

**Index Pennatulacea**  
**Annotated Bibliography and Indexes of the Sea Pens**  
**(Coelenterata: Octocorallia) of the World 1469–1999**

by

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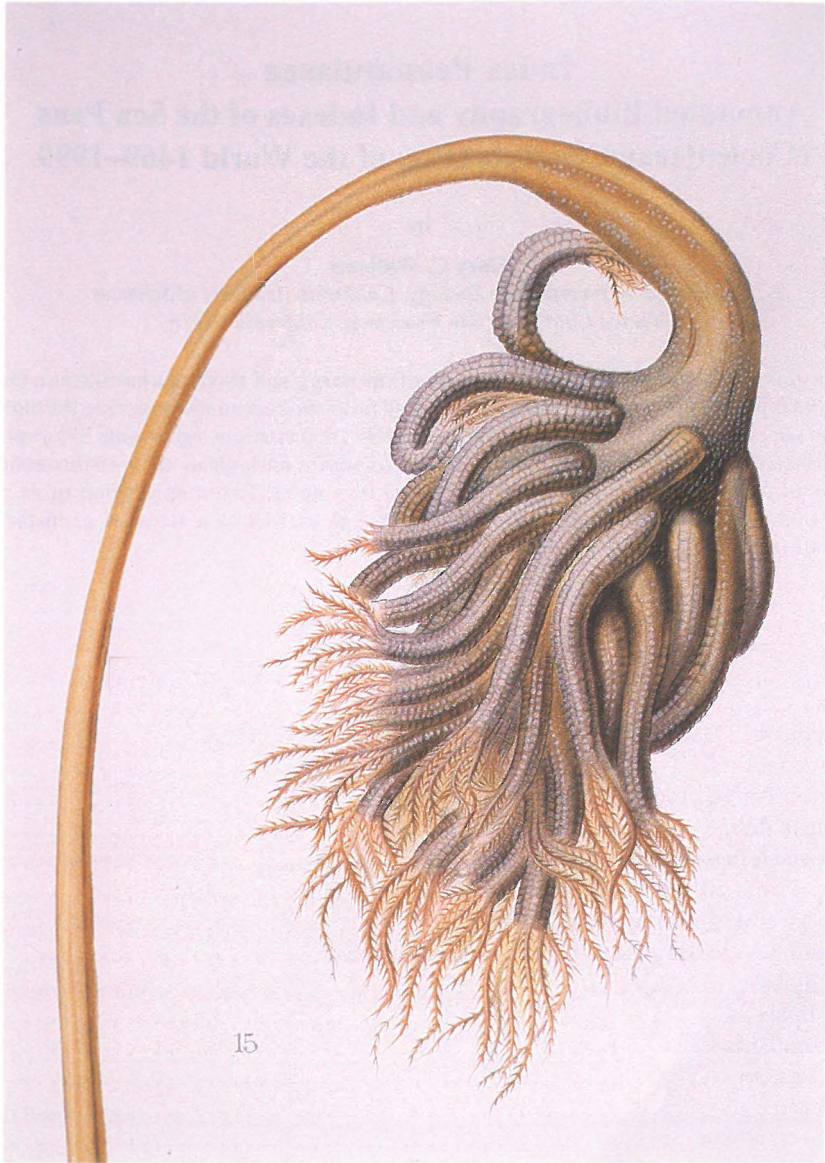
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A reasonably comprehensive bibliography of the living and fossil pennatulacean Octocorallia is presented, with the goal of including all published accounts regarding the biology of the sea pens. This compilation of approximately 1000 citations represents 530 years of published research. Complete unabbreviated citations for periodicals are used throughout. Many of the citations are annotated with descriptive notes. Taxonomic, geographic, and field-of-study indexes to the literature are included, as well as a synopsis of historical periods in the study of the Pennatulacea.

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PLATE 1



*Umbellula antarctica*  
After Kükenthal & Broch, 1911

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## INTRODUCTION

The pennatulaceans, commonly known as sea pens and sea pansies, are a highly specialized and distinct group of sessile benthic coelenterates. They are distributed throughout the world's oceans from the polar seas to the tropics, and at all depths from the intertidal (certain virgulariids) to over 6200 meters (Umbellulidae, Pl. 1). Morphologically, sea pens are highly diverse and exhibit morphological changes as evolutionary events within different lineages. Examples are bilateral symmetry, concentration and localization of feeding polyps, the development of lateral processes as polyp leaves or ridges, and the reduction in the number and size of sclerites. As octocorallian coelenterates, pennatulaceans are characterized by having eight pinnate tentacles surrounding the mouth of each polyp, and eight mesenteries. Unlike other octocorals, however, mature colonies develop from a single large polyp (the oozoid) that produces secondary zooids by lateral budding of its body wall. Also unique to the Pennatulacea, is the unbranched muscular peduncle, which anchors the animal by peristaltic contractions into soft substrata such as sand, mud, or abyssal ooze. The secondary polyps (larger autozooids for feeding and reproduction, and smaller siphonozooids for internal water circulation) are restricted to the distal rachis, which is also unbranched but may have laterally-produced polyp leaves.

The ability to inhabit soft substrata has allowed several abyssal-dwelling sea pens to have nearly cosmopolitan distributions. Despite these very widespread geographic ranges, pennatulacean species diversity in the deep-sea is relatively low, and may be attributable to a combination of factors including: relatively low energy input and depauperate productivity in the abyssal environment, coupled with a relative lack of ecological diversity.

Thirty-two genera in fifteen families of living pennatulaceans are currently recognized. Of the 436 nominal species names described in the literature, approximately one half are currently considered valid. Major monographic works on the Pennatulacea include Kükenthal (1915), Hickson (1916), and Williams (1990, 1995a).

The sparsely-represented pennatulacean fossil record extends back to the Cretaceous Period and consists primarily of virgulariid fossil taxa in the genera *Graphularia* and *Virgularia*. Bayer (1956:228) observed that fossils of *Graphularia* closely resemble the axial structure of the genus *Stylatula*, and the two may be congeneric. Problematic and controversial frondlike taxa that resemble pennatulid sea pens are described from the Vendian Period of the late Precambrian. In fact, the coming of age of Precambrian paleobiology in the 1980s has produced a wealth of publications dealing with the Ediacaran or Vendian biota. Many of the Vendian frondlike taxa have been allied with the Pennatulacea by various authors, but these interpretations remain highly disputatious. Because of the importance of recent fossil discoveries, which have helped to bridge the gap between fossil biotas of the Precambrian and the Cambrian, many of the references on these Vendian pennatulacean-like organisms are included here, but the coverage should in no way be considered comprehensive.

The goal of this work is to produce a bibliography of all published works pertaining in part or in full to the pennatulacean octocoral coelenterates. Although no work of this kind can claim to be absolutely comprehensive, this bibliography can at least be considered reasonably complete, certainly more so than any previously-published, similar work. The fine bibliography of octocorals by Bayer (1996) concentrates on taxonomic works for all of the Octocorallia, but does not claim to be inclusive for Pennatulacea or fields of study outside of taxonomy.

The following annotated and alphabetical bibliography to the Pennatulacea of the world is derived from a variety of sources—primarily the Zoological Record (1864–1998), as well as the author's research library. Other sources include Bayer (1981), Bayer (1996), and Hickson (1916). My annotations are in square brackets at the end of many of the citations.

This work is intended for a variety of users including professional biologists, biology students, fisheries biologists and marine resource managers.

The intent of the presentation is to make this work as user friendly as possible. In order to facilitate this goal, full citations are given for the vast majority of the references listed, as abbreviations for periodical publications have proved in the past to be confusing, inconsistent, or often unusable.

The Melvyl System, library data base of the University of California, [<http://www.melvyl.ucop.edu>] was used extensively to acquire complete citations for periodicals. Other sources used for abbreviations and complete citations of periodicals include the List of Serial Publications in the BM(NH) Library, the World List of Scientific Periodicals 1900–1960, and Biosis Serial Sources.

For the most recently-recognized, valid species names of Pennatulacea, see Williams (1995a, 1997f).

#### ACKNOWLEDGMENTS

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I thank Leen van Ofwegen (Nationaal Natuurhistorisch Museum, Leiden), Phil Alderslade (Museum and Art Gallery of the Northern Territory, Darwin), Frederick Bayer (National Museum of Natural History, Washington, D. C.), and Michael Ghiselin (California Academy of Sciences) for their valuable contributions and comments.

I especially thank Alan Leviton (California Academy of Sciences) for his interest and patience, regarding many hours spent at the computer preparing the figures.

## HISTORICAL ACCOUNT

**Pre-Linnean Period (1469–1757)**

In writing about the history of research regarding pennatulacean bioluminescence, E. Newton Harvey (1952:170), related the following, "Although the Romans knew of sea pens, referring to them as 'Penna marina,' the sea feather, or as 'Mentula alata,' the winged penis, the ability to luminesce does not appear to have been recorded. Probably the first mention of luminous sea pens comes to us in the famed 'De lunariis' and the 'Historia Animalium' of Conrad Gesner, published in the middle sixteenth century."

The earliest published accounts describing aspects of the natural history of octocorals, including the sea pens, are Pliny the Elder (1469), Guillaume Rondelet (1554, 1555), Conrad Gesner (1555, 1558) (Pl. 2), Ferrante Imperato (1599), and Captain Lancaster (1601). Other noteworthy pre-Linnean works dealing at least in part with the Octocorallia are those of Francisci Erasmi (1668), Paolo Boccone (1674), Hans Sloane (1707), Jacques Barrelier (1714), Herman Boerhaave (1720, 1727), Christlob Mylius (1753, 1754), and John Ellis (1753, 1755).

Pennatulacean bioluminescence is at least mentioned by François Boussuet (1558), Caspar Bauhin (1620, 1671), Ulisse Aldrovandi (1642, 1648), Johann Bauhin (1650–51), and Thomas Shaw (1738–46).

Louis Agassiz (1860) praised the perspicacity of early workers such as Rondelet and Gesner, who first established the animal nature of the "acalephs" (many of the taxa that we now regard as coelenterates), departing from the earlier views of Aristotle and Pliny, who compared them to plants (the "zoöphytes").

Pertaining to Rondelet, Agassiz (1860:8) stated, ". . . we are chiefly indebted to Rondelet for contributions to the natural history of the Acalephs. He was, indeed, not only better acquainted with the inhabitants of the Mediterranean than all his predecessors, but he knew them even more accurately than any naturalist that lived before the present century."

In his praise of sixteenth century naturalists, Agassiz (1860:10) continues, "It has been a source of constant delight for me, while perusing the works of the earlier naturalists, to sympathize with the genial spirit and the earnestness that pervade their writings, so free from egotism, and animosity against their fellow-students. Their devotion to their studies is equal to the spirit of reverence with which they look upon nature; and it is disgraceful to our age, that we must contrast with such dispositions the ill-will, the jealousies, the quarrels for priority, and the profanation, which pervade the discussions of certain modern authors. Moreover, in a systematic point of view, the great naturalists of the sixteenth century deserve to be studied more fully than they have been thus far. It is astonishing, for instance, to see how near Rondelet, in discussing the views of Aristotle upon the affinities of animals, came to perceiving their true affinities, and their natural classification . . ."

A good example of the evolution of thought in natural history is exemplified by various views regarding the nature of corals in the seventeenth and eighteenth centuries. The concept of corals as "zoöphytes," transitional between plants and animals, was established by the Roman scholars Sextus Empiricus and Pliny the Elder (Caius Plinius Secundus), based on Aristotle's notion of the gradation from plants to higher animals. This undoubtedly served to propagate a state of confusion for nearly two thousand years—the false view that corals as living beings share the natures of both animals and plants (Agassiz, 1860:6–7). Paolo Boccone (1670) and John Woodward (1695) emphasized the inanimate aspect of corals and regarded them as stones, while L. F. Marsigli (1725) considered them to be plants, and the coral polyps as "flowers of the coral." It was the perceptive observer, Jean-André Peyssonnel (1753), who first recognized the animal nature of corals and their affinities to other coelenterates, after observing the contraction, expansion and movement of the tentacles of coral polyps (Hyman 1940:365).

## PLATE 2



Conrad Gesner (1516-1565). Courtesy  
Kraig Adler, Cornell University.



Carl von Linné (Linnaeus) (1707-1778). Courtesy  
Picture Collection, California Academy of Sciences.



Peter Simon Pallas (1741-1811). Courtesy  
Kraig Adler, Cornell University.



Lazzaro Spallanzani (1729-1799). Courtesy  
Michael Ghiselin, California Academy of Sciences.

### The Linnean Period (1758–1858)

The publication of the 10th edition of *Systema Naturae* by Linnaeus (Carl von Linné 1758) (Pl. 2) is accepted as the starting point for our contemporary system of binominal nomenclature. Linnaeus named the genus *Pennatula*, from which the ordinal name Pennatulacea is derived. Other contributors during the Linnean Period include William Borlase (1758), Job Baster (1759–65); Joannes Baptist Bohadsch (1761); John Ellis (1764); Peter Simon Pallas (1766) (Pl. 2), first monographer of the “zoophytes”; Pieter Boddaert (1771); I. Lepechin (1781); John Ellis and Daniel Solander (1786); Lazzaro Spallanzani (1796) (Pl. 2); Georges Cuvier (Pl. 3), originally Jean Léopold Nicolas Frédéric Cuvier (1797), who named the genera *Umbellula* and *Veretillum*; Jean Baptiste Pierre Antoine de Monet de Lamarck (1816) (Pl. 3), who named the genera *Funiculina*, *Renilla*, and *Virgularia*; Tilesius von Tilenau (1819); S. della Chiaje (1827, 1841–44); M. W. Rapp (1827); H.-M. Ducrotay de Blainville (1834); Christian Gottfried Ehrenberg (1834a) (Pl. 3), who introduced the family name Pennatulina, later corrected by Dana, 1846 to Pennatulidae; Fredrich Sigismund Leuckart (1841); James Dwight Dana (1846) (Pl. 3), who corrected the familial name of Ehrenberg to Pennatulidae; George Johnston (1847); John Edward Gray (1840–1873), who named the genus *Sarcoptilus* in 1848; Henri Milne Edwards (Pl. 4) and Jules Haime (1850), who named the fossil genus *Graphularia*; Achille Valenciennes (1850), who named the veretillid genera *Lituaria* and *Cavernularia*; P. Chr. Asbjørnsen (1856), who named the genus *Kophobelemnon*; and Jan Adrianus Herklots (1858) (Pl. 4), who named the genera *Scytalium* and *Pteroeides*.

### The Darwinian Period (1859–1899)

The publication of the *Origin of Species* by Charles Darwin (1859) initiated what is here referred to as the Darwinian Period.

The pre-eminent author of the Pennatulacea during this period was Rudolf Albert von Kölliker, who produced major descriptive taxonomic works between 1865 and 1880. Kölliker described the sea pens of the *H. M. S. Challenger* Expedition, in which thirty species were described. Kölliker also named the genera *Acanthoptilum*, *Anthoptilum*, *Halipteris*, *Protoptilum*, *Sclerobelemnon*, *Scleroptilum*, and *Stachyptilum*. Other noteworthy contributions during this period include Pieter Bleeker (1859) (Pl. 4), who described several species of *Pteroeides*; William More Gabb (1859–1864) (Pl. 4); Jan Adrianus Herklots (1863); Josua Lindahl (1874); Johan Koren and Daniel C. Daniëlsen (1847–1884); Addison Emery Verrill (1865–1882), who named the genera *Distichoptilum*, *Ptilosarcus*, and *Stylatula*, and introduced the name Pennatulacea in 1865 as a subordinal name, later elevated to ordinal status by Studer, 1887a; Sir Charles Wyville Thomson (1874), chief scientist of the *H. M. S. Challenger* Expedition (Pl. 5); Robert Edward Carter Stearns (1873–1883) (Pl. 5); Ambrosius Arnold Willem Hubrecht (1885) (Pl. 5), who named the genus *Echinoptilum*; G. Herbert Fowler (1888, 1894); A. Milnes Marshall (1883a, 1883b); A. Milnes Marshall and G. Herbert Fowler (1887, 1889); and A. Milnes Marshall and William P. Marshall (1882); T. H. Tizard et al. (1885); and Théophile Studer (1891), who named the genus *Gyrophyllum*.

The Darwinian Period produced numerous studies of evolutionary relationships for many groups of organisms. Important works pertaining to pennatulacean phylogeny during this time included R. A. von Kölliker (1870, 1880), Gottlieb von Koch (1878), and A. Milnes Marshall (1887).

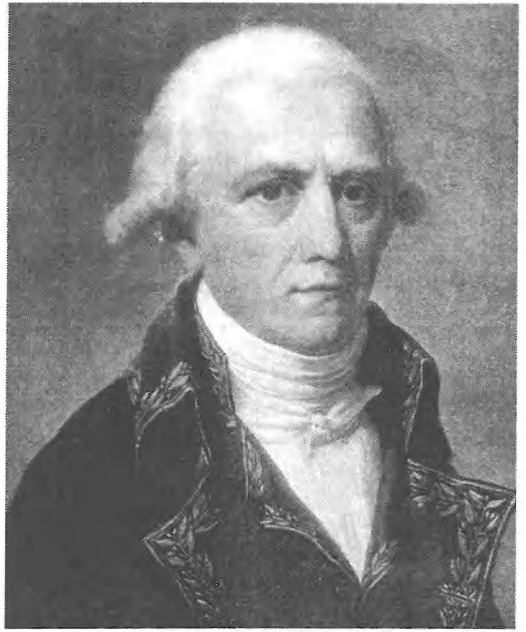
### The Early Twentieth Century (1900–1949)

Significant contributions in octocorallian systematics (including pennatulaceans) during the early part of the Twentieth Century include Hector F. E. Jungersen (1904, 1907, 1917); Charles Gravier (1906), who named the genus *Scytaliopsis*; Charles Cleveland Nutting (1908), who named the genus *Calibelemnon*; Heinrich Balss (1909, 1910); Hjalmar Broch (1910–1961); Willy Kükenthal (1902–1925) (Pl. 6), who named the genera *Actinoptilum*, *Amphiacme*, and *Chunella*; W. Kükenthal and H. Broch (1911), who named the genus *Cavernulina*; Sydney John Hickson (1883–1940);

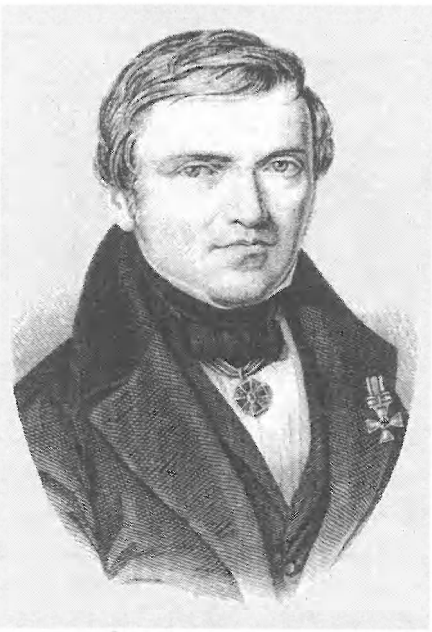
PLATE 3



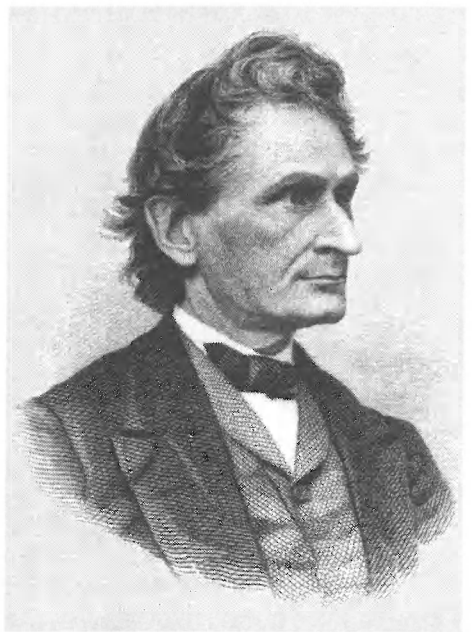
Baron Georges Cuvier (1769-1832). Courtesy GS Myers/AE Leviton Portrait File in Natural History, California Academy of Sciences.



Jean Baptiste Pierre Antoine de Monet de Lamarck (1744-1829). Courtesy GS Myers/AE Leviton Portrait File in Natural History, California Academy of Sciences.



Christian Gottfried Ehrenberg (1795-1876). Courtesy of the Linnean Society of London.



James Dwight Dana (1813-1895). Courtesy Smithsonian Institution Archives.



PLATE 4



Henri Milne Edwards (1800-1885).  
Courtesy Nationaal Natuurhistorisch Museum, Leiden.



Jan Adrianus Herklots (1820-1872).  
Courtesy Nationaal Natuurhistorisch Museum, Leiden.

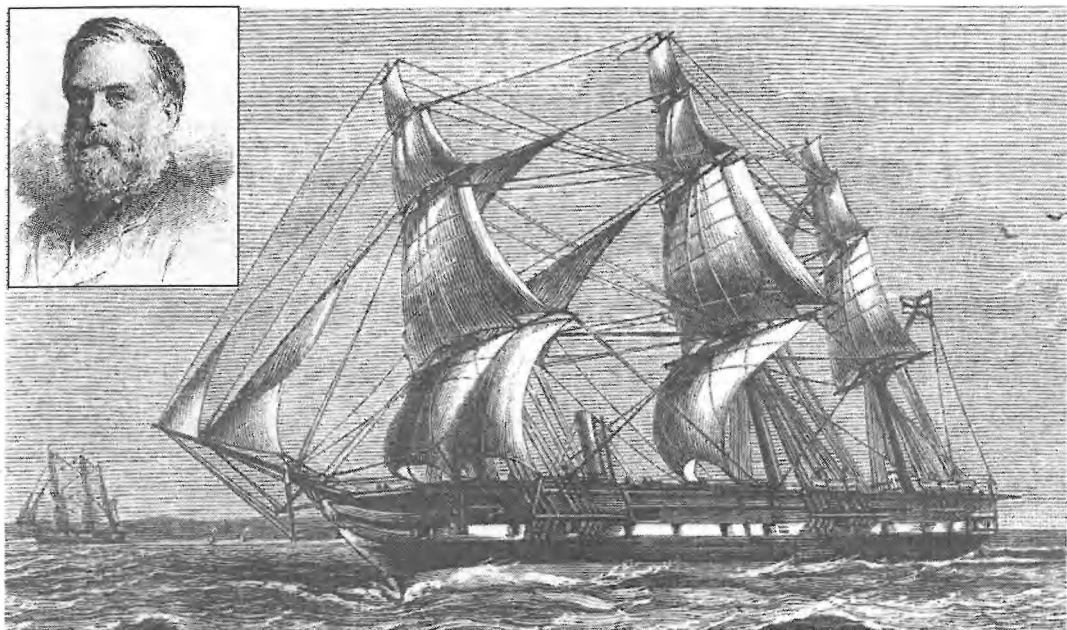


Pieter Bleeker (1819-1878). Courtesy  
Nationaal Natuurhistorisch Museum, Leiden.

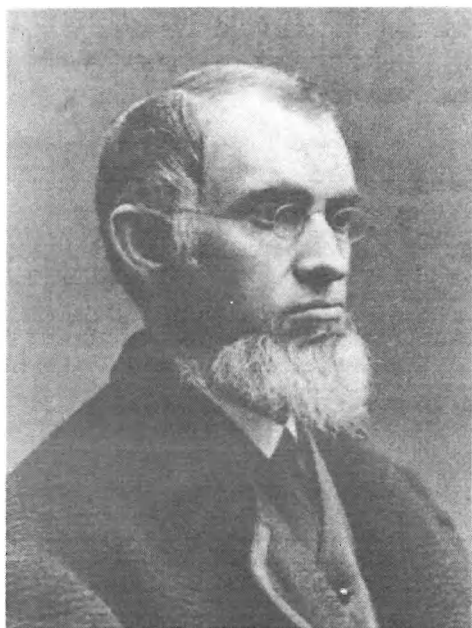


William Gabb (1839-1878). Courtesy Department of  
Invertebrate Zoology and Geology, California  
Academy of Sciences.

## PLATE 5



HMS Challenger (1872–1876), Sir Charles Wyville Thomson, Chief scientist (inset).  
After "Voyage of the Challenger," Narrative, Vol. 1 (1885) and "The Atlantic," Vol. 1 (1877) respectively.



Robert Edwards Carter Stearns (1827-1909). Courtesy Bancroft Library, University of California, Berkeley.



Ambrosius Arnold Willem Hubrecht (1853-1915).  
Courtesy Nationaal Natuurhistorisch Museum, Leiden.

Elisabeth Deichmann (1936, 1941) (Pl. 6); and J. Arthur Thomson (1905–1931). The latter published in collaboration with several co-authors including George Crane, Doris L. Mackinnon, Nita I. Rennet, W. D. Henderson, James Ritchie, and James J. Simpson. F. M. Bayer (pers. comm.) stated, “Deichmann . . . is the 20th Century link with the 19th Century in octocoral systematics. Her Blake report (1936) is pivotal for the western Atlantic.”

It was during this period that the proposal was introduced by Libbie Henrietta Hyman (1940:365) to abandon the name “Coelenterata” of Rudolph Leuckart in favor of “Cnidaria,” introduced by Berthold Hatschek. This argument has apparently convinced many zoologists to substitute a name long in use with a more recently created one. Hyman stated, “Leuckart (1847) clearly grasped the fundamental differences between the two great radiate groups, the coelenterates and the echinoderms, and separated them, creating the name Coelenterata. Leuckart’s Coelenterata, however, included the sponges and the ctenophores . . . . The proper splitting of Leuckart’s Coelenterata was achieved by Hatschek (1888), who recognized three phyla: Spongiaria, Cnidaria, and Ctenophora. We therefore consider Cnidaria to be the most suitable name for the phylum . . . .”

The acceptance of this line of reasoning is both unnecessary and inconsistent. As an example, Ernst Haeckel’s “Scyphozoa” originally included both the Scyphozoa and the Anthozoa, yet the name Scyphozoa is still retained by most zoologists. This is just one example of a major animal group in which the name has long usage and is still recognized today, even though it originally encompassed more taxa than are now accepted.

#### The Late Twentieth Century (1950–1999)

Previous to this period, publications on the Pennatulacea dealt predominantly with descriptive taxonomy or general natural history (particularly bioluminescence). This most recent period has produced a flourishing of works in fields of study other than taxonomy—including behavior, ecology, morphology, physiology, cell biology, natural products biochemistry, and evolutionary biology. Important contributions in systematics during this period include Frederick M. Bayer (1955–1996) (Pl. 6); Huzio Utinomi, also known as Fujio Hiro (1956–1982) (Pl. 6); Manfred Grasshoff (1972–1991); F. M. Bayer, M. Grasshoff, and Jakob Verseveldt (1983); F. M. Bayer and M. Grasshoff (1997); Marie-José d’Hondt (1984); Andrée Tixier-Durivault (1954–1987), who named the genera *Crassophyllum* and *Malacobelemnion*; and Gary C. Williams (1986–1999). The latter author introduced cladistic methodology to the study of evolutionary relationships in the Pennatulacea.

#### SYNONYMS AND MISSPELLED GENERIC NAMES OF PENNATULACEA

Revised from Williams, 1995a:101; synonyms are listed on the left with the valid genera to which they belong shown in parentheses; \* = misspelled names or transcription errors; \*\* = see Bayer and Grasshoff, 1997.

\**Acanthoptilon* Traquair in Zoological Record 7, 1870 (*Acanthoptilum*)

*Actinoptilon* Kükenthal, 1910 (*Actinoptilum*)

\**Actinoptinum* Day et al., 1970 (*Actinoptilum*)

*Amphianthus* Kükenthal, 1902 (*Amphiacme*)

*Argentella* Gray, 1870 (*Pteroeides*)

*Balticina* Gray, 1870 (*Halipteris*)

*Bathypenna* Marion, 1906 (possibly synonymous with *Gyrophyllum* according to Kükenthal, 1915)

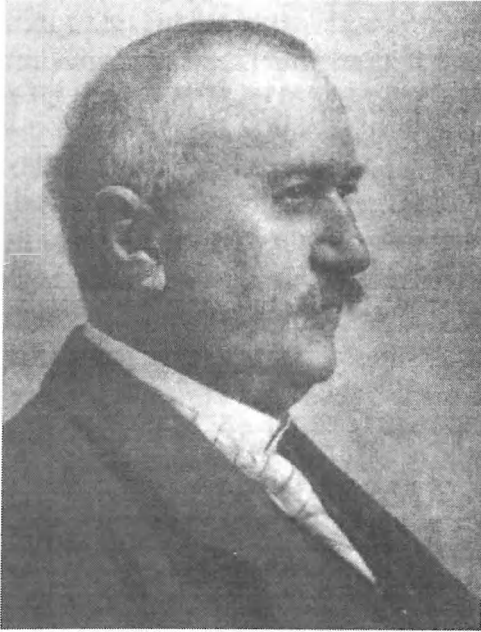
*Bathyptilum* Kölliker, 1872 (*Kophobelemnion*)

*Benthoptilum* Verrill, 1885 (*Anthoptilum*)

\**Benthoptillum* Haddon in Zoological Record 22, 1885 (*Anthoptilum*)

*Cladiscus* Koren and Danielssen, 1877 (*Virgularia*)

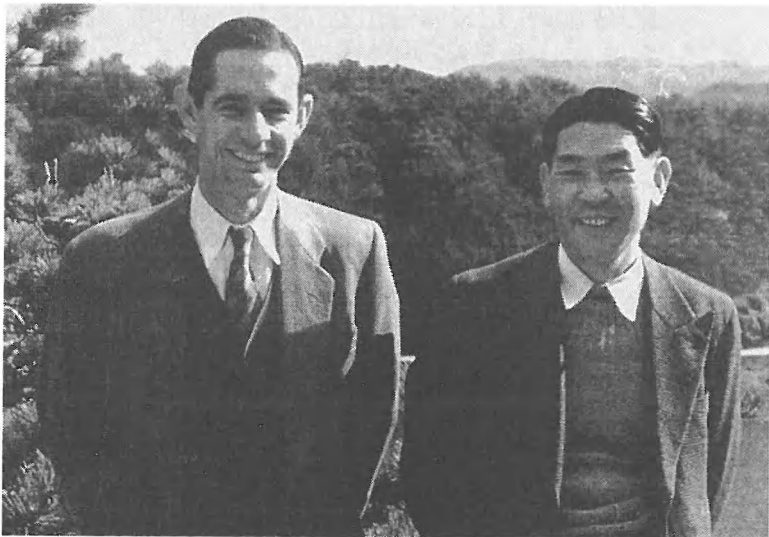
## PLATE 6



Willy Kükenthal (1861-1922). Courtesy  
Nationaal Natuurhistorisch Museum, Leiden.



Elizabeth Deichmann (1896-1975). Courtesy  
Frederick M. Bayer, Smithsonian Institution.



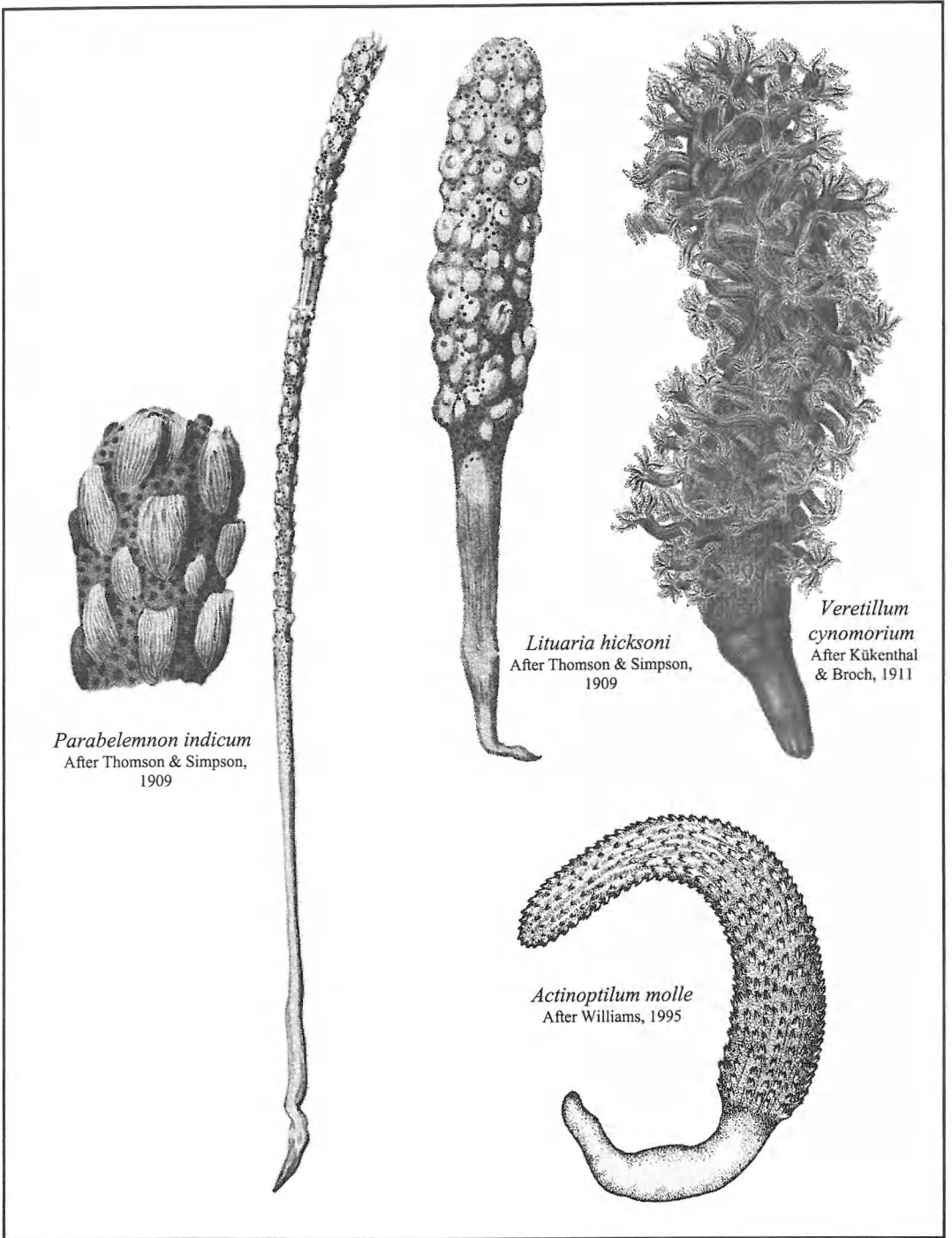
Frederick M. Bayer

Huzio Utinomi

Courtesy Frederick M. Bayer, Smithsonian Institution.

- Clavella* Gray, 1870 (*Lituaria*)  
*Crinillum* Harting, Miquel and Hoeven, 1861 (*Umbellula*)  
*Crispella* Gray, 1870 (*Pteroeides*)  
*Deutocaulon* Marshall and Fowler, 1888 (*Virgularia*)  
*Dübenia* Danielssen and Koren, 1884 (*Stylatula*)  
*Encrinus* Lamarck, 1801 (*Umbellula*)  
*Fusticularia* Simpson, 1905 (probably synonymous with *Cavernularia* according to Kükenthal, 1915)  
 \**Godefroyia* Leuckart, 1872 (*Pteroeides*)  
*Godeffroyia* Kölliker, 1870 (*Pteroeides*)  
*Göndul* Koren and Danielssen, 1883 (*Halipteris*)  
*Gunneria* Danielssen and Koren, 1884 (*Kophobelemnon*)  
*Halisceptrum* Herklots, 1863 (*Virgularia*)  
*Helicoptilum* Nutting, 1912 (*Distichoptilum*)  
*Herklotsia* Gray, 1860 (*Renilla*)  
*Juncoptilum* Thomson and Henderson, 1905 (*Distichoptilum*)  
 \**Leioptilum* Verrill, 1865 (*Ptilosarcus*)  
 \**Leioptillum* Verrill, 1868 (*Ptilosarcus*)  
*Leioptilus* Gray, 1860 (*Pennatula*)  
*Leioptilus* of authors other than Gray, 1860 (*Ptilosarcus*)  
*Leptoptilum* Kölliker, 1880 (*Funiculina*)  
 \**Lioptilum* Kölliker, 1872 (*Ptilosarcus*)  
*Lygomorpha* Koren and Danielssen, 1877 (*Halipteris*)  
*Lygus* Herklots, 1858 (*Virgularia*)  
*Mesobelemnon* Gravier, 1907 (considered synonymous with *Sclerobelemnon* by Hickson, 1916)  
*Microptilum* Kölliker, 1880 (*Halipteris*)  
*Norticina* Gray, 1870 (*Halipteris*)  
*Ombellulaires* Cuvier, 1817 (*Umbellula*)  
 \*\**Ombellula* Cuvier, 1797 (*Umbellula*)  
*Ombellularia* Lamarck, 1836 (*Umbellula*)  
*Osteocella* Gray, 1870 (*Halipteris*)  
*Parabelemnon* Thomson and Simpson, 1909 (possibly synonymous with *Cavernularia* according to Kükenthal, 1915) (Pl. 7)  
*Pavonaires* Cuvier, 1817 (*Funiculina*)  
*Pavonaria* Schweigger, 1820 (*Funiculina*)  
*Pavonaria* Kölliker, 1869 (*Halipteris*)  
*Penna* Bohadsch, 1761 (*Pennatula*, in part) (name unavailable as the work was suppressed by ICZN)  
*Phosphorella* Gray, 1870 (*Pennatula*)  
*Policella* Gray, 1870 (*Veretillum*)  
*Prochunella* Balss, 1909 (*Calibelemnon*)  
*Protocaulon* Kölliker, 1880 (*Virgularia*)  
 \**Pteroides* Pfeffer, 1886 (*Pteroeides*)  
*Pteromorpha* Herklots, 1858 (*Pteroeides*)  
*Ptilella* Gray, 1870 (*Pennatula*)  
 \**Renilla* Schweigger, 1820 (*Renilla*)  
*Renillina* Gray, 1860 (possibly a young example of the alcyoniid soft coral *Sarcophyton* according to Kükenthal, 1915)  
*Sarcobelemnon* Herklots, 1858 (*Cavernularia*)

PLATE 7



*Parabelemnites indicum*  
After Thomson & Simpson,  
1909

*Lituaria hicksoni*  
After Thomson & Simpson,  
1909

*Veretillum  
cynomorium*  
After Kükenthal  
& Broch, 1911

*Actinoptilum molle*  
After Williams, 1995

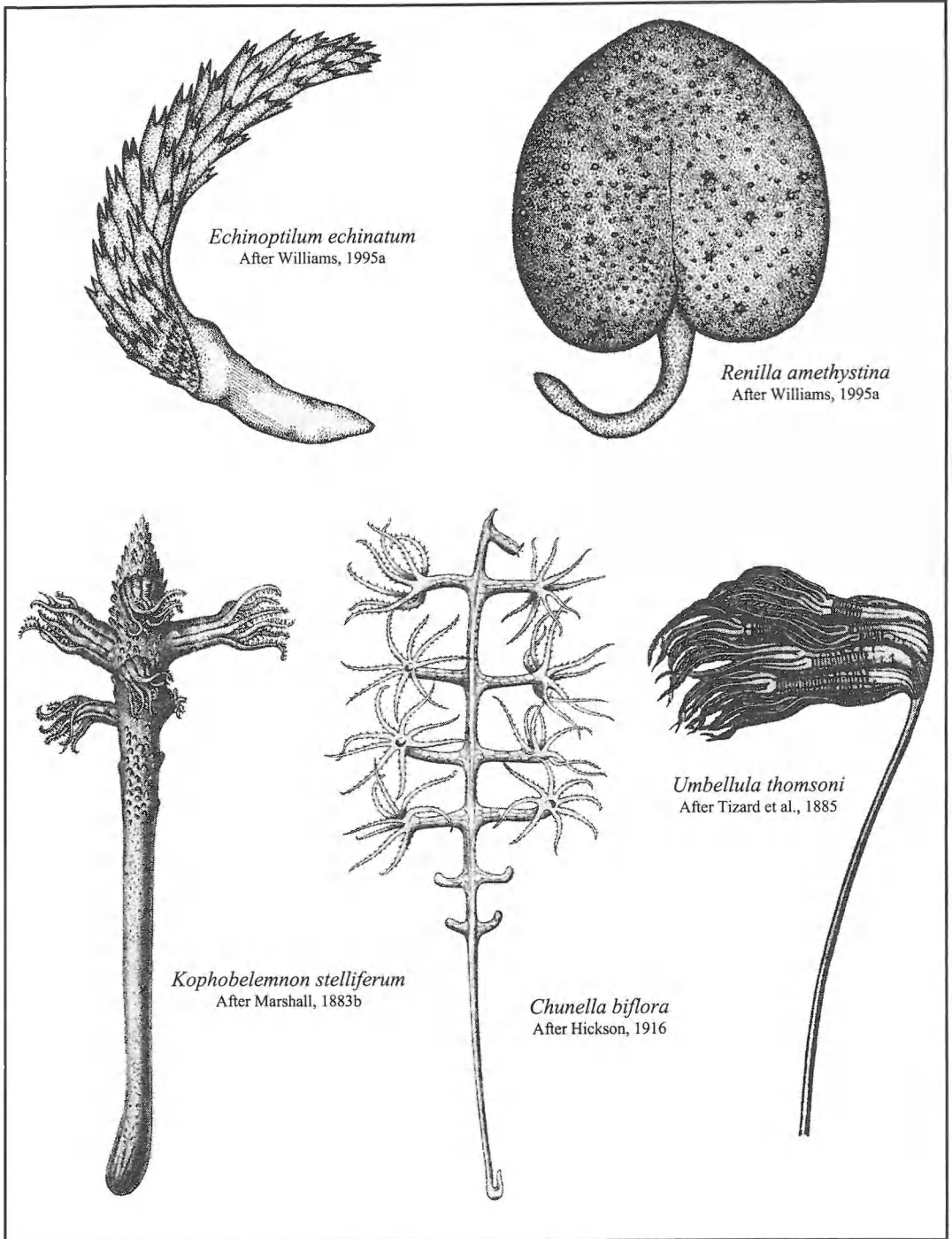
- Sarcophyllum* K lliker, 1870 (*Sarcoptilus*)  
*Sceptonidium* Richiardi, 1869 (*Virgularia*)  
*Stephanoptilum* Roule, 1905 (*Anthoptilum*)  
*Stichoptilum* Grieg, 1887 (*Halipterus*)  
*Struthiopteron* Broch, 1910 (*Pteroeides*)  
*Stylobelemnnon* K lliker, 1872 (*Cavernularia*)  
*Stylobelemnoides* J. A. Thomson and Henderson, 1905 (possibly synonymous with *Cavernularia* according to K kenthal, 1915)  
*Svava* Danielssen and Koren, 1884 (*Virgularia*)  
*Svavopsis* Roule, 1908 (*Virgularia*)  
*Thesioides* J. A. Thomson and Henderson, 1906 (*Anthoptilum*)  
*Trichoptilum* K lliker, 1880 (*Funiculina*)  
*Umbellaria* Schweigger, 1820 (*Umbellula*)  
*Umbellularia* Lamarck, 1801 (*Umbellula*)  
 \**Verrilia* L tken in Zoological Record 10, 1873 (*Halipterus*)  
*Verrillia* Stearns, 1873 (*Halipterus*)  
*Vorticella* Linnaeus, 1767 (*Umbellula*, in part)

## TAXONOMIC INDEX

Original descriptions and other selected taxonomic references—restricted primarily to taxa considered valid by Williams (1995a, 1997f, and the present work); † = fossil taxa; ‡ = taxa with both living and fossil representation.

- Acanthoptilum* K lliker, 1870  
 [See also Balss (1910); Bayer (1957); K kenthal (1915); Williams (1995a)]  
*Acanthoptilum album* Nutting, 1909  
*Acanthoptilum agassizi* K lliker, 1872  
*Acanthoptilum annulatum* Nutting, 1909  
*Acanthoptilum gracile* (Gabb, 1863)  
*Acanthoptilum oligacis* Bayer, 1957  
*Acanthoptilum pourtalesii* K lliker, 1870  
*Acanthoptilum scalpelifolium* Moroff, 1902  
*Actinoptilum* K kenthal in K kenthal and Broch, 1911  
 [See also K kenthal (1910, 1915); Williams (1990, 1995a)]  
*Actinoptilum molle* (K kenthal, 1910) (Pl. 7)  
*Amphiacme* K kenthal, 1903  
 [See also Hickson (1916); K kenthal (1902a, 1915); K kenthal and Broch (1911); Williams (1990, 1995a)]  
*Amphiacme abyssorum* (K kenthal, 1902)  
*Anthoptilum* K lliker, 1880 (Pl. 9, 10)  
 [See also Grasshoff (1982a, 1982b); Hickson (1916); K kenthal (1915); K kenthal and Broch (1911); Williams (1990, 1995a)]  
*Anthoptilum grandiflorum* (Verrill, 1879) (Pl. 9)  
*Anthoptilum murrayi* K lliker, 1880  
 †*Bensonularia* Hamilton, 1958  
 †*Bensonularia spatulata* Hamilton, 1958 [Eocene of New Zealand]  
*Calibelemnon* Nutting, 1908  
 [See also Balss (1910); Hickson (1916); K kenthal (1915); Williams (1990, 1995a)]

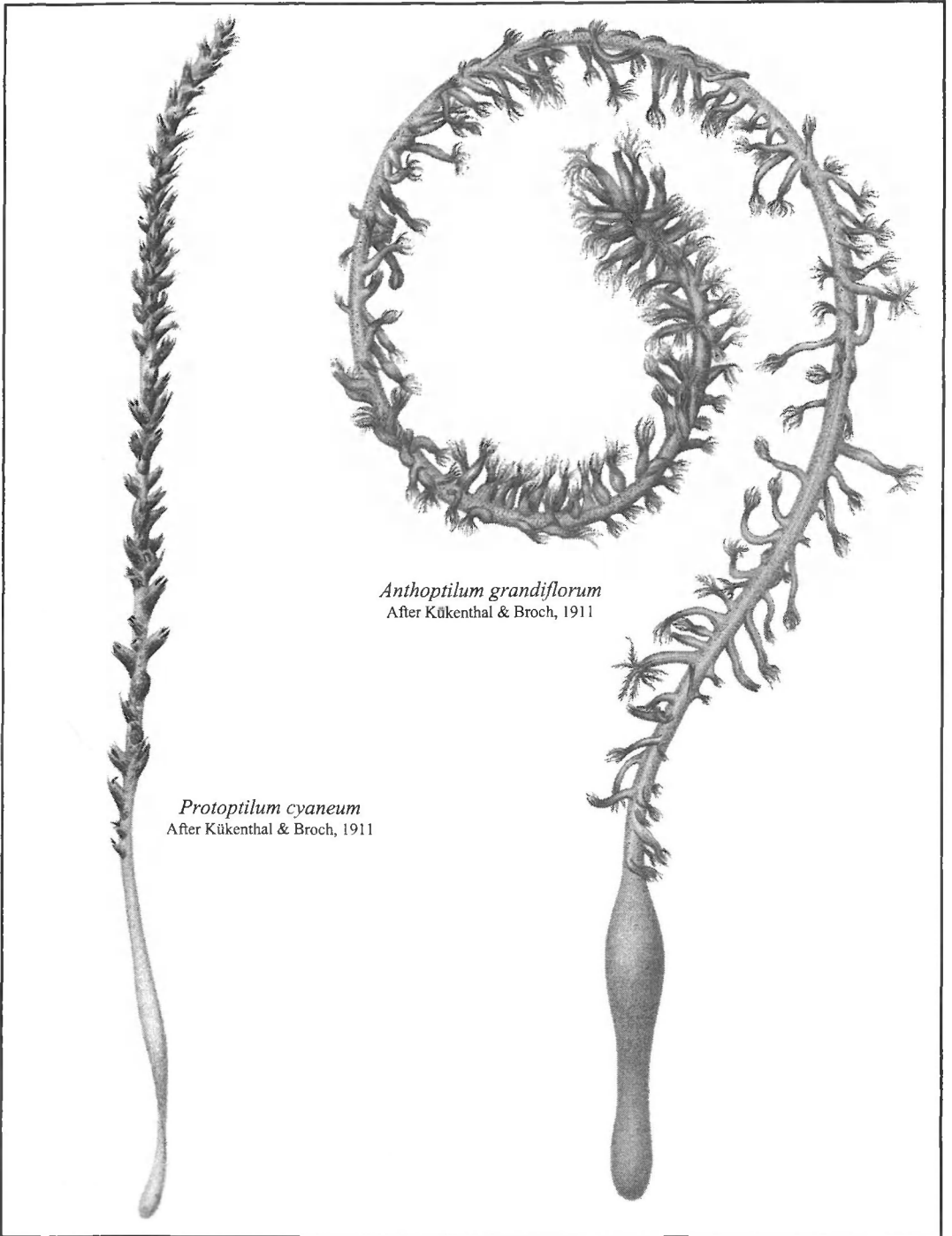
## PLATE 8





- Calibelemnon hertwigi* (Balss, 1909)  
*Calibelemnon indicum* (Thomson and Henderson, 1906)  
*Calibelemnon symmetricum* Nutting, 1908  
*Cavernularia Valenciennes* in Milne Edwards and Haime, 1850  
 [See also Hickson (1916); Hondt (1984b); Kükenthal (1915); Lopez-Gonzalez, Gili, and Williams (in press); Williams (1989b, 1990, 1995a)]  
*Cavernularia capitata* Williams, 1989  
*Cavernularia clavata* Kükenthal and Broch, 1911  
*Cavernularia chuni* Kükenthal and Broch, 1911  
*Cavernularia dayi* Tixier-Durivault, 1954  
*Cavernularia dedeckeri* Williams, 1989  
*Cavernularia elegans* (Herklots, 1858)  
*Cavernularia glans* Kölliker, 1872  
*Cavernularia habereri* Kölliker, 1872  
*Cavernularia luetkeni* Kölliker, 1872 (also spelled *C. lütkeni* and *C. lutkeni*)  
*Cavernularia malabarica* Fowler, 1894  
*Cavernularia mirifica* Tixier-Durivault, 1963  
*Cavernularia obesa* Valenciennes in Milne Edwards and Haime, 1850  
*Cavernularia pusilla* (Philippi, 1835)  
*Cavernulina* Kükenthal and Broch, 1911  
 [See also Hickson (1916); Hondt (1984b); Kükenthal (1915); Williams (1989b, 1990, 1995a)]  
*Cavernulina cylindrica* Kükenthal and Broch, 1911  
*Cavernulina darwini* (Hickson, 1921)  
*Cavernulina grandiflora* Hondt, 1984b  
*Cavernulina orientalis* Thomson and Henderson, 1909  
*Chunella* Kükenthal, 1902 (Pl. 8)  
 [See also Kükenthal (1915); Kükenthal and Broch (1911); Hickson (1916); Williams (1990, 1995a, 1997c)]  
*Chunella gracillima* Kükenthal, 1902  
*Crassophyllum* Tixier-Durivault, 1961  
 [See also Williams (1995a, 1995d)]  
*Crassophyllum cristatum* Tixier-Durivault, 1961  
*Crassophyllum thessalonicae* Vafidis and Koukouras, 1991  
*Distichoptilum* Verrill, 1882  
 [See also Hickson (1916); Kükenthal (1915); Kükenthal and Broch (1911); Williams (1990, 1995a)]  
*Distichoptilum gracile* Verrill, 1882  
*Echinoptilum* Hubrecht, 1885  
 [See also Balss (1910); Hickson (1916); Kükenthal (1915); Kükenthal and Broch (1911); Sachs (1913); Williams (1990, 1995a)]  
*Echinoptilum asperum* Hickson, 1916  
*Echinoptilum echinatum* (Kükenthal, 1910) (Pl. 8)  
*Echinoptilum elongatum* Hickson, 1916  
*Echinoptilum macintoshi* Hubrecht, 1885  
*Echinoptilum minimum* Hickson, 1916  
*Echinoptilum roseum* Hickson, 1916  
*Funiculina* Lamarck, 1816  
 [See also Balss (1910); Herklots (1858); Hickson (1916); Jungersen (1904); Kölliker (1872); Kükenthal (1915); Kükenthal and Broch (1911); Williams (1990, 1995a)]

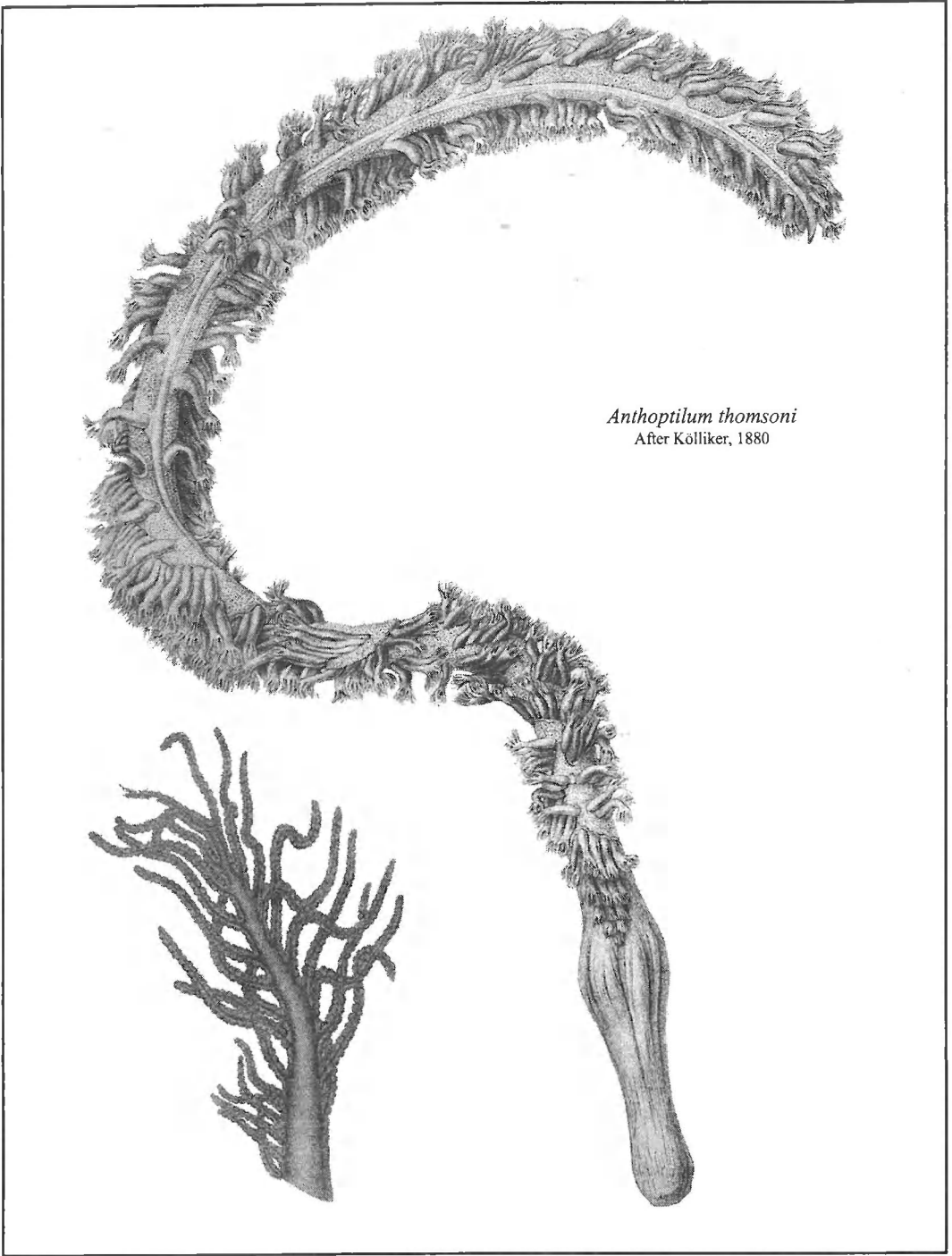
PLATE 9



*Anihoptilum grandiflorum*  
After Kükenthal & Broch, 1911

*Protophilum cyaneum*  
After Kükenthal & Broch, 1911

PLATE 10



*Anthoptilum thomsoni*  
After Kolliker, 1880

- Funiculina armata* Verrill, 1879  
*Funiculina parkeri* Kükenthal, 1909  
*Funiculina quadrangularis* (Pallas, 1766)  
†*Graphularia* Milne Edwards and Haime, 1850  
†*Graphularia ambigua* (Morton, 1830) [Cretaceous/Tertiary of southeastern North America]  
[See also Shapiro and Ramsdell (1965)]  
†*Graphularia badenia* Strand, 1928  
†*Graphularia belgica* Vincent (1893) [Eocene of Belgium]  
†*Graphularia crecelii* Andrée, 1912 [Oligocene of Germany]  
†*Graphularia desertorum* Kuhn, 1949  
†*Graphularia groenwalli* Nielsen, 1914 [Cretaceous of Denmark]  
†*Graphularia incerta* Malaroda, 1951 [Oligocene of Italy]  
†*Graphularia irregularis* Nielsen, 1914 [Cretaceous of Denmark]  
†*Graphularia kalimnae* Chapman and Crespin, 1928 [Tertiary of Australia]  
†*Graphularia longissima* Squires, 1958 [Cretaceous/Tertiary of New Zealand]  
†*Graphularia meijeri* Voight, 1958  
†*Graphularia nigra* Malaroda, 1951 [Oligocene of Italy]  
†*Graphularia quadrata* Voigt, 1958  
†*Graphularia salisburgensis* Traub, 1938 [Paleocene of Austria]  
†*Graphularia* sp. [Eocene of Hungary]  
†*Graphularia sulcata* Nielsen, 1914 [Cretaceous of Denmark]  
[See also Kolosvary (1949)]  
†*Graphularia wetherelli* Milne-Edwards and Haime, 1850 [Eocene of England]  
[See also Davis (1936)]  
†*Graphularia? yamakawai* Yabe and Sugiyama, 1937 [Pleistocene of Japan]  
*Gyrophyllum* Studer, 1891  
[See also Hickson (1916); Kükenthal (1915); Roule (1905); Studer (1901); Williams (1995a, 1995d)]  
*Gyrophyllum hironellei* Studer, 1891  
*Gyrophyllum sibogae* Hickson, 1916 (Pl. 14)  
*Halipterus* Kölliker, 1869  
[See also Williams (1990, 1995a)]  
*Halipterus africana* (Studer, 1879)  
*Halipterus californica* (Moroff, 1902)  
*Halipterus christii* (Koren and Danielssen, 1847)  
*Halipterus finmarchica* (Sars, 1851)  
*Halipterus heptazooidea* Acuña and Zamponi, 1992  
*Halipterus willemoesi* Kölliker, 1870  
*Kophobelemnon* Asbjørnsen, 1856  
[See also Balss (1910); Danielssen and Koren (1884); Herklots (1858); Hickson (1916); Jungersen (1904); Kölliker (1872); Kükenthal (1915); Kükenthal and Broch (1911); Thomson and Simpson (1909); Williams (1990, 1995a)]  
*Kophobelemnon affine* Studer, 1894  
*Kophobelemnon heterospinosum* Kükenthal, 1910  
*Kophobelemnon hispidum* Nutting, 1912  
*Kophobelemnon irregulatus* Keller, Pasternak and Naumov, 1975  
*Kophobelemnon leucharti* Cecchini, 1917  
*Kophobelemnon macrospinosum* J. A. Thomson, 1927  
*Kophobelemnon molanderi* Pasternak, 1975

- Kophobelemnon pauciflorum* Hickson, 1916  
*Kophobelemnon stelliferum* (Müller, 1776) (Pl. 8)  
*Lituaria Valenciennes* in Milne Edwards and Haime, 1850  
 [See also Balss (1910); Gray (1870); Hickson (1916); Hondt (1984b); Light (1921); Kölliker (1872); Küenthal (1915); Thomson and Simpson (1909); Williams (1990, 1995a)]  
*Lituaria amoyensis* Koo, 1935  
*Lituaria australasiae* (Gray, 1860)  
*Lituaria breve* Light, 1921  
*Lituaria habereri* Balss, 1910  
*Lituaria hicksoni* Thomson and Simpson, 1909 (Pl. 7)  
*Lituaria kuekenthali* Light, 1921  
*Lituaria molle* Light, 1921  
*Lituaria phalloides* (Pallas, 1766)  
*Lituaria philippinesis* Light, 1921  
*Lituaria valenciennesi* Hondt, 1984  
*Malacobelemnon* Tixier-Durivault, 1965  
 [See also Williams (1995a)]  
*Malacobelemnon stephensoni* Tixier-Durivault, 1965  
 †*Octobasis* Malecki, 1982 [Upper Cretaceous of Poland]  
 †*Pavonaria portisi* Angelis, 1895? [Tertiary of Italy]  
 †*Pavonaria? singularis* Malaroda, 1951 [Oligocene of Italy]  
*Pennatula* Linnaeus, 1758 (Pl. 12, 13)  
 [See also Balss (1910); Gray (1870); Herklots (1858); Kölliker (1869); Lamarck (1816); Leuckart (1872); Hickson (1916); Küenthal (1915); Küenthal and Broch (1911); Williams (1990, 1995a, 1995d)]  
*Pennatula aculeata* Danielssen, 1860  
*Pennatula argentina* Acuña and Zamponi, 1992  
*Pennatula delicata* Tixier-Durivault, 1966  
*Pennatula fimbriata* Herklots, 1858  
*Pennatula grandis* Ehrenberg, 1834  
*Pennatula indica* Thomson and Henderson, 1906  
*Pennatula inflata* Küenthal, 1910 (Pl. 13)  
*Pennatula mollis* Alder, 1867 (considered a junior synonym of *Pennatula phosphorea* by Cornelius and Garfath, 1980, after examination of the two well-preserved syntypes)  
*Pennatula phosphorea* Linnaeus, 1758 (Pl. 13)  
*Pennatula prolifera* Jungersen, 1904  
*Pennatula rubra* (Ellis, 1764)  
 †*Pennatulites* Nelli, 1903  
 †*Pennatulites manzonii* Nelli, 1903 [Miocene of Italy]  
 †*Prographularia* Frech, 1890  
 †*Prographularia tradica* Frech, 1890 [Triassic]  
*Protoptilum* Kölliker, 1872  
 [See also Balss (1910); Hickson (1916); Jungersen (1904); Kölliker (1880); Küenthal (1915); Küenthal and Broch (1911); Williams (1995a)]  
*Protoptilum carpenteri* Kölliker, 1872  
*Protoptilum celebense* Hickson, 1916  
*Protoptilum cyaneum* Küenthal, 1910 (Pl. 9)  
*Protoptilum denticulatum* Jungersen, 1904  
*Protoptilum smitti* Kölliker, 1872

*Protoptilum thomsoni* Kölliker, 1872

*Pteroeides* Herklots, 1858 (Pl. 14)

[See also Gray (1870); Hickson (1916); Hondt (1984a); Kölliker (1872); Kükenthal (1915); Kükenthal and Broch (1911); Leuckart (1872); Williams (1990, 1995a, 1995d)]

*Pteroeides acutum* Tixier-Durivault, 1966

‡ *Pteroeides argenteum* (Ellis and Solander, 1786) [Tertiary of Kei Islands]

[See also Bayer (1955a)]

*Pteroeides bankanense* Bleeker, 1859

*Pteroeides bestae* Hondt, 1984

*Pteroeides breviradiatum* Kölliker, 1869

*Pteroeides caledonicum* Kölliker, 1869

*Pteroeides carnosum* Tixier-Durivault, 1972

*Pteroeides crossieri* Tixier-Durivault, 1966

*Pteroeides densum* Tixier-Durivault, 1966

*Pteroeides duebeni* Kölliker, 1869

*Pteroeides dofleini* Balss, 1909

*Pteroeides durum* Kölliker, 1872

*Pteroeides esperi* Herklots, 1858

*Pteroeides flexuosum* Tixier-Durivault, 1966

*Pteroeides humesi* Tixier-Durivault, 1966

*Pteroeides hymenocaulon* Bleeker, 1859

*Pteroeides isosceles* J. S. Thomson, 1915

*Pteroeides jungersenii* Broch, 1910

*Pteroeides laboutei* Hondt, 1984

*Pteroeides latissimum* Kölliker, 1869

*Pteroeides lusitanicum* Broch, 1910

*Pteroeides malayense* Hickson, 1916

*Pteroeides morbusus* Tixier-Durivault, 1961

*Pteroeides oblongum* Gray, 1860

*Pteroeides sagamiense* Moroff, 1902

*Pteroeides sparmanni* Kölliker, 1869

*Pteroeides spicatum* Tixier-Durivault, 1972

*Pteroeides spinosum* (Ellis, 1764)

*Pteroeides tenerum* Kölliker, 1869

*Pteroeides timorensis* Hickson, 1916

*Pteroeides triangulum* Tixier-Durivault, 1972

*Ptilosarcus* Verrill, 1865

[See also Leuckart (1872); Nutting (1909); Verrill (1865); Williams 1995a, 1995d)]

*Ptilosarcus gurneyi* (Gray, 1860)

*Ptilosarcus undulatus* (Verrill, 1865)

*Renilla* Lamarck, 1816 (Pl. 8)

[See also Ehrenberg (1834); Eisen (1876); Gray (1860); Herklots (1858); Kölliker (1871b); Kükenthal (1915); Kükenthal and Broch (1911); Müller (1864); Williams (1995a); Zamponi and Pérez (1996); Zamponi, Pérez, and Capitoli (1997)]

*Renilla koellikeri* (also spelled *R. kollikeri* or *R. köllikeri*) Pfeffer, 1886

*Renilla muelleri* (also spelled *R. mulleri* or *R. mülleri*) Kölliker, 1872

*Renilla musaica* Zamponi and Pérez, 1995

*Renilla octodentata* Zamponi and Pérez, 1995

*Renilla reniformis* (Pallas, 1766)

- Renilla tentaculata* Zamponi, Pérez, and Capitoli, 1997
- Sarcoptilus* Gray, 1848  
[See also Williams (1995a, 1995c, 1995d)]
- Sarcoptilus bollonsi* (Benham, 1906)
- Sarcoptilus grandis* Gray, 1848
- Sarcoptilus nullispiculatus* Williams, 1995
- Sarcoptilus rigidus* Williams, 1995
- Sarcoptilus shaneparkerii* Williams, 1995
- Sclerobelemnon* Kölliker, 1872  
[See also Balss (1910); Hickson (1916); Kölliker (1872); Kükenthal (1915); Kükenthal and Broch (1911); Thomson and Henderson (1906b); Williams (1995a, 1995d)]
- Sclerobelemnon burgeri* (Herklots, 1858)
- Sclerobelemnon elongatum* Hickson, 1916
- Sclerobelemnon gracile* (Gravier, 1908)
- Sclerobelemnon gravieri* Hickson, 1916
- Sclerobelemnon koellikeri* Thomson and Henderson, 1906
- Sclerobelemnon magniflorum* Hickson, 1916
- Sclerobelemnon schmeltzi* Kölliker, 1872
- Sclerobelemnon theseus* Bayer, 1959
- Scleroptilum* Kölliker, 1880  
[See also Balss (1910); Kükenthal (1915); Kükenthal and Broch (1911); Williams (1990, 1995a)]
- Scleroptilum grandiflorum* Kölliker, 1880
- Scytaliopsis* Gravier, 1906  
[See also Gravier (1908); Kükenthal (1915); Williams (1990, 1995a)]
- Scytaliopsis djiboutiensis* Gravier, 1906
- Scytaliopsis ghardagensis* (?Gravenhorst, 1821) (also spelled *S. ghardaqana*; a probable *nomen nudem* since it is unclear whether this citation represents an original description of a new taxon, or merely the use of an unsubstantiated name)  
[See also Atiya (1994); Schuhmacher and Hinterkircher (1996)]
- Scytalium* Herklots, 1858  
[See also Balss (1910); Hickson (1916); Kölliker, 1870; Kükenthal (1915); Kükenthal and Broch (1911); Thomson and Simpson (1909); Williams (1995a)]
- Scytalium balssi* Hickson, 1916
- Scytalium martensi* Kölliker, 1870
- Scytalium sarsii* Herklots, 1858
- Scytalium tentaculatum* Kölliker, 1880 (Pl. 11)
- Stachyptilum* Kölliker, 1880  
[See also Kükenthal (1915); Kükenthal and Broch (1911); Williams (1995a)]
- Stachyptilum dofleini* Balss, 1909
- Stachyptilum macleari* Kölliker, 1880
- Stachyptilum superbum* Studer, 1894
- Stylatula* Verrill, 1864  
[See also Balss (1910); Jungersen (1904); Kölliker (1870); Kükenthal (1915); Kükenthal and Broch (1911); Williams (1995a)]
- Stylatula antillarum* Kölliker, 1870
- Stylatula brasiliensis* (Gray, 1870)
- Stylatula darwini* Kölliker, 1870
- Stylatula diadema* Bayer, 1959
- Stylatula elegans* (Danielssen, 1860)

## PLATE 11

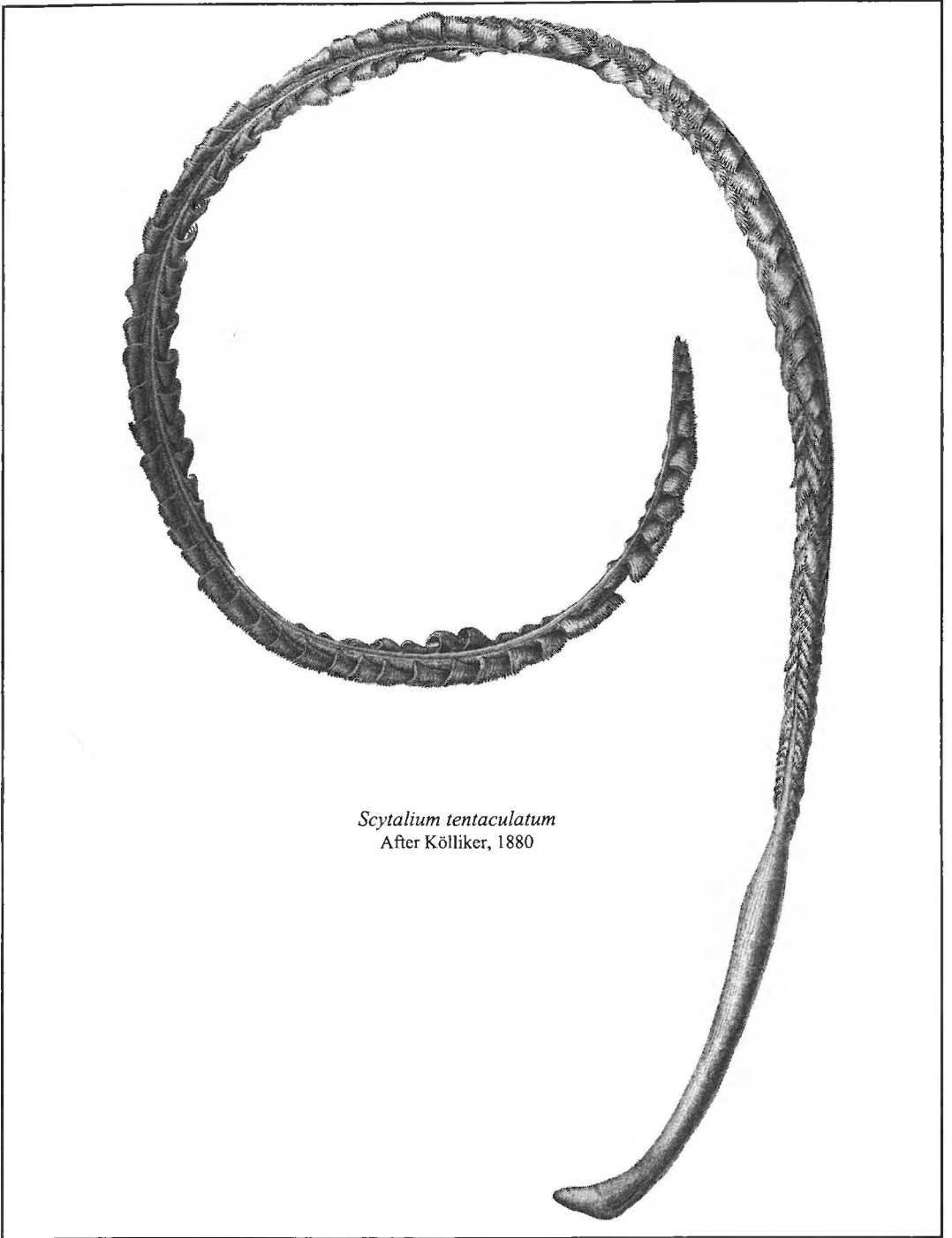
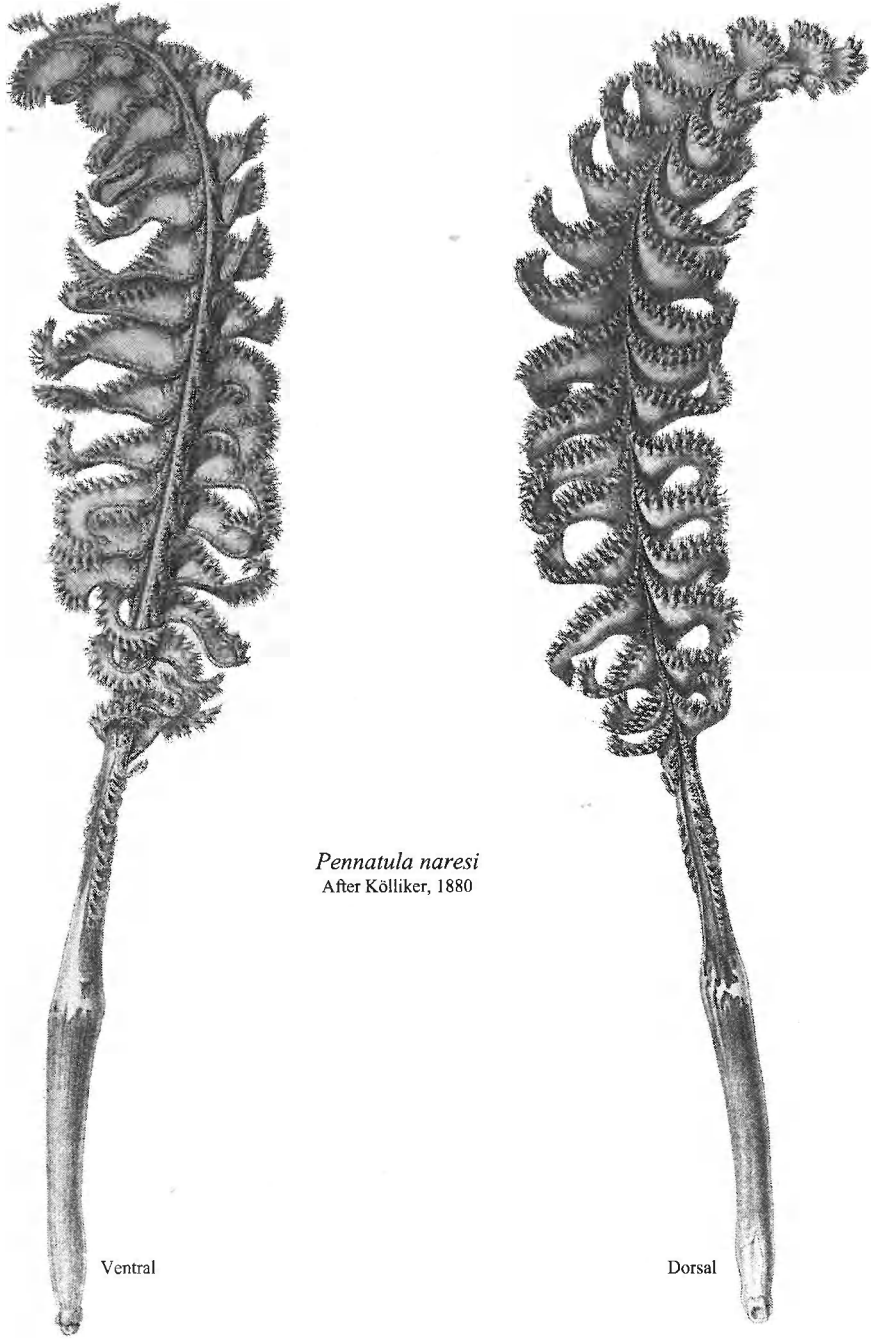




PLATE 12



*Pennatula naresi*  
After Kölliker, 1880

Ventral

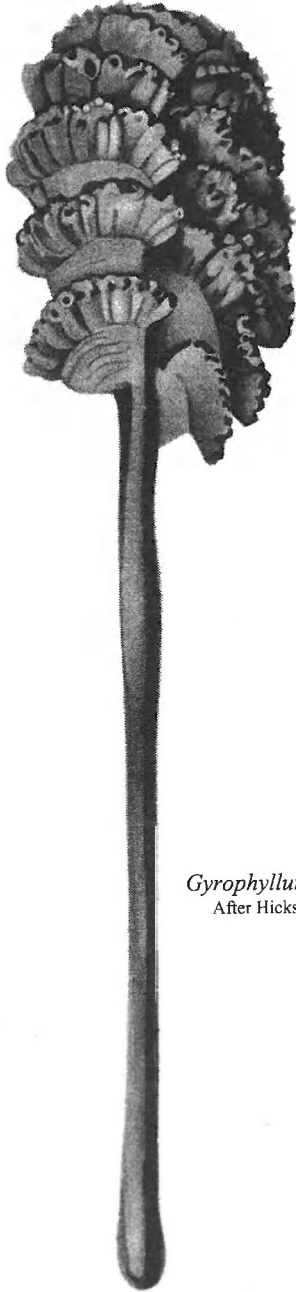
Dorsal

## PLATE 13

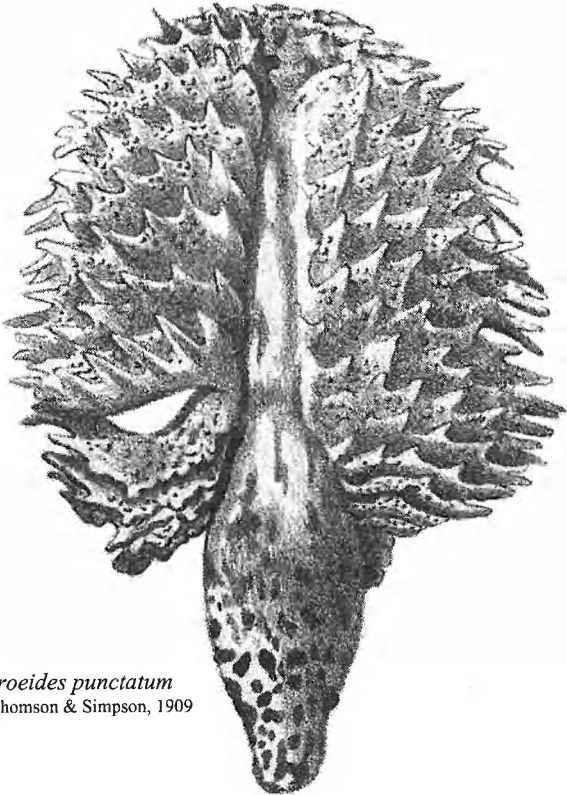


*Virgularia schultzei*, upper left; *Virgularia schultzei*, lower left; *Pennatula inflata*, center; *Pennatula phosphorea*, right.  
After Kükenthal & Broch, 1911

PLATE 14



*Gyrophyllum sibogae*  
After Hickson, 1916



*Pteroeides punctatum*  
After Thomson & Simpson, 1909

- Stylatula elongata* (Gabb, 1862)  
*Stylatula gracilis* (Gabb, 1864)  
*Stylatula kinbergi* Kölliker, 1870  
*Stylatula lacazi* Kölliker, 1870  
*Stylatula polyzoidea* Zamponi and Pérez, 1996  
*Umbellula* Cuvier, 1797 (see Bayer and Grasshoff, 1997) (Pl. 1, 8)  
 [See also Broch (1957, 1958a); Cuvier (1800); Ellis (1753, 1755); Grasshoff (1971, 1973, 1982a, 1982b); Heezen and Hollister (1971); Hickson (1916); Kölliker (1875, 1880); Kükenthal (1902b, 1915); Kükenthal and Broch (1911); Lamarck (1801); Mylius (1755); Pasternak (1975); Williams (1990, 1993b, 1995a, 1997a, 1997c); Williams and Rogers (1989)]  
*Umbellula durissima* Kölliker, 1880  
*Umbellula encrinus* Linnaeus, 1758  
*Umbellula hemigymna* Pasternak, 1975  
*Umbellula huxleyi* Kölliker, 1880  
*Umbellula lindahli* Kölliker, 1874  
*Umbellula monocephalus* Pasternak, 1975  
*Umbellula pellucida* Kükenthal, 1902  
*Umbellula spicata* Kükenthal, 1902  
*Umbellula thomsoni* Kölliker, 1874 (Pl. 8)  
*Veretillum* Cuvier, 1797  
 [See also Balss (1910); Gray (1870); Herklots (1858); Hickson (1916); Kükenthal (1915); Kükenthal and Broch (1911); Williams (1990, 1995a)]  
*Veretillum australis* (Gray, 1870)  
*Veretillum cynomorium* (Pallas, 1766) (Pl. 7)  
*Veretillum leloupi* Tixier-Durivault, 1960  
*Veretillum malayense* Hickson, 1916  
*Veretillum manillensis* (Kölliker, 1872)  
*Veretillum tenue* (Marshall and Fowler, 1889)  
*Veretillum vanderbilti* Boone, 1938  
*Virgularia* Lamarck, 1816  
 [See also Herklots (1858); Kölliker (1880); Koren and Danielssen (1877); Kükenthal (1915); Kükenthal and Broch (1911); Richiardi (1869); Williams 1990, 1995a)]  
*Virgularia abies* Kölliker, 1870  
*Virgularia brochi* Kükenthal, 1915  
*Virgularia bromleyi* Kölliker, 1880  
*Virgularia densa* Tixier-Durivault, 1966  
*Virgularia galapagensis* Hickson, 1930  
*Virgularia glacialis* Kölliker, 1870  
*Virgularia gracillima* Kölliker, 1880  
*Virgularia gustaviana* (Herklots, 1863)  
*Virgularia halisceptrum* Broch, 1910  
*Virgularia juncea* (Pallas, 1766)  
*Virgularia kophameli* May, 1899  
*Virgularia loveni* Utinomi, 1971  
*Virgularia mirabilis* (Müller, 1776)  
*Virgularia patagonica* (a probable *nomen nudem* since an original description cannot be found and a type specimen has not been located)  
 [See also Barrattini and Ureta, 1960; Darwin, 1860]  
*Virgularia patachonica* (see *Virgularia patagonica*)

- ‡ *Virgularia presbytes* Bayer, 1955a [Tertiary of Trinidad]  
 [See also Bayer (1957); Belém and Figueiredo Alvarenga (1973)]  
*Virgularia reinwardti* Herklots, 1858  
*Virgularia rumpfi* Kölliker, 1870  
*Virgularia schultzei* Kükenthal, 1910 (Pl. 13)  
*Virgularia tuberculata* Marshall, 1883

## GEOGRAPHIC INDEX

- Africa – eastern (see Indo-Pacific)  
 Africa – northern (see North Atlantic and Mediterranean)  
 Africa – southern  
 Branch et al. (1994); Broch (1939, 1940); Day (1974b); Day et al. (1970); Molander (1929); J. S. Thomson (1915, 1917, 1924); Tixier-Durivault (1954, 1960); Williams (1987, 1989a, 1989b, 1990, 1992, 1993a); Williams and Rogers (1989).  
 Africa – western  
 Broch (1910a; 1914b, 1958b); Buchanan (1955); Dollfus (1938); López-González et al. (in press); Molander (1929); Pax and Müller (1954); Studer (1878); Tixier-Durivault (1961b, 1963); Williams (1987, 1989b, 1990, 1992).  
 Africa – Atlantic (see Africa – western)  
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 Arctic Ocean  
 Broch (1913c, 1955, 1956); Jungersen (1907, 1915, 1917); Lindahl (1874c); Madsen (1948); May (1900); Mylius (1753, 1754); Pasternak (1980); Verrill (1922); Yashnov (1948).  
 Asia – northeastern (see Pacific Ocean – northern; or Japan)  
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 Atlantic – northern (see North Atlantic and Mediterranean)  
 Atlantic – western temperate (see North Atlantic and Mediterranean or South America – Atlantic)  
 Atlantic – western tropical (see Western Tropical Atlantic and Caribbean)  
 Australia – eastern (see Indo-Pacific)  
 Australia – northern (see Indo-Pacific)  
 Australia – southern  
 Broch (1910c); Briggs (1915); Godfrey (1943); Gray (1848); McCoy (1892); Pasternak (1966); Utinomi (1971); Utinomi and Shepherd (1982); Williams (1995c).  
 Australia – western  
 Broch (1910c); Williams (1995c).  
 Caribbean Sea (see Western Tropical Atlantic and Caribbean)  
 Cosmopolitan (see Worldwide)  
 East Africa (see Africa – eastern)  
 East Asia (see Indo-Pacific)  
 Eastern Australia (see Indo-Pacific)  
 Eastern Pacific – western North America (see North America – Pacific)  
 Eastern Pacific – western South America (see South America – Pacific)  
 Europe (see North Atlantic and Mediterranean)  
 Indo-Pacific (including Red Sea\*)  
 Alcock (1902); Allen and Steene (1994); \*Atiya (1994); Briggs (1915); Clastres et al. (1984); Colin and Arneson (1995); Dinamani (1965); Fowler (1894); Gosliner et al. (1996); Gravely (1941); \*Gravenhorst (1821); \*Gravier (1906a, 1906b, 1906c, 1907a, 1908, 1912a); Hickson (1905); Hondt (1984a, 1984b); Hornell (1922); Humes (1978); Imahara (1991); Koo (1935,

1940); \*Kükenthal (1913b); Light (1921); \*Magnus (1966); A. M. Marshall and Fowler (1889); Mather and Bennet (1993); Nakasone and Yu (1987); Nutting (1908); Pasternak (1964); Ridley (1883); Roule (1908); Sankolli and Neelakantan (1971); \*Schuhmacher and Hinterkircher (1996); Simpson (1905); J. A. Thomson (1905); J. A. Thomson and Crane (1909a, 1909b); J. A. Thomson and Henderson (1905a, 1905b, 1906a, 1906b); Tixier-Durivault (1960, 1965, 1966, 1972); Tixier-Durivault and Hondt (1974a); Utinomi (1956b).

#### Japan

Balss (1910); Fisher (1874); Hubrecht (1885); Kumano (1937); Moroff (1902b); Nutting (1912); Okutani (1969); Stearns (1883); Stimpson (1855); J. A. Thomson and Rennet (1927); Utinomi (1956a, 1958, 1961, 1964).

#### Mediterranean Sea (see North Atlantic and Mediterranean)

#### New Zealand

Benham (1906, 1907); Dendy (1897); Hamilton (1958); Hutton (1904); Powell (1947); Williams (1995c).

#### North America – temperate Atlantic (see North Atlantic and Mediterranean)

#### North America – Pacific

Allen (1969); Anonymous (1898); Batie (1972); Belcik (1977); Blake (1872, 1873); Brusca (1980); Dawson (1872); Fautin et al. (1987); Flora and Fairbanks (1966); Gabb (1862, 1864); Gotshall (1987, 1994); Gotshall and Laurent (1979); Hartman (1960); Hickson (1930a); Hochberg and Ljubenkov (1998); Human (1973); Johnson and Snook (1935); Kerstitch (1989); Kozloff (1974, 1983, 1987); Kükenthal (1913a); Lam et al. (1982); Nutting (1909); Ricketts et al. (1985); Sclater (1872, 1873); Shimek (1998); Stearns (1873a); Strathmann (1988); Studer (1894); Verrill (1865, 1868a, 1868b).

#### North Atlantic and Mediterranean (Europe and eastern North America)

Abel (1963); Alder (1862); Alder (1863); Altuna-Prados (1994); Andrée (1912); Angelis (1895?); Arculeo et al. (1990); Atkinson (1989); Broch (1913a, 1914a, 1953); Baluk and Pisera (1984); Bellini (1905); Berenguier (1954); Broch (1953); Demir (1952); Dyer et al. (1981); Eckelbarger et al. (1998); Ellis (1753, 1755, 1764); Field (1949); Fischer (1889); Forbes and Goodsir (1851); Gili and Pagès (1987); Gili et al. (1987); Grasshoff (1981, 1982a, 1982b, 1989); Grieg (1887, 1892, 1893, 1896); Jahn (1970); Keller et al. (1975); Koren and Danielssen (1847, 1856, 1874, 1877, 1883, 1884); Kramp (1932, 1933, 1950); Lacaze-Duthiers (1891); Langton et al. (1990); Lindahl (1874a, 1874b, 1874c); Luther and Fiedler (1961); Madsen (1948); Manuel (1981); Marion (1906); Mylius (1753, 1754); Nobre (1931); Patterson (1986); Pax (1936); Pax and Müller (1953, 1955a, 1955b, 1955c, 1959, 1962); Pères and Picard (1958); Perrier (1936); Rice et al. (1992); Riedl (1963, 1983); Rossi (1971); Roule (1905); Rowe (1971); Sars (1846, 1851); Stephens (1909); Tixier-Durivault and Lafargue (1968); Vafidis and Koukouras (1991); Vafidis et al. (1994); Verrill (1878, 1879, 1882a, 1882b, 1884a, 1884b, 1885a).

#### Northern Pacific (see Pacific Ocean – northern)

#### Pacific Ocean – eastern (see North America – Pacific)

#### Pacific Ocean – northern

Blake (1872, 1873); Broch (1935); Pasternak (1960, 1961a, 1970); Rho and Song (1976, 1977).

#### Pacific Ocean – western (see Indo-Pacific)

#### South America (Atlantic)

Bartini and Ureta (1960); Acuña and Zamponi (1992); ; Belém and Figueiredo Alvarenga (1973); Darwin (1860); Pasternak (1975b, 1993); Sanchez (1994); Tommasi et al. (1972); Zamponi and Perez (1996); Zamponi et al. (1997).

#### South America (Pacific)

Pasternak (1975b); Pérez (1996); Zuñiga (1948).

#### Southeast Asia (see Indo-Pacific)

Southern Asia (see Indo-Pacific)

Southern Africa (see Africa – southern)

Southern Australia (see Australia – southern)

Southern Oceans (Antarctica and the subantarctic)

Acuña and Zamponi (1992); Branch and Williams (1993); Kükenthal (1912a); May (1900);

Pasternak (1961b, 1962); J. A. Thomson and Rennet (1931); Zamponi and Perez (1995a, 1995b).

Subantarctic (see Southern Oceans)

West Africa (see Africa – western)

Western Australia (see Australia – western)

Western Tropical Atlantic and Caribbean

Bayer (1957, 1959, 1961); Cairns, Hartog, and Arneson (1986); Deichmann (1936a, 1936b);

Fowler (1888); Kaplan (1982, 1988); Keller et al. (1975); Pasternak (1975a); Sanchez (1994);

Voss (1976).

Worldwide

Bayer (1956); Kükenthal (1915); Williams (1995a, 1997e, 1997f).

## SUBJECT INDEX

**NOTE: The largest percentage, approximately 37%, of the citations listed pertain to taxonomy and geographic records (see Fig. 1).**

### **Anatomy (see Morphology and Ultrastructure)**

#### **Behavior**

P. A. V. Anderson (1976); P. A. V. Anderson and Case (1975); Buisson (1974, 1976, 1980, 1988); Darwin (1860); Couet (1979); Dickinson (1978); Hoare and Wilson (1977); Kastendiek (1975a, 1975b, 1976); Lancaster (1601); Langton et al. (1990); Mori (all citations); Mori and Ondo (1957); Mori and Tanase (1973); Pantin (1950); Pavans de Ceccatty and Buisson (1965); Takada and Mori (1956, 1957).

#### **Bibliography**

Bayer (1981a, 1996); Hickson (1916); Kükenthal (1915); D. W. Thompson (1885); Williams (1990).

#### **Biography (Regarding Authors of Pennatulacean Research)**

Boeseman (1973); Forest (1996); Fransen et al. (1997); Gardiner (1940); Holthuis (1993, 1995); Smit (1979); Zimmer (1925).

#### **Bioluminescence**

Agassiz (1850); Aldrovandi (1642, 1648); Anctil et al. (1982); J. M. Anderson and Cormier (1978); J. M. Anderson et al. (1974, 1978); P. A. V. Anderson and Case (1975); Awad and Anctil (1993a, 1993b); Batie (1972); C. Bauhin (1620, 1671); J. Bauhin (1650-51); Bilhaut (1975a, 1975b); Blainville (1834); Boussuet (1558); Buck (1973); Chiaje (1827); Charbonneau (1981); Cormier (1978); Davenport and Nicol (1956); DeLuca et al. (1976); Dittrich (1888); Ehrenberg (1834c); Ellis (1764); Forbes (1847); Forbes and Goodsir (1851); Germain and Anctil (1988); Gesner (1555, 1558); Grant (1827, 1829); Grober (1990a, 1990b); Hart et al. (1979); Harvey (1917, 1920, 1940, 1952); Hastings (1968, 1983); Hastings and Morin (1969); Herdman (1913a); Herring (1978, 1991); Hori and Cormier (1973); Hori et al. (1972, 1973); Imperato (1599); Korotneff (1887); Kreiss and Cormier (1967); Krukenberg (1887, 1888); Mangold (1910); N. B. Marshall (1979); Matern (1984); Matthews

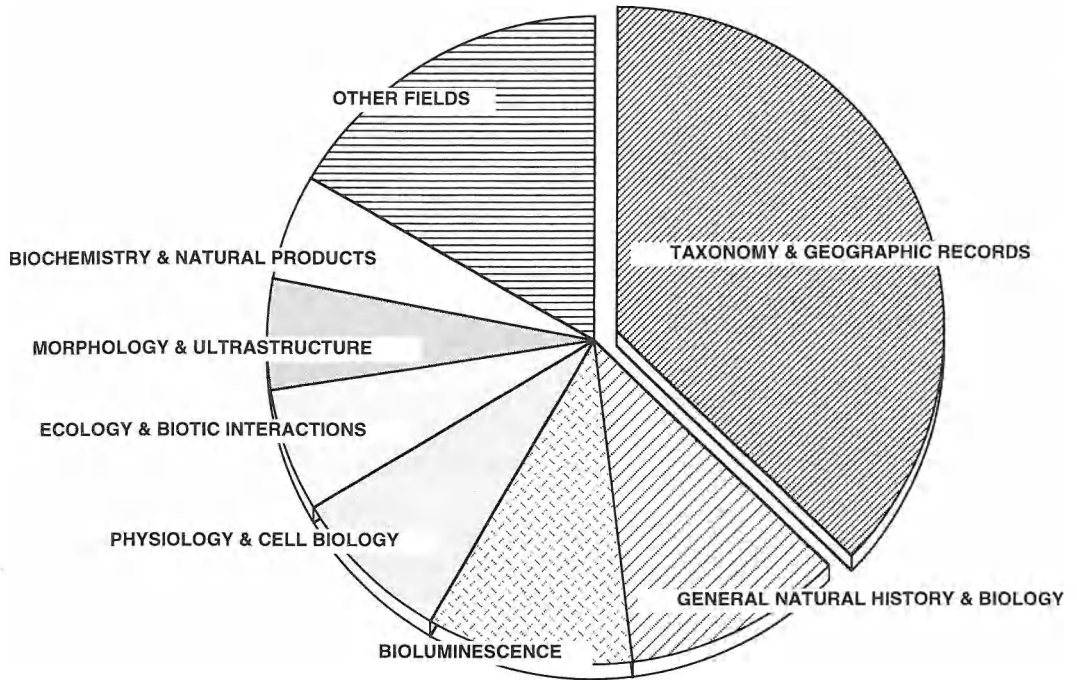


FIGURE 1. Quantitative analysis of the literature by field of study.

et al. (1977); Morin (1974, 1976, 1998); Neelson et al. (1986); Nicol (1955a, 1955b, 1955c, 1958); Panceri (1871b, 1871c, 1872a, 1872b, 1872c); Parker (1920c); Péron (1804); Pratje (1923); Rapp (1827); Royal Society (1870); Satterlie and Case (1979); Shaw (1838–46); Shimomura and Johnson (1975, 1979); Soares and Sawaia (1975); Spallanzani (1784, 1796); Spurlock and Cormier (1975); Tilesius von Tilenau (1819); Titschack (1965, 1966); Tizard et al. (1885); Wampler et al. (1971, 1973); Ward (1979); Ward and Cormier (1978a, 1978b); Williams (1990); Wyville Thomson (1874).

#### **Corals (Pre-Linnean General Natural History)**

Boccone (1670); Marsigli (1725); Peyssonnel (1753); Rondelet (1554-1555); Woodward (1695).

#### **Ecology and Biotic Interactions**

P. K. Anderson (1989); Atkinson (1989); Bertsch (1968, 1982); Best (1988); Birkeland (1969, 1971, 1974); Brafield (1969); Creed and Coull (1984); Davis (1978); Davis et al. (1982); Dawydoff (1930, 1938); Day (1974a); Dube and Ball (1971); Fager (1968); Fujita and Ohta (1988); Gili et al. (1987); Gilluly (1970); Gosliner et al. (1996); Hornell (1922); Howson and Davies (1991); Humes (1978); Jones (1960); Kastendiek (1975a, 1975b, 1976, 1982); Lam et al. (1982); Laubier (1972); Magnus (1966); Mariscal and Bigger (1977); McDonald and Nybakken (1978); Miyajima (1897, 1900); Mori (all citations); Mori and Ondo (1957); Mori and Tanase (1973); Nakasone and Yu (1987); Okutani (1969); Ramesh et al. (1985); Rittschof et al. (1986, 1988); Rowe (1971); Sankolli and Neelakantan (1971); Shepherd (1983); Shimek (1998); Short and Trower (1986); Standing et al. (1984); Thompson et al. (1988); Tyler et al. (1995).



**General Natural History and General Biology**

Alcock (1902); Allen (1969); Arculeo et al. (1990); Arndt (1912); R. D. Barnes (1987); R. S. K. Barnes et al. (1988); Bayer (1973, 1981a); Bayer et al. (1983); Bayer and Owre (1968); Bellomy (1974); Bourne (1900); Branch et al. (1994); Brusca and Brusca (1990); Colin and Arneson (1995); Coleman and Teague (1973); Cooke (1889); Dakin (1953); Dalyell (1848); Darwin (1860); Delage and Hérouard (1901); Donovan (1995); Dunn (1982); Faulkner and Chesher (1979); Fosså and Nilsen (1995); Frische (1991); Gage and Tyler (1991); Gesner (1565); Hadi (1994); Hardy (1967); Gosliner et al. (1996); Gotshall (1987, 1994); Gotshall and Laurent (1979); Gravier (1912b); Haeckel (1904); Hardy (1965, 1967); Heezen and Hollister (1971); Hickson (1906, 1909, 1930b); Huxlely (1907); Hyman (1940); Johnson and Snook (1935); Kaplan (1982, 1988); Kerstitch (1989); Koren and Danielssen (1877); Kozloff (1974, 1983, 1987, 1990); Kükenthal (1923-1925); Lancaster (1601); Luther and Fiedler (1961); Lutz (1986); Lydekker (no date); MacGinitie (1938); MacGinitie and MacGinitie (1968); N. B. Marshall (1979); W. P. Marshall (1895); Mather and Bennet (1993); Meglitsch (1972); Milne and Milne (no date); Milne Edwards and Haime (1857); Ming (1993); Modeer (1786); H. B. Moore (1937); Moseley (1872); Moss (1878); Mylius (1753, 1754); Nordgaard (1905); Omori (1991); Pearse et al. (1987); Philippi (1835); Pimentel (1967); Ricketts et al. (1985); Riedl (1963); Ricketts et al. (1985); Rondelet (1554-1555); Rumphius (1705); Schechter (1959); Schömann (1949); Schuhmacher and Hinterkircher (1996); Selater (1872, 1873); Smith (1964); Smith and Carlton (1975); Sphon (1964); Sprung and Delbeek (1997); Thurston (1890); Tilesius (1812); Tizard et al. (1885); Tixier-Durivault (1987); A. Trembley (1744); Tyler and Zibrowius (1992); Utinomi (1956a, 1964); Voss (1976); Wilkins and Birkholz (1986); Williams (1986, 1993a, 1995a, 1997c); Wyville Thomson (1874); Zim and Ingle (1955).

**Histology**

Hasama (1944); Kölliker (1865); Korotneff (1887); Lyke (1965); Niedermeyer (1913, 1914); Titschack (1970).

**History of Science (Regarding Coelenterates and/or Sea Pens)**

Agassiz (1860); Bayer (1981a); Hickson (1916); Hyman (1940); Shapiro and Ramsdell (1965); Williams (1993b, 1995a, 1997c).

**Molecular Biology and Genetics**

Lorenz et al. (1991).

**Morphology and Ultrastructure**

Alonso (1979); Beklemishev (1969a, 1969b); Buisson (1970); Buisson and Franc (1969); Bujor (1901); Chia and Crawford (1977); Crawford and Chia (1974); Bullough (1950); Dunkelberger and Watabe (1972, 1974); Fautin and Mariscal (1991); S. Franc (1979); S. Franc et al. (1971, 1974, 1985); Franzén (1967); Germain and Anctil (1988); Hickson (1883); Ivester and Dunkelberger (1971); Jungersen (1888a, 1888b); Koch (1878, 1889, 1890); Kölliker (1865, 1871b, 1872, 1874); Korotneff (1887); Ledger and Franc (1978); Lenhoff et al. (1971); Lightbown (1918); Lyke (1965); Mariscal (1974, 1979); Mariscal and Bigger (1977); Marks et al. (1949); Niedermeyer (1911, 1912); Panceri (1870); Parker (1919); Roule (1907); Satterlie et al. (1976); Shapeero (1969); Spurlock and Cormier (1975); Titschack (1966, 1968, 1970); P. Trembley (1941, 1942); Watabe and Dunkelberger (1979); Wilbur (1976); Wilson (1884).

**Natural Products Chemistry, Biochemistry, and Toxicology**

Anctil (1987, 1989a, 1989b); Anctil et al. (1982, 1984, 1991); J. M. Anderson and Cormier (1978); J. M. Anderson et al. (1974, 1978); P. A. V. Anderson (1976); Awad and Anctil (1993a,

1993b); Bernheimer and Arigad (1981); Bullock (1970); Charbonneau (1981); Clastres et al. (1984); Coan and Travis (1970); Datta et al. (1990); DeLuca et al. (1976); Fu et al. (in press); Goswami et al. (1995); Grimmelikhuijzen and Groeger (1987); Grimmelikhuijzen et al. (1987); Harmon et al. (1984); Hart et al. (1979); Hori and Cormier (1973); Hori et al. (1972, 1973); Huang and Mir (1972); Jones et al. (1979); Karkhanis and Cormier (1971); Keifer et al. (1986); Kittredge et al. (1962); Kreiss and Cormier (1967); Morin (1976); Kumar et al. (1990); Lorenz et al. (1991); Mackie (1987); Pani and Anctil (1994); Shapeero (1969); Shimomura and Johnson (1975, 1979); Standing et al. (1984); Thompson et al. (1988); Tillet-Barret et al. (1992); Vanderah and Djerassi (1977); Vidal et al. (1992); Waele et al. (1987); Wampler et al. (1971); Wekell (1974, 1978); Wratten et al. (1977a, 1977b).

#### **Paleontology (Mesozoic and Cenozoic Fossil Taxa)**

Andrée (1912); Angelis (1895?); Baluk and Pisera (1984); Bayer (1955a, 1955b, 1956); Bradley (1980, 1981); Branco (1885); Chapman and Crespín (1928); Davis (1936); Fowler (1911); Frech (1890); Gabb (1859, 1861); Gregorio (1890); Hamilton (1958); Häntzschel (1958); Howell (1947); Kolosvary (1949); Kuhn (1949); Malaroda (1951); Malecki (1982); Milne Edwards and Haime (1850); Morton (1830, 1834); R. C. Moore (1956); Nelli (1903); Nielsen (1914); Shapiro and Ramsdell (1965); Roemer (1880); Squires (1958); Strand (1928); Traub (1938); P. Trembley (1941, 1942); Valenciennes (1850); Vincent (1893); Voigt (1958); Yabe and Sugiyama (1937).

#### **Paleontology (Vendian Frondlike Fossil Taxa)**

Arthur (1997); Bergström (1989, 1991); Buss and Seilacher (1994); Conway Morris (1991, 1993); Deng and Chen (1981); Dzik (1991); Fedonkin (1992, 1996); Glaessner (1958a, 1958b, 1959, 1961, 1984); Glaessner and Daily (1959); Glaessner and Wade (1966); Jenkins (1985, 1992); Jenkins and Gehling (1978); Lewin (1984); Liu (1981, 1983); Richter (1955); Runnegar (1992); Seilacher (1989); Simonetta and Conway Morris (1991); Weiguo (1986); Williams (1995b, 1997c, 1997d); Wright (1997).

#### **Photography (Color Photographs of Living Sea Pens)**

Allen and Steen (1994); Branch et al. (1994); Colin and Arneson (1995); Faulkner and Chesher (1979); Gosliner et al. (1996); Fosså and Nilsen (1995); Gotshall (1987, 1994); Gotshall and Laurent (1979); Kerstitch (1989); Ming (1993); Nishimura (1992); Schumacher and Hinterkircher (1996); Shimek (1998); Sprung and Delbeek (1997); Weinberg (1996); Williams (1990, 1996); Wilkins and Birkholz (1986).

#### **Phylogeny, \*Cladistics, Evolution, and Biogeography**

Altuna-Prados (1994); Bergström (1989, 1991); Bourne (1900); Broch (1913b); Conway Morris (1991); Grasshoff (1973, 1991); Hickson (1916, 1930b); Kinoshita (1912); Koch (1878); Kölliker (1869-72, 1872, 1880); Kükenthal (1912b, 1914, 1915a, 1921); Kükenthal and Broch (1910, 1911); A. M. Marshall (1883b); Niedermeyer (1913); Patterson (1986); Williams (1992, \*1993b, 1995a, \*1995b, \*1995d, 1997a, 1997b, \*1997c, 1997d, 1997e).

#### **Physiology and Cell Biology**

Anctil (1987, 1989a, 1989b); Anctil et al. (1982, 1984, 1991); J. M. Anderson and Cormier (1978); J. M. Anderson et al. (1974); P. A. V. Anderson (1976); P. A. V. Anderson and Case (1975); Awad and Anctil (1993a, 1993b); Bilhaut and Pavans de Ceccatty (1971a, 1971b); Brafield (1969); Brafield and Chapman (1967); Case and Morin (1966); Chapman (1972); Child (1951); Buck and Hanson (1967); Buisson (1964, 1969, 1971a, 1971b, 1973, 1976, 1979, 1988); Carlgren (1940); Charbonneau (1981); Crawford and Chia (1974); Dickinson (1978); J. M. Franc (1979); S. Franc (1970, 1973, 1979, 1980); Hagiwata et al. (1981); Honjo (1940); Imafuku (1973, 1975, 1976); Ivester

(1977); Korotneff (1887); Krukenberg (1887); Ledger and Franc (1978); A. R. Moore (1926); Mori (all citations); Mori and Ondo (1957); Mori and Tanase (1973); Musgrave (1909); Nicol (1955b, 1955c); Parker (1920a, 1920b); Pavans de Ceccatty and Buisson (1964a, 1964b, 1965); Pavans de Ceccatty et al. (1963); Pratt (1909); Satterlie et al. (1976, 1980); Senut and Franc (1985); Takada and Mori (1956, 1957); Titschack (1965, 1966, 1968, 1970); Umbriaco et al. (1990); Waele et al. (1987).

### **Polymorphism, Phenotypic Variability, and Biodiversity**

Hickson (1903b, 1903c); Human (1973); Jaworski (1939); A. M. Marshall (1883); Pasternak (1989); Williams (1992, 1993b, 1997b).

### **Quoted Passages**

Agassiz (1860); Harvey (1952); Hyman (1940); Lankaster (1601); N. B. Marshall (1979); Péron (1804); C. W. Thomson (1874); Shapiro and Ramsdell (1965) quoted under Gregorio (1890); Tizard et al. (1885), Williams (1993b).

### **Reproductive and Developmental Biology (including Growth Stages and Regeneration)**

Birkeland (1969, 1971); Chia and Crawford (1973); Dalyell (1839); Delage and Hérouard (1901); Eckelbarger et al. (1998); Franzén (1967); Jungersen (1888a, 1888b); Korschelt (1936); Lacaze-Duthiers (1865, 1887); Mori and Tanase (1973); Roule (1932); Satterlie and Case (1979); Strathmann (1988); Tarent and Tarent (1980); Torrey (1901); Tyler et al. (1995); Willemoes-Suhm (1875); Wilson (1880, 1881, 1882a, 1882b, 1883b, 1903).

### **Taxonomy, Distributional and Bathymetric Records**

Abel (1963); Acuña and Zamponi (1992); Alder (1861, 1862, 1863, 1867); Allen (1969); Anonymous (1898); Arculeo et al. (1990); Arndt (1912); Asbørnsen (1856); Atiya (1994); Atkinson (1989); Balss (1909, 1910, 1911); Barattini and Ureta (1960); Barreira y Castro (1990); Batie (1972); Bayer (1955b, 1956, 1957, 1959, 1961); Bayer and Grasshoff (1997); Belcik (1977); Belem and Alvarenga (1973); Belyaev (1972); Benham (1906, 1907); Boone (1933, 1938); Branch et al. (1994); Branch and Williams (1993); Broch (all citations); Buchanan (1955); Cairns, Hartog, and Arneson (1986); Carpine and Grasshoff (1985); Castro (1981); Colin and Arneson (1995); Costa Soares (1979); Cuvier (1797, 1800); Dana (1846); Danielssen and Koren (1884); Dawson (1966); Deichmann (1936a, 1936b, 1941); Ehrenberg (1834a, 1834b); Ellis and Solander (1786); Erhardt and Moosleitner (1995); Fautin et al. (1987); Fowler (1888, 1894); Fu et al. (in press); Gabb (1862, 1864); Gili (1986); Gili and Pagès (1987); Gosliner et al. (1996); Gotshall (1987, 1994); Gotshall and Laurent (1979); Grasshoff (all citations); Gravenhorst (1821); Gravier (all citations); Gray (all citations); Hartman (1960); Herklots (1858, 1863); Hickson (1890, 1894, 1900, 1903a, 1904, 1905, 1907, 1911, 1914, 1916, 1921, 1922, 1930a, 1936, 1937, 1940); Hoare and Wilson (1977); Hochberg and Ljubenkov (1998); Hondt (1984a, 1984b); Hubrecht (1885); Imahara (1991); Jahn (1970); Johnston (1847); Jungersen (1904, 1905, 1907, 1915, 1917); Kölliker (all citations); Koo (1935, 1940); Koren and Danielssen (1847, 1856, 1874, 1877, 1883, 1884); Kükenthal (all citations); Kramp (1932, 1933, 1950); Kumano (1937); Lacaze-Duthiers (1891); Lamarck (1816, 1836); Langton et al. (1990); Lepechin (1781); Leuckart (1841); Leunis (1886); Light (1921); Lindahl (1874a, 1874b, 1874c); Linnaeus (1758, 1767); Lopez-Gonzalez et al. (in press); Madsen (1948); Manuel (1981); A. M. Marshall (1883b); A. M. Marshall and Fowler (1888); A. M. Marshall and Marshall (1882); May (1899, 1900); Milne Edwards and Haime (1850, 1857); Molander (1929); Moroff (1902a, 1902b); O.F. Müller (1776); F. Müller (1866); Naumov (1955); Nobre (1931); Norman (1867); Nutting (1908, 1909, 1912); Pallas (1766, 1787); Panceri (1871a); Pasternak (all citations); Pax (1936); Pax and Müller (1955b, 1955c, 1962); Pérez (1996); Pfeffer (1886); Poche (1914, 1915a, 1915b); Quoy and Gaimard (1827); Rho and Song (1976, 1977); Richiardi (1869); Richmond (1997); Ridley (1883);

Riedl (1963, 1983); Riveros Zunica (1948); Robertson (1887); Rossi (1971); Roule (1905, 1906, 1908); Sachs (1913); Sars (1846,1851); M. Schultze (1871); F. E. Schulze (1875); Simpson (1905); Stearns (1873a, 1873b, 1873c, 1874, 1882, 1883); Stephens (1909); Stiasny (1937, 1938); Stimpson (1855); Studer (all citations); J. A. Thomson (1905, 1927); J. A. Thomson and Crane (1909a, 1909b); J. A. Thomson and Henderson (1905a, 1905b, 1906a, 1906b); J. A. Thomson and Mackinnon (1911); J. A. Thomson and Rennet (1927, 1931); J. A. Thomson and Ritchie (1906); J. A. Thomson and Simpson (1909); J. S. Thomson (1915, 1917, 1924); Tilesius (1826); Tixier-Durivault (all citations); Tixier-Durivault and Hondt (1974a, 1974b); Tixier-Durivault and Lafargue (1968); Utinomi (all citations); Utinomi and Shepherd (1982); Vafidis and Koukouras (1991); Van Soest (1977); Verrill (all citations); Waterman (1950); Williams (all citations); Wiktor (1974); Yashnov (1948); Zamponi and Pérez (1995a, 1995b,1996); Zamponi et al. (1997); Zuñiga (1948).

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