Mushroom corals (Scleractinia: Fungiidae) of Madang Lagoon, northern Papua New Guinea: an annotated check-list with the description of *Cantharellus jebbi* spec. nov.*

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Hoeksema, B.W. Mushroom corals (Scleractinia: Fungiidae) of Madang Lagoon, northern Papua New Guinea: an annotated check-list with the description of *Cantharellus jebbi* spec. nov.

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Key words: Scleractinia; Fungiidae; mushroom corals; Madang; Papua New Guinea; Bismarck Sea; distribution; new species.

A check-list of mushroom corals (Fungiidae) is given with annotations on their distribution in Madang Lagoon, northern Papua New Guinea, Bismarck Sea. A total of 36 fungiid species is recorded from this locality, which is more than from any other studied so far. One species, *Cantharellus jebbi* spec. nov., is new to science. It is the only monostomatous mushroom coral species known that is entirely encrusting. It also represents the first record of a recent *Cantharellus* species in the Indo-Malayan region.

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Introduction

In connection to the 7th International Coral Reef Symposium at Guam (22-26 June 1992), during which special attention was given to the theme "Biodiversity and biogeography of marine invertebrates of the north coast of New Guinea", field work was performed in the vicinity of the Christensen Research Institute (CRI) at Madang, northern Papua New Guinea. This field work offered the opportunity to compare the scleractinian reef coral fauna of northern New Guinea with that of other areas in the Indo-Malayan region (Hoeksema, in press).

In this comparison, emphasis was put on mushroom corals (Scleractinia: Fungiidae), since extensive distribution data of these species were already available from neighbouring areas (Hoeksema, 1989). North Papua New Guinea records were also obtained from corals recently collected at Laing Island, Hansa Bay (Claereboudt & Hoeksema, 1987; Claereboudt, 1988, 1989; Hoeksema, 1989), which were studied in the Royal Belgian Institute of Natural Sciences (IRSNB/KBIN) at Brussels. In addition small collections of corals from Madang Lagoon were studied in the California Academy of Sciences (CAS) at San Francisco, and in the Zoological Museum at Berlin (ZMB). The collection at the CAS is recent, while the one at the ZMB was collected under German colonial rule, when northern Papua New Guinea was known as Kaiser Wilhelmsland and Madang was called Friedrich Wilhelmshafen. Altogether, the field work and the museum study resulted in a total of 39 species known from northern New Guinea, which is more than from any other area (Hoeksema, in press).

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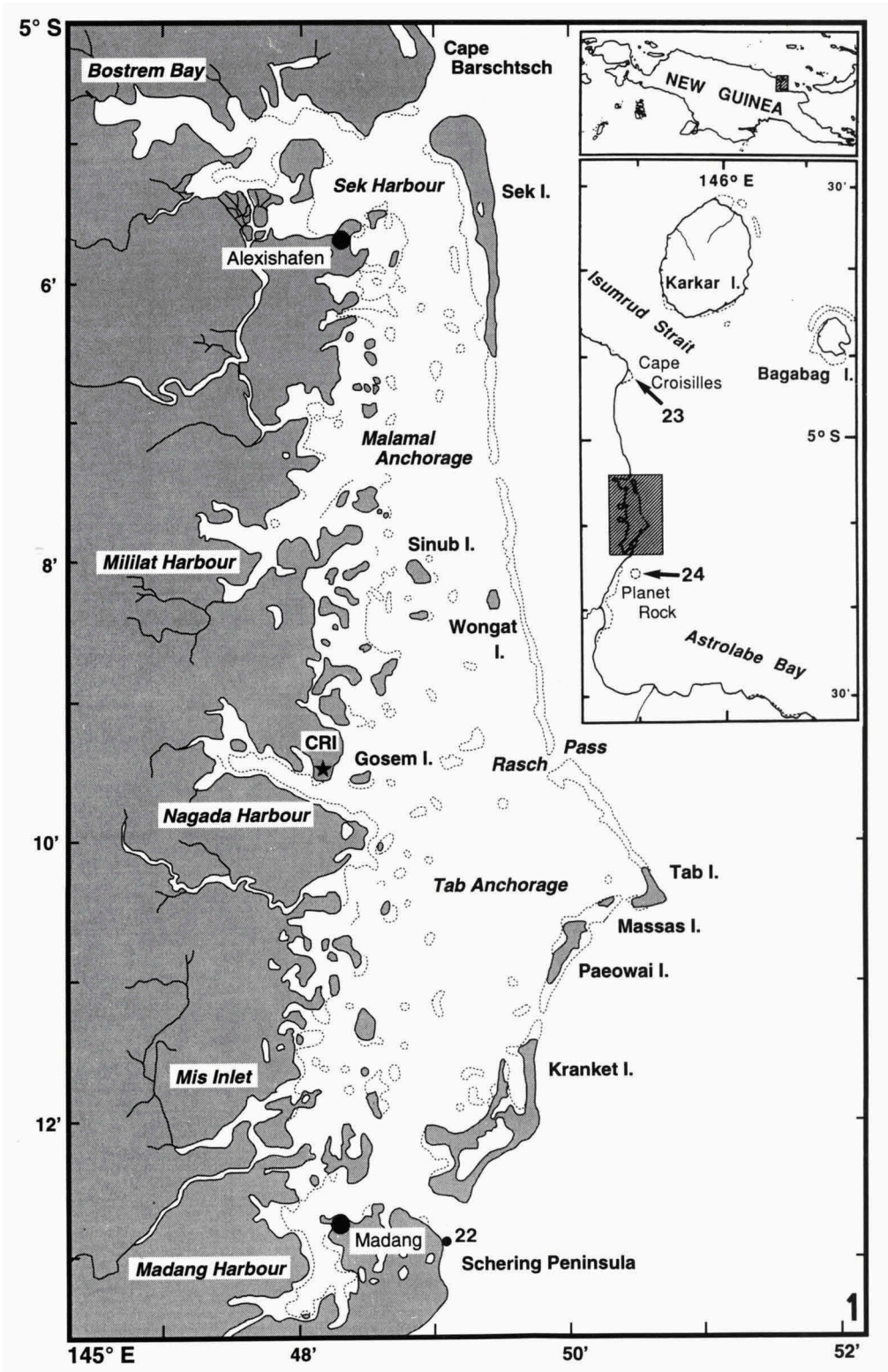
* Contribution No. 94 from the Christensen Research Institute, Madang.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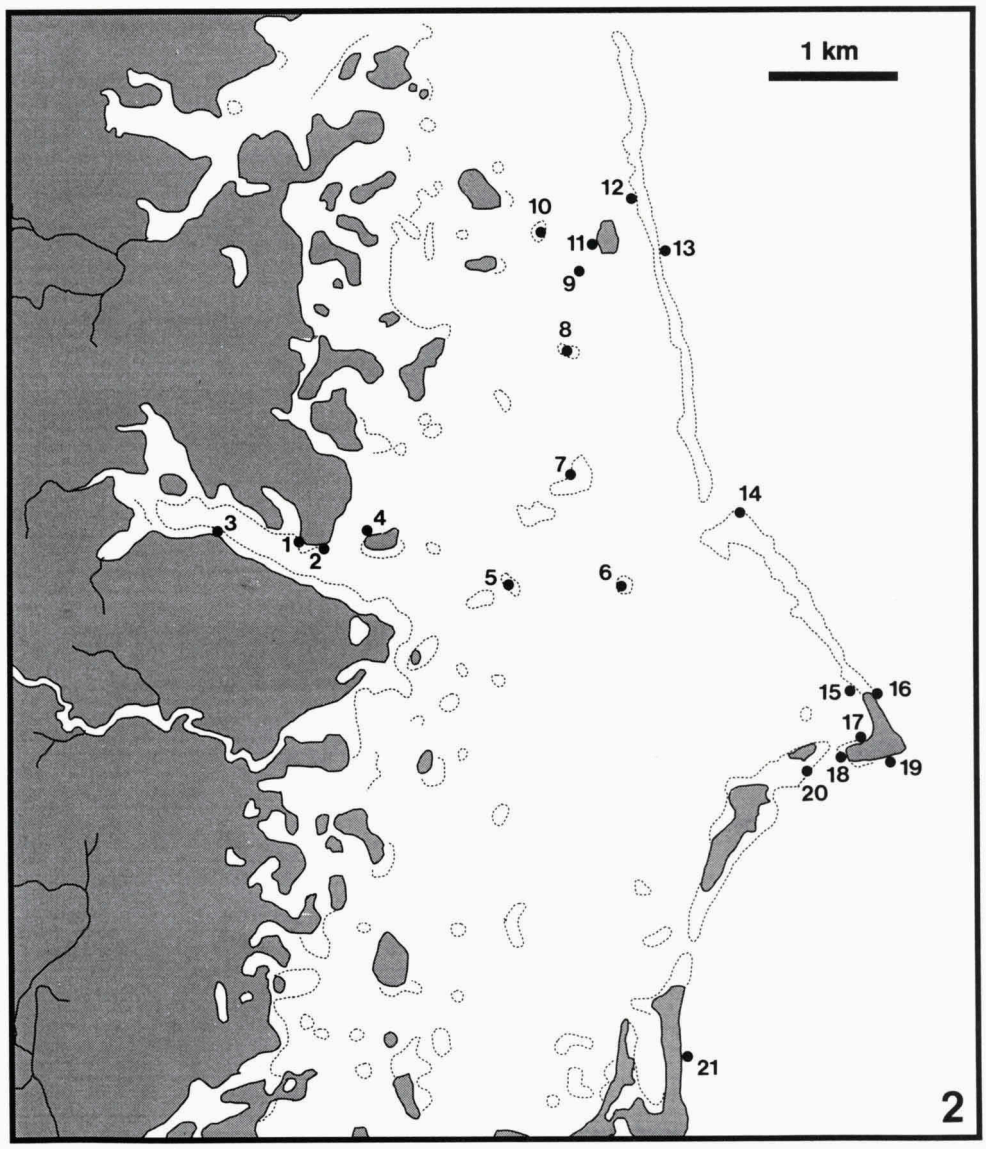


Figs. 1-2. Madang Lagoon and its position (inset) at northern Papua New Guinea. Stations: 1. CRI; 2. Jais Aben Resort; 3. Jetty Kristen Press; 4. NW Gosem I.; 5. Large Padoz reef ('Padoz Tinan'); 6. Mizegwadan reef (with tripod beacon); 7. Large Tinan reef ('Yazi Tinan'); 8. Mazomoz reef; 9. Dagadugaban reef (with B25-bomber wreck); 10. Depilik Tabub reef; 11. Ship wreck W off Wongat I.; 12. Barrier reef NE off Wongat I., inner side; 13. Barrier reef E off Wongat I., outer side; 14. S Rasch Pass; 15. Barrier reef N off Pig. I., inner side; 16. Idem, outer side; 17. W off Pig I.; 18. SW off Pig I.; 19. Barracuda Point; 20. S off Little Pig. I.; 21. E Kranket I., vertical wall; 22. Madang Lighthouse ('Coastwatcher's Monument'); 23. Cape Croisilles; 24. Planet Rock (seamount).

In the present paper a list of the mushroom corals from Madang is presented with annotations on their distribution and miscellaneous remarks on their characters. One species, which represents the first record of a recent *Cantharellus* species in the Indo-Malaysian region, is described as new to science.

The research area

Over a month period in May-June 1992, various reef sites in the vicinity of Madang were examined with the help of snorkel equipment and SCUBA (figs. 1-2). Various reefs along an onshore-offshore environmental gradient across the elongate lagoon (17 km long, 5 km wide) were sampled, from an inland bay to the outer side of the barrier reef, with various patch reefs in between (for additional information see Morgan, 1988). In addition to the lagoon sites, an onshore locality to the north and a seamount to the south were examined (fig. 1: inset). Sites mentioned in the text are indicated by numbers in figs. 1-2.

Species account

Most species have previously been described extensively elsewhere: for references see abbreviated synonymies. Voucher specimens are to be deposited in the museum of the Christensen Research Institute at Madang, the National Museum of Natural History, Smithsonian Institution, at Washington, and the National Museum of Natural History at Leiden.

Family Fungiidae Dana, 1846

Genus **Fungia** Lamarck, 1801

Subgenus **Cycloseris** Milne Edwards & Haime, 1849

Fungia (Cycloseris) sinensis (Milne Edwards & Haime, 1851)

Fungia (Cycloseris) sinensis; Hoeksema, 1989: 31-36, figs. 1, 43-54, 611, 616; Hoeksema & Dai, 1991: 207, 209, figs. 2-3.

Local distribution.— The species is known to occur in two forms: complete and fragmented (Hoeksema, 1989). Two unbroken specimens were found in shallow water onshore (site 1, 6-9 m), one on a submerged reef (site 9, 24 m), and many at the leeward side of the barrier reef (site 15, 20-30 m). Fragmented specimens were observed in high densities at the leeward side of the barrier reef (site 15, 25-30 m) and at the seaward side of the barrier (site 20, 25-30 m), where also two complete specimens were found. Another fragmented individual was found at the east side of a patch reef (site 10, 22 m).

Fungia (Cycloseris) cyclolites Lamarck, 1815
(fig. 13)

Fungia (Cycloseris) cyclolites; Hoeksema, 1989: 41-46, figs. 72-84, 612, 617; Hoeksema & Dai, 1991: 209, figs. 4-6.

Colouration.— The living animals were grey-brown. The small translucent tentacles were extended in the dark (fig. 13).

Local distribution.— Two specimens at the top of a submerged reef inside the lagoon (site 6, 2-3 m).

Fungia (Cycloseris) somervillei Gardiner, 1909

Fungia (Cycloseris) somervillei; Hoeksema, 1989: 50-54, figs. 2-3, 97-108.

Local distribution.— Two specimens on sandy slopes at the leeward side of the barrier reef (sites 12, 15).

Fungia (Cycloseris) fragilis (Alcock, 1893)

Fungia (Cycloseris) fragilis; Hoeksema, 1989: 54-59, figs. 4, 110-121, 614; Hoeksema & Dai, 1991: 209, figs. 7-9.

Local distribution.— Two unfragmented specimens, one on a patch reef (site 5) and another on the leeward side of the barrier reef (site 15).

Fungia (Cycloseris) hexagonalis Milne Edwards & Haime, 1848

Fungia (Cycloseris) hexagonalis; Hoeksema, 1989: 59-64, figs. 123-135, 613.

Local distribution.— One complete individual and various fragmented ones at the leeward side of the barrier reef (site 15, 25-30 m). Many other fragmented specimens were sampled at the outer rim of the lagoon (site 20, 25-30 m). These co-occurred with similarly fragmented individuals of *F. (C.) sinensis*.

Fungia (Cycloseris) costulata Ortmann, 1889

Fungia (Cycloseris) costulata; Hoeksema, 1989: 64-69, figs. 5, 137-156; Hoeksema & Dai, 1991: 209, figs. 10-12.

Local distribution.— Onshore (sites 1, 3), on patch reefs (sites 7-8, 10), at both sides of the barrier reef (sites 13, 15-16, 19, 21) and outside the lagoon on an offshore seamount (site 24).

Fungia (Cycloseris) tenuis Dana, 1846

Fungia (Cycloseris) tenuis; Hoeksema, 1989: 70-74, figs. 6, 158-175; Hoeksema & Dai, 1991: 209, 211, figs. 13-15.

Local distribution.— On submerged patch reefs (sites 6, 8, 10), at the leeward side of the barrier reef (site 15), and at Cape Croisilles (site 23).

Fungia (Cycloseris) vaughani Boschma, 1923

Fungia (Cycloseris) vaughani; Hoeksema, 1989: 74-78, figs. 7, 177-184, 615, 618; Hoeksema & Dai, figs. 991: 211, figs. 16-18.

Local distribution.— On sandy slopes at the leeward side of the barrier reef (sites 12, 15).

Subgenus **Verrillofungia**, Wells, 1966

Fungia (Verrillofungia) spinifer Claereboudt & Hoeksema, 1987 (fig. 14)

Fungia (Verrillofungia) spinifer Claereboudt & Hoeksema, 1987: 304-308, figs. 2-8; Hoeksema, 1989: 79-83, figs. 190-201.

Colouration.— Most specimens were greenish lemon with a violet margin and mouth (fig. 14). A few were predominantly brown.

Local distribution.— Onshore (site 1), on patch reefs in the lagoon (sites 5, 8), and at both sides of the barrier reef (sites 13, 15, 22). Two paratypes were found on the barrier reef; the type locality, Laing Island in Hansa Bay, is c. 200 km west of Madang (Claereboudt & Hoeksema, 1987). Here the species was found in high densities (Claereboudt, 1988). Many specimens are in the collection of the IRSNB at Brussels. Apparently, the species is relatively common at northern Papua New Guinea.

Fungia (Verrillofungia) concinna Verrill, 1864

Fungia (Verrillofungia) concinna; Hoeksema, 1989: 87-91, figs. 9, 220-233; Hoeksema & Dai, 1991: 211, figs. 19-21.

Local distribution.— Common on all reefs in and outside the lagoon.

Fungia (Verrillofungia) repanda Dana, 1846

Fungia (Verrillofungia) repanda; Hoeksema, 1989: 92-96, figs. 10, 235-242, 621, 623-624; Hoeksema & Dai, 1991: 211, 213, figs. 22-26.

Local distribution.— Common on all reefs in and outside the lagoon.

Subgenus **Danafungia** Wells, 1966

Fungia (Danafungia) horrida Dana, 1846

Fungia (Danafungia) horrida; Hoeksema, 1989: 101-108, figs. 13, 255-280; Hoeksema & Dai, 1991: 213, figs. 27-29.

Local distribution.— On all reefs in and outside the lagoon but not common.

Fungia (Danafungia) scruposa Klunzinger, 1879

Fungia (Danafungia) scruposa; Hoeksema, 1989: 108-116, figs. 16-17, 282-305, 627-628, 631-632; Hoeksema & Dai, 1991: 213, figs. 30-33.

Local distribution.— Fairly common on all reefs in and outside the lagoon.

Subgenus **Fungia** Lamarck, 1801

Fungia (Fungia) fungites (Linnaeus, 1758)

Fungia (Fungia) fungites; Hoeksema, 1989: 116-124, figs. 14-15, 307-321, 633-637; Hoeksema & Dai, 1991: 215, figs. 34-35.

Local distribution.— Very common on shallow parts of reefs in and outside the lagoon.

Subgenus **Wellsofungia** Hoeksema, 1989

Fungia (Wellsofungia) granulosa Klunzinger, 1879

Fungia (Wellsofungia) granulosa; Hoeksema, 1989: 125-129, figs. 18, 323-335, 638-639; Hoeksema & Dai, 1991: 215, figs. 36-38.

Local distribution.— On reefs inside the lagoon (e.g. sites 5, 10) and at the outer rim (e.g. sites 15-16).

Subgenus **Lobactis** Verrill, 1864

Fungia (Lobactis) scutaria Lamarck, 1801

Fungia (Lobactis) scutaria; Hoeksema, 1989: 130-134, figs. 19-20, 337-347, 640-641; Hoeksema & Dai, 1991: 216, figs. 39-42.

Local distribution.— On reefs inside the lagoon (sites 5, 10) and at the outer rim (sites 15-16, 21-22).

Subgenus **Pleuractis** Verrill, 1864

Fungia (Pleuractis) moluccensis Van der Horst, 1919

Fungia (Pleuractis) moluccensis; Hoeksema, 1989: 135-139, figs. 21, 349-358, 642-643; Hoeksema & Dai, 1991: 216, figs. 43-47.

Local distribution.— On soft substrata of onshore reefs (sites 1-3), on reefs inside the lagoon (sites 4, 8, 10), and at the inner side of the barrier reef (site 15).

Fungia (Pleuractis) gravis Nemenzo, 1955

Fungia (Pleuractis) gravis; Hoeksema, 1989: 140-143, figs. 22, 360-370, 644-645; Hoeksema & Dai, 1991: 221, figs. 63-66.

Local distribution.— On patch reefs inside the lagoon (sites 6-8, 10), and at both sides of the barrier reef (sites 15-16, 20).

Fungia (Pleuractis) paumotensis Stutchbury, 1833

Fungia (Pleuractis) paumotensis; Hoeksema, 1989: 143-148, figs. 23, 372-385, 646-647; Hoeksema & Dai, 1991: 221, figs. 67-70.

Local distribution.— Onshore (sites 1-3), on patch reefs (sites 7, 9-10), at both sides of the barrier reef (sites 15-16), and outside the lagoon (site 22).

Genus **Heliofungia** Wells, 1966

Heliofungia actiniformis (Quoy & Gaimard, 1833)

Heliofungia actiniformis; Hoeksema, 1989: 149-153, figs. 24, 387-399, 648-649; Hoeksema & Dai, 1991: 221-222, figs. 71-72.

Local distribution.— At sheltered localities varying from onshore reefs (sites 1-3), and patch reefs (sites 5-10), to the inner side of the barrier (site 15).

Genus **Ctenactis** Verrill, 1864

Ctenactis echinata (Pallas, 1766)

Ctenactis echinata; Hoeksema, 1989: 158-163, figs. 26, 416-428, 650-651; Hoeksema & Dai, 1991: 222, figs. 73-74.

Local distribution.— On patch reefs (sites 8, 10) and on the barrier reef (sites 15-16).

Ctenactis crassa (Dana, 1864)

Ctenactis crassa; Hoeksema, 1989: 163-167, figs. 27, 430-440; Hoeksema & Dai, 1991: 222, figs. 75-77.

Local distribution.— On patch reefs (sites 6, 8, 10), on the barrier reef (sites 14-16), just outside the lagoon (site 22), on the fringing reef of Cape Croisilles (site 23), and offshore (site 24).

Ctenactis albitentaculata Hoeksema, 1989

Ctenactis albitentaculata; Hoeksema, 1989: 154-158, figs. 25, 401-414.

Local distribution.— On patch reefs (sites 7-8, 10), the outer side of the barrier reef (sites 13, 16, 21), and an offshore seamount (site 24).

Genus **Herpolitha** Eschscholtz, 1825

Herpolitha limax (Esper, 1797)

Herpolitha limax; Hoeksema, 1989: 168-175, figs. 28, 442-459, 652-653; Hoeksema & Dai, 1991: 222, 224, fig. 78.

Local distribution.— Common on all reefs in and outside the lagoon.

Genus **Polyphyllia** Blainville, 1830

Polyphyllia talpina (Lamarck, 1801)

Polyphyllia talpina; Hoeksema, 1989: 181-185, figs. 29, 473-483, 654-655; Hoeksema & Dai, 1991: 224, fig. 79.

Local distribution.— Onshore (site 1), on a patch reef (site 8) and on the barrier reef (sites 15-16).

Polyphyllia novaehiberniae (Lesson, 1831)
(fig. 15)

Polyphyllia novaehiberniae; Hoeksema, 1989: 177-181, figs. 461-471.

Characters.— Live individuals (fig. 15) of this species are difficult to distinguish from those of *P. talpina* (Hoeksema, 1989: fig. 29). Its corallum is thinner and its septa are more parallel to each other (Hoeksema, 1989). All observed specimens were complete, unlike the fragmented ones common at oceanic islands, such as Fiji, Tonga, Samoa, and Vanuatu (Lamberts, 1984; Hoeksema, 1989; Veron, 1990a).

Local distribution.— Only inside the lagoon (sites 5, 7-10).

Genus **Sandalolitha** Quelch, 1884

Sandalolitha dentata Quelch, 1884

Sandalolitha dentata; Hoeksema, 1989: 187-190, figs. 485-495, 658-659; Hoeksema & Dai, 1991: 224, figs. 48, 80-83.

Local distribution.— Although occurring on some patch reefs (sites 8, 10), the species was more common on the barrier reef (sites 15-16, 21) and outside the lagoon (sites 22-24).

Sandalolitha robusta (Quelch, 1886)

Sandalolitha robusta; Hoeksema, 1989: 191-194, figs. 30, 497-506, 656-657; Hoeksema & Dai, 1991: 224, 226, figs. 84-87.

Local distribution.— On patch reefs (sites 5, 8, 10) and on the outer rim (sites 16, 20); less common than *S. dentata*.

Genus **Zoopilus** Dana, 1846

Zoopilus echinatus Dana, 1846

Zoopilus echinatus; Hoeksema, 1989: 195-199, figs. 31, 508-523, 660-661.

Local distribution.— In clear water at the outer rim (sites 13, 16, 20) and offshore (site 24). Specimens were usually unbroken. Fragmented, regenerating individuals were found in small aggregations.

Genus **Halomitra** Dana, 1846

Halomitra pileus (Linnaeus, 1758)

Halomitra pileus; Hoeksema, 1989: 200-205, figs. 32, 525-538, 662-663.

Local distribution.— In clear water at the outer rim (sites 16, 20, 22) and offshore (site 24).

Halomitra clavator Hoeksema, 1989
(fig. 16)

Halomitra spec. Hoeksema & Moka, 1989: 152-153, 156.
Halomitra clavator Hoeksema, 1989: 205-209, figs. 33, 540-552.

Characters.— From Indonesia and the Philippines so far only known as complete

specimens: thin, circular, < 40 cm in diameter, with the first, central calice intact (Hoeksema, 1989). At Madang, individuals up to 1 m in diameter were encountered, either complete with the central calice present, or as regenerating fragments in various sizes. The largest individuals did not have a circular margin, but showed a lobed periphery (fig. 16). All specimens showed the characteristic club-shaped septal dentations.

Local distribution.— Although generally rare, the species appeared to be fairly common at Madang. Specimens were found on a shallow fringing reef onshore (site 1, 6-9 m), in deeper water inside the lagoon (site 9, 18-20 m), and at the outside of the barrier reef (site 20, 25-30 m). Fragmented, regenerating specimens were found in small aggregations (sites 1, 9, 20). They were found in relatively quiet water, either shallow at sheltered sites or otherwise at greater depths. Apparently the species can tolerate murky water with suspended silt; it does not necessarily occur in clear water as suggested by previous observations (Hoeksema & Moka, 1989).

Colouration.— All animals were ochre (fig. 16).

Genus **Cantharellus** Hoeksema & Best, 1984

Characters (altered after Hoeksema, 1989).— Animals are monostomatous, cup-shaped or encrusting, and remain attached in adult stage. The corallum wall is imperforate and without fragmentation clefts. The septa and costae are simply ornamented with fine, granular projections. The septal margins may be slightly frayed.

Geographical distribution.— All species of this genus appear to have a very restricted geographical range (fig. 3). The new species, *C. jebbi*, is only known from Madang. *Cantharellus noumeae* Hoeksema & Best, 1984, occurs on sheltered reefs of New Caledonia, but as a fossil it has been collected from the Indonesian province of East Kalimantan on the island of Borneo. *Cantharellus doederleini* (Von Marenzeller, 1907) is endemic to the northern Red Sea, where it occurs on protected reef slopes (Chadwick-Furman & Loya, 1992). Mushroom corals from reef flats near Yanbu (Saudi Arabia), central Red Sea, that were identified by Sheppard & Sheppard (1991: fig. 93) as *Cycloseris doederleini* most likely are juveniles of *Fungia (Fungia) fungites*.

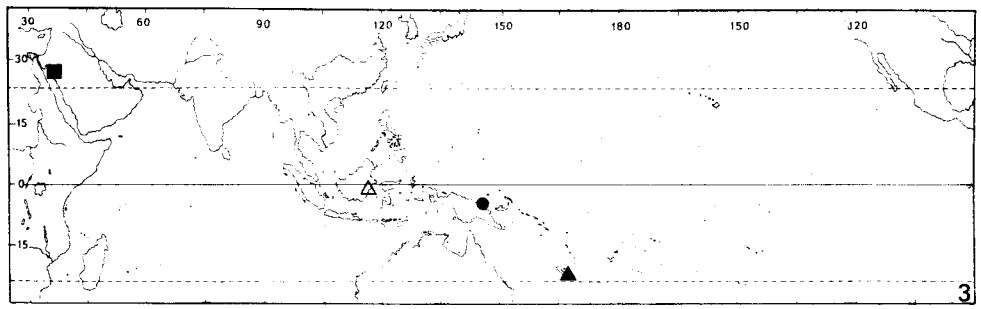
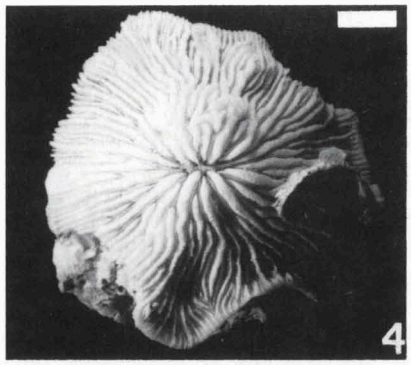


Fig. 3. Known distribution of the genus *Cantharellus*. *C. doederleini*: ■; *C. noumeae* recent: ▲; *C. noumeae* fossil: Δ; *C. jebbi* spec. nov.: ●.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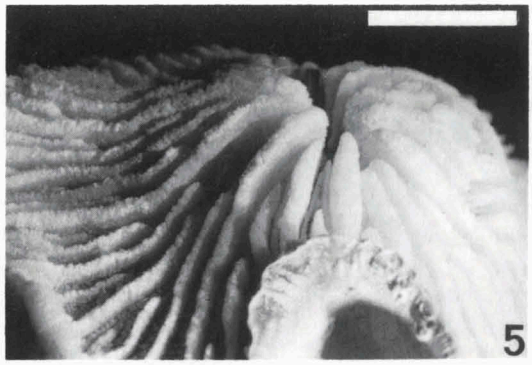
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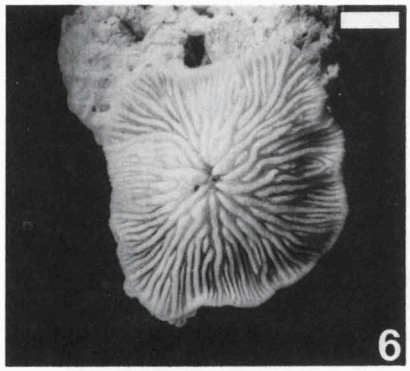
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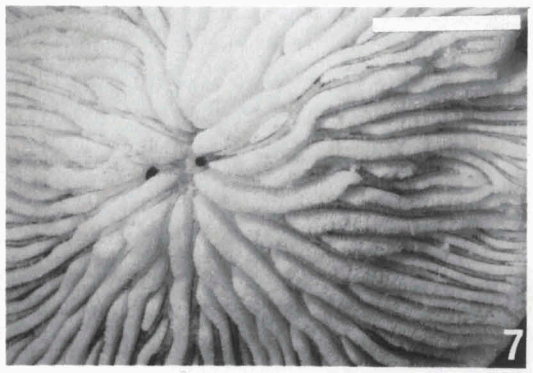
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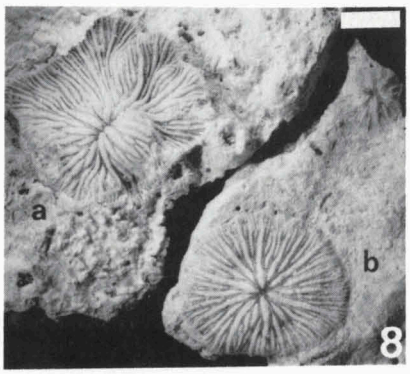
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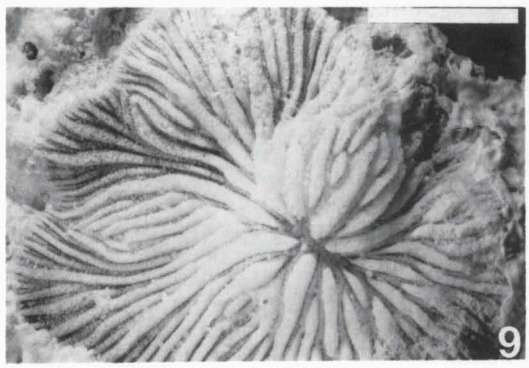
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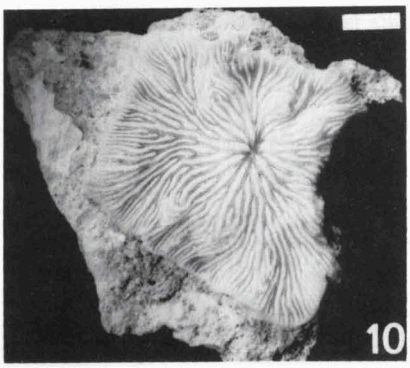
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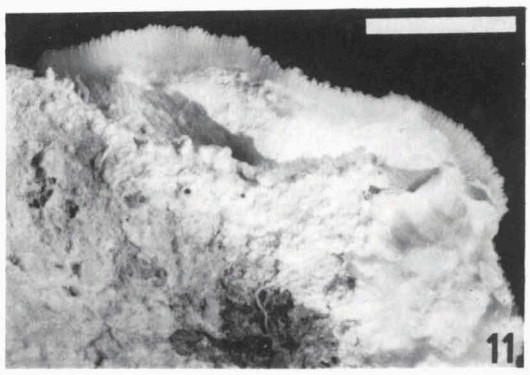
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Cantharellus jebbi spec. nov.
(figs. 4-11, 17)

Type material.— Holotype (RMNH 18530) and paratypes (RMNH 18531: 6 specimens; USNM 92969: 3 specimens) from 9-13 m depth on the fringing reef at the Christensen Research Institute, Nagada Harbour, Madang Lagoon, Papua New Guinea (fig. 2: site 1).

Characters.— Corals are solitary and encrusting. The corallum outline varies from regularly circular (mostly in small specimens) to undulating or folded. The diameter of the specimens varies from 3 to 7 cm. The length of the central fossa, at its bottom, is $^1/_{10}$ to $^1/_{14}$ of the corallum diameter. The septal edges at both sides of the fossa stand upright, whereas those at the ends are slightly diverging. The columella is formed by a mingled mass of tightly packed and partly fused trabeculae and paliform lobes with their tips pointing upwards.

The densely packed septa are straight near the centre, but wavy and diverging/converging towards the periphery. The septa of lower orders are high, imperforate, and very thick; those of higher orders are low, perforate, and thin. Tentacular lobes may be present. The septal margins are almost smooth, finely dentated or slightly frayed. The dentations are regularly granular; their number varies from 40 to 80 per cm. The septal sides are densely granulated. The granulations are fine or coarse, and are more or less evenly distributed or arranged in indistinct rows parallel to the septal margin. The compound synapticulae, connecting the septa laterally, cannot easily be detected because of the tight septal arrangement.

The corallum wall is solid. A detachment scar is not present. Costae are only visible where the corallum periphery extends beyound the substratum. The costae are poorly developed and nearly of equal size. They are ornamented by simple granular spines, which vary in density from 40 to 80 per cm. Apart from the granular spines on the costae, the corallum wall is not granulated.

Colouration.— The animals are light brown, especially between the septa (fig. 17). The tentacles are small (difficult to see when retracted), translucent, and colourless.

Affinities.— The species shares the thick granulated septa with *Cantharellus doederleini* and the lobed corallum periphery with *C. noumeae*. The encrusting growth form is unique among monostomatous mushroom corals. The species resembles juvenile specimens of *Lithophyllon undulatum* and *L. mokai*, which become polystomatous in adult stage. The latter is the only other encrusting mushroom coral species that is known. Specimens of *C. jebbi* may be confused with attached juveniles of *Fungia (Pleuractis) moluccensis*, occurring in similar environments.

Etymology.— The species is named after Dr Matthew Jebb, Director of the Christensen Research Institute, Madang.

Local distribution.— Onshore (site 1) and on patch reefs inside the lagoon (sites 5, 7). On the lower reef slopes, in murky water due to suspended silt from nearby soft substrata.

Figs. 4-11. Scale bars: 1 cm. Holotype and paratypes of *Cantharellus jebbi* spec. nov. Fig. 4. Upper surface of the holotype (RMNH 18530) from the fringing reef at the Christensen Research Institute, Nagada Harbour, Madang Lagoon (fig. 2: site 1). Fig. 5. Close-up of the same coral showing granular surface of the septa. Figs. 6, 8, 10. Upper surfaces of paratypes (RMNH 18531) from the same locality. Fig. 7. Close-up of septa of coral in fig. 6; the two holes belong to a *Leptoconchus* sp. (Gastropoda: Coralliophilidae; see Massin, 1988). Fig. 9. Close-up of septa of coral in fig. 8a. Fig. 11. Lower surface of coral in fig. 10, showing costal spines.

Genus **Lithophyllon** Rehberg, 1892

Lithophyllon undulatum Rehberg, 1892

Lithophyllon undulatum; Hoeksema, 1989: 216-222, figs. 35-36, 567-581, 509b, 664, 666-667; Hoeksema & Dai, 1991: 226, figs. 88-89.

Local distribution.— At the inner and outer side of the barrier reef (sites 15, 21) and outside the lagoon (sites 23-24).

Lithophyllon mokai Hoeksema, 1989

Lithophyllon mokai; Hoeksema, 1989: 222-226, figs. 37, 583-594, 665, 668; Hoeksema & Dai, 1991: 226, figs. 90-91.

Local distribution.— Similar to that of the former species (sites 15, 23-24).

Genus **Podabacia** Milne Edwards & Haime, 1849

Podabacia crustacea (Pallas, 1766)

Podabacia crustacea; Hoeksema, 1989: 226-231, figs. 34, 590c, 596-609, 669-670; Hoeksema & Dai, 1991: 226, figs. 92-93.

Local distribution.— Onshore (site 3), on a patch reef (site 6) and on the barrier reef (site 14).

Podabacia motuporensis Veron, 1990
(fig. 18)

Podabacia sp.; Veron & Kelley, 1988: 29; Veron & Hodgson, 1988: 263; Veron, 1990a: 63.
Podabacia motuporensis Veron, 1990b: 128-130, figs. 33-34, 78.

Type material examined.— Holotype (Tropical Museum of Queensland G32482) from Apo I., Negros, Philippines. Paratypes (Australian Institute of Marine Science) from Horseshoe Reef near Motupore I., south Papua New Guinea, and from Efate, Tana and Aneityum Is., Vanuatu.

Characters.— The mouths are small, deep and numerous (fig. 18). The columellae are poorly developed. Septa are thin; only few radiate from each calice. The numbers of septal dentations and costal spines vary from 30 to 60 per cm.

Colouration.— Usually brown (fig. 18); sometimes partially bleached or slightly greenish.

Affinities.— This species is difficult to separate from *Podabacia crustacea*, especially since the densities of septal dentations and costal spines in that species may be similar and amount to 40 per cm (Hoeksema, 1989). The small size of its deep mouths (fossae), each adjacent to only a few thin septa, is the most distinctive character.

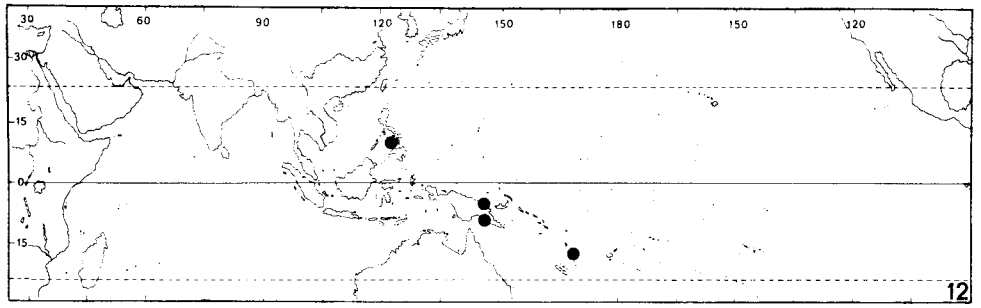


Fig. 12. Localities where *Podabacia motuporensis* has been found.

Geographical distribution.— This is the fourth record; previous records (see synonymy) are from southern Papua New Guinea, the Philippines and Vanuatu (fig. 12).

Local distribution.— One specimen was found onshore (site 1); others were found on patch reefs (sites 5-6, 9), on the seaward side of the barrier reef (sites 13-14, 16, 20-21) or outside the lagoon (sites 22, 23).

Onshore-offshore distributions

When the distribution of fungiid species is compared for the onshore sites, the reefs in the lagoon, the predominantly sandy leeward side of the barrier, and all the sites at the other side of the barrier and offshore, there may be some shifts in species composition but only little in species number (table 1). The onshore localities are relatively the poorest in species diversity.

Discussion

A total of 36 mushroom coral species is recorded here from Madang. This is slightly more than the 35 known from SW Sulawesi (Hoeksema, 1990) and the 33 from NE Komodo (Hoeksema & Moka, 1989). Together with three additional species recorded from Laing Island, i.e. *Fungia (Cycloseris) distorta* Michelin, 1842, *F. (C.) curvata* Hoeksema, 1989, and *F. (Danafungia) fralinae* Nemenzo, 1955 (see Hoeksema, 1989), the total number of species of northern New Guinea amounts to 39, which is the maximum recorded from any area studied so far (Hoeksema, in press). Three species recorded from Madang have not yet been found west of New Guinea: *Polyphyllia novaehiberniae, Cantharellus jebbi,* and *Podabacia motuporensis* (Hoeksema, 1989, in press). On the other hand, *Fungia (Verrillofungia) scabra* Döderlein, 1901, which may occur abundantly in Indonesia (Hoeksema & Moka, 1989; Hoeksema, 1990) has not yet been recorded from New Guinea.

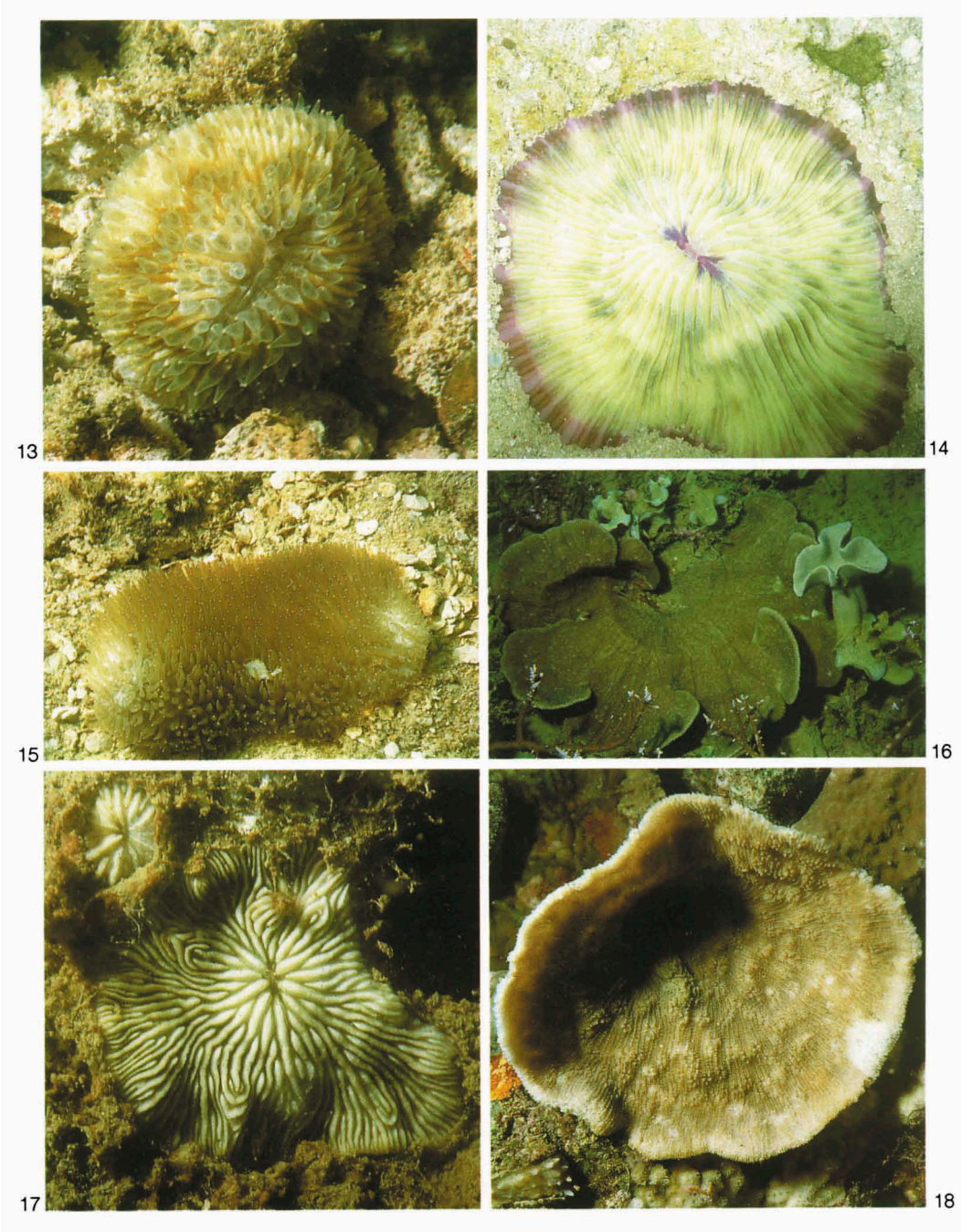
It is also remarkable that some recently described species, which so far are only known from a few records outside Papua New Guinea, occur commonly at Madang (e.g. *Fungia (Verrillofungia) spinifer* and *Halomitra clavator*). Apparently, northern New Guinea is important for finding rarely known or even undescribed species of sclerac-

Table 1. Mushroom corals (Fungiidae) and their onshore-offshore distribution pattern at Madang Lagoon. Barrier seaward includes sites 21-24.

	Onshore	Inside lagoon	Barrier landward	Barrier seaward
01. *Fungia (Cycloseris) sinensis*	+	+	+	+
02. *Fungia (Cycloseris) cyclolites*		+		
03. *Fungia (Cycloseris) somervillei*			+	
04. *Fungia (Cycloseris) fragilis*		+	+	
05. *Fungia (Cycloseris) hexagonalis*			+	+
06. *Fungia (Cycloseris) costulata*	+	+	+	+
07. *Fungia (Cycloseris) tenuis*		+	+	+
08. *Fungia (Cycloseris) vaughani*			+	
09. *Fungia (Verrillofungia) spinifer*	+	+	+	+
10. *Fungia (Verrillofungia) concinna*	+	+	+	+
11. *Fungia (Verrillofungia) repanda*	+	+	+	+
12. *Fungia (Danafungia) horrida*	+	+	+	+
13. *Fungia (Danafungia) scruposa*	+	+	+	+
14. *Fungia (Fungia) fungites*	+	+	+	+
15. *Fungia (Wellsofungia) granulosa*		+	+	+
16. *Fungia (Lobactis) scutaria*		+	+	+
17. *Fungia (Pleuractis) moluccensis*	+	+	+	
18. *Fungia (Pleuractis) gravis*		+	+	+
19. *Fungia (Pleuractis) paumotensis*	+	+	+	+
20. *Heliofungia actiniformis*	+	+	+	
21. *Ctenactis echinata*		+	+	+
22. *Ctenactis crassa*		+	+	+
23. *Ctenactis albitentaculata*		+	+	+
24. *Herpolitha limax*	+	+		+
25. *Polyphyllia talpina*	+	+	+	+
26. *Polyphyllia novaehiberniae*		+	+	
27. *Sandalolitha dentata*		+	+	+
28. *Sandalolitha robusta*		+		+
29. *Zoopilus echinatus*				+
30. *Halomitra pileus*				+
31. *Halomitra clavator*	+	+		+
32. *Cantharellus jebbi*	+	+		
33. *Lithophyllon undulatum*			+	+
34. *Lithophyllon mokai*			+	+
35. *Podabacia crustacea*	+	+		+
36. *Podabacia motuporensis*	+	+	+	+
Total number	17	29	28	28

tinian corals. Although relatively little reef coral research has been performed in Papua New Guinea, three new scleractinian species have been described in recent years: *Fungia (Verrillofungia) spinifer* Hoeksema & Claereboudt, 1987, *Galaxea paucisepta* Claereboudt, 1990, and *Cantharellus jebbi* spec. nov. All have been found in the vicinity of Madang (this paper; Hoeksema, 1993).

In Madang Lagoon the fringing reefs of Nagada Harbour (sites 1-3) are distinctly poorer in fungiid species than the patch reefs and the inner and outer sides of the



Figs. 13-18. Live mushroom corals at Madang Lagoon. Fig. 13. *Fungia (Cycloseris) cyclolites* Lamarck, 1815, at site 6. Fig. 14. *Fungia (Verrillofungia) spinifer* Claereboudt & Hoeksema, 1987, at site 15. Fig. 15. *Polyphyllia novaehiberniae* (Lesson, 1831) at site 10. Fig. 16. *Halomitra clavator* Hoeksema, 1989, at site 9. Fig. 17. *Cantharellus jebbi* spec. nov. at site 1. Fig. 18. *Podabacia motuporensis* Veron, 1990, at site 16.

barrier (table 1). The reefs at sites 1-3 are sheltered and shallow and therefore offer a smaller variety of habitats than the other reefs, which are partly more exposed and deeper. Overall, there is not a clear cross-shelf gradient in fungiid species diversity, such as described from the 40 km wide Spermonde Shelf, SW Sulawesi, Indonesia (Hoeksema, 1990). Species from that area absent on nearshore reefs, can be found onshore at Madang (e.g. *Fungia (Cycloseris) sinensis, F. (Verrillofungia) spinifer, Halomitra clavator*). Madang Lagoon, which has a similar shape (but in mirror image), is much smaller than the Spermonde Shelf, and it does not have as much fluvial impact near the shoreline. Nevertheless, a resembling diversity gradient as that of the 35 species of Fungiidae at SW Sulawesi can be observed at Madang Lagoon with respect to its foraminiferal fauna, with at least 187 species (Langer & Lipps, 1991).

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