PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES

Volume 52, No. 6, pp. 65–75, 5 figs., 3 tables. July 26, 2000

Two New Genera of Soft Corals (Anthozoa: Alcyoniidae) from South Africa, with a Discussion of Diversity and Endemism in the Southern African Octocorallian Fauna

by

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Two previously described taxa of soft corals, each apparently endemic to southern Africa, are each given new generic names. The two species were originally described in the genus *Alcyonium* Linnaeus, 1758, but are shown here to belong to distinct genera. Several southern African soft coral taxa share a similar growth form, i.e., unbranched, digitiform to capitate, with a conspicuously elongated stalk, and polyps restricted to a distal polyparium. A comparison of superficially similar taxa is provided, along with a revised faunistic analysis regarding diversity and endemism in the Octocorallia of southern Africa.

Since 1985, a resurgence of interest in the systematics of southern African octocorals has produced a variety of publications describing various taxa comprising the fauna. Included here are: Alderslade (1985), Benayahu (1993), Benayahu and Schleyer (1995, 1996), Branch, Griffiths, Branch and Beckley (1994), Grasshoff (1988, 1991, 1992), Lopez-Gonzalez, Gili, and Williams (2000), Ofwegen and Schleyer (1997), Richmond (1997), Verseveldt and Bayer (1988), Verseveldt and Ofwegen (1992), Verseveldt and Williams (1988), Williams (1986a, 1986b, 1986c, 1987a, 1987b, 1988, 1989a, 1989b, 1989c, 1989d, 1990a, 1990b, 1992a, 1992b, 1992c, 1992d, 1992e, 1993, in press), Williams and Lindo (1997), and Williams and Rogers (1989).

Two new genera of soft corals from the Cape Endemic Province of southern Africa (as defined by Williams, 1992d), are here described. Each genus includes a single species previously described in the genus *Alcyonium*. It is here argued that these taxa are better placed in genera other than *Alcyonium*.

METHODS

An examination of recently collected material was made for part of this study. The material was collected by SCUBA and preserved in 70% ethanol. Sclerites were isolated using sodium hypochlorite. Scanning electron micrographs were made on a Hitachi S-510 scanning electron microscope. Photographic plates for publication were made using Adobe Photoshop 4.0 software. Abbreviations used in the text are as follows: CAS (California Academy of Sciences, San Francisco), CRRF (Coral Reef Research Foundation, Palau), SAM (South African Museum, Cape Town).

SYSTEMATIC ACCOUNT

Family Alcyoniidae Lamouroux, 1812

Lampophyton gen. nov.

non *Alcyonium* Linnaeus, 1758:803; Williams, 1992a:271 (in part).

DIAGNOSIS. — Upright, unbranched soft corals, clavate or torch-shaped. Stalk prominent, expanding distally to form a flat-topped polyparium. Polyps monomorphic, retractile, restricted to the distal terminus of the coral. Polyp calyces absent. Sclerites colorless, densely set coarse spindles, more or less longitudinally arranged along the walls of the stalk and polyparium. Color alcohol soluble.

TYPE SPECIES. — *Alcyonium planiceps* Williams, 1986.

ETYMOLOGY. — The new generic name is derived from the Greek, *lampas* (a lamp or torch) and *phyton* (a creature, either plant or animal); in reference to the torchlike appearance of colonies of this species, with narrow stalk and expanded, flat-topped polyparium.

Lampophyton planiceps (Williams, 1986) new comb.

Figs. 1A–C, 2A–F, 3

Alcyonium planiceps Williams, 1986:53, figs. 1–7. 1992a:289, figs. 20 e–j, 21.

MATERIAL EXAMINED. CAS 118496 (Sta. No. SAFR 334), South Africa, Cape Province, off Port Elizabeth, Algoa Bay, Riy Banks, 15–24 m, 23 February 1999; collected by John Starmer with aid of SCUBA, two whole specimens. CAS 118497 (Sta. No. SAFR 365), South Africa, Cape Province, off Port Elizabeth, Algoa Bay, White Sands 6, 20 m depth, 26 February 1999, collected by John Starmer with aid of SCUBA, two whole specimens. Fig. 1B from SAM-H3280, Llandudno, Atlantic side of Cape Peninsula, Cape Province, South Africa, 21 m in depth, 24 January 1984, collected by G. C. Williams with aid of SCUBA. Fig. 1A, C from SAM-H3281, Llandudno, Atlantic side of Cape Peninsula, Cape Province, South Africa, 25–30 m in depth, 24 March 1984, collected by G. C.Williams with aid of SCUBA.

DESCRIPTION. — The specimens examined range in length from 18–32 mm. In each specimen, the distal polyparium arises from an upright and unbranched stalk, which in turn arises from the basal holdfast. The distal-most portion of the stalk expands gradually to form the polyparium at the distal terminus. This feature gives the body of the coral a club-shaped or torch-shaped appearance (Fig 1A–C). The polyps are restricted to the flat, disc-shaped distal terminus. The polyps are monomorphic, retractile, and without calyces. The sclerites are relatively large and robust spindles with varying amounts of surface ornamentation (Fig. 2A–F). The tubercles vary from simply rounded and relatively sparsely distributed knoblike structures to more densely-set crownlike arrangements (Fig. 2D–F). The sclerites are densely set and are mostly longitudinally arranged along the surface of the stalk (Fig. 1A). A few sclerites are scattered in the shallow subsurface of the stalk and polyparium, but are not present in the deep interior. The sclerites range in length from 0.82–1.80 mm. Sclerites are altogether absent from the polyps. The wet preserved specimens have stalks that are tan to yellowish brown in color (but apparently without zooxanthellae), with polyps and polyparies greenish gray or brown. Pigments are alcohol soluble. The vivid coloration of living material is recorded in Fig. 1A–C.

DISTRIBUTION. — Cape Province of South Africa; Atlantic side of the Cape Peninsula, Cape St. Francis, Algoa Bay, and East London; 21–90 m in depth (Fig. 3).

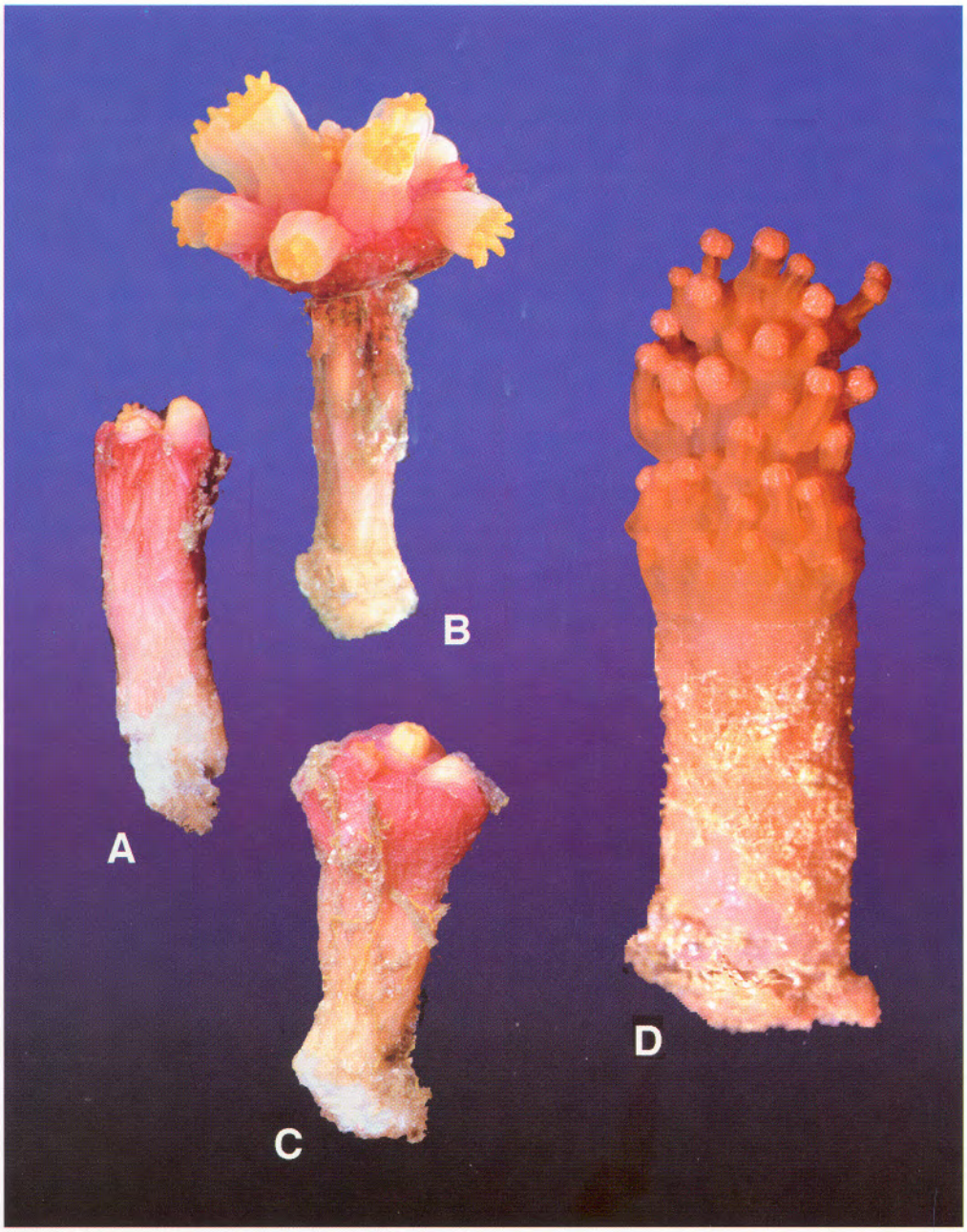

FIGURE 1. Living soft corals A-C. *Lampophyton planiceps*. A. Colony with polyps retracted, total length 18 mm (SAM-H3281). B. Colony with polyps partially expanded, total length 30 mm (SAM-H3280). C. Colony with polyps retracted, total length 17 mm (SAM-H3281). D. *Dimorphophyton mutabiliforme*; 25 mm in length (SAM-H3716).

REMARKS. — The surface of the stalk is often partly covered with a variety of epizoic organisms, including tubicolous amphipods, tubicolous terebellid polychaetes, sponges, foraminiferans, and diatoms (Fig 1B, C).

Turbellarian flatworms and an undescribed species of the arminacean nudibranch genus *Dermatobranchus* have also been found on colonies of *Lampophyton planiceps*. It is probable that the nudibranch feeds on the soft coral. Both predator and prey exemplify similar rose lavender colorations.

Dimorphophyton gen. nov.

non *Alcyonium* Linnaeus, 1758:803; Williams, 1992a:271 (in part).

DIAGNOSIS. — Upright, unbranched soft corals, with changing growth form: digitiform or cylindrical in shape when expanded, capitate during retraction. Stalk conspicuous, comprising half of total body length when expanded, more than half during retraction. Polyparium finger-shaped when expanded, subspherical during retraction. Polyps monomorphic, retractile into the capitulum. Polyp calyces absent. Sclerites thin, flattened, irregularly-shaped rods with smooth surface texture, tuberculation not evident. Sclerites colorless, few in number; sparsely scattered in anthocodiae and often in circles surrounding the bases of the polyps. Rust orange color, alcohol-soluble.

TYPE SPECIES. — *Alcyonium mutabiliforme* Williams, 1988.

ETYMOLOGY. — The new generic name is derived from the Greek, *di-* (a prefix meaning two or double), *morphe* (form or shape), and *phyton* (a creature, either plant or animal); in reference to the two colony shapes (digitiform when expanded and capitate when retracted) displayed by these soft corals.

Dimorphophyton mutabiliforme (Williams, 1988) new comb.

Figs. 1D; 2G, H; 3

Alcyonium mutabiliforme Williams, 1988:14, figs. 11–14; 1992a:286, figs. 19, 20 a–d.

MATERIAL EXAMINED. — SAM-H3716, Hottentot's Huisie, Atlantic side of Cape Peninsula, Cape Province, South Africa, 15–18 m in depth, 11 November 1984, four whole specimens, collected by G. C. Williams with aid of SCUBA.

DESCRIPTION. — Williams (1988:14–19 and 1992a:286–289) has previously described this species. A brief redescription is provided as follows: The seven known specimens are upright and unbranched, each less than 40 mm in length. The distal polyparium arises from a conspicuous stalk, which in turn arises from the basal holdfast. Expanded specimens are digitiform, with the cylindrical polyparium comprising 50–55% of the total length of the specimen (Fig. 1D). Retracted specimens are capitate, with the subspherical polypary comprising 35–45% of the total length of the specimen. The monomorphic polyps are retractile and are evenly distributed over the surface of the polyparium. They do not have calyces. Sclerites are very thin, relatively smooth, irregularly-shaped rods, with little to no surface ornamentation. They vary in length from 0.06–0.26 mm (Fig. 2G, H). The sclerites are very few in number and are sparingly distributed in the anthocodiae; as well as on the surface of the polyparium where they are arranged in rings surrounding the bases of most of the polyps. Sclerites are absent from other areas of the specimens. The specimens are deep orange to rust orange in life (apparently without zooxanthellae), fading to a dull reddish brown wet preserved. Pigments are alcohol-soluble. The vivid coloration of living material is recorded in Fig. 1D.

DISTRIBUTION. — Llandudno and Hottentot's Huisie, Atlantic side of the Cape Peninsula, Cape Province of South Africa; 15–21 m in depth (Fig. 3).

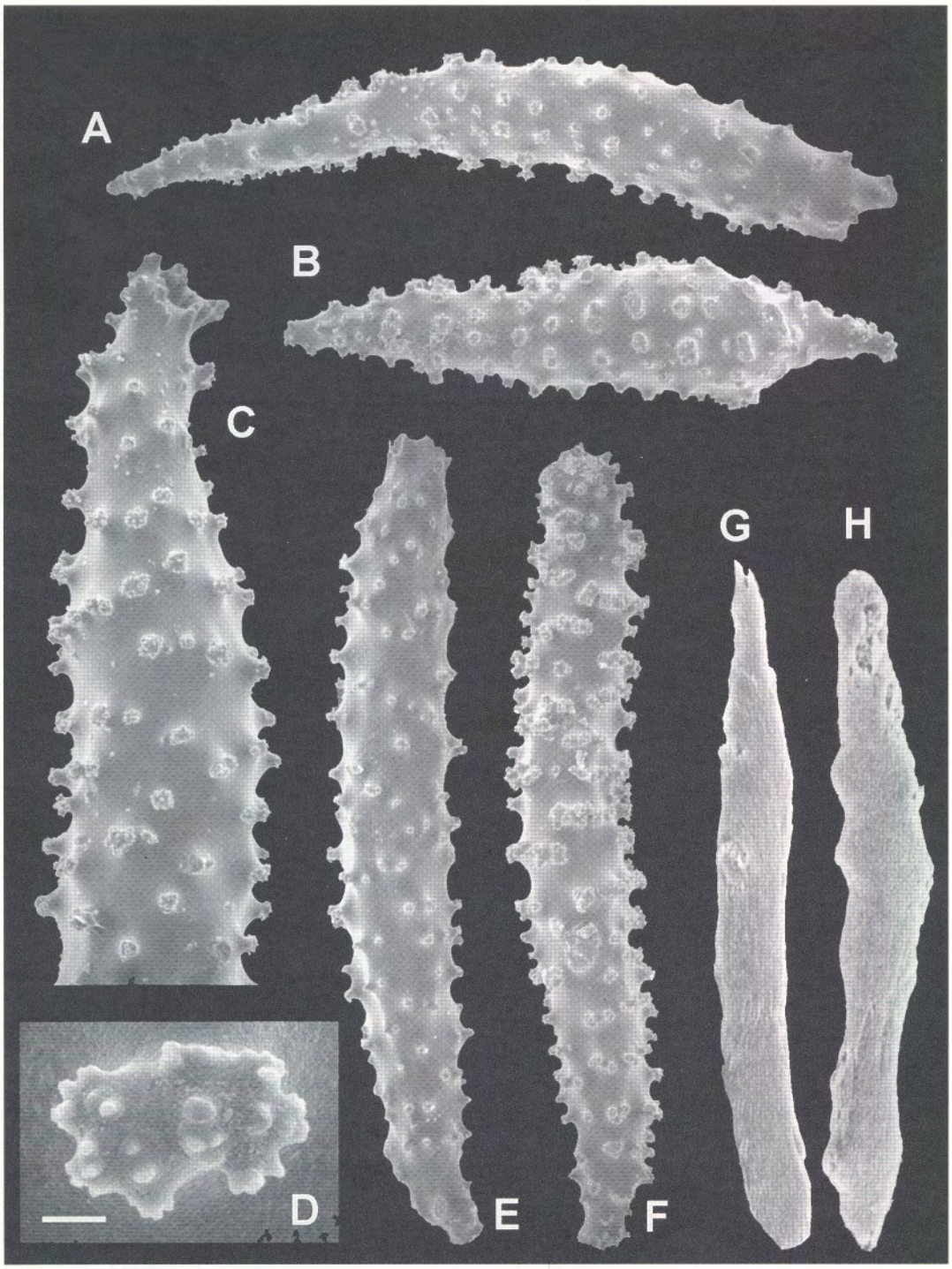

FIGURE 2. Scanning electron micrographs of sclerites. A-F. *Lampophyton planiceps*. A. 1.18 mm in length. B. 0.82 mm in length. C. Detail of one end of a sclerite; length of portion shown 0.64 mm. D. Detail of a single tubercle from sclerite shown in C; scale bar = 0.005 mm. E. 1.20 mm in length. F. 1.20 mm in length. G-H. *Dimorphophyton mutabiliforme*. G. 0.16 mm in length. H. 0.18 mm in length.

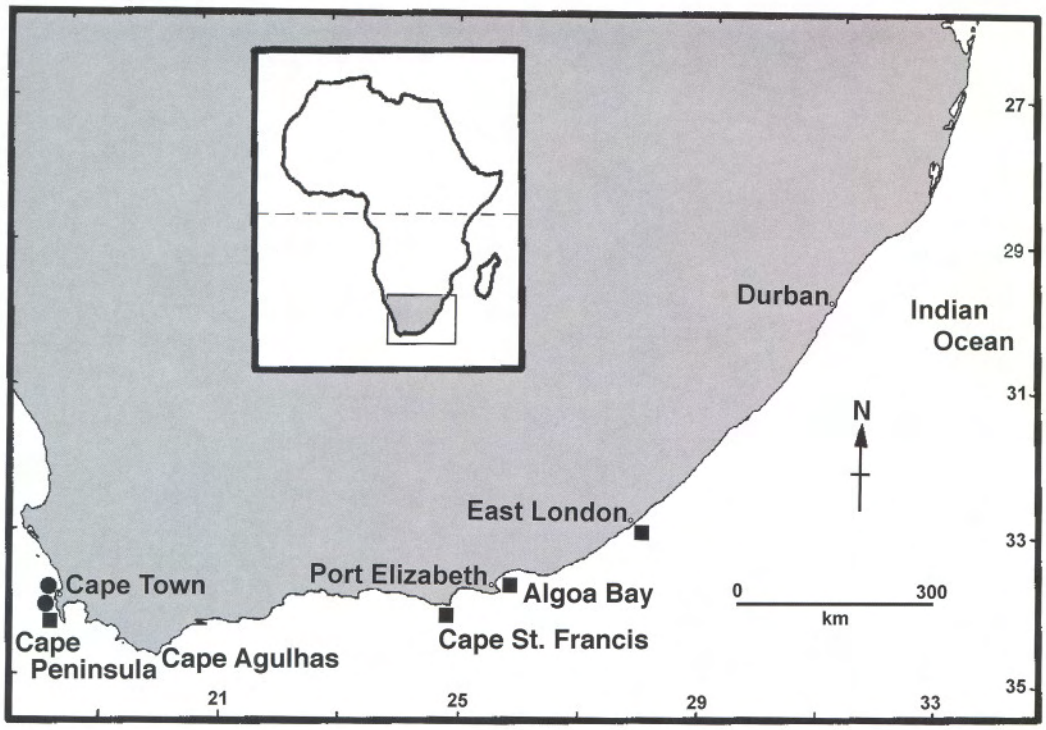

FIGURE 3. Map of southern Africa showing collecting stations for *Dimorphophyton mutabiliforme* (●) and *Lampophyton planiceps* (■).

REMARKS. — The surface of the stalk is often partly covered with a variety of epizoic organisms such as sponges, barnacles, and tunicates (Fig 1D).

DISCUSSION

SYSTEMATICS. — I have discussed and revised the definition of the genus *Alcyonium* Linnaeus, 1758, in earlier publications (1986a:262–264; 1986b:61–62; 1988:18–19; 1992a:271), and I also provided (1986:259–262) a synopsis of the history of taxonomy relating to this genus and related taxa. Since that period, it has been generally agreed by workers in soft coral systematics (P. Alderslade and L. P. van Ofwegen, pers. comm., and the present work) that it is more realistic to recognize a *sensu stricto* definition reflecting the lobate or digitate growth form of the type secies *Alcyonium digitatum* Linnaeus, 1758, rather than a broader *sensu lato* definition encompassing a variety of growth forms as I have listed previously (1988:19). It is proposed that as our knowledge of alcyoniid taxonomy increases, species previously included in the genus *Alcyonium* that do not suitably fit the original definition, should either be placed in other previously described genera such as *Eleutherobia* Pütter, 1900, or new genera should be named to accommodate them (such as *Lampophyton* gen. nov., and *Dimorphophyton* gen. nov.).

In addition, recent study has indicated that the genus *Alcyonium* as presently recognized may actually be comprised of two distinct clades: one representing cold-water to temperate, azooxanthellate, often brightly-colored species such as *Alcyonium fauri* J. S. Thomson, 1910; and the other represented mostly by coral reef taxa of tropical regions, such *as Alcyonium utinomii* Verseveldt, 1971, which are zooxanthellate and mostly white or light brown in color (pers. observ. and P. Alderslade,

pers. comm.). It remains to be determined whether or not the latter clade deserves separate generic designation. Alderslade (in press) addresses this issue.

Other taxa of southern African or Indian Ocean soft corals are superficially similar in growth form (unbranched: digitiform, clavate, or capitate) to *Lampophyton planiceps* and *Dimorphophyton mutabiliforme*, but differ as follows. *Malacanthus capensis* (Hickson, 1900), *Acrophytum claviger* Hickson, 1900, *Anthomastus* spp., *Paraminabea* spp., and *Verseveldtia* spp. are dimorphic. *Bellonella* spp. have spindles less than 0.15 mm in length, while *Eleutherobia* spp. have radiates. *Alcyonium* spp. are mostly lobate to digitate or membranous in growth form. *Pieterfaurea* spp. have a palisade-like arrangement of sclerites around the base of each polyp.

DIVERSITY AND ENDEMISM IN THE SOUTHERN AFRICAN OCTOCORALLIA. — I have previously (1992d) provided a detailed biogeographic analysis of the octocorallian fauna of southern Africa, describing diversity and levels of endemism in the Cape Endemic Province, as well as faunal contributions to the regional biota from neighboring zoogeographic provinces. Included here are the Indo-Pacific, Atlantic, and Southern Oceans (Antarctic and Subantarctic). Since 1992, new information has allowed for a refinement of analysis concerning diversity and endemism in the fauna. Figures 4 and 5 summarize the results of this revised assessment. The charts are based on data presented in Tables 1–3. A revised list of valid species of southern African octocorals will be published after the publication of several generic revisions and descriptions of new taxa.

Some definitions relevant to the reassessment are as follows: Soft corals are octocorals without an internal axis (families Alcyoniidae, Nephtheidae, Nidaliidae, and Xeniidae). Gorgonians refer to octocorals with an internal axis (families Anthothelidae, Melithaeidae, Keroeididae, Acanthogorgiidae, Plexauridae, Gorgoniidae, Ellisellidae, Chrysogorgiidae, Primnoidae, and Isididae). Widespread refers to scattered or cosmopolitan distributions as I have previously defined (1992d:356–357). This reference also defines the limits of other biogeographic regions such as Cape Endemic, Indo-Pacific, Atlantic, and Southern Oceans. I have previously elucidated the geographical limits of southern Africa (1992d:355). A particular genus is assigned a biogeographic affinity if the majority of species within the genus are endemic to that particular biogeographic region (Williams 1992d:368–369).

TABLE 1. Southern African Octocorallia - largest genera by number of species.

Genus	Number of species
Sinularia	15
Eleutherobia	7
Alcyonium	6
Sarcophyton	6
Leptogorgia	5
Lobophytum	5
Pieterfaurea	5
Simpsonella	5
Xenia	5
Drifa	4
Virgularia	4
Cavernularia	3
Eunicella	3
Ditypic genera	30
Monotypic genera	62
Total	165

TABLE 2. Southern African Octocorallia - biogeographic composition.

Biogeographic category	Number of genera	Number of species
Indo-Pacific	36	47
Widespread	30	9
Endemic	13	78
Atlantic	9	2
Antarctic	2	0
Unidentified	–	29
Total	90	165

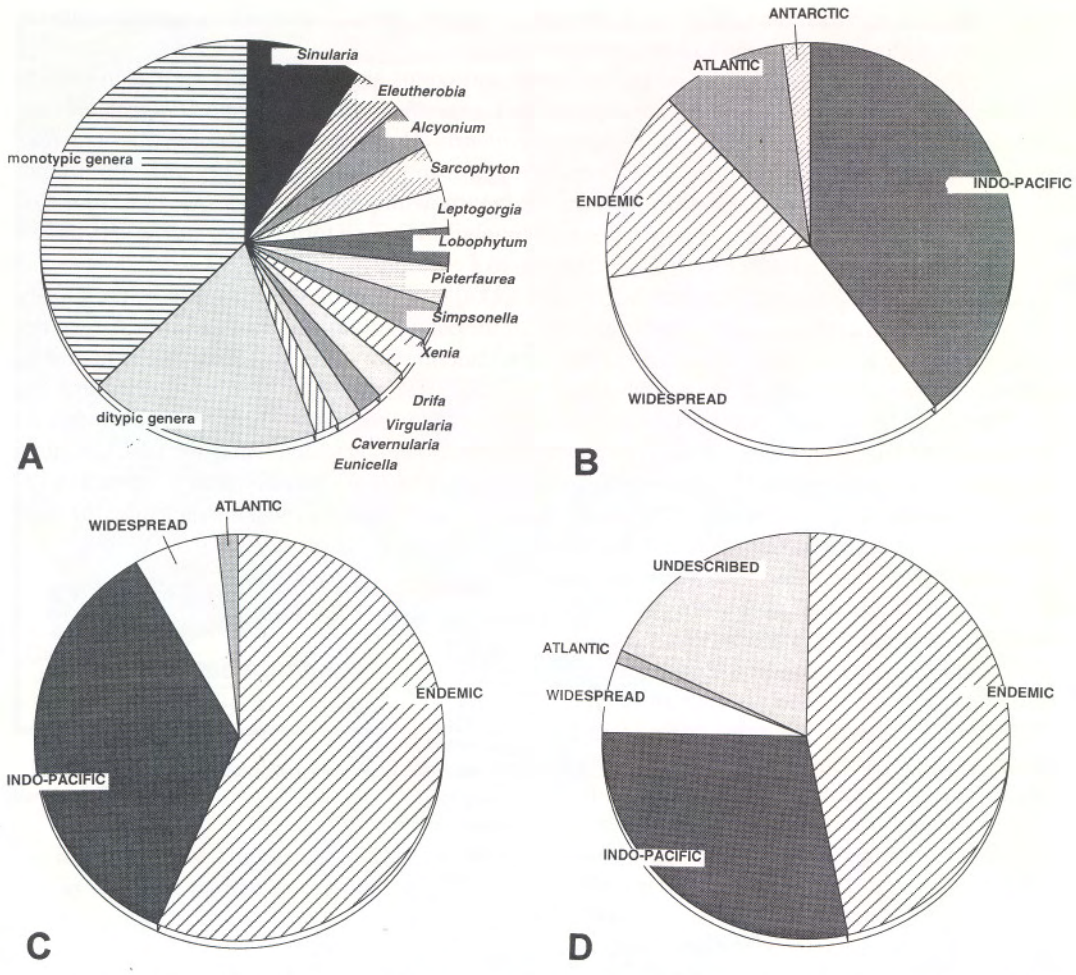

FIGURE 4. Faunistic analysis of southern African Octocorallia. A. Largest genera by number of species per genus, n = 165 (estimated number of species). B. Biogeographic affinities of the genera, n = 90 (number of genera). C. Biogeographic categories of species considered valid, n = 135 (number of valid described species). Biogeographic categories including undescribed species, n = 165 (estimated number of species).

Of the thirteen largest genera in the fauna, nine are soft corals, two are gorgonians (*Leptogorgia* and *Simpsonella*), and two are pennatulaceans (*Cavernularia* and *Virgularia*). The fauna also contains 15 ditypic genera and 62 monotypic genera. The largest genus is *Sinularia* (9.1% of the fauna), followed by *Eleutherobia* (4.3%), and *Alcyonium* and *Sarcophyton* (both 3.6%) (Table 1 and Fig. 4A).

An analysis of biogeographic affinities at the generic level shows that the Indo-Pacific represents the largest source contribution to the fauna with 40%, followed by those with widespread distributions (33%), and southern African endemic genera (15%). Atlantic (10%) and Antarctic or Southern Ocean (2%) contributions are relatively minor (Table 2 and Fig. 4B). The previous assessment (Williams 1992d:369, fig. 12A) showed similar percentages, except for the Indo-Pacific (45%) and the endemic component (10%). This change partly reflects the fact that four new endemic genera have been recognized since the last analysis was published.

Regarding identified species that are considered valid, the endemic component is by far the largest with 57%, followed by the Indo-Pacific with 35%, species with widespread distributions (7%), and

Atlantic species (1%) (Table 2 and Figure 4C). When the undescribed species that are considered valid (18%) are added to this, the endemic component shows a contribution of 46%, while the Indo-Pacific component represents 29%, with minor contributions from the widespread category (6%) and the Atlantic (1%) (Table 3 and Figure 4D).

It is presumed that if undescribed species were described and added to the data set, that the percentages shown in Figure 4C would probably reflect a relatively accurate and consistent quan-

TABLE 3. Southern African Octocorallia - comparative species richness.

Taxonomic group	Number of species
Heliporaceans	1
Stoloniferans	9
Soft corals	78
Gorgonians	43
Pennatulaceans	34
Total	165

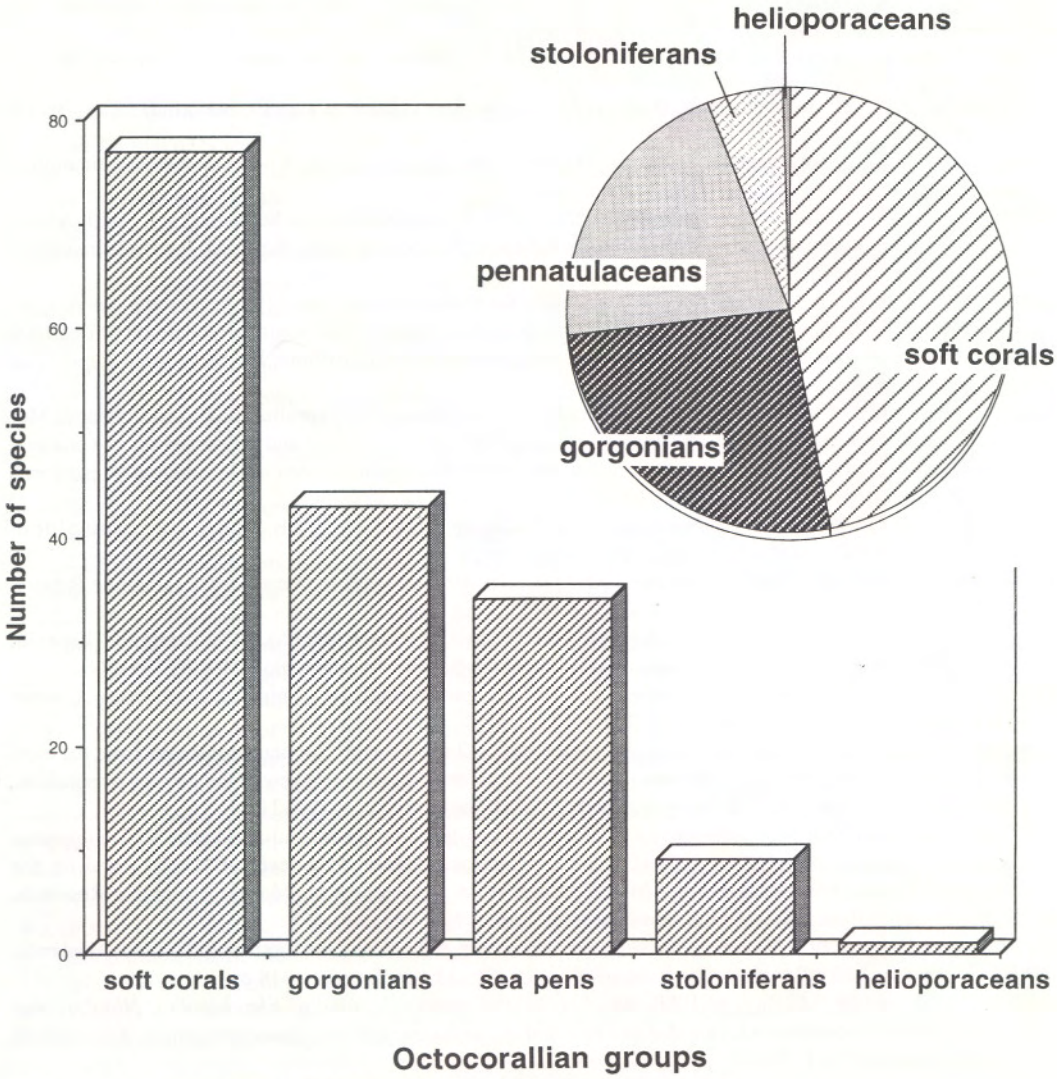

FIGURE 5. Species richness in southern African octocorals (n=165).

titative portrayal of the faunistic elements. Williams (1992d:632, fig. 6F) shows a 53.30% contribution for endemics based on estimated number of species of Octocorallia. The new assessment shows a 56.72% contribution. Therefore, a reasonable interpretation is that over one-half of the southern African octocorallian fauna is represented by endemic species.

Soft corals comprise the largest group regarding species richness (47%), followed by gorgonians (26%), pennatulaceans (21 %), stoloniferans (5%), and helioporaceans (1%) (Table 3 and Figure 5).

ACKNOWLEDGMENTS

I am grateful to Phil Alderslade (Museum and Art Gallery of the Northern Territory, Darwin), Yehuda Benayahu (Tel Aviv University, Tel Aviv), and Katie Martin (Scientific Publications, California Academy of Sciences, San Francisco) for their comments and suggestions; and to John Starmer (Coral Reef Research Foundation, Palau) for recently collected material.

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