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

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Awarding institution:
University of Wales, Bangor

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

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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.

CONTENTS

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 communties 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, assessement 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^2. 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 Godwanaland 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.

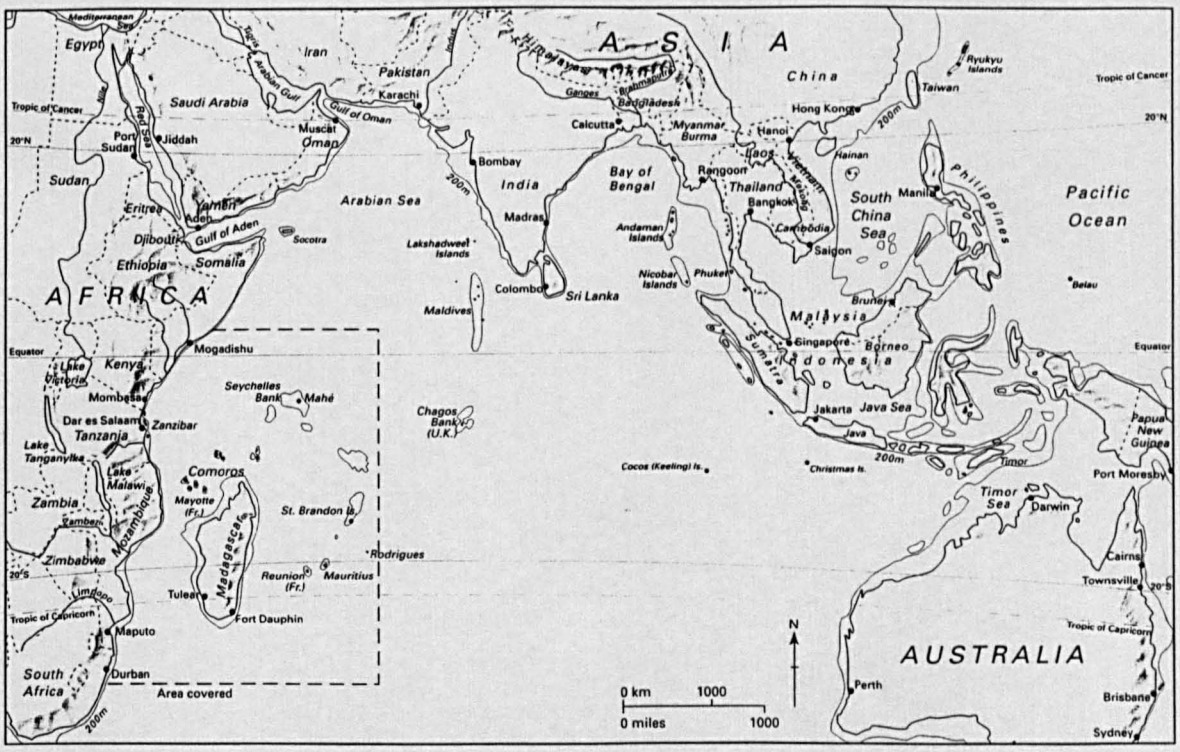
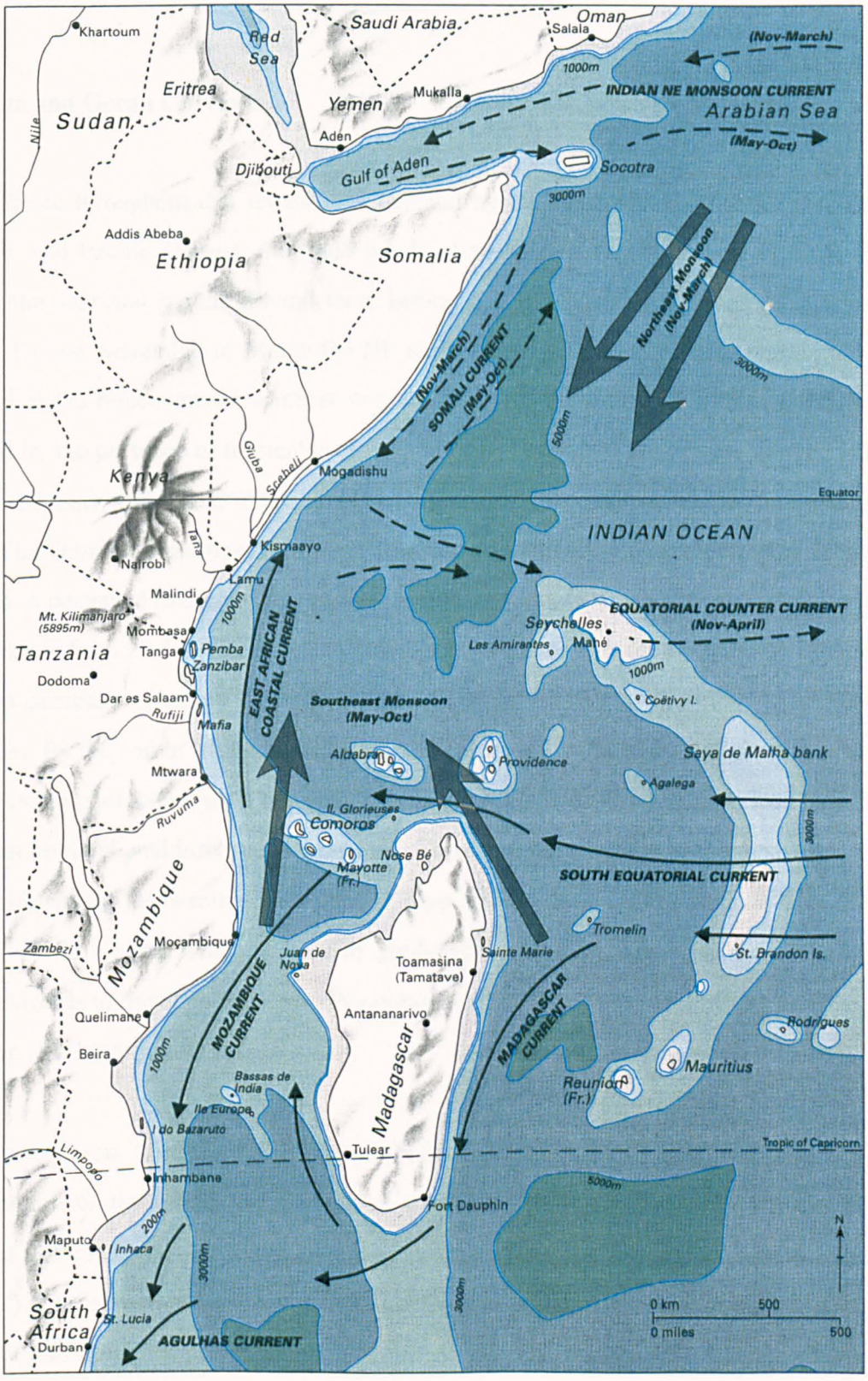


Figure 2. Ocean currents, monsoon winds and water depths prevalent in the western and northwestern Indian Ocean.



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^{-1} are not uncommon during cyclones and the resulting waves of 14 m or more can have devasting 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 salinty 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.

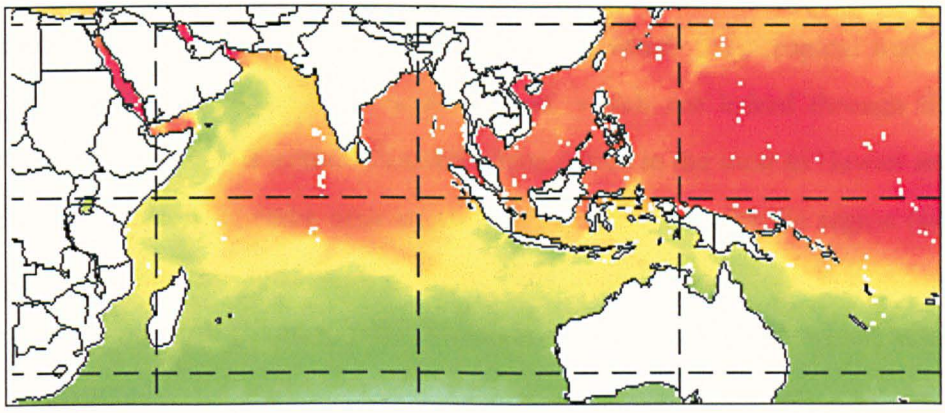
The main ocean current of the central Indian Ocean is the Equatorial Current, with movement from the eastern Indian Ocean towards East Africa at about 10-15°S (see Figure 2). This current divides and then continues north forming the East Africa Coastal Current (EACC) and south forming the Moçambique 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).



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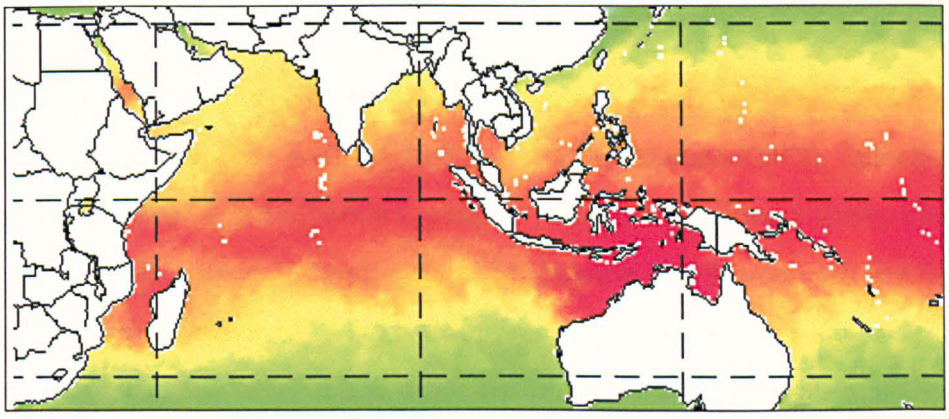

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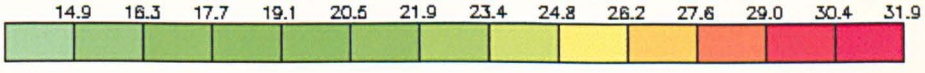

Key to temperature (C)

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.

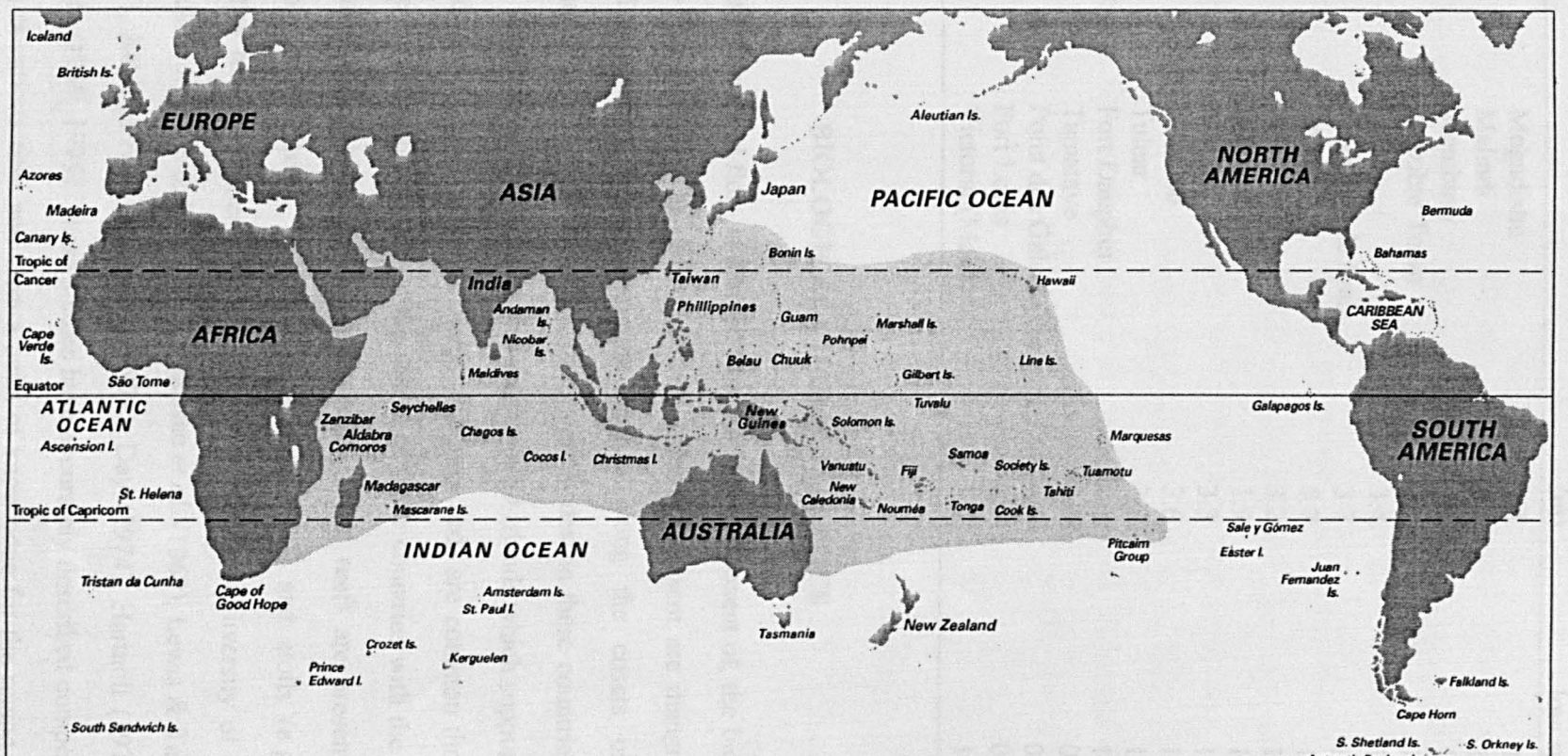

Figure 4. Major oceans and islands of the Indo-Pacific region (shaded area).

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
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^2)	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 techinques. 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 potentialy 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, Tulear, 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 Ndaro Dr. Jude Shunula	geology meiobenthos lichens
National Museums of Tanzania, Shaaban Robert St., Dar es Salaam, P.O. Box 511, Tanzania	Dr. Nobert 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	nemerteans
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 Y015YW, UK	Dr. Peter Hogarth	porcellanids
University College Cork – Dept. Zooloy, Lee Maltings, Prospect Row, Cork, Ireland	Prof. Alan Myers	amphipods
Universiteite 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
Stockhom 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 Gravely (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 accomodate 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 analyis.

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 $0.1m^2$ 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 numeorus 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 tansect 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 eulitttoral 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^2 cores samples were taken. Details are divided by tidal levels, hence MHWS (Mean Hgh 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 (*Sonneratia*). Numerous *Uca*.
Mkoba MK	5	MHW	mud	mangroves (*Avicennia* and *Sonneratia*); numerous *Uca*.
Mazizini MZT1S2	3	MHW	medium/coarse sand	mostly bare, some seagrasses (*Halodule* and *Halophila*).
Mazizini MZT2S2	3	MHW	fine sand	none.
Mbweni MB	5	MHW	medium/fine sand	mangroves (*Avicennia* and *Sonneratia*); *Clypeomorus* and *Uca* common.
Nungwi NGS1	3	MHWN	fine sand	mostly bare (some *Halodule*).
Harbour HBS2	3	MHWN	medium sand	none (anoxic below 10 cm).
Bawe Is. BWS1	3	MHWN	coarse sand and rubble	mostly bare (some *Padina*).
Mazizini MZT3S2	3	MHWN	fine sand	seaward of mangroves (*Avicennia* and *Sonneratia*); mostly bare (some *Uca*).
Bawe BWS2	3	MTL	medium sand and rubble	partly dominated by *Sargassum* and *Halodule*.
Mazizini MZT1S3	3	MTL	medium shelly sand	mostly seagrasses (*Cymodocea* and *Halodule*); some hermit crabs (*Calcinus*), holothurians.
Nungwi NGS2	3	MTL	fine sand and rubble	mostly bare; some *Halodule* and *Sargasssum*.

Table 1. (continued)

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

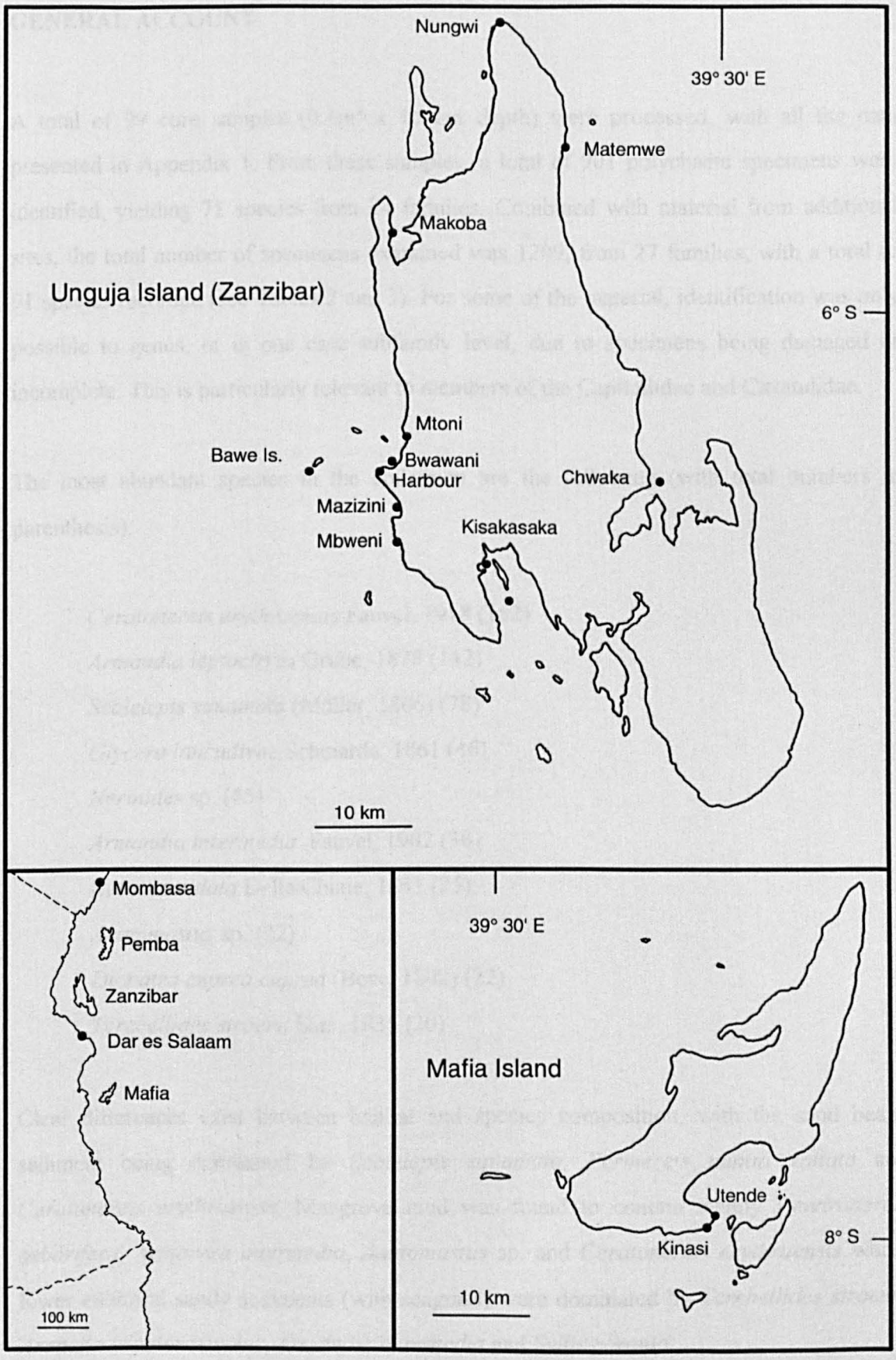

Figure 1. The islands of Zanzibar and Mafia showing locations of sampling sites (•). Note: the southernmost sites at Kisakasaka is situated in a mangrove channel which was not sampled quantitatively.

RESULTS

GENERAL ACCOUNT

A total of 99 core samples ($0.1m^2$ 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	*Aphrogenia* sp.	7	-	7
POLYNOIDAE	Harmothoinae sp.	1	-	1
	Gastrolepidia clavigera Schmarda, 1861	-	2	2
	Iphione cf. *muricata* (Savigny, 1818)	1	1	2
	Lepidonotus temisetosus (Gravier, 1901)	-	4	4
SIGALIONIDAE	*Sthenelais boa* (Johnston, 1839)	4	-	4
AMPHINOMIDAE	*Chloeia* sp.	-	1	1
	Eurythoe complanata (Pallas, 1766)	-	54	54
	Notopygos sp.	-	1	1
PHYLLODOCIDAE	*Phyllodoce* cf. *capensis* Day, 1960	1	-	1
	Phyllodoce cf. *castanea* (Marenzeller, 1879)	2	-	2
	Phyllodoce sp.	8	-	8
PILARGIDAE	*Ancistrosyllis parva* Day, 1963	2	-	2
SYLLIDAE	*Opisthosyllis* sp.	-	3	3
	Pharyngeovalvata natalensis Day, 1951	1	-	1
	Syllis cf. *amica* Quatrefages, 1865	1	-	1
	Syllis bouvieri Gravier, 1900	5	-	5
	Syllis cornuta Rathke, 1843	8	-	8
	Syllis cf. *gracilis* Grube, 1840	1	-	1
	Syllis cf. *prolifera* Krohn, 1852	2	1	3
	Syllis variegata Krohn, 1852	-	3	3
	Syllis sp. juv.	1	-	1
NEREIDAE	*Ceratonereis erythraensis* Fauvel, 1918	152	9	161
	Ceratonereis mirabilis Kinberg, 1866	4	-	4
	Dendronereis arborifera Peters, 1854	78	4	82
	Namalycastis indica (Southern, 1921)	1	-	1
	Nereis caudata Delle Chiaje, 1841	25	1	26
	Nereis coutieri Gravier, 1899	3	-	3
	Nereis persica Fauvel, 1911	1	4	5
	Nereis unifasciata Willey, 1905	8	1	9
	Perinereis nigropunctata (Horst, 1889)	-	7	7
	Perinereis nuntia vallata (Grube, 1857)	15	21	36
	Platynereis isolita Gravier, 1901	12	1	13
	Platynereis pulchella Gravier, 1901	3	-	3
	Platynereis sp.	4	-	4
GLYCERIDAE	*Glycera convoluta* Keferstein, 1862	-	7	7
	Glycera lancadivae Schmarda, 1861	46	-	46
EUNICIDAE	*Eunice antennata* (Savigny, 1820)	4	4	8
	Eunice indica Kinberg, 1865	2	-	2
	Lysidice collaris Grube, 1870	1	-	1
	Marphysa bifurcata Kott, 1951	1	-	1
	Marphysa mossambica (Peters, 1854)	12	21	33
	Nematoneries unicornis (Grube, 1840)	4	-	4
OENONIDAE	*Arabella iricolor iricolor* (Montagu, 1804)	13	4	17
	Drilonereis monroi Day, 1960	-	3	3
	Notocirrus australis Day, 1960	3	-	3
	Oenone fulgida (Savigny, 1818)	-	1	1
	Oenone sp.	2	1	3
LUMBRINERIDAE	*Lumbrineris latreilli* Audouin & M. Edwards, 1834	7	-	7
ONUPHIDAE	*Diopatra cuprea cuprea* (Bosc, 1802)	22	1	23

Table 2. (continued)

FAMILY	SPECIES	No. (cores)	No. (add. sites)	No. total
SPIONIDAE	*Aonides oxycephala* (Sars, 1862)	6	-	6
	Malacoceros indicus (Fauvel, 1928)	4	-	4
	Nerinides sp.	45	3	48
	Prionospio cf. *convexa* Imajima, 1990	5	-	5
	Prionospio malmgreni Claparéde, 1870	4	-	4
	Prionospio sexoculata Augener, 1918	2	-	2
	Scolelepis squamata (Müller, 1806)	55	2	57
	Spio sp.	1	-	1
MAGELONIDAE	*Magelona* sp.	1	-	1
POECILOCHAETIDAE	*Poecilochaetus serpens* Allen, 1904	1	-	1
CIRRATULIDAE	*Caulleriella* sp.	4	-	4
	Cirratulus sp.	14	-	14
	Cirriformia sp.	3	14	17
ORBINIDAE	*Naineris laevigata* (Grube, 1855)	-	3	3
	Scoloplos capensis Day, 1961	1	1	2
	Scoloplos cf. *uniramus* Day, 1961	4	1	5
	Orbinidae sp. juv.	4	-	4
PARAONIDAE	*Paraonis* sp.	1	-	1
OPHELIDAE	*Armandia intermedia* Fauvel, 1902	30	12	42
	Armandia leptocirrus Grube, 1878	142	-	142
	Armandia melanura Gravier, 1905	8	1	9
	Polyophthalmus pictus (Dujardin, 1839)	2	-	2
CAPITELLIDAE	*Anatomastus* sp.	22	-	22
	Capitella cf. *capitata* (Fabricius, 1780)	5	-	5
	Capitellid sp.	14	19	33
	Dasybranchus caducus (Grube, 1846)	5	-	5
	Heteromastides sp.	1	-	1
	Mediomastus sp.	7	2	9
	Notomastus latericeus Sars, 1851	2	-	2
OWENIIDAE	*Owenia fusiformis* Delle Chiaje, 1844	-	2	2
AMPHARETIDAE	*Amphicteis gunneri* (Sars, 1835)	2	-	2
TEREBELLIDAE	*Loimia medusa* (Savigny, 1820)	-	9	9
	Nicolea venustula africana Augener, 1918	14	-	14
	Terebella pterochaeta Schmarda, 1861	-	1	1
	Thelepus plagiostoma (Schmarda, 1861)	-	1	1
	Thelepus setosus (Quatrefages, 1865)	-	1	1
	Terebellid sp. 1	2	1	3
	Terebellid sp. 2	-	1	1
TRICHOBRANCHIDAE	*Terebellides stroemi* Sars, 1835	20	-	20
SABELLIDAE	*Branchioma violacea* (Schmarda, 1861)	-	73	73
	Jasmineira elegans Saint-Joseph, 1894	2	-	2
SERPULIDAE	*Hydroides* cf. *heteroceros* (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
Oenonidae	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 occured at the greatest densities (up to 131 per $0.1m^2$) 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^{-2}) 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-Pacifc 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
Syllis cf. *amica* Quatrefages, 1865
Syllis cf. *gracilis* Grube, 1840
Syllis cf. *prolifera* Krohn, 1852
Syllis variegata Krohn, 1852
Family NEREIDAE
Nereis caudata Delle Chiaje, 1841
Family GLYCERIDAE
Glycera convoluta Keferstein, 1862
Family LUMBRINERIDAE
Lumbrineris latreilli Aud. & M. Ed. 1834
Family SPIONIDAE
Aonides oxycephala (Sars, 1862)
Prionospio malmgreni Claparéde, 1870
Scolelepis squamata (Müller, 1806)
Family POECILOCHAETIDAE
Poecilochaetus serpens Allen, 1904
Family OPHELIDAE
Polyophthalmus pictus (Dujardin, 1839)
Family CAPITELLIDAE
Capitella cf. *capitata* (Fabricius, 1780)
Notomastus latericeus Sars, 1851
Family OWENIDAE
Owenia fusiformis Delle Chiaje, 1844
Family AMPHARETIDAE
Amphicteis gunneri (Sars, 1835)
Family TEREBELLIDAE
Loimia medusa (Savigny, 1820)
Thelepus plagiostoma (Schmarda, 1861)
Thelepus setosus (Quatrefages, 1865)
Family TRICHOBRANCHIDAE
Terebellides stroemi Sars, 1835

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 alagae (*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-Pacifc.

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); Austalia (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.

Nematoneries 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) synonomised *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 TEREBELLIDAE

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 subllittoral 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, incuding 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^2 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^2 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 subtrates 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 compositon 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 Aladabra 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 particulary 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 definiton 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 at 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 - Cardiiff) 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 mispellings 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), Columbellidae (87), Fasciolaridae (78), Nasariidae (77), Costellariidae (69) and Cerithidae (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 conspicious 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
Cerithiopsdiae	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
Mopaliidae	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
Cucullaiedae	1	1	Solenidae	1	7
Limopsidae	1	1	Cultellidae	3	6
Glycymeridídae	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	Vesicomyidae	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
Unguliniidae	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) Totals	182	667 (698)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

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

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

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

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

Table 5. (continued)

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

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

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

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

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

Table 5. (continued)

Taxa	Reference sources
AMATHINIDAE	
Amathina angustata Souverbie	37
Amathina bicarinata Pease	37
Amathina imbricata Sow., 1889	22;37
Amathina tricarinata (L., 1758)	22;1
Amathina tricostata 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
LEPTOCHITONIDAE	
Leptochiton eugenei Kass & Van Belle, 1981	1
Leptochiton nierstrazi (Leloup, 1985)	1
Lepidopleurus angusticostatus Quoy & Gaimard	7
ISCHNOCHITONIDAE	
Callistochiton barnardi Leloup, 1981	1
Callistochiton crosslandi Sykes, 1907	1;4(?).
Callistochiton rotondus Leloup, 1981	1
Callochiton clausadei Kass & Van Belle, 1985	1
Callochiton deshayesi Thiele, 1909	1;*7*
Callochiton vannini Ferreira, 1983	1
Ischnochiton oniscus (Krauss, 1848)	3
Ischnochiton yerburyi (Smith, 1891)	1;2
Lepidozona sp.	1
Stenoplax madagassicus (Thiele, 1917)	1
MOPALIIDAE	
Plaxiphora granulata Leloup, 1981	1
Plaxiphora parva Nierstrasz, 1906	1
Plaxiphora tulearensis Leloup, 1981	1
CHITONIDAE	
Acanthopleura brevispinosa (Sow., 1840)	1;4;*6*;*7*
Acanthopleura gemmata (Blain., 1825)	1;4;*5*;*6*
Chiton barnardi Ashby, 1931	4(?)
Chiton fosteri Bullock, 1972	2
Chiton hululensis (Smith, 1903)	1
Chiton kaasi (Leloup, 1981)	1
Chiton laterorugosus Kaas, 1986	1
Chiton mauritianus Quoy & Gaimard	1;*7*
Chiton rusticus Des.	7;5
Onithochiton literatus (Krauss, 1848)	4;3
Onithochiton maillardi (Des., 1863)	1;5;*7*
Schizochiton incisus Des.	7
Tonicia carnosa Kaas, 1979	1
Tonicia sueziensis (Rve., 1847)	2
ACANTHOCHITONIDAE	
Acanthochitona limbata Kaas, 1986	1
Acanthochitona garnoti (Blain., 1825)	7
Acanthochitona pencillata (Des., 1863)	7;1
Acanthochitona quincunx Leloup, 1981	1
Cryptoconchus burrowi Nierstrasz, 1905	1
Cryptoplax sykesi Thiele, 1909	1
Notoplax elegans Leloup, 1981	1
Notoplax productus (Carpenter & Pilsbury, 1892)	1
CRYPTOPLACIDAE	
Choneplax indica 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
NUCULIDAE	
Leda sp.	29
Leda novae-guineensis Smith	8
Nucula sp.	23
Nucula convexa Sow.	1
Nucula mauritiana Sow.	28
Nucula rugosa Odhner	29
Nucula sultana Thiele	9
SOLEMYIDAE	
Solemya africana Martens, 1879	12;20
Solemya australis Lam.	1
Solemya togata Poli	*8*
Solemya occidentalis Koch	8
ARCIDAE	
Acar plicata Dill., 1817	24;25;22;23;1;*20*
Anadara antiquata (L., 1758)	22;1;2;8;26;20;*28*
Anadara clathrata (Rve.)	23
Anadara ehrenbergi (Dunker, 1868)	*8*
Anadara erythraeonensis (Phil., 1851)	22;20
Anadara natalenis (Krauss, 1848)	22;1;3;8;20;*9*.
Anadara uropigimelana (Bory, 1824)	23;9;*28*
Arca avellana Lam., 1819	18;22;23;9;20;*8;1;28;29*
Arca bistrigata Dunker, 1866	8;9;*22*
Arca cunealis (Rve.)	1
Arca donaciformis Rve.	27
Arca erythraensis Jonas	8;9;18
Arca granosa L.	28
Arca lactea L.	28
Arca linter Jonas, 1845	8
Arca natalensis Krauss	28
Arca navicularis Brug.,1789	22;8;23;9;28;1;*8*
Arca nivea Chemn.	8;28;29
Arca plicata Chemn.	29;8;9;28
Arca truncata (Sow.)	1
Arca ventricosa Lam., 1819	22;1
Arca zebra Swa., 1832	8
Barbatia caelata Rve., 1844	22;*28;1*
Barbatia cometa (Rve.)	1
Barbatia decussata (Sow., 1833)	24;1;8;17
Barbatia dichotoma Des., 1863	22;*28*
Barbatia foliata (Forskal, 1775)	19;2;20;22;*28;1;23;9;28*
Barbatia fusca (Brug.)	1;5;8;23
Barbatia kraussi (Krauss)	1
Barbatia lacerata L., 1758	22;1;18;*28*
Barbatia obliquata (Wd., 1828)	1;4;22;*20;9;29*
Barbatia parva (Sow., 1833)	1
Barbatia revelata (Des., 1863)	2;20
Barbatia setigera (Rve., 1844)	22
Barbatia tenella Rve., 1844	22;1;2;23;28
Barbatia tetraquetra Kilburn, 1983	22
Barbatia virescens Rve., 1844	22;1
NOETIIDAE	
Arcopsis gibba (Krauss, 1848)	20;*9;22;1;3;8*
Sheldonella lateralis (Rve., 1844)	*20*;22;*1*

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

Table 7. (continued)

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

practials 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 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 complied 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 ^{0} N in central Somalia to Durban (South Africa) at approximately 30 ^{0} 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 ^{0} 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 southen 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 Guniea 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).

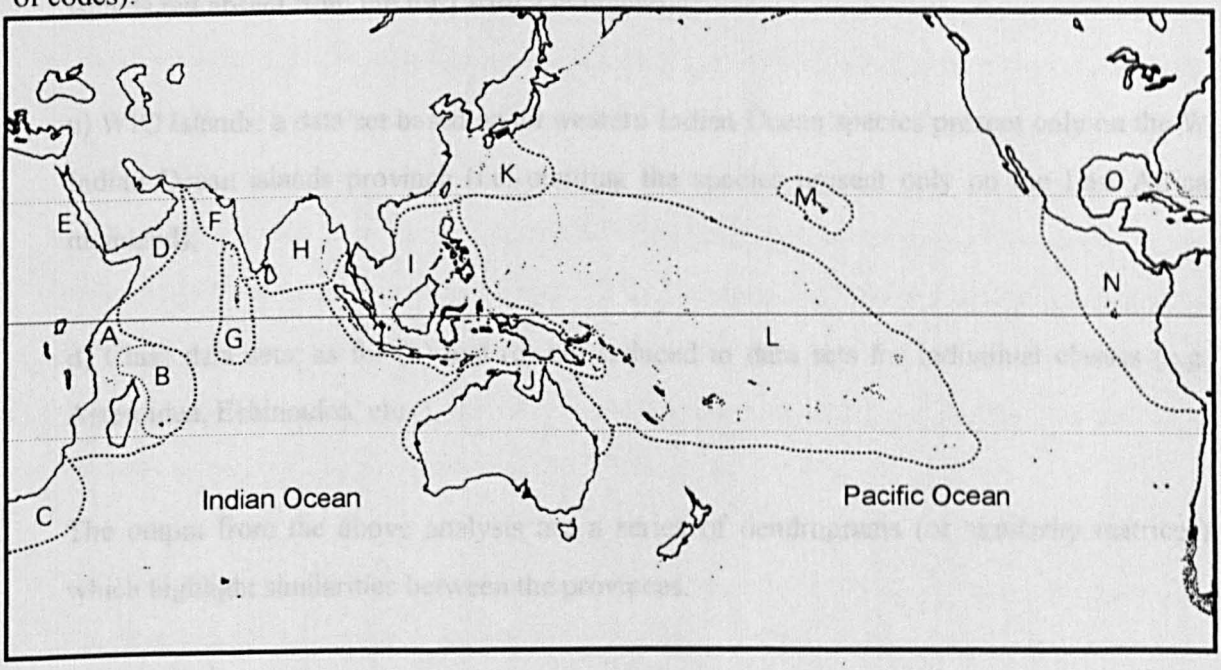
L Pacific Islands – all islands extending from the Marianas, Palau, Solomons and New Caledonia in the western Pacific to the Pitcairn Islands group in the central south Pacific. Ditto Clark & Rowe (1971).

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 explantion 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

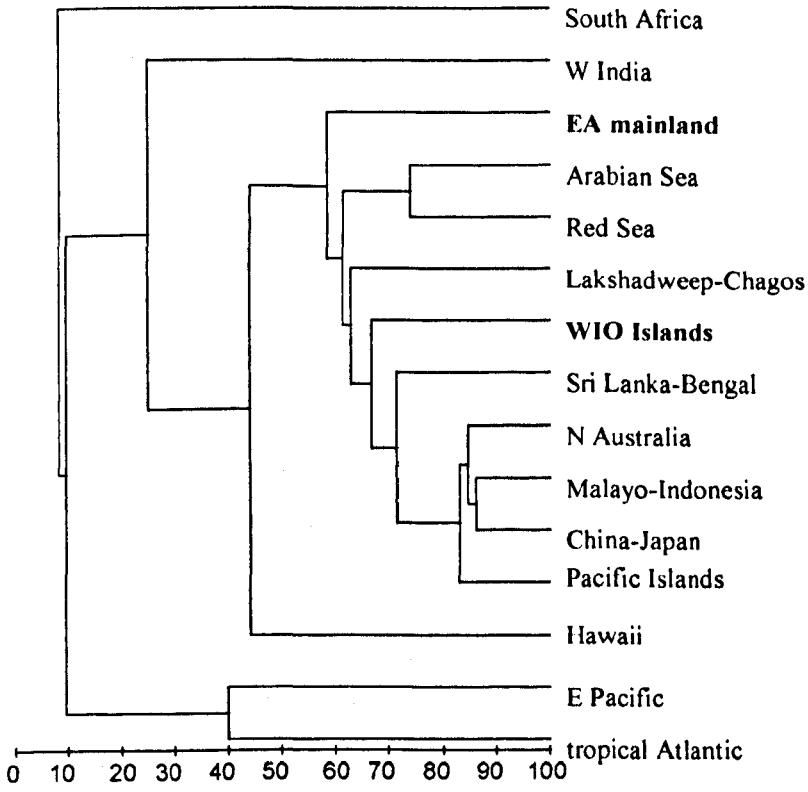


Figure 2a. Bray-Curtis similarity matrix for the Echinodermata recorded in the western Indian Ocean.

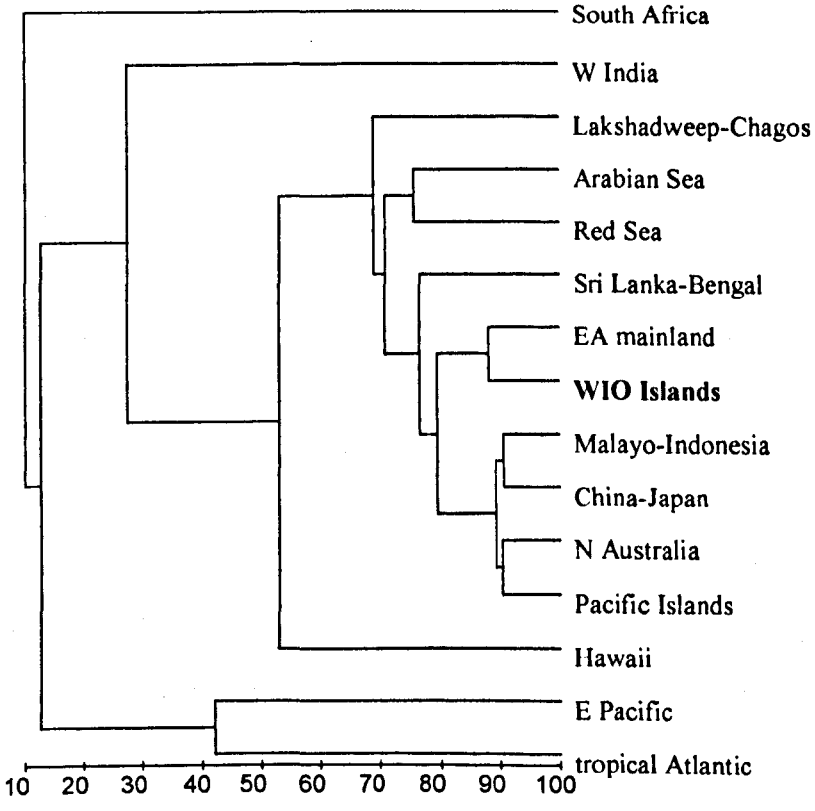


Figure 2b. Bray-Curtis similarity matrix for the Echinodermata recorded from the western Indian Ocean islands only.

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 where 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 identificaton 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

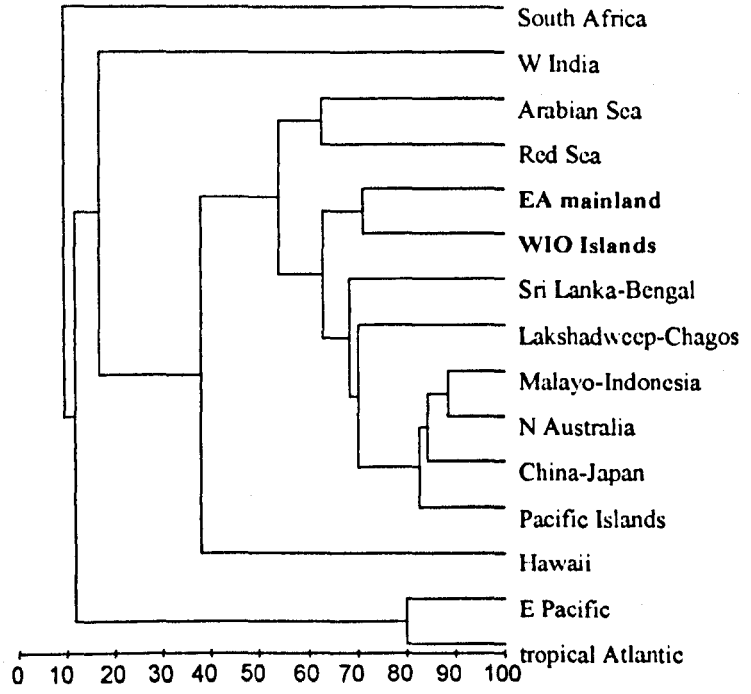


Figure 3. Bray-Curtis similarity matrix for the Asteroidea recorded in the western Indian Ocean.

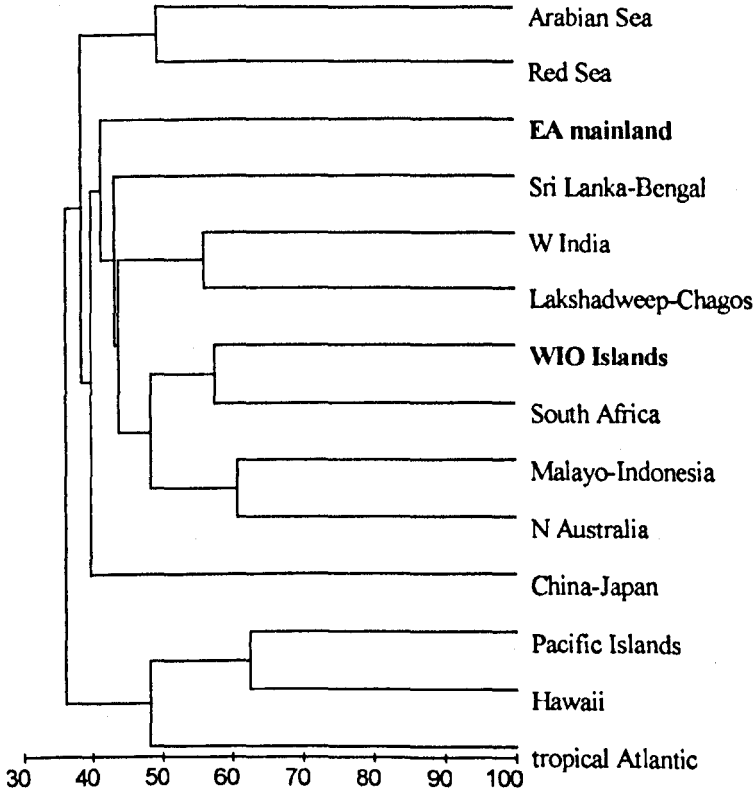


Figure 4a. Bray-Curtis similarity matrix for the Ophiuroidea recorded in the western Indian Ocean.

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 isalnds 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 availabity 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).

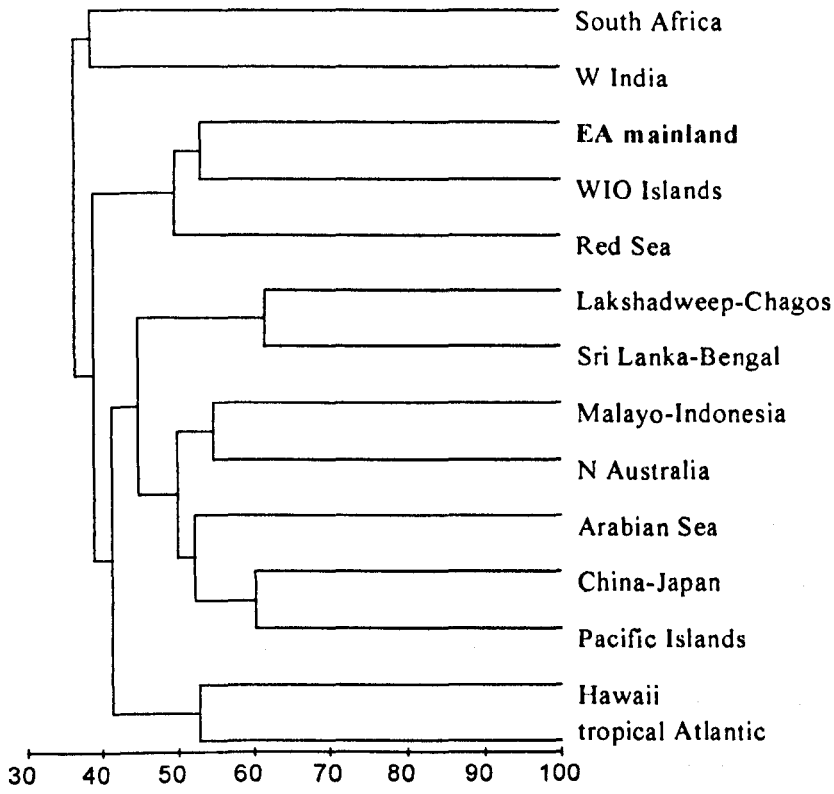


Figure 4b. Bray-Curtis similarity matrix for Ophiuroidea fauna recorded from the East Africa mainland only (including Madagascar).

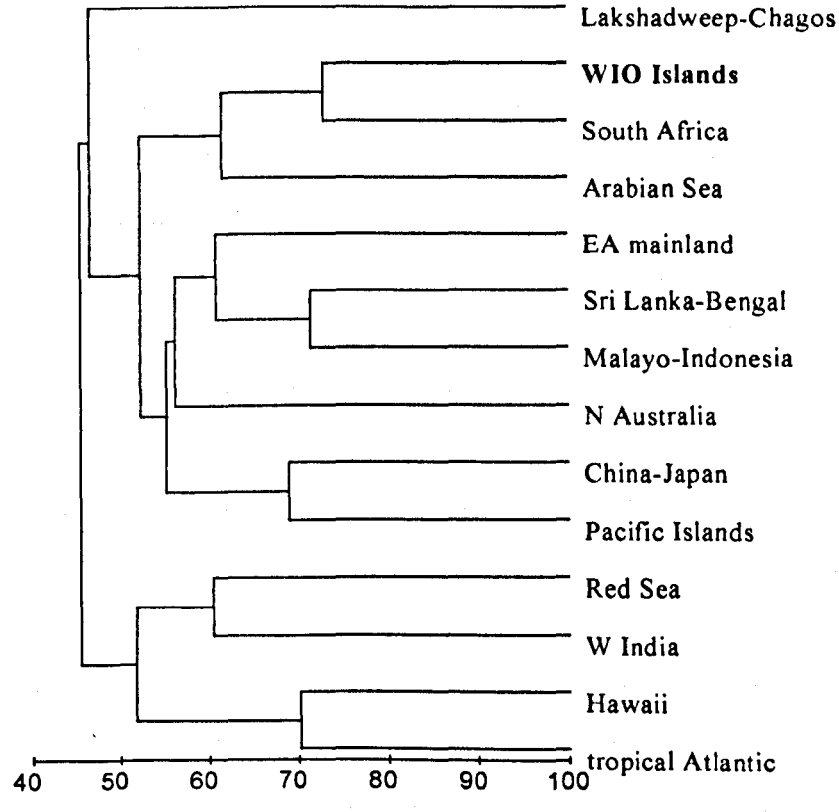


Figure 4c. Bray-Curtis similarity matrix for Ophiuroidea fauna recorded from the western Indian Ocean islands only.

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 tp 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 perfomed 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.

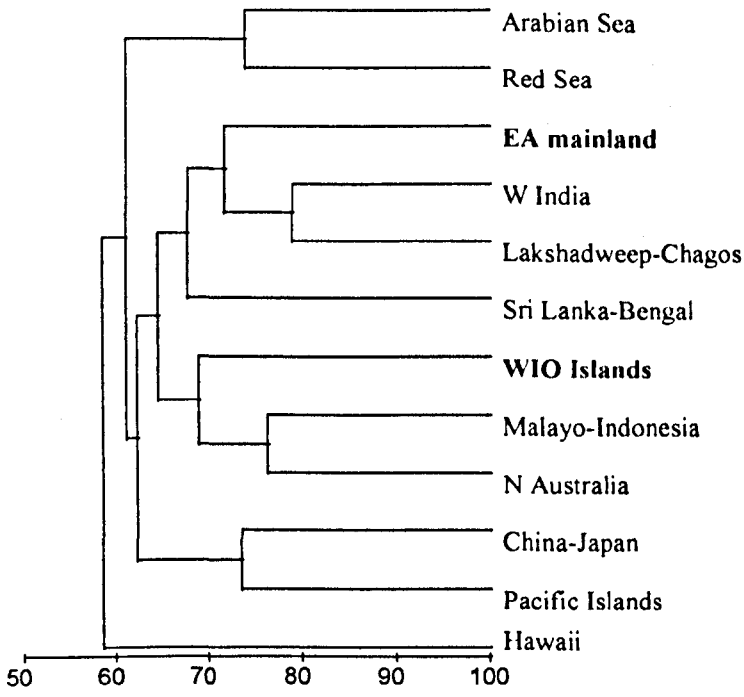


Figure 5a. Bray-Curtis similarity matrix for Echinoidea recorded in the western Indian Ocean.

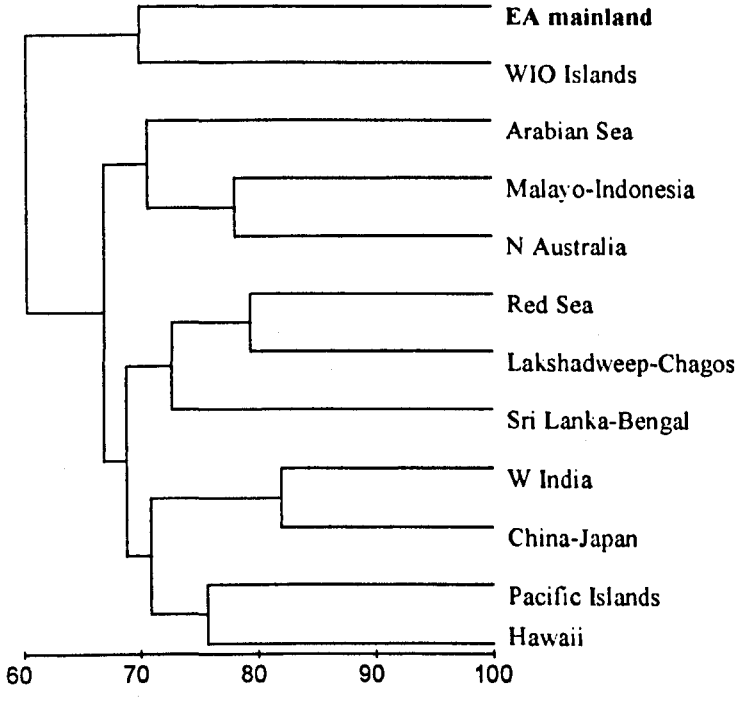


Figure 5b. Bray-Curtis similarity matrix for Echinoidea recorded from the East Africa mainland only (including Madagascar).

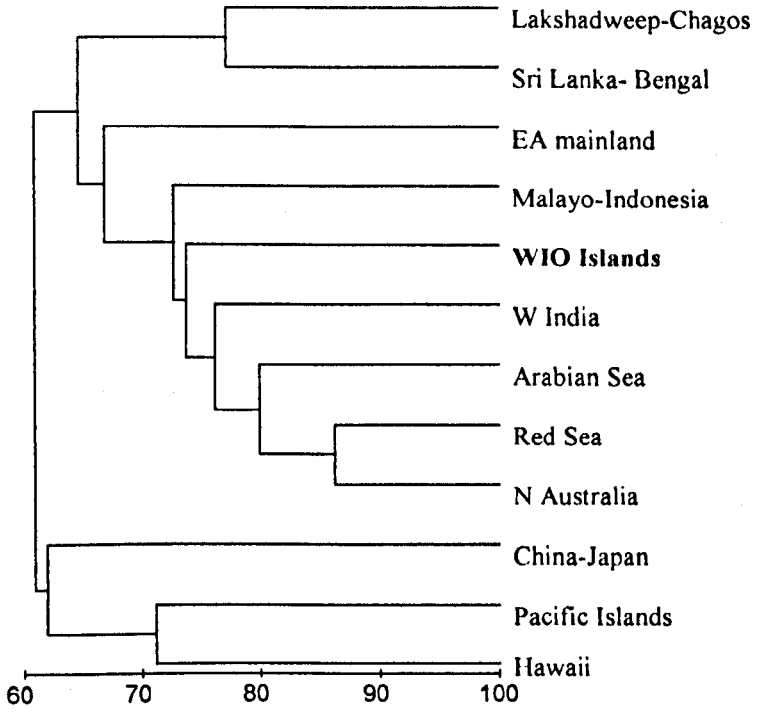


Figure 5c. Bray-Curtis similarity matrix for Echinoidea recorded from the western Indian Ocean Islands only.

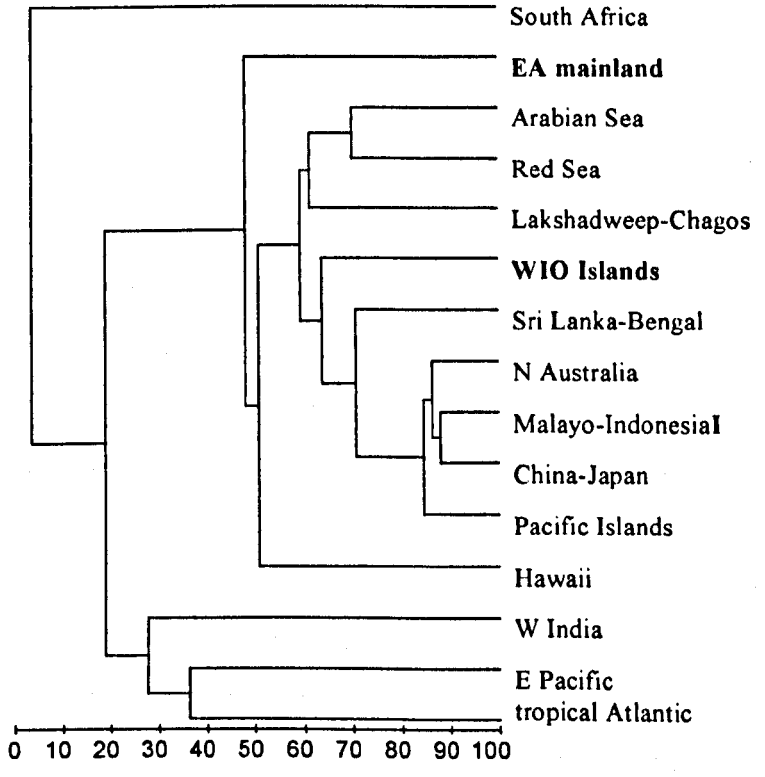


Figure 6a. Bray-Curtis similarity matrix for Holothuroidea recorded in the western Indian Ocean.

Class HOLOTHUROIDEA

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).

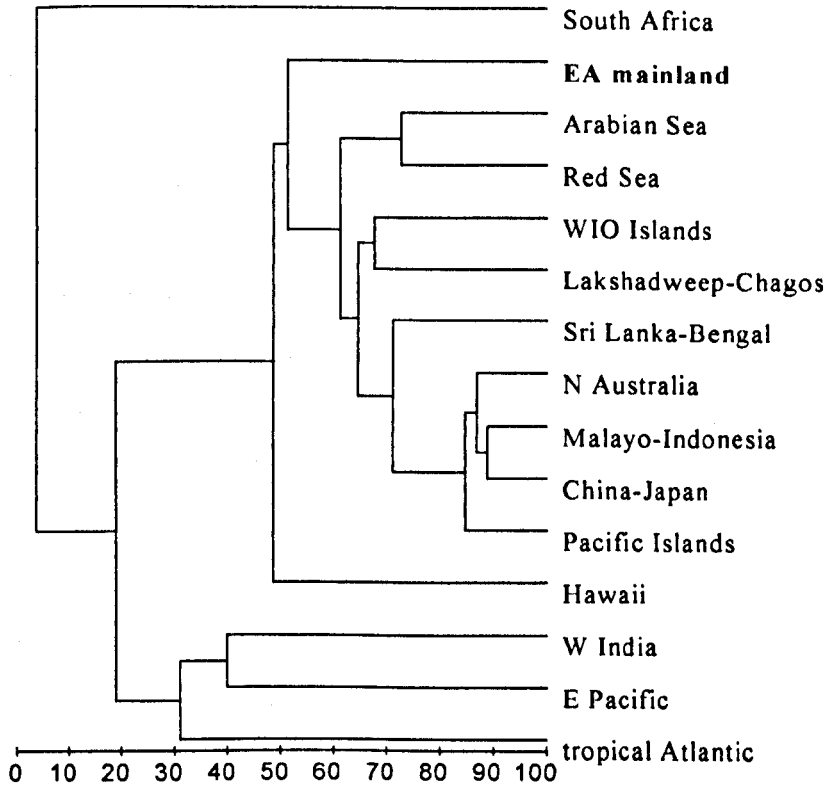


Figure 6b. Bray-Curtis similarity matrix for Holothuroidea recorded from the East Africa mainland only (including Madagascar).

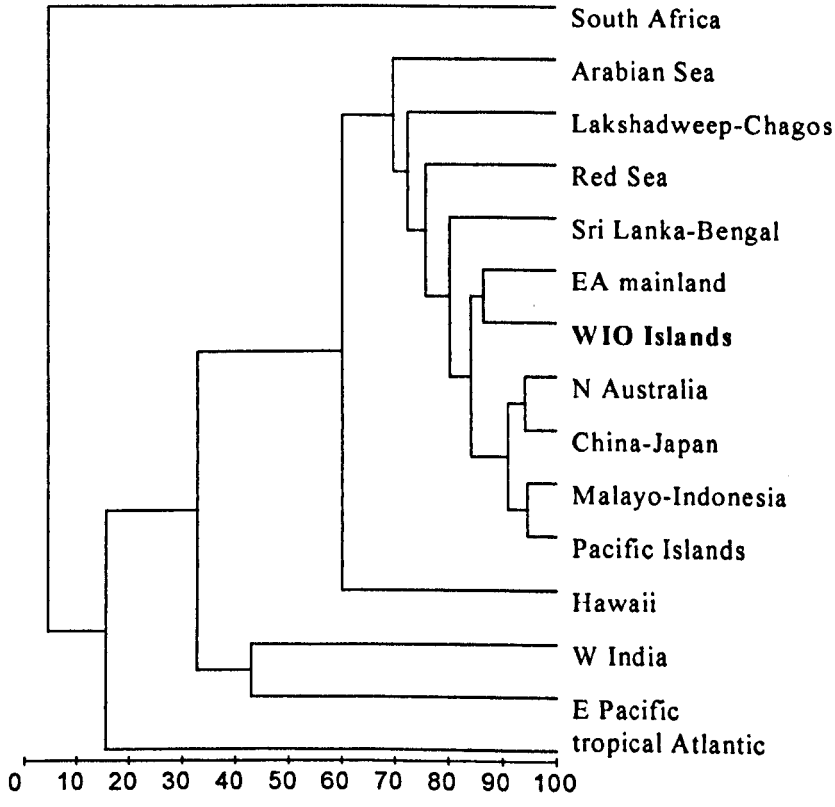


Figure 6c. Bray-Curtis similarity matrix for Holothuroidea recorded from the western Indian Ocean islands only.

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
CRINOIDEA															
COMASTERIDAE															
Capillaster multiradiatus (L.)	+	+			+		+	+	+		+	+	+		
Comanthus wahlbergi (J. Müller)	+	+	+	+	+		+			+	+	+			
Comaster distinctus (P.H. Carpenter)	+				+				+	+	+	+			
Comaster multifidus (J. Müller)		+					+		+	+	+	+			
HIMEROMETRIDAE															
Heterometra africana (A.H. Clark)	+			+		+									
Heterometra delagoae Gislen	+														
Heterometra gravieri A.H. Clark	+														
Heterometra joubini (A.H. Clark)	+														
Heterometra madagascarensis (A.H. Clark)	+														
MARIAMETRIDAE															
Dichrometra flagellata (J. Müller)	+		+						+	+	+	+			
Lamprometra klunzingeri (Hartlaub)	+	+		+	+										
Stephanometra indica (Smith)	+	+			+	+	+	+	+	+	+	+			
COLOBOMETRIDAE															
Cenometra emendatrix (Bell)	+	+													
Decametra modica A.H. Clark	+	+													
Oligometra serripinna (P.H. Carpenter)	+	+		+	+		+	+	+	+	+	+			
TROPIOMETRIDAE															
Tropiometra carinata (Lamarck)	+	+	+	+	+			+	+						
ANTEDONIDAE															
Antedon arabica A.H. Clark & A.M. Clark	+			+											
Dorometra mauritiana A.H. Clark	+	+					+								
Iridometra malagasiensis Marshall & Rowe	+														
ASTEROIDEA															
LUIDIIDAE															
Luidia hardwicki (Gray)		+		+				+	+	+	+				
Luidia maculata M. & T.	+	+	+	+	+		+	+	+	+	+	+			
Luidia mauritiensis Koehler		+													
Luidia savignyi (Auduoin)	+	+			+			+	+			+			
ASTROPECTINIDAE															
Astropecten antares Doderlein	+		+												
Astropecten granulatus M. & T.	+		+						+	+					
Astropecten hemprichi M. & T.	+	+		+	+										
Astropecten mauritianus Gray		+													
Astropecten monacanthus Sladen	+			+	+		+	+	+	+	+				
Astropecten polyacanthus M. & T.	+	+		+	+		+	+	+	+	+	+	+		
ARCHASTERIDAE															
Archaster angulatus M. & T.	+		+						+	+	+	+			
Archaster lorioli Sukarno & Jangoux		+					+								
GONIASTERIDAE															
Stellaster childreni Gray	+			+	+			+	+	+	+				
Stellasteropsis colubrinus Macan	+			+											
ASTERODISCIDIDAE															
Asterodiscides belli Rowe	+	+				+		+							
Asterodiscides tessellatus Rowe		+													
OREASTERIDAE															
Choriaster granulatus Lutken	+	+			+		+		+	+	+	+			
Culcita schmideliana (Retzius)	+	+		+			+	+							
Halityle regularis Fisher	+			+					+	+		+			
Monachaster sanderi Meissner	+			+	+										

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
Pentaceraster horridus (Gray)	+	+													
Pentaceraster mammillatus (Auduoin)	+			+	+										
Pentaceraster tuberculatus (M. & T.)	+			+	+										
Protoreaster lincki (de Blainville)	+	+		+				+	+	+					
Protoreaster nodosus (L.)	+	+						+	+	+	+	+			
OPHIDIASTERIDAE															
Andora faouzii (Macan)		+		+		+	+								
Cistina columbiae Gray		+					+			+		+			
Dactylosaster cylindricus (Lamarck)	+	+		+			+	+	+	+	+	+	+		
Ferdina flavescens Gray		+					+								
Fromia milleporella (Lamarck)	+	+		+			+	+	+	+	+	+			
Fromia monilis Perrier	+				+		+	+	+	+	+	+			
Fromia nodosa A.M. Clark		+					+	+				+			
Gomophia egyptiaca Gray	+	+			+		+	+	+	+	+	+			
Leiaster coriaceus Peters	+	+			+				+	+		+		+	
Leiaster glaber Peters	+							+					+		
Leiaster leachi (Gray)		+		+	+		+		+	+	+	+	+		
Linckia guildingi Gray	+	+		+			+	+	+	+	+	+	+	+	+
Linckia laevigata (L.)	+	+					+	+	+	+	+	+			
Linckia multifora (Lamarck)	+	+		+	+	+	+	+	+	+	+	+	+		
Nardoa frianti Koehler		+					+	+	+	+	+	+			
Nardoa variolata (Retzius)	+	+		+											
Neoferdina offreti M. & T.	+	+					+	+	+		+	+			
Ophidiaster duncani de Loriol	+	+								+					
Ophidiaster hemprichi M. & T.	+	+			+		+		+	+	+	+			
Ophidiaster perrieri de Loriol	+	+													
Ophidiaster cribrarius Lutken		+								+		+			
Tamaria lithosora H.L. Clark	+	+													
Tamaria marmorata (Michelin)	+	+													
ASTEROPSEIDAE															
Asteropsis carinifera (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		
Valvaster striatus (Lamarck)		+						+	+	+		+	+		
ASTERINIDAE															
Asterina burtoni Gray	+	+		+	+										
ACANTHASTERIDAE															
Acanthaster planci (L.)	+	+		+	+	+	+	+	+	+	+	+	+		
PTERASTERIDAE															
Euretaster cribrosus (v. Martens)	+	+		+	+			+	+						
MITHRODIIDAE															
Mithrodia clavigera (Lamarck)	+	+			+		+		+	+	+	+		+	+
Thromidia seychellesensis Pope & Rowe		+													
ECHINASTERIDAE															
Echinaster callosus v. Marenzeller	+	+			+			+	+	+	+	+			
Echinaster purpureus (Gray)	+	+		+	+			+							
ASTERIIDAE															
Stolasterias calamaria (Gray)	+	+	+							+	+	+			
OPHIUROIDEA															
OPHIOMYXIDAE															
Ophiomyxa australis Lutken	+	+		+	+			+	+	+	+	+			
EURYALIDAE															
Euryale aspera Lamarck	+							+	+	+	+	+			
GORGONOCEPHALIDAE															
Astroboa clavata (Lyman)	+	+		+	+		+	+		+	+				
Astroboa nuda (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
Astrocladus exiguus (Lamarck)	+							+	+	+	+				
Astroboa granulatus H.L. Clark	+									+		+			
Astrocladus tonganus Doderlein	+											+			
Astroglymma sculptum (Doderlein)		+							+	+	+	+			
OPHIACANTHIDAE															
Ophiacantha gracilis (Studer)	+								+	+					
AMPHIURIDAE															
Amphilycus scripta (Koehler)	+			+	+			+			+				
Amphiodia dividua (Mortensen)	+	+													
Amphiodia picardi Cherb. & Glle.	+														
Amphiodia microplax Burfield	+			+	+					+	+				
Amphioplus impressus (Ljungman)	+	+							+	+	+				
Amphioplus cyrtacanthus H.L.Clark	+								+		+				
Amphioplus heptagonus Cherb. & Glle.	+														
Amphioplus longuscutum Cherb. & Glle.	+														
Amphioplus lucidus Koehler	+								+	+	+				
Amphioplus margueritae Cherb. & Glle.	+														
Amphioplus parvitus Cherb. & Glle.	+														
Amphioplus polymorphus Cherb.	+														
Amphioplus spinosus Cherb. & Glle.	+														
Amphioplus thomassini Cherb. & Glle.	+														
Amphioplus titubantius Cherb. & Glle.	+														
Amphioplus hastatus (Ljungman)	+	+		+	+					+					
Amphioplus integer (Ljungman)	+	+	+		+										
Amphioplus laevis (Lyman)	+			+	+				+	+	+	+			
Amphioplus furcatus Mortensen	+														
Amphipholis littoralis Cherb. & Glle.	+														
Amphipholis loripes Koehler	+								+		+				
Amphipholis serrataspina Cherb. & Glle.	+														
Amphipholis sigillata Cherb. & Glle.	+														
Amphipholis squamata (D.Chiaje)	+	+	+	+	+	+			+	+	+	+	+		+
Amphiura acrisia H.L. Clark	+									+					
Amphiura capensis Ljungman	+		+												
Amphiura candida Ljungman	+	+									+				
Amphiura clausadae Cherb. & Guille	+														
Amphiura corona Cherb. & Guille	+														
Amphiura crispa Mortensen	+			+											
Amphiura dejectoides H.L. Clark	+	+			+				+						
Amphiura duncani Lyman	+							+	+	+	+	+			
Amphiura leptotata H.L. Clark	+								+	+		+			
Amphiura madecassae Cherb. & Guille	+														
Amphiura micra H.L. Clark	+								+	+					
Amphiura plantei Cherb. & Glle.	+														
Amphiura sexradiata Koehler	+								+						
Amphiura africana (Balinsky)	+														
Amphiura octacantha (H.L. Clark)	+									+	+				
Amphiura tenuis (H.L. Clark)	+			+		+				+	+				
Ophiocentrus asper (Koehler)	+								+	+		+			
Ophiocentrus crassuspinosus Cherb. & Glle.	+														
Ophiocentrus dilatatus (Koehler)	+						+		+	+		+			
Ophiocentrus inequalis (H.L. Clark)	+								+	+	+				
Ophiocentrus spinacutus Cherb. & Glle.	+														
Paracrocnida sacensis (Balinsky)	+														

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
OPHIACTIDAE															
Ophiactis carnea Ljungman	+		+	+	+										
Ophiactis crosnieri Cherb. & Glle.	+														
Ophiactis delagoa Balinsky	+														
Ophiactis hemiteles H.L. Clark	+									+					
Ophiactis lymani Ljungman	+														+
Ophiactis modesta Brock	+					+		+	+	+	+	+	+		
Ophiactis macrolepidota Mark.Turn.	+			+	+					+	+				
Ophiactis plana Lyman	+				+										
Ophiactis picteti (de Loriol)	+	+							+		+				
Ophiactis savignyi M. & T.	+	+		+	+	+	+	+	+	+	+	+	+		+
Ophiactis versicolor H.L. Clark	+	+			+										
Ophiosphaera insignis Brock	+	+							+	+		+			
OPHIOTRICHIDAE															
Macrophiothrix demessa (Lyman)	+	+		+	+		+		+	+	+	+	+		
Macrophiothrix hirsuta (M. & T.)	+			+	+			+	+			+			
Macrophiothrix longipeda (Lamarck)	+	+					+	+	+	+	+	+			
Macrophiothrix robillardi (de Loriol)		+							+	+	+	+			
Macrophiothrix nereidina (Lamarck)	+	+						+	+	+	+	+			
Macrophiothrix propinqua Lyman	+	+		+	+		+	+	+	+	+	+			
Ophiocnemis marmorata (Lamarck)	+							+	+	+	+				
Ophiomaza cacaotica Lyman	+			+	+			+	+	+	+	+			
Ophiothela danae Verrill	+	+		+	+	+	+	+	+	+	+	+			
Ophiothela tigris Lyman	+	+													
Ophiothela venusta (de Loriol)	+			+					+	+					
Ophiothrix comata M. & T.	+								+						
Ophiothrix echinotecta Balinsky	+			+											
Ophiothrix exigua Lyman	+						+	+	+	+	+	+			
Ophiothrix foveolata Mark.Turn.	+						+	+	+	+		+			
Ophiothrix picturata de Loriol		+													
Ophiothrix savignyi (M. & T.)	+	+		+	+	+	+					+			
Ophiothrix tricuspida Cherb. & Glle.	+														
Ophiothrix trilineata Lutken	+	+		+	+		+	+	+	+	+	+			
Ophiothrix tristis de Loriol		+													
Ophiothrix vitrea Doderlein		+						+	+		+				
Ophiothrix proteus Koehler	+			+	+			+	+	+	+	+			
Ophiothrix purpurea Martens	+	+		+	+		+	+	+	+	+	+			
OPHIOCOMIDAE															
Ophiarthrum elegans Peters	+	+		+	+			+	+	+	+	+			
Ophiarthrum lymani de Loriol		+													
Ophiocoma brevipes Peters	+	+		+	+		+	+	+	+	+	+	+		
Ophiocoma dentata M. & T.	+	+		+			+	+	+	+	+	+	+		
Ophiocoma doederleini de Loriol	+	+								+		+			
Ophiocoma erinaceus M. & T.	+	+		+	+		+	+	+	+	+	+	+		
Ophiocoma pica M. & T.	+	+		+	+		+	+	+	+	+	+	+		
Ophiocoma pusilla (Brock)	+	+		+	+				+	+	+	+			
Ophiocoma scolopendrina (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		
Ophiocoma valenciae M. & T.	+	+		+	+										
Ophiocomella sexradia (Duncan)	+	+		+	+		+	+	+	+	+	+	+		
Ophiomastix caryophyllata Lutken	+	+							+	+	+	+			
Ophiomastix koehleri Devaney	+	+													
Ophiomastix palaoensis Murakami	+									+		+			
Ophiomastix variablis Koehler	+	+			+		+		+	+	+	+			
Ophiomastix venosa Peters	+	+		+				+	+						

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
Ophiopsila paucispina Koehler	+														
Ophiopsila timida Koehler	+								+						
OPHIONEREIDAE															
Ophionereis australis (H.L. Clark)	+									+					
Ophionereis degeneri (A.H. Clark)	+												+		
Ophionereis dubia (M. & T.)	+	+	+	+	+	+	+	+	+	+	+	+			
Ophionereis hexactis H.L. Clark	+									+					
Ophionereis porrecta Lyman	+	+	+		+		+	+	+	+	+	+	+		
Ophionereis thryptica (Murakami)	+											+			
Ophionereis vivipara Mortensen	+	+													
Ophioneroides granum Cherb. & Glle.	+														
OPHIODERMATIDAE															
Cryptopelta granulifera H.L. Clark		+					+		+	+					
Ophiarachna affinis Lutken	+	+							+	+		+			
Ophiarachna incrassata (Lamarck)	+	+			+			+	+	+	+	+	+		
Ophiarachna robillardi de Loriol		+						+							
Ophiarachnella gorgonia (M. & T.)	+	+		+				+	+	+	+	+			
Ophiarachnella macracantha H.L. Clark		+								+		+			
Ophiarachnella septemspinosa (M. & T.)	+	+					+	+	+	+	+	+			
Ophiochaeta hirsuta Lutken	+	+					+		+			+			
Ophioconis cincta Brock	+	+		+	+				+	+	+	+			
Ophiopeza fallax Peters	+	+		+	+	+			+						
Ophiopeza spinosa (Ljungman)	+	+		+	+		+		+	+	+	+	+		
OPHIURIDAE															
Ophiolepis cincta M. & T.	+	+		+	+		+	+	+	+	+	+			
Ophiolepis irregularis Brock	+								+		+	+			
Ophiolepis superba H.L. Clark	+	+		+	+		+	+	+	+	+	+			
Ophioplocus imbricatus M. & T.	+	+		+		+		+	+	+	+	+	+		
Ophiura kinbergi (Ljungman)	+	+		+	+	+		+	+	+	+	+	+		
ECHINOIDEA															
CIDARIDAE															
Eucidaris metularia (Lamarck)	+	+		+	+		+	+	+	+	+	+	+		
Phyllacanthus imperialis (Lamarck)	+	+			+			+	+	+	+	+			
Prionocidaris baculosa (Lamarck)	+	+		+	+	+	+	+	+	+	+	+			
Prionocidaris pistillaris (Lamarck)	+	+	+	+											
Prionocidaris verticillata (Lamarck)	+	+		+			+	+	+	+	+	+	+		
ECHINOTHURIDAE															
Asthenosoma varium Grube	+			+	+		+	+	+	+	+	+			
DIADEMATIDAE															
Astropyga radiata (Leske)	+	+		+	+		+	+	+	+	+	+	+		
Diadema savignyi Michelin	+	+		+			+	+	+	+	+	+			
Diadema setosum (Leske)	+	+		+	+			+	+	+	+	+			
Echinothrix calamaris (Pallas)	+	+		+	+		+	+	+	+	+	+	+		
Echinothrix diadema (L.)	+	+		+	+		+	+	+	+	+	+	+		
STOMOPNEUSTIDAE															
Stomopneustes variolaris (Lamarck)	+	+		+		+	+	+	+	+	+	+			
TEMNOPLEURIDAE															
Microcyphus maculatus L. Agassiz		+													
Microcyphus rousseaui L. Agassiz	+			+	+					+					
Salmaciella dussumieri L. Agassiz	+	+		+	+			+	+	+	+	+			
Salmacis bicolor L.	+	+		+	+	+	+	+	+		+				
Temnopleurus reevesi (Gray)	+								+		+				
Temnopleurus toreumaticus (Leske)	+			+	+	+	+	+	+	+	+	+			
Temnotrema siamense (Mortensen)	+	+		+			+	+	+	+	+				

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
TOXOPNEUSTIDAE															
Cyrtechinus verruculatus (Lütken)		+							+	+	+	+	+		
Gymnechinus robillardi (de Loriol)	+	+		+				+							
Pseudoboletia indiana (Michelin)	+	+						+	+	+	+	+	+		
Toxopneustes pileolus (Lamarck)	+	+		+	+			+	+	+	+	+			
Tripneustes gratilla (L.)	+	+	+	+	+		+	+	+	+	+	+	+		
PARASALENIIDAE															
Parasalenia gratiosa A. Agassiz	+	+					+		+	+	+	+			
ECHINOMETRIDAE															
Colobocentrotus atratus (L.)	+	+		+				+	+				+		
Echinometra mathaei (de Blainville)	+	+		+	+	+	+	+	+	+	+	+	+		
Echinostrephus molaris (de Blainville)	+	+		+	+	+	+	+	+	+	+	+			
Heterocentrotus mammillatus (L.)	+	+		+	+		+	+	+	+	+	+	+		
Heterocentrotus trigonarius (Lamarck)	+	+		+	+				+		+	+			
ECHINONEIDAE															
Echinoneus abnormalis de Loriol		+							+		+	+	+		
Echinoneus cyclostomus Leske	+	+		+			+	+	+	+	+	+	+		+
CLYPEASTERIDAE															
Clypeaster fervens Koehler	+	+		+	+			+	+		+				
Clypeaster humilis (Leske)	+			+	+	+		+	+	+		+			
Clypeaster rarispinus de Meijere	+			+	+	+	+	+	+						
Clypeaster reticulatus (L.)	+	+		+	+	+	+	+	+	+	+	+	+		
FIBULARIIDAE															
Echinocyamus crispus Mazetti	+	+		+	+		+	+	+	+	+		+		
Echinocyamus grandis H.L. Clark		+													
Fibularia ovulum Lamarck	+	+			+		+	+	+	+	+	+			
Fibularia volva A. Agassiz		+		+	+	+			+	+	+	+			
LAGANIDAE															
Laganum depressum Lesson	+	+		+	+		+	+	+	+	+	+			
Laganum joubini (Koehler)	+	+			+										
ASTRICLYPEIDAE															
Echinodiscus auritus Leske	+	+		+	+	+		+	+	+	+				
Echinodiscus bisperforatus Leske	+			+	+			+	+			+			
ECHINOLAMPADIDAE															
Echinolampas alexandri de Loriol		+		+	+			+	+			+			
Echinolampas ovata (Leske)		+			+			+	+	+					
SPATANGIDAE															
Maretia planulata (Lamarck)	+	+		+	+		+	+	+	+	+	+			
Pseudomaretia alta (A. Agassiz)		+					+	+	+		+				
LOVENIIDAE															
Lovenia elongata (Gray)	+			+	+		+	+	+	+	+	+			
Lovenia subcarinata (Gray)	+							+	+		+				
SCHIZASTERIDAE															
Diploporaster barbatus Mort.	+														
Diploporaster savignyi (Fourtau)	+				+										
Moira stygia Lutken	+				+			+	+						
Paraster gibberulus (L. Agassiz)	+				+			+							
Prymnaster investigatoris Koehler		+						+							
Schizaster lacunosus (L.)	+	+			+		+		+	+	+	+			
BRISSIDAE															
Brissopsis luzonicus (Gray)	+				+	+	+	+	+	+	+	+	+		
Brissus latecarinatus (Leske)	+	+			+		+	+	+	+	+	+	+		
Metalia dicrana H.L. Clark		+							+	+	+	+			
Metalia robillardi (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
Metalia spatagus (L.)	+	+		+	+			+	+	+	+	+	+		
Metalia sternalis (Lamarck)	+	+		+	+			+	+	+	+	+	+		
HOLOTHURIOIDEA															
HOLOTHURIIDAE															
Actinopyga bacilla Cherb.	+														
Actinopyga bannwarthi Panning	+			+	+					+					
Actinopyga echinites (Jaeger)	+	+		+	+		+	+	+	+	+	+			
Actinopyga lecanora (Jaeger)	+	+		+				+	+	+	+	+			
Actinopyga mauritiana (Q. & G.)	+	+		+	+	+	+	+	+	+	+	+	+		
Actinopyga miliaris (Q. & G.)	+	+			+			+	+	+	+	+			
Actinopyga obesa (Selenka)	+								+	+	+	+	+		
Actinopyga serratidens Pearson	+	+			+			+	+	+					
Bohadschia argus Jaeger	+	+					+	+	+	+	+	+			
Bohadschia cousteaui Cherb.	+				+										
Bohadschia koellikeri (Semper)	+	+										+			
Bohadschia marmorata Jaeger	+	+			+			+	+	+	+	+			
Bohadschia mitsionensis Cherb.	+														
Bohadschia similis (Semper)		+							+			+			
Bohadschia subrubra (Q. & G.)	+	+													
Bohadschia temissima (Semper)	+				+		+	+	+		+	+			
Bohadschia vitiensis (Semper)	+							+	+	+	+	+	+		
Holothuria mammosa Cherb.	+														
Holothuria rigida (Selenka)	+	+		+	+		+		+	+	+	+		+	
Holothuria atra (Jaeger)	+	+		+	+		+	+	+	+	+	+	+		
Holothuria edulis Lesson	+			+	+		+	+	+	+	+	+	+		
Holothuria pulla Selenka	+								+			+			
Holothuria duoturricula Cherb.	+														
Holothuria hawaiiensis Fisher	+									+		+	+		
Holothuria pardalis Selenka	+	+		+	+	+	+	+	+	+	+	+	+	+	
Holothuria verrucosa Selenka	+	+							+	+	+	+	+		
Holothuria albofusca Cherb.	+														
Holothuria fuscorubra Théel		+		+						+	+		+		
Holothuria leucospilota (Brandt)	+	+		+	+	+	+	+	+	+	+	+	+	+	
Holothuria albiventer Semper	+				+		+		+	+	+	+			
Holothuria fuligina Cherb.	+														
Holothuria martensi Semper	+			+	+		+	+	+	+	+				
Holothuria scabra Jaeger	+	+		+	+		+	+	+	+	+	+			
Holothuria fuscopunctata Jaeger	+								+	+	+	+			
Holothuria nobilis (Selenka)	+	+		+	+		+	+	+	+	+	+			
Holothuria whitmaei Bell	+									+	+	+	+		
Holothuria crosnieri Cherb.	+														
Holothuria difficilis Semper	+	+			+		+	+	+	+	+	+	+	+	
Holothuria excellens (Ludwig)	+											+			
Holothuria insolita Cherb.	+														
Holothuria samoana Ludwig	+									+		+			
Holothuria bacilla Cherb.	+														
Holothuria erinaceus (Brandt)	+			+				+	+	+		+			
Holothuria moebii Ludwig		+						+	+	+	+	+			
Holothuria parva Krauss in Lampert	+	+		+	+			+							
Holothuria spinea Cherb.	+														
Holothuria vittalonga Cherb.	+														
Holothuria cinerascens (Brandt)	+	+		+	+		+	+	+	+	+	+	+		
Holothuria flavomaculata Semper	+				+			+	+	+	+	+			
Holothuria granosa 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
Holothuria dofleini Augustin	+								+	+	+	+	+		
Holothuria fuscocinerea Jaeger	+	+			+			+	+	+	+	+		+	
Holothuria pervicax Selenka	+	+		+	+		+	+	+	+	+	+	+		
Holothuria olivaceus Ludwig	+				+				+	+	+	+	+		
Holothuria maculosa Pearson	+	+										+			
Holothuria arenicola Semper	+	+		+	+	+	+	+	+	+	+	+	+	+	+
Holothuria comusalba Cherb. & Féral	+								+	+		+	•		
Holothuria gracilis Semper	+								+	+	+	+			
Holothuria hilla Lesson	+	+		+	+		+	+	+	+	+	+	+	+	
Holothuria impatiens (Forskål)	+	+		+	+		+	+	+	+	+	+	+	+	+
Holothuria remollescens Lampert		+			+			+		+					
Holothuria strigosa Selenka	+			+	+										
Labidodemas pertinax (Ludwig)	+						+		+	+	+	+			
Labidodemas rugosum (Ludwig)	+	+		+			+	+	+	+		+			
Labidodemas semperianum (Selenka)	+			+	+			+	+	+	+	+	+		
Pearsonothuria graeffei (Semper)	+				+		+		+	+	+	+			
STICHOPODIDAE															
Neostichopus grammatus (H.L. Clark)	+		+												
Stichopus chloronotus Brandt	+	+		+	+		+	+	+	+	+	+	+		
Stichopus hermanni Semper	+								+	+		+			
Stichopus horrens Selenka	+	+					+	+	+	+	+	+	+		
Stichopus monotuberculatus (Q. & G.)	+	+		+	+				+	+	+	+			
Thelenota ananas (Jaeger)	+	+					+		+	+	+	+			
Thelenota anax H.L. Clark	+								+	+	+	+			
PSOLIDAE															
Psolus appendiculatus de Blainville		+													
CUCUMARIIDAE															
Colochirus quadrangularis (Lesson)	+							+	+	+	+				
Cucumella decaryi Cherb.	+														
Koehleria unica Cherb.	+														
Plesiocolochirus cylindricus (Semper)		+													
Plesiocolochirus dispar (Lampert)	+			+	+					+					
Plesiocolochirus tantulus (Cherb.)	+														
Plesiocolochirus tesselera (Cherb.)	+														
Plesiocolochirus verrucula (Cherb.)	+														
Pseudocnella sinorbis (Cherb.)	+		+												
Pseudocnella sykion (Lampert)	+		+												
Pseudocolochirus violaceus (Theel)	+				+			+	+	+	+				
Psolidium ornatum (Ed. Perrier)	+														
Roweia frauenfeldi (Ludwig)	+		+												
Trachythyone crucifera (Semper)	+	+	+	+	+			+							
SCLERODACTYLIDAE															
Afrococumis africana (Semper)	+	+		+			+	+	+	+	+	+			
Cladolabes acicula (Semper)		+				+		+	+	+	+	+	+		
Cladolabes bifurcatus (Deichmann)	+		+												
Cladolabes pichoni Cherb.	+														
Globosita murrea Cherb.	+														
Ohshimella ehrenbergi (Selenka)	+			+	+	+	+	+			+				
Ohshimella mauritiensis Heding & Panning		+													
PHYLLOPHORIDAE															
Athyone exila Cherb.	+														
Athyone maculispara Cherb.	+														
Parathyone incurva Cherb.	+														
Havelockia ferali 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
Havelockia turripinea Cherb.	+														
Havelockia versicolor (Semper)	+							+	+	+	+				
Hemithyone semperi (Bell)	+					+		+	+	+					
Lipotrapeza ambigua Cherb.	+														
Lipotrapeza incurva Cherb.	+														
Lipotrapeza ventripes (Joshua & Creed)	+														
Neothyonidium dissimilis Cherb.	+														
Phyllophorus anomalia Cherb.	+														
Phyllophorus contractura Cherb.	+														
Phyllophorus brocki Ludwig	+							+	+	+					
Phyllophorus oculus Cherb.	+														
Phyllophorus tenuis Haacke		+													
Selenkiella paradoxa Cherb.	+														
Stolus buccalis (Stimpson)	+			+	+	+		+	+	+	+				
Thyone avenusta Cherb.	+														
Thyone carens Cherb.	+														
Thyone comata Cherb.	+														
Thyone crebrapodia Cherb.	+														
Thyone curvata Lampert	+				+										
Thyone guillei Cherb.	+														
Thyone longicornis Cherb.	+														
Thyone sineturra Cherb.	+														
Thyone vadosa Cherb.	+														
Thyone venusta Selenka	+				+					+		+			
Thyonidiella exigua Cherb.	+														
Thyonidiella oceana Heding & Panning	+	+							+			+			
SYNAPTIDAE															
Anapta gracilis Semper	+							+	+		+	+			
Euapta godeffroyi (Semper)	+	+			+		+		+	+	+	+	+		
Leptosynapta geyserensis Cherb.	+														
Leptosynapta oblonga Cherb.	+														
Leptosynapta tantula Cherb.	+														
Opheodesoma grisea (Semper)	+	+		+	+			+	+	+	+	+	+		
Opheodesoma serpentina (J. Müller)	+								+						
Opheodesoma sinevirga Cherb.	+														
Patinapta crosslandi Heding	+		+		+										
Patinapta ooplax von Marenzeller	+						+		+		+	+			
Patinapta vaughani Cherb.		+													
Polyplectona kefersteini (Selenka)		+			+				+	+	+	+	+	+	
Protankyra picardi Cherb.	+														
Synapta maculata (Chamisso & Eysenhardt)	+	+		+	+		+	+	+	+	+	+			
Synaptula mortenseni Heding	+														
Synaptula reciprocans (Forskal)	+			+	+										
CHIRODOTIDAE															
Chiridota eximia Haacke		+													
Chiridota rigida Semper	+								+	+	+	+			
Chiridota stuhlmanni Lampert	+	+			+		+		+		+	+			
Chiridota violacea J. Müller	+	+					+		+						
Polycheira rufescens (Brandt)	+	+	+					+	+	+	+	+			
Trochodota mira Cherb.	+														
Trochodota vivipara 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-Pacifc 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 endemicity 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 anlaysis 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 off-shore, 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[1]	Arabian Sea[2]	Red Sea[2]	Malay-Indonesia[3]	Northern Australia[3]	China Japan[4]	Pacific islands[5]
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 occurence within broad geographical areas, based on distribution data presented in Table 1, is shown in Tabe 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 Ocena 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 cental 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 capabale 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 & Prashad, 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 developemnt 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 distributiion 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 apopodids (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 dendrochirotids 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-Pacifc. 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 clypeastroids 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.

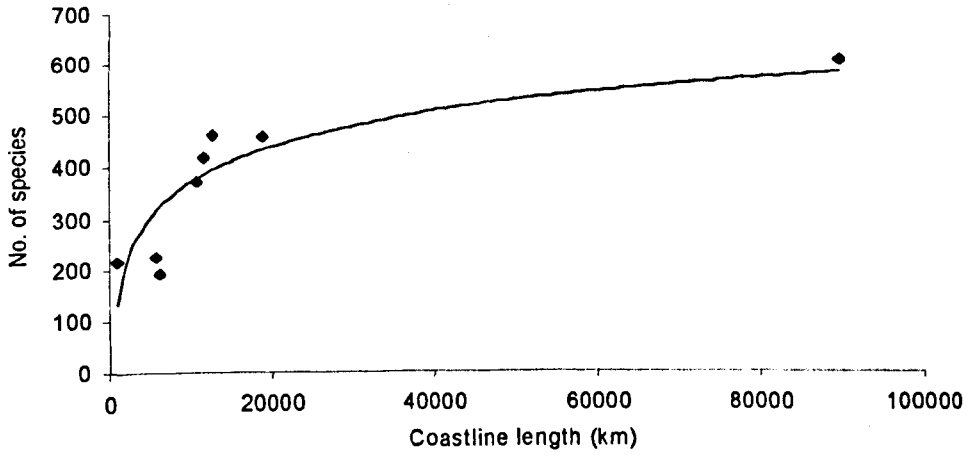
The central Indo-Pacific region is characterised by thousands of islands of varying sizes and geology, a wide continental shelf and a rich diversity of coastal habitats. It was noted earlier that the geographical areas (provinces) defined in the present study differed greatly in size and habitat diversity 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).



Explantions 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 identify 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 occuring 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[1]	1,011	Thalassinidea	20
Porifera	200	Anomura	50
Scyphozoa	30	Brachyura	100
Ctenophora	20	Scaphopoda	10
Hydrozoa	100	Polyplacophora[3]	39
Octocorallia	300	Prosobranchia[3]	2,500
Ceriantharia	20	Opisthobranchia[4]	400
Actiniaria	30	Pulmonata	20
Corallimorpharia	10	Bivalvia[3]	667
Zoanthidea	5	Cephalopoda	20
Scleractinia	200	Echinoidea[5]	62
Antipatharia	10	Holothuroidea[5]	148
Platyhelminthes	100	Asteriodea[5]	58
Echiura	22	Ophiuroidea[5]	132
Sipuncula	50	Crinoidea[5]	19
Polychaeta[2]	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[6]	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.

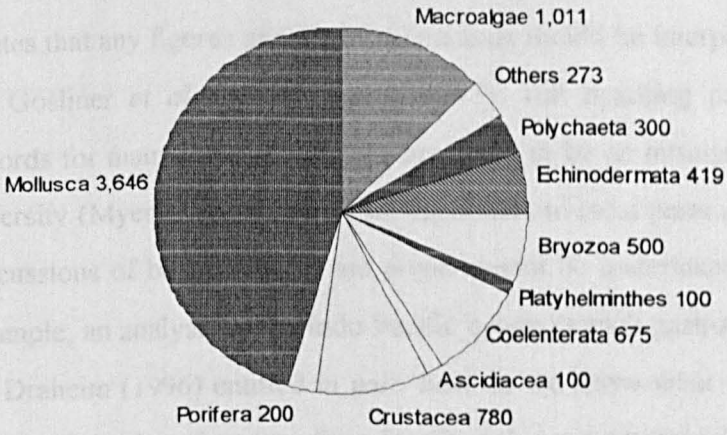


Figure 1. Numbers of species of the major benthic taxa from the western Indian Ocean (figures from Table 1, excluding fish and other neritic groups).

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 Indan 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 % endemicity 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 (Prosbranchia, 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 Pacifc 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 endemicity that 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 paguridcans 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 pontoniine 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 % endemicity of genera and 45 % endemicity among species (Ledoyer, 1982, 1986). The same is true for freshwater decapods where endemicity 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 inverterbrate 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 insufficent 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 distibution.

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 endemicity 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 endemicity. 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 (encompasing 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 be 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.

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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
Aphrogenia sp.												
Iphione cf. *muricata* (Savigny, 1818)												
Harmothoinae sp.												
Sthenelais boa (Johnston, 1839)												
Phyllodoce capensis Day, 1960												
Phyllodoce cf. *castanea* (Marenz., 1879)												
Phyllodoce sp.												
Ancistrosyllis parva Day, 1963												
Pharyngeovalvata natalensis Day, 1951												
Syllis cf. *amica* Quatrefages, 1865												
Syllis bouvieri Gravier, 1900												
Syllis comuta Rathke, 1843												
Syllis cf. *gracilis* Grube, 1840												
Syllis cf. *prolifera* Krohn, 1852												
Ceratonereis erythraensis Fauvel, 1918		13							2			
Ceratonereis mirabilis Kinberg, 1866												
Dendronereis arborifera Peters, 1854												
Namalycastis indica (Southern, 1921)												
Nereis caudata Delle Chiaje, 1841												
Nereis coutieri Gravier, 1899												
Nereis persica Fauvel, 1911												1
Nereis unifasciata Willey, 1905				8								
Perinereis nuntia vallata (Grube, 1857)	3		1			5		1				1
Platynereis isolita Gravier, 1901												
Platynereis pulchella Gravier, 1901												
Platynereis sp.												
Glycera lancadivae Schmarda, 1861												
Eunice antennata (Savigny, 1820)												
Eunice indica Kinberg, 1865												
Lysidice collaris Grube, 1870												
Marphysa bifurcata Kott, 1951												
Marphysa mossambica (Peters, 1854)												
Nematonereis unicornis (Grube, 1840)												
Arabella iricolor iricolor (Montagu, 1804)												
Notocirrus australis Day, 1960												
Oenone sp.												
Lumbrineris latreilli Aud. & M. Ed., 1834												
Diopatra cuprea cuprea (Bosc, 1802)												
Aonides oxycephala (Sars, 1862)												
Malacoceros indicus (Fauvel, 1928)												
Nerinides sp.												
Prionospio cf. *convexa* Imajima, 1990												
Prionospio malmgreni Claparède, 1870												
Prionospio sexoculata Augener, 1918												
Scolelepis squamata (Müller, 1806)								1	24			
Spio sp.												
Magelona sp.												
Poecilochaetus serpens Allen, 1904												
Caulleriella sp.												
Cirratulus sp.												
Cirriformia sp.												
Scoloplos capensis Day, 1961												
Scoloplos cf. *uniramus* Day, 1961												
Orbinidae sp.												
Paraonis sp.												
Armandia intermedia Fauvel, 1902												
Armandia leptocirrus Grube, 1878												
Armandia melanura Gravier, 1905												
Polyophthalmus pictus (Dujardin, 1839)												
Anatomastus sp.												
Capitella cf. *capitata* (Fabricius, 1780)												
Capitellid sp. 1									1			
Dasybranchus caducus (Grube, 1846).												
Heteromastides sp.												
Mediomastus sp.												
Notomastus latericeus Sars, 1851												
Amphicteis gunneri (Sars, 1835)												
Nicolea venustula africana Aug., 1918												
Terebellid sp. 1												
Terebellides stroemi Sars, 1835												
Jasmineira elegans 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
Aphrogenia sp.										
Iphione cf. *muricata* (Savigny, 1818)										
Harmothoinae sp.										
Sthenelais boa (Johnston, 1839)										
Phyllodoce capensis Day, 1960										
Phyllodoce cf. *castanea* (Marenz., 1879)										
Phyllodoce sp.										
Ancistrosyllis parva Day, 1963										
Pharyngeovalvata natalensis Day, 1951										
Syllis cf. *amica* Quatrefages, 1865										
Syllis bouvieri Gravier, 1900										
Syllis cornuta Rathke, 1843										
Syllis cf. *gracilis* Grube, 1840										
Syllis cf. *prolifera* Krohn, 1852										
Ceratonereis erythraensis Fauvel, 1918										
Ceratonereis mirabilis Kinberg, 1866										
Dendronereis arborifera Peters, 1854						1			6	
Namalycastis indica (Southern, 1921)						1				
Nereis caudata Delle Chiaje, 1841										
Nereis coutieri Gravier, 1899										
Nereis persica Fauvel, 1911										
Nereis unifasciata Willey, 1905										
Perinereis nuntia vallata (Grube, 1857)										
Platynereis isolita Gravier, 1901										
Platynereis pulchella Gravier, 1901										
Platynereis sp.										
Glycera lancadivae Schmarda, 1861										
Eunice antennata (Savigny, 1820)										
Eunice indica Kinberg, 1865										
Lysidice collaris Grube, 1870										
Marphysa bifurcata Kott, 1951										
Marphysa mossambica (Peters, 1854)										
Nematonereis unicornis (Grube, 1840)										
Arabella iricolor iricolor (Montagu, 1804)										
Notocirrus australis Day, 1960										
Oenone sp.										
Lumbrineris latreilli Aud. & M. Ed., 1834										
Diopatra cuprea cuprea (Bosc, 1802)										
Aonides oxycephala (Sars, 1862)										
Malacoceros indicus (Fauvel, 1928)										
Nerinides sp.										
Prionospio cf. *convexa* Imajima, 1990										
Prionospio malmgreni Claparède, 1870										
Prionospio sexoculata Augener, 1918										
Scolelepis squamata (Müller, 1806)										
Spio sp.										
Magelona sp.										
Poecilochaetus serpens Allen, 1904										
Caulleriella sp.										
Cirratulus sp.										
Cirriformia sp.										
Scoloplos capensis Day, 1961										
Scoloplos cf. *uniramus* Day, 1961										
Orbinidae sp.										
Paraonis sp.										
Armandia intermedia Fauvel, 1902		1								
Armandia leptocirrus Grube, 1878										
Armandia melanura Gravier, 1905										
Polyophthalmus pictus (Dujardin, 1839)										
Anatomastus sp.					7					
Capitella cf. *capitata* (Fabricius, 1780)										
Capitellid sp. 1										
Dasybranchus caducus (Grube, 1846)										
Heteromastides sp.										
Mediomastus sp.										
Notomastus latericeus Sars, 1851										
Amphicteis gunneri (Sars, 1835)										
Nicolea venustula africana Aug., 1918										
Terebellid sp. 1										
Terebellides stroemi Sars, 1835										
Jasmineira elegans 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: Mbweni; 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
Aphrogenia sp.											
Iphione cf. *muricata* (Savigny, 1818)											
Harmothoinae sp.											
Sthenelais boa (Johnston, 1839)											
Phyllodoce capensis Day, 1960											
Phyllodoce cf. *castanea* (Marenz., 1879)											
Phyllodoce sp.											
Ancistrosyllis parva Day, 1963											
Pharyngeovalvata natalensis Day, 1951											
Syllis cf. *amica* Quatrefages, 1865											
Syllis bouvieri Gravier, 1900											
Syllis cornuta Rathke, 1843											
Syllis cf. *gracilis* Grube, 1840											
Syllis cf. *prolifera* Krohn, 1852											
Ceratonereis erythraensis Fauvel, 1918	1	6	2	22	12		33	16			
Ceratonereis mirabilis Kinberg, 1866											
Dendronereis arborifera Peters, 1854	5	3			2		13	10		1	1
Namalycastis indica (Southern, 1921)											
Nereis caudata Delle Chiaje, 1841											
Nereis coutieri Gravier, 1899											
Nereis persica Fauvel, 1911											
Nereis unifasciata Willey, 1905											
Perinereis nuntia vallata (Grube, 1857)										4	
Platynereis isolita Gravier, 1901	6	2									
Platynereis pulchella Gravier, 1901											
Platynereis sp.											
Glycera lancadivae Schmarda, 1861					1	2					
Eunice antennata (Savigny, 1820)											
Eunice indica Kinberg, 1865											
Lysidice collaris Grube, 1870											
Marphysa bifurcata Kott, 1951											
Marphysa mossambica (Peters, 1854)						1		2		1	
Nematonereis unicornis (Grube, 1840)											
Arabella iricolor iricolor (Montagu, 1804)											
Notocirrus australis Day, 1960				1							
Oenone sp.							1			1	
Lumbrineris latreilli Aud. & M. Ed., 1834											
Diopatra cuprea cuprea (Bosc, 1802)											
Aonides oxycephala (Sars, 1862)		1									
Malacoceros indicus (Fauvel, 1928)										1	3
Nerinides sp.											
Prionospio cf. *convexa* Imajima, 1990											
Prionospio malmgreni Claparède, 1870	1		2								
Prionospio sexoculata Augener, 1918											
Scolelepis squamata (Müller, 1806)											
Spio sp.											
Magelona sp.											
Poecilochaetus serpens Allen, 1904											
Caulleriella sp.											
Cirratulus sp.											
Cirriformia sp.											
Scoloplos capensis Day, 1961											
Scoloplos cf. *uniramus* Day, 1961		2	1								
Orbinidae sp.											
Paraonis sp.											
Armandia intermedia Fauvel, 1902							10			10	
Armandia leptocirrus Grube, 1878											
Armandia melanura Gravier, 1905											4
Polyophthalmus pictus (Dujardin, 1839)											
Anatomastus sp.									15		
Capitella cf. *capitata* (Fabricius, 1780)											
Capitellid sp. 1			1				1				
Dasybranchus caducus (Grube, 1846)							1				
Heteromastides sp.											
Mediomastus sp.											
Notomastus latericeus Sars, 1851											
Amphicteis gunneri (Sars, 1835)											
Nicolea venustula africana Aug., 1918											
Terebellid sp. 1											
Terebellides stroemi Sars, 1835											
Jasmineira elegans 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
Aphrogenia sp.												
Iphione cf. *muricata* (Savigny, 1818)												
Harmothoinae sp.												
Sthenelais boa (Johnston, 1839)												
Phyllodoce capensis Day, 1960												
Phyllodoce cf. *castanea* (Marenz., 1879)												
Phyllodoce sp.										1		1
Ancistrosyllis parva Day, 1963												
Pharyngeovalvata natalensis Day, 1951												
Syllis cf. *amica* Quatrefages, 1865												
Syllis bouvieri Gravier, 1900												
Syllis cornuta Rathke, 1843												
Syllis cf. *gracilis* Grube, 1840												
Syllis cf. *prolifera* Krohn, 1852												
Ceratonereis erythraensis Fauvel, 1918										4		8
Ceratonereis mirabilis Kinberg, 1866												
Dendronereis arborifera Peters, 1854										25		6
Namalycastis indica (Southern, 1921)												
Nereis caudata Delle Chiaje, 1841												
Nereis coutieri Gravier, 1899			1									
Nereis persica Fauvel, 1911												
Nereis unifasciata Willey, 1905												
Perinereis nuntia vallata (Grube, 1857)												
Platynereis isolita Gravier, 1901							1					
Platynereis pulchella Gravier, 1901												
Platynereis sp.												
Glycera lancadivae Schmarda, 1861	1		2						1			1
Eunice antennata (Savigny, 1820)												
Eunice indica Kinberg, 1865												
Lysidice collaris Grube, 1870												
Marphysa bifurcata Kott, 1951												
Marphysa mossambica (Peters, 1854)												
Nematonereis unicornis (Grube, 1840)												
Arabella iricolor iricolor (Montagu, 1804)												
Notocirrus australis Day, 1960												
Oenone sp.												
Lumbrineris latreilli Aud. & M. Ed., 1834										1		
Diopatra cuprea cuprea (Bosc, 1802)												
Aonides oxycephala (Sars, 1862)												
Malacoceros indicus (Fauvel, 1928)												
Nerinides sp.					41	2						
Prionospio cf. *convexa* Imajima, 1990												
Prionospio malmgreni Claparède, 1870												
Prionospio sexoculata Augener, 1918												
Scolelepis squamata (Müller, 1806)				8	3	15						
Spio sp.												
Magelona sp.												
Poecilochaetus serpens Allen, 1904												
Caulleriella sp.												
Cirratulus sp.							1					
Cirriformia sp.							1					
Scoloplos capensis Day, 1961												
Scoloplos cf. *uniramus* Day, 1961												
Orbinidae sp.												
Paraonis sp.												
Armandia intermedia Fauvel, 1902										1		
Armandia leptocirrus Grube, 1878												
Armandia melanura Gravier, 1905										3		
Polyophthalmus pictus (Dujardin, 1839)												
Anatomastus sp.												
Capitella cf. *capitata* (Fabricius, 1780)												
Capitellid sp. 1												
Dasybranchus caducus (Grube, 1846)												
Heteromastides sp.												
Mediomastus sp.												
Notomastus latericeus Sars, 1851												
Amphicteis gunneri (Sars, 1835)												
Nicolea venustula africana Aug., 1918												
Terebellid sp. 1												
Terebellides stroemi Sars, 1835												
Jasmineira elegans 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
Aphrogenia sp.												
Iphione cf. *muricata* (Savigny, 1818)												
Harmothoinae sp.												
Sthenelais boa (Johnston, 1839)												
Phyllodoce capensis Day, 1960								1				
Phyllodoce cf. *castanea* (Marenz., 1879)												
Phyllodoce sp.									3			
Ancistrosyllis parva Day, 1963												
Pharyngeovalvata natalensis Day, 1951	1											
Syllis cf. *amica* Quatrefages, 1865												
Syllis bouvieri Gravier, 1900												
Syllis cornuta Rathke, 1843												
Syllis cf. *gracilis* Grube, 1840												
Syllis cf. *prolifera* Krohn, 1852		1										
Ceratonereis erythraensis Fauvel, 1918												
Ceratonereis mirabilis Kinberg, 1866					1							
Dendronereis arborifera Peters, 1854												
Namalycastis indica (Southern, 1921)												
Nereis caudata Delle Chiaje, 1841												
Nereis coutieri Gravier, 1899	2											
Nereis persica Fauvel, 1911												
Nereis unifasciata Willey, 1905												
Perinereis nuntia vallata (Grube, 1857)												
Platynereis isolita Gravier, 1901												1
Platynereis pulchella Gravier, 1901					1							
Platynereis sp.												
Glycera lancadivae Schmarda, 1861		1		4	1	4		4	2	2	2	
Eunice antennata (Savigny, 1820)												
Eunice indica Kinberg, 1865												
Lysidice collaris Grube, 1870				1								
Marphysa bifurcata Kott, 1951												
Marphysa mossambica (Peters, 1854)												
Nematoneries unicornis (Grube, 1840)												
Arabella iricolor iricolor (Montagu, 1804)												
Notocirrus australis Day, 1960												
Oenone sp.												
Lumbrineris latreilli Aud. & M. Ed., 1834												1
Diopatra cuprea cuprea (Bosc, 1802)												
Aonides oxycephala (Sars, 1862)				4								
Malacoceros indicus (Fauvel, 1928)												
Nerinides sp.				1								
Prionospio cf. *convexa* Imajima, 1990												
Prionospio malmgreni Claparède, 1870				1								
Prionospio sexoculata Augener, 1918												
Scolelepis squamata (Müller, 1806)											1	
Spio sp.												
Magelona sp.												
Poecilochaetus serpens Allen, 1904												
Caulleriella sp.												
Cirratulus sp.			11									
Cirriformia sp.				1								
Scoloplos capensis Day, 1961												
Scoloplos cf. *uniramus* Day, 1961												
Orbinidae sp.	4											
Paraonis sp.												
Armandia intermedia Fauvel, 1902			1									
Armandia leptocirrus Grube, 1878							131	3	2			
Armandia melanura Gravier, 1905												
Polyophthalmus pictus (Dujardin, 1839)			1									
Anatomastus sp.												
Capitella cf. *capitata* (Fabricius, 1780)												
Capitellid sp. 1				1								
Dasybranchus caducus (Grube, 1846)												
Heteromastides sp.												
Mediomastus sp.												
Notomastus latericeus Sars, 1851												
Amphicteis gunneri (Sars, 1835)												
Nicolea venustula africana Aug., 1918								7	7			
Terebellid sp. 1												
Terebellides stroemi Sars, 1835					2							
Jasmineira elegans 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
Aphrogenia sp.												
Iphione cf. *muricata* (Savigny, 1818)												
Harmothoinae sp.												
Sthenelais boa (Johnston, 1839)												
Phyllodoce capensis Day, 1960												
Phyllodoce cf. *castanea* (Marenz., 1879)												
Phyllodoce sp.		1									1	
Ancistrosyllis parva Day, 1963												
Pharyngeovalvata natalensis Day, 1951												
Syllis cf. *amica* Quatrefages, 1865												
Syllis bouvieri Gravier, 1900												
Syllis cornuta Rathke, 1843												
Syllis cf. *gracilis* Grube, 1840												
Syllis cf. *prolifera* Krohn, 1852												
Ceratonereis erythraensis Fauvel, 1918		22	7							1		
Ceratonereis mirabilis Kinberg, 1866							1					
Dendronereis arborifera Peters, 1854											4	
Namalycastis indica (Southern, 1921)												
Nereis caudata Delle Chiaje, 1841										25		
Nereis coutieri Gravier, 1899												
Nereis persica Fauvel, 1911												
Nereis unifasciata Willey, 1905												
Perinereis nuntia vallata (Grube, 1857)												
Platynereis isolita Gravier, 1901												
Platynereis pulchella Gravier, 1901												
Platynereis sp.					1							
Glycera lancedivae Schmarda, 1861	1		1	3	3							
Eunice antennata (Savigny, 1820)												
Eunice indica Kinberg, 1865												1
Lysidice collaris Grube, 1870												
Marphysa bifurcata Kott, 1951												
Marphysa mossambica (Peters, 1854)										3	1	3
Nematoneries unicornis (Grube, 1840)												
Arabella iricolor iricolor (Montagu, 1804)												
Notocirrus australis Day, 1960	1		1									
Oenone sp.												
Lumbrineris latreilli Aud. & M. Ed., 1834												
Diopatra cuprea cuprea (Bosc, 1802)	1	1								7	4	5
Aonides oxycephala (Sars, 1862)		1										
Malacoceros indicus (Fauvel, 1928)												
Nerinides sp.												
Prionospio cf. *convexa* Imajima, 1990												
Prionospio malmgreni Claparède, 1870												
Prionospio sexoculata Augener, 1918												
Scolelepis squamata (Müller, 1806)												
Spio sp.		1										
Magelona sp.												
Poecilochaetus serpens Allen, 1904						1						
Caulleriella sp.		1	3									
Cirratulus sp.												
Cirriformia sp.												
Scoloplos capensis Day, 1961												
Scoloplos cf. *uniramus* Day, 1961												
Orbinidae sp.												
Paraonis sp.			1									
Armandia intermedia Fauvel, 1902												
Armandia leptocirrus Grube, 1878												
Armandia melanura Gravier, 1905												
Polyophthalmus pictus (Dujardin, 1839)												
Anatomastus sp.												
Capitella cf. *capitata* (Fabricius, 1780)											1	4
Capitellid sp. 1	2		2							1	1	
Dasybranchus caducus (Grube, 1846)					1							
Heteromastides sp.					1							
Mediomastus sp.												
Notomastus latericeus Sars, 1851												
Amphicteis gunneri (Sars, 1835)												
Nicolea venustula africana Aug., 1918												
Terebellid sp. 1												
Terebellides stroemi Sars, 1835												
Jasmineira elegans 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: Mbweni; 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
Aphrogenia sp.					1				1	1		
Iphione cf. *muricata* (Savigny, 1818)										1		
Harmothoinae sp.												
Sthenelais boa (Johnston, 1839)					1							
Phyllodoce capensis Day, 1960												
Phyllodoce cf. *castanea* (Marenz., 1879)												
Phyllodoce sp.												
Ancistrosyllis parva Day, 1963					1				1			
Pharyngeovalvata natalensis Day, 1951												
Syllis cf. *amica* Quatrefages, 1865	1											
Syllis bouvieri Gravier, 1900				1								
Syllis cornuta Rathke, 1843				1	1							
Syllis cf. *gracilis* Grube, 1840	1											
Syllis cf. *prolifera* Krohn, 1852											1	
Ceratonereis erythraensis Fauvel, 1918											3	
Ceratonereis mirabilis Kinberg, 1866											1	
Dendronereis arborifera Peters, 1854					1							
Namalycastis indica (Southern, 1921)												
Nereis caudata Delle Chiaje, 1841												
Nereis coutieri Gravier, 1899												
Nereis persica Fauvel, 1911												
Nereis unifasciata Willey, 1905												
Perinereis nuntia vallata (Grube, 1857)												
Platynereis isolita Gravier, 1901											1	
Platynereis pulchella Gravier, 1901												
Platynereis sp.												
Glycera lancadivae Schmarda, 1861	1					1						1
Eunice antennata (Savigny, 1820)											1	2
Eunice indica Kinberg, 1865												
Lysidice collaris Grube, 1870												
Marphysa bifurcata Kott, 1951												
Marphysa mossambica (Peters, 1854)												
Nematoneries unicornis (Grube, 1840)												
Arabella iricolor iricolor (Montagu, 1804)												
Notocirrus australis Day, 1960												
Oenone sp.												
Lumbrineris latreilli Aud. & M. Ed., 1834												
Diopatra cuprea cuprea (Bosc, 1802)												
Aonides oxycephala (Sars, 1862)												
Malacoceros indicus (Fauvel, 1928)												
Nerinides sp.									1			
Prionospio cf. *convexa* Imajima, 1990					3							
Prionospio malmgreni Claparède, 1870												
Prionospio sexoculata Augener, 1918									1			
Scolelepis squamata (Müller, 1806)									2			
Spio sp.												
Magelona sp.					1							
Poecilochaetus serpens Allen, 1904												
Caulleriella sp.												
Cirratulus sp.												
Cirriformia sp.										1		
Scoloplos capensis Day, 1961												
Scoloplos cf. *uniramus* Day, 1961					1							
Orbinidae sp.												
Paraonis sp.												
Armandia intermedia Fauvel, 1902												
Armandia leptocirrus Grube, 1878												
Armandia melanura Gravier, 1905												
Polyophthalmus pictus (Dujardin, 1839)												
Anatomastus sp.												
Capitella cf. *capitata* (Fabricius, 1780)												
Capitellid sp. 1												
Dasybranchus caducus (Grube, 1846)												
Heteromastides sp.												
Mediomastus sp.									7			
Notomastus latericeus Sars, 1851												
Amphicteis gunneri (Sars, 1835)					1							
Nicolea venustula africana Aug., 1918												
Terebellid sp. 1					2							
Terebellides stroemi Sars, 1835												
Jasmineira elegans 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: Mbweni; 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
Aphrogenia sp.									
Iphione cf. *muricata* (Savigny, 1818)									
Harmothoinae sp.									
Sthenelais boa (Johnston, 1839)									
Phyllodoce capensis Day, 1960									
Phyllodoce cf. *castanea* (Marenz., 1879)			2						
Phyllodoce sp.			1						
Ancistrosyllis parva Day, 1963									
Pharyngeovalvata natalensis Day, 1951									
Syllis cf. *amica* Quatrefages, 1865									
Syllis bouvieri Gravier, 1900									
Syllis comuta Rathke, 1843									
Syllis cf. *gracilis* Grube, 1840									
Syllis cf. *prolifera* Krohn, 1852									
Ceratonereis erythraensis Fauvel, 1918									
Ceratonereis mirabilis Kinberg, 1866									
Dendronereis arborifera Peters, 1854									
Namalycastis indica (Southern, 1921)									
Nereis caudata Delle Chiaje, 1841									
Nereis coutieri Gravier, 1899									
Nereis persica Fauvel, 1911									
Nereis unifasciata Willey, 1905									
Perinereis nuntia vallata (Grube, 1857)									
Platynereis isolita Gravier, 1901									
Platynereis pulchella Gravier, 1901									
Platynereis sp.									1
Glycera lancadivae Schmarda, 1861				2					
Eunice antennata (Savigny, 1820)		1							
Eunice indica Kinberg, 1865									
Lysidice collaris Grube, 1870									
Marphysa bifurcata Kott, 1951									
Marphysa mossambica (Peters, 1854)									
Nematonereis unicornis (Grube, 1840)									
Arabella iricolor iricolor (Montagu, 1804)									
Notocirrus australis Day, 1960									
Oenone sp.									
Lumbrineris latreilli Aud. & M. Ed., 1834									
Diopatra cuprea cuprea (Bosc, 1802)									
Aonides oxycephala (Sars, 1862)									
Malacoceros indicus (Fauvel, 1928)									
Nerinides sp.									
Prionospio cf. *convexa* Imajima, 1990									
Prionospio malmgreni Claparède, 1870									
Prionospio sexoculata Augener, 1918									
Scolelepis squamata (Müller, 1806)									
Spio sp.									
Magelona sp.									
Poecilochaetus serpens Allen, 1904									
Caulleriella sp.			1						
Cirratulus sp.			2						
Cirriformia sp.									
Scoloplos capensis Day, 1961									
Scoloplos cf. *uniramus* Day, 1961									
Orbinidae sp.									
Paraonis sp.									
Armandia intermedia Fauvel, 1902									
Armandia leptocirrus Grube, 1878				2					3
Armandia melanura Gravier, 1905									
Polyophthalmus pictus (Dujardin, 1839)									1
Anatomastus sp.									
Capitella cf. *capitata* (Fabricius, 1780)									
Capitellid sp. 1									
Dasybranchus caducus (Grube, 1846)									
Heteromastides sp.									
Mediomastus sp.									
Notomastus latericeus Sars, 1851									
Amphicteis gunneri (Sars, 1835)									
Nicolea venustula africana Aug., 1918									
Terebellid sp. 1									
Terebellides stroemi Sars, 1835									
Jasmineira elegans 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	MZ	MZ	MZ	MZ	MZ	MZ	HB	HB	HB
STATION	S5	S5	S5	S5	S5	S5	S4	S4	S4
REPLICA	T2C1	T2C2	T2C3	T3C1	T3C2	T3C3	C1	C2	C3
Aphrogenia sp.	2	2							
Iphione cf. *muricata* (Savigny, 1818)									
Harmothoinae sp.	1								
Sthenelais boa (Johnston, 1839)				1	1	1			
Phyllodoce capensis Day, 1960									
Phyllodoce cf. *castanea* (Marenz., 1879)									
Phyllodoce sp.									
Ancistrosyllis parva Day, 1963									
Pharyngeovalvata natalensis Day, 1951									
Syllis cf. *amica* Quatrefages, 1865									
Syllis bouvieri Gravier, 1900				4					
Syllis cornuta Rathke, 1843	4	1		1					
Syllis cf. *gracilis* Grube, 1840									
Syllis cf. *prolifera* Krohn, 1852									
Ceratonereis erythraensis Fauvel, 1918									
Ceratonereis mirabilis Kinberg, 1866	1								
Dendronereis arborifera Peters, 1854									
Namalycastis indica (Southern, 1921)									
Nereis caudata Delle Chiaje, 1841									
Nereis coutieri Gravier, 1899									
Nereis persica Fauvel, 1911									
Nereis unifasciata Willey, 1905									
Pennereis nuntia vallata (Grube, 1857)									
Platynereis isolita Gravier, 1901	1								
Platynereis pulchella Gravier, 1901		1	1						
Platynereis sp.		1		1					
Glycera lancadivae Schmarda, 1861	4					1			
Eunice antennata (Savigny, 1820)									
Eunice indica Kinberg, 1865						1			
Lysidice collaris Grube, 1870									
Marphysa bifurcata Kott, 1951			1						
Marphysa mossambica (Peters, 1854)									
Nematonereis unicornis (Grube, 1840)	3				1				
Arabella incolor incolor (Montagu, 1804)	1			4	5	3			
Notocirrus australis Day, 1960									
Oenone sp.									
Lumbrineris latreilli Aud. & M. Ed., 1834		2		1	1	1			
Diopatra cuprea cuprea (Bosc, 1802)								1	3
Aonides oxycephala (Sars, 1862)									
Malacoceros indicus (Fauvel, 1928)									
Nerinides sp.									
Prionospio cf. *convexa* Imajima, 1990	1			1					
Prionospio malmgreni Claparède, 1870									
Prionospio sexoculata Augener, 1918				1					
Scoletepis squamata (Müller, 1806)					1				
Spio sp.									
Magelona sp.									
Poecilochaetus serpens Allen, 1904									
Caulleriella sp.									
Cirratulus sp.									
Cirriformia sp.									
Scoloplos capensis Day, 1961								1	
Scoloplos cf. *uniramus* Day, 1961									
Orbiniidae sp.									
Paraonis sp.									
Armandia intermedia Fauvel, 1902	1			4		1			1
Armandia leptocirrus Grube, 1878	1				2				
Armandia melanura Gravier, 1905					1				
Polyophthalmus pictus (Dujardin, 1839)									
Anatomastus sp.									
Capitella cf. *capitata* (Fabricius, 1780)									
Capitellid sp. 1		1				3			
Dasybranchus caducus (Grube, 1846)	2				1				
Heteromastides sp.									
Mediomastus sp.									
Notomastus latericeus Sars, 1851				2					
Amphicteis gunneri (Sars, 1835)	1								
Nicolea venustula africana Aug., 1918									
Terebellid sp. 1									
Terebellides stroemi Sars, 1835	6	5		5		2			
Jasmineira elegans 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 Afruca	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
Class CRINOIDEA															
COMASTERIDAE															
Capillaster multiradiatus (L.)	1	1	..	..	1	?	1	1	1	1	1	1	1	..	..
Comanthus wahlbergi (J.Müller)	5	*19*	9	40	1	..	34	..	..	9	9	9	..	..	..
Comaster distinctus (P.H. Carpenter)	2	..	..	..	48	..	..	..	1	10	1	1	..	..	..
Comaster multifidus (J. Muller)	..	19	..	..	..	..	34	..	1	1	39	1	..	..	..
HIMEROMETRIDAE															
Heterometra africana (A.H. Clark)	1	..	..	1	..	1	..	..	..	..	..	..	..	..	..
Heterometra delagoae Gislen	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Heterometra gravieri A.H. Clark	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Heterometra joubini (A.H. Clark)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Heterometra madagascarensis (A.H. Clark)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
MARIAMETRIDAE															
Dichrometra flagellata (J. Muller)	1	..	*16*	..	..	..	..	..	1	10	1	1	..	..	..
Lamprometra klunzingeri (Hartlaub)	1	7	..	1	1	..	..	..	..	..	..	..	..	..	..
Stephanometra indica (Smith)	1	1	..	..	1	1	1	1	1	1	1	1	..	..	..
COLOBOMETRIDAE															
Cenometra emendatrix (Bell)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Decametra modica A.H. Clark	1	1	..	..	..	..	?	?	..	..	..	..	..	..	..
Oligometra serripinna (P.H. Carpenter)	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
TROPIOMETRIDAE															
Tropiometra carinata (Lamarck)	1	1	16	1	1	..	..	34	34	..	..	..	..	..	..
ANTEDONIDAE															
Antedon arabica A.H. Clark & A.M. Clark	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Dorometra mauritiana A.H. Clark	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..
Iridometra malagasiensis Marshall & Rowe	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Class ASTEROIDEA															
LUIDIIDAE															
Luidia hardwicki (Gray)	..	1	..	1	..	..	..	1	1	1	1	..	..	..	..
Luidia maculata Muller & Troschel	1	1	16	1	1	..	1	1	1	1	1	37	..	..	..
Luidia mauritiensis Koehler	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Luidia savignyi (Auduoin)	1	1	..	..	1	..	..	1	1	..	..	1	..	..	..
ASTROPECTINIDAE															
Astropecten antares Doderlein	1	..	16	..	..	..	..	..	..	..	..	..	..	..	..
Astropecten granulatus Muller & Troschel	1	..	16	..	..	..	..	..	1	1	..	..	..	..	..
Astropecten hemprichi Muller & Troschel	1	1	..	1	1	..	..	?	?	..	..	..	..	..	..
Astropecten mauritianus Gray	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Astropecten monacanthus Sladen	1	..	..	1	1	..	1	1	1	1	1	..	..	..	..
Astropecten polyacanthus Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
ARCHASTERIDAE															
Archaster angulatus Muller & Troschel	1	..	16	..	..	..	..	..	1	1	1	1	..	..	..
Archaster lorioli Sukarno & Jangoux	..	49	..	..	..	..	49	..	..	..	..	..	..	..	..
GONIASTERIDAE															
Stellaster childreni Gray	*1*	..	..	*1*	*1*	..	..	*1*	*1*	*1*	*1*	..	..	..	..
Stellasteropsis colubrinus Macan	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..
ASTERODISCIDIDAE															
Asterodiscides belli Rowe	51	51	..	..	..	51	..	51	..	..	..	..	..	..	..
Asterodiscides tessellatus Rowe	..	50	..	..	..	..	..	..	..	..	..	..	..	..	..
OREASTERIDAE															
Choriaster granulatus Lutken	6	11	..	..	1	..	52	..	1	10	1	1	..	..	..
Culcita schmideliana (Retzius)	1	1	..	1	..	..	1	1	..	..	..	..	..	..	..
Halityle regularis Fisher	17	..	..	17	..	..	..	..	1	17	..	37	..	..	..
Monachaster sanderi Meissner	1	..	..	40	40	..	..	..	..	..	..	..	..	..	..
Pentaceraster horridus (Gray)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Pentaceraster mammillatus (Auduoin)	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
Pentaceraster tuberculatus (M. & Troschel)	1	..	..	1	1	..	..	..	..	..	..	..	..	..	..
Protoreaster lincki (de Blainville)	1	1	..	1	..	..	..	1	1	10	..	..	..	..	..
Protoreaster nodosus (L.)	1	1	..	..	..	..	..	1	1	1	1	1	..	..	..
OPHIDIASTERIDAE															
Andora faouzii (Macan)	..	19	..	1	..	6	52	..	..	..	..	..	..	..	..
Cistina columbiae Gray	..	1	..	..	..	..	6	..	..	10	..	6	..	..	..
Dactylosaster cylindricus (Lamarck)	1	1	..	1	..	..	1	1	1	10	39	1	1	..	..
Ferdina flavescens Gray	..	1	..	..	..	..	52	..	..	..	..	..	..	..	..
Fromia milleporella (Lamarck)	1	1	..	40	?	..	1	1	1	1	1	1	..	..	..
Fromia monilis Perrier	12	..	..	..	6	..	53	1	1	10	1	1	..	..	..
Fromia nodosa A.M. Clark	..	1	..	..	..	..	1	1	..	..	..	45	..	..	..
Gomophia egyptiaca Gray	1	1	..	..	1	..	52	1	1	1	1	1	..	..	..
Leiaster coriaceus Peters	1	1	..	..	15	..	..	..	1	10	..	1	..	6	..
Leiaster glaber Peters	1	..	..	..	..	..	..	1	..	..	..	..	1	..	..
Leiaster leachi (Gray)	..	1	..	48	1	..	1	..	1	1	1	1	1	..	..
Linckia guildingi Gray	1	1	..	1	?	..	1	1	1	1	1	1	1	37	37
Linckia laevigata (L.)	1	1	..	..	..	..	1	1	1	1	1	1	..	..	..
Linckia multifora (Lamarck)	1	1	..	1	1	1	1	1	1	10	1	1	1	..	..
Nardoa frianti Koehler	..	19	..	..	..	..	52	1	1	1	1	1	..	..	..
Nardoa variolata (Retzius)	1	1	..	40	..	..	..	..	..	..	..	..	..	..	..
Neoferdina offreti Muller & Troschel	11	7	..	..	..	..	52	1	46	..	46	46	..	..	..
Ophidiaster duncani de Loriol	1	1	..	..	..	..	..	..	..	10	..	..	..	..	..
Ophidiaster hemprichi Muller & Troschel	1	1	..	..	1	..	1	..	1	1	1	1	..	..	..
Ophidiaster perrieri de Loriol	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophidiaster cribrarius Lutken	..	/	..	..	..	..	..	..	..	10	?	46	..	..	..
Tamaria lithosora H.L. Clark	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Tamaria marmorata (Michelin)	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
ASTEROPSEIDAE															
Asteropsis carinifera (Lamarck)	1	1	..	1	1	..	52	1	1	1	1	1	1	..	..
Valvaster striatus (Lamarck)	..	1	..	..	..	..	..	1	1	10	..	1	1	..	..
ASTERINIDAE															
Asterina burtoni Gray	6	6	..	6	6	..	..	..	..	..	..	..	..	..	..
ACANTHASTERIDAE															
Acanthaster planci (L.)	1	1	..	1	1	1	1	1	1	1	1	1	1	..	..
PTERASTERIDAE															
Euretaster cribrosus (v. Martens)	1	1	..	48	1	..	..	1	1	..	..	..	..	..	..
MITHRODIIDAE															
Mithrodia clavigera (Lamarck)	1	1	..	..	1	..	1	..	1	10	1	37	..	13	13
Thromidia seychellesensis Pope & Rowe	..	13	..	..	..	..	..	..	..	..	..	..	..	..	..
ECHINASTERIDAE															
Echinaster callosus v. Marenzeller	1	1	..	..	1	..	..	1	1	10	1	1	..	..	..
Echinaster purpureus (Gray)	1	1	..	48	1	..	..	1	..	..	..	..	..	..	..
ASTERIIDAE															
Stolasterias calamaria (Gray)	1	1	16	..	..	..	..	..	..	10	1	1	..	..	..
Class OPHIUROIDEA															
OPHIOMYXIDAE															
Ophiomyxa australis Lutken	1	1	..	48	15	..	..	1	1	1	1	1	..	..	..
EURYALIDAE															
Euryale aspera Lamarck	4	..	..	..	..	..	..	1	1	1	1	37	..	..	..
GORGONOCEPHALIDAE															
Astroboa clavata (Lyman)	1	1	..	1	1	..	1	1	..	1	4	..	..	..	..
Astroboa nuda (Lyman)	1	..	..	1	1	..	..	..	1	10	1	37	..	..	..
Astrocladus exiguus (Lamarck)	4	..	..	..	..	..	..	1	1	10	4	..	..	..	..
Astroboa granulatus H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	37	..	..	..
Astrocladus tonganus Doderlein	4	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Astroglymma sculptum (Doderlein)	..	37	..	..	..	..	..	..	10	10	39	37	..	..	..
OPHIACANTHIDAE															
Ophiacantha gracilis (Studer)	4	..	..	..	..	..	..	..	1	1	..	..	..	..	..
AMPHIURIDAE															
Amphilycus scripta (Koehler)	1	..	..	1	1	..	..	1	..	..	39	..	..	..	..

Table 1 (continued)

Taxa	East Afruca	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
Amphiodia (Amphiodia) dividua (Mortensen)	4	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiodia (Amphiodia) picardi Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiodia (Amphispina) microplax Burfield	4	..	..	48	1	..	..	..	..	10	39	..	..	..	..
Amphioplus (Amphichilus) impressus (Ljung.)	4	7	..	..	..	..	..	..	1	10	39	..	..	..	..
A. (Amphioplus) cyrtacanthus H.L.Clark	4	..	..	..	..	..	..	..	1	..	39	..	..	..	..
A. (Amphioplus) heptagonus Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) longuscutum Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) lucidus Koehler	4	..	..	..	..	..	..	..	1	1	39	..	..	..	..
A. (Amphioplus) margueritae Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) parvitus Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) polymorphus Chr.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) spinosus Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) thomassini Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Amphioplus) titubantius Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
A. (Lymanella) hastatus (Ljungman)	1	7	..	1	1	..	..	..	..	10	..	..	..	..	..
A. (Lymanella) integer (Ljungman)	1	7	16	..	1	..	..	..	..	..	..	..	..	..	..
A. (Lymanella) laevis (Lyman)	4	..	..	1	1	..	..	..	1	10	1	1	..	..	..
A. (Lymanella) furcatus Mortensen	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphipholis littoralis Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphipholis loripes Koehler	4	..	..	..	..	..	..	..	4	..	39	..	..	..	..
Amphipholis serrataspina Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphipholis sigillata Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphipholis squamata (D.Chiaje)	1	1	16	1	1	1	..	..	1	1	39	1	1	..	4
Amphiura acrisia H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	..	..	..	..
Amphiura capensis Ljungman	16	..	16	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura candida Ljungman	16	7	..	..	..	..	..	..	..	..	4	..	..	..	..
Amphiura clausadae Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura corona Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura crispa Mortensen	4	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Amphiura dejectoides H.L. Clark	1	7	..	..	1	..	..	..	24	..	..	..	..	..	..
Amphiura duncani Lyman	5	..	..	..	..	..	..	1	1	10	1	1	..	..	..
Amphiura leptotata H.L. Clark	4	..	..	..	..	..	..	..	1	10	..	1	..	..	..
Amphiura madecassae Cherbonnier & Guille	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura micra H.L. Clark	4	..	..	..	..	..	..	..	24	1	..	..	..	..	..
Amphiura plantei Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura sexradiata Koehler	4	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Amphiura (Fellaria) africana (Balinsky)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Amphiura (Fellaria) octacantha (H.L. Clark)	4	..	..	..	..	..	..	..	..	1	1	..	..	..	..
Amphiura (Ophiopeltis) tenuis (H.L. Clark)	4	..	..	48	..	1	..	..	..	1	39	..	..	..	..
Ophiocentrus asper (Koehler)	4	..	..	..	..	..	..	..	1	10	..	37	..	..	..
Ophiocentrus crassuspinosus Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiocentrus dilatatus (Koehler)	1	..	..	..	..	..	1	..	1	1	..	37	..	..	..
Ophiocentrus inequalis (H.L. Clark)	4	..	..	..	..	..	..	..	1	10	1	..	..	..	..
Ophiocentrus spinacutus Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Paracrocnida sacensis (Balinsky)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
OPHIACTIDAE															
Ophiactis carnea Ljungman	1	..	16	1	15	..	..	..	..	..	..	..	..	..	..
Ophiactis crosnieri Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiactis delagoa Balinsky	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiactis hemiteles H.L. Clark	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..
Ophiactis lymani Ljungman	4	..	..	..	..	..	..	..	..	..	..	..	..	..	4
Ophiactis modesta Brock	16	..	..	..	..	1	..	24	1	1	1	1	1	..	..
Ophiactis macrolepidota Marktann.-Turneret.	*1*	..	..	*1*	*1*	..	..	..	..	10	39	..	..	..	..
Ophiactis plana Lyman	16	..	..	48	..	..	..	..	..	..	..	..	..	..	..
Ophiactis picteti (de Loriol)	5	7	..	..	..	..	..	..	1	..	39	..	..	..	..
Ophiactis savignyi Muller & Troschel	1	1	..	1	1	1	1	1	1	1	1	1	1	..	4
Ophiactis versicolor H.L. Clark	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..
Ophiosphaera insignis Brock	1	19	..	..	..	..	..	..	1	10	..	37	..	..	..

Table 1 (continued)

Taxa	East Afruca	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
OPHIOTRICHIDAE															
Macrophiothrix demessa (Lyman)	1	1	..	1	1	..	1	..	1	1	43	1	1	..	..
M. hirsuta (Muller & Troschel)	1	..	..	1	1	..	..	22	1	..	..	1	..	..	..
M. longipeda (Lamarck)	1	1	..	..	..	..	1	1	1	1	1	1	..	..	..
M. robillardi (de Loriol)	..	1	..	..	..	..	..	..	43	10	43	43	..	..	..
M. (Keystonea) nereidina (Lamarck)	1	1	..	..	..	..	..	1	1	1	1	1	..	..	..
M. (Keystonea) propinqua Lyman	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
Ophiocnemis marmorata (Lamarck)	1	..	..	..	..	..	..	1	1	1	1	..	..	..	..
Ophiomaza cacaotica Lyman	1	..	..	1	1	..	..	1	1	1	1	1	..	..	..
Ophiothela danae Verrill	16	1	..	1	1	1	1	1	1	10	1	1	..	..	..
Ophiothela tigris Lyman	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiothela venusta (de Loriol)	1	..	..	1	..	..	..	..	1	10	..	..	..	..	..
Ophiothrix comata Muller & Troschel	4	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Ophiothrix echinotecta Balinsky	1	..	..	40	..	..	..	..	..	..	..	..	..	..	..
Ophiothrix exigua Lyman	4	..	..	..	..	..	1	1	1	1	1	1	..	..	..
Ophiothrix foveolata Mark.- Turneretscher	1	..	..	..	..	..	1	1	1	10	..	23	..	..	..
Ophiothrix picturata de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiothrix savignyi (Muller & Troschel)	1	4	..	1	1	1	22	..	..	..	..	37	..	..	..
Ophiothrix tricuspida Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiothrix trilineata Lutken	1	1	..	40	4	..	1	1	1	1	1	1	..	..	..
Ophiothrix tristis de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiothrix vitrea Doderlein	..	1	..	..	..	..	..	1	1	..	1	..	..	..	..
Ophiothrix (Acanthophio.) proteus Koehler	4	..	..	1	1	..	..	1	1	10	1	1	..	..	..
Ophiothrix (Acanthophio.) purpurea Martens	1	1	..	1	1	..	1	1	1	10	1	1	..	..	..
OPHIOCOMIDAE															
Ophiarthrum elegans Peters	1	1	..	4	4	..	..	1	1	1	1	1	..	..	..
Ophiarthrum lymani de Loriol	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiocoma brevipes Peters	1	1	..	30	4	..	1	1	1	1	1	1	1	..	..
Ophiocoma dentata Muller & Troschel	1	1	..	30	..	..	1	20	24	1	1	1	1	..	..
Ophiocoma doederleini de Loriol	5	7	..	..	..	..	..	..	..	10	..	10	..	..	..
Ophiocoma erinaceus Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
Ophiocoma pica Muller & Troschel	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
Ophiocoma pusilla (Brock)	16	1	..	48	1	..	..	..	1	10	39	37	..	..	..
Ophiocoma scolopendrina (Lamarck)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
Ophiocoma valenciae Muller & Troschel	1	1	..	1	1	..	?	?	..	..	..	..	..	..	..
Ophiocomella sexradia (Duncan)	1	1	..	48	1	..	1	1	1	1	1	1	1	..	..
Ophiomastix caryophyllata Lutken	1	1	..	..	..	..	..	..	1	1	1	1	..	..	..
Ophiomastix koehleri Devaney	5	7	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiomastix palaoensis Murakami	4	..	..	..	..	..	..	..	..	10	..	1	..	..	..
Ophiomastix variablis Koehler	1	1	..	..	1	..	1	..	1	1	1	1	..	..	..
Ophiomastix venosa Peters	1	1	..	40	..	..	..	1	1	..	..	..	..	..	..
Ophiopsila paucispina Koehler	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophiopsila timida Koehler	4	..	..	..	..	..	..	..	4	..	..	..	..	..	..
OPHIONEREIDAE															
Ophionereis australis (H.L. Clark)	16	..	..	..	..	..	..	..	..	10	..	..	..	..	..
Ophionereis degeneri (A.H. Clark)	4	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Ophionereis dubia (Muller & Troschel)	1	1	16	1	1	1	1	1	1	1	1	37	..	..	..
Ophionereis hexactis H.L. Clark	4	..	..	..	..	..	..	..	..	1	..	..	..	..	..
Ophionereis porrecta Lyman	1	1	16	..	1	..	1	1	1	1	1	1	1	..	..
Ophionereis thryptica (Murakami)	4	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Ophionereis vivipara Mortensen	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Ophioneroides granum Chr. & Glle.	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
OPHIODERMATIDAE															
Cryptopelta granulifera H.L. Clark	..	1	..	..	..	..	24	..	24	1	..	..	..	..	..
Ophiarachna affinis Lutken	1	1	..	..	..	..	..	..	1	10	..	1	..	..	..
Ophiarachna incrassata (Lamarck)	1	1	..	..	15	..	..	1	1	1	1	1	50	..	..
Ophiarachna robillardi de Loriol	..	1	..	..	..	..	..	24	..	..	..	..	..	..	..
Ophiarachnella gorgonia (M. & Troschel)	1	1	..	30	..	..	..	1	1	1	1	1	..	..	..
O. macracantha H.L. Clark	..	7	..	..	..	..	..	..	..	10	..	1	..	..	..
O. septemspinosa (Muller & Troschel)	1	1	..	..	..	..	1	1	1	1	1	37	..	..	..

Table 1 (continued)

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

Table 1 (continued)

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

Table 1 (continued)

Taxa	East Afruca	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
H. (Lessonothuria) pardalis Selenka	1	1	..	1	1	1	1	1	1	1	1	1	1	51	..
H. (Lessonothuria) verrucosa Selenka	1	1	..	..	..	..	..	..	1	1	39	37	1	..	..
H. (Mertensiothuria) albofusca Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Mertensiothuria) fuscorubra Théel	..	8	..	8	..	..	..	..	..	10	10	..	10		
H. (Mertensiothuria) leucospilota (Brandt)	1	1	..	1	1	1	1	1	1	1	21	1	1	51	..
H. (Metriatyla) albiventer Semper	1	..	..	..	1	..	1	..	1	1	39	1	..	..	..
H. (Metriatyla) fuligina Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Metriatyla) martensi Semper	1	..	..	1	48	..	1	1	1	1	1	..	..	..	..
H. (Metriatyla) scabra Jaeger	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
H. (Microthele) fuscopunctata Jaeger	3	..	..	..	..	..	..	..	1	10	39	37	..	..	..
H. (Microthele) nobilis (Selenka)	1	1	..	40	1	..	1	1	1	1	1	1	..	..	..
H. (Microthele) whitmaei Bell	8	..	..	..	..	..	..	..	..	10	10	10	/	..	..
H. (Platyperona) crosnieri Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Platyperona) difficilis Semper	3	1	..	..	1	..	1	1	1	1	1	1	1	44	..
H. (Platyperona) excellens (Ludwig)	3	..	..	..	..	..	..	..	..	..	..	3	..	..	..
H. (Platyperona) insolita Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Platyperona) samoana Ludwig	3	..	..	..	..	..	..	..	..	10	..	10	..	..	..
H. (Selenkothuria) bacilla Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Selenkothuria) erinaceus (Brandt)	3	..	..	40	..	..	..	1	1	1	3?	1	..	..	..
H. (Selenkothuria) moebii Ludwig	..	1	..	..	..	..	..	1	1	1	1	1	..	..	..
H. (Selenkothuria) parva Krauss in Lampert	1	7	..	1	1	..	..	3	..	..	..	..	..	..	..
H. (Selenkothuria) spinea Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Selenkothuria) vittalonga Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Semperothuria) cinerascens (Brandt)	1	1	..	1	1	..	1	1	1	1	1	1	1	..	..
H. (Semperothuria) flavomaculata Semper	3	..	..	..	1	..	..	37	1	10	21	1	..	..	..
H. (Semperothuria) granosa Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
H. (Stauropora) dofleini Augustin	8	..	..	..	..	..	..	..	10	10	10	10	8	..	..
H. (Stauropora) fuscocinerea Jaeger	1	1	..	..	1	..	..	1	1	1	1	1	..	51	..
H. (Stauropora) pervicax Selenka	1	1	..	1	1	..	1	1	1	1	21	1	1	..	..
H. (Stauropora) olivaceus Ludwig	3	..	..	..	3	..	..	..	1	10	21	10	10	..	..
H. (Theelothuria) maculosa Pearson	3	1	..	..	..	..	..	..	..	..	..	37	..	..	..
H. (Thymiosycia) arenicola Semper	1	1	..	48	1	32	1	1	1	1	1	1	1	51	51
H. (Thymiosycia) conusalba Cherb. & Féral	11	..	..	..	..	..	..	..	37	10	..	37	..	..	..
H. (Thymiosycia) gracilis Semper	1	..	..	..	..	..	..	..	1	10	21	1	..	..	..
H. (Thymiosycia) hilla Lesson	1	1	..	1	1	..	1	1	1	1	1	1	1	51	..
H. (Thymiosycia) impatiens (Forskål)	1	1	..	1	1	..	1	1	1	1	1	1	1	51	3
H. (Thymiosycia) remollescens Lampert	..	7	..	..	1	..	..	1	..	1	..	..	..	..	..
H. (Thymiosycia) strigosa Selenka	1	..	..	40	1	..	..	..	..	..	..	..	..	..	..
Labidodemas pertinax (Ludwig)	3	..	..	..	..	..	3	..	3	10	25	3	..	..	..
Labidodemas rugosum (Ludwig)	3	7	..	40	..	..	1	1	1	1	..	1	..	..	..
Labidodemas semperianum (Selenka)	5	..	..	48	42	..	..	1	1	1	39	1	1	..	..
Pearsonothuria graeffei (Semper)	3	..	..	..	1	..	1	..	1	10	25	1	..	..	..
STICHOPODIDAE															
Neostichopus grammatus (H.L. Clark)	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..
Stichopus chloronotus Brandt	1	1	..	3	15	..	1	1	1	1	1	1	1	..	..
Stichopus hermanni Semper	1	?	..	?	?	.	38?	?	10	10	..	10	..	..	..
Stichopus horrens Selenka	14	7	..	..	..	..	1	1	1	1	1	1	1	..	..
Stichopus monotuberculatus (Quoy & Gaimard)	1	1	..	1	1	..	..	..	44	10	44	44	..	..	..
Thelenota ananas (Jaeger)	3	1	..	..	..	..	1	..	1	1	1	1	..	..	..
Thelenota anax H.L. Clark	3	..	..	..	..	..	..	..	3	1	39	47	..	..	..
PSOLIDAE															
Psolus appendiculatus de Blainville	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
CUCUMARIIDAE															
Colochirus quadrangularis (Lesson)	10	..	..	..	..	..	..	1	10	10	1	..	..	..	..
Cucumella decaryi Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Koehleria unica Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Plesiocolochirus cylindricus (Semper)	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Plesiocolochirus dispar (Lampert)	3	..	..	1	3	..	..	..	..	10	..	..	..	..	..
Plesiocolochirus tantulus (Cherbonnier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Plesiocolochirus tesselera (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
Plesiocolochirus verrucula (Cherbonnier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pseudocnella sinorbis (Cherbonnier)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
Pseudocnella sykion (Lampert)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
Pseudocolochirus violaceus (Theel)	3	..	..	..	3	..	..	1	1	1	1	..	..	..	..
Psolidium ornatum (Ed. Perrier)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Roweia frauenfeldi (Ludwig)	29	..	29	..	..	..	..	..	..	..	..	..	..	..	..
Trachythyone crucifera (Semper)	1	1	29	1	1	..	..	29	..	..	..	..	..	..	..
SCLERODACTYLIDAE															
Afrococumis africana (Semper)	1	1	..	40	..	..	1	1	1	1	1	1	..	..	..
Cladolabes acicula (Semper)	..	1	..	..	..	1	..	1	1	1	39	1	37	..	..
Cladolabes bifurcatus (Deichmann)	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..
Cladolabes pichoni Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Globosita murrea Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ohshimella ehrenbergi (Selenka)	1	..	..	1	1	1	1	1	..	..	39	..	..	..	..
Ohshimella mauritiensis Heding & Panning	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
PHYLLOPHORIDAE															
Athyone exila Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Athyone maculispara Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Parathyone incurva Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Havelockia ferali Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Havelockia turripinea Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Havelockia versicolor (Semper)	27	..	..	..	..	..	..	33	1	1	39	..	..	..	..
Hemithyone semperi (Bell)	1	..	..	..	..	1	..	1	1	1	..	..	..	..	..
Lipotrapeza ambigua Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lipotrapeza incurva Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lipotrapeza ventripes (Joshua & Creed)	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Neothyonidium dissimilis Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Phyllophorus (Phyllonovus) anomalia Cherb.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
P. (Phyllophorella) contractura Cherb.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
P. (Urodemella) brocki Ludwig	3	..	..	..	..	..	..	1	1	1	..	..	..	..	..
P. (Urodemella) oculus Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
P. (Urodemella) tenuis Haacke	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Selenkiella paradoxa Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Stolus buccalis (Stimpson)	1	..	..	1	3	1	..	1	1	1	1	..	..	..	..
Thyone avenusta Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone carens Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone comata Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone crebrapodia Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone curvata Lampert	1	..	..	..	15	..	..	..	..	..	..	..	..	..	..
Thyone guillei Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone longicornis Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone sineturra Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone vadosa Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyone venusta Selenka	28	..	..	..	28	..	..	..	..	1	..	47	..	..	..
Thyonidiella exigua Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thyonidiella oceana Heding & Panning	3	1	..	..	..	..	..	..	1	..	..	23	..	..	..
SYNAPTIDAE															
Anapta gracilis Semper	1	..	..	..	..	..	..	1	1	..	39	1	..	..	..
Euapta godeffroyi (Semper)	1	1	..	..	1	..	1	..	1	1	39	1	1	..	..
Leptosynapta geyserensis Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Leptosynapta oblonga Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Leptosynapta tantula Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Opheodesoma grisea (Semper)	1	3	..	1	1	..	..	1	1	1	39	35	1	..	..
Opheodesoma serpentina (J. Müller)	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Opheodesoma sinevirga Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Patinapta crosslandi Heding	1	..	26	..	1	..	..	..	..	..	..	..	..	..	..
Patinapta ooplax von Marenzeller	1	..	..	..	..	..	1	..	1	..	1	1	..	..	..
Patinapta vaughani Cherbonnier	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Polyplectona kefersteini (Selenka)	..	7	..	..	1	..	..	..	1	1	39	1	1	44	..
Protankyra picardi Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Table 1 (continued)

Taxa	East Afruca	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
Synapta maculata (Chamisso & Eysenhardt)	1	1	..	1	1	..	1	1	1	1	1	1	..	..	..
Synaptula mortenseni Heding	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Synaptula reciprocans (Forskal)	3	..	..	1	1	..	..	..	..	..	..	..	..	..	..
CHIRODOTIDAE															
Chiridota eximia Haacke	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Chiridota rigida Semper	41	..	41 ?	.	..	..	..	..	1	1	1	1	..	..	..
Chiridota stuhlmanni Lampert	1	7	..	..	42	..	3	..	38	..	39	1	..	..	..
Chiridota violacea J. Müller	1	7	..	..	..	..	1	..	3	..	..	..	..	..	..
Polycheira rufescens (Brandt)	1	1	26	..	..	..	..	1	1	1	1	1	..	..	..
Trochodota mira Cherbonnier	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Trochodota vivipara 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 variablis 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).