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Biodiversity and biogeography of zooxanthellate corals in Australasia revisited based on new data from the Kimberley

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ABSTRACT – The Kimberley Marine Region is a vast stretch of complex eastern Indian Ocean seascape spanning approximately six degrees of latitude and eight degrees of longitude. The region includes various habitats, including offshore reef and shoal systems, and a complex array of nearshore platform and fringing reefs along an estimated 12,000 km of the northern Western Australian coastline. Isolated from urban centres, the Kimberley features one of the world's least anthropogenically impacted tropical reef ecosystems and is predicted to be a significant repository for coral biodiversity. However, little information has been publicly available to verify this. Here we report a revision of the zooxanthellate coral biodiversity of the Kimberley region based on new specimen records. Replicate belt transects were surveyed at 135 intertidal and subtidal stations spanning the inshore, mid-shelf and offshore Kimberley from 2009–2014. Nineteen thousand and eighty-six colonies and 333 species were counted and identified on the belt transects, and an additional 62 species were recorded incidentally off transects. Combining the new museum-accessioned specimen records with recent specimen donations and published historical records from 1893 onwards resulted in an updated regional diversity estimate of 438 species of zooxanthellate reef-building corals in the Kimberley. This dataset extends the known distribution range of 85 species, 37 of which represent new records for Australia. Our results show that the Kimberley coral communities are heterogenous, with pronounced cross-shelf, depth, and subregional diversity patterns. Ashmore Reef, Cassini Island and Montgomery Reef are regional coral biodiversity hotspots. *Goniastrea retiformis*, *Porites lutea*, *Dipsastraea pallida*, *Goniastrea favulus* and *Coelastrea aspera* dominate the intertidal reef zones, whilst *Porites lichen*, *Heliopora coerulea*, *Seriatopora hystrix*, *Goniastrea pectinata* and *Montipora aequituberculata* dominate the subtidal reefs. This dataset suggests that the origins, biogeography, and connectivity within the Australasian region and the diversity of corals in the eastern Indian Ocean have been misinterpreted in the past. Overall, this study provides a revision of biodiversity and biogeographic patterns in Australia and highlights the importance of the Kimberley region as a nationally significant reservoir of tropical coral biodiversity with vital, yet under-studied, connections to the Indo-Australian Centre of Diversity.

KEYWORDS: baseline, diversity, gradients, hermatypic, hotspot, Indian Ocean, north-west Australia, Scleractinia

INTRODUCTION

Coral communities are heterogeneous in space and time, but over 60 years of biogeographic and ecological research has established global clines in generic and species richness (Wells, 1954; Rosen, 1971; Stelhi and Wells 1971; Veron 1986, 1993, 1995, 2000; Veron and Marsh 1988; Wallace and Wolstenholme 1998; Wallace 1999; Wallace and Rosen 2006; Wallace et al. 2009) along with regional assembly patterns (Bellwood and Hughes 2001). A conspicuous pattern is that the highest diversity of reef-building scleractinian corals occurs in the Indo-Australian Archipelago (IAA), an area extending between the Indian and Pacific Oceans (Bellwood et al. 2012; Green and Mous 2008; Veron et al. 2009; Wallace 2011). That region, often called the Coral Triangle, hosts at least 605 zooxanthellate species of scleractinian coral (Veron et al. 2009). The high diversity largely results from the complex tectonic history of the region and the high level of habitat heterogeneity and complexity (Veron et al. 2011). Favourable sea-surface temperatures, the retention of deep-water lagoonal habitats following late-Cenozoic eustatic sea-level changes, and vicariant speciation during low sea-level stands are also contributing factors to the high level of extant diversity (Briggs 1999; Wallace 2001; Hoeksema 2007; Wallace 2011; Santodomingo et al. 2013).

Lying south of the coral triangle, Australia is another critical region and reservoir for coral biodiversity, primarily because of the internationally recognised Great Barrier Reef and Ningaloo Reef systems. Based on the records in Coral Geographic (Veron et al. 2009), the Torres Strait and far northern Great Barrier Reef hosts the highest diversity of corals in Australia with 410 species, and this diversity attenuates in southerly (402 species on the Central and Northern GBR, 370 species on the SE GBR), easterly (354 spp. in the Coral Sea) and westerly directions (Arafura Sea; 127 spp.). Continuing to move in a westerly direction past the Gulf of Carpentaria in the Northern Territory, coral diversity rises again from Arnhem Land (233 spp.) to Darwin (267 spp.) and along the Kimberley coastline (314 spp.), peaking at Ashmore Reef (405 spp.). This putative westerly increase in coral biodiversity across northern Australia has yet to be explored in detail, mainly because limited information has been publicly available about the coral fauna of the Kimberley region.

A synthesis of the existing records of shallow water (<30 m) scleractinian coral species in the Kimberley region (including Ashmore Reef) based on specimens lodged in Australian museum collections (the 1880s–2009) determined that 338 species of hard corals belonging to 17 families and 71 genera occur in the Kimberley (Richards et al. 2014). This estimate, however, was considered an underestimate of the true diversity in the region because many areas had not yet been studied (e.g. Hibernia Reef, Imperieuse Reef and much of the inshore Kimberley region). In 2015, Veron et al. revised the estimate of the diversity of corals in the Kimberley region to 350 spp. If the Kimberley region, including the inshore reefs and the offshore atolls of NW Australia, does host the level of diversity originally reported in Veron et al. (2009) (i.e. 405 spp.), this region could be considered an essential yet under-appreciated hotspot for Australasian coral fauna. Identifying such caches of diversity is increasingly important, considering Australia's most renowned repository of coral biodiversity, the Far Northern Great Barrier Reef, was severely impacted by the 2016–2017 coral bleaching event (Hughes et al. 2018).

Another significant result arising from the Richards et al. (2014) study was that pronounced cross-shelf differences in species composition were evident, with 27 species (8%) recorded only from inshore locations and 111 species (33%) recorded only at offshore locations (Richards et al. 2014). Marked inshore/offshore differences were also apparent in a study of Kimberley reefs' general benthic composition and structure (Richards et al. 2018). That study also indicated prominent differences in the composition of intertidal versus subtidal communities. Both studies and others that focused on coral communities of the Bonaparte Archipelago in the central inshore Kimberley (Richards et al. 2015, 2019) have concluded that Kimberley coral communities are of regional and national significance, and further research into the diversity and distribution patterns in the region are warranted (Civitanovic et al. 2021).

In order to fill knowledge gaps about marine biodiversity in the Kimberley region, the Western Australian Museum (WAM) undertook an extensive 6-year marine survey (2009–2014). Here we synthesise new distribution records for shallow water zooxanthellate reef-building corals in the Kimberley region. We comprehensively summarise species presence at 171 stations, spanning intertidal and subtidal habitats across the inshore and offshore Kimberley. We test the hypothesis that there are pronounced differences in coral biodiversity across shelf, depth and subregional gradients and highlight locations that function as regional biodiversity hotspots. The overall findings are discussed in a broader biogeographic context, and this reference dataset should help inform biodiversity conservation efforts and provide a valuable guide for future research and impact assessments in the region.

METHODS

PROJECT AREA

We refer to the areas studied as 'Project Area' in continuation of terminology used in previous papers arising from the Woodside Collection Project (Bryce et al. 2018; Richards et al. 2018).

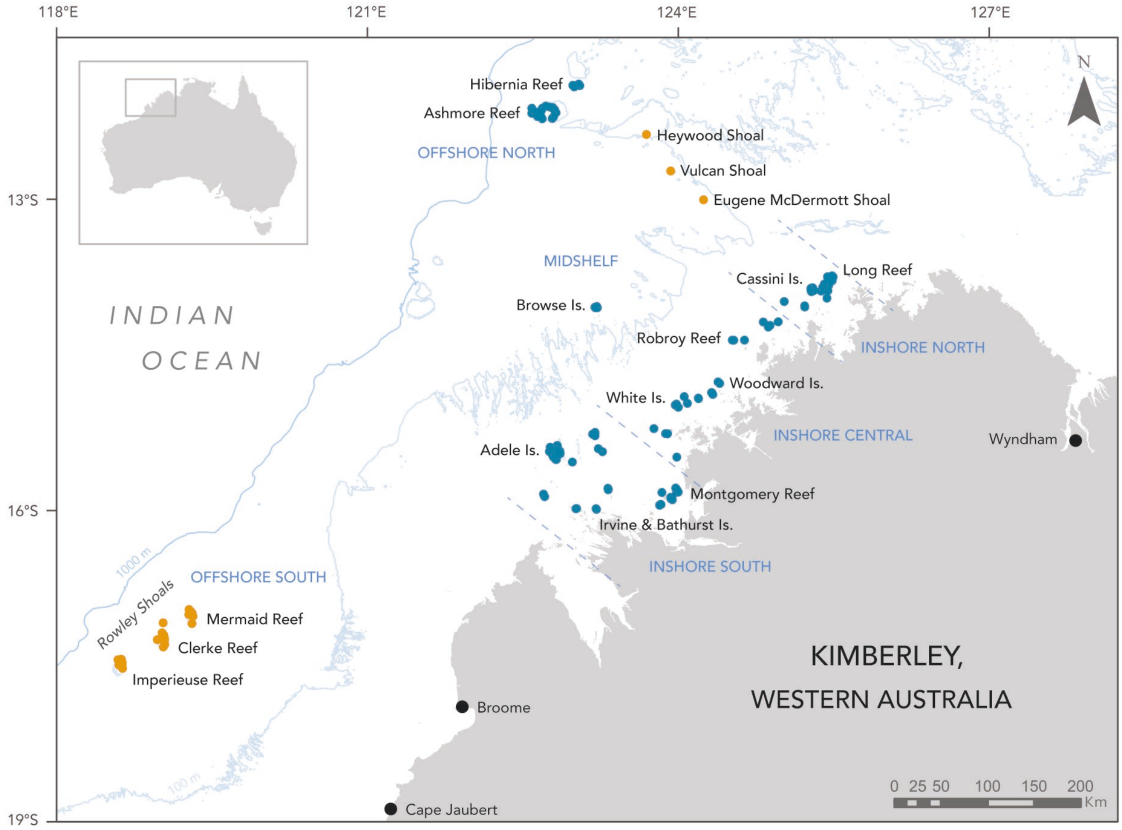

FIGURE 1 Locations where coral biodiversity belt survey transects were undertaken (blue dots); locations where incidental off-transect biodiversity records or specimen collections were obtained (orange dots).

The Project Area is defined by the coordinates (12.00°S, 118°E; 19.00°S, 126.00°E) ranging from Fraser Island in the Buccaneer Archipelago to Long Reef in the far north Kimberley and westward to Ashmore Reef and south to the Rowley Shoals (Figure 1). Reefs in the Project Area fall into two distinct groups — the large atolls, platform reefs, banks and shoals that occur in the offshore bioregion and the fringing and submerged patch reefs of the inshore bioregion (Wilson 2013, 2014) which occur within the seacountry of the Dambimangari, Mayala and Wunambal Gaambera peoples. The oceanographic setting of the offshore reefs is unique because they occur in a transition zone, receiving low to moderately productive oceanic water of mixed Pacific and Indian Ocean origins. Conversely, the inshore communities experience large tidal oscillations (>11 m), strong currents and high levels of turbidity (Wilson 2013; Collins et al. 2015; Solihuddin et al. 2016). As a result, inshore reef habitats are extraordinarily dynamic, and over spring tides, intertidal coral communities can be directly exposed to extreme temperature and light conditions for up to three hours at a time (Rosser and Veron 2011; Richards et al. 2015).

The Project Area was divided into continental shelf zones, using the following bathymetric ranges: inshore (coastal shoreline to 50 m), mid-shelf (51–150 m) and offshore (>150 m). Shelf positions are Offshore South (Rowley Shoals), Offshore North (Ashmore Reef, Hibernia Reef and Browse Island), Mid-shelf South (Adele Island), Inshore South (Fraser Island to Montgomery Reef), Inshore Central (Bathurst Island to North Montelivet Island) and Inshore North (Condilliac Island to Long Reef). Within these broad zones, reef locations and survey stations were chosen to maximise spatial spread and representation across geomorphic zones. See Sampey et al. (2014) for further descriptions of the Project Area and Bryce et al. (2018) for further descriptions of the stations surveyed.

FIELD SURVEYS

Hard coral biodiversity was recorded at single time points from 2009–2014 at 171 stations from 38 island/reef groups from the Kimberley Project Area (Figure 1). During the September/October spring tides each year, surveys were undertaken to enable reef flat habitats to be surveyed when they were subaerially exposed at low tide. The large tidal oscillation over spring tides (8–11 m) results in powerful currents and low water visibility due to sediment re-distribution; hence subtidal surveying on scuba was restricted to a limited time window of approximately 45 minutes over slack high tide.

The number of stations surveyed at each reef varied depending on the size of the reef, the prevailing weather, oceanic conditions and occupational safety considerations (e.g. presence of crocodiles). While only a single station was surveyed at some reefs, five reef systems were more intensively surveyed (Ashmore Reef, Long Reef, Cassini Island, Montgomery Reef and Adele Island). One hundred and ten survey stations were subtidal (mean depth 11.5 m, range 5–16 m, depending upon tidal amplitude), and 66 stations were intertidal (mean depth 0.5 m, range 0–4 m). The subtidal sites included reef slopes, patch reefs or submerged lagoonal habitats. Intertidal sites were mid to lower littoral reef flats and were surveyed by reef-walking or snorkelling at low tide.

At 135 stations (29 island/reef groups, 80 subtidal, 55 intertidal), zooxanthellate coral biodiversity (all Scleractinia plus six species of other non-scleractinian zooxanthellate reef-building corals from the Families Tubiporidae, Milleporidae, Helioporidae) was documented on three (or four) replicate 15 x 1 m belt transects (491 transects in total) across a total survey area of 7,365 m^2. The length of the transects was constrained by the limited time available to survey subtidal stations over slack high tide safely. Every coral colony (over 5 cm diameter) within the belt transects was counted and identified to species level in situ or collected for later verification in the laboratory. In the case of large stands or mature colonies, every 1 m^2 was counted as two colonies.

At the remaining 36 stations, incidental collecting occurred during rapid visual assessment surveys. Where possible, corals were identified in-situ and photographed; however, if corals could not be identified in-situ, small (5–10 cm) samples were collected with a hammer and chisel. Each sample was divided into two; one piece was preserved in 100% ethanol for DNA preservation, and the second was cleaned with liquid bleach (Sodium Hypochlorite) to retain the skeleton. Dr Zoe Richards and Monique Grol (Rowley Shoals) collected all corals; however an additional 18 specimens collected from the project area were donated to the WAM over the project period.

TAXONOMY AND DISTRIBUTION RECORDS

Dr Zoe Richards identified all corals based on morphological features using a range of taxonomic sources (including Wells 1956; Veron et al. 1971; Veron and Wallace 1984; Veron and Marsh 1988; Wallace 1999; Veron 2000; Dai and Horng 2009; Benzoni et al. 2010; Wallace, Done and Muir 2012). Corals were classified to align with the World List of Scleractinia as of June 2022 (http://www.marinespecies.org/scleractinia), which reflects the most up-to-date nomenclatural system based on published morphological and molecular research (Benzoni et al. 2010; Budd et al. 2012; Gittenberger et al. 2011; Arrigoni et al. 2012, 2014; Benzoni et al. 2012; Huang et al. 2014a,b; Kitano et al. 2014; Schmidt-Roach et al. 2014; Juszkiewicz et al. 2022). The identifications of selected specimens of interest were verified by co-authors: *Acropora* (Carden Wallace) and *Porites* (Michel Pichon); and by the following experts: *Psammocora* — Dr Francesca Benzoni; and Fungidae — Dr Bert Hoeksema. Two thousand and eighty-seven specimens were collected on this project (wet and dry duplicates of each) and have been accessioned into the WAM Aquatic Zoology Collection. Western Australian Museum data are publicly available via the Atlas of Living Australia Website and also available upon request from the museum's Marine Invertebrate Curator.

The known distributions of all species in this study was determined according to the Corals of the World online database (Veron et al. 2016), or Veron (2000) for taxa not available online. Other reference material for regional distribution records includes Veron (1993); Griffith (1997); McKinney (2009); Richards and Rosser (2012); Wallace et al. (2012); Richards et al. (2014, 2015); and Muir et al. (2015).

DATA ANALYSIS

Mean species (alpha) diversity (±SE) was quantified at each of the 135 belt transect sites, and sites were pooled for analysis according to subregion (inshore/mid-shelf/offshore), tidal zone (intertidal/subtidal) and habitat (reef slope/mid-reef platform/lower-reef platform/patch reef/lagoon/sand and coral outcrop). To test whether environmental heterogeneity differed between factors, we performed an analysis of homogeneity of multivariate dispersions (PERMDISP) in Primer-E (ver.7; Clarke and Gorley 2015) using presence/absence data. A resemblance matrix of similarities between sites was calculated using the Bray-Curtis coefficient. The resulting resemblance matrix was visualised using Principal Coordinates Analysis (PCO). To examine which variables contributed to the observed differences in community structure, we conducted a one-way analysis of similarity (SIMPER), and vectors for the key taxa driving the patterns were overlaid on the PCO.

To test whether coral communities varied in composition between subregion, tidal zone and habitat, the presence/absence data were analysed using a permutational multivariate analysis of variance (PERMANOVA in Primer-E (ver. 7; Clarke and Gorley 2015). The analysis was conducted with type III sums of squares using a fixed effects design where tidal zone and habitat were nested in subregion. To better visualise significant differences between locations and habitats identified through the PERMANOVA analysis, bootstrapping (100 replicates) of group means was undertaken, and a non-metric MDS ordination visualised the results. Incidental records and collections undertaken during rapid visual assessments were excluded from the analysis, but they are included in the overall species list (see Table 1 and Appendix 1).

RESULTS

REGIONAL DIVERSITY

Nineteen thousand and eighty-six hermatypic coral colonies were counted and identified on belt transects across the 135 survey stations. A total of 5,948 colonies occurred intertidally and 13,138 colonies occurred subtidally. Laboratory examinations of the specimens confirmed the presence of 333 species on belt transects. One hundred and ninety seven species occurred in the intertidal zone, and 324 species occurred subtidally.

When belt transect records and incidental off-transect records were combined, 389 species of scleractinian coral and six species of non-scleractinian reef-building corals (Tubiporidae, Milleporidae, Helioporidae) were recorded (Appendix 1). After updating the taxonomy based on the World Register of Marine Species (as of June 2022) and integrating the species list with that published by Richards et al. (2014: 332 spp.) and Richards et al. (2015: 229 spp.), the overall total of hard coral species recorded from the Kimberley is 438. Notably, these 438 records are linked to specimens held in the WAM or the Queensland Museum. Many of these specimens also have ethanol-preserved tissue samples and ultra-freeze tissue subsamples.

NEW DISTRIBUTION RECORDS

Two thousand four hundred and twenty specimens were collected from 57 offshore and 22 mid-shelf, and 92 inshore locations (Figure 1) in the Kimberley from 2009–2014 (and 18 specimens were donated). This collection determined 85 species to be new records from the region (Table 1). Thirty-seven of these new records represent new records for Australia. However, we use the open qualifier cf. for eight of these records, including one species that is nomen dubium; hence further integrated taxonomic and molecular studies are recommended to verify these records. Twenty-seven species were recorded from Western Australia for the first time, eight from the Kimberley region for the first time, and 14 from the inshore Kimberley for the first time (Table 1).

Among the new Australian records are species from 17 genera (Table 1). These include three *Acropora* species: *A. jacquelineae*, *A. retusa* (Supplementary Figure 2), and *Acropora* cf. *teres* (nomen dubium); seven *Montipora* species: *M. altasepta*, *M. capitata*, *M. cocosensis*, *M. porites*, *M. samarensis*, *M. verruculosa*, and *Montipora* cf. *palawanensis* (Supplementary Figure 6); and seven *Porites* species: *P. attenuata* (Supplementary Figure 8), *P. flavus* (Supplementary Figure 9), *P. horizontalata*, *P. latistellata* (Supplementary Figure 10), *P. profundus*, *P. rugosus*, and *P. sillimaniani*. Other new Australian records include *Goniopora polyformis* and *Goniopora* cf. *paliformis* (Supplementary Figure 7); *Echinophyllia patula* and *Echinophyllia* cf. *pectinata* (Supplementary Figure 11); *Pectinia maxima* and *P. elongata* (Supplementary Figure 12); *Pavona bipartita* (Supplementary Figure 14); *Psammocora albopicta* (Supplementary Figure 14); *Acanthastrea minuta* (Supplementary Figure 15) and *Seriatopora dendritica*, *S. guttata*, *S. stellata*, and *Stylophora subseriata*.

Among the new Western Australian records are species from 18 genera (Table 1), including *Acropora tenella* and *A. elegans* (Supplementary Figure 1), *A. globiceps*, *A. hoeksemai* (Supplementary Figure 3), and *A. spathulata* (Supplementary Figure 4); *Isopora cuneata* (Supplementary Figure 5); *Alveopora marionensis* (Supplementary Figure 7); *Oxypora crassispinosa* (Supplementary Figure 12); *Sandalolitha dentata* (Supplementary Figure 13); *Coscinaraea monile* (Supplementary Figure 14); *Micromussa regularis* (Supplementary Figure 15); *Blastomussa vivida* (Supplementary Figure 15); and *Australogyra zelli*.

Eight species from four genera were recorded from the Kimberley region for the first time, including *Acanthastrea subechinata* (Supplementary Figure 15); *Acropora palmarae* (Supplementary Figure 5), *A. tortuosa*, *A. willisae* (Supplementary Figure 4); *Favites acuticollis* and *Micromussa amakusensis*. Fourteen species from 11 genera were recorded from the inshore Kimberley for the first time (Table 1).

TABLE 1 New distribution records for Australia, Western Australia and the Kimberley region (this study).

Identified by: BH = Bert Hoeksema; CW = Carden Wallace; FB = Francesca Benzoni; MP = Michel Pichon; ZR = Zoe Richards.
Sources: # Scott Reef material donated by AIMS; ^ Scott Reef mesophotic samples donated by Andrew Heywood; * Broome samples donated by Simon Hawke; [A] Richards and Rosser 2012, Barrow Island; [B] Richards et al. 2014, Kimberley Historical (including McKinney 2009, Scott Reef, and Rowley Shoals); [C] Richards et al. 2015, Bonaparte Archipelago; [D] Wallace et al. 2012; [E] Muir et al. 2015, 2018; [F] Wallace et al. 2009.

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Acanthastrea minuta Moll & Best, 1984	Browse Island (stn 101); Hibernia Reef (stn 144); Ashmore Reef (stns 134, 135)	Patch reef, fore-reef slope (12 m)	Z89385, Z89353, Z89354, Z89386	ZR	No Australian records	+					15
Acanthastrea rotundoflora Chevalier, 1975	Jamieson Reef (stn 111); Mavis Reef (stn 77); Cassini Island (stn 34); Patricia Island (stn 114)	Patch reef, fore-reef slope (12 m)	Z66452; Z66456; Z65999; Z66198	ZR	No Australian records	+					
Acanthastrea subechinata Veron, 2000	Adele Island (stn 9); Bathurst and Irvine Islands (stn 89); Ashmore Reef (stn 122); Imperieuse Reef (stn 165)	Fore-reef slope, back reef (8–12 m); intertidal platform	Z65971, Z66155, Z66247, Z66458	ZR	No Kimberley records			+		[A] Barrow Island	15
Acropora desalwii Wallace, 1994	Mermaid Reef (stn 150)	Lagoon (12 m)	Z93157	ZR, CW	No Australian records	+				[B] as cf. from offshore Kimberley	
Acropora elegans (Milne Edwards, 1860)	Albert Reef (stn 79); Scott Reef Mesophotic^	Fore-reef slope (12 m)	Z66119, Z99600	ZR, CW	No Western Australian records		+			[D,E] Great Barrier Reef, Coral Sea, south-eastern Queensland	1
Acropora globiceps (Dana, 1846)	Clerke Reef (stn 156)	Fore-reef slope (12 m)	Z92730	ZR, CW	No Western Australian records		+			[H] south-eastern Queensland	
Acropora hoeksemai Wallace, 1997	Clerke Reef (stn 154)	Fore-reef slope (12 m)	Z93294	ZR, CW	No Western Australian records (recorded from Northern Territory)		+				3

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Acropora jacquelineae Wallace, 1994	Scott Reef[#]	Lagoon (depth unknown)	Z99601	ZR, CW	No Australian records	+					
Acropora palmerae Wells, 1954	Mermaid Reef (stn 180)	Intertidal	Z92792	ZR, CW	Strongly predicted from the Kimberley (recorded from Pilbara and eastern Australia)			+		[A] Barrow Island	5
Acropora pichoni[^] Wallace, 1999	Scott Reef	Mesophotic lagoon (52 m)	Z65496	ZR, CW	No confirmed Western Australian records (confirmed from Coral Sea)		+			[B,E] Scott Reef (unconfirmed) and Coral Sea	1
Acropora retusa (Dana, 1846)	Clerke Reef (stns 152–153, 173); Imperieuse Reef (stn 157)	Lagoon, fore-reef slope (12 m)	Z92718, Z92727, Z92751, Z92767	ZR, CW	No Australian records	+					2
Acropora spathulata (Dana, 1846)	Mermaid Reef (stn 177)	Intertidal	Z92789	ZR, CW	No Western Australian records (recorded from Great Barrier Reef and Coral Sea)		+				4
Acropora sukarnoi Wallace, 1997	Cassini Island (stn 38); Browse Island (stn 106); Hibernia Reef (stns 143, 145); Ashmore Reef (stns 128, 140)	Fore-reef slope (6–12 m)	Z92702, Z66426, Z66409, Z65670, Z65760, Z66379	ZR, CW	Ashmore Reef				+		3
Acropora tenella (Brook, 1892)	Scott Reef[^]	Mesophotic lagoon (52 m)	Z99602	ZR, CW	No Western Australian records (recorded from Great Barrier Reef, Coral Sea, Torres Strait and south-eastern Asia)		+				1
Acropora cf. *teres* (Verrill, 1866)	Clerke Reef (stn 155)	Lagoon (12 m)	Z93227, Z93231	ZR, CW	No Australian records	+					

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Acropora tortuosa (Dana, 1846)	Imperieuse Reef (stns 158, 160, 165); Mermaid Reef (stns 150, 176)	Intertidal; lagoon (8 m); fore-reef slope (12 m)	Z93394, Z93409, Z93435, Z93395, Z92744, Z92707, Z93150, Z92785	ZR, CW	Strongly predicted to occur in the Kimberley			+			4
Acropora willisae Veron & Wallace 1984	Clerke Reef (stns 151, 154)	Fore-reef slope (12 m)	Z93208, Z93314	ZR, CW	Strongly predicted to occur in the Kimberley			+			4
Alveopora cf. *ocellata* Wells, 1954	Jamieson Reef (stn 110)	Patch reef (12 m)	Z92981	ZR	No Australian records	+					
Alveopora marionensis Veron & Pichon, 1982	Adele Island (stn 3); Long Reef (stn 44); NW Black Rocks (stn 69); Beagle Reef (stn 75); Mavis Reef (stn 78); Brue Reef (stn 83)	Intertidal; submerged platform, reef slope (12 m)	Z93705, Z92923, Z93706, Z92958, Z92961, Z92966	ZR	No Western Australian records (recorded from Great Barrier Reef, Coral Sea, Torres Strait and south-eastern Asia)		+				7
Astrea cf. *devantieri* (Veron, 2000)	Ashmore Reef (stns 132–133)	Fore-reef slope (12 m)	Z93103, Z93104	ZR	No Australian records (known from western Indian Ocean)	+					
Astreopora cucullata Lamberts, 1980	Jamieson Reef (stn 110); Rob Roy Reef (stn 119); Mermaid Reef (stns 150, 178)	Lagoon, fore-reef slope, patch reef (12 m)	Z89936, Z66469, Z66470, Z66176, Z66214, Z66468	ZR	No inshore Kimberley records (confirmed from Rowley Shoals; strongly predicted from Scott Reef)				+		5
Astreopora incrustans Bernard, 1896	Mavis Reef (stn 77)	Reef slope (12 m)	Z66109	ZR	No confirmed Western Australian records (confirmed from Great Barrier Reef)		+				

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Australogyra zelli (Veron, Pichon & Best, 1977)	Fraser Island (stn 84)	Intertidal	Z66133	ZR	No Western Australian records (confirmed from Great Barrier Reef, Torres Strait and Lord Howe Island; predicted in Gulf of Carpenteria)		+				
Blastomussa vivida Benzoni et al. 2013	Adele Island (stn 6); Cassini Island (stn 58)	Fore-reef and channel slope (12 m)	Z66069, Z65963	ZR	No Western Australian records (confirmed from Great Barrier Reef)		+				15
Coscinaraea crassa Veron and Pichon, 1980	Patricia Island (stn 114)	Fore-reef slope (12 m)	Z66199	ZR	No Western Australian records		+				
Coscinaraea exesa (Dana, 1846)	Beagle Reef (stn 75); Heritage Reef (stn 115)	Lower mid-littoral reef platform and fore-reef slope (12 m)	Z92644, Z92645	ZR, FB	Strongly predicted from inshore Kimberley (confirmed from Pilbara and offshore Kimberley)				+		
Coscinaraea monile (Forskål, 1775)	Montgomery Reef (stn 18)	Intertidal	Z65935	ZR	No Western Australian records (confirmed from Great Barrier Reef, Torres Strait and Lord Howe Island; predicted in Gulf of Carpenteria)		+				14
Cyphastrea agassizi Vaughan, 1907	Black Rocks (stn 67); Eugene McDermott Shoal (stn 147); Ashmore Reef (stns 131, 141)	Intertidal; reef slope (12 m); submerged shoal (20 m)	Z66087, Z66433, Z66315, Z66396	ZR	No Western Australian records (recorded from Great Barrier Reef, Torres Strait and Cocos Keeling Islands)		+				

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Cyphastrea japonica Yabe & Sugiyama, 1932	Ashmore Reef (stn 125)	Fore-reef slope (12 m)	Z66273, Z66274	ZR	No Western Australian records (recorded from Great Barrier Reef, Torres Strait and Coral Sea)		+				
Dipsastraea marshae Veron, 2000	Adele Island (stn 5)	Lagoon (4 m); reef slope (12 m)	Z89210	ZR	Confirmed offshore Kimberley and strongly predicted inshore				+		
Echinophyllia patula (Hodgson & Ross, 1981)	Adele Island (stns 5, 13); Rob Roy Reefs stn (119); Imperieuse Reef (stn 165)	Reef and channel slope (8–12 m)	Z65956, Z65911, Z66217, Z89925	ZR	No Australian records	+					11
Echinophyllia cf. *pectinata* Veron, 2000	Mavis Reef (stn 76); Ashmore Reef (stn 124); Imperieuse Reef (stn 159)	Back reef, reef slope, lagoon (12 m)	Z66104, Z66260, Z92605	ZR	No Australian records	+					11
*Fimbriaphyllia paraancora** (Veron, 1990)	Long Reef (stn 47)	Patch reef (6 m)	Z69976	ZR	No Western Australian records (confirmed from Northern Territory, predicted from Gulf of Carpenteria and Timor Sea)		+				
Favites acuticollis (Ortmann, 1889)	King and Conway Islands (stn 86)	Reef slope (12 m)	Z66144	ZR	No Kimberley records			+		[A] Barrow Island	
Favites colemani (Veron, 2000)	Cassini Island (stns 36, 39); Beagle Reef (stns 72, 75); Mavis Reef (stns 77–78); Condillac Island (stn 33); White Island (stn 83); outcrop North Colbert Island (stn 99); Rob Roy Reefs (stn 119)	Intertidal; reef slope, patch reef (12 m)	Z89254, Z89252, Z66455, Z89255, Z89253, Z89253, Z89256, Z92615, Z89257, Z89258, Z89259, Z89260, Z89261, Z92616	ZR	No Kimberley records (confirmed from Pilbara, Northern Territory and Great Barrier Reef)		+			[A] Barrow Island	

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Favites micropentagonus Veron, 2000	Cassini Island (stns 29, 58); Whilte Island (stn 65); Jamieson Reef (stn 100); Echuca Shoal (stn 108); Ashmore Reef (stns 124, 126–127); Browse Island (stn 101); Adele Island (stn 4)	Intertidal; reef slope, patch reef, submerged shoal, back reef (12 m)	Z65981, Z66070, Z66084, Z66179, Z66261, Z66160, Z65953, Z66292, Z66282	ZR	No Western Australian records (strongly predicted from ecoregion 10, Ashmore Reef)		+				
Goniopora burgosi Nemenzo, 1955	Bathurst and Irvine Islands (stn 89); Ashmore Reef (stn 128); Mermaid Reef (stns 176, 178); Jamieson Reef (stn 111)	Intertidal; lagoon, patch reef, reef slope (3–12 m)	Z92973, Z93096, Z93456, Z93457, Z92976	ZR	No inshore Kimberley records				+	[B] offshore Kimberley	
Goniopora cf. *paliformis* Veron, 2000	Ashmore Reef (stn 122)	Lagoon, back reef (10 m)	Z93049	ZR, MP	No Australian records (recorded from northern and western Indian Ocean)	+					
Goniopora palmensis Veron & Pichon, 1982	Echuca Shoal (stn 108); Ashmore Reef (stn 126)	Submerged shoal (20 m); channel slope (6 m)	Z93007, Z93111	ZR	No inshore Kimberley records (recorded from Pilbara, Great Barrier Reef and Northern Territory)				+	[B] inshore and offshore Kimberley	
Goniopora polyformis Zou, 1980	Ashmore Reef (stn 132)	Channel slope (12 m)	Z93718	ZR	No Australian records	+					7
Goniopora tenella (Quelch, 1886)	Adele Island (stn 5)	Channel slope (12 m)	Z93717	ZR	No Australian records	+					
Hydnophora grandis Gardiner, 1904	Montgomery Reef (stn 24); Echuca Shoal (stn 108); Long Reef (stn 50)	Intertidal; lagoon (2 m); submerged shoal (20 m)	Z65948, Z66172, Z66056	ZR	No Western Australian records (confirmed from Great Barrier Reef and Torres Strait)		+			[A] Barrow Island	

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Isopora crateriformis (Gardiner, 1898)	Long Reef (stns 44, 54); Cassini Island (stn 38)	Mid and lower reef platform, reef slope (2–10 m)	Z65691, Z65666, Z65705	ZR	No Australian records (strongly predicted from Coral Sea)	+				[D] Flinders Reef, Queensland	5
Isopora cuneata (Dana, 1846)	Cassini Island (stn 37)	Mid reef platform (3 m)	Z65664	ZR	No Western Australian records (confirmed from Great Barrier Reef, Coral Sea, Torres Strait and Lord Howe Island)		+				5
Leptastrea bottae (Milne Edwards & Haime, 1849)	Ashmore Reef (stn 135); Imperieuse Reef (stn 166)	Intertidal; reef slope (12 m)	Z66333, Z92649	ZR	Confirmed offshore Kimberley and strongly predicted inshore				+		
Leptastrea inaequalis Klunzinger, 1879	Beagle Reef (stn 74)	Submerged reef (15 m)	Z99604	ZR	Confirmed offshore Kimberley and strongly predicted inshore				+		
Leptoseris gardineri van der Horst, 1921	Scott Reef Mesophotic^	Deep lagoon (~50 m)	Z99603	ZR	No Western Australian records (confirmed from Great Barrier Reef; stongly predicted from Coral Sea)		+				
Lobophyllia diminuta Veron, 1985	Wildcat Rocks (stn 61)	Intertidal	Z90620	ZR	No inshore Kimberley records (confirmed from Ashmore Reef, Great Barrier Reef and Torres Strait)				+		
Lobophyllia robusta Yabe, Sugiyama & Eguchi 1936	Long Reef (stn 58); Ashmore Reef (stn 124); Clerke Reef (stn 152)	Back reef, reef slope (12 m)	Z92936, Z92937, Z93246, Z90618	ZR	No inshore Kimberley records (confirmed from Pilbara, Northern Territory, Great Barrier Reef and Torres Strait)				+	[A] Barrow Island	

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Lobophyllia cf. *hassi* (Pillai & Scheer, 1976)	Clerke Reef (stn 155)	Lagoon (12 m)	Z93330	ZR	No Australian records	+					
Micromussa amakusensis (Veron, 1990)	Adele Island (stn 6); Ashmore Reef (stn 132)	Reef and channel slope (12–15 m)	Z65965, Z89352	ZR	No offshore Kimberley records (confirmed from inshore Kimberley, Northern Territory, Queensland and Coral Sea)			+		[C] Bonaparte Archipelago	
Micromussa regularis (Veron, 2000)	Adele Island (stn 3); Cassini Island (stn 38)	Mid-lower intertidal reef platform (0–4 m)	Z66453, Z66454	ZR	No Western Australian records (confirmed from Great Barrier Reef, Torres Strait)		+				15
Montipora altasepta Nemenzo, 1967	Montgomery Reef (stn 27)	Intertidal	Z89863	ZR	No Australian records	+					
Montipora cf. *australiensis* Bernard, 1897	Browse Island (stn 101)	Patch reef (12 m)	Z93488	ZR	No Kimberley records (recorded from Abrolhos, Northern Territory, Great Barrier Reef, Torres Strait and Coral Sea)			+			
Montipora capitata Dana, 1846)	Imperieuse Reef (stn 166)	Intertidal	Z89885	ZR	No Australian records	+					
Montipora cf. *capricornis* Veron, 1985	Mavis Reef (stn 78)	Patch reef (12 m)	Z93486	ZR	No Kimberley records (confirmed from Pilbara; strongly predicted from Kimberley)			+			
Montipora cf. *palawanensis* Veron, 2000	Scott Reef[#]	Lagoon (12 m)	Z89932	ZR	No Australian records	+					6

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Montipora cocosensis Vaughan, 1918	North Colbert Island (stn 99); Mermaid Reef (stn 150)	Lagoon, isolated outcrop (12 m)	Z89911, Z89934	ZR	No Australian records	+					6
Montipora corbettensis Veron & Wallace, 1984	Hibernia Reef (stn 145)	Reef slope (12 m)	Z89935	ZR	No Western Australian records (confirmed from Great Barrier Reef, Torres Strait and Coral Sea)		+				6
Montipora danae Milne, Edwards, & Haime 1851	Cassini Island (stn 29)	Reef and channel slope (10–12 m)	Z89886	ZR	No inshore Kimberley records (confirmed from Pilbara and offshore; strongly predicted from inshore Kimberley)				+		
Montipora porites Veron, 2000	Ashmore Reef (stn 134)	Reef slope (12 m)	Z89920	ZR	No Australian records	+					
Montipora samarensis Nemenzo, 1967	Ashmore Reef (stn 135)	Reef slope (12 m)	Z89921	ZR	No Australian records	+					
Montipora cf. *verruculosa* Veron, 2000	Mavis Reef (stn 77)	Submerged reef platform (12 m)	Z89869	ZR	No Australian records	+					6
Mycedium robokaki Moll & Best, 1984	Adele Island (stn 13), Ashmore Reef (stns 126, 130, 139)	Reef slope and lagoon (10–20 m)	Z65917, Z66311, Z66284, Z66364	ZR	No inshore Kimberley records (confirmed from Ashmore Reef, Torres Strait and Great Barrier Reef)				+	[B] as cf. from offshore Kimberley; [E] northern Great Barrier Reef	

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Oxypora crassispinosa Nemenzo, 1979	Ashmore Reef (stns 122, 124, 130, 139); Clerke Reef (stn 154)	Back reef, lagoon, reef slope (8–12 m)	Z66265, Z66252, Z66266, Z66310, Z66365, Z89924	ZR	No Western Australian records (confirmed from Great Barrier Reef and Torres Strait)		+				12
Paramontastraea salebrosa Nemenzo, 1959	Ashmore Reef (stns 132, 134)	Reef slope (12 m)	Z89387, Z89388	ZR	No Australian records (strongly predicted from Ashmore Reef)	+					
Pavona bipartita Nemenzo, 1979	Brue Reef (stn 80); De Freycinet Island (stn 94)	Reef slope (12 m)	Z66125, Z66229	ZR	No Australian records	+					14
Pavona minuta Wells, 1954	Cassini Island (stn 31); Albert Reef (stn 79); Rob Roy Reefs (stn 118)	Reef slope (12–20 m)	Z65991, Z66121; Z62212	ZR	No inshore Kimberley records (confirmed from Ashmore Reef, Great Barrier Reef and Torres Strait)				+	[B] inshore and offshore Kimberley	
Pectinia elongata (Rehberg, 1892)	Ashmore Reef (stn 139)	Lagoon (12 m)	Z66368, Z66370	ZR	No Australian records	+					12
Pectinia maxima (Moll & Best, 1984)	Montelivet Island (stn 117)	Reef slope (12 m)	Z66208	ZR	No Western Australian records (confirmed from Great Barrier Reef and Torres Strait)		+				12
Platygyra yaeyamaensis (Eguchi & Shirai, 1977)	Cassini Island (stn 40)	Reef slope (12 m)	Z66024	ZR	No Western Australian records (confirmed from Great Barrier Reef and Torres Strait)		+			[A] Barrow Island	

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Podabacia motuporensis Veron, 1990	Imperieuse Reef (stn 157); Clerke Reef (stn 156); Brue Reef (stn 80)	Reef slope (8–20 m)	Z66450, Z92650, Z89393, Z66126	ZR, BH	No inshore Western Australian records (confirmed from Ashmore Reef, Northern Territory, Torres Strait, Great Barrier Reef and Coral Sea)				+		
Porites attenuata Nemenzo, 1955	Long Reef (stns 50, 53); Imperieuse Reef (stns 159–160)	Intertidal; lagoon (12 m)	Z92930, Z93933, Z93342, Z93388, Z93390	ZR, MP	No Australian records	+					8
Porites flavus Veron, 2000	Champagny I (stn 63); Imperieuse Reef (stn 160); Mermaid Reef (stn 179)	Intertidal; lagoon (12 m)	Z91449, Z93196, Z93454	ZR, MP	No Australian records	+					9
Porites horizontalata Hoffmeister, 1925	Imperieuse Reef (stn 157)	Reef slope (12 m)	Z93322	ZR, MP	No Australian records (strongly predicted from Coral Sea)	+					
Porites latistellata Quelch, 1886	Hibernia Reef (stns 142, 144); Imperieuse Reef (stn 162)	Lagoon, reef slope (12 m)	Z93081, Z91449, Z93412	ZR, MP	No Australian records	+					10
Porites profundus Rehberg, 1892	Browse Island (stn 101); Ashmore Reef (stn 127)	Patch reef, reef slope (12 m)	Z92977, Z93100	ZR, MP	No Australian records	+					
Porites rugosa Veron & Fenner, 2000	Browse Island (stn 105); Ashmore Reef (stns 122, 139); Hibernia Reef (stn 145)	Lagoon, back reef, reef slope (12 m)	Z93002, Z93035, Z93057, Z93058, Z93117, Z92497	ZR, MP	No Australian records	+					

Taxa	Locations	Habitat	WAM Reg No.	Ident.	Australian Distribution	Australia	Western Australia	Kimberley	Inshore Kimberley	Other sources	Supp. Figure
Porites silimaniana Nemenzo, 1976	Hibernia Reef (stn 144); Ashmore Reef (stn 126)	Reef slope (12 m)	Z93026, Z93101	ZR, MP	No Australian records	+					
Psammocora albopicta Benzoni, 2006	Rob Roy Reef (stn 119)	Reef slope (12 m)	Z92642	ZR, FB	No Australian records (recorded from western Indian Ocean)	+					14
Sandalolitha dentata Quelch, 1884	White Island (stn 68); Albert Reef (stn 79)	Reef slope (12 m)	Z66094, Z66122	ZR, BH	No Western Australian records (confirmed from Great Barrier Reef and Torres Strait)		+				13
Seriatopora dentritica Veron, 2000	Ashmore Reef (stn 139)	Lagoon (12 m)	Z66374	ZR	No Australian records	+					
Seriatopora guttata Veron, 2000	Long Reef (stn 44)	Reef slope (12 m)	Z66038	ZR	No Australian records	+					
Seriatopora stellata Quelch, 1886	Ashmore Reef (stn 128); Clerke Reef (stns 151, 155)	Reef slope (12 m)	Z66301, Z93232, Z93187	ZR	No Australian records	+					
Stylophora subseriata (Ehrenberg, 1834)	Cassini Island (stn 39); Long Reef (stns 43, 47); King and Conway Islands (stn 88); White Island (stn 68); Brue Reef (stn 83); Mermaid Reef (stn 150); Clerke Reef (stn 175)	Submerged platform (6 m); reef slope (12 m)	Z66017, Z66154, Z66095, Z66132, Z89398, Z93237, Z89397, Z69960, Z69952, Z69973, Z91383	ZR	No Australian records (strongly predicted from Coral Sea)	+					
					Totals (85)	**37**	**26**	**8**	**14**		

THE INFLUENCE OF TIDAL ZONE AND SHELF POSITION ON DIVERSITY

Significant differences were observed in the level of diversity recorded between intertidal and subtidal zones (Table 2). While some intertidal reefs had a high species diversity (e.g. station 18 at Montgomery Reef, mean 28.67 ± 1.36 species per 15 m^2, see Appendix 2), species diversity was up to 70% higher in the subtidal zone. The subtidal station with the highest diversity was site 140 (reef slope on the eastern side of Ashmore Reef), with a mean of 49 (± 1.25) species per 15 x 1 m. This station was closely followed by stations 126–127, 132, 134 and 139 at Ashmore Reef, which all had means of over 38 species per transect (Appendix 2). Spatial differences in species richness were also observed at inshore versus offshore locations. Species diversity peaked in the offshore north in subtidal habitats and was lowest in the inshore central subregion (Table 2). Lagoonal habitats and reef slopes hosted the most diverse assemblages. Site diversity varied considerably at all locations; for example, at Cassini Island, species diversity per 15 m^2 ranged from 3.25 (± 0.41) to 37.75 (±_1.81) species. Similarly, at Montgomery Reef species diversity raged from 5.75 (± 2.70) to 28.68 (± 1.36) species per 15 x 1 m.

When the influence of shelf position and tidal zone on genus-level community composition was visualised as a PCO, 41.6% of the observed variation in community structure was accounted for by the first two axes (Figure 2A). When visualised at a species level, the two axes accounted for 26.5% of the variation (Figure 2B). PERMANOVA results confirmed there was a significant difference between inshore and offshore communities ($t = 2.9668$, $P_{perm} = 0.001$) and between intertidal and subtidal zones ($t = 4.7722$, $P_{perm} = 0.001$) (Table 3).

TABLE 2 Mean (and SE) alpha diversity of reef building hard corals per 15 x 1 m.

Test	Factors	Mean	SE	n transects	n sites
Tidal zone	Intertidal	12.869	0.5377	206	55
	Subtidal	24.584	0.5919	291	80
Shelf position	Inshore North	20.812	0.8525	160	43
	Inshore Central	16.97	0.9723	66	17
	Inshore South	17.237	0.7551	118	32
	Midshelf South	17.039	1.2068	51	13
	Offshore North	24.039	1.3986	102	30
Habitat	Reef slope	24.749	0.6919	219	60
	Patch reef	22.488	1.7042	41	11
	Lagoon	24.895	2.1966	19	6
	Lower reef platform	17.909	1.863	22	6
	Mid reef platform	13.245	0.5721	196	52
Shelf position x zone	Inshore North Intertidal	12.219	0.9863	64	17
	Inshore Central Intertidal	12.806	1.1856	31	8
	Inshore South Intertidal	15.194	0.8955	72	20
	Midshelf South Intertidal	13.625	2.2324	16	4
	Offshore North Intertidal	6.957	0.713	23	6
	Inshore North Subtidal	26.542	0.8554	96	26
	Inshore Central Subtidal	20.657	1.1966	35	9
	Inshore South Subtidal	20.435	1.1929	46	12
	Midshelf South Subtidal	18.6	1.3524	35	9
	Offshore North Subtidal	29.013	1.3524	79	24

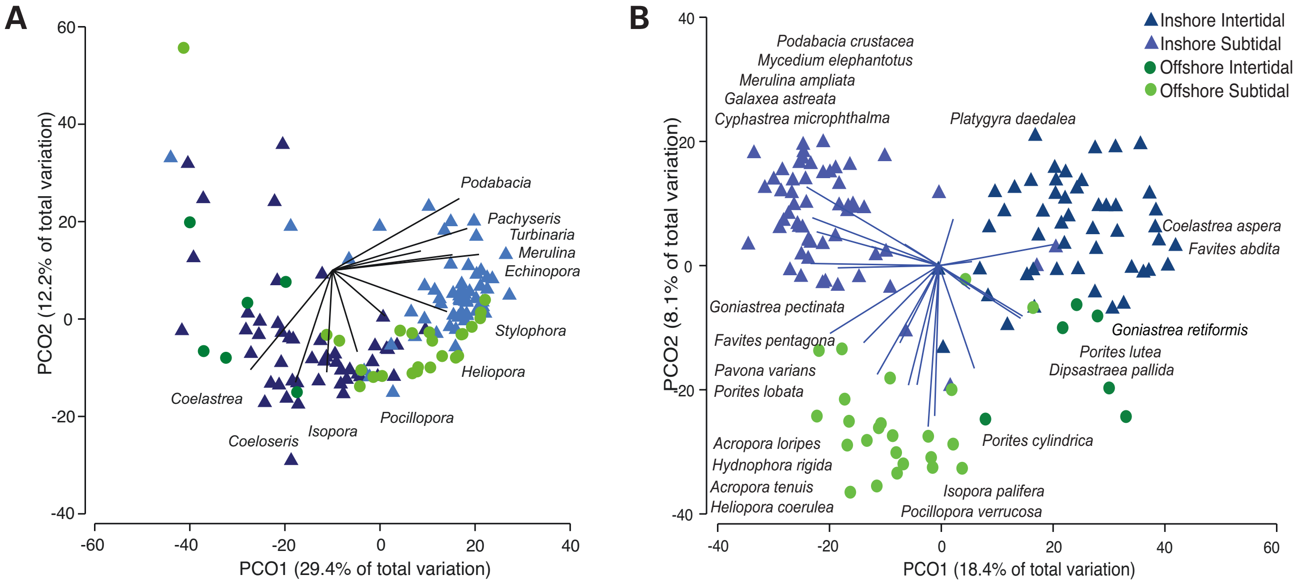

FIGURE 2 Principal coordinates analysis of coral community composition in the Kimberley survey area. Stations are clustered according to shelf position (inshore/offshore) and tidal zone (intertidal/subtidal). The vectors indicate the principal genera (A) and species (B) driving patterns of similarity between stations.

The SIMPER analysis of the group contributions to the average similarity between intertidal and subtidal zones (Table 4) supports the main vectors of the PCO (Figure 2), indicating that at a genus level, tidal zone separation is driven by the presence of *Coelastrea* in the intertidal zone and *Pavona*, *Merulina*, *Echinopora*, *Stylophora*, *Psammocora*, *Pachyseris and Podabacia* in the subtidal zone. At a species level, *Coelastrea aspera*, *Porites lutea* and *Goniastrea retiformis*, *Porites lutea*, *Dipsastraea pallida* distinguish the intertidal zone, whilst the presence of *Goinastrea pectinata*, *Pavona varians*, *Favites pentagona*, *Podabacia crustacea* and *Merulina ampliata* distinguish the subtidal zone. These patterns mirror the total abundance of each species recorded in intertidal and subtidal zones (Appendix 3).

Inshore, the tidal zone differences are driven by a higher presence of the genus *Coelastrea* in the intertidal zone, and the genera *Podabacia*, *Merulina*, *Echinophyllia*, *Pavona*, *Mycedium*, *Psammocora* and *Echinopora* in the subtidal zone. Three species — *Coelastrea aspera*, *Porites lutea* and *Goniastrea retiformis* characterise the inshore intertidal communities, whilst offshore, the difference between intertidal and subtidal communities is driven by the presence of the following genera in the subtidal zone: *Dipsastraea*, *Pavona*, *Stylophora*, *Galaxea*, *Favites*, *Echinopora*, *Leptastrea* and *Montipora*. At a species level, the differences between the intertidal and subtidal offshore communities are driven by the presence of *Montipora turgescens*, *Porites lobata*, *Pavona varians*, *Goniastrea pectinata*, *Acropora loripes* and *Stylophora pistillata* in the subtidal zone.

The SIMPER analysis also shows the main genera driving the average similarity between inshore and offshore locations (Table 3) and supports the main vectors of the PCO (Figure 2) which indicate that the cross-shelf separation is driven by the presence of *Turbinaria* and *Lobophyllia* inshore and *Pocillopora*, *Heliopora* and *Isopora* offshore. At a species level, the presence of *Platygyra daedalea* and *Favities abdita* inshore distinguishes those communities from the offshore communities with a higher presence of *Pocillopora verrucosa*, *Isopora palifera*, *Porites cylindrica*, *Heliopora coerulea* and *Porites lobata*.

The inshore intertidal communities are distinguished from the offshore intertidal communities by the presence of the following seven genera: *Favites*, *Dipsastraea*, *Platygyra*, *Galaxea*, *Montipora*, *Coelastrea* and *Turbinaria*, and the following five species: *Dipsastraea pallida*, *Favites abdita*, *Platygyra daedalea*, *Platygyra pini* and *Coelastrea aspera*. *Heliopora coerulea* uniquely characterises the offshore intertidal zones. The inshore subtidal zone is distinguished from the offshore subtidal zone by the presence of *Podabacia*, *Echinophyllia*, *Mycedium* and *Turbinaria* in the inshore and the presence of *Isopora*, *Coeloseris*, *Pocillopora* and *Acanthastrea* offshore. At a species level, the main species driving the differences between subtidal communities across the shelf are *Podabacia crustacea* and *Seriatopora hystrix* (inshore) and *Pocillopora verrucosa*, *Isopora palifera*, *Porites cylindrica*, *Hydophora rigida*, *Acropora tenuis* and *Acropora loripes* (offshore).

TABLE 3 PERMANOVA results from pairwise tests of the factors influencing community structure and the presence of interaction effects. P(perm): * significant at 0.05; ** significant at 0.001.

Factor	Test	t	P(perm)
Shelf Position	Inshore, offshore	2.9668	**0.001****
Zone	Intertidal, subtidal	4.7722	**0.001****
Subregion	Mid-shelf south, inshore south	1.8374	**0.002***
	Mid-shelf south, inshore north	1.7841	**0.001****
	Mid-shelf south, inshore central	1.6588	**0.002***
	Mid-shelf south, offshore north	2.2984	**0.001****
	Inshore south, inshore north	1.8674	**0.002***
	Inshore south, inshore central	1.6187	**0.014***
	Inshore south, offshore north	2.9690	**0.001****
	Inshore north, inshore central	1.5255	**0.011***
	Inshore north, offshore north	2.5256	**0.001****
	Inshore central, offshore north	2.3932	**0.001****
Shelf Position	Inshore subtidal, inshore intertidal	4.8896	**0.001****
	Inshore subtidal, offshore subtidal	3.3057	**0.001****
	Inshore subtidal, offshore intertidal	3.0437	**0.001****
	Inshore intertidal, offshore subtidal	3.9185	**0.001****
	Inshore intertidal, offshore intertidal	2.2285	**0.001****
	Offshore subtidal, offshore intertidal	2.5184	**0.001****
Habitat	Reef slope, mid-reef platform	4.5402	**0.001****
	Reef slope, lower-reef platform	1.7946	**0.001****
	Reef slope, patch reef	1.1437	0.145 *ns*
	Reef slope, lagoon	1.3681	**0.022***
	Mid reef platform, lower-reef platform	1.2518	0.059 *ns*
	Mid-reef platform, patch reef	2.1849	**0.001****
	Mid-reef platform, lagoon	1.7266	**0.001****
	Lower-reef platform, patch reef	1.4481	**0.007***
	Lower-reef platform, lagoon	1.1866	0.100 *ns*
	Patch reef, lagoon	1.1399	0.191 *ns*
Shelf Position (Inshore) x zone	Intertidal, subtidal	4.8896	**0.001****
Shelf Position (Offshore) x zone	Intertidal, subtidal	2.5184	**0.001****
Shelf Position (Inshore) x zone (subtidal)	Mid-shelf south, inshore south	1.8033	**0.001****
	Mid-shelf south, inshore north	1.7543	**0.001****
	Mid-shelf south, inshore central	1.7674	**0.001****
	Inshore south, inshore north	1.7675	**0.001****
	Inshore south, inshore central	1.4074	**0.006***
	Inshore north, inshore central	1.6122	**0.001****
Shelf Position (Inshore) x zone (intertidal)	Mid-shelf south, inshore south	1.2410	0.123 *ns*
	Mid-shelf south, inshore north	1.1898	0.085 *ns*
	Mid-shelf south, inshore central	1.3955	**0.011***
	Inshore south, inshore north	1.7151	**0.001****
	Inshore south, inshore central	1.2798	0.079 ns
	Inshore north, inshore central	1.5111	**0.003***

Factor	Test	t	P(perm)
Shelf position x subregion	Mid-shelf south; intertidal, subtidal	1.3094	**0.040***
	Inshore south; intertidal, subtidal	3.2810	**0.001****
	Inshore north; intertidal, subtidal	2.9053	**0.001****
	Inshore central; intertidal, subtidal	3.0442	**0.001****
	Offshore north; intertidal, subtidal	2.5184	**0.001****
Location	Adele Island, Montgomery Reef	2.3344	**0.001****
	Adele Island, Cassini Island	1.7873	**0.001****
	Adele Island, Long Reef	1.6387	**0.004***
	Adele Island, inshore central	1.6588	**0.005***
	Adele Island, inshore south	1.8148	**0.007***
	Adele Island, Browse Island	2.0472	**0.001****
	Adele Island, inshore north	1.3737	**0.026***
	Adele Island, Ashmore Reef	2.0472	**0.001****
	Adele Island, Hibernia Reef	1.8518	**0.001****
	Montgomery Reef, Cassini Island	2.5944	**0.001****
	Montgomery Reef, Long Reef	1.8555	**0.001****
	Montgomery Reef, inshore central	2.5247	**0.001****
	Montgomery Reef, inshore south	2.6209	**0.001****
	Montgomery Reef, Browse Island	2.7334	**0.001****
	Montgomery Reef, inshore north	2.283	**0.001****
	Montgomery Reef, Ashmore Reef	2.9839	**0.001****
	Montgomery Reef, Hibernia Reef	2.8273	**0.001****
	Cassini Island, Long Reef	1.3937	**0.029***
	Cassini Island, inshore central	1.6621	**0.006***
	Cassini Island, inshore south	1.9697	**0.001****
	Cassini Island, Browse Island	2.0981	**0.001****
	Cassini Island, inshore north	1.4502	**0.019***
	Cassini Island, Ashmore Reef	1.9061	**0.003***
	Cassini Island, Hibernia Reef	1.7974	**0.003***
	Long Reef, inshore central	1.4689	**0.030***
	Long Reef, inshore south	1.6710	**0.010***
	Long Reef, Browse Island	1.9719	**0.001****
	Long Reef, inshore north	1.3645	**0.044***
	Long Reef, Ashmore Reef	1.9976	**0.001****
	Long Reef, Hibernia Reef	1.8376	**0.001****
	Inshore Central, inshore south	1.2759	0.101 *ns*
	Inshore Central, Browse Island	1.9927	**0.001****
	Inshore Central, inshore north	1.0211	0.361 *ns*
	Inshore Central, Ashmore Reef	2.0859	**0.001****
	Inshore Central, Hibernia Reef	1.7581	**0.004***
	Inshore South, Browse Island	2.2589	**0.001****
	Inshore South, inshore north	1.3248	0.104 *ns*
	Inshore South, Ashmore Reef	2.2515	**0.001****
	Inshore South, Hibernia Reef	1.9299	**0.001****
	Browse Island, inshore north	1.8155	**0.008***
	Browse Island, Ashmore Reef	1.5253	**0.012***
	Browse Island, Hibernia Reef	1.5536	**0.019***
	Inshore North, Ashmore Reef	1.4840	**0.024***
	Inshore North, Hibernia Reef	1.9121	**0.027***
	Ashmore Reef, Hibernia Reef	1.1254	0.162 *ns*

TABLE 4 Simper analysis of the generic and species contributions to the average similarity between shelf position and tidal zone. Included are the top eight taxa explaining the largest percent of the variance. The principal driver is marked in bold.

Genera	Avg. Abund	Avg. Abund	Avg. Diss	Diss/SD	Cont. %	Cum.%
	Intertidal	**Subtidal**				
Pavona	0.18	**0.80**	1.50	1.38	2.92	2.92
Coelastrea	**0.73**	0.15	1.45	1.20	2.82	5.75
Merulina	0.16	**0.75**	1.44	1.34	2.80	8.55
Echinopora	0.16	**0.70**	1.39	1.24	2.70	11.25
Stylophora	0.29	**0.78**	1.37	1.18	2.66	13.91
Psammocora	0.31	**0.71**	1.31	1.08	2.55	16.46
Pachyseris	0.02	**0.63**	1.28	1.22	2.50	18.95
Podabacia	0.02	**0.59**	1.25	1.13	2.43	21.38
	Inshore	**Offshore**				
Turbinaria	**0.69**	0.33	1.26	0.97	2.60	2.60
Pocillopora	0.42	**0.87**	1.25	0.91	2.58	5.17
Heliopora	0.48	**0.87**	1.24	0.86	2.56	7.73
Isopora	0.41	**0.80**	1.23	0.92	2.54	10.27
Coeloseris	0.27	**0.57**	1.14	0.92	2.36	12.62
Lobophyllia	**0.73**	0.53	1.14	0.89	2.35	14.97
Pavona	0.50	**0.73**	1.13	0.92	2.33	17.30
Psammocora	**0.56**	0.50	1.11	0.88	2.28	19.58
	Inshore Intertidal	**Offshore Intertidal**				
Favites	**0.94**	0.17	3.05	1.60	5.36	5.36
Dipsastraea	**0.90**	0.17	2.94	1.57	5.17	10.53
Platygyra	**0.88**	0.17	2.82	1.56	4.95	15.48
Heliopora	0.37	**1.00**	2.65	1.17	4.66	20.13
Galaxea	**0.71**	0	2.46	1.46	4.32	24.45
Montipora	**0.84**	0.33	2.33	1.12	4.10	28.55
Coelastrea	**0.78**	0.33	2.29	1.11	4.02	32.57
Turbinaria	**0.59**	0	2.10	1.08	3.68	36.25
	Inshore Subtidal	**Offshore Subtidal**				
Podabacia	**0.79**	0.13	1.24	1.41	2.95	2.95
Echinophyllia	**0.75**	0.25	1.09	1.20	2.60	5.55
Isopora	0.32	**0.83**	1.07	1.17	2.56	8.11
Coeloseris	0.07	**0.63**	1.04	1.17	2.48	10.59
Mycedium	**0.68**	0.29	1.00	1.09	2.38	12.97
Pocillopora	0.43	**0.92**	0.99	0.88	2.37	15.34
Turbinaria	**0.77**	0.42	0.99	1.02	2.36	17.70
Acanthastrea	0.39	**0.75**	0.96	1.06	2.30	20.00

Genera	Avg. Abund	Avg. Abund	Avg. Diss	Diss/SD	Cont. %	Cum.%
	Inshore Intertidal	**Inshore Subtidal**				
Podabacia	0.02	**0.79**	1.63	1.71	3.24	3.24
Coelastrea	**0.78**	0.14	1.51	1.33	3.00	6.24
Merulina	0.18	**0.80**	1.48	1.43	2.95	9.18
Echinophyllia	0.10	**0.75**	1.46	1.46	2.91	12.09
Pavona	0.18	**0.77**	1.42	1.35	2.82	14.91
Mycedium	0.04	**0.68**	1.36	1.35	2.7	17.61
Psammocora	0.31	**0.79**	1.35	1.16	2.68	20.30
Echinopora	0.18	**0.70**	1.33	1.23	2.64	22.94
	Offshore Intertidal	**Offshore Subtidal**				
Dipsastraea	0.17	**0.96**	2.12	1.76	3.55	3.55
Pavona	0.17	**0.88**	1.93	1.46	3.22	6.77
Stylophora	0.17	**0.83**	1.91	1.44	3.20	9.97
Galaxea	0	**0.79**	1.91	1.80	3.19	13.16
Favites	0.17	**0.88**	1.89	1.45	3.16	16.33
Echinopora	0	**0.71**	1.81	1.44	3.03	19.36
Leptastrea	0.17	**0.79**	1.79	1.35	2.99	22.35
Montipora	0.33	**0.96**	1.76	1.13	2.94	25.28
	Intertidal	**Subtidal**				
Coelastrea aspera	**0.73**	0.15	0.85	1.13	1.08	1.08
Goniastrea pectinata	0.33	**0.85**	0.81	1.13	1.03	2.11
Pavona varians	0.07	**0.66**	0.79	1.22	1.00	3.11
Favites pentagona	0.20	**0.69**	0.77	1.12	0.98	4.09
Porites lutea	**0.85**	0.43	0.76	0.90	0.97	5.06
Podabacia crustacea	0.02	**0.59**	0.76	1.10	0.96	6.02
Merulina ampliata	0.13	**0.64**	0.75	1.16	0.95	6.98
Goniastrea retiformis	**0.76**	0.41	0.75	0.91	0.95	7.93
	Inshore	**Offshore**				
Pocillopora verrucosa	0.05	**0.70**	0.78	1.17	1.02	1.02
Isopora palifera	0.03	**0.70**	0.76	1.19	0.99	2.00
Platygyra daedalea	**0.68**	0.30	0.72	0.91	0.94	2.94
Porites cylindrica	0.40	**0.87**	0.70	0.79	0.92	3.86
Heliopora coerulea	0.48	**0.83**	0.70	0.76	0.91	4.77
Porites lobata	0.30	**0.60**	0.66	0.76	0.86	5.64
Favites abdita	**0.65**	0.57	0.66	0.73	0.86	6.49
Pavona varians	0.34	**0.70**	0.65	1.00	0.85	7.35

Genera	Avg. Abund	Avg. Abund	Avg. Diss	Diss/SD	Cont. %	Cum.%
	Inshore Intertidal	**Offshore Intertidal**				
Dipsastraea pallida	**0.88**	0.17	1.84	1.41	2.33	2.33
Heliopora coerulea	0.37	**1.00**	1.75	1.09	2.22	4.56
Favites abdita	**0.82**	0.17	1.73	1.24	2.20	6.75
Platygyra daedalea	**0.76**	0	1.70	1.49	2.16	8.91
Platygyra pini	**0.82**	0.17	1.67	1.33	2.13	11.04
Coelastrea aspera	**0.78**	0.33	1.48	1.06	1.88	12.92
Galaxea astreata	**0.63**	0	1.42	1.17	1.80	14.72
Cyphastrea microphthalma	**0.67**	0.33	1.34	0.98	1.70	16.42
	Inshore Subtidal	**Offshore Subtidal**				
Podabacia crustacea	**0.79**	0.13	0.67	1.35	0.92	0.92
Pocillopora verrucosa	0.05	**0.75**	0.66	1.48	0.91	1.83
Isopora palifera	0.02	**0.75**	0.65	1.54	0.89	2.72
Porites cylindrica	0.30	**0.96**	0.64	0.90	0.88	3.60
Hydnophora rigida	0.05	**0.71**	0.59	1.39	0.82	4.42
Seriatopora hystrix	**0.73**	0.25	0.57	1.13	0.79	5.20
Acropora tenuis	0.07	**0.67**	0.57	1.23	0.78	5.99
Acrpora loripes	0.25	**0.75**	0.56	1.18	0.77	6.76
	Inshore Intertidal	**Inshore Subtidal**				
Podabacia crustacea	0.02	**0.79**	1.00	1.65	1.28	1.28
Coelastrea aspera	**0.78**	0.14	0.92	1.25	1.17	2.45
Merulina ampliata	0.14	**0.75**	0.87	1.36	1.11	3.56
Porites lutea	**0.84**	0.34	0.84	1.05	1.08	4.64
Mycedium elephantotus	0.04	**0.68**	0.83	1.31	1.06	5.70
Goniastrea retiforms	**0.78**	0.30	0.82	1.06	1.05	6.75
Porites lichen	0.02	**0.63**	0.81	1.17	1.03	7.78
Goniastrea pectinata	0.37	**0.88**	0.80	1.11	1.03	8.80
	Offshore Intertidal	**Offshore Subtidal**				
Montipora turgescens	0	**0.79**	1.05	1.67	1.28	1.28
Porites lobata	0.17	**0.71**	1.02	0.64	1.24	2.52
Pavona varians	0.17	**0.83**	0.97	1.32	1.18	3.70
Goniastrea pectinata	0	**0.79**	0.97	1.81	1.18	4.88
Dipsastrea pallida	0.17	**0.83**	0.96	1.40	1.16	6.04
Acropora loripes	0	**0.75**	0.93	1.56	1.13	7.17
Stylophora pistillata	0.17	**0.75**	0.89	1.24	1.09	8.26
Hydnophora rigida	**0.71**	0	0.86	1.48	1.05	9.31

SUBREGIONAL TRENDS IN DIVERSITY

The PERMANOVA results demonstrate highly significant differences ($p < 0.001$) in coral assemblages from all subregions with slight affinities between inshore north and inshore central along with inshore south and inshore central ($p = 0.014$ and $p = 0.011$). These patterns were visualised in the non-metric multidimensional scale plot, which shows bootstrapped subregional means ($n = 100$ resampled with replacement) with 95% confidence (Figure 3) for 10 subregions. The ordination also shows a slight similarity between the Long Reef and Cassini Island communities and a strong separation of Ashmore Reef, Hibernia Reef, and Browse Island from each other and all inshore communities (including Adele Island, Long Reef, Cassini Island and Montgomery Reef). Generally, all habitat types support unique coral assemblages; however, there is some overlap between the mid and lower reef platforms (Figure 3B). Non-significant PERMDISP results indicate no significant within-group variation for stations grouped by habitat, zone, or shelf position.

DISCUSSION

The Kimberley region, encompassing the offshore atolls, the mid-shelf submerged shoals, and the inshore fringing and platform reefs, features a high level of alpha coral diversity. New data summarised here from biodiversity surveys undertaken from 2009 to 2014 reports 401 zooxanthellate coral species in the region. When combined with historical records (Richards et al. 2014, 2015), 438 species of zooxanthellate reef-building hard coral are known to occur in the Kimberley. This level of alpha diversity is substantially higher than previous regional estimates (i.e. 350 spp. sensu Veron et al. 2015).

Filling data gaps in the Kimberley has enabled the patterns of coral species diversity in Australasia to be revisited. The level of scleractinian coral diversity in the Kimberley is akin to that found in the central Great Barrier Reef and Coral Sea region and only slightly less than that found in the Northern Great Barrier Reef (Figure 4). This considerable difference between predicted and observed diversity relates in part to the lack of previous surveys on the western side of Australia (Kirkendale et al. 2019). That study identified gaps in marine invertebrate knowledge, grouped into geographic, faunal, ecological, methodological and engagement categories. By beginning to fill these data gaps for zooxanthellate corals, we have confirmed prior expectations that the Kimberley region provides a significant cache of incompletely documented coral biodiversity (Richards et al. 2014).

The high level of observed biodiversity is partly explained by the region's high level of heterogeneity. This study has revealed distinct inshore-offshore, intertidal-subtidal and subregional patterns of

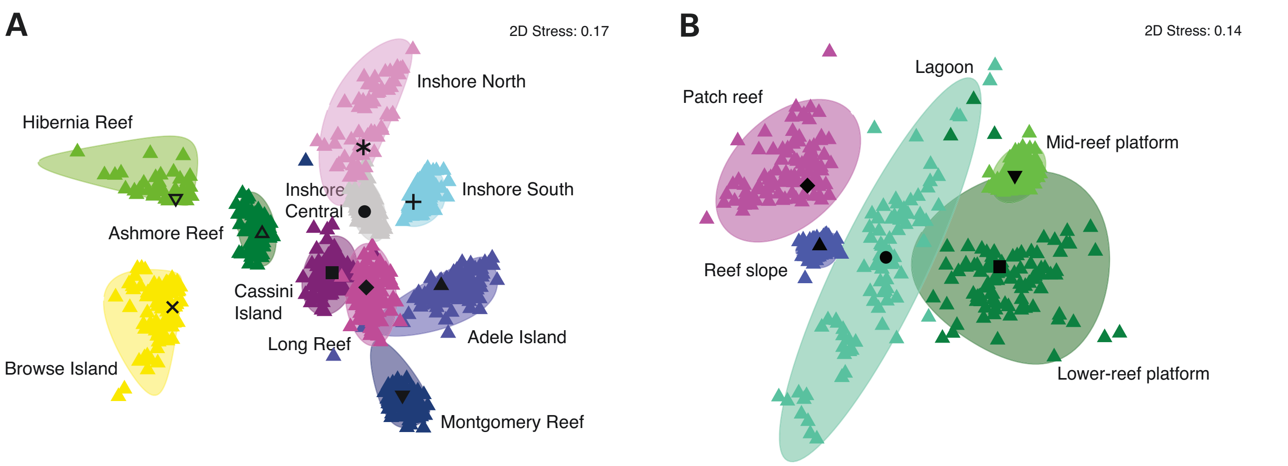

FIGURE 3 Non-metric multidimensional scale plot illustrating the 95% confidence intervals for species grouping according to locations (A) and habitat (B). Inshore North sites are: Condillac Island and Jameson Reef. Inshore Central sites are: Robroy Reefs, West Montelivet Island, Heritage Reef, Woodward Island, Hedley Island, De Freycinet Island, White Island, unnamed outcrop, Black Rocks, Champagny Island and Wildcat Rocks. Inshore South sites are: Bathurst Island, King and Conway Island, Fraser Island, Brue Reef, Mavis Reef and Beagle Reef. Adele Island, Montgomery Reef, Long Reef, Cassini Island, Browse Island, Hibernia Reef and Ashmore Reef are shown separately due to the large number of survey stations at these locations.

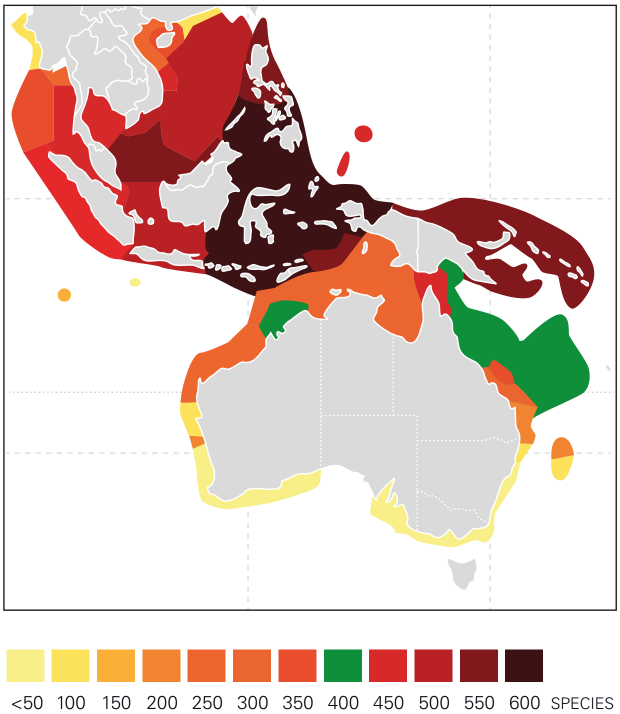

FIGURE 4 Australasian coral species diversity patterns, including the new results in this report. This figure has been adapted from that shown in ter Poorten et al. (2017) which was based on Veron et al. (2015).

species diversity (see Figures 2–3). The region also features similar patterns of spatial variability in benthic cover (Richards et al. 2018). Unique and starkly different environmental drivers across spatial and depth gradients influence heterogeneity. For example, benthic organisms living at the land-sea interface in the inshore Kimberley are governed by a daily macrotidal cycle and a fortnightly neap-spring tidal cycle that sees tidal oscillations ranging in amplitude from 3–11 m (Thackway and Cresswell 1998). Intertidal communities must withstand multiple stressors, including subaerial exposure at low tides of up to 3.5 hours, fluctuating and extreme ambient temperatures, extreme UV levels, variable wind conditions, and freshwater inundation (Wilson 2013, 2014; Richards et al. 2015). Despite these non-typical conditions, some species recorded for the first time in Australia, or the Kimberley, were only found at inshore locations. Examples include *Coscinaraea monile* and *Montipora altasepta*, found exclusively in the intertidal zone at Montgomery Reef, and *Australogyra zelli*, which only occurred intertidally at Fraser Island.

Corals living in the subtidal zone in the inshore Kimberley also face unique challenges. Approximately 30 major rivers drain into the nearshore Kimberley, and during monsoonal flooding, vast quantities of terrigenous sediments containing a high mineral clay composition are transported into the nearshore environments (Gingele et al. 2001). These fine clay sediments are constantly mobilised, resuspended and deposited by tide-driven currents and can detrimentally impact coral reproductive behaviour, growth and calcification.

More specifically, sediment can lead to:

1. tissue death caused by smothering (Loya 1976; Fabricius and Wolanski 2000) or disease (Pollock et al. 2014);
2. a reduction in the coral's energy budget due to decreased light available for photosynthetic production and decreased respiration associated with sediment removal (Stafford-Smith and Ormond 1992);
3. interference with the coral's capacity to capture food (Riegl and Branch 1995);
4. decreasing fertilisation success due to sperm coagulating with suspended particles (Gilmour 1999; Humphrey et al. 2008; Humanes et al. 2017); and
5. interference with recruitment and colonisation (Gilmour 1999; Babcock and Davies 1991; Wittenberg and Hunte 1992).

Conversely, in areas with naturally high levels of suspended sediments, a high load of organic nutrients may enhance the opportunities for heterotrophic feeding (Anthony 2000; Anthony et al. 2007). Further, it has been hypothesised that suspended solids may protect shallow-water corals from solar radiation by lowering the intensity of down-welling irradiance reaching the benthos (Devlin et al. 2008; Richards et al. 2015; Courtial et al. 2017). Some studies indicate that turbidity moderates coral bleaching at local scales (Morgan et al. 2017; Sully and van Woesik 2020). Various species were recorded exclusively in the inshore subtidal zone, including *Astreopora incrustans* and *Montipora* cf. *capricornis*, which were only recorded at Mavis Reef, indicating that these may be examples of species where elevated turbidity levels may have provided ecological opportunities.

While the inshore Kimberley is a non-typical tropical reef ecosystem, the offshore atolls are far more typical coral reef ecosystems. These reefs occur in more classic oligotrophic conditions, and the coral communities are structured by wave energy. Fifty-three of the newly recorded species were present at at least one offshore atoll (Ashmore, Scott and Rowleys). *Montipora porites*, *Montipora samarensis*, *Cyphastrea japonica*, *Pectinia elongata*, *Goniopora* cf. *paliformis*, *Seriatopora dentritca and Paramontastrea salebrosa* were recorded exclusively at Ashmore Reef. *Acropora jacquelineae*, *Acropora tenella*, *Acropora pichoni*, *Leptoseris gardineri*, *Montipora* cf. *palawanensis* were recorded exclusively at Scott Reef while *Acropora desalwii*, *Acropora palmerae*, *Acropora globiceps*, *Acropora hoeksemai*, *Acropora tortuosa*, *Acropora* cf. *teres*, *Montipora capitata* were recorded exclusively from the Rowley Shoals.

One of the most surprising results of this study is the large number of new records. Many species recorded from Australia for the first time (including several branching *Porites* spp.) were previously only known from the Coral Triangle (Veron 2000; see Table 1). In the case of branching *Porites* spp., it is possible that corals were misidentified in the past. For example, *Porites attenuata* and *P. profundus* may have been misidentified as *P. cylindrica*. Similarly, *P. flavus*, *P. rugosa* and *P. silimaniana* may have been mistaken for *P. nigrescens*. Closer attention should be paid to branch shape and corallite morphology when identifying branching *Porites* species in tropical Australia as this group's diversity and distribution range in Australasian waters may be greater than currently understood.

Based on the new records in this study, there is a strong affinity between the coral faunas of the Kimberley and the Coral Triangle. Richards et al. (2014) and Wilson (2014) previously suggested that the regions are linked, and the findings of this study have facilitated a revision of our understanding of coral faunal boundaries in Australasia. A good understanding of biogeographic patterns is essential because this information underpins more extensive efforts to identify biodiversity hotspots and is useful for determining conservation priorities (Roberts et al. 2002). Geographic range information also forms the basis of subsequent biogeographic, evolutionary, and macro-ecological studies (Bellwood and Hughes 2001; Hughes et al. 2013; Renema et al. 2008). This dataset suggests that the origins, biogeography, and connectivity within the Australasian region, and the role of corals in the eastern Indian Ocean, have been underestimated in the past (DeVantier and Turak 2017; Wallace et al. 2001, 2003; Veron et al. 2015).

The Kimberley marine region is directly exposed to the perpetually open Wallacea deep region of central Indonesia, the region of greatest marine diversity throughout the Cenozoic (Wallace 2000; Santodomingo et al. 2015). Thus, it is located in the path of the south-western flow of the Indonesian Throughflow current, giving it potentially consistent connectivity to the western equatorial Pacific as well as Indonesian localities in between (Gordon and Fine 1996; Wallace et al. 2003). However, low sea stands would have intermittently interrupted coral presence and growth on the adjacent shallow Sahul (Australian) shelf at the edge of this region (Pandolfi 1992). Genomic data have provided evidence of significant bottleneck events during low sea stands, and rapid population expansion as the sea level rose (Zhang et al. 2022). Further testing of the extent of connectivity between coral fauna of the Kimberley region and Indonesia is warranted.

Species were identified based on macroskeletal characteristics and generally, specimens with broadly similar and consistent macro-morphological features were lumped together and identified based on the accepted names in the World Register of Marine Species as of June 2022. Further systematic study referencing type specimens is required to unambiguously confirm the identity of many specimens (e.g. massive *Porites* spp.). Additional examples of species records requiring further study include *Echinophyllia* cf. *pectinata*, *Goniopora* cf. *paliformis*, *Acropora* cf. *teres*, *Echinophyllia* cf. *echinoporoides* and *Pleuractis* cf. *moluccensis*. It is important to note a high level of morphological variation was observed within some taxa; hence, numerous species complexes are likely to have been sampled. Some examples of putative species complexes whereby additional diversity or cryptic species may be discovered include but are not limited to — *Favites pentagona*, *F. halicora* and *Stylophora pistillata*. Regional population genetic studies have highlighted that *Acropora aspera* represents a species complex (Underwood et al. 2020) and that a cryptic species is likely to occur within Kimberley populations of *A. digitifera* (Adam et al. 2022). Unravelling these species complexes will require a detailed integrative taxonomic approach as demonstrated by Juszkiewicz et al. (2022) and Richards et al. (2018).

Several coral species have been described from specimens first collected from the Kimberley (e.g. *Caulastrea tumida*, *Echinopora ashmorensis*, *Acropora turaki*, *Acropora loisetteae*, *Acropora russelli*), however, based on current records, there is no evidence to date to suggest any of these species (or any other zooxanthellate corals) are endemic to the Kimberley. *Heliopora hiberniana*, a new species of reef-building octocoral described in this project (Richards et al. 2018), was first described from the offshore atolls, but it has since been recorded from the Maldives and Indonesia (Richards et al. 2020). Further examination of museum-accessioned material with molecular techniques and microstructural analyses may reveal cryptic lineages within currently recognised species that were not immediately apparent based on macro-morphological features alone. Incorporating Kimberley material into future phylogeographic studies is recommended to shed further light on the realised geographic range of coral fauna in the Australasian region.

The data presented here expands our knowledge of the range of coral biodiversity in the Kimberley and will help support species conservation in the region. Managing the region's growing tourism, industrial, economic, and research interests will be a challenge for joint managers; hence, the data presented here helps to provide an objective framework for guiding conservation action and strategic investment. The results highlight that the subregions designated in this study are discrete units and this has potential implications for management. The inshore Kimberley project area spans three state Marine Parks, the Mayala Marine Park in the West Kimberley within Mayala Sea Country. The Lalang-gaddam Marine Park in Dambeemangarddee people's native title determination area, and the North Kimberley Marine Park in Wunambal Gaambera, Balanggarra, Ngarinyin and Miriuwung Gajerrong people's native title determination area. This study's central and northern inshore subregions largely overlap with the Lalang-gaddam Marine Park and the North Kimberley Marine Park. Based on the findings of this study, further refinement of the zonation within the North Kimberley Marine Park may be warranted to protect the diverse coral communities at Jameson Reef, Cassini Island, Rob Roy Reef, and the Montelivet Islands, which are all currently zoned as general use areas (DPAW 2016).

Knowledge gaps still need to be filled about the corals occurring closer to the mainland, as only islands and reefs occurring at least 10 km from the mainland were surveyed. Data gaps also remain for many other Kimberley locations, such as the Buccaneer Archipelago, the Lalang-gaddam Marine Park, and the far northern Kimberley, including Holothuria Reef and throughout much of the Kimberley Commonwealth Marine Park. Habitats deeper than 16 m remain to be explored, so too do inter-reefal areas. Continuing to fill these ecological data gaps will likely lead to further increases in the overall diversity of the region and provide further data to help uncover the region's biogeographic affinities with South-East Asia. Such studies are also likely to further consolidate the region's role as a significant biodiversity hotspot.

Corals growing in the extreme macro-tidal habitats in the inshore Kimberley also provide exceptional opportunities to inform coral adaptation science; however, they have largely been overlooked in this regard. While reefs in the southern Kimberley have experienced mild coral bleaching events in the past (Gilmour et al. 2019), rapid recovery of intertidal communities was documented (Schoepf 2015, 2020; Jung et al. 2021). The central and northern Kimberley reefs appear to have largely resisted widespread bleaching and mortality events to date (Richards et al. 2019). Given the extreme environmental conditions the Kimberley corals routinely experience, corals living on these reefs provide a natural laboratory to examine the traits that confer resilience (Richards et al. 2019). This diverse community of corals also offers an opportunity to examine how local adaptative processes have responded to climate forcing (Thomas et al. 2022; Zhang et al. 2022), and we recommend that Kimberley coral reefs be included in the wider resilient reefs' narrative.

This study has revealed that the Kimberley is integral to Australia's coral reefscape. Some intertidal (and subtidal) communities are exceptionally diverse and extraordinarily valuable to science. More targeted research is needed to fill the remaining knowledge gaps about the diversity of corals in the Kimberley. Additional genetic studies are needed to better understand species diversity, the faunal connections to Indonesia and the mechanisms underpinning the resilience of corals growing in this region.

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REFERENCES

Adam, A.A., Thomas, L., Underwood, J., Gilmour, J. and Richards, Z.T. (2022). Population connectivity and genetic offset in the spawning coral *Acropora digitifera* in Western Australia. *Molecular Ecology* **31**: 3533–3547. doi: 10.1111/mec.16498

Anthony, K.R.N., Fabricius, K. (2000). Shifting roles of heterotrophy and autotrophy in coral energetics under varying turbidity. *Journal of Experimental Marine Biology and Ecology* **252**: 221–253. doi: 10.1016/s0022-0981(00)00237-9

Anthony, K., Connolly, S.R., Hoegh-Guldberg, O. (2007). Bleaching, energetics, and coral mortality risk: Effects of temperature, light, and sediment regime. *Limnology and Oceanography* **52**: 716–726. doi: 10.4319/lo.2007.52.2.0716

Arrigoni, R., Stefani, F., Pichon, M., Galli, P. and Benzoni, F. (2012). Molecular phylogeny of the robust clade (Faviidae, Mussidae, Merulinidae, and Pectiniidae): an Indian Ocean perspective. *Molecular Phylogenetics and Evolution* **65**: 183–193. doi: 10.1016/j.ympev.2012.06.001

Arrigoni, R., Richards, Z.T., Chen, C.A., Baird, A.H. and Benzoni, F. (2014.) Taxonomy and phylogenetic relationships of the coral genera Australomussa and Parascolymia (Scleractinia, Lobophylliidae). *Contributions to Zoology* **83**: 195–215. doi: 10.1163/18759866-08303004

Babcock, R. and Davies, P. (1991). Effects of sedimentation on settlement of *Acropora millepora*. *Coral Reefs* **9**: 205–208.

Bellwood, D.R. and Hughes, T.P. (2001). Regional-scale assembly rules and biodiversity of coral reefs. *Science* **292**: 1532–1535. doi: 10.1126/science.1058635

Bellwood, D.R., Renema, W. and Rosen, B.R. (2012). Biodiversity hotspots, evolution and coral reef biogeography. In: Gower, D.J., Johnson, K., Richardson, J., Rosen, B., Rüber, L., and Williams S. (eds). *Biotic evolution and environmental change in Southeast Asia*. pp. 216–242. doi: 10.1017/CBO9780511735882.011

Benzoni, F. (2006). *Psammocora albopicta* sp. nov., a new species of scleractinian coral from the Indo-West Pacific (Scleractinia; Siderastreidae). *Zootaxa* **1358**: 49–57.

Benzoni, F., Stefani, F., Pichon, M. and Galli, P. (2010). The name game: morpho-molecular species boundaries in the genus *Psammocora* (Cnidaria, Scleractinia). *Zoological Journal of the Linnean Society* **160**(3): 421–456. doi: 10.1111/j.1096-3642.2010.00622.x

Benzoni, F., Arrigoni, R., Stefani, F., Reijnen, B.T., Montano, S. and Hoeksema, B.W. (2012). Phylogenetic position and taxonomy of *Cycloseris explanulata* and *C. wellsi* (Scleractinia: Fungiidae): lost mushroom corals find their way home. *Contributions to Zoology* **81**: 125–146.

Benzoni, F., Arrigoni, R., Waheed, Z., Stefani, F. and Hoeksema, B.W. (2014). Phylogenetic relationships and revision of the genus *Blastomussa* (Cnidaria: Anthozoa: Scleractinia) with description of a new species. *Raffles Bulletin of Zoology* **62**: 358–378.

Bernard, H.M. (1896). The genus *Turbinaria*. The genus *Astræopora*. Catalogue of Madreporarian corals in the British Museum (Natural History) **2**: 1–166, pls 1–33.

Bernard, H.M. (1897). The genus *Montipora*. The genus *Anacropora*. Catalogue of the Madreporarian corals in the British Museum (Natural History) **3**: 1–192, pls 1–34.

Briggs, J.C. (1999). Coincident biogeographic patterns: Indo-West Pacific Ocean. *Evolution* **53**: 326–335. doi: 10.2307/2640770

Brook, G. (1892). Preliminary descriptions of new species of *Madrepora* in the collections of the British Museum. Part II. *Annals and Magazine of Natural History* **10**: 451–465.

Bryce, C., Bryce, M. and Radford, B. (2018). Project methods and station geomorphology related to a multi-taxon survey (2009–2014) of the Kimberley. *Records of the Western Australian Museum. Supplement* **85**: 1–43. doi: 10.18195/issn.0313-122x.85.2018.001-043

Budd, A.F., Fukami, H., Smith, N.D. and Knowlton, N. (2012). Taxonomic classification of the reef coral family Mussidae (Cnidaria: Anthozoa: Scleractinia). *Zoological Journal of the Linnean Society* **166**: 465–529. doi: 10.1111/j.1096-3642.2012.00855.x

Chevalier, J-P. (1975). Les Scléractiniaires de la Mélanésie Française (Nouvelle-Calédonie, Iles Chesterfield, Iles Loyauté, Nouvelles Hébrides): 2ème partie. *Expédition Française récifs coralliens Nouvelle-Calédonie*, volume 7. Éditions de la Fondation Singer-Polignac, Paris. 407pp.

Clarke, K.R. and Gorley, R.N. (2015). Getting started with PRIMER v7. *PRIMER-E: Plymouth*, *Plymouth Marine Laboratory*.

Collins, L.B., O'Leary, M.J., Stevens, A. M., Bufarale, G., Kordi, M., Solihuddin, T. (2015). Geomorphic patterns, internal architecture and Reef Growth in a macrotidal, high turbidity setting of coral reefs from the Kimberley Bioregion. *Australian Journal of Maritime & Ocean Affairs* **7**: 12–22. doi: 10.1080/18366503.2015.1021411

Courtial, L., Roberty, S., Shick, J.M., Houlbrèque, F. and Ferrier-Pagès, C. (2017). Interactive effects of ultraviolet radiation and thermal stress on two reef-building corals. *Limnology and Oceanography* **62**: 1000–1013. doi: 10.1002/lno.10481

Cvitanovic, C., Mackay, M., Kelly, R., Wilson, S.K., Waples, K., Nash, K.L., van Putten, E.I., Field, S., Botterill-James, T., Austin, B.J. and Beckley, L.E. (2021). Thirty critical research needs for managing an ecologically and culturally unique remote marine environment: The Kimberley region of Western Australia. *Ocean & Coastal Management* **212**: 105771. doi: 10.1016/j.ocecoaman.2021.105771

Dai, C.F. and Horng, S. (2009). *Scleractinia fauna of Taiwan II: the robust group*. National Taiwan University, Taipei. 162pp.

Dana, J.D. (1846). *Zoophytes. United States Exploring Expedition during the years 1838*, *1839*, *1840*, *1841*, *1842*, *under the command of Charles Wilkes*, *U.S.N.*, volume 7. Lea and Blanchard, Philadelphia. 740pp.

Department of Parks and Wildlife (2016). North Kimberley Marine Park Joint Management Plan 2016 Uunguu Balanggarra, Miriuwung Gajerrong, and Willinggin management areas. Department of Parks and Wildlife, Perth.

DeVantier, L. and Turak, E. (2017). Species richness and relative abundance of reef-building corals in the Indo-west Pacific. *Diversity* **9**: 25. doi: 10.3390/d9030025

Devlin, M.J., Barry, J., Mills, D.K., Gowen, R.J., Foden, J., Sivyer, D. and Tett, P. (2008). Relationships between suspended particulate material, light attenuation and Secchi depth in UK marine waters. *Estuarine and Coastal Shelf Science* **79**: 429–439. doi: 10.1016/j.ecss.2008.04.024

Ehrenberg, C.G. (1834). Beitrage zur physiologischen Kenntniss der Corallenthiere im allgemeinen und besunders des Rothen Meeres. *Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin* **1**: 225–380.

Fabricius, K.E. and Wolanski, E. (2000). Rapid smothering of coral reef organisms by muddy marine snow. *Estuarine and Coastal Shelf Science* **50**: 115–120. doi: 10.1006/ecss.1999.0538

Forskål, P. (1775). Corallia. In: *Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, Vermium quæ in itinere orientali observavit Petrus Forskål*. Mölleri. Hauniae. pp. 131–139.

Gardiner, J.S. (1898). On the fungiid corals collected by the author in the South Pacific. *Proceedings of the Zoological Society London* **3**: 525–539, pls 43–45.

Gardiner, J.S. (1904). Madreporaria. In: *Fauna and Geography of the Maldive and Laccadives Archipelagoes,* volume 2. Cambridge University Press. pp. 755–790, pls 59–64.

Gilmour J (1999). Experimental investigation into the effects of suspended sediment on fertilisation, larval survival and settlement in a scleractinian coral. *Marine Biology* **135**: 451–462.

Gilmour, J.P., Cook, K.L., Ryan, N.M., Puotinen, M.L., Green, R.H., Shedrawi, G., Hobbs, J.P.A., Thomson, D.P., Babcock, R.C., Buckee, J. and Foster, T. (2019). The state of Western Australia's coral reefs. *Coral Reefs* **38**: 651–667. doi: 10.1007/s00338-019-01795-8

Gingele, F.X., De Deckker, P. and Hillenbrand, C.D. (2001). Clay mineral distribution in surface sediments between Indonesia and NW Australia—source and transport by ocean currents. *Marine Geology* **179**: 135–146. doi: 10.1016/S0025-3227(01)00194-3

Gittenberger, A., Reijnen, B.T. and Hoeksema, B.W. (2011). A molecularly based phylogeny reconstruction of mushroom corals (Scleractinia: Fungiidae) with taxonomic consequences and evolutionary implications for life history traits. *Contributions to Zoology* **80**(2): 107–132. doi: 10.1163/18759866-08002002

Gordon, A.L. and Fine, R.A. (1996). Pathways of water between the Pacific and Indian Oceans. *Nature* **379**: 146–149. doi: 10.1038/379146a0

Griffith, J.K. (1997). 'The corals collected during September/October 1997 at Ashmore Reef, Timor Sea'. West Australian Museum: Perth. Unpublished report.

Green, A.L. and Mous P.J. (2008). Delineating the Coral Triangle, its Ecoregions and Functional Seascapes, version 5.0. TNC Coral Triangle Program.

Hoeksema, B.W., Cairns, S. (2022). World List of Scleractinia. https://www.marinespecies.org/scleractinia [accessed 7 June 2022]

Hoeksema, B.W. (2007). Delineation of the Indo-Malayan centre of maximum marine biodiversity: the Coral Triangle. In: *Biogeography, time, and place: distributions, barriers, and islands*. Springer, Dordrecht. pp. 117–178.

Hodgson, G. and Ross, M.A. (1981). Unreported scleractinian corals from the Philippines. In: Gomez, E.D. and Birkeland, C.E. (eds), *Proceedings of the Fourth International Coral Reef Symposium,* volume 2. University of Philippines. pp. 171–175.

Hoffmeister, J.E. (1925). Some corals from American Samoa and the Fiji Islands. Papers from the Department of Marine Biology Carnegie Institution for Science Washington **22**: 1–90.

Huang, D., Benzoni, F., Fukami, H., Knowlton, N., Smith, N.D. and Budd, A.F. (2014a). Taxonomic classification of the reef coral families Merulinidae, Montastraeidae, and Diploastraeidae (Cnidaria: Anthozoa: Scleractinia). *Zoological Journal of the Linnean Society* **171**(2): 277–355. doi: 10.1111/zoj.12140

Huang, D., Benzoni, F., Arrigoni, R., Baird, A.H., Berumen, M.L., Bouwmeester, J., Chou, L.M., Fukami, H., Licuanan, W.Y., Lovell, E.R. and Meier, R. (2014b). Towards a phylogenetic classification of reef corals: the Indo-Pacific genera Merulina, Goniastrea and Scapophyllia (Scleractinia, Merulinidae). *Zoologica Scripta* **43**: 531–548. doi: 10.1111/zsc.12061

Hughes, T.P., Connolly, S.R., Keith, S.A. (2013). Geographic ranges of reef corals (Cnidaria: Anthozoa: Scleractinia) in the Indo-Pacific. *Ecology* **94**: 1659. doi: 10.1890/13-0361.1

Hughes, T.P., Kerry, J.T., Baird, A.H., Connolly, S.R., Dietzel, A., Eakin, C.M., Heron, S.F., Hoey, A.S., Hoogenboom, M.O., Liu, G. and McWilliam, M.J. (2018). Global warming transforms coral reef assemblages. *Nature* **556**: 492–496. doi: 10.1038/s41586-018-0041-2

Humanes, A., Ricardo, G.F., Willis, B.L., Fabricius, K.E., Negri, A.P. (2017). Cumulative effects of suspended sediments, organic nutrients and temperatures stress on early life history stages of the coral *Acropora tenuis*. *Scientific Reports* **4**: 1–11. doi: 10.1038/srep44101

Humphrey, C., Weber, M., Lott, C., Cooper, T., Fabricius, K. (2008). Effects of suspended sediments, dissolved inorganic nutrients and salinity on fertilisation and embryo development in the coral *Acropora millepora* (Ehrenberg, 1834). *Coral Reefs* **27**: 837–850. doi: 10.1007/s00338-008-0408-1

Jung, E.M.U., Stat, M., Thomas, L., Koziol, A. and Schoepf, V. (2021). Coral host physiology and symbiont dynamics associated with differential recovery from mass bleaching in an extreme, macro-tidal reef environment in northwest Australia. *Coral Reefs* **40**: 893-905. doi: 10.1007/s00338-021-02094-x

Juszkiewicz, D.J., White, N.E., Stolarski, J., Benzoni, F., Arrigoni, R., Hoeksema, B.W., Wilson, N.G., Bunce, M. and Richards, Z.T. (2022). Phylogeography of recent Plesiastrea (Scleractinia: Plesiastreidae) based on an integrated taxonomic approach. *Molecular Phylogenetics and Evolution* **172**: 107469. doi: 10.1016/j.ympev.2023.107867

Kirkendale, L., Hosie, A.W.M., and Richards, Z. (2019). Defining biodiversity gaps for North West Shelf marine invertebrates. *Journal of the Royal Society of Western Australia* **102**: 1–9.

Kitano, Y.F., Benzoni, F., Arrigoni, R., Shirayama, Y., Wallace, C.C. and Fukami, H. (2014). A phylogeny of the family Poritidae (Cnidaria, Scleractinia) based on molecular and morphological analyses. *PLoS One* **9**: e98406. doi: 0.1371/journal.pone.0098406

Klunzinger, C.B. (1879). Die Astraeaceae und Fungiaceae. In: *Die Korallenthiere des Rothen Meeres*, volume 3. Gutmann, Berlin. pp. 1–100, pls 1–10.

Lamberts, A.E. (1980). Two new species of *Astreopora* (Anthozoa; Scleractinia; Astrocoeniidae) from the mid-Pacific. *Pacific Science* **34**: 261–267, pls 1–6.

Loya Y (1976). Effects of water turbidity and sedimentation on the community structure of Puerto Rican corals. *Bulletin of Marine Science* **26**: 450–466.

McKinney, D. (2009). A survey of the scleractinian corals at Mermaid, Scott, and Seringapatam Reefs, Western Australia. In: Marine Biodiversity Survey of Mermail Reef (Rowley Shoals), Scott and Seringapatam Reef. In: Bryce, C. (ed.), *Records of the Western Australian Museum Supplement* **77**: 105–143. doi: 10.18195/issn.0313-122x.77.2009.105-143

Milne Edwards, H. (1860). *Histoire naturelle des coralliaires ou polypes proprement dits*, volume 3. Librairie Encyclopédique de Roret, Paris. 560 pp.

Milne Edwards, H. and Haime J. (1849). Mémoire sur les polypiers appartenant à la famille des Oculinides, au groupe intermédiaire des Pseudastréides et à la famille des Fongides. *Compte Rendu Hebdomadaires des Séances de l'Académie des Sciences Paris* **29**: 67–73.

Milne Edwards, H. and Haime, J. (1851). Recherches sur les polypiers. 6eme Mem. Monographic des Fongides. *Annales des Sciences Naturelles*, *Zoologie*, series 3, **15**: 73–144.

Moll, H. and Best, M.B. (1984). New Scleractinian corals from the Spermonde Archipelago, South Suluwesi, Indonesia. *Zoologische Mededelingen*, *Leiden* **58**: 47–58.

Morgan, K.M., Perry, C.T., Johnson, J.A. and Smithers, S.G. (2017). Nearshore turbid-zone corals exhibit high bleaching tolerance on the Great Barrier Reef following the 2016 ocean warming event. *Frontiers in Marine Science* **4**: 224. doi: 10.3389/fmars.2017.00224

Muir, P., Wallace, C., Bridge, T.C. and Bongaerts, P. (2015). Diverse staghorn coral fauna on the mesophotic reefs of north-east Australia. *PLoS One* **10**: p.e0117933. doi: 10.1371/journal.pone.0117933

Muir, P.R., Pichon, M., Squire, L. Jnr, Wallace, C. C. (2018). *Acropora tenella*, a zooxanthellate coral extending to 110-m depth in the northern Coral Sea *Marine Biodiversity* **49**(2): 809–814. doi: 10.1007/s12526-018-0855-z

Nemenzo, F. (1955). Systematic studies on Philippine shallow water scleractinians: I. Suborder Fungiida. *Natural and Applied Science Bulletin of the University of the Philippines* **15**(1): 3–84, pls 1–14.

Nemenzo, F. (1959). Systematic studies on Philippine shallow-water Scleractinians. II: Suborder Faviida. *Natural and Applied Science Bulletin of the University of the Philippines* **16**: 73–135, pls. 1–24.

Nemenzo, F. (1967). Systematic studies on Philippine shallow-water scleractinians. VI. Suborder, Astrocoeniina (*Montipora* and *Acropora*). *Natural and Applied Science Bulletin of the University of the Philippines* **20**: 1–141, pls 1–40.

Nemenzo, F. (1971). Systematic studies on Philippine shallow water scleractinians. VII. Additional forms. *Natural and Applied Science Bulletin of the University of the Philippines* **23**: 141–185, pls 1–12.

Nemenzo, F. (1976). Some new Philippine scleractinian reef corals. *Natural and Applied Science Bulletin of the University of the Philippines* **28**: 229–276, pls 1–5.

Nemenzo, F. (1979). New species and new records of stony corals from west-central Philippines. *The Philippine Journal of Science* **108**: 1–25, pls 1–4.

Ortmann, A. (1889). Beobachtungen an Steinkorallen von der Südküste Ceylons. *Zoologische Jahrbücher*, *Abtheilung für Systematik*, *Geographie und Biologie der Thiere* **4**: 493–590, pls 11–18.

Pandolfi, J. (1992). Successive isolation, rather than evolutionary centres, for the origination of Indo-Pacific corals. Journal of Biogeography **19**: 593–609.

Pillai, C.S.G. and Scheer, G. (1976). Report on the stony corals from the Maldive Archipelago. *Zoologica* **43**(3): 1–83, pls 1–32.

Pollock, F.J., Lamb, J.B., Field, S.N., Heron, S.F., Schaffelke, B., Shedrawi, G., Willis, B.L. (2014). Sediment and turbidity associated with offshore dredging increase coral disease prevalence on nearby reefs. *PLOS one* **9**: e102498. doi: 10.1371/journal.pone.0102498

Quelch, J.J. (1884). Preliminary notice of new genera and species of 'Challenger' reef-corals. *Annals and Magazine of Natural History; Zoology, Botany, and Geology*, series 5, **13**: 292–297.

Quelch, J.J. (1886). Report on the reef-corals collected by H.M.S. Challenger during the years 1873–76. *Reports of the Scientific Results of the Voyage of H.M.S. Challenger.* Zoology, volume 16. 203 pp.

Rehberg, H. (1892). Neue und wenig bekannte Korallen. Abhandlungen *Naturwissenschaftliche Verein zu Hamburg* **12**: 1–50, pls 1–4.

Renema, W., Bellwood, D.R., Braga, J.C., Bromfield, K., Hall, R., Johnson, K.G., Lunt, P., Meyer, C.P., McMonagle, L.B., Morley, R.J. and O'dea, A. (2008). Hopping hotspots: global shifts in marine biodiversity. *Science* **321**: 654–657. doi: 10.1126/science.1155674

Riegl, B. and Branch, G. (1995). Effects of sediment on the energy budgets of four scleractinian (Bourne, 1900) and five alcyonacean (Lamouroux 1816) corals. *Journal of Experimental Marine Biology and Ecology* **186**: 259–275.

Richards, Z., Sampey, A. and Marsh, L. (2014). Kimberley marine biota. Historical data: scleractinian corals. *Records of the Western Australian Museum Supplement* **84**: 111–132. doi: 10.18195/issn.0313-122x.84.2014.111-132

Richards, Z.T., Garcia, R.A., Wallace, C.C., Rosser, N.L. and Muir, P.R. (2015). A diverse assemblage of reef corals thriving in a dynamic intertidal reef setting (Bonaparte Archipelago, Kimberley, Australia). *PLoS One* **10(**2): e0117791. doi: 10.1371/journal.pone.0117791

Richards, Z.T., Bryce, M. and Bryce, C. (2018). The composition and structure of shallow benthic reef communities in the Kimberley, north-west Australia. *Records of the Western Australian Museum Supplement* **85**: 75–103. doi: 10.18195/issn.0313-122x.85.2018.075-103

Richards, Z.T., Garcia, R., Moore, G., Fromont, J., Kirkendale, L., Bryce, M., Bryce, C., Hara, A., Ritchie, J., Gomez, O. and Whisson, C. (2019). A tropical Australian refuge for photosymbiotic benthic fauna. *Coral Reefs* **38**: 669–676. doi: 10.1007/s00338-019-01809-5

Richards, Z.T. and Rosser, N.L. (2012). Abundance, distribution and new records of scleractinian corals at Barrow Island and Southern Montebello Islands, Pilbara (offshore) bioregion. *Journal of the Royal Society of Western Australia* **95**: 155.

Richards, Z.T., Yasuda, N., Kikuchi, T., Foster, T., Mitsuyuki, C., Stat, M., Suyama, Y. and Wilson, N.G. (2018). Integrated evidence reveals a new species in the ancient blue coral genus *Heliopora* (Octocorallia). *Scientific Reports* **8**: 1–14. doi: 10.1038/s41598-018-32969-z

Richards, Z.T., Haines, L., Scaps, P. and Ader, D. (2020). New records of *Heliopora hiberniana* from SE Asia and the Central Indian Ocean. *Diversity* **12**(9): 328. doi: 10.3390/d12090328

Roberts, C.M., McClean, C.J., Veron, J.E., Hawkins, J.P., Allen, G.R., McAllister, D.E., Mittermeier, C.G., Schueler, F.W., Spalding, M., Wells, F. and Vynne, C. (2002). Marine biodiversity hotspots and conservation priorities for tropical reefs. *Science* **295**: 1280–1284. doi: 10.1126/science.1067728

Rosen, B.R. (1971). The distribution of reef coral genera in the Indian Ocean. *Symposium of the Zoological Society of London* **28**: 263–299.

Rosser, N.L. and Veron, J.E.N. (2011). Australian corals thriving out of water in an extreme environment. *Coral Reefs* **30**: 21. doi: 10.1007/s00338-010-0689-z

Rowlett J. (2020). Indo-Pacific Corals. self-published. 809 pp.

Sampey, A., Bryce, C., Osborne, S., Miles, A. (2014). Kimberley marine biota. Historical data: introduction and methods. *Records of the Western Australian Museum Supplement* **84**: 19–43. doi: 10.18195/issn.0313-122x.84.2014.019-043

Sanciangco, J.C., Carpenter, K.E., Etnoyer, P.J. and Moretzsohn, F. (2013). Habitat availability and heterogeneity and the Indo-Pacific warm pool as predictors of marine species richness in the tropical Indo-Pacific. *PloS one* **8**: e56245. doi: 10.1371/journal.pone.0056245

Santodomingo, N., Novak, V., Pretkovic, V., Marshall, N., Di Martino, E., Capelli, E.L.G., Roesler, A., Reich, S., BRAGA, J.C., Renema, W. and Johnson, K.G. (2015). A diverse patch reef from turbid habitats in the middle Miocene (East Kalimantan, Indonesia). *Palaios* **30**: 128–149. doi: 10.2110/palo.2013.047

Schoepf, V., Stat, M., Falter, J.L. and McCulloch, M.T. (2015). Limits to the thermal tolerance of corals adapted to a highly fluctuating, naturally extreme temperature environment. *Scientific Reports* **5**: 1–14. doi: 10.1038/srep17639

Schoepf, V., Jung, M.U., McCulloch, M.T., White, N.E., Stat, M. and Thomas, L. (2020). Thermally variable, macrotidal reef habitats promote rapid recovery from mass coral bleaching. *Frontiers in Marine Science* **7**: 245–257. doi: 10.3389/fmars.2020.00245

Schmidt-Roach, S., Miller, K.J., Lundgren, P. and Andreakis, N. (2014). With eyes wide open: a revision of species within and closely related to the Pocillopora damicornis species complex (Scleractinia; Pocilloporidae) using morphology and genetics. *Zoological Journal of the Linnean Society* **170**: 1–33. doi: 10.1111/zoj.12092

Shirai, S. (1977). *Ecological Encyclopedia of the marine animals of the Ryukyu Islands*. Shinsei-Tosho, Okinawa. 636pp.

Solihuddin, T., O'Leary, MJ., Blakeway, D., Parnum, I., Kordi, M. and Collins, L.B. (2016). Holocene reef evolution in a macrotidal setting: Buccaneer Archipelago, Kimberley Bioregion, Northwest Australia. *Coral Reefs* **35**: 783–794. doi: 10.1007/s00338-016-1424-1

Stafford-Smith M.G., Ormond R.F.G. (1992). Sediment rejection mechanisms of 42 scleractinian corals. *Australian Journal of Marine and Freshwater Sciences* **43**: 638–705.

Stehli, F. G., and Wells, J. W. (1971). Diversity and age patterns in hermatypic corals. *Systematic Biology* **20**: 115–126.

Sully, S. and van Woesik, R. (2020). Turbid reefs moderate coral bleaching under climate-related temperature stress. *Global Change Biology* **26**: 1367–1373. doi: 10.1111/gcb.14948

ter Poorten, J.J., Kirkendale, L.A. and Poutiers, J.M. (2017). The Cardiidae (Mollusca: Bivalvia) of tropical northern Australia: A synthesis of taxonomy, biodiversity and biogeography with the description of four new species. *Records of the Western Australian Museum* **32**(2): doi: 10.18195/issn.0312-3162.32(2).2017.101-190

Thackway, R. and Cresswell, I.D. (1998). Interim marine and coastal regionalisation for Australian ecosystem based classification for marine and coastal environments. Environment Australia, Commonwealth Department of Environment, Canberra.

Thomas, L., Underwood, J.N., Rose, N.H., Fuller, Z.L., Richards, Z.T., Dugal, L., Grimaldi, C.M., Cooke, I.R., Palumbi, S.R. and Gilmour, J.P. (2022). Spatially varying selection between habitats drives physiological shifts and local adaptation in a broadcast spawning coral on a remote atoll in Western Australia. *Science Advances* **8**: p.eabl9185. doi: 10.1126/sciadv.abl9185

Underwood, J.N., Richards, Z., Berry, O., Oades, D., Howard, A. and Gilmour, J.P. (2020). Extreme seascape drives local recruitment and genetic divergence in brooding and spawning corals in remote north-west Australia. *Evolutionary Applications* **13**: 2404–2421. doi: 10.1111/eva.13033

van der Horst, C.J. (1921). The Madreporaria of the Siboga Expedition: Part 2, Madreporaria Fungida. *Siboga-Expeditie* **16**(b): 53–98, pls 1–6.

Vaughan, T.W. (1907). Recent Madreporaria of the Hawaiian Islands and Laysan. *Bulletin of the United States National Museum* **59**: 1–427, pls 1–96.

Vaughan, T.W. (1918). Some shallow-water corals from Murray Island (Australia), Cocos-Keeling Island, and Fanning Island. *Papers from the Department of Marine Biology of the Carnegie Institution Washington* **9**: 49–234, pls 21–93.

Veron, J.E.N. (1986). *Corals of Australia and the Indo-Pacific*. Angus & Robertson, Sydney. pp. 26–43.

Veron, J.E.N. and Pichon, M. (1982). Scleractinia of Eastern Australia: Part IV, Family Poritidae. *Australian Institute of Marine Science Monograph Series* **5**: 1–156.

Veron, J.E.N. and Marsh, L.M. (1988). Hermatypic corals of Western Australia: records and annotated species list. *Records of the Western Australian Museum Supplement* **29**: 1–136.

Veron, J.E.N. (1990). New Scleractinia from Japan and other Indo-West Pacific countries. *Galaxea* **9**: 95–173.

Veron, J.E.N. (1993). Hermatypic corals of Ashmore Reef and Cartier Island. *Records of the Western Australian Museum Supplement* **44**: 13–20.

Veron, J.E.N. (1995). *Corals in space and time: Biogeography and evolution of the Scleractinia*. University of New South Wales Press, Sydney. 321 pp.

Veron, J.E.N. (2000). *Corals of the world*, volumes 1–3. Australian Institute of Marine Science, Townsville. 1410 pp.

Veron J.E.N. (2002). New species described in *Corals of the World*. *Australian Institute of Marine Science Monograph Series* **11**: 187–189.

Veron, J.E.N, Devantier, L.M., Turak, E., Green, A.L., Kininmonth, S., Stafford-Smith, M. and Peterson, N. (2009). Delineating the coral triangle. *Galaxea Journal of Coral Reef Studies* **11**: 91–100. doi: 10.3755/galaxea.11.91

Veron, J.E.N., DeVantier, L.M., Turak, E., Green, A.L., Kininmonth, S., Stafford-Smith, M. and Peterson, N. (2011). The coral triangle. In: Dubinsky, Z., Stambler, N. (eds), *Coral reefs: an ecosystem in transition*. Springer, Dordrecht. pp. 47–55.

Veron, J.E.N., Pichon, M. and Wijsman-Best, M. (1977). Scleractinia of eastern Australia II: Families Faviidae, Trachyphylliidae. *Australian Institute of Marine Science Monograph Series* **3**: 1–233.

Veron, J.E.N. and Wallace, C.C. (1984). Scleractinia of eastern Australia V. Family Acroporidae. *Australian Institute of Marine Science Monograph Series* **6**: 1–485.

Veron, J.E.N., Stafford-Smith, M., DeVantier, L. and Turak, E. (2015). Overview of distribution patterns of zooxanthellate Scleractinia. *Frontiers in Marine Science* **1**: 81. doi: 10.3389/fmars.2014.00081

Veron J.E.N., Stafford-Smith M.G., Turak E. and DeVantier L.M. (2016). Corals of the World. http://www.coralsoftheworld.org [accessed 1 October 2022]

Verrill, A.E. (1866). Synopsis of the polyps and corals of the North Pacific Exploring Expedition, with descriptions of some additional species from the West Coast of North America. *Proceedings of the Essex Institute, volume* **5**: 17–32, pls 1–2.

Wallace, C.C. (1994). New species and a new species group of the coral genus *Acropora* from Indo-Pacific locations. *Invertebrate Taxonomy* **8**: 961–988.

Wallace, C.C. (1997). New species and new records of recently described species of the coral genus *Acropora* (Scleractinia: Astrocoeniina: Acroporidae) from Indonesia. *Zoological Journal of the Linnean Society* **120**: 27–50.

Wallace, C.C. and Wolstenholme, J. (1998). Revision of the coral genus Acropora (Scleractinia: astrocoeniina: Acroporidae) in Indonesia. *Zoological Journal of the Linnean Society* **123**: 199–384.

Wallace, C.C. (1999). *Staghorn Corals of the World: A Revision of the Coral Genus Acropora (Scleractinia; Astrocoeniina; Acroporidae) worldwide, with emphasis on morphology, phylogeny and biogeography*. CSIRO Publishing, Collingwood. 421 pp.

Wallace, C.C. (2001). Wallace's Line and marine organisms: the distribution of staghorn corals (*Acropora*) in Indonesia. In: Metcalfe, I. (ed.), *Faunal and Floral Migrations and Evolution in SE Asia-Australasia*. Balkema, Rotterdam. pp. 168–178.

Wallace, C.C., Richards, Z.T. and Suharsono (2001). Regional distribution patterns of *Acropora* and their use in the conservation of coral reefs in Indonesia. *Pesisir & Lautan* **4**: 40–58.

Wallace, C.C. (2003). Journey to the heart of the centre — Origins of high marine faunal diversity in the central Indo-Pacific from the perspective of an Acropologist. In: Moosa, M. Kasim et al. (eds), *Proceedings of the Ninth International Coral Reef Symposium,* volume 1. Ministry of Environment, Indonesia. pp. 33–39.

Wallace, C.C., Paulay, G., Hoeksema, B.W., Bellwood, D.R., Hutchings, P.A., Barber, P.H., Erdmann, M. and Wolstenholme, J. (2003). Nature and origins of unique high diversity reef faunas in the Bay of Tomini, Central Sulawesi: The ultimate "center of biodiversity"? In: Moosa, M. Kasim et al. (eds), *Proceedings of the Ninth International Coral Reef Symposium*, volume 1. Ministry of Environment, Indonesia. pp. 33–39.

Wallace, C.C. and Rosen, B.R. (2006). Diverse staghorn corals (*Acropora*) in high-latitude Eocene assemblages: implications for the evolution of modern diversity patterns of reef corals. *Proceedings of the Royal Society B: Biological Sciences* **273**: 975-982. doi: 10.1098/rspb.2005.3307

Wallace, C.C., Fellegara, I., Muir, P.R. and Harrison, P.L. (2009). The scleractinian corals of Moreton Bay, eastern Australia: high latitude, marginal assemblages with increasing species richness. *Memoirs of the Queensland Museum* **54**: 1–118.

Wallace, C. C. (2011). East Indies triangle of biodiversity. In: Hopley, D. (ed.), Encyclopedia of modern coral reefs. Springer, Dordrecht. pp. 333–338.

Wallace, C.C., Done, B.J. and Muir, P.R. (2012). Revision and catalogue of worldwide staghorn corals Acropora and Isopora (Scleractinia: Acroporidae) in the Museum of Tropical Queensland. *Nature* **57**(1): 1–255.

Wells, J.W. (1954). Bikini and nearby atolls: Part 2, Oceanography (biologic). Recent corals of the Marshall Islands. *U.S. Geological Survey Professional Papers* **260**(I): 385–486, pls 94–185.

Williams, B.A., Watson, J.E., Beyer, H.L., Klein, C.J., Montgomery, J., Runting, R.K., Roberson, L.A., Halpern, B.S., Grantham, H.S., Kuempel, C.D. and Frazier, M., (2022). Global rarity of intact coastal regions. *Conservation Biology* 36(4): e13874. doi: 10.1111/cobi.13874

Wilson, B. (2013). *The biogeography of the Australian North West Shelf: Environmental change and life's response*. Western Australian Museum, Perth. 415 pp.

Wilson, B. (2014). Kimberley marine biota. History and environment. *Records of the Western Australian Museum Supplement* **84**: 1–18. doi: 10.18195/issn.0313-122x.84.2014.001-018

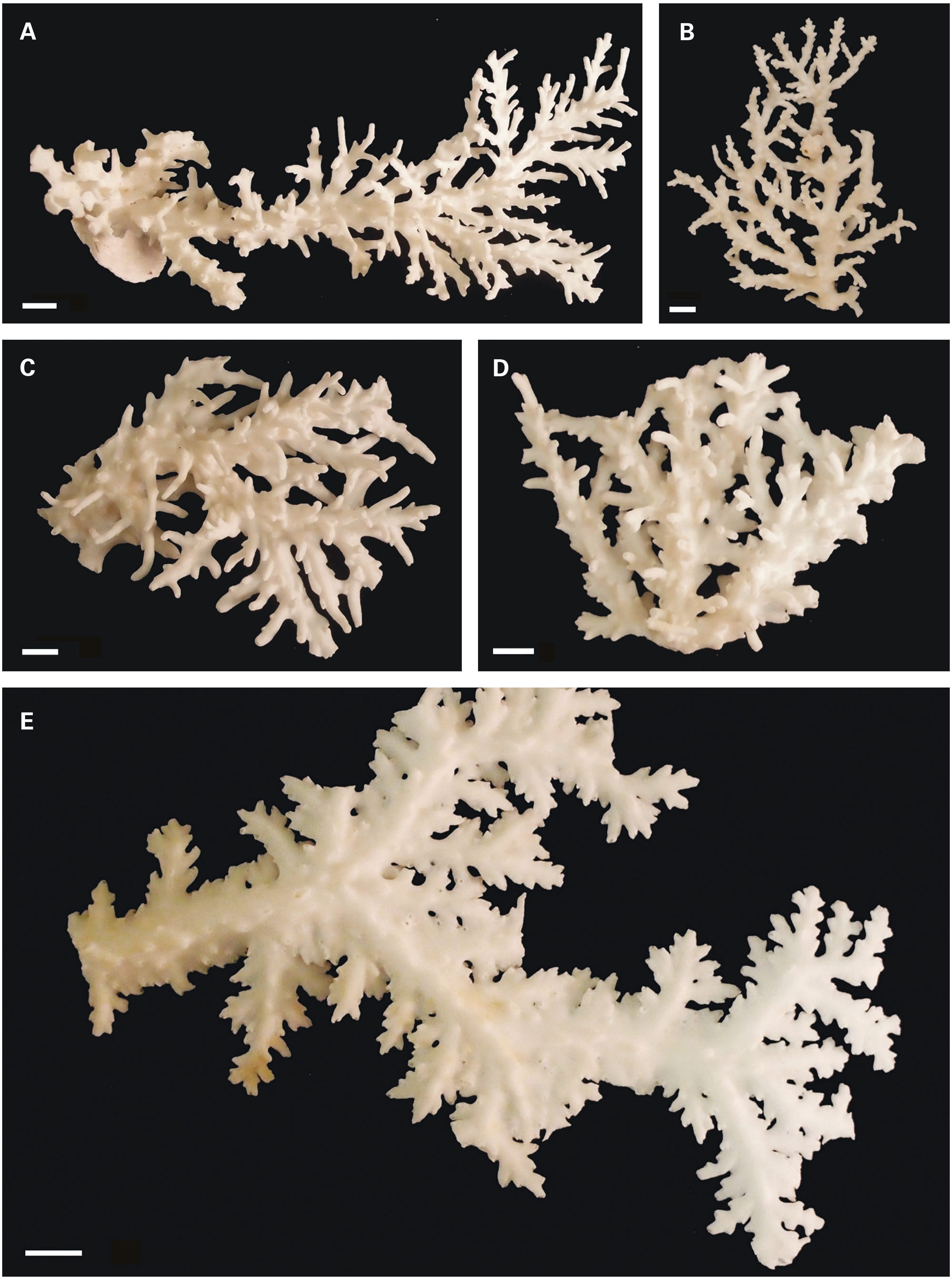
Wittenberg, M. and Hunte, W. (1992). Effects of eutrophication and sedimentation on juvenile corals. I. Abundance, mortality and community structure. *Marine Biology* **112**: 131–138.

Yabe, H. and Sugiyama, T. (1932). Reef corals found in the Japanese seas. *The Science Reports of the Tôhoku Imperial University* **15**(2): 143–167.

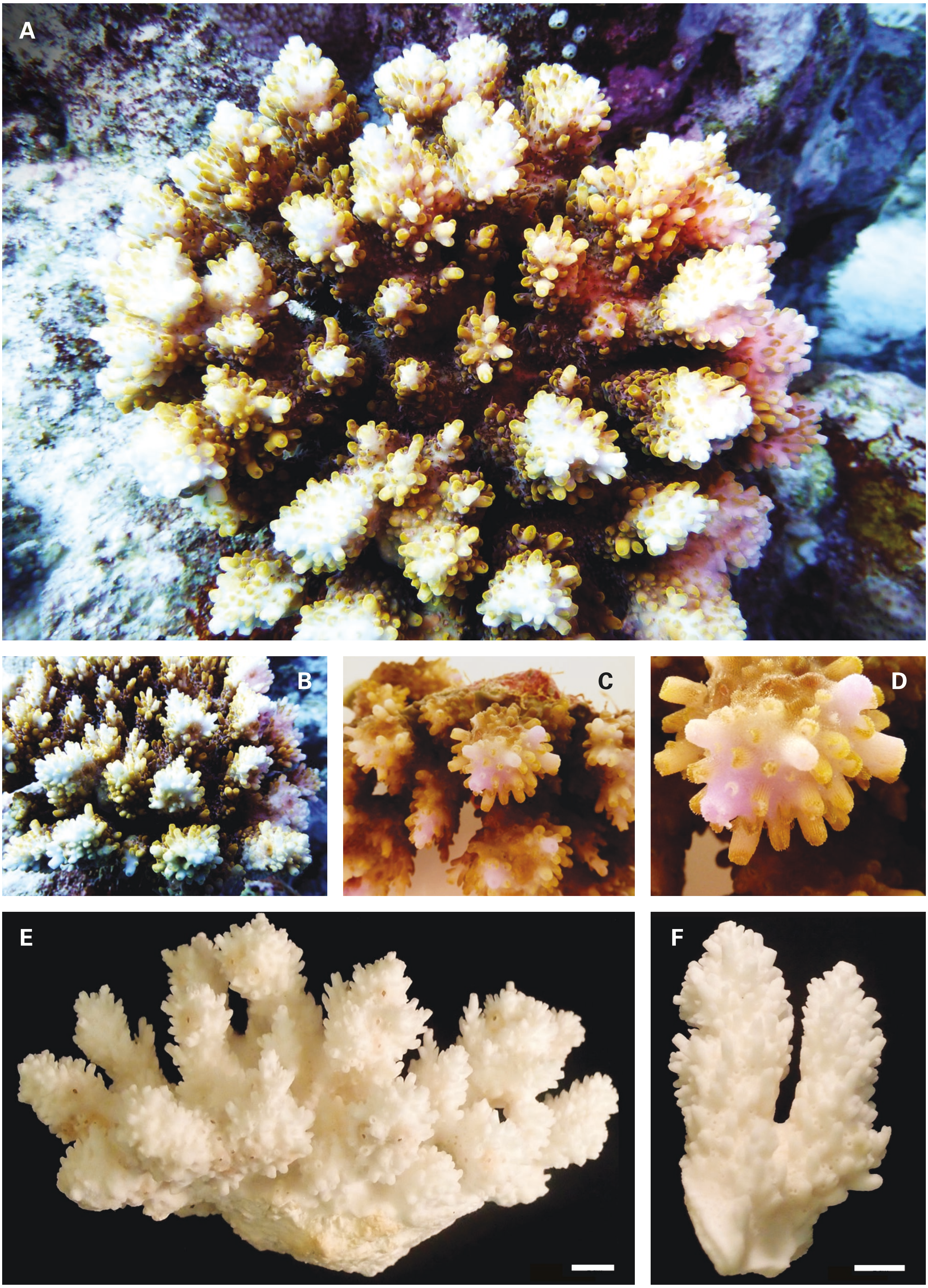
Yabe, H., Sugiyama, T. and Eguchi, M. (1936). Recent reef-building corals from Japan and the South Sea Islands under the Japanese mandate. I. *The Science Reports of the Tôhoku Imperial University.* Special volume 1: 1–66, pls. 1–59.

Zhang, J., Richards, Z.T., Adam, A.A., Chan, C.X., Shinzato, C., Gilmour, J., Thomas, L., Strugnell, J.M., Miller, D.J. and Cooke, I., 2022. Evolutionary responses of a reef-building coral to climate change at the end of the last glacial maximum. *Molecular Biology and Evolution* **39**(10): p.msac201. doi: 10.1093/molbev/msac201

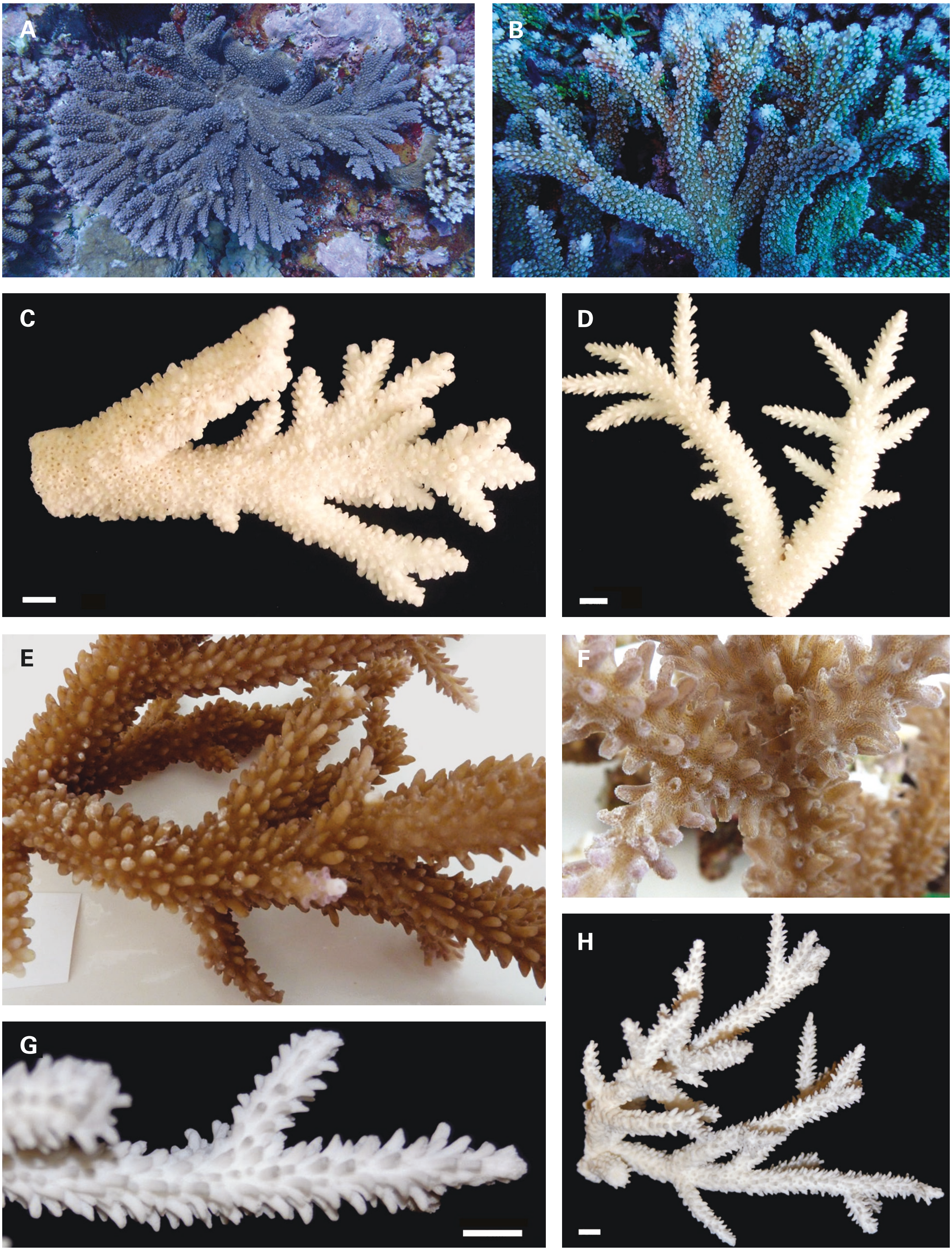
Zou, R.L. (1980). Studies on the corals of Xisha Islands. IV. Two new hermatypic scleractinian corals. *Nanhai Studia Marina Sinica* **1**: 113–118, pl. 1.



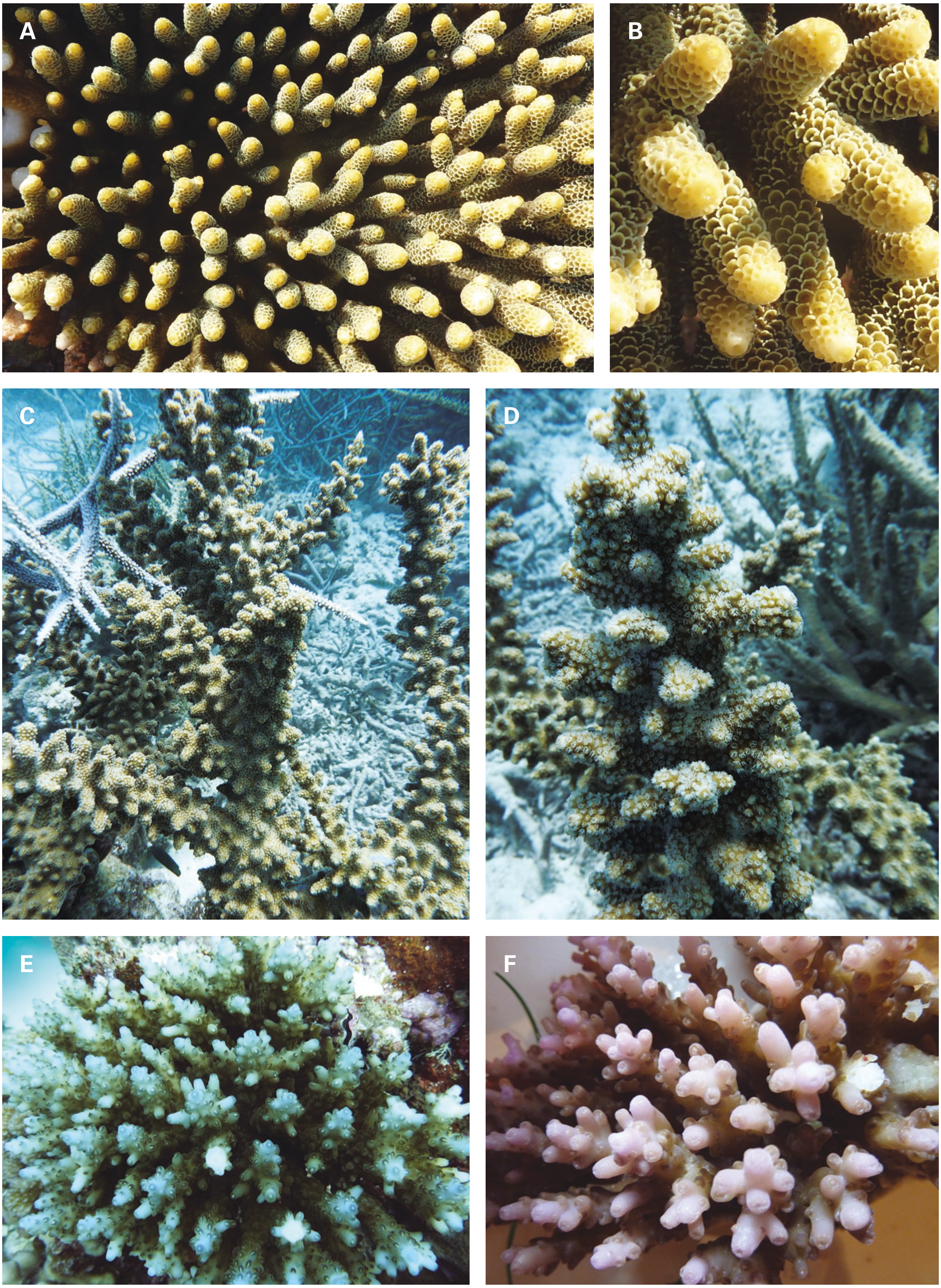
SUPPLEMENTARY FIGURE 1 A) *Acropora tenella* (WAM Z65477), Scott Reef (52 m). B) *Acropora elegans* (WAM Z66119), Albert Reef (16 m). C) *Acropora elegans* (WAM Z65484), Scott Reef, (52 m). D) *Acropora elegans* (WAM Z65480), Scott Reef, (52 m). E) *Acropora pichoni* (WAM Z65496), Scott Reef, (52 m). All scales = 10 mm.



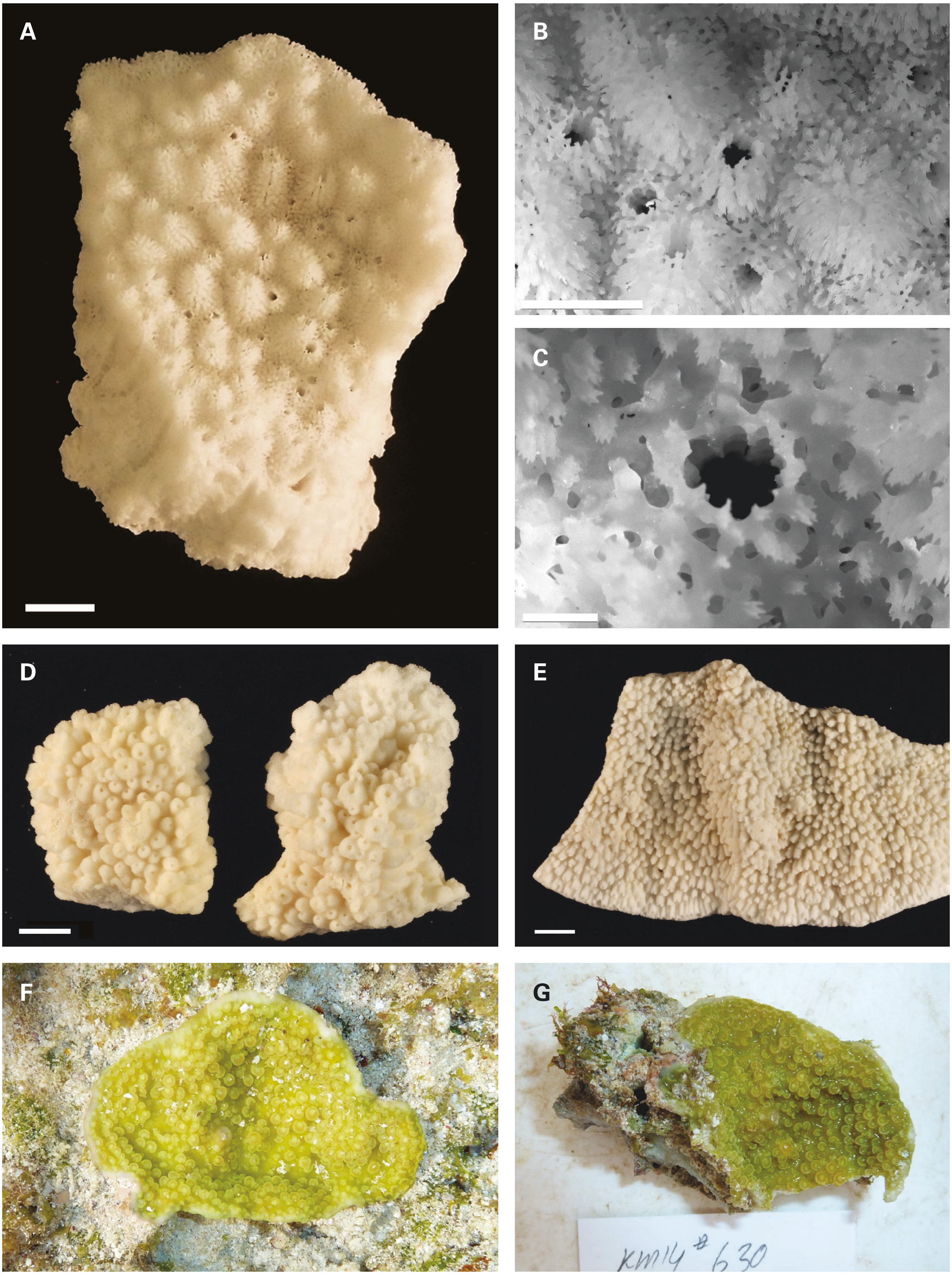
SUPPLEMENTARY FIGURE 2 A–E) *Acropora retusa* (WAM Z92751), in-situ at Mermaid Reef; on deck; and post tissue removal, scale = 10 mm. F) *Acropora retusa* (WAM Z92727), Clerke Reef, scale = 10 mm.



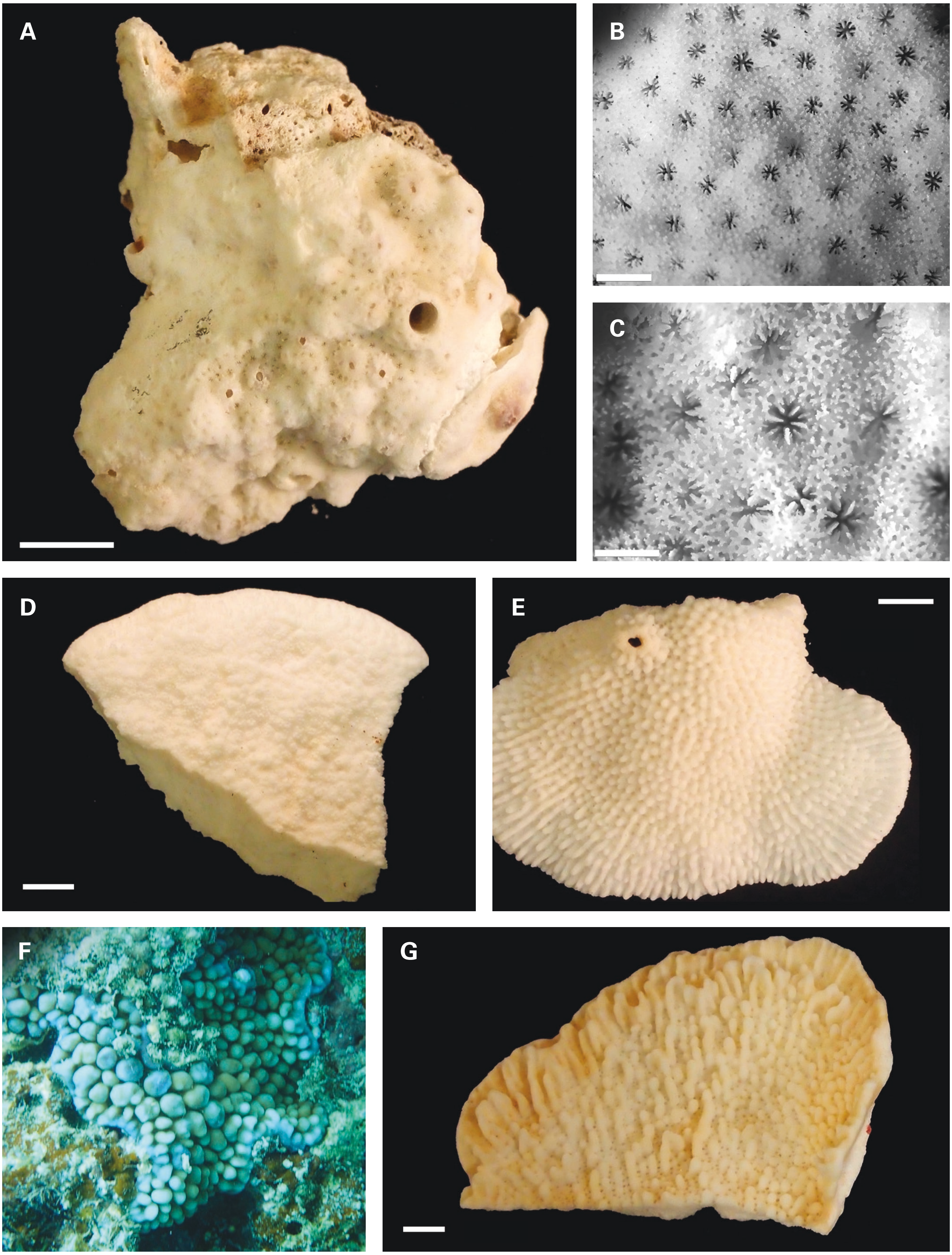
SUPPLEMENTARY FIGURE 3 A) *Acropora sukarnoi* (WAM Z66409), in-situ at Hibernia Reef. B) *Acropora sukarnoi* (WAM Z92702), in-situ at Ashmore Reef. C) *Acropora sukarnoi* (WAM Z66426), Hibernia Reef, scale = 10 mm. D) *Acropora sukarnoi* (WAM Z66379), Ashmore Reef, scale = 10 mm. E–G) *Acropora hoeksemai* (WAM Z93294), Clerke Reef, on deck; and post tissue removal, scale = 10 mm.



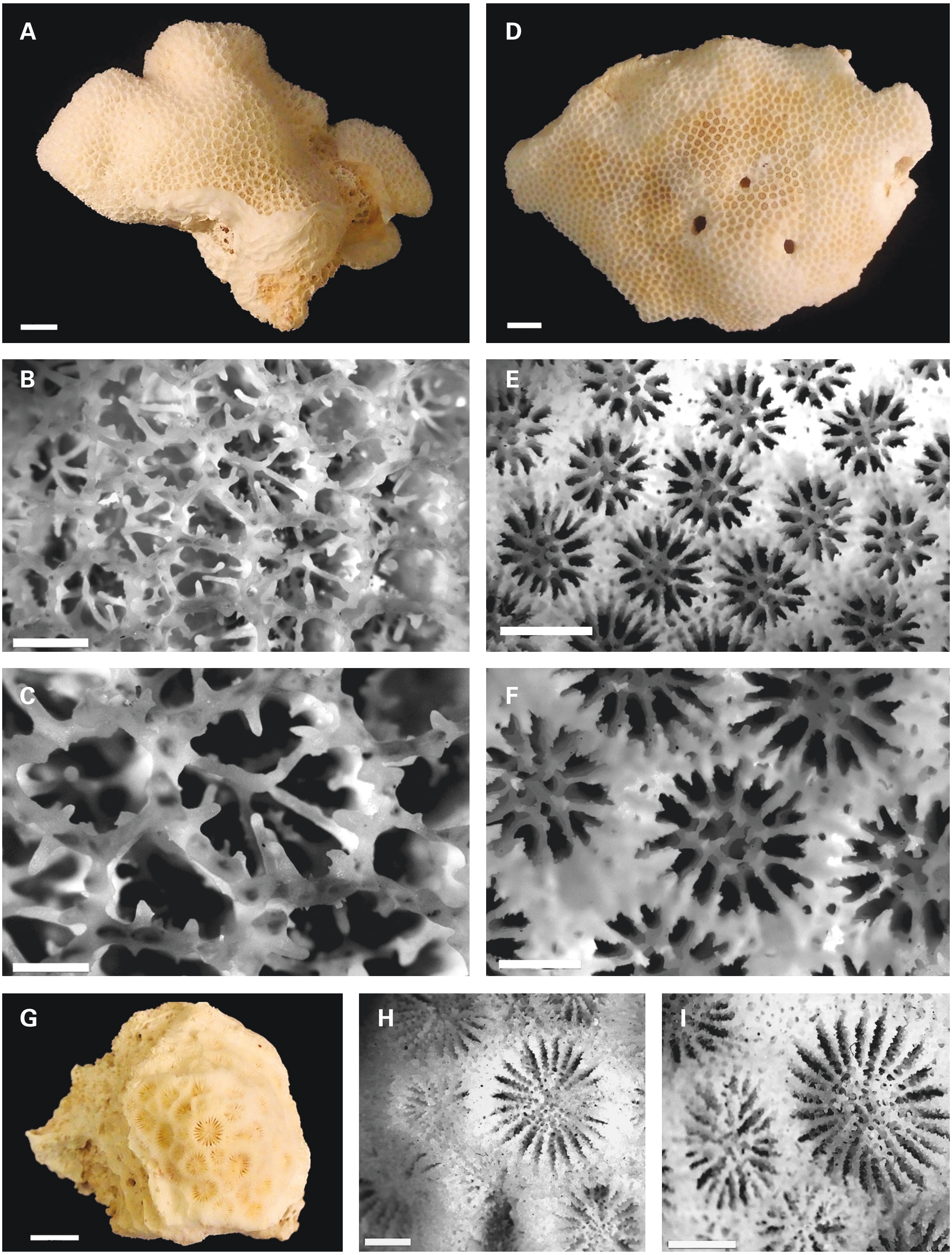
SUPPLEMENTARY FIGURE 4 A–B) *Acropora spathulata* (WAM Z92789), in-situ at Mermaid Reef. C–D) *Acropora tortuosa* (WAM Z92785), in-situ at Mermaid Reef. E–F) *Acropora willisae* (WAM Z93208), in-situ at Clerke Reef.



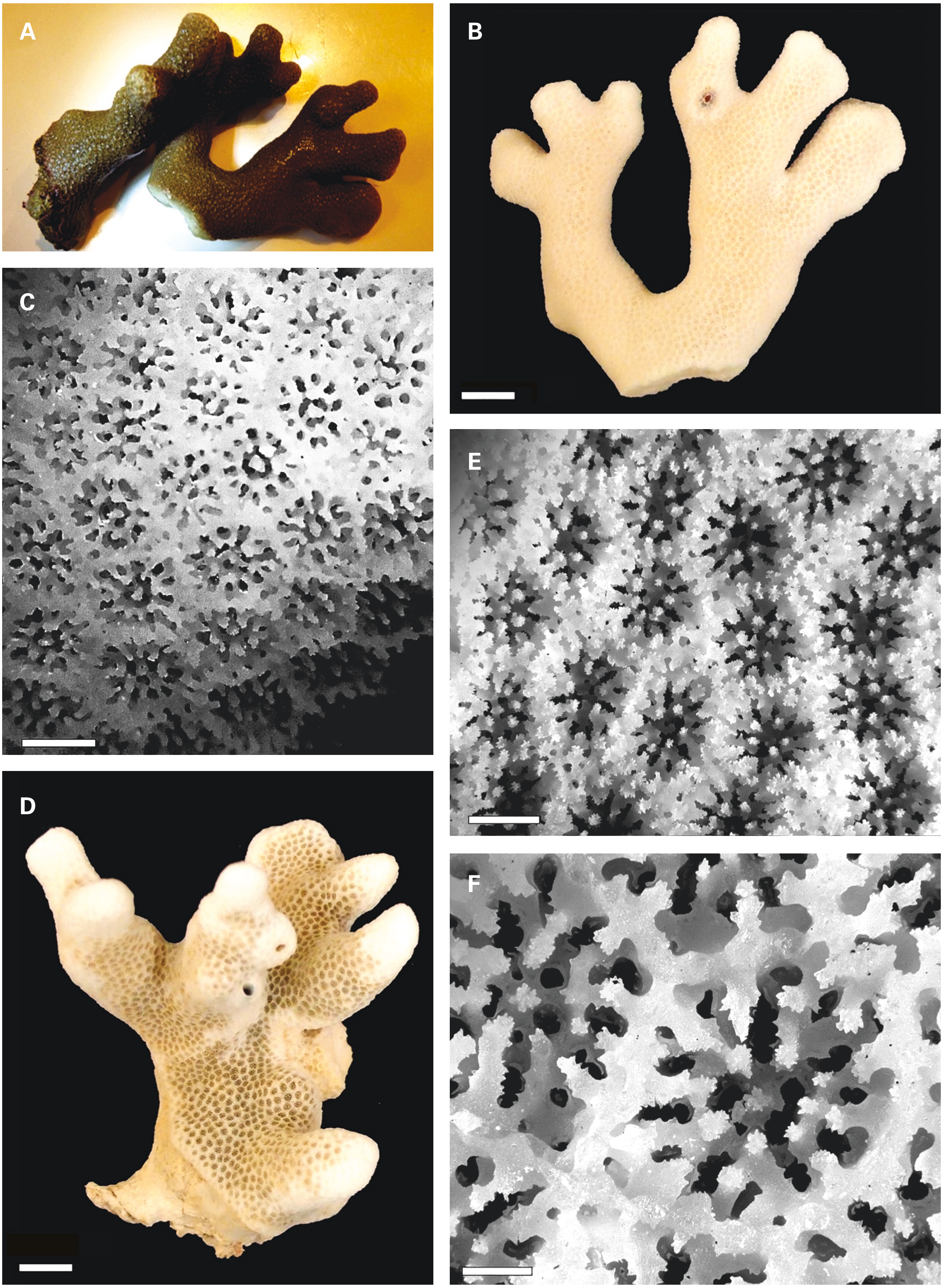
SUPPLEMENTARY FIGURE 5 A–C) *Astreopora cucullata* (WAM Z66470), Mermaid Reef, scale = 10 mm; and corallite details, scales = 5 mm and 1 mm. D) *Isopora cuneata* (WAM Z65664), Cassini Island, scale = 10 mm. E) *Isopora crateriformis* (WAM Z65691), Long reef, scale = 10 mm. F–G) *Acropora palmerae* (WAM Z92792), in-situ at Mermaid Reef; and on deck.



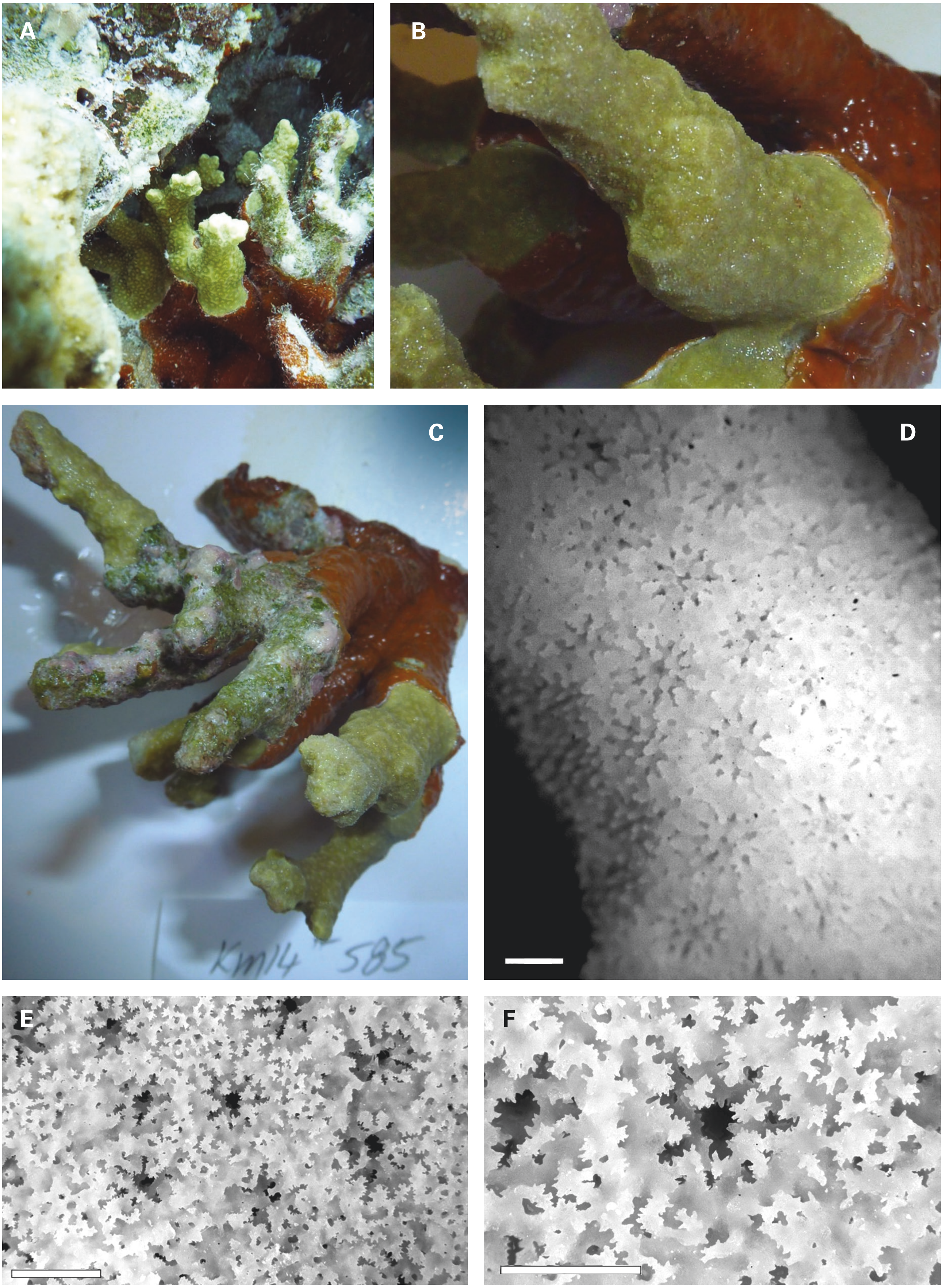
SUPPLEMENTARY FIGURE 6 A–C) *Montipora cocosensis* (WAM Z89911), NW of Colbert Island, scale = 10 mm; and corallite details, scales = 5 mm and 1 mm. D) *Montipora corbettensis* (WAM Z89935), Hibernia Reef, scale = 10 mm. E) *Montipora* cf. *verruculosa* (WAM Z89869), Mavis Reef, scale = 10 mm. F–G) *Montipora* cf. *palawanensis* (WAM Z89932), in-situ at Scott Reef; and post tissue removal, scale = 10 mm.



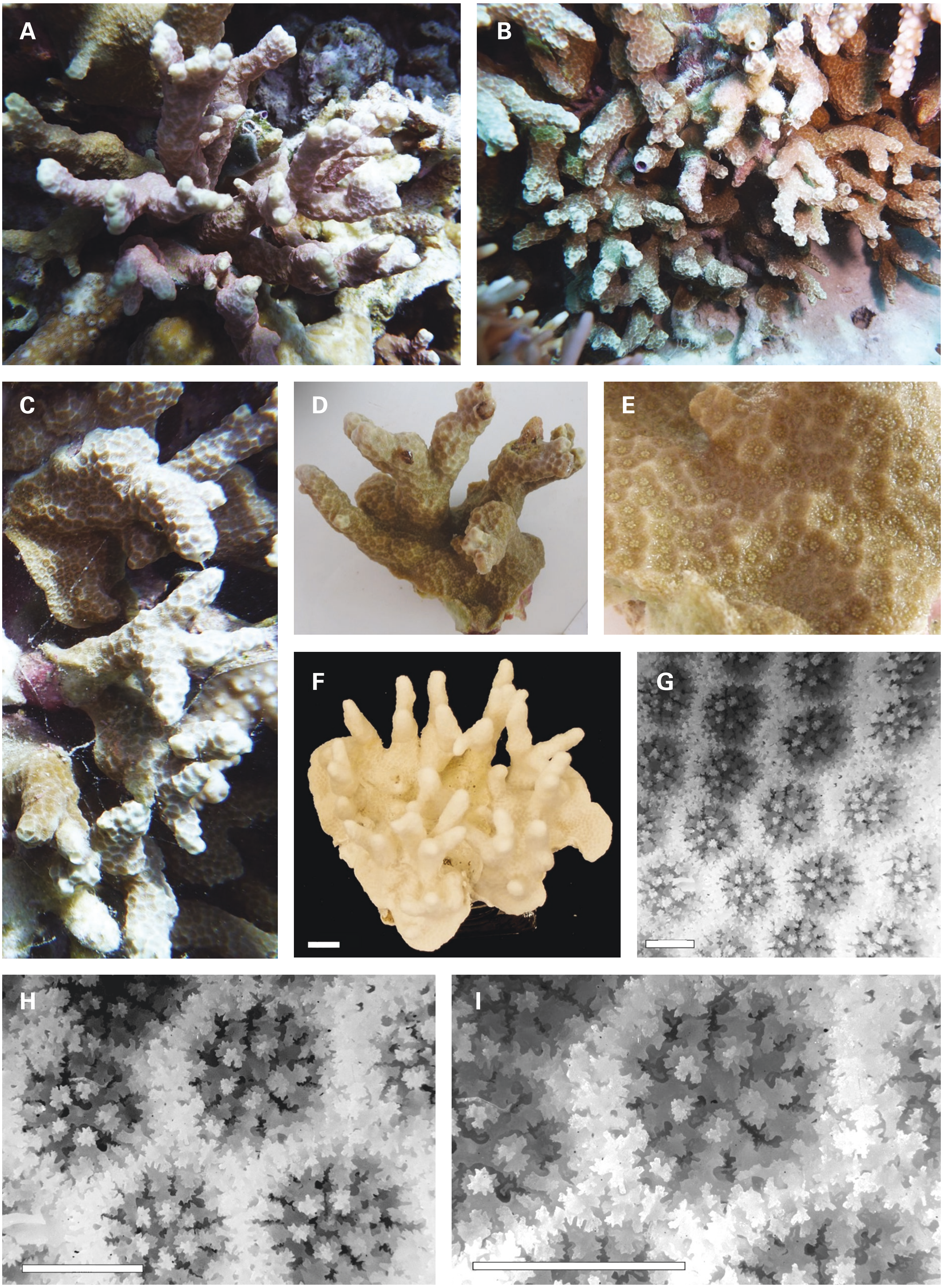
SUPPLEMENTARY FIGURE 7 A–C) *Alveopora marionensis* (WAM Z93705), Adele Island, scale = 10 mm; and corallite details, scales = 2 mm and 1 mm. D–F) *Goniopora* cf. *paliformis* (WAM Z93049), Ashmore Reef, scale = 10 mm; and corallite details, scales = 2 mm and 1 mm. G–I) *Goniopora polyformis* (WAM Z93718), Ashmore Reef, scale = 10 mm; and corallite details, scales = 2 mm.



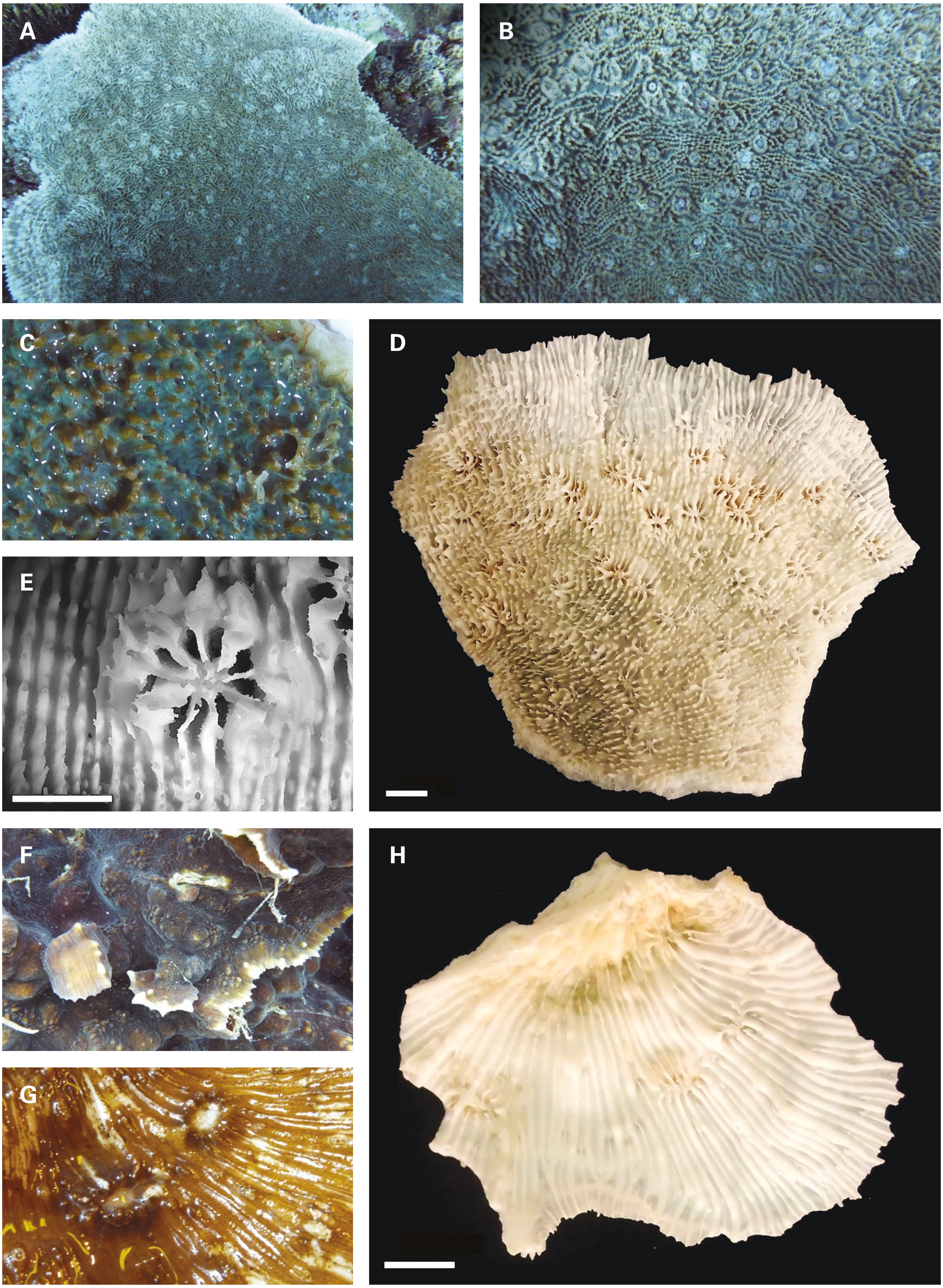
SUPPLEMENTARY FIGURE 8 A–C) *Porites attenuata* (WAM Z93342), Imperieuse Reef, on deck; post tissue removal, scale = 10 mm; and corallite detail, scale = 1 mm. D–F) *Porites attenuata* (WAM Z92933), Long Reef, scale = 10 mm; and corallite details, scales = 1 mm and 0.25 mm.



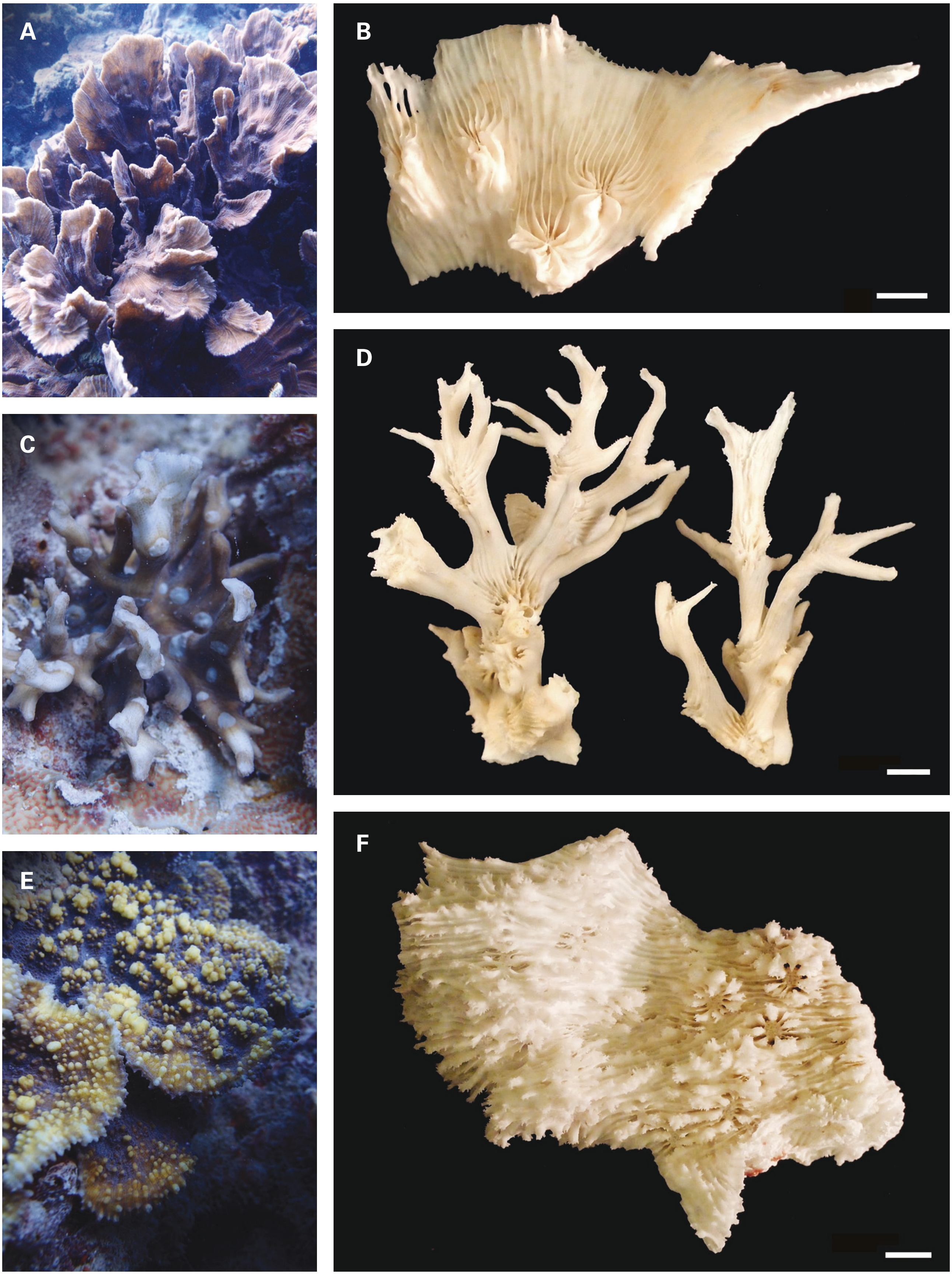
SUPPLEMENTARY FIGURE 9 A–C) *Porites flavus* (WAM Z93454), in-situ at Mermaid Reef; and on deck. D) *Porites flavus* (WAM Z91449), King and Conway Islands, corallite detail, scale = 1 mm. E–F) *Porites flavus* (WAM ZZ92860), Scott Reef, corallite details, scales = 1 mm.



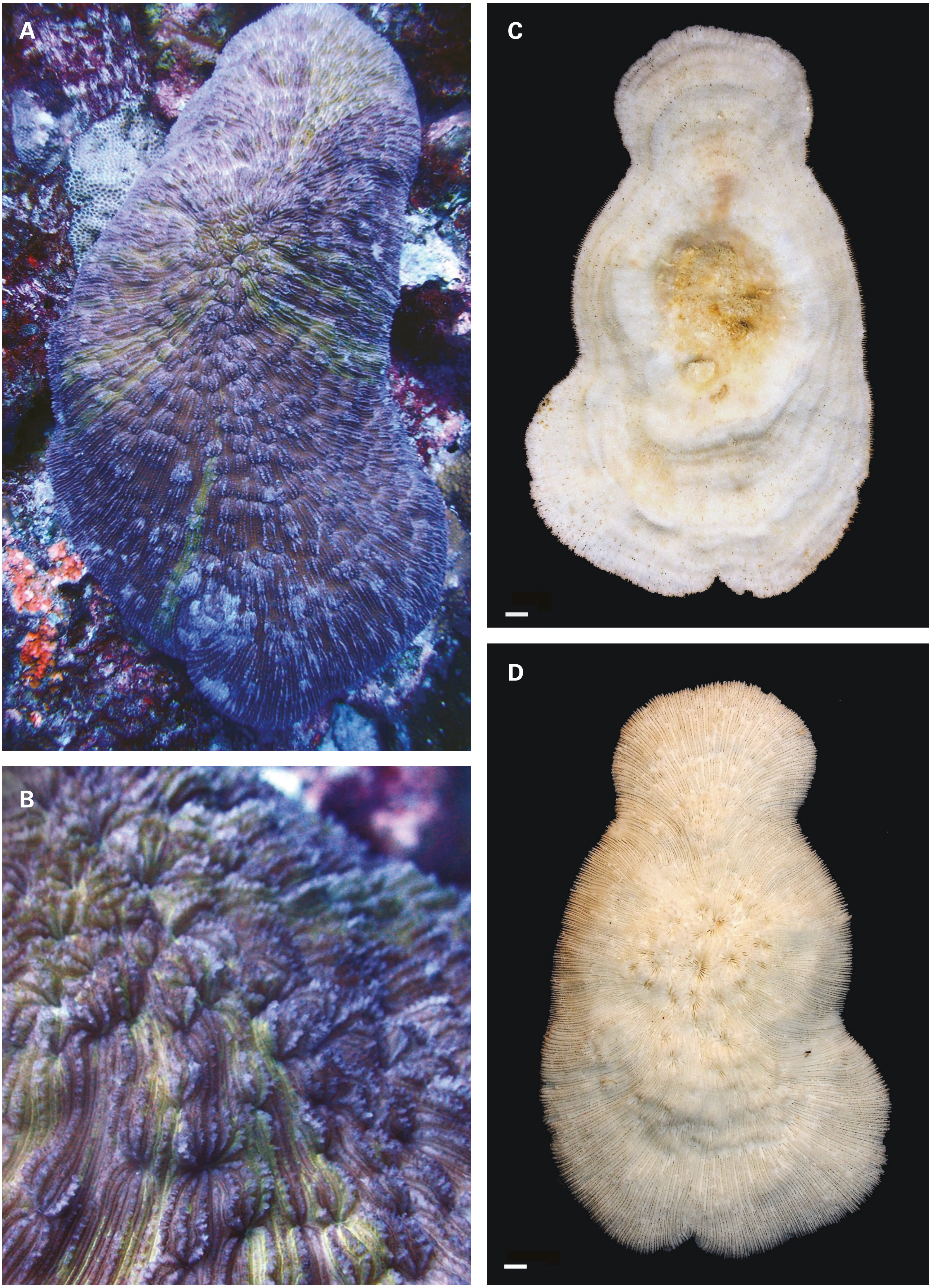
SUPPLEMENTARY FIGURE 10 A) *Porites latistellata* (WAM Z92856), in-situ at Scott Reef. B–F) *Porites latistellata* (WAM Z93412), in-situ at Imperieuse Reef; on deck; and post tissue removal, scale = 10 mm. G–I) *Porites latistellata* (WAM Z93081), Hibernia Reef, corallite details, scales = 1 mm.



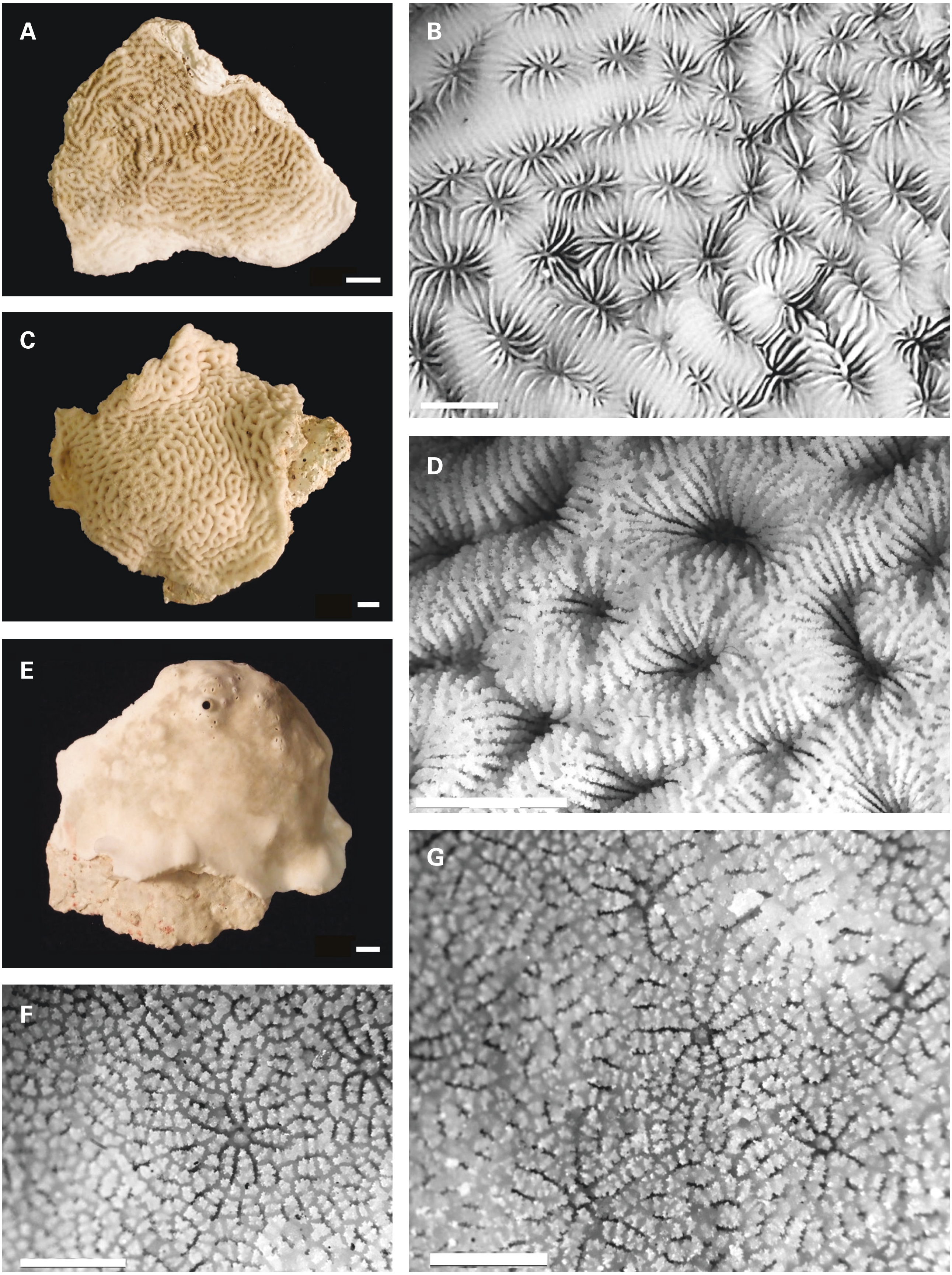
SUPPLEMENTARY FIGURE 11 A–E) *Echinophyllia patula* (WAM Z89925), in-situ at Imperieuse Reef; post tissue removal, scale = 10 mm; and corallite detail, scale = 5 mm. F–H) *Echinophyllia* cf. *pectinata* (WAM Z92605), in-situ at Imperieuse Reef; on deck; and post tissue removal, scale = 10 mm.



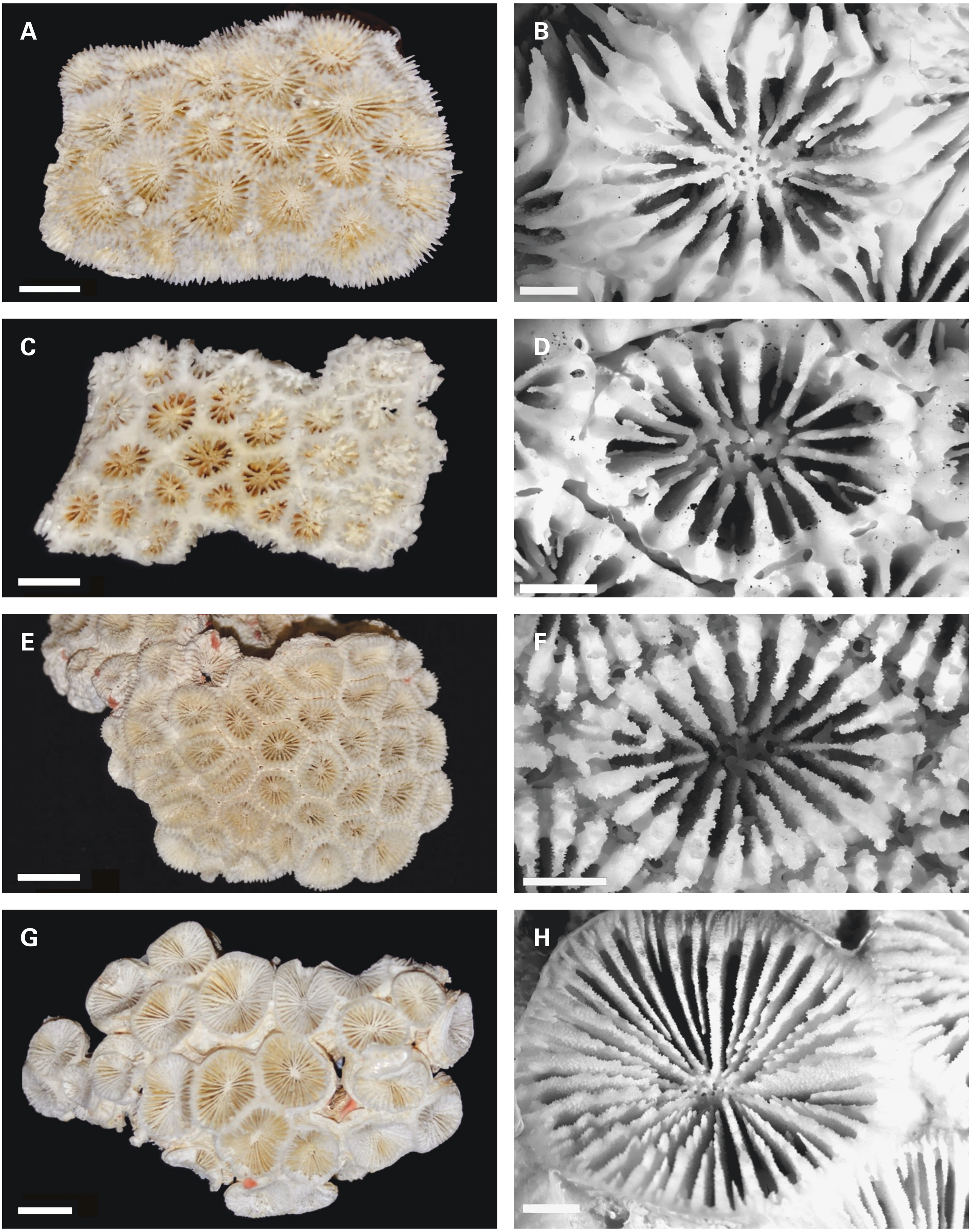
SUPPLEMENTARY FIGURE 12 A–B) *Pectinia maxima* (WAM Z66208), in-situ at Montelivet Island; and post tissue removal, scale = 10 mm. C–D) *Pectinia elongata* (WAM Z66368), in-situ at Ashmore Reef; and post tissue removal, scale = 10 mm. E–F) *Oxypora crassispinosa* (WAM Z66265), in-situ at Ashmore Reef; and post tissue removal, scale = 10 mm.



SUPPLEMENTARY FIGURE 13 A–B) *Sandalolitha dentata* (WAM Z66094), in-situ at White Island. C–D) *Sandalolitha dentata* (WAM Z66122), Albert Reef, lower and upper surfaces post tissue removal, scales = 10 mm.



SUPPLEMENTARY FIGURE 14 A–B) *Pavona biparta* (WAM Z66229), De Freyinet Island, scale = 10 mm; and corallite detail, scale = 5 mm. C–D) *Coscinaraea monile* (WAM Z65935), Montgomery Reef, scale = 10 mm; and corallite detail, scale = 5 mm. E–G) *Psammocora albopicta* (WAM Z92642), Rob Roy Reef, scale = 10 mm; and corallite details, scales = 1 mm.



SUPPLEMENTARY FIGURE 15 A–B) *Acanthastrea subechinata* (WAM Z66155), Bathurst Island, scale = 10 mm; and corallite detail, scale = 2 mm. C) *Acanthastrea minuta* (WAM Z89385), Ashmore Reef, scale = 10 mm. D) *Acanthastrea minuta* (WAM Z89353), Ashmore Reef, corallite detail, scale = 2 mm. E) *Micromussa regularis* (WAM Z66453), Adele Island, scale = 10 mm. F) *Micromussa regularis* (WAM Z66454), Cassini Island, corallite detail, scale = 2 mm. G–H) *Blastomussa vivida* (WAM Z65963), Adele Island, scale = 10 mm; and corallite detail, scale = 2 mm.

APPENDIX 1 Species checklist of hermatypic corals recorded from the Kimberley region, reported in this study and prior publications including taxonomic notes and biogeographic remarks. Historical reportings for the Kimberley (inshore and offshore) per Richards et al. 2014, and for the Bonaparte Archepelago per Richards et al. 2015. For further information on range extensions (excluding those verified by photographic records only) see Table 1.

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
ANTHOZOA										
Order: Scleractinia										
Family: Acroporidae										
Acropora abrolhosensis Veron, 1985					+		**+**	+		
Acropora abrotanoides (Lamarck, 1816)	+		+	+	+	+	**+**	+		
Acropora aculeus (Dana, 1846)	+	+	+		+	+	**+**	+	+	
Acropora acuminata (Verrill, 1864)			+		+		**+**	+	+	
Acropora anthocercis (Brook, 1893)			+		+	+	**+**	+	+	
Acropora arafura Wallace, Done & Muir, 2012	+	+	+			+	**+**		+	
Acropora aspera (Dana, 1846)	+	+	+		+	+	**+**	+	+	
Acropora austera (Dana, 1846)	+		+		+	+	**+**	+	+	
Acropora cf. *batunai* Wallace, 1997								+		
Acropora cf. *bushyensis* Veron & Wallace, 1984								+		
Acropora carduus (Dana, 1846)		+			+		**+**	+		
Acropora caroliniana Nemenzo, 1976	+						**+**	+		
Acropora cerealis (Dana, 1846)	+	+	+	+	+	+	**+**	+	+	
Acropora clathrata (Brook, 1891)	+	+	+	+	+	+	**+**	+	+	
Acropora cytherea (Dana, 1846)	+	+	+	+	+	+	**+**	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Acropora cf. *dendrum* (Bassett-Smith, 1890)								+		
Acropora desalwii Wallace, 1994					+		**+**	+		Range extension
Acropora digitifera (Dana, 1846)	+	+	+		+	+	**+**	+	+	
Acropora divaricata (Dana, 1846)	+	+	+	+	+	+	**+**	+	+	
Acropora donei Veron & Wallace, 1984	+	+	+		+	+	**+**	+		
Acropora echinata (Dana, 1846)					+		**+**	+		
Acropora elegans (Milne Edwards, 1860)		+					**+**			Range extension
Acropora elseyi (Brook, 1892)						+	**+**	+		
Acropora exquisita Nemenzo, 1971								+		
Acropora florida (Dana, 1846)	+		+		+	+	**+**	+	+	
Acropora gemmifera (Brook, 1892)	+		+		+	+	**+**	+	+	
Acropora glauca (Brook, 1893)	+	+		+		+	**+**	+	+	
Acropora globiceps (Dana, 1846)					+		**+**			Range extension
Acropora grandis (Brook, 1892)			+		+	+	**+**	+	+	
Acropora granulosa (Milne Edwards & Haime, 1860)	+	+	+			+	**+**	+		
Acropora hoeksemai Wallace, 1997					+		**+**			Range extension
Acropora horrida (Dana, 1846)	+	+	+		+		**+**	+		
Acropora humilis (Dana, 1846)	+	+	+	+	+	+	**+**	+	+	
Acropora hyacinthus (Dana, 1846)	+	+	+		+		**+**	+	+	
Acropora cf. *indonesia* Wallace, 1997								+		
Acropora intermedia (Brook, 1891)	+	+	+			+	**+**	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Acropora jacquelineae Wallace, 1994							+			Range extension
Acropora cf. *kimbeensis* Wallace, 1999						+	+			Incomplete collection data (education specimen); possible range extension, requires further verification
Acropora latistella (Brook, 1891)	+	+	+	+	+	+	+	+	+	
Acropora listeri (Brook, 1893)					+		+	+	+	
Acropora loisetteae Wallace, 1994					+	+	+	+		
Acropora longicyathus (Milne Edwards & Haime, 1860)					+	+	+	+		
Acropora loripes (Brook, 1892)	+	+	+		+	+	+	+	+	
Acropora lutkeni Crossland, 1952	+	+	+		+	+	+	+	+	
Acropora microclados (Ehrenberg, 1834)	+	+	+		+	+	+	+	+	
Acropora microphthalma (Verrill, 1869)	+	+	+		+	+	+	+	+	
Acropora millepora (Ehrenberg, 1834)	+		+		+	+	+	+	+	
Acropora monticulosa (Brüggemann, 1879)	+		+		+	+	+	+	+	
Acropora muricata (Linnaeus, 1758)	+	+	+		+	+	+	+	+	
Acropora nana (Studer, 1878)						+	+	+	+	
Acropora nasuta (Dana, 1846)	+		+	+	+	+	+	+	+	
Acropora palmerae Wells, 1954					+		+			Range extension
Acropora paniculata Verrill, 1902	+						+	+		
Acropora papillare Latypov, 1992	+		+		+		+	+	+	
Acropora pichoni Wallace, 1999							+	+		Range extension
Acropora polystoma (Brook, 1891)								+	+	
Acropora pulchra (Brook, 1891)	+	+	+		+	+	+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Acropora retusa (Dana, 1846)					+		+			Range extension
Acropora robusta (Dana, 1846)			+		+	+	+	+	+	
Acropora russelli Wallace, 1994								+		
Acropora samoensis (Brook, 1891)	+		+		+	+	+	+	+	
Acropora sarmentosa (Brook, 1892)		+					+	+	+	
Acropora secale (Studer, 1878)	+		+		+	+	+	+	+	
Acropora selago (Studer, 1878)	+	+	+		+	+	+	+	+	
Acropora solitaryensis Veron & Wallace, 1984	+	+				+	+	+	+	
Acropora spathulata (Brook, 1891)					+		+			Range extension
Acropora spicifera (Dana, 1846)	+	+	+		+		+	+	+	
Acropora striata (Verrill, 1866)			+				+		+	
Acropora cf. *stoddarti* Pillai & Scheer, 1976	+		+				+			Requires further verification
Acropora subglabra (Brook, 1891)					+	+	+	+		
Acropora subulata (Dana, 1846)	+		+		+	+	+	+	+	
Acropora sukarnoi Wallace, 1997			+			+	+			Range extension
Acropora tenella (Brook, 1892)							+			Range extension
Acropora tenuis (Dana, 1846)	+	+	+	+	+	+	+	+	+	
Acropora cf. *teres* (Verrill, 1866)					+		+			Taxon inquirendum; possible range extension, requires further verification
Acropora tortuosa (Dana, 1846)					+		+			Range extension
Acropora turaki Wallace, 1994					+		+	+		
Acropora valenciennesi (Milne Edwards & Haime, 1860)								+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Acropora valida (Dana, 1846)	+	+	+		+	+	+	+	+	
Acropora vaughani Wells, 1954				+		+	+	+	+	
Acropora verweyi Veron & Wallace, 1984			+		+		+	+	+	
Acropora willisae Veron & Wallace, 1984					+		+			Range extension
Acropora yongei Veron & Wallace, 1984						+	+	+	+	
Alveopora allingi Hoffmeister, 1925	+	+					+	+		Family combination (previously Poritidae)
Alveopora catalai Wells, 1968		+					+	+		Family combination (previously Poritidae)
Alveopora fenestrata (Lamarck, 1816)		+					+	+	+	Family combination (previously Poritidae)
Alveopora marionensis Veron & Pichon, 1982	+	+	+				+			Family combination (previously Poritidae); range extension
Alveopora cf. *ocellata* Veron, 1985		+					+			Family combination (previously Poritidae); range extension, requires further verification
Alveopora spongiosa Dana, 1846		+			+	+	+	+	+	Family combination (previously Poritidae)
Alveopora tizardi Bassett-Smith, 1890		+					+	+	+	Family combination (previously Poritidae)
Alveopora verrilliana Dana, 1872						+	+	+		Family combination (previously Poritidae)
Anacropora puertogalerae Nemenzo, 1964								+		
Astreopora cucullata Lamberts, 1980		+	+		+		+	+		Range extension
Astreopora expansa Brüggemann, 1877	+	+			+		+	+		
Astreopora gracilis Bernard, 1896			+			+	+	+		
Astreopora incrustans Bernard, 1896	+						+	+		Range extension
Astreopora listeri Bernard, 1896	+	+	+		+		+	+	+	
Astreopora myriophthalma (Lamarck, 1816)	+	+	+	+	+	+	+	+	+	
Astreopora ocellata Bernard, 1896	+	+	+				+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Isopora brueggemanni (Brook, 1893)	+	+	+		+	+	+	+	+	
Isopora crateriformis (Gardiner, 1898)			+				+		+	Range extension
Isopora cuneata Dana, 1846			+			+	+			Range extension
Isopora palifera (Lamarck, 1816)	+		+	+	+	+	+	+	+	
Montipora aequituberculata Bernard, 1897	+	+	+			+	+	+	+	
Montipora altasepta Nemenzo, 1967	+					+	+			Range extension
Montipora angulata (Lamarck, 1816)								+		
Montipora cf. *australiensis* Bernard, 1897						+	+	+		Range extension, requires further verification
Montipora calcarea Bernard, 1897	+	+	+			+	+		+	
Montipora caliculata (Dana, 1846)	+	+	+		+	+	+	+	+	
Montipora capitata (Dana, 1846)					+		+			Range extension
Montipora cf. *capricornis* Veron, 1985	+						+			Range extension, requires further verification
Montipora cocosensis Vaughan, 1918		+			+		+			Range extension
Montipora corbettensis Veron & Wallace, 1984						+	+			Range extension
Montipora crassituberculata Bernard, 1897	+	+	+		+	+	+	+	+	
Montipora danae (Milne Edwards & Haime, 1851)			+				+	+		Range extension
Montipora delicatula Veron, 2000									+	
Montipora digitata (Dana, 1846)	+	+	+				+	+	+	
Montipora efflorescens Bernard, 1897					+		+	+	+	
Montipora floweri Wells, 1954				+			+	+	+	
Montipora foliosa (Pallas, 1766)		+			+		+	+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Montipora foveolata (Dana, 1846)	+	+	+	+	+	+	+	+	+	
Montipora gaimardi Bernard, 1897									+	
Montipora grisea Bernard, 1897	+	+			+	+	+	+	+	
Montipora hispida (Dana, 1846)	+		+				+	+	+	
Montipora hoffmeisteri Wells, 1954						+	+	+		
Montipora incrassata (Dana, 1846)	+		+				+	+	+	
Montipora informis Bernard, 1897		+				+	+	+		
Montipora millepora Crossland, 1952	+						+	+		
Montipora mollis Bernard, 1897	+	+	+		+		+	+	+	
Montipora monasteriata (Forskål, 1775)	+		+			+	+	+	+	
Montipora nodosa (Dana, 1846)	+				+	+	+	+	+	
Montipora cf. *palawanensis* Veron, 2000							+			Range extension, requires further verification
Montipora peltiformis Bernard, 1897	+	+	+	+	+	+	+	+		
Montipora porites Veron, 2000						+	+			Range extension
Montipora samarensis Nemenzo, 1967						+	+			Range extension
Montipora spongodes Bernard, 1897								+	+	
Montipora spumosa (Lamarck, 1816)								+		
Montipora tuberculosa (Lamarck, 1816)	+	+	+	+	+	+	+	+	+	
Montipora turgescens Bernard, 1897	+	+	+	+	+	+	+	+	+	
Montipora turtlensis Veron & Wallace, 1984	+	+	+				+	+		
Montipora undata Bernard, 1897		+	+	+		+	+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Montipora venosa (Ehrenberg, 1834)	+			+	+		+	+	+	
Montipora cf. *verruculosa* Veron, 2000		+					+			Range extension, requires further verification
Montipora verrucosa (Lamarck, 1816)		+	+	+		+	+	+	+	
Family: Agariciidae										
Coeloseris mayeri Vaughan, 1918	+	+	+	+	+	+	+	+	+	
Gardineroseris planulata (Dana, 1846)	+	+	+	+	+	+	+	+		
Leptoseris explanata Yabe & Sugiyama, 1941					+		+	+		
Leptoseris foliosa Dinesen, 1980	+	+					+	+		
Leptoseris gardineri van der horst, 1921							+			Range extension
Leptoseris hawaiiensis Vaughan, 1907	+	+				+	+	+		
Leptoseris incrustans (Quelch, 1886)	+	+	+			+	+	+		
Leptoseris mycetoseroides Wells, 1954	+	+	+		+	+	+	+		
Leptoseris papyracea (Dana, 1846)								+		
Leptoseris scabra Vaughan, 1907						+		+		
Leptoseris yabei (Pillai & Scheer, 1976)	+	+	+	+		+	+	+		
Pavona bipartita Nemenzo, 1979	+		+				+			Range extension
Pavona cactus (Forskål, 1775)					+	+	+	+		
Pavona clavus (Dana, 1846)	+		+		+		+	+		
Pavona decussata (Dana, 1846)	+	+	+				+	+	+	
Pavona duerdeni Vaughan, 1907				+	+	+	+	+		
Pavona explanulata (Lamarck, 1816)	+	+	+	+	+	+	+	+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Pavona frondifera (Lamarck, 1816)	+						+	+		
Pavona maldivensis (Gardiner, 1905)	+	+	+		+	+	+	+		
Pavona minuta Wells, 1954	+	+	+				+	+		Range extension
Pavona varians Verrill, 1864	+	+	+	+	+	+	+	+	+	
Pavona venosa (Ehrenberg, 1834)	+	+				+	+	+	+	
Family: Astrocoeniidae										
Stylocoeniella armata (Ehrenberg, 1834)	+	+	+			+	+	+		
Stylocoeniella guentheri Bassett-Smith, 1890	+	+	+			+	+	+	+	
Family: Caryophylliidae										
Heterocyathus aequicostatus Milne Edwards & Haime, 1848	+		+				+	+		
Family: Coscinaraeidae										
Coscinaraea columna (Dana, 1846)	+	+	+			+	+	+	+	
Coscinaraea cf. *crassa* Veron & Pichon, 1980	+						+			Range extension, requires further verification
Coscinaraea exesa (Dana, 1846)		+	+			+	+	+	+	Synonymised (*Psammocora exesa*); range extension
Coscinaraea monile (Forskål, 1775)	+						+			Range extension
Family: Dendrophylliidae										
Duncanopsammia axifuga (Milne Edwards & Haime, 1848)	+		+				+	+		
Eguchipsammia sp.			+				+			Possible range extension, requires further validation
Rhizopsammia verrilli van der Horst, 1922								+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Tubastrea coccinea Lesson, 1829	+	+	+		+			+		
Tubastrea micranthus (Ehrenberg, 1834)			+			+	**+**	+		
Turbinaria bifrons Brüggemann, 1877	+		+			+	**+**	+	+	
Turbinaria conspicua Bernard, 1896								+		
Turbinaria frondens (Dana, 1846)	+		+				**+**	+	+	
Turbinaria irregularis Bernard, 1896									+	
Turbinaria mesenterina (Lamarck, 1816)	+	+	+	+		+	**+**	+	+	
Turbinaria patula (Dana, 1846)		+					**+**	+	+	
Turbinaria peltata (Esper, 1794)	+	+	+	+			**+**	+	+	
Turbinaria radicalis Bernard, 1896			+	+			**+**		+	
Turbinaria reniformis Bernard, 1896	+	+	+	+		+	**+**	+	+	
Turbinaria stellulata (Lamarck, 1816)		+	+		+	+	**+**	+	+	
Family: Euphylliidae										
Euphyllia cristata Chevalier, 1971						+	**+**	+		
Euphyllia glabrescens (Chamisso & Eysenhardt, 1821)	+	+	+			+	**+**	+	+	
Fimbraphyllia paraancora (Veron, 1990)			+				**+**			Genus combination (previously *Euphyllia*); range extension
Fimbriaphyllia ancora (Veron & Pichon, 1980)	+	+	+				**+**	+	+	Genus combination (previously *Euphyllia*)
Galaxea astreata (Lamarck, 1816)	+	+	+	+	+	+	**+**	+	+	
Galaxea fascicularis (Linnaeus, 1767)	+	+	+		+	+	**+**	+	+	
Galaxea horrescens (Dana, 1846)						+	**+**	+		
Galaxea cf. *longisepta* Fenner & Veron, 2000								+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Family: Fungiidae										
Ctenactis albitentaculata Hoeksema, 1989	+						+	+		
Ctenactis crassa (Dana, 1846)	+				+	+	+	+	+	
Ctenactis echinata (Pallas, 1766)	+					+	+	+		
Cycloseris costulata (Ortmann, 1889)								+		
Cycloseris cyclolites (Lamarck, 1801)								+		
Cycloseris explanulata (van der Horst, 1922)		+	+				+	+		Synonymised (*Psammocora explanulata*)
Cycloseris sinensis Milne Edwards & Haime, 1851								+		
Cycloseris somervillei (Gardiner, 1909)								+		
Cycloseris tenuis (Dana, 1846)								+		
Cycloseris vaughani (Boschma, 1923)								+		
Danafungia horrida Dana, 1846					+	+	+	+	+	Synonymised (*Fungia klunzingeri*)
Danafungia scruposa Klunzinger, 1879	+		+				+	+	+	Synonymised (*Fungia scruposa*)
Fungia fungites (Linnaeus, 1758)	+	+	+			+	+	+	+	
Halomitra pileus (Linnaeus, 1758)	+		+				+	+		
Heliofungia actiniformis (Quoy & Gaimard, 1833)						+	+	+		
Herpolitha limax (Esper, 1797)	+	+	+		+		+	+		
Lithophyllon concinna Verrill, 1864	+		+		+		+	+	+	
Lithophyllon mokai Hoeksema, 1989								+		
Lithophyllon repanda (Dana, 1846)	+	+	+		+	+	+	+	+	Synonymised (*Fungia repanda*)
Lithophyllon undulatum Rehberg, 1892	+	+	+				+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Lobactis scutaria (Lamarck, 1801)			+	+	+	+	+	+		Synonymised (*Fungia scutaria*)
Pleuractis cf. *moluccensis* Horst, 1919								+		
Pleuractis granulosa Klunzinger, 1879						+	+	+		
Pleuractis gravis Nemenzo, 1955								+		
Pleuractis paumotensis Stutchbury, 1833					+		+	+		
Podabacia crustacea (Pallas, 1766)	+	+	+			+	+	+	+	
Podabacia motuporensis Veron, 1990	+				+		+			Range extension
Polyphyllia talpina (Lamarck, 1801)	+		+		+	+	+	+	+	
Sandalolitha dentata Quelch, 1886	+	+					+			Range extension
Sandalolitha robusta Quelch, 1886		+	+		+		+	+		
Family: Lobophyllidae										
Micromussa amakusensis (Veron, 1990)	+					+	+		+	
Moseleya latistellata Quelch, 1884	+	+	+				+	+	+	
Oxypora crassispinosa Nemenzo, 1979					+	+	+			Range extension
Oxypora glabra Nemenzo, 1959	+	+	+			+	+	+		
Oxypora lacera (Verrill, 1864)	+	+	+		+	+	+	+	+	
Acanthastrea brevis Milne Edwards & Haime, 1849								+		
Acanthastrea echinata (Dana, 1846)	+	+	+			+	+	+	+	
Acanthastrea hemprichii (Ehrenberg, 1834)	+	+	+	+		+	+		+	
Acanthastrea minuta Moll & Best, 1984						+	+			Range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Acanthastrea pachysepta (Chevalier, 1975)			+				+			Synonymised (*Lobophyllia pachysepta*); range extension, photographic record only
Acanthastrea rotundoflora Chevalier, 1975	+	+	+				+			Range extension
Acanthastrea subechinata Veron, 2000	+	+			+	+	+			Range extension
Cynarina lacrymalis (Milne Edwards & Haime, 1848)			+				+	+		
Homophyllia bowerbanki (Milne Edwards & Haime, 1857)		+	+				+	+	+	Synonymised (*Acanthastrea bowerbanki*, *A. hillae*)
Lobophyllia agaricia (Milne Edwards & Haime, 1849)								+	+	Synonymised (*Symphyllia agaricia*)
Lobophyllia corymbosa (Forskål, 1775)	+	+	+			+	+	+	+	
Lobophyllia diminuta Veron, 1985	+						+		+	Range extension
Lobophyllia flabelliformis Veron, 2000						+	+		+	
Lobophyllia cf. *hassi* (Pillai & Scheer, 1976)					+		+	+		Range extension, requires further verification
Lobophyllia hemprichii (Ehrenberg, 1834)	+	+	+	+		+	+	+	+	
Lobophyllia radians (Milne Edwards & Haime, 1849)	+	+	+	+		+	+	+	+	Synonymised (*Symphyllia radians*)
Lobophyllia recta (Dana, 1846)	+	+	+	+		+	+	+	+	Synonymised (*Symphyllia recta*)
Lobophyllia robusta Yabe & Sugiyama, 1936			+			+	+			Range extension
Lobophyllia rowleyensis Veron, 1985	+	+	+			+	+	+		Synonymised (*Australomussa rowleyensis*, *Parascolymia rowleyensis*)
Lobophyllia serrata Veron, 2000									+	Previously spelt incorrectly (**Lobophyllia serratus*)
Lobophyllia valenciennesii (Milne Edwards & Haime, 1849)	+	+	+	+			+	+	+	Synonymised (*Symphyllia valenciennesii*)
Lobophyllia vitiensis (Bruggemann, 1877)	+						+	+		Synonymised (*Scolymia vitiensis*)
Micromussa amakusensis (Veron, 1990)	+					+	+			Range extension
Micromussa lordhowensis (Veron & Pichon, 1982)	+		+				+	+	+	Synonymised (*Acanthastrea lordhowensis*)
Micromussa regularis (Veron, 2000)	+		+				+			Synonymised (*Acanthastrea regularis*); range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Family: Merulinidae										
Astrea annuligera Milne Edwards & Haime, 1849	+						+	+	+	Synonymised (*Montastraea annuligera*)
Astrea curta Dana, 1846	+	+	+	+		+	+	+	+	Synonymised (*Montastraea curta*)
Astrea cf. *devantieri* (Veron, 2000)						+	+			Range extension, requires further verification
Australogyra zelli (Veron, Pichon & Best, 1977)	+						+			Range extension
Catalaphyllia jardinei (Saville-Kent, 1893)	+	+	+				+	+	+	
Caulastrea curvata Wijsman-Best, 1972	+						+	+		
Caulastrea furcata Dana, 1846	+		+			+	+	+	+	
Caulastrea tumida Matthai, 1928	+		+				+	+	+	
Coelastrea aspera Verrill, 1865	+	+	+			+	+	+	+	Synonymised (*Goniastrea aspera*)
Coelastrea palauensis (Yabe, Sugiyama & Eguchi, 1936)			+				+	+		
Cyphastrea agassizi (Vaughan, 1907)		+		+			+	+		Range extension
Cyphastrea chalcidicum (Forskål, 1775)	+	+	+	+	+	+	+	+	+	
Cyphastrea decadia Moll & Best, 1984	+	+	+				+			Range extension, photographic record only
Cyphastrea japonica Yabe & Sugiyama, 1932						+	+			Range extension
Cyphastrea microphthalma (Lamarck, 1816)	+	+	+	+		+	+	+	+	
Cyphastrea serailia (Forskål, 1775)	+	+	+	+			+	+	+	
Diploastrea heliopora (Lamarck, 1816)	+	+	+	+	+		+	+	+	
Dipsastraea amicorum (Milne Edwards & Haime, 1849)	+	+	+			+	+	+	+	Synonymised (*Barabattoia amicorum*)
Dipsastraea danae Verrill, 1872							+	+	+	Synonymised (*Favia danae*)
Dipsastraea favus (Forskål, 1775)	+	+	+	+		+	+	+	+	Synonymised (*Favia favus*)
Dipsastraea helianthoides Wells, 1954	+	+	+			+	+	+		Synonymised (*Favia helianthoides*)

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Dipsastraea laxa (Klunzinger, 1879)	+						+	+		Synonymised (*Favia laxa*)
Dipsastraea lizardensis Veron, Pichon & Wijsman-Best, 1977	+	+	+	+			+	+	+	Synonymised (*Favia lizardensis*)
Dipsastraea maritima (Nemenzo, 1971)	+	+	+		+		+	+	+	Synonymised (*Favia maritima*)
Dipsastraea marshae Veron, Pichon & Wijsman-Best, 1977	+						+			Synonymised (*Favia marshae*); range extension
Dipsastraea matthaii Vaughan, 1918	+		+	+		+	+	+	+	Synonymised (*Favia matthaii*)
Dipsastraea maxima (Veron, Pichon & Wijsman-Best, 1977)	+	+	+				+	+	+	Synonymised (*Favia maxima*)
Dipsastraea pallida (Dana, 1846)	+	+	+	+	+	+	+	+	+	Synonymised (*Favia pallida*)
Dipsastraea rotumana (Gardiner, 1899)						+	+	+	+	Synonymised (*Favia rotumana*)
Dipsastraea speciosa Dana, 1846	+	+	+	+		+	+	+	+	Synonymised (*Favia speciosa*)
Dipsastraea truncata Veron, 2000						+	+	+		Synonymised (*Favia truncata*)
Dipsastraea veroni Moll & Borel-Best, 1984	+	+	+				+	+	+	
Echinophyllia aspera (Ellis & Solander, 1786)	+	+	+			+	+	+	+	
Echinophyllia echinata (Saville-Kent, 1871)	+					+	+	+		
Echinophyllia cf. *echinoporoides* Veron & Pichon, 1980								+		Requires further verification
Echinophyllia orpheensis Veron & Pichon, 1980			+			+	+	+		
Echinophyllia patula (Hodgson & Ross, 1982)	+	+			+		+			Range extension
Echinophyllia cf. *pectinata* Veron, 2000	+				+	+	+			Range extension
Echinopora ashmorensis Veron, 1990		+	+		+	+	+	+		
Echinopora gemmacea Lamarck, 1816	+	+	+			+	+	+	+	
Echinopora hirsutissima Milne Edwards & Haime, 1849						+	+	+		
Echinopora horrida Dana, 1846					+	+	+	+		
Echinopora lamellosa (Esper, 1795)	+	+	+	+	+	+	+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Echinopora mammiformis (Nemenzo, 1959)	+						+	+		
Favites abdita (Ellis & Solander, 1786)	+	+	+	+	+	+	+	+	+	
Favites acuticollis (Ortmann, 1889)	+						+			Range extension
Favites chinensis (Verrill, 1866)	+	+	+				+	+	+	
Favites colemani (Veron, 2000)	+	+	+	+		+	+			Range extension
Favites complanata (Ehrenberg, 1834)	+	+	+				+	+	+	
Favites flexuosa (Dana, 1846)	+	+	+	+	+	+	+	+	+	
Favites halicora (Ehrenberg, 1834)	+	+	+	+		+	+	+	+	
Favites magnistellata (Milne Edwards & Haime, 1849)	+	+	+			+	+	+	+	Synonymised (*Montastrea magnistellata*)
Favites micropentagonus Veron, 2000	+	+	+	+		+	+			Range extension
Favites paraflexuosus Veron, 2000	+	+				+	+		+	
Favites pentagona (Esper, 1794)	+	+	+	+	+	+	+	+	+	Synonymised (*Favia rotundata*)
Favites rotundata (Veron, Pichon & Wijsman-Best, 1977)		+	+	+	+	+	+	+	+	
Favites stylifera (Yabe & Sugiyama, 1937)	+	+		+		+	+	+	+	
Favites valenciennesi (Milne Edwards & Haime, 1848)	+	+	+			+	+	+	+	Synonymised (*Montastrea valenciennesi*)
Goniastrea edwardsi Chevalier, 1971	+		+	+	+	+	+	+	+	
Goniastrea favulus (Dana, 1846)	+	+	+	+		+	+	+	+	
Goniastrea pectinata (Ehrenberg, 1834)	+	+	+		+	+	+	+	+	
Goniastrea retiformis (Lamarck, 1816)	+	+	+	+		+	+	+	+	
Goniastrea stelligera (Dana, 1846)	+	+	+		+	+	+	+	+	Synonymised (*Favia stelligera*)
Hydnophora exesa (Pallas, 1766)	+	+	+	+	+	+	+	+	+	
Hydnophora grandis Gardiner, 1904	+		+	+			+			Range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Hydnophora microconos (Lamarck, 1816)			+		+	+	**+**	+	+	
Hydnophora pilosa Veron, 1985	+	+	+		+		**+**	+	+	
Hydnophora rigida (Dana, 1846)	+		+		+	+	**+**	+	+	
Leptoria phrygia (Ellis & Solander, 1786)	+	+	+		+	+	**+**	+	+	
Merulina ampliata (Ellis & Solander, 1786)	+	+	+	+	+	+	**+**	+	+	
Merulina scabricula Dana, 1846	+	+	+	+	+	+	**+**	+	+	Synonymised (*Clavarina triangularis*, *Paraclavarina triangularis*); range extension
Merulina triangularis (Veorn & Pichon, 1980)		+					**+**			Range extension, photographic record only
Mycedium elephantotus (Pallas, 1766)	+	+	+	+	+	+	**+**	+	+	
Mycedium cf. *mancaoi* Nemenzo, 1979								+		Requires further verification
Mycedium robokaki Moll & Borel-Best, 1984	+					+	**+**	+		Range extension
Oulastrea crispata (Lamarck, 1816)								+	+	
Oulophyllia bennettae (Veron, Pichon & Wijsman-Best, 1977)	+	+	+		+	+	**+**	+	+	
Oulophyllia crispa (Lamarck, 1816)	+	+	+	+		+	**+**	+	+	
Paragoniastrea australensis (Milne Edwards & Haime, 1857)	+	+	+		+	+	**+**	+	+	
Paragoniastrea russelli (Wells, 1954)	+	+	+	+			**+**	+	+	Synonymised (*Favites russelli*)
Paramontastraea salebrosa (Nemenzo, 1959)						+	**+**			Synonymised (*Montastrea salebrosa*, *Phymastrea salebrosa*)
Pectinia alcicornis (Saville-Kent, 1871)						+	**+**	+		
Pectinia elongata (Rehberg, 1892)						+	**+**			Range extension
Pectinia lactuca (Pallas, 1766)	+	+	+		+	+	**+**	+	+	
Pectinia maxima (Moll & Best, 1984)		+					**+**			Range extension
Pectinia paeonia (Dana, 1846)	+	+	+		+	+	**+**	+	+	
Pectinia teres Nemenzo & Montecillo, 1981					+		**+**	+		

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Platygyra acuta Veron, 2000	+		+				+		+	
Platygyra carnosa Veron, 2000			+				+		+	
Platygyra daedalea (Ellis & Solander, 1786)	+	+	+	+		+	+	+	+	
Platygyra lamellina (Ehrenberg, 1834)	+	+	+			+	+	+	+	
Platygyra pini Chevalier, 1975	+	+	+	+	+	+	+	+	+	
Platygyra ryukyuensis Yabe & Sugiyama, 1936	+		+			+	+	+	+	
Platygyra sinensis (Milne Edwards & Haime, 1849)	+	+	+	+		+	+	+	+	
Platygyra verweyi Wijsman-Best, 1976	+				+	+	+	+		
Platygyra yaeyamaensis (Eguchi & Shirai, 1977)			+				+			Range extension
Scapophyllia cylindrica Milne Edwards & Haime, 1848	+				+	+	+	+		
Trachyphyllia geoffroyi (Audouin, 1826)	+	+	+				+	+		
Family: Plesiastreidae										
Plesiastrea peroni Milne Edwards & Haime, 1857	+	+	+	+		+	+	+	+	
Family: Pocilloporidae										
Madracis kirbyi Veron and Pichon, 1979		+					+		+	
Pocillopora damicornis (Linnaeus, 1758)	+	+	+			+	+	+	+	
Pocillopora grandis Milne Edwards & Haime, 1860	+	+	+	+	+	+	+	+		Synonymised (*Pocillopora eydouxi*)
Pocillopora meandrina Dana, 1846			+			+	+	+	+	
Pocillopora verrucosa (Ellis & Solander, 1786)		+	+	+	+	+	+	+	+	
Pocillopora woodjonesi Vaughan, 1918								+		
Seriatopora aculeata Quelch, 1886	+		+			+	+		+	
Seriatopora caliendrum Ehrenberg, 1834	+	+	+			+	+	+	+	

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Seriatopora dentritica Veron, 2000						+	+			Range extension
Seriatopora guttata Veron, 2000			+				+			Synonymised (*Seriatopora guttatus*); range extension
Seriatopora hystrix Dana, 1846	+	+	+		+	+	+	+	+	
Seriatopora stellata Quelch, 1886					+	+	+			Range extension
Stylophora pistillata Esper, 1797	+	+	+	+	+	+	+	+	+	
Stylophora subseriata (Ehrenberg, 1834)	+	+	+		+		+		+	Range extension
Family: Poritidae										
Bernardpora stutchburyi (Wells, 1955)	+	+	+			+	+	+	+	Synonymised (*Goniopora stutchburyi*)
Goniopora burgosi Nemenzo, 1955		+	+		+	+	+	+		Range extension
Goniopora columna Dana, 1846	+	+	+			+	+	+	+	
Goniopora djiboutiensis Vaughan, 1907	+	+	+	+		+	+	+	+	
Goniopora eclipsensis Veron & Pichon, 1982								+		
Goniopora fruticosa Saville-Kent, 1891	+					+	+		+	
Goniopora lobata Milne Edwards & Haime, 1860	+	+	+			+	+	+	+	
Goniopora norfolkensis Veron & Pichon, 1982	+	+	+			+	+	+	+	
Goniopora cf. *paliformis* (Veron, 2000)						+	+			Synonymised (*Poritipora paliformis*); possible range extension, requires further verification
Goniopora palmensis Veron & Pichon, 1982				+		+	+	+		Range extension
Goniopora pandoraensis Veron & Pichon, 1982	+	+				+		+		
Goniopora pedunculata Quoy & Gaimard, 1833		+				+	+	+		Synonymised (*Goniopora minor*)
Goniopora pendulus Veron, 1985								+	+	
Goniopora polyformis (Zou, 1980)						+	+			Range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Goniopora somaliensis Vaughan, 1907	+	+	+			+	+	+		
Goniopora stokesi Milne Edwards & Haime, 1851		+					+	+		
Goniopora tenella (Quelch, 1886)	+					+	+			Range extension
Goniopora tenuidens (Quelch, 1886)	+	+	+	+		+	+	+	+	
Poriites aranetai Nemenzo, 1955	+	+	+				+		+	
Porites annae Crossland, 1952	+	+	+			+	+	+	+	
Porites attenuata Nemenzo, 1955			+		+		+			Range extension
Porites cf. *australiensis* Vaughan, 1918	+	+	+	+		+	+	+	+	Requires further verification
Porites cylindrica Dana, 1846	+	+	+	+	+	+	+	+	+	
Porites cf. *eridani* Umbgrove, 1940								+		Requires further verification
Porites cf. *evermanni* Vaughan, 1907		+			+		+			Requires further verification
Porites flavus Veron, 2000		+			+		+			Range extension
Porites heronensis Veron, 1985					+	+	+			
Porites horizontalata Hoffmeister, 1925					+	+	+			Range extension
Porites latistellata Quelch, 1886					+	+	+			Range extension
Porites lichen Dana, 1846	+	+	+		+	+	+	+	+	
Porites lobata Dana, 1846	+	+	+	+	+	+	+	+	+	
Porites lutea Milne Edwards & Haime, 1851	+	+	+	+	+	+	+	+	+	
Porites monticulosa Dana, 1846					+		+	+		
Porites murrayensis Vaughan, 1918	+		+		+		+	+		
Porites nigrescens Dana, 1846	+				+	+	+	+	+	
Porites profundus Rehberg, 1892						+	+			Range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore		Kimberley region			
	South	Central	North	Midshelf	South	North		Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Porites rugosa Fenner &Veron, 2000						+	**+**			Range extension
Porites rus (Forskål, 1775)	+	+	+	+	+	+	**+**	+	+	
Porites silimaniani Nemenzo, 1976						+	**+**			Range extension
Porites solida (Forskål, 1775)		+				+	**+**	+	+	
Porites stephensoni Crossland, 1952	+	+	+	+	+	+	**+**	+	+	
Porites vaughani Crossland, 1952	+	+	+	+	+	+	**+**	+		
Stylaraea punctata (Linnaeus, 1758)									+	
Family: Psammocoridae										
Psammocora albopicta Benzoni, 2006		+					**+**			Range extension
Psammocora contigua (Esper, 1797)	+	+	+		+	+	**+**	+	+	Synonymised (*Psammocora obtusangula*)
Psammocora digitata Milne Edwards & Haime, 1851	+	+	+	+		+	**+**	+	+	
Psammocora haimeana Milne Edwards & Haime, 1851	+	+	+			+	**+**	+	+	
Psammocora nierstraszi Horst, 1921	+	+	+			+	**+**	+		
Psammocora profundacella Gardiner, 1898	+	+	+			+	**+**	+	+	Synonymised (*Psammocora superficialis*)
Psammocora cf. *stellata* (Verrill, 1866)						+	**+**			Possible range extension, requires further verification; photographic record only
Pseudosiderastrea tayami Yabe & Sugiyama, 1935	+	+	+				**+**	+	+	
Scleractinia incertae sedis										
Blastomussa vivida Benzoni, Arrigoni & Hoeksema, 2014	+		+				**+**			Range extension
Blastomussa wellsi Wijsman-Best, 1973	+						**+**			Requires further verification
Leptastrea aequalis Veron, 2000								+	+	
Leptastrea bottae (Milne Edwards & Haime, 1849)					+	+	**+**		+	Range extension
Leptastrea inaequalis Klunzinger, 1879	+						**+**	+		Range extension

	THIS STUDY							HISTOR.		
	Inshore				Offshore					
	South	Central	North	Midshelf	South	North	Kimberley region	Kimberley	Bonaparte	Taxonomic notes and biogeographic remarks
Leptastrea pruinosa Crossland, 1952	+	+	+		+	+	**+**	+	+	
Leptastrea purpurea (Dana, 1846)	+	+	+	+		+	**+**	+	+	
Leptastrea transversa Klunzinger, 1879		+	+			+	**+**	+	+	
Pachyseris rugosa (Lamarck, 1801)	+	+			+	+	**+**	+	+	
Pachyseris speciosa (Dana, 1846)	+	+	+	+	+	+	**+**	+	+	
Physogyra lichtensteini (Milne Edwards & Haime, 1851)		+	+		+	+	**+**	+	+	
Plerogyra sinuosa (Dana, 1846)	+	+	+				**+**	+		
Order: Alcyonacea										
Family: Tubiporidae										
Tubipora musica Linnaeus, 1758	+	+	+	+		+	**+**			
Order: Helioporacea										
Family: Helioporidae										
Heliopora coerulea (Pallas, 1766)	+	+	+	+	+	+	**+**		+	
Heliopora hiberniana Richards et al., 2018						+	**+**			
HYDROZOA										
Order: Anthoathecata										
Family: Milleporidae										
Millepora exaesa Forskål, 1775	+	+	+	+		+	**+**		+	
Millepora platyphylla Hemprich & Ehrenberg, 1834						+	**+**			Range extension
Millepora tenera Boschma, 1949	+	+		+		+	**+**			Range extension
TOTALS	258	220	247	92	165	251	**395**	332	229	**Overall regional hermatypic coral biodiversity = 438 species**

APPENDIX 2 Mean species diversity (+ SE) per 15 x 1 m at the 135 survey stations. See Bryce et al. 2017 for further descriptions of the stations surveyed. The twenty most diverse sites are marked in bold.

Shelf position	Tidal zone	Location	Site	Mean diversity	SE	n transects
Inshore	Subtidal	Adele Island	1	15.50	2.06	4
Inshore	Subtidal	Adele Island	2	21.00	1.58	4
Inshore	Intertidal	Adele Island	3	25.75	1.44	4
Inshore	Subtidal	Adele Island	4	13.75	1.25	4
Inshore	Subtidal	Adele Island	5	20.75	1.49	4
Inshore	Subtidal	Adele Island	6	19.75	2.93	4
Inshore	Intertidal	Adele Island	7	9.25	1.49	4
Inshore	Subtidal	Adele Island	8	1.00	0.00	4
Inshore	Subtidal	Adele Island	9	28.00	2.27	4
Inshore	Intertidal	Adele Island	10	16.50	2.33	4
Inshore	Intertidal	Adele Island	11	3.00	0.91	4
Inshore	Subtidal	Adele Island	12	21.25	2.87	4
Inshore	Subtidal	Adele Island	13	22.00	5.12	4
Inshore	Intertidal	Montgomery Reef	14	22.50	2.63	4
Inshore	Intertidal	Montgomery Reef	15	5.75	3.12	4
Inshore	Intertidal	Montgomery Reef	17	13.25	1.11	4
Inshore	Intertidal	Montgomery Reef	18	28.67	1.67	3
Inshore	Intertidal	Montgomery Reef	19	18.50	3.43	4
Inshore	Intertidal	Montgomery Reef	20	16.25	1.84	4
Inshore	Intertidal	Montgomery Reef	21	23.00	0.00	3
Inshore	Intertidal	Montgomery Reef	22	6.67	0.33	3
Inshore	Intertidal	Montgomery Reef	23	16.67	1.45	3
Inshore	Intertidal	Montgomery Reef	24	24.00	0.58	3
Inshore	Intertidal	Montgomery Reef	25	7.67	0.33	3
Inshore	Intertidal	Montgomery Reef	26	10.33	0.88	3
Inshore	Intertidal	Montgomery Reef	27	17.25	1.03	4
Inshore	Subtidal	Cassini Island	28	31.25	5.36	4
Inshore	Subtidal	Cassini Island	29	22.00	2.74	4
Inshore	Subtidal	Cassini Island	30	18.50	2.47	4
Inshore	Subtidal	Cassini Island	31	18.75	2.69	4
Inshore	Intertidal	Cassini Island	32	3.25	0.48	4
Inshore	Intertidal	Cassini Island	33	10.00	4.18	4
Inshore	Subtidal	Cassini Island	34	28.75	2.95	4
Inshore	Intertidal	Cassini Island	35	10.00	4.73	4
Inshore	Subtidal	Cassini Island	36	22.50	1.50	4
Inshore	Intertidal	Cassini Island	37	20.50	2.10	4
Inshore	Subtidal	Cassini Island	38	29.50	3.57	4
Inshore	Subtidal	Cassini Island	39	22.50	2.53	4
Inshore	**Subtidal**	**Cassini Island**	**40**	**37.75**	**2.10**	**4**
Inshore	Subtidal	Cassini Island	41	23.50	2.33	4
Inshore	Intertidal	Cassini Island	42	22.00	6.16	4
Inshore	Subtidal	Long Reef	43	15.75	1.49	4
Inshore	Subtidal	Long Reef	44	23.25	1.70	4
Inshore	Intertidal	Long Reef	45	8.25	4.13	4

Shelf position	Tidal zone	Location	Site	Mean diversity	SE	n transects
Inshore	Intertidal	Long Reef	46	18.25	2.25	4
Inshore	Subtidal	Long Reef	47	28.00	1.87	4
Inshore	Intertidal	Long Reef	49	3.33	0.88	3
Inshore	Intertidal	Long Reef	50	12.25	2.78	4
Inshore	Intertidal	Long Reef	51	8.00	2.38	4
Inshore	Intertidal	Long Reef	52	18.00	3.32	4
Inshore	Subtidal	Long Reef	53	15.25	1.75	4
Inshore	Intertidal	Long Reef	54	25.00	0.00	1
Inshore	Intertidal	Long Reef	55	6.75	1.11	4
Inshore	Intertidal	Long Reef	56	11.75	2.84	4
Inshore	Subtidal	Long Reef	57	27.25	3.64	4
Inshore	Subtidal	Cassini Island	58	28.50	1.32	4
Inshore	Intertidal	Cassini Island	59	11.00	4.22	4
Inshore	Intertidal	Cassini Island	60	15.75	2.69	4
Inshore	Intertidal	Wildcat Rocks	61	10.00	1.00	4
Inshore	Intertidal	Champagney Islands	62	5.25	2.29	4
Inshore	Intertidal	Champagney Islands	63	10.75	1.18	4
Inshore	Subtidal	White Island	64	12.00	1.47	4
Inshore	Intertidal	White Island	65	23.33	1.45	3
Inshore	Intertidal	White Island	66	12.25	0.85	4
Inshore	Subtidal	Black Rocks	67	22.67	0.88	4
Inshore	Subtidal	White Island	68	19.75	1.65	4
Inshore	Subtidal	Unnamed outcrop, NW of Black Rocks	69	12.75	1.65	4
Inshore	Intertidal	Beagle Reef	72	10.75	2.02	4
Inshore	Intertidal	Beagle Reef	73	8.50	0.65	4
Inshore	Subtidal	Beagle Reef	74	3.75	1.55	4
Inshore	Subtidal	Beagle Reef	75	27.33	0.67	3
Inshore	Subtidal	Mavis Reef	76	23.25	1.49	4
Inshore	**Subtidal**	**Mavis Reef**	**77**	**33.00**	**3.61**	**3**
Inshore	Subtidal	Mavis Reef	78	25.00	1.83	4
Inshore	Subtidal	Albert Reef	79	29.25	1.11	4
Inshore	Subtidal	Brue Reef	80	13.50	2.60	4
Inshore	Intertidal	Brue Reef	81	13.75	0.85	4
Inshore	Intertidal	Brue Reef	82	11.75	1.60	4
Inshore	Subtidal	Brue Reef	83	17.00	1.41	4
Inshore	Subtidal	Fraser Island	84	18.50	3.18	4
Inshore	Subtidal	Fraser Island	85	16.75	2.50	4
Inshore	Subtidal	King and Conway Islands	86	20.00	1.35	4
Inshore	Intertidal	King and Conway Islands	87	4.00	1.00	4
Inshore	Subtidal	King and Conway Islands	88	22.75	0.95	4
Inshore	Intertidal	Irvine and Bathurst Islands	89	25.00	0.82	4
Inshore	Intertidal	Irvine and Bathurst Islands	90	24.67	2.96	3
Inshore	Subtidal	White Island	93	21.00	1.73	4
Inshore	Subtidal	De Freycinet Island	94	18.50	2.40	4
Inshore	Subtidal	De Freycinet Island	95	20.75	3.45	4

Shelf position	Tidal zone	Location	Site	Mean diversity	SE	n transects
Inshore	Subtidal	Hedley Island	96	31.25	2.43	4
Inshore	Intertidal	Hedley Island	97	11.75	2.56	4
Inshore	Intertidal	Hedley Island	98	10.50	1.66	4
Inshore	Subtidal	Reef NW of Woodward Island	99	27.75	2.95	4
Inshore	Intertidal	Woodward Island	100	21.25	4.13	4
Offshore	Subtidal	Browse Island	101	22.50	3.23	4
Offshore	Subtidal	Browse Island	102	26.25	1.38	4
Offshore	Intertidal	Browse Island	103	6.50	0.96	4
Offshore	Intertidal	Browse Island	104	7.50	0.65	4
Offshore	Subtidal	Browse Island	105	24.00	2.68	4
Offshore	Subtidal	Browse Island	106	11.50	2.22	4
Inshore	**Subtidal**	**Jameson Reef**	**110**	**37.33**	**6.84**	**3**
Inshore	**Subtidal**	**Jameson Reef**	**111**	**35.00**	**1.00**	**3**
Inshore	Intertidal	Condillac Island	112	11.00	0.71	4
Inshore	**Subtidal**	**Condillac Island**	**113**	**32.67**	**6.64**	**3**
Inshore	**Subtidal**	**Condillac Island**	**114**	**32.67**	**0.33**	**3**
Inshore	Subtidal	Heritage Reef	115	31.00	1.53	3
Inshore	**Subtidal**	**West Montelivet Island**	**116**	**35.50**	**2.90**	**4**
Inshore	**Subtidal**	**West Montelivet Island**	**117**	**33.33**	**0.33**	**3**
Inshore	Subtidal	Robroy Reefs	118	15.00	0.58	4
Inshore	**Subtidal**	**Robroy Reefs**	**119**	**33.00**	**5.13**	**3**
Inshore	Subtidal	Maret Island	120	23.00	3.51	3
Offshore	Subtidal	Ashmore Reef	122	24.25	2.29	4
Offshore	Subtidal	Ashmore Reef	124	26.50	0.50	4
Offshore	**Subtidal**	**Ashmore Reef**	**125**	**34.00**	**3.79**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**126**	**45.33**	**0.67**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**127**	**44.33**	**1.76**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**128**	**32.75**	**1.55**	**4**
Offshore	Intertidal	Ashmore Reef	129	12.25	1.44	4
Offshore	**Subtidal**	**Ashmore Reef**	**130**	**37.33**	**8.95**	**3**
Offshore	Intertidal	Ashmore Reef	131	5.25	0.48	4
Offshore	**Subtidal**	**Ashmore Reef**	**132**	**43.67**	**2.19**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**133**	**32.00**	**4.16**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**134**	**38.33**	**2.85**	**3**
Offshore	Subtidal	Ashmore Reef	135	22.33	3.71	3
Offshore	Subtidal	Ashmore Reef	136	25.33	1.45	3
Offshore	Intertidal	Ashmore Reef	137	2.50	0.50	4
Offshore	Subtidal	Ashmore Reef	138	13.67	2.19	3
Offshore	**Subtidal**	**Ashmore Reef**	**139**	**40.00**	**6.24**	**3**
Offshore	**Subtidal**	**Ashmore Reef**	**140**	**49.00**	**1.53**	**3**
Offshore	Intertidal	Ashmore Reef	141	8.00	1.53	3
Offshore	Subtidal	Hibernia Reef	142	25.67	4.67	3
Offshore	Subtidal	Hibernia Reef	143	27.67	6.33	3
Offshore	**Subtidal**	**Hibernia Reef**	**144**	**35.67**	**2.60**	**3**
Offshore	Subtidal	Hibernia Reef	145	25.00	2.65	3

APPENDIX 3 Total abundance of the top 100 most numerically dominant species counted on belt transects in intertidal and subtidal zones. Species marked in bold are among the 20 most dominant species in both intertidal and subtidal habitat zones.

INTERTIDAL ZONE

Rank	Genus	Species	Abundance
1	*Goniastrea*	*retiformis*	443
2	*Porites*	*lutea*	391
3	*Dipsastraea*	*pallida*	318
4	*Goniastrea*	*favulus*	277
5	*Coelastrea*	*aspera*	266
6	*Montipora*	*digitata*	211
7	*Acropora*	*aspera*	205
8	*Favites*	*abdita*	205
9	***Cyphastrea***	***microphthalma***	**162**
10	***Isopora***	***brueggemanni***	**161**
11	***Galaxea***	***astreata***	**149**
12	***Platygyra***	***pini***	**147**
13	*Goniopora*	*lobata*	118
14	*Coeloseris*	*mayeri*	104
15	*Platygyra*	*daedalea*	98
16	*Acropora*	*digitifera*	97
17	*Leptastrea*	*purpurea*	95
18	***Heliopora***	***coerulea***	**90**
19	*Dipsastraea*	*favus*	85
20	***Porites***	***cylindrica***	**78**
21	*Pocillopora*	*damicornis*	76
22	*Acropora*	*spicifera*	73
23	*Favites*	*halicora*	72
24	*Goniopora*	*norfolkensis*	71
25	*Turbinaria*	*reniformis*	66
26	*Goniopora*	*tenuidens*	65
27	*Montipora*	*aequituberculata*	59
28	*Seriatopora*	*hystrix*	54
29	*Porites*	*annae*	53
30	*Platygyra*	*sinensis*	52
31	*Trachyphyllia*	*geoffroyi*	52
32	*Cyphastrea*	*chalcidicum*	51
33	*Goniastrea*	*pectinata*	49
34	*Plesiastera*	*versipora*	42
35	*Hydnophora*	*exesa*	40
36	*Isopora*	*palifera*	40
37	*Lobophyllia*	*corymbosa*	40
38	*Acropora*	*arafura*	34
39	*Acropora*	*millepora*	31
40	*Montipora*	*turgescens*	30
41	*Astrea*	*curta*	29
42	*Echinopora*	*lamellosa*	29
43	*Millepora*	spp.	28
44	*Montipora*	*hispida*	27
45	*Psammocora*	*contigua*	26
46	*Astreopora*	*myriophthalma*	25
47	*Porites*	*stephensoni*	25
48	*Favites*	*valenciennesi*	23

SUBTIDAL ZONE

Rank	Genus	Species	Abundance
1	*Porites*	*lichen*	607
2	***Heliopora***	***coerulea***	**418**
3	*Seriatopora*	*hystrix*	353
4	*Goniastrea*	*pectinata*	332
5	*Montipora*	*aequituberculata*	295
6	*Montipora*	*crassituberculata*	294
7	***Cyphastrea***	***microphthalma***	**263**
8	*Porites*	*rus*	251
9	*Pachyseris*	*speciosa*	247
10	***Isopora***	***brueggemanni***	**234**
11	*Turbinaria*	*mesenterina*	223
12	***Porites***	***cylindrica***	**214**
13	*Pavona*	*varians*	189
14	***Platygyra***	***pini***	**185**
15	*Favites*	*pentagona*	183
16	*Porites*	*lobata*	183
17	*Mycedium*	*elephantotus*	171
18	*Dipsastraea*	*pallida*	167
19	*Merulina*	*ampliata*	167
20	***Galaxea***	***astreata***	**165**
21	*Tubastrea*	sp.	143
22	*Stylophora*	*pistillata*	141
23	*Montipora*	*turgescens*	137
24	*Podabacia*	*crustacea*	132
25	*Stylophora*	*subseriata*	132
26	*Pavona*	*minuta*	129
27	*Isopora*	*palifera*	124
28	*Platygyra*	*daedalea*	121
29	*Porites*	*lutea*	120
30	*Echinopora*	*lamellosa*	119
31	*Acropora*	*muricata*	115
32	*Dipsastraea*	*speciosa*	111
33	*Acropora*	*granulosa*	107
34	*Favites*	*abdita*	105
35	*Millepora*	spp.	103
36	*Echinophyllia*	*aspera*	100
37	*Leptastrea*	*purpurea*	99
38	*Acropora*	*divaricata*	96
39	*Hydnophora*	*exesa*	93
40	*Astrea*	*curta*	92
41	*Cyphastrea*	*serailia*	86
42	*Goniastrea*	*retiformis*	83
43	*Lithophyllon*	*repanda*	82
44	*Lobophyllia*	*hemprichii*	82
45	*Porites*	*vaughani*	82
46	*Acropora*	*loripes*	81
47	*Oxypora*	*lacera*	80
48	*Dipsastraea*	*favus*	78

INTERTIDAL ZONE

Rank	Genus	Species	Abundance
49	*Porites*	*attenuata*	21
50	*Platygyra*	*lamellina*	20
51	*Fungia*	*fungites*	19
52	*Montipora*	*turtlensis*	19
53	*Stylophora*	*pistillata*	19
54	*Turbinaria*	*mesenterina*	19
55	*Euphyllia*	*glabrescens*	18
56	*Favites*	*acuticollis*	18
57	*Lobophyllia*	*radians*	18
58	*Stylophora*	*subseriata*	18
59	*Caulastraea*	*curvata*	17
60	*Favites*	*pentagona*	17
61	*Platygyra*	*ryukyuensis*	17
62	*Acropora*	*humilis*	16
63	*Cyphastrea*	*decadia*	16
64	*Acropora*	*nasuta*	15
65	*Cyphastrea*	*japonica*	15
66	*Goniastrea*	*stelligera*	15
67	*Lithophyllon*	*repanda*	15
68	*Montipora*	*crassituberculata*	15
69	*Leptastrea*	*transversa*	14
70	*Lithophyllon*	*concinna*	14
71	*Montipora*	*altasepta*	14
72	*Acanthastrea*	*hemprichi*	13
73	*Acropora*	*latistella*	13
74	*Favites*	*magnistellata*	13
75	*Favites*	*micropentagonus*	13
76	*Hydnophora*	*microconos*	13
77	*Merulina*	*ampliata*	13
78	*Montipora*	*grisea*	13
79	*Tubipora*	*musica*	13
80	*Turbinaria*	*bifrons*	13
81	*Acropora*	*pulchra*	12
82	*Galaxea*	*fascicularis*	12
83	*Hydnophora*	*rigida*	12
84	*Acropora*	*cerealis*	11
85	*Acropora*	*selago*	11
86	*Favites*	*colemani*	11
87	*Hydnophora*	*pilosa*	11
88	*Montipora*	*tuberculosa*	11
89	*Acropora*	*clathrata*	10
90	*Herpolitha*	*limax*	10
91	*Lobophyllia*	*hemprichii*	10
92	*Seriatopora*	*caliendrum*	10
93	*Goniastrea*	*edwardsi*	9
94	*Acropora*	*tenuis*	8
95	*Lobophyllia*	*recta*	8
96	*Porites*	*lobata*	8
97	*Scapophyllia*	*cylindrica*	8
98	*Acropora*	*cytherea*	7
99	*Acropora*	*muricata*	7
100	*Acropora*	*papillare*	7

SUBTIDAL ZONE

Rank	Genus	Species	Abundance
49	*Goniastrea*	*stelligera*	78
50	*Porites*	*nigrescens*	78
51	*Pocillopora*	*damicornis*	77
52	*Galaxea*	*fascicularis*	74
53	*Pocillopora*	*verrucosa*	74
54	*Goniopora*	*lobata*	73
55	*Pavona*	*explanulata*	73
56	*Favites*	*halicora*	72
57	*Stylocoeniella*	*guentheri*	72
58	*Acanthastrea*	*hemprichi*	68
59	*Seriatopora*	*caliendrum*	67
60	*Pavona*	*maldivensis*	64
61	*Acropora*	*intermedia*	63
62	*Porites*	*aranetai*	63
63	*Psammocora*	*profundacella*	63
64	*Platygyra*	*lamellina*	60
65	*Montipora*	*mollis*	58
66	*Acropora*	*aculeus*	56
67	*Acropora*	*selago*	53
68	*Merulina*	*scabricula*	53
69	*Goniopora*	*tenuidens*	52
70	*Lobophyllia*	*radians*	52
71	*Coeloseris*	*mayeri*	51
72	*Goniastrea*	*favulus*	50
73	*Lobophyllia*	*rowleyensis*	50
74	*Montipora*	*tuberculosa*	50
75	*Astreopora*	*myriophthalma*	49
76	*Favites*	*colemani*	49
77	*Lobophyllia*	*corymbosa*	49
78	*Montipora*	*peltiformis*	46
79	*Favites*	*valenciennesi*	45
80	*Acropora*	*tenuis*	44
81	*Dipsastraea*	*matthaii*	43
82	*Paragoniastrea*	*russelli*	43
83	*Acropora*	*millepora*	41
84	*Hydnophora*	*rigida*	38
85	*Bernardpora*	*stutchburyi*	37
86	*Echinopora*	*gemmacea*	37
87	*Leptoseris*	*yabei*	37
88	*Lobophyllia*	*robusta*	36
89	*Oulophyllia*	*crispa*	36
90	*Cyphastrea*	*chalcidicum*	35
91	*Diploastrea*	*heliopora*	35
92	*Turbinaria*	*reniformis*	35
93	*Acropora*	*cerealis*	34
94	*Acropora*	*spicifera*	34
95	*Oxypora*	*glabra*	33
96	*Pocillopora*	*meandrina*	33
97	*Porites*	*australiensis*	33
98	*Psammocora*	*contigua*	33
99	*Acropora*	*samoensis*	32
100	*Turbinaria*	*peltata*	32