

Reef-building corals (Cnidaria: Scleractinia) from the Watamu Marine National Reserve, Kenya; an annotated species list

J.W.T.J. Lemmens

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The scleractinian fauna of the Watamu Marine National Reserve, Kenya, was surveyed between November 1982 and April 1983. The survey yielded 276 specimens representing 113 species in 45 genera, which are presented in an annotated checklist. Four genera and 43 species are added to the list of previously known Scleractinia for East-Africa, bringing the number of species recorded for this region to 169. This substantial increase, as well as the high coral diversity of nearby communities, suggests that further additions can be expected.

Sjaak Lemmens, Laboratorium voor Aquatische Oecologie, Katholieke Universiteit Nijmegen, The Netherlands. Present address: Zoology Department, University of Western Australia, Nedlands WA 6009, Australia.

Introduction

So far coral studies in the western Indian Ocean mainly focussed on reefs from the Red Sea, the Arabian Gulf, the Maldives and the Mascarene Archipelago (see Wells, 1988, for an overview). By contrast reefs of the East African mainland (Somalia, Kenya, Tanzania and Mozambique) as well as those of Madagascar and the Seychelles have been the subject of only a limited number of coral studies. As a result the coral diversity of these regions is only partly known.

Recent major taxonomic revisions and faunistic overviews of Scleractinia (e.g., Veron & Pichon, 1976; 1979 and 1982; Veron et al., 1977; Veron & Wallace, 1984; Veron, 1986; Scheer & Pillai, 1974; 1983; Pillai & Scheer, 1976) have considerably facilitated identification of species and improved our knowledge on coral faunas and species diversity, although the coral fauna of many regions and islands is still imperfectly known. An initial attempt by Sheppard (1987) to analyse patterns of distribution of Scleractinia throughout the Indo-Pacific area resulted in the recognition of three more or less distinct faunistic regions: 1. the northwestern Indian Ocean (Red Sea to Sri Lanka), 2. a broad equatorial zone including the East African and Asian mainland, and 3. the island groups in the eastern Bay of Bengal. However, incompleteness of available fauna lists, as well as the problems involved in synonymy of species complicated and biased analyses, so that further studies are necessary to draw more definitive conclusions.

The present publication aims to extend the knowledge of the number of genera and species of Scleractinia of the East African region, and, more in particular, the Kenyan coast. This coast is skirted with some extensive stretches of fringing reef and includes the Watamu Marine National Reserve, the first marine park in Africa, established in 1968. It is situated offshore from the popular tourist village Malindi, 110-130

km north of Mombasa, at ca 3°10'S 40°10'E. The reserve covers ca. 21309 ha; it includes two parks with an area of 1600 ha, a large protected zone around the parks, and an inlet with luxuriant growth of mangroves, known as Mida Creek (fig. 1). Although the reserve is one of the largest single expanses of protected reef in the Indian Ocean, and one of the better studied reef areas of the Kenyan coast, its scleractinian fauna has been subject to only a limited number of studies (see Wells, 1988)

Rosen (1971) listed 41 genera of Scleractinia from the East African coast but states that this is a very conservative figure and that the diversity is thought to be comparable to West Pacific reefs. Hamilton (1975) added several genera to the list and listed as many as 140 species. In 1979 the Leopard Reef Expedition (see Green, 1983) added 11 genera to the list of Rosen (including two genera collected by Mrs. L. Didham, a resident of Malindi). Hamilton & Brakel (1984) listed 54 genera, bringing the total number of genera recorded from East Africa to 55 (*Leptoseris* Milne Edwards & Haime was only reported by Green, 1983). Although the above-mentioned authors have greatly extended the knowledge on the generic diversity of Scleractinia along the East African coast, they do not appear to present a complete record of the coral diversity in the Watamu Malindi region.

The checklist here presented is mainly based on coral collections from the Watamu Reef Expedition (November 1982 - April 1983) by students of the University of Nijmegen, The Netherlands, and forms an concise, improved version of an unpublished MSc thesis by Lemmens and Smeets (1987). Other reports (mainly unpublished MSc theses) that resulted from the expedition deal with coral synecology (Blom et al., 1985; van Katwijk et al., 1993, in press), the impact of soil erosion and the discharge of rivers in the reef area (Van Hoof, 1984; Van der Kerkhof & Giesen, 1983; Giesen & van der Kerkhof, 1983) and the importance of the Malindi and Watamu reefs for tourism and employment (Waning & Hafkenscheid, 1984).

Material and Methods

Corals were collected using SCUBA. A substantial part of the collection was photographed in the field before collecting. All specimens were labelled with a plastic tag, cleaned in fresh water and dried before being transported to The Netherlands.

The specimens were identified at the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum voor Natuurlijke Historie, RMNH) in Leiden, the Netherlands. Publications by Veron & Pichon (1976, 1979, 1982), Veron et al. (1977) and Veron & Wallace (1984) were mostly used for identification. Other papers consulted for species identification are: Searle (1956), Lamberts (1982), Scheer & Pillai (1983), Faure (1982) and Hoeksema (1989). Unless stated otherwise, the nomenclature follows Veron (1986).

The collections were deposited in the RMNH and the Zoology Department, University of Nairobi, Kenya.

Annotated species list

The collection consists of 113 species, belonging to 45 genera. All specimens

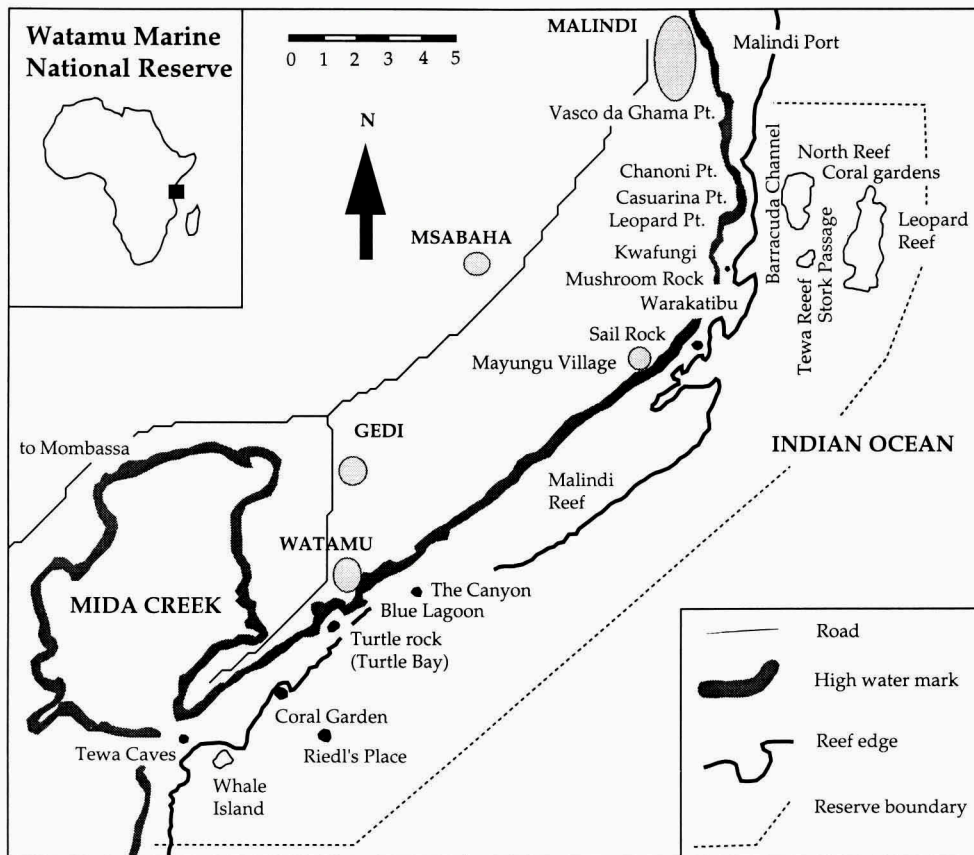


Fig. 1. The Watamu Marine National Reserve, Kenya (approximate location 3°S 40° E).

and their catalogue numbers are listed below. For collecting data see Lemmens & Smeets (1987) or the collection.

Additions to the the list of Hamilton & Brakel (1984) are marked with an asterisk *. Species that were not collected during the present study but that were previously reported from East Africa, are also mentioned. Discrepancies between the nomenclature used by Hamilton & Brakel (1984) and by Veron et al. (Veron & Pichon 1976, 1979, 1982; Veron et al., 1977; Veron & Wallace, 1984; Veron, 1986) and Hoeksema (1989) are noted.

POCILLOPORIDAE Gray, 1842

Pocillopora Lamarck, 1816

Pocillopora verrucosa (Ellis & Solander, 1786) [= ?*P. cf. danae* and ?*P. cf. elegans* sensu Hamilton & Brakel, 1984]. 6 specimens: RMNH 17015, 17016, 17017 [tentative identification], 17018 [stunted, heavily build specimen], 17019; Kenya S-32.

Pocillopora damicornis (Linnaeus, 1758). 1 specimen: RMNH 17020.

Hamilton & Brakel (1984) also reported *P. eydouxi* Milne Edwards & Haime, 1860.

Seriatopora Lamarck, 1816

Seriatopora hystrix Dana, 1846 [= *S. angulata* sensu Hamilton & Brakel, 1984]. 4 specimens: RMNH 17021, 17022, 17023, Kenya O/3.

Stylophora Schweigger, 1819

Stylophora pistillata Esper, 1797 [= *S. cf. septata*, *S. mordax* and *S. pistillata* sensu Hamilton & Brakel, 1984]. 9 specimens: RMNH 17004, 17005, 17006 (somewhat atypical specimen, but fitting in the range of variation given by Veron & Pichon, 1976 and Veron, 1986), 17007, 17008, 17009, 17010, 17014, Kenya O/1.

ACROPORIDAE Verrill, 1902

Montipora de Blainville, 1830

**Montipora undata* Bernard, 1897. 1 specimen: RMNH 17048.

Montipora verrucosa (Lamarck, 1816) [= *M. cf. verrucosa* sensu Hamilton & Brakel, 1984]. 3 specimens: RMNH 17043, 17044; Kenya S-21.

**Montipora digitata* (Dana, 1846) [= *M. divaricata* sensu Lemmens & Smeets, 1987]. 5 specimens: RMNH 17045, 17046, 17050; Kenya O/11, Kenya S-5.

**Montipora hispida* (Dana, 1846). 1 specimen: RMNH 17047.

Montipora foliosa (Fallas, 1766) [= *M. cf. foliosa* sensu Hamilton & Brakel, 1984]. 1 specimen: RMNH 17049.

Montipora aequituberculata Bernard, 1897 [= *M. cf. erythraea* sensu Hamilton & Brakel, 1984; *M. erythraea* sensu Lemmens & Smeets, 1987]. 3 specimens: RMNH 17051, 17052; Kenya O/50.

Hamilton & Brakel (1984) reported *M. foveolata* (Dana, 1846) [as *M. socialis* Bernard, 1897] and *Montipora cf. ramosa* Bernard, 1897. The latter is a heterogeneous species (see Veron & Wallace, 1984).

Acropora Oken, 1815.

Acropora (A.) *humilis* (Dana, 1846). 2 specimens: RMNH 17024; Kenya B-5.

Acropora (A.) *cf. robusta* (Dana, 1846) [= *A. conigera* sensu Hamilton & Brakel, 1984]. 1 specimen: RMNH 17035.

Acropora (A.) *danaei* (Milne Edwards & Haime, 1860) [= *A. irregularis* and *A. rotumana* sensu Hamilton & Brakel, 1984; *A. rotumana* sensu Lemmens & Smeets, 1987]. 1 specimen: RMNH 17027.

Acropora (A.) *cf. formosa* (Dana, 1846) [= *A. "formosa"* sensu Hamilton & Brakel, 1984] or *A. cf. nobilis* (Dana, 1846) [= *A. intermedia* sensu Hamilton & Brakel, 1984; Lemmens & Smeets, 1987]. 4 specimens: RMNH 17040, 17041, 17042; Kenya L-S-91a. Specimens are too small for accurate study of the radial calyces, necessary to distinguish between *A. nobilis* and *A. formosa*. Only *A. formosa* is reported to occur in the western Indian Ocean (Veron, 1986).

**Acropora* (A.) *microphthalmia* (Verrill, 1859) [= ?*A. pharaonis* sensu Hamilton & Brakel, 1984; see Veron & Wallace, 1984]. 1 specimen: RMNH 17032.

**Acropora* (A.) *horrida* (Dana, 1846). 1 specimen: RMNH 17025.

Acropora (A.) *cf. cytherea* (Dana, 1846) [= *A. reticulata* and *A. armata* sensu Hamilton & Brakel, 1984]. 3 specimens: RMNH 17033, 17034, Kenya O/41.

**Acropora* (A.) *aculeus* (Dana, 1846) [= ?*A. nana* sensu Hamilton & Brakel, 1984; *A. aculeus*, unlike *A. nana*, has a reported distribution in the western Indian Ocean (Veron, 1986)]. 1 specimen: RMNH 17030.

Acropora (A.) *valida* (Dana, 1846) [= *A. cf. rousseaui* and *A. variabilis* sensu Hamilton & Brakel, 1984; *A. variabilis* sensu Lemmens & Smeets, 1987]. 2 specimens: RMNH 17026, Kenya S-71.

Acropora (A.) *secale* (Studer, 1878) [= *A. diversa* and *A. secale* sensu Hamilton & Brakel, 1984; *A. diversa* sensu Lemmens & Smeets, 1987]. 1 specimen: RMNH 17029.

Acropora (A.) *clathrata* (Brook, 1891). 1 specimen: RMNH 17031.

**Acropora* (A.) *divaricata* (Dana, 1846). 1 specimen: RMNH 17028.

**Acropora* (A.) *cf. longicyanthus* (Milne Edwards & Haime, 1860) or *A. cf. sarmentosa* (Brook, 1892) [= *A. cf. rosaria* sensu Lemmens & Smeets, 1987]. 1 specimen: RMNH 17036 (a small section of a tip, which complicates distinction between *A. longicyanthus* and *A. sarmentosa*).

**Acropora* (A.) *cf. loripes* (Brook, 1892) [= *A. cf. squarrosa* sensu Lemmens & Smeets, 1987]. 1 specimen: RMNH 17037.

Acropora spec.1. 1 specimen: RMNH 17038.

Acropora spec. 2. 1 specimen: RMNH 17039.

Of the 16 species of *Acropora* listed above, most are represented in the collection by one specimen only. The species of the genus *Acropora* are variable (morphology of colonies varies with habitat and geographical distribution). This, together with the number of species (there are 364 nominal species; see Veron & Wallace, 1984), causes considerable taxonomic problems. Studies by Wallace (1978) and Veron & Wallace (1984) have resulted in a substantial reduction in the number of species.

Hamilton & Brakel (1984) further reported *A. tenuis* (Dana, 1846), *A. palifera* (Lamarck, 1816), *A. cuneata* (Dana, 1846), *A. florida* (Dana, 1846), *A. forskali* (Ehrenberg, 1834), *A. ocellata* (Klunzinger, 1879), *A. hemprichi* (Ehrenberg, 1834), *A. hyacinthus* (Dana, 1846) [as *A. hyacinthus* (Dana, 1846), *A. spicifera* (Dana, 1846), *A. cf. corymbosa* (Lamarck, 1816) and *A. cf. recumbens* (Brook, 1892)], *A. (Isopora) bruegemannii* (Brook, 1893) [as *A. Bruegemannii uncinata* (Brook, 1892)], *A. polystoma* (Brook, 1891) [as *A. mas-sawensis* von Marenzeller, 1906], *A. cf. millepora* (Ehrenberg, 1834) [as *A. cf. squamosa* (Brook, 1892)], and *A. clathrata* (Brook, 1891) [as *A. orbicularis* (Brook, 1892)].

Astreopora de Blainville, 1830

Astreopora myriophthalma (Lamarck, 1816). 3 specimens: RMNH 17053, 17054; Kenya O/6.

**Astreopora listeri* Bernard, 1896. 1 specimen: RMNH 17057.

**Astreopora randalli* Lamberts, 1980. 2 specimens: RMNH 17055, 17056. Both specimens fit Lambert's (1982) description of *A. randalli*: a glomerate colony form with smooth surface and round, regular, small (0.1 to 0.14 mm) calical openings.

**Astreopora expansa* (Brüggemann, 1877). 1 specimen: RMNH 17058. The explanate shape of specimen RMNH 17058 is characteristic of *A. expansa* (see Lamberts, 1982).

Astreopora spec. 1 specimen: RMNH 17059. This specimen differs considerably from other specimens of *Astreopora* in the collection because of its well developed columella.

Veron & Wallace (1984) described only two species of *Astreopora* while Veron (1986) described six species. No single habitat has been found where more than two species of *Astreopora* could be distinguished in situ (Veron & Wallace, 1984). *A. randalli* Lamberts, 1980, and *A. expansa* Brüggemann, 1877, are mentioned by Veron & Wallace (1984) but not further described. *A. randalli* and *A. expansa* here listed and *A. profunda* Gardiner, 1898 mentioned by Hamilton & Brakel (1984) were not described by Veron (1986).

A. horizontalis Bernard, 1896, listed by Hamilton & Brakel (1984) might be a turbid water ecomorph of *A. listeri* or *A. myriophthalma* (see Veron & Wallace, 1984).

PORITIDAE Gray, 1842

Porites Link, 1807

Porites (*P.*) *australiensis* Vaughan, 1918. 3 specimens: RMNH 17210, 17211; Kenya O/59.

**Porites* (*P.*) *cf. mayeri* Vaughan, 1918. 1 specimen: RMNH 17212. The species was so far only reported from Australia (Veron, 1986).

**Porites* (*P.*) *cf. densa* Vaughan, 1918. 1 specimen: RMNH 17213. The species was so far only reported from Australia (Veron, 1986).

Porites (*P.*) *nigrescens* Dana, 1848 [= *P. cf. nigrescens* sensu Hamilton & Brakel, 1984]. 4 specimens: RMNH 17206, 17207, 17208; Kenya S-23.

Porites (*P.*) *cylindrica* Dana, 1846 [= *P. andrewsi* sensu Hamilton & Brakel, 1984]. 1 specimen: RMNH 17209.

Porites spec. 5 specimens: RMNH 17214, 17215, 17216, 17217, 17218.

Hamilton & Brakel (1984) also reported *P. cf. Seychelles* 1 Bernard (sic!), 1905; *P. cf. cocosensis* Wells, 1950; *P. cf. mordax* Dana, 1846, and *P. faustinoi* Hoffmeister, 1929 (none of which are mentioned by Veron & Pichon, 1982, or Veron, 1986); *P. lutea* Milne Edwards & Haime, 1860; *P. somaliensis* Gravier, 1911 [possibly synonymous with *P. lutea* Milne Edwards & Haime; see Veron & Pichon, 1982]; *P. (Synaraea) rus* (Forskål, 1775) [as *P. (S.) convexa* Verrill]; *P. cf. lobata* Dana, 1846, *P. murrayensis* Vaughan, 1918; and an unidentified species.

Goniopora de Blainville, 1830

**Goniopora djiboutiensis* Vaughan, 1907. 1 specimen: RMNH 17099.

**Goniopora somaliensis* Vaughan, 1907. 1 specimen: RMNH 17098.

**Goniopora cf. minor* Crossland, 1952. 1 specimen: RMNH 17097. The species has so far only been reported from the central Indo-Pacific region (Veron, 1986).

Goniopora spec. 1 specimen: RMNH 17100.

Hamilton & Brakel (1984) only reported an unidentified species of *Goniopora*.

Alveopora de Blainville, 1830

**Alveopora cf. fenestrata* (Lamarck, 1816). 3 specimens: RMNH 17203, 17204, 17205.

**Alveopora cf. spongiosa* Dana, 1846. 2 specimens: RMNH 17201, 17202.

Although the small sizes of *Alveopora* specimens complicated identification, two groups could be distinguished, tentatively identified as *A. cf. fenestrata* (with relatively large corallites, a less conspicuous fenestration, and deep calyces) and *A. cf. spongiosa* (with small calyces and clear fenestration). Veron & Pichon (1982) give an overlap in calyx size for the two species. Both species were so far only known from Australia and the western Pacific (Veron, 1986).

Hamilton & Brakel (1984) only reported *A. allingi* Hoffmeister, 1925 [as *A. mortenseni* Crossland, 1952].

SIDERASTREIDAE Vaughan & Wells, 1943

Psammocora Dana, 1846

Psammocora contigua (Esper, 1797). 4 specimens: RMNH 17011, 17012, 17013; Kenya S-15.

**Psammocora superficialis* Gardiner, 1898. 1 specimen: RMNH 17003.

Hamilton & Brakel (1984) also reported *P. nierstraszi* van der Horst, 1921.

Coscinaraea Milne Edwards & Haime, 1848

**Coscinaraea columna* (Dana, 1846). 5 specimens: RMNH 17079, 17080, 17081, 17082; Kenya O/61. Specimen RMNH 17079 agrees with the description of *C. ostreaformis* van der Horst, 1922 (*non* Wells, 1954) by Scheer & Pillai (1983) and resembles specimen RMNH 13971 (identified as *C. ostreaformis* by G. Scheer). *C. ostreaformis* is possibly a deep water ecomorph of *C. columna* (see Veron & Pichon, 1979), or of *C. monile* Forskål, 1775 (see Scheer & Pillai, 1983). The taxonomic position remains unsettled.

Coscinaraea monile Forskål, 1775. 2 specimens: RMNH 17078. *Coscinaraea monile* is endemic to the Red Sea and the Indian Ocean (Veron & Pichon, 1979) and was previously reported from East Africa by Didham (see Green, 1983) and Hamilton & Brakel (1984).

AGARICIIDAE Gray, 1847

Pavona Lamarck, 1801

Pavona decussata (Dana, 1846) [= *P. cf. decussata* sensu Hamilton & Brakel, 1984]. 1 specimen: RMNH 17063. 1 specimen: RMNH 17065.

**Pavona explanulata* (Lamarck, 1816). 3 specimens: RMNH 17061, 17062; Kenya O/36.

**Pavona clavus* (Dana, 1846) .

**Pavona minuta* Wells, 1954. 1 specimen: RMNH 17064.

Pavona varians Verrill, 1864. 3 specimens: RMNH 17066, 17067; Kenya J-9.

Pavona venosa (Ehrenberg, 1834). 2 specimens: RMNH 17060; Kenya O/35.

Pavona maldivensis (Gardiner, 1905). 3 specimens (17068,17069; Kenya H-5.

Pavona cf. *frondifera* Lamarck, 1816. 2 specimens: RMNH 17070; Kenya S-35. *P. frondifera* (see Hamilton & Brakel, 1984; Faure, 1982) is not described by Veron & Pichon (1979) or Veron (1986).

Hamilton & Brakel (1984) also reported *P. venosa* (Ehrenberg, 1834) [as *P. (Polyastra) obtusata* Quelch] and *P. divaricata* Lamarck. The latter species (see also Faure, 1982; Antonius et al, 1990) is not described by Veron & Pichon (1979).

Leptoseris Milne Edwards & Haime, 1849

**Leptoseris explanata* Yabe & Sugiyama, 1941. 1 specimen: RMNH 17072.

**Leptoseris mycetoseroides* Wells, 1954. 2 specimens: RMNH 17071; Kenya O/57.

The genus was previously reported from East Africa by Green (1983).

Gardineroseris Scheer & Pillai, 1974

Gardineroseris planulata (Dana, 1846) [= *Gardineroseris planulata* and *Agariciella minikoiensis* sensu Hamilton & Brakel, 1984]. 4 specimens: RMNH 17073, 17074, 17075; Kenya O/16.

Pachyseris Milne Edwards & Haime, 1849

Pachyseris speciosa (Dana, 1846). 3 specimens: RMNH 17076, 17077; Kenya E-2.

Hamilton & Brakel (1984) also reported an unidentified species of *Pachyseris* , while *P. rugosa* Lamarck, 1801 has been reported from the Mascarene Archipelago (Faure, 1982; see also Veron, 1986).

FUNGIIDAE

Fungia Lamarck, 1801

**Fungia (Cycloseris) costulata* (Ortmann, 1889) [= *Cycloseris costulata* sensu Lemmens & Smeets, 1987]. 4 specimens: RMNH 17083, 17084, 17085; Kenya S-85.

Fungia (Fungia) fungites (Linnaeus, 1758). 4 specimens: RMNH 17086, 17087, 17088; Kenya O/42.

**Fungia (Danafungia) scruposa* Klunzinger, 1879 [= *F. (D.) lobulata* sensu Lemmens & Smeets, 1987]. 1 specimen: RMNH 17089.

Fungia (Lobactis) scutaria Lamarck, 1801 [= *F. (Pleuractis) paumotensis* sensu Lemmens & Smeets, 1987]. 2 specimens: RMNH 17090, 17091.

In a recent revision of the Fungiidae, Hoeksema (1989) synonymized the genera *Cycloseris* Milne Edwards & Haime, 1849, and *Diaseris* Milne Edwards & Haime, 1849, and lowered their status to subgenera of the genus *Fungia*.

Hamilton & Brakel (1984) also reported *Fungia (Cycloseris) fragilis* (Alcock, 1893) [as *Cycloseris* cf. *patelliformis* (Boschma, 1923)], *F. (C.) distorta* Michelin, 1842 [as *Diaseris distorta* (Michelin, 1843)], *F. (Pleuractis) scutaria* (Lamarck, 1801), *F. (Verillifungia) repanda* (Dana, 1846) and *F. (V.) concinna* Verrill, 1864 [as *F. (V.) plana* (Studer, 1877)].

Herpolitha Eschscholtz, 1825

Herpolitha limax (Esper, 1797). 4 specimens: RMNH 17092, 17093, 17094; Kenya H-38. See remarks in Hoeksema, 1989.

Podabacia Milne Edwards & Haime, 1849

Podabacia crustacea (Pallas, 1766). 3 specimens: RMNH 17095, 17096; Kenya J-6.

OCULINIDAE Gray, 1847

Galaxea Oken, 1815

Galaxea astreata (Lamarck, 1816) [= *G. clavus* sensu Hamilton & Brakel, 1984]. 3 specimens: RMNH 17277, 17279; Kenya O/28.

Galaxea fascicularis (Linnaeus, 1767). 4 specimens: RMNH 17280, RMNH 17281, 17282; Kenya O/29.

PECTINIIDAE Vaughan & Wells, 1943

Echinophyllia Klunzinger, 1879

Echinophyllia aspera (Ellis & Solander, 1788) [*E. ?aspera* sensu Hamilton & Brakel, 1984]. 5 specimens: RMNH 17294, 17295, 17296, 17297; Kenya S-52.

Echinophyllia spec. 2 specimens: RMNH 17298, 17299. Two species of *Echinophyllia* (*E. aspera*, *E. echinata* Saville-Kent, 1871, are known from the western Indian Ocean (Veron, 1986). RMNH 17298 and 17299 could not be further identified.

Oxypora Saville-Kent, 1871

Oxypora lacera (Verrill, 1864). 4 specimens: RMNH 17300, 17301, 17302; Kenya O/73.

Mycedium Oken, 1815

Mycedium elephantotus (Pallas, 1766). 5 specimens: RMNH 17303, 17304, 17305, 17306; Kenya S-12.

Pectinia Oken, 1815

Pectinia lactuca (Pallas, 1766) [= *P. cf. lactuca* sensu Hamilton & Brakel, 1984]. 4 specimens: RMNH 17307, 17308, 17309; Kenya H-2.

All *Pectinia* specimens in the present collection have a more or less uniform shape with long meanders of 12 to 20 mm width, a conspicuous columella, thin septo-costae and small ridges with dentations to five mm long. They fit the description of *P. lactuca* by Veron (1979), but differ from central Indo-Pacific specimens in the RMNH collection identified as *P. lactuca*.

MUSSIDAE Ortmann, 1890

Blastomussa Wells, 1961

**Blastomussa merletti* (Wells, 1961). 2 specimens: RMNH 17284; Kenya B-8.

Cynarina Brüggemann, 1877

**Cynarina lacrymalis* (Milne Edwards & Haime, 1848). 2 specimens: RMNH 17285; Kenya S-84.

Acanthastrea Milne Edwards & Haime, 1848

Acanthastrea echinata (Dana, 1846). 5 specimens: RMNH 17286, 17287, 17288, 17289; Kenya S-78.

**Acanthastrea cf. lordhowensis* Veron & Pichon, 1979. 1 specimen: RMNH 17290. The specimen is too small to be identified with certainty; the small, irregular calyces with steep walls closely resemble those of *Acanthastrea* spec. sensu Veron & Pichon (1979), later named *A. lordhowensis* Veron & Pichon, 1982, after more specimens were collected around Hong Kong. So far *A. lordhowensis* had not been found in the Indian Ocean.

Lobophyllia de Blainville, 1830

Lobophyllia hemprichii (Ehrenberg, 1834) [= *L. hemprichii* and *L. cf. costata* sensu Hamilton & Brakel, 1984]. 2 specimens: RMNH 17291, 17292.

Lobophyllia hattaii Yabe, Sugiyama & Eguchi, 1936. 1 specimen: RMNH 17293.

MERULINIDAE Verrill, 1866

Hydnophora Fischer de Waldheim, 1807

Hydnophora exesa (Pallas, 1766). 5 specimens: RMNH 17246, 17247, 17248, 17249; Kenya O/26.

Hydnophora cf. microconos (Lamarck, 1816). 6 specimens: RMNH 17250, 17251, 17252, 17253; Kenya O/25 and O/48. Tentative identifications as specimens are small.

Hamilton & Brakel (1984) also reported *H. cf. rigida* (Dana, 1846) [as *H. cf. collumellata* Rehberg, 1892].

Merulina Ehrenberg, 1834

Merulina ampliata (Ellis & Solander, 1786). 2 specimens: RMNH 17283; Kenya O/32.

FAVIIDAE Gregory, 1900

Favia Oken, 1815

**Favia stelligera* (Dana, 1846). 6 specimens: RMNH 17225, 17226, 17227, 17228, 17229; Kenya O/40.

Favia pallida (Dana, 1846) [= *F. cf. pallida* sensu Hamilton & Brakel, 1984]. 4 specimens: RMNH 17222, 17223, 17224 [tentative identification]; Kenya H-35.

**Favia fавus* (Forskål, 1775). 4 specimens: RMNH 17219, 17220, 17221; Kenya S-25.

Hamilton & Brakel (1984) also reported *F. laxa* (Klunzinger, 1879), *F. cf. speciosa* (Dana, 1846), *F. sinensis* Milne Edwards & Haime, 1849, and *F. maritima* Nemenzo, 1971. The latter two are not described by Veron & Wallace (1984).

Favites Link, 1807

Favites chinensis (Verrill, 1866). 1 specimen: RMNH 17233. [= *F. melicerum* (Ehrenberg) sensu Hamilton & Brakel, 1984]

Favites pentagona (Esper, 1794). 2 specimens: RMNH 17231, 17232.

**Favites cf. russelli* (Wells, 1954). 1 specimen: RMNH 17230. Previously only known from Australia and the Marshall Islands (Veron, 1986).

**Favites cf. peresi* Faure & Pichon, 1978. 1 specimen: RMNH 17234. Also known from the Red Sea and the central and western Indian Ocean (Faure & Pichon, 1978). Not mentioned in Veron (1986) as the species is not recorded from Australia.

Goniastrea Milne Edwards & Haime, 1848

Goniastrea retiformis (Lamarck, 1816). 2 specimens: RMNH 17235, 17236.

**Goniastrea edwardsi* Chevalier, 1971. 1 specimen: RMNH 17237.

**Goniastrea aspera* (Verrill, 1865). 1 specimen: RMNH 17238.

**Goniastrea cf. pectinata* (Ehrenberg, 1834). 1 specimen: RMNH 17239.

Hamilton & Brakel (1984) also reported *G. australiensis* (Milne Edwards & Haime, 1857).

Platygyra Ehrenberg, 1834

Platygyra lamellina Ehrenberg, 1834. 3 specimens: RMNH 17240, 17241; Kenya O/22.

Hamilton & Brakel (1984) and Didham (see Lemmens & Smeets, 1987) also reported *P. daedalea* (Ellis & Solander, 1786).

Leptoria Milne Edwards & Haime, 1848

Leptoria phrygia (Ellis & Solander, 1786). 1 specimen: RMNH 17242.

Oulophyllia Milne Edwards & Haime, 1848

Oulophyllia crispa (Lamarck, 1816). 4 specimens: RMNH 17243, 17244, 17245; Kenya J-2a.

All specimens of *Oulophyllia* in the present collection have broad meanders (up to 20 mm wide), gradually descending walls with conspicuous dentation and approximately 8 septa/cm. They differ considerably from specimens in the RMNH, collected in SW Sulawesi, Indonesia, by Moll (1983). Faure (1982) distinguished two

species, viz. *O. crispa* and *O. aspera*, Quelch, 1886, but these are considered synonymous by Veron et al. (1977).

Montastrea de Blainville, 1830

**Montastrea annuligera* (Milne Edwards & Haime, 1849). 1 specimen: RMNH 17254.

Diploastrea Matthai, 1914

**Diploastrea heliopora* (Lamarck, 1816). 2 specimens: RMNH 17255, 17256.

Leptastrea Milne Edwards & Haime, 1848

Leptastrea inaequalis Klunzinger, 1879 [= *L. bottae* sensu Hamilton & Brakel, 1984; Lemmens & Smeets, 1987]. 1 specimen: RMNH 17259.

Leptastrea purpurea (Dana, 1846). 1 specimen: RMNH 17258.

**Leptastrea transversa* Klunzinger, 1879. 5 specimens: RMNH 17260, 17261, 17262, 17263 ; Kenya O/15. Previously only known from New Caledonia and Australia (Veron, 1986).

**Leptastrea* cf. *pruinosa* Crossland, 1952. 1 specimen: RMNH 17257. Previously only known from New Caledonia and Australia (Veron, 1986).

Cyphastrea Milne Edwards & Haime, 1848

Cyphastrea serailia (Forskål, 1775). 4 specimens: RMNH 17264, 17265, 17266 [tentative identification as the specimen somewhat resembles *C. chalcidium* Forskål, 1775]; Kenya O/13.

Cyphastrea microphthalmia (Lamarck, 1816) [= *C. forskaliana* (Milne Edwards & Haime) in Hamilton & Brakel, 1984]. 1 specimen: RMNH 17267.

Hamilton & Brakel (1984) also reported *C. chalcidium* (Forskål, 1775).

Echinopora Lamarck, 1816

Echinopora lamellosa (Esper, 1795). 2 specimens: RMNH 17276; Kenya O/47.

Echinopora gemmacea (Lamarck, 1816). 7 specimens: RMNH 17268, 17269, 17270, 17271, 17272, 17273; Kenya O/52.

Echinopora hirsutissima Milne Edwards & Haime, 1849. 3 specimens: RMNH 17274, 17275; Kenya S-24.

Veron & Pichon (1977) stated that: "differences between *E. lamellosa*, *E. hirsutissima* and *E. gemmacea* are less conspicuous in the western Pacific than in the Indian Ocean. These observations tend to support the hypothesis that the evolution of *E. gemmacea* is more advanced in the Red Sea and western Indian Ocean than in the western Pacific".

CARYOPHYLLIIDAE Gray, 1847

Plerogyra Milne Edwards & Haime, 1848

Plerogyra sinuosa (Dana, 1846). 5 specimens: RMNH 17310, 17311, 17312, 17313, 17314.

Physogyra Quelch, 1884

Physogyra lichtensteini Milne Edwards & Haime, 1851. 1 specimen: RMNH 17315.

Gyrosmlia Milne Edwards & Haime, 1851

Gyrosmlia interrupta (Ehrenberg, 1834). 3 specimens: RMNH 17316, 17317, 17318.

The genus *Gyrosmlia* is endemic to the western part of the Indian Ocean and the Red Sea (Veron, 1986).

DENDROPHYLLIIDAE

Turbinaria Oken, 1815

Turbinaria frondens (Dana, 1846) [= *T. cf. frondens* sensu Hamilton & Brakel, 1984]. 2 specimens: RMNH 17327, 17328. The species was previously only known from east of the Nicobar Islands (Veron, 1986).

**Turbinaria reniformis* Bernard, 1896. 3 specimens: RMNH 17324, 17325, 17326. The species was previously considered absent from the western Indian Ocean (Veron & Pichon, 1979).

Hamilton & Brakel (1984) in addition reported *T. mesenterina* (Lamarck, 1816), *T. crater* (Pallas, 1766) and *Turbinaria* spec. The name *T. crater* is ambiguous and has been used for young colonies of other *Turbinaria* species especially *T. frondens*, *T. mesenterina* and *T. reniformis* (Veron & Pichon, 1979).

Tubastrea Lesson, 1829

Tubastrea aurea (Quoy & Gaimard, 1833) [= *T. coccinea* sensu Hamilton & Brakel, 1984]. 2 specimens: RMNH 17319, 17320.

Tubastrea cf. diaphana Dana, 1846. 2 specimens: RMNH 17321, 17322. Specimens were collected at 21-22 m depth.

Tubastrea micrantha Ehrenberg, 1834. 1 specimen: RMNH 17323 [calyces sometimes more than 5 mm deep, otherwise the specimen fits the description of Scheer & Pillai (1983)].

Identification of specimens of this genus follows Scheer & Pillai (1983) and Searle (1956).

Discussion

Apart from the genera and species listed above, a number of other Scleractinia were previously recorded from East Africa (see Hamilton & Brakel, 1984), but not collected during the present study: *Stylocoeniella armata* (Ehrenberg, 1834); possibly *Coeloseris mayeri* Vaughan, 1918 (further only reported from the central Indo-West-Pacific region; Veron, 1986); *Anomastrea irregularis* von Marenzeller, 1908; *Siderastrea* spec.; *Halomitra pileus* (Linnaeus, 1758) [as *H. philippinensis* Studer, 1901; see Veron & Pichon, 1979]; *Polyphyllia tulpina* (Lamarck, 1801) (see Hoeksema, 1989); *Caulastrea tumida* Matthai, 1928; *C. furcata* Dana, 1846; *Astreosmilia connata* Ortmann, 1892; *Trachyphyllia geoffroyi* Audouin, 1826; *Culicia cuticulata* Klunzinger, 1879 (not mentioned by Veron, 1986); *Symphyllia* spec.; *Heteropsammia cochlea* (Spengler, 1781) [as *H. cochlea* (Spengler) and *H. michelini* (Milne Edwards & Haime, 1848); see Veron & Pichon, 1979].

As a result of the present study five genera are added to the species list of Hamilton & Brakel (1984), viz. *Leptoseris* Milne Edwards & Haime, 1849, *Blastomussa* Wells, 1961, *Cynarina* Brüggemann, 1877, *Montastrea* de Blainville, 1830, and *Diploastrea* Matthai, 1914. Of these, the genus *Leptoseris* was previously collected in the Watamu Marine National Reserve by the Leopard Reef Expedition (see Green, 1983). The total number of genera recorded from East Africa now amounts to 56 (*Diaseris* and *Cycloseris* now have subgeneric status, *Agariciella minikoinsis* is synonymous with *Gardineroseris planulata*; see species list).

The annotated species list here presented also adds 43 species to the list of Hamilton & Brakel. Combining the two lists, and removing all synonyms according to recent revisions (as indicated in the annotated species list), the total number of

scleractinian species reported thus far from East Africa currently amounts to 169; an increase of about 27% on the previously known diversity.

Comparing this current species list of scleractinians from East Africa with those of other nearby regions (see Sheppard, 1987), it becomes apparent that more genera and species are to be expected in the Watamu Malindi region. The genera *Anacropora* Ridley, 1884, *Madracis* Milne Edwards & Haime, 1849, *Stylaraea* Milne Edwards & Haime, 1851, *Horastrea* Pichon, 1971, *Physophyllia* Duncan, 1884, *Scolymia* Haime, 1852, *Symphyllia* Milne Edwards & Haime, 1848, *Ctenella* Matthai, 1928, *Barabattoia* Yabe & Sugiyama, 1941, *Plesiastrea* Milne Edwards & Haime, 1848, *Euphyllia* Dana, 1846, *Catalaphyllia* Wells, 1971, *Heterocyathus* Milne Edwards & Haime, 1848, *Dendrophyllia* de Blainville, 1830, and *Balanophyllia* Wood, 1844, are represented in the western Indian Ocean (e.g. Veron, 1986) and are likely to occur along the Kenyan coast. Furthermore, additional species can be expected within the genera *Acropora* Oken, 1815, *Montipora* de Blainville, 1830, *Porites* Link, 1807, *Astreopora* de Blainville, 1830, *Goniopora* de Blainville, 1830, *Alveopora* de Blainville, 1830, *Psammocora* Dana, 1846, *Leptoseris* Milne Edwards & Haime, 1849, *Fungia* Lamarck, 1801, *Ctenactis* Verrill, 1864, *Lobophyllia* de Blainville, 1830, *Favia* Oken, 1815, *Favites* Link, 1807, *Goniastrea* Milne Edwards & Haime, 1848, *Platygyra* Ehrenberg, 1834, *Montastrea* de Blainville, 1830, *Seriatopora* Lamarck, 1816, *Turbinaria* Oken, 1815, and *Tubastrea* Lesson, 1829.

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