

VOLUME 68

DECEMBER 1975

ISSN 0303 2515

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'Smith (1969: 36, fig. 16) describes . . .'
'As described (Smith 1969a, 1969b; Jones 1971) . . .'
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Note: no comma separating name and year
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For books give title in italics, edition, volume number, place of publication, publisher.
For journal article give title of article, title of journal in italics (abbreviated according to the *World list of scientific periodicals*, 4th ed. London: Butterworths, 1963), series in parentheses, volume number, part number (only if independently paged) in parentheses, pagination (first and last pages of article).

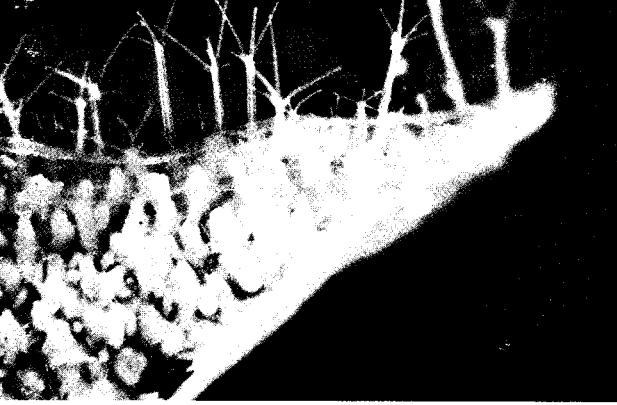
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FISCHER, P.-H. 1948. Données sur la résistance et de le vitalité des mollusques.—*J. Conch.*, Paris 88: 100–140.
FISCHER, P.-H., DUVAL, M. & RAFFY, A. 1933. Etudes sur les échanges respiratoires des littorines.—*Archs Zool. exp. gén.* 74: 627–634.
KOHN, A. J. 1960a. Ecological notes on *Conus* (Mollusca: Gastropoda) in the Trincomalee region of Ceylon.—*Ann. Mag. nat. Hist.* (13) 2: 309–320.
KOHN, A. J. 1960b. Spawning behaviour, egg masses and larval development in *Conus* from the Indian Ocean.—*Bull. Bingham oceanogr. Coll.* 17 (4): 1–51.
THIELE, J. 1910. Mollusca: B. Polyplacophora, Gastropoda marina, Bivalvia. In: SCHULTZE, L. *Zoologische und anthropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Süd-Afrika* 4: 269–270. Jena: Fischer.—*Denkschr. med.-naturw. Ges. Jena* 16: 269–270.

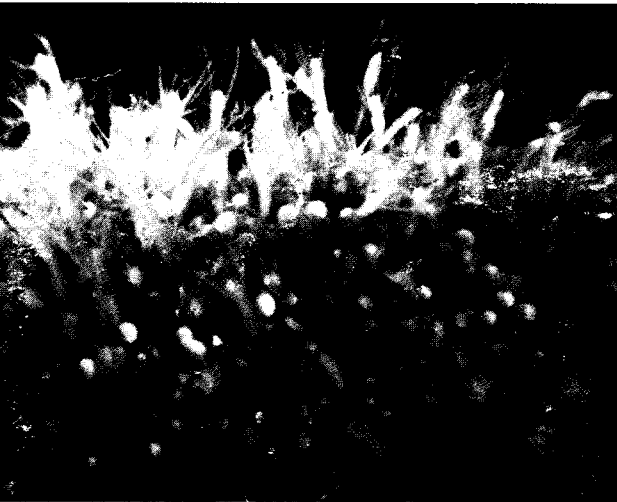
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Tubularia africana. Colony on shell, with calcareous processes in foreground.

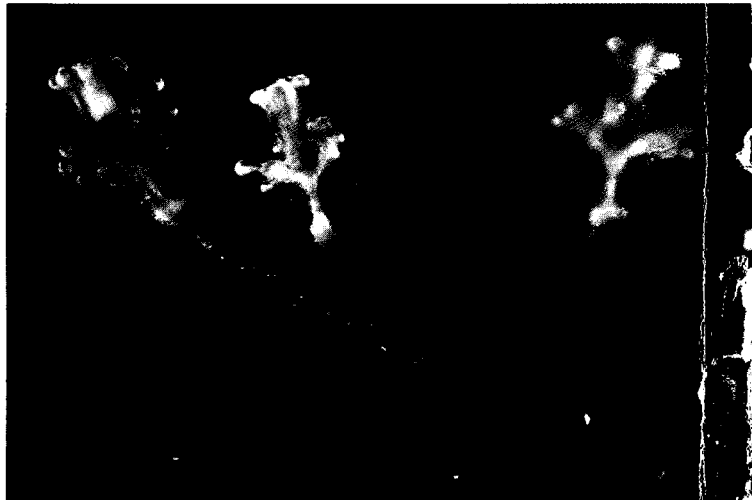


Tubularia altispina. Colony on shell, with gastrozooids and gonozooids.



Tubularia warreni. Hydranth with gonophores.

Photographs: D. Gerneke.



Bicolora elegans.

ANNALS OF THE SOUTH AFRICAN MUSEUM
ANNALE VAN DIE SUID-AFRIKAANSE MUSEUM

Volume 68 Band
December 1975 Desember



MONOGRAPH ON THE HYDROIDA
OF SOUTHERN AFRICA

By

N. A. H. MILLARD

Cape Town Kaapstad

The ANNALS OF THE SOUTH AFRICAN MUSEUM

are issued in parts at irregular intervals as material
becomes available

Obtainable from the South African Museum, P.O. Box 61, Cape Town

Die ANNALE VAN DIE SUID-AFRIKAANSE MUSEUM

word uitgegee in dele op ongereelde tye na beskikbaarheid
van stof

Verkrygbaar van die Suid-Afrikaanse Museum, Posbus 61, Kaapstad

OUT OF PRINT/UIT DRUK

1, 2(1, 3, 5-8), 3(1-2, 4-5, t.-p.i.), 5(1-3 5, 7-9),
6(1, t.-p.i.), 7(1-3), 8, 9(1-2), 10(1),
11(1-2, 5, 7, t.-p.i.), 15(5), 24(2), 27, 31(1-3), 33

Price of this part/Prys van hierdie deel
R22,50

Trustees of the South African Museum © Trustees van die Suid-Afrikaanse Museum
1975

ISBN 0 949940 81 X

Printed in South Africa by
The Rustica Press, Pty., Ltd.,
Court Road, Wynberg, Cape

In Suid-Afrika gedruk deur
Die Rustica-pers, Edms., Bpk.,
Courtweg, Wynberg, Kaap

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South African Museum, Cape Town

(With 143 figures)

[MS. accepted 7 October 1974]

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INTRODUCTION

CONTENT AND CLASSIFICATION

This monograph deals with the hydroid fauna of the African coast south of 20° south latitude, and as such covers all of the Republic of South Africa, most of South West Africa and the southern part of Moçambique as far north as Beira (Fig. 1). Seawards it covers the continental shelf and the Agulhas Bank, where records are abundant to a depth of about 100 m but become increasingly scarce below this.

The classification of the Hydrozoa accepted for the purpose of the monograph is as follows:

Class HYDROZOA

- Order 1. Hydrida
- Order 2. Actinulida
- Order 3. Trachylida
 - Suborder 1. Trachymedusae
 - Suborder 2. Narcomedusae
- Order 4. Hydroida (Leptolina)
 - Suborder 1. Athecata (Gymnoblastea, Anthomedusae)
 - Suborder 2. Thecata (Calyptoblastea, Leptomedusae)
 - Suborder 3. Chondrophora
 - Suborder 4. Limnomedusae
- Order 5. Hydrocorallida
 - Suborder 1. Milleporina
 - Suborder 2. Stylasterina
- Order 6. Siphonophora

The monograph deals with the marine and brack water Hydroida of the suborders Athecata, Thecata and Limnomedusae. Certain authorities (particularly Picard 1957) consider that the Chondrophora (originally included in the Siphonophora) and the Milleporina are closely related to the athecate hydroids. Evidence in favour of such an affinity appears to be increasing, and Bouillon (1974) evaluates these two groups as families (Velellidae and Milleporidae respectively) of capitate athecate Hydroida. However, in the meantime I have retained the old classification and these two groups are not covered in this monograph.

It is usual among hydroid systematists to divide the Athecata into the Capitata and the Filifera, a division which depends on the presence of capitate tentacles in the former and their absence in the latter. It is felt, however, that this fission is not a natural one and it has therefore not been used. In some genera capitate tentacles are present in the immature stages and not in the adult (e.g. *Tubularia*), while in others they are present in the medusa and not in the polyp (e.g. *Bougainvillia*).

In all 286 species and subspecies are described, nine of them new to science.* Keys to South African families, genera and species are provided. These keys do

* See also Addendum, p. 483.

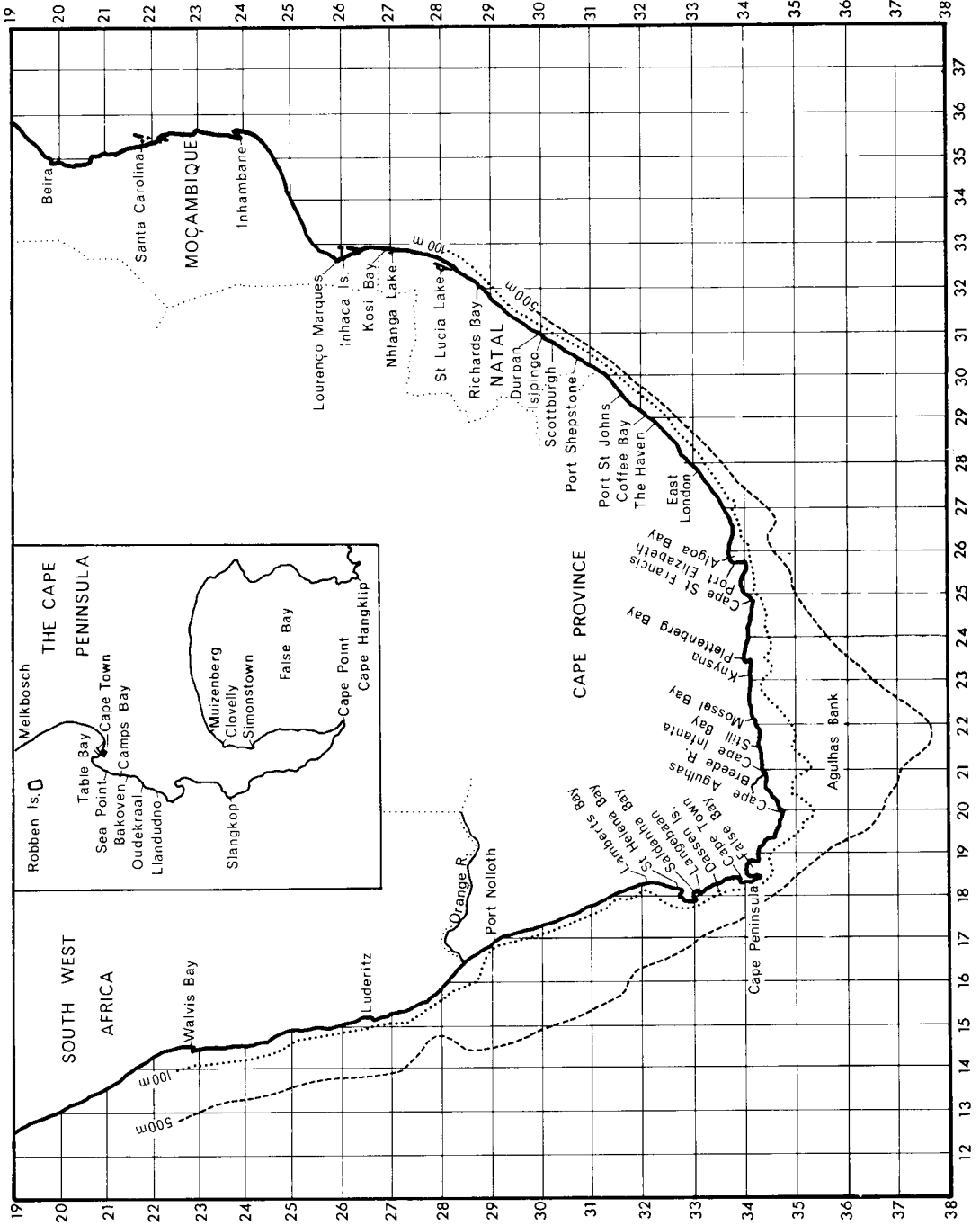


Fig. 1. Map of southern Africa showing the localities mentioned in the text.

not necessarily represent systematic relationships but are intended as a tool for identification only. They should be used with caution and the genera and species checked against the diagnoses and diagrams. Material which does not fit the keys may be new species or new records for the country. Some well-known genera not yet recorded from South Africa have been included in the keys but are enclosed in brackets.

The monograph is essentially on the polyp rather than the medusa generation, and the polyp generation has been emphasized throughout, both in the keys and in the descriptions. The medusa generation is described where known, but medusae with unknown polyps are not described. A check-list of South African medusa records is given on p. 481.

Families are arranged in the generally accepted order, which implies a very rough evolutionary sequence. Genera and species are arranged in alphabetical order within the families. Each family has a short introduction outlining its more important features.

The systematic descriptions are preceded by a section on structure and terminology where definitions of terms will be found. Certain terms, which are relevant to particular families only, will be defined in the introduction to those families. The index to scientific terms on p. 497 will give quick access to definitions.

MEASUREMENTS

Measurements are not given in detail, for they are intended only as a rough guide to the size. Measurements of a colony are given to the nearest mm and those of a hydrotheca to the nearest 0,1 mm except for those which are less than 0,2 mm which are given to the nearest 0,01 mm. Measurements apply strictly to South African material, as do numbers of tentacles, etc. The depth of a hydrotheca is taken in side-view in the centre, unless otherwise stated, and exclusive of regenerated margins when these occur. When the hydrothecal wall is curved the straight measurement is taken from the base to the edge and across the curvature.

RECORDS OF DISTRIBUTION AND DEPTH

At the end of each species the distribution in southern Africa, both from the author's findings and other papers, is briefly summarized. This is done by the use of two figures indicating the latitude/longitude squares. Thus, 35/20 would indicate a latitude between 35 and 36° south and a longitude between 20 and 21° east.

The depth range is added in parenthesis, thus: 35/20 (s), where 's' refers to 'shallow'. For the depth the following key is used:

l: littoral	vd: very deep (500–999 m)
s: shallow (1–99 m)	a: abyssal (1 000 m and over)
d: deep (100–499 m)	h: ships' hulls and floating objects

Estuarine records have not been separated; generally they are included in 's'.

No attempt has been made to indicate relative abundance. In the first place most of the records are from dredgings performed in a random fashion. In the second place many species can be identified only from fertile material, and in such cases sterile records have been omitted rather than risk incorrect identifications. Genera such as *Eudendrium*, *Tubularia* and *Hydractinia*, for instance, are much more abundant than is indicated by the records, which are usually of fertile material only.

Geographical distribution has not been analysed in this monograph, either within southern Africa or as related to world distribution. The matter will be discussed fully in a subsequent paper.

NEMATOCYSTS

Much attention has been paid in recent years to nematocyst type and its use in classification. It appears that within most families nematocysts are not of great diagnostic value since members of a family tend to have the same types. They may be of great value, though, in genera with few other diagnostic characters and are useful for establishing relationships in groups of doubtful affinity. In this monograph they have been described, where possible, for the Athecata only, where the diagnostic characters are fewer than in the Thecata.

For the examination of nematocysts only living material is satisfactory. Whole tentacles, smears or portions of the body should be mounted on a microscopic slide in sea-water. Replacement of the sea-water by distilled water will cause discharge of many types, and further discharge may be facilitated by alternate drying and re-hydration. Suitable stains include neutral red, methylene blue and magenta. A powerful microscope and oil immersion lens is necessary for observation of detail, though the category can often be determined without strong magnification.

SYNONYMY AND REFERENCES

The synonymy given with each species is not intended to be complete, but in each case there has been quoted the original description and, where possible, at least one good description or reference to a synonymy.

The literature on South African hydroids is very scattered, most of the earlier work being limited to descriptions of collections made by expeditions passing through the area. Stechow, in 1925*a*, published a check-list of 153 species up to that date. The most important records previous to 1925 are those of Warren, who deserves special praise for the accuracy of his descriptions and diagrams, Busk, Kirchenpauer, Allman, Ritchie, Billard, Jäderholm, Marktanner-Turneretscher, Vanhöffen and Stechow himself. Kirchenpauer's type material was unfortunately nearly all destroyed during the last world war. Some of his species were redescribed by Stechow (1919*b*), but many were inadequately described in the first place and may now be dropped. Stechow's slide material has been available to the author on loan. Busk's material and much of Allman's material is present in the British Museum (Natural History).

Warren's material is in part in the British Museum and in part in the Natal Museum. Ritchie's collection was redescribed by Rees & Thursfield (1965).

Since 1925 the quota of species has been added to by Vervoort, Leloup, Ewer, Kramp, Manton and the present author, and Stechow's check-list has been almost doubled.

In the list of references on p. 485 all those containing South African records have been marked with an asterisk.

On p. 471 a complete list of species is given together with the authorities for previous records. Thus, any record can be located through the index to species on p. 499, even though it may not be quoted with the description.

SOURCES OF MATERIAL

Collections from many sources have contributed material towards this monograph. They may be listed as follows:

The collection in the Zoology Department, University of Cape Town, consisting of some material left by the late Professor T. A. Stephenson from his intertidal survey of the coast, and a large body of material added more recently by Professor J. H. Day and his colleagues during work on estuaries, the bottom fauna of the continental shelf and the littoral area. Type specimens from this collection are housed in the South African Museum.

The collection in the South African Museum, much of it derived from dredgings of the s.s. *Pieter Faure* at the turn of the century.

The collection from Dr Th. Mortensen's Java-South Africa Expedition, 1929-1930, and material from the Universitetets Zoologiske Museum, København. A collection from Inhaca, Delagoa Bay, submitted by the University of the Witwatersrand, Johannesburg.

Material submitted by the Oceanography Department, University of Cape Town. Material submitted by the Zoology Department, Rhodes University, Grahamstown.

Material submitted by the Division of Sea Fisheries, Cape Town.

Material collected by the R/V *Anton Bruun* during the International Indian Ocean Expedition, 1964.

Material collected by Professor J. Bouillon, Bruxelles, on the coast of Moçambique in 1969.

Material collected by the author from various parts of the coast.

STRUCTURE AND TERMINOLOGY

Accounts of the detailed structure and histology of the Hydrozoa are readily obtainable in textbooks. The present account of the anatomy does not claim to be complete and is intended only to provide a glossary to the terms used in the keys and diagnoses.

The polyp and medusa phases characteristic of the life-history of the Hydrozoa are primarily radially symmetrical, though occasionally a secondary bilateral symmetry is superimposed. The polyp, or asexual generation, usually multiplies by vegetative propagation to produce colonies and is typically permanently attached to the substratum. The medusa, or sexual generation, is free-swimming and responsible for distribution of the sexual products.

The POLYP has a cylindrical body with a body-wall of ectoderm, endoderm and mesogloea, and it contains a cavity, or COELENTERON, with a single opening, the MOUTH. It consists of a base, the HYDRORHIZA, an upright stem, the HYDROCAULUS, and a terminal part bearing the mouth and tentacles, the HYDRANTH.

The HYDRORHIZA normally takes the form of branching tubes, or STOLONS, which ramify over the substratum and affix the body of the animal. In certain cases the stolons may fuse with one another to form a continuous mat, said to be INCRUSTING (Fig. 35C). In certain mud- and sand-dwelling forms the hydrorhiza is in the form of slender root-like ANCHORING FILAMENTS (Fig. 13). Forms also occur in which the hydrorhiza is provided with ATTACHMENT DISCS or PEDAL DISCS with adhesive properties (Fig. 142).

The HYDROCAULUS rises from the hydrorhiza and bears the hydranth, from which it is often not clearly demarcated. Its body-wall is the COENOSARC. Its cavity provides communication between the various parts of a colony; it is usually simple, but in some of the larger polyps may be provided with special

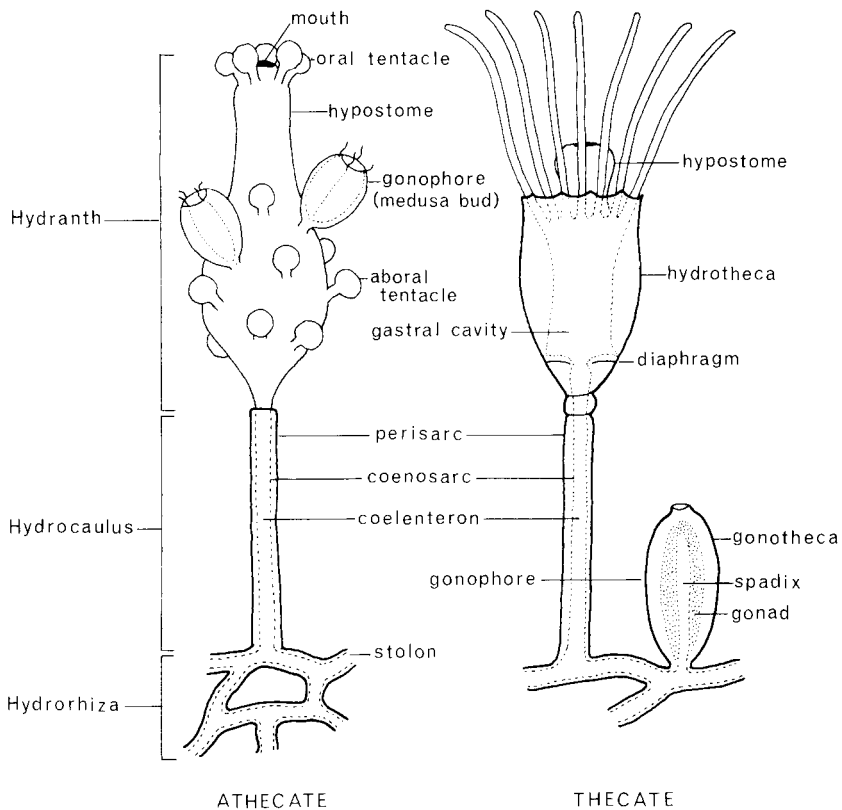


Fig. 2. Diagrammatic representation of the parts of the polyp generation.

