Macroinvertebrates associated with macrophytes in Sodwana Bay, with further consideration of amphipod taxonomy

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Declaration

Sample collection in the field was conducted with the ACEP II biodiversity team. For certain groups, taxonomic experts were consulted. Jennifer Olbers provided identifications of Ophiuroidea, and Aiden Biccard of Cirripedia. Algal turf species were identified in the field by Rob Anderson and John Bolton. Data on seagrass weights, proportions and epiphyte identification and sorting was provided by Catherine Browne.

The remaining data collection, analysis, and writing of this dissertation are my own work, with the assistance of Professor Charles Griffiths.

I know the meaning of plagarism, and declare that all of the work in the dissertation, save for that which is properly acknowledged, is my own.

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Rebecca Milne

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Date

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Abstract

Biodiversity knowledge in South Africa is uneven, both taxonomically and geographically. The KwaZulu-Natal coast is under sampled in comparison to the rest of South Africa, which limits the accuracy of biogeographic diversity analyses. The study site for this thesis is Sodwana Bay, focus of the African Coelacanth Ecosystem Programme, a multidisciplinary project centered on understanding the Coelacanth habitat of Sodwana Bay at an ecosystem level. Globally and locally, the biodiversity of small species is under-studied. While historically, research in Sodwana Bay has focused on larger, more conspicuous species, this study records for the first time macroinvertebrate communities in Sodwana Bay. Macroalgal biotopes were selected to focus sampling. Macroinvertebrates, macrophytes and sediment were collected from forty-five 25 x 25 cm quadrats.

Chapter 2 examined the community inhabiting *Thalassodendron ciliatum* beds. From this biotope, 204 macroinvertebrate and 41 algal epiphyte species were identified. Polychaeta, Mollusca and Arthropoda were the most speciose phyla (76%); Hydrozoa and Bryozoa also contributed a considerable portion to the community composition (20%). Red algae were dominant among the epiphytes (76%). There was no strong statistical differentiation between seagrass bed samples from different exposure levels. This is partially due to the low number of replicates, but also the sheltering of the macroinvertebrate community by *T. ciliatum*.

Chapter 3 examined algal turfs biotopes from across six depth groups and recorded 314 species of macroinvertebrates and 72 of macroalgae. Species composition differed quite dramatically with depth. Different species characterised the community composition for each depth, and 67% of macroinvertebrate species were specific to one depth. Macroinvertebrate biodiversity was greater on inshore reefs than in the surf zone ($r^2=0.358$). A second stage analysis was attempted to detect whether macroinvertebrate communities were more closely related to algal community by species composition or functional groupings, but this was inconclusive due to the overwhelming influence of depth on community composition.

Chapter 4 examined the amphipod component of the material collected from Sodwana Bay. Two new species were described: *Varohios* n. sp. and *Ceradocus* n. sp. In addition to the two species new to science, ten species were recorded for the first time in South Africa from Sodwana Bay material. A literature review increased the listed number of South African Amphipoda from 256 to 485 species.

This study recorded 469 macroinvertebrate species in Sodwana Bay. This is not a complete species list, as species accumulation curves do not near an asymptote, and there were many rare species only recorded once. In addition to the Amphipoda new records and species, most other phyla included a number of species that were not in regional identification guides. Isopoda is particularly poorly known, and is estimated globally to have a large proportion of undescribed species. This study has only examined a few of the biotopes in Sodwana Bay, and the biodiversity of macroinvertebrates inhabiting large invertebrates such as coral, sponges and ascidians remain to be studied.

Chapter 1: General Introduction

1.1 Literature Review

South African marine biodiversity

South Africa has a coastline of more than 3 650 km and a continental Exclusive Economic Zone (EEZ) of 1.07 million km² (Sink *et al*. 2011), almost the same size as the land area (Griffiths *et al.* 2010). There are currently 12 914 marine species recorded as occurring in South Africa (Griffiths *et al.* 2010). However, the actual species richness of the country is certainly much higher, as regional and taxonomic knowledge is uneven, and taxa with small body sizes are particularly under-represented in South African literature. Griffiths *et al.* (2010) estimate the percentage of undescribed South African species at 38%. The greater East African region is even less studied, with entire taxonomic groups unexplored. Griffiths (2005) estimates that more than half of the East African marine biota remains to be described.

Regional Biodiversity Knowledge

In South Africa, as in most other developing regions, marine species richness is certainly severely underestimated (Griffiths *et al.* 2010), and much more work on assessing South African species remains to be done. This is particularly evident when examining the patterns of species richness by along the coastline (Awad *et al.* 2002). The coast adjoining Durban, Port Elisabeth, and False Bay (which are the three locations where research universities are situated) have a disproportionately large number of recorded species compared to adjacent coastline. Griffiths *et al.* (2010) attribute this to better sampling of these regions, compared to the rest of the South African coastline, resulting in biases in the current state of knowledge of biodiversity. This suggests that known species richness is limited by sampling effort, and more work remains to be done in order to be able to accurately assess biogeographic trends in species richness and endemicity patterns and set conservation priorities.

The South African coastline is divided into six ecoregions, namely the Southern Benguela, Southeast Atlantic, Agulhas, Southwest Indian, Natal and Delagoa ecoregions (Sink *et al.* 2011). Each of these regions is further broken down into ecozones, and then into habitat types.

Biodiversity knowledge in KwaZulu-Natal

The northern KwaZulu-Natal coast is particularly under-sampled (Medd 2007), due to its low level of development and difficulty of access. Medd demonstrated that benthic samples from the tropical east coast showed a more rapid species accumulation curve than those from other regions (Figure 1.1). However, based on benthic samples, KwaZulu-Natal still only had 214 recorded benthic invertebrate species, compared to 744 for the South Coast. The reason for this is that, in comparison with the other regions, KwaZulu-Natal was severely under-sampled, with only 24 samples analysed, compared to 115 for the South Coast. Thus if sampling intensity was equal, KwaZulu-Natal would be expected to have a greater species richness than the other regions in Southern Africa.

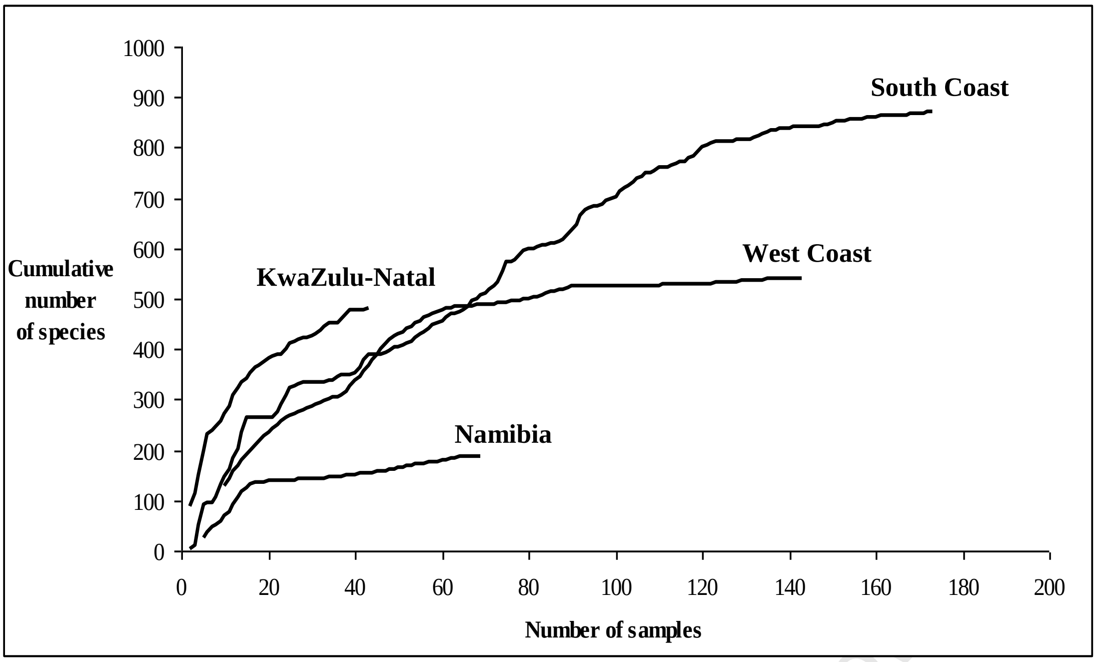


Figure 1.1 Species accumulation curves for four Southern African regions, after Medd (2007)

The under-sampling of KwaZulu-Natal should be addressed, as the Delagoa bioregion is contained entirely in that province, and biodiversity trends will be unable to be addressed with any certainty without an adequate knowledge of the region. It also has the potential to have a very high level of biodiversity, due to its tropical climate. The Indian Ocean is known to have a high level of fish biodiversity, particularly along eastern Africa (van der Elst *et al.* 2005).

African Coelacanth Ecosystem Programme

This study forms part of the African Coelacanth Ecosystem Programme (ACEP), a multidisciplinary research project focused around Sodwana Bay, the site of the first discovery of a living coelacanth population in South Africa (Venter *et al.* 2000). The programme is an attempt at gaining a whole-ecosystem understanding of the habitat of South African coelacanths and is divided into several different levels: coelacanth ecology, biodiversity studies, coelacanth population estimates, energy flows and trophic interdependencies, habitat mapping, capacity development and public awareness. This project will contribute to the biodiversity focus, specifically with respect to benthic invertebrates.

Sodwana Bay is located in the Delagoa ecoregion, and sampling for this study took place in the Delagoa inshore ecozone, in Delagoa Mixed Shore and Delagoa Inshore Reef.

Coral reefs in Sodwana Bay

South Africa's only coral reefs are located along the coast of KwaZulu-Natal. These are grouped into three complexes: the southern complex, central complex and northern complex (Riegl *et al.* 1995). The central reef complex consists of a series of reefs in Sodwana Bay, stretching northward from Jesser Point (Figure 1.2). These reefs are of high significance to the area, particularly the central reef complex, where a vibrant dive-tourism industry operates. This is the primary driver of the local economy (Nzama 2009). Although they have been designated a marine protected area, the reefs are open to some human use, with most open to diving and some of them to limited sport fishing. Although Two-Mile Reef is open to diving only, it is the focus of intense dive pressure. Sodwana Bay reefs see 80 000 dives per year, with 68 000 of these taking place on Two-Mile Reef (Walters and Samways 2001).

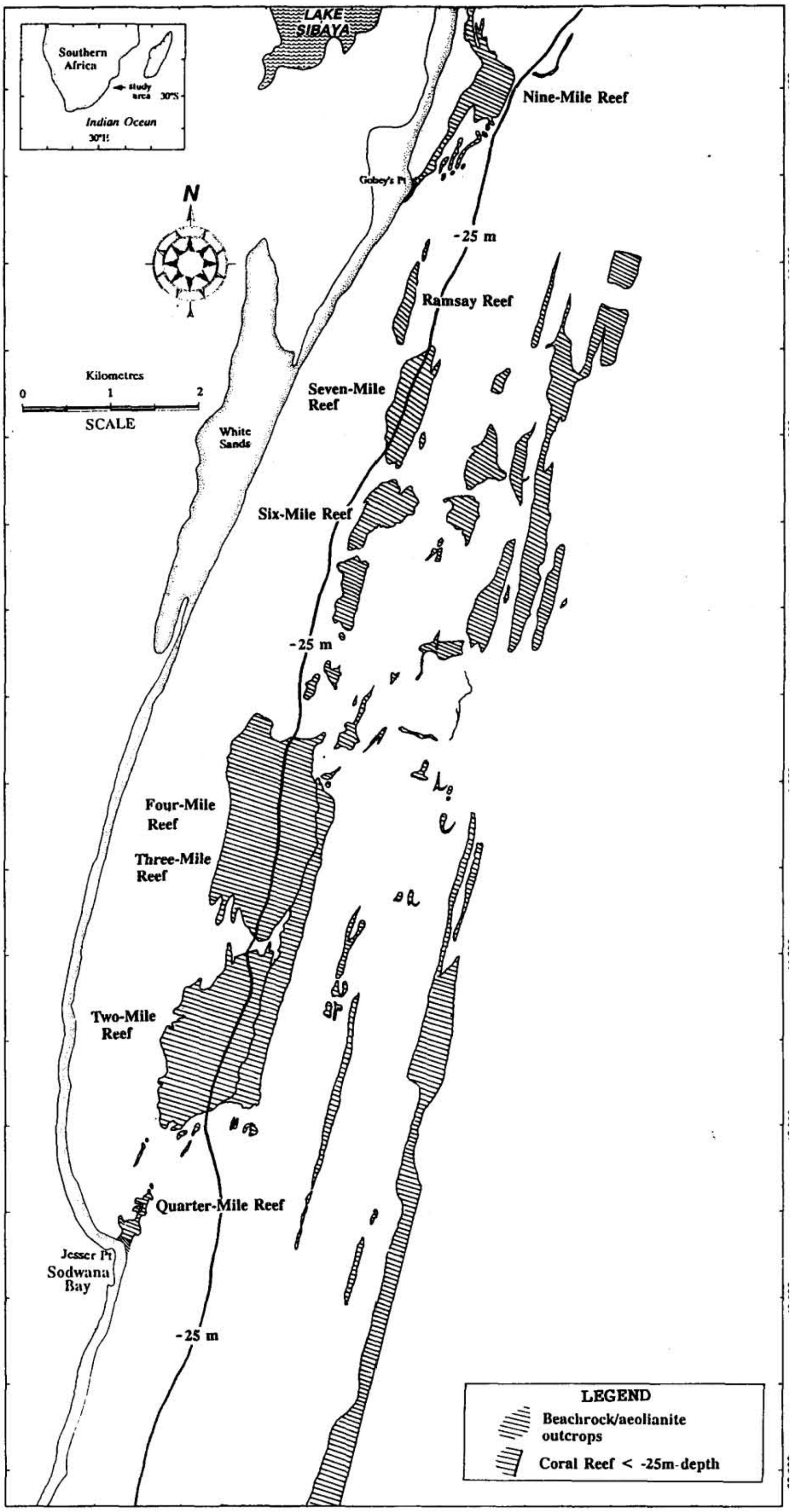


Figure 1.2 Study site. Coral reefs in Sodwana Bay, after Ramsay (1996).

Roberts *et al.* (2002) identified South Africa's coral reefs as one of the top ten centers of endemism, and as such are a conservation priority. The unique biodiversity and ecological value of Sodwana Bay has been recognized as part of iSimangaliso Wetland Park, a World Heritage Site.

Sodwana reefs are ideal for the study of global stresses to coral reefs, as they are at the extreme margin of coral reef distribution in the Western Indian Ocean (Schleyer and Celliers 2003; Schleyer *et al.* 2008). The South African reefs are geologically atypical of coral reefs, as they are founded on fossilised dunes (Riegl *et al.* 1995). Additionally, Roberts *et al.* (2002) identified the coral reefs of Southern Africa as having one of the highest levels of endemicity among global coral reefs, based on reef fish, coral, snail and lobster species. This suggests that in addition to yet to be discovered tropical species in that region, there is likely also a number of undescribed new species in the region, especially among the less studied phyla.

Previous biodiversity research in Sodwana Bay

The small invertebrates of South Africa's coral reefs are not well studied. In Sodwana Bay, scientific inquiry has focused on large taxa, such as fish (Floros 2010; Wartenberg 2011), corals (Reigl *et al.* 1995; Schleyer *et al.* 2008), sponges (Samaai *et al.* 2010) and larger invertebrates from intertidal sandy beaches (Dye *et al.* 1981).

Nested Biodiversity

Especially in remote areas, biodiversity is vastly underestimated, as species lists tend to include only larger, easy to sample species or those that are of economic importance. In South Africa, larger taxa are better known than ones with a smaller body size (Griffiths *et al.* 2010). This has also been found in other regions such as the United States, where Fauntin *et al.* (2010) report that body size, depth and distance from shore, and commercial importance were correlated with species knowledge. Similarly, von der Heyden (2011) has found that for fish in South Africa, the species that are most under-represented in the country's species lists are those that are small and cryptic. There are also gaps in our knowledge of species restricted to habitats that are logistically difficult to sample.

As one looks closer at habitats, and examines species with smaller body sizes, biodiversity progressively increases. In addition to the increase in diversity that comes from smaller species being able to take advantage of smaller niches in the habitat, larger individuals can themselves play host to smaller species. Individual organisms can host a number of commensal or parasitic species. These parasites are most often host-specific, which results in a unique species assemblage for each host species. Yeld (2009), for example, found eight parasite species in three species of South African sharks, and noted that this was a particularly species-poor parasite assemblage. Tang (2010) examined the small intertidal fish species *Muraenoclinus dorsalis* and found 23 parasitic species. What this means for biodiversity is that in looking at only the conspicuous species, biodiversity is severely underestimated, and that examining a given area at a greater magnification results in further increases to species richness.

In addition to the case of parasites and other commensals, there are also looser species associations, which are equally important in increasing diversity at a community level. Larger species may form habitat for smaller ones, and so attract a species assemblage composed of many smaller species. For example, Voultsiadou *et al.* (2007) found a community of 38 peracarid crustacean species living on a single tunicate species while Stella *et al.* (2010) examined four coral hosts, and found 178 associated infaunal species from 76 families in 12 phyla.

Ecosystem engineering

Biogenic habitats are substrates formed by living organisms. Coral reefs are but one example of a marine habitat where large invertebrates increase the nature and complexity of the substrate for other associated species. A change in the presence of one habitat-forming species will have a magnified effect on the biodiversity of a site through the effects on the number of smaller species that depend on that habitat. The specific characteristics of each habitat-forming species have significant impacts on which smaller invertebrates will be associated with them.

Jones *et al.* (1994) first proposed the term "ecosystem engineering", defining ecosystem engineers as "organisms that directly or indirectly modulate the availability of resources to other species, by causing physical state changes in biotic or abiotic materials. In so doing they modify, maintain and create habitats."

Several South African studies have examined the macrofauna associated with larger "ecosystem engineer" species and have greatly increased the known species richness of these habitats. For example, (Hammond and Griffiths 2006) looked at infauna of mussel beds, and found these to include 114 macroinvertebrate species from across seven sampling locations. Fielding *et al.* (1994) examined beds of the giant ascidian *Pyura stolonifera* in KwaZulu-Natal and noted 83 infaunal species from ten phyla associated with this habitat. A number of papers have examined macroinvertebrates from kelp forests (Velimirov *et al.* 1977; Allen and Griffiths 1980; Field *et al.* 1980). Velimirov *et al.* (1977) recorded 57 invertebrate species inhabiting kelp beds (excluding holdfast infauna). Allen and Griffiths (1980) recorded 27 species of macrofauna in the kelp canopy alone.

National Spatial Biodiversity Assessment: Ecoregions to biotopes

In 2004, a spatial assesment of South Africa's marine biodiversity was undertaken as part of the National Spatial Biodiversity Assessment (Lombard *et al.* 2004). This was to assist with conservation, management and research of biodiversity in South Africa. Lombard *et al.* list a hierarchical structure of zones for the marine region: bioregions, biozones, habitats and biotopes. The 2004 assessment maps bioregions and biozones, and considers habitat diversity in the discussion. The 2011 National Biodiversity Assessment revises the categories from the previous report, renaming them ecoregions and ecozones (Sink *et al.* 2011). It also maps habitats across the South African marine environment.

Although the 2011 report has not progressed to this level, it is common in other regions to assess biotopes as the next level of division (eg. Connor *et al.* 2004). A biotope is a combination of physical habitat and a particular biotic community. Connor *et al.* (1995) first used the term in reference to habitat classification for management purposes. Olenin and Ducrotoy (2006) review the use of this term in marine ecology, and support its usage in classification and functional marine ecology. Presumably, by examining other biotopes along the South African coast, the South African species list would increase, and a more accurate assessment of biodiversity would be achieved. This study will focus on community composition in biotopes dominated by macrophytes in the Sodwana Bay area, specifically the seagrass *Thalassodendron ciliatum* and turf algae.

1.2 Motivation and objectives

The purpose of this thesis is to investigate the diversity of small, cryptic invertebrates in Sodwana Bay. The scope of this study will be specific to macrophyte-dominated biotopes, specifically algal turfs and seagrass beds. I will attempt to identify the species assemblages, biodiversity and factors influencing the structure of these macroinvertebrate communities. Due to the low level of taxonomic knowledge for obscure taxa in this region, several undescribed species are likely to be found. While an analysis and description of all of these is too large a scope for this thesis, Amphipoda are selected as a focus group, and a review of this taxon in South Africa and descriptions of new species are presented.

Chapter 1, this chapter, summarises and evaluates the literature on South African marine biodiversity, with particular reference to the study region in KwaZulu-Natal. This chapter frames the research, justifies the choice of algal biotopes for inquiry, and summarises the focus of this study on macroinvertebrates, as well as providing a site description and history of marine research in Sodwana Bay.

Chapter 2 presents research on material collected from seagrass beds in Sodwana Bay. This includes an evaluation of macroinvertebrates and algal epiphyte diversity. Samples were collected from *Thalassodendron ciliatum* beds, with three levels of exposure, on rocky Jesser Point in Sodwana Bay. Species lists, community composition data, and statistics on the relation between the invertebrate community, algal epiphytes and environmental factors are included.

Chapter 3 presents research on material collected from algal turfs in Sodwana Bay. Samples were collected from six depths, ranging from the upper intertidal, to a sponge reef at 22 m. Motile macroinvertebrates, and algal turf species were analysed. Biodiversity data are presented, as is an analysis of changes in the macroinvertebrate community with depth grouping. The relationship between invertebrates and algae is investigated in terms of their functional groups.

Chapter 4 describes two new species of amphipod found during the course of the Sodwana Bay sampling. These new species, as well as twelve new records for South Africa, are incorporated into a taxonomic review of the known Amphipoda in South Africa, with an updated species list for the country. Due to the high volume of taxonomic literature given in

Chapter 4, and its distinctiveness from the remainder of this dissertation, it retains its own Literature Cited list.

Chapter 5 is a summary of the increase in South Africa’s biodiversity knowledge that this study has contributed. It also presents implications of this research, and suggests future lines of investigation.

Chapter 2: Seagrass Beds

2.1 Introduction

Ecosystem engineers

Berke (2010) reviews the term ecosystem engineer and its usage in the scientific literature since its definition by Jones *et al.* (1994). Additionally, she proposes a classification system for ecosystem engineers, creating four classes of ecosystem engineers: structural engineers, bioturbators, light engineers and chemical engineers. She gives examples from marine environments, and lists seagrasses as both structural engineers and chemical engineers. Thus, seagrasses play a structural role in creating habitat through providing living space, refuge from predation and heterogeneity, and in altering hydrodynamics and sedimentation. They can also act as chemical engineers by creating a nutrient gradient in the sediment.

Thalassodendron ciliatum in Sodwana Bay

Thalassodendron ciliatum functions mainly as a structural ecosystem engineer in Sodwana Bay, as the plants alter the exposed coastline by providing shelter and habitat complexity, which protects organisms from wave energy and predation. *Thalassodendron ciliatum* builds up the biomass of the rocky coast, as it is a high energy environment, and elsewhere the rocks are covered in low-lying algal turf or mats of anthozoans. As a rocky shore seagrass, *T. ciliatum* builds up a structurally secure network of rhizomes, stems and leaves, which represent a substantial biomass.

This seagrass species' ability to stabilize the sediment is especially pertinent, as it grows on a rocky coast that is exposed to a high level of wave energy. Its ability to collect and stabilize sediment is in contrast to the surrounding areas, which are either rock with a very low biomass, a few centimeters high, or else very unstable shifting sand. The *T. ciliatum* beds are therefore likely to form a habitat for species that would not otherwise exist at that location.

T. ciliatum forms dense beds with a thick mat of roots and rhizomes, which stabilizes sediment and shelters from high-energy waves. Bandeira (2002) found *T. ciliatum* to have a below-ground biomass greater than its above-ground biomass, which is uncommon for seagrass species. Other algae grow in the understory of the fronds, and *T. ciliatum* is also associated with several epiphytes that grow on its blades and stem. Seagrasses have also been shown to be important contributors to the regional food web (Heck *et al.* 2008).

Unique among Western Indian Ocean seagrass species, *T. ciliatum* grows not in soft sediments, but on hard rocky substrates. In Sodwana Bay, *T. ciliatum* beds are found on the rocky outcropping of Jesser Point. This is a high-energy environment, and the beds are located in the surf zone, and are occasionally covered by sifting sand. A higher epiphytic load is found in seagrass species from such rocky, high-energy habitats (Ducker *et al.* 1977; Bandeira 2002).

Other rocky shore seagrasses

There are two other groups of rocky shore seagrasses: *Phyllospadix spp.* and *Amphibolis spp.*

Gartner *et al.* (2010) found that one of the factors affecting the abundance of macroinvertebrates in *Amphibolis griffithii* beds was light intensity, which can be significantly altered by anthropogenic activities, such as eutrophication and sedimentation. They suggest that light intensity affects macroinvertebrates through its effect on seagrass structure and epiphytic algae biomass.

Phyllospadix spp. is another rocky-shore dwelling seagrass. It forms beds along the rocky shores of the northwest Pacific. As in Sodwana Bay, these seagrass beds form a landscape mosaic with articulated coralline dominated algal turfs. Crouch (1991) looked at polychaete communities in the rhizomes of *Phyllospadix* beds and found that the species composition resembles that of the nearby *Corralina-Gelidium* turfs, but the feeding guild makeup was more similar to soft-sediment seagrass communities. She suggests that the seagrass beds provide a similar function for the polychaete community in providing habitat and trophic resources.

Moulton and Hacker (2011) examined invertebrates in two *Phyllospadix* species, and found that the communities did differ in species and feeding guild composition. They suggest that although the two seagrasses are similar taxonomically and physiologically they have slightly different functional capacities in their role as foundational species.

Thalassodendron ciliatum bed communities

There has been only one other study that has examined the infauna of *T. ciliatum* beds (Paula *et al.* 2001). However, this study considered biomass only, and not species composition There have also been studies on epiphytes of *T. ciliatum* (Uku and Björk 2001), and on predation by urchins and fish (Mariani and Alcoverro 1999; Alcoverro and Mariani 2002, 2004; Gullström *et al.* 2002), but this is the first study looking at the community composition of resident macroinvertebrates in this species.

Studies on epiphytes of *T. ciliatum* from Inhaca Island, Mozambique (165 km north of Sodwana Bay) found that epiphytic biomass represented 47.9% of total *T. ciliatum* biomass (Bandeira 2002). The majority of this biomass was in the form of encrusting coralline algae, of which *Pneophyllum amplexifrons* was the dominant species. Studies from Zanzibar Island, Tanzania (2400 km north of Sodwana Bay) found an average percent epiphyte cover of 83% on *T. ciliatum* stems, and 29.6% on leaves, the majority of which was encrusting corallines (Leliaert *et al.* 2001). They found 49 epiphyte taxa on Zanzibar seagrasses, 21 of which were mentioned specifically as occurring on *T. ciliatum*.

Epiphytes and invertebrates in community

Epiphytes on seagrass blades contribute significantly to the structure of a seagrass ecosystem. Epiphytes may affect epifauna in three ways: by increasing primary production and providing a food source, by increasing the spatial complexity of the seagrass blades and providing habitat shelter, and by influencing flow and creating potential for larval settlement.

Epiphytes play an important role in attracting epifauna to macrophyte habitats, as suggested by Edgar (1991), who looked at artificial turfs preconditioned with and without algal biofilms, and noted faster macroinvertebrate colonization of substrates with an epiphytic layer.

Bologna and Heck (1999) suggest that the trophic role of epiphytes is more important than the increase in spatial complexity, especially to herbivorous epifauna. This was established experimentally using artificial substrates to approximate epiphytic structure.

Moksnes *et al.* (2008), looking at a temperate seagrass community, found that invertebrate mesograzers played an important role in grazing seagrass epiphytes, and that high predation of those mesograzers by a predatory amphipod led to overgrowth of seagrass by ephemeral algae. Newcombe and Taylor (2010) identify a trophic cascade between small fish, epifauna, epiphytes and brown algae. In that study, higher densities of macroinvertebrate grazers both limited fouling of macroalgae by epiphytes and caused greater damage to the host brown algae.

Purpose

This chapter examines the macroinvertebrate community of *T. ciliatum* beds. The objectives are to describe the species composition of the macrofaunal and epiphytic communities in seagrass beds, and to evaluate the factors affecting the distribution of these across the range of *T. ciliatum* beds occurring in Sodwana Bay.

2.2 Methods

Data Collection

Jesser Point has multiple patches of the seagrass species *Thalassodendron ciliatum*. Samples were collected on 1 - 3 March 2010. Fifteen samples of seagrass bed were collected from three general areas on the Point. Five were from beds that were exposed to air at extreme low tide, five were from submerged beds at approximately 1 m depth, and five were from beds in rock pools, which were always submerged, but in water isolated from the rest of the ocean except at high tide. Depth was measured with a meter stick. Seagrass bed diameter was estimated by the collectors. The exposed samples were collected while the seagrass was exposed to air, whereas the pool and subtidal samples were collected underwater. In each case, 25 x 25 cm quadrats were cut into the seagrass mat. The upper fronds of the seagrass were removed, as well as the dense mat of rhizome and roots and the sediment below, down to the rock the bed was anchored to. This also included the understorey algae that grew between the seagrass stems on the substrate secured by their roots.

Seagrass and algae material was rinsed well, and removed from the sample. The remaining sediment was searched and visible invertebrates were removed for a total of one man-hour per sample. All organisms were preserved in 15% formalin. A weight was taken for the remaining sediment. One quarter of the seagrass biomass was removed for further analysis of its epiphytes, and epifauna was cut off the remaining seagrass and combined with the other invertebrates.

The seagrass and algal proportions of the samples were retained and analysed by Catherine Browne as part of her MSc thesis analysing the epiphytic algae of *Thalassondendron ciliatum*. In the interests of collaboration, she graciously provided algal data.

Environmental variables measured in the field included sample depth, water temperature, salinity, seagrass bed size, total sample weight and sediment weight.

Specimens were sorted according to phyla. Arthropoda, Polychaeta and Ophiuroidea were identified down to species wherever possible, with extensive search of the literature. Other phyla were identified to morphospecies, and assigned to Order or species only where distinctive characteristics allowed this to be done reliably without specialized taxonomic input.

Statistical Analysis

From the laboratory and field data, three datasets were compiled: one of macroinvertebrate species richness and abundance, one of algal epiphyte abundance, and one with environmental variables. Abundance data was used for macroinvertebrates. Juveniles and damaged specimens, which could only be identified to an amalgamated species group, were removed from the dataset. Algal epiphyte abundance was given in relative terms (present, rare, common, abundant, and dominant). These values were then converted to a base 2 logarithmic scale. The environmental variables examined were the ratio of wet weight of seagrass rhizome to stem, the ratio of wet weight of algal epiphytes to seagrass stem and leaf, depth below surface at low water, sediment wet weight and seagrass patch size. Biological datasets were fourth root transformed, and Bray-Curtis resemblance was used. Environmental data were normalised, and Euclidian distance was used.

Univariate statistics were conducted using STATISTICA 9. ANOVA was used to determine whether biodiversity or abundance differed between seagrass bed exposure levels. Normality of data was assessed visually by examination of histograms. Levene's test was used to assess homogeneity of variances. Multivariate statistics were calculated with PRIMER-E. Non-metric multidimensional scaling demonstrated the multivariate pattern in community samples. From the resemblance matrix, an ANOSIM analysis was run to determine whether communities significantly differed between seagrass bed exposure levels. From the non-transformed abundance dataset, a SIMPER analysis was run to assess which species contributed most to the similarity of the community across all samples. BIO-ENV was used to determine the relation between environmental variables and the macroinvertebrate community.

Species accumulation curves were plotted in PRIMER-E, which through permutation generates standard deviation values for the curve. A species richness estimator was also calculated. First-order jackknife was selected as a species richness estimator due to its good performance at low levels of sampling (Walther and Morand 1998; Walther and Moore 2005). This estimator is based on the number of rare species, with the assumption that as the observed species richness approaches the actual species richness, the number of species present in only one sample will decline.

2.3 Results

Biodiversity

The associated macroinvertebrate community inhabiting *T. ciliatum* seagrass beds is taxonomically diverse, with no one phylum dominating the assemblage. In total, 204 species in eight phyla were identified from 2 259 individuals (Table 2.1). A complete listing of all species recorded from *T. ciliatum* beds is given in Appendix 1. The three most diverse groups were Arthropoda, Annelida, and Mollusca, which together comprised 76% of the species from the samples (Figure 2.1). Arthropoda was the most speciose group, with 74 species in 34 families, followed by Annelida with 58 species in 23 families. Mollusca contributed 41 species to the community composition. Several species represented new records for South Africa, or new species to science (see Chapter 4, 5).

In terms of the algal epiphytes on *T. ciliatum*, 41 species were identified from four algal groups (Table 2.2). The largest component of the epiphyte community were the Rhodophyta, representing 80% by abundance, and 76% of the species (Figure 2.1).

Table 2.1 Distribution of macroinvertebrate species richness among phyla identified from seagrass beds.

		No. Families	No. Species	Abundance
Annelida	Polychaeta	23	58	735
Arthropoda	Crustacea	30	65	540
	Pycnogonida	3	9	
	Acari	1	1	
Cnidaria	Hydrozoa	7	20	384
	Actinaria		3	
Bryozoa	Bryozoa		16	299
Mollusca	Gastropoda		22	266
	Bivalvia		16	
	Nudibranchia		2	
	Polyplacophora		1	
Echinodermata	Ophiuroidea	5	6	25
	Holothuria		3	
	Asteroidea	1	1	
	Echinoidea	1	1	
Entoprocta	Entoprocta	1	1	6
Platyhelminthes	Platyhelminthes		5	4

Table 2.2 Distribution of species richness among algal groups identified from seagrass beds.

	No. Orders	No. Species
Cyanobacteria	1	1
Phaeophyceae	2	4
Chlorophyta	3	5
Rhodophyta	8	31

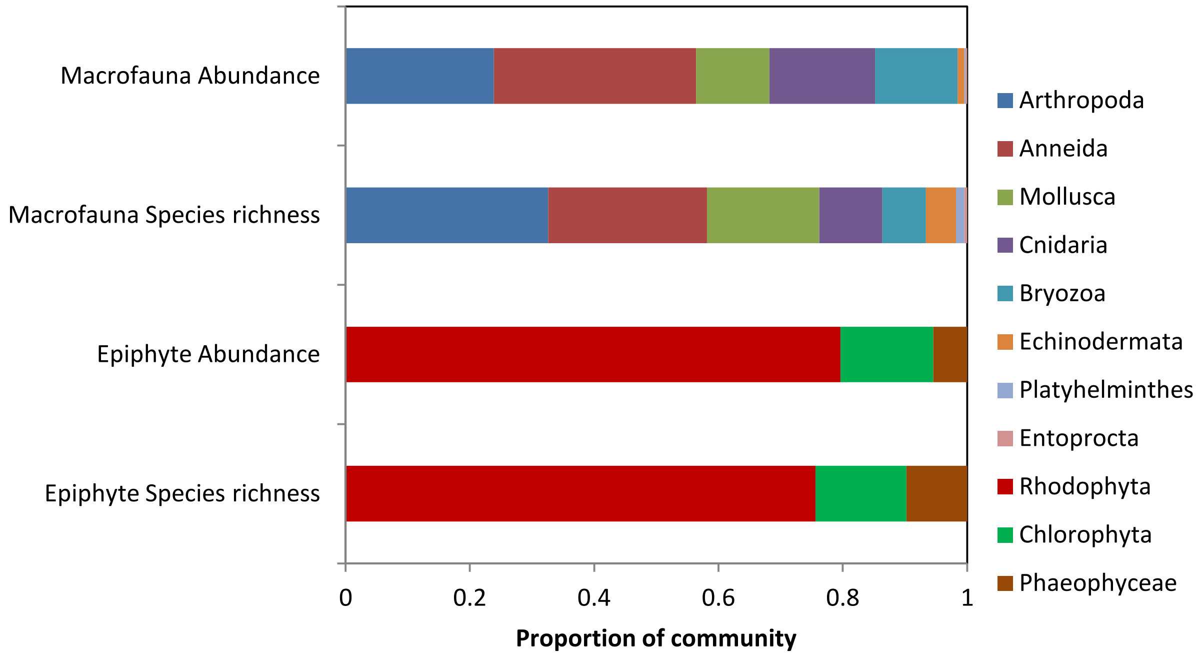


Figure 2.1 Macroinvertebrate and algal epiphyte communities in seagrass beds, shown as relative contributions of phyla by both number of species and abundance.

The species that contributed most to the similarity of the macroinvertebrate and algal epiphyte communities in *T. ciliatum* seagrass beds are represented in Figure 2.2.

Two sertularian hydroids were the largest contributors to the similarity across macroinvertebrate species assemblages (at 8.8 and 6.2 %). These were pervasively found growing on the leaf blades of the seagrass plant. Also contributing substantial amounts to the similarity of samples were two gastropods (*Tricolia capensis* at 5.8% and a turretoid species at 6%), and an amphipod (*Quadrimaera pacifica* at 5.1%).

Two encrusting corallines were the largest contributors to the similarity across algal epiphyte species assemblages (12.6% for *Pneophyllum amplexifrons* and 12.2% for *Hydrolithon farinosum*). Other than *Jania intermedia*, an articulated coralline algae, which contributed 5.5% to the similarity of the samples, the remaining substantial algal contributors to community similarity were filamentous algae.

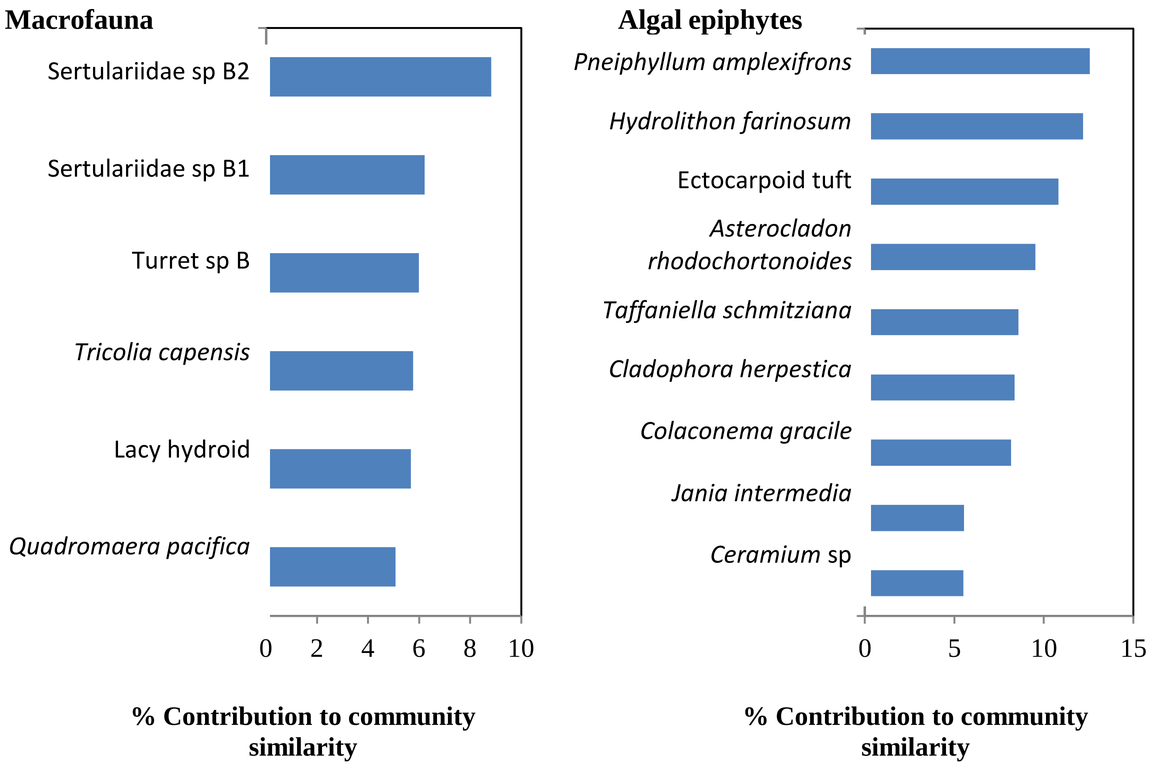


Figure 2.2 Species which contribute more than 5% to the similarity of each community inhabiting seagrass beds in Sodwana Bay (SIMPER).

Although 204 macroinvertebrate species were identified from seagrass beds in Sodwana Bay, this is only a portion of the actual total biodiversity of the *T. ciliatum* biotope. A species accumulation curve, based on a permutation of the cumulative number of species plotted against the number of samples collected, is shown in Figure 2.3. This curve is not approaching an asymptote, as is evident by the slope of the accumulation curve near the end of the fifteen samples. The species richness estimator, first-order jackknife predicts a total species richness of 302, which is 150% of the observed species richness. The curve of the jackknife estimator is also not approaching an asymptote, and is not approaching the species accumulation curve. Rather, after fifteen samples, it is still diverging from it.

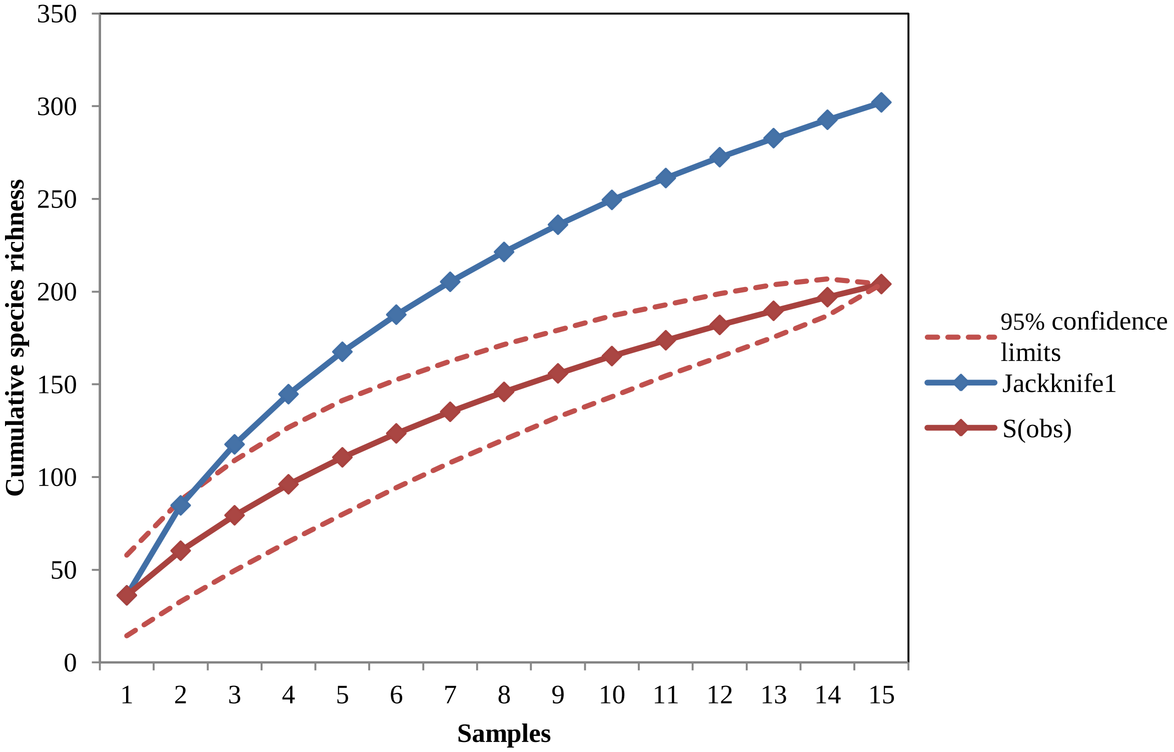


Figure 2.3 Species accumulation curve for macroinvertebrates from seagrass beds in Sodwana Bay.

Patterns across seagrass beds

The relative location of seagrass beds on Jesser Point, as evaluated by the three exposure levels (tide pool, exposed, subtidal), did not have an effect on the macroinvertebrate biodiversity (ANOVA; F=0.40, df=2,12; p=0.679). There was a significant effect of exposure level on abundance of invertebrates (ANOVA; F=4.05; df=2,12; p=0.045). However, all post-hoc Tukey comparisons were non-significant (Figure 2.4). In the case of the algal epiphytes, biomass did not differ significantly between groups (ANOVA; F=1.99; df=2,12; p=0.179). Diversity did differ between the groups (ANOVA; F=5.96; df=2,12; p=0.016). Tukey post-hoc revealed that epiphytes from tidepools were less diverse than in beds exposed at low tide, or those situated subtidally (Figure 2.5).

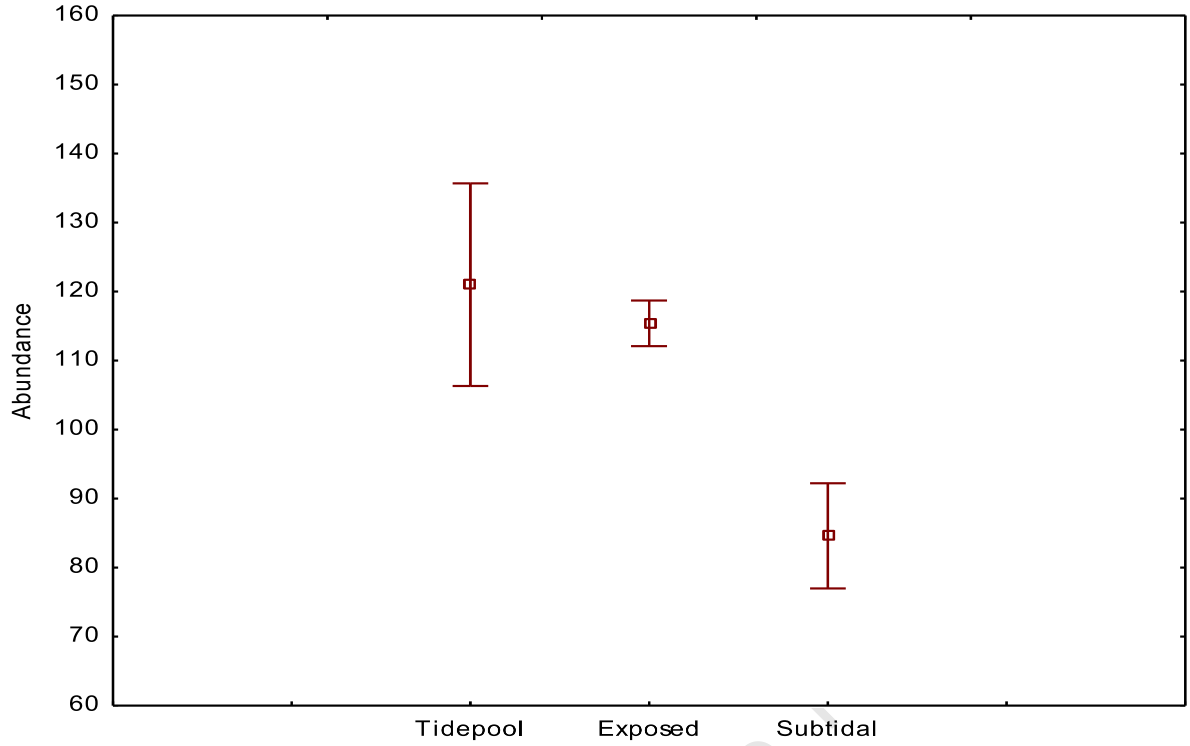


Figure 2.4 Abundance of macroinvertebrates per 25 x 25 cm quadrat from seagrass beds on Jesser Point, Sodwana Bay. Error bars represent standard error.

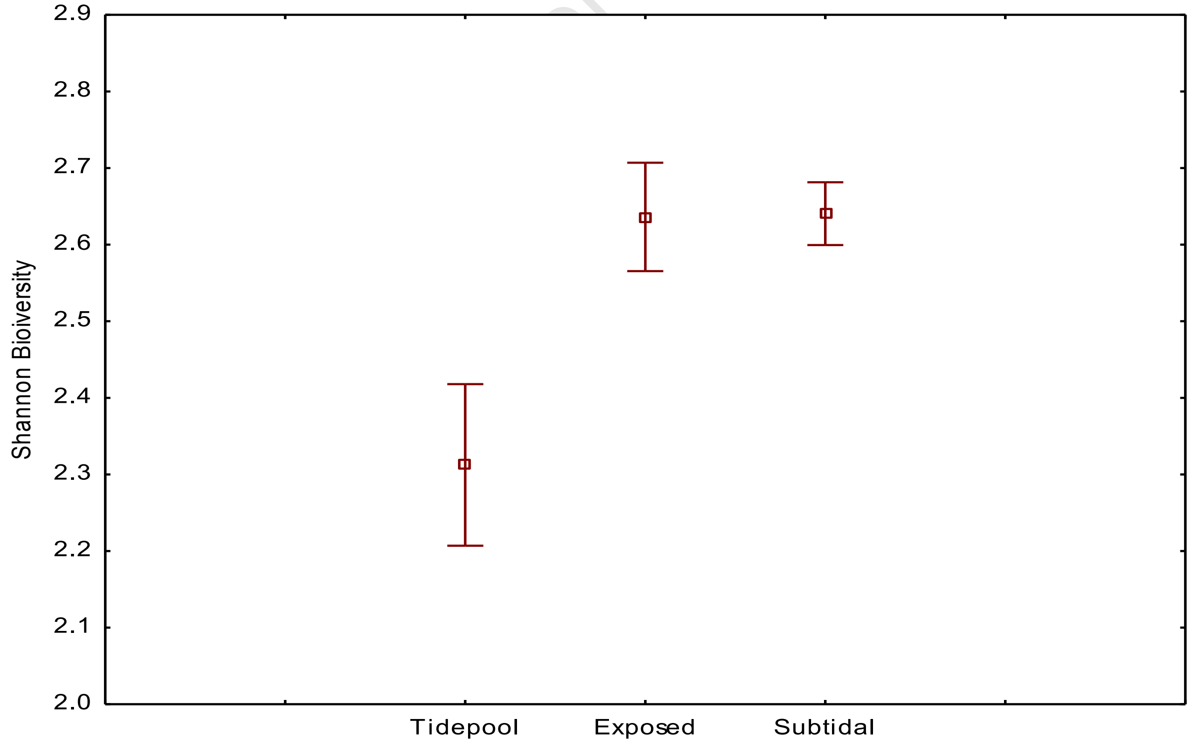


Figure 2.5 Shannon's biodiversity of algal epiphyte community in seagrass beds from three exposure levels on Jesser Point, Sodwana Bay. Asterisk marks average diversity significantly different from other two. Error bars represent standard error

When looking at species assemblages, macroinvertebrate community did not differ between the three seagrass bed exposure levels (ANOSIM; R=0.18; p=0.067) (Figure 2.6). Algal epiphyte communities from the same seagrass beds showed a slight differentiation between communities in tide pools compared to exposed or subtidally (ANOSIM; R=0.3; p<0.05) (Figure 2.7).

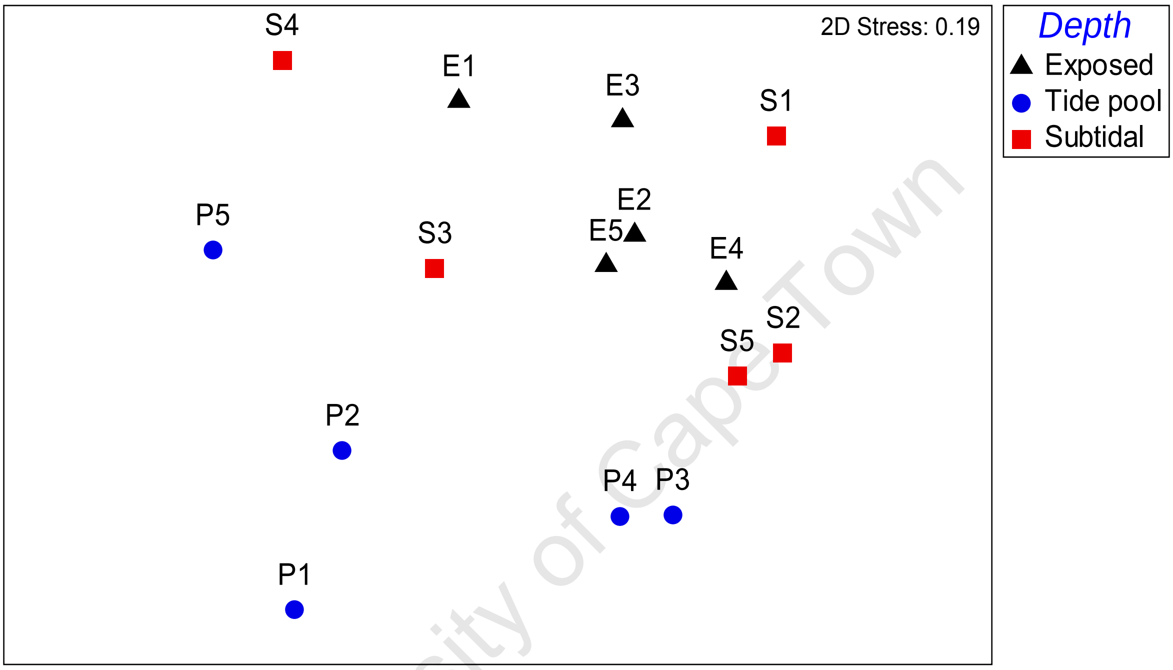


Figure 2.6 Multidimensional scaling of macroinvertebrate communities from three seagrass bed exposure levels in Sodwana Bay.

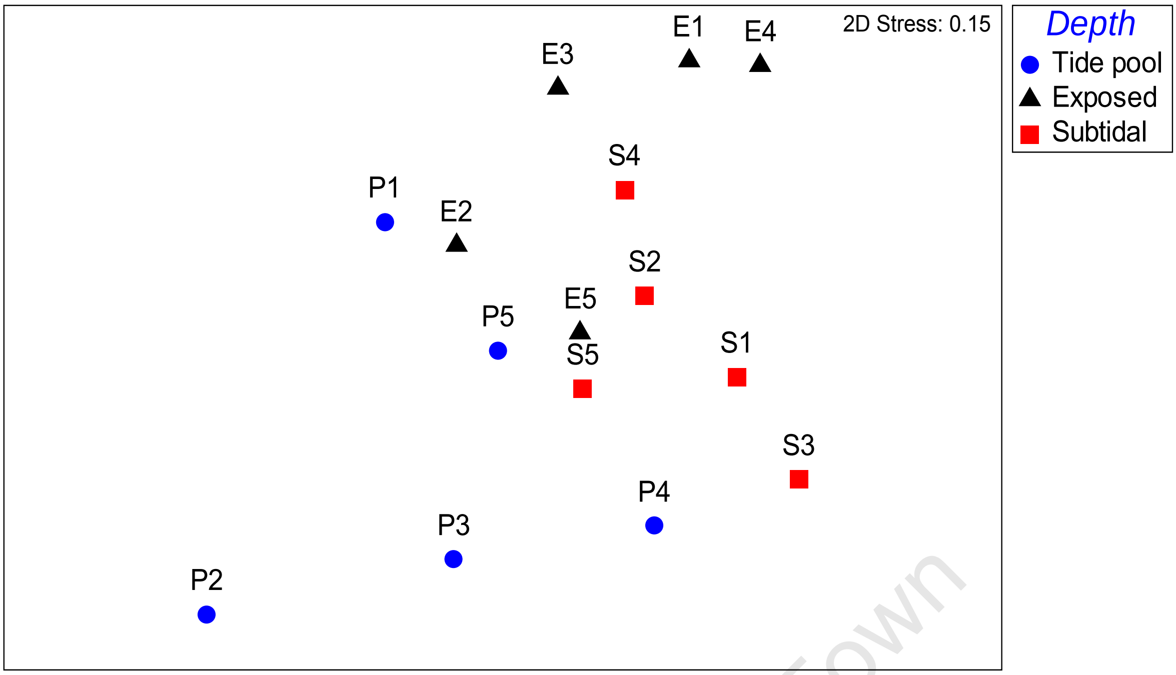


Figure 2.7 Multidimensional scaling of epiphytic algae communities from three seagrass bed exposure levels in Sodwana Bay.

Of the six environmental and macrophyte-related variables measured, the combination that explained the highest proportion of the variation in the macrophyte samples was a single variable, total sample wet weight. However, this did not explain a significant amount of the variation of the macroinvertebrate community (BIO-ENV, $\rho=0.33$, $p=0.09$).

2.4 Discussion

Seagrass bed exposure level had no effect on either species richness or Shannon biodiversity, but there was a significant difference between the groups for abundance of macroinvertebrates. Although the post-hoc test could not discern where the difference between diversity of the different treatments lay, the average number of macroinvertebrates per quadrat was smallest for samples collected subtidally. This could be a sampling artifact, as the subtidal samples were collected under high wave action, which Jesser Point is almost always subject to. The difficulty of sampling under these conditions may have washed away some of the specimens, as the seagrass was agitated more by the waves while being put in the sample bags, in comparison to the other exposure levels. Sampling the exposed samples while the sites were in air, as compared to the subtidal and pool samples which were collected while exposed is another possible source of sampling error. While the abundance of macroinvertebrates may not be affected, it may have influenced the probability of certain invertebrate groups being collected, which would have a possible effect on the community composition. For example, the exposure to air could have reduced the probability of highly mobile invertebrates escaping sampling. There was no difference found between the exposed and other seagrass communities, but with more samples, and an increased statistical rigor, this may have shown an effect.

Variation in macroinvertebrate communities across seagrass beds

Seagrass in soft sediments are known for increasing the structural complexity of bare sediment, and also the diversity of the resident fauna (Lee *et al.* 2001). This relationship may not be so simple for rocky seagrasses, such as *T. ciliatum*, because rocky marine habitat is known for its high biodiversity, compared to soft sediments. Although structural complexity is an important determinant of why biodiversity of associated macroinvertebrates is higher in seagrass beds than in surrounding soft sediments, Attrill *et al.* (2000) found that seagrass biomass was the most important determinant of macroinvertebrate community. They attribute this to the species-area relationship, as a measure of surface area available to invertebrates, and that seagrass complexity did not play a measurable role in determining biodiversity or community structure of macroinvertebrates among seagrass beds. They further concluded that the relationship between invertebrate diversity and seagrass biomass was a sampling artifact, which would need to be carefully considered in further studies of diversity between seagrass beds. While seagrass biomass and patch size have been examined in relation to associated macrofauna and found to increase diversity, Bowden *et al.* (2001) show that patch placement in relation to small-scale environmental factors is a much greater determinant of macroinvertebrate community.

The variation in the macroinvertebrate community across seagrass bed samples in Sodwana Bay was not particularly large. Any statistical differences were very weak. As with the afore mentioned studies, much of this may be due to the sampling method used. It may also be an effect of the seagrass *T. ciliatum* moderating the local scale environmental factors, which may otherwise determine the macroinvertebrate community. The statistical power of the tests used to investigate this further was limited by the number of samples analysed. For this study, the number of samples which could be collected was limited by the processing time, and identification of the species assemblage. The species richness of the samples, and the paucity of local identification guides and taxonomic knowledge limited the number of samples it was reasonable to process for this scope of this project. However, as scientific knowledge on the Sodwana Bay regions continues to grow, further indepth studies become more feasible.

Composition of macroinvertebrate communities in seagrass beds

Crouch (1991), looking at *Phyllospadix spp,.* found that the rhizome communities were dominated by polychaetes, crustaceans and gastropods (90% of individuals). These three groups represented a much smaller proportion in this study (68%), in part due to sampling method. Crouch sampled only the rhizome mat, excluding the seagrass blades. The epiphytic groups Hydrozoa and Bryozoa represent a substantial proportion of the *T. ciliatum* macrofaunal community, and many of these species were found only on the blades and stems of the seagrass.

Three of the species which most characterized the seagrass macrofauna community were hydrozoan species. These were quite ubiquitous on the blades and stems of the seagrass. Of the more mobile species, two gastropods and an amphipod (*Quadrimaera pacifica*) were most characteristic of seagrass communities. *Quadrimaera pacifica* is a new record for South Africa, as it had previously only been recorded in Mozambique. It is likely that this does not represent a range extension, but rather reflects the relatively low lack of sampling for smaller species in the study region.

There is certainly a significant and diverse biota supported by *T. ciliatum* seagrass beds, which this study has only begun to document. More discussion of the biodiversity hosted by *T. ciliatum* beds, and other specific biotopes is given in Chapter 5.

For future research, further investigation of the relation between *T. ciliatum* and hosted invertebrates would be illuminating. Separating the infaunal invertebrates living in the rhizomes from the epifaunal invertebrates living in the canopy might provide insight into the mechanism by which invertebrates select seagrass habitat. Another interesting route for future research would be an analysis of where on the plant epibionts grow, similar to Borowitzka *et al.* (1990) who in their study of *Amphibolis griffithii* found Bryozoa and Hydrozoa preferentially colonised the younger parts of the leaves in advance of epiphytic algae.

Chapter 3: Algal Turf Community Ecology

3.1 Introduction

Algal Turfs

Two algal communities are referred to in the literature as algal turfs: dense mats of algae dominated by small species and small forms of larger macroalgae (Miller *et al.* 2009) and sparse fringes of unicellular and filamentous algae (Hackney *et al.* 1989). While it is the sparse patches which are thought to contribute up to 80% of the total primary productivity on tropical reefs, the larger, denser algal turfs also play a distinct role on the reefs (Littler and Littler 1994), both in terms of their own primary productivity, and in their role as a refugium for smaller invertebrates, due to their greater structural complexity. Turfs on tropical reefs are differentiated from other macroalgal beds in part due to their persistence under high grazing pressure, through high productivity (Hackney *et al.* 1989; Anderson *et al.* 2005), rather than through grazer resistance.

Algal turfs are distributed throughout the rocky outcrops of Sodwana Bay, including Jesser Point and the submerged reefs. The rocky Jesser Point shows a diversity of habitats, including sand, seagrass beds, anthozoan mats and low algal turf. Subtidally, reef cover includes hard and soft corals, sponges, ascidians, sand and algal turfs. Two-Mile Reef has a living benthic cover of 71.8%, of which 30.4% is hard corals, 41.4% soft corals, 18.0% is algal turf and 3.52% sponges and ascidians, as well as 6.7% sand (Walters and Samways 2001).

Anderson *et al.* (2005) have assessed the extent and algal composition of turfs on the tropical reefs of Sodwana Bay. They found a considerable amount of biodiversity, with 104 algal taxa in 25 quadrats at five depths ranging from 0.5 m to 27 m. They characterise the Sodwana algal turfs as being typical of tropical reefs, and composed primarily of small red algae with sparse larger macroalgae.

While the algal composition of turfs in Sodwana Bay has been evaluated, the invertebrate community living within these turfs has not yet been examined scientifically. Cryptofauna are often overlooked due to their generally small size and cryptic life histories. However, these small invertebrates play a key role in the trophic web, and are important for an ecosystem level understanding of Sodwana Bay. This study will quantify the community composition and diversity in these turf habitats, as well as examine the relationship between the algal and invertebrate communities.

Functional groups

Miller *et al.* (2009) looked at algal turfs from Californian reefs, and found a higher abundance of macroinvertebrates in algal turfs, which they attributed to greater structural complexity.

A useful method of considering algae is to divide them into functional groups. These may be defined in a number of ways. Padilla and Allen (2000) suggest several: for example nutrient uptake or photosynthesis rates, or grazing or disturbance resistance. Algae species may be divided into functional groups based on complexity of cellular structure. Littler and Littler (1980) and Steneck and Watling (1982) proposed schema which divide algae into discrete categories based on structural forms. This paper uses the eight functional forms defined by Steneck and Dethier (1994). Divisions are based on the number of layers of algal cells, the division of cells into cortex and medulla layers, and degree of calcification. The groups given are single celled algae, filamentous algae, foliose algae, corticated foliose algae, corticated macrophytes, leathery macrophytes, articulated calcareous algae and crustose algae). Figure 3.1.

There is some debate as to the true functional value that functional form models hold (Padilla and Allen 2000) in terms of inferring primary productivity, resistance to herbivores, susceptibility to physiological stress and other ecological functions. However, Padilla and Allen suggest that using a functional form grouping is generally appropriate when considering the relationship between algae and associated invertebrates, as it represents an acceptable proxy for structural complexity. Accordingly, this study uses algal functional groups as a surrogate for structural complexity, following Steneck and Dethier (1994), which uses the complexity of internal cellular structure. This has become a commonly considered surrogate for algal structural complexity in studies investigating the relationship between invertebrate communities and host algae.

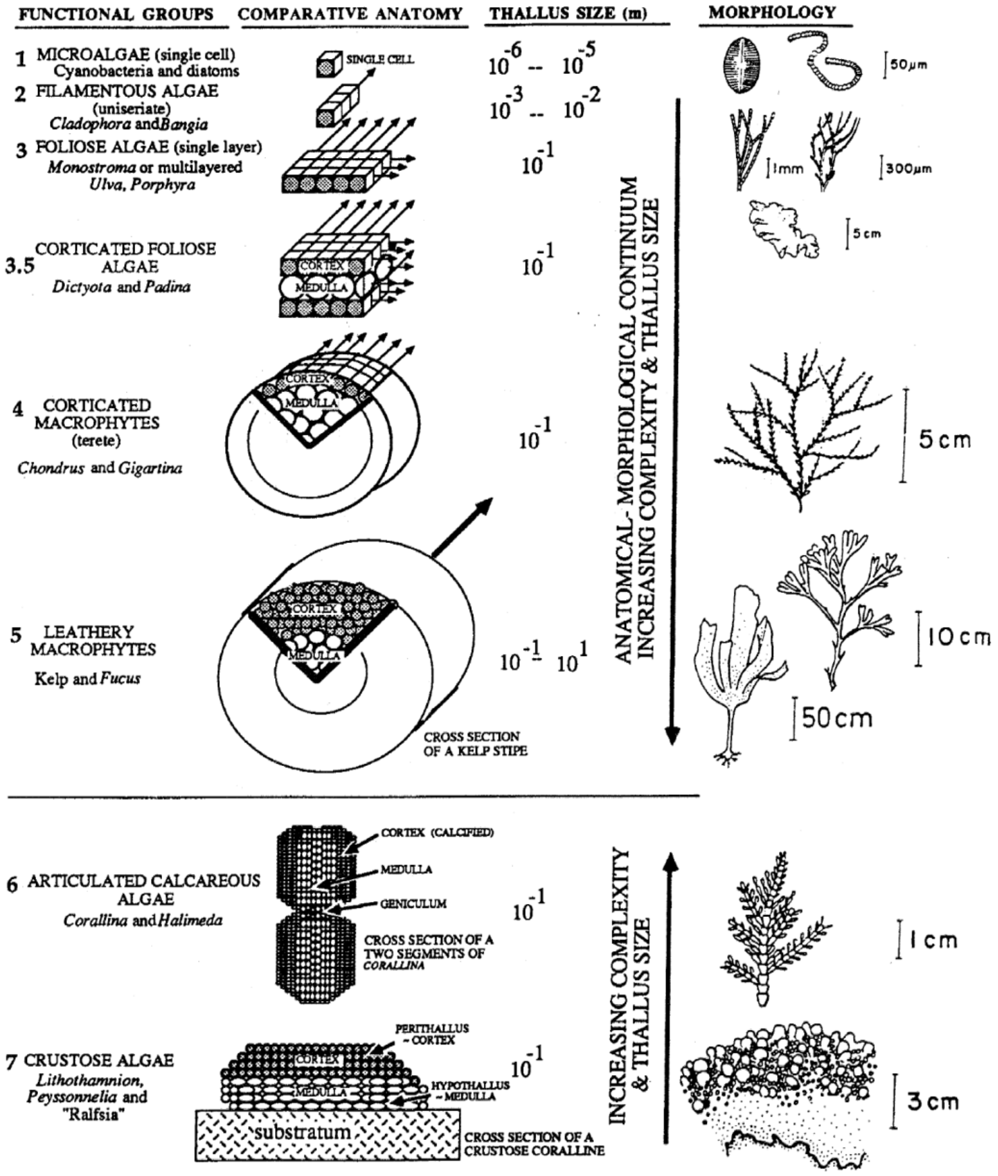


Figure 3.1 Algal functional groups based on cellular structure, after Steneck and Dethier (1994).

Algal functional groups and invertebrates

There have been several studies examining the relationship between structure-providing algae and hosted macroinvertebrates. There have been a number of different approaches, including examining the architectural complexity, species diversity and functional group composition of the algae in relation to the abundance, sizes, biodiversity and community composition of the infauna. Hacker and Steneck (1990), Chemello and Milazzo (2002) and McAbendroth *et* *al.* (2005) have found evidence for the abundance of invertebrates being related to algal architecture, either as measured habitat complexity, or using functional groups as a surrogate. However, Christie *et al.* (2009) found that the abundance of invertebrates was unrelated to algal functional groups, and was rather influenced by habitat patch size.

Several authors have shown that the structural complexity of a macrophyte species determines both the species richness and composition of the hosted macroinvertebrate community. In their study of *Zostera* and *Fucus* beds, Christie *et al.* (2009) found that the structuring macrophyte was a more important determinant of macrofaunal community composition than sample location. Moreover, they found that while macrofauna abundances and species richness were determined by habitat patch size, the specific species found were independent of patch size, suggesting that communities are not specific to habitats of certain sizes.

Cacabelos *et al.* (2010) found that epifaunal density was correlated to epiphyte biomass by examining two algal species of the same functional group (leathery macrophytes), but of differing structural complexity. Although epifaunal communities differed between the two species, height on the shore, epiphyte biomass and temporal variation were more important factors in determining epifaunal variability than the difference in structural complexity between the two species.

Hacker and Steneck (1990), looking at the amphipod *Gammarellus angulosus*, found that abundance depended on the complexity of the host algae, abundance being higher in algae with a branched form. They also found that the size of the spaces between branches was an important determinant of the size of the amphipods in the community, with smaller amphipods selecting filamentous algae, and larger amphipods selecting corticated macrophytes. Although their study looked at individuals of a single species, for this study, it could be expected for smaller species to have affinities for algae of different functional groups than larger species.

Algae form is more important than taxonomy to habitat selection by macroinvertebrates, with resident invertebrate communities being no more similar between closely related algae than between more distantly related algae (Bates 2009). This is because of the way most epifauna use hosts: more as a habitat than as a food source. Macroinvertebrates demonstrate a variety of feeding mechanisms, and even the herbivores rarely feed exclusively on the host algae, often preferring epiphytes (Arrontes 1999). Bates also found that the epifaunal community depended more on the specific algal host species, and there was too much variation of epifaunal communities within functional groups for functional group to be playing a significant role in structuring the macroinvertebrate community. This suggests that algal functional group is not a good predictor of epifaunal community.

The relationships between epifauna and the functional group of the algal hosts follow a number of paths, and are specific to the group of epifauna examined. While Bates looked at motile invertebrates and found that increasing taxonomic distance of algae did not play a role in differentiating between invertebrate communities, Liuzzi and López Gappa (2011) found that bryozoan communities were more similar on closely-related algal taxa. They suggest that this is because sessile organisms like bryozoans have a closer relationship with the algae they use as a substrate, compared to mobile invertebrates. They also found that the growth format of the bryozoan species was correlated with the functional group of the algal host, with filamentous algae supporting bryozoans with linear growth, and foliose algae supporting bryozoans with sheet-like growth.

There has been no clear consensus on the influence of algal functional groups on macroinvertebrate communities. In addition to the experimental and manipulated environment studies of the theoretical role of functional groups, the subject may also benefit from complementary *in situ* studies of natural species assemblages, and the interrelation of algal functional group and macroinvertebrates within them.

Purpose

This chapter examined the macroinvertebrate community of algal turfs from a range of depths. The objectives are to describe the species composition of the macrofaunal and algal communities, evaluate the changes in those communities with depth, and investigate the relation between macroinvertebrates and algal functional groups.

3.2 Methods

Data collection

Benthic samples were collected from algal turfs in Sodwana Bay from 1 to 7 October 2009. Five replicates of 25 × 25 cm quadrats were collected from each of six depth intervals. Figure 3.2. Samples from the high-water mark were taken from the tip of Jesser Point. This location experiences a lot of foot traffic, as it is along the path to the larger tidal pools. It is also subjected to regular inundation with sand. Samples from the low-water mark were also collected at the tip of Jesser Point, along the more wave-exposed side. This also experiences some foot traffic, although less than the high tide samples. The 1.5 m samples were taken just seaward from Jesser Point. The 7.5 m samples were collected from Quarter-Mile Reef, which extends out from Jesser Point. The 12.5 m samples were collected from “Four Buoy” on Two-Mile Reef and the 22 m samples from Bikini Reef, located on the seaward edge of Two-Mile Reef. Samples from the intertidal zone were collected while exposed to air; subtidal samples were collected by SCUBA. In both cases, a frame was laid down and the substrate within was cut out down to rock or as close as possible and then placed in fine mesh bags.

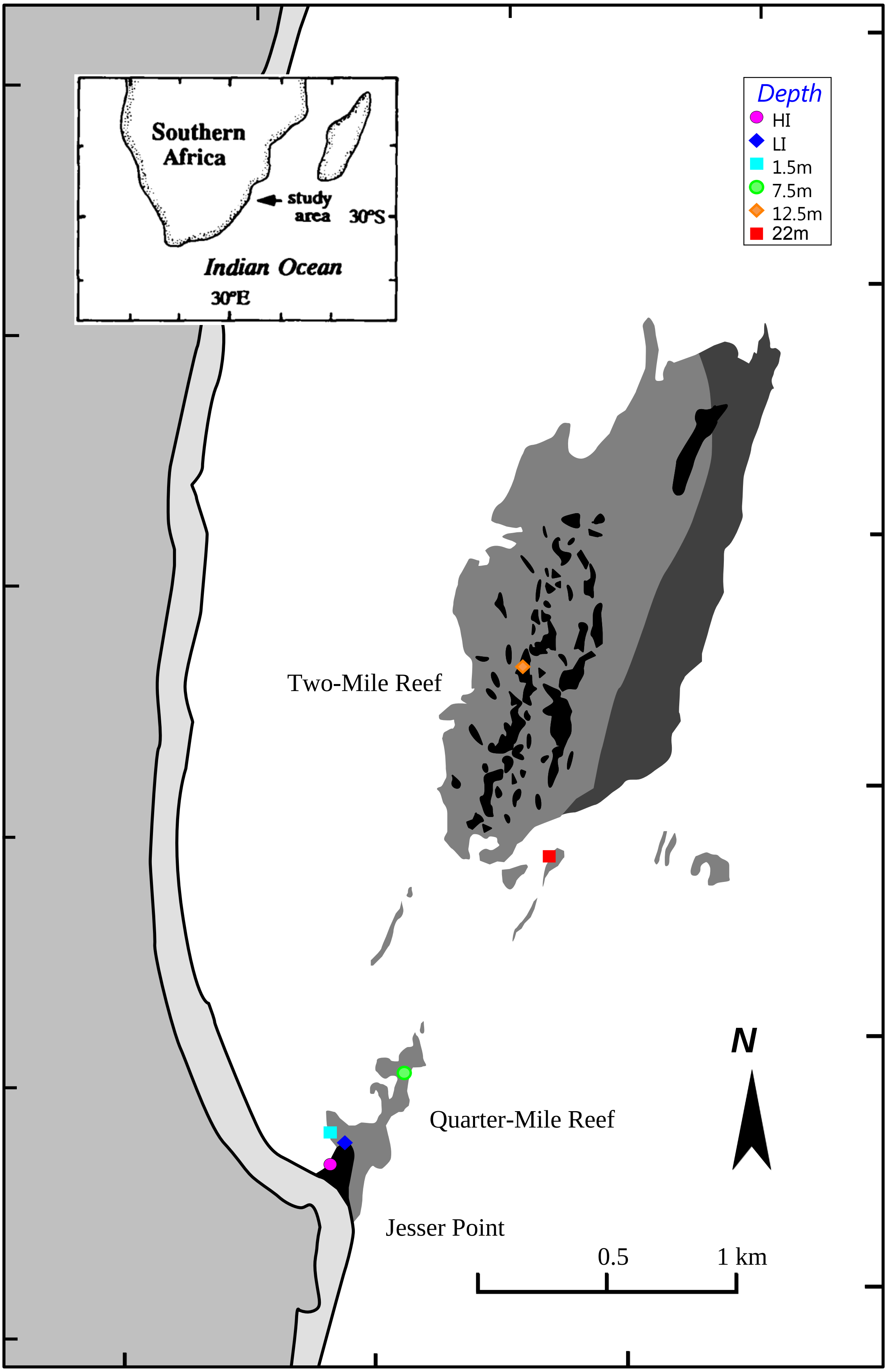


Figure 3.2 Map of Sodwana Bay, with algal turf sampling locations marked, after Ramsay (1996).HI = High intertidal, LI =Low intertidal.

Samples were processed first by sieving through a 1 mm mesh, preserving the sediment. All visible animals were removed from the sample for a total of one man-hour, or until no specimens were found after searching for five minutes. All organisms were preserved in either 70% ethanol or 15% formalin. Algae were removed, and identified to species wherever possible. Percentage dominance was estimated for each algal taxon. Because algal turfs are incredibly diverse and hard to identify, only the major taxa in each sample were identified. After identification, all the algae from the sample were weighed together. The remaining sediment from the sample was combined with that which passed through the sieve and a wet-weight was taken.

Macroinvertebrate specimens were sorted according to phyla and Arthropoda and Annelida were identified down to species wherever possible. Echinodermata and Mollusca were identified to Class and morphospecies, with the exception of Ophiuroidea, which were assigned to species. Other phyla were retained, but not included in this analysis due to time constraints, and lack of availability of taxonomic facilities or experts who could accurately identify specimens to species level.

Data Analysis

From the laboratory and field data, three datasets were compiled: one of macroinvertebrate species richness and abundance, one of estimated algal biomass, and one with environmental variables. Macroinvertebrate abundance was used, and juveniles and damaged specimens, which could only be identified to an amalgamated species group, were removed from the dataset. The estimated weight of each algal taxon was calculated by multiplying the estimated relative abundance of the algal taxa by the total algal biomass of the sample. The environmental variables examined were depth, sediment weight and algal weight.

Algal species were assigned to functional groups, based on the structure of the thallus, following Steneck and Dethier (1994). Invertebrate species were assigned to feeding guilds, based on their mode of feeding, as given in the literature. For polychaetes, the classification used follows Fauchald and Jumars (1979). For arthropods, feeding guilds were assigned based on studies of individual taxon's feeding habits. Where species exhibited multiple feeding strategies, the most dominant one was used. Where there was not enough scientific information to assign a species to a feeding guild, they were designated "undefined".

Parametric statistical tests were conducted using Statistica statistical software. For multivariate analysis of community data, PRIMER-E software was used. The similarities between samples were examined to determine how species assemblages related to the depth of the sample. Species were fourth root transformed to down-weight highly abundant taxa and a resemblance matrix was generated using Bray-Curtis similarity. Non-metric multidimensional scaling demonstrated the multivariate pattern in community samples. From the resemblance matrix, an ANOSIM analysis was run to determine whether communities significantly differed between depths. From the non-transformed abundance dataset, a SIMPER analysis was run to ascertain which species were most important in structuring the different communities at each depth. Species accumulation curves were plotted and first-order jackknife, a species richness estimator, was also calculated.

The relationship between the macroinvertebrate community and environmental variables was also examined for the algal turf samples. This was accomplished using second stage resemblance analysis. Clarke *et al.* (2006) delineate the statistical basis and reccommend some biological applications for this approach, which compares similarities between multivariate patterns in different datasets. This technique has been used to compare the spatial patterns between different classification schemes of the same species dataset (Surugiu *et al.* 2010) and different taxonomic groups within the same community (Papageorgiou *et al.* 2007).

Second stage analysis was done by comparing community patterns between the various datasets by generating a matrix of rank correlations between the previously generated resemblance matrices. Samples from the high intertidal were excluded from the second stage analysis due to low species abundance, as were those Echinodermata and Mollusca that could only be identified to morphospecies, and so could not be assigned to a feeding guild.

Datasets used were macroinvertebrate species composition, macroinvertebrate feeding guilds, Algal species composition, algal functional groups, sample volume (sediment wet weight and algae wet weight) and depth.

If invertebrates are functional group specific in their habit, rather than selecting for specific algal species, then the macroinvertebrate dataset will be more similar to the algal functional group dataset than the algal species dataset. In a second stage MDS, these points would be plotted closer together.

3.3 Results

Biodiversity

In total, 314 species of motile invertebrates were found inhabiting algal turfs (Table 3.1). A complete listing of all species recorded from algal turfs is included in Appendix 1. Arthropoda was the most speciose and abundant group, with 119 species in 64 families from 1001 individuals. Annelida was the second most abundant, with 82 species in 24 families from 790 individuals. Mollusca and Echinodermata represented a smaller portion of the community, with 81 and 32 species respectively. Several species represented new records for South Africa or new species to science (see Chapter 4, 5).

Table 3.1 Distribution of macroinvertebrate species richness among Phyla identified from algal turf in Sodwana Bay.

		No. Families	No. Species	Abundance
Arthropoda	Amphipoda	24	49	836
	Decapoda	12	26	47
	Isopoda	10	16	29
	Pycnogonida	4	10	19
	Tanaidacea	5	8	44
	Harpacticoida	4	4	9
	Stomatopoda	1	2	2
	Ostracoda	2	2	12
	Cumacea	2	2	3
Annelida	Phyllodocida	8	40	533
	Eunicida	4	17	90
	Terebellida	4	10	33
	Scolecida	3	5	30
	Sabellida	2	4	19
	Amphinomida	2	3	36
	Spionida	1	3	49
Mollusca	Gastropoda		53	270
	Bivalvia		26	118
	Polyplacophora		2	14
Echinodermata	Ophiuroidea		20	91
	Holothuroidea		5	16
	Echinoidea		4	12
	Asteroidea		2	3
	Crinoidea		1	1

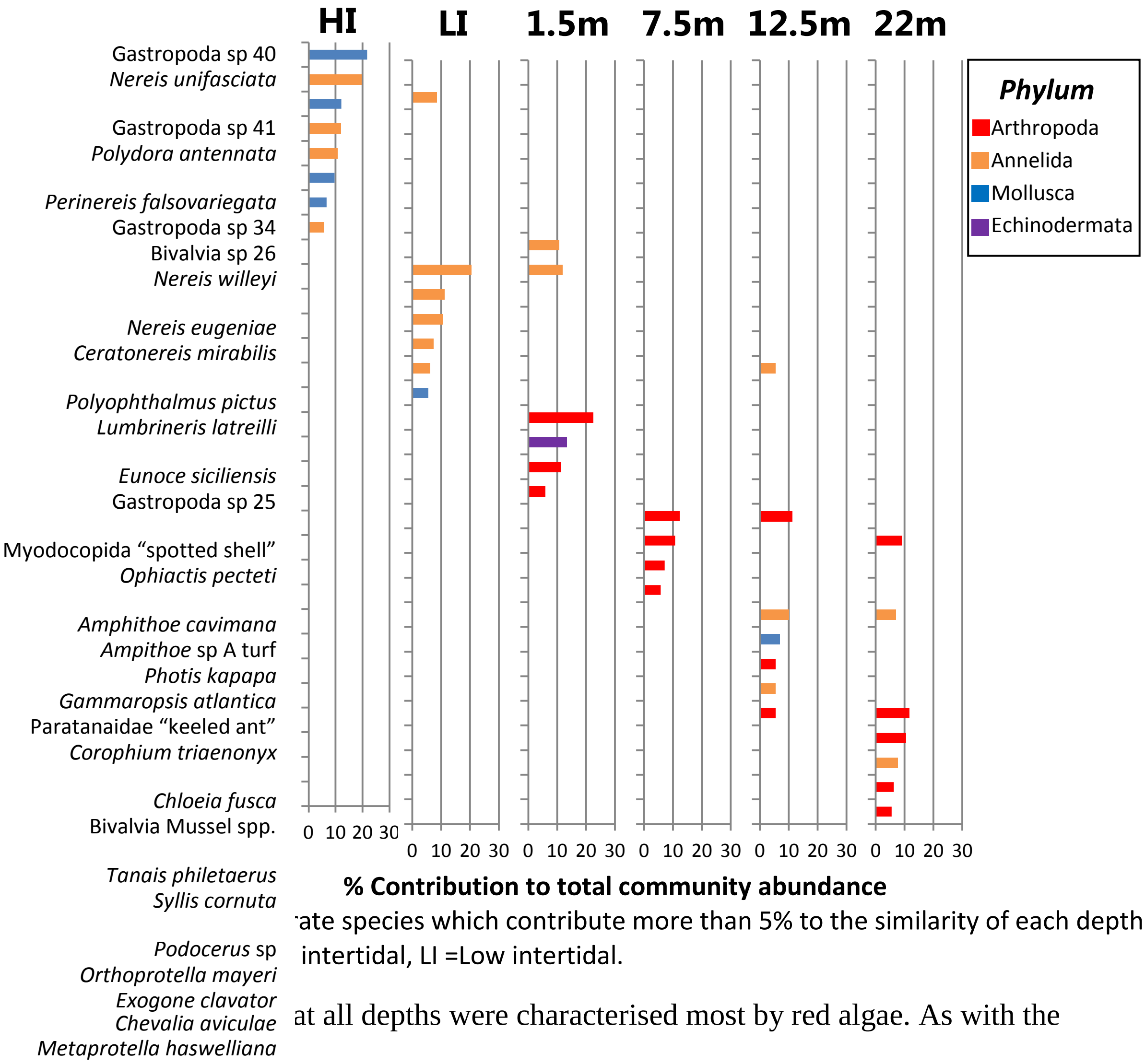
Macrofauna from the algal turf biotopes in Sodwana Bay were very depth specific. This is true not only of the macroinvertebrates, but also of the dominant algal turf species themselves. In fact, most species were highly depth specific, with 67% of the species found being specific to only one depth. Very few taxa were found to be generalists present at multiple depths.

A total of 72 algal species were collected from algal turf quadrats in Sodwana Bay. Rhodophyta was the most speciose (40 species), and accounted for the most biomass from turfs. Chlorophyta was more speciose than Phaeophycea, but accounted for less biomass.

Table 3.2 Algae species collected from algal turfs in Sodwana Bay.

	No. Species	Total Biomass (g)
Rhodophyta	40	1191
Phaeophyceae	14	330
Chlorophyta	18	150

The taxonomic composition of samples varied greatly between the different depth groupings, with intertidal samples being characterised mainly by polychaetes and molluscs, and arthropods being found more consistently across intertidal samples than they were in subtidal samples (Figure 3.3). Samples from the high intertidal were characterised mainly by two gastropod species, by the nereid polychaete *Nereis unifasciata* (which is also characteristic of the low intertidal) and the syllid polychaete *Polydora antennata*. Samples from the low interidal were dominated by polychaetes, with nereids including *Nereis eugeniae*, *Ceratonereis mirabilis* and *N. unifasciata*, as well as the opheliid polychaete *Polyophthalmus pictus* being characteristic. A myodocopid ostracod contributed the most to the similarity of samples from 1.5 m; it was found most consistently across the five replicates, although in quite low abundance. *Ophiactis pecteti* a brittle star, also characterised the 1.5 m samples and was found in quite high abundance in one replicate. This was the only echinoderm abundant enough to make a substantial contribution to the similarity of a depth grouping. Nereid polychaetes also contributed to the similarity of the depth, although those species were also present in significant numbers in the intertidal. Samples from 7.5 m were primarily characterised by arthropods, with three amphipods and a tanaiid contributing the most to the similarity of the depth group. The 12.5 m samples were the least unique of the depth groups, with the top two contributing species to the similarity of the depth also being found in substantial numbers at other depths. *Photis kapapa* (an amphipod) was also characteristic of the 7.5 m samples, and *Chloeia fusca* (a polychaete) and *Podocerus* sp. (an amphipod) also being characteristic of 22 m samples. The 22 m samples were characterised mainly by amphipods and polychaetes, with the amphipods *Podocerus* sp. and *Othroprotella mayeri* contributing the most to the similarity of the samples.



ate species which contribute more than 5% to the similarity of each depth intertidal, LI =Low intertidal.

at all depths were characterised most by red algae. As with the macroinvertebrates, few species were found to contribute substantially to the similarity of more than one depth group. The exceptions to this are *Jania verrucosa*, found in the low intertidal and at 1.5 m, and *Hypnea* sp., at 7.5 m and 12.5 m. Also, *Gelidiopsis* sp., although it's discontinuous range and generic level identification may suggest that this is two species. Green algae occur in substantial numbers in the intertidal, with *Enteromorpha* sp. contributing 13% to the similarity of all samples from the high intertidal, and *Phyllodictyon anastomosans* contributing 10% to the similarity of lower intertidal samples.

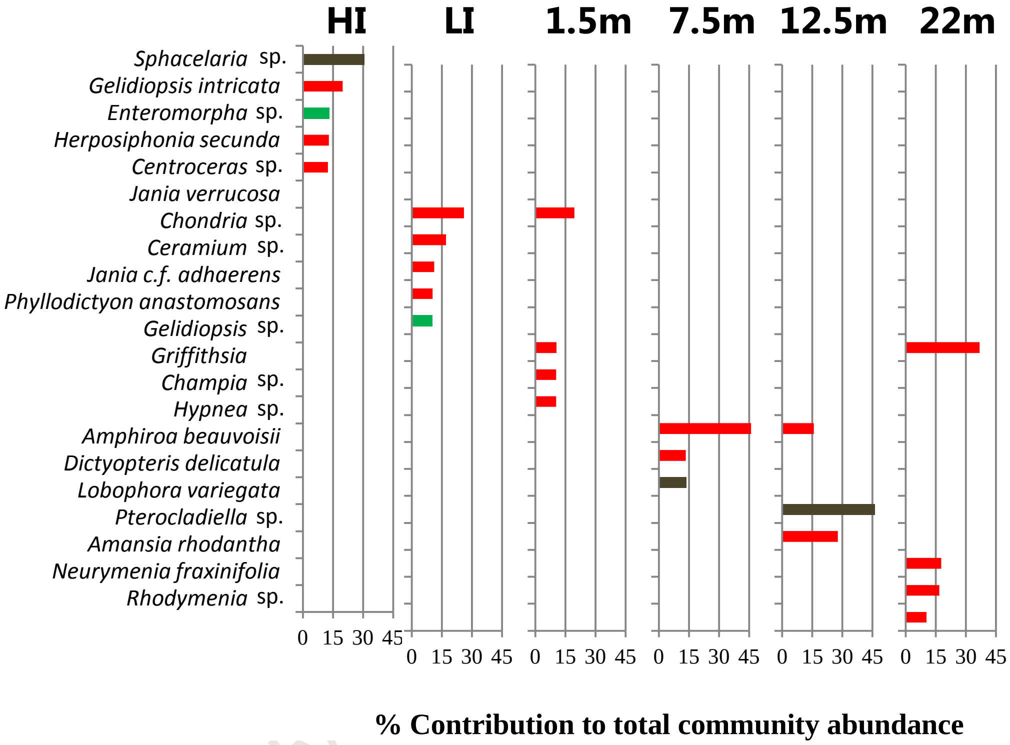


Figure 3.4 Algal species which contribute more than 10% to the similarity of each depth group (SIMPER). HI = High intertidal, LI =Low intertidal.

Although 307 macroinvertebrate species were identified from the samples, this is only a portion of the actual total biodiversity of algal turfs in Sodwana Bay. A species accumulation curve, based on a permutation of the cumulative number of species plotted against the number of samples collected, is shown in Figure 3.5. This curve is not approaching an asymptote, as is evident by the slope of the accumulation curve near the end of the fifteen samples. The species richness estimator, first-order jackknife predicts a total species richness of 470, which is more than 150% of the observed species richness. The curve of the jackknife estimator is also not approaching an asymptote, and is not approaching the species accumulation curve. Rather, after 30 samples, it is still diverging from it.

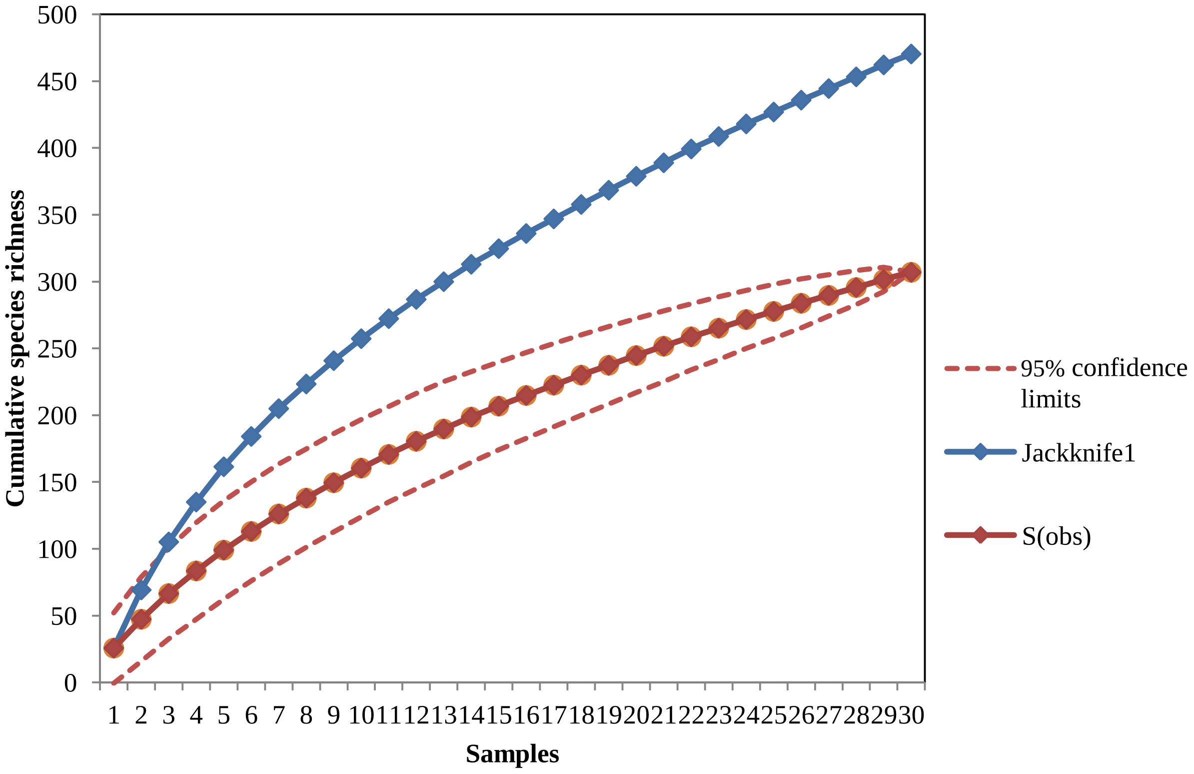


Figure 3.5 Species accumulation curve for macroinvertebrates from seagrass beds in Sodwana Bay.

A trend of increasing biodiversity with depth was evident (Figure 3.6). Although there was a significant regression between biodiversity and depth ($r^2=0.358$, $p<0.05$) with a reasonable slope , in considering the scatterplot, it appears that the more accurate trend would be that there is a break in biodiversity between samples in the surf-zone (HI, LI, 1.5 m) and the deeper, more sheltered reefs (7.5 m, 12.5 m and 22 m) rather than a gradient in biodiversity between HI and 22 m.

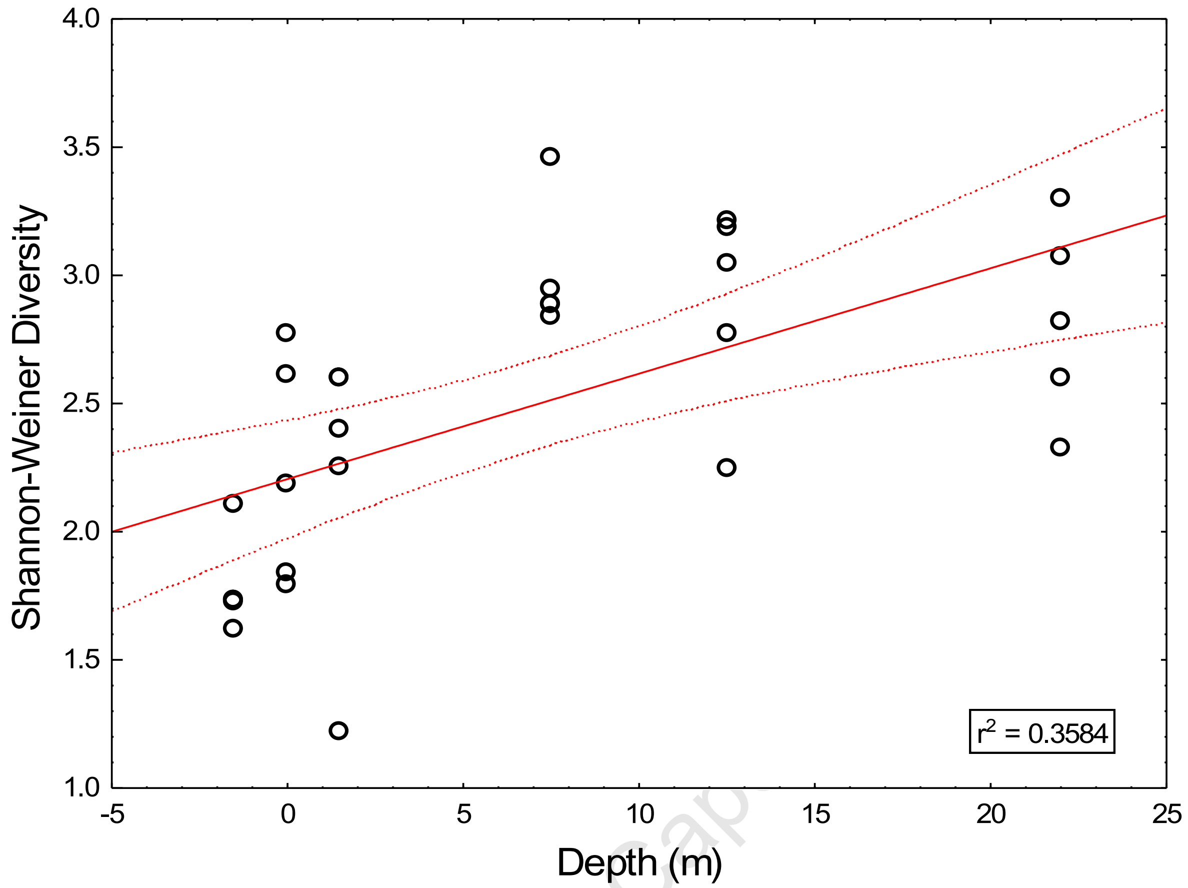


Figure 3.6 Macroinvertebrate diversity from algal turfs increases with depth from the high intertidal to 22 m.

The macroinvertebrate communities showed a distinct grouping pattern (Figure 3.7), with each of the sets of replicate reef samples grouping close to each other, and the shallower rocky shore samples grouping apart, and showing greater variation within the depth groups. The macroinvertebrate communities at each depth were highly significantly different from each other (ANOSIM,Global test: $R=0.904$, $p<0.01$; Pairwise tests: $R\geq0.682$, $p<0.01$), which correlates with the SIMPER analysis, where very few species are shared between depths in any notable numbers (Figure 3.3).

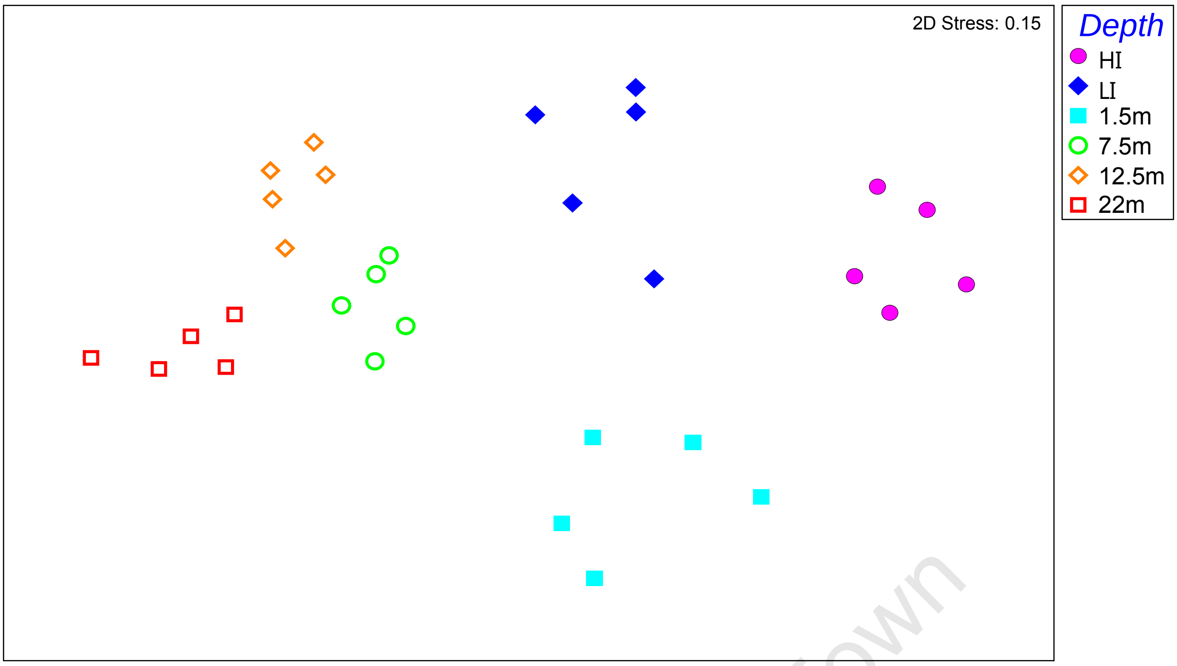


Figure 3.7 Multidimensional scaling plot of macroinvertebrate communities in algal turfs from six depths. HI = High intertidal, LI =Low intertidal.

Influence of functional groups

The relative proportions of the different feeding guilds change with the depth sampled (Figure 3.8). The number of grazers was greatest at the shallow depths, and declined in samples from the deeper reefs. The proportion of deposit feeders declined with depth. Filter feeders showed the opposite trend, with the filter feeding proportion of the fauna increasing with depths, the exception being in the high intertidal.

Algal biomass was greatest in the lower intertidal (Figure 3.9), where the predominant algal functional group was articulated calcareous algae. The 22 m samples showed very little algal biomass. Corticated macrophytes were found at a similar biomass across all depths except 22 m. More filamentous algae was found in the surf zone than on subtidal reefs.

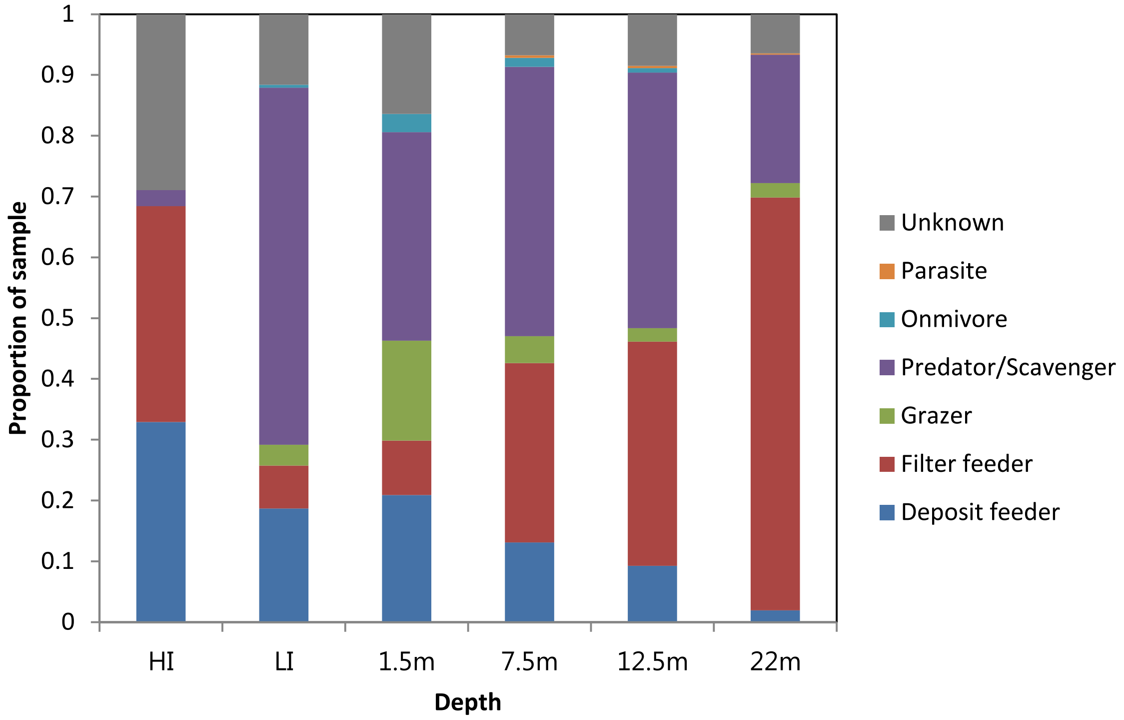


Figure 3.8 Feeding guilds of macroinvertebrates inhabiting algal turfs in Sodwana Bay

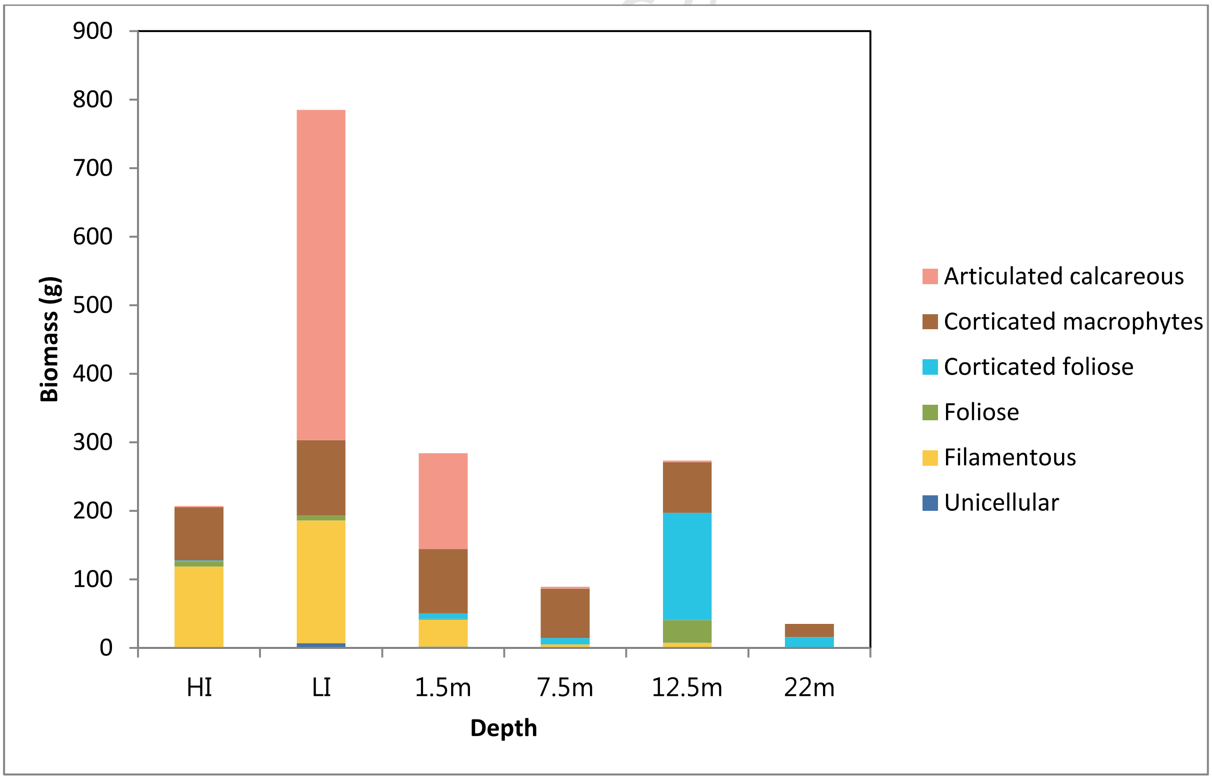


Figure 3.9 Biomass of algae in algal turfsampled at various depths in Sodwana Bay, by functional group.

A second stage MDS represents the relation of the different algal turf datasets to each other(Figure 3.10). Points closer together in the MDS ordination derived from this second stage resemblance matrix show more similarity in the patterns of the relation of samples to each other. The first stage MDS plots of these datasets are represented in Figure 3.11. There is a fair amount of variability in the pattern of similarity between samples for the various datasets for macroinvertebrate and algal species composition, feeding guilds, functional groups and physical variables. The pattern in samples for algae species and algal functional group are approximately equally similar to depth. Macroinvertebrate species are more closely related to depth than macroinvertebrate feeding guilds (Figure 3.10). None of the biotic datasets seem to be particularly closely related to sample volume.

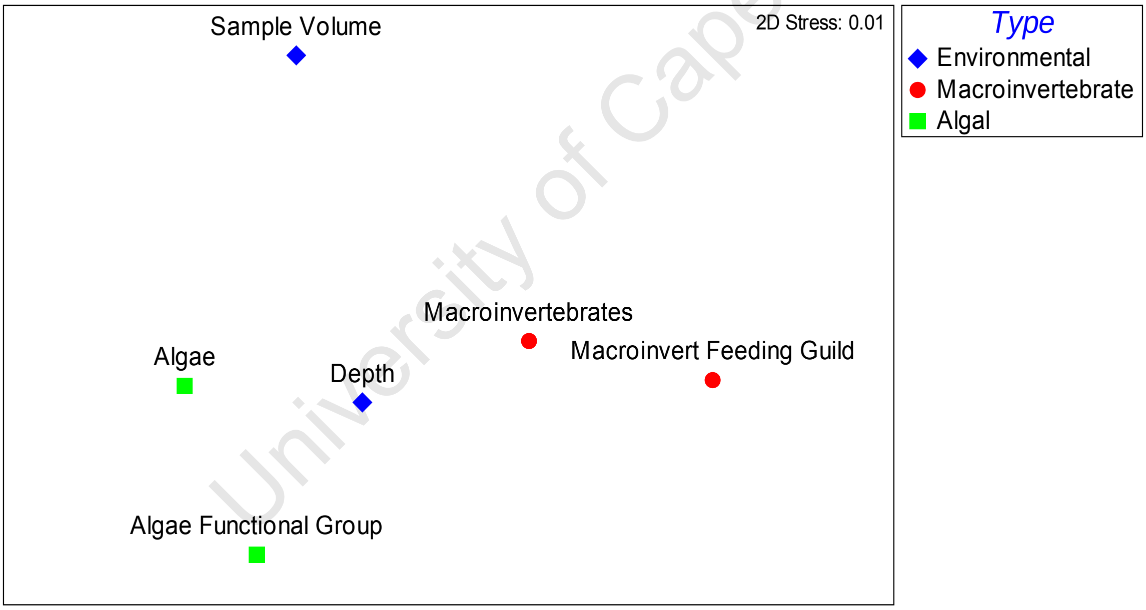
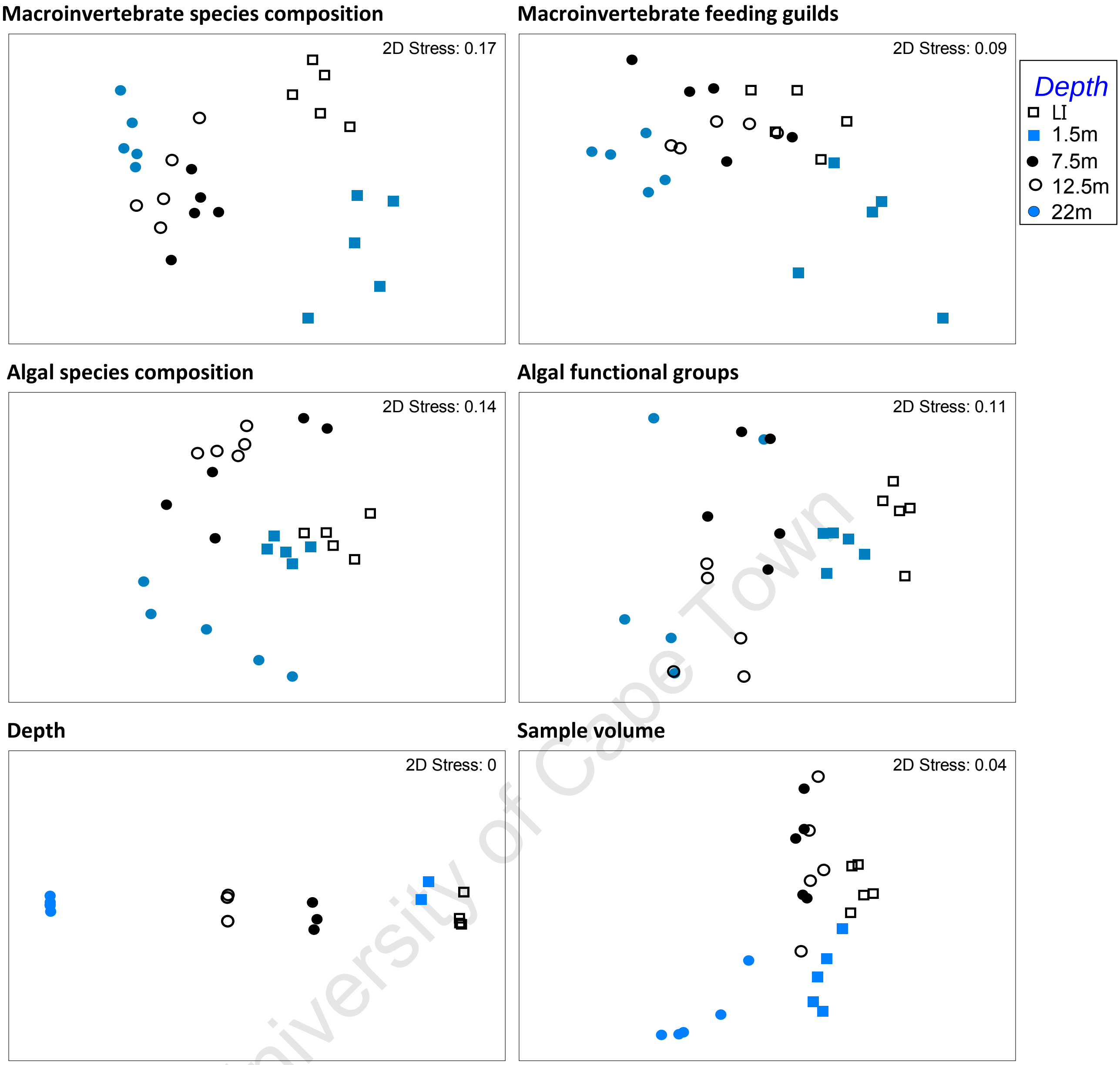


Figure 3.10 Second stage MDS of six different datasets from algal turfs in Sodwana Bay.



Macroinvertebrate species composition

Macroinvertebrate feeding guilds

Algal species composition

Algal functional groups

Depth

Sample volume

Figure 3.11 MDS plots of samples generated from six different datasets for algal turfs at five depths. LI =Low intertidal.

3.4 Discussion

Biodiversity

A key finding of this study was that macroinvertebrate diversity increased with depth. This is a fairly commom phenomenon among marine communities. Another study in Sodwana Bay, focusing on sponges (Samaai *et al*. 2010) found a similar depth trend, with a maximum of 53 species found at 20 m. Diversity of macroinvertebrates in this study peaked at 12.5 m. Both these depths correlate to the depth range of coral reefs.

Community ecology

This study found that the main determinant of invertebrate community structure was depth, with only 33% of the invertebrate species found being present at more than one depth. Additionally, the dominant species, which typify the community, were almost entirely different for each of the various depths sampled. This suggests that in terms of their macroinvertebrate communities algal turfs in Sodwana Bay are not uniform. Despite being fairly unassuming in appearance, algal turfs represent a sizeable contribution to the biodiversity of the reefs and rocky shore in Sodwana Bay. The contribution of macroinvertebrates to the diversity of Sodwana Bay is covered in more detail in Chapter 5.

The decline of grazers with depth is to be expected, as algae do not grow well at deeper depths due to light attenuation. Anderson *et al.* 2005, in their study of Sodwana algal turfs, found a similar decline in algal biomass with depth. Anderson *et al.* reported 104 algal species, compared to this study’s 72. However, while there was much less taxonomic effort put into identifying small, cryptic turf species, there were more green- and brown algae species identified in this study than in the previous, much more thorough account (18 and 14 species to their 14 and 8). This may be attributed to the slightly different depth range between the two studies (Anderson *et al.* did not include intertidal), and the increase in algal taxonomic knowledge since 2005.

Community composition

The three deeper depth groups show less variation between depths compared to the samples in the surf zone, despite being collected from sites more disparate in terms of both depth range and geographical distance. This is likely due to the greater physical stress in the intertidal and surf zone, with specific adaptations required by the different levels of desiccation and wave stress. The National Biodiversity Assessment (Sink *et al.* 2011) decided to revise the previous depth classification, which separated depth zones into Supra-tidal, Intertidal and shallow photic zone into a coastal type and an inshore zone, with 5 m depth forming the boundary between the two. They did this to support better linkage between the terrestrial and the benthic-pelagic environment, and on the supposition that the light and wave energy of the surf zone placed it better with the coastal type. The division in macroinvertebrate communities supports that decision, and provides evidence that macroinvertebrates in the surf zone are more closely related to intertidal communities than those at deeper depths.

Influence of functional groups

Algae functional groups do not appear to have a particular effect on macroinvertebrates, as algae species composition and algae functional groups are equally similar to macroinvertebrate species composition. The macrofaunal community is not more closely related to algae species composition than to algae functional groups, suggesting, in this case, that functional group is not an important factor in structuring macroinvertebrate community.

However, the pattern of samples based on macroinvertebrate feeding guild is less similar to algae than that based on macroinvertebrate species composition. This may suggest that macroinvertebrate feeding guild is unrelated to the functional group composition of its hosting algal turf. However, it is more likely due to the varying influence of depth on the samples than any finer-scale interaction between the species.

The second stage analysis shows no great difference in similarity between the macroinvertebrate community and algae species composition of functional groups. This then does not suggest that macroinvertebrates are selecting for functional group, or for specific algal species. This is likely due to the highly depth-stratified nature of the data, whereby most species (both algal and invertebrate) were found at only one depth, meaning that the effective sample size available for detecting a relationship between a macroinvertebrate specificity and algal grouping is only the five replicates, and not the 30 samples collected. Due to this depth stratification, rather than detecting the relationship between macroinvertebrates and their habitat-structuring algal turf, this technique is more likely to just detect the level of influence that depth has on the communities.

In this case, depth is a complicating factor, and the second stage analysis appears to be detecting not the variance of the component datasets in relation to each other, but rather measuring differences in their response to depth, over a 22.5 m range.

This study did not show any strong evidence for invertebrates selecting for functional group over algal species. However, due to the small sample size, and the strong, overwhelming influence of depth on the samples, I would regard this as inconclusive, rather than as evidence against the hypothesis that invertebrates select for functional group rather than individual algal species.

One problem with using functional group as a surrogate for measured diversity is that even within a single species, there can be great variation in complexity, which can have a measurable effect of the associated faunal community (Leite *et al.* 2007). This may make algal turfs a non-ideal ecosystem in which to study the effect of algal functional group, as often algal turfs are composed of stunted, small forms of larger macrophyte species (Miller *et al.* 2009), and so do not follow the standard functional group classification of the species. This may also mean that the absence of a structuring role for functional groups in algal turfs does not invalidate the theory, and if scientific consensus is found in favour of the faunal structuring role of functional groups, it may not be applicable in all ecosystems (algal turfs among them).

However, I believe this may be tried again and suggest that this technique may prove quite useful in an environment that is more uniformly variable, and not subject to such a strong structuring variable. Although it would build on more species-specific studies, which examine the relation between specific species and specific functional groups, the technique may be able to discern the role that these relationships play in a complex community.

Although the second stage analysis from this study was not particularly clear, I believe this approach may be used to complement experimental approaches in determining the role that the functional group of algae plays in structuring resident invertebrate communities.

This study has attempted to use second stage MDS as a field based complement to single algae species studies examining the relation between algae functional group and hosted invertebrate assemblages. Although this study was ultimately unsuccessful in determining any strong associations between groups, I believe the technique may prove useful as a tool to measure interactions between functional group diversity and invertebrates in a multi-species habitat.

Chapter 4: Amphipod Taxonomy

4.1 Introduction

The principal aims of this chapter are to add two new species and several new records, identified during the survey work described above, to the regional amphipod fauna and at the same time to provide a single, unified and taxonomically updated listing of all amphipod species currently known from South Africa, including marine, freshwater and terrestrial components of the fauna. This is accomplished largely with the amalgamation of existing published records and the incorporation of taxonomic revisions derived from the literature. Species described here as new or recorded from the region for the first time are indicated as such in the following species accounts.

No listing of all known South African representatives of the Order Amphipoda has been published since Barnard (1940). Subsequent literature has in fact been almost completely divided into separate components dealing with marine, freshwater, or terrestrial species and, indeed, within the marine fauna, with separate planktonic and benthic components. The latest major review of the planktonic marine suborder Hyperiidae was published by Dick (1970) and very little additional research has been done on this group in South African waters since that time, although there have been some revisions of the taxonomy of the group as a whole, and these have resulted in some additional records and changes in nomenclature of South African species, which are detailed below. The benthic marine Amphipoda of Southern Africa were last listed by Griffiths (1976a), but many additional species and records have been documented since that time, principally by Griffiths (1976b,c, 1977, 1979). Many existing taxa have also been subject to taxonomic revision by authors working outside of the region and these changes are each documented in the text that follows. The familial classification of marine amphipods has also undergone considerable revision since 1976 and the present list follows the familial structure suggested in the comprehensive review of the families and genera of marine gammaridean Amphipoda by Barnard and Karaman (1991), except where well-accepted subsequent changes in familial taxonomy have taken place. Thus, changes in familial structure subsequent to Griffiths (1976a), but appearing in Barnard and Karaman (1991) are not discussed individually in the taxonomic account that follows, but the sources of those changes post 1991 are detailed and referenced.

A considerable number of additional freshwater amphipod species have been described from South Africa in recent decades, and these fall into two distinct groups – members of the sub-Order Gammaridea falling within the families Paramelitidae and Sternophysingidae, and those within the Sub-Order Ingolfiellidae. A revision of the South African Paramelitidae was published by Stewart and Griffiths (1995), while new species within the Sternophysingidae have been described by Griffiths (1981, 1991) and Griffiths and Stewart (1996). A key to all known freshwater species in both groups is also provided in Griffiths and Stewart (2001).

The Ingolfiellidae of the wider Southern African region have been described by Griffiths (1989, 1991), but of these only the single marine, interstitial, ingolfiellid has been recorded from South Africa itself and this is thus the only representative included here. The larger, cave-dwelling, freshwater species are presently known only from Namibia, the Democratic Republic of Congo and Zambia. However, samples of at least one freshwater ingolfiellid from the Northern Cape Province of South Africa have been informally reported, although to date this species remains un-identified.

Only seven species of terrestrial amphipods (two of which are introduced) are known from South Africa and these are all illustrated and described by Griffiths (1999). No additional species have been reported since that time.

Appendix 2 provides a list of all valid marine, freshwater and terrestrial amphipod species known from within the political boundaries of continental South Africa, out to the limits of the EEZ. Some of the marine species listed by Griffiths (1976a) and freshwater species included by Griffiths (1981, 1989, 1991) and Griffiths and Stewart (2001) are thus excluded, since those papers covered a wider Southern African region. Species occurring in the sub-Antarctic Marion and Prince Edward Islands are also excluded, since, although these islands are politically part of South Africa, they fall within a quite different biogeographic province. The crustacean fauna of the islands has been described by Branch *et al.* (1991) and readers are referred to that paper for a list of, and key to, all known amphipods from the islands.

In the taxonomic text that follows, additional references and notes are provided only for those species which have been added to the fauna, or which have experienced a name change, subsequent to the most recent monograph for that group. The monographs chosen as departure points are Dick (1970) for the Hyperiidea, Griffiths (1976a) for benthic marine taxa, Stewart and Griffiths (1995) for the freshwater family Paramelitidae and Griffiths (1999) for the terrestrial Amphipoda. Species with status that has remained unchanged since they were treated in those monographs thus simply appear in the tabulated fauna list (Appendix 1), with no additional text entry. There is no single monograph on the freshwater family Sternophysingidae, although an illustrated key to known species in the wider region is given in Griffiths and Stewart (2001). All South African representatives of that family are thus detailed in text entries below. Within the sub-Order Ingolfiellidae only a single described species occurs in South Africa; thus a text entry is provided for this. Where new species are added to the fauna, these are illustrated. For illustrations of existing species, readers are referred to the publications listed.

To date the total number of amphipod species known from South Africa is 484, comprising 335 benthic and 105 planktonic marine species, 35 freshwater species and 7 terrestrial species. This is a dramatic increase from the 256 full species (excluding subspecies, some of which have subsequently been elevated to species rank) listed by Barnard (1940). This rapid growth rate of the known fauna is further indicative of the fact that even the greatly enhanced list given here is certainly far from complete. The deep sea is particularly poorly sampled, with less than one quantitative benthic invertebrate sample taken per 1000 km^2 in the 75% of the South African EEZ that lies deeper than 1000 m (Griffiths *et al.* 2010). This is further illustrated by the fact that, in one of the few papers on abyssal amphipods from the region, Griffiths (1977) describes a small collection of only seven species, but of these two were new to science and four of the remaining five new records for the region. Even the coastal fauna of some parts of the region is poorly explored, as exemplified by the fact that the following account reports on ten new records (including one new family) and two new species collected from a series of samples with a total area of only 2.8 m^2, collected from intertidal and shallow reef habitats in Sodwana Bay, probably the most intensively dived site in the region.

4.2 Methods

Amphipod records for this analysis were assembled from material collected in Sodwana Bay from seagrass and algal turf habitats (see chapters 2 and 3), as well as two more new records added from additional material.

Drawings were made from specimens using a stereomicroscope equipped with a camera lucida by Rebecca Milne. Whole and dissected specimens were observed in water. Measurements were taken with a scaled micrometer eyepiece.

Type specimens and new records are housed in the collections of the South African Museum.

4.3 Taxonomic section

Suborder Corophiidea Leach, 1814

Family Ampithoidae Stebbing, 1899

***Ampithoe kava* Myers, 1985 NEW RECORD**

Figure 4.1

Ampithoe ramondi J. L. Barnard 1970: 50, Figs 18-19 (non Audouin, 1826).

Ampithoe kava Hughes and Lowry 2009: 161-164, Figs 5-6.

Specimens of this species were collected from seagrass beds on Jesser Point in Sodwana Bay, in March 2010. This is the first record of this species in South Africa. *Ampithoe kava* is distributed throughout the Indo-Pacific, including the Red Sea, Mauritius, Australia, Tonga, Fiji and Hawaii.

Ampithoe kava is similar to *A. ramondi*, but differs in the male gnathopod 2; in *A. ramondi* the thumb-like process is separated from the palm by a round-bottomed excavation, whereas in *A. kava* it is separated by an acute cleft. *Ampithoe kava* also has a ventral rounded spur on the distal end of uropod 1, which is absent in *A. ramondi*.

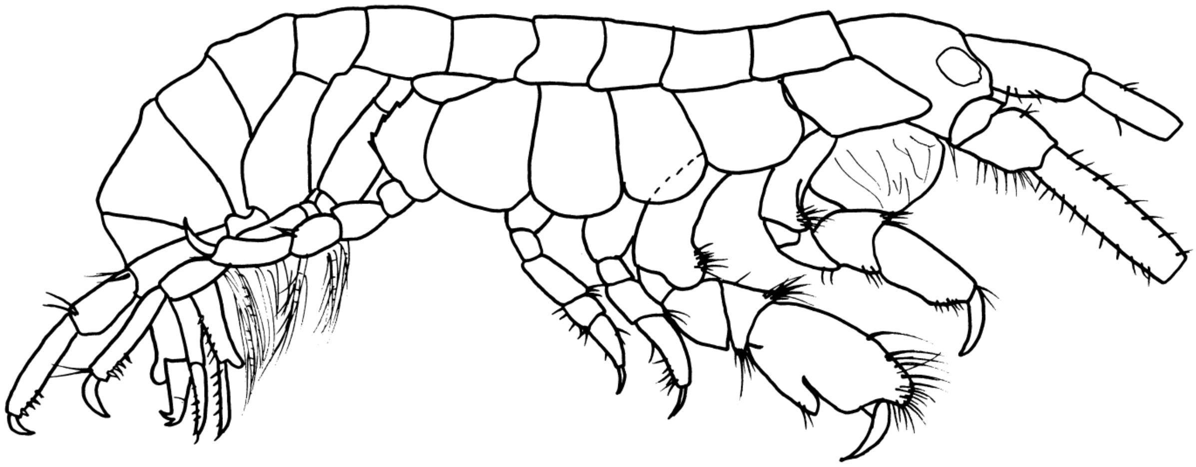


Figure 4.1 *Ampithoe kava* Myers, 1985, male, Jesser Point, Sodwana Bay, KwaZulu-Natal.

***Cymadusa cavimana* (Sivaprakasam, 1970) NEW RECORD**

Figure 4.2

Ampithoe cavimana Sivaprakasam 1970: 65-68, Fig. 1; Ledoyer 1982: 116-117, Fig. 37.

Cymadusa cavimana Appadoo and Myers 2004: 343; Hughes and Lowry 2009: 174-178, Figs 13-14.

Cymadusa cavimana was recorded from seagrass beds off Jesser Point in Sodwana Bay, in March 2010. This is a new record for South Africa, and the African mainland. This species has also been found in India, Australia, Indonesia, Madagascar and Mauritius.

Cyamadusa cavimana is notable for the shape of the palmar process on gnathopod 2, which forms a flattened platform for the swollen tip of the dactyl. It differs from *C. filosa*, the other *Cyamadusa* species known from South Africa, based on the form of gnathopod 2, but also on the number of setae on the margins of coxae 1-4: *C. filosa* having setae all along this margin, and *C. cavimana* having only a patch of slender setae on the latter coxae.

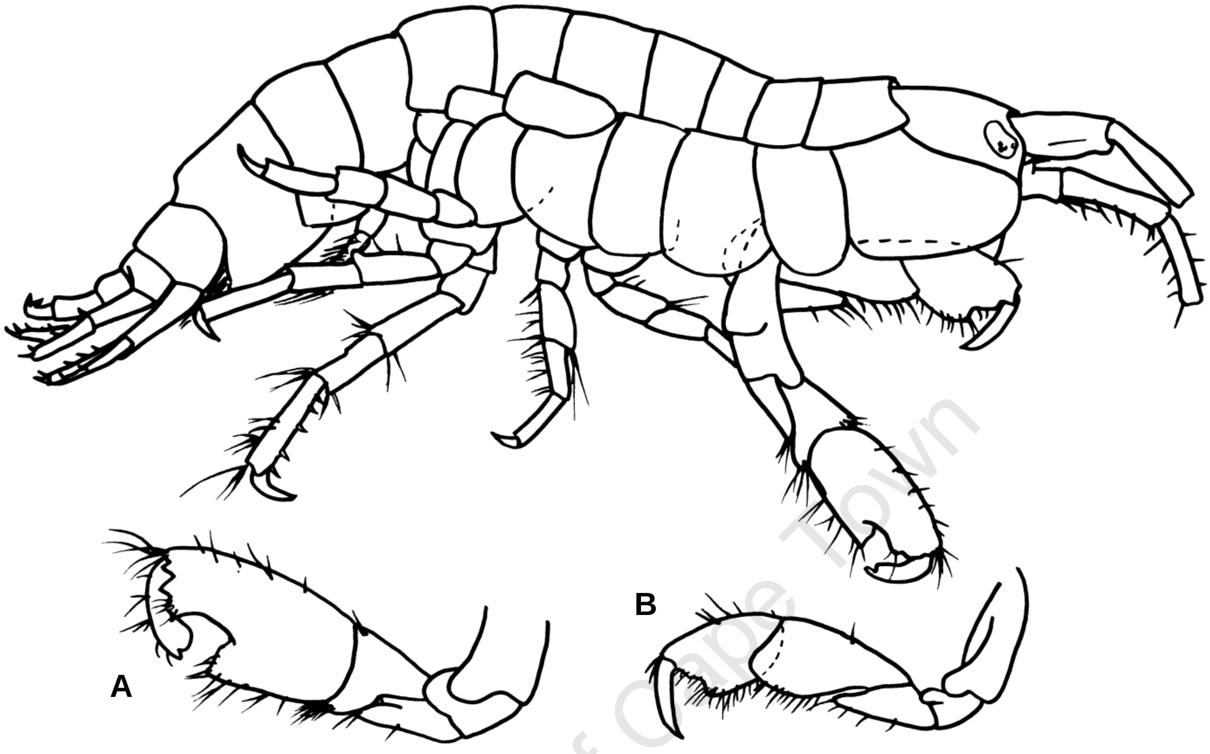


Figure 4.2 *Cymadusa cavimana* (Sivaprakasam, 1970), male, Jesser Point, Sodwana Bay, KwaZulu-Natal. A: Gnathopod 2. B: Gnathopod 1.

Macropisthopus stebbingi **K.H. Barnard, 1916**

Macropisthopus stebbingi K.H. Barnard 1916: 260-262, Pl. 27, Fig. 15-17.

Ampithoe stebbingi Griffiths 1979: 137, Fig. 3D-E.

Although we maintain the original name for this species some clarification of the reasons for doing so are required. The species was described as the type of a new genus by Barnard (1916) but Griffiths (1979) proposed that the genetic distinction between *Ampithoe* and *Macropisthopus,* which is based largely on the expanded, oar-like pereiopod 5 in the former, was inadequate to distinguish between genera, and suggested that they should be amalgamated under the name *Ampithoe*. This recommendation appears to have gone unnoticed in the subsequent literature, which has included revision of *Ampithoe* itself by Conlan and Bousefield (1982). Since *M. stebbingi* also continues to be recognised as the type of the monotypic genus *Macropisthopus* in the subsequent monograph by Barnard and Karaman (1991) we consider it best to retract the proposal to amalgamate the genera and to retain the original generic name.

Peramphithoe n. sp. NEW SPECIES

(note: the names of proposed new species are not included in this dissertation so that the dissertation cannot be regarded as constituting a formal first description of the species – this is only appropriate in a journal following applicable peer-review)

Amphithoe humeralis Griffiths 1979: 132-133, Figs 1-3 (non Stimpson, 1864).

non *Perampithoe humeralis* Conlan and Bousfield 1982: 61-63, Fig. 11.

Conlan and Bousfield (1982) place *A. humeralis* in their new genus *Perampithoe*, but suggest that the South African specimens described by Griffiths (1979) represent a separate species based on various differences in the shape and structure of the limbs and mouthparts. Since a fairly complete description of the South African material has already been provided by Griffiths (1979), the species described there is now elevated to species rank.

Perampithoe falsa (K. H. Barnard, 1932)

Ampithoe falsa K.H. Barnard 1932: 34; 1937 170-171; Ruffo 1969: 57-62, Figs 18-20.

Paramphithoe falsa Conlan and Bousfield 1982: 60.

The best available description of this species is the detailed one given by Ruffo (1969) and the species is listed here since it has been re-allocated to the new genus *Perampithoe* by Conlan and Bousefield.

Family Aoridae Walker, 1908

Aora inflata Griffiths, 1976

Aora inflata Griffiths 1976b: 19-21, Fig. 5.

Described from False Bay, in coarse sand.

Autonoe hirsutipes (Stebbing, 1895)

Lembos hirsutipes Myers 1976: 460-466, Figs 101-104.

Autonoe hirsutipes Myers 1988: 188.

This species has been re-described in detail by Myers (1976) and subsequently moved to the genus *Autonoe* by Myers (1988).

Bemlos teleporus (K. H. Barnard, 1955)

Lembos teleporus Ledoyer 1982: 291-294, Fig. 108.

Bemlos teleporus Myers 1988: 188.

Transferred to the genus *Bembos* in the course of a revision of the sub-family by Myers (1988).

Grandidierella nyala **(Griffiths, 1974)**

Neomicrodeutopus nyala Griffiths 1974c: 283-285, Fig. 7.

Grandidierella nyala Myers 1981: 214.

Neomicrodeutopus was incorporated into *Grandidierella* by Myers (1981).

Xenocheira leptocheira (**Walker, 1909)**

Lembos leptocheirus Griffiths 1975: 114.

Bembos leptocheirus Myers 1988: 188.

Moved to *Bembos* by Myers (1981) and then again to *Xenocheira* in Barnard and Karaman (1991).

Family Caprellidae Leach, 1814

The following account follows the familial classification proposed by Myers and Lowry (2003), who proposed a suborder Corophiidea Leach, 1814 to incorporate the former Suborder Caprellidea, plus the Caprogammaridae, Dulichiidae and Podoceridae. In this system those Caprellids divided amongst the families Caprellidae, Pthiscidae and Aeginellidae by Griffiths (1976a) have been merged into a single family Caprellidae. The parasitic ‘whale lice’ remain unchanged in the family Cyamidae. Note that this system supercedes that of Laubitz (1993), who proposed a new taxonomy for the Caprellidea that involved the erection of several new families, in addition to those previously used.

***Metaproto novaehollandiae* (Haswell, 1880)**

Metaproto novaehollandiae Guerra-García and Lowry 2009: 313-315, Fig. 12.

Added to the fauna based on a first record in South Africa by McCain and Steinberg (1970).

Family Corophiidae Leach, 1814

***Cheiriphotis durbanensis* K. H. Barnard, 1916**

Cheiriphotis durbanensis Ledoyer 1982: 191-194, Fig. 65.

Formerly incorrectly synonymized with *Cheiriphotis megacheles*, but differs from that species on the basis of its oblique palm and biramus uropod 3.

***Monocorophium acherusicum* (Costa, 1857)**

Corophium acherusicum Bousfield 1973: 201, Pl. LXII.2.

Moved to *Monocorophium* from *Corophium* by Bousfield and Hoover (1997).

***Siphonoecetes erythraeus* Ruffo, 1959 NEW RECORD**

Siphonoecetes erythraeus Ledoyer 1982: 317-318, Fig. 118.

Griffiths (1976a) listed two South African representatives of the genus *Siphonoecetes*, but the genus had subsequently been divided into three subgenera by Just (1983). Two of these subgenera are found in South Africa. The subgenus *Centraloecetes*, which is characterised by a row of long pectinate setae along the distal margin of the peduncle of uropod 3 and by having spines only on articles 2 and 3 of the flagellum of antenna 2, is represented by *S. delavallei*, first reported by K. H. Barnard (1925). The subgenus *Orientocetes*, which lacks pectinate setae on the distal margin of the peduncle of uropod 3 and has several strong spines along each margin of article 1, as well as on articles 2 and 3 of antenna 2, is represented by *S. (Orientocetes) orientalis*, first reported by K.H. Barnard (1916).

Here we provide the first confirmed record of a third species *S. (Orientocetes) erythraeus* from South Africa, although divers have in fact been aware of the existence of this species for some time, referring to it by the common name ‘jumping sand’ (Jones 2008).

S. (Orientocetes) erythraeus samples were collected by hand from sandy substrata at 18 m depth in False Bay (collector Georgina Jones). The specimens agree closely with those described and figured by Ledoyer (1982) and are hence not figured again here. They are best distinguished from *S. (Orientocetes) orientalis* by having a single spine on the palms of both gnathopods 1 and 2 (as opposed to 5 on gnathopod 1 and 4 on gnathopod 2 in *S. orientalis*). The most distinctive characteristic in the field is, however, the distinctive Y–shaped abode and unusual mode of locomotion. The tubular stem of the abode is formed of a variety of cemented gastropod shells, calcareous polychaete tubes, barnacle shells, sand grains, etc, while the two branches each consist of a single flat piece of shell or stone (see image on p. 95 of Jones 2008). The animal moves either by crawling slowly forward or by flicking the enlarged second antennae against the substratum, resulting in the unusual mode of backward jumping locomotion that gives it the common name “jumping sand”. Similar modes of locomotion in other Siphonoecetinae are described by Just (1988), who gives a detailed account of various abodes and modes of locomotion within this group.

Family Cyamidae Rafinesque, 1815

Syncyamus aequus **Lincoln & Hurley, 1981**

Syncyamus aequus Lincoln and Hurley, 1981: 188-194, Figs 1-3.

Described as a new species ectoparasitic on Common, Blue-white and Indo-Pacific Bottlenosed dolphins collected on the Eastern Cape and KwaZulu-Natal coast of South Africa. Notable for its small adult size of less than 3 mm.

Family Ischyroceridae Stebbing, 1899

Africoecetes armatus **(Griffiths, 1974)**

Concholestes armatus Griffiths 1974c: 278-281, Fig. 5.

Africoecetes armatus Just 1983: 133: Just 1984: 229-234, Figs 4-6.

Just (1983) provided a revision of the subfamily Siphonoecetinae in which he erected and diagnosed the new genus *Africoecetes* to accommodate the species described by Griffiths (1974c). In a subsequent paper (Just 1984) he also provided a full re-description of the species.

Ericthonius ledoyeri **Barnard and Karaman, 1991 NEW RECORD**

Figure 4.3

Ericthonius latimanus Ledoyer 1986: 625-628, Fig. 238a (non Grube, 1864).

Ericthonius ledoyeri Barnard and Karaman 1991: 189.

This species is recorded here for the first time in South Africa. It was found October 2009 in Sodwana Bay, northern KwaZulu-Natal, in algal turfs on Two-Mile Reef, at 22 m depth. This species is known previously from Madagascar and Mauritius.

E. ledoyeri differs from *E. brasiliensis* and *E. pugnax* mainly in the form of gnathapod 2: *E. ledoyeri* having a distinct palm on article 6, and a series of spines on the lower margin of the expanded tooth of article 5. Pereiopod 3 also differs between the species of this genus, having an ovoid article 2 in *E. ledoyeri*, as opposed to *E. brasiliensis*, where it is quadrate and *E. pugnax*, where it has a distinct lobe.

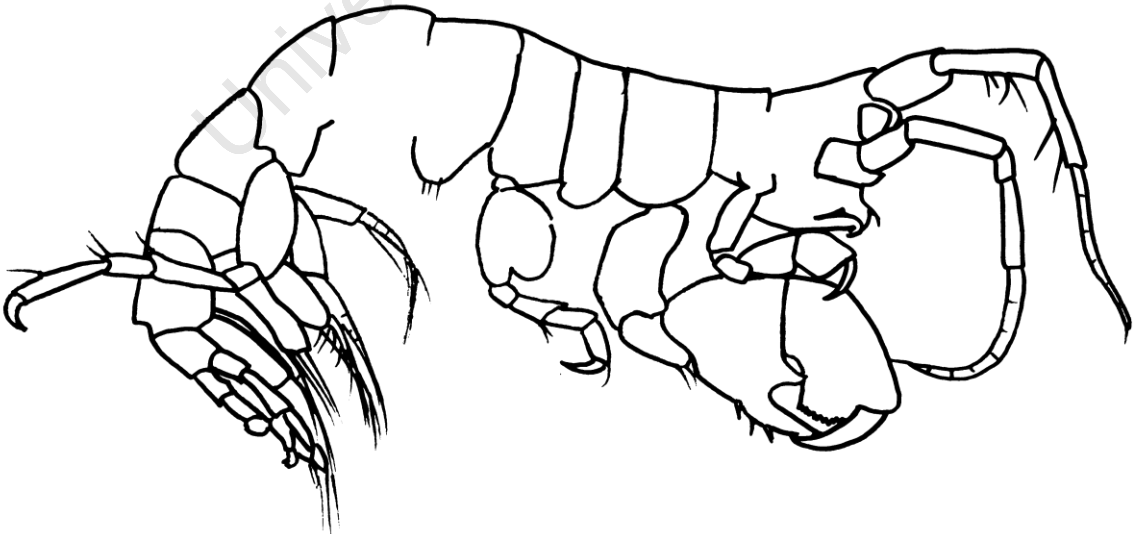


Figure 4.3 *Ericthonius ledoyeri* Barnard and Karaman, 1991, male, 2mm, Jesser Point, Sodwana Bay, KwaZulu-Natal. Specimen with parieopods and coxal plates from pereional segments 3, 5 and 6 damaged.

Ericthonius pugnax **Dana, 1852 NEW RECORD**

Ericthonius pugnax Ledoyer 1986: 628, Fig. 239.

This species is here recorded from South Africa for the first time, although it has a wide Indo-Pacific distribution, including Australia, New Zealand, Japan, Korea, India, Madagascar and Mauritius. The material was collected in 1995 from 1-5 m depth amongst fouling on mussel rafts adjacent to Port Elizabeth harbour.

The specimens agree closely with those described and figured by Ledoyer (1982) and are hence not figured again here. *Ericthonius pugnax* can be distinguished from *E. brasiliensis*, which has long been known from the region, by the form of pereiopod 3 (= p5 in the numbering system used by Ledoyer). In *E. brasiliensis* article 2 is quadrate but in *E. pugnax* it is postero-distally extended to form a hooked lobe. The form of gnathopod 2, with its expanded toothed article 5, is distinctive in species of this genus, but is very variable within species, depending on state of maturity (see Fig. 239 of Ledoyer (1986)).

Jassa marmorata **Holmes, 1903**

Jassa marmorata Conlan 1990: 2053-2055, Figs 2-6,17.

Conlan (1990) revises the genus *Jassa*, and provides a key to worldwide species. She places South African specimens of *Jassa falcata* in one of three species: *J. marmorata, J. morinoi* and *J. slatteryi.*

Jassa morinoi **Conlan, 1990**

Jassa morinoi Conlan 1990: 2057-2058, Figs 2-6,8,10,19.

Conlan (1990) revises the genus *Jassa*, and provides a key to worldwide species. She places South African specimens of *Jassa falcata* in one of three species: *J. marmorata, J. morinoi* and *J. slatteryi.*

***Jassa slatteryi* Conlan, 1990**

Jassa slatteryi Conlan 1990: 2058-2059, Figs 2-10,20.

Conlan (1990) revises the genus *Jassa*, and provides a key to worldwide species. She places South African specimens of *Jassa falcata* in one of three species: *J. marmorata, J. morinoi* and *J. slatteryi.*

***Notopoma africana* Lowry and Berents, 1996**

Notopoma africana Lowry and Berents 1996: 91- 95, Figs 9-12.

Described from deep waters off St Lucia, KwaZulu-Natal.

Family Kamakidae

***Aorchoides crenatipalma* (K. H. Barnard, 1916)**

Lemboides crenatipalma K. H. Barnard 1916: 240-242, Pls 28.

Aorchoides crenatipalma Myers and Lyons 1987: 268-272, Figs 1-3.

Myers and Lyons (1987) transfer this species from *Lemboides* to *Aorchoides* Ledoyer, 1972.

Family Neomegamphopidae Myers, 1981

Varohios n. sp. NEW SPECIES

Figure 4.4, 5

Holotype : Male 2.5 mm, from algal turf at 12 m on Two-Mile Reef, Sodwana Bay, KZ-N, South Africa. 1 October 2010.

Allotype: Female 2.6 mm, from algal turf at 12 m on Two-Mile Reef, Sodwana Bay, KZ-N, South Africa. 1 October 2010.

Material:

Five specimens from 12.m Four Buoy on Two-Mile Reef, Sodwana Bay, KZ-N, South Africa 1. October 2009. Two specimens from 2m Bikini Reef off Two-Mile Reef, Sodwana Bay, KZ-N, South Africa. 2 October 2009.

Description of male holotype:

Eyes ovoid, semi-transparent with a black core. Antenna 2 inset, well behind antenna 1 insertion. Accessory flagellum small, 2-segmented, with second segment much smaller than first. Mandibular palp 3-segmented, with clavate distal segment. Maxilla 1 with 2-segmanted palp. Maxilliped with 4-segmented palp.

Gnathopod 1 greatly enlarged and chelate, with only 6 segments. Segment 5 is produced distally into a long curved chela; the other is formed by the dactyl. Gnathopod 1 dactyl with a hooked protuberance. Palm with a secondary tooth near the hinge. Interior surface of fifth segment covered in long setae. Gnathopod 2 is subchelate and smaller than gnathopod 1. Cutting edge of dactyl with several proximally-pointing teeth, and palm with flange with undulating margin on the interior side.

Pereiopods 3 and 4 similar; 7 segmented with segment 4 overhanging 5 anteriorly. Basis of pereiopods 5-7 enlarged, being almost circular on pereiopod 5, pear-shaped on 6 and oval on 07. Epimeral plates rounded.

Uropods biramous. Uropod 1 with long ventral spine on peduncle. Uropod 2 rami unequal. Outer rami slightly shorter than inner. Uropod 3 with small second segment on outer ramus. Telson with a dorso-distal depression flanked by a lateral boss on each side. Each side is tipped with a large spine, 3 setae and 2 setules. Distal to each boss is a small proximally pointing spine, and a setule.

In alcohol, specimens have patches of dark pigment behind the eye, dorsally and on coxal plate 1 and 4, the bases of the pleopods and the peduncle of uropod 1.

Description of female allotype:

As for adult male, with some exceptions. Gnathopod 1 and 2 very similar, both with 7 segments. Gnathopod 1 not enlarged as in male specimens. Both gnathopods subchelate, with crenellated palm. Dactyl has several irregular teeth on cutting edge.

Remarks:

The genus *Varohios* was established by Barnard (1979) for members of the Neomegamphopidae that exhibit a highly chelate, 6-segmented gnathopod 1 in the male. Barnard hypothesized that in the adult male segments 6 and 7 fuse, as the related genus *Neomegamphopus* is carpochelate, with a projection on the propodus, which could be analagous to the boss on the distal segment of *Varohios*.

This new species is allocated in *Varohios* primarily because of the form of gnathopod 1, which displays the chelate propodus and fused dactyl characteristic of the genus. There are currently three species recognised in the genus *Varohios*. *Varohios topianus* possess a similar gnathopod 1 to specimens from this study, but lacks any serration on the secondary palmar tooth. Segment 5 of gnathopod 1 is also longer in *V. topianus* than in *V.* n. sp., with a length to width ratio of ≈3:1 as opposed to ≈2:1. The telsons of *V. pseudochelatus* and *V. chelatus* bear fewer long setae than *V.* n. sp., with *V. pseudochelatus* bearing none, and *V. chelatus* with one on each side. *V.* n. sp. also differs from *V. pseudochelatus* and *V. chelatus* by gnathopod 1 which is only moderately chelate in those species. In *V. chelatus*, as illustrated by Walker (1904), gnathopod 1 bears 7 segments, instead of the 6 typical of adult males of the genus. However, Walker notes that his specimen may be a juvenile, which are known to bear 7 segments.

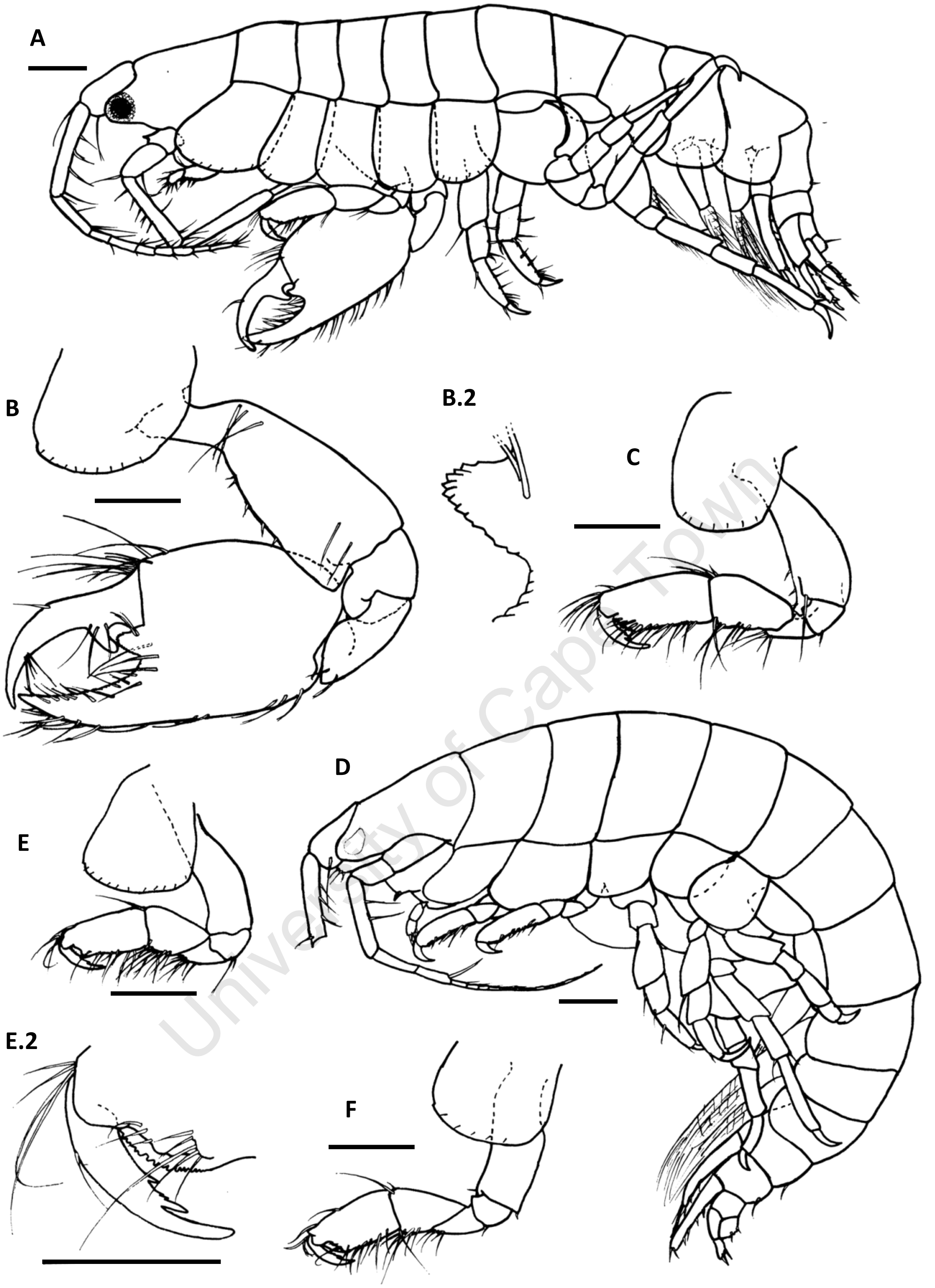


Figure 4.4 *Varohios* n. sp. Holotype male (A-C). Allotype type female (D-F). Two-Mile Reef, Sodwana Bay, KZ-N. A: Male lateral aspect B: Male gnathopod 1 B.2: Palmar boss on male gnathopod 1 C: Male gnathopod 2 D: Female lateral aspect E: Female gnathopod 1 E.2: Palm of female gnathopod 1, internal aspect F: Female gnathopod 2. Scales B,C,E,F 0.2 mm. B.2, E.2 scale 0.1 mm. A,D scale 0.2 mm.

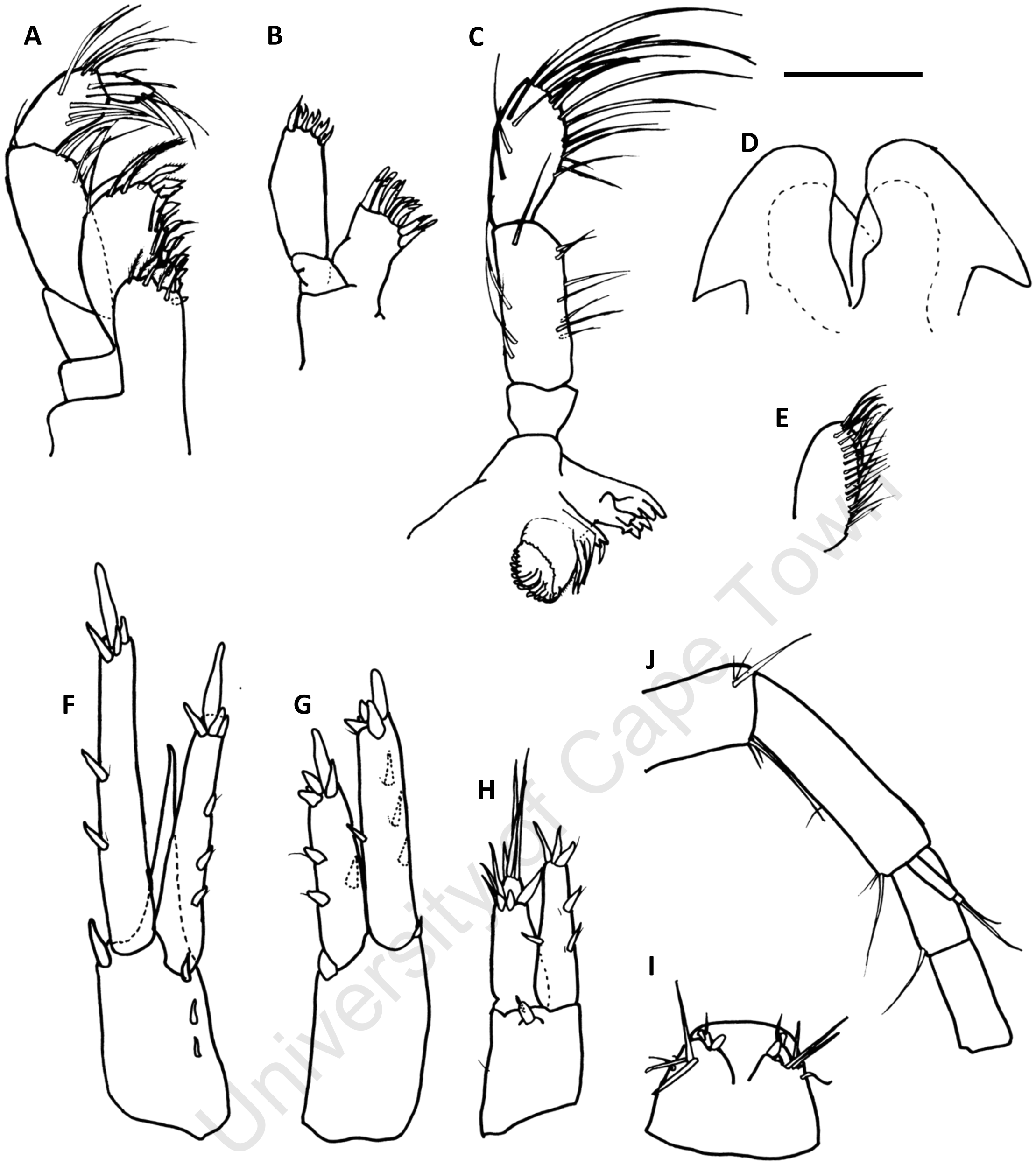


Figure 4.5 *Varohios* n. sp. Holotype male, Two-Mile Reef, Sodwana Bay, KZ-N. A: Maxilliped B: Maxilla 1 C: Mandible with palp D:Lower lip E: Maxilla 2 F: Uropod 1 G: Uropod 2 H: Uropod 3 I: Telson J: Antenna 1, end of peduncle showing accessory flagellum. Scale 0.1mm.

Suborder Gammaridea Latreille, 1802

Family Amaryllididae Lowry & Stoddart, 2002

***Amaryllis macrophthalma* Haswell, 1880?**

Amaryllis macrophthalma Ledoyer 1986: 718-720, Fig. 275 (? non Haswell 1880).

Lowry and Stoddart (2002) suggest that published African specimens actually belong in *Erikus*, and differ from the type specimen of *A. macrophthalma*. This requires further investigation. Both *Amaryllis* and *Erikus* are moved from Lysianassidae to Amaryllididae (Lowry and Stoddart 2002).

***Devo conocephala (*K.H. Barnard, 1925)**

Bathyamaryllis conocephala Griffiths 1977: 112-115, Fig. 5.

Lowry and Stoddart (2002) place *B. conocephala* in their new genus, *Devo*, which is placed in the family Amaryllididae.

Family Amathillopsidae Pirlot, 1934

***Cleonardopsis carinata* K. H. Barnard, 1916**

Cleonardopsis carinata K. H. Barnard 1916: 176-178, Pl. 27.

This species was incorrectly placed in Eusiridae, based on mouthpart morphology, body carination and gnathopod shape and was moved to Amathillopsidae by Lowry (2006).

Family Ampeliscidae Krøyer, 1842

Ampelisca insignis **(K. H. Barnard, 1916)**

Triodos insignis K. H. Barnard 1916: 140-142, Pl. 24.

Triodos has been synonymised with *Ampelisca* by Karaman and Barnard (1981).

Family Amphilochidae Boeck, 1871

Rostrogitanopsis mariae **(Griffiths, 1973)**

Gitanopsis mariae Griffiths 1973: 275, Fig. 4.

Karaman (1980) created a new genus, *Rostrogitanopsis*, for *G. mariae*.

Family Aristiidae Lowry & Stoddart, 1997

Aristias symbioticus **K. H. Barnard, 1916**

Aristias symbioticus Ledoyer 1986: 728-731, Fig. 280.

Moved from Lysianassidae to the new family Aristiidae by Lowry and Stoddart (1997).

Family Atylidae Lilljeborg, 1865

Lepechinella occlo J.L.Barnard, 1973

Lepichinella occlo Griffiths 1977: 109, Fig. 2.

Recorded for the first time in South Africa by Griffiths (1977) from 550-860 m depth off Natal (now KwaZulu-Natal). Formerly listed under family Dexaminidae, this group has now been re-allocated to subfamily Lepechinellinae within the family Atylidae, following Bousefield and Kendall (1994).

Nototropis granulosus (Walker, 1904)

Nototropis granulosus K. H. Barnard 1955: 90, Fig. 40.

Atylus granulosus Ledoyer 1982: 332-334, Fig. 123.

Formerly in Dexaminidae, this group has now been placed in its own subfamily Nototropiinae within the family Atylidae following Bousfield & Kendall (1994).

Nototropis guttatus (Costa, 1851)

Atylus guttatus Griffiths 1976a: 38.

Nototropis guttatus Bousfield and Kendall 1994: 28-29, Fig. 13.

As above, formerly placed in Family Dexaminidae, but now in the new subfamily Nototropiinae within the family Atylidae, following Bousfield & Kendall (1994).

***Nototropis homochir* (Haswell, 1885)**

Atylus homochir Griffiths 1976a: 38.

Nototropis homochir Stebbing 1910: 455; Bousfield and Kendall 1994: 28.

As above, formerly in Dexaminidae but now in the new subfamily Nototripiinae, within Atylidae, following revision by Bousfield and Kendall (1994).

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***Nototropis swammerdamei* (Milne-Edwards, 1830)**

Atylus swammerdamei Griffiths 1976a: 38.

Nototropis swammerdamei Bousfield and Kendall 1994: 28.

As above, formerly in Dexaminidae, but now in the new subfamily Nototripiinae, within Atylidae, following revision by Bousfield and Kendall (1994).

Family Bogidiellidae Hertzog, 1936

***Bollegidia capensis* Ruffo, 1974**

Bollegidia capensis Ruffo 1974: 405, Figs 3-5.

A minute (0.8 mm) species described from interstitial sands in Table Bay and currently only known from the type locality, although probably much more widespread and overlooked by other workers, due to its small size.

Family Calliopiidae G.O. Sars, 1895

Barnard and Karaman (1991) combine Calliopidae with Eusiridae. However, subsequent publications retain the family (Bousfield and Hendrycks 1997). South African genera include *Calliopiella* and *Metaleptamphopus.*

Family Cheirocratidae Ren, 2006

Incratella inermis **(Ledoyer, 1968)**

Cheirocratus inermis Griffiths 1975: 121, Fig. 5; Ledoyer 1982: 451-452, Fig. 170.

Barnard and Drummond (1982) erect a new genus, *Incratella*, for *C. inermis.* Ren (2006) creates the new family, Cheirocratidae, and places *Incratella* in it.

Family Colomastigidae Stebbing, 1899

Colomastix armata **Ledoyer, 1979 NEW RECORD**

Figure 4.6

Colomastix armata Ledoyer 1982: 149-152, Fig. 51.

This species was described from Madagascar and is here recorded from South Africa for the first time. Specimens were collected from Quarter-Mile reef in Sodwana Bay, Northern KwZulu-Natal at 7.5 m depth on 4 October 2009.

Colomastix armata is distinguishable from other *Colomastix* species of the region by article 6 of pereiopods 1 to 5, which have a strongly denticulate hind margin. The inner ramus of uropod 1 on males is also notable, being longer than the outer ramus, and inwardly curved.

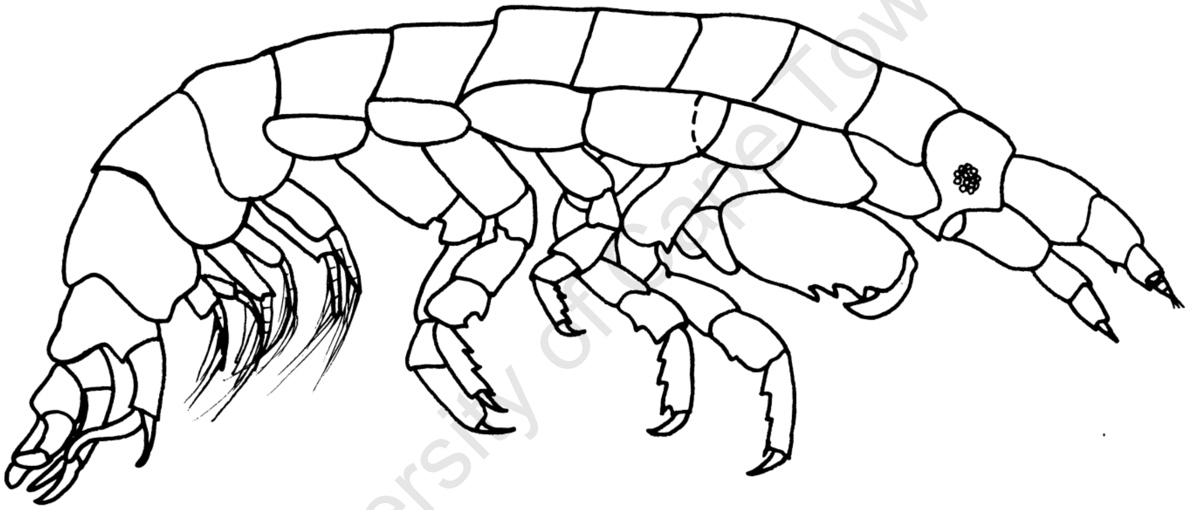

Figure 4.6 *Colomastix armata* Ledoyer, 1979, male, Quarter-Mile Reef, Sodwana Bay, KwaZulu-Natal.

***Colomastix plumosa* Ledoyer, 1979 NEW RECORD**

Figure 4.7

Colomastix plumosa Ledoyer 1982: 158, Fig. 55; Lyons and Myers 1990: 1220-1221, Fig. 19; LeCroy 2009: 360-363, Figs 7-8.

This species is known from Madagascar, Australia, Japan and the Red Sea, and is here recorded from South Africa for the first time. Specimens were collected from seagrass beds in rock pools along Jesser Point, Sodwana Bay in Northern KwZulu-Natal in March 2010.

C. plumosa is distinct from the other *Colomastix* species of the region, having densely setose rami on uropods 2 and 3.

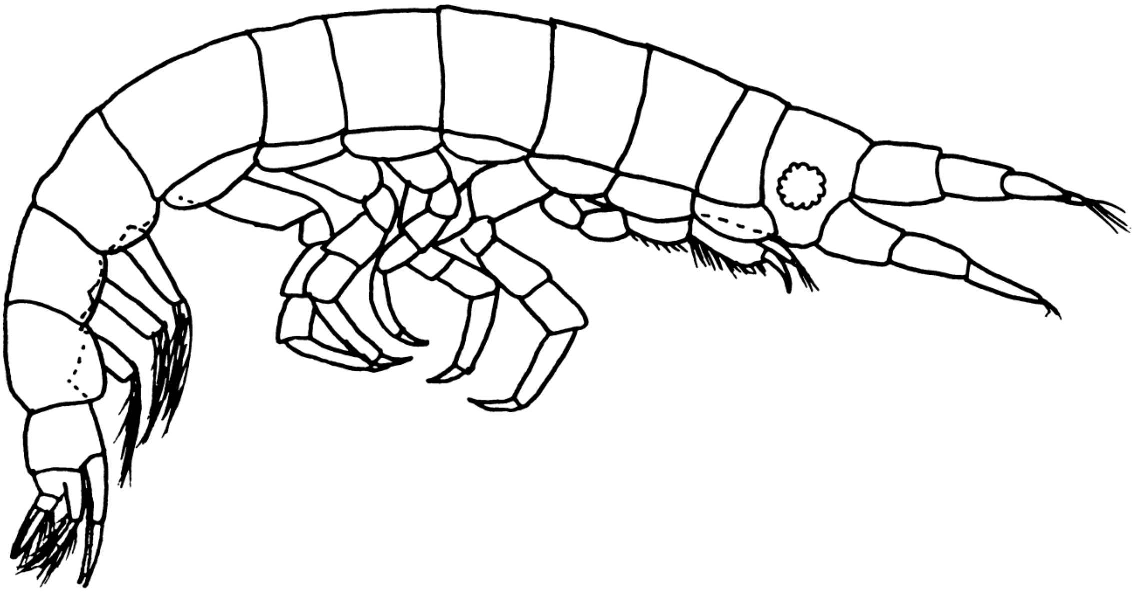

Figure 4.7 *Colomastix plumosa* Ledoyer, 1979, female, Jesser Point, Sodwana Bay, KwaZulu-Natal.

Yulumara improvisa **Griffiths, 1976**

Yulumara improvisa Griffiths 1976b: 17-19, Fig. 4.

Described from Oudekraal on the Cape Peninsula, in the holdfasts of kelps, *Laminaria pallida*.

Family Cyphocarididae Lowry and Stoddart, 1997

The four South African *Cyphocaris* species are moved from Lysianassidae to their own family, Cyphocarididae, as established by Lowry and Stoddart (1997).

Family Cyproideidae J.L. Barnard, 1974

Unguja yaya **Griffiths, 1976**

Unguja yaya Griffiths 1976b: 15-17, Fig. 3.

Described from Oudekraal, on the Cape Peninsula, in the holdfasts of the kelp *Laminaria pallida*.

Family Dexaminidae Leach, 1814

Guernea tumulosa **Griffiths, 1976**

Guernea tumulosa Griffiths 1976b: 21-23, Fig. 6.

Described from Oudekraal on the west coast of the Cape Peninsula, on the holdfasts of kelps, *Laminaria pallida*.

Family Dikwidae Coleman & Barnard, 1991

***Dikwa acrania* Griffiths, 1974**

Dikwa acrania Griffiths 1974c: 266, Fig. 2; Griffiths 1977: 108-109, Fig. 1.

Dikwa moved to new family Dikwidae, from Acanthonotozomatidae, by Coleman and Barnard (1991).

Family Epimeriidae Boeck, 1871

Coleman and Barnard (1991) create the new family Epimeriidae. South African members of this family include *Epimeria cornigera, Epimeria longispinosa* and *Epimeria semiarmata.*

Family Eurytheneidae Stoddart & Lowry, 2004

***Eurythenes obesus* (Chevreux, 1905)**

Eurythenes obesus Stoddart and Lowry 2004: 445-451, Figs 12-15.

Stoddart and Lowry (2004) create the family Eurytheneidae for *Eurythenes* and redescribe *E. obesus*.

***Eurythenes gryllus* (Lichtenstein in Mandt, 1822)**

Eurythenes gryllus Stoddart and Lowry 2004: 429-445, Figs 1-11.

Eurythenes gryllus is removed from synonymy with *E. obesus*. Stoddart and Lowry (2004) redescribe the species and place it in Eurytheneidae.

Family Hyalidae Bulycheva, 1957

Parhyale hawaiensis (K. H. Barnard, 1916)

Parhyale hawaiensis Ledoyer 1986: 1013-1014, Fig. 400; Stock 1987: 180-182, Figs 1-9.

Stock (1987) synonymises *P. inyacka* with *P. hawaiensis.*

Family Iphimediidae Boeck, 1871

Iphimedia excisa (K. H. Barnard, 1932)

Panoploea excisa K. H Barnard 1932: 129, Fig. 73.

Iphimedia excisa Watling and Holman 1980: 619; Barnard and Karaman 1991: 395.

Now included in the genus *Iphimedia* by Watling and Holman (1980) and subsequent authors.

Iphimedia gibba (K. H. Barnard, 1955)

Iphimedia gibba Watling and Holman 1980: 619, Fig. 4; Barnard and Karaman 1991: 195.

Cypsiphimedia gibba K.H. Barnard 1955: 87-89, Fig. 43.

Watling and Holman (1980) re-describe this species and transfer it to *Iphimedia*.

Iphimedia stegosaura **(Griffiths, 1975)**

Panoploea stegosaura Griffiths 1975: 100-102, Fig. 2.

Cypsiphimedia stegosaura Karaman and Barnard 1979: 108.

Iphimedia stegosuara Barnard and Karamen 1991: 395.

Karaman and Barnard (1991) transfer this species from *Panoploea* to *Cypsiphimedia*, but subsequently amalgamate this genus with *Iphimedia*.

Family Izinkalidae Lowry & Stoddart, 2010

Izinkala fihla **Griffiths, 1977**

Izinkala fihla Griffiths 1977: 116, Fig. 6-7; Ledoyer 1986: 768-770, Fig. 298.

Described from KwaZulu-Natal by Griffiths (1977) this genus has recently been moved to its own family by Lowry and Stoddard (2010).

Family Leucothoidae Dana, 1852

Leucothoe euryonyx Walker, 1901

Leucothoe dentitelson Griffiths 1975: 140.

Leucothoe euryonyx Krapp-Schickel 1975: 98, Pl. 4; Ledoyer 1986: 658-661, Figs 246,251.

Krapp-Schickel (1975) places *L. dentitelson* in synonymy with *L. euryonyx.*

Family Liljeborgiidae Stebbing, 1899

Isipingus epistomata (K. H. Barnard, 1932)

Liljeborgia epistomata Barnard 1955: 89-90, Fig. 44.

Isipingus epistomatus Barnard and Karaman 1987: 864.

Barnard and Karaman (1987) create a new genus, *Isipingus*, for *L. epistomata*.

Family Lysianassidae Dana, 1849

*Socarnopsis septimus (*Griffiths, 1975)

Socarnes septimus Griffiths 1975: 150-152, Fig. 15.

Barnard and Karaman (1991) create the genus *Septcarnes* for *S. septimus*. Lowry and Stoddart (1997) subsequently synonymise *Septcarnes* with *Socarnopsis*.

Family Maeridae Krapp-Schickel, 2008

Krapp-Schickel (2008) creates a new family, Maeridae, from 40 Melitid genera. South African genera included in Maeridae are *Ceradocus, Elasmopoides, Elasmopus, Jerbarnia, Maera, Mallacoota, Othomaera, Parelasmopus, Quadrimaera, Quadrivisio* and *Zygomaera*.

Ceradocus (Denticeradocus) n. sp. NEW SPECIES

Figure 4.8,9

Holotype: Male 6 mm, from *Thalassodendron ciliatum* bed in a rockpool on Jesser Point, Sodwana Bay, KwaZulu-Natal, *South Africa. 3 March 2010.*

Paratype: Male 7.5 mm, from *Thalassodendron ciliatum* bed 1.5 m subtidally, off Jesser Point, Sodwana Bay, KwaZulu-Natal, South Africa. 2 March 2010.

Description of holotype male:

Body length 6 mm. Antenna 1 of unequal length, with the left antennae being half body length and shorter than the right, which measures approximately two thirds body length. Accessory flagellum 4-segmented on the left, and 7-segmented on the right.

Head with sub-ocular notch. Eyes dark and compact. Mandible with 3-segmented palp. First segment with distal projection, molar with serrated setae. Maxilla 1 inner plate triangular, outer plate with distally serrated setae and forked setae. Palp with two segments. Maxilla 2 inner plate with two fringing rows of setae and an oblique row of long setae. Inner plate with several rows of distal setae. Maxillipedal palp 4-articulate. Article 2 longest at 2.5x length of article 1. Gnathopods subchelate. Gnathopod 1smaller than 2, ventral edge of segment 4 produced distally into a tooth. Ventral margins of segments 4 to 6 densely setose. Segment 5 and 6 subequal. Palm not well defined, but with several short spines. Two spines on hind margin. Gnathopod 2 asymmetrical,that of right side larger. Palm oblique, with two palmar notches. Palmar corner defined by a large tooth.

Metasome segments 1-3 serrated dorsally. All have fine teeth of approximately equal size. Segment 1 with 24 teeth, segment 2 with 27 teeth and segment 3 with 27 teeth. Epimeral plates 1 and 2 with fine tooth at end of crease and defined corner tooth. Epimeral plate 3 with two teeth below corner tooth and 8 along posterior margin.

Urosome segments 1 and 2 serrated dorsally: urosome segment 1 with 10 teeth of approximately equal size, and urosome segment 2 with 9 irregular teeth. Uropod 3 rami semi-quadrate, less than twice length of peduncle. Telson deeply cleft, with a combination of long and short terminal spines, 6-8 in number . One inner subterminal spine on each side in the cleft between the two halves of the telson. Fine lateral setae.

Female:

No known specimens.

Remarks:

This species is typical of *Ceradocus* with enlarged, subchelate gnathopod 2, pleon denticulate dorsally and extended uropod 3. It is allocated to the subgenus *Denticeradocus* because of its dorsally multidentate metasome segments 1-3. There are 35 species in the genus *Ceradocus*, of which 18 are assigned to *Denticeradocus*.

Gnathopod 2 of *C.* n. sp. is quite similar to *C. rubromaculatus*, but the epimeral plates 1 and 2 are smooth, not deeply serrated as in *C. rubromaculatus*. *Ceradocus mahalafiensis* is also close to *C.* n. sp., with a similar gnathopod 2 and un-serrated epimeral plates 1 and 2. But, the dorsal teeth on urosome segments 1 and 2 are too few, being 5 and 4 in *C. mahalafiensis* and

11 and 9 in *C.* n. sp. *Ceradocus tattersalli* has similar epimeral plates to *C.* n. sp., but the male gnathopod 2 is very oblique, and lacks a defining tooth at the corner of the palm. The telsons of *C. rubromaculatus*, *C. mahalafiensis* and *C. tattersalli* also differ from *C.* n. sp., with fewer terminal spines, and lacking the inner spine along the cleft.

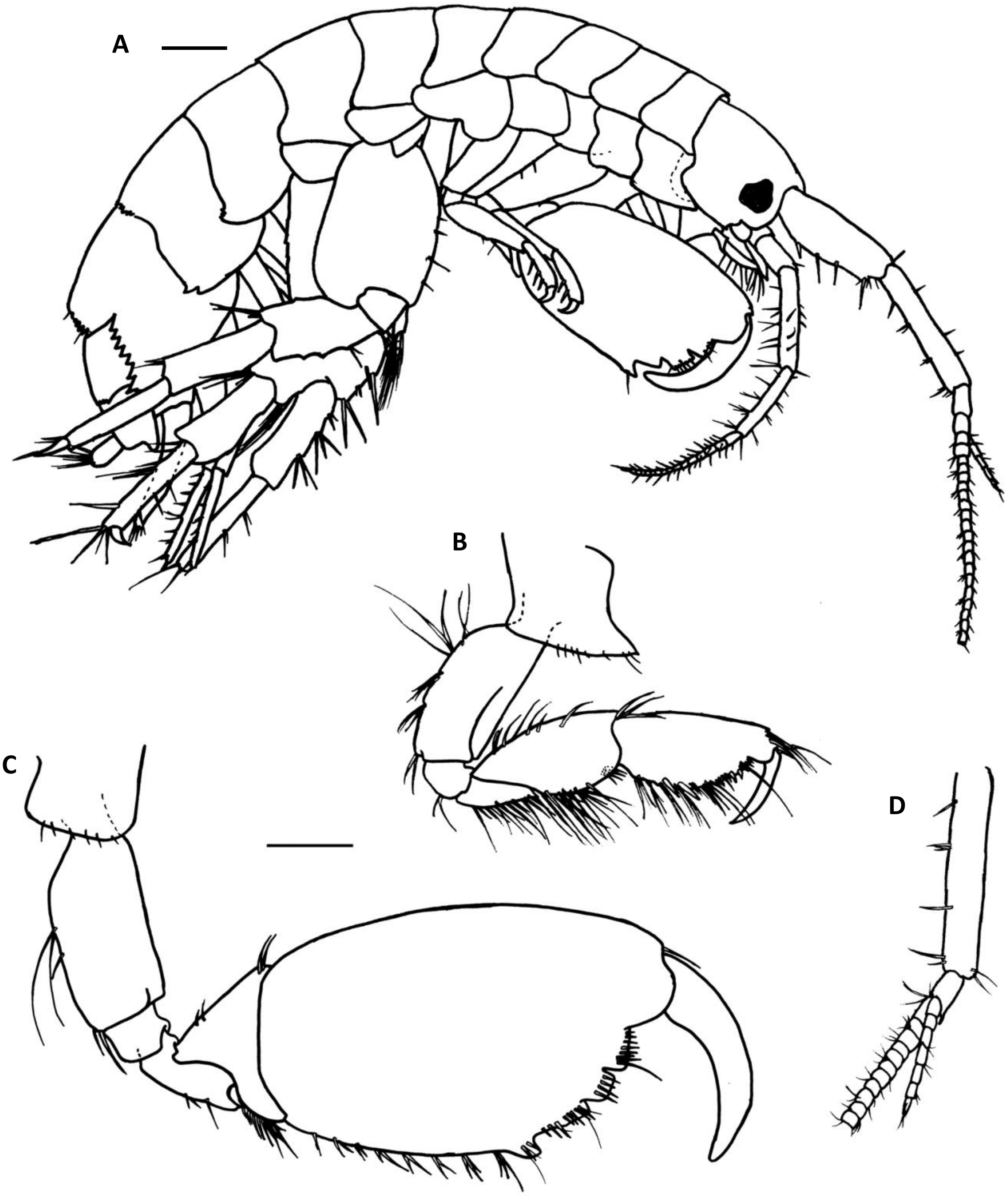

Figure 4.8 *Ceradocus* n. sp. holotype male. Two-Mile Reef, Sodwana Bay, KZ-N. A: lateral aspect B: Gnathopod 1 C: Gnathopod 2 D: Antenna 1, end of peduncle showing accessory flagellum. A scale 0.5 mm. B-D scale 0.5 mm.

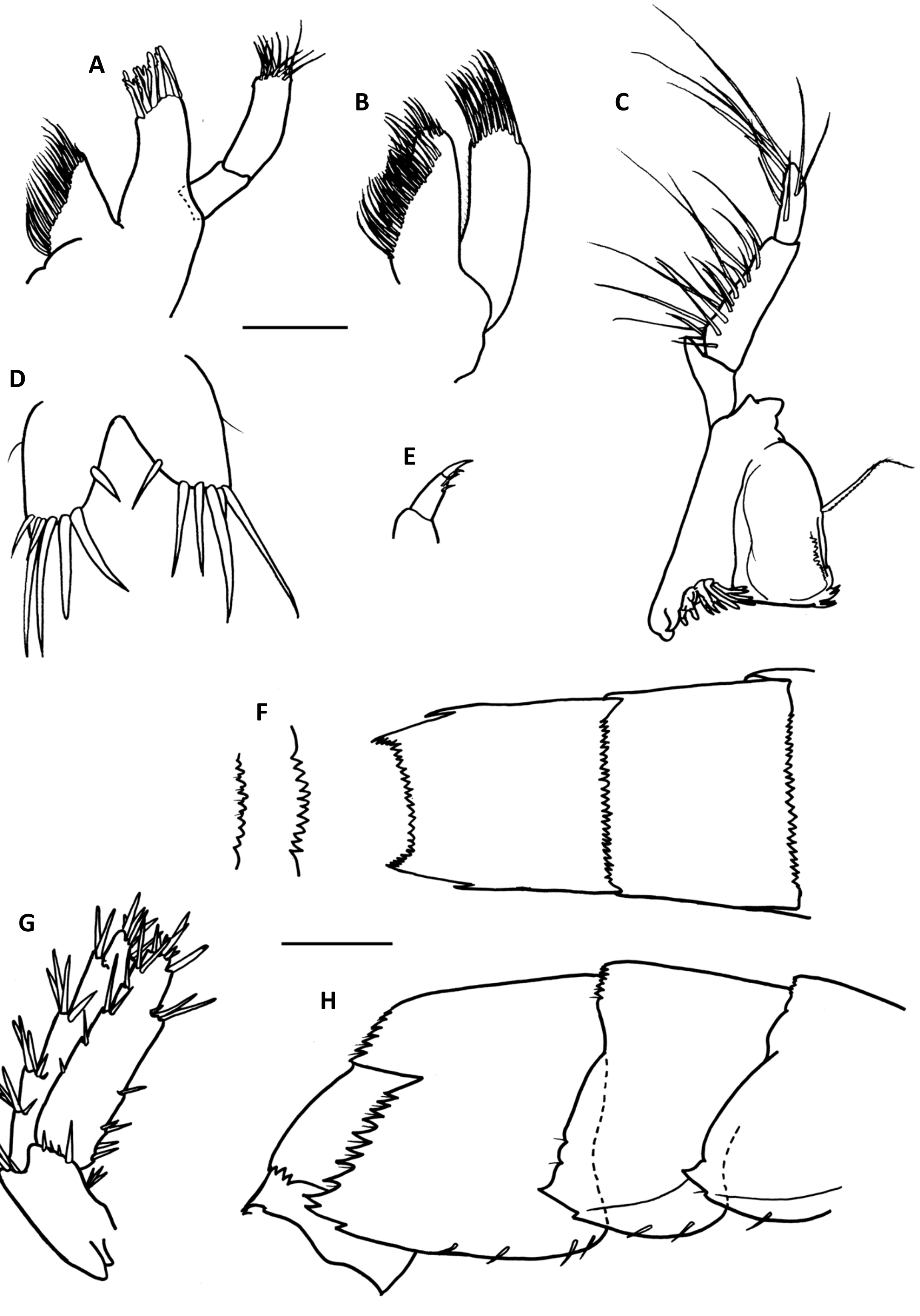

Figure 4.9 *Ceradocus* n. sp. Holotype male. A: Maxilla 1 B: Maxilla 2 C: Mandible with palp D: Telson E: Dactyl of pereiopod 3 F: Dorsal view of metasome, with serration of urosome 1-2, and metasome 1-3 G: Uropod 3 H: Lateral view of metasome, with urosome 1-2 and metasome 1-3. A-E scale 0.2 mm. F-H scale 0.5 mm.

***Ceradocus rubromaculatus* (Stimpson, 1955)**

Ceradocus capensis K.H. Barnard 1957: 8; Sheard 1939: 299,277.

Ceradocus rubromaculatus J.L. Barnard 1972: 220-221, Fig. 129.

Although recent literature treats *C. capensis* as valid, K.H. Barnard re-examined *C. rubromaculatus* from the region and suggested that based on the characters Sheard used, *C. capensis* falls within the natural variation of *C. rubromaculatus*.

***Elasmopus alalo* Myers, 1986 NEW RECORD**

Figure 4.10

Elasmopus pseudaffinis Ledoyer 1982: 480-482, Figs 181-182.

Elasmopus alalo Lowry and Hughes 2009: 646-649, Figs 1-2.

This species is a new record for South Africa. It is distributed throughout the Indo-Pacific, including Australia, Madagascar, Mauritius, Micronesia, the South China Sea and Tonga. Current specimens were collected from seagrass beds on Jesser Point, Sodwana Bay in Northern KwaZulu-Natal in March 2010.

The male gnathopod 2 of *E. alalo* is sparsely setose, with numerous spines. The dactyl folds into a sinus on the palm, and is approximately half the length of the propodus. *Elasmopus alalo* may be differentiated from *E. affinis*, which shows a similar gnathopod 2, by the distal segment of the mandibular palp, which is elongate (three times longer than broad), while that in *E. affinis* is short. The telson also differs between *E. alalo* and *E. affinis*, with *E. alalo* having pointed inner lobes, and *E. affinis* having rounded ones.

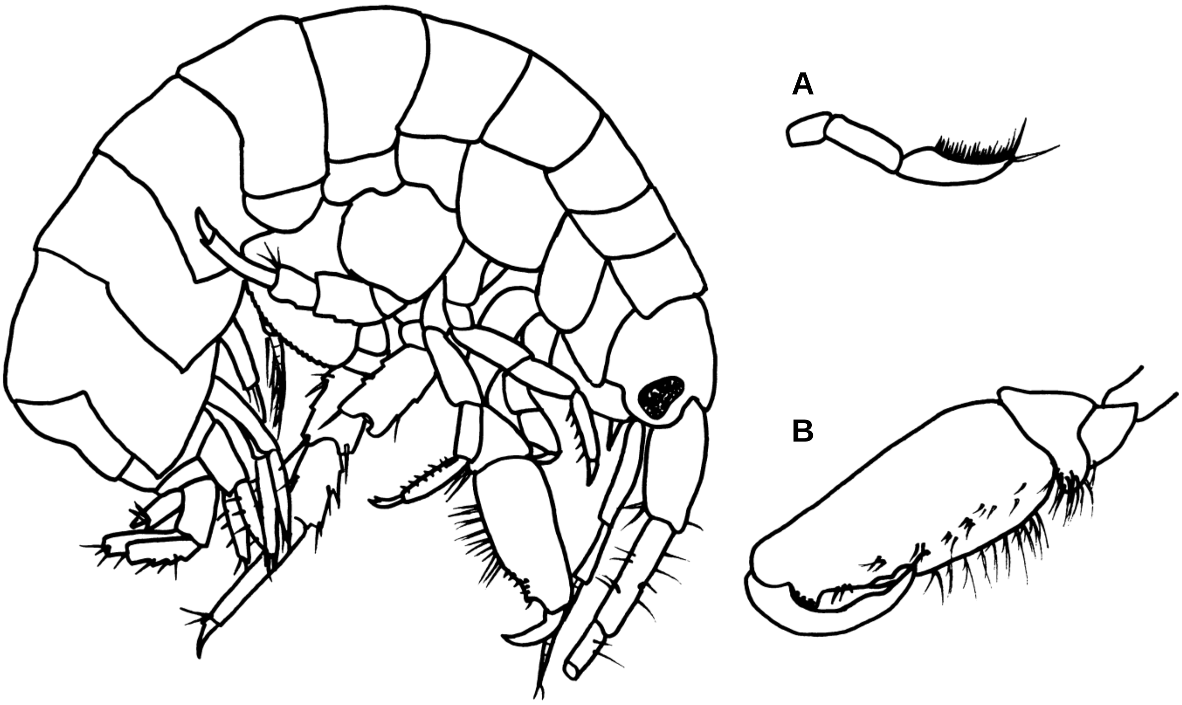

Figure 4.10 *Elasmopus alalo* (Myers, 1986), male, Jesser Point, Sodwana Bay, KwaZulu-Natal. A: Mandibular palp. B: Gnathopod 2.

Othomaera bruzelii (Stebbing, 1888)

Maera bruzeli Griffiths 1975: 123-125, Fig. 7.

Krapp-Schickel (2001) divides *Maera* into seven genera, and places *M. lobata* in *Orthomaera*.

Orthomaera lobata (Griffiths, 1976)

Maera lobata Griffiths 1976b: 23-25, Fig. 7.

Described from Stillbaai, in shelly sand. Krapp-Schickel (2001) divides *Maera* into seven genera, and places *M. lobata* in *Orthomaera*.

***Orthomaera simplex* (Reid, 1951)**

Maera komma Griffiths 1975: 128, Fig. 9.

Krapp-Schickel (2001) divides *Maera* into seven genera, and places *M. komma* in synonymy with *Orthomaera simplex*.

***Othomaera thrixa* (Griffiths, 1975)**

Maera thrixa Griffiths 1975: 130, Fig. 10.

Krapp-Schickel (2001) divides *Maera* into seven genera, and places *M. lobata* in *Orthomaera*.

***Quadrimaera pacifica* (Schellenberg, 1938) NEW RECORD**

Maera pacifica Griffiths 1976b: 25-26, Fig. 8.

Maera pacifica Ledoyer 1982: 534-538, Figs 201-203.

Quadrimaera pacifica Krapp-Schickel 2009: 627-629, Fig. 20.

Previously recorded by Griffiths (1973) from southern Mozambique and hence listed by Griffiths (1976b), as that guide covers the wider Southern African region. This study extends the range for the first time into South Africa, with records from Sodwana Bay, in northern KwaZulu-Natal. Krapp-Schickel (2001) divides *Maera* into seven genera, and places *M. pacifica* in *Quadrimaera*.

***Zygomaera emarginata* (Griffiths, 1975)**

Maera emarginata Griffiths 1975: 125-127, Fig. 8.

Krapp-Schickel (2001) divides *Maera* into seven genera and places *M. emarginata* in her new genus *Zygomaera*.

Family Melitidae Bousfield, 1973

***Dulichiella appendiculata* (Say, 1818)**

Melita appendiculata Barnard and Barnard 1983: 667, Fig. 45.

Dulichiella appendiculata Jarrett and Bousfield 1996: 13, Figs 5-6; Lowry and Springthorpe 2007: 12-19, Figs 7-10.

Jarret and Bousfield (1996) moved *M. appendiculata* to the genus *Dulichiella.* However, in their detailed revision of the genus Lowry and Springthorpe (2007) consider it unlikley that the South african material in fact represents the true *D. appendiculata*, which has a North American distribution. The South African materail should this be re-examined to ascertain its correct identity.

***Nuuanu castellana* (Griffiths, 1977)**

Valettiella castellana Griffiths 1977: 119-122, Figs 8-9.

Described from 550 m depth off northern KwaZulu-Natal but subequently transferred to Nuannu by Lowry and Watson (2002).

Melita excavata Ledoyer, 1979 NEW RECORD

Figure 4.11

Melita excavata Ledoyer 1982: 572-574, Fig. 217.

M. excavata is a new record for South Africa from Sodwana Bay. Formerly, this species has been known only from a single specimen from Madagascar. Specimens were collected from Two-Mile Reef in Sodwana Bay, Northern KwaZulu-Natal, at 22m depth in October 2009.

M. excavata may be distinguished from the other South African *Melita* species by the pattern of dorsal teeth on pleon segments 1 to 5, being 3-3-0-3-5. Male specimens also have a characteristic gnathapod 2, with an enlarged dactyl tip which fits into a sinus on the palm. In his description of the species, Ledoyer suggested that the male gnathopods were equal, but could not confirm it, because his specimen was damaged. The Sodwana Bay material is intact, and confirms that both gnathopods are of equal size. There were no female specimens in the Sodwana material.

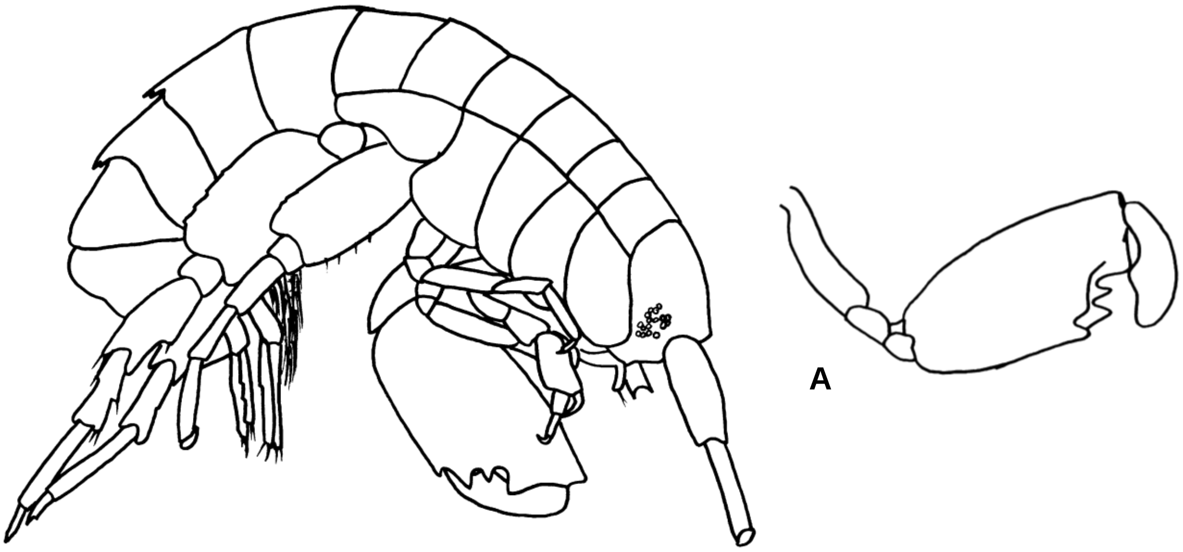

Figure 4.11 Melita excavata Ledoyer, 1979, male, 2.5mm, Jesser Point, Sodwana Bay, KwaZulu-Natal. A: Gnathopod 2, internal view.

Roropisa epistomata **(Griffiths, 1974)**

Eriopisa epistomata Griffiths 1974a: 186-187, Fig. 4.

Victoriopisa epistomata Karaman and Barnard 1979: 150.

Roropisa epistomata Karaman 1984: 55-56.

Karaman and Barnard (1979) erected the new genus *Victoriopisa* to accommodate this and two other species, but Karaman (1984) has subsequently moved this species once again to another new genus *Roropisa*.

Verdeia subchelata (**Schellenberg, 1925)**

Melita subchelata K. H. Barnard 1932: 211, Fig. 130.

Verdeia subchelata Lowry and Springthorpe 2007: 55-57, Fig. 41-44.

Lowry and Springthorpe (2007) create the new genus *Verdeia* and place *M. subchelata* in it.

Victoriopisa chilkensis **(Chilton, 1921)**

Victoriopisa chilkensis Karaman and Barnard 1979: 149-150.

Eriopisa chilkensis Ledoyer 1982: 495-497, Fig. 186.

Victoriopisa chilkensis ssp *griffithsi* Karaman 1984:65-66.

Karaman and Barbard (1979) erected the new genus *Victoriopisa* to accommodate this species, as well as the Australian *V. australiensis* (Chilton 1923) and South African *V. epistomata* (Griffiths 1974a), but the latter has subsequently been moved once again to *Roropisa* (see above). Karaman (1984) recognised the South African form as a separate subspecies.

Family Phliantidae Stebbing, 1899

Pereionotus alaniphlias **(J. L. Barnard, 1970) NEW RECORD**

Figure 4.12

Pereionotus alaniphlias Ledoyer 1986: 869-872, Fig. 342; Lyons and Myers 1993: 590-593, Fig. 11.

This species is recorded here from South Africa for the first time. It is previously known from Fiji, Society Islands, Madagascar, Mauritius, India and the Red Sea. Specimens were collected from 12.5 m on Two-Mile Reef in Sodwana Bay, northern KwaZulu-Natal in October 2009.

P. alaniphlias is distinguished from *P. natalensis* by the dorsal margin of the metasome: *P. alaniphlias* having a strong row of dorsal carinae. Article 2 of pereiopod 5 in *P. alaniphlias* is also ovoid, rather than extending into a broad lobe, as it is in *P. natalensis*.

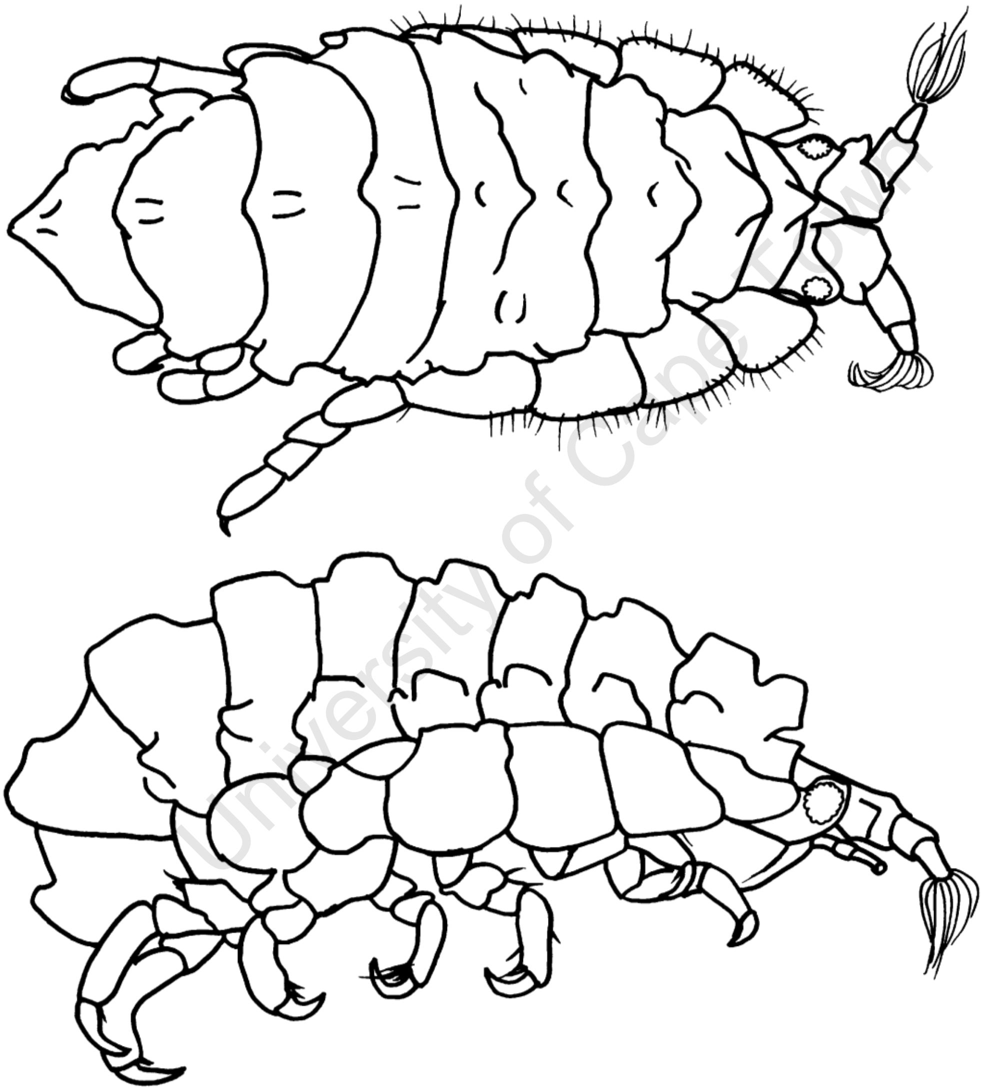

Figure 4.12 *Pereionotus alaniplias* (J. L. Barnard, 1970), 3mm, Jesser Point, Sodwana Bay, KwaZulu-Natal. Dorsal and lateral view. Sex indeterminate.

***Pereionotus natalensis (*K. H. Barnard, 1940)**

Palinnotus natalensis K. H. Barnard 1940: 445-446, Fig. 22.

Pereionotus natalensis Ledoyer 1986: 872, Fig. 343.

Palinnotus is treated as a synonym of *Pereionotus* by Ledoyer (1986) and subsequent authorities.

Family Phoxocephalidae Sars, 1891

***Basuto stimpsoni* (Stebbing 1908)**

Mandibulophoxus stimpsoni J. L. Barnard 1957: 436.

Basuto stimpsoni Barnard and Drummond 1978: 531.

non? *Mandibulophoxus stimpsoni* Griffiths 1976a: 66.

The genus *Basuto* was created by Barnard and Drummond (1978) to accommodate the former *M. stimpsoni*. Jarrett and Bousfield (1994) suggest that the *M. stimpsoni* depicted by Griffiths (1976a) differs from the *M. stimpsoni* of Barnard (1957), and may represent an undescribed *Basuto* sp. However, these field guide illustrations may not have been drawn with sufficient taxonomic accuracy for such a distinction to be made. Nevertheless the current identification should be checked.

***Griffithsius latipes* (Griffiths, 1976)**

Mandibulophoxus latipes Griffiths 1976b: 27-30, Figs 9-10.

Griffithsius latipes Jarrett and Bousefield 1994: 76, Fig. 2; Hoffmann 2003: 1-3, Figs 1-13.

Described from intertidal sandy beaches in Namibia and the Cape Peninsula. Placed in its own genus by Jarrett and Bousfield (1994).

Family Platyischnopidae Barnard & Drummond, 1979

Indischnopus capensis (K. H. Barnard, 1925)

Platyichnopus capensis K. H. Barnard 1925: 338-340, Pl. 34, Figs 13-14.

Platischnopus herdmani Griffiths 1976a: 65, Fig. 39b (non Walker 1904).

Indischnopus capensis Barnard and Drummond 1979: 33-37, Figs 19-20.

Barnard and Drummond (1979) create the new genus *Indischnopus* and revive the name *I. capensis* for South African material, which was previously allocated to *I. herdmani*. *Indischnopus herdmani* remains a valid species, but is confined to India and Sri Lanka and differs from South African material.

Family Pontogeneiidae Stebbing, 1906

Barnard and Karaman (1991) combine Pontogeneiidae with Eusiridae. However, subsequent publications retain the family (Bousfield and Hendrycks 1995). South African genera include *Dautzenbergia*, *Eusiroides*, *Paramoera* and *Paramoerella*.

***Dautzenbergia grandimana* Chevreux, 1900**

Dautzenbergia grandimana Griffiths 1977: 109-112, Fig. 3.

Recorded for the first time in South Africa by Griffiths (1977) from benthic samples collected off KwaZulu-Natal.

***Paramoerella interstitialis* Ruffo, 1974**

Paramoerella interstitialis Ruffo 1974: 412-418, Figs 6-8.

A minute (2.2 mm) interstitial species described from intertidal sand in Table Bay. Probably far more widespread, but overlooked by other workers, who conventionally work with a sieve size too course to collect this species.

Family Pontoporeiidae Dana, 1853

***Bathyporeia cunctator* d'Udekem d'Acoz & Vader, 2005**

Bathyporeia sp. Griffiths 1774a: 192; 1974b: 293; 1975: 135.

Bathyporeia cunctator d'Udekem d'Acoz and Vader 2005: 2767-2772, Figs 5-8.

South African representatives of this genus were listed by earlier authors either (incorrectly) as *B. gracilis*, or as *Bathyporeia* sp. D’Udekem d’Acoz and Vader erect three new species from the region, but one of these, *B. griffithsi*, is so far recorded only from Namibia, so is excluded from the present listing.

The genus *Bathyporeia* was formerly included in family Haustoriidae by Griffiths (1976a).

Bathyporeia gladiura **d'Udekem d'Acoz & Vader, 2005**

Bathyporeia gladiura d'Udekem d'Acoz and Vader 2005: 2772-2779, Figs 11-15.

South African representatives of this genus were listed by earlier authors either (incorrectly) as *B. gracilis*, or as *Bathyporeia* sp. D'Udekem d'Acoz and Vader erect three new species from the region, but one of these, *B. griffithsi*, is so far recorded only from Namibia, so is excluded from the present listing

The genus *Bathyporeia* was formerly included in family Haustoriidae by Griffiths (1976a).

Family Stegocephalidae Dana, 1855

Austrocephaloides australis (**K. H. Barnard, 1916)**

Stegocephaloides australis Ledoyer 1986: 962-964, Fig. 379.

Berge and Vader (2001) divide *Stegocephaloides* into two genera and place *S. australis* in their new genus *Austrocephaloides*.

Family Stenothoidae Boeck, 1871

***Knysmetopa grandimana (*Griffiths, 1974)**

Parametopa grandimana Griffiths 1974c: 324, Fig. 18; Griffiths 1977: 122-123, Fig. 10.

Barnard and Karaman (1987) create the genus *Knysmetopa* for *P. grandimana.*

***Probolisca ovata* (Stebbing, 1888)**

Probolisca ovata Griffiths 1976b: 30, Fig. 11.

Described from Oudekraal, on the west coast of the Cape Peninsula, from the holdfasts of kelp, *Laminaria pallida*.

Family Sternophysingidae Holsinger, 1992

***Sternophysinx alca* Griffiths, 1981**

Sternophysinx alca Griffiths 1981: 92-93, Fig. 8.

Freshwater species found in small freshwater pools in caves in Makapansgat, Limpopo Province, where it occurs in the same pools as *S. robertsi*. For an illustrated key to this and other species in the genus, see Griffiths and Stewart (2001).

***Sternophysinx basilobata* Griffiths, 1991**

Sternophysinx basilobata Griffiths 1991: 81-85, Figs 1-2.

Freshwater form found in Boesmans Gat Cave in the Kuruman District, Northern Cape Province, where it occurs together with the larger and less abundant *S. megacheles.*

Sternophysinx calceola **Holsinger, 1992**

Sternophysinx calceola Holsinger 1992: 116-119, Figs 1A-D,3- 5.

A freshwater species easily distinguished from all other species in the genus by the distinctive calceoli on the second antennae of both sexes. Found in pools in caves in Limpopo and Mpumalanga Provinces as well as in Chaos Cave near Potchefstroom (North West Province) where it co-occurs with *S. filaris.*

Sternophysinx filaris **Holsinger and Straskraba, 1973**

Sternophysinx filaris Holsinger and Straskraba 1973: 75-76. Griffiths 1981: 95, Fig. 7A.

Distinguished by thread-like setae on posterior margins of pereiopods 5-7. Found in freshwater pools in caves and in springs in Limpopo and Mpumalanga Provinces and co-occurs with *S. calceola* in Chaos Cave near Potchefstroom (North West Province).

Sternophysinx megacheles **Griffiths and Stewart, 1995**

Sternophysinx megacheles Griffiths and Stewart 1995: 81-86, Figs 3-4.

Known only from freshwater pools in Boesmans Gat Cave in the Kuruman district, Northern Cape Province, where it is found together with the smaller and more common *S. basilobata.*

Sternophysinx robertsi (Methuen, 1911)

Eucrangonyx robertsi Methuen 1911: 948-957, Pls 49-51; Barnard 1927: 141-209.

Sternophysinx robertsi Holsinger and Straskraba 1973: 72-74, Fig. 1; Griffiths 1981: 95, Fig. 7B.

In freshwater pools caves and springs in the Makapan Caves and vicinity.

Sternophysinx transvaalensis Holsinger and Straskraba, 1973

Sternophysinx transvaalensis Holsinger and Straskraba 1973: 76-79, Figs 4-5; Griffiths 1981: 95, Fig. 7C.

A freshwater species reported in surface streams in the Northern Drakensberg region of KwaZulu-Natal and Mpumalanga Provinces. An additional sample has subsequently been collected from caves in the De Hoop Nature Reserve near Swellendam in the Western Cape Province (over 1000 km from the previous unpublished record). Given the enormous distribution gap between these records genetic analysis of these samples would be interesting, as the current distribution, which is based on morphological identification, seems unlikely. The specimens identified by Barnard (1949) as *Crangonyx (=Sternophysinx) robertsi* were transferred to *S. transvaalensis* by Griffiths (1981).

Family Talitridae Rafinesque, 1815

Eorchestia rectipalma **(K. H. Barnard, 1940)**

Orchestia rectipalma K. H. Barnard 1940: 473, Fig. 32.

Bousfield (1984) establishes the genus *Eorchestia*, and places *O. rectipalma* in it.

Platorchestia platensis **(Kröyer, 1845)**

Orchestia platensis Bousfield 1973:160, Pl. 46.

Bousefield (1982) created the new genus *Platorchestia* with the type species being *P. platensis.*

Family Temnophliantidae Griffiths, 1975

Formerly Temnophiidae; spelling revised by Barnard and Karaman (1987) to conform to correct Latin derivation.

Hystriphlias hystrix (**K. H. Barnard, 1954)**

Temnophlias hystrix K. H. Barnard 1954: 130, Fig. 8.

Barnard and Karaman (1987) create the genus *Hystriphlias* for *T. hystrix.*

Family Uristidae Hurley, 1963

Lowry and Stoddart (1992) elevate Uristinae from a subfamily of Lysianassidae to family status. South African genera include *Euonyx, Ichnopus*, *Stephonyx* and *Uristes*.

Ichnopus macrobetomma **Stebbing, 1917**

Ichnopus macrobetomma Stebbing 1917: 38, Pl. 96.

Formerly placed in synonomy with *I. taurus* by Griffiths (1974c). However, upon examination of the holotype, Lowry and Stoddart (1992) conclude that it should remain a separate species until more complete material can be collected.

Stephonyx biscayensis **(Chevreux, 1908)**

Euonyx biscayensis Ledoyer 1986: 748-751, Fig. 289.

Lowry and Stoddart (1989) establish the genus *Stephonyx*, and place *E. biscayensis* in it, but suggest that Southern African specimens likely belong to another, as yet un-described, species of *Stephonyx.*

Family Urothoidae Bousfield, 1978

Urothoides inops **J. L. Barnard, 1967**

Urothoides inops Griffiths 1977: 112, Fig. 4.

Recorded for the first time in South Africa by Griffiths (1977) from samples dredged in 550 m off KwaZulu-Natal.

Family Wandinidae Lowry & Stoddart, 1990

***Pseudocyphocaris coxalis* Ledoyer, 1986 NEW RECORD**

Figure 4.13

Pseudocyphocaris coxalis Ledoyer 1986: 804, Fig. 313.

Pseudocyphocaris coxalis is previously known only from Madagascar. Specimens were found in Sodwana Bay, northern KwaZulu-Natal on Two-Mile Reef at 12.5 and 22 m in October 2009.

This species is recognised by its highly expanded coxa 4, which completely covers coxa 1 to 3, and its simple gnathapod 1. It is differentiated from *Cyphocaris*, which similarly displays an enlarged coxa 4, by its entire, rather than cleft telson.

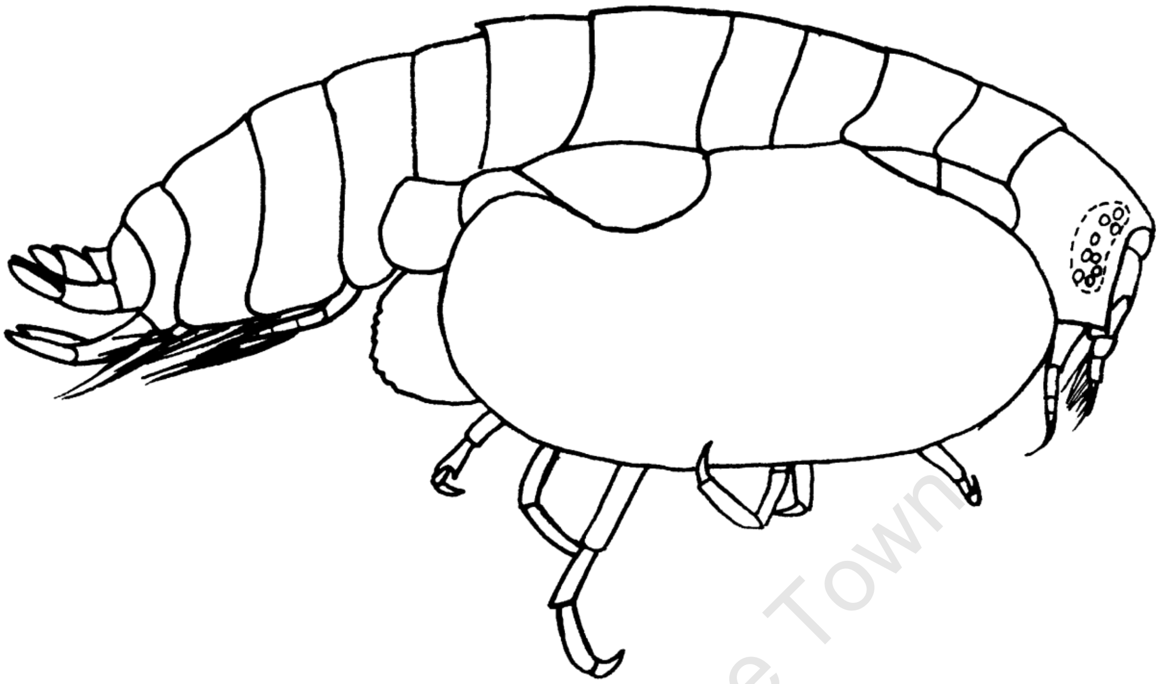

Figure 4.13 *Pseudocyphocaris coxalis* Ledoyer, 1986, 3mm, Jesser Point, Sodwana Bay, KwaZulu-Natal.Sex indeterminate.

Suborder Ingolfiellidea Hansen, 1903

Family Ingolfiellidae Hansen, 1903

Ingolfiella berrisfordi Ruffo, 1974

Ingolfiella berrisfordi Ruffo 1974: 400-405.

Trianguliella berrisfordi Stock 1976: 64. Griffiths 1989: 60-61.

This tiny, interstitial species is the only member of the suborder currently reported from South Africa and has been recorded only from course intertidal sand at Bloubergstrand, near Cape Town. This habitat is very poorly explored, however, and the distribution is probably much more extensive. At least one larger freshwater ingolfiellid has also been reported from caves in the Northern Cape Province, but remains un-described. Given that several freshwater species occur in Namibia, more similar records from South Africa can be expected.

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Chapter 5: Conclusion

5.1 Summary

This thesis has attempted to describe the macroinvertebrate fauna of Sodwana Bay. This was achieved by focusing on biotopes dominated by macrophytes, specifically algal turfs and seagrass beds.

While different biotopes may be identified in Sodwana Bay by just a few foundational species, the actual biodiversity represented by these habitats is much larger. Smaller organisms reside in the habitat created by these foundational species, and form communities specific to that biotope. Although this study focused on biotopes in which the main foundational species were macrophytes, Sodwana Bay is composed of a rich mosaic of biotopes, and one would expect unique assemblages of species to inhabit each biotope.

In Chapter 2, the community inhabiting *Thalassodendron ciliatum* beds was examined. Within the biotope created by the single ecosystem engineering species, a community composed of 204 macroinvertebrate and 41 algal epiphyte species was supported. The macroinvertebrate community was composed of a diverse number of phyla. While Polychaeta, Mollusca and Arthropoda were the most speciose phyla in the seagrass bed community(76%), Hydrozoa and Bryozoa, also contributed a considerable portion to the community composition (20%). Red algae were dominant among the epiphytes (76%). The two species found most consistently across all seagrass samples were sertularian hydroids. There was no strong differentiation between seagrass bed samples, in either biodiversity, species composition or invertebrate abundance or algal biomass. This would be partially due to the low number of samples enumerated, but the sheltering effect of seagrass beds on the hosted community may also contribute to the uniformity across samples.

In Chapter 3, algal turfs biotopes were examined, for both macroinvertebrate and algal communities. From sampling across six depth groups, 314 species of motile invertebrates were identified from the phyla Arthropoda, Annelida, Mollusca and Echinodermata, and 72 macroalgal species. Although all samples were classified as algal turfs, with small, low-growing macroalgae, the species composition differed quite dramatically with depth. The species that most characterised the community composition for each depth grouping were almost entirely different for each group. In addition to this, 67% of macroinvertebrate species were found at only one depth. Macroinvertebrate communities from inshore reefs showed a higher level of biodiversity than communities in the surf zone. A second stage analysis was attempted to detect whether macroinvertebrate communities were more closely related to algal community by species composition or functional groupings. However, due to the overwhelming influence of depth on community composition, this analysis was inconclusive.

Chapter 4 examines the amphipod component of the material collected from Sodwana Bay. Two new species are described: *Varohios* n. sp. from Two-Mile Reef, and *Ceradocus* n. sp. from *T. ciliatum* beds on Jesser Point. In addition to the two species new to science, ten species are recorded for the first time in South Africa from Sodwana Bay material, one of which is the first time that family has been recorded in South Africa. The South African species list was revised to include these species, as well as being updated to include all suborders of Amphipoda in a single list. The previous list of all known South African Amphipoda was published by Barnard in 1940. He listed 256 species of Amphipoda. The current list has been updated to include 484 species.

5.2 Synthesis

Species richness

This study has resulted in a species list of 469 species for the macroinvertebrates of Sodwana Bay. Of these, 42 species are shared between the two types of biotope sampled (See Appendix 1). Algal turfs had a total species richness of 307, and seagrass beds showed a total species richness of 204.

To compare the two sets of samples, the species accumulation curves were plotted on the same graph (Figure 5.1). As the algal turf samples were composed of Arthropoda, Annelida, Mollusca and Echinodermata, those four phyla were selected for the species accumulation curve. The algal turf curve increases much more steeply than the seagrass bed curve, and by the fifteenth and final sample, the seagrass total cumulative species is below the lower confidence level of the algal turf species accumulation curve.

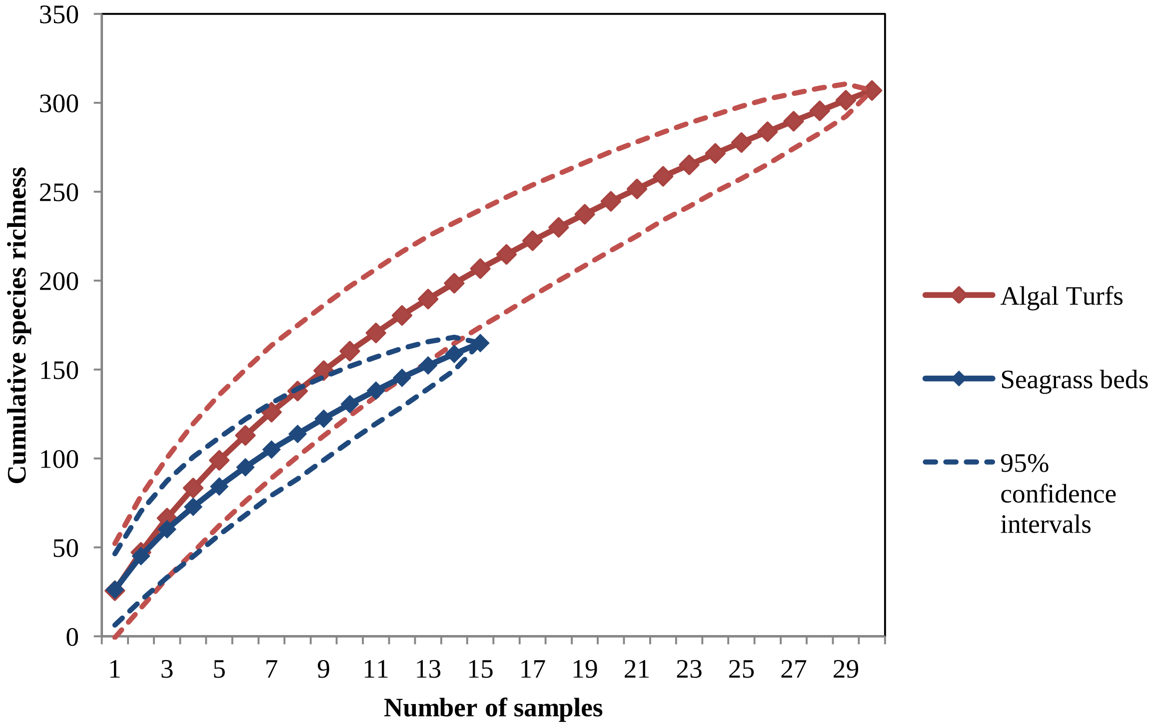

Figure 5.1 Species accumulation curves of macrofauna samples collected from macrophyte-dominated biotopes in Sodwana Bay.

This difference was as expected, because of the high amount of variability between the depth groups in the algal turf samples, compared to the relatively homogeneous seagrass bed samples. However, these conclusions should not be over-interpreted, due to the differences in sampling: sampling the two types of biotopes at different times of the year, and using slightly different collection methods, due to the differences in substrate structure.

The species richness measured in this study matches or exceeds the level of species richness measured in studies looking at other groups in this area. Schleyer and Celliers (2003), looking at large benthic cover of inshore reefs, recorded more than 163 species, composed of 133 coral species from 55 genera, 30 ascidian species from 17 genera, and an unknown number of sponge species from 20 genera. Samaai *et al.* (2010) evaluated Porifera along a bathymetric gradient in Sodwana Bay, and recorded 96 species of sponge, from 55 genera. Fifty-three of these species were from inshore reefs, and 22 species were collected intertidally. Dye *et al.* (1981) examined sandy beaches in Natal, and recorded 11 invertebrate species greater than 4 mm. Wartenberg (2011) identified 209 fish species from 41 families on Two-Mile Reef. Floros (2010) identified 284 fish species from south-east African reefs. Chater *et al.* (1993) recorded 399 fish species from 73 families from inshore reefs in iSiMangaliso Park.

The number of macroinvertebrates greatly increases the amount of biodiversity for Sodwana Bay. These smaller species represent an often overlooked, but substantial, component of the biodiversity of the ecosystem.

Although macrofauna samples require more effort to process than those of larger species, fewer samples are required to achieve the same species richness.

Despite the small sampling domain for this study, the species richness of macrofauna is greater than all of the similar studies looking at other groups in the region, except for the fish species of Chater *et al.* (1993), a study that covered a much larger area, and had a much higher sampling effort. In addition, from the species accumulation plots, it is clear that increased sampling would increase the species richness. Because of the high numbers of rare species, one would expect that increased replication would substantially increase species richness. Additionally, completing the identifications of the sessile species from the algal turf samples would also increase species richness.

Biotope diversity

This study examined two biotopes in Sodwana Bay: algal turfs and seagrass beds. In total, 469 species were identified, with 162 being unique to seagrass beds, 265 to algal turfs, and 42 being held in common.

Studies elsewhere of adjacent biotopes show that while there were many species held in common between the two biotopes, the macroinvertebrate communities were distinct. Chapman *et al.* (2005) examined corraline algal turfs with invasive mussel beds, and found that infauna of mussel beds were larger in body size, and at a lower abundance than the corraline turfs. Crouch (1991) found that there were more species held in common between the infauna of a rocky seagrass species, and that of a nearby algal turf. However, the feeding guilds of the rocky seagrass species more closely resembled soft sediment seagrass infauna.

The two macrophyte biotopes here hosted unique species assemblages, and there are many more biotopes in the region. In addition to the macrophyte-dominated biotopes, large areas of the reefs and rocky shore in Sodwana Bay are covered by specific communities of large sessile invertebrates. These include tunicates, sponges and cnidarians, most notably corals, both hard and soft (Ramsay and Mason 1990; Riegl *et al.* 1995). The macroinvertebrate communities of these biotopes are surely significantly different from those examined in this study, and would include many species not recorded here. Also, given the high level of depth structuring present in algal turf samples, sampling at more depths would also be expected to represent more distinct macroinvertebrate communities.

Taxonomic knowledge

This is an area where biodiversity research is still needed. Although South Africa has significant taxonomic knowledge and an investment in biodiversity knowledge that is remarkable for a developing nation, the best in Africa, there are still significant gaps in the knowledge of South African species. From the Amphipoda alone, ten new records have been presented, and two species have been described from material sampled from only 2.8 m² of habitat. The knowledge of other taxa is even less advanced. The two best-known macrofaunal groups (Arthropoda and Annelida) encountered in this study were analysed in terms of the percentage of species encountered in Sodwana Bay that could not be identified using the literature of the region. These were restricted to species with specimens in good enough condition that it could be said with some confidence they were not any of the known South African species. The number of species that could not be identified using Southern African identification references ranged from 0% for Stomatopoda to 93% for Pycnogonida (Table 5.1). The larger taxa (Decapoda, Stomatopoda and shrimp) as well as the better-studied groups (Amphipoda and Polychaeta), showed the highest percentage of positive identifications, with between 0% and 16% of species not in regional guides. The percentages of unknown species among the taxa given here are similar to numbers given for percent endemicity given by Awad *et al.* (2002) and Scott (2007). Scott presents percentages endemic for Isopoda, Amphipoda, Polychaeta and Brachyura as 84%, 40%, 34% and 24% respectively, whereas the percent of Sodwana Bay specimens that could not be identified in regional identification guides was 57%, 24%, 14% and 14% for the same groups. Given the low level of biodiversity knowledge for eastern KwaZulu-Natal, and the relationship between endemicity and range size, it would follow that fewer species from highly endemic groups would be described in guides from better-known regions of the country.

Table 5.1 Unknown species encountered in Sodwana Bay sampling, by group.

	Unknown Species	Species found	Unknown proportion (%)	Last Comprehensive Reference
Pycnogonida	14	15	93	Day 1974
Isopoda	13	23	57	Kensley 1978
Amphipoda	16	66	24	Griffiths 1976 Ledoyer 1982 (Madagascar)
Tanaiidacea	2	9	22	Day 1974
Decapoda	5	37	14	Barnard 1972 (Crabs) Kensley 1972 (Shrimp)
Polychaetea	14	114	14	Day 1967
Stomatopoda	0	2	0	Barnard 1972

The two most poorly described taxa for Sodwana Bay are Pycnogonida and Isopoda. In the case of Pycnogonida, this is understandable, as there is no nation-wide guide to the class, and knowledge of the group is poor. The most comprehensive treatment of the class is given in the general guide to South African marine life, Day (1974). This only gives a key to eight common intertidal species. Day noted that very little was known about South African Pycnogonida, and little work has been done on the group since his monograph.

In the case of Isopoda, the second least known group in Sodwana Bay, there is a higher degree of taxonomic knowledge. Kensey (1978) provides an extensive coverage of Southern African Isopoda, and provides a key to 275 species. The high percentage of unidentifiable species in Sodwana Bay could be attributable to the low levels of historical sampling in northern KwaZulu-Natal, and the consistently high levels of endemicity noted in South African Isopoda (Awad *et al.* 2002; Scott 2009). Awad *et al.* attribute part of this to low taxonomic expertise in the regions surrounding South Africa. However, high levels of endemicity in Isopoda are a global trend. Isopoda in Europe still have a high rate of description, with the greatest number of species yet to be discovered compared to other taxa (Wilson and Costello 2005). Svavarsson *et al.* (1993) record a high level of endemism among asellote Isopoda in the Northern Seas. High levels of endemism due to small species ranges would mean that South Africa's uneven geographical distribution of biological samples has so far been unable to uncover large numbers of South African isopod species. This would be particularly true of Sodwana Bay, which until relatively recently was not easily accessible to sampling.

High numbers of undescribed species are then expected for these two taxa: Pycnogonida due to the low baseline level of taxonomic knowledge, and Isopoda due to the groups high rates of endemism and small species ranges. Isopoda and Pycnogonida, in particular, would greatly benefit from taxonomic revision in a South African context. Given the low level of sampling in Sodwana Bay, it is reasonable that the morphospecies not identified here represent species that have not been discovered or described before.

Indeed, the ability to estimate and evaluate South African biodiversity is limited by the lack of taxonomic knowledge, and more research into these groups would give a better understanding of both the amount of biodiversity in South Africa, and the role that cryptobenthos could play in South African marine ecosystems.

5.3 Conclusions

This study has added 469 species to the Sodwana Bay species list, including the description of two species new to science, and collection of many more unknown species with the potential for description. This has greatly contributed to the knowledge of the area by providing a preliminary record of the macroinvertebrate component of the Sodwana Bay ecosystem. This contributes to the African Coelacanth Ecosystem Programme, which is coordinating research on this specific area across a range of disciplines. This study contributes a baseline of macroinvertebrate species in some biotopes in Sodwana Bay, and will contribute to the whole ecosystem understanding of the region, which in turn will help to form the basis of ecosystem-based conservation of Coelacanth habitat, which is the root goal of ACEP. Specifically, this study has formed the foundation of investigation into macroinvertebrates in Sodwana Bay. From this study, further research may be conducted into relationships between macroinvertebrates and other trophic levels, closer species relationships within these macrophyte-structured biotopes, and levels of variation across a broader range of biotopes, including those dominated by reef-structuring invertebrates such as corals and sponges.

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Appendix 1: Sodwana Bay Species List

List of species collected from Sodwana Bay, total abundance given for all samples from algal turfs and seagrass beds.

Class	Order	Family	Species	Algal Turf	Sea-grass
Phylum: Annelida					
Polychaeta	Amphinomida	Amphinomidae	*Chloeia fusca*	34	
Polychaeta	Amphinomida	Amphinomidae	*Pherecardia striata*	1	
Polychaeta	Amphinomida	Amphinomidae	*Pseudoeurythoe microcephala*	1	
Polychaeta	Amphinomida	Amphinomidae	*Eurythoe complanata*		1
Polychaeta	Amphinomida	Amphinomidae	*Eurythoe parvecarunculata*		3
Polychaeta	Capitellidae	Capitellidae	*Heteromastus filiformis*		6
Polychaeta	Eunicida	Eunicidae	*Eunice afra punctata*	4	1
Polychaeta	Eunicida	Eunicidae	*Eunice siciliensis*	13	2
Polychaeta	Eunicida	Eunicidae	*Nematonereis unicornis*	5	4
Polychaeta	Eunicida	Eunicidae	*Eunice antennata*	2	
Polychaeta	Eunicida	Eunicidae	*Eunice australis*	6	
Polychaeta	Eunicida	Eunicidae	*Lycidice natalensis* or *collaris*	8	
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris latreilli*	21	1
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris tetraura*	6	3
Polychaeta	Eunicida	Lumbrineridae	*Lumbrineris cavifrons*	1	
Polychaeta	Eunicida	Oenonidae	*Arabella irricolor irricolor*	6	1
Polychaeta	Eunicida	Oenonidae	*Oenone fulgida*		1
Polychaeta	Eunicida	Onuphidae	*Onuphis eremita*	1	1
Polychaeta	Eunicida	Onuphidae	Onuphinae	5	
Polychaeta	Eunicida	Onuphidae	*Diopatra* sp	1	
Polychaeta	Eunicida	Onuphidae	*Onuphis (Nothria)* sp	1	
Polychaeta	Eunicida	Onuphidae	*Paronuphis* "ceratophore lobes"	8	
Polychaeta	Eunicida	Onuphidae	*Paronuphis* "no lobes"	1	
Polychaeta	Eunicida	Onuphidae	*Paronuphis* sp B	1	
Polychaeta	Maldanidae	Maldanidae	Maldanidae dam		1
Polychaeta	Orbiniidae	Orbiniidae	Orbiniidae dam		1
Polychaeta	Orbiniidae	Orbiniidae	*Scolaricia* sp A		2
Polychaeta	Phyllodocida	Chrysopetalidae	*Paleanotus chrysolepis*		1
Polychaeta	Phyllodocida	Glyceridae	*Glycera* sp	4	
Polychaeta	Phyllodocida	Goniadidae	*Goniada maculata*	2	
Polychaeta	Phyllodocida	Hesionidae	*Leocrates claparedii*		1
Polychaeta	Phyllodocida	Nereididae	*Ceratonereis mirabilis*	24	1
Polychaeta	Phyllodocida	Nereididae	*Nereis eugeniae*	222	1
Polychaeta	Phyllodocida	Nereididae	*Nereis willeyi*	16	1
Polychaeta	Phyllodocida	Nereididae	*Ceratonereis erythraeensis*	6	

Class	Order	Family	Species	Algal Turf	Sea-grass
Polychaeta	Phyllodocida	Nereididae	*Nereis* "huge eyes"	2	
Polychaeta	Phyllodocida	Nereididae	*Nereis* "pigmented, cleft prostomium"	1	
Polychaeta	Phyllodocida	Nereididae	*Nereis falcaria*	1	
Polychaeta	Phyllodocida	Nereididae	*Nereis persica*	1	
Polychaeta	Phyllodocida	Nereididae	*Nereis unifasciata*	56	
Polychaeta	Phyllodocida	Nereididae	*Perinereis falsovariegata*	17	
Polychaeta	Phyllodocida	Nereididae	*Platynereis australis*	13	
Polychaeta	Phyllodocida	Nereididae	*Pseudonereis variegata*	7	
Polychaeta	Phyllodocida	Nereididae	*Leptonereis* sp		5
Polychaeta	Phyllodocida	Nereididae	*Nereis pelagica*		1
Polychaeta	Phyllodocida	Nereididae	*Platynereis dumerillii*		32
Polychaeta	Phyllodocida	Pholoidae	*Pholoe* "gravelly"	2	
Polychaeta	Phyllodocida	Phyllodocidae	*Phyllodoce madeirensis*	4	
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia* sp A		1
Polychaeta	Phyllodocida	Phyllodocidae	*Eulalia* sp B		2
Polychaeta	Phyllodocida	Polynoidae	*Iphione ovata*	3	3
Polychaeta	Phyllodocida	Polynoidae	*Harmothoe* "black" or *Polyeunoa nigropunctata*	3	
Polychaeta	Phyllodocida	Polynoidae	*Lepidasthenia microlepis*	1	
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus carinulatus*	1	
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus durbanensis*	2	
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus tenuisetosus*	1	
Polychaeta	Phyllodocida	Polynoidae	*Lepidonotus carinatus*		1
Polychaeta	Phyllodocida	Sigalionidae	*Sthenelais boa*	11	1
Polychaeta	Phyllodocida	Sigalionidae	*Psammolyce*	10	
Polychaeta	Phyllodocida	Syllidae	*Exogone verugera*	1	4
Polychaeta	Phyllodocida	Syllidae	*Syllis cornuta*	18	6
Polychaeta	Phyllodocida	Syllidae	*Syllis spongicola*	47	17
Polychaeta	Phyllodocida	Syllidae	*Brania rhopalophora*	2	
Polychaeta	Phyllodocida	Syllidae	*Exogone clavator*	38	
Polychaeta	Phyllodocida	Syllidae	*Odontosyllis ctenostoma*	1	
Polychaeta	Phyllodocida	Syllidae	*Odontosyllis gibba*	1	
Polychaeta	Phyllodocida	Syllidae	*Opisthosyllis brunnea*	1	
Polychaeta	Phyllodocida	Syllidae	*Pionosyllis ehlersiaeformis*	1	
Polychaeta	Phyllodocida	Syllidae	*Sphaerosyllis capensis*	1	
Polychaeta	Phyllodocida	Syllidae	Syllidae "not syllidae?" large, 2 pieces	1	
Polychaeta	Phyllodocida	Syllidae	Syllidae "not syllidae?" small, no head	1	
Polychaeta	Phyllodocida	Syllidae	*Syllis cirropunctata*	7	
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis* "bigger"	1	
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis* "flat"	1	
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis* "half"	1	
Polychaeta	Phyllodocida	Syllidae	*Exogone* sp		5

Class	Order	Family	Species	Algal Turf	Sea-grass
Polychaeta	Phyllodocida	Syllidae	*Pionosyllis magnidens*		1
Polychaeta	Phyllodocida	Syllidae	*Trypanosyllis* sp		4
Polychaeta	Phyllodocida	Syllidae	Eusyllinae (or *Brania*?) big eyes		1
Polychaeta	Polychaeta	Capitellidae	*Notomastus* sp	3	
Polychaeta	Polychaeta	Opheliidae	*Armandia intermedia*	1	
Polychaeta	Polychaeta	Opheliidae	*Polyophthalmus pictus*	24	
Polychaeta	Polychaeta	Orbiniidae	*Scoloplos* sp	1	
Polychaeta	Sabellida	Sabellariidae	*Idanthyrsus pennatus*	8	1
Polychaeta	Sabellida	Sabellidae	*Potamilla reniformis*	1	1
Polychaeta	Sabellida	Sabellidae	*Branchiomma nigromaculata*	5	
Polychaeta	Sabellida	Sabellidae	*Megalomma quadrioculatum*	5	
Polychaeta	Sabellida	Sabellidae	*Branchiomma violacea*		12
Polychaeta	Sabellida	Serpulidae	*Hydroides* sp		7
Polychaeta	Sabellida	Serpulidae	*Serpula vermicularis*		1
Polychaeta	Scalibregmatidae	Scalibregmatidae	*Hyboscolex longiseta*		1
Polychaeta	Spionida	Spionidae	*Polydora antennata*	27	1
Polychaeta	Spionida	Spionidae	*Polydora* "serrated seg 5 setae"	21	
Polychaeta	Spionida	Spionidae	*Spio filicornis*	1	
Polychaeta	Spionida	Spionidae	*Polydora c.f. giardi*		1
Polychaeta	Spionida	Spionidae	*Prionospio sexoculata*		1
Polychaeta	Terebellida	Ampharetidae	*Melinnopsides* sp	10	7
Polychaeta	Terebellida	Ampharetidae	*Amphicteis gunneri*	3	
Polychaeta	Terebellida	Cirratulidae	*Cirriformia punctata*	8	3
Polychaeta	Terebellida	Cirratulidae	*Cirriformia tentaculata*	2	24
Polychaeta	Terebellida	Flabelligeridae	*Pherusa* sp	1	
Polychaeta	Terebellida	Terebellidae	*Polycirrus* sp	4	9
Polychaeta	Terebellida	Terebellidae	*Nicolea* "14 seg notosetae"	1	
Polychaeta	Terebellida	Terebellidae	*Nicolea venustula*	2	
Polychaeta	Terebellida	Terebellidae	*Pista foliigera*	1	
Polychaeta	Terebellida	Terebellidae	*Terebellobranchia* "not natalensis"	1	
Polychaeta	Terebellida	Terebellidae	*Pista fasciata*		1
Polychaeta	Terebellida	Terebellidae	*Terebella pterochaeta*		1
Polychaeta	Terebellida	Terebellidae	*Terebellobranchia* not natalensis		2
Polychaeta		Capitellidae	*Dasybranchus caducus*	1	1
Phylum: Arthropoda					
Arachnida	Acarina	Halacaridae	Halacaridae		2
Malacostraca	Amphipoda	Amaryllididae	*Amaryllis macrophthalma*	1	
Malacostraca	Amphipoda	Ampeliscidae	*Ampelisca brevicornis*	5	
Malacostraca	Amphipoda	Ampeliscidae	*Ampelisca palmata*	7	
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe cavimana*	8	
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe* turf sp 1	19	

Class	Order	Family	Species	Algal Turf	Sea-grass
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe kava*		31
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe* sp A		38
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe* sp B		4
Malacostraca	Amphipoda	Ampithoidae	*Ampithoe* sp C		7
Malacostraca	Amphipoda	Caprellidae	*Phtisica marina*	5	
Malacostraca	Amphipoda	Caprellidae	Fluffy Aeginellid	8	
Malacostraca	Amphipoda	Caprellidae	*Metaprotella haswelliana*	22	
Malacostraca	Amphipoda	Caprellidae	*Orthoprotella mayeri*	61	
Malacostraca	Amphipoda	Caprellidae	*Monoliropus falcimanus*	58	
Malacostraca	Amphipoda	Caprellidae	*Pseudoprotella phasma*	8	
Malacostraca	Amphipoda	Caprellidae	*Pseudaeginella tristanensis*		15
Malacostraca	Amphipoda	Caprellidae	*Caprella* "not aequilibria"		36
Malacostraca	Amphipoda	Caprellidae	*Caprella pentanalis*		7
Malacostraca	Amphipoda	Chevaliidae	*Chevalia aviculae*	31	
Malacostraca	Amphipoda	Colomastigidae	*Colomastix armata*	1	
Malacostraca	Amphipoda	Colomastigidae	*Colomastix pusilla*	1	
Malacostraca	Amphipoda	Colomastigidae	*Colomastix plumosa*		2
Malacostraca	Amphipoda	Corophiidae	*Corophium triaenonyx*	27	
Malacostraca	Amphipoda	Corophiidae	Corophiidae? (♀)		2
Malacostraca	Amphipoda	Dexaminidae	*Polycheria atolli*	4	
Malacostraca	Amphipoda	Dogielinotidae	*Parhyallella natalensis*		1
Malacostraca	Amphipoda	Hyalidae	*Hyale grandicornis*		8
Malacostraca	Amphipoda	Ischyroceridae	*Erichthonius brasiliensis*	20	57
Malacostraca	Amphipoda	Ischyroceridae	*Erichthonius latimanus*	1	
Malacostraca	Amphipoda	Ischyroceridae	*Ischyrocerus c.f. anguipes*	11	
Malacostraca	Amphipoda	Ischyroceridae	*Jassa morinoi*		19
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe* sp*inicarpa*	9	1
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe ctenochir*	2	
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe richiardi*	1	
Malacostraca	Amphipoda	Leucothoidae	*Leucothoe* sp A	2	
Malacostraca	Amphipoda	Liljeborgiidae	*Liljeborgia* sp	2	
Malacostraca	Amphipoda	Lysianassidae	*Lysianassa ceratina*	15	
Malacostraca	Amphipoda	Lysianassidae	Lysianassidae "large coxa 4"		1
Malacostraca	Amphipoda	Maeridae	*Elasmopus c.f. pectenicrus*	10	35
Malacostraca	Amphipoda	Maeridae	*Maera pacifica*	7	52
Malacostraca	Amphipoda	Maeridae	*Ceradocus c.f. natalensis*	5	
Malacostraca	Amphipoda	Maeridae	*Elasmopus* ? (new)	1	
Malacostraca	Amphipoda	Maeridae	*Maera* sp A	4	
Malacostraca	Amphipoda	Maeridae	*Mallacoota subcarinata*	1	
Malacostraca	Amphipoda	Maeridae	*Ceradocus* n. sp		2
Malacostraca	Amphipoda	Maeridae	*Elasmopus alalo*		22
Malacostraca	Amphipoda	Melitidae	*Melita excavata*	2	
Malacostraca	Amphipoda	Neomegamphopidae	*Varohios* n. sp	7	
Malacostraca	Amphipoda	Oedicerotidae	Oedicerotidae? (v. dam)		1

Class	Order	Family	Species	Algal Turf	Sea-grass
Malacostraca	Amphipoda	Phliantidae	*Pereionotus alaniphlias*	1	
Malacostraca	Amphipoda	Photidae	*Gammaropsis atlantica*	134	4
Malacostraca	Amphipoda	Photidae	*Photis kapapa*	125	
Malacostraca	Amphipoda	Photidae	*Photis* sp A	5	
Malacostraca	Amphipoda	Photidae	*Photis* ? (v. small, new)	6	
Malacostraca	Amphipoda	Photidae	*Gammaropsis pseudodenticulata*		15
Malacostraca	Amphipoda	Photidae	*Photis?*		9
Malacostraca	Amphipoda	Phoxocephalidae	Phoxocephalidae	2	
Malacostraca	Amphipoda	Podoceridae	*Laetmatophilus tridens*	19	
Malacostraca	Amphipoda	Podoceridae	*Podocerus hystrix*	5	
Malacostraca	Amphipoda	Podoceridae	*Podocerus* sp	158	
Malacostraca	Amphipoda	Podoceridae	*Podocerus africanus*		1
Malacostraca	Amphipoda	Pontogeneiidae	*Paramoera capensis*	1	
Malacostraca	Amphipoda	Stenothoidae	*Stenothoe* "straight, hairy palm" sp A	1	
Malacostraca	Amphipoda	Stenothoidae	*Stenothoe valida*	8	
Malacostraca	Amphipoda	Urothoidae	*Urothoe elegans*	1	
Malacostraca	Amphipoda	Urothoidae	*Urothoe* sp	1	
Malacostraca	Amphipoda	Wandinidae	*Pseudocyphocaris coxalis*	2	
Malacostraca	Amphipoda		Amphipod w/ proections on urosome	1	
Malacostraca	Cumacea		Cumacea "upturned rostrum"	2	
Malacostraca	Cumacea		Cumacea "sculptured w/ ppods"	1	
Malacostraca	Decapoda	Alpheidae	*Alpheus parvirostris*	1	
Malacostraca	Decapoda	Alpheidae	*Alpheus macrochirus*	1	
Malacostraca	Decapoda	Alpheidae	*Alpheus deuteropus* (2)	1	
Malacostraca	Decapoda	Alpheidae	*Athanas minikoensis*		3
Malacostraca	Decapoda	Alpheidae	*Alpheus deuteropus* (1)		1
Malacostraca	Decapoda	Alpheidae	*Synalpheus anisocheir*		1
Malacostraca	Decapoda	Calappidae	*Calappa gallus*	1	
Malacostraca	Decapoda	Decapoda	*Oxyrhyncha* sp A	1	
Malacostraca	Decapoda	Decapoda	*Brachyura* sp A	1	
Malacostraca	Decapoda	Diogenidae	*Aniculus?* sp		3
Malacostraca	Decapoda	Epialtidae	*Dehaanius undulatus*	2	3
Malacostraca	Decapoda	Epialtidae	*Menaethiops delgoae*	6	1
Malacostraca	Decapoda	Epialtidae	Acanthonychidae sp A	1	
Malacostraca	Decapoda	Epialtidae	*Menaethiops fascicularis*		5
Malacostraca	Decapoda	Leucosiidae	*Leucisca squalina*	1	6
Malacostraca	Decapoda	Majidae	Majidae (smooth)	1	
Malacostraca	Decapoda	Paguridae	*Pagurus* sp A	3	1
Malacostraca	Decapoda	Pilumnidae	*Actumnus setifer*	1	
Malacostraca	Decapoda	Pilumnidae	*Pilumnus trichophoroides*	1	
Malacostraca	Decapoda	Porcellanidae	*Polyonyx "c.f. biunguiculatus"*	2	

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Malacostraca	Decapoda	Porcellanidae	*Petrolisthes lamarckii*		1
Malacostraca	Decapoda	Porcellanidae	*Porcellana dehaanii*		1
Malacostraca	Decapoda	Portunidae	*Carupella natalensis*	1	
Malacostraca	Decapoda	Portunidae	*Thalamita admete* (juv)	1	
Malacostraca	Decapoda	Portunidae	*Thalamita* sp B	1	
Malacostraca	Decapoda	Portunidae	*Thalamita* sp C	1	
Malacostraca	Decapoda	Upogebiidae	*Upogebia c.f. "c.f. rhadames"*	1	
Malacostraca	Decapoda	Xanthidae	Xanthidae sp A	1	2
Malacostraca	Decapoda	Xanthidae	*Xantho c.f. quinquedentatus*	2	11
Malacostraca	Decapoda	Xanthidae	*Actaea nodulosa*	1	
Malacostraca	Decapoda	Xanthidae	*Actaea rufopunctata*	8	
Malacostraca	Decapoda	Xanthidae	*Atergeris floridus*	1	
Malacostraca	Decapoda	Xanthidae	*Xanthidae* sp B	5	
Malacostraca	Decapoda	Xanthidae	*Lybia plumosa*		3
Malacostraca	Decapoda	Xanthidae	*Xanthidae* sp C		1
Malacostraca	Isopoda	Aegidae	*Aega* sp New	2	
Malacostraca	Isopoda	Anthuridae	Anthiuridae sp A	1	2
Malacostraca	Isopoda	Arcturidae	*Neastacilla* "tuberculate"	1	
Malacostraca	Isopoda	Cirolanidae	*Cirolana* "serrated telson"	1	
Malacostraca	Isopoda	Cirolanidae	*Cirolana* "spiny telson"		3
Malacostraca	Isopoda	Gnathiidae	*Gnathia spongicola*	2	3
Malacostraca	Isopoda	Joeropsididae	*Jaeropsis* "eye bar" *c.f. waltervadi*	1	1
Malacostraca	Isopoda	Joeropsididae	*Jaeropsis* "serated rostrum" *c.f. waltervadi*	2	
Malacostraca	Isopoda	Joeropsididae	*Jaeropsis* "smooth telson" *c.f. waltervadi*		1
Malacostraca	Isopoda	Munnidae	?Munnidae	1	
Malacostraca	Isopoda	Paranthuridae	Paranthura? sp New	1	
Malacostraca	Isopoda	Sphaeromatidae	*Cymodoce* "setose"	5	
Malacostraca	Isopoda	Sphaeromatidae	*Cymodoce alia*	3	
Malacostraca	Isopoda	Sphaeromatidae	*Dynamenella* "smooth" *c.f. austaloides*		5
Malacostraca	Isopoda	Sphaeromatidae	*Dynamenella huttoni*		1
Malacostraca	Isopoda	Sphaeromatidae	*Dynamenella c.f. scabricula*		2
Malacostraca	Isopoda	Stenetriidae	*Stenetrium saldanha*	1	
Malacostraca	Isopoda	Stenetriidae	*Stenetrium crassimanus*	1	
Malacostraca	Isopoda	Stenetriidae	*Stenetrium* "hooked pleotelson"	1	
Malacostraca	Isopoda	Stenetriidae	*Stenetrium* "5-tooth rostrum"	1	
Malacostraca	Isopoda	Stenetriidae	*Stenetrium* "10-tooth rostrum"	5	
Malacostraca	Isopoda	Stenetriidae	*Stenetrium dagama*		5
Malacostraca	Isopoda				1
Malacostraca	Stomatopoda	Gonodactylidae	*Gonodactylus chiragra*	1	

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Malacostraca	Stomatopoda	Gonodactylidae	*Gonodactylus demanii*	1	
Malacostraca	Tanaidacea	Leptocheliidae	Leptocheliidae "males/generic"	4	
Malacostraca	Tanaidacea	Leptocheliidae	Leptocheliidae "long ant setae"	2	
Malacostraca	Tanaidacea	Leptocheliidae	Leptocheliidae "carpus hood"	6	
Malacostraca	Tanaidacea	Leptocheliidae	Leptocheliidae "minute expod"	5	
Malacostraca	Tanaidacea	Metapseudidae	Metapseudidae	5	
Malacostraca	Tanaidacea	Pagurapseudidae	Paguropseudidae	2	
Malacostraca	Tanaidacea	Paratanaidae	Paratanaidae "keeled ant"	15	6
Malacostraca	Tanaidacea	Tanaidae	*Tanais philetaerus*	5	
Maxillopoda	Cyclopoida		Cyclopoida "spade-shaped"		1
Maxillopoda	Harpacticoida		Harpacticoida "long uropod spines"	2	
Maxillopoda	Harpacticoida		Harpacticoida "corrugated"	5	
Maxillopoda	Harpacticoida		Harpacticoida "short urosome"	1	
Maxillopoda	Harpacticoida		Harpacticoida "flat attenuated corners"	1	
Maxillopoda	Harpacticoida		Harpacticoida "flat disc"		1
Ostracoda	Myodocopida		Myodocopida "spotted shell"	10	
Ostracoda	Podocopida		Podocopida "large foot"	2	
Pycnogonida	Pantopoda	Ammotheidae	?Ammotheidae "disc body"	3	8
Pycnogonida	Pantopoda	Ammotheidae	?*Achelia* "sm ovigers"	1	
Pycnogonida	Pantopoda	Ammotheidae	?Ammotheidae "long spines"	3	
Pycnogonida	Pantopoda	Ammotheidae	?*Achelia* "bent propodus"		7
Pycnogonida	Pantopoda	Ammotheidae	?*Achelia* "very spiny"		3
Pycnogonida	Pantopoda	Ammotheidae	?*Tanystylum* "pointed proboscis"		2
Pycnogonida	Pantopoda	Ammotheidae	*Tanystylum brevipes*		3
Pycnogonida	Pantopoda	Callipallenidae	?Calliapallenidae "aux spines = claw"	4	1
Pycnogonida	Pantopoda	Callipallenidae	?Calliapallenidae "no neck"	1	5
Pycnogonida	Pantopoda	Callipallenidae	?Calliapallenidae "long neck"	1	
Pycnogonida	Pantopoda	Callipallenidae	?Calliapallenidae "no aux spines"	2	
Pycnogonida	Pantopoda	Phoxichilidiidae	*Anoplodactylus* "upright abdomen"	2	
Pycnogonida	Pantopoda	Phoxichilidiidae	Phoxochelididae "short eye tubercle"	1	
Pycnogonida	Pantopoda	Phoxichilidiidae	*Anoplodactylus* "ventral abdomen"		2
Pycnogonida			Pycnogonida "2-seg palp"	1	
Phylum: Bryozoa					
Gymnolaemata	Cheilostomatida		Cylindrical bryozoan		1
Gymnolaemata	Cheilostomatida	Beaniidae	Stolonal sp D		2

Class	Order	Family	Species	Algal Turf	Sea-grass
Gymnolaemata	Cheilostomatida	Electridae	*Electra pilosa*		26
Gymnolaemata	Cheilostomatida	Phidoloporidae	waffle bryozoan		1
Gymnolaemata	Cheilostomatida		Stolonal sp A (=Upright sp E?)		4
Gymnolaemata	Cheilostomatida		Curly white		32
Gymnolaemata	Cheilostomatida		Buguloid sp A double row		2
Gymnolaemata	Cheilostomatida		Bugulioid sp B		1
Gymnolaemata	Cheilostomatida		Buguloid sp C		1
Gymnolaemata	Cheilostomatida		Buguloid sp D		1
Gymnolaemata	Cheilostomatida		Eyelash bryozoan		1
Gymnolaemata	Ctenostomatida	Buskiidae	*Cryptopolyzoon concretum*		81
Stenolaemata	Cyclostomatida	Crisiidae	*Crisia* sp		22
Stenolaemata	Cyclostomatida		red bryozoan		20
Stenolaemata	Cyclostomatida		Net bryozoan		55
Phylum: Cnidaria					
Hydrozoa	Anthoathecata	Bougainvilliidae	Bougainvilliidae sp A		52
Hydrozoa	Anthoathecata	Oceaniidae	Claviidae sp A		2
Hydrozoa	Leptothecata	Campanulariidae	lacy hydroid		62
Hydrozoa	Leptothecata	Campanulariidae	Campanulariidae sp A		3
Hydrozoa	Leptothecata	Campanulariidae	Campanulariidae sp B		8
Hydrozoa	Leptothecata	Campanulariidae	Campanulariidae sp C		1
Hydrozoa	Leptothecata	Campanulariidae	Campanulariidae sp D		3
Hydrozoa	Leptothecata	Campanulariidae	Campanulariidae sp E		1
Hydrozoa	Leptothecata	Plumulariidae	Plumariidae sp A		24
Hydrozoa	Leptothecata	Plumulariidae	Plumariidae sp B		6
Hydrozoa	Leptothecata	Plumulariidae	Plumariidae sp C		10
Hydrozoa	Leptothecata	Sertulariidae	Sertulariidae sp A		16
Hydrozoa	Leptothecata	Sertulariidae	Sertulariidae sp B1		59
Hydrozoa	Leptothecata	Sertulariidae	Sertulariidae sp B2		73
Hydrozoa	Leptothecata	Sertulariidae	Sertulariidae sp B3		10
Hydrozoa	Leptothecata	Sertulariidae	Sert-ist sp D (alternate)		6
Hydrozoa	Leptothecata	Sertulariidae	*Dynamena quadridentata*		27
Hydrozoa	Leptothecata	Sertulariidae	*Crateritheca acanthostoma*		10
Hydrozoa	Leptothecata		Vase hydroid		2
Hydrozoa	Leptothecata		Thecata sp ?		9
Phylum: Echinodermata					
Asteroidea	Valvatida	Valvatida	*Asteroides* sp A cushion star-ish		1
Asteroidea			Asteroidea AT sp 1	1	
Asteroidea			Asteroidea AT sp 2	2	
Crinoidea			Crinoidea sp 1	1	
Echinoidea	Camarodonta	Toxopneustidae	*Tripneustes gratilla*		3
Echinoidea			Echinoidea sp 1	2	
Echinoidea			Echinoidea sp 2	6	
Echinoidea			Echinoidea sp 3	1	

Class	Order	Family	Species	Algal Turf	Sea-grass
Echinoidea			Echinoidea sp 4	3	
Holothuroidea	Apodida	Synaptidae	Synaptidae		3
Holothuroidea	Dendrochirotida		Dendrochirotida sp A		2
Holothuroidea	Dendrochirotida		Dendrochirotida sp B		1
Holothuroidea	Holothuroidea	Holothuroidea	Holothuroidea sp 5	3	
Holothuroidea			Holothuroidea sp 1	4	
Holothuroidea			Holothuroidea sp 2	7	
Holothuroidea			Holothuroidea sp 3	2	
Ophiuroidea	Ophiurida	Amphiuridae	*Amphipholis similis*	1	
Ophiuroidea	Ophiurida	Amphiuridae	*Amphiura* sp A	1	
Ophiuroidea	Ophiurida	Amphiuridae	*Amphiura* sp B	1	
Ophiuroidea	Ophiurida	Amphiuridae	*Amphiura brachyactis*	1	
Ophiuroidea	Ophiurida	Amphiuridae	*Amphipholis squamata*		8
Ophiuroidea	Ophiurida	Ophiacanthidae	*Ophiacantha* sp A	1	
Ophiuroidea	Ophiurida	Ophiactidae	*Ophiactis picteti*	66	
Ophiuroidea	Ophiurida	Ophiactidae	*Ophiactis hemiteles*	3	
Ophiuroidea	Ophiurida	Ophiactidae	*Ophiactis* sp A (juv.)	1	
Ophiuroidea	Ophiurida	Ophiactidae	*Ophiactis savignyi*	2	
Ophiuroidea	Ophiurida	Ophiocomidae	*Ophiocoma valenciae*	1	3
Ophiuroidea	Ophiurida	Ophiocomidae	*Ophiocoma* sp A (juv.)	1	
Ophiuroidea	Ophiurida	Ophionereididae	*Ophionereis* sp A	1	
Ophiuroidea	Ophiurida	Ophionereididae	*Ophionereis dubia*	3	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Macrophiothrix hirsuta chenyi*	1	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Ophiothrix (Acanthophiothrix) proteus*	1	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Ophiothrix* sp B (juv.)	1	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Ophiothrix* sp A (juv.)	1	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Macrophiothrix* sp A	1	
Ophiuroidea	Ophiurida	Ophiotrichidae	*Macrophiothrix propinqua*	1	1
Ophiuroidea	Ophiurida	Ophiotrichidae	*Macrophiothrix demessa*		1
Ophiuroidea	Ophiurida		Black disc, banded arms		2
Ophiuroidea	Ophiurida		Unknown 1		1
Ophiuroidea	Ophiurida		Unknown 2		1
Ophiuroidea	Ophiurida		Unknown 3		5
Phylum: Entoprocta					
Entoprocta			Entoprocta		6
Phylum: Mollusca					
Bivalvia	Arcoida	Arcidae	*Barbatia obliquata*		5
Bivalvia	Arcoida	Arcidae	Arcidae sp B		6
Bivalvia	Arcoida	Arcidae	red ?Arcidae		1
Bivalvia	Carditoida	Carditidae	*Cardita variegata*		1
Bivalvia	Limoida	Limidae	Limidae		1
Bivalvia	Pectinoida	Pectinidae	Pectinidae sp A		1
Bivalvia	Pectinoida	Pectinidae	Pectinidae sp B		1

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Bivalvia	Pterioida	Pteriidae	winged zebra bivalve		4
Bivalvia			Bivalvia AT Mussel spp.	25	
Bivalvia			Bivalvia AT sp 1	1	
Bivalvia			Bivalvia AT sp 2	4	
Bivalvia			Bivalvia AT sp 3	9	
Bivalvia			Bivalvia AT sp 4	1	
Bivalvia			Bivalvia AT sp 5	3	
Bivalvia			Bivalvia AT sp 6	1	
Bivalvia			Bivalvia AT sp 7	3	
Bivalvia			Bivalvia AT sp 8	5	
Bivalvia			Bivalvia AT sp 9	11	
Bivalvia			Bivalvia AT sp 10	3	
Bivalvia			Bivalvia AT sp 11	8	
Bivalvia			Bivalvia AT sp 12	1	
Bivalvia			Bivalvia AT sp 13	2	
Bivalvia			Bivalvia AT sp 15	1	
Bivalvia			Bivalvia AT sp 16	1	
Bivalvia			Bivalvia AT sp 17	2	
Bivalvia			Bivalvia AT sp 23	1	
Bivalvia			Bivalvia AT sp 24	1	
Bivalvia			Bivalvia AT sp 25	3	
Bivalvia			Bivalvia AT sp 26	28	
Bivalvia			Cemented bivalve		3
Bivalvia			Red mussel		15
Bivalvia			Transverse ribbed bivalve		1
Bivalvia			Embedded bivalve		1
Bivalvia			Bivalvia SG sp A		1
Bivalvia			Bivalvia SG sp B		1
Bivalvia			Bivalvia SG sp C		1
Bivalvia			Spotted encrusting bivalve		2
Gastropoda	Caenogastropoda	Cerithiopsidae	*Seila?* sp A		1
Gastropoda	Caenogastropoda	Epitoniidae	*Epitonium* sp A		3
Gastropoda	Caenogastropoda	Eulimidae	*Melanella* sp		2
Gastropoda	Caenogastropoda	Triphoridae	*Triphora* sp A		2
Gastropoda	Caenogastropoda	Triphoridae	*Viriola* sp A		4
Gastropoda	Cycloneritimorpha	Neritidae	*Nerita* sp		26
Gastropoda	Fissurellidae	Fissurellidae	Fissurellidae		1
Gastropoda	Neogastropoda	Columbellidae	Columbellidae		40
Gastropoda	Neogastropoda	Conidae	*Conus* sp A		1
Gastropoda	Neogastropoda	Conidae	*Conus* sp A		1
Gastropoda	Neogastropoda	Conidae	*Conus* sp A		1
Gastropoda	Neogastropoda	Fasciolariidae	*Peristernia forskalii*		1
Gastropoda	Neogastropoda	Muricidae	Muricidae sp A		5
Gastropoda	Neogastropoda	Muricidae	Muricidae sp B		1

Class	Order	Family	Species	Algal Turf	Sea-grass
Gastropoda	Neogastropoda	Muricidae	Muricidae sp C		1
Gastropoda	Phasianellidae	Phasianellidae	*Tricolia capensis*		40
Gastropoda	Sacoglossa		Antenna, folded gills		1
Gastropoda	Scissurellidae	Scissurellidae	*Scissurella* sp A		1
Gastropoda			Gastropoda AT sp 1	3	
Gastropoda			Gastropoda AT sp 2	1	
Gastropoda			Gastropoda AT sp 3	1	
Gastropoda			Gastropoda AT sp 4	2	
Gastropoda			Gastropoda AT sp 5	1	
Gastropoda			Gastropoda AT sp 6	1	
Gastropoda			Gastropoda AT sp 7	3	
Gastropoda			Gastropoda AT sp 8	1	
Gastropoda			Gastropoda AT sp 9	2	
Gastropoda			Gastropoda AT sp 10	2	
Gastropoda			Gastropoda AT sp 11	2	
Gastropoda			Gastropoda AT sp 12	5	
Gastropoda			Gastropoda AT sp 13	1	
Gastropoda			Gastropoda AT sp 14	1	
Gastropoda			Gastropoda AT sp 15	1	
Gastropoda			Gastropoda AT sp 16	4	
Gastropoda			Gastropoda AT sp 17	1	
Gastropoda			Gastropoda AT sp 18	5	
Gastropoda			Gastropoda AT sp 19	3	
Gastropoda			Gastropoda AT sp 20	1	
Gastropoda			Gastropoda AT sp 21	4	
Gastropoda			Gastropoda AT sp 22	2	
Gastropoda			Gastropoda AT sp 23	2	
Gastropoda			Gastropoda AT sp 24	1	
Gastropoda			Gastropoda AT sp 25	11	
Gastropoda			Gastropoda AT sp 26	2	
Gastropoda			Gastropoda AT sp 27	1	
Gastropoda			Gastropoda AT sp 29	2	
Gastropoda			Gastropoda AT sp 30	1	
Gastropoda			Gastropoda AT sp 31	2	
Gastropoda			Gastropoda AT sp 32	1	
Gastropoda			Gastropoda AT sp 33	1	
Gastropoda			Gastropoda AT sp 34	18	
Gastropoda			Gastropoda AT sp 35	1	
Gastropoda			Gastropoda AT sp 36	1	
Gastropoda			Gastropoda AT sp 37	1	
Gastropoda			Gastropoda AT sp 38	1	
Gastropoda			Gastropoda AT sp 39	1	
Gastropoda			Gastropoda AT sp 40	80	
Gastropoda			Gastropoda AT sp 41	71	

Class	Order	Family	Species	Algal Turf	Sea-grass
Gastropoda			Gastropoda AT sp 42	3	
Gastropoda			Gastropoda AT sp 43	1	
Gastropoda			Gastropoda AT sp 51	1	
Gastropoda			Gastropoda AT sp 52	2	
Gastropoda			Gastropoda AT sp 53	2	
Gastropoda			Gastropoda AT sp 54	2	
Gastropoda			Gastropoda AT sp 55	1	
Gastropoda			Gastropoda AT sp 56	2	
Gastropoda			Gastropoda AT sp 57	1	
Gastropoda			Gastropoda AT sp 58	1	
Gastropoda			Gastropoda AT sp 59	1	
Gastropoda			Gastropoda AT sp 60	2	
Gastropoda			Gastropoda AT sp 61	1	
Gastropoda			Gastropoda SG sp A		2
Gastropoda			Turret sp A		20
Gastropoda			Turret sp B		58
Gastropoda			Turret sp C		1
Gastropoda			Turret sp D		2
Polyplacophora			Polyplacophora sp 1	1	
Polyplacophora			Polyplacophora sp 2	13	
Polyplacophora			Spiny mantled chiton		1
Phylum: Platyhelminthes					
Rhabditophora	Polycladida	Cestoplanidae	3-striped flatworm		1
Platyhelminthes			Flatworm with eyes		1
Platyhelminthes			Antennaed flatworm		1

Appendix 2: Amphipod Taxonomy

List of Amphipoda species recorded from within South Africa.

	Synonym	**Family in Griffiths 1967**	**Habitat**
Suborder Corophiidea			
Family Ampithoidae			
Ampithoe africana K. H. Barnard, 1925		Ampithoidae	Benthic
Ampithoe kava Myers, 1985		-	Benthic
Ampithoe ramondi (Audouin, 1826)	*Ampithoe vaillanti*	Ampithoidae	Benthic
Cymadusa cavimana (Sivaprakasam, 1971)	*Ampithoe cavimana;* *Ampithoe kergueleni;* *Cymadusa jiigurru*	-	Benthic
Cymadusa filosa Savigny, 1818	*Cymadusa australis,* *Grubia australis*	Ampithoidae	Benthic
Exampithoe natalensis K. H. Barnard, 1925		Ampithoidae	Benthic
Macropisthopus stebbingi K. H. Barnard, 1916		Ampithoidae	Benthic
*Peramphithoe falsa (*K. H. Barnard, 1932)	*Ampithoe falsa;* *Ampithoe brevipes*	Ampithoidae	Benthic
Peramphithoe humeralis (Stimpson, 1864)	*Ampithoe humeralis*	-	Benthic
Family Aoridae			
Aora anomala Schellenberg, 1926	*Aora typica* forma *anomala*	Corophiidae	Benthic
Aora gibbula K. H. Barnard, 1932	*Aora typica* forma *gibbula*	Corophiidae	Benthic
Aora inflata Griffiths, 1976		Corophiidae	Benthic
Aora kergueleni Stebbing, 1888	*Aora typica* of K.H.B. & Griff.	Corophiidae	Benthic
Autonoe hirsutipes (Stebbing, 1895)	*Lembos hirsutipes*	Corophiidae	Benthic
Bemlos teleporus (K. H. Barnard, 1955)	*Lembos teleporus ;* *Lembos podoceroides* of Griff. 1973	Corophiidae	Benthic
Camacho bathyplous Stebbing, 1888		Corophiidae	Benthic
Grandidierella bonnieroides Stephenson, 1948	*Grandidierella bonnieri*	Corophiidae	Benthic
Grandidierella chelata K. H. Barnard, 1951		Corophiidae	Benthic
Grandidierella lignorum Barnard, 1935		Corophiidae	Benthic
Grandidierella lutosa K. H. Barnard, 1952		Corophiidae	Benthic
*Grandidierella nyala (*Griffiths, 1974)	*Neomicrodeutopus nyala*	Corophiidae	Benthic
Lemboides acanthiger K. H. Barnard, 1916		Corophiidae	Benthic
Lemboides afer Stebbing, 1895		Corophiidae	Benthic
Lembos hypacanthus K. H. Barnard, 1916		Corophiidae	Benthic

	Synonym	Family in Griffiths 1967	Habitat
Microdeutopus thumbellinus Griffiths, 1974		Corophiidae	Benthic
*Xenocheira leptocheira (*Walker, 1909)	*Lembos leptocheirus; Bembos leptocheirus*	Corophiidae	Benthic
Family Caprellidae			
Caprella cicur Mayer, 1903		Caprellidae	Benthic
Caprella danilevski Czerniavski, 1868		Caprellidae	Benthic
Caprella equilibra Say, 1818		Caprellidae	Benthic
Caprella laevipes Mayer, 1903		Caprellidae	Benthic
Caprella natalensis Mayer, 1903	*Caprella acutifrons* var. *natalensis*	Caprellidae	Benthic
Caprella penantis Leach, 1814	*Caprella falsa*	Caprellidae	Benthic
Caprella scaura Templeton, 1836		Caprellidae	Benthic
Caprella triodous Stebbing, 1910		Caprellidae	Benthic
Caprellina longicollis (Nicolet, 1849)		Phtisicidae	Benthic
Caprellina spiniger K. H. Barnard, 1916		Phtisicidae	Benthic
Chaka leoni Griffiths, 1974		Phtisicidae	Benthic
Eupariambus fallax K. H. Barnard, 1957		Aeginellidae	Benthic
Hemiaegina minuta Mayer, 1890		Caprellidae	Benthic
Metaprotella haswelliana (Mayer, 1882)		Aeginellidae	Benthic
Metaprotella macrodactylos Stebbing, 1910		Aeginellidae	Benthic
Metaproto novaehollandiae (Haswell, 1880)	*Proto novaehollandiae*	-	Benthic
Monoliropus falcimanus Mayer, 1904		Aeginellidae	Benthic
Orthoprotella mayeri K. H. Barnard, 1916		Aeginellidae	Benthic
Paracaprella pusilla Mayer, 1890		Caprellidae	Benthic
Paracaprella tenuis Mayer, 1903		Caprellidae	Benthic
Paradeutella serrata Mayer, 1890		Aeginellidae	Benthic
Phtisica marina Slabber, 1769		Phtisicidae	Benthic
Pseudaeginella tristanensis (Stebbing, 1888)		Aeginellidae	Benthic
Pseudoprotella phasma (Montagu, 1804)		Aeginellidae	Benthic
Family Cheluridae			
Chelura terebrans Philippi, 1839		Cheluridae	Benthic
Family Chevaliidae			
Chevalia aviculae Walker, 1904		Corophiidae	Benthic
Family Corophiidae			
Cheiriphotis durbanensis K. H. Barnard, 1916		-	Benthic
Cheiriphotis magacheles (Giles, 1885)	*Cheiriphotis walkeri*	Corophiidae	Benthic
Corophium triaenonyx Stebbing, 1904		Corophiidae	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Monocorophium acherusicum (Costa, 1857)	*Corophium acherusicum*	Corophiidae	Benthic
Family Cyamidae			
Cyamus balaenopterae K. H. Barnard, 1931		Cyamidae	Benthic
Cyamus boopis Lutken, 1873	*Paracyamus boopis*	Cyamidae	Benthic
Cyamus erraticus R. de Vauzeme, 1834	*Paracyamus erraticus*	Cyamidae	Benthic
Cyamus gracilis R. de Vauzeme, 1834	*Paracyamus gracilis*	Cyamidae	Benthic
Cyamus ovalis R. de Vauzeme, 1834		Cyamidae	Benthic
Isocyamus delphini (Guerin-Meneville, 1836)		Cyamidae	Benthic
Neocyamus physeteris (Pouchet, 1888)	*Paracyamus physeteris*	Cyamidae	Benthic
Syncyamus aequus Lincoln & Hurley, 1981		-	Benthic
Family Ischyroceridae			
Africoecetes armatus (Griffiths, 1974)	*Concholestes armatus*	Corophiidae	Benthic
Cerapus tubularis Say, 1817		Ischyroceridae	Benthic
Ericthonius brasiliensis (Dana, 1853)		Ischyroceridae	Benthic
Ericthonius latimanus Ledoyer, 1979		-	Benthic
Ericthonius pugnax		-	Benthic
Isaeopsis tenax K. H. Barnard, 1916		Ischyroceridae	Benthic
Ischyrocerus anguipes Kröyer, 1836		Ischyroceridae	Benthic
Ischyrocerus carinatus K. H. Barnard, 1916		Ischyroceridae	Benthic
Ischyrocerus ctenophorus Schellenberg, 1953		Ischyroceridae	Benthic
Ischyrocerus gorgoniae K. H. Barnard, 1940		Ischyroceridae	Benthic
Jassa falcata (Montagu, 1808)		Ischyroceridae	Benthic
Jassa marmorata Holmes, 1903		Ischyroceridae	Benthic
Jassa morinoi Conlan, 1990		Ischyroceridae	Benthic
Jassa slatteryi Conlan, 1990		Ischyroceridae	Benthic
Notopoma africana Lowry & Berents, 1996		-	Benthic
Parajassa chilkoa Griffiths, 1974	*Parajassa chikoa*	Ischyroceridae	Benthic
Siphonoecetes dellavallei Stebbing, 1893		Corophiidae	Benthic
Siphonoecetes erythraeus Ruffo, 1959		-	Benthic
Siphonoecetes orientalis Walker, 1904		Corophiidae	Benthic
Ventojassa frequens (Chilton, 1883)	*Jassa frequens*	Ischyroceridae	Benthic
Family Kamakidae			
Aorcho delgadus J. L. Barnard, 1961		Corophiidae	Benthic
Aorchoides crenatipalma (K. H. Barnard, 1916)	*Lemboides crenatipalma*	Corophiidae	Benthic
Family Neomegamphopidae			
Pseudomegamphopus jassopsis (K. H. Barnard, 1951)		Corophiidae	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Varohios **sp. nov.**		-	Benthic
Family Photidae			
Gammaropsis afra Stebbing, 1888	*Eurystheus afer*	Corophiidae	Benthic
Gammaropsis atlantica Stebbing, 1888	*Eurystheus atlantica*	Corophiidae	Benthic
Gammaropsis chelifera (Chevreux, 1901)	*Eurystheus semichelatus*	Corophiidae	Benthic
Gammaropsis holmesi (Stebbing, 1908)	*Eurystheus semidentatus*	Corophiidae	Benthic
Gammaropsis longicarpus (Reid, 1951)	*Eurystheus longicapus*	Corophiidae	Benthic
Gammaropsis palmoides (K. H. Barnard, 1932)	*Eurystheus palmoides*	Corophiidae	Benthic
Gammaropsis pseudodenticulata Ledoyer, 1979		-	Benthic
Gammaropsis scissimanus (K. H. Barnard, 1925)	*Eurystheus scissimanus*	Corophiidae	Benthic
Photis dolichommata Stebbing, 1910		Corophiidae	Benthic
Photis kapapa J. L. Barnard, 1970		Corophiidae	Benthic
Photis longidactylus Griffiths, 1974		Corophiidae	Benthic
Photis longimanus Walker, 1904		Corophiidae	Benthic
Photis uncinata K. H. Barnard, 1932		Corophiidae	Benthic
Podoceropsis sophiae Boeck, 1861		Corophiidae	Benthic
Family Podoceridae			
Laetmatophilus durbanensis K. H. Barnard, 1916		Podoceridae	Benthic
Laetmatophilus purus Stebbing, 1888		Podoceridae	Benthic
Laetmatophilus tridens K. H. Barnard, 1916		Podoceridae	Benthic
Podocerus africanus K. H. Barnard, 1916		Podoceridae	Benthic
Podocerus brasiliensis (Dana, 1853)		Podoceridae	Benthic
Podocerus hystrix Stebbing, 1910		Podoceridae	Benthic
Podocerus inconspicuus (Stebbing, 1888)	*Podocerus palinuri; Podocerus cristatus* of KHB & Griff.	Podoceridae	Benthic
Podocerus multispinis K. H. Barnard, 1925		Podoceridae	Benthic
Podocerus pyurae Griffiths, 1975		Podoceridae	Benthic
Family Unciolidae			
Unciolella foveolata K. H. Barnard, 1955		Corophiidae	Benthic
Unciolella spinosa Griffiths, 1974		Corophiidae	Benthic
Suborder Gammaridea			
Family Amaryllididae			
Amaryllis macrophthalma Haswell, 1880		Lysianassidae	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
*Devo conocephala (*K.H. Barnard, 1925)	*Bathyamaryllis conocephala; Amaryllis conocephala*	Lysianassidae	Benthic
Family Amathillopsidae			
Cleonardopsis carinata K. H. Barnard, 1916	Formerly in Eusiridae	Eusiridae	Benthic
Family Ampeliscidae			
Ampelisca acris Griffiths, 1974	*Ampelisca excavata* of KHB 1955	Ampeliscidae	Benthic
Ampelisca anisuropa Stebbing, 1908	*Byblis anisuropus*	Ampeliscidae	Benthic
Ampelisca anomala Sars, 1882		Ampeliscidae	Benthic
Ampelisca brachyceras Walker, 1904		Ampeliscidae	Benthic
Ampelisca brevicornis (Costa, 1853)		Ampeliscidae	Benthic
Ampelisca chiltoni Stebbing, 1888		Ampeliscidae	Benthic
Ampelisca diadema (Costa, 1853)		Ampeliscidae	Benthic
Ampelisca excavata K. H. Barnard, 1925		Ampeliscidae	Benthic
Ampelisca fusca Stebbing, 1888		Ampeliscidae	Benthic
*Ampelisca insignis (*K. H. Barnard, 1916)	*Triodos insignis*	Ampeliscidae	Benthic
Ampelisca miops K. H. Barnard, 1916		Ampeliscidae	Benthic
Ampelisca natalensis K. H. Barnard, 1916		Ampeliscidae	Benthic
Ampelisca palmata K. H. Barnard, 1916		Ampeliscidae	Benthic
Ampelisca spinimana Chevreux, 1887		Ampeliscidae	Benthic
Byblis gaimardi (Kröyer, 1846)		Ampeliscidae	Benthic
Family Amphilochidae			
Amphilochus neapolitanus Della Valle, 1893		Amphilochidae	Benthic
Gitanopsis pusilla K. H. Barnard, 1916		Amphilochidae	Benthic
*Rostrogitanopsis mariae (*Griffiths, 1973)	*Gitanopsis mariae*	Amphilochidae	Benthic
Family Argissidae			
Argissa hamatipes (Norman, 1869)	*Argissa stebbingi*	Argissidae	Benthic
Family Aristiidae			
Aristias symbioticus K. H. Barnard, 1916	*Aristias symbiotica*	Lysianassidae	Benthic
Family Atylidae			
Lepechinella occlo J.L.Barnard, 1973		-	Benthic
Nototropis granulosus (Walker, 1904)	*Atylus granulosus*	Dexaminidae	Benthic
*Nototropis guttatus (*Costa, 1851)	*Atylus guttatus*	Dexaminidae	Benthic
*Nototropis homochir (*Haswell, 1885)	*Atylus homochir*	Dexaminidae	Benthic
Nototropis swammerdamei Milne-Edwards, 1830	*Atylus swammerdamei*	Dexaminidae	Benthic
Family Bogidiellidae			
Bollegidia capensis Ruffo, 1974		-	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Family Bolttsiidae			
Bolttsia minuta Griffiths, 1976			Freshwater
Family Calliopiidae			
Calliopiella michaelseni Schellenberg, 1925		Eusiridae	Benthic
Metaleptamphopus membrisetata J. L. Barnard, 1961		Eusiridae	Benthic
Family Cheirocratidae			
*Incratella inermis (*Ledoyer, 1968)	*Cheirocratus inermis*	Gammaridae	Benthic
Family Chiltoniidae			
Afrochiltonia capensis (K. H. Barnard, 1916)	*Chiltonia capensis; Austrochiltonia subtenuis*	Ceinidae	Benthic
Family Colomastigidae			
*Colomastix armata*Ledoyer, 1979		-	Benthic
Colomastix keiskama Griffiths, 1974		Colomastigidae	Benthic
Colomastix plumosa Ledoyer, 1979		-	Benthic
Colomastix pusilla Grube, 1864		Colomastigidae	Benthic
Yulumara improvisa Griffiths, 1976		-	Benthic
Family Cyphocarididae			
Cyphocaris anonyx Boeck, 1871		Lysianassidae	Benthic
Cyphocaris challengeri Stebbing, 1888		Lysianassidae	Benthic
Cyphocaris faurei K. H. Barnard, 1916		Lysianassidae	Benthic
Cyphocaris richardi Chevreux, 1905		Lysianassidae	Benthic
Family Cyproideidae			
Cyproidea ornata (Haswell, 1880)		Amphilochidae	Benthic
Hoplopleon australis (K. H. Barnard, 1916)	*Peltocoxa australis*	Amphilochidae	Benthic
Hoplopleon medusarum K. H. Barnard, 1932		Amphilochidae	Benthic
Hoplopleon similis Schellenberg, 1953		Amphilochidae	Benthic
Unguja yaya Griffiths, 1976		-	Benthic
Family Dexaminidae			
Dexamine spiniventris (Costa, 1853)		Dexaminidae	Benthic
Guernea rhumba Griffiths, 1974	*Guernea laevis* of KHB 1916	Dexaminidae	Benthic
Guernea tumulosa Griffiths, 1976			Benthic
Paradexamine pacifica (Thomson, 1879)		Dexaminidae	Benthic
Polycheria atolli Walker, 1905	*Polycheria antarctica*	Dexaminidae	Benthic
Family Dikwidae			
Dikwa acrania Griffiths, 1974		Acanthonotozomatidae	Benthic
Family Dogielinotidae			
Parhyalella natalensis (Stebbing, 1917)	*Echyalella natalensis*	Talitridae	Benthic
Family Epimeriidae			

	Synonym	Family in Griffiths 1967	Habitat
Epimeria cornigera (Fabricius, 1779)		Paramputhoidae	Benthic
Epimeria longispinosa K. H. Barnard, 1916		Paramputhoidae	Benthic
Epimeria semiarmata K. H. Barnard, 1916		Paramputhoidae	Benthic
Family Eurytheneidae			
Eurythenes gryllus (Lichtenstein in Mandt, 1822)		Lysianassidae	Benthic
Eurythenes obesus (Chevreux, 1905)	*Katius obesus*	Lysianassidae	Benthic
Family Eusiridae			
Eusirus minutus Sars, 1893		Eusiridae	Benthic
Rhachotropis grimaldi (Chevreux, 1887)		Eusiridae	Benthic
Rhachotropis kergueleni Stebbing, 1888		Eusiridae	Benthic
Rhachotropis paeneglaber K. H. Barnard, 1916		Eusiridae	Benthic
Rhachotropis palporum Stebbing, 1908		Eusiridae	Benthic
Family Hyalidae			
Hyale diastoma K. H. Barnard, 1916		Talitridae	Benthic
Hyale grandicornis (Kröyer, 1845)	*Allorchestes inquirendus*	Talitridae	Benthic
Hyale hirtipalma (Dana, 1852)		Talitridae	Benthic
Hyale macrodactyla Stebbing, 1899		Talitridae	Benthic
Hyale maroubrae Stebbing, 1899		Talitridae	Benthic
Hyale plumulosa (Stimpson, 1853)		Talitridae	Benthic
Hyale saldanha Chilton, 1912		Talitridae	Benthic
Parhyale hawaiensis (K. H. Barnard, 1916)	*Parhyale inyacka, Hyale inyacka*	Talitridae	Benthic
Family Iphimediidae			
Iphimedia capicola K. H. Barnard, 1932		Acanthonotozomatidae	Benthic
Iphimedia excisa (K. H. Barnard, 1932)	*Panoploea excisa*	Acanthonotozomatidae	Benthic
Iphimedia gibba (K. H. Barnard, 1955)	*Cypsiphimedia gibba*	Acanthonotozomatidae	Benthic
Iphimedia stegosaura (Griffiths, 1975)	*Cypsiphimedia stegosaura; Panoploea stegosaura*	Acanthonotozomatidae	Benthic
Family Izinkalidae			
Izinkala fihla Griffiths, 1977		-	Benthic
Family Leucothoidae			
Leucothoe ctenochir K. H. Barnard, 1925		Leucothoidae	Benthic
Leucothoe dolichoceras K. H. Barnard, 1916		Leucothoidae	Benthic
Leucothoe euryonyx Walker, 1901	*Leucothoe dentitelson*	Leucothoidae	Benthic
Leucothoe richiardi Lesson, 1865		Leucothoidae	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Leucothoe spinicarpa (Abildgaard, 1789)		Leucothoidae	Benthic
Family Liljeborgiidae			
*Isipingus epistomata (*K. H. Barnard, 1932)	*Liljeborgia epistomata*	Liljeborgiidae	Benthic
Liljeborgia consanguinea Stebbing, 1888		Liljeborgiidae	Benthic
Liljeborgia dubia (Haswell, 1880)		Liljeborgiidae	Benthic
Liljeborgia kinahani (Bate, 1862)		Liljeborgiidae	Benthic
Liljeborgia palmata Griffiths, 1974		Liljeborgiidae	Benthic
Liljeborgia proxima Chevreux, 1908		Liljeborgiidae	Benthic
Listriella lindae Griffiths, 1974		Liljeborgiidae	Benthic
Listriella saldanha Griffiths, 1975		Liljeborgiidae	Benthic
Listriella sinuosa Griffiths, 1974		Liljeborgiidae	Benthic
Family Lysianassidae			
Acidostoma obesum (Bate, 1862)		Lysianassidae	Benthic
*Acontiostoma capense (*K. H. Barnard, 1916)	*Stomacontion capense*	Lysianassidae	Benthic
Acontiostoma prionoplax (Monod, 1937)	*Stomacontion prionoplax*	Lysianassidae	Benthic
Hippomedon longimanus (Stebbing, 1888)	*Tryphosa longimanus;* *Tryphosella africana*	Lysianassidae	Benthic
Hippomedon normalis (K. H. Barnard, 1955)	*Tryphosa normalis;* *Tryphosella normalis*	Lysianassidae	Benthic
Hippomedon onconotus (Stebbing, 1908)	*Tryphosa onconotus*	Lysianassidae	Benthic
Lepidepecreum clypeatum Chevreux, 1900		Lysianassidae	Benthic
Lepidepecreum clypodentatum J. L. Barnard, 1962		Lysianassidae	Benthic
Lepidepecreum twalae Griffiths, 1974		Lysianassidae	Benthic
Lysianassa ceratina (Walker, 1889)	*Lysianassa cubensis*	Lysianassidae	Benthic
Lysianassa minimus (Schellenberg, 1953)	*Proannonyx minimus*	Lysianassidae	Benthic
Lysianassa variegata (Stimpson, 1855)		Lysianassidae	Benthic
Microlysias xenoceras Stebbing, 1918	*Microlysias indica*	Lysianassidae	Benthic
Orchomene plicata (Schellenberg, 1926)	*Orchomenopsis chilensis*	Lysianassidae	Benthic
Phoxostoma algoense K. H. Barnard, 1925		Lysianassidae	Benthic
Schisturella adversicola (K. H. Barnard, 1925)	*Lakota adversicola;* *Chironesimus adversicola*	Lysianassidae	Benthic
Socarnopsis crenulata Chevreux, 1910		Lysianassidae	Benthic
*Socarnopsis septimus (*Griffiths, 1975)	*Socarnes septimus;* *Septcarnes septimus*	Lysianassidae	Benthic
Trischizostoma paucispinosum K. H. Barnard, 1916		Lysianassidae	Benthic

	Synonym	Family in Griffiths 1967	Habitat
Trischizostoma remipes Stebbing, 1908		Lysianassidae	Benthic
Trischizostoma serratum K. H. Barnard, 1925		Lysianassidae	Benthic
Family Maeridae			
Ceradocus natalensis Griffiths, 1974		Gammaridae	Benthic
Ceradocus rubromaculatus (Stimpson, 1855)		Gammaridae	Benthic
Elasmopoides chevreuxi Stebbing, 1908		Gammaridae	Benthic
Elasmopus affinis Della Valle, 1893		Gammaridae	Benthic
Elasmopus alalo Myers, 1986	*Elasmopus pseudaffinis*	-	Benthic
Elasmopus japonicus Stephenson, 1932		Gammaridae	Benthic
Elasmopus pectenicrus (Bate, 1862)		Gammaridae	Benthic
Jerbarnia mecochira Croker, 1971	*Jerbania mecochira*	Gammaridae	Benthic
Maera boecki (Haswell, 1879)	*Elasmopus boeckii*	Gammaridae	Benthic
Maera grossimana (Montagu, 1808)		Gammaridae	Benthic
Maera hamigera (Haswell, 1880)		Gammaridae	Benthic
Maera hirondellei Chevreux, 1900		Gammaridae	Benthic
Maera inaequipes (Costa, 1851)		Gammaridae	Benthic
Maera vagans K. H. Barnard, 1940	*Elasmopus levis*	Gammaridae	Benthic
Mallacoota subcarinata (Haswell, 1880)	*Maera subcarinata; Elasmopus subcarinata*	Gammaridae	Benthic
*Othomaera bruzelii (*Stebbing, 1888)	*Maera mastersi* of Griff. 1974c, *Maera bruzeli*	Gammaridae	Benthic
*Othomaera lobata (*Griffiths, 1976)	*Maera lobata*	-	Benthic
Othomaera simplex (Reid, 1951)	*Maera komma; Maera simplex*	Gammaridae	Benthic
*Othomaera thrixa (*Griffiths, 1975)	*Maera thrixa*	Gammaridae	Benthic
Parelasmopus suluensis (Dana, 1852)		Gammaridae	Benthic
Quadrimaera pacifica Schellenberg, 1938	Maera pacifica	-	Benthic
Quadrivisio aviceps (K. H. Barnard, 1940)	*Ceradocus aviceps*	Gammaridae	Benthic
*Zygomaera emarginata (*Griffiths, 1975)	*Maera emarginata*	Gammaridae	Benthic
Family Megaluropidae			
Megaluropus agilis Hoek, 1889	*Phylloropus capensis*	Gammaridae	Benthic
Megaluropus namaquaeensis Schellenberg, 1953		Gammaridae	Benthic
Family Melitidae			
Dulichiella appendiculata (Say, 1818)	*Melita appendiculata*	Gammaridae	Benthic
Eriopisella capensis (K. H. Barnard, 1916)		Gammaridae	Benthic
Eriopisella epimera Griffiths, 1974		Gammaridae	Benthic
Melita excavata Ledoyer, 1979		-	Benthic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Melita machaera K. H. Barnard, 1955		Gammaridae	Benthic
Melita mucronata Griffiths, 1975		Gammaridae	Benthic
Melita orgasmos K. H. Barnard, 1940		Gammaridae	Benthic
Melita zeylanica Stebbing, 1904		Gammaridae	Benthic
*Nuuanu castellana (*Griffiths, 1977)	*Gammarella castellana; Valettiella castellana*	-	Benthic
*Roropisa epistomata (*Griffiths, 1974)	*Eriopisa epistomata*	Gammaridae	Benthic
*Verdeia subchelata (*Schellenberg, 1925)	*Melita subchelata; Melita fresnelii* var. *subchelata*	Gammaridae	Benthic
Victoriopisa chilkensis (Chilton, 1921)	*Eriopisa chilkensis; Niphargus chilkensis*	Gammaridae	Benthic
Family Ochlesidae			
Ochlesis lenticulosus K. H. Barnard, 1940		Ochlesidae	Benthic
Ochlesis levetzowi Schellenberg, 1953		Ochlesidae	Benthic
Family Oedicerotidae			
Halicreion ovalitelson K. H. Barnard, 1916		Oedicerotidae	Benthic
Monoculodopsis longimana Ledoyer, 1973		Oedicerotidae	Benthic
Oediceroides cinderella Stebbing, 1888		Oedicerotidae	Benthic
Perioculodes longimanus (Bate & Westwood, 1868)		Oedicerotidae	Benthic
Perioculodes pallidus Griffiths, 1975		Oedicerotidae	Benthic
Synchelidium tenuimanum Norman, 1871	*Synchelidium tenuimanus*	Oedicerotidae	Benthic
Westwoodilla manta Griffiths, 1974		Oedicerotidae	Benthic
Family Paramelitidae			
Aquadulcaris andronyx (Stewart & Griffiths, 1992)			Freshwater
Aquadulcaris auricularia (Barnard, 1916)			Freshwater
Aquadulcaris crassicornis (Barnard, 1916)			Freshwater
Aquadulcaris dentata (Stewart & Griffiths, 1992)			Freshwater
Aquadulcaris marunguis (Stewart & Griffiths, 1992)			Freshwater
Aquadulcaris pheronyx (Stewart & Griffiths, 1992)			Freshwater
Mathamelita aequicaudata Stewart & Griffiths, 1995			Freshwater
Paramelita aurantia (Barnard, 1927)			Freshwater
Paramelita barnardi Thurston, 1973			Freshwater
Paramelita capensis (Barnard, 1916)			Freshwater
Paramelita flexa Griffiths, 1981			Freshwater
Paramelita granulicornis (Barnard,			Freshwater

	Synonym	**Family in Griffiths 1967**	**Habitat**
1927)			
Paramelita kogelensis (Barnard, 1927)			Freshwater
Paramelita magna Stewart & Griffiths, 1992			Freshwater
Paramelita magnicornis Stewart & Griffiths, 1992			Freshwater
Paramelita nigroculus (Barnard, 1916)			Freshwater
Paramelita odontophora Stewart, Snaddon & Griffiths, 1994			
Paramelita parva Stewart & Griffiths, 1992			Freshwater
Paramelita pillicornis Stewart & Griffiths, 1992			Freshwater
Paramelita pinnicornis Stewart & Griffiths, 1992			Freshwater
Paramelita platypus Stewart & Griffiths, 1992			Freshwater
Paramelita seticornis (Barnard, 1927)			Freshwater
Paramelita spinicornis (Barnard, 1927)			Freshwater
Paramelita triangula (Griffiths & Stewart, 1996			Freshwater
Paramelita tulbaghensis (Barnard, 1927)			Freshwater
Paramelita validicornis Stewart & Griffiths, 1992			Freshwater
Family Pardaliscidae			
Nicippe tumida Bruzelius, 1859		Pardaliscidae	Benthic
Pardisynopia anacantha (K. H. Barnard, 1925)	*Halite anacantha*	Pardaliscidae	Benthic
Family Phliantidae			
Pereionotus alaniphlias (J. L. Barnard, 1970)	*Palinnotus alaniphlias;* *Pereionotus testudo*	-	Benthic
*Pereionotus natalensis (*K. H. Barnard, 1940)	*Palinnotus natalensis*	Phliantidae	Benthic
Family Phoxocephalidae			
Basuto stimpsoni (Stebbing, 1908)	*Mandibulophoxus stimpsoni ;* *Pontharpinia stimpsoni*	Phoxocephalidae	Benthic
Griffithsius latipes (Griffiths, 1976)	*Mandibulophoxus latipes*	-	Benthic
Heterophoxus cephalodens Griffiths, 1975		Phoxocephalidae	Benthic
Heterophoxus opus Griffiths, 1975		Phoxocephalidae	Benthic
Paraphoxus oculatus Sars, 1891		Phoxocephalidae	Benthic
Pseudharpinia excavata (Chevreux, 1887)	*Harpinia excavata*	Phoxocephalidae	Benthic
Family Platyischnopidae			

	Synonym	Family in Griffiths 1967	Habitat
Indischnopus capensis (K . H. Barnard, 1925)	*Platyischnopus capensis;* *Platyischnopus herdmani*	Phoxocephalidae	Benthic
Family Plioplateidae			
Plioplateia triquetra K. H. Barnard, 1916		Phliantidae	Benthic
Family Pontogeneiidae			
Dautzenbergia grandimana Chevreux, 1900		-	Benthic
Eusiroides monoculoides (Haswell, 1880)		Eusiridae	Benthic
Paramoera bidentata K. H. Barnard, 1932		Eusiridae	Benthic
Paramoera capensis (Dana, 1853)	*Paramoera schizurus*	Eusiridae	Benthic
Paramoerella interstitialis Ruffo, 1974		-	Benthic
Family Pontoporeiidae			
Bathyporeia cunctator d'Udekem d'Acoz & Vader, 2005	*Bathyporeia gracilis* of KHB 1949	Haustoriidae	Benthic
Bathyporeia gladiura d'Udekem d'Acoz & Vader, 2005	*Bathyporeia gracilis* of KHB 1949	Haustoriidae	Benthic
Family Sebidae			
Seba saundersi Stebbing, 1875	*Paravalettia chelata*	Sebidae	Benthic
Family Stegocephalidae			
*Austrocephaloides australis (*K. H. Barnard, 1916)	*Stegocephaloides australis*	Stegocephalidae	Benthic
Parandania boecki (Stebbing, 1888)		Stegocephalidae	Benthic
Stegocephaloides attingens K. H. Barnard, 1916		Stegocephalidae	Benthic
Family Stenothoidae			
Knysmetopa grandimana (Griffiths, 1974)	*Parametopa grandimana;* *Wallametopa grandimana*	Stenothoidae	Benthic
Probolisca ovata (Stebbing, 1888)	*Metopa ovata*	Stenothoidae	Benthic
Proboloides rotunda (Stebbing, 1917)	*Metopa rotunda*	Stenothoidae	Benthic
Stenothoe adhaerens Stebbing, 1888		Stenothoidae	Benthic
Stenothoe dolichopous K. H. Barnard, 1916		Stenothoidae	Benthic
Stenothoe gallensis Walker, 1904		Stenothoidae	Benthic
Stenothoe valida Dana, 1853		Stenothoidae	Benthic
Family Sternophysingidae			
Sternophysinx alca Griffiths, 1981			Freshwater
Sternophysinx basilobata Griffiths, 1991			Freshwater
Sternophysinx calceola Holsinger, 1992			Freshwater
Sternophysinx filaris Holsinger & Straskraba, 1973			Freshwater

	Synonym	**Family in Griffiths 1967**	**Habitat**
Sternophysinx hibernica Griffiths, 1991			Freshwater
Sternophysinx megacheles Griffiths & Stewart, 1996			Freshwater
Sternophysinx robertsi (Methuen, 1911)			Freshwater
Sternophysinx transvaalensis Holsinger & Straskraba, 1973			Freshwater
Family Synopiidae			
Tiron australis Stebbing, 1908		Synopiidae	Benthic
Family Talitridae			
Eorchestia rectipalma (K. H. Barnard, 1940)	*Orchestia rectipalma; Parorchestia rectipalma; Parorchestia tennis*	Talitridae	Benthic
Orchestia ancheidos (K. H. Barnard, 1916)	*Talorchesia ancheidos*	Talitridae	Benthic
Orchestia dassenensis (K. H. Barnard, 1916)	*Parorchestia dassenensis*	Talitridae	Benthic
Orchestia gammarella (Pallas, 1766)	*Talorchestia inaequalipes*	Talitridae	Benthic
Orchestia notabilis (K. H. Barnard, 1935)	*Parorchestia notabilis*	Talitridae	Benthic
*Platorchestia platensis (*Kröyer, 1845)	*Orchestia platensis*	Talitridae	Benthic
Talitriator africana (Bate, 1862)	*Talorchestia africana; Talitriator africanus; Talitroides eastwoodae* forma *typica*		Terrestrial
Talitriator calva (Barnard, 1940)	*Talitroides eastwoodae* forma *calva; Talitriator calva*		Terrestrial
Talitriator cylindripes (Barnard, 1940)	*Talitroides eastwoodae* forma *cylindripes; Talitriator cylindripes; Talitriator insularis*		Terrestrial
Talitriator eastwoodae Methuen, 1913	*Talitroides eastwoodae* forma *typica*		Terrestrial
Talitriator setosa (Barnard, 1940)	*Talitroides eastwoodae* forma *setosa; Talitroides eastwoodae* forma *macronyx; Talitriator setosa; Talitriator macronyx*		Terrestrial
Talitroides alluaudi (Chevreux, 1896)	*Talitrus alluaudi*		Terrestrial
Talitroides topitotum (Burt, 1934)	*Talitrus topitotum; Talitrus sylvaticus* of		Terrestrial

	Synonym	**Family in Griffiths 1967**	**Habitat**
	Shoemaker 1936		
Talorchestia australis K. H. Barnard, 1916		Talitridae	Benthic
Talorchestia capensis (Dana, 1853)		Talitridae	Benthic
Talorchestia quadrispinosa K. H. Barnard, 1916	*Orchestoidea fisherii* of Stebb.	Talitridae	Benthic
Family Temnophliantidae			
*Hystriphlias hystrix (*K. H. Barnard, 1954)	*Temnophlias hystrix*	Temnophliidae	Benthic
Temnophlias capensis K. H. Barnard, 1916		Temnophliidae	Benthic
Family Uristidae			
Euonyx conicurus K. H. Barnard, 1955		Lysianassidae	Benthic
Ichnopus macrobetomma Stebbing, 1917		Lysianassidae	Benthic
Ichnopus taurus Costa, 1851	*Ichnopus macrobetomma*	Lysianassidae	Benthic
*Stephonyx biscayensis (*Chevreux, 1908)	*Euonyx biscayensis*	Lysianassidae	Benthic
Uristes natalensis K. H. Barnard, 1916		Lysianassidae	Benthic
Uristes sulcus Griffiths, 1974		Lysianassidae	Benthic
Family Urothoidae			
Cunicus profundus Griffiths, 1974		Haustoriidae	Benthic
Urothoe coxalis Griffiths, 1974		Haustoriidae	Benthic
Urothoe elegans Bate, 1857		Haustoriidae	Benthic
Urothoe grimaldi Chevreux, 1895		Haustoriidae	Benthic
Urothoe pinnata K. H. Barnard, 1955		Haustoriidae	Benthic
Urothoe platypoda Griffiths, 1974		Haustoriidae	Benthic
Urothoe pulchella (Costa, 1853)		Haustoriidae	Benthic
Urothoe serrulidactylus K. H. Barnard, 1955		Haustoriidae	Benthic
Urothoe tumorosa Griffiths, 1974		Haustoriidae	Benthic
Urothoides inops J. L. Barnard, 1967		-	Benthic
Family Wandinidae			
Pseudocyphocaris coxalis Ledoyer, 1986		-	Benthic
Suborder Hyperiidea			
Family Brachyscelidae			
Brachyscelus crusculum Spence Bate, 1861			Planktonic
Brachyscelus rapacoides Stephensen, 1925			Planktonic
Brachyscelus rapax (Claus, 1879)			Planktonic
Thamneus rostratus Bovallius, 1887	*Thamneus platyrhynchus*		Planktonic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Family Cyllopodidae			
Cyllopus magellanicus Dana, 1853	Formerly in Vibiliidae		Planktonic
Family Cystisomatidae			
Cystisoma fabricii Stebbing, 1888	Family formerly Cystisomidae; *Cystisoma coalitum*		Planktonic
Cystisoma longipes (Bovallius, 1886)	Family formerly Cystisomidae; *Cystisoma africanum*		Planktonic
Family Dairellidae			
Dairella californica (Bovallius, 1885)	*Dairella latissima*		Planktonic
Family Hyperiidae			
Hyperia atlantica (Woltereck, 1903)			Planktonic
Hyperia crucipes Bovallius, 1889			Planktonic
Hyperia fabrei (Milne-Edwards, 1830)			Planktonic
Hyperia gaudichaudii Milne-Edwards, 1840			Planktonic
Hyperia macrophthalma Vosseler, 1901			Planktonic
Hyperoche cryptodactylus Stebbing, 1888			Planktonic
Hyperoche martinezi (Fr. Müller, 1864)			Planktonic
Hyperoche mediterranea Senna, 1908			Planktonic
Hyperoche medusarum (Kröyer, 1838)			Planktonic
Themisto gaudichaudi Guérin Méneville, 1825	*Parathemisto gaudichaudi*		Planktonic
Family Lanceolidae			
Lanceola pacificaa Stebbing, 1888			Planktonic
Lanceola serrata Bovallius, 1885			Planktonic
Scypholanceola aestiva (Stebbing, 1888)	*Scypholanceola vanhoeffeni*		Planktonic
Family Lestrigonidae			
Hyperioides longipes Chevreux, 1900	Formerly in Hyperiidae		Planktonic
Hyperionyx macrodactylus (Stephensen, 1924)	*Hyperia macrodactyla;* formerly in Hyperiidae		Planktonic
Lestrigonus schizogeneios (Stebbing, 1888)	*Hyperia schizogeneios;* formerly in Hyperiidae		Planktonic
Phronimopsis spinifera Claus, 1879	Formerly in Hyperiidae		Planktonic
Family Lycaeidae			
Lycaea nasuta Claus, 1879			Planktonic
Lycaea pulex Marion, 1874			Planktonic
Lycaea serrata Claus, 1879			Planktonic
Pseudolycaea pachypoda Claus, 1879			Planktonic

	Synonym	Family in Griffiths 1967	Habitat
Simorhynchotus antennarius (Claus, 1871)	Formerly in Oxycephalidae		Planktonic
Family Lycaeopsidae			
Lycaeopsis themistoides Claus, 1879			Planktonic
Lycaeopsis zamboangae (Stebbing, 1888)			Planktonic
Family Oxycephalidae			
Calamorphynchus pellucidus Streets, 1878			Planktonic
Cranocephalus scleroticus (Streets, 1878)			Planktonic
Glossocephalis milne-edwardsi Bovallius, 1887			Planktonic
Leptocotis tenuirostris (Claus, 1871)			Planktonic
Oxycephalus clausi Bovallius, 1887			Planktonic
Oxycephalus latirostris Claus, 1879			Planktonic
Oxycephalus piscator Milne-Edwards, 1830			Planktonic
Rhabdosoma brevicaudatum Stebbing, 1888			Planktonic
Rhabdosoma minor Fage, 1954			Planktonic
Rhabdosoma whitei Spence Bate, 1862			Planktonic
Streetsia challengeri Stebbing, 1888			Planktonic
Streetsia mindanaonis (Stebbing, 1888)			Planktonic
Streetsia porcella (Claus, 1879)			Planktonic
Streetsia steenstrupi (Bovallius, 1887)			Planktonic
Family Paraphronimidae			
Paraphronima crassipes Claus, 1879			Planktonic
Paraphronima gracilis Claus, 1879			Planktonic
Family Parascelidae			
Parascelus edwardsi Claus, 1879			Planktonic
Parascelus typhoides Claus, 1879			Planktonic
Schizoscelus ornatus Claus, 1879			Planktonic
Thyropus sphaeroma (Claus, 1879)			Planktonic
Family Phronimidae			
Anchylomera blossevillei Milne-Edwards, 1830			Planktonic
Phronima colletti Bovallius, 1887			Planktonic
Phronima pacifica Streets, 1887			Planktonic
Phronima sedentaria (Forskal, 1775)	*Phronima atlantica*		Planktonic
Phronima sedentaria (Forskål, 1775)			Planktonic
Phronima solitaria Guérin Méneville, 1836			Planktonic
Phronimella elongata (Claus, 1862)			Planktonic
Phrosina semilunata Risso, 1882			Planktonic
Primno macropa Guérin Méneville, 1836			Planktonic

	Synonym	**Family in Griffiths 1967**	**Habitat**
Family Platyscelidae			
Amphithyrus bispinosus Claus, 1879			Planktonic
Amphithyrus glaber Spandl, 1924			Planktonic
Amphithyrus sculpturatus Claus, 1879			Planktonic
Amphithyrus similis Claus, 1879			Planktonic
Hemityphis rapax (Milne-Edwards, 1830)			Planktonic
Paratyphis maculatus Claus, 1879			Planktonic
Paratyphis promontori Stebbing, 1888			Planktonic
Paratyphis spinosus Spandl, 1924	*Paratyphis clausii*		Planktonic
Platyscelus ovoides (Risso, 1816)			Planktonic
Platyscelus serratulus Stebbing, 1888			Planktonic
Tetrathyrus forcipatus Claus, 1879			Planktonic
Family Pronoidae			
Eupronoe armata Claus, 1879			Planktonic
Eupronoe intermedia Stebbing, 1888			Planktonic
Eupronoe laticarpa Stephensen, 1925			Planktonic
Eupronoe maculata Claus, 1879			Planktonic
Eupronoe minuta Claus, 1879			Planktonic
Paralycaea gracilis Claus, 1879			Planktonic
Parapronoe crustulum Claus, 1879			Planktonic
Parapronoe parva Claus, 1879	*Sympronoe parva*		Planktonic
Pronoe capito Guérin Méneville, 1836			Planktonic
Family Scinidae			
Ctenoscina brevicaudata Wagler, 1926			Planktonic
Scina borealis (G. O. Sars, 1882)			Planktonic
Scina crassicornis (Fabricius, 1775)			Planktonic
Scina curvidactyla Chevreux, 1914			Planktonic
Scina excisa Wagler, 1926			Planktonic
Scina incerta Chevreux, 1900			Planktonic
Scina langhansi Wagler, 1926			Planktonic
Scina marginata (Bovallius, 1885)			Planktonic
Scina nana Wagler, 1926			Planktonic
Scina oedicarpus Stebbing, 1895			Planktonic
Scina rattrayi Stebbing, 1895			Planktonic
Scina similis Stebbing, 1895			Planktonic
Scina spinosa Vosseler, 1901	*Scina uncipes spinosa* var. *affinis*		Planktonic
Scina stenopus Stebbing, 1895			Planktonic
Scina tullbergi (Bovallius, 1885)			Planktonic
Scina woltereckі Wagler, 1926			Planktonic
Family Tryphanidae			
Tryphana malmii Boeck, 1871	Formerly in Lycaeidae		Planktonic
Family Vibiliidae			

	Synonym	Family in Griffiths 1967	Habitat
Vibilia antarctica Stebbing, 1888			Planktonic
Vibilia armata Bovallius, 1887			Planktonic
Vibilia chuni Behning & Woltereck, 1912			Planktonic
Vibilia cultripes Vosseler, 1901			Planktonic
Vibilia propinqua Stebbing, 1888			Planktonic
Vibilia stebbingi Behning & Woltereck, 1912			Planktonic
Vibilia viatrix Bovallius, 1887			Planktonic
Suborder Ingolfiellidea			
Family Ingolfiellidae			
Ingolfiella berrisfordi Ruffo, 1974			Benthic