

CHECKLIST OF THE SCLERACTINIAN CORAL SPECIES FROM THE
WATERS OF PADANG (WEST SUMATRA, INDONESIA) HELD IN THE
CORAL COLLECTION OF BUNG HATTA UNIVERSITY

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ABSTRACT

The coral collection project at Bung Hatta University, Padang, Indonesia, was initiated during March 1996, to fulfill an urgent need to document the coral fauna in the waters of West Sumatra. Before this time an extensive survey of the coral species of the area had not been performed and at the time of writing, the Bung Hatta University collection is the only substantial collection of scleractinian corals in Indonesia. This paper documents the reasons for which a coral collection was required, the development of the coral collection and the infrastructure required to support it. In addition, the 163 scleractinian coral species from 58 hermatypic and ahermatypic genera represented in the Bung Hatta University collection are listed.

KEYWORDS: Scleratinia, coral, checklist, Padang, Sumatra, Indonesia.

INTRODUCTION

The Indonesian Archipelago consists of 17,000 islands with over 81,000 km of coastline. Both the Indian and Pacific Oceans wash these islands, with Indonesian territorial waters being approximately 3,650,000 km² (World Resources Institute 1996). This vast aquatic environment contains a kaleidoscope of habitats including coral reefs, mangrove forests and sea grass beds. In fact, the coral reefs of Indonesia and the neighbouring Philippines are renowned as a global center of coral reef diversity. The reefs themselves are made up of as many as 70 genera of corals (Veron 1986), the highest generic diversity of anywhere in the world. In spite of the diversity and extent of the coral reefs of Indonesia, many of the areas are poorly known in a taxonomic sense and there was no substantial taxonomic reference collection of scleractinian corals held in any institution in Indonesia that documented the species present in the archipelago.

Prior to 1996, the Fisheries Research and Development Centre (PPPP) of Bung Hatta University had worked collaboratively with overseas coral taxonomists from the Museum of Tropical Queensland, Australia and the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands. This work, along with opportunistic coral collecting performed by members of the PPPP, indicated that there was an urgent requirement to document the coral fauna of the territorial waters of West Sumatra. The reasons for the urgency to establish this coral collection were twofold. Firstly, due to the lack of research which has been performed in the waters of West Sumatra, the coral species which can be found in the area are poorly known and further investigations would improve knowledge of genus and species distributions (Jonker and Johan 1998). This in turn would provide information for subsequent coral biodiversity and biogeographical studies for this area, whose coral fauna is influenced by both the Indian and Pacific Ocean faunas.

Secondly, the coral reefs in West Sumatra are under threat from anthropogenic sources, which include untreated waste from Padang's population of 700,000, pollution from industry, sedimentation and heavy metals from logging and mining operations, and fertiliser runoff from intensive agriculture activities. As well as these disturbances, coral and shell collecting and destructive fishing techniques (trawling, poison and explosives) are still used (Kunzmann 1997). Obviously there was a need to document the coral diversity in West Sumatra before it was destroyed and to assist in the implementation of marine protection programs to conserve what is left (Jonker and Johan 1998).

The importance of this second reason was realised with the onset of more recent and dramatic disturbances to the reefs which consisted of two consecutive events. From August till December 1998, West Sumatra, along with many other provinces of Indonesia, was blanketed by thick smoke, which was the direct result of uncontrolled forest fires. This smoke obscured the sun and thus resulted in a dramatic drop in water temperature of 5-6° C (from an average of 29° C). It is already clear that sudden and major deviations from an acclimated temperature regime may trigger bleaching in corals (Tomascik *et al.* 1997) and thus the drop in temperature caused by the predominating smoke conditions undoubtedly resulted in physiological stress to the corals, and minor localised bleaching events were noted. When the smoke cleared with the onset of delayed rain, the reefs were then subjected to a red tide event from late December 1997 to early January 1998. This proved to be catastrophic to the reefs in these waters, resulting in widespread coral death. In areas which, prior to the smoke and red tide events had a percentage live coral cover of up to 83% (Kunzmann and Efendi 1994), the live coral cover has been reduced to almost 0% (Efendi and Indrawadi 1998).

In response to the need to document the coral diversity of the waters of West Sumatra, it was decided that a coral collection would be developed at Bung Hatta University in Padang. Technical assistance

on taxonomy and collection management practices was requested from Australia and in March 1996, the project to establish coral collections at the University commenced. This paper describes the development of the scleractinian coral collection at Bung Hatta University, Padang, Indonesia with a checklist of the species collected.

STUDY AREA

The province of West Sumatra (capital Padang), Indonesia has a shoreline of approximately 450 km. Nearly 50% of the province's total area (20,000 km²) is sea, and encompasses 86 inshore islands and reefs as well as the offshore Mentawai Island group. The inshore islands and reefs are in two chains, running parallel to the coast at distances of 13 and 22 km from the coast. They can be categorised in a north-south direction, with those islands in the north being sandy, flat coral cays, while islands towards the south have their basis in volcanic rock and are generally higher and more heavily vegetated than those found in the north (Kunzmann 1997). This north-south demarcation emulates the geography of the mainland.

Due to prevailing weather and wave conditions most islands are elongated north to south and are kidney shaped. Reefs on the west side are exposed to powerful wave action, reefs on the southerly aspect of the island can be exposed to strong winds for at least three months of the year, while the reefs on the east sides of the islands are on the protected leeward side (Kunzmann 1997). These differences in wind and wave regime, plus the differing geology of the islands and the differences in distance from the coast have resulted in a high diversity of coral habitats and coral species. Reefs in these waters can usually be described as submerged patch reefs and fringing reefs that surround islands. These fringing reefs generally have steep slopes with well-developed spur and groove formations at some sites (Kunzmann 1997). Reefs in nearshore areas are exposed to turbid waters and large sediment loads from mainland rivers, especially during the rainy season,

while offshore, visibility is often in excess of 30 m. Reefs are found adjacent to both seagrass and mangrove areas.
The study area is presented in Figure 1.

METHODOLOGY AND PROJECT DEVELOPMENT

Identification and literature used. At the time of the project's commencement

(1996), there was a small collection of approximately 150 scleractinian specimens, including a comprehensive series of *Acropora* (Family: Acroporidae) species, and representatives of the family Fungiidae which had been collected and identified by Dr Carden Wallace (Museum of Tropical Queensland) and Dr Bert Hoeksema (Rijksmuseum van Natuurlijke Historie) respectively. The first phase of the project involved verification of the identification of

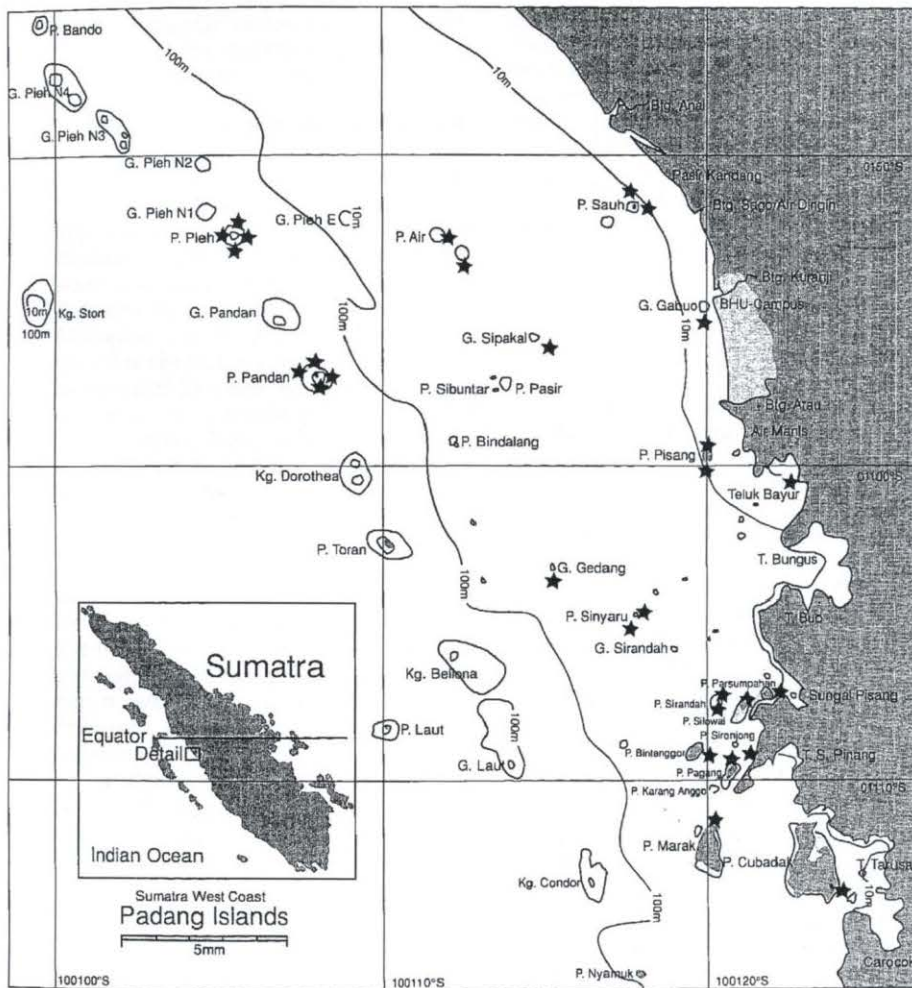


Fig 1. Locality map of Padang and surrounding waters. Stars indicate sites from which corals were collected. (Adapted from Kunzmann, 1997).

the corals that had already been collected. Identification of these and samples subsequently collected was based on the following taxonomic literature: Hoeksema (1989), Veron (1986), Veron and Pichon (1976), Veron and Pichon (1980), Veron and Pichon (1982), Veron, Pichon and Wijsman-Best (1977), Veron and Wallace (1984), Wallace (1994), Wallace (1997) and Wallace and Wolstenholme (1997). Identification was based on growth form and corallite structure, the latter being examined with the aid of a stereomicroscope. Comparison with examples in the literature and specimens positively identified in the collection was extensive.

Specimen collection and preparation.

The majority of the specimens in the collection have been collected from the reef flat and reef slope to depths of approximately 25-30 m with an extensive coverage of the inshore islands both to the north and south of Padang. In addition, fieldwork has been performed at the offshore Mentawai Islands group. Collecting was carried out by SCUBA divers, at depths to 30 m, who used hammers and chisels to collect specimens or representative samples of larger colonies. Notes were taken on depth, colour of the colony, and the substrate on which the colony was found. The sites at which corals were collected are shown on Figure 1.

Upon arrival at the laboratory, specimens were immediately immersed in a solution of bleach (sodium hypochlorite), rinsed in fresh water and then dried in the sun until the corallum was white. Upon identification the sample was registered into the specimen database, labelled and stored in the collection.

Database system. A database was developed using the FoxPro database software package and all specimens were registered in this database. Foxpro allows search and reporting based on any field in the database. Consistent with standard collection management practice, each specimen was given a unique reference number and various taxonomic and habitat parameters were recorded.

Infrastructure. As coral collecting continued it soon became apparent that a laboratory and storage facility was required, which could be used both for specimen preparation and to house the collection safely. Plans were prepared and the 144 m² collections laboratory was completed during June 1997. This air-conditioned laboratory encompasses a wet area with a fumehood, bench space and desk space and an area for storage of the collection in custom made wood and glass cupboards. In addition, a secure outside coral preparation room was designed to facilitate the preparation of coral specimens. This tiled area has a perspex roof to allow the sun to penetrate and walls made from metal trellis to allow air circulation, both of which assist in the drying and bleaching of the specimens. Trellis foldaway shelves on each of the walls, are used for cleaning the coral and provide excellent air circulation for the subsequent drying of the specimens.

NEW GENUS AND DISTRIBUTION RECORDS

Hoeksema (1997) has previously reported on the genera of corals found in the waters of West Sumatra. In addition to the genera reported in Hoeksema's (1997) list, the coral collection at Bung Hatta University also holds specimens of the following eleven coral genera, which are previously unreported from this area: *Palauastrea* (Family: Pocilloporidae), *Coscinarea*, *Pseudosiderastrea* (Family: Siderastreidae), *Achrelia* (Family: Oculinidae), *Halomitra* (Family: Fungiidae), *Cynarina* (Family: Mussidae), *Caulastrea*, *Oulastrea*, *Plesiastrea* (Family: Faviidae) *Astrangia* and *Culicia* (Family: Rhizangiidae).

Due to the previously unexplored nature of the waters of West Sumatra, it is inevitable that range extensions for generic distribution would be encountered. Veron (1986, 1993) gives a thorough coverage of coral genus distribution from research results and literature searches. Based on the computer generated distribution maps prepared from these results which predict the range of each genus (Veron 1986), the

following genera which are held in the Bung Hatta University collection represent range extensions to previously known distribution patterns: *Palauastrea* (Fam: Pocilloporidae), *Pseudosiderastrea* (Fam: Siderastreidae), *Coeloseris* (Fam: Agariciidae), *Acrhelia* (Fam: Oculinidae), *Australomussa* (Fam: Mussidae) and *Oulastrea* (Fam: Faviidae).

NEW SPECIES RECORDS

In addition to the range extensions for genera, several new species of coral have been discovered in the waters of West Sumatra, these being representatives of the families Acroporidae and Fungiidae. According to Wallace's (1997) research on the *Acropora* species found in the waters of Indonesia, the paratype specimens of two newly described species, *Acropora* (*Acropora*) *sukarnoi* and *Acropora* (*Acropora*) *indonesia* were found on West Sumatran reefs. In addition, the recently described *Acropora kosurini* (Wallace 1994) can be found in West Sumatra (Wallace and Wolstenholme 1998). As a result of Hoeksema's research in the area, a new *Podabacia* (Fam: Fungiidae) species was discovered and will be described.

CHECKLIST OF CORALS IN THE BUNG HATTA UNIVERSITY COLLECTION

The coral collection held at Bung Hatta University contains almost 900 specimens. Of the 58 genera (163 species) which are represented in the collection, 55 genera are hermatypic and 3 genera are ahermatypic. This represents an extensive coverage of the coral fauna which would be expected to be found in this area, as Veron (1993) predicted 70 genera of coral from this region of Indonesia.

Up till now, limited sampling has taken place in the intertidal zone, in areas of high turbidity, or in deep water, and it is envisaged that further collecting efforts which could be centered on these habitats will undoubtedly

result in the discovery of further genera.

The species of coral which are represented in the Bung Hatta University coral collection are presented in Table 1.

ACKNOWLEDGMENTS

This work could not have been performed without the support and assistance of the Rektor and Vice Rektor II of Bung Hatta University through the provision of funds and infrastructure. In addition, assistance in the form of field support and funds that was provided by Bapak Yempita Efendi, Ketua Posteri Wilayah I Sumatera, and members of the study group was most gratefully appreciated. Sue Boyd and Jennie Cary provided constructive comments on the manuscript. Finally thank you to Dr A. Kunzmann for continued advice and encouragement.

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Accepted 21 October 1999

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Family Astrocoeniidae	<i>Acropora clathrata</i> (Brook, 1891)
<i>Stylocoeniella armata</i> (Ehrenberg, 1834)	<i>Acropora cytherea</i> (Dana, 1846)
<i>Stylocoeniella guentheri</i> Bassett-Smith, 1890	<i>Acropora divaricata</i> (Dana, 1846)
	<i>Acropora donei</i> Veron and Wallace, 1984
Family Pocilloporidae	<i>Acropora echinata</i> (Dana, 1846)
<i>Palauastrea ramosa</i> Yabe and Sugiyama, 1941 ^(1,2)	<i>Acropora elseyi</i> (Brook, 1892)
<i>Pocillopora damicornis</i> (Linnaeus, 1758)	<i>Acropora florida</i> (Dana, 1846)
<i>Pocillopora eydouxi</i> Milne Edwards and Haime, 1860	<i>Acropora formosa</i> (Dana, 1846)
<i>Pocillopora verrucosa</i> (Ellis and Solander, 1786)	<i>Acropora gemmifera</i> (Brook, 1892)
<i>Seriatopora caliendrum</i> Ehrenberg, 1834	<i>Acropora humilis</i> (Dana, 1846)
<i>Seriatopora hystrix</i> Dana, 1846	<i>Acropora hyacinthus</i> (Dana, 1846)
<i>Stylophora mordax</i> (Dana, 1846)	<i>Acropora millepora</i> (Ehrenberg, 1834)
<i>Stylophora pistillata</i> Esper, 1797	<i>Acropora nasuta</i> (Dana, 1846)
	<i>Acropora nobilis</i> (Dana, 1846)
Family Acroporidae ⁽³⁾	<i>Acropora palifera</i> (Lamarck, 1816)
<i>Acropora austera</i> (Dana, 1846)	<i>Acropora palmerae</i> Wells, 1954
<i>Acropora brueggemanni</i> (Brook, 1893)	<i>Acropora samoensis</i> (Brook, 1891)
<i>Acropora cerealis</i> (Dana, 1846)	<i>Acropora sarmentosa</i> (Brook, 1892)
	<i>Acropora secale</i> (Studer, 1878)

Table 1 cont. Checklist of scleractinian coral species found in the waters of West Sumatra, represented in the coral collection of Bung Hatta University, Padang, West Sumatra, Indonesia.

<i>Acropora spicifera</i> (Dana, 1846)	<i>Pavona explanulata</i> (Lamarck, 1816)
<i>Acropora tenuis</i> (Dana, 1846)	<i>Pavona minuta</i> Wells, 1956
<i>Acropora valenciennesi</i> (Milne Edwards and Haime, 1860)	<i>Pavona varians</i> Verrill, 1864
<i>Acropora valida</i> (Dana, 1846)	<i>Pavona venosa</i> (Ehrenberg, 1834)
<i>Astreopora myriophthalma</i> (Lamarck, 1816)	Family Pectiniidae
<i>Astreopora ocellata</i> Bernard, 1896	<i>Echinophyllia aspera</i> (Ellis and Solander, 1788)
<i>Montipora aequituberculata</i> Bernard, 1897	<i>Echinophyllia echinata</i> (Saville-Kent, 1871)
<i>Montipora danae</i> (Milne Edwards and Haime, 1851)	<i>Echinophyllia echinoporoides</i> Veron and Pichon, 1980
<i>Montipora digitata</i> (Dana, 1846)	<i>Mycedium elephantotus</i> (Pallas, 1766)
<i>Montipora foliosa</i> (Pallas, 1766)	<i>Oxypora lacera</i> (Verrill, 1864)
<i>Montipora hispida</i> (Dana, 1846)	<i>Pectinia alpicornis</i> (Saville-Kent, 1871)
Family Poritidae	<i>Pectinia elongata</i> Rehberg
<i>Goniopora columna</i> Dana, 1846	<i>Pectinia lactuca</i> (Pallas, 1766)
<i>Goniopora lobata</i> Milne Edwards and Haime, 1860	<i>Pectinia paeonia</i> (Dana, 1846)
<i>Goniopora pandoraensis</i> Veron and Pichon, 1982	Family Oculinidae
<i>Goniopora stokesi</i> Milne Edwards and Haime, 1851	<i>Achrelia horrescens</i> (Dana, 1846) ^(1,2)
<i>Porites cylindrica</i> Dana, 1846	<i>Galaxea astreata</i> (Lamarck, 1816)
<i>Porites lichen</i> Dana, 1846	<i>Galaxea fascicularis</i> (Linnaeus, 1767)
<i>Porites lutea</i> Milne Edwards and Haime, 1860	Family Fungiidae
<i>Porites nigrescens</i> Dana, 1848	<i>Ctenactis albitentaculata</i> Hoeksema, 1989
<i>Porites (Synaraea) rus</i> (Forsskål, 1775)	<i>Ctenactis crassa</i> (Dana, 1846)
<i>Porites solida</i> (Forsskål, 1775)	<i>Ctenactis echinata</i> (Pallas, 1766)
Family Siderastreidae	<i>Fungia (Cycloseris) costulata</i> Ortmann, 1889
<i>Coscinaraea exesa</i> (Dana, 1846) ⁽²⁾	<i>Fungia (Cycloseris) tenuis</i> Dana, 1846
<i>Psammocora contigua</i> (Esper, 1797)	<i>Fungia (Danafungia) horrida</i> Dana, 1846
<i>Psammocora digitata</i> Milne Edwards and Haime, 1851	<i>Fungia (Danafungia) scruposa</i> Klunzinger, 1879
<i>Psammocora explanulata</i> Van Der Horst, 1922	<i>Fungia (Fungia) fungites</i> (Linnaeus, 1758)
<i>Psammocora haimeana</i> Milne Edwards and Haime, 1851	<i>Fungia (Lobactis) scutaria</i> Lamarck, 1801
<i>Pseudosiderastrea tayami</i> Yabe and Sugiyami, 1935 ^(1,2)	<i>Fungia (Pleuractis) moluccensis</i> Van der Horst, 1919
Family Agariciidae	<i>Fungia (Pleuractis) paumotensis</i> Stutchbury, 1833
<i>Coeloseres mayeri</i> Vaughan, 1918 ⁽¹⁾	<i>Fungia (Verrillofungia) concinna</i> Verrill, 1864
<i>Gardineroseris planulata</i> (Dana, 1846)	<i>Fungia (Verrillofungia) repanda</i> Dana, 1846
<i>Leptoseris gardineri</i> Van Der Horst, 1921	<i>Fungia (Wellsofungia) granulosa</i> Klunzinger, 1879
<i>Leptoseris hawaiiensis</i> Vaughan, 1907	<i>Halomitru pileus</i> (Linnaeus, 1758) ⁽²⁾
<i>Leptoseris mycetoseroides</i> Wells, 1954	<i>Herpolitha limax</i> (Esper, 1797)
<i>Leptoseris scabra</i> Vaughan, 1907	<i>Lithophyllon mokai</i> Hoeksema, 1989
<i>Leptoseris yabei</i> Pillai and Scheer, 1976	<i>Podabacia crustacea</i> (Pallas, 1766)
<i>Pachyseris rugosa</i> (Lamarck, 1801)	<i>Podabacia</i> sp. nov. Hoeksema, in press
<i>Pachyseris speciosa</i> (Dana, 1846)	<i>Polyphyllia ialpina</i> (Lamarck, 1801)
<i>Pavona cactus</i> (Forsskål, 1775)	<i>Sandalolitha dentata</i> Quelch, 1884
<i>Pavona clavus</i> (Dana, 1846)	Family Mussidae
<i>Pavona decussata</i> (Dana, 1846)	<i>Australomussa rowleyensis</i> Veron, 1985 ⁽¹⁾
	<i>Cynarina lacrymalis</i> (Milne Edwards and Haime, 1848) ⁽²⁾

Table 1 cont. Checklist of scleractinian coral species found in the waters of West Sumatra, represented in the coral collection of Bung Hatta University, Padang, West Sumatra, Indonesia.

<i>Lobophyllia corymbosa</i> (Forsskål, 1775)	<i>Montastrea curta</i> (Dana, 1846)
<i>Lobophyllia hataii</i> Yabe, Sugiyama and Eguchi, 1936	<i>Oulastrea crispata</i> (Lamarck, 1816) ^(1,2)
<i>Lobophyllia hemprichii</i> (Ehrenberg, 1834)	<i>Platygyra daedalea</i> (Ellis and Solander, 1786)
<i>Lobophyllia pachysepta</i> Chevalier, 1975	<i>Platygyra lamellina</i> (Ehrenberg, 1834)
<i>Symphyllia agaricia</i> Milne Edwards and Haime, 1849	<i>Platygyra pini</i> Chevalier, 1975
<i>Symphyllia radians</i> Milne Edwards and Haime, 1849	<i>Platygyra sinensis</i> (Milne Edwards and Haime, 1849)
<i>Symphyllia recta</i> (Dana, 1846)	<i>Platygyra verweyi</i> Wijsman-Best, 1976
	<i>Plesiastrea versipora</i> (Lamarck, 1816) ⁽²⁾
Family Faviidae	Family Merulinidae
<i>Caulastrea curvata</i> Wijsman-Best, 1972 ⁽²⁾	<i>Hydnophora exesa</i> (Pallas, 1766)
<i>Cyphastrea chalcidicum</i> (Forsskål, 1775)	<i>Hydnophora microconos</i> (Lamarck, 1816)
<i>Cyphastrea microphthalma</i> (Lamarck, 1816)	<i>Hydnophora rigida</i> (Dana, 1846)
<i>Cyphastrea serailia</i> (Forsskål, 1775)	<i>Merulina ampliata</i> (Ellis and Solander, 1786)
<i>Diploastrea heliopora</i> (Lamarck, 1816)	<i>Merulina scabricula</i> Dana, 1846
<i>Echinopora horrida</i> Dana, 1846	<i>Hydnophora rigida</i> (Dana, 1846)
<i>Echinopora lamellosa</i> (Esper, 1795)	<i>Merulina ampliata</i> (Ellis and Solander, 1786)
<i>Favia laxa</i> (Klunzinger, 1879)	<i>Merulina scabricula</i> Dana, 1846
<i>Favia matthaii</i> Vaughan, 1918	Family Caryophylliidae
<i>Favia pallida</i> (Dana, 1846)	<i>Euphyllia glabrescens</i> (Chamisso and Eysenhardt, 1821)
<i>Favia rotumana</i> (Gardiner, 1899)	<i>Physogyra lichtensteini</i> (Milne Edwards and Haime, 1851)
<i>Favia speciosa</i> (Dana, 1846)	<i>Plerogyra sinuosa</i> (Dana, 1846)
<i>Favia stelligera</i> (Dana, 1846)	
<i>Favites complanata</i> (Ehrenberg, 1834)	Family Dendrophylliidae
<i>Favites halicora</i> (Ehrenberg, 1834)	<i>Tubastraea micrantha</i> Ehrenberg, 1834
<i>Favites pentagona</i> (Esper, 1794)	<i>Turbinaria peltata</i> (Esper, 1794)
<i>Favites russelli</i> (Wells, 1954)	<i>Turbinaria reniformis</i> Bernard, 1896
<i>Goniastrea edwardsi</i> Chevalier, 1971	
<i>Goniastrea favulus</i> (Dana, 1846)	Family Rhizangiidae
<i>Goniastrea pectinata</i> (Ehrenberg, 1834)	<i>Astrangia</i> sp. Milne Edwards and Haime, 1848 ⁽²⁾
<i>Goniastrea retiformis</i> (Lamarck, 1816)	<i>Culicia</i> sp. Dana, 1846 ⁽²⁾
<i>Leptastrea purpurea</i> (Dana, 1846)	
<i>Leptastrea transversa</i> Klunzinger, 1879	
<i>Leptoria phrygia</i> (Ellis and Solander, 1786)	
<i>Montastrea annuligera</i> (Milne Edwards and Haime, 1849)	

⁽¹⁾ indicates an extension of distribution range for the genera according to Veron (1986).⁽²⁾ indicates first record of the genus from West Sumatra.⁽³⁾ note that Tomascik *et al.* (1997) lists an additional 12 *Acropora* species from Padang which are not represented in the collection.