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SPATIAL DISTRIBUTION OF CORAL COMMUNITIES ON FRINGING REEFS AT TIOMAN ISLAND MARINE PARK, MALAYSIA

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Abstract. Monitoring coral health status is important for effective reef ecosystem management. The present study aimed to determine the coral condition and distribution at twenty sites around Tioman Island Marine Park (TIMP), Malaysia. The Coral Video Transect (CVT) method was used to survey coral, and the Coral Point Count with Excel extension (CPCe) software was used to analyse images for identification and coral coverage measurement. The findings indicate that TIMP reefs had a mean live coral cover of 48.0% ± 0.7, suggesting they were in 'fair' coral condition. A total of 254 species, spanning 61 genera and 15 families of scleractinian coral were identified across all reef sites. Following the recent taxonomic classification, coral surveys and past studies revealed 355 species from 67 genera and 15 families of scleractinian coral with additional 30 new species records for TIMP, and 15 for the east coast of Peninsular Malaysia. Overall, 29 identified scleractinian species are considered rare, 86 vulnerable, and 3 are endangered. Current data also recorded 77 genera from 24 families of hard and soft corals with *Acropora*, *Montipora* and *Porites* predominantly found in reef assemblages. Overall, it can be concluded that the extensive coastal development and widespread tourism activities may have influenced the variations in coral condition and distribution in this Marine Park.

INTRODUCTION

Malaysia's coral reefs cover approximately 4,000 km^2, with more than 75% reef areas found along the coast of Sabah (Burke et al. 2012). In Peninsular Malaysia, coral reefs are found at several localities, including off the west coast, south coast and east coast areas. The east coast area of Peninsular Malaysia encompasses higher hard coral diversity, compared to the south coast, with 398 and 245 species identified, respectively (Affendi and Rosman 2012). Meanwhile, the west coast of Peninsular Malaysia showed the lowest coral diversity area with only 56 species identified (Affendi and Rosman 2012). The data compiled to date gives a species count of 480 hard corals in Peninsular Malaysia (Affendi and Rosman 2012). This figure represents approximately 80% of the total number of hard coral species identified in the Coral Triangle area (Veron et al. 2015).

Tioman Island Marine Park (TIMP), situated on the east coast of Peninsular Malaysia has formed the basis of a valuable Malaysian tourism industry, due to its high coral diversity (Shahbudin et al. 2017; Akmal et al. 2019). It comprises nine large islands (Chebeh, Seri Buat, Sembilang, Tioman, Tulai, Labas, Tokong Bahara, Gut and Sepoi Islands) and five small islands (Renggis, Tumok, Soyak, Tasu and Raja Islands), with approximately 69 km^2 of fringing reef areas (DMPM 2011). These areas are fully protected under the Fisheries Act 1985, with no fishing activities being permitted within two nautical miles of the Marine Park area. TIMP is also recognized as the most popular tourist destination for diving and snorkelling activities (Saad et al. 2015). Over 4.5 million tourists are estimated to have visited TIMP between 2000 and 2019, with an annual average of more than 200 thousand tourists (DMPM 2019). In addition to diverse coral species, good accommodation and well-equipped tourist facilities are promoting the inflow of local and foreign tourists (Hanim et al. 2010; Omar et al. 2015). Currently, a total of 72 coastal resorts have been developed and the majority are located along the west coast zone of Tioman Island (RCM 2018).

However, extensive coastal development and tourism activities have been reported to contribute to the low coverage of live corals at some reef sites in the west coast zone of Tioman Island (Toda et al. 2007; Shahbudin et al. 2017; Akmal et al. 2019). Additionally, a high number of tourists visiting TIMP has been linked to the excess of untreated sewage disposed directly from hotels and resorts into the reefs (RCM 2018). This is further compounded by effluent discharges from local houses into the river system, as has been recorded at the Lalang River on Tioman Island (Zakariah et al. 2007). Apart from that, the severity of the bleaching event in 2010 has been observed to cause partial mortality of approximately 50% of live coral cover at several reef sites in the isolated zone of TIMP (Tan and Heron 2011).

Numerous studies have determined the coral condition around TIMP (e.g. Harborne et al. 2000; Affendi et al. 2005, 2007; Toda et al. 2007; Khodzori et al. 2015; Shahbudin et al. 2017; Akmal et al. 2019; Lau et al. 2019). However, few published studies determined the diversity and distribution patterns of hard and soft corals around TIMP (e.g. Saad and Khodzori 2017; Shahbudin et al. 2017; Akmal et al. 2019). Additionally, data collected from the previous studies was inadequate to represent the study area of TIMP due to a limited number of survey reef sites (e.g. Harborne et al. 2000; Affendi et al. 2005, 2007). In fact, reef sites in the east coast zone of TIMP remain undocumented, and the information on the conservation status of coral species, either rare, endangered, or vulnerable, is yet to be comprehensively determined.

Therefore, this study aimed to update the list of scleractinian hard corals, including rare, vulnerable, and endangered species. The following update of the species list is further combined with the previous datasets published by Harborne et al. (2000), Affendi et al. (2005) and Affendi et al. (2007). Based on comprehensive coral surveys at 20 reef sites around TIMP, this study also provides updated data on coral condition as well as the distribution patterns of hard and soft corals using the Coral Video Transect (CVT) method. The findings of this study would be beneficial to the section of Marine Park Malaysia, Department of Fisheries (DOF) and universities in updating the status of coral condition for the protection of reefs around TIMP. The data presented in this study can also be used to update geographical information on coral diversity and distribution in tropical reef ecosystems.

MATERIALS AND METHODS

Study area

Tioman Island, in the South China Sea (02°48′52.1″N and 104°10′29.3″E), is the largest island on the east coast of Peninsular Malaysia, covering approximately 21 km in length and 12 km in width (Ng. et al. 1999). The island's coast is 58% rocky headlands and cliffs, and 42% sandy beach (DMPM 2011). It is estimated about 3,200 villagers reside in nine villages, with three on the northwest coast (Salang, Air Batang and Tekek villages), four on the southeast coast (Paya, Genting, Lanting and Nipah villages), Mukut village on the south coast, and Juara village on the east coast of Tioman Island (Omar et al. 2015). Tekek is the capital village of Tioman which serves as the administrative centre of the island, providing many infrastructures and facilities including an airport, bank, marina, jetty complex, and several retail stores.

In this study, twenty reef sites were surveyed, including the east coast, west coast and isolated zones of TIMP, which exhibit different environmental settings, coastal developments and human activities that might establish a gradient of human impacts, allowing comparisons in coral condition and distribution (Figure 1). Six reef sites were surveyed in the east coast zone: Dalam Bay (TE1), Dungun Bay (TE2), Ruit Bay (TE3), Juara Bay (TE4), Benuang Bay (TE5) and Sanggit Bay (TE6). All reef sites are less visited by snorkelers and divers since they are directly facing the South China Sea and frequently exposed to strong winds and current actions. No coastal development takes place nearby to the reef sites, except at TE4. TE4 is in front of Juara Village, which is surrounded by resorts and residential sites. Meanwhile, six reef sites were surveyed in the west coast zone: Salang Bay (TW1), Soyak Bay (TW2), Renggis Island (TW3), Tomok Island (TW4), Genting Bay (TW5) and Nipah Bay (TW6). All reef sites are surrounded by a high density of resorts, chalets and residential areas. They are also known as tourist hotspots for recreational diving and snorkelling activities. In the isolated zone, spanning the north and south-west of Tioman Island (Figure 1), eight reef sites were surveyed: Gado Bay (TI1), Bayan Bay (TI2), Bakau Bay (TI3), Malang Rock (TI4), Labas Island (TI5), Chebeh Island (TI6), Tokong Rock (TI7) and Bahara Rock (TI8). There are no coastal developments near to the isolated zone reef sites. However, they are heavily used for snorkelling and deep diving activities.

Coral survey method

The Coral Video Transect (CVT) method was used with a 100 m transect line, with 4 × 20 m segments at 5 m intervals, to survey coral at each of the 20 reef sites around TIMP (Liew et al. 2012; Safuan et al. 2015). An underwater camera (Olympus TG-4 in a ratio of 16:4 and 1980 × 1080 high definition (HD) resolution) protected with a waterproof casing (Olympus PT-053) was used to record coral images along the transect lines. The height of the camera from the substrates was approximately 50 cm, fixed by following a reference bar and held at a perpendicular angle to the substrate. The camera was run along a transect line at a speed of 4 minutes per segment to record clear and sharp images. Additional still images of close-up coral corallites were captured to aid in the identification process. The scleractinian hard coral species were identified using the books of Corals of the World (Veron 2000) and the website of World Register of Marine Species (WoRMS).

Video processing and data analysis

The four videos recorded along each 100 m transect line (n = 20) were converted to 160 images (40 images per each 20 m transect segment). All images were analyzed using a Coral Point Count with Excel extension

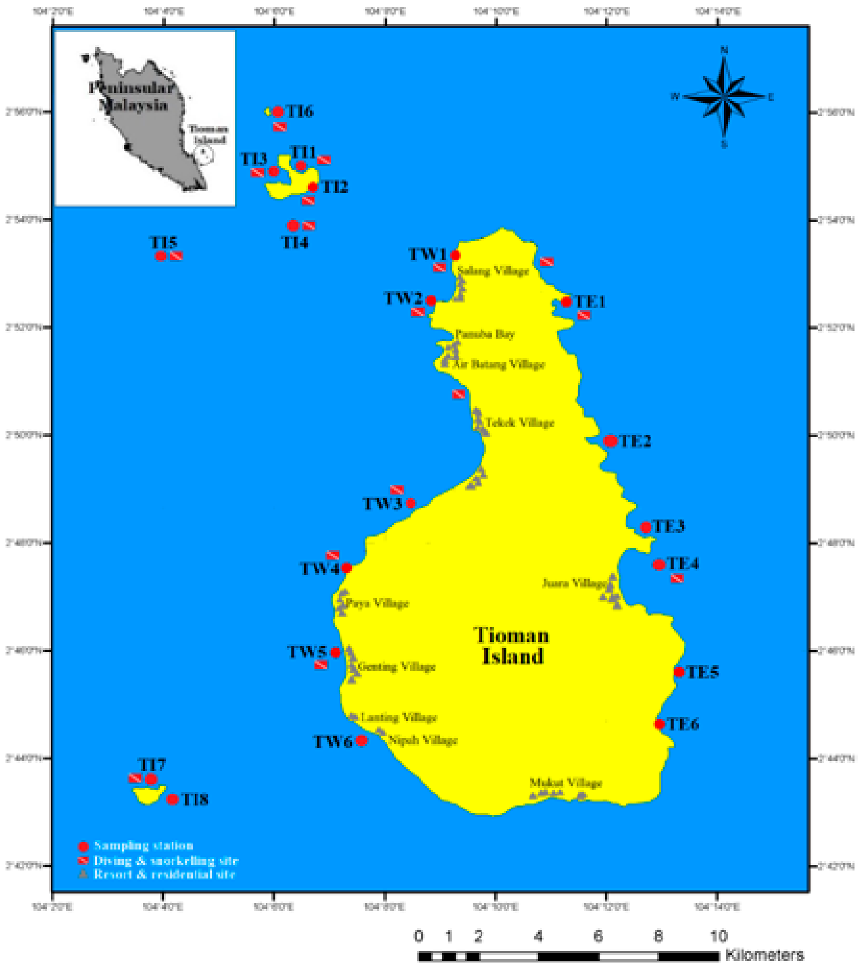

Figure 1. Locations of 20 reef sites around Tioman Island Marine Park.

(CPCe) software version 4.1 developed by Kohler and Gill (2006), with 50 uniform points per image. Data were summarized into three major categories: live corals (hard and soft corals), dead corals, and other (algae, other invertebrates, and abiotic elements). The coral condition was classified based on the mean percentage of live coral cover, following Chou et al. 1994, as either excellent (> 75% of live corals), good (51%–75% of live corals), fair (26%–50% of live corals) or poor (< 25% of live corals). A rating scale, from one to five crosses (+), was used to represent the relative abundance of each coral genus, where + = one or covering < 1% of coral colonies; ++ = uncommon covering 1–5% of coral colonies; +++ = common covering 6–10% of coral colonies; ++++ = abundant covering 11–20% of coral colonies; and +++++ = dominant covering > 20% of coral colonies, as used by Fabricius and McCorry (2006).

Statistical analysis

Kolmogorov-Smirnov (Lilliefors 1967) and Shapiro-Wilk (Shapiro and Francia 1972) tests indicated normally distributed data. Therefore, the difference in the mean percentage cover of benthic categories among reef sites and zones was tested using One-way Analysis of Variance (ANOVA) followed by Post-hoc Tukey HSD tests. The cluster analysis of coral taxa was performed to determine the group of similarities for all reef sites, using normalized data with log (x + 1) transform function and Bray Curtis method (Bray and Curtis 1957). A non-metric multidimensional scale (nMDS) plot was then used to illustrate the group of similarities for all reef sites from data interactions derived by the cluster analysis. Additionally, the similarity percentage (SIMPER) analysis was used to determine the mean similarity within all taxonomic coral compositions between different groups, as illustrated from the nMDS plot. All analyses were conducted using PAST software ver. 3 (Hammer et al. 2001).

RESULTS

Mean percentage cover of live corals and coral condition

The mean percentage of live coral cover varied significantly among the 20 reef sites ($F_{19,60} = 6.75$, $p = 0.001$), as did the percentage of other invertebrates ($F_{19,60} =$

4.47, $p = 0.002$). The Post-hoc test indicated that the mean percentage cover of live coral, which ranged from approximately 25.0% at TE4 to 73.0% at TI6, was significantly higher at reef sites in the east coast zone (e.g. TE1, TE3, TE5 and TE6) and some reef sites in the west coast (TW2 and TW3) and isolated (TI1, TI4 and TI6) zones (Table 1). Meanwhile, the mean percentage cover of other invertebrates ranged from approximately 6.2% at TW2 to 41.2% at TW6 and was significantly higher at TW6 compared to TE1, TW1, TW2, TW3, TW5, TI1, TI2, TI6, TI7 and TI8. No significant difference was observed for the dead coral cover among reef sites ($F_{19,60} = 14.08$, $p = 0.577$), though the highest was recorded at TI7 (57.6% ± 4.3), followed by TE4 (52.5% ± 2.8) and TW5 (52.4% ± 4.4).

The mean percentage of live coral cover ($F_{2,9} = 10.85$, $p = 0.004$) and dead coral ($F_{2,9} = 16.37$, $p = 0.001$) differed significantly among the three categorized zones. The Post-hoc test indicated that the mean percentage of live coral cover on the east coast (51.4% ± 0.8) and isolated zone (49.0% ± 1.9) was significantly higher compared to the west coast (43.3% ± 0.6) zones. The mean percentage cover of dead coral was significantly higher in the west coast (38.9% ± 1.1) compared to the isolated (34.7% ± 5.0) and east coast (27.3% ± 1.0) zones. There was no significant difference in the mean percentage cover of other invertebrates among the zones ($F_{2,9} = 2.10$, $p = 0.178$), though the east coast zone had the highest cover at 21.6% ± 0.6. Overall, the results showed that TIMP reefs were categorized as being in 'fair' coral condition with the live coral cover of 48.0% ± 0.7. Most reef sites in the east coast zone were categorized as being in 'good' coral condition, while the west coast zone was in 'fair' coral condition. In the isolated zone, the reef sites varied between 'fair' to 'good' coral condition.

Checklist of scleractinian hard coral species

Based on recent taxonomic classification of the Scleractinia, the TIMP coral surveys recorded 254 scleractinian coral species from 61 genera and 15 families (including 6 species and 4 genera of Incertae sedis) (Supplementary Table 1). TE5 had the highest number of scleractinian corals with 155 species, followed by TE1 (138 species) and TE3 (129 species). These reef sites also harboured a higher number of scleractinian species compared to other reef sites (TE2, TE2 and TE6) in the east coast zone. In the west coast zone, TW1 had the highest number

Table 1. Mean percentage cover (% ± SE) of three benthic categories and coral condition at 20 reef sites and 3 zones around TIMP.

No.	Reef sites		Live coral (%)	Dead coral (%)	Other invertebrates (%)	Coral condition
	East coast zone					
1	TE1	Dalam Bay	56.0 ± 3.2^a	28.4 ± 2.4	15.6 ± 2.1^b	Good
2	TE2	Dungun Bay	53.7 ± 2.0	18.7 ± 2.6	27.7 ± 1.6	Good
3	TE3	Ruit Bay	57.9 ± 3.0^a	22.0 ± 1.2	20.1 ± 1.9	Good
4	TE4	Juara Bay	25.0 ± 8.2^b	52.5 ± 2.8	23.4 ± 4.9	Fair
5	TE5	Benuang Bay	56.9 ± 3.0^a	28.1 ± 2.4	16.8 ± 4.1	Good
6	TE6	Sanggit Bay	59.8 ± 1.6^a	14.3 ± 1.0	25.9 ± 2.4	Good
	Mean ± SE		51.4 ± 0.8^a	27.3 ± 1.0^b	21.6 ± 0.6	Good
	West coast zone					
7	TW1	Salang Bay	40.5 ± 1.4	46.4 ± 2.6	13.1 ± 2.0^b	Fair
8	TW2	Soyak Island	66.0 ± 2.2^a	27.8 ± 1.4	6.2 ± 1.5^b	Good
9	TW3	Renggis Island	45.6 ± 3.4^a	40.3 ± 4.9	14.2 ± 1.9^b	Fair
10	TW4	Tomok Island	31.0 ± 8.7	45.9 ± 3.2	23.1 ± 10.4	Fair
11	TW5	Genting Bay	38.3 ± 4.4	52.4 ± 4.4	9.4 ± 2.4^b	Fair
12	TW6	Nipah Bay	38.3 ± 9.1	20.5 ± 2.2	41.2 ± 9.3^a	Fair
	Mean ± SE		43.3 ± 0.6^b	38.9 ± 1.1^a	17.9 ± 1.7	Fair
	Isolated zone					
13	TI1	Gado Bay	59.7 ± 4.1^a	31.5 ± 4.1	8.8 ± 1.2^b	Good
14	TI2	Bayan Bay	49.5 ± 8.1	43.2 ± 6.5	7.3 ± 1.7^b	Fair
15	TI3	Bakau Bay	27.6 ± 3.6^b	41.4 ± 4.4	30.9 ± 7.4	Fair
16	TI4	Malang Rock	55.0 ± 6.6^a	24.2 ± 4.1	20.8 ± 8.9	Good
17	TI5	Labas Island	42.4 ± 3.8	21.8 ± 0.8	35.9 ± 4.3	Fair
18	TI6	Chebeh Island	73.0 ± 2.6^a	14.6 ± 2.5	12.4 ± 2.2^b	Good
19	TI7	Tokong Rock	34.9 ± 6.2	57.6 ± 4.3	7.5 ± 2.0^b	Fair
20	TI8	Bahara Rock	48.0 ± 0.7	33.9 ± 1.4	13.9 ± 2.3^b	Fair
	Mean ± SE		49.0 ± 1.9^a	34.7 ± 5.0^b	17.2 ± 2.2	Fair
	Tioman island		48.0 ± 0.7	33.4 ± 1.4	18.7 ± 3.7	Fair

Note: Superscripts a and b indicate significant level ($p < 0.05$) based on Post-hoc Tukey HSD test.

of scleractinian corals with 122 species. In the isolated zone, TI2 (112 species) and TI1 (111 species) had the highest number of scleractinian species compared to other reef sites (TI3, TI4, TI5, TI6, TI7 and TI8). A low number of scleractinian species was recorded at TI7 (33 species) and TW6 (35 species), located in the isolated and west coast zones, respectively. Among the 254 recorded scleractinian species, 19 species were considered the most common and recorded at most reef sites (n ≥ 17) while 94 species were the least common and were recorded at a few sites (n ≤ 3). Previous scleractinian coral species lists for TIMP presented by Harborne et al. (2000) recorded 157 scleractinian species at seven reef sites (Batu Malang, Tlk. Juara, Pulau Gut, Pulau Tokong Bahara, Pulau Seri Buat, Tlk. Kadar at Pulau Tulai and Pulau Renggis). The additional coral surveys done by Affendi et al. (2005) at Tlk. Tekek and by Affendi et al. (2007) at several reef sites from Kg. Paya to Kg. Genting recorded 204 species and 248 species, respectively. Therefore, in comparison to all studies above, the present checklist revealed a total of 355 species from 67 genera and 15 families (including 8 species from 5 genera of Incertae sedis) of the scleractinian hard corals in TIMP (Table 2). There were 30 new scleractinian species records for Tioman Island, of which 15 were also new records for the east coast of Peninsular Malaysia. The surveys also documented 29 rare coral species, 86 vulnerable and three endangered (Supplementary Table 2).

Mean percentage cover, diversity and distribution patterns of coral

A total of 77 coral genera from 24 families were recorded in TIMP. Out of these 77 genera, 61 were identified as scleractinian hard corals, three were non-scleractinian hard corals and 13 were soft corals (Table 2). Family Acroporidae had the highest mean percentage of coral cover at 35.0% ± 3.7, followed by Merulinidae (20.9% ± 0.4), Poritidae (12.7% ± 6.0), Alcyoniidae (5.7% ± 0.6), Euphylliidae (5.40% ± 0.97), Pocilloporidae (4.77% ± 2.29), Fungiidae (4.27 ± 0.18) and Lobophylliidae (3.52 ± 0.47). Coral cover for other families was < 5%. In terms of the coral genera, *Acropora* had the highest mean percentage of coral cover with 21.0% ± 2.3, followed by *Porites* (12.3% ± 2.3), *Montipora* (9.3% ± 2.0), *Goniastrea* (5.4% ± 1.0), *Pocillopora* (4.7% ± 1.5), *Platygyra* (4.6% ± 0.7), *Galaxea* (3.7% ± 0.7), *Isopora* (4.0% ± 2.3), *Dipsastraea* (3.3% ± 0.6), *Lobophyllia* (3.1% ± 0.5), *Favites* (3.0% ± 0.6) and *Sinularia* (3.0% ± 0.6), while other genera cover was < 3%.

The number of crosses (+) in Table 2 represents the relative abundance of coral genera based on the range of the mean percentage cover of an individual coral genus. Genera *Acropora, Montipora, Galaxea, Lobophyllia, Dipsastraea, Goniastrea, Platygyra, Pocillopora* and *Porites* were recorded at all reef sites. Among these genera, *Acropora*, *Montipora* and *Porites* were abundant to dominant at most reef sites in the study area. The genera *Isopora* and *Pocillopora* were dominant at TW5 and TW6, respectively. Other genera, such as *Pavona*, *Galaxea*, *Fungia*, *Goniastrea*, *Platygyra* and *Nepthea,* were abundant at some reef sites in the east coast and isolated zones, while genera *Galaxea*, *Lobophyllia*, *Dipsastraea*, *Favites*, *Goniastrea*, *Platygyra* and *Sinularia* were common at most reef sites in the east coast zone. There are 22 coral genera classified as the least common, namely *Alveopora*, *Coeloseris*, *Leptoseris*, *Stylocoeniella*, *Danafungia, Heliofungia, Lobactis, Podabacia, Homophyllia, Oxypora, Pectinia, Scapophyllia, Trachyphyllia, Pseudosiderastrea*, *Physogyra*, *Distichipora*, *Klyxum*, *Scleronephthya*, *Dichotella*, *Clavularia*, *Xenia* and *Acanthogorgia*, and they can be found at three or less reef sites (n ≤ 3) in TIMP. Among these 22 genera, 8 genera from *Homophyllia*, *Oxypora*, *Scapophyllia, Trachyphyllia, Pseudosiderastrea*, *Distichipora*, *Xenia* and *Acanthogorgia* were classified as rare, as they were found in low abundance at only one reef site.

Coral genera composition in reef assemblages

The results of the cluster and nMDS plot revealed six groups (G1–G6) represented by five different dominant coral genera (Figure 2). SIMPER analysis (Figure 3) indicated that genus *Acropora* was the most dominant in G1, G2, G4 and G5, with the mean percentage of coral cover ranging from 15.2% ± 1.5 to 40.5% ± 5.8. Meanwhile, *Porites* (34.0% ± 9.2) and *Isopora* (42.9% ± 8.9) were the most dominant coral genera in G3 and G6, respectively. Other genera, such as *Fungia* (10.8% ± 3.5), *Pocillopora* (32.1% ± 11.1) and *Montipora* (16.4% ± 2.9), were recorded as the second most dominant corals in G1, G4 and G5, respectively. SIMPER analysis also showed that several hard coral genera (*Platygyra*, *Goniastrea*, *Lobophyllia*, *Pavona* and *Dipsastraea*) and soft coral genera (*Nepthea* and *Sinularia*) were among the most dominant within the six different groups.

The cluster and nMDS plot also indicated that all reef sites in the east coast (TE1–TE6), two reef sites in the isolated (TI1 and TI2) and TW1 in the west coast zones were in G2, which was dominated by genera *Acropora*, *Porites*, *Montipora*, *Platygyra* and *Sinularia*. In comparison, most reef sites in the isolated (TI4, TI6, TI7 and TI8) and two reef sites in the west coast (TW2 and TW3) zones were in G5, dominated by genera *Acropora*, *Montipora*, *Porites*, *Pavona* and *Pocillopora*. Other reef sites in the west coast and isolated zones were found to be scattered in G3 (TI5 and TW4), G4 (TW6) and G6 (TW5), dominated by the genera *Porites*, *Acropora* and *Isopora*, respectively. Within G1, the genera

Table 2. Diversity and distribution patterns of coral genera at 20 reef sites in TIMP.

No.	Corals	East coast zone						West coast zone						Isolated zone								Mean (%)
		TE 1	TE 2	TE 3	TE 4	TE 5	TE 6	TW 1	TW 2	TW 3	TW 4	TW 5	TW 6	TI 1	TI 2	TI 3	TI 4	TI 5	TI 6	TI 7	TI 8	
	SCLERACTINIAN HARD CORALS																					
	Acroporidae																					35.03
1	*Acropora*	++ +++	++ ++	++ +++	++ ++	++ ++	++ ++	++ ++	++ +++	++ +++	+++	++ +++	++ +++	++ ++	++ ++	++ ++	++ +++	+++	++ ++	++ +++	++ +++	21.02
2	*Alveopora*	+	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.05
3	*Anacropora*	—	—	—	—	+	—	+	—	—	—	—	—	+	++	—	—	—	—	—	—	0.15
4	*Astreopora*	+	+	+	++	+	+	++	+	+	+	—	—	—	++	+	+	—	—	—	—	0.45
5	*Isopora*	—	—	—	+	+	+	+	+	+++	++ ++	++ +++	+++	—	+	++	—	—	—	—	—	4.03
6	*Montipora*	+++	+++	+++	++	+++	++ ++	++	++ ++	++	++	++	+++	+++	+++	++	++	++	++ ++	++ +++	++ ++	9.33
	Agariciidae																					2.58
7	*Coeloseris*	—	—	—	—	+	+	—	—	—	—	—	—	+	—	—	—	—	—	—	—	0.02
8	*Gardineroseris*	+	—	—	—	+	+	—	—	+	—	—	—	+	+	+	—	+	—	—	—	0.05
9	*Leptoseris*	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	0.02
10	*Pavona*	+	+	++	++	+	++	+	++	++	++	+	—	+	+	++	++ ++	++	+++	+	+	2.49
	Astrocoeniidae																					0.04
11	*Stylocoeniella*	—	—	—	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04
	Coscinaraeidae																					0.06
12	*Coscinaraea*	—	+	—	—	—	—	—	+	—	—	+	—	—	—	—	—	+	—	—	—	0.06
	Dendrophylliidae																					0.20
13	*Turbinaria*	—	+	—	+	+	+	+	+	+	—	—	—	—	+	+	+	++		—	—	0.20
	Diploastraeidae																					0.75
14	*Diploastrea*	+	+	+	++	++	++	+	+	—	+	—	—	++	+	—	—	+	—	—	+	0.75
	Euphylliidae																					5.40
15	*Euphyllia*	+	+	+	+	+	++	+	—	+	+	+	—	+	—	+	+	+	—	++	++	0.77
16	*Galaxea*	+++	++	+++	+++	+++	+++	++	++	++	++	+	+	+++	++	++	+	++	++	++ ++	+	3.74
17	*Pachyseris*	++	+	+	++	++	++	+	+	+	+	+	+	+	++	+	+	++	+	—	+	0.89
	Fungiidae																					4.27
18	*Ctenactis*	—	+	—	—	+	+	+	—	+	+	+	—	+	+	+	++	—	—	—	+	0.24
19	*Cycloseris*	—	—	—	—	+	—	+	—	—	—	—	—	—	—	+	+	—	—	—	—	0.08
20	*Danafungia*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	+	0.06
21	*Fungia*	+	+	+	+	++	++	+	++	++	+++	++	++	+	+	++ ++	++	—	++	++	++	1.90
22	*Heliofungia*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	0.07
23	*Herpolitha*	—	—	+	—	—	—	—	+	+	—	+	—	—	+	+	+	+	—	—	—	0.08
24	*Lithophyllon*	+	+	+	—	+	+	+	+	++	++	++	—	+	++	++	++	—	+	+	+	0.81
25	*Lobactis*	—	—	+	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	0.01
26	*Pleuractis*	+	—	—	—	+	+	+	—	++	—	+	—	+	+	++	++	—	—	++	++	0.64
27	*Podabacia*	+	—	—	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	0.01
28	*Polyphyllia*	+	—	+	—	+	+	+	+	+	—	+	—	+	+	+	+	+	—	—	—	0.10
29	*Sandalolitha*	+	+	+	+	+	+	+	—	+	—	+	+	—	+	++	+	+	—	—	—	0.28
	Lobophylliidae																					3.52
30	*Acanthastrea*	++	++	++	+	+	+	+	—	+	+	—	+	+	+	+	—	+	+	—	—	0.47
31	*Echinophyllia*	+	+	+	+	+	+	+	—	—	—	+	+	+	+	—	—	—	—	—	+	0.11
32	*Homophyllia**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	0.01
33	*Lobophyllia*	+++	+++	++	+++	++	+++	++	++	+	++	++	++	+++	++	++	++	++	+	+	++	3.04
34	*Micromussa*	+	+	+	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01
35	*Oxypora**	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00
	Merulinidae																					20.86
36	*Astrea*	+	+	+	—	+	—	+	+	—	+	—	—	+	+	+	—	++	—	+	+	0.35
37	*Coelastrea*	++	++	++	+	++	++	+	+	+	+	—	++	++	++	++	—	++	—	—	—	0.86
38	*Cyphastrea*	++	++	++	++	++	++	+	++	—	+	—	—	++	++	++	+	++	—	—	++	1.26
39	*Dipsastraea*	+++	+++	++	++	+++	+++	++	++	+	++	++	++	+++	+++	++	+	++	+	+	+	3.30
40	*Echinopora*	+	+	+	—	+	++	+	—	+++	+	—	—	+	+	+	+	+	+++	—	—	0.75
41	*Favites*	+++	+++	+++	++	+++	++	++	++	+	++	+	+	+++	+++	++	++	++	+	—	++	3.01
42	*Goniastrea*	+++	+++	++ ++	+++	++	++	++ ++	++	++	+++	+++	++	+++	++ ++	++	++	++	++	+	+	5.35

No.	Corals	East coast zone						West coast zone						Isolated zone								Mean (%)
		TE 1	TE 2	TE 3	TE 4	TE 5	TE 6	TW 1	TW 2	TW 3	TW 4	TW 5	TW 6	TI 1	TI 2	TI 3	TI 4	TI 5	TI 6	TI 7	TI 8	
43	*Hydnophora*	+	+	+	++	+	++	+	+	+	+	+	–	++	+	+	–	+	+	+	++	0.65
44	*Leptoria*	+	+	+	+	+	+	+	+	–	–	–	–	+	–	–	–	–	+	–	–	0.10
45	*Merulina*	+	+	+	+	+	+	+	+	+	–	+	–	++	+	–	+	–	+	–	–	0.31
46	*Oulophyllia*	+	+	+	–	+	+	–	+	–	–	–	–	–	–	–	–	+	+	–	++	0.19
47	*Paragoniastrea*	+	++	+	–	+	+	–	–	–	–	–	–	+	+	–	–	–	–	–	–	0.15
48	*Pectinia*	–	+	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	0.01
49	*Platygyra*	+++	+++	+++	+++	+++	++++	++	++	++	++	+	++	+++	+++	++	+++	++++	++	+	++	4.56
50	*Scapophyllia**	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01
51	*Trachyphyllia**	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00
	Pocilloporidae																					4.77
52	*Pocillopora*	++	++	++	++	++	++	++	++	++	+	++	+++++	++	++	+++	++	++	+++	++	+++	4.68
53	*Stylophora*	–	–	–	–	–	–	–	–	+	–	+	–	–	–	+	+	–	–	–	–	0.09
	Poritidae																					12.73
54	*Goniopora*	–	+	+	–	+	+	–	–	+	–	+	–	+	+	+	–	–	–	++	++	0.39
55	*Porites*	+++	++	++	++++	+++	+++	++++	++++	+++++	+++++	+++	+	++++	++++	+++	++++	+++++	+++	++	++	12.34
	Psammocoridae																					0.77
56	*Psammocora*	+	–	+	+	+	+	++	+	+	+	–	–	++	+	+	++	+	+	–	++	0.74
	Siderastreidae																					0.00
57	*Pseudosiderastrea**	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00
	Incertae Sedis																					0.74
58	*Leptastrea*	+	+	+	–	+	–	+	+	+	+	+	–	+	+	+	++	++	–	–	+	0.51
59	*Physogyra*	–	–	–	–	–	–	–	–	+	–	–	–	–	–	+	–	–	+	–	–	0.03
60	*Plerogyra*	–	–	–	+	+	+	+	+	+	–	–	+	+	–	+	+	+	+	+	+	0.16
61	*Plesiastrea*	–	–	+	–	+	–	+	–	–	–	–	–	–	–	–	–	+	+	–	+	0.04
	NON-SCLERATINIAN HARD CORALS																					
	Helioporidae																					0.81
62	*Heliopora*	+	–	+	–	++	+	+++	+	+	+	+	–	+	+	+	++	–	–	–	–	0.81
	Milleporidae																					0.68
63	*Millepora*	+	+	++	++	–	+	–	+	+	–	–	+	–	+	+	–	+	++	–	–	0.68
	Distichoporidae																					0.02
64	*Distichopora**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	0.02
	SOFT CORALS																					
	Alcyoniidae																					5.66
65	*Sinularia*	+++	+++	++	+++	+++	++	+++	+	+	++	+	+	+++	++	+	–	++	++	+	–	3.00
66	*Sarcophyton*	++	++	+	+	+	++	++	+	–	+	+	–	+	–	+++	+	+	–	+	–	0.86
67	*Lobophytum*	++	+++	++	++	++	++	++	+	+	+	+	–	+++	+	+	+	–	+	–	–	1.74
68	*Cladiella*	+	–	+	–	+	–	–	–	–	+	–	–	+	–	+	–	–	–	–	–	0.05
69	*Klyxum*	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	+	–	–	–	–	0.02
	Nephtheidae																					0.66
70	*Nepthea*	–	–	+	–	+	–	–	+	–	–	–	+	–	–	++++	+	++	–	–	–	0.64
71	*Scleronephthya*	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01
	Ellisellidae																					0.35
72	*Junceella*	+	–	–	–	++	+	++	–	–	–	–	–	–	–	–	–	+	–	–	+	0.28
73	*Dichotella*	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	+	–	–	–	0.07
	Clavulariidae																					0.01
74	*Clavularia*	–	–	+	–	+	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	0.01
	Xeniidae																					0.00
75	*Xenia**	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00
	Briareidae																					0.11
76	*Briareum*	+	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	+	+	+	0.11
	Acanthogorgiidae																					0.01
77	*Acanthogorgia**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	0.01
	Total Genera	46	40	46	33	57	47	44	38	40	33	32	21	42	42	46	35	41	30	22	33	

Note: +: one or few covering < 1% of coral colonies; ++: uncommon covering 1−5% of coral colonies; +++: common covering 6 −10% of coral colonies; ++++: abundant covering 11−20% of coral colonies; and +++++: dominant covering > 20% of coral colonies. Suffix * indicates a rare coral genus.

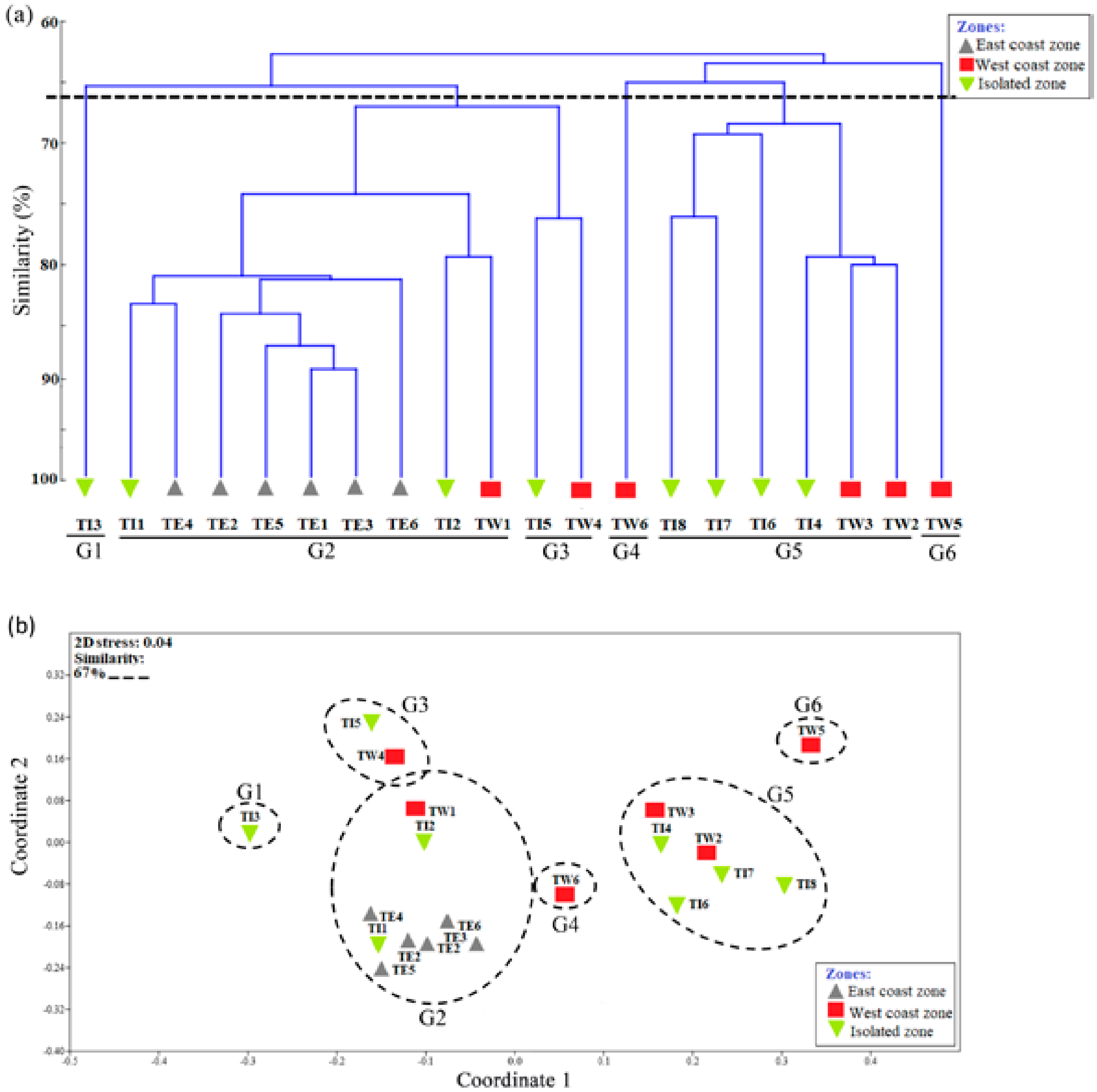

Figure 2. Dendrogram (a) and nMDS plot (b) clustered all reef sites within six groups (G1–G6) based on a 67% similarity threshold. All groups were separated based on the mean percentage cover of coral genera.

Acropora, *Fungia*, *Nepthea*, *Pocillopora* and *Porites* were dominant at TI3 located in the isolated zone of Tioman Island.

DISCUSSION

Coral condition in Tioman Island Marine Park

Coral reefs in TIMP may have been subjected to extensive coastal development and widespread tourist activities, with an increased number of tourists over the years (Shahbudin et al. 2017; Akmal et al. 2019). Earlier coral surveys indicated that reef sites in TIMP were in 'fair' to 'good' coral condition (Harborne et al. 2000; Toda et al. 2007; Shahbudin et al. 2017). Following the current surveys at 20 fringing reef sites, no remarkable change of the live coral cover was recorded. All reef sites were varied between 'fair' to 'good' coral condition but some of them had a relatively low live coral cover and closely approached the borderline of 'poor' coral condition (< 25%).

Among 20 surveyed reef sites, Juara Bay (TE4) and Bakau Bay (TI3) showed a lower live coral cover. A high dead coral cover, mainly from coral rubble, recorded at these reef sites indicated direct and indirect pressures from anthropogenic activities. A previous report had also a relatively low hard coral cover at TE4 and high dead coral cover at the survey site located nearby to TI3 (Harborne et al. 2000). These reef sites were impacted with high sedimentation and siltation loads (Harborne et al. 2000; Lee and Mohamed 2011). Throughout the surveys, many coral colonies and abiotic substrates, such as rocks and boulders, were also found to be covered with a layer of silt. Hence, the sedimentation problem together with deleterious effects of nutrient enrichment, which may be from

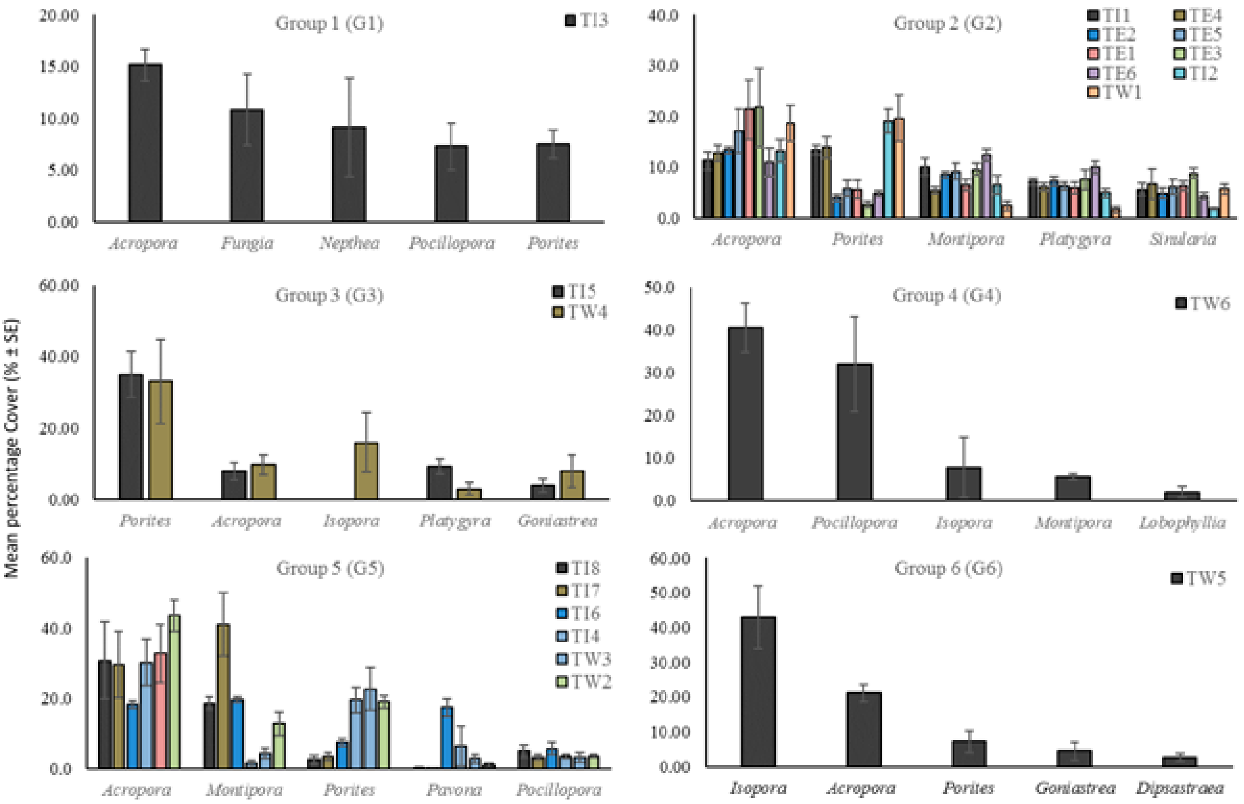

Figure 3. Six groups derived from cluster and nMDS plot. Each group consists of five different dominant coral genera derived from the SIMPER analysis and values are indicated based on their mean percentage cover (% ± SE).

nearby resorts at TE4, might contribute to future 'poor' coral condition.

Of the three categorized reef zones around the island, the east coast exhibited the highest average live coral cover and was categorized as being in 'good' coral condition. The 'good' coral condition established in this zone may be due to minimal human impacts, with no local human settlements and less coastal development activities. Additionally, coral reefs in the east coast zone have less divers and snorkelers as they are directly facing the South China Sea and frequently exposed to strong currents and waves (Shahbudin et al. 2017). This is further supported by the minimal physical damage observed on coral colonies and breakage of coral fragments due to the trampling action along the survey transects. In fact, strong currents and waves especially during the northeast monsoon season may also have contributed to a higher soft coral cover recorded at TE1, TE2 and TE3. Soft corals are able to thrive on this exposed reef sites since they have a flexible structure that can tolerate the high current, wave and sediment actions (Fabricius and Alderslade 2001).

A high average live coral cover was also recorded in the isolated zone, with three reef sites (TI1, TI4, TI6) categorized as being in 'good' coral condition. However, most reef sites in the isolated zone were in 'fair' coral condition, and TI7, located in the south-west of Tioman Island, showed the highest mean percentage of dead corals with more than 50% covered by coral rubble fragments with filamentous algae. Some extensive coral rubble areas were also observed at TI7, suggesting reef destruction caused by boating activities in this area. Additionally, all reef sites located in the north-west of Tioman Island (TI1–TI6) are often visited by snorkelers and divers. For example, more than 10 snorkeling and diving boats were regularly observed during fieldworks. Some evidence of multiple breakages of coral fragments were seen at many reef sites in this isolated zone, suggested from direct fin contact by inexperienced divers. There were also signs of multifocal and diffused patterns of bleaching observed on the surface of coral colonies (obviously found on the surface of *Porites* spp.) at Labas Island (TI5) that may be linked to the significant impacts of the bleaching events.

The west coast zone showed the lowest average live coral cover, and all reef sites, except TW2, were categorized as being in 'fair' coral condition. The extensive coastal development is potentially the main influence on the coral condition at most reef sites surveyed. Many human settlements and resorts can be found along the coastal areas in the west coast of Tioman. By 2008, over 47 resorts have been developed across the Air Batang (20 resorts), Tekek (14 resorts) and Salang (13 resorts) villages (Omar et al. 2015). To date, a total of 72 resorts including small, medium and world standard classes (e.g. Berjaya, Japamala, Tunamaya and Melina Beach

Resorts) have been developed in Tioman and are mostly concentrated in the west coast area (RCM 2018). Rapid growth and any unsustainable coastal development activities may threaten the health of coral reefs (Jordan et al. 2010; Akmal and Shahbudin 2020).

All reef sites in the west coast zone were observed to be a focal point for water-based recreational activities, such as snorkeling, diving and boating. The reefs along the west coast zone are considered the most favourable sites for snorkeling activity due to the shallow water fringing reef (< 2 m depth) area. As a result, the signs of abraded coral fragments, due to the trampling action by less experienced snorkelers and divers, were frequently observed at many reef sites within this zone. Inexperienced snorkelers and divers are frequently trampling, standing on and walking across the reef flat, and these have led to coral partial mortality due to the loosening and abrasion of coral fragments (Wielgus et al. 2004; Barker and Roberts 2004; Hannak et al. 2011; Webler and Jakubowski 2016; Giglio et al. 2020). These factors together with boating activity in shallow water areas might increase the re-suspension of bottom sediments. High suspended sediments covered on the surface of coral colonies cause coral mortality due to insufficient penetration of sunlight required for corals to undertake the photosynthesis process (Erftemeijer et al. 2012).

Coral community structure in Tioman Island Marine Park

Current survey efforts showed an increase in the total number of scleractinian coral species as compared with a previous study done by Akmal et al. (2019). When combined with the previous species lists published by Harborne et al. (2000), Affendi et al. (2005) and Affendi et al. (2007), the current checklist revealed a total of 355 species from 67 genera and 15 families (including 8 species from 5 genera of Incertae sedis) of the scleractinian coral in TIMP. This study also revealed 30 new scleractinian species records for TIMP, and 15 species for the east coast of Peninsular Malaysia, which supplements and updates the work done by Affendi and Rosman (2012). The current species list also identified 29 rare, 86 vulnerable and 3 endangered species in TIMP. When combined with the total number for non-scleractinian hard and soft corals, there was also a slight increase in genera diversity, as compared to a previous study conducted by Shahbudin et al. (2017). Unfortunately, a comparison of the soft coral diversity with other previous studies in Tioman Island could not be made due to a lack of available data. Hence, these updated coral species and genera lists, including all categorized threatened species, offer a baseline data and information to management personnel from the relevant authorities on the status of coral diversity in TIMP.

There was spatial variability in coral diversity among east coast, west coast and isolated zones. The east coast had a higher diversity of coral species and genera compared to other reef zones. The difference in coral diversity between reef zones could be related to variations in environmental conditions, such as habitat heterogeneity and wave exposure (Veron et al. 2009; Polónia et al. 2015). Field observations indicated that the reefs around the east coast consist of more structural habitats (crevices, spurs, grooves and overhangs) across the gentle reef slopes compared to the west coast and isolated (mainly dominated by rocky and sandy substratum) zones. Additionally, the reefs exposed to wind and currents in the east coast zone may limit a dense coverage of fast-growing *Acropora* and *Montipora* corals. Fast-growing corals are less resistant to breakage by relatively high wave energy (Madin and Connolly 2006; Denis et al. 2017). Hence, these environmental conditions may reflect the prevalence of various coral species within the reefs along the east coast zone, particularly from wave-resistant taxa, including *Galaxea*, *Lobophyllia*, *Dipsastraea*, *Favites*, *Goniastrea*, *Platygyra* and soft coral *Sinularia*.

The findings based on the distribution pattern of coral genera in Tioman Island showed that the genera *Acropora*, *Montipora* and *Porites* were classified as common to dominant at most reef sites surveyed. Genera *Acropora* (163 species) and *Montipora* (73 species), which encompassed more than 90% from the total number of Acroporidae family (259 species), are recognized to be naturally found distributed in the Indo-Pacific reefs (Veron 2000). These genera with various growth forms are also known as fast-growing corals with lateral growth rates of 5–20 cm per year (Done et al. 1991; Done 1999). They are rapidly outgrown and become more dominant under optimal conditions (considerable wave, current and sediment actions), compared to slow-growing coral, like massive *Porites,* with radial growth rates of 1–2 cm per year (Done et al. 1991; Done 1999). However, massive *Porites* colonies can withstand in harsh environmental conditions, such as high energy forces from wave and current actions due to their greater skeleton density compared to more fragile branching *Acropora* and foliose *Montipora* colonies (Madin and Connolly 2006; Halid et al. 2016). Moreover, *Porites* colonies have a higher tolerance towards fluctuation of suspended sediment concentrations compared to *Acropora* and *Montipora* colonies (Hong and Sasekumar 1981; Jones et al. 2015; Denis et al. 2017). Hence, it is suggested that the dominance of *Acropora*, *Montipora* and *Porites* within Tioman reefs could be linked with their ability to cope with any environmental conditions, such as currents, wave actions and sedimentation loads.

Coral genera, such as *Isopora* and *Pocillopora,* were dominant at some reef sites in the west coast zone.

Meanwhile, genera *Pavona*, *Galaxea*, *Fungia*, *Goniastrea*, *Platygyra* and soft coral *Nepthea* were classified as abundant at some reef sites in the isolated zone. It can be observed that the branching *Isopora* and *Pocillopora* corals were found to dominate the sheltered area across the upper reef slope in the west coast zone. Meanwhile, massive *Pavona, Galaxea*, *Goniastrea* and *Platygyra* corals were found to dominate the fore reef area in the isolated zone, which is frequently exposed to strong wind during the northeast monsoon season. The difference in environmental gradients, such as wind and wave exposure, are probably the main factor influencing the variation in coral genera dominance across the reef zones (Cleary et al. 2006; Hoeksema 2012; Halid et al. 2016; Kamarumtham et al. 2016). Other factors, such as morphological structures and adaptive capacities, also play important roles in increasing coral survival and growth (Muko et al. 2000; Zawada et al. 2019). For example, massive and submassive corals (*Pavona*, *Galaxea*, *Goniastrea*, *Platygyra*) can tolerate current and wave actions through their hemispherical shape (Madin and Connolly 2006). They are also able to remove the accumulated sediment on surface through their own cleaning mechanisms such as mucus secretion and ciliary action (Hong and Sasekumar 1981). The tentacular action by free-living *Fungia* and massive *Galaxea* also enable them to repel suspended sediments and thrive in a high sediment load area (Erftemeijer et al. 2012; Junjie et al. 2014). Soft corals such as *Sinularia* and *Nepthea* are able to resist wave and currents due to their flexible skeleton structure (Fabricius and Alderslade 2001). Hence, all of these contribute as defensive mechanisms in coral survivorship at Tioman Island.

CONCLUSION

This study updated the current 'fair' condition, high diversity, and good complexity of live corals within reef sites in TIMP. Genera *Acropora*, *Montipora* and *Porites* were dominant across the reef sites in the study area. Most reef sites in the east coast zone have 'good' coral condition and consist of high coral diversity, potentially due to the low rates of human activities. The intensive tourism activities along with the cumulative impacts on adjacent coastal development might contribute to 'fair' coral condition and lower coral diversity at most reef sites in the west coast and isolated zones.

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Supplementary Table 1. The scleractinian coral species at 20 reef sites in TIMP. Species were identified following the current taxonomic revisions and descriptions. Symbol x indicates the species occurrence, while a indicates the most common species (n ≥ 17) and b the least common species (n ≤ 3).

No.	Scleractinian coral species	East coast zone (TE)						West coast zone (TW)						Isolated zone (TI)							
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7	8
	Acroporidae																				
1	*Acropora abrolhosensis* [b]													x							
2	*Acropora anthocersis*	x				x	x	x				x									
3	*Acropora austera* [b]					x		x							x						
4	*Acropora carduus* [b]					x		x													
5	*Acropora cerealis*	x	x	x		x	x	x								x			x		x
6	*Acropora clathrata*	x		x		x		x	x	x							x				
7	*Acropora cytherea* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
8	*Acropora digitifera*	x	x	x		x	x	x		x		x									
9	*Acropora divaricata*					x		x						x	x			x			
10	*Acropora donei* [b]													x							
11	*Acropora florida*	x		x	x	x	x	x	x	x				x		x	x	x		x	x
12	*Acropora gemmifera*	x	x	x	x	x	x	x	x		x	x	x					x			
13	*Acropora grandis* [b]	x												x				x			
14	*Acropora hoeksemai* [b]								x		x										
15	*Acropora horrida* [b]						x					x								x	
16	*Acropora humilis* [b]			x																	
17	*Acropora hyacinthus*	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		
18	*Acropora Indonesia*[b]												x								
19	*Acropora insignis* [b]															x					
20	*Acropora intermedia* [a]	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
21	*Acropora latistella*	x		x		x	x	x								x					
22	*Acropora loripes*		x	x	x		x		x				x								
23	*Acropora microphthalma*	x		x		x	x	x	x	x				x	x	x	x	x	x	x	x
24	*Acropora millepora*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
25	*Acropora monticulosa* [b]					x															
26	*Acropora muricata* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
27	*Acropora nasuta*	x	x	x	x	x	x	x	x	x	x	x	x	x		x			x		
28	*Acropora plana*[b]	x												x	x						
29	*Acropora robusta* [b]				x	x	x														
30	*Acropora secale* [b]			x		x															
31	*Acropora selago*	x	x	x		x	x	x	x	x	x	x	x	x		x		x	x		
32	*Acropora solitaryensis* [b]										x										
33	*Acropora spicifera*	x				x		x									x				
34	*Acropora tenuis*	x	x	x		x	x	x	x	x	x	x	x	x		x		x	x	x	
35	*Acropora valenciennesi*					x		x		x								x			
36	*Alveopora spongiosa* [b]	x				x															
37	*Anacropora matthai* [b]													x							
38	*Anacropora forbesi* [b]					x									x						
39	*Anacropora puertogalerae* [b]							x							x						
40	*Astreopora gracilis*	x	x	x		x	x	x	x						x						
41	*Astreopora myriophthalma*	x	x	x	x	x	x	x	x	x					x	x	x				
42	*Astreopora ocellata* [b]							x			x										
43	*Isopora bruggemanni*					x		x	x	x	x	x	x		x	x					
44	*Isopora cuneata* [b]					x															
45	*Isopora palifera*				x	x	x								x						
46	*Montipora aequituberculata* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
47	*Montipora altasepta* [b]															x					
48	*Montipora cebuensis* [b]		x				x								x						
49	*Montipora confusa* [b]	x																			
50	*Montipora crassituberculata* [b]					x								x							

No.	Scleractinian coral species	East coast zone (TE)						West coast zone (TW)						Isolated zone (TI)							
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7	8
51	*Montipora danae*					x	x	x							x			x			
52	*Montipora delicatula* [b]					x				x				x							
53	*Montipora efflorescens*	**x**	**x**	**x**	**x**		x				x			x	x	x		x			**x**
54	*Montipora foliosa* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x	x	x		x		**x**
55	*Montipora friabilis*					x		x		x				x							
56	*Montipora grisea*	**x**	**x**	**x**		x								x	x						
57	*Montipora hispida* [b]					x			x					x							
58	*Montipora informis* [a]	**x**	**x**	**x**	**x**	**x**	**x**	x	x	x	x		x	x	x	x		x	x		**x**
59	*Montipora millepora*		x	x	x	x		x							x						
60	*Montipora monasteriata* [b]	**x**	**x**			x															
61	*Montipora stellata* [b]					x														x	
62	*Montipora tuberculosa*	**x**	**x**	**x**		x		x	x		x			x	x			x			
63	*Montipora turgescens*	**x**		x	x	x	x						x		x						
64	*Montipora undata*	**x**		x	x			x	x	x		x				x					**x**
65	*Montipora venosa* [b]									x											
66	*Montipora verrucolosus* [b]	**x**																			
67	*Montipora verrucosa*	x		x		x		x							x						**x**
68	*Montipora vietnamensis*			x		x		x						x							
	Agariciidae																				
69	*Coeloseris mayeri* [b]					x	x							x							
70	*Gardineroseris planulata*	**x**				x	x			x				x	x	x		x			
71	*Leptoseris mycetoseroides* [b]																	x			
72	*Leptoseris scabra* [b]					x															
73	*Pavona cactus*			x			x		x	x	x	x				x	x	x	x		
74	*Pavona clavus*				x			x								x	x			x	
75	*Pavona danai*	**x**	**x**	**x**			x							x		x					
76	*Pavona decussata* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x	x	x	x	x		
77	*Pavona explanulata*													x	x			x	x		
78	*Pavona frondifera*	**x**	**x**	**x**		x	x			x		x				x	x				**x**
79	*Pavona venosa*	**x**		x			x										x				
80	*Pavona varians*	**x**			x				x	x				x				x			x
	Astrocoeniidae																				
81	*Stylocoeniella guentheri* [b]				x	x															
	Coscinaraeidae																				
82	*Coscinaraea columna*		x	x								x						x			
83	*Coscinaraea exesa* [b]								x												
	Dendrophylliidae																				
84	*Turbinaria frondens* [b]					x		x							x						
85	*Turbinaria irregularis* [b]						x														
86	*Turbinaria mesenterina* [b]					x									x	x					
87	*Turbinaria peltata*							x	x	x							x	x	x		
88	*Turbinaria reniformis* [b]		x																		
89	*Turbinaria stellulata* [b]		x		x	x															
	Diploastraeidae																				
90	*Diploastrea heliopora*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x			x	x			x			x
	Euphylliidae																				
91	*Euphyllia ancora*		x			x	x	x						x						**x**	**x**
92	*Euphyllia cristata* [b]						x											x			
93	*Euphyllia divisa*	**x**	**x**	**x**	**x**	**x**	x				x			x							
94	*Euphyllia glabrescens*	**x**					x			x		x		x		x	x	x		x	
95	*Euphyllia yaeyamensis* [b]	**x**		x																	
96	*Galaxea astreata*	**x**		x		x			x		x			x				x		x	
97	*Galaxea fascicularis* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
98	*Pachyseris foliosa* [b]					x												x			
99	*Pachyseris gemmae*	**x**				x		x							x						

No.	Scleractinian coral species	East coast zone (TE)						West coast zone (TW)						Isolated zone (TI)							
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7	8
100	*Pachyseris rugosa*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**			x	x		x	x	x		
101	*Pachyseris speciosa*	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x		x	x	x	x	x		x	x		x
	Fungiidae																				
102	*Ctenactis albitentaculata* [b]									x						x					
103	*Ctenactis crassa*		x							x							x				**x**
104	*Ctenactis echinata*					x	x	x		x	x	x		x	x	x	x				
105	*Cycloseris costulata* [b]							x								x	x				
106	*Cycloseris somervillei* [b]					x											x				
107	*Danafungia horrida* [b]															x					**x**
108	*Fungia fungites* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	x	x	x	x	x		**x**	**x**	**x**
109	*Heliofungia actiniformis* [b]																		**x**	**x**	**x**
110	*Herpolitha limax*			x					x	x		x			x	x	x	x			
111	*Lithophyllon concinna*		x	x		x	x	x	x	x	x	x		x	x	x	x		x		
112	*Lithophyllon repanda*	**x**	**x**	**x**			x		x	x					x	x	x			**x**	**x**
113	*Lithophyllon scabra* [b]						x							x		x					
114	*Lithophyllon undulatum* [b]			x		x						x									
115	*Lobactis scutaria* [b]			x						x											
116	*Pleuractis granulosa*	**x**				x	x	x		x		x		x	x	x	x			x	
117	*Pleuractis gravis* [b]															x					
118	*Pleuractis moluccensis*									x		x					x				**x**
119	*Pleuractis paumotensis*									x		x			x	x	x			x	x
120	*Pleuractis seychellensis* [b]															x					
121	*Podabacia crustacea* [b]	**x**																			
122	*Podabacia motuporensis* [b]	**x**							x												
123	*Polyphyllia talpina*	**x**		x		x	x	x	x	x		x		x	x	x	x	x			
124	*Sandalolitha dentata*	**x**			x	x	x	x							x	x	x				
125	*Sandalolitha robusta*	**x**	**x**	**x**	**x**	**x**	**x**			x		x	x		x	x	x	x			
	Lobophylliidae																				
126	*Acanthastrea brevis*	**x**				x					x					x					
127	*Acanthastrea echinata*	**x**	**x**	**x**		x	x	x			x				x	x			x		
128	*Acanthastrea hemprichi*	**x**	x	x	x			x		x			x	x	x			x			
129	*Acanthastrea pachysepta* [b]	**x**																			
130	*Acanthastrea rotundoflora* [b]		x																		
131	*Acanthastrea subechinata* [b]			x																	
132	*Echinophyllia aspera* [b]							x							x						**x**
133	*Echinophyllia orpheensis*	**x**	x	x	x	x	x					x	x	x							
134	*Homophyllia australis* [b]																	x			
135	*Lobophyllia agaricia* [a]	**x**	**x**	**x**	x	x	x	x	x	x	x	x	x	x	x	x	x	x			**x**
136	*Lobophyllia corymbosa*	**x**					x	x						x			x				
137	*Lobophyllia flabelliformis*						x					x			x			x			**x**
138	*Lobophyllia hassi*	**x**	**x**	**x**		x	x	x		x				x							
139	*Lobophyllia hataii*	**x**	**x**	**x**	**x**	**x**	x	x	x					x	x			x			
140	*Lobophyllia hemprichii*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x		x	x	x	x	x			**x**
141	*Lobophyllia radians* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	x			x	x	x	x	x	x		**x**	**x**
142	*Lobophyllia recta*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	x		x			x	x			x	x		**x**
143	*Lobophyllia robusta*	**x**	**x**	**x**	**x**	**x**	**x**	**x**			x	x		x	x			x			
144	*Lobophyllia valenciennesii* [b]					x									x			x			
145	*Lobophyllia vitiensis* [b]					x															
146	*Micromussa diminuta* [b]					x															
147	*Micromussa lordhowensis* [b]	**x**		x																	
148	*Micromussa multipunctata* [b]		x																		
149	*Oxypora lacera* [b]					x															
	Merulinidae																				
150	*Astrea curta*	**x**	**x**	**x**		x		x	x		x			x	x	x		x		**x**	**x**
151	*Coelastrea aspera*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	x	x		x	x	x	x		x			

No.	Scleractinian coral species	East coast zone (TE)						West coast zone (TW)						Isolated zone (TI)							
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7	8
152	*Coelastrea palauensis*	x	x	x		x		x					x	x	x	x		x			
153	*Cyphastrea chalcidicum*	x	x	x		x	x	x	x					x	x	x					
154	*Cyphastrea microphthalma*	x	x	x	x	x	x		x		x			x	x	x	x	x			x
155	*Cyphastrea serailia*	x	x	x	x	x	x		x					x	x	x	x	x			x
156	*Dipsastraea amicorum*	x	x		x	x	x	x				x	x		x	x		x			
157	*Dipsastraea camrasensis* [b]							x						x							
158	*Dipsastraea favus*	x	x	x	x	x	x	x			x	x		x	x	x		x	x		
159	*Dipsastraea helianthoides*	x	x	x	x	x		x	x						x						
160	*Dipsastraea lizardensis*	x	x	x		x	x		x		x				x		x				
161	*Dipsastraea maritima*		x				x	x							x	x	x				x
162	*Dipsastraea matthaii*	x	x	x	x		x		x			x	x								
163	*Dipsastraea maxima*	x	x	x		x									x	x					
164	*Dipsastraea pallida*	x		x			x	x							x						
165	*Dipsastraea rosaria*		x	x		x		x													
166	*Dipsastraea rotundata*		x			x	x								x						
167	*Dipsastraea speciosa* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x
168	*Dipsastraea truncatus*	x		x					x									x	x		
169	*Dipsastraea vietnamensis*	x		x												x		x			
170	*Dipsastraea veroni*	x		x		x		x		x	x			x	x		x				
171	*Echinopora gemmacea* [b]					x															
172	*Echinopora horrida* [b]									x							x				
173	*Echinopora lamellosa*	x	x	x			x	x		x	x			x	x		x	x	x		
174	*Echinopora pacificus*	x					x			x				x		x			x		
175	*Favites abdita* [a]	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x
176	*Favites acuticollis*		x	x	x	x								x			x				
177	*Favites chinensis* [b]	x		x										x							
178	*Favites colemani* [b]		x																		
179	*Favites complanata*	x	x	x		x	x	x	x					x	x		x		x		x
180	*Favites flexuosa*	x	x	x					x			x				x		x			
181	*Favites halicora*	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x			x
182	*Favites magnistellata*			x		x		x						x	x	x	x				
183	*Favites melicerum*	x	x	x		x	x														
184	*Favites micropentagonus*	x	x					x						x							
185	*Favites paraflexuosus*	x	x			x	x	x													
186	*Favites pentagona*	x	x	x			x	x							x		x				x
187	*Favites valenciennesi* [b]					x		x										x			
188	*Goniastrea edwardsi* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
189	*Goniastrea favulus*		x		x	x								x			x			x	
190	*Goniastrea minuta* [b]					x	x	x													
191	*Goniastrea pectinata* [a]	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
192	*Goniastrea retiformis* [a]	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x
193	*Goniastrea stelligera*	x		x		x	x												x		
194	*Hydnophora exesa*	x	x	x	x	x	x	x				x		x	x			x	x		
195	*Hydnophora microconos*	x	x			x	x	x	x	x	x			x							
196	*Hydnophora pilosa* [b]	x																			x
197	*Hydnophora rigida*	x					x		x	x		x		x	x	x		x		x	x
198	*Leptoria phrygia*	x	x	x	x	x	x	x	x					x					x		
199	*Merulina ampliata*	x	x	x	x	x	x	x	x					x	x		x		x		
200	*Merulina scabricula*	x	x	x		x	x	x		x		x		x	x						x
201	*Oulophyllia bennettae* [b]			x														x			
202	*Oulophyllia crispa*	x	x	x		x	x		x									x	x		x
203	*Paragoniastrea australensis*	x				x								x	x						
204	*Paragoniastrea russelli*	x	x	x		x	x								x						
205	*Pectinia alcicornis* [b]		x												x						
206	*Pectinia lactuca* [b]			x		x	x														

No.	Scleractinian coral species	East coast zone (TE)						West coast zone (TW)						Isolated zone (TI)							
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	7	8
207	*Pectinia paeonia* [b]														x						
208	*Platygyra acuta*	**x**	**x**	**x**		x	x	x			x			x	x		x	x			**x**
209	*Platygyra carnosus*	**x**	**x**	**x**			x		x		x							x			
210	*Platygyra contorta*		x				x								x		x	x			
211	*Platygyra crosslandi*	**x**						x			x			x	x	x	x				
212	*Platygyra daedalea*	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**			x	x		x	x	x		**x**
213	*Platygyra lamellina*	**x**	**x**	**x**		x	x	x	x	x	x			x	x	x	x	x	x	x	
214	*Platygyra pini* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x	x	x	x	x		**x**
215	*Platygyra ryukyuensis*	**x**	**x**	**x**		x	x	x	x	x				x		x	x				
216	*Platygyra sinensis* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**			x	x	x	x	x	x		**x**
217	*Platygyra verweyi* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x	x	x	**x**	**x**	**x**	**x**	**x**	**x**	**x**
218	*Platygyra yaeyamaensis* [b]					x	x														
219	*Scapophyllia cylindrica* [b]	**x**																			
220	*Trachyphyllia geoffroyi* [b]						x														
	Pocilloporidae																				
221	*Pocillopora acuta*		x				x						x			x	x	x	x	x	**x**
222	*Pocillopora damicornis* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
223	*Pocillopora meandrina* [b]					x												x	x		
224	*Pocillopora verrucosa*	**x**	**x**	**x**	**x**		x		x	x								x	x	x	
225	*Stylophora pistillata* [b]									x		x									
226	*Stylophora subseriata* [b]									x		x									
	Poritidae																				
227	*Goniopora columna*		x	x		x	x			x				x	x	x					
228	*Goniopora djiboutiensis* [b]											x									
229	*Goniopora lobata*		x	x												x				**x**	**x**
230	*Porites annae*	**x**				x		x							x		x	x			
231	*Porites australiensis*	**x**		x		x		x	x	x	x	x		x	x		x		x		
232	*Porites cylindrica*	**x**		x		x	x	x	x	x	x	x		x	x	x	x	x			
233	*Porites densa* [b]			x		x	x														
234	*Porites horizontalata*	**x**			x	x	x	x	x	x				x	x		x				
235	*Porites lichen*	**x**		x		x	x	x	x	x								x			
236	*Porites lobata* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		x	x	x	x	x	x		**x**
237	*Porites lutea* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	x		**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
238	*Porites mayeri* [b]													x							
239	*Porites monticulosa*	**x**				x		x						x	x		x				
240	*Porites murrayensis* [b]					x		x							x						
241	*Porites nigrescens* [b]									x							x				
242	*Porites rus* [a]	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**	**x**	**x**	**x**	**x**
243	*Porites solida*	**x**	**x**	**x**	**x**	**x**		x	x					x	x			x		x	x
	Psammocoridae																				
244	*Psammocora contigua*			x		x	x	x	x	x	x			x	x	x	x	x			
245	*Psammocora digitata*	**x**		x	x	x	x	x	x					x	x				x		**x**
246	*Psammocora haimiana* [b]															x			x		
247	*Psammocora profundacella* [b]			x																	
	Siderastreidae																				
248	*Pseudosiderastrea tayami* [b]			x																	
	Scleractinia Incertae sedis																				
249	*Leptastrea pruinosa*							x	x	x		x		x				x			
250	*Leptastrea purpurea*	x	x			x		x	x	x	x			x	x	x	x	x			**x**
251	*Leptastrea transversa*	**x**		x				x		x				x			x				
252	*Physogyra lichtensteini* [b]									x						x			x		
253	*Plerogyra sinuosa*				x	x	x	x	x	x	x		x	x		x	x	x	x	x	x
254	*Plesiastrea versipora*			x		x		x										x	x		x
	254 species, 61 genera and 14 families	**138**	**110**	**129**	**70**	**155**	**123**	**122**	**87**	**87**	**65**	**62**	**35**	**111**	**112**	**91**	**81**	**92**	**56**	**33**	**62**

Supplementary Table 2. List of scleractinian coral species in TIMP. Symbol x indicates species occurrence. Species that were not previously recorded are highlighted. Previous records were obtained from Harborne et al. (2000), Affendi et al. (2005) and Affendi et al. (2007) and updated according to the World Register of Marine Species (WoRMS). The abundance and conservation status for each species were referred based on the websites of Corals of the World (COTW) and IUCN Red List of Threatened Species.

No.	Scleractinian hard coral species	Harborne et al. 2000	Affendi et al. 2005	Affendi et al. 2007	Present Record	Abundance (COTW)	IUCN Red List
	Acroporidae Verrill, 1902						
1	*Acropora abrolhosensis* Veron, 1985		x	x	x	C	**VU**
2	*Acropora aculeus* (Dana, 1846)		x			**C**	**VU**
3	*Acropora anthocersis* (Brook, 1893)			**x**	**x**	**C**	**VU**
4	*Acropora appressa* (Ehrenberg, 1834)			x		**UC**	**NT**
5	*Acropora aspera* (Dana, 1846)	x	x	x		**C**	**VU**
6	*Acropora austera* (Dana, 1846)	x	x	**x**	**x**	**UC**	**NT**
7	*Acropora awi* allace & Wolstenholme, 1998		x			**C**	**VU**
8	*Acropora carduus* (Dana, 1846)				x	C	NT
9	*Acropora cerealis* (Dana, 1846)		**x**	**x**	**x**	**C**	**LC**
10	*Acropora clathrata* (Brook, 1891)			x	x	C	LC
11	*Acropora cytherea* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**LC**
12	*Acropora dendrum* (Bassett-Smith, 1890)			x		**R**	**VU**
13	*Acropora digitifera* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**NT**
14	*Acropora divaricata* (Dana, 1846)				**x**	**C**	**NT**
15	*Acropora donei* Veron & Wallace, 1984		**x**	**x**	**x**	**UC**	**VU**
16	*Acropora elseyi* (Brook, 1892)		x	x		**C**	**LC**
17	*Acropora florida* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**NT**
18	*Acropora gemmifera* (Brook, 1892)	x	x		x	C	LC
19	*Acropora grandis* (Brook, 1892)		**x**	**x**	**x**	**C**	**LC**
20	*Acropora hemprichii* (Ehrenberg, 1834)			x		**C**	**VU**
21	*Acropora hoeksemai* Wallace, 1997			**x**	**x**	**C**	**VU**
22	*Acropora horrida* (Dana, 1846)	**x**	**x**	**x**	**x**	**UC**	**VU**
23	*Acropora humilis* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**NT**
24	*Acropora hyacinthus* (Dana, 1846)	x	x	x	x	**C**	**NT**
25	*Acropora indonesia* Wallace, 1997*				**x**	**C**	**VU**
26	*Acropora insignis* Nemenzo, 1967				**x**	**UC**	**DD**
27	*Acropora intermedia* (Brook, 1891)	x	**x**	**x**	**x**	**C**	–
28	*Acropora kirstyae* Veron & Wallace, 1984		x			**UC**	**VU**
29	*Acropora latistella* (Brook, 1892)	x	**x**	**x**	**x**	**C**	**LC**
30	*Acropora listeri* (Brook, 1893)		x			**UC**	**VU**
31	*Acropora loripes* (Brook, 1892)	x	x	**x**	**x**	**C**	**NT**
32	*Acropora lutkeni* Crossland, 1952		x			**UC**	**NT**
33	*Acropora microclados* (Ehrenberg, 1834)		x	x		**UC**	**VU**
34	*Acropora microphthalma* (Verrill, 1869)	**x**	**x**	**x**	**x**	**C**	**LC**
35	*Acropora millepora* (Ehrenberg, 1834)	x	x	**x**	**x**	**C**	**NT**
36	*Acropora monticulosa* (Brüggemman, 1879)	x			**x**	**UC**	**NT**
37	*Acropora muricata* (Linnaeus, 1758)	x	x	**x**	**x**	**C**	–
38	*Acropora nana* (Studer, 1878)			x		**C**	**NT**
39	*Acropora nasuta* (Dana, 1846)	x	x	**x**	**x**	**C**	**NT**
40	*Acropora papillare* Latypov, 1992			x		**UC**	**VU**
41	*Acropora plana* Nemenzo, 1967*				x	UC	DD
42	*Acropora pruinosa* (Brook, 1893)			x		**UC**	**DD**
43	*Acropora pulchra* (Brook, 1891)			x		**UC**	**LC**
44	*Acropora retusa* (Dana, 1846)		x			UC	**VU**
45	*Acropora robusta* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**LC**
46	*Acropora samoensis* (Brook, 1891)	x	x	x		**UC**	**LC**
47	*Acropora secale* (Studer, 1878)	**x**	**x**	**x**	**x**	**C**	**NT**
48	*Acropora selago* (Studer, 1878)	x	x	**x**	**x**	**C**	**NT**

No.	Scleractinian hard coral species	Harborne et al. 2000	Affendi et al. 2005	Affendi et al. 2007	Present Record	Abundance (COTW)	IUCN Red List
49	*Acropora solitaryensis* Veron & Wallace, 1984	x	x	x	x	R	VU
50	*Acropora spicifera* (Dana, 1846)				x	UC	VU
51	*Acropora tenuis* (Dana, 1846)	x	x	x	x	C	NT
52	*Acropora valida* (Dana, 1846)	x		x		C	LC
53	*Acropora valenciennesi* (Milne Edwards & Haime, 1860)		x		x	C	LC
54	*Acropora vaughani* Wells, 1954		x	x		UC	VU
55	*Acropora yongei* Veron & Wallace, 1984		x			C	LC
56	*Alveopora minuta* Veron, 2000		x			R	EN
57	*Alveopora spongiosa* Dana, 1846			x	x	UC	NT
58	*Anacropora matthai* Pillai, 1973	x			x	R	VU
59	*Anacropora forbesi* Ridley, 1884				x	UC	LC
60	*Anacropora puertogalerae* Nemenzo, 1964*				x	UC	VU
61	*Anacropora reticulata* Veron & Wallace, 1984		x			R	VU
62	*Astreopora gracilis* Bernard, 1896		x	x	x	C	LC
63	*Astreopora listeri* Bernard, 1896		x			UC	LC
64	*Astreopora myriophthalma* (Lamarck, 1816)	x	x	x	x	C	LC
65	*Astreopora ocellata* Bernard, 1896	x	x	x	x	R	LC
66	*Isopora bruggemanni* (Brook, 1893)	x	x	x	x	C	VU
67	*Isopora cuneata* (Dana, 1846)				x	C	VU
68	*Isopora palifera* (Lamarck, 1816)	x			x	UC	NT
69	*Isopora togianensis* (Wallace, 1997)			x		C	EN
70	*Montipora aequituberculata* Bernard, 1897	x		x	x	C	LC
71	*Montipora altasepta* Nemenzo, 1967	x			x	C	VU
72	*Montipora calcarea* Bernard, 1897			x		-	VU
73	*Montipora caliculata* (Dana, 1846)			x		UC	VU
74	*Montipora capricornis* Veron, 1985			x		C	VU
75	*Montipora cebuensis* Nemenzo, 1976				x	UC	VU
76	*Montipora cocosensis* Vaughan, 1918			x		–	VU
77	*Montipora confusa* Nemenzo, 1967	x	x	x	x	UC	NT
78	*Montipora crassituberculata* Bernard, 1897		x	x	x	UC	VU
79	*Montipora danae* (Milne Edwards & Haime, 1851)		x	x	x	C	LC
80	*Montipora delicatula* Veron, 2000		x	x	x	UC	VU
81	*Montipora digitata* (Dana, 1846)		x	x		C	LC
82	*Montipora effusa* Dana, 1846			x		UC	NT
83	*Montipora efflorescens* Bernard, 1897 *				x	C	NT
84	*Montipora florida* Nemenzo, 1967		x			C	VU
85	*Montipora foliosa* (Pallas, 1766)	x	x	x	x	C	NT
86	*Montipora foveolata* (Dana, 1846)			x		UC	NT
87	*Montipora friabilis* Bernard, 1897			x	x	UC	VU
88	*Montipora gaimardi* Bernard, 1897	x				C	VU
89	*Montipora grisea* Bernard, 1897				x	C	LC
90	*Montipora hirsuta* Nemenzo, 1967			x		-	NT
91	*Montipora hispida* (Dana, 1846)	x	x	x	x	UC	LC
92	*Montipora informis* Bernard, 1897	x			x	C	LC
93	*Montipora malampaya* Nemenzo, 1967	x				C	VU
94	*Montipora meandrina* (Ehrenberg, 1834)		x			UC	VU
95	*Montipora millepora* Crossland, 1952		x	x	x	C	LC
96	*Montipora monasteriata* (Forskål, 1775)		x	x	x	C	LC
97	*Montipora nodosa* (Dana, 1846)			x		UC	NT
98	*Montipora palawanensis* Veron, 2000			x		UC	NT
99	*Montipora peltiformis* Bernard, 1897			x		UC	NT
100	*Montipora spumosa* (Lamarck, 1816)			x		C	LC
101	*Montipora stellata* Bernard, 1897			x	x	C	LC
102	*Montipora tuberculosa* (Lamarck, 1816)	x		x	x	C	LC

No.	Scleractinian hard coral species	Harborne et al. 2000	Affendi et al. 2005	Affendi et al. 2007	Present Record	Abundance (COTW)	IUCN Red List
103	*Montipora turgescens* Bernard, 1897*				**x**	**C**	**LC**
104	*Montipora undata* Bernard, 1897			**x**	**x**	**C**	**NT**
105	*Montipora venosa* (Ehrenberg, 1834)			**x**	**x**	**UC**	**NT**
106	*Montipora verrucolosus* Veron, 2000			x	**x**	**UC**	**VU**
107	*Montipora verrucosa* (Lamarck, 1816)		**x**	**x**	**x**	**C**	**LC**
108	*Montipora vietnamensis* Veron, 2000				x	UC	VU
	Agariciidae Gray, 1847						
109	*Coeloseris mayeri* Vaughan, 1918 *				**x**	**UC**	**LC**
110	*Gardineroseris planulata* (Dana, 1846)	x	x	x	**x**	**UC**	**LC**
111	*Leptoseris explanata* Yabe & Sugiyama, 1941	x		x		**UC**	**LC**
112	*Leptoseris foliosa* Dinesen, 1980		x	x		UC	**LC**
113	*Leptoseris gardineri* Van der Horst, 1921		x			**UC**	**LC**
114	*Leptoseris hawaiiensis* Vaughan, 1907		x			**UC**	**LC**
115	*Leptoseris mycetoseroides* Wells, 1954	x	x		**x**	**C**	**LC**
116	*Leptoseris papyracea* (Dana, 1846)	x	x			**UC**	**LC**
117	*Leptoseris scabra* Vaughan, 1907	x	x	**x**	**x**	**UC**	**LC**
118	*Leptoseris tubulifera* Vaughan, 1907		x			**UC**	**LC**
119	*Leptoseris yabei* (Pillai & Scheer, 1976)		x			UC	VU
120	*Pavona bipartite* Nemenzo, 1979	x		x		**UC**	**VU**
121	*Pavona cactus* (Forskål, 1775)	x	x	x	x	C	**VU**
122	*Pavona clavus* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**LC**
123	*Pavona danai* Milne Edwards & Haime, 1860			x	x	UC	**VU**
124	*Pavona decussata* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**VU**
125	*Pavona duerdeni* Vaughan, 1907		x			UC	LC
126	*Pavona explanulata* (Lamarck, 1816)	**x**	**x**	**x**	**x**	**C**	**LC**
127	*Pavona frondifera* (Lamarck, 1816)		x	x	x	**C**	**LC**
128	*Pavona gigantea* Verrill, 1869			x		**UC**	**LC**
129	*Pavona maldivensis* (Gardiner, 1905)		x			**C**	**LC**
130	*Pavona venosa* (Ehrenberg, 1834)		x		**x**	**UC**	**VU**
131	*Pavona varians* Verrill, 1864	x		x	x	C	LC
	Astrocoeniidae Koby, 1890						
132	*Palauastrea ramosa* Yabe & Sugiyama, 1941		x			**C**	**NT**
133	*Stylocoeniella armata* (Ehrenberg, 1834)			x		**R**	**LC**
134	*Stylocoeniella cocosensis* Veron, 1990			x		**R**	**VU**
135	*Stylocoeniella guentheri* (Bassett-Smith, 1890)	x			x	UC	LC
	Coscinaraeidae Benzoni, Arrigoni, Stefani & Stolarski, 2012						
136	*Coscinaraea columna* (Dana, 1846)	x			**x**	**C**	**LC**
137	*Coscinaraea exesa* (Dana, 1846)	x		**x**	**x**	**C**	**LC**
138	*Coscinaraea hahazimaensis* Yabe & Sugiyama, 1936	x				R	VU
	Dendrophylliidae Gray, 1847						
139	*Turbinaria frondens* (Dana, 1846)				**x**	**C**	**LC**
140	*Turbinaria irregularis* Bernard, 1896	x			**x**	**C**	**LC**
141	*Turbinaria mesenterina* (Lamarck, 1816)	x		x	**x**	**C**	**VU**
142	*Turbinaria peltata* (Esper, 1794)	x			**x**	**C**	**VU**
143	*Turbinaria reniformis* Bernard, 1896			x	x	C	VU
144	*Turbinaria stellulata* (Lamarck, 1816)	x	x	x	x	UC	VU
	Diploastraeidae Chevalier & Beauvais, 1987						
145	*Diploastrea heliopora* (Lamarck, 1816)	x	x	x	x	C	NT
	Euphylliidae Alloiteau, 1952						
146	*Euphyllia ancora* Veron & Pichon, 1980	x	x	x	x	**UC**	**VU**
147	*Euphyllia cristata* Chevalier, 1971*				**x**	**UC**	**VU**
148	*Euphyllia divisa* Veron & Pichon, 1980	x	x	x	x	UC	NT
149	*Euphyllia glabrescens* (Chamisso & Eysenhardt, 1821)	x		**x**	**x**	**UC**	**NT**
150	*Euphyllia paradivisa* Veron, 1990		x	x		**UC**	**VU**

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151	*Euphyllia paraglabrescens* Veron, 1990		x			**R**	**VU**
152	*Euphyllia yaeyamensis* (Shirai, 1980)	x			**x**	**UC**	**–**
153	*Galaxea astreata* (Lamarck, 1816)	x	x	**x**	**x**	**C**	**VU**
154	*Galaxea fascicularis* (Linnaeus, 1767)	**x**	**x**	**x**	**x**	**C**	**NT**
155	*Galaxea horrescens* (Dana, 1846)			x		**UC**	**LC**
156	*Pachyseris foliosa* Veron, 1990	**x**	**x**	**x**	**x**	**UC**	**LC**
157	*Pachyseris gemmae* Nemenzo, 1955		**x**	**x**	**x**	**R**	**NT**
158	*Pachyseris rugosa* (Lamarck, 1801)	**x**	**x**	**x**	**x**	**C**	**VU**
159	*Pachyseris speciosa* (Dana, 1846)	x	x	x	x	C	LC
	Fungiidae Dana, 1846						
160	*Ctenactis albitentaculata* Hoeksema, 1989	x	x		**x**	**C**	**NT**
161	*Ctenactis crassa* (Dana, 1846)	**x**	**x**	**x**	**x**	**UC**	**LC**
162	*Ctenactis echinata* (Pallas, 1766)	**x**	**x**	**x**	**x**	**C**	**LC**
163	*Cycloseris costulata* (Ortmann, 1889)		**x**	**x**	**x**	**R**	**LC**
164	*Cycloseris distorta* (Michelin, 1842)	x	x			**UC**	**LC**
165	*Cycloseris fragilis* (Alcock, 1893)	x		x		**UC**	**LC**
166	*Cycloseris somervillei* (Gardiner, 1909)			**x**	**x**	**UC**	**LC**
167	*Cycloseris tenuis* (Dana, 1846)		x	x		**R**	**LC**
168	*Cycloseris vaughani* (Boschma, 1923)		x	x		**R**	**LC**
169	*Danafungia horrida* (Dana, 1846)		**x**	**x**	**x**	**C**	**LC**
170	*Danafungia scruposa* (Klunzinger, 1879)			x		UC	LC
171	*Fungia fungites* (Linnaeus, 1758)	**x**	**x**	**x**	**x**	**C**	**NT**
172	*Heliofungia actiniformis* (Quoy & Gaimard, 1833)	x	x	x	**x**	**C**	**VU**
173	*Heliofungia fralinae* (Nemenzo, 1955)		x			**UC**	**LC**
174	*Herpolitha limax* (Esper, 1797)	x	x	x	**x**	**C**	**LC**
175	*Lithophyllon concinna* (Verrill, 1864)	x		**x**	**x**	**C**	**LC**
176	*Lithophyllon repanda* (Dana, 1846)	x	x	**x**	**x**	**C**	**LC**
177	*Lithophyllon scabra* (Döderlein, 1901)		**x**	**x**	**x**	**R**	**LC**
178	*Lithophyllon spinifer* (Claereboudt & Hoeksema, 1987)		x	x		**R**	**LC**
179	*Lithophyllon undulatum* Rehberg, 1892	**x**	**x**	**x**	**x**	**UC**	**NT**
180	*Lobactis scutaria* (Lamarck, 1801)		x		**x**	**C**	**LC**
181	*Pleuractis granulosa* (Klunzinger, 1879)	**x**	**x**	**x**	**x**	**UC**	**LC**
182	*Pleuractis gravis* (Nemenzo, 1955)				x	**UC**	**–**
183	*Pleuractis moluccensis* (Van der Horst, 1919)	**x**	**x**	**x**	**x**	**UC**	**LC**
184	*Pleuractis paumotensis* (Stutchbury, 1833)	x	x	**x**	**x**	**C**	**LC**
185	*Pleuractis seychellensis* (Hoeksema, 1993) *				**x**	**UC**	**VU**
186	*Podabacia crustacea* (Pallas, 1766)	x	x	x	**x**	**UC**	**LC**
187	*Podabacia motuporensis* Veron, 1990		x		**x**	**UC**	**NT**
188	*Polyphyllia talpina* (Lamarck, 1801)	x	x	x	**x**	**C**	**LC**
189	*Sandalolitha dentata* Quelch, 1884		x		**x**	**UC**	**LC**
190	*Sandalolitha robusta* (Quelch, 1886)	x	x	x	x	C	LC
	Lobophylliidae Dai & Horng, 2009						
191	*Acanthastrea brevis* Milne Edwards and Haime, 1849*				**x**	**UC**	**VU**
192	*Acanthastrea echinata* (Dana, 1846)				x	UC	LC
193	*Acanthastrea hemprichi* (Ehrenberg, 1834)	x			**x**	**UC**	**VU**
194	*Acanthastrea pachysepta* Chevalier, 1975		**x**	**x**	**x**	**UC**	**NT**
195	*Acanthastrea rotundoflora* Chevalier, 1975				**x**	**UC**	**NT**
196	*Acanthastrea subechinata* Veron, 2000*				**x**	**UC**	**NT**
197	*Echinophyllia aspera* (Eillis & Solander, 1786)	x	x		x	C	LC
198	*Echinophyllia orpheensis* Veron & Pichon, 1980		x		**x**	**UC**	**LC**
199	*Homophyllia australis* (Milne Edwards & Haime, 1849)	x		**x**	**x**	**UC**	**LC**
200	*Lobophyllia agaricia* Milne Edwards & Haime, 1849	**x**	**x**	**x**	**x**	**UC**	**LC**
201	*Lobophyllia corymbosa* (Forskål, 1775)		x	x	x	C	LC
202	*Lobophyllia diminuta* Veron, 1985			x		**UC**	**VU**

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203	*Lobophyllia flabelliformis* Veron, 2000		**x**	**x**	**x**	**UC**	**VU**
204	*Lobophyllia hassi* Pillai & Scheer, 1976		**x**	**x**	**x**	**UC**	**VU**
205	*Lobophyllia hataii* Yabe, Sugiyama & Eguchi, 1936	**x**	**x**	**x**	**x**	**UC**	**LC**
206	*Lobophyllia hemprichii* (Ehrenberg, 1834)	**x**	**x**	**x**	**x**	**C**	**LC**
207	*Lobophyllia radians* Milne Edwards & Haime, 1849	x	x	x	**x**	**C**	**LC**
208	*Lobophyllia recta* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**LC**
209	*Lobophyllia robusta* Yabe & Sugiyama, 1936		x	**x**	**x**	**UC**	**LC**
210	*Lobophyllia valenciennesii* Milne Edwards & Haime, 1849			**x**	**x**	**UC**	**LC**
211	*Lobophyllia vitiensis* (Brüggemann, 1877)	x	x	**x**	**x**	**UC**	**NT**
212	*Micromussa diminuta* Veron, 2000 *				**x**	**C**	**NT**
213	*Micromussa lordhowensis* Veron and Pichon, 1982	x			**x**	**R**	**VU**
214	*Micromussa multipunctata* Hodgson, 1985			**x**	**x**	**UC**	**VU**
215	*Micromussa regularis* Veron, 2000			x		**UC**	**LC**
216	*Oxypora crassispinosa* Nemenzo, 1979	x				C	**LC**
217	*Oxypora glabra* Nemenzo, 1959			x		**C**	**LC**
218	*Oxypora lacera* (Verrill, 1864)	x		x	x	UC	VU
	Merulinidae Verrill, 1865						
219	*Australogyra zelli* (Veron, Pichon & Wijsman-Best, 1977)			x		**UC**	**NT**
220	*Astrea annuligera* Milne Edwards & Haime, 1849			x		**C**	**LC**
221	*Astrea curta* Dana, 1846	x	**x**	**x**	**x**	**C**	**LC**
222	*Coelastrea aspera* (Verrill, 1866)		**x**	**x**	**x**	**UC**	**NT**
223	*Coelastrea palauensis* (Yabe & Sugiyama, 1936)		**x**	**x**	**x**	**UC**	**VU**
224	*Cyphastrea agassizi* (Vaughan, 1907)		x	x		**C**	**LC**
225	*Cyphastrea chalcidicum* (Forskål, 1775)		x	**x**	**x**	**UC**	**LC**
226	*Cyphastrea japonica* Yabe & Sugiyama, 1932			x		**C**	**LC**
227	*Cyphastrea microphthalma* (Lamarck, 1816)			x	x	**R**	**VU**
228	*Cyphastrea ocellina* (Dana, 1846)		x			**C**	**LC**
229	*Cyphastrea serailia* (Forskål, 1775)		x		**x**	**UC**	**NT**
230	*Dipsastraea albida* (Veron, 2000)			x		**UC**	**LC**
231	*Dipsastraea amicorum* (Milne Edwards & Haime, 1849)	**x**	**x**	**x**	**x**	**–**	**–**
232	*Dipsastraea camrasensis* (Latypov, 2013)*				**x**	**UC**	**VU**
233	*Dipsastraea faviaformis* Veron, 2000		x			**C**	**LC**
234	*Dipsastraea favus* (Forskål, 1775)		x	x	**x**	**C**	**NT**
235	*Dipsastraea helianthoides* (Wells, 1954)		**x**	**x**	**x**	**UC**	**NT**
236	*Dipsastraea lizardensis* (Veron, Pichon & Wijsman, 1977)			x	**x**	**UC**	**NT**
237	*Dipsastraea maritima* (Nemenzo, 1971)	**x**	**x**	**x**	**x**	**UC**	**NT**
238	*Dipsastraea marshae* (Veron, 2000)			x		**C**	**NT**
239	*Dipsastraea matthaii* (Vaughan, 1918)			**x**	**x**	**UC**	**NT**
240	*Dipsastraea maxima* (Veron, Pichon & Wijsman, 1977)	x		x	**x**	**UC**	**LC**
241	*Dipsastraea pallida* (Dana, 1846)	**x**	**x**	**x**	**x**	**R**	**VU**
242	*Dipsastraea rosaria* (Veron, 2000)		x		**x**	**UC**	**LC**
243	*Dipsastraea rotumana* (Gardiner, 1899)		x	x		**C**	**NT**
244	*Dipsastraea rotundata* (Veron and Pichon, 1977)		x	**x**	**x**	**C**	**LC**
245	*Dipsastraea speciosa* (Dana, 1846)		**x**	**x**	**x**	**C**	**LC**
246	*Dipsastraea truncatus* (Veron, 2000)		**x**	**x**	**x**	**R**	**NT**
247	*Dipsastraea vietnamensis* (Veron, 2000)			**x**	**x**	**R**	**NT**
248	*Dipsastraea veroni* (Moll & Best, 1984)	x			**x**	**UC**	**LC**
249	*Echinopora gemmacea* (Lamarck, 1816)	x	x		**x**	**UC**	**NT**
250	*Echinopora horrida* Dana, 1846	x	x		**x**	**C**	**LC**
251	*Echinopora lamellosa* (Esper, 1795)	x		**x**	**x**	**C**	**NT**
252	*Echinopora mammiformis* (Nemenzo, 1959)		x	x		**UC**	**NT**
253	*Echinopora pacificus* Veron, 1990	x	x		**x**	**C**	**NT**
254	*Favites abdita* (Ellis & Solander, 1786)	**x**	**x**	**x**	**x**	**R**	**NT**
255	*Favites acuticollis* (Ortmann, 1889)	x		x	x	**UC**	**NT**

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256	*Favites chinensis* (Verrill, 1866)		**x**	**x**	**x**	**C**	**NT**
257	*Favites colemani* (Veron, 2000)			x	x	**C**	**NT**
258	*Favites complanata* (Ehrenberg, 1834)		**x**	**x**	**x**	**C**	**NT**
259	*Favites flexuosa* (Dana, 1846)		x	x	**x**	**UC**	**NT**
260	*Favites halicora* (Ehrenberg, 1834)	**x**	**x**	**x**	**x**	**UC**	**NT**
261	*Favites magnistellata* (Chevalier, 1971)	x		**x**	**x**	**R**	**NT**
262	*Favites melicerum* (Ehrenberg, 1834)		x	x	x	UC	NT
263	*Favites micropentagonus* Veron, 2000		x		**x**	**UC**	**NT**
264	*Favites paraflexuosus* Veron, 2000			**x**	**x**	**C**	**LC**
265	*Favites pentagona* (Esper, 1794)		**x**	**x**	**x**	**UC**	**VU**
266	*Favites spinosa* (Klunzinger, 1879)			x		**R**	**NT**
267	*Favites stylifera* (Yabe & Sugiyama, 1937)		x	x		**UC**	**NT**
268	*Favites valenciennesi* (Milne Edwards & Haime, 1849)		**x**	**x**	**x**	**C**	**LC**
269	*Goniastrea edwardsi* Chevalier, 1971	x	**x**	**x**	**x**	**UC**	**NT**
270	*Goniastrea favulus* (Dana, 1846)	x		x	x	UC	NT
271	*Goniastrea minuta* Veron, 2000			**x**	**x**	**C**	**LC**
272	*Goniastrea pectinata* (Ehrenberg, 1834)	x	x	x	x	**C**	**LC**
273	*Goniastrea retiformis* (Lamarck, 1816)	**x**	**x**	**x**	**x**	**C**	**NT**
274	*Goniastrea stelligera* (Dana, 1846)	x		**x**	**x**	**C**	**NT**
275	*Hydnophora exesa (*Pallas, 1766)	**x**	**x**	**x**	**x**	**UC**	**NT**
276	*Hydnophora microconos* (Lamarck, 1816)	**x**	**x**	**x**	**x**	**UC**	**LC**
277	*Hydnophora pilosa* Veron, 1985 *				**x**	**C**	**LC**
278	*Hydnophora rigida* (Dana, 1846)	**x**	**x**	**x**	**x**	**C**	**NT**
279	*Leptoria phrygia* (Ellis & Solander, 1786)	x		x	x	**UC**	**LC**
280	*Merulina ampliata* (Ellis & Solander, 1786)	**x**	**x**	**x**	**x**	**C**	**LC**
281	*Merulina scabricula* Dana, 1846	x		**x**	**x**	**C**	**LC**
282	*Mycedium elephantotus* (Pallas, 1766)	x	x	x		**UC**	**NT**
283	*Oulophyllia bennettae* (Veron, Pichon & Wijsman, 1977)	x		**x**	**x**	**UC**	**NT**
284	*Oulophyllia crispa* (Lamarck, 1816)	x		x	x	C	LC
285	*Paragoniastrea australensis* (Milne Edwards, 1857)			**x**	**x**	**UC**	**NT**
286	*Paragoniastrea russelli* (Wells, 1954)		x	x	x	R	VU
287	*Paramontastraea salebrosa* (Nemenzo, 1959)		x	x		**UC**	**VU**
288	*Pectinia alcicornis* (Saville-Kent, 1871)	x	x	x	x	**C**	**VU**
289	*Pectinia lactuca* (Pallas, 1766)	**x**	**x**	**x**	**x**	**UC**	**EN**
290	*Pectinia maxima* (Moll & Best, 1984)	x				**C**	**NT**
291	*Pectinia paeonia* (Dana, 1846)		**x**	**x**	**x**	**C**	**NT**
292	*Platygyra acuta* Veron, 2000		x	x	**x**	**UC**	**NT**
293	*Platygyra carnosus* Veron, 2000		x		**x**	**UC**	**LC**
294	*Platygyra contorta* Veron, 1990*				x	C	NT
295	*Platygyra crosslandi* Matthai, 1928		**x**	**x**	**x**	**C**	**LC**
296	*Platygyra daedalea* (Ellis & Solander, 1786)	x		x	x	**UC**	**NT**
297	*Platygyra lamellina* (Ehrenberg, 1834)	**x**	**x**	**x**	**x**	**UC**	**LC**
298	*Platygyra pini* Chevalier, 1975		x	**x**	**x**	**UC**	**NT**
299	*Platygyra ryukyuensis* Yabe & Sugiyama, 1936				**x**	**UC**	**LC**
300	*Platygyra sinensis* (Milne Edwards & Haime, 1849)	x	x	**x**	**x**	**UC**	**NT**
301	*Platygyra verweyi* Wijsman-Best, 1976	x	x		**x**	**R**	**VU**
302	*Platygyra yaeyamaensis* Eguchi & Shirai, 1977			**x**	**x**	**UC**	**LC**
303	*Scapophyllia cylindrica* Milne Edwards & Haime, 1849	x			**x**	**R**	**NT**
304	*Trachyphyllia geoffroyi* (Audouin, 1826)	x		x	x	C	–
	Pocilloporidae Gray, 1842						
305	*Pocillopora acuta* Lamarck, 1816*				**x**	**C**	**LC**
306	*Pocillopora damicornis* (Linnaeus, 1758)	**x**	**x**	**x**	**x**	**–**	**–**
307	*Pocillopora grandis* Dana, 1846	x		x		**C**	**LC**
308	*Pocillopora meandrina* Dana, 1846	x			**x**	**C**	**LC**

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309	*Pocillopora verrucosa* (Ellis & Solander, 1786)	x	x	x	x	C	NT
310	*Stylophora pistillata* Esper, 1797	x	x	x	x	C	LC
311	*Stylophora subseriata* (Ehrenberg, 1834)	x	x		x	C	NT
	Poritidae Gray, 1842						
312	*Goniopora columna* Dana, 1846		x		x	C	LC
313	*Goniopora djiboutiensis* Vaughan, 1907		x	x	x	UC	LC
314	*Goniopora fruticosa Saville*-Kent, 1893			x		C	NT
315	*Goniopora lobata* Milne Edwards & Haime, 1860		x	x	x	UC	LC
316	*Goniopora norfolkensis* Veron & Pichon, 1982		x			UC	VU
317	*Goniopora planulata* (Ehrenberg, 1834)	x				UC	LC
318	*Goniopora somaliensis* Vaughan, 1907		x	x		UC	NT
319	*Goniopora stokesi* Milne Edwards & Haime, 1851		x	x		C	LC
320	*Goniopora tenuidens* (Quelch, 1886)		x			C	NT
321	*Porites annae* Crossland, 1952	x		x	x	C	VU
322	*Porites aranetai* Nemenzo, 1955			x		C	VU
323	*Porites attenuata* Nemenzo, 1955		x	x		C	LC
324	*Porites australiensis* Vaughan, 1918			x	x	C	VU
325	*Porites cocosensis* Wells, 1950			x		UC	VU
326	*Porites cumulatus* Nemenzo, 1955		x			C	NT
327	*Porites cylindrica* Dana, 1846	x	x	x	x	C	NT
328	*Porites densa* Vaughan, 1918			x	x	C	NT
329	*Porites echinulata* Klunzinger, 1879			x		UC	DD
330	*Porites evermanni* Vaughan, 1907	x	x			C	VU
331	*Porites horizontalata* Hoffmeister, 1925	x	x		x	C	LC
332	*Porites lichen* Dana, 1846				x	C	NT
333	*Porites lobata* Dana, 1846		x	x	x	C	LC
334	*Porites lutea* Milne Edwards & Haime, 1851		x	x	x	UC	LC
335	*Porites mayeri* Vaughan, 1918			x	x	UC	LC
336	*Porites monticulosa* Dana, 1846	x	x	x	x	C	NT
337	*Porites murrayensis* Vaughan, 1918		x		x	UC	NT
338	*Porites negrosensis* Veron, 1990			x		C	VU
339	*Porites nigrescens* Dana, 1846	x	x	x	x	C	LC
340	*Porites rus* (Forskål, 1775)	x	x	x	x	C	LC
341	*Porites solida* (Forskål, 1775)	x		x	x	R	DD
342	*Stylaraea punctata* (Linnaeus, 1758)			x		C	NT
	Psammocoridae Chevalier & Beauvais, 1987						
343	*Psammocora contigua* (Esper, 1797)	x		x	x	UC	NT
344	*Psammocora digitata* Milne Edwards & Haime, 1851	x	x	x	x	UC	-
345	*Psammocora haimiana* Edwards & Haime, 1851		x		x	UC	LC
346	*Psammocora profundacella* Gardiner, 1898	x			x	UC	NT
	Siderastreidae Vaughan & Wells, 1943						
347	*Pseudosiderastrea tayami* Yabe & Sugiyama, 1935	x			x	UC	NT
	Scleractinia Incertae sedis						
348	*Blastomussa wellsi* Wijsman-Best, 1973	x				R	VU
349	*Leptastrea aequalis* Veron, 2000					UC	LC
350	*Leptastrea pruinosa* Crossland, 1952	x	x		x	C	LC
351	*Leptastrea purpurea* (Dana, 1846)	x	x		x	UC	LC
352	*Leptastrea transversa* Klunzinger, 1879		x		x	C	VU
353	*Physogyra lichtensteini* (Milne Edwards & Haime, 1851)				x	UC	NT
354	*Plerogyra sinuosa* (Dana, 1846)	x	x		x	UC	LC
355	*Plesiastrea versipora* (Lamarck, 1816)	x			x	C	VU
	355 species, 67 genera and 15 families	**157**	**204**	**248**	**254**		

Note: * new scleractinian species records for the east coast of Peninsular Malaysia; COTW: 29 rare species; IUCN Red List: 86 vulnerable and 3 endangered species.