

**Bangor University**

## **DOCTOR OF PHILOSOPHY**

**The biodiversity and biogeography of shallow-water flora and fauna of the Western Indian ocean:  
with special reference to the Polychaeta, Mollusca and Echinodermata**

Richmond, M.D.

*Award date:*  
1998

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University of Wales, Bangor

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**THE BIODIVERSITY AND BIOGEOGRAPHY OF SHALLOW-  
WATER FLORA AND FAUNA OF THE WESTERN INDIAN  
OCEAN, WITH SPECIAL REFERENCE TO THE  
POLYCHAETA, MOLLUSCA AND ECHINODERMATA**

by

Matthew D. Richmond

BSc Southampton University, 1984  
MSc University of Wales – Bangor, 1989

A thesis submitted in fulfilment of requirements for the degree  
of Philosophiae Doctor in the University of Wales - Bangor.



University of Wales - Bangor  
School of Ocean Sciences  
Menai Bridge  
LL59 5EY, Anglesey,  
Gwynedd, North Wales, UK

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**This thesis is dedicated to my Parents**

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## SUMMARY

The biodiversity and biogeography of the western Indian Ocean shallow-water marine flora and fauna was examined with special emphasis on Polychaeta, Mollusca (excluding Opisthobranchia) and Echinodermata. A collection of predominantly eulittoral polychaetes from Zanzibar and Mafia (Tanzania) revealed a minimum of 91 species, of which 29 % are reported to occur across the Indian Ocean to the West Pacific, and 21 % are regarded as 'cosmopolitan'. Taxonomic problems associated with this taxon are discussed. Over 3,200 species of shelled Mollusca have been reported from the region, though the overall diversity of the groups are likely to be less due to the presence of many synonyms within the taxa which remain to be resolved. Of those families which have been taxonomically reviewed, it appears that the western Indian Ocean supports up to 15-20 % endemism, with noticeable differences in species diversity between the mainland of Africa and the western Indian Ocean islands, especially among bivalves. A total of 419 species of echinoderms are now known from this region, with 107 species (25 %) endemic. About 84 % of the non-endemic species are reported from several localities across the Indian Ocean to the West Pacific. Differences in the diversity of this group between mainland Africa-Madagascar and the western Indian Ocean islands are shown and possible reasons discussed.

Origins of the marine macro-invertebrate taxa in the western Indian Ocean include the maintenance of ancient Tethyan Sea fauna and larval (or adult) dispersal across the northern Indian Ocean. The possibility of species diversity being a function of coastline length was briefly investigated.

The preparation of *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*, describing over 1,600 species, forms part of the work of this thesis and provides a baseline of taxonomic information for macrofauna and flora. From the latter, together with predictions provided by specialists, an estimate of about 10,000 species of shallow-water marine macrofauna and flora are found in this region. It is acknowledged that taxonomic problems affect many invertebrate taxa which require additional attention before estimates can be defined more precisely. Continued taxonomic research and dissemination of biodiversity findings are considered priorities to help stem the degradation and misuse of marine resources of this region resulting from human exploitation which is expected to increase considerably over the coming decades.

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**CHAPTER 1**  
**THE WESTERN INDIAN OCEAN**

## INTRODUCTION

It has become widely accepted that the rate of human development, especially in the coastal zone, has resulted in a threat to the very existence of the marine communities on which much of that human development depends (e.g. Safina, 1995, Gaston & Spicer, 1998). The coastal nations of the world agreed in 1992 at the Conference on Environment and Development (UNCED) in Rio de Janeiro that the protection of coastal environments to ensure sustainable use of natural resources was a priority. However, before the coastal environment can be effectively managed and preserved, the biological diversity has to be documented (Ziegler & Krupp, 1996). Assessments of biodiversity, be they measured as species numbers or as the sum of all species interaction, require considerable taxonomic experience, access to biological collections and literature, and specialist equipment. Documenting the effects of human impacts on marine habitats and species is vital, as the potential for habitat destruction and species extinctions are high. Information on the biological, ecological, geological and oceanographic characteristics and processes of marine environments must be gathered if coastal zone management is to be successful. Unfortunately, the economic realities facing many developing countries means very that little of the needed research is being undertaken (Holthus & Maragos, 1995).

Taxonomic studies began in Europe and developed rapidly after the establishment of the *System Naturae* by the Swedish naturalist Carl Linnaeus in 1753. Over the following 200 years exploratory voyages and expeditions by natural scientists generated a vast wealth of information regarding species diversity and biogeography of marine taxa. By the mid 1900's continued studies depended on the newly emerging countries maintaining links with the European scientific institutions which had visited earlier. For many parts of the tropics these links dwindled and only in a few tropical countries has the local scientific base grown to continue the research. Only 6 % of the world's taxonomists are presently located in tropical developing countries, yet these countries hold by far the greatest number of species (May, 1994). For much of Africa, the south Pacific Ocean islands, south east Asia and south and central America, inventories of marine habitats with accurate taxonomic descriptions of contained species have ceased to develop. Consequently, in large parts of the tropics a lack of knowledge on much of the biota present forms a severe constraint to tropical marine biodiversity management, both for decision makers and the general public. This is also true



of terrestrial ecosystems but more extreme with respect to marine systems. Without detailed knowledge of what constitutes a pristine habitat or community, assessment and monitoring of changes imposed through human development cannot be made and there is an increasing danger of the acceptance of modified marine habitats and communities as the normal baseline. The present loss of biodiversity globally is thus of great concern. This is particularly true within the western Indian Ocean which forms the focus of this study.

The main aims of this study are:

1. The establishment of an inventory of the characteristic western Indian Ocean intertidal and shallow subtidal flora and fauna.
2. The description of the geographical distribution of the above flora and fauna.
3. A comparison of the shallow-water marine biodiversity of the western Indian Ocean with that from other marine regions.
4. The production of an illustrated field guide to the common and representative intertidal and shallow subtidal flora and fauna of the region to promote awareness and aid further taxonomic and ecological research.

The remainder of this introductory section includes a definition of the region, a description of the geomorphological characteristics, followed by a summary of the knowledge of the biological aspects and species diversity, and finally a synopsis of the human activities in the region which affect the coastal zone. These topics are further expanded in the introduction, appendix and bibliography of the field guide (Richmond, 1997) which forms part of this thesis.

While the present author (Matthew D. Richmond) is responsible for this thesis and for much of the research contributing to the field guide, completion of the latter would have been impossible without contributions by specialists to many of the taxonomic groups. Grateful acknowledgements are given at the start of the guide and under each section as well as in Chapter 2 of this thesis to clarify the contributions by this author.

## DEFINITION OF THE WESTERN INDIAN OCEAN

Although defining regions on the global surface is largely an arbitrary exercise, it is viewed as essential to provide a focus on a given area. The area defined as the western Indian Ocean (WIO) for the purpose of this study is shown in Figure 1. This region stretches from about central Somalia (5°N) to Natal in South Africa (at 30°S) and embraces the islands of Madagascar, Comoros, Réunion, Mauritius (the latter two also referred to as the Mascarenes) and the Seychelles. The total area within the region is about 15 million km<sup>2</sup>. With the exclusion of South Africa, this region is also defined by the United Nations Environment Programme (UNEP) as 'Eastern Africa'. For reasons which will be explained below, this region is also characterised by certain geomorphological, oceanographical and biological features which partially separates it from neighbouring seas.

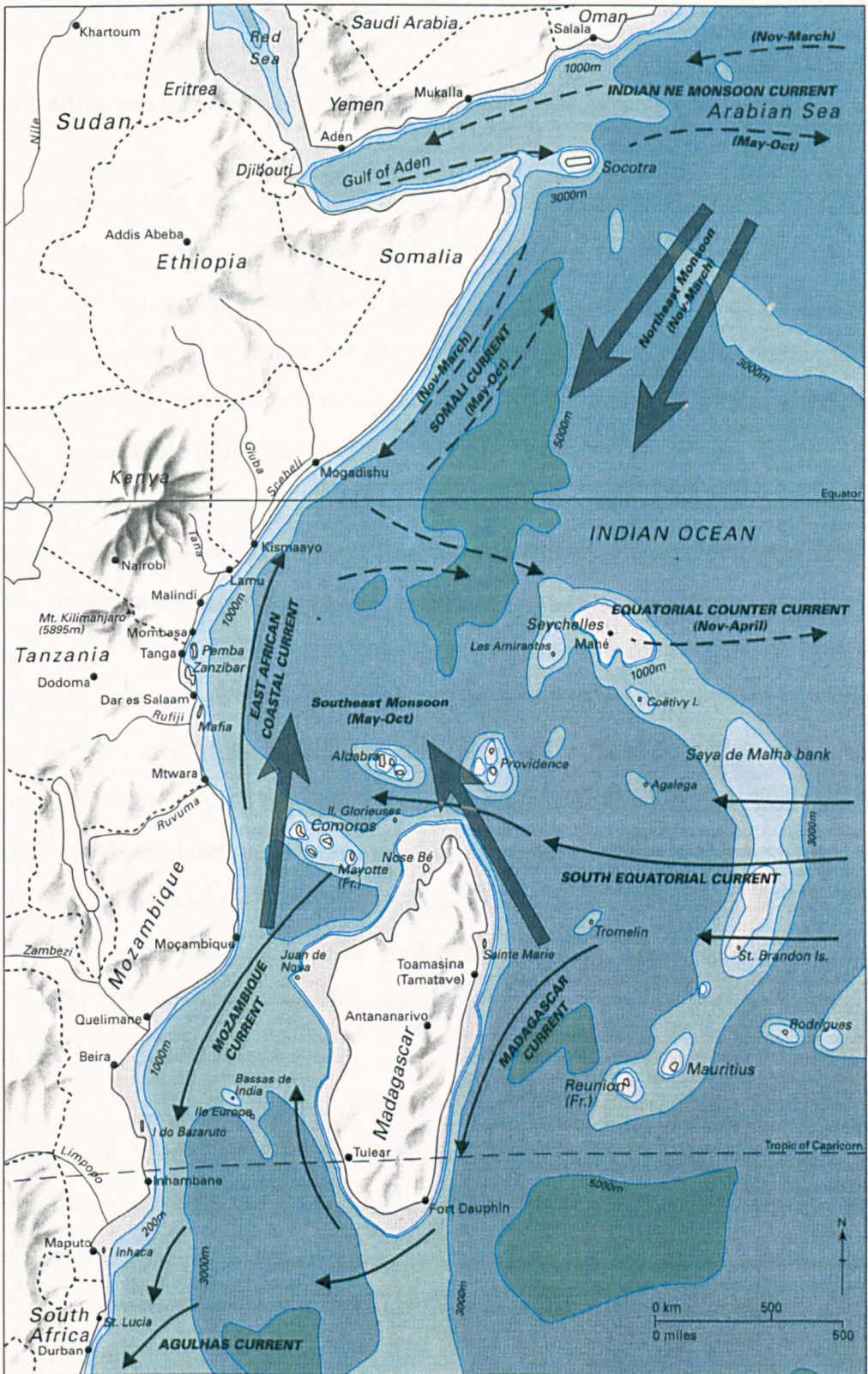
## GEOMORPHOLOGY OF THE REGION

The total length of the coastline within the WIO region defined above is 11,612 km, based on data from Couper (1989). The shoreline of Madagascar extends for 4,828 km in length; that of the WIO islands (Mascarenes and Seychelles) extends to only 858 km, and that of mainland Africa, from central Somalia to Durban, to 5,586 km. The width of the continental shelf, defined as the distance to the 200 m depth contour, varies greatly within this region and is not related to coastline length. In general the shelf of mainland Africa and Madagascar is narrow, rarely extending more than 15-30 km from shore. The Mascarene islands are of volcanic origin and have virtually no continental shelf with the shore dipping steeply to 2000 m within 10-20 km from shore. The Seychelles are unique in that they reside on a wide, shallow continental shelf, greatly disproportionate to the length of the coastlines of these islands (see Figure 2). This plateau, known as the Seychelles Plate is of ancient geological origin, mostly granitic, and associated with the breakup of Gondwanaland during the Cretaceous Period (70-135 million years ago). The Seychelles are also unique as continental islands in an oceanic situation. In addition to the few granitic islands, the Seychelles also include another 74 islands which are of limestone (carbonate) origin, principally of coral rock on the tops of more recent, submerged volcanoes. One other area of submerged shelf which is also unique to the Indian Ocean is the Saya de Malha Bank,

Figure 1. The Indian Ocean, with 'Area covered' representing the western Indian Ocean.



Figure 2. Ocean currents, monsoon winds and water depths prevalent in the western and northwestern Indian Ocean.



part of the Mascarene Ridge. This large bank stretches from north of Mauritius almost to the Seychelles Plate, but unlike the latter, is believed to be composed of coralline sediments on top of volcanic rock (Francis & Shor, 1966).

### **Climate and Ocean Currents**

The climate throughout this region is dominated by the trade winds. Unlike those of the Atlantic and Pacific Oceans, the trade winds of the Indian Ocean reverse their direction during the year and are the driving force behind the two monsoon seasons (McClanahan, 1988). During November to March the NE monsoon winds blow, bringing warm moist air to most of the region. In the southern and northern fringes of the WIO, this period is also marked by the presence of tropical cyclones. Winds of over 100 km hr<sup>-1</sup> are not uncommon during cyclones and the resulting waves of 14 m or more can have devastating impacts on coastal habitats and human settlements. Following the NE Monsoon is a period of about 3-4 months of persistent rain and light, variable winds, associated with a general reduction in air temperature from 29-33° C to 23-27° C . During this period inshore waters may experience a sharp decrease in salinity from the usual 35 ppt to 10 ppt or less close to large river estuaries. By the end of May the winds have swung round to the south and the SE monsoon blows steady and strong until November. This period is usually cooler and less humid but seas can be rough and inshore turbidity high. The changing direction of the monsoons, apart from influencing the weather and rainfall, also affects coastal currents and thus inshore mixing of the region. The regular and predictable monsoon winds have also permitted sailing vessels to travel up and down this region and northwards to Arabia with relative ease over the last 2,000 years.

The main ocean current of the central Indian Ocean is the Equatorial Current, with movement from the eastern Indian Ocean towards East Africa at about 10-15°S (see Figure 2). This current divides and then continues north forming the East Africa Coastal Current (EACC) and south forming the Moçambique Current which passes down the Moçambique Channel and into the colder waters off South Africa. The northward EACC is affected by the monsoon winds and its extension towards Arabia is dependent on the season. During the SE monsoon period the EACC extends as far as northern Somalia where it diverts

eastwards and then follows a clockwise movement through the Arabian Sea. During the NE monsoon the EACC meets the southerly Somali Current at about 3°S, but the latter may extend as far south as Zanzibar, at about 6°S, depending on the strength of the NE monsoon winds (Leetman & Truesdale, 1972). During this season the confluence of these opposing currents results in the Equatorial Counter Current which extends eastwards across the Indian Ocean from about 2°N-5°S depending on the strength of the NE monsoon.

The net result of the coastal currents in this region is that they encourage the continental distribution of species arising on the African coast (Taylor, 1971). The exchange of surface waters between the WIO Islands would appear to be predominantly from east to west with a seasonal eastward exchange only around the Equator. On the whole however, there is surprisingly little detailed, factual information about large scale mixing in the Indian Ocean (Sheppard, *in press*).

Sea water temperature is also influenced by the changing direction of the monsoonal winds. During the cooler SE monsoon season (May-October), surface temperatures throughout most of the WIO are 23-27° C (see Figure 3). A noticeable feature of the northwest Indian Ocean during this season is an area of upwelling off NE Somalia and southern Oman which brings cool, nutrient-rich waters to the surface, reducing sea surface temperatures in that area to about 17° C (Smith, 1983; Sheppard *et al.*, 1992) as shown in Figure 3. This area acts a temperature barrier at the northern extreme of the WIO. Sea surface temperatures increase from August to summer maximums during the NE monsoon of 25-32° C throughout the WIO. At the southern extreme of the region, around the port of Natal in South Africa, sea surface temperatures rarely exceed 24° C and drop to about 20° C in the winter forming a southern temperature barrier, in an area which can be regarded as a transition zone between tropical and temperate regimes.

Figure 3. Mean monthly (night-time) sea surface temperature for the Indian Ocean and adjacent waters, for months of the two monsoon periods. Source: NOAA website Sea Surface Temperature (SST) (NOAA, 1998).



August 1994



December 1994



Key to temperature (C)

Sea surface temperatures not only help define the northern and southern limits of the WIO, but are critical to the development of coral reefs and associated marine biota. The limiting temperature to coral reef growth is about 16° C, with an ideal range of 20-27° C. The upwelling of cool waters off Somalia mentioned above prevents the development of typical tropical biotopes such as coral reefs (Debelius, 1993). The 20° C isotherm is widely accepted as demarcating the extent of the world's waters in which truly tropical marine biota can develop. Across the Indian and Pacific Ocean, which are linked through the Malay-Indonesian archipelagos, this isotherm extends from Africa in the west to Hawaii and French Polynesia in the east. This entire area is referred to as the Indo-Pacific region (see Figure 4). Also known as the Indo-West Pacific, this region represents the largest biogeographic province on earth (Ekman, 1953; Gosliner *et al.*, 1996) within which many marine taxa are widespread.

## Tides

Tides in the WIO are mostly semi-diurnal but tidal ranges are of two quite different magnitudes. Most localities between northern Kenya (1°S) and Maputo (26°S), including the west coast of Madagascar and the Aldabra group of islands, experience a spring tidal range of between 2-4 m. In contrast, the east coast of Madagascar, the Mascarenes and the Seychelles experience much smaller tides, with spring ranges of only a metre or less (see Table 1). Of note is that the local times of low water are virtually the same for the mainland Africa and Madagascar coasts which experience similar tidal ranges, as shown in Table 1. The resulting coastline length, which is therefore subjected to very similar tidal patterns, extends for approximately 8,500 km, or about 73 % of the total coastal length of the region.



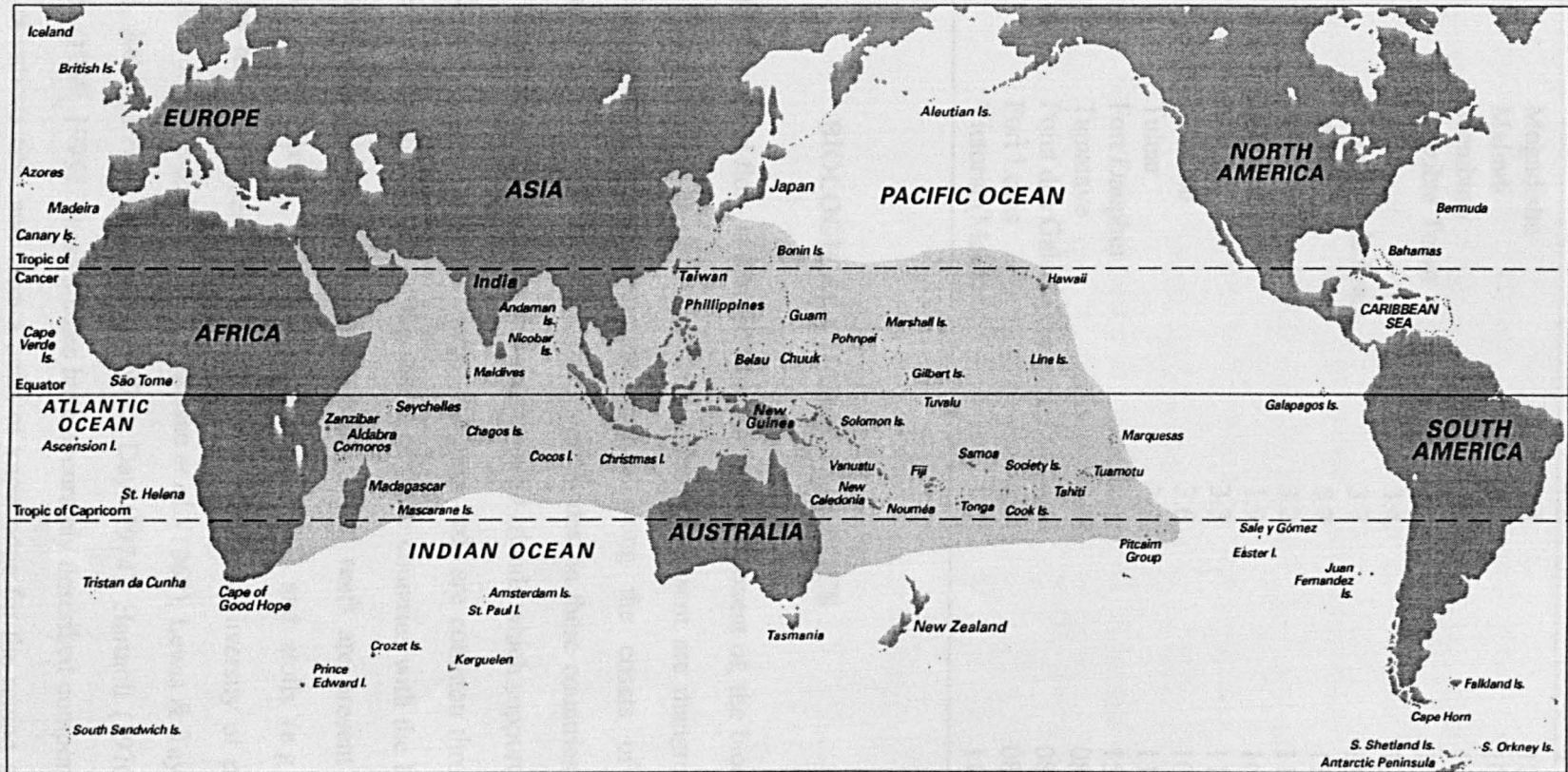


Figure 4. Major oceans and islands of the Indo-Pacific region (shaded area).

Table 1. Approximate spring tidal ranges and local times of low spring tides for selected ports in the western Indian Ocean.

Country	Port	Spring tidal range (m)	Mean local time of low spring time
Somalia	Mogadishu	2.1	10:45
Kenya	Malindi	3.1	10:40
	Mombasa	3.6	10:30
Tanzania	Zanzibar Town	3.6	10:40
	Lindi	3.4	10:50
Moçambique	Mocimbo da Praia	3.7	11:30
	Beira	5.7	11:40
	Maputo	3.2	11:10
South Africa	Durban	1.9	10:40
Comoros	Moroni	3.3	11:00
Madagascar	Nose Bé	3.6	10:40
	Tulear	2.7	11:30
	Fort Dauphin	0.7	15:20
	Tamatave	0.6	08:45
	Point des Galets	0.4	08:45
Réunion	Point des Galets	0.4	08:45
Mauritius	Port Louis	0.5	08:00
Seychelles	Victoria (Mahe)	1.2	11:00

### BIOLOGICAL CHARACTERISTICS

The WIO coastal fauna and flora is derived from, or is a component of, the biodiversity of the huge Indo-Pacific region, as defined above. Typically present are mangrove forests, especially well-developed in the estuarine regions along the coasts of Tanzania, Moçambique and Madagascar. Intertidal expanses are widest in these countries due to the relatively large tidal ranges, compared to the smaller WIO islands which support only small mangrove stands and narrow intertidal shores. Seagrass beds are common throughout the region, with the best developed beds on the shores of those countries with the largest tidal ranges. Subtidal seagrass beds are also widespread. Coral reefs are present in various forms, including fringing reefs, small patch or island reefs and atolls (e.g. Aldabra). Numerous studies have examined components of the marine biodiversity of parts of the WIO. These include Macnae & Kalk (1969), Baissac *et al.* (1962), Lewis & Taylor (1966), Stoddart (1967), Jones (1970), Thomassin (1971), Day (1974), Hartnoll (1976), Jassund (1976), and Kalk (1959, 1995). These studies have accurately described components of the flora and fauna at various sites and form a basis of knowledge for the region as a whole. However, no study has yet attempted to combine the existing knowledge with updated taxonomy and recent findings.

## ANTHROPOGENIC INFLUENCES

Coastal and marine ecosystems are of critical importance to the peoples, cultures and economies of the WIO. The coastal and nearshore marine areas of many of the islands in the WIO, of Madagascar and the mainland states of Kenya, Tanzania and Moçambique are the location of the vast majority of human habitation, supporting a coastal population of over 30 million people. Human impacts are growing and likely to continue at ever increasing rates, especially on the mainland countries of Kenya, Tanzania, Moçambique as well as Madagascar where population growth rates indicate that populations will double in 20 years (see Table 2). The fact that the majority of this population resides on the coast is of great concern as much of the coastal land along the shores of the WIO is of limited agricultural use and resident populations rely heavily on marine resources for their existence.

Table 2. Populations of the main countries of the WIO. Data from World Bank (1995); Shah (1995) and Kamuzora (1995).

Country	Area (km <sup>2</sup> )	Percentage of population living on coast	Annual growth rate (%)	Population 1994	Population 2000 (estimate)
Somalia	640,061	38	2.9	9,950,000	11,800,000
Kenya	588,045	6	4.1	25,840,000	32,870,000
Tanzania	942,654	25	3.6	28,390,000	34,890,000
Moçambique	789,508	34	2.8	16,600,000	19,600,000
Comoros	2,030	100	3.1	630,000	750,000
Madagascar	592,797	37	2.8	13,050,000	15,400,000
Réunion	2,036	100	0.8	640,000	670,000
Mauritius	1,328	100	1.3	1,100,000	1,180,000
Seychelles	210	100	1.1	70,000	76,000

These coastal areas are also the focus of subsistence and commercial fisheries (as discussed below) and the target of most economic development (e.g. tourism, light and heavy industry). This combination of factors is accelerating the degradation and restriction of coastal habitats, the overexploitation of natural resources, and conflicts in coastal resource use. The most important marine resources currently exploited include mangroves (predominantly for building material or firewood); living coral for building materials, and seaweeds (mostly for export). Crustaceans, molluscs, echinoderms, fish and reptiles are caught for food or for export using assorted techniques. The exploitation of all these resources is having serious effects on the coastal integrity of marine habitats in parts of the region (Linden, 1995). Coastal tourism contributes to local economies, but brings with it

added pressure to the coastal zone (Shah, 1995). The aquarium industry is in its infancy and may potentially bring added pressure to inshore reef areas. Pollution of the coastal zone is reported to be increasing, both from domestic sources and oil (Ferrari, 1995).

Following General Approach and Methods (Chapter 2), this thesis contains three taxonomic chapters, examining in detail the Polychaeta, Mollusca and Echinodermata of the region. The methodology employed for each varies, reflecting the variation in knowledge for each group, with full details given in each chapter. In Chapter 3 the biodiversity of the Polychaeta is considered, based on the results from extensive collecting and taxonomic analysis from intertidal soft substratum surveys from Zanzibar (Tanzania). The material provides a basis for the analysis of this taxon, and is combined with relevant literature to compare observed distribution and abundance with other studies from within and outside of the WIO. In Chapter 4 a summary of the molluscan fauna (excluding Opisthobranchia) for the region is provided, focusing mainly on existing literature, but including some limited sampling and new collections. Chapter 5 compares the Echinodermata, based on new regional collections with the published literature on distribution and diversity of this group from other areas. Chapter 6 presents a general discussion on the biodiversity of the WIO and its biogeography in the light of information gathered from other taxa and other parts of the Indo-Pacific. The preparation of the field guide for the common and representative marine life of Eastern Africa and the western Indian Ocean island took 6 years, culminating in its publication in December 1997. The importance of such guides has been emphasised (e.g. Taylor, J.D. in Sharabati, 1984) as they stimulate an increased awareness and knowledge of local marine life to a wider audience, an essential prerequisite for effective conservation programmes.

**CHAPTER 2**  
**GENERAL APPROACH AND METHODS**

## GENERAL

In January 1992, the author was awarded the position of Associate Research Fellow at the Institute of Marine Sciences (University of Dar es Salaam), on Zanzibar, Tanzania. The purpose of this position was to gather material for the current study, focusing mainly on the preparation of the marine life guide. To this end a working base with laboratory facilities was established in Zanzibar and relevant published material on marine taxonomy and biogeography of the WIO and adjacent regions was collated. From this base, visits were made to most parts of the region to conduct brief field surveys, liase with regional specialists and examine taxonomic collections.

In addition to the brief field sampling and surveys, quantitative sampling of soft substrata was conducted in Zanzibar (Tanzania) and eastern Saudi Arabia (Arabian Gulf). Brief surveys and collections were undertaken in western Saudi Arabia (Red Sea), Watamu and Mombasa (Kenya), Mafia and Pemba islands (Tanzania), Inhaca Island (Moçambique), northern Natal (South Africa), Tulear (SW Madagascar), Nose Be (NW Madagascar), Moroni (Comoros), La Digue and Mahe islands (Seychelles) and SE Papua New Guinea (Solomon Sea/Coral Sea).

## PREPARATION OF THE FIELD GUIDE

All material for every taxonomic group to be included was collected, catalogued and in many cases shipped to relevant specialists. Taxonomic collections were maintained in Zanzibar, and, where necessary, deposited or exchanged with other institutions. Currently accepted taxonomic methodology is used in the identification of material collected and numerous specialists (see Table 1) provided assistance with identification. For the following taxa (Cirripedia, Nudibranchia, Ascidiacea, Holothuria, Amphipoda, Porifera, and Octocorallia) new species have been identified and are either being described or awaiting final examinations.

The name for each species was researched from the existing literature up to 1997 and the earliest valid name has been adopted. In attempting to provide a baseline text, earlier but still commonly used synonyms were also included. These allow the user to compare previous records with others or their own. Illustrations of species for the guide were made

from numerous sources depending on the taxa. Seaweeds for example were illustrated from dried collection material; molluscs were illustrated from specimens either recently collected from the region or material from regional museum collections; preserved specimens of crustaceans and polychaetes were also used. Fish were mainly illustrated from photographs of live specimens taken by the author, who co-authored book sections on seaweeds, hydrozoans, stomatopods, lobsters, molluscs, echinoderms, fish and birds. In December 1995 the final stage of editing of the various contributions was initiated at the School of Ocean Sciences (University of Wales – Bangor) and in December 1997 the illustrated field guide was published (see Richmond, 1997).

Table 1. Details of taxonomists and institutions that assisted in the preparation of *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands* (Richmond, 1997).

Institution/address	Name	Taxonomic specialty
Institut Halietique et des Sciences Marines, B.P. 141, Tuléar, Madagascar	Dr. Rachel Rabesandratana Dr. Dieudonne Rabesandratana	macroalgae molluscs
Centre National de Recherche Oceanographiques, B.P. 68 (207), Nosy Be, Madagascar	Dr. Jean Maharavo	echinoderms
National Museum of Kenya, P.O.Box 40658, Nairobi, Kenya	Dr. Leon Bennun Dr. Helida Oyieke	coastal birds macroalgae
Kenya Wildlife Service, Mombasa Marine Park, P.O.Box 82144, Kenya	Dr. George M. Wamukoya	macroalgae
Kenya Marine Fisheries Research Institute, P.O.Box 81651 Mombasa, Kenya	Dr. Ezekiel Okemwa	zooplankton
University of Nairobi, Zoology Dept., P.O. Box 30197, Nairobi, Kenya	Prof. Victor Jaccarini Dr. Micheni Ntiba	echiurans fish
Universidade Eduardo Mondlane - Dept. Biological Sciences, P.O. Box 257, Maputo, Moçambique	Mr. Almeida Guissamulo Mr. Salomão Bandeira	mammals seagrasses
University of Dar es Salaam - Botany Dept., P.O. Box 35060, Dar es Salaam, Tanzania	Mr. Leonard Mwasumbi Prof. Aldelaide Semesi	shore plants mangroves
University of Dar es Salaam - Zoology Dept. P.O. Box 35064, Dar es Salaam, Tanzania	Prof. Kim Howell	reptiles
University of Dar es Salaam - Institute of Marine Sciences, P.O. Box 668, Zanzibar, Tanzania	Mr. Amani Ngusaru Dr. Simon Ndaru Dr. Jude Shunula	geology meiobenthos lichens
National Museums of Tanzania, Shaaban Robert St., Dar es Salaam, P.O. Box 511, Tanzania	Dr. N Robert A. Kayombo	molluscs
University of Witwatersrand - Dept. of Botany, Private Bag 3, 2050, Johannesburg, South Africa	Dr. Simone Silva	blue-greens
Oceanographic Research Institute, P.O.Box 10712, Marine Parade, Durban 4056, KwaZulu Natal, South Africa	Dr. Michael Schleyer Dr. Rudy Van der Elst	coelenterates fish
South African Museum, P.O. Box 61 Cape Town, South Africa	Dr. Leonard Compagno Dr. Peter Best	fish mammals
The Marine Laboratory, Uni. Portsmouth, Ferry rd., Hayling Is., PO11 ODG, Hampshire, UK	Dr. Yvonne Chamberlain	coralline algae
The Natural History Museum, Cromwell rd., London SW7 5BD, UK	Dr. Paul Cornelius Dr. David Galloway Dr. Michelle Kelly-Borges	jellyfish/hydroids lichens sponges
Kew Gardens, London, UK	Ms. Diane Bridson	shore plants
Scottish Association for Marine Research, P.O. Box 3, Oban, Argyll, PA34 4AD Scotland, UK	Dr. Bill Burnett	zooanthids
School of Biological Sciences, Liverpool John Moores Uni., Byrom St., Liverpool, L33AF, UK	Dr. Ray Gibson	nemertean
University of Wales - Bangor, School of Ocean Sciences, Menai Bridge, LL59 5EY, N.Wales, UK	Dr. David A. Jones Mr. John Coppock Dr. Eifion Jones Dr. Lewis LeVay	crabs polychaetes macroalgae crustaceans
Yr Aelwyd, Cambria rd., Menai Bridge, Anglesey LL59 5EY, UK	Mr. Hugh Knott	coastal birds
Bryniau Duon, Old Llandegfan, Anglesey LL59 5PW, UK	Mr. Martin Esseen	fish



Table 1. (continued)

Institution/address	Name	Taxonomic specialty
National Museum of Wales - Cardiff, Cathays Park, Cardiff, CF1 3NP, UK	Dr. Andy Mackie Dr. Malcom Luxton Dr. Graham Oliver	polychaetes coastal mites molluscs
Zoology Dept., Swansea Uni. Singleton Park, Swansea, SA2 8PP, UK	Dr. Peter Hayward Dr. Natalie Yonow Prof. John S. Ryland	bryozoans opisthobranchs zooanthids
Goldbrook Boarding Kennels, Nuttery Vale, Cross St., Hoxne, Suffolk, IP21 5BB, UK	Dr. Frank Rowe	echinoderms
University of York, Biology Dept., P.O. Box 373, York YO15YW, UK	Dr. Peter Hogarth	porcellanids
University College Cork – Dept. Zoology, Lee Maltings, Prospect Row, Cork, Ireland	Prof. Alan Myers	amphipods
Universiteit Gent, V.M.S. Ecologie, Lab. Plantkunde, K.L. Ledeganckstraat 35, B 9000 Gent, Belgium	Prof. Eric Coppegans Mr. Olivier DeClerck	macroalgae
National Board of Fisheries, Institute of Marine Science, Box 445321 Lysekil, Sweden	Dr. Vidar Oresland	zooplankton
University of Nijmegen, Holland	Mr. Thomas Lymo	phytoplankton
National Museum of Natural History, P.O. Box 9517, 2300 RA Leiden, Holland	Dr. Leen P. van Ofwegen Dr. Koos DenHartog	octocorals anemones
Amsterdam University Museum, Holland	Dr. Rob van Soest	sponges
Senckenberg Institute, Senckenberganlage 25, D-60325, Frankfurt a.m., Germany	Dr. Wolfgang Schneider	coastal insects
Zoologisk Museum, Copenhagen Uni., Universitetsparken 15, DK 2100 Copenhagen, Denmark	Dr. Niel L. Bruce	isopods
Stockholm Universitet - Zoologisk Institutionen, 10691, Stockholm, Sweden	Dr. Emil Olafsson	meiobenthos
Muséum National d'Histoire Naturelle 55 Rue Buffon, F - 75005, Paris, France	Dr. Francoise Monniot Dr. Claude Monniot Dr. Alain Crosnier Nguyen Ngoc-Ho	tunicates tunicates crustaceans thallasinids
Zoological Museum of the University of Florence, "La Specola", via Romana 17, 50125 Firenze, Italy	Dr. Marco Vannini	crustaceans
American Museum of Natural History, Central Park W at 79th St., New York, USA	Dr. Alan Harvey	porcellanids
Western Washington Uni., Shannon Point rd., Anacortes, WA 98221-4042, USA	Dr. Patsy MacLaughlin	hermit crabs
Museum of Natural History, Smithsonian Institution, Institute of Zoology, MDC 163, Washington DC 20560, USA	Dr. Leslie Newman	flatworms
Western Australia Museum, Francis St., Perth, WA 6000 Australia	Dr. Diana Jones Ms. Leslie Brooker	barnacles polyplacophorans
Queensland Museum, Crustacea Section, P.O. Box 3300, Brisbane, QLD 4101, Australia	Dr. Sandy Bruce	shrimps

## **CHAPTER 3**

# **DIVERSITY OF THE SOFT-SUBSTRATUM POLYCHAETE FAUNA OF ZANZIBAR AND MAFIA ISLANDS, TANZANIA**

## INTRODUCTION

### POLYCHAETE RESEARCH IN THE WESTERN INDIAN OCEAN

The study of the polychaete fauna of the western Indian Ocean and adjacent waters began almost 150 years ago, with the first records made by Peters (1854) on collections from the coast of Moçambique. From a little further south, along the Natal coast, Kinberg (1857-1910) described some of the fauna, and Schmarda (1861) described material from numerous localities he visited during that period, from southern Africa to Sri Lanka. The Red Sea fauna was first examined in detail by Grube (1868-69), and later by Gravier (1900-08). The fauna of Sri Lanka then received attention by Grube (1874) and others (e.g. Michaelson, 1892; Willey, 1905), while during the same period, the polychaetes of eastern Africa were being examined for the first time by Crossland (1903-04) who included material from Zanzibar, and later, from the Maldives (Crossland, 1904). Subsequent Indian Ocean studies were conducted on material from expeditions and scattered locations (e.g. Potts 1909a,b; Fauvel, 1918-19; Crossland, 1924) and on Arabian Gulf collections (Fauvel, 1911). On the eastern side of the Indian Ocean Augener (1913-14) examined south west Australian polychaetes. India and Sri Lanka, however, were to become a focus of polychaete knowledge beginning with the contributions of Augener (1926) and Gravelly (1927) and concluding with the numerous studies of Fauvel (1928-40), resulting in the comprehensive volume on Indian polychaetes (Fauvel, 1953) describing 450 species. This figure he estimated to represent barely more than half of the numbers to be expected.

Other studies from that period which contributed to the knowledge of the polychaete fauna of the region include the examination of the John Murray Expedition material (Monro, 1937), and the early studies in Moçambique and southern Africa by Day (1951). Day later examined material from several parts of the western Indian Ocean, with several new records for Mauritius, Dar es Salaam and Mombasa (Day, 1962). Additional studies were conducted on material from Natal and Moçambique (Day, 1957) and he further contributed to the knowledge of the fauna of southern Africa with a monograph on southern African polychaetes (Day, 1967), describing about 750 species, including many new species. Polychaete taxonomic research around India continued (e.g. Banse, 1959; Pillai, 1960, 1971; De Silva, 1961; Tampi & Rangarajan, 1964) and an examination of Indian collections

and those made by the 1963-64 International Indian Ocean Expedition led Hartman (1974a) to conclude that the polychaete fauna of the Indian Ocean is the largest known tropical polychaete fauna. Further analysis of collections from India revealed a total of 883 species (Hartman, 1974b). More recent studies from specific localities on the shores of India include Srikrishnadhas *et al.*, (1987) and Bharati Goswami (1992), and from adjacent waters to the Indian Ocean region, Mohammed (1970-80) from the Arabian Gulf and Ong (1995) from Malaysia. The most recent publications on polychaetes from the western Indian Ocean is Knight-Jones (1972) describing a new species of Serpulidae from the shallow sublittoral in northern Kenya, and Hartmann-Schröder & Hartmann (1974) from southern Africa, including sites in Moçambique. The ecological study by Hughes & Gamble (1977) on soft substrata biota of Aldabra also includes an analysis of the polychaete component of the fauna.

## **BIOGEOGRAPHICAL PROBLEMS**

One feature common to many of the above broad polychaete studies is that a significant proportion of the species encountered are regarded as widespread in their geographical distribution, not only throughout the Indo-Pacific, but also in the Mediterranean and the Atlantic Ocean. Fauvel (1953) stated that of the 450 species he reports from India, 108 are also European species (approximately 25 %). Ekman (1953) in his comprehensive zoogeographical analysis stated that “the polychaetes which are to a large extent cosmopolitan and therefore generally do not throw much light on regional zoogeography” This observation has received support (e.g. Hartman, 1974) and a general statement now commonly associated with polychaete biogeography is that the fauna is widespread, even cosmopolitan, contrary to the known patterns of biogeography demonstrated by other marine taxa (e.g. fish, molluscs, echinoderms) which show clear regional affinities.

The question of cosmopolitanism has begun to prompt debate (see Gambi *et al.*, 1990; Mackie, 1996). One of the problems facing polychaete taxonomists today is the lack of precise and thorough descriptions of the species in the early literature, combined with inadequately preserved and catalogued type specimens. Claparède (1867) for example was firm in his belief that studies on preserved specimens were “positively useless, and that the

Annelida can only be well studied at the seaside and by means of living individuals"! A further problem faced by taxonomists is the use of 'out of area' reference material. As Mackie (1996) explains, the use of taxonomic keys which were designed for one particular area (e.g. Day, 1967; Fauvel, 1927; Fauvel 1953) when used in other areas (out of area) can result in erroneous identifications. For example, the use of Day (1967) to identify a specimen from Europe may result in a new record of that species outside of the southern Africa region. Mackie states that this in itself is not a serious matter, but when the description of the southern African species is expanded to accommodate the European one, this then represents the first step to that species becoming 'cosmopolitan'. Clearly the use of taxonomic keys has limitations, some associated with the region, and some with the definitions and points in the keys themselves used to define the species. The interpretation of biogeographic distributions of particular species suffers as a result of these limitations. Mackie (1996) suggests that use of tables of species versus characters may provide a superior method of identifying taxa, allowing all characters for each taxon to be compared directly without loss of information. In addition, the tabular approach has the benefit of providing a suitable framework for future cladistic analysis.

The aims of the present study are:

1. to establish a collection of new polychaete specimens from Tanzania, focusing primarily on littoral species;
2. to identify the specimens and use these findings as a basis of a chapter on the polychaetes of the western Indian Ocean for the Field Guide (see Chapter 1);
3. to establish the geographical distribution of the species encountered in Tanzania and examine the existence of 'cosmopolitan' species;
4. provide a basis for further taxonomic research on polychaetes of the western Indian Ocean by making material available for further examination.

## METHODS

Between September 1993 and April 1997 material was collected from the shores around the island of Unguja (main island of Zanzibar, and hereafter referred to as Zanzibar) and from two sites on the island of Mafia (see Fig. 1). Sites were chosen to cover the broad range of littoral habitats and deposits, including coarse mineral sand of wave exposed beaches, fine muds and silts associated with mangrove forests and coarse shelly sand associated with sublittoral fringe seagrass beds. Quantitative sampling and sorting of samples were undertaken by the author with the assistance of first-year undergraduates of the University of Dar es Salaam (P. Ndilahomba and E.M. Machamu) as part of their field studies programme and by a visiting student Sandra Canares. Material was collected from 0.1m<sup>2</sup> cores, to a depth of 15 cm (as per similar studies in the Arabian Gulf, see Richmond (1994)). Sediments were sieved with a 1 mm plastic sieve and fixed with 15 % formalin solution in the field and later sorted. Non-quantitative sampling was also conducted at numerous additional sites on Zanzibar and on Mafia Island.

Taxa were separated and only the polychaete component is considered here. Preliminary identification of material was conducted by the author and students in Zanzibar, and later by Mr. J. Coppock at the University of Wales – Bangor in January-March 1996. Details of the taxonomic reference material used to identify the fauna are included in the Bibliography. Of particular relevance to the fauna from this area is the work by Day (1967) which included material from southern Moçambique. Other works of particular relevance include Crossland (1903, 1904, 1924) and Fauvel (1919). Assistance with identification was also provided by Dr. A.S.Y. Mackie (Zoology Department, National Museum of Wales – Cardiff). Material was maintained in formalin solution so as to preserve existing colours as much as possible, since these would subsequently be used as a basis for the illustrations depicting species in the contribution of the Field Guide (see Coppock, 1997). Subsequent analysis and sorting of the collection was conducted by the author for this chapter. Specimens of most species are deposited at the National Museum of Wales – Cardiff, with the remainder of the collection to be returned to the Institute of Marine Sciences (University of Dar es Salaam).

## DESCRIPTION OF SITES AND SAMPLING DATES

Sampling for polychaetes was conducted at numerous sites on the islands of Unguja and Mafia. At four sites on Unguja, transects were established from the upper eulittoral to the sublittoral fringe. Transects were aimed at being re-locatable for future sampling and thus precise details of the bearing and upper shores features of each transect were noted, as were the distances between stations. Sites varied in the number of stations and the number of replicate core samples taken at each. From July-September 1993, 5 soft-substratum transects were established (T1-T4) at the Mazizini Bay (MZ) site, along which 4-5 stations were sampled with 3 replicate cores taken at each. At the Zanzibar Harbour (HB) site a single transect was established in July 1994 and sampled at 4 stations at which 3 replicate cores were taken. In August 1994 on Bawe Island the single transect was sampled at 5 stations, each with 3 replicate core samples. At Nungwi (NG) during July 1994 a single transect was established with 5 stations and 3 replicate core samples collected at each. At the mangrove sites of Kisakasaka (KS), Mbweni (MB) and Makoba (MK) (all visited between July-August 1995) 5 replicate core samples were taken at a single station, among the mangrove trees, at approximately the mean high water level. All stations have been grouped into approximate tidal heights, as shown in Table 1.

Additional sites sampled are: Chwaka (middle-eulittoral sandy mud); Mtoni (middle-eulittoral sandy mud); Chumbi Is. (middle-eulittoral sandy rubble); Mafia - Utende (middle to lower eulittoral sand beach); Mafia - Kinasi (middle - upper sublittoral sand-mud among mangroves *Avicennia* and *Sonneratia*). The location of all sites are shown on Figure 1.

Table 1. Details of sampling stations on Zanzibar from which 0.1 m<sup>2</sup> cores samples were taken. Details are divided by tidal levels, hence MHWS (Mean High Water Springs); MHW (Mean High Water); MHWN (Mean High Water Neaps); MTL (Mean Tide Level); MLWN (Mean Low Water Neaps) and MLWS (Mean Low Water Springs).

Site name, stations and codes	No. cores	Approx. tidal height	Substrate	Epifauna/flora
Mazizini MZT1S1	3	MHWS	medium sand (beach)	none.
Mazizini MZT2S1	3	MHWS	medium/fine sand (beach)	none.
Mazizini MZT3S1	3	MHWS	medium/fine sand (beach)	none.
Harbour HBS1	3	MHWS	medium sand (beach)	none.
Kisakasaka KS	5	MHW	fine sand/mud	mangroves ( <i>Sonneratia</i> ). Numerous <i>Uca</i> .
Mkoba MK	5	MHW	mud	mangroves ( <i>Avicennia</i> and <i>Sonneratia</i> ); numerous <i>Uca</i> .
Mazizini MZT1S2	3	MHW	medium/coarse sand	mostly bare, some seagrasses ( <i>Halodule</i> and <i>Halophila</i> ).
Mazizini MZT2S2	3	MHW	fine sand	none.
Mbweni MB	5	MHW	medium/fine sand	mangroves ( <i>Avicennia</i> and <i>Sonneratia</i> ); <i>Clypeomorus</i> and <i>Uca</i> common.
Nungwi NGS1	3	MHWN	fine sand	mostly bare (some <i>Halodule</i> ).
Harbour HBS2	3	MHWN	medium sand	none (anoxic below 10 cm).
Bawe Is. BWS1	3	MHWN	coarse sand and rubble	mostly bare (some <i>Padina</i> ).
Mazizini MZT3S2	3	MHWN	fine sand	seaward of mangroves ( <i>Avicennia</i> and <i>Sonneratia</i> ); mostly bare (some <i>Uca</i> ).
Bawe BWS2	3	MTL	medium sand and rubble	partly dominated by <i>Sargassum</i> and <i>Halodule</i> .
Mazizini MZT1S3	3	MTL	medium shelly sand	mostly seagrasses ( <i>Cymodocea</i> and <i>Halodule</i> ); some hermit crabs ( <i>Calcinus</i> ), holothurians.
Nungwi NGS2	3	MTL	fine sand and rubble	mostly bare; some <i>Halodule</i> and <i>Sargassum</i> .



Table 1. (continued)

Site name, station and codes	No. cores	Approx. tidal height	Substrate	Epifauna/flora
Mazizini MZT2S3	3	MTL	medium sand	mostly seagrasses ( <i>Cymodocea</i> and <i>Halodule</i> ); few holothurians.
Mazizini MZT3S3	3	MTL	fine sand	mostly bare; some <i>Halodule</i> ; numerous burrows and hermit crabs ( <i>Calcinus</i> spp.).
Nungwi NGS3	3	MTL	fine sand	mostly bare, some seagrasses ( <i>Cymodocea</i> and <i>Halodule</i> ).
Bawe Is. BWS3	3	MTL	sandy mud over rock	mostly seagrasses ( <i>Cymodocea</i> and <i>Thalassia</i> ).
Harbour HBS3	3	MTL	sand	loose <i>Ulva</i> on surface; sand anoxic below 10 cm.
Mazizini MZT1S4	3	MLWN	shelly sand	mostly seagrasses ( <i>Cymodocea</i> , <i>Halodule</i> , <i>Thalassia</i> ); some <i>Pinna</i> echinoderms and scleractinians.
Mazizini MZT2S4	3	MLWN	shelly sand	mostly seagrasses ( <i>Syringodium</i> , <i>Cymodocea</i> , <i>Thalassia</i> ); some echinoderms, scleractinians, <i>Pinna</i> .
Mazizini MZT3S4	3	MLWN	shelly sand	mostly seagrasses ( <i>Cymodocea</i> , <i>Halodule</i> , <i>Thalassia</i> , <i>Halophila</i> ); some <i>Nassarius</i> , <i>Pinna</i> .
Bawe Is. BWS4	3	MLWN	sand and rubble	mostly <i>Sargassum</i> .
Bawe Is. BWS5	3	MLWN	sand and rubble	mostly bare; some seagrasses ( <i>Cymodocea</i> , <i>Thalassia</i> , <i>Syringodium</i> , <i>Thalassodendron</i> ,) and <i>Sargassum</i> .
Nungwi NGS4	3	MLWN	fine sand	mostly bare; some seagrasses ( <i>Cymodocea</i> , <i>Halodule</i> , <i>Thalassia</i> ) and <i>Sargassum</i> .
Nungwi NGS5	3	MLWN	fine sand	mostly bare; some seagrasses ( <i>Cymodocea</i> , <i>Halodule</i> , <i>Thalassia</i> ) and <i>Sargassum</i> .
Mazizini MZT2S5	3	MLWS	shelly sand	mostly seagrasses ( <i>Cymodocea</i> , <i>Thalassodendron</i> , <i>Syringodium</i> ); some echinoderms, scleractinians.
Mazizini MZT3S5	3	MLWS	shelly sand	mostly seagrasses ( <i>Halodule</i> , <i>Thalassia</i> ); some macroalgae plus bivalves ( <i>Anadara</i> ), asteroids.
Harbour HBS4	3	MLWS	medium sand	none (anoxic below 5 cm).



Figure 1. The islands of Zanzibar and Mafia showing locations of sampling sites (●). Note: the southernmost sites at Kisakasaka is situated in a mangrove channel which was not sampled quantitatively.

## RESULTS

### GENERAL ACCOUNT

A total of 99 core samples (0.1m<sup>2</sup> x 15 cm depth) were processed, with all the data presented in Appendix 1. From these samples, a total of 901 polychaete specimens were identified, yielding 71 species from 24 families. Combined with material from additional sites, the total number of specimens examined was 1209, from 27 families, with a total of 91 species recorded (see Tables 2 and 3). For some of the material, identification was only possible to genus, or in one case subfamily level, due to specimens being damaged or incomplete. This is particularly relevant to members of the Capitellidae and Cirratulidae.

The most abundant species in the collection are the following (with total numbers in parenthesis):

*Ceratonereis erythraensis* Fauvel, 1918 (152)

*Armandia leptocirrus* Grube, 1878 (142)

*Scolelepis squamata* (Müller, 1806) (78)

*Glycera lancadivae* Schmarda, 1861 (46)

*Nerinides* sp. (45)

*Armandia intermedia* Fauvel, 1902 (30)

*Nereis caudata* Delle Chiaje, 1841 (25)

*Anatomastus* sp. (22)

*Diopatra cuprea cuprea* (Bosc, 1802) (22)

*Terebellides stroemi* Sars, 1835 (20)

Clear differences exist between habitat and species composition, with the sand beach sediment being dominated by *Scolelepis squamata*, *Perinereis nuntia vallata* and *Ceratonereis erythraensis*. Mangrove mud was found to contain mainly *Dendronereis arborifera*, *Armandia intermedia*, *Anatomastus* sp. and *Ceratonereis erythraensis* whilst lower eulittoral sandy sediments (with seagrass) were dominated by *Terebellides stroemi*, *Arabella iricolor iricolor*, *Armandia intermedia* and *Syllis cornuta*.

Table 2. List of polychaete families and species recorded from Zanzibar and Mafia Islands, with numbers recorded from core samples and additional sites together with the total numbers for each species.

FAMILY	SPECIES	No. (cores)	No. (add. sites)	No. total
APHRODITIDAE	<i>Aphrogenia</i> sp.	7	-	7
POLYNOIDAE	<i>Harmothoinae</i> sp.	1	-	1
	<i>Gastrolepidia clavigera</i> Schmarda, 1861	-	2	2
	<i>Iphione</i> cf. <i>muricata</i> (Savigny, 1818)	1	1	2
	<i>Lepidonotus temisetosus</i> (Gravier, 1901)	-	4	4
SIGALIONIDAE	<i>Sthenelais boa</i> (Johnston, 1839)	4	-	4
AMPHINOMIDAE	<i>Chloeia</i> sp.	-	1	1
	<i>Eurythoe complanata</i> (Pallas, 1766)	-	54	54
	<i>Notopygos</i> sp.	-	1	1
PHYLLODOCIDAE	<i>Phyllodoce</i> cf. <i>capensis</i> Day, 1960	1	-	1
	<i>Phyllodoce</i> cf. <i>castanea</i> (Marenzeller, 1879)	2	-	2
	<i>Phyllodoce</i> sp.	8	-	8
PILARGIDAE	<i>Ancistrosyllis parva</i> Day, 1963	2	-	2
SYLLIDAE	<i>Opisthosyllis</i> sp.	-	3	3
	<i>Pharyngeovalvata natalensis</i> Day, 1951	1	-	1
	<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865	1	-	1
	<i>Syllis bouvieri</i> Gravier, 1900	5	-	5
	<i>Syllis cornuta</i> Rathke, 1843	8	-	8
	<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840	1	-	1
	<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852	2	1	3
	<i>Syllis variegata</i> Krohn, 1852	-	3	3
	<i>Syllis</i> sp. juv.	1	-	1
NEREIDAE	<i>Ceratonereis erythraensis</i> Fauvel, 1918	152	9	161
	<i>Ceratonereis mirabilis</i> Kinberg, 1866	4	-	4
	<i>Dendronereis arborifera</i> Peters, 1854	78	4	82
	<i>Namalycastis indica</i> (Southern, 1921)	1	-	1
	<i>Nereis caudata</i> Delle Chiaje, 1841	25	1	26
	<i>Nereis coutieri</i> Gravier, 1899	3	-	3
	<i>Nereis persica</i> Fauvel, 1911	1	4	5
	<i>Nereis unifasciata</i> Willey, 1905	8	1	9
	<i>Perinereis nigropunctata</i> (Horst, 1889)	-	7	7
	<i>Perinereis muntia vallata</i> (Grube, 1857)	15	21	36
	<i>Platynereis isolita</i> Gravier, 1901	12	1	13
	<i>Platynereis pulchella</i> Gravier, 1901	3	-	3
	<i>Platynereis</i> sp.	4	-	4
GLYCERIDAE	<i>Glycera convoluta</i> Keferstein, 1862	-	7	7
	<i>Glycera lancadivae</i> Schmarda, 1861	46	-	46
EUNICIDAE	<i>Eunice antennata</i> (Savigny, 1820)	4	4	8
	<i>Eunice indica</i> Kinberg, 1865	2	-	2
	<i>Lysidice collaris</i> Grube, 1870	1	-	1
	<i>Marphysa bifurcata</i> Kott, 1951	1	-	1
	<i>Marphysa mossambica</i> (Peters, 1854)	12	21	33
	<i>Nematoneris unicornis</i> (Grube, 1840)	4	-	4
OENONIDAE	<i>Arabella iricolor iricolor</i> (Montagu, 1804)	13	4	17
	<i>Drilonereis monroi</i> Day, 1960	-	3	3
	<i>Notocirrus australis</i> Day, 1960	3	-	3
	<i>Oenone fulgida</i> (Savigny, 1818)	-	1	1
	<i>Oenone</i> sp.	2	1	3
LUMBRINERIDAE	<i>Lumbrineris latreilli</i> Audouin & M. Edwards, 1834	7	-	7
ONUPHIDAE	<i>Diopatra cuprea cuprea</i> (Bosc, 1802)	22	1	23

Table 2. (continued)

FAMILY	SPECIES	No. (cores)	No. (add. sites)	No. total
SPIONIDAE	<i>Aonides oxycephala</i> (Sars, 1862)	6	-	6
	<i>Malacoceros indicus</i> (Fauvel, 1928)	4	-	4
	<i>Nerinides</i> sp.	45	3	48
	<i>Prionospio</i> cf. <i>convexa</i> Imajima, 1990	5	-	5
	<i>Prionospio malmgreni</i> Claparède, 1870	4	-	4
	<i>Prionospio sexoculata</i> Augener, 1918	2	-	2
	<i>Scolecopsis squamata</i> (Müller, 1806)	55	2	57
	<i>Spio</i> sp.	1	-	1
MAGELONIDAE	<i>Magelona</i> sp.	1	-	1
POECILOCHAETIDAE	<i>Poecilochaetus serpens</i> Allen, 1904	1	-	1
CIRRATULIDAE	<i>Caulleriella</i> sp.	4	-	4
	<i>Cirratulus</i> sp.	14	-	14
	<i>Cirriiformia</i> sp.	3	14	17
ORBINIDAE	<i>Naineris laevigata</i> (Grube, 1855)	-	3	3
	<i>Scoloplos capensis</i> Day, 1961	1	1	2
	<i>Scoloplos</i> cf. <i>uniramus</i> Day, 1961	4	1	5
	Orbinidae sp. juv.	4	-	4
PARAONIDAE	<i>Paraonis</i> sp.	1	-	1
OPHELIDAE	<i>Armandia intermedia</i> Fauvel, 1902	30	12	42
	<i>Armandia leptocirrus</i> Grube, 1878	142	-	142
	<i>Armandia melanura</i> Gravier, 1905	8	1	9
	<i>Polyophthalmus pictus</i> (Dujardin, 1839)	2	-	2
CAPITELLIDAE	<i>Anatomastus</i> sp.	22	-	22
	<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)	5	-	5
	Capitellid sp.	14	19	33
	<i>Dasybranchus caducus</i> (Grube, 1846)	5	-	5
	<i>Heteromastides</i> sp.	1	-	1
	<i>Mediomastus</i> sp.	7	2	9
	<i>Notomastus latericeus</i> Sars, 1851	2	-	2
	<i>Owenia fusiformis</i> Delle Chiaje, 1844	-	2	2
OWENIIDAE	<i>Owenia fusiformis</i> Delle Chiaje, 1844	-	2	2
AMPHARETIDAE	<i>Amphicteis gunneri</i> (Sars, 1835)	2	-	2
TEREBELLIDAE	<i>Loimia medusa</i> (Savigny, 1820)	-	9	9
	<i>Nicolea vemustula africana</i> Augener, 1918	14	-	14
	<i>Terebella pterochaeta</i> Schmarda, 1861	-	1	1
	<i>Thelepus plagiostoma</i> (Schmarda, 1861)	-	1	1
	<i>Thelepus setosus</i> (Quatrefages, 1865)	-	1	1
	Terebellid sp. 1	2	1	3
	Terebellid sp. 2	-	1	1
	TRICHOBRANCHIDAE	<i>Terebellides stroemi</i> Sars, 1835	20	-
SABELLIDAE	<i>Branchioma violacea</i> (Schmarda, 1861)	-	73	73
	<i>Jasmineira elegans</i> Saint-Joseph, 1894	2	-	2
SERPULIDAE	<i>Hydroides</i> cf. <i>heteroceros</i> (Grube, 1868)	-	1	1
Totals		901	308	1209

Table 3. Summary of number of genera and species for the 27 families of polychaetes collected from Zanzibar and Mafia, Tanzania.

FAMILY	Genera	Species
Aphroditidae	1	1
Polynoidae	4	4
Sigalionidae	1	1
Amphinomidae	3	3
Phyllodocidae	1	3
Pilargidae	1	1
Syllidae	3	8
Nereidae	6	13
Glyceridae	1	2
Eunicidae	4	6
Oeonidae	4	5
Lumbrineridae	1	1
Onuphidae	1	1
Spionidae	6	8
Magelonidae	1	1
Poecilochaetidae	1	1
Cirratulidae	3	3
Orbinidae	3	4
Paraonidae	1	1
Ophelidae	2	4
Capitellidae	7	7
Oweniidae	1	1
Ampharetidae	1	1
Terebellidae	6	7
Trichobranchidae	1	1
Sabellidae	2	2
Serpulidae	1	1
Totals	67	91

Of the 27 families included in the collection, the Nereidae comprised the largest number of species (13) from 6 genera. Other families with high numbers of genera were the Spionidae (6), Capitellidae (7), Terebellidae (6). Twelve families were represented by single species.

The densities of individual species varied greatly, with highest values recorded for *Armandia leptocirrus* which occurred at the greatest densities (up to 131 per 0.1m<sup>2</sup>) in fine sand in the middle eulittoral on the north coast of Zanzibar at Nungwi. In general, species numbers were lowest at the stations highest on the shore, and increased from the upper shore to the middle eulittoral (MTL) then dropped slightly towards the sublittoral fringe (MLWS), as shown below (Table 4).

Table 4. Numbers of species and mean abundance (0.1 m<sup>-2</sup>) at each tidal level with numbers of replicate cores taken at each level.

Tidal level	MHWS	MHW	MHWN	MTL	MLWN	MLWS
Total no. species	6	20	13	40	32	28
Mean abundance of individuals	5.08	10.43	10.67	14.39	2.9	11.2
No. replicate cores	12	21	12	23	21	9

## ANALYSIS OF SPECIES DISTRIBUTIONS

Of the 91 species recorded in this study, 27 (29 %) occur at localities between eastern Africa and the west Pacific or beyond. An additional 20 species (22 %) are recorded from littoral or shallow sublittoral localities in the Indo-Pacific region as well as localities in the Atlantic, and are considered to be 'cosmopolitan' (see Table 5). Fuller zoogeographical records are given in the Systematic Account (see below).

Table 5. List of species recorded from the present study and considered to be 'cosmopolitan' in distribution.

Family SYLLIDAE	Family OPHELIDAE
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865	<i>Polyophthalmus pictus</i> (Dujardin, 1839)
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840	Family CAPITELLIDAE
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852	<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)
<i>Syllis variegata</i> Krohn, 1852	<i>Notomastus latericeus</i> Sars, 1851
Family NEREIDAE	Family OWENIDAE
<i>Nereis caudata</i> Delle Chiaje, 1841	<i>Owenia fusiformis</i> Delle Chiaje, 1844
Family GLYCERIDAE	Family AMPHARETIDAE
<i>Glycera convoluta</i> Keferstein, 1862	<i>Amphicteis gunneri</i> (Sars, 1835)
Family LUMBRINERIDAE	Family TERESELLIDAE
<i>Lumbrineris latreilli</i> Aud. & M. Ed. 1834	<i>Loimia medusa</i> (Savigny, 1820)
Family SPIONIDAE	<i>Thelepus plagiostoma</i> (Schmarda, 1861)
<i>Aonides oxycephala</i> (Sars, 1862)	<i>Thelepus setosus</i> (Quatrefages, 1865)
<i>Prionospio malmgreni</i> Claparède, 1870	Family TRICHOBRANCHIDAE
<i>Scoletepis squamata</i> (Müller, 1806)	<i>Terebellides stroemi</i> Sars, 1835
Family POECILOCHAETIDAE	
<i>Poecilochaetus serpens</i> Allen, 1904	

## SYSTEMATIC ACCOUNT

Records indicate numbers of specimens (in parenthesis) from all sites and stations sampled. Abbreviations used: T1-T3 specific transects at Mazizini; S1-S5 stations along specific transects; C1-C5 replicate core samples. Details of all sampling stations are provided in Table 1. Distribution information is mostly based on Day (1967) with the following symbols indicating level on shore: i – intertidal; e – estuarine; s – shallow; d – deep; vd – very deep; a – abyssal. Additional distribution data with sources are included. The abbreviation NHM refers to zoogeographic records from specimens held at the Natural History Museum (London). Numbers of specimens deposited with the National Museum of Wales – Cardiff follows the abbreviation NMW.

### Family APHRODITIDAE

#### *Aphrogenia* sp.

Records: Zanzibar – Mazizini: T2S4C2 (1), T3S4C3 (1), T2S5C2 (2), T2S5C1 (2); Bawe S4C1 (1).

Number of specimens: 7.

Habitat: lower eulittoral in shelly sand and seagrass.

Note: specimen T3S4C3 (1) deposited with NHM.

### Family POLYNOIDAE

#### *Harmothoinae* sp.

Records: Zanzibar – Mazizini: T2S5C1 (1).

Number of specimens: 1.

Habitat: sublittoral fringe in sand and seagrass.

Note: specimen lacking elytra.

#### *Gastrolepidia clavigera* Schmarda, 1861

Records: Zanzibar – Mazizini, on *Holothuria atra* sea cucumber (2).

Number of specimens: 2.

Habitat: commensal on holothurian lower eulittoral.

Distribution: Indo-Pacific.



*Iphione cf. muricata* (Savigny, 1818)

Records: Zanzibar – Bawe S4C1 (1), Bawe (1)

Number of specimens: 2. NMW (1).

Habitat: mid-eulittoral sand mud (mangroves).

Distribution: Indo-Pacific and Mombasa Day (1962); Aldabra (Hughes & Gamble, 1977).

*Lepidonotus tenuisetosus* (Gravier, 1901)

Records: Zanzibar – Kisakasaka (4).

Number of specimens: 4. NMW (1).

Habitat: mangrove channel.

Distribution: Indo-Pacific.

#### Family SIGALIONIDAE

*Sthenelais boa* (Johnston, 1839)

Records: Zanzibar – Mazizini: T3S5C3 (1), T3S5C1 (1), T3S5C2 (1), T2S4C2 (1).

Number of specimens: 4. NMW (1).

Habitat: lower eulittoral and sublittoral fringe in sand (seagrass).

Distribution: Day (1967) recorded: SW Africa (i,s), Cape (i,s) to Natal (i), Moçambique (i), Madagascar (s) “fairly common in sand among stones”; Aldabra (Hughes & Gamble, 1977); Australia (Day & Hutchings, 1977).

#### Family AMPHINOMIDAE

*Chloeia* sp.

Records: Zanzibar – off Harbour, 15 m: (1).

Number of specimens: 1.

Habitat: sublittoral (15 m) on sand. Caught in baited (fish) trap with funnel entrance set for isopods.

Note: specimen photographed live, and despite species identifications largely based on colour pattern. None of the descriptions of patterns of existing species fit this specimen.

Collected by Dr. Neil Bruce.

*Eurythoe complanata* (Pallas, 1766)

Records: Zanzibar – Kisakasaka (51); Chumbi (2); Matemwe (1).

Number of specimens: 54.

Habitat: mangrove channel among algae (Kisakasaka), mid-eulittoral on sand (Chumbi) and reef crest (Matemwe).

Distribution: Circumtropical.

Note: entire Kisakasaka sample comprised of juveniles 5-30 mm in length. Reef crest specimen from Matemwe 200 mm in length. At the latter site this species is commonly encountered during spring-low tide, often seen dragging foliaceous green algae (*Ulva* sp.) into burrows.

*Notopygos* sp.

Zanzibar – Chumbe (1).

Number of specimens: 1.

Habitat: mid-eulittoral sandy gravel.

Note: *N. variabilis* (Potts) recorded from Aldabra (Hughes & Gamble, 1977).

**Family PHYLLODOCIDAE**

*Phyllodoce* cf. *capensis* Day, 1960

Records: Zanzibar – Nungwi S2C2 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in fine sand.

Distribution: Day (1967) recorded: Cape (s).

*Phyllodoce* cf. *castanea* (Marenzeller, 1879)

Records: Zanzibar – Bawe S5C3 (2).

Number of specimens: 2.      NMW (1).

Habitat: mid-eulittoral in mud (mangroves).

Distribution: Indo-Pacific.

*Phyllodoce* sp.

Records: Zanzibar – Mazizini:T3S2C3 (1), T3S2C1 (1), T3S3C2 (1); Nungwi S2C3 (3); Harbour S3C2 (1); Bawe S5C3 (1).

Number of specimens: 8. NMW (1).

Habitat: mid-eulittoral to sublittoral fringe in fine and coarse sand (seagrass).

**Family PILARGIDAE**

*Ancistrosyllis parva* Day, 1963

Records: Zanzibar – Mazizini:T2S4C2 (1), T3S4C3 (1).

Number of specimens: 2. NMW (1).

Habitat: lower eulittoral in sand (seagrass).

Distribution: Day (1967) recorded: Cape (s), Natal (s,d).

**Family SYLLIDAE**

*Opisthosyllis* sp.

Records: Mafia – Utende (3).

Number of specimens: 3. NMW (1).

Habitat: mid-eulittoral in medium sand.

Note: *O. laevis* Day recorded from Aldabra (Hughes & Gamble, 1977).

*Pharyngeovalvata natalensis* Day, 1951

Records: Zanzibar – Bawe S2C1 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in mud (mangrove).

Distribution: Day (1967) recorded: Cape (s), Natal (i).

*Syllis* cf. *amica* Quatrefages, 1865

Records: Zanzibar – T1S4C1 (1).

Number of specimens: 1.

Habitat: lower eulittoral in sand (seagrass)

Distribution: Day (1967) recorded: Natal (i). Plus Ireland, English Channel, Madeira, Mediterranean (i,s).

*Syllis bouvieri* Gravier, 1900

Records: Zanzibar – Mazizini:T3S5C1 (4), T2S4C1 (1).

Number of specimens: 5. NMW (1).

Habitat: lower eulittoral and sublittoral fringe in coarse sand (seagrass).

Distribution: Day (1967) recorded: Madagascar (i). Plus: Gulf of Aden. Day (1962) Mauritius.

*Syllis cornuta* Rathke, 1843

Records: Zanzibar - Mazizini:T2S4C2 (1), T2S5C2 (1), T2S4C1 (1), T2S5C1 (4), T3S5C1 (1).

Number of specimens: 8. NMW (3).

Habitat: lower eulittoral and sublittoral fringe in sand (seagrass).

Distribution: Day (1967) recorded: Cape (i,d), Natal (i), Moçambique (i) fairly common.

*Syllis cf. gracilis* Grube, 1840

Records: Zanzibar – T1S4C1 (1).

Number of specimens: 1.

Habitat: lower eulittoral in sand (seagrass).

Distribution: Cosmopolitan.

*Syllis cf. prolifera* Krohn, 1852

Records: Zanzibar – Chumbi (1); Bawe S4C2 (1), S2C2 (1).

Number of specimens: 3. NMW (1).

Habitat: mid-eulittoral in medium sand and mud (mangroves).

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

*Syllis variegata* Grube, 1860

Records: Zanzibar – Kisakasaka (3).

Number of specimens: 3. NMW (1).

Habitat: mangrove channel.

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

*Syllis* sp. (juv.)

Records: Zanzibar – Bawe S3C1 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in mud (mangroves).

### Family NEREIDAE

*Ceratonereis erythraensis* Fauvel, 1918

Records: Zanzibar – Mazizini: T1S1C2 (13), T1S2C3 (2), T3S1C3 (2), T3S3C2 (22), T1S2C1 (1), T2S2C1 (22), T3S2C1 (4), T3S2C3 (8), T1S2C2 (6), T3S3C3 (7), T2S2C2 (12); Mbweni C1 (33), C2 (16); Chwaka (2); Bawe S4C2 (3); Harbour S3C1 (1); Mafia – Utende (9).

Number of specimens: 161. NMW (10;4).

Habitat: upper to mid-eulittoral in medium sand (seagrass), organically enriched sand, and mud (mangrove).

Distribution: SW Africa and Indo-Pacific.

*Ceratonereis mirabilis* Kinberg, 1866

Records: Zanzibar – Mazizini: T1S3C2 (1), T2S5C1 (1); Bawe S3C1 (1), S4C2 (1).

Number of specimens: 4.

Habitat: mid-eulittoral to sublittoral fringe in sand (seagrass) and mud (mangrove).

Distribution: Indo-Pacific; Mombasa (Day, 1962); Aldabra (Hughes & Gamble, 1977)

*Dendronereis arborifera* Peters, 1854

Records: Zanzibar – Mazizini: T1S2C1 (5), T1S2C2 (3), T2S2C2 (2), T2S4C2 (1), T3S2C1 (25), T3S2C3 (6); Mbweni C5 (1), C4 (1), C2 (10), C1 (13); Makoba C4 (6), C2 (1); Bwawani: (2); Harbour S3C2 (4); Mafia – Utende: (2).

Number of specimens: 82. NMW (5;5).

Habitat: mid-to lower eulittoral in sand (seagrass), sand (organically enriched), mud (mangroves).

Distribution: Day (1967) recorded: Eastern Cape (e), Natal (e), Moçambique (e) – common in black mud among mangroves. Plus: Moçambique (e), Madagascar (e).

*Namalycastis indica* (Southern, 1921)

Records: Zanzibar – Makoba C1 (1).

Number of specimens: 1.

Habitat: mid-eulittoral mud (mangroves).

Distribution: Day (1967) recorded: Natal (e) to Moçambique (e) – few specimens in muddy sand of estuaries. Plus: India (e), Macassar (e), Andamans (e).

*Nereis caudata* Delle Chiaje, 1841

Records: Zanzibar – Harbour S3C1 (25); Mafia – Kinasi (1).

Number of specimens: 26. NMW (5).

Habitat: mid-eulittoral in fine sand (mangrove) and medium sand (organically polluted).

Distribution: Day (1967) recorded: Cape (i,s) “rare”; plus N Atlantic (i,s), Mediterranean, S California (s), Mexico, Tasmania, New Zealand (s); Aldabra (Hughes & Gamble, 1977); Australia (Day & Hutchings, 1977).

*Nereis coutieri* Gravier, 1899

Records: Zanzibar – Bawe S2C1 (2); Nungwi S1C3 (1).

Number of specimens: 3. NMW (1).

Habitat: upper to mid-eulittoral in fine sand and mud (mangrove).

Distribution: Day (1967) recorded: Natal (i), Moçambique (i) – occasional specimens on rocky shores.

*Nereis persica* Fauvel, 1911

Records: Zanzibar – Harbour S1C3 (1); Yacht ‘Starfish’ (4).

Number of specimens: 5. NMW (1).

Habitat: mid-eulittoral in medium sand (organically enriched) and shallow sublittoral (fouling on vessel which had sailed from South Africa to Zanzibar within 2 months prior to sampling).

Distribution: Day (1967) recorded: Cape (s), Natal (s), Moçambique (s), Madagascar (s). Plus: Red Sea and Indo-Pacific (i,s). Hartman (1974): Arabian Sea (55-72 m).

***Nereis unifasciata*** Willey, 1905

Records: Zanzibar – Harbour (1); Mazizini:T2S1C1 (8).

Number of specimens: 9. NMW (1).

Habitat: upper eulittoral in medium sand.

Distribution: Indo-Pacific.

***Perinereis nigropunctata*** (Horst, 1889)

Records: Zanzibar – Bawe S2C1 (3); Kisakasaka (4).

Number of specimens: 7. NMW (2).

Habitat: mid-eulittoral in mud (mangroves).

Distribution: Indo-Pacific. Day (1962): Mombasa.

***Perinereis nuntia vallata*** (Grube, 1857)

Records: Zanzibar – Chwaka (4); Harbour S1C3 (1); Mbweni C4 (4); Mazizini (1); Mazizini: T1S1C1 (3), T1S1C3 (1), T3S1C2 (1), T2S1C3 (5); Mafia – Utende (16).

Number of specimens: 36. NMW (5;5).

Habitat: upper to mid-eulittoral in sand (seagrass) and mud (mangroves).

Distribution: Day (1967) recorded: SW Africa (i), Cape (i,e), Moçambique (e) – fairly common under stones near high tide mark. Plus: Red Sea, Indian Ocean, S Pacific, New Zealand (e,i), Chile (i).

***Platynereis isolita*** Gravier, 1901

Records: Zanzibar – Mazizini:T1S2C2 (2), T1S2C1 (6), T2S5C1 (1), T2S3C3 (1); Chumbi (1); Bawe S4C2 (1); S1C1 (1).

Number of specimens: 13. NMW (2).

Habitat: mid-eulittoral to sublittoral fringe in sand (seagrass) and mud (mangrove).

Distribution: Day (1967) recorded: Moçambique (i,e), Madagascar (s). Plus: Red Sea (i), Sri Lanka, Madras, Andaman Is.; Aldabra (Hughes & Gamble, 1977); Australia (Day & Hutchings, 1977).

***Platynereis pulchella*** Gravier, 1901

Records: Zanzibar – Mazizini:T2S5C2 (1), T2S5C3 (1), T1S3C2 (1).

Number of specimens: 3.

Habitat: mid-eulittoral to sublittoral fringe in sand (seagrass).

Distribution: Red Sea, Arabian Gulf, Arabian Sea, Indo-China (Day, 1967).

*Platynereis* sp.

Records: Zanzibar – Mazizini: T3S5C1 (1), T2S5C2 (1); Nungwi S5C3 (1), S3C2 (1).

Number of specimens: 4.

Habitat: mid-eulittoral to sublittoral fringe in sand (seagrass).

**Family GLYCERIDAE**

*Glycera convoluta* Keferstein, 1862

Records: Zanzibar – Chwaka (1); Mafia – Utende (6).

Number of specimens: 7. NMW (2).

Habitat: mid-eulittoral in medium sand.

Distribution: Cosmopolitan.

*Glycera lancadivae* Schmarda, 1861

Records: Zanzibar – Nungwi: S3C2 (3), S1C3 (2), S1C1 (1), S2C2 (4), S3C1 (3), S4C1 (2), S2C3 (2); Bawe S4C3 (1), S2C2 (1), S1C3 (1); Mazizini: T2S4C3 (1), T2S5C1 (4), T1S4C1 (1), T1S3C3 (4), T2S3C1 (2), T3S3C1 (1), T2S3C2 (2), T1S3C1 (4), T3S3C3 (1), T3S5C3 (1), T2S2C2 (1), T3S2C3 (1), T1S3C2 (1), T2S2C3 (2).

Number of specimens: 46. NMW (3;3).

Habitat: upper-eulittoral to sublittoral fringe in mud (mangroves) from fine to coarse sand.

Distribution: Day (1967) recorded Madagascar (i). Plus: tropical Indian Ocean (i,s), New Caledonia (i); Aldabra (Hughes & Gamble, 1977); Cook Islands, “found in the lagoon, in a wide range of deposits” (Gibbs, 1972); Australia (Day & Hutchings, 1977).

**Family EUNICIDAE**

*Eunice antennata* (Savigny, 1820)

Records: Zanzibar – Bawe S4C2 (1), S4C3 (2), S5C2 (1); Kisakasaka (4).

Number of specimens: 8. NMW (2).



Habitat: mid-eulittoral to sublittoral fringe, in medium to fine sand and mud (mangroves).

Distribution: Day (1967) recorded: Cape (i), Natal (i), Moçambique (i) and Madagascar (i).

Plus: Gulf of Suez (i), Red Sea (i,s), tropical Indo-Pacific (i,s), southern California, Senegal (s), North Carolina (s); NHM: New Zealand, Arabian Gulf. Crossland (1904) recorded in Chwaka Bay (Zanzibar) as very common.

***Eunice indica*** Kinberg, 1865

Records: Zanzibar – Mazizini:T3S5C3 (1); Harbour S3C3 (1).

Number of specimens: 2.

Habitat: mid-eulittoral to sublittoral fringe in sand (and seagrass), including organically enriched.

Distribution: Day (1967) recorded: Moçambique, Madagascar (i). Plus Red Sea (i,s) and tropical Indo-Pacific (i,s,d,vd). Crossland (1904) recorded Chwaka Bay (Zanzibar).

***Lysidice collaris*** Grube, 1870

Records: Zanzibar – Mazizini: T1S3C1 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in sand (seagrass).

Distribution: Cape and Indo-Pacific.

***Marphysa bifurcata*** Kott, 1951

Records: Zanzibar – T2S5C3 (1).

Number of specimens: 1.

Habitat: sublittoral fringe sand (seagrass).

Distribution: Day (1967) recorded: Moçambique (s). Plus: SW Australia.

***Marphysa mossambica*** (Peters, 1854)

Records: Zanzibar - Harbour S3C1 (3), S3C2 (1), S3C3 (3); Mbweni C4 (1); Mbweni C2 (2); Mazizini:T2S2C3 (1), T4S2Q1 (1); Chwaka (8); Bwawani (3). Mafia – Utende (10).

Number of specimens: 33. NMW (1;1).

Habitat: mid to upper eulittoral, in medium sand and fine mud (mangroves).

Distribution: Indo-Pacific, including Aldabra (Hughes & Gamble, 1977).

Note: regularly used as fish bait on Zanzibar. Crossland (1903) states ‘..occurs abundantly in Chuaka Bay, Zanzibar... well above low-water mark.’ He also noted their use as fish bait.

*Nematoneris unicornis* (Grube, 1840)

Records: Zanzibar – Mazizini:T2S5C1 (3); Mazizini:T3S5C2 (1).

Number of specimens: 4. NMW (2).

Habitat: sublittoral fringe in sand (seagrass).

Distribution: Day (1967) recorded: Natal (i) and Madagascar (e); plus North Atlantic, Morocco, Mediterranean, Suez Canal, Indo-Pacific.

**Family OENONIDAE**

*Arabella iricolor iricolor* (Montagu, 1804)

Records: Zanzibar - Mazizini:T3S5C1 (4), T3S5C2 (5), T3S5C3 (3), T2S5C1 (1); Mafia - Utende (4).

Number of specimens: 17. NMW (5)

Habitat: mid-eulittoral to sublittoral fringe, in medium to shelly sand and seagrass.

Distribution: Cosmopolitan temperate and tropical.

*Drilonereis monroi* Day, 1960

Records: Mafia – Kinasi (3).

Number of specimens: 3. NMW (1).

Habitat: mid-eulittoral in medium to fine sand, among mangroves.

Distribution: Day (1967) recorded: SW Africa (s), Cape (s,d). Plus: Tristan da Cunha (d). Hartman (1974a): Arabian Sea (92-95 m).

*Notocirrus australis* Day, 1960

Records: Zanzibar – Mazizini:T3S3C3 (1), T3S3C1 (1), T2S2C1 (1).

Number of specimens: 3. NMW (1).

Habitat: mid-eulittoral in medium sand.

Distribution: Day (1967) recorded: False Bay, South Africa – single record (s).

***Oenone fulgida*** (Savigny, 1818)

Records: Mafia – Utende (1).

Number of specimens: 1.

Habitat: mid eulittoral in medium sand and seagrass.

Distribution: Day (1967) recorded: Natal (i), Moçambique (i,e,s) and Madagascar (i,s). Plus Suez (i), Red Sea (i,s) and Indo-west-Pacific Sea (i,s). NHM: British East Africa.

***Oenone* sp.**

Records: Zanzibar – Mbweni C4 (1), C1 (1); Mafia – Kinasi (1).

Number of specimens: 3.      NMW (2).

Habitat: mid to upper eulittoral in fine sand and mud (mangrove).

Note: possibly juveniles of *O. fulgida* but with long narrow gills.

**Family LUMBRINERIDAE**

***Lumbrineris latreilli*** Audouin & Milne Edwards, 1834

Records: Zanzibar – Mazizini: T2S5C2 (2), T3S5C1 (1), T3S5C2 (1), T3S5C3 (1), T3S2C1 (1), T2S3C3 (1).

Number of specimens: 7.      NMW (3).

Habitat: mid-eulittoral to sublittoral fringe, in medium to shelly sand and seagrass.

Distribution: Day (1967) recorded: Moçambique (i) – fairly common in sand. Cosmopolitan in temperate and tropical seas (i,s,d); Aldabra (Hughes & Gamble, 1977).

Note: Hartman (1974a) recorded *L. inhacae* Hartman, 1970 off NW Madagascar (34 m), off Madras (15-23 m depth) and in the Bay of Bengal (37 m depth).

**Family ONUPHIDAE**

***Diopatra cuprea cuprea*** (Bosc, 1802)

Records: Zanzibar - Harbour S3C3 (5), S4C2 (1), S3C2 (4), S3C1 (7), S4C3 (3); MTL (1); Mazizini: T3S3C1 (1), T3S3C2 (1).

Number of specimens: 23.      NMW (1).

Habitat: mid-eulittoral, in medium/coarse sand (organic enriched).

Distribution: Day (1967) recorded: Natal (s), Moçambique (i,e,s). Plus: USA east coast (i), Brazil (i), tropical west Africa (s), tropical Indian Ocean (i,s,d).

### Family SPIONIDAE

#### *Aonides oxycephala* (Sars, 1862)

Records: Zanzibar – Mazizini:T3S3C2 (1), T1S2C2 (1), T1S3C1 (4).

Number of specimens: 6.

Habitat: mid-eulittoral in sand (seagrass).

Distribution: Day (1967) recorded: Cape (e,s), Moçambique (i), Madagascar (s). Plus: N. Atlantic, English Channel (i,e), Morocco (s), Mediterranean; Aldabra (Hughes & Gamble, 1977); Australia (Day & Hutchings, 1977); Cook Islands (Gibbs, 1976).

#### *Malacoceros indicus* (Fauvel, 1928)

Records: Zanzibar – Mbweni C5 (3), C4 (1).

Number of specimens: 4.

Habitat: mid-eulittoral in mud (mangroves).

Distribution: Day (1967) recorded: Natal (i), Moçambique (i,e). Plus: India (i,e), New Caledonia; Aldabra (Hughes & Gamble, 1977); Cook Islands “found in extremely dense numbers in the eulittoral” (Gibbs, 1972).

#### *Nerinides* sp.

Records: Zanzibar - Harbour S2C3 (2), S2C2 (41); Mazizini:T1S3C1 (1), T3S4C3 (1); PL20 (3).

Number of specimens: 48. NMW (5).

Habitat: mid-eulittoral in medium sand (seagrass) and sand (organically enriched).

#### *Prionospio* cf. *convexa* Imajima, 1990

Records: Zanzibar – Mazizini:T2S4C2 (3), T2S5C1 (1), T3S5C1 (1).

Number of specimens: 5. NMW (1).

Habitat: lower eulittoral in sand (seagrass).

Distribution: Imajima (1990) recorded: Japan (25-57 m).

*Prionospio malmgreni* Claparède, 1870

Records: Zanzibar – Mazizini:T1S2C3 (2), T1S2C1 (1), T1S3C1 (1).

Number of specimens: 4. NMW (1).

Habitat: mid-eulittoral in medium sand (seagrass)

Distribution: Cosmopolitan.

*Prionospio sexoculata* Augener, 1918

Records: Zanzibar – Mazizini:T3S5C1 (1), T3S4C3 (1).

Number of specimens: 2.

Habitat: lower eulittoral and sublittoral fringe in sand (seagrass).

Distribution: Day (1967) recorded: SW Africa (s), Cape (s), Natal (e). Endemic.

*Scolelepis squamata* (Müller, 1806)

Records: Zanzibar – Mazizini: T3S5C2 (1), T3S1C3 (24), T3S1C2 (1), T2S3C2 (1), T3S4C3 (2); Harbour: S2C2 (3), S2C1 (8), S2C3 (15), Harbour: MLWN (2).

Number of specimens: 57. NMW (5).

Habitat: upper eulittoral to sublittoral fringe in fine to coarse sand (seagrass) and organically enriched sand.

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

*Spio* sp.

Records: Zanzibar – Mazizini:T3S3C2 (1).

Number of specimens: 1.

Habitat: lower eulittoral in shelly sand (seagrass).

Note: hooks starts on setiger 8; gills start on setiger 3.

**Family MAGELONIDAE**

*Magelona* sp.

Records: Zanzibar – Mazizini:T2S4C2 (1).

Number of specimens: 1.

Habitat: lower eulittoral in sand (seagrass).

Note: specimen not intact.

## Family POECILOCHAETIDAE

### *Poecilochaetus serpens* Allen, 1904

Records: Zanzibar – Nunwgi S3C3 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in fine sand.

Distribution: Day (1967) recorded: Cape (s,d,vd), Natal (s,d). Plus: North East Atlantic to Morocco (i,s) and Mediterranean. NHM: Kuwait, Israel; Aldabra (Hughes & Gamble, 1977).

## Family CIRRATULIDAE

### *Caulleriella* sp.

Records: Zanzibar – Mazizini:T3S3C2 (1), T3S3C3 (3); Bawe S5C3 (1).

Number of specimens: 4.

Habitat: mid-eulittoral in sand.

### *Cirratulus* sp.

Records: Zanzibar – Bawe S1C1 (1); S2C3 (11), S5C3 (2).

Number of specimens: 14.

Habitat: mid-eulittoral in mud (mangrove).

### *Cirriformia* sp.

Records: Zanzibar – Bawe S1C1 (1), S4C1 (1); Mazizini:T1S3C1 (1); Mafia – Utende (14).

Number of specimens: 17. NMW (6).

Habitat: mid-eulittoral in mud (mangrove).

Note: *C. tentaculata* (Montagu, 1808) abundant in muddy *Cymodoce* seagrass beds, Nyali, Mombasa (Day, 1962).

## Family ORBINIDAE

### *Naineris laevigata* (Grube, 1855)

Records: Mafia - Kinasi (3).

Number of specimens: 3.      NMW (1).

Habitat: mid-eulittoral in fine sand and mud (mangroves).

Distribution: Day (1967) recorded: SW Africa (i,s), Cape (i,s), Natal (i), Moçambique (i).

Plus: warm and tropical Atlantic (i), SE Australia (i), Mediterranean, Arabian Gulf, Sri Lanka, Japan. Day (1977): Perth (W Australia); Augener (1926-27): New Zealand.

### *Scoloplos* cf. *capensis* Day, 1961

Records: Zanzibar – Harbour S4C2 (1); Harbour on yacht ‘Starfish’ (1).

Number of specimens: 2.

Habitat: lower eulittoral in medium sand (organically enriched) and sublittoral, on vessel which had sailed from South Africa to Zanzibar within 2 months prior to sampling.

Distribution: Day (1967) recorded: Cape (s,d). Endemic.

### *Scoloplos* cf. *uniramus* Day, 1961

Records: Zanzibar – Mazizini: T1S2C2 (2), T1S2C3 (1), T2S4C2 (1); Mafia – Utende (1).

Number of specimens: 5.      NMW (2).

Habitat: mid- to lower eulittoral in fine and medium sand (seagrass).

Distribution: Day (1967) recorded: Cape (s,d), Natal (s). Note: Day (1977) synonymised *S. uniramous* with *S. johnstonie* Day, 1934 and gives the distribution as: S Australia, Solomon Is, differing from allied species *S. fimbriatus* in having 6 branchiate setigers, as opposed to 7 in the former.

### Orbiniid sp. juv.

Records: Zanzibar – Bawe S2C1 (4).

Number of specimens: 4.      NMW (2).

Habitat: mid-eulittoral in mud (mangrove).

## Family PARAONIDAE

### *Paraonis* sp.

Records: Zanzibar – Mazizini:T3S3C3 (1).

Number of specimens: 1.

Habitat: mid-eulittoral in sand and seagrass.

## Family OPHELIIDAE

### *Armandia intermedia* Fauvel, 1902

Records: Zanzibar – Mazizini: T3S5C1 (4), T3S5C3 (1), T3S2C1 (1), T2S5C1 (1); Bawe S2C3 (1); Mbweni C1 (10), C4 (10); Kisakasaka C2 (1); Harbour S4C3 (1); Mafia –Kinasi (12).

Number of specimens: 42. NMW (10;3).

Habitat: mid-eulittoral to sublittoral fringe, in coarse sand (and seagrass), fine sand and mud (mangroves).

Distribution: Day (1967) recorded: Cape (i,s), Natal (i). Plus: Senegal (s), Ghana (s), Angola, Indo-Pacific, Japan; Aldabra (Hughes & Gamble, 1977).

### *Armandia leptocirrus* Grube, 1878

Records: Zanzibar – Mazizini:T2S5C1 (1), T3S5C2 (2); Nungwi S5C3 (3), S2C3 (2), S2C2 (3), S4C1 (2), S2C1 (131).

Number of specimens: 142.

Habitat: sublittoral fringe, in coarse sand (and seagrass).

Distribution: Day (1967) recorded: Cape (s), Moçambique (i,e,s). Plus: Indo-Pacific (Red Sea and Arabian Gulf (i), to Andaman Is. (i) and New Caledonia).

### *Armandia melanura* Gravier, 1905

Records: Zanzibar – Mazizini:T3S2C1 (3),T3S5C2 (1); Chwaka (1); Mbweni C5 (4).

Number of specimens: 9. NMW (2).

Habitat: sublittoral fringe in shelly sand (seagrass).

Distribution: Gibbs (1972): Gulf of Aden, Cook Islands.



*Polyophthalmus pictus* (Dujardin, 1839)

Records: Zanzibar – Bawe S2C3 (1); Nungwi S5C3 (1).

Number of specimens: 2.

Habitat: mid-eulittoral in fine sand and mud (mangroves).

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

## Family CAPITELLIDAE

*Anatomastus* sp.

Records: Zanzibar – Mbweni C3 (15); Kisakasaka C5 (7).

Number of specimens: 22.      NMW (3).

Habitat: mid-eulittoral in mud (mangroves).

*Capitella* cf. *capitata* (Fabricius, 1780)

Records: Zanzibar – Harbour S3C2 (1), S3C3 (4).

Number of specimens: 5.      NMW (2).

Habitat: mid-eulittoral, in medium sand (organically enriched).

Distribution: Cosmopolitan.

*Capitellid* sp.

Records: Mafia - Kinasi (10), Utende (9); Zanzibar - Mazizini: T3S3C1 (2), T3S1C3 (1), T3S5C3 (3), T3S3C3 (2), T2S5C2 (1), T1S3C1 (1), T1S2C3 (1); Harbour S3C1 (1), S3C2 (1); Mbweni C1 (1).

Number of specimens: 33.      NMW (2;2;2).

Habitat: mid-eulittoral in fine sand (mangrove); sublittoral fringe in medium sand (seagrass).

*Dasybranchus caducus* (Grube, 1846)

Records: Zanzibar – Mazizini: T3S5C2 (1), T2S5C1 (2); Nungwi S3C2 (1); Mbweni C1 (1).

Number of specimens: 5.

Habitat: mid to lower eulittoral in sand and mud (mangroves).

Distribution: Day (1967) recorded: Natal (i), Moçambique (i,e), and states: records confused, certainly present in Mediterranean (i), Red Sea (i), tropical Indian Ocean south to Madagascar (i,s); Aldabra (Hughes & Gamble, 1977); Australia (Day & Hutchings, 1977).

*Heteromastides* sp.

Records: Zanzibar – Nungwi S3C2 (1).

Number of specimens: 1.

Habitat: mid eulittoral in sand.

*Mediomastus* sp.

Records: Zanzibar – Kisakasaka (2); Mazizini:T3S4C3 (7).

Number of specimens: 9. NMW (2).

Habitat: lower eulittoral and shallow sublittoral (mangrove channel).

Distribution: Day (1967) recorded: *M. capensis* Day, 1961: SW Africa (s), Cape (s,d),

Natal (s,d). Endemic.

*Notomastus latericeus* Sars, 1851

Records: Zanzibar – Mazizini:T3S5C1 (2).

Number of specimens: 2.

Habitat: sublittoral fringe in coarse shelly sand (seagrass).

Distribution: Cosmopolitan.

**Family OWENIIDAE**

*Owenia fusiformis* Delle Chiaje, 1844

Records: Mafia – Kinasi (2).

Number of specimens: 2.

Habitat: mid-eulittoral in fine sand (mangroves).

Distribution: Cosmopolitan.

**Family AMPHARETIDAE**

*Amphicteis gunneri* (Sars, 1835)

Records: Zanzibar – Mazizini:T2S4C2 (1), T2S5C1 (1).

Number of specimens: 2. NMW (1).

Habitat: lower eulittoral/sublittoral fringe in sand (seagrass).

Distribution: Day (1967) recorded: SW Africa (s), Cape (s,d), Natal (s). Plus: north and central Atlantic (s,d,vd,a), Mediterranean, tropical Indian Ocean (d,vd), Kerguelen (s); Australia (Day & Hutchings, 1977).

### Family TERESELLIDAE

#### *Loimia medusa* (Savigny, 1820)

Records: Zanzibar – Chwaka (2); Mtoni (1); Mafia – Utende (6).

Number of specimens: 9. NMW (2).

Habitat: mid-eulittoral in medium sand.

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

#### *Nicolea venustula africana* Augener, 1918

Records: Zanzibar – Nungwi S2C3 (7), S2C2 (7).

Number of specimens: 14. NMW (3)

Habitat: mid-eulittoral in fine sand.

Distribution: Day (1967) recorded: not in South Africa. Present: Ivory Coast, Angola (s); New Zealand (Day & Hutchings, 1977); NHM specimens of *Nicolea venustula* (Montagu, 1818) from NE Europe and South Africa.

#### *Terebella pterochaeta* Schmarda, 1861

Records: Zanzibar – Mazizini: T4S4Q1 (1).

Number of specimens: 1.

Habitat: lower eulittoral in rock.

Distribution: Day (1967) recorded: SW Africa (i,s), Cape (i,s), Natal (i). Plus: Indo-Pacific.

#### *Thelepus plagiostoma* (Schmarda, 1861)

Records: Zanzibar – Kisakasaka (1).

Number of specimens: 1.

Habitat: shallow sublittoral in mangrove channel.

Distribution: Cosmopolitan.

*Thelepus setosus* (Quatrefages, 1865)

Records: Zanzibar - Mazizini:T4S4Q1 (1).

Number of specimens: 1.

Habitat: lower eulittoral among rocks.

Distribution: Cosmopolitan.

**Terebellid sp. 1.**

Records: Zanzibar – Mazizini:T2S4C2 (2), Bwawani (1).

Number of specimens: 3 NMW (1).

Habitat: mid- to lower eulittoral in sand and mud (mangrove).

**Terebellid sp. 2.**

Records: Zanzibar – Mazizini (1).

Number of specimens: 1.

Habitat: mid-eulittoral in sand.

#### Family TRICHOBRANCHIDAE

*Terebellides stroemi* Sars, 1835

Records: Zanzibar – Mazizini:T2S5C1 (6), T3S5C3 (2), T3S5C1 (5), T1S3C2 (2), T2S5C2 (5).

Number of specimens: 20.

Habitat: mid-eulittoral to sublittoral fringe in sand (seagrass).

Distribution: Cosmopolitan, including Aldabra (Hughes & Gamble, 1977).

#### Family SABELLIDAE

*Branchioma violacea* (Schmarda, 1861)

Records: Zanzibar – Harbour, on yacht 'Starfish' (73).

Number of specimens: 73. NMW (10).

Habitat: shallow sublittoral fouling community on vessel which had sailed from South Africa to Zanzibar within 2 months prior to sampling.

Distribution: Day (1967) recorded: SW Africa (i,s), Cape (i,s), Natal (i). Endemic.

*Jasmineira elegans* Saint-Joseph, 1894

Records: Zanzibar – T2S2C1 (1); Nungwi S2C3 (1).

Number of specimens: 2.

Habitat: mid-eulittoral in sand.

Distribution: Cape (s,d), Natal (s,d). Plus North Atlantic from Scotland (s) to Senegal (i,s), Angola (s).

#### Family SERPULIDAE

*Hydroides* cf. *heteroceros* (Grube, 1868)

Records: Zanzibar – Harbour on yacht 'Starfish' (1).

Number of specimens: 1.

Habitat: fouling shallow sublittoral, on vessel which had sailed from South Africa to Zanzibar within 2 months prior to sampling.

Distribution: Day (1967) recorded: Madagascar (s). Plus: tropical Indian Ocean (i,s).

## DISCUSSION

In the present study a collection of predominantly littoral polychaetes has been established with 91 species recorded from 27 families. The quantitative sampling revealed a total of 71 species from 9.9 m<sup>2</sup> of substrate sampled to a depth of 15 cm, using a 1 mm sieve. Comparable eulittoral studies within the western Indian Ocean are relatively scarce, though that of Hughes & Gamble (1977) on the intertidal fauna of Aldabra, a distance of 780 km from Zanzibar, is useful for comparison. In their study, Hughes & Gamble sampled 65 m<sup>2</sup> to a depth of 40 cm, using a 2 mm sieve and found a total of 69 species from 16 families including 18 species recorded in the present study. The Aldabra study also revealed 10 species which could not be identified beyond genus, thus the number of species common to both studies may be greater. On Aldabra, soft substrates were sampled from intertidal habitats which are generally dominated by coralline sand, whereas the samples taken in the present study were predominantly taken from low-energy, fine sediment habitats, including those from mangroves and a sheltered bay (Mazizini) which differ from the sites sampled on Aldabra, possibly contributing to the differences in species composition of the two studies.

Comparison at the species level of the polychaete diversity from the present study, with other areas is ambitious due to difficulties associated with the taxonomy of the group. Comparisons based on genera, considered to be more consistent, especially for polychaetes, can, however, be made. The present study found 67 genera from 27 families. The study from Aldabra by Hughes & Gamble (1977) recorded 54 genera from 16 families. From recent studies in the Pacific region, Bailey-Brock (1995) found that for the Hawaiian fauna 51 genera from 21 families are recorded and Gibbs (1972) recorded 16 genera from 11 families from the Cook Islands. From the Solomon Islands 34 genera from 22 families were recorded (Gibbs 1971). The greater tidal range in Tanzania (ca. 4 m compared to ca. 1 m for Pacific Islands) and the presence of diverse littoral habitats may in part explain the greater diversity of genera.

The given distributions for each species, compiled from the literature, can only be viewed as provisional since the problems of polychaete taxonomy described in the introduction preclude the known distribution of many species from being established with certainty. These problems stem from the early taxonomic work on this class which have resulted in weak morphological definitions of species and the absence of suitable type material for

valid comparisons to be made. Further comparison of the present material with that from other regions is necessary before a true analysis of the biogeographical distribution of each species can be ascertained with confidence. This is particularly true for the 20 'cosmopolitan species' from the present collection (see Table 6). However, such a comparison may result in questioning the validity of species and require the definition of many new species. The distributions given in the Systematic Analysis for the non-cosmopolitan species found in the present study can be treated with more confidence and reveals that 27 species, or 29 % of the total found, occur at localities between eastern Africa and the west Pacific or beyond, reflecting the occurrence of widespread Indo-Pacific taxa. A study of the Serpulidae of the Seychelles by Hove (1994) found that of the 40 taxa recorded from 1-60 m depth, the majority are known from other Indo-Pacific localities, except for a few probably new species.

Of the 20 'cosmopolitan' species recorded in the present study the only one which has received attention to date is *Owenia fusiformis* Delle Chiaje (Dauvin & Thiebaut, 1992). A single specimen of this species was recorded in the present study. Dauvin & Thiebaut (1992) examined populations from intertidal to 2,325 m depth from the Atlantic, Pacific and Indian Oceans and concluded that this species is truly cosmopolitan. However, the comparison was lacking in a full morphological examination of many characters (e.g. branching of the food-gathering membrane), and this analysis can be regarded as provisional pending a more thorough examination (Mackie *pers. com*). Numerous additional morphological characters, including internal features for many species need to be considered (see Mackie, 1996). Kelly-Borges & DeFelice (*in press*) found that for sponge fauna in Hawaii, the presence of 'cosmopolitan' species has masked the true diversity of that fauna, and following detailed examination, some of the taxa have been shown to include more species.

Despite the present study providing for the first time a comprehensive collection of polychaetes from Zanzibar, there are numerous limitations associated with this investigation which should be addressed if research on this taxa is to continue in Tanzania and other parts of the western Indian Ocean. Firstly, no reliable estimate of the diversity of the polychaetes of this region has been achieved, though a tentative, minimum estimate may be attempted. A total of 91 species was recorded mostly from intertidal habitats in the present study and the

comparison with the Aldabra study by Hughes & Gamble (1977) revealed a possible additional 53 species for the region. The detailed study of Seychelles serpulids by Hove (1994) defined 40 species from shallow depths. Few other studies have examined the shallow sublittoral fauna in the region. As many lower eulittoral species are also present at greater water depths, but additional species certainly also occur, the diversity of the polychaetes from the eulittoral and shallow sublittoral within this region could be expected to be between 300-500 species.

Any study is likely to provide new species depending on the level of investigation. In the Arabian Gulf for example, a study by a single experienced polychaete taxonomist found 61 genera from 23 families with 23 new species records and 8 new genera records for that area (Fiege, 1992). He also found that of the total entities recorded, only 45 could be positively identified to species level, reflecting the widespread lack of a thorough knowledge of this taxon. The study by Fiege (1992) serves also as an example of the 'grey literature' which may be derived from diverse studies (environmental, ecological or consultative reports) which include polychaete species records and taxonomic keys but which fail to become more widely available, despite contributing to the overall understanding of the diversity and zoogeography of this taxonomically difficult group.

Other limitations of this study are listed below. Some of these may be achievable in the short term, whilst others will require the cooperation of numerous research institutions and individual specialists.

1. sampling from hard substrates (limestone rocky and rubble shores);
2. sampling of the sublittoral substrates including coral reefs;
3. better preservation and taxonomic investigation into members of the families Capitellidae and Cirratulidae;
4. sampling of cryptic and commensal species;
5. obtaining higher numbers of individuals, from diverse localities, for many of the species for which few individuals have been found;
6. establishing whether undescribed species exist in the collection;
7. confirming new records for eastern Africa;
8. conducting a thorough scrutiny of the 'cosmopolitan' species;



9. examining the effects of seasonality on species diversity by repeating surveys at the same sites at different times of year.

Considering that polychaetes comprise the greatest percentage of the community of soft substrata and are the most important taxon in these communities (e.g. Knox, 1977; Guerreiro *et al.* 1996) much taxonomic research is required, especially on tropical species before a complete appraisal of the diversity and biogeography of this important taxon is achieved. Major revisions to families are long and laborious processes, but they must be undertaken for those families where needed. Furthermore, revisions of families must be based on material, not descriptions, since interpretation of descriptions frequently is dependent on poorly understood and used terminology, which has obscured species differentiation in the past (see Fauchald, 1977).

Fortunately, some recent collections exist which may allow such research to begin. For example, much of the material collected by Day (1967) is deposited in the Natural History Museum (London), as is the collection from the Cook islands (Gibbs, 1972) which includes 22 littoral species plus additional species from the sublittoral. A selection of the material in this chapter is deposited at the National Museum of Wales - Cardiff with the remainder being returned to the University of Dar es Salaam by the author.

## **CHAPTER 4**

# **ANALYSIS OF THE DIVERSITY OF THE MOLLUSC FAUNA OF THE WESTERN INDIAN OCEAN WITH SPECIAL REFERENCE TO THE PROSOBRANCHIA, BIVALVIA AND POLYPLACOPHORA**

## INTRODUCTION

The Mollusca comprise by far the largest taxonomic group of macro-invertebrates in the tropical waters of the Indo-Pacific. Examination of the molluscan fauna of the western Indian Ocean and adjacent waters began over 200 years ago with the pioneering collecting efforts and studies conducted by Pehr Forskål and Linnaeus in the mid 1700's, mostly on material from the Red Sea and Gulf of Aden. Though a complete review of the molluscan studies of the entire western Indian Ocean and adjacent waters is beyond the scope of this introduction, a brief examination of the major contributions forms a background to the knowledge of the fauna today. The Opisthobranchia of the western Indian Ocean have recently been reviewed (see Yonow, 1997) and will be omitted from the present study.

For the 150 years or so following Forskål's travels, taxonomic work tended to be focused, unequally, in different parts of the region. Considerable attention was paid to the northwestern portion of the Indian Ocean where the basis of a comprehensive knowledge for that area today was derived largely from the studies of Smith (1877-1906), Sowerby (1895a,b) and Melvill (1893-1928). In the southeastern corner of the western Indian Ocean at about the same time, the molluscan fauna of Mauritius received attention from Leinard (1877), Möbius *et al.* (1880) and Viader (1937). Smith (1888), Dautzenberg (1893) and von Martens (1903) documented molluscs from the Seychelles but the most comprehensive studies on those islands were only conducted later by the Percy Sladen Trust Expedition of 1905 with results summarised by Gardiner (1936) and by the individual collection made by Winckworth (1940). Southern Africa experienced a great deal of interest from numerous professional naturalists beginning in the mid 1700's, though most of these collected in the cooler waters of the Cape. It was C.F.F. Krauss who was probably the first to explore and collect on the tropical shores of northern Natal during the 1840's. Much of his specimens were later examined by L. Reeve and G.B. Sowerby, though his work on the molluscs of South Africa (Krauss, 1848) can be considered to be the first comprehensive treatise of the fauna. Numerous subsequent accounts of South African molluscs followed but these tended to omit the tropical elements. In Madagascar, Dautzenberg (1906-32) provides the most comprehensive account of the fauna of that island.

Over the last forty years, the knowledge of the western Indian Ocean mollusc fauna continued to develop, again with a regional bias. Knowledge of the Arabian Sea fauna has benefitted from the comprehensive studies of Biggs (1958-73), Smythe (1972-1988) and Bosch & Bosch (1982-89), resulting in a comprehensive analysis of the eastern Arabian fauna by Dance (1995). The Red Sea fauna is also reasonably well known and summarised by Sharabati (1984) and Oliver (1992), the latter exclusively examining the bivalve component which tends to be omitted by most workers. In South Africa, the studies by Barnard (1958-69) and Kilburn & Rippey (1982) provide a reasonably complete coverage of the fauna of those shores, though as Kilburn & Rippey (1982) admit, the tropical component of the fauna remains to be examined thoroughly. For Mauritius, the volume by Drivas & Jay (1988) covers the bulk of the prosobranch fauna, and the two short volumes by Spry (1961, 1964) cover the common fauna of the shores of Dar es Salaam (Tanzania). With the exception of several short accounts of specific mollusc families, notably Cypraeidae from Kenya (e.g. Copley, 1945; Verdcourt, 1954-60 and Liversidge, 1963) and bivalves from southern Moçambique (Boshoff, 1965), few taxonomic studies of the mollusc fauna of the western Indian Ocean have been undertaken recently.

Though the malacological history of the western Indian Ocean, and indeed the entire Indo-Pacific region has been an active one over the last 200 years, and has benefitted from the involvement of hundreds of amateur naturalists, shell collectors and professional malacologists, the true extent of the knowledge of the fauna remains incomplete (see Oliver, 1992; Kay, 1995). Whilst, undoubtedly, museum collections (mostly in Europe) have grown as a result of the enthusiasm and interest in shells by so many individuals who have collected material from remote corners of the region, the enormous numbers of species which have been described as a result have, in many cases, been described in isolation, i.e. without due regard to similar forms from other parts of the region. Consequently a species may have many synonyms. The major tasks facing malacologists today are establishing which are the synonyms of the valid species, what are the geographical limits of the species and what are the ecological boundaries within which the species exists. For most species within the Indo-Pacific, this information is not known, though progress is being made and new species continue to be described throughout the Indo-Pacific at an average of twenty-four new species each year between 1990-95 for the tropical Pacific alone (Kay, 1995).

In the light of the recent comprehensive works mentioned above which examine the mollusc fauna of the waters adjacent to the western Indian Ocean (Arabian Sea, Red Sea and South African coasts), it seems appropriate that a detailed examination of the fauna of the East African region and western Indian Ocean islands be undertaken. Such an analysis would now benefit from the sound taxonomic base which has been established by these studies in adjacent waters.

The objectives of this study are:

1. to examine the diversity of molluscs of the western Indian Ocean by compiling a preliminary species checklist for the region;
2. to summarise the above into an illustrated chapter for the Field Guide;
3. to examine the biogeography of western Indian Ocean prosobranch and bivalve molluscs.

## METHODS

### Field Surveys

Collections of molluscs were made in several parts of the western Indian Ocean between January 1992 and June 1997. Detailed quantitative sampling of intertidal soft substrates were undertaken in Zanzibar, Tanzania (as described in Chapter 3), and Jubail (Saudi Arabia) in the Arabian Gulf (see Richmond, 1994), combined with brief collections and field surveys in other parts of the region. Sites where brief field surveys were conducted include Watamu (Kenya), Mafia Island (Tanzania), Inhaca Island (Moçambique), Durban and northern Natal (South Africa), Gran Comores (Comoros), Tulear (SW Madagascar), Nose Be (NW Madagascar), Mahé and La Digue Islands (Seychelles), Yanbu (Saudi Arabia, NE Red Sea) and SW Papua New Guinea.

Most survey and collecting efforts were concentrated in the littoral zone, though shallow coral reefs and sublittoral seagrass beds were also examined. Field annotations and

photographs accompany much of the collection. Specimens were preserved dry and catalogued, with the bulk of the material collected deposited at the Institute of Marine Sciences (University of Dar es Salaam). Material at the Institut Halietique et des Sciences Marines, Tulear, Madagascar was also examined. The identification of parts of the collection made in Zanzibar were verified by staff at the Natural History Museum (London) and National Museum Wales – Cardiff, where specimens were also deposited. Collections from the two latter institutions were also examined. Taxonomic assistance was provided by Dr. D. Rabesandratana (Tulear, Madagascar) and Dr. G. Oliver (National Museum of Wales - Cardiff).

### **Preparation of the Preliminary Species Checklist**

The list is based on the compilation of 72 publications and reports dating from 1932 to 1997, unpublished collection lists and the species list of the material held by the National Museum of Wales, which holds the Melvill-Tomlin collection including many species from Mauritius as well as other parts of the western Indian Ocean. Where possible, emphasis was placed on records from revisionary works (of genera, sub-families or families) in an attempt to establish synonyms and valid species. The findings of more general works and ecological studies from the region were also considered. Comments on the bivalve section by Dr. Graham Oliver (National Museum of Wales - Cardiff) have been incorporated.

The species checklist is arranged by family with the genera and species listed alphabetically. Vaught's *A classification of living Mollusca* (1989) was followed as regards the arrangement of the families. Her classification has also permitted junior synonyms for genera to be identified and these have been replaced by senior genera. In addition, Vaught (1989) allowed sub-genera to be identified, and in most cases sub-genera have been replaced by the senior genus. This was done because it became clear that in several cases different authors use either the senior genus or the subgenus, or both, leading to a great deal of confusion and replication. Furthermore, with the exception of only a few well-established cases, the use of subspecies has been omitted. Where the species in question has not itself been reported for the region the species and subspecies are listed. Other distinctions, e.g. varieties (*var*) and forms (*forma*) have not been considered. The authority for each species

is given where possible with the year. However, for many sources the year, and in a few cases the authority are absent. Where obvious misspellings exist, these species have been combined.

The list can only be regarded as preliminary since the material was not examined, and some families which are not popular with collectors and have not been recently revised are probably underestimated (see Wells, 1990). For these reasons the diversity of some families should be considered to be only relative.

## RESULTS

The preliminary species checklist (included at the end of this section) includes a minimum of 2,550 species of gastropod prosobranchs from 75 families, 39 species of polyplacophorans representing 6 families and a minimum of 667 species of bivalves from 49 families.

A summary of the numbers of genera and species numbers for each family is presented in Tables 1-3. For some of the families in Tables 1 and 3 an additional species number is presented in parenthesis. This refers to the possible maximum should synonyms based on instances where different but closely related genera support the same species name and authority prove to be in fact different species. Since one of the major difficulties in this endeavour is establishing correct synonyms without examining the material, only the figure considered as the minimum species number is used for further analysis in this chapter. While accepting that there will be errors, these are as low as possible.

The most diverse families are the Mitridae with 210 species, Conidae (198), Muricidae (187), Turridae (180), Cypraeidae (97), Trochidae (92), Terebridae (88), Columbelloidea (87), Fasciolaridae (78), Nasariidae (77), Costellariidae (69) and Cerithiidae (69). Together these 12 families have 1,432 species, 56 % of the total recorded. Of the remainder, several families included in the checklist are considered little known. These tend to include families whose members are smaller than 10 mm, from deep water or from cryptic or parasitic habitats (e.g. living in sponges, or on echinoderms). Such families include the following: Scissurellidae, Delphinulidae, Rissoidae, Litiopidae, Diastomatidae, Cerithiopsidae, Triphoridae, Siliquariidae, Trichotrophidae, Pediculariidae, Lamellaridae, Triphoridae, Epitoniidae, Eulimidae, Stiliferidae and Marginellidae. For these families, positive identification of species is particularly complex and, pending further revision, ambitious at best. These families however, include 327 species from the present checklist, thus comprising about 13 % of the total. Analysis of distribution, diversity or ecology of these species cannot be undertaken at present.

The chitons, though few in number, are relatively well-known, thus the diversity reported can be considered to be a reliable measure of the true diversity of this group. Dominant



species in the region are the upper eulittoral *Acanthopleura* species, of the family Chitonidae, which are conspicuous in their presence on limestone cliffs.

The bivalve fauna for the western Indian Ocean has been less well documented than the prosobranch fauna. Few detailed studies of bivalves exist and the checklist was compiled from only 30 sources compared to 72 used in preparing the prosobranch checklist. The most diverse families are the Veneridae with 101 species, Tellinidae (68), Pectinidae (51), Cardiidae (47), Arcidae (37) and Mytilidae (35). Together these 6 families comprise 339 species, 51 % of the total recorded.

Table 1. Summary of number of genera and species for western Indian Ocean prosobranchs.

Family	Genera	Species no.	Family	Genera	Species no.
Scissurellidae	2	2	Ovulidae	10	27
Haliotidae	1	11	Triviidae	4	20
Fissurellidae	12	40	Pediculariidae	1	3
Lottiidae	1	2	Lamellariidae	1	3
Patellidae	2	14	Naticidae	7	63
Delphinulidae	2	4	Tonnidae	2	17
Trochidae	27	92 (100)	Ficidae	1	5
Turbinidae	6	33	Cassidae	4	14
Phasianellidae	3	15	Ranellidae	6	65 (67)
Neritidae	4	24	Bursidae	3	34
Septariidae	1	1	Triphoridae	2	56
Neritopsidae	1	1	Epitoniidae	5	48
Phenacolepadidae	1	3	Janthinidae	2	9
Littorinidae	6	22	Eulimidae	6	25 (26)
Rissoidae	6	63	Thycidae	1	1
Assimineidae	1	1	Stiliferidae	2	5
Tornidae	1	1	Muricidae	25	187 (203)
Fossariidae	1	3	Coralliophilidae	4	34
Planaxidae	4	11	Buccinidae	9	66 (68)
Modulidae	1	3	Columbellidae	4	87
Cerithiidae	5	69	Nassaridae	4	77
Cerithiopsidae	2	6	Melongenidae	3	3
Triphoridae	1	49	Fasciolaridae	7	78
Dialidae	1	2	Volutidae	2	5
Litiopidae	1	1	Harpidae	2	13
Diastomatidae	3	17	Vasidae	2	4
Potamididae	2	2	Olividae	5	65
Turritellidae	2	9 (10)	Marginellidae	6	38
Siliquariidae	1	4	Mitridae	8	210
Vermetidae	3	14	Costellariidae	3	69
Strombidae	4	27	Cancellariidae	3	11
Hipponicidae	2	19	Conidae	1	198
Vanikoridae	1	16	Turridae	31	180 (194)
Crepidulidae	1	1 (2)	Terebridae	5	88
Capulidae	1	5	Architectonicidae	3	15
Trichotrophidae	1	2	Pyramidellidae	7	29 (30)
Xenophoridae	1	7	Amathinidae	1	5
Cypraeidae	1	97			
			(75 families)	Totals	303
					2,550 (2,596)

Table 2. Summary of number of genera and species for western Indian Ocean polyplacophorans.

Family	Genera	Species no.
Leptochitonidae	2	3
Ischnochitonidae	5	10
Mopalidae	1	3
Chitonidae	5	14
Acanthochitonidae	4	8
Cryptoplacidae	1	1
Totals	18	39

Table 3. Summary of number of genera and species for western Indian Ocean bivalves.

Family	Genera	Species no.	Family	Genera	Species no.
Nuculidae	2	5	Cardiidae	9	47 (51)
Solemyidae	1	4	Tridacnidae	2	3
Arcidae	4	37	Mactridae	4	16 (17)
Noetiidae	4	5	Mesodesmatidae	2	3
Cucullaeidae	1	1	Solenidae	1	7
Limopsidae	1	1	Cutellidae	3	6
Glycymerididae	3	12	Tellinidae	8	68
Mytilidae	11	35 (38)	Donacidae	1	21
Pteriidae	2	17 (18)	Solecurtidae	1	1
Malleidae	3	7	Psammobiidae	6	14 (15)
Isognomonidae	3	11	Semelidae	6	17
Pinnidae	3	6	Trapeziidae	2	9
Limidae	2	10	Vesicomysidae	2	3
Ostreidae	5	19	Veneridae	33	101 (114)
Gryphaeidae	2	3	Petricolidae	1	8
Plicatulidae	1	2 (8)	Myidae	1	1
Pectinidae	10	51	Corbulidae	2	5
Spondylidae	1	18	Gastrochaenidae	1	5
Anomidae	1	3	Pholadidae	4	6
Lucinidae	8	20 (22)	Teredinidae	6	8
Ungulinidae	2	5	Laternulidae	1	1
Erycinidae	6	17	Thraciidae	1	1
Sportellidae	1	2	Cuspidariidae	1	1
Carditidae	2	6	Clavagellidae	3	3
Chamidae	2	15			
			(49 families)	182	667 (698)
			Totals		

One of the functions of the checklist is to establish which species have been most commonly documented, and from which localities within the region, by examining the reference sources. Table 4 below summarises the records from a few of the major sources used to compile the checklist of prosobranchs and bivalves.

Table 4. Comparison of major sources used in preparation of the species checklist.

Western Indian Ocean reference sources	PROSOBRANCHIA	BIVALVIA
Checklist totals	2,550	667
Dar es Salaam (Spry, 1961,1964)	439	180
Madagascar (Dautzenberg, 1932 )	276	120
Mauritius (Viader, 1937)	1,647	251
Mauritius (Drivas & Jay, 1988)	727	71
Natal-Moçambique (Kilburn & Rippey, 1982)	207	109
Natal- Moçambique (Barnard, 1958-69)	224	113
National Museum Wales collection	612	169

From the table above it can be seen that the report of Viader (1937) is the most comprehensive for both prosobranchs and bivalves. His study from Mauritius includes a large component of species from families which are regarded as little-known (as discussed above). The study by Drivas & Jay (1988) also derives from Mauritius and Reunion but their coverage of the bivalves is scant. The other studies clearly reveal the lack of comprehensive coverage for western Indian Ocean fauna in general.

A summary of the findings of this chapter are presented by Richmond & Rabesandratana (1997) where they emphasize littoral or shallow sublittoral fauna, describing 162 prosobranch species from 48 families, 91 bivalve species from 37 families and 2 species of polyplacophorans, together with a representative of the Scaphopoda and several representatives of the Cephalopoda. Prosobranchs were mainly illustrated from specimens loaned by the Natural History Museum (London) and bivalves from material loaned by the National Museum of Wales - Cardiff. The approach was to depict each shell so as to include features important in its identification. In the case of bivalves, for the majority of species both outer and inner shells were depicted, thus revealing such taxonomically important details as the pallial sinus, position of the muscle scars and details of the hinge. The descriptions of species included size, general morphology, habitat and geographical distribution, together with a

summary of family level diagnoses. This total species checklist is presented in Table 5 together with the list of bibliographic sources, for which full details are presented in the bibliography.

Table 5. Preliminary checklist of western Indian Ocean prosobranch molluscs.

Reference source numbers in italics represent records of synonyms. For details of reference sources see Checklist Sources at end of this section.

Taxa	Reference sources
<b>SCISSURELLIDAE</b>	
<i>Pleurotomaris</i> sp.	24
<i>Scissurella</i> sp.	15
<b>HALIOTIDAE</b>	
<i>Haliotis asinina</i> L., 1758	28
<i>Haliotis clathrata</i> Rve., 1846	11
<i>Haliotis ovina</i> Gm., 1791	37
<i>Haliotis pustulata</i> Rve., 1846	23;1;2;38;37;22
<i>Haliotis queckettii</i> Smith	3;15
<i>Haliotis revelata</i> Des.	37
<i>Haliotis spadicea</i> Donovan 1808	20;12;15
<i>Haliotis speciosa</i> Rve. 1846	4
<i>Haliotis squamosa</i> Gray	38
<i>Haliotis unilateralis</i> (Lam.) Weinkauff	37
<i>Haliotis varia</i> (L., 1758)	2;37;22
<b>FISSURELLIDAE</b>	
<i>Amblychilepas dubia</i> (Rve., 1849)	20
<i>Amblychilepas scutellum</i> (Gm., 1791)	20
<i>Diodora australis</i> (Krauss, 1848)	20
<i>Diodora calyculata</i> Sow.	38
<i>Diodora crucifera</i> (Pilsbury, 1890)	2;20
<i>Diodora elizabethae</i> (Smith, 1901)	20
<i>Diodora lima</i> Sow.	3
<i>Diodora jukesi</i> Rve.	38
<i>Diodora quadriradiata</i> (Rve.)	1;37
<i>Diodora rueppellii</i> (Sow., 1834)	22;1;2;15;37;38
<i>Diodora singaporensis</i> (Rve., 1850)	57;37
<i>Diodora spreta</i> (Smith, 1901)	20;59;37
<i>Elegidion quadriradiata</i> (Rve., 1850)	22
<i>Emarginula clathrata</i> Ad. & Rve.	37
<i>Emarginula costulata</i> Des., 1863	2;37
<i>Emarginula decorata</i> Des., 1863	22;2;37
<i>Emarginula fenestrata</i> Des.	37
<i>Emarginula peasei</i> Thiele, 1915	15
<i>Emarginula scutellata</i> Des.	22;37
<i>Emarginula spinosa</i> Des.	37;38
<i>Emarginula tenuicostata</i> Sow.	59;37
<i>Emarginula tricarinata</i> Born	22
<i>Fissurella natalensis</i> Krauss, 1848	4;15;20;30;38;3
<i>Fissurella mutabilis</i> Sow.	15;20
<i>Hemitoma cumingi</i> Sow.	59;38
<i>Macrochisma africana</i> Tomlin, 1931	2;26;20
<i>Macrochisma compressa</i> A. Ad.	37;38
<i>Macrochisma magathura</i> A. Ad.	59
<i>Montfortia brevirimata</i> Des.	37
<i>Montfortia eurythima</i> Dautz.	37
<i>Rimula exquisita</i> A. Ad., 1851	22;59;37
<i>Scutellastra exusta</i> Rve., 1854	22
<i>Scutellastra pica</i> (Rve.)	15
<i>Scutus anatinus</i> (Donovan, 1820)	30;1
<i>Scutus breviculus</i> (Blain., 1817)	22
<i>Scutus corrugatus</i> Rve.	37
<i>Scutus elegans</i> (Gray)	15
<i>Scutus sinensis</i> (Blain.	22

Table 5. (continued)

Taxa	Reference sources
<i>Scutus unguis</i> (L., 1758)	2;3;11;15;20;38
<i>Submarginula rugosa</i> Quoy & Gaimard	38
<i>Tugali parmophoidea</i> (Quoy & Gaimard, 1834)	22
<b>LOTTIIDAE</b> (Acmaeidae)	
<i>Patelloida</i> ( <i>Acmaea</i> ) <i>profunda</i> (Des., 1863)	72;2;26;15;22;59;54;1;4;37;71
<i>Patelloida</i> ( <i>Acmaea</i> ) <i>saccharina</i> (L.)	1
<b>PATELLIDAE</b>	
<i>Cellana eucosmia</i> (Pilsbury, 1891)	1
<i>Cellana garconi</i> (Des., 1863)	37;31
<i>Cellana livescens</i> (Rve., 1855)	31;22;2;26;38;37
<i>Cellana radiata capensis</i> (Gm., 1791)	3;4;15;20;6;31;37;38
<i>Cellana radiata radiata</i> (Born, 1778)	72;22;15;38;37;71
<i>Cellana radiata enneagona</i> (Rve., 1854)	31;22
<i>Cellana vitiensis</i> Powell, 1973	31;37;57;59;71
<i>Patella barbara</i> L., 1758	1;2;3;20;37;31
<i>Patella compressa</i> L., 1758	37;31
<i>Patella concolor</i> Krauss, 1848	4;31
<i>Patella exusta</i> Rve., 1854	72;31;37;38;26;2;20;37
<i>Patella flexuosa</i> Quoy & Gaimard, 1834	72;2;37;1;38
<i>Patella granularis</i> L., 1758	31;4;20
<i>Patella longicosta</i> Lam., 1819	20;31
<i>Patella miniata</i> Born, 1778	31;5;20
<i>Patella tabularis</i> Krauss, 1848	38;31
<b>DELPHINULIDAE</b>	
<i>Liotia granulosa</i> Dunker	37
<i>Liotia parvissima</i> Hedley	37
<i>Liotia peronii</i> Keiner	37
<i>Mecoliotia iredalei</i> Bavay	37
<b>TROCHIDAE</b>	
<i>Broderipa cumingi</i> A. Ad.	37
<i>Broderipa eximia</i> Nevill	37
<i>Broderipa iridescens</i> (Brod., 1834)	22;27;37
<i>Broderipa nitidissima</i> Des., 1863	22;37
<i>Broderipa rosea</i> (Brod.)	15;59
<i>Broderipa subiridescens</i> Pilsbury	37
<i>Calliostoma burmupi</i> Smith, 1899	20
<i>Calliostoma comptum</i> A. Ad.	37
<i>Calliostoma eucosmia</i> (Bartsch)	1
<i>Calliostoma interruptus</i> Wd.	22;1
<i>Calliostoma jujubinum</i> Gm.	37
<i>Calliostoma ocellatum</i> Rve., 1863	22
<i>Calliostoma picturatus</i> (A. Ad.)	1;72
<i>Cantharidus fultoni</i> (Sow.)	15
<i>Cantharidus suarezensis</i> (Fischer, 1878)	22;20;38
<i>Chrysostoma paradoxum</i> Born	37
<i>Clanculus clanguloides</i> (Wd.)	1
<i>Clanculus flosculus</i> Fischer, 1880	22;15;59;1
<i>Clanculus margaritarius</i> Phil., 1846	37;2;2;26
<i>Clanculus mauritianus</i> Melvill, 1909	37;22;2
<i>Clanculus miniatus</i> (Anton, 1839)	3
<i>Clanculus pharaonius</i> (L., 1758)	26;37
<i>Clanculus puniceus</i> (Phil., 1846)	1;2;3;4;15;20;45;38
<i>Clanculus rarus</i> (Dufou, 1840)	2
<i>Clanculus stigmatarius</i> A. Ad.	37
<i>Clanculus tonnerrei</i> (G. & H. Nevill, 1874)	41
<i>Euchelus atratus</i> (Gm., 1791)	2

Table 5. (continued)

Taxa	Reference sources
<i>Euchelus bicinctus</i> (Phil., 1849)	1
<i>Euchelus gemmatus</i> Gould, 1845	15
<i>Euchelus providentiae</i> Melvill	37
<i>Euchelus planatus</i> Carpenter	37
<i>Gena auricula</i> Lam.	37
<i>Gena fuliginosa</i> A. Ad.	37
<i>Gena lineata</i> A. Ad.	37
<i>Gena lutea</i> Ad.	37
<i>Gena nigra</i> Quoy	37
<i>Gena planulata</i> (Lam.)	1;37
<i>Gena strigosa</i> A. Ad.	37
<i>Gena varia</i> (A. Ad.)	37;6;15;59
<i>Gibbula capensis</i> (Gm.)	1
<i>Gibbula phasianella</i> Des.	37
<i>Gibbula townsendi</i> Sow., 1895	1;20
<i>Gibbula tyroni</i> Pilsbury	20
<i>Infundibulops cariniferus</i> (Rve.)	1;22
<i>Infundibulum aemulans</i> A. Ad., 1855	22
<i>Infundibulum venetus</i> Rve., 1862	22
<i>Minolia eudeli</i> Des.	37
<i>Minolia singaporensis</i> Pilsbury	15;59
<i>Minolia splendens</i> (Sow., 1897)	20
<i>Minolia tragema</i> Melvill & Standen	37
<i>Minolia variegata</i> Odhner	38
<i>Monilea philippi</i> A. Ad., 1854	22
<i>Monodonta australis</i> (Lam., 1816)	2;4;15;27;15;20;59;37;38
<i>Monodonta labio</i> (L., 1758)	2;15;27;37
<i>Nevillia lucida</i> H. Ad.	37
<i>Nevillia picta</i> H. Ad., 1868	22;37
<i>Oxystele tabularis</i> (Krauss, 1848)	3;4;20
<i>Priothrochus chrysolaeama</i> Martens	22;37
<i>Priothrochus obscurus</i> (Wd., 1828)	15;22;37;1;20;3
<i>Prothalotia lepida</i> Phil., 1846	22
<i>Pyramidae nodulifera</i> (Chem.)	1;38
<i>Rossiteria nucleus</i> Phil., 1849	22;37
<i>Solariella aquamarina</i> Melvill, 1909	22;37
<i>Solariella incisura</i> Melvill	37
<i>Solariella sayademalhana</i> Melvill	37
<i>Stomatella articulata</i> A. Ad.	38;3
<i>Stomatella concinna</i> Gould	37
<i>Stomatella exquisita</i> Sow.	38
<i>Stomatella impertusa</i> (Burrow)	59
<i>Stomatella montrouzieri</i> Pilsbury	37
<i>Stomatella orbiculata</i> A. Ad., 1850	1;37;22
<i>Stomatella pulchella</i> A. Ad.	37
<i>Stomatella stellata</i> Souverbie	37
<i>Stomatella sulcifera</i> Lam., 1822	20;38
<i>Stomatia ivisata</i> (Dufo)	15
<i>Stomatia phymotis</i> (Helbling, 1779)	2;37
<i>Stomatia splendidula</i> A. Ad.	59
<i>Stomatia variegata</i> H. Ad.	37
<i>Stomatollina rubra</i> (Lam., 1822)	2;
<i>Synaptocochlea caliginosa</i> H. & A. Ad., 1864	22
<i>Synaptocochlea concinna</i> Gould, 1845	22
<i>Tectus concavus</i> (Gm., 1791)	2;37
<i>Tectus mauritianus</i> Gm., 1791	2;15;22;59;37;38;1;45
<i>Tectus pyramis</i> Born, 1778	2;11;22
<i>Trochus baccatus</i> Sow.	37

Table 5. (continued)

Taxa	Reference sources
<i>Trochus cariniferus</i> Rve.	2;38
<i>Trochus erythraeus</i> (Broochi, 1823)	1;45;59
<i>Trochus flammulatus</i> Lam., 1822	59;2;15;27;22;37
<i>Trochus maculatus</i> (L., 1758)	59;1;2;15;37;38
<i>Trochus nigropunctatus</i> Rve., 1861	3;4;15;20
<i>Trochus niloticus</i> L.	37
<i>Trochus obeliscus</i> Gm.	37
<i>Trochus ochroleucus</i> Gm.	2;
<i>Trochus radiatus</i> Gm., 1791	2;37;38
<i>Trochus tentorium</i> (Gm.)	1;45
<i>Trochus tubiferus</i> Gm.	37
<i>Trochus virgatus</i> Gm., 1791	1;26;37;2;22
<i>Umbonium elegans</i> Beck	37
<i>Umbonium vestiarium</i> (L., 1758)	22;2
<b>TURBINIDAE</b>	
<i>Astraea</i> ( <i>Cookia</i> ) <i>cookii</i> (Gm.)	1
<i>Astraliu</i> <i>imperator</i>	1
<i>Astraliu</i> <i>petrosum</i> Martyn	37
<i>Bolma andersoni</i> (Smith)	20
<i>Leptothyra candida</i> Pease	15;59
<i>Leptothyra filifera</i> Des.	21;59;37
<i>Leptothyra folini</i> Pilsbury	37
<i>Leptothyra gestroi</i> Caramagna	38
<i>Leptothyra laeta</i> Montrouzier	37
<i>Leptothyra purpurata</i> Des.	21;37
<i>Leptothyra roseocincta</i> Martens	37
<i>Leptothyra semilugubris</i> Des.	21;37
<i>Leptothyra viridula</i> Sow.	37
<i>Liotina crenata</i> Kiener	59
<i>Turbo argyrostomus</i> L., 1758	37;59;45;1;3;2;15;22
<i>Turbo chrysostrabus</i> L., 1758	37;45;2;22
<i>Turbo cidaris</i> Gm.	27;20
<i>Turbo coronatus</i> Gm., 1791	72;54;1;3;20;38;22;2;4
<i>Turbo filiosus</i> Kiener	37
<i>Turbo histrio</i> Rve.	37
<i>Turbo imperialis</i> Gm.	38
<i>Turbo intercostalis</i> Menke, 1843	2;37
<i>Turbo japonicus</i> Rve., 1848	2;37
<i>Turbo margaritaceus</i> L.	37
<i>Turbo marmoratus</i> L., 1758	59;45;1;2;57;37;38
<i>Turbo natalensis</i> Krauss	4
<i>Turbo petholatus</i> L.	3;15;37
<i>Turbo radiatus</i> Gm., 1791	59;2;37;38
<i>Turbo reevei</i> Phil., 1847	2
<i>Turbo setosus</i> Gm., 1843	2;15;26;37
<i>Turbo spinosus</i> Gm.	59
<i>Turbo splendidulus</i>	1
<i>Turbo ticaonicus</i> Rve.	37
<b>PHASIANELLIDAE</b>	
<i>Gabrielona pisinna</i> Roberston, 1973	66;25
<i>Phasianella aethiopica</i> Phil.	59;15;27;37;38;72
<i>Phasianella brougniarti</i> Audoin	37
<i>Phasianella grata</i> Phil.	37
<i>Phasianella jaspidea</i> Rve.	15
<i>Phasianella marmorata</i> Dufo	37
<i>Phasianella nivosa</i> (Rve.)	1;37
<i>Phasianella rubens</i> Lam.	37



Table 5. (continued)

Taxa	Reference sources
<i>Phasianella solida</i> (Born, 1778)	2;11;37
<i>Phasianella splendida</i> Phil.	37
<i>Phasianella variegata</i> Lam., 1822	2;1;27;37;38
<i>Phasianella vitrea</i> Des.	37
<i>Tricolia capensis</i> (Dunker, 1846)	4;20
<i>Tricolia ios</i> Robertson, 1985	67
<i>Tricolia variabilis</i> (Pease, 1861)	67;37
<b>NERITIDAE</b>	
<i>Nerita albicilla</i> L., 1758	54;60;1;2;3;4;15;26;15;20;7;37;38;71;72
<i>Nerita aterrima</i> Gm., 1791	2;6
<i>Nerita atrata</i> Rve.	37
<i>Nerita bensoni</i> (Rcz.)	2
<i>Nerita bisecta</i> Rve.	2;37
<i>Nerita chamaeleon</i> L., 1758	2;27;37
<i>Nerita costata</i> Gm., 1791	2
<i>Nerita debilis</i> Dufo, 1840	15;58;72
<i>Nerita histrio</i> L.	37
<i>Nerita maxima</i> Gm.	37
<i>Nerita ornata</i> Sow.	37
<i>Nerita plexa</i> Chemn.	37;38
<i>Nerita plicata</i> L., 1758	59;54;1;2;72;3;4;15;26;20;7;37;38;71
<i>Nerita polita</i> L., 1758	55;1;2;3;4;15;26;11;20;37;38;71
<i>Nerita punctata</i> Quoy & Gaimard	2;37
<i>Nerita textilis</i> Gm., 1791	59;1;2;3;4;15;72;20;71
<i>Nerita umlaasiana</i> Krauss	15;20
<i>Nerita undata</i> L., 1758	54;1;2;7;15;26;20;72;37;38;71
<i>Neritina longispina</i> Rcz.	27
<i>Neritina mauriciae</i> (Lesson)	2
<i>Neritina gagates</i> (Lam.)	2;27
<i>Smaragdia rangiana</i> (Rcz.)	59;60;15;38
<i>Smaragdia souverbiana</i> (Montrouzier, 1863)	59;12;15;72;38
<i>Theodoxus coronatus</i> (Leach)	2
<b>SEPTARIIDAE</b>	
<i>Septaria borbonic</i> (Saint-Vincent, 1803)	2
<b>NERITOPSIDAE</b>	
<i>Neritiopsis radula</i> (L., 1758)	59;26;27;37
<b>PHENACOLEPADIDAE</b>	
<i>Phenacolepas asperulata</i> H & A Ad.	15;15;59;37
<i>Phenacopleas cremulata</i> (Brod.)	2
<i>Phenacolepas galathea</i> (Lam.)	2;6
<b>LITTORINIDAE</b>	
<i>Bembicium melanostama</i> Gm	37
<i>Bembicium tantillus</i> Gould	37
<i>Bembicium infracostata</i> Issel	37
<i>Littoraria coccinea</i> (Gm., 1791)	51;45;1;3;37
<i>Littoraria glabrata</i> (Phil., 1846)	7;4;72;20;51;58;49;37;38;2;26;71
<i>Littoraria intermedia</i> (Phil., 1846)	4;7;51;37
<i>Littoraria mauritiana</i> (Lam., 1822)	2;26;20;51;37
<i>Littoraria pallescens</i> (Phil., 1846)	7;51
<i>Littoraria pintado</i> (Wd., 1828)	2;26;51;49;37;38
<i>Littoraria scabra</i> (L., 1758)	1;3;2;26;20;4;15;7;51;42;54;59;37;38;71
<i>Littoraria subvittata</i> Reid, 1986	4;7;51;37
<i>Littoraria undulata</i> (Gray, 1839)	51;1;2;57;7;37
<i>Littorina zebra</i> Wd.	37
<i>Nodilittorina africana</i> Phil.	49;4;20;38

Table 5. (continued)

Taxa	Reference sources
<i>Nodilittorina millegrana</i> (Phil., 1848)	49;59;7;26
<i>Nodilittorina natalensis</i> (Phil., 1847)	4;20;49;72;59;54;71 1;3;38
<i>Peasiella</i> sp.	15
<i>Tectarius coronatus</i> Valenciennes, 1832	58
<i>Tectarius granularis</i> Gray	37
<i>Tectarius malaccanua</i> Phil.	38
<i>Tectarius miliaris</i> Quoy	37
<i>Tectarius tectumpersicum</i> (L., 1758)	37
<b>RISSOIDAE</b>	
<i>Alvania fenestrata</i> (Krauss)	20
<i>Alvania mauritiana</i> Martens	37
<i>Alvania tiberiana</i> Issel	37
<i>Rissoa deformis</i> (Sow.)	1
<i>Rissoa microthyra</i> Marten	37
<i>Rissoa pulicaria</i> de Folin	37
<i>Rissoina triticea</i> Pearce	37
<i>Rissoina abnormis</i> Nevill	37
<i>Rissoina ambigua</i> Gould, 1849	22;15;59;37
<i>Rissoina balteata</i> Pease	59
<i>Rissoina bertholleti</i> (Audoin) Issel	38
<i>Rissoina bidentata</i> Phil.	37
<i>Rissoina burgdigaliensis</i> d'Orbingy	37
<i>Rissoina canaliculata</i> Schwartz	37
<i>Rissoina cerithiiformis</i> (Dunker)	15
<i>Rissoina chesneli</i> Michaud	37
<i>Rissoina clathrata</i> A. Ad., 1853	22
<i>Rissoina concinna</i> A. Ad.	37
<i>Rissoina conifera</i> Montagu	21;37
<i>Rissoina coronata</i> Rcz.	37
<i>Rissoina crassa</i> Angas	37
<i>Rissoina decussata</i> Montagu	37
<i>Rissoina deshayesi</i> Schwartz	59
<i>Rissoina distans</i> Anton, 1839	22
<i>Rissoina erythraea</i> Phil.	37;38
<i>Rissoina eulimoides</i> A. Ad.	37
<i>Rissoina exasperata</i> Souverbie	37
<i>Rissoina exigua</i> Dunker	37
<i>Rissoina fenestrata</i> Schwartz	59;37
<i>Rissoina funiculata</i> Souverbie	38
<i>Rissoina insignis</i> A. Ad.	37
<i>Rissoina insolita</i> Des.	37
<i>Rissoina lateritia</i> Preston	21
<i>Rissoina media</i> Schwartz	15
<i>Rissoina miltozona</i> Tomlin, 1915	22;37
<i>Rissoina miranda</i> A. Ad.	37;38
<i>Rissoina mohrensteini</i> Des	37
<i>Rissoina monilis</i> A. Ad.	37
<i>Rissoina myosoroides</i> (Rcz.) Schwartz	38
<i>Rissoina nesioties</i> Melvill & Standen	37
<i>Rissoina obeliscus</i> Rcz.	15;37
<i>Rissoina oryza</i> Garret	37
<i>Rissoina percrassa</i> Nevill	37
<i>Rissoina plicata</i> A. Ad.	15;59;37
<i>Rissoina plicatula</i> Gould	37
<i>Rissoina pseudo-bryerea</i> Nevill	37
<i>Rissoina pusilla</i> Brocchi	37
<i>Rissoina reticulata</i> Sow.	37

Table 5. (continued)

Taxa	Reference sources
<i>Rissoina rissoi</i> (Andoin) Weinkauff	38
<i>Rissoina rosea</i> Des	37
<i>Rissoina scalariformis</i> R.B. Adams	37
<i>Rissoina seguenziana</i> Issel	37
<i>Rissoina striolata</i> A. Ad	37
<i>Rissoina subangulata</i> C.B. Adams	21;37
<i>Rissoina subdebilis</i> Weinkauff	37
<i>Rissoina tenuis</i> A. Ad	37
<i>Rissoina tenuistrata</i> Pease	59
<i>Rissoina tridentata</i> Michaud	37
<i>Rissoina turricula</i> Pease	59;37
<i>Schwartziella triticea</i> Pease, 1861	22;37
<i>Setia bizonata</i> Nevill	37
<i>Zebina semiplicata</i> Pease	59
<i>Zebina spirata</i>	59
<b>ASSIMINEIDAE</b>	
<i>Assimineia ovata</i> (Krauss, 1848)	4;20;37
<b>TORNIDAE</b>	
<i>Tornus</i> sp.	59
<b>FOSSARIDAE</b>	
<i>Fossarus ambiguus</i> L.	37
<i>Fossarus capensis</i> Pilsbury	16
<i>Fossarus lamellosus</i> Montrouzier	15;58
<b>PLANAXIDAE</b>	
<i>Angiola periscelida</i> Dall, 1926	22
<i>Fissilabia decollata</i> Lam., 1822	22
<i>Holcostoma piliger</i> Phil., 1848	22
<i>Holcostoma setigerum</i> A. Ad	37
<i>Planaxis acutus</i> Krauss	15;37
<i>Planaxis ineptus</i> Gould	37
<i>Planaxis lineatus</i> Gould	20;38
<i>Planaxis lineolatus</i> Gould	37
<i>Planaxis nucleus</i> Lam.	37
<i>Planaxis pyramidalis</i> Gm.	37
<i>Planaxis sulcatus</i> (Born, 1780)	59;54;22;1;2;3;4;26;27;7;37;38;71;72
<b>MODULIDAE</b>	
<i>Modulus duplicatus</i>	21
<i>Modulus obtustatus</i> Phil.	37
<i>Modulus tectum</i> (Gm., 1791)	22;1;2;15;26;59;37;38
<b>CERITHIIDAE</b> Review refs. 17;66;75	
<i>Bittium aelomitres</i> Melvill & Standen, 1896	22
<i>Bittium albocinctum</i> Melvill & Standen	37
<i>Bittium glareosum</i> Gould	37
<i>Bittium granarium</i> Kiener	37
<i>Bittium marileutes</i> Melvill & Standen	37
<i>Bittium tricarinatum</i> Pease	37
<i>Bittium uveanum</i> Melvill	37
<i>Cerithium africanum</i> Houbriek, 1992	17
<i>Cerithium amirantium</i> Smith, 1884	17
<i>Cerithium atomarginatum</i> (Dautz. & Bouge. 1833)	17;2;59;37;59
<i>Cerithium caeruleum</i> Sow., 1855	72;17;54;45;22;1;16;7;38
<i>Cerithium citrinum</i> Sow., 1855	17;1;2;37;38
<i>Cerithium clypeomorus</i> Jous.	37
<i>Cerithium columna</i> Sow., 1834	17;22;59;45;1;2;15;26;16;37;38
<i>Cerithium coralium</i> (Kiener)	1;37

Table 5. (continued)

Taxa	Reference sources
<i>Cerithium crassilabrum</i> Krauss	17;20
<i>Cerithium crossei</i> Des.	37
<i>Cerithium dialencum</i> Phil., 1849	17;22;3;26;16;37
<i>Cerithium echinatum</i> Lam., 1822	17;59;45;22;1;2;15;26;37
<i>Cerithium egenum</i> Gould	17;59;37;38
<i>Cerithium eximium</i> (Sow.)	1
<i>Cerithium ferrugineum</i> Say.	37
<i>Cerithium flemischi</i> Martin, 1933	17
<i>Cerithium gemmatum</i> Hinds	37
<i>Cerithium gloriosum</i> Houbriek, 1992	17
<i>Cerithium graniferum</i> Pease	37
<i>Cerithium ianthinum</i> Gould	59;37
<i>Cerithium impendens</i> Hedley	37
<i>Cerithium interstriatum</i> Sow., 1855	17;22
<i>Cerithium lissum</i> Watson, 1880	17
<i>Cerithium litteratum</i> Born	37
<i>Cerithium matukense</i> Watson, 1880	17
<i>Cerithium munitum</i> Sow., 1855	17;37
<i>Cerithium morum</i> Lam.	5;37;71
<i>Cerithium nesioticum</i> Pilsbury & Vanatta, 1906	17;59;22;2;37;38;1
<i>Cerithium nodulosum</i> Brug., 1792	17;45;59;22;1;2;15;26;37;38
<i>Cerithium patiens</i> Bayle	37
<i>Cerithium pingue</i> A. Ad.	37
<i>Cerithium punctatum</i> Brug., 1792	17;22;2;1;15;59;45;37;38
<i>Cerithium rostratum</i> Sow., 1855	59;60;22;2;15;26;16;37;38;1
<i>Cerithium rugosum</i> Wd.	3;16
<i>Cerithium ruppelli</i> Phil., 1848	17;37
<i>Cerithium salebrosum</i> Sow., 1855	17;2
<i>Cerithium sinon</i> Bayle	37
<i>Cerithium tenuiscalptum</i> Sow.	37
<i>Cerithium torulosum</i> L., 1758	2;37
<i>Cerithium traillii</i> Sow., 1855	22;1
<i>Cerithium turritella</i> Anton	38
<i>Cerithium uncinatum</i> Gm.	37
<i>Cerithium zebrum</i> Kiener, 1841	17;22;59;37;38
<i>Cerithium zonatum</i> (Wd., 1828)	17;2;37
<i>Clypeomorus batillariaeformis</i> Habe & Kosuge, 1966	66;2
<i>Clypeomorus bifasciatus</i> Sow., 1855	72;66;22;7;1;3;16;59;57;7;5;37;2;38
<i>Clypeomorus conciscus</i> (Hombron & Jacquinot, 1854)	2
<i>Clypeomorus genesi</i> (Fischer & Vignal, 1901)	2
<i>Clypeomorus petrosa</i> (Wd., 1828)	66;37;1;37;38
<i>Clypeomorus nymphea</i> Houbriek, 1985	66;22
<i>Clypeomorus purpurastoma</i> Houbriek, 1985	66
<i>Plesiotrochus exilis</i> Pease	37
<i>Pseudovertagus aluco</i> (L., 1758)	75;37
<i>Pseudovertagus nobilis</i> (Rve., 1855)	75
<i>Rhinoclavis articulata</i> (Ad. & Rve., 1850)	75;2;1;57;59
<i>Rhinoclavis aspera</i> (L., 1758)	75;22;15;26;59;60;1;37
<i>Rhinoclavis diadema</i> Houbriek, 1978	75;2
<i>Rhinoclavis fasciata</i> Brug. 1792	75;22;15;26;9;37;1;2
<i>Rhinoclavis kochi</i> (Phil., 1848)	75;37;2;1;3;16;37
<i>Rhinoclavis vergatus</i> (L., 1758)	75; 37;38
<i>Rhinoclavis sinensis</i> Gm., 1791	75;1;2;59;22;4;20;1;26;45;37;22;38
<i>Rhinoclavis sordidula</i> Gould, 1849	75;22
<b>CERITHIOPSIDAE</b>	
<i>Cerithiopsis catenaria</i> Melvill & Standen	37
<i>Cerithiopsis fosterae</i> Melvill & Standen	37

Table 5. (continued)

Taxa	Reference sources
<i>Cerithiopsis mathildaeformis</i> Melvill	37
<i>Cerithiopsis pulvis</i> Issel	37
<i>Cerithiopsis subreticulata</i> Dunker	37
<i>Seila alfredensis</i> Bartsch	37
<b>TRIPHORIDAE</b>	
<i>Triphora acicula</i> Issel	37
<i>Triphora acuta</i> Kiener	37
<i>Triphora adamsi</i> Des.	37
<i>Triphora angustissima</i> Des.	37
<i>Triphora alteruter</i> A. Ad.	37
<i>Triphora atomus</i> Issel	37
<i>Triphora aureus</i> Hervier	37
<i>Triphora chaperi</i> Jouss.	37
<i>Triphora cingulifera</i> Pease	37
<i>Triphora concinna</i> Hinds	37
<i>Triphora concors</i> Hinds	37
<i>Triphora connata</i> Montrouzier	37
<i>Triphora crassula</i> Martens	37
<i>Triphora crenulata</i> Des.	37
<i>Triphora distincta</i> Des.	37
<i>Triphora douvillei</i> Jouss.	37
<i>Triphora ducosensis</i> Jouss.	37
<i>Triphora episcopalis</i> Hervier	37
<i>Triphora eupunctata</i> Sow.	37
<i>Triphora flammulata</i> Pease	37
<i>Triphora formosa</i> Des.	37
<i>Triphora fusca</i> Dunker	37
<i>Triphora fuscozonata</i> Sow.	37
<i>Triphora hilaris</i> Hinds	37
<i>Triphora hindisi</i> Des.	37
<i>Triphora lilaceocincta</i> Smith	37
<i>Triphora lilacina</i> Des.	37
<i>Triphora maxillaris</i> Hinds	37
<i>Triphora melantera</i> Hervier	37
<i>Triphora mirifica</i> Des.	37
<i>Triphora monacha</i> Hervier	37
<i>Triphora monilifera</i> Hinds	37
<i>Triphora pupaeformis</i> Des.	37
<i>Triphora pura</i> (Smith)	1
<i>Triphora reevei</i> Des.	37
<i>Triphora regalis</i> Jouss.	37
<i>Triphora rosea</i> Hinds	37
<i>Triphora rubra</i> Hinds	37
<i>Triphora rutilans</i> Hervier	37
<i>Triphora sculpta</i> Hinds	37
<i>Triphora speciosa</i> Ad. & Rve.	37
<i>Triphora taeniolata</i> Hervier	37
<i>Triphora tibialis</i> Jouss.	37
<i>Triphora trilirata</i> Jouss.	37
<i>Triphora tristis</i> Hinds	37
<i>Triphora tristoma</i> Blain.	37
<i>Triphora turricula</i> Hervier	37
<i>Triphora violacea</i> Quoy & Gaimard	37
<i>Triphora xystica</i> Jouss.	37
<b>DIALIDAE</b>	
<i>Diala lauta</i> (Ad.)	6
<i>Diala semistriata</i> Phil.	38,59;37

Table 5. (continued)

Taxa	Reference sources
<b>LITIOPIDAE</b>	
<i>Alaba gonocheila</i> A. Ad.	37
<b>DIASTOMATIDAE</b>	
<i>Cerithidium perparvulum</i> Watson, 1886	22
<i>Obtortio cerithina</i> Phil.	37
<i>Obtortio elongella</i> Melvill	37
<i>Obtortio geayi</i> Lamy	38
<i>Obtortio joviana</i> Melvill & Standen	37
<i>Obtortio latefasciata</i> Nevill	37
<i>Obtortio pupoides</i> A. Ad.	57;7
<i>Obtortio pyrachacma</i> Melville & Standen	15;37
<i>Obtortio reticulata</i> A. Ad., 1860	22
<i>Obtortio scabra</i> A. Ad.	57
<i>Obtortio tulgida</i> C.B Ad.	37
<i>Obtortio vinacea</i> Nevill	37
<i>Obtortio virgata</i> Phil.	37;38
<i>Scaliola arenosa</i> A. Ad.	59;15;37
<i>Scaliola caledonica</i> Crosse	38
<i>Scaliola elata</i> Semper	37
<i>Scaliola glareosa</i> A. Ad.	37
<b>POTAMIDIDAE</b>	
<i>Terebralia palustris</i> (Brug.) (L., 1767)	1;3;4;5;15;20;59;38
<i>Cerithidea decollata</i> L.	1;3;4;5;20;22;38
<b>TURRITELLIDAE</b>	
<i>Turritella carinifera</i> Lam.	4;20
<i>Turritella cingalifera</i> Sow.	37
<i>Turritella cochlea</i> Rve., 1849	2
<i>Turritella columnaris</i> Kiener	37
<i>Turritella concava</i> Martens	37
<i>Turritella duplicata</i> L.	37
<i>Turritella gascialis</i> Menke	15
<i>Turritella graciliima</i> Gould, 1860	2
<i>Turritella terebra</i> (L.)	1
<i>Vermicularia</i> sp.	1
<b>SILIQUARIDAE</b>	
<i>Siliquaria anguinus</i> L.	37
<i>Siliquaria cumingii</i> (Morch, 1860)	2
<i>Siliquaria lacteus</i> Lam.	37
<i>Siliquaria trochlearis</i> (Morch)	37;2
<b>VERMETIDAE</b>	
<i>Dendropoma corallinaceum</i> (Tomlin, 1939)	4
<i>Dendropoma tholia</i> Keen & Morton, 1960	20;16
<i>Dendropoma maximum</i> Sow.	37
<i>Serpulorbis natalensis</i> (Mörch, 1862)	4;16
<i>Vermetus contors</i> Carpenter	37
<i>Vermetus decussatus</i> Gm.	37
<i>Vermetus dentifer</i> Lam.	38
<i>Vermetus eruca</i> Lam	37
<i>Vermetus glomeratus</i> Bivona	37
<i>Vermetus imbricatus</i> Dunker	38
<i>Vermetus lilacinus</i> Morch	38
<i>Vermetus roussaei</i> Vaillant	38
<i>Vermetus semisurrectus</i> Bivona	37
<i>Vermetus triquetra</i> Bivona	37

Table 5. (continued)

Taxa	Reference sources
<b>STROMBIDAE</b> Review refs: 67;68;69;70	
<i>Lambis chiragra arthritica</i> (Rdg., 1798)	59;22;1;2;5
<i>Lambis chiragra</i> (L., 1758)	59;45;3;26;37;38
<i>Lambis crocata</i> (Link, 1807)	67;37;59;45;22;1;2;15;10
<i>Lambis digitata</i> (Perry, 1811)	67;1;45;2;26;37
<i>Lambis lambis</i> (L., 1758)	59;45;22;1;2;5;10;27;37;38
<i>Lambis scorpius</i> (L., 1758)	67;40;2;45;11;1;37;38
<i>Lambis scorpius indomaris</i> Abbott, 1961	40;2;37
<i>Lambis truncata</i> (Humphrey, 1786)	67;59;45;2;9;26
<i>Lambis violacea</i> (Swa., 1821)	67;22;2;26;27;37
<i>Strombus aurisdiane</i> (L., 1758)	69;59;45;22;2;1;26;37;38
<i>Strombus decorus</i> (Rdg., 1798)	69;59;22;2;26;20;1;3;38;37
<i>Strombus dentatus</i> L., 1758	69;1;2;59;22;37
<i>Strombus erythrinus erythrinus</i> Dill., 1817	69;22;2
<i>Strombus fusiformis</i> Sow., 1842	69;1
<i>Strombus gibberulus gibberulus</i> L., 1758	72;22;1;5;3;15;10;2;26;20;59;54
<i>Strombus haemastoma</i> Sow., 1842	22;2;37
<i>Strombus labiatus olydius</i> (Duclos, 1844)	69;22;1;2;22;3;2;37;38
<i>Strombus labiosus</i> Wd., 1828	69;1
<i>Strombus lentiginosus</i> L., 1758	59;45;22;1;2;26;37
<i>Strombus mutabilis ochroglottis</i> Abbott, 1960	40;69;40;4;15;26;20;3;27;37;38;59;54;60;1
<i>Strombus plicatus</i> Lam.,	69;15;37;3;37;22
<i>Strombus pipus</i> (Rdg., 1798)	69;22;2;37
<i>Strombus rugosus</i> Sow.	69;38;37
<i>Strombus taurus</i> Rve., 1857	22;37
<i>Strombus terebellatus afrobellatus</i> Abbott, 1960	69;40;22
<i>Strombus wilsoni</i> Abbott, 1960	70;40;22;2
<i>Tibia fuscus</i> L.	22;2
<i>Tibia insulaechorab</i> Rdg.	22
<i>Terebellum terebellum</i> (L., 1758)	68;15;11;37
<b>VANIKORIDAE</b>	
<i>Vanikoro acuta</i> Rcz.	37
<i>Vanikoro blainvilleana</i> Rcz.	37
<i>Vanikoro cancellata</i> (Rve.)	59;3;57;16;38;1;22;37
<i>Vanikoro clathrata</i> Rcz.	27
<i>Vanikoro cuvieriana</i> (Rcz., 1845)	2;37
<i>Vanikoro distans</i> (Rcz., 1845)	2
<i>Vanikoro gramulosa</i> Rcz.	37
<i>Vanikoro gueriniiana</i> Rcz.	37;1
<i>Vanikoro ligata</i> (Rcz., 1843)	22;2;59;37;38
<i>Vanikoro mauritii</i> (Rcz., 1845)	2;37;27
<i>Vanikoro natalensis</i> Smith, 1908	22;20;1
<i>Vanikoro plicata</i> (Rcz., 1844)	2
<i>Vanikoro rosea</i> Rcz.	37
<i>Vanikoro rugata</i> A. Ad., 1853	22;37
<i>Vanikoro scalaris</i> Rcz.	37
<i>Vanikoro solida</i> Sow.	22
<b>HIPPONICIDAE</b>	
<i>Cheilea cicatricosa</i> Rve.	59;37
<i>Cheilea dormitoria</i> (Rve., 1858)	2
<i>Cheilea equestris</i> (L., 1758)	1;22;2;57;16;37;38
<i>Cheilea hipponiciformis</i> Rve.	37
<i>Cheilea neptuni</i> Schumacher	37
<i>Cheilea papyracea</i> (A. Ad.)	1;37
<i>Cheilea tectumsinensis</i> (Lam. 1822)	2;1;37
<i>Hipponix acuta</i> Quoy & Gaimard	37
<i>Hipponix antiquata</i> L.	37;38

Table 5. (continued)

Taxa	Reference sources
<i>Hipponix australis</i> Quoy	37;38
<i>Hipponix barbata</i> Sow.	37
<i>Hipponix conicus</i> (Schumacher, 1817)	2;4;16;20;59;1;57;10
<i>Hipponix crystallina</i> Gould	37
<i>Hipponix grayana</i> Menke	37
<i>Hipponix lissa</i> (Smith)	57;37
<i>Hipponix pilosus</i> (Des.)	20;37;38
<i>Hipponix radiatus</i> Quoy & Gaimard	38
<i>Hipponix ticaonica</i> Sow.	37;38
<i>Hipponix violacea</i> Angas	37
<b>CREPIDULIDAE</b>	
<i>Crepidula</i> sp.	26
<i>Crepidula aculeata</i> (Gm.)	38;20;37
<b>CAPULIDAE</b>	
<i>Capulus badius</i> Dunker	37
<i>Capulus incurvus</i> (Gm., 1791)	2
<i>Capulus intortus</i> (Lam.)	16;37;38
<i>Capulus paleacea</i> Menke	22
<i>Capulus reductus</i> Des.	37
<b>TRICHOTROPHIDAE</b>	
<i>Separatista chemnitzii</i> (A. Ad., 1855)	2
<i>Separatista blainvilleana</i> Petit	37
<b>XENOPHORIDAE</b>	
<i>Xenophora cerea</i> (Rve., 1845)	2
<i>Xenophora conchyliophora</i> Born	37
<i>Xenophora corrugata</i> (Rve., 1842)	3;16;20;37
<i>Xenophora indica</i> Gm.	37
<i>Xenophora pallidula</i> (Rve., 1842)	2;20
<i>Xenophora solaroides</i> Rve., 1845	22;2;57;37
<i>Xenophora solaris</i> (L., 1764)	16
<b>Family CYPRAEIDAE</b>	
<i>Cypraea amarata</i> Meuschen	37
<i>Cypraea annulus</i> L., 1758	34;53;35;43;22;1;2;3;4;57;10;11;26;16;20;37;38
<i>Cypraea arabica</i> L., 1758	72;34;59;53;64;22;1;2;3;5;26;27;16;20;37;38
<i>Cypraea arabicula</i> Lam.	35;37
<i>Cypraea argus</i> L., 1758	34;59;64;1;5;2;27;37
<i>Cypraea asellus</i> (L., 1758)	34;45;64;53;1;2;37;38
<i>Cypraea barclayi</i> Rve.	16;37
<i>Cypraea beckii</i> Gaskoin, 1836	22;2
<i>Cypraea bistrinotata</i> Schilder & Schilder	2;34
<i>Cypraea brevidentata</i> Sow.	37
<i>Cypraea broderip</i> Sow., 1832	2;16;24;34
<i>Cypraea camelopardalis</i> Perry	34;37
<i>Cypraea caputserpentis</i> L., 1758	22;1;5;3;2;4;57;26;16;20;34;35;53;64;37;38
<i>Cypraea carneola</i> L., 1758	34;59;35;53;22;1;5;3;2;4;57;10;26;20;37;38;2
<i>Cypraea caurica</i> L., 1758	22;1;3;2;59;34;43;53;64;37;38
<i>Cypraea cernica</i> Sow., 1870	22;2;34;37
<i>Cypraea childreni</i> Gray, 1825	2;34
<i>Cypraea chinensis</i> Gm., 1791	22;59;34;53;64;1;3;2;11;16;20;37;38;61;63
<i>Cypraea cicercula</i> L., 1758	22;2;26;34;53;37;1
<i>Cypraea citrina</i> (Gray, 1825)	4;16;20;37
<i>Cypraea clandestina</i> L., 1767	22;1;2;20;59;34;53;37
<i>Cypraea coloba</i> Melvill, 1888	34
<i>Cypraea contaminata</i> Sow., 1832	22;2;27;20;34
<i>Cypraea cribellum</i> Gaskoin, 1849	22;2;34;37



Table 5. (continued)

Taxa	Reference sources
<i>Cypraea cribraria</i> L., 1758	63;34;53;22;1;3;11;20;37
<i>Cypraea cruenta</i> Gm.	35
<i>Cypraea cylindrica</i> Born	37
<i>Cypraea depressa</i> Gray, 1824	34;64;22;2
<i>Cypraea diluculum</i> Rve., 1845	34;59;53;64;22;1;2;27
<i>Cypraea erosa</i> L., 1758	34;59;53;64;35;43;22;1;5;3;2;4;26;16;20;37;38
<i>Cypraea erronea</i> L., 1758	22;37
<i>Cypraea erythraeensis</i> Sow., 1837	34
<i>Cypraea esontropia</i> Duclos, 1833	34;64;22;2;26;27;37
<i>Cypraea exusta</i> Sow., 1832	34
<i>Cypraea fabula</i> Kiener	37
<i>Cypraea felina</i> Gm., 1791	72;34;53;64;43;22;1;3;2;4;26;16;20;37;38
<i>Cypraea fimbriata</i> Gm., 1791	22;2;57;20;34;59;64;37;43
<i>Cypraea fultoni</i> Sow.	33;20;61
<i>Cypraea gaskoini</i> Rve., 1846	22;2;34;37
<i>Cypraea gillei</i> Jous.	37
<i>Cypraea globulus</i> L., 1758	22;2;34;53;59;35
<i>Cypraea gracilis</i> Gaskoin, 1849	22;2;9;34;59;37
<i>Cypraea grangranosa</i> Dill., 1817	34
<i>Cypraea granulosa</i> Pease	37
<i>Cypraea grayana</i> Schilder, 1930	6;34
<i>Cypraea helvola</i> L., 1758	22;1;3;2;4;57;10;11;26;16;20;43;35;53;64;37;38
<i>Cypraea hirundo</i> L., 1758	22;34;45;35;37;61
<i>Cypraea histrio</i> Gm., 1791	34;59;53;64;1;5;2;57;26;27
<i>Cypraea inocellata</i> Gray.	64
<i>Cypraea interrupta</i> Gray, 1824	34;59
<i>Cypraea isabella</i> L., 1758	34;35;53;64;43;22;1;5;3;2;57;26;27;16;20;37;38
<i>Cypraea kieneri</i> Hildago, 1906	22;1;2;10;26;34;59;53;64;43;37;38;61
<i>Cypraea lamarckii</i> Gray, 1825	34;64;22;1;3;2;10;16;20;37
<i>Cypraea leviathan</i> Schilder & Schilder, 1937	34;2
<i>Cypraea limancina</i> Lam., 1810	34;53;64;1;2
<i>Cypraea lynx</i> L., 1758	72;34;35;53;59;43;61;22;1;2;57;26;16;20;37;38
<i>Cypraea madagascariensis</i> Gm.	37
<i>Cypraea mappa</i> L., 1758	22;1;5;2;26;11;34;59;64;53;37
<i>Cypraea margarita</i> Dill.	2
<i>Cypraea marginalis</i> Dill., 1827	22;20;34;63;43;1
<i>Cypraea mariae</i> Schilder, 1927	22;2;34
<i>Cypraea mauritiana</i> L., 1758	72;34;59;64;22;1;5;3;2;26;37;38
<i>Cypraea melvilli</i> Hidalgo	37;38
<i>Cypraea microdon</i> Gray, 1828	22;2;34;35;37;38
<i>Cypraea miliaris</i> Gm.	37
<i>Cypraea minoridens</i> Melville, 1901	22;37
<i>Cypraea moneta</i> L., 1758	22;1;3;2;4;57;26;16;27;20;34;35;43;53;60;64;37;38
<i>Cypraea nebrites</i> Melvill, 1888	34
<i>Cypraea nebulosa</i> Kiener	37
<i>Cypraea nucleus</i> L., 1758	22;1;2;26;27;16;34;59;53;64;38;37
<i>Cypraea ocellata</i> L., 1758	3;37
<i>Cypraea onyx</i> L., 1758	22;1;5;3;11;16;34;37;38;2;9
<i>Cypraea ovum</i> Gm., 1791	22
<i>Cypraea owenii</i> Sow., 1837	34;64;22;1;2;61;63;37
<i>Cypraea peasei</i> Sow.	37
<i>Cypraea pantherina</i> (Solander) Dill.	37
<i>Cypraea polita</i> Roberts	37
<i>Cypraea poraria</i> L., 1758	22;2;34;64;53;43;37
<i>Cypraea punctata</i> L., 1771	22;1;2;34;64;43;37
<i>Cypraea puntulata</i> Gm	37;38
<i>Cypraea rashleighana</i> Mel.	37
<i>Cypraea scurra</i> Gm., 1791	22;5;2;57;34;53;64;43

Table 5. (continued)

Taxa	Reference sources
<i>Cypraea semiplota</i> Mighels	37
<i>Cypraea staphylaea</i> L., 1758	22;1;2;4;27;20;34;45;35;64;38;37
<i>Cypraea stolidia</i> L., 1758	34;64;53;22;1;2;1;27;37;61
<i>Cypraea talpa</i> L., 1758	34;53;59;1;5;3;2;11;37
<i>Cypraea teres</i> Gm., 1791	34;59;53;64;22;1;2;57;11;27;20;37;63
<i>Cypraea testudinaria</i> (L., 1758)	34;59;64;1;2;27; 37;61
<i>Cypraea tigris</i> L., 1758	22;1;5;3;2;4;57;27;16;20;34;59;35;60;64;43;37;38
<i>Cypraea trizonata</i> Sow.	37
<i>Cypraea turdus</i> Lam., 1810	34;64;37
<i>Cypraea undata</i> Lam.	37
<i>Cypraea ursellus</i> Gm.	37
<i>Cypraea ventriculus</i> Lam.	37
<i>Cypraea vinosa</i> Gm.	37
<i>Cypraea vitellus</i> L., 1758	22;1;43;61;72;5;3;2;57;10;26;11;16;20;34;63;53;37;38
<i>Cypraea walkeri</i> Sow., 1832	22;34;37
<i>Cypraea zizac</i> L., 1758	34;59;64;53;22;3;2;27;20;37
<b>OVULIDAE</b>	
<i>Calpurnus lacteus</i> (Lam., 1810)	2;11;34;22; 1;37
<i>Calpurnus verrucosus</i> (L., 1758)	1;2;11;16;37
<i>Crenavolva conspicua</i> Cate, 1975	2
<i>Crenavolva stiatula hesperia</i> Cate, 1973	2
<i>Crenavolva rosewateri</i> Cate, 1973	11
<i>Cymbovula deflexa</i> (Sow., 1848)	11
<i>Dentiovula dorsuosa</i> Hinds, 1844	22
<i>Dentiovula eizoi</i> Cate & Azuma in Cate, 1973	11
<i>Ovula borbonica</i> Des.	37
<i>Ovula concinna</i> Ad. & Rve.	37
<i>Ovula costellata</i> Lam., 1810	2;11;1;22
<i>Ovula nuberculata</i> Ad. & Rve.	37
<i>Ovula obtusa</i> Sow.	37
<i>Ovula ovum</i> (L., 1758)	1;5;2;11;26;59;45;38;22;37
<i>Ovula pulchella</i> A. Ad.	37
<i>Ovula smithi</i> Sow.	37
<i>Ovula tramentum</i> Sow.	37
<i>Phenacovolva birostris</i> (L., 1769)	2
<i>Phenacovolva longirostrata</i> (Sow., 1828)	2;37;22
<i>Phenacovolva rosea</i> (A. Ad., 1855)	11;20
<i>Phenacovolva tokioi</i> Cate, 1973	2
<i>Phenacovolva weaveri</i> Cate, 1973	11
<i>Primolvula punctata</i> Duclos	27;37
<i>Prosimnia coarctata</i> A. Ad.	22;1
<i>Prosimnia semperi</i> (Weinkauff, 1881)	11
<i>Pseudocypraea adamsonii</i> (Sow., 1832)	22;2;37
<i>Volva volva</i> (L., 1758)	22;2;11;37
<b>TRIVIIDAE</b>	
<i>Erato guttata</i> Sow.	37
<i>Erato nana</i> Duclos	37
<i>Eratoena smithi</i> Schilder, 1933	22
<i>Eratoena sulcifera</i> Sow., 1832	22;59;16;57;20;37
<i>Trivia candidula</i> Gaskoin	37
<i>Trivia childreni</i> Gray	37
<i>Trivia corrugata</i> Pease	37
<i>Trivia globosa</i> Gray	37
<i>Trivia grando</i> Gaskoin	37
<i>Trivia insecta</i> Mighels	37;38
<i>Trivia paucilirata</i> Sow.	37
<i>Trivia pilula</i> Kiener	37;38

Table 5. (continued)

Taxa	Reference sources
<i>Trivirostra edgardi</i> Shaw, 1909	22
<i>Trivirostra exigua</i> (Gray, 1831)	2;22;37
<i>Trivirostra hordacea</i> Kiener, 1843	22
<i>Trivirostra oryza</i> (Lam., 1811)	2;4;11;16;22;1;57;20;59;37;38
<i>Trivirostra pellucidula</i> (Rve., 1846)	4;20;22;37
<i>Trivirostra scabriuscula</i> Gary, 1827	22;37
<i>Trivirostra triticum</i> Schilder, 1932	22
<i>Trivirostra turneri</i> Schilder, 1932	22
<b>PEDICULARIIDAE</b>	
<i>Pedicularia elegantissima</i> Des. 1863	22;2;37
<i>Pedicularia pacifica</i> Pease	37
<i>Pedicularia subtilis</i> Schilder, 1931	22
<b>LAMELLARIIDAE</b>	
<i>Lamellaria berghi</i> (Des., 1863)	2;37;22
<i>Lamellaria mauritiana</i> Berg.	27;37;20
<i>Lamellaria perspicua</i> (L.)	16
<b>NATICIDAE</b> Review ref: 59	
<i>Glyphepithena alapapilonis</i> (Rdg., 1798)	59;2;20;37;16
<i>Natica albospira</i> Smith	37
<i>Natica antoni</i> Phil.	37
<i>Natica arachnoidea</i> (Gm., 1791)	59;22;2
<i>Natica asellus</i> Rve.	37
<i>Natica avellana</i> Phil.	37
<i>Natica burmupi</i> Smith	38
<i>Natica canrena</i> L.	37
<i>Natica chinensis</i> (Lam.)	1;3;37
<i>Natica colliei</i> Rcz.	37
<i>Natica decipiens</i> Smith	3
<i>Natica didyma</i> Bolten	3;4
<i>Natica dillwyni</i> Payrandean	37;1
<i>Natica forskalii</i> Sow., 1825	59;37
<i>Natica hebraea</i> Phil.	37
<i>Natica incei</i> Phil.	38
<i>Natica kraussi</i> Smith	37
<i>Natica lineozona</i> Jouss.	37
<i>Natica maculosa</i> Lam.	37
<i>Natica maheensis</i> Dufo.	37
<i>Natica marochiensis</i> (Gm.)	1;3;57;26;16;60;45;37;38
<i>Natica nemo</i> Bartsch	3
<i>Natica pulicaris</i> Phil., 1852	59;22
<i>Natica queckettii</i> Sow., 1894	59;20
<i>Natica raynaudiana</i> (Rcz.)	1;57;37;38
<i>Natica robillardii</i> Sow., 1894	22;37
<i>Natica rufa</i> Born	37
<i>Natica seychellium</i> (Watson, 1886)	59;22
<i>Natica strongyla</i> Melvill	37
<i>Natica taeniata</i> Menke	38
<i>Natica venustula</i> Phil.	37
<i>Natica vitellus</i> (L., 1758)	59;22
<i>Naticarius gualteriana</i> (Rcz., 1844)	72;59;1;37;5;2;4;20;22;54
<i>Naticarius manceli</i> (Jouss., 1874)	59;37
<i>Naticarius onca</i> (Rdg., 1798)	59;2;26
<i>Polinices albula</i> Rcz.	37
<i>Polinices ampla</i> Phil.	27;37
<i>Polinices aurantia</i> Lam.	37
<i>Polinices columnaris</i> Rcz.	37;38

Table 5. (continued)

Taxa	Reference sources
<i>Polinices didyma</i> (Rdg., 1798)	22;20;11;16
<i>Polinices flemingianus</i> Rcz., 1844	22;2;59;54
<i>Polinices mamillaris</i> Lam.	37
<i>Polinices mamilla</i> (L., 1758)	72;1;3;4;57;11;16;37;38;5;2;20;22
<i>Polinices melanostoma</i> Gm., 1791	59;22;1;26;2;37;38
<i>Polinices melanostomoides</i> Quoy & Gaimard, 1833	22;37
<i>Polinices melastoma</i> Lam.	37
<i>Polinices orientalis</i> Gm.	37
<i>Polinices priamus</i> Rcz.	26;37
<i>Polinices ravidus</i> Souleyet, 1852	22
<i>Polinices sebae</i> Rcz., 1844	22;16
<i>Polinices simiae</i> Des., 1838	22;20;2;57;38;37
<i>Polinices zanzibarica</i> (Rcz.)	1
<i>Sigaretus delesserti</i> Rcz.	26
<i>Sigaretus papilla</i> Gm.	38
<i>Sigaretus plamulatus</i> Rcz.	16;37;38;1
<i>Simum paulocomvexum</i> Iredale, 1931	22
<i>Tanea areolatus</i> (Rcz., 1844)	59;22;2;1;37
<i>Tanea picta</i> (Rcz., 1844)	59;37
<i>Tanea euzona</i> (Rcz., 1844)	59;2
<i>Tectonatica bougei</i> (Sow., 1908)	59;22
<i>Tectonatica cernica</i> Jous., 1874	59;22;2;37
<i>Tectonatica tecta</i> (Anton, 1838)	59;20;38;3
<i>Tectonatica violacea</i> (Sow., 1825)	59;2;26;37
<b>TONNIDAE</b>	
<i>Malea pommun</i> (L., 1758)	2;22;11;26;37;38;1
<i>Tonna allium</i> (Dill., 1817)	2
<i>Tonna ampullacea</i> Phil., 1845	22;
<i>Tonna canaliculata</i> (L., 1758)	1;5;2;26;16
<i>Tonna cepa</i> Rdg., 1798	22
<i>Tonna costatum</i> Menke	26;37
<i>Tonna deshayesii</i> Rve., 1849	22
<i>Tonna dolium</i> (L., 1758)	22;2
<i>Tonna fimbriata</i> (Sow.)	16
<i>Tonna galea</i> L., 1758	3
<i>Tonna luteostoma</i> (Kuster)	3
<i>Tonna maculatum</i> Lam.	37
<i>Tonna olearium</i> Brug.	37;38
<i>Tonna perdix</i> (L., 1758)	59;1;2;11;26
<i>Tonna ringens</i> Swain.	37
<i>Tonna variegata</i> (Lam.)	16;20
<i>Tonna zonatum</i> (Green)	1
<b>FICIDAE</b>	
<i>Ficus ficoides</i> Lam.	37;38
<i>Ficus ficus</i> (L., 1758)	2;16;20;37
<i>Ficus gracilis</i> (Sow., 1825)	6
<i>Ficus subintermedia</i> (Orbigny, 1852)	22;20
<i>Ficus tessellata</i> (Kobelt)	1
<b>CASSIDAE</b> Review ref: 56	
<i>Casmaria ponderosa</i> (Gm., 1791)	56;2;37;1;38;16
<i>Casmaria erinaceus</i> (L., 1758)	56;59;2;26;27;37;38;1
<i>Cassis cornuta</i> (L., 1758)	56;22;1;5;2;26
<i>Cypraecassis rufa</i> (L., 1758)	56;58;22;1;5;3;2;26;27;16;37;38
<i>Phalium areolua</i> (L., 1758)	56;1;3;2;26;16;20;37;38
<i>Phalium bandatum exaratum</i> (Rve., 1848)	56;2;37
<i>Phalium bisulcatum booleyi</i> (Sow., 1900)	56;2;11;38

Table 5. (continued)

Taxa	Reference sources
<i>Phalium craticulatum</i> (Euthyme, 1885)	56
<i>Phalium faurotis</i> (Jouss., 1888)	56
<i>Phalium fimbria</i> Gm., 1791	56;22;2;37
<i>Phalium glaucum</i> (L., 1758)	56;1;5;3;2;9;16;37
<i>Phalium labiatum</i> (Perry, 1811)	56;16;4
<i>Phalium microstoma</i> (Martens, 1903)	56
<i>Phalium pyrum</i> (Lam., 1822)	56;37;27
<b>RANELLIDAE</b>	
<i>Charonia grandimaculatus</i> (Rve.)	1;37
<i>Charonia tritonis</i> (L., 1758)	1;5;2;11;26;16;45;59;37;38
<i>Cymatium aegrotum</i> (Rve., 1844)	2;37
<i>Cymatium amictum</i> Rve.	37
<i>Cymatium aquatile</i> (Rve., 1844)	2;20;45;37;1
<i>Cymatium caudatum</i> Gm.	37
<i>Cymatium chlorostoma</i> Lam.	37
<i>Cymatium clandestinum</i> Lam.	37
<i>Cymatium clavator</i> Lam.	37
<i>Cymatium comptum</i> (A. Ad., 1854)	2
<i>Cymatium crispum</i> Rve.	37
<i>Cymatium cutaceum africanum</i> (A. Ad.)	20
<i>Cymatium cynocephalum</i> Lam.	37
<i>Cymatium doliarium</i> Lam.	3;16;37
<i>Cymatium elongatum</i> Rve.	37
<i>Cymatium exile</i> Rve.	37
<i>Cymatium eximium</i> Rve.	37
<i>Cymatium femorcle</i> L.	37
<i>Cymatium gallinago</i> Rve., 1844	3;2;16;22;37;1
<i>Cymatium gemmatum</i> Rve.	37;1;3;26;16;20;45
<i>Cymatium gracils</i> Rve.	37
<i>Cymatium gyrinum</i> (L.)	2
<i>Cymatium hepaticum</i> (Rdg., 1798)	2
<i>Cymatium kleinei</i> Sow.	3;16
<i>Cymatium labiosum</i> (Wd., 1828)	45;22;1;2;37
<i>Cymatium loroisi</i> Petit	37
<i>Cymatium lotorium</i> (L., 1758)	1;2;26;37
<i>Cymatium moniliferus</i> (Rve.)	1
<i>Cymatium moritinctum</i> Rve.	37;1
<i>Cymatium mundum</i> (Gould, 1849)	2
<i>Cymatium muricinum</i> Rdg., 1798	72;45;22;2;59
<i>Cymatium nicobaricum</i> (Rdg., 1798)	2;26;11;59;45
<i>Cymatium nodiferum</i> Lam.	37
<i>Cymatium olearium</i> L.	3;16;37
<i>Cymatium orientale</i> G & H, Nevill	37
<i>Cymatium pachycheilos</i> Tapparone-Canefri	37
<i>Cymatium parthenopeum</i> (von Salis, 1793)	20
<i>Cymatium pfeifferianum</i> (Rve., 1888)	2;20;37
<i>Cymatium pileare</i> (L., 1758)	59;5;3;2;57;10;26;16;20;37;38;22
<i>Cymatium pyrum</i> (L., 1758)	2;37
<i>Cymatium quoyi</i> Rve.	37
<i>Cymatium retustum</i> Lam.	27;37;1
<i>Cymatium rubeculum</i> (L., 1758)	1;2;26;37;38;1
<i>Cymatium sarcostomum</i> (Rve., 1844)	2;37;1
<i>Cymatium sinense</i> Rve.	37
<i>Cymatium tabulatum durbanensis</i> (Smith)	20
<i>Cymatium testudinarium</i> (A. Ad. & Rve., 1850)	2
<i>Cymatium thersites</i> Rve.	37
<i>Cymatium tripus</i> Lam.	37

Table 5. (continued)

Taxa	Reference sources
<i>Cymatium tuberosum</i> Lam.	37;38;57;26
<i>Cymatium vespaceum</i> (Lam., 1822)	22;1;26;16;20;45;37
<i>Distorsio amus</i> (L., 1758)	1;2;26;45;37
<i>Distorsio cancellimus</i> (Roissy)	1;37
<i>Distorsio decipiens</i> Rve.	37
<i>Distorsio reticularis</i> (L., 1758)	16
<i>Distorsio ridens</i> Rve.	37
<i>Gyrineum bituberculare</i> (Lam.)	57
<i>Gyrineum gyrinum</i> (L., 1758)	2;45
<i>Gyrineum pusillum</i> (Brod., 1833)	2;1;20;59;45;57;16;22
<i>Linatella clandestina</i> (Lam.)	1
<i>Linatella cingulata</i> (Lam.)	1
<i>Linatella succincta</i> (L., 1771)	2
<i>Ranella anceps</i> Lam.	38
<i>Ranella cruentata</i> Sow.	38
<i>Ranella crumena</i> Lam.	3
<i>Ranella gemmifera</i> (Euthyene)	3
<i>Ranella reticularis</i> L.	38
<i>Ranella siphonata</i> Rve.	38
<b>BURSIDAE</b>	
<i>Bufo naria crumena</i> (Lam., 1816)	1;16;22;2
<i>Bufo naria crumenoides</i> (Valenciennes, 1832)	20
<i>Bufo naria echinata</i> (Link, 1807)	2
<i>Bufo naria foliata</i> (Brod., 1825)	20
<i>Bursa anceps</i> Lam.	37
<i>Bursa argus</i> Gm.	27
<i>Bursa bergeri</i> (Tapparone-Canefri, 1880)	2
<i>Bursa bubo</i> L. 1758	59;22;2
<i>Bursa bufonia</i> (Gm., 1791)	59;45;22;2;57;16;37;1
<i>Bursa cumingiana</i> Dunker	37
<i>Bursa cruentata</i> Sow., 1835	45;22;2;16;37
<i>Bursa granifera</i> Rdg.	3
<i>Bursa granularis</i> (Rdg., 1798)	59;45;2;4;57;20;16
<i>Bursa granularis affinis</i> Brod., 1833	26;37;20
<i>Bursa granularis alfredensis</i> Turton, 1932	20
<i>Bursa grayana</i> Dunker	37
<i>Bursa gyrina</i> Lam.	37
<i>Bursa lampas</i> (L.)	1;2;26;59;37;38;57;10;16
<i>Bursa livida</i> Rve.	1;45
<i>Bursa marginata</i> Gm.	27
<i>Bursa nigrita</i> Mulhauser & Blotcher, 1979	2
<i>Bursa nobilis</i> (Rve., 1844)	2
<i>Bursa paulucciana</i> Tapparone-Canefri	37
<i>Bursa ponderosa</i> Rve.	37
<i>Bursa pusilla</i> Brod.	37
<i>Bursa rhodostoma</i> (Sow., 1835)	59;45;2;20;37
<i>Bursa rosa</i> Perry, 1811	22;1;2;20
<i>Bursa rosea</i> Rve.	37
<i>Bursa rufo</i> (L.)	1
<i>Bursa rugosa</i> (Born, 1778)	1;45
<i>Bursa thomae</i> d'Orbigny, 1842	37;22
<i>Bursa spinosa</i> Lam.	37
<i>Bursa semigranosa</i> Lam.	37
<i>Bursa siphonata</i> Rve.	37
<i>Bursa tuberculata</i> Brod.	37
<i>Bursa tuberosissima</i> Rve.	37
<i>Bursa vemustula</i> (Rve., 1844)	2

Table 5. (continued)

Taxa	Reference sources
<b>TRIPHORIDAE</b>	
<i>Mastonia peanites</i> Jouss., 1898	2
<i>Triphora acicula</i> Issel	37
<i>Triphora acuta</i> Kiener	37
<i>Triphora adamsi</i> Des.	37
<i>Triphora alteruter</i> A. Ad.	37
<i>Triphora angustissima</i> Des.	37
<i>Triphora atomus</i> Issel	37
<i>Triphora aurea</i> (Hervier)	57;37
<i>Triphora cancellata</i> Hinds	59
<i>Triphora chaperi</i> Jouss.	37
<i>Triphora cingulata</i> A. Ad.	59
<i>Triphora cingulifera</i> Pease	37
<i>Triphora coetiviensis</i> (Melvill)	57;59
<i>Triphora concinna</i> Hinds.	37
<i>Triphora comata</i> Montr.	37
<i>Triphora consors</i> Hinds	59;37
<i>Triphora corrugata</i> (Hinds)	57
<i>Triphora crassula</i> Martens	37
<i>Triphora crenulata</i> Des.	37
<i>Triphora distincta</i> Des.	37
<i>Triphora douvillei</i> Jouss.	37
<i>Triphora elegans</i>	59
<i>Triphora episcopalis</i> Herv.	37
<i>Triphora eupunctata</i> Sow.	37
<i>Triphora flammulata</i> Pease	37
<i>Triphora formosa</i> Des.	37
<i>Triphora fusca</i> Dunker	37
<i>Triphora fuscozonata</i> Sow.	37
<i>Triphora hilaris</i> Hinds	37
<i>Triphora hindsii</i> Des.	37
<i>Triphora incisa</i> Bolten	57
<i>Triphora intergranosa</i> Hervier	59
<i>Triphora lilaceocincta</i> Smith	59;37
<i>Triphora lilacina</i> Des.	37
<i>Triphora maxillaris</i> Hinds.	37
<i>Triphora melantera</i> Hervier	37
<i>Triphora mirifica</i> Des.	37
<i>Triphora monacha</i> Hervier	37
<i>Triphora monilifera</i> (Hinds)	57;59;37
<i>Triphora pupaeformis</i> Des.	37
<i>Triphora pyrimidata</i> Hinds	59
<i>Triphora reevei</i> Des.	37
<i>Triphora regalis</i> Jouss.	37
<i>Triphora rosea</i> Hinds	37
<i>Triphora rubra</i> (Hinds)	57;10;37
<i>Triphora rutilans</i> Hervier	37
<i>Triphora sculpta</i> Hinds	37
<i>Triphora speciosa</i> Ad. & Rve.	37
<i>Triphora taeniolata</i> Hervier	37
<i>Triphora tibialis</i> Jouss.	37
<i>Triphora trilirata</i> Jouss.	37
<i>Triphora tristis</i> Hinds	37
<i>Triphora tristoma</i> Blain.	37
<i>Triphora turricula</i> Herv.	37
<i>Triphora violacens</i> Quoy & Gaimard	59;37
<i>Triphora xystica</i> Jouss.	37

Table 5. (continued)

Taxa	Reference sources
<b>EPITONIIDAE</b>	
<i>Alora rapunculus</i> Kilburn, 1975	2
<i>Alora reticulata</i> (Habe, 1962)	2
<i>Amaea acuminata</i> (Sow., 1844)	6;2
<i>Eglisia elegans</i> Melvill	1
<i>Epitonium abbreviatum</i> Sow.	37
<i>Epitonium aculeatum</i> Sow.	37
<i>Epitonium alata</i> Sow.	59;37
<i>Epitonium antennata</i> Pease	38
<i>Epitonium artimi</i> Jouss.	38
<i>Epitonium billeanum</i> (Dushane & Bratcher, 1965)	11
<i>Epitonium bulbulum</i> Sow.	37
<i>Epitonium bullatum</i> (Sow., 1844)	2;20
<i>Epitonium cancellatum</i> Humphreys	37
<i>Epitonium clementina</i>	1;21
<i>Epitonium coronatum</i> Lam., 1816	22;1;20;59;37
<i>Epitonium crispatum</i> (Pease, 1863)	2
<i>Epitonium fasciatum</i> Sow., 1844	22;37
<i>Epitonium gracile</i> Sow.	37
<i>Epitonium histricosa</i> Jouss.	38
<i>Epitonium interstriatum</i> Sow.	37
<i>Epitonium kieneri</i> Canefri	27;37
<i>Epitonium lactea</i> Krauss	37
<i>Epitonium lamellosa</i> (Lam., 1822)	20;2
<i>Epitonium lamellosum</i> Sow.	37
<i>Epitonium latedisjuncta</i> Jouss.	38
<i>Epitonium latifasciatum</i> Sow., 1874	22;37
<i>Epitonium laxatum</i> Sow.	37
<i>Epitonium lineolatum</i> Sow.	37
<i>Epitonium lyra</i> Sow., 1844	22;2;37;59
<i>Epitonium marmoratum</i> Sow.	37
<i>Epitonium martinii</i> Wd.	37
<i>Epitonium multicostatum</i> (Sow., 1844)	2;37
<i>Epitonium multiperforatum</i> Sow.	37
<i>Epitonium obliquum</i> (Sow., 1844)	2
<i>Epitonium pallosi</i> Kiener	37
<i>Epitonium papyracea</i> (de Boury)	1
<i>Epitonium perplexum</i> Des., 1863	22
<i>Epitonium raricostatum</i> (Lam., 1822)	2;27;37
<i>Epitonium replicatum</i> Sow.	37
<i>Epitonium robillardi</i> Sow., 1894	37;22;21;38
<i>Epitonium savignyi</i> Jouss., 1912	2
<i>Epitonium sexcosta</i> Jouss.	38
<i>Epitonium subauriculata</i> Souverbie	38
<i>Epitonium textum</i> Smith	37
<i>Epitonium undulatissimum</i> Sow., 1874	22
<i>Epitonium varicosum</i> Lam.	27;1
<i>Epitonium viaderi</i> Fenaux, 1938	2
<i>Variscala varicostata</i> Lam.	22
<b>JANTHINIDAE</b>	
<i>Janthina balteata</i> Rve., 1858	2
<i>Janthina bicolor</i> Menke	37
<i>Janthina communis</i> Lam.	37
<i>Janthina exigua</i> (Lam.)	20;37
<i>Janthina prolongata</i> Blain., 1822	20;1;59;2;38;37;22
<i>Janthina janthina</i> (L., 1758)	22;1;20;38
<i>Janthina vinsoni</i> Des., 1863	2;37



Table 5. (continued)

Taxa	Reference sources
<i>Recluzia jehemnei</i> Petit, 1853	22;2;37
<i>Recluzia rollandiana</i> Rcz.	37
<b>EULIMIDAE</b>	
<i>Arcuella mirifica</i> Nelvill, 1874	22
<i>Echineulima eburneus</i> Des., 1863	22;37
<i>Echineulima metcalfei</i> A. Ad., 1853	22;37
<i>Eulima acicalata</i> Sow.	37
<i>Eulima acuta</i> A. Ad.	37
<i>Eulima ascuata</i> Sow	37
<i>Eulima epeterium</i> Melville, 1889	22
<i>Eulima flexuosa</i> Sow.	26;37
<i>Eulima hastata</i> Sow., 1834	22;37
<i>Eulima inflexa</i> Blain.	37
<i>Eulima labiosa</i> Sow.	57;1
<i>Eulima lactea</i> A. Ad.	1;37
<i>Eulima major</i> Sow.	26;37
<i>Eulima mirifica</i> Nelvill	37
<i>Melanella algoensis</i> (Smith)	16
<i>Melanella cumingi</i> (A. Ad. 1854)	22;37
<i>Melanella dufresnei</i> (Bowdich, 1822)	2
<i>Melanella teinostoma</i> A. Ad., 1853	22
<i>Melanella robillardiana</i> (Pilsbury)	57;37
<i>Pyramidelloides angusta</i> (Hedley, 1898)	22
<i>Pyramidelloides miranda</i> (A. Ad., 1861)	22
<i>Scalenostoma carinata</i> Des., 1863	22;37
<i>Scalenostoma exarata</i> A. Ad., 1855	22;37
<i>Scalenostoma lubricum</i> Fischer, 1886	22
<i>Scalenostoma speciosus</i> H. Ad., 1869	22;37;26
<i>Scalenostoma subulata</i> Brod., 1832	22;2;37
<b>THYCIDAE</b>	
<i>Thyca crystallina</i> (Gould)	11;57
<b>STILIFERIDAE</b>	
<i>Robillardia cernica</i> Smith	37
<i>Stilifer ovoideus</i> H. & A. Ad., 1853	22;1
<i>Stilifer apiculatus</i> Souverbie	37
<i>Stilifer cumingianus</i> A. Ad.	37
<i>Stilifer subangulatus</i> A. Ad.	37
<b>MURICIDAE</b>	
<i>Aspella anceps</i> Lam.	59
<i>Aspella lamellosa</i> Dunker, 1863	22
<i>Aspella platylaevis</i> Radwin & d'Attilio, 1976	2
<i>Aspella producta</i> (Pease, 1861)	2
<i>Chicoreus akritos</i> Radwin & d'Attilio, 1976	22
<i>Chicoreus banksii</i> (Sow., 1841)	1
<i>Chicoreus (Naquetia) barclayi</i> Rve., 1858	22;2;37
<i>Chicoreus brunneus</i> (Link, 1807)	2;11
<i>Chicoreus cloveri</i> Houart, 1985	2
<i>Chicoreus dovi</i> Houart, 1984	44
<i>Chicoreus (Naquetia) fenestrata</i> Chemn.	22
<i>Chicoreus groscegi</i> Vokes, 1978	2
<i>Chicoreus incarnatus</i> (Rdg.)	57
<i>Chicoreus maurus</i> (Brod.)	20
<i>Chicoreus microphyllus</i> (Lam.)	1
<i>Chicoreus palmarosae</i> (Lam., 1822)	2;26;2;37
<i>Chicoreus ramosus</i> (L., 1758)	22;1;5;3;2;4;26;20;59;45;14
<i>Chicoreus saulii</i> (Sow., 1841)	2;37

Table 5. (continued)

Taxa	Reference sources
<i>Chicoreus superbus</i> (Sow., 1889)	2
<i>Chicoreus torrefactus</i> (Sow., 1841)	2;45;1
<i>Chicoreus (Naquetia) trigomula</i> Lam., 1822	22
<i>Chicoreus (Naquetia) triqueter</i> (Born, 1789)	2;37;1
<i>Cronia coronata</i> (H. Ad., 1869)	2
<i>Cronia crassulnata</i> (Hedley, 1915)	2
<i>Cronia heptagonalis</i> (Rve., 1846)	2;20;3;22;14
<i>Cronia iostoma</i> (A. Ad., 1853)	2;45
<i>Cronia konkanensis</i> (Melvill, 1893)	6
<i>Cronia latiaxidea</i> (Sow., 1893)	2
<i>Cronia margariticola</i> (Brod., 1833)	72;59;2;20;22;45;37;1;57;14;58;60
<i>Cronia marginatra</i> (Blain., 1832)	2;20;37
<i>Cronia ochrostoma</i> (Blain., 1832)	2;57;20;60;37;59;22
<i>Cronia spinosa</i> (H & A Ad., 1853)	2;37
<i>Drupa andrewsi</i> Smith	37
<i>Drupa angulata</i> Sow.	37;27
<i>Drupa aspera</i> Lam.	37
<i>Drupa biconica</i> Blain	37
<i>Drupa cancellata</i> Q & G., 1833	22;37
<i>Drupa chrysostoma</i> Des.	37;38
<i>Drupa clathrata miticula</i> (Lam., 1822)	59;2;57;37
<i>Drupa concatenta</i> Lam.	37;38
<i>Drupa elata</i> Blain	37;3
<i>Drupa fiscellum</i> Chemn.	37
<i>Drupa fusconigra</i> Dunker	72;6;59
<i>Drupa grossularia</i> Rdg., 1798	22
<i>Drupa horrida</i> Lam.	37
<i>Drupa hystrix</i> Lam.	37
<i>Drupa lobata</i> (Blain., 1832)	22;1;26;58;45;80;37
<i>Drupa morum morum</i> Rdg., 1798	59;54;22;1;2;57;26;80
<i>Drupa muricina</i> Blain.	37
<i>Drupa nodus</i> Lam.	37
<i>Drupa porphyrostoma</i> Rve.	37
<i>Drupa ricinus ricinus</i> (L., 1758)	72;1;58;80;38;3;57;26;20;37;38
<i>Drupa ricina albolabris</i> (Blain., 1832)	45;2;20;1
<i>Drupa ricina arachnoidea</i> (Lam., 1810)	54;2
<i>Drupa rubusidaeus</i> Rdg., 1798	45;59;2;80
<i>Drupa siderea</i> Rve.	37
<i>Drupa spathulifera</i> (Blain.)	1;57
<i>Drupa spectrum</i> Rve.	37;38
<i>Drupa squamulosa</i> Des.	37
<i>Drupa striata</i> Pease	37
<i>Drupa tuberculata</i> Blain	37;1;3;38
<i>Drupa undata</i> Chemn.	37;38
<i>Drupella cariosa</i> Wd.	59;72
<i>Drupella cormus</i> (Rdg., 1798)	22;2;59;45;1;57
<i>Drupella fraga</i> (Blain., 1832)	2;37
<i>Drupella rugosa</i> (Born, 1778)	59;2
<i>Favartia brevicula</i> Sow., 1834	22;37
<i>Favartia cyclostoma</i> (Sow., 1841)	22;2
<i>Favartia garretti</i> (Pease, 1868)	2
<i>Favartia jeanae</i> D'Attilio & Bartch, 1980	2
<i>Favartia judithae</i> D'Attilio & Bartch, 1980	2
<i>Favartia minotauros</i> Radwin & d'Attilio, 1976	2
<i>Favartia obtusus</i> Sow., 1893	22;27;37
<i>Favartia salmonea</i> Melvill & Standen, 1899	22;2;37
<i>Haustellum gallinago fernandesi</i> Houart, 1990	52
<i>Haustellum haustellum</i> L., 1758	2

Table 5. (continued)

Taxa	Reference sources
<i>Homolocantha anatomica</i> (Perry, 1811)	2
<i>Homolocantha fauroti</i> (Jouss., 1888)	2
<i>Homalocanthe zamboi</i> (Burch & Burch, 1960)	2
<i>Maculotriton bracteatus</i> Hinds, 1844	22
<i>Maculotriton digitalis</i> (A. Ad.)	1;57;59
<i>Maculotriton serriale</i> (Des. in Laborde & Linant, 1834)	20;2;59
<i>Morulaanaxares</i> (Duclos MS Kiener, 1843)	72;54;59;22;57;2;14;20;70;3;38;1;37
<i>Morula biconica</i> (Blain., 1832)	2;20
<i>Morula concatenata</i> Lam., 1843	2;22;1
<i>Morula echinata</i> (Rve., 1846)	2
<i>Morula fiscella</i> Gm., 1791	22;37
<i>Morula granulata</i> (Duclos, 1832)	59;72;54;22;1;2;4;57;16;20;70;3;42
<i>Morula marginatra</i> Blain., 1832	22;45;72;59;3;71
<i>Morula mutica</i> (Lam., 1816)	80;2;20;37;27;22
<i>Morula nodosa</i> (Hombrun & Jacquinot)	20;14;1
<i>Morula rosea</i> (Rve., 1846)	2
<i>Morula spinosa</i> H. & A. Ad.	59
<i>Morula squamiliratum</i> Smith	59
<i>Morula uva</i> (Rdg., 1798)	45;59;1;2;10;20;57
<i>Murex aculeatus</i> Lam.	37
<i>Murex aduncospinosus</i> Beck in Sow., 1841	2
<i>Murex adustus</i> Lam.	57;38;37;1
<i>Murex affinis</i> Rve.	37
<i>Murex alveatus</i> (Kiener)	1
<i>Murex anguliferus</i> Lam.	27;37
<i>Murex antelmei</i> Viades	37
<i>Murex axicornis</i> Lam.	37
<i>Murex benedictus</i> Melvill	37
<i>Murex brevispina</i> Lam., 1822	22;1;3;4;14;20;38;1
<i>Murex clavus</i> Kiener	37
<i>Murex crossei</i> Leinard	37
<i>Murex crouchi rufescens</i> Sow.	27
<i>Murex crouchi</i> Sow.	27
<i>Murex darrosensis</i> Smith	37
<i>Murex demudatus</i> Perry	37
<i>Murex dichrous</i> Tapparone-Canefri	37
<i>Murex euracanthus</i> Adams	37
<i>Murex fenestratus</i> Chemn.	37
<i>Murex haustellum</i> (L.)	1;37
<i>Murex incarnatus</i> Bolten	37
<i>Murex inflatus</i> Lam.	38
<i>Murex lienardi</i> Crosse	37
<i>Murex lobbeckei</i> Kobelt	37
<i>Murex malabaricus</i> Smith	37
<i>Murex microphyllus</i> Lam.	37;38
<i>Murex motacilla</i> Chemn.	37
<i>Murex mundus</i> Rve.	37
<i>Murex pecten</i> Lightfoot, 1786	5;2;26
<i>Murex pinnatus</i> Wd.	37
<i>Murex purpuroides</i> (Dunker)	1;27
<i>Murex rectirostris</i> Sow., 1841	22
<i>Murex rota</i> (Sow.)	1;37
<i>Murex rubiginosus</i> Rve.	14
<i>Murex scalopax</i> Dill., 1817	22
<i>Murex scorpio</i> L.	37
<i>Murex submissus</i> Smith	37
<i>Murex sykesi</i> Preston	37
<i>Murex ternispina</i> Lam.	38;37

Table 5. (continued)

Taxa	Reference sources
<i>Murex tetragonus</i> Brod.	37
<i>Murex trialatus</i> Sow.	37
<i>Murex tribulus</i> L.	37
<i>Murex tripterus</i> Born.	37
<i>Murex uncinarius</i> Lam.	37
<i>Murex virgineus</i> Bolten-Rdg.	14
<i>Nassa francolina</i> (Brug., 1789)	45;59;2;20
<i>Nassa glans</i> (L.)	14
<i>Nassa kraussiana</i> Dunker	3;14
<i>Nassa margaritifera</i> (Dunker)	14
<i>Nassa natalensis</i> Smith	14
<i>Nassa papillosa</i> (L.)	14
<i>Nassa plebecula</i> Gould	14
<i>Nassa sarta</i> (Brug., 1789)	57;1;22;37;38;26
<i>Ocenebra inermicosta</i> Vokes, 1964	22
<i>Pascuala lefevreiana</i> (Tapparone-Canefri, 1880)	2
<i>Phyllocoma convolutus</i> (Brod., 1833)	2
<i>Phyllocoma sculptilis</i> (Rve., 1846)	2
<i>Pinaxia coronata</i> A. Ad., 1853	1;22;37
<i>Pinaxia versicolor</i> (Gray, 1839)	2
<i>Pterynotus barclayana</i> H. Ad., 1873	22;2
<i>Pterynotus celinamarumai</i> Kosuge, 1980	2
<i>Pterynotus elongata</i> Lightfoot, 1786	22;2
<i>Pterynotus loebbeckei</i> Kobelt, 1879	22;2
<i>Pterynotus martineta</i> (Rdg., 1798)	2;22
<i>Pterynotus nodulifera</i> Sow., 1841	22
<i>Pterynotus pellucida</i> (Rve., 1845)	2
<i>Purpura javanica</i> Phil.	38
<i>Purpura luteomarginata</i> Montrouzier	38
<i>Purpura pseudohippocastanum</i> Dautz.	38
<i>Purpura (Thais) panama</i> Rdg., 1798	4;45;20;57;59;54;38;1;3;37
<i>Purpura (Thais) persica</i> L., 1758	72;2;26;22;37
<i>Rapana bulbosa</i> (Born)	3;14
<i>Rapana rapiformis</i> (Born, 1778)	1
<i>Ricimula clathrata</i> Lam.	38
<i>Spinidrupa euracanthus</i> (A. Ad., 1853)	2
<i>Thais (Mancinella) alouina</i> (Rdg., 1798)	2;4;20;54;45;14;1;3;37
<i>Thais aculeatus</i> (Des. & M. Edwards)	59;72;54;2;57;71
<i>Thais aevolata</i> Rve.	37
<i>Thais armigera</i> (Lam.)	59;1;57;9;37;2
<i>Thais bimaculata</i> (Jonas, 1845)	27
<i>Thais bitubercularis</i> Lam., 1822	22;1;14
<i>Thais blanfordi</i> (Melvill, 1892)	22;1;20;45
<i>Thais buccinea</i>	1
<i>Thais bufo</i> (Lam., 1822)	3;4;20;38
<i>Thais coronata</i> (Lam., 1816)	1
<i>Thais echinata</i> Blain.	37
<i>Thais echinulata</i> (Lam.)	1;57;45;37;20;59
<i>Thais elata</i> Blain.	37
<i>Thais haemastoma</i> L.	37
<i>Thais hippocastanum</i> (L., 1758) Lam.	22;37
<i>Thais intermedia</i> (Kiener, 1836)	22;3;2;26;37;59
<i>Thais lacera</i> (Born, 1778)	20;14
<i>Thais luculentus</i> (Rve.)	1
<i>Thais muricina</i> Blain	37
<i>Thais neritoidea</i> Des.	37
<i>Thais pica</i> Blain.	37
<i>Thais savignyi</i> (Des., 1844)	4;20;59;54;45;14;38

Table 5. (continued)

Taxa	Reference sources
<i>Thais spectrum</i> Rve.	37
<i>Thais squamigera</i> (Des., 1832)	2
<i>Thais squamosa</i> Lam.	37
<i>Thais tissoi</i> (Petit, 1853)	20
<i>Thais tuberosa</i> Rdg., 1798	22;59;45;2;3
<i>Trophon fossuliferus</i> Tapparone-Canefri	37
<i>Usila leucostoma</i> Des.	37
<i>Vexilla fusconigra</i> (Pease, 1860)	2
<i>Vexilla lineata</i> (A. Ad., 1853)	2
<i>Vexilla taeniata</i> Powys	37
<i>Vexilla vexillum</i> (Gm., 1791)	1;20;59;37;38
<i>Vexilla variabilis</i> (Des., 1863)	2;37
<b>CORALLIOPHILIDAE</b>	
<i>Coralliophila barclayana</i> A. Ad.	37
<i>Coralliophila clathrata</i> (A. Ad., 1854)	2;37
<i>Coralliophila coronata</i> Barclay, 1869	22;37
<i>Coralliophila costata</i> Blain	37
<i>Coralliophila costularis</i> (Lam., 1816)	22;1;2;59;45;37
<i>Coralliophila curta</i> Sow., 1894	22;27;37
<i>Coralliophila deformis</i> (Lam.)	37
<i>Coralliophila erosa</i> (Rdg., 1798)	1;2
<i>Coralliophila fimbriata</i> (A. Ad., 1854)	2;22;37
<i>Coralliophila fritschi</i> (Martens)	14
<i>Coralliophila latiaxidea</i> Sow.	27;37
<i>Coralliophila madreporarum</i> (Sow., 1822)	2;14;37;22;59
<i>Coralliophila meyendorffi</i> (Calcara)	1
<i>Coralliophila monodonta</i> (Quoy & Gaimard)	57
<i>Coralliophila neritoidea</i> (Lam., 1816)	2;11;47;37
<i>Coralliophila orbignyana</i> Rve.	59;38
<i>Coralliophila radula</i> (A. Ad., 1855)	2
<i>Coralliophila squamosissima</i> (Smith, 1876)	22;2;20
<i>Coralliophila squamulosa</i> Lam.	37
<i>Coralliophila violacea</i> (Kiener)	59;46;1;57;10;38;37
<i>Latiaxis deburghiae</i> Rve.	37
<i>Latiaxis princeps</i> Melvill	37;26
<i>Magilus antiquus</i> Montfort, 1810	22;1;2;26;27;37;59
<i>Magilus cumingi</i> Des.	37
<i>Magilus curvieri</i> Des.	37
<i>Magilus ellipticus</i> Sow.	37
<i>Magilus lamarckii</i> Des., 1863	1;22;37
<i>Magilus robillardii</i> Lienard	27;37
<i>Magilus ruppellii</i> Des., 1863	22;27;37
<i>Magilus striatus</i> Ruppell	37
<i>Rapa bulbiformis</i> Sow., 1870	2
<i>Rapa incurvus</i> (Dunker, 1852)	2
<i>Rapa papyracea</i> Lam.	37
<i>Rapa penardi</i> (Montroux)	1
<b>BUCCINIDAE</b>	
<i>Caducifer truncata</i> (Hinds, 1844)	2
<i>Cantharus crocata</i> Rve., 1846	37;22;2;26
<i>Cantharus fumosus</i> (Dill., 1817)	22;37;38
<i>Cantharus iostoma</i> (Gray, 1834)	20;2
<i>Cantharus marmorata</i> Rve., 1846	59;22;37;14
<i>Cantharus recurva</i> Rve., 1846	22;37
<i>Cantharus rubiginosus</i> Rve.	37
<i>Cantharus spiralis</i> Gray	37
<i>Cantharus subcostatus</i> (Krauss)	1

Table 5. (continued)

Taxa	Reference sources
<i>Cantharus tranquebaricus</i> Gm.	37
<i>Cantharus undosus</i> (L., 1758)	22;59;20;1;57;37;26;2;38
<i>Cantharus (Pollia) wagneri</i> (Anton, 1839)	2;26
<i>Colus longicauda</i> L.	37
<i>Engina alveolata</i> (Kiener, 1836)	2;37
<i>Engina andrewsi</i> Smith	37
<i>Engina astricta</i> Rve.	37;38
<i>Engina bonasia</i> Martens, 1880	59;22;2;37
<i>Engina carbonaria</i> Rve.	37
<i>Engina carolinae</i> Kiener	37
<i>Engina concinna</i> Rve.	37
<i>Engina elegans</i> (Dunker)	1
<i>Engina egregia</i> Rve., 1846	22;2;37
<i>Engina fusiformis</i> Pease	21;37
<i>Engina gibbosa</i> Garrett	37
<i>Engina histrio</i> Rve.	37
<i>Engina incarnata</i> (Des., 1834)	22;2
<i>Engina iodusia</i> Duclos	37
<i>Engina lineata</i> (Rve.)	57;37
<i>Engina melanozona</i> Tomlin	37;59
<i>Engina mendicaria</i> (L., 1758)	22;1;3;72;26;14;59;55;37;38;71
<i>Engina natalensis</i> Melvill, 1895	22;20
<i>Engina nodicostata</i> Pease	37
<i>Engina obliquicostata</i> Rve., 1846	22
<i>Engina phasinola</i> Duclos	37
<i>Engina rawsoni</i> Melvill	37
<i>Engina striata</i> Pease	37
<i>Engina variabilis</i> Pease	37
<i>Engina xantholeuca</i> Smith	37
<i>Engina zatricium</i> Melvill	37
<i>Engina zea</i> Melvill, 1893	2
<i>Engina zepa</i> Duclos	37
<i>Engina zonata</i> Rve.	37
<i>Nassaria acuminata</i> (Rve., 1844)	76;22
<i>Nassaria gracilis</i> Sow., 1902	76;14
<i>Nassaria (Hindsia) nivea</i> Gm.	37
<i>Olivipollia fragaria</i> (Wd. 1828)	2;26;22
<i>Olivipollia pulchra</i> (Rve., 1846)	2;37
<i>Phos cyanostoma</i> (A. Ad., 1850)	59;2;57;1
<i>Phos roseatus</i> (Hinds, 1844)	22;2;57;37
<i>Phos senticostus</i> L., 1758	22
<i>Phos textum</i> (Gm., 1791)	2;37;22
<i>Pisania amphodon</i> Martens	22;37
<i>Pisania billehensti</i> Petit	37
<i>Pisania crenilabrum</i> A. Ad.	37
<i>Pisania fasciculata</i> Rve., 1846	22;2;20;37
<i>Pisania gracilis</i> Rve.	37
<i>Pisania ignea</i> (Gm., 1791)	22;1;2;37
<i>Pisania inctuosa</i> Tapparone-Canefri	37
<i>Pisania lefevreiana</i> Tapparone-Canefri	37
<i>Pisania luctuosa</i> Tapparone-Canefri, 1880	2
<i>Pisania montrouzieri</i> Crosse	37
<i>Pisania naevosa</i> Martens	37
<i>Pisania obliquecostata</i> Tapparone-Canefri.	37
<i>Pisania polychloros</i> Tapparone-Canefri	37
<i>Pisania proxima</i> Tapparone-Canefri	37
<i>Pisania rubiginosa</i> (Rve.)	1
<i>Pisania truncatus</i> Hinds	59
<i>Siphonalia corrugata</i> A. Ad.	37

Table 5. (continued)

Taxa	Reference sources
<b>COLUMBELLIDAE</b>	
<i>Anachis atrata</i> (Gould)	20;37;14
<i>Anachis (Zafra) punctata</i> Brug.	27;37
<i>Columbella alabastrum</i> Martens	37
<i>Columbella galaxias</i> Rve.	38
<i>Columbella mercatoria</i> Lam.	3;37
<i>Columbella moleculinella</i> Dautz.	38
<i>Columbella pardalina</i> Lam.	59;37
<i>Columbella tankervillei</i> (Montrouzier) Hervier	38;37;26
<i>Columbella turturina</i> Lam.	59;3;57;20;38;1;45;37;22
<i>Columbella zelina</i> Duclos	37
<i>Mitrella albina</i> (Kiener, 1841)	2;37
<i>Mitrella (Atilia) cumingii</i> Rve., 1859	22;37
<i>Mitrella flexuosa</i> Lam., 1822	22;37
<i>Mitrella hanleyi</i> Des., 1863	22;37
<i>Mitrella (Atilia) lactea</i> Duclos	27;37
<i>Mitrella marquesa</i> Gaskoin, 1852	22;37
<i>Pyrene albinodulosa</i> Gaskoin	37
<i>Pyrene amirantium</i> Smith	37
<i>Pyrene araneosa</i> Kiener	37
<i>Pyrene articulata</i> Souverbie	37
<i>Pyrene atomella</i> Duclos	37
<i>Pyrene azora</i> (Duclos, 1840)	57;37;22;38
<i>Pyrene bidentata</i> Menke	37
<i>Pyrene blanda</i> Sow.	59
<i>Pyrene brevissima</i> Hervier	37
<i>Pyrene carolinae</i> Smith	37
<i>Pyrene cartwrighti</i> Melvill	37
<i>Pyrene chuni</i> (Thiele, 1925)	22;1
<i>Pyrene cincinnata</i> (Martens)	57;37
<i>Pyrene clausiliformis</i> Kiener	37
<i>Pyrene conspera</i> Gaskoin	37;1
<i>Pyrene dautzenbergi</i> Hervier	37
<i>Pyrene digglesii</i> Brazier	37
<i>Pyrene dunkeri</i> Tyron	37
<i>Pyrene filicineta</i> Tapparone-Canefri	37
<i>Pyrene flava</i> (Brug., 1789)	72;22;1;57;20;45;37;38
<i>Pyrene floccata</i> (Rve.)	1;20
<i>Pyrene fulgurans</i> Lam.	37;14
<i>Pyrene gowllandi</i> Brazier	37
<i>Pyrene hindsi</i> Rve.	37
<i>Pyrene indica</i> Rve.	37
<i>Pyrene isabellina</i> Crosse	37
<i>Pyrene isomella</i> Duclos	37
<i>Pyrene kraussi</i>	1
<i>Pyrene lachryma</i> Rve.	37
<i>Pyrene ligula</i> (Duclos)	1;37;59
<i>Pyrene moleculina</i> Duclos	59;37;38
<i>Pyrene mutata</i> D. & B.	37
<i>Pyrene nana</i> (Michaud) Duclos	37
<i>Pyrene nevillei</i> Tryon	37
<i>Pyrene nympa</i> Kiener	37
<i>Pyrene obesula</i> Hervier	37
<i>Pyrene obtusa</i> (Sow.)	20
<i>Pyrene ocellata</i> Link, 1807	22;7
<i>Pyrene ocellatula</i> Hervier	37
<i>Pyrene oselmonta</i> Duclos	37
<i>Pyrene pacei</i> Smith	37

Table 5. (continued)

Taxa	Reference sources
<i>Pyrene peasei</i> Martens & Langkavel	37
<i>Pyrene pellucida</i> Pease	37
<i>Pyrene pinguis</i> Hervier	37
<i>Pyrene poecila</i> Sow.	37
<i>Pyrene polita</i> Nevill	37
<i>Pyrene puella</i> Sow.	37
<i>Pyrene purpurea</i> Adams	37
<i>Pyrene pusilla</i> Sow.	37
<i>Pyrene rasolia</i> Duclos	37
<i>Pyrene regnardi</i> Viader, 1938	22
<i>Pyrene regulus</i> Souverbie	37
<i>Pyrene robillardii</i> Sow.	37
<i>Pyrene rorida</i> Rve., 1859	37;22
<i>Pyrene rufopiperctia</i> Smith	37
<i>Pyrene rustica</i> L.	37
<i>Pyrene scalpta</i> Rve.	37
<i>Pyrene scripta</i> (L.)	1;45
<i>Pyrene scripta</i> Lam.	37
<i>Pyrene selasphora</i> Melville & Standen	59
<i>Pyrene spiratella</i> Martens	37
<i>Pyrene stepheni</i> Melvill & Standen	37;38
<i>Pyrene striatula</i> Dunker	37
<i>Pyrene sublaevis</i> Montrouzier	37
<i>Pyrene succinea</i> Hervier	37
<i>Pyrene testudinaria</i> (Link, 1807)	22
<i>Pyrene troglydytes</i> (Souver)	57;37;38
<i>Pyrene tylerae</i> (Griffiths & Pidgeon)	1;45
<i>Pyrene unifascialis</i> Lam.	37
<i>Pyrene varians</i> (Sow.)	1;37;38
<i>Pyrene versicolor</i> Sow.	37
<b>NASSARIDAE</b>	
<i>Bullia annulata</i> (Lam.)	20
<i>Bullia diluta</i> (Krauss)	20;3;14
<i>Bullia mauritiana</i> Gray, 1839	22
<i>Bullia mozambicensis</i> Smith, 1878	22;20;14
<i>Bullia natalensis</i> Krauss	3;14
<i>Bullia rhodostoma</i> (Gray) Rve.	14
<i>Bullia similis</i> Sow.	20
<i>Bullia vittata</i> L., 1767	22
<i>Cyllene japonica</i> Pilsbury	37
<i>Cyllene pulchella</i> Ad. & Rve.	37
<i>Nassarius albescens gemmuliferus</i> (A. Ad., 1852)	72;59;60;7;1;2;4;26;20;57;11;37;3;38;37;14;22
<i>Nassarius arcularia plicatus</i> (Rdg., 1798)	22;72;20;1;2;3;4;57;37
<i>Nassarius callosa</i> A. Ad.	37
<i>Nassarius callospira</i> (A. Ad.)	1
<i>Nassarius canaliculata</i> Lam.	37
<i>Nassarius cancellata</i> A. Ad.	37
<i>Nassarius capensis</i> (Dunker)	14;37
<i>Nassarius castus</i> (Gould, 1835)	2
<i>Nassarius compta</i> A. Ad., 1852	26;2;37;22
<i>Nassarius concinnus</i> (Powys, 1835)	2;26;22;37
<i>Nassarius coronatus</i> (Brug., 1789)	72;22;1;2;57;26;3;38;14;20;59;55;37
<i>Nassarius coronulus</i> (A. Ad., 1852)	2;4;37
<i>Nassarius crematus</i> (Hinds, 1844)	1;2
<i>Nassarius cremulata</i> Brug.	1;37
<i>Nassarius dermestina</i> Gould	37
<i>Nassarius dorsuosa</i> A. Ad.	37



Table 5. (continued)

Taxa	Reference sources
<i>Nassarius echinatus</i> (Ad., 1852)	59;72;22;37
<i>Nassarius elegans</i> (Kiener)	57;37
<i>Nassarius erythraea</i> Issel	37
<i>Nassarius eximia</i> Gould	37
<i>Nassarius fasciata</i> Quoy & Gaimard	37
<i>Nassarius filosus</i> (Rve., 1853)	20
<i>Nassarius fraudulentus</i> Marrat, 1877	22;
<i>Nassarius gaudiosus</i> (Hinds, 1844)	2;59;37;22
<i>Nassarius geniculata</i> A. Ad.	37
<i>Nassarius glabrata</i> A. Ad.	37
<i>Nassarius glans</i> (L., 1758)	1;2;22;37
<i>Nassarius granifera</i> Kiener	1;59;37
<i>Nassarius granuliferus</i> (Kiener, 1834)	2
<i>Nassarius granum</i> Lam.	37
<i>Nassarius graphitera</i> Hombrun & Jacquinet	37
<i>Nassarius gruneri</i> (Dunker)	1
<i>Nassarius horridus</i> Dunker	59;37;22
<i>Nassarius isabellei</i> Rve.	37
<i>Nassarius kieneri</i> Des.	37
<i>Nassarius kraussianus</i> (Dunker, 1846)	4;20
<i>Nassarius lentiginosa</i> A. Ad.	37
<i>Nassarius labiatus</i> A. Ad., 1853	22
<i>Nassarius livescens</i> (Phil., 1849)	2;22
<i>Nassarius luctuosa</i> A. Ad.	37
<i>Nassarius maculata</i> A. Ad.	37
<i>Nassarius margaritiferus</i> Dunker, 1847	1;55;59;72;22
<i>Nassarius mucronata</i> Ad.	26;37
<i>Nassarius muricatus</i> Quoy & Gaimard	27;37
<i>Nassarius nana</i> A. Ad.	37
<i>Nassarius natalensis</i> Smith, 1903	22
<i>Nassarius nodifer</i> Powys, 1835	22
<i>Nassarius obockensis</i> Jous.	38
<i>Nassarius oneratus</i> (Des., 1863)	2;37
<i>Nassarius ornata</i> Des.	37
<i>Nassarius papillosus</i> (L., 1758)	59;2;11;26;1;37
<i>Nassarius pauperus</i> Gould, 1850	59;37;38;1;22
<i>Nassarius picta</i> Dunker	37
<i>Nassarius pullus</i> (L., 1758)	38;1;22
<i>Nassarius punctata</i> Ad.	37
<i>Nassarius reeveanus</i> Dunker, 1847	22
<i>Nassarius scalaris</i> A. Ad.	37
<i>Nassarius scalpta</i> Marrat	37
<i>Nassarius sertula</i> Ad.	37
<i>Nassarius sinusigera</i> A. Ad.	37
<i>Nassarius siquijorensis</i> (A. Ad., 1852)	2;37
<i>Nassarius stolata</i> Gm.	37
<i>Nassarius striata</i> A. Ad.	37
<i>Nassarius subspinosus</i> (Lam.)	1;37
<i>Nassarius taenius</i> (Gm.)	1;26;38;37
<i>Nassarius thersites</i> Gm.	37
<i>Zeuxius olivaceus</i> (Brug., 1789)	22;37;2
<b>MELONGENIDAE</b>	
<i>Busycon perversum</i> (L.)	1
<i>Melongena pyrum</i> (Gm., 1791)	2;1;20;38
<i>Volema paradisiaca</i> Rdg., 1798	72;22;3;14
<b>FASCIOLARIDAE</b>	
<i>Colubraria angulata</i> Rve.	37
<i>Colubraria antiquata</i> Hinds	37

Table 5. (continued)

Taxa	Reference sources
<i>Colubraria bracteata</i> Hinds	37
<i>Colubraria ceylonensis</i> Sow.	37
<i>Colubraria clathratus</i> Sow., 1833	22;37
<i>Colubraria convoluta</i> Brod. & Sow.	37
<i>Colubraria decapitatus</i> Rve., 1844	22;37
<i>Colubraria digitalis</i> Rve.	37
<i>Colubraria distorta</i> Schubert & Wagner	37
<i>Colubraria lanceolata</i> Menke	37
<i>Colubraria maculosa</i> (Gm.)	1
<i>Colubraria muricata</i> (Lightfoot, 1786)	26;37
<i>Colubraria nitidula</i> (Sow., 1833)	26;37;1
<i>Colubraria obscura</i> (Rve., 1844)	26;22;59;37;1
<i>Colubraria reticosa</i> A. Ad., 1870	22;37
<i>Colubraria sculptilis</i> Rve., 1844	22;37
<i>Colubraria sowerbyi</i> Rve.	37
<i>Colubraria testacea</i> March	37
<i>Colubraria tortuosa</i> (Rve., 1844)	26
<i>Colubraria truncata</i> Hinds	37
<i>Fusinus colus</i> (L., 1758)	1;3;2;14;45
<i>Fusinus forceps</i> (Perry, 1811)	2
<i>Fusinus longissimus</i> (Gm., 1791)	2;37
<i>Fusinus oblitus</i> (Rve., 1847)	2;37
<i>Fusinus toreuma</i> (Martyn, 1784)	2
<i>Fusus barclayi</i> Sow.	37
<i>Fusus nicobaricus</i> Chemn.	37
<i>Fusus tuberculatus</i> Lam.	38
<i>Fusus xanthochrous</i> Tapparone-Canefri	37
<i>Latirus (Fusus) tenuistriatus</i> (Sow.)	1
<i>Latirus australiensis</i> (Rve.)	1
<i>Latirus barclayi</i> (Rve., 1847)	2;26;37;21
<i>Latirus brazieri</i> (Angas)	1
<i>Latirus cariniferus</i> Lam.	37
<i>Latirus concinnus</i> Tapparone-Canefri, 1880	2;37
<i>Latirus craticulatus</i> (L., 1758)	22;2;57;26;59;37
<i>Latirus lancea</i> Gm.	37
<i>Latirus lanceolatus</i> (Rve., 1847)	2
<i>Latirus nodatus</i> Gm., 1791	22;37
<i>Latirus noumeensis</i> (Crosse, 1870)	22;26;2;37
<i>Latirus ocellatus</i> Gm.	37
<i>Latirus polygonus</i> Gm., 1791	22;1;57;59;45;37;14;38
<i>Latirus praestantior</i> Melvill, 1891	22
<i>Latirus prismaticus</i> (Martyn)	1
<i>Latirus puchellus</i> (Rve.)	1
<i>Latirus robillardi</i> Tapparone-Canefri	2;37
<i>Latirus turrita</i> (Gm., 1791)	22;2;26;37
<i>Leucozonia smaragdula</i> (L., 1758)	14;59;1;45;2;37
<i>Peristernia belcheri</i> Rve.	37
<i>Peristernia caledonica</i> Petit	37
<i>Peristernia canthariformis</i> Melvill, 1891	22;2;37
<i>Peristernia carotiana</i> Tapparone-Canefri	37
<i>Peristernia chlorostoma</i> Sow., 1825	22;37
<i>Peristernia cremnochione</i> Melvill, 1891	22;37
<i>Peristernia cremulata</i> Kiener	37
<i>Peristernia forskalli forskalli</i> (Tapparone-Canefri, 1875)	22;4;20;45;37
<i>Peristernia fragaria</i> Wd.	59
<i>Peristernia hesteriae</i> Melvill, 1911	22
<i>Peristernia hilaris</i> Melville	2;37
<i>Peristernia incarnata</i> Des.	37

Table 5. (continued)

Taxa	Reference sources
<i>Peristernia infracincta</i> Kuster	37
<i>Peristernia jeaniae</i> Melvill, 1911	22
<i>Peristernia kobeltiana</i> Tapparone-Canefri	21;37
<i>Peristernia leucothea</i> Melville	3
<i>Peristernia maculata</i> Rve.	37
<i>Peristernia mannophora</i> Melvill	37
<i>Peristernia marquesana</i> A. Ad.	37
<i>Peristernia microstoma</i> Kuster	37
<i>Peristernia nana</i> Rve.	37
<i>Peristernia nassatula</i> (Lam., 1822)	22;57;10;3;72;26;14;59;45;38;37;1
<i>Peristernia photiformis</i> Melvill, 1891	22
<i>Peristernia reticularia</i> Melvill, 1891	22;2;37
<i>Peristernia scabra</i> Souverbie	37
<i>Peristernia smithiana</i> Melvill, 1891	22;37
<i>Peristernia ustulata</i> Rve.	37
<i>Peristernia wagneri</i> Anton	37
<i>Pleuroploca trapezium</i> (L., 1758)	2;57;26;59;45;22;1;3;14;37;38
<i>Pleuroploca filamentosa</i> (Rdg.)	45;1;2;57;14;37
<b>VOLUTIDAE</b>	
<i>Lyria delessertiana</i> Petit, 1842	22;28;12;27;37
<i>Lyria lyraeformis</i> Swai., 1821	22;12;27
<i>Lyria queketti</i> (Smith)	20
<i>Voluta africana</i> Rve.	14
<i>Voluta costata</i> Swai.	37
<b>HARPIDAE</b>	
<i>Harpa amouretta</i> Rdg., 1798	59;45;22;1;2;26;20;38;81
<i>Harpa articularis</i> Lam., 1822	2;81
<i>Harpa costata</i> (L., 1758)	81;22;2;26;27;37;2
<i>Harpa davidis</i> Rdg., 1798	81;37
<i>Harpa duplicata</i> L.	27
<i>Harpa gracilis</i> Brod. & Sow., 1829	81;37
<i>Harpa harpa</i> L., 1758	81;5;11;38
<i>Harpa lanceata</i> L.	27
<i>Harpa major</i> Rdg., 1798	81;22;2;5;27;20;37;3
<i>Harpa nobilis</i> (Rumphius) Bolten	37
<i>Harpa ventricosa</i> Lam., 1816	81;22;2;26;20
<i>Morum exquisitum</i> Ad. & Rve.	37
<i>Morum praeclarum</i> Melvill	29
<b>VASIDAE</b> Review ref.: 74	
<i>Tudicula zanzibarica</i> Abbott, 1958	74;40;26
<i>Vasum ceramicum</i> (L., 1758)	74;45;1;2;38
<i>Vasum rhinocerus</i> (Gm., 1791)	74;22;1;45
<i>Vasum turbinellus</i> (L., 1758)	72;74;1;2;57;10;45;59;38;37;71
<b>OLIVIDAE</b>	
<i>Amalda obesa</i> (Sow.)	20
<i>Ancilla albisulcata</i> Sow.	38
<i>Ancilla ampla</i> (Gm.)	57;37
<i>Ancilla aperta</i> Sow., 1825	22
<i>Ancilla candida</i> Lam.	37
<i>Ancilla castanea</i> (Sow., 1830)	3;37
<i>Ancilla cinnamomea</i> Lam., 1801	1;37;22
<i>Ancilla djiboutiensis</i> (Jouss.)	38
<i>Ancilla exigua sulcata</i> Thiele, 1925	22
<i>Ancilla lineolata</i> A. Ad.	38
<i>Ancilla mauritiana</i> Sow.	37
<i>Ancilla minima</i> Thiele, 1925	22

Table 5. (continued)

Taxa	Reference sources
<i>Ancilla optima</i> Sow.	3
<i>Ancilla rubiginosa</i> Swa.	27;37
<i>Ancilla sarda</i> (Rve.)	72
<i>Ancilla torosa</i> (Meuschen)	1
<i>Ancilla turrida</i> Rdg., 1798	22
<i>Ancilla ventricosa ventricosa</i> (Lam., 1811)	2;27;22
<i>Oliva amethystina</i> (Rdg.)	1
<i>Oliva annulata</i> Gm., 1791	59;2;26;37;22
<i>Oliva atalina</i> Duclos	37
<i>Oliva athenia</i> Duclos	37
<i>Oliva australis</i> (Duclos)	1
<i>Oliva bulbosa</i> (Rdg., 1798)	1;2;22
<i>Oliva carneola</i> (Gm., 1791)	2;37
<i>Oliva caroliniana</i> Duclos, 1835	4;20;37;22;3
<i>Oliva duclosi</i> Rve., 1850	2
<i>Oliva elegans</i> Lam.	3
<i>Oliva emicator</i> Meuschen	37
<i>Oliva episcopalis</i> (Lam.)	37;1;26;57;59;2
<i>Oliva erythrostoma</i> Meuschen	57;37
<i>Oliva inflata</i> (Lam.)	1;37
<i>Oliva infrenata</i> Marrat, 1871	22
<i>Oliva ispidula</i> L.	37
<i>Oliva lecoquiana</i> Duclos	37
<i>Oliva lepida</i> Duclos, 1835	2;22
<i>Oliva leucostoma</i> Duclos, 1835	22
<i>Oliva macleaya</i> Duclos, 1835	2
<i>Oliva minacea</i> Rdg., 1798	2;22
<i>Oliva oliva</i> (L., 1758)	5;2;37
<i>Oliva olympiadinia</i> Duclos, 1844	2
<i>Oliva panniculata</i> Duclos, 1835	2;37
<i>Oliva paxillus</i> Rve., 1850	1;2;37;59
<i>Oliva pica</i> Lam., 1811	59;37;22
<i>Oliva ponderosa</i> Duclos, 1835	37;22
<i>Oliva reticularis</i> Lam.	37
<i>Oliva reticulata</i> Rdg., 1798	11;22
<i>Oliva sanguinolenta</i> Lam.	37
<i>Oliva scitula</i> (Marrat)	1
<i>Oliva scripta</i> Lam.	37
<i>Oliva sericea</i> (Rdg., 1798)	1;2
<i>Oliva sidelia</i> Duclos	57;11;37
<i>Oliva sowerbyi</i> Marrat	37
<i>Oliva tessellata</i> Lam.	37
<i>Oliva textilina</i> Lam.	37
<i>Oliva tigerina</i> Lam., 1811	1;5;2;37;38;22
<i>Oliva todosina</i> Duclos, 1835	2;22
<i>Oliva tremulina</i> Lam., 1811	1;2;37;22
<i>Oliva tricolor</i> Lam.	37
<i>Oliva volvaroides</i> Duclos, 1835	2;22
<i>Olivancillaria gibbosa</i> (Born, 1778)	2
<i>Olivancillaria nana</i> Lam., 1811	22
<i>Olivancillaria nebulosa</i> (Lam., 1811)	2
<i>Olivella nymphe</i> Ad. & Angus	37
<i>Olivella williamsi</i> Melvill & Standen	37
<b>MARGINELLIDAE</b>	
<i>Bullata strigata</i> Dill., 1817	22
<i>Extra extra</i> Jouss., 1894	22
<i>Gramula atomella</i> Bavay, 1917	22

Table 5. (continued)

Taxa	Reference sources
<i>Marginella angustata</i> Sow., 1846	2
<i>Marginella asellina</i> Jous.	37
<i>Marginella burnupi</i> Sow.	14
<i>Marginella crassilabrum</i> Sow.	37
<i>Marginella delessertiana</i> Rcz., 1841	37;22
<i>Marginella festiva</i> Kiener	27
<i>Marginella fusiformis</i> Hinds	37
<i>Marginella gemma</i> Adams	37
<i>Marginella granum</i> Phil., 1850	37;22
<i>Marginella guttula</i> Sow.	37
<i>Marginella lantzi</i> Jous.	37;22
<i>Marginella louisae</i> Bavay	37
<i>Marginella majuscula</i> Martens	37
<i>Marginella mancielli</i> (Jous., 1875)	2;37
<i>Marginella monilis</i> L., 1758	22
<i>Marginella mariei</i> Crosse	37
<i>Marginella nevilli</i> Jous.	37
<i>Marginella obscura</i> (Rve., 1865)	1;22
<i>Marginella osteri</i> Jous.	37;22
<i>Marginella paros</i> Jous., 1875	37;22
<i>Marginella peasei</i> Rve., 1865	37;22
<i>Marginella picturata</i> G. & H. Nevill	37;22
<i>Marginella pulchella</i> Kiener	38
<i>Marginella pulvis</i> Jous., 1875	37;22
<i>Marginella pumila</i> Redfield	37
<i>Marginella ros</i> Rve., 1865	22
<i>Marginella rufula</i> Gaskoin	37
<i>Marginella sarda</i> (Kiener, 1834)	2;27;37;22
<i>Marginella scripta</i> Hinds	27
<i>Marginella serrata</i> Gaskoin	37;22
<i>Marginella sordida</i> Rve., 1865	37;22
<i>Marginella sueziensis</i> (Issel, 1869)	22
<i>Prunum gibbosa</i> Jous., 1875	22
<i>Volvarina compressa</i> Rve., 1865	22
<i>Volvarina eumorpha</i> Melvill, 1906	22
<b>MITRIDAE</b>	
<i>Cancilla antoniae</i> (H. Ad.)	1;37;59
<i>Cancilla carnicolor</i> (Rve., 1844)	2
<i>Cancilla filaris</i> (L., 1771)	2;22;37;27
<i>Cancilla granatina</i> (Lam., 1811)	2;59
<i>Cancilla praestantissima</i> (Rdg., 1758)	2;26
<i>Cancilla rufilirata</i> (Ad. & Rve., 1850)	2
<i>Imbricaria filum</i> Wd.	59;1
<i>Imbricaria olivaeformis</i> (Swai., 1821)	2
<i>Imbricaria punctata</i> Swai., 1821	22;2;1;37
<i>Mitra acuminata</i> Swai., 1824	2;26;59;37;82;1
<i>Mitra acupicta</i> Rve.	37
<i>Mitra acutilirata</i> Sow.	14;37
<i>Mitra adamsoni</i> Rve.	37
<i>Mitra adusta</i> Lam.	37
<i>Mitra alveolus</i> Rve.	37
<i>Mitra amabilis</i> (Rve.)	1;38;37;26
<i>Mitra ambigua</i> Swa., 1832	2;1;82
<i>Mitra arenosa</i> (Lam.)	1
<i>Mitra assimilis</i> Pease, 1868	82
<i>Mitra astricta</i> Rve.	37
<i>Mitra aurantia aurantia</i> (Gm., 1791)	22;37;82;3;14;20

Table 5. (continued)

Taxa	Reference sources
<i>Mitra aureolata</i> Gm.	37
<i>Mitra auriculoides</i> Rve., 1845	2;26;37;82;22
<i>Mitra aurora floridula</i> Sow., 1874	2;82;37;22
<i>Mitra avenacea</i> Rve., 1845	2;82
<i>Mitra (Nebularia) barclayi</i> "Hanley" 1874	22
<i>Mitra bicolor</i> Des.	37
<i>Mitra bilieata</i> Rve.	37
<i>Mitra brevicaudata</i> Sow.	37
<i>Mitra brevicula</i> Souverbie	37
<i>Mitra buryi</i> Melvill & Sykes	1
<i>Mitra cadaverosa</i> Rve.	37
<i>Mitra caeligna</i> Rve.	37
<i>Mitra caffra</i> (L.)	14
<i>Mitra candida</i> Rve.	37
<i>Mitra cardinalis</i> (Gm., 1791)	2;26;82;37
<i>Mitra casta</i> Lam.	27
<i>Mitra catenata</i> Swai.	37
<i>Mitra (Thala) cernica</i> Sow.	37
<i>Mitra chrysalis</i> Rve., 1844	82;2;45;38;37;22
<i>Mitra chrystoma</i> Brod., 1836	37;82;22
<i>Mitra cinctella</i> Lam.	37
<i>Mitra cineracea</i> Rve.	37
<i>Mitra clathrus</i> Rve.	37
<i>Mitra coarctata</i> Rve., 1844	2
<i>Mitra coffea</i> Schubert & Wagner, 1829	2;26;37;82
<i>Mitra columbellaeformis</i> Kiener, 1838	37
<i>Mitra commutata</i> B. & Dantz.	37
<i>Mitra compta</i> A. Ad.	37
<i>Mitra conica</i> Schumacher	37
<i>Mitra contracta</i> Swa., 1820	2;82
<i>Mitra corallina</i> Rve.	37
<i>Mitra coronata</i> Lam., 1811	2;26;59;82;37;22
<i>Mitra corrugata</i> Lam.	37
<i>Mitra crebrilineata</i> Sow.	37
<i>Mitra crebrilirata</i> Rve.	37
<i>Mitra crenifera</i> Lam.	14;59
<i>Mitra crocata</i> Lam.	37;38
<i>Mitra cruentata</i> Chemn.	37
<i>Mitra cucumerina</i> Lam., 1811	2;57;26;22;59;38;37;82
<i>Mitra cumingi</i> Rve.	37
<i>Mitra cylindracea</i> Rve.	3
<i>Mitra daedala</i> Rve., 1845	3;22
<i>Mitra decaryi</i> Dautz.	38
<i>Mitra dermestina</i> Lam.	37
<i>Mitra deshayesi</i> Rve.	3;26;38;37
<i>Mitra discoloria</i> Rve.	37
<i>Mitra diutenera</i> herbier	37
<i>Mitra doilum</i> Kuster, 1839	82;37;22
<i>Mitra dorotheae</i> Melvill & Standen	37
<i>Mitra edentula</i> Swa., 1823	2;22;37;1;59;82
<i>Mitra episcopalis</i> L.	14
<i>Mitra eremitarum</i> Rdg., 1798	2
<i>Mitra exasperata</i> Gm.	37;1
<i>Mitra fasciata</i> Martyn	37
<i>Mitra fastigium</i> Rve., 1845	82;2;6;1;37
<i>Mitra fenestrata</i> Lam.	37
<i>Mitra ferruginea</i> Lam., 1811	1;2;26;37;59;45;22
<i>Mitra festa</i> Rve.	37

Table 5. (continued)

Taxa	Reference sources
<i>Mitra flammea</i> Quoy & Gaimard	26;37;38;22
<i>Mitra fraga</i> Q & G., 1833	82;1;2;37;45;22
<i>Mitra fulgetrum</i> Rve.	37
<i>Mitra fulvescens</i> Brod., 1836.	82;37;2;22
<i>Mitra gruneri</i> Rve.	37
<i>Mitra guttata</i> Swa., 1824	82;2;37
<i>Mitra harpeformis</i> Lam.	37
<i>Mitra hastata</i> Sow.	37
<i>Mitra honesta</i> Melvill & Standen	37
<i>Mitra imperialis</i> Rdg., 1798	2;82;37;21;1;59
<i>Mitra incisa</i> Ad. & Rve.	37
<i>Mitra incompta</i> (Lightfoot, 1786)	2;22;82;1
<i>Mitra infansta</i> Rve.	37
<i>Mitra ingubris</i> Swai.	37
<i>Mitra intermedia</i> Kiener	37
<i>Mitra judaeorum</i> Dohrn	37
<i>Mitra lanta</i> Rve.	37
<i>Mitra litterata</i> Lam., 1811	82;3;2;4;37;27;14;20;22
<i>Mitra lobens</i> Rve.	37
<i>Mitra luctuosa</i> A & Ad., 1853	82;3;2;37;22
<i>Mitra mediomaculata</i> Sow.	37
<i>Mitra michelini</i> Petit	37
<i>Mitra militaris</i> Rve.	37
<i>Mitra mirabilis</i> A. Ad.	37
<i>Mitra mitra</i> (L., 1758)	3;2;26;37;59;45;82
<i>Mitra modesta</i> Rve.	37
<i>Mitra multiplicata</i> (Pease, 1865)	2;82;22;37
<i>Mitra musiculata</i> Lam.	37
<i>Mitra nassoides</i> Sow., 1874	37;22
<i>Mitra nitidina</i> Duclos	6;1
<i>Mitra nitidissima</i> Melvill & Standen	37
<i>Mitra nodosa</i> Swai.	37
<i>Mitra nubila nubila</i> (Gm., 1791)	22;37;1
<i>Mitra nucea</i> Gronovius	37
<i>Mitra obeliscus</i> Rve.	37
<i>Mitra ocellata</i> (Swai., 1831)	14;22
<i>Mitra ochracea</i> Hervier	37
<i>Mitra oleacea</i> Rve.	1;6;37;59
<i>Mitra osidiris</i> Issel	37
<i>Mitra pacifica</i> Pease	37
<i>Mitra paligera</i> Sow.	37
<i>Mitra papalis</i> (L.)	1;2;11;26;37
<i>Mitra pardalis</i> Kuster	37
<i>Mitra patriarchalis</i> Gm.	37
<i>Mitra paupercula</i> (L., 1758)	27;20;37;82;1;57;22;54;59
<i>Mitra pellisserpentis pellisserpentis</i> Rve., 1844	2;26;37;82;22;59
<i>Mitra pharaonis</i> Adams	37
<i>Mitra pica</i> (Dill., 1817)	2;26;22;37
<i>Mitra polita</i> (Rve.) Martens	37
<i>Mitra porphyritica</i> Rve.	37
<i>Mitra praetexta</i> A. Ad.	37
<i>Mitra pretiosa</i> Rve.	37;1;2
<i>Mitra proscissa</i> Rve.	37
<i>Mitra puncticulata</i> Lam., 1811	82
<i>Mitra punctostriata</i> (A. Ad., 1855)	20
<i>Mitra purpurata</i> Rve.	37
<i>Mitra pyramis</i> (Wd., 1828)	82;2;22;37
<i>Mitra recurra</i> Rve.	37

Table 5. (continued)

Taxa	Reference sources
<i>Mitra regina</i> Swain.	37
<i>Mitra retusa</i> Lam., 1811	82;37
<i>Mitra rosacea</i> Rve., 1845	2
<i>Mitra rossiae</i> Rve., 1844	82;22;37
<i>Mitra rubiginosa</i> Rve.	37
<i>Mitra rubra</i> Rve.	37
<i>Mitra rubritincta</i> Rve., 1844	82;2;37
<i>Mitra rufescens</i> A & Ad.	3;37
<i>Mitra rugosa</i> Rve.	37
<i>Mitra sanguisuga</i> L.	37
<i>Mitra scabricula</i> Lam.	37
<i>Mitra scarbiuscula</i> (Solander)	1
<i>Mitra sculptilis</i>	1
<i>Mitra scutulata</i> (Gm., 1891)	6
<i>Mitra semifasciata</i> Lam.	38;37
<i>Mitra semiferruginea</i> Rve., 1845	22
<i>Mitra semirosea</i> Sow.	37
<i>Mitra serotina</i> A. Ad.	37
<i>Mitra simulans</i> Martens	37
<i>Mitra sinensis</i> Rve.	37
<i>Mitra smithi</i> Sow.	37
<i>Mitra solandri</i> Rve., 1844	37
<i>Mitra sophiae</i> Crosse, 1862	2
<i>Mitra speciosa</i> Rve.	37
<i>Mitra sphaerulata</i> Martyn	37
<i>Mitra stictica</i> (Link, 1807)	82;2;26;22;45;59;14;37
<i>Mitra striatula</i> Lam.	37
<i>Mitra suavis</i> Souverbie	37
<i>Mitra subdivisa</i> (Chemn.) Lam.	37
<i>Mitra subquadrata</i> Sow.	37
<i>Mitra subulata</i> Lam.	37
<i>Mitra suffecta</i> B. & D.	37
<i>Mitra sanginolenta</i> Lam., 1811	82;37
<i>Mitra tabanula</i> Lam., 1811	82;38;37;2;26;22
<i>Mitra taeniata</i> Lam.	37
<i>Mitra telescopium</i> Rve., 1844	82;37;2;22
<i>Mitra texturata</i> Lam.	37
<i>Mitra ticaonica</i> Rve., 1844	82;37;2;22;59
<i>Mitra triplicata</i> Martens, 1904	82
<i>Mitra turben</i> Rve.	37
<i>Mitra turgida</i> Rve., 1845	2;37;82
<i>Mitra tusa</i> Rve.	37
<i>Mitra typha</i> Rve., 1845	37;2;82;22
<i>Mitra umbonata</i> Sow.	37
<i>Mitra ustulata</i> Rve., 1844	2
<i>Mitra vanikoroensis</i> Quoy & Gaimard	37
<i>Mitra variata</i> Rve.	37
<i>Mitra variegata</i> Gm.	37
<i>Mitra vulpecula</i> L.	37
<i>Mitra zephyrina</i> Duclos	26;37
<i>Neocancilla circula</i> (Kiener, 1838)	2;37;38
<i>Neocancilla clathrus</i> (Gm., 1791)	22;2;57
<i>Neocancilla papilio</i> (Link, 1807)	2
<i>Pterygia crenulata</i> (Gm., 1791)	22;1;2;37
<i>Pterygia nucea</i> Gm., 1791	2;22;59;1
<i>Pterygia pudica</i> (Pease, 1860)	2
<i>Pterygia scabricula</i> L., 1758	22
<i>Scabricula bicolor</i> Swai., 1824	2



Table 5. (continued)

Taxa	Reference sources
<i>Scabricula caerulea</i> (Rve., 1845)	2
<i>Scabricula casta</i> Gm., 1791	22
<i>Scabricula coriacea</i> (Rve., 1845)	2
<i>Scabricula desetangsii</i> (Kiener, 1838)	22;37
<i>Scabricula eximia</i> (A. Ad., 1853)	22;2;26;37
<i>Scabricula fissurata</i> (Lam., 1811)	2;1;22;27;37
<i>Scabricula fusca</i> Swai., 1824	2;22
<i>Scabricula lacunosa</i> Rve., 1844	22
<i>Scabricula mauritiana</i> Sow., 1874	22;37
<i>Scabricula newcombi</i> Pease	1
<i>Scabricula zephyra</i> Rcz.	59;1
<i>Subcancilla annulata</i> Rve., 1844	22;37
<i>Subcancilla interlirata</i> Rve., 1844	22;2;37
<i>Subcancilla juttingae</i> Koperberg, 1931	2
<i>Ziba intersculpta</i> (Sow., 1870)	2
<b>COSTELLARIIDAE</b>	
<i>Thala maxmarrowi</i> Cernohorsky, 1980	2
<i>Thala mirifica</i> (Rve., 1845)	22;2
<i>Thala simulans</i> (Martens, 1880)	2
<i>Thala todilla</i> Mighels, 1845	22
<i>Vexillum acupictum</i> (Rve., 1845)	2;26
<i>Vexillum alauda</i> (Sow.)	14;1
<i>Vexillum amabile</i> (Rve., 1845)	2;22
<i>Vexillum amanda</i> Rve., 1844	22
<i>Vexillum angustissimum</i> (Smith, 1903)	2
<i>Vexillum approximatum</i> Pease, 1860	22
<i>Vexillum bernhardina</i> (Rdg., 1798)	2;22
<i>Vexillum bipartitum</i> (Smith, 1894)	2
<i>Vexillum cadaverosum</i> (Rve., 1844)	1;59;2;26;22
<i>Vexillum catenatum</i> Brod., 1836	22;2
<i>Vexillum cancellarioides</i> (Anton, 1839)	2;22;26
<i>Vexillum cineria</i> Rve.	59
<i>Vexillum Pusia cithara</i> Rve., 1845	22
<i>Vexillum coccineum</i> (Rve.)	2
<i>Vexillum Pusia consanguineum</i> Rve., 1845	22;26;1
<i>Vexillum corbicula</i> (Sow., 1870)	2;22
<i>Vexillum coronatum</i> (Helbling, 1779)	2
<i>Vexillum costatum</i> (Gm., 1791)	2;1
<i>Vexillum crocatum</i> (Lam., 1811)	2;22
<i>Vexillum cumingi</i> (Rve., 1844)	2
<i>Vexillum microzonias</i> Lam., 1811	22
<i>Vexillum deshayesi</i> (Rve., 1844)	2;57;22
<i>Vexillum discoloria</i> (Rve.)	14
<i>Vexillum diutenerum</i> (Hervier, 1897)	2
<i>Vexillum echinatum</i> (A. Ad., 1853)	2;22
<i>Vexillum evelynae</i> Melvill, 1895	22
<i>Vexillum exasperatum</i> (Gm., 1791)	2;57;14;22
<i>Vexillum (Pusia) fulvosulcata</i> Melvill, 1888	22
<i>Vexillum humilis</i> (Hevier, 1897)	2
<i>Vexillum intermedium</i> (Kiener)	2;57
<i>Vexillum interstriatum</i> (Sow., 1870)	2
<i>Vexillum lyratum</i> Lam., 1811	22
<i>Vexillum mediomaculatum</i> (Sow., 1870)	2;22
<i>Vexillum micra</i> (Pilsbury, 1921)	2
<i>Vexillum millecostatatum</i> (Brod., 1836)	2;22
<i>Vexillum mirabilie</i> (A. Ad., 1858)	2
<i>Vexillum modestum</i> (Rve., 1845)	2;22

Table 5. (continued)

Taxa	Reference sources
<i>Vexillum obeliscus</i> (Rve., 1844)	2;22
<i>Vexillum osiridis</i> (Issel, 1869)	2;22
<i>Vexillum pacificum</i> (Rve., 1845)	2;22
<i>Vexillum pardalis</i> (Kuster, 1841)	2;22
<i>Vexillum plurinotatum</i> (Hervier, 1897)	2
<i>Vexillum polygonum</i> (Gm., 1791)	2;22
<i>Vexillum regina</i> (Sow., 1828)	2;22
<i>Vexillum (Pusia) rhodinosphaera</i> Melvill, 1888	2237
<i>Vexillum roseum</i> (Brod., 1836)	2;22
<i>Vexillum rubrum</i> (Brod., 1836)	2
<i>Vexillum rugosum</i> (Gm., 1791)	3;22;1
<i>Vexillum rusticum</i> Rve., 1845	22
<i>Vexillum salisbury</i> Cernohorsky, 1976	2
<i>Vexillum sanguisugrum</i> (L.)	57
<i>Vexillum sculptile</i> (Rve., 1845)	2;22
<i>Vexillum semicostatum</i> (Anton, 1838)	2
<i>Vexillum spicatum</i> Rve., 1845	22
<i>Vexillum speciosum</i> (Rve., 1844)	2;22
<i>Vexillum suavis</i> (Sow., 1875)	2;22
<i>Vexillum subdivisum</i> (Gm., 1791)	26
<i>Vexillum takisaoi</i> (Kuroda, 1959)	2
<i>Vexillum tankervillei</i> (Melville, 1888)	2;26
<i>Vexillum tuberosum</i> (Rve., 1845)	2;26
<i>Vexillum turrigerum</i> Rve., 1845	22
<i>Vexillum tusum</i> (Rve., 1845)	2
<i>Vexillum unifascialis</i> (Lam., 1811)	2;22
<i>Vexillum unifasciatum</i> (Wd., 1828)	2;22
<i>Zierliana woldemarii</i> Kiener, 1838	22
<b>CANCELLARIIDAE</b>	
<i>Cancellaria cantabulata</i> (Sow.)	1
<i>Cancellaria costifera</i> (Sow.)	1;37
<i>Cancellaria hystrix</i> Rve.	37
<i>Cancellaria lamellosa</i> Hinds	3;1
<i>Cancellaria melanostoma</i> (Sow., 1849)	6
<i>Cancellaria scalariformis</i> Lam.	37
<i>Cancellaria scalarina</i> Lam.	14;37
<i>Cancellaria textilis</i> Kieo	37
<i>Scalptia obliquata</i> (Lam., 1822)	2;27
<i>Scalptia scalata</i> (Sow., 1833)	22;2;37
<i>Turehua antiquata</i> (Hinds)	2
<b>CONIDAE</b>	
<i>Comus abbas</i> Hwass	37
<i>Comus achatinus</i> (Gm., 1791)	1;2;37
<i>Comus adansonii</i> Rve.	37
<i>Comus amadis</i> Gm., 1791	2
<i>Comus ammiralis</i> L., 1758	22;37
<i>Comus anabathrum</i> Crosse	37
<i>Comus araneosus</i> (Hwass)	1
<i>Comus archiepiscopus</i> Hwass	37
<i>Comus arenatus</i> Hwass in Brug., 1792	59;45;22;1;3;37;10;26;19;57
<i>Comus articulatus</i> Sow., 1873	2;37
<i>Comus artoptus</i> Sow., 1833	22
<i>Comus atramentosus</i> Rve.	37
<i>Comus augur</i> (Solander)	1;59;37
<i>Comus aulicus</i> L., 1758	22;2;26;37;1
<i>Comus auratus</i> Hwass	37
<i>Comus aureus</i> Hwass 1792	22

Table 5. (continued)

Taxa	Reference sources
<i>Comus auricomos</i> Hwass	2
<i>Comus balteatus</i> Sow., 1833	22;2;37
<i>Comus bandanus</i> Hwass, 1792	2;37
<i>Comus barthelemyi</i> Bernardi, 1861	2;37
<i>Comus betulinus</i> L., 1758	1;5;3;2;57;26;27;19;20;59;45;60;37;38
<i>Comus biliosus</i> Rdg., 1798	20
<i>Comus blainvillii</i> Vignard, 1829	2
<i>Comus boeticus</i> Rve., 1844	22
<i>Comus borbonicus</i> H. Ad.	37
<i>Comus broderipii</i> Sow.	24
<i>Comus bullatus</i> L., 1758	2;26;37
<i>Comus cailliaudi</i> Kiener	37
<i>Comus cancellatus</i> Hwass	37
<i>Comus canonicus</i> Hwass, 1792	72;22;2;37
<i>Comus capitaneus</i> (L., 1758)	1;2;57;10;26;20;37
<i>Comus catus</i> Hwass, 1792	22;1;2;26;45;59;37
<i>Comus cernicus</i> H. Ad., 1869	22;2;37
<i>Comus ceylanensis</i> Hwass in Brug.	45;3;19;37;1
<i>Comus chaldeus</i> Hwass, 1792	72;45;59;1;2;57;26;20
<i>Comus circumclausus</i> Fenaux, 1942	2
<i>Comus clarus</i> Smith	9
<i>Comus clavus</i> L.	37
<i>Comus clytospira</i> Melvill & Standen	37
<i>Comus coelinae</i> Crosse, 1858	2
<i>Comus coffea</i> Gm.	37
<i>Comus colubrinus</i> Lam., 1810	22;2;37
<i>Comus connectens</i> A. Ad., 1855	22;2
<i>Comus convolutus</i> Sow., 1857	2;37
<i>Comus coronalis</i> (Rdg.)	1
<i>Comus coronatus</i> Gm., 1791	72;2;57;20;22;59;45;37;38;1
<i>Comus crocatus</i> Lam.	37
<i>Comus cylindraceus</i> Brod. & Sow., 1830	22;2;37
<i>Comus dictator</i> Melvill	37
<i>Comus dilectus</i> Gould, 1850	2
<i>Comus distans</i> Hwass 1792	22;1;2;45;37
<i>Comus dusaveli</i> H. Ad., 1872	22;37
<i>Comus eberneus</i> Hwass	37
<i>Comus ebraeus</i> L., 1758	22;1;3;2;4;57;19;20;45;59;37;72;38;71
<i>Comus elongatus</i> Rve.	37
<i>Comus encaustus</i> Kiener	37;72
<i>Comus episcopatus</i> Da Motta, 1982	2
<i>Comus episcopus</i> Hwass, 1792	2;37
<i>Comus epistomium</i> Rve.	37;1
<i>Comus ermineus</i> (Born)	1
<i>Comus erythraeensis</i> Rve., 1843	22
<i>Comus euetrios</i> Sow., 1882	2
<i>Comus festivus</i> Chem.	37
<i>Comus figulinus</i> L., 1758	22;1;2;26;37
<i>Comus flavidus</i> Lam., 1810	22;1;3;72;2;57;20;59;45;60;37
<i>Comus floccatus</i> Sow.	37
<i>Comus frauenfeldi</i> Crosse, 1865	2
<i>Comus frigidus</i> Rve., 1848	2;37
<i>Comus fulgetrum</i> (Sow.)	1;45
<i>Comus furvus</i> Rve., 1843	22
<i>Comus fuscatus</i> Born, 1778	2;26
<i>Comus generalis</i> L., 1767	22;1;5;26;27;45;37
<i>Comus geographus</i> L., 1758	22;1;3;2;11;26;27;37;38
<i>Comus glans</i> Hwass in Brug., 1792	22;2;37;1

Table 5. (continued)

Taxa	Reference sources
<i>Conus glaucus</i> Hwass	37
<i>Conus gloynei</i> Sow.	37
<i>Conus gubernator</i> Hwass 1792	22;1;2;26;27;37;38
<i>Conus hebraeus</i> Born	27
<i>Conus hwassi</i> A. Ad.	37
<i>Conus imperialis</i> L., 1758	22;2;57;19;72;59;45;37;1
<i>Conus inscriptus</i> Rve., 1843	22
<i>Conus jamus</i> Hwass 1792	22;2;37
<i>Conus julii</i> Lienard, 1870	22;2;26;37
<i>Conus legatus</i> Lam., 1810	2;37
<i>Conus leinardi</i> Bernardi	37
<i>Conus leopardus</i> Rdg., 1758	22;2;26;59;45
<i>Conus litoglyphus</i> Hwass in Brug. 1792	22;2;26;59;45;37;38
<i>Conus litteratus</i> L., 1758	1;5;2;57;26;27;59;45;60;37
<i>Conus lividus</i> Hwass in Brug., 1792	22;1;3;2;4;57;26;72;14;20;59;45;37;38
<i>Conus lohri</i> Kilburn	20
<i>Conus lombei</i> Sow.	37
<i>Conus macarae</i> Bernardi	37
<i>Conus madagascariensis</i> Sow.	37
<i>Conus magnificus</i> Rve., 1843	2
<i>Conus magus</i> L., 1758	22;37
<i>Conus maldivus</i> Hwass	2;37
<i>Conus mappa</i> Crosse	37
<i>Conus marmoreus</i> L.	6;11;26;45;37;1
<i>Conus miles</i> L., 1758	22;1;3;2;57;26;27;20;59;45;37;38
<i>Conus miliaris</i> Hwass in Brug. 1792	3;2;27;26;19;20;59;45;37
<i>Conus milneedwardsi</i> Jous., 1894	2;11;26;24
<i>Conus mindanus</i> Hwass 1792	22
<i>Conus minimus</i> L.	3
<i>Conus mitratus</i> Hwass in Brug., 1792	22;2;27;37
<i>Conus moluccensis</i> Küster, 1833	2
<i>Conus monachus</i> L.	37
<i>Conus monile</i> Hw.	37
<i>Conus montillai</i> Rockel, 1985	2
<i>Conus moreleti</i> Crosse, 1858	2;59
<i>Conus mucronatus</i> Rve., 1843	2
<i>Conus muriculatus</i> Sow., 1833	22
<i>Conus musicus</i> Hwass, 1792	22;59;45;37;72
<i>Conus mustelinus</i> Hwass, 1792	22;37
<i>Conus namocanus</i> (Hwass)	1;2;20;45;37
<i>Conus namus</i> Brod., 1833	2;37
<i>Conus natalis</i> Sow.	3
<i>Conus nicobaricus</i> Hwass	26;37
<i>Conus nobilis</i> L.	37
<i>Conus nocturnus</i> Hwass	37
<i>Conus nucleus</i> Rve., 1848	2;37
<i>Conus nussatella</i> L., 1758	22;1;2;57;26;27;37;38
<i>Conus nux</i> Brod.	37
<i>Conus obesus</i> Hw.	37
<i>Conus oblitus</i> Rve.	37
<i>Conus obscurus</i> Sow., 1833	59;1;2;37;38
<i>Conus omaria</i> Hwass, 1792	59;1;2;37
<i>Conus orbigny</i> Audouin, 1931	22
<i>Conus parvatus</i> Walls, 1979	2
<i>Conus paulucciae</i> Sow., 1843	2;37
<i>Conus pennaceus</i> Born, 1778	22;37
<i>Conus penniculus</i> Lam.	37
<i>Conus pertusus</i> Hwass 1792	22;2;26;37;38

Table 5. (continued)

Taxa	Reference sources
<i>Conus pigmentatus</i> Ad. & Rve.	37
<i>Conus planaxis</i> Des., 1863	22;37
<i>Conus planorbis</i> Born	26;37
<i>Conus plumbeus</i> Rve.	37
<i>Conus pontificalis</i> Lam.	37
<i>Conus praecellens</i> A. Ad.	37
<i>Conus praeclarus</i> Fenaux	2
<i>Conus praelatus</i> (Hwass)	1
<i>Conus proteus</i> Hw.	37
<i>Conus pulchellus</i> Swai.	37
<i>Conus pulicarius</i> Hwass in Brug.	26;37
<i>Conus punctatus</i> Sow.	37
<i>Conus puncturatus</i> Brug.	37
<i>Conus pupaeformis</i> Sow.	37
<i>Conus pusillus</i> Chemn.	37
<i>Conus pyramidalis</i> Lam.	37
<i>Conus quercinus</i> Lightfoot, 1786	20;37
<i>Conus quercinus</i> Solander, 1786	59;2;26;1
<i>Conus rattus</i> Hwass, 1792	72;59;1;2;57;10;20;37
<i>Conus retifer</i> Menke, 1829	2;37
<i>Conus robillardi</i> Bernard	37
<i>Conus rosaceus</i> (Chemn.) Tyron	37
<i>Conus rubiginosus</i> Hwass, 1792	2;37
<i>Conus rubropennatus</i> Da Motta, 1982	2
<i>Conus saecularis</i> Melvill	37
<i>Conus sanguinolentus</i> Quoy & Gaimard, 1832	59;2;20
<i>Conus simplex</i> Sow.	19
<i>Conus spectrum</i> L., 1758	22;27;37
<i>Conus spirogloxus</i> Des.	37
<i>Conus splendidulus</i> Sow.	37
<i>Conus sponsalis</i> Hwass in Brug. 1792	1;22;72;2;4;20;59;37
<i>Conus stercus muscarum</i> L.	37
<i>Conus stramineus</i> Link, 1807	22
<i>Conus striatellus</i> Link, 1807	22;1;59;45;
<i>Conus striatus</i> L., 1758	22;2;26;59;45;37
<i>Conus sugillatus</i> Rve., 1844	2;37
<i>Conus sulphuratus</i> Kiener	37
<i>Conus sumatrensis</i> (Brug.)	1
<i>Conus sutorianus</i> Weinkauff	37
<i>Conus tahitensis</i> Hwass	37
<i>Conus telatus</i> Rve.	37
<i>Conus tendeneus</i> Hwass in Brug.	57;37;1
<i>Conus temistriatus</i> Sow., 1857	2
<i>Conus tenuisulcatus</i> Sow.	37
<i>Conus terebra</i> Born, 1778	2;37
<i>Conus teremachii</i> Kuroda	24
<i>Conus terminus</i> Lam.	37
<i>Conus tessulatus</i> Born, 1778	60;59;45;22;1;2;5;57;10;26;19;20;38;37;3
<i>Conus textile</i> L., 1758	45;22;1;5;3;2;4;57;11;26;19;20;37;38
<i>Conus thailandis</i> Da Motta, 1978	2
<i>Conus thalassiarachus</i> Sow., 1834	22
<i>Conus tigrinus</i> (Sow.)	1
<i>Conus timorensis</i> Hwass, 1792	22;2;37
<i>Conus tulipa</i> L., 1758	22;2;1;26;27;37
<i>Conus typhon</i> Kilburn	20
<i>Conus varius</i> L., 1758	59;45;22;1;2;37
<i>Conus vermiculatus</i> Lam.	3;37
<i>Conus verriculum</i> Rve., 1843	2

Table 5. (continued)

Taxa	Reference sources
<i>Comus vexillum</i> (Gm., 1791)	59;45;1;2;27;19;20;37;38;57
<i>Comus victoriae</i> Rve.	37
<i>Comus violaceus</i> Gm., 1791	22;2;26
<i>Comus virgo</i> L., 1758	1;2;57;10;26;37
<i>Comus viridis</i> Sow.	37
<i>Comus vitulinus</i> Hwass	37
<i>Comus zeylanicus</i> Gm., 1791	2;1;19
<i>Comus zonatus</i> Hwass, 1791	2
<b>TURRIDAE</b>	
<i>Asthenotoma vertebrata</i> (Smith)	19;1
<i>Austrodrillia burmupi</i> (Sow., 1897)	20
<i>Clathurella alba</i> Des.	21;37
<i>Clathurella albicaudata</i> Smith	37
<i>Clathurella albovirgulata</i> Souverbie	37
<i>Clathurella clandestina</i> Des.	37
<i>Clathurella cumingi</i> (Powys) Rve.	37
<i>Clathurella euzonata</i> (Hervier)	57
<i>Clathurella edychroa</i> Hervier	37
<i>Clathurella exquisita</i> Hinds	37
<i>Clathurella felina</i> Rve.	37
<i>Clathurella hadfieldi</i> Melville & Standen	37
<i>Clathurella cyclophora</i> Des.	37
<i>Clathurella hindsii</i> Rve.	37
<i>Clathurella hirsuta</i> de Folin	37
<i>Clathurella lactea</i> Rve.	37
<i>Clathurella rexa</i> Rve.	37
<i>Clathurella punctifera</i> Garret	37
<i>Clathurella reeveana</i> Des.	37
<i>Clathurella robillardii</i> (Barclay) H. Ad.	37
<i>Clathurella tessellata</i> Hinds	37
<i>Clathurella tincta</i> Rve.	37
<i>Clathurella tricarinata</i> Rve.	37
<i>Clavus auriculifera</i> Lam.	59
<i>Clavus bilineata</i> Rve., 1845	22
<i>Clavus exasperatus</i> (Rve., 1843)	22;2;37
<i>Clavus flammulatus</i> Montfort, 1810	22
<i>Clavus formosus</i> Rve.	37
<i>Clavus inclinatus</i> (Sow., 1893)	2;37
<i>Clavus infrafusca</i> (Sow., 1893)	2
<i>Clavus laetus</i> Hinds	37
<i>Clavus lamberti</i> Montrouzier, 1860	22
<i>Clavus mediocris</i> Des.	37
<i>Clavus pica</i> Rve.	37
<i>Clavus protentus</i> Hinds	37
<i>Clavus pulchellus</i> Rve.	37
<i>Clavus unizonalis</i> Lam., 1822	22;1
<i>Clavus zebra</i> Lam.	37
<i>Comitas aequatorialis</i> (Thiele, 1925)	48
<i>Comitas erica</i> (Thiele, 1925)	48
<i>Comitas subsuturalis</i> (Martens, 1902)	48
<i>Cochlespira travancorica</i> (Smith, 1904)	48
<i>Crassispira barkliensis</i> H. Ad.	21;37
<i>Crassispira digitatis</i> Rve.	37
<i>Crassispira zebra</i> Lam.	37
<i>Cyathara citharella</i> (Lam.)	1
<i>Cyathara euselma</i> Melville & Standen	57
<i>Daphnella atractoides</i> Hervier	37

Table 5. (continued)

Taxa	Reference sources
<i>Daphnella boholensis</i> Rve., 1843	22
<i>Daphnella candida</i> Des.	37
<i>Daphnella cumingii</i> (Lam.)	1
<i>Daphnella (Hemidaphne) cyclophora</i> Des., 1863	22
<i>Daphnella delicata</i> Rve.	59;37
<i>Daphnella flammea</i> (Hinds)	1
<i>Daphnella fragilis</i> Rve.	37
<i>Daphnella lymneiformis</i> Kiener	37
<i>Daphnella menecharmes</i> Melvill	37
<i>Daphnella (Hemidaphne) reeveana</i> Des.	59
<i>Daphnella rissoides</i> (Rve., 1845)	2
<i>Daphnella sabauriformis</i> Smith	37
<i>Daphnella trivaricosa</i> Martens	37
<i>Drillia allaudi</i> Dautzenberg	38
<i>Drillia cremularis</i> Lam.	37
<i>Drillia flavidula</i> Lam.	37
<i>Drillia intertincta</i> Smith	38
<i>Drillia lallemantiana</i> Crosse & Fischer	38
<i>Drillia lanta</i> Pease	37
<i>Drillia mariesi</i> Souverbie	37
<i>Drillia ochroleuca</i> Melvill & Sykes	37
<i>Drillia pupoidea</i> H. Ad.	37
<i>Drillia pygmaea</i> (Duclos)	1
<i>Drillia suavis</i> Hervier	37
<i>Drillia varicosa</i> Rve.	37
<i>Etrema scalarina</i> Des.	59
<i>Eucithara agna</i> Melvill & Standen	37
<i>Eucithara amabilis</i> G. & H. Nevill	37
<i>Eucithara articulata</i> Sow., 1894	22;37
<i>Eucithara cernica</i> Nevill	37
<i>Eucithara (Pleurotomoides) decaryi</i> Dautz.	38
<i>Eucithara delacourciana</i> Crosse	37
<i>Eucithara dubiosa</i> Nevill	37
<i>Eucithara eumerista</i> Melvill & Standen	37
<i>Eucithara funiculata</i> Rve., 1846	22
<i>Eucithara gracilis</i> Rve., 1846	22;37
<i>Eucithara gradata</i> G. & H. Nevill	37
<i>Eucithara isseli</i> Nevill	37
<i>Eucithara lamellata</i> (Rve., 1846)	2
<i>Eucithara lyrica</i> Rve., 1846	22;38
<i>Eucithara (Pleurotomoides) petiti</i> Dautz.	38
<i>Eucithara richardi</i> Crosse	37
<i>Eucithara souverbiei</i> Tyron	37
<i>Eucithara stromboides</i> (Rve., 1846)	2
<i>Eucithara (Pleurotomoides) tessellata</i> Hinds	38
<i>Eucithara trivaricosa</i> (Martens, 1880)	2
<i>Eucithara zonata</i> Rve., 1846	22
<i>Gemmula aethiopica</i> (Thiele, 1925)	48
<i>Gemmula (Ptychosyrinx) bisimata</i> (Martens, 1901)	48
<i>Gemmula ducalis</i> (Thiele, 1925)	48
<i>Gemmula gilchristi</i> (Sow., 1902)	48;19
<i>Gemmula martini</i> (Tesch, 1915)	48
<i>Gemmula rosario</i> Shikama & Hayashi, 1977	2
<i>Gemmula rotatilis</i> (Martens, 1902)	48
<i>Gemmula thielei</i> (Finlay, 1930)	2
<i>Glyphostoma graveli</i> Dautz.	38
<i>Glyphostoma hervieri</i> Dautz.	38
<i>Leucosyrinx caecilia</i> Thiele, 1925	48

Table 5. (continued)

Taxa	Reference sources
<i>Leucosyrinx elsa</i> Theiele, 1925	48
<i>Leucosyrinx erna</i> Thiele, 1925	48
<i>Leucosyrinx julia</i> Thiele, 1925	48
<i>Leucosyrinx sansibarica</i> Thiele, 1925	48
<i>Lienardia aliciae</i> Melvill & Standen	37
<i>Lienardia apiculata</i> Montrouzier	37
<i>Lienardia compta</i> Rve., 1846	22,37
<i>Lienardia crassilabrum</i> Rve.	37
<i>Lienardia fallax</i> G. Nevill	37
<i>Lienardia infracinta</i> Sow.	37
<i>Lienardia lousseaumi</i> Hervier	37
<i>Lienardia malleti</i> Rcz.	37
<i>Lienardia mighelsi</i> Iredale & Tomlin	59
<i>Lienardia nigrocincta</i> Montrouzier	37
<i>Lienardia ocellata</i> Jous.	37
<i>Lienardia polynesiense</i> Rve.	38
<i>Lienardia purpurascens</i> Dunker	38
<i>Lienardia rabida</i> Hinds	37
<i>Lienardia roseotincta</i> (Montrouzier, 1872)	22,2;37,38
<i>Lienardia rugosa</i> Mighels	37
<i>Lienardia scalarium</i> Des.	37
<i>Lienardia strombillum</i> Hervier	37
<i>Lienardia trigonostoma</i> Hervier	37
<i>Lienardia vultuosa</i> Rve.	37
<i>Lophiotoma abbreviata</i> (Rve., 1843)	48,2;37
<i>Lophiotoma acuta</i> (Perry, 1811)	48,22,2;57,19
<i>Lophiotoma albina</i> (Lam., 1822)	48,2;37,1,38
<i>Lophiotoma babylonia</i> (L., 1758)	37,2;11,27
<i>Lophiotoma cingulifera</i> (Lam., 1822)	48,1;57,22,59,2;26,19,37,38
<i>Lophiotoma indica</i> (Rdg., 1798)	2;19,37
<i>Lophiotoma ruthveniana</i> (Melvill, 1923)	48
<i>Lucerapex denticulata</i> (Thiele, 1925)	48
<i>Macteola segesta</i> Chenu, 1850	22
<i>Mangelia alticostata</i> (Sow.)	1
<i>Mangelia angicostata</i> Rve.	37
<i>Mangelia bella</i> Deace	37
<i>Mangelia calathiscus</i> Melvill & Standen	37
<i>Mangelia cithara</i> Gould	37
<i>Mangelia cycloptera</i> Des.	37
<i>Mangelia decaryi</i> Dautz.	38
<i>Mangelia dulcinea</i> Melvill & Standen	37
<i>Mangelia euselma</i> Melvill & Standen	37
<i>Mangelia fintera</i> Smith	21,37
<i>Mangelia gemmulata</i> Des.	37
<i>Mangelia gracilienta</i> Rve.	37
<i>Mangelia hexagonalis</i> Rve.	37
<i>Mangelia himerodes</i> Melvill & Standen	37
<i>Mangelia himerta</i> Melvill & Standen	37
<i>Mangelia interrupta</i> Rve.	37
<i>Mangelia louisiana</i> Sow.	37
<i>Mangelia nanisca</i> Hervier	38
<i>Mangelia thermeropsis</i> Melvill & Standen	37
<i>Mangelia theskela</i> Melvill & Standen	37
<i>Mangelia theskeloides</i> Melvill	37
<i>Mangelia townsendi</i> Sow.	37
<i>Mangelia triticea</i> Kiener	37
<i>Mangelia turricula</i> Rve.	37
<i>Marshallena philippinarum</i> (Watson, 1882)	48



Table 5. (continued)

Taxa	Reference sources
<i>Mitromorpha atramentosa</i> Rve.	59
<i>Mitromorpha metula</i> Hinds, 1843	22
<i>Nihonia circumstricta</i> (Martens, 1901)	48
<i>Philbertia barnardi</i> Brazier	59
<i>Philbertia granicostata</i> Rve.	59
<i>Philbertia (Pseudoraphitoma) hexagonalis</i> Rve., 1845	22
<i>Philbertia tincta</i> Rve.	59
<i>Pseudodaphnella granicostata</i> (Rve., 1846)	2
<i>Ptychobela</i> sp.	2
<i>Tritonoturris cumingi</i> (Powys, 1835)	22;2
<i>Tritonoturris menecharmes</i> (Melvill, 1923)	22;2
<i>Tritonoturris robillardii</i> (H. Ad., 1869)	22;2
<i>Turricula aethiopica</i> (Thiele, 1925)	48
<i>Turricula javana</i> (L., 1767)	48
<i>Turricula nelliae</i> Smith, 1877	48;37
<i>Turridrupa bijubata</i> (Rve., 1843)	48;22;36;37
<i>Turridrupa cerithina</i> (Anton, 1839)	48;38
<i>Turridrupa cincta</i> (Lam., 1822)	48;22;2;27;37
<i>Turris bulowi</i> Sow.	37
<i>Turris crassa</i> (Smith)	1
<i>Turris crista</i> (Lam., 1816)	48
<i>Turris garnonsii</i> (Rve., 1843)	48;1;22;2;37
<i>Turris jickeli</i> Weisskauf	37
<i>Turris multiseriata</i> (Smith)	19
<i>Turris spectabilis</i> (Rve., 1843)	48;1;2;26
<i>Turris tuberculata</i> Gray	37
<i>Turris unedo</i> Valenciennes	37
<i>Turris ustulata</i> Rve.	37
<i>Turris variegata</i> (Kiener, 1839)	37
<i>Vexitomina regis</i> (Rve., 1842)	48
<b>TEREBRIDAE</b>	
<i>Diplomeriza duplicata</i> (L., 1758)	22
<i>Diplomeriza evoluta</i> (Des.)	2
<i>Diplomeriza fictilis</i> (Hinds)	20;1
<i>Diplomeriza raphanula</i> (Lam., 1822)	2;26;37
<i>Diplomeriza trochlea</i> Des., 1857	22
<i>Hastula albula</i> (Menke, 1843)	59;2;20
<i>Hastula castanea</i> (Kiener)	2
<i>Hastula celidonta</i> (Melville & Sykes, 1898)	2;37
<i>Hastula diversa</i> (Smith)	20;18
<i>Hastula inconstans</i> (Hinds)	2
<i>Hastula penicillata</i> Hinds, 1844	22;2;1;37
<i>Hastula solida</i> (Des., 1855)	2;59;37
<i>Hastula strigilata</i> (L., 1758)	2;37
<i>Impages hectica</i> (L., 1758)	22;1;37;38;2
<i>Impages aciculina</i> Lam., 1822	22
<i>Terebra aciculina</i> (Rve.)	1
<i>Terebra affinis</i> Gray, 1834	59;22;3;2;57;10;19;37
<i>Terebra albula</i> Hinds	37
<i>Terebra alveolata</i> Hinds	37
<i>Terebra amanda</i> Hinds, 1844	22;37
<i>Terebra amoena</i> Des.	37
<i>Terebra andamanica</i> Melvill & Sykes	37
<i>Terebra anilis</i> (Rdg., 1798)	2;20;3
<i>Terebra approximata</i> Des.	37
<i>Terebra archimedis</i> Des.	59
<i>Terebra areolata</i> (Link, 1807)	2;45

Table 5. (continued)

Taxa	Reference sources
<i>Terebra argus</i> Hinds, 1844	22;2;59;37;1
<i>Terebra babylonica</i> Lam., 1822	1;2;57;59;37
<i>Terebra caliginosa</i> Des., 1859	22
<i>Terebra cancellata</i> Quoy	37
<i>Terebra casta</i> Hinds	59;19;37;1
<i>Terebra cerithina</i> Lam., 1822	22;2;57;59;1;37
<i>Terebra cernica</i> Sow.	37
<i>Terebra chlorata</i> Lam., 1822	22;1;2;37
<i>Terebra cinerea</i> Born	37;38
<i>Terebra cingulifera</i> Lam., 1822	2;59;37;1
<i>Terebra collumellaria</i> Hinds, 1844	59;2;26;37;1
<i>Terebra confusa</i> Smith	37
<i>Terebra consobrina</i> Des.	37
<i>Terebra consors</i> Hinds, 1844	22;1;2;37
<i>Terebra conspersa</i> Hinds, 1844	22;2;37
<i>Terebra crenulata</i> (L., 1758)	59;45;1;2;57;37
<i>Terebra cumingi</i> Des.	37
<i>Terebra cuspidata</i> Hinds	37
<i>Terebra deshayes</i> Rve., 1860	2
<i>Terebra dimidiata</i> (L., 1758)	59;45;1;3;2;57;26;19;37
<i>Terebra duplicata</i> Lam.	37;1
<i>Terebra felina</i> (Dill., 1817)	2;59
<i>Terebra flavofasciata</i> Pilsbury, 1921	2;
<i>Terebra funiculata</i> Hinds, 1844	22;1;2;37
<i>Terebra guttata</i> (Rdg., 1798)	59;1;2;57
<i>Terebra hastata</i> Gm.	1;37
<i>Terebra kilburni</i> Burch, 1965	2
<i>Terebra laevigata</i> Gray, 1834	1;59;22;57
<i>Terebra lanceata</i> (L.)	1;2;26;18;59;37;22
<i>Terebra ligata</i> Hinds	37
<i>Terebra livida</i> (Rve.)	1
<i>Terebra longicosta</i> Des.	3;37
<i>Terebra mactanensis</i> Bratcher & Cernohorsky, 1982	2
<i>Terebra maculata</i> (L., 1758)	5;2;26;37
<i>Terebra marmorata</i>	1
<i>Terebra mera</i> Hinds	37
<i>Terebra monilis</i> Quoy & Gaimard	1;59;37;38
<i>Terebra muscaria</i> (Lam.)	1;57;37
<i>Terebra nassoides</i> Hinds	72;38
<i>Terebra nebulosa</i> Sow., 1825	1;59;22;2;26;37
<i>Terebra nitida</i> Hinds, 1844	22;59;37
<i>Terebra nodularis</i> Des., 1859	2
<i>Terebra oculata</i> Lam.	37
<i>Terebra parkinsoni</i> Cernohorsky & Bratcher, 1976	2
<i>Terebra pica</i> (Hinds)	1
<i>Terebra pertusa</i> Born, 1778	59;2;57
<i>Terebra plicatella</i> Hinds	37
<i>Terebra plumbea</i> Quoy & Gaimard	37
<i>Terebra praelonga</i> Des., 1859	2
<i>Terebra pseudopertusa</i> Bratcher & Cernohorsky, 1985	2
<i>Terebra pulchella</i> Des.	37
<i>Terebra puncticulata</i> Des.	37
<i>Terebra quoygaimardi</i> Cernohorsky & Bratcher, 1976	2
<i>Terebra reunionensis</i> Bratcher & Cernohorsky, 1985	2
<i>Terebra straminea</i> Gray	3;37
<i>Terebra striata</i> (Quoy & Gaimard)	1
<i>Terebra subulata</i> (L., 1767)	1;59;22;3;2;57;37;38
<i>Terebra textilis</i> Hinds, 1844	2

Table 5. (continued)

Taxa	Reference sources
<i>Terebra tigrina</i> Gm.	37
<i>Terebra tricolor</i> Hinds	37
<i>Terebra triseriata</i> Gray, 1834	2;37
<i>Terebra undulata</i> Gray	1;59;37
<i>Terebra venosa</i> Hinds	37
<i>Terebra violascens</i> Hinds	37
<i>Terenolla pygmaea</i> (Hinds, 1844)	2
<b>ARCHITECTONICIDAE</b>	
<i>Architectonica laevigatum</i> Lam.	38
<i>Architectonica modesta</i> (Phil., 1848)	2
<i>Architectonica perspectiva</i> (L., 1758)	59;22;3;57;11;37;16
<i>Heliacus areola</i> (Gm., 1791)	22
<i>Heliacus crenellus</i> (L.)	16;37
<i>Heliacus dilecta</i> (Des.)	2;37
<i>Heliacus dorsuosus</i> Hinds	37;38
<i>Heliacus implexus</i> (Mighels, 1845)	22;2
<i>Heliacus infundibuliformis</i> (Gm., 1791)	2;37
<i>Heliacus trochoides</i> Des.	37
<i>Heliacus variegatus</i> (Gm., 1791)	22;1;2;4;57;11;26;20;59;37;38
<i>Philippia cingulum</i> Kiener	37
<i>Philippia comulus</i> Weinkauff	37
<i>Philippia hybrida</i> (Lam.)	1;37; 38
<i>Philippia radiata</i> Rdg., 1798	22;1;2;20;59
<b>PYRAMIDELLIDAE</b>	
<i>Miralda (Oscilla) tornata</i> Melvill	57
<i>Odostomia aciculina</i> Souverbie	37
<i>Odostomia bulimoides</i> Souverbie	37
<i>Odostomia gemma</i> A. Ad.	37
<i>Odostomia mauritiana</i> Dall & Bartsch	37
<i>Odostomia rufula</i> Souverbie	37
<i>Odostomia versicolor</i> Melvill & Standen	37
<i>Odostomia zaleuca</i> Melville	57
<i>Otopleura auris-cati</i> (Holten)	1;27;37
<i>Otopleura mitralis</i> (A. Ad. in Sow., 1854)	57;26;59;37;1;3;37
<i>Otopleura nodocincta</i> A. Ad.	59
<i>Otopleura sulcata</i> A. Ad.	37
<i>Pyramidella acus</i> (Gm., 1791)	26;27;2;37
<i>Pyramidella corrugata</i> Lam.	1;37
<i>Pyramidella dolobrata</i> (L., 1758)	2;26;16;37;38;3
<i>Pyramidella garrettii</i> Tryon	37
<i>Pyramidella maculosa</i> Lam., 1822	57
<i>Pyramidella sulcatus</i> (A. Ad., 1854)	59;1;2;16;37;38
<i>Pyramidella terebelloides</i> (Ad.)	1;37
<i>Pyramidella terebellum</i> Melvill	57;37;1;59
<i>Pyramidella teres</i> (Ad.)	1
<i>Pyramidella ventricosa</i> (Guerin, 1831)	2;38
<i>Syrnola aperanta</i> Melvill	57
<i>Syrnola brunnea</i> (A. Ad.)	1
<i>Tropaeas livida</i> Sow.	37
<i>Turbonilla basilica</i> Melvill	57
<i>Turbonilla chrysozona</i> (Martens)	2;37
<i>Turbonilla isseli</i> Tryon	37
<i>Turbonilla princeps</i> Preston	37
<i>Turbonilla scalpidens</i> Watson	37

Table 5. (continued)

Taxa	Reference sources
<b>AMATHINIDAE</b>	
<i>Amathina angustata</i> Souverbie	37
<i>Amathina bicarinata</i> Pease	37
<i>Amathina imbricata</i> Sow., 1889	22;37
<i>Amathina tricarinata</i> (L., 1758)	22;1
<i>Amathina tricostata</i> Gm.	37

Table 6. Preliminary checklist of western Indian Ocean polyplacophoran molluscs.

Reference source numbers in italics represent records of synonyms. For details of reference sources see Checklist Sources at end of this section. Question marks indicate uncertainty of identification.

Taxa	Reference sources
<b>LEPTOCHITONIDAE</b>	
<i>Leptochiton eugenei</i> Kass & Van Belle, 1981	1
<i>Leptochiton nierstrazi</i> (Leloup, 1985)	1
<i>Lepidopleurus angusticostatus</i> Quoy & Gaimard	7
<b>ISCHNOCHITONIDAE</b>	
<i>Callistochiton barnardi</i> Leloup, 1981	1
<i>Callistochiton crosslandi</i> Sykes, 1907	1;4(?)
<i>Callistochiton rotundus</i> Leloup, 1981	1
<i>Callochiton clausadei</i> Kass & Van Belle, 1985	1
<i>Callochiton deshayesi</i> Thiele, 1909	1;7
<i>Callochiton vannini</i> Ferreira, 1983	1
<i>Ischnochiton oniscus</i> (Krauss, 1848)	3
<i>Ischnochiton yerburyi</i> (Smith, 1891)	1;2
<i>Lepidozona</i> sp.	1
<i>Stenoplax madagassicus</i> (Thiele, 1917)	1
<b>MOPALIIDAE</b>	
<i>Plaxiphora granulata</i> Leloup, 1981	1
<i>Plaxiphora parva</i> Nierstrasz, 1906	1
<i>Plaxiphora tulearensis</i> Leloup, 1981	1
<b>CHITONIDAE</b>	
<i>Acanthopleura brevispinosa</i> (Sow., 1840)	1;4;6;7
<i>Acanthopleura gemmata</i> (Blain., 1825)	1;4;5;6
<i>Chiton barnardi</i> Ashby, 1931	4(?)
<i>Chiton fosteri</i> Bullock, 1972	2
<i>Chiton hululensis</i> (Smith, 1903)	1
<i>Chiton kaasi</i> (Leloup, 1981)	1
<i>Chiton laterorugosus</i> Kaas, 1986	1
<i>Chiton mauritanus</i> Quoy & Gaimard	1;7
<i>Chiton rusticus</i> Des.	7;5
<i>Onithochiton literatus</i> (Krauss, 1848)	4;3
<i>Onithochiton maillardi</i> (Des., 1863)	1;5;7
<i>Schizochiton incisus</i> Des.	7
<i>Tonicia carnosus</i> Kaas, 1979	1
<i>Tonicia sueziensis</i> (Rve., 1847)	2
<b>ACANTHOCHITONIDAE</b>	
<i>Acanthochitona limbata</i> Kaas, 1986	1
<i>Acanthochitona garnoti</i> (Blain., 1825)	7
<i>Acanthochitona pencillata</i> (Des., 1863)	7;1
<i>Acanthochitona quincunx</i> Leloup, 1981	1
<i>Cryptoconchus burrowi</i> Nierstrasz, 1905	1
<i>Cryptoplax sykesi</i> Thiele, 1909	1
<i>Notoplax elegans</i> Leloup, 1981	1
<i>Notoplax productus</i> (Carpenter & Pilsbury, 1892)	1
<b>CRYPTOPLACIDAE</b>	
<i>Choneplax indica</i> Odhner, 1919	1

Table 7. Preliminary checklist of western Indian Ocean bivalve molluscs.

Reference source numbers in italics represent records of synonyms. For details of reference sources see Checklist Sources at end of this section.

Taxa	Reference sources
<b>NUCULIDAE</b>	
<i>Leda</i> sp.	29
<i>Leda novae-guineensis</i> Smith	8
<i>Nucula</i> sp.	23
<i>Nucula convexa</i> Sow.	1
<i>Nucula mauritiana</i> Sow.	28
<i>Nucula rugosa</i> Odhner	29
<i>Nucula sultana</i> Thiele	9
<b>SOLEMYIDAE</b>	
<i>Solemya africana</i> Martens, 1879	12;20
<i>Solemya australis</i> Lam.	1
<i>Solemya togata</i> Poli	8
<i>Solemya occidentalis</i> Koch	8
<b>ARCIDAE</b>	
<i>Acar plicata</i> Dill., 1817	24;25;22;23;1;20
<i>Anadara antiquata</i> (L., 1758)	22;1;2;8;26;20;28
<i>Anadara clathrata</i> (Rve.)	23
<i>Anadara ehrenbergi</i> (Dunker, 1868)	8
<i>Anadara erythraeonensis</i> (Phil., 1851)	22;20
<i>Anadara natalenis</i> (Krauss, 1848)	22;1;3;8;20;9.
<i>Anadara uropigimelana</i> (Bory, 1824)	23;9;28
<i>Arca avellana</i> Lam., 1819	18;22;23;9;20;8;1;28;29
<i>Arca bistrigata</i> Dunker, 1866	8;9;22
<i>Arca cunealis</i> (Rve.)	1
<i>Arca donaciformis</i> Rve.	27
<i>Arca erythraensis</i> Jonas	8;9;18
<i>Arca granosa</i> L.	28
<i>Arca lactea</i> L.	28
<i>Arca linter</i> Jonas, 1845	8
<i>Arca natalensis</i> Krauss	28
<i>Arca navicularis</i> Brug., 1789	22;8;23;9;28;1;8
<i>Arca nivea</i> Chemn.	8;28;29
<i>Arca plicata</i> Chemn.	29;8;9;28
<i>Arca truncata</i> (Sow.)	1
<i>Arca ventricosa</i> Lam., 1819	22;1
<i>Arca zebra</i> Swa., 1832	8
<i>Barbatia caelata</i> Rve., 1844	22;28;1
<i>Barbatia cometa</i> (Rve.)	1
<i>Barbatia decussata</i> (Sow., 1833)	24;1;8;17
<i>Barbatia dichotoma</i> Des., 1863	22;28
<i>Barbatia foliata</i> (Forsk., 1775)	19;2;20;22;28;1;23;9;28
<i>Barbatia fusca</i> (Brug.)	1;5;8;23
<i>Barbatia kraussi</i> (Krauss)	1
<i>Barbatia lacerata</i> L., 1758	22;1;18;28
<i>Barbatia obliquata</i> (Wd., 1828)	1;4;22;20;9;29
<i>Barbatia parva</i> (Sow., 1833)	1
<i>Barbatia revelata</i> (Des., 1863)	2;20
<i>Barbatia setigera</i> (Rve., 1844)	22
<i>Barbatia tenella</i> Rve., 1844	22;1;2;23;28
<i>Barbatia tetraquetra</i> Kilburn, 1983	22
<i>Barbatia virescens</i> Rve., 1844	22;1
<b>NOETIIDAE</b>	
<i>Arcopsis gibba</i> (Krauss, 1848)	20;9;22;1;3;8
<i>Sheldonella lateralis</i> (Rve., 1844)	20;22;1

Table 7. (continued)

Taxa	Reference sources
<i>Striarca symmetrica</i> (Rve., 1844)	22;23;8;9
<i>Trisidos semitorta</i> Lam., 1817	22;8;9
<i>Trisidos tortuosa</i> (L., 1758)	22;9
<b>CUCULLAIEDAE</b>	
<i>Cucullaea cucullata</i> Rdg., 1798	22;23;27
<b>LIMOPSIDAE</b>	
<i>Limopsis multistriata</i> (Forsk.)	9
<b>GLYCYMERIDIDAE</b>	
<i>Glycymeris amboinensis</i> (L. & Gm.)	1;22
<i>Glycymeris hoylei</i> Melvill & Standen, 1899	23;22
<i>Glycymeris livida</i> (Rve., 1843)	2;22;28
<i>Glycymeris pallium</i> Rve., 1848	22
<i>Glycymeris pectunculus</i> (L., 1758)	6
<i>Glycymeris queckettii</i> (Sow., 1897)	3;8;20
<i>Glycymeris tenuicostatus</i> Rve.	23
<i>Pectunculus arabicus</i> A. Ad.	29
<i>Pectunculus asperus</i> Ad. & Rve.	28
<i>Pectunculus nodosus</i> Rve.	28
<i>Pectunculus vitreus</i> Lam.	28
<i>Tucetona audouini</i> Matsukama, 1985	2
<b>MYTILIDAE</b>	
<i>Arcuatula capensis</i> (Krauss, 1848)	4;20
<i>Botula cinnamomea</i> (Lam.)	23
<i>Brachidontes australis</i> (Sow.)	1
<i>Brachidontes australis</i> Martens, 1879	22
<i>Brachidontes variabilis</i> (Krauss, 1848)	17;18;24;1;3;8;23;26;9;22
<i>Brachidontes semistriatus</i> (Krauss, 1848)	4;20
<i>Brachidontes virgiliae</i> (Barnard, 1964)	20;4;9
<i>Choromytilus meridionalis</i> (Krauss)	5
<i>Leiosolemus obesa</i> (Phil., 1847)	23;9;20
<i>Lithophaga calcifer</i> (Iredale)	1
<i>Lithophaga cinnamomina</i> Chemn.	28;29
<i>Lithophaga gracilis</i> Phil.	28
<i>Lithophaga lithophaga</i> L., 1758	22;8;3;28
<i>Lithophaga malaccana</i> Rve.	24
<i>Lithophaga nasuta</i> (Phil., 1846)	1;20;24;17;18
<i>Lithophaga teres</i> Phil., 1846	22;1;18;23;2
<i>Modiolus auriculatus</i> (Krauss, 1848)	22;2;4;8;23;26;9;20;24;25;29;1
<i>Modiolus barbatus</i> (L., 1758)	8
<i>Modiolus cylindricus</i> (Krauss)	1
<i>Modiolus floridus</i> (Dunker)	1
<i>Modiolus ligneus</i> (Rve., 1858)	20
<i>Modiolus metcalfei</i> Hanley, 1943	22;1
<i>Modiolus philippinarum</i> (Hanley, 1843)	1;3;5;8;11;9;29
<i>Modiolus pulex</i> (Lam.)	1
<i>Modiolus trailli</i> Rve.	29
<i>Modiolus vagina</i> (Lam.)	1
<i>Musculus africana</i> (Bartsch)	8
<i>Musculus cumingiana</i> (Dunker)	1;28
<i>Musculus cuneata</i> (Gould)	9
<i>Musculus difficilis</i> (Des.)	9
<i>Mytilus edulis</i> (L.)	1
<i>Mytilus elongatus</i> (Chemn.) Schroter	29
<i>Mytilus variabilis</i> Krauss	28;29
<i>Perna picta</i> (Born, 1778)	4;5;20;9;3;8;1;24;186;12;29

Table 7. (continued)

Taxa	Reference sources
<i>Ryenella cumingiana</i> Rve., 1857	22
<i>Septifer bilocularis</i> (L., 1758)	1,3;2;4,8,23;26;9;20;24,28,29
<i>Septifer excisus</i> (Wiegmann, 1837)	22;1;19,28;29
<i>Septifer kraussi</i> Kuster	28;29
<b>PTERIIDAE</b>	
<i>Electroma alacorvi</i> (Dill.)	23
<i>Electroma physoides</i> (Lam., 1819)	20;3;8;9
<i>Electroma vexillum</i> (Rve.)	9
<i>Pinctada imbricata</i> (Rdg., 1798)	20;1
<i>Pinctada margaritifera</i> (L., 1758)	1;23;11;26;8;28
<i>Pinctada nigra</i> (Gould, 1850)	20
<i>Pinctada radiata</i> (Leach)	18
<i>Pinctada vulgaris</i> (Schum.)	1;3;8
<i>Pteria alacorvi</i> Chemn.	28
<i>Pteria capensis</i> (Sow., 1889)	1;5;3;4;8;9;20
<i>Pteria chinensis</i> (Leach, 1814)	6
<i>Pteria crocea</i> (Lam.)	11;27;28
<i>Pteria iridescens</i> (Rve.)	1;29
<i>Pteria loweni</i> Dunker	2
<i>Pteria malleoides</i> (Rve.)	1;28
<i>Pteria mauritii</i> Jameson	28
<i>Pteria semisagitta</i> Lam.	28
<i>Pteria tortirostris</i> (Dunker, 1848)	11;20;1
<b>MALLEIDAE</b>	
<i>Malleus anatinus</i> (Gm.)	1
<i>Malleus legumen</i> L.	8
<i>Malleus regula</i> (Forsk., 1775)	9;20
<i>Malvufundus normalis</i> (Lam., 1819)	6;28
<i>Vulsella minor</i> Rdg., 1798	9;20
<i>Vulsella rugosa</i> (Lam.)	1
<i>Vulsella (Reniella) spongiarum</i> (Lam.)	1;23
<b>ISOGNOMONIDAE</b>	
<i>Crenatula mytiloides</i> Lam.	9
<i>Isognomon dentifera</i> (Krauss)	18;17;8;9;22;23;13;24;1;3;28;20
<i>Isognomon ephippium</i> (L.)	1;28;29
<i>Isognomon isognomon</i> (L.)	1;2;29;28
<i>Isognomon legumen</i> (Gm.)	24;20;29
<i>Isognomon linguaeformis</i> Rve.	28
<i>Isognomon maillardi</i> Des.	28
<i>Isognomon sulcata</i> Lam.	28
<i>Isognomon vitrea</i> Rve.	28
<i>Isognomon vulsella</i> Lam.	28
<i>Perna patibulum</i> Rve.	29
<b>PINNIDAE</b> Review ref: 15	
<i>Atrina pectinata</i> (L., 1767)	5;20;
<i>Atrina squamifera</i> (Sow., 1835)	3;9;28;8
<i>Atrina vexillum</i> (Born, 1778)	1;3;8;20;22;8;29;28
<i>Pinna bicolor</i> Gm., 1791	9;20;28;29;1;8;3
<i>Pinna muricata</i> L., 1758	18;22;2;4;23;8;26;9;20;25;29;3;1;28
<i>Streptopinna saccata</i> (L., 1758)	1;2;23;9;20;8;28;29
<b>LIMIDAE</b>	
<i>Ctenoides annulata</i> (Dill.)	23;26;28
<i>Lima inflata</i> Chemn.	28
<i>Lima lima</i> (L.)	3;8;9;29
<i>Lima multicosata</i> Sow.	28

Table 7. (continued)

Taxa	Reference sources
<i>Lima nimbifera</i> Iredale, 1924	20
<i>Lima simplex</i> Robillard	27
<i>Lima sowerbyi</i> Des., 1863	2;28
<i>Lima temis</i> H. Ad.	28
<i>Limaria fragilis</i> (Gm., 1791)	20;23;28;29;9
<i>Promantellum parafragile</i> (Iredale)	1
<b>OSTREIDAE</b>	
<i>Alectryonella plicatula</i> (Gm., 1791)	11
<i>Lopha cristagalli</i> (L., 1758)	11;26;23;25;28;29
<i>Ostrea amasa</i> (Iredale)	1
<i>Ostrea barclayana</i> Sow.	28
<i>Ostrea cerata</i> Sow.	22;28
<i>Ostrea cucullina</i> Des.	28
<i>Ostrea denticulata</i> (Born)	28
<i>Ostrea folium</i> L.	8;23
<i>Ostrea forskali</i> Chemn.	29
<i>Ostrea frons</i> L.	28
<i>Ostrea lentiginosa</i> (Sow.)	1
<i>Ostrea mytiloides</i> Lam.	8
<i>Ostrea pes-tigris</i> Hanley	8
<i>Ostrea plicata</i> Chemn.	8
<i>Ostrea radiata</i> Valenciennes	28
<i>Ostrea violacea</i> Des.	28;22
<i>Ostrea vitrefacta</i> Sow.	1;8;28
<i>Saccostrea cucullata</i> (Born, 1778)	5;4;18;26;13;24;21;1;3;23;8;9;20;17
<i>Striostrea margaritacea</i> (Lam., 1819)	5;4;1;9;3;8;20
<b>GRYPHAEIDAE</b>	
<i>Hyothissa hyotis</i> (L., 1758)	11;1;13;28;29;8;26;9
<i>Hyothissa mumisma</i> (Lam., 1819)	18;1;8;23;28;22;20;25
<i>Neopycnodonte cochlear</i> (Poli, 1795)	19
<b>PLICATULIDAE</b>	
<i>Plicatula australis</i> Lam., 1819	1
<i>Plicatula chinensis</i> Morch	23
<i>Plicatula depressa</i> Lam.	28
<i>Plicatula imbricata</i> (Menke)	1;28
<i>Plicatula multiplicata</i> Des.	28
<i>Plicatula plicata</i> (L., 1767)	9;29
<i>Plicatula ramosa</i> Lam.	28
<i>Plicatula squamosissima</i> Smith, 1899	20
<b>PECTINIDAE</b>	
<i>Anguipecten aurantiacus</i> (Ad. & Rve., 1850)	2
<i>Chlamys albolineatus</i> (Sow.)	1
<i>Chlamys andamanica</i> Preston, 1908	2
<i>Chlamys asperrimus</i> Lam.	28
<i>Chlamys bernardi</i> Phil., 1851	22;28
<i>Chlamys cauteriatus</i> Des.	28
<i>Chlamys concinnus</i> Rve.	28
<i>Chlamys corallinoides</i> d'Orbingy	28
<i>Chlamys coruscans</i> (Hinds, 1845)	20;22;23;28
<i>Chlamys crassicostata</i> Sow.	29
<i>Chlamys dringii</i> (Rve.)	23
<i>Chlamys elegantissima</i> (Des.)	2;22
<i>Chlamys fultoni</i> Sow., 1904	20;22
<i>Chlamys gibbus</i> L.	28
<i>Chlamys guendolinae</i> Melvill, 1888	22



Table 7. (continued)

Taxa	Reference sources
<i>Chlamys histrionica</i> (Gm.)	23;28
<i>Chlamys inaequalis</i> Sow., 1842	22;28
<i>Chlamys irregularis</i> Sow., 1842	22;23;28;29
<i>Chlamys lemniscata</i> Rve., 1853	22;2;23
<i>Chlamys lentiginosa</i> (Rve., 1853)	3;8
<i>Chlamys livida</i> (Lam., 1819)	28;22
<i>Chlamys madreporarum</i> Sow., 1842	22;28
<i>Chlamys maldivensis</i> Smith	28
<i>Chlamys nodosus</i> L.	28
<i>Chlamys max</i> Rve.	28
<i>Chlamys ornata</i> Lam.	28
<i>Chlamys pallium</i> L.	28;29;1;2;23
<i>Chlamys perfectus</i> Melvill	28
<i>Chlamys pseudo-lima</i> Sow.	28
<i>Chlamys radula</i> L.	28
<i>Chlamys reticulatus</i> Rve.	28
<i>Chlamys rosaceus</i> Des.	28
<i>Chlamys rubromaculatus</i> Sow.	28
<i>Chlamys senatorius</i> (Gm., 1791)	22;1;5;23;28;2;8;9
<i>Chlamys squamosus</i> Gm., 1791	22;28;29;2
<i>Chlamys textiliosus</i> Des.	28
<i>Chlamys tinctoria</i> (Rve., 1853)	3;4;8;20;22
<i>Chlamys vexillum</i> Rve.	29
<i>Decaptopecten amiculum</i> Phil., 1851	22
<i>Decaptopecten plica</i> (L., 1758)	23
<i>Excellichlamys spectabilis</i> (Rve., 1853)	22;2
<i>Lyropecten noduliferus</i> (Sow., 1842)	23;11;28;22
<i>Mirapecten mirificus</i> (Rve., 1853)	22;2;28
<i>Mirapecten rastellum</i> Lam.	22;
<i>Pecten pyxidatus</i> Born	29
<i>Pecten tranquebaricus</i> Lam.	8
<i>Pecten velutinus</i> Sow.	8
<i>Pedum spondyloideum</i> Gm., 1791	22;11;28
<i>Propeamussium caducum</i> Smith, 1885	22;28
<i>Semipallium crouchi</i> Smith, 1892	22;2;28
<i>Semipallium tigris</i> (Lam.)	1;22
<b>SPONDYLIDAE</b>	
<i>Spondylus aculeatus</i> Chemn.	29
<i>Spondylus anacanthus</i> Mawe	28
<i>Spondylus aurantiacus</i> Bolten	28
<i>Spondylus aurantius</i> Lam.	22;28
<i>Spondylus candidus</i> L.	22
<i>Spondylus coccineus</i> Lam.	28;29
<i>Spondylus concavus</i> Des.	28
<i>Spondylus foliaceus</i> Chemn.	27
<i>Spondylus longitudinalis</i> Lam.	28
<i>Spondylus marisrubri</i> Bolten	28
<i>Spondylus microlepos</i> Lam.	8
<i>Spondylus multisetosus</i> (Sow.)	1
<i>Spondylus nicobaricus</i> Schreibers, 1793	19;2;8;26;23;22;27;9;1;28;3
<i>Spondylus peasaninus</i> Bolten	28
<i>Spondylus spectrum</i> Rve.	28
<i>Spondylus tenuispinosus</i> Sow.	28
<i>Spondylus varius</i> Sow.	26;28
<i>Spondylus zonalis</i> Lam.	28

Table 7. (continued)

Taxa	Reference sources
<b>ANOMIIDAE</b>	
<i>Anomia acheus</i> Gray, 1850	4;20;22;12;1
<i>Anomia scabra</i> Rve.	8
<i>Anomia sol</i> Rve.	29
<b>LUCINIDAE</b>	
<i>Anodontia edentula</i> (L., 1758)	20;25;2;4;23;9;26;29
<i>Anodontia ovulum</i> Rve.	22;28
<i>Codakia divergens</i> Phil.	25;2
<i>Codakia bella</i> Conrad	28
<i>Codakia exasperata</i> (Rve.)	1;3;8;28
<i>Codakia interrupta</i> (Lam.)	1;23;28
<i>Codakia miniata</i> Des.	2
<i>Codakia punctata</i> (L.)	18;1;3;2;8;23;28;29
<i>Codakia paytenorum</i> Iredale, 1937	2;28
<i>Codakia punctata</i> (L., 1758)	25;9
<i>Codakia reevei</i> (Des., 1863)	2;
<i>Codakia simplex</i> (Rve.)	6
<i>Codakia tigrina</i> L., 1758	18;22;1;2;23;9;25;28;29
<i>Ctena divergens</i> (Phil., 1850)	23
<i>Divaricella dalliana</i> Vanetta, 1901	1;2;9;20
<i>Divaricella ornata</i> Rve.	23;2;29
<i>Linga roscoeorum</i> Kilburn, 1974	22;20
<i>Linga semperiana</i> (Issel, 1869)	22;1;9
<i>Loripes clausus</i> (Phil., 1847)	18;22;1;3;4;8;9;20;29
<i>Lucina jacksoniensis</i> Smith	8
<i>Phacoides rosea</i> (Angas)	9
<i>Phacoides semperiana</i> Issel	29;9
<b>UNGULINIIDAE</b>	
<i>Cryptodon eutornus</i> (Tomlin)	1;8
<i>Cryptodon tumidus</i> (Rve.)	1
<i>Diplodonta globosa</i> Forskal	28;8
<i>Diplodonta lateralis</i> Smith	23
<i>Diplodonta</i> cf. <i>sansibarica</i> Jaeckel & Thiel	9
<b>ERYCINIDAE</b>	
<i>Erycina</i> sp.	23
<i>Galeoma aurantia</i> (Des., 1835)	11
<i>Galeoma argentea</i> (Des.)	23
<i>Galeoma turtoni</i> Sow.	28
<i>Galeoma splendida</i> Des.	28
<i>Kellia approximata</i> Des.	22
<i>Lasaea adansoni turtoni</i> Bartsch, 1915	4;20
<i>Lasaea rubra</i> Montagu	24
<i>Scintilla ambigua</i> (Des.)	23
<i>Scintilla aperta</i> Sow.	28
<i>Scintilla aurantia</i> Lam	28;22
<i>Scintilla incerta</i> Des.	28
<i>Scintilla lutea</i> Lam.	28
<i>Scintilla oblonga</i> (Sow.)	1
<i>Scintilla paucistriata</i> (Des.)	1
<i>Scintilla solidula</i> Des.	29
<i>Thyreopsis coralliophila</i> H. Ad.	28
<b>SPORTELLIDAE</b>	
<i>Prasina borbonica</i> Des.	28
<i>Prasina cornuta</i> de Folin	28

Table 7. (continued)

Taxa	Reference sources
<b>CARDITIDAE</b>	
<i>Cardita bimaculata</i> Des.	8
<i>Cardita gubernaculum</i> (Rve., 1843)	8;22
<i>Cardita rufescens</i> Lam.	28
<i>Cardita variegata</i> Brug., 1792	18;1;3;2;4;8;23;9;20;24;28;29
<i>Carditella</i> sp.	23
<i>Cardites cooperi</i> Melvill, 1909	22;28
<b>CHAMIDAE</b>	
<i>Chama aspera</i> Rve., 1846	1;23;10;28
<i>Chama asperella</i> Lam. 1819	2;10;20
<i>Chama brassica</i> Rve., 1847	1
<i>Chama damaecornis</i> (Lam.)	1;28
<i>Chama delesserti</i> Chenu	22
<i>Chama fibula</i> Rve.	28
<i>Chama fimbriata</i> (Rve.)	1
<i>Chama gryphoides</i> L.	28
<i>Chama imbricata</i> Brod.	28;29
<i>Chama lazarus</i> L., 1758	22;2;28
<i>Chama limbula</i> Lam., 1819	20;10
<i>Chama macrophylla</i> Gm.	28
<i>Chama nivosa</i> (Rve.)	1
<i>Chama reflexa</i> (Rve.)	1
<i>Pseudochama cristella</i> (Lam., 1819)	20
<b>CARDIIDAE</b>	
<i>Cardium adamsi</i> Ad. & Rve.	28
<i>Cardium alternatum</i> Sow.	8
<i>Cardium assimile</i> (Rve.)	1;8
<i>Cardium australe</i> (Sow.)	1;28;29;23
<i>Cardium bicolor</i> Sow.	28
<i>Cardium biradiatum</i> Brug.	28
<i>Cardium (Acanthocardia) burnupi</i> (Sow.)	1;8
<i>Cardium cardissa</i> L.	28
<i>Cardium costatum</i> L.	27
<i>Cardium crenelloides</i> Rve.	28
<i>Cardium dupuchense</i> Rve.	28
<i>Cardium elongatum</i> (Brug.)	1;28;29
<i>Cardium flavum</i> (Lam.)	1
<i>Cardium fornicatum</i> Sow.	28
<i>Cardium leucostoma</i> Born	28
<i>Cardium lyratum</i> (Sow.)	1;29;9
<i>Cardium mauritianum</i> Des.	28
<i>Cardium medium</i> L.	28
<i>Cardium orbita</i> Rve.	29
<i>Cardium papyraceum</i> Chemn.	28;29
<i>Cardium pectiniforme</i> Born	29
<i>Cardium robillardii</i> Sow.	28
<i>Cardium roseolum</i> Melvill	28
<i>Cardium simillimum</i> Smith	28
<i>Cardium tenuicostatum</i> Lam.	8
<i>Cardium unedo</i> L.	28
<i>Cardium unicolor</i> (Sow.)	1
<i>Ctenocardia victor</i> Angas, 1872	22;2;28
<i>Fragum auricula</i> (Niebuhr in Forskål, 1775)	6
<i>Fragum fornicatum</i> (Sow., 1840)	2;8
<i>Fragum fragum</i> (L.)	18;1;23;9;28;29
<i>Fragum hemicardium</i> (L., 1758)	23;27

Table 7. (continued)

Taxa	Reference sources
<i>Fragum levisulcatum</i> (Smith)	1
<i>Fragum nivale</i> Rve., 1845	22
<i>Fragum subretusa</i> (Sow.)	1
<i>Laevicardium australe</i> (Sow., 1841)	22;2
<i>Laevicardium biradiatum</i> (Brug., 1789)	2,23
<i>Laevicardium fragilis</i> (Forskal, 1775)	22
<i>Laevicardium papyracea</i> (Brug., 1789)	20;9
<i>Parvicardium sueziense</i> (Issel, 1869)	23;25
<i>Plagiocardium pseudolima</i> (Lam., 1819)	1;22
<i>Plagiocardium setosum</i> (Redfield, 1848)	2
<i>Trachycardium elongatum</i> (Brug., 1789)	2
<i>Trachycardium flavum</i> (L., 1758)	4;20;3;8;9;2;5;22
<i>Trachycardium lacunosum</i> Rve., 1856	22
<i>Trachycardium leucostoma</i> Born, 1780	22;23
<i>Trachycardium nebulosum</i> (Rve.)	2
<i>Trachycardium rubicundum</i> (Rve. 1844)	5;4;20;22;1;3;8
<i>Trachycardium variegatum</i> Sow., 1841	22
<i>Vasticardium elongatum</i> L.	22
<i>Vepricardium asiaticum</i> Brug., 1792	22;8
<b>TRIDACNIDAE</b> Ref. source: 16	
<i>Hippopus hippopus</i> L.	28
<i>Tridacna maxima</i> (Rdg., 1798)	16;22;5;4;23;8;9;28;29;1;28;29
<i>Tridacna squamosa</i> Lam.	16;1;5;3;4;8;23;9;28
<b>MACTRIDAE</b>	
<i>Lutraria (Phsamophila) australis</i> Rve.	22
<i>Lutraria rhynchaena</i> (Jonas)	1
<i>Mactra achatina</i> (Chemn.) Dill.	8;23
<i>Mactra aequisulcata</i> Sow., 1894	1;3;8;9;20;22;29
<i>Mactra angulifera</i> (Rve.)	1
<i>Mactra capensis</i> (Sow., 1892)	3;8
<i>Mactra cuneata</i> (Chemn.) Gm.	5;9
<i>Mactra fragilis</i> Chemn.	8
<i>Mactra glabrata</i> L. 1767	1;3;4;8;20;29;5;23;9;22
<i>Mactra jekelli</i> Weinkauff	29
<i>Mactra lurida</i> (Phil.)	22;1;8
<i>Mactra ovalina</i> (Lam., 1818)	9;22;20
<i>Mactra semisulcata</i> Des.	8
<i>Meropesta nicobarica</i> (Gm., 1791)	22;1;3;8;9;29
<i>Meropesta solanderi</i> (Gray 1837)	22;1;20;29
<i>Spisula rugosa</i> (Helbl.)	8
<i>Spisula solanderi</i> (Gray, 1837)	9;22
<b>MESODESMATIDAE</b>	
<i>Atactodea glabrata</i> (Gm., 1791)	29;1;23;24;25;22;2;29;28
<i>Paphies corneum</i> Lam.	28
<i>Paphies trigonum</i> Des.	28
<b>SOLENIDAE</b>	
<i>Solen acutangulus</i> Dunker	8
<i>Solen cylindraceus</i> Hanley 1843	5;4;20
<i>Solen ceylonensis</i> (Leach)	6
<i>Solen corneus</i> Lam.	29
<i>Solen gouldi</i> Conrad	3;8;9
<i>Solen roseamaculatus</i> Pilsbury	5;3;8;9
<i>Solen vaginoides</i> Lam.	29
<b>CULTELLIDAE</b>	
<i>Cultellus pellucidus</i> Pen.	3;8
<i>Phaxas (Ensiculus) philippianus</i> (Dunker)	1

Table 7. (continued)

Taxa	Reference sources
<i>Phaxas (Ensiculus) cultellus</i> (L., 1758)	9;29
<i>Siliqua fasciata</i> (Spengler, 1794)	20
<i>Siliqua polita</i> (Wd., 1828)	3;8;9
<i>Siliqua radiata</i> (L.)	9
<b>TELLINIDAE</b>	
<i>Acropagia fimbriata</i> (Hanley, 1845)	2;22
<i>Cadella roblini</i> (Sow.)	23
<i>Cadella semen</i> (Hanley, 1845)	23;25
<i>Clathrotellina carnicolor</i> (Hanley)	23;22
<i>Gastrana matadoa</i> (Gm., 1791)	4;20;3;8;9;28
<i>Macoma clathrata</i> (Des., 1835)	20;23
<i>Macoma dubia</i> Des.	29
<i>Macoma edentula</i> (Spengler)	1
<i>Macoma litoralis</i> (Krauss, 1848)	4;9;20
<i>Macoma retrorsa</i> (Sow., 1867)	9;20
<i>Macoma subovata</i> Sow.	29
<i>Morella (Donacilla) africana</i> Turton	9
<i>Morella (Donacilla) delagoae</i> Barnard	9
<i>Strigilla carnaria</i> L.	28
<i>Strigilla tomlini</i> (Smith)	1
<i>Tellina aethiopica</i> Jackael & Thiel, 1931	22
<i>Tellina alfredensis</i> Bartsch, 1915	22;3;8;9
<i>Tellina apelina</i> Gm., 1791	20
<i>Tellina asperrima</i> Hanley, 1844	2
<i>Tellina capsoides</i> Lam., 1818	3;4;8;20
<i>Tellina chinensis</i> Hanley	28
<i>Tellina decussata</i> Lam.	29
<i>Tellina diaphana</i> (Des.)	1
<i>Tellina difficilis</i>	22
<i>Tellina dispar</i> Conrad, 1837	28;22;9;23;25;20
<i>Tellina elegans</i> Gray	22;28
<i>Tellina emarginata</i> Sow., 1825	1
<i>Tellina fabrefacta</i> Pilsbury	23
<i>Tellina foliacea</i> L.	22;28
<i>Tellina (Quodrans) gargadia</i> (L.)	1;23
<i>Tellina hilaris</i> Hanley	28;29
<i>Tellina immaculata</i> Phil.	9
<i>Tellina inflata</i> Chemn.	28
<i>Tellina linguafelis</i> L.	28;29;23
<i>Tellina ludwigii</i> Krauss	9
<i>Tellina opalina</i> Schroter	29
<i>Tellina palatum</i> Iredale, 1929	22;2;23;25;18
<i>Tellina pellucida</i> Phil.	28
<i>Tellina perna</i> Spengler	22;1;8;29
<i>Tellina pinguis</i> (Hanley, 1844)	1
<i>Tellina planissima</i> (Sow.)	1
<i>Tellina prismatica</i> Sow., 1897	20
<i>Tellina pristis</i> Lam.	8;29
<i>Tellina pulcherrima</i> Sow.	22
<i>Tellina rastellum</i> (Hanley)	22;1;8;28
<i>Tellina remies</i> L.	28
<i>Tellina resecta</i> (Des.)	1
<i>Tellina rhomboides</i> Quoy & Gaimard	22;28;29
<i>Tellina robusta</i> Hanley	28; 23;25
<i>Tellina rostrata</i> L.	28;23
<i>Tellina rousi</i> Sow., 1892	20
<i>Tellina rubella</i> Des.	28

Table 7. (continued)

Taxa	Reference sources
<i>Tellina rugosa</i> (Born)	22;26;28;29
<i>Tellina rutila</i> (Dunker)	22
<i>Tellina salamensis</i> Thiel & Jaeckel, 1931	22
<i>Tellina scalpellum</i> Hanley	22
<i>Tellina scobinata</i> (L.)	1;8;28;29;2;23
<i>Tellina semilaevis</i> Martens	28
<i>Tellina (Quodrans) spinosa</i> (Hanley)	23
<i>Tellina staurella</i> Lam.	22;28;29;1;23;25;2
<i>Tellina striatula</i> Lam.	28
<i>Tellina subpallida</i> Smith, 1891	22
<i>Tellina subtruncata</i> Hanley	28
<i>Tellina trifasciata</i> Rve.	22
<i>Tellina trotteriana</i> Sow.	22
<i>Tellina vestalis</i> Hanley	28
<i>Tellina virgata</i> L., 1758	28;29;26;1;2;8;23
<i>Tellina vulsellia</i> (Chemn. & Hanley)	1;28
<b>DONACIDAE</b>	
<i>Donax aemulus</i> Smith	22;9;29
<i>Donax abbreviatus</i> Lam.	29
<i>Donax australis</i> Lam.	28
<i>Donax bicolor</i> Lam.	28
<i>Donax bertini</i> Dautz.	29
<i>Donax bipartitus</i> Sow., 1892	20;29
<i>Donax brazieri</i> Smith	29
<i>Donax burmupi</i> Sow., 1894	4;20
<i>Donax casta</i> A. Ad.	22
<i>Donax cuneata</i> L., 1758	8;23
<i>Donax elegans</i> Odhner, 1919	2
<i>Donax exaratus</i> Krauss	22
<i>Donax faba</i> Gm., 1791	22;1;5;3;2;8;23;26;9;28
<i>Donax incarnatus</i> Schröter	22;1;2;8;9
<i>Donax lubricus</i> Hanley, 1845	22;2;4
<i>Donax madagascariensis</i> Wd., 1828	4;9;20;22;29;1
<i>Donax nitidus</i> Des.	22
<i>Donax pallidus</i> Gould, 1850	2
<i>Donax simplex</i> Sow., 1897	20
<i>Donax triradiata</i> Des.	28
<i>Donax veruimus</i> Hedley	28
<b>SOLECURTIDAE</b>	
<i>Selenocurtus exaratus</i> Phil.	29
<b>PSAMMOBIIDAE</b>	
<i>Asaphis deflorata</i> (L.)	1;23;28;29;2
<i>Asaphis dichotoma</i> (Anton)	26;9
<i>Florisarka (Soletellina) atrata</i> (Des.)	1
<i>Gari contraria</i> (Des., 1863)	3;8
<i>Gari maculosa</i> (Lam., 1818)	2
<i>Gari pulcherrima</i> (Des.)	23
<i>Gari radiata</i> Des.	28
<i>Heterodonax ludwigii</i> (Krauss, 1848)	20
<i>Hiatula lunata</i> (Des., 1855)	4;20
<i>Hiatula clouei</i> Bertin, 1880	20
<i>Psammotaea elongata</i> (Lam.)	1
<i>Psammobia lunulata</i> (Des.)	9
<i>Psammobia radiata</i> (Des.)	23
<i>Psammobia valdiviae</i> Jaeckel & Thiel, 1931	22
<i>Psammobia weinkauffi</i> Crosse	8;23

Table 7. (continued)

Taxa	Reference sources
<b>SEMELIDAE</b>	
<i>Ervilia bisculpta</i> (Gould)	23
<i>Iacra lactea</i> Dunker	29
<i>Iacra petiti</i> Dautz., 1923	20;29
<i>Iacra seychellarum</i> (A. Ad., 1856)	23;9;20
<i>Iacra trotteriana</i> (Sow., 1894)	20
<i>Leptomys psittacus</i> Hanley	9
<i>Leptomys rostrata</i> Hanley	25;23
<i>Semele bourbonica</i> (Des.)	22
<i>Semele carnicolor</i> (Hanley, 1845)	1
<i>Semele cordiformis</i> Wd.	22
<i>Semele crenulata</i> Sow.	28;29
<i>Semele jukesii</i> A. Ad.	28;22
<i>Semele obscura</i> (Des.)	22
<i>Semele striata</i> (Rve., 1853)	20;5;8;9;29
<i>Theora lata</i> (Hinds, 1843)	20
<i>Theora opalina</i> Hinds	22
<i>Thyellisca (Thyella) lamellosa</i> A. Ad.	22
<b>TRAPEZIIDAE</b>	
<i>Coralliophaga coralliophaga</i> (Gm., 1791)	22;28
<i>Coralliophaga decussata</i> (Rve.)	1;23
<i>Trapezium angulatum</i> Lam.	28;29
<i>Trapezium bicarinatum</i> Schum., 1817	22;2;1;29
<i>Trapezium dolodum</i> Des.	28
<i>Trapezium guinaicum</i> Lam.	28
<i>Trapezium obesa</i> (Rve., 1843)	2
<i>Trapezium oblongum</i> L., 1758	22;23;28
<i>Trapezium rostratum</i> Lam., 1887	28
<b>VESICOMYIDAE</b>	
<i>Isocardia moltkiana</i> Chemn.	28
<i>Isocardia lamarckii</i> Rve.	28
<i>Mediocardia tetragona</i> (Ad. & Rve., 1850)	2;28
<b>VENERIDAE</b> Ref. source: 14	
<i>Amiantis grata</i> (Des.)	23
<i>Amiantis umbonella</i> (Lam., 1818)	14
<i>Anomalocardia kockii</i> (Phil.)	1;9
<i>Anomalocardia paupercula</i> (Dill.)	1;23;22;5;4;20;3;8
<i>Anomalocardia manolei</i> Vanatta, 1901	14
<i>Antigona lamellaris</i> (Schum., 1817)	23;14
<i>Antigona purpurea</i> (L., 1771)	14;1;23
<i>Antigona reticulata</i> (L., 1758)	14;1;8;9;29
<i>Bassina calophylla</i> (Phil., 1846)	6
<i>Bassina foliacea</i> (Phil., 1846)	1
<i>Callista erycina</i> (L., 1767)	14
<i>Callista costata</i> (Dill., 1817)	2;28
<i>Callista erycina</i> (L., 1767)	14;28
<i>Callista florida</i> (Lam., 1818)	22;1;28;29;9
<i>Callista laeta</i> L.	28
<i>Callista obliquata</i> Hanley	28
<i>Callista varians</i> Wd.	28
<i>Chione embrithes</i> (Melvill)	1
<i>Chione toreuma</i> Gould	6;22
<i>Circe callipyga</i> (Born, 1780)	14;29
<i>Circe corrugata</i> (Chemn., 1784)	14;1
<i>Circe nana</i> Melvill, 1898	14
<i>Circe plana</i> Odhner, 1917	14

Table 7. (continued)

Taxa	Reference sources
<i>Circe scripta</i> (L., 1758)	14;1;8;9;28
<i>Circe sulcata</i> Gray, 1838	14
<i>Circomphalus casina</i> (L., 1758)	14
<i>Clausiella foliacea</i> (Phil., 1846)	14;3;8;9
<i>Clementia papyracea</i> (Gray, 1825)	22;1;9;14
<i>Comus platyaulax</i> (Tomlin, 1924)	20;14
<i>Dosinia hepatica</i> (Lam., 1818)	22;1;3;4;8;9;20;29;14
<i>Dosinia histrio</i> (Gm., 1791)	14;22;28;23;28
<i>Dosinia isocardia</i> Dunker	28
<i>Dosinia parva</i> Sow.	28
<i>Dosinia sanata</i> Fischer-Piette & Delmas, 1967	14
<i>Dosinia tumida</i> (Gray, 1838)	14;8;9;29
<i>Dosinia trigona</i> Rve.	29
<i>Gafrarium aduncum</i> Romer	8;29
<i>Gafrarium arabicum</i> (Lam.)	1
<i>Gafrarium corrugatum</i> Chemn.	28
<i>Gafrarium dispar</i> (Dill.)	1;23;25;28
<i>Gafrarium distors</i> (Spengler)	8
<i>Gafrarium divaricatum</i> (Gm., 1791)	22;5;3;9;20;1
<i>Gafrarium gibbium</i> Lam.	28
<i>Gafrarium pectinatum</i> (L., 1758)	18;4;1;2;23;9;20;25;28;29;23;25
<i>Gomphina undulosa</i> (Lam., 1818)	14;28
<i>Irus irus</i> (L., 1758)	20;14;22;1;9;23;29
<i>Lioconcha castrensis</i> (L., 1758)	6;14;30
<i>Lioconcha fastigiata</i> (Sow.)	8
<i>Lioconcha philippinarum</i> (Hanley, 1844)	14
<i>Lioconcha picta</i> (Lam., 1818)	28;26;14;22;23;2
<i>Lioconcha tigrina</i> (Lam., 1819)	2
<i>Macrocallista semisulcata</i> (Sow.)	1
<i>Marcia paupercula</i> Chemn.	14
<i>Marcia opima</i> (Gm., 1791)	14
<i>Meretrix hebraea</i> (Sow.)	3;8
<i>Meretrix meretrix</i> (L.)	5;4;14
<i>Paphia gallus</i> (Gm.)	5
<i>Paphia malabarica</i> Chemn.	14
<i>Paphia textile</i> (Gm., 1791)	2;14
<i>Periglypta (Antigma) clathrata</i> (Des.)	1
<i>Periglypta crispata</i> (Des., 1853)	2
<i>Pitar abbreviatus</i> (Krauss, 1848)	4;20
<i>Pitar affinis</i> (Gm., 1791)	22;2;23;14;29
<i>Pitar hebraea</i> (Lam., 1818)	14;9;22;1
<i>Pitar madecassimua</i> (Fischer-Piette & Delmas, 1967)	14;20
<i>Pitar manillae</i> (Sow., 1851)	14;22;9
<i>Pitar obliquata</i> Hanley, 1844	22;1;23
<i>Pitaria (Pitarina) subpellucidum</i> (Sow.)	1
<i>Placamen isabellina</i> (Phil., 1849)	2
<i>Placamen tiara</i> Dill., 1817	22
<i>Psammocula castrensis</i> (Spengler)	23
<i>Samarangia quadrangularis</i> (Ad. & Rve., 1850)	2
<i>Sunetta bruggeni</i> Fischer-Piette, 1973	14;1;9;20;8
<i>Sunetta effosa</i> (Hanley, 1842)	14
<i>Sunetta meroe</i> L.	28
<i>Sunetta truncata</i> Des.	8;29
<i>Tapes sulcarius</i> (Lam., 1818)	1
<i>Tapes deshayesii</i> (Hanley, 1844)	14;1;20;22;28
<i>Tapes kochi</i> Phil.	29
<i>Tapes geographica</i> Gm.	28



Table 7. (continued)

Taxa	Reference sources
<i>Tapes literatus</i> (L.)	1,5;23;26;28
<i>Tapes malabarica</i> (Chemn.)	8,9
<i>Tapes papillionacea</i> Chemn.	28
<i>Tapes punctata</i> Chemn.	28
<i>Tapes quadriradiata</i> Desh.	8
<i>Tapes sulcarius</i> (Lam., 1818)	1;20;14,8
<i>Tapes sulcosa</i> (Phil.)	1
<i>Timoclea arakana</i> (Nevill, 1871)	20;22
<i>Timoclea costellifera</i> (Ad. & Rve., 1850)	14;8,9
<i>Timoclea lavrani</i> Fischer-Piette 1974	20
<i>Timoclea levicostata</i> (Kuroda)	8
<i>Timoclea marica</i> (L., 1758)	14;1;23;26;26;28;29
<i>Timoclea platyanalax</i> (Tomlin)	1
<i>Timoclea recognita</i> (Smith, 1885)	14;22;8
<i>Timoclea valdiviae</i> (Thiel & Jeckel, 1931)	14
<i>Tivela compressa</i> (Sow., 1851)	3;8;14
<i>Tivela damaoides</i> (Wood, 1828)	14;9;20;22
<i>Tivela lamyi</i> Dautz.	29
<i>Tivela natalensis</i> Dunker, 1858	3;8;20;14
<i>Tivela petiti</i> Dautz.	29
<i>Tivela ponderosa</i> (Koch, 1844)	14;22
<i>Tivela rejecta</i> Smith, 1914	14;20;22
<i>Tivela transversa</i> Sow., 1897	14
<i>Transennella platyanalax</i> (Tomlin)	1
<i>Venerupsis carditoides</i> Lam.	28
<i>Venerupsis corrugata</i> (Gm., 1791)	14
<i>Venerupsis derelicta</i> Des.	28
<i>Venus cancellata</i> Chemn.	28
<i>Venus crispata</i> Des.	28
<i>Venus listeri</i> Gray	28
<i>Venus lamellaris</i> (Schum.)	9
<i>Venus puerpera</i> L.	28;29
<i>Venus scabra</i> Hanley	28
<i>Venus toreuma</i> Gould	14;28;29
<i>Venus verrucosa</i> L., 1758	3;4;8;20;22;28
<b>PETRICOLIDAE</b>	
<i>Petricola brugieri</i> (Hanley)	1
<i>Petricola divaricata</i> Gm.	22
<i>Petricola divergens</i> Gm., 1791	22
<i>Petricola fabagella</i> Lam., 1818	22;29
<i>Petricola lapicida</i> (Gm., 1791)	28;29;1
<i>Petricola ponsonbyi</i> Sow., 1892	20
<i>Petricola robusta</i> Sow.	3;8
<i>Petricola typica</i> Jonas, 1844	22
<b>MYIDAE</b>	
<i>Sphenia similis</i> Smith	22
<b>CORBULIDAE</b>	
<i>Corbula acutangula</i> Issel	29
<i>Corbula rugifera</i> (Smith 1903)	1;20
<i>Corbula subquadrata</i> Melvill & Standen, 1907	23
<i>Corbula taitensis</i> Lam., 1818	8
<i>Lepton cumingi</i> (A. Ad.)	1
<b>GASTROCHAENIDAE</b>	
<i>Gastrochaena cunieformis</i> (Spengler, 1783)	23;9;28;29
<i>Gastrochaena dubia</i> Penn.	3;8

Table 7. (continued)

Taxa	Reference sources
<i>Gastrochaena gigantea</i> Des., 1830	6
<i>Gastrochaena mytiloides</i> Lam.	27;28
<i>Gastrochaena retzi</i> Des.	28
<b>PHOLADIDAE</b>	
<i>Barnea manilensis</i> (Phil., 1847)	1;9;20
<i>Martesia multistriata</i> Sow.	29
<i>Martesia striata</i> (L., 1758)	1;9;20
<i>Parapholsa quadrizonata</i> (Spengler)	1
<i>Pholas erythraea</i> Rve.	29
<i>Pholas silucula</i> Lam.	28
<b>TEREDINIDAE</b>	
<i>Dicyathifer (Teredo) manni</i> (Wright)	9
<i>Bankia carinata</i> (Gray, 1827)	4;20
<i>Lyrodus massa</i> (Lamy, 1923)	20;9
<i>Teredo</i> sp.	1
<i>Teredo affinis</i> Des.	22
<i>Teredo brevis</i> Sow.	22
<i>Teredo clava</i> Gm.	9;28
<i>Teredora princesae</i> (Sivickis 1928)	20;9
<i>Uperotus clavus</i> (Gm. 1791)	20
<b>LATERNULIDAE</b>	
<i>Laternula anatina</i> (L., 1758)	22
<b>THRACIIDAE</b>	
<i>Thracia</i> sp.	1
<b>CUSPIDARIIDAE</b>	
<i>Cuspidaria macrorynchus</i> Smith	28
<b>CLAVAGELLIDAE</b>	
<i>Brechites attrahens</i> (Lightfoot, 1786)	22;28
<i>Bryopa aperta minima</i> Sow., 1889	1
<i>Penicillus giganteus</i> (Sow.)	1

## CHECKLIST REFERENCE SOURCES

### Prosobranchia (Table 5).

1. Spry (1961).
2. Drivas (1988)
3. Macnae & Kalk (1969)
4. Branch *et al* (1994)
5. Fischer *et al* (1990)
6. Richmond & Rabesandratana (1997)
7. Richmond, M.D. collected spm. - Zanzibar.
8. Cernhorsky (1973)
9. Hinton (1972)
10. Price (1971)
11. Gosliner *et al* (1996)
12. Oliver (1975)
13. Rehder (1973)
14. Barnard (1959)
15. Barnard (1963)
16. Barnard (1963)
17. Houbrick (1992)
18. Barnard (1969)
19. Barnard (1958)
20. Kilburn & Rippey (1982)
21. Emerson & Cernhorsky (1973)
22. NMW -Cardiff: collection list.
23. Talmadge (1974)
24. Schimdt & Bellec (1994)
25. Roberston (1973)
26. Michel (1988)
27. Smith (1953)
28. Dance (1992)
29. Emerson (1990)
30. Abbott & Dance (1982)
31. Powell (1973)
32. Cernohorsky (1981)
33. Berry (1954)
34. Burgess (1970)
35. Copley (1945)
36. Dance (1974)
37. Viader (1937)
38. Dautzenberg (1932)
39. Houbrick (1978)
40. Harasewych (1997)
41. Herbert (1996)
42. Lawson (1969)
43. Liversidge (1963)
44. Houart (1984)
45. McClanahan (1990)
46. McClanahan (1994)
47. McClanahan (1997)
48. Powell (1967)
49. Mienis (1973)
50. Kabat (1996)
51. Reid (1986)
52. Houart (1990)
53. Ruwa (1984)
54. Ruwa (1984)
55. Ruwa (1989)
56. Abbott (1968)
57. Taylor (1968)
58. Taylor (1971)
59. Taylor (1973)
60. Taylor & Lewis (1970)
61. Verdcourt (1954)
62. Abbott (1959)
63. Verdcourt (1959)
64. Verdcourt (1960)
65. Houbrick (1985)
66. Robertson (1985)
67. Abbott (1961)
68. Jung & Abbott (1967)
69. Abbott (1960)
70. Abbott (1967)
71. Hartnoll (1976)
72. Chelazzi & Vannini (1980)

### Polyplacophora (Table 6).

1. Kaas (1986)
2. Kaas & Van Belle (1988)
3. Kilburn & Rippey (1982)
4. Barnard (1963)
5. Hodgkin & Michel (1960)
6. Chelazzi & Vannini (1980)
7. Viader (1937)

### Bivalvia (Table 7).

1. Spry (1964)
2. Drivas & Jay (1988)
3. Macnae & Kalk (1969)
4. Branch *et al* (1994)
5. Fischer *et al* (1990)
6. Richmond & Rabesandratana (1997)
7. Richmond, M.D. collected spm. - Zanzibar.
8. Castro-Fernandez (1981)
9. Barnard (1964)
10. Price (1971)
11. Gosliner *et al* (1996)
12. Oliver (1992)
13. Ruwa (1984)
14. Fischer-Piette (1973)
15. Rosewater (1961)
16. Rosewater (1961)
17. Hartnoll (1976)
18. Chelazzi & Vannini (1980)
19. Paulay (1996)
20. Kilburn & Rippey (1982)
21. Lawson (1969)
22. NMW -Cardiff: collection list.
23. Taylor (1968)
24. Taylor (1971)
25. Taylor & Lewis (1970)
26. Michel (1988)
27. Smith (1953)
28. Viader (1937)
29. Dautzenberg (1932)
30. Viader (1951)

## DISCUSSION

The mollusc checklist is the first prepared for the western Indian Ocean and though certainly includes errors and duplication, does allow for comment on some of the better-known, larger, shallow-water and conspicuous groups.

The overall figure of about 3,100 species of molluscs recorded (excluding Opisthobranchia) in the present study can be compared to others areas of the Indo-Pacific. The coasts of western Australia are home to about 2,000 species of shelled molluscs (Wells & Bryce, 1988) with the entire Australian fauna likely to comprise about 10,000 species as recently suggested by Wilson (1993), who admits that the Australian fauna still remains incompletely known. The southern African fauna is thought to include fewer than 1,600 species of littoral molluscs (Kilburn & Rippey, 1982). The Hawaiian fauna is estimated to include about 1,000 species (Kay, 1979) and the south Pacific Islands about 1,200 species (Cernhorsky, 1967, 1972, 1978).

### a) Polyplacophora

The class Polyplacophora is reasonably known and the 39 species recorded from the region derive mostly from littoral and shallow sublittoral sites. Of these the most conspicuous are the large upper eulittoral *Acanthopleura brevispinosa* and *A. gemmata* which are widespread and common on cliffs and rocky shores in the region. The former is restricted to the western Indian Ocean with the latter wide-spread throughout the Indo-Pacific. The difficulty associated with identification of chitons, relying as it does on dissection of the plates and microscopic examination of the girdle and spicules, has resulted in a paucity of records of this group in the literature for the region. Melvill & Standen (1901,1906) reporting on the molluscs of the Arabian Sea and adjacent areas failed to include a single chiton record (see Kass & van Belle, 1988). Fifteen of the species recorded from the region were only described in the last 30 years. Nevertheless, the composition of species from the region, though doubtless incomplete, has led one of the few chiton workers familiar with the fauna of the western Indian Ocean (Ferreira, 1983) to conclude that as far as chitons are concerned, the tropical western Indian Ocean (from and including the Red Sea to Natal) constitutes a definite zoogeographical province. From the adjacent Arabian Sea area only

12 species are reported (Kass & van Belle, 1988), whilst from southern Africa, Kilburn & Rippey (1982) report 26 species, including deep water species. The Indo-Malaysia region however, appears to maintain the highest diversity. For the genus *Acanthopleura* alone, 5 species are found (Ferreira, 1986).

## **b) Prosobranchia**

A comparison of the findings of the present study (which recorded 2,550 species) with similar data from other regions within the Indo-Pacific is possible for a few families (see Table 8). The minimum species numbers for each family from the present study have been re-evaluated to include a second set of calculations based on species for which there are 2 or more records (WIO b). In preparing these figures, it becomes apparent that a considerable number of the single records for most species are derived from the study by Viader (1937) suggesting that his analysis of the fauna of Mauritius and its dependencies includes many synonyms which have yet to be resolved.

The comparison made in Table 8 reveals some marked differences between the localities. In general the number of species from the various families in the western Indian Ocean (WIO a) are greater than recorded from the other regions listed. The edited species numbers (WIO b) tend to agree more closely with what might be expected, and the true figures for the western Indian Ocean are likely to lie between these 2 data sets. Only further analysis of the synonymies of these families can attempt to resolve these differences. Nevertheless, 2 marked differences are evident which deserve attention. Numbers of species for the Trochidae appears to be higher for the western Indian Ocean for reasons which cannot at present be explained, though possibly the findings from the present study include many more deeper water species than those included in comparative works. The Volutidae by contrast reveals a marked lack of species, compared to the Australian region and vicinity. As Wells (1990) explains, these species deposit their eggs in masses on the seabed from which crawling juveniles hatch, a feature which accounts for the high number of endemic species of this family in Australian waters. This family is altogether absent from Hawaiian waters for the same reason (Scheltema, 1986).

Table 8. Number of shallow-water species of 20 families of prosobranch molluscs recorded from different geographical provinces. Abbreviations: WIO (western Indian Ocean: present study) – WIOa: minimum species number, WIOb records from more than a single source; NAST (northern Australia), AUS-NG-IND (northern Australia, New Guinea and Indonesia), the latter from Wells (1990); Guam data from Kay (1995); na: no available data.

Family	WIOa	WIOb	NAUST	AUS-NG-IND	Guam
Haliotidae	11	4	6	6	5
Trochidae	92	58	24	25	46
Turbinidae	33	14	17	20	20
Neritidae	24	15	10	10	24
Littorinidae	22	12	18	28	9
Strombidae	27	26	35	39	21
Naticidae	63	29	24	25	9
Cypraeidae	97	69	73	87	61
Cassidae	14	11	9	11	2
Tonnidae	17	9	9	11	2
Muricidae	187	67	47	97	56
Columbellidae	87	28	14	15	29
Nassariidae	77	31	50	84	na
Fasciolaridae	78	48	26	27	na
Olividae	65	26	23	35	9
Mitridae	210	76	83	109	72
Costellariidae	69	35	59	95	74
Volutidae	5	3	28	32	na
Conidae	198	92	93	127	89
Terebridae	88	41	66	94	43
Total	1,305	694	754	977	na

### c) Bivalves

This class is generally poorly covered by field surveys and has attracted the attention of few workers in the past (Morton, 1983) thus comparisons with other regions cannot be made at present due to the lack of data. Of the estimated 667 species reported in the present study a margin of error is certain to exist, though the extent of that cannot be determined without further analysis of the synonymies. For the Red Sea, despite the lengthy period during which molluscan studies have been conducted there, few comprehensive texts on the molluscan fauna exist, with the exception of Oliver (1992) who provides the first comprehensive treatise on the bivalve fauna. He concludes that of the over 800 names applied in the existing literature for Red Sea bivalve shells, only 411 species can be retained as valid taxa. The figure from the present study can therefore be viewed as being of the right order of magnitude, considering the greater diversity of habitats, far greater tidal range and closer proximity to the Malay-Indonesian province for the western Indian Ocean as compared to the Red Sea. The problem of synonymies is not restricted to the Mollusca.

In an analysis of the coral fauna of the Indian Ocean Sheppard (1987) examined 796 entities from which he confirmed the presence of 439 species.

Far fewer species of bivalves than prosobranchs have been observed in most localities in the Indo-Pacific (see Kay, 1995). The ratio from her compilation of data across the south Pacific appears to be approximately 7 : 1 (prosobranchs : bivalves). The data from the present study, with 2,550 prosobranchs reported provides a ratio of approximately 4 : 1. One of the reasons for the greater portion of bivalves in the present study is the far larger tidal range and thus habitat suitable for bivalves along western Indian Ocean shores. This agrees with the findings by Kohn (1971) from an analysis of the molluscan fauna of tropical continental and oceanic islands. He found a ratio of prosobranchs to bivalves of 2.2 : 1 for continental islands and 4.8 : 1 for oceanic islands, providing further evidence that in continental environments, a greater diversity and contribution of bivalves is manifest. Bivalves probably evolved in shallow, coastal, continental waters rich in suspended material (Salvat, 1967; Taylor, 1971) and their adaptive radiation into coral reef habitats has only been achieved by a few families involving relatively fewer genera (Morton, 1983).

### **Endemicity**

For the western Indian Ocean few estimates of endemicity exist at present. However, Drivas & Jay (1988) state that of the 2,500 species reported from Reunion Island and 3,500 species from Mauritius, only 10 % are considered to be endemic to those islands. Kabat (1996) found that no genera of Naticinae (subfamily of the Naticidae) were endemic to regions within the Indo-Pacific, though at the species level the bulk of the endemicity observed occurred in the western Indian Ocean (including Sri Lanka and India). Kay (1990) found 23 species of cowries, out of a total of 150 species in the Indo-Pacific, endemic to the Indian Ocean, approximately 15 %. One common, upper eulittoral species which lives on the trunks of mangrove trees is *Cerithidea decollata* (L.). This species appears to be endemic to the western Indian Ocean though absent from smaller islands. In Australia it is replaced by *C. largillierti* (Philippi). Similarly, *Bullia* spp. are restricted to continental margins (Taylor, 1971), absent from the western Indian Ocean islands, but found on the west coast of Madagascar and east Africa.

Kilburn & Rippey (1982) observed that southern Africa (covering South Africa and Namibia) has fewer than 1,600 species of littoral species of molluscs. This region they divide into 4 provinces, with northern Natal (Zululand) and Moçambique referred to as the Indo-Pacific province. The latter region is characterised by having the only coral reefs in South Africa, and in terms of molluscan fauna, a marked reduction in the presence of endemic species (probably less than 14 %) with about 85 % of the fauna comprised of genuinely Indo-Pacific species. They also note that an accurate analysis of the composition of the fauna cannot be made because the Zululand molluscs are in general very poorly known and concentrated on submerged coral reefs which have so far been little explored. Herbert (1998) gives figures for the entire South African fauna as follows: Gastropoda (marine) 2,183 species (58 % endemics); Bivalvia 560 species (48 % endemics).

### **Fossil evidence**

The fossil record can do much to elucidate the origin and location of species and explain the observed patterns of distribution found today especially as mollusc shells are particularly suited to fossil study. For example, Abbott (1960) found that *Strombus aurisdianae* is abundant in the mid Indian Ocean from East Africa to Sumatra and he suggests that this species may be a recent migrant from Africa into the western Pacific as far as Okinawa and the Solomons. This species was found to be relatively abundant in east African fossil records, but absent from Indonesian fossil beds. It is also the only species in the western Pacific which abruptly stops at the Solomons. The populations of this species on Indian Ocean islands show great instability in shell character and he believes this represents a potential isolation and further development of Indian Ocean species or subspecies in the geological future.

For some taxa diversity has been shown to reduce over geological time. This is conspicuously true of the giant clams *Tridacna*. Currently only 2 species are known with certainty from the region, *Tridacna squamosa* and *T. maxima* (the record of *Hippopus* from Mauritius by Viader (1937) needs confirmation). The fossil record however, reveals that a total of 5 species were present amongst the younger limestone cliffs of Aldabra (Taylor, 1971) including the distinctive *T. gigas* which has become extinct in the last 125,000 years, though it widely present in the Malay-Indonesia province and across parts of the western



Pacific. Taylor (1971) suggests that possibly the Malay-Indonesia area, rather than a being centre for dispersal for the Indo-Pacific as accepted by many (e.g. Ekman, 1953), is more likely to be an area where survival has been maintained, or accumulated, when other areas suffered losses of diversity accompanying a reduction in habitat availability caused by sea-level changes. Kohn (1967) found similar evidence for the distribution of *Conus* species where no diversity gradient towards Malay-Indonesia is observed, concluding that habitat complexity is a greater determinant of species diversity than isolation or distance from faunistic centre. Emerson (1990) observed a not dissimilar pattern for members of the genus *Morum* (Harpidae). These were widely distributed during the Tertiary, but presently only 16 species are found in the Indo-Pacific, with only a single endemic species occurring in the western Indian Ocean. The remainder are concentrated in the Malay-Indonesian / Australian region, with a single endemic species in the Marshall Islands.

### **Island versus mainland species**

One area of research which could provide further biogeographic information is an examination of the differences between the species diversity of the western Indian Ocean islands and that of the continental margins. As discussed above, the bivalve populations are likely to differ markedly due to habitat requirements. Taylor (1971) was one of the first to highlight the differences between island mollusc diversity and that of the mainland of Africa, with the latter supporting larger biodiversity than the islands. This observation has received further support by numerous workers. Abbott (1960) for example found that certain species of *Strombus* in the Pacific showed a clear preference for continental, high nutrient environments whilst others were found only on coral island environments. Abbott (1968) also found similar preferences among members of the Cassidae. Kay (1990) found a greater number of species of cowries (41) common to the continental margins of western Indian Ocean compared with those on the islands (33 species). With respect to the differences between island and continental species diversity, Taylor (1971) concludes that the islands within the region have a very uniform fauna composed of species with larvae capable of surviving pelagic transport. He also concludes that the fringes of the region demonstrate a higher degree of endemism while experiencing a latitudinal decrease in species diversity.

## Further studies

As Spry (1961) admits, many shells remain to be found, particularly among the smaller species, while the deep water species are still unknown. Study is especially needed of the Fissurellidae, the Vermetidae, the Calyptracea (Hipponicidae, Crepidulidae and Capulidae), the Lamellariidae, in addition to several Opisthobranchia families (notably Melanellidae and Siphonariidae). To fully ascertain the molluscan diversity of the western Indian Ocean further taxonomic work and regional collecting must be undertaken. The task of eliminating synonyms in the literature must be pursued and the present checklist amended. Present work has identified the location of the most comprehensive collections for the region (e.g. those of Winckworth and Spry now held at the Natural History Museum, London; the Melvill-Tomlin collection at the National Museum of Wales; the Viader collection at Port Louis, Mauritius; and the collections held at the National Museum of Tanzania, Dar es Salaam, and the Institut Halietique et des Sciences Marines, Tulear, Madagascar), and although a significant task, further examination of these collections should clarify the molluscan biodiversity for the western Indian Ocean region.

## **CHAPTER 5**

# **THE DIVERSITY AND DISTRIBUTION OF THE SHALLOW-WATER ECHINODERM FAUNA OF THE WESTERN INDIAN OCEAN**

## INTRODUCTION

By the middle of this century the systematics of the echinoderm fauna of the Indian Ocean (and indeed the bulk of the world) could be said to be based on a reasonably sound footing. The reasons for this are that they are relatively few in numbers, with current estimates at about 7,000 species globally (Pawson, 1995), they are mostly of a medium size (3-50 cm), they have a long fossil history, dating to the Lower Cambrian (over 500 million year ago) and their taxonomy is, on the whole, fairly robust. For the Indo-Pacific region the phylum includes about 1,300 species from nearshore and shallow waters (Pawson, 1995).

Within the western Indian Ocean and adjacent waters (e.g. Arabian Sea, Arabian Gulf, northern Indian Ocean, Red Sea and southern African waters), there have been numerous studies on echinoderms over the last two hundred years. James (1976) provides a review of echinodermology of the Indian Ocean which began in 1743 with reports from Goa (west coast of India) by Plancus and Gaultire. Various expeditions which collected and catalogued diverse taxa, including echinoderms, subsequently visited the region. These include the Challenger Expedition (1873-74), the Deutchen Tiefsee Expedition (1902-03), the Percy Sladen Trust Expedition (1904), the Willebrod Expedition (1929) and the John Murray Expedition (1933-34). The reports which resulted from these voyages greatly contributed to knowledge of the fauna of the Indian Ocean and adjacent waters. Several independent studies have similarly taken place over the first quarter of this century.

The landmark monograph of Clark & Rowe (1971) for the entire Indo-Pacific shallow-water species (from less than 20 m depth) collated and updated the taxonomy and distribution of the fauna of this region and has since served as a sound basis for further research. This monograph includes all relevant literature up to 1969. From then onwards the most significant studies in the western Indian Ocean and adjacent waters which have added to the knowledge of the fauna are summarised here. From southern Africa (including the southern portion of Moçambique) the work of Thandar (1977-94), Cherbonnier (1970) and Clark & Courtman-Stock (1976) help in providing a thorough appraisal of the echinoderms from those waters. The asteroid assemblage of Inhaca Island (southern Moçambique) has been examined by Jangoux (1973) and more recently by Walenkamp (1990). Madagascar's holothurians have been extensively studied by Cherbonnier (1988); the ophiuroid fauna by

Cherbonnier & Guille (1978) and the crinoids by Marshall & Rowe (1981). Humphreys (1981) provides a summary of the fauna mainly from the Watamu Marine Park (northern Kenya) and Herring (1972) examined the ecology and distribution of the echinoid fauna of the shores on the west coast of Zanzibar (Tanzania). From the western Indian Ocean islands a few recent echinoderm works have been forthcoming, all from the Seychelle islands. These include Sloan *et al.* (1979) and Clark (1984). Clark (1980) also examined the ophiuroids of the Seychelles and Inhaca Island. The echinoderms of the northern part of the Indian Ocean, notably around India and the Andaman Islands, have been studied by Daniel & Halder (1974) and more extensively by James (1969-89). In addition, the four reports from the recent *Sinbad Voyage* (1980-81) have contributed significantly to the knowledge of the northern Indian Ocean echinoderm fauna, from sites at Muscat (Oman), the Maldives, Lakshadweep Islands, India, Sri Lanka and northern Sumatra (see Price & Reid, 1985; Marsh & Price, 1991; Price & Rowe, 1996, and Crossland & Price *in press*). The knowledge of the echinoderm fauna of Diego Garcia (Chagos Archipelago) has been updated by Clark & Taylor (1971) and the asteroid fauna of the Maldives has been examined recently by Jangoux & Aziz (1984) which included material from the Seychelles, and by Moosleitner (1997). Arabian Gulf echinoderms have been examined by Price (1981) and those of the southern Oman coast by Campbell & Morrison (1988). Subsequent to Clark & Rowe (1971) the Red Sea echinoderms have been examined by James & Pearce (1969), Roman (1979) and have been the subject of a comprehensive analysis by Price (1983) who includes analysis of the fauna from the Arabian Sea and Arabian Gulf. Numerous other studies which include examination of material from the western Indian Ocean tend to focus on specific echinoderm families, genera or species groups. Relevant examples include Campbell & Rowe (1997) on a new species of asteroid from Oman, and Rowe *et al.* (1986) on a revision of some comasterid crinoids.

The recent studies on the echinoderm faunas of the western Indian Ocean and adjacent waters described above provide a comprehensive understanding of the diversity of the phylum over much of this region, though some parts of the region have either been only sparsely covered or not at all (e.g. the Comoros and other islands in the Moçambique Channel, northern Moçambique, Tanzania, Mauritius and Réunion). Furthermore, a few taxonomic problems do continue to exist and stem in part from the lack of adequate type material of some of the species first described in the mid to late 1800's. For example Koehler and Sluiter were known to use the type material as part of student dissection

practicals after which specimens were discarded (Rowe *pers. com.*). Clark (1907) laments that for some holothurians the incomplete characterisation of the genera and loss of type material adds to the difficulties. With time the few inconsistencies are being resolved and the fauna as a whole benefits from a far more solid basis than that of the Polychaeta or Mollusca for example (see Chapters 3 and 4). One aspect of echinoderm taxonomy which certainly helps reduce taxonomic ambiguities is the seemingly widespread dismissal of the need for varieties and subspecies (e.g. Clark, 1907; Rowe *pers. com.*) in contrast to mollusc systematics where these lower levels are commonly encountered.

For the western Indian Ocean, no comprehensive analysis of the fauna exists and the numerous site-specific studies do not generally examine their fauna in the broader context of this region as a whole. This study attempts to bring together all the relevant taxonomic research on the echinoderm fauna of the western Indian Ocean in order to provide an overview of its diversity and distribution. More specifically, the objectives of this study are to:

1. Establish the identity of the species of echinoderms present in the western Indian Ocean;
2. Produce a summary of the diversity of western Indian Ocean echinoderm species as a contribution to the Field Guide;
3. Examine the distribution of the species of echinoderms found in the western Indian Ocean and attempt to explain the observed patterns.

## METHODS

### Field Surveys

Collections of echinoderms were made in Zanzibar, Tanzania between January 1992 and June 1997. Detailed quantitative samples of intertidal soft substrates were taken in Zanzibar, Tanzania (as described in Chapter 3), and Jubail (Saudi Arabia) in the Arabian Gulf (see Richmond, 1994), combined with brief collections and field surveys in other parts of the region. Sites where brief field surveys were conducted include Watamu (Kenya), Mafia Island (Tanzania), Inhaca Island (Moçambique), Durban and northern Natal (South Africa), Gran Comores (Comoros), Tulear (SW Madagascar), Nose Be (NW Madagascar), Mahé and La Digue Islands (Seychelles), Yanbu (Saudi Arabia, NE Red Sea) and SW Papua New Guinea.

Most survey and collecting efforts were concentrated in the littoral zone, though shallow coral reefs and sublittoral seagrass beds were also examined. Field annotations and photographs accompany much of the collection. Specimens were preserved in alcohol or dry and catalogued, with the bulk of the material collected deposited at the Institute of Marine Sciences (University of Dar es Salaam). Material at the Institut Halietique et des Sciences Marines, Tulear, Madagascar and at the Inhaca Marine Laboratory Museum (Universidade Eduardo Mondlane, Moçambique) was also examined. The identification of parts of the collection made in Zanzibar were verified by Dr. Frank Rowe and deposited in Natural History Museum (London).

### Preparation of the Species Checklist

An echinoderm faunal checklist was compiled for the western Indian Ocean using data from numerous works. Pre-1969 records were taken from Clark & Rowe (1971) and, where necessary, modified following discussions with Dr. Frank Rowe, for example to elucidate synonyms established since 1971. Un-published records of material collected from the region were also included. Doubtful records presented in Clark & Rowe (1971) are indicated as '?' and excluded from the analysis here. Records are included only for species

which are reported from depths shallower than 100 m. The distribution of the fauna was established by dividing the Indo-Pacific region and adjacent waters into thirteen provinces, and the western Indian Ocean records have been separated into those from the East Africa mainland (and including Madagascar) and those from the western Indian Ocean islands (Seychelles and the Mascarenes). Thus fifteen provinces are defined (see below). The records given are in most cases the earliest published and most reliable, though in many cases subsequent publications confirmed the first record. Only a single record for species presence at each province is included. The term 'province' is used here only with reference to a geographical area and not to a biogeographically distinct region. Systematic arrangement of families follows Clark & Rowe (1971) with genera listed alphabetically.

### **Descriptions of Geographic Provinces**

The provinces are roughly similar to those provided in Clarke & Rowe (1971) with minor alterations to group similar land masses (e.g. the Lakshwadeep Islands are grouped with the Maldives and Chagos), to reduce the overall number of provinces considered (e.g. the Arabain Gulf is grouped with the Arabian Sea) and to accord with the recent literature which summarises fauna for particular regions (e.g. Australia, China-Japan and the Pacific Islands). It is accepted that the extent of shorelines, habitats (and their complexity), as well as the quantity and level of research conducted in each province, and within the two sub-provinces of the western Indian Ocean vary considerably. Given this caveat, analysis of the diveristy of echinoderm species in each, and their wider distribution can be examined. The definition of the fifteen provinces used in this study are depicted in Figure 1 and summarised below:

**A East Africa** (A sub-province of the western Indian Ocean) - from approximately 7<sup>0</sup> N in central Somalia to Durban (South Africa) at approximately 30<sup>0</sup> S, including Kenya, Tanzania, Comoros and Madagascar and the Moçambique Channel. This area corresponds with 'E Africa & Madagascar' in Clark & Rowe (1971).

**B Western Indian Ocean islands** (A sub-province of the western Indian Ocean) - Seychelles, Mauritius and dependencies and Réunion. This area includes the provinces of 'Is. of the W Indian Ocean' and 'Mascarene Is.' in Clark & Rowe (1971).



**C Southern Africa** - south of Durban.

**D Arabian Sea** - from central Somalia at approximately 7° N to the entrance of the Red Sea, and extending eastwards to the border between Iran and Pakistan, thus including all of Oman, and also including the Arabian Gulf. This province includes the 'SE Arabia' and 'Persian Gulf' defined in Clark & Rowe (1971).

**E Red Sea** - from the southern entrance at the Straits of Bab el Mandeb to the northern extreme and Gulf of Suez. Ditto Clark & Rowe (1971).

**F Western India** - from the border between Iran and Pakistan, extending to the southern tip of mainland India. Ditto Clark & Rowe (1971).

**G Lakshadweep-Chagos** - both these island groups and the Maldives. This province corresponds with 'Maldives area' in Clark & Rowe (1971).

**H Sri Lanka-Bay of Bengal** - the island of Sri Lanka, east coast of India and Bay of Bengal extending to southern Burma and including the Andaman and Nicobar islands. This province includes 'Ceylon area' and 'Bay of Bengal' in Clark & Rowe (1971).

**I Malay-Indonesia** - including Malaysia, Indonesia, Papua New Guinea and the Philippines. This province includes 'East Indies' and 'Philippines Is.' in Clark & Rowe (1971).

**J Northern Australia** - from the central west coast to the southern extreme of the Great Barrier Reef on the east coast. Ditto Clark & Rowe (1971).

**K China-Japan** - southern Japan, the Ryukyu Islands, Bonin Islands and the coast of China from Korea to Hainan and the east coast of Vietnam. Ditto Clark & Rowe (1971).

**L Pacific Islands** - all islands extending from the Marianas, Palau, Solomons and New Caledonia in the western Pacific to the Pitcairn Islands group in the central south Pacific. Ditto Clark & Rowe (1971).

**M Hawaii** – all islands in the Hawaiian group. Ditto Clark & Rowe (1971).

**N Eastern Pacific Ocean** – the tropical coastlines of Peru, Ecuador (including the Galápagos), central America and Mexico.

**O Tropical Atlantic**

Figure 1. Provinces within and adjacent to the Indian and Pacific Oceans (see text for explanation of codes).



### Non-parametric data analysis

The species checklist was converted to a presence-absence data set which includes only those species found in the western Indian Ocean and their presence or absence from the other provinces defined here. Cluster analysis of the data set was performed using the Bray-Curtis Similarity program 'Primer' developed by Clarke & Warwick (1994). It should be emphasized here that the resulting similarity values relate only to the species found in the western Indian Ocean, and not to the fauna of the entire region. Compiling an up-to-date

species checklist for the entire region is a task which is beyond the scope of this study. In some instances the data sets were modified and reduced to allow factors which may be affecting the relationship between the various provinces to be examined in more detail, as summarised below:

a) Entire western Indian Ocean fauna: the entire data set with all 15 provinces;

b) East African fauna: a data set based on all western Indian Ocean species present on the East Africa mainland province (i.e. omitting the species present on the W Indian Ocean islands but absent from the East Africa mainland);

c) WIO Islands: a data set based on all western Indian Ocean species present only on the W Indian Ocean islands province (i.e. omitting the species present only on the East Africa mainland);

d) Class data sets: as for (b) and (c) but reduced to data sets for individual classes (e.g. Asteroidea, Echinoidea, etc..).

The output from the above analysis are a series of dendrograms (or similarity matrices) which highlight similarities between the provinces.

## RESULTS

### GENERAL

The faunal list of echinoderms found in the western Indian Ocean, and their distribution, is shown in Table 1. The detailed checklist showing the source for each species record for each province and details of the 58 sources used are presented in Appendix 2. A total of 419 species were recorded from the western Indian Ocean, with 354 species recorded from East Africa (including Madagascar) and 206 species recorded from the western Indian Ocean islands. Sections below describe the findings for each class (Crinoidea, Asteroidea, Ophiuroidea, Echinoidea and Holothuroidea) and provide details of species with doubtful records from the western Indian Ocean which have been excluded from the analysis. Details of synonyms adopted from the recent literature and applied to species recorded in the present study are also given in the Appendix 2. A summary of the findings are presented by Rowe & Richmond (1997) with illustrations of 119 species accompanied by general descriptions of the organisms with details on their habitats and wider distribution, and brief notes on a further 73 species encountered in the region.

The cluster analysis for the complete data set on species presence is shown in Figure 2a. The dendrogram reveals that the faunal assemblage of the western Indian Ocean islands differs from that of the East Africa mainland (including Madagascar), although both sub-provinces are clearly and strongly associated (at the 60 % similarity level) with each other and the adjacent Indo-Pacific provinces, but decreasingly associated with Hawaii, western India, the eastern Pacific and tropical Atlantic, and South Africa. The reasons for the difference between the two western Indian Ocean sub-provinces include the difference in overall species number between the two areas (354 and 206), and the number and proportion of endemics in each. Of the total of 107 endemic species found in the entire western Indian Ocean province, 81 occur exclusively on the mainland/Madagascar subprovince, with only 15 recorded from the islands. Analysis of the faunal data set based only on those species recorded from the western Indian Ocean islands (Figure 2b) reveals that the echinoderm assemblage of this sub-province is more strongly associated with the East Africa mainland than any other province, supporting the possibility that the large



Figure 2a. Bray-Curtis similarity matrix for the Echinodermata recorded in the western Indian Ocean.



Figure 2b. Bray-Curtis similarity matrix for the Echinodermata recorded from the western Indian Ocean islands only.

number of endemic species recorded from the mainland and Madagascar have caused the separation of these two sub-provinces observed in Figure 2a. Analysis of the data set based only on species found on the mainland (i.e. excluding species occurring on western Indian Ocean islands but not on East Africa or Madagascar) does not differ from Figure 2a, and is not included here.

### **Class CRINOIDEA**

A total of 19 species was found in the western Indian Ocean, of which seven are endemic to the region (see Table 1). Of the seven endemic species, only two are also found on the islands. Nine species (47 % of the total) are present in both sub-provinces of the western Indian Ocean and of the remainder, seven species occur at more than two provinces east of the Bay of Bengal. Compared to the central Indo-Pacific (e.g. Papua New Guinea) very few species were observed in the western Indian Ocean, and those which were most common, such as *Comanthus walhbergi* and *Stephanometra indica* were mostly encountered at night on shallow reefs, whereas in Papua New Guinea crinoids were conspicuous by their presence during the daytime.

The presence of only a few species, which include a large proportion of endemics (37 %) results in a weak association with the adjacent provinces and the cluster analysis performed on this class does not reveal any significant associations.

### **Class ASTEROIDEA**

A total of 58 species of asteroids was found to occur in the western Indian Ocean with 7 species endemic to the province (see Table 1). Twenty-nine species occur in both sub-provinces of the region, yet the diversity of species for each is very similar, with 54 species found to occur in East Africa and 46 on the western Indian Ocean islands. Twenty nine species (or 50 % of the total for the province) were found in both sub-provinces, and 32 species (55 %) occur at more than two provinces east of the Bay of Bengal.

The cluster analysis performed on the data set for all records reveals that the two sub-provinces within the western Indian Ocean are closely associated (at 70 %) as shown in

Figure 3, with a 63 % association with the adjacent provinces of the Lakshadweep-Chagos group, Sri Lanka-Bay of Bengal and the central Indo-Pacific and west Pacific provinces. A weaker association with the Arabian Sea and Red Sea is found, followed by less significant association with the outlying provinces considered. Analysis of the faunas present only on the islands, and only on the mainland do not differ from the associations shown in Figure 3.

**Notes:** Additional species which were not included in the analysis include an intertidal species of *Asterina* collected from Zanzibar which awaits further examination. This genus is troubled by taxonomic uncertainties and the species may prove to be *A. limboonkengi* G.A. Smith, recently accepted as a valid species in southern China (Liao & Clark, 1995). Similarly, the species *Patiriella exigua* (Lamarck), closely related to members of the genus *Asterina*, is thought to comprise more than one species (see Clark & Rowe, 1971) and further examination of material from the western Indian Ocean (e.g. Clark & Courtman-Stock, 1976; Walenkamp, 1990) is required to determine its true identity.

Records for the goniasterid *Stellaster equestris* (Retzius) reported in Clark & Rowe (1971) for the western Indian Ocean have subsequently been accepted by Clark (1993) as having been based on mistaken identification for the valid species *Stellaster childreni* Gray which is included in this study.

### **Class OPHIUROIDEA**

One hundred and thirty-two species of brittlestars were found to occur in the western Indian Ocean (see Table 1). The mainland assemblage includes 123 species while the islands were found to support only 60 species. Nevertheless, of the total, 51 species (39 %) were present in both sub-provinces. Thirty-three species are endemic to the region, the majority of which (25 species) were found to occur only on the mainland sub-province and only 3 on the islands, with 5 species found in both sub-provinces. Seventy-two species (i.e. 55 %) occur at more than one province east of the Bay of Bengal.

The similarity analysis supports observed difference between the two sub-provinces, clearly separating these from each other at the 42 % level of similarity (Figure 4a) and revealing a weak association of the islands' fauna with that of South Africa. When the faunal list is



Figure 3. Bray-Curtis similarity matrix for the Asteroidea recorded in the western Indian Ocean.

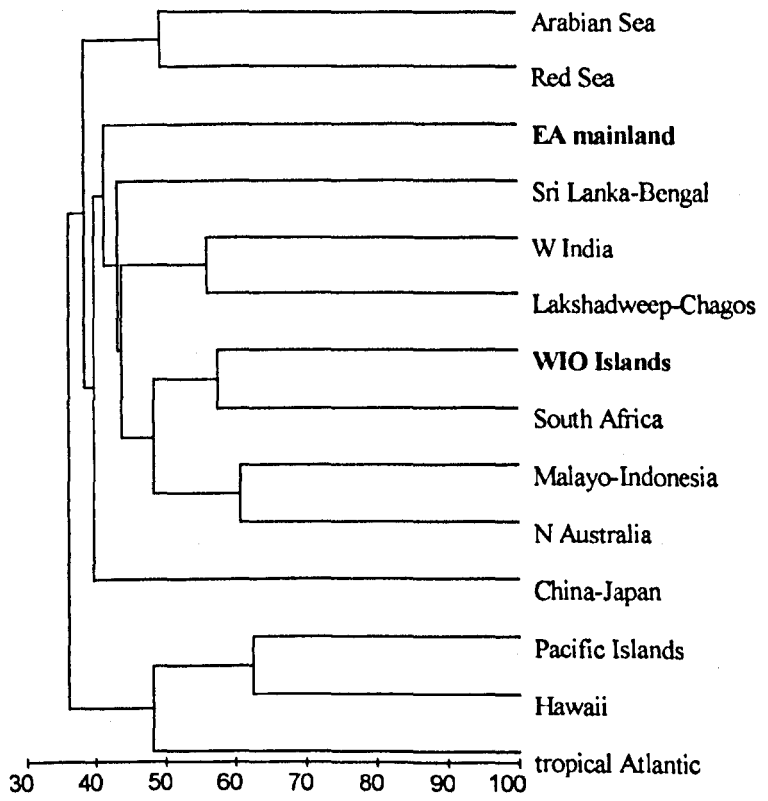


Figure 4a. Bray-Curtis similarity matrix for the Ophiuroidea recorded in the western Indian Ocean.



modified to include only those species present on the mainland, a stronger, but nevertheless still weak similarity (54%) with the island fauna is revealed, and a 50% association with the Red Sea (Figure 4b). When only the fauna present on the islands are treated in the same way, the association between the islands and the mainland is increased slightly (to 52 %) with a greater association shown for the assemblage from the islands with that for South Africa and the Arabian Sea (Figure 4c).

The disparity between the ophiuroid faunal assemblage of the islands and that of the mainland (including Madagascar) may reflect two major differences between the two sub-provinces. Firstly, the different physiographical attributes between these two sub-provinces, including the availability and diversity of suitable habitats, may contribute to the observed differences. Secondly, the relative difference in taxonomic research conducted on this group in the two areas may play a role. Of the 123 species found on the mainland (including Madagascar) 50 species were reported from Madagascar by Cherbonnier & Guille (1978) including 22 new species. The comprehensive treatise of this group by these authors has not been matched for any other part of the western Indian Ocean and is likely to contribute significantly to the observed differences.

**Notes:** Rowe & Gates (1995) suggest that *Ophiactis lymani* Ljungman and *Ophiactis macrolepidota* Marktanner-Turneretscher may prove to be junior synonyms for *Ophiactis plana* Lyman resulting in the species being of pantropical distribution.

The record of *Amphioplus (Amphiopsis) stenaspis* H.L. Clark by Cherbonnier & Guille (1978) is considered by Price & Rowe (1996) to be doubtful and is not included in this study. *Amphira ficta* Koehler also recorded in Madagascar by Cherbonnier & Guille (1978) is for depths between 100-500m and is similarly excluded. *Ophiarachnella infernalis* (Müller & Troschel) reported in Clark & Rowe (1971) is also excluded since, as they describe, the origins of the record from Zanzibar derive from H.L. Clark (1909, 1915a,b) who subsequently refers to it as an East Indies species H.L. Clark (1938, 1946).



Figure 4b. Bray-Curtis similarity matrix for Ophiuroidea fauna recorded from the East Africa mainland only (including Madagascar).



Figure 4c. Bray-Curtis similarity matrix for Ophiuroidea fauna recorded from the western Indian Ocean islands only.

## Class ECHINOIDEA

The above class is represented in the western Indian Ocean by 62 species. The mainland fauna comprises 52 species while that of the islands includes 48 species, with 38 species (i.e. 61 % of the total) common to both sub-provinces. Three species are found to be endemic to the region, two of which are found only on the islands. Forty-nine of the species present in the western Indian Ocean (79 %) are also encountered at more than one province east of the Bay of Bengal.

Data from the provinces of South Africa and the tropical Atlantic, which include, of the western Indian Ocean assemblage, only two species and a single pantropical species (*Echinoneus cyclostomus* Leske) respectively, were removed from the analysis to reduce distortion of the comparisons. The overall analysis associates the assemblage from the islands with that of the mainland at the 65 % similarity level (Figure 5a). The mainland assemblage is more closely associated with the depauperate fauna of western India and that of the Lakshwadeep-Chagos islands (both of which have relatively few species which are mostly among those found along the mainland and Madagascar shores). The fauna of the western Indian Ocean islands is shown to be slightly more closely related to that of the central Indo-Pacific than with the East African mainland. When the analysis is performed on the assemblage based on only those species which occur on the mainland sub-province, the association with the western Indian Ocean islands is shown to increase to about 70 %, as revealed in Figure 5b. Conversely, when the analysis is performed on the assemblage from the western Indian Ocean islands, the fauna of the latter is associated more closely with that of Sri Lanka-Bay of Bengal and the central Indo-Pacific provinces than with East Africa and Madagascar (Figure 5c). Nevertheless, the associations between the echinoderm fauna of the two sub-provinces in the western Indian Ocean are consistently greater than 65 %.

**Notes:** The cidariid urchin *Stereocidaris squamosa* Mortensen recorded from Durban and reported from the Saya de Malha Bank in Clark & Courtman-Stock (1976) as 'sd' (meaning shallow-deep) is thought to be a typographical error which should read 'vd' meaning 'very deep' (Rowe *pers. com.*) and is thus omitted from this study. A further species, the irregular urchin *Echinocyamus megapetalus* H.L. Clark. is reported in Clark & Rowe (1971) from the Mascarene islands as a doubtful record since the type locality is not known with certainty, and is thus omitted from this study.



Figure 5a. Bray-Curtis similarity matrix for Echinoidea recorded in the western Indian Ocean.



Figure 5b. Bray-Curtis similarity matrix for Echinoidea recorded from the East Africa mainland only (including Madagascar).



Figure 5c. Bray-Curtis similarity matrix for Echinoidea recorded from the western Indian Ocean Islands only.

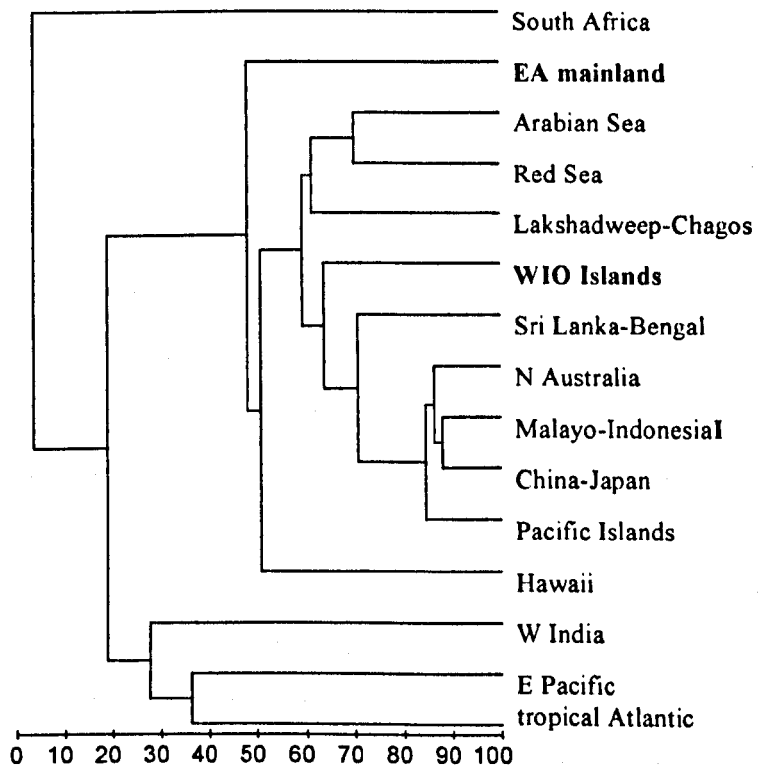


Figure 6a. Bray-Curtis similarity matrix for Holothuroidea recorded in the western Indian Ocean.

## Class HOLOTHIROIDEA

Holothurians are represented in the western Indian Ocean by 148 species, with 57 species (39 %) endemic to this area. The mainland (including Madagascar) supports the majority, with 136 species, while the islands were found to comprise only 51 species of holothurians. Thirty-nine species (26 %) are common to both sub-provinces of the western Indian Ocean and 70 species (47 %) are present at more than one province east of the Bay of Bengal.

The cluster analysis reveals a weak (48 %) association between the western Indian Ocean islands' fauna and that of the mainland, as shown in Figure 6a. Also evident is a stronger association of the islands' fauna with that of Sri Lanka-Bay of Bengal and the central Indo-Pacific provinces. The fauna of the mainland clusters with all the Indo-Pacific provinces from the Red Sea to Hawaii (and including the western Indian Ocean islands) at the 48 % level of similarity. When the analysis is conducted using only those species which occur on the mainland there are virtually no significant differences in the clusters as shown in Figure 6b. However, when a similar analysis is conducted using only those species which occur on the islands (i.e. omitting species present on the mainland but absent from the islands) the island fauna relates more closely to the mainland than to any other province (Figure 6c). These analyses confirm the observed differences between the fauna of the islands and that of the mainland which supports a greater overall number of species including many endemics.

The large number of holothurians recorded from the mainland can be attributed, as with the ophiuroids, to either the physiographical differences between the mainland and the western Indian Ocean islands, or to the unequal taxonomic effort conducted on this taxa in these two sub-provinces. As with the ophiuroids, the majority of the species recorded from the mainland sub-province are derived from a single study on Madagascar by Cherbonnier (1988) which accounts for a total of 74 records (i.e. 54 % of the total from the mainland sub-province) and which includes 47 species described by Cherbonnier, mostly from Madagascar. Surprisingly, though some of the species recorded by Cherbonnier (1988) are first published records for the western Indian Ocean, they are commonly seen elsewhere in the area (e.g. the holothurid *Personothuria graeffei* Semper is a common coral reef associate on Zanzibar reefs, as is the stichopodid *TheLANOTA anax* H.L. Clark).



Figure 6b. Bray-Curtis similarity matrix for Holothuroidea recorded from the East Africa mainland only (including Madagascar).



Figure 6c. Bray-Curtis similarity matrix for Holothuroidea recorded from the western Indian Ocean islands only.

**Notes:** *Bohadschia koellikeri* (Semper), *B. similis* (Semper), *B. tenuissima* (Semper) and *B. vitiensis* (Semper) are considered by Rowe & Doty (1977) to be synonyms of *B. marmorata* Jaeger, and further work is required to determine their validity according to Rowe & Gates (1995). *Holothuria (Theelothuria) hamata* Pearson recorded in Sloan *et al.* (1979) from Aldabra as doubtful is omitted from the present study. The record of *Holothuria (Thymiosycia) milloti* Cherbonnier recorded by Cherbonnier (1988) as a new species from northern Madagascar based on a single specimen from unspecified depth is also omitted. *Orbithyone megapodia* H.L. Clark was record from Aldabra by Hughes & Gamble (1977) and later regarded as a very doubtful record by Sloan *et al.* (1979) and is therefore also omitted from the faunal list.

The species *Holothuria scabra* Jaeger possibly comprises two species. Two forms appear to exist, with one form being consistently multi-coloured (with large reddish-brown patches interspersed with black and white, and a consistently flattened, white ventral base) and possessing Cuvierian tubules. The latter are absent from *H. scabra* though the spicules found are consistent with those described by Cherbonnier (1988) for *H. scabra* from Madagascar. The multi-coloured form has been collected from Zanzibar where it is common, and was observed in southern Madagascar. It is depicted in Rowe & Richmond (1997) where they have incorrectly labelled it as *Bohadschia subrubra*. Further analysis of a range of specimens is required to elucidate this inconsistency and determine whether or not this is a distinct species, as yet undescribed.



Table 1. The echinoderm fauna of the western Indian Ocean and its distribution.

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<b>CRINOIDEA</b>															
<b>COMASTERIDAE</b>															
<i>Capillaster multiradiatus</i> (L.)	+	+			+		+	+	+		+	+			+
<i>Comanthus wahlbergi</i> (J. Müller)	+	+	+	+	+		+			+	+	+			
<i>Comaster distinctus</i> (P.H. Carpenter)	+				+				+	+	+	+			
<i>Comaster multifidus</i> (J. Müller)		+					+		+	+	+	+			
<b>HIMEROMETRIDAE</b>															
<i>Heterometra africana</i> (A.H. Clark)	+			+		+									
<i>Heterometra delagoae</i> Gislén	+														
<i>Heterometra gravieri</i> A.H. Clark	+														
<i>Heterometra joubini</i> (A.H. Clark)	+														
<i>Heterometra madagascarensis</i> (A.H. Clark)	+														
<b>MARIAMETRIDAE</b>															
<i>Dichrometra flagellata</i> (J. Müller)	+		+						+	+	+	+			
<i>Lamprometra klunzingeri</i> (Hartlaub)	+	+		+	+										
<i>Stephanometra indica</i> (Smith)	+	+			+	+	+	+	+	+	+	+			
<b>COLOBOMETRIDAE</b>															
<i>Cenometra emendatrix</i> (Bell)	+	+													
<i>Decametra modica</i> A.H. Clark	+	+													
<i>Oligometra serripinna</i> (P.H. Carpenter)	+	+		+	+		+	+	+	+	+	+			
<b>TROPIOMETRIDAE</b>															
<i>Tropiometra carinata</i> (Lamarck)	+	+	+	+	+			+	+						
<b>ANTEDONIDAE</b>															
<i>Antedon arabica</i> A.H. Clark & A.M. Clark	+			+											
<i>Dorometra mauritiana</i> A.H. Clark	+	+					+								
<i>Iridometra malagasiensis</i> Marshall & Rowe	+														
<b>ASTEROIDEA</b>															
<b>LUIDIIDAE</b>															
<i>Luidia hardwicki</i> (Gray)		+		+				+	+	+	+				
<i>Luidia maculata</i> M. & T.	+	+	+	+	+		+	+	+	+	+	+			
<i>Luidia mauritiensis</i> Koehler		+													
<i>Luidia savignyi</i> (Audouin)	+	+			+			+	+				+		
<b>ASTROPECTINIDAE</b>															
<i>Astropecten antares</i> Doderlein	+		+												
<i>Astropecten granulatus</i> M. & T.	+		+						+	+					
<i>Astropecten hemprichi</i> M. & T.	+	+		+	+										
<i>Astropecten mauritianus</i> Gray		+													
<i>Astropecten monacanthus</i> Sladen	+			+	+		+	+	+	+	+	+			
<i>Astropecten polyacanthus</i> M. & T.	+	+		+	+		+	+	+	+	+	+	+	+	
<b>ARCHASTERIDAE</b>															
<i>Archaster angulatus</i> M. & T.	+		+						+	+	+	+			
<i>Archaster lorioli</i> Sukarno & Jangoux		+					+								
<b>GONIASTERIDAE</b>															
<i>Stellaster childreni</i> Gray	+			+	+			+	+	+	+				
<i>Stellasteropsis colubrinus</i> Macan	+			+											
<b>ASTERODISCIDIDAE</b>															
<i>Asterodiscides belli</i> Rowe	+	+				+		+							
<i>Asterodiscides tessellatus</i> Rowe		+													
<b>OREASTERIDAE</b>															
<i>Choriaster granulatus</i> Lutken	+	+			+		+		+	+	+	+			
<i>Culcita schmideliana</i> (Retzius)	+	+		+			+	+							
<i>Halityle regularis</i> Fisher	+			+					+	+		+			
<i>Monachaster sanderi</i> Meissner	+			+	+										

Table 1 (continued)

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Pentaceraster horridus</i> (Gray)	+	+													
<i>Pentaceraster mammillatus</i> (Audouin)	+			+	+										
<i>Pentaceraster tuberculatus</i> (M. & T.)	+			+	+										
<i>Protoreaster lincki</i> (de Blainville)	+	+		+				+	+	+					
<i>Protoreaster nodosus</i> (L.)	+	+						+	+	+	+	+			
<b>OPHIDIASTERIDAE</b>															
<i>Andora faouzii</i> (Macan)		+		+		+	+								
<i>Cistina columbiae</i> Gray		+					+			+		+			
<i>Dactylosaster cylindricus</i> (Lamarck)	+	+		+			+	+	+	+	+	+		+	
<i>Ferdina flavescens</i> Gray		+					+								
<i>Fromia milleporella</i> (Lamarck)	+	+		+			+	+	+	+	+	+			
<i>Fromia monilis</i> Perrier	+				+		+	+	+	+	+	+			
<i>Fromia nodosa</i> A.M. Clark		+					+	+				+			
<i>Gomophia egyptiaca</i> Gray	+	+			+		+	+	+	+	+	+			
<i>Leiaster coriaceus</i> Peters	+	+			+				+	+		+		+	
<i>Leiaster glaber</i> Peters	+							+						+	
<i>Leiaster leachi</i> (Gray)		+		+	+		+		+	+	+	+	+	+	
<i>Linckia guildingi</i> Gray	+	+		+			+	+	+	+	+	+	+	+	+
<i>Linckia laevigata</i> (L.)	+	+					+	+	+	+	+	+			
<i>Linckia multifora</i> (Lamarck)	+	+		+	+	+	+	+	+	+	+	+	+		
<i>Nardoa frianti</i> Koehler		+					+	+	+	+	+	+			
<i>Nardoa variolata</i> (Retzius)	+	+		+											
<i>Neoferdina offreti</i> M. & T.	+	+					+	+	+		+	+			
<i>Ophidiaster duncani</i> de Loriol	+	+								+					
<i>Ophidiaster hemprichi</i> M. & T.	+	+			+		+		+	+	+	+			
<i>Ophidiaster perrieri</i> de Loriol	+	+													
<i>Ophidiaster cribrarius</i> Lutken		+								+		+			
<i>Tamaria lithosora</i> H.L. Clark	+	+													
<i>Tamaria marmorata</i> (Michelin)	+	+													
<b>ASTEROPSEIDAE</b>															
<i>Asteropsis carinifera</i> (Lamarck)	+	+		+	+		+	+	+	+	+	+	+	+	
<i>Valvaster striatus</i> (Lamarck)		+						+	+	+		+	+		
<b>ASTERINIDAE</b>															
<i>Asterina burtoni</i> Gray	+	+		+	+										
<b>ACANTHASTERIDAE</b>															
<i>Acanthaster planci</i> (L.)	+	+		+	+	+	+	+	+	+	+	+	+	+	
<b>PTERASTERIDAE</b>															
<i>Euretaster cribrus</i> (v. Martens)	+	+		+	+			+	+						
<b>MITHRODIIDAE</b>															
<i>Mithrodia clavigera</i> (Lamarck)	+	+			+		+		+	+	+	+		+	+
<i>Thromidia seychellesensis</i> Pope & Rowe		+													
<b>ECHINASTERIDAE</b>															
<i>Echinaster callosus</i> v. Marenzeller	+	+			+			+	+	+	+	+			
<i>Echinaster purpureus</i> (Gray)	+	+		+	+			+							
<b>ASTERIIDAE</b>															
<i>Stolasterias calamaria</i> (Gray)	+	+	+							+	+	+			
<b>OPHIUROIDEA</b>															
<b>OPHIOMYXIDAE</b>															
<i>Ophiomyxa australis</i> Lutken	+	+		+	+			+	+	+	+	+			
<b>EURYALIDAE</b>															
<i>Euryale aspera</i> Lamarck	+							+	+	+	+	+			
<b>GORGONOCEPHALIDAE</b>															
<i>Astroboa clavata</i> (Lyman)	+	+		+	+		+	+		+	+				
<i>Astroboa nuda</i> (Lyman)	+			+	+				+	+	+	+			

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Astrocladus exiguus</i> (Lamarck)	+							+	+	+	+				
<i>Astroboa granulatus</i> H.L. Clark	+									+				+	
<i>Astrocladus tonganus</i> Doderlein	+													+	
<i>Astroglymma sculptum</i> (Doderlein)		+							+	+	+	+			
<b>OPHIACANTHIDAE</b>															
<i>Ophiacantha gracilis</i> (Studer)	+								+	+					
<b>AMPHIURIDAE</b>															
<i>Amphilycus scripta</i> (Koehler)	+			+	+			+				+			
<i>Amphiodia dividua</i> (Mortensen)	+	+													
<i>Amphiodia picardi</i> Cherb. & Gille.	+														
<i>Amphiodia microplax</i> Burfield	+			+	+						+	+			
<i>Amphioplus impressus</i> (Ljungman)	+	+							+	+	+				
<i>Amphioplus cyrtacanthus</i> H.L. Clark	+								+		+				
<i>Amphioplus heptagonus</i> Cherb. & Gille.	+														
<i>Amphioplus longuscutum</i> Cherb. & Gille.	+														
<i>Amphioplus lucidus</i> Koehler	+								+	+	+				
<i>Amphioplus margueritae</i> Cherb. & Gille.	+														
<i>Amphioplus parvitus</i> Cherb. & Gille.	+														
<i>Amphioplus polymorphus</i> Cherb.	+														
<i>Amphioplus spinosus</i> Cherb. & Gille.	+														
<i>Amphioplus thomassini</i> Cherb. & Gille.	+														
<i>Amphioplus titubantius</i> Cherb. & Gille.	+														
<i>Amphioplus hastatus</i> (Ljungman)	+	+		+	+					+					
<i>Amphioplus integer</i> (Ljungman)	+	+	+	+	+										
<i>Amphioplus laevis</i> (Lyman)	+			+	+				+	+	+	+			
<i>Amphioplus furcatus</i> Mortensen	+														
<i>Amphipholis littoralis</i> Cherb. & Gille.	+														
<i>Amphipholis loripes</i> Koehler	+								+		+				
<i>Amphipholis serrataspina</i> Cherb. & Gille.	+														
<i>Amphipholis sigillata</i> Cherb. & Gille.	+														
<i>Amphipholis squamata</i> (D. Chiaje)	+	+	+	+	+	+			+	+	+	+	+	+	+
<i>Amphiura acrisia</i> H.L. Clark	+									+					
<i>Amphiura capensis</i> Ljungman	+		+												
<i>Amphiura candida</i> Ljungman	+	+										+			
<i>Amphiura clausadae</i> Cherb. & Guille	+														
<i>Amphiura corona</i> Cherb. & Guille	+														
<i>Amphiura crispa</i> Mortensen	+			+											
<i>Amphiura dejectoides</i> H.L. Clark	+	+			+				+						
<i>Amphiura duncani</i> Lyman	+							+	+	+	+	+			
<i>Amphiura leptotata</i> H.L. Clark	+								+	+		+			
<i>Amphiura madecassae</i> Cherb. & Guille	+														
<i>Amphiura micra</i> H.L. Clark	+								+	+					
<i>Amphiura plantei</i> Cherb. & Gille.	+								+						
<i>Amphiura sexradiata</i> Koehler	+								+						
<i>Amphiura africana</i> (Balinsky)	+														
<i>Amphiura octacantha</i> (H.L. Clark)	+									+	+				
<i>Amphiura tenuis</i> (H.L. Clark)	+			+		+				+	+				
<i>Ophiocentrus asper</i> (Koehler)	+								+	+		+			
<i>Ophiocentrus crassuspinosus</i> Cherb. & Gille.	+														
<i>Ophiocentrus dilatatus</i> (Koehler)	+						+		+	+		+			
<i>Ophiocentrus inequalis</i> (H.L. Clark)	+								+	+	+				
<i>Ophiocentrus spinacutus</i> Cherb. & Gille.	+														
<i>Paracrocnida sacensis</i> (Balinsky)	+														

Table 1 (continued)

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<b>OPHIACTIDAE</b>															
<i>Ophiactis carnea</i> Ljungman	+		+	+	+										
<i>Ophiactis crosnieri</i> Cherb. & Gille.	+														
<i>Ophiactis delagoa</i> Balinsky	+														
<i>Ophiactis hemiteles</i> H.L. Clark	+									+					
<i>Ophiactis lymani</i> Ljungman	+														+
<i>Ophiactis modesta</i> Brock	+					+		+	+	+	+	+	+		
<i>Ophiactis macrolepidota</i> Mark. Turn.	+			+	+					+	+				
<i>Ophiactis plana</i> Lyman	+				+										
<i>Ophiactis picteti</i> (de Loriol)	+	+							+		+				
<i>Ophiactis savignyi</i> M. & T.	+	+		+	+	+	+	+	+	+	+	+	+		+
<i>Ophiactis versicolor</i> H.L. Clark	+	+			+										
<i>Ophiosphaera insignis</i> Brock	+	+							+	+		+			
<b>OPHIOTRICHIDAE</b>															
<i>Macrophiothrix demessa</i> (Lyman)	+	+		+	+		+		+	+	+	+	+		+
<i>Macrophiothrix hirsuta</i> (M. & T.)	+			+	+			+	+			+			
<i>Macrophiothrix longipeda</i> (Lamarck)	+	+					+	+	+	+	+	+			
<i>Macrophiothrix robillardi</i> (de Loriol)		+							+	+	+	+			
<i>Macrophiothrix nereidina</i> (Lamarck)	+	+						+	+	+	+	+			
<i>Macrophiothrix propinqua</i> Lyman	+	+		+	+		+	+	+	+	+	+			
<i>Ophiocnemis marmorata</i> (Lamarck)	+							+	+	+	+				
<i>Ophiomaza cacaotica</i> Lyman	+			+	+			+	+	+	+	+			
<i>Ophiothela danae</i> Verrill	+	+		+	+	+	+	+	+	+	+	+			
<i>Ophiothela tigris</i> Lyman	+	+													
<i>Ophiothela venusta</i> (de Loriol)	+			+					+	+					
<i>Ophiothrix comata</i> M. & T.	+								+						
<i>Ophiothrix echinotecta</i> Balinsky	+			+											
<i>Ophiothrix exigua</i> Lyman	+						+	+	+	+	+	+			
<i>Ophiothrix foveolata</i> Mark. Turn.	+						+	+	+	+		+			
<i>Ophiothrix picturata</i> de Loriol		+													
<i>Ophiothrix savignyi</i> (M. & T.)	+	+		+	+	+	+					+			
<i>Ophiothrix tricuspida</i> Cherb. & Gille.	+														
<i>Ophiothrix trilineata</i> Lutken	+	+		+	+		+	+	+	+	+	+			
<i>Ophiothrix tristis</i> de Loriol		+													
<i>Ophiothrix vitrea</i> Doderlein		+						+	+		+				
<i>Ophiothrix proteus</i> Koehler	+			+	+			+	+	+	+	+			
<i>Ophiothrix purpurea</i> Martens	+	+		+	+		+	+	+	+	+	+			
<b>OPHIOCOMIDAE</b>															
<i>Ophiarthrum elegans</i> Peters	+	+		+	+			+	+	+	+	+			
<i>Ophiarthrum lymani</i> de Loriol		+													
<i>Ophiocoma brevipes</i> Peters	+	+		+	+		+	+	+	+	+	+	+		+
<i>Ophiocoma dentata</i> M. & T.	+	+		+			+	+	+	+	+	+	+		+
<i>Ophiocoma doederleini</i> de Loriol	+	+							+			+			
<i>Ophiocoma erinaceus</i> M. & T.	+	+		+	+		+	+	+	+	+	+	+		+
<i>Ophiocoma pica</i> M. & T.	+	+		+	+		+	+	+	+	+	+	+		+
<i>Ophiocoma pusilla</i> (Brock)	+	+		+	+				+	+	+	+			
<i>Ophiocoma scolopendrina</i> (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		+
<i>Ophiocoma valenciae</i> M. & T.	+	+		+	+										
<i>Ophiocomella sexradia</i> (Duncan)	+	+		+	+		+	+	+	+	+	+	+		+
<i>Ophiomastix caryophyllata</i> Lutken	+	+							+	+	+	+			
<i>Ophiomastix koehleri</i> Devaney	+	+													
<i>Ophiomastix palaoensis</i> Murakami	+									+		+			
<i>Ophiomastix variabilis</i> Koehler	+	+			+		+		+	+	+	+			
<i>Ophiomastix venosa</i> Peters	+	+		+				+	+						

Table 1 (continued)

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Ophiopsila paucispina</i> Koehler	+														
<i>Ophiopsila timida</i> Koehler	+								+						
<b>OPHIONEREIDAE</b>															
<i>Ophionereis australis</i> (H.L. Clark)	+									+					
<i>Ophionereis degeneri</i> (A.H. Clark)	+													+	
<i>Ophionereis dubia</i> (M. & T.)	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Ophionereis hexactis</i> H.L. Clark	+									+					
<i>Ophionereis porrecta</i> Lyman	+	+	+		+		+	+	+	+	+	+	+		
<i>Ophionereis thryptica</i> (Murakami)	+											+			
<i>Ophionereis vivipara</i> Mortensen	+	+													
<i>Ophioneroides granum</i> Cherb. & Gille	+														
<b>OPHIODERMATIDAE</b>															
<i>Cryptopelta granulifera</i> H.L. Clark		+					+		+	+					
<i>Ophiarachna affinis</i> Lutken	+	+							+	+			+		
<i>Ophiarachna incrassata</i> (Lamarck)	+	+			+			+	+	+	+	+	+		+
<i>Ophiarachna robillardi</i> de Loriol		+						+							
<i>Ophiarachnella gorgonia</i> (M. & T.)	+	+		+				+	+	+	+	+			
<i>Ophiarachnella macracantha</i> H.L. Clark		+								+				+	
<i>Ophiarachnella septemspinosa</i> (M. & T.)	+	+					+	+	+	+	+	+			
<i>Ophiochaeta hirsuta</i> Lutken	+	+					+		+						
<i>Ophioconis cincta</i> Brock	+	+		+	+				+	+	+	+			
<i>Ophiopeza fallax</i> Peters	+	+		+	+	+			+						
<i>Ophiopeza spinosa</i> (Ljungman)	+	+		+	+		+		+	+	+	+	+		+
<b>OPHIURIDAE</b>															
<i>Ophiolepis cincta</i> M. & T.	+	+		+	+		+	+	+	+	+	+	+		
<i>Ophiolepis irregularis</i> Brock	+								+		+	+			
<i>Ophiolepis superba</i> H.L. Clark	+	+		+	+		+	+	+	+	+	+			
<i>Ophioplocus imbricatus</i> M. & T.	+	+		+		+		+	+	+	+	+	+		+
<i>Ophiura kinbergi</i> (Ljungman)	+	+		+	+	+		+	+	+	+	+	+		+
<b>ECHINOIDEA</b>															
<b>CIDARIDAE</b>															
<i>Eucidaris metularia</i> (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		+
<i>Phyllacanthus imperialis</i> (Lamarck)	+	+			+			+	+	+	+	+			
<i>Prionocidaris baculosa</i> (Lamarck)	+	+		+	+	+	+	+	+	+	+	+			
<i>Prionocidaris pistillaris</i> (Lamarck)	+	+	+	+											
<i>Prionocidaris verticillata</i> (Lamarck)	+	+		+			+	+	+	+	+	+	+		+
<b>ECHINOTHURIDAE</b>															
<i>Asthenosoma varium</i> Grube	+			+	+		+	+	+	+	+	+			
<b>DIADEMATIDAE</b>															
<i>Astropyga radiata</i> (Leske)	+	+		+	+		+	+	+	+	+	+	+		+
<i>Diadema savignyi</i> Michelin	+	+		+			+	+	+	+	+	+			
<i>Diadema setosum</i> (Leske)	+	+		+	+			+	+	+	+	+			
<i>Echinothrix calamaris</i> (Pallas)	+	+		+	+		+	+	+	+	+	+	+		+
<i>Echinothrix diadema</i> (L.)	+	+		+	+		+	+	+	+	+	+	+		+
<b>STOMOPNEUSTIDAE</b>															
<i>Stomopneustes variolaris</i> (Lamarck)	+	+		+		+	+	+	+	+	+	+			
<b>TEMNOPLEURIDAE</b>															
<i>Microcyphus maculatus</i> L. Agassiz		+													
<i>Microcyphus rousseaui</i> L. Agassiz	+			+	+					+					
<i>Salmaciella dussumieri</i> L. Agassiz	+	+		+	+			+	+	+	+	+			
<i>Salmacis bicolor</i> L.	+	+		+	+	+	+	+	+		+				
<i>Temnopleurus reevesi</i> (Gray)	+								+		+				
<i>Temnopleurus toreumaticus</i> (Leske)	+			+	+	+	+	+	+	+	+	+			
<i>Temnotrema siamense</i> (Mortensen)	+	+		+			+	+	+	+	+				

Table 1 (continued)

Taxa	East Africa	W/O islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<b>TOXOPNEUSTIDAE</b>															
<i>Cyrtechinus verruculatus</i> (Lütken)		+							+	+	+	+	+		
<i>Gymnechinus robillardii</i> (de Loriol)	+	+		+				+							
<i>Pseudoboletia indiana</i> (Michelin)	+	+						+	+	+	+	+	+		
<i>Toxopneustes pileolus</i> (Lamarck)	+	+		+	+			+	+	+	+	+	+		
<i>Tripneustes gratilla</i> (L.)	+	+	+	+	+		+	+	+	+	+	+	+		
<b>PARASALENIIDAE</b>															
<i>Parasalenia gratiosa</i> A. Agassiz	+	+					+		+	+	+	+			
<b>ECHINOMETRIDAE</b>															
<i>Colobocentrotus atratus</i> (L.)	+	+		+				+	+						+
<i>Echinometra mathaei</i> (de Blainville)	+	+		+	+	+	+	+	+	+	+	+	+		+
<i>Echinostrephus molaris</i> (de Blainville)	+	+		+	+	+	+	+	+	+	+	+	+		
<i>Heterocentrotus mammillatus</i> (L.)	+	+		+	+		+	+	+	+	+	+	+		
<i>Heterocentrotus trigonarius</i> (Lamarck)	+	+		+	+				+		+	+			
<b>ECHINONEIDAE</b>															
<i>Echinoneus abnormalis</i> de Loriol		+							+		+	+	+		
<i>Echinoneus cyclostomus</i> Leske	+	+		+			+	+	+	+	+	+	+		+
<b>CLYPEASTERIDAE</b>															
<i>Clypeaster fervens</i> Koehler	+	+		+	+			+	+		+				
<i>Clypeaster humilis</i> (Leske)	+			+	+	+		+	+	+		+			
<i>Clypeaster rarispinus</i> de Meijere	+			+	+	+	+	+	+						
<i>Clypeaster reticulatus</i> (L.)	+	+		+	+	+	+	+	+	+	+	+	+		
<b>FIBULARIIDAE</b>															
<i>Echinocyamus crispus</i> Mazetti	+	+		+	+		+	+	+	+	+		+		
<i>Echinocyamus grandis</i> H.L. Clark		+													
<i>Fibularia ovulum</i> Lamarck	+	+			+		+	+	+	+	+	+			
<i>Fibularia volva</i> A. Agassiz		+		+	+	+			+	+	+	+			
<b>LAGANIDAE</b>															
<i>Laganum depressum</i> Lesson	+	+		+	+		+	+	+	+	+	+			
<i>Laganum joubini</i> (Koehler)	+	+			+										
<b>ASTRICLYPEIDAE</b>															
<i>Echinodiscus auritus</i> Leske	+	+		+	+	+		+	+	+	+				
<i>Echinodiscus bisperforatus</i> Leske	+			+	+			+	+			+			
<b>ECHINOLAMPADIDAE</b>															
<i>Echinolampas alexandri</i> de Loriol		+		+	+			+	+			+			
<i>Echinolampas ovata</i> (Leske)		+			+			+	+	+					
<b>SPATANGIDAE</b>															
<i>Maretia planulata</i> (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		
<i>Pseudomaretia alta</i> (A. Agassiz)		+					+	+	+		+				
<b>LOVENIIDAE</b>															
<i>Lovenia elongata</i> (Gray)	+			+	+		+	+	+	+	+	+	+		
<i>Lovenia subcarinata</i> (Gray)	+							+	+		+				
<b>SCHIZASTERIDAE</b>															
<i>Diploporaster barbatus</i> Mort.	+														
<i>Diploporaster savignyi</i> (Fourtau)	+				+										
<i>Moira stygia</i> Lutken	+				+			+	+						
<i>Paraster gibberulus</i> (L. Agassiz)	+				+			+							
<i>Prymnaster investigatoris</i> Koehler		+						+							
<i>Schizaster lacunosus</i> (L.)	+	+			+		+		+	+	+	+			
<b>BRISSIDAE</b>															
<i>Brissopsis luzonicus</i> (Gray)	+				+	+	+	+	+	+	+	+	+	+	
<i>Brissus latecarinatus</i> (Leske)	+	+			+		+	+	+	+	+	+	+	+	
<i>Metalia dicrana</i> H.L. Clark		+							+	+	+	+			
<i>Metalia robillardii</i> (de Loriol)	+	+										+			

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Metalia spatagus</i> (L.)	+	+		+	+			+	+	+	+	+	+		
<i>Metalia sternalis</i> (Lamarck)	+	+		+	+			+	+	+	+	+	+		
<b>HOLOTHURIOIDEA</b>															
<b>HOLOTHURIDAE</b>															
<i>Actinopyga bacilla</i> Cherb.	+														
<i>Actinopyga bannwarthi</i> Panning	+			+	+					+					
<i>Actinopyga echinites</i> (Jaeger)	+	+		+	+		+	+	+	+	+	+			
<i>Actinopyga lecanora</i> (Jaeger)	+	+		+				+	+	+	+	+			
<i>Actinopyga mauritiana</i> (Q. & G.)	+	+		+	+	+	+	+	+	+	+	+		+	
<i>Actinopyga miliaris</i> (Q. & G.)	+	+			+			+	+	+	+	+			
<i>Actinopyga obesa</i> (Selenka)	+								+	+	+	+		+	
<i>Actinopyga serratidens</i> Pearson	+	+			+			+	+	+					
<i>Bohadschia argus</i> Jaeger	+	+					+	+	+	+	+	+			
<i>Bohadschia cousteaui</i> Cherb.	+				+										
<i>Bohadschia koellikeri</i> (Semper)	+	+											+		
<i>Bohadschia marmorata</i> Jaeger	+	+		+				+	+	+	+	+			
<i>Bohadschia mitsionensis</i> Cherb.	+														
<i>Bohadschia similis</i> (Semper)		+							+			+			
<i>Bohadschia subrubra</i> (Q. & G.)	+	+													
<i>Bohadschia tenuissima</i> (Semper)	+				+		+	+			+	+			
<i>Bohadschia vitiensis</i> (Semper)	+							+	+	+	+	+		+	
<i>Holothuria mammosa</i> Cherb.	+														
<i>Holothuria rigida</i> (Selenka)	+	+		+	+		+		+	+	+	+			+
<i>Holothuria atra</i> (Jaeger)	+	+		+	+		+	+	+	+	+	+	+		
<i>Holothuria edulis</i> Lesson	+			+	+		+	+	+	+	+	+	+		
<i>Holothuria pulla</i> Selenka	+								+			+			
<i>Holothuria duoturricula</i> Cherb.	+														
<i>Holothuria hawaiiensis</i> Fisher	+									+		+	+		
<i>Holothuria pardalis</i> Selenka	+	+		+	+	+	+	+	+	+	+	+	+	+	
<i>Holothuria verrucosa</i> Selenka	+	+							+	+	+	+	+		
<i>Holothuria albobusca</i> Cherb.	+														
<i>Holothuria fuscorubra</i> Théel		+		+						+	+		+		
<i>Holothuria leucospilota</i> (Brandt)	+	+		+	+	+	+	+	+	+	+	+	+	+	
<i>Holothuria albiventer</i> Semper	+				+		+		+	+	+	+			
<i>Holothuria fuligina</i> Cherb.	+														
<i>Holothuria martensi</i> Semper	+			+	+		+	+	+	+					
<i>Holothuria scabra</i> Jaeger	+	+		+	+		+	+	+	+	+	+			
<i>Holothuria fuscopunctata</i> Jaeger	+								+	+	+	+			
<i>Holothuria nobilis</i> (Selenka)	+	+		+	+		+	+	+	+	+	+			
<i>Holothuria whitmaei</i> Bell	+									+	+	+	+		
<i>Holothuria crosnieri</i> Cherb.	+														
<i>Holothuria difficilis</i> Semper	+	+			+		+	+	+	+	+	+	+	+	
<i>Holothuria excellens</i> (Ludwig)	+											+			
<i>Holothuria insolita</i> Cherb.	+														
<i>Holothuria samoana</i> Ludwig	+									+		+			
<i>Holothuria bacilla</i> Cherb.	+														
<i>Holothuria erinaceus</i> (Brandt)	+			+				+	+	+		+			
<i>Holothuria moebii</i> Ludwig		+						+	+	+	+	+			
<i>Holothuria parva</i> Krauss in Lampert	+	+		+	+			+							
<i>Holothuria spinea</i> Cherb.	+														
<i>Holothuria vittalonga</i> Cherb.	+														
<i>Holothuria cinerascens</i> (Brandt)	+	+		+	+		+	+	+	+	+	+	+		
<i>Holothuria flavomaculata</i> Semper	+				+			+	+	+	+	+			
<i>Holothuria granosa</i> Cherb.	+														

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Holothuria dofleini</i> Augustin	+								+	+	+	+	+		
<i>Holothuria fuscocinerea</i> Jaeger	+	+			+			+	+	+	+	+		+	
<i>Holothuria pervicax</i> Selenka	+	+		+	+		+	+	+	+	+	+	+		
<i>Holothuria olivaceus</i> Ludwig	+			+					+	+	+	+	+		
<i>Holothuria maculosa</i> Pearson	+	+										+			
<i>Holothuria arenicola</i> Semper	+	+		+	+	+	+	+	+	+	+	+	+	+	+
<i>Holothuria comusalba</i> Cherb. & Féral	+								+	+		+			
<i>Holothuria gracilis</i> Semper	+								+	+	+	+			
<i>Holothuria hilla</i> Lesson	+	+		+	+		+	+	+	+	+	+	+	+	
<i>Holothuria impatiens</i> (Forskål)	+	+		+	+		+	+	+	+	+	+	+	+	+
<i>Holothuria remollescens</i> Lampert		+			+			+		+					
<i>Holothuria strigosa</i> Selenka	+			+	+										
<i>Labidodemas pertinax</i> (Ludwig)	+						+		+	+	+	+			
<i>Labidodemas rugosum</i> (Ludwig)	+	+		+			+	+	+	+		+			
<i>Labidodemas semperianum</i> (Selenka)	+			+	+			+	+	+	+	+	+		
<i>Pearsonothuria graeffei</i> (Semper)	+				+		+		+	+	+	+			
<b>STICHOPODIDAE</b>															
<i>Neostichopus grammatus</i> (H.L. Clark)	+		+												
<i>Stichopus chloronotus</i> Brandt	+	+		+	+		+	+	+	+	+	+	+		
<i>Stichopus hermanni</i> Semper	+								+	+		+			
<i>Stichopus horrens</i> Selenka	+	+					+	+	+	+	+	+	+		
<i>Stichopus monotuberculatus</i> (Q. & G.)	+	+		+	+				+	+	+	+	+		
<i>Thelenota ananas</i> (Jaeger)	+	+					+		+	+	+	+	+		
<i>Thelenotaanax</i> H.L. Clark	+								+	+	+	+			
<b>PSOLIDAE</b>															
<i>Psolus appendiculatus</i> de Blainville		+													
<b>CUCUMARIIDAE</b>															
<i>Colochirus quadrangularis</i> (Lesson)	+							+	+	+	+				
<i>Cucumella decaryi</i> Cherb.	+														
<i>Koehleria unica</i> Cherb.	+														
<i>Plesiocolochirus cylindricus</i> (Semper)		+													
<i>Plesiocolochirus dispar</i> (Lampert)	+			+	+					+					
<i>Plesiocolochirus tantulus</i> (Cherb.)	+														
<i>Plesiocolochirus tessellera</i> (Cherb.)	+														
<i>Plesiocolochirus verrucula</i> (Cherb.)	+														
<i>Pseudocnella sinorbis</i> (Cherb.)	+		+												
<i>Pseudocnella sykion</i> (Lampert)	+		+												
<i>Pseudocolochirus violaceus</i> (Theel)	+				+			+	+	+	+				
<i>Psolidium ornatum</i> (Ed. Perrier)	+														
<i>Roweia frauenfeldi</i> (Ludwig)	+		+												
<i>Trachythone crucifera</i> (Semper)	+	+	+	+	+				+						
<b>SCLERODACTYLIDAE</b>															
<i>Afroccumis africana</i> (Semper)	+	+		+			+	+	+	+	+	+			
<i>Cladolabes acicula</i> (Semper)		+				+		+	+	+	+	+	+		
<i>Cladolabes bifurcatus</i> (Deichmann)	+		+												
<i>Cladolabes pichoni</i> Cherb.	+														
<i>Globosita murrea</i> Cherb.	+														
<i>Ohshimella ehrenbergi</i> (Selenka)	+			+	+	+	+	+			+				
<i>Ohshimella mauritiensis</i> Heding & Panning		+													
<b>PHYLLOPHORIDAE</b>															
<i>Athyone exila</i> Cherb.	+														
<i>Athyone maculispara</i> Cherb.	+														
<i>Parathyone incurva</i> Cherb.	+														
<i>Havelockia ferali</i> Cherb.	+														



Table 1 (continued)

Taxa	East Africa	W/O islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay.-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	tropic. Atlantic
<i>Havelockia turripinea</i> Cherb.	+														
<i>Havelockia versicolor</i> (Semper)	+							+	+	+	+				
<i>Hemithyone semperi</i> (Bell)	+					+		+	+	+					
<i>Lipotrabeza ambigua</i> Cherb.	+														
<i>Lipotrabeza incurva</i> Cherb.	+														
<i>Lipotrabeza ventripes</i> (Joshua & Creed)	+														
<i>Neothyonidium dissimilis</i> Cherb.	+														
<i>Phyllophorus anomalia</i> Cherb.	+														
<i>Phyllophorus contractura</i> Cherb.	+														
<i>Phyllophorus brocki</i> Ludwig	+							+	+	+					
<i>Phyllophorus oculus</i> Cherb.	+														
<i>Phyllophorus tenuis</i> Haacke		+													
<i>Selenkiella paradoxa</i> Cherb.	+														
<i>Stolus buccalis</i> (Stimpson)	+		+	+	+			+	+	+	+				
<i>Thyone avemusta</i> Cherb.	+														
<i>Thyone carens</i> Cherb.	+														
<i>Thyone comata</i> Cherb.	+														
<i>Thyone crebrapodia</i> Cherb.	+														
<i>Thyone curvata</i> Lampert	+				+										
<i>Thyone guillei</i> Cherb.	+														
<i>Thyone longicornis</i> Cherb.	+														
<i>Thyone sineturra</i> Cherb.	+														
<i>Thyone vadosa</i> Cherb.	+														
<i>Thyone venusta</i> Selenka	+				+					+				+	
<i>Thyonidiella exigua</i> Cherb.	+														
<i>Thyonidiella oceana</i> Heding & Panning	+	+							+					+	
<b>SYNAPTIDAE</b>															
<i>Anapta gracilis</i> Semper	+							+	+		+	+			
<i>Euapta godeffroyi</i> (Semper)	+	+			+			+	+	+	+	+	+	+	
<i>Leptosynapta geysereensis</i> Cherb.	+														
<i>Leptosynapta oblonga</i> Cherb.	+														
<i>Leptosynapta tantula</i> Cherb.	+														
<i>Opheodesoma grisea</i> (Semper)	+	+		+	+			+	+	+	+	+	+	+	
<i>Opheodesoma serpentina</i> (J. Müller)	+								+						
<i>Opheodesoma sinevirga</i> Cherb.	+														
<i>Patinapta crosslandi</i> Heding	+		+		+										
<i>Patinapta ooplax</i> von Marenzeller	+							+	+		+	+			
<i>Patinapta vaughani</i> Cherb.		+													
<i>Polyplectona kefersteini</i> (Selenka)		+			+				+	+	+	+	+	+	+
<i>Protankyra picardi</i> Cherb.	+														
<i>Synapta maculata</i> (Chamisso & Eysenhardt)	+	+		+	+			+	+	+	+	+	+	+	
<i>Synaptula mortenseni</i> Heding	+														
<i>Synaptula reciprocans</i> (Forskal)	+			+	+										
<b>CHIRODOTIDAE</b>															
<i>Chiridota eximia</i> Haacke		+													
<i>Chiridota rigida</i> Semper	+								+	+	+	+			
<i>Chiridota stuhlmanni</i> Lampert	+	+			+			+	+		+	+			
<i>Chiridota violacea</i> J. Müller	+	+						+	+						
<i>Polycheira rufescens</i> (Brandt)	+	+	+					+	+	+	+	+			
<i>Trochodota mira</i> Cherb.	+														
<i>Trochodota vivipara</i> Cherb.	+														

## DISCUSSION

In a study of the fauna of the Seychelles, Clark (1984) concluded by stating that 'it is clear that the echinoderm fauna of the western Indian Ocean is relatively limited in comparison to the rich fauna of the Malaysian/Indonesian area, having few characteristic species and only a small proportion of the widespread ones.' The findings of this study demonstrate that this is in fact no longer the case. Of the total of 419 echinoderm species reported in this study (compared to 151 in the above study by Clark), over 100 are considered to be endemic to the region and a large proportion of the fauna is comprised of widespread Indo-Pacific species.

The measure of the progress of research and knowledge of the echinoderm fauna of the western Indian Ocean is best initially gauged by comparing the findings of the present study with those in the monograph of Clark & Rowe (1971). A cautionary note which is appropriate at this point is that, as with all taxonomic studies, continuous progress is underway to elucidate confusing species, synonyms and describe new species, thus the science is automatically outdated the moment it is put to paper. Though no major restructuring of the systematics of the Indo-Pacific echinoderm fauna has been undertaken in the last 30 years, a few changes have been made to the status of some of the taxa. All these cannot be detailed here but it is sufficient that it be understood that analyses of the echinoderm fauna from any part of the Indo-Pacific over the last few decades will be slightly out of date with respect to the identity of a few species.

The comprehensive and invaluable work of Clark & Rowe (1971) is restricted to include species which occurred at depths shallower than 20 m. Nevertheless, despite the present study including a few records (less than 2 %) from depths to 100 m, the comparison is still a valid one.

Table 2 shows an increase over 29 years of 156 new species records for the region, equivalent to an increase of 59 %. This is in part attributed to the many new species and records by Cherbonnier & Guille (1978) for ophiuroids (50 species, including 22 new species) and Cherbonnier (1988) for holothurians (74 records, of which 47 were considered new species). Even if all the new species described by these authors are omitted (and there

are no valid reasons for doing so) the increase in the number of species known from the western Indian Ocean is 328 – an increase of 25 % on the Clark & Rowe (1971) findings.

Table 2. Comparison of the number of echinoderm species for each class from Clark & Rowe (1971) with that of the present study.

\* indicates overall percentage increase.

	W Indian Ocean Clark & Rowe (1971)	W Indian Ocean present study	% increase
Crinoidea	15	19	28.2
Asteroidea	52	58	12.0
Ophiuroidea	70	132	89.0
Echinoidea	58	62	7.0
Holothuroidea	68	148	120
Totals	263	419	59*

The increase in species richness shown in Table 2 is not wholly surprising. A single study of Aldabra echinoderms (Sloan *et al.*, 1979), only 10 years after the monograph data ceased to be collected, added 30 species to the records of the Seychelles based on the published data in Clark & Rowe (1971). The increase of the known species over this period is not exceptional to the western Indian Ocean. Pawson (1995) in a recent update of the echinoderm fauna of the Pacific islands found that the records of species diversity of that province had increased by 38 %, largely attributed to the detailed work around the New Caledonia reefs by Guille *et al.* (1986). An increase in the known total number of species from southern China waters from 298 in Clark & Rowe (1971) to 457 is shown by Liao & Clark (1995), resulting in an increase of 53 %, and Price (1982) demonstrated an increased species diversity for the Red Sea from the figure of 183 in Clark & Rowe (1971) to 231, an increased of 26 %.

While the present study did not undertake to establish which species are most widely distributed within the western Indian Ocean, and thus characteristic to this province, the number of species found in the two sub-provinces and the number of endemic species are worthy of further comment (see Table 3). The islands clearly support fewer species than the mainland and, of the total of 107 endemic species reported for the western Indian Ocean (approximately 25 % of the total), only 11 of these (3 %) are common to both the mainland (including Madagascar) and the western Indian Ocean islands. Reasons for these differences may be related to the massive differences in the sizes of the two sub-provinces and thus attributable to an 'area-effect', as well as to the unequal sampling efforts between

these two sub-provinces. The relatively high level of endemism supports the findings of Kay (1984) who, based on studies of molluscs, echinoderms and fish, recognises the Indian Ocean as a major area of endemism. Possible reasons for this endemism among the echinoderm fauna of the western portion of this Ocean will be considered below. In contrast, the recent update of the echinoderm fauna in the Pacific demonstrated that endemics comprise a virtually non-existent component of the fauna (Pawson, 1995), contradicting Kay's (1984) suggestion that the Pacific basin should also be a major area of endemism. Thandar (1989b) found that for southern Africa (south of the Tropic of Capricorn) the level of endemism accounts for 47 % of the echinoderm fauna (including deep water species). This is not surprising given the unique geographical position of southern Africa, benefitting as it does from temperate and tropical elements. Indeed, Thandar notes that 37 % of the southern African fauna is comprised of western Indian Ocean species. The recent study of the echinoderm fauna of the southern China and Japanese waters by Liao & Clark (1995) found that of the 457 species present in that province, 20 % were endemic.

Table 3. Summary of species richness and endemism in the western Indian Ocean. Abbreviations are EA: East Africa-Madagascar; WIO Is.: western Indian Ocean islands.

Taxa	EA totals	WIO Is. Totals	EA endemics	WIO Is. endemics	Endemics in common	Endemic totals
Crinoidea	18	10	5	0	2	7
Asteroidea	44	46	0	4	3	7
Ophiuroidea	123	60	25	3	5	33
Echinoidea	52	48	1	2	0	3
Holothuroidea	136	51	50	6	1	57
Totals	373	215	81	15	11	107

Differences among the classes and their broader presence within the western Indian Ocean were identified by examining the data in Table 1 and by the cluster analysis subsequently performed. The crinoid fauna, though sparse, was common to both sub-provinces, with about 50 % of the species shared between the islands and the mainland. Among the asteroids and the echinoids close association between the islands and mainland also exist. The two classes for which there has been extensive work, on Madagascar (the ophiuroids and holothurians), again show the greatest differences between the two sub-provinces, which cannot be commented on more at this stage without examination of the species and

the precise habitats from which they were recorded. Notwithstanding, of the 45 species found on the islands but not on the mainland (nor on Madagascar), 15 are endemic as shown in Table 3. An additional 5 species, the starfish *Archaster lorioli*, *Cistina columbiae*, *Fromia nodosa* and *Ophiaster cribrarius* together with the brittlestar *Ophiarachnella macracantha* were recorded only from the Lakshwadeep-Chagos groups, northern Australia and the Pacific islands. If the sites in northern Australia from which these are found are offshore, oceanic reefs, then all these species may be considered to be truly 'island species'.

In examining the overall diversity, direct comparisons of the western Indian Ocean fauna can be made with that of other provinces within or adjacent to the Indo-Pacific from where recent studies have been conducted. Table 4 shows that, as stated by Clark (1984) and many others, the Malay-Indonesia province is the richest as regards echinoderm diversity, though the western Indian Ocean fauna is by no means poor by comparison.

Table 4. Echinoderm diversity for provinces within and adjacent to the Indo-Pacific.

Sources: 1. Thandar (1989b); 2. Price (1982); 3. Clark & Rowe (1971); 4. Liao & Clark (1995); 5. Pawson (1995).

	WIO present study	Southern Africa <sup>1</sup>	Arabian Sea <sup>2</sup>	Red Sea <sup>2</sup>	Malay- Indonesia <sup>3</sup>	Northern Australia <sup>3</sup>	China Japan <sup>4</sup>	Pacific islands <sup>5</sup>
Crinoidea	19	17	15	18	91	46	62	40
Asteroidea	58	99	51	29	108	102	78	105
Ophiuroidea	132	124	77	49	157	128	131	103
Echinoidea	62	59	45	48	89	70	85	90
Holothuroidea	148	108	45	80	161	114	101	114
Total	419	407	233	224	606	460	457	452

A summary of the general distribution of the non-endemic species and their occurrence within broad geographical areas, based on distribution data presented in Table 1, is shown in Table 5. It can clearly be seen that the western Indian Ocean shares a greater proportion of its echinoderm fauna with the central Indo-Pacific than any other area, perhaps surprisingly more so than with the adjacent northern Indian Ocean where the similarity, though high (71 %) is lower than that for the central Indo-Pacific (84 %). Rowe (1985a), studying Australia's non-endemic echinoderm fauna found that 73 % (116 species) was shared with East Africa (including Madagascar), 55 % with the Mascarene islands (88 species) and 59 % (94 species) with the Seychelles. The present study, despite the increase in 49 non-endemic species, continues to support those findings. The questions which immediately arise are firstly, why is the non-endemic component of the western Indian Ocean fauna so closely related to the central Indo-Pacific, and secondly, how has that come about? The answers may include aspects related to the origin of the fauna (and its

distribution within the Tethyan Sea), the reproductive and larval dispersion strategy of each species in question, and the ocean currents present within the Indian Ocean. Equally possible is the alternative that the fauna of the northern Indian Ocean was at one time more diverse than present, and that the 41 non-endemic species which occur in the western Indian Ocean and in the central Indo-Pacific have subsequently become extinct from the northern borders of the Indian Ocean. Finally, anthropogenic factors (notably shipping) may contribute to aiding dispersal or extinction.

Table 5. Summary of the distribution of W Indian Ocean non-endemic echinoderm species. Percentage figures in parenthesis. Northern Indian Ocean includes the Arabian Sea, Lakshwadeep Is, Maldives and Chagos to Bay of Bengal; Central Indo-Pacific comprises Malay-Indonesia, northern Australia and the W Pacific Islands, excluding Hawaii.

Taxa	W Indian Ocean non-endemic fauna	Red Sea	Northern Indian Ocean	Central Indo-Pacific
Crinoidea	12	6 (50)	10 (83)	8 (67)
Asteroidea	51	23 (45)	43 (84)	35 (69)
Ophiuroidea	99	42 (42)	60 (61)	87 (88)
Echinoidea	59	41 (69)	49 (83)	53 (90)
Holothuroidea	91	47 (52)	61 (67)	79 (87)
Totals	312	159 (51)	223 (71)	262 (84)

Initially it is worth considering the reproductive strategies of the echinoderm fauna. Rowe (1985a) found surprisingly little to be known of the pre-metamorphic life spans of echinoderms and states that according to Thorson (1961) most have relatively short (4-6 weeks) pre-metamorphic lives. A little more has become known since then, and is mostly summarised in the volume on echinoderm reproduction edited by Giese *et al.* (1991) from which most of the findings below are derived.

Among a few species of Crinoidea free-swimming larvae last for a few days (Holland, 1991), yet these larvae are exclusively non-planktotrophic (i.e. are not capable of obtaining food from their environment) (Strathman, 1978; Breimer, 1978; Jablonski & Lutz, 1983). Within the Asteroidea, brooding species exist, as well as those with pelagic lives lasting 30 days (Chia & Walker, 1991), though no measure of the proportions within the class are given. The Ophiuroidea include viviparous species and those with relatively long-lived planktotrophic larvae, as well as those which cling to neuston (e.g. Panikkar & Prasad, 1954). As a group, however, they are considered to be largely weak swimmers, with brief life spans, incapable of long-distance dispersal (Thorson, 1961; Tommasi, 1967), though

some may survive for months (see Hendler, 1991; Scheltema, 1971). Brooding is nevertheless a more common feature of tropical species than those of cold waters (Hendler, 1991). Reproduction among the Echinoidea is equally confusing and lacking in generalities. The class was reviewed by Pearse & Cameron (1991) who found that 103 of 154 species (from the literature) undergo planktotrophic larval development and 51 are either lecithotrophic or brood their young. Most regular urchins have planktotrophic larvae and among the irregulars the ratio between those species with planktotrophic and lecithotrophic larva was approximately 50:50. These authors go on to conclude that "planktonic transport and survival, which are notoriously difficult to estimate, are too poorly known to advance simple generalities relating larval abundance and distribution to recruitment, however, glimpses are beginning to emerge". Finally, among the Holothuroidea the study by Smiley *et al* (1991) records that the families Holothuridae, Stichopodidae and Synaptidae have pelagic auricularia larvae, as do the apodids (e.g. *Polycheria rufescens*, *Synapta maculata*, *Phiodesoma grisea* and *Patinapta taiwanenseis* as found by Chao *et al.*, 1995). The pelagic period from spawning to settlement spans from two weeks to two months (McEuen, 1986). All shallow-water dendrochirotidids have lecithotrophic larvae (Smiley *et al.*, 1991; Chao *et al.*, 1995).

Eastern Africa is about 5,000 nautical miles from the Malay-Indonesia area and fed by the Equatorial Current at about 12° South. All year long the current flows from east to west, and though there is no detailed information of net transport rates, the data from the Admiralty Chart 4071 (Indian Ocean northern part), Leetmaa & Truesdale (1972) and Neumann (1968) produce figures ranging from 0.5-2.5 nautical miles per hour westward. Nothing is known of the deeper water currents. Assuming an echinoderm larva happened to find itself in this surface current, travelling at the maximum velocity of 2.5 nautical miles an hour, it would have to remain afloat and survive for 83 days (2 ½ months) before reaching the coastal waters of eastern Africa or Madagascar. With respect to what is known of the larval longevity described above, this means of arrival in eastern Africa can only be considered as a viable possibility for a few species of brittlestars, sea urchins and sea cucumbers, and then only if they are capable of feeding in the generally poorly productive mid-ocean waters. Starfish and crinoids would appear to rely on other factors. The non-endemic members of these two groups do commonly occur in the northern Indian Ocean (Table 4) and their

presence in the western Indian Ocean may be due to a stepping-stone dispersal across the northern Indian Ocean.

Anomalies associated with the distribution and larval behaviour of echinoderms do, however, exist. Yamaguchi (1977) invokes differences in behaviour patterns of planktonic larvae to account for differences in present-day distribution patterns of adult seastars. Larvae that display negative geotaxis represent widely distributed species e.g. *Acanthaster planci* while positively geotactic larvae represent species that are less widely distributed e.g. *Protoreaster nodosus*. The latter is, however, present in the western Indian Ocean and common across the Indo-Pacific. Pawson (1995) suggests that this may be worthy of further research, but points out that the viviparous brittlestar, *Amphiopholis squamata*, with no apparent means of dispersal, inexplicably has a cosmopolitan distribution pattern. This species is known to bear live young and may be one that relies wholly on drifting material. The brown alga *Sargassum* spp. is common throughout the Indo-Pacific and is often seen floating in large masses sometimes with several species of invertebrates and fish associated with it.

The possibility that a large proportion of the western Indian Ocean echinoderm fauna was present during the Tethyan period, as part of a widespread fauna, should not be considered lightly, even though it partly contradicts the conclusion by Ekman (1953) and Ladd (1960) who suggested that the Malay-Indonesia area was a centre of origin. Recent advances in biogeography, some from the fossil record, lend support to an ancient, wider echinoderm fauna. Rose & Olver (1979) describe a fossil echinoid (from a spine) in Australia dating from the Jurassic, which significantly extends the geographical range of early echinoids which were known from fossils elsewhere. Durkin (1979) describes how the Saleniinae (Echinoidea) rose from a Jurassic Tethyan stock which then diversified and became widely distributed at all depths during the Cretaceous. Following the Cretaceous-Tertiary boundary event, the sublittoral dwellers suffered near extinction, while species adapted to the warm mid-Atlantic ridge flanks survived. He suggests that it is likely that survival was limited to two main regions, namely the Caribbean and Indonesia, and that the populations in these regions today are relicts of the more widespread late Cretaceous communities. Similarly, Ghiold & Hoffman (1986), studying clypeasteroid echinoids of the Indo-Pacific, found that this region includes mostly local endemics and broadly distributed species that gradually



drop out across the longitudinal gradient. They found that clypeasteroid species distributions seem to represent a mosaic, with areas of endemism located not only in the Malay-Indonesia area, but also around Japan, Australia and western Indian Ocean, and with the ranges of non-endemic species overlapping to the highest degree in the centrally-located Malay-Indonesia area. Furthermore, they contend that the very high clypeasteroid species richness in the Malay-Indonesia focus may also be at least partly due to historical factors, such as the merging of SE Asia and Australian faunas, brought about by the northwards drift of the Australian plate in the Cenozoic. Finally, they suggest that the Malay-Indonesia area appears with respect to its very high diversity of clypeasteroids in the historical biogeographical perspective as a museum rather than a cradle; its clypeasteroid fauna includes apparently numerous immigrant groups, but not a single indigenous genus. Rowe (1985a) agrees that the Malay-Indonesia area is not 'a centre of origin' (Ekman, 1953) for an Indo-Pacific fauna, based on the extensive distribution patterns of at least 15 echinoderm species, which would have been possible prior to the final restriction of the Tethyan seaway. In an analysis of fish, molluscs and echinoderms, Kay (1984), suggests that the central Indo-Pacific area is one of accumulation rather than export of species.

The central Indo-Pacific region is characterised by thousands of islands of varying sizes and geology, a wide continental shelf and a rich diversity of coastal habitats. It was noted earlier that the geographical areas (provinces) defined in the present study differed greatly in size and habitat diversity and extent and therefore direct comparisons of echinoderm diversity cannot easily be made. Abele (1982) demonstrated that the overall area of the four large tropical regions he examined (eastern Atlantic, western Atlantic, eastern Pacific and Indo-West Pacific) accounted for 98 % of the variation in the number of crustacean species from these regions. He also found that shrimp species number in the West Indies was strongly related to the perimeter length of the islands. While estimates of the coastal areas for the Indo-Pacific provinces considered in Table 4 may be difficult to obtain, coastline length data are given in Table 7, together with species number for each of the provinces. Coastline length measurements for whole countries were mainly taken from Couper's (1989) *Times Atlas of the Oceans*, with portions of country coastlines forming part of provinces derived from estimates. Though these coastline length measurements may include an error of unknown dimension (but likely to be small, and equal to all data sets), they provide an opportunity to examine the presence of a relationship with echinoderm species number. A

plot of these data against the number of species is shown in Figure 7. The relationship between coastline length and echinoderm species number is given by the formula  $y = 97.062 \ln(x) - 523.21$ , with  $R^2 = 0.741$ , indicating that species number is a strong function of coastline length.

Table 7. Echinoderm species richness and coastline length for provinces within the Indo-Pacific. Sources: species number, from Table 4; Arabian Sea figure omits species recorded only from the Arabian Gulf; province coastline lengths based on Couper (1989) (see text); province codes relate to Figure 7.

	WIO	E Africa Madag.	WIO Islands	Arabian Sea	Red Sea	Northern Australia	China Japan	Malay- Indonesia
Province codes	1	2	3	4	5	6	7	8
Species no.	419	373	215	191	224	460	457	606
Coastline length (km)	11,612	10,754	858	6,058	5,730	12,800	18,844	89,654

Figure 7. Echinoderm species number against coastline length of Indo-Pacific provinces (see Table 7 for province codes).



Explanations for the relationship shown in Figure 7 between coastline length and species diversity are certain to include the influence that coastline length has on habitat heterogeneity which is known to have a strong affect on species diversity (Ricklefs, 1979; Williamson, 1988) and must itself be a function of coastline length. However, certain coastlines in the Indian Ocean exist which are likely to fail to conform to the above. The western shores of India for example, though lengthy, are predominantly of fine sediments and prone to high freshwater influences, not suited to echinoderms. To test the reliability of the relationship shown in Figure 7 more data are needed, especially within the coastline length ranges of 20,000-80,000 km for which species diversity must also be ascertained.

It was shown earlier that knowledge of shallow-water echinoderm diversity has increased for many parts of the Indo-Pacific since the publication by Clark & Rowe (1971). The figures used in the coastline length-species diversity analysis (Table 7 and Figure 7) include data from Clark & Rowe (1971) for northern Australia and Malay-Indonesia, which can be assumed to be outdated. When an increase of 20 % is applied to the species number for these two provinces and plotted, the value of  $R^2$  is reduced only slightly, from 0.741 to 0.725, reflecting the robustness of the function. Although it cannot be concluded from the relationship derived from this brief analysis that echinoderm species diversity is simply a function of the length of coastline sampled, the findings do indicate that further examination of this coastal perimeter effect may reveal interesting results.

In the final analysis, the echinoderm fauna of the western Indian Ocean is shown to be highly diverse, though with fewer species than the central Indo-Pacific, and supporting a large proportion of endemics. Of the non-endemics, the majority are widespread species, common to the northern Indian Ocean and to the central Indo-Pacific. Taxonomic uncertainties do exist with respect to the western Indian Ocean fauna, and further research is required to establish the true identity of a small component of the fauna.

On the issue of taxonomic uncertainties, Pawson (1995) discusses the “great difficulties in studying brittlestars, with problems of variability within and between populations, and in many cases, profound growth changes contribute to confusion”. Smith *et al.* (1994) found some value in a combined morphological and molecular approach to the classification of brittlestars, but there are still many difficulties to overcome. Similar difficulties were described by Clark (1907) with respect to foot-less holothurians where many genera and species are described from a single specimen or at most a few, and nothing is recorded of their life histories. He adds that “especially is this true of the various East Indies species. Furthermore, many species have been described from fragments, the anterior end of the body being missing, and consequently the species are based wholly on the calcareous particles, which is of course unfortunate; for it ought to be clearly understood that the calcareous spicules in the skin in members of the Synaptidae (and indeed all holothurians) are more or less variable, and while each species usually has its own distinct sort, yet there is a very wide range of diversity, even in one individual, and the exact conformity to a given

type must not be expected or looked for". Perhaps an additional approach which would assist in strengthening the validity of the less rigid species would be to consider tabulating the morphological features, as discussed by Mackie (1996) (see Chapter 3) for polychaetes; this technique involves tabulating measurements and descriptions of a series of morphological features for specimens of various age classes and from different areas, depths and habitats.

The biogeographical and evolutionary analysis may benefit from examining in more detail the distribution of genera and the presence of sympatric species, while field efforts should be concentrated in those areas which have not been well sampled to date. These include southern Tanzania, northern Moçambique, the Comoros islands and the Mascarene Ridge. Lastly, ecological studies are also needed in order to attempt to explain the commonly observed outbreaks of the sea urchins *Echinometra mathaei*, *Echinothrix calmaris*, *E. diadema*, *Diadema setosum* and the notorious crown-of thorns *Acanthaster planci*, and to attempt to establish the role played by human activities in affecting the observed distribution of the fauna.

## **CHAPTER 6**

### **GENERAL DISCUSSION**

## INTRODUCTION

At the turn of the century Gardiner (1907) stated that “.. of all oceanic areas none seems so little known in 1905 as that between India and Madagascar”. He then went on to lead the Percy Sladen Trust Expedition with H.M.S. ‘Sealark’ for 6 months, visiting mainly the western Indian Ocean islands, including Madagascar, from which numerous reports were produced. Despite these reports and those of later expeditions, in his landmark treatise of zoogeography, Ekman (1953) acknowledged that the “northern and western parts of the Indian Ocean are on the whole not so systematically investigated that their zoogeographical position can be determined.” For much of the marine biota this is no longer the situation. Various taxonomic groups have received attention in the last 50 years and there has been a considerable growth of information. *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands* (Richmond, 1997) provides a recent, brief and concise summary of the many taxa which contribute to the diversity of the flora and fauna of the shores and shallow seas of that region and Sheppard *et al.* (1992) present an overview of available information on the Arabian Seas and adjacent Arabian waters. In Richmond (1997) over 1,600 species are described and illustrated from photographs of living organisms, or recently preserved specimens. This volume also eliminates many confusing synonyms of some of the taxa (e.g. molluscs, echinoderms), highlights groups where more research is required and provides a basis for continued documentation of marine taxa for the region. Though this work is by no means complete, it provides for most taxa, for the first time, a description of the species diversity - the essential basic component for the study of biogeography of the region.

## BIODIVERSITY

A summary from the various taxonomic sections in Richmond (1997) allows an estimate of the overall diversity of the taxa in the region to be ascertained (see Table 1). These figures when represented graphically permit the contribution of each taxa to be visualised with ease (Figure 1). The marine taxa occurring in the intertidal and shallow seas of the western Indian Ocean comprise 10,094 species. The Mollusca dominate the fauna (45 %), with the Prosobranchia contributing the greatest proportion to the fauna as well as being the most speciose taxon. For many taxa the figures can be largely regarded as conservative estimates of the true diversity of species for the region. As was shown with the polychaetes (Chapter

3), the presence of 'cosmopolitan' species may result in fewer species recorded than actually exist. Conversely, the problem of synonyms, as found with the Prosobranchia and Bivalvia, may produce species diversity estimates which are exaggerated. Figures for mangroves, seagrasses, macroalgae, scleractinian corals, most of the decapod crustaceans, echinoderms and fish can be regarded with more confidence. In a study of the Hawaiian marine diversity Paulay (1997) found similar proportions among the taxa, with a total of over 7,000 species recorded from those islands. Molluscs comprised about 20 % of the total species, though Paulay's study includes such groups as Nematoda and Protista which are excluded from the present study.

Taxa	Minimum no. species	Taxa	Minimum No. species
Mangroves	10	Caridea	150
Seagrasses	12	Palinura	20
Macroalgae <sup>1</sup>	1,011	Thalassinidea	20
Porifera	200	Anomura	50
Scyphozoa	30	Brachyura	100
Ctenophora	20	Scaphopoda	10
Hydrozoa	100	Polyplacophora <sup>3</sup>	39
Octocorallia	300	Prosobranchia <sup>3</sup>	2,500
Ceriantharia	20	Opisthobranchia <sup>4</sup>	400
Actiniaria	30	Pulmonata	20
Corallimorpharia	10	Bivalvia <sup>3</sup>	667
Zoanthidea	5	Cephalopoda	20
Scleractinia	200	Echinoidea <sup>5</sup>	62
Antipatharia	10	Holothuroidea <sup>5</sup>	148
Platyhelminthes	100	Asterioidea <sup>5</sup>	58
Echiura	22	Ophiuroidea <sup>5</sup>	132
Sipuncula	50	Crinoidea <sup>5</sup>	19
Polychaeta <sup>2</sup>	300	Phoronida	5
Oligochaeta	10	Brachiopoda	5
Cirripedia	30	Bryozoa	500
Nemertea	59	Hemichordata	20
Amphipoda	300	Chaetognatha	50
Isopoda	100	Thaliacea	30
Stomatopoda	30	Ascidiacea <sup>6</sup>	100
Dendrobranchiata	10	Pisces	2,000

**Table 1.** Summary of the minimum estimated species number for the taxonomic groups of macroflora and macrofauna of the littoral and shallow sublittoral waters of the western Indian Ocean. Data from Richmond (1997) unless indicated. 1 - Macroalgae: total from the website database by Silva *et al.* (1996) reporting known species records from the countries of the western Indian Ocean (excluding South Africa); 2 - Polychaeta: data from this study (Chapter 3); 3 - Polyplacophora, Prosobranchia and Bivalvia: data from from this study (Chapter 4) 4 - Opisthobranchia: estimated from Yonow (*pers com*); 5 - Echinoderms: data from present study (Chapter 5); 6 - Ascidiacea: estimates for species numbers for Moçambique are 100 according to Monniot (*pers com*) who indicated that any estimates for this group are highly unreliable as they are so little known from this region.



**Figure 1.** Numbers of species of the major benthic taxa from the western Indian Ocean (figures from Table 1, excluding fish and other neritic groups).

## MAINLAND AND ISLANDS

Differences between the biodiversity of the western Indian Ocean islands (Mascarenes and Seychelles) and that of the East Africa mainland and Madagascar are apparent (see Chapters 4 and 5). Particularly noticeable are the differences in diversity of molluscs (and of echinoderms) and the reduced diversity of bivalves recorded from the islands compared to the mainland and Madagascar which may be attributed to habitat requirements. This is not surprising given the differences in the physical properties (size, geological history and location) as outlined in the Chapter 1. Differences in habitat diversity and extent are also great. For example, the islands lack any significant development of mangrove forests and estuarine conditions common along parts of the mainland and Madagascar shores. The islands, however, contribute to the overall diversity of the region acting as features which favour endemism (see Barnes & Hughes, 1982) and the remoteness of many of the smaller islands from human habitation (and possible degradation as increasingly found on mainland shores) may also create reservoirs of intact communities and thus sources from which export of larvae to neighbouring degraded areas can take place.

## BIOGEOGRAPHY AND ENDEMISM

Three phenomena affect almost all aspects of biogeography: sampling, dispersal and evolution (Williamson, 1988). With regard to the origins and geographical distribution of



the western Indian Ocean (WIO) marine taxa, discrepancies arising from regionally unequal sampling indicates that any figures and observed patterns should be interpreted with caution (Veron, 1995; Gosliner *et al.*, 1996; Paulay, 1997). The resulting paucity of reliable distribution records for many invertebrate taxa continues to be an intrinsic problem for the study of biodiversity (Myers, 1996) and is still applicable to most parts of the tropics. For many taxa, discussions of biogeography and origin cannot be undertaken since so little is known. For example, an analysis of the Indo-Pacific opisthobranch gastropod biogeography by Gosliner & Draheim (1996) entitled in part 'how do we know what we don't know ?' points out the lack of baseline data even from localities that were believed to be well known (Hawaii) from which they claim the known diversity of opisthobranchs has increased by 75 % in the last 3 years alone. Similarly Sheppard (1998) recommends, with respect to Indian Ocean corals, that the taxonomy still requires considerable revision despite the substantial improvements achieved recently, a condition which may also apply to many other groups in the Indian Ocean.

The summary from Richmond (1997) found that of the 1,500 fully aquatic taxa for which reliable distribution information could be ascertained, the majority (70%) occur at sites extending to the western Pacific Ocean (half of which occur beyond and into the central Pacific). Of the total, 15 % were found to be endemic to the WIO. These figures indicate only a broad pattern since they represent only the most common and typical coastal species. Notwithstanding, this serves as a general estimate which will be examined more closely below. A similar approach was taken by Gosliner & Draheim (1996) who, in considering levels of endemism of Hawaiian opisthobranchs, regard the figure of 43% (of all species known to occur only in Hawaiian waters) to be less reliable than the estimate of 4 % endemism derived from figures only for the larger, more conspicuous and better known species which they regard as less likely to be overlooked.

Earlier chapters in this thesis have examined the Polychaeta, Mollusca (Prosobranchia, Bivalvia and Polyplacophora) and Echinodermata in more detail. Of the collection of polychaetes from Zanzibar and Mafia islands, 29 % are found to occur at localities as far as the western Pacific and 22 % are regarded as 'cosmopolitan'. The expected diversity of shallow water polychaetes for the WIO was estimated to be at least 300 species, though the confused taxonomy of a substantial proportion of the class provides little confidence for

biogeographical statements. Being soft-bodied, little is offered from fossil evidence (Valentine, 1967), and though the tubes of some groups can form large components of fossils, species identification is extremely difficult.

The shelled Mollusca on the other hand, though highly numerous in terms of species numbers, have been studied intensively by equally numerous malacologists around the world, often in isolation, with the result that confusing synonyms plague a large proportion of the fauna. Of those families which have been reviewed recently (e.g. Conidae, Cypraeidae, Cassidae, Littorinidae, and Strombidae) the trend seems to be that most genera are widespread and small-scale endemism is apparent in areas of the Indo-Pacific. For the WIO endemism varies between groups from 0-15 %, and some of these may be explained by larval dispersability and habitat. For example, Vermeij (1972, 1973a,b) found that many snails inhabiting the high intertidal zone have strikingly narrow geographical ranges compared to species lower down the shore. Citing examples from Kenya he described how 6 of 13 species (46 %) of snails found high on the limestone cliffs were restricted to the Indian Ocean while from the lower shore only one of 14 species was endemic to the Indian Ocean, with a similar pattern found in the northern Red Sea. Studies from Barbados, Hawaii and the Red Sea show that upper-shore gastropods exhibit a reduced planktonic phase or none at all and that the dispersal stage limits the spread of the species as a whole (Lewis, 1960; Kay, 1967). Vermeij (1978) also noted that the inshore gastropods adapted to harsh, sand-scoured shores in Brazil demonstrate more endemism than those of the less harsh lower shore or occurring under boulders. Whether a similar pattern exists in the WIO remains to be determined.

The echinoderm data presented in Chapter 5 is considered to be relatively accurate and shows that ca. 25 % of the total of 419 species recorded from the WIO are endemic to this region (compare with figure for general taxa above derived from Richmond (1997)), and that 53 % occur at various sites eastwards to the central Indo-Pacific. Explanations for these patterns are associated with larval dispersal (across the Indian Ocean and along the northern shores), dispersal of adults on floating material and the presence of a widely-distributed ancient fauna.

Very little can be said at present for the distribution and species abundance of macroalgae, given the lack of comparative studies. This applies equally to the tropical Pacific (see Abbott, 1995). The Porifera have been investigated, and the WIO (in this case including the Red Sea and Arabian Sea) supports 683 species compared to 965 for the Malay-Indonesia area (Soest, 1994). Soest (1994) also found from his analysis of 411 Demospongiae that the WIO clusters closely with the Malay-Indonesia area. He suggests that for widespread genera (13 % of the total examined) their distributions are probably determined by historical and large scale geographic factors such as tectonic events and barriers associated with deep water, temperature and continental run-off.

As a result of the study of hermatypic corals of the Indian Ocean Rosen (1971) suggested that this region should be considered as a sub-province of the Indo-Pacific (based on the high coral diversities). However, the question as to whether the WIO constitutes a third centre (the other two being the Caribbean and the Indonesian-West Pacific) as a separate feature, or simply a western extension of the richly diverse belt that stretches from East Africa to the West Pacific could not be resolved until further studies in the western portion of the Indonesian area are conducted. Unlike the Pacific Ocean, the Indian Ocean does not reveal a pattern of decreasing concentric coral diversity levels radiating from the Malay-Indonesian region (Sheppard, 1998). What is found instead, is a band of high diversity stretching across the Indian Ocean, as proposed by Rosen (1971), with about half of the corals widespread in this ocean (from and including the Red Sea to South Africa and the western coasts of Australia and Malaysia), and only a few genera limited to the western extremes, though new species are continuing to be described (e.g. Riegl, 1995). Sheppard (1998) found that the WIO is relatively homogeneous (among corals) and that the observed limited distribution of a high proportion of species accounts for the strong grouping of Madagascar with the Mascarene islands and Aldabra. He also found evidence for a substantial substructure of differential species distributions which is important in biogeographic and conservation considerations, and noted that the mainland sites of Moçambique, Tanzania and Kenya are likely to have a closer similarity with the central and WIO areas once they have been sampled more thoroughly. Interestingly, one genus endemic to the Arabian Sea, *Parasimplastrea* is found only as fossils in Papua New Guinea (Sheppard *et al.*, 1992), providing yet another example of a more widespread relict fauna, in

this case, one which survived in the Arabian Sea and disappeared from the central Indo-Pacific region.

Among the Crustacea, the available evidence of high diversity of species for the WIO with a proportion of endemics is not clear, but may be largely related to larval dispersal. Among the Grapsidae and Ocypodidae from Tanzania and Madagascar, Hartnoll (1975) found a very limited level of endemism, with the majority of species occurring in both these sites and in the Malay-Indonesia area. Hartnoll suggests that larval transport across the Indian Ocean is a more likely explanation than movement across the northern borders of the Indian Ocean. Hogarth (1988) examined southern Oman porcellanids and pagurideans and observed a degree of heterogeneity in species distributions which does not appear to relate closely to larval dispersal ability. Myers (1997) reasons that crustaceans with planktonic larvae have the greatest potential for extending their distribution, yet for the development of endemism, colonization of new areas must be followed by a cessation of gene flow from donor regions to the new area for a sufficient period of time to allow genetic isolation mechanisms to act. If this is the case, and larvae of the widespread species are constantly being supplied, the lack of endemism among crabs and other crustaceans with long planktonic life periods (e.g. lobsters of the genus *Panulirus*) can be partly explained. Among caridean shrimps Bruce (1984) reported that of the 133 carideans found on the Seychelles, 16.5 % were endemic to the WIO and the remainder extended to the Malay-Indonesia area and beyond. However, Bruce (1998) later concluded that for the many coral-associated pontonine shrimp species (which generally account for about half of the caridean fauna) the distributions are still not well known, due largely to the haphazard nature of collecting activities. For crustaceans with short larval stages, or none at all, the picture does appear to be somewhat different. Of the Amphipoda (which brood their young), Madagascar supports 9 % endemism of genera and 45 % endemism among species (Ledoyer, 1982, 1986). The same is true for freshwater decapods where endemism is extremely high (Ng, 1986).

The fossil record provides evidence of invertebrate species with long-range larval dispersal such as *Cymatium nicobaricum* and *Thais haemastoma* which date back to the Oligocene and Miocene respectively, as well as inshore gastropod species with crawling larvae (and thus reduced powers of dispersal) (see Scheltema, 1977). This suggests that larval strategy

does not necessarily favour long-term survival of species. Both of the former gastropod species are found in the WIO. Pearse & Barksdale (1986) conclude that most species of invertebrates along the WIO shores have long-range dispersal larvae and are widespread throughout the Indo-Pacific region.

It would appear that from the above, with between 50-70 % of the WIO biota common to the central Indo-Pacific and beyond, widespread species do have extended larval lives. However, although the implication that those invertebrate species which are endemic to the WIO have short-range dispersal larvae appears to be true for amphipods and some upper shore gastropods (as discussed above), this generalisation does not seem to apply to the echinoderms. For other faunal groups insufficient evidence is currently available. Myers (1992) concludes that despite the ubiquity of planktonic larvae amongst inshore marine animals and their dispersal potential, there does not seem to be a close correlation, in general, between the immigration rates of larvae and subsequent colonization. Finally, human-facilitated dispersal of species, either accidentally by shipping, or deliberate, apart from inviting potentially severe ecological and economic impacts (see Paulay, 1997), contributes to the general biogeographic picture of species distribution for some taxa.

Analysis of the coral reef fish of the entire Indo-Pacific confirms that the Indo-Australian Archipelago is a 'centre' of diversity with over 3,000 species of shorefish (Lieske & Myers, 1994). They also found that within the WIO, the Mascarene islands are characterised by a significant endemic element, and that species diversity in this region, although high, is less than that of the central Indo-Pacific. These observations cannot be wholly explained by larval dispersal as for some reef fish the relationship between larval longevity and observed distribution of adults is not obvious. For example, the larval duration of the damselfish (Pomacentridae) common on coral reefs is 1-39 days (Wellington & Victor, 1989) but their observed species distribution does not correlate with planktonic duration (Thresher *et al.*, 1989). A similar situation is also found for angelfish (Pomacanthidae) (Thresher & Brothers, 1985) suggesting some other mechanisms are involved. For Hawaiian shorefish Randall (1995) reported 24.3 % endemism and related the presence of some of the fauna to the geological history of the Pacific Plate rather than larval distribution.

From the WIO some taxa clearly do not show endemism (e.g. giant clams *Tridacna*) while endemism among many other groups does exist. An overall estimate for WIO endemism of about 15 % (as noted above) may prove realistic although further taxonomic and biogeographical work is required, not only within the WIO but also throughout the Indo-Pacific to refine the observed levels of endemism. The well known coelocanth (*Latimeria chalumnae*, Smith 1938) was considered endemic to the south-western Indian Ocean (Smith & Heemstra, 1995) until the discovery in July 1998 of this species from 100-150m depth off north Sulawesi (Indonesia), 10,000 km from its known population around the Comoros Islands (see Erdmann *et al.*, 1998). This discovery has major biogeographical and conservation implications for the fish, but also serves as a clear reminder to biogeographers of the continued need to give observed biogeographic patterns only as much confidence as a knowledge of the sampling efforts invested in providing the data on which patterns are based.

The question as to whether the central Indo-Pacific (encompassing the coastal waters of the Philippines, Indonesia and Papua New Guinea) should be considered as the 'centre and focus' from which other subregions of the Indo-Pacific are recruited as Ekam (1953) suggests has been examined by many (e.g. Ladd, 1960; Taylor, 1971; Briggs, 1974; Abele, 1982; Woodland, 1983; Kay, 1984; Rowe, 1985; Donaldson, 1985 and Emerson, 1990). A summary of these and other studies suggests that this region, undoubtedly the richest in species, has achieved this condition by maintaining a rich biodiversity derived from a widespread, warm, Tethyan Sea biota which was present up to the Late Eocene (Vermeij, 1978). At the same time further speciation occurred in some taxa and additional taxa from neighbouring areas were accumulated. An example of the former resulted from the drying of the Sunda Shelf in Indonesia during the Pleistocene which effectively separated the Pacific from the Indian Ocean. This in turn promoted speciation in a number of mangrove-associated taxa which after the post-glacial sea-level rise contributed to enhance the diversity of these groups (Vermeij, 1978). All other regions within the Indo-Pacific support less diversity. Examples of these less diverse areas include the central Pacific islands, the Red Sea and the WIO, each of which demonstrate high levels of endemism (see Gosliner *et al.*, 1996). These areas are likely to have begun with some of the widespread Tethyan biota, lost part of this during sea-level and other tectonic changes, and over time, accumulated additional species from the Malay-Indonesian region (which may have either existed since

Tethyan times or developed subsequently) as well as developed their own unique biota. In Chapter 5 the relationship between coastline length and echinoderm species diversity is examined and analyses of this type of relationship may provide further interesting, and controversial insights.

## FUTURE RESEARCH

To solve some of the above remaining queries regarding biodiversity and biogeography, further work should focus on the taxonomy and larval biology of the 'cosmopolitan' species (notably among polychaetes); compare the larval biology of widespread species with that of endemic; and evaluate the existence of sympatric (sister) species among the widespread and endemic fauna. To resolve differences between recent species establishment and those of Tethyan origin, a comparison of the biota from equivalent habitats from recently formed oceanic islands (e.g. Mauritius, Réunion) with that of older oceanic islands (e.g. those of the Seychelles granitic group) is required. Suitable studies would include the examination of isopod taxa caught using baited traps, or the diversity of butterfly fish (Chaetodontidae) using visual observations on coral reefs.

The mangroves, seagrasses, macroalgae, scleractinian corals, most of the decapod crustaceans, echinoderms and fish are taxonomic groups which can be considered to be reasonably well known. These account for about 50 % of the total estimate of species of shallow-water taxa for the region (see Table 1). For the remainder, further taxonomic work is a priority. Future studies on all taxa in the WIO will undoubtedly reveal new records for the region as well as new species. The elimination of synonyms among the mollusc fauna and other groups requires particular attention. The development of molecular genetic approaches will undoubtedly assist in such taxonomic and biogeographic studies. Genetic analyses have already been undertaken in parts of the world and are beginning to resolve the degree of divergence between species, the differences in populations of the same species, the possible origins of taxa, and act as a complimentary tool to traditional taxonomic methods based on morphological characters. Current examples include the studies on seaweeds (e.g. Pakker *et al.*, 1996), fiddler crabs *Uca* (Levinton *et al.*, 1996), the coconut crab *Birgus latro* (Lavery *et al.*, 1996), the mangrove crab *Scylla serrata* (Keenan

*et al.*, 1998); sea urchins (Palumbi, 1996), goatfish of the species complex *Mulloidichthys* (Stepien, 1994) and billfish (Graves & McDowell, 1995).

Physical oceanography, in particular with respect to the transport of larvae from different parts of the region and from adjacent areas should also be investigated, as should areas within the region which have not been sampled to date (e.g. Pemba Island coral reefs and the Pemba Channel, southern Tanzania, Comoros, NE Moçambique, eastern Madagascar, and the Mascarene Ridge). The effects of human development on the diversity of marine life in the WIO must also form an important focus for research in the future, aiming to document both the impact and its amelioration.

Finally, there is the need to revise species checklists for the region by making them widely available to specialists and thus continuing to catalogue biodiversity. The production of freely-distributed reports is currently being undertaken by SIDA (Swedish International Development Agency) (e.g. for mangroves, seagrasses and corals) using CD formats. This will greatly assist in the dissemination of information and will be expanded to cover other taxa. In addition, world, or regional, species lists and distribution now exists on the Internet for some groups (e.g. University of California Berkley for macroalgae for the Indian Ocean; Smithsonian Institution for freshwater and marine isopods of the world) making the information easily available globally. Chace (1969, in Abele, 1972) stated that "The time is far in the future when a tropical marine ecologist can identify the components of an ecosystem or a food chain from his handy pocket guide". It is hoped that *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands* (Richmond, 1997) goes some way to achieving that aim.



## **BIBLIOGRAPHY**

- Abbott, I.A. 1995. The state of systematics of marine algae in tropical island Pacific. p. 25-38. In: Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West centre, Honolulu, Hawaii.
- Abbott, R.T. 1959. The family Vasidae in the Indo-Pacific. *Indo-Pacific Mollusca*. 1 (1):15-32.
- Abbott, R.T. 1960. The genus *Strombus* in the Indo-Pacific. *Indo-Pacific Mollusca*. 1 (2): 33-144.
- Abbott, R.T. 1961. The genus *Lambis* in the Indo-Pacific. *Indo-Pacific Mollusca*. 1 (3):147-174.
- Abbott, R.T. 1967. *Strombus (Canarium) wilsoni* new species from the Indo-Pacific. *Indo-Pacific Mollusca*. 1 (7):455-456.
- Abbott, R.T. 1968. The helmet shells of the world (Cassidae). Part 1. *Indo-Pacific Mollusca*. 2 (9): 15-202.
- Abbott, R.T. & Dance, S.P. 1982. *Compendium of Sea Shells*. E.P. Dutton Inc. 411 pp.
- Abele, L.G. 1972. Comparative habitat diversity and faunal relationships between the Pacific and Caribbean Panamanian decapod Crustacea: a preliminary report, with some remarks on the crustacean fauna of Panama. *Bull. Biol. Soc. Wash.* 2: 125-138.
- Abele, L.G. 1982. Biogeography. p. 242-305. In: Abele, L.G. (ed.) *The Biology of Crustacea, Volume 1. Systematics, the Fossil Record and Biogeography*. Academic Press.
- Augener, H. 1913. Polychaeta Errantia. In: Michaelsen, W. & Hartmeyer, R. (eds.) *Die Fauna Sudwest-Australiens*. Jena 4: 65-304.
- Augener, H. 1914. Polychaeta Sedentaria. In: Michaelsen, W. & Hartmeyer, R. (eds.) *Die Fauna Sudwest-Australiens*. Jena 5: 1-170.
- Augener, H. 1926. Ceylon-Polychaeten. *Z. Naturw. Jena* 62: 435-472.
- Bailey-Brock, J.H. 1995. Polychaetes of Western Pacific Islands: A Review of their Systematics and Ecology. In: Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West centre, Honolulu, Hawaii.
- Baissac, J. de B., Lubet, P. & Michael, C. 1962. Les biocoenoses benthiques littorales de l'île Maurice. *Rec. Trav. Stn. Mar. Endoume-Mars. Fasc. Hors. Ser. suppl.* 25 (39): 253-291.
- Baker, A.N. & L.M. Marsh. 1976. The rediscovery of *Halityle regularis* Fisher (Echinodermata: Asteroidea). *Rec. West. Aust. Mus.* 4 (2): 107-116.

- Banse, K. 1959. On marine polychaeta from Mandapam (South India). *J. Mar. Biol. Ass. India* 1 (2):165-177.
- Barnard, K.H. 1958. Contributions to the knowledge of South African marine Mollusca. Part I. Gastropoda: Prosobranchiata: Toxoglossa. *Ann. S. Afr. Mus.* XLIV: 73-163.
- Barnard, K.H. 1959. Contributions to the knowledge of South African marine Mollusca. Part II. Gastropoda: Prosobranchiata: Rhachiglossa. *Ann. S. Afr. Mus.* XLV: 1-237.
- Barnard, K.H. 1963a. Contributions to the knowledge of South African marine Mollusca. Part IV. Gastropoda: Prosobranchiata: Rhipidoglossa, Docoglossa, Tectibranchiata. Polyplacophora. Solenogastres. Scaphopoda. *Ann. S. Afr. Mus.* XLVI: 201-360.
- Barnard, K.H. 1963b. Contributions to the knowledge of South African marine Mollusca. Part III. Gastropoda: Prosobranchiata: Taenioglossa. *Ann. S. Afr. Mus.* XLVII: 1-199.
- Barnard, K.H. 1964. Contributions to the knowledge of South African marine Mollusca. Part V. Lamellibranchiata. *Ann. S. Afr. Mus.* XLVII: 361-593.
- Barnard, K.H. 1969. Contributions to the knowledge of South African marine Mollusca. Part IV. Gastropoda: Prosobranchiata: Supplement. *Ann. S. Afr. Mus.* XLVII: 595-661.
- Barnes, R.S.K. & Hughes, R.N. 1982. *An Introduction to Marine Ecology*. Blackwell, Oxford. 339 pp.
- Berry, L.E. 1954. Africa's rarest cowries. *J. E. Afr. Nat. Hist. Soc.* 22 (95): 82-85.
- Bharati Gowsami, B.C. 1992. Marine fauna of Digha Coast of West Bengal, India. *J. Mar. Biol. Ass. India* 34 (1-2): 115-137.
- Biggs, H.E.J. 1958. Littoral collecting in the Persian Gulf. *J. Conch. Lond.* 24: 270-207.
- Biggs, H.E.J. 1959. Marine Mollusca of Masirah I., South Arabia. *Arch. Mollusckenk* 99: 210-207.
- Biggs, H.E.J. 1973. The Marine Mollusca of the Trucial Coast, Persian Gulf. *Bull. Brit. Mus. Nat. Hist. Zoology* 24: 343-421.
- Bosch, D. & Bosch, E. 1982. *Seashells of Oman*. Longman Group, London. 206 pp.
- Bosch, D. & Bosch, E. 1989. *Seashells of Southern Arabia*. Motivate Publishing, UAE. 95 pp.
- Boshoff, P.H. 1965. Pelecypoda of Inhaca Is. *Mem. Inst. Inv. Cientif. Moçambique, Lourenço Marques. Ser A.* 7: 65-206.
- Branch, G.M., Griffiths, C.L., Branch, M.L. & Beckely, L.E. 1994. *Two Oceans. Guide to the Marine Life of Southern Africa*. David Philip. 340 pp.
- Breimer, A. 1978. General morphology, recent crinoids. p. 9-58. In: Moore, R.C. & Teichert, C. (eds.) *Treatise on Invertebrate Paleontology*. Part T, Echinodermata 2, Vol. 1. Univ. Kansas, Lawrence, KA.

Briggs, J.C. 1974. *Marine Zoogeography*. McGraw Hill. New York.

Bruce, A.J. 1984. Marine caridean shrimps of the Seychelles. p. 141-168. In: Stoddart, D.R. (ed.) *Biogeography and ecology of the Seychelles Islands*. Dr. W Junk Publishers, The Hague.

Bruce, A.J. 1998. New keys for the identification of Indo-West Pacific coral associated pontonine shrimps, with observations on their ecology. *Ophelia* **49** (1): 29-46.

Burgess, C.M. 1970. *The Living Cowries*. A.S. Barnes & Co. Ltd. Cranbury, New Jersey. 389 pp.

Campbell, A.C. & Morrison, M. 1988. The echinoderm fauna of Dhofar (southern Oman) excluding holothuroids. p. 369-378. In: Burke *et al.* (eds.) *Echinoderm Biology* Balkema, Rotterdam.

Campbell, A.C. & Rowe, F.W.E. 1997. A new species in the asterinid genus *Patiriella* (Echinodermata, Asteroidea) from Dhofar, southern Oman: a temperate taxon in a tropical locality. *Bull. Nat. Hist. Mus.Lond. (Zool.)* **63** (2): 129-136.

Castro-Fernandez, M. del P. 1981. Contribuição para o estudo de bivalves de Moçambique. *Garcia de Orta, Sér. Zool.* Lisboa **10** (1-2):55-102.

Cernhorsky, W.O. 1967, 1972, 1978. *Marine Shells of the Pacific*. 3 Vols. Sydney: Pacific Publications.

Cernhorsky, W.O. 1973. The Mitridae of the world. Part 1. The subfamily Mitrinae. Indo-Pacific Mollusca. **3** (17):273-528.

Cernohorsky, W.O. 1981. The family Buccinidae. Part 1. The genera *Nassaria*, *Tryiana* and *Neoteon*. Monographs of Marine Mollusca. No. 2. American Malacologists, Inc. 52 pp.

Chao, S.-M., Chen, C.-P. & Alexander, P.S., 1995. Reproductive cycles of tropical sea cucumbers (Echinodermata: Holothuroidea) in southern Taiwan. *Mar. Biol.* **122**: 289-295

Chelazzi, G. & Vannini, M. 1980. Zonation of intertidal molluscs on rocky shores of southern Somalia. *Est. Coast Mar. Sci.* **10**: 569-583.

Cherbonnier, G. 1970. Nouvelles especes D'holothuries des cotes D'Afrique du sud et du Mozambique. Bulletin du Museum National D'Histoire Naturelle ser 2 Tome 42 (1): 280-299.

Cherbonnier, G. 1988. Echinodermes: Holothurides. *Faune de Madagascar* **70**: 292 pp.

Cherbonnier, G. & Guille, A. 1978. Echinodermes: Ophiurides. *Faune de Madagascar* **48**: 272 pp., 17 pl.

Chia, F.S. & Walker, C.W. 1991. Echinodermata: Asteroidea. Chapter 5. p. 300-355. In: Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.

Claparède, E. 1867. On the structure of the Annelida, including a critical examination of the most recent works on this class of worms. *Ann. Mag. Nat. Hist. Ser.* **3** **20** (119): 337-361.

- Clark, A.M. 1980. Some Ophiuroidea from the Seychelles Islands and Inhaca, Mozambique. *Rev. Zool. Afr.* **94** (3): 533-558.
- Clark, A.M. 1984. Echinodermata of the Seychelles. p. 83-103. In: Stoddart, D.R. (ed.) *Biogeography and Ecology of the Seychelles Islands*. Junk Publ., The Hague.
- Clark, A.M. 1993. An index of names of recent Asteroidea – Part 2: Valvatids. p. 187-366. In: Jangoux, M. & Lawrence, J.M. (eds.) *Echinoderm Studies*. Balkema, Rotterdam.
- Clark, A.M. & Courtman-Stock, J. 1976. *The Echinoderms of Southern Africa*. The British Museum (Natural History), London. 277 pp.
- Clark, A.M. & Rowe F.W.E. 1971. *Monograph of shallow-water Indo-West Pacific Echinoderms*. The British Museum (Natural History), London. 234 pp.
- Clark, A.M. & Taylor, J.D. 1971. Echinoderms from Diego Garcia. *Atoll Res. Bull.* **149**: 89-92.
- Clark H.L. 1907. The Apodus Holothurians. A monograph of the Synaptidae and Molpadiidae. *Smithsonian Contribution to Knowledge*. **35** (part). 207 pp, 13 pls.
- Clark H.L. 1909. Notes on some Australian and Indo-Pacific Echinoderms. *Mem. Mus. Comp. Zool. Harv.* **52**: 107-135.
- Clark H.L. 1915. The Echinoderms of Ceylon (other than holothurians). *Spolia Zeeland.* **10** (37): 83-102.
- Clark, H.L. 1915a. Catalogue of recent ophiurans. *Mem. Mus. Comp. Zool. Harv.* **25**: 165-376.
- Clark, H.L. 1915b. The comatulids of Torres Strait with special reference to their habits and reactions. *Pap. Dep. Mar. Biol. Carnegie Instn. Wash.* **8**: 67-125.
- Clark, H.L. 1938. Echinoderms from Australia. *Mem. Mus. Comp. Zool. Harv.* **55**: viii + 596.
- Clark, H.L. 1946. The Echinoderm Fauna of Australia. *Publs. Carnegie Instn.* No. 566 1-567.
- Clarke K.R. & Warwick R.M. 1994. Change in marine communities: an approach to statistical analysis and interpretation. Natural Environmental Research Council, UK, 144 pp.
- Copley, H. 1945. List of cowries collected on the Kenyan coast by Colonel Maxwell and friends during July, 1944. *J. E. Afr. Nat. Hist. Soc.* **17** (83-84): 160.
- Coppock, J. 1997. Annelida – Segmented Worms. p.162-181. In: Richmond, .D. (ed.) *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*. SIDA Department for Research Cooperation, SAREC.
- Couper, A. 1989. *The Times Atlas and Encyclopaedia of the Ocean*. Times Books Ltd. /Guild Publishing. 272 pp.

- Crossland, C. 1903. The marine fauna of Zanzibar and British East Africa from collections made by Cyril Crossland in the years 1901 and 1902. Polychaeta Part II. *Proc. Zool. Soc. London*. 1903 (2):129-144.
- Crossland, C. 1904. The marine fauna of Zanzibar and British East Africa from collections made by Cyril Crossland in the years 1901 and 1902. Polychaeta Part III. *Proc. Zool. Soc. London*. 1904 (1):287-330.
- Crossland, C. 1924. Polychaeta of tropical East Africa, the Red Sea and Cape Verde Islands, collected by Cyril Crossland and the Maldivic Archipelago collected by Professor Stanley Gardiner, M.A., F.R.S. The Lumbriconeridae and Staurocephalidae. *Proc. Zool. Soc. London*. 1924 (1):1-106.
- Crossland Marshall, J.I. & Price, A.R.G. 1999 (*in press*). Indian Ocean echinoderms collected during the *Sinbad Voyage* (1980-81). *Bull. nat. Hist. Mus. Lond. (Zool.)* 65 (1).
- Dance, S.P. 1974. *The Encyclopaedia of Shells*. Blanford Press
- Dance, S.P. 1992. *Shells*. Eyewitness Handbook. Dorling Kindersley. 256 pp.
- Dance, S.P. (ed.) 1995. *Seashells of Eastern Arabia*. Motivate Publishing. 296 pp.
- Daniel, A. & Halder, B.P. 1974. Holothuroidea of the Indian Ocean with remarks on their distribution. *J. Mar. Biol. Ass. India* 16 (2): 412- 436
- Dautzenberg, Ph. 1906. Coquilles Marine d'Ambodifoutra. *J. Conchyliologie* 54: 27-29.
- Dautzenberg, Ph. 1893. Contribution à la faune Malacologique des Iles Seychelles. *Bull. Soc. zool. Fr.* 18: 78-84.
- Dautzenberg, Ph. 1923. Mollusques Marins de Madagascar et description de deux espèces nouvelles. *J. Conchyliologie* 68: 21-74.
- Dautzenberg, Ph. 1932. Mollusques Testacés Marins de Madagascar. Supplément. *J. Conchyliologie* 76: 5-119.
- Dauvin, J.C. & Thiebaut, E. 1992. Is *Owenia fusiformis* Delle Chiaje a cosmopolitan species? *Mem. Mus. Natl. Hist. Nat. Zool.* 162: 383-404.
- Day, J.H. 1951. The polychaete fauna of south Africa. Part 1: The intertidal and estuarine Polychaeta of Natal and Mocambique. *Ann. Natal Mus.* 21: 1-67.
- Day, J.H. 1957. The polychaete fauna of south Africa. Part 4: New species and records from Natal and Mocambique. *Ann. Natal Mus.* 14: 59-129.
- Day, J.H. 1962. Polychaeta from several localities in the western Indian Ocean. *Proc. Zool. Soc. London*. 139 (1):627-656.
- Day, J.H. 1967. *A Monograph of the Polychaeta of Southern Africa. Part 1. Errantia; Part 2: Sedentaria*. Trustees of the British Museum (Natural History), London. 878 pp.

- Day, J.H. 1973. Polychaeta collected by U.D. Gadwad at Ratnagiri, south of Bombay. *Zool. J. Linn. Soc.* **52** (4):337-361.
- Day, J.H. 1974. *A Guide to the Marine Life of South African Shores*. A.A. Balkema, Cape Town. 272 pp.
- Day, J.H. 1977. A review of the Australian and new Zealand Orbinidae (Annelkida: Polychaeta). p. 217-246. In: Reish, D.J. & Fauchald, K. *Essays on Polychaetous Annelids*. Allan Hancock Foundation.
- Day, J.H. & Hutchings, P.A. 1979. An annotated check-list of Australian and New Zealand Polychaeta, Archiannelida and Myzostomida. *Rec. Austr. Mus.* **32**: (3): 80-161.
- De Silva, P.H.D.H. 1961. New species and records of Polychaete from Ceylon. *Proc. Zool. Soc. Lond.* **144**: 537-563.
- Debelius, H. 1993. *Indian Ocean Tropical Fish Guide*. Aquaprint. 320 pp.
- Donaldson, T.J. 1985. Distribution and species richness patterns of Indo-West Pacific Cirrhitidae: Support for Woodland's hypothesis. In: Yyeno, T., Arai, R., Tanischi, T. & Matsuura, K. (eds.) *Indo-Pacific Fish Biology*. Proceedings of the 2<sup>nd</sup> International Confereneec on Indo-Pacific Fishes. Tokyo National Museum, Ueno Park, Tokyo, July 29-August 3.
- Drivas, J. & Jay, M. 1988. *Coquillages de La Réunion et de l'île Maurice*. Times Editions/Les Editions du Pacifique.159 pp.
- Durkin, M.K. 1979. The Saleniidae in time and space. p. 3-14. In: *Proceedings of the European Colloquium on Echinoderms, Brussels, 3-8 September, 1979*.
- Ekman, S. 1953. *Zoogeography of the Sea*. Sidgwick & Jackson Ltd. 416 pp.
- Emerson, W.K. 1990. New reocrds for western Pacific *Morum* (Gastropoda: Harpidae) with biogeographic implications. *The Veliger* **33** (2):145-154.
- Emerson, W.K. & Cernhorsky, W.O. 1973. The genus *Drupa* in the Indo-Pacific. *Indo-Pacific Mollusca*. **3** (13):1-40.
- Erdmann, M.V., Caldwell, R.L. & Moosa, M.K. 1998. Indonesian 'king of the sea' discovered. *Nature* **396** p.335.
- Fauchald, K. 1977. *The Polychaete Worms. Definitions and Keys to the Orders, Families and Genera*. Natural History Museum of Los Angeles County/Allan Hancock Foundation, University of Southern California. 186 pp.
- Fauvel, P. 1911. Annélides polychètes du golfe Persique. *Archs. Zool. Exp. Gén.* **6** (5): 353-439.
- Fauvel, P. 1918. Annélides polychètes nouvelles de l'Afrique orientale. *Bull. Mus. Hist. Nat. Paris* **24**: 503-509.
- Fauvel, P. 1919. Annélides polychètes de Madagascar, de Djibouti et du Glofe Persique. *Arch. Zool. Exp. Gén.* **58**: 315-473.

- Fauvel, P. 1923. Polychètes errantes. *Faune de France, Paris* 5 :1-488.
- Fauvel, P. 1927. Polychètes sédentaires. *Faune de France, Paris* 16 :1-494.
- Fauvel, P. 1928. Annélides polychètes de l'Inde. I. *Bull. Mus. Hist. Nat. Paris* 34: 90-96.
- Fauvel, P. 1928. Annélides polychètes nouvelle de l'Indie. Pt. 2. *Bull. Mus. Hist. Nat. Paris* 34: 159-165.
- Fauvel, P. 1929. Polychètes nouvelles du Golfe de Manaar (Inde). *Bull. Soc. Zool. France, Paris* 54: 180-186.
- Fauvel, P. 1932. Annelida Polychaeta of the Indian Museum, Calcutta. *Mem. Indian Mus.* 12: 1-262.
- Fauvel, P. 1953. Annelida Polychaeta. The Fauna of India. Seymour Sewell (ed.) The Indian Press Ltd.
- Ferrari, J.G.J. 1995. Pollution and environmental degradation. p. 63-84. In: Linden, O. (ed.) *Workshop and Policy Conference on Integrated Coastal Zone Management in East Africa including the Island States*. World Bank, Environment Department/Sida, Department for Research Cooperation, SAREC.
- Ferreira, A.J. 1983. Researches on the coast of Somalia. The chiton fauna (Mollusca Polyplacophora). *Monit. Zool. It. N.S.) Suppl.* 18 (9): 249-297.
- Ferreira, A.J. 1986. A revision of the genus *Acanthopleura* Guilding, 1829 (Mollusca: Polyplacophora). *Veliger* 28 (3): 221-279.
- Fiege, D. 1992. Polychaeta of the intertidal zone in the Ras Az-Zawr-Marduma Bay region. p. 171-186. In: *Establishment of a Marine Habitat and Wildlife Sanctuary for the Gulf Region*. Final Report for Phase I. Jubail & Frankfurt a.M.
- Fischer, W., Sousea, I, Silva, C., de Freits, A., Poutiers, J.M., Schneider, W., Borges, T.C., Féral, J.P. & Massinga, A. 1990. *Guia de Campo das Espécies Comercias Marinhas e de Águas Salobras de Moçambique*. Rome, FAO. 424 pp.
- Fischer-Piette, E. 1973. Sur des Veneridae de l'océan Indien occidental (Mollusca, Pelyceopoda). *Tethys* 5 (2-3): 267-316.
- Francis, T.J.G. & Shor, G.G. Jr. 1966. Seismic refraction measurements in the northwest Indian Ocean. *J. Geophys. Res.* 71: 427-449.
- Gambi, M.C., Gravina, M.F. & Giangrande, A. 1990. Aspetti e problematiche della biogeografia degli anellidi policheti. *Oebalia Suppl.* 16 (1): 365-376.
- Gardiner, J.S. 1907. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanely Gardiner, No. 9. Description of the expedition. *Trans. Linn. Soc. Lond. (2) Zool.* 12:11-175.
- Gardiner, J.S. 1936. The reefs of the Western Indian Ocean I-II. *Trans. Linn. Soc. Lond. (2) Zool.* 19: 393-436.



- Gaston, K.J. & Spicer, J. 1998. *Biodiversity: An Introduction*. Blackwell Science. 113 pp.
- Ghiold, J. & Hoffman, A. 1986. Biogeography and biogeographic history of clypeasteroid echinoids. *Journal of biogeography*. Oxford. **13** (3): 183-206
- Gibbs, P.E. 1971. Polychaete fauna of the Solomon Islands. *Bull. Br. Mus. (Na. Hist.)* **21**: 101-211.
- Gibbs, P.E. 1972. Polychaete annelids from the Cook Islands. *J. Zool. Lond.* **168**: 199-220.
- Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.
- Gosliner, T.M. & Draheim, R. 1996. Indo-Pacific opisthobranch gastropod biogeography: how do we know what we don't know? *Am. Malac. Bull.* **12** (1-2):37-43.
- Gosliner, T.M., Behrens, D.W. & Williams, G.C. 1996. *Coral Reef Animals of the Indo-Pacific*. Sea Challengers, Monterey, California. 314 pp.
- Gravelly, F.H. 1927. Chaetopoda. The Littoral Fauna of Krusadai Island in the Gulf of Mannar. *Bull. Madras Govt. Mus. Nat. Hist.* **1** (1): 1-32.
- Graves, J.E. & McDowell, J.R. 1995. Inter-ocean genetic divergence of istiopodid billfishes. *Mar. Biol.* **122** (2): 193-203.
- Gravier, Ch. 1900. Contribution à l' étude des Annélides Polychètes de la Mer Rouge. *Nouv. Arch. Mus. Hist. Nat. Paris* (4) II: 137-282.
- Gravier, Ch. 1901. Contribution à l' étude des Annélides Polychètes de la Mer Rouge. *Nouv. Arch. Mus. Hist. Nat. Paris* (4) III: 147-152.
- Gravier, Ch. 1906. Contribution à l' étude des Annélides Polychètes de la Mer Rouge. *Nouv. Arch. Mus. Hist. Nat. Paris* (4) VIII: 123-272.
- Gravier, Ch. 1908. Contribution à l' étude des Annélides Polychètes de la Mer Rouge. *Nouv. Arch. Mus. Hist. Nat. Paris* (4) X: 67-108.
- Grube, Ed. 1868. Beschreibungen einiger von Georg Ritter von Frauenfeld gesammelten Annelidien und Gephyreen des Rothen Meeres. *Verhandl. Zool.-Bot. Gesell. Wien* **18**: 629-650.
- Grube, Ed. 1869. Beschreibungen neuer oder wenig bekannter von Hrn. Ehrenberg gesammelten Annelidien des Rothen Meeres. *Monatsber, Kon. Preuss. Akad. Wiss. Berlin*: 484-521.
- Grube, Ed. 1874. Descriptiones Annulorum novorum mare Ceylonicum habitantium ab honoratissimo Holdsworth collectorum. *Proc. Zool. Soc. Lond.*: 325-329.
- Guerreiro, J., Freitas, S., Pereira, P. & Paula, J. 1996. Sediment macrobenthos of mangrove flats at Inhaca Island, Mozambique. *Cah. Biol. Mar.* **37** (4): 309-327.

- Guille, A., Laboute, P. & Menou, J-L. 1986. *Guide des étoiles de mer, oursins et autres échinodermes du lagon de Nouvelle-Calédonie*. Éditions de l'ORSTOM. Institut Français de Recherche Scientifique pour le Développement en Coopération. 238 pp.
- Harasewych, M.G. 1997. The life and malacological contributions of R. Tucker Abbott (1919-1995). *The Nautilus* 110 (2): 55-77.
- Hartman, O. 1966. Polychaetous annelids from the Hawaiian Islands. *Occ. Pap. Bernice P. Bishop Mus.* 23: 163-252.
- Hartman, O. 1974a. Polychaetous annelids of the Indian Ocean including an account of species collected by members of the International Indian Ocean Expeditions, 1963-1964, and a catalogue and bibliography of the species from India. Part I. *J. Mar. Biol. Ass. India* 16 (1): 191-254.
- Hartman, O. 1974b. Polychaetous annelids of the Indian Ocean including an account of species collected by members of the International Indian Ocean Expeditions, 1963-1964, and a catalogue and bibliography of the species from India. Part II. *J. Mar. Biol. Ass. India* 16 (2): 609-644.
- Hartmann-Schröder, G. 1974a. Zur polychetenfauna von Natal (Sudafrika) (mit betrachtungen zur zoogeographie und ökologie). *J. Mar. Biol. Ass. India* 16 (2): 540-582.
- Hartmann-Schröder, G. 1974b. Weiter Polychaeten von Ostafrika (Moçambique und Natal). *Mitt. Hamburg. Zool. Mus. Inst.* 71: 23-33.
- Hartmann-Schröder, G. & Hartmann, G. 1974. Beschreibung der Lebensräume, Ökologie und Zoogeographie. *Mitt. Hamburg. Zool. Mus. Inst.* S 5-94, 68: 5-94.
- Hartnoll, R.G. 1975. The Grapsidae and Ocypodidae (Decapoda: Brachyura) of Tanzania. *J. Zool. Lond.* 177: 305-328.
- Hartnoll, R.G. 1976. The ecology of some rocky shores in tropical East Africa. *Est. Coast. Mar. Sci.* 4: 1-21
- Hendler, G. 1991 Echinodermata: Ophiuroidea. Chapter 6. p. 356-513. In: Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.
- Herbert D.G. 1996. Observations on *Clanculus tonnerrei* (G & H Nevill 1874) (Mollusca Gastropoda Trochidae). *Tropical Zoology* 9: 31-45.
- Herbert, D.G. 1998. Molluscan conservation in South Africa: Diversity, Issues and Priorities. *J. Conchology* Special Publication No. 2: 61-76.
- Herring, P.J. 1972. Observations on the distribution and feeding habits of some littoral echinoids from Zanzibar. *J. nat. Hist.* 6: 169-175
- Hinton, A.G. 1972. Shells of New Guinea and the Central Indo-Pacific. La Galamo Books, The Jacaranda Press. 94 pp.
- Hodgkin, E.P. & Michel, C. 1960. Zonation of plants and animals on rocky shores of Mauritius. *Proc. Roy. Soc. Arts Sci. Mauritius* 2 (2):121-145.

- Hogarth, P.J. 1988. Anomuran Crustacea (Paguridea, Porcellanidae, and Hippidea) from Oman, principally from Dhofar Province, southern Oman. *J. Nat. Hist.* **22**: 1095-1110.
- Hogget, A.K. 1991. The genus *Macrophiolithrix* (Ophiuroidea: Ophiotrichidae) in Australian waters. *Invertebrate Taxonomy* **4**:1077-1146.
- Holland, N.D. 1991. Echinodermata: Crinoidea. Chapter 4. p. 247-300. In: Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.
- Holthus, P.F. & Maragos, J.E. 1995. Marine ecosystem classification for the tropical island Pacific. p. 239-278. In: Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West Centre, Honolulu, Hawaii.
- Houart, R. 1984. Description of a new species of Muricidae (Mollusca: Gastropoda) from the eastern African coast: *Chicoreus (Chicoreus) dovi* n. sp. *Venus Jap. J. Malacol.* **43** (1): 55-59.
- Houart, R. 1990. New taxa and new records of Indo-Pacific species of *Murex* and *Haustellum* (Gastropoda, Muricidae, Muricinae). *Bull. Mus. Natl. Hist. Nat. (France)* (4 Ser.) (A) **12** (2): 329-347.
- Houbrick, R.S. 1978. The family Cerithiidae in the Indo-Pacific. Part 1: The genera *Rhinoclavis*, *Pseudovertagus*, and *Clavocerithium*. *Monographs of Marine Mollusca*. No. 1. American Malacologists, Inc. 128 pp.
- Houbrick, R.S. 1985. Genus *Clypeomorus* Jousseaume (Cerithiidae: Prosobranchia). *Smithsonian Contrib. Zool.* **403**: 131 pp. Smithsonian Institution Press.
- Houbrick, R.S. 1992. Monograph of the Genus *Cerithium* Bruguière in the Indo-Pacific (Cerithiidae: Prosobranchia). *Smith. Contrib. Zool.* **510**: 211 pp. Smithsonian Institution Press.
- Hove, H.A.T ten 1994. Serpulidae (Annelida: Polychaeta) from the Seychelles and Amirantes Islands. p. 107-116. In: Land, J. van der (ed.) *Oceanic Reefs of the Seychelles*. Report on a cruise of RV *Tyro* to the Seychelles in 1992 and 1993. Netherlands Indian Ocean Programme. Cruise Reports Vol. 2. National Museum of National History, Leiden.
- Hughes, R.N. & Gamble, J.C. 1977. A quantitative survey of the biota of intertidal soft substrata on Aldabra Atoll, Indian Ocean. *Phil. Trans. R. Soc. Ser. B.* **279**: 327-355.
- Humphreys, W.F. 1981. The echinoderms of Kenya's marine parks and adjacent regions. *Docum. Zool. Mus. Roy. Afr. Centr. Tervuren (Belgique)* **19**: 1-39.
- Imajima, M. 1990. Spionidae (Annelida, Polychaeta) from Japan II. The Genus *Prionospio* (*Aquilaspio*). *Bull. Natn. Sci. Mus., Tokyo Ser. A.* **18** (1): 1-13.
- Ingole, B.S., Ansari, Z.A. & Parulekar, A.H. 1992. Benthic fauna around Mauritius, Southwest Indian Ocean. *Ind. J. Mar. Sci.* **21** (4): 268-273.

- Jablonski, D. & Lutz, R.A. 1983. Larval ecology of marine benthic invertebrates: paleobiological implications. *Biol. Rev.* **58**: 21-89.
- James, D.B. 1969. Catalogue of echinoderms in the Reference List in the Central Marine Fisheries Research Institute. *Bull. Mar. Fish. Res. Inst.* **7**: 51-62.
- James, D.B. 1976. History of echinodermology of the Indian Ocean. *J. Mar. Biol. Ass. India* **18** (2): 298-309.
- James, D.B. 1979. Studies on Indian Echinoderms - 6. Redescription of two little known *Holothuria* with a note on an early juvenile of *Holothuria scabra* Jaeger from the Indian Seas. *J. Mar. Biol. Ass. India.* **18** (1): 55-61.
- James D.B. 1980. History of Echinodermology of Indian Ocean. *J. Mar. Biol. Ass. India* **18** (2): 298-309.
- James, D.B. 1983. Research on Indian Ocean Echinoderms - a review. *J. Mar. Biol. Ass. India* **25** (1-2): 91-108
- James, D.B. 1987. Studies on Indian Echinoderms - 9. *Ophionereis andamanensis* sp. nov. (Ophiuroidea:Ophionereidae) from Port Blair, Andaman. *J. Mar. Biol. Ass. India.* **24** (1-2): 36-41.
- James, D.B. 1989. Echinoderms of the Lakshadweep and their zoogeography. *Bull. Centre Mar. Fish. Res. Inst.* **43**: 97-144.
- James, D.B. & Pearse, J.S. 1969. Echinoderms from the Gulf of Suez and the northern Red Sea. *J. Mar. Biol. Ass. India* **11** (1-2): 78-125.
- Jangoux, M. 1973. Les astéries de l'île d'Inhaca (Moçambique). *Ann. Mus. R. Afr. Centr. (Tervuren Belg.)* **208**: 1-50.
- Jangoux, M. & Aziz, A. 1984. Les astérides (échinodermes) du Centre-Ouest de l'Océan Indien (Seychelles, Maldives et îles mineures). *Bull. Mus. Natl. Hist. Nat. (Paris) Sér. 4.* **6A** (4): 857-884.
- Jassund, E. 1976. *Intertidal Seaweeds in Tanzania*. 1<sup>st</sup> Edition. University of Tromsø. 160 pp.
- Jones, D.A. (ed.) 1970. Preliminary Report of the 1969 Bangor-Watamu Expedition. University College of North Wales Press. 66 pp.
- Jung, P. & Abbott, R.T. 1967. The genus *Terebellum* (Gastropoda: Strombidae). *Indo-Pacific Mollusca*. **1** (7):445-454.
- Kaas, P. 1986. Revision of the chitons (Mollusca: Polyplacophora) from the coral-reefs of Tulear, SW Madagascar, and the Mascarene Islands. *Mesogee* **46** (1):9-23.
- Kaas, P. & Van Belle, R.A. 1988. Chitons (Mollusca: Polyplacophora) from the coasts of Oman and the Arabian Gulf. *Am. Malacol. Bull.* **6** (1): 115-130
- Kabat, A.R. 1996. Biogeography of the genera of Naticidae (Gastropoda) in the Indo-Pacific. *Am. Malac. Bull.* **12** (1-2):29-35.

- Kalk, M. 1959. A general ecological survey of some shores in northern Moçambique. *Revista de Biologia, Lisboa*. 2: 1-24.
- Kalk, M. (ed.) 1995. *A Natural History of Inhaca Island, Moçambique*. Witwatersrand University Press, Johannesburg. 3<sup>rd</sup> Edition. 395 pp.
- Kamuzora, C.L. 1995. Demographic patterns and trends in the coastal areas of East Africa and the western Indian Ocean. In: Linden, O. (ed.) *Workshop and Policy Conference on Integrated Coastal Zone Management in East Africa including the Island States*. pp 131-141. World Bank, Environment Department/Sida, Department for Research Cooperation, SAREC.
- Kay, E.A. 1967. The composition and relationship of marine molluscan fauna of the Hawaiian Islands. *Venus* 25: 94-104.
- Kay, E.A. 1979. *Hawaiian marine shells: Reefs and shore fauna of Hawaii*. Section 4: Mollusca. Bernice P. Bishop Museum Special Publication 64 (4). Honolulu.
- Kay, E.A. 1984. Patterns of speciation in the Indo-West Pacific. p. 15-31. In: Raven, P.H., Radovsky, F.J. & Sohmer, S.H. (eds.) *Biogeography of the Tropical Pacific*. Association of Systematics Collections and the Bernice P. Bishop Museum, Honolulu.
- Kay, E.A. 1990. Cypraeidae of the Indo-Pacific: Cenozoic fossil history and biogeography. *Bull. mar. sci.* 47 (1): 23-34.
- Kay, E.A. 1995. Pacific Island Marine Mollusks: Systematics. Chapter 8. p. 135-159. In: . Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West centre, Honolulu, Hawaii.
- Keenan, C.P., Davie, P.J.F. & Mann, D.L. 1998. A revision of the genus *Scylla* de Haan, 1833 (Crustacea: Decapoda: Brachyura: Portunidae). *Raffles Bull. Zool.* 46 (1): 217-245.
- Kelly-Borges, M. & DeFelice, R. (*in press*). Sponges on the floating docks and piers of Pearl Harbour, Hawaii: taxonomic and biogeographical status.
- Kerr, A.M. 1994. Shallow-water Holothurioids (Echinodermata) of Kosrae, Eastern Caroline Islands. *Pacific Science*. 48 (2): 161-174.
- Kilburn, R. & Rippey, E. 1982. *Sea Shells of Southern Africa*. Macmillan South Africa (Publishers) Pty. Ltd. 249 pp.
- Kinberg, J.G.H. 1857-1910. Annulata Konglika Svenska Fregatten "Eugenies" Resa omkring Jorden. 1851-1853. *Zoologi*. III, *Annulater (Uppsala-Stockholm 1857-1910)*: 1-78, pls. i-xxix.
- Knight-Jones, P. 1972. New species and a subgenus of Spirorbinae (Serpulidae: Polychaeta) from Kenya. *J. Zool. Lond.* 166: 1-16.

- Knox, G.A. 1977. The role of polchaetes in benthic soft-bottom communities. p. 547-604. In: Reish, D. & Fauchald, K. (eds.) *Essays on Polychaetous Annelids. In Memory of Dr. Olga Hartman*. The Allan Hancock Foundation, University of Southern California.
- Kohn, A.J. 1967. Environmental complexity and species diversity in the gastropod genus *Conus* on Indo-Pacific reef platforms. *Amer. Natur.* **101**: 251-259.
- Kohn, A.J. 1971. Diversity, utilization of resources, and adaptive radiation in shallow-water marine invertebrates of tropical oceanic islands. *Limnol. Oceanogr.* **16** (2): 332-348.
- Kott, P. 1951. Neriedae and Eunicidae of South Western Australia; also notes on the ecology of Western limestone reefs. *J. Proc. R. Soc. West. Aust.* **35**: 85-130.
- Krauss, 1848. *Die südafrikanischen Mollusken*. Ebner & Seubert, Stuttgart.
- Ladd, H.S. 1960. Origin of the Pacific island molluscan fauna. *Amer. J. Sci.* **258** A: 137-150.
- Lavery, S., Moritz, C. & Fielder, D.R. 1996. Indo-Pacific population structure and evolutionary history of the crab *Birgus latro*. *Mol. Ecol.* **5** (4): 557-570.
- Lawson, G.W. 1969. Some observations on the littoral ecology of rocky shores in East Africa (Kenya and Tanzania). *Trans. Roy. Soc. S. Afr.* **38** (4): 329 - 339.
- Ledoyer, M. 1982. Crustacés amphipodes gammariens familles des Acanthanotozomatidea à Gammaridae. *Faune de Madagascar* **59**: 1-598.
- Ledoyer, M. 1986. Crustacés amphipodes gammariens familles des Haustoriidae à Vitjazianidae. *Faune de Madagascar* **59**: 599-1112.
- Leetmaa, A. & Truesdale, V. 1972. Changes in the currents in 1970 off the East African Coast with the onset of the Southeast Monsoon. *J. Geophys. Res.* **77** (18): 3281-3283
- Leinard, E. 1877. *Catalogue de la faune malacologique de l'île Maurice et de ses dependances*. Paris, Tremblay. 115 pp.
- Levinton, J., Sturmbaer, C. & Christy, J. 1996. Molecular data and biogeography: Resolution of a controversy over evolutionary history of a pantropical group of invertebrates. *J. Exp. Mar. Biol. Ecol.* **203** (1): 117-131.
- Lewis, J.B. 1960. The fauna of rocky shores of Barbados, West Indies. *Canad. J. Zool.* **38**: 391-435.
- Lewis, M.S. & Taylor, J.T. 1966. Marine sediments and bottom communities of the Seychelles. *Phil. Trans. Roy. Soc. Lond. A.* **259**: 279-190.
- Liao, Y. 1979. The Aspidochirote holothurians of China with erection of a new genus. *Proceedings of the European Colloquium on Echinoderms, Brussels, 3-8 September, 1979*. p. 115-120.
- Liao Y. 1997. *Fauna Sinica. Phylum Echinodermata, Class Holothuroidea*. Science Press, Beijing. 327 pp.

- Liao, Y. & Clark, A.M. (eds.) 1995. *The Echinoderms of Southern China*. Science Press, Beijing, New York. 614 pp. + 23 pts.
- Lieske, E. & Myers, R. 1994. *Coral Reef Fishes. Indo-Pacific and Caribbean*. Harper Collins Publishers. 400 pp.
- Linden, O. (ed.) 1995. *Workshop and Policy Conference on Integrated Coastal Zone Management in East Africa including the Island States*. World Bank, Environment Department/Sida, Department for Research Cooperation, SAREC. 371 pp.
- Liversidge, M.J.H. 1963. A collection of *Cypraea* from Diani, Kenya. *J. Conchology* **25** (4): 166-169.
- Mackie, A.S.Y. 1996. *Taxonomy and Phylogeny of Spioniform Polychaetes (Annelida)*. Goteborg University PhD thesis.
- Macnae, W. & Kalk, M. (eds.) 1969. *A Natural History of Inhaca Island, Moçambique*. Witswatersrand University Press. 163 pp.
- Marsh, L.M. 1977. Coral reef asteroids of Palau, Caroline Islands. *Micronesica* **13** (2): 251-281.
- Marsh, L.M. & Price, A.R.G. 1991. Indian Ocean echinoderms collected during the *Sinbad Voyage* (1980-81): 2. Asteroidea. *Bull. Br. Mus. Nat. Hist. (Zool.)* **57** (1): 61-70.
- Marshall, J.I. & Rowe, F.W.E. 1981. The crinoids of Madagascar. *Bull. Mus. Natl. Hist. Nat. (Paris)*. **4** (3) (Sect. A, No. 2): 379-413.
- Martens, E. von. 1903. Die beschaltten Gastropoden der Deutschen Tiefsee-Expedition 1898-1899. A Systematische-Geographischer Teil. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer Valdiviam, 1898-1899*, **7**: 1-156. Jena: Gustav Fischer.
- Massin, C. 1996. The holothurians of Easter Island. *Bull. Inst. Roy. Sci. Nat. Belg. Biol.* **66**: 151-178.
- May, R.M. 1994. Conceptual aspects of the quantification of the extent of biological diversity. *Phil. Trans. Roy. Soc. Lond. B.* **345**: 13-20.
- McClanahan, T.R. 1988. Seasonality in East Africa's coastal waters. *Mar. Ecol. Prog. Ser.* **44**: 191-199.
- McClanahan, T.R. 1990. Unpublished list of Mollusca from Kenya.
- McClanahan, T.R. 1994. Coral-eating snail *Drupella cornus* population increase in Kenyan coral reef lagoons. *Mar. Ecol. Prog. Ser.* **115**: 131-137.
- McClanahan, T.R. 1997. Dynamics of *Drupella cornus* populations on Kenyan coral reefs. *Proc. 8th. Int. Coral Reef Symp.* **1**: 633-638.
- McEuen, F.S. 1986. The reproductive biology and development of twelve species of holothuroids from the San Juan Islands, Washington. PhD Dissertation, Univ. Alberta, Edmonton, Alberta, Canada.

- Melville, J.C. 1893. Description of twenty-five new species of marine shells from Bombay. Collected by Alexander Abercrombie. *Mem. Proc. Manchr. Lit. Phil. Soc.* (Ser. 4) 7: 52 - 67, 1 pl. Reprinted in *J. Bombay nat. Hist. Soc.* 8: 234-245, 1 pl.
- Melville, J.C. 1897. Description of thirty-four species of marine Mollusca from the Arabian Sea, Persian Gulf and Gulf of Oman. (Mostly collected by F.W. Townsend Esq.) *Mem. Proc. Manchr. Lit. Phil. Soc.* 41: (7): 1-26.
- Melville, J.C. 1898. Further investigations into the molluscan fauna of the Arabian Sea, Persian Gulf and Gulf of Oman, with descriptions of forty species (Mostly dredged by F.W. Townsend Esq.). *Mem. Proc. Manchr. Lit. Phil. Soc.* 42: (4): 1-36.
- Melville, J.C. 1899. Notes on the Mollusca of the Arabian Sea, Persian Gulf and Gulf of Oman, with descriptions of twenty-seven species. *Ann. Mag. Nat. Hist.* (Ser. 7) 4: 81-101.
- Melville, J.C. 1904. Descriptions of twelve new species and one variety of marine Gastropoda from the Persian Gulf, Gulf of Oman and Arabian Sea, collected by Mr. F.W. Townsend. 1903. *J. Malac.* 11: 79-85.
- Melville, J.C. 1904. Descriptions of twenty-three species of gastropod from the Persian Gulf, Gulf of Oman and Arabian Sea, dredged by Mr. F.W. Townsend of the Indo-European Telegraph Service in 1903. *Proc. Malac. Soc. Lond.* 6: 51-60.
- Melville, J.C. 1906. Descriptions of thirty-one Gastropoda and one Scaphopoda from the Persian Gulf and Gulf of Oman, dredged by Mr. F.W. Townsend, 1902-1094. *Proc. Malac. Soc. Lond.* 7: 69-80.
- Melville, J.C. 1910. Descriptions of twenty-nine species of marine Mollusca from the Persian Gulf, Gulf of Oman and Northern Arabian Sea, mostly collected by Mr. F.W. Townsend of the Indo-European Telegraph Service. *Ann. Mag. Nat. Hist.* (Ser. 8) 6: 1-17.
- Melville, J.C. 1918. Descriptions of thirty-four species of marine Mollusca from the Persian Gulf, Gulf of Oman and Arabian Sea, collected by Mr. F.W. Townsend. *Ann. Mag. Nat. Hist.* (Ser. 9) 1: 137-158.
- Melville, J.C. 1928. The Marine Mollusca of the Persian Gulf, Gulf of Oman and North Arabian Sea as evidenced mainly through the collections of Captain F.W. Townsend, 1893-1914. *Proc. Malac. Soc. Lond.* 18: 93-117.
- Melville, J.C. & Standen, R. 1901. The Mollusca of the Persian Gulf, Gulf of Oman and Arabian Seas as evidenced mainly through the collections of Mr. F.W. Townsend, 1893-1900, with descriptions of new species. Part I. Cephalopoda, Gastropoda and Scaphopoda. *Proc. Zool. Soc. Lond.* (1901): 327-460.
- Melville, J.C. & Standen, R. 1906. The Mollusca of the Persian Gulf, Gulf of Oman and Arabian Seas as evidenced mainly through the collections of Mr. F.W. Townsend, 1893-1900, with descriptions of new species. Part II. Pelecypoda. *Proc. Zool. Soc. Lond.* (1906): 783-848.
- Michaelson, W. 1892. Polychaeten von Ceylon. *Jahresber. Hamburg Wissen. Aust.* 9: 91-113.



- Michel, C. 1988. *Marine molluscs of Mauritius*. Editions de l'Océan Indien. Stanley, Rose Hill. Mauritius. 83pp.
- Mienis, H.K. 1973. Notes on a small collection of Littorinidae from Somalia. *Basteria* **37**: 57-62.
- Möbius, K., Richters, F. & von Martens, E. 1880. *Beitrage zur Meerefauna des Insel Mauritius und der Seychellen*, 8 vols. Berlin: Gustav Fischer.
- Mohammed, M.-B.M. 1970. On two new polychaetous annelids from Kuwait. *Zoologischer Anzeiger* **185**: 303-307.
- Mohammed, M.-B.M. 1971. Intertidal polychaetes from Kuwait, Arabian Gulf, with descriptions of three new species. *J. Zool.* **163**: 285-303.
- Mohammed, M.-B.M. 1973. New species and records of polychaete annelids from Kuwait, Arabian Gulf. *Zool. J. Linn. Soc.* **52**: 23-44.
- Mohammed, M.-B.M. 1980. Polychaete annelids from Kuwaitian Islands, Arabian Gulf, with descriptions of four new species. *Zool. J. Linn. Soc.* **69**: 31-42.
- Monro, C.C.A. 1937. Polychaeta. *John Murray Expedition 1933-34 Scientific Reports IV* No. 8: 243-321.
- Moosleitner, H. 1997. Shallow water Asteroidea (Echinodermata) from the coral reefs of the Maldives Islands. *Revue Fr. Aquariol.* **24 (1-2)**: 3-14.
- Morton, B. 1983. Coral-Associated Bivalves of the Indo-Pacific. p. 139-224. In: Russell-Hunter, W.D. (ed.) *The Mollusca* Vol. 6. Ecology. Academic Press Inc.
- Myers, A.A. 1992. Biogeographic patterns in shallow-water marine systems and the controlling processes at different scales. p. 547-574. In: Giller, P.S., Hildrew, A.G. & Raffaelli, D.G. *Aquatic Ecology: scale, pattern and process*. 34<sup>th</sup> Symposium of the British Ecological Society. University of Cork, Cork. Blackwell Scientific Publications.
- Myers, A.A. 1996. Species and generic gamma-scale diversity in shallow-water marine Amphipoda with particular reference to the Mediterranean. *J. Mar. Biol. Ass. U.K.* **76**: 195-202.
- Myers, A.A. 1997. Biogeographic barriers and the development of marine biodiversity. *Est. Coast. Shelf Sci.* **44**: 241-248.
- Neumann, G. 1968. *Ocean Currents*. Elsevier Publishing Company. 352 pp.
- Ng, P.K.L. 1986. Preliminary descriptions of 17 new freshwater crabs of the genera *Geosesarma*, *Parathelphusa*, *Johora* and *Stoliczia* (Crustacea, Decapoda, Brachyura) from SE Asia. *J. Singapore Nat. Accad. Sci.* **15**: 36-44.
- NOAA, 1998. [http://psbgsil.nesdis.noaa.gov:8080/PSB/EPS/SST/al\\_climo\\_mon.html](http://psbgsil.nesdis.noaa.gov:8080/PSB/EPS/SST/al_climo_mon.html)
- Oguro, C. & Sasayama, Y. 1984. Occurrence of *Fromia nodosa* A.M. Clark (Asteroidea: Ophidiasteridae) from the Marshall Islands, the western Pacific. *Proc. Jap. Soc. Systematic Zool.* **27**: 101-106.

- Oliver, A.P. 1975. *Shells of the World*. Country Life Books. Hamlyn Publishing Group. 320 pp.
- Oliver, P.G. 1992. *Bivalved Seashells of the Red Sea*. Hemmen & Natural History Museum of Wales. 330 pp.
- Ong, B. 1995. Polychaetes of Telok Aling, Penang, Malaysia. *The Raffles Bull. Zool.* **43** (1): 257-283.
- Pakker, H., Klerk, H., van Campen, J.H., Olsen, J.L. & Breeman, A.M. 1996. Evolutionary and ecological differentiation in the pantropical to warm-temperate seaweed *Digenea simplex* (Rhodophyta). *J. Phycol.* **32** (2): 250-257.
- Palumbi, S.R. 1996. What can molecular genetics contribute to marine biogeography? An urchin's tale. *J. Exp. Mar. Biol. Ecol.* **203** (1): 75-92.
- Panikkar, N.K. & Prasad, R.R. 1954. On an interesting association of ophiuroids, fish and crab with the jellyfish *Rhopilema hispidum*. *J. Bombay Nat. Hist. Soc.* **51**: 295-296.
- Paulay, G. 1996. New records and synonymies of Hawaiian Bivalves (Mollusca). Records of the Hawaii Biol. Surveys for 1995. *Bishop Mus. Occasional Papers* **45**: 19-28.
- Paulay, G. 1997. Diversity and distribution of reef organisms. p. 298-353. In: Birkeland, C.E. (ed.) *Life and Death of Coral Reefs*. Chapman & Hall, New York.
- Pawson, D.L. 1995. Echinoderms of the tropical island Pacific: status of their systematics and notes on their ecology and biogeography. p. 171-192. In: Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West Centre, Honolulu, Hawaii.
- Pearse, J.S. & Barksdale, M.J. 1986. Temporal patterns of reproduction by shallow-water invertebrates in the Indian Ocean. p. 13-18. In: Thompson, M.-F., Saojini, R. & Nagabhushanam, R. eds. *Biology of Benthic Marine Organisms: techniques and methods as applied to the Indian Ocean*. Indian Ed. Ser. No. 12.
- Pearse, J.S. & Cameron, R.A. 1991. Echinodermata: Echinoidea. Chapter 7. p. 514-663. In: Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.
- Peters, W.C.H. 1854. Naturwissenschaftliche Reise Nach Mosambique in 1842 bis 1848 angeführt. *Monatsber. Akad. Wiss. Berlin* 1854: 610-614.
- Pillai, T.G. 1960. Some marine and brackish-water Serpulidae from Ceylon, including new genera and species. *Ceylon J. Sci. (Biol. Sci.)* **3**: 1-40.
- Pillai, T.G. 1971. Studies on a collection of marine and brackish-water polychaete annelids of the family Serpulidae from Ceylon. *Ceylon J. Sci. (Biol. Sci.)* **9**: 88-130.

- Pope, E.C. & Rowe, F.W.E. 1977. A new genus and two new species in the family Mithrodiidae (Echinodermata: Asteroidea) with comments on the status of the species of *Mithrodia* Gray 1840. *Aus. Zool.* 19 (2):201-216.
- Potts, F.A. 1909a. Polychaeta of the Indian Ocean. Part I. The Amphinomidae. *Trans. Linn. Soc. London (Zool)* Ser. 2 XII: 355-371.
- Potts, F.A. 1909b. Polychaeta of the Indian Ocean. Part II. The Palmyridae, Aphroditidae, Polynoidae, Acoetidae and Sigalionidae. *Trans. Linn. Soc. London (Zool)* Ser. 2 XIII: 325-353.
- Powell, A.W.B. 1967. The family Turridae in the Indo-Pacific. The subfamily Turrinae, Parts 1 & 2. *Indo-Pacific Mollusca* 1 (5):227-416.
- Powell, A.W.B. 1973. The patellid limpets of the world (Patellidae). *Indo-Pacific Mollusca*. 3 (5):75-206.
- Price A.R.G. 1981. Studies on the echinoderm fauna of the Western Arabian Gulf. *J. Nat. Hist.* 15: 1-15.
- Price, A.R.G. 1982. Echinoderms of Saudi Arabia. Comparison between echinoderm faunas of Arabian Sea, SE Arabia, Red Sea and Gulfs of Aqaba and Suez. *Fauna Saudi Arabia* 4: 3-21.
- Price, A.R.G. 1983. Echinoderms of Saudi Arabia. Echinoderms of the Arabian Gulf. *Fauna of Saudi Arabia* 5: 28-108.
- Price, A.R.G. & Reid C.E. 1985. Indian Ocean echinoderms collected during the *Sinbad Voyage* (1980-81): 1. Holothuroidea. *Bull. Br. Mus. Nat. Hist. (Zool.)* 48 (1): 1-9.
- Price, A.R.G. & Rowe, F.W.E. 1996. Indian Ocean echinoderms collected during the *Sinbad Voyage* (1980-81): 3. Ophiuroidea and Echinoidea. *Bull. Nat. Hist. Mus. Lond. (Zool.)* 62 (2): 71-82.
- Price, J.H. 1971. The shallow sublittoral marine ecology of Aldabra. *Phil. Trans. Roy. Soc. Lond.B* 260: 123-171.
- Randall, J.E. 1995. Zoogeographic analysis of the inshore Hawaiian fish fauna. p. 193-203. In: . Maragos, J.E., Peterson, M.N.A., Eldredge, L.G., Bardach, J.E. & Takeuchi, H.F. (eds.) *Marine and Coastal Biodiversity in the Tropical Island Pacific region*. Vol. 1. Species Systematics and Information Management Priorities. Program on Environment East-West centre, Honolulu, Hawaii.
- Rehder, H.A. 1973. The family Harpidae of the world. *Indo-Pacific Mollusca*. 3 (16):207-274.
- Reid, D.G. 1986. *The littorinid molluscs of mangrove forests in the Indo-Pacific region*. British Museum (Natural History), London.
- Richmond, M.D. 1994. Ecological status of the the marine subtidal habitats and the effects of the 1991 oil spill, with special reference to soft-substrata communities. *Cour. Forsch.-Inst. Senckenberg* 166: 55-60.

- Richmond, M.D. (ed.) 1997. *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*. Sida, Sweden. 448 pp.
- Richmond, M.D. & Rabesandratana, D. 1997. Mollusca (excluding Opisthobranchia) p. 238-265; p. 274-289. In Richmond, M.D. (ed.) *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*. Sida, Sweden. 448 pp.
- Riegl, B. 1995. Description of four new species of hard coral genus *Acropora* Oken, 1815 (Scleractinia: Astrocoeniina: Acroporidae from south-east Africa. *Zool. J. Linn. Soc.* **113**: 229-247.
- Ricklefs, R.E. 1979. *Ecology*. Chiron Press. New York.
- Roberston, R. 1973. The genus *Gabrielona* (Phasianellidae) in the Indo-Pacific and West Indies. *Indo-Pacific Mollusca*. **3** (14): 4-61.
- Robertson, R. 1985. Archeogastropod biology and the systematics of the genus *Tricolia* (Trochacea: Tricoliidae) in the Indo-West-Pacific. *Monographs of Marine Mollusca*. No. 3. 103 pp. American Malacologists, Inc.
- Roman, J. 1979. Une monographie des echinides de la mer Rouge. Principaux resultats. A Proc. *Proceedings of the European Colloquium on Echinoderms, Brussels, 3-8 September 1979*. p. 133-136.
- Rose, E.P.F. & Olver, J.B.S. 1979. Australian Jurassic echinoids and their biogeographical significance. *Proceedings of the European Colloquium on Echinoderms, Brussels, 3-8 September, 1979*. p. 47-52.
- Rosen, B.R. 1971. The distribution of reef coral genera in the Indian Ocean. *Symp. Zool. Soc. Lond.* **28**: 263-299.
- Rosewater, J. 1961a. The family Pinnidae in the Indo-Pacific. *Indo-Pacific Mollusca* **1** (4): 175-226.
- Rosewater, J. 1961b. The family Tridacnidae in the Indo-Pacific. *Indo-Pacific Mollusca* **1** (4): 347-394.
- Rowe, F.W.E. 1977. A new family of Asteroidea (Echinodermata) with the description of five new species and one new subspecies of *Asterodiscides*. *Rec. Aust. Mus.* **31** (5): 187-233.
- Rowe, F.W.E. 1985a. Preliminary analysis of distribution patterns of Australia's non endemic, tropical echinoderms. In: Keegan, B.F. & O'Connor, B.D.S. (eds.) *Echinodermata*. A.A. Balkema, Rotterdam.
- Rowe, F.W.E. 1985b. Six new species of *Asterodiscides* A.M. Clark (Echinodermata: Asteroidea), with a discussion of the origin and distribution of the Asterodiscididae and other "amphi-Pacific" echinoderms. *Bull. Mus. Hist. Nat. Paris. (Ser. 4)* **3**: 531-577.
- Rowe, F.W.E & Doty, J.E. 1977. The shallow-water holothurians of Guam. *Micronesica* **13** (2): 217-250.

- Rowe, F.W.E. & Gates, J. 1995. Echinodermata. In: Wells, A (ed.) Zoological catalogue of Australia. Vol. 33. Melbourne: CSIRO, Australia.
- Rowe, F.W.E., Hoggett, A.K., Birtles, R.A. & Vail, L. 1986. Revision of some comasterid genera from Australia (Echinodermata: Crinoidea), with descriptions of two new genera and nine new species. *Zool. J. Linn. Soc.* **86**: 197-277.
- Rowe, F.W.E. & Richmond, M.D. 1997. Echinodermata. p.290-321. In: .Richmond, M.D. (ed.) *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*. Sida / SAREC.
- Ruwa, R.K. 1984a. The commercial *Cypraea* (Mollusca: Gastropoda) of Kenya: their zoogeography and the implications to conservation. *POST (Kenya)* **9** (1-3):33-49.
- Ruwa, R.K. 1984b. Invertebrate faunal zonation on rocky shores around Mombasa, Kenya. *Kenya J. Sci. Series B* **7** (2):41-45.
- Ruwa, R.K. 1989. Macrofaunal composition and zonation on sandy beaches at Gazi, Kanamai and Malindi Bay, Kenya. *Kenya J. Sci. (Series B)* **10** (1-2):31-45.
- Safina, C. 1995. The world's imperiled fish. *Sci. Amer. Nov.*: 30-37.
- Salvat, B. 1967. Importance de la faune malacologique dans les atolls Polynésiens. *Cah. Pac.* **11**: 7-49.
- Scheltema, R.S. 1971. Larval dispersal as a means of genetic exchange between geographically separated populations of shallow-water benthic marine gastropods. *Biol. Bull.* **140**: 284-322.
- Scheltema, R.S. 1977. Dispersal of marine invertebrate organisms: paleobiogeographic implications. p. 73-108. In: Kauffman, E.G. & Hazel, J.E. (eds.) *Concepts and Methods of Biostratigraphy*. Strodsberg Penn: Dowden, Hutchinson & Ross.
- Scheltema, R.S. 1986. Long-distance dispersal by planktonic larvae of shoal-water benthic invertebrates among central Pacific islands. *Bull. Mar. Sci.* **39**: 241-156.
- Schimdt, W. & O. Bellec. 1994. Findings of some uncommon sea-shells off Madagascar. *African J. Trop. Hydrobiol. Fisheries* **5** (1): 63 - 66.
- Schmarda, L.K. Neue wirbellose Thiere. II. Leipzig, pp. 1-164, pls xv1-xxxvii.
- Shah, N. 1995. The coastal zone of Seychelles. p. 275-290. In: Linden, O. (ed.) *Workshop and Policy Conference on Integrated Coastal Zone Management in East Africa including the Island States*. World Bank, Environment Department/Sida, Department for Research Cooperation, SAREC.
- Sharabati, D. 1984. *Red Sea Shells*. Keegan Paul International. 127 pp.
- Sheppard, C.R.C. 1987. Coral species of the Indian Ocean and adjacent seas: a synonymized compilation and some regional distibutional patterns. *Atoll Res. Bull.* **307**: 1032.

- Sheppard, C.R.C. 1998. Biodiversity patterns in Indian Ocean corals, and effects of taxonomic error in data. *Biodiv. Conserv.* **7**: 22 pp.
- Sheppard, C.R.C. *in press*. Biodiversity patterns in Indian Ocean corals, and effects of taxonomic error in data. *Biodiversity and Conservation* **7**.
- Sheppard, C.R.C., Price, A.R.G. & Roberts, C. 1992. *Marine Ecology of the Arabian Region. Patterns and Processes in Extreme Tropical Environments*. Academic Press. 359 pp.
- Silva, P.C., Basson, P.W. & Moe, R.L. 1996. Catalogue of benthic marine algae of the Indian Ocean. University of California, Publications in Botany, **79**. Uni. California. (also, internet website: <http://ucjeps herb.berkeley.edu/rlmoe/tioc/ioctoc.html>).
- Sloan, N.A., Clark, A.M. & Taylor, J.D. 1979. The echinoderms of Aldabra and their habitats. *Bull. Br. Mus. (Nat. Hist.) Zool.* **37** (2): 81-128.
- Smiley, S., McEuen, F.S., Chafee, C. & Krishnan, S. 1991. Echinodermata: Holothuroidea. Chapter 8. p. 664-750. In: Giese, A.C., Pearse, J.S. & Pearse, V.B. (eds.) 1991. *Reproduction in Marine Invertebrates*. Vol. VI Echinoderms and Lophophorates. The Boxwood Press. 808 pp.
- Smith, A.B., Paterson, G. & Lafay, B. 1994. Morphological and molecular phylogeny of ophiuroids. In: David, B., Guille, A., Féral, J.-P. & Roux, M. (eds.). *Echinoderms through time*. A.A. Balkema, Rotterdam.
- Smith, E.A. 1877. Descriptions of new species of Conidae and Terebridae. *Ann. Mag. Nat. Hist. (Ser. 4)* **19**: 222-231.
- Smith, E.A. 1888. Mollusca. p. 487-508. In: Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. 'Alert' 1881-1882. British Museum (Natural History) London.
- Smith, E.A. 1894. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander C.F. Oldham, R.N. - Series 2, No. 10. Report upon some Mollusca dredged in the Bay of Bengal and the Arabian Sea. *Ann. Mag. Nat. Hist. (Ser. 6)*, **14**: 157-174, pls 3-5.
- Smith, E.A. 1895. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander C.F. Oldham, R.N.-Series 2, No. 20. Report upon some Mollusca dredged in the Arabian Sea during the season 1894-5. *Ann. Mag. Nat. Hist. (Ser. 6)* **16**: 1-19.
- Smith, E.A. 1899. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander T.H. Hemming, R.N.-Series 3, No. 1. On Mollusca from the Bay of Bengal and the Arabian Sea. *Ann. Mag. Nat. Hist. (Ser. 7)* **4**: 237-251.
- Smith, E.A. 1904. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander T.H. Hemming, R.N.-Series 3, No. 1. On Mollusca from the Bay of Bengal and the Arabian Sea. *Ann. Mag. Nat. Hist. (Ser. 7)* **13**: 453-473; continued in *Ann. Mag. Nat. Hist. (Ser. 7)* **14**: 1-14.

- Smith, E.A. 1906. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator', Commander T.H. Hemming, R.N.-Series 3, No. 10. On Mollusca of the Bay of Bengal and the Arabian Sea. *Ann. Mag. Nat. Hist.* (Ser. 7) **18**: 157-175; continued in *Ann. Mag. Nat. Hist.* (Ser. 7) **18**: 245-264.
- Smith, M. 1953. *World-Wide Sea Shells and Rock Shell Catalog*. Tropical Laboratory, Windermer, Florida. 139 + 34.
- Smith, M.M. & Heemstra, P.C. (eds.) 1995. *Smith's Sea Fishes*. Southern Book Publishers. Johannesburg. 1047 pp.
- Smith, S.L. 1983. Biological indications of active upwelling in the northwestern Indian Ocean in 1964 and 1979, and a comparison with Peru and Northwest Africa. In: Angel, M.V. (ed.) *Science of the North-West Indian Ocean and Adjacent Waters*. *Deep Sea Res.* **31** (6-8): 951-967.
- Smythe, K.R. 1972. Marine Mollusca from Bahrain Island, Persian Gulf. *J. Conch. Lond.* **27**: 491-496.
- Smythe, K.R. 1979. The marine Mollusca of the United Arab Emirates, Arabian Gulf. *J. Conch. Lond.* **30**: 57-80.
- Smythe, K.R. 1982. *Seashells of the Arabian Gulf*. Allen & Unwin, London. 123 pp.
- Smythe, K.R. 1988. A new species of *Medusafissurella* (Gastropoda: Fissurellidae), a keyhole limpet from Oman. *J. Conch. Lond.* **33**: 97-101.
- Soest, R.W.M. van. 1994. Demosponge distribution patterns. p. 213-223 In: Soest, R.W.M. van, Kempen, van & Breekman, (eds.) *Sponges in Time and Space*. Balkema, Rotterdam.
- Sowerby, G.B. (III) 1895a. Descriptions of four new shells from the Persian Gulf and Bay of Zaila. *Proc. Malac. Soc. Lond.* **1**: 160-161.
- Sowerby, G.B. (III) 1895b. Descriptions of nine new species of shells from the Persian Gulf. *Proc. Malac. Soc. Lond.* **1**: 214-217.
- Spry, J.F. 1961. The sea shells of Dar es Salaam: Gastropods. *Tanganyika Notes and Records* **56** 32 pp. + Supplement (1968) p. 33-40.
- Spry, J.F. 1964. The Sea Shells of Dar es Salaam. Part II Pelecypoda. *Tanganyika Notes & Records* **63**: 41 pp. + Supplement (1968) p. 33-40.
- Srikrishnadhas, B., Ramamoorthi, K. & Balasubrahmanyam, K. 1987. Polychaetes of Porto Novo waters. *J. Mar. Biol. Ass. India* **29** (1-2): 134-139.
- Stepien, C.A., Randall, J.E. & Rosenblatt, R.H. 1994. Genetic and morphological divergence of a circumtropical complex of goatfishes: *Mulloidichthys vanicolensis*, *M. dentatus* and *M. martinicus*. *Pacific Science* **48** (1): 44-56.
- Stoddart, D.R. 1967. Ecology of Aldabra Atoll. *Atoll Res. Bull.* **118**: 1-141.
- Strathman, R.R. 1978. Progressive vacating of adaptive types during the Phanerozoic. *Evolution* **32**: 907-914.

- Sukarno, P. & Jangoux M. 1977. Revision du genre *Archaster* Müller et Troschel. *Rev. Zool. Afr.* **91** (4): 817-847
- Tahera, Q. & Tirmizi, N.M. 1995. A new record of *Holothuria* (*Thymosycia*) *arenicola* Semper, 1868 (Echinodermata: Holothuroidea) from Pakistan. *Raffles Bull. Zool.* **43** (1): 217-220.
- Talmadge, R.R. 1974. Some notes of the distribution and taxonomy of Haliotids. *Veliger* **16** (4): 411-412.
- Tampi, P.R.S. & Rangarajan, K. 1964. Some polychaetous annelids from the Andaman Islands. *J. Mar. Biol. Ass. India* **6** (1): 98-123.
- Taylor, J.D. 1968. Coral reef and associated invertebrate communities (mainly molluscan) around Mahé, Seychelles. *Phil. Trans. Roy. Soc. Lond. B* **254**: 129-206.
- Taylor, J.D. 1971. Intertidal zonation at Aldabra Atoll. *Phil. Trans. Roy. Soc. Lond. B.* **260**: 173-213
- Taylor, J.D. 1973. Provisional list of the Mollusca of Aldabra Atoll – unpublished.
- Taylor, J.D. & Lewis, M.S. 1970. The flora, fauna and sediments of the marine grass beds of Mahe, Seychelles. *J. Nat. Hist.* **4**: 199-220.
- Thandar, A.S. 1977. Descriptions of two new species of Holothuroidea from the East Coast of South Africa. *Ann. Natal Mus.* **23** (1): 57-66.
- Thandar, A.S. 1985. A new southern African genus in the holothurian family Cucumariidae (Echinodermata: Holothuroidea) with the recognition of two subspecies in *Cucumaria frauenfeldi* Ludwig. *S. Afr. Tyd. Skr. Dierk.* **20** (3): 109-114.
- Thandar, A.S. 1986. A new genus and species of adentrochirotid holothurian from southern Africa. *J. Zool. (A)* **210**: 483-488.
- Thandar, A.S. 1987. The Status of some southern African nominal species of *Cucumaria* (s.e.) referable to a new genus and their ecological isolation. *S. Afr. J. Zool.* **22**(4): 287 - 296.
- Thandar, A.S. 1989. A new species of phylloporid holothurian from Southern Africa. *J. Zool. Lond.* **219**: 637-644
- Thandar, A.S. 1989a. The sclerodactylid holothurians of southern Africa, with the erection of one new subfamily and two new genera (Echinodermata: Holothuroidea). *S. Afr. Tydsk. Dierk.* **24** (4): 290-304.
- Thandar, A.S. 1989b. Zoogeography of the southern African echinoderm fauna. *S. Afr. Tydsk. Dierk.* **24** (4): 311-313.
- Thandar, A.S. 1990. The phylloporid holothurians of southern Africa with the erection of one new subfamily and two new genera. *S. Afr. Tydsk. Dierk.* **25** (4): 207-223.



- Thandar, A.S. 1991. The cucumariid holothurians of southern Africa with the erection of one new subfamily and two new genus. *S. Afr. Tydskr. Dierk.* **26** (3): 115-139.
- Thandar, A.S. 1994. A new species of the holothurian genus *Phyllophorus* from South Africa with a key to subgenus *Phyllophorella*. *J. Zool. (A)* **234**: 341-351.
- Thandar, A.S. & F.W.E. Rowe 1989. New species and new records of apodous holothurians (Echinodermata, Holothuroidea) from southern Africa. *Zoologica Scripta* **18**(1): 145 - 155."
- Thomassin, B.A. 1971. Les facies d'epifaune et d'epiflore des biotopes sedimentaires des formations coralliennes dans la region de Tuléar (Sud-Oest de Madagascar). *Symp. Zool. Soc. Lond.* **28**: 371-396.
- Thorson, G. 1961. Length of pelagic larval life in marine bottom invertebrates as related to larval transport by ocean currents. *Amer. Assoc. Adv. Science* **67**: 455- 474.
- Thresher, R.E. & Brothers, E.B. 1985. Reproductive ecology and biogeography of the Indo-West Pacific angelfish Pisces: Pomacanthidae. *Evolution* **39** 4 : 878-887.
- Thresher, R.E., Colin, P.L. & Bell, L.J. 1989. Planktonic duration, distribution and population structure of western and central Pacific damselfishes (Pomacentridae). *Copeia* **2**: 420-434.
- Tommasi, L.R. 1967. Ophiuroidea de la Côte-d'Ivoire. *Bull. Inst. Fondam. Afr. Noire Ser. A.* **29**: 523-583.
- Tortonese, E. 1977. Report on Echinoderms from the Gulf of Aqaba (Red Sea). *Italian Journal of Zoology* N.S. S. IX(12): 273-290.
- Tortonese, E. 1980. Researches on the coast of Somalia. Littoral Echinodermata. *Monitore zoologico italiano NS Supplemento XIII* 5: 99-139.
- Valentine, J.W. 1967. The influence of climatic fluctuations on species diversity within the Tethyan Provincial system. p. 153-166. In: Adams, C.G. & Ager, D.V. *Aspects of Tethyan Biogeography*. Systematics Association Publication No. 7, London.
- Vaught, K.C 1989. *A Classification of the Living Mollusca*. Abbott, R.T. (ed.) Am. Malac. Inc. Melbourn, Florida, U.S.A. 189 pp.
- Verdcourt, B. 1954. The cowries of the East African Coast (Kenya, Tanganyika, Zanzibar and Pemba). *J. E. Afr. Nat. Hist. Soc.* **22** (96): 129-144.
- Verdcourt, B. 1959. The cowries of the East African Coast: Supplement II. *J. E. Afr. Nat. Hist. Soc.* **23** (100): 130-134.
- Verdcourt, B. 1960. The cowries of the East African Coast: Supplement III. *J. E. Afr. Nat. Hist. Soc.* **23** (104): 281-285.
- Vermeij, G. 1972. Endemism and environment: some shore molluscs of the tropical Atlantic. *Amer. Nat.* **106**: 89-101.

- Vermeij, G. 1973a. West Indian molluscan communities in rocky intertidal zone: a morphological approach. *Bull. Mar. Sci.* **23**: 351-386.
- Vermeij, G. 1973b. Molluscs in mangrove swamps: physiognomy, diversity and regional differences. *Syst. Zool.* **22**: 609-624.
- Vermeij, G. 1978. *Biogeography and Adaptation. Patterns of marine life*. Harvard Uni. Press. 332 pp.
- Veron, J.E.N. 1995. *Corals in time and space*. Cambridge University Press.
- Viader, R. 1937. Revised Catalogue of the Testaceous Mollusca of Mauritius and its Dependencies. *Mauritius Institute Bulletin* Vol. 1 (2). 111pp.
- Viader, R. 1951. New or unrecorded shells from Mauritius and its dependencies. *Ibid* **3** (2):125-155.
- Vine, P. 1986. *Red Sea Invertebrates*. Immel Publishing, London. 224 pp.
- Walenkamp, J.H.C. 1990. Systematic and zoogeography of Asteroidea (Echinodermata) from Inhaca Island, Mozambique. *Zool. Verh. (Leiden)* **261**: 1-86.
- Wellington, G.M. & Victor, B.C. 1989. Planktonic larval duration of one hundred species of Pacific and Atlantic damselfish (Pomacentridae). *Mar. Biol.* **101**: 557-567.
- Wells, F. 1990. Comparative zoogeography of marine mollusks from northern Australia, New Guinea, and Indonesia. *Veliger* **33** (2): 140-144.
- Wells, F. & Bryce, C.W. 1988. *Seashells of Western Australia*. Western Australia Museum. 207 pp.
- Wesenberg-Lund, E. 1940. Polychaetes of the Iranian Gulf. *Dan. scient. Invest. Iran* **4**: 247-400.
- Wiley, A. 1905. Report on the Polychaeta collected by Professor Herdman at Ceylon. *Roy. Soc. Rep. on Pearl Oyster Fisheries, Suppl. Rep.* XXX: 243-324.
- Williamson, M. 1988. Relationship of species number to area, disturbance and other variables. p. 91-115. In: Myers, A.A. & Giller, P.S. *Analytical Biogeography*. Chapman & Hall.
- Wilson, B. 1993. *Australian Marine Shells. Prosobranch Gastropods. Part I*. Odyssey. 408 pp.
- Winckworth, H.C. 1940. *Catalogue of the marine Mollusca of the Seychelle Islands*. Victoria, Seychelles, Clarion Press. 25 pp.
- Woodland, D.J. 1983. Zoogeography of the Siganidae (Pisces): an interpretation of distribution and richness patterns. *Bull. Mar. Sci.* **33**: 713-717.
- World Bank 1995. *Africa: A Framework for Integrated Coastal Zone Management*. Land, Water and Natural Habitats Division. Africa Environmentally Sustainable Development Division. The World Bank. 139 pp.

Yamaguchi, M. 1977. Larval behavior and geographic distribution of coral reef asteroids in the Indo-West Pacific. *Micronesica* 13 (2): 283-296.

Yonow, N. 1997. Opisthobranchia and Pulmonata. p. 266-273. In: Richmond, M.D. (ed.) *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*. Sida, Sweden. 448 pp.

Ziegler, W. & Krupp, F. 1996. The role of taxonomic research in biodiversity conservation. p. 193-198. In: Krupp, F., Abuzinada, A.H. & Nader, I.A. *A Marine Wildlife Sanctuary for the Arabian Gulf. Environmental Research following the 1991 Gulf War Oil Spill*. NCWCD, Riyadh and Senckenberg Research Institute, Frankfurt a.M.

## **APPENDIX 1**

Table 1. MHWS benthos samples (see main text for codes for sites and stations).

Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	MZ	MZ	MZ	MZ	MZ	MZ	MZ	MZ	MZ	HB	HB	HB
	STATION	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
	REPLICA	T1C1	T1C2	T1C3	T2C1	T2C2	T2C3	T3C1	T3C2	T3C3	C1	C2	C3
<i>Aphrogenia</i> sp.													
<i>Iphione cf. muricata</i> (Savigny, 1818)													
Harmothoinae sp.													
<i>Sthenelais boa</i> (Johnston, 1839)													
<i>Phyllodoce capensis</i> Day, 1960													
<i>Phyllodoce cf. castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.													
<i>Ancistrosyllis parva</i> Day, 1963													
<i>Pharyngeovalvata natalensis</i> Day, 1951													
<i>Syllis cf. amica</i> Quatrefages, 1865													
<i>Syllis bouvieri</i> Gravier, 1900													
<i>Syllis comuta</i> Rathke, 1843													
<i>Syllis cf. gracilis</i> Grube, 1840													
<i>Syllis cf. prolifera</i> Krohn, 1852													
<i>Ceratonereis erythraensis</i> Fauvel, 1918			13							2			
<i>Ceratonereis mirabilis</i> Kinberg, 1866													
<i>Dendronereis arborifera</i> Peters, 1854													
<i>Namalycastis indica</i> (Southern, 1921)													
<i>Nereis caudata</i> Delle Chiaje, 1841													
<i>Nereis coutieri</i> Gravier, 1899													
<i>Nereis persica</i> Fauvel, 1911													1
<i>Nereis unifasciata</i> Willey, 1905					8								
<i>Perinereis nuntia vallata</i> (Grube, 1857)		3		1			5			1			1
<i>Platynereis isolita</i> Gravier, 1901													
<i>Platynereis pulchella</i> Gravier, 1901													
<i>Platynereis</i> sp.													
<i>Glycera lancadivae</i> Schmarda, 1861													
<i>Eunice antennata</i> (Savigny, 1820)													
<i>Eunice indica</i> Kinberg, 1865													
<i>Lysidice collaris</i> Grube, 1870													
<i>Marphysa bifurcata</i> Kott, 1951													
<i>Marphysa mossambica</i> (Peters, 1854)													
<i>Nematoneis unicomis</i> (Grube, 1840)													
<i>Arabella iricolor iricolor</i> (Montagu, 1804)													
<i>Notocirrus australis</i> Day, 1960													
<i>Oenone</i> sp.													
<i>Lumbrineris latreilli</i> Aud. & M. Ed., 1834													
<i>Diopatra cuprea cuprea</i> (Bosc, 1802)													
<i>Aonides oxycephala</i> (Sars, 1862)													
<i>Malacoceros indicus</i> (Fauvel, 1928)													
<i>Nerinides</i> sp.													
<i>Prionospio cf. convexa</i> Imajima, 1990													
<i>Prionospio malmgreni</i> Claparède, 1870													
<i>Prionospio sexoculata</i> Augener, 1918													
<i>Scolecopsis squamata</i> (Müller, 1806)										1	24		
<i>Spio</i> sp.													
<i>Magelona</i> sp.													
<i>Poecilochaetus serpens</i> Allen, 1904													
<i>Caulerella</i> sp.													
<i>Cirratulus</i> sp.													
<i>Cirriformia</i> sp.													
<i>Scoloplos capensis</i> Day, 1961													
<i>Scoloplos cf. uniramis</i> Day, 1961													
Orbinidae sp.													
<i>Paraonis</i> sp.													
<i>Armandia intermedia</i> Fauvel, 1902													
<i>Armandia leptocirrus</i> Grube, 1878													
<i>Armandia melanura</i> Gravier, 1905													
<i>Polyophthalmus pictus</i> (Dujardin, 1839)													
<i>Anatomastus</i> sp.													
<i>Capitella cf. capitata</i> (Fabricius, 1780)													
<i>Capitellid</i> sp. 1											1		
<i>Dasybranchus caducus</i> (Grube, 1846)													
<i>Heteromastides</i> sp.													
<i>Mediomastus</i> sp.													
<i>Notomastus latericeus</i> Sars, 1851													
<i>Amphiteis gunneri</i> (Sars, 1835)													
<i>Nicolea venustula africana</i> Aug., 1918													
<i>Terebellid</i> sp. 1													
<i>Terebellides stroemi</i> Sars, 1835													
<i>Jasmineira elegans</i> Saint-Joseph, 1894													
Total:		3	13	1	8	0	5	0	2	27	0	0	2

Table 2a. MHW benthos samples (see main text for codes for sites and stations). Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	KS	KS	KS	KS	KS	MK	MK	MK	MK	MK
	STATION	S2	S2	S2	S2	S2	S2	S2	S2	S2	S2
	REPLICA	C1	C2	C3	C4	C5	C1	C2	C3	C4	C5
<i>Aphrogenia</i> sp.											
<i>Iphione</i> cf. <i>muricata</i> (Savigny, 1818)											
<i>Harmothoinae</i> sp.											
<i>Sthenelais</i> <i>boa</i> (Johnston, 1839)											
<i>Phylodoce</i> <i>capensis</i> Day, 1960											
<i>Phylodoce</i> cf. <i>castanea</i> (Marenz., 1879)											
<i>Phylodoce</i> sp.											
<i>Ancistrosyllis</i> <i>perva</i> Day, 1963											
<i>Pharyngeovalvata</i> <i>natalensis</i> Day, 1951											
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865											
<i>Syllis</i> <i>bouvieri</i> Gravier, 1900											
<i>Syllis</i> <i>cornuta</i> Rathke, 1843											
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840											
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852											
<i>Ceratonereis</i> <i>erythraensis</i> Fauvel, 1918											
<i>Ceratonereis</i> <i>mirabilis</i> Kinberg, 1866											
<i>Dendronereis</i> <i>arborifera</i> Peters, 1854							1			6	
<i>Namalycastis</i> <i>indica</i> (Southern, 1921)							1				
<i>Nereis</i> <i>caudata</i> Delle Chiaje, 1841											
<i>Nereis</i> <i>coutien</i> Gravier, 1899											
<i>Nereis</i> <i>persica</i> Fauvel, 1911											
<i>Nereis</i> <i>unifasciata</i> Willey, 1905											
<i>Perinereis</i> <i>nuntia</i> <i>vallata</i> (Grube, 1857)											
<i>Platynereis</i> <i>isolita</i> Gravier, 1901											
<i>Platynereis</i> <i>pulchella</i> Gravier, 1901											
<i>Platynereis</i> sp.											
<i>Glycera</i> <i>lencadivae</i> Schmarda, 1861											
<i>Eunice</i> <i>antennata</i> (Savigny, 1820)											
<i>Eunice</i> <i>indica</i> Kinberg, 1865											
<i>Lysidice</i> <i>collaris</i> Grube, 1870											
<i>Marphysa</i> <i>bifurcata</i> Kott, 1951											
<i>Marphysa</i> <i>mossambica</i> (Peters, 1854)											
<i>Nematoneis</i> <i>unicornis</i> (Grube, 1840)											
<i>Arabella</i> <i>incolar</i> <i>incolar</i> (Montagu, 1804)											
<i>Notocirrus</i> <i>australis</i> Day, 1960											
<i>Oenone</i> sp.											
<i>Lumbrineris</i> <i>latreilli</i> Aud. & M. Ed., 1834											
<i>Diopatra</i> <i>cuprea</i> <i>cuprea</i> (Bosc, 1802)											
<i>Aonides</i> <i>oxycephala</i> (Sars, 1862)											
<i>Malacoceros</i> <i>indicus</i> (Fauvel, 1928)											
<i>Nerinides</i> sp.											
<i>Prionospio</i> cf. <i>convexa</i> Imajima, 1990											
<i>Prionospio</i> <i>malmgreni</i> Claparède, 1870											
<i>Prionospio</i> <i>saxoculata</i> Augener, 1918											
<i>Scolecopsis</i> <i>squamata</i> (Müller, 1806)											
<i>Spio</i> sp.											
<i>Magelona</i> sp.											
<i>Poecilochaetus</i> <i>serpens</i> Allen, 1904											
<i>Caulerella</i> sp.											
<i>Cirratulus</i> sp.											
<i>Cirriiformia</i> sp.											
<i>Scoloplos</i> <i>capensis</i> Day, 1961											
<i>Scoloplos</i> cf. <i>uniramus</i> Day, 1961											
Orbinidae sp.											
<i>Paraonis</i> sp.											
<i>Armandia</i> <i>intermedia</i> Fauvel, 1902			1								
<i>Armandia</i> <i>leptocirrus</i> Grube, 1878											
<i>Armandia</i> <i>melanura</i> Gravier, 1905											
<i>Polyophthalmus</i> <i>pictus</i> (Dujardin, 1839)											
<i>Anatomastus</i> sp.						7					
<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)											
Capitellid sp. 1											
<i>Dasybranchus</i> <i>ceducus</i> (Grube, 1846)											
<i>Heteromastides</i> sp.											
<i>Mediomastus</i> sp.											
<i>Notomastus</i> <i>latericeus</i> Sars, 1851											
<i>Amphicteis</i> <i>gunneri</i> (Sars, 1835)											
<i>Nicolea</i> <i>venustula</i> <i>africana</i> Aug., 1918											
Terebellid sp. 1											
<i>Terebellides</i> <i>stroemi</i> Sars, 1835											
<i>Jasmineira</i> <i>elegans</i> Saint-Joseph, 1894											
Total:		0	1	0	0	7	2	0	0	6	0

Table 2b. MHW benthos samples (see main text for codes for sites and stations).  
 Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5:  
 stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mweni; KS:  
 Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE		MZ	MZ	MZ	MZ	MZ	MZ	MB	MB	MB	MB	MB
	STATION		S2	S2	S2	S2	S2	S2	S2	S2	S2	S2	S2
	REPLICA		T1C1	T1C2	T1C3	T2C1	T2C2	T2C3	C1	C2	C3	C4	C5
<i>Aphrogenia</i> sp.													
<i>Iphione</i> cf. <i>muricata</i> (Savigny, 1818)													
Harmothoinae sp.													
<i>Sthenelais</i> <i>boa</i> (Johnston, 1839)													
<i>Phyllodoce</i> <i>capensis</i> Day, 1960													
<i>Phyllodoce</i> cf. <i>castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.													
<i>Ancistrosyllis</i> <i>parva</i> Day, 1963													
<i>Pharyngeovalvata</i> <i>natalensis</i> Day, 1951													
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865													
<i>Syllis</i> <i>bouvieri</i> Gravier, 1900													
<i>Syllis</i> <i>cornuta</i> Rathke, 1843													
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840													
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852													
<i>Ceratonereis</i> <i>erythraensis</i> Fauvel, 1918	1	6	2	22	12			33	16				
<i>Ceratonereis</i> <i>mirabilis</i> Kinberg, 1866													
<i>Dendronereis</i> <i>arborifera</i> Peters, 1854	5	3			2			13	10		1	1	
<i>Namelycastis</i> <i>indica</i> (Southern, 1921)													
<i>Nereis</i> <i>caudata</i> Delle Chiaje, 1841													
<i>Nereis</i> <i>coutieri</i> Gravier, 1899													
<i>Nereis</i> <i>persica</i> Fauvel, 1911													
<i>Nereis</i> <i>unifasciata</i> Willey, 1905													
<i>Parinereis</i> <i>nuntia</i> <i>vallata</i> (Grube, 1857)											4		
<i>Platynereis</i> <i>isolita</i> Gravier, 1901	6	2											
<i>Platynereis</i> <i>pulchella</i> Gravier, 1901													
<i>Platynereis</i> sp.													
<i>Glycera</i> <i>lancadivae</i> Schmarda, 1861						1	2						
<i>Eunice</i> <i>antennata</i> (Savigny, 1820)													
<i>Eunice</i> <i>indica</i> Kinberg, 1865													
<i>Lysidice</i> <i>collaris</i> Grube, 1870													
<i>Marphysa</i> <i>bifurcata</i> Kott, 1951													
<i>Marphysa</i> <i>mossambica</i> (Peters, 1854)							1		2		1		
<i>Nematoneis</i> <i>unicornis</i> (Grube, 1840)													
<i>Arabella</i> <i>incolor</i> <i>incolor</i> (Montagu, 1804)													
<i>Notocirrus</i> <i>australis</i> Day, 1960				1									
<i>Oenone</i> sp.								1			1		
<i>Lumbrineris</i> <i>letrilli</i> Aud. & M. Ed., 1834													
<i>Diopatra</i> <i>cuprea</i> <i>cuprea</i> (Bosc, 1802)													
<i>Aonides</i> <i>oxycephala</i> (Sars, 1862)			1										
<i>Malacoceros</i> <i>indicus</i> (Fauvel, 1928)											1	3	
<i>Nerinides</i> sp.													
<i>Prionospio</i> cf. <i>convexa</i> Imajima, 1990													
<i>Prionospio</i> <i>malmgreni</i> Claparède, 1870	1		2										
<i>Prionospio</i> <i>sexoculata</i> Augener, 1918													
<i>Scolecopsis</i> <i>squamata</i> (Müller, 1806)													
<i>Spio</i> sp.													
<i>Magelona</i> sp.													
<i>Poecilochaetus</i> <i>serpens</i> Allen, 1904													
<i>Caulerrella</i> sp.													
<i>Cirratulus</i> sp.													
<i>Cirriformia</i> sp.													
<i>Scoloplos</i> <i>capensis</i> Day, 1961													
<i>Scoloplos</i> cf. <i>uniramus</i> Day, 1961		2	1										
Orbinidae sp.													
<i>Paraonis</i> sp.													
<i>Armandia</i> <i>intermedia</i> Fauvel, 1902								10			10		
<i>Armandia</i> <i>leptocirrus</i> Grube, 1878													
<i>Armandia</i> <i>melanura</i> Gravier, 1905												4	
<i>Polyophthalmus</i> <i>pictus</i> (Dujardin, 1839)													
<i>Anatomastus</i> sp.										15			
<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)													
<i>Capitellid</i> sp. 1				1				1					
<i>Dasybranchus</i> <i>caducus</i> (Grube, 1846)								1					
<i>Heteromastides</i> sp.													
<i>Mediomastus</i> sp.													
<i>Notomastus</i> <i>latericeus</i> Sars, 1851													
<i>Amphicteis</i> <i>gunneri</i> (Sars, 1835)													
<i>Nicolea</i> <i>venustula</i> <i>africana</i> Aug., 1918													
<i>Terebellid</i> sp. 1													
<i>Terebellides</i> <i>stroemi</i> Sars, 1835													
<i>Jasmineira</i> <i>elegans</i> Saint-Joseph, 1894					1								
Total:	13	14	6	24	15	3	59	28	15	18	8		

Table 3. MHWN benthos samples (see main text for codes for sites and stations). Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	NG	NG	NG	HB	HB	HB	BW	BW	BW	MZ	MZ	MZ
	STATION	S1	S1	S1	S2	S2	S2	S1	S1	S1	S2	S2	S2
	REPLICA	C1	C2	C3	C1	C2	C3	C1	C2	C3	T3C1	T3C2	T3C3
<i>Aphrogenia</i> sp.													
<i>Iphione cf. muricata</i> (Savigny, 1818)													
Harmothoinae sp.													
<i>Sthenelais boa</i> (Johnston, 1839)													
<i>Phyllodoce capensis</i> Day, 1960													
<i>Phyllodoce cf. castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.											1		1
<i>Ancistrosyllis parva</i> Day, 1963													
<i>Pharyngeovalvata natalensis</i> Day, 1951													
<i>Syllis cf. amica</i> Quatrefages, 1865													
<i>Syllis bouvieri</i> Gravier, 1900													
<i>Syllis comuta</i> Rathke, 1843													
<i>Syllis cf. gracilis</i> Grube, 1840													
<i>Syllis cf. prolifera</i> Krohn, 1852													
<i>Ceratonereis erythraensis</i> Fauvel, 1918											4		8
<i>Ceratonereis mirabilis</i> Kinberg, 1866													
<i>Dendronereis arborifera</i> Peters, 1854											25		6
<i>Namalycastris indica</i> (Southern, 1921)													
<i>Nereis caudata</i> Delle Chiaje, 1841													
<i>Nereis coutieri</i> Gravier, 1899				1									
<i>Nereis persica</i> Fauvel, 1911													
<i>Nereis unifasciata</i> Willey, 1905													
<i>Peninereis nuntia vailata</i> (Grube, 1857)													
<i>Platynereis isolita</i> Gravier, 1901								1					
<i>Platynereis pulchella</i> Gravier, 1901													
<i>Platynereis</i> sp.													
<i>Glycera lancadivae</i> Schmarda, 1861		1		2							1		1
<i>Eunice antennata</i> (Savigny, 1820)													
<i>Eunice indica</i> Kinberg, 1865													
<i>Lysidice collaris</i> Grube, 1870													
<i>Marphysa bifurcata</i> Kott, 1951													
<i>Marphysa mossambica</i> (Peters, 1854)													
<i>Nematonereis unicornis</i> (Grube, 1840)													
<i>Arabella incolor incolor</i> (Montagu, 1804)													
<i>Notocirrus australis</i> Day, 1960													
<i>Oenone</i> sp.													
<i>Lumbrineris letreilli</i> Aud. & M. Ed., 1834											1		
<i>Diopatra cuprea cuprea</i> (Bosc, 1802)													
<i>Aonides oxycephala</i> (Sars, 1862)													
<i>Malacoceros indicus</i> (Fauvel, 1928)													
<i>Nerinides</i> sp.						41	2						
<i>Prionospio cf. convexa</i> Imaijima, 1990													
<i>Prionospio malmgreni</i> Claparède, 1870													
<i>Prionospio sexoculata</i> Augener, 1918													
<i>Scoelepis squamata</i> (Müller, 1806)					8	3	15						
<i>Spio</i> sp.													
<i>Magelona</i> sp.													
<i>Poecilochaetus serpens</i> Allen, 1904													
<i>Caulleriella</i> sp.													
<i>Cirratulus</i> sp.								1					
<i>Cirriformia</i> sp.								1					
<i>Scoloplos capensis</i> Day, 1961													
<i>Scoloplos cf. uniramus</i> Day, 1961													
Orbinidae sp.													
<i>Paraonis</i> sp.													
<i>Armandia intermedia</i> Fauvel, 1902											1		
<i>Armandia leptocirus</i> Grube, 1878													
<i>Armandia melanura</i> Gravier, 1905											3		
<i>Polyopthalmus pictus</i> (Dujardin, 1839)													
<i>Anatomastus</i> sp.													
<i>Capitella cf. capitata</i> (Fabricius, 1780)													
Capitellid sp. 1													
<i>Dasybranchus caducus</i> (Grube, 1846)													
<i>Heteromastides</i> sp.													
<i>Mediomastus</i> sp.													
<i>Notomastus latericeus</i> Sars, 1851													
<i>Amphicteis gunneri</i> (Sars, 1835)													
<i>Nicolea venustula africana</i> Aug., 1918													
Terebellid sp. 1													
<i>Terebellides stroemi</i> Sars, 1835													
<i>Jasminiera elegans</i> Saint-Joseph, 1894													
Total:		1	0	3	8	44	17	3	0	1	35	0	16



Table 4a. MTL benthos samples (see main text for codes for sites and stations).  
 Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	BW	BW	BW	MZ	MZ	MZ	NG	NG	NG	MZ	MZ	MZ
	STATION	S2	S2	S2	S3	S3	S3	S2	S2	S2	S3	S3	S3
	REPLICA	C1	C2	C3	T1C1	T1C2	T1C3	C1	C2	C3	T2C1	T2C2	T2C3
<i>Aphrogenia</i> sp.													
<i>Iphoné cf. muricata</i> (Savigny, 1818)													
Harmothoinae sp.													
<i>Sithenelais boa</i> (Johnston, 1839)													
<i>Phyllodoce capensis</i> Day, 1960									1				
<i>Phyllodoce cf. castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.										3			
<i>Ancistrosyllis parva</i> Day, 1963													
<i>Pharyngeovalvata natalensis</i> Day, 1951		1											
<i>Syllis cf. amica</i> Quatrefages, 1865													
<i>Syllis bouvieri</i> Gravier, 1900													
<i>Syllis comuta</i> Rathke, 1843													
<i>Syllis cf. gracilis</i> Grube, 1840													
<i>Syllis cf. prolifera</i> Krohn, 1852			1										
<i>Ceratonereis erythraensis</i> Fauvel, 1918													
<i>Ceratonereis mirabilis</i> Kinberg, 1866						1							
<i>Dendronereis erbonifera</i> Peters, 1854													
<i>Nemalycaeus indica</i> (Southern, 1921)													
<i>Nereis caudata</i> Delle Chiaje, 1841													
<i>Nereis coutieri</i> Gravier, 1899		2											
<i>Nereis persica</i> Fauvel, 1911													
<i>Nereis unifasciata</i> Willey, 1905													
<i>Perinereis nuntia vallate</i> (Grube, 1857)													
<i>Platynereis isolite</i> Gravier, 1901													1
<i>Platynereis pulchella</i> Gravier, 1901						1							
<i>Platynereis</i> sp.													
<i>Glycera lancidivae</i> Schmarida, 1861			1		4	1	4		4	2	2	2	
<i>Eunice antennata</i> (Savigny, 1820)													
<i>Eunice indica</i> Kinberg, 1865													
<i>Lysidice collaris</i> Grube, 1870					1								
<i>Marphysa bifurcata</i> Kott, 1951													
<i>Marphysa mossambica</i> (Peters, 1854)													
<i>Nematonereis unicornis</i> (Grube, 1840)													
<i>Arabella inicolor inicolor</i> (Montagu, 1804)													
<i>Notocirrus australis</i> Day, 1960													
<i>Oenone</i> sp.													
<i>Lumbinereis latreilli</i> Aud. & M. Ed., 1834													1
<i>Diopatra cuprea cuprea</i> (Bosc, 1802)													
<i>Aonides oxycephala</i> (Sars, 1862)					4								
<i>Malacoceros indicus</i> (Fauvel, 1928)													
<i>Nerinides</i> sp.					1								
<i>Prionospio cf. convexa</i> Imajima, 1990													
<i>Prionospio malmgreni</i> Claparède, 1870					1								
<i>Prionospio sexoculata</i> Augener, 1918													
<i>Scoelelepis squamata</i> (Müller, 1806)													1
<i>Spio</i> sp.													
<i>Magelona</i> sp.													
<i>Poecilochaetus serpens</i> Allen, 1904													
<i>Caulleriella</i> sp.													
<i>Cirratulus</i> sp.				11									
<i>Cirriformia</i> sp.					1								
<i>Scoloplos capensis</i> Day, 1961													
<i>Scoloplos cf. uniramis</i> Day, 1961													
Orbinidae sp.		4											
<i>Paraonis</i> sp.													
<i>Armandia intermedia</i> Fauvel, 1902				1									
<i>Armandia leptocirrus</i> Grube, 1878								131	3	2			
<i>Armandia melanura</i> Gravier, 1905													
<i>Polyophthalmus pictus</i> (Dujardin, 1839)				1									
<i>Anatomastus</i> sp.													
<i>Capitella cf. capitata</i> (Fabricius, 1780)													
<i>Capitellid</i> sp. 1					1								
<i>Dasybranchus caducus</i> (Grube, 1846)													
<i>Heteromastides</i> sp.													
<i>Mediomastus</i> sp.													
<i>Notomastus latericeus</i> Sars, 1851													
<i>Amphicteis gunneri</i> (Sars, 1835)													
<i>Nicolea venustula africana</i> Aug., 1918									7	7			
<i>Terebellid</i> sp. 1													
<i>Terebellides stroemi</i> Sars, 1835						2							
<i>Jasmineira elegans</i> Saint-Joseph, 1894										1			
Total:		7	2	13	13	5	4	131	15	15	2	3	2

Table A4b. MTL benthos samples (see main text for codes for sites and stations). Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	MZ	MZ	MZ	NG	NG	NG	BW	BW	BW	HB	HB	HB
	STATION	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3
	REPLICA	T3C1	T3C2	T3C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
<i>Aphrogenia</i> sp.													
<i>Iphione</i> cf. <i>muricata</i> (Savigny, 1818)													
Harmothoinae sp.													
<i>Sthenelais</i> <i>boa</i> (Johnston, 1839)													
<i>Phyllodoce</i> <i>capensis</i> Day, 1960													
<i>Phyllodoce</i> cf. <i>castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.			1									1	
<i>Ancistrosyllis</i> <i>parva</i> Day, 1963													
<i>Pharyngeovalvata</i> <i>natalensis</i> Day, 1951													
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865													
<i>Syllis</i> <i>bouvieri</i> Gravier, 1900													
<i>Syllis</i> <i>cornuta</i> Rathke, 1843													
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840													
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852													
<i>Ceratonereis</i> <i>erythraensis</i> Fauvel, 1918			22	7								1	
<i>Ceratonereis</i> <i>mirabilis</i> Kinberg, 1866								1					
<i>Dendronereis</i> <i>arborifera</i> Peters, 1854													4
<i>Namalycastis</i> <i>indica</i> (Southern, 1921)													
<i>Nereis</i> <i>caudata</i> Delle Chiaje, 1841												25	
<i>Nereis</i> <i>coutieri</i> Gravier, 1899													
<i>Nereis</i> <i>persica</i> Fauvel, 1911													
<i>Nereis</i> <i>unifasciata</i> Willey, 1905													
<i>Perinereis</i> <i>nuntia</i> <i>vallata</i> (Grube, 1857)													
<i>Platynereis</i> <i>isolita</i> Gravier, 1901													
<i>Platynereis</i> <i>pulchella</i> Gravier, 1901													
<i>Platynereis</i> sp.							1						
<i>Glycera</i> <i>lancedivae</i> Schmarda, 1861		1		1	3	3							
<i>Eunice</i> <i>antennata</i> (Savigny, 1820)													
<i>Eunice</i> <i>indica</i> Kinberg, 1865													1
<i>Lysidice</i> <i>collens</i> Grube, 1870													
<i>Marphysa</i> <i>bifurcata</i> Kott, 1951													
<i>Marphysa</i> <i>mossambica</i> (Peters, 1854)											3	1	3
<i>Nematonereis</i> <i>unicornis</i> (Grube, 1840)													
<i>Arabella</i> <i>inicolor</i> <i>inicolor</i> (Montagu, 1804)													
<i>Notocirrus</i> <i>australis</i> Day, 1960		1		1									
<i>Oenone</i> sp.													
<i>Lumbrineris</i> <i>letrilli</i> Aud. & M. Ed., 1834													
<i>Diopatra</i> <i>cuprea</i> <i>cuprea</i> (Bosc, 1802)		1	1								7	4	5
<i>Aonides</i> <i>oxycephala</i> (Sars, 1862)			1										
<i>Malacoceros</i> <i>indicus</i> (Fauvel, 1928)													
<i>Nerinides</i> sp.													
<i>Pronospio</i> cf. <i>convexa</i> Imajima, 1990													
<i>Pronospio</i> <i>malmgreni</i> Claparède, 1870													
<i>Pronospio</i> <i>sexoculata</i> Augener, 1918													
<i>Scolecopsis</i> <i>squamata</i> (Müller, 1806)													
<i>Spio</i> sp.			1										
<i>Magelona</i> sp.													
<i>Poecilochaetus</i> <i>serpens</i> Allen, 1904							1						
<i>Caulerella</i> sp.			1	3									
<i>Cirratulus</i> sp.													
<i>Cirriiformia</i> sp.													
<i>Scoloplos</i> <i>capensis</i> Day, 1961													
<i>Scoloplos</i> cf. <i>uniramus</i> Day, 1961													
Orbinidae sp.													
<i>Paraonis</i> sp.				1									
<i>Armandia</i> <i>intermedia</i> Fauvel, 1902													
<i>Armandia</i> <i>leptocirrus</i> Grube, 1878													
<i>Armandia</i> <i>melanura</i> Gravier, 1905													
<i>Polyophthalmus</i> <i>pictus</i> (Dujardin, 1839)													
<i>Anatomastus</i> sp.													
<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)												1	4
Capitellid sp. 1		2		2							1	1	
<i>Dasybranchus</i> <i>caducus</i> (Grube, 1846)						1							
<i>Heteromastides</i> sp.						1							
<i>Mediomastus</i> sp.													
<i>Notomastus</i> <i>latericeus</i> Sars, 1851													
<i>Amphicteis</i> <i>gunneri</i> (Sars, 1835)													
<i>Nicolea</i> <i>venustula</i> <i>africana</i> Aug., 1918													
Terebellid sp. 1													
<i>Terebellides</i> <i>stroemi</i> Sars, 1835													
<i>Jasmineira</i> <i>elegans</i> Saint-Joseph, 1894													
Total:		5	27	14	3	6	1	1	0	0	37	12	13

Table 5a. MLWN benthos samples (see main text for codes for sites and stations). Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	MZ	MZ	MZ	MZ	MZ	MZ	MZ	MZ	MZ	BW	BW	BW
	STATION	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4
	REPLICA	T1C1	T1C2	T1C3	T2C1	T2C2	T2C3	T3C1	T3C2	T3C3	C1	C2	C3
<i>Aphrogenia</i> sp.						1				1	1		
<i>Iphione cf. muricata</i> (Savigny, 1818)											1		
Harmothoinae sp.													
<i>Sthenelais boa</i> (Johnston, 1839)						1							
<i>Phyllodoce capensis</i> Day, 1960													
<i>Phyllodoce cf. castanea</i> (Marenz., 1879)													
<i>Phyllodoce</i> sp.													
<i>Ancistrosyllis parva</i> Day, 1963						1				1			
<i>Pharyngeovalvata natalensis</i> Day, 1951													
<i>Syllis cf. amica</i> Quatrefages, 1865	1												
<i>Syllis bouvieri</i> Gravier, 1900					1								
<i>Syllis comuta</i> Rathke, 1843					1	1							
<i>Syllis cf. gracilis</i> Grube, 1840	1												
<i>Syllis cf. prolifera</i> Krohn, 1852													1
<i>Ceratonereis erythraensis</i> Fauvel, 1918													3
<i>Ceratonereis mirabilis</i> Kinberg, 1866													1
<i>Dendronereis arborifera</i> Peters, 1854						1							
<i>Nemalycaeus indica</i> (Southern, 1921)													
<i>Nereis caudata</i> Delle Chiaje, 1841													
<i>Nereis coutieri</i> Gravier, 1899													
<i>Nereis persica</i> Fauvel, 1911													
<i>Nereis unifasciata</i> Willey, 1905													
<i>Perinereis nuntia vallata</i> (Grube, 1857)													
<i>Platynereis isolita</i> Gravier, 1901													1
<i>Platynereis pulchella</i> Gravier, 1901													
<i>Platynereis</i> sp.													
<i>Glycera lancædivæ</i> Schmarda, 1861	1						1						1
<i>Eunice antennata</i> (Savigny, 1820)												1	2
<i>Eunice indica</i> Kinberg, 1865													
<i>Lysidice collaris</i> Grube, 1870													
<i>Marphysa bifurcata</i> Kott, 1951													
<i>Marphysa mossambica</i> (Peters, 1854)													
<i>Nematoneis unicomis</i> (Grube, 1840)													
<i>Arabella incolor incolor</i> (Montagu, 1804)													
<i>Notocircus australis</i> Day, 1960													
<i>Oenone</i> sp.													
<i>Lumbrineris latreilli</i> Aud. & M. Ed., 1834													
<i>Diopatra cuprea cuprea</i> (Bosc, 1802)													
<i>Aonides oxycephala</i> (Sars, 1862)													
<i>Malacoceros indicus</i> (Fauvel, 1928)													
<i>Nerinides</i> sp.										1			
<i>Prionospio cf. convexa</i> Imajima, 1990						3							
<i>Prionospio malmgreni</i> Claparède, 1870													
<i>Prionospio sexoculata</i> Augener, 1918										1			
<i>Scolecopsis squamata</i> (Müller, 1806)										2			
<i>Spio</i> sp.													
<i>Magelona</i> sp.						1							
<i>Poecilochaetus serpens</i> Allen, 1904													
<i>Caulleriella</i> sp.													
<i>Cirratulus</i> sp.													
<i>Cirriformia</i> sp.											1		
<i>Scoloplos capensis</i> Day, 1961													
<i>Scoloplos cf. uniramus</i> Day, 1961						1							
Orbinidae sp.													
<i>Paraonis</i> sp.													
<i>Armandia intermedia</i> Fauvel, 1902													
<i>Armandia leptocirrus</i> Grube, 1878													
<i>Armandia melanura</i> Gravier, 1905													
<i>Polyophthalmus pictus</i> (Dujardin, 1839)													
<i>Anatomastus</i> sp.													
<i>Capitella cf. capitata</i> (Fabricius, 1780)													
<i>Capitellid</i> sp. 1													
<i>Dasychanichus caducus</i> (Grube, 1846)													
<i>Heteromastides</i> sp.													
<i>Mediomastus</i> sp.										7			
<i>Notomastus latericeus</i> Sars, 1851													
<i>Amphiteis gunneni</i> (Sars, 1835)						1							
<i>Nicoletia venustula africana</i> Aug., 1918													
<i>Terebellid</i> sp. 1						2							
<i>Terebellides stroemi</i> Sars, 1835													
<i>Jasmineira elegans</i> Saint-Joseph, 1894													
Total:		3	0	0	2	13	1	0	0	13	3	7	3

Table 5b. MLWN benthos samples (see main text for codes for sites and stations). Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbeni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE	BW	BW	BW	NG	NG	NG	NG	NG	NG
	STATION	S5	S5	S5	S4	S4	S4	S5	S5	S5
	REPLICA	C1	C2	C3	C1	C2	C3	C1	C2	C3
<i>Aphrogenia</i> sp.										
<i>Iphione</i> cf. <i>muricata</i> (Savigny, 1818)										
Harmothoinae sp.										
<i>Sthenelais</i> <i>boa</i> (Johnston, 1839)										
<i>Phyllodoce</i> <i>capensis</i> Day, 1960										
<i>Phyllodoce</i> cf. <i>castanea</i> (Marenz., 1879)				2						
<i>Phyllodoce</i> sp.				1						
<i>Ancistrosyllis</i> <i>parva</i> Day, 1963										
<i>Pharyngeovalvata</i> <i>natalensis</i> Day, 1951										
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865										
<i>Syllis</i> <i>bouvieri</i> Gravier, 1900										
<i>Syllis</i> <i>cornuta</i> Rathke, 1843										
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840										
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852										
<i>Ceratonereis</i> <i>erythraensis</i> Fauvel, 1918										
<i>Ceratonereis</i> <i>mirabilis</i> Kinberg, 1866										
<i>Dendronereis</i> <i>arborifera</i> Peters, 1854										
<i>Namalycestis</i> <i>indica</i> (Southern, 1921)										
<i>Nereis</i> <i>caudata</i> Delle Chiaje, 1841										
<i>Nereis</i> <i>coutieri</i> Gravier, 1899										
<i>Nereis</i> <i>persica</i> Fauvel, 1911										
<i>Nereis</i> <i>unifasciata</i> Willey, 1905										
<i>Perinereis</i> <i>nuntia</i> <i>vallata</i> (Grube, 1857)										
<i>Platynereis</i> <i>isolata</i> Gravier, 1901										
<i>Platynereis</i> <i>puichella</i> Gravier, 1901										
<i>Platynereis</i> sp.										1
<i>Glycera</i> <i>lancedivae</i> Schmarda, 1861					2					
<i>Eunice</i> <i>antennata</i> (Savigny, 1820)			1							
<i>Eunice</i> <i>indica</i> Kinberg, 1865										
<i>Lysidice</i> <i>collaris</i> Grube, 1870										
<i>Marphysa</i> <i>bifurcata</i> Kott, 1951										
<i>Marphysa</i> <i>mossambica</i> (Peters, 1854)										
<i>Nematonereis</i> <i>unicornis</i> (Grube, 1840)										
<i>Arabella</i> <i>incolor</i> <i>incolor</i> (Montagu, 1804)										
<i>Notocirrus</i> <i>australis</i> Day, 1960										
<i>Oenone</i> sp.										
<i>Lumbrineris</i> <i>latreilli</i> Aud. & M. Ed., 1834										
<i>Diopatra</i> <i>cuprea</i> <i>cuprea</i> (Bosc, 1802)										
<i>Aonides</i> <i>oxycephala</i> (Sars, 1862)										
<i>Malacoceros</i> <i>indicus</i> (Fauvel, 1928)										
<i>Nerinides</i> sp.										
<i>Prionospio</i> cf. <i>convexa</i> Imaizumi, 1990										
<i>Prionospio</i> <i>malmgreni</i> Claparède, 1870										
<i>Prionospio</i> <i>sexoculata</i> Augener, 1918										
<i>Scolecopsis</i> <i>squamata</i> (Müller, 1806)										
<i>Spio</i> sp.										
<i>Magelona</i> sp.										
<i>Poecilochaetus</i> <i>serpens</i> Allen, 1904										
<i>Caulericiella</i> sp.				1						
<i>Cirratulus</i> sp.				2						
<i>Cirriformia</i> sp.										
<i>Scoloplos</i> <i>capensis</i> Day, 1961										
<i>Scoloplos</i> cf. <i>uniramus</i> Day, 1961										
Orbinidae sp.										
<i>Paraonis</i> sp.										
<i>Armandia</i> <i>intermedia</i> Fauvel, 1902										
<i>Armandia</i> <i>leptocirrus</i> Grube, 1878					2					3
<i>Armandia</i> <i>melanura</i> Gravier, 1905										
<i>Polyophthalmus</i> <i>pictus</i> (Dujardin, 1839)										1
<i>Anatomastus</i> sp.										
<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)										
Capitellid sp. 1										
<i>Dasybranchus</i> <i>caducus</i> (Grube, 1846)										
<i>Heteromastides</i> sp.										
<i>Mediomastus</i> sp.										
<i>Notomastus</i> <i>latericeus</i> Sars, 1851										
<i>Amphicteis</i> <i>gunneri</i> (Sars, 1835)										
<i>Nicolea</i> <i>venustula</i> <i>africana</i> Aug., 1918										
Terebellid sp. 1										
<i>Terebellides</i> <i>stroemi</i> Sars, 1835										
<i>Jasmineira</i> <i>elegans</i> Saint-Joseph, 1894										
Total:		0	1	6	4	0	0	0	0	5

Table 6. MLWS benthos samples (see main text for codes for sites and stations).

Abbreviations associated with sampling sites: MZ: Mazizini Bay, T1-T4: transects, S1-S5: stations along transect; MK: Makoba; NG: Nungwi; HB: Zanzibar Harbour; MB: Mbweni; KS: Kisakasaka; BW: Bawe Island; C1-C5: replicate core samples.

	SITE			STATION			REPLICA		
	MZ	MZ	MZ	MZ	MZ	MZ	HB	HB	HB
	S5	S5	S5	S5	S5	S5	S4	S4	S4
	T2C1	T2C2	T2C3	T3C1	T3C2	T3C3	C1	C2	C3
<i>Aphrogenia</i> sp.	2	2							
<i>Iphione</i> cf. <i>municata</i> (Savigny, 1818)									
Harmothoinae sp.	1								
<i>Sthenelais</i> <i>boa</i> (Johnston, 1839)				1	1	1			
<i>Phyllodoce</i> <i>capensis</i> Day, 1960									
<i>Phyllodoce</i> cf. <i>castanea</i> (Marenz., 1879)									
<i>Phyllodoce</i> sp.									
<i>Ancistrosyllis</i> <i>parva</i> Day, 1963									
<i>Pharyngeovalvata</i> <i>natalensis</i> Day, 1951									
<i>Syllis</i> cf. <i>amica</i> Quatrefages, 1865									
<i>Syllis</i> <i>bouvieri</i> Gravier, 1900				4					
<i>Syllis</i> <i>cornuta</i> Rathke, 1843	4	1		1					
<i>Syllis</i> cf. <i>gracilis</i> Grube, 1840									
<i>Syllis</i> cf. <i>prolifera</i> Krohn, 1852									
<i>Ceratonereis</i> <i>erythraensis</i> Fauvel, 1918									
<i>Ceratonereis</i> <i>mirabilis</i> Kinberg, 1866	1								
<i>Dendronereis</i> <i>arborifera</i> Peters, 1854									
<i>Nemalycaeus</i> <i>indica</i> (Southern, 1921)									
<i>Nereis</i> <i>caudata</i> Delle Chiaje, 1841									
<i>Nereis</i> <i>coutieri</i> Gravier, 1899									
<i>Nereis</i> <i>persica</i> Fauvel, 1911									
<i>Nereis</i> <i>unifasciata</i> Willey, 1905									
<i>Pennereis</i> <i>nuntia</i> <i>vallata</i> (Grube, 1857)									
<i>Platynereis</i> <i>isolita</i> Gravier, 1901	1								
<i>Platynereis</i> <i>pulchella</i> Gravier, 1901		1	1						
<i>Platynereis</i> sp.		1		1					
<i>Glycera</i> <i>lanceodivae</i> Schmarda, 1861	4					1			
<i>Eunice</i> <i>antennata</i> (Savigny, 1820)									
<i>Eunice</i> <i>indica</i> Kinberg, 1865							1		
<i>Lysidice</i> <i>collaris</i> Grube, 1870									
<i>Marphysa</i> <i>bifurcata</i> Kott, 1951			1						
<i>Marphysa</i> <i>mossambica</i> (Peters, 1854)									
<i>Nematonenes</i> <i>unicomis</i> (Grube, 1840)	3				1				
<i>Arabella</i> <i>incoler</i> <i>incoler</i> (Montagu, 1804)	1			4	5	3			
<i>Notocirrus</i> <i>australis</i> Day, 1960									
<i>Oenone</i> sp.									
<i>Lumbrineris</i> <i>latreilli</i> Aud. & M. Ed., 1834		2		1	1	1			
<i>Diopatra</i> <i>cuprea</i> <i>cuprea</i> (Bosc, 1802)								1	3
<i>Aonides</i> <i>oxycephala</i> (Sars, 1862)									
<i>Malacoceros</i> <i>indicus</i> (Fauvel, 1928)									
<i>Nemertes</i> sp.									
<i>Pronospio</i> cf. <i>convexa</i> Imajima, 1990	1			1					
<i>Pronospio</i> <i>malmgreni</i> Claparède, 1870									
<i>Pronospio</i> <i>sexoculata</i> Augener, 1918				1					
<i>Scolecopsis</i> <i>squamata</i> (Müller, 1806)						1			
<i>Spio</i> sp.									
<i>Magelona</i> sp.									
<i>Poecilochaetus</i> <i>serpens</i> Allen, 1904									
<i>Caulleriella</i> sp.									
<i>Cirratulus</i> sp.									
<i>Cirriformia</i> sp.									
<i>Scotoplanes</i> <i>capensis</i> Day, 1961								1	
<i>Scotoplanes</i> cf. <i>uniramus</i> Day, 1961									
Orbinidae sp.									
<i>Paraonis</i> sp.									
<i>Armadia</i> <i>intermedia</i> Fauvel, 1902	1			4		1			1
<i>Armadia</i> <i>leptocirrus</i> Grube, 1878	1					2			
<i>Armadia</i> <i>melanura</i> Gravier, 1905						1			
<i>Polyopthalmus</i> <i>pictus</i> (Dujardin, 1839)									
<i>Anatommastus</i> sp.									
<i>Capitella</i> cf. <i>capitata</i> (Fabricius, 1780)									
Capitellid sp. 1		1				3			
<i>Dasybranchus</i> <i>ceducus</i> (Grube, 1846)	2					1			
<i>Heteromastus</i> sp.									
<i>Mediomastus</i> sp.									
<i>Notomastus</i> <i>latericeus</i> Sars, 1851				2					
<i>Amphicteis</i> <i>gunneri</i> (Sars, 1835)	1								
<i>Nicolea</i> <i>venustula</i> <i>africana</i> Aug., 1918									
Terebellid sp. 1									
<i>Terebellides</i> <i>stroemi</i> Sars, 1835	6	5		5		2			
<i>Jasminera</i> <i>elegans</i> Saint-Joseph, 1894									
Total:	29	13	2	25	13	13	0	2	4

## **APPENDIX 2**

Table 1. Sources for records of echinoderma fauna of the western Indian Ocean and its distribution. Numbers correspond to sources (see List of Sources to Appendix 2 Table 1 at the end of this section), with records marked '?' equivalent to doubtful records in Clark & Rowe (1971). Numbers in italics correspond to synonyms.

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<b>Class CRINOIDEA</b>															
<b>COMASTERIDAE</b>															
<i>Capillaster multiradiatus</i> (L.)	1	1	..	..	1	?	1	1	1	1	1	1	1	..	..
<i>Comanthus wahlbergi</i> (J. Müller)	5	19	9	40	1	..	34	..	..	9	9	9	..	..	..
<i>Comaster distinctus</i> (P.H. Carpenter)	2	..	..	..	48	..	..	..	1	10	1	1	..	..	..
<i>Comaster multifidus</i> (J. Muller)	..	19	..	..	..	..	34	..	1	1	39	1	..	..	..
<b>HIMEROMETRIDAE</b>															
<i>Heterometra africana</i> (A.H. Clark)	1	..	..	1	..	1	..	..	..	..	..	..	..	..	..
<i>Heterometra delagoae</i> Gislén	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Heterometra gravieri</i> A.H. Clark	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Heterometra joubini</i> (A.H. Clark)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Heterometra madagascarensis</i> (A.H. Clark)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>MARIAMETRIDAE</b>															
<i>Dichrometra flagellata</i> (J. Muller)	1	..	16	..	..	..	..	..	1	10	1	1	..	..	..
<i>Lamprometra klunzingeri</i> (Hartlaub)	1	7	..	1	1	..	..	..	..	..	..	..	..	..	..
<i>Stephanometra indica</i> (Smith)	1	1	..	..	1	1	1	1	1	1	1	1	..	..	..
<b>COLOBOMETRIDAE</b>															
<i>Cenometa emendatrix</i> (Bell)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Decametra modica</i> A.H. Clark	1	1	..	..	..	..	?	?	..	..	..	..	..	..	..
<i>Oligometra serripinna</i> (P.H. Carpenter)	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<b>TROPIOMETRIDAE</b>															
<i>Tropiometra carinata</i> (Lamarck)	1	1	16	1	1	..	..	34	34	..	..	..	..	..	..
<b>ANTEDONIDAE</b>															
<i>Antedon arabica</i> A.H. Clark & A.M. Clark	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..
<i>Dorometra mauritiana</i> A.H. Clark	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..
<i>Iridometra malagasiensis</i> Marshall & Rowe	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>Class ASTEROIDEA</b>															
<b>LUIDIIDAE</b>															
<i>Luidia hardwicki</i> (Gray)	..	1	..	1	..	..	..	1	1	1	1	..	..	..	..
<i>Luidia maculata</i> Muller & Troschel	1	1	16	1	1	..	1	1	1	1	1	37	..	..	..
<i>Luidia mauritiensis</i> Koehler	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Luidia savignyi</i> (Audouin)	1	1	..	..	1	..	..	1	1	..	..	1	..	..	..
<b>ASTROPECTINIDAE</b>															
<i>Astropecten antares</i> Doderlein	1	..	16	..	..	..	..	..	..	..	..	..	..	..	..
<i>Astropecten granulatus</i> Muller & Troschel	1	..	16	..	..	..	..	..	1	1	..	..	..	..	..
<i>Astropecten hemprichi</i> Muller & Troschel	1	1	..	1	1	..	..	?	?	..	..	..	..	..	..
<i>Astropecten mauritanus</i> Gray	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Astropecten monacanthus</i> Sladen	1	..	..	1	1	..	1	1	1	1	1	..	..	..	..
<i>Astropecten polyacanthus</i> Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<b>ARCHASTERIDAE</b>															
<i>Archaster angulatus</i> Muller & Troschel	1	..	16	..	..	..	..	..	1	1	1	1	..	..	..
<i>Archaster lorioli</i> Sukarno & Jangoux	..	49	..	..	..	..	49	..	..	..	..	..	..	..	..
<b>GONIASTERIDAE</b>															
<i>Stellaster childreni</i> Gray	1	..	..	1	1	..	..	1	1	1	1	..	..	..	..
<i>Stellasteropsis colubrinus</i> Macan	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..
<b>ASTERODISCIDIDAE</b>															
<i>Asterodiscides belli</i> Rowe	51	51	..	..	..	51	..	51	..	..	..	..	..	..	..
<i>Asterodiscides tessellatus</i> Rowe	..	50	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>OREASTERIDAE</b>															
<i>Choriaster granulatus</i> Lutken	6	11	..	..	1	..	52	..	1	10	1	1	..	..	..
<i>Culcita schmideliana</i> (Retzius)	1	1	..	1	..	..	1	1	..	..	..	..	..	..	..
<i>Halityle regularis</i> Fisher	17	..	..	17	..	..	..	..	1	17	..	37	..	..	..
<i>Monachaster sanderi</i> Meissner	1	..	..	40	40	..	..	..	..	..	..	..	..	..	..
<i>Pentaceraster horridus</i> (Gray)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pentaceraster mammillatus</i> (Audouin)	1	..	..	1	1	..	..	..	..	..	..	..	..	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>Pentaceraster tuberculatus</i> (M. & Troschel)	1	..	..	1	1	..	..	..	..	..	..	..	..	..	..
<i>Protoreaster lincki</i> (de Blainville)	1	1	..	1	..	..	..	1	1	10	..	..	..	..	..
<i>Protoreaster nodosus</i> (L.)	1	1	..	..	..	..	..	1	1	1	1	1	..	..	..
<b>OPHIDIASTERIDAE</b>															
<i>Andora faouzii</i> (Macan)	..	19	..	1	..	6	52	..	..	..	..	..	..	..	..
<i>Cistina columbiae</i> Gray	..	1	..	..	..	..	6	..	..	10	..	6	..	..	..
<i>Dactylosaster cylindricus</i> (Lamarck)	1	1	..	1	..	..	1	1	1	10	39	1	1	..	..
<i>Ferdina flavescens</i> Gray	..	1	..	..	..	..	52	..	..	..	..	..	..	..	..
<i>Fromia milleporella</i> (Lamarck)	1	1	..	40	?	..	1	1	1	1	1	1	..	..	..
<i>Fromia monilis</i> Perrier	12	..	..	..	6	..	53	1	1	10	1	1	..	..	..
<i>Fromia nodosa</i> A.M. Clark	..	1	..	..	..	..	1	1	..	..	..	45	..	..	..
<i>Gomphia egyptiaca</i> Gray	1	1	..	..	1	..	52	1	1	1	1	1	..	..	..
<i>Leiaster coriaceus</i> Peters	1	1	..	..	15	..	..	..	1	10	..	1	..	6	..
<i>Leiaster glaber</i> Peters	1	..	..	..	..	..	..	1	..	..	..	..	1	..	..
<i>Leiaster leachi</i> (Gray)	..	1	..	48	1	..	1	..	1	1	1	1	1	..	..
<i>Linckia guildingi</i> Gray	1	1	..	1	?	..	1	1	1	1	1	1	1	37	37
<i>Linckia laevigata</i> (L.)	1	1	..	..	..	..	1	1	1	1	1	1	..	..	..
<i>Linckia multifora</i> (Lamarck)	1	1	..	1	1	1	1	1	1	10	1	1	1	..	..
<i>Nardoa frianti</i> Koehler	..	19	..	..	..	..	52	1	1	1	1	1	..	..	..
<i>Nardoa variolata</i> (Retzius)	1	1	..	40	..	..	..	..	..	..	..	..	..	..	..
<i>Neoferdina offreti</i> Muller & Troschel	11	7	..	..	..	..	52	1	46	..	46	46	..	..	..
<i>Ophidiaster duncani</i> de Loriol	1	1	..	..	..	..	..	..	..	10	..	..	..	..	..
<i>Ophidiaster hemprichi</i> Muller & Troschel	1	1	..	..	1	..	1	..	1	1	1	1	..	..	..
<i>Ophidiaster perrieri</i> de Loriol	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophidiaster cribrarius</i> Lutken	..	1	..	..	..	..	..	..	..	10	?	46	..	..	..
<i>Tamaria lithosora</i> H.L. Clark	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Tamaria marmorata</i> (Michelin)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>ASTEROPSEIDAE</b>															
<i>Asteropsis carinifera</i> (Lamarck)	1	1	..	1	1	..	52	1	1	1	1	1	1	..	..
<i>Valvaster striatus</i> (Lamarck)	..	1	..	..	..	..	..	1	1	10	..	1	1	..	..
<b>ASTERINIDAE</b>															
<i>Asterina burtoni</i> Gray	6	6	..	6	6	..	..	..	..	..	..	..	..	..	..
<b>ACANTHASTERIDAE</b>															
<i>Acanthaster planci</i> (L.)	1	1	..	1	1	1	1	1	1	1	1	1	1	..	..
<b>PTERASTERIDAE</b>															
<i>Euretaster cribrus</i> (v. Martens)	1	1	..	48	1	..	..	1	1	..	..	..	..	..	..
<b>MITHRODIDAE</b>															
<i>Mithrodia clavigera</i> (Lamarck)	1	1	..	..	1	..	1	..	1	10	1	37	..	13	13
<i>Thromidia seychellesensis</i> Pope & Rowe	..	13	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>ECHINASTERIDAE</b>															
<i>Echinaster callosus</i> v. Marenzeller	1	1	..	..	1	..	..	1	1	10	1	1	..	..	..
<i>Echinaster purpureus</i> (Gray)	1	1	..	48	1	..	..	1	..	..	..	..	..	..	..
<b>ASTERIIDAE</b>															
<i>Stolasterias calamaria</i> (Gray)	1	1	16	..	..	..	..	..	..	10	1	1	..	..	..
<b>Class OPHIUROIDEA</b>															
<b>OPHIOMYXIDAE</b>															
<i>Ophiomyxa australis</i> Lutken	1	1	..	48	15	..	..	1	1	1	1	1	..	..	..
<b>EURYALIDAE</b>															
<i>Euryale aspera</i> Lamarck	4	..	..	..	..	..	..	1	1	1	1	37	..	..	..
<b>GORGONOCEPHALIDAE</b>															
<i>Astroboa clavata</i> (Lyman)	1	1	..	1	1	..	1	1	..	1	4	..	..	..	..
<i>Astroboa nuda</i> (Lyman)	1	..	..	1	1	..	..	..	1	10	1	37	..	..	..
<i>Astrocladus exiguus</i> (Lamarck)	4	..	..	..	..	..	..	1	1	10	4	..	..	..	..
<i>Astroboa granulatus</i> H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	37	..	..	..
<i>Astrocladus tonganus</i> Doderlein	4	..	..	..	..	..	..	..	..	..	..	1	..	..	..
<i>Astroglymma sculptum</i> (Doderlein)	..	37	..	..	..	..	..	..	10	10	39	37	..	..	..
<b>OPHIACANTHIDAE</b>															
<i>Ophiacantha gracilis</i> (Studer)	4	..	..	..	..	..	..	..	1	1	..	..	..	..	..
<b>AMPHIURIDAE</b>															
<i>Amphilycus scripta</i> (Koehler)	1	..	..	1	1	..	..	1	..	..	39	..	..	..	..



Table 1 (continued)

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>Amphiodia (Amphiodia) dividua</i> (Mortensen)	4	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiodia (Amphiodia) picardi</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiodia (Amphispina) microplax</i> Burfield	4	..	..	48	1	..	..	..	..	10	39	..	..	..	..
<i>Amphioplus (Amphichilus) impressus</i> (Ljung.)	4	7	..	..	..	..	..	..	1	10	39	..	..	..	..
<i>A. (Amphioplus) cyrtacanthus</i> H.L. Clark	4	..	..	..	..	..	..	..	1	..	39	..	..	..	..
<i>A. (Amphioplus) heptagonus</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) longuscutum</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) lucidus</i> Koehler	4	..	..	..	..	..	..	..	1	1	39	..	..	..	..
<i>A. (Amphioplus) margueritae</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) parvitus</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) polymorphus</i> Chr.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) spinosus</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) thomassini</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Amphioplus) titubantius</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>A. (Lymanella) hastatus</i> (Ljungman)	1	7	..	1	1	..	..	..	..	10	..	..	..	..	..
<i>A. (Lymanella) integer</i> (Ljungman)	1	7	16	..	1	..	..	..	..	..	..	..	..	..	..
<i>A. (Lymanella) laevis</i> (Lyman)	4	..	..	1	1	..	..	..	1	10	1	1	..	..	..
<i>A. (Lymanella) furcatus</i> Mortensen	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphipholis littoralis</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphipholis loripes</i> Koehler	4	..	..	..	..	..	..	..	4	..	39	..	..	..	..
<i>Amphipholis serrataspina</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphipholis sigillata</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphipholis squamata</i> (D. Chiaje)	1	1	16	1	1	1	..	..	1	1	39	1	1	..	4
<i>Amphiura acrisia</i> H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	..	..	..	..
<i>Amphiura capensis</i> Ljungman	16	..	16	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura candida</i> Ljungman	16	7	..	..	..	..	..	..	..	..	4	..	..	..	..
<i>Amphiura clausadae</i> Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura corona</i> Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura crispa</i> Mortensen	4	..	..	1	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura dejectoides</i> H.L. Clark	1	7	..	..	1	..	..	..	24	..	..	..	..	..	..
<i>Amphiura duncani</i> Lyman	5	..	..	..	..	..	..	1	1	10	1	1	..	..	..
<i>Amphiura leptotata</i> H.L. Clark	4	..	..	..	..	..	..	..	1	10	..	1	..	..	..
<i>Amphiura madecassae</i> Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura micra</i> H.L. Clark	4	..	..	..	..	..	..	..	24	1	..	..	..	..	..
<i>Amphiura plantei</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura sexradiata</i> Koehler	4	..	..	..	..	..	..	..	1	..	..	..	..	..	..
<i>Amphiura (Fellaria) africana</i> (Balinsky)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Amphiura (Fellaria) octacantha</i> (H.L. Clark)	4	..	..	..	..	..	..	..	..	1	1	..	..	..	..
<i>Amphiura (Ophiopeltis) tenuis</i> (H.L. Clark)	4	..	..	48	..	1	..	..	..	1	39	..	..	..	..
<i>Ophiocentrus asper</i> (Koehler)	4	..	..	..	..	..	..	..	1	10	..	37	..	..	..
<i>Ophiocentrus crassuspinosus</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiocentrus dilatatus</i> (Koehler)	1	..	..	..	..	..	1	..	1	1	..	37	..	..	..
<i>Ophiocentrus inequalis</i> (H.L. Clark)	4	..	..	..	..	..	..	..	1	10	1	..	..	..	..
<i>Ophiocentrus spinacutus</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Paracrocnoidea sacensis</i> (Balinsky)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>OPHIACTIDAE</b>															
<i>Ophiactis carnea</i> Ljungman	1	..	16	1	15	..	..	..	..	..	..	..	..	..	..
<i>Ophiactis crosnieri</i> Chr. & Gille.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiactis delagoa</i> Balinsky	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiactis hemiteles</i> H.L. Clark	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..
<i>Ophiactis lymani</i> Ljungman	4	..	..	..	..	..	..	..	..	..	..	..	..	..	4
<i>Ophiactis modesta</i> Brock	16	..	..	..	..	1	..	24	1	1	1	1	1	..	..
<i>Ophiactis macrolepidota</i> Marktann.-Turneret.	1	..	..	1	1	..	..	..	..	10	39	..	..	..	..
<i>Ophiactis plana</i> Lyman	16	..	..	48	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiactis picteti</i> (de Loriol)	5	7	..	..	..	..	..	..	1	..	39	..	..	..	..
<i>Ophiactis savignyi</i> Muller & Troschel	1	1	..	1	1	1	1	1	1	1	1	1	1	..	4
<i>Ophiactis versicolor</i> H.L. Clark	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..
<i>Ophiosphaera insignis</i> Brock	1	19	..	..	..	..	..	..	1	10	..	37	..	..	..

Table I (continued)

Taxa	East Africa	WTO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<b>OPHIOTRICHIDAE</b>															
<i>Macrophiothrix demessa</i> (Lyman)	1	1	..	1	1	..	1	..	1	1	43	1	1	..	..
<i>M. hirsuta</i> (Muller & Troschel)	1	..	..	1	1	..	..	22	1	..	..	1	..	..	..
<i>M. longipeda</i> (Lamarck)	1	1	..	..	..	..	1	1	1	1	1	1	..	..	..
<i>M. robillardi</i> (de Loriol)	..	1	..	..	..	..	..	..	43	10	43	43	..	..	..
<i>M. (Keystonea) nereidina</i> (Lamarck)	1	1	..	..	..	..	..	1	1	1	1	1	..	..	..
<i>M. (Keystonea) propinqua</i> Lyman	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>Ophiocnemis marmorata</i> (Lamarck)	1	..	..	..	..	..	..	1	1	1	1	..	..	..	..
<i>Ophiomaza cacatoica</i> Lyman	1	..	..	1	1	..	..	1	1	1	1	1	..	..	..
<i>Ophiothela danae</i> Verrill	16	1	..	1	1	1	1	1	1	10	1	1	..	..	..
<i>Ophiothela tigris</i> Lyman	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiothela venusta</i> (de Loriol)	1	..	..	1	..	..	..	..	1	10	..	..	..	..	..
<i>Ophiothrix comata</i> Muller & Troschel	4	..	..	..	..	..	..	..	1	..	..	..	..	..	..
<i>Ophiothrix echinotecta</i> Balinsky	1	..	..	40	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiothrix exigua</i> Lyman	4	..	..	..	..	..	1	1	1	1	1	1	..	..	..
<i>Ophiothrix foveolata</i> Mark.-Turneretscher	1	..	..	..	..	..	1	1	1	10	..	23	..	..	..
<i>Ophiothrix picturata</i> de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiothrix savignyi</i> (Muller & Troschel)	1	4	..	1	1	1	22	..	..	..	..	37	..	..	..
<i>Ophiothrix tricuspida</i> Chr. & Gile.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiothrix trilineata</i> Lutken	1	1	..	40	4	..	1	1	1	1	1	1	..	..	..
<i>Ophiothrix tristis</i> de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiothrix vitrea</i> Doderlein	..	1	..	..	..	..	..	1	1	..	1	..	..	..	..
<i>Ophiothrix (Acanthophio.) proteus</i> Koehler	4	..	..	1	1	..	..	1	1	10	1	1	..	..	..
<i>Ophiothrix (Acanthophio.) purpurea</i> Martens	1	1	..	1	1	..	1	1	1	10	1	1	..	..	..
<b>OPHIOCOMIDAE</b>															
<i>Ophiarthrum elegans</i> Peters	1	1	..	4	4	..	..	1	1	1	1	1	..	..	..
<i>Ophiarthrum lymani</i> de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiocoma brevipes</i> Peters	1	1	..	30	4	..	1	1	1	1	1	1	1	..	..
<i>Ophiocoma dentata</i> Muller & Troschel	1	1	..	30	..	..	1	20	24	1	1	1	1	..	..
<i>Ophiocoma doederleini</i> de Loriol	5	7	..	..	..	..	..	..	..	10	..	10	..	..	..
<i>Ophiocoma erinaceus</i> Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>Ophiocoma pica</i> Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>Ophiocoma pusilla</i> (Brock)	16	1	..	48	1	..	..	..	1	10	39	37	..	..	..
<i>Ophiocoma scolopendrina</i> (Lamarck)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>Ophiocoma valenciae</i> Muller & Troschel	1	1	..	1	1	..	?	?	..	..	..	..	..	..	..
<i>Ophiocomella sexradia</i> (Duncan)	1	1	..	48	1	..	1	1	1	1	1	1	1	..	..
<i>Ophiomastix caryophyllata</i> Lutken	1	1	..	..	..	..	..	..	1	1	1	1	..	..	..
<i>Ophiomastix koehleri</i> Devaney	5	7	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiomastix palaoensis</i> Murakami	4	..	..	..	..	..	..	..	..	10	..	1	..	..	..
<i>Ophiomastix variabilis</i> Koehler	1	1	..	..	1	..	1	..	1	1	1	1	..	..	..
<i>Ophiomastix venosa</i> Peters	1	1	..	40	..	..	..	1	1	..	..	..	..	..	..
<i>Ophiopsila paucispina</i> Koehler	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophiopsila timida</i> Koehler	4	..	..	..	..	..	..	..	4	..	..	..	..	..	..
<b>OPHIONEREIDAE</b>															
<i>Ophionereis australis</i> (H.L. Clark)	16	..	..	..	..	..	..	..	..	10	..	..	..	..	..
<i>Ophionereis degeneri</i> (A.H. Clark)	4	..	..	..	..	..	..	..	..	..	..	..	1	..	..
<i>Ophionereis dubia</i> (Muller & Troschel)	1	1	16	1	1	1	1	1	1	1	1	37	..	..	..
<i>Ophionereis hexactis</i> H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	..	..	..	..
<i>Ophionereis porrecta</i> Lyman	1	1	16	..	1	..	1	1	1	1	1	1	1	..	..
<i>Ophionereis thryptica</i> (Murakami)	4	..	..	..	..	..	..	..	..	..	..	1	..	..	..
<i>Ophionereis vivipara</i> Mortensen	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ophioneroides granum</i> Chr. & Gile.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>OPHIODERMATIDAE</b>															
<i>Cryptopelta granulifera</i> H.L. Clark	..	1	..	..	..	..	24	..	24	1	..	..	..	..	..
<i>Ophiarachna affinis</i> Lutken	1	1	..	..	..	..	..	..	1	10	..	1	..	..	..
<i>Ophiarachna incrassata</i> (Lamarck)	1	1	..	..	15	..	..	1	1	1	1	1	50	..	..
<i>Ophiarachna robillardi</i> de Loriol	..	1	..	..	..	..	..	24	..	..	..	..	..	..	..
<i>Ophiarachnella gorgonia</i> (M. & Troschel)	1	1	..	30	..	..	..	1	1	1	1	1	..	..	..
<i>O. macracantha</i> H.L. Clark	..	7	..	..	..	..	..	..	..	10	..	1	..	..	..
<i>O. septemspinosa</i> (Muller & Troschel)	1	1	..	..	..	..	1	1	1	1	1	37	..	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>Ophiochaeta hirsuta</i> Lutken	4	1	..	..	..	..	24	..	24	..	..	1	..	..	..
<i>Ophioconis cincta</i> Brock	1	7	..	1	1	..	..	..	1	10	1	1	..	..	..
<i>Ophiopeza fallax</i> Peters	1	1	..	1	1	1	..	?	1	..	..	..	..	..	..
<i>Ophiopeza spinosa</i> (Ljungman)	4	1	..	40	15	..	1	..	1	10	39	1	1	..	..
<b>OPHIURIDAE</b>															
<i>Ophiolepis cincta</i> Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>Ophiolepis irregularis</i> Brock	4	..	..	..	..	..	..	..	1	..	1	1	..	..	..
<i>Ophiolepis superba</i> H.L. Clark	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>Ophioplocus imbricatus</i> Muller & Troschel	1	1	..	30	..	1	..	1	1	1	1	1	1	..	..
<i>Ophiura kinbergi</i> (Ljungman)	16	19	..	1	1	1	..	1	1	1	1	1	1	..	..
<b>Class ECHINOIDEA</b>															
<b>CIDARIDAE</b>															
<i>Euclidaris metularia</i> (Lamarck)	1	1	..	40	1	..	1	1	1	1	1	1	1	..	..
<i>Phyllacanthus imperialis</i> (Lamarck)	1	1	..	..	1	..	..	1	1	1	1	1	..	..	..
<i>Prionocidaris baculosa</i> (Lamarck)	1	1	..	1	1	1	1	1	1	10	1	37	..	..	..
<i>Prionocidaris pistillaris</i> (Lamarck)	1	1	16	1	..	..	..	..	..	..	..	..	..	..	..
<i>Prionocidaris verticillata</i> (Lamarck)	1	1	..	48	..	..	1	1	1	1	1	1	1	..	..
<b>ECHINOTHURIDAE</b>															
<i>Asthenosoma varium</i> Grube	11	..	..	48	1	..	1	1	1	10	1	37	..	..	..
<b>DIADEMATIDAE</b>															
<i>Astropyga radiata</i> (Leske)	1	1	..	1	31	..	1	1	1	1	1	1	1	..	..
<i>Diadema savignyi</i> Michelin	1	1	..	1	..	..	1	1	1	1	1	1	..	..	..
<i>Diadema setosum</i> (Leske)	1	1	..	1	1	..	..	1	1	1	1	1	..	..	..
<i>Echinothrix calamaris</i> (Pallas)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>Echinothrix diadema</i> (L.)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<b>STOMOPNEUSTIDAE</b>															
<i>Stomopneustes variolaris</i> (Lamarck)	1	1	..	1	..	1	1	1	1	1	1	1	..	..	..
<b>TEMNOPLEURIDAE</b>															
<i>Microcyphus maculatus</i> L. Agassiz	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Microcyphus rousseaui</i> L. Agassiz	1	..	..	1	1	..	..	..	..	10	..	..	..	..	..
<i>Salmaciella dussumieri</i> L. Agassiz	1	1	..	1	1	..	..	1	1	1	1	1	..	..	..
<i>Salmacis bicolor</i> L.	1	1	..	30	1	1	1	1	1	..	1	..	..	..	..
<i>Temnopleurus reevesi</i> (Gray)	1	..	..	..	..	..	..	..	1	..	1	..	..	..	..
<i>Temnopleurus toreumaticus</i> (Leske)	1	..	..	1	1	1	1	1	1	1	1	1	..	..	..
<i>Temnotrema siamense</i> (Mortensen)	1	1	..	1	..	..	1	1	1	1	1	..	..	..	..
<b>TOXOPNEUSTIDAE</b>															
<i>Cyrtechinus verruculatus</i> (Lütken)	..	1	..	..	..	..	..	..	1	1	39	1	1	..	..
<i>Gymnechinus robillardi</i> (de Loriol)	1	1	..	1	..	..	..	1	..	..	..	..	..	..	..
<i>Pseudoboletia indiana</i> (Michelin)	1	1	..	..	..	..	..	1	1	1	39	37	1	..	..
<i>Toxopneustes pileolus</i> (Lamarck)	1	1	..	1	31	..	..	1	1	10	1	1	..	..	..
<i>Tripneustes gratilla</i> (L.)	1	1	16	1	1	..	1	1	1	1	1	1	1	..	..
<b>PARASALENIIDAE</b>															
<i>Parasalenia gratiosa</i> A. Agassiz	1	7	..	..	..	..	1	..	1	1	1	1	..	..	..
<b>ECHINOMETRIDAE</b>															
<i>Colobocentrotus atratus</i> (L.)	1	1	..	40	..	..	..	1	1	..	..	..	1	..	..
<i>Echinometra mathaei</i> (de Blainville)	1	1	..	1	1	1	1	1	1	1	1	1	1	..	..
<i>Echinostrephus molaris</i> (de Blainville)	1	1	..	1	1	1	1	1	1	1	1	1	..	..	..
<i>Heterocentrotus mammillatus</i> (L.)	1	1	..	1	1	..	..	1	1	1	1	1	1	..	..
<i>Heterocentrotus trigonarius</i> (Lamarck)	1	1	..	48	31	..	..	..	1	..	1	1	..	..	..
<b>ECHINONEIDAE</b>															
<i>Echinoneus abnormalis</i> de Loriol	..	1	..	..	..	..	..	..	1	..	39	1	1	..	..
<i>Echinoneus cyclostomus</i> Leske	1	1	..	1	..	..	1	1	1	1	1	1	1	..	39
<b>CLYPEASTERIDAE</b>															
<i>Clypeaster fervens</i> Koehler	1	1	..	1	1	..	..	1	1	..	1	..	..	..	..
<i>Clypeaster humilis</i> (Leske)	1	..	..	1	1	1	..	1	1	1	..	1	..	..	..
<i>Clypeaster rarispinus</i> de Meijere	1	..	..	1	1	1	1	1	1	..	..	..	..	..	..
<i>Clypeaster reticulatus</i> (L.)	1	1	..	1	1	1	1	1	1	1	1	1	1	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<b>FIBULARIIDAE</b>															
<i>Echinocyamus crispus</i> Mazetti	1	7	..	1	1	..	1	1	1	10	1	..	1	..	..
<i>Echinocyamus grandis</i> H.L. Clark	..	19	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Fibularia ovulum</i> Lamarck	1	7	..	..	1	..	1	1	1	10	1	1	..	..	..
<i>Fibularia volva</i> A. Agassiz	..	18	..	1	1	39	..	?	1	10	1	23	?	..	..
<b>LAGANIDAE</b>															
<i>Laganum depressum</i> Lesson	1	1	..	48	1	..	1	1	1	1	1	1	..	..	..
<i>Laganum joubini</i> (Koehler)	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..
<b>ASTRICLYPEIDAE</b>															
<i>Echinodiscus auritus</i> Leske	1	1	..	1	1	1	..	1	1	1	1	..	..	..	..
<i>Echinodiscus bisperforatus</i> Leske	1	?	..	1	1	..	..	1	1	..	..	37	..	..	..
<b>ECHINOLAMPADIDAE</b>															
<i>Echinolampas alexandri</i> de Loriol	..	1	..	1	31	..	..	1	1	..	..	1	..	..	..
<i>Echinolampas ovata</i> (Leske)	..	1	..	..	1	..	..	1	1	1	..	..	..	..	..
<b>SPATANGIDAE</b>															
<i>Maretia planulata</i> (Lamarck)	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>Pseudomaretia alta</i> (A. Agassiz)	..	1	..	..	..	..	1	1	1	..	1	..	..	..	..
<b>LOVENIIDAE</b>															
<i>Lovenia elongata</i> (Gray)	1	..	..	1	1	..	1	1	1	1	1	37	..	..	..
<i>Lovenia subcarinata</i> (Gray)	1	..	..	..	..	..	..	1	1	..	1	..	..	..	..
<b>SCHIZASTERIDAE</b>															
<i>Diploporaster barbatus</i> Mort.	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Diploporaster savignyi</i> (Fourtau)	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..
<i>Moira stygia</i> Lutken	1	..	..	..	1	..	..	1	1	..	..	..	..	..	..
<i>Paraster gibberulus</i> (L. Agassiz)	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..
<i>Prymnaster investigatoris</i> Koehler	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..
<i>Schizaster lacunosus</i> (L.)	1	7	..	..	48	..	16	..	1	1	1	37	..	..	..
<b>BRISSIDAE</b>															
<i>Brissopsis luzonicus</i> (Gray)	1	..	..	..	1	1	1	1	1	1	1	1	1	..	..
<i>Brissus latecarinatus</i> (Leske)	1	1	..	..	31	..	1	1	1	1	1	1	1	..	..
<i>Metalia dicrana</i> H.L. Clark	..	7	..	..	..	..	..	..	1	10	39	1	..	..	..
<i>Metalia robillardi</i> (de Loriol)	1	1	..	..	..	..	..	..	..	..	39	..	..	..	..
<i>Metalia spatagus</i> (L.)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>Metalia sternalis</i> (Lamarck)	1	1	..	1	1	..	..	1	1	1	1	1	1	..	..
<b>Class HOLOTHURIOIDEA</b>															
<b>HOLOTHURIIDAE</b>															
<i>Actinopyga bacilla</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Actinopyga bannwarthi</i> Panning	3	7?	..	1	1	..	..	..	..	10	..	..	..	..	..
<i>Actinopyga echinites</i> (Jaeger)	1	1	..	1	3	..	22	1	1	1	1	1	..	..	..
<i>Actinopyga lecanora</i> (Jaeger)	1	1	..	1	..	..	..	1	1	1	1	1	..	..	..
<i>Actinopyga mauritiana</i> (Quoy & Gaimard)	1	1	..	40	1	1	1	1	1	1	1	1	1	..	..
<i>Actinopyga miliaris</i> (Quoy & Gaimard)	1	1	..	..	1	..	..	1	1	1	1	1	..	..	..
<i>Actinopyga obesa</i> (Selenka)	3	..	..	..	..	..	..	..	1	10	1	36	1	..	..
<i>Actinopyga serratidens</i> Pearson	3	3	..	..	1	..	..	1	1	10	..	..	..	..	..
<i>Bohadschia argus</i> Jaeger	3	1	..	..	..	..	22	1	1	1	1	1	..	..	..
<i>Bohadschia cousteaui</i> Cherbonnier	3	..	..	..	1	..	..	..	..	..	..	..	..	..	..
<i>Bohadschia koellikeri</i> (Semper)	1	1	..	..	..	..	..	..	..	..	..	1	..	..	..
<i>Bohadschia marmorata</i> Jaeger	1	1	..	..	1	..	..	1	1	1	1	1	..	..	..
<i>Bohadschia mitsionensis</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Bohadschia similis</i> (Semper)	..	1	..	..	..	..	..	..	1	..	..	1	..	..	..
<i>Bohadschia subrubra</i> (Quoy & Gaimard)	3	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Bohadschia tenuissima</i> (Semper)	3	..	..	..	1	..	1	1	1	1	1	1	..	..	..
<i>Bohadschia vitiensis</i> (Semper)	3	..	..	..	..	..	..	1	1	1	1	1	37	..	..
<i>Holothuria (Cystipus) mammosa</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Cystipus) rigida</i> (Selenka)	1	1	..	48	1	..	1	..	1	1	21	1	..	51	..
<i>H. (Halodeima) atra</i> (Jaeger)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>H. (Halodeima) edulis</i> Lesson	1	..	..	1	1	..	1	1	1	1	1	1	3	..	..
<i>H. (Halodeima) pulla</i> Selenka	1	..	..	..	..	..	..	..	1	..	..	1	..	..	..
<i>H. (Lessonothuria) duoturricula</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Lessonothuria) hawaiiensis</i> Fisher	3	..	..	..	..	..	..	..	..	44	..	44	3	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>H. (Lessonothuria) pardalis</i> Selenka	1	1	..	1	1	1	1	1	1	1	1	1	1	51	..
<i>H. (Lessonothuria) verrucosa</i> Selenka	1	1	..	..	..	..	..	..	1	1	39	37	1	..	..
<i>H. (Mertensiothuria) albofusca</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Mertensiothuria) fuscorubra</i> Théel	..	8	..	8	..	..	..	..	..	10	10	..	10	..	..
<i>H. (Mertensiothuria) leucospilota</i> (Brandt)	1	1	..	1	1	1	1	1	1	1	21	1	1	51	..
<i>H. (Metriatyla) albiventer</i> Semper	1	..	..	..	1	..	1	..	1	..	39	1	..	..	..
<i>H. (Metriatyla) fuligina</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Metriatyla) martensi</i> Semper	1	..	..	1	48	..	1	1	1	1	1	..	..	..	..
<i>H. (Metriatyla) scabra</i> Jaeger	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>H. (Microthele) fuscopunctata</i> Jaeger	3	..	..	..	..	..	..	..	1	10	39	37	..	..	..
<i>H. (Microthele) nobilis</i> (Selenka)	1	1	..	40	1	..	1	1	1	1	1	1	..	..	..
<i>H. (Microthele) whitmaei</i> Bell	8	..	..	..	..	..	..	..	..	10	10	10	1	..	..
<i>H. (Platyperona) crosnieri</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Platyperona) difficilis</i> Semper	3	1	..	..	1	..	1	1	1	1	1	1	1	44	..
<i>H. (Platyperona) excellens</i> (Ludwig)	3	..	..	..	..	..	..	..	..	..	..	3	..	..	..
<i>H. (Platyperona) insolita</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Platyperona) samoana</i> Ludwig	3	..	..	..	..	..	..	..	..	10	..	10	..	..	..
<i>H. (Selenkothuria) bacilla</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Selenkothuria) erinaceus</i> (Brandt)	3	..	..	40	..	..	..	1	1	1	3?	1	..	..	..
<i>H. (Selenkothuria) moebii</i> Ludwig	..	1	..	..	..	..	..	1	1	1	1	1	..	..	..
<i>H. (Selenkothuria) parva</i> Krauss in Lampert	1	7	..	1	1	..	..	3	..	..	..	..	..	..	..
<i>H. (Selenkothuria) spinea</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Selenkothuria) vitalonga</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Semperothuria) cinerascens</i> (Brandt)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
<i>H. (Semperothuria) flavomaculata</i> Semper	3	..	..	..	1	..	..	37	1	10	21	1	..	..	..
<i>H. (Semperothuria) granosa</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>H. (Stauropora) dofleini</i> Augustin	8	..	..	..	..	..	..	..	10	10	10	10	8	..	..
<i>H. (Stauropora) fuscocinerea</i> Jaeger	1	1	..	..	1	..	..	1	1	1	1	1	..	51	..
<i>H. (Stauropora) pervicax</i> Selenka	1	1	..	1	1	..	1	1	1	1	21	1	1	..	..
<i>H. (Stauropora) olivaceus</i> Ludwig	3	..	..	..	3	..	..	..	1	10	21	10	10	..	..
<i>H. (Theleothuria) maculosa</i> Pearson	3	1	..	..	..	..	..	..	..	..	..	37	..	..	..
<i>H. (Thymiosycia) arenicola</i> Semper	1	1	..	48	1	32	1	1	1	1	1	1	1	51	51
<i>H. (Thymiosycia) conusalba</i> Cherb. & Féral	11	..	..	..	..	..	..	..	37	10	..	37	..	..	..
<i>H. (Thymiosycia) gracilis</i> Semper	1	..	..	..	..	..	..	..	1	10	21	1	..	..	..
<i>H. (Thymiosycia) hilla</i> Lesson	1	1	..	1	1	..	1	1	1	1	1	1	1	51	..
<i>H. (Thymiosycia) impatiens</i> (Forskål)	1	1	..	1	1	..	1	1	1	1	1	1	1	51	3
<i>H. (Thymiosycia) remollescens</i> Lampert	..	7	..	..	1	..	..	1	..	1	..	..	..	..	..
<i>H. (Thymiosycia) strigosa</i> Selenka	1	..	..	40	1	..	..	..	..	..	..	..	..	..	..
<i>Labidodemas pertinax</i> (Ludwig)	3	..	..	..	..	..	3	..	3	10	25	3	..	..	..
<i>Labidodemas rugosum</i> (Ludwig)	3	7	..	40	..	..	1	1	1	1	..	1	..	..	..
<i>Labidodemas semperianum</i> (Selenka)	5	..	..	48	42	..	..	1	1	1	39	1	1	..	..
<i>Pearsonothuria graeffei</i> (Semper)	3	..	..	..	1	..	1	..	1	10	25	1	..	..	..
<b>STICHOPODIDAE</b>															
<i>Neostichopus grammatus</i> (H.L. Clark)	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..
<i>Stichopus chloronotus</i> Brandt	1	1	..	3	15	..	1	1	1	1	1	1	1	..	..
<i>Stichopus hermanni</i> Semper	1	?	..	?	?	..	38?	?	10	10	..	10	..	..	..
<i>Stichopus horrens</i> Selenka	14	7	..	..	..	..	1	1	1	1	1	1	1	..	..
<i>Stichopus monotuberculatus</i> (Quoy & Gaimard)	1	1	..	1	1	..	..	..	44	10	44	44	..	..	..
<i>Thelenota ananas</i> (Jaeger)	3	1	..	..	..	..	1	..	1	1	1	1	..	..	..
<i>Thelenota anax</i> H.L. Clark	3	..	..	..	..	..	..	..	3	1	39	47	..	..	..
<b>PSOLIDAE</b>															
<i>Psolus appendiculatus</i> de Blainville	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>CUCUMARIIDAE</b>															
<i>Colochirus quadrangularis</i> (Lesson)	10	..	..	..	..	..	..	1	10	10	1	..	..	..	..
<i>Cucumella decaryi</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Koehleria unica</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Plesiocolochirus cylindricus</i> (Semper)	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Plesiocolochirus dispar</i> (Lampert)	3	..	..	1	3	..	..	..	..	10	..	..	..	..	..
<i>Plesiocolochirus tantulus</i> (Cherbonnier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Plesiocolochirus tesselera</i> (Cherbonnier)	29	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>Plesiocolochirus verrucula</i> (Cherbonnier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pseudocnella sinorbis</i> (Cherbonnier)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pseudocnella sykion</i> (Lampert)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
<i>Pseudocolochirus violaceus</i> (Theel)	3	..	..	..	3	..	..	1	1	1	1	..	..	..	..
<i>Psolidium ornatum</i> (Ed. Perrier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Roweia frauenfeldi</i> (Ludwig)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
<i>Trachythylene crucifera</i> (Semper)	1	1	29	1	1	..	..	29	..	..	..	..	..	..	..
<b>SCLERODACTYLIDAE</b>															
<i>Afroccumis africana</i> (Semper)	1	1	..	40	..	..	1	1	1	1	1	1	..	..	..
<i>Cladolabes acicula</i> (Semper)	..	1	..	..	..	1	..	1	1	1	39	1	37	..	..
<i>Cladolabes bifurcatus</i> (Deichmann)	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..
<i>Cladolabes pichoni</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Globosita murrea</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Ohshimella ehrenbergi</i> (Selenka)	1	..	..	1	1	1	1	1	..	..	39	..	..	..	..
<i>Ohshimella mauritiensis</i> Heding & Panning	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<b>PHYLLOPHORIDAE</b>															
<i>Athyone exila</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Athyone maculispara</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Parathyone incurva</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Havelockia ferali</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Havelockia turripinea</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Havelockia versicolor</i> (Semper)	27	..	..	..	..	..	..	33	1	1	39	..	..	..	..
<i>Hemithyone semperi</i> (Bell)	1	..	..	..	..	1	..	1	1	1	..	..	..	..	..
<i>Lipotrapeza ambigua</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Lipotrapeza incurva</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Lipotrapeza ventripes</i> (Joshua & Creed)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Neothyoniidium dissimilis</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Phyllophorus (Phyllonovus) anomalia</i> Cherb.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>P. (Phyllophorella) contractura</i> Cherb.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>P. (Urodemella) brocki</i> Ludwig	3	..	..	..	..	..	..	1	1	1	..	..	..	..	..
<i>P. (Urodemella) oculus</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>P. (Urodemella) tenuis</i> Haacke	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Selenkiella paradoxa</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Stolus buccalis</i> (Stimpson)	1	..	..	1	3	1	..	1	1	1	1	..	..	..	..
<i>Thyone avenusta</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone carens</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone comata</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone crebrapodia</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone curvata</i> Lampert	1	..	..	..	15	..	..	..	..	..	..	..	..	..	..
<i>Thyone guillei</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone longicornis</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone sineturra</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone vadosa</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyone venusta</i> Selenka	28	..	..	..	28	..	..	..	..	1	..	47	..	..	..
<i>Thyonidiella exigua</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Thyonidiella oceana</i> Heding & Panning	3	1	..	..	..	..	..	..	1	..	..	23	..	..	..
<b>SYNAPTIDAE</b>															
<i>Anapta gracilis</i> Semper	1	..	..	..	..	..	..	1	1	..	39	1	..	..	..
<i>Euapta godeffroyi</i> (Semper)	1	1	..	..	1	..	1	..	1	1	39	1	1	..	..
<i>Leptosynapta geysereensis</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Leptosynapta oblonga</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Leptosynapta tantula</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Opheodesoma grisea</i> (Semper)	1	3	..	1	1	..	..	1	1	1	39	35	1	..	..
<i>Opheodesoma serpentina</i> (J. Müller)	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..
<i>Opheodesoma sinevirga</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Patinapta crosslandi</i> Heding	1	..	26	..	1	..	..	..	..	..	..	..	..	..	..
<i>Patinapta ooplax</i> von Marenzeller	1	..	..	..	..	..	1	..	1	..	1	1	..	..	..
<i>Patinapta vaughani</i> Cherbonnier	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Polyplectona kefersteini</i> (Selenka)	..	7	..	..	1	..	..	..	1	1	39	1	1	44	..
<i>Protankyra picardi</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Table 1 (continued)

Taxa	East Africa	WIO islands	S Africa	Arabian Sea	Red Sea	W India	Laks-Chagos	Lanka-Bengal	Malay-Indon.	N Australia	China-Japan	W Pacific Is.	Hawaii	E Pacific	Trop. Atlantic
<i>Synapta maculata</i> (Chamisso & Eysenhardt)	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
<i>Synaptula mortenseni</i> Heding	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Synaptula reciprocans</i> (Forsk.)	3	..	..	1	1	..	..	..	..	..	..	..	..	..	..
<b>CHIRODOTIDAE</b>															
<i>Chiridota eximia</i> Haacke	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Chiridota rigida</i> Semper	41	..	41 ?	..	..	..	..	..	1	1	1	1	..	..	..
<i>Chiridota stuhlmanni</i> Lampert	1	7	..	..	42	..	3	..	38	..	39	1	..	..	..
<i>Chiridota violacea</i> J. Müller	1	7	..	..	..	..	1	..	3	..	..	..	..	..	..
<i>Polycheira rufescens</i> (Brandt)	1	1	26	..	..	..	..	1	1	1	1	1	..	..	..
<i>Trochodota mira</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Trochodota vivipara</i> Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..

## LIST OF SOURCES TO APPENDIX 2 TABLE 1.

1. Clark & Rowe (1971)
2. Marshall & Rowe (1981)
3. Cherbonnier (1988)
4. Cherbonnier & Guille (1978)
5. Humphreys (1981)
6. Clark (1993)
7. Sloan *et al.* (1979)
8. Rowe *pers. com.*
9. Rowe *et al.* (1986)
10. Rowe & Gates (1995)
11. Spm. obs./photogr. by MDR
12. Spm. identified by Rowe
13. Pope & Rowe (1977)
14. Spm. identified by Pawson
15. Vine (1986)
16. Clark & Courtman-Stock (1967)
17. Baker & Marsh (1976)
18. Hughes & Gamble (1977)
19. Clark (1984)
20. James (1987)
21. Liao (1979)
22. Clark & Taylor (1971)
23. Pawson (1995)
24. Price & Rowe (1996)
25. Liao (1997)
26. Thandar (1989a)
27. Thandar (1989b)
28. Thandar (1990)
29. Thandar (1991)
30. Campbell & Morrison (1988)
31. Roman (1979)
32. Tahera & Tirmizi (1995)
33. James (1979)
34. Crossland & Price (*in press*)
35. Kerr (1994)
36. Kerr *et al.* (1993)
37. Guille *et al.* (1986)
38. Price & Reid (1985)
39. Liao & Clark (1995)
40. Tortonese (1980)
41. Thandar & Rowe (1989)
42. Tortonese (1977)
43. Hogget (1991)
44. Massin (1996)
45. Oguro & Sasayama (1984)
46. Marsh (1977)
47. Rowe & Doty (1977)
48. Price (1982)
49. Sukarno & Jangoux (1977)
50. Rowe (1977)
51. Rowe (1985b)
52. Moosleitner (1997)
53. Marsh & Price (1991)

## SYNONYMS ADOPTED IN THE PRESENT STUDY

Synonyms in square brackets, where possible with defining authority.

### Crinoidea

*Comanthus wahbergi* [*Commisia hatmeyeri*; *Commisia ignota*]  
*Dichrometra flagellata* [*D. afra* A.H. Clark : Marshall & Rowe (1981)]

### Asteroidea

*Neoferdina offreti* Muller & Troschel [*N. mahei* Jangoux: Clark (1993)]  
*Ophidiaster cribrarius* Lutken [*Ophidiaster robillardi* Loriol]  
*Asterina burtoni* Gray [*Asterina wega* Perrier]

### Ophiuroidea

*Amphilycus scripta* Koehler [*Ophidaphne scripta* Koehler]  
*Amphiura candida* Ljungman [*Amphiura kalki*]  
*Amphiura dejectoides* H.L. Clark [*A. inhacensis*]  
*Amphiura duncani* Lyman [*A. luetkeni* Duncan]  
*Amphiura (Fellaria) octacantha* (H.L. Clark) [*Amphiura (Ophiopeltis) iranica* (Mortensen)]  
*Ophiactis macrolepidota* Marktanner-Turneretscher [*Ophiactis parva* Mortensen]  
*Ophiothela danae* Verrill [*Ophiothela hadra* H.L. Clark]  
*Ophiothela venusta* (de Loriol) [*Ophiothela beauforti* Engel]  
*Ophiomastix koehleri* Devaney [*Ophiomastix wendti* sensu Koehler]  
*Ophiomastix variabilis* Koehler [*Ophiomastix bispinosa*]  
*Ophiarachna affinis* Lutken [*Ophiarachna mauritiensis*]  
*Ophiochaeta hirsuta* Lutken [*Ophiochaeta boschmae*; *Ophiochaeta crinita*]  
*Ophioconis cincta* Brock [*Ophioconis permixta*; *Ophioconis cupida*]  
*Ophiopeza spinosa* (Ljungman) [*Ophiopeza dubiosa*]  
*Ophiolepis irregularis* Brock [*Ophiolepis cardioplax* Murakami]

### Holothuroidea

*Actinopyga echinites* (Jaeger) [*Actinopyga crassa*, *A. plebeja*: Rowe (1995)]  
*Holothuria (Lessonothuria) pardalis* Selenka [*H. insignis* Ludwig]  
*Holothuria (Microthele) nobilis* (Selenka) [*Holothuria fuscogilva*]  
*Holothuria (Platyperona) samoana* Ludwig [*Holothuria altimensis* H.L. Clark]  
*Havelockia versicolor* (Semper) [*Havelockia mirabilis* (Ludwig)]  
*Thyone venusta* Selenka [*Thyone okeni*]  
*Opheodesoma grisea* (Semper) [*Opheodesoma mauritiae* Heding]  
*Polycheira rufescens* (Brandt) [*Polycheira fusca* (Q. & G.): Cherbonnier (1952)].