially high at Uban-Uban which recorded 36%.
- Silt level is very high at Usukan Cove Lodge which recorded 37%
- Pollution indicators are slightly high.
- The level of nutrient indicator algae is especially high at Pandan-Pandan which recorded 22%.

### CORAL IMPACTS

- Boat anchor damage, dynamite fishing and trash were recorded at some sites.
- Many sites, with an average 2% of the reefs, were impacted by warm water bleaching.

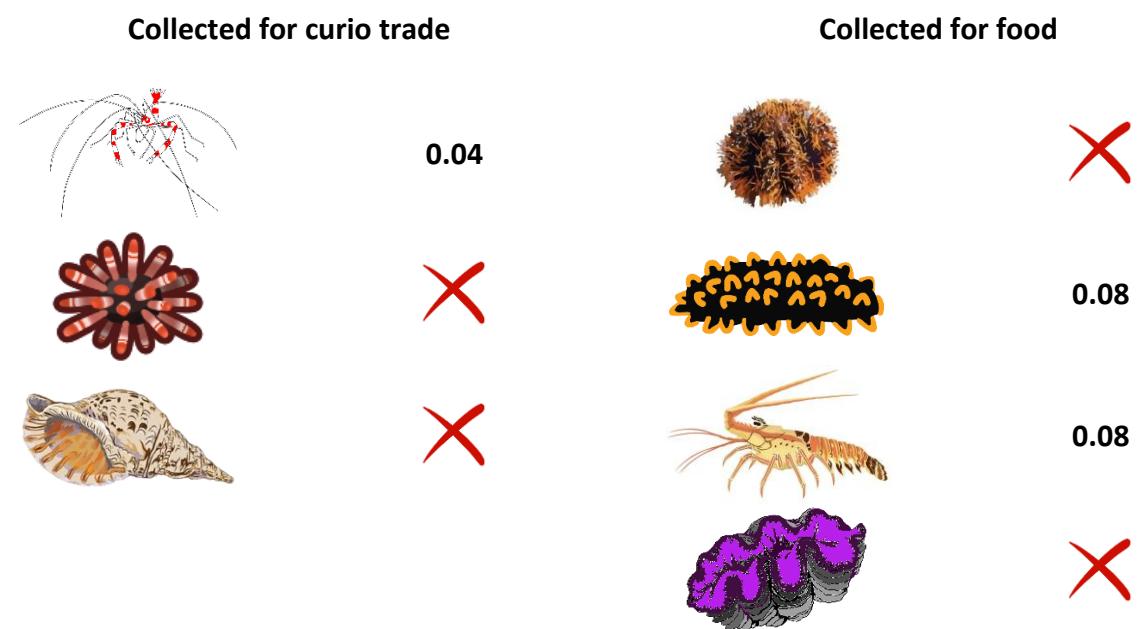


### Fish Abundance at Usukan Cove (Individuals per 500m<sup>3</sup>)

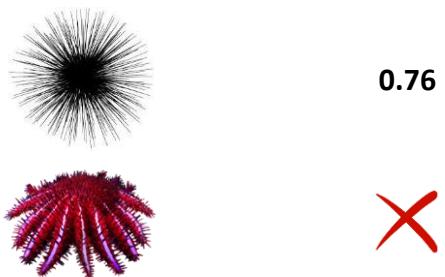


- Butterflyfish, indicator for aquarium trade, is recorded.
- Indicators targeted for live-food fish trade are absent.
- The abundance of fish targeted for food is very low.

## Invertebrate Abundance at Usukan Cove (Individuals per 100m<sup>2</sup>)

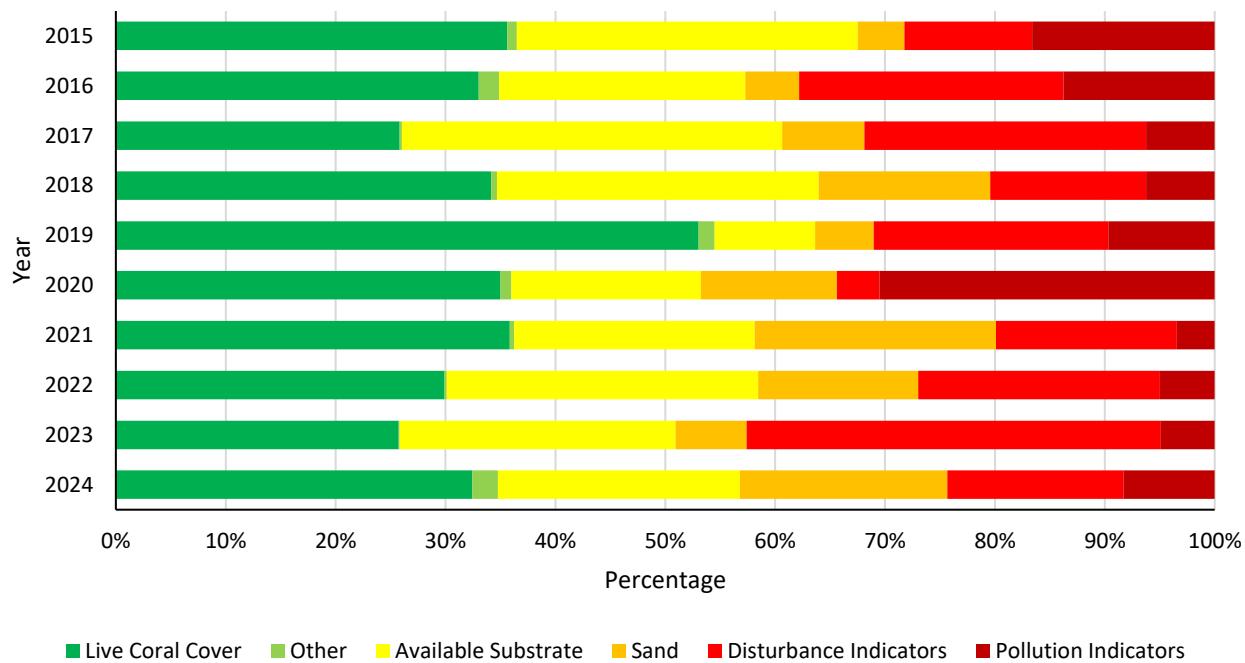


### Ecological Imbalance/Predator Outbreaks



- Banded coral shrimp, indicator for curio trade, is recorded.
- The abundance of invertebrates collected for food is very low.

### Reef Health at Usukan Cove



- Usukan Cove reefs have maintained in 'fair' condition.
- The decrease in live coral cover in 2017 was considered to reflect the elimination of 3 sites that year, rather than an actual decrease in live coral cover.
- The cause of the spike in live coral cover in 2019 was not known.
- In 2022 and 2023, the reefs had deteriorated. The deterioration was most likely due to physical damage caused by human activities and/or storms.
- In 2024, the reefs showed improvement.
- Pollution indicators show variation over the years.

## 4. Summary & Recommendations

### Summary

The results of the 2024 survey programme should ring alarm bells for all stakeholders – whether in government, the tourism industry, or among local communities. After several years of slow decline from 2014–2019, followed by recovery during the Covid pandemic, 2024 marks the second year of a declining trend in overall reef health (as measured by Live Coral Cover) that should be of concern to all. Action is required now to improve management and conservation of Malaysia's coral reefs. The key findings from the surveys are:

- The deterioration in coral reef health noted in our 2023 survey programme has continued into 2024. **63% of the islands/areas surveyed saw a decrease in Live Coral Cover (LCC)**, a key coral reef health indicator.
- As in previous years, the **abundance of most fish and invertebrate indicators continues to be low**, suggesting either historical over-fishing or on-going fishing pressure. This raises a concern about poaching in those survey sites that are in protected areas. In Sabah, **64% of the reefs recorded dynamite fishing damage**.
- Disturbance and pollution indicators highlight the trends in the trajectory of reef health, with both local and global impacts evident during surveys. Approximately **83% of the islands/areas surveyed are impacted by discarded fishing nets and trash** and **56% are impacted by anchor damage**. Malaysia's reefs have not been spared from the 4<sup>th</sup> Global Coral Bleaching Event, with **coral bleaching documented at nearly 90% of the islands/areas surveyed**.

The reduction in LCC noted above is indicative of impacts arising from a variety of human activities including unsustainable tourism, fishing, land clearing, pollution and other activities. These, combined with the recent large-scale coral bleaching event, are among the causes of the deterioration in reef health and urgent action is needed to address this decline.

### Cause for Hope: Community Marine Conservation Groups (CMCGs)

In early 2000, the Department of Fisheries launched the Reef Care programme. Designed to give local communities in Marine Parks limited responsibility for coral reef management, the programme has proven to be a hugely successful one, and has shown that communities can play a significant role in the conservation and management of their marine resources.

Reef Check Malaysia works with local community groups in eight locations around Malaysia. We use the generic term Community Marine Conservation Groups, CMCGs, because Reef Care is only used in Peninsular Malaysia. The CMCGs have shown that local communities are interested to participate in managing and conserving their marine biodiversity and natural resources. Given appropriate training and support, local community groups are very capable of addressing numerous local threats.

In 2024, CMCGs removed over 1,700 ghost nets or other fishing gear weighing over 4,000kg; conducted 67 underwater clean-ups to remove over 2,000kg of marine debris; installed over 50 moorings for local boatmen to reduce anchor damage; and conducted monitoring surveys at 136 sites. The programme grew in 2024 to include additional sites in Sabah, and CMCGs are now an essential part of local action to protect marine and coastal resources.

The commitment and active involvement of these local communities also improves compliance with marine protected area rules and regulations. RCM strongly supports the establishment of joint management bodies that integrate local communities into the management of Malaysia's marine protected areas.

## Recommendations

Coral reefs significantly contribute to Malaysia's economy. For example, dive tourism alone has been estimated to generate millions annually, particularly in islands such as Tioman and Mabul. Additionally, healthy reefs support fisheries, contributing to food security and livelihoods. This economic dependency strengthens the case for urgent action.

The decline in Live Coral Cover (LCC) and increased impacts such as dynamite fishing damage and pollution risk reducing these economic benefits. This decline directly threatens local incomes derived from fisheries and tourism, underlining the economic imperative of effective reef management.

### Build Resilience

The goal of coral reef management in Malaysia is to protect and conserve coral reefs (and other interconnected marine ecosystems such as mangroves and seagrass) so that they continue to provide the ecosystem services that society relies on. A recommended approach is to focus on building the resilience of coral reefs by addressing the local impacts that are affecting them. Urgent actions include:

- **Reducing physical damage:**
  - training courses for boat operators to reduce impacts from groundings and anchors
  - encourage dive operators to Best Practice programmes such as the Green Fins programme
  - training courses for snorkel guides in eco-friendly snorkelling guiding Best Practices
  - consider limiting number of tourists allowed access to particularly sensitive areas
  - awareness raising programmes for fishing communities to reduce fishing pressure on reefs
  - provide fishing net collection bins at all fish landing ports and regulate the sale of fishing nets.
- **Reducing sewage pollution:**
  - encourage resorts to upgrade sewage treatment
  - increase water quality testing
  - implement septic tank maintenance programmes on all islands
- **Reducing impacts of coastal development:**
  - rigorously enforce planning controls in sensitive islands
  - ensure EIAs are completed and EMPS are prepared and implemented
- **Protecting fish populations:**
  - manage fishing effort to ensure herbivore populations are maintained
  - reduce IUU (illegal, un-regulated and un-reported) and destructive fishing practices through enforcement and awareness campaigns.

**It is important to note that none of these interventions requires novel technologies, and most are zero or low cost, with the emphasis on improved enforcement. Many can be achieved simply by strengthening management or enforcing existing regulations to reduce or eliminate impacts.**

## Whole of Government participation

Success in this endeavour will require a “whole of government” approach. No individual department has the mandate to respond to and manage the variety of impacts facing coral reefs; it will require government agencies with different responsibilities to collaborate and integrate coral reef management between them.

Specifically, this will require the participation of State governments in managing marine resources, particularly in Peninsular Malaysia (there is already greater integration of State governments into marine resource management in East Malaysia).

In Peninsular Malaysia, under the current management system, most gazetted Marine Parks comprise the waters surrounding an island to one or two nautical miles from low water mark (Fisheries Act 1985 and regulations). The Marine Parks are the responsibility of the Department of Fisheries Malaysia (DoFM), which has established patrolling, enforcement and other programmes. However, in accordance with the Malaysian constitution, under which land is a State matter, the islands themselves are largely the responsibility of State governments. Thus, a significant proportion of the impacts to the coral reefs and other ecosystems in the Marine Parks emerge from the islands (land development, tourism, boating, local fishing effort, sewage pollution, etc.), which State governments are responsible for managing. However, the Marine Park management authority (DoFM) has little influence on activities on the islands.

Furthermore, other legislation (e.g. the Territorial Seas Act 2012) suggests that State governments have control of the seabed to three nautical miles from low water mark, which includes sessile organisms living on the seabed – including seagrass meadows and coral reefs. A strong argument can be made that State governments should be involved in managing the marine resources around the islands, so that management of marine areas can be integrated with terrestrial activities.

Other government agencies that might be involved include:

- Ministry of Tourism, Arts and Culture, which promotes tourism to the islands, but is not responsible for the impacts of tourism
- Ministry of Natural Resources and Environment, responsible for biodiversity conservation in Malaysia, and its agency, Department of Environment, responsible for the prevention, control and abatement of pollution (such as oil spills that regularly affect the islands)
- Malaysia Maritime Enforcement Agency, responsible for enforcing Federal laws in the Malaysian Maritime Zone
- Ministry of Housing and Local Government, responsible for urban well-being and town planning, and PLAN Malaysia, the agency responsible for preparing local plans – but not for implementation.

The Fisheries Act 1985 provides for the establishment of a National Advisory Council for Marine Parks and Marine Reserves, members of which include representatives of the above agencies as well as State governments. The council, which meets on an ad hoc basis, has the opportunity to contribute significantly to sustainable marine resource management in protected areas.

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## Whole of Society participation

Success in building resilience will also require a “whole of society” approach. Marine resource management largely uses a “top-down” approach, with decisions being made by government agencies. The role of local stakeholders (including communities, businesses, state and municipal government) is currently limited – despite local and international agreements that encourage a greater role in management and conservation for such stakeholders. The Kunming-Montreal Global Biodiversity Framework (KMGBF), the Sustainable Development Goals (SDGs), Malaysia’s National Policy on Biological Diversity (NPBD), and the 12<sup>th</sup> Malaysia Plan (RMK 12) all envisage a greater role for indigenous peoples and local communities. **However, there is no formal mechanism that currently exists to enable this and empower local stakeholders.** This issue is further explored in the following section.

## 5. Managing and conserving island biodiversity: what more can we do?

Tioman Island. Sipadan Island. Mantanani Island. Langkawi Island. To name just a few of the thousand or so islands found in Malaysia's waters. Many of them are popular tourist destinations – with both marine and terrestrial attractions. And many of them are havens of biodiversity, providing a raft of ecosystem services that society relies on. But are we managing and protecting that biodiversity effectively?

### Tioman Island: a Case Study

In the late 1970's, Tioman Island was voted one of the 10 most beautiful islands in the world by TIME Magazine. Even before that it was rumoured to have served as a location for a scene in the movie "South Pacific". Visitors are still drawn by its un-disturbed nature.

Tioman has large areas of intact rainforest, which could be several thousand years old. Its forests are home to endemic species including the Tioman walking catfish (*Clarias batu*) and the Kajang slender litter frog (*Leptolalax kajangensis*). The island is surrounded by fringing reefs, which have been carbon dated at over six thousand years old. They are home to 350 species of reef-building corals, 320 species of coral reef fish, as well as endangered species such as sharks, turtles and dolphins. There are areas of mangrove and seagrass which, together with coral reefs, are important components of the nursery ground that these linked ecosystems form.

Despite this wealth of natural resources, the island's biodiversity faces challenges. The local population numbers only around 3,700 living in seven villages scattered around the island, but:

- There are approximately 250,000 tourist visitors per year.
- The number of both resorts and dive operators on the island is growing: since 2007 the number of resorts has increased from around 60 to over 100 today; the number of dive operators has increased from around 12 in 2007 to over 40 today.
- Previously un-developed areas, particularly in the South and East of the island, are now seeing pressure to develop resorts, particularly on the East coast in Kg. Juara, where several resorts have been constructed in recent years.
- The number of vehicles is increasing. In the main village, Kg. Tekek, there were four trucks in 2002; now there are traffic jams at the jetty at peak periods.
- The amount of waste is increasing (the incinerator has insufficient capacity).
- Water quality is declining (according to anecdotal observations and sparse water quality testing data).

Finally, RCM's data shows declining reef health. By any indicator, it is clear that development on the island is not following a sustainable trajectory.

Regular visitors to other islands will recognise this story, and will have similar experiences of other popular destinations. When we are reminded that these islands host invaluable ecosystems, we have to ask: what's going wrong? Why are such important national assets languishing and suffering harm that will compromise their ability to continue to provide us with critical ecosystem services in the future?

A review of the governance system on the island suggests some responses.

## Who “Owns” Tioman?

The Malaysian Constitution is clear on this point: States are responsible for managing issues related to land. States decide on disposals, use, sale, etc.

But it goes further. According to Malaysian law, State governments are also responsible for 3 nautical miles of the seabed from low water mark. This can be taken to include any sessile organisms on that seabed. Which includes most seagrasses and coral reefs, as these are usually found in shallow waters fringing islands.

According to the law, a case can be made that States clearly have a role in managing and conserving both terrestrial and marine biodiversity.

## Who “Manages” Tioman?

This is more complicated.

Approximately 61% of the area of Tioman Island is gazetted as a wildlife reserve, which is managed by the Wildlife Department (PERHILITAN).

The remaining land is managed by the local municipality, Tioman Development Authority, which provides a variety of services including waste management. Some land is in private ownership; some is owned by the State government. The Rompin District and Land Office (Pejabat Daerah Dan Tanah Rompin) is locally responsible for land administration.

The waters around the island, covering an area from low water mark to 2 nautical miles, is a Marine Park, managed by Department of Fisheries.

The Ministry of Tourism, Arts and Culture (MOTAC), together with Tourism Malaysia is responsible for promoting tourism in Malaysia, and for the expansion of the tourism industry.

Numerous other government agencies and departments are also involved in some way in the bureaucratic management of Tioman, including:

- PLAN Malaysia (part of the Ministry of Housing and Local Government) is responsible for State and Local Plans, as well as Special Area plans
- Department of Environment (Part of the Ministry of Natural Resources and Environmental Sustainability) has a variety of relevant duties including management EIAs and the Environmental Quality Act
- Jabatan Laut (part of Ministry of Transport) is responsible for maritime affairs within Malaysian waters.

Despite its “ownership” of biodiversity assets, State governments are absent from this list.

## Where are the gaps?

There are two key gaps in this approach to managing the island's biodiversity.

The first "gap" appears to be that there is no effective mechanism for these various agencies to collaborate to holistically manage the terrestrial and marine biodiversity of Tioman Island **at a local level**:

- PERHILITAN is responsible for the wildlife reserve
- DoF is responsible for the Marine Park
- TDA is responsible for municipal management
- MOTAC is responsible for promoting tourism...

...but no-one is specifically responsible for the effective coordination and conservation of the island's biodiversity in a way that takes account of the various impacts currently managed separately by the different institutions. It appears that the agencies are "working in silos", each following its own policies without coordination with others.

The second "gap" is the absence of a mechanism to give local stakeholders a voice in decisions affecting how the island is managed and developed. Local stakeholders include local island residents, businesses, whether in the tourism industry or supplying the local economy, and State governments.

## Integrating management of terrestrial and marine biodiversity on islands: a new paradigm?

Government is asked to consider a modified approach to management and conservation of critical ecosystems, particularly in Marine Parks and the islands surrounded by them. Such an approach should integrate conservation of terrestrial and marine ecosystems and should involve all stakeholders. It should provide for an integrated management body for the islands and their surrounding waters.

This might take the form, for example, of a State Park (a protected area gazetted under a State Enactment) that incorporates both an island and its surrounding waters. A Protected Area Management Body (PAMB) is envisaged that has "a seat at the table" for all relevant stakeholders. Such a body might have representation from:

- DoFM, as the agency responsible for patrolling and enforcing Marine Park regulations
- State Parks agencies, responsible for managing State Parks
- Ketua Kampung, as a representative of the local community
- Business operator, as a representative of the tourism industry on an island
- MOTAC, responsible for tourism, and increasingly, sustainable tourism
- PERHILITAN, Sabah Wildlife Department and Sarawak Forestry Corporation, responsible for managing, protecting and conserving wildlife and national parks
- Other relevant agencies.

Each member would represent a defined stakeholder or community, representing their views in decision making relating to the management of the Park.

By delegating specific responsibilities to other members, it might be possible for agencies such as DoFM to share some day-to-day activities with the community, allowing it to focus efforts on more important issues such as identifying new protected areas. And the involvement in management of other agencies, such as MOTAC, might provide new opportunities to establish a more sustainable tourism industry on the islands.

---

Establishing State Parks with integrated management bodies creates an opportunity for collaboration with State Park Corporations, State Economic Planning Units, and related state agencies which could ensure a coordinated approach to managing both land and marine impacts.

This model could also leverage existing state-led biodiversity and tourism management initiatives, aligning them with marine conservation goals. Partnerships with agencies like PERHILITAN and Biodiversity Councils could further integrate reef conservation into broader state economic and environmental strategies.

Pursuing international certifications or recognition, such as those offered by the Green List of Protected and Conserved Areas (IUCN) or Sustainable Tourism certifications, could elevate the profile of these sites. This boosts conservation credibility and enhances the site's marketability for eco-tourism.

Such certifications often come with guidelines for sustainable management and can provide additional economic value by attracting environmentally conscious tourists and investors.

**The approach described above is just one possibility. But, given the decline in the health of coral reefs around Malaysia, we urge all relevant parties to work together to improve the management and conservation of Malaysia's marine biodiversity. The Department of Fisheries Malaysia, the Ministry of Natural Resources and Environmental Sustainability, the Ministry of Tourism and Culture, Ministry of Tourism, Culture and Environment Sabah, Sarawak Forestry Corporation are just a few key government stakeholders. The conversation must include other stakeholders including small scale fishers, local communities and the tourism industry. Action is required now to reverse the decline in coral reef health if we are to continue to benefit from the many goods and services they provide us.**

## 6. Conclusion

The 4<sup>th</sup> Global Coral Bleaching Event combined with local threats have greatly affected coral reefs in Malaysia. Building the resilience of our reefs is crucial to ensure they can cope with, and recover from, future major stress events such as mass coral bleaching events or storms, and will continue to thrive. This can be achieved by reducing or eliminating the various local impacts that affect our reefs. It is clear that tourism, fisheries and coastal development need to be managed in such a way as to ensure the needs of local communities are met at the same time that ecosystem conservation is maximised.

Providing opportunities for stakeholders to participate in management and building resilience will contribute to economic growth and healthier and more productive ecosystems. We encourage relevant government agencies to bring stakeholders together to discuss the challenges faced by our reefs and derive solutions that benefit all.

## Acknowledgements

Reef Check Malaysia cannot work in isolation, we partner with government and the private sector, whom make significant contributions to this annual survey programme by conducting surveys at some of the sites, as well as assisting in reef rehabilitation programmes and school education projects.



We are grateful to Department of Fisheries Malaysia for taking the responsibility to carry out Reef Check surveys at some Marine Parks and non-Marine Parks islands.



We are grateful to Ministry of Tourism, Culture and Environment Sabah and Sabah Parks for their continuous efforts in funding and/or carrying out Reef Check surveys at many islands in Sabah.

We are grateful to the following sponsors for supporting the 2024 survey programme and conservation efforts:



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Tioman Marine Conservation Group (TMCG), a local conservation group established in 2015, is involved in the annual Reef Check surveys. Members are also active in bleaching and COT monitoring, reef rehabilitation, installation of mooring lines, school education programmes and ghost net removals.



Redang Marine Conservation Group (RMCG), established in 2023, played an active role in conducting the annual Reef Check surveys in 2024. RMCG is also involved in reef rehabilitation, installation of mooring lines, education programs for schools, and ghost net removal initiatives.



Mersing Marine Conservation Group (MMCG) was formed in 2024. Members have assisted in numerous underwater clean-ups, mooring buoy installations, reef rehabilitation and EcoDiver training.



Pemimpin Belia IKLIM Mabul (PBIM) was established in 2022 through a collaboration with Green Semporna. The youth group was initially focused on climate change initiative. This eventually evolved to include a coral reef monitoring and conservation programme around Mabul Island.



Larapan Marine Conservation Group (LMCG) was established in 2023 after a year of community engagement on the island. LMCG is currently conducting a variety of coral reef conservation initiative around the island including coral restoration.



Selakan Marine Conservation Group (SMCG) is based on Selakan Island, within Tun Sakaran Marine Park. Members are currently working closely with Sabah Parks and Reef Check Malaysia to restore and protect reefs around Selakan Island. Activities also include community-led sea patrolling to deter illegal fishing activities.



Kulapuan Marine Conservation Group (KMCG) is based on Kulapuan Island. The group is currently involved in coral restoration initiatives to restore reefs damaged by blast fishing.

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- Mohd Shahrin Bin Mohktar
- Mohd Shaleh bin Bural
- Mohd Syukri
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- Muhammad Addin bin Mazni
- Muhamad Fairus Bin Khalit
- Mohamad Zulhafidz Farhan Alias
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## Appendix 1: Survey Sites

### Sunda Shelf

Site Name	Island	Coordinate
Batu Layar	Seri Buat	2 41.893 N 103 53.980 E
Fish Alley	Seri Buat	2 40.404 N 103 54.264 E
Pulau Tasu	Seri Buat	2 41.704 N 103 55.813 E
Sembilang	Seri Buat	2 41.555 N 103 52.775 E
Batu Malang	Tioman	2 54.139 N 104 06.148 E
Batu Nipah	Tioman	2 43.928 N 104 08.125 E
Chebeh	Tioman	2 55.946 N 104 05.814 E
Fan Canyon	Tioman	2 54.650 N 104 06.753 E
Jahat East	Tioman	2 40.127 N 104 10.518 E
Labas	Tioman	2 53.318 N 104 03.920 E
Munjor South	Tioman	2 44.492 N 104 13.068 E
Nayak	Tioman	2 46.758 N 104 12.760 E
Pirates Reef	Tioman	2 49.428 N 104 09.445 E
Renggis	Tioman	2 48.594 N 104 08.161 E
Saing	Tioman	2 45.502 N 104 11.950 E
Sepoi	Tioman	2 53.883 N 104 03.100 E
Soyak North	Tioman	2 52.558 N 104 08.828 E
Soyak South	Tioman	2 52.480 N 104 08.810 E
Tekek House Reef	Tioman	2 48.960 N 104 09.062 E
Teluk Dalam	Tioman	2 52.456 N 104 11.254 E
Teluk Kador	Tioman	2 54.891 N 104 06.507 E
Tumuk	Tioman	2 47.581 N 104 07.335 E
Heritage Row	Bidong/Yu	5 36.922 N 103 03.412 E
Pasir Tenggara	Bidong/Yu	5 36.607 N 103 03.780 E
P. Karah	Bidong/Yu	5 35.935 N 103 03.851 E
P. Tengkorak	Bidong/Yu	5 39.967 N 103 04.277 E
P. Yu Besar	Bidong/Yu	5 38.615 N 103 09.063 E
P. Yu Kecil	Bidong/Yu	5 37.533 N 103 09.570 E
Batu Payong	Kapas	5 13.468 N 103 15.658 E
Coral Garden 1	Kapas	5 14.113 N 103 15.678 E
Coral Garden 3	Kapas	5 14.149 N 103 15.782 E
Silent Reef	Kapas	5 13.785 N 103 16.079 E
Teluk Jawa	Kapas	5 12.526 N 103 16.165 E
Batu Bulan	Lang Tengah	5 47.807 N 102 53.978 E
Broler North	Lang Tengah	5 48.149 N 102 53.613 E
Summer Bay House Reef	Lang Tengah	5 47.666 N 102 53.531 E
Tanjung Telunjuk	Lang Tengah	5 47.251 N 102 54.146 E
Batu Layar	Perhentian	5 54.722 N 102 44.693 E
Batu Nisan	Perhentian	5 55.259 N 102 43.536 E
Batu Tabir	Perhentian	5 56.345 N 102 43.321 E
D' Lagoon	Perhentian	5 55.927 N 102 43.395 E
P. Rawa	Perhentian	5 57.777 N 102 40.833 E

Sea Bell	Perhentian	5 54.636 N 102 42.589 E
Shark Point	Perhentian	5 53.044 N 102 44.821 E
Tanjung Basi	Perhentian	5 55.387 N 102 45.518 E
Tiga Ruang	Perhentian	5 54.867 N 102 45.244 E
Tukas Laut	Perhentian	5 53.162 N 102 46.216 E
Chagar Hutang East	Redang	5 49.038 N 103 00.597 E
Mak Simpan	Redang	5 47.302 N 102 59.556 E
Pasir Akar	Redang	5 44.398 N 102 59.955 E
P. Kerengga Besar	Redang	5 45.261 N 103 01.737 E
P. Kerengga Kecil	Redang	5 45.519 N 103 01.751 E
P. Lima Southern Tip	Redang	5 46.397 N 103 03.553 E
P. Paku Besar	Redang	5 46.777 N 103 02.557 E
P. Paku Kecil	Redang	5 46.305 N 103 02.338 E
P. Pinang Marine Park Centre	Redang	5 44.814 N 102 59.987 E
Redang Kalong House Reef	Redang	5 45.660 N 103 01.584 E
Teluk Kerma	Redang	5 47.970 N 103 01.017 E
Terumbu Kili	Redang	5 43.928 N 102 59.825 E
Site 2	Rhu	5 49.551 N 102 36.777E
Site 6	Rhu	5 49.752 N 102 36.515 E
Site 7	Rhu	5 49.958 N 102 36.725 E
Site 9	Rhu	5 49.706 N 102 36.985 E
Freshwater Bay	Tenggol	4 48.546 N 103 40.669 E
Gua Rajawali	Tenggol	4 48.768 N 103 40.556 E
Pasir Tenggara	Tenggol	4 48.021 N 103 40.456 E
Rajawali Reef	Tenggol	4 49.037 N 103 40.755 E
Teluk Rajawali	Tenggol	4 48.931 N 103 40.824 E
Turtle Point	Tenggol	4 48.364 N 103 40.468 E
Atlantis Bay	Aur/Dayang	2 28.271 N 104 30.633 E
P. Lang	Aur/Dayang	2 27.594 N 104 29.358 E
Teluk Batu Kapal	Aur/Dayang	2 28.368 N 104 30.481 E
Teluk Jawa	Aur/Dayang	2 28.651 N 104 30.271 E
Teluk Meriam	Aur/Dayang	2 26.509 N 104 30.571 E
Teluk Teluran	Aur/Dayang	2 27.617 N 104 31.587 E
Mirage	Besar	2 25.823 N 103 58.718 E
Palenting	Besar	2 27.408 N 103 58.298 E
Rapang	Besar	2 27.503 N 203 58.758 E
Teluk Buluh	Besar	2 26.543 N 103 58.385 E
Teluk Kalih	Besar	2 25.398 N 103 59.410 E
Teluk Meriam	Besar	2 26.672 N 103 59.309 E
Teluk Meriam South	Besar	2 26.127 N 103 59.610 E
Transect 1	Gual	2 31.964 N 103 58.128 E
Transect 2	Gual	2 32.106 N 103 58.093 E
Transect 3	Gual	2 32.252 N 103 58.105 E
Transect 4	Gual	2 32.205 N 103 58.198 E
Transect 5	Gual	2 32.096 N 103 58.235 E
Transect 6	Gual	2 31.988 N 103 58.198 E
Transect 7	Gual	2 31.807 N 103 58.241 E

Transect 8	Gual	2 31.745 N 103 58.282 E
Transect 9	Gual	2 31.894 N 103 58.280 E
Transect 1	Harimau	2 33.512 N 103 56.825 E
Transect 2	Harimau	2 33.460 N 103 56.705 E
Transect 3	Harimau	2 33.510 N 103 56.540 E
Transect 4	Harimau	2 33.625 N 103 56.462 E
Transect 5	Harimau	2 33.673 N 103 56.567 E
Transect 6	Harimau	2 33.650 N 103 56.775 E
Transect 7	Harimau	2 33.634 N 103 56.861 E
Transect 1	Hujung	2 29.326 N 103 56.964 E
Transect 2	Hujung	2 29.745 N 103 56.850 E
Transect 3	Hujung	2 29.549 N 103 56.824 E
Transect 4	Hujung	2 29.705 N 103 57.001 E
Transect 5	Hujung	2 29.627 N 103 57.259 E
Transect 6	Hujung	2 29.440 N 103 57.343 E
Transect 7	Hujung	2 29.214 N 103 57.316 E
Transect 8	Hujung	2 29.183 N 103 57.133 E
Transect 9	Hujung	2 29.009 N 103 57.367 E
P. Lima	Lima	2 13.099 N 104 08.990 E
P. Lima Kecil	Lima	2 13.303 N 104 08.770 E
Tokong Sanggul	Lima	2 13.377 N 104 08.082 E
Transect 1	Mensirip	2 32.865 N 103 57.701 E
Transect 2	Mensirip	2 32.914 N 103 57.602 E
Transect 3	Mensirip	2 32.995 N 103 57.497 E
Transect 4	Mensirip	2 33.093 N 103 57.505 E
Transect 5	Mensirip	2 33.195 N 103 57.488 E
Transect 6	Mensirip	2 33.147 N 103 57.619 E
Transect 7	Mensirip	2 32.977 N 103 57.685 E
Mertang Barat	Mertang	2 39.194 N 103 52.755 E
Mertang Barat 2	Mertang	2 39.304 N 103 52.812 E
Mertang Tengah	Mertang	2 39.152 N 103 52.983 E
Mertang Tengah 2	Mertang	2 39.019 N 103 52.978 E
Mertang Timur	Mertang	2 38.886 N 103 53.216 E
Mertang Timur 2	Mertang	2 38.665 N 103 53.286 E
Bumphead Bay	Pemanggil	2 35.066 N 104 20.180 E
Lobster Bay	Pemanggil	2 34.237 N 104 19.306 E
Pemanggil Village South	Pemanggil	2 34.761 N 104 18.945 E
Tridacna Bay	Pemanggil	2 35.790 N 104 19.588 E
Transect 1	Rawa	2 31.112 N 103 58.490 E
Transect 2	Rawa	2 31.331 N 103 58.406 E
Transect 3	Rawa	2 31.514 N 103 58.343 E
Transect 4	Rawa	2 31.464 N 103 58.455 E
Transect 5	Rawa	2 31.295 N 103 58.626 E
Transect 6	Rawa	2 31.067 N 103 58.702 E
Transect 7	Rawa	2 30.934 N 103 58.651 E
Transect 8	Rawa	2 30.848 N 103 58.626 E
Transect 9	Rawa	2 31.668 N 103 58.321 E

Beach 3	Sibu	2 11.268 N 104 05.888 E
Buntut Meriam	Sibu	2 13.860 N 104 03.130 E
Malang Acha	Sibu	2 11.040 N 104 06.409 E
Sibu Hujung	Sibu	2 10.374 N 104 06.721 E
Sibu Kukus	Sibu	2 10.696 N 104 06.553 E
The Coconut	Sibu	2 13.567 N 104 03.184 E
Northern Reef	Tengah	2 28.754 N 103 57.377 E
Lagoon Bay Reef	Tengah	2 28.855 N 103 57.375 E
Mangrove Island	Tengah	2 28.904 N 103 57.551 E
Turtle Beach	Tengah	2 28.878 N 103 57.676 E
Shingle Beach	Tengah	2 28.776 N 103 57.818 E
Malang Tedung	Tengah	2 28.672 N 103 57.992 E
Rocky Viewpoint	Tengah	2 28.561 N 103 57.922 E
Tiny Beach	Tengah	2 28.416 N 103 57.869 E
Sunrise Beach	Tengah	2 28.378 N 103 57.767 E
Junior Reef	Tengah	2 28.365 N 103 57.582 E
Northern Reef Deep	Tengah	2 28.907 N 103 57.341 E
P. Ibol	Tinggi	2 18.183 N 104 08.935 E
P. Mentinggi	Tinggi	2 16.405 N 104 06.940 E
P. Nanga	Tinggi	2 16.274 N 104 07.640 E
P. Tanjung Gua Subang	Tinggi	2 18.792 N 104 07.552 E

## Malacca Strait

Site Name	Island	Coordinate
Coral Garden	Payar	6 03.371 N 100 02.157 E
Kaca	Payar	6 04.389 N 100 03.444 E
Langkawi Coral	Payar	6 03.951 N 100 02.606 E
Lembu	Payar	6 04.293 N 100 03.067 E
Singapore Bay	Payar	6 03.639 N 100 02.472 E
Pangkor Laut	Pangkor Laut	4 11.393 N 100 32.899 E
Anemone Garden, P. Saji	Sembilan	4 00.390 N 100 32.088 E
Frogfish, P. Nipis	Sembilan	4 03.450 N 100 32.382 E
Pasir Tengkorak, P. Lalang	Sembilan	4 00.162 N 100 32.802 E
P. Buluh	Sembilan	3 59.650 N 100 32.048 E
Rock Garden, P. Saji	Sembilan	4 00.684 N 100 32.106 E
Site 1, P.Saga	Sembilan	4 00.732 N 100 32.694 E
Site 2, P. Lalang	Sembilan	4 00.099 N 100 32.945 E
Site 2, P. Rumbia	Sembilan	4 01.344 N 100 32.874 E
Zoanthid Garden, P. Rumbia	Sembilan	4 01.926 N 100 33.000 E
Pantai Labuan	Malacca	2 06.546 N 102 19.357 E
Pulau Undan 1	Malacca	2 02.944 N 102 20.021 E
Undan Jetty	Malacca	2 02.869 N 102 20.119 E
Pulau Nangka	Malacca	2 04.483 N 102 20.017 E
Pulau Dodol	Malacca	2 04.933 N 102 19.983 E
Kem Askar	Port Dickson	2 25.619 N 101 51.331 E
Monkey Bay	Port Dickson	2 24.841 N 101 51.041 E

## North Borneo

Site Name	Island	Coordinate
Cleaning Station	Kapalai	4 13.517 N 118 41.283 E
Kapalai Rock	Kapalai	4 12.615 N 118 40.797 E
Little Okinawa	Kapalai	4 12.850 N 118 40.533 E
Lost World	Kapalai	4 12.093 N 118 41.392 E
Siu Siu Point	Kapalai	4 13.087 N 118 40.313 E
Adam's Point	Lahad Datu	4 57.052 N 118 15.473 E
Blue Ring	Lahad Datu	4 51.182 N 118 15.990 E
Cabbage Reef	Lahad Datu	4 56.927 N 118 15.470 E
Fish Eye	Lahad Datu	4 57.782 N 118 15.165 E
House Reef	Lahad Datu	4 58.027 N 118 15.841 E
Ira's Reef	Lahad Datu	4 55.412 N 118 15.363 E
Lam's Point	Lahad Datu	4 56.275 N 118 16.464 E
Light House	Lahad Datu	4 56.922 N 118 15.076 E
Mid Reef	Lahad Datu	4 54.740 N 118 15.256 E
Nemo Garden	Lahad Datu	4 56.494 N 118 16.945 E
Paradise	Lahad Datu	4 56.548 N 118 17.637 E
P. Burung	Lahad Datu	4 55.439 N 118 16.003 E
P. Laila	Lahad Datu	4 55.811 N 118 13.711 E
P. Maganting	Lahad Datu	4 48.720 N 118 17.361 E
P. Tabun	Lahad Datu	4 55.246 N 118 12.076 E
Small Reef	Lahad Datu	4 54.444 N 118 14.595 E
Tabawan 1	Lahad Datu	4 46.842 N 118 22.930 E
Tumunong Hallo	Lahad Datu	4 54.510 N 118 10.644 E
Bimbo Rock	Lankayan	6 31.240 N 117 55.763 E
Froggie Fort	Lankayan	6 30.806 N 117 54.337 E
Goby Rock	Lankayan	6 28.745 N 117 53.448 E
Jawfish Lair	Lankayan	6 29.182 N 117 54.670 E
Ken's Rock	Lankayan	6 30.393 N 117 55.651 E
Lycia Garden	Lankayan	6 29.895 N 117 55.634 E
Mel's Rock	Lankayan	6 29.140 N 117 53.584 E
Moray Reef	Lankayan	6 33.125 N 117 56.141 E
Pegaso Reef	Lankayan	6 33.726 N 117 55.210 E
Reef 38	Lankayan	6 32.619 N 117 55.201 E
Reef 77	Lankayan	6 33.124 N 117 55.482 E
Veron's Fan Garden	Lankayan	6 31.259 N 117 54.944 E
Kampung Point	Larapan	4 33.319 N 118 35.396 E
Point 2	Larapan	4 33.586 N 118 36.910 E
Point 3	Larapan	4 33.878 N 118 35.592 E
SMEE 1	Larapan	4 34.453 N 118 36.254 E
SMEE 2	Larapan	4 32.947 N 118 35.949 E
Eel Garden	Mabul	4 13.883 N 118 38.017 E
Panglima	Mabul	4 14.922 N 118 37.529 E
Paradise	Mabul	4 14.989 N 118 37.830 E
Ribbon Valley	Mabul	4 14.046 N 118 38.255 E
Scuba Junkie House Reef	Mabul	4 14.938 N 118 37.925 E
Stingray City	Mabul	4 14.222 N 118 37.641 E

Abalone	Mantanani	6 43.207 N 116 22.105 E
Coral Reef	Mantanani	6 42.389 N 116 20.840 E
Indian Brothers	Mantanani	6 43.191 N 116 20.454 E
Italian Place	Mantanani	6 42.308 N 116 19.232 E
Kolam	Mantanani	6 43.930 N 116 21.567 E
Linggisan	Mantanani	6 42.832 N 116 20.084 E
Mari Mari House Reef	Mantanani	6 42.396 N 116 19.275 E
Police Gate	Mantanani	6 42.730 N 116 20.313 E
Riza Garden	Mantanani	6 42.136 N 116 21.812 E
Sahara	Mantanani	6 43.295 N 116 20.905 E
South East Point	Mantanani	6 42.454 N 116 22.329 E
Stingray Point	Mantanani	6 42.764 N 116 19.771 E
Cahaya Way	Mataking	4 30.252 N 118 56.504 E
Coral Garden	Mataking	4 34.212 N 118 57.415 E
Mataking House Reef	Mataking	4 34.758 N 118 56.415 E
Pandanan Bay	Mataking	4 34.907 N 118 54.795 E
Stingray City	Mataking	4 33.359 N 118 55.627 E
Sweetlips Rock	Mataking	4 35.960 N 118 56.454 E
Mid Reef	Pulau Penyu	6 10.402 N 118 04.287 E
Pulau Bakungan 1	Pulau Penyu	6 10.192 N 118 06.538 E
Pulau Bakungan 2	Pulau Penyu	6 09.805 N 118 06.483 E
Pulau Gulisan	Pulau Penyu	6 09.268 N 118 03.512 E
Selingan	Pulau Penyu	6 10.813 N 118 03.803 E
Larai-Larai	Pulau Tiga	5 43.017 N 115 38.097 E
Larai-Larai Midreef	Pulau Tiga	5 43.779 N 115 36.477 E
Lutjanus	Pulau Tiga	5 43.213 N 115 38.688 E
Mid Reef	Pulau Tiga	5 42.302 N 115 37.705 E
Senanggol	Pulau Tiga	5 42.482 N 115 41.958 E
Tagi Beach	Pulau Tiga	5 42.768 N 115 40.347 E
Tanjung Putri	Pulau Tiga	5 42.517 N 115 39.195 E
Barracuda Point	Sipadan	4 07.130 N 118 37.745 E
Coral Garden	Sipadan	4 06.342 N 118 37.722 E
Drop Off	Sipadan	4 07.092 N 118 37.675 E
Hanging Garden	Sipadan	4 06.703 N 118 37.495 E
Lobster Lair	Sipadan	4 06.557 N 118 37.540 E
Mid Reef	Sipadan	4 06.812 N 118 38.158 E
South Point	Sipadan	4 06.258 N 118 38.110 E
Staghorn Crest	Sipadan	4 06.257 N 118 37.895 E
Turtle Patch	Sipadan	4 06.450 N 118 38.177 E
West Ridge North	Sipadan	4 06.910 N 118 37.487 E
White Tip	Sipadan	4 07.137 N 118 38.055 E
Base Camp	Tunku Abdul Rahman Park	6 00.491 N 116 01.322 E
Mamutik	Tunku Abdul Rahman Park	5 58.067 N 116 00.756 E
Manukan West	Tunku Abdul Rahman Park	5 58.246 N 115 59.659 E
Mid Reef	Tunku Abdul Rahman Park	5 58.433 N 116 00.750 E
Police Beach	Tunku Abdul Rahman Park	6 02.483 N 116 01.183 E
Sapi	Tunku Abdul Rahman Park	6 00.479 N 116 00.190 E
Sulug	Tunku Abdul Rahman Park	5 57.547 N 115 59.464 E
Tanjung Wokong	Tunku Abdul Rahman Park	5 59.433 N 116 02.417 E

Batu Sirih	Tun Mustapha Park	7 11.403 N 116 52.805 E
Belaruan	Tun Mustapha Park	7 02.075 N 117 00.187 E
Berungus	Tun Mustapha Park	6 57.345 N 117 00.600 E
Fairway Shoal 1	Tun Mustapha Park	7 07.155 N 117 30.555 E
Inderason	Tun Mustapha Park	6 46.560 N 116 36.969 E
Lubani Rock 1	Tun Mustapha Park	6 53.152 N 117 22.949 E
Lubani Rock 2	Tun Mustapha Park	6 53.698 N 117 22.338 E
Maliangin Besar 6	Tun Mustapha Park	7 04.880 N 117 03.267 E
Maliangin Kecil Reef	Tun Mustapha Park	7 04.707 N 117 01.772 E
Pancang Pukul	Tun Mustapha Park	7 02.027 N 117 04.408 E
Pulau Kalutan (Batu Sirih)	Tun Mustapha Park	7 12.130 N 116 50.702 E
Pulau Tiga	Tun Mustapha Park	7 21.380 N 117 03.283 E
Pulau Mati	Tun Mustapha Park	7 04.877 N 117 14.872 E
Sibaliu North	Tun Mustapha Park	7 11.390 N 117 22.213 E
Sibogo	Tun Mustapha Park	7 13.974 N 117 23.099 E
Simpang Mengayau	Tun Mustapha Park	7 02.966 N 116 44.665 E
Straggler Reef	Tun Mustapha Park	7 02.632 N 117 27.910 E
Tampakan	Tun Mustapha Park	6 51.651 N 116 51.681 E
Kapikan Reef	Tun Sakaran Marine Park	4 37.698 N 118 50.112 E
Mantabuan	Tun Sakaran Marine Park	4 37.933 N 118 47.798 E
Ribbon Reef	Tun Sakaran Marine Park	4 36.135 N 118 46.090 E
Sibuan	Tun Sakaran Marine Park	4 39.154 N 118 39.884 E
South Rim	Tun Sakaran Marine Park	4 34.078 N 118 45.498 E
Tanjung Kenangan	Tun Sakaran Marine Park	4 35.127 N 118 47.155 E
Keramat	Usukan Cove	6 23.635 N 116 19.637 E
Lok Liak	Usukan Cove	6 22.126 N 116 19.101 E
Pandan-Pandan	Usukan Cove	6 21.265 N 116 18.666 E
Poduko	Usukan Cove	6 22.322 N 116 19.438 E
Uban-Uban	Usukan Cove	6 23.442 N 116 19.342 E
Usukan Cove Lodge	Usukan Cove	6 22.455 N 116 20.586 E