THE HOLOTHURIAN FAUNA OF SOUTHERN AFRICA

by

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To my parents, wife and children

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ABSTRACT

The last thorough revision of the southern African holothurian fauna appeared in 1948 and since then there have been numerous additions to the fauna. A comprehensive revision of the fauna is here undertaken on the basis of currently accepted changes in classification and nomenclature. The survey is based on the collections of the South African Museum and of the Universities of Cape Town and Durban-Westville. The material comprises some 2768 specimens distributed over six orders and 72 species. Another 48 species, excluding the two pelagic forms, are included to complete the survey. The about 95 species recorded from this region prior to this in= vestigation are tabulated in chronological sequence of their descriptions and/or records. The new taxa diagnosed include eight genera, one subgenus, 12 species and one subspecies. There are in addition 15 new records and 15 new synonyms. A checklist to all species known to date is included and keys reconstructed. Full descriptions of new species and those formerly inadequately described are given. The diagnoses of some others are modified and/or additional notes added. The zoogeographical distribution of the fauna, based on our current knowledge of ocean currents and their effects along the coast, is discussed and the following four faunal provinces recognised: tropical, subtropical, warm temperate and cold temperate. The relationship of the Dactylochirotida and Dendrochirotida is discussed. The inclusion of the Rhopalodinidae in the Dactylochirotida is questioned and so is also the status of the cucumariid subfamily Colochirinae. It is concluded that the southern African holothurian fauna is of largely Indo-Pacific origin with most of the endemic component probably representing cold water tolerants of former Indo-Pacific species. The Atlantic Ocean region has played a very small but significant role in the development of the fauna, while the contribution of the Southern Ocean and Antarctic regions is negligible.

INTRODUCTION

The southern African holothurian fauna is poorly known. Scarcely a dozen papers exist describing in particular the fauna of this region. Notable amongst these works are those of H.L. Clark (1923), Deichmann (1948) and Cherbonnier (1952a, 1970). The remaining papers describe merely one or two new species. The first comprehensive report is that of H.L. Clark (1923) prior to which only seven species had been reported from southern Africa (excluding Moçambique). The history of the southern African holothurians was detailed by Thandar (1971: unpublished Masters Thesis). It is here revised and tabulated, together with the present taxonomic status of each species (see Table 1).

H.L. Clark's (1923) survey, based on collections made by the South African Museum, included material not only from South Africa but also from South West Africa and Moçambique. Clark described three new species but included in his report all hitherto known species. He also provided a key to all the 30 then valid species discussed.

Ecological surveys carried out along the southern African coast by the University of Cape Town from the early thirties led to reports on the holothurians by Heding (1938), John (1939), Deichmann (1944, 1948) and Cherbonnier (1952a-1954, 1970).

A comprehensive revision of the southern African holothurians by Deichmann appeared in 1948, based partly on the University of Cape Town material and partly on the material present in the Museum of Comparative Zoology, Harvard (U.S.A.). Although Deichmann described no new species and excluded all refe= rence to the tropical Moçambique and truely deep water species, her revision included 22 certain species for which keys were provided and distributions detailed.

Cherbonnier's (1952a-1954, 1970) contributions led to descriptions of no fewer than 22 new species and redescriptions of several others. Although these descriptions are detailed and well illustrated, Cherbonnier neither included keys nor diagnoses and his earlier works (1952a,1953) suffered much from lack of any considerations given to Panning's (1949) revision of the family Cucumariidae. Despite this, the reports went a long way in resolving the validity of Cucumaria insolens Théel, regarded by Deichmann to be conspecific with C. sykion (Lampert), and of Thyone articulata Vaney, considered by Deichmann to be conspecific with T. aurea (Quoy and Gaimard). Of the 22 new species described by Cherbonnier as many as 17 appear to be valid but at least 12 are based on single specimens and six still require verification from new material.

The Natal shallow water holothurians were worked out in detail by Thandar (1971: unpublished Masters Thesis). Subsequently the descriptions of two new species were published from this work (Thandar, 1977).

Our knowledge of the Moçambique holothurian fauna stems largely from the works of Semper (1868), Bell (1884), Pearson (1910a), H.L. Clark (1923), Cherbonnier (1952a, 1970) and from reports of the University of Witwatersrand ecological surveys at Inhaca Island (Kalk, 1958;Macnae and Kalk, 1958, 1962) and on the shores of northern Moçambique (Kalk, 1959). Besides the endemic Psolidium ornatum described by E. Perrier (1893) and four others by Cherbonnier (1970), most of the remaining species are well known tropical Indo-West Pacific forms.

Our knowledge of the southern African deep sea holothurians is scanty. The only major collections reported were six shelf species collected by the 'Valdivia'(Ludwig and Heding, 1935) and seven abyssal species taken by the 'Galathea' (Hansen, 1975). In addition to these two abyssal species each were recorded by H.L. Clark (1923) and Cherbonnier (1952a) and one by A.M. Clark (1977).

Although about 95 species have so far been recorded from southern Africa (including the whole of South West Africa and Moçambique) the various authors have been inconsistent in their use of current taxonomic changes and nomenclature. This is especially true of the dendrochirotids, many of which are still known by names given to them by their original des= cribers (see Day, 1974a). The most recent comprehensive key to the southern African holothurians was published some 35 years ago by Deichmann (1948) who is still the only writer to have detailed the distribution of the shallow water species with the exception of Day (1974a) who outlines the distribution of some of the commoner shore forms.

The taxonomy of holothurians is still in hiatus despite the works of such careful researchers as Selenka, Semper, Ludwig, Théel, Sluiter, Koehler and Vaney, H.L. Clark, Heding, Panning, Deichmann, Rowe, Hansen and others. In fact, Clark and Courtman-Stock (1976) excluded the holothurians from their monograph of the southern African echinoderms.

In this thesis many species are rediagnosed and/or additional notes added, new synonymies are realised and keys reconstructed. A number of new taxa are described, the composition and zoogeographical implications of the fauna are discussed, and some taxonomic problems highlighted.

ACKNOWLEDGEMENTS

In work of this nature the number of persons and institutions to whom gratitude is due cannot be fully listed. I, therefore, single out a few with the hope that those I have not listed will forgive me for this. I am greatly indebted to my promotors Dr F.W.E. Rowe of the Australian Museum and Prof. A.L. Smit of the University of Durban-Westville for supervising the research. Without Dr Rowe's expert guidance, continued encouragement and constructive criticism, this investigation would not have reached completion. My sincere thanks are also due to Drs. T.H. Barry and N.A.H. Millard of the South African Museum and Prof. A.C. Brown of the University of Cape Town, for the loan of their invaluable collections, for providing working space at their institutions, and for their assistance in locating types and/or data required. Gratitude is also due to Drs. Cherbonnier and Guille of the Paris Museum of Natural History for supplying type material and reprints; to Miss A.M. Clark of the British Museum of Natural History and Dr D.L. Pawson of the United States National Museum for providing advice, foreign species and literature, at times on very short notice; to Dr E. Tortonese, formerly of the Instituto Zooprofillatico in Italy, for donating several Mediterranean species from his private collection. Permission was granted by the Trustees of the British Museum of Natural History to reproduce maps. Gratitude is also due to my colleagues in the Zoology and Botany departments of the University of Durban-Westville for their continued encouragement and generous assistance in the form of discussions, material and information. Special thanks here are due to Mr F.L. Farquharson for critically reading parts of the manuscript. Grants made by the South African Council for Scientific and Industrial Research towards travel expenses and by the University of Durban-Westville Research Fund for purchase of literature, are gratefully acknowledged. Finally, my sincere thanks are due to my dear wife and children for their patience, tolerance and understanding during the long years the research was in progress.

TABLE 1. Southern African holothurian species in chronological sequence of their descriptions and/or first records. Since type localities, type locations (where known) and the present taxonomic status of each nominal species are included, those species recorded under more than one name are of necessity duplicated.

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Pallas, 1766	Actinia doliolum Pallas, 1766	Lost	Cape of Good Hope	Type locality	Pentacta doliolum (Pallas, 1766)
Quoy & Gaimard, 1833	Holothuria aurea (Quoy & Gaimard, 1833)	Lost; Neotype (LB1) in PMNH-designated Cherbonnier, 1952a)	Cape of Good Hope	Type locality	Thyone aurea (Quoy & Gaimard, 1833)
J. Müller, 1850	Chiridota violacea J. Müller, 1850	MCZ (syntype)	Ibo (N. Moçambique)	Type locality	No change
Semper, 1868	Cucumaria africana Semper, 1868	?Germany	Querimba (N. Moçambique)	Type locality	Afrocucumis africana (Semper, 1868)
	Holothuria atra Jaeger, 1833	?Lost	Celebes (Indonesia)	Moçambique	H.(Halodeima) atra Jaeger, 1833
	Holothuria edulis Lesson, 1830	PMNH	Molucca Is.	Moçambique	H.(Halodeima) edulis Lesson, 1830
	H. impatiens Forskaal, 1775	?Lost	Red Sea	"	H.(Thymiosycia) impatiens Forskaal, 1795
	H. monocaria Lesson, 1830	PMNH	Society Is.	"	?H.(Thymiosycia) hilla Lesson, 1830
	H. pardalis Selenka, 1867	MCZ (syntype)	Sandwich Is. & Zanzibar	"	H.(Lessonothuria) pardalis Selenka, 1867
	H. pulchella Selenka, 1867	MCZ	Hawaii	"	H.(Semperothuria) cinerascens (Brandt, 1835)
	H. scabra Jaeger, 1833	?Lost	Celebes (Indonesia)	"	H.(Metriatyla) scabra Jaeger, 1833
	H. vagabunda Selenka, 1867	MCZ	Hawaii	"	H.(Mertensiothuria) leucospilota (Brandt, 1835)
	Stichopus chloronotus Brandt, 1835	Lost	Lugunor & Guam	"	No change
	Thyone rigida Semper, 1868	? Germany	Bohol (Phillipines)	"	Stolus buccalis (Stimpson, 1856)

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Ludwig, 1875	Cucumaria improvisa Ludwig, 1875	Lost	Algoa Bay (S.Afr.)	Type locality	Trachythyone improvisa (Ludwig, 1875)
Ludwig, 1882	Cucumaria frauenfeldi Ludwig, 1882	Leyden (Holland)	Cape of Good Hope	Type locality	Roweia frauenfeldi frauenfeldi (Ludwig, 1882)
Bell, 1884	Holothuria atra var. amboinensis Bell, 1884	BMNH	Amboina	Moçambique	H.(Halodeima) atra Jaeger, 1833
Bell, 1884	H. lagoena Bell, 1884	BMNH	Moçambique	Type locality	H.(Mertensiothuria) leucospilota (Brandt, 1835)
Bell, 1884	H. maxima delle Chiaje, 1823	-	-	"	Proposed for suppression (Clark & Rowe, 1967a)
Bell, 1884	H. pulla Selenka, 1867	?Berlin Mus.	Amboina	"	H.(Halodeima) pulla Selenka, 1867
Bell, 1884	Mulleria mauritiana (Quoy & Gaimard, 1833)	?PMNH	Mauritius	"	Actinopyga mauritiana (Quoy & Gaimard, 1833)
Lampert, 1885	Cucumaria jägeri Lampert, 1885	Lost	Natal (S.Afr.)	Type locality	Pseudocnella sykion (Lampert, 1885)
Lampert, 1885	C. posthuma Lampert, 1885	?Stuttgart	Table Bay	"	Roweia frauenfeldi frauenfeldi (Ludwig, 1882)
Lampert, 1885	Holothuria parva Lampert, 1885	?Lost	Natal (S.Afr.)	"	H.(Selenkothuria) parva Lampert, 1885
Lampert, 1885	Semperia sykion Lampert, 1885	Lost	Algoa Bay (S. Afr.)	"	Pseudocnella sykion (Lampert, 1885)
Thēel, 1886a	Cucumaria capensis Thēel, 1886	BMNH	Off Cape Point (S. Afr.)	Type locality	Ocnus capensis (Thēel, 1886)
Thēel, 1886a	C. discolor Thēel, 1886	BMNH	Simons Bay (S. Afr.)	"	Pentacta doliolum (Pallas, 1766)
Thēel, 1886a	C. insolens Thēel, 1886	BMNH	"	"	Pseudocnella insolens (Thēel, 1886)
Thēel, 1886a	Holothuria africana Thēel, 1886	BMNH	"	"	H.(Halodeima) mexicana Ludwig, 1875

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
R. Perrier, 1893	Georisia ornata R. Perrier, 1893	?PMNH	Moçambique Channel (25m)	Type locality	Psolidium ornatum (R. Perrier, 1893)
Vaney, 1908	Thyone articulata Vaney, 1908	Edinburgh Mus.	Saldanha Bay (S. Afr.) (16-18m)	Type locality	Thyonina articulata (Vaney, 1908)
Britten, 1910	Cucumaria leonina var. africana Britten, 1910	MCZ (syntype)	Luderitz (S.W.A.)	Type locality	Pseudocnella insolens (Théel)
	Thyone serratus Britten, 1910	?	"	"	Thyone aurea (Quoy & Gaimard, 1833)
	Cucumaria semperi Bell, 1884	BMNH (Lectotype 82.2.22.116) designated Pawson, 1967	Port Denison & Torres Straits (latter lectotype locality)	Pekawi (Querimba)	Hemithyone semperi (Bell, 1884)
	C. turbinata Pearson, 1910 (non Hutton)	Colombo Mus.	Pekawi (Querimba)	Type locality	Ohshimella ehrenbergii (Selenka, 1867)
	Holothuria albiventer Semper, 1868	?Germany	Phillipine Is.	Querimba (N. Moç.)	H.(Metriatyla) albiventer Semper, 1868
	H. curiosa Ludwig, 1875	?Hamburg Mus.	Bowen (Aust.)	Matemo Is. (Querimba)	H.(Mertensiothuria) leucospilota (Brandt, 1835)
Pearson, 1910a	H. doffleinii Augustin, 1908	?	?	Tunghi Bay (Querimba)	H.(Mertensiothuria) pervicax Jaeger, 1833
	H. lineata Ludwig, 1875	?Hamburg	Bowen (Aust.)	Maiyapa Bay (Querimba)	H.(Lessonothuria) pardalis Selenka, 1867
	H. marmorata Jaeger, 1833	?Lost	Celebes (Indonesia)	Tunghi Bay (Querimba)	Bohadschia marmorata Jaeger, 1833
	H. martensii Semper, 1868	?Germany	Amboina	S. of Pekawi (Querimba)	H.(Metriatyla) martensii Semper, 1868
	Müllleria lecanora Jaeger, 1833	Lost	Celebes (Indonesia)	Maiyapa Bay (Querimba)	Actinopyga lecanora (Jaeger, 1833)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Pearson, 1910a (contd.)	M. mauritiana (Quoy & Gaimard, 1833)	PMNH	Mauritius	Matemo Is. (Querimba)	Actinopyga mauritiana (Quoy & Gaimard, 1833)
	M. miliaris (Quoy & Gaimard, 1833)	?PMNH	Vanikoro Is.	"	Actinopyga miliaris (Quoy & Gaimard, 1833
	Pseudocolochirus violaceus (Théel, 1886)	BMNH	Indian Ocean, (11°6'N, 123° 9'E) 38m	Maiyapa Bay (Querimba)	No change
	Stichopus variegatus Semper, 1868	?Germany	Phillipine & Navigator Is.	"	No change
	Synapta grisea Semper, 1868	"	Bohol (Phillipine Is.)	Tunghi Bay (Querimba)	No change
Gilchrist, 1920	Planktothuria diaphana Gilchrist, 1920	Lost	Off Cape of Good Hope	Type locality	No change
H.L. Clark, 1923	Benthodytes sanguinolenta Théel, 1882	BMNH	Off coast of Chile, 4069m	Off Cape Point, 1372m	No change
	Cucumaria spyridophora H.L. Clark, 1923	SAM(A6453) MCZ (paratype)	Mossel Bay (S.Afr.)	Type locality	Aslia spyridophora (H.L. Clark, 1923)
	Echinocucumis typica H.L. Clark, 1923 (non Sars, 1859)	SAM, PF 17350	Off Cape Point 1674-1830m	"	Ypsilothuria bitentaculata (Ludwig, 1893)
	Holothuria cinerascens (Brandt, 1835)	Lost	Boninshima (Japan)	Natal and ?Moçambique	H.(Semperothuria) cinerascens (Brandt, 1835)
	H. difficilis Semper, 1868	MCZ(syntype)	Samoa	Moçambique	H.(Platyperona) difficilis Semper, 1868
	H. grammata H.L. Clark, 1923	SAM (A6455) MCZ(paratype)	Sebastian Bay (S. Afr.)	Type locality	Neostichopus grammatus (H.L. Clark, 1923)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
H.L. Clark, 1923 (contd.)	H. leucospilota (Brandt, 1835)	Lost	Ualan, Marshall Is.	Natal and ?Moçambique	H.(Mertensiothuria) leucospilota (Brandt, 1835)
	H. pardalis H.L. Clark, 1923 (non Selenka, 1867)	SAM	Natal/Moçambique	Natal/Moçambique	H.(Lessonothuria) insignis Ludwig, 1875
	Phyllophorus frauenfeldi Ludwig, 1875	Vienna Mus.	Red Sea	Natal	Ohshimella ehrenbergii (Selenka, 1867)
	Pseudocucumis africana (Semper, 1868)	?Germany	Querimba (N. Moçambique)	Moçambique	Afrocucumis africana (Semper, 1868)
	Psolus imperfectus H.L. Clark, 1923	SAM A6454 MCZ(paratype)	Off Cape Agulhas (376m)	Type locality	No change
	P. squamatus H.L. Clark, 1923 (non O.F. Müller, 1776)	SAM (PF 14310)	Agulhas Bank (S. Afr.) (146m)	Type locality	Psolus agulhasicus Ludwig & Heding, 1935
	Thyone sacellus (Selenka, 1867)	MCZ(syntype)	Zanzibar	Moçambique	Stolus buccalis (Stimpson, 1856)
Ludwig & Heding (1935)	Cucumaria?chuni Ludwig & Heding, 1935	?Bonn (W.Germany)	Off S.W. Cape, 318m	Type locality	Temparena chuni (Ludwig & Heding, 1935)
	Cucumaria? velligera Ludwig & Heding, 1935	"	Off S.W. Cape, 318m	"	Sclerothyone velligera (Ludwig & Heding, 1935)
	Cucumella triplex Ludwig & Heding, 1935	"	Agulhas Bank (155m)	"	No change
	Psolus agulhasicus Ludwig & Heding, 1935	"	Agulhas Bank (155m)	"	No change
	P. capensis Ludwig & Heding, 1935	"	Agulhas Bank (86-102m)	"	No change
	Thyone venustella Ludwig & Heding, 1935	"	Agulhas Bank (155m)	"	Havelockia venustella (Ludwig & Heding, 1935

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Heding, 1937	Rhopalodinopsis capensis Heding, 1937	Copenhagen	Kalk Bay (S.Afr.)	Type locality	No change
Heding, 1938	Cucumaria tetracentriophora Heding, 1938	BMNH	South Africa	Type locality	Pseudoaslia tetracentriophora (Heding, 1938)
John, 1939	Cucumaria stephensoni John, 1939	BMNH	St. James (S. Afr.)	Type locality	Roweia stephensoni (John, 1939)
Heding, 1940	Mesothuria (Zygothuria) lactea (Thēel, 1886)	BMNH	Off New Zealand, 1880m	Off S.W. Africa, 936m	Mesothuria lactea (Thēel, 1886)
	Molpadia capensis Heding, 1940	Copenhagen	South Africa	Type locality	No change
Deichmann, 1944	Urodemas bifurcatum Deichmann, 1944	UCT, M9F1, MCZ(paratype)	Umtwalumi (S. Afr.)	Type locality	Cladolabes bifurcatus (Deichmann, 1944)
Panning, 1944	Actinopyga echinites crassa Panning, 1944	Berlin Mus (2684)	Port Moresby & Querimba	Querimba	Actinopyga crassa Panning, 1944
	A. echinites echinites (Jaeger, 1833)	?Lost	Celebes (Indonesia)	"	Actinopyga echinites (Jaeger, 1833)
	A. echinites plebeja (Selenka, 1867)	MCZ(syntype)	Zanzibar	"	Actinopyga plebeja (Selenka, 1867)
Deichmann, 1948	Cucumaria crucifera Semper, 1867	Lost. Lectotypes & paralectotypes in Hamburg Mus; 2760	Aden	Umtwalumi (Natal)	Trachythyone crucifera (Semper, 1867)
	Leptosynapta sp.	-	-	Buffels River	Leptosynapta knysnaensis (Cherbonnier, 1952)
	Patinapta crosslandi Heding, 1928	Copenhagen	Zanzibar	Port Edward (Natal)	No change

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
	Cucumaria deichmanni Cherb., 1952	SAM; PMNH (EcHh 1480) paratype	Swakopmund (S.W. Afr.)	Type locality	Roweia frauenfeldi frauenfeldi (Ludwig, 1882)
	C. rigidapeda Cherb., 1952	UCT (Afr.738B)	Off Hondeklip Bay (S.Afr.), 185m	"	Trachythyone rigidapeda (Cherbonnier, 1952)
	C. sinorbis Cherb., 1952	SAM; PMNH, EcHh 1481 (syntypes)	Port Edward & Table Bay (S. Afr.)	"	Pseudocnella sinorbis (Cherbonnier, 1952)
Cherbonnier, 1952a	Epitomapta knysnaensis Cherb., 1952	UCT, KNY 36G	Knysna (S.Afr.)	"	Leptosynapta knysnaensis (Cherbonnier, 1952)
	Ophiodesoma mauritiae Heding, 1928	Copenhagen Mus.	Mauritius	Inhaca Is. (Moçambique)	No change
	Synallactes mollis Cherb., 1952	UCT, AFR. 723.5.7B	Off S.W. Cape, 376m	Type locality	"
	S. viridilimus Cherb., 1952	UCT, AFR. 700C	Off S.W. Cape, 545m	"	"
	Taeniogyrus dayi Cherb., 1952	UCT, FB 1051B	False Bay (S. Afr.)	"	"
	Thyone procera= corona Cherb., 1952	UCT, TB 81A[2]	Table Bay (S. Afr.)	"	Thyone aurea (Quoy & Gaimard, 1833)
Cherbonnier, 1953	Cucumaria corbula Cherb. 1953	PMNH, EcHh 1483	False Bay (S. Afr.)	Type locality	Ocnus corbulus (Cherbonnier, 1953)
	Epitomapta sp.	-	-	Simons Bay	Leptosynapta knysnaensis (Cherbonnier, 1952)
Cherbonnier, 1954	Leptosynapta ancoracuta Cherb., 1953	PMNH, EcHh 1478	Simons Bay (S.Afr.)	Type locality	No change
	Leptosynapta sp.	-	-	Durban	Leptosynapta naiga sp. nov.
	Thyone infusca Cherb., 1954	PMNH, EcHh 1482	Oatland Pt. (False Bay), 8-9m	Type locality	No change

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Cherbonnier, 1954	T. turrisolida Cherb., 1954	PMNH, EcHh 1476	Simonstown (S. Afr.)	Type locality	Thyone aurea (Quoy & Gaimard, 1833)
Macnae & Kalk, 1958	Chiridota stuhlmanni Lampert, 1896	?Stuttgart	Tumbatu (E. Afr.)	Inhaca Is.	No change
	Colochirus minutus (non Ludwig, 1875)	?Univ. of Witwatersrand (S. Afr.)	Inhaca Is.	"	?Pentacta tessellera Cherbonnier, 1970
	H. cumulus H.L. Clark, 1921	MCZ	Murray Is.	"	H.(?Lessonothuria) cumulus H.L. Clark, 1921
	Holothuria hilla Lesson, 1830	PMNH	Borabora (Society Is.)	"	H.(Thymiosycia) hilla Lesson, 1830
	H. pervicax Selenka, 1867	MCZ (syntype)	Zanzibar & Hawaii	"	H.(Mertensiothuria) pervicax Selenka, 1867
	Synapta oceanica Lesson, 1830	?PMNH	Tahiti	"	No change
Kalk, 1958	Thyone mirabilis Ludwig, 1875	?Hamburg	Phillipine Is.	Inhaca Is.	Havelockia versicolor (Semper, 1868)
Kalk, 1959	Holothuria erinaceus Semper, 1868	MCZ (syntype)	Bohol, Fiji Is., Port Mackay (Australia)	Mocambique Is.	H.(Selenkothuria) erinaceus Semper, 1868
Macnae & Kalk, 1962	Holothuria arenicola Semper, 1868	?Germany	Bohol (Phillip. Is.)	"	H.(Thymiosycia) arenicola Semper, 1868
Cherbonnier, 1970	Havelockia imperfecta Cherb., 1970	PMNH, EcHh 1486	False Bay (S. Afr.)	Type locality	Thyone imperfecta (Cherbonnier, 1970)
	Leptosynapta pustulosa Cherb., 1970	PMNH, EcHh 1497	Morrumbene (Moç.)	"	No change
	Pentacta squamosa Cherb., 1970	PMNH, EcHh 1484	False Bay	"	"

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
	P. tessellara Cherb., 1970	PMNH, EcHh 1485	Morrumbene (Moç) 3-5m	Type locality	No change
	Rhopalodinaria gigantea Cherb., 1970	PMNH, EcHh 1495	False Bay (S. Afr.) 82m	"	"
Cherbonnier, 1970 (contd.)	R. minuta Cherb., 1970	PMNH, EcHh 1496	False Bay (S. Afr.) 44m	"	"
	Selenkiella paradoxa Cherb., 1970	PMNH, EcHh 1494	Morrumbene (Moç) 3-5m	"	"
	Thyone avenusta Cherb., 1970	PMNH, EcHh 1487	Morrumbene (Moç)	"	"
	T. hirta Cherb., 1970	PMNH, EcHh 1489	False Bay (S. Afr.) 48m	"	"
	T. propinqua Cherb., 1970	PMNH, EcHh 1493	Mossel Bay (S. Afr.) 19m	"	"
	Benthodytes lingua R. Perrier, 1896	PMNH	North Atlantic (30°08'N, 14°02'W)	South Africa	No change
	B. plana Hansen, 1975	ZMC	Off Port St. Johns (Transkei) 3620m	Type locality	"
	B. typica Théel, 1882	BMNH	Off Morocco, 1993m	Off Transkei & Mocambique Channel (2720-3620m)	"
Hansen, 1975	Deima validum validum Théel, 1879	BMNH	North Pacific, (36°10'N, 178°00'E), 3749m	Off Durban & Mocambique Channel (2720-3680m)	"
	Laetmogone fimbriata (Sluiter, 1901)	Zool. Mus. Amsterdam	Banda Sea (0°54'S, 128°39'E)	Off Durban (412m)	"

Table 1 (contd.)

AUTHOR	SPECIES	TYPE LOCATION	TYPE LOCALITY	FIRST S. AFRICAN RECORD	PRESENT STATUS
Hansen, 1975 (contd.)	Oneirophanta mutabilis Théel, 1879	BMNH	South Indian Ocean, 22-54°S, 45-170°E, 2515-5304m	Off Durban & Moçambique Channel (3390-3530m)	No change
	Psychropotes verrucosa (Ludwig, 1894)	MCZ	Off Cuba (1°7'N, 80°21'W),2877m	Off Durban, 3530m	"
Thandar, 1977	Cucumaria webbi Thandar, 1977	Natal Mus. (Pietermaritzburg) (1603)	Isipingo (S.Afr.)	Type locality	Roweia frauenfeldi webbi (Thandar, 1977)
	Holothuria (Selenkothuria) perrieri Thandar, 1977	" (1604)	Perriers Rock (Natal, S.Afr.)	"	H.(Selenkothuria) parva Lampert, 1885
A.M. Clark, 1977	Orphnurgus glaber (non Walsh)	BMNH	Off Natal Coast	Type locality	Orphnurgus aspersignis sp. nov.
Cherbonnier, 1979	Thelenota anax H.L. Clark, 1921	MCZ	Murray Is.	Moçambique Channel	No change

MATERIAL AND METHODS

1. LIMITS OF STUDY AREA

Day (1967), in his monograph of the polychaetes, places the northern limit of southern Africa arbitrarily at 20°S latitude while Clark and Courtman-Stock (1976), in their monograph of the other echinoderms, place the northern limit at 23½S latitude. However, for the present investigation, all holothurian species so far known from Moçambique are included since any tropical Indo-Pacific species not yet known from south of the tropic of Capricorn can be expected to come down, under the influence of the southbound Moçambique-Agulhas Current, as far as the southern limit of Natal at about 31°S or even beyond to Transkei at 32°S latitude. Further, some old records from Moçambique do not list the actual locality where a particular species was obtained. Hence on the east coast the northern limit is taken arbitrarily as the northern border of Moçambique at about 10°S latitude.

On the west coast, however, the northern limit is taken as the northern border of South West Africa at about 17°S latitude since the northbound cold Benguella current successfully prevents the influx of shallow water tropical West African species down the coast. Further, the holothurian fauna of Angola is too poorly known to make any comparison with that of South West Africa worth=while.

Hence, although the northern limit may appear to be political rather than geographical, the hydrographical conditions on both sides of the southern African subcontinent make such a limitation desirable. Of course, many tropical Indo-Pacific species, not yet recorded from Moçambique or Natal but occurring further north or east, may yet be found on the east coast and similarly several continental shelf and deep sea East Atlantic species known from north of Angola will one day turn up on the west coast. Even if the northern limit is placed at 23½°S latitude the number of nominal species is reduced from 122 to 110.

2. SOURCES OF MATERIAL

The following abbreviations are used throughout the text to denote institutions whose specimens were either utilised in the survey or where type material is housed, or from which specimens for comparative work were obtained.

BMNH - British Museum (Natural History), London.
MCZ - Museum of Comparative Zoology, Harvard, U.S.A.
PMNH - National Museum of Natural History, Paris.
SAM - South African Museum, Cape Town.
UCT - University of Cape Town.
UDW - University of Durban-Westville, Durban.
USNM - United States National Museum (Smithsonian Institution) Washington.
ZMC - Zoological Museum, University of Copenhagen.

Material used in this investigation includes some 2768 specimens in the collections of the SAM, UCT and UDW. The number of specimens and species examined from each of the above institutions is listed in Table 2. (See Appendix for details of Station lists).

Table 2. Material list. Local collections.

Source	No. of specimens	Range of Stations	No. of species
UCT	1101	Swakopmund, near Walvis Bay (SWA) to Morrumbene near Inhambane (Moçambique)	41
SAM	297	Rocky Point (northern S.W.A.) to Zavora, S. of Inhambane	39
UDW	1370	Saldanha Bay (C.P.) to Vilanculos, N. of Inhambane	37
Total	2768		72

The following paratypes were received through the courtesies of Drs. Cherbonnier and Guille of the PMNH.

Pentacta tessellara Cherbonnier, 1970, EcHh 1485.

Thyone hirta Cherbonnier, 1970, EcHh 1489.

Rhopalodinaria gigantea Cherbonnier, 1970, EcHh 1495.

R. minuta Cherbonnier, 1970, EcHh 1496.

In addition fragments of type material from the PMNH, the entire Reference Collection of the UCT, and some extant dry specimens in the SAM, used by H.L. Clark (1923), were examined (See Discussion). Foreign species obtained, through the generosities of Miss Clark (BMNH), Dr. Pawson (USNM) and Dr. Tortonese, for comparison with local forms, are listed in Table 3.

Table 3. Material list. Foreign species.

Source	Species	Locality	No. of specimens
BMNH	Pseudocnus dubiosus koellikeri (Semper)	Naples	2
	Pseudocnus dubiosus leoninus (Semper) (syntypes of P. mendax (Théel))	Falkland Is.	2
	Pseudocnus (=Ocnus) syracusanus (Grube)	Naples	2
	Thyone fusus (O.F. Müller)	N. Ireland	2
USNM	Pseudocnus dubiosus dubiosus (Semper)	Falkland Is.	10
	Pseudocnus dubiosus koellikeri (Semper)	Naples	1
	Pseudocnus (=Ocnus) syracusanus (Grube)	El Maghreb	2
	Pentamera calcigera (Stimpson)	Labrador, 90m	5
	Pentamera pulcherrima Ayres	Virginia	10
	Thyone fusus (O.F. Müller)	Norway	1
Dr. Tortonese (Private Collection)	Pseudocnus dubiosus koellikeri (Semper)	Sicily	1
	Pseudocnus (=Ocnus) syracusanus (Grube)	Atlith (Israel)	1
	Thyone fusus (O.F. Müller)	North Adriatic Sea	1

3. PRESENTATION OF DATA

Although the locality lists (Appendix 1) are given systematically from the west to the east coast it is not always possible to locate any particular area on an average map of southern Africa. Hence the practice of Day (1967) in expressing distribution in terms of latitude and longitude degree squares is used in the locality lists as well as in the text, the latter to indicate both previous records and examined material. This system was also adopted by Clark and

Courtman-Stock (1976) and it is hoped will become the standard system for expressing distribution of other southern African fauna. Such a system allows the reader to pin-point any locality in a 60 mile square formed by a degree of latitude and longitude. Following Day, the words south latitude and east longitude are omitted since the southern African region lies south of the equator and east of Greenwich Meridian. The main localities and degree squares are indicated on Map 1 (p.23).

The following symbols are used to denote provinces and depth records, the latter are the same as those used by Clark and Courtman-Stock for the other echinoderms.

PROVINCE

A - Angola
C - Cape Province
M - Moçambique
N - Natal
SWA- South West Africa
T - Transkei

DEPTH RANGE

i - intertidal
s - shallow (0-99m)
d - deep (100-499m)
vd - very deep (over 500m)

4. PREPARATION OF MATERIAL

The specimens were studied according to conventional methods outlined by other workers, notably Deichmann (1948) and Rowe and Doty (1977). Although all spicule illustrations were made by camera lucida from temporary mounts in water, permanent preparations were also made. It was found that the quickest way to remove the spicules was to macerate a fragment of the body wall in a watch glass containing antiformin. For permanent preparations the spicules were washed in two rinses each of distilled water and absolute alcohol, transferred with a fine pipette together with a little alcohol onto a glass slide and the alcohol allowed to quickly evaporate by placing the slide on a slide warmer. The spicules were then mounted directly in Canada Balsam or euparin. It is imperative that the mountant be neutral or slightly alkaline otherwise the spicules are rapidly corroded.

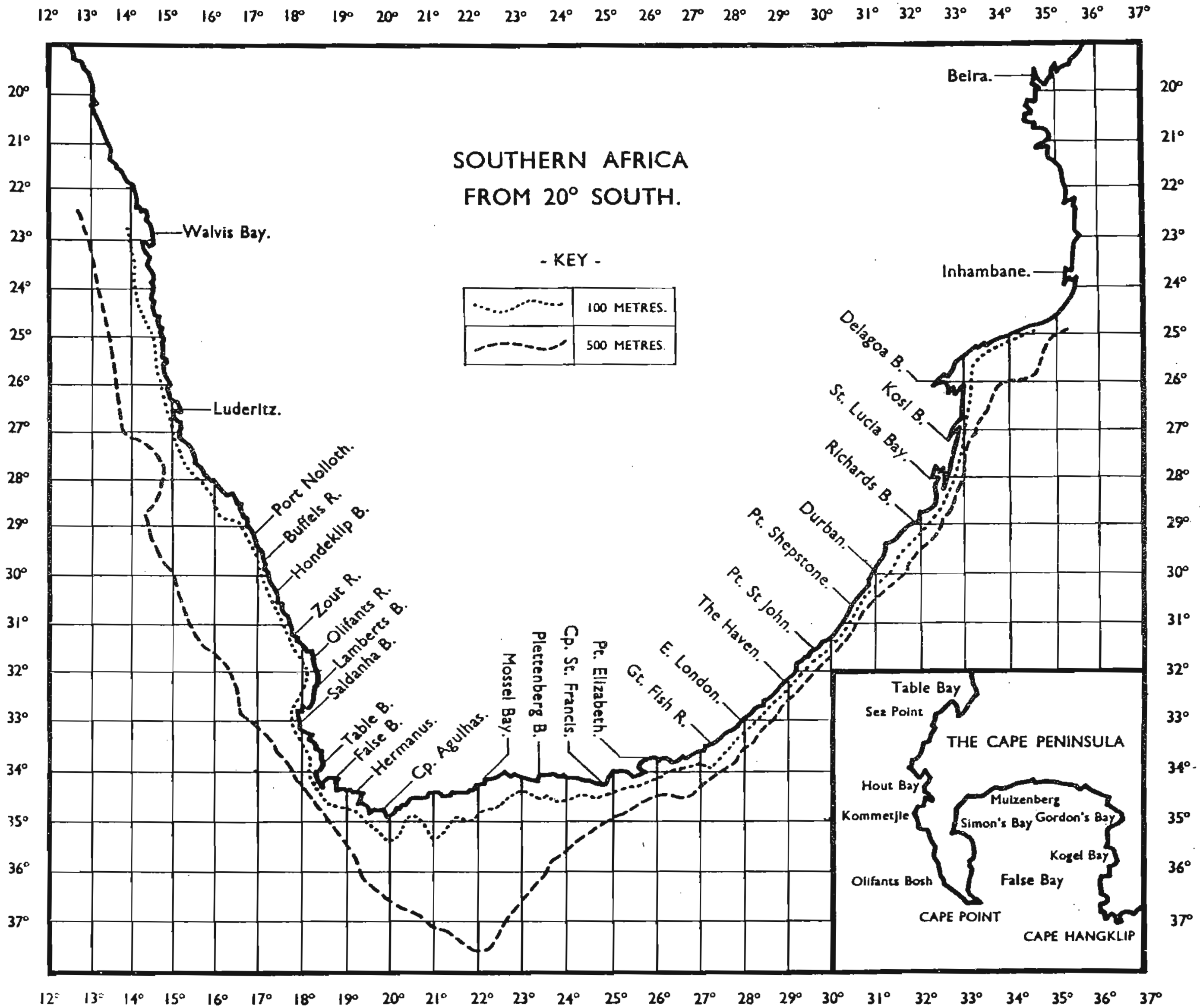
5. TAXONOMIC SYSTEM ADOPTED

Despite certain reservations expressed by Hansen (1975) and more recently by Pawson (1982) the groupings of the higher taxa adopted in the present survey is that proposed by Pawson and Fell (1965), based on the shape of the tentacles, the structure of the calcareous ring and on the form of the spicules. This system led to the diagnoses of three subclasses, one new order and two new families and resulted in the various subfamilies of the Cucumariidae and Phyllophoridae becoming intermixed. This system has gained some support from Panning, Cherbonnier and Rowe amongst some of the more recent workers.

The synonymies are limited to original references to the species; taxonomic and ecological papers dealing in particular with the southern African fauna; works of a general nature; and those in which detailed descriptions of the species can be obtained or to some other more useful publications.

The habit or habitat notes are based on the author's personal observations as well as those of others. A key to the genera precedes the systematic account. Keys to the species are included under respective genera in the text. For species not examined by the writer the original work describing the species has been consulted. Not to burden the reader with diagnoses of known taxa these have been avoided as far as possible. In any case the chief diagnostic features of each taxon can be obtained from the key/keys. With this in mind the keys to the larger genera are somewhat detailed. The species are alphabetically arranged for easy reference and in no way indicate relationships which are fully discussed for each taxon.

All six orders of holothurians are represented in southern Africa. Apart from the 72 nominal and two unnamed species present in the material a further 48 species formerly recorded are included to complete the survey. However, no reference is made, except in the checklist and the discussion, to the two poorly known pelagic species, Pelagothuria ludwigii Chun, 1900, recorded by Heding (1940) and Plankothuria diaphana described by Gilchrist, 1920.



Map 1. Southern Africa showing main localities. (By courtesy of the Trustees of the British Museum (Natural History).

CHECKLIST OF SOUTHERN AFRICAN HOLOTHUROIDEA

Subclass Dendrochirotacea Grube, 1840

Order Dendrochirotida Grube, 1840

Family Phyllophoridae Oestergren, 1907

Subfamily Thyoninae Panning, 1949

Genus Havelockia Pearson, 1903

H. venustella (Ludwig and Heding, 1935)

(H. versicolor (Semper, 1868))

Genus Hemithyone Pawson, 1963

(H. semperi (Bell, 1884))

Genus Stolus Selenka, 1867

S. buccalis (Stimpson, 1856)

Genus Thyone Jaeger, 1833

T. aurea (Quoy and Gaimard, 1833)

T. avenusta Cherbonnier, 1970

(T. hirta Cherbonnier, 1970)

(T. imperfecta (Cherbonnier, 1970))

(T. infusca Cherbonnier, 1954)

(T. propinqua Cherbonnier, 1970)

• T. ? venusta Selenka, 1869

*Genus Thyonina Gen. nov.

† T. articulata (Vaney, 1908)

Subfamily Phyllophorinae Oestergren, 1907

Genus Selenkiella Heding and Panning, 1954

(S. paradoxa Cherbonnier, 1970)

Subfamily Semperiellinae Heding and Panning, 1954

Genus Neothyonidium Deichmann, 1938

*N. arthroprocessum sp. nov.

Family Sclerodactylidae Panning, 1949

Subfamily Sclerodactylinae Panning, 1949

*Genus _Sclerothyone_ Gen. nov.

†_S. velligera_ (Ludwig and Heding, 1935)

*Genus _Temparena_ Gen. nov.

†_T. chuni_ (Ludwig and Heding, 1935)

Subfamily Cladolabinae Heding and Panning, 1954

Genus _Afrocucumis_ Deichmann, 1944

A. africana (Semper, 1868)

Genus _Cladolabes_ Brandt, 1835

C. bifurcatus (Deichmann, 1944)

Genus _Ohshimella_ Heding and Panning, 1954

O. ehrenbergii (Selenka, 1867)

Family Psolidae E. Perrier, 1902

Genus _Psolus_ Düben and Koren, 1846

(_P. agulhasicus_ Ludwig and Heding, 1935)

(_P. capensis_ Ludwig and Heding, 1935)

(_P. imperfectus_ H.L. Clark, 1923)

Genus _Psolidium_ Ludwig, 1887

(_P. ornatum_ (E. Perrier, 1893))

Family Cucumariidae Ludwig, 1894

Subfamily Colochirinae Panning, 1949

Genus _Aslia_ Rowe, 1970

A. spyridophora (H.L. Clark, 1923)

*Genus _Pseudoaslia_ Gen. nov.

†_P. tetracentriophora_ (Heding, 1937)

Genus <u>Ocnus</u> Forbes and Goodsir, 1841

<u>O</u>. <u>capensis</u> (Théel, 1886)

†(<u>O</u>. <u>corbulus</u> (Cherbonnier, 1953))

Genus <u>Pentacta</u> Goldfuss, 1820

<u>P</u>. <u>doliolum</u> (Pallas, 1766)

(<u>P</u>. <u>squamosa</u> Cherbonnier, 1970)

<u>P</u>. <u>tesselera</u> Cherbonnier, 1970

*Genus <u>Pseudocnella</u> Gen. nov.

†<u>P</u>. <u>insolens</u> (Théel, 1886)

†<u>P</u>. <u>sinorbis</u> (Cherbonnier, 1952)

†<u>P</u>. <u>sykion</u> (Lampert, 1885)

Genus <u>Trachythyone</u> Studer, 1876

<u>T</u>. <u>crucifera</u> (Semper, 1867)

(<u>T</u>. <u>improvisa</u> (Ludwig, 1875))

•<u>T. ? parva</u> (Ludwig, 1875)

†<u>T</u>. <u>rigidapeda</u> (Cherbonnier, 1952)

<u>T</u>. sp. (ex Natal coast)

Subfamily Cucumariinae Ludwig, 1894

*Genus <u>Pawsonella</u> Gen. nov.

*<u>P</u>. <u>africana</u> sp. nov.

Genus <u>Pseudocolochirus</u> Pearson, 1910

(<u>P</u>. <u>violaceus</u> (Théel, 1886))

*Genus <u>Roweia</u> Gen. nov.

†<u>R</u>. <u>frauenfeldi</u> (Ludwig, 1882)

<u>R</u>. <u>frauenfeldi frauenfeldi</u> (Ludwig, 1882)

<u>R</u>. <u>frauenfeldi webbi</u> (Thandar, 1977)

†<u>R</u>. <u>stephensoni</u> (John, 1939)

Subfamily Thyonidiinae Heding and Panning, 1954

Genus *Cucumella* Ludwig and Heding, 1935

(*C. triplex* Ludwig and Heding, 1935)

Order Dactylochirotida Pawson and Fell, 1965

Family Rhopalodinidae Perrier, 1902

Genus *Rhopalodinaria* Cherbonnier, 1970

R. gigantea Cherbonnier, 1970

R. minuta Cherbonnier, 1970

Genus *Rhopalodinopsis* Heding, 1937

R. capensis Heding, 1937

Family Vaneyellidae Pawson and Fell, 1965

*Genus *Psolidothuria* Gen. nov.

**P. octodactyla* sp. nov.

Family Ypsilothuriidae Heding, 1942

Genus *Echinocucumis* Sars, 1859

•*E. hispida* (Barrett, 1856)

Genus *Ypsilothuria* E. Perrier

•*Y. bitentaculata* (Ludwig, 1893)

Subclass Aspidochirotacea Grube, 1840

Order Aspidochirotida Grube, 1840

Family Stichopodidae Haeckel

Genus *Neostichopus* Deichmann, 1948

N. grammatus (H.L. Clark, 1923)

Genus *Stichopus* Brandt, 1835

S. chloronotus Brandt, 1835

S. variegatus Semper, 1868

Genus <u>Thelenota</u> Brandt, 1835

(<u>T</u>. <u>anax</u> H.L. Clark, 1921)

Family Holothuriidae Ludwig, 1894

Genus <u>Actinopyga</u> Bronn, 1860

<u>A</u>. <u>echinites</u> (Jaeger, 1833)

(<u>A</u>. <u>crassa</u> Panning, 1944)

(<u>A</u>. <u>lecanora</u> (Jaeger, 1833))

<u>A. mauritiana</u> (Quoy and Gaimard, 1833)

(<u>A</u>. <u>miliaris</u> (Quoy and Gaimard, 1833))

(<u>A</u>. <u>plebeja</u> (Selenka, 1867))

Genus <u>Bohadschia</u> Jaeger, 1833

(<u>B</u>. <u>marmorata</u> Jaeger, 1833)

Genus <u>Holothuria</u> Linnaeus, 1767

Subgenus <u>Cystipus</u> Haacke, 1880

*<u>H.(C.) longicosta</u> sp. nov.

Subgenus <u>Halodeima</u> Pearson, 1914

<u>H.(H.) atra</u> Jaeger, 1833

(<u>H.(H.) edulis</u> Lesson, 1830)

(<u>H.(H.) mexicana</u> Ludwig, 1875)

(<u>H.(H.) pulla</u> Selenka, 1867)

Subgenus <u>Lessonothuria</u> Deichmann, 1958

<u>H.(L.) insignis</u> Ludwig, 1875

<u>H.(L.) pardalis</u> Selenka, 1867

*<u>H.(L.) tuberculata</u> sp. nov.

(<u>H.(?L.) cumulus</u> H.L. Clark, 1921)

Subgenus <u>Mertensiothuria</u> Deichmann, 1958

(<u>H.(M.) fuscocinerea</u> Jaeger, 1833)

<u>H.(M.) leucospilota</u> (Brandt, 1835)

<u>H.(M.) pervicax</u> Selenka, 1867

Subgenus Metriatyla Rowe, 1969

(H.(M.) albiventer Semper, 1868)

(H.(M.) martensii Semper, 1868)

H.(M.) scabra Jaeger, 1833

Subgenus Microthele Brandt, 1835

(H.(M.) nobilis (Selenka, 1867))

Subgenus Platyperona Rowe, 1969

H.(P.) difficilis Semper, 1868

*Subgenus Roweothuria subgen. nov.

*H.(R.) vemae sp. nov.

Subgenus Selenkothuria Deichmann, 1958

H.(S.) erinaceus Semper, 1868

H.(S.) parva Lampert, 1885

Subgenus Semperothuria Deichmann, 1958

H.(S.) cinerascens (Brandt, 1835)

Subgenus Theelothuria Deichmann, 1958

•H.(T.) ? maculosa Pearson, 1913

•H.(T.) ? notabilis Ludwig, 1875

Subgenus Thymiosycia Pearson, 1914

H.(T.) arenicola Semper, 1868

H.(T.) hilla Lesson, 1830

(H.(T.) impatiens Forskaal, 1775)

Family Synallactidae Ludwig, 1894

Genus Mesothuria Ludwig, 1894

•M. parva (Théel, 1886)

(M. lactea (Théel, 1886))

Genus Pseudostichopus Théel, 1886

*P. echinatus sp. nov.

Genus Synallactes Ludwig, 1894

(S. mollis Cherbonnier, 1952)

(S. viridillimus Cherbonnier, 1952)

Order Elasipodida Théel, 1882

Suborder Deimatina Hansen, 1975

Family Deimatidae Ekman, 1926

Genus Deima Théel, 1897

(D. validum validum Théel, 1879)

Genus Oneirophanta Théel, 1879

(O. mutabilis mutabilis Théel, 1879)

Genus Orphnurgus Théel, 1879

*O. aspersignis sp. nov.

•O. insignis Fisher, 1907

*O. natalasper sp. nov.

Family Laetmogonidae Ekman, 1926

Genus Laetmogone Théel, 1879

(L. fimbriata (Sluiter, 1901))

*L. perplexa sp. nov.

Suborder Psychropotina Hansen, 1975

Family Psychropotidae Théel, 1882

Genus Benthodytes Théel, 1882

B. lingua R. Perrier, 1896

(B. plana Hansen, 1975)

(B. sanguinolenta Théel, 1882)

(B. typica Théel, 1882)

B. valdiviae Hansen, 1975

Genus Psychropotes Théel, 1882

(P. verrucosa (Ludwig, 1894))

Family Elpidiidae Théel, 1879

Genus Elpidia Théel, 1876

•E. gracilis Belyaev, 1975

°E. gracilis austroafricana subsp. nov.

Genus Scotoplanes Théel, 1882

•S. globosa Théel, 1879

Family Pelagothuriidae Ludwig, 1894

Genus Pelagothuria Ludwig, 1894

(P. ludwigii Chun, 1900)

Genus Planktothuria Gilchrist, 1920

(P. diaphana Gilchrist, 1920)

Subclass Apodacea Brandt, 1835

Order Molpadida Haeckel, 1896

Family Molpadiidae Müller, 1850

Genus Molpadia Risso, 1826

•M. ? abyssicola Pawson, 1977

(M. capensis Heding, 1940)

M. ? sp. indet.

Order Apodida Brandt, 1835

Family Synaptidae Oestergren, 1898

Genus Euapta Oestergren, 1898

•E. godeffroyi (Semper, 1868)

Genus Leptosynapta Verrill, 1867

(L. ancoracuta Cherbonnier, 1954)

†L. knysnaensis (Cherbonnier, 1952)

*L. naiga sp. nov.

(L. pustulosa Cherbonnier, 1970)

Genus _Opheodesoma_ Fisher, 1907

(_O. grisea_ (Semper, 1868))

(_O. mauritiae_ Heding, 1928)

Genus _Patinapta_ Heding, 1928

(_P. crosslandi_ Heding, 1929)

Genus _Rynkatorpa_ Rowe and Pawson, 1967

*_R. spatula_ sp. nov.

Genus _Synapta_ Eschscholtz, 1829

(_S. oceanica_ Lesson, 1830)

Family Chiridotidae Oestergren, 1898

Genus _Chiridota_ Eschscholtz, 1829

•_C. rigida_ Semper, 1868

(_C. stuhlmanni_ Lampert, 1896)

(_C. violacea_ J. Müller)

Genus _Taeniogyrus_ Semper, 1868

T. dayi Cherbonnier, 1952

( )	Not present in material
*	New taxon
†	New combination
•	First southern African record

KEY TO THE SOUTHERN AFRICAN GENERA OF HOLOTHUROIDEA

1. Pedicels present, usually numerous; spicules never include anchors and anchor plates .... 2.

Pedicels (tubefeet) markedly reduced or, more usually, absent altogether; spicules may include anchors and anchor plates .... Apodacea Brandt, 1835 49.

2. Introvert and retractor muscles present; tentacles never peltate (shield-shaped); madreporite internal; no free tentacular ampullae; gonad in two tufts, one on each side of dorsal mesentery .... Dendrochirotacea Grube, 1840 3.

Introvert and retractor muscles absent; tentacles generally peltate; dorsal podia modified into papillae, warts or sensory processes; madreporite external or internal; gonad usually in a single tuft.

Aspidochirotacea Grube, 1840 31.

3. Tentacles 10-30, dendritic (richly branched); calcareous ring simple (see fig. 16j) or complex, with posterior processes (see fig. 3e); test sometimes present or, more commonly, reduced to microscopic spicules ...... Dendrochirotida Grube, 1840 4.

Tentacles 8-30, not branched but digitate or digitiform (finger-like), the digits sometimes bifurcate, body always enclosed in a test comprising imbricate plates; calcareous ring simple, without posterior processes; the latter, if present, vestigial or rudimentary

Dactylochirotida Pawson and Fell, 1965 27.

4. Body more or less naked, not enclosed by a test; sole absent; spicules usually microscopic 5.

Body dorsally invested by plates; ventral surface modified into a soft thin sole, sharply defined from the plated dorsal surface .... Psolidae Perrier, 1902 17.

5. Calcareous ring complex, with paired or unpaired posterior processes 6.

Calcareous ring simple, without posterior processes
Cucumariidae Ludwig, 1894 18.

6. Calcareous ring often tubular, posterior processes divided into few to several small pieces of calcite
Phyllophoridae Oestergren, 1907 7.

Calcareous ring not tubular, posterior processes entire, sometimes divided, but then spicules either in the form of spinous rods, plates or tables with handles, or large lenticular perforated plates
Sclerodactylidae Panning, 1949 13.

7. Tentacles 10, ventralmost two considerably smaller than the others .... Thyoninae Panning, 1949 9.

Tentacles more than 10 (usually 20) 8.

8. Calcareous ring whole or compound but never forming a tubular structure; posterior prolongations of the radials composed of a few large pieces of calcite
Phyllophorinae Oestergren, 1907 p. 83.

Calcareous ring tubular and together with the posterior prolongations of the radials composed of a mosaic of small pieces; body wall spicules generally include tables or their derivatives .... Semperiellinae Heding and Panning, 1954 p. 86

9. Spicules of body wall circular to oval bodies with two sets of transverse and longitudinal bars, one set on each side of spicule .... Hemithyone Pawson, 1963 p. 55

Spicules of body wall not as above 10.

10. Spicules almost exclusively in the form of slender, smooth, slightly curved rods or "spectacles" with one or more perforations at each end .... Thyonina Gen. nov. p. 77

Spicules either in the form of plates ("buttons"), tables or derivatives of tables, or spicules absent 11

11. Spicules knobbed plates (buttons) only, often quite regular with 10-12 marginal knobs and four holes; tables absent from body wall .... Stolus Selenka, 1867 p. 56

Spicules 2-4 pillared tables or their derivatives, often reduced with age or altogether absent 12.

12. Tables with two pillars and an oval to squarish disc usually perforated by four large and four smaller holes, the latter sometimes absent; calcareous ring usually short and stout, only processes of radials broken into few small pieces of calcite .... Havelockia Pearson, 1903 p. 50

Tables with 2-4 pillars and oval to elongate discs but often reduced or altogether absent; calcareous ring conspicuously tubular with long posterior processes, both ring and processes broken into a mosaic of small pieces of calcite

Thyone Jaeger, 1833 p. 60

13. Tentacles 10 .... Sclerodactylinae Panning, 1949 14.

Tentacles 15 or 20 .... Cladolabinae Heding and Panning, 1954 15.

14. Body wall spicules tables with or without a "handle" on one side .... Sclerothyone Gen. nov. p. 94

Body wall spicules tables, without "handles", and smooth plates .... Temparena Gen. nov. p. 100

15. Spicules in the form of large, coin-like, lenticular plates .... Afrocucumis Deichmann, 1944 p. 105

Spicules in the form of spinous rods, sometimes bifurcate at base 16.

16. Spinous rods rarely showing traces of one or two short arms; rosette-shaped miliary granules often present

Ohshimella Heding and Panning, 1954 p. 112

Spinous rods with a forked base and an apical cluster of spines; no rosette-shaped granules

Cladolabes Brandt, 1835 p. 108

17. Dorsal surface without pedicels .... Psolus Duben and Koren, 1846 p. 198

Dorsal surface with rudimentary pedicels

Psolidium Ludwig, 1887 p. 201

18. Tentacles more than 10 .... Thyonidiinae Heding and Panning, 1954 p.196

Tentacles 8-10 19.

19. Spicules include complete or incomplete baskets, the latter in the form of slender, symmetrical or asymmetrical, dichotomously branched rods, present at least in juveniles

Colochirinae Panning, 1949 20.

Spicules exclude baskets of any form

Cucumariinae Ludwig, 1894 25.

20. Spicules of inner layer of body wall mostly quadrilocular knobbed buttons or plates made up of a single layer of calcareous material 21.

Spicules of inner layer of body wall include multilocular plates, either simple (composed of a single layer of calcareous material) or complex (made up of more than one layer of calcareous material); in addition knobbed buttons present in some species 22.

21. Superficial layer of spicules in the form of complete cup-like baskets; buttons or plates quite regular with 10 marginal knobs; pedicels restricted to the ambulacra; interambulacra naked

Aslia Rowe, 1970 p. 117

Superficial layer of spicules reduced baskets in the form of thin branched rods; buttons or plates irregular with often a varying number of marginal knobs; interambulacra with papillae (papulae) .... Pseudoaslia Gen. nov. p. 137

22. Spicules of inner layer of body wall in the form of simple, smooth, multilocular plates, rarely showing incipient knobs or nodules ...... _Trachythyone_ Studer, 1876 p. 158

Spicules of inner layer of body wall in the form of large, knobbed, multilocular plates, often made up of several layers of calcareous material or developed into hollow fenestrated spheres, in addition knobbed buttons present in some species 23.

23. Body barrel-shaped; superficial spicules incomplete baskets in the form of dichotomously branched rods, absent in adults of one species; multilocular plates complex, made up of more than one layer of calcareous material but never developed into fenestrated spheres; interambulacra with papillae

Pseudocnella Gen. nov. p. 142

Body somewhat quadrangular in cross section; superficial spicules mostly in the form of complete baskets always ornamented with knobs or spines and sometimes developed into delicate reticulated bodies; multilocular plates either multi-layered or developed into hollow fenestrated spheres; interambulacra usually naked 24.

24. Skin thin; baskets simple with 2-4 holes, never developed into reticulated bodies; buttons usually regular with 10 knobs and four holes; multilocular plates never developed into fenestrated spheres; dorsal pedicels well developed, in double rows; interambulacra naked

Ocnus Forbes and Goodsir, 1839 p. 121

Skin thick, packed with spicules; baskets spiny, often developed into delicate reticulated bodies; buttons mostly irregular with more than four holes; multilocular plates often developed into hollow fenestrated spheres; dorsal pedicels papilliform, often scattered in inter= ambulacra .... Pentacta Goldfuss, 1820 p. 127

25. Anterior margin of calcareous ring scalloped; body wall spicules smooth to slightly knobbed plates or "buttons", absent in larger (>80mm) specimens

Pseudocolochirus Pearson, 1910 p. 180

Calcareous ring not scalloped but radial plates with long anterior projections; body wall spicules either thick imbricating plates or spectacle-shaped rods or "biscuits" 26.

26. Ventralmost two tentacles reduced to stubs; spicules exclusively thick imbricating multilocular plates

Pawsonella Gen. nov. p. 174

Tentacles of equal size; spicules spectacle-shaped rods, often accompanied by a superficial layer of minute, slender rods .... Roweia Gen. nov. p. 181

27. Body consisting of a rounded part, the sphere, and an elongate part, the proboscis, with mouth and anus opening at or near apex of proboscis; tentacles 10-30 in number

Rhopalodinidae Perrier, 1902 29.

Body spherical to U-shaped, proboscis absent; mouth and anus opening at opposite ends; tentacles 8-20 in number 28

28. Integumentary plates large, distinctly spired and composed of one or more layers of calcareous material, holes numerous, small; tentacles 8-10 ...... Ypsilothuriidae Heding, 1942 30.

Integumentary plates smooth or feintly knobbed, with or usually without a spire and composed of a single layer of calcareous material; holes few to numerous, usually large; tentacles 8-20 ..... Vaneyellidae Pawson and Fell, 1965 p. 215

29. Tentacles 10; tables usually common, well developed
Rhopalodinaria Cherbonnier, 1970 p. 204

Tentacles 30; tables rare ..... Rhopalodinopsis Heding, 1937 p. 210

30. Tentacles 10, spired plates of body wall composed of a single layer of calcareous material ... Echinocucumis Sars, 1859 p. 220

Tentacles 8; spired plates of body wall composed of several layers of calcareous material ... Ypsilothuria Heding, 1942 p. 226

31. Respiratory trees present; mesentery of posterior loop of intestine attached to right ventral interradius
Aspidochirotida Grube, 1840 32.

Respiratory trees absent; mesentery of posterior loop of intestine attached to right dorsal interradius
Elasipodida Théel, 1882 40.

32. Tentacle ampullae absent; deep sea forms
Synallactidae Ludwig, 1892 38.

Tentacle ampullae present, mostly shallow water forms 33

33. Gonad in two tufts; large warts on the dorsum; spicules of body wall usually include C-shaped bodies

Stichopodidae Haekel 34.

Gonad in a single tuft; spicules of body wall never include C-shaped bodies ..... Holothuriidae Ludwig, 1894 36.

34. Body wall spicules include well formed tables (retained through=out life), frequently accompanied by rosettes and C-shaped bodies; grains, rods or minute plates never present

<u>Stichopus</u> Brandt, 1835 p. 235

Body wall spicules without tables or tables severely reduced with age to be altogether absent; grains, rods or minute plates present 35.

35. Spicules exclusively minute grains or rods; tables or minute plates never present ...... <u>Thelenota</u> Brandt, 1835 p. 241

Spicules of juveniles exclusively tables, severely reduced early in life and altogether absent in adults; minute plates develop after tables but become variously modified with age to form rods, spectacles, ellipses, etc.

<u>Neostichopus</u> Deichmann, 1948 p. 232

36. Size of indiviudals and thickness of body wall variable; calcareous ring rarely with scalloped anterior margin, sutures distinct; tentacles about 20; tables nearly always present, usually in combination with buttons, rods, perforated plates or rosettes; dichotomously branched or lobed rods, if present, always in combination with tables

<u>Holothuria</u> Linnaeus, 1767 p. 254

Moderate to large forms, up to 400mm long; body wall thick; tentacles 20-30; calcareous ring stout, scalloped, sutures sometimes indistinct; spicules usually dichotomously branched or lobed rods or granules; tables and buttons never present 37.

37. Anus encircled by five, usually conspicuous, "teeth"; tentacles 20-30 ...... Actinopyga Bronn, 1860 p. 242

Anus not encircled by calcareous "teeth" but by five groups of papillae; tentacles 20 ...... Bohadschia Jaeger, 1833 p. 252

38. Anus situated in a furrow at posterior end; body wall spicules scarce or absent, if present, never in the form of tables ..... Pseudostichopus Théel, 1886 p. 344

Anus terminal, never situated in a furrow; body wall spicules abundant, always in the form of tables 39.

39. Gonad in a single tuft; tables with approximately circular discs with large holes .... Mesothuria Ludwig, 1894 p. 339

Gonad in two tufts; tables with cruciform or triradiate discs with holes at extremities of arms

Synallactes Ludwig, 1894 p. 349

40. Spicules perforated plates, spatulated crosses, rods or wheels .... Deimatina Hansen, 1975 41.

Spicules, when present, primary crosses (or primary cross derivatives) with arrested development of dichotomous divisions .... Psychropotina Hansen, 1975 44.

41. Spicules do not include wheels but perforated plates or spatulated crosses, rods, or spindle-shaped, rounded or amorphous bodies...... Deimatidae Ekman, 1926 42.

Spicules always include wheels, sometimes accompanied by rods or spinous crosses ...... Laetmogonidae Ekman, 1926 p. 372

42. Tentacular discs retractile into oral cavity; circumoral papillae present .... Deima Théel, 1879 p. 353

Tentacles non-retractile; circumoral papillae absent 43.

43. Tentacular discs circular in outline, usually with rounded knobs on margin, but never with ramified processes

Oneirophanta Théel, 1879 p. 354

Tentacular discs with ramified but often contracted processes on margin .... Orphnurgus Théel, 1879 p. 355

44. Midventral pedicels present; body surrounded by a brim of fused pedicels; calcareous ring feebly developed or absent, never consisting of five star-shaped pieces

Psychropotidae Théel, 1882 46.

Midventral pedicels absent; body not surrounded by a brim of fused pedicels though an anterior brim of fused pedicels may be present; calcareous ring, when present, consisting of five star-shaped pieces 45.

45. Anterior brim of fused pedicels present; tentacles 20; calcareous ring and spicules absent

Pelagothuriidae Ludwig, 1894

Anterior brim of fused pedicels absent (except in <u>Psychrelpidia</u>); tentacles 10-12; calcareous ring and spicules usually present .... Elpidiidae Théel, 1879 48.

46. Anus dorsal; circumoral or postoral papillae present, except in <u>Benthodytes superba</u>; tentacular discs soft and pliable ...... <u>Benthodytes</u> Théel, 1882 p. 379

Anus ventral; circumoral or postoral papillae absent; tentacular discs of a fixed shape, rounded in outline, and with marginal knobs 47.

47. Unpaired dorsal appendage present ..... <u>Psychropotes</u> Théel, 1882 p. 387

Unpaired dorsal appendage absent .... <u>Psychrotrephes</u> Théel, 1882

48. Spicules rod-shaped, with two pairs of obliquely placed, horizontal arms and two vertical apophyses

<u>Elpidia</u> Théel, 1876 p. 389

Spicules rods, sometimes tripartite, and C-shaped bodies

<u>Scotoplanes</u> Théel, 1882 p. 395

49. Body vermiform; respiratory trees and anal papillae absent; spicules often include wheels .... Apodida Brandt, 1835 50.

Body fusiform, often with tapering caudal portion; respiratory trees and anal papillae present; wheels absent

Molpadida Haeckel, 1896 p. 399

50. Tentacles pinnate or digitate; spicules as anchors and anchor plates, rods and granules, rarely spicules absent

Synaptidae Oestergren, 1898 51.

Tentacles peltato-digitate (shield-shaped with digits); spicules wheels, with not more than six spokes, and sigmoid bodies ...... Chiridotidae Oestergren, 1898 56.

51. Arms of anchor smooth, vertex with minute knob-like projections 52.

Arms of anchor serrate, sometimes smooth, but vertex always smooth without knob-like projections 54.

52. Anchors and anchor plates large, up to 1mm or more; stock of anchor unbranched; cartilaginous ring generally present

Synapta Eschscholtz, 1829 p. 430

Stock of anchor irregularly branched; usually no cartilaginous ring posterior to calcareous ring 53.

53. Anchor plates not abruptly contracted at posterior end but with a large hole on each side; calcareous ring without conspicuous anterior projections; stone canals always few in number (1-3)

Euapta Oestergren, 1898 p. 405

Anchor plates abruptly contracted posteriorly, thus without a large smooth hole on each side; calcareous ring with conspicuous anterior projections; stone canals numerous

Opheodesoma Fisher, 1907 p. 420

54. Tentacles digitate with 3-5 digits; eye spots present between tentacular bases; anchor plates with a posterior handle, most holes of plates small and irregular with the two central holes the largest .... Rynkatorpa Rowe and Pawson, 1967 p. 423

Tentacles pinnate with usually more than seven digits or pinnately notched without proper digits; eye spots absent; anchor plates without a posterior handle, holes large and regular 55.

55. Both anchors and generally anchor plates from posterior end of body larger than from anterior end; anchor plates normally with seven large toothed holes

Leptosynapta Verrill, 1867 p. 408

Anchors from anterior end of body always shorter with thicker arms but anchor plates from anterior end larger than from posterior end; anchor plates usually with more than seven holes, mostly smooth though the larger ones often toothed

Patinapta Heding, 1928 p. 422

56. Spicules as wheels and rods, no sigmoid bodies

Chiridota Eschscholtz, 1829 p. 434

Spicules as wheels and sigmoid bodies

Taeniogyrus Semper, 1868 p. 440

SYSTEMATIC ACCOUNT

CLASS HOLOTHUROIDEA de Blainville, 1834

The class Holothuroidea, containing over 1100 nominal species of echinoderms (Madsen, 1956), has traditionally been subdivided into five orders: Dendrochirotida, Aspidochirotida, Elasipodida, Molpadida and Apodida. However, recently Pawson and Fell (1965) erected the order Dactylochirotida, to accommodate some species formerly classified amongst the dendrochirotids, and proposed a reclassification of the six orders into three subclasses, each containing two orders, as follows:-

Subclass Dendrochirotacea: included orders Dendrochirotida and Dactylochirotida
Subclass Aspidochirotacea: included orders Aspidochirotida and Elasipodida
Subclass Apodacea: included orders Molpadida and Apodida

Although Hansen (1975) rejects the assemblage of the Aspidochirotida and Elasipodida in the subclass Aspidochirotacea because of the absence of peltate tentacles in some elasipodids (notably species of _Orphnurgus_), Pawson and Fell's grouping has been accepted for the purpose of this monograph since peltate tentacles do occur in many elasipodids. All six orders are represented in southern Africa.

Subclass DENDROCHIROTACEA Grube, 1840

Diagnosis: See Pawson and Fell, 1965: 3.

Remarks: Of the two orders contained in this subclass the Dendrochirotida is well represented in the southern African region while the Dactylochirotida so far appears to be restricted in its distribution to the west coast. The relationship and probable phylogeny of the two orders is well documented by Pawson (1966) and Fell and Pawson (1966).

Order DENDROCHIROTIDA Grube, 1840

Diagnosis: See Pawson and Fell, 1965: 2.

Remarks: Pawson and Fell, in their revised classification of the dendrochirotid holothurians, divide and key this order into six families: Placothuriidae Pawson and Fell, 1965; Paracucumidae Pawson and Fell, 1965; Psolidae Perrier, 1902; Phyllophoridae Oestergren, 1907; Sclerodactylidae Panning, 1949 and Cucumariidae Ludwig, 1894. The former two families are not yet known from southern Africa while the latter four are well represented in the intertidal and shallow waters from which about 40 nominal species have so far been recorded. More than half this number (about 24) are restricted to the cooler waters of the south and west coasts and do not occur north of Port St. Johns (c. 32°S) in the Transkei, while only about 14 species are restricted to the east coast. Only one species is here recorded from depth in excess of 1000m.

Family PHYLLOPHORIDAE Oestergren, 1907

Diagnosis: See Pawson, 1982: 815.

Remarks: This family is considered first because of the complex nature of its calcareous ring which, according to Pawson (1966), is a primitive character while the simple type of ring, with or without short processes, is probably derived.

The complex calcareous ring in combination with plates, rods, tables or their derivatives as body wall spicules is the chief diagnostic feature of this family. However, in the enigmatic *Cladolella virgo* Heding and Panning, 1954, spinous rods, not unlike those of *Ohshimella ehrenbergii* (Selenka, 1868) of the family Sclerodactylidae, occur, while in the southern African representative of the family Phyllophoridae, Neothyonidium arthroprocessum sp. nov., peculiar, somewhat U-shaped perforated rods are found. The spinous rods of C. virgo can be derived from tables as are those of some species of Cladolabes. The peculiar rods of N. arthroprocessum, however, do not appear to be table derivatives.

Pawson and Fell (1965) include in the Phyllophoridae, the subfamilies Thyoninae Panning, 1949; Phyllophorinae Oestergren, 1907 and Semperiellinae Heding and Panning, 1954. All three subfamilies are represented in the southern African waters, the Phyllophorinae and Semperiellinae, each by a single species.

Subfamily THYONINAE Panning, 1949

Diagnosis: See Panning, 1949: 461.

Remarks: This subfamily, originally classified within the family Cucumariidae by Panning (1949), is represented in southern Africa by five genera: Thyone Jaeger, 1833; Stolus Selenka, 1867; Havelockia Pearson, 1903; Hemithyone Pawson, 1963 and Thyonina Gen. nov. The latter genus is erected herein to accommodate Thyone articulata Vaney, 1908.

The Thyoninae contains all 10-tentacled phyllophorids with scattered pedicels and with usually tables or buttons (plates) as body wall spicules. In some species of Thyone, however, spicules may be secondarily reduced or lost, while in the monotypic Hemithyone, peculiar, circular to oval bodies occur, and in Thyonina slender spectacle-shaped rods are found.

This subfamily is represented in southern Africa by 12 species, all previously described.

Genus HAVELOCKIA Pearson, 1903

Havelockia Pearson, 1903: 197; Panning, 1949: 466; Clark and Rowe, 1971: 203.
Pentathyone H.L. Clark, 1938: 458; Panning, 1949:459.

Diagnosis: See Pearson, 1903: 197; Panning, 1949: 466.

Type species: Havelockia herdmani Pearson, 1903 (by original designation Pearson, 1903: 197 = Thyone versicolor Semper, 1868, according to James, 1976).

Remarks: Havelockia was erected by Pearson (1903) for H. herdmani from Ceylon which he designated the type species. H.L. Clark (1938), unaware of Pearson's paper, erected the genus Pentathyone with the Indo-West-Pacific Thyone mirabilis Ludwig, 1875, as type species. Panning (1949) rightly pointed out that both Havelockia and Pentathyone are synonymous and this view has been reiterated by Clark and Rowe (1971) and James (1976) amongst other authors. Although Clark and Rowe (1971) recognise H. herdmani, T. mirabilis and T. versicolor as distinct species, according to James (1976) both H. herdmani and T. mirabilis are conspecific with T. versicolor Semper, 1868. T. versicolor, being the older, has priority and now replaces H. herdmani as the type species of Havelockia.

KEY TO THE SOUTHERN AFRICAN SPECIES OF HAVELOCKIA

Body cylindrical, pedicels minute; no conical papillae; table discs oval, lobed; spire extremely low, ending in two clusters of teeth

Havelockia venustella (Ludwig and Heding, 1935).

Body quadrangular in cross section; pedicels large, papillae conical; table discs circular to squarish; spire, if present, high, pillars meeting at apex which may or may not be toothed

Havelockia versicolor (Semper, 1868).

Havelockia venustella (Ludwig and Heding)

(Fig.1 a-e)

Thyone venusta W.J. Schmidt, 1926: 125, fig. B (spicules figured for their optical properties).

Thyone venustella Ludwig and Heding, 1935: 203, pl.2, figs. 15-20; Deichmann, 1948: 356; Day, Field and Penrith, 1970: 83.

Havelockia venustella Panning, 1949: 466.

Diagnosis: See Ludwig and Heding, 1935: 203; Deichmann, 1948: 356.

Previous record: C(35/22/d), 155m

Material examined: C(32/16/d; 33/17/d; 34/18/d), 229-400m, 5 spec.

Description: Largest specimen (AFR 790A) 55mm in length. Colour off white speckled with a black substance possibly of foreign origin. Anal teeth, if present, small, flat, in only one specimen each flanked by terminal podia. Calcareous ring, other oral structures and most of viscera lost. Respiratory trees preserved in only largest specimen, each tree with two main trunks - medial trunks longer and more pro= fusely branched. Spicules restricted to posterior end. Table discs (fig. 1c) 0,05-0,08mm, spires 0,015-0,03mm high. Tables rarely incomplete or with distorted spires (fig. 1d). Periproctal plates (fig. 1e) huge, multilocular. Other minute (0,035-0,165mm) spicules (? foreign) in the form of C's or S's present throughout body wall of all excepting largest specimen. Pedicels without supporting spicules; end plates 0,05-0,08mm in diameter, usually well developed in only ventral and anal podia (fig. 1a & b).

Distribution: S.W. Cape Province from off Lamberts Bay to Mossel Bay, 155-400m. Map: 16.

Habitat: Green mud, khaki and black sand, gravel and nodules.

Remarks: This species was established by Ludwig and Heding (1935) upon three poorly preserved specimens, the largest of which measured 40mm. The specimens were originally identified as Thyone venusta Selenka by Schmidt (1926) but Heding (in Ludwig and Heding, 1935) believed it hardly likely that the Red Sea species could reach the southernmost tip of Africa. However, Deichmann (1948) observes that both T. venusta and H. venustella are probably conspecific basing her argument that in many species of Thyone the spicules do become reduced with age. However, a single specimen of Thyone collected at Isipingo Beach, near Durban, lacks spicules and differs so much from H. venustella that it is probable that this specimen is conspecific with Selenka's species.

The calcareous ring of H. venustella is poorly described and not illustrated. It is not clear whether Panning (1949), who referred the species to Havelockia, examined the holotype. The tables of H. venustella, except for their thinner margins, show a remarkable resem=blance to those of Thyone propinqua Cherbonnier, also described from southwest Cape Province. The fact that T. propinqua was collected from shallow waters and possesses also pedicel spicules suggest that it may represent a juvenile of H. venustella since the type measured only 20mm. It is regrettable that Cherbonnier (1970) only compared his species with the northern T. fusus (O.F. Müller) and not with H. venustella. Since the calcareous ring of H. venustella is poorly known and since this species was recognised by Dr. Cherbonnier (judging from some UCT material identified by him) there is no justification at this stage to synonymise both species.

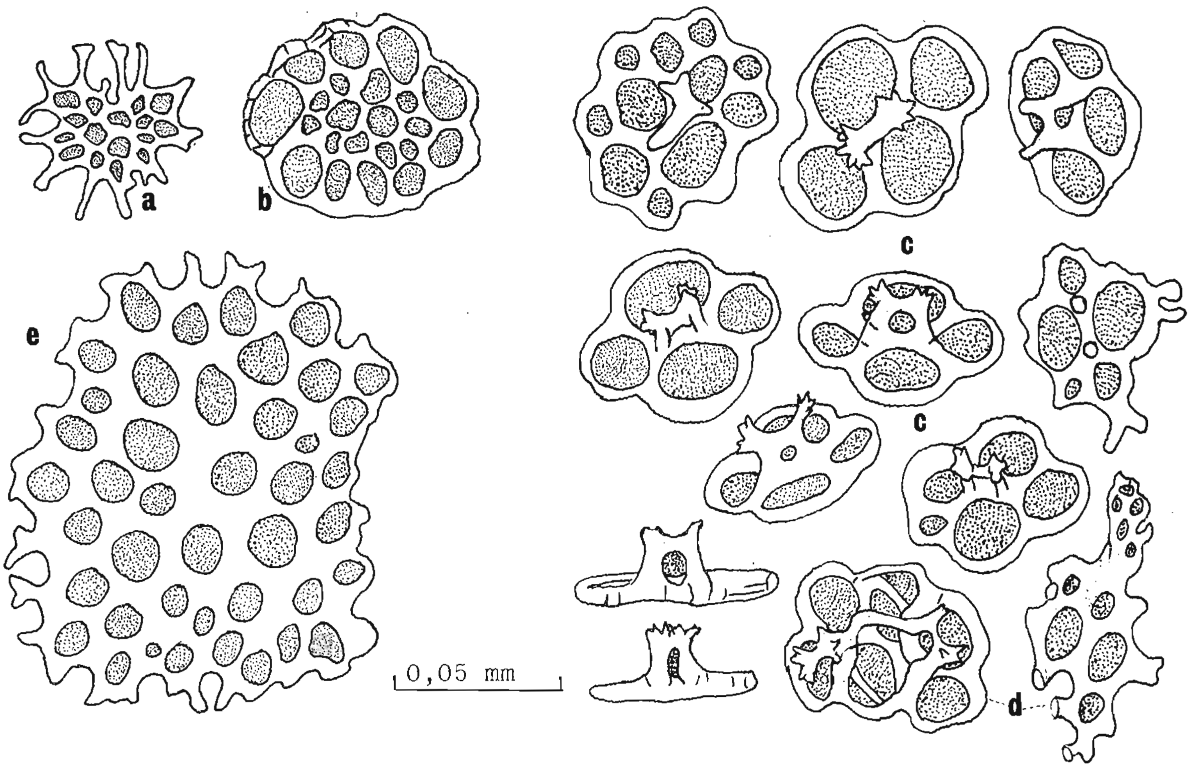


Fig. 1. Havelockia venustella (Ludwig and Heding). Anal spicules and end plates. TRA 73 J.

a. Reduced end plate from dorsal pedicel

b. Complete end plate from ventral pedicel

c. Tables

d. Abnormal table and plate from another specimen

e. Periproctal plate

(All drawn to same scale)

Havelockia versicolor (Semper)

Thyone versicolor Semper, 1868: 14.

Thyone mirabilis Ludwig, 1875: 93, pl.6, fig.18; Lampert, 1885: 162; Théel 1886a: 138; Sluiter, 1901b:93; Kalk, 1958: 216.

Thyone mirabilis? Bell, 1884: 149.

Thyone (?) calcarea Pearson, 1903: 194.

Havelockia herdmani Pearson, 1903: 197; Koehler and Vaney, 1908: 25; Panning, 1949: 466; Clark and Rowe, 1971: 180 (dist.).

Cucumaria areolata Ekman, 1918: 35.

Pentathyone mirabilis H.L. Clark, 1938: 459, pl.16, fig.3; 1946: 396; Panning, 1949: 459, text-fig.55.

Pentathyone versicolor Panning, 1949: 460.

Thyone herdmani James, 1969: 60.

Havelockia mirabilis Clark and Rowe, 1971: 180 (dist.).

Havelockia versicolor Clark and Rowe, 1971: 180 (dist.), text-fig. 91b, 92h; pl.29, fig.13; James, 1976: 55, text-fig. 1a-f.

Diagnosis: See Ludwig, 1875:93; James, 1976:55.

Southern African record: M(26/32,33/i).

Material examined: None.

Local distribution: Known only from Inhaca Island, Moçambique.

General distribution: Indo-West-Pacific.

Habitat: Coral.

Remarks: This Indo-West-Pacific species has been recorded from Inhaca Island (Moçambique) by Kalk (1958) as Thyone mirabilis upon identification of some material by Dr. Cherbonnier but has not been taken since. The most recent, complete description of the species is that of James (1976) who is also the author of the synonymy. The species can easily be distinguished from H. venustella in size and form of the body and table discs, the height of the spire, the nature of the toothed crown and the large size (0,235-0,345mm) of the pedicel end plates.

Genus HEMITHYONE Pawson

Heterothyone (partim) Panning, 1949: 464.

Hemithyone Pawson, 1963: 28; 1967: 159 (synonymy); Clark and Rowe, 1971: 204.

Diagnosis: See Pawson, 1967: 159.

Type species: Cucumaria semperi Bell, 1884 (by subsequent designation Pawson, 1967: 159).

Remarks: The genus Hemithyone was proposed by Pawson in 1963 in which he initially included both Cucumaria semperi Bell, 1884 and C. pigra Koehler and Vaney, 1908, both formerly classified in Heterothyone by Panning (1949). However, in 1967 Pawson synonymised both species, thus the genus is at present monotypic. In the same paper he gives a detailed distribution list of the species. Regrettably Pearson's (1910a) paper was overlooked and the average greatest length of the body wall spicules, in the diagnosis of the genus, erroneously given as 0,4mm instead of 0,04mm.

Hemithyone semperi (Bell)

Cucumaria semperi Bell, 1884: 147, pl.9, fig.8; Pearson, 1910a: 169.

Cucumaria pigra Koehler and Vaney, 1908: 38, pl.3, figs. 13-16.

Heterothyone semperi Panning, 1949: 464.

Heterothyone pigra Panning, 1949: 464.

Hemithyone semperi Pawson, 1963: 28 (passim); 1967: 159, figs. 1-10 (refs.); Clark and Rowe, 1971: 180 (dist.), pl.29, fig.15.

Hemithyone pigra Pawson, 1963: 28.

Diagnosis: See Pawson, 1967:159.

Southern African record: M(12/40/?i).

Material examined: None.

Local distribution: Known only from N. Moçambique.

General distribution: Indo-West-Pacific.

Remarks: The presence of this interesting species in southern Africa is based on a single specimen reported from south of Pekawi (Querimba) by Pearson (1910a). Pearson did not describe the species but referred to his report on the Mergui holothurians (Pearson, 1910b). Pawson (1967) records the total length of the species as 23-50mm. Pearson's specimen which measured 45mm hence fits this size range.

Genus STOLUS Selenka

Stolus Selenka, 1867: 355; Heding, 1940: 126; Panning, 1949: 462; Clark and Rowe, 1971: 204.

Pseudothyone (partim) Panning, 1949: 456.

Diagnosis: See Selenka, 1867: 355; Panning 1949, 462.

Type species: Stolus sacellus Selenka, 1867 (by subsequent designation Panning, 1949: 462 = Thyone buccalis Stimpson, 1856).

Remarks: This genus is represented in southern Africa by its type species, a well known Indo-West-Pacific form recently redescribed by James (1966).

Stolus buccalis (Stimpson)
(Fig.2 a-n)

Thyone buccalis Stimpson, 1856: 386; Thēel, 1886a: 136; H.L. Clark, 1921: 167; 1938: 461.

Stolus sacellus Selenka, 1867: 355, pl.20, figs.115, 116; Panning, 1949: 462, fig.57; Kalk, 1954: 112; 1958: 210, 214, 238; Macnae and Kalk, 1958: 36, 99, 107, 119, 130; Day, 1974a:191.

Thyone rigida Semper, 1868: 66.

Thyone sacella Thēel, 1886a: 138; H.L. Clark, 1923: 415; Mitsukuri, 1912: 227, fig.43; Erwe, 1913: 360, pl.5, fig.7.

Thyone sacellus Branch and Branch, 1981: 247.

Pseudothyone buccalis Panning, 1949: 457, fig.53.

Stereoderma murrayi Bell, 1883: 61, pl.15, fig.6.

Stolus buccalis Clark and Rowe, 1971: 182 (dist.), pl.29, fig.14; James, 1966: 285, 1 text-fig ; 1pl.

Diagnosis: (See James, 1966:285).

Description: Length up to 80mm. Colour dark to reddish brown or purple; tentacles black. Polian vesicles one or more; stone canals numerous. Buttons (fig. 2a-m) 0,05-0,09mm long with 10-12 marginal knobs, rarely more, and two central knobs often linked by a "handle" or half ring on each side. Pedicels with end plates and other jagged plates, 0,11-0,21mm long (fig.2n).

Previous southern African records: M(26/32,33/i).

Material examined: N(29/30/s; 30/31/i,s; 28/32/i), M(26/32/i, 26/33/i, 24/35/i, 23/35/i), 18 spec.

Local distribution: Moçambique into Natal as far south as Durban, 0-3m. Map: 3.

General distribution: Throughout the Indo-West-Pacific region.

Habitat: Usually found concealed under rock or in narrow crevices.

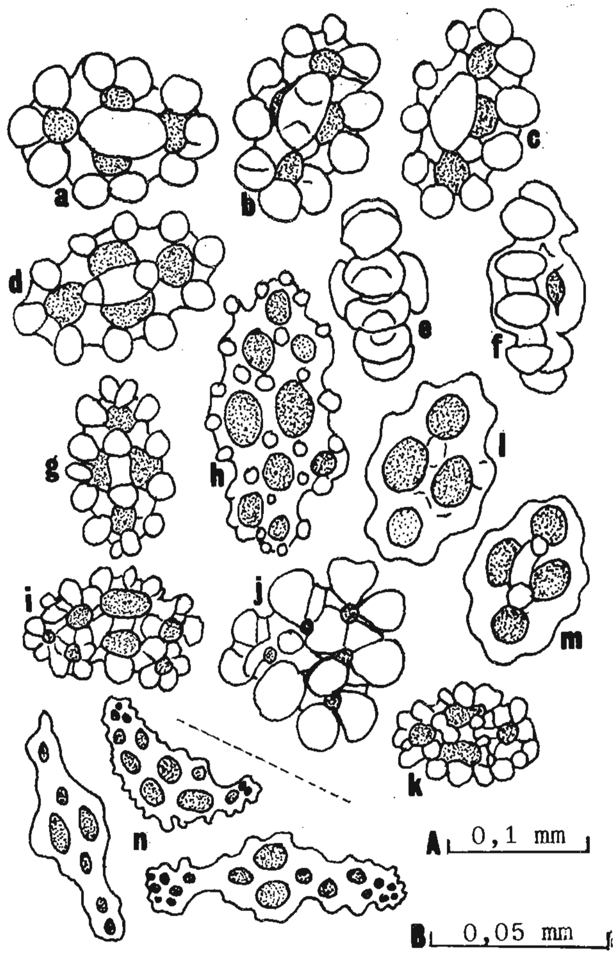


Fig. 2. Stolus buccalis (Stimpson). JAN 26 M.

a-f. Regular 10-knobbed buttons from body wall

g-k. Multi-knobbed buttons from body wall

l&m. Smooth buttons from body wall

n. Pedicel spicules

(a-m Scale A; n Scale B)

<u>Remarks</u>: The reddish brown life colouration of this species in Natal quickly fades in alcohol to cream or even white. The number of polian vesicles and stone canals is variable and apparently increases with age. Up to six polian vesicles and 20 stone canals were reported to be present in a single individual by Thandar (1971: unpublished M.Sc. Thesis).

From the texture of the body wall and form of the spicules it appears that there are two forms of the species. In specimens from Moçambique the body wall is soft, thin, with a reticulate pattern on the surface and the buttons nearly always have 12 small marginal knobs. Specimens from Natal, on the other hand, are more rigid, with a thicker body wall and without an external reticulate pattern. In these forms the plates usually have 10 large marginal knobs. However, no sharp distinction can be drawn between these forms since a single rigid individual collected at Durban has both 10 and 12 knobbed plates in more or less equal proportion.

The presence of this species at Durban is a noteworthy extension of its southward range.

Genus THYONE Jaeger

Thyone Oken, 1815: 351; Jaeger, 1833: 8; Pawson and Miller, 1981: 394.
Anaperus Troschel, 1846: 60 (partim).

Diagnosis: See Deichmann, 1948: 354; Pawson and Miller, 1981: 394.
Type species: Holothuria fusus Müller, 1776 (by original designation Jaeger, 1833).

Remarks: Although the genus Thyone has been attributed to Oken, 1815, Pawson and Miller (1981) point out that Oken's work (1815-1816) was placed on the Official Index of Rejected Works by the International Commission on Zoological Nomenclature (opinion 417, 1956). According to these authors the name Thyone must therefore be attributed to Jaeger (1833) who was the first to validate the name in accordance with the requirements of the International Code of Zoological Nomenclature.

Thyone currently contains approximately 40 species, seven species are included here from southern Africa. It is possible that not all seven species are valid for T. propinqua may prove to be identical to Havelockia venustella while some others like T. hirta and T. infusca are separated on minute characters and warrant a re-examination based on more material. Since the spicules of many species of Thyone change or disappear with growth, adults and juveniles may be referred to different species.

Only four of the seven species are represented in the material at hand. The following key is based partly upon this material and fragments of the types received from the PMNH and partly upon Cherbonnier's descriptions. The dimensions of the spicules of those species not personally examined by the writer are taken from Cherbonnier's illustrations. They are hence based on a small sample and are therefore approximate.

KEY TO THE SOUTHERN AFRICAN SPECIES OF THYONE (S.S.)

1. Small species, less than 30mm long; colour in life generally brown, violet at both ends; no spicules in body wall and pedicels; subtropical species .... Thyone venusta Selenka, 1867.

   Size and colour variable; body wall spicules tables or derivatives of tables, sometimes reduced to spectacle-shaped rods generally ornamented with one or more nodules; if spicules lost (in specimens > 30mm long) end plates nearly always present. 2

2. Tentacular spicules include rosettes or rosette-shaped deposits 3

   Tentacular spicules exclude rosettes or rosette-shaped deposits 6

3. Medium-sized species up to 110mm long; tables well-formed, discs large (0,075-0,10mm), circular to subrectangular, pierced by 10-20 holes; spire low ending in an irregular crown; pedicels supported by elongate (0,085-0,12mm), curved rods with a two-pillared spire ending in one or two teeth, spire often reduced .... Thyone imperfecta (Cherbonnier, 1970).

   Small species up to 30mm long; table discs small (0,04-0,09mm), circular to oblong, pierced by usually only four large holes but sometimes also four or more smaller marginal holes; spire reduced or ending in one or more clusters of teeth; pedicels supported by two-pillared tables or curved spired rods 4

4. Table discs circular to subcircular (0,055-0,09mm), pierced by up to 16 holes; spire low, ending in two clusters of teeth; pedicels with two-pillared oblong tables with spire similar to that of tables of body wall .... Thyone avenusta Cherbonnier, 1970.

Table discs oblong, usually pierced by only four holes, rarely more; spire either well developed, terminating in two clusters of teeth, or reduced or absent; pedicels with curved, spired rods with four central perforations and one at each extremity 5

5. Table discs lobed (0,04-0,053mm); spire well developed, low (0,013mm), often arched and with two clusters of teeth; pedicel rods large (0,10-0,115mm) with an arched spire bearing three or more teeth ..... Thyone propinqua Cherbonnier, 1970.

Tables reduced to minute, smooth plates without spires; pedicel rods elongate (0,085-0,10mm), curved, with a low (0,01-0,033mm), often reduced spire .... Thyone infusca Cherbonnier, 1954.

6. Medium-sized to large species, up to 130mm long; tables well developed in juveniles only with both small (0,03-0,08mm) regular discs to large (0,07-0,16mm) irregular ones but always ornamented with conspicuous nodules; tables severely reduced with age to minute nodular plates or spectacle-shaped rods; spicules often altogether absent in adults except for pedicel end plates.

Thyone aurea (Quoy and Gaimard, 1833)

Small species, less than 30mm long; tables well developed with smooth, circular to oval discs (0,07-0,093mm) perforated by up to 20 holes, spire low (0,03-0,04mm)

Thyone hirta Cherbonnier, 1970.

Thyone aurea (Quoy and Gaimard)
(Fig.3 a-f, Fig.4 a-h)

Holothuria aurea Quoy and Gaimard, 1833: 120, pl.7, figs.15-17.

Cladolabes aureus Brandt, 1835: 74.

Thyone aurea Semper, 1868: 66; Lampert, 1885: 163; Théel, 1886a: 141; H.L. Clark, 1923: 415 (partim); Deichmann, 1948: 354 (partim), text-figs. 1-5, pl.19, figs.13-18; Cherbonnier, 1952a: 493, pl.45, figs.1-28, pl.46, figs.1-2, 6-7; 1952b: 12; Day, 1959: 502; 1974a: 19; Day, Field and Penrith, 1970: 83; Moldan, 1978: 103; Branch and Branch, 1981: 247, 1 text-fig.

Thyone serratus Britten, 1910: 242.

Thyone serrata H.L. Clark, 1923: 415; Bright, 1937: 63; 1938: 87.

Thyone proceracorona syn. nov. Cherbonnier, 1952a: 492, pl.44, figs.1-16.

Thyone turrisolida syn. nov. Cherbonnier, 1954: 117, fig.1 (1-24), fig.2 (14); Day, Field and Penrith, 1970: 83.

Diagnosis: (From Deichmann, 1948 and Cherbonnier, 1952a, modified herein): Medium-sized species, up to 130mm long. Colour in life orange to pink. Calcareous ring tubular, broken into a mosaic of numerous tiny pieces of calcite; posterior bifurcate processes of radial plates shorter than height of ring, also compound. Spicules two-pillared tables with characteristically knobbed to spinose discs, well developed in juveniles, severely reduced in adults to slightly nodular plates with few holes or to spectacle-shaped rods or plates, or altogether absent. Pedicel tables with curved discs, reduced or lost with age; end plates well developed. Tentacles and introvert with rods and perforated plates, no rosettes.

Previous records: SWA (26/15/i,s), C(29/16/i; 29/17/i; 33/17/i,s; 33/18/i,s; 34/18/i,s).

Material examined: SWA (26/15/i,s), C(28/16/s; 29/17/i, 32/18/i,s; 33/17/i,s; 33/18/i,s; 34/18/i,s), 337 spec.

<u>Distribution</u>: Luderitz Bay (S.W.A.) to False Bay, 0-70m. Map: 11.

<u>Habitat</u>: Sand, white sand, fine sand, rock. Species often cryptofaunic or amongst <u>Pyura</u>, sometimes washed up on shore amongst <u>Laminaria</u> roots. Juveniles found in association with <u>Ciona</u> under stones at low tide.

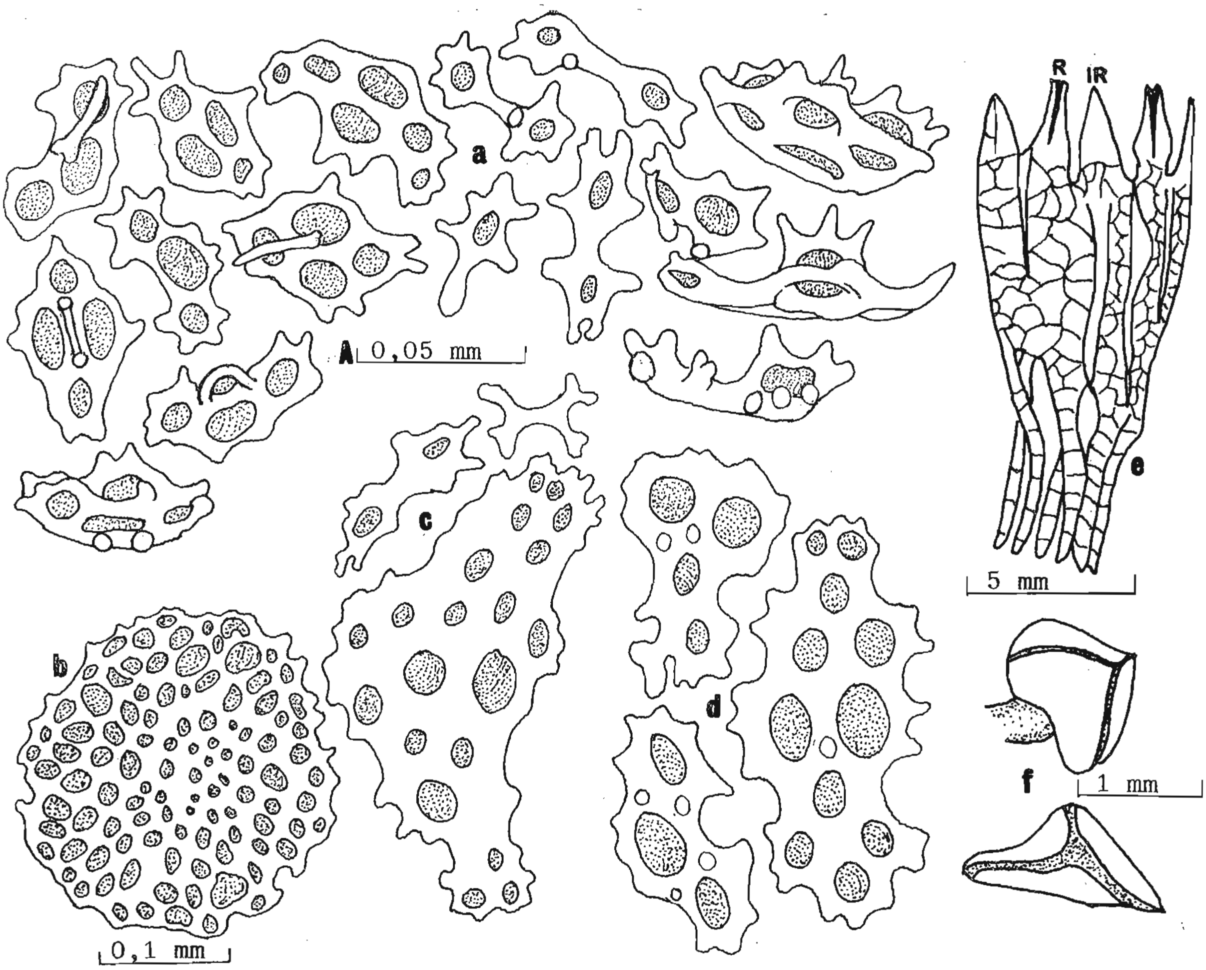


Fig. 3. <u>Thyone aurea</u> (Quoy and Gaimard). N34. (36mm).

a. Tables, reduced tables and "spectacles" from body wall

b. End plate from ventral pedicel

c. Tentacular spicules

d. Introvert spicules

e. Part of calcareous ring

f. Madreporite (lateral and frontal view)

(a, c & d Scale A)

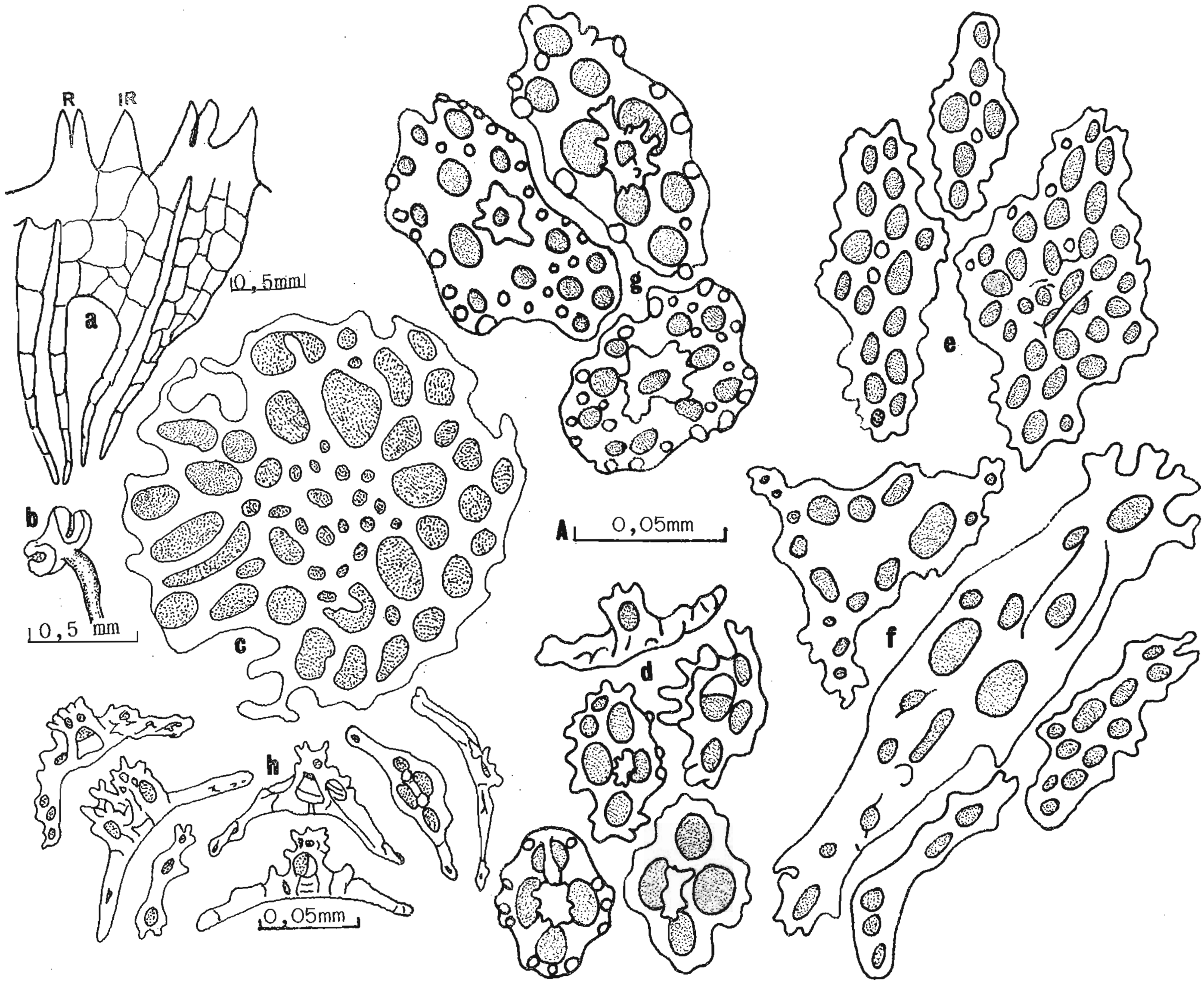


Fig. 4. <u>Thyone aurea</u> (Quoy and Gaimard). Simonstown. (8mm).

a. Part of calcareous ring

b. Madreporite

c. End plate from ventral pedicel

d. Small Tables from body wall

e. Plates (? reduced tables) from introvert

f. Plates and rods from tentacles

g. Large tables from body wall

h. Tables from pedicels

(c-f & h Scale A)

Remarks: The spicules of T. aurea undergo tremendous reduction with growth, a character which resulted not only in the confusion of this species with the locally abundant Thyone articulata Vaney several times but also led to the descriptions of at least two new species (T. proceracorona Cherbonnier, 1952 and T. turrisolida Cherbonnier, 1954) from specimens which apparently represent growth stages of T. aurea.

In juveniles of T. aurea (up to 25mm long) tables are remarkably well developed with small and oblong to large and irregular discs (figs.4 d&g) always ornamented with nodules. The smaller discs (0,03-0,08mm) have usually four holes while the larger ones (0,07-0,16mm) are perforated by 7-40 holes. The pedicels of juveniles are supported by tables (fig. 4h) with large (0,10-0,14mm) curved discs and a 2-4 pillared spire of moderate height (0,03-0,058mm). With growth all spires, except those of tables from the anal region, are reduced to knobs on the surface of discs while the discs themselves degenerate to few-holed or spectacle-shaped plates and rods. In adults spicules are totally absent, except for end plates in the pedicels.

Although H.L. Clark (1923) had both T. aurea and T. articulata in his material from the SAM he identified this material, with some hesitation, as T. aurea, thinking that the rods of his specimens were stages in the development of plates. Incidentally T. articulata is characterised by exclusively spectacle-shaped rods which are neither precursors of tables nor table derivatives.

Deichmann (1948), on the other hand, relegated T. articulata to the synonymy of T. aurea but drew attention to three small specimens from Table Bay (with exclusively spectacle-shaped rods in the body wall) which are obviously referable to T. articulata. It is therefore clear that Deichmann also confused the two species. However, her diagnosis of T. aurea is essentially correct and she was the first to realise that its spectacle-shaped rods are reduced tables.

Cherbonnier (1952a), after examining one of the type specimens of T. articulata, separated both species. However, in 1954 he described T. turrisolida on the basis of two small (7mm and 12mm) specimens which appear to be juveniles of T. aurea. What lends support to this assumption is that the spicules of the holotype of T. turrisolida (illustrated by Cherbonnier in 1954 and examined by the author from a fragment of the type) are identical to those of some juveniles of T. aurea determined by Cherbonnier in 1952, judging from his identification of some UCT material.

Some 220 small specimens collected by the writer from the west coast have spicules identical to those of T. turrisolida but since these specimens are juvenile, judging from the immaturity of the gonad, and, like T. aurea, also orange in life and restricted to the west coast, they most probably represent juveniles of this species. Further, their introvert and tentacular spicules are identical to those of T. aurea. Hence there is little doubt that both species are conspecific and hence T. turrisolida is here declared a synonym of T. aurea.

Cherbonnier (1952a) described T. proceracorona on the basis of only the calcareous ring and a fragment of the anterior body wall. According to him T. proceracorona differs from T. aurea in the stronger development of the calcareous ring and the peculiar nature of the pedicel deposits. Although an examination of the holotype of T. proceracorona failed to reveal any spicules, except for pedicel end plates, the calcareous ring does not differ significantly from that of T. aurea (fig. 3e). The body wall spicules of T. proceracorona, illustrated by Cherbonnier, are also present in T. aurea while the peculiar pedicel deposits are reduction stages of tables, many of which also occur in some growth stages of _T. aurea_. In fact, the complete tables illustrated by Cherbonnier, presumably from the pedicels, are identical to those found in juveniles of _T. aurea_. Hence _T. proceracorona_ is here also relegated to the synonymy of _T. aurea_.

T. aurea differs from the type species, _T. fusus_ (O.F. Müller), in its smaller maximum size, smaller tables and in the absence of rosettes from the introvert and elongate tables from the body wall. Its introvert spicules comprising feintly nodular plates and rods separate it from the other three groups of species in _Thyone_ which either possess only rosettes, or only tables or a combination of rosettes and tables in the introvert (see Pawson and Miller, 1981).

Thyone avenusta Cherbonnier
(Fig.5 a-g)

Thyone avenusta Cherbonnier, 1970: 286, fig.4 (A-M); Day, 1974b: 94.

Diagnosis (after Cherbonnier, 1970, modified herein): Small species, up to 47mm long. Colour, in alcohol, brown. Radial plates of calcareous ring (fig. 5g) prolonged posteriorly to terminate in bifur= cate processes. Tables (fig. 5a) two-pillared with circular to sub= circular discs, 0,055-0,09mm, pierced by up to 16 holes; spire low, 0,025-0,05mm; terminating usually in two clusters of teeth. Pedicels with oblong tables (fig. 5b); introvert with rosettes (fig. 5c); tentacles with rosettes and elongate rods, usually perforated at ends (fig. 5d).

Record: M(23/35/i).

Material examined: M(23/35/i), 1 spec; plus body wall fragment of holotype.

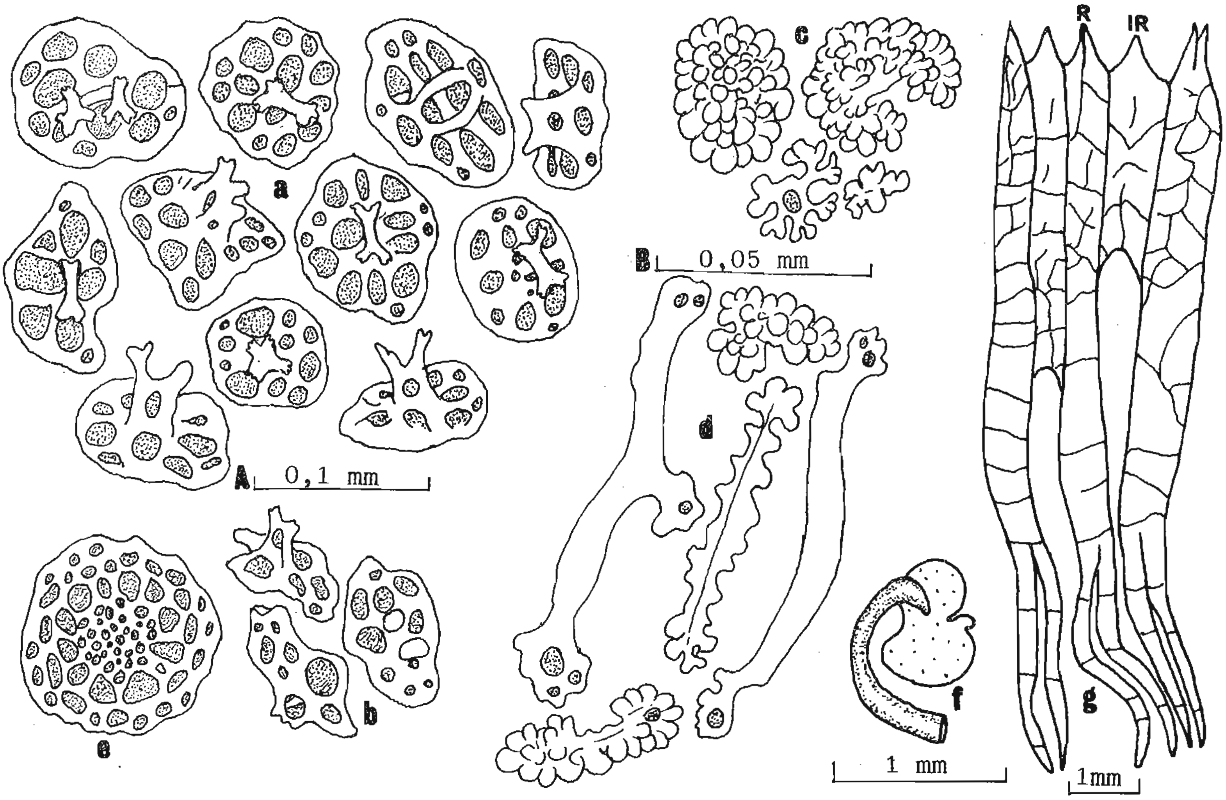


Fig. 5. Thyone avenusta Cherbonnier. MOR 71 H.

a. Tables from anal region

b. Reduced tables from bases of pedicels

c. Introvert rosettes

d. Tentacular rosettes and rods

e. End plate

f. Madreporite

g. Part of calcareous ring

(a,b,e Scale A, c & d Scale B)

Distribution: Known only from Morrumbene, Moçambique.

Habitat: Zostera bed, mangrove; uncovered at LWS.

Remarks: This species was established by Cherbonnier (1970) for a single 30mm specimen. From the UCT reference number it appears that the present specimen was collected together with the type and there= fore there is no doubt as to its identity. However, there are slight differences between it and the type. Cherbonnier describes the type as having more pedicels ventrally and the anus without calcareous "teeth". In the specimen at hand the pedicels are uniformly distributed and anal "teeth" are present. The table discs of the type have fewer marginal holes and the pedicel tables are not reduced. Since the holotype measured only 30mm compared with 47mm for the present specimen, these differences are perhaps age variations. Hence spicules in the present specimen are restricted to the posterior end whereas in the type they occurred in the entire body wall.

The tables of the present specimen bear close resemblance to those of *T. hirta* Cherbonnier from False Bay. It is a pity that Cherbonnier did not compare his material with this species. If it were not for the pedicel and tentacular deposits one would be tempted to consider them conspecific. The pedicel tables of *T. hirta*, however, have curved discs while rosettes are absent from the tentacles.

Thyone avenusta also closely resembles the holotype of *T. propinqua* Cherbonnier, 1970 from the south west Cape Province. However, the latter species has strongly curved table discs in the pedicels and different type of tentacular deposits.

Thyone hirta Cherbonnier

Thyone hirta Cherbonnier, 1970: 288, fig.4 (N-S), fig.5 (A,B).
Thyone sp. Day, Field and Penrith, 1970: 83.

Records: C(34/18/s).

Material examined: None.

Distribution: Known only from False Bay, 48-53m. Map:16.

Habitat: Sand, gravel, shelly sand, Phyllochaetopterus debris.

Remarks: Although established upon six specimens, no specimen in the present material could be referred to this species. Its body wall tables are reminiscent of those of T. avenusta Cherbonnier, 1970 and T. dura Koehler and Vaney, 1908. Its distinction from T. avenusta has already been discussed (see remarks under T. avenusta). It differs from T. dura in the form of its calcareous ring and pedicel deposits.

Regrettably the paratype of T. hirta, received from the PMNH, proved, without doubt, to be referable to Thyonina articulata. It is therefore imperative that the remaining paratypes be re-examined to confirm their conspecificity. A direct comparison between T. hirta and other related species has still to be made.

Thyone imperfecta (Cherbonnier) comb. nov.

(Fig.6 a & b)

Havelockia imperfecta Cherbonnier, 1970: 284, fig.3 (A-T); Day, Field and Penrith, 1970: 83.

Record: C(34/18/s).

Material examined: Dorsal and ventral body wall fragments of holotype.

Distribution: Known only from False Bay, Cape Province, 60-62m.

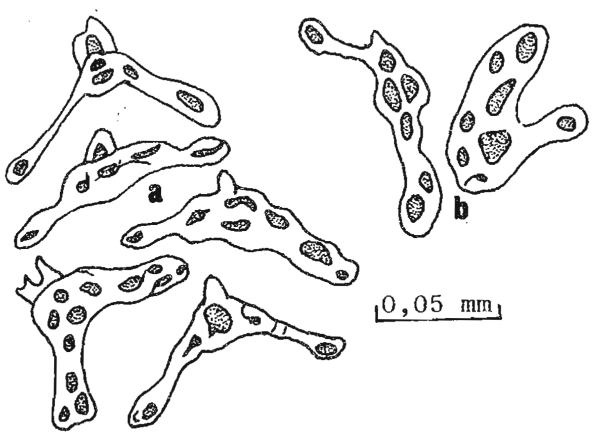


Fig. 6. Thyone imperfecta (Cherbonnier). Spicules from around bases of dorsal podia. Holotype.

a. Spired rods (tables)

b. Rod and plate

Remarks: This species was established by Cherbonnier (1970) for two specimens from False Bay. Cherbonnier referred the species to Havelockia without comparing it with other species. In H. versicolor (Semper), the type species of Havelockia, the calcareous ring, as illustrated by Clark and Rowe (1971: fig. 91b), is short and stout with only the short radial prolongations subdivided and the table discs usually perforated by eight or less marginal holes. However, the subdivided plates and the length of the radial prolongations of the calcareous ring of H. imperfecta suggest that the species belongs in Thyone. Although the fragments of the body wall of the holotype produced only rods and plates from around the bases of pedicels, judging from Cherbonnier's drawings, the spicules of this species are also reminiscent of those of Thyone species, especially T. hirta. Hence the species is here transferred to Thyone. It differs from T. hirta in its larger table discs with a crenulate margin, spires that are frequently distorted, and the presence of rosette-shaped bodies in the tentacles.

Thyone infusca Cherbonnier

(Fig.7 a-c)

Thyone infusca Cherbonnier, 1954: 119, fig.2 (1-13); Day, Field and Penrith, 1970: 83.

Record: C(34/18/s).

Material examined: Dorsal and ventral body wall fragments of holotype.

Distribution: Known only from False Bay, 8-9m.

Habitat: Rock.

Remarks: This presumably small species (Cherbonnier did not mention the state of maturity of the gonad), based upon a single 25mm specimen, is quite unlike other southern African species of Thyone. The plates of the body wall appear to be reduced table discs reminiscent of those of T. aurea. Although there is no evidence of reduction they must be regarded as such since complete tables are found in the anal region and pedicels. In similar size specimens of T. aurea well developed tables are present. T. infusca also differs from the latter species in the structure of the calcareous ring which is composed of large pieces of calcite, especially the interradial series, and in the presence of rosettes in the tentacles. It is improbable that the two species are conspecific. Since the Cape Province coastline is noted for its high endemic fauna it does not appear likely that T. infusca has any close relative outside the southern African subcontinent. The occurrence of several distinct species of Thyone in a restricted area such as False Bay does not preclude the existence of sympatric hybrids.

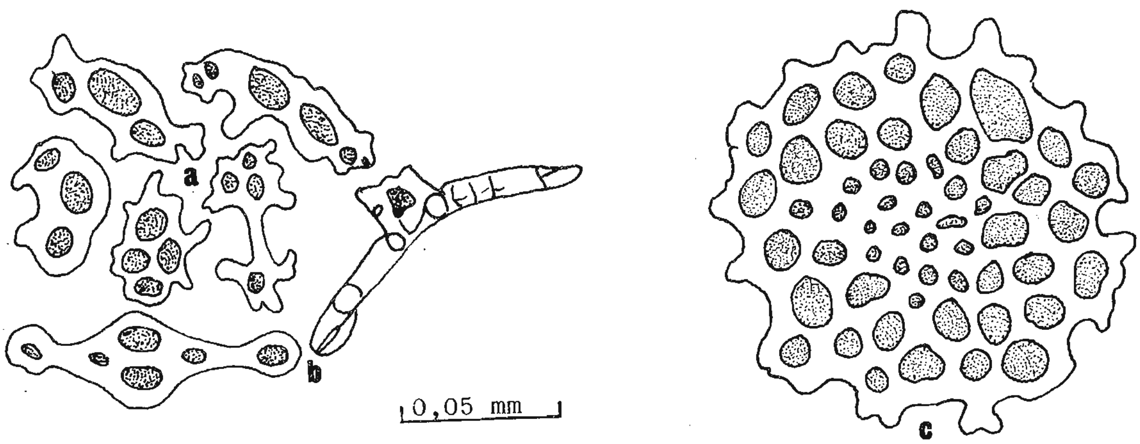


Fig. 7. Thyone infusca Cherbonnier. Holotype.

a. Rods and plates from body wall and pedicels

b. Pedicel tables

c. End plate

(All drawn to same scale)

Thyone propinqua Cherbonnier

Thyone propinqua Cherbonnier, 1970: 289, fig.5, c-k; Day, Field and Penrith, 1970: 83.

Records: C(34/18/s; 34/22/s).

Material examined: Fragment of body wall of paratype.

Distribution: False Bay to Mossel Bay, 19-51m. Map:16.

Habitat: Sand and shell.

Remarks: This species was established by Cherbonnier (1970) upon two probably juvenile specimens. It is a pity that Cherbonnier did not compare this species with Havelockia venustella (Ludwig and Heding) with which it shares the typical fusus - like tables (see Remarks under H. venustella). According to him, T. propinqua differs from T. fusus and other related species in the type of pedicel deposits. In a similar size specimen of T. fusus from N. Ireland, here examined, the disc length of the body wall tables is 0,05-0,0825mm and the spire height 0,03-0,05mm while the corresponding dimensions of the pedicel tables are 0,10-0,155mm and 0,0275-0,0425mm. T. propinqua, however, has in the body wall tables with smaller discs (0,04-0,053mm) and low spires (c. 0,13mm) and, while the pedicel table discs are of approximately the same size range as those of T. fusus, the spires are much lower.

Thyone venusta Selenka

Thyone venusta Selenka, 1868: 115, figs.11 and 12.

Previous southern African record: None.

Material examined: N(29/30/i), 1 spec.

Description: Specimen (mature female) without calcareous ring and associated structures. Length 26mm, diameter 8mm. Colour, in life, brown but dark purple anteriorly and at tip of anus. Pedicels fila= mentous in life, shortening on preservation, crowded, less numerous and sparsely distributed in dorsal mid-body, decreasing in size posteriorly. Anal "teeth" or papillae absent. Spicules, including end plates, absent.

Distribution: Red Sea and Natal.

Habitat: Found under stone in rock pool at LWS.

Remarks: This specimen (the first record of a Thyone from Natal) was examined immediately on preservation. The specimen is undoubtedly a Thyone but whether it is Selenka's T. venusta or another species is open to question. The identification is based upon the absence of deposits and upon the possibility that the Red Sea species could extend into Natal, as does Ohshimella ehrenbergii (Selenka). However, since many species of Thyone lose their deposits with growth, as happens in T. aurea, their absence is inconclusive. In its size, pedicels and colouration the present specimen is quite different from T. aurea. The latter species is bright orange in life, reaches a fairly large size at maturity (130mm) and not yet known to extend east of False Bay.

Selenka's species, based on a single specimen, has not been found since. Perhaps similar forms are masquerading under different names as they possess spicules. Selenka, however, reported the presence of well developed end plates in his specimen which are absent in the Natal form.

Bell's (1884) T. okeni, originally described from New South Wales but probably distributed throughout the western Pacific area (Rowe and Doty, 1977), like Selenka's T. venusta, also possesses only end plates in the pedicels. Since H.L. Clark (1921, 1946) describes his T. okeni from Torres Strait as brownish in life and Rowe and Doty (1977) also report their specimen from Guam as being brown, it seems highly likely that both species, occurring only in the Indo-West-Pacific region, are conspecific, T. venusta being the older, has priority.

Genus THYONINA Gen. nov.

Thyone Vaney, 1908b (non Thyone Oken, 1815; Jaeger, 1833).
Thyone (partim) H.L. Clark, 1923: 415; Deichmann, 1948: 354; Cherbonnier, 1952a: 491.

Diagnosis: Small, cylindrical species up to 55mm long. Pedicels numerous, scattered. Tentacles 10, ventral two reduced. Calcareous ring tubular, radials with long paired posterior prolongations, both ring and prolongations broken into a few large pieces of calcite. Body wall spicules minute, slender, straight or slightly curved, smooth rods, expanded and often digitated at ends which are pierced by a single large and one or more smaller holes. Pedicels with end plate (up to 0,135mm in diameter) with numerous small central holes and a single series of large marginal holes, both types sharply demarcated. Introvert with rosettes. Tentacles with simple plates and rods, often provided with spiny margins.

Type species: Thyone articulata Vaney, 1908 (designated herein).
Etymology: The name Thyonina is derived from Thyone. The gender is feminine.

Remarks: The genus Thyone has long been restricted (Jaeger, 1833) with the designation of T. fusus (O.F. Müller) as type species. It therefore should include only those species with 2(-4)-pillared tables or their derivatives as body wall spicules. The type species of the new genus, formerly classified in Thyone (S.E.), does not belong in this genus since its characteristic slender, spectacle-shaped rods are not derived from tables. Its calcareous ring, subdivided into large pieces of calcite, is also of a different form than that of species currently classified in Thyone (S.S.) and resembles to some extent that of Havelockia. Hence for T. articulata the genus Thyonina is here erected.

A complex calcareous ring in combination with simple rods as exclusive body wall deposits is not present in any other dendrochirotid and hence relating the new genus to others in the group appears proble= matical at this stage. It is for this reason that the genus is at present monotypic and T. articulata has remained in Thyone for so long. Amongst the Thyoninae simple rod-like spicules are found in the monotypic Thyoneria cognata (Lampert) (=Stolus cognatus according to Pawson and Miller, 1981) from the tropical West Atlantic. However, in this latter species the spicules are thick and elongate, with two series of holes and there are in addition small button-like plates with usually four holes (Deichmann, 1930; Caycedo, 1978). Hence the new genus does not even come close to Thyoneria. Hemioedema spectabilis (Ludwig), with which Vaney (1908b) compared his species, has spicules similar to those of T. articulata but its calcareous ring is simple without posterior prolongations.

Thyonina articulata (Vaney)

(Fig.8 a-i)

Thyone articulata Vaney, 1908a: 295; 1908b: 426, pl.4, figs.43, 44; Cherbonnier, 1952a: 495, pl.46, figs.6-9; Day, Field and Penrith, 1970: 83.

Thyone aurea H.L. Clark, 1923: 415 (partim); Deichmann, 1948: 354 (partim), text-figs. 6-9.

Diagnosis: As for the genus.

Previous records: C(33/17/S; 33/18/S).

Material examined: C(33/18/S; 34/18/S, d; 34/25/S), 372 spec.

Description: Colour dark maroon-brown. Plates of calcareous ring (fig. 8i) broken into 2(-4) radial and (1)-2 or 3 interradial series of calcareous elements; posterior prolongations of radials longer than height of ring, composed of a single series of calcareous elements. Each respiratory tree consisting of two main trunks, a short medial and a longer lateral trunk.

Spicules: Rods minute (0,04-0,065mm long) (fig. 8d & e), derived from slender forked deposits and not tables,more numerous ventrally, lost in some specimens, possibly due to preservation and not age. Some ventral rods stouter with larger holes often along most of their length (fig. 8f), rarely forming plates. Cross-shaped rods with 1-2 holes at each extremity occasionally present. Anal region with more slender rods with a single perforation.End plates (fig. 8a & b) with rims often showing deposition of additional calcareous material.

Distribution: Saldanha Bay to Port Elizabeth, 16-162m. Map:12.

Habitat: Course khakhi brown sand and shell, pebbles, stones, shelly sand, white sand, mud.

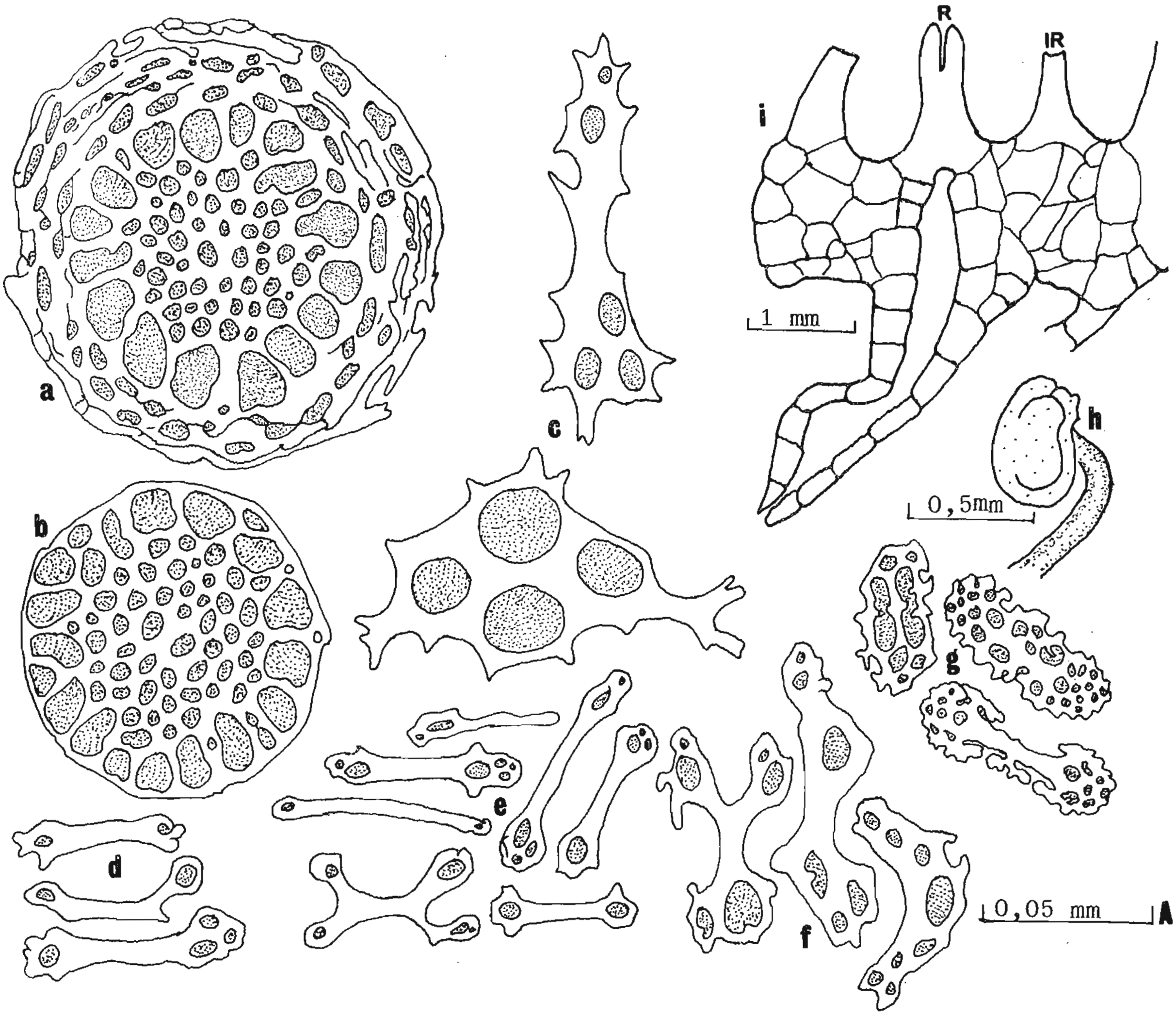


Fig. 8. Thyonina articulata (Vaney). TRA 115 D.

a. Ventral pedicel end plate

b. Anal pedicel end plate

c. Tentacular plates

d. Rods from dorsal body wall

e. Rods from ventral body wall

f. Plates from ventral body wall

g. Rosettes from introvert

h. Madreporite

i. Part of calcareous ring

(a-g Scale A)

Remarks: This species, based on two specimens taken at Saldanha Bay by the RIMSS 'Investigator', was erected and diagnosed by Vaney (1908a) but described in a subsequent paper (Vaney, 1908b). H.L. Clark (1923), in his monograph of the southern African echinoderms, overlooked Vaney's papers thus misidentifying three small specimens from Table Bay, obviously referable to *T. articulata*, as *T. aurea*. Deichmann (1948), in her revision of the South African holothurians, took an unusual step by referring *T. articulata* to the synonymy of *T. aurea* while drawing attention to and illustrating the spicules of the three Table Bay specimens misidentified by Clark. The reason for Deichmann's action is difficult to understand.

Cherbonnier (1952a) examined one of Vaney's types housed in Monaco and found it to be similar to his material from Table Bay. Regrettably Cherbonnier neither compared the calcareous ring of his *T. articulata* with that of the type nor did he comment on Vaney's description of its structure.

The description of the calcareous ring by Vaney (1908b) is brief and the illustration does not correspond with that of *T. articulata* given by Cherbonnier and herein (fig. 8i). Vaney mentions five radial and five interradial prolongations which are illustrated as being distally forked, each prolongation consisting of two series of calcareous elements. According to him the calcareous ring measured 10mm in height in the type which was 45mm in length. However, one of the specimens at hand which measures 40mm in length has a calcareous ring which is scarcely 5mm high. Nevertheless, the present material so well fits Vaney's description of the spicules and end plates that there is little doubt as to its identity.

Thyonina articulata clearly differs from _T. aurea_ not only in size but also in the structure of the calcareous ring, end plates and spicules. Further, it has a short gonadal stolon and two stems to each respiratory tree. Only the spectacle-shaped rods or plates of _T. aurea_ bear any resemblance to the spicules of _T. articulata_ but they are of different origin, being derived from reduced tables and not from dichotomously branched rods. Since all species of _Thyone_ (S.S.) have tables or their derivatives as body wall deposits there is no justifi= cation in retaining _T. articulata_ in this genus.

Note: There are four other specimens (TRA 67H) in the UCT collection, dredged from Dassen Island on the west coast at 29m with the bottom material also described as shelly sand. These specimens differ so much from the typical _T. articulata_ in their form, texture, colouration and some other features that they appear to belong to another species. They are somewhat barrel-shaped, 24-42mm in length, and yellowish with brownish blotches. The calcareous ring has one (rarely more) interradial series of elements, the end plates seldom have a complex rim and the retractors originate as 1-3 strands with the dorsal ones arising more anteriorly. However, they possess the same type of spicules, pedicel end plates and calcareous ring as _T. articulata_.

These specimens are therefore tentatively referred to _T. articulata_ forma _atypica_ but many represent a related, cryptic species. Since they are sympatric with the typical _T. articulata_ they cannot be considered a subspecies.

Subfamily PHYLLOPHORINAE Oestergren, 1907

Diagnosis: See Heding and Panning, 1954: 139.

Remarks: This subfamily is represented in southern Africa by only *Selenkiella paradoxa*, described from a single specimen from Moçambique by Cherbonnier (1970). As this species is not present in the material at hand its spicules are illustrated from a sample of the body wall of the holotype.

Genus *SELENKIELLA* Heding and Panning, 1954

Selenkiella Heding and Panning, 1954: 167; Clark and Rowe, 1971: 206.

Diagnosis: See Heding and Panning, 1954: 167.
Type species: *Selenkiella siamense* Heding and Panning, 1954 (by original designation Heding and Panning, 1954: 167)

Remarks: The type species occurs on the coast of Siam. Besides it and the Moçambique form the genus contains one other species, *S. malayense* Heding and Panning, 1954, from Indonesia.

Selenkiella paradoxa Cherbonnier
(Fig. 9 a-f)

Selenkiella paradoxa Cherbonnier, 1970: 291, fig. 6 (A-P); Day, 1974b:94.

Diagnosis (After Cherbonnier, 1970, modified herein): Holotype 21mm. Colour maroon. Tentacles 25 in two circles (15 + 5). Radial processes of calcareous ring subdivided into 6-8 pieces. Spicules as buttons (plates), tables and rosettes. Buttons (fig. 9c), 0,03-0,17mm, with smooth or undulating margins and one or more holes. Tables (fig. 9d & e) with mostly irregular discs, 0,055-0,08mm, with 4-9 holes and 2-4 pillars. Rosettes (0,02-0,035mm) rare (fig. 9b & f), present both

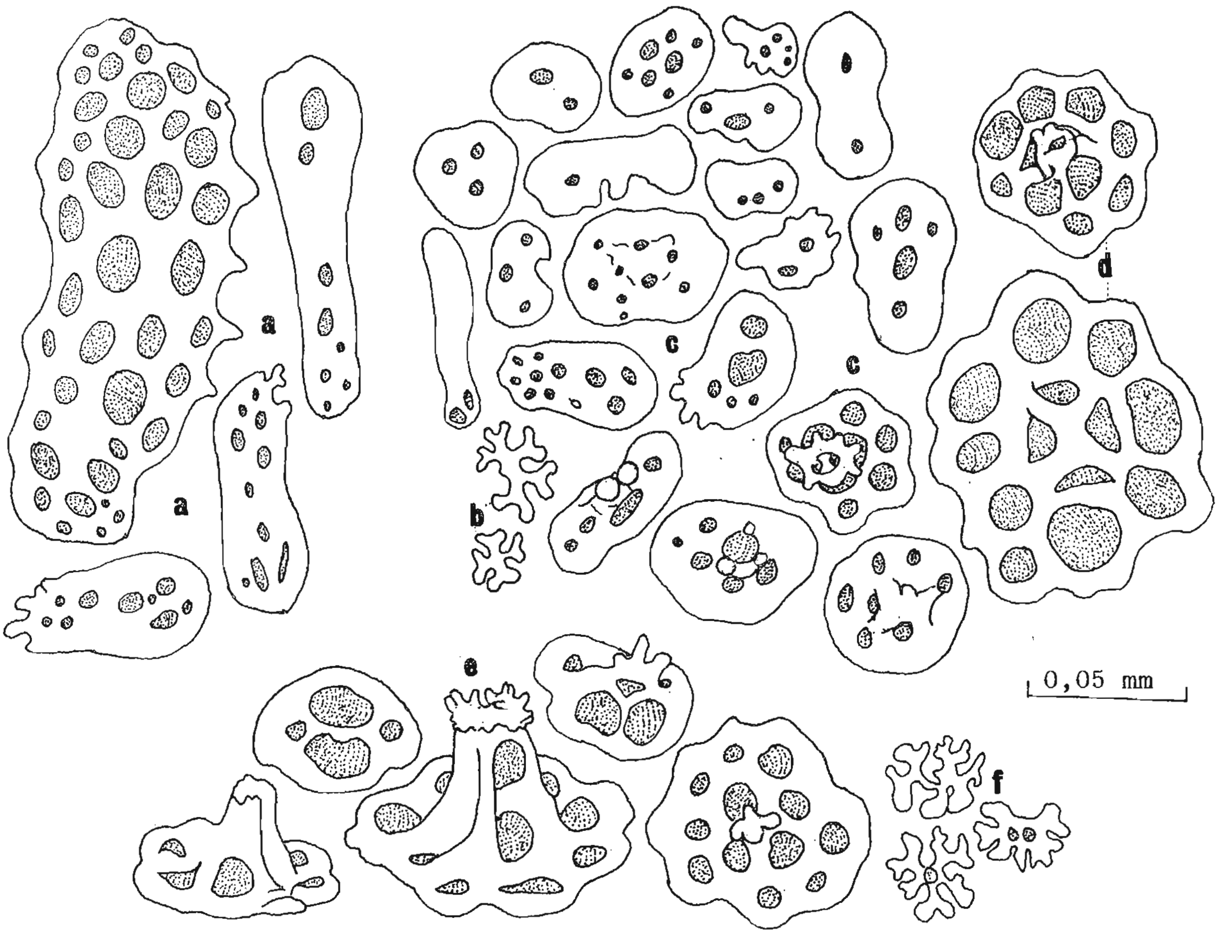


Fig. 9. Selenkiella paradoxa Cherbonnier. Holotype.

a. Plate and rods from ventral pedicels

b. Branched rods (rosettes) from ventral body wall

c. "Buttons", rods, plates and tables from ventral body wall

d. Large tables from ventral body wall

e. Tables from dorsal body wall

f. Branched rods (rosettes) from dorsal body wall

(All drawn to same scale)

dorsally and ventrally.

Record: M(23/35/S).

Material examined: Fragments of dorsal and ventral body wall of holotype.

Distribution: Only known with certainty from Morrumbene, Moçambique, 3-5m. However, Day (1974b) also records the species from Inhaca Island, M(26/32, 33) but this record could not be confirmed.

Habitat: Sand.

Remarks: Cherbonnier (1970) commented on the differences between this species and the two others (*S. siamense* and *S. malayense*) congeneric with it. In *S. siamense* the radial prolongations consist of four pieces, the body wall spicules include only tables with eight or more-holed discs, and the pedicels have only plates. In *S. malayense*, on the other hand, the tentacles are arranged in two circles of 20 + 5, the radial prolongations subdivided into three pieces, the body wall spicules consist of only regular tables with eight-holed discs and the pedicels contain only plates. The southern African species is hence distinct from those of the Far East and this considerably increases the known distri= bution of the genus. Its tentacle distribution and irregular tables place it closer to *S. siamense* than to *S. malayense*. However, more specimens of the species need be found.

Subfamily SEMPERIELLINAE Heding and Panning, 1954

Diagnosis: See Heding and Panning, 1954: 179.

Remarks: The new species, described below, is the first record of the presence of this subfamily in the southern African waters.

Genus NEOTHYONIDIUM Deichmann, 1938

Neothyonidium Deichmann, 1938: 379; Heding and Panning, 1954: 189 (synonymy).

Diagnosis: See Deichmann, 1938: 379.

Type species: Thyonidium hawaiiensis Fisher, 1907 (by original designation Deichmann, 1938: 379).

Neothyonidium arthroprocessum sp. nov.
(Fig.10 a-l)

Diagnosis: A large somewhat U-shaped phyllophorid up to 270mm along ventral surface. Radial plates of calcareous ring prolonged posteriorly into bifurcate processes, each united with the adjacent process of the neighbouring radial plate. Spicules short, thick, perforated rods of varying shapes, the perforations often occluded. Introvert with tables, rods and rosette-shaped bodies.

Etymology: The specific name is derived from a combination of arthron (Gk. joint) and processum, with reference to the jointed processes of the radial plates.

Material examined: Holotype (female), UCT, FAL 963W, 22 XII 1969, Fishhoek Bay, False Bay, C(34/18/S), 12m. Paratype (?male), SAM, A22654, 1 V 1963, Muizenberg Beach, False Bay, C(34/18/S).

Description: Holotype: Partly eviscerated but calcareous ring and part of gut still attached. Form cylindrical, somewhat U-shaped with anterior end strongly bent upwards and posterior only slightly so, hence mouth lying above level of anus. Length along ventral surface 270mm, along dorsal surface 170mm; width in mid-body 33mm, tapering to 19mm at each end. Colour in life grey (ex collector's notes), in alcohol uniformly off white. Body wall smooth, thick, leathery.

Podia papilliform, retracted except for few at both ends, scattered, more numerous ventrally and absent in five narrow longitudinal grooves marking the position of the radial muscles; suckers minute, of same diameter as podia.

Each interambulacrum, except dorsal, with a longitudinal series of narrow transverse slits (function unknown) - ventral interambulacra each with a single series, best developed in mid-body, gradually decreasing in size in both directions; lateral interambulacra each with slits fewer in mid-body and not forming a definite series but increasing in number in both directions.

Tentacles 20, in two circles of 10+10 - an outer ring of large bushy tentacles borne on a well developed, naked introvert and an inner ring of much smaller tentacles situated deep within the oral cavity, in pairs in the radii, only observed after slitting open the calcareous ring; tentacles, in alcohol, grey, speckled with reddish brown. Anus terminal, encircled by five minute calcareous "teeth" and numerous papillae.

Calcareous ring long, tubular (fig. 10n), radial and interradial plates fused for most of their length; anterior projections of radial plates bifid while those of interradial plates slightly pointed; each radial plate prolonged posteriorly to terminate in paired processes, each process linking with adjacent process of next radial to form a calcareous ribbon-like structure encircled by the water vascular ring; both calcareous ring and processes broken into a mosaic of numerous small pieces of calcite.

Polian vesicles five (one pair radius) of which three considerably elongate, the longest 75mm but shortest only 2-3mm - longer vesicles situated in the middorsal, left dorsal and left ventral interradius. Stone canal (fig. 10m) single, short, slightly curved and lodged in dorsal mesentery; madreporite ovoid, well calcified, slightly larger in diameter than stone canal, also suspended in mesentery. Alimentary canal partly eviscerated; last loop of intestine attached to midventral longitudinal muscle band for at least part of its length. Cloaca con= siderably elongate, suspensors strongly developed.

Both respiratory trees remarkably well developed, each tree extending forward in the dorso-lateral interradius as far as the extreme anterior end of body and giving off, at about middle of body, a short transverse branch which passes medially and subdivides into two additional branches in the ventral interradius - one extending anteriorly to anterior third of body, the other posteriorly to terminate ventral to the cloaca - thus giving the appearance of four respiratory trees. End branches of main trunks of respiratory trees filamentous, those of the supplementary trunks sacciform. Since respiratory trees run in close association with the dorsolateral and ventral interradii, some end branches are in close contact with the transverse slits. Both trees open independently into cloaca.

Gonad in two tufts of well branched yellowish tubules full of ripe eggs; gonadal stolon short; gonoduct long, thick, sinuous, running in dorsal mesentery, attached to dorsal body wall. Longitudinal muscles thick, unpaired. Retractors short, originating, all at same level, from anterior end of longitudinal bands. Peculiar, white, elongate to pyriform structures (1-3 per radius) present at base of retractors or attached to longitudinal muscles at this point, possibly representing regenerating retractors since they contain the same complement of spicules.

Spicules:

Spicules of dorsal and ventral body wall somewhat similar, comprising exclusively short (0,06-0,11mm), fairly stout rods of varying shapes, usually bent, U-shaped or branched once or twice, with one large and often one or more tiny holes at ends but holes often partially or completely occluded. Dorsal rods (fig. 10a) with holes frequently occluded, ventral rods (fig. 10b) usually with partially occluded holes. Rods of ventral body wall and anal region often feintly nodular (fig. 10c).

Podia with slightly curved rods, forked and/or perforated at ends or in the middle (fig. 10d), end plates well developed. Tentacles with elongate rods similar to those of pedicels (fig. 10e). Introvert also with elongate (0,05-0,105mm) rods, rosette-shaped rods (0,0175-0,06mm) and well developed tables (fig. 10f), the latter with somewhat oblong discs (0,04-0,07mm) pierced by 2-4 large central and several much smaller marginal holes, spire short, two-pillared, with or without teeth. Pyriform structures (in association with retractors) with rods similar to those of podia and tentacles as well as reticulate plates of varying degrees of complexity (fig. 10g & h). Retractor muscles with similar deposits.

Paratype: Specimen eviscerated - calcareous ring, associated structures and major part of gut lost. Body form subcylindrical and distinctly U-shaped (fig. 101). Dorsal surface considerably narrower than ventral. Length along ventral surface 250mm, along dorsal surface 145mm; width in mid-body 28mm; anterior and posterior ends respectively 17mm and 16mm in diameter. Podia similar to those of holotype. Transverse slits apparently absent. Four retractors originate from anterior ends of longitudinal muscles at about the same level but midventral retractor arises more anteriorly. Respiratory trees, cloaca and suspensors as in holotype. Gonad (?testis) in two tufts of long, narrow, branched tubules almost filling body cavity. Gonoduct long, thin, straight. Last loop of intestine attached to left ventral interradius.

Body wall spicules (0,06-0,115mm long) similar to those of holotype but perforations larger and more numerous, especially ventrally (fig. 10i & j). Anal spicules identical to those of holotype (fig. 10k).

Distribution: False Bay.

Habit/habitat: Burrowing, in sand.

Remarks: It is surprising to note that this large species, well characterised by its structure and spicules and occurring in shallow waters of the south west coast of Southern Africa (an area well explored by the UCT surveys), has not yet been described. In the nature of its calcareous ring, transverse slits (? in females only), respiratory trees and body wall deposits it is distinct from the other species of Semperiellinae to such an extent that there is temptation to erect a new genus for it. However, since the structure of the calcareous ring approaches that of some *Neothyonidium* species it is here included in this genus. Since *Neothyonidium* is characterised by two-pillared tables as body wall spicules, its diagnosis must be expanded to take in the new form. According to Rowe (pers. comm.) an undescribed, similar but not identical, form occurs in Queensland (Australia). Although there is no evidence that the rods of the body wall are derived from tables this possibility cannot be ruled out since those that are U-shaped are probably table derivatives. Spinous rods in many phyllo=phorids, notably in species of the subgenus <u>Phyllophorus</u>, appear to be modified tables, and different modifications are therefore possible in the new species. However, tables of the <u>Neothyonidium</u> type are present in the introvert.

In species of <u>Neothyonidium</u> both the radial and interradial plates are extended posteriorly into bifurcate processes which sometimes link. In <u>N</u>. <u>arthroprocessum</u> only the radials appear to be prolonged posteriorly into bifurcate processes and the interradials do not participate in the formation of the calcareous ribbon-like structure lying beneath the water vascular ring.

The presumed relationship of the transverse slits to the supplementary branches of the respiratory trees and the presence of the peculiar pyriform structures in relation with the retractors remain problematical and must await histological investigation. Since the transverse slits could only be demonstrated in the female (holotype) they may probably serve a reproductive function if this species, like some New Zealand and Antarctic species, incubates its eggs in the coelom. However, no evidence for this could be found in the dissected holotype.

The inner circle of tentacles deserves special mention as it lies much deeper than in other species with 2-3 circles of tentacles and can be easily overlooked on examination of the external features.

Since N. arthroprocessum possesses several features distinct from any other nominal species of the genus, relating it to other species in the group is problematical at this stage.

Fig. 10. Neothyonidium arthroprocessum sp. nov.

HOLOTYPE

a. Rods from dorsal body wall

b. Rods from ventral body wall

c. Rods from anal region

d. Pedicel rods

e. Tentacular rods

f. Introvert rods and tables

g. Rods from pyriform structures

h. Reticulate plate from pyriform structure

m. Madreporite

n. Calcareous ring (opened ventrally) (twice natural size)

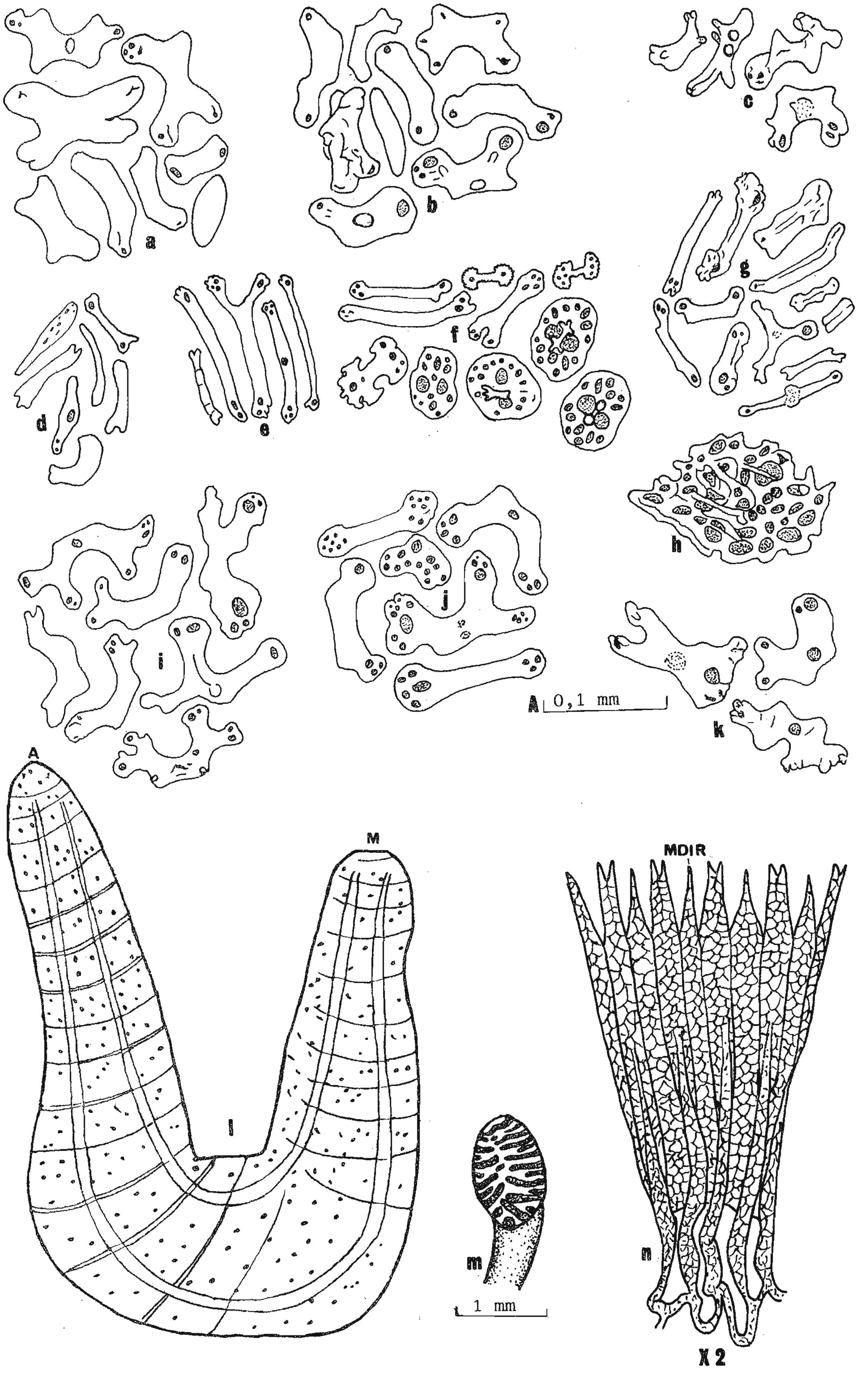
PARATYPE

i. Rods from dorsal body wall

j. Rods from ventral body wall

k. Rods from anal region

l. Entire specimen (natural size)
(a-k Scale A)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Family SCLERODACTYLIDAE Panning, 1949

Diagnosis: See Pawson, 1982: 815.

Remarks: Pawson and Fell (1965) assembled under the Sclerodactylidae the subfamilies Sclerodactylinae Panning, 1949 and the Cladolabinae Heding and Panning, 1954. The family is diagnosed chiefly by the compact nature of the plates of the calcareous ring but the radial processes may be either entire or subdivided. Included in this family are some 15 genera and about 55 species (Pawson, 1982). Two southern African species, formerly classified under *Pentamera* in the Thyoninae, are herein referred to new genera in the Sclerodactylinae.

Subfamily SCLERODACTYLINAE Panning, 1949

Diagnosis: See Panning, 1949: 456.

Genus *SCLEROTHYONE* Gen. nov.

Diagnosis: Tentacles 10, ventral two much reduced. Pedicels in double rows, restricted to ambulacra. No interradial papillae. Calcareous ring compact, posterior processes of radial plates long, entire or subdivided into about 10 pieces of calcite. Tables of two types: with a regular oval four-holed disc with or without a "handle" on one side, and a short, often arched, two-pillared spire; and with an irregular plate-like disc with 6-8 holes and usually an arched spire. Pedicels with end plates, oblong tables and other plates. Introvert and tentacles with perforated plates and rods but no tables.

Type species: *Cucumaria? velligera* Ludwig and Heding, 1935 (designated herein).

Etymology: The name *Sclerothyone* is derived from a combination of the stem of *Sclerodactyla* as a prefix and *Thyone*.

Remarks: The genus Sclerothyone is here erected to accommodate only the type species which was referred doubtfully to Cucumaria by Ludwig and Heding (1935). Deichmann (1948) transferred the species to Pentamera but commented that its tables are so much like those of Thyone parafusus and T. pseudofusus that, was it not for the ambulacral restriction of the pedicels, the species could well be a Thyone. Although there are remarkable similarities in the spicules of these three species, the pedicel tables and calcareous ring of C. velligera are different. These features in combination with the body form also prevent the in= clusion of the species in Pentamera which, as defined by its type species, P. pulcherrima, is characterised by a tubular, partially sub= divided, calcareous ring and handle-less tables and plates. Panning (1949), on the other hand, unaware of Deichmann's paper more or less contemporary with his, referred C.? velligera, with some doubt, to Neothyone, but this genus, as diagnosed by Deichmann (1941), has scattered pedicels and knobbed buttons or plates.

The non-tubular nature of the calcareous ring and the occurrence in at least the holotype, of unfragmented processes to the radial plates, suggest that C. velligera belongs in the Sclerodactylidae rather than in the Phyllophoridae (sensu Pawson and Fell, 1965). Since it is not referable to any of the existing genera, a new genus is here diagnosed to accommodate it. Sclerothyone appears to be distantly related only to Sclerodactyla amongst the Sclerodactylinae. It differs from it in the ambulacral restriction of the pedicels, in the form of the calcareous ring and in the presence of two-pillared tables with a "handle". The other genera currently included in this subfamily are generally characterised by knobbed buttons or plates.

Sclerothyone velligera (Ludwig and Heding) comb. nov.

(Fig.11 a-i)

Cucumaria? velligera Ludwig and Heding, 1935: 70, text-fig.49.

Pentamera velligera Deichmann, 1948: 351.

Neothyone ? velligera Panning, 1949: 458.

Diagnosis: As for the genus.

Previous record: C(34/18/d), 318m.

Material examined: C(34/18/d), 360-365m, 1 spec.

Description: Specimen (WCD 219H) vase-shaped (fig. 11j), length 22mm, breadth of anterior end 6,5mm. Colour, in alcohol, off white. Anal papillae present, "teeth" absent. Pedicels non-retractile, confined to ambulacra in groups of 2-5, more numerous anteriorly.

Calcareous ring (fig. 11f) compact, plates weakly fused at base only; paired posterior prolongations of radials about thrice height of ring, each broken into 9-10 pieces of calcite. Madreporite of two kidney-shaped calcareous pieces (fig. 11g). Gonadal tubules unbranched, full of eggs (fig. 11h). Each respiratory tree with two main trunks but only basal parts of trunks, with two sacciform end branches, preserved.

Spicules:

Regular table discs (fig. 11a) oval, 4-holed (0,08-0,12mm); spire (including "handle") 0,04-0,08mm, frequently reduced to knobs on surface of disc. Irregular table discs (fig. 11 a & b) plate-like, rectangular to subrectangular (0,08-0,158mm), perforated by 5-10 holes; spire arched or terminating in a single tooth. Pedicel plates irregular, multilocular (fig. 11c); pedicel tables with an elongate (0,12-0,17mm) curved disc, perforated by usually four large central holes and one hole at each extremity; spire short (0,035-0,07mm), terminating in one or more teeth. Introvert plates elongate, multilocular or reduced to spectacle-shaped rods (fig. 11e). Tentacular plates and rods curved, irregular (fig. 11d); few rods solid, C-shaped.

Distribution: South west of Cape Point, South Africa, 318-365m.
Map: 10.
Habitat: Rock.

Remarks: Ludwig and Heding (1935) established this species on the basis of two specimens. As the present specimen differs substantially from the type, it is briefly described above as it may not be con= specific with Ludwig and Heding's species.

Some differences are the distribution of pedicels (in Ludwig and Heding's species stated to be in double rows), the absence of anal "teeth", the subdivided radial processes, the shape of the madreporite, the origin of retractor muscles, the poor development of teeth on the body wall tables and the presence of subrectangular plate-like tables in the integument. Perhaps not all these differences are significant since a superficial study gives the impression that the pedicels are arranged in double rows, the presence of anal teeth is a variable character within a species, and members of the same species may have divided or undivided processes to the radial plates as in Ohshimella ehrenbergii (Selenka). The madreporite and the origin of retractors are also variable characters. The irregular tables, if they were present in the type, could have been overlooked.

Features which support the conspecificity of the two forms are their size (Ludwig and Heding's material was 23-24mm in length), locality and depth at which collected, poor development of respiratory trees and the presence of regular tables of similar form and size.

Since Ludwig and Heding did not comment on the degree of maturity of the gonad, Deichmann (1948) suspected that the ambulacral restriction of the pedicels may be a juvenile character and that the species may possibly belong in *Thyone*. Since the present specimen has mature gonadal tubules it cannot be referred to *Thyone*. In fact its calcareous ring is of a different form than that of species currently included in *Thyone* except *T. adinopoda* recently described by Pawson and Miller (1981). However, although the latter species also has tables with "handles" similar to those of *S. velligera*, its pedicels are scattered as in other *Thyone* species.

Regrettably the genus *Sclerothyone* is at present monotypic unless more material or a re-examination of the type proves that more than one species are here involved.

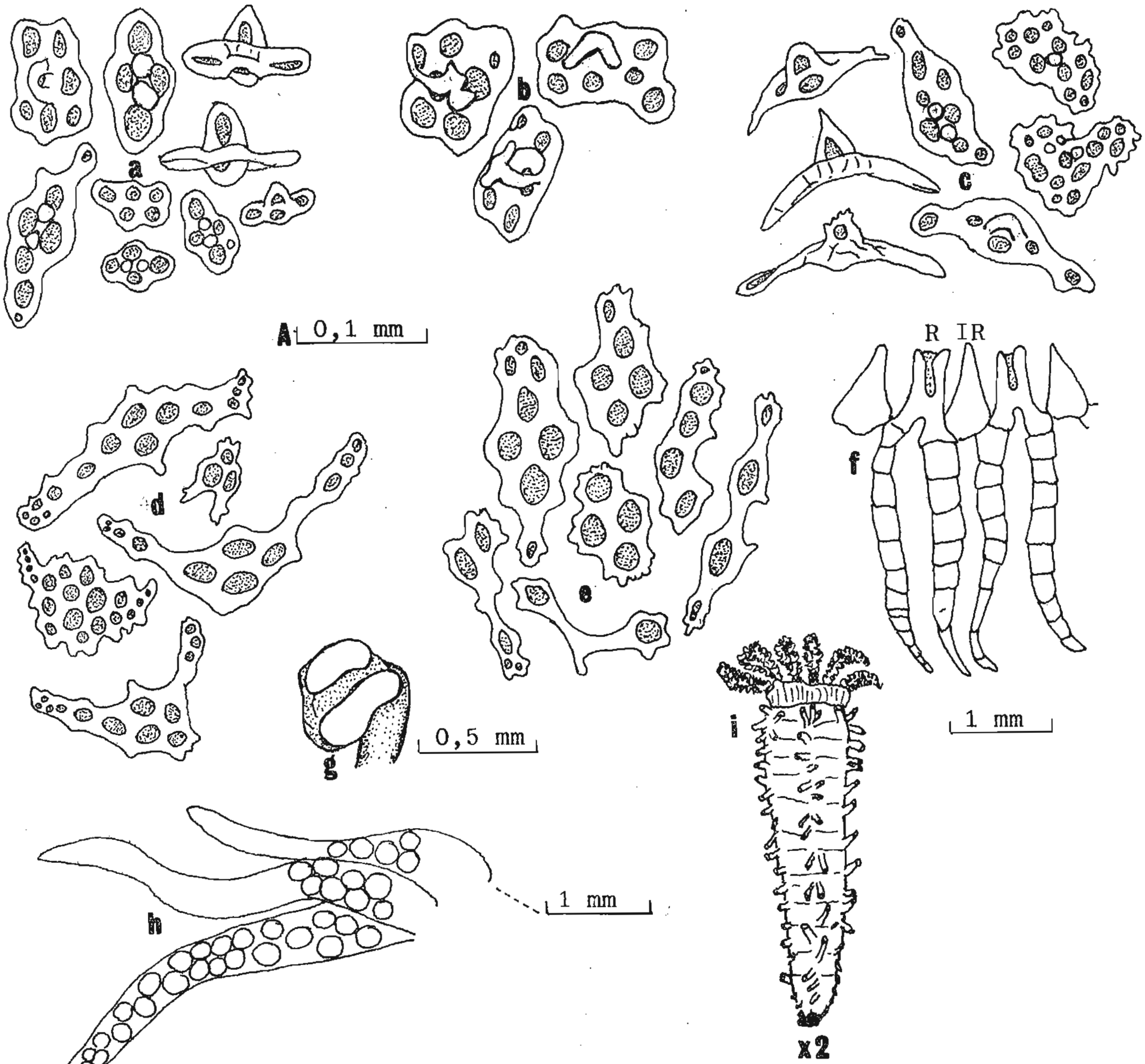


Fig. 11. <u>Sclerothyone velligera</u> (Ludwig and Heding). WCD 219 H.

a. Spicules from dorsal body wall

b. Plate-like tables from ventral body wall

c. Pedicel spicules

d. Tentacular spicules

e. Introvert spicules

f. Part of calcareous ring

g. Madreporite

h. Gonadal tubules

i. Entire animal (twice natural size)

(a-e Scale A)

Genus TEMPARENA Gen. nov.

Diagnosis: Small, barrel to U-shaped species up to 25mm long. Tentacles 10, ventral two reduced to stubs. Skin thin, rigid with spicules. Radial and interradial plates of calcareous ring small, compact, with radials carrying long, undivided, paired processes, up to eight times the height of ring. Gonad hermaphrodite, posterior tubes developed as testis, anterior as ovary, the latter may contain embryos. Body wall spicules tables and plates; tables with usually a four-holed, oval disc and a short, two-pillared spire, with or without teeth; plates thick, smooth, elongate, multilocular. Introvert and tentacles with perforated plates with crinkled margins; no tables.

Type species: *Cucumaria ? chuni* Ludwig and Heding, 1935 (designated herein).

Etymology: The generic name *Temparena* is an anagram of *Pentamera*, the genus in which the type species was formerly classified.

Remarks: The new genus is here erected to accommodate only Ludwig and Heding's *Cucumaria ? chuni*. Deichmann (1948) transferred the species to *Pentamera* and it was retained in this genus by Panning (1949). Although the body wall spicules of *C. chuni* are remarkably similar to those of *Pentamera* the calcareous ring is different. In *P. pulcherrima* (Ayres), the type species of *Pentamera*, the calcareous ring is tubular and, together with the posterior processes of the radial plates, at least partially broken into a mosaic of small pieces of calcite.

Since the calcareous ring and the processes are compact in *C. chuni* it cannot be classified in the Thyoninae but in the *Sclerodactylinae*.

Since no existing genus in this subfamily can accommodate the species, the genus Temparena is diagnosed. Within the subfamily, the genus shows some affinity to Sclerothyone and Sclerodactyla. It differs from the former in the form of its body and calcareous ring and in the presence of smooth plates and handle-less tables and, from the latter, in its distribution of pedicels, form of the calcareous ring and in the presence of plates in combination with tables.

Temparena chuni (Ludwig and Heding) comb. nov.
(Fig.12 a-j)

Cucumaria? chuni Ludwig and Heding, 1935: 192, text-figs. 51 and 52, pl.2, figs. 1-7.

Pentamera chuni Deichmann, 1948: 350; Panning, 1949: 460.

Diagnosis: As for the genus.

Previous record: C(34/18/d), 318m.

Material examined: C(34/18/d), 360-365m, 1 spec.

Description: Body form barrel to U-shaped (fig. 12j). Length 18mm, breadth 6mm. Colour uniform greyish cream in alcohol. Radial and interradial plates of calcareous ring (fig. 12i) united by narrow bridges. Posterior prolongations of radial plates about eight times height of ring. Each respiratory tree with two main trunks. Gonad (? testis) (fig. 12g) developed as paired clusters of short, rarely terminally branched, banana-shaped tubules. Ovary not observed but coelom contains several eggs and embryos up to the early post-gastrula stage (0,49mm) with a pair of coelomic pouches.

Spicules:

Table discs of body wall (fig. 12b) 0,095 - 0,16mm long; spire 0,02 - 0,06mm, of two pillars, either terminating in a toothed apex, or arched, or reduced to bow-shaped nodules. Plates (fig. 12a & c) elongate (0,175 - 0,35mm) pierced by 4-13 small holes. Pedicel table discs (fig. 12d) 0,08 - 0,125mm, spire height 0,025 - 0,04mm; pedicel plates and rods 0,06 - 0,115mm. End plates 0,04mm in diameter. Plates of introvert and tentacles multilocular, of varying size and with crinky margins (fig. 12e & f).

Distribution: South of Cape Point, South Africa, 318-365m. Map: 10.

Habitat: Rock.

Remarks: This is the second record of this interesting species, well characterised by its calcareous ring and spicules. In its body form and deposits it approaches Pentamera calcigera (Stimpson), from the N.E. Pacific and West Atlantic waters, illustrated by Pawson (1977a). However, a comparison of T. chuni with P. calcigera received from the USNM, shows that the latter species is much larger and unisexual with a tubular calcareous ring and short paired processes to the radial plates. The remarkable similarity in the spicules of both species (the plates of P. calcigera being only slightly smaller) raises some doubt as to the justification of the use of the calcareous ring to separate the Sclero= dactylidae and the Phyllophoridae (sensu Pawson and Fell, 1965). The similarity of the spicules of Sclerothyone with those of some Thyone species also supports this contention.

Since both T. chuni and P. calcigera are widely separated their similarities are probably a result of parallel evolution and convergence and hence not indicative of any close relationship. Since T. chuni is hermaphrodite and either ovoviviparous or practising coelomic in= cubation, it presumably has a southern origin. However, a similar form has yet to be described from the Antarctic region.

Fig. 12. Temparena chuni (Ludwig and Heding). WCD 219 H.

a. Plates from dorsal body wall

b. Tables from dorsal body wall

c. Tables and plates from ventral body wall

d. Pedicel spicules

e. Introvert spicules

f. Tentacular spicules

g. Male gonadal tubules

h. Madreporite

i. Middorsal interradial and adjoining radial plates of calcareous ring

j. Entire animal

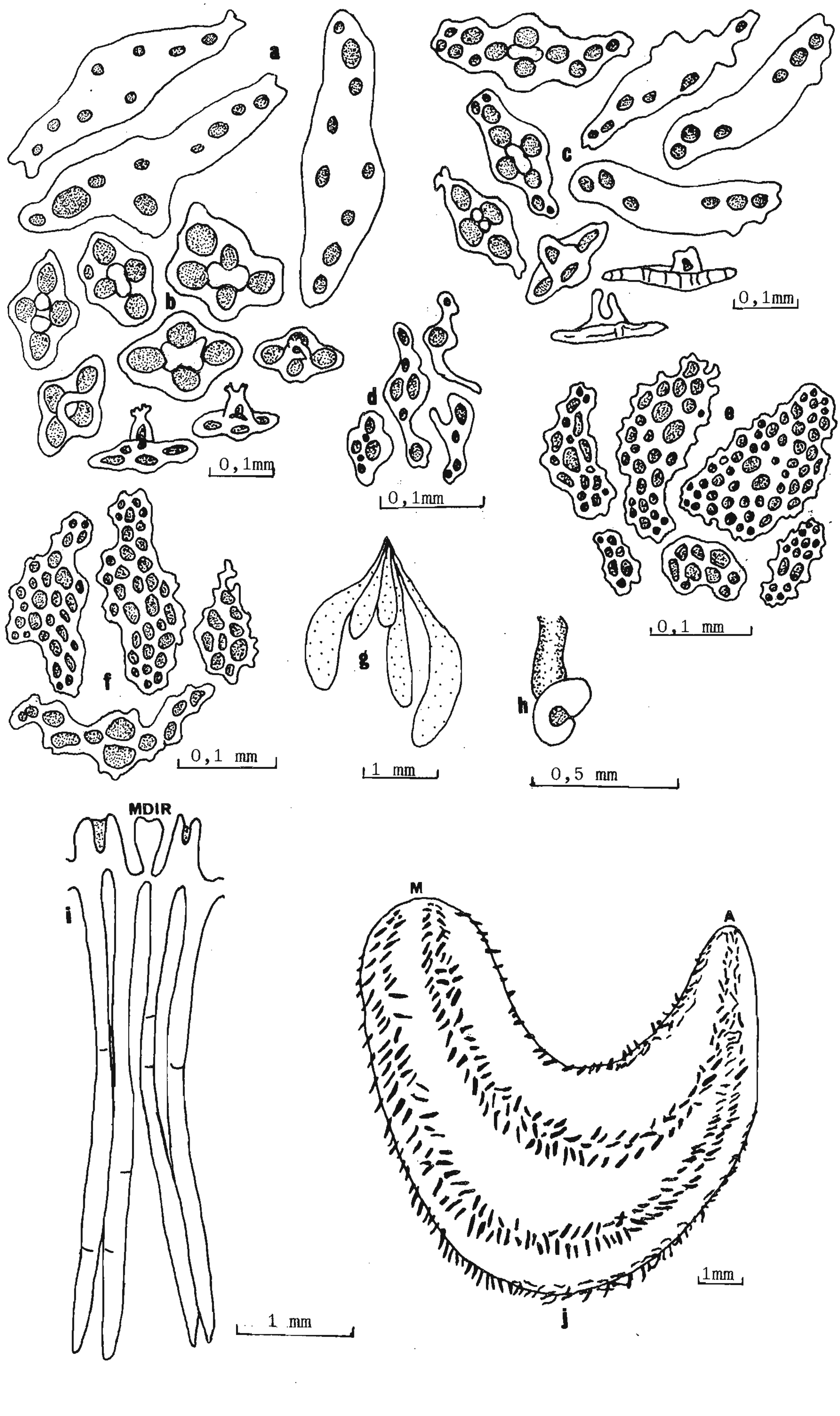


Fig. 12

Subfamily CLADOLABINAE Heding and Panning, 1954

Diagnosis: See Heding and Panning, 1954: 107.

Remarks: This is a polytentaculate subfamily of the Sclerodactylidae characterised by an undivided, non-tubular calcareous ring with processes that are either entire or fragmented. In southern Africa the subfamily is represented by three genera and as many species.

Genus AFROCUCUMIS Deichmann

Pseudocucumis (partim) Sluiter, 1901b: 107; H.L. Clark, 1923: 417;
Afrocucumis Deichmann, 1944: 736; 1948: 358; Heding and Panning, 1954: 108 (synonymy).
Discucumaria H.L. Clark, 1946: 404.

Diagnosis: Heding and Panning, 1954: 108.

Type species: Cucumaria africana Semper, 1868 (by monotypy).

Remarks: Heding and Panning (1954) include only two species in this genus, namely A. africana, the Indo-West-Pacific species and A. ovulum (Selenka) from the Panamic region. The latter species, described as a Stolus by Selenka (1867), was referred to Euthyonidium by Deichmann (1938). However, Heding and Panning transferred the species to Afrocucumis and relegated Euthyonidium to the synonymy of Duasmodactyla. Although the radial plates of the calcareous ring of A. ovulum are pro= longed posteriorly they are deeply incised and without posterior processes. The spicules are not disc-like plates, as found in A. africanus, but irregular crosses, plates and rods, the former, according to Deichmann, represent reduced tables. It, therefore, appears unlikely that A. ovulum belongs in Afrocucumis which is perhaps monotypic.

Afrocucumis africana (Semper)
(Fig.13 a-i)

Cucumaria africana Semper, 1868: 53, 270, pl.15, fig.16; Théel, 1886a: 108; Ludwig, 1887: 1236.

Pseudocucumus africana Ludwig, 1888: 815; Lampert, 1896: 61; Sluiter, 1901b: 107; Mitsukuri, 1912: 257, text-fig. 52, pl.8, fig.66; H.L. Clark, 1923: 417.

Phyllophorus transvectus Sluiter, 1914: 19, fig.7a, b.

Orcula cucumiformis Semper, 1868: 244, 274, pl.40, figs.8, 9.

Cucumaria assimilis Bell, 1886: 27; Ludwig, 1899: 561.

Pseudocucumis theeli Ludwig, 1887: 1236, pl.15, figs.12-16.

Discucumaria africana H.L. Clark, 1946: 404.

Afrocucumis africana Deichmann, 1944: 736; 1948: 358; Heding and Panning, 1954: 109, text-fig.39; Clark and Rowe, 1971: 182 (dist.), text-fig. 95g, pl.30, fig.3; Rowe and Doty, 1977: 226, fig. 2a.

Diagnosis: See Semper, 1868: 53; Deichmann, 1948: 358.

Previous southern African record: Moçambique/?Natal.

Material examined: M(24/35/i), 4 spec. (Adult + 3 juveniles).

Local distribution: Known with certainty only from Moçambique. Map: 3.

General distribution: According to Rowe and Doty (1977) the species is distributed throughout the Indian Ocean, Indonesia and Western Pacific Islands but has yet to be recorded from the Phillipine and Hawaiian Islands.

Remarks: This is a well known and well characterised species. The adult specimen in the present material measures 37mm. The radial processes of the calcareous ring are broken into three pieces of calcite (fig. 13 g & h). The ventral radial plate in one juvenile is fragmented trans= versely into two pieces, probably an artefact or an abnormal development. Smooth, simple, multilocular plates (fig. 13b), common in the youngest individual (17mm), are definite precursors of the large lenticular plates with pyramidal knobs which, in the adult, measure 0,22 - 0,325mm in diameter.

The record of this species from the Natal coast is dubious since H.L. Clark's (1923) material bore both Natal and Moçambique labels.

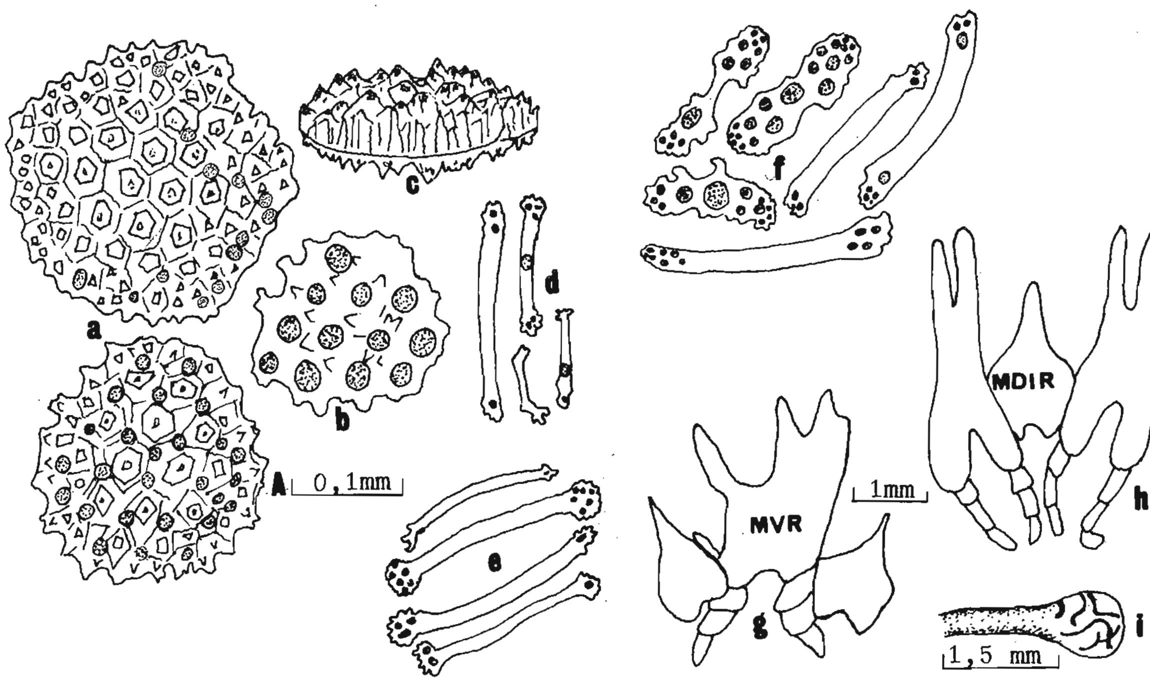


Fig. 13. Afrocucumis africana (Semper). JAN 26 S.

a. Lenticulate plates from dorsal body wall

b. Developing plate

c. Side view of plate from anal region

d. Introvert rods

e. Tentacular rods

f. Pedicel plates and rods

g. Midventral radial and adjoining interradial plates of calcareous ring

h. Middorsal interradial and adjoining radial plates

i. Madreporite

(a-f Scale A)

Genus CLADOLABES Brandt

Cladolabes Brandt, 1835: 35; Heding and Panning, 1954: 121 (synonymy).
Urodemas Selenka, 1867: 352; H.L. Clark, 1938: 797; 1946: 410.

Diagnosis: See Heding and Panning, 1954: 121.

Type species: Cladolabes limaconutus Brandt, 1835 (by subsequent designation Heding and Panning, 1954: 121).

Remarks: Heding and Panning (1954) analysed the genus and included in it eight species of which only C. bifurcatus, described as Urodemas bifurcatum by Deichmann (1944), occurs in southern Africa. The genus Urodemas, erected by Selenka (1867) and emended by H.L. Clark (1938), was relegated to the synonymy of Cladolabes by Heding and Panning.

Cladolabes bifurcatus (Deichmann)
(Fig.14 a-g)

Urodemasbifurcatum Deichmann, 1944: 731, fig.1; 1948: 357, pl.20, figs. 12, 13.
Cladolabes bifurcatus Heding and Panning, 1954: 132.

Diagnosis: See Deichmann, 1944: 731.

Previous record: N(30/30/i).

Material examined: N(29/30/S, 30/31/S, 29/31/i), 4 spec.

Distribution: Southern Natal between Umtwalumi and Umdloti, 0-3m. Map: 11.

Habitat: In rock crevices and under stones.

Remarks: Deichmann (1944) only diagnosed the species and briefly commented on its anatomy in the remarks. The length of the largest specimen in the present material is 85mm and breadth 27mm. The life colouration of the species is light to chestnut brown with rust to dark-coloured suckers and brown to black tentacles. The introvert is remarkably well developed and with three rows of pedicels per radius ventrally and two dorsally. The radial plates of the calcareous ring carry rudimentary bifurcate processes and the medial border of the two dorso-radials is notched. There are 12 polian vesicles arranged in groups of three in the interradii, except the middorsal (fig. 14g).

The spicules (fig. 14a & b), as suspected by Deichmann (1944), are modified two-pillared tables with the disc reduced to a forked spiny base, 0,02-0,07mm wide, and the pillars fused to form a rod, 0,07-0,11mm long, ending in a cluster of 12 or more spines. The latter may be symmetrically arranged, as observed by Deichmann, or quite asymmetrical (fig. 14c). Incomplete table discs with a pair of holes are occasionally preserved (fig. 14b). The end plates of the pedicels are 0,6mm in diameter and these are encircled by other plates, 0,14-0,22mm long, with 5-30 holes (fig. 4f). The tentacular deposits include rods with smooth to crinkly margins (fig. 4d) while the introvert deposits are tables with a spinose, 1-4-holed disc, sometimes reduced to a forked base, and a spire ending in a cluster of spines (fig. 14e).

This is the second record of this interesting species. Deichmann (1948) speculates that the species may reach a larger size (the type measured 60mm) but regards its occurrence around Durban as "almost certainly fortuitous" (1948: 358). The addition now of more material from shallow waters around Durban indicates that the species is present but may not be common. Further, Deichmann (1944, 1948) is of the opinion that the spicules are abnormal. It is now certain that spinous rods with bifurcate bases are characteristic of this species.

According to Deichmann (1944) the species is most closely related to C. aciculus (Semper) from Mauritius and other parts of the Indo-West-Pacific region. However, C. aciculus has a different type of calcareous ring with both the radials and the interradials carrying short processes that are often linked, while its spicules are highly modified tables with the spire ending in a single point. On the contrary, the calcareous ring, spicules and pedicel plates of C. bifurcatus approximate those of C. schmeltzii (Ludwig) from the East Indies, North Australia and Phillipine Islands, except that in the Natal species the interradials carry no processes. The rods of C. bifurcatus can be easily derived from the spiny tables with reduced discs of C. schmeltzii. In addition the size, colouration, tentacle arrangement and internal anatomy of both species are similar. However, in C. schmeltzii the pedicels are stated to be scattered while in C. bifurcatus they are restricted to the ambulacra except in the central mid-body where they also occur in the interambulacra.

C. bifurcatus appears to be endemic to Natal. Its absence from the colder waters of the Cape Province in which the southern African endemic fauna dominates, suggest that it is a warm water species.

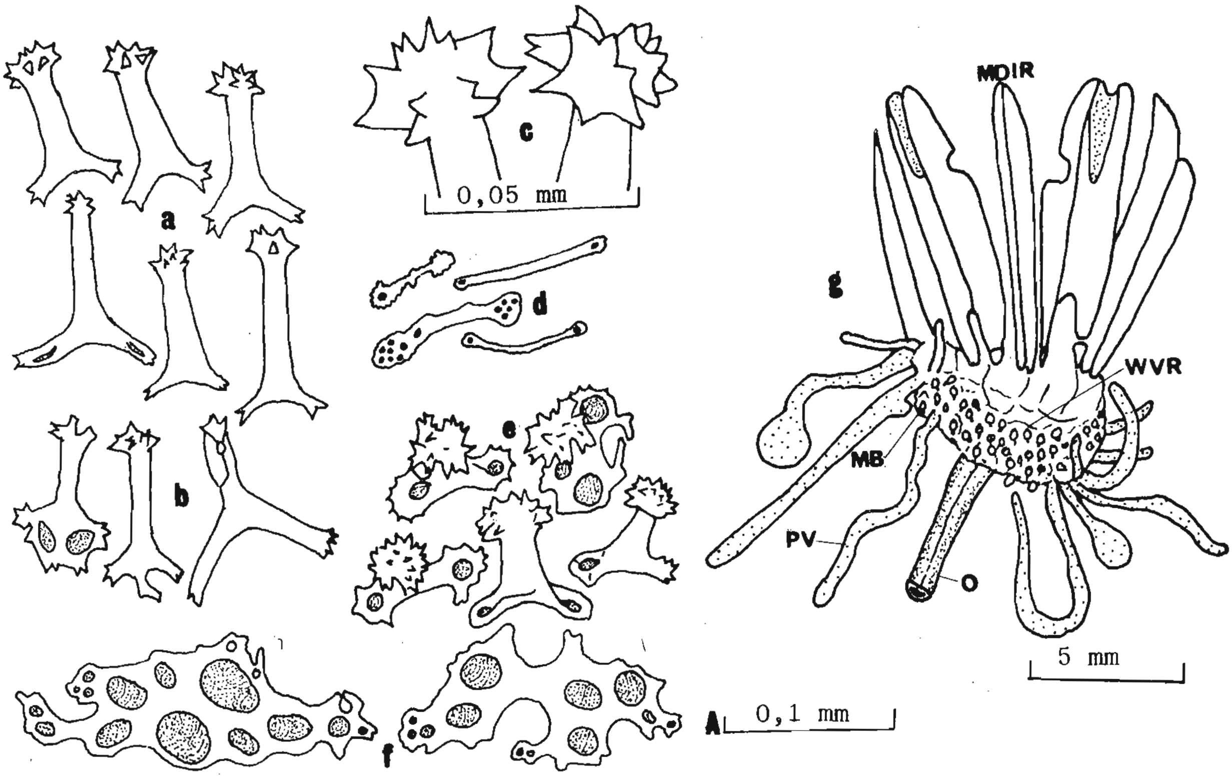


Fig. 14. <u>Cladolabes bifurcatus</u> (Deichmann). Umdloti

a. Normal forked rods from dorsal body wall

b. Abnormal rods from dorsal body wall

c. Apex of rods (enlarged)

d. Tentacular rods

e. Introvert tables

f. Pedicel plates

g. Calcareous ring and associated organs)

(a, b, d, e & f Scale A)

Genus OHSHIMELLA Heding and Panning

Urodemas (partim) Selenka, 1868: 352.

Phyllophorus Ludwig, 1875: 95; H.L. Clark, 1923: 417 (non Grube).

Urodemella Deichmann, 1948: 358.

Ohshimella Heding and Panning, 1954: 133.

Diagnosis: See Heding and Panning, 1954: 133.

Type species: Urodemas ehrenbergii Selenka, 1868 (by original designation Heding and Panning, 1954: 133).

Remarks: Ohshimella was erected by Heding and Panning (1954) to accommodate the type species originally from the Red Sea and O. mauritiensis from Mauritius, described as new. In southern Africa the genus is represented by its widely distributed type species.

Ohshimella ehrenbergii (Selenka)
(Fig.15 a-g)

Urodemas ehrenbergii Selenka, 1868: 14, figs.6-8; Macnae and Kalk, 1958: 130.

Phyllophorus n.sp. Semper, 1868: 245, pl.30, fig.21.

Phyllophorus ehrenbergi Lampert, 1885: 181, Théel, 1886a: 151.

Phyllophorus frauenfeldi Ludwig, 1875: 95, fig.22; Lampert, 1885: 178; Théel, 1886a:151, H.L. Clark, 1923: 417.

Cucumaria turbinata syn. nov. Pearson (non Hutton), 1903: 189, pl.1, figs.2-6; 1910a: 169, text-figs. 13,14; Heding and Panning, 1954: 137, text-fig.59.

Orcula torrense Helfer, 1913: 433, text-figs. 1-7.

Urodemella ehrenbergii Deichmann, 1944: 733; 1948: 358.

Ohshimella ehrenbergii Heding and Panning, 1954: 133, text-figs. 57-59; Clark and Rowe, 1971: 182 (dist.), pl.30, fig.5.

? Urodemas gracile Selenka, 1868: 114; Heding and Panning, 1954: 137.

Diagnosis (From Selenka 1868: 14, modified herein): Radial prolon= gations of calcareous ring compact or divided into a few pieces of calcite. Body wall spicules short spinous rods, usually accompanied by rosette-shaped miliary granules. Tables present only in body wall and/or pedicels of juveniles.

Previous southern African records: M(12/40), N(27/32/i,s).
Material examined: N(30/30/i; 30/31/S; 28/32/i; 27/32/i), 18 spec.
Local distribution: Moçambique to southern Natal, 0-3m. Map: 3.
General distribution: From India, Maldives and Ceylon, round Arabia to the Red Sea and east coast of Africa.
Habitat: In rock crevices or under stones at LWS.

Remarks: Urodemas ehrenbergii Selenka, 1868 and Phyllophorus frauenfeldi Ludwig, 1875, both originally described from the Red Sea, were synonymised and referred to Urodemella by Deichmann (1948) and to Ohshimella by Heding and Panning (1954). Thandar (1971, M.Sc. Thesis unpublished) referred some Natal forms to O. ehrenbergii but with some doubt since, in possessing divided radial processes to the calcareous ring and rosettes in the body wall, they corresponded with Ludwig's description of P. frauenfeldi. Thus the writer erroneously supported the separation of the two species. Because of the sympatry of both species this view cannot be upheld. The breaking up of the radial processes may just be an individual or local variation while the absence of rosettes in Selenka's type may be attributed to their dissolution in the preserving fluid.

However, three of the four more recent specimens in the present material from the Natal coast satisfy Pearson's (1910a) description of Cucumaria turbinata from Moçambique, also suspected by Heding and Panning (1954) to be conspecific with O. ehrenbergii. Since the three specimens are obviously juvenile, judging from their size (< 24mm), ambulacral restriction of most of the pedicels and the immaturity of the gonad, they are nevertheless also referred to O. ehrenbergii. Although Pearson (1910a) did not comment on the maturity of his single specimen from Moçambique, its size (45mm) and some ambulacral restriction of pedicels suggest that it undoubtedly was also a juvenile. Hence C. turbinata Pearson, 1903, 1910a (non Hutton, 1878) is here declared a synonym of O. ehrenbergii.

While the adults of O. ehrenbergii are cylindrical and brownish the juveniles are truncate and greyish-peach with black pedicels. The radial processes of the calcareous ring in juveniles are folded beneath the pharynx and hence not obvious from superficial study. The spinous rods (fig. 15a) (0,05-0,085mm) are more or less the same size as those of adults (0,06-0,09mm) but the rosette-shaped miliary granules (fig. 15c) (0,02-0,055mm) are slightly smaller (0,01-0,085mm in adults). The tables, present in the anal region and pedicels, are clumsy with a large (0,145-0,20mm) 2-8-holed disc and a short (0,04-0,085mm) 2-4 pillared spire. Tables are probably a juvenile feature and lost early in life. Reductional stages of these are visible in the rods and plates found frequently in the anal region and pedicels of larger specimens.

Since Urodemas gracile Selenka, 1868 also came from the Red Sea, Heding and Panning (1954) are perhaps correct in treating it also as a synonym of O. ehrenbergii. The presence of O. ehrenbergii south of Durban further extends the known range of this species.

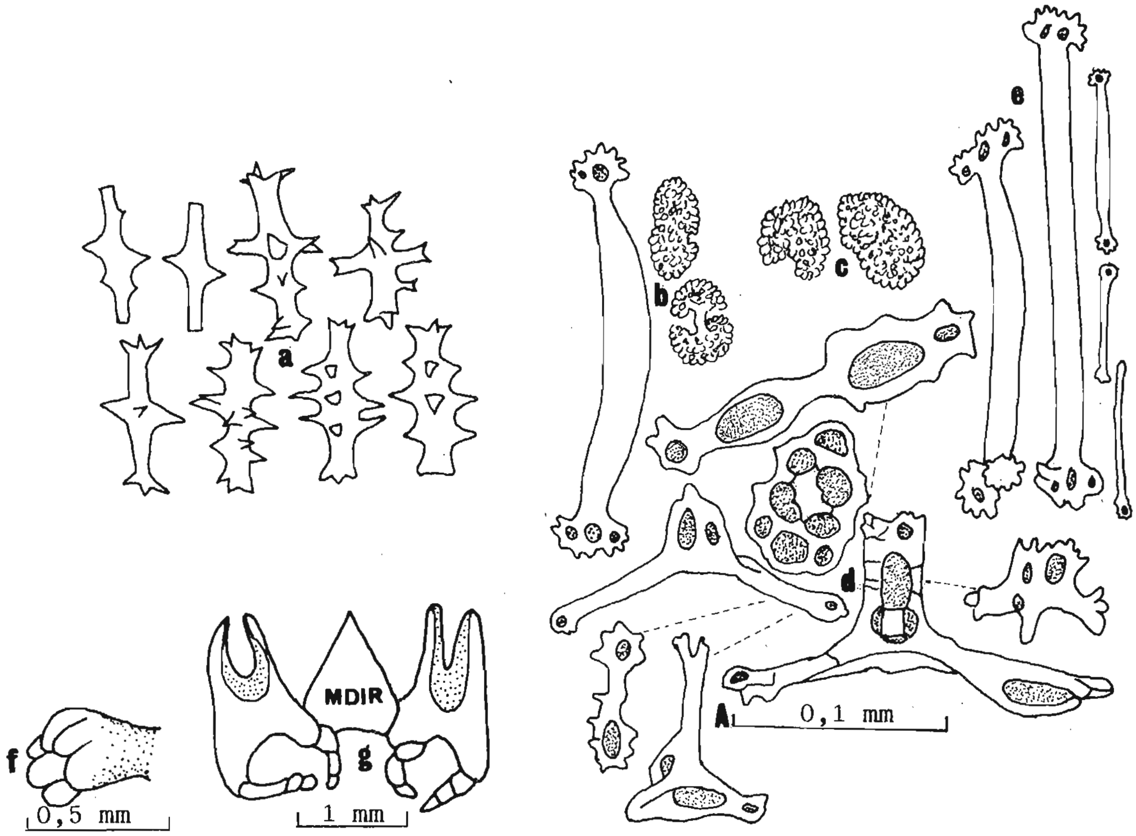


Fig. 15. <u>Ohshimella ehrenbergii</u> (Selenka). GG2S.

a. Spinous rods from dorsal body wall

b. Rod and rosettes from introvert

c. Rosettes from dorsal body wall

d. Spicules from anal region

e. Tentacular spicules

f. Madreporite

g. Middorsal interradial and adjoining radial plates of calcareous ring

(a - e Scale A)

Family CUCUMARIIDAE Ludwig, 1894

Diagnosis: See Panning, 1949: 411; Pawson, 1980: 815.

Remarks: This family, characterised by 10-20 tentacles, a simple calcareous ring and microscopic spicules, comprises about 30 genera and approximately 170 species. Included here are 10 genera and about 20 species from southern Africa. Three subfamilies, namely the Cucumariinae Ludwig, 1894; Colochirinae Panning, 1949; and the Thyonidiinae Heding and Panning, 1954; are contained in this family, the latter being the only polytentaculate family, formerly included in the Phyllophoridae by Heding and Panning, 1954. All three sub= families are represented in southern Africa.

Subfamily COLOCHIRINAE Panning, 1949

Diagnosis: See Panning, 1949: 411, 425.

Remarks: This subfamily is characterised by the presence of baskets (complete or reduced) in at least some stage of development. It is represented in southern Africa by six genera of which *Pseudoaslia* and *Pseudocnella* are here diagnosed as new. The former genus is monotypic while the latter includes three southern African and perhaps one Mediterranean species.

Genus *ASLIA* Rowe, 1970

Ludwigia (partim) Panning, 1949: 431 (preoccupied: Pawson, 1963: 28)
Aslia Rowe, 1970: 685; Clark and Rowe, 1971: 202.

Diagnosis: See Rowe, 1970: 685.

Type species: *Cucumaria lefevrei* Barrois, 1882 (by original designation Rowe, 1970: 685).

Remarks: *Aslia* was erected by Rowe (1970) to accommodate those species with complete baskets and four-holed buttons, formerly in= cluded in the preoccupied genus *Ludwigia* by Panning (1949). The genus at present includes scarcely five species, all referred to it by Rowe. In southern Africa the genus is represented by only *A. spyridophora* (H.L. Clark).

Aslia spyridophora (H.L. Clark)
(Fig.16 a-j)

Cucumaria spyridophora H.L. Clark, 1923: 410; Deichmann, 1948: 347, pl.19, figs. 6-9.

Ludwigia spyridophora Panning, 1949: 431.

Ocnus spyridophorus Panning, 1971: 30.

Pentacucumis spyridophora Day, 1974a:192; Branch and Branch, 1981: 247, 1 text-fig.

Aslia spyridophora Rowe, 1970: 685 (passim).

Diagnosis: See H.L. Clark, 1923: 410; Deichmann, 1948: 347

Previous records: C(33/18/i, 34/22/i to 34/25/i, 32/27/i), N(30/30/i).

Material examined: C(34/20/i,s to 34/27/i,s); T(31/29/i), N(30/30/i, 28/32/i), 70 spec.

Distribution: From Lamberts Bay on the south west coast to Perriers Rock, near Cape Vidal, on the east coast. Map: 12.

Habitat: Sand, pebbles, broken shells, rock. Usually cryptofaunic or in soft conglomerates of sand, shells and stones.

Remarks: This is a small species, the size range of the present material being 17-40mm. Although H.L. Clark (1923) described the species as being red in life, the life colouration is grey, greyish-brown or dark maroon with the suckers often rust-coloured. Alcohol preserved specimens usually fade to white or off white. As is characteristic of the genus, the midventral radial and adjacent interradial plates of the calcareous ring are fused (fig. 16j).

The baskets (fig. 16a & e) (0,03-0,055mm), are remarkably well developed, especially in the anal region of young individuals, often with four additional smaller holes alternating with the primary ones.

The buttons (fig. 16b) (0,045-0,095mm), are quite regular with 10 marginal knobs but occasionally a few may be smooth or show some tendency towards the formation of large (0,07-0,17mm), knobbed plates with up to 16 holes. The pedicel walls are strengthened by perforated rods (up to 0,22mm) while perforated plates occur in the suckers (fig. 16f). Typical end plates are absent. The tentacles and introvert contain rods, those of the introvert are longer with usually wavy margins and few large central holes and several small ones at the swollen ends (fig. 16g & h).

In the form of its buttons this species comes close to the local Cucumaria tetracentriophora Heding, 1937 but differs in its form, absence of interradial papillae (papulae), unequal size of the tentacles and the presence of true baskets. Hence the two species are not congeneric.

The writer could not find any definite record of the species occurring west of Still Bay but Day (1974a) records it extending as far as Saldanha Bay on the west coast. Several specimens from the UCT collection are listed as Pentacucumis spyridophora but, as far as it could be ascertained, this combination has been published twice only (Day, 1974a, Branch and Branch, 1981). The genus Pentacucumis was erected by Deichmann (1957) for Cucumaria planci (Brandt) which clearly belongs in Ocnus. Hence Pentacucumis has long been relegated to the synonymy of Ocnus.

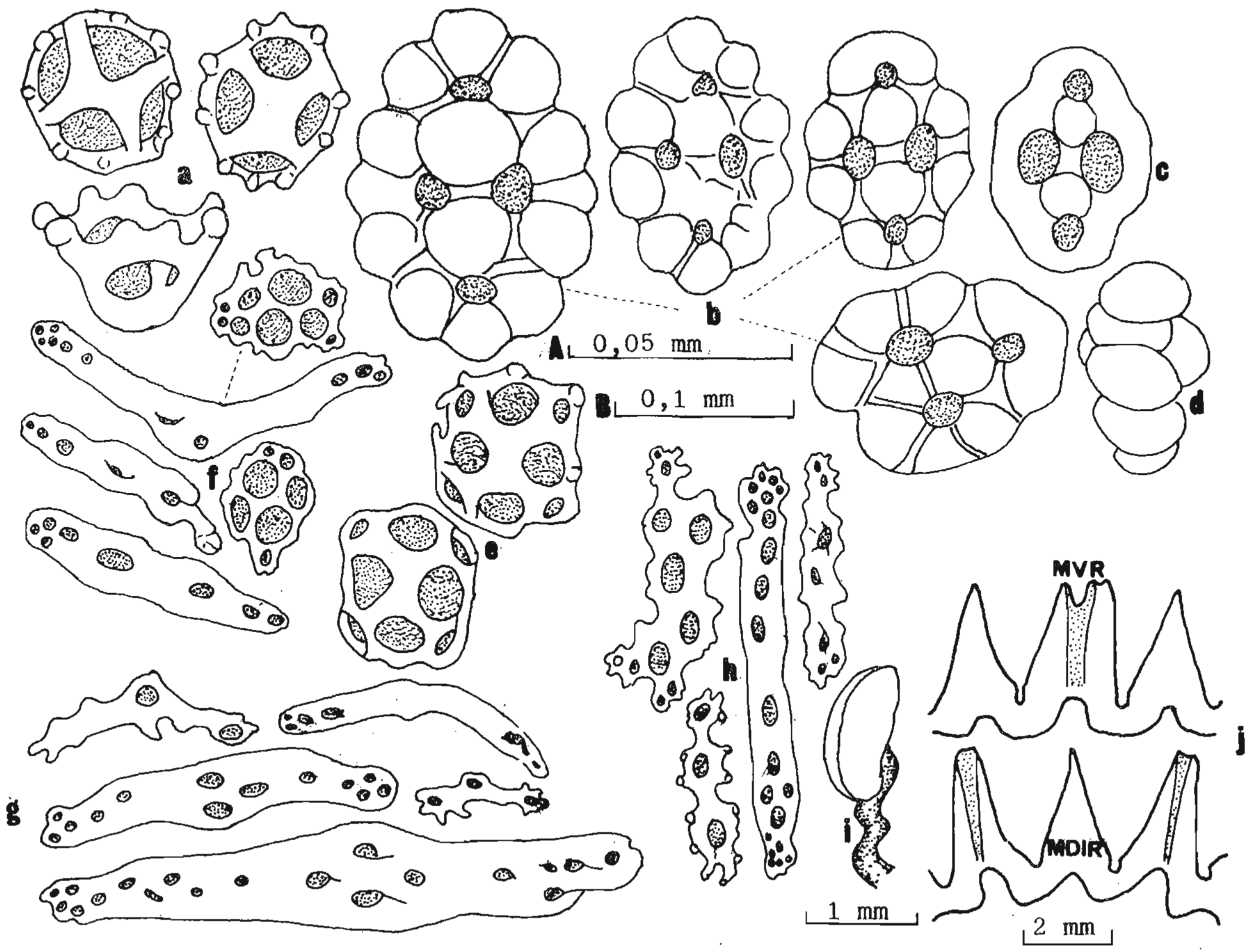


Fig. 16. Aslia spyridophora (H.L. Clark).

a. Baskets from dorsal body wall. KNY 189F.

b. Buttons from dorsal body wall. KNY 189F.

c. Smooth button. KNY 189F.

d. Button from side. KNY 189F.

e. Baskets of juvenile. KN 3G.

f. Pedicel plates and rods. KNY 189F.

g. Tentacular rods. KN 3G.

h. Introvert plate and rods. S38.

i. Madreporite. KNY 189F.

j. Ventral and dorsal parts of calcareous ring. KNY 189F.

(a-g Scale A, h Scale B)

Genus OCNUS Forbes and Goodsir, 1841

Ocnus Forbes, 1841: 229; Panning, 1949: 437; (non Semper, 1868).
Ludwigia (partim) Panning, 1949: 431 (preoccupied: Pawson, 1963: 28).
Pentacucumis Deichmann, 1957: 13.

Diagnosis: See Panning, 1949: 437.

Type species: Cucumaria lactea Forbes and Goodsir, 1839 (by subsequent designation Rowe, 1970).

Remarks: There is some confusion regarding the type species of this genus. Panning (1949) lists Ocnus brunneus Forbes, 1841 as type species although Mortensen (1927) indicated that both lactea and brunneus are synonymous of which lactea, being the older, has priority. In the same paper Panning places lactea in Ludwigia, a name long preoccupied. Rowe (1970) designates lactea as the type species of Ocnus and, following Mortensen, regards brunneus as a junior subjective synonym of lactea. However, Panning (1971), unaware of Rowe's paper more or less contemporary with his, designates planci as the type species of Ocnus while listing brunneus as a synonym of planci. If both lactea and brunneus are indeed synonymous, as Mortensen suspected, then Rowe's designation of the type species must be accepted. This genus is represented in southern Africa by only O. capensis (Théel) and O. corbulus (Cherbonnier), both from the South West Cape Province.

KEY TO THE SOUTHERN AFRICAN SPECIES OF OCNUS

Small species, holotype 11mm in length; baskets heavily nodular, complete; no regular buttons; plates often denticulate at one end
Ocnus corbulus (Cherbonnier, 1952)

Medium-sized species up to 55mm in length; baskets often incomplete; buttons numerous, regular; plates never denticulate at one end ..... Ocnus capensis (Théel, 1886)

Ocnus capensis (Théel)

(Fig.17 a-d)

Cucumaria capensis Théel, 1886a: 62, pl.5, fig.2; Ludwig, 1888: 20, 1236; H.L. Clark, 1923: 412; Ludwig and Heding, 1935: 171, text-fig.38. Deichmann, 1948: 348, pl.19, figs. 10-12; Cherbonnier, 1952a: 488, pl.42, figs. 1-13.

Ocnus capensis Panning, 1949: 437; Clark and Rowe, 1971: 180 (dist.), pl.29, fig.6.

Pseudocnus capensis Panning, 1962: 70 (passim).

Diagnosis: See Théel, 1886a: 62; Deichmann, 1948: 348.

Previous southern African records: C(29/14/d, 29/16/d, 33/18/d, 34/18/d, 35/22/d).

Material examined: C(34/18/d), 1 spec.

Description: Specimen (WCD 219-G) attenuated at both ends; length along ventral surface 33mm. Baskets (0,022-0,036mm) with 1-4 (usually 2) holes, or reduced to nodular crosses (fig. 17a). Buttons (fig. 17b) (0,06-0,15mm), usually quadrilocular with 10 marginal knobs. Plates huge (up to 0,604mm) with 7-37 holes (fig. 17c). Introvert with knobbed deposits of varying shapes and size (fig. 17d).

Local distribution: In deep waters off S.W. Cape Province from Port Nolloth to Mossel Bay, 155-400m. Map: 3.

General distribution: S.W. Atlantic Ocean, E. Indies, Phillipine Islands, China and S. Japan.

Habitat: Rock, khaki and black sand, gravel and nodules.

Remarks: The specimen is so similar in form and spicules to the holotype described by Théel (1886a) that there is little doubt as to its identity. However, its spicules also approach those of Pentacta squamosa Cherbonnier, 1970, also from the west coast, that one is inclined to consider the two forms as being conspecific. It is regrettable that Cherbonnier based his new species on an obvious juvenile measuring 8mm. His description and drawings of the spicules of P. squamosa differ but little from that of O. capensis (redescribed by him in 1952), except that the baskets, which he calls plates in P. squamosa, are always complete and the buttons rare. It is probable that with age the baskets become reduced to crosses and the buttons increase in size and number. Not unlike O. capensis, P. squamosa is also described as grey with a thin body wall. However, a direct comparison of the body wall spicules of O. capensis and P. squamosa, proved inconclusive but the introvert spicules are identical in both species (cf. fig. 17d and 20d). A good size range of O. capensis is needed to resolve the problem of the probable conspecificity of the two species.

Ocnus capensis has not yet been taken from shallow waters of the southern African coast. Clark and Rowe (1971), however, record the species as occurring in the warm shallow waters of the West Pacific-region. As the southern African dendrochirotids are highly endemic, it is unlikely that O. capensis originally described from the cold deep Cape waters, is so widely distributed in the warm waters of the West Pacific region. The writer agrees with Cherbonnier's (1952a) assertion that the West Pacific forms are not identical to Théel's species. A direct comparison of these forms with the holotype is therefore urgent.

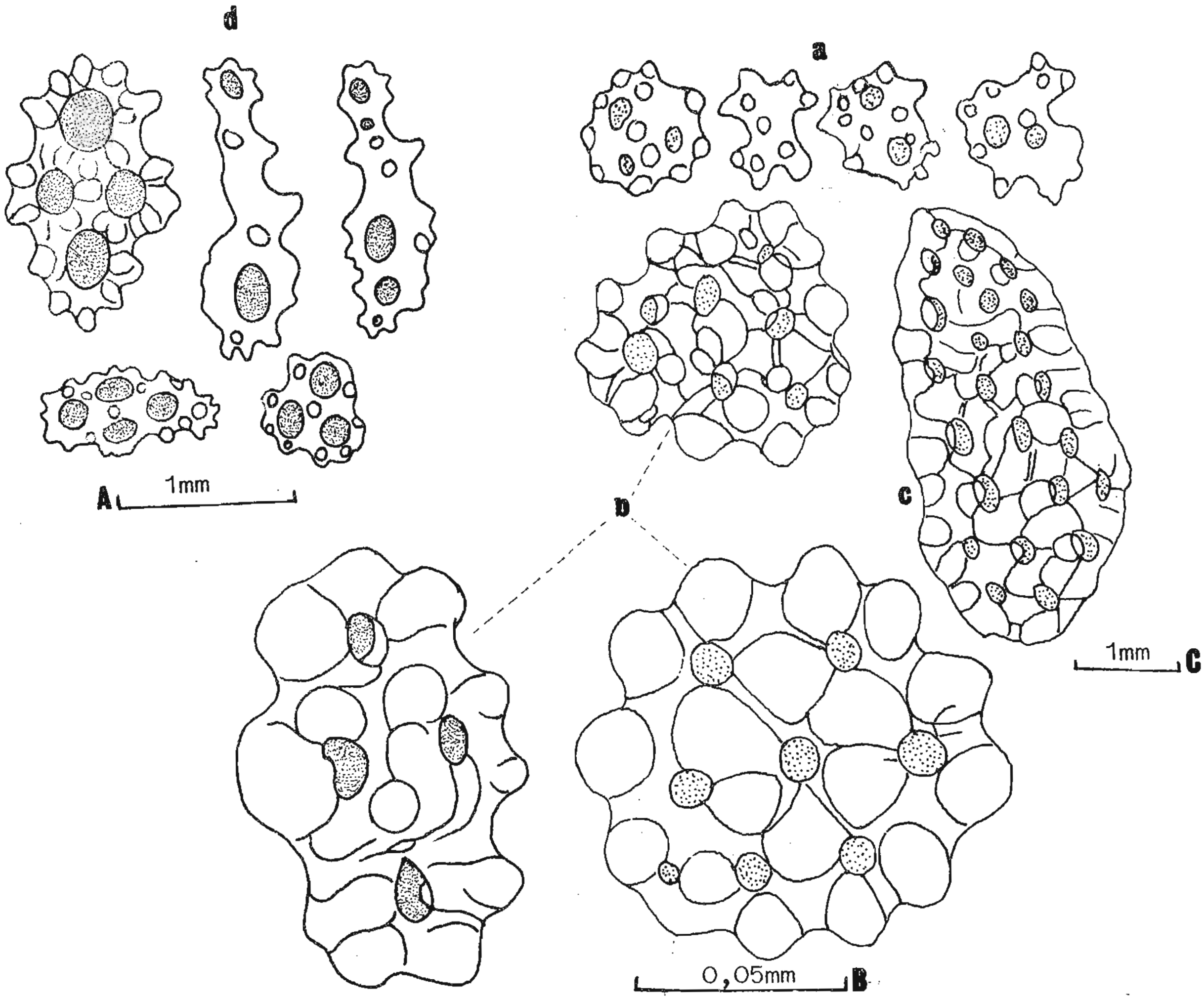


Fig. 17. <u>Ocnus capensis</u> (Théel). AFR. 775B.

a. Baskets from body wall

b. Knobbed buttons from body wall

c. Large plate from body wall

d. Introvert spicules

(d Scale A, b Scale B, c Scale C)

Ocnus corbulus (Cherbonnier) comb. nov.
(Fig.18 a-c)

Cucumaria corbula Cherbonnier, 1953: 594, fig.1 (1-23); Day, Field and Penrith, 1970: 83.

Diagnosis: See Cherbonnier, 1953: 594.

Record: C(34/18/?i/s).

Material examined: Dorsal body wall fragment of holotype.

Distribution: Known only from type locality (False Bay), 0-3m.

Habitat: Rock.

Remarks: This species is based only on the holotype which measured about 11mm. As the specimen contained ripe eggs it is possible that the species does not reach any appreciable size. Since Cherbonnier (1953) does not give the size of the holotype or the dimensions of the spicules these are here deduced from his drawings and the fragment of the type received from the PMNH. The baskets (0,04-0,05mm) have a strongly nodular rim and smooth to nodular base pierced by 4-8 holes (fig. 18a). The buttons (fig. 18c) (0,10-0,18mm) are rounded, multi=locular and composed of more than one layer of calcareous material. The elongate knobbed plates (fig. 18b) (up to 0,165mm long) usually have one end unthickened and denticulate. Such plates are reminiscent of those of Cucumaria insolens Théel but the absence, in O. corbulus, of interradial papillae and any regular buttons, and the presence of only complete baskets are noteworthy characters. The species is perhaps not common since it has not been taken again although its type locality has been thoroughly investigated by the UCT surveys.

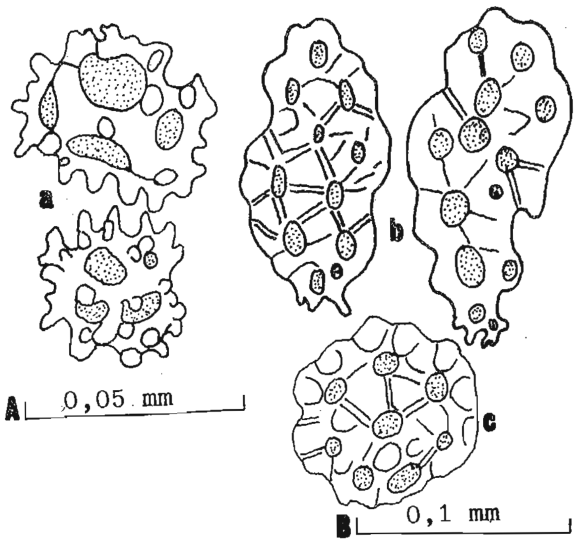


Fig. 18. Ocnus corbulus (Cherbonnier). Body wall spicules. Holotype.

a. Baskets

b. Denticulate plates

c. Knobbed button

(a Scale A, b & c Scale B)

Genus PENTACTA Goldfuss, 1820

Actinia Pallas, 1766: 152 (preoccupied).

Pentacta Goldfuss, 1820: 177; H.L. Clark, 1923: 416; Deichmann, 1930: 179; 1941: 98; 1948: 351; Cherbonnier, 1952a: 489; Panning, 1971: 38; Clark and Rowe, 1971: 201.

Colochirus Troschel, 1846: 64; Ludwig, 1887: 1229; Sluiter, 1901: 97; Panning, 1949: 439 (non Colochirus Panning, 1971).

Cercodemas Selenka, 1867: 343.

Diagnosis: See Deichmann, 1948: 351; Panning, 1971: 38.

Type species: Actinia doliolum Pallas, 1766 (designated Goldfuss, 1820: 177, according to Deichmann, 1948: 352).

Remarks: Four species, referable to Pentacta, have so far been reported from southern Africa but possibly not all are valid. As mentioned earlier P. squamosa Cherbonnier may be a young Ocnus capensis (Théel) (see Remarks under this species), while the sympatry of P. tesselera Cherbonnier and the material ascribed to Colochirus minutus by Macnae and Kalk (1958) suggest that they may be conspecific. Since the local C. minutus was determined by Dr Cherbonnier, who is also the authority to P. tesselera, the latter species is here retained but no further reference is made to C. minutus except in Remarks under P. tesselera.

KEY TO THE SOUTHERN AFRICAN SPECIES OF PENTACTA

1. Medium-sized species reaching a length of 100mm; tentacles usually of equal size; baskets often forming delicate reticulated bodies; plates lenticular or developed into hollow fenestrated spheres .... Pentacta doliolum (Pallas, 1766).

Small species, less than 35mm in length; ventral two tentacles somewhat reduced; baskets rarely forming reticu= lated bodies; plates large, not developed into hollow fenestrated spheres 2

2. Baskets deep, cup-like, with usually a smooth primary cross and with secondary bars alternating with arms of the cross, linking base of basket to rim; tentacles with rosettes
Pentacta tesselera Cherbonnier, 1970.

Baskets flat, plate-like; surface and margins ornamented with tiny nodules, secondary bars absent; tentacles without rosettes .... *Pentacta squamosa* Cherbonnier, 1970.

Pentacta doliolum (Pallas)
(Fig.19 a-j)

Actinia doliolum Pallas, 1766: 152, pl.2, figs. 10-12.

Pentacta doliolum Goldfuss, 1820: 177; H.L. Clark, 1923: 416; Deichmann, 1930: 180; 1948: 352, pl.20, figs. 1-6; Stephenson, Stephenson and du Toit, 1937: 359, 363, 381; Cherbonnier, 1952a: 490, pl.43, figs. 1-15; Day, 1959: 545; 1974: 192; Morgans, 1959: 426; 1962: 301, 307, 311; Day, Field and Penrith, 1970: 83; Panning, 1971: 38, 39 (passim); Branch and Grindley, 1979: 169; Branch and Branch, 1981: 247, 1 text-fig.

Colochirus doliolum von Marenzeller, 1874: 303; Ludwig, 1887: 13; ? Panning, 1949: 439, text-figs. 35, 36.

non *Colochirus doliolum* Ludwig, 1888: 818 (= *Pentacta australis* Ludwig).

non *Colochirus doliolum* delle Chiaje, 1828: 67, 71, 81, pl.35, figs., Grube, 1840: 39; Sars, 1857: 120, pl.1, figs. 18-23 (= *Ocnus planci* Brandt).

Cucumaria discolor Thēel, 1886a: 64, pl.4, fig.8; Vaney, 1908a: 428; Britten, 1910: 239; H.L. Clark, 1923: 410; Deichmann, 1930: 180; Bright, 1937: 63.

Diagnosis: See Deichmann, 1948: 352.

Previous southern African records: SWA(26/15/i,s); C(32/18/?i; 34/18/i,s; 34/21/i; 33/25/i); T(31/29/i).

Material examined: SWA(26/15/i), C(28/16/i,s to 29/16/i,s; 32/18/i,s to 34/18/i,s), 118 spec.

Distribution: From Luderitz Bay in South West Africa to Mngazana estuary in the Transkei, 0-52m. Also reported from East Africa and Ceylon but these records are doubtful. Map: 14.

Habitat: Sand, shell, rock, ?limestone, *Phyllochaetopterus*. Cryptofaunic or in rock crevices, from lower balanoid zone to 52m.

Description: Largest specimen 75mm in length (Cherbonnier, 1952a records maximum size as 95mm). Calcareous ring (fig. 19i) with inter=radial plates slightly shorter than radial plates. Baskets (fig. 19a & h) rarely incomplete, always with numerous spiny projections and with 3-7 holes, simple, 0,022-0,042mm in juveniles, modified to reticulated bodies up to 0,06mm in adults. Buttons 0,045-0,09mm, of two types: with small knobs (fig. 19b) and an average length of 0,06mm or with large knobs (fig. 19c) and average length of 0,09mm. Plates as large lenti=cular bodies or heavy fenestrated spheres, 0,50-0,60mm in length. Introvert with mostly irregular buttons with tiny knobs and knobbed plates (fig. 19g).

Remarks: In a 10mm specimen, the smallest in the present material; a full complement of spicules is present. However, the small knobbed buttons are rare, the baskets resemble those of *P. squamosa* and the plates few in number. In addition there are numerous scale-like plates in especially the anal region, which, because of secondary calcium deposition appear to be the probable precursors of the large lenticular plates of adults.

Fig. 19. Pentacta doliolum (Pallas). TB 84B.

a. Baskets from dorsal body wall

b. Small-knobbed buttons from dorsal body wall

c. Large-knobbed buttons from dorsal body wall

d. Fenestrated spheres from dorsal body wall

e. Dorsal pedicel plates

f. Tentacular rods

g. Introvert spicules

h. Baskets (enlarged)

i. Midventral radial and adjoining interradial plates of calcareous ring

j. Madreporite

(a-e, g Scale A, f Scale B; h Scale C)

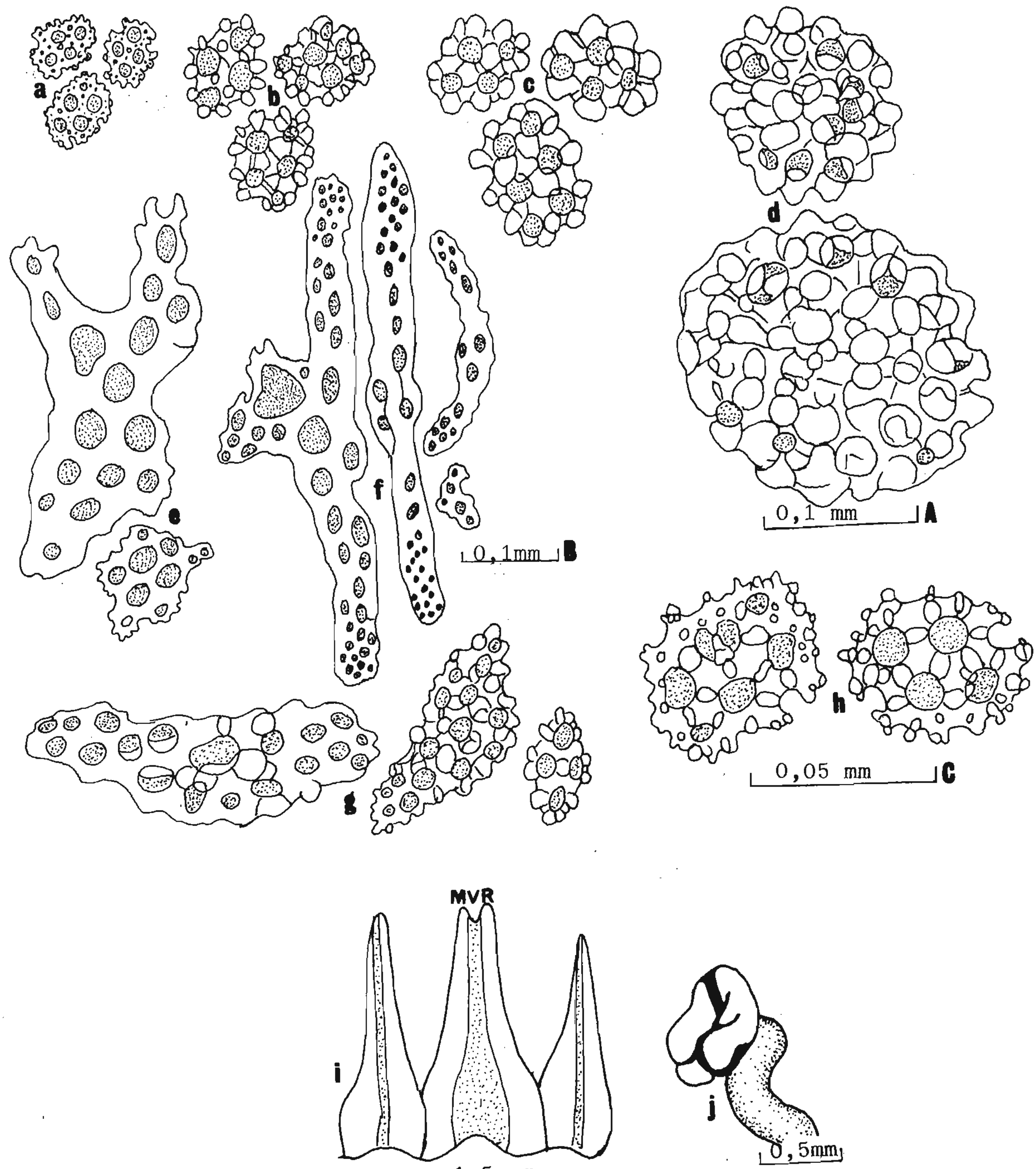


Fig. 19

Although Pallas' (1766) description and figures of the type specimen of Actinia doliolum are poor there is little doubt that his specimen was the same species here described. A full history of Pallas' species, given by von Marenzeller (1874), was updated and summarised by Deichmann (1948) and therefore it was thought unnecessary to repeat it here.

The closest relatives of P. doliolum appear to be P. robustoides, P. australis and P. anceps from which it differs in the type of baskets and the presence of huge lenticular plates or fenestrated spheres.

P. doliolum has also been reported from Ceylon by Pearson (1903) and from East Africa by Helfer (1912). However, since it is typically a cold shallow water species, probably endemic to southern Africa, and not yet found north of Port St. Johns (C32°S), its occurrence in tropical East Africa and Ceylon is dubious. Perhaps both Pearson's and Helfer's specimens are misidentified.

Pentacta squamosa Cherbonnier
(Fig.20 a-d)

Pentacta squamosa Cherbonnier, 1970: 280, fig.1 (e-m).

Diagnosis: See Cherbonnier, 1970: 280.

Record: C(34/18/d).

Material examined: Fragments of body wall and introvert of holotype.

Distribution: Known only from off Cape Peninsula, 110m.

Habitat: Black, muddy sand.

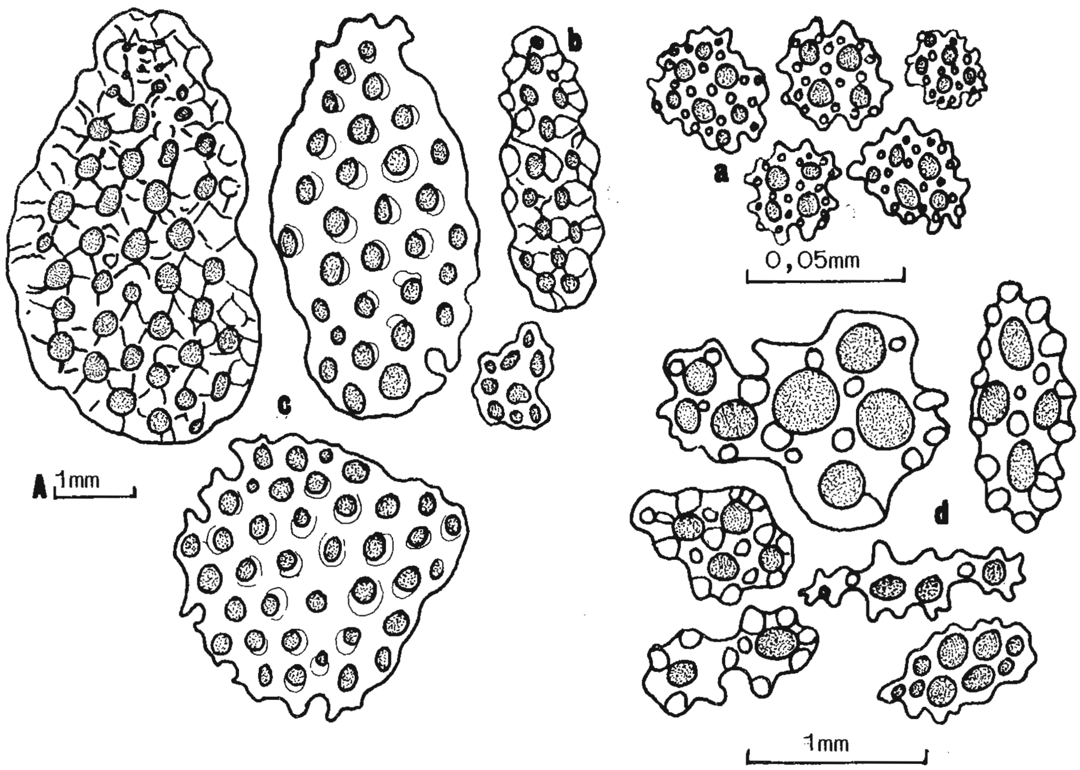


Fig. 20. Pentacta squamosa Cherbonnier. Holotype.

a. Baskets from ventral body wall

b. Knobbed button from ventral body wall

c. Plates from ventral body wall

d. Introvert spicules

(b-c Scale A)

Remarks: This species was described from a 7mm specimen and, as mentioned earlier, could represent a juvenile of Ocnus capensis (Théel). The baskets (fig. 20a) are knobbed and have 4 or more holes, the buttons (fig. 20b) are few and knobbed and the plates (fig. 20c) do not form fenestrated spheres. The introvert spicules (fig. 20d) are strongly knobbed rods and plates identical to those of O. capensis (see Remarks under O. capensis).

Pentacta tesselera Cherbonnier
(Fig.21 a-j)

Pentacta tesselera Cherbonnier, 1970: 282, fig. 2 (A-O); Day, 1974b:94.

Diagnosis: See Cherbonnier, 1970: 282.

Records: M(23/35/i,s).

Material examined: M(23/35/S), 47 spec. plus paratype EcHh 1485.

Distribution: Known with certainty only from type locality, Morrumbene, Mocambique, 3-5m.

Habitat: Sand, shells, leaf detritus.

Remarks: Cherbonnier (1970) based this species on the holotype and 32 paratypes. The specimens at hand are part of the same collection and hence there is no doubt as to their identity. Further, the material was compared with the paratype received from the PMNH. The holotype, probably the largest specimen selected by Cherbonnier, measured only 33mm. Since female specimens measuring 20-25mm contain ripe eggs, it does not seem likely that the species reaches any appreciable size. According to Cherbonnier the dorsal pedicels arise from large conical warts disposed in quincunx but these are not at all obvious in the specimens in hand. Contrary to Cherbonnier's observations the plates of the calcareous ring, including the ventro-medians, are weakly fused and no accessory polian vesicle was observed in any dissected specimen. The scales of the holotype measured up to 0,9mm, hence are much longer than those here illustrated.

With the exception of the above differences, clearly individual variations, the present material corresponds well with the description of the holotype. The live colouration of the species is said to be olive and purple but alcohol preserved specimens are greyish to brown with violet blotches interspersed with small greyish specks. The baskets (fig. 21a) (0,03-0,058mm) are deep with 4-8 primary holes, rarely some baskets are flat and up to 0,08mm in diameter. The buttons (fig. 21b) range in size from 0,03-0,13mm but the commonest ones are of the same size as the baskets. The scales (fig. 21c) are of varying shapes, multilayered, measuring 0,10-0,48mm in length. The tentacle spicules (fig. 21f & g) include rods, plates and rosettes up to 0,035mm long, while the introvert contains minute buttons (0,02-0,035mm) with usually an X-shaped base and a knobbed rim (fig. 21h).

Cherbonnier compared his species with several other small Indo-West Pacific species of the genus and concluded that it is not conspecific with any of the well known form. However, it appears that P. tesselera is closely related to or even conspecific with P. minuta (Ludwig) from northern Australia. Ludwig's (1875) description of the spicules is rather brief to provide a definite conclusion. Both species appear identical in their size, shape, distribution of podia, and in the form of the baskets and pedicel deposits. Panning (1949) redescribed P. minuta (wrongly credited to Fabricius) and provided good illustrations

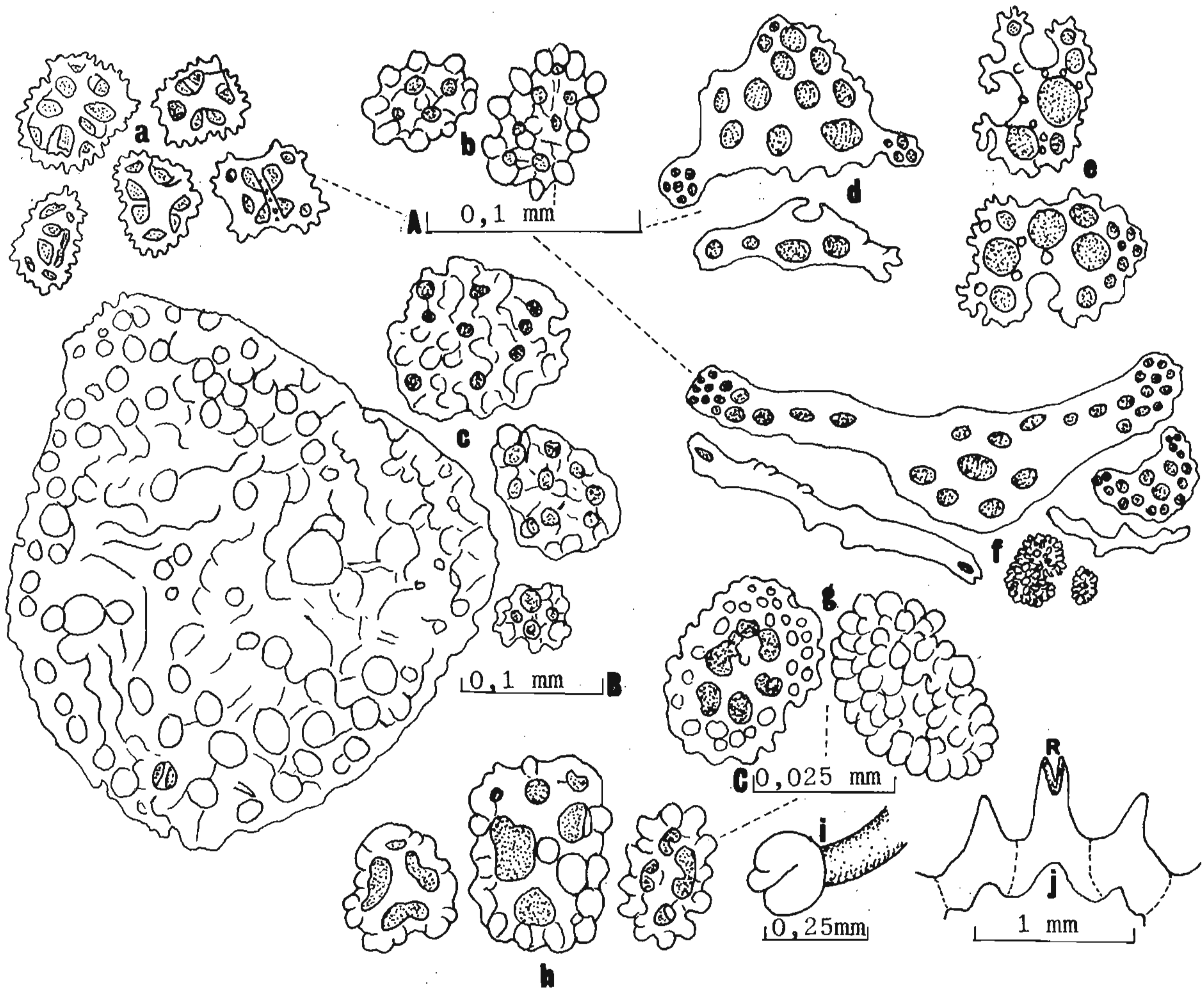


Fig. 21. Pentacta tesselera Cherbonnier. MOR 50B.

a. Baskets from dorsal body wall

b. Small-knobbed buttons from ventral body wall

c. Plates from dorsal body wall

d. Dorsal pedicel spicules

e. Ventral pedicel spicules

f. Tentacular spicules

g. Tentacular rosettes (enlarged)

h. Introvert spicules

i. Madreporite

j. Part of calcareous ring

(a, b, d, e & f Scale A; c Scale B; g & h Scale C) of the deposits. Judging from this as well there appears to be little difference between the two species. Furthermore, P. minuta was re= ported as Colochirus minutus from Inhaca Island, Moçambique, by Macnae and Kalk (1958) from material identified by Dr Cherbonnier. It is a pity that Cherbonnier (1970) makes no reference to this in his remarks under P. tesselera. However, since Cherbonnier has had the opportunity to examine both species, P. tesselera is here retained until a direct comparison between the two is undertaken.

Genus PSEUDOASLIA Gen. nov.

Diagnosis: Medium-sized, barrel-shaped species, up to 110mm long; tentacles 10, of more or less equal size; pedicels strongly retractile, in 3-5 rows per ventral ambulacrum, 2-3 rows per dorsal ambulacrum; dorsal interambulacra with numerous scattered papillae/papulae. Calcareous ring simple, without posterior bifurcations to the radial plates; radial and interradial plates solidly fused together. Body wall spicules a superficial layer of minute, slender, slightly curved, forked rods and a deeper dense layer of irregular, usually four-holed knobbed buttons or plates, rarely some spicules developed into simple multilocular plates.

Type species: Cucumaria tetracentriophora Heding, 1937 (designated herein).

Etymology: The generic name is derived from the combination of pseudo (Gr. false) and Aslia. The gender is feminine.

Remarks: This genus is erected to accommodate only the type species as no similar form has yet been reported. Pseudoaslia most closely resembles, not Aslia, but the new genus Pseudocnella from which it differs in the form of the superficial layer of rods (? reduced baskets) and the simplicity of the buttons or plates of the inner layer. Although it resembles Aslia in possessing mostly quadrilocular plates there are many significant differences which suggest that both genera are not closely allied.

Pseudoaslia tetracentriophora (Heding)
(Fig.22 a-g)

Cucumaria tetracentriophora Heding, 1938: 631, text-figs. 1-5; Deichmann, 1948: 343, pl. 18, figs. 4-12; Cherbonnier, 1952a: 487, pl. 41, figs. 18-22, pl. 42, figs. 14-28.

Ludwigia tetracentriophora Panning, 1949: 431.

Pentacucumis tetracentriophora Day, Field and Penrith, 1970: 83.

Diagnosis: As for the genus.

Previous records: C(33/25/i, 33/27/i, 33/28/i), T(32/28/i).

Material examined: C(34/18/i, 34/20/i, 34/22/i, 34/24/i, 33/27/i, 33/28/i), 17 spec.

Distribution: False Bay to Qolora, north of East London. Map: 14.

Habitat: Usually found burrowed in sand together with Roweia frauenfeldi frauenfeldi and Pseudocnella sinorbis.

Remarks: The present specimens range in size from 12-110mm and correspond well with the description of the species given by Heding (1938), Deichmann (1948) and Cherbonnier (1952a). The barrel-shaped body and the greyish-brown to rust colouration of the species strongly resemble those of P. sinorbis. Although both Heding (1938) and Cherbonnier (1952a) describe the anal "teeth" as large, these are, however, difficult to demonstrate or absent. The calcareous ring is well calcified and not "cartilaginous" as described by Heding (1938) and Deichmann (1948) who probably worked on old material.

As observed in many cucumariids, there is no remarkable change in the form of the spicules with the age of the animal. The calcareous deposits of a 12mm specimen are more or less identical to those of a 110mm specimen. However, in juveniles, the formation of knobbed plates from simple, smooth, X-shaped rods is evident. Such rods first develop holes as a result of the fusion of their dichotomous branches to form simple smooth buttons which later become thickened to form knobs, and with further addition of calcareous material, some of these buttons develop into large multilocular knobbed plates. A single juvenile may show all stages in the development of plates with up to 12 perforations and still contain the full complement of spicules. Hence, in this species at least, the spicules are deployed early in development and once formed are retained throughout life.

The rods ("baskets") (fig. 22b) are minute (0,024-0,077mm) with usually forked but occasionally perforated ends. The buttons (fig. 22c) measure 0,045-0,14mm and are usually four-holed but often quite irregular with 1-2 holes and with some tendency towards the formation of knobbed plates of the <u>Pseudocnus</u> type. The marginal knobs are variable in size and number and never consistently 10. The pedicel rods are spectacle-shaped (fig. 22d), 0,06-0,12mm, with digitated or swollen ends. The tentacular deposits (fig. 22e) are up to 0,35mm long while the introvert rods (fig. 22g) are slightly smaller, up to 0,25mm.

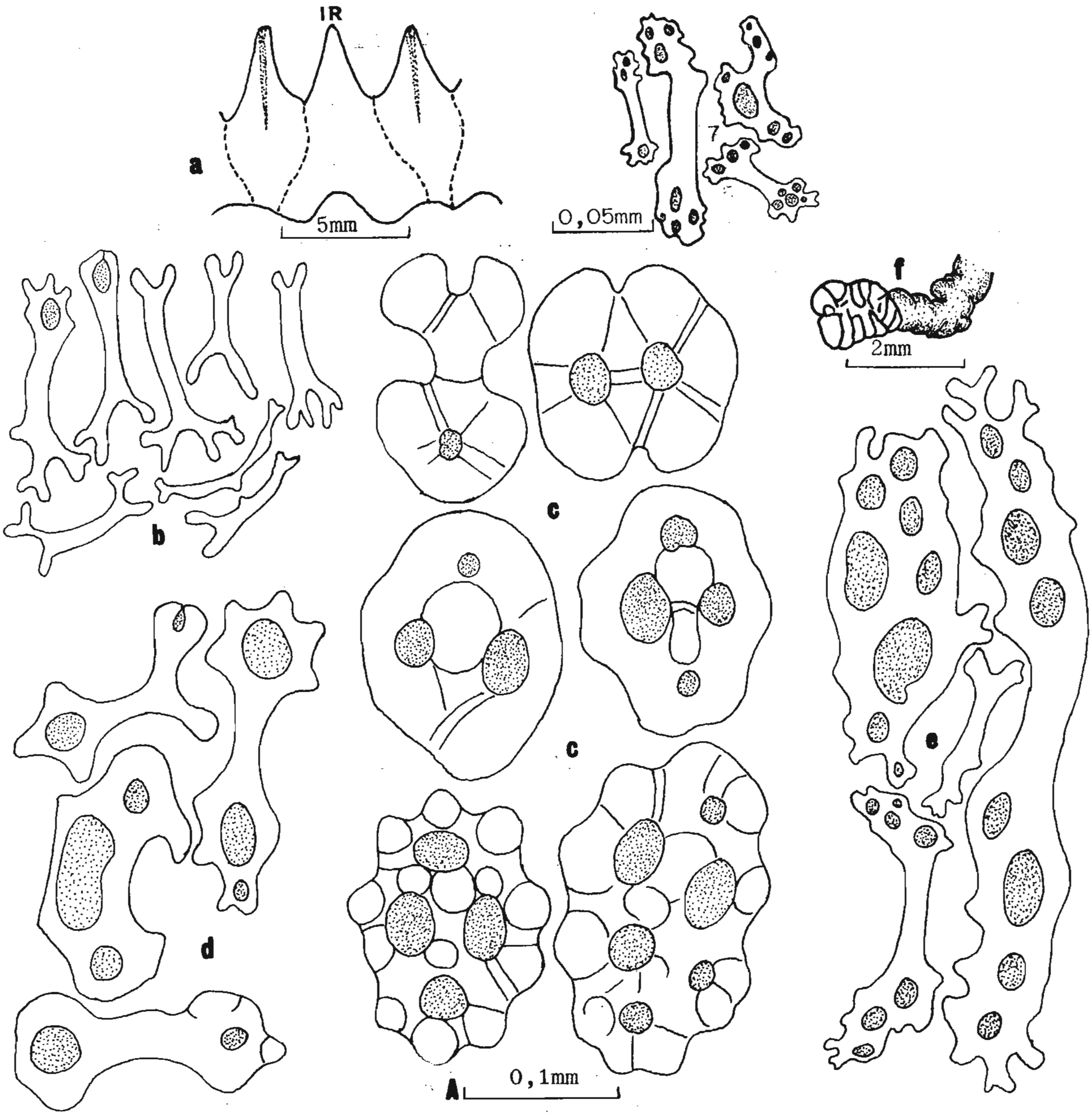


Fig. 22. <u>Pseudoaslia tetracentriophora</u> (Heding). Skihaven.

a. Part of calcareous ring

b. Slender forked rods (? reduced baskets) from dorsal body wall

c. Buttons from dorsal body wall

d. Pedicel spicules

e. Tentacular spicules

f. Madreporite

g. Introvert spicules

(b - e Scale A)

Although most of the plates of P. tetracentriophora are four-holed like those of the species of Aslia this is where the resemblance between them ends. The form of the body, the equal size of the tentacles, the presence of interambulacral papillae (papulae) and the type of superficial deposits separate this species sharply from those included in Aslia and warrant a higher taxonomic status for it. The species comes quite close to Pseudocnella sinorbis (Cherbonnier) from which it is quite indistinguishable externally. However, its spicules suggest that it is not congeneric with P. sinorbis, the similarities are probably consequent upon a similar mode of life. In fact both species occupy the same ecological niche.

Genus PSEUDOCNELLA Gen. nov.

Semperia Lampert, 1885: 250; Ludwig, 1887, 1231 (preoccupied).

Cucumaria (partim) Thēel, 1886a; Vaney, 1908b; Britten, 1910; H.L. Clark, 1923; Deichmann, 1948: 342; Cherbonnier, 1952a: 477, (non de Blainville, 1830).

Pseudocnus (partim) Panning, 1949: 422; 1962: 58.

Stereoderma (partim) Panning, 1949: 422.

Ocnus (partim) Panning, 1949: 437.

Diagnosis: Small to medium-sized species, up to 95mm long along ventral surface; usually barrel-shaped with mouth and anus often directed dorsally. Tentacles 10, of more or less equal size. Pedicels usually restricted to ambulacra, 2-7 rows ventrally and 2-6 rows dorsally; numerous interradial papillae/papulae. Calcareous ring compact, without posterior prolongations to radial plates but both radial and interradial plates with long anterior projections. Spicules of body wall a superficial layer of incomplete baskets, developed as cross-shaped rods with dichotomously branched arms, and an inner dense layer of round to oval, usually fir-cone shaped, knobbed plates made up of more than one layer of calcareous material; in one species (P. sykion) baskets present in juveniles only while in another (P. insolens), buttons present in addition to knobbed plates.

Type species: Cucumaria sinorbis Cherbonnier, 1952 (designated herein).
Other species included: Semperia sykion Lampert, 1885; Cucumaria insolens Théel, 1886; ?Cucumaria syracusana Grube, 1840.

Remarks: This genus is erected to accommodate especially three southern African holothurian species (Semperia sykion syn. Cucumaria jägeri Lampert, 1885), C. insolens and C. sinorbis which have been particularly confused in the past. This confusion stems largely from Lampert's incomplete descriptions of S. sykion and C. jägeri and Deichmann's error in regarding Théel's C. insolens as a growth stage of sykion. This latter error, although excellently resolved by Cherbonnier (1952a), was reiterated by Panning (1962). A full history of the three species is thus given in an attempt to resolve the problem.

Lampert (1885) described C. jägeri from Natal and S. sykion from Algoa Bay. Regrettably the descriptions were not accompanied by illustrations. Théel (1886a) listed and diagnosed both species but referred S. sykion to Cucumaria commenting that the presence of podia also in the interambulacra did not warrant a new genus. In the same paper Théel described C. insolens from Simons Bay in the Cape Province.

Theel's C. insolens was recognised several times since its description (Ludwig 1888; Vaney, 1908; H.L. Clark, 1923 and Cherbonnier, 1952a). However, Lampert's C. sykion was recognised for the first time by H.L. Clark (1923) from material collected at East London, Port Elizabeth and Natal. Clark was unable to refer any specimens to C. jägeri, a species which he retained with a comment that it is very close to C. sykion as far as its calcareous particles are concerned and the distribution of its pedicels is of doubtful significance.

Deichmann (1948) is the next specialist to have recognised C. sykion but regarded C. jägeri as a "faded sykion" relegating it, though with some doubt, to the synonymy of C. sykion. She, however, mistook Théel's C. insolens to be a growth stage of C. sykion, thus listing it also as a synonym of C. sykion. Deichmann's error was probably a result of the presence in her material of another species whose superficial layer of baskets is reminiscent of that of C. insolens while its inner layer of knobbed plates is of the C. sykion type. This species was probably mistaken to represent an intermediate stage between the presumed juvenile *insolens* stage and the adult *sykion* stage. What lends support to this assumption is that the incomplete baskets of *C. sykion* illustrated by her are not like those of *C. insolens* but of this "intermediate form" while the knobbed plate is definitely of the *insolens* type. Cherbonnier (1952a) inadvertantly corrected this error by separating this "intermediate form" as *C. sinorbis* while clearly tabulating the differences between it, *C. sykion* and *C. insolens*.

Panning (1949), unaware of Deichmann's paper which was more or less contemporary with his, studied a form from Zanzibar which, with some reservation, he identified as *C. jägeri* and referred it to *Stereoderma*. In the same paper he referred *C. sykion* to his newly erected genus *Pseudocnus* with *Cucumaria köllikeri* Semper as type species and *C. insolens* to *Ocnus* with *O. brunneus* Forbes as type species. Cherbonnier (1952a) was correct in his assumption that Panning's identification of *C. jägeri* was wrong as his description did not correspond with that of the type given by Lampert. Later, Panning (1952), corrected this error and redescribed *C. jägeri* from two specimens from Port Elizabeth (the type locality of *C. sykion*) as a subspecies of *Pseudocnus dubiosus* Semper. Although he had access to H.L. Clark's (1923) monograph, Panning made no mention of *C. sykion* which he included in *Pseudocnus* in 1949. However, in 1962, in his revision of *Pseudocnus*, Panning redescribed *C. jägeri* as *Pseudocnus dubiosus jägeri* but, clearly following Deichmann (1948), regarded *C. insolens* as a synonym of *C. sykion* which he also included in his *dubiosus* group. However, in this revision, he changed the designation of the type species of *Pseudocnus* to *Cucumaria dubiosa* Semper, since he now regarded *C. koellikeri* as a subspecies of *P. dubiosus*.

One can hardly discern from Panning's descriptions the differences between his jaegeri and Lampert's sykion. The structure, except for the retractor muscles which are said to be in single strands, does not differ from our knowledge of the structure of sykion. It is hence probable that Panning had sykion in front of him which he identified as jaegeri. What lends support to this assumption is that he now regarded sykion and insolens as being synonymous. It is regrettable that Panning overlooked Cherbonnier's (1952a) work which clearly re= solved the confusion initiated by Deichmann (1948).

Lampert (1885) assigned jägeri to Cucumaria because of the presumed absence of interradial papillae but assigned sykion to the preoccupied genus Semperia as it had podia also in the interradii. Since Lampert gave no figures of the calcareous deposits of his species it is impossible to visualise the differences if they did exist. In view of H.L. Clark's (1923) and Deichmann's (1948) suspicions that both forms are identical and of Panning's failure to separate them, one must conclude that they are conspecific. The absence of interradial papillae in C. jaegeri was probably an oversight as these are usually completely retracted in C. sykion and the crowded pedicels a feature of little taxonomic significance.

Since Lampert's description of C. sykion is in greater detail and since this species has been recognised several times in the past, it is best to treat C. jaegeri as a junior subjective synonym of C. sykion. Therefore, although C. jaegeri has page priority, the long established name C. sykion is preferred, for the sake of stability of nomenclature, since its the name that has been in common usage by both marine biologists in South Africa and holothurian specialists who worked particularly on on southern African material. Further, Deichmann (1948), as the first reviser, although with some doubt, lists C. jägeri as a synonym of C. sykion.

In this monograph C. sykion (syn. C. jaegeri), C. insolens and C. sinorbis are treated as distinct species characterised by the presence in the superficial layer of the body wall, at least in juveniles, of incomplete baskets. Although in 1949 Panning did not include any such forms in Pseudocnus these were included by him in 1962 but the diagnosis of the genus was not expanded accordingly. However, the type species was changed from C. koellikeri to C. dubiosa. According to Rowe and Pawson (pers. comm.) the genus Pseudocnus should stand as originally diagnosed with C. koellikeri as type species. An examination of P. koellikeri and P. dubiosus from identified material received from Dr. Tortonese, the BMNH and the USNM indicates that both species are characterised by the absence of interradial papillae and baskets and by the presence of only knobbed plates composed of a single layer of calcareous material. This combination of characters therefore restricts Pseudocnus to include only such forms. Since the southern African species with baskets and multilayered knobbed plates do not fall readily into any of the other genera, a new genus is here erected to accommodate them. Pseudocnella is most closely allied to Pseudocnus, Trachythyone and Ocnus amongst the Cucumariidae. It differs from Pseudocnus in the presence of interradial papillae, incomplete baskets, and complex knobbed plates made up of more than one layer of calcareous material; from Trachythyone in the equal size of the tentacles and the absence of smooth plates; and from Ocnus in the presence of interradial papillae and the equal size of the tentacles.

Within the new genus may also be included Ocnus syracusanus (Grube, 1840) from the Mediterranean Sea. This species, as revealed by examination of some identified material received from the above sources, shares characters with each of the southern African species of Pseudocnella. It resembles P. sykion in its body form and denticulate plates, P. sinorbis also in its body form and the presence throughout life of similar baskets, and P. insolens in possessing buttons in addition to plates. This combination of characters suggests that it is probably congeneric with the others. Although P. syracusanus lacks interradial papillae of the type possessed by the others, its pedicels are nevertheless also scattered in the interambulacra and hence it cannot belong in Ocnus. Perhaps some other similar species, formerly classified in Ludwigia by Panning but provisionally referred to Ocnus by Rowe (1970), can also be transferred to Pseudocnella. Although Panning (1962) suspected that Cucumaria capensis Théel also belonged in Pseudocnus this species can best be classified in Ocnus because of its reduced ventral tentacles, ambulacral restriction of the pedicels and the absence of interradial papillae/papulae.

Cucumaria sinorbis Cherbonnier is here designated the type species of the new genus because, in possessing well developed interradial papillae and a superficial layer of incomplete baskets throughout life, it best characterises the genus.

KEY TO THE SOUTHERN AFRICAN SPECIES OF PSEUDOCNELLA

1. Small species (up to 40mm long) without anal "teeth"; spicules of body wall a superficial layer of incomplete baskets, nearly always ornamented with knobs or spines, and an inner layer of regular four-holed knobbed buttons and complex knobbed plates often provided with a spinous "handle"

Pseudocnella insolens (Théel, 1886)

Medium-sized (up to 95mm long), barrel-shaped species with anal teeth; spicules of body wall a superficial layer of in= complete baskets developed as smooth, cross-shaped rods with dichotomously branching arms (in one species present in juveniles only) and an inner layer of round to oval knobbed plates without "handles" 2

2. Incomplete baskets present as a superficial layer throughout life; knobbed plates rarely with one end denticulate; inter= radial papillae well developed, seldom fully retracted; colour variable but never black or dark olive green in life

Pseudocnella sinorbis (Cherbonnier, 1952).

Incomplete baskets present only in juveniles (up to 20mm) and sometimes in anal region of slightly larger individuals; knobbed plates of oval type often (20%) with one end denti= culate; interradial papillae/papulae short, strongly retractile; colour always black or dark olive green in life, at least dorsally .... Pseudocnella sykion (Lampert, 1885).

Pseudocnella insolens (Théel) comb. nov.
(Fig.23 a-h)

Cucumaria insolens Théel, 1886a: 70, pl.4, fig.5; Vaney, 1908b: 431; 1910: 431; 1912: 27; H.L. Clark, 1923: 411; Bright, 1937: 63; 1938: 87; Stephenson, 1948: 266; Cherbonnier, 1952a: 480, pl.39, figs. 1-23; Day, 1959: 502, 545; 1974a: 192; Morgans, 1959: 425, 426; 1962: 301, 307, 311; Day, Field and Penrith, 1970: 83.

Semperia insolens Ludwig, 1887: 1231, 1236.

Cucumaria leonina var. africana Britten, 1910: 240.

Cucumaria sykion Deichmann, 1948: 346 (partim), pl.19, figs.1 and ?2.

?Pseudocnus dubiosus africanus Panning , 1962: 64, figs. 7-9.

Trichythyone insolens (sic) Christie and Moldan, 1977: 280.

Trachythyone insolens Branch and Branch, 1981: 247, figs., pl.156.

Diagnosis: See Théel, 1886a:70; Cherbonnier, 1952a:480.

Previous records: SWA(26/15/i); C(29/16/i to 29/17/i; 33/17/i,s to 34/21/i,s; 33/25/i).

Material examined: SWA(26/15/i), C(29/16/i to 29/17/i,s; 33/17/i,s to 34/19/i,s; 34/21/i, 33/25/i to 33/26/i); 438 spec.

Distribution: From Luderitz Bay (South West Africa) to Port Elizabeth, 0-40m. Map: 15.

Habitat: Stones, sand, coarse and khaki sand, shells and *Phyllochaetopterus* debris. Often cryptofaunic but buried in sand; common in dredgings, from intertidal zone to about 40m.

Description: Size range 3-34mm. Live colouration black to yellow dorsally and yellowish ventrally. Some specimens greyish brown, orange or rust-coloured. Brood pouches (mamelons) present on dorsal surface of only four specimens dredged from Saldanha Bay. In three specimens more numerous middorsally and on the left dorsal interradius, extending to level of anus, absent from most of right dorsal inter= radius as well as ventrally except at extreme anterior end; in fourth specimen entire dorsal surface, excepting anal region, beset with pouches.

Calcareous ring (fig. 23g) composed of 10 weakly fused pieces. Baskets (fig. 23a) occasionally complete, up to 0,058mm in diameter; incomplete baskets numerous, 0,022-0,04mm. Buttons (fig. 23b), 0,07-0,145mm, regular with 10 marginal knobs and four holes too quite irregular with 12 marginal knobs and up to 10 holes. Fir-cone-shaped plates (fig. 23c) 0,16-0,45mm long.

Remarks: This species is adequately described by both Théel (1886a) and Cherbonnier (1952a). Brood pouches were first observed by Cherbonnier.

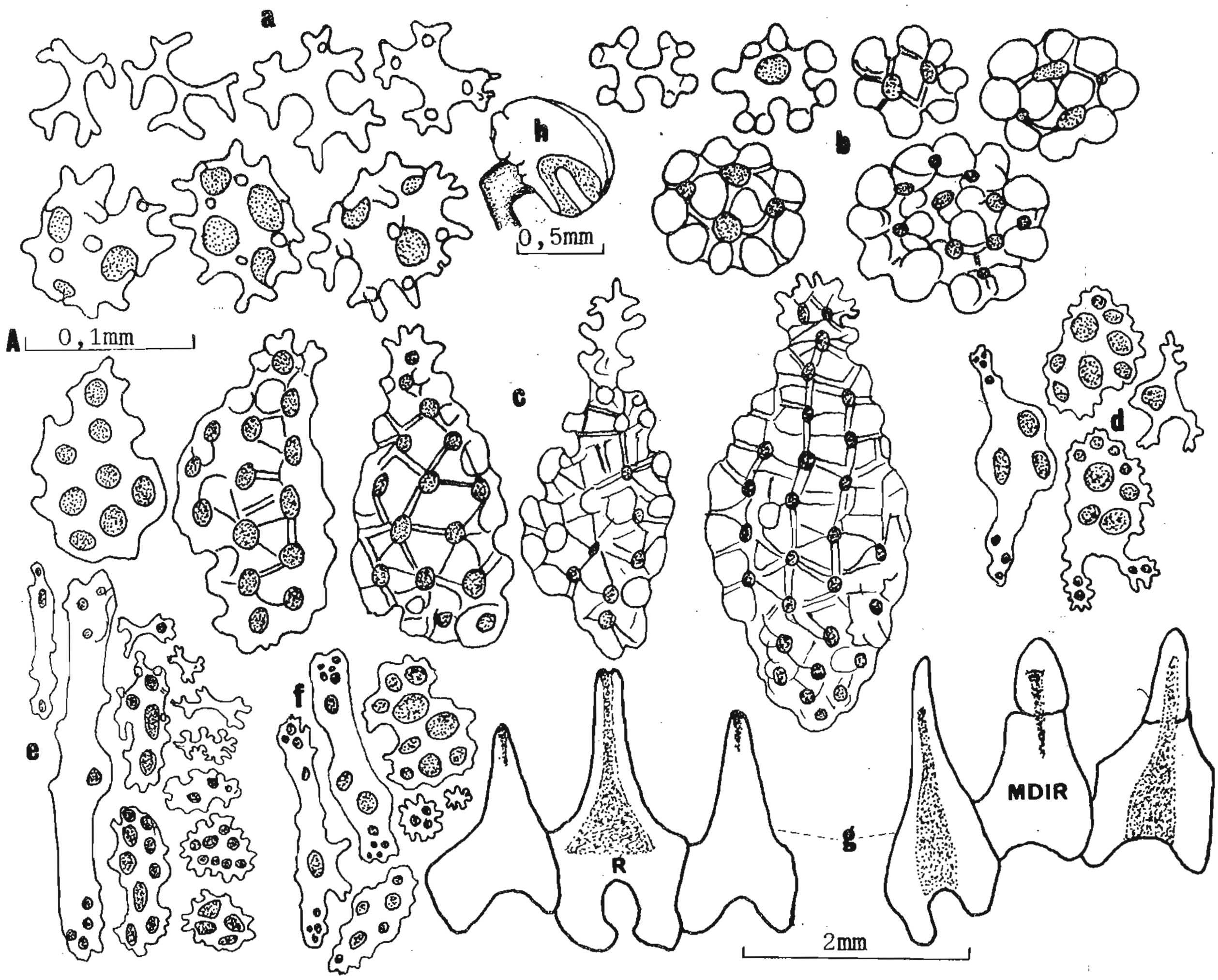


Fig. 23. <u>Pseudocnella insolens</u> (Théel). CF JUV. (6,5mm).

a. Baskets from dorsal body wall (various stages of development)

b. Buttons from dorsal body wall (various stages of development)

c. Denticulate plates (various stages)

d. Pedicel spicules

e. Tentacular spicules

f. Introvert spicules

g. Parts of calcareous ring of two specimens (S. 37A)

h. Madreporite

(a - f Scale A)

The embryos within the pouches are usually orientated anterior end outwards. The integument of the embryo is covered with scales developed as large, weakly formed, smooth plates with 3-4 large circular fenestrae. Such plates appear to be derived from simple rods with dichotomously branched extremities. Pedicel end plates are also an early development, each beginning as three Y-shaped rods with dichotomously branching arms, the branches of each rod eventually uniting with those of the adjacent rods to form simple end plates with oval fenestrae. Branched rods of a slightly different nature and arranged in two circles around the base of each pedicel are the probable precursors of pedicel deposits rods and plates. The baskets apparently develop later, also beginning as short X-shaped rods which later become dichotomously branched and ornamented with spines or nodules, initially one only at each point of bifurcation of the arms, more nodules are acquired later.

In a juvenile (3mm) from Luderitz Bay a few fenestrated plates of the embryo still persist. Its difficult to say whether these disappear later or are the precursors of the typical fir-cone-shaped plates which are already present but with only short projections instead of "handles". The baskets are mostly incomplete and smooth as in _P. sinorbis_.

In a slightly longer juvenile (3,5mm) from Cape St. Francis, the fir-cone-shaped plates are numerous, simple, but with clear signs of becoming multilayered. The buttons, however, are well formed and apparently acquired after baskets and plates.

Of the three southern African species here assembled under Pseudocnella, P. insolens is the least typical. In its size, brooding habits, terminal mouth and anus, absence of anal teeth, reduction of some tentacles, weakly fused radial and interradial plates of the calcareous ring, and in the presence of end plates, and buttons in addition to baskets and plates, it stands apart from the others in the group. Since it is brooding in habit, not yet recorded from east of Port Elizabeth and dominant on the west coast, it most certainly is a cold water species. Its brooding habit is probably indicative of a southern origin - its resemblance to others in the group may be a result of convergent evolution.

There is no evidence of brood pouches in forms examined from the intertidal zone. Their presence in forms dredged at 15 meters perhaps indicates that adults migrate into deeper waters during the breeding season, leaving only juveniles in the intertidal zone. During the non-breeding season, however, both adults and juveniles may be found in the intertidal zone. It does not seem likely that two varieties of the species or sibling species exist.

Cucumaria leonina var. africana, described by Britten (1910) from Luderitz Bay,was referred to the synonymy of P. insolens by H.L. Clark (1923) after examination of syntypes housed at the MCZ. Although Panning (1962) treats Britten's variety as a subspecies of Pseudocnus dubiosus it is here retained as a synonym of P. insolens.

Pseudocnella sinorbis (Cherbonnier) comb. nov.

(Fig.24 a-i)

Cucumaria sykion Deichmann, 1948: 346 (partim), pl.19, figs. 3 and 4; ?Plietz and Robinson, 1974: 60, pl. 326.

Cucumaria sykion (insolens stage) Deichmann, 1948: 372 (Station G), 373 (Station W) (non Station Ag).

Cucumaria sinorbis Cherbonnier, 1952a: 482, pl.38, figs. 1-13, pl.39, figs. 24-31.

Diagnosis: See Cherbonnier, 1952a: 482.

Previous records: C(33/18/?i, ?34/23/i), N(27/32/i; 31/30/i).

Material examined: C(34/20/i to 34/22/i, 34/24/i to 33/28/i); N(31/30/i, 27/32/i); M(24/35/i); 106 spec.

Distribution: Table Bay to Jangamo, south of Inhambane (Moçambique). Map: 15.

Habitat: Cryptofaunic, usually burried in sand; also found in soft conglomerates of stones, sand, shells, etc.

Remarks: The largest specimen in the present material measures 95mm along the ventral surface. The live colouration ranges from white to off white to grey or greyish-brown. Some specimens collected from the south coast are pale brown, orange or even rust coloured. As the species lives buried in sand or in soft conglomerates dark forms are rarely encountered.

The species can readily be separated from the congeneric P. sykion (Lampert) by its lighter colouration, rough skin, large interradial papillae frequently equalling the size of the dorsal pedicels, fewer rows of pedicels (2-4), and the presence, throughout life, of a continuous layer of incomplete baskets, which are always smooth and unlike those of P. insolens. The baskets (fig. 24a) (0,024-0,055mm) have rounded uncurved extremities, a feature overlooked by Deichmann

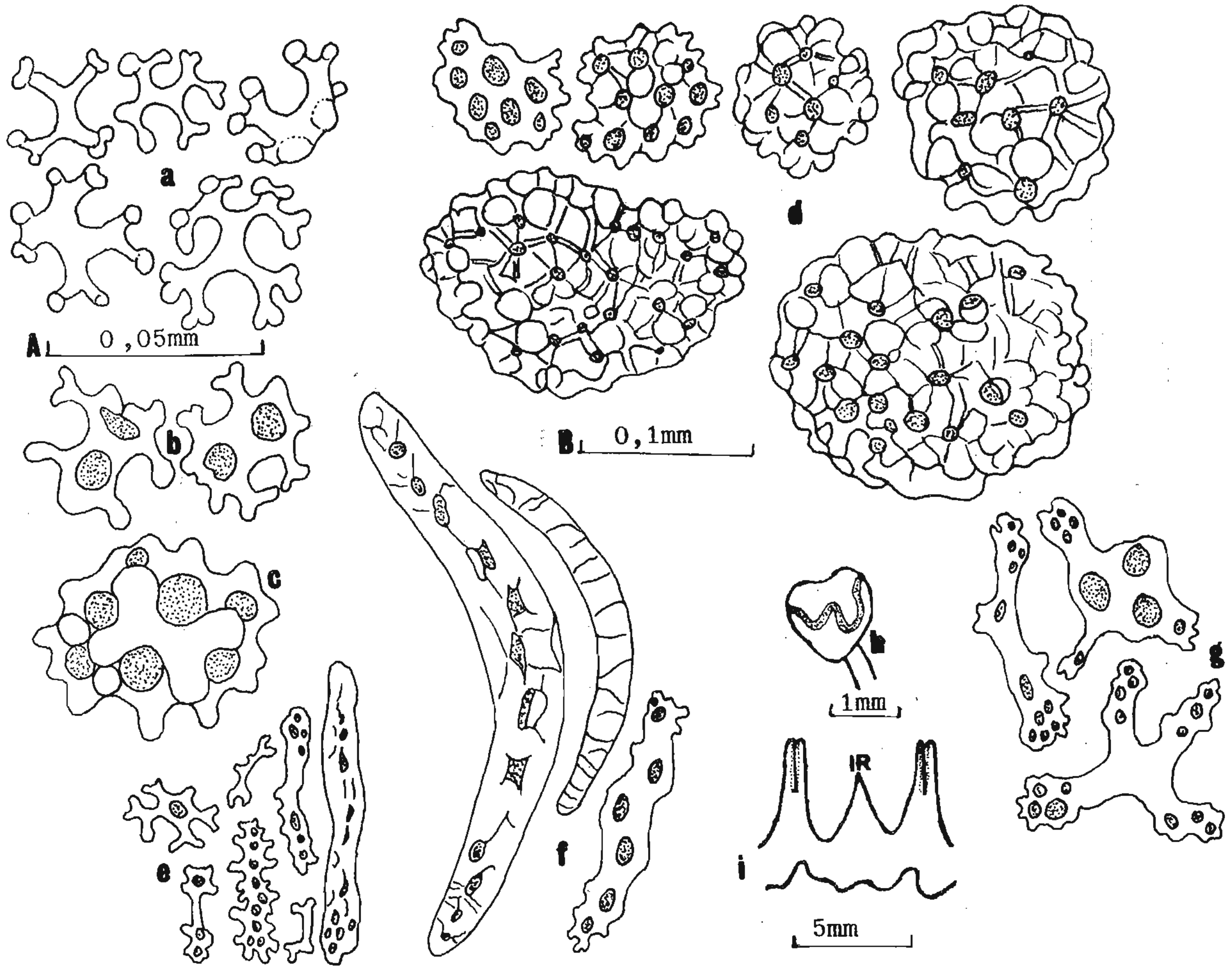


Fig. 24. Pseudocnella sinorbis (Cherbonnier). Z5A.

a. Incomplete baskets from oral region

b. Baskets from ventral body wall

c. Complete basket from anal region

d. Plates from dorsal body wall

e. Introvert spicules

f. Tentacular rods

g. Pedicel spicules

h. Madreporite

i. Part of calcareous ring

(a & b Scale A, d-g Scale B)

(1948). Complete baskets (fig. 24b & c) (up to 0,55mm) are sometimes present in juveniles. Since similar incomplete baskets also occur in juveniles of P. sykion, the juveniles of both species can be separated on the basis of knobbed plates (fig. 24d) which in P. sinorbis are rarely denticulate. Such plates measure 0,07-0,35mm in length.

Pseudocnella sinorbis shows a more or less identical distributional pattern to P. sykion (Map: 15). Its occurrence as far north as Moçambique extends its northward range. Besides P. sykion the species is closely related to the Mediterranean P. syracusanus differing from it in the presence of equal tentacles, absence of buttons, and the rarity of denticulate plates.

Pseudocnella sykion (Lampert) comb. nov.
(Fig.25 a-h)

Semperia sykion Lampert, 1885: 250.

Cucumaria sykion Thēel, 1886a: 266; H.L. Clark, 1923: 412; Stephenson, Stephenson and du Toit, 1937: 359, 363, 381; Stephenson, Stephenson and Bright, 1938: 18; Eyre and Stephenson, 1938: 18; Eyre, Broekhaysen and Crichton, 1938: 96, 110; Stephenson, 1944: 306, 317, 348; 1948: 266; Deichmann, 1948: 346 (partim) (non C. sykion, insolens stage); Cherbonnier, 1952a: 483, pl.40, figs. 1-18; ?Day, Millard and Harrison, 1952: 412 (black holothurian); Kalk, 1958: 223, 238; Macnae and Kalk, 1958: 130; Day, Field and Penrith, 1970: 83; Day, 1974a: 192; Jackson, 1976: 14, 15; Branch and Grindley, 1979: 169; Branch and Branch, 1981: 247, figs.

Cucumaria jägeri Lampert, 1885: 249; H.L. Clark, 1923: 413.

non Stereoderma jägeri Panning, 1949: 422.

Pseudocnus dubiosus jägeri Panning, 1952: 126, figs. 6-9.

Pseudocnus dubiosus jaegeri Panning, 1962: 66, figs. 10 and 11; Pawson, 1969: 37 (passim).

Diagnosis (From Lampert, 1885; Cherbonnier, 1952a; modified herein): Barrel-shaped species up to 60mm long. Colour dark olive green to black. Pedicels in 4-7 rows. Interradial papillae (papulae) minute, retractile. Spicules an external layer of minute, smooth, incomplete baskets present only in juveniles under 20mm; adults with only densely packed round to oval knobbed plates, often (20%) with one end denticulate but denticles never borne on a projecting "handle".

Previous records: C(34/18/i to 33/28/i; T(32/28/i, 31/29/i); N(29/30/i to 31/30/i, 27/32/i); M(26/32,33).

Material examined: C(34/19/i to 33/28/i); T(32/28/i to 31/29/i); N(30/30/i to 27/32/i); M(24/35/i); 357 spec.

Distribution: Cape Agulhas to Jangamo, south of Inhambane, Moçambique; intertidal. Map: 15.

Habitat: Common in lower part of littorina to lower balanoid zone, under stones, in pools and in rock crevices; adults usually exposed, juveniles cryptofaunic.

Remarks: This species is rediagnosed to separate it from the sympatric P. sinorbis with which it has been confused on numerous occasions. Since it lives mostly exposed only dark forms are en= countered. This probably also explains the loss of baskets in adults and their presence in juveniles which are always concealed. The baskets (fig. 25h) are smaller (0,015-0,037mm) than those of the juveniles of P. sinorbis (0,024-0,055mm) and may persist in the anal region of slightly larger individuals or sporadically in the entire integument. Rarely some adults ('freaks' or ?hybrids) contain baskets. The plates (fig. 25a & b) measure 0,10-0,25mm with the round ones (fig. 25b) resembling those of P. sinorbis.

The different ecological niches occupied by P. sykion and P. sinorbis might suggest that they are ecological varieties of the same species, an argument that is strengthened by their more or less total sympatry, their distribution lying east of Table Bay into southern Moçambique (Map:15).

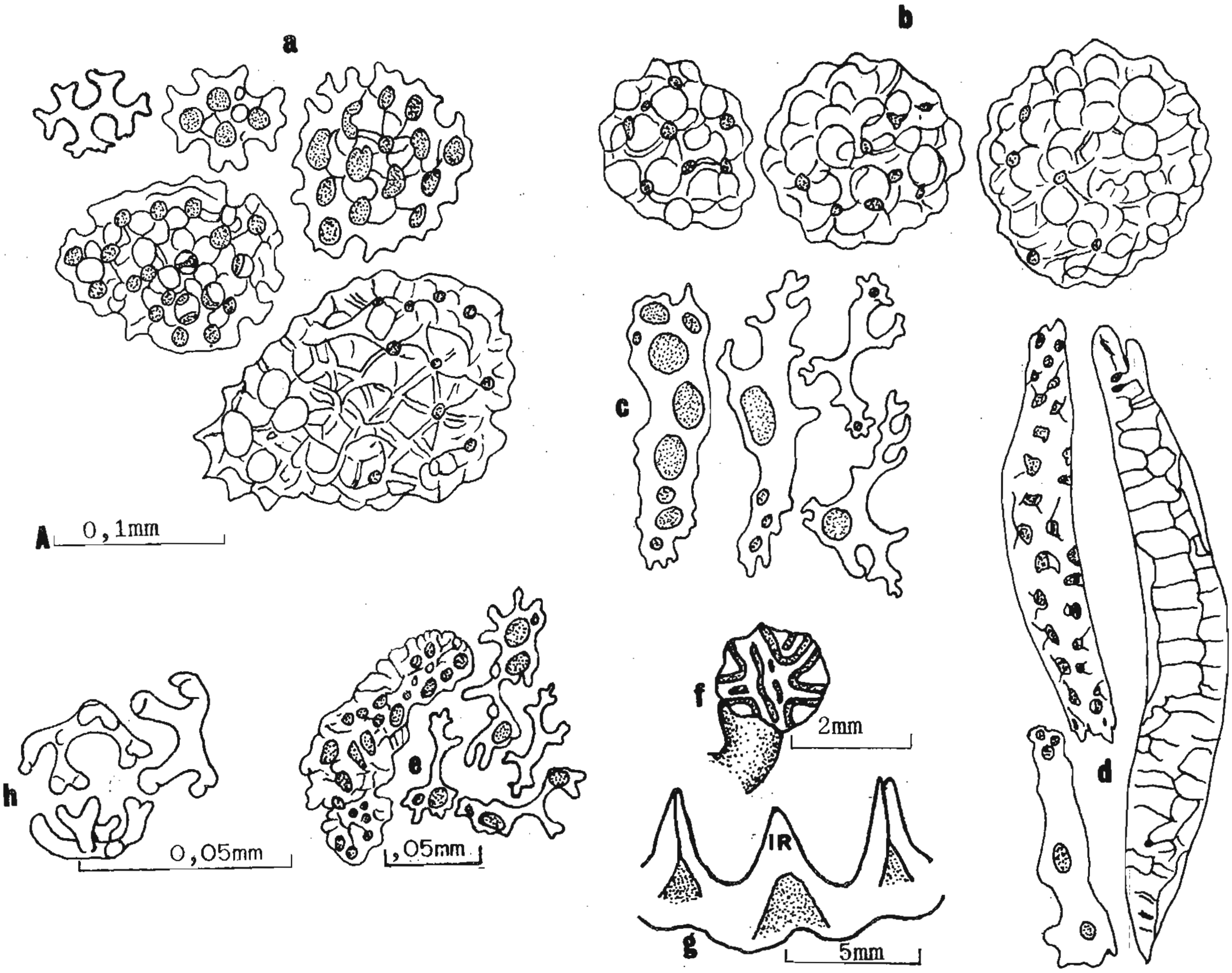


Fig. 25. <u>Pseudocnella sykion</u> (Lampert). Embotyi.

a. Plates from dorsal body wall (various stages of development)

b. Spherical plates from dorsal body wall

c. Pedicel spicules

d. Tentacular spicules

e. Introvert spicules

f. Madreporite

g. Part of calcareous ring

h. Incomplete baskets (Juv.)

(a - d Scale A)

Although this is difficult to verify the differences favour a specific separation. As the two species are closely related they must have speciated out, in the not so distant past, from a common ancestor not unlike P. sinorbis, which therefore appears nearest the ancestral stock. Perhaps this is a good example of speciation by ecological isolation.

Genus TRACHYTHYONE Studer

Trachythyone Studer, 1876: 453; Panning, 1949: 426 (synonymy); 1964: 162;

Leptopentacta (partim) Panning, 1966: 56 (non H.L. Clark, 1938: 453, Deichmann, 1941: 92).

Diagnosis: See Panning, 1949: 426; 1964: 162.

Type species: Trachythyone muricata Studer, 1896 (by subsequent designation Panning, 1949).

Remarks: Panning (1964) suspects that the type species is conspecific with Cucumaria (=Trachythyone) parva Ludwig, 1874. If this is so then C. parva, which has priority, must replace T. muricata as type species for the genus.

This genus, as diagnosed by Panning (1949), was cosmopolitan, containing about 20 nominal species. Since then several new species have been described. However, in 1966, Panning transferred several species including one southern African form to Leptopentacta H.L. Clark,

1938. However, Rowe (pers. comm.) is of the opinion that Trachythyone is probably a cold water genus while Leptopentacta is distributed in warmer waters. Since three of the four southern African species, probably referable to Leptopentacta, are from cooler temperate waters they are here classified in Trachythyone.

KEY TO THE SOUTHERN AFRICAN SPECIES OF TRACHYTHYONE

1. Body wall spicules include generally incomplete baskets or large spinous crosses with bifurcate arms, in addition to smooth to knobbed plates 2

   Body wall spicules include mostly complete baskets, though sometimes few in number, and smooth to slightly knobbed plates 3

2. Superficial spicules in the form of large spinous crosses with bifurcate arms; plates thick, smooth to slightly knobbed, with few (up to 12) holes; no buttons or rosette-shaped granules in body wall .....
   Trachythyone crucifera (Semper, 1867).

   Superficial spicules in the form of mostly incomplete baskets with stout primary cross; other deposits include elongate, multilocular, smooth to knobbed plates, irregular knobbed buttons and minute rosette-shaped granules ... Trachythyone sp.

3. Plates huge (up to 0,8mm), feintly knobbed at one extremity; anal region with minute, smooth to knobbed buttons or plates
   Trachythyone rigidapeda (Cherbonnier, 1952).

Plates large (up to 0,4mm), smooth and imbricating, rarely with minute nodules on surface 4

4. Plates elongate with numerous small-holes; margin of plates without nodules ..... Trachythyone improvisa (Ludwig, 1875)

Plates irregular with up to 12 (usually fewer) large holes; margin of plates often with incipient nodules.

Trachythyone ?parva (Ludwig, 1875)

Trachythyone crucifera (Semper)

(Fig.26 a-j)

Cucumaria crucifera Semper, 1869: 121, pl.1, fig.1; Théel, 1886a: 100; Ludwig, 1887: 19, pl.1, figs. 5-11; Lampert, 1896: 60; Deichmann, 1948: 343, pl.18, figs. 1-3; Kalk, 1958: 216, 238; Macnae and Kalk, 1958: 107, 119, 130.

Trachythyone crucifera Panning, 1949: 427, fig.15; Cherbonnier, 1955: 164, pl.45, figs. k-v; Clark and Rowe, 1971: 182 (dist.); Panning, 1971: 37; Day, 1974a: 192.

?Trachythyone crucifera Panning, 1964: 170, fig.9.

Trachythyone cruciferae (sic) Branch and Branch, 1981: 247, 1 text-fig.

Diagnosis: See Deichmann, 1948: 343; Panning, 1949: 427; 1964: 170.

Previous southern African records: N(30/30/i); M(26/32,33/i).

Material examined: N(30/30/i, 30/31/S), 3 spec.

Local distribution: Moçambique to Natal as far south as Scottsburgh, 0-3m. Map: 3.

General distribution: Predominantly West Indian Ocean. Also reported from the Bay of Bengal.

Habitat: Rock and sand.

Remarks: This characteristic Indian Ocean species has long been known from the east coast of Africa. Its Natal record is that of Deichmann (1948) based on two specimens collected at Umtwalumi (S. of Durban) by the UCT survey. The same specimens were here re-examined together with another more recent specimen collected at Durban. The maximum size of the present material is 63mm and the life colouration of the species beige with darker pedicels. One of the UCT specimens is quite abnormal in that it has only four ambulacra. This abnormality was overlooked by Deichmann. Deichmann briefly diagnosed the species and remarked that the crosses vary in the northern and southern forms. However, a comparison of the crosses with those figured by Semper (1869) from the holotype shows the variations to be insignificant.

The spicules are better developed ventrally. The crosses (fig. 26a & b) are 0,06-0,11mm in length and the plates (fig. 26c) 0,14-0,30mm. These dimensions correspond well with those given by Panning (1964) for the lectotype. The plates have 3-12 holes and usually an irregular margin while those from the anal region may be slightly knobbed. The pedicel deposits (fig. 26h) are typical, up to 0,26mm long. The tentacle and introvert deposits include both elongate (fig. 26d & g) and branched, rosette-like rods (fig. 26e & f) up to 0,02mm long.

The species was referred to Trachythyone by Panning in 1949. However, in 1964 he revised the genus but hesitated to include in it T. crucifera which, according to him, occupies an exceptional position within the Cucumariidae. Panning likens the spinous crosses to the spinous deposits of Ohshimella mauritiana Heding and Panning. Thus, according to him, T. crucifera occupies an intermediate position between the Cucumariidae and the currently known Sclerodactylidae and separating these families as is done at present demands a degree of evolutionary convergence that is difficult to comprehend. The writer agrees with Panning in as much as that the spinous deposits of _T. crucifera_ and _O. mauritiana_ are similar. Further, both species are typically West Indian Ocean in distribution and in both the spicules are not as densely packed as they are in typical species of _Trachythyone_. However, there exist several other totally unrelated species with spinous rods and the presence of such deposits in these species cannot be explained in any other way but by convergent evolution. The two West Indian Ocean species that come to mind here are _Holothuria parva_ Lampert and _Orphnurgus aspersignis_ sp. nov. These species must have developed similar deposits quite independently and this may also be true of _T. crucifera_ and _O. mauritiana_ since they differ not only in tentacle number but also in their calcareous rings. The spinous deposits of _O. mauritiana_ may be modified tables, such modifications can be clearly demonstrated in some phyllophorids with spinous rods, notably in species of the subgenus _Phyllophorella_. Since the assumption that the spinous crosses of _T. crucifera_ are modified baskets has no foundation Panning is perhaps correct that it should be assigned to a monotypic genus. However, more evidence is needed, especially from a study of juveniles, before this is done.

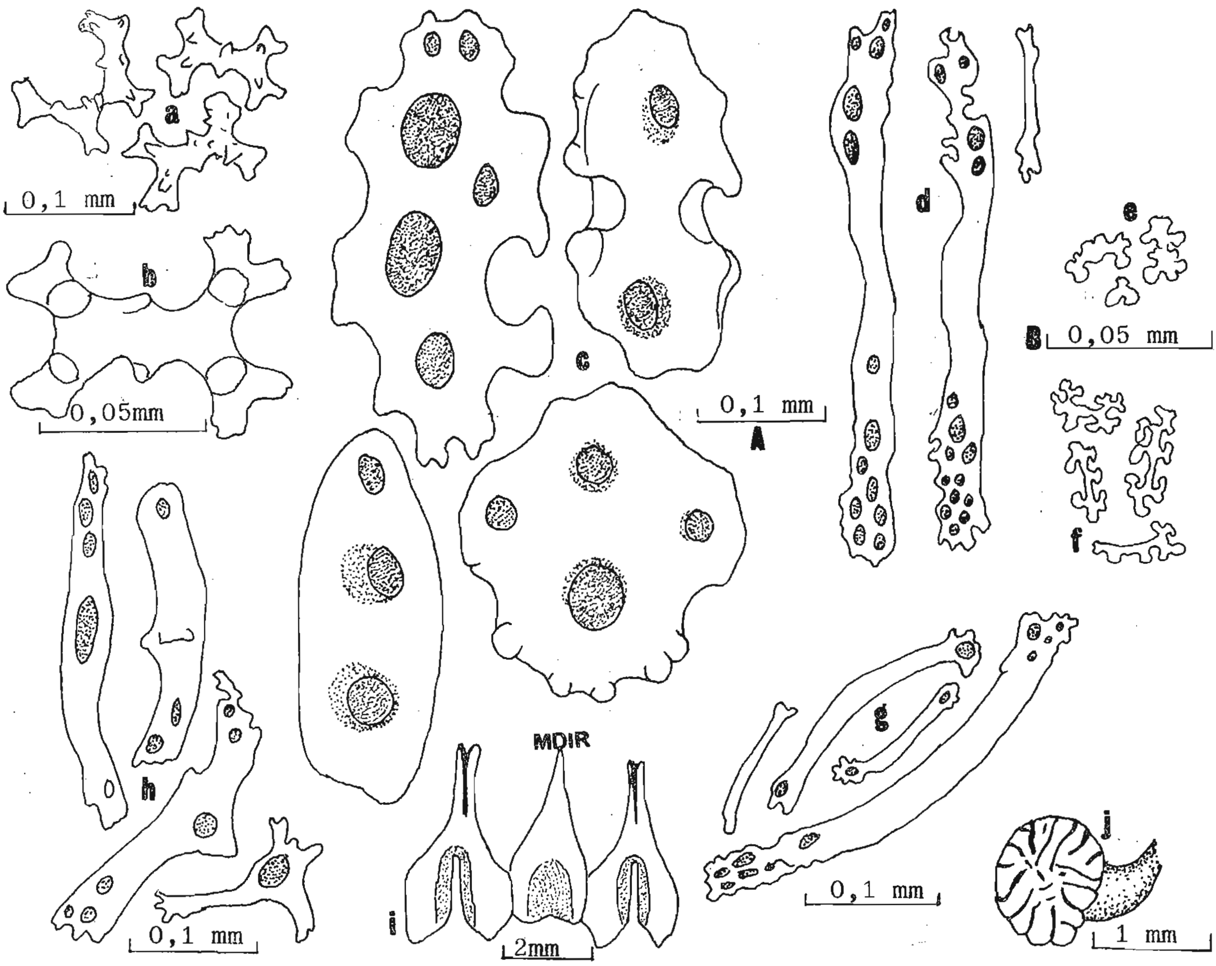


Fig. 26. Trachythyone crucifera (Semper). M9F2.

a. Crosses from anal region

b. Cross (enlarged)

c. Plates from anal region

d. Introvert rods

e. Branched rods (rosettes) from introvert

f. Branched rods (rosettes) from tentacles

g. Tentacular rods

h. Pedicel rods

i. Middorsal interradial and adjoining radial plates of calcareous ring

j. Madreporite

(c & d Scale A, e & f Scale B)

Trachythyone improvisa (Ludwig)

Cucumaria improvisa Ludwig, 1875: 85, pl.6, fig. 10; Théel, 1886a: 107; H.L. Clark, 1923: 414; Deichmann, 1948: 349.

Trachythyone improvisa Panning, 1949: 426.

Diagnosis: See Ludwig, 1875: 85; Deichmann, 1948: 349.

Record: C(38/25).

Material examined: None.

Distribution: Known only from Algoa Bay.

Remarks: This species, based on two specimens presumably from Algoa Bay, has not been found since its description. Both Théel (1886a) and Deichmann (1948) speculated that since the species resembles the mediterranean T. elongata (Düben and Koren), Ludwig's specimens were mislabelled and probably came from Algier Bay. However, Panning (1966) states that such an error was not possible since Ludwig's description was based on material brought into the Hamburg Museum from Algoa Bay before 1870, while material from the African Mediterranean coast was only received by the Museum after 1900. As no type material exists Panning recommends that the species should be disregarded.

Regrettably no specimen in the present collections is referable to T. improvisa. The species that comes nearest it is perhaps T. rigidapeda described below. However, the baskets of this latter species are some=what flat and the plates, although long and multilocular, are often complex, knobbed at one end and constricted in the middle, quite unlike those illustrated for T. improvisa.

At what depth T. improvisa was taken is not recorded. The study of the southern African deep water shelf fauna has only recently started receiving systematic attention and it is possible that T. improvisa would be found again. The species should therefore be left to stand until a thorough knowledge of the shelf fauna is forthcoming.

Trachythyone ? parva (Ludwig)

(Fig.27 a-j)

Cucumaria parva Ludwig, 1875: 7, fig. 12; 1887: 19; 1898: 25, pl. 1, figs. 14-18; Lampert, 1889: 833; Perrier, 1905: 29, pl.2, fig. 1, pl.3, figs. 16-19; Ekman, 1925: 92, fig. 20.

Semperia parva Lampert, 1885: 152.

Trachythyone parva Panning, 1949: 428, fig. 16; 1964: 162, figs. 2-4.

Diagnosis: Ludwig, 1875: 7; Panning, 1949: 428.

Previous southern African record: None.

Material examined: C(34/17/vd), 1 spec.

Description: Specimen (fig. 27f) small, U-shaped. Length 18mm. Colour, in alcohol, white. Tentacles 10, of equal size and feebly branched (fig. 27i). Anal papillae 10, longer than pedicels. Pedicels cylindrical, mostly restricted to ambulacra in double rows, a few also scattered in odd interambulacrum, especially orally.

Calcareous ring (fig. 27h) simple, radial and interradial plates delicately fused and of equal size; anterior projections of radials blunt. Polian vesicle elongate, slightly to left of dorsal mesentery (fig. 27j). Stone canal short, slightly curved; madreporite ovoid, not lodged in mesentery (fig. 27g). Gonad in two tufts, each consisting of 6-7 unbranched tubules, larger tubules with developing eggs (fig. 27 j).

Respiratory trees short, each consisting of two main trunks, each trunk with a few short sac-like diverticulations.

Spicules:

Baskets few, flat, rarely reduced to cross-shaped rods; plates large, imbricating. Baskets (0,05-0,095mm) with usually a nodular primary cross and rim (fig. 27a). Plates (0,15-0,40mm) with 1-12 holes and an uneven, slightly nodular margin (fig. 27b). Pedicel rods and plates (fig. 27c) 3-holed or spectacle-shaped. Tentacles with similar deposits (fig. 27e). Introvert with finely perforated plates of varying shapes and with jagged margins (fig. 15d).

Local distribution: Off south west Cape Province, 3157-3257m.
General distribution: Antarctic, subantarctic.

Remarks: The single specimen is tentatively identified with the well known *T. parva* (Ludwig), a species widely distributed throughout the Antarctic-Subantarctic region. Since it may not be conspecific with this species it is here briefly described. It differs from the typical *T. parva* in possessing equal poorly branched tentacles, sparingly distributed interradial podia and in the slender, finely nodular crosses of the baskets. However, Panning (1964) has shown that *T. parva* is very variable in the distribution of pedicels and the type of spicules while R. Perrier (1905) has described and illustrated baskets with nodular (spinose) primary crosses, similar to those found in the present specimen.

If the specimen is indeed *T. parva* its occurrence off the southern African coast, from which not a single certain Southern Ocean holothurian has yet been recorded, is puzzling. However, the specimen was taken from a considerable depth where the water is as cold as in the shallow Subantarctic region.

In many respects the specimen shares affinities with _T. bouvetensis_ (Ludwig and Heding 1935) from Bouvet Island; _T. macphersonae_ Pawson, 1962 and _T. bollonsi_ (Mortensen, 1925), both from New Zealand; _T. fallax_ Cherbonnier, 1958 from Sierra Leone and _T. crassipeda_ Cherbonnier, 1961 from the coast of Brazil.

It differs from _T. bouvetensis_ in the equal size of the tentacles, the lack of a deep notch in the radial plates, the occurrence of nodular crosses and the presence of plates with only a few holes. In _T. macphersonae_ and _T. bollonsi_ the ventral tentacles are reduced, the baskets are of a different type, and the plates small with few holes. Although _T. crassipeda_ has 10 equal tentacles the baskets have frequently a five-armed primary cross and the pedicel and tentacular deposits are different. In _T. fallax_ the two ventral tentacles are reduced, the calcareous ring and tentacular deposits are different and only smooth plates occur in the body wall. Since _T. parva_ is highly variable some of the above species, separated on minute differences, may possible be conspecific or consubspecific with it.

Fig. 27. Trachythyone ? parva (Ludwig). A22146.

a. Complete and incomplete baskets from body wall

b. Smooth to feebly nodulated plates from body wall

c. Pedicel plates and rods

d. Introvert plates

e. Tentacular plates and rods

f. Entire specimen

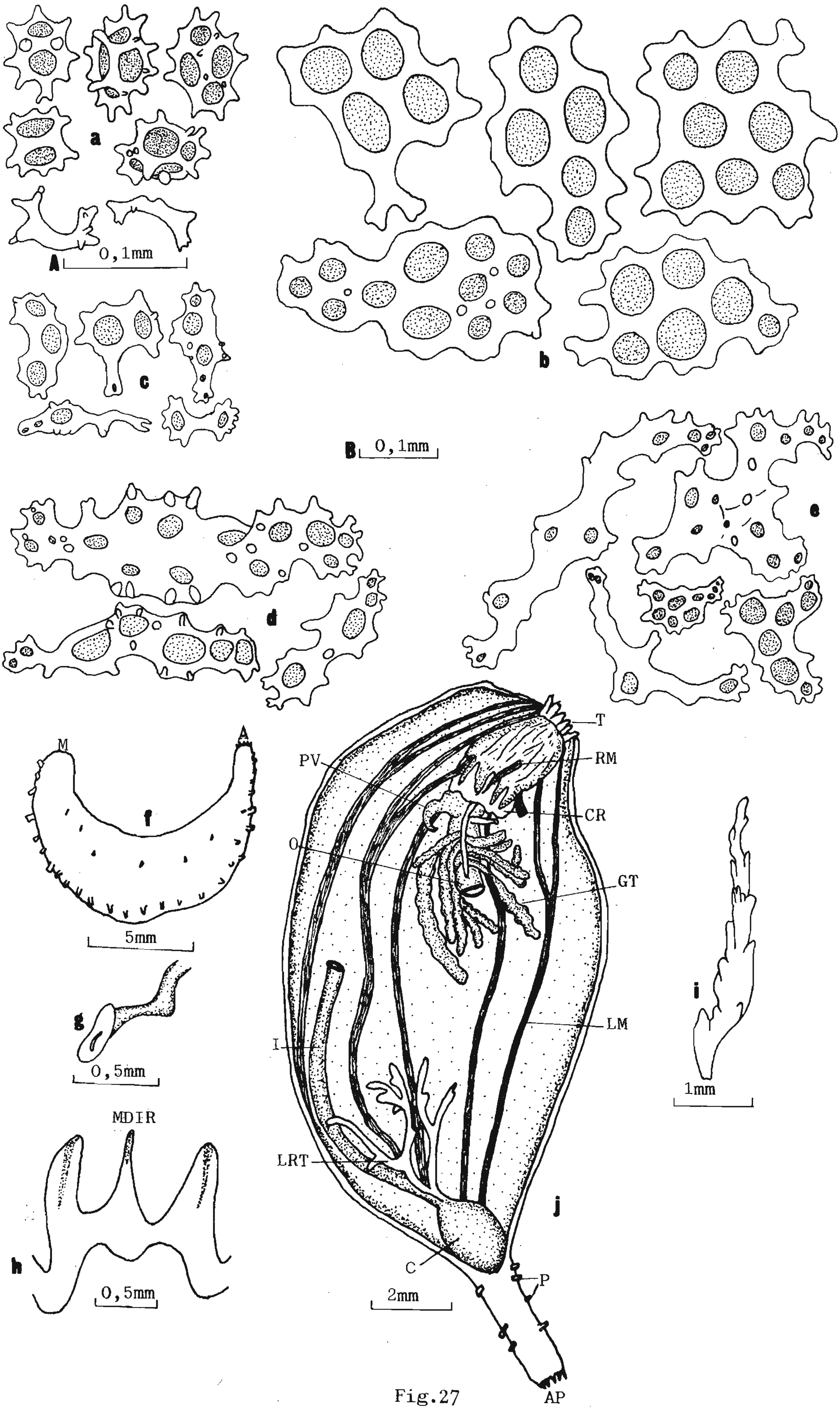
g. Madreporite

h. Part of calcareous ring

i. Entire tentacle

j. Specimen dissected to show internal anatomy

(a Scale A, b-e Scale B)



a
A
0,1mm
b
c
B
0,1mm
d
e
M
A
f
5mm
g
0,5mm
MDIR
h
0,5mm
T
RM
PV
CR
O
GT
I
LM
LRT
j
C
P
2mm
AP
i
1mm

Fig.27

Trachythyone rigidapeda (Cherbonnier) comb. nov.
(Fig.28 a-i)

Cucumaria rigidapeda Cherbonnier, 1952a: 485, pl.41, figs. 1-17.

Diagnosis: See Cherbonnier, 1952a: 485.

Previous record: Type locality only, C(30/16/d).

Material examined: C(28/14/d, 30/16/d, 32/17/d), 13 spec.

Distribution: Off Orange River MOuth to Lamberts Bay, 120-185m. Map: 12.

Habitat: Green mud, clay or sand.

Remarks: Cherbonnier's description, based on a single 98mm specimen, is complete except that the dimensions of the spicules are not given and the introvert and anal spicules not examined. The largest specimen in the present material measures 105mm along the ventral surface.

The baskets (fig. 28a & f) (0,04-0,08mm) are flat and often develop accessory holes as a result of fusion of tips of two or more nodules of the rim. The plates (fig. 28b-d) are huge (0,33-0,8mm), usually thickened and feintly knobbed at one end. They may be either simple with 6-55 large holes, or multilayered with numerous reduced holes, both types occurring in the same specimen. Minute (c 0,1mm) button-like plates with 5-8 holes are present in the anal region (fig. 28e). The introvert contains minute (0,05-0,09mm) crinkly rosette-shaped, often knobbed plates (fig. 28g) and elongate curved rods. The tentacles are without rosettes but with rods and plates of the introvert type (fig. 28h).

This species holds a unique position amongst the southern African dendrochirotids. The form of its body, the thinness of the body wall, the rigid nature and distribution of the pedicels and type of calcareous deposits are rather distinctive features. Perhaps the species has affinities with the European T. tergestina (Sars) with which it shares a similar body form and baskets.

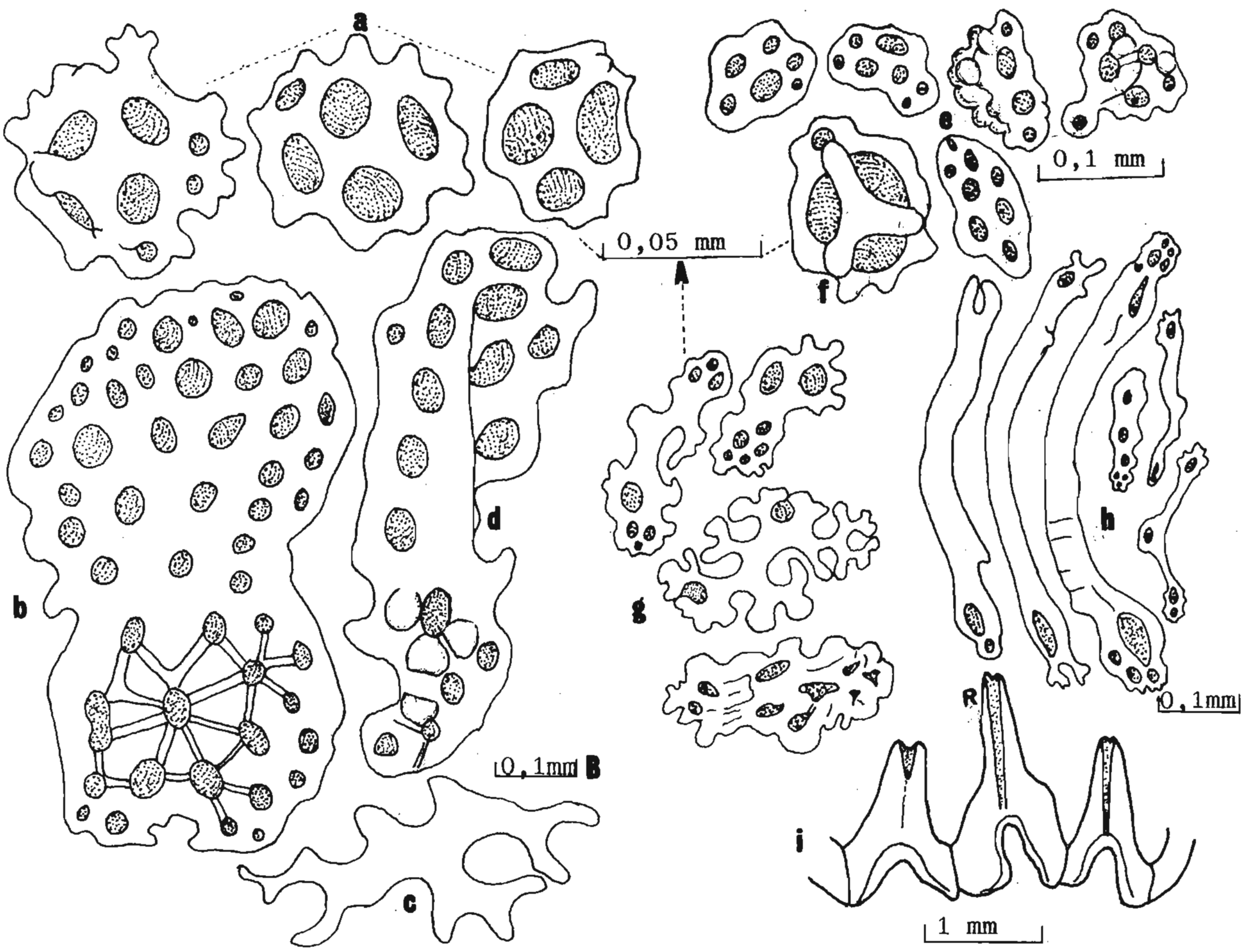


Fig. 28. Trachythyone rigidapeda (Cherbonnier). A22712.

a. Baskets from ventral body wall

b. Plate from dorsal body wall

c. Developing plate

d. Plate from ventral body wall

e. Minute plates from anal region

f. Basket from anal region

g. Introvert spicules

h. Tentacular spicules

i. Part of calcareous ring

(a, e, f & g Scale A; b-d Scale B)

? Trachythyone sp.

Material examined: N(28/32/i), 1 spec.

Description: Length 9mm. Ventralmost two tentacles reduced. Pedicels in 2-3 rows; interambulacra naked. Calcareous ring (fig. 29e) with unfused plates. Spicules baskets (fig. 29a) (frequently reduced to spinous crosses), minute rosette-shaped granules (fig. 29b), buttons (fig. 29c), and smooth to knobbed plates (fig. 29d), the latter often with an unthickened, spinose handle.

Habitat: Cryptofaunic, under rock in sand.

Remarks: The specimen, obviously a juvenile, was described as Cucumaria sp. by Thandar (1971) but this was not published. It is here referred to Trachythyone because of spinous crosses, some smooth plates and naked interradii. The specimen, however, may belong in Pseudocnella since the crosses and handled plates are reminiscent of P. insolens. However, the presence of rosettes, absent in all stages of development of P. insolens, prevents its identification with this species.

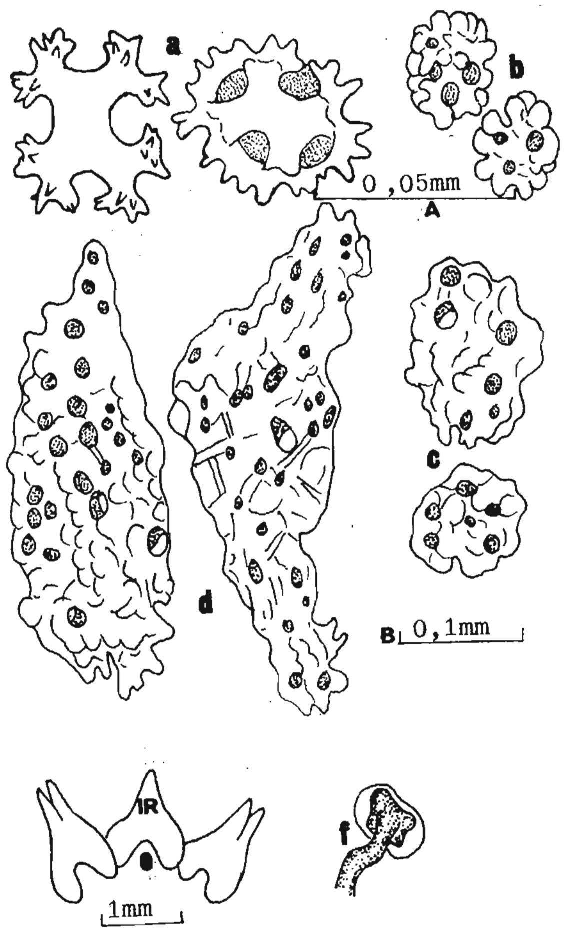


Fig. 29. <u>Trachythyone</u> sp. (Cape Vidal).

a. Cross and basket from body wall

b. Minute knobbed plates (rosettes) from body wall

c. Large knobbed plates from body wall

d. Elongate plates

e. Part of calcareous ring

f. Madreporite (not drawn to scale)

(a & b Scale A, c & d Scale B)

Subfamily CUCUMARIINAE Ludwig, 1894

Diagnosis: See Panning, 1949: 411, 412.

Remarks: This subfamily includes dendrochirotids with smooth to knobbed plates as body wall spicules. Rarely are these accompanied by a superficial layer of deposits. In southern Africa the subfamily is represented by three genera and four species, of which two genera and one species are here described as new.

Genus PAWSONELLA Gen. nov.

Diagnosis: Small, somewhat U-or barrel-shaped forms with pedicels restricted to ambulacra in double rows, shorter dorsally; inter= ambulacra naked. Tentacles 10, ventral two reduced to stubs. Calcareous ring simple, no posterior bifurcation to radial plates but radial and interradial plates with long anterior projections. Body wall spicules exclusively thick, imbricating, multilocular plates of two types: majority oblong, smooth, with small, often occluded, holes; others irregular to discoidal with larger holes and often one or more tiny nodules. Pedicels with minute, irregular, smooth to slightly nodular plates; end plates absent. Tentacles with rosettes and irregular, smooth, multilocular plates. Introvert with rosettes.

Type species: Pawsonella africana sp. nov. (designated herein).

Etymology: The genus is named after Dr David L. Pawson of the USNM, in recognition of his excellent contributions to the taxonomy of holothurians. The gender is feminine.

Remarks: This genus is erected to accommodate at present only the type species represented by small, barrel-shaped specimens collected from the shallow waters of Natal. The species is remarkable in the form of its tentacular crown, calcareous ring and spicules in combi= nation, and does not fall readily into any existing dendrochirotid genus. Although the spicules do show some resemblance to those of Pseudocolochirus, the calcareous ring of this latter genus is scalloped anteriorly, hence the radial and interradial plates lack any conspicuous anterior projections, and the tentacular crown is also different. Both genera are hence not closely related. The spicules also show some resemblance to those of some species of Panningia. However, in these species, although the radial and inter= radial plates of the calcareous ring have long, anterior projections, the radial plates, in addition, may carry short, paired, posterior processes. Further, the tentacles are equal in size and one end of the calcareous plates is usually pointed or turned up at an angle of about 90°. Species assigned to Panningia by Cherbonnier (1958, 1964) have a slender, curved, distinctly U-shaped body, quite unlike the usual barrel-shaped body of the new species.

Pawsonella africana sp. nov.
(Fig.30 a-i)

Diagnosis: As for the genus.

Material examined: Holotype: UCT, NAD 94A, 16km S. of Durban, 36m ?I 1967, C. Berrisford.

Paratypes: UCT, NAD 94A, 28 spec.; Natal Mus., Pietermaritzburg, ½km off Sezela Beach, N(30/31/S), 6m, 24 IV 1981, G. Lambert, 41 spec; ?SAM, A22727, Namaqualand South, ?I1964, 1 spec.

Description: Specimens small, U to barrel-shaped, depending on degree of contraction, U-shaped forms with body only slightly attenuated posteriorly, largest specimen 25mm in length along ventral surface, 20mm along dorsal surface; breadth 8mm in mid-body. Barrel-shaped forms with slightly flattened ventral surface and conspicuously arched dorsal surface. Colour in life an admixture of dark and light brown. Mouth terminal, surrounded by five valves; anus also terminal, encircled by five tiny calcareous "teeth", each flanked by a terminal podium. Tentacles (all retracted except in four specimens) eight, large, bushy, of more or less equal size and of same colouration as body wall, ventral-most two reduced to tiny whitish stubs, each ending in a pair of lobes. Three ventral ambulacra set close together, sole absent; pedicels rigid, thick, restricted to ambulacra in double rows, shorter and less crowded dorsally, decreasing in number posteriorly; suckers well developed; interambulacra naked.

Calcareous ring (fig. 30j) simple, well calcified, no posterior bifurcations to radial plates; radial and interradial plates solidly fused and with long, somewhat triangular, anterior projections, those of radial plates slightly longer, rounded anteriorly, those of inter= radials narrow, slightly pointed; outer surfaces of all plates with depressions, those of radials wider distally for insertion of retractor muscles; posterior margin of radial plates with a deep notch, that of the interradials broadly concave. Polian vesicle single, bulbous, ventrally attached. Stone canal short, slightly convoluted in dorsal mesentery; madreporite cotyledonous, poorly calcified (fig. 30h). Longitudinal muscles thin; retractors originate from middle of longitudinal bands, more anteriorly in ventral ambulacra. Each respiratory tree with two main trunks, a short medial trunk and a longer lateral trunk, latter reaching level of calcareous ring; end branches better developed distally. Gonad as two tufts of long unbranched tubules attached in dorsal midline, filling almost entire body cavity in mature individuals. Pedicel ampullae digitiform. Cloaca narrow, elongate.

Spicules:

Spicules of dorsal, ventral and anal body wall more or less similar, comprising fairly thick, imbricating plates of two basic types: Commoner plates smooth, oblong, 0,09-0,27mm in length, with uneven margins and 4-24 small (<0,02mm wide) holes, larger and fewer in centre, smaller and more numerous at ends, often with some indication of becoming occluded, possibly with age; one end of plate often narrow and feebly denticulate (fig. 30a). Other plates fewer, 0,125-0,24mm, irregular to perfectly discoidal with 9-41, larger (>0,02mm wide) holes and often with one or more tiny nodules on surface (fig. 30C); such plates, if irregular, sometimes also denticulate at one end and becoming more complex, possibly with age. Ventral body wall often with other tiny irregular perforated plates similar to those of pedicels (fig. 30b). Cross-shaped spicules, probable precursors of plates, present in juveniles. Pedicels with numerous, minute, smooth to slightly nodular plates of varying size (0,07-0,25mm) and form, with 4-17 tiny holes and irregular margins (fig. 30d). Tentacles with minute rosettes, and perforated plates and rods of varying size and shape (fig. 30f & g). Introvert with sparsely distributed rosettes, identical to those of tentacles (fig. 30e).

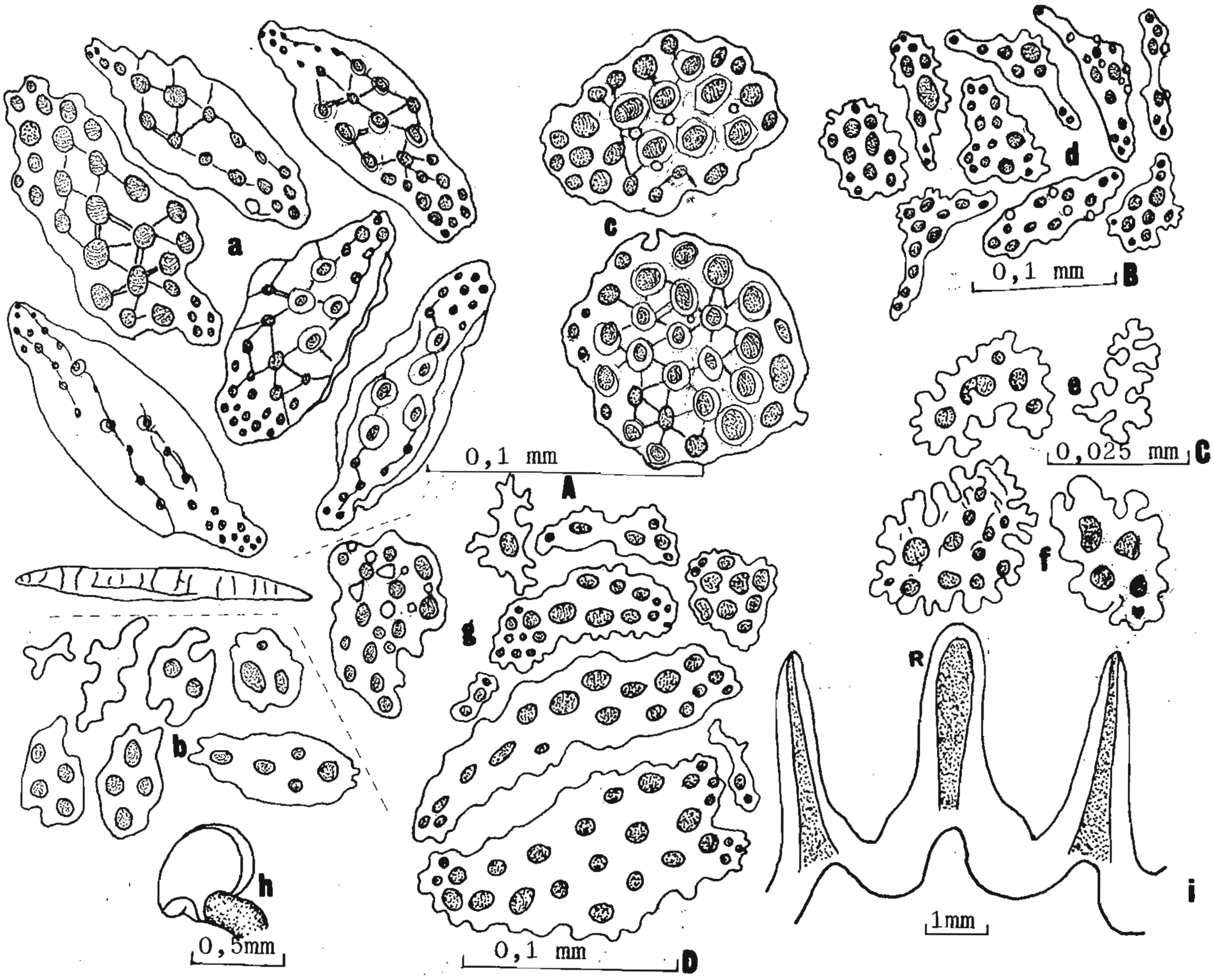


Fig. 30. Pawsonella africana Gen. & sp. nov. Holotype.

a. Elongate plates from dorsal body wall

b. Minute plates from ventral body wall

c. Discoidal plates from dorsal body wall

d. Pedicel spicules

e. Introvert rosettes

f. Tentacular rosettes

g. Tentacular plates

h. Madreporite

i. Part of calcareous ring

(a-c Scale A; d Scale B; e & f Scale C; g Scale D)

Distribution: Southern Natal, 6-36m and ?Namaqualand. Map: 11.

Habitat: Reef sand, sea weeds and bryozoans.

Remarks: The single Namaqualand individual (A22727, female, 16mm) differs from the Natal specimens in possessing 10 equal tentacles, 2-4 rows of pedicels per ambulacrum at least midventrally, a calcareous ring of 10 unfused plates, two polian vesicles and a spherical madreporite. Further it has no anal teeth and the body wall spicules, which are slightly corroded, comprise only oblong (0,15-0,26mm) brownish plates with 10-17 holes. Because of differing hydrological conditions on both sides of the southern African coast the Namaqualand specimen probably represents a subspecies or an ecological variant of the Natal form. However, more knowledge of the shallow water shelf fauna is needed to establish possible intergradients between the two forms. However, the differences between them are such that they may not even be congeneric.

In its spicules, tentacular crown and some features of the calcareous ring, the new species shares some affinities only with Cucumaria (=?Panningia) hyndmani Thomson from the north east Atlantic and Mediterranean, notably forma typica illustrated by Panning (1949). In the latter species, however, the spicules (0,5mm long plates) are prolonged and roughened at one end, there are no rosettes in the introvert and the pedicel deposits are of a different kind. Further, the body form is distinctly curved and the radial plates of the calcareous ring are said to bear short, paired, posterior prolongations. Hence it does not seem likely that the two species are closely related.

Genus PSEUDOCOLOCHIRUS Pearson, 1910

Colochirus (partim) Thĕel, 1886a: 78; Koehler and Vaney, 1908.

Pseudocolochirus Pearson, 1910a: 172; Deichmann, 1930: 181; James, 1976: 59.

Diagnosis: See Pearson, 1910a: 172.

Type species: Colochirus violaceus Théel, 1886 (by monotypy).

Remarks: The genus Pseudocolochirus was erected by Pearson (1910a) to accommodate the type species suspected by both Théel (1886a) and Koehler (1895) as not belonging strictly to Colochirus (=Pentacta). However, Deichmann (1930) thought that the name Pseudocolochirus was only proposed by Pearson in a letter to Mortensen and never pub= lished. She therefore re-erected and re-diagnosed the genus which, since then, has been erroneously credited to her by Ludwig and Heding (1935) and Clark and Rowe (1971) amongst some workers. James (1976) was the first person to point out this error. Since the genus was initially established for Colochirus violaceus Théel, this species must then be designated the type species. The genus at present contains about five species, one west Atlantic and others all Indo-West-Pacific forms.

Pseudocolochirus violaceus (Théel)

Colochirus violaceus Thĕel, 1886a: 78, pl.5, fig.4, pl.13, figs. 1 and 2.

Cucumaria tricolor Pearson, 1903: 188 (non Cucumaria tricolor Sluiter, 1901: 81).

Pseudocolochirus violaceus Pearson, 1910a: 170; Clark and Rowe, 1971: 180 (dist.); James, 1976:59, fig.1 (g-j), pl.1.

Diagnosis: See Théel, 1886a: 78; Pearson, 1910a: 170; James, 1976: 59.

Southern African record: M(10/40), depth not recorded.

Material examined: None.

Local distribution: Only known from Querimba (N. Moçambique).

General distribution: E. Africa, Bay of Bengal, E. Indies, N. Australia, Phillipine Islands, China and S. Japan.

Remarks: The species record from Moçambique is based on two specimens briefly described by Pearson (1910a), the larger measured 95mm. The colour is recorded as violet on the interambulacra and white on the ambulacra. There were very few papillae, 9-10 tentacles and 0,063mm long plates.

Genus ROWEIA Gen. nov.

Diagnosis: Medium-sized, cylindrical to U-shaped species, up to 130mm long. Tentacles 10, more or less of equal size. Pedicels usually restricted to ambulacra in 2-12 rows ventrally and two rows dorsally; interambulacra naked or with papillae. Calcareous ring without posterior bifurcation to the radial plates but radial plates with long anterior projections. Spicules of body wall a superficial layer of minute, slender, curved rods, forked and/or perforated at extremities (absent or rare in one subspecies), and an inner layer of fairly thick spectacle-shaped rods or "biscuits" with one or more holes at each end and often with few knobs, digitations or processes on the margin.

Type species: Cucumaria frauenfeldi Ludwig, 1875 (designated herein).
Other species included: Cucumaria stephensoni John, 1939.
Etymology: The genus is named after Dr F.W.E. Rowe of the Australian Museum in recognition of his invaluable contributions to the systematics of echinoderms. The gender is feminine.

Remarks: The designation by Panning (1949) of Cucumaria frondosa Gunnerus as type species of Cucumaria restricts the genus to include only those cucumariids with exclusively flat, thin, multilocular, often thorny plates as body wall spicules. Such plates, in the type species, are often present only in the posterior region or the pedicels. Two well known southern African species, C. frauenfeldi Ludwig, 1882 and C. stephensoni John, 1939, since the time of their descriptions, have been classified in Cucumaria (S.E.). Panning (1955: 40) commented on this anomaly since both species, in possessing a superficial layer of slender rods and an inner layer of spectacle-shaped spicules, do not correspond with the type. Hence these species do not belong in Cucumaria (S.S.) and the genus Roweia is here erected to accommodate them. R. frauenfeldi is represented by two forms which, because of their allopatry, are here regarded as subspecies.

Two other species with spectacle-shaped rods, Cucumaria nigricans Brandt, 1835 and C. vegae Théel, 1886, from the north east Pacific region, cannot be included in Roweia because of reduction of the two ventral tentacles, presence of pedicels also in the interambulacra and the complete absence of slender rods from the superficial layer of the body wall. The resemblance of their spicules to those of R. frauenfeldi may be a result of convergent evolution (Panning, 1955).

The genera most closely related to Roweia are Hemioedema, Hérouard, 1929, Pawsonia Rowe, 1970 and possibly Cladodactyla Brandt, 1835. Hemioedema has podia generally scattered over the body and exclusively thin, smooth, oval to rectangular, multilocular plates as body wall spicules. Pawsonia has the two ventralmost tentacles reduced, a single row of podia in the dorsal ambulacra and a superficial layer of small, stellate spicules (Rowe, 1970). Cladodactyla has spicules similar to those of Hemioedema but, in addition, tiny baskets may be present. The relationship of these four genera is strengthened in that they are mostly east Atlantic in distribution. Hemioedema includes three west African species, Pawsonia is monotypic, being represented by a single British species, while Cladodactyla includes two Antarctic and two west African species.

KEY TO THE SPECIES AND SUBSPECIES OF ROWEIA

1. Straight, cylindrical species, uniformly black in life; ventral pedicels in 6-12 rows per ambulacrum; numerous inter=radial papillae; superficial spicules of body wall slender, curved rods with forked ends ..... Roweia stephensoni (John, 1939).

   U- or barrel-shaped species, colour variable, never uniformly black; ventral pedicels in 2-5 rows per ambulacrum; no inter=radial papillae; superficial spicules, if present, with perforated ends ...... Roweia frauenfeldi (Ludwig, 1882) 2

2. Superficial spicules dense, always forming a continuous layer; anal region generally without rosettes; south and west coast form .... Roweia frauenfeldi frauenfeldi (Ludwig), 1882

   Superficial spicules usually absent, if present, rare,never forming a continuous layer; anal region generally with rosettes; east coast from

   Roweia frauenfeldi webbi (Thandar, 1977)

Roweia frauenfeldi (Ludwig) comb. nov.

(Fig.31 a-k & Fig.32 A-D)

Cucumaria sp. Semper, 1868: 236, pl.39, fig. 22.

Cucumaria frauenfeldi Ludwig, 1882: 130, Théel, 1886a: 109; Ludwig, 1887: 1231; Britten, 1910: 239; Vaney, 1911: 26, figs. 1-3; H.L. Clark, 1923: 413; Stephenson, Stephenson and du Toit, 1937: 381; Eyre, Broekhuysen and Crichton, 1938: 96, 110; John, 1939: 325, figs. 5 and 6; Stephenson, Stephenson and Day, 1940: 357; Stephenson, 1944: 317, 334, 348; 1948: 265; Deichmann, 1948: 345, pl.18, figs. 13-17; Cherbonnier, 1952a: 477, pl.37, figs. 1-14; Day, Millard and Harrison, 1952: 412; Panning, 1955: 40; 1971: 37 (passim); Day, 1959: 545; 1974: 191; Day, Field and Penrith, 1970: 83.

'Cucumaria' frauenfeldi Clark and Rowe, 1971: 192 (part. dist.), pl.29, fig. 1.

Cucumaria frauenfeldii (sic) Branch and Branch, 1981: 247, figs.

Cucumaria posthuma Lampert, 1885: 248, fig. 52; Théel, 1886a: 265.

Cucumaria deichmanni syn. nov. Cherbonnier, 1952a: 478, pl.37, figs. 16-24, pl.38, figs. 14-21.

Cucumaria webbi syn. nov. Thandar, 1977: 57, figs. 1 and 2.

Diagnosis (From Deichmann, 1948, modified herein): Length up to 90mm. Colour in life usually a shade of brown or yellow, never uniformly black. Pedicels in 2-4(5) rows, extending onto introvert; interambulacra naked. Calcareous ring with anteriorly projecting radial plates linked to small interradial plates by calcareous fragments (fig. 31a-h). Spicules a superficial layer of slender curved rods (0,034-0,07mm) (rare or absent in R. frauenfeldi webbi), usually perforated by 1-3 holes at each extremity, and an inner layer of much stouter, spectacle-shaped rods or "biscuits" (0,07-0,135mm), with one or few holes at ends and often with knobbed or digitated margins (figs. 32A-D), holes frequently reduced, completely absent or never developed; rods rarely developed into plates with up to seven holes and a wavy margin.

Previous southern African records: A(15/12); SWA(23/14/i; 26/15/i); C(30/17/i to 32/18/i; 34/18/i to 34/21/i; 34/23/i to 33/28/i); N(29/30/i).

Material examined:

West and south coasts: SWA (19/12/i, 20/13/?i,s; 23/14/i); C(28/16/s; 30/17/i; 33/17/i,s; 34/18/i to 33/28/i); 204 spec.

East coast: T(32/30/i); N(30/30/i to 29/30/i; 27/32/i; M(24/35/i); 18 spec.

Distribution: Throughout southern Africa from southern Angola to southern Moçambique (Map: 13). Semper's type is said to have come from Java but this record has never been verified.

Habitat:

South and west coast: In pool or under rock, embedded in sand; found low down on shore usually uncovered during LWS, sometimes among kelp below LWS; on the south coast usually associated with *Pseudocnella insolens*, *P. sinorbis* and *Pseudocnella tetracentriophora*.

East coast: In crevices between sandstone slabs containing little sand; never found burried in sand.

Remarks: This species has been described in detail several times (Lampert, 1885; Britten, 1910; Vaney, 1911; H.L. Clark, 1923; John, 1939 and Cherbonnier, 1952a). However, with ample material at hand, representing the entire southern African region, the species is here rediagnosed on the basis of individual and geographic variations out=lined below and two subspecies are here recognised.

Besides the geographic variation in habitat already noted, specimens collected from the east coast vary in form, being slender and distinctly U-shaped when compared with those from the south and west coasts which are more robust, slightly curved or barrel-shaped. In addition, the former are generally darker, with an admixture of different shades of brown, while the latter are usually greyish-brown to yellow, orange or even rust-coloured, with one or two exceptions.

Since anal "teeth" may be present or absent in forms taken the same locality and a higher pedicel number (up to 5 rows) present in only two specimens (ex False Bay and South West Africa) both these characters reflect individual and not geographic variations. The calcareous rings (fig. 31) of specimens taken randomly from the east to the west coast show considerable variations which appear to be roughly clinal (cf a-h). There is a tendency, from the east to the west coast, for the pyriform radial plates to increase in size, become quadrangular and fragmented, and for their connecting links with the interradials to also become fragmented. Likewise the interradial plates may also be subdivided. These apparent clinal variations are, however, not clear cut since in one or two specimens from the east coast the radials are broad with subdivided connecting links and similarly in some specimens from the south and west coasts the radial plates are not fragmented. One, therefore, wonders whether fragmentation of parts of the calcareous ring is a natural occurrence or the effect of the preserving or bleaching fluid. Lack of fresh material from the west coast prevents a positive conclusion. That the plates of the madreporite are also fragmented in some forms from the west-coast is noteworthy (fig. 31, cf. i-k).

There are considerable variations in the type of spectacle-shaped rods but no correlation is apparent in forms taken from different localities, except that in east coast specimens such rods are generally longer (up to 0,135mm) and with fewer holes than those from elsewhere. The margins of the rods may be smooth, wavy or slightly serrate; digitations, projections and/or knobs may be absent; and the holes may vary in size and number.

Fig. 31. Roweia frauenfeldi (Ludwig). Calcareous rings and madreporites.

a. Isipingo Beach (Natal)
b. Transkei
East Coast

c. Port Elizabeth
d. Arniston
e. St. James
South Coast

f. Cape Peninsula
g. Off Orange River Mouth
h. Torra Bay (S.W.A.)
West Coast

i. Isipingo Beach (Natal)

j. Off Orange River Mouth (C.P.)

k. Torra Bay (S.W.A.)

(all calcareous rings drawn to same scale)

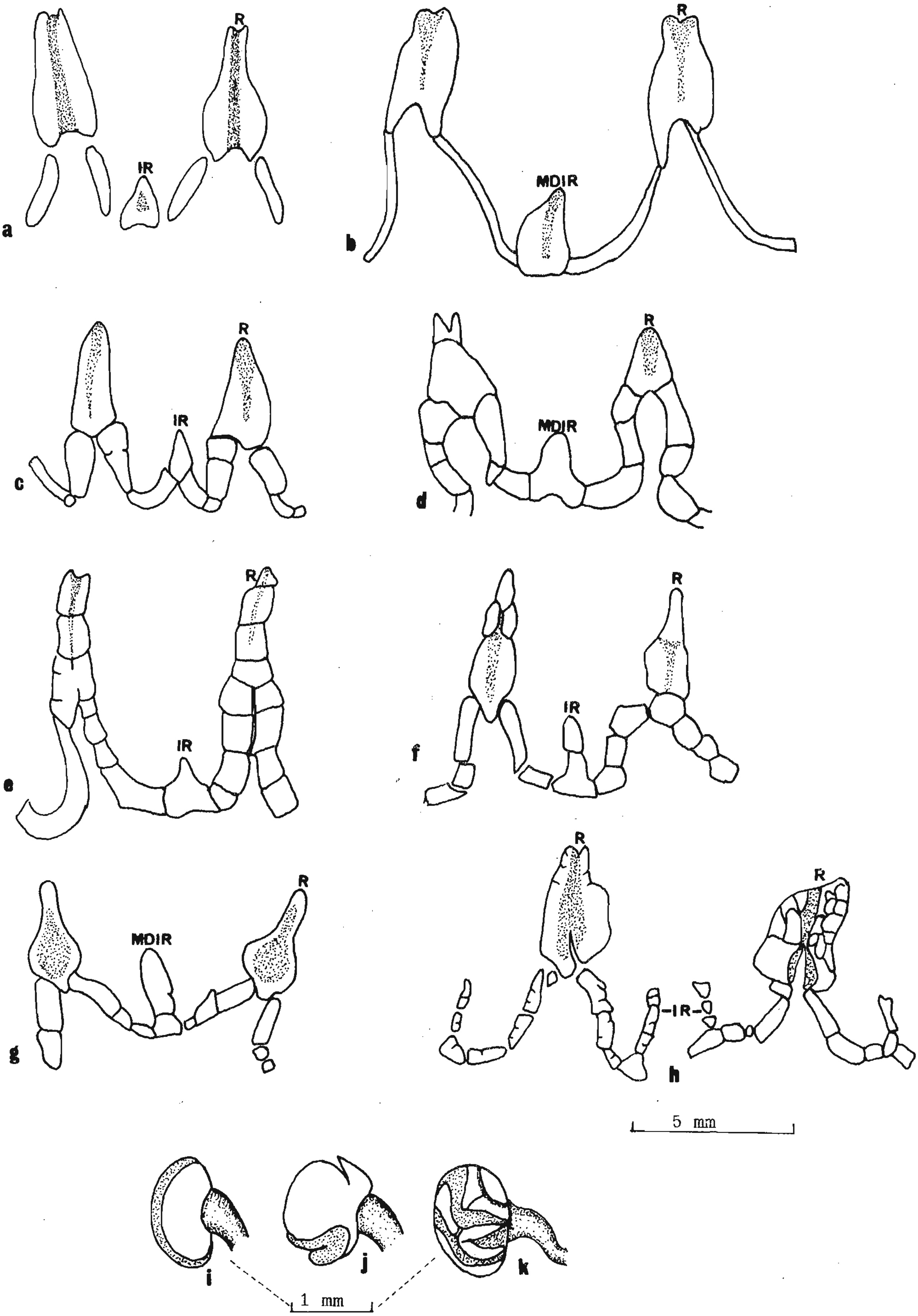


Fig.31

There are, however, definite geographic variations in the superficial deposits of the body wall and in the presence or absence of rosettes in the anal region, between specimens taken from the east coast and those from the south and west coasts (fig. 32A-D). The slender rods of the body wall nearly always form a continuous layer in the super= ficial integument in specimens from the south and west coasts. In only three specimens from Groen River (W. Cape Province) and two from South West Africa are the slender rods rare but since the spicules in these specimens are partially corroded no significance can be attached to this anomaly. Slender rods were not reported from the body wall by Cherbonnier (1952a) in his material from the Cape but his specimens were also stated to be poorly preserved. In specimens from the east coast on the other hand, slender rods are either absent or extremely rare, never forming a continuous layer in the body wall.

In all specimens from the east coast, except one from Natal, the anal integument is characterised by rosettes and strongly digitated spectacle-shaped rods (fig.32 A(b)). Amongst the south and west coast specimens rosettes are present in only one specimen from St. James (False Bay) (fig.32 C(b)), but these are accompanied by the characteristic slender rods; in others the anal integument has more or less the same complement of spicules as the general body wall.

There are no geographic but considerable individual variations in the type and size of tentacular deposits. These generally include rosettes, rods and large multilocular plates of varying shapes. However, rosettes are absent in some specimens, plates in others, while in some others tentacular spicules are altogether wanting.

Fig. 32. Roweia frauenfeldi (Ludwig). Body wall and anal spicules.

A. Jangamo (Moçambique)

a. Rods and "spectacles" from body wall

b. Digitated rods and rosettes from anal region

B. Port Elizabeth (Cape Province)

a. Slender rods and "spectacles" from body wall

b. Rods from anal region

C. St. James (False Bay)

a. Slender rods and "spectacles" from body wall

b. Slender rods and rosettes from anal region

D. Torra Bay (S.W.A.)

a. Slender rods and "spectacles" from body wall

b. Slender rods, "spectacle" and plate from anal region

(All drawn to same scale)

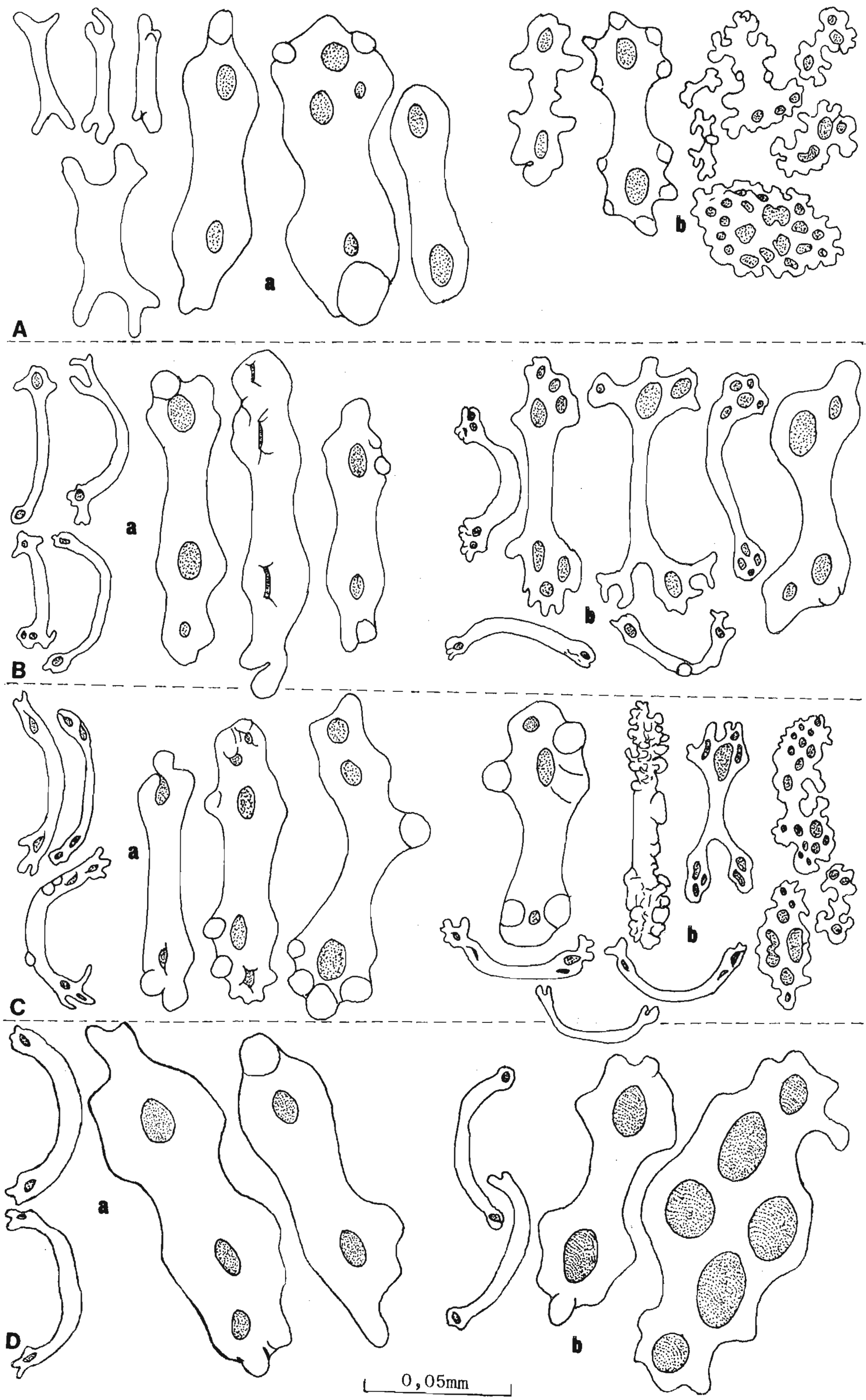


Fig. 32

Hence, while the distribution of pedicels, presence or absence of anal teeth and the form of the "spectacles" and tentacular deposits appear to be individual variations there are definite geographic variations not only in the habitat, form and colouration of the species but also in the nature of the anal spicules and in the pre= sence or absence of a superficial layer of deposits in specimens from the east coast on the one hand and those from the south and west coasts on the other. Its positive that there are two forms of the species which because of their allopatry are here treated as subspecies, the south and west coast form which corresponds with the type is referred to as _R. frauenfeldi frauenfeldi_ (Ludwig) and the east coast form as _R. frauenfeldi webbi_ (Thandar).

A full history of the species is given by John (1939) who was also the first to re-examine the spicules of Semper's type. Since then Deichmann (1948) rediagnosed the species from some UCT material and Cherbonnier (1952a) redescribed the species while separating Vaney's (1911) _C. frauenfeldi_ and some material from Swakopmund (SWA) as _C. deichmanni_, on the bases of pedicels in 4-5 rows, calcareous ring with fragmented links and rods without digitations but with minute holes. As these characters are highly variable within the species _C. deichmanni_ can no longer be upheld and must be relegated to the synonymy of _R. frauenfeldi frauenfeldi_.

Thandar (1977) described _C. webbi_ from Natal separating it from another Natal form (identified as _C. frauenfeldi_) mainly on the bases of the calcareous ring, short gonadal tubules, spectacle-shaped rods without digitations/knobs, absence of anal rosettes and the presence of large plates in the tentacles. Since these characters, except for the size of the gonadal tubules, are also extremely variable, C. webbi is here regarded as an individual variant of the east coast form of R. frauenfeldi which hence becomes R.f. webbi. Both forms may represent distinct species but they are here treated as subspecies because of several intergradations.

Semper's Vienna specimen is said to have come from Java but, in the absence of any other record of the species outside the southern African region, it must be assumed that the Vienna specimen is mislabelled. It hence appears that R. frauenfeldi is an endemic southern African species and it is here treated as such. Its presence in Moçambique marks a further extension of its northward range.

Roweia stephensoni (John) comb. nov.
(Fig.33 a-h)

Cucumaria stephensoni John, 1939: 321, figs. 1-4; Eyre, Broekhuysen and Crichton, 1938: 96, 100; Stephenson, 1944: 317, 348; 1948: 265; Deichmann, 1948: 344, pl.18, figs. 18-25; Cherbonnier, 1953: 596, fig. 2 (1-15); Morgans, 1959: 424, 425; Day, Field and Penrith, 1970: 83; Brown, 1972: 3 (Phys.); Day, 1974a:192; Branch and Branch, 1981: 247, fig. 369.
Cucumaria frauenfeldi H.L. Clark, 1923: 413 (partim); Eyre, 1939: 298.

Diagnosis: See John, 1939: 321, Deichmann, 1948: 344.

Previous records: C(34/18/i,s to 34/19/i; 33/25/i, 33/27/i); T(32/28/i).

Material examined: C(34/18/s to 34/21/i; 34/24/i to 33/28/i); T(32/28/i); 94 spec.

Distribution: False Bay to Qolora in the Transkei. Map: 13.

Habitat: Wedged in sandy crevices between stones or in rock pools containing little sand, from LWN to below LWS; sometimes washed up on shore after a heavy storm.

Remarks: The present specimens range in size from 11-95mm; none is 130mm as recorded by John (1939). The tentacle number occasionally varies from 8-12. Pedicels sometimes also occur in the interambulacra of the ventral surface. The plates of the calcareous ring appear to be connected by tiny calcareous elements (fig. 33h) but it was not possible to establish beyond doubt whether this is normal or a result of preparation. John does not mention these elements while Cherbonnier reports non-calcified ligaments between the plates.

The spicule dimensions of the present material vary slightly from those recorded by John. The slender rods (fig. 33a) measure 0,035-0,055mm while the spectacle-shaped rods (fig. 33b) are 0,05-0,09mm. The former are always forked and never perforated while the latter usually have one hole at each end. The tentacular plates and rods (fig. 33e) and the pedicel deposits (fig. 33d) are typical while the introvert is characterised by minute rods that are often branched and rosette-like (fig. 33c).

In the presence of interradial papillae (papulae), a high pedicel number and a different type of calcareous ring this species is distinct from the type species. These features in combination are perhaps worthy of a higher taxonomic status for the species and even Deichmann (1948: 346) observes that "the two forms are not particularly closely related". The two species hence may not be congeneric but are here referred to the same genus in order to limit the number of monotypic genera. Since both species are sympatric but occupy different ecological niches the similarity in their spicules is perhaps indicative of a remote common ancestry rather than a result of parallel evolution.

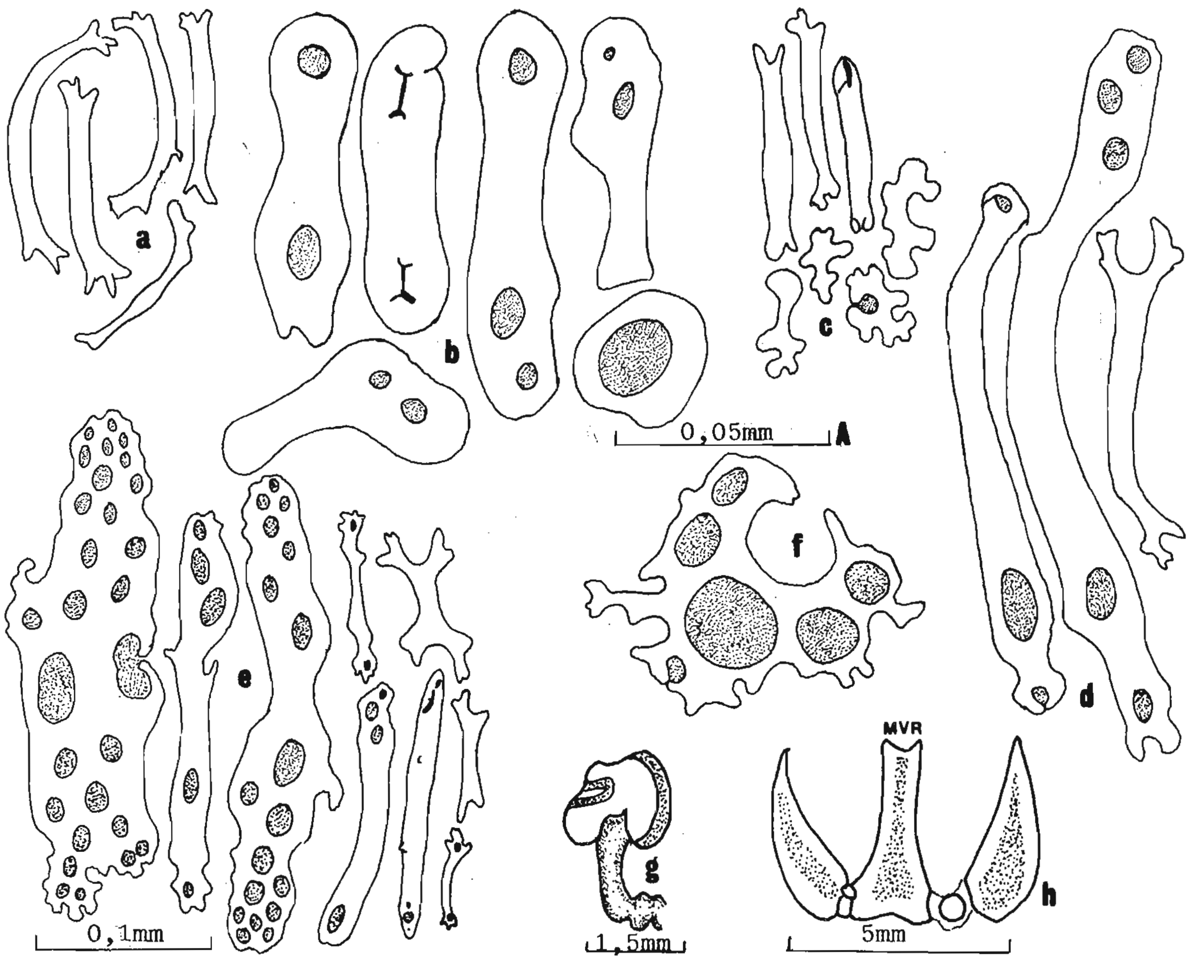


Fig. 33. <u>Roweia stephensoni</u> (John). De Hoop.

a. Slender rods from dorsal body wall

b. "Spectacles" or "biscuits" from ventral body wall

c. Introvert spicules

d. Pedicel rods

e. Tentacular plates and rods

f. Periproctal plate

g. Madreporite

h. Midventral radial and adjoining interradial plates of calcareous ring

(a - d & f Scale A)

Subfamily THYONIDIINAE Heding and Panning, 1954

Diagnosis: See Heding and Panning, 1954: 32.

Remarks: This subfamily is represented in southern Africa by only Cucumella triplex Ludwig and Heding, based on a single individual from the Agulhas Bank. According to Heding and Panning (1954), Actinocucumis typicus Ludwig, also belonging to this subfamily, was reported by Pearson from Portuguese East Africa (Moçambique). This is erroneous as Pearson's (1910a) paper on the "Marine fauna of Kerimba Archipelago, Portuguese East Africa" neither lists nor describes A. typicus. Apparently Heding and Panning were misled by the subsequent article in the same paper, also by Pearson (1910b), on the "Marine fauna of Mergui Archipelago" where A. typicus is recorded from Ceylon. According to the distribution table in Clark and Rowe (1971), A. typicus is restricted to the West Pacific and East Indian Oceans. Hence no record exists of its occurrence on the East African coast.

Genus CUCUMELLA Ludwig and Heding

Cucumella Ludwig and Heding, 1935: 210; Heding, 1942: 220; Deichmann, 1948: 358; Heding and Panning, 1954: 64.

Diagnosis: See Ludwig and Heding, 1935: 210; Deichmann, 1948: 358.
Type species: Cucumella triplex Ludwig and Heding, 1935 (by original designation).

Remarks: This genus was erected to accommodate only the type species at the time of its description. In their revision of the Phyllophoridae Heding and Panning (1954) referred two other species to the genus, C. mutans (Joshua, 1914) from S.W. Australia and C. problematica Heding and Panning, 1954 from Japan. All three species are well keyed by Heding and Panning.

Cucumella triplex Ludwig and Heding

Cucumella triplex Ludwig and Heding, 1935: 210, pl.2, figs. 39-49; 1942: 220, figs. 12 and 13; Deichmann, 1948: 359; Heding and Panning, 1954: 66, fig.16 (a-e).

Diagnosis (from Ludwig and Heding, 1935): A small species - type (male) 14mm long. Tentacles 13-15, possibly more. Spicules of body wall exclusively three-pillared tables with an angulated disc and a spire ending in a three-pronged toothed apex; ventral table discs with 3-10 holes; dorsal discs with about 12-21 holes.

Record: C(35/22/d).

Material examined: None.

Distribution: Known only from the Agulhas Bank, 155m.

Remarks: Since the type is a mature male that measured only 14mm it does not seem likely that the species grows to any appreciable size. Its tentacle number is not certain and requires verification from new material. The form of its calcareous ring and body wall spicules sharply separates this well characterised species from related West Pacific forms.

Family PSOLIDAE Perrier, 1902

Diagnosis: See Deichmann, 1948: 360.

Remarks: This cosmopolitan family, comprising six genera and about 80 species (Pawson, 1982) is represented in southern Africa by three species of *Psolus* and one of *Psolidium*. Besides two dried specimens of *Psolus agulhasicus* Ludwig and Heding, none of the other specimens in the present collections is referable to this family.

Genus *PSOLUS* Düben and Koren

Psolus Oken, 1815: 352; Düben and Koren, 1846: 316; Deichmann, 1948: 361.

Diagnosis: See Deichmann, 1948: 361.

Type species: *Holothuria phantapus* Strussenfeldt, 1765.

Remarks: Since the work of Oken (1815) has been placed by the International Commission on Zoological Nomenclature on the list of rejected works, the genus *Psolus* should date back to Düben and Koren, 1846, who were the first to validate the name in accordance with the International Code of Zoological Nomenclature. *Psolus* is a cosmopolitan genus comprising about 50 nominal species and is seriously in need of revision (Pawson, 1969). The three species reported from southern Africa are well keyed by Deichmann (1948). The key is here reproduced with slight modifications.

KEY TO THE SOUTHERN AFRICAN SPECIES OF *PSOLUS*

1. Scales composed of a single layer of calcareous material (?throughout life); an external layer of small baskets present; sole with oblong, slightly knobbed, perforated plates

   Psolus imperfectus H.L. Clark, 1923.

Scales composed of more than one layer of calcareous material; dorsal surface with or without an external layer of grains; baskets absent 2

2. Scales with an outer layer of grains, easily rubbed off; spicules of sole four-holed buttons with marginal and, occasionally, a few centrally placed knobs

Psolus agulhasicus Ludwig and Heding, 1935.

Scales without grains; spicules of sole four to many-holed plates with numerous small knobs

Psolus capensis Ludwig & Heding, 1935.

Psolus agulhasicus Ludwig and Heding

Psolus squamatus H.L. Clark, 1923: 419 (non P. squamatus (O.F. Müller)).
Psolus agulhasicus Ludwig and Heding, 1935: 160, figs. 25-27; Deichmann, 1948: 362, pl.21, figs. 11 and 12.

Diagnosis: See Ludwig and Heding, 1935: 160; Deichmann, 1948: 362.

Records: C(36/21/d; 35/22/d; 34/23/d).

Material examined: C(36/21/d; 35/22/d), 2 spec. (dry, incomplete).

Distribution: Known only from around Cape Agulhas and Cape Seal, 150 - 375m. Map: 10.

Remarks: H.L. Clark (1923) referred his five specimens to the northern P. squamatus stating that they were too young for a satisfactory determination. Deichmann (1948), on re-examination of two specimens housed at the MCZ, found them to be mature and referred them to P. agulhasicus stating that they differed from the type in the absence of granules on the scales, probably a result of rough handling.

According to Deichmann *P. agulhasicus* differs from *P. squamatus* in possessing a large number of scales between the oral and anal scales, in the presence of pedicels in the odd ambulacrum and spicules in the form of delicate buttons.

The two remaining specimens in the SAM collection are dry and in a hopeless condition. An examination of their scales for the presence or absence of granules was inconclusive.

Psolus capensis Ludwig and Heding

Psolus capensis Ludwig and Heding, 1935: 34, figs. 17-19; Deichmann, 1948: 361.

Record: C(36/21/d).

Material examined: None.

Distribution: Known only from the Agulhas Bank, 86-102m.

Remarks: According to Ludwig and Heding (1935) this species comes very close to *P. levis* Koehler and Vaney, 1905, from the Indian Ocean, but differs in the number and distribution of oral plates. However, according to Deichmann (1948), the species is most closely related to *P. operculatus* (Pourtales, 1868) and *P. tesselatus* Koehler, 1896 from the Atlantic but differing in the absence of granules and in the large number of oral teeth. In *P. operculatus*, however, the plates are more strongly knobbed and the tentacles, in addition to the elongate perforated rods, contain smaller perforated plates.

Psolus imperfectus H.L. Clark

Psolus imperfectus H.L. Clark, 1923: 418; Deichmann, 1948: 363, pl.21, figs. 1-10.

Record: C(36/21/d).

Material examined: None.

Distribution: Known only from S.E. of Cape Agulhas, 376m.

Remarks: This species was based on two obviously juvenile specimens which do not represent a typical Psolus as they possess, in addition to scales, an external layer of baskets, a character overlooked by H.L. Clark (1923) but observed by Deichmann (1948) after examination of the paratype. The species may belong to another genus within the family or represent a young Trachythyone perhaps T.? parva Ludwig described herein. Regrettably the holotype of P. imperfectus could not be located in the type collection of the SAM.

Genus PSOLIDIUM Ludwig

Georisia E. Perrier, 1893.
Psolidium Ludwig, 1886; Deichmann, 1941: 141.

Diagnosis: See Deichmann, 1941: 141.

Type species: Psolidium dorsipes Ludwig, 1886 (by monotypy).

Remarks: Psolidium comprises approximately 25 species (Pawson, 1969) of which P. ornatum, described from Moçambique by E. Perrier (1893) is the only southern African form.

Psolidium ornatum (E. Perrier)

Georisia ornata E. Perrier, 1893: 557; Ludwig, 1894: 136.
Psolidium ornatum R. Perrier, 1905: 54; Deichmann, 1948: 364.

Diagnosis: See Deichmann, 1948: 364.

Material examined: None.

Distribution: Known only from Moçambique Channel, 25m.

Remarks: This species is inadequately described. According to R. Perrier (1905) the spicules comprise scales with a few knobs united in a reticulum, baskets, and two kinds of knobbed buttons.

ORDER DACTYLOCHIROTIDA Pawson and Fell, 1965

Diagnosis: See Pawson and Fell, 1965:1.

Remarks: These are mostly deep water dendrochirotacean holothurians with 8-30 simple tentacles and usually a rigid, U-shaped body covered by imbricating plates. The order contains about 36 nominal species assembled into about eight genera and three families. Included here is a new southern African species assigned to a new genus in the family Vaneyellidae. The remaining families, the Ypsilothuriidae and Rhopalodinidae, have long been known from southern Africa.

Family RHOPALODINIDAE Perrier, 1902

Diagnosis: See Heding and Panning, 1954: 95.

Remarks: This small family of extraordinary holothurians is characterised by a pyriform or flask-shaped body with mouth and anus opening on the tip of the proboscis. When originally diagnosed the family included only species with 18-30 tentacles. However, with the erection of the genus *Rhopalodinaria* Cherbonnier, 1970, from southern Africa, the diagnosis of the family should be modified to include also 10-tentacled species. The family currently contains only three genera and about 10 species, all restricted in their distribution to the west coast of Africa. Only the genera *Rhopalodinopsis* and *Rhopalodinaria* are known from southern Africa. The genus *Rhopalodina* is at present restricted to the north east Atlantic waters.

Genus *RHOPALODINARIA* Cherbonnier

Rhopalodinaria Cherbonnier, 1970: 293.

Type species: *Rhopalodinaria gigantea* Cherbonnier, 1970 (by original designation).

Remarks: This endemic southern African genus includes only the type species and *R. minuta* also described by Cherbonnier (1970). In having pedicels traversing the ventral pole of the sphere the genus appears to be more closely related to *Rhopalodinopsis* than to the northern *Rhopalodina*.

KEY TO THE SPECIES OF *RHOPALODINARIA*

Large species; radial plates of calcareous ring with rudimentary posterior bifurcations ...... *Rhopalodinaria gigantea* Cherbonnier, 1970.

Small species; radial plates of calcareous ring without posterior bifurcations .... *Rhopalodinaria minuta* Cherbonnier, 1970

Rhopalodinaria gigantea Cherbonnier
(Fig.34 a-h)

Rhopalodinaria sp. (FAL 239T) Day, Field and Penrith, 1970: 83.
Rhopalodinaria gigantea Cherbonnier, 1970: 293, fig. 7 (A-J).

Diagnosis (after Cherbonnier, 1970, modified herein): Large species, presently known only from proboscides. Colour, in life, white. Radial plates of calcareous ring with short rudimentary posterior bifurcations (fig. 34h). Tables (fig. 34c) clumsy, discs 0,058-0,095mm, with 5-10 holes, spire moderate to high, 0,05-0,118mm, of four pillars with or without cross bars. Plates (fig. 34a) ovoid, 0,38-0,49mm, with 30-70 holes and with one end slightly spinose and knobbed. Tentacles and introvert with rods and rosette-like granules (fig. 34d-e).

Previous record: C(34/18/S).

Material examined: C(34/18/S) plus paratype (13 proboscides only).

Distribution: Known only from False Bay, 37-82m.

Habitat: Stones shelly sand, green mud.

Remarks: This species is adequately described but regrettably Cherbonnier (1970) did not record the dimensions of the spicules. Although Cherbonnier mentions the absence of posterior processes to the calcareous ring his illustration and the present specimens do show at least rudimentary bifurcations to the radial plates. In addition, the anterior border of each radial plate may be either notched or slightly serrate. Cherbonnier reports the presence of two stone canals and a single polian vesicle but in the present specimens there are two polian vesicles and a single stone canal. Whether this an individual variation or that the dorsal polian vesicle was mistaken by Cherbonnier for an additional stone canal is not possible to ascertain without an exami= nation of the type.

It is regrettable that of the 22 specimens of *R. gigantea* known (10 were examined by Dr. Cherbonnier) none is complete. It is therefore apparent that the species lives buried deep in sand and its proboscis may even be longer than the 95mm recorded for the holotype. It is surprising that Cherbonnier chose a species incompletely known to designate as type for his new genus when he had at his disposal 14 complete specimens of *R. minuta*. Perhaps he was biased against the small size and immaturity of this latter species.

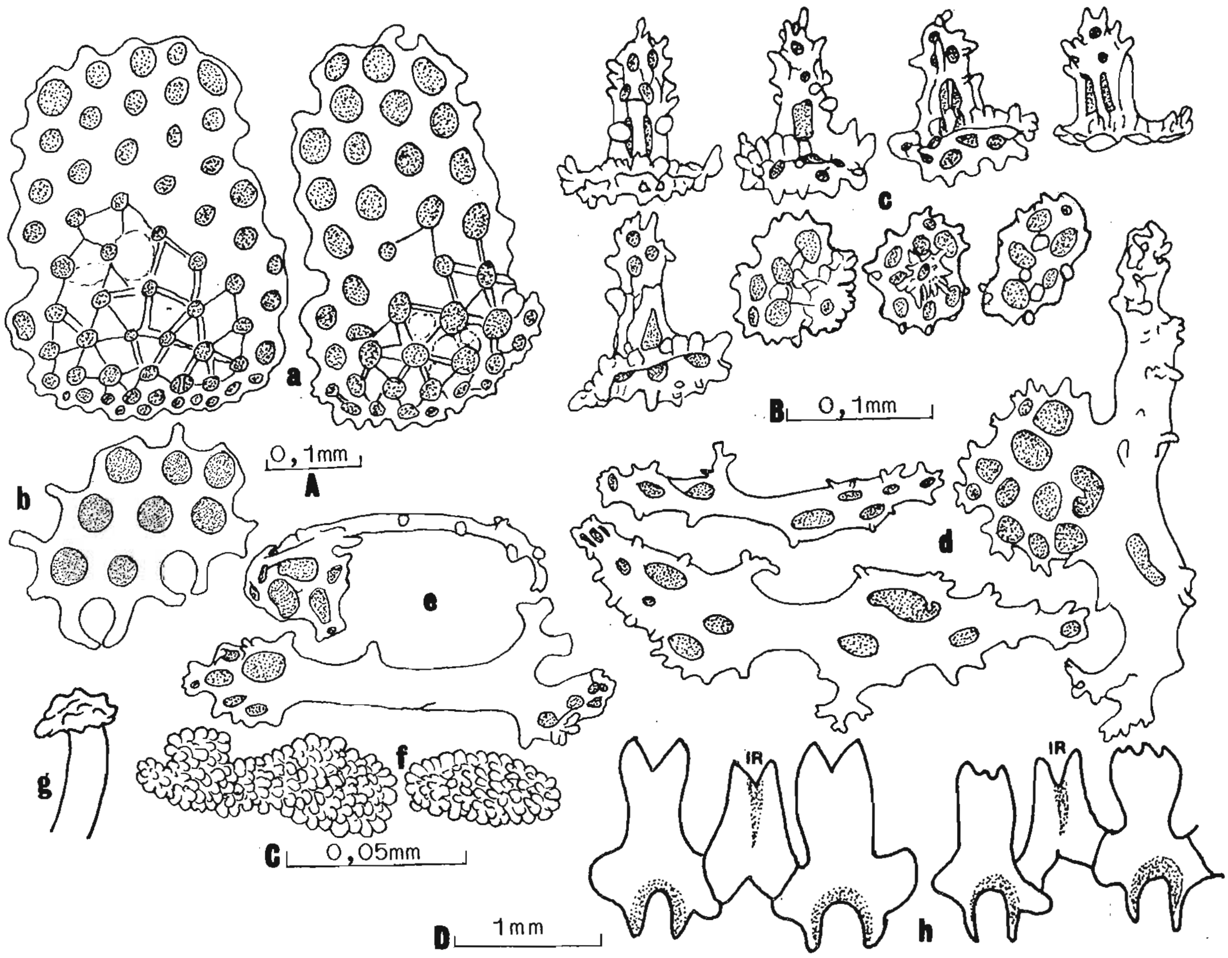


Fig. 34. <u>Rhopalodinaria gigantea</u> Cherbonnier. TRA 132Z.

a. Proboscis plates

b. Developing plate

c. Proboscis tables

d. Large rods from tentacles

e. Small rods from tentacles

f. Tentacular rosettes

g. Madreporite

h. Parts of calcareous ring of two specimens.

(a & b Scale A; c & d Scale B; e & f Scale C)

Rhopalodinaria minuta Cherbonnier

(Fig.35 a-j)

Rhopalodinaria sp. (FAL 338S) Day, Field and Penrith, 1970: 83.
Rhopalodinaria minuta Cherbonnier, 1970: 295, fig. 8 (A-L).

Diagnosis (After Cherbonnier, 1970, modified herein): A species presently known only from juveniles up to 7mm long (fig. 35a). Radial plates of calcareous ring without posterior bifurcations (fig. 35h). Spicules of sphere and proboscis somewhat similar; tables (fig. 35i) common, rare or absent; discs nodular, well developed or reduced; proboscis plates usually nodular, 0,095-0,178mm, with 5-60 holes, plates of sphere (fig. 35j) usually smooth, 0,08-0,17mm, with 2-24 holes. Tentacles with rods, plates and rosettes (fig. 35d & e).

Previous record: C(34/18/S).

Material examined: C(34/18/S) plus one paratype, 19 spec.

Description: Diameter of sphere 1-2mm, length of proboscis 2-4mm. Pedicels extending from ventral pole of sphere (fig. 35b) to base of proboscis but not beyond it. Tentacles 8-10, including two which are often absent or so severely reduced so as to be hardly discernable. Remaining tentacles varying in size, specimens with short proboscis usually with only 6-7 large tentacles. Generally tentacles furthest away from anus longer. Respiratory trees with three main trunks, two arising from a common stem and the third independently, each trunk with short end branches (caeca) (fig. 35c). Retractors originate from longitudinal muscles at base of proboscis. Gonad not confirmed with any degree of certainty, in one specimen short, transparent, banana-shaped tubules, in vicinity of stomach, may represent immature tubules.

Fig. 35. <u>Rhopalodinaria minuta</u> Cherbonnier. FAL 338S.

a. Entire animal

b. Base of sphere

c. Dissection to show internal anatomy

d. Tentacular spicules

e. Tentacular rosettes (enlarged)

f. Pedicel rods

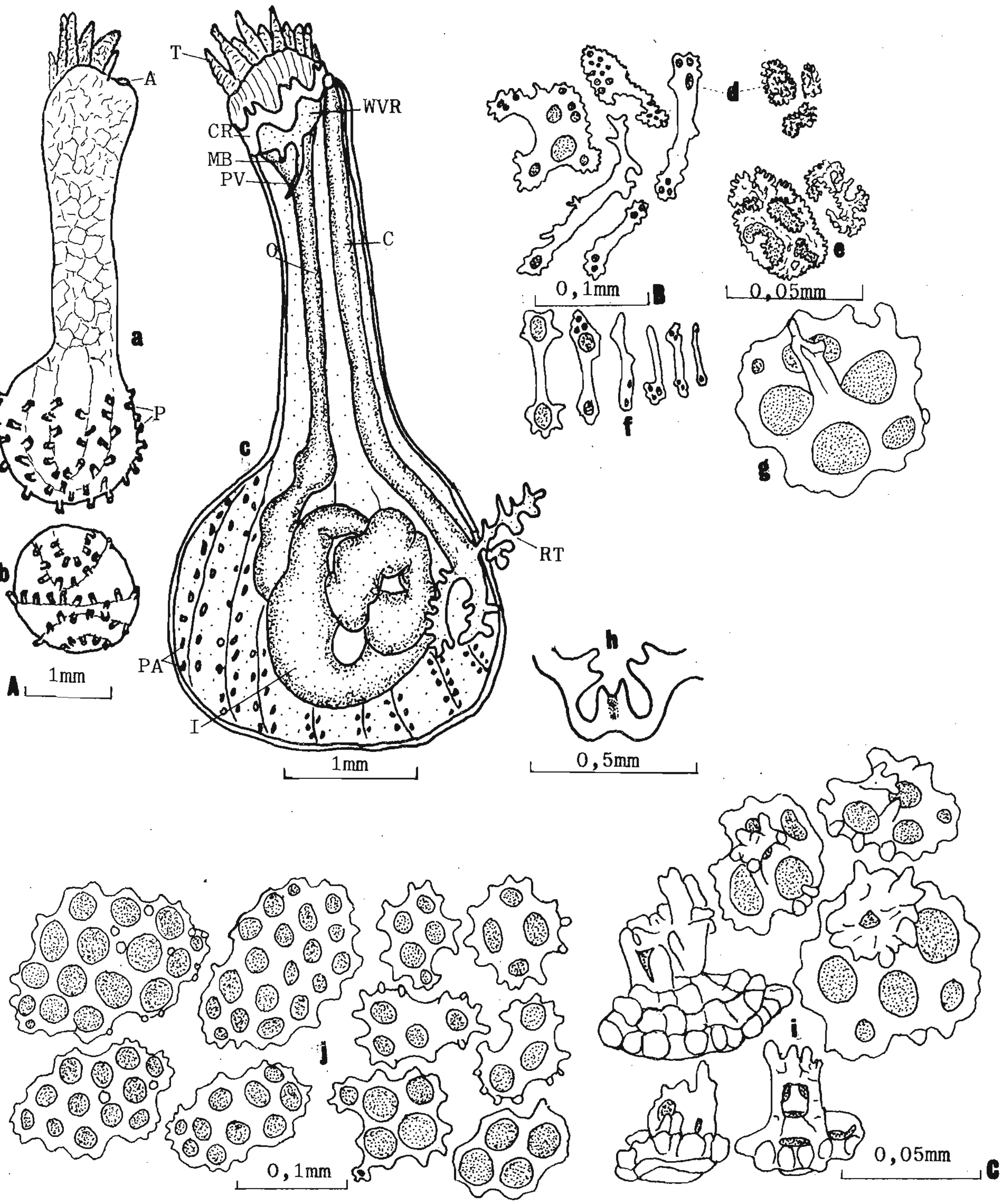
g. Table from sphere

h. Part of calcareous ring

i. Tables from sphere

j. Plates from sphere

(a & b Scale A; d & f Scale B; g & j Scale C)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h
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i
0,05mm
C

Fig.35

Distribution: Known only from False Bay.

Habitat: Very coarse sand.

Remarks: This species is also well described by Cherbonnier (1970) and hence only a few additional features are here recorded. Although gonadal tubules were described in the holotype their state of maturity was not mentioned. Since the holotype measured only 4mm it must be assumed it was also immature. Hence the species is currently known only from 32 juveniles (14 were examined by Cherbonnier) and may represent a growth stage of R. gigantea. However, unlike the latter species, it has no posterior bifurcations to the radial plates while tables may be common, rare or absent. Hence it may be argued that the radial plates only later develop bifurcations while the tables increase in size and number. There may be some justification in such a remark but judging from the other groups the superficial layer of spicules is frequently lost during growth and not added on later. Hence the opposite occurring in Rhopalodinaria, in the absence of a model, seems highly unlikely. Once complete specimens of R. gigantea are known a direct comparison of both species will be extremely rewarding in the light of the above.

Judging from UCT records the grid reference and depth record given for the type locality by Cherbonnier are inaccurate: 24m should read 24 fathoms; the locality data is also here corrected.

Genus RHOPALODINOPSIS Heding, 1937

Rhopalodinopsis Heding, 1937: 31; Deichmann, 1948: 360; Heding and Panning, 1954: 96.

Diagnosis: See species diagnosis.

Type species: Rhopalodinopsis capensis Heding, 1937 (by original designation).

Remarks: This genus is monotypic. When originally diagnosed it was characterised by 20 tentacles but a re-examination of the type and some other specimens by Heding and Panning (1954) revealed 30 tentacles and hence the diagnosis was emended accordingly.

Rhopalodinopsis capensis Heding

(Fig.36 a-j)

Rhopalodinopsis capensis Heding, 1937:32, figs.1 and 2, pls.4 and 5; Heding and Panning, 1954: 97, text-figs. 32(a); Day, Field and Penrith, 1970: 83; Christie, 1976: 156.

Rhopalodina lageniformis Panning, 1932: 362 (partim), pl.1, fig.2.

Rhopalodina sp. Panning, 1936: 15, fig. 20.

Diagnosis (From Heding, 1937, and Heding and Panning, 1954, modified herein): Tentacles about 30. Plates of calcareous ring asymmetrical with the radials carrying rudimentary posterior processes (fig. 36j). Pedicels stretching from sphere to proximal part of proboscis (fig. 36e). Spicules a superficial layer of sparsely distributed tables (often absent) and an inner layer of solid knobbed plates or buttons. Plates of sphere (fig. 36a), 0,09-0,15mm, with 1-5 holes, occasionally occluded; plates of proboscis (fig. 36b), 0,25-0,35mm, with 7-22 holes, a spinose margin and smooth to nodular surface at one end. Anal region and papillae with plates (fig. 36c); tentacles with plates, rods (fig. 36d) and rosette-shaped granules.

Southern African records: C(34/18/?S), 32/18/S), 20m.

Material examined: C(28/16/?S), 3 spec.

Local distribution: Kalk Bay to off Orange River Mouth. Map: 9.

General distribution: East Atlantic (from Cape Peninsula to Liberia).

Remarks: An excellent description of the species is given by Heding (1937) and the diagnosis modified by Heding and Panning (1954). The species is here re-diagnosed to record spicule dimensions and anal papillae deposits. The largest specimen in the present collection measures 51mm and hence is about half the size of the type which measured about 100mm. About 32 tentacles were counted but some are so minute that they can be easily overlooked. The tentacles appear some= what dendritic and not finger-shaped or with lateral branches as in the other dactylochirotids. Short posterior processes to the radial plates, first described by Heding but only illustrated by Heding and Panning (1954), are present. Each respiratory tree has two main trunks as in other dactylochirotids and some dendrochirotids. No tables could be detected in the body wall nor any rosette-shaped granules in the tentacles.

The species has not yet been taken from tropical west Africa. It is possible that due to equatorial submergence it may one day turn up from deeper waters of this region.

Fig. 36. Rhopalodinopsis capensis (Heding). A22683.

a. Plates from sphere

b. Plates from proboscis

c. Plates from anal region

d. Tentacular plates

e. Entire animal

f. Apex of proboscis (surface view)

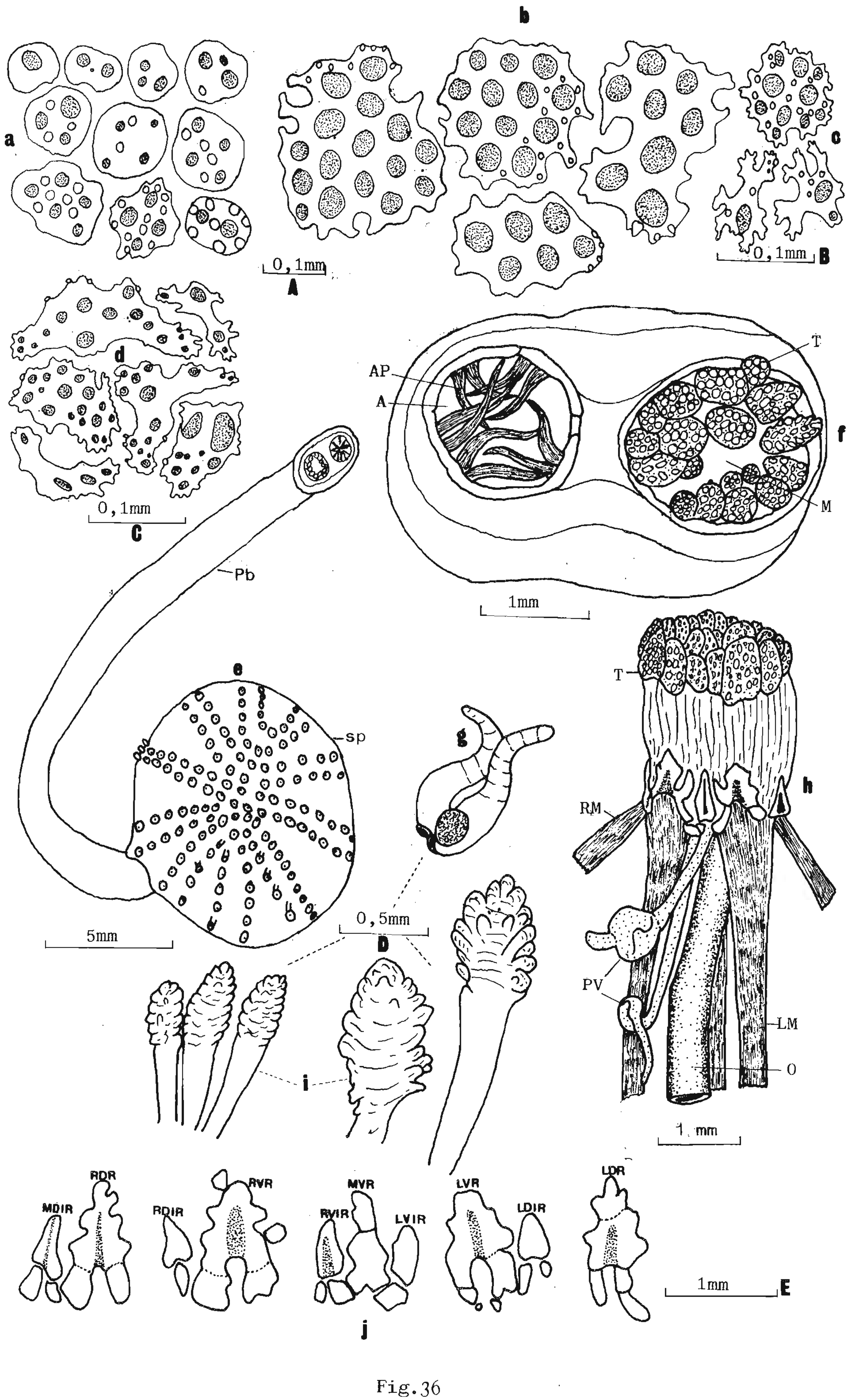
g. Two anal papillae with calcareous plate

h. Calcareous ring and associated organs

i. Tentacles

j. Radial and interradial plates of entire calcareous ring

(a & b Scale A; c Scale B; d Scale C; g & i Scale D; j Scale E)



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D
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O
i
1 mm
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MDIR
RVR
RDIR
MVR
RVIR
LVIR
LVR
LDIR
LDR
1mm
E
j

Fig.36

Family VANEYELLIDAE Pawson and Fell, 1965

Diagnosis (From Pawson and Fell, 1965, modified herein): Small U-shaped to fusiform dactylochirotid holothurians with 8-20 tentacles. Thecal plates smooth to feintly nodular, composed of a single later of calcareous material; holes large; spires present or, more usually, absent.

Remarks: This family, as proposed by Pawson and Fell (1965), included two genera, viz. Vaneyella and Mitsukuriella, both erected by Heding and Panning (1954) and characterised by 10-20 simple finger-shaped tentacles and smooth thecal plates, with or without spires. Four bathyal specimens, in the SAM collection, with simple but finely branched tentacles and spireless thecal plates are new to science and probably referable to this family, except that they have only eight tentacles and eight plates to the calcareous ring. Since they cannot be included in either of the two known genera a new genus is here erected and the diagnosis of the family emended accordingly.

Genus PSOLIDOTHURIA Gen. nov.

Diagnosis: Small U-shaped dactylochirotids with mouth and anus at opposite ends. Tentacles eight, unequal in size, finely branched. Calcareous ring simple, consisting of eight more or less similar plates without posterior prolongations. Thecal plates simple, imbri= cating, occasionally feintly nodular; holes few, large; spires absent.

Type species: Psolidothuria octodactyla sp. nov. (designated herein).
Etymology: The name Psolidothuria is derived from a combination of Psolidium and Holothuria since the plates resemble those of the genus Psolidium.

Psolidothuria octodactyla sp. nov.
(Fig.37 a-f)

Diagnosis: As for the genus.

Etymology: The specific name octodactyla refers to the eight simple tentacles (Gr. octo, eight; daktylos, finger).

Material examined: Holotype, SAM, A22164, off S.W. Cape Province (33°52'S, 16°51'E), Africana II St. A318, 2524-2790m, 15' beam trawl. Paratypes, SAM A22164, same data as holotype, 2 spec.; A22145, off S.W. Cape Province (34°42'S, 16°54'E), Africana II St. A316, 3155-3255m, 15' beam trawl, 1 spec.

Description: Specimens small, distinctly U-shaped (fig. 37a). Body somewhat flexible as in Echinocucumis. Skin smooth due to absence of spires on thecal plates. Oral and anal siphons conspicuous, apparently non-retractile. Colour in alcohol pale yellowish white to dirty yellowish brown. Largest specimen (holotype) 28mm in length along greater curvature, 20mm along lesser curvature, 4,5mm high in midbody; oral and anal siphons respectively 2,5mm and 1,5mm in diameter. Tentacles (fig. 37c) eight, with short lateral branches - in holotype two dorso-laterals the longest, single dorsal and two ventro-lateral of medium size, ventralmost three greatly reduced; in dissected paratype only ventralmost two reduced, others of more or less equal size. Anus encircled by papillae. Pedicels sparse, shorter than anal papillae and emitting between thecal plates.

Calcareous ring (fig. 37b) typically of eight plates with radials only slightly longer and broader than interradials, posterior processes absent; all plates with a groove on outer surface, that of radials deeper for insertion of retractor muscles. Polian vesicle (fig. 37b) single, sac-like, midventrally attached; stone canal short, lodged in dorsal mesentery; madreporite minute. Alimentary canal filled with

Globigerina. Gonad compact, developed as two sac-like structures, one on each side of mesentery, in both dissected specimens full of ripe eggs. Respiratory trees as short, simple tubes, each branched once distally, right tree slightly longer than left, one branch reaching level of gonad; both trees with a common opening into elongate cloaca. Longitudinal muscles thread-like; retractors originate from anterior third of longitudinal bands.

Spicules:

Spicules of body wall, oral and anal siphons similar, comprising more than one layer of irregular to spectacle-shaped spire-less, imbricating, thecal plates (fig. 37d). Irregular plates large, 0,24-0,40mm long, feintly nodular and with 2-17 large holes(up to 0,10mm in diameter). Spectacle-shaped plates 0,17-0,39mm long, narrow in the middle, with 2-5 large terminal holes. Pedicels with reduced end plates and a variety of other minute (0,08-0,175mm) plates and rods with 1-4 small holes (fig. 37f). Tentacular deposits similar but slightly larger than those of pedicels and often with an uneven, slightly nodular, margin (fig. 37e).

Distribution: Off S.W. Cape Province, 2524-3255m. Map: 10.

Remarks: The form, colouration (in alcohol) and the fact that the four specimens were collected together with Echinocucumis hispida (Barrett) can mislead one into considering, on superficial examination, that they represent juveniles of this species. However, the maturity of the gonad, the number of tentacles and plates of the calcareous ring, the nature of the respiratory trees and the spireless thecal plates clearly separate these specimens from the ypsilothuriids and support their classification in a new genus, probably in the family Vaneyellidae.

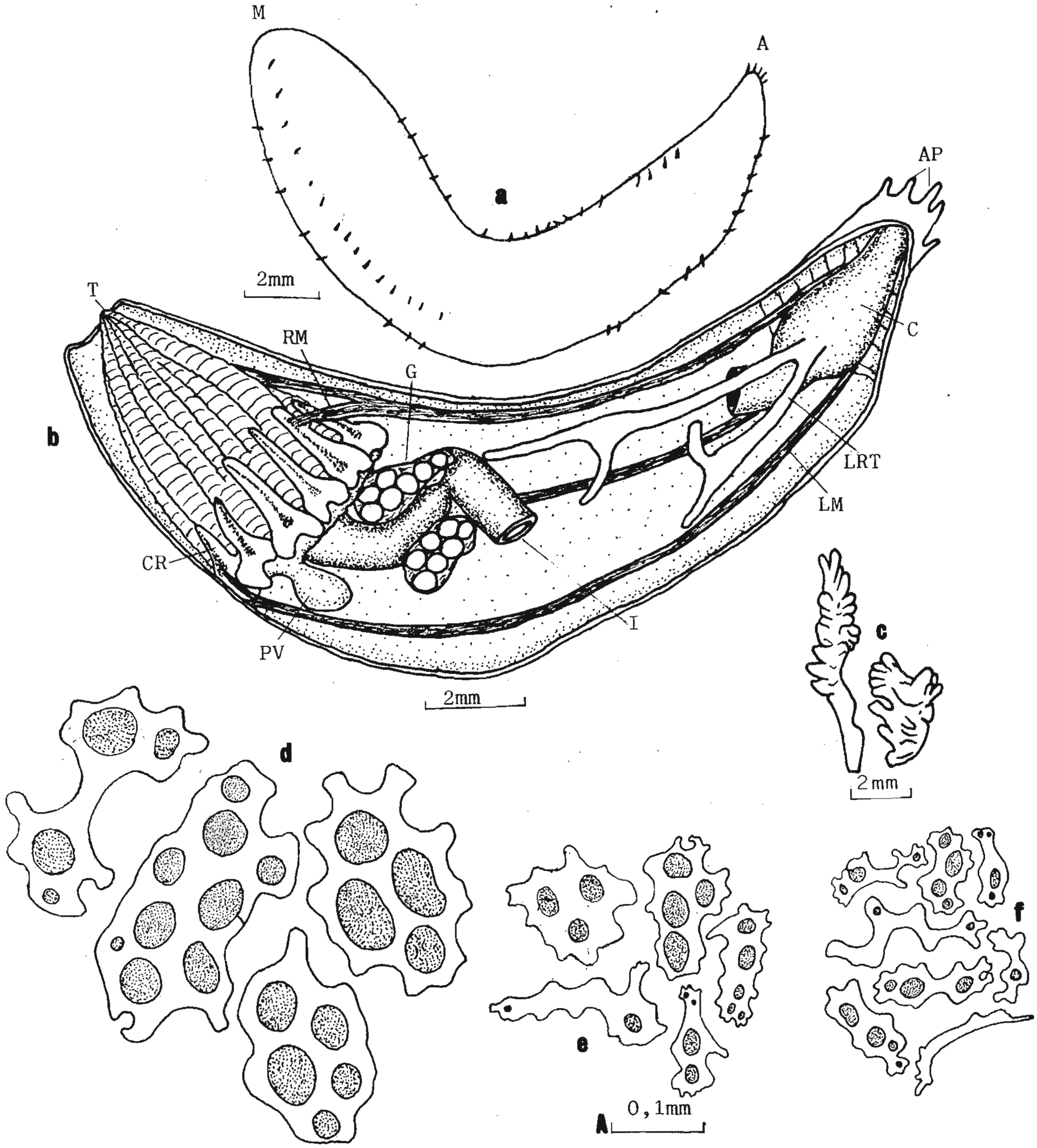


Fig. 37. <u>Psolidothuria octodactyla</u> sp. nov. Holotype.

a. Entire animal

b. Dissection to show internal anatomy

c. Two tentacles

d. Plates from body wall

e. Tentacular plates

f. Pedicel plates

(d - f Scale A)

Amongst the dactylochirotids only the genus Ypsilothuria has eight tentacles but this genus is well characterised by its unbranched tentacles and spired thecal plates, always composed of more than one layer of calcareous material.

According to Pawson and Fell (1965), the family Vaneyellidae has 10-20 tentacles. However, of the two genera presently included in the family, the genus Mitsukuriella, according to Heding and Panning (1954), has 16 tentacles while Vaneyella has 18-20 tentacles. Since Psolidothuria has only eight tentacles and eight plates to the calcareous ring, one wonders whether it does belong in the Vaneyellidae. However, its plates are so much like those of Mitsukuriella that the new genus is tentatively included in this family. Although the genus is at present monotypic a few more bathyal or abyssal species, currently classified in Echinocucumis, may be referred to it.

Family YPSILOTHURIIDAE Heding, 1942

Diagnosis: See Heding, 1942: 25.

Remarks: This family, as proposed by Heding (1942), included only the genera *Echinocucumis* and *Ypsilothuria*. However, Panning (1949) referred to it several other genera. Since the status of some of these genera is in doubt, Pawson (1965) states that they should be removed from the Ypsilothuriidae and classified with the dendrochirotids. Thus the family currently contains only three certain genera, namely, *Echinocucumis* Sars, *Ypsilothuria* Heding and *Ypsilocucumis* Panning. Of these only the former two are represented in southern Africa.

Genus *ECHINOCUCUMIS* Sars, 1859

Echinocucumis Sars, 1859; Deichmann, 1930: 150; Ludwig and Heding, 1935: 167; Heding, 1942: 29; Panning, 1949: 454; Pawson, 1965: 7.

Type species: *Eupyrgus hispidus* Barrett, 1856 (by monotypy).

Diagnosis: See Pawson, 1965: 7.

Remarks: This genus includes ypsilothuriids with thecal plates made up of only a single layer of calcareous material. Currently only the cosmopolitan type species, the West Indian Ocean *E. paratypica* Ludwig and Heding, 1935 and the East Atlantic *E. tenera* Cherbonnier, 1958 and *E. multipodia* Cherbonnier, 1964, are included in the genus. The latter two species with bifurcate processes to the calcareous ring may not strictly belong in *Echinocucumis*.

Echinocucumis hispida (Barrett)

(Fig.38 a-i)

Eupyrgus hispidus Barrett, 1856: 46, pl.4, figs. a-b.

Echinocucumis typica Sars 1861: 102, pl.10, figs. 11-20; pl.11, figs. 1-17; Théel, 1886a: 118, 1886b: 9, fig. 3.

non Echinocucumis typica H.L. Clark, 1923 (= Ypsilothuria bitentaculata (Ludwig).

Cucumaria typica Ludwig, 1901: 149.

Echinocucumis hispida Mortensen, 1927: 404; figs. 242 (i), 243; Deichmann, 1930: 150, pl.18, fig.9; Ludwig and Heding, 1935: 167; Heding, 1942: 29, figs. 31, 32; Panning, 1949: 454; Pawson, 1965:8, text-fig.2.

Diagnosis: See Pawson, 1965: 8.

Previous southern African record: None.

Material examined: C(33/16/vd to 34/16/vd), 7 spec.

Description: Specimens typically U-shaped (fig. 38a), largest 40mm along greater curvature. Tentacles 10 (fig. 38g) - one on each side very long, four slightly smaller and four very small; two large tentacles branched at base. Each respiratory tree (fig. 38i) with two main trunks, one whitish, the other brownish, each trunk with short extensions (? caeca) and, in addition, short thread-like processes at base.

Thecal plates (fig. 38b) 0,60-0,90mm, with a coarse reticulum spreading out from base of spire to partially cover primary disc. Spires (fig. 38c) 0,165-0,27mm, placed near margin, gradually lost toward oral and anal ends. Plates of anal siphon thick, holes large (fig. 38e); of oral siphon thin, holes small (fig. 38d). Tentacles with plates and rods (fig. 38f).

Local distribution: Known only from off S.W. Cape Province, 2525-3257m. Map: 2.

Fig. 38. Echinocucumis hispida (Barrett)

a. Entire animal

b. Spired plates

c. Spire (from side)

d. Smooth plates from oral siphon

e. Smooth plate from anal siphon

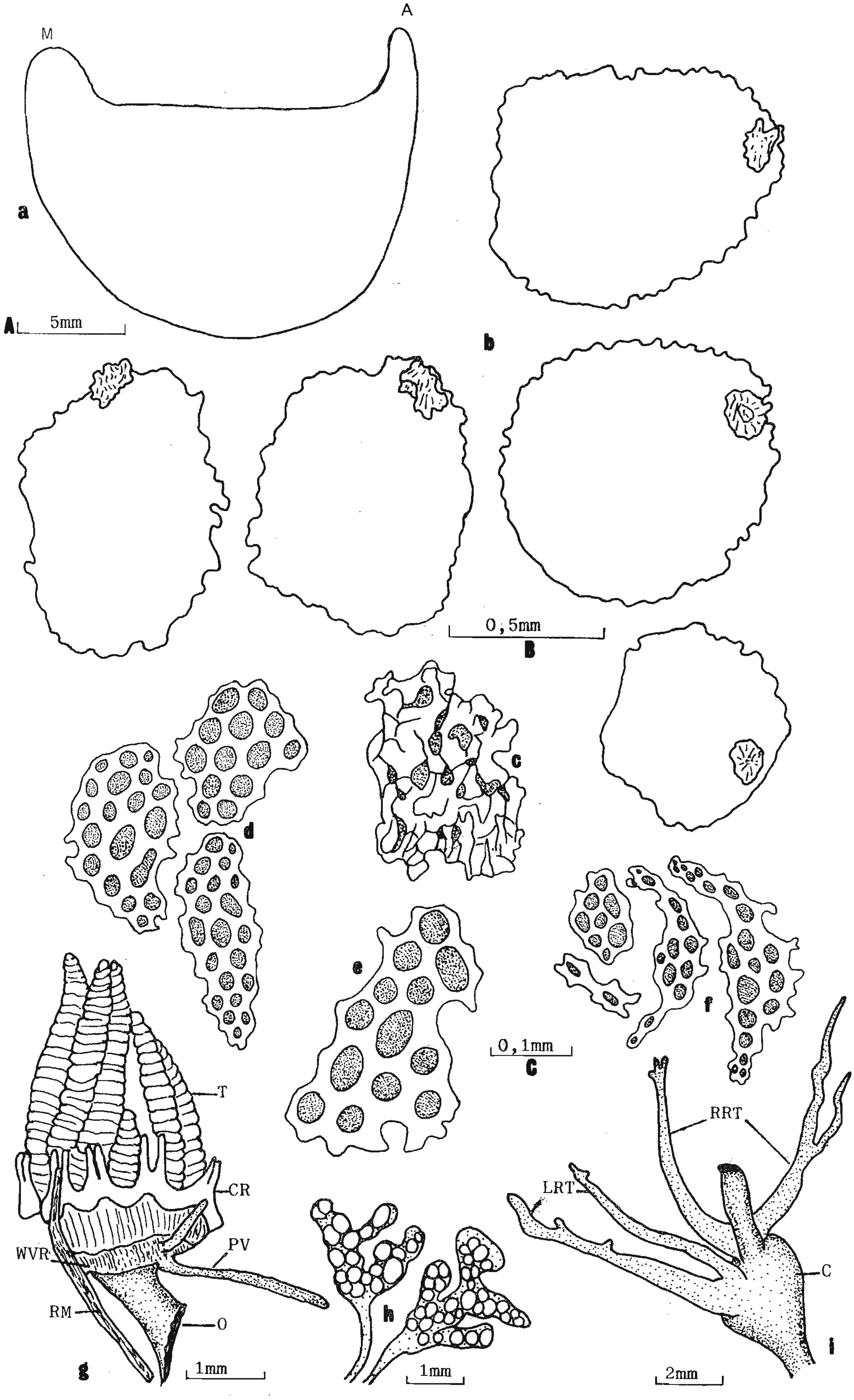
f. Tentacular plates

g. Calcareous ring and associated organs

h. Two gonadal tubules (female)

i. Cloaca with respiratory trees

(a Scale A; b Scale B; c-f Scale C)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h
1mm
RRT
LRT
C
i
2mm

General distribution: Cosmopolitan, 50-3257m.

Remarks: Although the form of the specimens, the number of tentacles and the marginal spires suggest that the present material belongs in Echinocucumis, the base of the spire spreads out as a coarse reticulum partially covering the primary plate so that it appears as if part of each thecal plate is made up of more than one later of calcareous material. Since a coarse reticulated network has also been described by Deichmann (1930) for Ypsilocucumis asperrima (Théel) one may be inclined to consider the present material as being identical with this species. The tentacular deposits also resemble those illustrated by Deichmann. However, judging from Théel's (1886b) description of the holotype it is certain that the thecal plates of Y. asperrima are clearly multilayered. In fact, Heding (1942: 27) does comment that "Deichmann did not distinguish clearly between the different forms of Ypsilothuria and Echinocucumis".

The thecal plates of the present specimens in fact resemble those of Ypsilothuria talismani talismani E. Perrier, illustrated by Heding (1942:28, fig. 27(3)), than any other ypsilothuriid. However, Heding quite categorically states that Ypsilothuria always has eight tentacles and eight plates to the calcareous ring. Echinocucumis, on the other hand, has 10 tentacles with 10 plates to the calcareous ring. Hence, if the number of tentacles is not of any great phylogenetic significance as Deichmann (1930) suggests (Deichmann notes that the two ventral tentacles may be aborted) then there appears to be some overlap of characters between the southern African E. hispida and Y. talismani talismani. As a point of interest the spires in the southern African material are more excentric than those illustrated by Pawson (1965) for the New Zealand form.

According to both M. Sars (1861) and Heding (1942) the four dorsal tentacles are always supplied with two digits each while the two large lateral ones are branched. In the present material, however, only the two largest ones have a few branches at their base. Nevertheless, unbranched tentacles have been described for the species by Deichmann (1930) who worked on Scandinavian material and by Pawson (1965) who studied the New Zealand form.

The respiratory trees, unlike those described for the species by both Deichmann and Pawson, are well developed, with separate origins, each supplied with two main and other supplementary branches. This obser= vation is in agreement with that made by Heding (1942).

The bathymetric range of E. hispida, according to Heding (1942), is 50-1300m. He states that deeper records are those of Y. talismani and not E. hispida. However, Pawson's material from the eastern side of New Zealand came from a depth of 1530m. If the southern African material represents a true Echinocucumis hispida then a depth of 2525-3257m is the deepest yet recorded for the species. The structural differences therefore between the southern African form and the typical E. hispida may be ascribed to both geographic and depth variations. At least, at infraspecific level, distinction can be drawn between the North Atlantic, southern African, New Zealand and West Indian (forma atypica Deichmann, 1930) forms of the species, each possibly representing a subspecies.

H.L. Clark's E. typica, recorded from Cape Point, is herein referred to the synonymy of Ypsilothuria bitentaculata (see remarks under Y. bitententaculata).

Genus YPSILOTHURIA E. Perrier, 1886

Ypsilothuria E. Perrier, 1886: 285; Heding, 1942: 25; Panning, 1949: 455; Pawson, 1965: 6.

Sphaerothuria Ludwig, 1894: 153; Deichmann, 1930: 152 (partim); Ludwig and Heding, 1935: 195.

Echinocucumis Hérouard, 1923: 118 (partim); H.L. Clark, 1923: 418 (non Sars, 1859).

Diagnosis: See Heding, 1942: 25; Panning, 1949: 455.

Type species: *Ypsilothuria talismani* E. Perrier, 1886 (by monotypy).

Remarks: Heding (1942) recognises only two species in this genus namely *Y. talismani* E. Perrier and *Y. bitentaculata* (Ludwig). According to him *Y. talismani* has two Atlantic varieties (? subspecies) while *Y. bitentaculata* has one Atlantic and two Indo-Pacific varieties.

Ypsilothuria bitentaculata (Ludwig)

(Fig.39 a-k)

Sphaerothuria bitentaculata Ludwig, 1893: 112; 1894: 141, pl.12, figs. 16-17, pl.14, figs. 5-14; Deichmann, 1930: 152, pl.19, figs. 4-5; Ludwig and Heding, 1935: 196, text-figs. 55-57.

Ypsilothuria bitentaculata Koehler and Vaney, 1905: 87; Heding, 1942: 28, text-figs. 25 (1-4, 9-10), 26(4-7), 27(2, 5), 30, pl.2, figs. 1-10; Panning, 1949: 455; Pawson, 1965: 6, text-fig. 1 (2-5).

Echinocucumis typica H.L. Clark, 1923: 418, syn. nov. (non *Echinocucumis typica* M. Sars, 1859 = *E. hispida* Barrett, 1854).

Sphaerothuria talismani Deichmann, 1930: 154, pl.19, fig.3 (partim). Syn. nov. (non *Sphaerothuria talismani* (E. Perrier) = *Ypsilothuria talismani* E. Perrier).

Diagnosis: See Heding, 1942: 28.

Previous southern African record: C(34/18/vd) as *Echinocucumis typica* by H.L. Clark (1923), 1647-1830m.

Material examined: C(33/16/vd to 34/18/vd), 31 spec.

Description: Specimens globular to spherical (fig. 39a), largest 25mm along greater curvature. Tentacles 7-8, unbranched (fig. 39b), lateral two largest; of remaining tentacles, two dorsal and 3-4 ventral in position. Respiratory trees each with two main trunks, each trunk with sac-like extensions (caeca) (fig. 39c).

Thecal plates (fig. 39f) 0,71-1,27mm; spire up to 0,5mm, slightly excentric (fig. 39e & g). Plates of oral siphon single-layered, with or without a spire (fig. 39j), the latter, if present, marginal. Plates of anal siphon also single-layered with small, concentrically arranged holes (fig. 39k). Tentacular rods curved, margins spinose (fig. 39h). Introvert plates with minute nodules and jagged edges (fig. 39i).

Local distribution: Known only from off S.W. Cape Province, 1647-2965m. Map: 2.

General distribution: Possibly cosmopolitan, 375-3231m.

Habitat: Green mud.

Remarks: Of the two species included in this genus there is no doubt that the present specimens belong to *Y. bitentaculata*. This is borne out by the shape and texture of the specimens, the form of the calcareous ring and the structure of the thecal plates. *Y. bitentaculata*, according to Heding (1942), is as rigid as a little echinoid whereas *Y. talismani* is soft. Further, the latter species is much smaller, reaching a length of 15mm, while *Y. bitentaculata*, according to Heding, reaches a length of 20mm. Heding also states that *Y. bitentaculata* always occurs at abyssal depths (true for the southern African material) while *Y. talismani* occurs in shallow waters.

Fig. 39. Ypsilothuria bitentaculata (Ludwig).

a. Entire animals

b. Part of calcareous ring and associated structures

c. Respiratory trees

d. Gonadal tubules (female)

e. Spired plates

f. Detail of one spired plate

g. Spire of plate

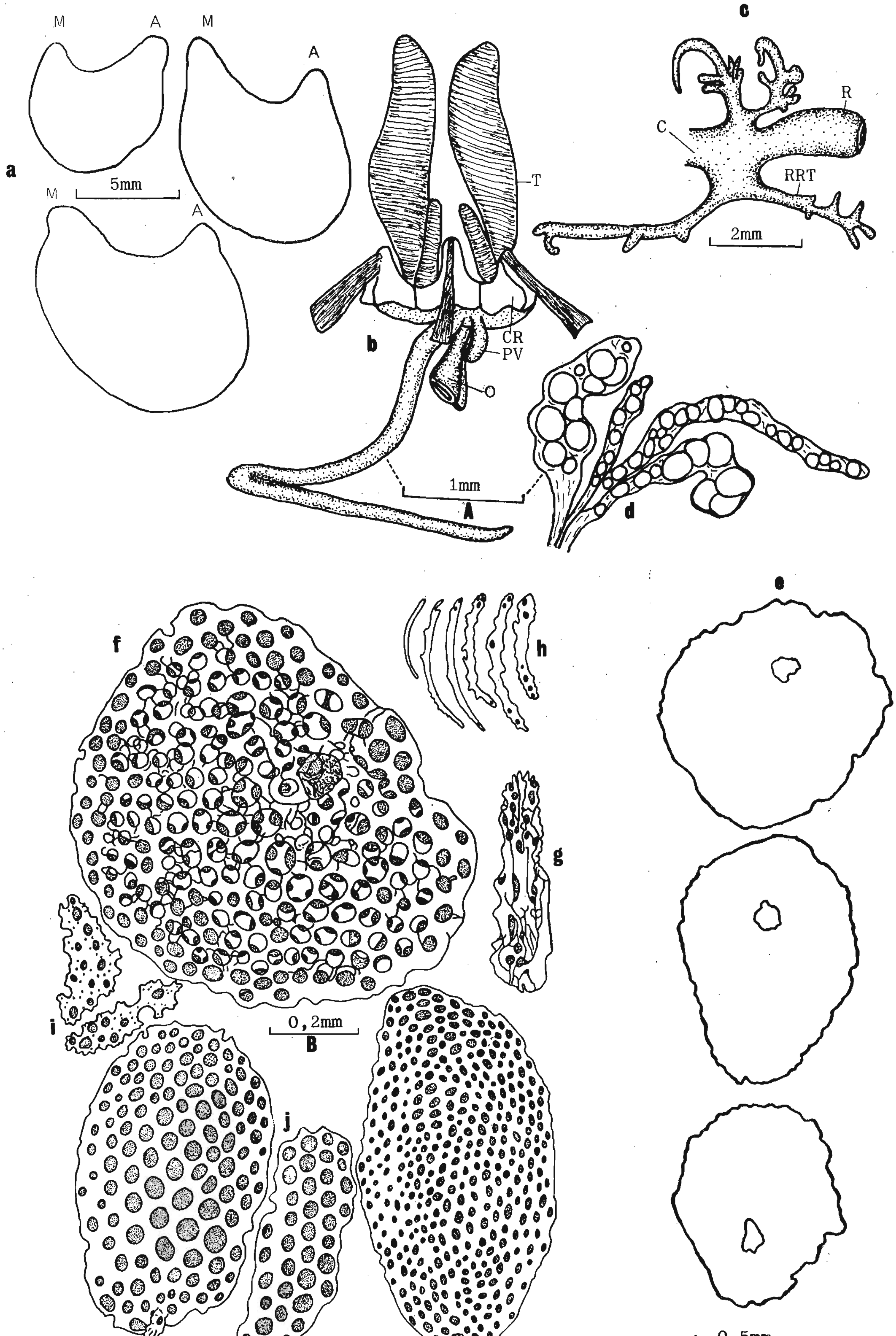
h. Tentacular rods

i. Introvert plates

j. Plates from oral siphon

k. Plate from anal siphon

(b & d Scale A; f-k Scale B; e Scale C)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The specimens agree well with Heding's description of Y. bitentaculata attenuata except that they reach a size of 25mm, the thecal plates (0,7-1,3mm) are smaller than those recorded for the variety (1,2-1,8mm), and the tentacular spicules resemble those of Y. talismani talismani illustrated by Heding rather than those of his Y. bitentaculata attenuata. Perhaps not all these differences are significant as the size of the animal may vary depending on the method of measuring, and the tentacular deposits may differ from the base of a tentacle to the tip. The present specimens are not referrable to the Indo-Pacific Y. bitentaculata bitentaculata since Heding states that the size of the plates in this form exceeds 1,8mm.

H.L. Clark (1923) recorded two spherical forms from Cape Point as Echinocucumis typica (= E. hispida). Deichmann (1930), who re-examined one of Clark's specimens, referred it to Sphaerothuria (= Ypsilothuria) talismani although she described the body as spherical, a shape typical for Y. bitentaculata. According to Heding Y. talismani is oblong spherical with a thin soft body wall similar to E. hispida. A dry specimen in the SAM type collection, labelled as E. typica, is possibly one of the specimens examined by Clark. Judging from its size, shape and external structure it is indistinguishable from Y. bitentaculata here described. Hence E. typica H.L. Clark, 1923 (non Sars, 1861) and S. talismani (partim) Deichmann, 1930 (non E. Perrier, 1886) is here relegated to the synonymy of Y. bitentaculata.

SUBCLASS ASPIDOCHIROTACEA Grube, 1840

Diagnosis: See Pawson and Fell, 1965: 5.

Remarks: This subclass includes generally large holothurians with peltate tentacles and well developed pedicels. Although the inclusion in it of the two orders has been disputed by Hansen (1975), Pawson (1982) states that they may have a common ancestry. Both orders are well represented in the southern African waters from which approximately 60 nominal species are here recorded.

ORDER ASPIDOCHIROTIDA Grube, 1840

Diagnosis: See Deichmann, 1948: 335; Pawson, 1982: 816.

Remarks: This order includes some of most conspicuous of all shallow water, tropical-subtropical holothurians in addition to several deep sea forms. The approximately 300 species contained in it are classified into three families, the Holothuriidae, Stichopodidae and Synallactidae. The order is represented in southern Africa by about 40 species.

Family STICHOPODIDAE Haeckel

Diagnosis: See Deichmann, 1948: 335; 1958: 278.

Remarks: This is a small, shallow water family characterised by the gonad in two tufts and usually C-shaped spicules. Deichmann (1958) provides a key to all the genera known then. Only a couple more genera has since been described. In southern Africa the family is represented by three genera and four species.

Genus NEOSTICHOPUS Deichmann, 1948

Holothuria (partim) H.L. Clark, 1923:424 (non Linnaeus, 1767).

H. (Holothuria) (partim) Panning, 1934:34.

Neostichopus Deichmann, 1948:335; 1958:279.

Diagnosis: See Deichmann, 1948: 335.

Type species: Holothuria grammata H.L. Clark, 1923 (by original designation Deichmann, 1948: 335).

Remarks: This genus is most closely allied to Parastichopus from the north Atlantic, north Pacific and New Zealand waters.

Neostichopus grammatus (H.L. Clark)
(Fig.40 a-k)

Holothuria grammata H.L. Clark, 1923:424.

Holothuria (Holothuria) grammata Panning, 1934: 34.

Stichopus grammatus syn. nov. Stephenson, Stephenson and du Toit, 1937:363, 381.

?Holothuria curiosa (?) Ludwig, Deichmann, 1948:375 syn. nov. (non H. curiosa Ludwig, 1875 = H. fuscocinerea Jaeger, 1833).

Neostichopus grammatus Deichmann, 1948:336, pl.17, figs. 1-17; Stephenson, 1944:348; 1948:265; Branch and Branch, 1981: 248, figs.

?(red holothurian) Day, Millard and Harrison, 1952: 412.

Diagnosis: See Deichmann, 1948:336.

Previous records: C(34/19/i to 34/22/i; 33/26/i to 33/27/i); T(32/28/i); N(31/30/i).

Material examined: C(34/19/i to 34/22/i; 34/24/i to 33/27/i); T(32/29/i), N(31/30/i to 29/31/i, s; 28/32/i), 88 spec.

Description: Colour in life extremely variable, usually a shade of pink or red but white, cream, yellow, grey or even mottled brown specimens not uncommon. Body wall thick, gelatinous. Well relaxed specimens often with a series of longitudinal and transverse ridges, often forming a reticulate pattern.

Spicules of juveniles (<30mm) exclusively tables with either a small disc with 2-4 marginal holes and a low spire (fig. 40c & d) or a large disc with up to 30 marginal holes and a tall spire (fig. 40g & e); spire of 4(-5) thin pillars, spinose at end, and 1-3 cross bars, terminating in a ring of teeth; disc diam. and spire height 0,025-0,075mm.

In older specimens tables replaced by minute plates ("pseudobuttons"), (0,015-0,04mm), (fig. 40b), with 2-8 holes and smooth to slightly serrate, knobbed or spinose margins, often thickened at one point. With age plates modified to asymmetrical rods (0,02-0,03mm) of diverse form (fig. 40a). Anal spicules plates, rods, corrugated crosses and modified tables with discs up to 0,10mm (fig. 40f). Podia with end plates and other huge vertically disposed oblong plates; papillae, in addition, with huge dumb-bell or skittle-shaped bodies (fig. 40h); tentacles with curved, spinulated rods (fig. 40i).

Distribution: From Cape Agulhas to Cape Vidal in N. Natal.
Map: 11.
Habitat: Fairly common under rock at low spring tide; in Durban found from low tide mark down to about 3m.

Remarks: H.L. Clark's (1923) material was in a poor state of preservation while the description of the species by Deichmann (1948) is very brief. Thandar (1971: unpublished M.Sc thesis) re-described the species on the basis of a few specimens from Natal. With ample material of both juvenile and adult in hand, the above notes are here added. Although the largest specimen in the present material measures

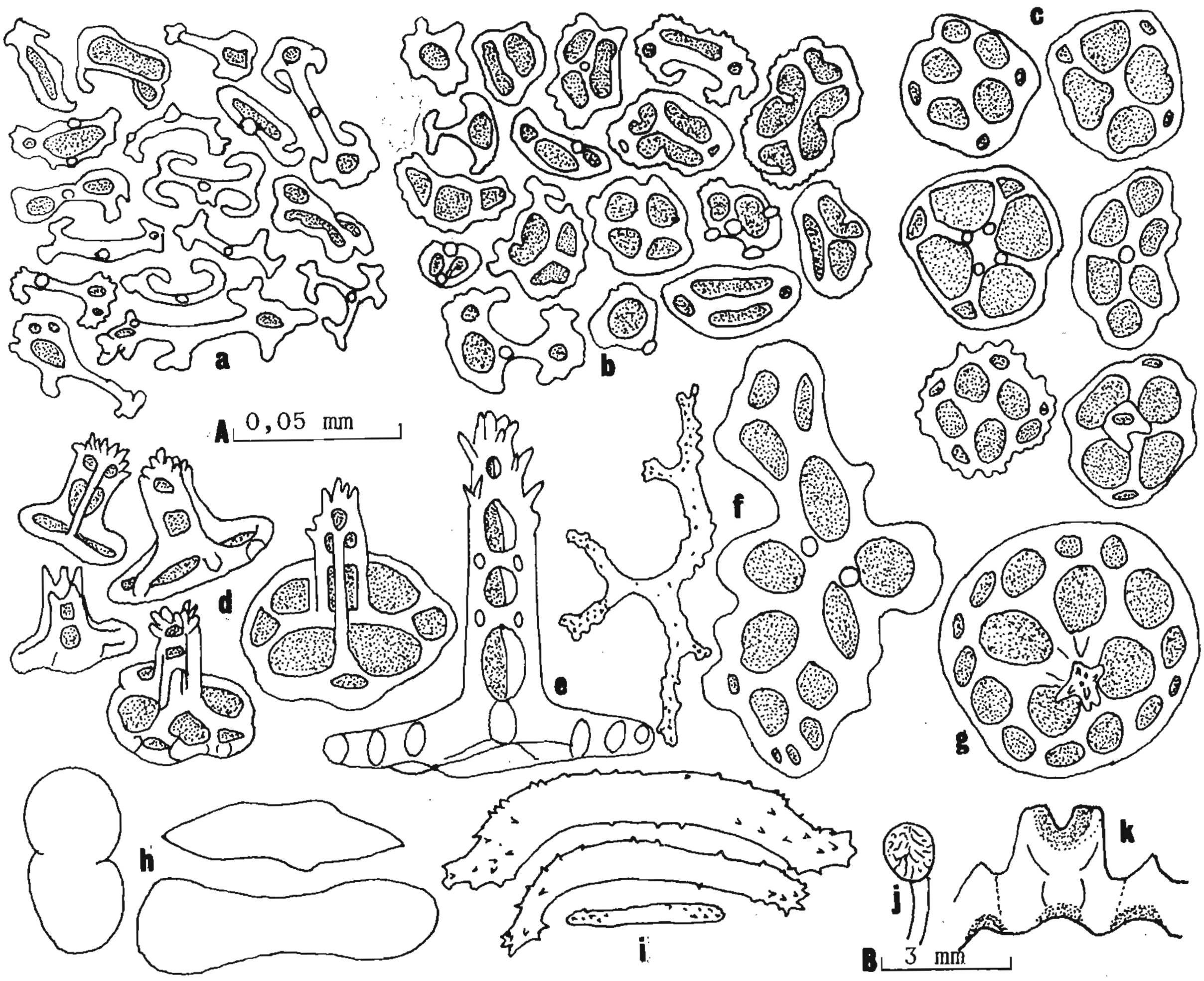


Fig. 40. <u>Neostichopus grammatus</u> (H.L. Clark).

a. Rods from body wall.

b. Plates from body wall.

c. Reduced tables from anal region.

d. Tables with short spires from anal region of juvenile.

e. Tall table from an 8mm specimen.

f. Branched rod and abnormal table disc from anal region.

g. Tall table from above.

h. Papillae rods.

i. Tentacular rods.

j. Madreporite.

k. Part of calcareous ring.

(a–i Scale A; j & k Scale B)

only 120mm, Deichmann records a maximum size of 150mm. None of the numerous living animals brought into the laboratory was of this size. The peculiar papillae deposits, characteristic of the species, were overlooked by both H.L. Clark and Deichmann but they are present in some of Deichmann's specimens here re-examined.

Stephenson, Stephenson and du Toit (1937) refer to the species as Stichopus grammatus which is clearly a synonym of N. grammatus while Deichmann (1948: 375), on the other hand, lists some material (E24) from Port Elizabeth, identified by either Heding or John, as Holothuria curiosa (?) Ludwig. Six specimens from the UCT collection, bearing this number, proved to be referable, without doubt, to N. grammatus. Although it could not be established whether the same or some other material with the same label was examined by Heding or John, H. curiosa (?) Deichmann (non Ludwig) is here relegated, with some doubt, also to the synonymy of N. grammatus.

Genus STICHOPUS Brandt, 1835

Stichopus Brandt, 1835:50; H.L. Clark, 1922:44; Deichmann, 1958:279; Clark and Rowe, 1971:201.

Diagnosis: See H.L. Clark, 1922:44.

Type species: Stichopus (Perideris) chloronotos Brandt, 1835 (by subsequent designation H.L. Clark, 1922:44).

KEY TO THE SOUTHERN AFRICAN SPECIES OF STICHOPUS

Body wall spicules in the form of small tables with somewhat squarish discs (0,024-04mm), usually pierced by four large and four other small holes; C-or S-shaped deposits minute (0,026-0,05mm); rosettes rare or absent; colour in life dark green with papillae tipped with rust or red .... Stichopus chloronotus Brandt, 1835

Body wall spicules in the form of large tables with more or less rounded discs (0,024-0,055mm) pierced by four large central and numerous (up to 15) small marginal holes; C- or S-shaped deposits large (0,058-0,205mm); rosettes numerous; colour variable, usually brown to yellowish brown with orange to red-tipped papillae.

Stichopus variegatus Semper, 1868

Stichopus chloronotus Brandt

(Fig.41 a-k)

Stichopus (Perideris) chloronotos Brandt, 1835:50.

Stichopus chloronotus Selenka, 1867:315, pl.17, figs. 20-24, pl.18, fig. 25; Théel, 1886a: 159, pl.7, fig.6; Pearson, 1910a:172; H.L. Clark, 1922:53, pl.2, figs. 1-10 (refs.); 1923:425; Kalk, 1958:216, 238; 1959: 6, 22; Macnae and Kalk, 1958:107, 119, 130; Clark and Rowe, 1971: 178 (dist.), pl.27, fig. 18; Branch and Branch, 1981: 246, 248.

Stichopus cylindricus Haacke, 1880:47.

Stichopus chloronotus var. fuscus Pearson, 1903:204.

Diagnosis: See H.L. Clark, 1922:53.

Previous southern African records: M(12-15/40/i; 26/32,33/i).

Material examined: M(22/35/i), 3 spec.

Description: Maximum length 112mm; colour, in alcohol, greyish white. Anus surrounded by papillae in only one specimen, by naked periproctal membrane in others. Dorsal papillae arise directly from warts arranged in four bands. Table discs (0,024-0,04mm), squarish, with jagged margins. (fig. 41b & d). Wart tables (fig. 41g) with discs up to 0,065mm;spire (0,028-0,042mm), terminating in 8-16 teeth. Dorsal tables (fig. 41a & b) with taller spires (fig. 41d). C- or S-shaped spicules (fig. 41f) 0,026-0,05mm, larger in the warts.

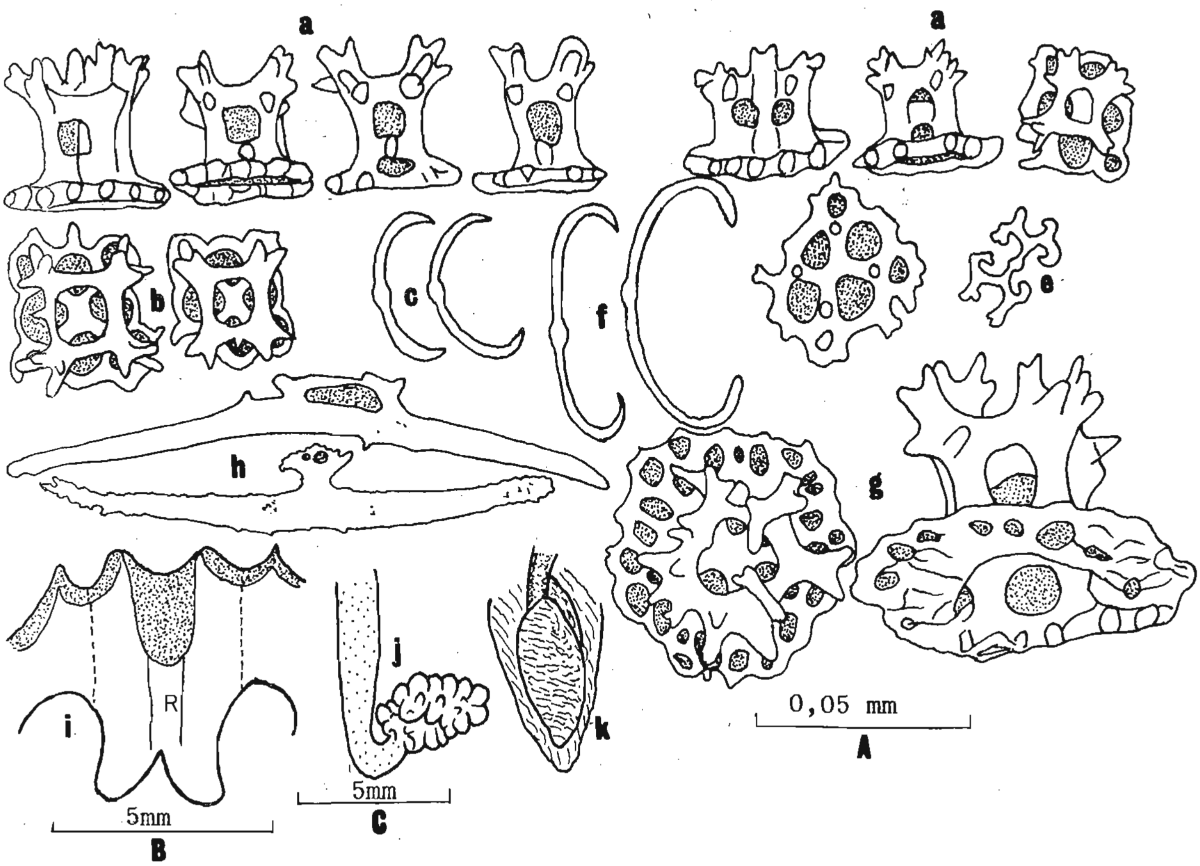


Fig. 41. Stichopus chloronotus Brandt. 32VN 671.

a. Tables from dorsal body wall.

b. Same (from above).

c. C-es from dorsal body wall.

d. Tables from ventral body wall.

e. Rosette from ventral body wall.

f. Large C-es from wart.

g. Large tables from wart.

h. Pedicel rods.

i. Part of calcareous ring.

j. Polian vesicle (terminal end).

k. Madreporite in dorsal mesentery.

(a-h Scale A; i Scale B; j & k Scale C)

Local distribution: Known from Moçambique only. Map: 4.

General distribution: Indo-West Pacific but not yet recorded from the Red Sea, Persian Gulf, India and Pakistan.

Habitat: Sand.

Remarks: It is well known that this species, over 300mm in life, contracts so drastically and quickly loses its green colouration in alcohol. Although H.L. Clark (1922) and Rowe and Doty (1977) indicate the absence of rosettes in this species, these were confirmed to be present but sparsely distributed in at least one of the present specimens (fig. 41e). Fisher (1907) also reported their occurrence in his presumably mislabelled specimen (according to H.L. Clark, 1922) from Hawaii and Ludwig (1887) in specimens from Sri Lanka. Evidently then rosettes are either absent or poorly developed in this species.

Previous records of this species from Moçambique are those of Pearson (1910a), H.L. Clark (1923), Kalk (1958, 1959) and Macnae and Kalk (1959).

Stichopus variegatus Semper
(Fig.42 a-k)

Stichopus variegatus Semper, 1868:73, pls. 16 and 30, fig. 1; H.L. Clark, 1922:67; Théel, 1886a:191; Pearson, 1910a:173; Clark and Rowe, 1971:178 (dist.), pl.27, fig.20.

Stichopus naso Haacke, 1880:46.

Stichopus levis Sluiter, 1887:198, pl.1, fig.6.

Stichopus vastus Sluiter, 1887:198, pl.2, figs. 46-48.

Stichopus hirotai Mitsukuri, 1912:161.

?Stichopus oshimae Mitsukuri, 1912:171.

Diagnosis: See H.L. Clark, 1922:67.

Previous southern African record: M(10/40/S), 18m.

Material examined: M(22/35/i), N(29/30/i), 6 spec.

Description: Largest specimen over 400mm in life, 210mm in alcohol. Live colouration an admixture of dark and light brown, speckled with white. Warts better developed laterally and at both ends. Tables (fig. 42a & b) with large discs and small crowns or small discs and large crowns, both types common; disc diameter 0,024-0,055mm, spire height 0,022-0,04mm. C- or S-shaped spicules (fig. 42c & e) and rosettes (fig. 42d) few or numerous, the latter 0,012-0,035mm.

Local distribution: Moçambique to Natal, as far south as Isipingo. Map: 4.

General distribution: Throughout the Indo-West Pacific but not yet reported from W. India, Pakistan and Hawaii.

Habitat: Sand, mud, rock or coral.

Remarks: Contrary to the condition in S. chloronotus, numerous papillae arise directly from the body independent of the warts. Apart from colour, this character is quite useful in separating local forms of both species on external features alone. Although H.L. Clark (1922) states that the disc diameter does not exceed 0,05mm that of the wart tables often exceed 0,07mm. This species was recorded from Querimba (N. Moçambique) by Pearson (1910a). Its presence as far south as southern Natal is a noteworthy extent of its southward range. It is surprising that the species was not recorded from Inhaca Island by the University of the Witwatersrand survey.

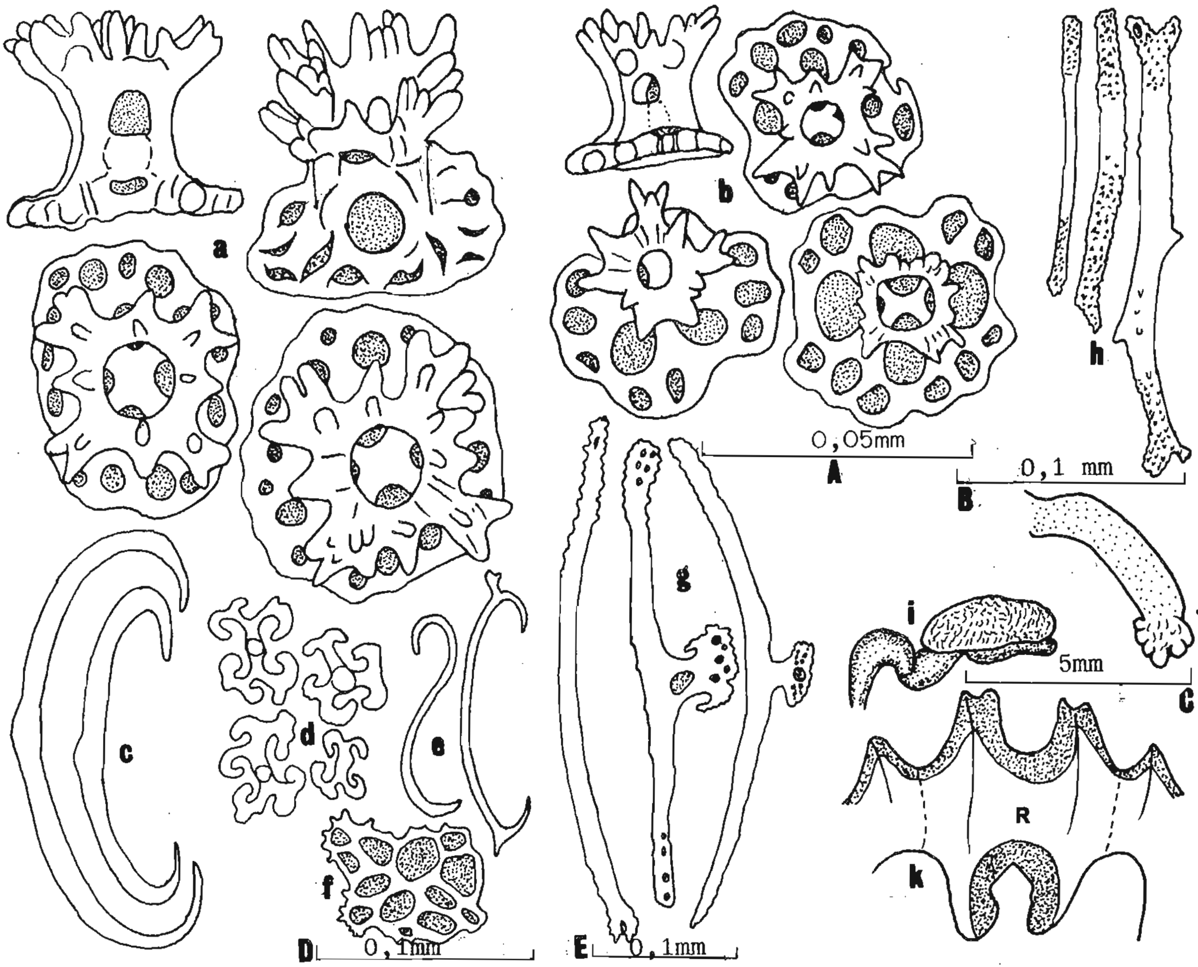


Fig. 42. Stichopus variegatus Semper.

a. Tables from dorsal body wall.

b. Tables from ventral body wall.

c. C-es from dorsal body wall.

d. Rosettes from dorsal body wall.

e. C- and S-shaped deposits from collar.

f. Plate from wart.

g. Pedicel rods.

h. Papillae rods.

i. Madreporite.

j. Polian vesicle (terminal end).

k. Part of calcareous ring.

(a-d Scale A; h Scale B; i-k Scale C; e & f Scale D; g Scale E).

Genus THELENOTA Brandt, 1835

Trepang (partim) Jaeger, 1833 (suppressed).
Thelenota H.L. Clark, 1921: 185; 1922:48.

Diagnosis: See H.L. Clark, 1921:185.

Type species: Trepang ananas Jaeger, 1833 (by subsequent designation H.L. Clark, 1922: 48).

Remarks: The genus Thelenota only includes two species, T. ananas and T. anax, both from the Indo-West Pacific region and distinguished from each other by the colouration and the form of the dorsal papillae. Of the two species only T. anax has been recorded from the southern African region.

Thelenota anax H.L. Clark

Thelenota anax H.L. Clark, 1921: 185, pl.18, fig.3; Clark and Rowe, 1971:178 (dist.); Rowe and Doty, 1977:27, fig. 5f; Cherbonnier, 1979:9, text-fig. 5 (A-N).

Diagnosis: See H.L. Clark, 1921:185; Cherbonnier, 1979:9.

Material examined: None.

Distribution: Moçambique, N.E. Australia and Guam.

Remarks: The southern African record is that of Cherbonnier (1979), based on a single specimen collected from Glory Islands, Moçambique Channel, at a depth of 25m.

Family HOLOTHURIIDAE Ludwig, 1894

Diagnosis: See Deichmann, 1948:337; 1958:281.

Remarks: This is another family of mostly tropical-subtropical shallow water holothurians comprising four genera and about 140 species, many of which form conspicuous biota of coral reefs. Three genera (Actinopyga, Bohadschia and Holothuria) and over 30 species occur in southern Africa, nearly all restricted in their distribution to the east coast.

Genus ACTINOPYGA Bronn, 1860

Muellaria Jaeger, 1833:7; Selenka, 1867:310 (preoccupied).
Actinopyga Bronn, 1860; Panning, 1944:45; Rowe, 1969:130 (synonymy); Clark and Rowe, 1971:196.

Diagnosis: See Rowe, 1969: 130.

Type species: Mülleria echinites Jaeger, 1833 (by subsequent designation Clark and Rowe, 1967:101).

Remarks: Actinopyga includes approximately 12 species, six of which are known from southern Africa. Of these only A. echinites Jaeger and A. mauritiana Quoy and Gaimard are represented in the present material. The remaining four species occur in Moçambique, two of which have not yet been taken from south of Querimba (N. Moçambique).

KEY TO THE SOUTHERN AFRICAN SPECIES OF ACTINOPYGA

1. Large chocolate brown species up to 200mm long; spicules of dorsal and ventral body wall exclusively minute, rosette-like, dichotomously branched, X or Y-shaped rods up to 0,05mm long; no elongate branched rods, spiny rods or granules 2

Colour variable, but usually a shade of brown or yellow; spicules of dorsal and ventral body wall dissimilar and of more than one type, usually comprising elongate branched rods about 0,10mm long and much smaller X or Y-shaped dichotomously branched rods 3

2. Colour chocolate brown with yellowish specks and a light patch around anus; spicules slender dichotomously branched rods 0,016-0,05mm long, larger and stronger dorsally

Actinopyga lecanora (Jaeger, 1833)

Colour uniformly chocolate brown without specks and without a light patch around anus; spicules up to 0,045mm long, dorsally with open dichotomous ramifications while ventrally with somewhat closed ramifications

Actinopyga miliaris (Quoy and Gaimard, 1833)

3. Brown to greyish brown species mottled with brown or black; elongate spiny rods (fig. 43f) present in addition to elongate rods (0,05-0,108mm), branched at ends, and dichotomously branched X or Y-shaped, rosette-like rods (0,015-0,07mm) (fig. 43a & b); no granules in ventral body wall; anal "teeth" yellowish, often concealed ...... Actinopyga echinites (Jaeger, 1833)

Grey, yellow, yellowish brown to dark chocolate or chestnut brown species, sometimes with whitish specks; no spiny rods but large, often stout, elongate branched rods and X or Y-shaped rosette-like rods common; granules may be present in ventral integument 4

4. Colour yellow to yellowish brown, usually darker in the middle; dorsal spicules minute, rosette-like, dichotomously branched rods up to 0,046mm long; ventral surface with similar spicules up to 0,062mm long, aggregated into heaps, and in addition thick curved rods, up to 0,095mm long, with only terminal ramifications; no granules

Actinopyga crassa Panning, 1944

Colour grey, yellowish brown to dark chestnut or chocolate brown, sometimes speckled with white; dorsal spicules elongate branched rods and dichotomously branched X and Y-shaped rods; ventral spicules stouter elongate rods and often smooth spherical, oval to lobed granules 5

5. Colour dark chestnut brown or grey, usually with white specks; tentacles more than 20; elongate rods of dorsal surface (0,062-0,12mm) with lateral projections of varying degrees of complexity (fig. 44a); ventral integument with stouter, often smooth, elongate rods and minute granules of varying shapes, the latter (fig. 44b) usually spherical, oval or rosette-like, 0,014-0,05mm long; cuvierian tubules present

Actinopyga mauritiana (Quoy and Gaimard, 1833)

Colour yellowish to chocolate brown, rarely mottled; tentacles 20; dorsal spicules thin, rosette-like, X or Y-shaped rods and thick elongate rods (up to 0,062mm) with often fused ramifications; ventral spicules with similar rods (up to 0,055mm) and in addition smooth, slightly branched rods and lobed granules; cuvierian tubules absent (?)

Actinopyga plebeja Selenka, 1867

Actinopyga crassa Panning

Actinopyga echinites crassa Panning, 1944:51, text-fig. 19.

Actinopyga crassa Rowe, 1969:131 (passim), Clark and Rowe, 1971: 176 (dist.).

Diagnosis: See Panning, 1944:51.

Previous southern African record: M(10/40/?i).

Material examined: None.

Local distribution: Querimba only (N. Moçambique).

General distribution: East Indies and West Indian Ocean.

Remarks: This species is not truely southern African as it has not yet been taken south of the tropic of Capricorn. Its dorsal spicules, according to Panning (1944), are similar to those of A. echinites. However, it differs from the latter species and the others in the genus by its characteristic curved ventral rods with complicated terminal ramifications.

Actinopyga echinites (Jaeger)

(Fig.43 a-f)

Mülleria echinites Jaeger, 1833:17, pl.3, fig.6; Semper, 1868:76, 276, pl.30, fig.8; Théel, 1886a:201.

Actinopyga echinites Saville-Kent, 1893:236; Panning, 1929:129, fig. 11 (refs.); Rowe, 1969:131 (figs.); Clark and Rowe, 1971:176 (dist.), pl.27, fig. 1.

Actinopyga echinites echinites Panning, 1944:48, text-fig. 17.

Diagnosis: See Jaeger, 1833:17; Panning, 1929:129.

Previous southern African record: M(10/40/?i).

Material examined: N(29/30/i, 28/32/i), M(24/35/i), 18 spec.

Local distribution: From Isipingo Beach northwards to Querimba (N. Moçambique). Map: 4.

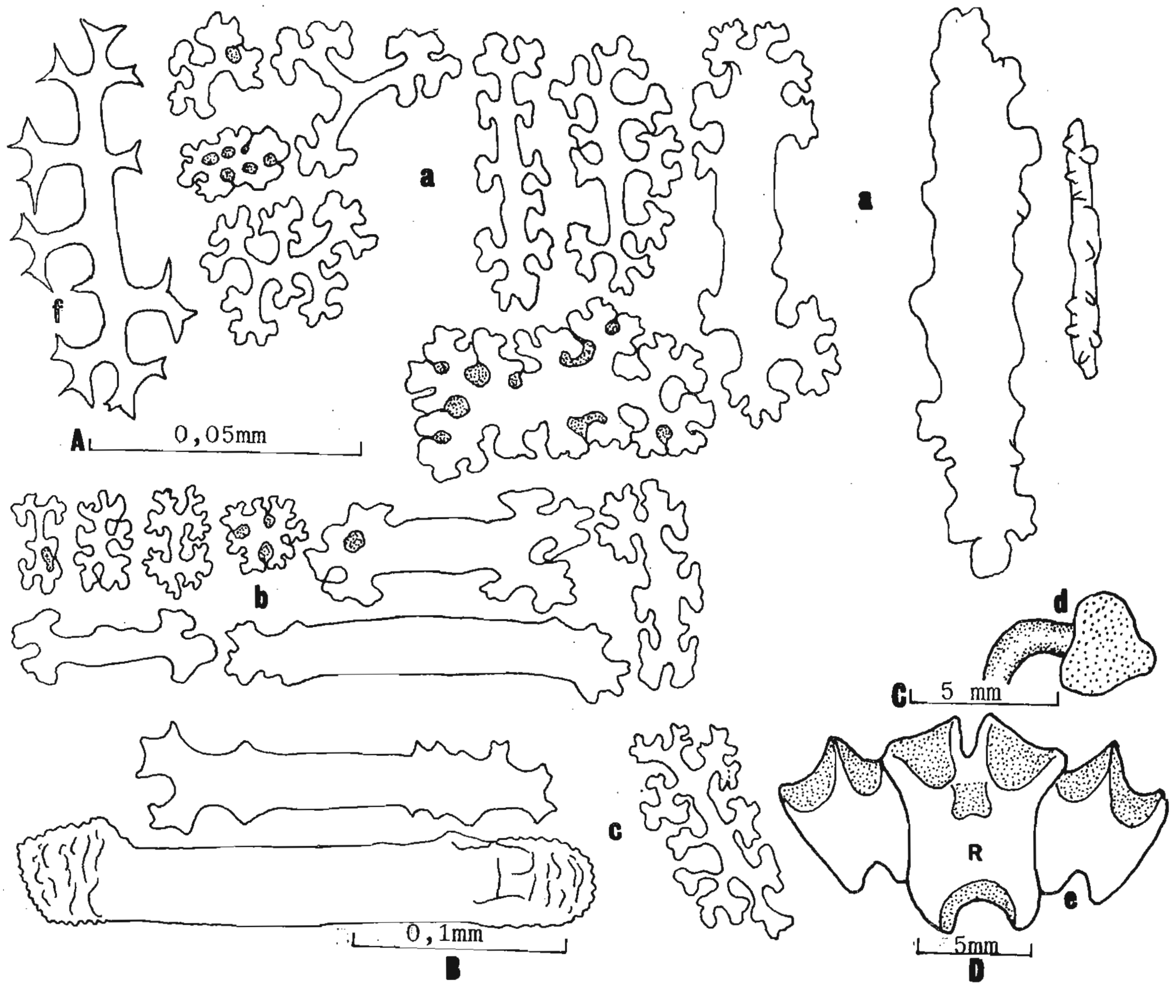


Fig. 43. Actinopyga echinites (Jaeger). Isipingo.

a. Rods from dorsal body wall and papillae.

b. Rods from ventral body wall and pedicels.

c. Tentacular spicules.

d. Madreporite.

e. Part of calcareous ring.

f. Spiny rod.

(a & **b** Scale A; c Scale B; d Scale C; e Scale D).

General distribution: Throughout the Indo-West Pacific region but not known from Hawaii and the Arabian and Indian peninsulas.

Nature of bottom: Rock.

Habitat: In rock pools; takes no precaution to hide itself.

Remarks: This is a well known Indo-West Pacific species recorded from Moçambique by Panning (1944). The Natal forms of the species were described by Thandar (1971) but since this was not published there is no record of the species south of the tropic of Capricorn. A characteristic feature of the species is the large spiny rods (fig. 43f) of the type illustrated by Rowe (1969) and Rowe and Doty (1977). Similar spicules are described by Cherbonnier (1979) for A. flammea from New Caledonia but this species, according to Cherbonnier, is close to A. serratidens and A. obesa.

The dimensions of the rods given in the key are from the southern African material and correspond well with the size of similar deposits illustrated by Rowe (1969) and Clark and Rowe (1971).

Actinopyga lecanora (Jaeger)

Mülleria lecanora Jaeger, 1833:12, pl.2, fig.2, pl.3, fig.8; Selenka, 1867: 312; Semper, 1868:75, pl.30, fig.7; Lampert, 1885: 100; Théel, 1886a:200; Pearson, 1910a:173, text-fig. 15.

Actinopyga lecanora Saville-Kent, 1893:235; Pearson, 1914:182, pl.29, fig.9; Panning, 1941:4, text-figs. 1 and 2; Clark and Rowe, 1971:176 (dist.), pl.27, fig.2.

Holothuria (Actinopyga) lecanora Panning, 1929:127, text-fig.9 (refs.).

Actinopyga lecanora lecanora Panning, 1944:47, text-fig.16.

Holothuria dubia Brandt, 1835:54; Selenka, 1867:331, Semper, 1868:92, 279.

Southern African record: M(10/40/S), 18m.

Diagnosis: See Jaeger, 1833:12; Panning, 1929:127; 1944:47.

Material examined: None.

Local distribution: Known only from Querimba (N. Moçambique).

General distribution: Indo-West Pacific but not yet reported from the Arabian and Indian peninsulas and Hawaii.

Remarks: This species is well characterised by the presence of a light patch around the anus and only minute branched rods in the body wall. It also is not strictly a southern African species. Its Querimba record is that of Pearson (1910a).

Actinopyga mauritiana (Quoy and Gaimard)

(Fig.44 a-d)

Holothuria mauritiana Quoy and Gaimard, 1833:138; Selenka, 1867:315; Semper, 1868:76, 276; Théel, 1886a:201.

Holothuria guamensis Quoy and Gaimard, 1833:137.

Microthele guamensis Cherbonnier, 1952b:40, pl.2, fig.1.

Mülleria mauritiana Ludwig, 1883:157, 165; Pearson, 1910a:174, text-fig.16.

Mülleria varians Selenka, 1867:310, pl.17, figs. 4-9.

Holothuria (Actinopyga) mauritiana Panning, 1929:128, text-fig.11 (refs.).

Actinopyga mauritiana Bell, 1887:653, pl.39, fig.1; Fisher, 1907:648, pl.66, fig.1; H.L. Clark, 1923:426; Panning, 1944:55, text-fig.24; Cherbonnier, 1952a:41, text-fig.16; Macnae and Kalk, 1958:34, 99, 107, 120, 130; Kalk, 1959:5, 22; Clark and Rowe, 1971:176 (dist.), pl.27, fig.3; Branch and Branch, 1981:248.

Diagnosis: See Panning, 1929:128; 1944:55.

Previous southern African records: M(26/32,33/i; 12 to 15/40/i).

Material examined: N(29/30/i, 28/32/i); M(24/35/i, 23/35/i), 31 spec.

Local distribution: From Moçambique as far south as Isipingo in Natal. Map: 4.

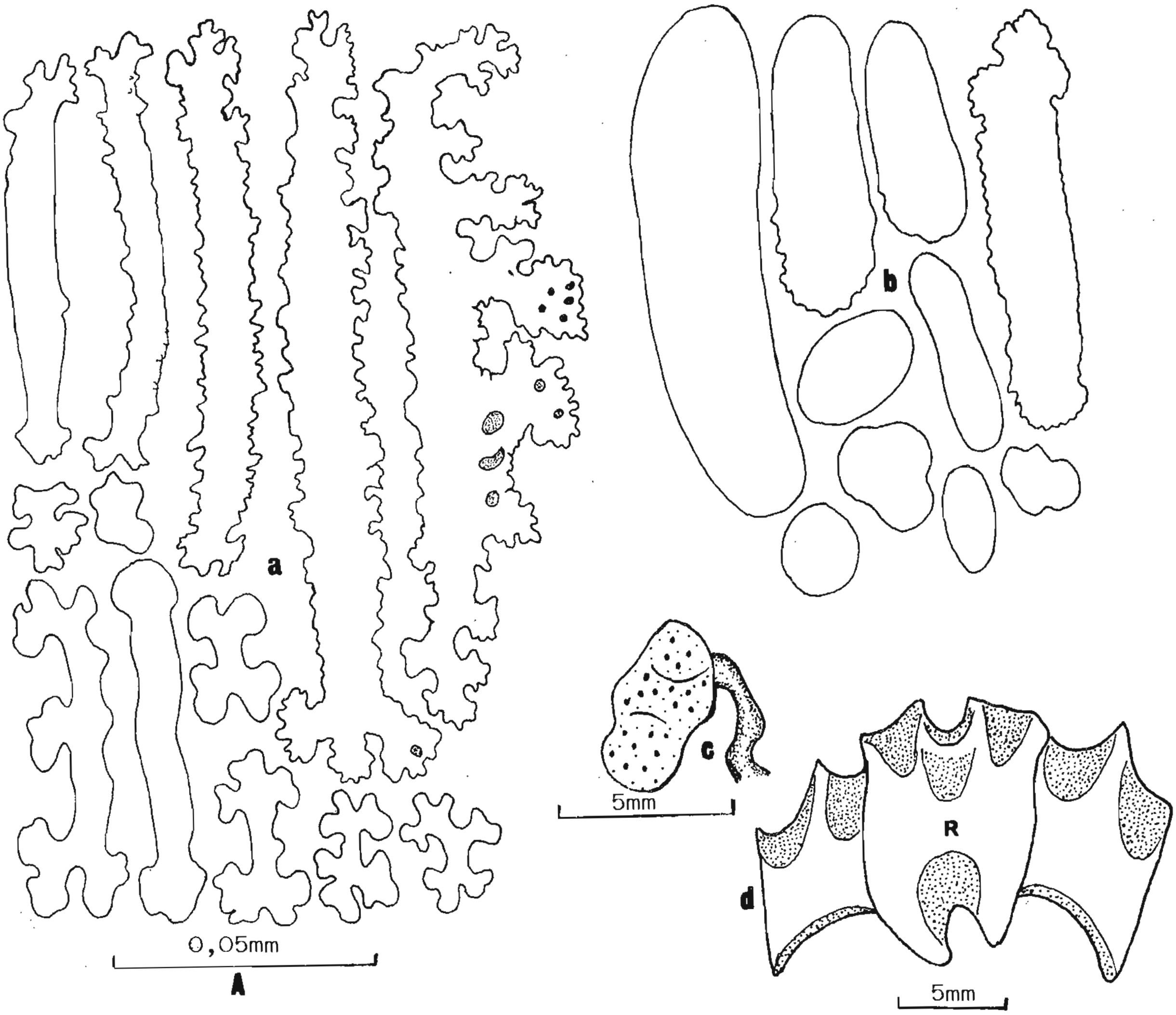


Fig. 44. <u>Actinopyga mauritiana</u> (Quoy and Gaimard). Inhaca.

a. Rods from dorsal body wall and papillae.

b. Rods from ventral body wall and pedicels.

c. Madreporite.

d. Part of calcareous ring.

(a & b Scale A)

<u>General distribution</u>: Throughout the Indo-West Pacific region including Hawaii but excluding the Arabian peninsula.

<u>Habitat</u>: Rock and coral; in shallow pools, never concealed.

<u>Remarks</u>: This is an easily recognisable species that takes no special precautions to hide itself. It has long been known from Moçambique but its first record from Natal is that of Thandar (1971: M.Sc. thesis unpublished) who reported the species to be quite abundant in the northern parts of the Province at certain time of the year. Rowe (in Rowe and Doty, 1977) concluded that Quoy and Gaimard's <u>Holothuria guamensis</u> is conspecific with <u>A. mauritiana</u>. Despite page priority he retained the well known name <u>mauritiana</u> for the species.

<u>Actinopyga miliaris</u> (Quoy and Gaimard)

<u>Holothuria miliaris</u> Quoy and Gaimard, 1833:137.

<u>Müllería miliaris</u> Brandt, 1835:74; Selenka, 1867:314; Semper, 1868:76, 276; Lampert, 1885:99; Théel, 1886a:200; Pearson, 1910a:175.

<u>Holothuria lineolata</u> Quoy and Gaimard, 1833:137; Selenka, 1867:314; ?Cherbonnier, 1952b:37, text-fig.15.

<u>Holothuria (Actinopyga) miliaris</u> Panning, 1929:127, text-fig.10 (refs.).

<u>Actinopyga lecanora miliaris</u> Panning, 1944:41, text-fig. 16.

<u>Actinopyga miliaris</u> Bell, 1887:653, pl.40, fig.1; Pearson, 1914:181, pl.29, fig.6; H.L. Clark, 1923:426; Kalk, 1954:112; 1958:198, 238; Clark and Rowe, 1971:176 (dist.), pl.27, fig.4.

<u>Diagnosis</u>: See Panning, 1929: 127; 1944:41.

<u>Southern African records</u>: M(26/32,33; 12-15/40/i).

<u>Material examined</u>: None.

<u>Local distribution</u>: Recorded from Moçambique only. Map: 4.

<u>General distribution</u>: Indo-West Pacific but not yet known from the Arabian and Indian peninsulas and Hawaii.

<u>Habitat</u>: Coral reef.

Remarks: This species was reported from Moçambique by Pearson (1910a), H.L. Clark (1923) and Kalk (1954, 1958). Regrettably no specimen in the present material could be assigned to it. It is not a well characterised species and its deposits appear to be close to A. lecanora. Although Panning (1929) regards Holothuria lineolata Quoy and Gaimard as a synonym of A. miliaris, Cherbonnier (1952b) is of the opinion that both A. lineolata and A. lecanora are conspecific of which the former has priority.

Actinopyga plebeja (Selenka)

Mülleria plebeja Selenka, 1867:312.
Mülleria miliaris Théel, 1886a:200 (partim).
Holothuria (Actinopyga) miliaris Panning, 1929:127, text-fig.10 (partim).
Actinopyga echinites plebeja Panning, 1944:51, text-fig.18.
Actinopyga plebeja Macnae and Kalk, 1958:130; 1962:112; Kalk, 1959:22; Clark and Rowe, 1971:176 (dist.).

Diagnosis: See Selenka, 1867:312; Panning, 1944:51.

Southern African record: M(26/32,33/i; 12 to 15/40).

Material examined: None.

Local distribution: Known only from Querimba in N. Moçambique and Inhaca Island. Map: 4.

General distribution: Indo-West Pacific but not yet known from N. Australia, China, S. Japan and Hawaii.

Remarks: This species is also not well characterised except for the probable absence of cuvierian tubules. It is a pity that Selenka (1867) did not illustrate its deposits but mentions that they are similar to those of *A. agassizi* from the West Atlantic, also described in the same paper. Although Panning (1929), probably following Semper (1868) and Théel (1886a), regarded *A. plebeja* as a synonym of *A. miliaris*, in 1944 he treated it as a subspecies of *A. echinites*. However, Rowe (in Clark and Rowe, 1971) thinks that it deserves specific ranking. If the deposits are really like those of *A. agassizi* illustrated by Selenka (1867) then the species should be retained since no Indo-West Pacific species of *Actinopyga* has this combination of spicules. Since this species has been confused with both *A. echinites* and *A. miliaris* there must be some overlapping of records. Panning (1944) records the species from Querimba while Macnae and Kalk (1958,1962) from Inhaca Island.

Genus *BOHADSCHIA* Jaeger, 1833

Bohadschia Jaeger, 1833:18; Panning, 1944:35; Clark and Rowe, 1967: 101; 1971:196; Rowe, 1969:129 (synonymy).

Diagnosis: See Rowe, 1969:129.

Type species: *Bohadschia marmorata* Jaeger, 1833.

Remarks: This genus contains 13 nominal species, all restricted to the Indo-West Pacific region. Only *B. koellikeri* and *B. marmorata* have been reported from the West Indian Ocean and of these only the latter reaches N. Moçambique.

Bohadschia marmorata Jaeger

Bohadschia marmorata Jaeger, 1833:18, pl.3, figs. 9-10; Selenka, 1867:339; Panning, 1944:39, text-figs. 9,10 (partim); Rowe, 1969: 129, text-fig. 2; Clark and Rowe, 1971:176 (dist.), pl.27, fig.8.

Holothuria marmorata Selenka, 1868:118; Semper, 1868:79, 227, pl.30; fig.10, pl.35: fig.3, pl.36: fig.8, pl.37: figs. 1-4; Théel, 1886a: 202; Pearson, 1910a:179.

Holothuria (Bohadschia) marmorata Panning, 1929:120, text-fig.1 (refs.).

Sporadipus (Colpochirota) ualensis Brandt, 1835:146.

Holothuria ualensis Selenka, 1867:341.

Holothuria brandti Selenka, 1867:320.

Holothuria ultrimquestigmosa Haacke, 1880:48.

Diagnosis: See Jaeger, 1833:18, Théel, 1886a:202.

Southern African record: M(10/40/S).

Material examined: None.

Local distribution: Known only from Tunghi Bay (N. Moçambique), 9-33m.

General distribution: Indo-West Pacific.

Habitat: Sand, mud and shell.

Remarks: The Mocambique record is that of Pearson (1910a) based on a single specimen (90mm long) which, according to him, corresponded well with Théel's (1886a) description of the species.

Genus HOLOTHURIA Linnaeus, 1767

Holothuria Linnaeus, 1767:1089, Opinion 80, 1924:17; Panning, 1929-35; Rowe, 1969:133 (synonymy), (non Linnaeus, 1758 - suppressed).

Diagnosis: See Rowe, 1969:133.

Type species: Holothuria tremula Linnaeus, 1767 (non H. tremula Gunnerus, 1767) = H. tubulosa Gmelin, 1890.

Remarks: This genus, comprising about 120 nominal species, is well represented in the tropical-subtropical waters of Natal and Moçambique. 27 species are here keyed and of these as many as 23 are truely southern African, occurring south of the tropic of Capricorn. The latter figure includes two new species described herein as H. (Cystipus) longicosta and H. (Lessonothuria) tuberculata. Of the four species not truely belonging to the southern African region, three are from Querimba (N. Moçambique) while the remaining one, H. (Roweothuria) vemae subgen. et sp. nov., is from the Vema Seamount, 724km off the west coast. No reference is made to H. maxima Forskaal reported from Moçambique by Bell (1884), a species suspected by Panning (1934) to be synonymous with H. (H.) tubulosa Gmelin from the Mediterranean but proposed for suppression by Clark and Rowe (1967a). It appears that Cherbonnier's (1954) H. (H.) massaspicula from the Red Sea is identical to this species.

KEY TO THE SOUTHERN AFRICAN SUBGENERA AND SPECIES OF THE GENUS HOLOTHURIA

1. Tables, if present, only in combination with rosettes, rods or perforated plates, never with buttons or pseudo= buttons, occasionally tables reduced or absent 2

Tables always present and in combination with buttons or pseudobuttons, never with rods, rosettes or perforated plates 4

2. Spicules in the form of spinose (thorny) rods or per= forated plates; tables, if present (juveniles only), always greatly reduced and sparsely distributed ..... subgenus Selenkothuria 12

Tables always well developed but with small or reduced discs, spire tall or of moderate height terminating in about 12 teeth which give the appearance of a maltese cross when viewed from above; other spicules in the form of rods or rosettes 3

3. Tables present in combination with finely granulated rods, discs usually reduced or absent; rosettes never present; large species up to 200mm long; colour reddish brown mottled with black; rarely with a double series of ill-defined dark blotches along dorsum; pedicels and papillae yellow-tipped; found in sand or rock pools, usually en= crusted with foreign material ..... H. (Semperothuria) cinerascens (Brandt, 1835)

Tables present in combination with rosettes, never with finely granulated rods, discs normally reduced; usually large, robust forms; colour variable

..... subgenus <u>Halodeima</u> 13

4. Tables variously developed; buttons smooth, rarely feintly knobbed, regular or irregular or in the form of pseudobuttons 5

Tables strongly developed, sometimes modified to form hollow fenestrated spheres; buttons always conspicuously knobbed, sometimes modified to form hollow fenestrated ellipsoids 9

5. Table discs with smooth, non-spinose rims; buttons smooth, rarely a few buttons with two ill-defined median knobs also present; buttons sometimes flat and thin, regular or irregular in outline 6

Table discs with spinose rims, rarely a few tables with smooth rims also present; buttons irregular or incomplete and in the form of pseudobuttons; rarely buttons complete with three pairs of holes or a slightly knobbed surface

.... 7

6. Table discs smooth, round with a varying number of marginal holes; spire of moderate height ending in several teeth; buttons smooth, oval, thin and flat with a characteristic median optical discontinuity and 3-6 pairs of relatively small holes; size small up to 60mm, rarely longer ..... <u>H. (Platyperona) difficilis</u> Semper, 1868

Tables fairly stout, discs smooth, usually squarish in outline, with 8-10 marginal holes; spire of moderate height terminating in a cluster of teeth; buttons regular or irregular in outline with three or more pairs of comparatively large holes (except in _H. (Thymiosycia) arenicola_), not flattened and without a median optical discontinuity; rarely some buttons nodular or forming fenestrated ellipsoids; size small to moderate, up to 200mm long ..... subgenus _Thymiosycia_ 16

7. Tables not strongly developed, disc with rim usually spinose, rarely smooth; spire low to moderate, ending in a ring or cluster of teeth; tables occasionally degenerate or incomplete; buttons frequently irregular, usually with three pairs of holes, sometimes incomplete but rarely twisted; size moderate to large, up to 300mm long .... subgenus _Mertensiothuria_ 18

Tables clumsy, spire low, terminating in a ring or cluster of teeth; disc well developed, conspicuously spinose, often turned up to give to table a "cup and saucer" appearance in lateral view; pseudobuttons abundant, smooth or slightly knobbed or rugose, usually irregular, often twisted or reduced to a single series of holes on one side; occasionally buttons quite regular with three pairs of holes 8

8. Table discs with round to squarish rims that are turned up to give to table a "cup and saucer" appearance in lateral view; spire low ending in a cluster of 8-15 teeth, not giving the appearance of a maltese cross when viewed from above; pseudobuttons numerous, often irregular or twisted, sometimes reduced to a single series on one side; occasionally buttons quite regular with three pairs of holes; sometimes feintly knobbed but never rugose

..... subgenus Lessonothuria 20

Table discs well developed but rims not turned up to give to table a "cup and saucer" appearance in lateral view; spire of moderate height, terminating in a ring or cluster of teeth frequently appearing as a maltese cross when viewed from above; pseudobuttons abundant, rosette-like, smooth to rugose or spinose with smooth or serrated margins and up to six pairs of holes; some= times buttons incomplete, twisted, with or without rudimentary knobs ..... H. (Roweothuria) vemae

subgen. et sp. nov.

9. Table discs circular to squarish, usually spinose, rarely knobbed; spire low terminating in short teeth rarely connected to knobs or spines on margin of disc to give to table the appearance of a fenestrated sphere; buttons usually simple with few large knobs, 2-6 pairs of holes and with the shaft often prolonged at both ends, rarely buttons modified to fenestrated ellipsoids; radial plates of calcareous ring prolonged posteriorly but most plates without obvious signs of posterior

bifurcations. Length 110mm; colour, in alcohol, yellowish-brown tinted with black, dorsum with a double series of dark blotches; whitish areas around bases of podia, the latter with rust-coloured tips; body wall thick, packed with spicules

..... _H. (Cystipus) longicosta_ sp. nov.

Tables stout, well developed, rarely modified into hollow fenestrated spheres; spire moderate or high; buttons either simple with numerous irregular knobs of moderate size or modified into hollow fenestrated ellipsoids, central shaft of buttons not prolonged at both ends; calcareous ring stout with radial plates not prolonged posteriorly but sometimes showing indications of posterior bifurcations 10

10. Tables of two or more types; discs usually smooth or spinose, sometimes synallactid-like (multi-armed as in _Synallactes_ or with large holes as in _Mesothuria_); spire moderate or high, usually terminating in a cluster of small teeth; buttons either simple with irregular, moderate-sized knobs, or modified into hollow fenes= trated ellipsoids; calcareous ring stout with well developed or rudimentary posterior bifurcations to the radial plates; both radial and interradial plates longer than broad; size moderate to large, up to 250mm long

...... subgenus _Théelothuria_ 23

Table discs smooth, never spinose, often squarish in outline; spire moderate or high, terminating in small teeth; tables of one type, never synallactid-like;

buttons simple with moderate-sized knobs or modified into hollow fenestrated ellipsoids; calcareous ring well developed but no posterior bifurcations to the radial plates, both radial and interradial plates broader than long; size small to massive, over 400mm long 11

11. Table discs smooth, spire terminating in numerous teeth; buttons with irregularly arranged knobs and 3-6 pairs of relatively large holes, never modified into fenes= trated ellipsoids; anterior margin of calcareous ring never scalloped, anal teeth absent; size small to large, up to 200mm long .... subgenus Metriatyla 24

Tables stout with smooth squarish discs; spire termi= nating in many teeth; buttons usually always hollow fenestrated ellipsoids though a few simple knobbed buttons may also be present; calcareous ring massive with a characteristic scalloped anterior margin; anal teeth present except in large (>400mm long) specimens .... H. (Microthele) nobilis (Selenka, 1867)

12. Spicules short to elongate (0,05-0,14mm), curved or straight, flat rods or bars, usually finely spinulated and dichotomously branched at ends with a few lateral and/or terminal holes or a lace-like festoon of holes along the sides; tables rarely present (?juveniles only); colour dorsally mottled brown to black with a

paired series of ill-defined dark blotches; pedicel suckers green, tentacles yellowish brown

H. (*Selenkothuria*) *erinaceus* Semper, 1868

Spicules short (0,035-0,09mm long), stout, spinous rods, sometimes perforated, the holes developing from the union of some longer spines; degenerate, sparsely distributed tables present in juveniles; colour, in life, uniformly dark greyish brown, podial tips green, tentacles yellowish

H. (*Selenkothuria*) *parva* Lampert, 1885

13. Table discs (up to 0,056mm) smooth, sometimes spinose, with 4-8 marginal holes; rosettes small, elongate to rectangular with few large holes to slightly larger (0,04mm), circular biscuit-like with numerous small holes; size up to 500mm long, colour dark greyish brown dorsally, whitish grey ventrally.... *H.* (*Halodeima*) *mexicana* Ludwig, 1875

Table discs smooth to spinose with 4-8 marginal holes or discs reduced to a ring; rosettes small, developed from branched rods, never biscuit-like and multilocular; colour variable from uniformly black to greyish black dorsally and light pink ventrally 14

14. Table discs reduced to a ring; spire tall with a single cross bar more or less centrally placed; cuvierian tubules absent; size over 400mm; colour, in life, greyish black dorsally, bright pink ventrally

H. (*Halodeima*) *edulis* Lesson, 1830

Table discs small with four large central and four or more smaller marginal holes, discs never reduced to a ring; spire tall with a single cross bar situated near disc; size up to about 200mm; colour in life uniformly black or very dark purplish red; dark brown to greyish or purple in alcohol 15

15. Cuvierian tubules present ... H. (Halodeima) pulla Selenka, 1867

Cuvierian tubules absent ... H. (Halodeima) atra Jaeger, 1833

16. Table discs circular to irregular in outline with four or more small marginal holes, disc diameter 0,0425-0,075mm; spire of moderate height, 0,035-0,06mm, terminating in 12-15 teeth; buttons 0,05-0,08mm long with 3-5 pairs of relatively narrow (<0,0125mm) holes, rarely some buttons with a pair of ill-defined median knobs; slender, vermiform or cigar-shaped species up to 150mm long; colour, in life, mottled light greyish brown or cream with 4-5 pairs of dark blotches along dorsum ..... H. (Thymiosycia) arenicola Semper, 1868

Table discs circular to squarish in outline with eight or more marginal holes, disc diameter 0,0425-0,09mm; buttons 0,05-0,10mm long with 3-10 pairs of fairly wide (>0,0125mm) holes; colour and form variable but without dark blotches on dorsum 17

17. Tables large with squarish discs with eight large, marginal holes, disc diameter 0,08-0,10mm; spire of moderate (0,04-0,075mm) height terminating in numerous teeth; buttons up to 0,075mm long, remarkably regular with usually three pairs of holes; robust, cylindrical, vermiform or bottle-shaped species, gritty to the touch; length 150mm; colour, in life, yellowish or greyish brown with 12 or more transverse black bands along dorsum .... H. (Thymiosycia) impatiens (Forskaal, 1775)

Table discs smooth, circular to irregular, with about 12 marginal holes; spire 0,05-0,065mm terminating in a few teeth; buttons 0,0675-0,09mm in length with 3-5 pairs of fairly wide ($\pm$ 0,02mm) holes; no plates around base of podia; vermiform to spindle-shaped species up to 150-200mm long; colour light to bright brown dorsally and often with pale areas around papillae, the latter yellowish or greenish

H. (Thymiosycia) hilla Lesson, 1830

18. Table discs spinose, rarely smooth, 0,04-0,07mm in diameter, with four or more small marginal holes, the latter often reduced; spire with a single cross bar and terminating in 8-12 teeth, spire sometimes reduced; buttons 0,0425-0,07mm long, complete or incomplete, with 3-4 pairs of large holes; large, subcylindrical species up to 300mm long; colour, in life, uniformly black or very dark purplish or reddish brown

... H. (Mertensiothuria) leucospilota Brandt, 1835

Tables weakly developed, disc diameter 0,03-0,05mm, discs often reduced to 3-4 central and one or more small marginal holes; spire low, often irregular, terminating in 1-4 teeth; buttons numerous, complete or more often severely reduced to branched rosette-like or knobbed rods; colour variable, never uniformly black or dark reddish-brown 19

19. Table discs squarish to round, about 0,04mm in diameter; spire, when complete, with 1-2 cross bars and terminating in 1-4 teeth; buttons small, 0,02-0,04mm long, often incomplete, resembling branched rosette-like rods; complete buttons with two or more slit-like central holes and 1-2 minute holes at ends; large species, uo to 300mm long; dorsal surface ash-grey to brownish, usually mottled, black around base of papillae with narrow white ring inside it; ventral surface pale grey with velvet black rim around base of pedicels
... H. (Mertensiothuria) fuscocinerea Jaeger, 1833

Table discs smooth, uneven, 0,03-0,05mm in diameter; spire terminating in a ring of about four teeth; buttons numerous, 0,021-0,08mm in length, irregular, complete or severely reduced to the central shaft, then resembling knobbed rods; size up to 165mm; colour in life variegated grey mottled with white and purple, with darker transverse bands on dorsum, warts and base of papillae purple.
... H. (Mertensiothuria) pervicax Selenka, 1867

20. Table discs large, 0,08mm in diameter, rim smooth with eight or more large marginal holes and often about six smaller ones outside these; spire tall with 2(-3) cross bars and terminating in a ring of numerous teeth; buttons smooth, 0,04-0,09mm long, with 4-6 (rarely three) pairs of holes; size 50mm, colour (? in life) whitish ... _H_. (?_Lessonothuria_) _cumulus_ H.L. Clark, 1921

Table discs nearly always turned up to give to table a "cup and saucer" appearance in lateral view; discs with up to 10 marginal holes or latter reduced or absent; spire low with or without cross bar; pseudo= buttons numerous, often twisted or reduced to a single series of holes on one side, sometimes quite regular with three pairs of holes; size up to 150mm; colour variable, never white 21

21. Table discs circular to squarish, 0,0325-0,0925mm in diameter; spire ending in 8-15 teeth; pseudobuttons 0,03-0,115mm in length, usually flat, rarely twisted but often asymmetrical or incomplete with an unequal development of holes on both sides or with only a single series of up to seven holes on one side; vermiform to cigar-shaped species with no special anal papillae colour, in life, mottled greyish with a double series of dark blotches dorsally; grey to off-white ventrally ... _H_. (_Lessonothuria_) _insignis_ Ludwig, 1875

Table discs 0,04-0,075mm in diameter; spire ending in 8-12 teeth; pseudobuttons 0,02-0,07mm long, regular to irregular, often twisted and/or slightly knobbed; and with unequal development of holes on both sides of shaft; regular buttons with 3-4 pairs of holes, rarely more; anal papillae present, spindle-shaped or vermiform species 22

22. Table discs 0,04-0,075mm in diameter; spire ending in a ring of about eight teeth; pseudobuttons 0,035-0,07mm long, frequently regular with 3-4 pairs of holes; podia in the form of pedicels only, the latter supported by elongate curved rods expanded and perforated at ends; spindle-shaped species, up to 100mm long; colour greyish brown to dark brown, frequently mottled with white and black and with a paired series of dark blotches along dorsum.

.... _H_. (_Lessonothuria_) _pardalis_ Selenka, 1867

Table discs 0,035-0,085mm in diameter, frequently some discs smooth; spire with 7-12 teeth; pseudobuttons 0,02-0,09mm long, longer ventrally, rarely symmetrical but frequently twisted or with holes developed only on one side; podia differentiated into pedicels and papillae, the latter placed on pointed tubercles giving the body a rough texture; pedicels supported by curved, elongate plates with two series of holes; vermiform species, 145mm long; dorsal surface, in life, a variegated brown mottled with black but without any dark blotches

... _H_. (_Lessonothuria_) _tuberculata_ sp. nov.

23. Tables of three types, the commonest with circular, slightly spinose discs, 0,04-0,075mm in diameter, with up to eight marginal holes; spire terminating in a ring of about six teeth, ring and spire often reduced; discs rarely knobbed or tables modified to fenestrated spheres; buttons numerous, 0,03-0,06mm long, feintly knobbed and with up to six pairs of relatively small holes, frequently obliterated to a single hole on each side, rarely some buttons modified to fenestrated ellipsoids; length about 60mm; colour, in alcohol, an admixture of different shades of brown, dorsum with eight pairs of dark blotches; skin around base of podia whitish; skin thin

... H. (Theelothuria) ? maculosa Pearson, 1913

Tables of four distinct types, the commonest with circular, distinctly spinose discs, 0,05-0,07mm in diameter with 8-10 smaller marginal holes; spire terminating 6-8 teeth, both spires and discs frequently reduced but tables never modified into fenestrated spheres; buttons numerous, 0,035-0,05mm long, with numerous knobs and 3-4 pairs of holes, rarely forming fenestrated ellipsoids; length 75mm; colour in alcohol chocolate brown dorsally with a double series of dark blotches, white posteriorly and around base of papillae; skin thick, packed with spicules ... H. (Theelothuria) ? notabilis Ludwig, 1875

24. Tables massive, discs up to 0,16mm in diameter, perforated by 20 or more holes; spire tall, 0,125mm high, with four pillars and 6-8 cross bars; buttons elongate, up to 0,14mm long with 3(-8) pairs of holes, either distinctly knobbed or knobs feeble or absent; podia as conical papillae (Ca 7mm) on each side of body; length 150mm; colour (? in alcohol) yellowish white laterally, darker dorsally and ventrally, mottled with brown ... H. (Metriatyla) martensii Semper

Tables large, discs up to 0,10mm in diameter, perforated by 12 or more holes; spire of moderate (0,04-0,085mm) height with four or more pillars but a single cross bar; buttons 0,03-0,085mm long with usually 3-5 pairs of holes; length variable; colour not as above..... 25

25. Table discs 0,055-0,09mm in diameter; spire 0,037-0,085mm high, of 6-10 pillars terminating in a cluster of teeth; buttons ? feintly knobbed, 0,0295mm long; length 85mm; colour (? in alcohol) dorsally greenish brown with irregular light patches and an indefinite dark patch and ventrally dark grey with numerous white patches; dorsal papillae grey, ventral white

... H. (Metriatyla) albiventer Semper, 1868

Table discs 0,05-0,10mm in diameter; spire 0,04-0,0775mm high, of four pillars terminating in 12-15 teeth; buttons 0,035-0,085mm long with 3(-5) pairs of holes and large irregularly arranged marginal knobs or often only two median knobs; stout species about 200mm long and about half as broad; colour of dorsum, in life, usually grey with yellowish white streaks or broad transverse white bands or mottled grey or black; ventrum yellowish with grey patches ... H. (Metriatyla) scabra Jaeger, 1833

Subgenus Cystipus Haacke, 1880

Cystipus Haacke, 1880:47.

Holothuria (Cystipus) Rowe, 1969:154 (synonymy); Clark and Rowe, 1971:200.

Diagnosis: See Rowe, 1969:154.

Type species: Cystipus pleuripus Haacke, 1886 (by monotypy) = Stichopus rigidus Selenka, 1867 (according to Deichmann, 1958).

Remarks: Only H.(C.) longicosta sp. nov. is here referred to this subgenus which has not hitherto been recorded from southern Africa.

Holothuria (Cystipus) longicosta sp. nov.

(Fig.45 a-e)

Diagnosis: A moderate-sized cylindrical species. Dorsal surface yellowish brown mottled with black and with a paired series of dark blotches. Podia in the form of scattered pedicels. Radial plates of calcareous ring prolonged far beyond posterior border of interradial plates, ventral radial plates with rudimentary posterior bifurcations. Tables few, disc squarish to roundish with spinose rim; spire low, terminating in a ring of few blunt teeth; discs rarely knobbed or tables modified to fenestrated spheres. Buttons numerous, usually feintly knobbed and with 2-6 pairs of holes, shaft distinct and often prolonged at both ends, fenestrated ellipsoids rarely present.

table discs: av. diam. 0,058mm; buttons: av. length 0,055mm.

Material examined: Holotype, UCT, MOR 228D, Linga Linga, Morrumbene, M(23/35/i).

Description: Specimen badly contracted and partially eviscerated; length 110mm, breadth in mid-body 42mm. Body cylindrical, dorsal surface conspicuously arched, ventral less so. Colour, in alcohol, dorsally yellowish brown, speckled with black, especially in mid-body; ventral surface light greenish yellow with a slight tinge of black or dark brown; dorsal surface in addition with a paired series of dark blotches decreasing in size and intensity both anteriorly and posteriorly; bases of dorsal podia with whitish areas. Mouth and anus terminal, collar and anal papillae absent. Podia in the form of tiny, highly retractile pedicels, scattered, more numerous ventrally but not forming a "sole", papilliform dorsally; suckers minute, rust-coloured. Body wall thick (c. 4,5mm), leathery, slightly rough to the touch and packed with spicules.

Calcareous ring (fig. 45e) well developed, about 6mm high; radial plates about twice as long as interradial plates, deeply notched anteriorly, prolonged posteriorly beyond posterior margin of inter=radial plates, only ventral radial plates with rudimentary bifurcations; interradial plates triangular with a pointed anterior projection and a slightly concave posterior margin. Tentacular ampullae short (14mm). Polian vesicle ventral, elongate (25mm), slightly coiled. Stone canal short, free, coiled; madreporic body small, pyriform, well calcified (fig. 45d).

Respiratory trees well ramified, right tree longer, attached by mesenteries to right ventral interambulacrum. Cuvierian organ well developed as tufts of short, thick, unbranched tubules attached to base of right respiratory tree; some emitted tubules, possibly from base of left tree, visible in anus as long threads. Gonad developed as a single tuft of long unbranched tubules, attached on left side of dorsal mesentery, new tubules present anteriorly on stolon. Cloaca short, wide. Pedicel ampullae not visible. Longitudinal muscles paired, thicker ventrally, possibly due to stronger contraction.

Spicules:

Tables (fig. 24a) few, discs squarish to roundish (0,035-0,09mm), pierced by four large central and up to 10 smaller marginal holes; rims usually spinose, rarely turned up to give a "cup and saucer" effect to table in lateral view; spire short (0,025-0,0525mm), terminating in a ring of few blunt teeth; occasionally disc knobbed or connected to distorted spire to form a fenestrated sphere; rarely tables reduced to discs with only four central holes.

Buttons (fig. 24b) (0,04-0,075mm), numerous, with a well-defined central shaft that is often prolonged at both ends, beyond margin of buttons; holes 2-6 (usually 3) pairs, larger in the middle and decreasing in size at ends; buttons smooth to knobbed, knobs either developed on central shaft only, or both on shaft and on margins; rarely buttons modified into fenestrated ellipsoids.

Podia supported by small (0,03-0,05mm) tables with a reduced spire, smooth to slightly knobbed buttons (similar to those of integument), small (0,03mm) spectacle-shaped rods and minute (0,02mm) plates with

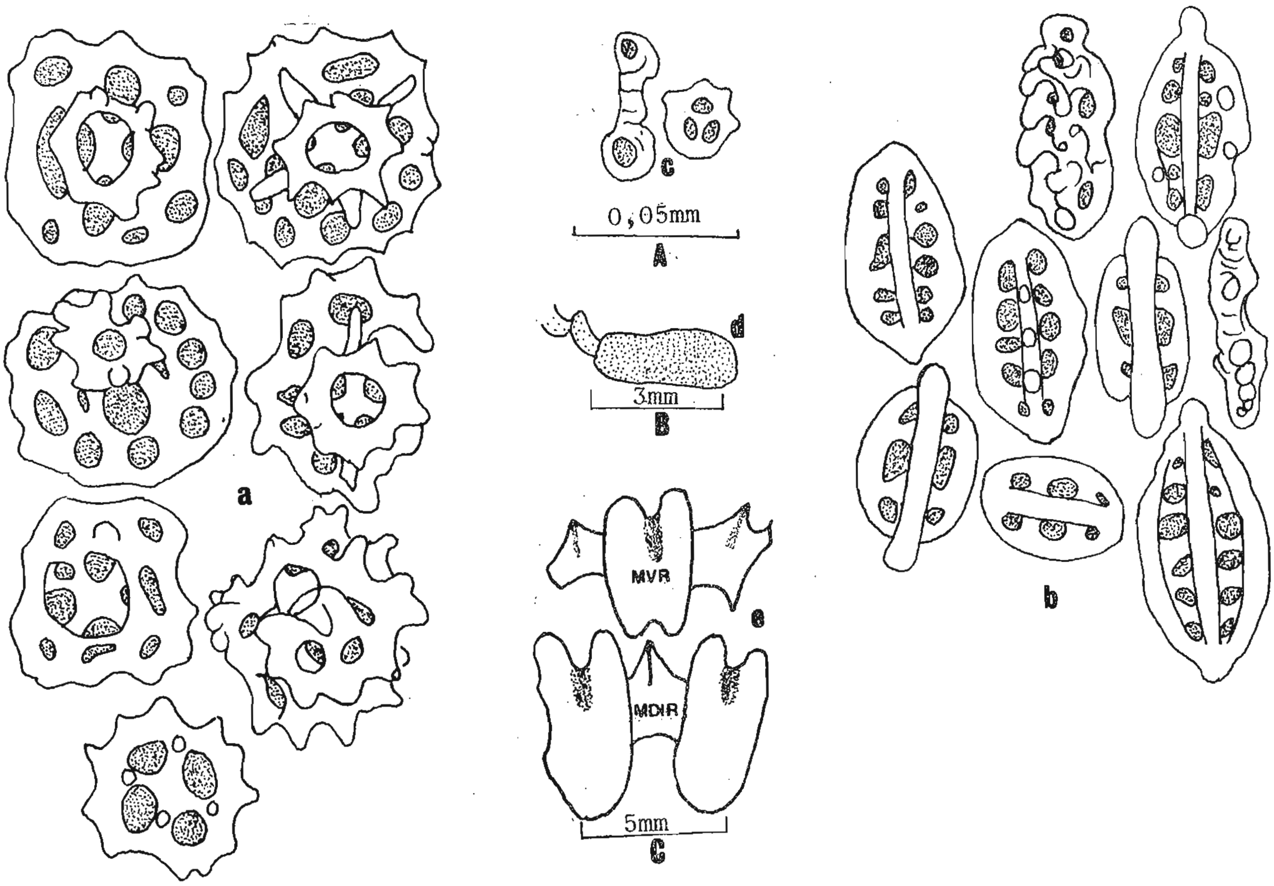


Fig. 45. Holothuria (Cystipus) longicosta sp. nov.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Pedicel spicules.

d. Madreporite.

e. Parts of calcareous ring.

(a-c Scale A; d Scale B; e Scale C)

2-4 holes (fig. 24c); end plates absent.

Distribution: Type locality only.

Habitat: Sand or shipwreck nearby (collector's note).

Remarks: Although the new species has a calcareous ring reminiscent of H. (Theelothuria) notabilis Ludwig it is here referred to the subgenus Cystipus because of the presence of only one type of tables, occasionally modified into fenestrated spheres. Some buttons are also modified into fenestrated ellipsoids. Further, the buttons with their prolonged central shaft strongly resemble those of H.(C.) turrisimperfecta described by Cherbonnier (1964) from the coast of Guinea. Although the tables of H.(C.) longicosta also resemble those of H.(C.) turrisimperfecta, the discs in the latter species are frequently knobbed. The new species also differs in its colouration, calcareous ring, absence of end plates, and different pedicel deposits.

Subgenus Halodeima Pearson, 1914

Holothuria (Halodeima) Pearson, 1914:170; Rowe, 1969:137 (synonymy); Clark and Rowe, 1971:198.

Diagnosis: See Rowe, 1969:137.

Type species: Holothuria atra Jaeger, 1833 (designated Pearson, 1914:171).

Remarks: This subgenus is represented in southern Africa by four species: H.(H.) atra, H.(H.) edulis, H.(H.) pulla and H.(H.) mexicana. The former three are well known Indo-West Pacific forms while the latter, described from False Bay as H. africana by Théel, 1886a, has never been found again.

Holothuria (Halodeima) atra Jaeger

(Fig.46 a-f)

Holothuria atra Jaeger, 1833:22; Selenka, 1867:327, pl.18, figs. 52, 53; Semper, 1868:88, 250, 278, pl.26; Thēel, 1886a:181, 213, pl.7, fig.4; Fisher, 1907:657, pl.70, fig.2; Pearson, 1910a:176; 1913:67, pl.9, fig.11; H.L. Clark, 1923:421; Kalk, 1954:113; 1958:216; Macnae and Kalk, 1958:43, 99, 101, 107, 117, 130 (non 104 = ? H. pulla Selenka); 1962:108, 112, 118; Kalk, 1959:5, 22; Branch and Branch, 1981:248.

Holothuria (Holothuria) atra Panning, 1934 (II):30, text-fig. 22 (refs.).

Holothuria radackensis Chamisso and Eysenhardt, 1821:352, pl.26.

Holothuria amboinensis Semper, 1868:92, 279.

Holothuria atra var. amboinensis Thēel, 1886a:214.

Holothuria sanguinolenta Bell, 1893; Domantay, 1933:73, pl.3, fig.3.

Halodeima atra Cherbonnier, 1952b:14, pl.2, figs. 11-14.

Ludwigothuria atra Deichmann, 1958:312, pl.2, figs. 18-23.

Holothuria (Halodeima) atra Rowe, 1969:137, fig.7; Clark and Rowe, 1971: 176 (dist.), pl.27, fig.11; Rowe and Doty, 1977:230, figs. 3d, 7a.

Diagnosis: See Selenka, 1867:237; Deichmann, 1958:312.

Previous southern African records: M(26/32,33/i; 12-15/40/i).

Material examined: M(22/33/i), 2 spec.

Description: Larger specimen 140mm long. Colour, in alcohol, greyish brown and white all round. Polian vesicles 6-20; stone canals 8-16, in two clusters, a single canal in larger specimen with up to four madreporic bodies. Table discs (fig. 46a) 0,031-0,063mm; spire height 0,042-0,071mm; rosettes (fig. 46c) 0,016-0,035mm long. Anal papillae with reduced end plates and slender rods branched at ends (fig. 46b). Tentacle rods elongate, spinulated and/or perforated at ends (fig. 26d).

Local distribution: Moçambique only. Map: 5.

General distribution: Throughout the tropical Indo-West Pacific region, excepting W. India and Pakistan.

Habitat: Sand, coral.

Remarks: This species, well characterised by its black colouration, numerous stone canals and the absence of cuvierian organs,has long been known from Moçambique (Semper, 1868). There is as yet no record of its presence further south than Inhaca Island.

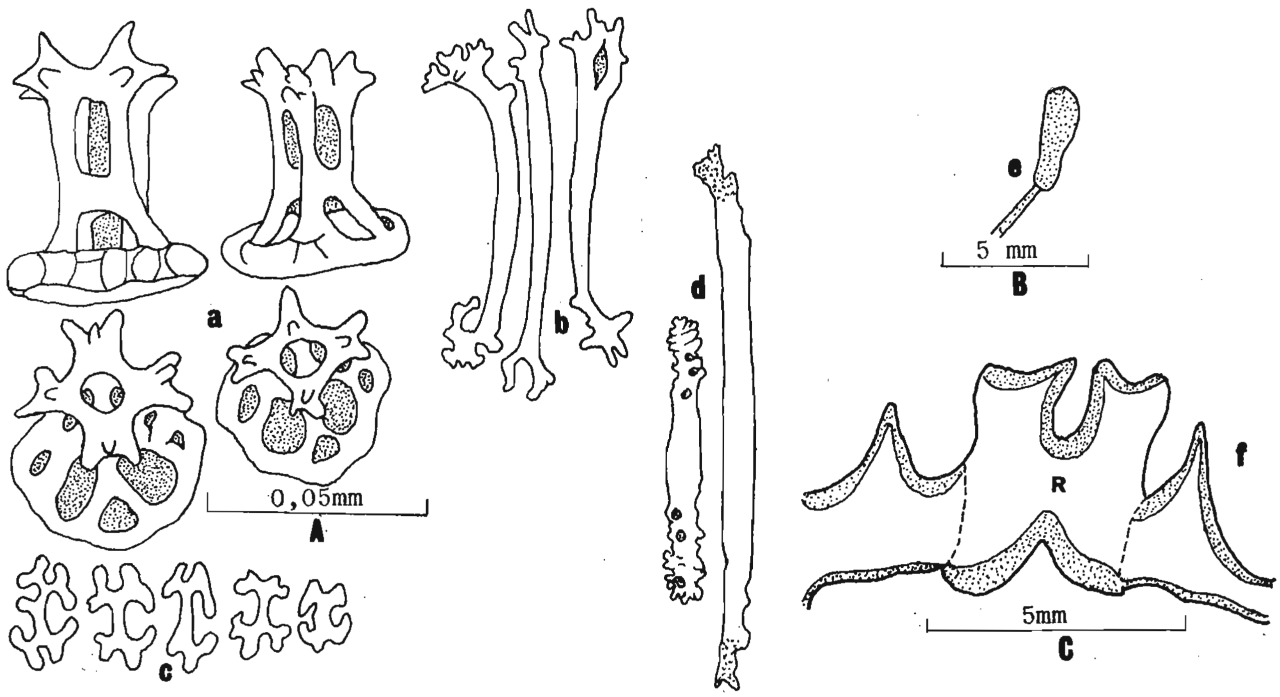


Fig. 46. Holothuria (Halodeima) atra Jaeger. Vilanculos.

a. Tables from dorsal body wall.

b. Rods from anal papillae.

c. Rosettes from dorsal body wall.

d. Tentacular rods.

e. Madreporite.

f. Part of calcareous ring.

(a-d Scale A; e Scale B; f Scale C)

Holothuria (Halodeima) edulis Lesson

Holothuria edulis Lesson, 1830:125, pl.46, fig.2; Selenka, 1867:341; Semper, 1868:89, 278, pl.31: fig.7, pl.32: fig.4, pl.33: fig.3, pl.36: figs. 2,5,9,10; Théel, 1886a:216; Pearson, 1913:69, pl.9, fig.12; H.L. Clark, 1923:421; Macnae and Kalk, 1962:108.

Trepang edulis Jaeger, 1833:24; Brandt, 1835:57.

Holothuria fusco-cinerea Selenka (non Jaeger), 1867:337, pl.19, fig.86.

Holothuria signata Ludwig, 1875:23, fig.36; Théel, 1886a:222.

Holothuria (Holothuria) edulis Panning, 1934 (II): 43, text-fig. 36.

Holothuria (Halodeima) edulis Rowe, 1969:137 (passim); Clark and Rowe, 1971:176 (dist.), pl.27, fig.14; Rowe and Doty, 1977:231; figs. 3e, 7b.

Diagnosis: See Selenka, 1867:341, Panning, 1934:43.

Southern African record: M(26/32,33/i).

Material examined: None.

Local distribution: Moçambique only. Map: 5.

General distribution: Throughout the tropical Indo-West Pacific region but not yet recorded from the West Indian Ocean Islands, Persian Gulf, W. India, Pakistan and Hawaii.

Remarks: This species, although similar in form and deposits to the preceding one, is well characterised by its bright pink colouration ventrally and reduced table discs. The species was first recorded from Moçambique by Semper (1868) and has since been reported once only (Macnae and Kalk, 1962).

Holothuria (Halodeima) mexicana Ludwig

Holothuria mexicana Ludwig, 1875:25, pl.7, fig.47; Thēel, 1886a:215; Deichmann, 1930:74, pl.5, figs. 15-20.

Holothuria africana Thēel, 1886a:174, pl.8, fig.7; H.L. Clark, 1923:422; Day, Field and Penrith, 1970:82.

Holothuria floridana Selenka, 1867:324, pl.18, figs. 47-50.

Holothuria (Holothuria) mexicana Panning, 1934 (II):31, text-fig. 24 (refs.).

Holothuria (Halodeima) mexicana Rowe, 1969:138 (passim).

Diagnosis: See Théel, 1886a:174.

Material examined: None.

Local distribution: Known only from Simons Bay, Cape Province, 13-36m.

General distribution: Tropical West Atlantic, ? Azores, west coast of southern Africa.

Remarks: The southern African record of this species is based on a single specimen described as H. africana by Théel (1886a). As Théel himself suspected, the specimen is identical to Ludwig's species and in fact both Deichmann (1930) and Panning (1934) consider it a synonym of H. mexicana. Although many species are common on both sides of the tropical Atlantic Ocean, it seems unlikely that H.(H.) mexicana can come as far south as Simons Bay, unless attached to the bottom of a sailing vessel. Since the species has not been taken again from southern Africa it would be best not to consider it as belonging to this region.

Holothuria (Halodeima) pulla Selenka

Holothuria pulla Selenka, 1867:326, pl.18, fig.51; Semper, 1868:92, 279; Bell, 1884; Théel, 1886a:214.

Microthele aethiops Brandt, 1835:55.

Holothuria aethiops Selenka, 1867:331; Semper, 1868:90, 250; Théel, 1886a:214.

Holothuria atra Domantay, 1933:61, pl.2, fig.6; ? Macnae and Kalk, 1958: 104. (non H. atra Jaeger, 1833).

Holothuria (Halodeima) pulla Rowe, 1969:138 (passim); Clark and Rowe, 1971:176 (dist.).

Diagnosis: See Selenka, 1867:326.

Southern African records: ? Moçambique (Bell, 1884); ?M(26/32,33/i) (Macnae and Kalk, 1958, as H. atra).

Material examined: None.

Local distribution: Moçambique only, as far south as Inhaca Island. Map: 5.

General distribution: Tropical Indo-West Pacific, recorded from E. Africa, E. Indies, Phillipine and S. Pacific Islands.

Remarks: Selenka (1867) separated this species from the well known H. (H.) atra on the bases of its broad calcareous ring, the smallness of the tables, the large size of the rosettes (0,05mm) and the presence of cuvierian tubules.

Cherbonnier (1952b) and Domantay (1953) are amongst the more recent workers who have had the opportunity to examine both species but no reliable reference could be found on the live colouration of H.(H.) pulla. Domantay records this as dark chestnut red, almost black at a distance, and that of H.(H.) atra as purplish black. However, he remarks that both exude a purplish fluid in the preservative but while H.(H.) atra is stated to be blackish in the preservative, H.(H.) pulla is said to become light brown. As a point of interest the present material of H.(H.) atra, which has been in alcohol for over 10 years, is greyish brown to white. Hence not much significance can be attached on colouration to separate the species.

Cherbonnier's (1952b) illustration of the calcareous ring and tables of H.(H.) atra resemble those of the holotype of H.(H.) pulla and the same is true for the size of tables in the present specimens of H.(H.) atra. Hence, even the calcareous ring and tables do not offer satisfactory characters.

It, therefore, appears that the presence or absence of cuvierian tubules is our only reliable guide. However, Théel (1886a) commented on the doubtful significance of cuvierian tubules to separate both species. Despite this the writer emphasises the importance of this feature in separating the two forms of H. (Semperothuria) cinerascens which, if proved to be allopatric, can be considered as subspecies. However, the sympatry of H.(H.) pulla and H.(H.) atra suggests that they are true species. Since they occupy the same niche they cannot even be considered as ecological varieties.

Macnae and Kalk's (1958) comment on H. atra from Inhaca Island emitting cuvierian tubules possibly refers either to H.(H.) pulla or to H.(M.) leucospilota.

Subgenus Lessonothuria Deichmann (restricted herein)

Holothuria (partim) Selenka, 1867; Ludwig, 1875; Cherbonnier, 1955.

Lessonothuria Deichmann, 1958:295.

Holothuria (Lessonothuria) (partim) Rowe, 1969:149; Clark and Rowe, 1971:199.

Type species: Holothuria pardalis Selenka, 1867 (designated Deichmann, 1958:295).

Remarks: The subgenus Lessonothuria is here restricted to include only those species with smooth to slightly knobbed pseudobuttons and with table rims turned up to give to the table a "cup and saucer" appearance in lateral view. Hence, of the six species included in this subgenus by Rowe (1969), H. arguinensis Koehler and Vaney and H. poli delle Chiaje, with smooth to rugose buttons and straight-rimmed tables, do not belong here and are referred to the new subgenus Roweothuria. Of the remaining four species only the two well known but frequently confused H.(L.) pardalis and H.(L.) insignis Ludwig occur in southern Africa. A third species H.(L.) tuberculata is herein described as new, while H. cumulus H.L. Clark is, following Rowe, also referred to this subgenus.

Holothuria (Lessonothuria) insignis Ludwig
(Fig.47 a-i)

Holothuria insignis Ludwig, 1875:106, pl.7, fig.28; Lampert, 1885:61; Théel, 1886a:226; Ludwig, 1888:807 (partim).

Holothuria pardalis var. insignis Sluiter, 1889:106.

Holothuria pardalis H.L. Clark, 1923 (non Selenka, 1867):423.

Holothuria (Holothuria) pardalis Panning, 1935, (V):3, text-fig. 106 (partim).

Holothuria (Lessonothuria) insignis Rowe, 1969:149 (passim); Clark and Rowe, 1971:176 (dist.), 194 (note).

Diagnosis: See Ludwig, 1875:106.

Previous southern African record: Natal or Moçambique (as H. pardalis by H.L. Clark, 1923).

Material examined: N(30/30/i, 29/30/i, 29/31/S), 0-6m, 8 spec.

Description: Largest specimen 92mm long. Colour in life mottled greyish with paired series of dark blotches. Cuvierian tubules present. Table discs (fig. 47a & b) with up to 10 marginal holes. Pseudobuttons (fig. 47c) rarely feintly knobbed. Dorsal podia with elongate rods, perforated at ends (fig. 47f); ventral podia with shorter rods (fig. 47e) and elongate plates with jagged margins (fig. 47d).

table disc diam.: 0,033-0,093mm; spire height: 0,025-0,058mm

pseudobutton length: 0,03-0,115mm.

Local distribution: Natal and ? Moçambique. Map: 6.

General distribution: Throughout the Indo-West Pacific region but frequently confused with H.(L.) pardalis. Not known from Hawaii.

Habitat: In sand, under rock or between sandstone slabs.

Remarks: H. pardalis reported by H.L. Clark (1923) from either Moçambique or Natal proved, on re-examination, to be definitely referable to H.(L.) insignis and so is also the H. pardalis described by Thandar (1971: M.Sc. thesis, unpublished) from Isipingo Beach (Natal). Although the form of the body and the life colouration of the original Isipingo specimen and the more recent material from Natal are identical, in the former there is a clear distinction between papillae and pedicels. Although both forms lack special anal papillae, the anus of the original Isipingo specimen is bordered by naked skin. Since all specimens are sympatric with an identical complement of spicules, the differences are

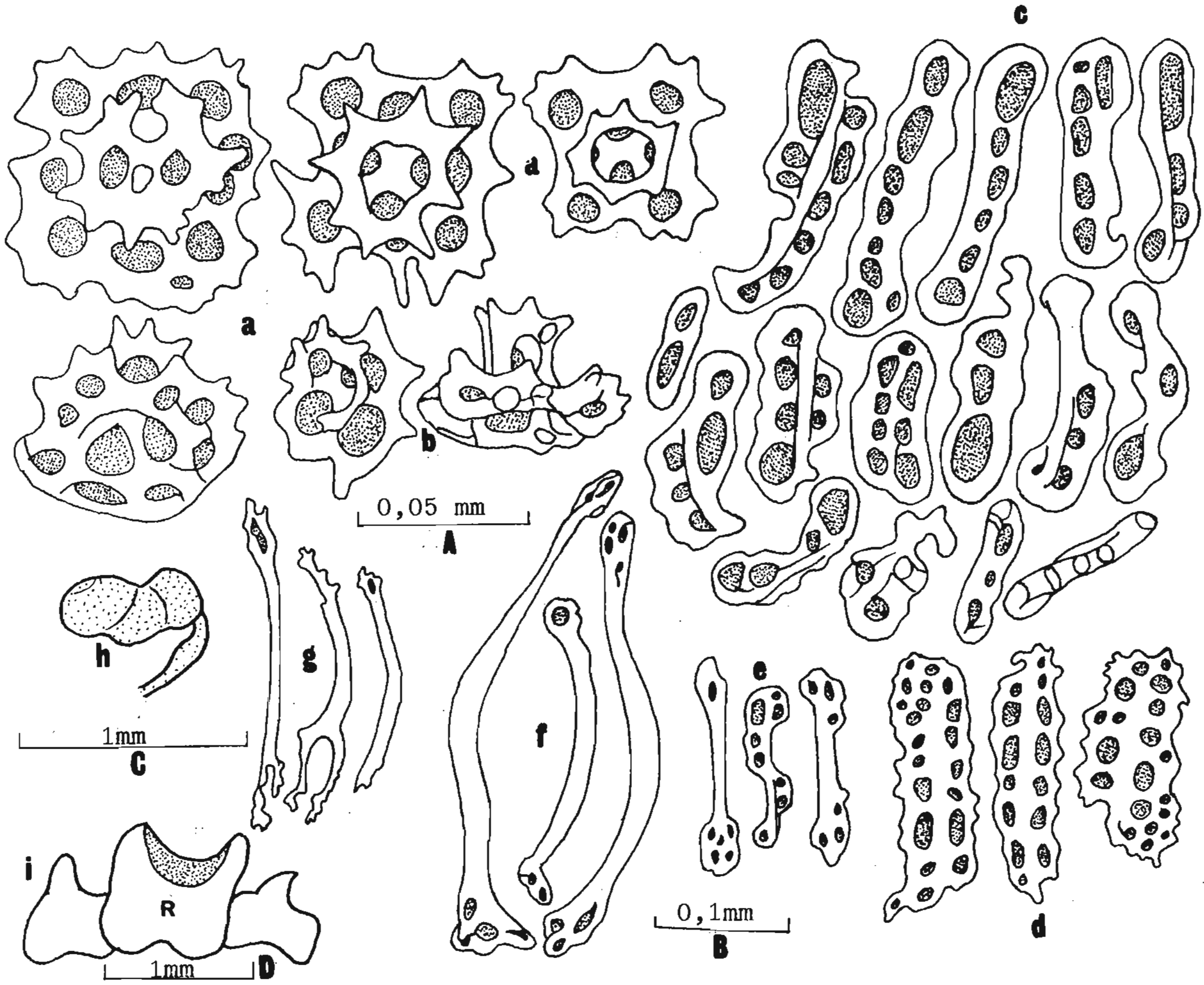


Fig. 47. Holothuria (Lessonothuria) insignis Ludwig. Isipingo.

a. Tables from dorsal body wall.

b. Tables from ventral body wall.

c. Pseudobuttons from dorsal body wall.

d. Plates from around pedicel end plates.

e. Pedicel rods.

f. Papillae rods.

g. Tentacular rods.

h. Madreporite.

i. Part of calcareous ring.

(a-c Scale A; d-g Scale B; h Scale C; i Scale D) clearly individual or ecological variations. A point of some interest is that the original Isipingo specimen came from between sandstone slabs containing little sand while the others were collected beneath stones, more or less embedded in sand. This might speak in favour of ecological variations.

In its spicules and the absence of special anal papillae this species is distinct from H.(L.) pardalis as maintained by Heding (1934) and supported by Rowe (in Clark and Rowe, 1971). H. lineata Ludwig has similar pedicel plates but, since in other respects it strongly resembles H.(L.) pardalis, it is perhaps correctly treated as a synonym of the latter species. Since it is intermediate between the two it might represent a hybrid.

Holothuria (Lessonothuria) pardalis Selenka

(Fig.48 a-h)

Holothuria pardalis Selenka, 1867:336, pl.19, fig.85; Semper, 1868:87, 248,278, pl.30, fig.31; Lampert, 1885:62, fig.28; Thēel, 1886a:224; Ludwig, 1888:807 (partim); Fisher, 1907:664, pl.69, fig.1; Pearson, 1913:78, pl.11, fig.17 (partim); (non H.L. Clark, 1923:423 = H. insignis); Kalk, 1958:212; Day, 1974b:94.

Holothuria lineata Ludwig, 1875:29, pl.7, fig.42; Lampert, 1885:63, fig.26; Thēel, 1886a:225; Pearson, 1910a:179.

Holothuria peregrina Ludwig, 1875:29, pl.7, fig.30.

Holothuria subditiva Selenka, 1867:338, pl.19, fig.87.

Holothuria tenuicornis Helfer, 1913:434.

Labidodemas punctulatum Haacke, 1880:47.

Holothuria (Holothuria) pardalis Panning, 1935(V):3; fig.106 (partim).

Lessonothuria pardalis Deichmann, 1958:296, pl.2, figs. 1-17.

Holothuria (Lessonothuria) pardalis Rowe, 1969:149, fig.15; Clark and Rowe, 1971:176 (dist.), pl.28, fig.11; Rowe and Doty, 1977:233, fig. 4e.

Diagnosis: See Selenka, 1867:336; Fisher, 1907:664.

Previous southern African records: M(26/32,33; 23/35/i, 10/40/i).

Material examined: M(26/32,33/i, 23/35/i), 7 spec.

Description: Maximum length 76mm. Colour brown, speckled with black and white. Tentacles minute. Anal papillae and cuvierian organ present. Radial plates of calcareous ring (fig. 48h) only 1mm high. Body wall thin (1,5mm). Table discs (fig. 48a & b) with up to 11 marginal holes. Pseudobuttons (fig. 48c) often twisted.

table disc diam.: 0,04-0,075mm; spire height: 0,02-0,048mm

pseudobutton length: 0,03-0,07mm.

Local distribution: Moçambique only, 0-18m. Map: 6.

General distribution: Tropical Indo-Pacific.

Habitat: Sand, mud and coral.

Remarks: This is apparently a very variable species and according to both Pearson (1903) and Deichmann (1958) the numerous variations cannot be separated. However, despite the lumping together of the different species, there may be some justification in keeping at least some forms apart, as was recently accomplished with H.(L.) insignis, by considering the form and maximum size of the individuals, the nature of the podia, the presence or absence of cuvierian tubules, the form of the podial spicules and the relative dimensions of the body wall spicules. For a study of this nature representative specimens from different parts of the world are required and access to type material. Hence it is beyond the scope of this monograph.

Although H. lineata Ludwig and H. peregrina Ludwig are perhaps correctly treated as synonyms of H. pardalis due to similar spicules and the absence, in at least the former, of cuvierian tubules, H. subditiva, according to Selenka (1867), is characterised by cuvierian

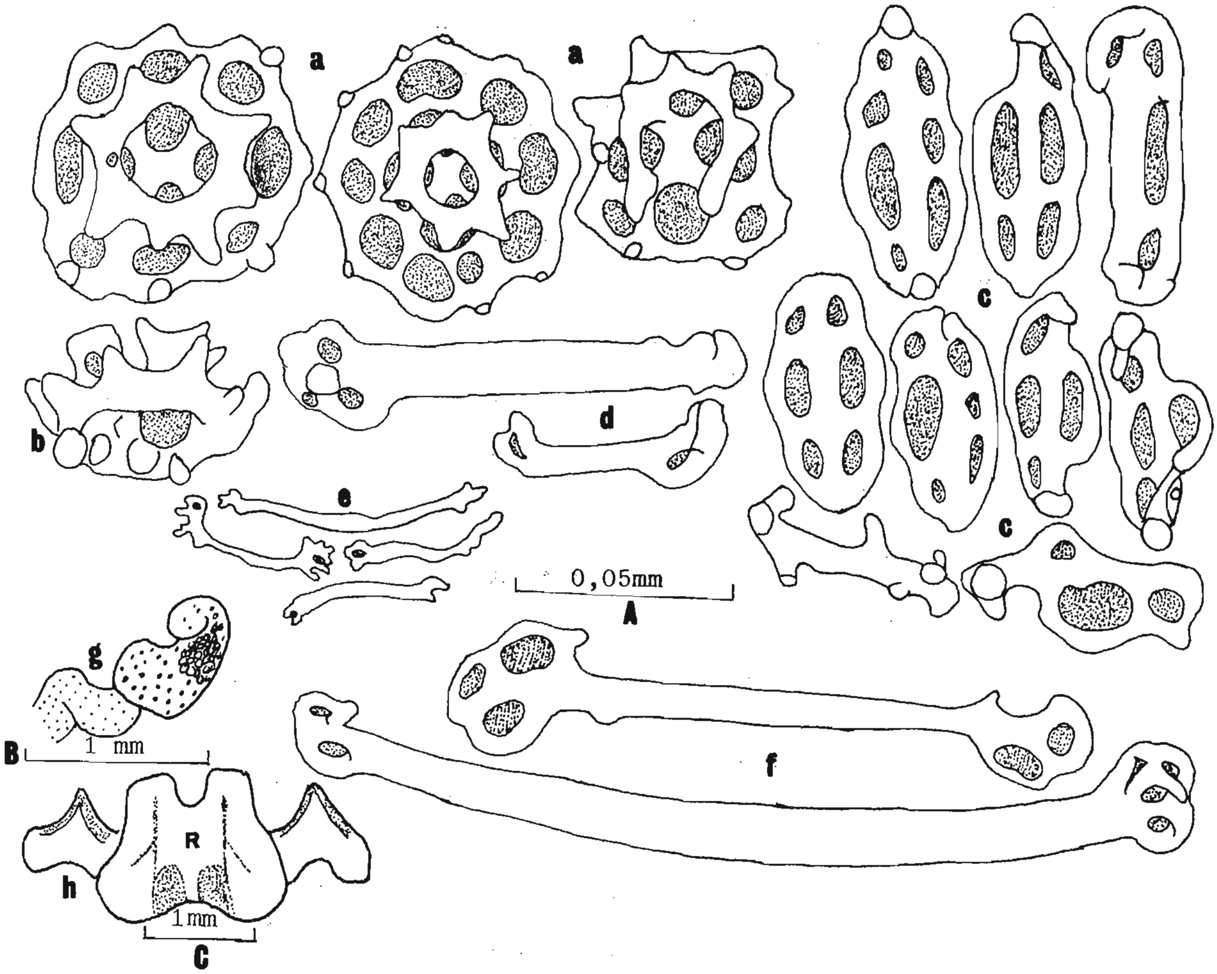


Fig. 48. Holothuria (Lessonothuria) pardalis Selenka. Inhaca.

a. Tables from dorsal body wall.

b. Same from side.

c. Pseudobuttons from dorsal body wall.

d. Papillae rods.

e. Tentacular rods.

f. Pedicel rods.

g. Madreporite.

h. Part of calcareous ring.

(a-f Scale A; g Scale B; h Scale C).

tubules and very small tentacles. The southern African specimens are hence closer to Selenka's _H. subditiva_ than to his _H. pardalis_. In fact their table discs are much smaller than the 0,085mm reported for _H. pardalis_ by both Selenka (1867) and Fisher (1907). Hence there may be some justification in reviving _H. subditiva_.

Holothuria (Lessonothuria) tuberculata sp. nov.

(Fig.49 a-j)

Holothuria (Lessonothuria) verrucosa Cherbonnier, 1980:637, fig.12 (A-O), (non _H. verrucosa_ Selenka, 1867).

Diagnosis: Cylindrical, vermiform species, holotype 145mm long. Podia in the form of conical papillae (situated on warts) dorsally and pedicels ventrally. Tentacles 20, no distinct collar around mouth; anal papillae present. Body wall thick, leathery. Polian vesicles one or two, stone canal single. Table discs spinose to smooth with 8-10 marginal holes; spire of moderate height terminating in 7-12 teeth. Pseudobuttons mostly irregular, often twisted and/or knobbed or with holes developed only on one side. Pedicels with end plates and other surrounding elongate plates with two series of holes.

table disc diam.: 0,035-0,085mm; spire height 0,02-0,05mm; pseudobutton length: 0,02-0,09mm; length of pedicel plates: 0,13-0,22mm.

Etymology: The name _tuberculata_ is derived from tuberculum (L.) meaning small hump with reference to the wart-like prominences of the body wall.

Material examined: Holotype, Natal Mus; Pietermaritzburg; Isipingo, N(29/30/i), rock pool, under stone, 24 IV 1978, K.S. Ganga.

Description: Specimen cylindrical, 145mm in length, 29mm in breadth in mid-body, tapering gradually at both ends. Dorsal and ventral surfaces clearly differentiated but not delimited; dorsal surface, in life, a variegated brown with numerous dark specks, ventral surface lighter. Podia differentiated into papillae, situated on tiny warts, and pedicels, latter not forming a crowded series but with some indication of their arrangement into three distinct bands, at least posteriorly; pedicels short, thin, cylindrical with yellow discs; papillae with reduced discs. Other minute warts with aggregated spicules also present. Mouth ventral; collar inconspicuous. Tentacles 20, short, with yellowish crowns. Anus terminal; anal papillae long, tapering. Body wall tough, leathery, rough to the touch and about 3mm thick.

Calcareous ring (fig. 49j) small, well calcified, similar in form to Holothuria pardalis but radial plates 2,5mm high. Tentacular ampullae extremely short. Polian vesicle single, long, tubular, extending to about a third of body length from anterior end. Stone canal single, short, straight and free; madreporite elongate, slightly calcified (Fig. 49i). Cuvierian organ developed as a spongy mass, probably an aborted or expended structure.

Spicules:

Spicules of body wall tables and pseudobuttons, larger ventrally. Tables (fig. 49a-d) usually incomplete; complete tables with usually a spinose disc with 8-10 marginal holes and a moderate spire termi= nating in a perforated ring of 7-12 unequal teeth. Pseudobuttons (fig. 49f) mostly irregular, often twisted and/or knobbed or with holes developed only on one side, regular buttons with 3-4 pairs of holes. Anal integument with few elongate, symmetrical pseudobuttons with seven pairs of holes (fig. 49e) and tables with smooth undulating rims.

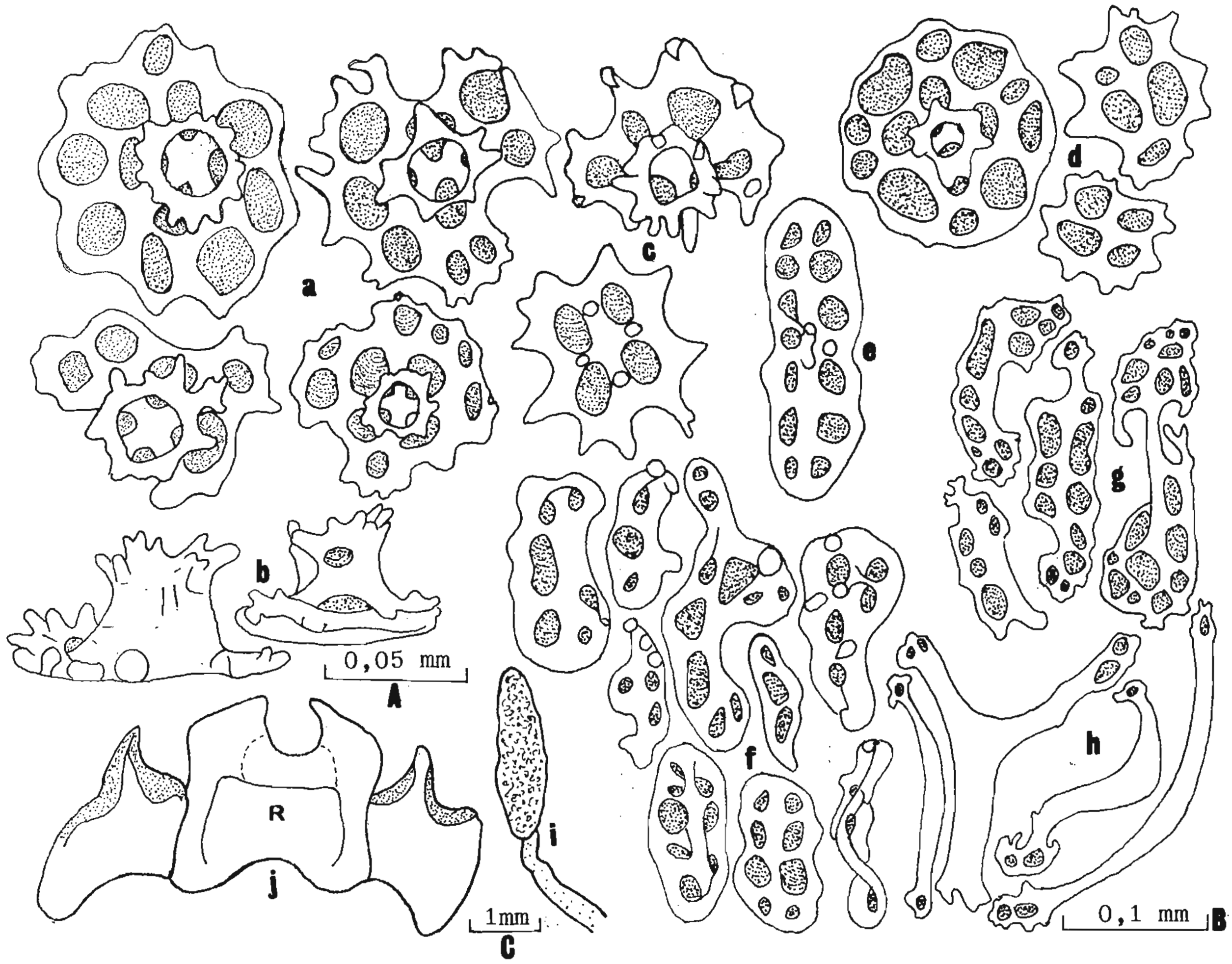


Fig. 49. Holothuria (Lessonothuria) tuberculata sp. nov. Holotype.

a. Tables from dorsal body wall.

b. Same from side.

c. Reduced tables from dorsal body wall.

d. Tables from ventral body wall.

e. Button from anal region.

f. Pseudobuttons from dorsal body wall.

g. Pedicel plates.

h. Rods from anal papillae.

i. Madreporite.

j. Part of calcareous ring.

(a-f Scale A; g & h Scale B; i & j Scale C).

Pedicels with large end plates and other surrounding elongate plates with two series of large holes (fig. 49g). Dorsal and anal papillae without end plates but with curved, elongate rods, expanded and perforated at ends and sometimes bearing a third arm (fig. 49h). Tentacles with minute rods, smooth or slightly rough at ends.

Distribution: Natal and East Caledonia.

Habitat: Rock pool, in sand.

Remarks: Although this single specimen comes very close to *H. pardalis* in its spicules, judging from its size, body form, colouration, presence of distinct warts on the dorsum, distribution and differentiation of podia, general texture and thickness of body wall, and maximum size of the spicules, referring it to *H. pardalis* is inadmissable. Because of the presence of warts on the dorsum and the form of the spicules the writer was at first inclined to consider this form as conspecific with *H. verrucosa* Selenka. However, the latter species is well characterised by its large size (about 230mm) and numerous tentacles (about 30), stone canals and polian vesicles. The specimen thus appears intermediate between *H. pardalis* and *H. verrucosa* and not close to any other species within the *Lessonothuria* group.

H. verrucosa, described by Cherbonnier (1980), from New Caledonia has only 20 tentacles, two polian vesicles and a single stone canal. Hence it is also not identical to Selenka's species. In fact in its size (165mm), colouration, conical papillae, spicules and the presence of some tables with undulating rims, it appears identical to *H.(L.) tuberculata*. Hence it is here regarded as a synonym of the new species.

Holothuria (? Lessonothuria) cumulus H.L. Clark

Holothuria cumulus H.L. Clark, 1921:176, pl.38, figs. 14-18; Macnae and Kalk, 1958:130; 1962:112; Kalk, 1959:22. Clark and Rowe, 1971 (dist.).
Holothuria (Holothuria) cumulus Panning, 1935 (V):94, text-fig. 81.
Holothuria (? Lessonothuria) cumulus Rowe, 1969:166 (passim).

Diagnosis: See H.L. Clark, 1921:176; Panning, 1935:94.

Southern African records: M(26/32,33/s, 12-15/40/i).

Material examined: None.

Local distribution: Moçambique only. Map: 6.

General distribution: Northern Australia and Moçambique.

Habitat: In sand on the infralittoral fringe.

Remarks: This species, originally described from N. Australia, was reported from Inhaca Island, Moçambique, by Kalk (1959) and Macnae and Kalk (1958, 1962), upon identification of some material by Dr. Cherbonnier. Its subgeneric position is uncertain since its tables with smooth discs and exceptionally thorny crowns are not diagnostic of the Lessonothuria group. The size of the tables and the nature of the table discs and crowns are reminiscent of H. (Thymiosycia) truncata Lampert, recently re-described by Cherbonnier (1974), while the buttons are somewhat like those of H.(T.) arenicola Brandt. The species may therefore belong in Thymiosycia but lack of material prevents a positive conclusion.

Subgenus Mertensiothuria Deichmann, 1958

Mertensiothuria Deichmann, 1958:296.

Holothuria (Mertensiothuria) Rowe, 1969:148 (synonymy); Clark and Rowe, 1971:199.

Diagnosis: See Rowe, 1969:148.

Type species: Stichopus leucospilota Brandt, 1835 (designated Deichmann, 1958:297).

Remarks: The subgenus Mertensiothuria is represented in southern Africa by three well known species, of which H.(M.) leucospilota and H.(M.) pervicax extend into Natal. Both these species are present in the collections. H. fuscocinerea, not yet known to extend further south than Querimba, is not represented.

Holothuria (Mertensiothuria) fuscocinerea Jaeger

Holothuria fusco-cinerea Jaeger, 1833:22; Semper, 1868:88, pl.27, pl.30: fig.22; Théel, 1886a:221; Pearson, 1913:74, pl.10, fig.15 (partim).

Holothuria curiosa Ludwig, 1875:34, pl.7, fig.29; Théel, 1886a:181, 220, pl.8, fig.9; Pearson, 1910a:177 (non H. curiosa ? Deichmann, 1948 = ?Neostichopus grammatus (H.L. Clark, 1923)).

Holothuria (Holothuria) curiosa Panning, 1935 (V):4, text-fig.107.

Holothuria pleuricuriosa Deichmann, 1937:166, text-fig.1 (11-20).

Holothuria pseudozacae Cherbonnier, 1951:23, pl.6, figs. 1-19, 21.

Mertensiothuria fuscocinerea Deichmann, 1958:300, pl.3, figs. 13-23.

Holothuria (Mertensiothuria) fuscocinerea Rowe, 1969:149 (passim); Clark and Rowe, 1971:176 (dist.).

Diagnosis: See Jaeger, 1833:2; Deichmann, 1958:300.

Material examined: None.

Local distribution: Known only from Matemo Island, Querimba Archipelago.

General distribution: Tropical Indo-Pacific but not yet reported from Islands of the West Indian Ocean (excluding Mascarene Islands), Middle East, India, Pakistan and Hawaii.

Remarks: This species is well characterised by its life colouration and reduced tables and buttons, the latter resembling branched rosette-like rods similar to those of H. (M.) pervicax. The only certain record of its occurrence in southern Africa is that of Pearson (1910a), based on a single specimen identified as H. curiosa Ludwig, a species long relegated to the synonymy of H. fuscocinerea by Panning (1935).

Holothuria curiosa (?) Ludwig from Port Elizabeth, listed by Deichmann (1948) from the UCT Survey records is herein referred, with some doubt, to the synonymy of Neostichopus grammatus (H.L. Clark). (See Remarks under this species).

Holothuria (Mertensiothuria) leucospilota (Brandt)

(Fig. 50 a-e)

Stichopus (Gymnochirota) leucospilota Brandt, 1835:51.

Holothuria leucospilota Lampert, 1885:71; H.L. Clark, 1920:149; 1923:423; Stephenson, 1948:265; Deichmann, 1948:337, pl.17, figs.28-33; Cherbonnier, 1952a:471 (passim); Macnae and Kalk, 1958:107; 1962:112; Kalk, 1958:205, 238; 1959:5,22; Branch and Branch, 1981:248, figs.

Holothuria vagabunda Selenka, 1867:334, pl.19, figs. 75-76; Semper, 1868: 61,248, pl.21, pl.31: fig.1, pl.34: figs.15-17, pl.35: figs.9,10; pl.38: figs.5-8; Théel, 1886a:180,281, pl.7, fig.16; Pearson, 1910a:181; Eyre and Stephenson, 1938:43; Stephenson, 1944:277,306,348.

Holothuria (Holothuria) vagabunda Panning, 1934 (III):67, text-fig.45 (refs.).

Holothuria fusco-rubra Théel, 1886a:182, pl.7, fig.2.

Holothuria lamperti Ludwig, 1887:6; Panning, 1934 (III):72.

Holothuria oxurropa Sluiter, 1887:190, pl.1, figs.3-5.

? Holothuria (Microthele) lubrica Sluiter, 1894 (according to Rowe, 1969).

Holothuria infesta Sluiter, 1901:20, pl.6, fig.4.

Holothuria curiosa var. fusco-rubra Panning, 1935 (V):5.

Holothuria homoea H.L. Clark, 1938:533, text-fig.56.

Holothuria gelatinosa Heding, 1939:213-216, figs.1-17.

Mertensiothuria leucospilota Deichmann, 1958:297, pl.3, figs.1-9 (refs.).

Holothuria (Mertensiothuria) leucospilota Rowe, 1969:148, fig.14; Clark and Rowe, 1971:176 (dist.), pl.28, fig.19.

Diagnosis: See Deichmann, 1948:337.

Previous southern African records: M(26/32,33/i; 12 to 15/40/i); N(29/30/i; 29/31/i, 30/31/i).

Material examined: T(32/29/i), N(30/30/i,s to 29/31/i; 28/32/i), M(26/32,33/i), 13 spec.

Description: Size range 80-200mm. Anus encircled by papillae in groups of 2-4 per radius, in some specimens other special papillae between these and anus. Only two individuals with a papillose collar around mouth. Table spires (fig. 50a) usually terminating in eight teeth, more or less symmetrically arranged, either of the same length or alternating ones longer, more teeth usually resulting from bifurca= tion of some original ones. Although both spinose and smooth discs usually occur in the same specimen, discs may be only spinose in one specimen and smooth in another. Occasionally table spires with two cross-bars and buttons with serrate margins.

Local distribution: Moçambique to Transkei. Map: 6.

General distribution: Throughout the tropical Indo-West Pacific region and beyond to the East Pacific and the Panamic region.

Habitat: Usually lying exposed in rock pools at LWS.

Remarks: This species has long been known from Moçambique (Semper, 1868) but its first record from Natal is that of H.L. Clark (1923) based on a few individuals from Durban. Pearson (1910a) records the dimensions of the table discs and buttons in his 80mm specimen from

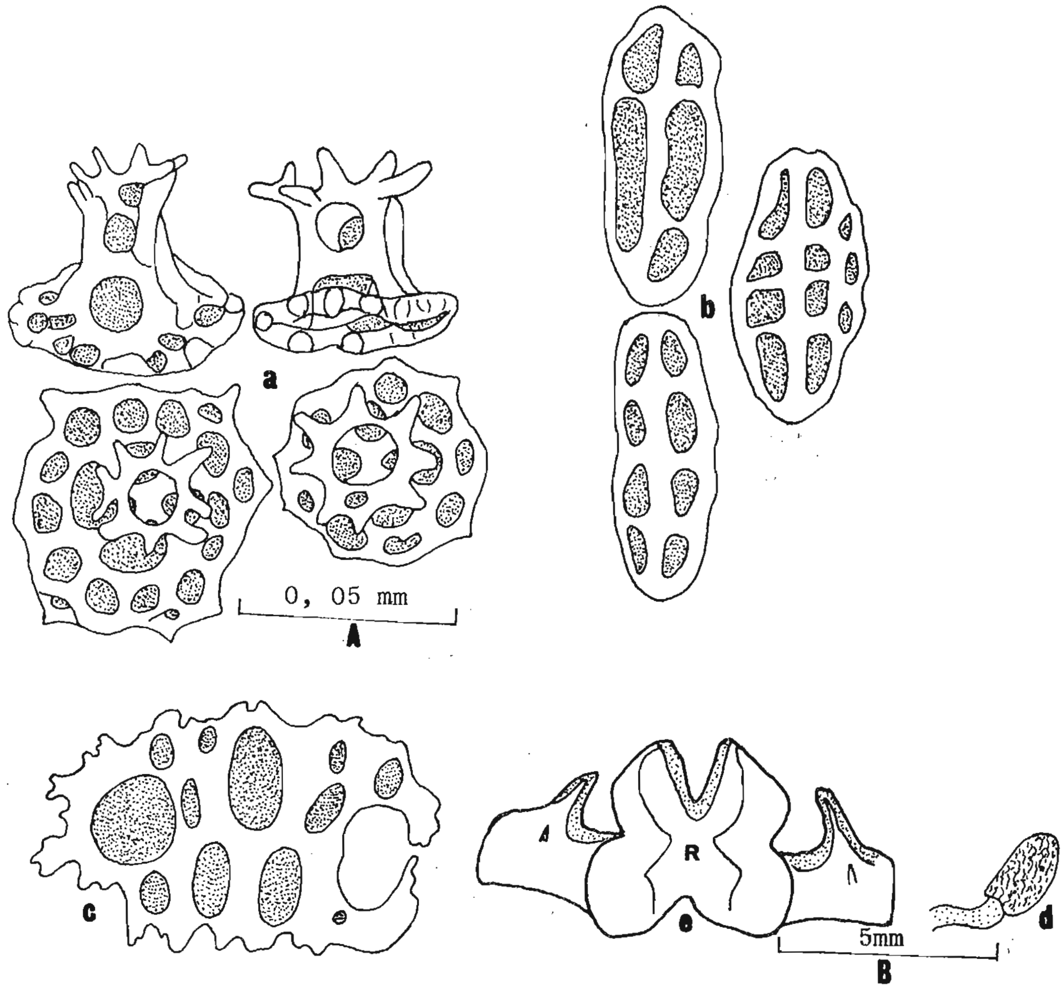


Fig. 50. Holothuria (Mertensiothuria) leucospilota Brandt.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Pedicel plate.

d. Madreporite.

e. Part of calcareous ring.

(a-c Scale A; d & e Scale B).

Querimba as 0,044mm. This figure corresponds with the size of the smaller tables and buttons in an 80mm specimen from the present material.

Although the species is uniformly black in life, in alcohol, it rapidly changes first to reddish and then to brown or even yellow. It is perhaps because of this, the presence of smooth table discs in some specimens and the gradual degeneration of the spicules with age that the species has a long list of synonyms.

Holothuria (Mertensiothuria) pervicax Selenka

(Fig.51 a-i)

Holothuria pervicax Selenka, 1867:327, pl.18, fig.54; Semper, 1868:92, 251, 279; Lampert, 1885:62, fig.25; Théel 1886a:213; Fisher, 1907:655, pl.68, fig.2; Macnae and Kalk, 1958:42,43,99,107,117,130; 1962:104,108, 112,115; Kalk, 1959:4,22; Branch and Branch, 1981:248.

Holothuria fusco-cinerea Lampert, 1885:64; Pearson, 1913:74, pl.10, fig.15 (partim); (non Jaeger, 1833).

Holothuria fusco-cinerea var. pervicax Bedford, 1898:837, pl.52, figs. 2a, b.

Holothuria mammiculata Haacke, 1880:46, 48.

Holothuria depressa Ludwig, 1875:32, pl.7, fig.44.

Holothuria doffleinii Augustin, 1908:4, text-figs.1-3, pl.1, fig.1; Pearson, 1910a:177, fig.17.

Holothuria (Holothuria) curiosa var. pervicax Panning, 1935 (V):6 (refs.).

Mertensiothuria pervicax Deichmann, 1958:297 (in key).

Holothuria (Mertensiothuria) pervicax Rowe, 1969:149 (passim); Clark and Rowe, 1971:176 (dist.); Rowe and Doty, 1977:234, figs. 4g, 8c.

Diagnosis: See Selenka, 1867:327; Fisher, 1907:655.

Previous southern African record: M(26/32,33; 10-15/40/i,s).

Material examined: N(29/30/i), 6 spec.

Description: Size range 35-163mm; colour typical (see key) with 5-8 dark transverse bands on dorsum. Table discs with up to 15 marginal holes; spires often deformed (fig. 51a,b & d). Dorsal buttons small, drastically reduced (fig. 51c), rarely complete. Ventral buttons longer with up to 7 pairs of holes (fig. 51e). Anal buttons minute with reduced holes. Pedicel deposits up to 0,1mm long, with 1-4 series of holes (fig. 51f). Spicules of juvenile (35mm) identical to those of adults except for some minute "buttons" of the Neostichopus type.

table disc diameter: 0,024-0,068mm; spire height: 0,02-07mm; dorsal button length: 0,015-0,042mm; ventral button length: 0,037-0,09mm.

Local distribution: Moçambique to Natal as far south as Isipingo. Map: 6.

General distribution: Throughout the tropical Indo-Pacific but not yet reported from the Persian Gulf, W. India, Pakistan, China and Japan.

Habitat: Intertidal pool, in sand.

Remarks: This species has been recorded from Moçambique by Macnae and Kalk (1958) and Kalk (1959) but this is its first record from Natal. *H. doffleini* Ludwig, recorded by Pearson (1910a) from Querimba, is, according to Panning (1935), conspecific with *H. pervicax*. Rowe and Doty (1977) report the warts and papillae to be red in their specimens from Guam. In all the present specimens they are distinctly purple, perhaps indicating geographic variation.

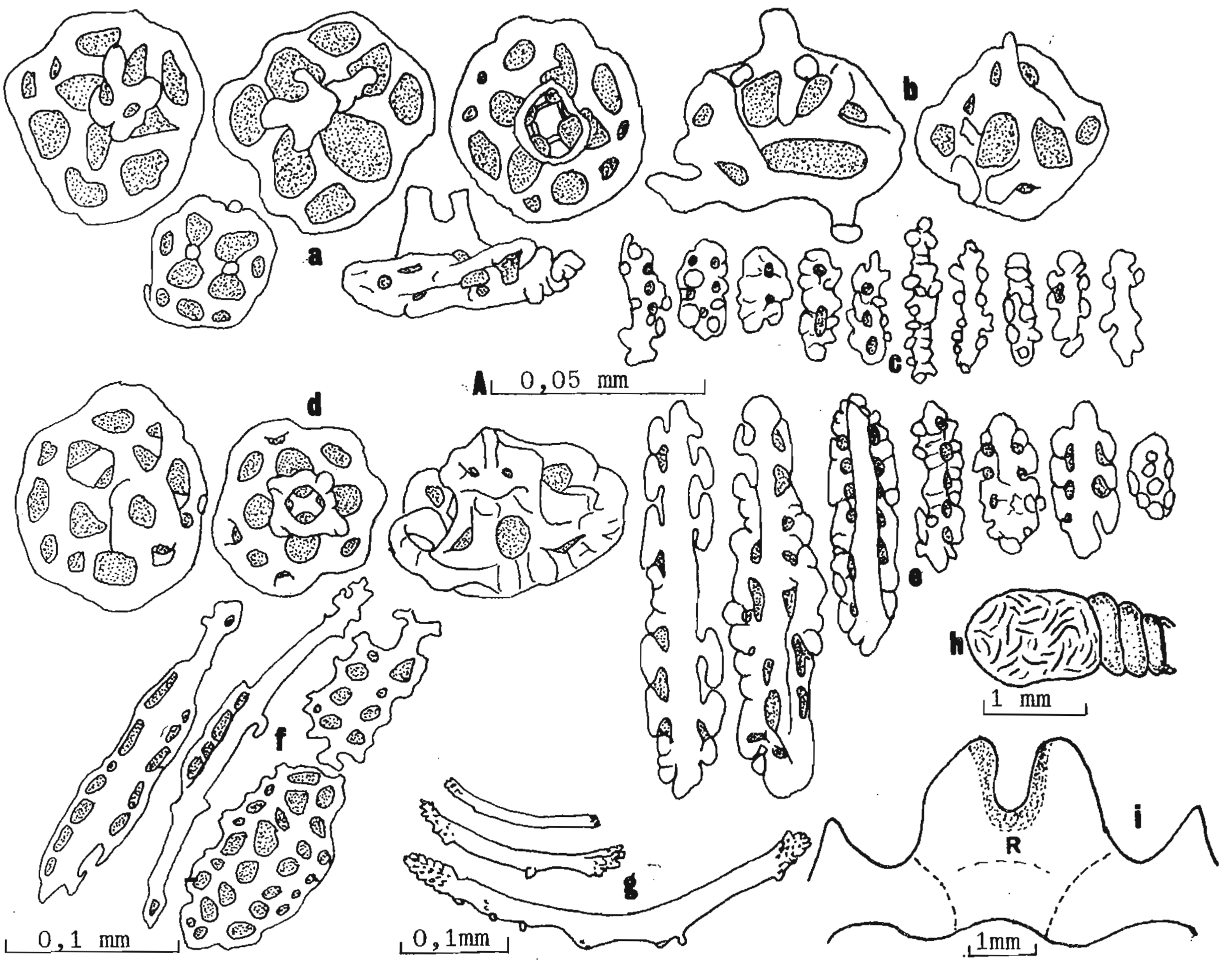


Fig. 51. Holothuria (Mertensiothuria) pervicax Selenka. Isipingo.

a. Tables from dorsal body wall.

b. Deformed tables.

c. Buttons from dorsal body wall.

d. Tables from ventral body wall.

e. Buttons from ventral body wall.

f. Pedicel plates and rods.

g. Tentacular rods.

h. Madreporite.

i. Part of calcareous ring.

(a-e Scale A).

Subgenus Metriatyla Rowe, 1969

Holothuria (Metriatyla) Rowe, 1969:160 (synonymy); Clark and Rowe, 1971:200.

Diagnosis: See Rowe, 1969:160.

Type species: Holothuria scabra Jaeger, 1833 (designated by Rowe, 1969:160).

Remarks: This subgenus is represented in southern Africa by H.(M.) scabra Jaeger, H.(M.) albiventer Semper and H.(M.) martensii Semper. The latter two species have not yet been taken south of Querimba and hence are not truely southern African. H. scabra is present in the material from both Moçambique and Natal.

Holothuria (Metriatyla) albiventer Semper

Holothuria albiventer Semper, 1868:83,248,277, pl.30, fig.14; Lampert, 1885:75, fig.10; Thëel, 1886a:236; Pearson, 1910a:175; 1913:93, pl.14, fig.26.

Holothuria (Holothuria) albiventer Panning, 1934 (IV):103, text-fig.96.

Holothuria (Metriatyla) albiventer Rowe, 1969:160 (passim); Clark and Rowe, 1971:176 (dist.), pl.28, fig.2.

Diagnosis: See Semper, 1868:83; Panning, 1934:103.

Southern African records: M(10 to 12/40/i,s), 0-40m.

Material examined: None.

Local distribution: Known only from Querimba Archipelago, N. Moçambique.

General distribution: Indo-West Pacific, from N. Australia, East Indies, Phillipines and Maldive Islands to East Africa and the Red Sea.

Habitat: Sand, mud, shell, coral.

Remarks: This species was recorded from Moçambique by Pearson (1910a) who examined several specimens from various northern localities. It is well characterised by the nature of its podia, a long stone canal and solid tables with several pillars and numerous teeth. Pearson records the spicule dimensions of his Moçambique material as follows: disc diam. 0,055mm; spire height 0,037mm; button length 0,0295mm. The corresponding dimensions of the spicules of his Maldive specimens described in 1913 are 0,09mm; 0,085mm; 0,04mm. If Pearson's identification and measurements are correct the differences in the size of the spicules suggest considerable geographical variation between the East Indian and West Indian Ocean forms.

Holothuria (Metriatyla) martensii Semper

Holothuria martensii Semper, 1868:86,277, pl.30, fig.16; Théel, 1886a:177, 237, pl.7, fig.12, pl.16, fig.2; Pearson, 1910a:179; 1913:92, pl.14, fig.25.

Holothuria (Holothuria) martensii Panning, 1934 (IV):96, text-fig.85.

Holothuria (Metriatyla) martensii Rowe, 1969:160 (passim); Clark and Rowe, 1971:178 (dist.).

Holothuria subverta H.L. Clark:1921.

Diagnosis: See Semper, 1868:86; Panning, 1934:96.

Southern African record: M(10/40/i).

Material examined: None.

Local distribution: Known only from Querimba Archipelago, N. Moçambique.

General distribution: Indo-West Pacific, from N. Australia, East Indies and Phillipine Islands, through Maldive Islands to East Africa.

Remarks: This is another well characterised species long known from Moçambique (Pearson, 1910a). The dimensions of the spicules given in the key are taken from Théel (1886a). The spicules of Pearson's 43mm and 30mm specimens are smaller, possibly reflecting age or geographical variation.

Holothuria (Metriatyla) scabra Jaeger

(Fig.52 a-f)

Holothuria scabra Jaeger, 1833:23; Selenka, 1867:341; Semper, 1868:79, 247,277; Lampert, 1885:69; Théel, 1886a:234; Pearson, 1910a: 180; 1913:87, pl.13, fig.22; H.L. Clark, 1923:424; Cherbonnier, 1952a: 504, pl.50, figs.1-20; Day and Morgans, 1956:274,278; Kalk, 1954:113; 1959:22; Macnae and Kalk, 1958:43,99,101,107,117,130; 1962:105,112,119; Day, 1974a:192; 1974b:54,59,94; Frienkel and Hepburn, 1975 (phys.); Branch and Branch, 1981:248, figs.

Holothuria (Holothuria) scabra Panning, 1935 (III):80, text-fig.66 (refs.).

Holothuria (Metriatyla) scabra Rowe, 1969:160, text-fig.20; Clark and Rowe, 1971:178 (dist.), pl.28, fig.15.

Holothuria tigris Selenka, 1867:333, pl.19, figs. 70-72.

Holothuria cadelli Bell, 1887:144, pl.16, fig.7.

Holothuria gallensis Pearson, 1903:203, pl.3, figs.46-50.

Diagnosis: See Jaeger, 1833:23; Cherbonnier, 1952a:504.

Previous southern African records: N(30/31/S); M(26/32,33/i, 23/35/i, 10-15/40/i);

Material examined: N(29/31/i); M(26/32,33/i; 23/35/i-22/35/i); 14 spec.

Local distribution: Moçambique to Natal as far south as Durban, 0-33m. Map: 7.

General distribution: Tropical Indo-West Pacific but not yet reported from the islands of the West Indian Ocean, Persian Gulf, W. India, Pakistan and Hawaii.

Habitat: Sand, mud and shell.

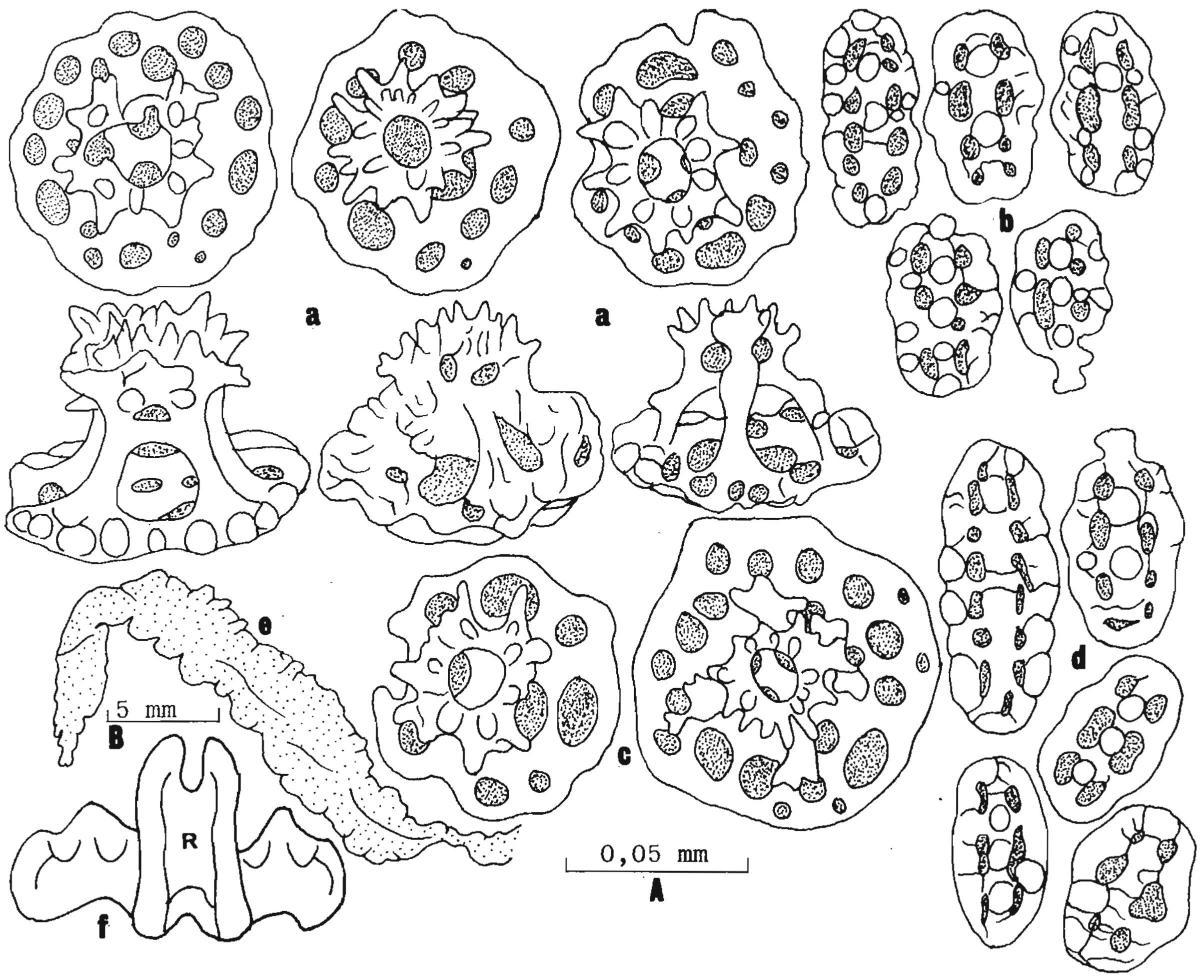


Fig. 52. Holothuria (Metriatyla) scabra Jaeger. Vilanculos (juvenile).

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Tables from ventral body wall.

d. Buttons from ventral body wall.

e. Madreporite.

f. Part of calcareous ring.

(a-d Scale A; e & f Scale B)

Remarks: This species is long known from Moçambique (Pearson, 1910a; H.L. Clark, 1923). The present material ranges in size from 45-210mm, most specimens being only twice as long as broad. A collar is absent or indistinct in all specimens except one from Inhaca Island. Anal papillae or periproctal membrane may be present or absent. Although cuvierian tubules were absent in all dissected specimens they are reported to be present in some forms of the species. This character can be used to separate geographically isolated populations.

Subgenus Microthele Brandt, 1835

Holothuria (Microthele) Brandt, 1835:54; Rowe, 1969:162 (synonymy), Clark and Rowe, 1971:201 (non Microthele Deichmann, 1958:287 = Platyperona Rowe, 1969:143).

Diagnosis: See Rowe, 1969:143.

Type species: Holothuria (Microthele) maculata Brandt, 1835:54 = Muelleria nobilis Selenka, 1867 (according to Rowe, 1969) (designated Clark and Rowe, 1967a:100).

Remarks: This subgenus includes only its well known type species.

Holothuria (Microthele) nobilis (Selenka)

Holothuria (Microthele) maculata Brandt, 1835:54 (junior homonym).
Mülleria nobilis Selenka, 1867:313, pl.17, figs.13-15; Semper, 1868:76, 276, pl.37, figs. 9-12; Thēel, 1886a:198.

Actinopyga nobilis Fisher, 1907:647.

Holothuria (Microthele) nobilis Panning, 1929(I):131, text-fig.15 (refs.); Rowe, 1969:162, text-fig.21; Clark and Rowe, 1971:178 (dist.), pl.27, fig.10, pl.28, fig.20; Rowe and Doty, 1977:231, figs.3f, 7d.

Holothuria whitmaei Bell, 1887:532, pl.45, fig.4.

Holothuria (Holothuria) whitmaei Panning, 1935 (V):12, text-fig.121.

Mülleria hadra Selenka, 1867:313, pl.17, fig.16.

Diagnosis: See Rowe, 1969:162.

Southern African record: ? Natal.

Material examined: None.

General distribution: Indo-West Pacific but not yet reported from the Middle East and the Indian subcontinent.

Remarks: This species grows to a very large size (up to 600mm) and is said to be white or black speckled with white (Rowe and Doty, 1977). It has been reported to occur in Natal by James and Pearse (1969) but this record is doubtful. However, it has long been known from Zanzibar and can be expected to reach at least the northern limits of Moçambique or even beyond into Natal as it is quite common in other parts of the Indo-West Pacific region.

Subgenus Platyperona Rowe, 1969

Microthele Deichmann, 1958 (non H. microthele Brandt, 1835).
Holothuria (Platyperona) Rowe, 1969:143 (synonymy); Clark and Rowe, 1971:199.

Diagnosis: See Rowe, 1969:143.

Type species: Holothuria difficilis Semper, 1868 (designated Rowe, 1969:143).

Remarks: This subgenus includes three species of which only the type species occurs in the Indo-Pacific region.

<u>Holothuria (Platyperona) difficilis</u> Semper

(Fig.53 a-g)

<u>Holothuria difficilis</u> Semper, 1868:92, pl.30, fig.1; Théel, 1886a: 219; H.L. Clark, 1923:422; Deichmann, 1937:164; Kalk, 1959:5,22.

<u>Holothuria (Microthele) difficilis</u> Panning, 1929 (I):136, text-fig.20 (refs.).

<u>Microthele difficilis</u> Deichmann, 1958:288, pl.1, figs.6-9.

<u>Actinopyga difficilis</u> Deichmann, 1922:206, figs. 6 and 9.

<u>Actinopyga bedfordi</u> Deichmann, 1922:212.

<u>Holothuria (Microthele) bedfordi</u> Panning, 1929 (I):136, text-fig. 19.

<u>Mülleria excellens</u> Ludwig, 1875:98, pl.7, fig.32.

<u>Holothuria (Microthele) excellens</u> Panning, 1929 (I):136, text-fig.19.

<u>Holothuria frequentiamensis</u> H.L. Clark, 1902:530; Panning, 1934 (III):73.

<u>Holothuria altimensis</u> H.L. Clark, 1921:172, pl.37, figs.20-29; Panning, 1935 (IV):94, text-fig.82.

<u>Holothuria (Platyperona) difficilis</u> Rowe, 1969:143, text-fig. 12; Clark and Rowe, 1971:178 (dist.), pl.27, fig. 9; Rowe and Doty, 1977:232, fig. 3h.

<u>Diagnosis</u>: See Semper, 1868:92; Deichmann, 1958:288.

<u>Previous southern African record</u>: M(12 to 15/40/i).

<u>Material examined</u>: N(29/31/i,s), 4 spec.

<u>Description</u>: Specimens small, largest 60mm long. Colour in life olive green to brown with yellowish green warts and black papillae, one specimen with bright yellow patch on ventral surface near anus. Collar and anal papillae present or absent. Cuvierian tubules present.

Table discs with eight marginal holes (fig. 53a). Dorsal buttons (fig. 53b) with 3-4 pairs of holes; ventral buttons (fig. 53c) larger, with 6-7 pairs of holes, and occasionally an incomplete third series outside main series. Rods and fenestrated plates of papillae (fig. 53d) with uneven margins. Pedicels with rods and plates (fig. 53e), the latter with somewhat serrate margins and numerous small holes in 2-4 series. All podial spicules also with characteristic median optical discontinuity.

table disc diam.: 0,03-0,08mm; spire height: 0,048-0,085mm; button length: 0,08-0,14mm.

Local distribution: Known only from around Durban and Moçambique.

Map: 7.

General distribution: Throughout the tropical Indo-Pacific but not yet reported from the Arabian and Indian peninsulas.

Habitat: Under stones, in sand.

Remarks: The three species included in this subgenus are well keyed by Deichmann (1958) who also provides useful information regarding the colouration, presence or absence of cuvierian tubules and the synonyms of *H. difficilis*. However, she does not mention the occurrence of any green forms of *H. difficilis* but this colouration is recorded for the consubgeneric *H. parvula* from the West Atlantic region.

Since *H. difficilis* is so widely distributed, several variations, probably at subspecific level, must be expected between such geographically isolated populations as those of the East Pacific, West Pacific and West Indian Oceans. This is perhaps the chief reason for the application of so many names to a species which is otherwise well characterised. It is only recently that many of these names were relegated to the synonymy of *H. difficilis* (see Rowe, 1969). However, some of the names may have to be reinstated, at least at sub=specific level, as our knowledge of the intraspecific variations increases. The colouration, presence or absence of warts and cuvierian tubules, the maximum size of mature individuals, the relative dimensions of spicules and the type of podial deposits may offer satisfactory characters. H.L. Clark's (1923) and Kalk's (1959) are the only published records of this species from southern Africa based on specimens from Moçambique.

These records were overlooked by Clark and Rowe (1971) who do not report the species from the east African coast. The presence of the species at Durban increases its range further south.

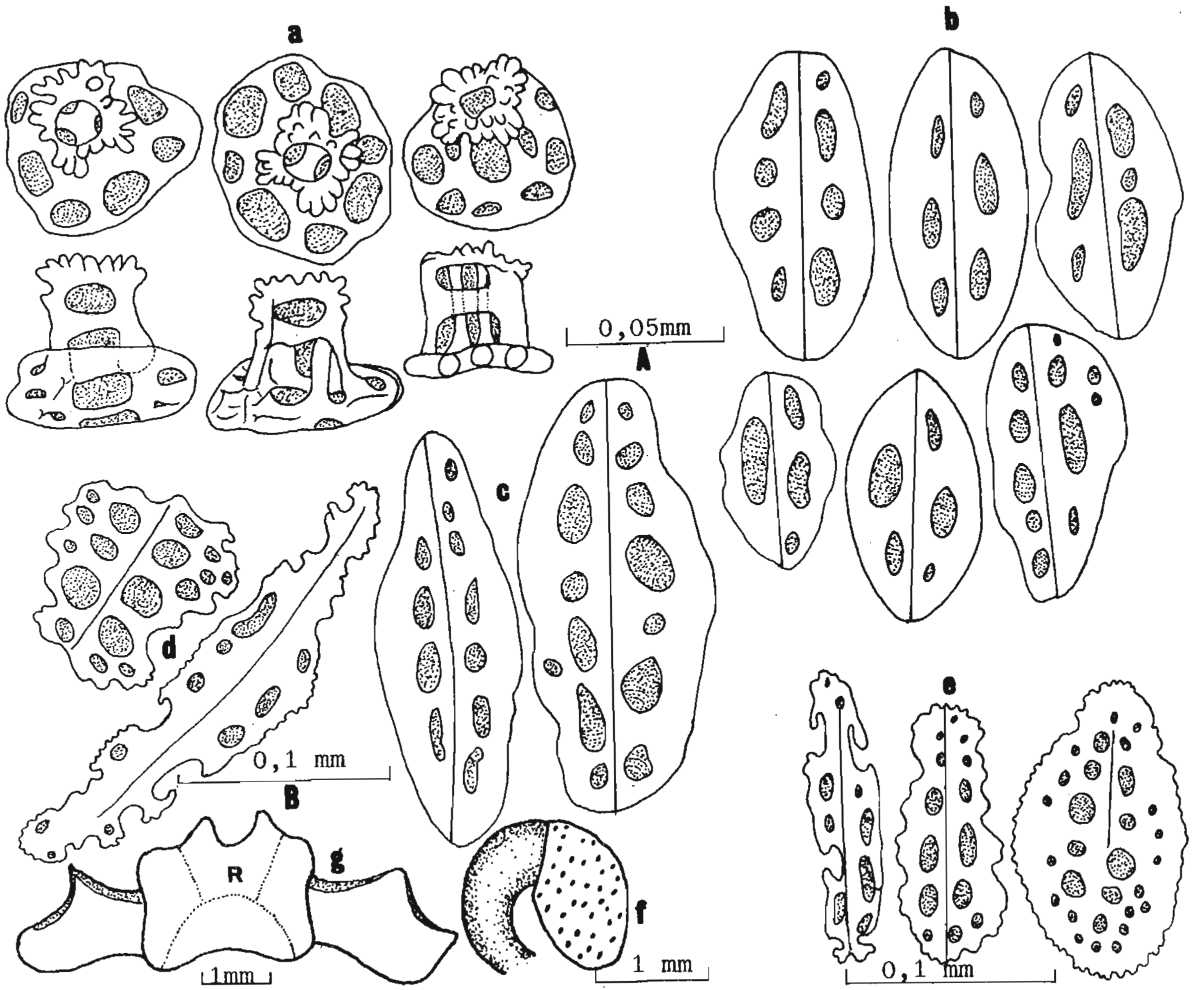


Fig. 53. <u>Holothuria (Platyperona) difficilis</u> Semper. Durban.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Buttons from ventral body wall.

d. Papillae rod and plate.

e. Pedicel plates.

f. Madreporite.

g. Part of calcareous ring.

(a-c Scale A; d Scale B)

Subgenus *Roweothuria* Subgen. nov.

Diagnosis: Cylindrical to subcylindrical species up to 220mm long. Tentacles 19-20. Podia either in the form of papillae only or papillae dorsally and pedicels ventrally, the former scattered or in rows, either on warts or warts absent; pedicels, if present, crowded but not forming a definite "sole". Body wall tough, thick, 9-20mm. Calcareous ring stout, radial plates with a median ampullary notch and twice as high as interradial plates, the latter with an anterior, tooth-like median projection. Spicules consisting of tables and buttons. Tables clumsy, the spire low to moderate, terminating in a ring or cluster of teeth, often giving the appearance of a maltese cross when viewed from above; disc well developed and spinose, rarely some discs smooth, rim flat, not turned up to give "cup and saucer" appearance to table in lateral view. Buttons rosette-like, smooth to rugose or spinose, with 1-6 pairs of holes, some= times incomplete or twisted or with rudimentary central knobs.

Type species: *Holothuria arguinensis* Koehler and Vaney, 1905.

Other species included: *Holothuria poli* delle Chiaje, 1823.
Holothuria vemae sp. nov.

Etymology: This subgenus is named after Dr. F.W.E. Rowe of the Australian Museum in recognition of his contributions to our understanding of the family Holothuriidae. The gender is feminine.

Remarks: Although Deichmann (1958) considered her genus Lessonothuria to be monotypic, including only H. pardalis Selenka, Rowe (1969) included in it five other species, viz. H. insignis Ludwig, H. verrucosa Selenka, H. glandifera Cherbonnier, H. poli delle Chiaje and H. arguinensis Koehler and Vaney, and lowered the rank of the genus to that of sub=genus. The designation of H. pardalis as the type species of Lessonothuria restricts the subgenus to include only those species with pseudobuttons and with table discs with spinose rims that are turned up to give a "cup and saucer" appearance to the tables in lateral view. Therefore, while H. insignis, H. verrucosa and H. glandifera clearly belong with H. pardalis in Lessonothuria, H. arguinensis and H. poli with spinose, flat-rimmed discs and with smooth to rugose or spinose, rosette-like buttons do not. Rowe (pers. comm.) states that he might have erred in including the latter two species in Lessonothuria. These species are now removed from Lessonothuria and classified in the new subgenus Roweothuria diagnosed above. Another Atlantic species, H. vemae, here described as new, and with spicules similar to those of H. arguinensis, is included as a third species in the new subgenus.

H. arguinensis from West Africa is chosen as the type species of Roweothuria since it occupies more or less an intermediate position between the northern H. poli and the southern H. vemae, not only geographically but also because it shares with H. poli the wart-like papillae and with H. vemae the rugose nature of the buttons.

In the provisional evolutionary tree of the subgenera of Holothuria proposed by Rowe (1969:125, fig.1), the new subgenus falls between Halodeima and Vaneyothuria, possibly occupying an intermediate position either between Acanthotrapeza and Lessonothuria on the one hand or between Lessonothuria and Vaneyothuria on the other. The former case necessitates a change from spiny rosettes to rugose or spiny rosette-like buttons with the concomitant flattening of the table rims. Although the former is possible, as far as the latter is concerned, it would imply that raised rims developed twice in evolution, first in Acanthotrapeza and then again in Lessonothuria. No model as yet exists for this. In the second case, i.e. placing Roweothuria between Lessonothuria and Vaneyothuria, would necessitate the development of rugose buttons from smooth deposits, a new development of the maltese cross and a flattening of the table rims. If Rowe (1969) has placed Vaneyothuria in its correct evolutionary position it provides a model for rim flattening and a new development of the maltese cross while the subgenera Holothuria, Selenkothuria and Semperothuria provide good models for the independent development of rugose deposits at different times in evolution. Perhaps Lessonothuria with its smooth, often twisted, pseudo=buttons and tables without maltese crosses does not fall in the direct line leading to Vaneyothuria although its tables are obvious derivatives of the Acanthotrapeza type. If either one of the two views expressed above is accepted then H. poli with its smooth pseudobuttons or rosette-like buttons provides a good intermediate in the line leading from Roweothuria to Lessonothuria or vice versa.

Holothuria (Roweothuria) vemae sp. nov.
(Fig.54 a-h)

Holothuria ? n. sp. Berrisford, 1969:391-393.

Diagnosis: Cylindrical to subcylindrical species, up to 165mm long. Colour, in alcohol, brownish, lighter ventrally. Mouth ventral, surrounded by a non-papillose collar; special anal papillae absent. Tentacles 19-20. Podia strongly retractile, papilliform, scattered but never crowded, warts absent. Skin leathery, 9mm thick. Tables clumsy, more numerous than buttons dorsally, fewer ventrally; disc spinose, spire low to moderate, ending in a cluster of teeth, often appearing as a maltese cross when viewed from above. Buttons rosette-like, dorsal buttons with smooth to slightly spinose margins; ventral buttons more numerous, smooth to rugose, often knobbed and with 1-6 pairs of holes, the latter often occluded.

table disc diam.: 0,05-0,09mm; spire height: 0,04-0,085mm; button length: 0,03-0,085mm.

Etymology: This species is named after its type locality.

Material examined: Holotype, SAM A 22717, Vema Seamount (31°38'S, 8°20'E), 724km off west coast of South Africa, G.R. Grindley, ? XI 1966, scuba diving or air lift dredge, 42-61m.

Paratypes, SAM A22717, 2 spec, A22718, 1 spec, same data as holotype; A22713, Vema Seamount, Ship 'Justin', ? IX 1965, 1 spec.

Description: Holotype well preserved but eviscerated, length 165mm, breadth 30mm in midbody. Form subcylindrical with dorsal surface well arched and ventral only a little flattened, no clear distinction between both surfaces. Colour, in alcohol, dull brown dorsally, lighter ventrally, (one paratype light greyish brown dorsally, yellowish white ventrally).

Anterior and posterior ends of holotype respectively 22mm and 18mm in diameter, both terminating bluntly. Mouth ventral; collar non-papillose, whitish, 2,75mm wide dorsally, 2mm ventrally. Tentacles 19 in holotype, 20 in one paratype, in others withdrawn; crowns dis= tinctly peltate, slightly darker than ventral surface. Anus terminal, no special anal papillae but non-retracted terminal podia of each ambulacrum appear as paired anal papillae. Podia minute, papilliform, scattered, with no apparent crowding or differentiation, strongly retractile, with reduced sucking discs; warts and creeping "sole" absent. Body wall thick (9mm), tough, leathery and rough to the touch.

Gut, gonad, left respiratory tree and rete mirabile not intact but atypical of genus. Calcareous ring (fig. 54g) fairly high, ventrally attached; radial plates roughly rhomboid, almost as wide as high, with rounded sides, a deep anterior notch and a slight posterior indentation; interradial plates almost as wide as radial plates but only half as high, with a straight posterior margin and an anterior, tooth-like, median projection. Tentacular ampullae thin, long, tapering to a pigmented tip, occasionally bifid distally.

Haemal and water vascular rings low, situated far behind calcareous ring, at about third the body length from anterior end. Polian vesicles two, one saccular to elongate, extending to half the body length, the other minute attached at base of longer vesicle, both arising from water ring slightly to left of dorsal mesentery. Stone canals seven (four on left and three on right of dorsal mesentery), short, thin, slightly convoluted; madreporites (fig. 54f) remarkably small. Oesophagus long (34mm), stomach elongate. Respiratory trees with common stem, right tree reaching level of calcareous ring, both trees profusely branched with short lateral extensions. Cloaca wide, elongate. Gonadal tubules branched, proximal ends narrow. Longitudinal muscles thick, typical.

Spicules:

Spicules of dorsal and ventral body wall dissimilar, dorsally numerous tables and few smooth to slightly rugose buttons, ventrally fewer tables but buttons more densely packed and rugose. Dorsal tables (fig. 54a & b) with mostly spinose, sometimes smooth, flat discs, perforated by four large and usually four or more (up to 12) slightly smaller, marginal holes; spire of moderate height, of four pillars, a single cross bar and terminating in a ring of well developed but often unequal teeth, frequently appearing as a maltese cross when viewed from above; disc sometimes reduced to four central holes but spire still intact with teeth extending beyond margin of disc. Dorsal buttons (fig. 54c) rosette-like with smooth, wavy or distinctly spinose margins and 2-4 pairs of unequal holes and often an unpaired hole at each end; buttons occasionally incomplete or slightly twisted, rarely with reduced holes. Ventral tables, well formed or reduced, or crowns dis= torted. Ventral buttons (fig. 54d) more spinose, often with a pair of rudimentary median knobs and with 2-4 pairs of holes, or holes reduced to two. Podia without end plates but those of ventral surface supported by elongate, rugose plates with dentate margins and one or two series of minute holes (fig. 54h). Tentacles with numerous, nearly straight or slightly curved rods (0,05-0,5mm), often with minutely perforated and/or spinulated extremities (fig. 54e).

Distribution: Known only from type locality.

Habitat: Rock.

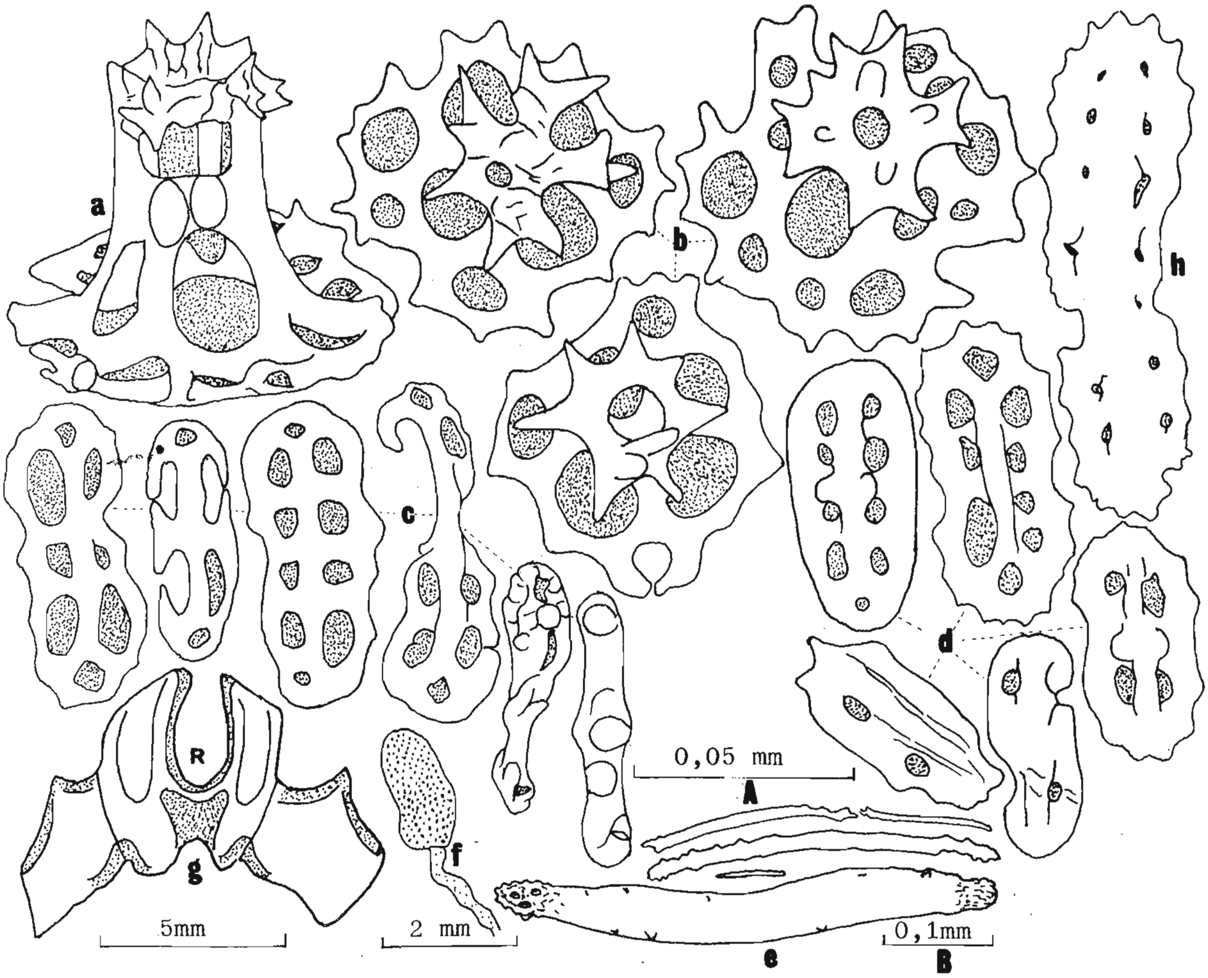


Fig. 54. Holothuria (Roweothuria) vemae subgen. et sp. nov. Holotype.

a. Table from dorsal body wall (side view).

b. Tables from dorsal body wall (from above).

c. Buttons from dorsal body wall.

d. Buttons from ventral body wall.

e. Tentacular rods.

f. Madreporite.

g. Part of calcareous ring.

h. Button from ventral podia.

(a-d & h Scale A, e Scale B)

Remarks: Of the five specimens in hand, three (A22717), including the holotype, are well relaxed but without part of their viscera. The fourth specimen (A22718) is contained in a jar together with the viscera of three other specimens, probably those of A22717. The fifth specimen (A22713), collected a year earlier, is distorted and in a poor state of preservation. The largest specimen of A22717 is chosen as the holotype.

The new species from the South Atlantic appears to be closely related to the type species from the North. It differs in the lack of any differentiation of podia, absence of wart-like prominences, thickness of the body wall (20mm in *H.*(*R.*) *arguinensis*) and in some aspects of the spicules. In *H.*(*R.*) *arguinensis* there is a clear distinction between pedicels and papillae of which the former are crowded and the latter arise from black or white wart-like prominences arranged in about six rows. Although the thickness of the body wall depends on the degree of contraction a difference of 11mm between the two species is quite significant. In *H.*(*R.*) *arguinensis* the dorsal buttons are said to be more rugose and knobs are apparently absent. Although the Mediterranean *H. poli* resembles *H. arguinensis* in the differentiation and distribution of podia it differs from both *H. arguinensis* and *H. vemae* in having buttons that are neither spinose, rugose nor knobbed.

Dr Pawson, who studied the holothurian material collected at Vema Seamount, realised that it represented a new species (see Berrisford, 1969) but did not describe it. Despite this, the writer was at first inclined to consider the material as representing a southern form of *H. arguinensis* (probably a subspecies) but Dr Rowe, to whom slides of the spicules were sent, concurred with Dr Pawson. A new subgenus is here erected on his advice.

Subgenus Selenkothuria Deichmann, 1958

Selenkothuria Deichmann, 1958:314.

Holothuria (Selenkothuria) Rowe, 1969:134 (synonymy); Clark and Rowe, 1971:198.

Diagnosis: See Rowe, 1969:134.

Type species: Holothuria lubrica Selenka, 1867 (designated Deichmann, 1958:314).

Remarks: The seven species contained in this subgenus are well keyed by Deichmann (1958). Of these only H. (S.) parva Lampert and H.(S.) erinaceus Semper occur in southern Africa.

Holothuria (Selenkothuria) erinaceus Semper

(Fig.55 a-e)

Holothuria erinaceus Semper, 1868:91, 250,279, pl.30: fig.24, pl.34: fig.9, pl.35: fig.14, pl.36: fig.11, pl.38: figs.1 and 2; Thēel, 1886a: 206; Kalk, 1959:7,22.

Holothuria erinaceus var. pygmae Semper, 1868:91, pl.30, figs.23, 24; Thēel, 1886a:206.

Holothuria marenzelleri Ludwig, 1883:167; Thēel, 1886a:207; (non Holothuria marenzelleri Ludwig, 1887:2, fig.12 (A-E)= Holothuria theeli Deichmann).

Holothuria andersoni Bell, 1886:28.

Holothuria lubrica var. marenzelleri Mitsukuri, 1912:97.

Holothuria (Holothuria) lubrica var. marenzelleri Panning, 1934 (II):47, text-fig.41.

Holothuria (Holothuria) lubrica var. glaberrima Panning, 1934 (II):47, text-fig.42 (partim).

Selenkothuria erinaceus Deichmann, 1958:314-319 (passim), pl.7, figs. 10-15.

Holothuria (Selenkothuria) erinaceus Rowe, 1969:135 (passim); Clark and Rowe, 1971:178 (dist.), 194(note), pl.28, fig.5.

Diagnosis: See Semper, 1868:91.

Previous southern African record: M(12/40/i to 15/40/i).

Material examined: N(29/30/i), 1 spec.

Local distribution: Known only from S. Natal and N. Moçambique.

Map: 5.

General distribution: Indo-West Pacific but not recorded from Hawaii, W. India, Pakistan, China and Japan.

Habitat: In rock pool, found beneath several specimens of *H. cinerascens*.

Remarks: The first record of this species from southern Africa is that of Kalk (1959), based upon some material from Moçambique Island, identified by Dr Cherbonnier. The single Natal specimen here referred to this species, was formerly described as *H. portovallartensis* by the writer (1971: M.Sc. thesis, unpublished) and sent to Dr. Cherbonnier for confirmation of identification. Dr Cherbonnier merely queried the identification but did not name the species despite that the Moçambique form of *H. erinaceus* was determined by him. However, Dr. Rowe, who also examined the specimen, thinks that its spicules are quite typical of *H.(S.) erinaceus*.

However, it must be pointed out that the spicules of the Natal specimen are quite unlike those illustrated for the species by other workers and approach those of *H.(S.) portovallartensis* illustrated by Caso (1954) and Deichmann (1958), even in their dimension (0,05-0,14mm in the Natal specimen; 0,062-0,155mm in *H. portovallartensis*). Hence, it is probable that, since both *H. parva* and the typical *H. erinaceus* have parallel forms respectively in *H. lubrica* and *H. theeli* from the East Pacific, the Natal form of *H. erinaceus* is the parallel form of *H. portovallartensis* differing in its smaller size and different colouration. Just as the latter species was confused with *H. theeli* on several occasions until it was separated by Caso (1954) so it is likely that what is considered as *H. erinaceus* in the Indo-West Pacific region may represent two species.

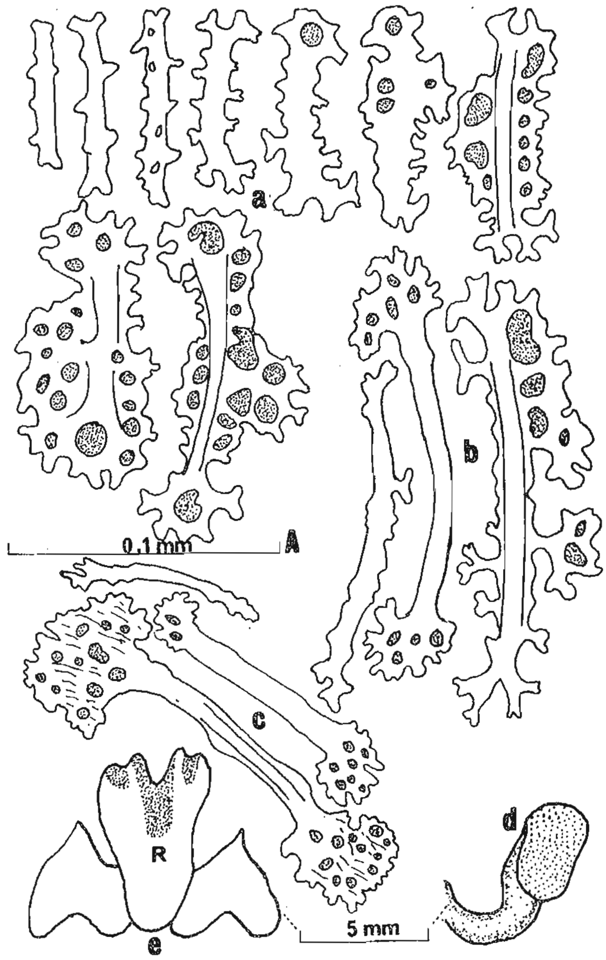


Fig. 55. <u>Holothuria (Selenkothuria) erinaceus</u> Semper. Isipingo.

a. Rods and plates from dorsal body wall (various stages).

b. Papillae rods.

c. Tentacular rods.

d. Madreporite.

e. Part of calcareous ring.

(a-c Scale A)

Clark and Rowe (1971) expressed some doubt as to the occurrence of H. erinaceus on the East African coast. This second record indicates that the species is present but not common.

Holothuria (Selenkothuria) parva Lampert

(Fig.56 a-e)

Holothuria parva Lampert, 1885:246, pl.1, fig.38; Théel, 1886a:264; Koehler and Vaney, 1908:13, pl.1, fig.4; H.L. Clark, 1923:424; Deichmann, 1948:339, pl.17, figs.22-27; Cherbonnier, 1952a:503, pl.49, figs.1-23; Day and Morgans, 1956:276,277; Macnae and Kalk, 1958:41,101,107,130; 1962:112; Kalk, 1959:22; Day, 1974a:192; Branch and Grindley, 1979:169; Branch and Branch, 1981:248, fig.

Holothuria (Holothuria) lubrica var. parva Panning, 1934 (II):45, text-fig.39.

Holothuria lubrica var. parva Mitsukuri, 1912:97.

Halodeima parva Heding, 1940:120.

Selenkothuria parva Deichmann, 1958:315 (passim).

Holothuria (Selenkothuria) parva Rowe, 1969:135 (passim); Clark and Rowe, 1971:178 (dist.).

Holothuria (Selenkothuria) perrieri syn. nov. Thandar, 1977:62, fig.2.

Diagnosis: See Lampert, 1885:246; Deichmann, 1948:339.

Previous southern African records: T(31/29/i), N(31/30/i, 29/31/i,s), M(26/32,33/i; 12-15/40/i).

Material examined: N(31/30/i, 30/30/i, 29/31/i, 29/30/i, 28/32/i), M(26/32,33/i, 23/35/i), 16 spec.

Local distribution: Moçambique to Transkei, as far south as Mngazana Estuary, south of Port St. Johns. Map: 5.

General distribution: West Indian Ocean between the Arabian peninsula and Transkei.

Habitat: Tenaciously attached to rock in the upper littoral zone or amongst mangrove roots,almost buried in sand.

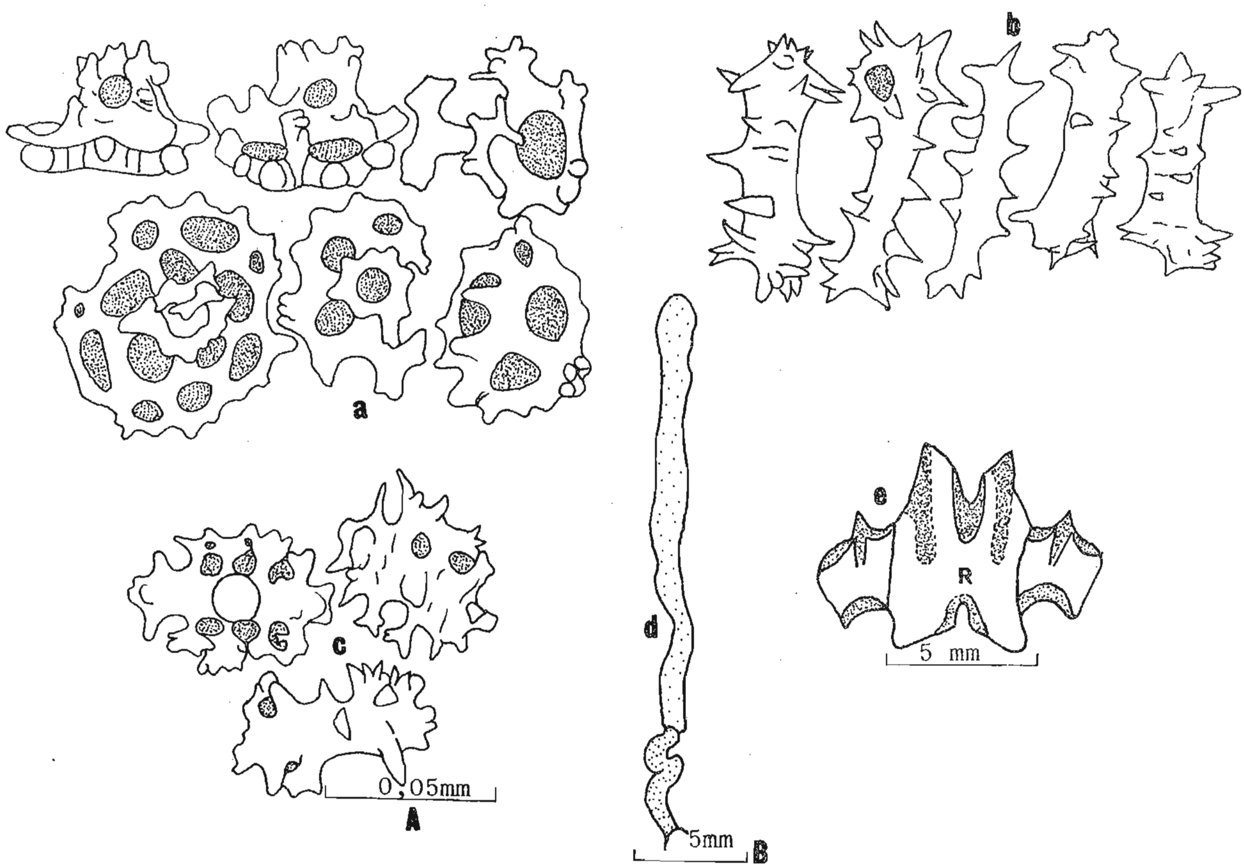


Fig. 56. Holothuria (Selenkothuria) parva Lampert.

Port Edward (W3H).

a. Tables of dorsal body wall from a 19mm specimen.

b. Spinous rods from dorsal body wall of same.

c. Spinous rods from an 80mm specimen.

d. Madreporite.

e. Part of calcareous ring.

(a-c Scale A; d Scale B)

Remarks: In a 19mm specimen from Port Edward (Natal) reduced tables are fairly common. The table discs (0,035-0,09mm) (fig. 56a) are smooth to spinose with 4-8 (16), usually incomplete, marginal holes and a low (0,028-0,05mm), often reduced, spire. The rods (fig. 56b) are elongate (0,05-0,09mm), with one or more perforations. In an 80mm specimen from the same locality tables are absent and the rods frequently shorter (0,035-0,075mm), with more perforations (fig. 56c).

Thandar (1977) erred in describing *H.* (*S.*) *perrieri* from Natal, based only on the holotype whose spicules were apparently corroded in the preserving fluid. Its large size (210mm) and sulphur-coloured pedicel discs indicate that it is probably an individual variant of *H. parva* and must now be withdrawn as a junior subjective synonym.

Subgenus *Semperothuria* Deichmann, 1958

Semperothuria Deichmann, 1958:302.

Holothuria (Semperothuria) Rowe, 1969:135 (synonymy); Clark and Rowe, 1971:198.

Diagnosis: See Rowe, 1969:135.

Type species: *Holothuria languens* Selenka, 1867 (designated Deichmann, 1958:303).

Holothuria (Semperothuria) cinerascens (Brandt)

(Fig.57 a-h)

Stichopus (Gymnochirota) cinerascens Brandt, 1835:35.

Stichopus cinerascens Grube, 1840:36; Selenka, 1867:319; Semper, 1868:74,275.

Holothuria cinerascens Ludwig, 1881:597; Fisher, 1907:654, pl.68, fig.1; Pearson, 1913:65, pl.9, fig.10; H.L. Clark, 1923:422; Eyre and Stephenson, 1938:38,43; Stephenson, 1944:277,306,348. Deichmann, 1948:339, pl.17, figs.18-21; Macnae and Kalk, 1958:34,99,107,120,130; Kalk, 1958:198,238; 1959:22; Macnae, 1962:208; Day, 1974a:192; Jackson, 1976:15; Branch and Branch, 1981:248, fig.370.

Holothuria (Holothuria) cinerascens Panning, 1934 (II):37, text-fig.32.

Holothuria pulchella Selenka, 1867:329, pl.18, figs.61-62; Semper, 1868:89, 278; Théel, 1886a:212.

Halodeima cinerascens Cherbonnier, 1951:16, pl.2, figs.15-19.

Holothuria (Semperothuria) cinerascens Rowe, 1969:135 (passim); Clark and Rowe, 1971:178 (dist.), pl.27, fig.12.

Diagnosis: See Deichmann, 1948:339.

Previous southern African records: N(30/30/i, 29/31/i, 27/32/i); M(26/32,33/i, 12-15/40/i).

Material examined: T(32/29/i), N(30/30/i-29/31/i; 28/32/i-27/32/i), M(26/32,33/i, 24/35/i), 85 spec.

Description: Maximum size 250mm. Cuvierian tubules absent. Tables (fig. 57a-c) better developed and numerous in younger individuals. Discs (0,0275-0,0525mm), usually smooth; spire (0,0325-0,055mm) with single cross-bar; rods (fig.54d) (0,09-0,19mm) often branched at extremities.

Local distribution: From Moçambique to Transkei as far south as Port St Johns. Map: 5.

General distribution: Tropical Indo-West Pacific including Hawaii, but not yet recorded from the Persian Gulf and the Indian subcontinent.

Habitat: Common in shallow intertidal pools, usually encrusted with sand grains.

Remarks: Although the polian vesicle and stone canal are usually single as many as 38 polian vesicles and four stone canals can occur in a single individual (Thandar, 1971, M.Sc. thesis, unpublished). A specimen from Jangamo, Moçambique, appears atypical with table discs reduced to the four central holes, the spire often deformed and the rods finely spinulated and occasionally three-armed. The rims of some table discs of another specimen from the same locality are slightly spinose, resembling those illustrated by Cherbonnier (1951).

A search through the available literature indicates that specimens taken from outside Hawaii lack cuvierian tubules. Thandar (op. cit.) drew attention to this and expressed the opinion that the two forms of the species must at least be separated at subspecific level. Since both Selenka (1867) and Cherbonnier (1951) reported the absence of cuvierian tubules in their specimens also from Hawaii (Sandwich Islands), this view cannot be upheld unless in both Selenka's and Cherbonnier's specimens the tubules were lost at capture or preservation. However, in addition to the presence of cuvierian tubules, Fisher (1907), who described the Hawaiian specimens, also reported table discs up to 0,086mm in diameter and rods up to 0,3mm in length. In specimens taken from outside Hawaii the corresponding dimensions of the deposits do not exceed 0,06mm and 0,19mm. It would therefore appear that Fisher's specimens at least do show some geographical variations and it is possible that such variations may be characteristic of all Hawaiian specimens. If this is true both forms of the species, because of their allopatry, can be considered as subspecies. Hence a thorough knowledge of intraspecific variations in the species is urgent.

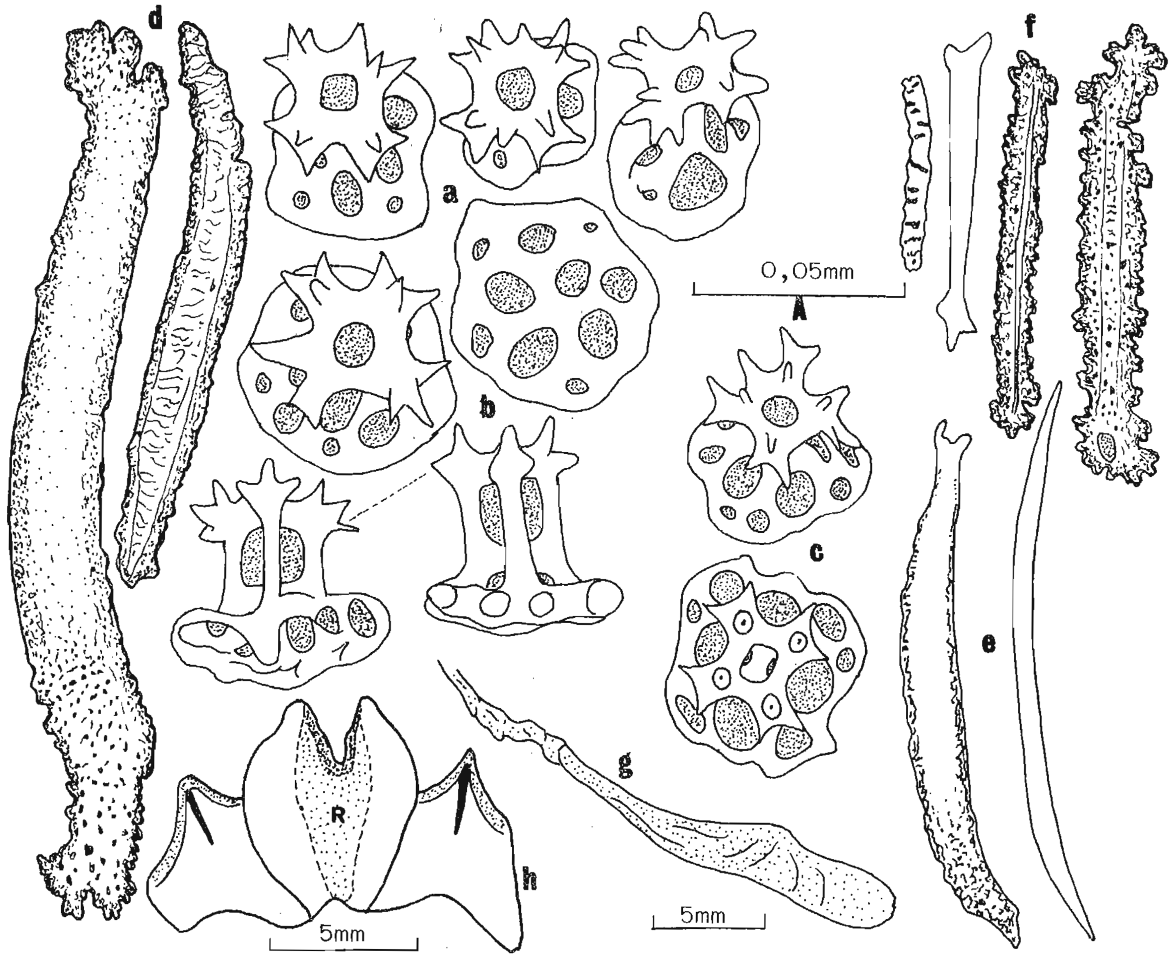


Fig. 57. Holothuria (Semperothuria) cinerascens (Brandt).

a. Tables from dorsal body wall.

b. Tables from ventral body wall.

c. Tables from dorsal body wall of juvenile.

d. Rods from dorsal body wall.

e. Pedicel rods.

f. Tentacular rods.

g. Madreporite.

h. Part of calcareous ring.

(a-f Scale A)

Subgenus Theelothuria Deichmann, 1958

Theelothuria Deichmann, 1958:325.

Holothuria (Theelothuria) Rowe, 1969:157 (synonymy); Clark and Rowe, 1971:200.

Diagnosis: See Rowe, 1969:157.

Type species: Holothuria princeps Selenka, 1867 (designated Deichmann, 1958:325).

Remarks: There has been to date no record of this subgenus from southern Africa. However, two specimens, definitely referable to it, are present in the material from Moçambique. They are here tentatively identified as H.(T.) maculosa Pearson and H.(T.) notabilis Ludwig and briefly described below as they may warrant new species.

Holothuria (Theelothuria) ?maculosa Pearson

(Fig.58 a-n)

Holothuria maculosa Pearson, 1913:53, pl.6, fig.3.

Holothuria (Holothuria) maculosa Panning, 1934(45): 105, text-fig.100.

Holothuria (Theelothuria) maculosa Rowe, 1969:158 (passim); Clark and Rowe, 1971:178 (dist.).

Diagnosis: See Pearson, 1913:53.

Previous southern African record: None.

Material examined: M(26/32,33/i), 1 spec.

Description: Length 59mm. Colour, in alcohol, a mixture of browns, dorsum with eight pairs of dark blotches; whitish areas around bases of podia. Collar not evident; anal papillae in five groups. Podia as scattered pedicels, shorter dorsally, papilliform posteriorly.

Calcareous ring (fig. 58n) high, radial plates with rudimentary posterior bifurcations. Cuvierian tubules present.

Spicules:

Tables few but of three types. Commonest type (fig. 58 a-c) with circular, slightly spinose to smooth discs (0,04-0,075mm) with about eight marginal holes and a low spire (0,02-0,05mm), terminating in a ring of about six blunt teeth, disc and spire frequently reduced (fig. 58d) but rarely rim knobbed or tables modified to hollow fenestrated spheres (fig. 58c). Second type (fig. 52h) rare, disc oblong, up to 0,1mm, with two or three series of holes, smaller marginally. Third type of tables commoner than second and of Mesothuria type (fig. 58 f & g) with a smooth disc (0,06mm), 6-7 large marginal holes and a spire terminating in a compact, often tripartite, cluster of teeth.

Buttons (fig. 58i & j) numerous, knobbed, 0,03-0,06mm, holes 3(-7) pairs, often obliterated, especially ventrally; rarely buttons smooth or modified into fenestrated ellipsoids. Pedicels with end plates and elongate rods (up to 0,15mm) with central and terminal perforations (fig. 58k & l).

Distribution: Sri Lanka and ?Inhaca Is. (Moçambique).

Remarks: From the literature available it appears that this species has not been encountered since its description. The Moçambique specimen differs from the type in the thickness of the body wall and in the absence of spiny spireless tables from the body wall and minute plates ("cups") from the podia. Since it agrees with the type in its size, colouration, distribution of podia, presence of anal papillae, cuvierian tubules, a similar type of calcareous ring, and in the form and size of

Fig. 58. Holothuria (Theelothuria) ?maculosa Pearson. Inhaca.

a. Table from dorsal body wall (side view).

b. Tables from dorsal body wall (from above).

c. Table from ventral body wall (side view).

d. Reduced ventral tables.

e. Fenestrated sphere from ventral body wall.

f. Table with large holes from ventral body wall, Mesothuria type.

g. Same from side.

h. Table with multilocular disc.

i. Buttons from dorsal body wall.

j. Buttons from ventral body wall.

k. Rods from dorsal podia.

l. Rod from ventral podium.

m. Madreporite.

n. Part of calcareous ring.

(a-l Scale A; m & n Scale B)

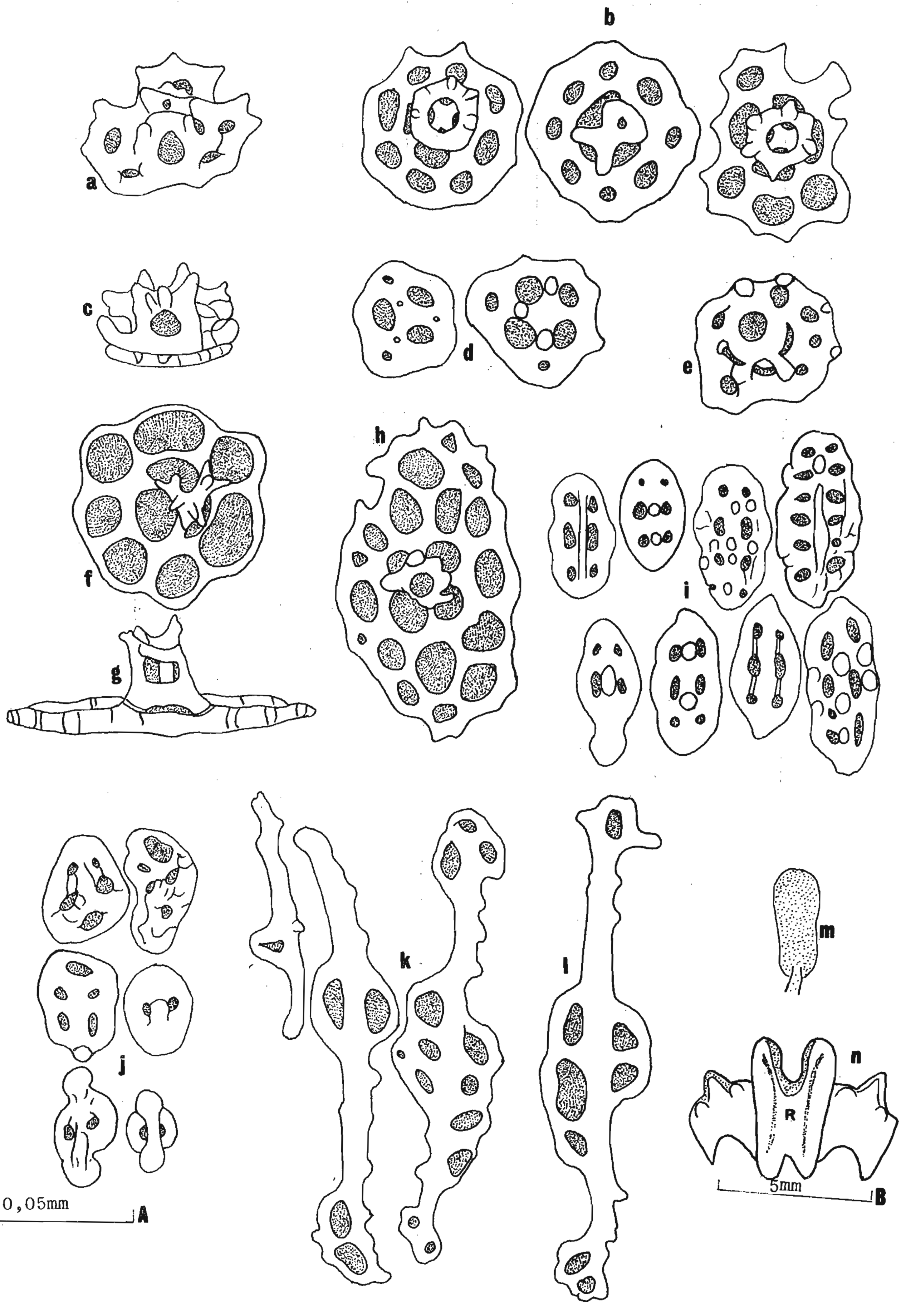


Fig. 58

the typical spicules, including the pedicel rods, the differences may not be all that significant. Since the other types of tables are not common they could have been overlooked in the type.

The specimen also comes quite close to H.(T.) ?notabilis Ludwig described below, but differs in its colouration, thickness of body wall, form of the calcareous ring, spinosity of table discs and different kind of buttons. Although both are not conspecific there is no doubt that they are closely related.

Holothuria (Theelothuria) ?notabilis Ludwig
(Fig.59 a-i)

Holothuria notabilis Ludwig, 1875:102, pl.7, fig.43; Sluiter, 1895:78; H.L. Clark, 1932:233.

Holothuria (Holothuria) notabilis Panning, 1935 (V):10, text-fig.115.

Holothuria (Theelothuria) notabilis Rowe, 1969:158 (passim); Clark and Rowe, 1971:178 (dist.).

Diagnosis: See Ludwig, 1875:102.

Previous southern African record: None.

Material examined: M(23/35/i), 1 spec.

Description Length 80mm. Colour, in alcohol, a mottled dull greyish to yellowish brown with eight pairs of dark blotches on dorsum and six series of black specks throughout body length; whitish areas around bases of podia. Tentacles and anal papillae minute; collar not evident. Podia papilliform, scattered. Body wall thin (1-1,25mm).

Calcareous ring (fig. 59h) high, radial plates broader posteriorly with rudimentary bifurcations. Cuvierian tubules present. Gonadal tubules remarkably flat.

Spicules:

Tables numerous and of four types. Commonest type (fig. 59a) with round, distinctly spinose discs (0,05-0,07mm) with a single series of 8-10 marginal holes and a low spire terminating in a ring of about 6-8 teeth, frequently spire or disc reduced (fig. 59b). Second type less common, with a low spire and a slightly upturned disc up to 0,06mm (fig. 59c). Third type of tables with spinose or slightly knobbed discs (0,07mm) with 10-25 tiny holes in one or more series (fig. 59e). Fourth type like those of Mesothuria, with a lobed disc (0,07mm) with eight large peripheral holes and a spire terminating in a compact cluster of teeth (fig. 59d).

Buttons (0,035-0,058mm) oval, heavily knobbed, but rarely forming fenestrated ellipsoids (fig. 59f). Podia with reduced end plates, tables, buttons and button-like knobbed plates (0,05-0,10mm) (fig. 59g).

Distribution: East Indies, North Australia, ?Morrumbene (Moçambique).

Habitat: Sandbank or wreck nearby (Collector's note).

Remarks: The single specimen resembles the type in its colouration, differentiation of podia, presence of cuvierian tubules and in the typical spicules. It, however, differs in the form of its calcareous ring and in the presence of four kinds of tables. In the holotype the radial plates of the calcareous ring are prolonged posteriorly beyond the level of the interradial plates to form rudimentary posterior bifurcations. In the present specimen, however, although rudimentary bifurcations are present, no posterior prolongations of the radial plates are evident. Its distinction from the preceding species has already been discussed (see Remarks under H. (T.) ?maculosa).

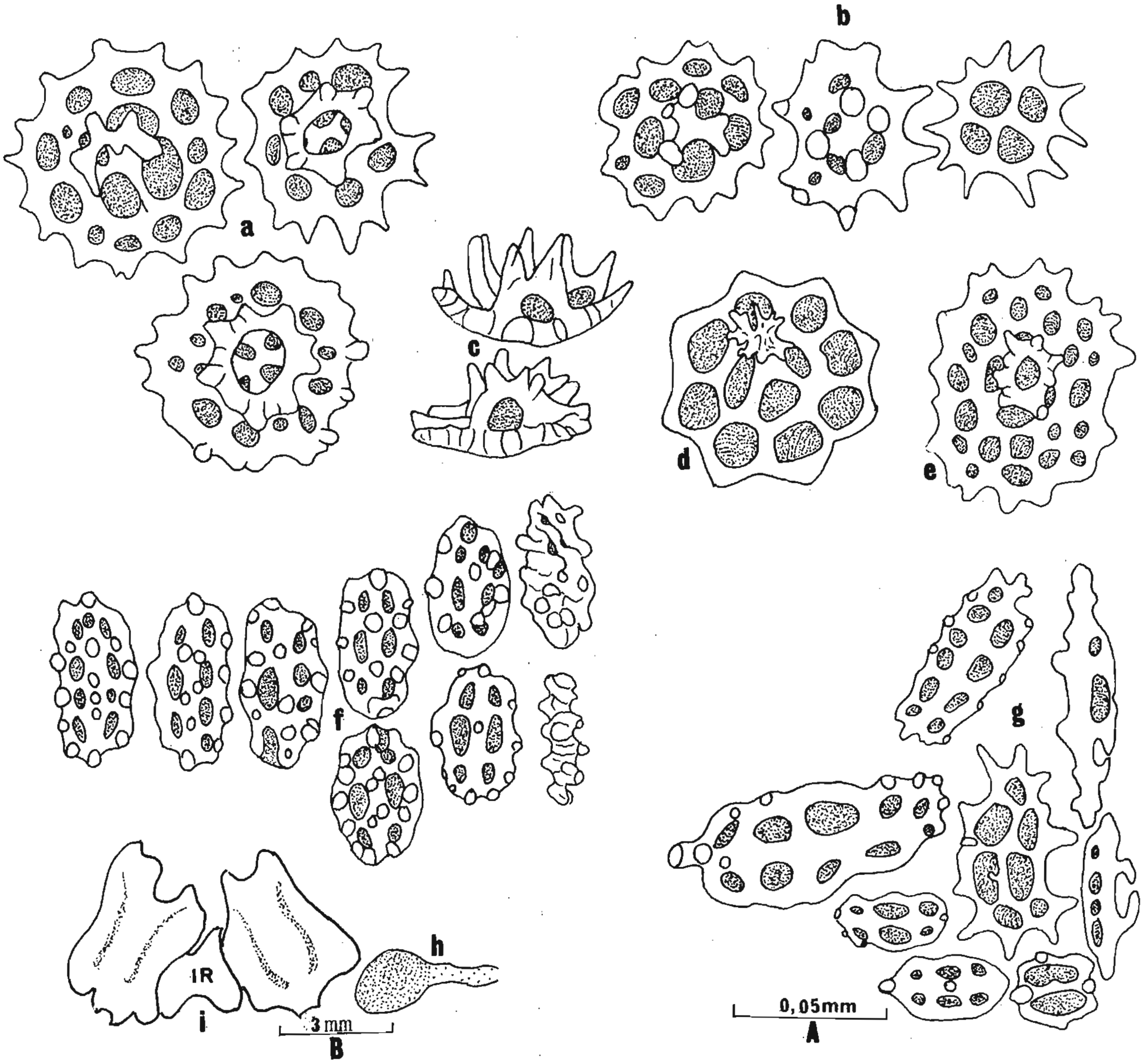


Fig. 59. Holothuria (Theelothuria) ? notabilis Ludwig.

Morrumbene.

a. Normal tables from dorsal body wall.

b. Same (reduced).

c. Tables with short spiny spire.

d. Table with large holes (Mesothuria type).

e. Table with multilocular disc.

f. Buttons from dorsal body wall.

g. Podial deposits.

h. Madreporite.

i. Part of calcareous ring.

(a-g Scale A; h & i Scale B)

Subgenus Thymiosycia Pearson, 1914

Holothuria (Thymiosycia) Pearson, 1914:171; Rowe, 1969:145 (synonymy), Clark and Rowe, 1971:199.

Brandothuria Deichmann, 1958:290.

Diagnosis: See Rowe, 1969:145.

Type species: Fistularia impatiens Forskaal, 1775 (designated Pearson, 1914:164).

Remarks: Rowe (1969) included 13 nominal species within this subgenus but commented that possibly not all species are valid. Since then Pawson and Caycedo (1980) described H.(T.) thomasi from shallow waters of Florida. In the southern African region three species occur and all are present in the material in hand.

Holothuria (Thymiosycia) arenicola Semper

(Fig.60 a-g)

Holothuria arenicola Semper, 1868:81,277, pl.20, pl.30:fig.13, pl.35: fig.4; Thėel 1886a:222; Fisher, 1907:662; Deichmann, 1930:66, pl.4, figs. 1-9; Macnae and Kalk, 1962:108,112.

Sporadipus (Acolpos) maculatus Brandt, 1835; Semper, 1868:92, 279.

Holothuria maculata Selenka, 1867:331; Thėel, 1886a:198,222; Pearson, 1913:80, pl.11, fig.18.

Holothuria humilis Selenka, 1867:339, pl.19, fig.89; Thėel, 1886a:218; Fisher, 1907:660.

Holothuria rathbuni Lampert, 1885:73; Thėel, 1886a:68; H.L. Clark, 1902: 259, pl.17, figs. 2-10.

Holothuria boutani Hėrouard, 1893:132, pl.7, fig.A.

Holothuria densipedes H.L. Clark, 1902:257, pl.17, fig.1 (3-10); Deichmann, 1930:68.

Holothuria monsuni Heding, 1939:217, figs. 18-26.

Holothuria (Holothuria) arenicola Panning, 1935 (IV):88, text-fig.73 (refs.).

<u>Holothuria (Holothuria) arenicola</u> var. <u>boutani</u> Panning, 1935 (IV):89, text-fig.74.

<u>Brandothuria arenicola</u> Deichmann, 1958:291, pl.1, figs.10-13.

<u>Holothuria (Thymiosycia) arenicola</u> Rowe, 1969:147 (passim); Clark and Rowe, 1971:178 (dist.), pl.28, fig.3; Rowe and Doty, 1977:232, fig.4a.

<u>Diagnosis</u>: See Semper, 1868:81; Deichmann, 1958:291.

<u>Previous southern African record</u>: M(26/32,33/i).

<u>Material examined</u>: N(30/30/i, 29/30/i, 28/32/i), 4 spec.

<u>Description</u>: Largest specimen 100mm long, dorsum in life, a mottled greyish white to beige to a mottled greyish brown, always with 8-9 pairs of dark greyish brown or rust-coloured blotches; ventrum greyish white to brown; skin around anus sometimes rust-coloured. Podia in the form of pedicels only or differentiated into papillae and pedicels. Spicules (fig. 60a-f) typical, some larger table discs with five central and up to 14 smaller marginal holes.

<u>Local distribution</u>: From Moçambique to Park Rynie (Natal). Map: 9.

<u>General distribution</u>: Almost circumtropical.

<u>Habitat</u>: Under rock ledge or between sandstone slabs.

<u>Remarks</u>: The colour of this species is variable, probably depending to some extent on the immediate habitat. Apart from the normal coloured individuals, rust-coloured specimens were also reported by Fisher (1907), Deichmann (1958) and Pawson (1976) and black individuals by Pawson (1976).

This species was first discovered in Natal by the writer but regrettably this record was not published (Thandar, 1971: M.Sc. thesis). Dr Cherbonnier, to whom a specimen was sent for confirmation of identifi= cation, thought that it represented <u>H. hilla</u>. The writer has since examined <u>H. hilla</u> both from Mauritius and Natal and is forced to disagree with Dr Cherbonnier. This opinion is supported by Dr Rowe (pers. comm.).

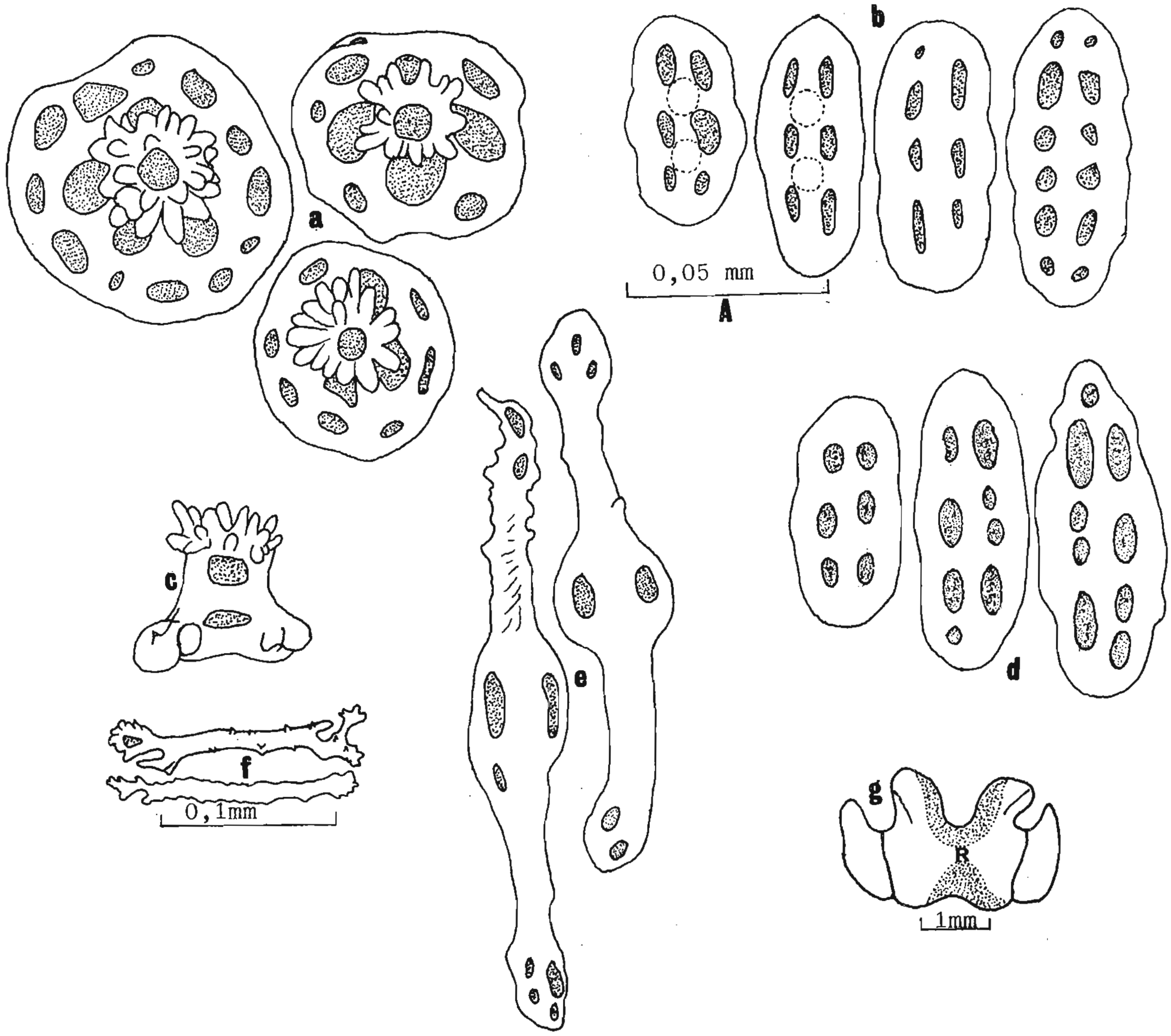


Fig. 60. Holothuria (Thymiosycia) arenicola Semper. Treasure Beach.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Table from ventral body wall (side view).

d. Buttons from ventral body wall.

e. Pedicel rods.

f. Rods from tentacular stalk.

g. Part of calcareous ring.

(a-e Scale A)

The Natal specimens are so typical of the species as described by other writers, notably Pearson (1913), Panning (1934), Deichmann (1930, 1958) and Pawson (1976, 1978), that they cannot be referred to another species.

Holothuria (Thymiosycia) hilla Lesson

(Fig.61 a-f)

Holothuria hilla Lesson, 1830:226, pl.79; Cherbonnier, 1951:532, fig.1; Macnae and Kalk, 1958:36,42,99,107,117,130; 1962:104; Kalk, 1958:213,214,338; 1959:7,22. Branch and Branch, 1981:248.

Holothuria monacaria Théel, 1886a:172,217, pl.8, fig.10; Fisher, 1907:659; Pearson, 1910a:180; 1913:71, pl.10, fig.13.

non H. monacaria Lesson, 1830:226, pl.9. (Suppressed - See Clark and Rowe, 1967b).

non Psolus monacaria Lesson, 1830:225, pl.78.

Thelenota monacaria Brandt, 1835:55.

Stichopus monacaria Selenka, 1868:117.

Holothuria (Holothuria) monacaria Panning, 1934 (III):69, text-fig.47 (refs.).

Holothuria flammea Quoy and Gaimard, 1833:117, pl.6, figs.5,6.

Stichopus flammeus Brandt, 1835:73; Selenka, 1867:320.

Labidodemas leucopus Haacke, 1880:46,47.

Labidodemas neglectum Haacke, 1880:48.

Holothuria decorata von Marenzeller, 1881:137, pl.4, fig.12; Théel, 1886a:218.

Holothuria minax Théel, 1886a:173, pl.8, fig.8.

Holothuria macleari Mitsukuri, 1912:98, text-fig.20.

Holothuria fasciola Quoy and Gaimard, 1833:133; Cherbonnier, 1952b:21, pl.1, fig.

? Holothuria fusco-punctata Quoy and Gaimard, 1833:132; Cherbonnier, 1952b: 26, pl.3, fig.1.

Stichopus gyrifer Selenka, 1867:319.

Holothuria gyrifer Domantay, 1954:343.

Brandothuria gyrifer Deichmann, 1958:294, pl.1, figs. 16-18.

Holothuria (Thymiosycia) gyrifer Rowe, 1969:147 (passim).

Holothuria (Thymiosycia) hilla Rowe, 1969:147 (passim); Clark and Rowe, 1967:126; 1971:178 (dist.), 194 (note); pl.28, fig.9; Rowe and Doty, 1977:232, figs. 4b, 8b.

Diagnosis: See Deichmann, 1958:294.

Previous southern African records: M(26/33/i, 12-15/40/i).

Material examined: N(29/30/i), 2 spec.

Description: Larger specimen 35mm in length. Colour, in life, bright brown, podia yellowish green. Cuvierian organs present. Spicules typical (fig. 61a-f). Table discs (fig. 61a) with 8-12 (rarely 4) small marginal holes and occasionally with second series of much smaller holes outside main series. Spire with one or two cross bars.

Local distribution: Isipingo Beach (Natal) and Moçambique. Map: 7.

General distribution: Throughout the tropical Indo-Pacific from East Africa to Panama but not yet reported from West India and Pakistan.

Habitat: Rock pool in intertidal zone.

Remarks: Rowe (1969) records the disc diameter of the tables as 0,065-0,080mm and the length of the buttons as 0,065-0,160mm. The spicules of the Natal specimens are smaller, the corresponding dimensions being 0,0425-0,070mm and 0,05-0,105mm. Since Pearson (1910a) also reports smaller tables (0,06mm) and buttons (0,055mm) from his 60mm specimen from Moçambique, the southern African specimens probably show geographic or age variations.

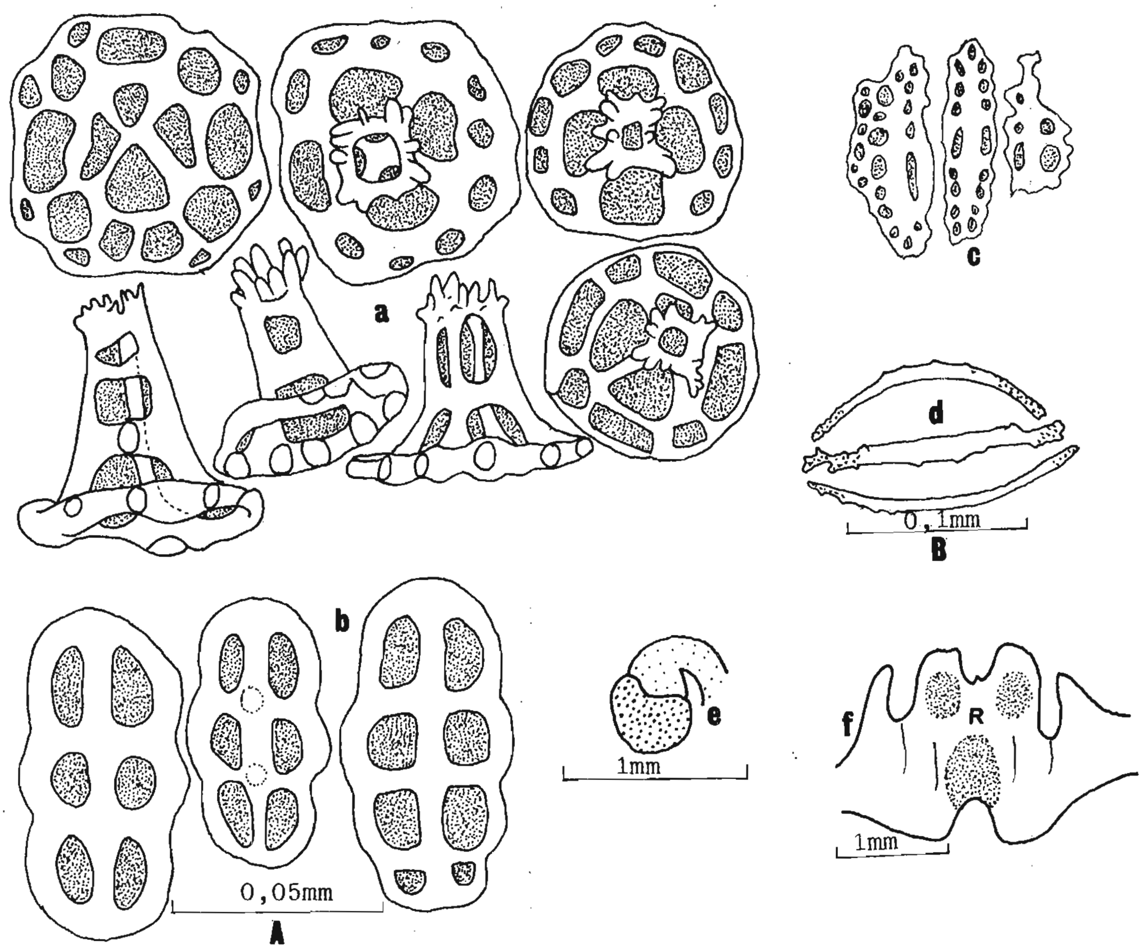


Fig. 61. <u>Holothuria (Thymiosycia) hilla</u> Lesson. Isipingo.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Pedicel plates.

d. Tentacular rods.

e. Madreporite.

f. Part of calcareous ring.

(a & b Scale A; c & d Scale B)

Holothuria (Thymiosycia) impatiens (Forskaal)

(Fig.62 a-c)

Fitularia impatiens Forskaal, 1775:121, pl.39, fig.B.

Holothuria impatiens Selenka, 1867:340; Semper, 1868:82, 277; Lampert, 1885:65; Théel, 1886a:179,233, pl.7, fig.9; Fisher, 1907:660, pl.69, fig.4; Pearson, 1910a:178; 1913:85, pl.13, fig.21; H.L. Clark, 1923:423; Kalk, 1959:22; Macnae and Kalk, 1962:108, 112.

Holothuria fulva Quoy and Gaimard, 1833:135.

Holothuria botellus Selenka, 1867:335, pl.19, figs.82-84; Semper, 1868:82, 248.

Holothuria (Holothuria) impatiens Panning, 1935 (IV):86, text-fig.87 (refs.).

Brandothuria impatiens Deichmann, 1958:293, pl.1, figs.14,15.

Holothuria (Thymiosycia) impatiens Rowe, 1969:145, text-fig.13; Clark and Rowe, 1971:178 (dist.), pl.28, fig.8; Rowe and Doty, 1977:233, figs.4c, 7e.

Diagnosis: See Deichmann, 1958:293.

Southern African records: M(26/32,33/i, 10-15/40/i, ? s).

Material examined: ?Moçambique, 1 spec.

Local distribution: Moçambique only. Map: 9.

General distribution: Almost circumtropical including West Indies and the Panamic region, East Africa and Hawaii.

Remarks: This well characterised species has long been known from Mocambique (Semper, 1868; Bell, 1884; Pearson, 1910a) but there is no definite record of its occurrence in Natal. Hence H.L. Clark's (1923) unlabelled specimen from the SAM (here re-examined) must be referred to the fauna of Moçambique.

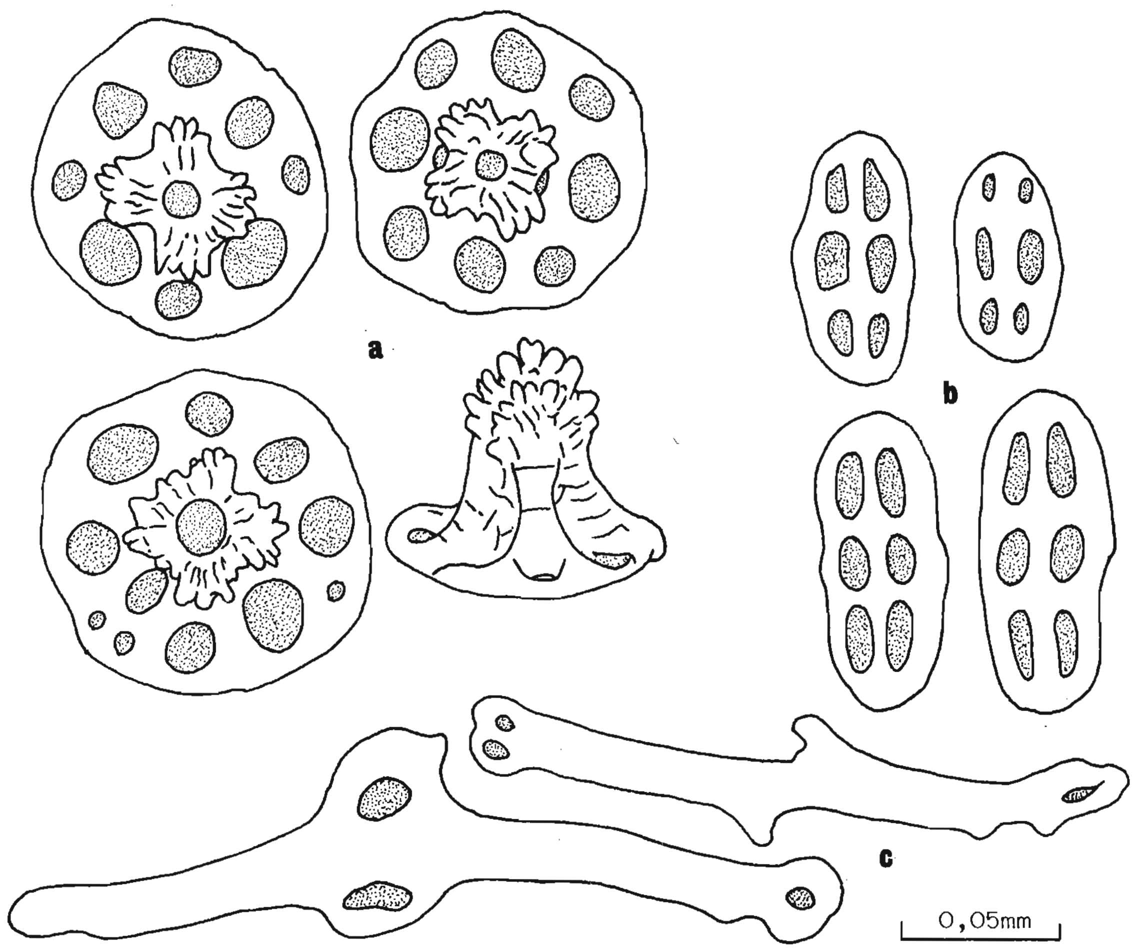


Fig. 62. Holothuria (Thymiosycia) impatiens Forskaal.

a. Tables from dorsal body wall.

b. Buttons from dorsal body wall.

c. Pedicel rods.

(All drawn to same scale)

Family SYNALLACTIDAE Ludwig, 1894

Diagnosis: See Ludwig, 1894:8, 26.

Remarks: This is a cosmopolitan family comprising mainly deep sea forms. Approximately 15 genera are currently recognised (Pawson, 1965) and of these only *Mesothuria*, *Synallactes* and *Pseudostichopus* are represented in southern Africa.

Genus *MESOTHURIA* Ludwig, 1894

Mesites Ludwig, 1893:79. Type sp. *M. multipes* Ludwig (nomen nudum).
Mesothuria Ludwig, 1894:31; Fisher, 1907:679; Deichmann, 1930.
Zygothuria Perrier, 1898.
Allantis Hérouard, 1902.

Diagnosis: See Ludwig, 1894:31.

Type species: *Mesothuria multipes* Ludwig, 1894 (by monotypy).

Remarks: The genus *Mesothuria* at present comprises about 25 nominal species of which only *M. parva* (Théel) and *M. lactea* (Théel) are here included. The former is recorded for the first time from southern Africa and is also the first record of this species from the West Indian Ocean. *M. lactea* was reported by Heding (1940) from off the west coast at 6°E longitude and is thus not strictly southern African. It is here included since it is possible for the species to occur further east.

KEY TO THE SOUTHERN AFRICAN SPECIES OF MESOTHURIA

Tables with small and large discs (<0,15mm), spire of three non-diverging pillars terminating in a compact, often tripartite, toothed apex .... Mesothuria parva (Théel, 1886)

Tables with large discs (>0,15mm), spire terminating in three smooth, rarely toothed, diverging processes, or a single process Mesothuria lactea (Théel, 1886)

Mesothuria lactea (Théel)

Holothuria lactea Théel, 1886a:183, pl.10, figs.9 and 15.

Zygothuria lactea Perrier, 1902:322, pl.17, figs.1-5; Deichmann, 1930:108, pl.8, figs.8 and 9.

Mesothuria lactea Hérouard, 1923:13, 4, figs.1-3.

Mesothuria (Zygothuria) lactea Heding, 1940:340, text-fig.7.

Diagnosis: See Théel, 1886a:83; Heding, 1940:340.

Southern African record: SWA (25/6/vd), C(30/6/vd), 936-5108m.

Material examined: None.

General distribution: Atlantic and Pacific Oceans, 800- over 5000m.

Habitat: Volcanic mud, blue mud.

Remarks: The presence of this species off the southern African coast is based on 23 specimens collected by the 'Valdivia'. Of these, 21 specimens from a depth of 936m, off South West Africa, had, according to Heding (1940), small (0,15mm) tables with smooth processes while the remaining two, from further south at 5108m, had larger tables (0,02-0,025mm) with toothed processes. Heding referred the latter to a new variety, spinosa, which may prove to be a distinct species.

Mesothuria parva (Théel)

(Fig.63 a-h)

Holothuria murrayi var. parva Théel, 1886a:186, pl.9, fig.2, pl.16, figs. 4 and 5.

Mesothuria parva Fisher, 1907:686, pl.71, figs.2, 2a-c.

Diagnosis: See Théel, 1886a:186; Fisher, 1907:686.

Previous southern African record: None.

Material examined: N(27/32/d), 2 spec.

Description: Length 75mm and 37mm. Colour, in alcohol, dull greyish brown, darker ventrally. Podia more sparsely distributed midventrally, absent just behind collar. Polian vesicles paired.

Spicules: Tables of two distinct sizes. Discs of large tables (fig. 63a & c) (0,10-0,135mm) overlapping, marginal holes 6-24; spire (0,078-0,113mm) of three (occasionally fused) pillars, a single cross bar situated near disc, and a compact, tri=partite or irregular apex, occasionally pierced by a minute hole. Smaller tables (fig. 63b) less common, discs 0,055-0,095mm, marginal holes 6-18. Anal region with large periproctal plates (fig. 63d). Pedicels with small tables and large (0,27-0,30mm) end plates. Tentacles with smooth to spinulated rods, occasionally perforated at extremity (fig. 63e).

Local distribution: Off St. Lucia Bay, Natal, 280-454m.

General distribution: Hawaii, Admiralty Island and South East African coast.

Habitat: Globigerina ooze, sand grains and broken shells.

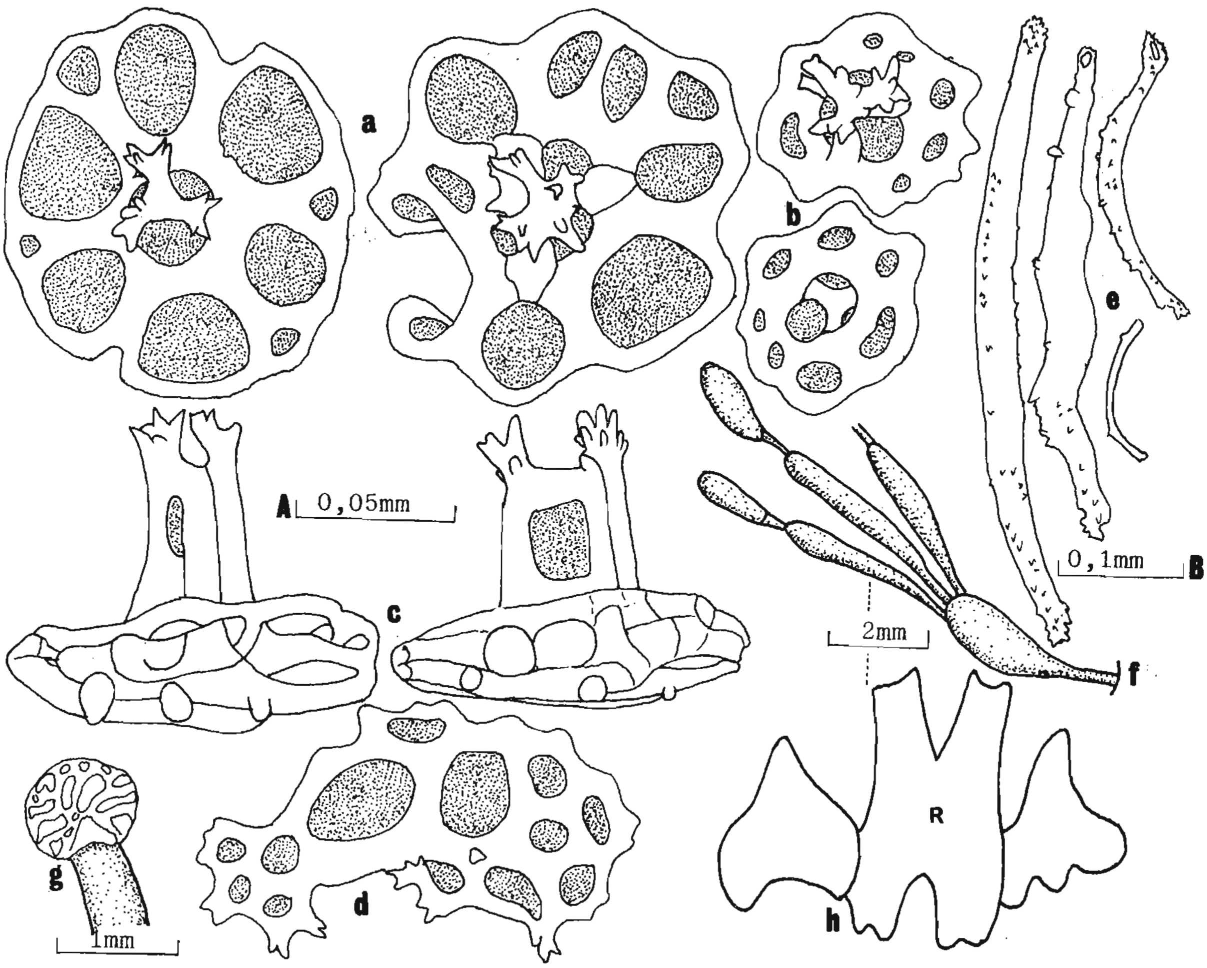


Fig. 63. <u>Mesothuria parva</u> (Théel). Off St Lucia.

a. Large tables from dorsal body wall.

b. Small tables from ventral body wall.

c. Large tables (from side).

d. Periproctal plate.

e. Tentacular rods.

f. Gonadal tubule.

g. Madreporite.

h. Part of calcareous ring.

(a-d Scale A; e Scale B)

Remarks: The present material differs from that described by both Théel (1886a) and Fisher (1907) in the absence of a marked difference in size between the ventro-lateral pedicels and those from elsewhere on the body. However, its spicules are identical to those illustrated by the above authors. Tables with perforated apices were also observed by Fisher. According to Théel, the smaller tables are commoner in the bodywall while Fisher states that they are confined to the pedicels. In the present material both small and large tables occur in the body wall but the former are not at all common while the pedicels only contain small tables. Although the maximum size of the table discs (0,135mm) in the present material corresponds roughly to that of Fisher's material (0,12mm) the spires are much taller (max. size 0,113mm) compared to 0,085mm recorded by him. Unless Fisher recorded the mean, this difference might suggest geographical variation.

The species is closely related to M. murrayi (Théel) but Fisher (1907) points out that the differences in the calcareous deposits between the two are possibly attributable to the substrate, M. murrayi living in softer bottoms than M. parva. However, he mentions that due to the absence of intermediate forms and the lack of difficulty in separating them, they should be regarded as separate species.

Genus PSEUDOSTICHOPUS Théel, 1886

Pseudostichopus Théel, 1886a:169; Fisher, 1907:691; Heding, 1940:356.

Diagnosis: See Théel, 1886a:169; Fisher, 1907:691.

Type species: Pseudostichopus mollis Théel, 1886 (by subsequent designation Fisher, 1907:691).

Remarks: Heding (1940) referred this genus together with several others, previously occupying isolated positions in the Synallactidae, to the family Gephyrothuriidae, diagnosed by Koehler and Vaney (1905) for their monotypic Gephyrothuria alcocki. A similar form from the East Pacific was described as Himasthlephora glauca by H.L. Clark (1907). G. alcocki was stated to be Molpadid-like, while H. glauca, which possessed a tail-like appendage, was described as a molpadiid. According to Clark both H. glauca and G. alcocki may be congeneric while Rowe (pers. comm.) thinks they may even be conspecific. If this is true then Pseudostichopus cannot be classified in the Gephyrothuriidae and is therefore, at least tentatively, transferred back to the Synallactidae.

Pseudostichopus is a large cosmopolitan genus subdivided by Heding (1940) into the subgenera Pseudostichopus and Trachostichopus, each containing half a dozen nominal species. P.(P.) echinatus, here described as new, is the only representative of the genus in southern Africa.

Subgenus Pseudostichopus Théel, 1886

Diagnosis: See Heding, 1940:356.

Type species: Pseudostichopus mollis Théel, 1886 (by original designation Heding, 1940:356).

Remarks: This subgenus includes all cylindrical species without body wall spicules and with little or no distinction between the ventro-lateral and other podia. When proposed by Heding (1940), the subgenus contained six nominal and one unnamed species. A single specimen in the SAM collection from off Natal, is identical to Heding's unnamed species from off the East African coast. It is here described as P.(P.) echinatus sp. nov.

Pseudostichopus (Pseudostichopus) echinatus sp. nov.
(Fig.64 a-c)

Pseudostichopus (Pseudostichopus) sp. Heding, 1940:360, text-fig. 16.

Diagnosis: A medium-sized species up to 65mm long. Body wall encrusted with shells, foraminifera, and sand grains, etc. Tentacles about 20. Podia scattered, only slightly longer in ventro-lateral radii. Stone canal rudimentary or absent. Spicules restricted to tentacles, in the form of large (up to 0,3mm), irregularly knobbed rods. Body wall, podia, respiratory trees and gonad without spicules.

Etymology: The specific name is derived from echinos (Gk): sea urchin, with reference to the echinoid appearance of the holotype.

Material examined: Holotype, SAM, SM 38, off Natal coast (28°21,9'S, 32°34,6'E), 775-825m.

Description: Specimen (fig. 64a) partially eviscerated, most of alimentary canal lost. Length 55mm, breadth in mid-body 12mm. Colour, in alcohol, a uniform pale greyish brown. Body form almost cylindrical, dorsal surface well arched, ventral less so. Mouth very small, ventral. Tentacles white, peltate, about 17, all except three retracted (exact number not determined for fear of damage to holotype). Anus subventral, situated in a prominent vertical furrow; no anal papillae. Body wall encrusted with Globigerina ooze, shell fragments, coral debris, sand grains and pteropod (?Creseis) shells, the latter projecting perpendicularly from surface giving specimen a prickly appearance, not unlike that of heart urchins. Body wall remarkably thin, especially ventrally.

Podia thin, non-retractile, barely visible to unaided eye, scattered but more numerous and slightly longer in the ventro-lateral ambulacra, shorter dorsally, few and small in midventral ambulacrum, where they are difficult to distinguish from encrustations; discs small, brownish; end plates and supporting rods absent.

Calcareous ring (fig. 64b) delicate, radial plates dissimilar, usually squarish, concave posteriorly but either scalloped anteriorly or with a single median notch; interradial plates more uniform, four times as wide as long, with a short anterior triangular median pro= jection and a concave posterior margin. No tentacular or podial ampullae. Polian vesicle single, midventral, sacciform. Stone canal not observed (? rudimentary or absent). Longitudinal muscles thick, unpaired. Respiratory trees short, well branched and with common origin, left tree shorter than right. Gonad (? testis) attached in anterior third of body, developed as two tufts of unbranched tubules, each constricted serially along entire length. Cloaca wide, suspensors well developed.

Spicules:

Spicules (fig. 64C) confined to tentacles, in the form of numerous, slightly curved, often branched rods of varying size (up to 0,3mm long) and thickness, each ornamented with numerous knobs of varying size and density; rarely rods thin and smooth but occasionally with holes resulting from fusion of once parallel branches.

Local distribution: Type locality only.

General distribution: East African coast, south of the equator.

Remarks: There are no differences between the present specimen and Heding's Pseudostichopus (P.) sp. Their size, form, encrustations, distribution of podia and the presence of identical spicules (confined to the tentacles) indicate that they belong together. A species that comes quite close to P. echinatus is P. trachus described by Sluiter (1901), Mitsukuri (1912), Mortensen (1917) and Heding (1940). According to Heding (1940), both Mitsukuri's and Mortensen's descriptions refer to another species as they do not correspond with that of the type. P. echinatus resembles Sluiter's and Heding's descriptions of P. trachus in the restriction of the spicules to the tentacles but differs in its cylindrical form, absence of thickened flanks, no sharp distinction between the ventral podia and different form and size of the tentacular spicules. In P. trachus the spicules have fewer knobs, no perforations and measure 0,13mm in length, unlike those of P. echinatus which are heavily knobbed, occasionally perforated and have an upper size limit of 0,3mm.

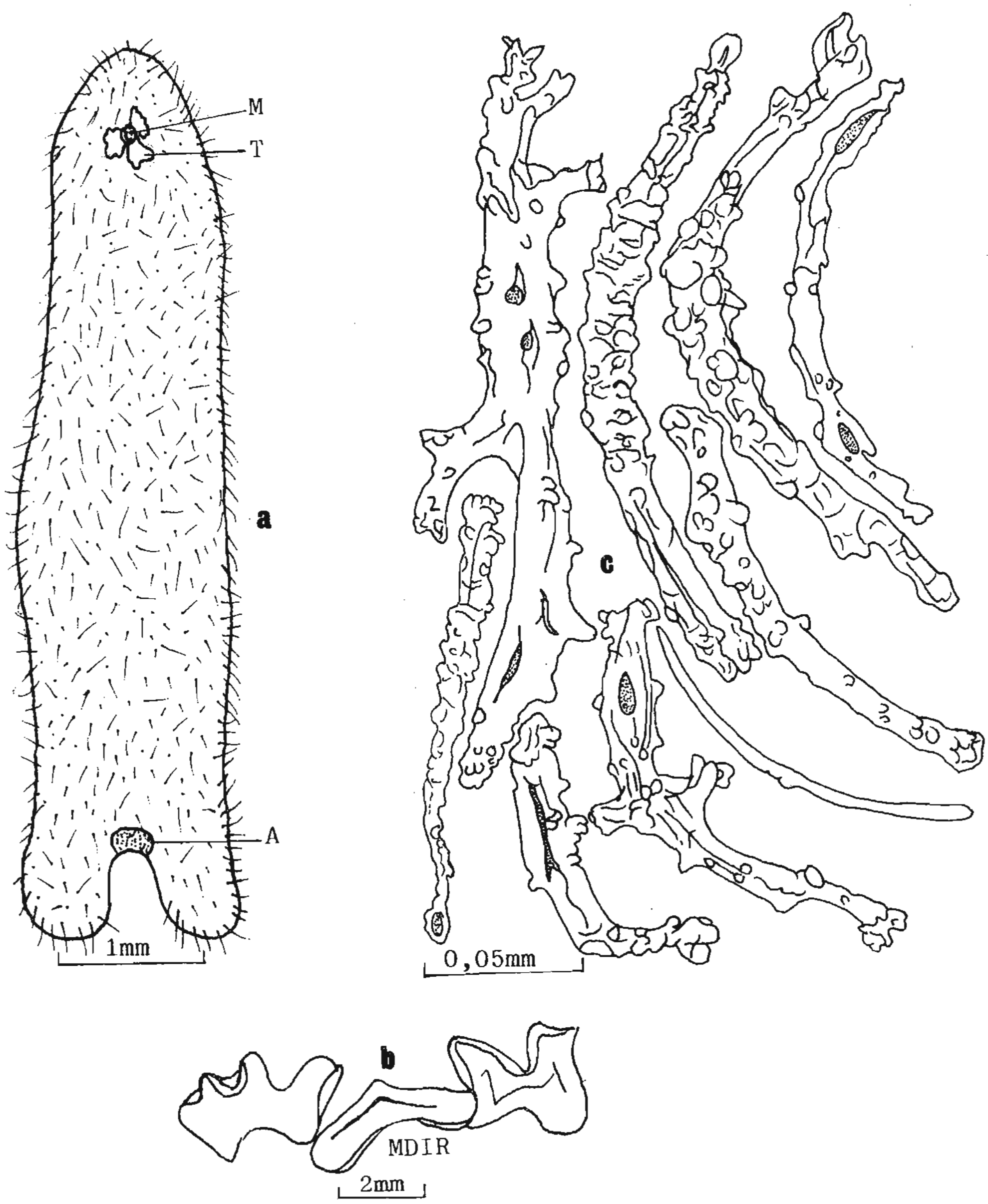


Fig. 64. <u>Pseudostichopus (Pseudostichopus) echinatus</u> sp. nov.
Off St Lucia.

a. Holotype (entire).

b. Part of calcareous ring.

c. Tentacular rods.

Heding's P. trachus was taken from off the central East African coast at 638-977m while his Pseudostichopus sp. also came from more or less the same locality at 693m. Despite this Heding not only emphasised the differences between them but went so far as to refer them to different subgenera. Therefore it does seem likely that both forms are conspecific.

Pseudostichopus echinatus differs from the six species included in the subgenus Pseudostichopus by Heding as follows. The type species P. mollis Théel, 1886 has at least the ventro-lateral pedicels arranged in rows and, in addition to the tentacles, has spicules also in the gonad and pedicels; P. pustulosus Sluiter, 1901 also has the ventro-lateral pedicels arranged in rows but the stone canal is distinct and the genital tubules branched; P. unguiculatus Ohshima, 1915 has deposits in the tentacles, gonad and pedicels; P. lapidus Hérouard, 1923 has very few pedicels which are united by some sort of webbing posteriorly; P. globigerinae Hérouard, 1923 has no spicules while P. marenzelleri Hérouard, 1923 has podia apparently arranged in bands and spicules in only the genital tubules.

Genus SYNALLACTES Ludwig, 1894

Synallactes Ludwig, 1894:21; Cherbonnier, 1952a:473.

Diagnosis: See Ludwig, 1894:21.

Type species: Synallactes alexandri Ludwig, 1894 (by original designation - use of n.g. & n.sp.).

Remarks: The genus Synallactes is represented in southern Africa by two endemic species, S. mollis and S. viridillimus, both described by Cherbonnier (1952a) from deep waters off the south west coast. Neither of the species has been taken since.

KEY TO THE SOUTHERN AFRICAN SPECIES OF THE GENUS SYNALLACTES

Tentacles 10 + 8, six of inner circle reduced to stubs; tables with a cruciform to triradiate disc with arms never ramified to form a large multilocular disc ...... Synallactes mollis Cherbonnier, 1952

Tentacles 7 + 13, none reduced to stubs; table discs cruciform, triradiate or 5-armed with arms sometimes ramified to form a large, multilocular, lobed disc .... Synallactes viridillimus Cherbonnier, 1952

Synallactes mollis Cherbonnier

Synallactes mollis Cherbonnier, 1952a:475, pl.36, figs.1-15,18,19.

Record: C(31/17/d).

Material examined: Holotype.

Distribution: Known only from off S.W. Cape Province, 376m.

Remarks: According to Cherbonnier (1952a) this species comes close to S. crucifera Perrier from the coast of Morocco but differs from it in the structure of the spire.

Synallactes viridillimus Cherbonnier

Synallactes viridillimus Cherbonnier, 1952a:473, pl.35, figs. 1-17, pl.36, figs. 16-17.

Record: C(32/16/d).

Material examined: Holotype.

Distribution: Known only from off S.W. Cape Province, 545m.

Remarks: This species is very close to the preceding species but differs from it in the distribution and number of tentacles and in the form of the tables. Since both species are known only from holotypes the differences are of doubtful significance since more specimens may show a whole range of variations in these features. The minute tables in S. viridillimus and the occasional completeness of some discs of the larger tables may be due to age. As Cherbonnier (1952a) suspected this species approaches S. challengeri (Théel) from Crozet Islands (S. Indian Ocean) but differs from it in the form of the body, distribution of pedicels and papillae, the presence of minute 3-4 pillared tables and the completeness of some table discs.

ORDER ELASIPODIDA Théel, 1882

Diagnosis: See Théel, 1882:9; Hansen, 1975:14.

Remarks: This is an exclusively deep sea order of usually large, often bizarre holothurians with peltate tentacles and no respiratory trees. The order was recently excellently revised by Hansen (1975) who assembled the approximately 110 species, recognised by him, into the suborders Deimatina and Psychropotina. Both suborders are repre= sented in southern Africa where 15 species occur.

Suborder DEIMATINA Hansen, 1975

Diagnosis: See Hansen, 1975:14.

Remarks: This suborder comprises elasipodids with numerous, usually large papillae. Included in it are the families Deimatidae and Laetmogonidae, both with representatives in southern Africa.

Family DEIMATIDAE Ekman, 1926

Diagnosis: See Hansen, 1975:15.

Remarks: This family, characterised by the absence of wheels, includes three genera and eight species. In addition to the three species hitherto recorded from southern Africa, a further two species are here described as new. All three genera are represented.

Genus DEIMA Théel, 1879

Deima Théel, 1879:4; 1882:68; Hansen, 1975:16 (synonymy).

Type species: Deima validum Théel, 1879 (by subsequent designation Deichmann, 1930).

Remarks: Hansen (1975) lumps the six species, formerly referred to this genus, into a single species, D. validum Théel, containing the subspecies D.v. validum and D.v. pacificum. Only the cosmopolitan nominate subspecies occurs in southern Africa.

Deima validum validum Théel

Deima validum Théel, 1879:5, figs.36-38; 1882:68, pls.18,19,31: figs.4-9, pl.36: fig.4, pl.37: fig.8, pl.43: fig.7, pl.44:fig.13, pl.46: fig.5.

Deima fastosum Théel, 1879:5, figs.1-3; 1882:71, pls.20,21: fig.1, pl.31: figs.10-13, pl.35:figs.7-10, pl.36: fig.7, pl.37:fig.3, pl.43:figs.2-3,5, pl.46:fig.8.

Deima blakei Théel, 1886b:1, figs.1-2; Deichmann, 1930:115-116, pl.10, figs.7-11, pl.11, figs.1-3.

Deima atlanticum Hérouard, 1898:88, figs.1,2.

Deima mosaicum Ohshima, 1915:233.

Deima validum validum Hansen, 1967:488, fig.5; 1975:17, text-fig.1.

Diagnosis: See Hansen, 1975:17.

Southern African records: T(32/31/vd), N(29/33/vd); M(14/45/vd).

Material examined: None.

Local distribution: Off east coast, 2720-3430m. Map: 2.

General distribution: Indian Ocean (from East Africa to Ceylon) and the Tasman Sea, Kermadec Trench and south west Atlantic Ocean, 724-4820m.

Remarks: The southern African material (eight specimens), described by Hansen (1975), was collected by the "Galathea" Expedition from the Moçambique Channel and off Durban.

Genus ONEIROPHANTA Théel, 1879

Oneirophanta Théel, 1879:6; 1882:62; Hansen, 1975:24 (synonymy).

Type species: Oneirophanta mutabilis Théel, 1879 (by monotypy).

Remarks: This genus includes three species, of which only the cosmopolitan nominate subspecies, O. mutabilis mutabilis, occurs in southern Africa. O.m. affinis is restricted to a small area in the East Pacific.

Oneirophanta mutabilis mutabilis Théel

Oneirophanta mutabilis Théel, 1879:6, figs.4-6; 1882:62, pl.21:fig.2, pl.22, pl.31:figs.1-3, pl.36:figs.1-2, 8-11, pl.37:figs.4,13, pl.38: figs.11, 12, pl.40:figs.1-3, pl.41:figs.1-2,4, pl.42:fig.9, pl.43: figs.1,6, pl.45, pl.46:figs.6,7.

Oneirophanta alternata R. Perrier, 1900:117-118.

Oneirophanta alternata var. talismani R. Perrier, 1902:386, fig.6.

Oneirophanta mutabilis mutabilis Hansen, 1967:485, figs.3,4; 1975:24, text-figs.2-5.

Diagnosis: See Théel, 1879:6; Hansen, 1975:24.

Southern African records: N(32/32/vd); M(14/45/vd).

Material examined: None.

Local distribution: Off east coast, 3390-3530m. Map: 2.

General distribution: Cosmopolitan, 2515-6000m.

Habitat: Globigerina and diatom ooze, red clay, grey mud.

Remarks: Hansen's (1975) is the only record of this species from southern Africa, based on four poorly preserved specimens taken by the 'Galathea' from off Durban and the Moçambique Channel.

Genus ORPHNURGUS Théel, 1879

Orphnurgus Théel, 1879:8; 1882:82; Hansen, 1975:38 (synonymy).

Diagnosis (after Hansen, 1975, modified herein): Tentacles 15-20, non-retractile, discs with ramified processes. Circumoral papillae absent. Spicules spatulated crosses and/or rods of greatly varying shape, either spatulated, spindle-shaped, smooth with dichotomous ramifications, or spinous, often a combination of two types.

Type species: Orphnurgus asper Théel, 1879 (by monotypy).

Remarks: This genus was erected by Théel (1879) for the West Indian species O. asper characterised by only spinous rods in the body wall. Since then the following seven Indo-West Pacific species, all referable to Orphnurgus, were described:-

O. glaber Walsh, 1891 (Koehler and Vaney, 1905): with smooth elongate rods with short, sometimes spinous, terminal ramifications.
O. invalidus Koehler and Vaney, 1905: with mainly spatulated rods.
O. insignis Fisher, 1907: with crosses and dichotomously ramified rods.
O. vitreus Fisher, 1907: With spatulated rods and sometimes spatulated crosses.
O. rigidus Ohshima, 1915: With spatulated rods.
Scotodeima protectum Sluiter, 1901: with spatulated crosses.
Amphideima investigatoris Koehler and Vaney, 1905: with spatulated rods.

These species were further distinguished by the number and distribution of pedicels and papillae in either single or double rows and by the presence or absence of any transformation of the spicules ventrally.

In his revision of the elasipodid holothurians, Hansen recognises only *O. asper*, *O. glaber*, *O. vitreus* and *O. protectus* while relegating the remaining four to the synonymy of *O. glaber* because of "the presence of many intergradations" (Hansen, 1975:40). This action resulted in *O. glaber* being represented by several morphological types showing numerous geographical variations, not only in the spicules but also in the number and distribution of pedicels and papillae.

A study of some deep sea material collected off the southern African east coast, revealed the presence of *O. insignis* and two further morphological types, also referable to *Orphnurgus*. Of the latter, one is intermediate between *O. asper* and *O. insignis*, having both *asper* and *insignis* type of rods, while the other, which has double rows of pedicels and dorsal papillae, is characterised by only *asper* type of rods in the dorsal body wall and a mixture of *asper* and *insignis* type in the ventral body wall. All three types show similar transformation of deposits ventrally. Because of these intergradations the writer was at first inclined to refer all three types to *O. asper* and to relegate *O. glaber* (sensu Hansen) and its synonyms to the synonymy of this species. Such a step would have not only effected the status of *O. glaber* but also of *O. vitreus* and *O. protectus*, characterised by spatulated rods and/or crosses, since spatulated rods are the basic deposit in *O. glaber* (sensu Hansen) and spatulated crosses also occur sporadically in some forms of the latter species. According to Rowe (pers. comm.) Hansen's decision to synonymise five species into a single species was too sweeping, a step that would have been further aggravated by lumping all nominal species of *Orphnurgus* and the southern African material under *O. asper* which would then assume the status of a superspecies.

Since the southern African forms differ not only in their deposits but also in some other significant features, all three types are here described as distinct species, namely, O. insignis Fisher and two others, O. aspersignis and O. natalasper, new to science.

KEY TO THE SOUTHERN AFRICAN SPECIES OF ORPHNURGUS

1. Pedicels and dorsal papillae in double rows on each side of body; dorsal spicules exclusively short, spinous, often perforated, rods ..... Orphnurgus natalasper sp. nov.

   Pedicels and dorsal papillae in single rows on each side of body; dorsal spicules either exclusively smooth rods with terminal dichotomous ramifications or accompanied by short, spinous, non-perforated rods 2

2. Dorsal spicules exclusively smooth rods with open, often spiny, dichotomous ramifications; no short spinous rods in integument; papillae elongate, often filiform

   Orphnurgus insignis Fisher, 1907

   Dorsal spicules with short, spinous, non-perforated rods in combination with dichotomously ramified rods; papillae short, stout, often rudimentary ..... Orphnurgus aspersignis sp. nov.

Orphnurgus aspersignis sp. nov.

(Fig.65 a-k)

Orphnurgus glaber A.M. Clark, 1977:146 (non O. glaber Walsh, 1891).

Diagnosis: A medium-sized species up to about 100mm long. Tentacles (15-)20 with bright yellow discs. Ventrolateral pedicels in single rows of 15-20 on each side, midventral pedicels absent. Ventro=lateral papillae 6-10 on each side, usually larger than dorsal papillae, the latter in a single row of 7-20 on each side of middorsal line; papillae generally short, often stout or quite rudimentary. Spicules numerous, short, non-perforated, spinous rods and few elongate smooth rods with open, often spinous, dichotomous ramifications; ventral spicules always sturdier and transformed into dumb-bell-shaped, rounded, ellipsoidal or amorphous bodies. Smooth primary crosses with arrested dichotomous divisions occasionally present.

Etymology: The specific name is derived from a combination of asper and insignis because of the presence of spicules similar to those of O. asper Théel and O. insignis Fisher.

Previous record: N(28/32/vd), 1000-1200m, as O. glaber A.M. Clark, 1977.
Material examined: Holotype, SAM, off Sibaya, Natal, 'Meiring Naude' St. SM 72 (27°17,8'S, 33°04,5'E), beam trawl, 20V1976, 1050m. Paratypes, SAM, same data as holotype, 4 spec; off Sordwana Bay, Natal, 'Meiring Naude' St. SM77 (27°31,6'S, 32°50'E), heavy dredge, 21V1976, 780m, 1 spec.

Description:

Holotype: Length 90mm, breadth in mid-body 20mm. Anterior and posterior ends of more or less equal width, only slightly less than that of mid-body. Colour yellowish white with bright yellow to orange tips to tentacles, pedicels and larger papillae. Form subcylindrical, ventral surface flattened, dorsal somewhat arched. Odd ambulacrum marked by absence of podia but presence of a feint longitudinal line, indicating position of midventral longitudinal muscle. Skin opaque to somewhat translucent, but not as much as in O. insignis. Body wall thin and rough to the touch.

Mouth terminal but ventrally directed, collar absent. Tentacles 20, non-retractile, stalks thin, white, discs with contracted ramifications and hence distinctly peltate or subglobose in appearance. Anus terminal but slightly dorsal, anal papillae absent.

Ventrolateral pedicels in single rows, 15 on the left and 18 on the right, conical, non-retractile, projecting horizontally from body, longest anteriorly (8mm), decreasing in size posteriorly. Ventro= lateral papillae 10 on each side, placed in a single row, short (max. length 6mm), stout, often quite rudimentary, never filiform. Dorsal papillae 16 on the left and 13 on the right, one row on each side of dorsal midline, papillae short (max. length 8mm), often stout or quite rudimentary.

Calcareous ring delicate, poorly calcified. Tentacular ampullae absent. Water ring well developed, proximal ends of radial canals broad. Polian vesicle single, elongate (14mm), reaching level of gonad, originating from water ring slightly to left of left dorsal radius. Stone canal middorsal; madreporite sieve-like, external, situated between the most anterodorsal papillae. Longitudinal muscles as thin double strands. Gonad in two clusters of small globular sacs of varying size, each cluster resembling a bunch of grapes.

Spicules:

Dorsally simple non-perforated short spinous rods (0,06-0,15mm) of the O. asper type but with spines usually developed only at extremities, and elongate rods (0,29-0,47mm) of the O. insignis type with terminal, often spiny, open dichotomous ramifications (fig. 65a-c); ventrally sturdier rods (0,20-0,63mm), transformed into huge dumb-bell-shaped, ellipsoidal, rounded or amorphous bodies with spinous extremities, the spines representing pointed ends of otherwise fused ramifications (fig. 65d-f). Simple primary crosses (0,285mm long) with arrested dichotomous ramifications also present (fig. 65k). Pedicels with elongate, slender to stout, smooth rods with short spinous terminal ramifications (fig. 65h). Papillae with small slender rods with dichotomous, usually non-spinous ramifications (fig. 65g). Tentacles with rods similar to those of papillae but often with spinous ramifications (fig. 65j), those of tentacular stalks occasionally Y-shaped and up to 0,45mm long (fig. 65i).

Paratypes: Size range 65-95mm. Colour and body wall as in holotype. Tentacles 15-19 (two specimens each with 15, one with 18, and two each with 19). Ventrolateral pedicels 17-20 on each side (max. length 15mm). Ventrolateral papillae 6-9 on each side (max. length 10mm); dorsal papillae always in single rows, 8-16 on each side (max. length 8mm). Spicules as in holotype.

Distribution: Off Natal coast between Richards Bay and Kosi Bay, 780-1200m. Map: 10.

Remarks: This species is well characterised by the presence of both spinous rods and elongate rods with dichotomous ramifications. The simultaneous presence of both these deposits renders the new species intermediate between the West Indian O. asper Théel and the Indo-West Pacific O. insignis Fisher. No species with a similar combination of

Fig. 65. Orphnurgus aspersignis sp. nov. Holotype.

a. Spicules from antero-dorsal body wall.

b. Spicules from middorsal body wall.

c. Spicules from postero-dorsal body wall.

d. Spicules from antero-ventral body wall.

e. Spicules from midventral body wall.

f. Spicules from postero-ventral body wall.

g. Papillae rods.

h. Pedicel rods.

i. Rods from tentacular stalk.

j. Rods from tentacular tip.

k. Cross from antero-dorsal body wall.

(All drawn to same scale)

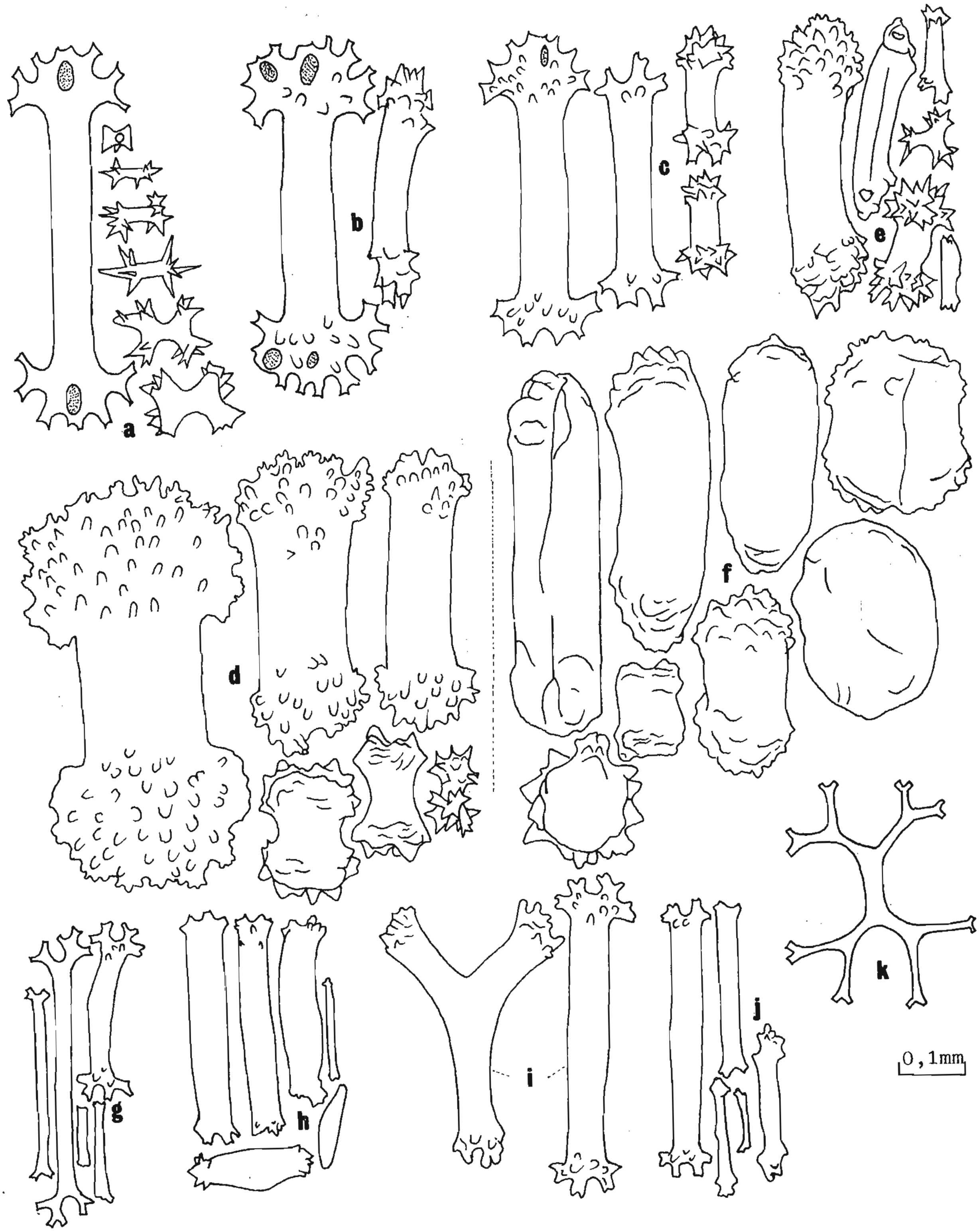


Fig.65

spicules has yet been described from other parts of the world. O. aspersignis, is, however, closer to the sympatric O. insignis since it shares with it a low number of dorsal papillae arranged in single rows, identical rods with dichotomous ramifications and a similar transformation of the ventral deposits. O. asper, on the other hand, has a high number of dorsal papillae arranged in double rows, different type of spinous rods, lacks ramified rods and shows no transformation of the deposits.

As in the other species of the genus, the number of tentacles in the new species varies from 15 to 20 and there is no apparent correlation between tentacle number and size of the specimen since the two largest specimens each has 15 or 20 tentacles.

No general increase is apparent in the number of ventrolateral pedicels with the size of the specimens perhaps because the sample size (6 specimens) is too small or the size range of the specimens too narrow (65-95mm) for any effective analysis. However, such a correlation, with notable exceptions, was reported for O. insignis by Fisher (1907) and for O. glaber (S.E.) by Hansen (1975).

As in O. glaber (S.E.) there is a general increase in the number of both dorsal and ventrolateral papillae with the size of the specimens, the larger specimens having 10-12 pairs of each type while the smaller ones from 7-8 pairs, with a 75mm specimen being an exception with 8 pairs of ventrolateral and up to 11 pairs of dorsal papillae.

There is also, in each specimen, a close correlation between the number of ventrolateral and dorsal papillae with one or two exceptions. Generally a high number of ventrolateral papillae is accompanied by a more or less similar number of dorsal papillae. However, no correlation exists in each specimen between the number of papillae and pedicels.

The short spinous rods are derived from tiny bow-shaped deposits which come to bear a cluster of spines usually at each of the four extremities or, more exceptionally, all round. As in _O_. _glaber_, the basic spicules are found dorsally but both the spinous and dichotomously ramified rods become robust postero-dorsally. The ventral spicules are always robust but tend to increase in sturdiness posteriorly while becoming progressively deformed. Such transformation is not dependent on age since all specimens, without exception, show similar trans= formation. The type of transformation, as in _O_. _glaber_ (sensu Hansen), does not involve the extremities of the spicules as these are nearly always preserved.

A juvenile specimen, referred to _O_. _glaber_ by A.M. Clark (1977), was described as having spicules similar to those of _O_. _asper_ and _O_. _insignis_. Judging from the data given by Miss Clark the specimen in question was part of the present collection and hence _O_. _glaber_ A.M. Clark (non Walsh) is here relegated, without doubt, to the synonymy _O_. _aspersignis_.

Orphnurgus insignis Fisher

(Fig.66 a-c)

Orphnurgus insignis Fisher, 1907:702, pl.73, fig.1; pl.77, figs. 1-3; Ohshima, 1915:234; 1916-1919, 3 figs.

Orphnurgus glaber Hansen, 1975:39 (partim), text-fig.13 (28-33 and 40-45); (non O. glaber A.M. Clark, 1977 = O. aspersignis sp. nov.).

Diagnosis (from Fisher, 1907, modified herein): Small to medium-sized species, reaching a length of 160mm. Tentacles (15-)20. Ventrolateral pedicels 14-24 on each side in single rows, rarely about 30 in double rows on each side; midventral pedicels rarely present. Ventrolateral papillae 4-24 on each side. Dorsal papillae 4-36 on each side in single or double rows per dorsal ambulacrum. Papillae rather elongate and filiform, never stout or rudimentary. Spicules dorsally crosses and rods with dichotomously ramified ends and small rods with rudimentary ramifications; ventrally robust rods with enlarged spiny ends and large ellipsoidal to rounded bodies plus all intermediates between these two types.

Previous southern African record: None.

Material examined: N(27/33/vd, 27/32/vd), 8 spec.

Description:

St. SM74: Specimens flattened. Maximum length 60mm. Colour white with yellowish tentacles and pale yellow tips to pedicels. Tentacles (19)-20. Ventrolateral pedicels (14)-20, in single rows (max. length 8mm). Ventro=lateral papillae approximately 4-10 on each side (max. length 12mm). Dorsal papillae (2)-10 in single rows per dorsal radius (max. length 10mm). Body wall thin, translucent. Dorsal deposits a few crosses and dichotomously ramified rods (0,27-0,88mm), sturdier posteriorly but with spiny extremities (fig. 66a). Ventral deposits (0,81-1,08mm), resembling those of O. aspersignis (fig. 66b & c).

St. SM72: Maximum length 70mm, form subcylindrical. Tentacles 20 in one; 13(?15) in the other. Ventrolateral pedicels 18-21 (max. length 8mm). Ventrolateral papillae 7-10 (max. length 14mm). Dorsal papillae 7-20 in single rows, one pair radius (max. length 16mm). Spicules as above.

Local distribution: Off Natal, between Cape St Lucia and Kosi Bay, 860-1050m. Map: 8.

General distribution: East Africa, Japan and Hawaii.

Remarks: In possessing only crosses and dichotomously ramified rods and their derivatives as spicules, the southern African material is identical to Fisher's (1907) species from Hawaii and that of Ohshima (1915) from Japan. It however, shows some geographic variations, differing from the Hawaiian form in its smaller size and lower number of papillae and from the Japanese form in having only one row of dorsal papillae on each side. Hence the diagnosis of the species is here modified to take in the new form. The aberrant Hawaiian specimens of Fisher were extraordinary in possessing midventral pedicels not en=countered elsewhere in the genus. Further, they have a higher number of ventrolateral pedicels in one or two rows and double rows of dorsal papillae.

As in O. aspersignis and in other species of the genus there is no correlation between the size of the specimens and the number of tentacles. The largest individual (70mm) has only 13(?15) tentacles while the majority, including the smallest, has 20. There is also no correlation between the size of the specimens and the number of pedicels

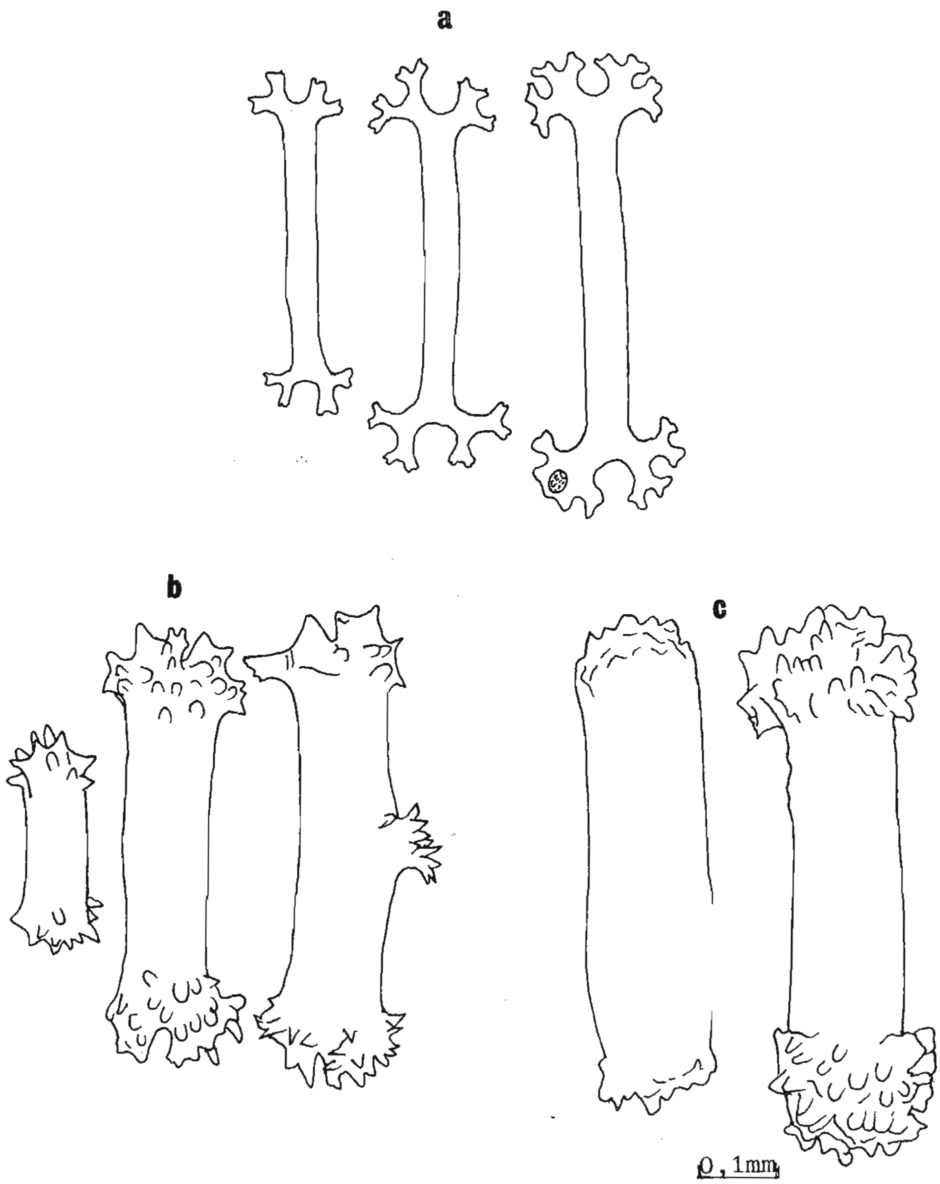


Fig. 66. Orphnurgus insignis Fisher. Off Natal coast.

a. Rods from middorsal body wall.

b. Rods from antero-ventral body wall.

c. Rods from postero-ventral body wall.

(All drawn to same scale)

which varies from 15-21. Although the highest pedicel number (21 pairs) is found in the largest individual (70mm) the two smallest individuals (48mm) both have 20 pairs each. Perhaps, here again, the sample is too small (8 specs.) and the size range of the specimens too narrow (48-70mm) for any effective analysis.

As in O. aspersignis the number of ventrolateral and dorsal papillae generally increase with the size of the specimens. However, the smallest individual has a relatively high number, 9 and 10 pairs, of dorsal and ventrolateral papillae respectively. There is also a close correlation, in each specimen, between the number of ventro= lateral and dorsal papillae except in the largest specimen which has twice as many dorsal as ventrolateral papillae.

As in other species of the genus the basic type of deposits in O. insignis is found in the dorsal body wall and sturdier deposits, in various stages of transformation, ventrally. As in O. aspersignis and other related species the transformations do not affect the extremities of the deposits.

O. insignis appears to be most closely related to the type of O. glaber from the Bay of Bengal which has rods with few terminal ramifications and rather sturdy rods with enlarged spinous extremities. In O. glaber (S.S.), however, there are no ellipsoidal and dumb-bell-shaped deposits. It is extremely likely that O. insignis is a modifi= cation of the O. glaber condition.

Orphnurgus natalasper sp. nov.

(Fig.67 a-d)

Diagnosis: Holotype 82mm long. Tentacles 19(?20). Ventrolateral pedicels about 40 on each side in alternating double or triple rows. Midventral pedicels absent. Ventrolateral papillae about 20 on each side in a single row. Dorsal papillae about 43-44 in alternating double rows in each dorsal radius, decreasing to single rows pos= teriorly. Dorsal deposits very spinous, often perforated, rods with spines frequently present throughout length of rod; ventral deposits sturdier rods with spiny ends and huge dumb-bell-shaped deposits with spiny extremities.

Etymology: The specific name is derived from a combination of Natal, the type locality, and asper because of rods of the O. asper Théel type.

Material examined: Holotype, SAM, off Lake St. Lucia, Natal, 'Meiring Naude' St. SM74 (27°38,6'S; 32°52,6'E), beam trawl, 2 IV 1976, 860m.

Description: Length 82mm, breadth in mid-body 16mm. Form subcylindrical. Tentacles 19, discs with extremely contracted ramifications giving the tentacles a distinctly peltate appearance. Ventrolateral pedicels short, stout, about 40 on each side, arranged alternatively in double or triple rows (max. length 10mm). Ventrolateral papillae about 20 on each side with some indication of a zig-zag arrangement, size equal to that of pedicels. Dorsal papillae difficult to count, about 43-44 on each side in alternating double rows per ambulacrum, varying from short, rudi= mentary to slightly long and filiform (max. length 10mm). Anterior papillae with light yellow tips. Body wall relatively thick, opaque.

Spicules:

Dorsally short spinous rods (0,14-0,30mm long), spines long, usually undivided but occasionally bifid or even trifid at apex. Rods frequently perforated, the holes resulting from fusions of distal ends of some long spines (fig. 67a). Ventrally sturdier rods (fig. 67b-d) with few spiny projections, slender rods with spinous terminal ramifications, and huge elongate to dumb-bell-shaped bodies also with spinous extremities. Length of ventral spicules 0,22-0,58mm. Spatulated rods, crosses, ellipsoidal and amorphous deposits absent. Pedicels with stout, elongate or tripartite rods with spinous extremities. Tentacular discs and papillae with slender rods (0,225-0,35mm long) with spinous dichotomous ramifications.

Remarks: In the presence of double rows of ventrolateral pedicels and dorsal papillae and in the occurrence of different form of spinous rods, this species is distinct from the other southern African species of the genus. Since double rows of pedicels and papillae do occur sporadically in members of a single species within the genus it may be argued that O. natalasper is an individual variant of O. aspersignis. However, the nature of the spinous rods and the absence of any dichotomously ramified deposits in O. natalasper speak against this.

While the spinous rods with their frequent perforations are reminiscent of those of O. asper, the ventral spicules are somewhat like those of O. aspersignis. Hence O. natalasper appears intermediate between the two species. It differs from O. asper not only in the nature of the ventral deposits (no transformation of deposits occur in O. asper) but also in the high number of double-rowed pedicels and a low number of dorsal papillae. The similarity of the spinous rods in both species might suggest that O. asper probably developed from a form resembling

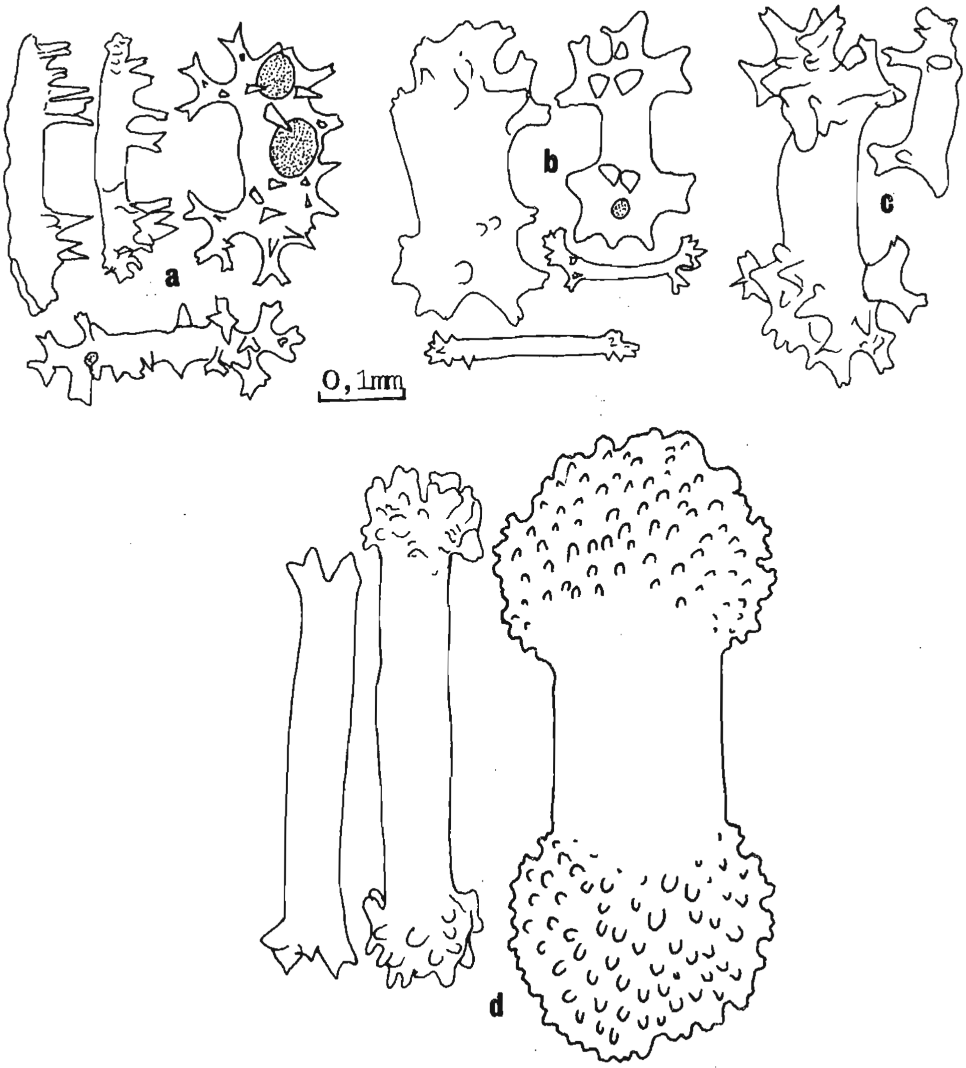


Fig. 67. Orphnurgus natalasper sp. nov. Holotype.

a. Rods from middorsal body wall.

b. Rods from antero-ventral body wall.

c. Rods from mid-ventral body wall.

d. Rods from postero-ventral body wall.

(All drawn to same scale)

O. natalasper in which there was a loss of transformation of the ventral deposits. It is possible that further intermediates, more closely approaching the asper condition, may one day be found from waters of the East Atlantic.

Family LAETMOGONIDAE Ekman, 1926

Diagnosis: See Hansen, 1975:47.

Remarks: This family is characterised by wheels, often accompanied by scattered rods or spinous crosses, as body wall spicules. Of the four genera included in this family by Hansen (1975) only Laetmogone is at present known from southern Africa.

Genus LAETMOGONE Théel, 1879

Laetmogone Théel, 1879:9; 1882:73; Fisher, 1907:706; Hansen, 1975:52 (synonymy).

Type species: Laetmogone wyvillethomsoni Théel, 1879 (by subsequent designation Fisher, 1907:706).

Remarks: Only L. fimbriata (Sluiter, 1901), was hitherto known from southern Africa. This species is not present in the collections at hand. However, a single specimen, not referable to any of the known species, is present in the SAM collection. It is here described as L. perplexa sp. nov.

KEY TO THE SOUTHERN AFRICAN SPECIES OF LAETMOGONE

1. Papillae conspicuous, white; pedicels crowded, slender from base to tip; large wheels usually (95%) with nine spokes
Laetmogone fimbriata (Sluiter, 1901)

Papillae inconspicuous, dark violet; pedicels short, truncate, retractile into pockets, not crowded; large wheels usually (76%) with 10-12 spokes .... Laetmogone perplexa sp. nov.

Laetmogone fimbriata (Sluiter)

Ilyodaemon fimbriatus Sluiter, 1901a:23; 1901b:67, pl.9, fig.8. (non Ilyodaemon fimbriatus var. magna Sluiter, 1901a = L. ijimai).

Laetmogone parva Mitsukuri, 1912:186, fig.34, pl.5, figs.46-47.

Laetmogone selenkai Mitsukuri, 1912:189, fig.35, pl.5, figs.48-51.

Bathygone papillatum Pawson, 1965:77, figs.7-11.

Laetmogone fimbriata Hansen, 1975:67, text-fig.25.

Diagnosis: See Hansen, 1975:67.

Southern African record: N(30/31/d).

Material examined: None.

Local distribution: Known only from off Durban, 412m.

General distribution: S.E. Africa, Indonesia, Japan and New Zealand, 164-827m.

Remarks: The southern African record of this species is that of Hansen (1975) based on 10 specimens (12-35mm long) taken by the 'Galathea'. In the number, form and distribution of pedicels and papillae and the maximum size (0,14mm) of the wheels, this species differs considerably from the new species described below.

Laetmogone perplexa sp. nov.
(Fig.68 a-c)

Diagnosis: A large subcylindrical species, holotype 220mm long. Colour uniform dark violet. Tentacles 15, slightly lobed. Pedicels 20 on each side, short, truncate, retractile into pockets, the latter situated on an indistinct brim which also encircles mouth. Papillae minute (1mm), retractile, about 25 on each side. Body wall spicules restricted to anterior and posterior ends; rods of varying shapes, 0,4-0,55mm long; wheels not sharply differentiated into two types, diameter varying from 0,05-0,18mm with mostly (76%) four central rays and 10-12 spokes.

Etymology: The specific name is formed from latinisation of perplex, meaning puzzling.

Material examined: Holotype, SAM, A22165, W. of Dassen Is., 'Africana' II St. A191 (33°36'S, 16°15'E), 15' beam trawl,26 VIII 1959, 2782-2871m.

Description: Length 220mm, breadth in midbody 60mm, anterior and posterior ends rounded. Colour, including pedicels, papillae and tentacles, uniformly dark violet. Tentacles 15, large, apparently non-retractile and slightly lobed, stalks short. Mouth ventral; anus apparently surrounded by minute papillae, difficult to demonstrate.

Podia not obvious in superficial study. Pedicels short (av. length 2mm), truncate, about 20 in each ventrolateral radius, decreasing in size posteriorly, all (except two) retracted into pockets, the latter at least at both ends borne on an indistinct brim which also encircles the mouth anteriorly, discs well developed, only slightly larger than width of pedicels. Papillae retractile, minute (av. length 1mm), easily overlooked, placed in single rows, one in each dorsal radius, 20 visible on right side and only three on left, but dissection revealed about 25 on each side.

Body wall fairly thick (about 2mm), smooth and somewhat gelatinous. Internal anatomy typical; polian vesicle single; gut filled with grey mud. Gonad (? testis) deep violet, tubular and branched. Longitudinal muscles unpaired. Cloaca elongate.

Spicules:

Limited to anterior and posterior ends and to pedicels, papillae and tentacles. Body wall spicules comprising rods (of varying shapes) and wheels, the latter not sharply differentiated into two types. Rods (fig. 68b) elongate (0,40-0,55mm), slightly curved with roughened ends, rarely cruciform or with two short lateral arms; postero-ventral region with fewer, smooth rods, often appearing as elongate ellipsoids.

Wheels (fig. 68a) more numerous in posterior than anterior body wall, diameter 0,05-0,18mm, no sharp distinction between small and large ones but latter more frequent in anal region; number of rays per wheel four, sometimes five, rarely three or six; number of spokes usually 10-12, occasionally more or less; rarely wheels with calcareous membrane covering nave.

Pedicels, papillae and tentacles with rods similar to those of body wall (fig. 68c). Pedicels, in addition, with end plates and wheels; papillae without end plates but sometimes with wheels with only two rays and seven spokes or showing some sort of superstructure on nave.

Table 4. Laetmogone perplexa sp. nov. Diameter, number of central rays and spokes of 100 wheels from posterior body wall and anal region of holotype.

Diam.	Central rays				Spokes							
(mm)	3	4	5	6	8	9	10	11	12	13	14	8-14
0,05	1	26	5	–	–	2	7	13	10	–	–	32
0,06	1	31	7	–	1	1	15	13	9	–	–	39
0,07	–	1	3	–	–	–	1	1	2	–	–	4
0,08	–	11	2	1	–	–	1	1	10	2	–	14
0,09	–	2	4	–	–	–	–	1	2	1	2	6
0,10	–	1	1	–	–	–	–	–	2	–	–	2
0,11	–	–	–	–	–	–	–	–	–	–	–	0
0,12	–	–	1	–	–	–	–	–	–	1	–	1
0,13	–	–	1	–	–	–	–	–	–	1	–	1
0,14	–	–	–	–	–	–	–	–	–	–	–	0
0,15	–	–	–	–	–	–	–	–	–	–	–	0
0,16	–	–	–	–	–	–	–	–	–	–	–	0
0,17	–	–	–	–	–	–	–	–	–	–	–	0
0,18	–	–	–	1	–	–	–	–	1	–	–	1
0,05-0,18	2	72	24	2	1	3	24	29	36	5	2	100

A sample of 100 wheels taken from the posterior body wall and anal region (Table 4) revealed the following: 72% of wheels have four central rays, 24% have five, while the remainder (4%) have either three or six rays. The number of spokes per wheel varies from 8-14 with the majority having 10-12 spokes (24% with 10, 29% with 11 and 36% with 12 spokes). Although 13-14 spokes are usually present in wheels above 0,08mm in diameter, the largest wheel (0,18mm) has only 12 spokes, a number frequent in wheels below 0,08mm in diameter. A lower spoke number, with exceptions, is typical of smaller (<0,06mm) wheels. While 55% of wheels are 0,06mm in diameter or less, only 5% are 0,10mm or more in diameter. In only rare instances a few wheels may have their naves covered by a calcareous membrane.

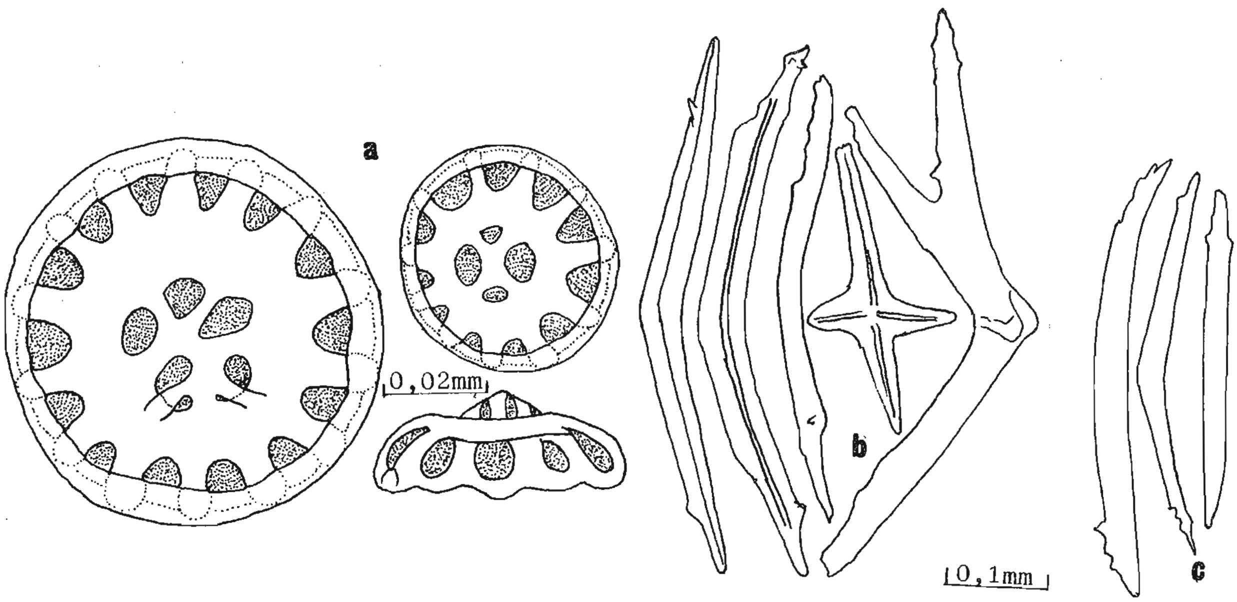


Fig. 68. Laetmogone perplexa sp. nov. Holotype.

a. Wheels from antero-dorsal body wall.

b. Rods from antero-dorsal body wall.

c. Tentacular rods.

Remarks: This new species is well characterised by its minute papillae, short truncate pedicels that are retractile into pockets situated on a poorly defined brim, and by its wheels which are not sharply differentiated into two types. These features in combination indicate that the new species is not identical to any of the nine species included in Laetmogone by Hansen (1975), of which only L. scotoeides (H.L. Clark) and L. interjacens Sluiter have minute papillae. In L. scotoeides the wheels are sharply differentiated into two types, the larger ones reaching an upper size limit of 0,30mm. In L. perplexa no wheels greater than 0,18mm in diameter are present. Further in L. scotoeides the peridels are bulky, the spokes variable. from 10-18 (8-14 in L. perplexa) and the spokes of the larger wheels are consistently five in number.

In L. interjacens, on the other hand, although a broad lateral brim is present, the wheels have more or less consistently four central rays and a diameter of 0,08-0,14mm. In the new species, the majority (55%) of wheels are 0,06mm in diameter or less and only 72% of the wheels have four rays. Hansen (1975) states that L. interjacens is probably related to Benthogone because of its sometimes high (up to 17) tentacle number and the similarity of the wheels to those of B. rosea Koehler and B. fragilis (Koehler and Vaney). L. perplexa also has wheels of similar size range, spoke and ray numbers as those of B. rosea but a covering membrane is rarely present to the nave of the wheels and there is no evidence of any circumoral papillae. Therefore, while the new species clearly belongs in Laetmogone, like L. interjacens, it occupies an intermediate position between this genus and Benthogone.

Suborder PSYCHROPOTINA Hansen, 1975

Diagnosis: See Hansen, 1975:75.

Remarks: Hansen (1975) assembled in this suborder the families Pelagothuriidae Ludwig, 1894, Elpidiidae Théel, 1879 and Psychropotidae Théel, 1882. All three families are known from southern Africa but since the Pelagothuriidae comprises poorly known pelagic species it is excluded from this report.

Family PSYCHROPOTIDAE Théel, 1882

Diagnosis: See Hansen, 1975:75.

Remarks: This family includes the genera *Benthodytes*, *Psychropotes* and *Psychrotrephes*, all erected by Théel (1882) and characterised by the presence of spicules, midventral pedicels and a brim of fused pedicels surrounding the body. Only the former two genera are known from southern Africa.

Genus *BENTHODYTES* Théel, 1882

Benthodytes Théel, 1882:102; Hansen, 1975:76.

Type species: *Benthodytes typica* Théel, 1882 (by indication).

Remarks: *Benthodytes* is characterised by soft retractile tentacles, circumoral or postoral papillae and the absence of an unpaired dorsal appendage. It includes eight species, of which *B. sanguinolenta*, *B. lingua*, *B. plana* and *B. typica* are currently known from southern

Africa. The material at hand includes only B. lingua and one other species herein referred to B. valdiviae.

KEY TO THE SOUTHERN AFRICAN SPECIES OF BENTHODYTES

1. Spicules cross-shaped; dorsal papillae usually well developed 2

   Spicules rod-shaped or absent; dorsal papillae minute ... 4

2. Brim narrow, often completely enclosed in body wall, body somewhat cylindrical .... Benthodytes lingua R. Perrier, 1896

   Brim broad, its margin forming the edge of the rather flattened body 3

3. Anterior and posterior ends of body rounded; tentacular crown placed a considerable distance from anterior edge of body .... Benthodytes plana Hansen, 1975

   Anterior and posterior ends of body somewhat tapered; tentacular crown adjoining anterior edge of body Benthodytes valdiviae Hansen, 1975

4. Dorsal papillae numerous arranged in two bands; tentacles 18; postoral papillae present .... Benthodytes sanguinolenta Théel, 1882

   Dorsal papillae few, arranged in two single rows; tentacles 15-20; circumoral papillae present ..... Benthodytes typica Théel, 1882

Benthodytes lingua R. Perrier

(Fig.69 a & b)

Benthodytes lingua R. Perrier, 1896:902; 1902:456, pl.12:figs.1-2, pl.21:figs.1-9; Deichmann, 1930:124; Hansen, 1975:80, text-fig.29, pl.9:figs.3-5, pl.12:figs.2-3.

Benthodytes janthina Grieg, 1921:11(non von Marenzeller).

Pannychia glutinosa Hérouard, 1902:32, pl.4, fig.17.

Diagnosis: See Hansen, 1975:80.

Previous southern African record: Locality unknown (Hansen, 1975).

Material examined: C(33/16/vd), 1 spec.

Description: Length 250mm. Pedicels, dorsal papillae and brim not recognisable. Circumoral papillae well developed. Each longitudinal muscle consisting of 4-7 strands, united at point of origin and insertion.

Spicules:

Common only anteriorly and posteriorly, dominant type large crosses with bipartite apophyses (fig. 69a) but latter rarely preserved, arms spinous, 0,75-(1,0mm), with spines increasing in density distally. Other spicules include crosses without apophyses, tripartite rods and spinous rods (fig. 69b), arms of crosses 0,35mm long, spinous rods up to 0,6mm long. Tentacles with rods, tripartite spicules and crosses, spinose at ends. Gonad with crosses and tripartite spicules without apophyses but with distally spinose arms.

Local distribution: Off S.W. Cape, 2780-2871m. Map: 9.

General distribution: North and South Atlantic, 860-3192m.

<u>Remarks</u>: The only record of this species from southern Africa is that of Hansen (1975) based on seven specimens from an unknown locality. According to Hansen the apophyses in this species are bipartite from the base but this could not be discerned from the few spicules in which the apophyses were intact. However, the size of the specimen, its cylindrical shape, thick gelatinous body wall, the type of tentacular discs and the size and robustness of the deposits, all agree with Hansen's description of *B. lingua*. The closest relative of this species is the East Pacific *B. incerta* from which it differs in its form, thick skin, well developed circumoral papillae and the absence of the characteristic crosses of the type illustrated by Hansen (1975:79: fig.28).

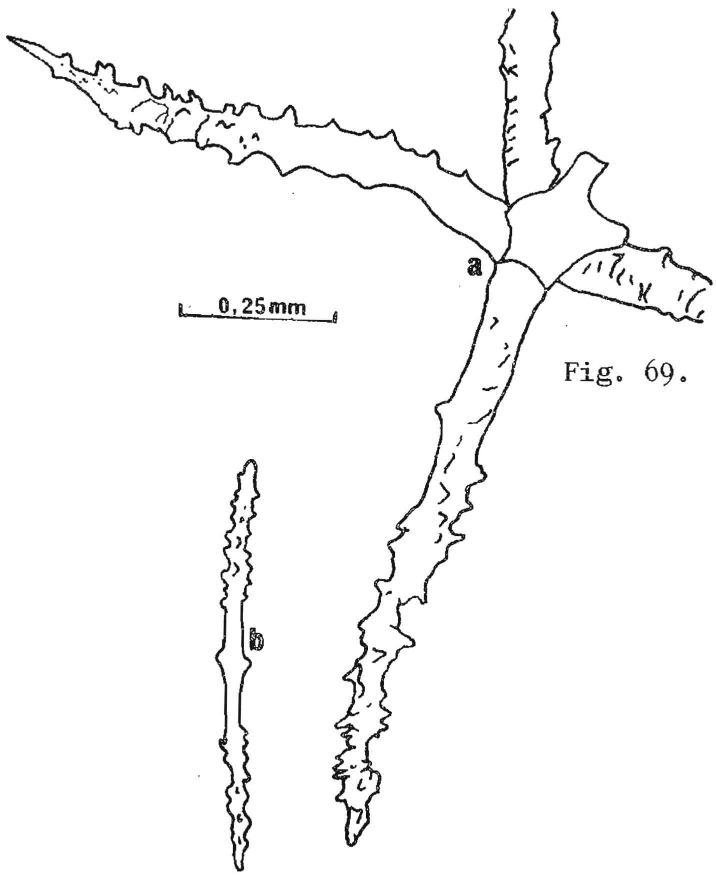


Fig. 69. *Benthodytes lingua* R. Perrier. Off S.W. Cape.

a. Cross-shaped rod with bipartite apophysis from dorsal body wall.

b. Rod from anal region.

Benthodytes plana Hansen

Benthodytes plana Hansen, 1975:87, text-figs. 34-35.

Diagnosis: See Hansen, 1975:87.

Southern African record: T(32/32/vd).

Material examined: None.

Local distribution: Known only from off Transkei, 3620m.

General distribution: West Indian ocean, 3310-3620m.

Remarks: This species is based on two specimens of which the holotype (from off Transkei) measured 130mm. According to Hansen the spinous crosses had 0,4mm long arms with few spicules having three or even five arms and some tripartite apophyses. No spicules occurred in the ventrum.

It is regrettable that no specimen in the present collections is referable to this species. However, two specimens, which come close to it are here referred to the related *B. valdiviae* Hansen since their tentacular crown is placed near the anterior margin of the body.

Benthodytes sanguinolenta Théel

Benthodytes sanguinolenta Théel, 1882:104, pl.23, pl.40:figs.4 and 5, pl.42:fig.6; H.L. Clark, 1923:420; Madsen, 1953:171; Hansen, 1975:94, pls.3-6, pl.9:figs.6 and 7, pl.12:figs.4 and 5. (non *Benthodytes sanguinolenta* var. *marginata* Théel, 1882).

Diagnosis: See Hansen, 1975:94.

Southern African record: C(34/18/vd).

Material examined: None.

Local distribution: Known only from Cape Point, 1372m.

General distribution: Throughout the Indo-Pacific region, 768-7250m.

Habitat: Grey mud, red clay.

Remarks: The only record of this species from southern Africa is that of H.L. Clark (1923) based on two fragments. Since Clark's identification was based only on colour and body form the occurrence of this species in southern Africa is questionable.

Benthodytes typica Théel

Benthodytes typica Théel, 1882:103, pl.27:fig.7, pl.35:fig.14, pl.38: fig.5, pl.44:fig.8; Deichmann, 1930:123; Hansen, 1975:89, text-fig.36, pls.1 and 2 (refs.).

Benthodytes papillifera Théel, 1882:102, pl.34, fig.14.

Benthodytes glutinosa R. Perrier, 1896:902; 1902:462, pl.13:fig.5, pl.20:fig.31.

Benthodytes janthina Hérouard, 1902:30; 1923:103 (non von Marenzeller).

Diagnosis: See Théel, 1882:103; Hansen, 1975:89.

Southern African records: T(33/32/vd), N(29/33/vd); M(14/45/vd).

Material examined: None.

Local distribution: Transkei coast to Moçambique Channel, 2720-3620m. Map:2.

General distribution: Cosmopolitan, 1873-4700m.

Habitat: Mud.

Remarks: All southern African records of this species are those of Hansen (1975) based on 35 specimens collected off the east coast. The dorsal papillae were few and inconspicuous while spicules were only present in the Durban and Transkeian material.

Benthodytes valdiviae Hansen

(Fig.70 a-d)

Benthodytes valdiviae Hansen, 1975:82, text-figs. 30-31.
Benthodytes lingua Heding, 1940:368 (non R. Perrier).
Benthodytes janthina Heding, 1940:368 (non von Marenzeller).

Diagnosis: See Hansen, 1975:82.

Previous southern African record: None.

Material examined: C(33/16/vd), 2 spec.

Description: Specimens flattened, larger 42mm long. Colour light violet to dirty grey. Tentacles dark purple, 15 in the larger and 12 in the smaller specimen. Tentacular crown adjoining anterior edge of body. Circumoral papillae, dorsal papillae and midventral pedicels not seen. Brim broad, pedicels of brim more or less completely fused, except anteriorly but lateral canals often visible.

Spicules:

Dorsal spicules crosses (with apophysis), tripartite deposits and rods. Crosses of two types: one type large, similar to that described for B. lingua, with arms up to 0,8mm long; other type (fig. 70a, c, & d) slender, with 4-5 smooth to slightly thorny arms, 0,35-0,6mm long, with distally bipartite apophysis, feebly spinose at ends. Ventral spicules similar to dorsal -crosses, tripartite spicules and spinous to smooth rods common (fig. 70b).

Local distribution: Off S.W. Cape, 2780-2871m.

General distribution: East Atlantic.

Remarks: Although the specimens are here referred to B. valdiviae, their flattened nature, free anterior pedicels and five-armed spicules suggest that they may belong to B. plana. However, since B. valdiviae

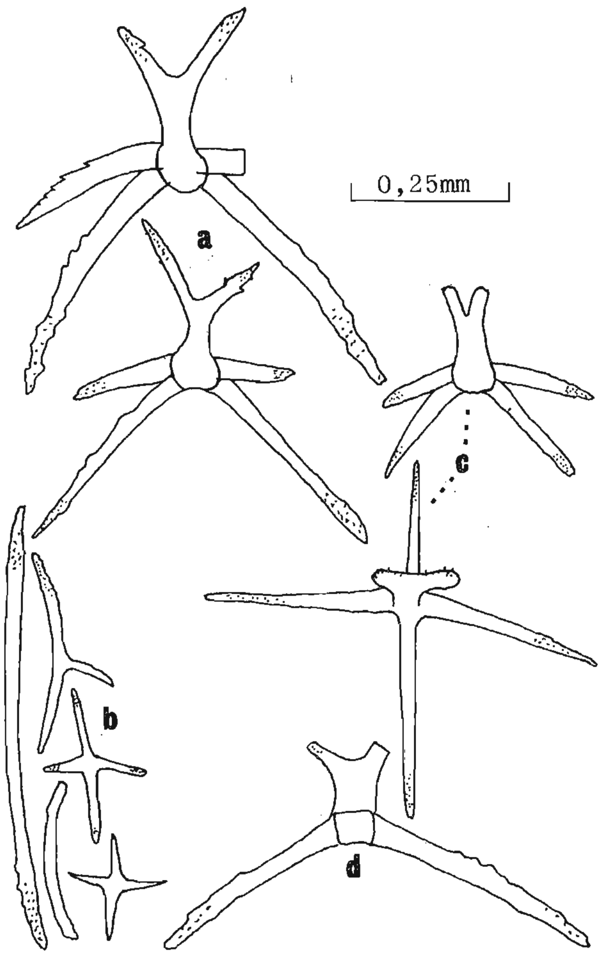


Fig. 70. Benthodytes valdiviae Hansen. Off S.W. Cape.

a. Cross-shaped rods with apophysis from dorsal body wall.

b. Rods, crosses and tripartite deposit from ventral body wall.

c. Cross-shaped rods from ventral body wall of another specimen.

d. Same from dorsal body wall.

(All drawn to same scale)

differs from B. plana only in the shape of the body, the more anterior position of the tentacles and a greater robustness of the deposits (Hansen, 1975) the present material is referred to it.

A point of some interest is that while B. plana appears to be an Indian Ocean species, currently known only from the east coast of southern Africa and from between Seychelles and Ceylon, B. valdiviae is probably East Atlantic in distribution, formerly known from Canary Islands and now possibly off Cape Peninsula.

In the presence of two types of crosses with apophysis it is quite unlike any other species except B. incerta. The latter species, however, is semicircular in cross section with a warty skin and peculiar crosses of the type illustrated by Hansen (1975:79, fig.28).

Genus PSYCHROPOTES Théel, 1882

Psychropotes Théel, 1882:96; Hansen, 1975:99 (synonymy).

Type species: Psychropotes longicauda Théel, 1882 (by subsequent designation Deichmann, 1930).

Remarks: The most characteristic feature of this genus is the single unpaired dorsal appendage and the absence of circumoral papillae. The genus is represented in southern Africa by only P. verrucosa, based on a single specimen collected by the 'Galathea' and described by Hansen (1975).

Psychropotes verrucosa (Ludwig)

Euphronides verrucosa Ludwig, 1894:44, pl.3, figs.1-6.

Euphronides bifurcata Koehler and Vaney, 1905:75, pl.8:figs.1-2, pl.12:fig.22.

Psychropotes verrucosa Hansen, 1975:112, text-figs.47 and 48.

Diagnosis: See Hansen, 1975:112.

Southern African record: T(32/32/vd).

Material examined: None.

Local distribution: Known only from off Transkei, 3530m.

General distribution: West Indian Ocean to East Pacific and the Caribbean, 2417-7250m.

Remarks: Hansen's specimen was 80mm long with 16 tentacles and one left and two right dorsal papillae, 1mm long. The unpaired appendage was level with the skin and the midventral pedicels small and conical.

Family ELPIDIIDAE Théel, 1879

Diagnosis: See Théel, 1882:10; Hansen, 1975:127.

Remarks: This family comprises small elasipodids with few tentacles (10-12), pedicels and papillae. Hansen (1975) critically analyses the family and rejects the ideas expressed by Hérouard (1923) and Ekman (1926) that the genera represent two evolutionary lines. He reduces the number of genera from 13 to 10. Only the genera Elpidia Théel, 1876 and Scotoplanes Théel, 1882, each represented by a single species, occur in southern Africa, here recorded for the first time.

Genus ELPIDIA Théel, 1876

Elpidia Théel, 1876:1; 1877:1; Hansen, 1975:172 (synonymy).

Diagnosis: See Théel, 1876:1; Hansen, 1975:172.

Type species: Elpidia glacialis Théel, 1876 (by monotypy).

Remarks: This genus is well characterised by its rod-shaped spicules with two pairs of obliquely placed horizontal arms and two vertical apophyses. The genus was formerly regarded as monotypic, but due to the works of mostly Hansen (1956,1975) and Belyaev (1971,1975) the genus currently contains 13 nominal and three unnamed species. Some scanty material collected off the south west coast of southern Africa is here referred to E. gracilis Belyaev, 1975 but since it differs in some significant features a new subspecies is diagnosed.

Elpidia gracilis Belyaev austroafricana subsp. nov.
(Fig.71 a-i)

Diagnosis: Body length 7mm. Dorsal papillae possibly three pairs, up to 1mm long. Spicules up to 0,65mm long, slightly serrate; diameter of axis up to 0,03mm. Apophyses 10-78% length of spicules.

Etymology: Australis (L.) = southern.

Material examined: Holotype, SAM, A22149, Africana II St. A190, W. of Dassen Island, (33°26'S, 16°33'E), 15' Beam Trawl, 26 VIII 1959, 2268-2377m.

Paratypes, SAM; (same data as holotype), 2 fragments (ant. and post. ends).

Description:

Holotype (fig. 71a): Colour whitish, length 7mm, width 5mm; skin thin, delicate, ruptured at several points; apophyses of spicules projecting from skin all round. Mouth ventral, tentacles 10, short

(c. 1mm), truncate, with slender retractile processes; diameter of oral disc c. 30% of body length. Anus terminal. Pedicels c. 4 pairs, two short projections, one on each side or oral disc, may represent a fifth pair of pedicels or probably torn fragments of body wall. Papillae dorsal, only five counted with certainty, first definite pair in between first definite pair of pedicels, second pair between second and third pair of pedicels, single posterior papilla on right side between third and fourth pairs of pedicels; longest papilla c. 1mm. An unpaired papilla-like structure at anterior end of left side may represent a sixth papilla or a torn piece of body wall.

Spicules:

Dorsal and ventral spicules slender and elongate (fig. 71b-e). Axis and arms either smooth or slightly serrate with rounded extremities. Spicules 0,16-0,65mm long; longest dorsal spicule 0,65mm, longest ventral spicule 0,50mm; maximum diameter of axis of dorsal spicules 0,03mm, of ventral spicules 0,02mm. Arms up to 31% length of spicule; extremities of some spicules bent off plane (fig. 71d). Apophyses straight, acicular, of dorsal spicules 0,05-0,285mm long or 18-78% length of spicules, of ventral spicules 0,045-0,07mm long or 12-21% length of spicules. Some spicules abnormal with strongly curved axis and arms of unequal length (fig. 71d). Tentacular spicules (fig. 71f) 0,20-0,45mm, slightly or strongly curved with both arms and apophyses reduced and/or absent.

Paratypes: Tentacles as in holotype. Spicules (fig. 71g) 0,175-0,52mm long; diameter of axis 0,02mm. Arms up to 32% length of spicules. Apophyses 0,018-0,205mm long or 10-62% length of spicules. Irregularly branched rods (fig. 71h), 0,11-0,13mm in length also present. Tentacular

Fig. 71. Elpidia gracilis austroafricana subsp. nov.

a. Holotype (entire) A. Dorsal View. B. Ventral View.

b. Normal spicule from dorsal body wall of holotype.

c. Developing spicules from dorsal body wall of holotype.

d. Abnormal spicules from dorsal body wall of holotype.

e. Normal spicules from ventral body wall of holotype.

f. Tentacular spicules of holotype.

g. Normal spicules from paratype.

h. Branched rods from paratype.

i. Tentacular spicules of paratype.

(All drawn to same scale)

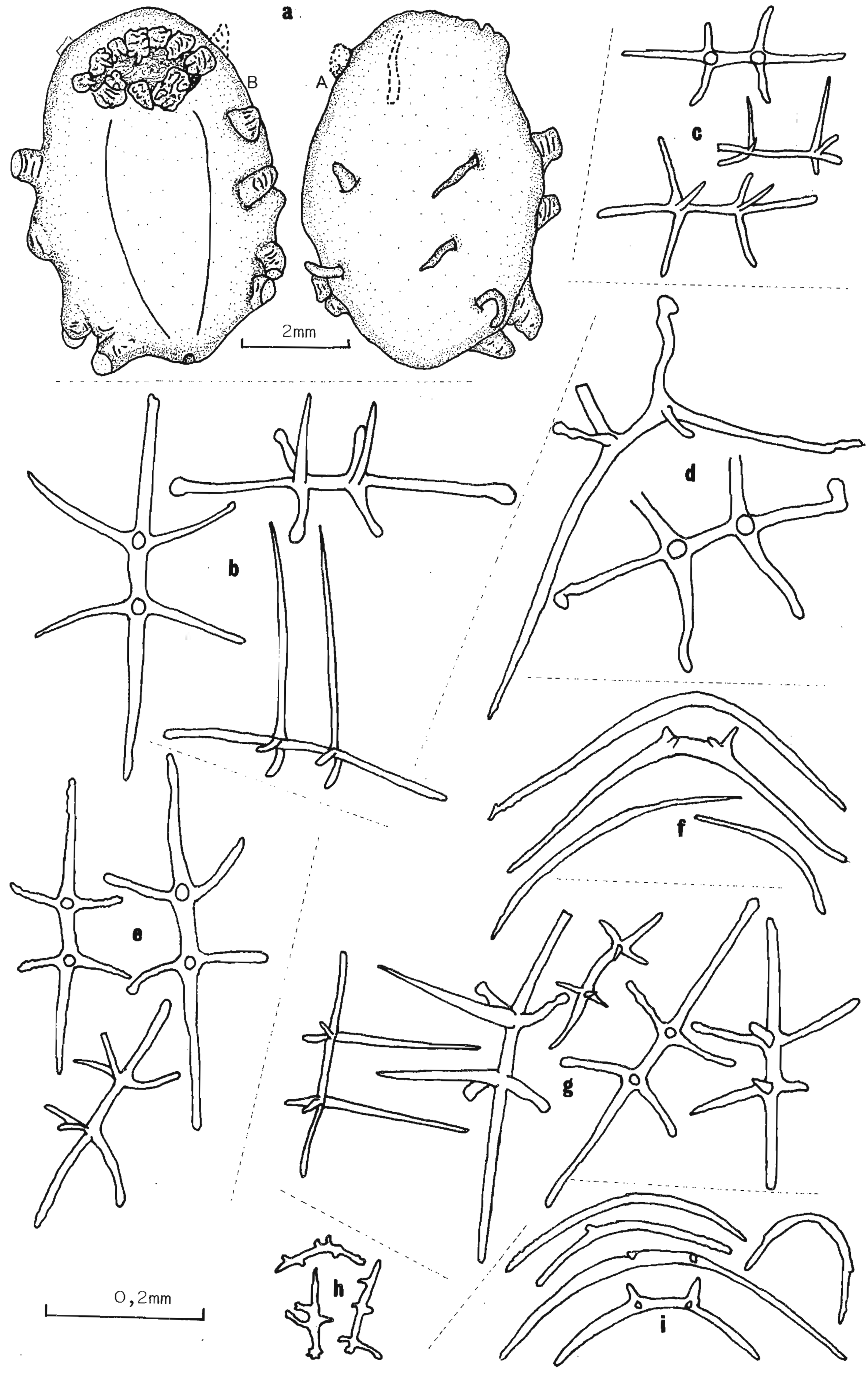


Fig. 71

spicules as in holotype (fig. 71i), 0,13-0,445mm long.

Distribution: South West Cape Province, 2268-2377m.

Remarks: Of the two fragments here designated as paratypes, one (the posterior end) was contained in the same vial as the holotype while the other (anterior end) was included together with a synaptid in another vial which contained four labels as follows: everted part of holothurian, sac-like holothurian, SAM A189C 25/8/59, and SAM A190N 26/8/59. It is certain that the second and last labels belong together and refer to the elpidiid since the Station No. and date of collection are the same as those of the holotype and the remaining paratype. The two fragments most probably belong to a single specimen.

The southern African material is here referred to *E. gracilis* because of short papillae, smooth as well as serrate extremities of spicules and arms, length of arms relative to the axis, and the form and maximum size of the apophyses. However, there are slight differences, here considered as geographic variations between the present material and Belyaev's species. These differences (summarised in Table: 5) include the presence of papillae in the posterior rather than the anterior half of the body, the short maximum size of the spicules, the slightly narrower diameter of the central axis of the spicules and the shorter and less developed tentacular deposits.

The soft thin nature of the skin and the extremely slender spicules with well developed acicular apophyses are reminiscent of *E. theeli* Hansen, *E. minutissima* Belyaev, *E. chilensis* Belyaev and *E. adenensis* Belyaev. However, while both *E. theeli* and *E. minutissima* have spicules up to 0,60 and 0,80mm in length respectively, the diameter of the central axis is 0,02mm with the apophyses 20-50% the length of the spicules in E. *théeli* and only 25-35% in E. *minutissima* (Hansen, 1975). Further, E. *theeli* has 5-7 pairs of long (12mm) papillae.

Table 5. Comparison of characters of the two subspecies of *Elipidia gracilis*.

CHARACTER	E. *gracilis gracilis* Belyaev	E. *gracilis austroafricana* subsp. nov.
Length	6,4-23mm	7mm
Width	½ body length	5mm
Pedicels	4 pairs	4 - (?5) pairs
Papillae	no. unknown; in anterior half of body	?3 pairs; in posterior half of body
Papillae length	3-4mm (adults), 1,5mm (juvenile)	up to 1mm (? juvenile)
Oral disc	20%-23% body length	30% body length
SPICULES		
Longest dorsal spicule	1,2mm	0,65mm
Longest ventral spicule	0,8mm	0,5mm
Max. diam. of axis	dorsal : 0,04mm ventral : 0,03mm	dorsal : 0,03mm ventral : 0,02mm
Arms	length 35% of shaft; smooth, occasionally serrate at extremity	length 37% of shaft; smooth or serrate at extremity
Apophyses	0,15 - 0,20mm (20 - 70% length of spicules)	0,02 - 0,285mm (10-78% length of spicules)
Tentacular spicules	length: 0,8-0,9mm; arms short, or absent, apophyses well developed	length: 0,13-0,45mm arms and apophyses reduced and/or absent

E. *adenensis* is characterised by smooth spicules up to 1,25mm long, with the diameter of axis as 0,02mm and the apophyses only 7-15% the length of the spicules. Like E. *gracilis*, E. *chilensis* also has smooth to serrate spicules but its apophyses are only 10-14% the length of the spicules and there are only two pairs of papillae.

E. gracilis has only previously been recorded from South Orkney Islands at 5500m. The presence of the species in the deep waters of the S.W. Cape increases its range of distribution.

Genus SCOTOPLANES Théel, 1882

Scotoplanes Théel, 1882:29 (partim); Hansen, 1975:166.

Diagnosis: See Hansen, 1975:166.

Type species: Scotoplanes globosa Théel, 1882 (by subsequent designation Hansen, 1975:166).

Remarks: Scotoplanes includes only S. globosa and S. clarki distinguished primarily by the presence of smooth skin with sturdy papillae in the former and warty skin with slender papillae in the latter. In southern Africa only the type species occurs, here reported for the first time. Scotoplanes albida Théel, 1882, collected by the 'Challenger' from off the S.W. Cape coast at 347m is, according to Hansen (1975), probably referable to Ellipinion Hérouard, 1923. Following Hansen it is here excluded.

Scotoplanes globosa (Théel)

(Fig.72 a-f)

Elpidia globosa Théel, 1879:14, figs.17-19.

Scotoplanes globosa Théel, 1882:29, pl.4, pl.5:fig.3, pl.34:figs.8-9, pl.36:figs.5-6, pl.44:fig.12; Hansen, 1975:167, text-fig.83,95:4, pl.9:fig.9.

Elpidia murrayi Théel, 1879:16, figs. 23-25.

Scotoplanes murrayi Théel, 1882:34, pl.3:figs.3-4, pl.34:fig.2, pl.44:fig.4.

Scotoplanes théeli Ohshima, 1915:242; 1916-1919, 3 figs.

Diagnosis: See Hansen, 1975:167.

Previous southern African record: None.

Material examined: C(33/17/vd), 2 specs.

Description: Larger specimen (fig. 72e & f) 15mm long. Colour grey. Pedicels 5-6 pairs, situated in distinct ventrolateral grooves. Only 2-3 papillae identifiable on right side, on left side only anterior well preserved in both specimens.

Rods (fig. 72a) either slender with few spines or robust with strongly developed, often ramified spines; slender rods up to 0,02mm thick and about 0,4mm long; stout rods up to 0,05mm thick and 0,55mm long; C-, S- and Y-shaped bodies (fig. 72b) 0,05-0,12mm in length, delicate in young specimen. Tentacles with spinous rods (fig. 72d) and C-shaped bodies (fig. 72c).

Local distribution: Known only from off Cape Point, 2268m.

General distribution: Almost cosmopolitan but not yet known from the north Atlantic, 2100-6770m.

Habitat: Diatom ooze, grey mud.

Remarks: The present specimens are identical to Théel's species. Because of their poor state of preservation no significance can be attached to the distribution of papillae. The rods, however, are similar to those of Hansen's material from the deepest Kermadec Stations (5850-6770m). Such rods can attain a maximum length of 1mm as shown both by Théel (1882) and Hansen (1975).

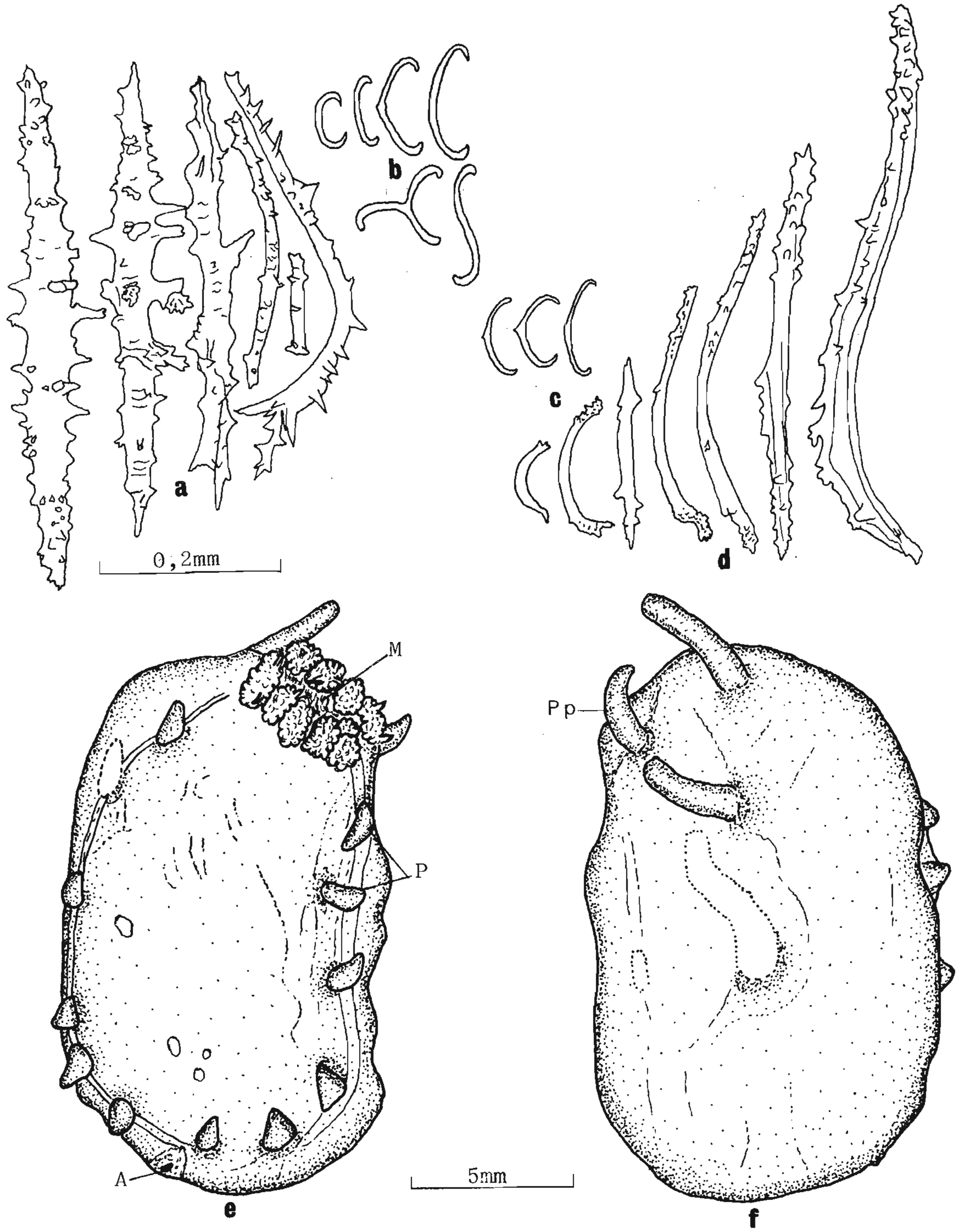


Fig. 72. Scotoplanes globosa Théel. Off Cape Point.

a. Rods from body wall.

b. C-, S- and Y-shaped deposits from body wall.

c. C-shaped deposits from tentacles.

d. Rods from tentacles.

e. Ventral view of entire specimen.

f. Dorsal view of entire specimen.

(All spicules drawn to same scale)

SUBCLASS APODACEA Brandt, 1835

Diagnosis: See Pawson and Fell, 1965:6.

Remarks: Included in this subclass are the orders Molpadida and Apodida but Pawson (1982) states that this grouping may be artificial, the similarities between the orders are probably a result of a similar mode of life rather than relationship. Despite this, the subclass is here retained. While the molpadids are mostly small, deep sea forms, yet poorly known from Southern Africa, the apodids are largely shallow water in distribution and well represented. Approximately 14 species are here recorded, including two new to science.

ORDER MOLPADIDA Haeckel, 1896

Diagnosis: See Pawson, 1977b:98.

Remarks: These are short, stout holothurians with the body usually tapering posteriorly to form a well defined tail. The spicules include tables, plates or rods. Of the three families contained in this order only the Molpadiidae is represented in southern Africa.

Family MOLPADIIDAE Müller, 1850

Diagnosis: See Pawson, 1977b:98.

Remarks: This family, characterised by triradiate tables with a three-pillared spire, is represented in southern Africa by its nominate type genus.

Genus MOLPADIA Risso, 1826

Molpadia Risso, 1826:293; Pawson, 1977b:99 (synonymy).

Diagnosis: See Pawson, 1977b:99.

Type species: Molpadia musculus Risso, 1826 (By monotypy).

Remarks: This more or less cosmopolitan genus is represented in southern Africa by Molpadia ?abyssicola Pawson, 1977, not previously recorded from this region, and M. capensis, Heding, 1935. A single indeterminate specimen from the Cape Province is also referred to this genus.

KEY TO THE SOUTHERN AFRICAN SPECIES OF MOLPADIA

Calcareous ring without significant sculpturings, radial plates without posterior bifurcations; body wall spicules exclusively tables ...... Molpadia ?abyssicola Pawson, 1977

Calcareous ring deeply sculptured, radial plates with posterior bifurcations; body wall spicules fusiform rods, plates and tables
Molpadia capensis Heding, 1935

Molpadia ?abyssicola Pawson

(Fig.73 a-j)

Molpadia abyssicola Pawson, 1977b:116, text-figs. 8a-8g, 8k.

Diagnosis: See Pawson, 1977b:116.

Previous southern African record: None.

Material examined: C(34/17/vd), 2 spec.

Description: Specimens juvenile, length (including tail) 20mm and 22mm, tail roughly one third body length. Colour dirty grey, oral disc and tail whitish. Radial plates of calcareous ring (fig. 73e) slightly prolonged posteriorly. Longitudinal muscles paired.

Spicules:

Discs of body wall tables (fig. 73a, b, f & g) smooth (av. diam. 0,14mm), with 3(-6) large holes; spire high (0,09-0,15mm), of three pillars solidly fused at apex. Tail tables (fig. 73c, d & h) with elongate disc (av. length 0,27mm) with up to 12 holes; spire low, of three discrete or fused pillars. Table discs of anterior body wall large (up to 0,33mm), irregular, with usually more than six holes (fig. 73i). Table discs from base of tail equally long and irregular but with perforated pseudopodia-like extensions (fig. 73j). No phosphatic deposits.

Local distribution: Off Cape Point, 2743m.

General distribution: West of Drake Passage, Scotia Sea, west of South Georgia and Amundsen Sea, ?south west coast of S. Africa.

Remarks: The southern African material is here tentatively identified with Pawson's species although there are few significant differences which may warrant a new species. However, since the spicules of Molpadia undergo remarkable transformations during growth, several writers (H.L. Clark, 1907; Deichmann, 1930 and Pawson, 1977b amongst others) have advised against the naming of specimens without a more or less complete series of individuals. The present material differs from Pawson's species in the small size of the tail spicules, the form of the tables from the base of the tail, and in the paired nature of

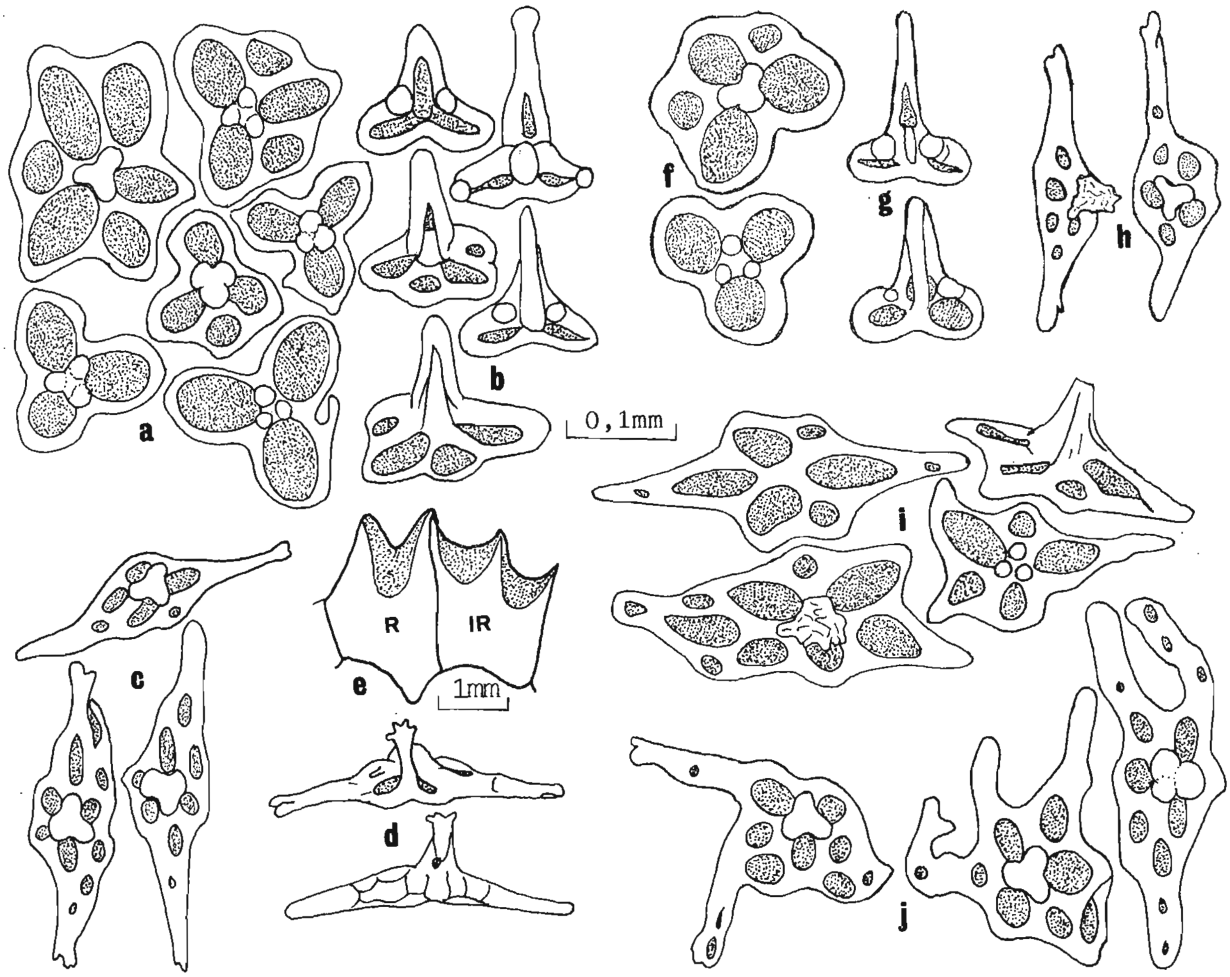


Fig. 73. Molpadia ? abyssicola Pawson. Off Cape Point.

a. Tables from body wall of spec. 1.

b. Same from side.

c. Tables from caudal appendage of spec. 1.

d. Same from side.

e. Part of calcareous ring of spec. 2.

f. Tables from body wall of spec. 2.

g. Same from side.

h. Tables from tail of spec. 2.

i. Tables from anterior body wall of spec. 2.

j. Tables from base of tail of spec. 2.

(All spicules drawn to same scale).

the radial muscles. However, features which support its conspecificity with M. abyssicola are the size and form of the body wall tables, the absence of phosphatic deposits, and the type of calcareous ring. The calcareous ring with long processes illustrated for the holotype is, according to Pawson (1977b), probably abnormal and hence the ring of the southern African material must be compared with that of the paratype (Pawson, 1977b:118, fig. 8e). Although the tail tables of the holotype (52mm) have numerous (about 20) perforations, younger specimens, according to Pawson, have fewer perforations in both the tail and body wall spicules. In fact the tables of the present, probably juvenile, specimens resemble those of a 32mm specimen figured by Pawson (1977b:118, figs. 8f, 8g).

In the small size of the tables the specimens approach M. blakei Théel but, judging from both Deichmann's (1930) and Pawson's (1977b) illustrations of the spicules of this species (the latter from the holotype), the spires of the body wall tables in M. blakei are extremely long, with downwardly directed teeth. The South African form also comes close to M. granulata (Ludwig) but, according to Pawson (1977b), this species has body wall tables with six or more (up to 20) perforations and the spires of the tail tables are always composed of three pillars solidly fused together.

Pawson's supposition that those molpadiids without phosphatic deposits always have undivided radial muscles must be discounted unless larger specimens of the southern African form are found with phosphatic deposits.

Molpadia capensis Heding

Molpadia capensis Heding, 1935:41, fig.8 (1-6).

Material examined: None.

Distribution: Only known from the Cape of Good Hope.

Remarks: This species, based on some dried specimens collected by the Danish 'Ingolf' Expedition, is incompletely known. Heding (1935) did not describe the species but figured its calcareous ring and spicules and in the footnote (p.41) states "that the species has tentacle-ampullae, a long stone canal with a distinct pore-canal, and that the right respiratory tree is fastened to the calcareous ring". This species seems close to Heding's M. diploa with which it shares a similar calcareous ring. It, however, differs in the absence of racquet-shaped bodies and in the form of the other spicules.

Molpadia sp. indet.

Material examined: C(34/16/vd), 1 spec.

Description: Form and colour as in M. ?abyssicola; tail absent (?lost). Length 23mm. Calcareous ring small, radial plates about twice as wide as interradial plates, notched at both ends, posterior processes absent. Interradial plates with a blunt, triangular, anterior projection and an indented posterior surface. Longitudinal muscles un=paired. Spicules absent (?dissolved).

Distribution: Off Cape Point, 2688-2725m.

Remarks: Since the specimen lacks a tail and spicules it is not possible to determine its specific identity. Although its general appearance (except for the smooth skin) and colouration are identical to *M. ?abyssicola*, the form of the calcareous ring suggests that it may belong to another species.

ORDER APODIDA Brandt, 1835

Diagnosis: See Deichmann, 1930:203; 1948:364.

Remarks: This order, comprising cylindrical or vermiform apodaceans, has received good treatment from both H.L. Clark (1907,1924) and Heding (1928-1931). Of the three families included in it, the Myriotrochidae is limited to deep waters of especially the northern hemisphere while the Synaptidae and Chiridotidae, comprising mainly shallow water species, are fairly well represented in all parts of the world.

Family SYNAPTIDAE Oestergren, 1898

Diagnosis: See Deichmann, 1930:204.

Remarks: This family comprises about 12 genera and 130 species occurring mostly in the subtidal zone of the tropical regions (Pawson, 1982). Six genera and twice as many species occur in southern Africa.

Genus EUAPTA Oestergren, 1898

Euapta Oestergren, 1898:112; Fisher, 1907:721; H.L. Clark, 1907:72; 1924:462; Heding, 1928:132; 1931:647.

Diagnosis: See Fisher, 1907:721; Heding, 1928:132.

Type species: Synapta godeffroyi Semper, 1868 (by subsequent designation Fisher, 1907:721).

Remarks: Deichmann's (1930) reference to E. lappa (Müller) as the type species of this genus is erroneous since Synapta godeffroyi Semper was designated the type by Fisher (1907). The genus Euapta is repre= sented in southern Africa by its type species, a well known tropical Indo-West Pacific form, not hitherto recorded from either Moçambique or Natal.

Euapta godeffroyi (Semper)
(Fig.74 a-i)

Synapta godeffroyi Semper, 1868:231, pl.39, fig.13; Théel, 1886a:22.

Euapta godeffroyi Oestergren, 1898:113; Fisher, 1907:721; H.L. Clark, 1907:72; 1921:158; 1924:462, pl.1, figs.1-4; Heding, 1928:137, fig.9 (2), fig.10(1-2); Cherbonnier, 1951:52, pl.22:fig.8(10-16), pl.26:figs.1-9, pl.27:figs.1-3; Clark and Rowe, 1971:184 (dist.), pl.30, fig.8; Rowe and Doty, 1977:235, figs.5c, 8h.

Diagnosis: See Semper, 1868:231; Fisher, 1907:721.

Previous southern African record: None.

Material examined: N(29/30/i), 2 spec. (1 fragmented).

Description: Complete specimen 770mm long. Dorsal surface, in life, with dark brown longitudinal stripes along radii, each bordered by yellow on both sides, in addition, spaced yellow and brown to greenish brown transverse bands; ventral surface creamy white. Tentacles 12-15, large ones with 38-45 digits. Polian vesicles about 50. Ciliated funnels (fig. 74h) anteriorly cluttered, posteriorly scattered in bundles of 3-10 or more.

Spicules:

Anchors (fig. 74a) 0,31-0,41mm, distance between arms 0,17-0,25mm; anchor plates (fig. 74b) 0,21-0,27mm, most plates with six large toothed holes and seventh hole partially toothed. Miliary granules (fig. 74e) 0,018-0,026mm.

Local distribution: Isipingo (Natal) only. Map: 8.

General distribution: Generally throughout the tropical Indo-West Pacific region as far east as Hawaii. Cherbonnier (1951) records the species from the Californian Gulf but this record could not be verified. It could represent *E. lappa* (Müller) which is common in the Caribbean.

Habitat: Intertidal pool, in sand, beneath stones at LWS.

Remarks: The occurrence of this large species as far south as Durban, considerably extends its known range of distribution. According to Heding (1928) the anchor plates are more or less abnormal and this malformation is characteristic of the species. In fact both Semper (1868) and Cherbonnier (1951) also illustrate abnormal plates. However, Fisher (1907) reports only regular plates which also charac= terise the Natal specimens. Perhaps the presence of abnormal plates is an individual and not a geographic variation since both Heding's and Fisher's material came from Hawaii.

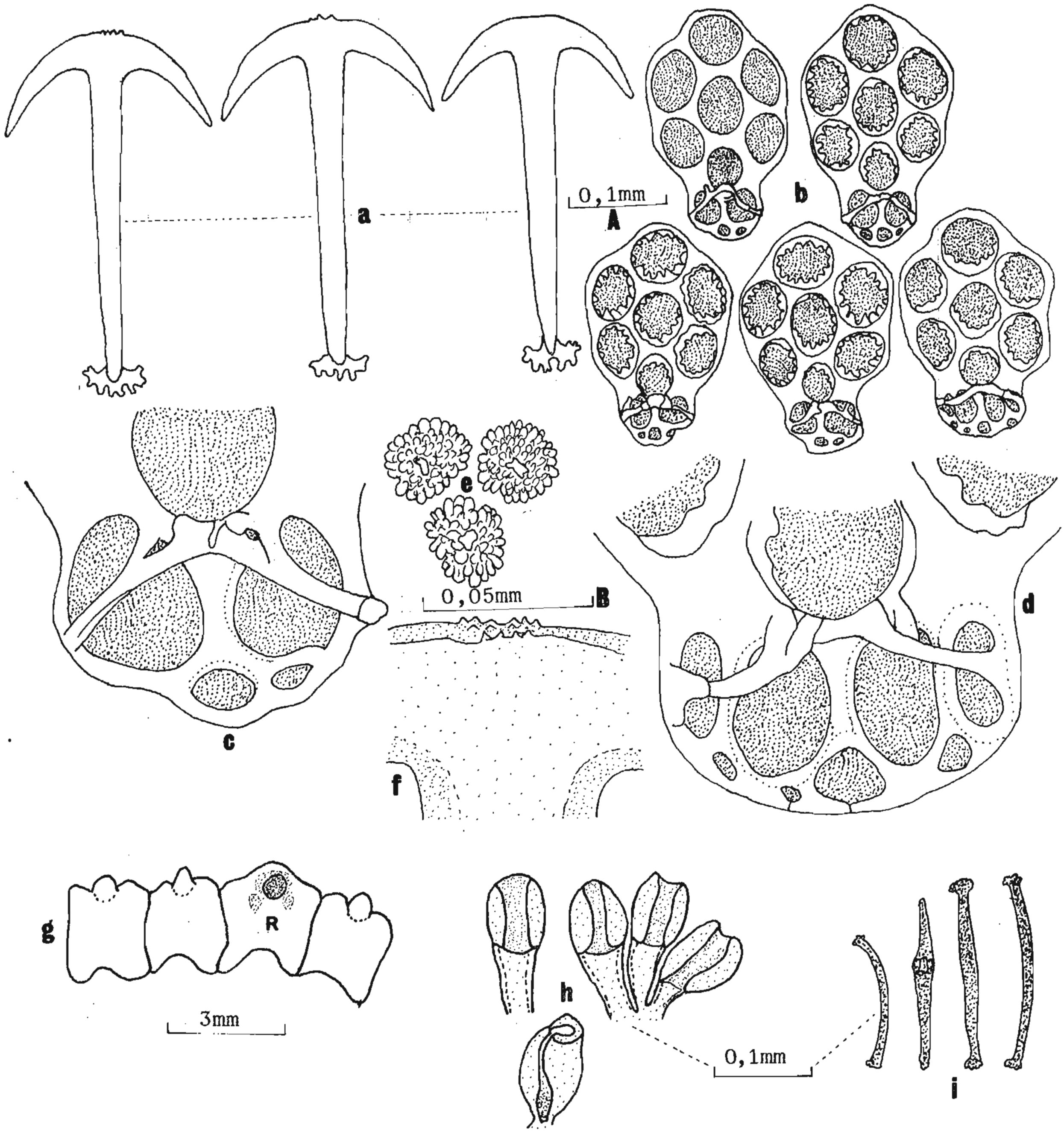


Fig. 74. Euapta godeffroyi (Semper). Isipingo.

a. Anchors from body wall.

b. Anchor plates from body wall.

c. Posterior end of anchor plate.

d. Same to show variation.

e. Rosette-shaped granules from body wall.

f. Vertex of anchor.

g. Part of calcareous ring.

h. Ciliated funnels.

i. Tentacular rods.

(a & b Scale A; e-f Scale B)

Genus LEPTOSYNAPTA Verrill, 1867

Leptosynapta Verrill, 1867:325; H.L. Clark, 1907:86; Heding, 1928:203; Deichmann, 1948:365.

Epitomapta Cherbonnier, 1952a:498; 1954:122 (non Heding, 1928).

Diagnosis: See H.L. Clark, 1907:86; Heding, 1928:203.

Type species: Synapta tenuis Ayres, 1867 (by original designation Verrill, 1867 according to Heding, 1928).

Remarks: The genus Leptosynapta contains about 30 nominal species and is urgently in need of revision (Pawson, 1976). Perhaps not all the species are valid and the genus may contain several subgroups. In southern Africa four nominal species occur, of which L. naiga, is here described as new to science. Of the three remaining species, L. knysnaensis, L. ancoracuta and L. pustulosa, all described by Cherbonnier (1952a, 1954, 1970), only the former is present in the collections.

KEY TO THE SOUTHERN AFRICAN SPECIES OF LEPTOSYNAPTA

1. Tentacles with 3-4 pairs of digits; maximum size of anchor plates 0,11mm; miliary granules of radial muscles cheliform, O-, C- or E-shaped .... Leptosynapta naiga sp. nov.

   Tentacles with more than four pairs of digits; maximum size of anchor plates well in excess of 0,11mm; miliary granules of radial muscles not as above 2

2. Tentacles with eight pairs of digits; miliary granules of radial muscles rod-shaped, frequently with one or more perforations .... Leptosynapta pustulosa Cherbonnier, 1970

Tentacles with mostly 5-7 pairs of digits; miliary granules of radial muscles rod-shaped, without perforations 3

3. Tentacles with six pairs of digits; ciliated funnels in stalked clusters; posterior end of anchor plates somewhat pointed; tentacles with curved, forked and/or perforated rods .... Leptosynapta ancoracuta Cherbonnier, 1954

Tentacles with 5-7 pairs of digits; ciliated funnels solitary; posterior end of anchor plates rounded; tentacles with curved, forked rods, never perforated.

Leptosynapta knysnaensis (Cherbonnier, 1952)

Leptosynapta ancoracuta Cherbonnier

Leptosynapta ancoracuta Cherbonnier, 1954:120, fig.3, 1-13; Day, Field and Penrith, 1970:83.

Record: Known only from Simon's Bay in False Bay.

Material examined: Fragments of anterior and posterior body wall of holotype.

Remarks: This species was established by Cherbonnier (1954) for a 50mm holotype. In the form of its spicules it comes quite close to L. knysnaensis (Cherbonnier) common on the south coast. It, however, differs in the presence of ciliated funnels in stalked clusters, in the larger size of the anchors (0,14-0,21mm) and anchor plates (0,13-0,17mm), and in the form of the tentacular spicules. It is regrettable that no specimen in the present collection could be referred to this species. However, Cherbonnier's (1954) Epitomapta sp. and another specimen from False Bay have spicules of the same size range as those of L. ancoracuta, but since they both lack tentacles, and have only solitary ciliated funnels they are here tentatively referred to L. knysnaensis.

Leptosynapta knysnaensis (Cherbonnier) comb. nov.

(Fig.75 a-l & Fig.76 a-g)

Epitomapta knysnaensis Cherbonnier, 1952a:498, pl.48, figs.8-14; Day, Millard and Harrison, 1952:394; Day, 1974a:191; Day, Field and Penrith, 1970:83, Branch and Branch, 1981:247.

Leptosynapta sp. Deichmann, 1948:365, figs.14-16.

? Epitomapta sp. Cherbonnier, 1954:122, fig.2, 15-16; Day, Field and Penrith, 1970:83.

Diagnosis (After Cherbonnier, 1952a, modified herein): Length up to 80mm. Colour, in life, brown fading to lilac posteriorly. Tentacles (11)-12 with 6-7 pairs of digits (fig. 75e), sensory cups up to 23 per tentacle. Radial plates of calcareous ring perforated for passage of radial nerves (fig. 75h). Ciliated funnels of two kinds, not in stalked clusters (fig. 75f). Anterior anchors 0,12-0,143mm (fig. 75a), posterior anchors 0,12-0,183mm (fig. 75c), arms with 0-6 teeth. Anterior anchor plates 0,103-0,138mm (fig. 75b), posterior plates 0,11-0,143mm (fig. 75d), posterior end of plates rounded. Radial muscle granules rod-like, rarely branched at ends (fig. 75j & k). Tentacular rods lobed, non-perforate (fig. 75i).

Previous records: C(29/17/i; 33/17/i; 34/18/i; 34/23/i).

Material examined: C(34/18/i, 34/22/i,s, 34/24/i), 23 specs. and 25 fragments, plus holotype and two paratypes.

Distribution: Buffels River on the west coast to Cape St Francis on the south coast. Map: 17.

Habitat: Amongst Zostera roots and under stones.

<u>Remarks</u>: This species was described as an <u>Epitomapta</u> since, according to Cherbonnier (1952a), the radial plates of the calcareous ring are not perforated for the radial nerves. An examination of several individuals collected from the type locality convinced the writer that Dr. Cherbonnier might have erred in his observation since, in all dissected specimens, the radial plates are pierced by discrete pores. A re-examination of the type material proved futile as in none of the three specimens is the calcareous ring preserved. The spicules are also so badly affected that no worthwhile comparisons could be made. In other respects the present material is identical to the type specimens. Hence the species is here rediagnosed and transferred to <u>Leptosynapta</u>.

The spicules of the present material are identical in size and form to those illustrated by Cherbonnier (1952a) except that the two holes immediately posterior to the seventh hole of the anchor plate are nearly always feebly toothed, and the number of teeth on each anchor arm varies from 0-6, and is not consistently five as was reported by Cherbonnier. However, Dr. Cherbonnier did comment that the spicules of his specimens were badly affected.

A single eviscerated individual from False Bay differs from the typical form of the species in the larger size of its spicules (fig. 76) (anterior anchors 0,12-0,16mm; posterior anchors 0,14-0,19mm; anterior anchor plates 0,12-0,17mm; posterior plates 0,13-0,17mm) and in the form of its large funnels. Since in other respects it resembles the typical form it is here tentatively referred to <u>L. knysnaensis</u>.

Fig. 75. Leptosynapta knysnaensis (Cherbonnier). Knysna.

a. Anchor from anterior body wall.

b. Anchor plates from anterior body wall.

c. Anchor from posterior body wall.

d. Anchor plates from posterior body wall.

e. Tentacle.

f. Ciliated funnels.

g. Stone canal and madreporite.

h. Part of calcareous ring.

i. Tentacular rods.

j. Deposits from radial muscles (anterior end).

k. Same (posterior end).

l. Stock of anchor.

(a-d Scale A)

Fig. 76. Leptosynapta ? knysnaensis (Cherbonnier). False Bay.

a. Anchors from anterior body wall.

b. Anchor plates from anterior body wall.

c. Anchors from posterior body wall.

d. Anchor plates from posterior body wall.

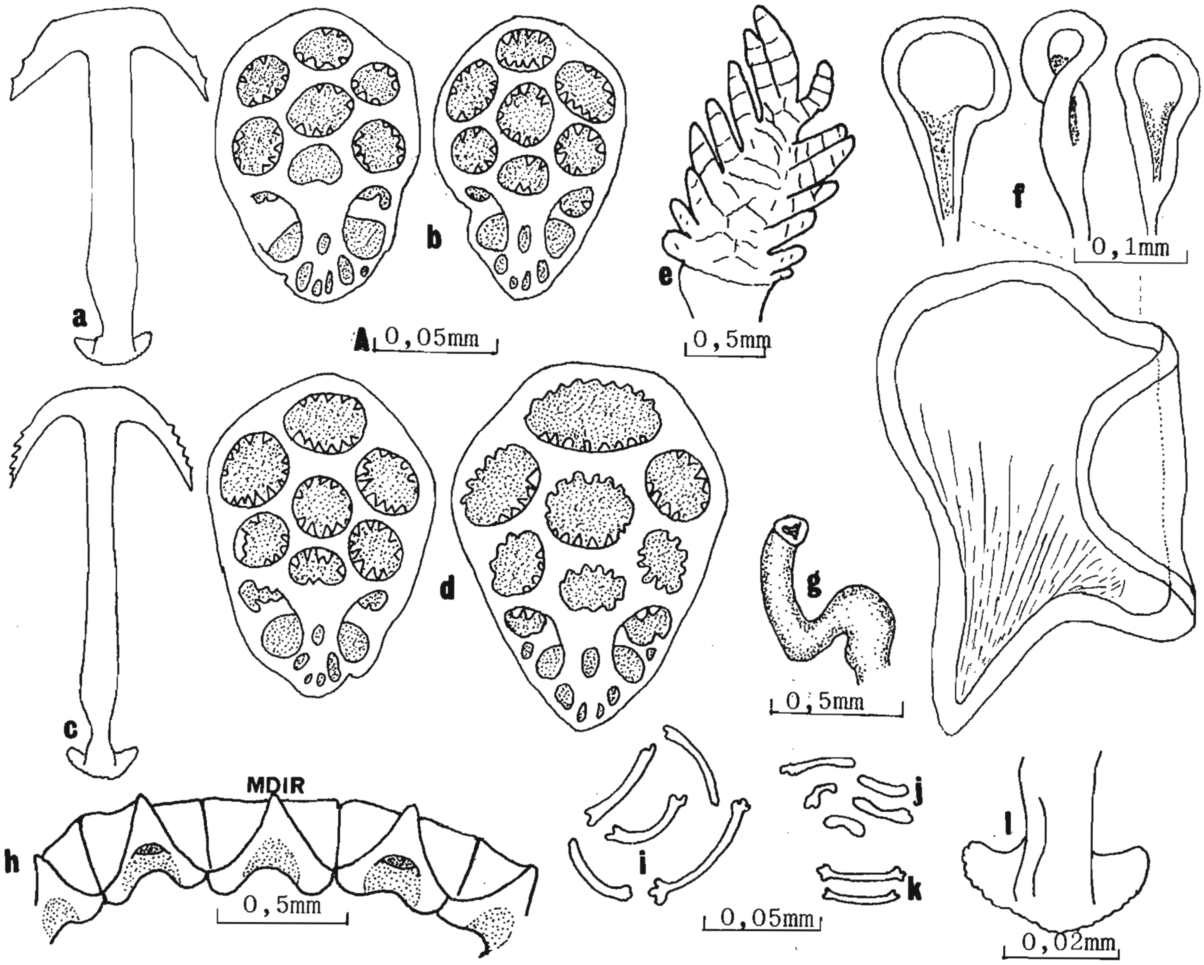
e. Radial muscle deposits.

f. Stock of anchor.

g. Ciliated funnels.

(a-e Scale A)

Fig.75


a
b
A 0,05mm
e
0,5mm
f
0,1mm
c
d
g
0,5mm
MDIR
h
0,5mm
i
j
k
0,05mm
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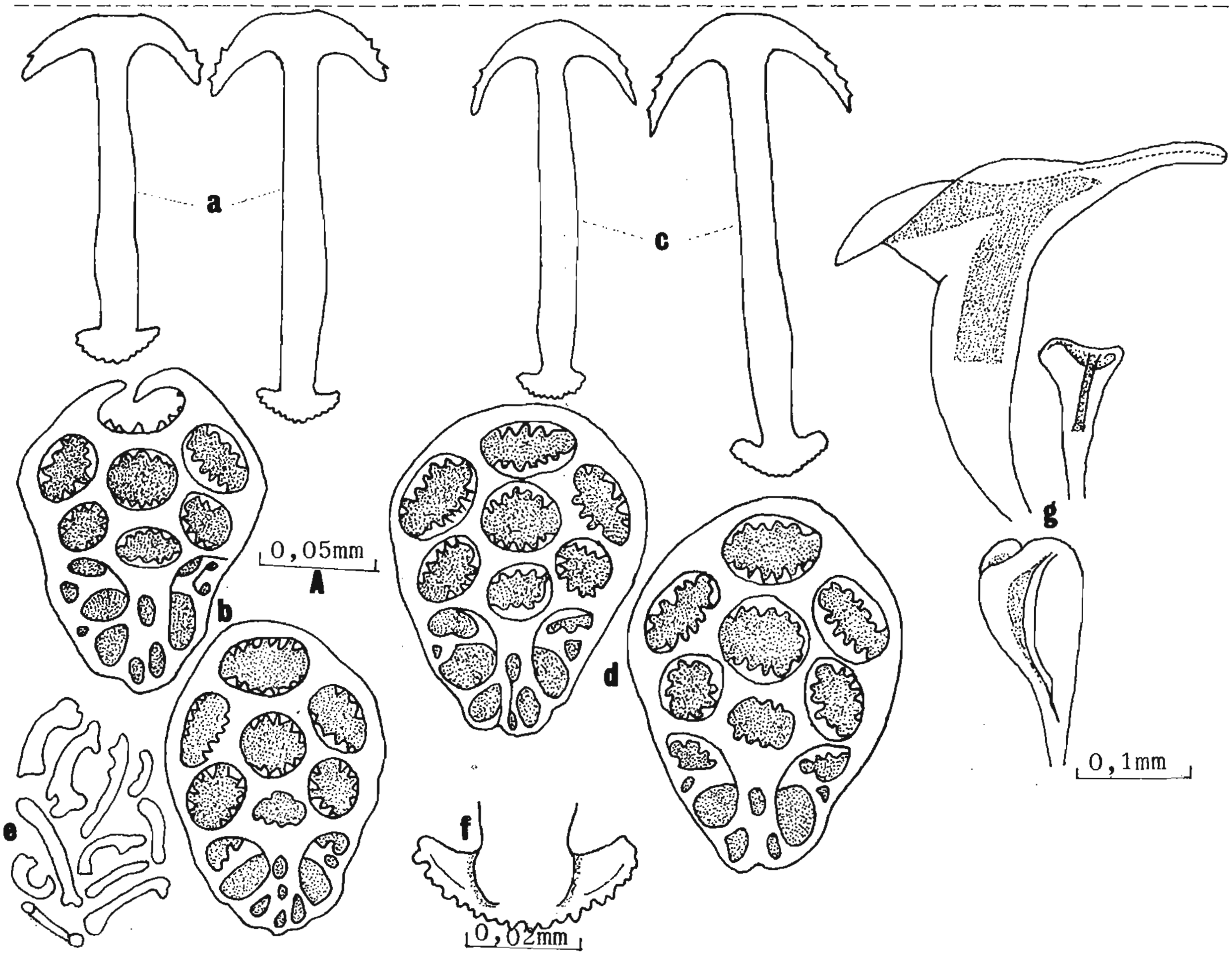

a
c
b
0,05mm
A
d
e
f
0,02mm
g
0,1mm

Fig.76

Despite the presence of only 3-4 pairs of tentacular digits, Deichmann's (1948) Leptosynapta sp. from Buffels River, following Cherbonnier, is here referred to the synonymy of L. knysnaensis. Perhaps the same fate must also befall the Epitomapta sp. from False Bay which, according to Cherbonnier (1954), has spicules twice the size of L. knysnaensis. Although a re-examination of this specimen showed that its posterior anchors (0,17-0,20mm) and anchor plates (0,125-0,16mm) are larger than those of L. knysnaensis they are no way double their size. In fact they come quite close to those of the atypical form of L. knysnaensis from False Bay suggesting that both are conspecific. Although no large ciliated funnels were found in the Epitomapta sp., the smaller ones are solitary and resemble those of the atypical form. Since, it also lacks tentacles and calcareous ring, it is here also referred with some reservation, to the synonymy of L. knysnaensis.

Leptosynapta naiga sp. nov.
(Fig.77 a-l)

Leptosynapta sp. Cherbonnier, 1954:122, pl.2, fig.17; Day and Morgans, 1956:278.

Diagnosis: A small species, up to 44mm long. Colour, in life, greyish pink. Tentacles (11-)12 with usually 3-4 pairs of digits and 0-14 sensory cups per tentacular stalk. Ciliated funnels of two types, not in clusters. Anterior anchors 0,10-0,155mm, posterior anchors 0,11-0,16mm. Anchor plates small, approximately 0,075-0,12mm at both ends of body, with six toothed-holes and seventh hole with usually few teeth. Spicules of radial muscles in the form of C-, O- or E-shaped cheliform rods.

Etymology: This species is named after its collectors Mr G.C. Naidu and Mr K.S. Ganga by an arbitrary combination of letters.

Material examined: Holotype, SAM, Isipingo, Natal, 11 V 1979; Paratypes, Natal Mus ; Isipingo, 11 V 1979, 6 spec ; 11 VI 1979, 6 spec; 22 VIII 1979, 2 spec.

Description:

Holotype: Length 35mm, breadth 2mm in mid-body. Colour, in life, greyish pink with rather conspicuous rust-coloured to purplish warts all round. Longitudinal muscles visible through translucent body wall. Skin sticky to the touch. Tentacles 12, whitish, with 3-4 pairs of digits, increasing in size distally, unpaired terminal digit largest (fig. 77e), number of digits on each side of single tentacle often unequal. Eye spots absent. Sensory cups 1-7 on inner face of tentacular stalks.

Calcareous ring (fig. 77l) delicate, radial and interradial plates roughly rectangular with slightly concave posterior surface and blunt anterior projection, each radial plate with a pore for passage of radial nerve. Polian vesicle single, elongate; stone canal single, short; madreporite small, ring-like (fig. 77k). Gonad in two tufts, one on each side of dorsal mesentery, gonadal tubules thick, dichotomously branched, only a few tubules reaching posterior third of body, at least on one side. Gonoduct short, opening between bases of middorsal tentacles. Longitudinal muscles thin, unpaired. Ciliated funnels (fig. 77j) bell-shaped and of two sizes, attached to left dorsal interradius from one to about three quarters the body length, generally larger in the midbody than at both ends.

Spicules:

Anchors of different sizes at both ends of body but anchor plates of more or less similar size. Anterior anchors (fig. 77a), 0,10-0,155mm (av. length 0,12mm), vertex smooth, straight or convex; arms with 1-5 teeth, only 3-5 well developed, distance between arms 0,55-0,065mm; shaft straight, not constricted at base, stock finely toothed (fig. 77f). Posterior anchors (fig. 77c), 0,11-0,16mm (av. length 0,135mm), vertex smooth, convex or slightly concave, arms with 5-6 teeth, only four well developed, distance between arms 0,05-0,625mm; shaft straight, stock finely toothed. Anchor plates (fig. 77b & d), 0,08-0,11mm (av. length 0,10mm), with seven toothed holes but seventh hole always partially toothed, 5-12 much smaller holes behind seventh hole. Spicules of radial muscles (fig. 77g) minute, C-, O- or E-shaped cheliform rods, usually with uneven margins. Tentacular stalks with similar but slightly larger spicules (fig. 77i); tentacular digits with elongate, slightly curved rods, usually branched at ends (fig. 77h).

Paratypes: Maximum length 44mm. Tentacles (11)-12, tentacular digits 3-4 pairs, increasing in size distally; one or two tentacles in a single specimen sometimes with only 1 or 2 paired digits; 0-14 sensory cups per stalk. Gonadal tubules often full of eggs. Other structures and spicules as in holotype. Younger specimens without radial muscle deposits.

Distribution: Known only from Isipingo Beach, Natal. Map: 17.

Habitat: In cave, close on-shore, buried in sand at LWS.

Remarks: This species differs from other southern African leptosynaptids in its small number (3-4 pairs) of tentacular digits, the small size of the anchors and anchor plates, the form of the radial muscle deposits and in the presence of different types of deposits in

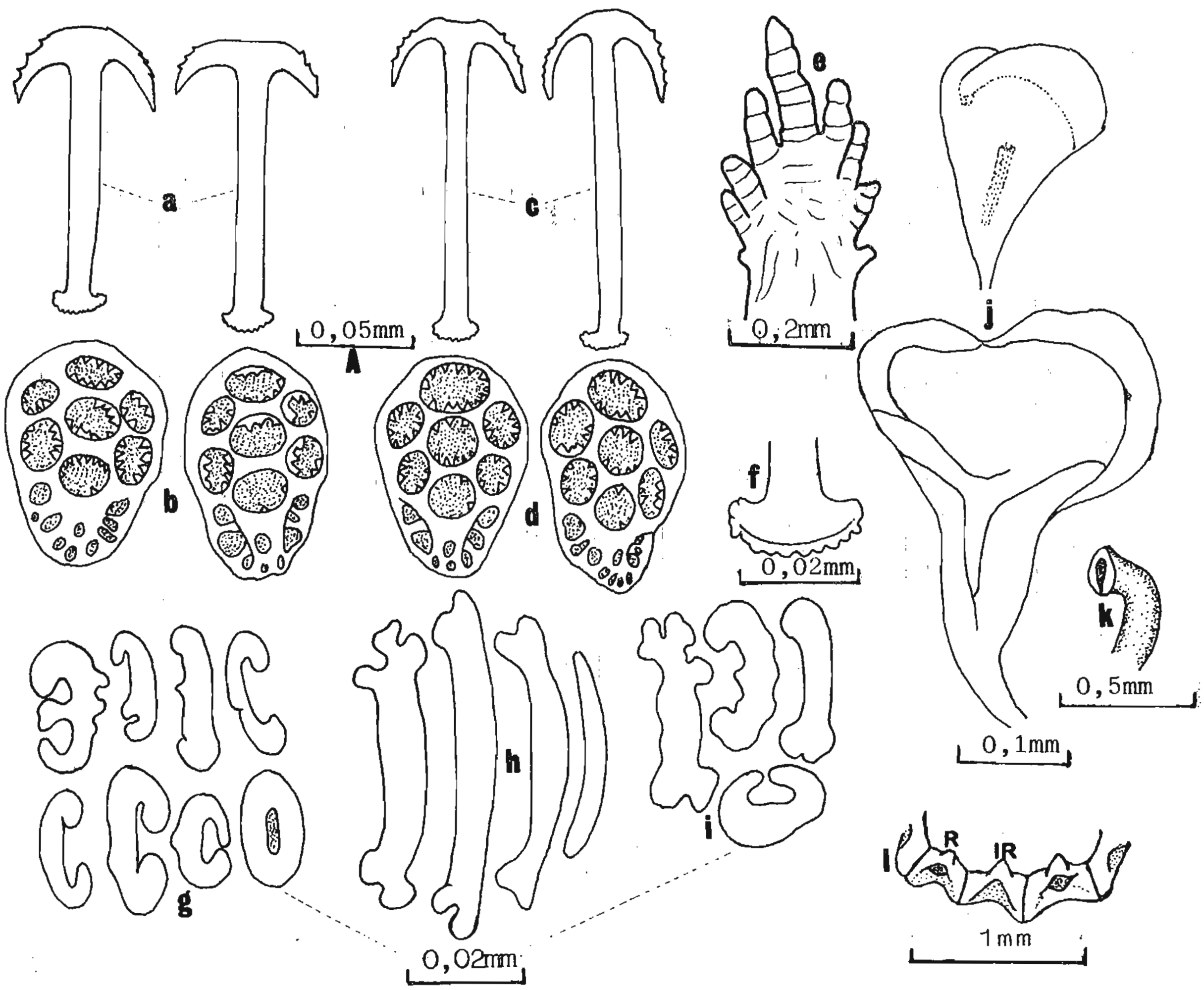


Fig. 77. Leptosynapta naiga sp. nov. Isipingo.

a. Anchors from anterior body wall.

b. Anchor plates from anterior body wall.

c. Anchors from posterior body wall.

d. Anchor plates from posterior body wall.

e. Tentacle.

f. Stock of anchor.

g. Radial muscle deposits.

h. Deposits from tentacular digits.

i. Deposits from tentacular stalk.

j. Ciliated funnels.

k. Stone canal and madreporite.

l. Part of calcareous ring.

(a - d Scale A)

the tentacular stalks and digits. The most distinctive features of the species, when compared to the other local forms, are the cheliform radial muscle deposits which recall those of monaxonid sponges.

Chelae-like deposits are also found in some other related Indo-Pacific species, notably L. irregularis Heding, L. reducta Heding, L. dolabrifera (Stimpson) and L. chela Mortensen. However, L. irregularis from Australia is up to 170mm long with 7-8 pairs of tentacular digits, three polian vesicles, anchors up to 0,25mm in length and irregular anchor plates with additional anterior holes. L. reducta, also from Australia, has seven pairs of digits, anchors up to 0,20mm long and the posterior end of anchor plates more or less reduced; further both the digits and tentacular stalks have similar deposits. L. dolabrifera, another Australian species, has 6-7 pairs of digits, anchors up to 0,25mm long, and distinctly undulating margins to the digit rods (Heding, 1928). L. chela from the Red Sea also has seven pairs of digits to the tentacles, while the polian vesicles are 2-3 in number and the rods of the digits have undulating margins (Mortensen, 1926). However, in size of the body, dimensions of the deposits, regular form of the anchor plates and type of ciliated funnels, L. naiga is most closely related to the Red Sea species.

According to Cherbonnier (1970) his Leptosynapta sp., described from Durban in 1954, is possibly identical to his L. pustulosa described in 1970. However, the Durban specimen possessed only 5-6 pairs of tentacular digits and, although most of the deposits were corroded, according to Cherbonnier, the plates resembled those of Patinapta. Since a low digit number is found in the sympatric L. naiga which also has plates like those of Patinapta, Cherbonnier's indetermined leptosynaptid is here referred to the synonymy of this species.

Leptosynapta pustulosa Cherbonnier

Leptosynapta pustulosa Cherbonnier, 1970:297, fig.9, A-L; Day, 1974b:94.

Diagnosis: See Cherbonnier, 1970:297.

Records: M(23/35/i).

Material examined: Fragment of body wall of holotype (no spicules detected).

Distribution: Only known from Morrumbene in Moçambique.

Remarks: Cherbonnier (1970) compared his specimen with the types of *L. reducta* Heding and concluded that they are not conspecific. *L. pustulosa* differs from *L. naiga*, also from the east coast, in the number of tentacular digits, the size of the spicules, the type of radial muscle deposits and the nature of the ciliated funnels.

Genus OPHEODESOMA Fisher, 1907

Opheodesoma Fisher, 1907:723; H.L. Clark, 1907:119; Heding, 1928:119; 1931:640; Cherbonnier, 1952a:496.

Diagnosis: See Fisher, 1907:723.

Type species: Opheodesoma spectabilis Fisher, 1907 (by original designation).

Remarks: This is a small genus containing large, serpentine apodids with numerous tentacular digits, polian vesicles and stone canals. In southern Africa two species occur, reported only from Moçambique.

KEY TO THE SOUTHERN AFRICAN SPECIES OF OPHEODESOMA

Anterior processes of radial plates same as height of calcareous ring ...... Opheodesoma grisea (Semper, 1868)

Anterior processes of radial plates not more than one third height of calcareous ring .... Opheodesoma mauritiae Heding, 1928

Opheodesoma grisea (Semper)

Synapta grisea Semper, 1868:11, pl.4, figs.6-7; Théel, 1886a:21; Pearson, 1910a:168.

Euapta grisea Oestergren, 1898:113.

Opheodesoma grisea Fisher, 1907:723 (passim); Heding, 1928:129, text-figs.4(7), 6(7-9), 7(3 and 9); Clark and Rowe, 1971:186 (dist.), pl.30, fig.11; Rowe and Doty, 1977:235, figs.5d, 8g.

Diagnosis: See Semper, 1868:11; Heding, 1928:129.

Southern African record: M(10/40/S), 9-33m.

Material examined: None.

Local distribution: Known only from Tunghi Bay, Querimba.

General distribution: Tropical Indo-West Pacific, from East Africa to the Red Sea and then from Bay of Bengal to the Phillipines, north Australia and Hawaii.

Remarks: This species may reach a length of up to 350mm. Its colour is said to be variable but with generally broad brownish green and narrow cream transverse bands, darker dorsally (Rowe and Doty, 1977). The species was reported from Querimba by Pearson (1910a) but not yet known from further south.

Opheodesoma mauritiae Heding

Synapta serpentina Lampert, 1896:64 (non J. Müller, 1842 = O. serpentina).

Opheodesoma mauritiae Heding, 1928:130, text-figs.4(1), 6(14-17), 7(4 and 10). Cherbonnier, 1952a:497, pl.47, figs.1-18; Macnae and Kalk, 1958:43, 130; 1962:111; Kalk, 1959:22; Clark and Rowe, 1971:186 (dist.).

Opheodesoma africana Heding, 1931:645, fig. 2(2, 6-11).

Diagnosis: See Lampert, 1896:64; Heding, 1928:130.

Southern African record: M(26/32,33/i, 12-15/40/i).

Material examined: M(26/32,33/i), 1 spec.

Local distribution: Known only from Moçambique. Map: 8.

General distribution: East Africa and Mauritius.

Remarks: This species is very similar to the preceding species but is yellowish brown in colour and reaches a length of 900mm. It was reported from Mocambique by Cherbonnier (1952a) based upon material collected at Inhaca Island. One of the two specimens described by Cherbonnier (1952a) was here re-examined. It measures 900mm in length and, except for the presence of only 14 tentacles (17 were reported by Cherbonnier), it corresponds well with Cherbonnier's description.

According to Cherbonnier O. africana Heding, 1931 and Synapta serpentina Lampert, 1896 (non J. Müller), both from Zanzibar, are synonyms of O. mauritiae.

Genus PATINAPTA Heding, 1928

Patinapta Heding, 1928:237; Deichmann, 1948:366.

Diagnosis: See Heding, 1928:237; Deichmann, 1948:366.

Type species: Synapta oöplax von Marenzeller, 1881 (by original designation Heding, 1928:237).

Remarks: This genus contains about five species of which only one has been, with some doubt, reported from Natal by Deichmann (1948) based on two poorly preserved specimens described as P. crosslandi Heding, 1929.

Patinapta crosslandi Heding

Synapta oöplax Lampert, 1896:66 (non S. oöplax von Marenzeller = Patinapta oöplax).

Patinapta crosslandi Heding, 1929:146, text-figs.4 and 5 (1-6); 1931:661, text-fig.7(3); Deichmann, 1948:367; Clark and Rowe, 1971:186 (dist.).

Diagnosis: See Lampert, 1896:65; Deichmann, 1948:367.

Southern African record: N(31/30/i).

Material examined: N(31/30/i), 1 spec.

General distribution: Red Sea to Natal.

Remarks: Although the species has 12 tentacles and measures about 100mm Deichmann's material had only 10 tentacles and measured 20mm. As the specimens were in a poor state of preservation with most of the spicules dissolved it is unlikely that Deichmann's identification was correct. A re-examination of one of the specimens housed at UCT failed to reveal any clue as to its identity. It could be conspecific with either L. pustulosa or L. naiga but no spicules are preserved to confirm this.

Genus RYNKATORPA Rowe and Pawson, 1967

Rynkatorpa Rowe and Pawson, 1967:31; Clark and Rowe, 1971:208.

Diagnosis: See Rowe and Pawson, 1967.

Type species: Rynkatorpa hickmani Rowe and Pawson, 1967 (by original designation Rowe and Pawson, 1967:31).

Remarks: This genus was established by Rowe and Pawson (1967) to include the type species and seven others formerly referred to Protankyra Oestergren, 1898. Since then two other species belonging to it were described. Thus Rynkatorpa currently contains 10 species. To these is now added R. spatula, a new species from the warm temperate waters of the Cape Province. Since the anchor plates of R. spatula have fewer (15- about 30) holes, the diagnosis of the genus should be emended to take in the new species.

Rynkatorpa spatula sp. nov.

(Fig.78 a-p)

Diagnosis: Tentacles with four digits. Anchors 0,0975-0,21mm in length, stock unbranched but denticulate. Anchor plates 0,105-0,16mm long, posterior end of plate always narrowed to form a distinct handle, bridge absent, holes 15-30, central two conspicuously larger than the rest.

Etymology: Spatula (L.) = spoon, with reference to the shape of the anchor plates.

Material examined: Holotype, UCT, FAL 460H, False Bay, (34°21'S, 18°43'E), dredge, 80m, 22 V 1961.

Paratypes: SAM, 3c (anterior fragment only), 14J (anterior end plus 10 other fragments), 24A (3 fragments, no anterior end), 30A (anterior and posterior ends), PM (2 anterior ends + 3 fragments) - 5 specimens in 22 fragments altogether.

Paratype localities: Port Elizabeth Museum, T.B. Davie Cruises, St.3 (24°42'S, 33°53'E), 16-18m, 7,6km off shore, 14 II 1980; St.14 (26°24'S, 33°48'E), 36-45km, 5km off shore, 16 II 1980; St.24 (23°04'S, 34°06'E), 55m, 4,6km off shore, 18 II 1980; 2,1km W. of Gericke Point (P.M.), 25,6m, 0,6km off shore, 18 II 1980; St.30 (22°10'S, 34°06'E), 22m, 2,6km off shore, 19 II 1980.

Description:

Holotype (FAL 460H): Specimen eviscerated - tentacles, calcareous ring and other oral structures, gonad and most of alimentary canal lost. Body somewhat spirally coiled (possibly due to strong contraction), tapering gradually posteriad. Length 80mm, breadth 6mm in widest part of body. Colour, in alcohol, light greyish pink. Mouth and anus terminal. Whole body covered with minute warts, densely crowded but more conspicuous in contracted anterior and posterior ends, rather

Longitudinal muscles in single strands. Ciliated funnels (fig. 78h) minute, 0,1-0,2mm, attached to dorsal mesentery and to dorsal body wall.

Spicules: Body wall with anchors and anchor plates; radial muscles with miliary granules. Anterior anchors (fig. 78a) stout, 0,135-0,17mm long (av. length 0,153mm), shaft slightly thickened, stock unbranched but finely toothed, vertex smooth, either straight, slightly concave or convex; arms smooth or with 2-3 minute teeth (fig. 78g). Posterior anchors (fig. 78c) slender and longer, 0,18-0,21mm (av. length 0,20mm), shaft constricted at base, stock finely toothed and occasionally perforated, vertex smooth, straight or slightly concave, arms with 1-5 minute teeth. Anterior anchor plates (fig. 78b) complete, 0,105-0,14mm (av. length 0,126mm), somewhat rounded anteriorly, slightly constricted in the middle, expanded posteriorly to wing-like processes, and termina= ting in a narrow, well-defined handle; holes smooth, few (15-25), with the two central ones always the largest; of the three holes anterior to central holes, middle hole the largest; 2-5 minute holes in each expanded portion of plate; handle with several holes decreasing in size distally; margin of plate occasionally with one or more small projections, bridge absent. Posterior anchor plates (fig. 78d) slightly larger than anterior, 0,13-0,158mm long (av. length 0,144mm), but always rudimentary or incomplete. Miliary granules of radial muscles smooth, round to oval, 0,015-0,025mm in length (fig. 78e & f).

Paratypes: Colour pinkish grey, warts arranged in concentric rows anteriorly. Tentacles 12, each with four digits, proximal digits longer. Eye-spots visible in only three specimens, each situated between bases of two tentacles. Sensory cups generally 10-15 on inner face of each tentacular stalk, usually arranged in two linear series along margins (fig. 781).

Paratype 14J:

Calcareous ring (fig. 78j) well calcified, of 12 plates, only ventral radial plates perforated for passage of radial nerves. Polian vesicle single, tubular, situated dorsally, slightly to left of mesentery. Stone canal short, somewhat coiled; madreporite spherical, composed of about six well calcified fragments (fig. 78k). Longitudinal muscles thin, unpaired. Gonad anterior, situated close to stone canal, consisting of a few tubules dichotomously branched once or twice.

Anchors as in holotype but smaller. Anterior anchors 0,10-0,12mm (av. length 0,108mm); posterior anchors 0,135-0,17mm (av. length 0,15mm). Anterior anchor plates 0,113-0,13mm (av. length 0,116mm), holes numerous, over 30, central holes largest but not as much as in holotype (fig. 78m); handle conspicuous. Posterior plates 0,11-0,14mm (av. length 0,125mm), as in holotype but handle sometimes perforated by only two holes (fig. 78n). Miliary granules of radial muscles as in holotype. Tentacular stalks with granules similar to those of radial muscles (fig. 78o), others elongate, rod-like, up to 0,06mm long. Tentacular digits with smooth, straight or slightly curved rods (0,04-0,06mm long), nearly always thickened in the middle or with one or two short central branches and/or with bifurcate extremities (fig. 78p).

Distribution: False Bay to Port Elizabeth, 16-80m. Map: 17.
Habitat: Khaki sand.

Remarks: Although the single UCT specimen from False Bay has lost its tentacles and most of the viscera it is chosen as the holotype since it is the only unfragmented specimen in the series. The remaining specimens from the Port Elizabeth Museum are in 22 fragments contained in five vials. Since it is impossible to determine whether all fragments from a single individual are preserved none of these could be chosen as the holotype.

Fig. 78. Rynkatorpa spatula sp. nov.

Holotype

a. Anchors from anterior body wall.

b. Anchor plates from anterior body wall.

c. Anchors from posterior body wall.

d. Anchor and anchor plate from posterior body wall.

e. Granules from radial muscles.

f. Same (enlarged).

g. Stock and vertex of anchor.

h. Ciliated funnels from midbody.

i. Same from anterior end.

Paratype

j. Parts of calcareous ring.

k. Stone canal and madreporite.

l. Tentacle.

m. Anchor plate from anterior body wall.

n. Anchor plates from post body wall.

o. Deposits from tentacular stalk.

p. Deposits from tentacular digits.

(1-e, m & n Scale A; f & g, o & p Scale B;
h & i Scale C; j & k Scale D; l Scale E)

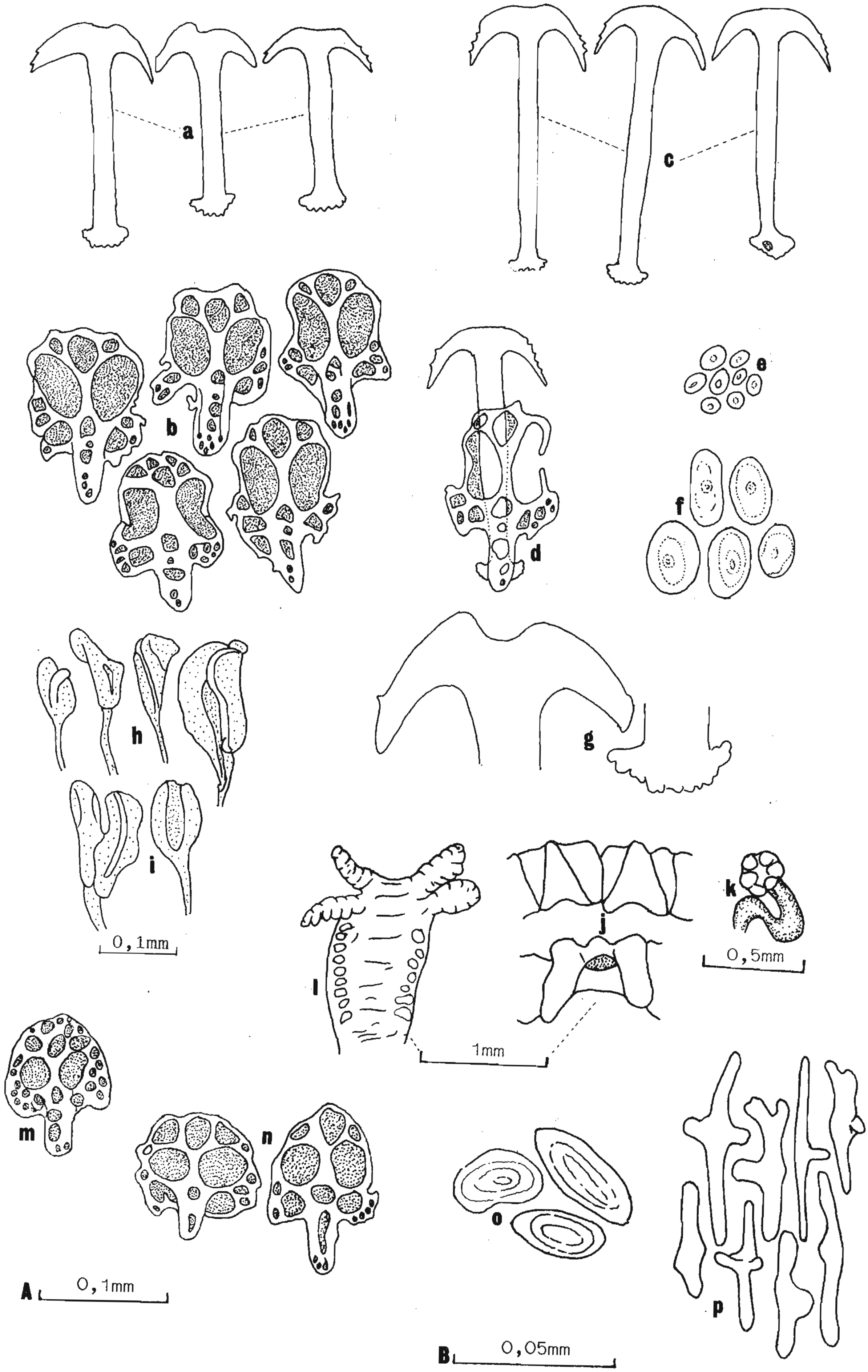


Fig.78

In the presence of a few (15-30) perforations and a distinct handle to the anchor plates, the new species shows clear relationship to Labidoplax Oestergren, 1898, perhaps occupying an intermediate position between it and Rynkatorpa. The idea to refer it to Rynkatorpa is due to the presence of eye-spots between the tentacle bases (absent in Labidoplax, according to Clark and Rowe, 1971) and on the fact that the two holes near the centre of the anchor plates are conspicuously larger than the rest (a feature characteristic of Rynkatorpa, according to Rowe and Pawson, 1967).

In the presence of a handle to the plates R. spatula appears closest to R. challengeri (Théel) from the East Indies, Fiji and Hawaii and R. hickmani Rowe and Pawson from Tasmania. However, in R. challengeri, both anchors and anchor plates (respectively 0,24-0,35mm and 0,20-0,27mm) are larger than those of the holotype of the new species (0,135-0,21mm and 0,105-0,158mm respectively). R. spatula is probably closer to R. hickmani as its spicules fall close to the range of variation in this species (anchors 0,09-0,23mm, anchor plates 0,09-0,17mm). However, in R. hickmani, the handle is rudimentary and not present in all the plates, the holes are nearly always in excess of 25 and there are in addition to the anchors and anchor plates other accessory rods and plates in the anterior body wall of at least the holotype.

Of the several species included in Labidoplax the new species comes close to L. variabilis (Théel) from Kei Islands and L. mortenseni Heding from the Red Sea. L. variabilis, according to Heding (1928), lacks eye-spots. Its spicules are much smaller, the anchor plates lack the two large central holes and the handles are pierced by usually a single hole. L. mortenseni has, in addition, smooth arms to the anterior anchors while the posterior anchors are 0,30mm long with 8-10 teeth and the posterior anchor plates 0,25mm long. R. spatula hence has no close relative in any of the two groups.

Genus SYNAPTA Eschscholtz, 1892

Synapta Escholtz, 1829:12; H.L. Clark, 1907:78 (synonymy); Heding, 1928:110; 1931:639.

Diagnosis: See H.L. Clark, 1907:78; Heding, 1928:110.

Type species: Holothuria maculata Chamisso and Eysenhardt, 1821 (by subsequent designation H.L. Clark, 1907:22).

Remarks: This genus includes large apodids with numerous polian vesicles and with large anchors (up to 1,3mm) and anchor plates (up to 1,0mm long). It contains, besides the type species, the also widely distributed tropical Indo-West Pacific S. oceanica. Only the latter species has been recorded from southern Africa as far south as Inhaca Island (Macnae and Kalk, 1958, 1962; Kalk 1959). Two poorly preserved fragments in the SAM collection from Inhaca Island are here also referred to S. oceanica solely on the basis of colour since no other reliable character as yet exists to separate the two species.

Synapta oceanica (Lesson)

(Fig.79 a-e)

Holothuria oceanica Lesson, 1830:99.

Synapta maculata Clark, 1907:78 (partim).

Synapta oceanica Heding, 1928:117, fig.3(1, 6, 7, 8); 1929:140, figs.1 and 2; 1931:639; Macnae and Kalk, 1958:43,69,75,99,107,117,130; 1962:111,118; Kalk, 1959:22; Branch and Branch, 1981:247.

Diagnosis: See Heding, 1928:117.

Previous southern African records: M(26/32,33/i, 12-15/40/i).

Material examined: M(26/32,33/i), 2 fragments (without anterior end).

Local distribution: Moçambique only. Map: 8.

General distribution: East coast of Africa and Tahiti.

Habitat: Sand bank.

Description: Colour dirty greyish yellow with five darker longitudinal lines in the radii. Anchors (fig. 79c & d) 1,10-1,32mm long, distance between arms 0,075-1,00mm. Anchor plates (fig. 79b) 0,80-1,00mm long, holes numerous, some larger holes with few minute teeth, bridge well developed, smooth. Miliary granules typical (fig. 79e).

Remarks: Although H.L. Clark (1907) considered both *S. maculata* and *S. oceanica* as synonymous, Heding (1928, 1929, 1931) maintains that both are distinct species but categorically states that the presence or absence of webs between the tentacular digits and the dimensions of the spicules cannot be used to separate them (Heding, 1929). Hence it appears that colour is the only reliable guide. Since Heding, on several occasions, has had the opportunity to examine both species his interpretation of the colour patterns must be accepted as our basis for separation but this is not always useful, especially in preserved animals.

According to Heding, *S. maculata* is a mottled olive green with a darker olive brown stripe in each radius while *S. oceanica* is bright yellow with a dark brown stripe in each radius and another stripe on each side of a radius. However, Macnae and Kalk (1958) describe living specimens of *S. oceanica* from Moçambique (identified by Dr. Cherbonnier) as grey, spotted, while Rowe and Doty (1977) describe their specimens of *S. maculata* from Guam as also mottled grey but

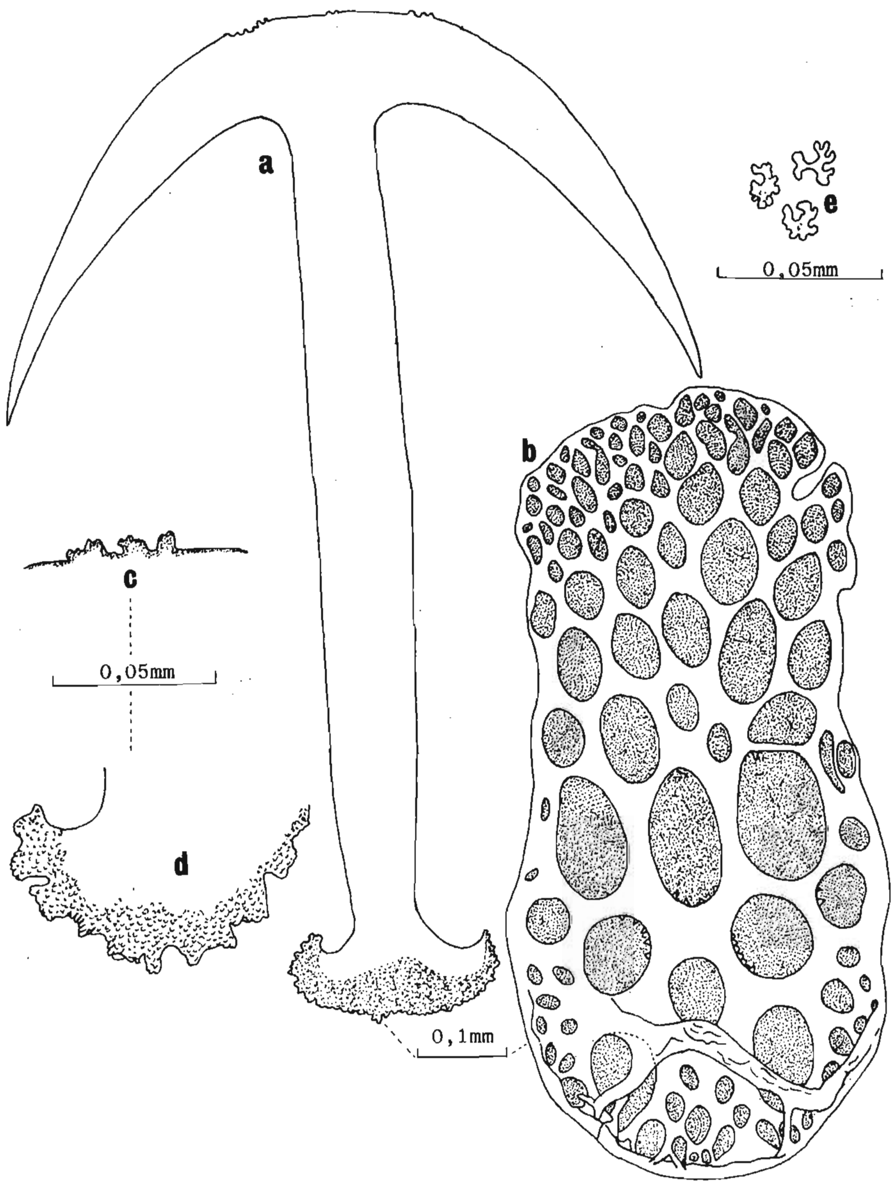


Fig. 79. Synapta oceanica Lesson. Inhaca.

a. Anchor from body wall.

b. Anchor plate from body wall.

c. Part of vertex of anchor.

d. Part of stock of anchor.

e. Rosettes from body wall.

with darker transverse bands or blotches. If Rowe and Doty's identification of their material from Guam is correct then the present fragments from Inhaca Island, which are without any trans= verse bands or blotches must be referred to *S. oceanica*. Admittedly there is still a certain degree of confusion regarding the live colouration and hence delimitation of each species and there must thus exist some overlapping of records. The fact that some holes of the anchor plates of the present material are sparsely toothed is perhaps not very significant since these were also illustrated by Heding (1929) for *S. oceanica* and by Cherbonnier (1952b) for *S. doreyana* (Quoy and Gaimard), a synonym of *S. maculata*, according to Cherbonnier.

Family CHIRIDOTIDAE Oestergren, 1898

Diagnosis: See Deichmann, 1930:210.

Remarks: This family comprises apodids with wheels and/or sigmoid bodies as calcareous deposits. It contains about 60 species distributed over seven genera, of which only *Chiridota* and *Taeniogyrus* are presently known from southern Africa.

Genus CHIRIDOTA Eschscholtz, 1829

Chiridota Eschscholtz, 1829:12; H.L. Clark, 1907:113 (synonymy); 1921:163; Heding, 1928:278; 1931:676.

Diagnosis: See Heding, 1928:278.

Type species: *Chiridota discolor* Eschscholtz, 1829 (by subsequent designation Fisher, 1907:731).

Remarks: This genus, characterised by the absence of sigmoid bodies, is represented in southern Africa by three tropical Indo-Pacific species, *C. stuhlmanni*, *C. violacea* and *C. rigida*, restricted in their distribution to the east coast.

KEY TO THE SOUTHERN AFRICAN SPECIES OF CHIRIDOTA

1. A large violet-coloured species up to 300mm long; tentacles with 10 pairs of digits ..... *Chiridota violacea* J. Müller, 1849

   Small to medium sized species, up to 80mm long; colour reddish orange to reddish brown; tentacles with 5-7 pairs of digits 2

2. Colour reddish brown; tentacles with 5 pairs of digits; spicules wheels and large (0,21-0,27mm long) curved rods with swollen, densely spinous ends

Chiridota stuhlmanni Lampert, 1896

Colour reddish orange to reddish brown; tentacles with 5-7 pairs of digits; spicules wheels and minute (0,02-0,04mm long) C-shaped rods with swollen,occasionally finely branched ends ..... Chiridota rigida Semper, 1868

Chiridota rigida Semper
(Fig.80 a-h)

Chiridota rigida Semper, 1868:18, pl.3:fig.3, pl.5:figs.3, 13, pl.6: fig.4, pl.8:fig.11; Thêel, 1886a:35; H.L. Clark, 1907:117 (partim); Heding, 1928:284; 1929:149, text-fig.6; Clark and Rowe, 1971:188 (dist.), pl.31, fig.9; Rowe and Doty, 1977:234, figs.4h, 8d.

Diagnosis: See Semper, 1868:18; Heding, 1929:149.

Previous southern African record: None.

Material examined: N(30/30/i), M(22/35/i), 3 spec.

Description: Mocambique specimens 35mm and 14mm long, larger without calcareous ring and tentacles; colour, in alcohol, white. Natal specimen 16mm; colour, in life, reddish orange with white papillae. Wheel papillae 50-56 middorsally, 42-47 in each dorsal interradius, and 4-12 in each ventral interradius. Tentacles with five pairs of digits (fig. 80c). Calcareous ring with only two radial plates perforated, others notched (fig. 80d). Polian vesicles over 20, mostly minute. Wheels (fig. 80a & b) 0,048-0,10mm in diameter.

Rods (fig. 80e) 0,02-0,039mm. Granules of radial muscles (fig. 80f) 0,012-0,035mm. Rods of tentacular stalks similar to those of integu= ment, 0,63-0,055mm (fig. 80h), those of digits elongate, often dichotomously branched (fig. 80g).

<u>Local distribution</u>: Moçambique to Natal, as far south as Park Rynie, South of Durban. Map: 8.

<u>General distribution</u>: Probably throughout the Indo-West Pacific region.

<u>Habitat</u>: Sand or rock.

<u>Remarks</u>: Besides the bright colouration of the Natal form and the absence of tentacular deposits, there is no essential difference between it and the Moçambique specimens, not even in the number of wheel papillae and the relative dimensions of the spicules. It is regrettable that the original colouration of the Moçambique specimens (in alcohol for over 10 years) was not recorded for it does not seem likely that the bright colouration of this species so completely disappears in alcohol.

In possessing only five pairs of tentacular digits instead of 6-7 pairs and only two perforated radial plates, the present specimens differ from the type from Phillipines described by Semper (1868) and the Tahiti specimen described by Heding (1929), and approaches <u>C. hawaiiensis</u> described by Fisher (1907) and Heding (1928). Further, the paucity of wheel papillae in the ventral interradii and their abundance antero-dorsally are features said to be characteristic of <u>C. hawaiiensis</u>. However, Heding (1928) does comment that the arrangement of wheel papillae and the number of tentacular digits and polian vesicles vary highly within a single species in the genus.

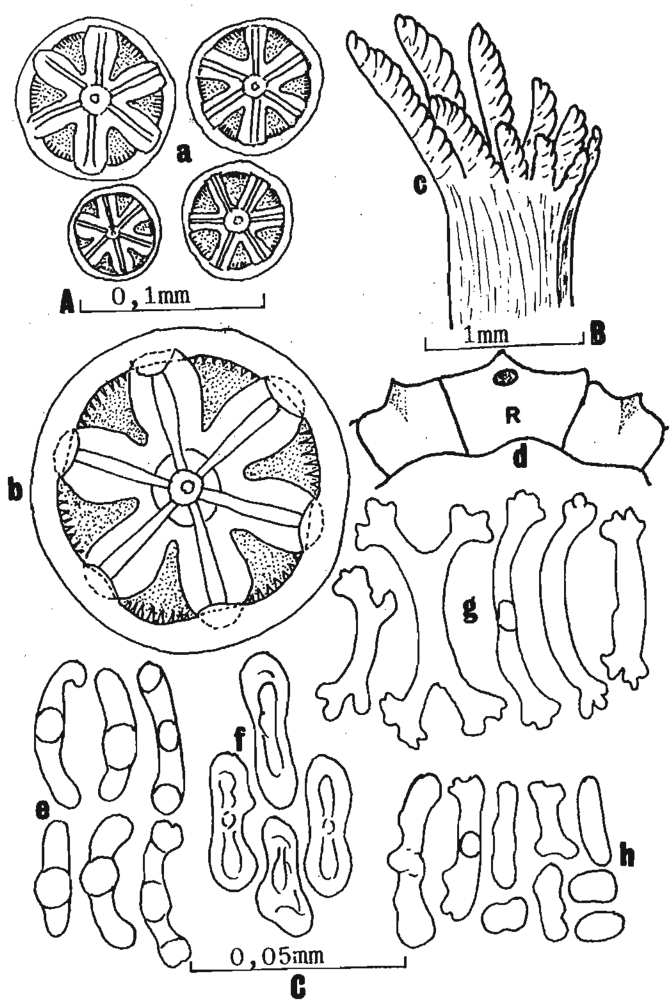


Fig. 80. Chiridota rigida Semper. Vilanculos.

a. Wheels from body wall.

b. Wheel (enlarged).

c. Tentacle.

d. Part of calcareous ring.

e. Rods from body wall.

f. Granules from radial muscle.

g. Rods from tentacular digits.

h. Rods and granules from tentacular stalk.

(a Scale A; c & d Scale B; b, e-h Scale C)

It is for this reason that the southern African material is here referred to the more widely distributed C. rigida.

Although C. rigida has 3-4 perforated radials (Heding, 1928,1929), the low number in the present material is probably a transitory feature since the calcareous ring is intact in only the two juveniles. This also explains the absence of tentacular deposits in the Natal form. The presence of only a few branched radial muscle deposits also supports the inclusion of the southern African material in C. rigida, rather than in C. hawaiiensis in which they are stated to be distinctly spinose.

Perhaps H.L. Clark (1907) was correct in treating C. hawaiiensis and C. intermedia Bedford as synonyms of C. rigida. C. intermedia appears to be a young, faded C. rigida (as suspected by Clark) while the differences between C. hawaiiensis, the southern African C. rigida and that from the East Indian Region and Tahiti are probably geographic and hence separable at subspecific level. Incidentally C. hawaiiensis has the same live colouration as C. rigida.

Chiridota stuhlmanni Lampert

Chiridota stuhlmanni Lampert, 1896:67; H.L. Clark, 1907:115; Heding, 1928:302, text-fig.64; Macnae and Kalk, 1958:130; Clark and Rowe, 1971:188 (dist.).

Diagnosis: See Lampert, 1896:67; Heding, 1928:302.

Southern African record: M(26/32,33/i).

Material examined: None.

Local distribution: Known only from Inhaca Island, Moçambique.

General distribution: East Africa and Fiji.

Habitat: Rock.

Remarks: This species has not been frequently encountered. The form described by Heding (1928) from Fiji appears slightly different from the type but since both descriptions are based on single individuals widely separated geographically, the differences may reflect individual or geographic variations. The Moçambique record is that of Macnae and Kalk (1958), based on material identified by Dr. Cherbonnier.

Chiridota violacea J. Müller

Chiridota violacea J. Müller, 1849:379; Ludwig, 1898:563; H.L. Clark, 1907:116; Heding, 1928:296, text-fig.61; Macnae and Kalk, 1958:130, Clark and Rowe, 1971:188 (dist.), pl.31, fig.10.

Diagnosis: See Heding, 1928:296.

Southern African record: M(26/32,33/i, 12-15/40/i).

Material examined: None.

Local distribution: Moçambique. Map: 8.

General distribution: East Africa and the Maldives. Heding (1928) records the species with some doubt from Banda.

Habitat: Rock.

Remarks: The size, colouration and number of tentacular digits clearly distinguish this species from the others in the genus. Its southern African record is based on the type from Ibo (Moçambique) and on some material from Inhaca Island recorded by Macnae and Kalk (1958).

Genus TAENIOGYRUS Semper, 1868

Taeniogyrus Semper, 1868:23; Fisher, 1907:735; H.L. Clark, 1907:121; 1921:165; Heding, 1928:310; Rowe, 1976:204.

Diagnosis: See Rowe, 1976:204 (emend.).

Type species: Chiridota australianus Stimpson, 1856 (by monotypy).

Remarks: Rowe (1976) recently revised the genus Trochodota and referred several species, formerly included in it, to Taeniogyrus which was rediagnosed. The latter genus, as emended, now contains approximately 14 nominal species of which only T. dayi occurs in southern Africa. It is possible that not all species included in the genus are valid (H.L. Clark, 1921; Pawson, 1964; Rowe, 1976).

Taeniogyrus dayi Cherbonnier
(Fig.81 a-f)

Taeniogyrus dayi Cherbonnier, 1952a:500, pl.48, figs.1-7; Day, 1959: 501, 545; Morgans, 1962:313; Day, Field and Penrith, 1970:83; Day, 1974a:191; Rowe, 1976:204 (passim).

Diagnosis: See Cherbonnier, 1952a:500.

Previous records: C(33/18/i,s; 34/18/i,s; 34/23/i).

Material examined: C(33/18/s, 34/18/s), 3 spec. (1 fragmented).

Description: Maximum length 55mm. Ciliated funnels (fig. 81d) solitary, attached to left dorsal interradius. Wheels (fig. 81a), 0,088-0,113mm in diameter, few with more than six spokes, additional spokes resulting from subdivisions of original ones. Sigmoid bodies (fig. 81b) 0,08-0,11mm long. Tentacular rods (fig. 81c) 0,05mm.

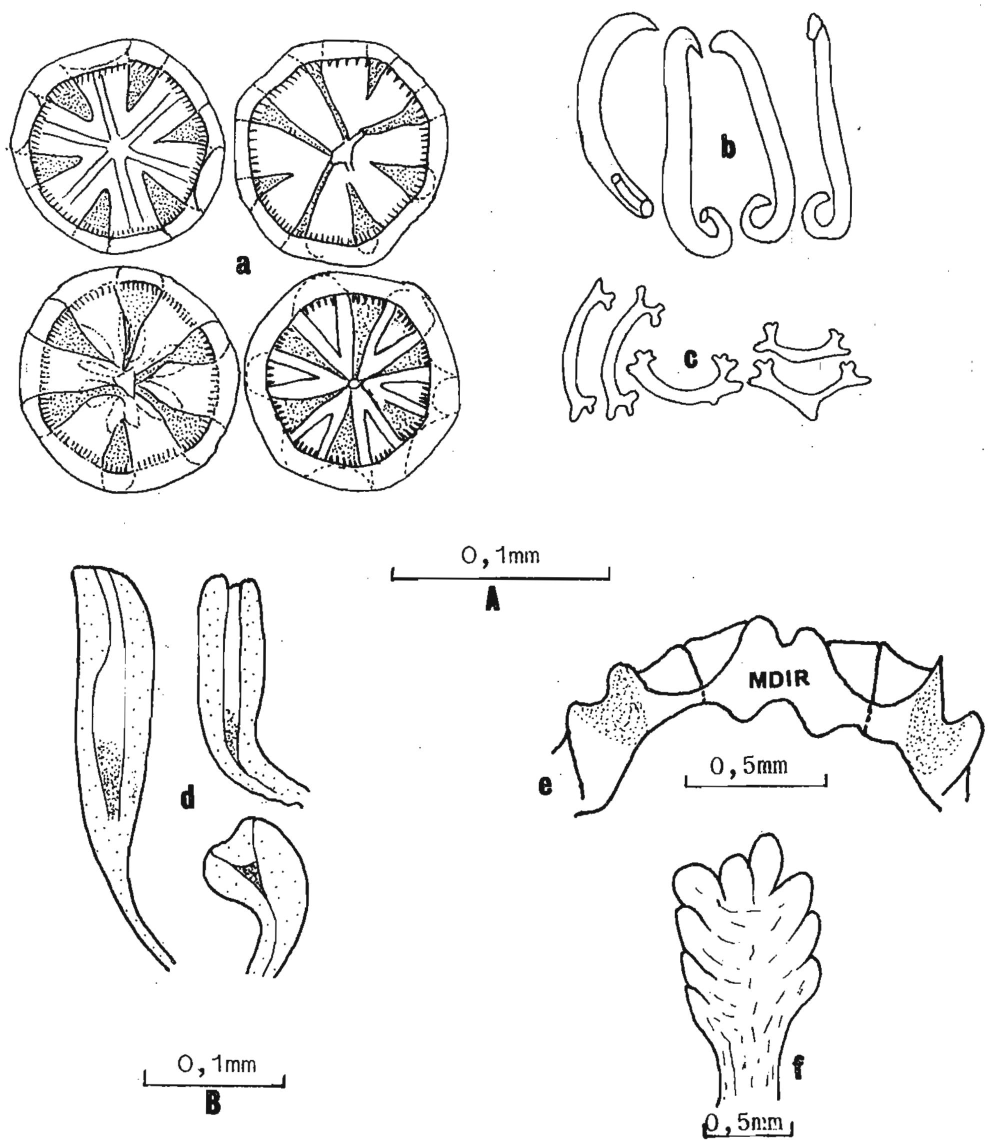


Fig. 81. <u>Taeniogyrus dayi</u> Cherbonnier. Langebaan.

a. Wheels from body wall.

b. Sigmoid bodies from body wall.

c. Rods from tentacle.

d. Ciliated funnels.

e. Part of calcareous ring.

f. Tentacle.

(a-c Scale A; d Scale B)

Distribution: Langebaan Lagoon to Knysna. Map: 17.

Habitat: Khaki sand and shell.

Remarks: Of the 14 species included in *Taeniogyrus* by Rowe (1976) only six other species have wheels confined to papillae. Of these, *T. dayi* comes closest to the subantarctic *T. contortus* (Ludwig) as was also observed by Cherbonnier (1952a). However, the latter species is hermaphrodite with 12 tentacles and several polian vesicles. Hence it is not closely related to the southern African species.

ZOOGEOGRAPHIC CONSIDERATIONS

Despite the presence of some 122 species of shelf and deep sea holothurians in southern Africa our knowledge of the fauna of this subcontinent is still incomplete. Although a lot is known about the number and distribution of intertidal and shallow water species, several species are known from single specimens and many others from a single locality. Investigation into the deeper continental shelf and abyssal fauna has just begun and despite its early stage it has added several new species or new records for the southern African region. Since an adequate coverage of approximately 4000km of coast= line and continental shelf takes a long time it is anticipated that many more species will most certainly be added. What follows then is a preliminary analysis of the holothurian fauna from the intertidal zone to the deepest reaches of the oceans yet explored within the limits of southern Africa. Further discussions of the distribution of the southern African holothurians will be found in H.L. Clark (1923), Deichmann (1948) and Thandar (1971, unpublished MSc. thesis).

METHOD

Of the 122 nominal species here recorded, *Holothuria (Roweothuria) vemae* and *Mesothuria lactea* do not strictly belong to the southern African region, while nine others have not yet been recorded south of the tropic of Capricorn, the northern limit of the southern African region used by Clark and Courtman-Stock (1976) for the other echinoderms. This leaves us with 111 species strictly belonging to the southern African region. Of these as many as 43 species (c. 39%) are either known from single specimens or recorded from a single locality within southern Africa. These are here discounted as being too rare for distributional analysis. Only the remaining 68 species are analysed further.

The geographic or horizontal distribution of the 68 species is analysed according to the conventional method used by other workers. Although the more recent method of using radial sectors, propagated by Millard (1978) for the hydroids, has much to commend it, it has not been adopted since only 68 species are here analysed and there are relatively few deep sea records. The distribution of the species is shown in Table 7 and on Maps 2-17. The areas along the coast used in the Table are those employed by Clark and Courtman-Stock (1976) for analysing the distribution of the other echinoderms. The areas from west to east and their extent are listed below (see also Map 1).

1. Luderitz Bay Area: Tropic of Capricorn ($23\frac{1}{2}$°S) to Port Nolloth (c. 29°S).

2. Lamberts Bay Area: Port Nolloth to north of Saldanha Bay (33°S).

3. Cape Town Area: Saldanha Bay to Cape Point (c. $34\frac{1}{2}$°S), but excluding False Bay.

4. False Bay Area: Cape Point to Cape Hangklip (c. 19°E).

5. Cape Agulhas Area: Cape Hangklip to Cape Infanta (c. 21°E).

6. Mossel Bay - Knysna area: Cape Infanta to Cape St. Francis (c. 25°E).

7. Port Elizabeth Area: Cape St. Francis to The Haven (c. 32°S, 29°E).

8. Durban Area: The Haven to Kosi Bay on the Natal - Moçambique border (c. 27°S).

9. Lorenco Marques (Maputo) Area: Mocambique-Natal border to the tropic of Capricorn.

Grid references for the localities included in each area can be found in Clark and Courtman-Stock but are here excluded as they are irrelevant to the subsequent discussion. The areas, however, are grouped into west, south and east coast regions as these are pertinent for the division of the southern African region into faunistic provinces. The range of each species is shown as a line joining the limits of their recorded distribution, meaning that although there may be no records between two localities the distribution is taken as continuous between the two points. Only the endemic Pawsonella africana has apparently a discontinuous distribution but since its occurrence on the west coast is based on a single poorly preserved specimen that appears significantly different from the Natal form, its west coast record is ignored.

FAUNISTIC COMPONENTS AND HORIZONTAL DISTRIBUTION

The 68 species here considered are grouped into five faunistic components on the basis of their distribution beyond the limits of southern Africa and each component, which includes shelf, slope and abyssal species, is treated separately. Table 6 lists the components and their relative concentration throughout the coast.

1. The cosmopolitan component is poorly represented. Only five deep sea species, occurring in waters between 1600-3620m, belong to this component and this represents only c. 7,4% of the total fauna. Two of these species, Echinocucumis hispida and Ypsilothuria bitentaculata, are so far known only from the south west coast while

Table 6. Faunistic components and their relative composition in the east, south and west coasts based on actual records of a sample of 68 species.

COMPONENT	TOTAL		EAST COAST (TROPICAL)		EAST COAST (SUBTROPICAL)		SOUTH COAST (TEMPERATE)		WEST COAST (TEMPERATE)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cosmopolitan	5	7,4	3	8,3	3	9,4	-	-	2	10,5
Circumtropical	2	2,9	2	5,6	1	3,1	-	-	-	-
Indopacific	31	45,6	28	77,8	18	56,3	1	4,75	1	5,3
Atlantic	2	2,9	-	-	-	-	1	4,75	2	10,5
Endemic (to one or more areas)	28	41,2	3	8,3	10	31,2	19	90,5	14	73,7
TOTAL	68	100	36	100	32	100	21	100	19	100

the remaining three, Deima validum validum, Oneirophanta mutabilis mutabilis and Benthodytes typica, have only been recorded from the east coast (Map 2). Since shallow water holothurians are notoriously stenothermic there are no shallow water cosmopolitan species. It does not appear likely that some species are masquerading under different names and which may one day prove to be geographical variants of some well known species. Even some forms suspected by Panning (1962) to belong to the Pseudocnus dubiosus group of species are herein referred to the new genus Pseudocnella.

A low percentage (c. 2,8%) is reported for the other echinoderms by Clark and Courtman-Stock (1976) but regrettably their monograph did not include the numerous deep sea east coast species which were received too late for inclusion in their work. A figure of 12% for the shelf polychaetes was arrived at by Day (1967) and these, accor= ding to him, are distributed all round the coast, forming a very constant proportion of the fauna at all collecting stations. However, it must be emphasised that the polychaetes, being more adaptable than the echinoderms, are notorious for their wide distribution (Day, 1970). Millard (1978) records a figure of 11,2% for the hydroids. As our knowledge of the continental slope and deep sea increases it is likely that more cosmopolitan species will be added.

2. The circumtropical component is here taken to include those species which are common in the tropics of the Indian, Pacific and at least the West Atlantic oceans but which may extend into subtropical waters. This component is very weak and does not form a definite component of the southern African holothurian fauna as only two species (c. 2,9%), namely *Holothuria (Thymiosycia) arenicola* and *H.(T.) impatiens*, fall in this category. Both these are well known shallow water forms restricted to the east coast, but only the former extends into subtropical Natal (Map 9). Since both species are clearly Indo-West Pacific in origin and for most of their distribution they can just as well be included with the Indo-Pacific component discussed below.

3. The Indo-Pacific component forms the largest component in the southern African region. It includes those species which are either distributed in the whole or part of the Indo-West Pacific region or extend as far as the tropical-subtropical East Pacific region. This component is represented by 31 out of the sample of 68 species, which is roughly 45,6% of the total fauna. It makes up 77,8% of the fauna of Moçambique and 56,3% of the fauna of Natal (Table 6). Included in this component is *Ocnus capensis* which has been recorded from the West Pacific region on several occasions but excluded are *Pentacta doliolum* and *Roweia frauenfeldi*. *P. doliolum* appears to be an endemic southern African species and its occurrence in Madagascar and tropical East Africa (Helfer, 1912) and in Ceylon (Pearson, 1903)

is dubious, while R. frauenfeldi has been recorded once only from outside the southern African region (Ludwig, 1882). If we add to the 31 species the two circumtropical species, the Indo-Pacific component rises to 48,5%. Even if the total number of southern African species or only the shelf forms are considered this component remains fairly constant.

A low figure of 30% is recorded for the other echinoderms by Clark and Courtman-Stock (1976), however, their work excluded those species that are distinctly Australasian in character and the numerous deep sea forms from the east coast. An even lower figure of 15% is reported by Day (1967) for the shelf polychaetes and about 22% for the hydroids by Millard (1978).

Of the 31 Indo-Pacific species only Ocnus capensis and Holothuria (Selenkothuria) parva extend further south than Port St. Johns in the Transkei. In fact the former species has only been taken in southern Africa from deep cold waters between Port Nolloth and Mossel Bay (Map 3) and hence its occurrence in the warm shallow waters of the East Indian region (Sluiter, 1901), China and Japan (Mitsukuri, 1912) and Phillipine Islands (Ohshima, 1915), is dubious. H.(S.) parva does not extend beyond Mngazana estuary (c. 32°S) in the Transkei. Since this species is well established in Natal its extension to south of Port St. Johns is not surprising (Map 5). The remaining 29 species are restricted to north of Port St. Johns but there is a definite thinning out of the number of species southwards from Delagoa Bay (Maps 3-8).

Since the Indo-Pacific component is the largest component in the southern African region it is from this component that we must expect regular additions to our fauna.

4. The Atlantic component, like the cosmopolitan and circumtropical components, is equally poor and does not form a definite element of the southern African holothurian fauna. Only 2 (c. 2,9%) of the 68 species belong to this component (Map 9). Of these Rhopalodinopsis capensis is a shelf form extending from False Bay northwards into Liberia but has not yet been reported from tropical West Africa, while Benthodytes lingua is herein recorded from deep waters off Lamberts Bay - Cape Town area. Even if all the southern African species are considered this component remains virtually unchanged. Clark and Courtman-Stock record a figure of less than 10% for the other echinoderms while Day records 13% for the shelf polychaetes but the latter figure includes species from Angola which is not truely part of the southern African region. It is possible that many more East Atlantic holothurians reported by Panning (1932, 1936), Madsen (1947, 1953) and Cherbonnier (1958, 1963-65) will be found on the west coast once the deeper shelf fauna of this region becomes better known.

5. None of the 68 species here considered is southern in character and hence one is tempted to state that there is no Antarctic-Subantarctic component in the southern African holothurian fauna. However, if all the species are included at least three abyssal forms, namely Trachythyone ?parva, Molpadia ?abyssicola and Elpidia gracilis may belong to this component but each species is known from only one or two specimens which are sufficiently different from their southern counterparts to warrant the erection of new endemic taxa.

TABLE 7: GEOGRAPHIC DISTRIBUTION OF SOUTHERN AFRICAN HOLOTHURIANS.

C = Cosmopolitan

Ct = Circumtropical

IP = Indopacific

A = Atlantic

E = Endemic

i = intertidal

	COMPONENT	DEPTH IN METERS	DISTRIBUTION									
			WEST COAST			SOUTH COAST				EAST COAST		
			LUDERITZ BAY AREA	LAMBERTS BAY AREA	CAPE TOWN AREA	FALSE BAY AREA	CAPE AGULHAS AREA	MOSSEL BAY-KNYSNA AREA	PORT ELIZABETH AREA	DURBAN AREA	MAPUTO AREA	OTHER LOCALITIES
Benthodytes typica Théel	C	2720-3620								—	—	—
Deima validum validum Théel	C	2720-3430								—	—	—
Oneirophanta mutabilis mutabilis Théel	C	3390-3530								—	—	—
Echinocucumis hispida (Barrett)	C	2525-3257		—	—							
Ypsilothuria bitentaculata (Ludwig)	C	1647-2965		—	—							
Holothuria (Thymiosycia) arenicola Semper	Ct	i								—	—	—
H.(T.) impatiens Forskaal	Ct	i									—	—
Ocnus capensis (Théel)	?IP	155-400		—	—	—	—	—				
Holothuria (Selenkothuria) parva (Lampert)	IP	i								—	—	—
H.(Mertensiothuria) leucospilota (Brandt)	IP	0-4								—	—	—
H.(Semperothuria) cinerascens (Brandt)	IP	i								—	—	—
H.(Lessonothuria) insignis Ludwig	IP	0-6								—	—	—
H.(Mertensiothuria) pervicax Selenka	IP	i								—	—	—
H.(Metriatyla) scabra Jaeger	IP	i								—	—	—
H.(Platyperona) difficilis Semper	IP	0-6								—	—	—
H.(Selenkothuria) erinaceus Semper	IP	i								—	—	—
H.(Thymiosycia) hilla Lesson	IP	i								—	—	—
Actinopyga echinites (Jaeger)	IP	i								—	—	—
A. mauritiana (Quoy & Gaimard)	IP	i								—	—	—
Stichopus variegatus Semper	IP	i								—	—	—
Stolus buccalis (Stimpson)	IP	0-4								—	—	—
Ohshimella ehrenbergii (Selenka)	IP	0-3								—	—	—
Trachythyone crucifera (Semper)	IP	0-3								—	—	—
Orphnurgus insignis Fisher	IP	860-1050								—	—	—
Euapta godeffroyi (Semper)	IP	i								—	—	—
Chiridota rigida (Semper)	IP	i								—	—	—
Actinopyga miliaris (Quoy & Gaimard)	IP	i									—	—
A. plebeja (Selenka)	IP	i									—	—
Holothuria (Halodeima) atra Jaeger	IP	i									—	—
H.(H.) edulis Lesson	IP	i									—	—
H.(H.) pulla Selenka	IP	i									—	—
H.(Lessonothuria) pardalis Selenka	IP	i									—	—
H.(?L.) cumulus H.L. Clark	IP	i									—	—
Stichopus chloronotus Brandt	IP	i									—	—
Afrocucumis africana (Semper)	IP	i									—	—
Opheodesoma mauritiae Heding	IP	i									—	—
Synapta oceanica Lesson	IP	i									—	—
Chiridota violacea J. Müller	IP	i									—	—

TABLE 7 (contd.)

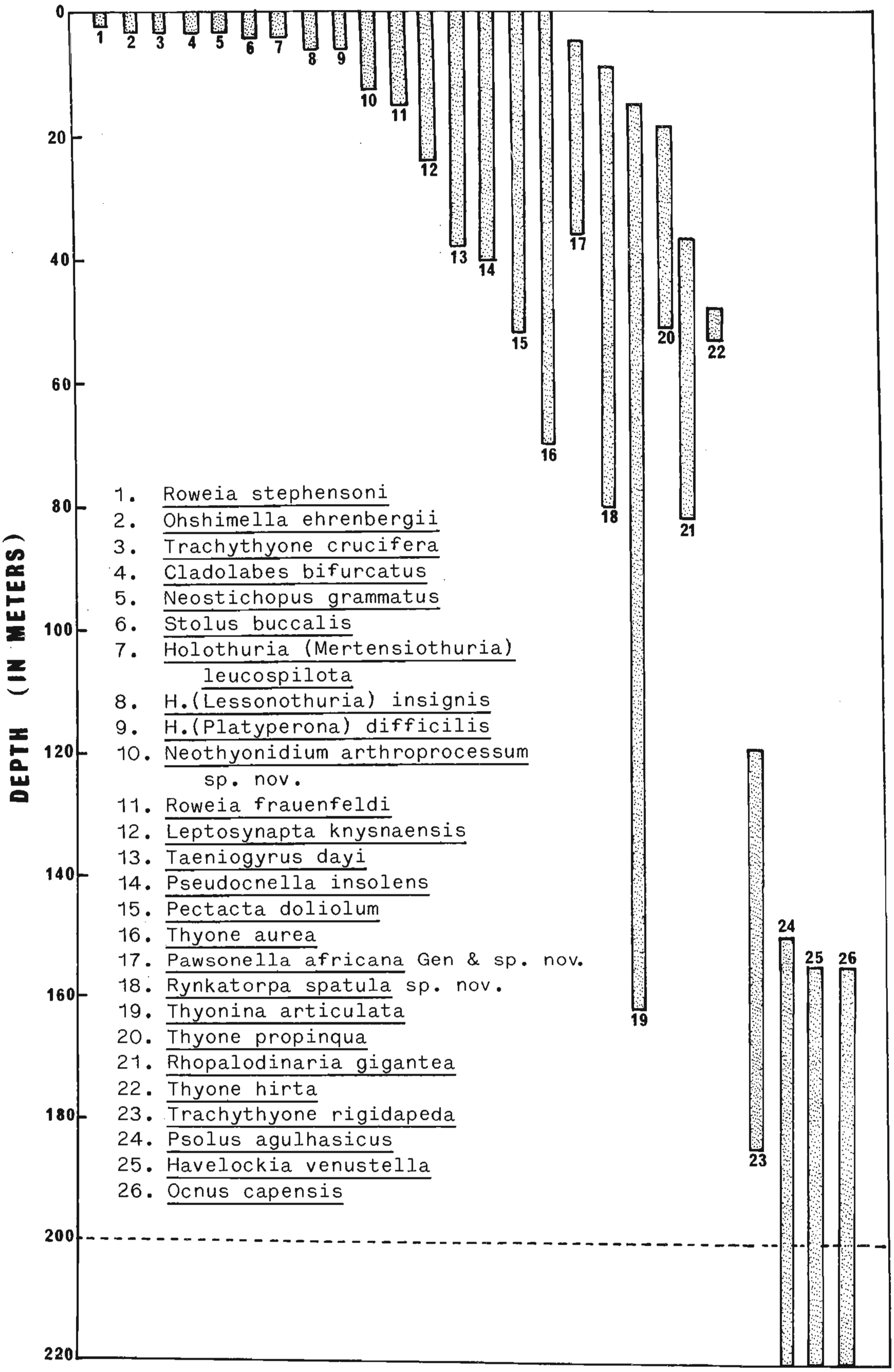
	COMPONENT	DEPTH IN METERS	LUDERITZ BAY AREA	LAMBERTS BAY AREA	CAPE TOWN AREA	FALSE BAY AREA	CAPE AGULHAS AREA	MOSSEL BAY-KNYSNA AREA	PORT ELIZABETH AREA	DURBAN AREA	MAPUTO AREA	OTHER LOCALITIES
			WEST COAST			SOUTH COAST				EAST COAST		
Rhopalodinopsis capensis Heding	A	20	—	—	—	—						
Benthodytes lingua R. Perrier	A	2780-2871		—	—							—
Roweia frauenfeldi (Ludwig)	E	0-15	—	—	—	—	—	—	—	—	—	-?-
Pentacta doliolum (Pallas)	E	0-52	—	—	—	—	—	—	—			-?-
Pseudocnella insolens (Théel)	E	0-40	—	—	—	—	—	—	—			
Thyone aurea (Quoy & Gaimard)	E	0-70	—	—	—	—						
Leptosynapta knysnaensis (Cherbonnier)	E	0-24	—	—	—	—	—	—	—			
Trachythyone rigidapeda (Cherbonnier)	E	120-185	—	—								
Aslia spyridophora (H.L. Clark)	E	i		—	—	—	—	—	—	—		
Thyonina articulata (Vaney)	E	16-162		—	—	—	—	—	—			
Havelockia venustella (Ludwig & Heding)	E	155-400		—	—	—	—	—				
Taeniogyrus dayi Cherbonnier	E	0-38		—	—	—	—	—				
Psolidothuria octodactyla Gen. & sp. nov.	E	2514-3255		—	—							
Pseudocnella sinorbis (Cherbonnier)	E	i			—	—	—	—	—	—	—	
Sclerothyone velligera (Ludwig & Heding)	E	318-365			—							
Temparena chuni (Ludwig & Heding)	E	318-365			—							
Roweia stephensoni (John)	E	0-2				—	—	—	—			
Pseudoaslia tetracentriophora (Heding)	E	i				—	—	—	—			
Rynkatorpa spatula sp. nov.	E	9-80				—	—	—	—			
Thyone propinqua Cherbonnier	E	19-51				—	—	—				
T. hirta Cherbonnier	E	48-53				—						
Neothyonidium arthroprocessum sp. nov.	E	0-12				—						
Rhopalodinaria gigantea Cherbonnier	E	37-82				—						
Pseudocnella sykion (Lampert)	E	i					—	—	—	—	—	
Neostichopus grammatus (H.L. Clark)	E	0-3					—	—	—	—		
Psolus agulhasicus Ludwig & Heding	E	150-375					—	—				
Cladolabes bifurcatus (Deichmann)	E	0-3								—		
Pawsonella africana gen. & sp. nov.	E	5-36								—		
Leptosynapta naiga sp. nov.	E	i								—		
Orphnurgus aspersignis sp. nov.	E	1000-1200								—		

6. The endemic component is almost as high as the Indo-Pacific component as 28 species (c. 41,2%) belong to this group in our sample of 68 species. Even if all truely southern African species are considered this component rises to only 45%. A figure of 48% is reported for the other echinoderms, 36% for the shelf polychaetes, and 32,7% for the hydroids. Table 6 shows that the endemic com= ponent is particularly high in the south coast (west of the Port Elizabeth area) and then northwards up the west coast (Maps 10-17). In fact between East London and False Bay, all records besides Ocnus capensis and Rhopalodinopsis capensis, amongst the 68 species, are endemic, making up 90,5% of the total fauna. Up the west coast the endemic component drops slightly to 73,7%. On the east coast, on the other hand, this component makes up only 31,2% of the fauna in the Durban area between Port St. Johns and Kosi Bay while in the Maputo area it drops drastically to 8,3%. However, if the local endemics are added the latter figure rises to about 15%.

VERTICAL DISTRIBUTION

Despite the generally narrow bathymetric range of most species, as a group the holothurians are remarkable for their wide distribution, ranging from the intertidal zone to the deepest trenches of the hadal zone where they may comprise 90% of the total biomass (Pawson, 1970). However, as far as the vertical distribution of the southern African holothurians is concerned very little can be said at this stage. Since many species are known from a single locality any speculation about their bathymetric range would be premature. Hence what follows is a preliminary analysis of the vertical distribution of only those species known from more than one locality.

Fig. 82. Vertical distribution of southern African shelf holothurians excluding species restricted to the intertidal zone.

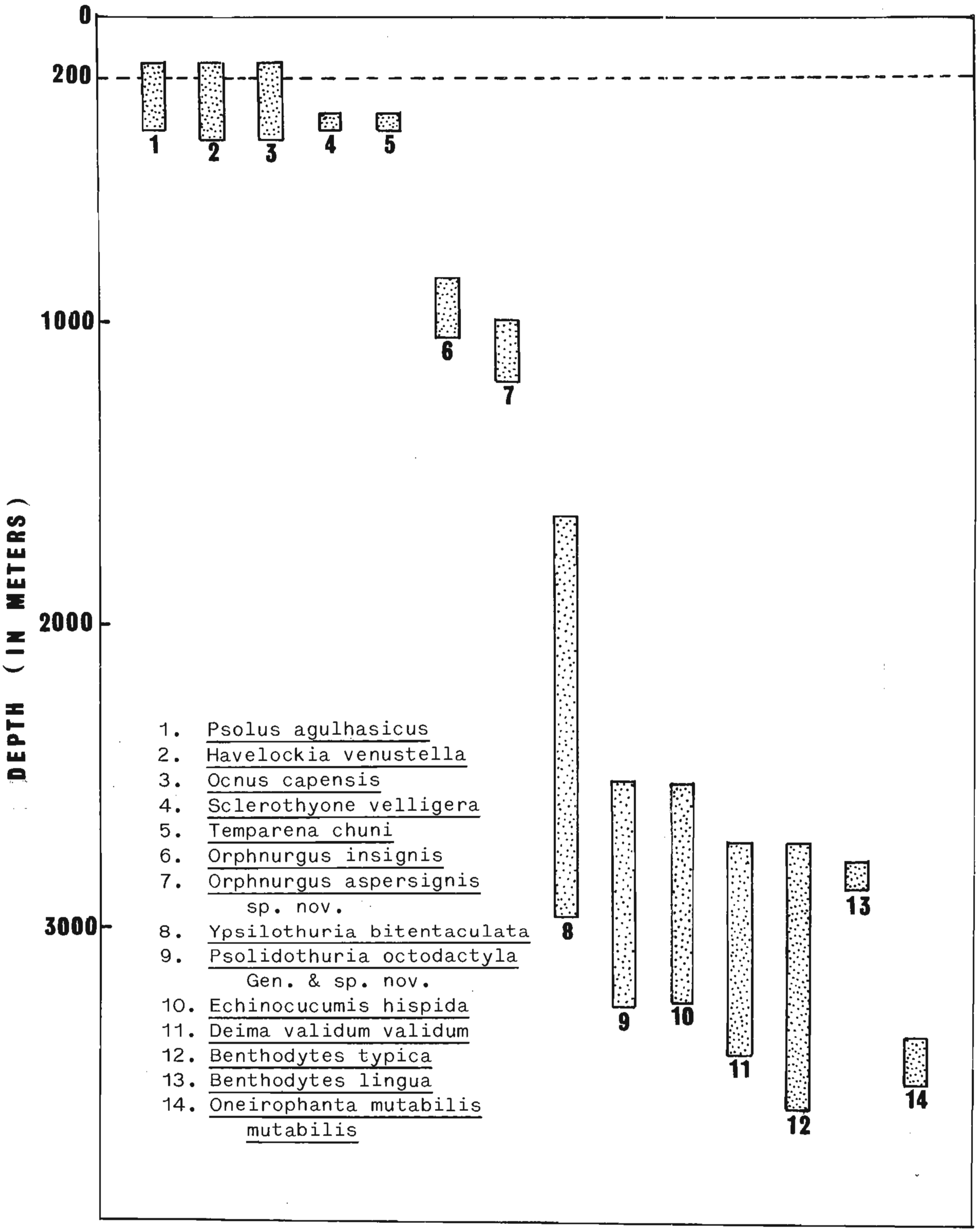


Of the 68 species as many as 54 (c. 79,5%) are restricted to the shelf, which, as defined by Ekman (1953), extends from the intertidal zone to approximately 200m. The vertical distribution of these species, excluding those (30 species) restricted to the intertidal zone, is shown in fig. 82. 52 (c. 96%) of the 54 shelf species are shallow water forms limited in their distribution from the intertidal zone to about 100m, while the remaining two (Thyonina articulata and Trachythyone rigidapeda) extend below the 100m line, to the outer edge of the conti= nental shelf with the former showing the widest bathymetric range (16-162m).

Of the 14 species occurring in deeper waters, three (c. 4,5%) (Ocnus capensis, Havelockia venustella and Psolus agulhasicus) are shared between the shelf and the slope (150-400m); two others (c. 3%) (Sclerothyone velligera and Temparena chuni) appear restricted to the upper slope between 318-365m, the remaining nine species (c. 13%) are either lower slope or abyssal in distribution, known only from waters between 780-3620m (fig. 83). From this it is clear that very little is known of the lower limit of the continental shelf and the slope while our knowledge of the abyssal species is just a little better.

Of the nine lower slope or abyssal species only two (Orphnurgus insignis and O. aspersignis) are found between 780-1200m while the remaining seven species are mostly limited in their distribution between 2000-3620m (fig. 83). The deepest species have all been collected from the east coast and include Benthodytes typica which reaches a depth of 3620m, the deepest yet recorded for any southern African species. The remaining four abyssal species are only known from off the west coast. Of these Echinocucumis hispida and Psolidothuria octodactyla both from

Fig. 83. Vertical distribution of southern African deep sea (>200m) holothurians.



the south west Cape Province, share approximately the same bathymetric range (c. 2500-3250m) and this is also true for Deima validum validum and Benthodytes typica from the east coast (c. 2700-3600m). The widest bathymetric range yet recorded for any southern African species is that for Y. bitentaculata (c. 1600-3000m).

No shelf species has yet been taken from the east coast from waters in excess of 36m. In fact the upper bathymetric range of any east coast deep sea species is approximately 400m (only one species). Hence there is no record of holothurians from the east coast in waters between 36-400m. This is not surprising since the shelf here is very narrow (7-8km in N. Natal compared to a world average of 72km-Shepard, 1963), the gradient steep and the seabed very rocky. To add to this the shelf is frequently excavated by gullies and submarine canyons or traversed by numerous ridges. Hence the general topography of the east coast is hostile, making dredging very difficult if not impossible. Although the shelf widens to 30-40km between Zululand and Durban as a result of additional sediment transported by the many rivers, much of this sediment is according to Flemming (in Heydorn, 1978), dispersed by littoral drift and ocean currents. Flemming, in addition, describes southward migrating submarine dunes, some up to 8m high, in some parts of the east coast in water depths greater than 50m. These sediment movements, not yet reported from elsewhere, are possibly caused by the Agulhas current with its high flow velocities of 1-2m per second. Such massive sediment transport, according to Heydorn (1978), has far reaching ecological implications, forming a powerful physical barrier to most benthic organisms. In fact, he states that sanding up and uncovering of infratidal reefs are known to occur and those animals which do survive here must be adapted for these changes. Even the outer shelf, with its relict algal nodules and shell fragments, is capable of supporting only sparse populations of singular corals and bryozoans and hence is unsuitable for mobile benthic organisms such as holothurians.

FAUNISTIC PROVINCES

The southern African subcontinent, lying between latitudes $23\frac{1}{2}°$-$35°$S and longitudes $14°$-$36°$E and narrowing gradually southwards, forms a small, open landmass where the ocean currents tend to find a free course. It has long been established that these currents have had a profound effect on the nature and distribution of especially the intertidal biota. This was demonstrated conclusively by Stephenson in a long series of papers summarised in 1939, 1944 and 1948 and supported by Ekman (1953), Day (1967) and many other commentators. Stephenson divides the southern African intertidal zone into three faunistic provinces as follows:-

1. An eastern tropical-subtropical region extending from Moçambique to the Natal coast and Transkei as far south as Port St. Johns.

2. A southern warm temperate region between Port St. Johns to the Cape Agulhas-Cape Point region.

3. A cold temperate region along the west coast from Cape Point northwards into South West Africa.

Day (1967) states that while such faunistic regions are clearly discernable when intertidal polychaetes alone are considered the division comes short when all shelf species (up to 200m depth) are included. According to him, from Cape Point northwards along the west coast, the fauna is similar to the south coast with both the endemic and the Indo-Pacific components remaining equally strong.

He states that although some changes do occur near Cape Point these are not well marked as those that occur on the east coast. Day hence divides the southern African region into the following faunistic provinces:-

1. The Moçambique - Madagascar province, dominated by tropical species, reaching Delagoa Bay at 26°S latitude.

2. The Natal province, with many tropical but also a fair number of endemics and Atlantic species, reaching Bashee River at 32°S latitude.

3. The Cape-South West African province dominated by endemics with a few tropical species and several other components.

Not included here is Day's Angolan Province, dominated by tropical West African species, as it is not strictly part of the southern African region. Recently Millard (1978), in analysing the geographical distribution of the hydroids, also considered the Cape fauna as re= presenting just one province, the Agulhas-Namaqua province.

Because of the difference of opinion, Clark and Courtman-Stock (1976) illustrate the distribution of the other echinoderms by dividing the region into nine areas demarcated by points along the coast. While these areas have here been used to illustrate the horizontal distribution of southern African holothurians (Table 7) an attempt is made to show in which way this distribution supports one or other of the above viewpoints regarding faunistic provinces.

The holothurian fauna of Moçambique comprises mostly tropical Indo-West Pacific and circumtropical species with a sprinkling of endemics in the region of Delagoa Bay (26°S). The 36 species occurring here consist of 83,3% Indo-Pacific and circumtropical species with the remainder made up of both southern African and local endemics. This distribution supports Day's Moçambique-Madagascar province and Clark and Courtman-Stock's Lorenco Marques (Maputo) area. The high concentration of tropical species here is not surprising since the surface water temperature is about 25°C, similar to that further north.

As many as 11 tropical Indo-Pacific and circumtropical species do not occur south of Delagoa Bay. Hence in Natal the Indo-Pacific and circumtropical component drops to c. 59% while the endemic component rises to c. 31%. There is a marked weakening of the Indo-Pacific component beyond the southern border of Natal to Port St. Johns, probably a reflection of both cooling waters and the infrequency of collections. Hence the area, extending from Delagoa Bay to the region of Port St. Johns at about 32°S, is characterised by a subtropical fauna subjected to surface water temperature of 21-24°C, cooler than that further north. This region corresponds with the Natal province of Day and the Durban area of Clark and Courtman-Stock.

South of Port St. Johns and then westward the Indo-Pacific component drops drastically. In fact not a single shallow water tropical Indo-Pacific species, identified with any degree of certainty, has yet been recorded beyond Mngazana Estuary, a little south of Port St. Johns. Hence between East London and Cape Agulhas the endemic component jumps to about 94%; in False Bay it decreases slightly to 88% while north of Cape Point it drops to about 74%. In the East London-Cape Agulhas area the Indo-Pacific <u>Ocnus capensis</u> is the only non-endemic species while in False Bay both <u>O. capensis</u> and the Atlantic <u>Rhopalodinopsis capensis</u> are the two non-endemic forms. On the west coast both these species and a few deep sea forms are responsible for a drop in endemics. However, if intertidal species alone are considered there is 100% endemicity of the holothurian fauna on both the south and west coasts.

While Stephenson (1948) regarded Kommetjie on the western shore of Cape Peninsula as the breakpoint between the south and west coast faunas others have placed this point at Cape Point or somewhere between Cape Point and Cape Agulhas or even further east at Cape Agulhas itself (Brown and Jarman, in Werger, 1978). Since many typically south coast holothurians do not proceed beyond False Bay and one West coast endemic reaches False Bay, this area can be taken to represent the break point between the two faunas in question.

When only shelf holothurians of the temperate region of southern Africa are considered, we are left with 23 out of our sample of 68 species. Of these three are restricted to False Bay, three occur only north of False Bay of which two reach False Bay, while seven occur only east of False Bay of which four reach False Bay. This leaves us with as many as 10 species (43,5%) found on both sides of False Bay. Of the 13 shelf species occurring on the west coast, two (15,4%) are endemic to the area, including the well established Thyone aurea. If two other endemic species restricted to the upper slope between 318-365m are taken to represent shelf forms, the west coast endemics rise to just over 30%. Since Briggs (1974) requires only 10% endemic species for an area to be considered a province, the west coast of southern Africa satisfies this requirement. Even if Cape Point is taken as representing the southern limit of the west coast fauna as done by some workers at least three species (20%) are still endemic to the west coast.

A figure of 43,5% of species common to both coasts is very close to that of 40% recorded for the other echinoderms by Clark and Courtman-Stock (1976). For other well known groups the figure varies from 43% for the molluscs to about 65% for the fishes (Day, 1970). In fact the average for all invertebrate groups, according to Day (1970), is 47%. This figure increases if the more mobile fishes are added.

Although some changes are noticeable in the False Bay-Cape Point area it must be emphasised that this area does not form a marked barrier on the south west coast as does Port St. Johns on the east. This is because this area lies in a region of overlap which is bathed by waters derived from the warm Agulhas current and the cold Westwind Drift (Dietrich, 1935; Clowes, 1950). Such mixed water probably result from seasonal changes in the direction of the prevailing winds, causing warm water to flow around Cape Point in summer and cold water to flow into False Bay in winter (Darbyshire, 1966; Day, 1970). This mixed water is perhaps the chief reason for the number of species common to both coasts.

On the southeast coast, however, the migration of warm temperate species up the east coast is perhaps aided by the cooler water moving up the coast inshore of the Agulhas current. Such flow is either in the form of a counter current (Mallory, 1961; Jackson, 1976) or as advection of pockets of cooler water inshore of the Agulhas current as was recently suggested by Bang and Pearse (in Heydorn, 1978). Whatever the nature of this water, it together with the diversion of the Agulhas Current, must also prevent many tropical shallow water species migrating further south than Port St. Johns.

On the basis of the zoogeographic distribution of the southern African holothurians one can thus recognise four faunal provinces as follows:-

1. A tropical province extending down the Moçambique coast as far south as Maputo (c. 26°S).

2. A subtropical province from Maputo southwards through Natal to Port St. Johns in the Transkei (c. 32°S).

3. A warm temperate province from Port St. Johns southwestwards to the Cape Agulhas-Cape Point region (c. 32,5°S).

4. A cold temperate province on the west coast from Cape Point northwards into South West Africa (Namibia).

There is a very high concentration of endemics in the False Bay-Cape Town area. In fact of all the Cape endemics presently known, 11 are restricted to the Cape Town area and 13 to False Bay. Although the high concentration is probably a reflection of the intensity of collections, the seasonal mixing of warm and cold waters must result in some specialisation and hence speciation, thus preventing many species from extending their range northwards or eastwards.

Thyone aurea, is a good indicator species on the west coast, Roweia stephensoni on the south coast and Holothuria (Semperothuria) cinerascens on the east coast.

DISCUSSION

HISTORY OF MATERIAL

If the southern African region is rightly considered to include only that part of the African subcontinent lying south of the tropic of Capricorn, the present material is fairly representative of the entire region. However, if the whole of South West Africa and Moçambique are included, the material is greatly impoverished as only two additional localities are included from South West Africa and one from Moçambique. In fact the only reasonable sample of holothurians from South West Africa is contained in the SAM material.

This material, ranging from Rocky Point (c 19°S) in South West Africa to Zavora (c. 24°S) in Moçambique, dates back to 1897 and includes, besides the miscellaneous collections, several deep sea species brought home by the 'Africana II' and 'Meiring Naude' cruises. Re=grettably no localities are included between Port Shepstone and Port Alfred on the east coast and hence the transitional zone in the Transkei between the subtropical and warm temperate faunas is not represented.

The only published works on the SAM material is the comprehensive survey by H.L. Clark (1923), the description of Rhopalodinopsis capensis by Heding (1937) and the records of Holothuria n. sp. from the Vema Seamount by Berrisford (1969) and of Orphnurgus glaber from off Natal coast by A.M. Clark (1977). Most of the specimens studied by H.L. Clark and re-examined by the writer are in the dry state, some even having deteriorated beyond recognition. The SAM material, however, is fairly rich and includes eight new species and 10 new records, mostly from deep waters.

The UCT material is more representative since it has been accumulated mainly as a result of extensive ecological surveys along the coast from the early thirties. This material ranges from Swakopmund (c. $22\frac{1}{2}$°S) in South West Africa to Morrumbene (c. $23\frac{1}{2}$°S) in Moçambique, the former being the only South West African locality represented and from which only one species, Roweia frauenfeldi, is here recorded. One new species each was described from this material by Heding (1937), John (1939) and Deichmann (1944) but the material did receive extensive treatment by Deichmann (1948) and Cherbonnier (1952a-54, 1970). The present UCT material contains four new species and one new record for the southern African region. Once again the Transkeian transitional region is only represented by one locality (Qoloha at c. $32\frac{1}{2}$°S) from which only two well known endemic species were obtained.

The types of some of the species described from this material by Deichmann (1944) and Cherbonnier (1952a, 1954) were, until recently, included with topotypes in the UCT Reference Collection. This collection (now transferred to the SAM), is in an excellent state of preservation and reliably identified, except that the specimens labelled as Cucumaria sykion Lampert are referable to three species, namely Pseudocnella insolens (Théel), P. sinorbis (Cherbonnier) and P. sykion (Lampert) and that Pentacumis (sic) tetracentriophora (Heding) proved to be referable to P. sykion.

Regrettably many new species described from this material by Cherbonnier (1952-54, 1970) are based on single, occasionally incomplete or juvenile specimens, the types of which are in the PMNH. Besides the paratypes listed earlier (see Materials and Method Chapter) fragments of the body wall and/or introvert of types were obtained for type matching, through the courtesies of Drs. Cherbonnier and Guille. Unfortunately no spicules could be detected in the body wall fragments of Thyone propinqua and T. avenusta and in the introvert of T. turrisolida, while the paratype of T. hirta proved, beyond any doubt, to be referable to Thyonina articulata.

The UDW material, accumulated since 1965 as a result of both syste= matic and miscellaneous collections, ranges from Saldanha Bay (33°S) on the Cape west coast to Vilanculus (22°S) in Moçambique. Part of this collection was used by the writer in the survey of the Natal intertidal holothurians (Thandar, 1971: Unpublished M.Sc. thesis) subsequent to which descriptions of two new species were published (Thandar, 1977). This material is also impoverished by the absence of any forms from South West Africa and more localities from Moçambique. However, two more stations are included from Transkei but none from south of Port St. Johns.

The type species and other related species of Pseudocnus, Pentamera and Thyone received from the BMNH, USNM and from the private collection of Dr. Tortonese (see Material and Methods Chapter) helped tremendously in resolving the generic status of Cucumaria sykion Lampert, C. insolens Théel, C. sinorbis Cherbonnier, C. ?velligera Ludwig and Heding, C.?chuni Ludwig and Heding and Thyone articulata Vaney, resulting in the diagnoses of two new genera, Pseudocnella and Thyonina in the Phyllophoridae and another two genera, Sclerothyone and Temparena, in the Sclerodactylidae.

It is regrettable that so little is known about the fauna of South West Africa, the coastline of which stretches for some 1000km. This is not surprising since most of the shore remains inaccessible or in diamond proclaimed reserves. Since the South West African coastline is bathed by the cold Benguella current its fauna is said to be just as impoverished in the number of species as that of the Cape west coast. However, we know nothing about the extent of the Angolan species into at least the northern parts of the province.

Although only a few southern localities from Moçambique are represented in the present material our knowledge of the fauna of this region is pretty good, thanks to the early vessels calling at Delagoa Bay and to the University of Witwatersrand ecological survey. The holothurians collected from Inhaca Island and the shores of northern Moçambique were determined by Dr. Cherbonnier and are housed in the University of the Witwatersrand. They comprise well known tropical Indo-Pacific forms, most of which are also represented in the present material.

COMPOSITION OF THE FAUNA

All six orders of the class occur in southern Africa but the order Molpadida is poorly represented. The dendrochirotids are particularly well established and over 40 species are known, mostly from shallow waters all round the coast. The greatest number of species occur along the southern coast between East London and False Bay, most being endemic, with a noticeable weakening in the number of species northwards both along the east and west coasts. Despite the preponderance of this order, the primitive families Placothuriidae and Paracucumidae are not represented while the Sclerodactylidae and the Psolidae are poorly known, mostly from just one or two specimens. As the family Psolidae is essentially cold water in distribution and the members invariably sedentary in habit, considerable dredging in rocky areas of the cold west coast should yield more species and/or increase our knowledge of the distribution of the already known forms. The occurrence of <u>Psolidium</u>

in southern Africa is based on the inadequately described P. ornatum from the Moçambique Channel. This species has not been found again since its description over 80 years ago.

The smallest order Dactylochirotida is represented by two cosmopolitan species of the family Ypsilothuriidae, one endemic species of the Vaneyellidae and three species of the Rhopalodinidae. All three families appear to be restricted to the southwest coast with two endemic species of Rhopalodinidae not yet found outside False Bay. As the order Dactylochirotida is small it is unlikely that many more species will be discovered.

The order Aspidochirotida is well represented in the shallow waters of the east coast where about 30 species belonging to the two large tropical-subtropical families, the Holothuriidae and Stichopodidae, occur. These families dominate the fauna of Moçambique as far south as Delagoa Bay. Many species also reach Natal where forms like Holothuria (Semperothuria) cinerascences, H.(Selenkothuria) parva, H.(Mertensiothuria) leucospilota and Actinopyga mauritiana are well established components of the fauna, with at least the former three species reaching Port St. Johns in Transkei. The family Synallactidae is essentially deep sea and as yet poorly known from southern Africa. This is not surprising since the deep sea fauna has only recently started receiving systematic attention. The family is represented by one species each of Mesothuria and Pseudostichopus from off Natal and two species of Synallactes from off south west Cape Province. Besides M. parva, which is based on two specimens, the others are known only from holotypes.

The essentially ubiquitous deep sea order Elasipodida is fairly well represented but many more species probably await discovery. Some elasipodids appear restricted to the east coast and some to the west coast; none has so far been taken from the south coast and no species is as yet known to be distributed all round the coast. However, all five families are represented but more systematic dredgings are bound to yield many more species and increase our know=ledge of the horizontal and vertical distributions of the already known forms.

The also ubiquitous order Apodida is also well represented by the small but well known tropical-subtropical genera Euapta, Opheodesoma and Synapta and the more widely distributed genera like Leptosynapta, Rynkatorpa, Chiridota and Taeniogyrus. As many of the smaller apodids live buried in sand careful searching in suitable habitats will definitely yield many more species. The genus Patinapta is known from poorly preserved specimens while Trochodota has not yet been found. According to Pawson (1970) the distribution of the latter genus closely parallels that of Taeniogyrus so it is probable that it may be found in the cold waters of the south west Cape Province. Of the apodid families the Myriotrochidae is essentially deep water and generally limited in its distribution to the northern hemisphere. It is therefore unlikely that this family will be represented in southern Africa.

The order Molpadida is as yet poorly known from southern Africa as only two species have so far been recorded of which Molpadia capensis is inadequately described, if at all, and M.?abyssicola based on only two specimens. As this order is mostly abyssal and certain identifi=cation only possible after careful examination of a whole series of specimens, our knowledge of its worldwide distribution and of the range of variation of each species is scanty.

About 120 species of holothurians here included fall into 56 genera, giving an approximate genus-species ratio of 1:2. This ratio is much higher than that of New Zealand, Antarctica and Chile and approximates that of Australia. At least seven genera appear to be endemic to southern Africa.

Since the fauna of Moçambique is dominated by the large tropical Indo-Pacific aspidochirotes many species are conspicuous components of the intertidal zone. In Natal, on the other hand, although the major component is Indo-Pacific, only two species at all can be said to be conspicuous intertidally, namely, Holothuria (Semperothuria) cinerascens and the endemic Pseudocnella sykion and the same is true for the Transkei as far as Port St. Johns. South and west of Port St. Johns right up to False Bay, Roweia frauenfeldi, R. stephensoni, Pseudocnella sykion, P. sinorbis, P. insolens and Neostichopus grammatus are quite abundant. R. stephensoni and P. sykion are conspicuous components of intertidal rocky pools; N. grammatus part of the cryptofauna; and R. frauenfeldi, P. sinorbis and P. insolens found under stones usually buried in sand. West and north of False Bay Thyone aurea, P. insolens, R. frauenfeldi and Pentacta doliolum appear abundant, judging from the number of specimens taken by the UCT and SAM.

The high proportion of dendrochirotids (c. 60%) in the Cape Province and the South West African region is not unexpected as this order is especially well adapted for life in cold waters and comprises 70% of the Antarctic fauna (Pawson, 1969) and 45% of the New Zealand fauna (Pawson, 1970). According to Pawson (1970) the dendrochirotids develop directly, without a pelagic larval stage in their life history. This is definitely a cold water adaptation as the elimination of a pelagic larval form will be of a high selective value in the usually harsh cold water environment. The lack of a drifting larval stage is perhaps the chief reason for the high endemicity of this order.

Besides P. insolens and Temparena chuni which incubate their young no other special adaptation for life is evident in the southern African waters. Although T. chuni is said to be hermaphrodite no evidence for this was found by the writer from the single specimen studied.

TAXONOMIC AND EVOLUTIONARY CONSIDERATIONS

The holothurians have here been worked out on the basis of currently accepted changes in classification and nomenclature. Hence heavy reliance is placed on the revised classification of the dendrochirotid holothurians by Pawson and Fell (1965), and on the revisions of the Synaptidae by Heding (1928), the Cucumariidae by Panning (1949), the Phyllophoridae by Heding and Panning (1954), the Holothuriidae by Rowe (1969) and the Elasipodida by Hansen (1975). Of tremendous use also was the monograph of Indo-West Pacific echinoderms by Clark and Rowe (1971).

Pawson and Fell's assemblage of the orders Aspidochirotida and Elasipodida in the subclass Aspidochirotacea, primarily on the basis of the presence of peltate tentacles, has met with some criticism from Hansen (1975) who rejects the taxon because ramified tentacles do occur in some elasipodids, notably members of Orphnurgus. However, the taxon Aspidochirotacea is here retained since many elasipodids do show peltate tentacles and contracted ramifications in at least the southern African species of Orphnurgus do make the tentacles appear distinctly peltate. Recently Pawson (1982) has also indicated his reservation on the validity of the subclass Apodacea for the orders Apodida and Molpadida. According to him the similarity between the orders is probably not indicative of any close relationship but perhaps conse= quent upon a similar mode of life. However, for consistency of nomenclature, the taxon Apodacea is also retained. The subclass Dendro= chirotacea is perhaps a more natural assemblage judging from their structure and from the fact that the two included orders, Dendro= chirotida and Dactylochirotida, comprised initially just one group until those forms with simple finger-shaped tentacles were separated by Pawson and Fell (1965) and assembled in the order Dactylochirotida.

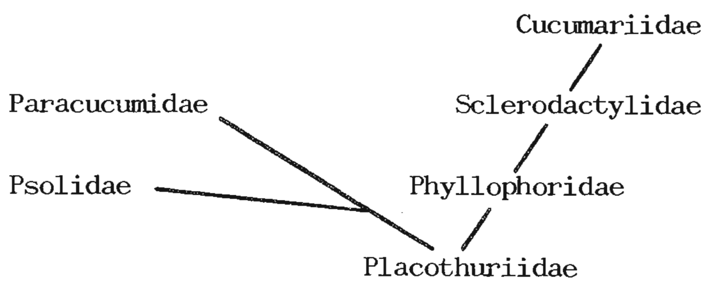
At the same time these writers concluded that the traditional classification of the dendrochirotids, based on tentacle numbers, concealed some important evolutionary trends and hence, on the bases of the calcareous ring and spicules, proposed a new classification of dendrochirotids, thereby supporting the premise of Fell (1965) that the calcareous ring of holothurians is probably homologous with the ambulacral plate system of fossil edrioasteroids. They speculate that such a plate system was lost as a consequence of holothurian evolution but parts of it persist as the calcareous ring. Hence the supposition that the greater the reduction of the calcareous ring the more advanced the holothurian. On this basis Pawson and Fell regrouped the various sub- families of the Cucumariidae and the Phyllophoridae so that they became intermixed; assembled the subfamilies Sclerodactylinae and Cladolabinae in the family-group taxon, the Sclerodactylidae; and diagnosed two more families, the Placothuriidae and Paracucumidae for some small group of plated forms. Pawson and Fell's system has gained some support from workers such as Panning and Cherbonnier. Although this system was not adopted by Clark and Rowe (1971) in their monograph of the Indo-West Pacific echinoderms, Rowe comments that "there are clear parallels in the forms of the calcareous rings and body wall deposits" thus supporting the contention of Pawson and Fell (Clark and Rowe, 1971: 194:10).

Pawson and Fell further argue that the dactylochirotid holothurians presumably arose from the dendrochirotids by secondary simplification of the tentacles and the calcareous ring. However, while Pawson (1966) warns against considering the dactylochirotids with their simple tentacles as ancestors of dendrochirotids and states that the skeletal morphology favours the placothuriids as being more archaic than any known dactylochirotid, Fell and Pawson (1966) suggest that the more ancient of the two orders are the dactylochirotids with their digitiform tentacles. Due to lack of fossil evidence its difficult at present to conjecture about the possible antiquity of any particular order. One can just as well derive the dactylochirotids and dendro= chirotids from a common ancestor with simple, finger-shaped tentacles, a plated skeleton and a complex calcareous ring. It can be assumed that in the dactylochirotid line the original tentacles and skeleton were retained but slightly improved upon and the calcareous ring simplified, while in the dendrochirotid line the tentacles were elaborated and there was a progressive simplification of the calcareous ring and the replacement of a plated skeleton by non-contiguous calcareous deposits. The Placothuriidae with their plated skeletons and complex calcareous rings in combination would still satisfy their claim to be the most primitive of the dendrochirotids. Members of each order can then be visualised as having retained different primitive characters in accordance with their mode of life, while improving upon the others.

Of the dactylochirotids the Rhopalodinidae are the most atypical when compared with the Ypsilothuriidae and the Vaneyellidae, differing not only in their peculiar body shape but also in the form, number and arrangement of tentacles and in the structure of the calcareous ring. In Rhopalodinopsis and Rhopalodinaria at least, the tentacles appear to be finely dendritic and the radial plates of the calcareous ring carry, except in the southern African Rhopalodinaria minuta, short paired processes or bifurcations. In addition, in at least Rhopalodina and Rhopalodinopsis, the tentacles number 20-30 and are arranged in two or three circles. These features in combination perhaps place the rhopalodinids intermediate between the two dendrochirotacean orders and support Pawson and Fell's (1965) and Pawson's (1966) supposition that the dactylochirotids probably evolved from dendrochirotid forms by secondary simplification of the tentacles, the calcareous ring and perhaps some other features. Although there may be some truth in this remark one wonders whether Pawson and Fell (1965) are correct in classifying the rhopalodinids in the Dactylochirotida. In fact Heding and Panning (1954) classify these forms as a subfamily of the Phyllophoridae. The writer, however, is of the opinion that the peculiar body form of the rhopalidinids demands a higher taxonomic status for the group and would therefore support their classification as a distinct family within the Dendrochirotida, close to the poly=tentaculate Phyllophoridae. Hence there is little justification in retaining this family in the Dactylochirotida.

The common ancestry of the Dactylochirotida and Dendrochirotida is also supported by their respiratory trees. In many primitive phyllophorids and in some cucumariids, each respiratry tree consists of two well ramified trunks, although one is usually shorter than the other. In the dactylochirotids, on the other hand, although the branching is much reduced, four trunks occur in many ypsilothuriids as well as in the new Psolidothuria octodactyla, herein classified in the Vaneyellidae. In some ypsilothuriids, however, a trunk of one tree may be aborted as in Echinocucumis hispida from New Zealand (see Pawson, 1965). In the rhopalodinids as well four poorly branched trunks are found at least in Rhopalodinopsis. In the southern African Rhopalodinaria minuta there are only three trunks to the respiratory trees but since two of these have a common origin it seems fair to speculate that its ancestor must also have had two trunks to each respiratory tree but that a trunk of one tree was lost during evolution, probably as a result of secondary reduction of body parts consequent upon a new mode of life. The presence of two trunks to each respiratory tree in the related Rhopalodinopsis capensis and the retention in this species of posterior processes to the radial plates support its primitiveness and perhaps places it close to the rhopalo= dinid ancestral form. Since the number of tentacles in R. capensis is high (c. 30) it is fair to assume that this is also a primitive trait and the low number in species of Rhopalodinaria is derived. The fact that all polytentaculate rhopalodinids have minute tentacles with many showing extreme degrees of reduction supports the assumption that the polytentaculate forms are the more primitive. Even in R. minuta seven or eight tentacles are often the only ones present. The rhopalodinids can thus be thought of as possibly coming from some polytentaculate dendrochirotid stock. There is no evidence at present to indicate that the ypsilothuriids also came from once polytentaculate forms despite the presence of only eight tentacles in Ypsilothuria. Their plated skeletons, simple tentacles and sedentary habits suggest that they are an archaic group which probably had a common origin with the dendrochirotids from some early holothurian stock. The presence of about 20 tentacles in some Vaneyellidae must be interpreted, at least tentatively, as a secondary increase in tentacle number. It therefore appears that the extant dactylochirotids are polyphyletic in origin.

The evolution of the various families within the Dendrochirotida is also obscure but there appears to be a progressive trend leading from the Placothuriidae to the Phyllophoridae, Sclerodactylidae, and Cucumariidae on the one hand and from the Placothuriidae to the Psolidae and Paracucumidae on the other (see below).



In the line from the Placothuriidae to the Cucumariidae there is a loss of a rigid plated skeleton with a gradual simplification of the calcareous ring. The intermediate Sclerodactylidae hence comprises several transitional forms apparently bridging the gap between the phyllophorids and the cucumariids. Although the Psolidae and Paracucumidae have simplified their calcareous rings they have never= theless retained their primitive sendentary habits and consequently their rigid plated skeletons. Hence in the Psolidae pedicels are reduced and a secondary "sole" developed while in the Paracucumidae pedicels are altogether wanting.

Amongst the Phyllophoridae, the Thyoninae with their small number (10) of tentacles and a complex, often tubular, calcareous ring, appear to be the most primitive. In the polytentaculate Phyllophorinae there is not only an increase in the number of tentacles (up to 30) but often the calcareous ring shows considerable specialisation (perhaps cor= related with the high tentacle number), with both the radial and inter= radial plates carrying paired processes that are occasionally linked. However, in the Semperiellinae, despite its high tentacle number, the calcareous ring is much reduced, approximating that of the Sclerodactylinae, probably showing parallel evolution and convergence.

While most of the dendrochirotid families appear to be rather homogeneous assemblages, the Sclerodactylidae comprises seemingly un= related forms with many genera being equally at home in the Phyllo= phoridae. Even Pawson (1966) comments that the boundary between the Phyllophoridae and the Sclerodactylidae is not well defined, suggesting a gradual evolutionary sequence. However, while Panning (1949) cate= gorically states that only exceptionally are the radial processes of the calcareous ring in the Sclerodactylinae unbroken, Pawson and Fell (1965) use the undivided processes as a key character to separate the Sclerodactylidae from the Phyllophoridae. Since Pawson and Fell's system is here used no importance is attached to this anomaly but two southern African dendrochirotids - Cucumaria? chuni Ludwig and Heding, with undivided processes, and C.? velligera Ludwig and Heding with either divided or undivided processes, both formerly classified in the Thyoninae, are herein referred to new genera in the Sclerodactylidae. Since many sclerodactylid genera have divided or undivided processes it is felt that greater emphasis must be placed on the non-tubular nature of the calcareous ring which characterises most members of this family. With this in mind the genus Havelockia is here classified in the Phyllophoridae rather than in the Sclerodactylidae. Within the Sclerodactylidae it appears that the subfamily Sclerodactylinae is mostly Atlantic in distribution while the Cladolabinae distinctly Indo-West Pacific.

Of the three subfamilies included in the Cucumariidae only the polytentaculate Thyonidiinae is well characterised. The Colochirinae and the Cucumariinae are separated on the basis of the presence or absence of baskets from the superficial layer of the integument. This character is not sound since superficial deposits are occasionally reduced to branching rods, which often do not give the impression of their derivation from baskets, as is the case in the local Pseudoaslia tetracentriophora (Heding), or incomplete baskets resembling dichotomously branched rods, are present in only juveniles of a species, as is the case in the southern African Pseudocnella sykion (Lampert), the adults of which would obviously be classified in the Cucumariinae, like species of Pseudocnus, rather than in the Colochirinae, like its congenors P. sinorbis and P. insolens. Thus, when classifying only adults, one is inclined to place two closely related species in separate subfamilies thereby demanding a degree of evolutionary convergence that hardly seems possible. Even two closely related genera like Pseudocnella and Pseudocnus demand their classification in separate subfamilies. The separation of the two subfamilies hence appears artificial and cannot be upheld. Due to our present poor understanding of the Cucumariidae, especially with regard to change in deposits with age, one is tempted to unite the two subfamilies until more satisfactory character/s are found to reassemble related genera. It might be preferable to consider the inner layer of deposits since it is least subject to adaptive change rather than the more superficial layer. The common occurrence of smooth to spiny or feebly knobbed plates in some genera in contrast to heavily knobbed plates in others may offer a more reliable character. This would unite genera like *Cucumaria*, *Pseudocolochirus*, *Cladodactyla*, *Paracucumaria*, *Trachythyone*, *Leptopentacta* etc. in one group and *Pseudocnus*, *Pseudocnella*, *Pentacta*, *Ocnus*, *Aslia* etc., in another. For a conservative approach, however, the two subfamilies, as proposed by Panning (1949), are here retained but because of the presence of reduced baskets *Pseudocnella* is classified in the Colochirinae.

There are no definite clues, in the absence of fossil or other evidence, of the possible origin of the Aspidochirotida. One is therefore forced to accept the hypothesis that the group had an origin independent of the other orders in support of Frizzel, Exline and Pawson's (1966) view that the class Holothuroidea is polyphyletic. Since the aspidochirotid holothurians comprise usually large, shallow water tropical species our knowledge of their taxonomy is better than that of the other groups.

For our understanding of the largest holothurian family, the Holothuriidae, we owe a lot to the works of Deichmann (1958) and especially of Rowe (1969) and Clark and Rowe (1971). A provisional phylogenetic tree of this family is given by Rowe and since then a few more subgenera were diagnosed. The relative position on this tree of the new subgenus *Roweothuria* proposed in this monograph is discussed elsewhere (see Remarks under this subgenus).

Since the small family Synallactidae is restricted to the deep sea it remains one of the lesser known families of the class with only a few known genera. Of the three recorded from southern Africa none are endemic. The genus Pseudostichopus which was referred to the family Gephyrothuriidae by Heding (1940) is here transferred back to the Synallactidae since the former family was originally proposed for a small aberrant molpadid-like form.

The elasipodids were recently excellently revised by Hansen (1975) who, on the bases of morphological and geographical variations, lumped several forms thus reducing the number of valid genera and species. However, Hansen's attempt at consolidating several species of Orphnurgus under O. glaber Walsh is here rejected on the basis of the southern African material and two new species are described. It is believed that if such a step was not taken it would have resulted in lumping all known forms of Orphnurgus under O. vitreus Fisher which would then be elevated to the level of a superspecies. It is here suggested that the various geographical variants recognised by Hansen be treated as species. The other elasipodids are poorly represented in the present material to throw any light on Hansen's revision.

In the family Psychropotidae the separation of the various species of Benthodytes is still problematical especially concerning those species with spicules having bipartite apophyses. As spicules in these species are few, delicate and rarely removed complete, the correct determination of a species is not always easy. To add to this difficulty rarely are the animals properly preserved so that external characters are frequently lost or not clearly perceived. The southern African material herein referred to Benthodytes lingua and B. valdiviae may prove to be referable to other species.

Thanks to the works of Belyaev (1971, 1975) and Hansen (1975) we have a fair knowledge of the variations in the genus *Elpidia* of the family Elpidiidae. In this group as well rarely are the spicules removed whole and hence the correct determination of species also difficult. The southern African specimens are herein considered a geographical variant of the southern *Elpidia gracilis* chiefly on the bases of their size and the slenderness of their deposits. The entire family probably has a southern origin, perhaps in the south Atlantic. The adaptive radiation of the genus *Elpidia* has recently been well docu= mented by Belyaev (1975).

We know very little of the elasipodid family Pelagothuriidae comprising small, medusoid forms without spicules. Hansen (1975) excluded this family in his revision of the Elasipodida and because of lack of material this is also done here. Of the two forms reported from southern Africa none has been taken since.

Théel (1882) has conjectured on the possible evolution of the elasipodids. According to him they are an archaic group but concluded that they do not form an ancestral stock but are perhaps secondarily adapted to a deep sea life. An external madreporite is hence interpreted as a logical consequence of the absence of respiratory trees, rather than a primitive feature. According to Hansen (1975) several features indicate that the elasipodids form a monophyletic group but states that their re= lationship to the other orders of the class is not clear. He considers the similarities in the external features of the orders Elasipodida and Aspidochirotida a result of convergent evolution.

Although the apodids and molpadids lack podia, have pinnate or digitate tentacles and often possess anchors and anchor plates as spicules their common characters are probably also a result of parallel evolution and convergence. In fact, although the anchors and anchor plates serve the same function in locomotion in both groups, they are constructed on a different plan (Pawson, 1982).

The apodids have received several good treatments by H.L. Clark (1907, 1924) and Heding (1928, 1929, 1931) but none of late. The absence of any gross external morphological features make the satisfactory determination of species difficult. *Leptosynapta* comprises a large assemblage of about 40 species perhaps representing several subgroups. The number of tentacular digits, the type of radial muscle and tentacular spicules and the relative dimensions of anchors and anchor plates may offer satisfactory characters to assemble related species. In southern Africa the two Cape species, *L. knysnaensis* and *L. ancoracuta*, on the bases of the maximum size of anchors and anchor plates and the type of miliary granules, are different from the east coast species, *L. pustulosa* and *L. naiga*, which also have fewer tentacular digits. Perhaps each subgroup is referable to a different genus, one endemic and the other probably Indo-Pacific or Indianic in distribution.

SUMMARY OF RESULTS

This investigation has resulted in the diagnoses of eight new genera, one new subgenus, 12 new species and one new subspecies. There are altogether 15 new records for the southern African region and 15 new synonyms. These main results of the investigation are summarised in the subsequent tables.

TABLE 8. NEW SOUTHERN AFRICAN RECORDS. SPECIES/TYPE/TYPE LOCALITY.

Phyllophoridae

Thyone venusta Selenka, 1868/Berlin Mus./Red Sea.

Cucumariidae

Trachythyone ?parva Ludwig, 1875/Hamburg Mus;/Chile.

Ypsilothuriidae

Echinocucumis hispida (Barrett, 1856)/?lost/coast of Norway.
Ypsilothuria bitentaculata Ludwig, 1893/MCZ (syntypes)/Equador and Galapagos Is.; 1573-1189 fm

Holothuriidae

Holothuria (Lessonothuria) insignis Ludwig, 1875/?/Bowen (N. Aust.).
H. (Theelothuria) ?maculosa Pearson, 1913/?Colombo Mus./Aldabra.
H. (T.) ?notabilis Ludwig, 1875/?Germany/Bowen (N. Aust.).

Synallactidae

Mesothuria parva (Théel, 1886)/BMNH/near Admiralty Is. (1°54'S, 146°39'E).

Deimatidae

Orphnurgus insignis Fisher, 1907/USNM (21220)/Kauai Is.; Hawaii, 592-411m.

Psychropotidae

Benthodytes valdiviae Hansen, 1975/ZMC/Canary Is. (24°35'N, 17°05'W, 2480m).

Elpidiidae

Elpidia gracilis Belyaev, 1975/Acad. Kurcatov/S. Orkney Is., 5500m.
Scotoplanes globosa Théel, 1879/BMNH/Southern Ocean, 3566-3950m.

Molpadiidae

Molpadia ?abyssicola Pawson, 1977/USNM (E11335)/Drake Passage, Antarctica, 5042-5045m.

Synaptidae

Euapta godeffroyi (Semper, 1868)/MCZ (syntypes)/Samoa.

Chiridotidae

Chiridota rigida Semper, 1868/?Germany/Bohol (Phillipines).

TABLE 9. NEW GENUS-GROUP TAXA.

FAMILY	GENUS-GROUP	TYPE-SPECIES	OTHER SPECIES INCLUDED
Phyllophoridae	*Thyonina*	*Thyone articulata* Vaney	-
Scleroactylidae	*Sclerothyone*	*Cucumaria? velligera* Ludwig & Heding	-
	Temparena	*Cucumaria? chuni* Ludwig & Heding	-
Cucumariidae	*Pseudoaslia*	*Cucumaria tetracentriophora* Heding	-
	Pseudocnella	*Cucumaria sinorbis* Cherbonnier	*Semperia sykion* Lampert *Cucumaria insolens* Théel *?C. syracusanus* Grube
	Pawsonella	*P. africana* sp. nov.	-
	Roweia	*Cucumaria frauenfeldi* Ludwig	*Cucumaria stephensoni* John
Vaneyellidae	*Psolidothuria*	*P. octodactyla* sp. nov.	-
Holothuriidae	*Roweothuria* subgen. nov.	*Holothuria arguinensis* Koehler and Vaney	*H.(R.) vemae* sp. nov. *H.(R.) poli* Delle Chiage

TABLE 10. NEW SPECIES-GROUP TAXA.

Phyllophoridae	Neothyonidium arthroprocessum
Cucumariidae	Pawsonella africana
Vaneyellidae	Psolidothuria octodactyla
Holothuriidae	Holothuria (Cystipus) longicosta
	H. (Lessonothuria) tuberculata
	H. (Roweothuria) vemae
Synallactidae	Pseudostichopus echinatus
Deimatidae	Orphnurgus aspersignis
	O. natalasper
Elpidiidae	Elpidia gracilis austroafricana
Laetmogonidae	Laetmogone perplexa
Synaptidae	Leptosynapta naiga
	Rynkatorpa spatula

TABLE 11. NEW SYNONYMS

NOMINAL SPECIES	PRESENT DISPOSITION HEREIN
Thyone proceracorona Cherbonnier, 1952	T. aurea (Quoy & Gaimard, 1833)
T. turrisolida Cherbonnier, 1954	T. aurea (Quoy & Gaimard, 1833)
Cucumaria turbinata Pearson, 1903 (non Hutton)	Ohshimella ehrenbergii (Selenka, 1867)
Pseudocnus dubiosus jaegeri (Lampert, 1885)	Pseudocnella sykion (Lampert, 1885)
Cucumaria deichmanni Cherbonnier, 1952	Roweia frauenfeldi (Ludwig, 1882)

Cucumaria webbi Thandar, 1977	*Roweia frauenfeldi* (Ludwig, 1882)
Echinocucumis typica H.L. Clark, 1923 (non Sars)	*Ypsilothuria bitentaculata* (Ludwig, 1893)
Stichopus grammatus Stephenson, 1944	*Neostichopus grammatus* (H.L. Clark, 1923)
Holothuria ?curiosa Deichmann, 1948 (non Ludwig)	*?Neostichopus grammatus* (H.L. Clark, 1923)
Holothuria pardalis H.L. Clark, 1923 (non Selenka)	*Holothuria (Lessonothuria) insignis* Ludwig, 1875
Holothuria (Lessonothuria) verrucosa Cherbonnier, 1980 (non Selenka)	*H.(L.) tuberculata* sp. nov.
H. (Selenkothuria) perrieri Thandar, 1977	*H.(S.) parva* Lampert, 1885
Pseudostichopus sp. Heding, 1940	*P. echinatus* sp. nov.
Orphnurgus glaber A.M. Clark, 1977 (non Walsh)	*O. aspersignis* sp. nov.
Epitomapta sp. Cherbonnier, 1954	*?Leptosynapta knysnaensis* (Cherbonnier, 1952)
Pentacucumis spyridophora (H.L. Clark, 1923)	*Aslia spyridophora* (H.L. Clark, 1923)
Sphaerothuria talismani Deichmann, 1930, partim (non E. Perrier)	*Ypsilothuria bitentaculata* (Ludwig, 1893)
Leptosynapta sp. Cherbonnier, 1954	*Leptosynapta naiga* sp. nov.

CONCLUSIONS

It is clear that the southern African shallow water tropical Indo-Pacific fauna, including the circumtropical species, has moved in from the north under the influence of the Moçambique-Agulhas current and perhaps also the East Madagascar current. In fact, recent work summarised by Bang and Pearse (in Heydorn, 1978) shows that the East Madagascar current forms a major component of the Agulhas current, whereas the Moçambique current is of less importance than has previously been supposed and at times may not even be confluent with it. In any case these currents aid the migration of tropical Indianic and Indo-West Pacific species down the coast but since the Agulhas current cools as it progresses the limit attained by each species is defined by the increasing coldness of the water. Since tropical holothurians are re= markably stenothermic truely Indo-Pacific littoral species do not occur south of Port St. Johns and very few species common in Moçambique have successfully established themselves in Natal or Transkei.

Despite the presence of numerous endemic species and several endemic genera, there is not a single endemic family. This is in accordance with observations made on various groups by different workers. As far as the origin of the endemic holothurian species is concerned it remains problematical as it is with most of our endemic fauna. The central Indo-Pacific region of the Indo-Malayan archipelago has been the nursery for the development of most of the families and hence it is probable that the ancestors of the local endemics must have come from that region. The endemics thus represent cold water tolerants of former Indo-Pacific species, survivors from earlier colonisations which probably became isolated by profound physical and climatic changes on our shores. The fact that most of the east coast endemics are clearly related to some

Indo-Pacific species and that, apart from the deep sea, cosmopolitan and endemic genera, most of the remaining genera are shared with other parts of the Indo-West Pacific region, strongly support an Indo-Pacific origin of the endemic fauna. It is possible that the rifting of the Gondwana landmass and the subsequent redistribution of land and sea around South Africa might have played some role in the isolation but the lack of any significant relationship of the shelf fauna with that of Australia, Antarctica, Subantarctica and South America does not require this. It is possible that secondary colonisation took place after the rift since no relic species once common to the Gondwana landmass are evident. Genera like <u>Sclerothyone</u> and <u>Temparena</u> are possibly of Atlantic origin since they appear to be remotely related to <u>Pentamera</u> and <u>Sclero=dactyla</u> from the West Atlantic. They may thus represent relics of species which migrated during colder times and have survived on the relatively stable slope, free from any effective competition.

Hence, the nature of the fauna indicates that southern Africa, like New Zealand and Antarctica, has been a region of secondary colonisation, built up initially by migration of taxa, rather than that of primary development. However, once the fauna became well established and isolated there was a later development of an active evolutionary centre as evidenced by the richness of the endemic species, the restriction of some species to the West Indian Ocean and some evidence of speciation by ecological and geographic isolation within the region.

Only a relatively small proportion of the massive Indo-Pacific species is found in our area. The Agulhas current, however, will continually bring tropical Indo-Pacific species down the east coast and it is almost certain that we do not know anything near all that is already present.

More and complete investigations into the deeper shelf, slope and abyssal fauna are also needed for it is mainly from the Indo-Pacific and deep sea we may expect regular additions to our fauna.

Although we now know a great deal more about the systematics and zoogeography of the southern African holothurians our knowledge of their biology is virtually nil. Apart from a few physiological papers on Roweia frauenfeldi, R. stephensoni and Pseudocnella sykion, nothing is known about the habits, behaviour, ecology and reproductive biology of even the commonest species. Investigations into various aspects of their biology will be more than rewarding.

SUMMARY

The only comprehensive works dealing particularly with the southern African holothurian fauna are those of H.L. Clark (1923), Deichmann (1948) and Cherbonnier (1952a, 1970). Although Cherbonnier's contri= butions are detailed they lack diagnoses, keys and distributional analysis and his earlier work suffers much from lack of any consideration given to Panning's (1949) revision of the family Cucumariidae. Hence a thorough revision is here undertaken on the basis of currently accepted changes in classification and nomenclature. Material for the survey was obtained from the South African Museum and the Universities of Cape Town and Durban-Westville.

Although, strictly speaking, the southern African region should be considered to lie south of the tropic of Capricorn, the present investigation also includes the whole of Moçambique and South West Africa. The about 100 species recorded from this region prior to this investigation are tabulated in Table 1, in chronological sequence of their descriptions and/or records. All told 122 nominal species are here recorded, of which 72 are present in the collections at hand.

A complete checklist to all species and a comprehensive key to genera precede the systematic account while a key to species is included in the text under each genus. The practice of Day (1967) and Clark and Courtman-Stock (1976) is expressing distribution in terms of latitude/longitude degree squares is used for outlining both previous records and examined material. The habitat notes are kept as brief as possible and are based on the writer's personal experiences and those of others. The taxonomic system adopted for the higher categories is that proposed by Pawson and Fell (1965).

The new taxa diagnosed includes eight genera, one subgenus, 12 species and one subspecies. There are in addition 15 new records and 15 new synonyms. These main results of the investigation are summarised in Tables 8 - 11. All new taxa are fully described while several others are re-diagnosed or additional notes included.

Of the 122 nominal species only 111 are truly southern African. These fall into 54 genera giving an approximate genus-species ratio of 1:2, approximating that of Australia. All six orders are represented with the majority of species belonging to the Dendrochirotida (>40spp.) and to the Aspidochirotida (>30spp.), the former constituting conspicuous components of the intertidal fauna on the south and west coasts and the latter on the east coast. However, only four species, Thyone aurea (Quoy & Gaimard), Pentacta doliolum (Pallas), Pseudocnella insolens (Théel) and Roweia frauenfeldi (Ludwig), can be termed fairly abundant on the west coast; the latter two and four others, namely Roweia stephensoni (John), Pseudocnella sykion (Lampert), P. sinorbis (Cherbonnier) and Neostichopus grammatus (H.L. Clark), on the south coast; and only Holothuria (Semperothuria) cinerascens (Brandt) and P. sykion (Lampert) on the east coast as far as the northern border of Natal.

Only 68 truly southern African species recorded from more than one locality are zoogeographically analysed to show both horizontal and vertical distribution. Of these 7,4% are cosmopolitan, 2,9% circum=tropical, 45,6% Indo-Pacific, 2,9% Atlantic and 41,2% endemic. However, there is an apparent 100% endemicity of the intertidal species west of East London. All cosmopolitan species are from the deep sea. There are no southern species in the sample of 68 species analysed.

As far as vertical distribution is concerned as many as 54 of the 68 species are restricted to the shelf, three are shared between the shelf and the slope, two are restricted to the slope and nine are lower slope or abyssal in distribution.

No shelf species has yet been taken from the east coast from waters in excess of 36m. The general topography of the east coast and massive sediment transport are considered the possible reasons for the paucity in our knowledge of the shelf fauna of this region.

The zoogeographical analysis of the fauna supports a subdivision of the southern African marine region into four faunistic provinces: tropical and subtropical on the east coast, warm temperate on the south coast and cold temperate on the west coast. A good indicator species on the subtropical east coast is Holothuria (Semperothuria) cinerascens, on the south-coast Roweia stephensoni and on the west coast Thyone aurea.

Due to conflicting viewpoints expressed by Pawson (1966) and Fell and Pawson (1966), regarding the antiquity of any one order of the Dendrochirotacea,both the dactylochirotid and dendrochirotid holo=thurians can be thought of as having evolved from a common ancestor with a sedentary mode of life, a plated skeleton, finger-shaped tentacles and a complex calcareous ring with each order retaining different primitive characters in accordance with its mode of life while improving upon others.

The relationship of the families of the Dendrochirotida is discussed and the Sclerodactylidae with its many transitional forms is regarded as bridging the gap between the Phyllophoridae and the Cucumariidae. The status of Panning's subfamily Colochirinae is questioned and it is suggested that more emphasis be placed on the inner layer of deposits for characterising higher taxa since it is least subject to adaptive change. The inclusion of the family Rhopalodinidae in the Dactylochirotida is also questioned because of the presence of often numerous finely branched tentacles, and it is suggested that this family be classified within the Dendrochirotida close to the Phyllophoridae.

It is concluded that the southern African holothurian fauna is of largely Indo-Pacific origin, with most of the endemic component probably representing cold water tolerants of former Indo-Pacific species. The Atlantic and Southern Ocean regions have played an insignificant role in the development of the fauna. Although southern Africa hence appears to be a region of secondary colonisation the high endemicity of the south and west coast fauna, some evidence of speciation by ecological and geographic isolation, and the presence of some species restricted to the West Indian Ocean, nevertheless, suggest a later development of an active evolutionary centre within the region.

ABBREVIATIONS IN THE FIGURES

A	anus
AP	anal papillae
C	cloaca
CR	calcareous ring
G	gonad
GT	gonadal tubule
I	intestine
IR	interradial plate
LDIR	left dorsal interradial plate
LDR	left dorsal radial plate
LM	longitudinal muscle
LRT	left respiratory tree
LVIR	left ventral interradial plate
LVR	left ventral radial plate
M	mouth
MB	madreporite
MDIR	middorsal interradial plate
MVR	midventral radial plate
O	oesophagus
P	pedicels
PA	pedicel ampullae
Pb	proboscis
Pp	papillae
PV	polian vesicle
R	rectum
RDIR	right dorsal interradial plate
RDR	right dorsal radial plate
RM	retractor muscle
RT	respiratory trees
RRT	right respiratory tree
RVIR	right ventral interradial plate
RVR	right ventral radial plate
S	stomach
Sp	sphere
T	tentacles
WVR	water vascular ring

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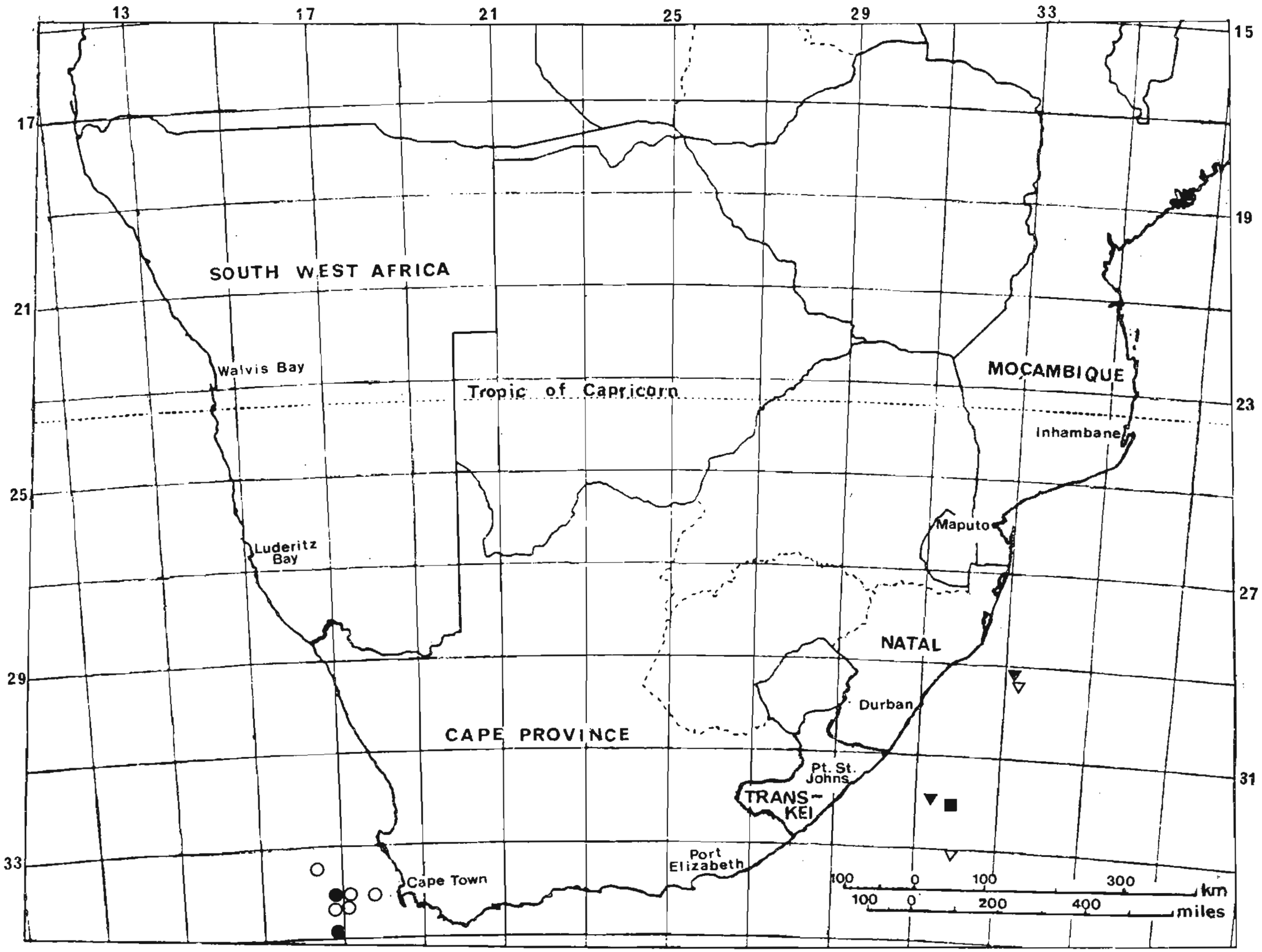
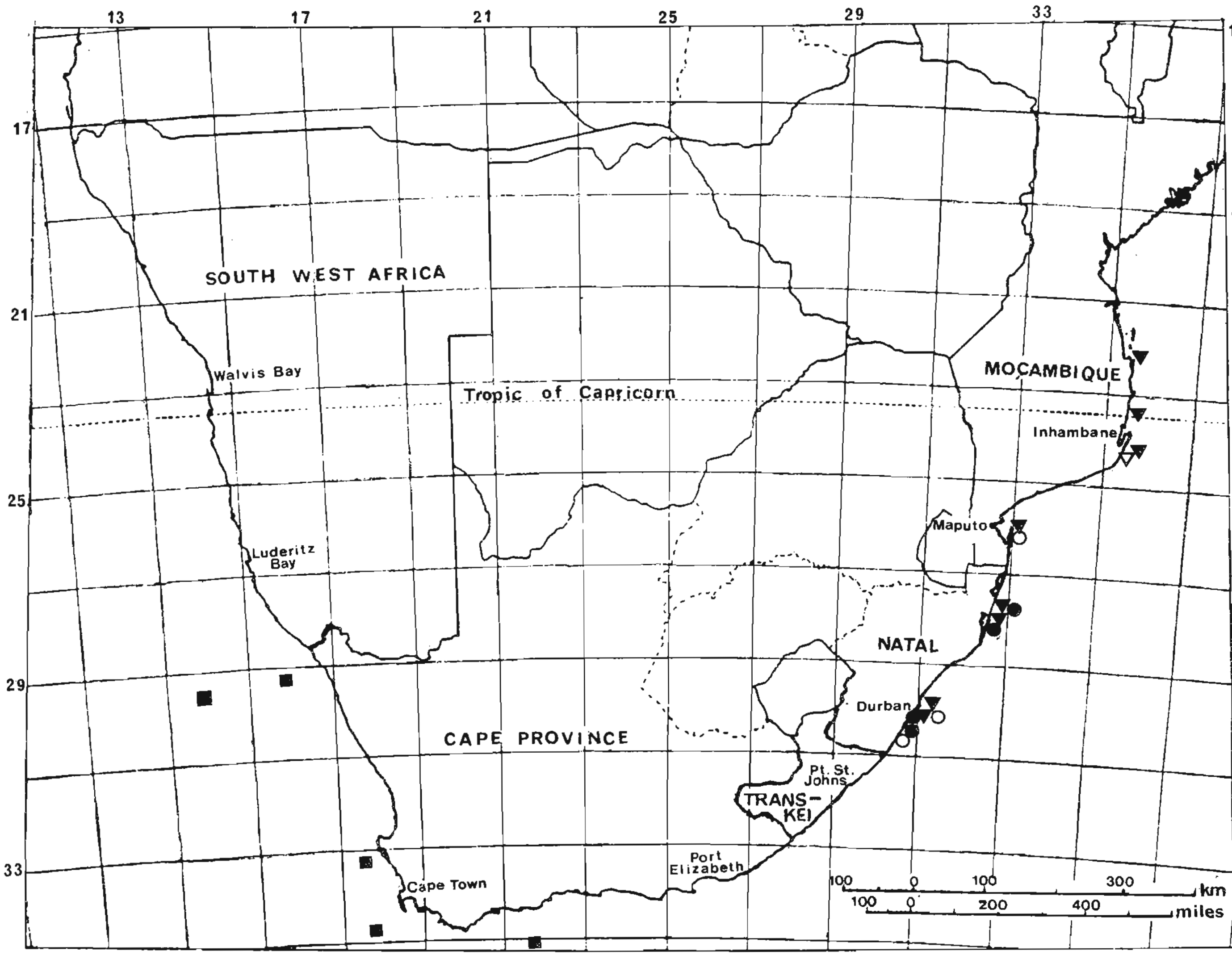
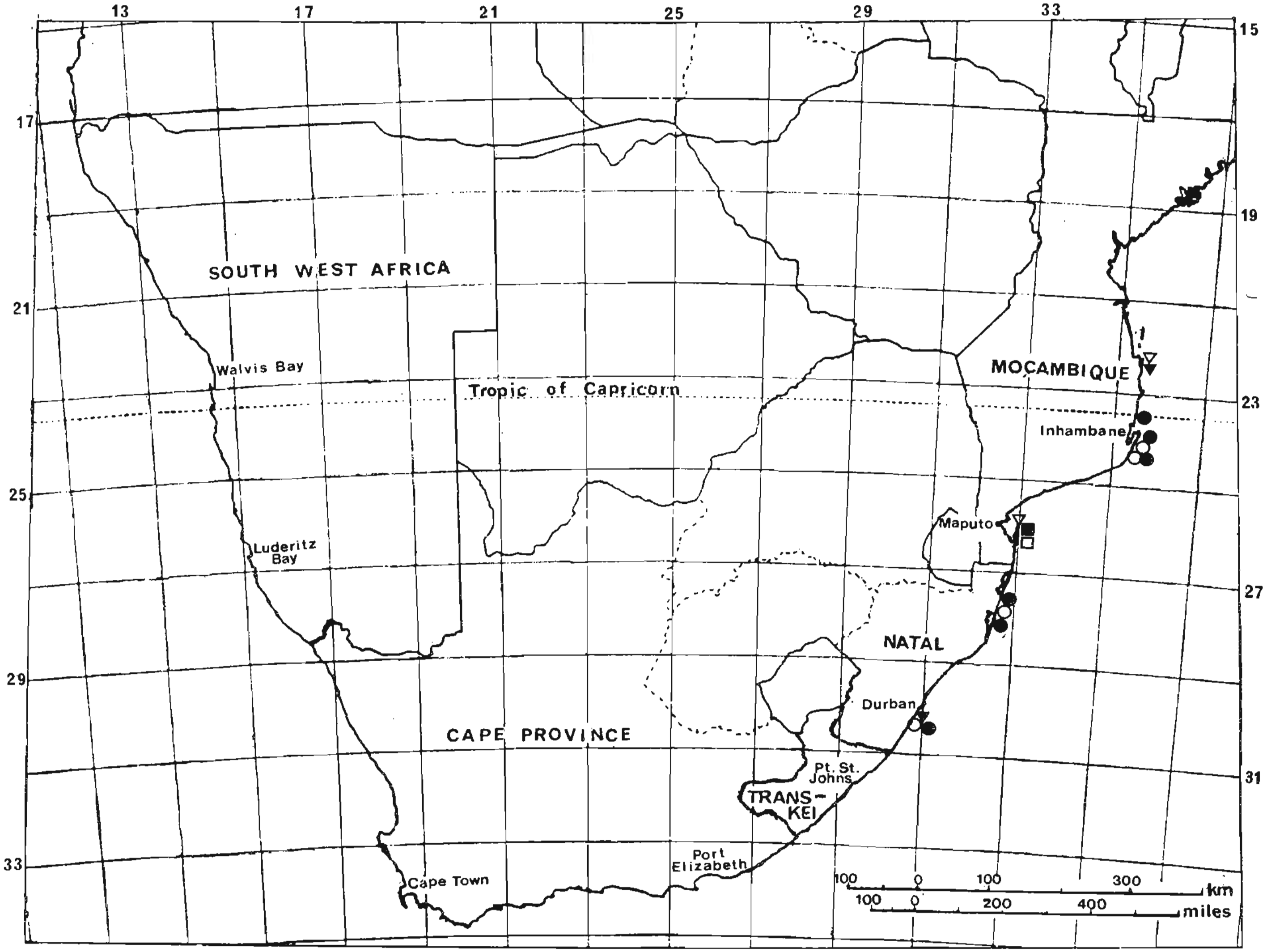


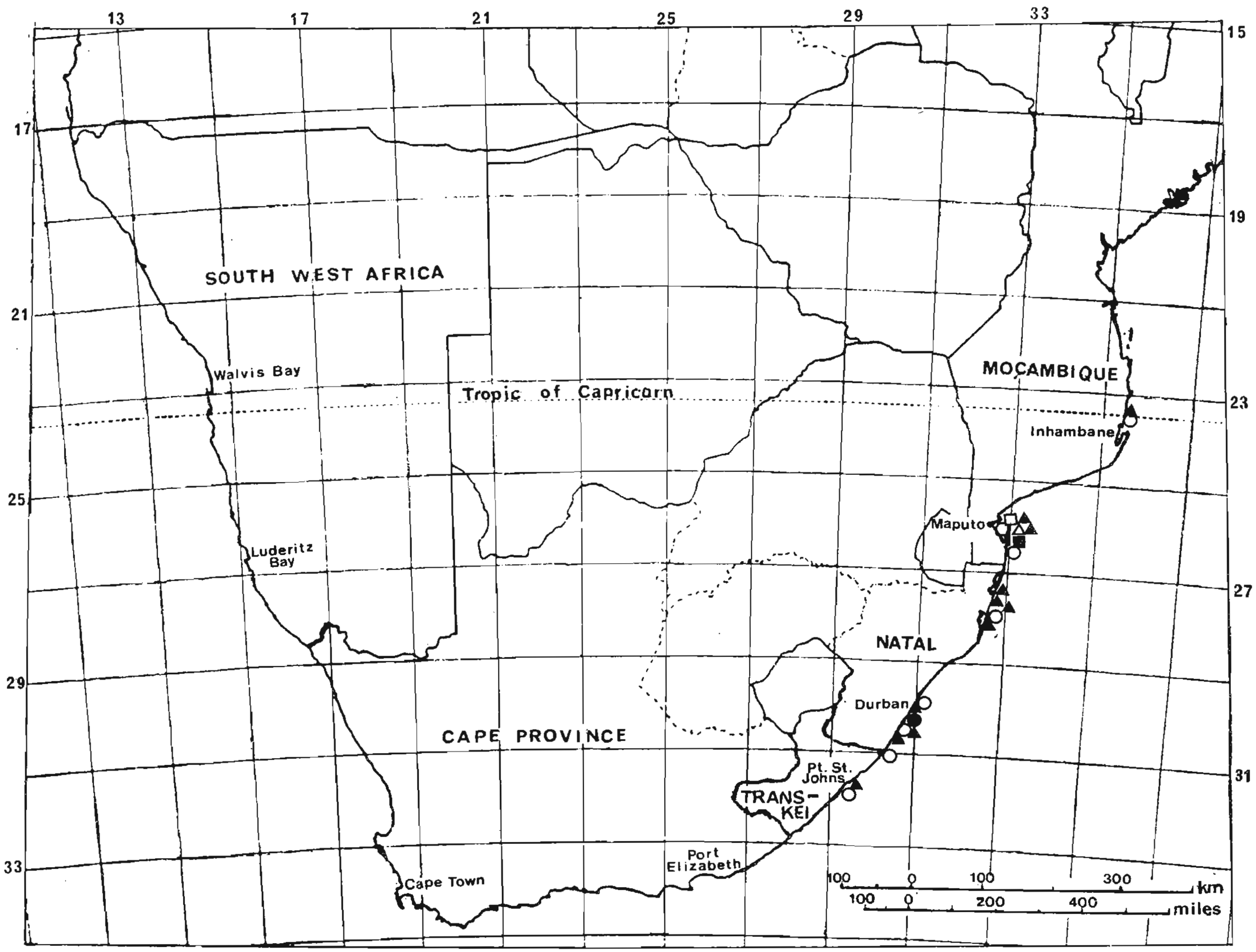
Map 2. Cosmopolitan species. ▽ Benthodytes typica Théel. ▼ Deima validum validum Théel. ■ Oneirophanta mutabilis mutabilis Théel. ● Echinocucumis hispida (Barrett). ○ Ypsilothuria bitentaculata (Ludwig).



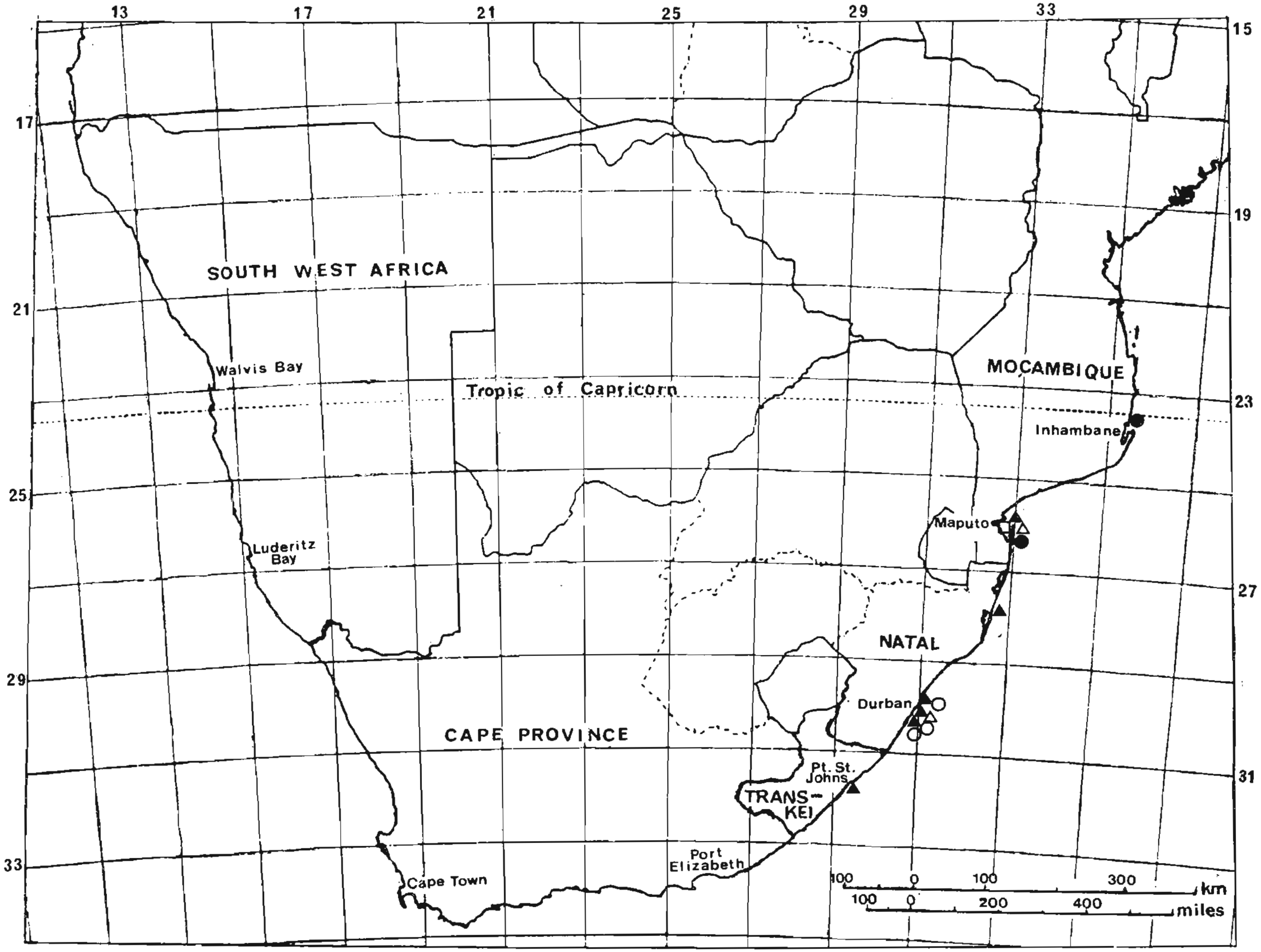
Map 3. Indopacific species. Dendrochirotida. ■ Ocnus capensis (Théel). ▼ Stolus buccalis (Stimpson). ● Ohshimella ehrenbergii (Selenka). ○ Trachythyone crucifera (Semper). ▽ Afrocucumis africana (Semper).



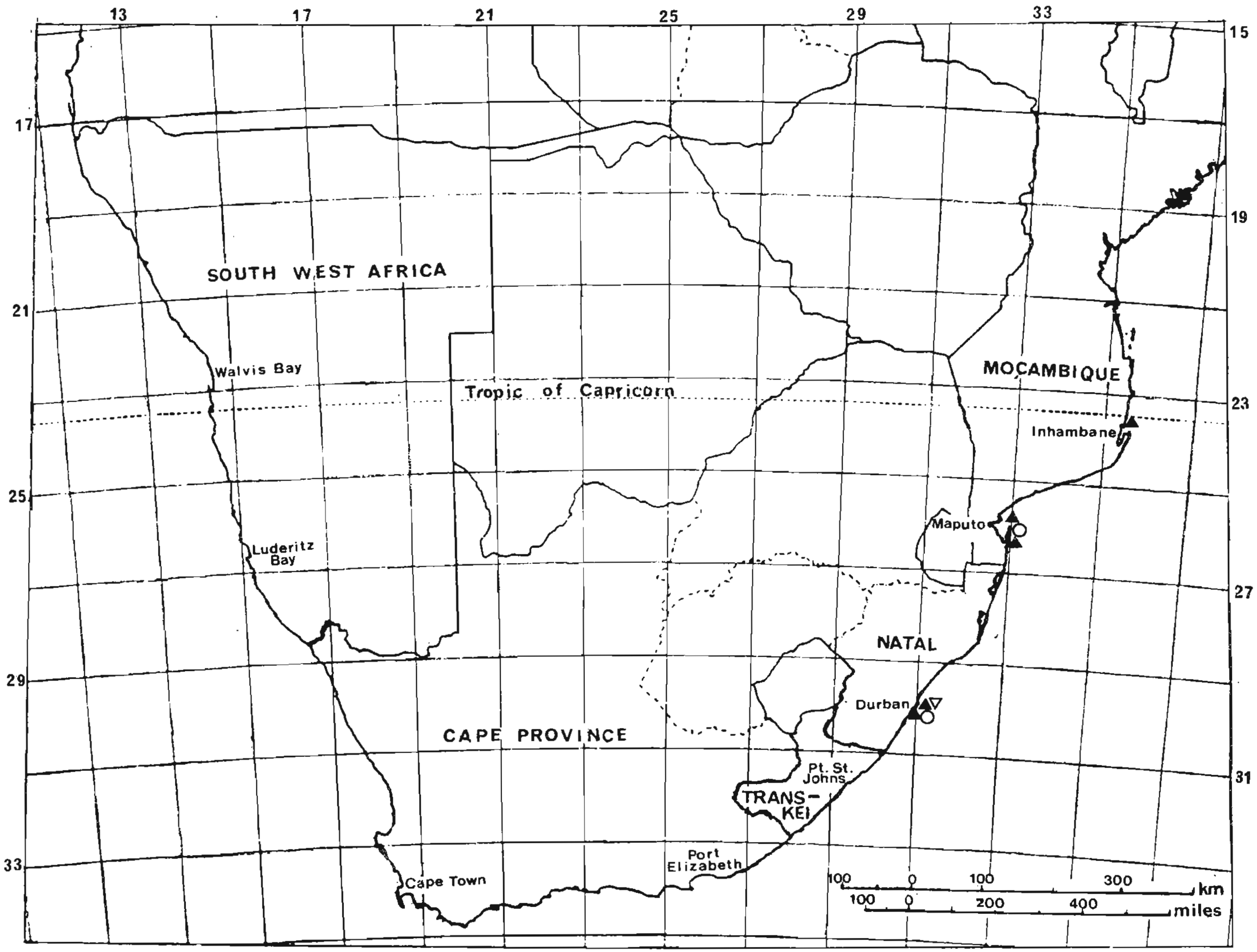
Map 4. Indopacific species. Stichopus and Actinopyga spp. ▽ Stichopus chloronotus Brandt. ▼ S. variegatus Semper. ○ Actinopyga echinites (Jaeger). ● A. mauritiana (Quoy & Gaimard). □ A. miliaris (Quoy & Gaimard). ■ A. plebeja (Selenka).



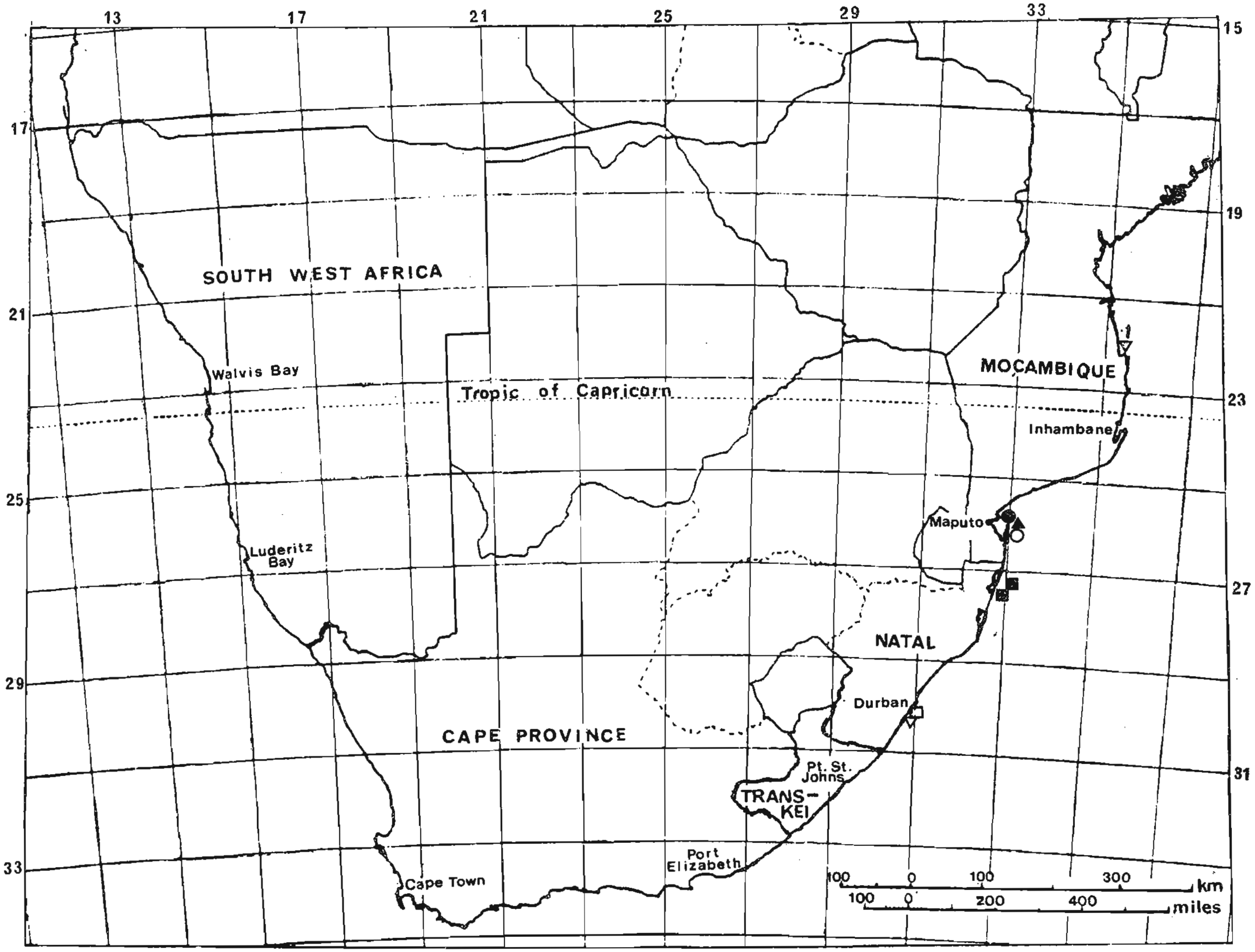
Map 5. Indopacific species of Holothuria. Subgenera Halodeima, Selenkothuria and Semperothuria. △ Holothuria (H.) atra Jaeger. ■ H.(H.) edulis Selenka. □ H.(H.) pulla Selenka. ○ H. (Selenkothuria) parva Lampert. ● H.(S.) erinaceus Semper. ▲ H. (Semperothuria) cinerascens (Brandt).



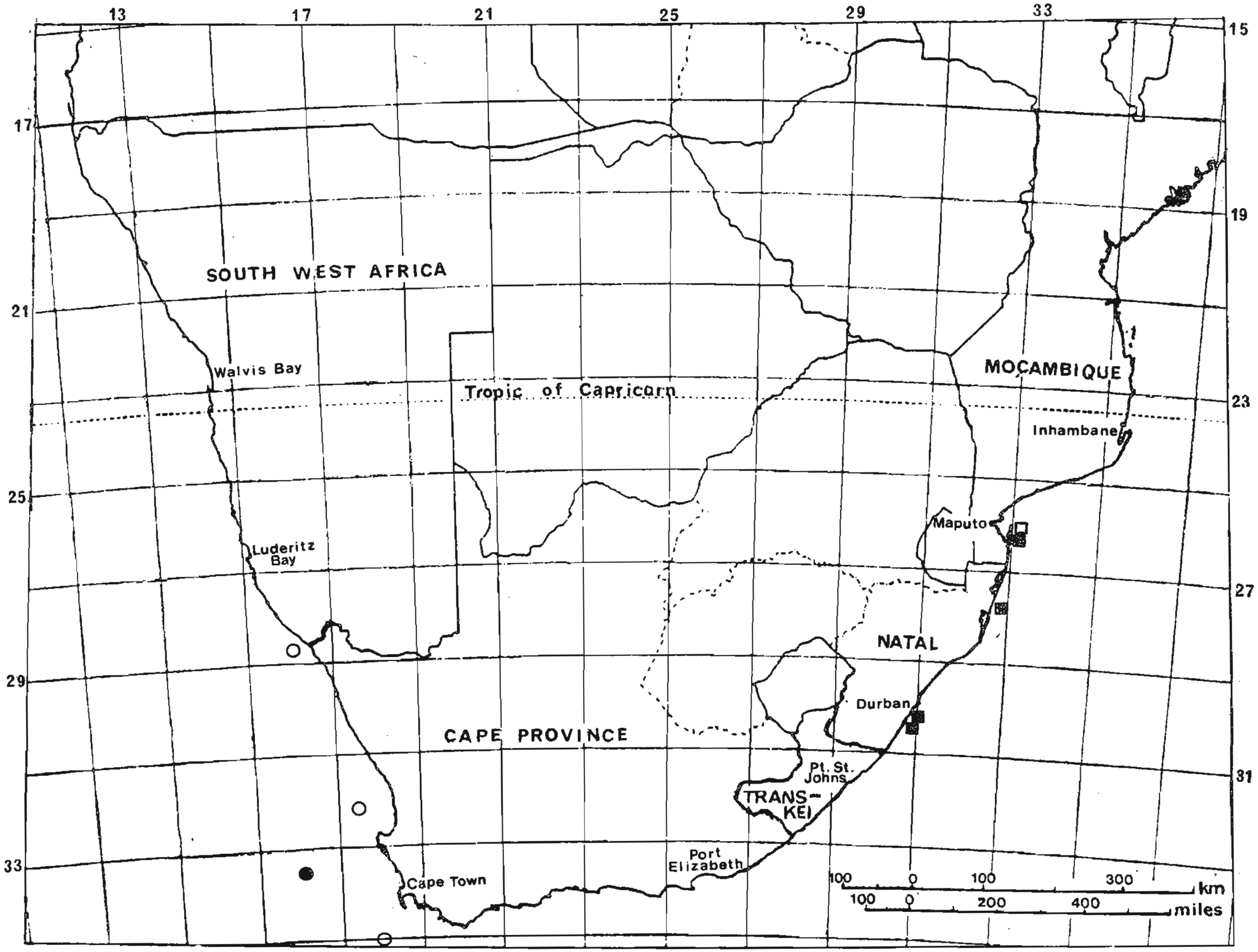
Map 6. Indopacific species of Holothuria. Subgenera Mertensiothuria and Lessonothuria. ▲ H.(M.) leucospilota (Brandt). △ H.(M.) pervicax Selenka. ○ H.(L.) insignis Ludwig. ● H.(L.) pardalis Selenka. □ H.(?L.) cumulus H.L. Clark.



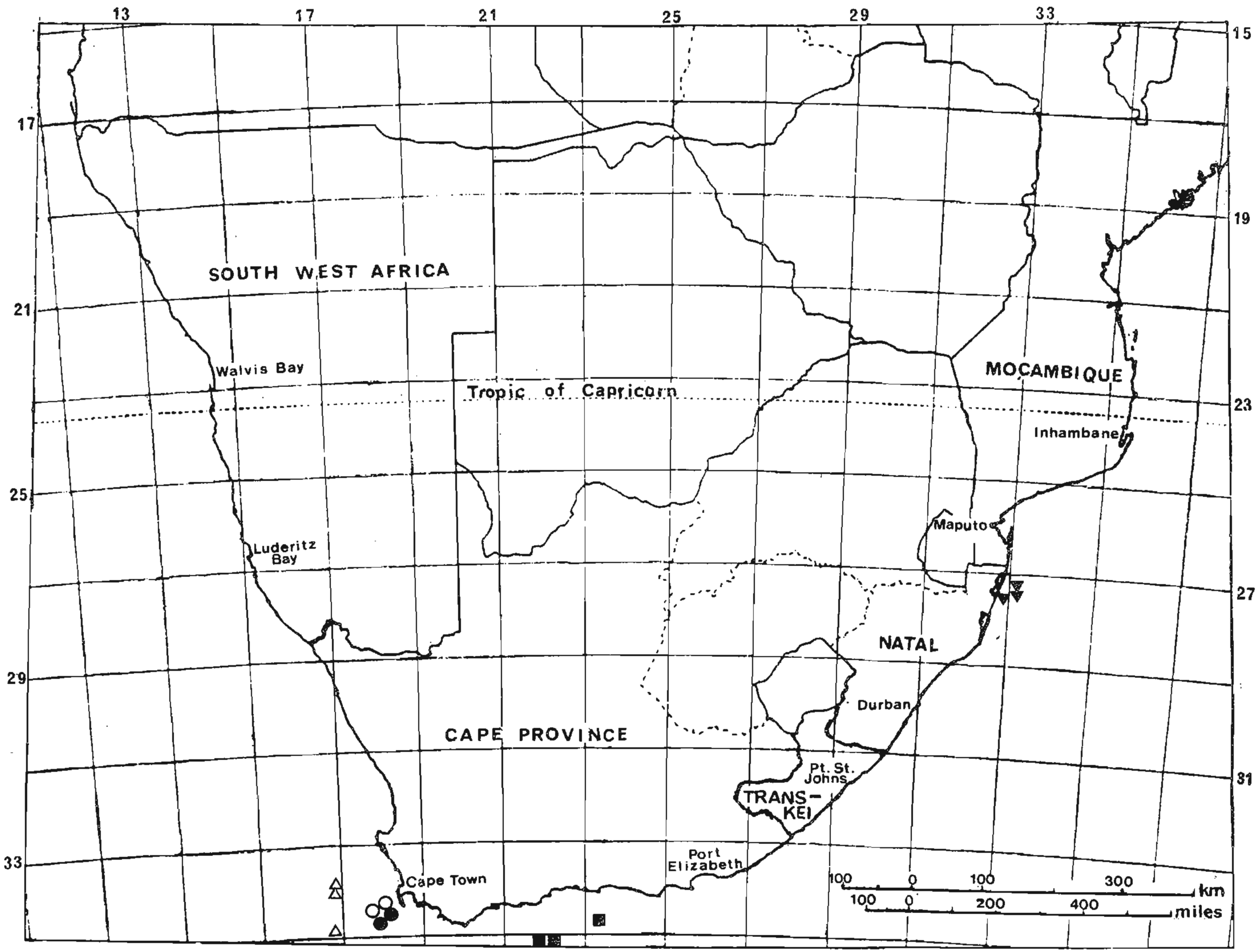
Map 7. Indopacific species of Holothuria. Subgenera Metriatyla, Platyperona and Thymiosycia. ▲ H.(M.) scabra Jaeger. ▽ H.(P.) difficilis Semper. ○ H.(T.) hilla Lesson.



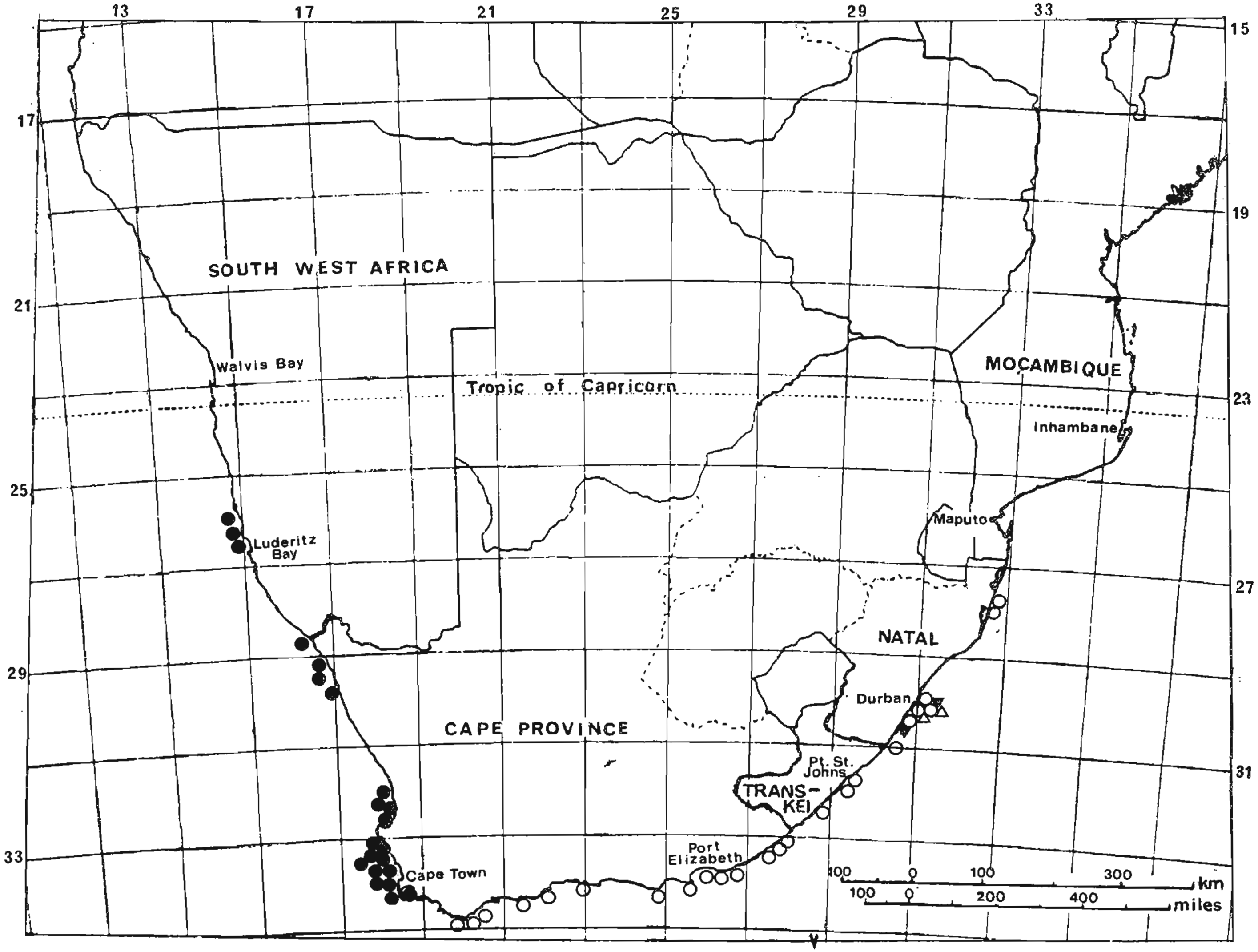
Map 8. Indopacific species. Elasipodida and Apodida. ■ Orphnurgus insignis Fisher. ▲ Chiridota violacea (J. Müller). ▽ C. rigida (Semper). ○ Opheodesoma mauritiae Heding. ● Synapta oceanica Lesson. □ Euapta godeffroyi (Semper).



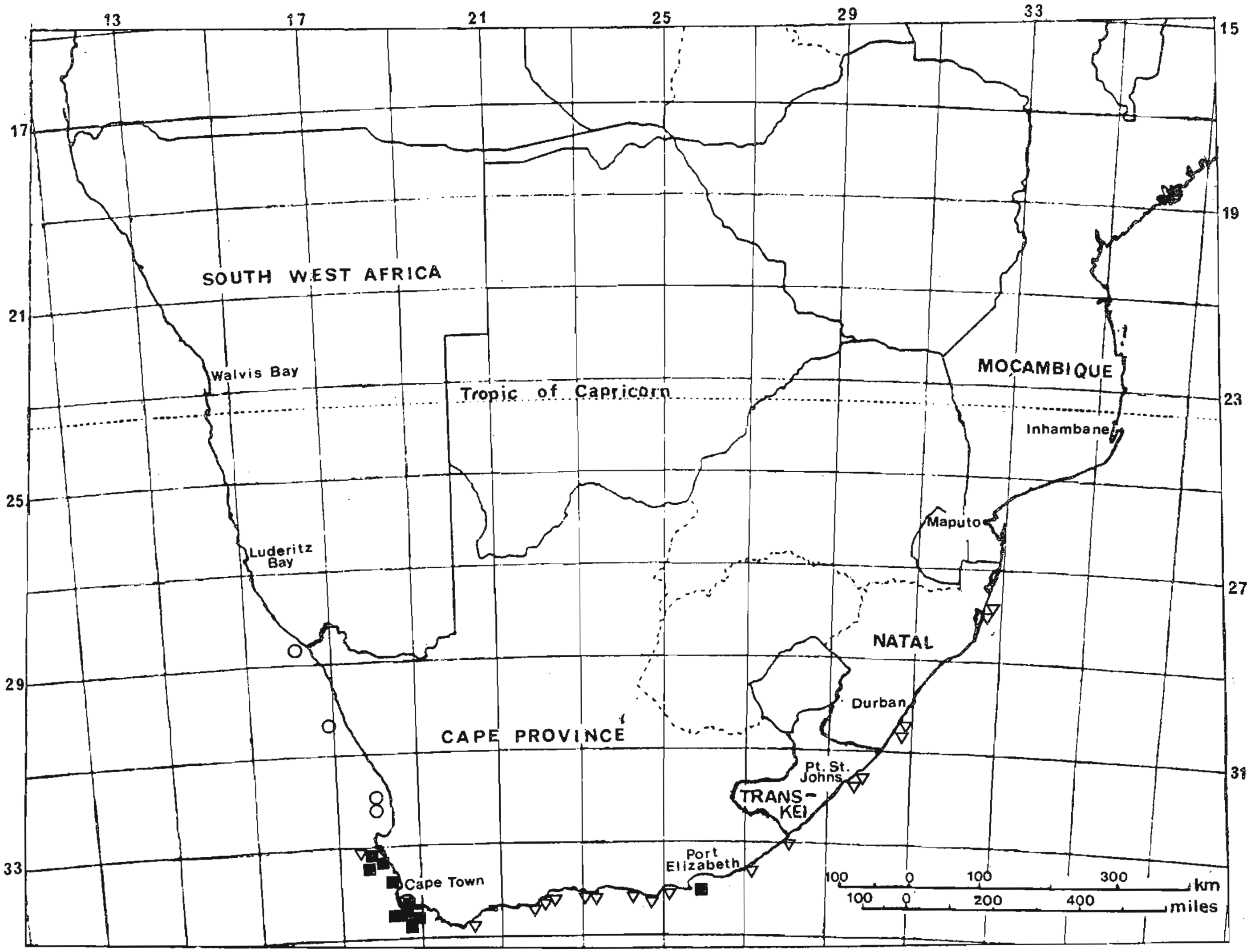
Map 9. Circumtropical and Atlantic species. ■ Holothuria (Thymiosycia) arenicola Semper. □ H.(T.) impatiens Forskaal. ○ Rhopalodinopsis capensis Heding. ● Benthodytes lingua E. Perrier.



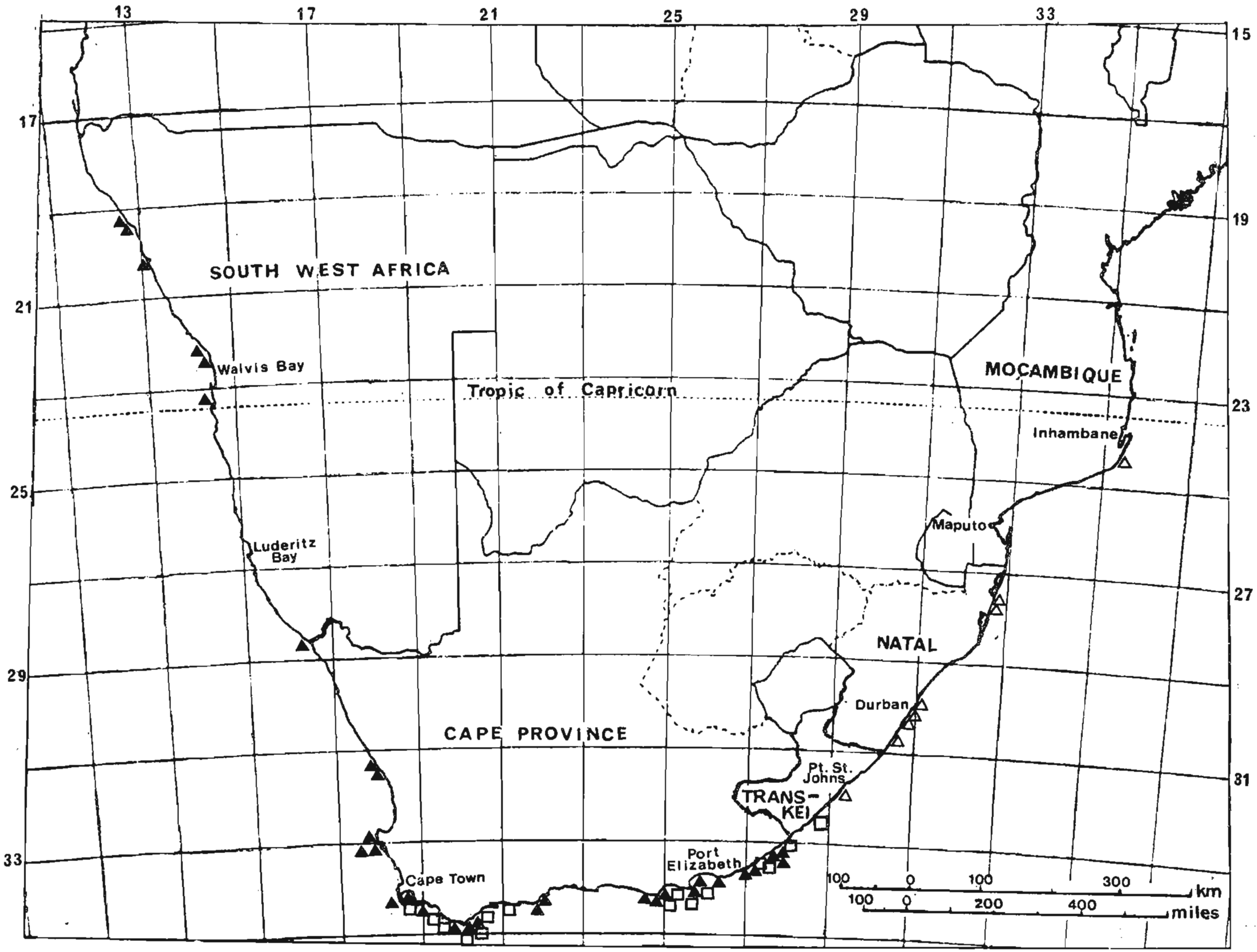
Map 10. Deep water (>200m) endemics. ▼ Orphnurgus aspersignis sp. nov. △ Psolidothuria octodactyla sp. nov. ○ Sclerothyone velligera (Ludwig & Heding). ● Temparena chuni (Ludwig & Heding). ■ Psolus agulhasicus Ludwig & Heding.



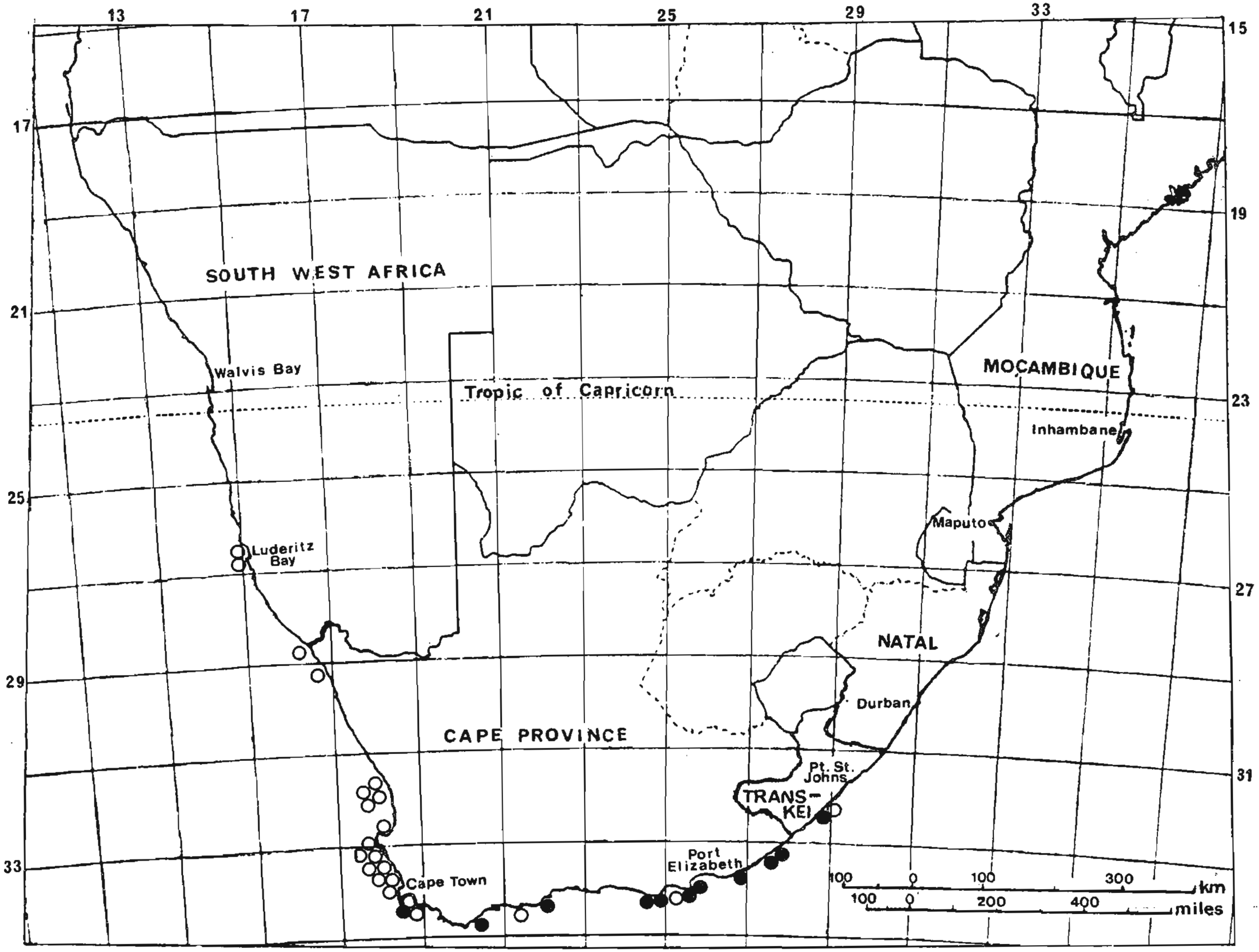
Map 11. Shelf endemics. ● Thyone aurea (Quoy & Gaimard). ○ Neostichopus grammatus (H.L. Clark). ▼ Cladolabes bifurcatus (Deichmann). △ Pawsonella africana gen. & sp. nov.



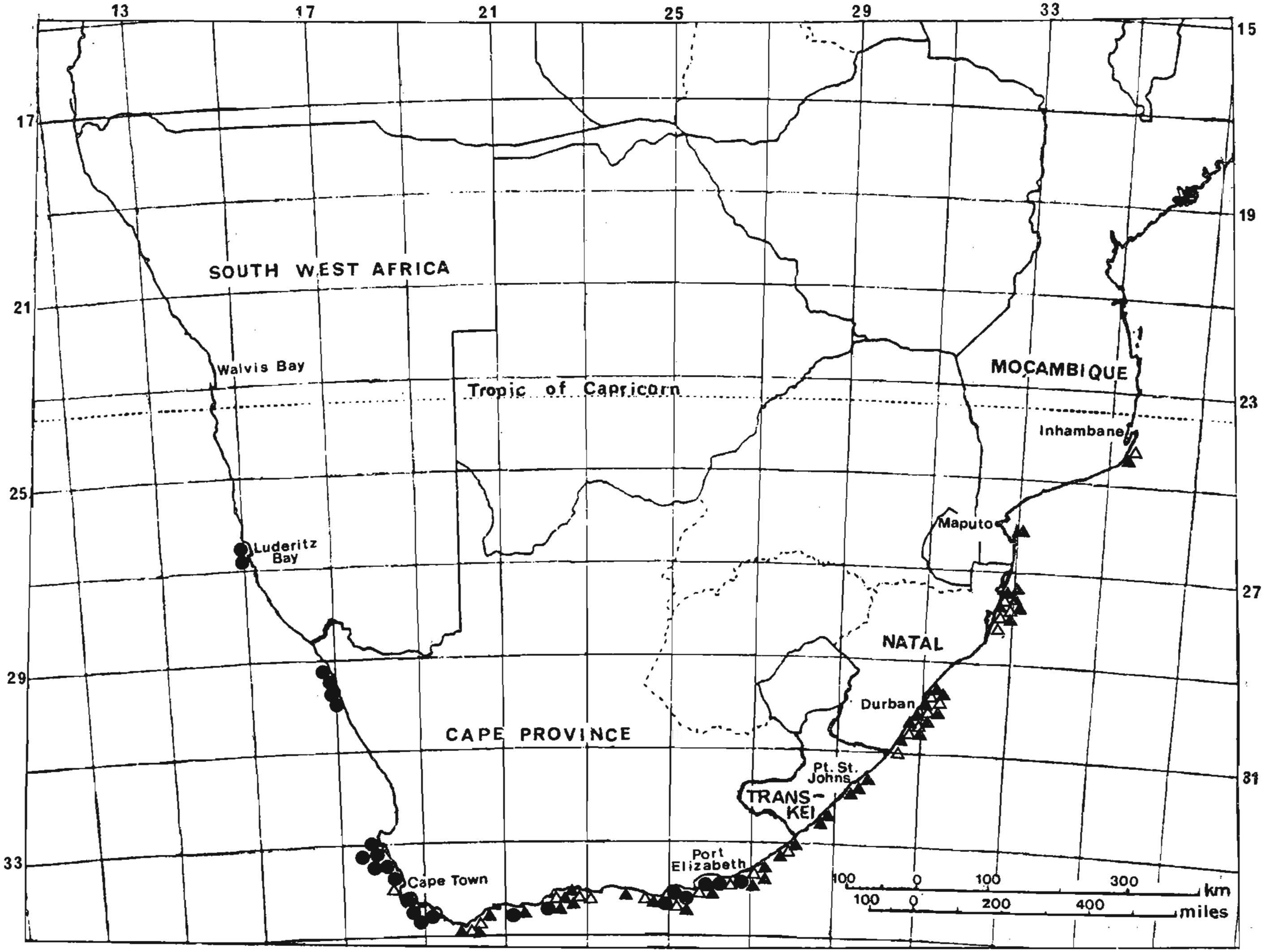
Map. 12. Shelf endemics (cont.). ■ Thyonina articulata (Vaney). ○ Trachythyone rigidapeda (Cherbonnier). ▽ Aslia spyridophora (H.L. Clark).



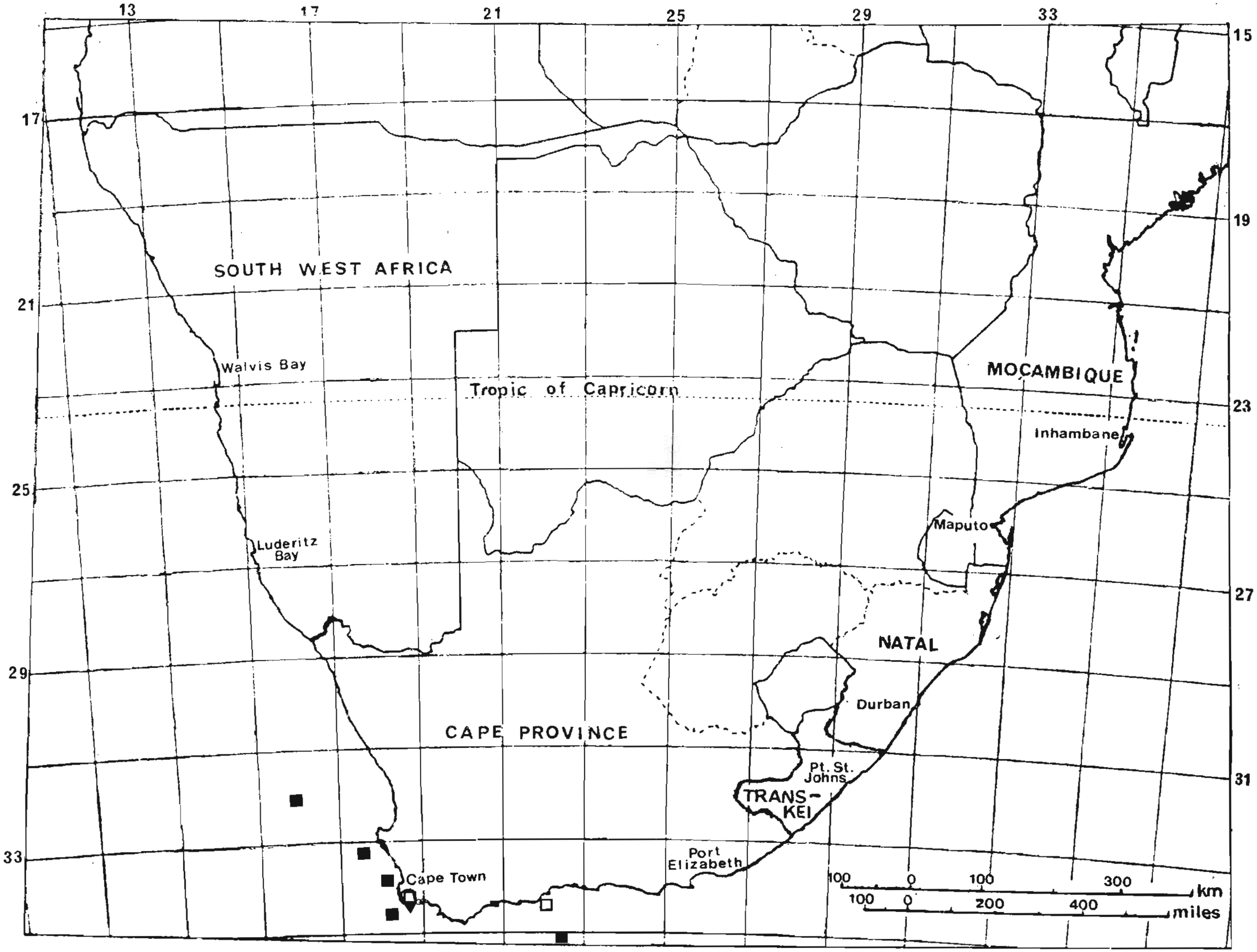
Map. 13. Shelf endemics (cont.). ▲ Roweia frauenfeldi frauenfeldi (Ludwig). △ R.f. webbi (Thandar). □ R. stephensoni (John).



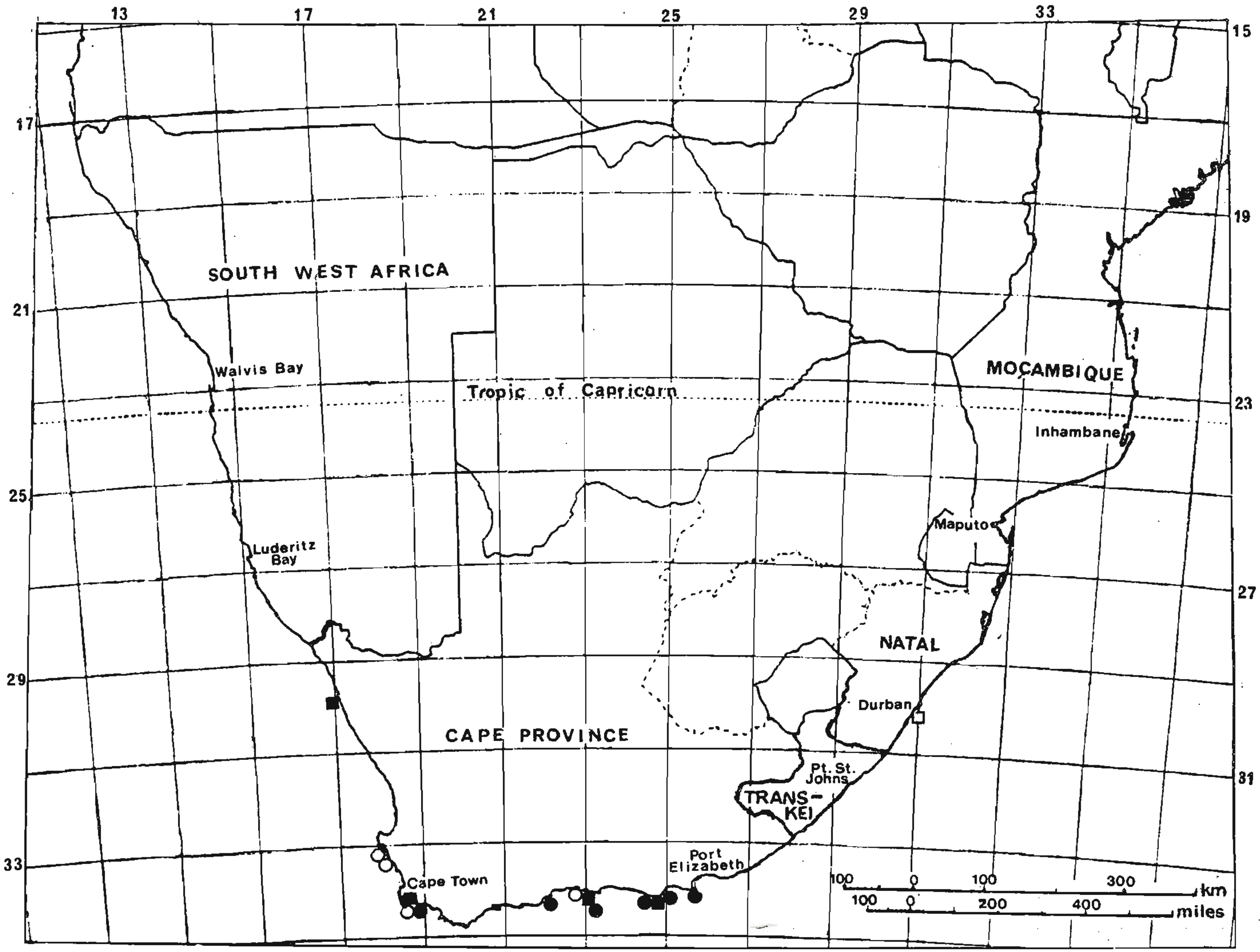
Map. 14. Shelf endemics (cont.). ○ Pentacta doliolum (Pallas). ● Pseudoaslia tetracentriophora (Heding).



Map. 15. Shelf endemics (cont.). ● Pseudocnella insolens (Théel). △ P. sinorbis (Cherbonnier). ▲ P. sykion (Lampert).



Map. 16. Shelf endemics (cont.). ■ Havelockia venustella (Ludwig & Heding). □ Thyone propinqua Cherbonnier. ▼ T. hirta Cherbonnier.



Map. 17. Shelf endemics (cont.). ■ Leptosynapta knysnaensis (Cherbonnier). □ L. naiga sp. nov. ○ Taeniogyrus dayi Cherbonnier. ● Rynkatorpa spatula sp. nov.

APPENDIX
STATION DATA

The stations or localities are listed in sequence from the west to the east coast. Where exact grid references are unavailable or not given, the approximate position of each station or locality is indi= cated by latitude/longitude degree squares appearing in parantheses after each province or state. C = Cape Province, M = Moçambique, N = Natal, SWA = South West Africa (Namibia); T = Transkei; i = intertidal; LWS = low water spring.

UNIVERSITY OF CAPE TOWN

SWA, Swakopmund, SWA (23/14)

? VII 1957, i,

SWA 1K, Roweia frauenfeldi frauenfeldi (Ludwig), 6 spec.

WCD, West Coast Dredge, C(34/18)

12 X 1965, S.W. of Cape Point, 400m, khaki and black sand, gravel and nodules

WCD 216 A Temparena chuni (Ludwig & Heding), 1 spec.

WCD 216 B Havelockia venustella (Ludwig & Heding), 1 spec.

29 VIII 1967, S.W. of Cape Point, 360-365m, rocky bottom, uneven surface

WCD 219 G Ocnus capensis (Thēel), 1 spec.

WCD 219 H Sclerothyone velligera (Ludwig & Heding), 1 spec.

N, Port Nolloth (shore), C(29/16)

27 X 1935

N31 Pentacta doliolum (Pallas), 1 spec.

N31 Pseudocnella insolens (Thēel), 1 spec.

N32 " " " , 10 spec.

N34 Thyone aurea (Quoy & Gaimard), 1 spec.

BR, Buffels River (shore), C(29/17)

22 II 1940,

BR 1 E Pseudocnella insolens (Thēel), 13 spec.

22 X 1940

BR 1 F Thyone aurea (Quoy & Gaimard), 6 spec.

ZR, Zout River (shore), C(30/17).

19 IV 1940

ZR 4 D, Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

GR, Groen Rivier (shore), C(30/17).

7 III 1940,

GR 5 B, Roweia frauenfeldi frauenfeldi (Ludwig), 3 spec.

LAM, Lamberts Bay (dredge).

19 I 1957; 32°05,1' S; 18° 17, 7'E; S. Chimney 174°; S. Point 194°; N. Point 22°; 20m

29 M Pentacta doliolum (Pallas), 8 spec.

29 N Thyone aurea (Quoy & Gaimard), 11 spec.

29 P " " " " , 1 spec.

31 W " " " " , 3 spec.

23 I 1957, 32° 08,5' S; 18°17, 7'E; S. Chimney 38°, S. Point 168°; 16,5m; sand, rock

50 K Pectacta doliolum (Pallas), 1 spec.

50 L Thyone aurea (Quoy & Gaimard), 7 spec.

23 I 1957, 32° 09'S; 18° 18'E, 0,4-0,8km S. of LAM 50, 0,4km off shore; 16m; mussels, sand, rock

58 J Pentacta doliolum (Pallas), 3 spec.

LBT, Lamberts Bay (transect)

15 IX 1970, 32°05'S; 17°57, 8'E; 120m; clay,sand

LBT 21 G Trachythyone rigidapeda (Cherbonnier), 5 spec.

SB, Saldanha Bay (dredge)

13 VII 1946, St.II, 33°00,7'S; 17°59,8'E, about 3km N.E. of Hoetjies Pt; 15m, sand

SB 95 Thyone aurea (Quoy & Gaimard), 6 spec.

SB 99 Pentacta doliolum (Pallas), 5 spec.

SB 99 Pseudocnella insolens (Thēel), 1 spec.

14 VII 1946, 33°01'S; 17°58,5'E; 9m

SB 101 Pseudocnella insolens (Théel), 17 spec.

22 IX 1957, among kelp on rocks at Lynch Pt, below LWS

SB 150 K Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

27 IV 1959, (= GIL 25), 33°2,8'S; 18°0,6'E; 15m; shelly sand, scattered rocks

SB 174 Thyone aurea Quoy & Gaimard, 2 spec.

AFR, Africana (dredge)

28 XI 1947, 33°12'S; 17°39,9'E, 229m, black speckled green mud

AFR 790 A Havelockia venustella (Ludwig & Heding), 1 spec.

LB, Langebaan Lagoon, C(33/18)

15 VII 1946, St.XV

LB 119 Thyone aurea (Quoy & Gaimard), 6 spec.

15 VII 1946, St.XVIII

LB 121 Pseudocnella insolens (Théel), 6 spec.

LB 154 Taeniogyrus dayi Cherbonnier, 1 spec.

16 VII 1946, St.XXI

LB 123 Pentacta doliolum (Pallas), 4 spec.

4 V 1951, Schaapen Is., Lagoon side, rock, lower balanoid to infratidal fringe

LB 282 Z Pentacta doliolum (Pallas), 1 spec.

CPR, Cape Province (shore),(33/18)

25 I 1948, Springfontein (between Ysterfontein and Blouberg)

CPR 24 Thyone aurea (Quoy & Gaimard), 5 spec.

TB, Table Bay (dredge)

11 II 1947, 33°48,3'5; 18°24'E; 10-12m; rock, sand

TB 82 C Pentacta doliolum (Pallas), 1 spec.

11 II 1947, 33°47,5'S; 18°24,3'E, St.2, 19-20m; shell, stones,

TB 83 B Thyone aurea (Quoy & Gaimard), 2 spec.

11 II 1947, 33°50,5'S; 18°25,7'E; St.4; 27m; rock;

Pentacta doliolum (Pallas), 4 spec.

15 XII 1957, 33°48,6'S; 18°24,6'E, Leeukop, 15m; large stones, broken shell, sponges, crinoids, P. doliolum,

TB 105 A Thyone aurea Quoy & Gaimard, 5 spec.

A, Oudekraal (shore), C(33/18)

18 I 1934

A 81 Thyone aurea (Quoy & Gaimard), 3 spec.

A 82 Pentacta doliolum (Pallas), 8 spec.

28 VII 1934

A 81 b Thyone aurea (Quoy & Gaimard), 2 spec.

CP, Cape Peninsula (shore), C(34/18), St. James, pool B

CP 220 A Roweia frauenfeldi frauenfeldi (Ludwig), 13 spec.

F, St. James (shore), C(34/18)

23 II 1933, very common, usually wedged into sandy crevices between stones,

F 110 Roweia stephensoni (John), 8 spec.

F 110 Pseudoaslia tetracentriophora (Heding), 4 spec.

26 VIII 1938, Muizenberg, large, grey, fairly common under stones, low down on shore

F 373 Roweia frauenfeldi frauenfeldi (Ludwig), 5 spec.

FB, False Bay, C(34/18)

21 IV 1947, St.II, about 1km due E. of S. tip of Seal Is., dredge, rock

FB 1057 A, Pseudocnella insolens (Théel), 5 spec.

FB 1057 B, Pentacta doliolum (Pallas), 2 spec.

6 VIII 1947, 34° 08'S, 18°30'E, Sector IX, St.I, 17,5m, sand

FB 1070, Pseudocnella insolens (Théel), 2 spec.

9 III 1950, 34°08,5'S; 18°27'E, Sector VIII, St.I, 14m, sand and Pyura

FB 1076 (?b), Thyone aurea (Quoy and Gaimard), 4 spec.

FBS, False Bay (shore), C(34/18)

20 IX 1971

FBS 1 H Leptosynapta knysnaensis (Cherbonnier), 1 spec.

FBY, False Bay (transect)

24 I 1967, 34°07,5'S; 18°,29'E; TBD 75A, grab 0,2 sq.m; 51, 15m, white sand, temp. 13,4°

FBY 5 X, Thyone aurea (Quoy & Gaimard), 2 spec.

FAL, False Bay (dredge), C(34/18)

12 II 1953, Simons Bay, "broken lithothamnion", 23,5m

FAL 117 Z Leptosynapta knysnaensis (Cherbonnier), fragmented, 1 spec.

26 II 1953, Oatland Pt, 1-2m below LWS, scattered rocky bottom, locally abundant

FAL 129 W Roweia stephensoni (John), 2 spec.

21 & 22 IV 1953, Oatland Pt, 0-3m, cryptobiota under rock D (Lagoon Rock)

FAL 158 C Pentacta doliolum (Pallas), 2 spec.

10 VI 1953, Oatland Pt, S.W. face of Big Rock, 4-6m below Ecklonia level, p.

FAL 173 S Pentacta doliolum (Pallas), 1 spec.

10 IX 1953, 34° 15,3'S; 18°44,8'E; Africana; Kogel Bay, South, 48m, dredge (lined with hessian), coarse khaki brown sand, shell, pebbles, stones; fairly common

FAL 234 R Thyonina articulata (Vaney), 4 spec.

10 IX 1953, 34°20,6'S; 18°39,4'E; Africana, 82m, dredge (lined with 1/4 netting), ?mixed shelly sand and green mud

FAL 239 T Rhopalodinaria gigantea Cherbonnier, 1 proboscis

18 IX 1954, Roman Rock, about 100m E.S.E. of Lighthouse, 14-17m below LWS, rocks (granite)

FAL 272 A Pseudocnella insolens (Théel), 3 spec.

FAL 272 B Pentacta doliolum (Pallas), 2 spec.

31 I 1959, 34°13'S, 18°35'E, 44m, very coarse sand

FAL 338 S Rhopalodinaria minuta Cherbonnier, 18 spec.

24 II 1959 (= GIL. 13), 34°18,8'S; 18°39'E, rock dredge, 72m; coarse sand, shell

FAL 357 E Thyonina articulata (Vaney), 2 spec.

25 II 1959 (= GIL. 18), 34°15,1'S, 18°44,8'E, 'Gilchrist', rock dredge, 54m; sand, shell, pale pink

FAL 372 E Thyonina articulata (Vaney), 2 spec.

22 V 1961 (= GIL. 263), 34°17,4'S; 18°39,2'E, dredge, 10m; khaki sand, mud

FAL 456 X Rhopalodinaria gigantea Cherbonnier, 8 proboscides

22 V 1961 (= GIL.264), 34°21'S; 18°43'E, dredge, 80m, khaki sand, holotype,

FAL 460 H Rynkatorpa spatula sp. nov., 1 spec.

22 II 1965 (= GIL. 640), 34°18,6'S, 18°42,9' to 18°43,3'E, W.N.W. of Pringle Bay, dredge, 71m; coarse green sand, stones, Dictenophiura

FAL 759 B Thyone aurea (Quoy & Gaimard), 5 spec.

FAL 759 C Thyonina articulata (Vaney), 7 spec.

15 II 1965 (= GIL. 615), 34°17' to 34°17,1'S; 18°29,2' to 18°28,9'E, S. of Smitswinkel Bay, 27m; coarse sand, shell; abundant

FAL 784 G Pentacta doliolum (Pallas), 5 spec.

FAL 784 G Pseudocnella insolens (Théel), 164 spec.

18 II 1965 (= GIL. 631), 34°17,7'S; 18°47,6'E, grab, 81, temp. 20°C, 51m, coarse khaki sand, shells

FAL 802 A Thyonina articulata (Vaney), 200 spec.

17 VI 1965 (= GIL. 626), 34°14,5' to 34°15,2'S; 18°38,8' to 18°39,1'E, Central Bay, 53m khaki sand

FAL 850 B-C Thyonina articulata (Vaney), 17 spec.

18 II 1965 (= GIL. 629), 34°16,6' to 34°16,8'S; 18°48,8' to 18°48,4'E, S.W. of Kogel Bay, 36m, coarse shell, white sand, abundant

FAL 853 C-D Thyonina articulata (Vaney), 90 spec.

21 I 1967, 34°09,3'S, 18°42,5'E, 1 sq.m grab, 38m, khakhi sand, shell

FAL 898 X Taeniogyrus dayi Cherbonnier, purple, 2 spec.

FAL 898 Y Pentacta doliolum (Pallas), 1 spec.

25 I 1967, 34°15'S, 18°45'E, 1 sq.m grab, 91, temp 10,1°, 49m, fine sand, Virgularia

FAL 945 L Thyonina articulata (Vaney), 38 spec.

25 I 1967, 34°17'S, 18°40,5'E, 1 sq.m grab, 3,51, temp. 10,5°, 162m, shelly sand, mud

FAL 946 L Thyonina articulata (Vaney), 1 spec.

22 XII 1969, Fishhoek Bay, off Sunny Cove, burrowed in sand, tentacles projecting, holotype,

FAL 963 A Neothyonidium arthroprocessum sp. nov., 1 spec.

TRA, Trawler (dredge)

7 II 1953, 'Africana II', Dassen Is. C(33/18), 29m, shelly sand

TRA 67 H Thyonina articulata (Vaney) forma atypica, 4 spec.

32°06'S, 16°37'E, 'Africana II', 311m

TRA 73 J Havelockia venustella (Ludwig & Heding), 3 spec.

32°05'S, 17°52'E, 'Africana II', 123m, green mud

TRA 74 J Trachythyone rigidapeda (Cherbonnier), 7 spec.

34°15'07"S, 18°43'06"E, 'Africana II', False Bay, dredge 9, 53m

TRA 115 D Thyonina articulata (Vaney), 3 spec.

34°19,65', 18°30'E, 'Africana II', sand, shells, Phyllochaetopterus;

TRA 132 Z Rhopalodinaria gigantea Cherbonnier, 3 proboscides

34°19'S, 18°30'E, Africana II, dredge II, 52m, sand, shells, Phyllochaetopterus on flat rock

TRA 135 R Pentacta doliolum (Pallas), 5 spec.

CH, Cape Hangklip (shore), C(34/18)

8 I 1940

CH 5 E Roweia stephensoni (John), 2 spec.

CH 5 F Pseudocnella insolens (Thēel), 8 spec.

HM, Hermanus (shore), C(34/19)

30 VI 1939

HM 9 F Roweia stephensoni (John), 1 spec.

DP, Danger Point (shore), C(34/19)

5 VII 1939

DP 5 A & B Roweia stephensoni (John), 7 spec.

DP 5 B Pseudocnella insolens (Thēel), 5 spec.

AG, Agulhas (shore), C(34/19)

27 IX 1939

AG 2 G Pseudocnella insolens (Thēel), 1 spec.

29 IX 1939

AG 6 A Roweia stephensoni (John), 10 spec.

AG 11 H Neostichopus grammatus (H.L. Clark), 1 spec.

AG 13 A Pseudocnella sykion (Lampert), 3 spec.

AR, Arniston (Waenhuiskrans) (shore), C(34/20)

23 II 1939

AR 7 B Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

AR 7 B Pseudocnella sykion (Lampert), 1 spec.

AR 7 B Pseudocnella sinorbis (Cherbonnier), 1 spec.

AR 7 C Pseudocnella sykion (Lampert), 2 spec.

AR 7 D Neostichopus grammatus (H.L. Clark), 1 spec.

ARR, Boulder Beach, about 3 km S.W. of Arniston, C(34/20)

16 I 1968

ARR 2 B Pseudocnella sykion (Lampert), 1 spec.

ARR 2 V Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

ARR 2 V Roweia stephensoni (John), 1 spec.

ARR 7 B Pseudocnella sykion (Lampert), 1 spec.

CI, Cape Infanta (shore), C(34/20)

8 XII 1939

CI 4 C Neostichopus grammatus (H.L. Clark), 1 spec.

7 IV 1963

CI 21 M Pseudocnella sykion (Lampert), 1 spec.

CI 21 M Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

S, SSS, Still Bay, C(34/21)

5 I 1932

S 38 Aslia spyridophora (H.L. Clark), 5 spec.

10 I 1932

S 37 A Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

S 37 A Roweia stephensoni (John), 4 spec.

S 37 B Pseudocnella sykion (Lampert), 3 spec.

10 XI 1935

SSS 1 D Pseudocnella insolens (Théel), 1 spec.

VV, Mossel Bay (shore), C(34/22)

27 X 1939

VV 7 C Aslia spyridophora (H.L. Clark), 1 spec.

VV 7 E Pseudocnella sykion (Lampert), 1 spec.

KNY, Knysna Estuary (shore and dredge), C(34/23)

14 VII 1950, Fountain Point, Knysna Head, i, black

KNY 189 F Aslia spyridophora (H.L. Clark), 1 spec.

KN, Knysna (shore), C(34/23)

6 IV 1939

KN 3 A Pseudocnella sykion (Lampert), 2 spec.

KN 3 G Aslia spyridophora (H.L. Clark), 2 spec.

R, Robberg (shore), C(34/24)

8 IV 1939

R 3 A Pseudocnella sykion (Lampert), 2 spec.

Z, ZZ, Jeffries Bay (shore), C(34/24)

28 III 1939

Z 5 A Pseudocnella sinorbis (Cherbonnier), 2 spec.

28 III 1939

ZZ 6 H1 Roweia frauenfeldi frauenfeldi (Ludwig), 4 spec.

2 VI 1939

ZZ 6 H2 Aslia spyridophora (H.L. Clark), 1 spec.

E, Port Elizabeth (shore), C(33/25)

5 VII 1936

E23 Roweia frauenfeldi frauenfeldi (Ludwig), 2 spec.

E24 Neostichopus grammatus (H.L. Clark), 6 spec.

E25 Pseudocnella insolens (Théel), 1 spec.

18 VII 1936

E 164 Pseudocnella sinorbis (Cherbonnier), 1 spec.

E 164 Roweia frauenfeldi frauenfeldi (Ludwig), 1 spec.

20 VII 1936

E 171 Pseudocnella sinorbis (Cherbonnier), 1 spec.

LIZ, Port Elizabeth (Algoa Bay dredge)

11 IV 1954, 34°00,4'S; 25°44,5'E; St. 12, 39m, coarse sand, shell

LIZ 25 H Thyonina articulata (Vaney), 4 spec.

Y, Richmond (Boknes) (shore), C(33/26)

25 III 1939

Y8A1 Pseudocnella sinorbis (Cherbonnier), 2 spec.

Y8A1 Pseudocnella sykion (Lampert), 2 spec.

Y8A1 Roweia frauenfeldi frauenfeldi (Ludwig), 2 spec.

Y8A2 Neostichopus grammatus (H.L. Clark), 1 spec.

Y8A3 Roweia frauenfeldi frauenfeldi (Ludwig), 4 spec.

5 IV 1940

Y24D Pseudocnella insolens (Thëel), 1 spec.

X, Kleinmond (shore), C(33/27)

19 III 1939

X4F Pseudocnella sykion (Lampert), 1 spec.

X6A1 Roweia frauenfeldi frauenfeldi (Ludwig), 2 spec.

L, LLL, East London (shore), C(33/28)

6 VII 1937, Shelley Beach, lower part of littorina zone under stones and in pools and cracks, common, black

L27 Pseudocnella sykion (Lampert), 6 spec.

7 VII 1937, Shelly Beach, in channel below balanoid zone, greyish (det. by John as Cucumaria frauenfeldi)

L86 Pseudoaslia tetracentriophora (Heding), 1 spec.

12 VII 1937, Bats Cove, under stones in pools in middle balanoid zone, greyish (det. by John as Cucumaria frauenfeldi)

L258 Pseudocnella sinorbis (Cherbonnier), 1 spec.

L258 Roweia frauenfeldi frauenfeldi (Ludwig), 3 spec.

19 VII 1937, Aquarium Rocks, in pool embedded in sand rather high up, common in one pool

L295 Roweia frauenfeldi frauenfeldi (Ludwig), 5 spec.

11 and 12 I 1967, Shelley beach, about 5km. S.W. of East London

LLL8N Roweia stephensoni (John), 1 spec.

LLL8N Pseudocnella sykion (Lampert), 2 spec.

LLL8P Pseudocnella sinorbis (Cherbonnier), 1 spec.

LLL8P Roweia frauenfeldi frauenfeldi (Ludwig), 3 spec.

LLL8Q Neostichopus grammatus (H.L. Clark), 2 spec.

Q, QQ, Qoloha (shore), T(32/28)

21 V 1939

QQ 5J Roweia stephensoni (John), 1 spec.

QQ 5K Pseudocnella sykion (Lampert), 1 spec.

W, Port Edward, N(31/30)

30 XII 1938

W3H Holothuria (Selenkothuria) parva (Lampert), 2 spec.

W3J Neostichopus grammatus (H.L. Clark), 1 spec.

31 XII 1938, (det. as Cucumaria insolens Théel),

W10B Pseudocnella sinorbis (Cherbonnier), 1 spec.

M, Umtwalumi (Mtwalumi) (shore), N(30/30)

26 XII 1938

M9A Holothuria (Semperothuria) cinerascens (Brandt), 1 spec.

M9B Pseudocnella sykion (Lampert), 3 spec.

M9B Roweia frauenfeldi webbi (Thandar), 1 spec.

M9F2 Aslia spyridophora (H.L. Clark), 1 spec.

M9F3 Trachythyone crucifera (Semper), 1 spec.

M9F3 " " " 1 spec.

D, Durban and Isipingo (shore), N(29/31, 29/30)

? 1932

?AD20 Pseudocnella sykion (Lampert), 1 spec.

27 VI 1935, Isipingo Beach

D1E Holothuria (Semperothuria) cinerascens (Brandt), 1 spec.

D25 Pseudocnella sykion (Lampert), 4 spec.

D25A " " " 2 spec.

28 X 1936, Isipingo Beach, platform, middle zone,
several in one pool, 2 ft when alive

D263 Holothuria (Mertensiothuria) leucospilota Brandt, 1 spec.

NAD, Natal (dredge), N(30/31)

? I 1967, 16km S. of Durban, about 36m, C. Berrisford, types,

NAD Pawsonella africana Gen. et sp. nov., 29 spec.

DBN, Durban Bay (shore and dredge), N(29/30, 29/31)

12 VII 1950, seaward side of Causeway, amongst mangrove roots, half burried in muddy sand

DBN 20A Holothuria (Selenkothuria) parva (Lampert), 1 spec.

16 VII 1950, Congella Channel, central mudbanks, half burried in water-logged sand, speckled

DBN 30E Holothuria (Metriatyla) scabra Jaeger, 3 spec.

U, Umhlali (shore), N(29/31)

22 XII 1938

U10 J Pseudocnella sykion (Lampert), 2 spec.

U10 K Pseudocnella sinorbis (Cherbonnier), 1 spec.

U24 A Holothuria (Mertensiothuria) leucospilota Brandt, 1 spec.

G, GG, Umpangazi (shore), N(27/32)

2 V - 5 V 1939

G3E Pseudocnella sinorbis (Cherbonnier), 1 spec.

G8J " " " 2 spec.

G9L Pseudocnella sykion (Lampert), 2 spec.

G11Q Holothuria (Semperothuria) cinerascens Brandt, 1 spec.

25 IV 1967

GG2S Ohshimella ehrenbergii (Selenka), 1 spec.

JAN, Jangamo (shore), M(24/35)

8 VII 1968

JAN 26 J Actinopyga mauritiana (Quoy & Gaimard), 3 spec.

JAN 26 K Holothuria (Semperothuria) cinerascens (Brandt), 3 spec.

JAN 26 L Actinopyga echinites Jaeger, 1 spec.

JAN 26 M Stolus buccalis (Stimpson), 2 spec.

JAN 26 N Afrocucumis africana (Semper), 4 spec.

JAN 26 P Pseudocnella sinorbis (Cherbonnier), 3 spec.

JAN 26 R Pseudocnella sykion (Lampert), 3 spec.

JAN 26 S Roweia frauenfeldi webbi (Thandar), 2 spec.

MOR, Morrumbene, M(23/35)

21 I 1954, in channel off mouth of Rio Coche, dredge, 3-5m, leaf detritus, sand, shells, olive and purple

MOR 50B Pentacta tesselera Cherbonnier, 47 spec.

23 I 1954, Mongue Ferry, _Zostera_ bed, transect through mangroves, LWS

MOR 71H _Thyone avenusta_ Cherbonnier, 1 spec.

MOR 71H _Holothuria (Lessonothuria) pardalis_ Selenka, 3 spec.

12 VII 1968, Linga Linga, ? on wreck or on sandbanks nearby

MOR 228 A _Stolus buccalis_ Stimpson

MOR 228 B _Actinopyga mauritiana_ (Quoy & Gaimard), 1 spec.

MOR 228 C _Holothuria (Selenkothuria) parva_ Lampert, 3 spec.

MOR 228 D _Holothuria (Cystipus) longicosta_ sp. nov. (holotype) 1 spec.

MOR 228 D _Holothuria (Theelothuria)? notabilis_ Ludwig, 1 spec.

12 VII 1968, Rio Coche

MOR 236 B _Holothuria (Metriatyla) scabra_ Jaeger, 1 spec.

UNIVERSITY OF DURBAN-WESTVILLE COLLECTION

Stolus buccalis (Stimpson)

Treasure Beach, Durban, N(29/30/S), 7 II 1982, 1 spec.

North Pier, Durban, N(30/31), 8 X 1977, G.C. Naidu, 4m, admixture of dark and light brown, 1 spec.

Vetchy Pier, Durban, N(30/31), 9 IV 1982, Mrs J. Maxwell, 2-3m, under rock, 1 spec.

Vetchy Pier, Durban, N(30/31), 27 IV 1982, Mrs J. Maxwell, 3 spec.

Perriers Rock, N(28/32/i), 13 VII 1968, A.S. Thandar, under rock, LWS, 4 spec.

Mission Rock, N(28/32/i), 12 VII 1968, A.S. Thandar, 1 spec.

Cape Vidal, N(28/32/i), 26 I 1967, A.S. Thandar, 2 spec.

Vilanculos, M(22°00'S, 35°20'E), 20 VI 1970, F.L. Farquharson, i, sand, 3 spec.

Thyone aurea (Quoy & Gaimard)

St. Helena Bay, C(32/18/i), 12 I 1980, A.S. Thandar, orange in life, 1 spec.

Saldanha Bay, C(33/17/i), 14 I 1980, A.S. Thandar, amongst Ciona, under rock, orange in life, 221 spec.

Thyone ?venusta Selenka

Isipingo Beach, N(29/30/i), ? IV 1980, K.S. Ganga, rock pool, brown with purple tips, calcareous ring lost, 1 spec.

Cladolabes bifurcatus (Deichmann)

Treasure Beach, Durban, N(29/30/S), 7 II 1982, Mrs J. Maxwell, brown, black tentacles, 1 spec.

Vetchy Pier, Durban, N(30/31/S), 9 IV 1982,
Mrs J. Maxwell, 2-3m, in rock crevice or under stone, 2 spec.

Umdloti Beach, N(29/31/i), ? III 1978, K.S. Ganga & R. Biseswar, rock pool, 1 spec.

<u>Ohshimella ehrenbergii</u> (Selenka)

Park Rynie, N(30/30/i), 20 III 1981, K.S. Ganga, under rock at night, greyish peach with black podia, 2 spec.

Vetchy Pier, Durban, N(30/31/S), ? VI 1982, Mrs J. Maxwell, 2-3m, 2 spec.

Perriers Rock, N(28/32/i), 13 VII 1968, A.S. Thandar, wedged in rock crevice, LWS, 3 spec.

Cape Vidal, N(28/32/i), 26 I 1967, A.S. Thandar, wedged in rock crevice on leeward side of wave washed rock, LWS, 10 spec.

Sordwana Bay, N(27/32/i), 29 I 1967, A.S. Thandar, under rock, 1 spec.

<u>Aslia spyridophora</u> (H.L. Clark)

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, under rock, greyish to maroon with rust-coloured suckers, 5 spec.

Buffels Bay, S. of Knysna, C(34/22/i), 20 I 1980, A.S. Thandar, under Rock, 1 spec.

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 13 spec.

Cape St. Francis, C(34/24/i), 26 I 1980, A.S. Thandar, under rock or in sand, 14 spec.

Fishpoint Light House, N.E. of Port Alfred, C (33/27/i), 31 I 1980, A.S. Thandar, under stone, 5 spec.

Embotyi, N. of Port St. Johns, T(31/29/i), 21 V 1977, A.S. Thandar, in soft conglomerates, 3 spec.

Perrier's Rock, N(28/32/i), 13 VII 1968, A.S. Thandar, under stone, in sand, 1 spec.

<u>Pentacta doliolum</u> (Pallas)

St. Helena Bay, C(32/18/i), 12 I 1980, A.S. Thandar, 1 spec.

<u>Pseudoaslia tetracentriophora</u> (Heding)

Skihaven, near De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, 2 spec.

Buffels Bay, near Knysna, C(34/22/i), 20 I 1980, A.S. Thandar, under rock at low tide, 2 spec.

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 4 spec.

Cape St. Francis, C(34/24/i), 26 I 1980, A.S. Thandar, under rock, 1 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i), 31 I 1980, A.S. Thandar, 3 spec.

<u>Pseudocnella insolens</u> (Théel)

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 2 spec.

Cape St. Francis, C(34/24/i), 26 & 27 I 1980, A.S. Thandar, in sand under stones, 163 spec.

<u>Pseudocnella sinorbis</u> (Cherbonnier)

Skihaven, near De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, 6 spec.

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, greyish brown, discs rust-coloured, 3 spec.

Buffels Bay, S. of Knysna, C(34/22/i), 20 I 1980, A.S. Thandar, 1 spec.

Cape St. Francis, C(34/24/i), 26 I 1980, A.S. Thandar, rust-coloured, 1 spec.

Jeffries Bay, C(34/24/i), 29 I 1980, A.S. Thandar, 3 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i), 31 I 1980, A.S. Thandar, 7 spec.

Park Rynie, N(30/30/i), 23 III 1981, K.S. Ganga, under rock, 3 spec.

Isipingo Beach, N(29/30/i), ? VI 1981, K.S. Ganga, 1 spec.

Umdloti Beach, N(29/31/i), 13 XI 1981, K.S. Ganga, 2 spec.

Tongaat Beach, N(29/31/i), 6 IX 1968, A.S. Thandar, 5 spec.

Cape St. Lucia, N(28/32/i),
9 VIII 1968, A.S. Thandar, 13 spec.
12 VI 1979, G.C. Naidu, 4 spec.

Perriers Rock, N(28/32/i), 13 VIII 1968, A.S. Thandar, 5 spec.

Cape Vidal, N(28/32/i), 26 I 1967, A.S. Thandar & L.G. Moodley, 11 spec.

Leven Point, N. of Cape Vidal, N(27/32/i), 25 I 1967, A.S. Thandar & L.G. Moodley, 21 spec.

Black Rock, S. of Kosi Bay, N(27/32/i), 7 II 1967, A.S. Thandar, 1 spec.

<u>Pseudocnella sykion</u> (Lampert)

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, in rock pool, 2 spec.

Buffels Bay, S. of Knysna, C(34/22/i), 20 I 1980, A.S. Thandar, 13 spec.

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 1 spec.

Cape St. Francis, C(34/24/i), 26 & 27 I 1980, A.S. Thandar, 17 spec.

Jeffries Bay, C(34/24/i), 29 I 1980, A.S. Thandar, 13 spec.

Port Elizabeth, C(34/25), no further data, 5 spec.

Kleinemond, C(33/27/i), 30 I 1980, A.S. Thandar, 8 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i), 31 I 1980, A.S. Thandar, 8 spec.

Banyana River, T(32/28/i), ? VI 1979, R. Kilburn, 1 spec.

Port St. Johns, T(31/29/i), 20 V 1977, A.S. Thandar, wedged in rock crevices, 39 spec.

Embotyi, N. of Port St. Johns, T(32/29/i), A.S. Thandar, in rock crevices and under stones, numerous juveniles, 66 spec.

Isipingo Beach, N(29/30/i),
20 IV 1968, A.S. Thandar, 16 spec.
31 V 1969, A.S. Thandar, 9 spec.
22 & 23 VII 1970, A.S. Thandar, 8 spec.
7 IX 1981, G.C. Naidu, juvenile, 1 spec.
21 IX 1981, G.C. Naidu, juvenile, under stone, 3 spec.
? VII 1982, K.S. Ganga, 1 spec.

Umdloti Beach, N(29/31/i), 13 XI 1981, G.C. Naidu, 1 spec.

Tongaat Beach, N(29/31/i), 6 IX 1968, A.S. Thandar, 6 spec.

Tinley Manor, N(29/31/i), 17 V 1965, A.S. Thandar, 18 spec.

New Guelderland, N. of Stanger, N(29/31/i), A.S. Thandar, 11 spec.

Perriers Rock, N(28/32/i), 29 I 1967, A.S. Thandar, 3 spec.

Mission Rock, N(28/32/i), 29 I 1967, A.S. Thandar, 7 spec.

Cape Vidal, N(28/32/i), 13 VIII 1966, A.S. Thandar, 28 spec.

Leven Point, N(28/32/i), 25 I 1967, A.S. Thandar, 5 spec.

Sordwana Bay, N(27/32/i), 29 I 1967, A.S. Thandar, 10 spec.

Black Rock, S. of Kosi Bay, N(27/32/i), 7 II 1967, A.S. Thandar, 4 spec.

Dog Point, N. of Black Rock, N(27/32/i), 8 II 1967, A.S. Thandar, 2 spec.

<u>Trachythyone crucifera</u> (Semper)

Vetchy Pier, Durban, N(30/31/S), 24 I 1982, Mrs J. Maxwell, 3m, beige with darker pedicels, 1 spec.

<u>Trachythyone sp.</u>

Cape Vidal, N(28/32/i), ? XII 1966, A.S. Thandar, under stone, 1 spec.

<u>Pawsonella africana</u> Gen. & sp. nov. (paratypes)

Sezela Beach, S. of Durban, N(30/30/S), 12 IV 1981, Miss G. Lambert, ½km offshore, 6m, temp. 24°C, amongst seaweed and bryozoans, 41 spec.

<u>Roweia frauenfeldi frauenfeldi</u> (Ludwig)

Saldanha Bay, Long Point, C(33/17/i), 14 I 1980, A.S. Thandar, 1 spec.

Skihaven, near De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, greyish brown, 25 spec.

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, under rock in sand, yellow to rust-coloured to maroon, 19 spec.

Buffels Bay, S. of Knysna, C(34//22/i), 20 I 1980, A.S. Thandar, 5 spec.

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 11 spec.

Cape St. Francis, C(34/24/i), 26 & 27 I 1980, A.S. Thandar, 50 spec.

Jeffries Bay, C(34/24/i), 29 I 1980, A.S. Thandar, 3 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i), 31 I 1980, A.S. Thandar, 14 spec.

<u>Roweia frauenfeldi webbi</u> (Thandar)

Transkei coast, R. Kilburn, ex Natal Museum, 1 spec.

Isipingo Beach, N(29/30/i)
31 V 1969, A.S. Thandar, rock pool, in sand, 5 spec.
? VI 1981, K.S. Ganga & R. Biseswar, rock pool, 1 spec.

Tinley Manor, N(29/31/i), 17 VI 1966, A.S. Thandar, 1 spec.

Black Rock, S. of Kosi Bay, N(27/32/i), 7 II 1967, A.S. Thandar, wedged in sandstone crevice, 6 spec.

Dog Point, N. of Black Rock, N(27/32/i), 8 II 1967, A.S. Thandar, 1 spec.

<u>Roweia stephensoni</u> (John)

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, rock pool, 14 spec.

Sea Vista, near Jeffries Bay, C(34/24/i), 27 I 1980, A.S. Thandar, 10 spec.

Cape St. Francis, C(34/24/i), 27 I 1980, A.S. Thandar, 9 spec.

Port Elizabeth, C(33/25), no further data, 7 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i), 31 I 1980, A.S. Thandar, 9 spec.

<u>Neostichopus grammatus</u> (H.L. Clark)

De Hoop, C(34/20/i), 17 I 1980, A.S. Thandar, 25 spec.

Buffels Bay, S. of Knysna, C(34/22/i), 20 I 1980, A.S. Thandar, 3 spec.

Knysna Lagoon, C(34/22/i), 22 I 1980, A.S. Thandar, 3 spec.

Cape St. Francis, C(34/24/i), 26 & 27 I 1980, A.S. Thandar, 12 spec.

Kleinemond , C(33/27/i), 30 I 1980, A.S. Thandar, 4 spec.

Fishpoint Lighthouse, N.E. of Port Alfred, C(33/27/i),
31 I 1980, A.S. Thandar, 2 spec.

Embotyi, N. of Port St. Johns, T(32/29/i), 21 V 1977,
A.S. Thandar, 1 spec.

Isipingo Beach, N(29/30/i)
20 IV 1968, A.S. Thandar, 1 spec.
24 IV 1978, K.S. Ganga, 1 spec.
IV & VI 1979, K.S. Ganga, 5 spec.
18 VIII 1980, K.S. Ganga, juvenile, 1 spec.

Vetchy Pier, Durban, N(30/31/S), 27 IV 1982,
Mrs Maxwell, 3m, 1 spec.

Umdloti Beach, N(29/31/i), ? III 1978, K.S. Ganga, 6 spec.

Mission Rock, N(28/32/i), 29 I 1967, A.S. Thandar, 3 spec.

Cape Vidal, N(28/32/i), 26 I 1967, A.S. Thandar, 4 spec.

Stichopus chloronotus Brandt

Vilanculos, M(22°00'E/35°20'S/i), 20 VI 1971,
F.L. Farquharson, sandy shore, 3 spec.

Stichopus variegatus Semper

Isipingo Beach, N(29/30/i), IV & VII 1979,
K.S. Ganga & G.C. Naidu, rock pool, 5 spec.

Vilanculos, M(22°00E/35°20'S/i), 20 VI 1971,
F.L. Farquharson, sandy shore, 1 spec.

<u>Actinopyga echinites</u> Jaeger

Isipingo Beach, N(29/30/i), rock pool
31 V 1967, A.S. Thandar, 2 spec.
29 II 1972, R. Biseswar, 1 spec.
13 I 1978, R. Biseswar, 1 spec.
14 IV 1978, K.S. Ganga, 2 spec.
24 IV 1978, K.S. Ganga, 5 spec.
? VII 1979, K.S. Ganga, 1 spec.

Mission Rock, N(28/32/i), 29 I 1967, A.S. Thandar, 1 spec.

<u>Actinopyga mauritiana</u> (Quoy & Gaimard)

Isipingo Beach, N(29/30/i), rock pool
? X 1968, A.S. Thandar, 2 spec.
23 VII 1970, A.S. Thandar, 2 spec.
3 IV 1978, K.S. Ganga, 1 spec.
24 IV 1978, K.S. Ganga, 1 spec.

Mission Rock, N(28/32/i), 29 I 1967, A.S. Thandar & L.G. Moodley, 15 spec.

Cape Vidal, N(28/32/i), 26 I 1967, A.S. Thandar, 3 spec.

<u>Holothuria (Cystipus) rigida</u> Selenka

Isipingo Beach, N(29/30/i), rock pool,
14 IV 1979, K.S. Ganga & G.C. Naidu, juvenile, 1 spec.
26 IV 1979, K.S. Ganga & G.C. Naidu, 2 spec.
22 VIII 1979, K.S. Ganga & G.C. Naidu, eviscerated, 1 spec.
? VII 1980, K.S. Ganga, 1 spec.
31 VIII 1981, K.S. Ganga, 1 spec.
27 IV 1982, K.S. Ganga, 1 spec.

<u>Holothuria (Halodeima) atra</u> Jaeger

Vilanculos, M(22°00'S/33°20'E/i), 20 VI 1971, F.L. Farquharson, sandy shore, 2 spec.

<u>Holothuria (Lessonothuria) insignis</u> Ludwig

Park Rynie, N(30/30/i), 9 III 1981, K.S. Ganga,
rock pool, under rock, 1 spec.

Isipingo Beach, N(29/30/i), ? VII 1982, K.S. Ganga,
juvenile, 1 spec.

Vetchy Pier, Durban, N(30/31/S), Mrs Maxwell,
9 IV 1982, 2-3m, under stone, 1 spec.
27 IV 1982, 6m, 1 juvenile, 4 spec.

<u>Holothuria (Lessonothuria) tuberculata</u> sp. nov. (holotype)

Isipingo Beach, N(29/30/i), 24 IV 1978,
rock pool, under stone, 1 spec.

<u>Holothuria (Mertensiothuria) leucospilota</u> Brandt

Embotyi, N. of Port St. Johns, T(32/29/i),
2 IV 1977, A.S. Thandar, under rock, 1 spec.

Park Rynie, N(30/30/i), 9 III 1981, K.S. Ganga,
rock pool, 2 spec.

Isipingo Beach, N(29/30/i), rock pool
31 V 1969, A.S. Thandar, 1 spec.
3 XI 1971, R. Biseswar, 1 spec.

Durban Area, ex Natal University, X 1971, 6 spec.

Cape Vidal, N(28/32/i), 12 VIII 1966, 1 spec.

<u>Holothuria (Metriatyla) scabra</u> Jaeger

Vilanculos, M(22°00'S/35°20'E/i), 20 IV 1971,
F.L. Farquharson, sandy shore, 2 spec.

<u>Holothuria (Platyperona) difficilis</u> Semper

North Pier, Durban, N(30/31/S), 8 X 1977,
G.C. Naidu, juvenile, 1 spec.

Vetchy Pier, Durban, N(30/31/S), Mrs Maxwell
9 IV 1982, 1-2m, under rock, 2 spec.
27 IV 1982, 6m, 1 spec.

<u>Holothuria (Selenkothuria) erinaceus</u> Semper

Isipingo Beach, N(29/30/i), 13 X 1969,
A.S. Thandar, rock pool, eviscerated, 1 spec.

<u>Holothuria (Selenkothuria) parva</u> Lampert

Park Rynie, N(30/30/i),
20 III 1981, R. Biseswar, 1 spec.
8 VII 1982, R. Biseswar, 1 spec.

Isipingo Beach, N(29/30/i)
23 VII 70, A.S. Thandar, 3 spec.
8 & 11 VI 1979, K.S. Ganga & G.C. Naidu, 2 spec.

Cape Vidal, N(28/32/i), 12 VIII 1966,
A.S. Thandar, 1 spec.

<u>Holothuria (Semperothuria) cinerascens</u> (Brandt)

Embotyi, N. of Port St. Johns,, T(32/29/i), 21 VI 1977,
A.S. Thandar, rock pool, 1 spec.

Isipingo Beach, N(29/30/i)
31 V 1969, A.S. Thandar, rock pool, 4 spec.
23 VII 1970, A.S. Thandar, 10 spec.
? VII 1979, K.S. Ganga, 1 spec.

Perriers Rock, N(28/32/i), 13 IX 1968, A.S. Thandar, 2 spec.

Mission Rock, N(28/32/i)
29 I 1967, A.S. Thandar, 10 spec.
13 IX 1968, A.S. Thandar, 5 spec.

Cape Vidal, N(28/32/i), 12 VIII 1966, 7 spec.

Leven Point, N(28/32/i), 22 I 1967, 1 spec.

Sordwana Bay, N(27/32/i), 29 I 1967, 8 spec.

Dog Point, S. of Kosi Bay, N(27/32/i), 8 II 1967, 1 spec.

<u>Holothuria (Thymiosycia) arenicola</u> Semper

Park Rynie, N(30/30/i), 20 III 1981, K.S. Ganga, in sand, under rock ledge, 1 spec.

Isipingo Beach, N(29/30/i), 22 VII 1970, A.S. Thandar, between sandstone slabs, juvenile, 1 spec.

Treasure Beach, Durban, N(29/30/i), 21 VII 1974, F.L. Farquharson, in sand, under rock ledge, 1 spec.

Mission Rock, N(28/32/i), 12 VII 1968, A.S. Thandar, 1 spec.

<u>Holothuria (Thymiosycia) hilla</u> Lesson

Isipingo Beach, N(29/30/i), 26 IV 1979, K.S. Ganga & G.C. Naidu, rock pool, juvenile, 1 spec.

<u>Euapta godeffroyi</u> (Semper)

Isipingo Beach, N(29/30/i), 26 IV 1979, 22 VIII 1979, K.S. Ganga & G.C. Naidu, 2 spec.

<u>Leptosynapta knysnaensis</u> (Cherbonnier)

Knysna (Leisure Island), C(34/22/i), 21 I 1980, A.S. Thandar, among <u>Zostera</u> roots, 17 spec. + 21 fragments

Cape St. Francis, C(34/24/i), 26 I 1980, under stones, in sand, 2 spec. + 4 fragments

<u>Leptosynapta naiga</u> sp. nov. (holotype and paratypes)

Isipingo Beach, N(29/30/i), K.S. Ganga & G.C. Naidu
11 V 1979, 7 spec.
11 VI 1979, 6 spec.
22 VIII 1979, 2 spec.

<u>Chiridota rigida</u> Semper

Park Rynie, N(30/30/i), 9 III 1981, K.S. Ganga, brick red in life, 1 spec.

Vilanculos, M(22°00'S/35°20'E/i), 20 VI 1971, F.L. Farquharson, sandy shore, 2 spec.

SOUTH AFRICAN MUSEUM

Miscellaneous Collections

<u>Stolus buccalis</u> (Stimpson)

Inhaca Is., M(26/32,33), ? IX 1919, H.G. Breyer & Adendorff, 1 spec.

<u>Thyone aurea</u> (Quoy & Gaimard)

Agate Beach, Luderitz Bay, SWA (26/15), 18 II 1969, B. Kensley, M.J. & M.L. Penrith, A22748, 1 spec.

Agate Beach/Diaz Point, Luderitz Bay, SWA (26/15), 17/18 II 1969, B. Kensley, M.J. & M.L. Penrith, A 22746, as <u>Pentacta doliolum</u>, 1 spec.

Off Orange River mouth, C(28/16), Emmerson, K., A22678, 10 spec.

Saldanha Bay, C(33/17), Division of Fisheries St. D-430, A22667, as <u>Holothuria</u>, 7 spec.

Central Banks, Langebaan Lagoon, C(33/18), ? V 1961, UCT, A22632, 5 spec.

Woodstock Power Station, Cape Town, C(33/18), 1 VI 1961, J.R. Grindley, A22634, 5 spec.

Devon Dock, Cape Town, C(33/18), sucked in through Power Station water supply, 3 spec.

Off S.W. Cape, St. E1181, 33°39,5'S, 18°24,1'E, dredge, 12,8m, 1 spec.

Off S.W. Cape, St. E1178, 33°51'S, 18°28'E, 5 spec.

Kalk Bay, C(34/18), ? X 1931, C.L. Biden, washed up on shore, 4 spec.

Simonstown Harbour, C(34/18), 10 IV 1958, 15m, F.H.T., pink in life, 1 spec.

<u>Neothyonidium arthroprocessum</u> sp. nov. (paratype)

Muizenberg Beach, C(34/18), IV 1963, Mrs Kerr, 1 spec.

<u>Aslia spyridophora</u> (H.L. Clark)

Port Shepstone, N(30/30), J.R. Ivy, T.M. 7427 (INV.), 17 spec.

<u>Pentacta doliolum</u> (Pallas)

Diaz Point/Agate Beach, Luderitz Bay, SWA (26/15), 17/18 II 1969, B. Kensley, M.J. & M.L. Penrith, A22746, six labels in jar, 27 spec.

Griffiths Bay, Luderitz, SWA (26/15), 18 III 1968, A22730, as <u>Cucumaria</u> sp., 1 spec.

Agate Beach, Luderitz, SWA (26/15), 18 II 1962, B. Kensley, M.J. and M.L. Penrith, A22749, in kelp holdfast, 1 spec.

Off Orange River Mouth, C(28/16), Emmerson, K., A22696, 2 spec.

Schaapen. Is., Langebaan, C(33/18), 24 IV 1962, J.R. Grindley, A22644, under rock, 11 spec.

Salt River Power Station, Table Bay, C(33/18), ? VIII 1961, Mr Meek, A22640, 1 spec.

Off S.W. Cape, St. E1181, 33°39'S, 18°24,1'E, dredge, 12,8m, 2 spec.

Off S.W. Cape, St. E1178, 33°51'S, 18°28'E, 9 spec.

Off S.W. Cape, 27 XI 1968, St. E1185, 33°52'2"S, 18°28'8"E, dredge, 14,6m, 1 spec.

Off S.W. Cape, St. E1185, 33°53'S, 18°28'E, dredge, 11m, 1 spec.

Simonstown Harbour, C(34/18), 10 IV 1958, F.H.T., 15m, grey in life pale ventrally, 5 spec.

<u>Pseudocnella insolens</u> (Théel)

Luderitz Bay, SWA (26/15), as <u>Pentacta doliolum</u>, 1 spec.

Saldanha Bay, C(33/17), Division of Fisheries St. D-430, A22668 as <u>Holothuria</u>, 19 spec.

Simonstown Harbour, C(34/18), 10 IV 1958, 15m, 2 spec.

Dalebrook, False Bay, C(34/18), 6 I 1982, A22637, 1 spec.

Sunny Cove, False Bay, C(34/18), 29 II 1969, 15m, M.J.P., 10 spec.

Pseudocnella sinorbis (Cherbonnier)

Port Shepstone, N(30/30), J.R. Ivy, T.M. 7427 (INV.), 2 spec.

Pseudocnella sykion (Lampert)

Port Alfred, C(33/26), 11 I 1911, R.H. Investigator, 3 spec.

Vetchy Pier, Durban, N(30/31), 28 V 1917, H.W. Bell-Marley, black, white tentacles, 1 spec.

Vetchy Pier Durban, N(30/31), 5 VIII 1917, H.W. Bell-Marley, 1 spec.

Trachythyone rigidapeda (Cherbonnier)

Off Orange River Mouth, 190-240km, C(28/14), Dramond dredge, A22712, 1 spec.

Pawsonella ? africana sp. nov.

Namaqualand South, C(30/17), ? I 1964, A22727, 1 spec.

Roweia frauenfeldi frauenfeldi (Ludwig)

Rocky Point, SWA(18-19/12), 13-15 VI 1969, B. Kensley, M.L. Penrith, C.G. Coetzee, A22754, 5 spec.

Torra Bay, SWA(20°28'S, 13°15'E), 5 XI 1968, C.G. Coetzee, A22738, as Cucumaria sykion, 9 spec.

Off Orange River Mouth, C(28/16), Emmerson, K, A22677, 2 spec.

Port Alfred, C(33/26), 11 I 1911, R.H. Investigator, 1 spec.

Roweia stephensoni (John)

Kalk Bay, C(34/18), ? X 1931, C.L. Biden, washed up on shore, 3 spec.

Port Alfred, C(33/26), 11 I 1911, R.H. Investigator, 5 spec.

<u>Rhopalodinopsis capensis</u> (Heding)

Off Orange River Mouth, C(28/16), Emmerson, K., 3 spec.

<u>Neostichopus grammatus</u> (H.L. Clark)

Still Bay, C(34/21), 8 V 1963, L. Kerr, under rocks, bright red in life, A22656, 1 spec.

Bluff, Durban, N(30/31), 1917, H.W. Bell-Marley, 1 spec.

Vetchy Pier, Durban, N(30/31), 5 VIII 1917, H.W. Bell-Marley, 1 spec.

<u>Actinopyga echinites</u> (Jaeger)

Cape Vidal, N(28/32), ? VI 1971, B. Kensley, 1 spec.

Zavora, M(24/35), 15 VI 1971, B. Kensley, 1 spec.

<u>Actinopyga mauritiana</u> (Quoy & Gaimard)

Zavora, M(24/35), 15 VI 1971, B. Kensley, 3 spec.

<u>Holothuria (Lessonothuria) pardalis</u> Selenka

Inhaca Is., M(26/32,33), ? VI 1971, B. Kensley, 4 spec.

<u>Holothuria (Mertensiothuria) leucospilota</u> Brandt

Inhaca Is., M(26/32,33), ? VI 1971, B. Kensley, 1 spec.

<u>Holothuria (Metriatyla) scabra</u> Jaeger

Inhaca Is., M(26/32,33)
? X 1912, K.H. Barnard, sandy shore, light grey, black speckles, No.305, 4 spec.
1 X 1919, H.G. Dreyer, A. Adendorff, 2 spec.
? VI 1971, B. Kensley, 3 spec.

<u>Holothuria (Roweothuria) vemae</u> Subgen. & sp. nov. (holotype & paratypes)

Vema Seamount, 724km off West coast, 31°38'S, 18°20'E,
? IX 1965, Ship "Justin", A22713, 1 spec.
? XI 1966, G.R. Grindley, scuba diving or air-lift dredge, 42-61m, A22717, 3 spec.
A22718, 1 spec.

Holothuria (Selenkothuria) parva Lampert

Inhaca Is., M(26/32,33), ? IX 1919, H.G. Dreyer & A. Adendorff, 1 spec.

Holothuria (Semperothuria) cinerascens (Brandt)

Bluff, Durban, N(30/31), 6 V 1917, H.W. Bell-Marley, 1 spec.

Inhaca Is., M(26/32,33), ? VI 1971, B. Kensley, 3 spec.

Holothuria (Theelothuria) ? maculosa Pearson

Inhaca Is., M(26/32,33), ? VI 1971, B. Kensley, 1 spec.

Synapta oceanica Lesson

Inhaca Is., M(26/32,33), ? VI 1971, B. Kensley, 2 fragments

Africana II Cruises

A 190, W. of Dassen Island, 33°26'S, 16°33'E, 26 VIII 1959, 15'Beam trawl, 2268-2377m

A22149 Ypsilothuria bitentaculata (Ludwig), 9 spec.

Elpidia gracilis Belyaev austroafricana subsp. nov., 1 spec. + fragments

A 191, W. of Dassen Island, 33°36'S, 16°15'E, 26 VIII 1959, 15' Beam trawl, 2780-2871m.

A22165 Laetmogone perplexa sp. nov. (holotype), 1 spec.

Benthodytes lingua R. Perrier, 1 spec.

Benthodytes valdiviae Hansen, 2 spec.

A 193, W. of Cape Town, 33°50'S, 17°21'E, 26 VIII 1959, 2268m.

A22147 Scotoplanes globosa Théel, 2 spec.

A 315, W. of Cape Point, 34°37'S, 17°03'E, 2890-2963m.

A22150 Ypsilothuria bitentaculata (Ludwig), 3 spec.

A 322, W. of Cape Point, 34°36'S, 17°00'E, 10 XII 1959, 2743m.

A22163 Molpadia ? abyssicola Pawson.

A 319, W. of Cape Peninsula, 34°05'S, 16°58'E, 9 XII 1959, 2688-2725m.

A22141 Molpadia sp. indet.

A316, S.W. of Cape Point, 34°42'S, 16°54'E, 8 XII 1959, 15' Beam trawl, 3155-3255m.

A22130 Echinocucumis hispida (Barrett), 1 spec.

A22143 " " " 3 spec.

A22145 Psolidothuria octodactyla Gen. & sp. nov. (paratype), 1 spec.

A22146 Trachythyone ?parva (Ludwig), 1 spec.

A318, W. of Cape Peninsula, 33°52'S, 16°51'E, 9 XII 1959, 15' Beam trawl, 2524-2780m.

A22132 Echinocucumis hispida (Barrett), 1 spec.

A22164 " " " 2 spec.

" Psolidothuria octodactyla Gen. & sp. nov. (holotype & paratypes), 3 spec.

A22132 Ypsilothuria bitentaculata (Ludwig), 6 spec.

A22144 " " " 1 spec.

A319, W. of Cape Town, 34°05'S, 16°58'E, 9 XII 1959, 2688-2725m.

A22139 Ypsilothuria bitentaculata (Ludwig), 4 spec.

A322, S.W. of Cape Point, 34°36'S, 17°00'E, 2743m,

A22148 Ypsilothuria bitentaculata (Ludwig), 6 spec.

Meiring Naude Cruises

SM 15, off Sordwana Bay, Natal, 27°31,5'S, 32°45,6'E,
25 V 1975, beam trawl, 280-454m.
Mesothuria parva (Théel), 2 spec.

SM 38, off St. Lucia, Natal, 28°21,9'S, 32°34,6'E,
28 V 1975, beam trawl, 775-825m
Pseudostichopus echinatus sp. nov. (holotype), 1 spec.

SM 72, off Sibaya, Natal, 27°17,8'S, 33°04,5'E,
20 V 1976, beam trawl, 1050m
Orphnurgus aspersignis sp. nov. (holotype & paratypes), 5 spec.
Orphnurgus insignis Fisher, 2 spec.

SM 74, off Umpangazi, Natal, 27°38,6'S, 32°52,6'E,
21 V 1976, beam trawl, 860m
Orphnurgus insignis Fisher, 6 spec.
Orphnurgus natalasper sp. nov. (holotype), 1 spec.

SM 77, off Sordwana Bay, Natal, 27°31,6'S, 32°50'E,
21 V 1976, heavy dredge, 780m
Orphnurgus aspersignis sp. nov. (paratype), 1 spec.