An Annotated and Illustrated Checklist of Species of the Coral Genus Acropora (Cnidaria: Scleractinia) from Vamizi Island, Mozambique

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An annotated and illustrated checklist of species of the coral genus *Acropora* (Cnidaria: Scleractinia) from Vamizi Island, Mozambique

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ABSTRACT

The hermatypic coral fauna of the Western Indian Ocean is one of the least known globally. This is true of the East African Coast and especially Mozambique, where taxonomic studies are scarce and date mostly from decades ago. The morphology of coral species is subjected to a high level of geographical and environmental variability, which leads to difficulties in field identification and may limit the level of taxonomic resolution at which coral studies can be conducted. Thorough examination of collected specimens can provide more reliable identification of species and more importantly provide a physical record that can be studied further. We collected and identified 32 species of corals from the genus *Acropora* (Anthozoa: Scleractinia: Acroporidae) of Vamizi Island, northern Mozambique, and present an annotated and illustrated checklist of species. These species records illustrate the high diversity of *Acropora* in Vamizi, which is comparable to the diversity of this genus in the region. This study can help assess the biodiversity of the region and provides a baseline against which changes can be closely monitored.

KEY WORDS: Mozambique, Scleractinia, Vamizi Island, Western Indian Ocean.Acropora, biogeography, checklist, diversity, hermatypic corals, morphology.

INTRODUCTION

The taxonomy of reef corals has been extensively studied worldwide. Nevertheless, some biogeographic regions, such as the Australian Great Barrier Reef (GBR) or the Caribbean, are much better known than others. The Western Indian Ocean (WIO) has been subject to little research effort and, as a result, this coral fauna is among the least known (Arrigoni *et al.* 2012; Obura 2012), especially along the southeastern coast of Africa (Riegl 1993). Furthermore, studies have often been restricted to small geographical and temporal scales (Obura 2012).

The diversity of corals found along the coast of Mozambique is very poorly known. Motta *et al.* (2002) characterise three distinct sections of the Mozambican coastline: the northern coral coast, from 10°S down to about 17°S; the central swamp coast, from 17°S to 21°S; and the southern dune coast, from 21°S to the southern tip (26°S). The first section is characterised by extensive coral formations forming "an almost continuous fringing reef" (Motta *et al.* 2002), the second by numerous river outlets and associated mangroves, devoid of coral reefs, and the third by a high-energy coast with rocky outcrops covered by a none-accreting coral reef veneer (Ramsay 1994, 1996). Along the southern section, this continuous reef system extends towards the southernmost distribution of African corals in South Africa (Boshoff 1981).

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To our knowledge, studies purely dedicated to Mozambican coral diversity are scarce. Exceptions where comprehensive collection of data has been performed include Inhaca Island, Xai-Xai, Ponta Zavora and Bazaruto Island (Boshoff 1981; Riegl 1995, 1996*a;* Benahayu & Schleyer 1996). All this research, however, was restricted to the southern section of Mozambique and some is out of date. In northern Mozambique, few detailed studies of coral diversity have been conducted, despite the most extensive and species-diverse reefs occurring there. Close to 300 species of hermatypic coral are estimated to occur at locations such as Nacala and the Quirimbas Archipelago (Obura 2012), along the northern coast of Mozambique; and the northern Mozambique Channel has been described as the core of WIO coral biodiversity, a second hotspot of Indo-Pacific species diversity after the Coral Triangle in the Western Pacific Ocean (Obura 2012). Hence, the lack of knowledge on the coral fauna of northern Mozambique compared to the southern coast has contributed to an underestimation of Mozambican coral biodiversity. In the northern Quirimbas Archipelago, Vamizi Island is surrounded by some of the most diverse and well-preserved coral reefs of East Africa (Hill *et al.* 2009). Only a few studies have assessed the diversity of reef fish and corals in the area (Davidson *et al.* 2006; Hill *et al.* 2009; Obura 2012). Davidson *et al.* (2006) provide a species list of 183 scleractinian corals using the Rapid Ecological Assessment (REA) method described by DeVantier *et al.* (1998). Obura (2012) identified species *in situ* using digital photography, while focusing on "ecomorph/biogeography observation", and recorded 207 species although he estimates species richness at 269 species.

The genus *Acropora* Oken, 1815 is by far the most speciose of extant scleractinian genera (Wallace 1999; Veron 2000). *Acropora* dominate most Indo-Pacific reefs, where they usually outcompete other taxa due to unmatched growth rates and branching/overtopping growth forms (Wallace & Wolstenholme 1998). *Acropora* are considered major architects of reef structural complexity, providing habitat richness (Wallace 1999). It is thus an important genus for the ecology and function of coral reef ecosystems (e.g. Veron & Wallace 1984; Wallace 1999; Rahmani *et al.* 2013). However, little is known about *Acropora* species diversity in Mozambique, especially in the north.

Coral taxonomy, particularly for the genus *Acropora*, is rendered very complex by the existence of both geographical and environmental variability in species morphology (Budd 1985; Veron 2000; Todd 2008). The macromorphological approach has long been the principal tool for coral identification and classification (Veron & Pichon 1976; Veron 2000; Budd *et al.* 2010). Although recent molecular work has demonstrated that the classic coral phylogeny based on this approach is incorrect (Kerr 2005; Budd *et al.* 2010), morphological analysis at corallite and subcorallite level can still provide satisfactory species identification for *Acropora* and is still in use (A. Baird, pers. comm.). Sampling and identification of specimens from specific locations can contribute to the understanding of the biodiversity of an area and the biogeography of coral species, as well as improve the taxonomic resolution in other studies. It provides a physical record of specimens that can be further analysed or reinterpreted, and constitutes a baseline against which future assemblage changes can be closely measured.

Here, we present the first detailed checklist with annotations and illustrations of hard corals of the genus *Acropora* (Scleractinia: Acroporidae) from the collection of specimens from Vamizi Island gathered between 2012 and 2013. We compare this list to the earlier lists of *Acropora* from Vamizi of Davidson *et al.* (2006) and Obura (2012).

MATERIAL AND METHODS

Study area

Vamizi is a tropical island (11°S) situated in the Quirimbas Archipelago, northern Mozambique (Fig. 1A). It is of Pleistocene origin, and is approximately 12 km long and 2 km wide, stretching on an east-west axis (Fig. 1B). It is bound in the north and south by deep canyons. Close to 500 m deep, these canyons supply cooler waters to the reefs from the depths of the Mozambique Channel, which may provide thermal refugia from coral bleaching (Hill *et al.* 2009). The island is surrounded by a fringing reef with an associated shallow lagoon where coral bommies are interspersed with sandy patches. At the northern edge of this platform, the reef slopes plunge steeply into the canyons, while the eastern edge is a vertical wall with numerous overhangs.

Collection and processing of specimens

All specimens were collected from the reef flats near the platform edge on the northern side of the island, and at depths ranging from 3–7 m, except for *Acropora loripes* (Brook, 1892), which was collected along a wall about 15 m deep.

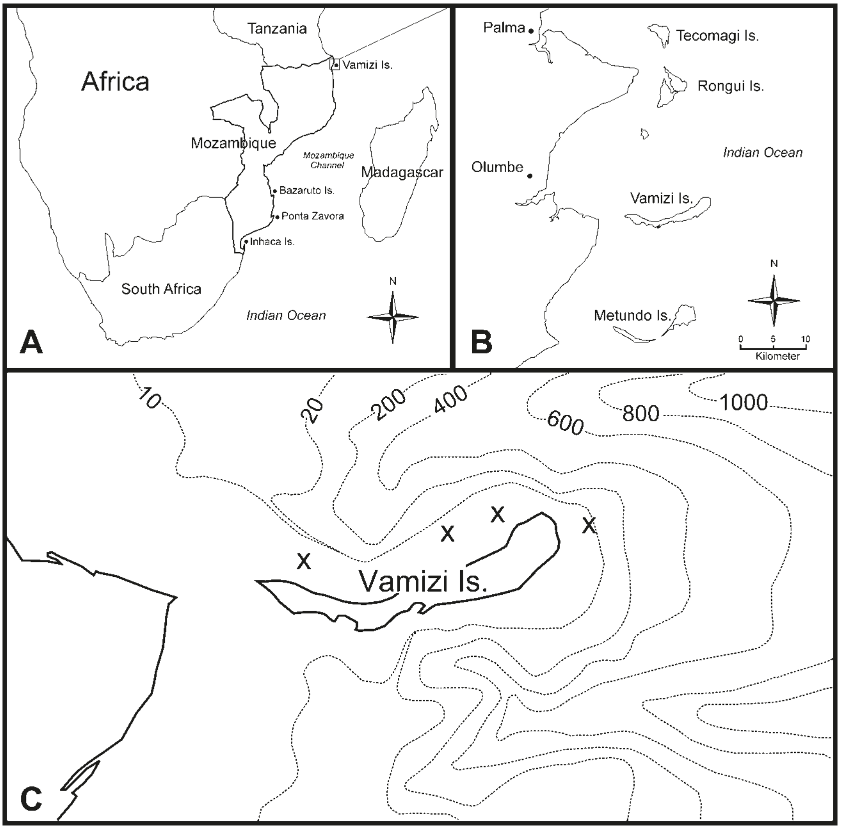

Fig. 1. (A) Map of Africa showing Mozambique and relative position of Vamizi Island. (B) Vamizi Island, in the northern section of the Quirimbas Archipelago. (C) Bathymetry around Vamizi Island. Dotted lines show depth contours in metres and collection sites are shown by 'x' marks.

TABLE 1
Comparison of species reported in Davidson *et al.* (2006) and Obura (2012, supplemental online material) with species recorded in the present study. R = recorded; N = not recorded; C = specimen collected; P = photographed in the field only.

Species	Davidson *et al* (2006)	Obura (2012)	Present Study
Acropora abrotanoides	R	R	R, C
Acropora aculeus	R	N	N
Acropora appressa	R	N	R, C
Acropora arabensis	R	N	N
Acropora aspera	N	R	N
Acropora austera	R	R	R, C
Acropora bifurcata	N	N	R, C
Acropora branchi	R	N	R, C
Acropora cerealis	R	N	R, C
Acropora clathrata	R	R	R, C
Acropora copiosa	N	R	N
Acropora cytherea	R	R	N
Acropora digitifera	R	R	R, C
Acropora divaricata	R	R	R, C
Acropora donei	N	R	N
Acropora florida	R	R	R, C
Acropora forskali	R	N	R, C
Acropora gemmifera	R	R	R, C
Acropora grandis	R	R	R, C
Acropora granulosa	R	R	R, C
Acropora hemprichii	R	N	R, C
Acropora horrida	R	N	N
Acropora humilis	R	R	R, C
Acropora hyacinthus	R	R	N
Acropora insigni	N	R	N
Acropora intermedia	R	R	R, C
Acropora latistella	R	R	R, C
Acropora listeri	N	R	N

Samples were collected using SCUBA. Colony fragments were taken from adult *Acropora* colonies (>20 cm in diameter) encountered during the dives and given numbered tags. High-resolution digital photographs of the whole colonies were taken to assist with identification.

Samples were left in sodium hypochlorite overnight in order to remove the soft tissue and expose the skeleton. Cleaned skeletons were rinsed thoroughly in fresh water and left to dry. Finally, whole skeleton fragments were photographed with a digital camera, and close-up pictures of the skeletal microstructure were obtained with a digital camera mounted on a dissection microscope (40×). The specimen collection is kept at Universidade do Lúrio of Pemba, Mozambique.

Methodology for coral identification

Species identification relied on the examination of the morphology of specimens' skeletons at the corallum, corallite and subcorallite levels.

The Genus *Acropora* is characterised by a porous skeleton, simple septa, the absence of a columella and the presence of two types of corallites, i.e. axial and radial (Wallace 1999). The terminology used to describe skeletal characters follows Wallace and Wolstenholme (1998) and Wallace (1999). For each species, we examined the growth form of the corallum; shape and inner and outer diameter of axial corallites; the shape,

TABLE 1 (*continued*)
Comparison of species reported in Davidson *et al.* (2006) and Obura (2012, supplemental online material) with species recorded in the present study. R = recorded; N = not recorded; C = specimen collected; P = photographed in the field only.

Species	Davidson *et al* (2006)	Obura (2012)	Present Study
Acropora longicyathus	R	N	N
Acropora loripes	R	N	R, C
Acropora lukteni	N	R	N
Acropora macrostoma	N	R	N
Acropora microphthalma	R	R	R, C
Acropora monticulosa	R	N	R, C
Acropora muricata	R	R	R, C
Acropora nana	N	N	R, C
Acropora nasuta	R	R	R, C
Acropora ocellata	R	N	N
Acropora pharaonis	N	R	N
Acropora polystoma	R	N	R, C
Acropora retusa	N	R	N
Acropora robusta	R	N	R, C
Acropora rosaria	R	R	N
Acropora roseni	N	N	R, P
Acropora samoensis	N	R	N
Acropora secale	N	R	R, P
Acropora selago	R	N	R, C
Acropora squarrosa	R	N	N
Acropora subulata	R	R	R, C
Acropora tenuis	R	R	R, C
Acropora valenciennesi	R	R	N
Acropora valida	R	R	R, C
Acropora variabilis	R	N	N
Acropora vermiculata	R	N	R, C
Acropora verweyi	R	N	R, P
Acropora willisae	R	N	R, C
Acropora yongei	R	N	R, P

arrangement and density of radial corallites; and the presence of one or more types of radial corallites. At the subcorallite level, size and shape of septa, number of septal cycles and characteristics of the coenosteum on and between corallites were considered. Axial corallite diameters were expressed as the range for three to five corallites randomly selected, except when only one branch was available, for which only a single value could be recorded. Species were identified using primarily Veron and Wallace (1984, Wallace and Wolstenholme (1998), Wallace (1999) and Veron (2000). For certain species, an identification was reached after additional discussion with B. Riegl. Species are listed in alphabetic order for purposes of clarity in the reading of this paper.

Due to the complexity of the genus *Acropora*, some species could not be conclusively identified. To make this clear, the abbreviation cf. precedes the names of these species.

RESULTS

We collected and identified 32 species of *Acropora* (Table 1). Thirty of these were also recorded by Davidson *et al.* (2006) and 17 by Obura (2012), and two species, *A. bifuracta, Nemenzo 1971* and *A. nana* (Studer, 1878), are new records for the location (Table 1).

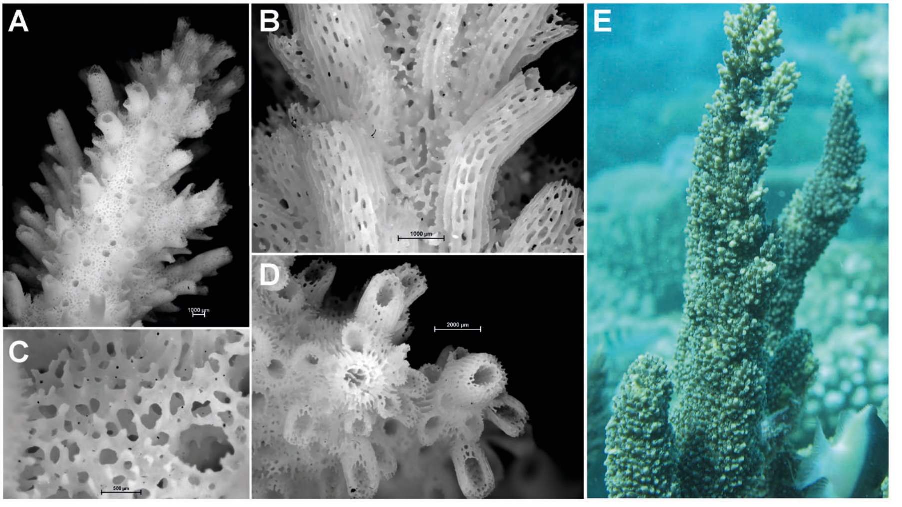

Fig. 2. *Acropora abrotanoides*. Specimen number: VAM61. (A) branch detail; (B) radial corallites; (C) coenosteum between corallites; (D) axial corallites; (E) live colony.

TAXONOMY

Family Acroporidae Verrill, 1902
Genus *Acropora* Oken, 1815

Acropora abrotanoides (Lamarck, 1816)

Fig. 2

Colony growth form: Strongly irregular with thick prostrate to upright branches and an encrusting base; basal branches are highly fused and upward-projecting ones may be pointed or rounded, bearing many axial corallites.
Axial corallites: Outer diameter 1.6–2.3 mm; inner diameter 0.7–1.1 mm; not well differentiated from radial corallites at the tip of branches; long and tubular; primary septa extend deep within calyx; secondary septa absent.
Radial corallites: Mixture of sizes and shapes gives colony spiny appearance; long and tubular with clearly dimidiate opening; shorter ones are completely dimidiate; interspersed are sub-immersed corallites with round opening; long tubular incipient axial corallites with round opening are frequent; septal development is reduced to lines of spines. *Coenosteum*: Costate on radial corallites and reticulate with scattered spinules in intercorallite areas.

Remarks: This species has similarities with *A. robusta* (Dana, 1846), but is distinguished mainly by the profusion of incipient axial corallites distally on branches and for having more elongate radial corallites.

Acropora cf. *appressa* (Ehrenberg, 1834) (Riegl 1995 as *A. sordiensis*)

Fig. 3

Colony growth form: Caespito-corymbose; branches are irregularly anastomosed and taper slightly. Incipient axial corallites are common distally on branch.

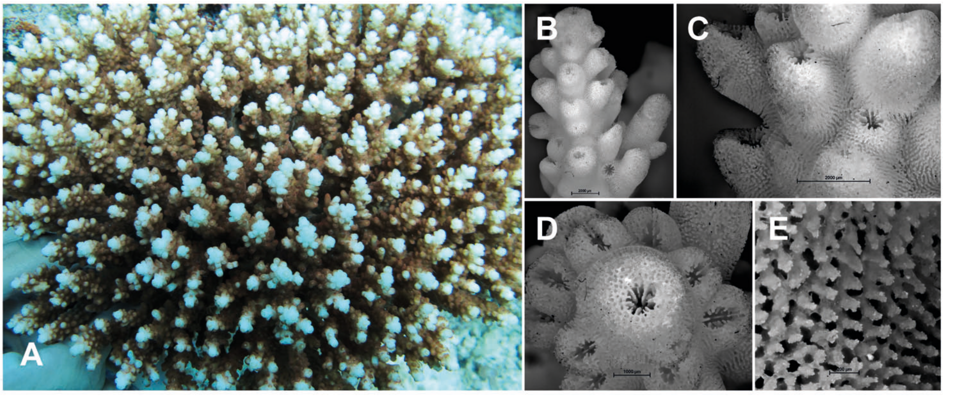

Fig. 3. *Acropora* cf. *appressa.* Specimen number: VAM68. (A) live colony; (B) branch detail; (C) radial corallites; (D) axial corallite; (E) coenosteum between corallites.

Axial corallites: Outer diameter 2.9 mm; inner diameter 1.0 mm; prominent, dome-shaped to conical with small round opening; clearly, two septal cycles are well developed and a third cycle may be visible.
Radial corallites: Irregularly sized and arranged, appressed tubular with round to oblique opening; the most appressed ones have a reduced inner wall and those with oblique opening are usually hooked upward; towards the base of branches, radials are generally absent or sub-immersed to immersed; two cycles of dentate septa, directives are usually prominent.
Coenosteum: Dense arrangement of laterally flattened spinules with elaborated tips throughout.

Remarks: At locations like Madagascar, the Seychelles and Tanzania, this species usually has longer and more conical axial corallites (see Veron 2000). Our specimen, however, is more consistent with those described in Riegl (1995) (as *A. sordiensis*), owing to the similar growth form, the characteristics of radial corallites with some having a hooked lip, and the structure of the coenosteum, which consists of an arrangement of elaborated spinules.

Acropora austera (Dana, 1846)

Fig. 4

Colony growth form: Irregularly arborescent, sometimes slightly hispidose; main branches taper and may be very thick, they give-off secondary branches at irregular intervals.
Axial corallites: Outer diameter 2.6–3.3 mm; inner diameter 0.8–0.9 mm; large and thick-walled with small opening; first and second septal cycles are present and well developed.
Radial corallites: Size and shape are variable; usually tubular to rounded tubular or appressed. Primary septa are present, secondary septa are generally absent or incomplete, but well developed in some colonies; radial corallites are numerous and may be arranged in rows or not.

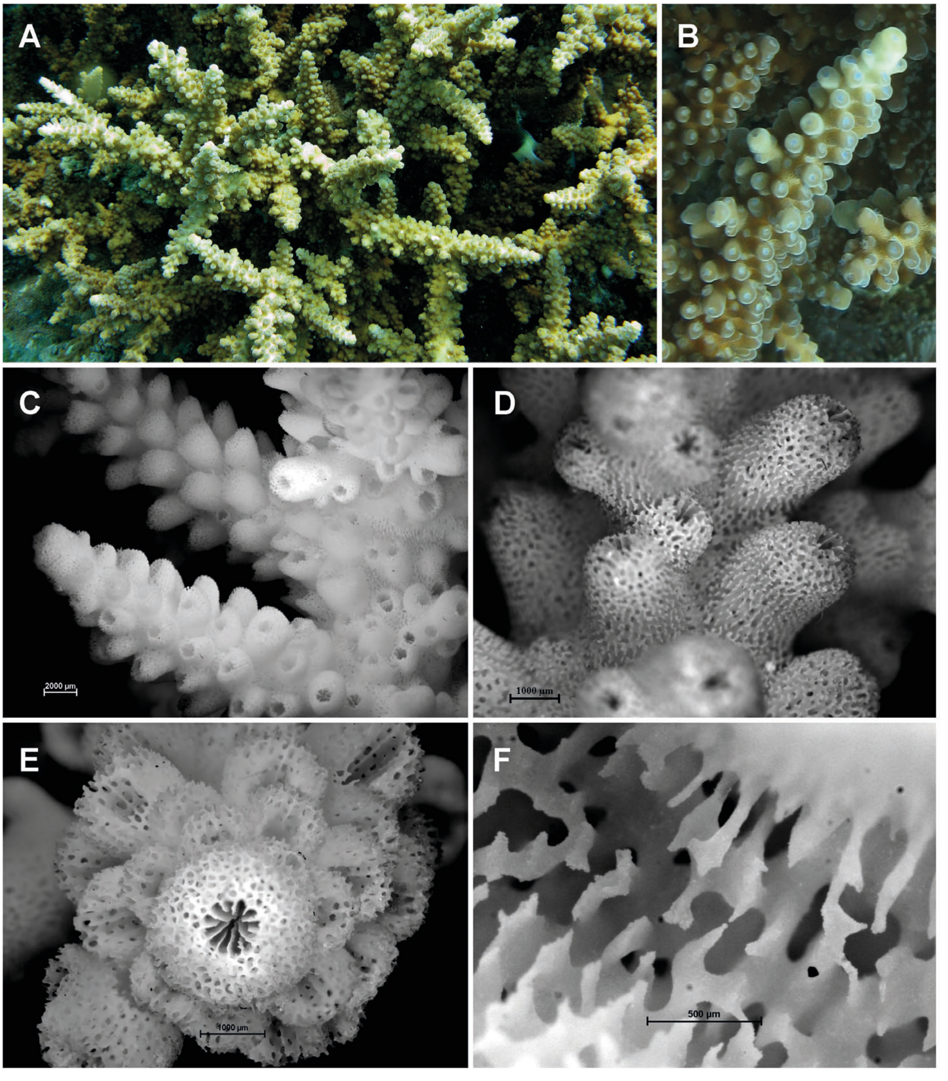

Fig. 4. *Acropora austera.* Specimen number: (A, B, E) VAM39; (C, D) VAM13. (A) live colony; (B) branch detail; (C) portion of colony; (D) radial corallites and (E) axial corallite; (F) coenosteum between corallites.

Coenosteum: Densely reticulate with rows of elaborated spinules on and between corallites.

Acropora cf. *bifurcata* Nemenzo, 1971

Fig. 5

Colony growth form: Tables or plate-like usually side-attached; fine horizontally spreading branches that may be fused especially in the centre of table; secondary branches often consist of incipient axial corallite surrounded by a crown of radials

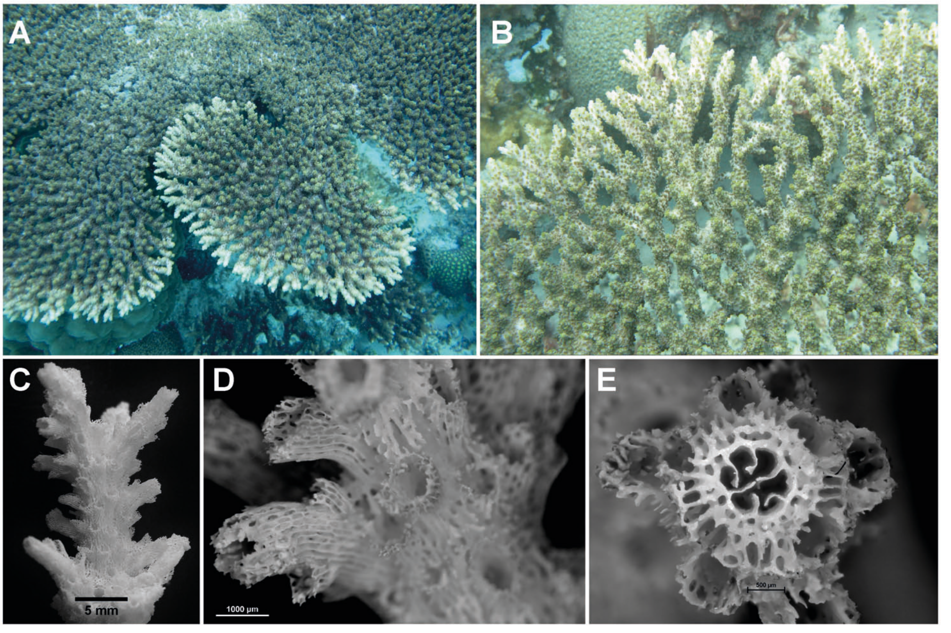

Fig. 5. *Acropora* cf. *bifurcata.* Specimen number: VAM56. (A) live colony (B) branch detail; (C) branch fragment; (D) radial corallites; (E) axial corallite.

slightly projecting upward from main branch surface and giving a clumsy appearance; under-surface of colony is usually devoid of branchlets.
Axial corallites: Outer diameter 1.7–2.1 mm; inner diameter 0.5–0.9 mm; exsert and tubular; primary septa are well developed and usually dentate and secondary septa are reduced or absent.
Radial corallites: Small, tubular and strongly appressed with round to oval opening; radial corallites are evenly sized and spaced with the exception of few longer ones with flaring outer lip; primary septa are rudimentary and second cycle absent.
Coenosteum: Costate or lines of laterally flattened spinules.

Remarks: This species was somewhat problematic and presented similarities with *Acropora cytherea* (Dana, 1846), namely in its branching pattern, but the structure of radial corallites and the branching pattern of secondary branchlets, consisting of clumps of one axial and radial corallites projecting only little from the surface of horizontal main branches, pointed to Nemenzo's (1971) *A. bifurcata.*

Acropora branchi Riegl, 1995

Fig. 6

Colony growth form: Large tables with side or central attachment usually not circular but tiered or fractioned with different sections contorted in various directions sometimes with a thick columnar stalk. In Vamizi specimens, horizontal branches are fused into thick solid plates; branchlet formation is minimal, rather, the surface is covered with a mixture of axial and radial corallites.

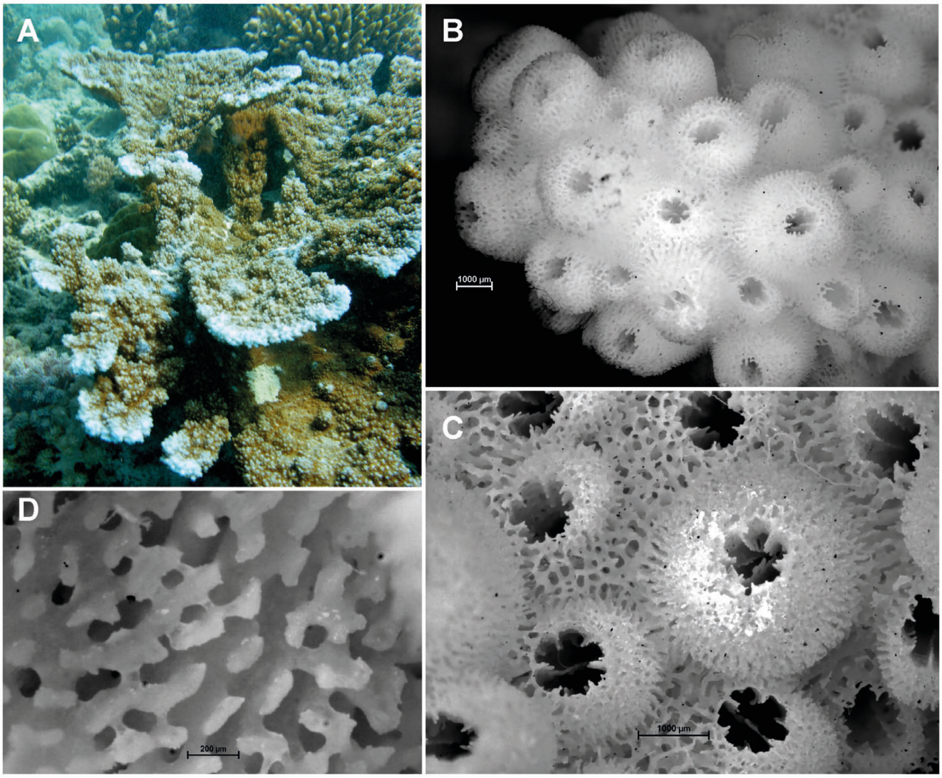

Fig. 6. *Acropora branchi.* Specimen number: VAM64. (A) live colony; (B) branch tip detail; (C) radial corallites; (D) coenosteum between corallites.

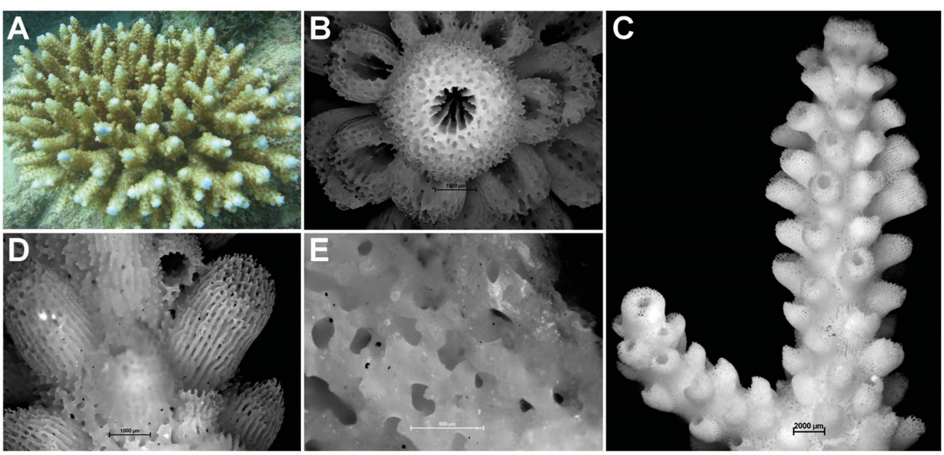

Fig. 7. *Acropora cerealis* Specimen number: VAM63. (A) live colony; (B) axial corallite; (C) branch fragment; (D) radial corallites; (E) coenosteum between corallites.

Axial corallites: Outer diameter 1–3 mm; inner diameter 0.7–0.9 mm; mostly undistinguished except at edge of plates; large and dome shaped and thick walled with small round opening; primary septa are well developed, dentate and secondary absent or only visible as points.
Radial corallites: Numerous, variable in size, similar in shape to axials; primary septa are present strongly dentate, secondary septa are generally absent.
Coenosteum: Densely reticulate with spinules with elaborated tips, throughout.

Remarks: This species has high morphological variability (B. Riegl pers. comm.). Here, the identification is really based on the near-exact fit of radial corallites characters to those described in Riegl (1995) and the fact that axial corallites are inconspicuous.

Acropora cerealis (Dana, 1846)

Fig. 7

Colony growth form: Small corymbose bushes.
Axial corallites: Outer diameter 2.8–3.6 mm; inner diameter 0.9–1.2 mm; tubular with thick wall; blade-like septa are present in two neat cycles.
Radial corallites: Uniformly sized and arranged; nariform with extending and thickened outer wall that can be slightly hooked; opening is very elongate or dimidiate; septa are dentate but rudimentary.
Coenosteum: Costate or broken costae on and between radial corallites.

Remarks: *A. cerealis* has a resemblance to *A. nasuta* (Dana, 1846), but Wallace and Wolstenholme (1998) differentiate them by *A. cerealis* having thinner branches and radial corallites with more extended outer-wall, sometimes hooked upwards. Our diagnosis is mainly based on these two features as well as the different coenosteum structure. As noted by Veron and Wallace (1984), *A. cerealis* also has a more branching growth pattern than *A. nasuta*, which was also the case here.

Acropora clathrata (Brook, 1891)

Fig. 8

Colony growth form: Thick flattened branches spreading horizontally giving tabulate or plate-like colonies with single or tiered plates; irregularly anastomosed main branches have variable degree of fusion, but central older parts of the colony are often completely fused into a solid plate; Vertical branchlets are absent.
Axial corallites: Usually not well defined on branch tips except plate's margins where there may be more than one; they are tubular with round opening and thick wall; primary septa are conspicuous, but second cycle absent.
Radial corallites: Wide variety of shapes and sizes; they may be exsert or sub-immersed; tubular, nariform or tubular appressed with round or dimidiate openings; radials are usually crowded and tend to be shorter or sub-immersed on the underside of branches; primary septa may be visible as points on longer corallites, but secondary septa are absent.
Coenosteum: Costate on radial corallites occasionally dense rows of simples spinules; reticulate with scattered spinules between corallites.

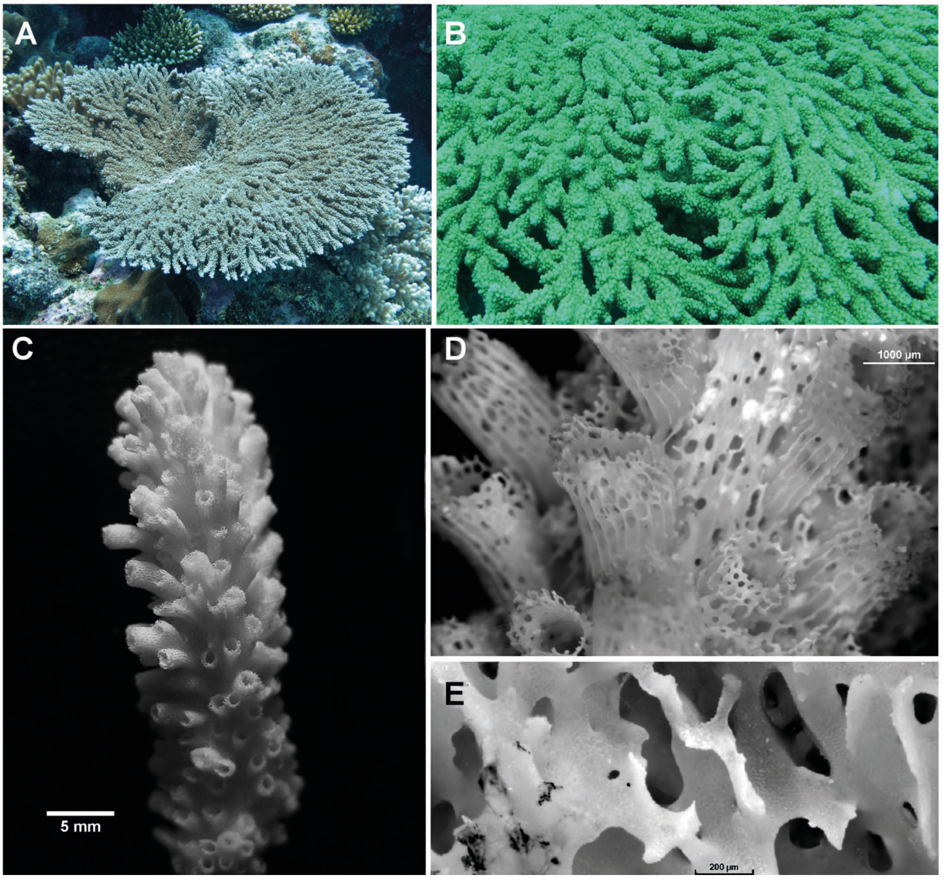

Fig. 8. *Acropora clathrata.* Specimen number: (A, C–E) VAM20; (B) VAM26. (A) live colony; (B) plate surface; (C) branch fragment; (D) radial corallites; (E) coenosteum between corallites.

Acropora digitifera (Dana, 1846)

Fig. 9

Colony growth form: Digitate with little ramifications at the base of branches.
Axial corallites: Outer diameter 2.7 mm; inner diameter 0.9 mm; conspicuous, tubular with thick wall and round opening; first and second septal cycles are well developed and usually not dentate.
Radial corallites: Dimidiate, upper wall is absent and lower wall is thickened and flaring; they are uniform and usually arranged in rows; radials are numerous but not touching; primary septa are present and second cycle is reduced or incomplete.
Coenosteum: Densely arranged line of elaborated spinules on corallites, may resemble costae on longer corallites; between corallites, coenosteum is reticulate with elaborated spinules.

Remarks: Species of the *A. humilis* group are closely related and very similar in growth form and other characters (Veron & Wallace 1984). We distinguished *A. digitifera* from

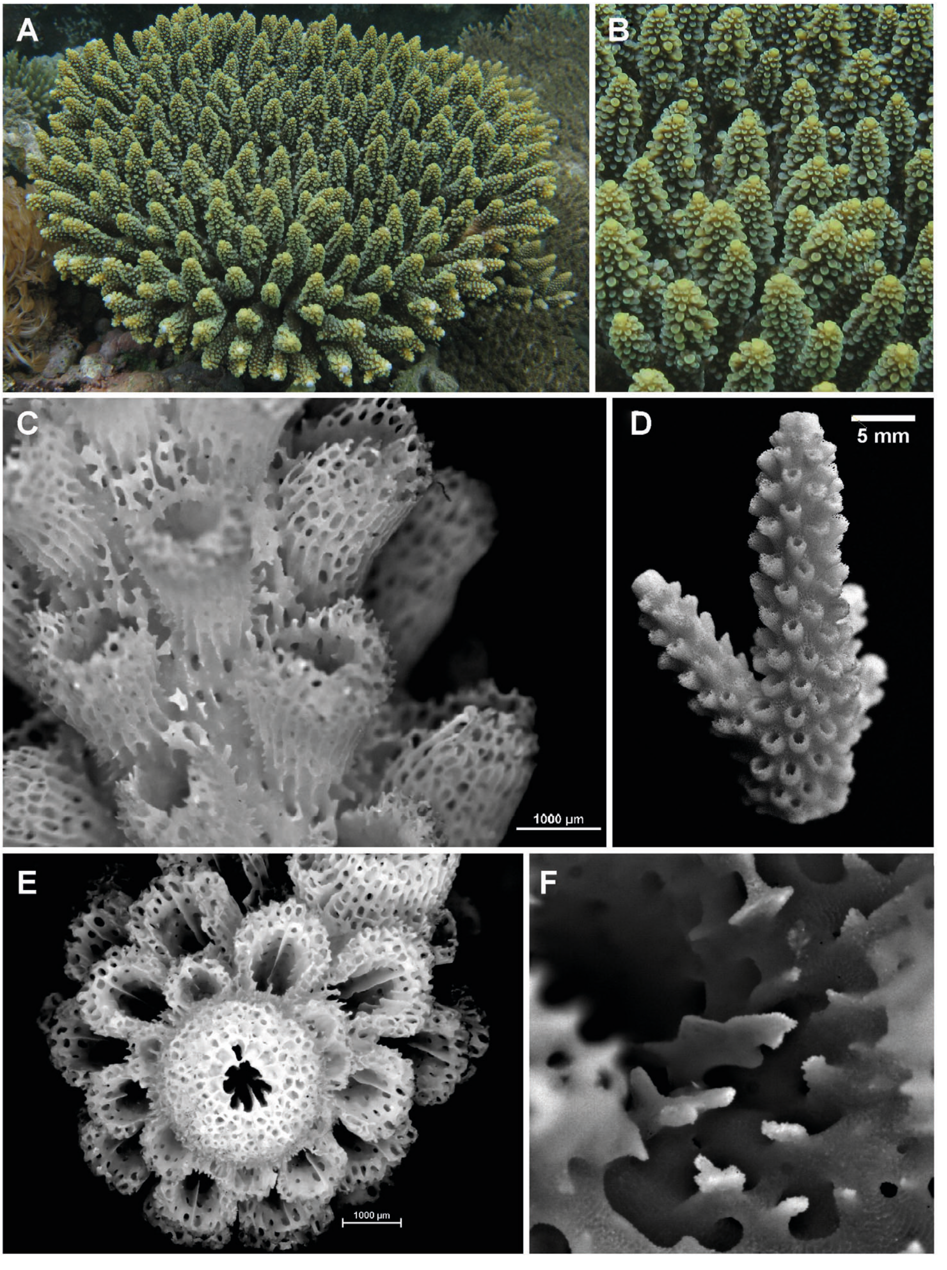

Fig. 9. *Acropora digitifera.* Specimen number: VAM29. (A) live colony; (B) branch fragment; (C) radial corallites; (D) branch fragment; (E) axial corallite; (F) coenosteum between corallites.

others by its thinner branches, its radials corallites with a characteristically flaring outer lip and the absence of an upper wall, which gives them a sharp appearance, as noted by (Veron 2000).

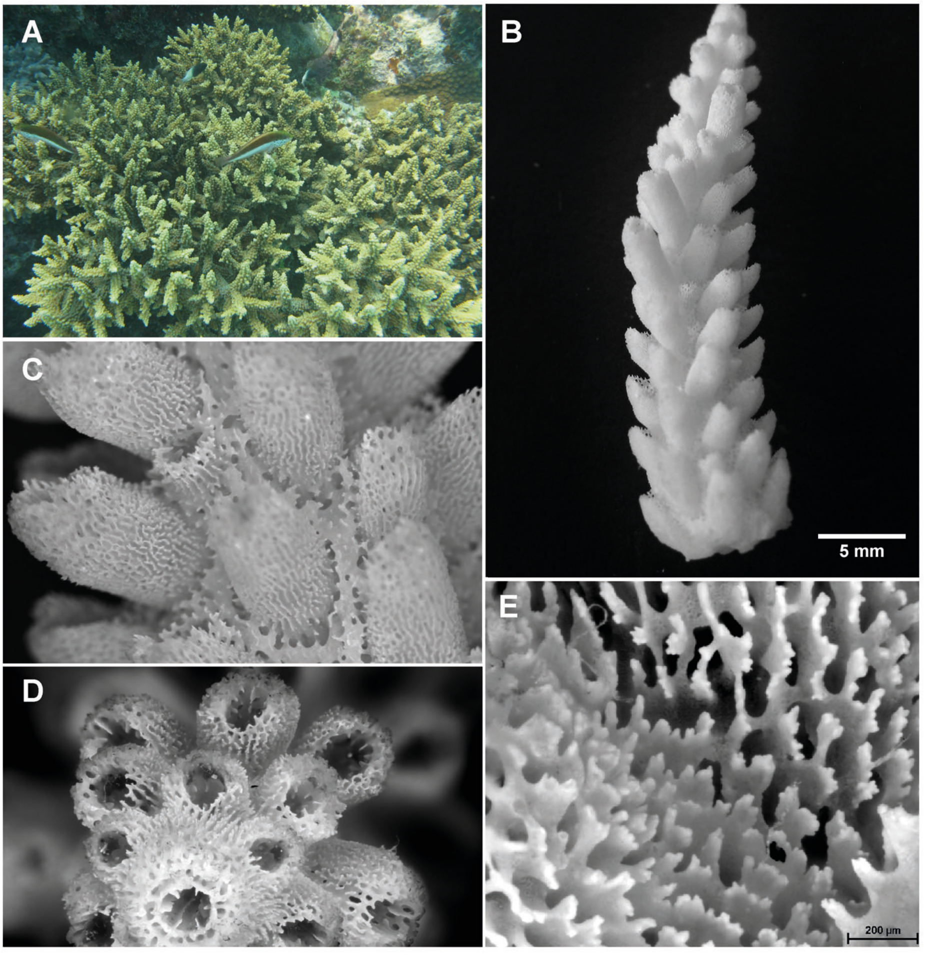

Fig. 10. *Acropora divaricata.* Specimen number: VAM40. (A) live colony; (B) branch fragment; (C) radial corallites and (D) axial corallite; (E) coenosteum between corallites.

Acropora divaricata (Dana, 1846)

Fig. 10

Colony growth form: Caespito-corymbose or corymbose; typical divergent branching pattern giving a dense network of highly interlocked branches; large tables may be over a meter across and have upturned branches at the margins.

Axial corallites: Outer diameter 2.2 mm; inner diameter 0.7 mm; conspicuous, slightly conical with small round opening and thick wall; primary and secondary septal cycles are well developed.

Radial corallites: Shape and size may vary a lot between and within colonies; tubular, appressed tubular to slightly nariform; usually aligned in rows.

Coenosteum: Densely arranged costae or usually rows of elaborated and laterally flattened spinules on corallites; reticulate with less densely arranged elaborated spinules

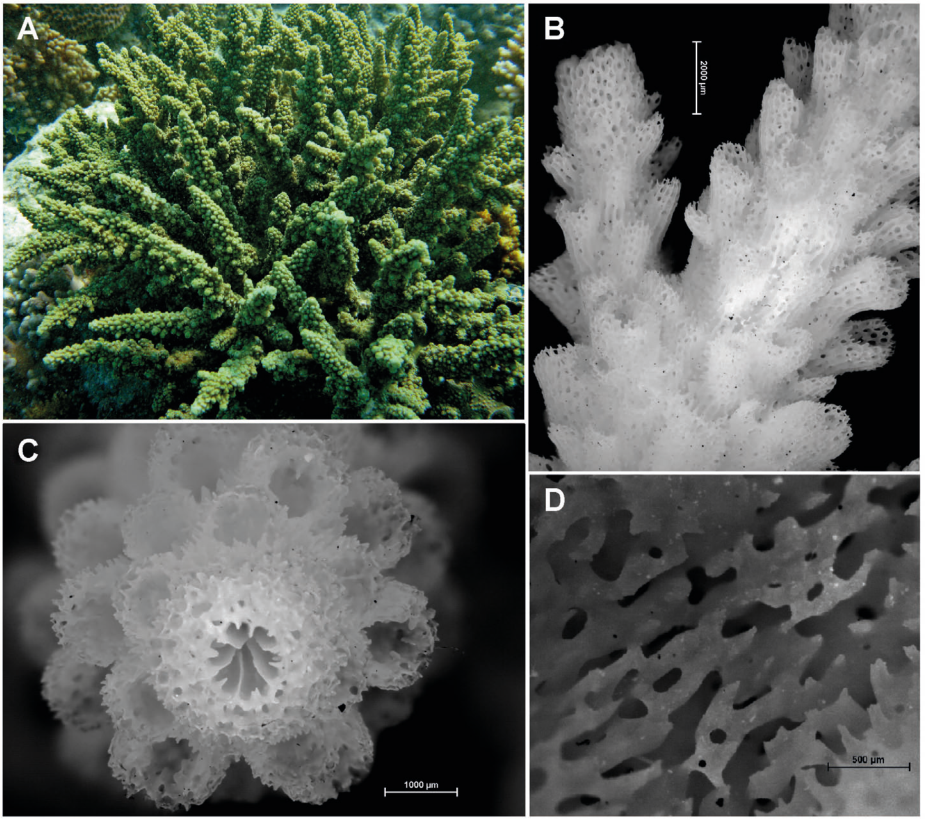

Fig. 11. *Acropora* cf. *florida.* Specimen number: VAM65. (A) live colony; (B) branch fragment; (C) axial corallite; (D) coenosteum between corallites.

which may be forked; spinules are less densely arranged in intercorallite area.

Remarks: *A. divaricata* is exceptionally plastic in its growth form (Veron 2000), so this identification was based on the typical Y branching pattern and the characteristics of the coenosteum which fitted the description in Veron & Wallace (1984) and Wallace & Wolstenholme (1998).

Acropora cf. *florida* (Dana, 1846)
Fig. 11

Colony growth form: Hispidose branching pattern, main branches are long and terete.
Axial corallites: Outer diameter 2.3–2.7 mm; inner diameter 0.9–1.1 mm; short, but conspicuous and slightly dome-shaped; blade-like primary septa occupy most of calyx radius and second cycle septa are visible as points or rows of short spines.
Radial corallites: Similar in size and shape, they are appressed tubular with round or slightly dimidiate opening, may be nariform towards branch tip; one cycle of dentate septa is present.
Coenosteum: Costate on radial corallites and coarse reticulate with some projecting spinules in between.

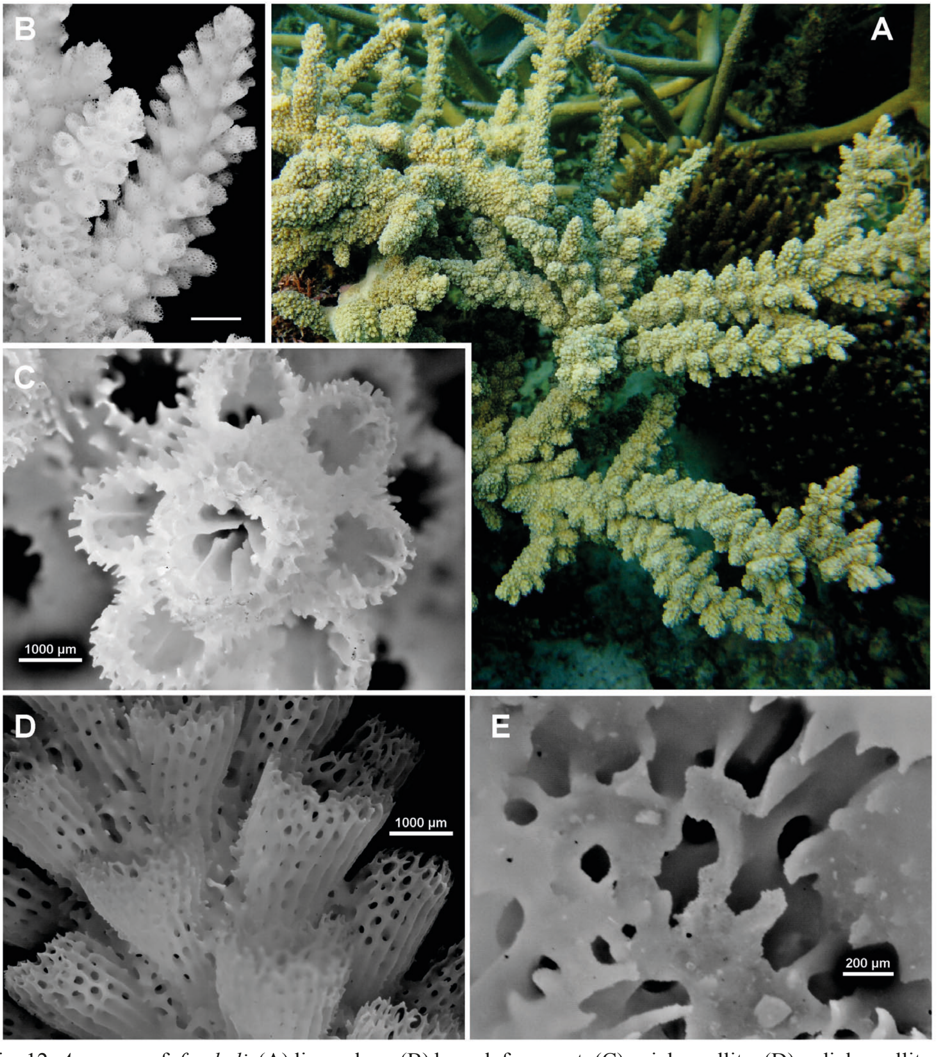

Fig. 12. *Acropora* cf. *forskali*. (A) live colony (B) branch fragment; (C) axial corallite; (D) radial corallites; (E) coenosteum between corallites.

Remarks: The general appearance of this specimen may remind that of *A. austera*, but the latter usually has more exsert axial corallites and a reticulate coenosteum. Here, all characters seem to fit Wallace (1999) *A. florida* better, especially the characteristics of the coenosteum on and between corallites. This identification may require further examination.

Acropora cf. *forskali* (Ehrenberg, 1834)

Fig. 12

Colony growth form: Irregular shape with prostrate branches contorted in all directions; main branches may or may not have small projecting secondary branchlets, and look

hispidose when they do; secondary branches on under surface of main branch often reduced to short incipient axials.
Axial corallites: Outer diameter 1.9–2.5 mm; inner diameter 0.9–1.1 mm; slightly exsert and tapering; thick walled with wide round opening; primary septa are blade-like; second cycle absent or poorly developed visible only as points.
Radial corallites: On main branches, radials are mostly immersed or sub-immersed; on branchlets, radial corallites are numerous and similar in size and shape, nariform and aligned. Incipient axials may occur sparsely.
Coenosteum: Costate on radial corallites, reticulate with scattered simple spinules in between.

Remarks: The present specimen has a great resemblance with *A. florida,* with hispidose branches consistent to Wallace's (1999) *A. florida.* Main branches, however, appear more contorted and frequently anastomosed. In addition, the radial corallites are slightly longer and thinner with very neat costae. For these reasons, and because the field photographs of this species are strikingly similar to that of *A. forskali* from Madagascar shown in Veron (2000), it is identified as *A. forskali* in this study.

Acropora gemmifera (Brook, 1892)

Fig. 13

Colony growth form: Digitate or corymbose with thick tapering; almost conical branches; incipient axial corallites occur near base of branches.
Axial corallites: Outer diameter 2.7–3.5 mm; inner diameter 1.0–1.1 mm; short but conspicuous; thick walled with a small opening; septa are reduced and smooth edged but clearly present in two cycles.
Radial corallites: Dimorphic, usually in rows; larger ones are tubular with dimidiate opening (or completely dimidiate) and may become slightly nariform at branch extremity; typically, these increase in size down the branch and have thickened lower wall; smaller radials are sub-immersed; septal development is rudimentary and dentate.
Coenosteum: Irregular costae on corallites and coarsely reticulate with scattered spinules in intercorallite area.

Remarks: *A. gemmifera* and other species of the *A. humilis* group can be difficult to distinguish as noted in the literature. In Wallace and Wolstenholme (1998), *A. gemmifera* is "*distinguished by the consistent presence of immersed as well as longer radial corallites throughout a branch in A. gemmifera*". We have made the distinction on this basis and because the size of radial corallites clearly increases down the branch (Veron & Wallace 1984).

Acropora grandis (Brook, 1892)

Fig. 14

Colony growth form: Arborescent with frequent ramifications; main branches are usually straight and upright.
Axial corallites: Outer diameter 2.2–2.5 mm; inner diameter 0.9–1.0 mm; exsert but thin walled; one cycle of large and neat septa, second cycle is absent.
Radial corallites: Two sizes; most are tubular to appressed tubular with oblique opening but tend to be longer at the branch tip and slightly nariform; directive septa are prominent and remaining first cycle strongly dentate.

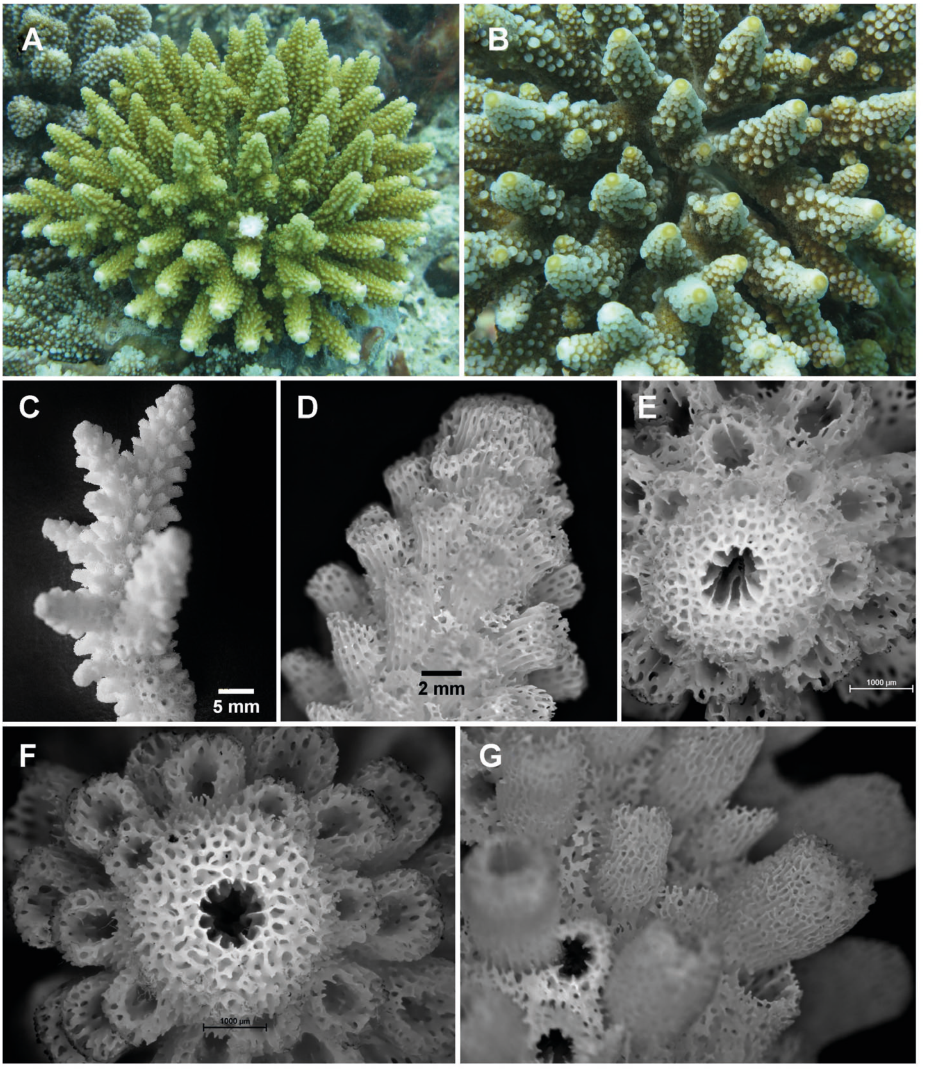

Fig. 13. *Acropora gemmifera.* Specimen number: (A, F, G) VAM22; (B–E) VAM2. (A) live colony; (B) branch tip detail; (C, D) branch fragment; (E, F) axial corallite; (G) radial corallites.

Coenosteum: On corallites, costae are joined by synapticules and coarsely reticulate or spongy with occasional spinules in intercorallite area; branch tips are very brittle.

Acopora cf. *granulosa* (Edwards & Haime, 1860)

Fig. 15

Colony growth form: Small corymbose plates or cushion-shaped; horizontal branches anastomose and branchlets are frequently ramified.
Axial corallites: Outer diameter 1.8–2.2 mm; inner diameter 0.9–1.1 mm; slightly conical; primary septa well developed and secondary cycle reduced or absent; some

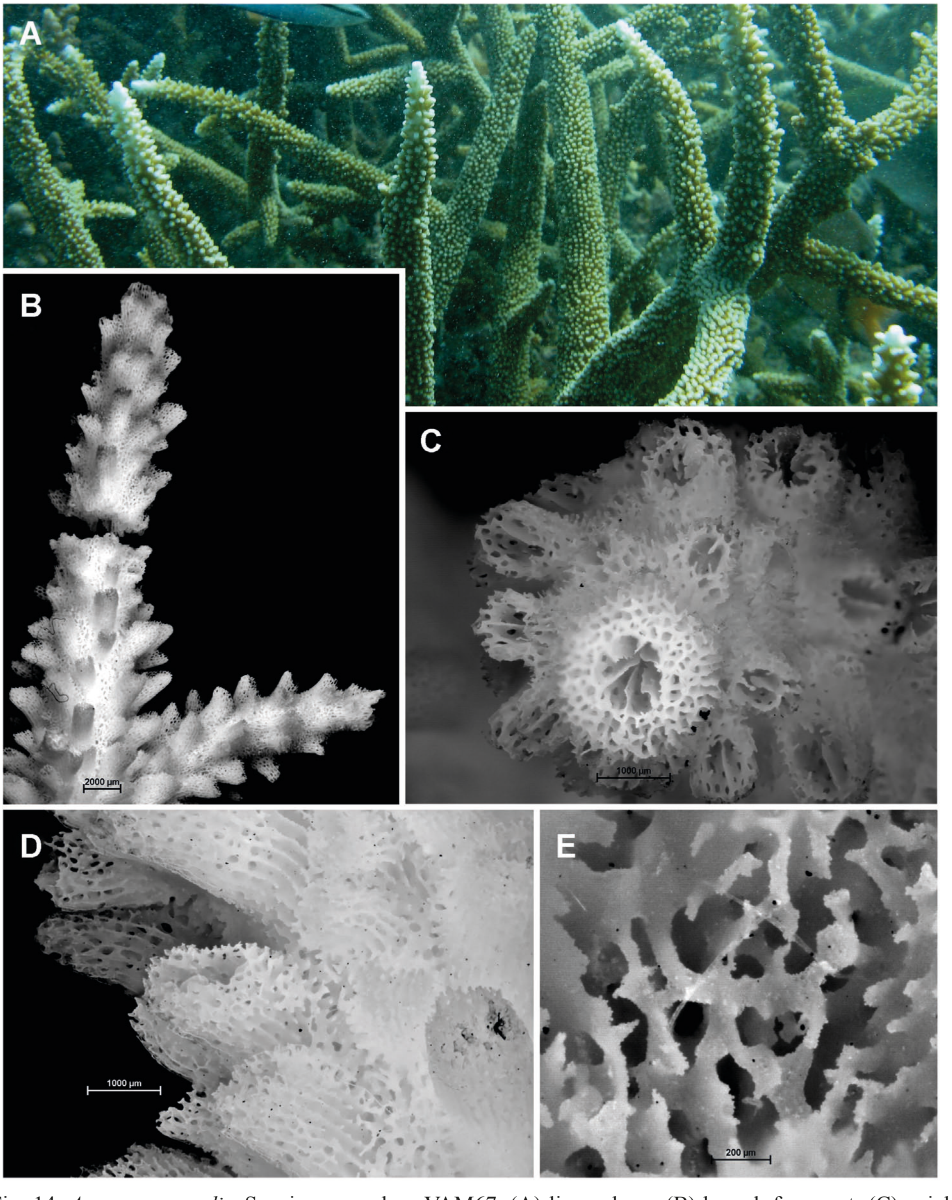

Fig. 14. *Acropora grandis*. Specimen number: VAM67. (A) live colony; (B) branch fragment; (C) axial corallite; (D) radial corallites; (E) coenosteum between corallites.

axial corallites are devoid of radial corallites and incipient axials are frequently found toward branch tips.

Radial corallites: Proximally on branches, corallites are scarce and immersed with one cycle of septa and one prominent directive septum; radials distally on branches are well spaced, tubular strongly appressed with round or oval opening; septation is rudimentary with only one cycle and possibly one directive.

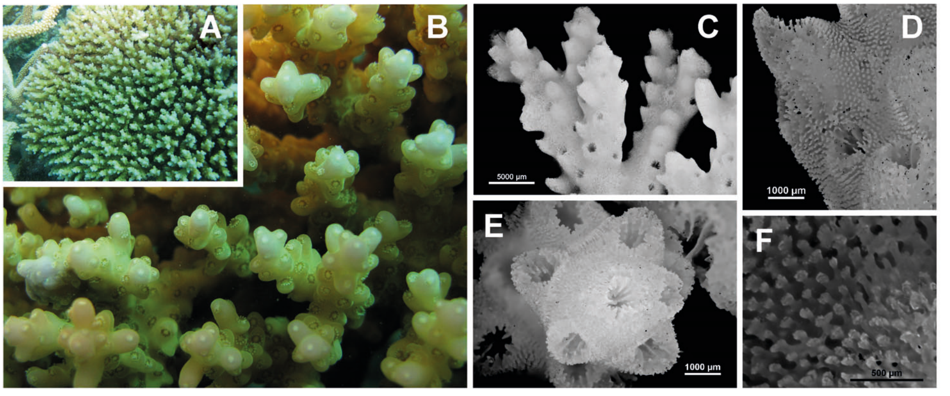

Fig. 15. *Acropora* cf. *granulosa.* Specimen number: VAM77. (A, B) live colony; (C) branch fragment; (D) radial corallites; (E) axial corallite; (F) coenosteum between corallites.

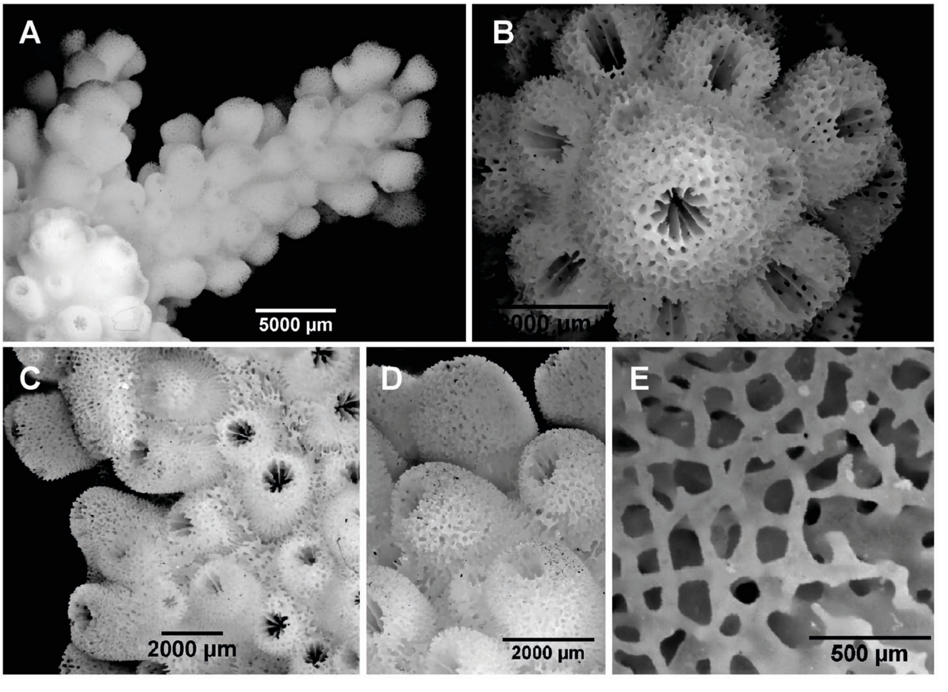

Fig. 16. *Acropora hemprichii*. (A) branch fragment; (B) axial corallite; (C, D) radial corallites; (E) coenosteum between corallites. Note that no field photograph is available due to camera failure during the collection of this specimen.

Coenosteum: Dense arrangement of spinules with clubbed tips, throughout.

Remarks: This is species is similar to *A. loripes,* but the latter displays a more nariform opening and a coenosteum with more elaborated spinules (see Wallace 1999). Here, the spinules are very similar to those of *A. granulosa* shown in Wallace and Wolstenholme (1998) and partly motivate the present identification.

Acropora hemprichii (Ehrenberg, 1834)

Fig. 16

Colony growth form: Irregularly arborescent; stubby branches irregularly sub-divide.
Axial corallites: Outer diameter 3.2–3.7 mm; inner diameter 0.9–1.1 mm; large and dome shaped; two neat cycles of septa are present.
Radial corallites: Crowded on branch; dimorphic; tubular to rounded-tubular with round opening, sometimes slightly oblique;
Coenosteum: Dense reticulate with lines of laterally flattened spinules on corallites; less densely reticulate with scattered spinules between corallites.

Remarks: This species is closely related to and difficult to distinguish from *A. austera* (see Wallace 1999). We made the distinction between the two species on the basis that colonies of *A. hemprichii* were sturdier and more sprawling than those of *A. austera* observed at Vamizi Island. The branches were also more twisted with less exsert axial corallites and shorter, rounder radial corallites.

Acropora humilis (Dana, 1846)

Fig. 17

Colony growth form: Similar to *A. gemmifera*, but longer non-tapering branches.
Axial corallites: Outer diameter 4.3 mm; inner diameter 1.4 mm; prominently large and dome shaped; two cycles of smooth-edged septa are clearly visible; incipient axial corallites are frequent proximally on branch.
Radial corallites: Short, tubular with dimidiate opening and thickened lower wall; generally arranged in rows; their size only increases slightly towards the base of branches; primary septa are small and dentate, while secondary are absent or incomplete, just visible as points.
Coenosteum: Reticulate or lines of elaborated laterally flattened spinules on corallites and coarse reticulate with scattered spinules in intercorallite areas.

Remarks: *A. humilis* is distinguished from other species of the group by its thinner terete branches and characteristically large axial corallite. (see Wallace 1999; Veron 2000).

Acropora intermedia (Brook, 1891)

Fig. 18

Colony growth form: Indeterminate arborescent with thick cylindrical branches that may be straight or contorted.
Axial corallites: Outer diameter 2.2–2.4 mm; inner diameter 0.8–0.9 mm; long and tubular; primary septa are well developed and secondary septa may be present or not, sometimes incomplete; margin of septa is rather smooth.
Radial corallites: They are of two types, tubular with oval to strongly dimidiate opening interspersed with sub-immersed corallites; longer ones have two cycles of small dentate

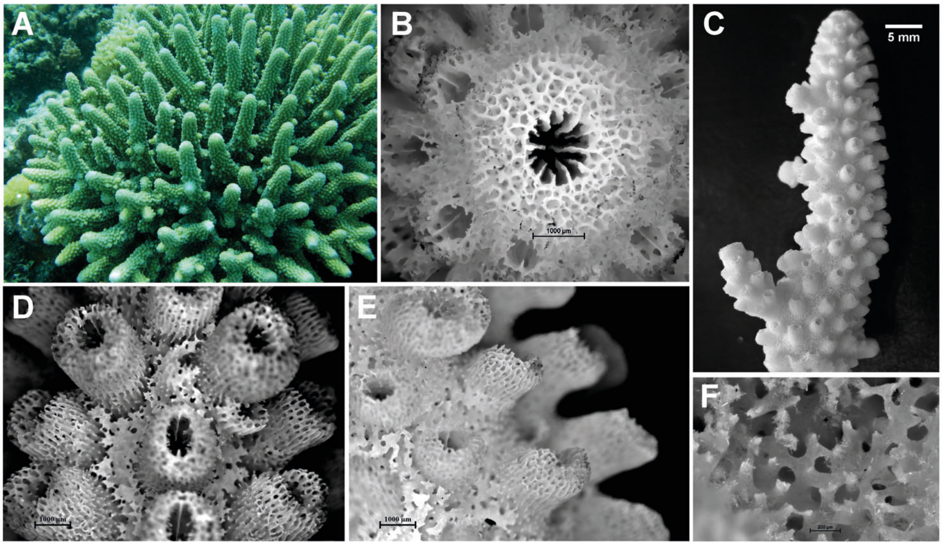

Fig. 17. *Acropora humilis*. Specimen number: (A–C, E, F) VAM44; (D) VAM24. (A) live colony; (B) axial corallite; (C) branch fragment; (D, E) radial corallites; (F) coenosteum between corallites.

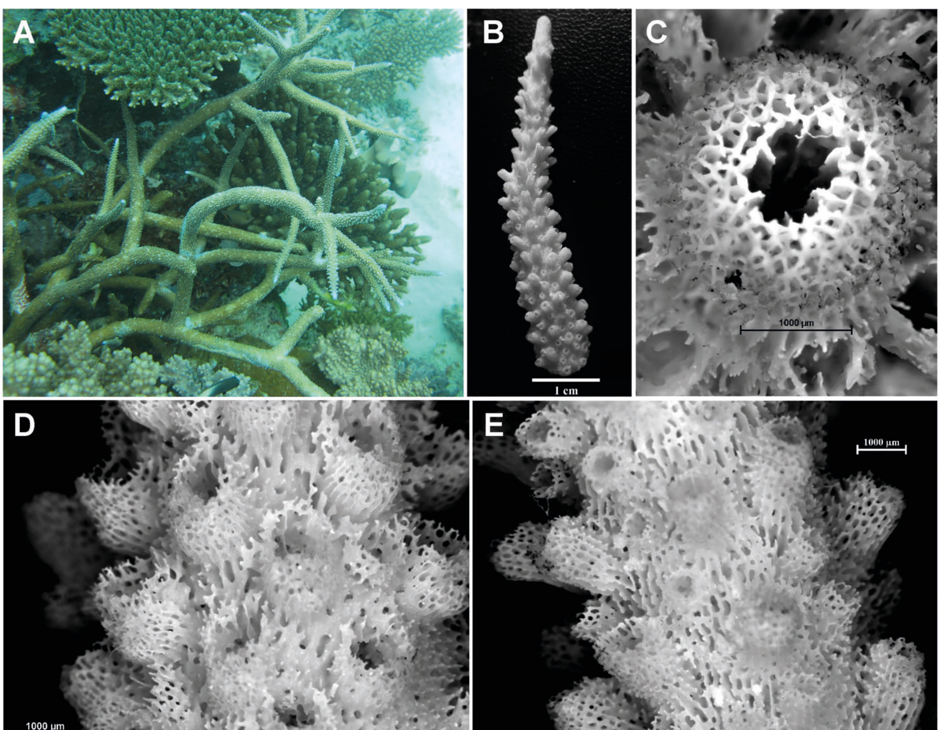

Fig. 18. *Acropora intermedia.* Specimen number: VAM41. (A) live colony with (B) branch fragment; (C) axial corallite; (D, E) portion of branch showing radial corallites.

septa (which may be incomplete on those with very dimidiate opening), while septa on shorter ones may be absent or only visible as points; radials generally have a sharp-edged lower lip, giving colonies a rasp-like appearance.
Coenosteum: Costate on corallites and reticulate with scattered spinules in intercorallite areas.

Remarks: This species has longer, thinner branches than other species of the *Acopora robusta* group. We distinguished it from other staghorns, with which it shares the general appearance, by its highly calcified corallum giving robust branches as well as the dissimilar structure of radial corallites. At Vamizi, live colonies of *A. intermedia* consistently produced large amounts mucus and were very slimy to the touch during collection.

Acropora latistella (Brook, 1892)

Fig. 19

Colony growth form: Corymbose plates. Slender branches with delicate upward projecting branchlets; corallum is light and crumbly.
Axial corallites: Outer diameter 1.7–2.2 mm; inner diameter 0.7–0.9 mm; exsert tubular with rounded openings with well developed first septal cycle, second cycle absent.
Radial corallites: Similar, appressed with oval opening; inner wall is not well defined and outer wall may project upward, especially toward branch tip where they can take a nariform appearance; septa are undeveloped.
Coenosteum: Dense lines of spinules on corallites; in intercorallite areas, spinules are more widely spaced but still in lines and slightly elaborated.

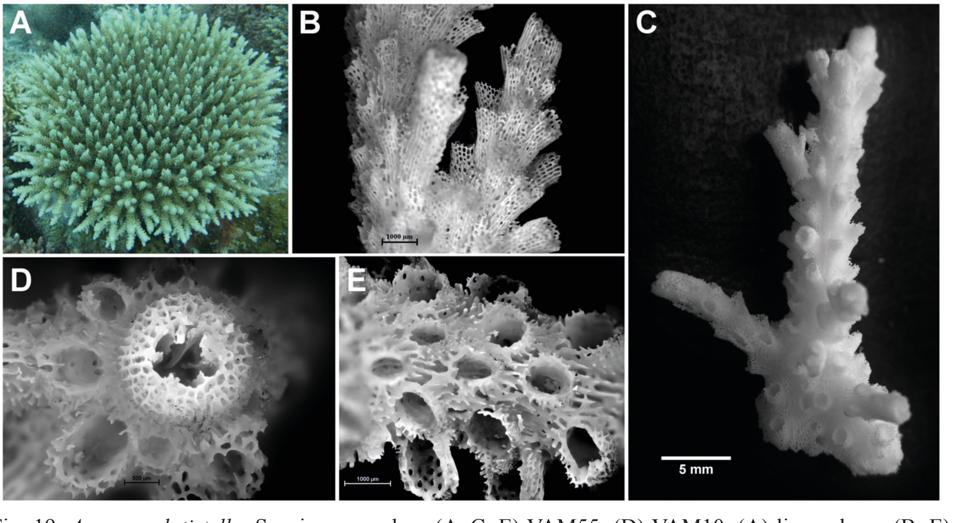

Fig. 19. *Acropora latistella.* Specimen number: (A–C, E) VAM55; (D) VAM10. (A) live colony; (B, E) radial corallites; (C) branch fragment; (D) axial corallite.

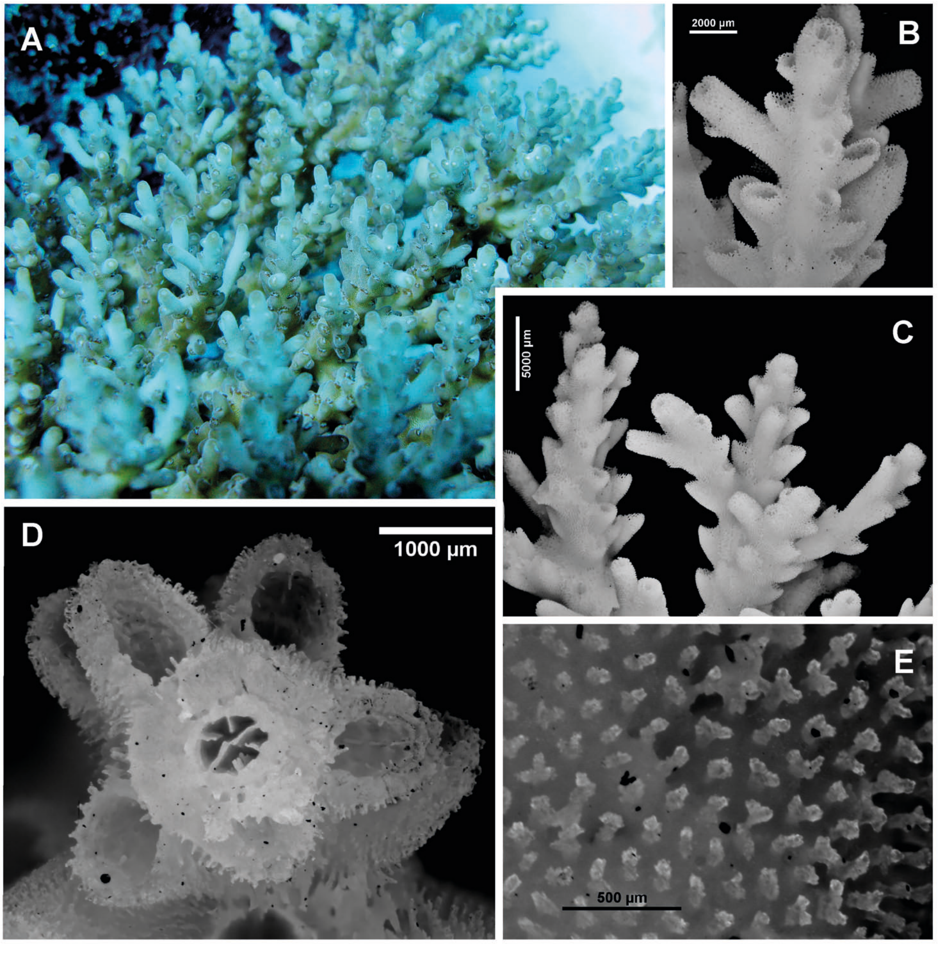

Fig. 20. *Acropora loripes*. Specimen number: VAM80. (A) live colony; (B, C) branch fragment with radial corallites; (D) axial corallite; (E) coenosteum between corallites.

Acropora loripes (Brook, 1892)

Fig. 20

Colony growth form: Caespito-corymbose; frequently anastomosed branching pattern; colonies form small bushes or cushions.

Axial corallites: Outer diameter 1.3–1.9 mm; inner diameter 0.8–1.0 mm; tubular with round opening; long incipient axial corallites are frequent and occur anywhere on branch; axials may bear small number of, or be devoid of, radial corallites on one side; one cycle of septa is present

Radial corallites: Well spaced; similar in size; tubular appressed with oval opening or slightly nariform; septation of distally radial corallites are poorly developed or absent; lower on branch, radials may have some to all primary septa present and directive may be prominent.

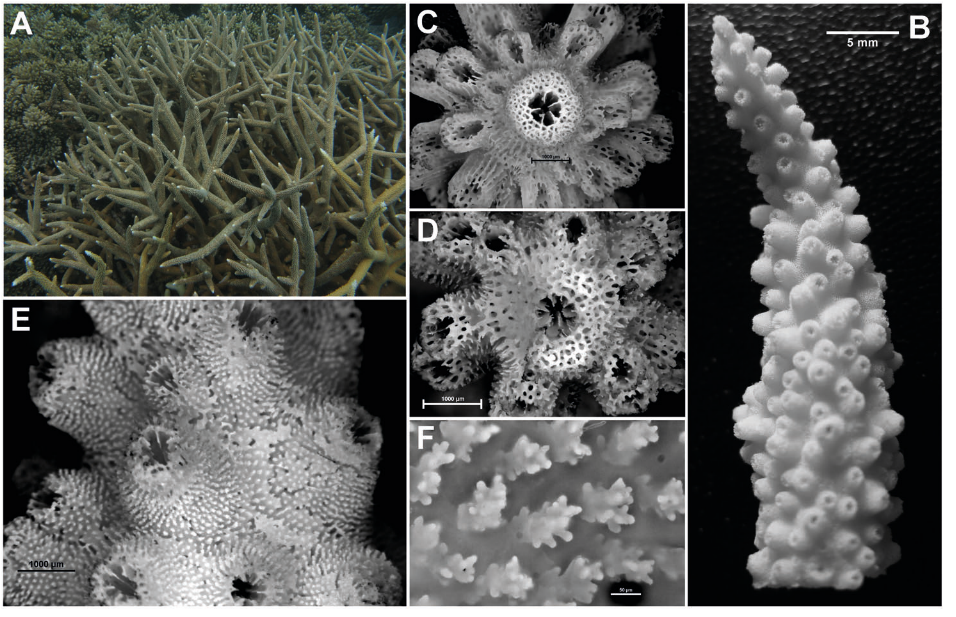

Fig. 21. *Acropora microphthalma.* Specimen number: (A, B, D–F) VAM21; (C) VAM14. (A) live colony; (B) branch fragment; (C, D) axial corallite; (E) radial corallites; (F) coenosteum between corallites.

Coenosteum: Dense arrangement of elaborated spinules on and between corallites.

Remarks: A diagnostic character used to define this species was the common occurrence of long axial corallites devoid of radial corallites one side. In addition, the openings of radial corallites were more elongate almost nariform and the spinules more elaborated than for *A. granulosa* and *A. willisae* Veron & Wallace, 1984.

Acropora microphthalma (Verrill, 1869)

Fig. 21

Colony growth form: Small staghorn with arborescent growth pattern; branches are slender and frequently divide such that compact thickets may be formed.
Axial corallites: Outer diameter 2.3–2.8 mm; inner diameter 0.9–1.0 mm; tubular and short; primary septa are well developed and second cycle may be present or incomplete.
Radial corallites: Small and numerous, generally similar and aligned in rows; they are tubular to tubo-nariform towards branch tip with round or oval opening; dentate primary septa are present and rudimentary or incomplete second cycle may develop.
Coenosteum: On corallites, dense arrangement of laterally flattened elaborated spinules forming neat lines; between corallites spinules with elaborated tips are less densely arranged.

Remarks: Despite some resemblance with other staghorn corals, especially *A. muricata* (Linnaeus, 1758), colonies of *A. microphthalma* have more slender branches and radial corallites that are tubular but not appressed (see Wallace 1999). Furthermore, the coenosteum of our specimens consists of a dense arrangement of spinules with very

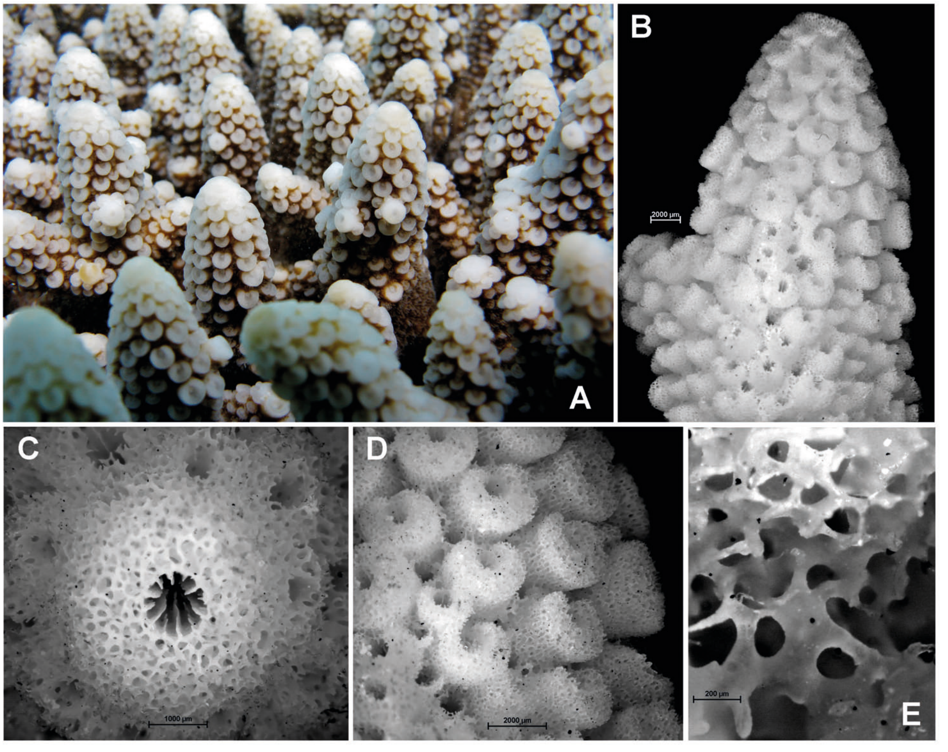

Fig. 22. *Acropora monticulosa.* Specimen number: VAM73. (A) live colony; (B) branch fragment; (C) axial corallite; (D) radial corallites; (E) coenosteum between corallites.

elaborate tips, a characteristic of well developed colonies of *A. microphthalma* (Wallace 1999; B. Riegl pers. comm.)

Acropora monticulosa (Brüggemann, 1879)

Fig. 22

Colony growth form: Digitate with short stubby branches tapering to small axial corallite.
Axial corallites: Outer diameter 3.8 mm; inner diameter 1.0 mm; conspicuous but not exsert; thick wall and small opening with two cycle of well defined blade-like septa.
Radial corallites: They are similar in size and shape, usually aligned in rows down the branch; short and tubular, they are touching on branch, thick walled with round opening, sometimes slightly dimidiate toward tips; septa are present in two cycles.
Coenosteum: Densely reticulate throughout; very irregular costae may form on radial corallites.

Remarks: This specimen was distinguished from *A. humilis* by its much smaller axial corallite and thicker branches. It also slightly shorter radial corallites that are uniform in size down the branch, in opposition to their increasing size in *A. gemmifera* (Veron 2000). Radial corallites of *A. monticulosa* are also the less dimidiate of the *A. humilis* group (Wallace 1999), giving a smoother appearance to the colony.

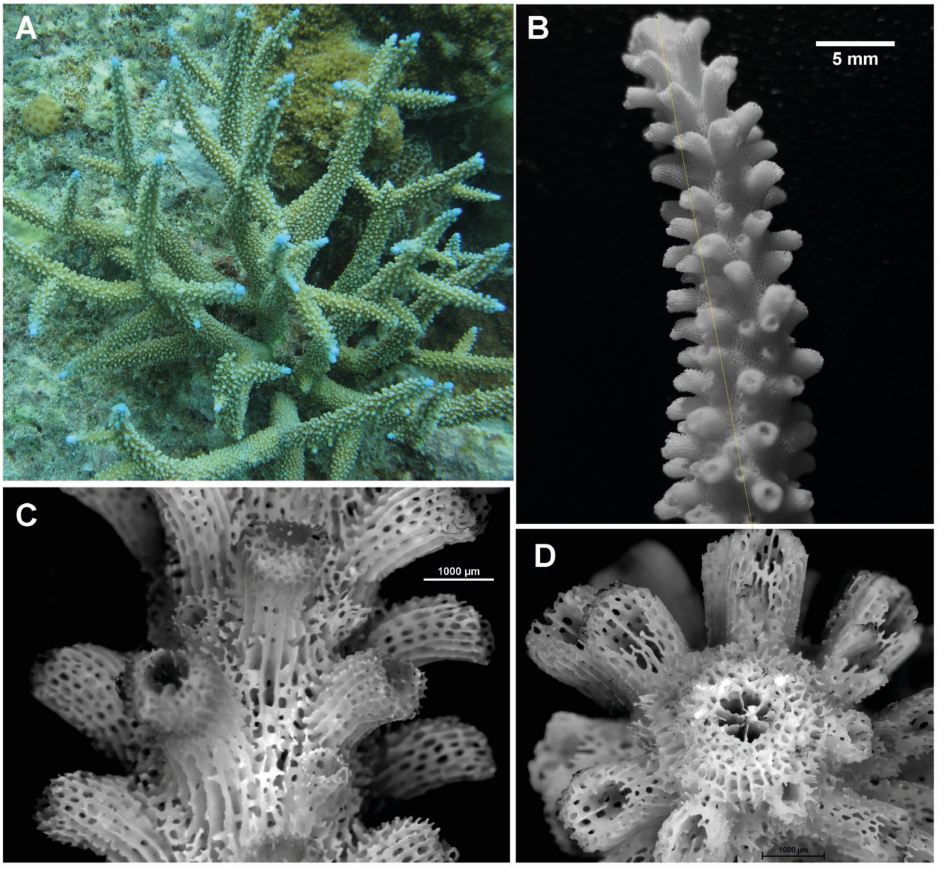

Fig. 23. A*cropora muricata.* Specimen number: VAM33. (A) live colony; (B) branch fragment; (C) portion of branch showing radial corallites; (D) axial corallite.

Acropora muricata (Linnaeus, 1758)

Fig. 23

Colony growth form: Arborescent, with indeterminate branching pattern; colonies can form extensive single species stands being bushy or open according to depth; main branches are long, straight, tapering and can be quite thick at the base.

Axial corallites: Outer diameter 2.0–2.2 mm; inner diameter 0.7–0.9 mm; tubular with thick wall; primary septa are well developed, possibly dentate and second cycle is present or incomplete.

Radial corallites: Crowded on branches but not touching; tubular or appressed with round sometimes oval opening radials may be evenly sized and arranged in rows or variable in size and pointing different direction; primary septa are dentate and a second septal cycle may develop on larger radial corallites.

Coenosteum: Costate with finely dentate margin on corallites and reticulate with scattered spinules in between, or dense arrangement of spinules with elaborate tips throughout.

Acopora cf. *nana* (Studer, 1878)

Fig. 24

Colony growth form: Small corymbose with closely and evenly spaced terete branches.
Axial corallites: Outer diameter 1.4–2.2 mm; inner diameter 0.9–1.2 mm; tubular with thick wall; primary septa are short and blade-like and second cycle absent or visible only as points.
Radial corallites: Similar in size and shape they are numerous but not touching; tubular-appressed with oval opening; outer wall extends upward; distally on branch, radials have poor septal development with only one incomplete cycle; lower on branch, first cycle complete, usually with two prominent directive and secondary septa may be visible as points.
Coenosteum: Lines of simple spinules, throughout.

Remarks: Although branches of this specimen are not as long as commonly observed for *A. nana* (see Wallace 1999, Veron 2000), all other characters are a close fit to Wallace's (1999) *A. nana*. This choice was motivated by the aspect of branches emerging from a central attachment, the density of radial corallites and tendency of the upper wall to extend upwards as well as the simple spinules covering the branches, which characterise the species (Wallace 1999). This specimen could also possibly be *Acropora rosaria* (Dana, 1846).

Acropora nasuta (Dana, 1846)

Fig. 25

Colony growth form: Corymbose with tapering branches seldom anastomosed.
Axial corallites: Outer diameter 2.1–2.7 mm; inner diameter 1.5 mm; short and tubular but conspicuous. Septa are small, but present in two cycles.
Radial corallites: Nariform with oval to dimidiate opening, sometimes slightly laterally flattened; radials are numerous on branch and usually arranged in neat rows; few sub-immersed radial corallites may be present; first cycle septa present with directives possibly very pronounced; secondary septa are mostly absent or just visible as spines.
Coenosteum: Costate or arrangement of laterally flattened spinules on radials and reticulate with scattered spinules in between.

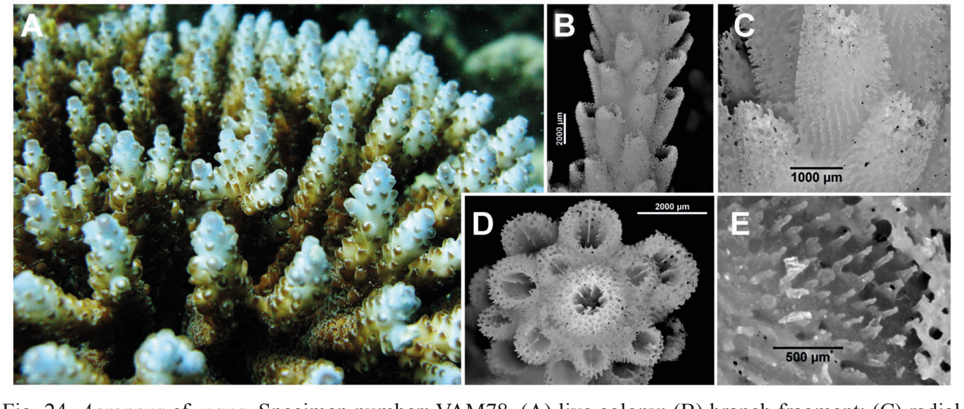

Fig. 24. *Acropora* cf. *nana.* Specimen number: VAM78. (A) live colony; (B) branch fragment; (C) radial corallites; (D) axial corallite; (E) coenosteum between corallites.

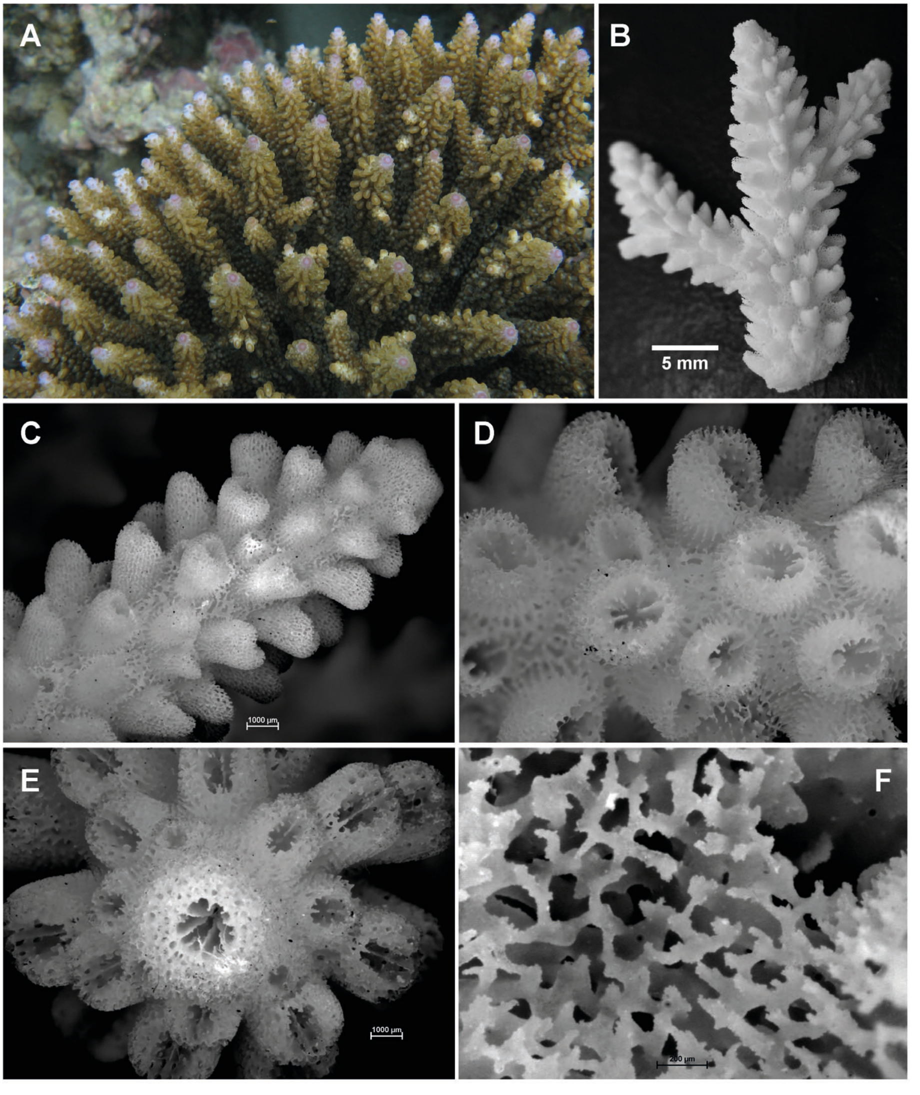

Fig. 25. *Acropora nasuta.* Specimen number: (A, B) VAM51; (C–F) VAM75. (A) live colony with (B) branch fragment; (C, D) portion of branch showing radial corallites; (E) axial corallite; (F) coenosteum between corallites.

Acropora polystoma (Brook, 1891)

Fig. 26

Colony growth form: Corymbose to caespito-corymbose; thick tapering branches with irregularly spaced branchlets. Incipient axial corallites are common, especially distally on branch.

Axial corallites: Outer diameter 2.7–3.7 mm; inner diameter 0.6–1.3 mm; short, tubular and thick walled with wide opening; primary septa present, secondary may be present or much reduced, particularly on incipient axials where they are reduced to points.

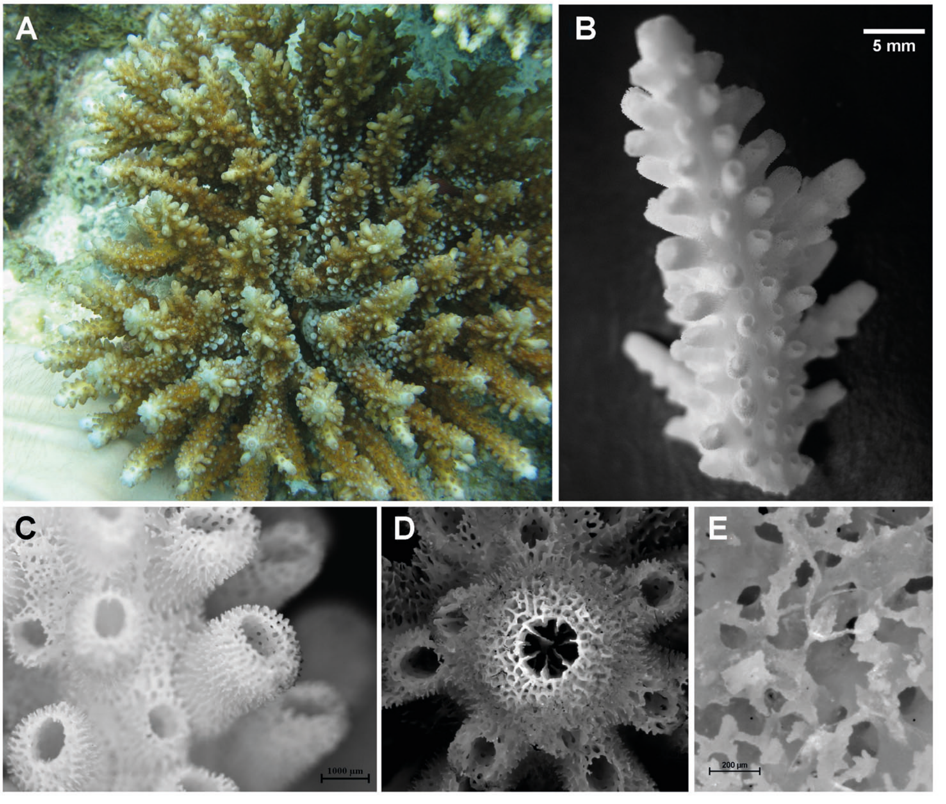

Fig. 26. *Acropora polystoma.* Specimen number: VAM34. (A) live colony with (B) branch fragment; (C) radial corallites and (D) axial corallite; (E) coenosteum between corallites.

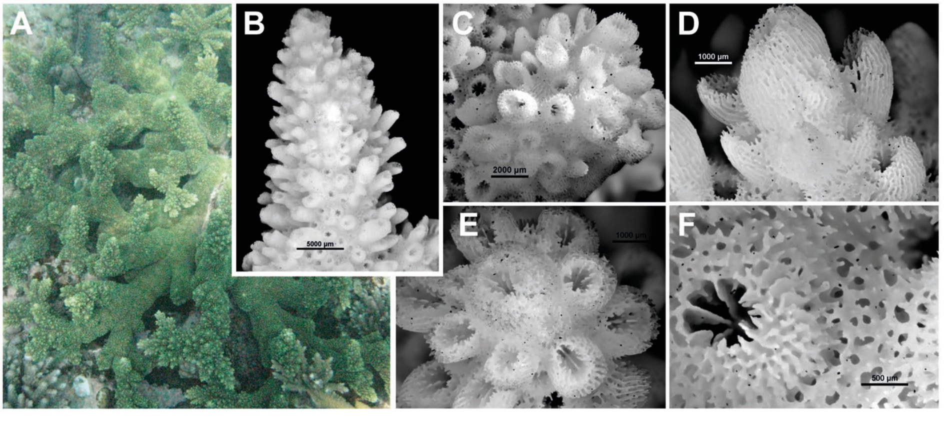

Fig. 27. *Acropora robusta.* (A) live colony; (B) main branch tip; (C, D) radial corallites on branchlets; (E) axial corallite; (F) sub-immersed radials and intercorallite area.

Radial corallites: Highly dimorphic; longer corallites are tubular or tubular appressed with rounded to oval or nariform opening; septal development is reduced or incomplete and directive may be prominent; shorter radials are sub-immersed with a single septal cycle, usually just visible as spines.
Coenosteum: Densely arranged lines of simple spinules on corallites; coarsely reticulate with scattered spinules in intercorallite area.

Acropora robusta (Dana, 1846)

Fig. 27

Colony growth form: Irregular with large and thick prostrate branches (> 30 mm basal diameter) which are usually contorted in different directions with either pointed or rounded extremities; different parts of the colony look different; peripheral branch often prostrate with upturned ends while those in the centre of colony may be long, conical and upward projected; formation of branchlets is rare and irregular and these are often short and clumpy.
Axial corallites: Outer diameter 2.1–3.7 mm; inner diameter 0.75–1.8 mm; short and tubular, they are not conspicuous, but can be distinguished from radials from their round opening; two complete cycles of dentate septa; two well defined directives are blade-like.
Radial corallites: Mixture of sizes, crowded; on main branch, most are immersed to sub-immersed; only have one cycle of septa. On branchlets, rounded, tubular and slightly appressed with clearly dimidiate opening and some longer ones have hooked upper lip; septation usually in two cycles but second cycle may be incomplete; one or two directives present.
Coenosteum: Neatly costate on corallites and reticulate with numerous simple spinules in between; all corallite are highly calcified and branches are very hard and robust.

Acropora selago (Studer, 1878)

Fig. 28

Colony growth form: Caespito-corymbose; finely structured branches are terete and branchlets are regularly spaced.
Axial corallites: Outer diameter 1.6–2.3 mm; inner diameter 0.6–0.8 mm; primary and secondary septa are reduced or absent.
Radial corallites: Scale-like; upper wall absent, lower wall projects upward and has sharp lip usually not flaring.
Coenosteum: Neatly costate, occasional lines of spinules in space between radial corallites.

Acropora cf. *subulata* (Dana, 1846)

Fig. 29

Colony growth form: Tabular with delicate branches; horizontally spreading branches are highly ramified and give off small upright branchlets; tables can be more than 2 m across.
Axial corallites: Outer diameter 1.9–2.2 mm; inner diameter 0.9–1.0 mm; exsert, sometimes slightly elongated; primary septa present but reduced and consisting of spines, usually no secondary septa.

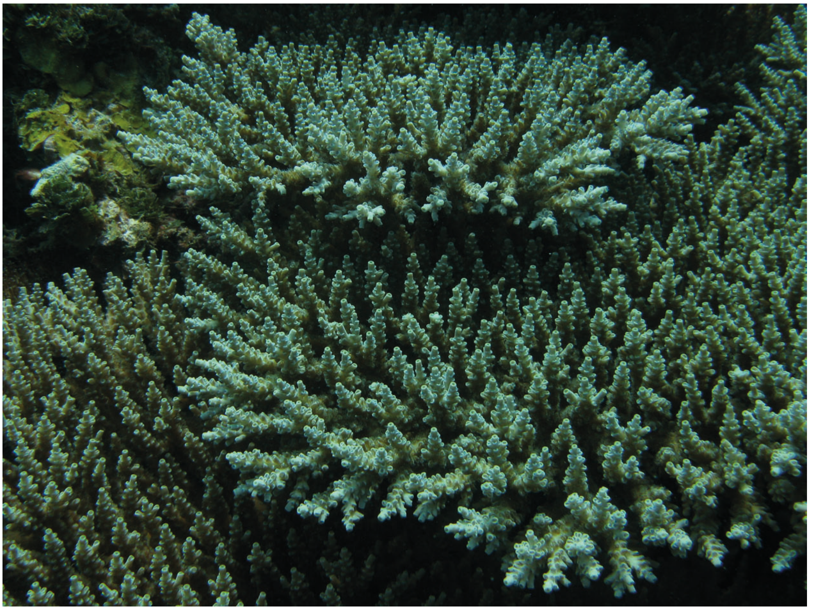

Fig. 28. *Acropora selago*. Live colony. Note that this specimen was unfortunately lost from the collection before photographic processing, therefore skeleton photographs are not available.

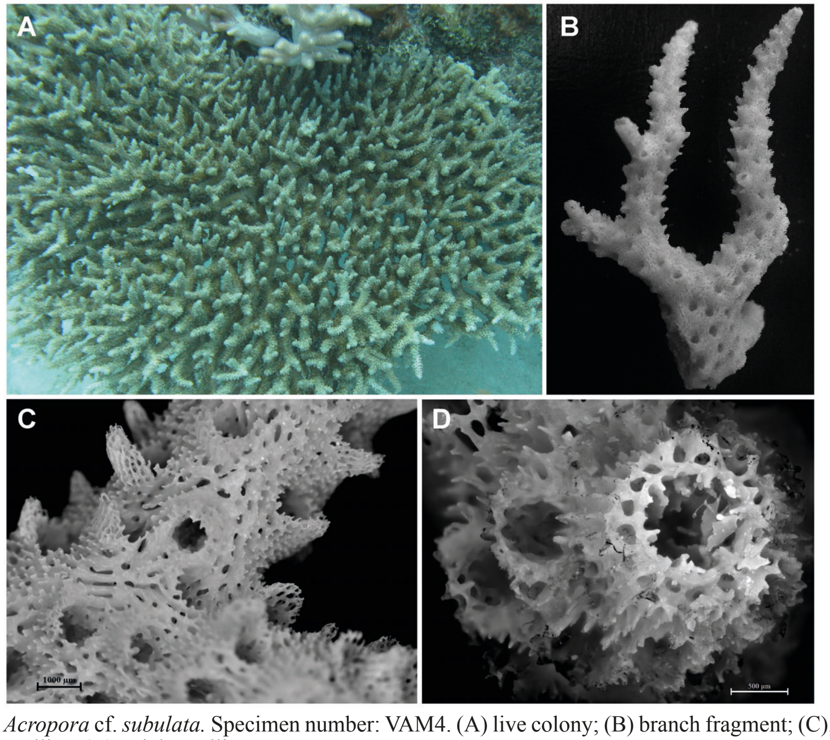

Fig. 29. *Acropora* cf. *subulata*. Specimen number: VAM4. (A) live colony; (B) branch fragment; (C); radial corallites (D) axial corallite.

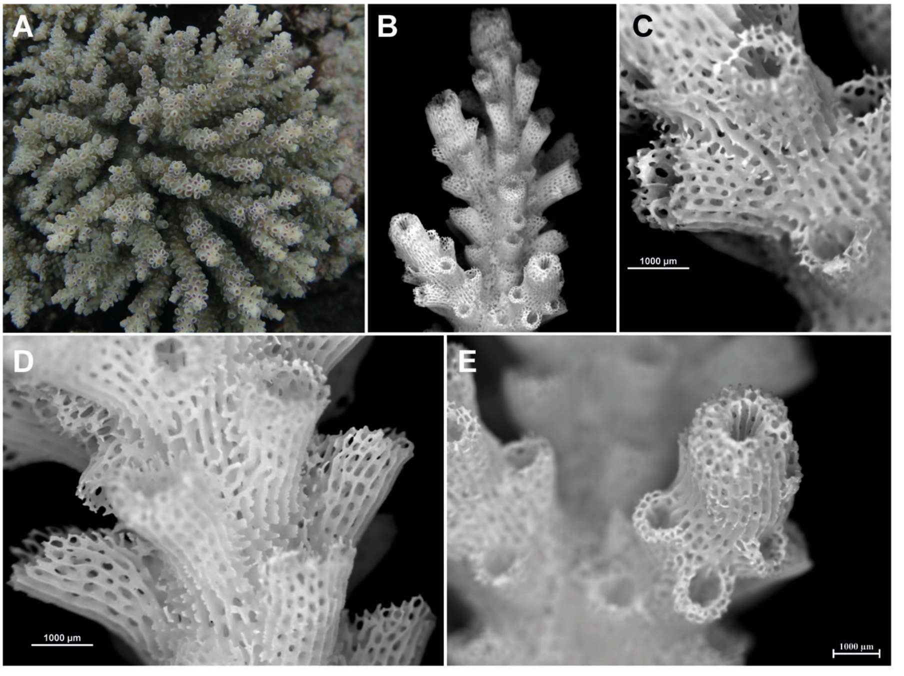

Fig. 30. *Acropora tenuis*. Specimen number: (A, B, C, E) VAM 17; (D) VAM48. (A) live colony; (B) portion of colony; (C, D) portion of branch showing radial corallites; (E) axial corallite.

Radial corallites: Labellate or dimidiate with lower lip flaring or extending outward; upper wall is absent; septal development is variable but generally incomplete. Radial corallites on horizontal braches are mostly immersed, especially on undersurface.
Coenosteum: Lines of simple spinules; may appear slightly costate on radial corallites.

Remarks: This specimen shared characters with different species, making this identification challenging. The shape of corallites is similar to those of *Acropora hyacinthus* (Dana, 1846), but the branching pattern of the latter is very different, with densely arranged upright branchlets and much more crowded radial corallites (Wallace 1999). The corallum also has a crumbly texture. It is defined here as *A. subuluta* rather than *Acropora cytherea* because the latter typically has multiple axial corallites, radials with a more extended lower wall, and a costate coenosteum, while the present species has less-developed radial corallites and a more reticulate coenosteum with clear spinules.

Acropora tenuis (Dana, 1846)

Fig. 30

Colony growth form: Caespito-corymbose; branches are very thin and delicate with regular spacing.
Axial corallites: Outer diameter 2.1 mm; inner diameter 0.8 mm; tubular and elongated; primary and secondary septa are clearly defined and plate-like.
Radial corallites: Similar, dimidiate to cochleariform with no upper wall; lower lip is flaring or extended upward; septal development is rudimentary, usually with incomplete

cycles, mainly with directive septa; radial corallites are arranged in a neat rosette around axial corallite.
Coenosteum: Neatly costate on corallites and reticulate with spinules scattered or in lines in between.

Acropora valida (Dana, 1846)

Fig. 31

Colony growth form: Small corymbose or caespitose, giving well-pruned cushion-shaped colonies growing isolated or in moderate single-species stands.
Axial corallites: Outer diameter 1.8–2.9 mm; inner diameter 0.7–1.3 mm; prominent, with wide round opening; first-cycle septa are well developed and have a smooth edge; secondary septa are present but reduced.
Radial corallites: Tubular-appressed or slightly nariform, opening is round; usually similar in size and touching; primary septa are small and dentate, and secondary cycle can be present or not.
Coenosteum: Reticulate with densely arranged lines of spinules, throughout; may resemble costae on radial corallites.

Remarks: This species is known for its considerable growth-form plasticity (Veron & Wallace 1984). The present identification relies mainly on the characteristic tubular-appressed radial corallites (slightly swollen), their level of crowding on branches, and the structure of the coenosteum, which is consistent with descriptions in the available literature.

Acropora cf. *vermiculata* (Nemenzo, 1967)

Fig. 32

Colony growth form: Corymbose, caespitose or cushion-shaped and finely structured, frequent branchlet formation on main branches; colonies occur isolated or in extensive single-species stands.
Axial corallites: Outer diameter 2.3 mm; inner diameter 0.9 mm; slightly elongate with primary septa occupying most of calyx diameter; second cycle is incomplete, with just a few points.
Radial corallites: Similar in size and shape; labellate, with poorly developed inner wall and outer wall extending upward; form rosette around axial corallite; one directive septum may be visible.
Coenosteum: Costate with some synapticules visible, both on and between radial corallites.

Remarks: *A. vermiculata* has been mentioned as a synonym of *Acropora sarmentosa*, but the latter has tubular appressed radial corallites and a very reticulate coenosteum (Wallace 1999), while the specimens found at Vamizi clearly have labellate radial corallites, with straight lip, with a neatly costate coenosteum. The radials are similar to those of *A. selago* or *A. tenuis*, but these two species have more delicate branches and usually well-defined colonies. Live colonies were closely consistent with Veron's (2000) *A. vermiculata* from Tanzania and were also found in extensive single-species stands, justifying the present identification.

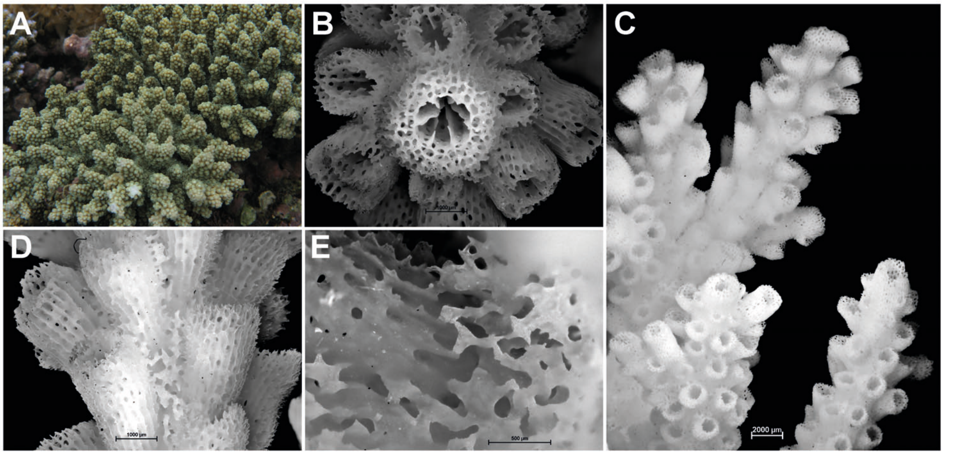

Fig. 31. *Acropora valida* Specimen number: VAM62. (A) live colony; (B) axial corallite; (C) branch fragment; (D) radial corallites; (E) coenosteum between corallites.

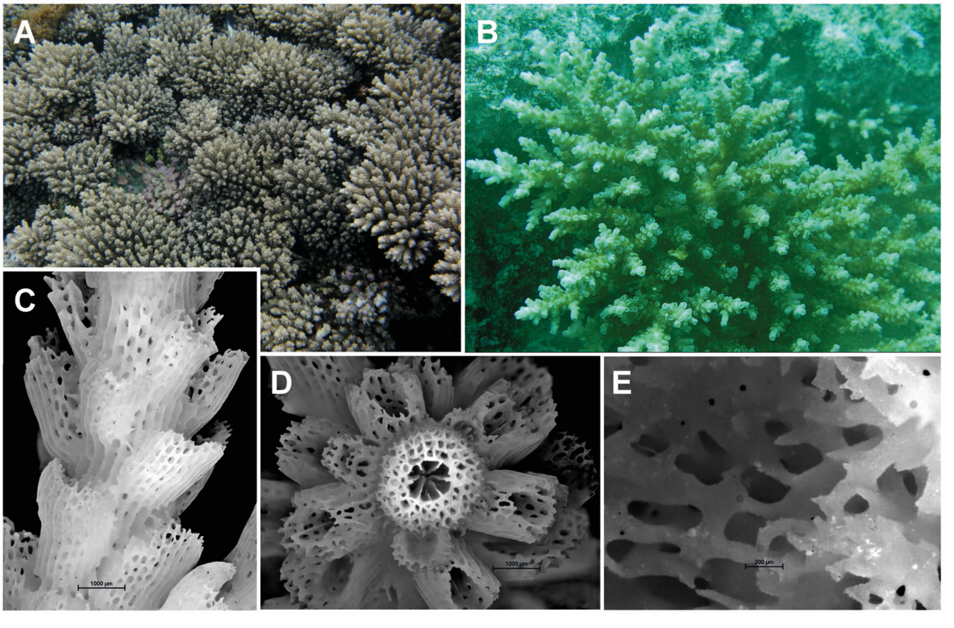

Fig. 32. *Acropora* cf. *vermiculata.* Specimen number: VAM70. (A) live colony; (B) branch detail; (C) radial corallites; (D) axial corallite; (E) coenosteum between corallites.

Acropora cf. *willisae* Veron & Wallace, 1984

Fig. 33

Colony growth form: Corymbose plates; branches are thin and anastomose frequently.
Axial corallites: Outer diameter 2.5 mm; inner diameter 0.9 mm; slightly exsert, tubular with rounded opening; septation consists of one cycle of moderately dentate septa; long incipient axials are abundant distally on branch.

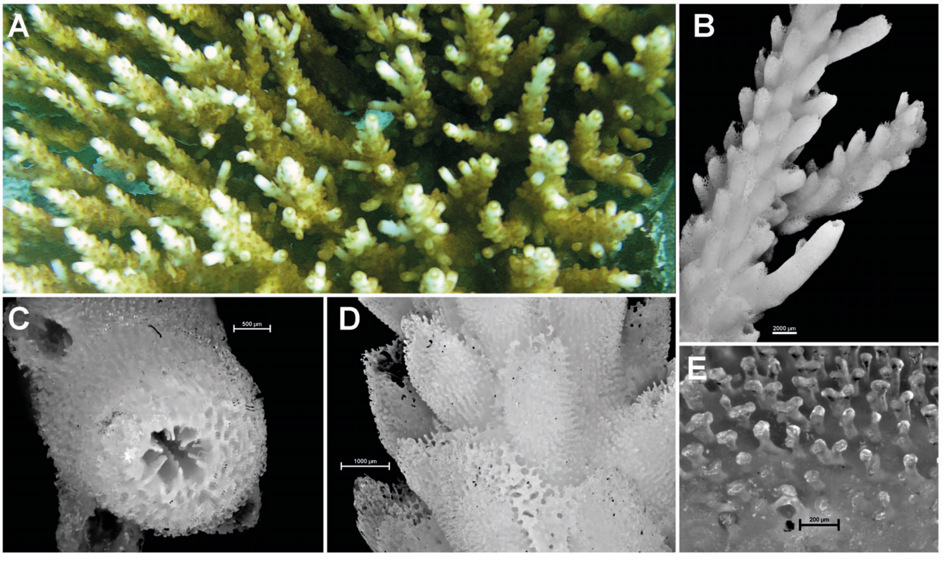

Fig. 33. *Acropora* cf. *willisae.* Specimen number: VAM69. (A) live colony; (B) branch fragment; (C) axial corallites; (D) radial corallite; (E) coenosteum between corallites.

Radial corallites: Tubular-appressed with nariform opening; septation is reduced, but two directive septa usually prominent; second cycle absent or just visible as points.
Coenosteum: On radial corallites lines of spinules, simple or with clubbed tips; reticulate, coarse spongy in intercorallite area.

Remarks: This species is closely related to those of the *A. loripes*, but corolla are more corymbose with more slender branches ending on a single plane (see original description in Veron & Wallace 1984). Our specimens of *A. willisae* are distinguished from those of *A. loripes* by more appressed radials with more nariform opening and less elaborate spinules. The distinction from *A. granulosa* is based on the denser corallum and shorter, more spaced, radials of the latter.

DISCUSSION AND CONCLUSIONS

The collection gathered in this study is representative of the high diversity of *Acropora* at Vamizi Island. The great majority of species found in this study have a wide Indo-Pacific distribution, as the WIO region has a low degree of endemism and species exclusive to specific sub-regions of the WIO are even scarcer (Obura 2012). The record of *A. bifurcata* in Vamizi Island extends the range of the species to the East African Coast. *A. bifurcata* has been considered a possible synonym of *A. hyacinthus* in Wallace (1999). We found, however, that our specimens of *A. bifurcata* differed considerably from those of *A. hyacinthus* described in the literature (e.g. Veron & Wallace 1984; Wallace 1999; Veron 2000), especially by the length of branchlets (short and irregular in *A. bifurcata*) and the shape and arrangement of radial corallites (appressed tubular in *A. bifurcata* versus labellate and arranged in rosettes in *A. hyacinthus*). Our specimen of *A. bifurcata* was more consistent with the description by Nemenzo (1971).

Vamizi Island lies at the mid-point of the East African Coral Coast (Spalding *et al.* 2007), in the northern Mozambique Channel (MC) ecoregion, which extends eastward to include northern Madagascar and the central islands as well (Obura 2012). Estimates of *Acropora* diversity for the region include: 45 species for the East African Coast (Wallace 1999: 66), 55 species for Kenya and Tanzania, 58 species for Mayotte and Comoros, and 65 for northern Madagascar (Veron 2000; coral.aims.gov.au). Other studies at Vamizi have recorded 44 species (Davidson *et al.* 2006) and 33 species (Obura 2012) of *Acropora*. This study reports 32 species of *Acropora* in a relatively small area and a limited shallow habitat. These numbers are higher than the 23 species of *Acropora* in southern Mozambique (Riegl 1995), and 10–20 species on the northern Kenyan coast (Obura 2012), supporting the notion that Vamizi Island is at the high diversity centre for the East African coast.

The checklist presented here is mostly consistent with the lists of Davidson *et al.* (2006) and Obura (2012) (Table 1). A few differences are inevitable owing to different methods of sampling and differences in the area visited, as well as the difficulty of species identifications in the genus *Acropora*. Sampling effort was concentrated on shallow reef flats where extensive *Acropora* communities thrive, and only a few dives on deeper reefs or along walls were conducted. Nonetheless, our survey has the advantages that coral identification from collected specimens can incorporate subcorallite characteristics and that specimens are available for verification, for comparison with other locations and for further studies.

In conclusion, our data support Obura's (2012) assertion that the northern Mozambique Channel is characterised by high scleractinian diversity and a low level of endemism. This study confirmed the presence in Vamizi of at least 32 *Acropora* species with widespread Indo-Pacific distribution. These records contribute to the assessment of the coral diversity in the region and provide insights on the biogeography of these species. This study may also inform the management and conservation of these reefs, as potential changes in *Acropora* diversity in Vamizi, either due to global or local pressure, can now be monitored more accurately.

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REFERENCES

Arrigoni, R., Stefani, F., Pichon, M., Galli, P. & 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.

Benahayu, Y. & Schleyer, M.H. 1996. Corals of the South-west Indian Ocean III. Alcyonacea (Octocorallia) of Bazaruto Island, Mozambique, with a redescription of Cladiella australis (Macfadyen, 1936) and a description of Cladellia kashmani spec. nov. *Oceanographic Research Institute Investigational Report* **69**: 1–22.

Boshoff, P.H. 1981. An annotated checklist of Southern African scleractinia. *Oceanographic Research Institute Investigational Report* **49**: 1–49.

Budd, A.F. 1985. Variation within coral colonies and its importance for interpreting fossil species. Journal of Paleontology **59**: 1359–1381.

Budd, A.F., Romano, S.L., Smith, N.D. & Barbeitos, M.S. 2010. Rethinking the phylogeny of scleractinian corals: A review of morphological and molecular data. *Integrative and Comparative Biology* **50**: 411–427.

Davidson, J., Hill, N., Muaves, L., Mucaves, S.I.S., Guissamulo, A. & Shaw, A. 2006. *Vamizi Island, Mozambique, Marine Ecological Assessment, October 2006: Assessment of Fish and Coral Community Biodiversity and Health, and Recommendations for Marine Resource Management*. Maluane, Pemba, Mozambique: Maluane/ZSL/Natural History Museum of Maputo.

DeVantier, L.M., De'ath G., Done, T.J. & Turak, E. 1998. Ecological assessment of a complex natural system: A case study from the Great Barrier Reef. *Ecological Applications* **8**: 480–496.

Hill, N., Davidson, J., Silva, I., Mucaves, S., Muaves, L., Guissamulo, A., Debney, A. & Garnier, J. 2009. Coral and reef fish in the northern Quirimbas Archipelago, Mozambique – A first assessment. *West Indian Ocean Journal of Marine Science* **8**: 1–12.

Kerr, A.M. 2005. Molecular and morphological supertree of stony corals (Anthozoa: Scleractinia) using matrix representation parsimony. *Biological Reviews* **80**: 543–558.

Motta, H., Pereira, A.M., Gonçalves, M., Ridgway, T. & Schleyer, M.H. 2002. *Coral reef monitoring in Mozambique. II: 2000 report*. MICOA/CORDIO/ORI/WWF. Maputo: Mozambique Coral Reef Management Programme.

Nemenzo, F. 1967. Systematic studies on Philippine shallow water scleractinians: VI. Suborder Astrocoeniida (Montipora and Acropora). Part I — Text. *Natural and Applied Science Bulletin* **20** (1–2): 1–141.

Nemenzo, F. 1971. Systematic studies on Philippine shallow-water scleractinians: VII. Additional forms. *Natural and Applied Science Bulletin* **23**: 141–209, pls. 1–12.

Obura, D. 2012. The diversity and biogeography of Western Indian Ocean reef-building corals. *PLoS ONE* **7** (9): e45013. DOI: 10.1371/journal.pone.0045013

Rahmani M., Rahimian H., Ardalan, M., Keshavmurthy, S., Fontana, S., Wallace, C. & Chen, C. 2013. *Acropora* distribution patterns in the northern and northeastern Persian Gulf. *Zoological Studies* **52** (1):1–9. DOI: 10.1186/1810-522X-52-40

Ramsay, P.J. 1994. Marine geology of the Sodwana Bay shelf, southeast Africa. *Marine Geology* **120**: 225–247.

———1996. Quaternary marine geology of the Sodwana Bay continental shelf, Northern KwaZulu-Natal. *Bulletin of the Geological Survey of South Africa* **117**: 1–86.

Riegl, B. 1993. *Taxonomy and Ecology of South African Reef Corals*. Unpublished PhD thesis, University of Cape Town.

———1995. Description of four new species in the hard coral genus Acropora Oken, 1815 (Scleractinia: Astrocoeniina: Acroporidae) from south-east Africa. *Zoological Journal of the Linnean Society* **113**: 229–247.

———1996*a*. The hermatypic coral fauna of subtropical southeast Africa: A checklist. *Pacific Science* **50** (4): 404–414.

———1996*b*. Corals of the South-west Indian Ocean IV.The hard coral family Faviidae Gregory, 1900 (Scleractinia Faviina). *Investigational Reports of the Oceanographic Research Institute, Durban* **70**: 1–47.

Spalding, M.D., Fox, H.E., Allen, G.R., Davidson, N., Ferdaña, Z.A., Finlayson, M., Halpern, B.S., Jorge, M.A., Lombana, A., Lourie, S.A., Martin, K.D., McManus, E., Molnar, J., Recchia, C.A. & Robertson, J. 2007. Marine ecoregions of the world: A bioregionalization of coastal and shelf areas. *Bioscience* **57**: 573–583.

Todd, P.A. 2008. Morphological plasticity in scleractinian corals. *Biological Reviews* **83** (3): 315–337. DOI:10.1111/j.1469-185X.2008.00045.x

Veron, J.E.N. 2000. *Corals of the World*. Townsville, Australia: Australian Institute of Marine Sciences.

Veron, J.E.N. & Pichon, M. 1976. Scleractinia of eastern Australia. Part I: Families Thamnasteriidae, Astrocoeniidae, Pocilloporidae. *Australian Institute of Marine Science Monograph Series* **1**: 1–86.

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

Wallace, C.C. 1999. *Staghorn Corals of the World: A Revision of the Coral Genus Acropora (Scleractinia; Astroncoeniina; Acroporidae) Worldwide, with Emphasis on Morphology, Phylogeny and Biogeography*. Collingwood: CSIRO publishing.

Wallace, C.C., Chen, C.A., Fukami. H. & Muir, P.R. 2007. Recognition of separate genera within Acropora based on new morphological, reproductive and genetic evidence from Acropora togianensis, and elevation of the subgenus Isopora Studer, 1878 to genus (Scleractinia: Astrocoeniidae; Acroporidae). *Coral Reefs* **26**: 231–239.

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