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# Diversity, size frequency distribution and trophic structure of the macromollusc fauna of Vavvaru Island (Faadhippolhu Atoll, northern Maldives)

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**Abstract**

Little is known about the malacofauna of the Maldives despite the ecological significance and diversity of molluscs in tropical coral reef ecosystems. We qualitatively collected molluscs with shell sizes of approximately 1 cm or larger at different major habitats (lagoon, reef flat and reef drop-off) at Vavvaru Island, northern Maldives. Shells collected on the beach supplemented the species inventory. Two hundred fifty-eight species were found, including 180 gastropods from 45 families, 75 bivalves from 23 families, and 3 cephalopods from 3 families. Seventeen families were represented by five or more species, with Muricidae (20 spp.), Conidae (20 spp.) and Cypraeidae (17 spp.) being most speciose. Maximum shell size ranged from 7 to 450 mm, with a median of 34 mm. Fifty percent of the species had shell sizes ranging between 21 and 50 mm; only 4.8% exceeded 100 mm. The median shell size of gastropods was 34 mm, that of bivalves 32 mm. The most common trophic category was predatory carnivores (38.8% of mollusc species), followed by suspension feeders (22.5%). Among gastropods, predatory carnivores accounted for more than half (53.9%) of the species. Suspension feeders were the most common (72.0%) trophic category among bivalves. Our survey provides the first faunistic data on molluscs from Vavvaru as well as new records for the Maldives. We probably captured the diversity of large and common shallow-dwelling species at the lagoon and reef flat well, and increased sampling effort would most likely have predominantly added rare and small species to the inventory. In contrast, at the much less intensively sampled drop-off, further large and common species can also be expected. The low number of mollusc species from the largest size classes and the preponderance of carnivorous species among gastropods are typical features of coral reef mollusc communities and have also been reported from other tropical settings such as the Caribbean, East Africa, the Red Sea and New Caledonia.

**Key words**: coral reef, taxonomic diversity, Indian Ocean, new records, shell size, species inventory, trophic classification

**Zusammenfassung**

Trotz der wichtigen ökologischen Rolle und Diversität von Mollusken in tropischen Korallenriffen ist nur wenig über die Malakofauna der Malediven bekannt. In der vorliegenden Studie wurden Mollusken mit Schalengrößen von ca. 1 cm und größer in verschiedenen Großhabitaten (Lagune, Riffdach und Riffabhang) der Insel Vavvaru (nördliche Malediven) qualitativ gesammelt. Das Arteninventar wurde durch Aufsammlungen gestrandeter Molluskenschalen ergänzt. Insgesamt konnten 258 Arten nachgewiesen werden, darunter 180 Gastropoden aus 45 Familien, 75 Bivalven aus 23 Familien und 3 Cephalopoden aus 3 Familien. Siebzehn Familien waren mit fünf oder mehr Arten vertreten, wobei Muricidae (20 spp.), Conidae (20 spp.) und Cypraeidae (17 spp.) am artenreichsten waren. Die maximale Schalengröße lag zwischen 7 und 450 mm, der Median bei 34 mm. Fünfzig Prozent der Arten wiesen Schalengrößen zwischen 21 und 50 mm auf, nur 4.8% erreichten Größen von mehr als 100 mm. Der Median der Schalengröße bei Gastropoden lag bei 34 mm, der von Bivalven bei 32 mm. Die häufigste trophische Kategorie war ‘räuberische Arten’ (38.8% der Molluskenarten), gefolgt von Suspensionsfressern (22.5%). Räuberische Spezies stellten mehr als die

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Hälfte (53.9%) der Gastropoden. 'Suspensionsfresser' war die häufigste trophische Kategorie (72.0%) unter den Bivalven. Die vorliegende Arbeit liefert erste faunistische Daten über die Mollusken Vavvarus sowie Erstnachweise für die Malediven. Der Artenreichtum großer und häufiger flachwasserbewohnender Arten in der Lagune und am Riffdach wurde vermutlich relativ gut abgedeckt, sodass größerer Sammelaufwand die vorliegende Artenliste wahrscheinlich hauptsächlich um seltene und kleine Arten ergänzen würde. Im Gegensatz dazu sind am viel weniger stark besammelten Riffabhang darüber hinaus auch noch weitere große und häufige Arten zu erwarten. Die geringe Zahl an Molluskenarten der größten Größenklassen sowie das Vorherrschen räuberischer Arten unter den Schnecken sind charakteristisch für Weichtiergemeinschaften von Korallenriffen, und auch von anderen tropischen Regionen, wie der Karibik, Ostafrika, dem Roten Meer und Neu Kaledonien bekannt.

## Introduction

The Maldive Islands are located in the northern part of the Indian Ocean southwest of India and extend between 7°06'N and 0°42'S in meridional direction along 73°E (Purdy & Bertram 1993). The archipelago consists of 26 atolls with a total of 1190 to more than 1300 islands, depending on the source cited, covering an area of approximately 107,500 km$^2$ (Purdy & Bertram 1993, Hameed 2002). Less than 0.3 % of this total area is comprised by land (Purdy & Bertram 1993). With a total coral reef cover of 21,370 km$^2$, the Maldives archipelago ranks among the world's largest coral reef and carbonate platform areas (Gischler & al. 2014).

The atolls' lagoons are characterized by a variety of morphological features including micro-atolls, faros (smaller circular reefs emerging during low tide), thilas (shoals located a few meters below the sea surface), knolls and patch reefs (Hameed 2002, Dell' Angelo & al. 2010, Gischler & al. 2014). Despite the large area covered by coral reefs, the diversity of habitats and the popularity of the Maldives as a tourist destination, so far little is known about the fauna and flora of the archipelago. Proper knowledge and baseline data on the composition of local coral reef communities are essential for the study and conservation of these ecosystems, an urgent topic considering the multiple threats to local biodiversity that arise from tourism, population increase, fisheries, fertilizer and pesticide input, sand and coral mining, coastal zone modification and global warming, to name just a few (Hameed 2002).

Due to their diversity, specialized lifestyles and important ecological roles (Taylor 1978, Taylor & Reid 1984, Stella & al. 2011), molluscs are among the taxa frequently used as proxies for biodiversity in assessments of coral reef ecosystems (Roberts & al. 2002). The current knowledge of the Maldivian malacofauna is restricted to relatively few studies, some published more than a century ago. A short list of species purchased by Captain John Slack is probably the earliest account of Maldivian molluscs (Marrat 1879). The first well-documented and important collection of molluscs resulted from the expedition of J. Stanley Gardiner in 1899-1900 (Gardiner 1901). His collecting efforts in the Maldive and Laccadive archipelagoes were the basis for an inventory listing 381 species (363 from the Maldives), including Solenogastres, shelled Gastropoda, Bivalvia and Polyplacophora (Smith 1903). In addition, 32 species of nudibranchs (22 from the Maldives; Eliot 1903) and 17 species of cephalopods (16 from the Maldives) were reported from that expedition (Gardiner 1901, Hoyle 1906).

Later, several expeditions added further species, including the Yale Seychelles Expedition in 1957 (collections in four atolls) and the Te Vega Cruise B in 1964 (U.S. Program

in Biology, International Indian Ocean Expedition; collections in eight atolls) (KOHN & ROBERTSON 1966, ROBERTSON unpublished manuscript). The latter expedition yielded 543 species of marine molluscs (ROBERTSON unpublished manuscript). In 2003, the International Scientific Maldives Expedition organized by W. Backhuys, A. Voogt and A. Saeed made collections in six atolls, reporting 142 gastropods and 13 species of bivalves in addition to SMITH's list (DELSAERDT 2006, 2011). SMYTHE and PHILLIPS (1972) provided a list of molluscs from Malé and Addu Atolls collected in the 1950s, including more than a hundred species picked up by the authors on beaches and coral reefs, or presented to them by local people.

Apart from those expeditions, some studies dealing more specifically with certain groups of molluscs have been published: TURNER & al. (2007) provide an account of Maldivian Costellariidae with the description of nine new species, and Mitridae were dealt with by FRANTZEN (1985). Opisthobranchs were treated by MARCUS & MARCUS (1960), RUDMAN (1982) and YONOW (1994, 2012). DELL´ANGELO & al. (2010) studied Maldivian Polyplacophora based on material collected at several locations in five atolls and reported 19 species.

In September 2014, a student field course of the University of Vienna on coral reef ecology was held at Vavvaru, a small island in the western part of the Faadhippolhu (Lhaviyani) Atoll, northern Maldives. Among other taxa, the collecting efforts were aimed at qualitatively assessing the species richness and size distribution of larger shelled molluscs and cephalopods inhabiting coral reef habitats and associated soft bottoms. The present study summarizes the results of the collections of molluscs made during the field course and provides the first faunistic baseline data for Vavvaru. For this purpose, the distribution of species in different parts of the island was recorded, their shell sizes measured and the trophic structure analysed by assigning all taxa to trophic categories according to the literature.

The species list presented herein deals with macromolluscs larger than approximately 1 cm; smaller taxa extracted from sediment samples will be treated in another study. Our species inventory is intended to provide a first guideline for future malacological and biodiversity research at Vavvaru. Considering the scarcity of recent faunistic data on the Maldivian malacofauna in the light of multiple threats to local marine biodiversity, this study represents a significant contribution to the knowledge of the local fauna.

## Materials and methods

### Study area

Vavvaru (05°25'05"N, 73°21'16"E) is a small island located in the western part of the Faadhippolhu Atoll (also Fadiffolu/Lhaviyani Atoll), northern Maldives (Figs. 1 & 2). The atoll occupies an area of 699 km$^2$; its lagoon reaches a maximum depth of 55 m (PURDY & BERTRAM 1993). Vavvaru is roughly triangular in shape and has approximate dimensions of 560 and 180 m across its longest and widest part, respectively (Fig. 2). A comparison of its shape and dimensions at the time of sampling with available maps and Google Earth satellite images, however, revealed that the island changes its outline continuously due to wave action and currents.

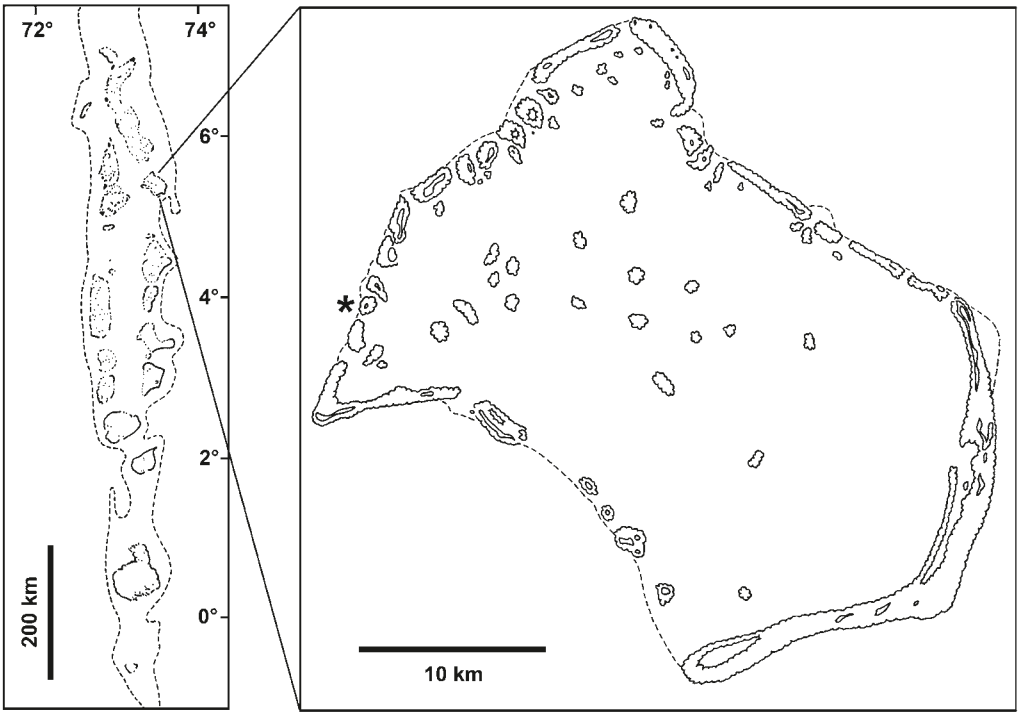


Fig. 1: Map of the Maldives (left; redrawn after PURDY & BERTRAM 1993) and the Faadhippolhu/ Lhaviyani Atoll (right). The position of Vavvaru is marked with an asterisk.

The southeastern shore is part of the protected lagoon of the Faadhippolhu Atoll, whereas the western shore is exposed to the deep Inner Sea of the Maldives. Due to its more sheltered position, the southeastern shore is characterized by a sandy beach and patch reefs of different size and composition. Patch reefs range from the shallow subtidal down to approximately 15 m depth off the northeastern part of the island, and to around 7 m depth further south. In deeper parts, the lagoon is dominated by bottoms of coral sand. Scattered patch reefs, however, are also present down to a depth of at least 20 to 22 m. In the northern part of the southeastern shore, the shallow reefs are mainly dominated by corals of the genus *Acropora* OKEN, 1815, whereas in more southern patch reefs other corals, particularly *Porites* LINK, 1807, increase in frequency. The southernmost reefs of the lagoon are characterized by a high proportion of *Porites*.

The western shore of Vavvaru is exposed to higher wave energies, and the sandy beach rapidly turns into a reef flat covered by coral rubble and living corals in varying proportions. Sand is hardly present, except in close proximity to the beach. The reef flat is approximately 400 m wide and reaches a maximum depth of about 7 m before turning into an almost vertical drop-off that descends to a depth of at least 190 m (personal observations from grab sampler deployments).

Mud flats, seagrass meadows and mangroves are not present at Vavvaru. A very small patch of beach rock is present at the northern part of the island's western shore.

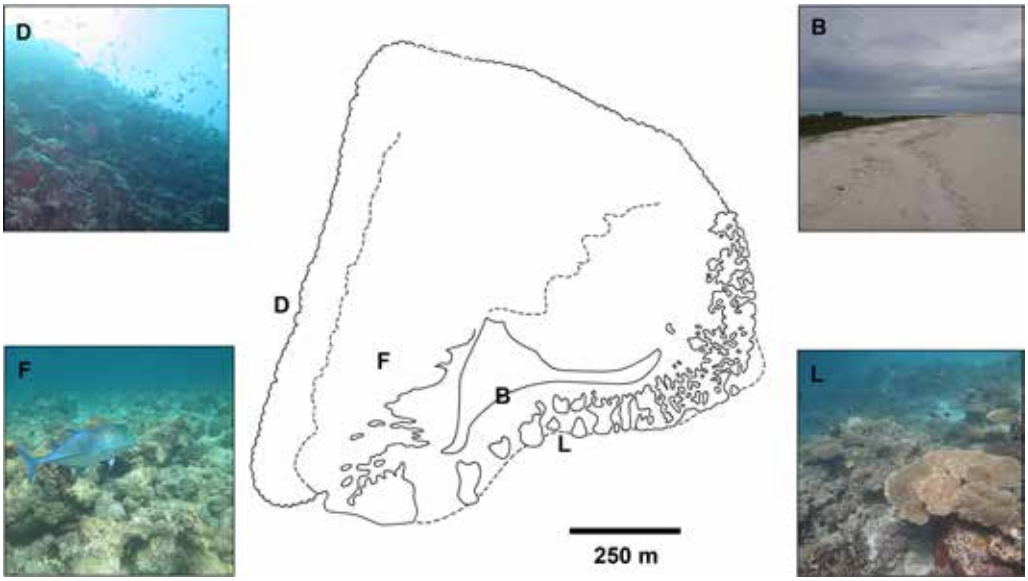


Fig. 2: Schematic drawing of Vavvaru with the location of the major habitats indicated by letters (B, beach; D, drop-off; F, reef flat; L, lagoon). Insets are *in situ* images of the major habitats.

**Sampling of molluscs**

Main sampling took place in the period from 8-20 September 2014 and was conducted by participants of a student field course of the University of Vienna on coral reef ecology (permit nos. (OTHR)30-D/INDIV/2014/276 and (OTHR)30-D/INDIV/2014/356). Some additional specimens were collected by P. J. between 20 September and 2 October 2014. Only macromolluscs with sizes of approximately 1 cm or larger were considered in this study. We are aware that this approach covers only a fraction of the species actually present, but, as pointed out by BOUCHET & al. (2002), it is 'a perfectly valid approach when limited collecting and sorting resources are available in the field'. Furthermore, the taxonomy of larger molluscs is much better known, permitting identification of many specimens in the field, which makes this approach particularly environmentally friendly (BOUCHET & al. 2002).

Molluscs were collected by hand picking from different major habitats of Vavvaru: the lagoon, the reef flat and the drop-off. To supplement the species inventory, shells and molluscs washed up on the beach, mainly along the eastern shore, were also included in the analysis. Beached specimens represent a mixture of taxa inhabiting various soft- and hard substrate microhabitats of the island, but were considered in this study as they provide important additional faunistic information. For reasons of simplicity, the beach will hereafter also be referred to as 'habitat'. Therefore, in total, four different habitats – lagoon, reef flat, drop-off and beach – were distinguished (Fig. 2). In addition, (terrestrial) hermit crabs were collected and their shells studied.

Molluscs were sampled qualitatively by means of beachcombing, snorkeling and SCUBA diving down to a depth of 32 m on soft and hard substrates. Molluscs permanently

attached to the reef (e.g. living Vermetidae, Spondylidae, Pinnidae, *Hyotissa* Stenzel, 1971, etc.) and boring/endolithic bivalves (e.g. *Lithophaga* Röding, 1798, Gastrochaenidae) were not collected in order to reduce the impact on the reef; whenever possible, these taxa were photographed *in situ*. Furthermore, images of living individuals of several other species were taken while snorkeling and diving. Sampling was carried out in as many different habitat types as possible in order to obtain a comprehensive dataset of molluscan taxa occurring around the island. Nonetheless, due to time restrictions and limited number of SCUBA divers, not all major habitats could be sampled to an equal extent. For example, the least sampled was the steep drop-off because it was accessible only to SCUBA divers. Both living individuals and empty shells were included in the analysis. For each species, information is provided if it was found alive (i.e., represented in our collections by at least one living individual).

**Data acquisition**

Collected living specimens were kept in tanks with running sea water at the Korallion Research Lab field station until examination. Molluscs were photographed with a digital camera (at least one specimen per species, often more), with a mm-scale in the background, and identified to the lowest taxonomic level possible. Identification of taxa was based on various publications, including Cernohorsky (1976), Oliver (1992), Poppe & Goto (1993), Bosch & al. (1995), Jarrett (2000), Lamprell (2006), Rusmore-Villaume (2008) and Huber (2010). Shell size was measured with sliding calipers to the closest millimeter. In gastropods, the maximum distance from apex to aperture (including siphonal channels, if present) as well as the width (lateral diameter) of the shells was measured. The latter measurement was made without including spines and knobs. An exception was made for *Lambis* Röding, 1798, whose appendages of the outer lip were included in the measurements. In bivalve shells, the height (dorso-ventral dimension) and length (anterior-posterior dimension) were measured. If the largest dimension in any shell was neither of the ones mentioned above, e.g. in the gastropod families Patellidae, Fissurellidae and Siliquariidae, the largest diameter was measured. The size of species that were permanently attached to the reef was measured based on mm-scales on the *in situ* images. Only specimens of *Tridacna* Bruguière, 1797 dwelling in very shallow water were directly measured *in situ* while snorkeling. In living specimens of the flag pen shell *Atrina vexillum* (Born, 1778), only the height could be measured due to its partially buried lifestyle. In addition to size, information on the specific microhabitat (e.g. substrate type and approximate depth of collection) was recorded. After examination, collected living specimens were returned to their original habitats. Broken shells were not considered in the inventory except when they clearly represented a species of which no complete specimens were found and the preservation allowed identification. The size of such incomplete specimens was not measured. Species were assigned to trophic categories based on information from Beesley & al. (1998) and the Neogene Marine Biota of Tropical America molluscan life habits databases (Todd 2001), following the classification of feeding types proposed by Todd (2001). For species of *Tridacna*, an additional trophic category (symbiotic suspension feeders; SS) was introduced to distinguish members of this symbiotic zooxanthellate genus (Rosewater 1965) from purely suspension-feeding bivalves. Families or genera containing representatives that differ in their feeding habits were assigned to mixed trophic categories (i.e., more than one trophic category was assigned to a family or genus). For many species detailed information on

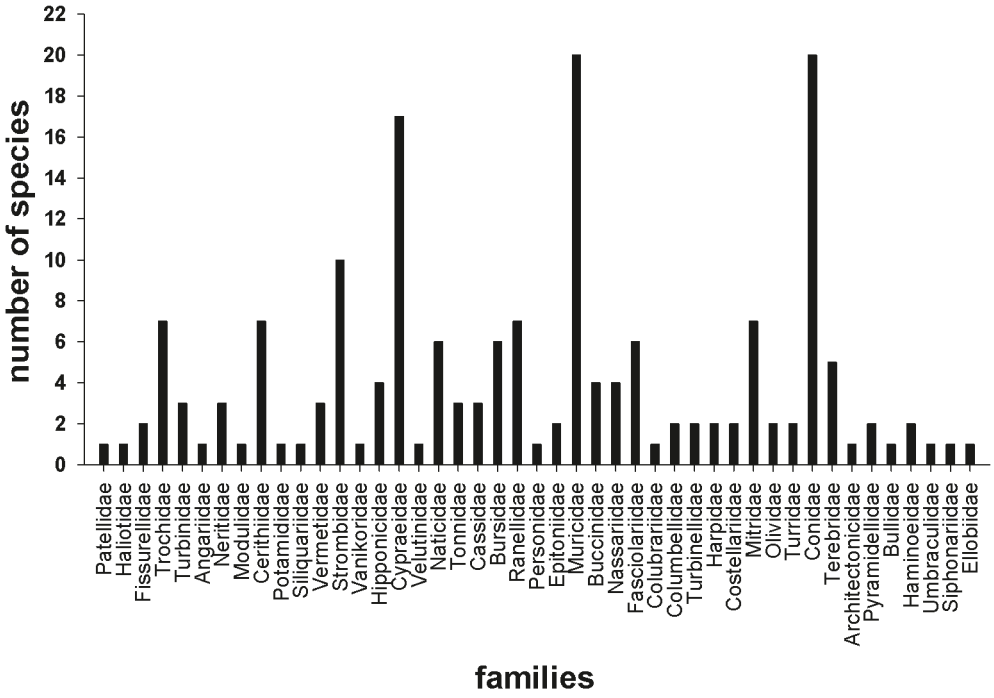


Fig. 3: Species richness of the 45 gastropod families found at Vavvaru.

feeding habits and diet is not available. In such cases, trophic categories were assigned at family or genus level (compare JANSSEN & al. 2011).

### Data analysis

All data were entered in digital spreadsheets and subsequently imported into a relational database (Microsoft Access) for further analysis. Size distribution of molluscs was analysed based on the maximum size of the largest specimen found for each species. Univariate statistics of shell size data were calculated using PAST ver. 2.17c (HAMMER & al. 2001). Graphs were made using Microsoft Excel 2007, PAST ver. 2.17c and SigmaPlot 11.0 (Systat Software, Inc., San Jose, California, USA). Images of molluscs were processed with Adobe Photoshop CS6 (Adobe Systems, San Jose, California, USA).

## Results

### Taxonomic diversity

Two hundred fifty-eight species of shelled molluscs and cephalopods were found at Vavvaru. This includes 180 species of gastropods from 45 families (Fig. 3), 75 bivalves from 23 families (Fig. 4) and 3 cephalopods from 3 families. A complete species list with additional information, including previous literature records from the Maldives, is provided in Tab. 5.

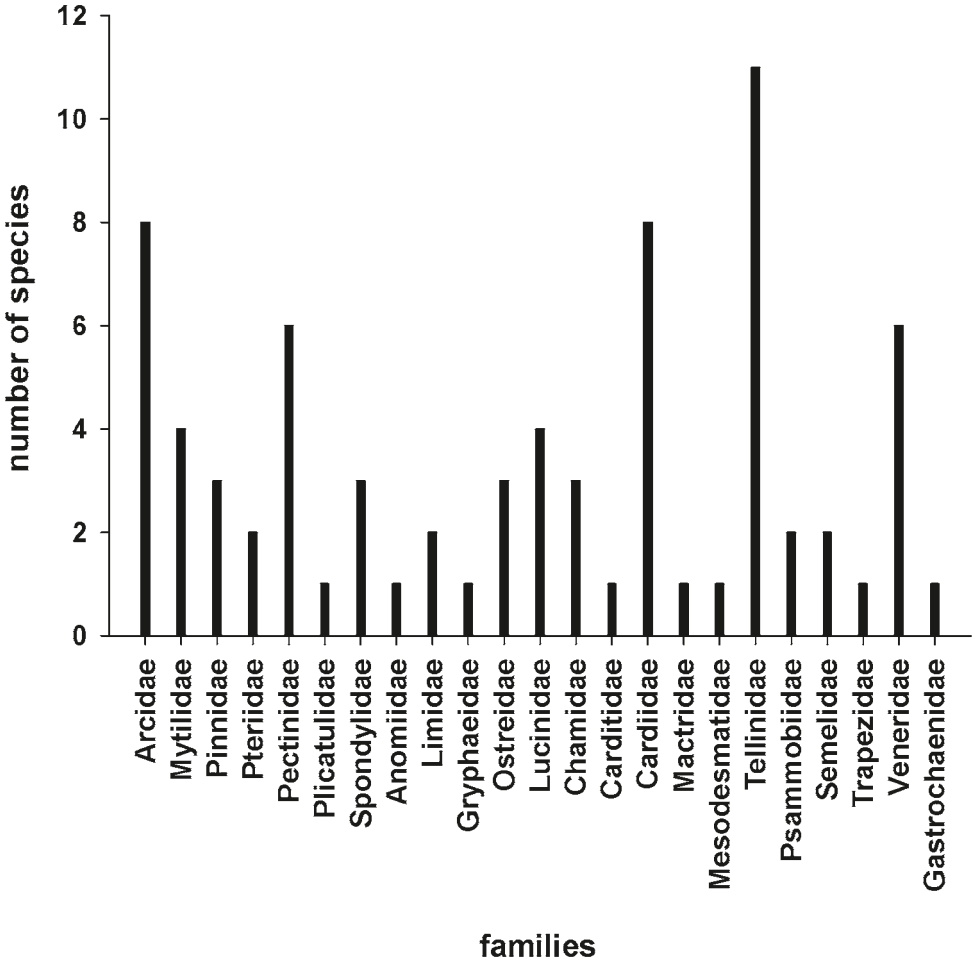


Fig. 4: Species richness of the 23 bivalve families found at Vavvaru.

The number of species per family varied greatly, ranging from 1 to 20 (Figs. 3–5). Seventeen families with five or more species were found, the most speciose being Muricidae and Conidae (20 species each), followed by Cypraeidae (17 species), Tellinidae (11 species) and Strombidae (10 species) (Fig. 5). Twenty-six of the 71 families of molluscs (36.6%) were represented by a single species only. Gastropods accounted for 63.4%, bivalves for 32.4% and cephalopods for 4.2% of the total number of families. Living specimens were found of 83 species (32.2%), whereas the remaining 175 species were represented only by empty shells or shells occupied by hermit crabs. Figs. 11–13 provide *in situ* images of living individuals of selected taxa and give an impression of these molluscs in their original habitats at Vavvaru.

**Mollusc diversity of the major habitats**

The number of mollusc species recorded at the major habitats differed considerably due to great differences in collecting effort, reflecting methodological and time constraints.

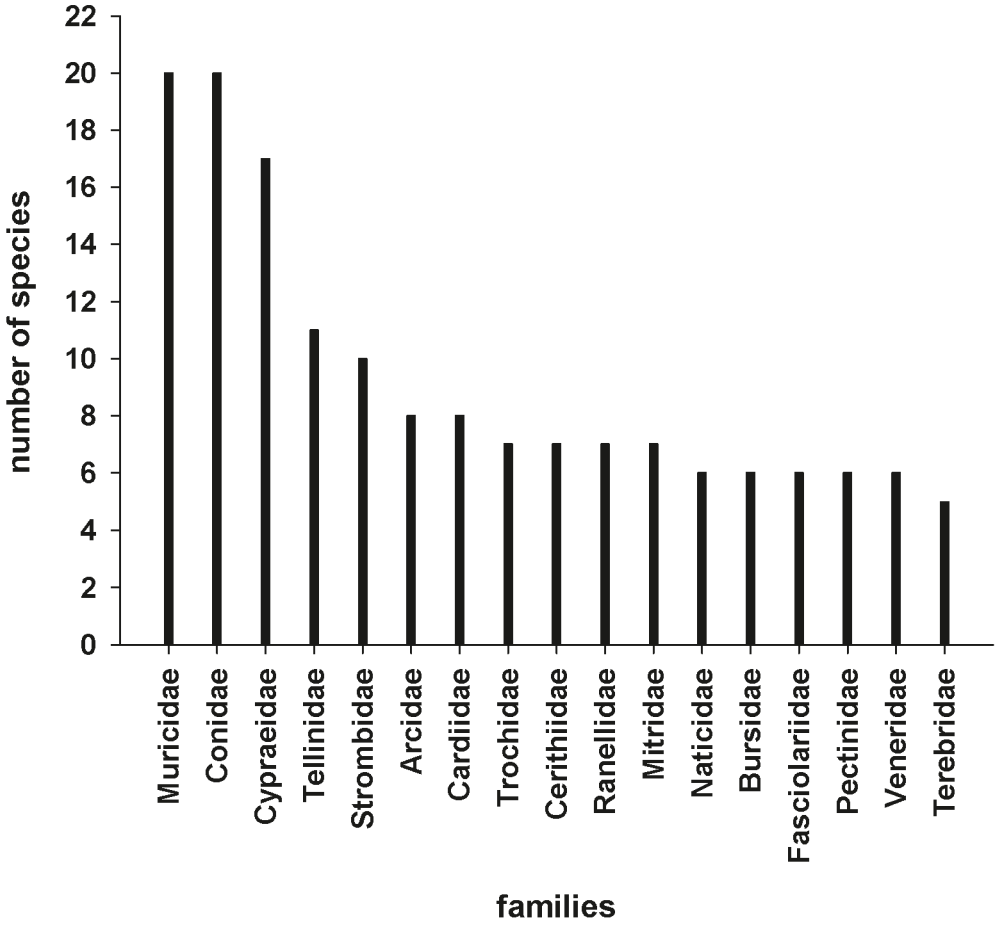


Fig. 5: Mollusc families with at least five representatives at Vavvaru.

One hundred thirteen species from 44 families were collected at the lagoon, 95 species from 42 families at the reef flat (Tabs. 1–2). Only 17 species from 13 families were recorded at the drop-off, the least sampled habitat. One hundred thirty-five species from 57 families were found washed up along the beach (Tabs. 1–2), and 81 species (31.4 % of the total inventory) were recorded from beached shells only.

The proportions of living species at the lagoon, reef flat and drop-off – 47.8, 41.2 and 40.0 % of the local species inventory, respectively – were rather similar (Tab. 1), whereas no living specimens of truly beach-dwelling molluscs were found. The only living specimen collected at the beach was a stranded individual of the bivalve *Codakia punctata* (LINNAEUS, 1758) (Tab. 1).

As beached shells represent an allochthonous mixture of species inhabiting various microhabitats, and the drop-off was too difficult to access to be accurately sampled, we briefly compare species assemblages only between the lagoon and the reef flat: in both habitats, Conidae, Muricidae and Cypraeidae were the three most speciose families.

Tab. 1: Number of mollusc families and species collected at the major habitats of Vavvaru. Beach-collected specimens are a mixture of taxa inhabiting various microhabitats but provide important information on the island's species inventory. For living species, absolute numbers and percentages of the species inventory of the respective habitat are given. The percentage of total number of species refers to the proportion of all 258 molluscan species that was found in the respective habitat.

| habitat | no. of families | no. of species | living species | % of total no. of spp. |
|---|---|---|---|---|
| drop-off | 13 | 17 | 7 (41.2%) | 6.6 |
| lagoon | 44 | 113 | 54 (47.8%) | 43.8 |
| reef flat | 42 | 95 | 38 (40.0%) | 36.8 |
| beach | 57 | 135 | 1 (0.7%)* | 52.3 |

*stranded living individual of *Codakia punctata*.

Great differences, however, were evident in the number of species for some other families: in the lagoon, Strombidae, Terebridae and Cardiidae (including Tridacninae) were each represented by at least five species, whereas only 1–3 species of each of these families were found at the reef flat. The opposite was observed for Fasciolariidae, which was considerably more diverse at the reef flat (six species in total, five living) than in the lagoon (two species, both also found alive) (Tab. 2).

### Shell size

Size data was available for 243 of the 258 mollusc species found in this study, and maximum shell size of each species is provided in Tab. 5. Shell size ranged from 7 to 450 mm, with a median of 34 mm (Fig. 6). The median size of bivalves was 32 mm and that of gastropods 34 mm. Fifty percent of the species had sizes ranging between 21 and 50 mm (Fig. 6); only 4.8% exceeded 100 mm (Fig. 7). When binning species in 20-mm-wide size classes, 38.7% of all taxa had sizes of > 20-40 mm (Fig. 7). The widest size ranges within families were found in Strombidae and Cardiidae (including Tridacninae) (Fig. 6). Of some species, e.g. *Tonna allium* (Dillwyn, 1817), *Pinna* cf. *muricata* Linnaeus, 1758 and *Pinctada* cf. *margaritifera* (Linnaeus, 1758), only juvenile specimens were found.

### Trophic categories

The molluscs found during our survey belonged to ten trophic categories (Tab. 3) and six mixed categories (CP/CB, HM/HR, HO/CB, HR/CB, HR/HP and HR/SU). For very few species, no information on feeding habits and diet was available (UN).

The most common category at Vavvaru was predatory carnivores, representing 38.8% of the mollusc species found, followed by suspension feeders (22.5%) (Fig. 8a). Together, these two trophic categories accounted for more than 60% of the total species inventory. Among bivalves, the vast majority (72.0%) were suspension feeders (Fig. 8b). One fifth of the species found were surface deposit feeders. Chemosymbiotic bivalves and symbiotic suspension feeders were relatively rare. More than half of the gastropod species were predatory carnivores (Fig. 8c), representing the by far most common trophic

Tab. 2: Species richness of mollusc families at the major habitats. Numbers represent total species richness at each habitat, numbers in brackets living species richness. Families are listed in systematic order following BOUCHET & al. 2002.

| class | family | drop-off | lagoon | reef flat | beach |
|---|---|---|---|---|---|
| Gastropoda | Patellidae | — | — | — | 1 |
| | Haliotidae | — | — | 1 | 1 |
| | Fissurellidae | — | — | — | 2 |
| | Trochidae | — | 3 (1) | 2 (2) | 6 |
| | Turbinidae | 1 (1) | 2 | 1 | — |
| | Angariidae | — | — | — | — |
| | Neritidae | — | 2 | — | 3 |
| | Modulidae | — | — | — | 1 |
| | Cerithiidae | — | 3 (2) | 3 (2) | 4 |
| | Potamididae | — | — | — | 1 |
| | Siliquariidae | — | — | — | 1 |
| | Vermetidae | 2 (2) | 3 (3) | 1 (1) | — |
| | Strombidae | — | 6 (6) | 3 (1) | 4 |
| | Vanikoridae | — | — | 1 | 1 |
| | Hipponicidae | — | 1 | 2 (1) | 3 |
| | Cypraeidae | — | 7 (3) | 9 (2) | 12 |
| | Velutinidae | — | — | — | 1 |
| | Naticidae | — | 2 | 2 | 3 |
| | Tonnidae | — | 1 | — | 3 |
| | Cassidae | — | 2 (1) | 1 | 2 |
| | Bursidae | 1 | 1 (1) | 1 (1) | 3 |
| | Ranellidae | 1 (1) | 1 | 1 (1) | 6 |
| | Personidae | — | — | — | 1 |
| | Epitoniidae | — | — | — | 2 |
| | Muricidae | 1 (1) | 11 (8) | 9 (8) | 5 |
| | Buccinidae | 1 | 1 (1) | 1 (1) | 1 |
| | Nassariidae | — | 2 | 2 | 1 |
| | Fasciolariidae | — | 2 (2) | 6 (5) | — |
| | Colubrariidae | — | 1 (1) | — | — |
| | Columbellidae | — | 1 (1) | 1 | — |
| | Turbinellidae | — | 2 (1) | 1 (1) | — |
| | Harpidae | — | 1 | 1 | 2 |
| | Costellariidae | — | 2 (1) | 1 | — |
| | Mitridae | — | 2 (1) | 4 (1) | 2 |
| | Olividae | — | 1 (1) | 1 | 1 |
| | Turridae | — | — | 1 | 2 |
| | Conidae | 2 | 10 (6) | 10 (7) | 2 |
| | Terebridae | — | 5 (1) | 2 | 2 |

| class | family | drop-off | lagoon | reef flat | beach |
|---|---|---|---|---|---|
| | Architectonicidae | — | — | — | 1 |
| | Pyramidellidae | — | — | 1 | 1 |
| | Bullidae | — | 1 | 1 | 1 |
| | Haminoeidae | — | 2 | — | — |
| | Umbraculidae | — | — | — | 1 |
| | Siphonariidae | — | — | — | 1 |
| | Ellobiidae | — | — | — | 1 |
| Bivalvia | Arcidae | 2 | 5 (2) | 2 | 6 |
| | Mytilidae | — | 1 (1) | — | 3 |
| | Pinnidae | — | 2 (2) | — | 1 |
| | Pteriidae | 1 (1) | — | — | 1 |
| | Pectinidae | — | 2 (1) | 3 (1) | 3 |
| | Plicatulidae | 1 | — | 1 | 1 |
| | Spondylidae | 2 (1) | 2 (1) | — | 1 |
| | Anomiidae | — | — | — | 1 |
| | Limidae | 1 | 1 | — | 1 |
| | Gryphaeidae | — | 1 (1) | — | — |
| | Ostreidae | — | 2 (1) | 1 | 2 |
| | Lucinidae | — | 2 | 2 | 4 (1) |
| | Chamidae | — | — | 3 | 3 |
| | Carditidae | — | — | 1 | 1 |
| | Cardiidae | — | 6 (2) | 1 (1) | 5 |
| | Mactridae | — | — | 1 | — |
| | Mesodesmatidae | — | — | — | 1 |
| | Tellinidae | — | 3 | 4 | 6 |
| | Psammobiidae | — | — | 1 | 2 |
| | Semelidae | — | 1 | — | 1 |
| | Trapezidae | — | 1 | — | — |
| | Veneridae | 1 | 4 | 3 | 5 |
| | Gastrochaenidae | — | 1 (1) | 1 (1) | — |
| Cephalopoda | Sepiidae | — | — | — | 1 |
| | Spirulidae | — | — | — | 1 |
| | Octopodidae | — | 1 (1) | 1 (1) | — |

category. A mixed herbivorous omnivore/browsing carnivore feeding category was also rather common, accounting for 9.4 % of the gastropod species, whereas all other feeding categories contained less than 9 % of the gastropod species each.

For reasons of simplicity, the rarest trophic categories, each represented by less than 5 species, were summarized in Figs. 8a and c in the category ‘other’. Tab. 4 provides a list of these categories and the number of species assigned to them.

Tab. 3: Trophic categories of mollusc species collected at Vavvaru (modified after TODD 2001). Mixed categories (CP/CB, HM/HR, HO/CB, HR/CB, HR/HP and HR/SU) were used for families/genera containing representatives that differ in their feeding habits.

| abbreviation | trophic category |
|---|---|
| CB | browsing carnivores (feed on sedentary animals without killing them; includes parasites) |
| CP | predatory carnivores (species that kill whole prey organisms) |
| DC | chemosymbiotic deposit feeders |
| DS | surface deposit feeders |
| HM | herbivores on fine-grained substrates (microalgivores, detritivores, microphages, unselective deposit feeders) |
| HO | herbivorous omnivores (browsing macroherbivores with unselective omnivory) |
| HP | herbivores on plant or algal substrates (micro-and macroalgivores and detritivores on macroalgal and seagrass substrates) |
| HR | herbivores on rock, rubble or coral substrates (microalgivores) |
| SS | symbiotic suspension feeders |
| SU | suspension feeders (taxa feeding solely or dominantly upon suspended particles, including mucociliary feeders) |
| UN | unknown |

Tab. 4: Rare trophic categories, represented by less than five species each. The number of species is given for each category, separately for all molluscs found and for gastropods and bivalves only. For abbreviations of trophic categories see Tab. 3.

| trophic category | Mollusca | Gastropoda | Bivalvia |
|---|---|---|---|
| CP/CB | 2 | 2 | — |
| DC | 4 | — | 4 |
| HM/HR | 4 | 4 | — |
| HP | 3 | 3 | — |
| HR/CB | 2 | 2 | — |
| HR/HP | 1 | 1 | — |
| HR/SU | 4 | 4 | — |
| SS | 2 | — | 2 |
| UN | 3 | 3 | — |

## New records

Some species in our inventory represent new records for the Maldives, including *Conus mcbridei* LORENZ, 2005 (Figs. 9 and 12) and *Spondylus* cf. *gloriosus* DALL, BARTSCH & REHDER, 1938 (Fig. 10).

Living specimens of *C. mcbridei* were found on hard substrates at the lagoonal side and the exposed reef flat of Vavvaru. Furthermore, this species occurred at the steep reef drop-off. *Conus mcbridei* was observed by SCUBA diving at depths ranging from 5 to

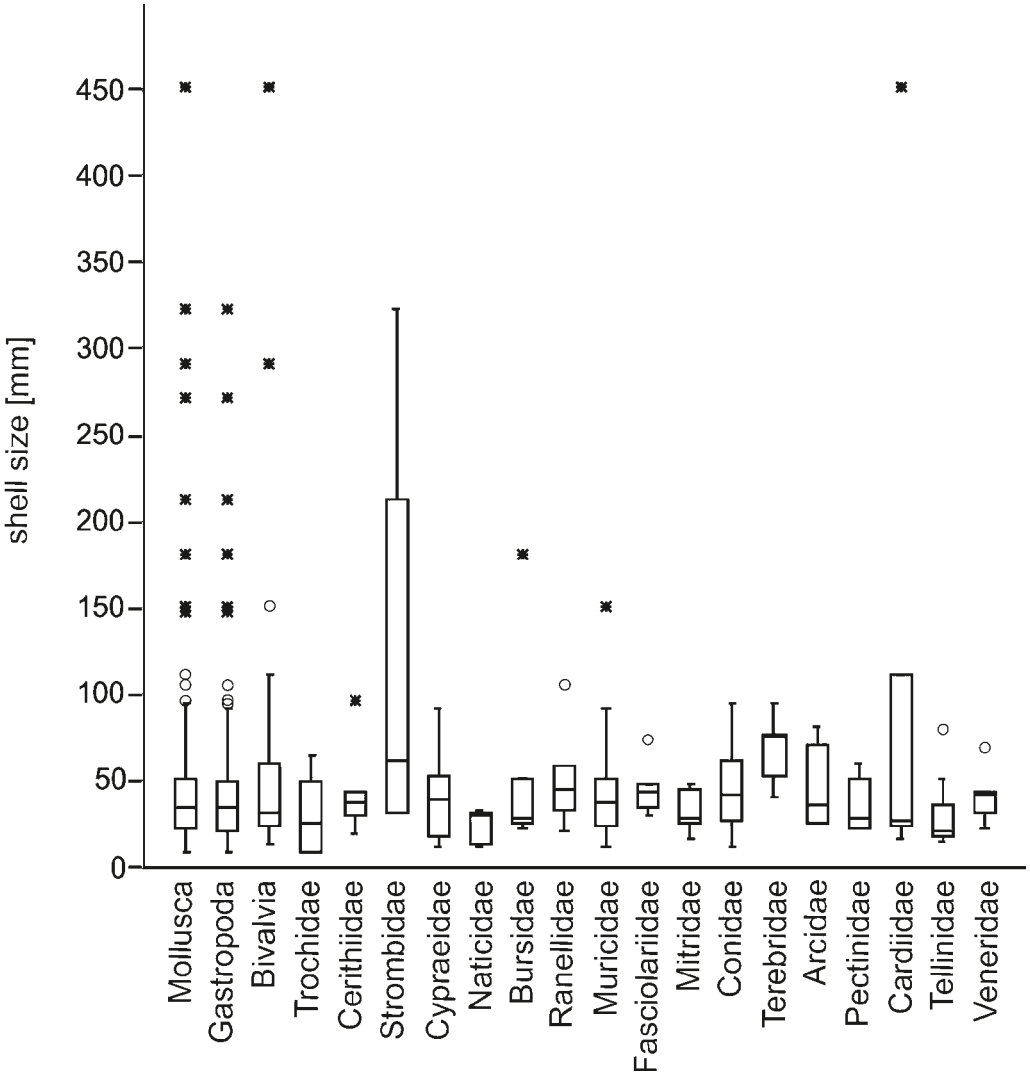


Fig. 6: Boxplots of shell size for all molluscs, bivalves, gastropods and families with at least five species. Boxes mark the 25–75 percent quartiles, horizontal line inside the box the median, whiskers values within 1.5 interquartile ranges from the lower and upper boundary of the box. Circles represent outliers, asterisks represent extreme outliers.

15 m. A voucher specimen (Fig. 9; size: 11 mm) has been deposited in the Natural History Museum Vienna (catalogue no. NHMW Mollusca 110174), a second (size: 9 mm) remains in the collection of the first author. Both were found on an *Acropora*-dominated patch reef at 15 m depth in the lagoon of Vavvaru.

No living specimens of *Spondylus* cf. *gloriosus* were found. A single dead specimen was collected at the steep drop-off at a depth of 32 m (Fig. 10).

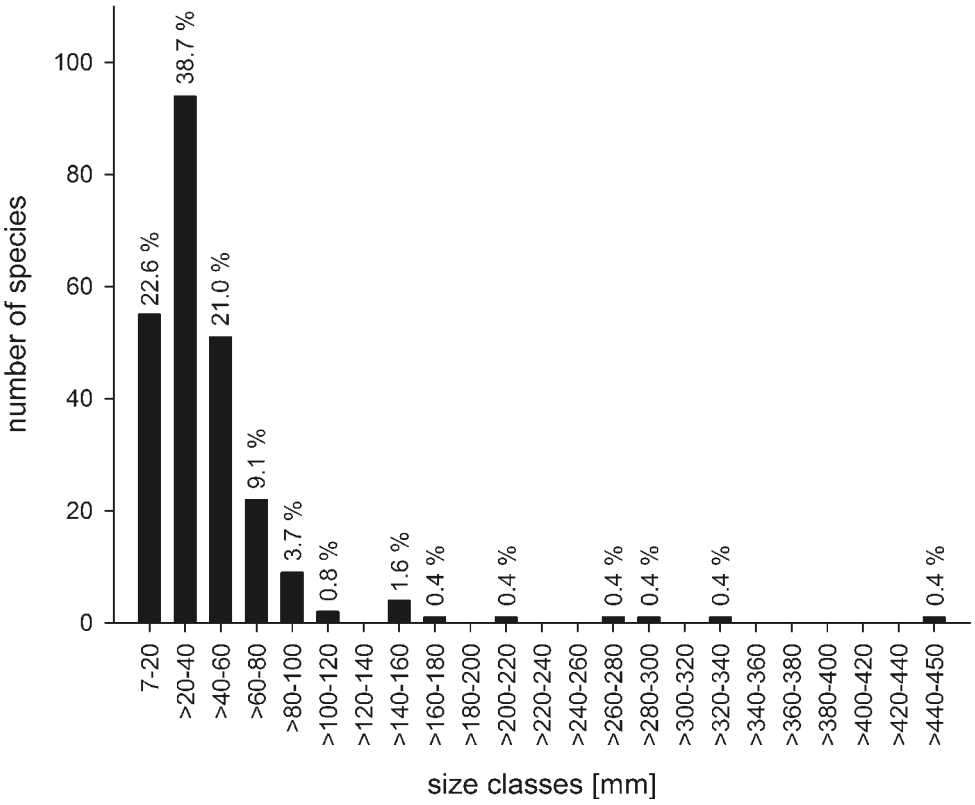


Fig. 7: Size distribution of mollusc species found at Vavvaru.

## Discussion

### Diversity of the malacofauna of Vavvaru and the Maldives

During our two-week survey at Vavvaru, we recorded 258 species of shelled molluscs and cephalopods with sizes of approximately 1 cm or larger, representing the first malacofaunistic data for the island. The number of species found was much higher than expected from the available literature, considering the small size of Vavvaru and the comparatively low sampling effort. In the course of GARDINER's six-month expedition to the Maldives (1899–1900), numerous dredge hauls in 13 atolls across the whole archipelago and down to depths of 80 m (GARDINER 1901) yielded 370 species of bivalves, shelled gastropods and cephalopods (GARDINER 1901, SMITH 1903, HOYLE 1906). ROBERTSON (unpublished manuscript) found 543 species of marine molluscs within 28 days of sampling in the course of the auxiliary cruise B of the vessel Te Vega (International Indian Ocean Expedition). During that cruise, molluscs were collected from 16 stations at the Maldives, mostly on reefs, but also at some dredging stations in lagoons to a maximum depth of 64 m (ROBERTSON unpublished manuscript). In the course of the one-month International Scientific Maldives Expedition in 2003, 322 shelled gastropod

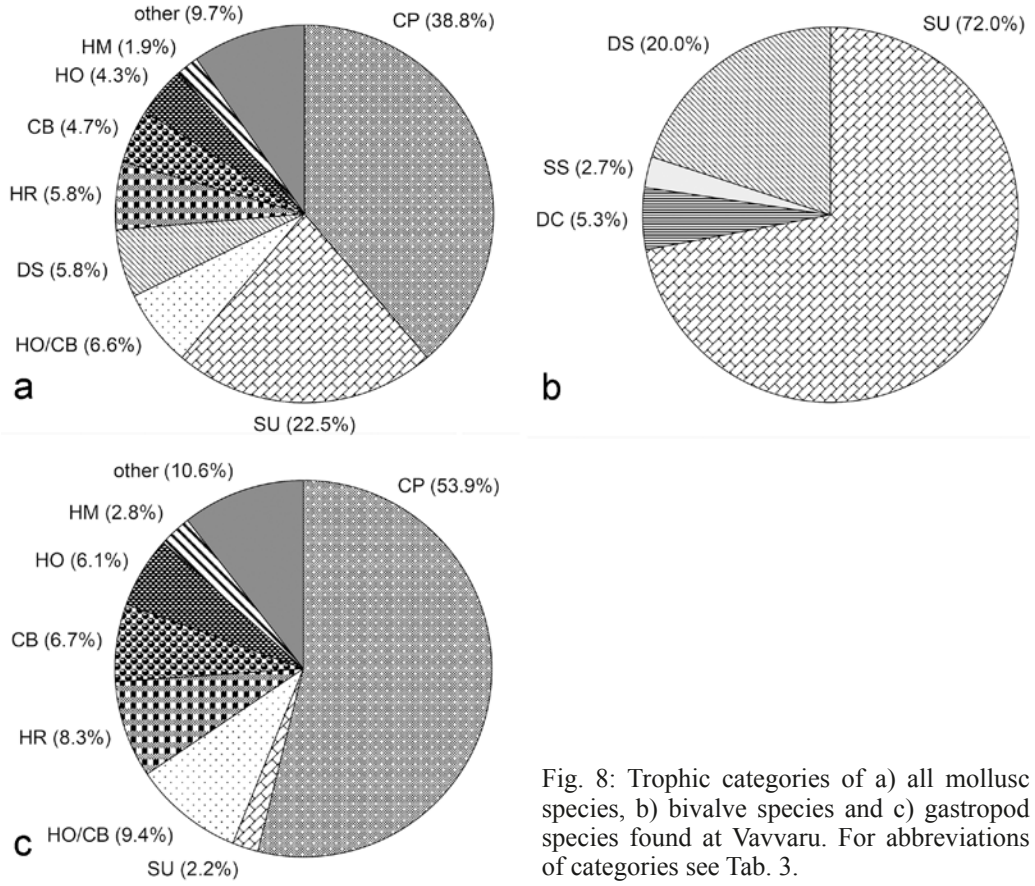


Fig. 8: Trophic categories of a) all mollusc species, b) bivalve species and c) gastropod species found at Vavvaru. For abbreviations of categories see Tab. 3.

and bivalve species were collected in six atolls. The species list of the latter expedition does not include 'micromolluscs' (DELSAERDT 2011).

We probably reasonably covered the diversity of large and common shallow-dwelling species at the lagoon and reef flat of Vavvaru; a greater collecting effort would have predominantly yielded further small and rare species. This interpretation is supported by the decreasing numbers of large species that could be added to our inventory towards the end of the field campaign. In contrast, the much less intensively sampled drop-off would most probably still yield many additional common and large species. Overall, the species inventory presented herein is a good first approximation of the island's total macromollusc diversity. Previous studies have shown the great effect of collecting effort and techniques on the total number of species found in tropical ecosystems, as many taxa are rare and small (BOUCHET & al. 2002, 2009, ZUSCHIN & OLIVER 2005, ALBANO & al. 2011). Micromolluscs are known to contribute a considerable proportion to overall species richness in tropical ecosystems, but could not be considered in this study.

Among the macromolluscs, Muricidae and Conidae were the most speciose families at Vavvaru with 20 species each, followed by Cypraeidae with 17 species. According


Fig. 9: *Conus mcbridei* LORENZ 2005. The illustrated specimen was collected alive from an *Acropora*-dominated patch reef at 15 m depth in the lagoon of Vavvaru by SCUBA diving. It has been deposited in the collection of the Natural History Museum Vienna (catalogue no. NHMW Mollusca 110174).

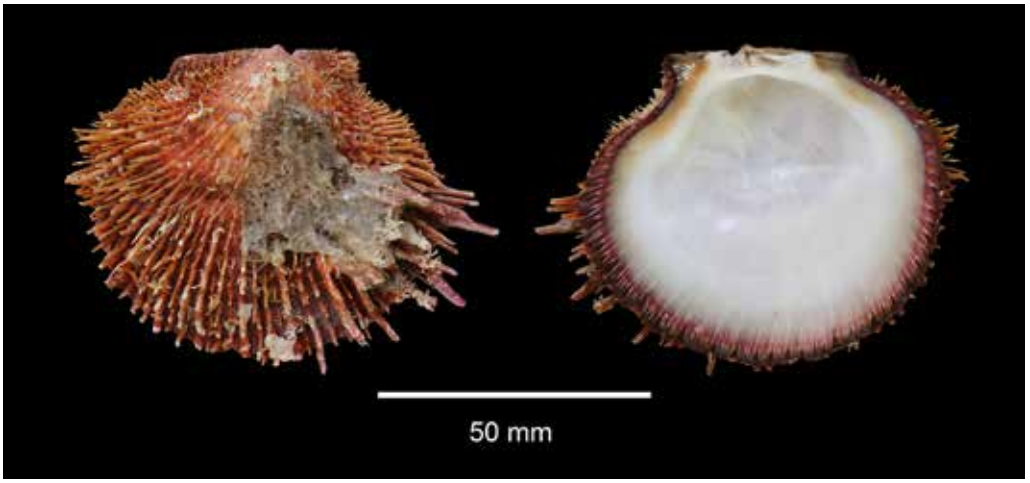


Fig. 10: Left valve of *Spondylus* cf. *gloriosus* DALL, BARTSCH & REHDER, 1938 collected at a depth of 32 m at the drop-off of Vavvaru.

to literature data, 56 species of Muricidae (including Coralliophilinae), 73 species of Conidae and 54 species of Cypraeidae are known to occur at the Maldives (SMITH 1903, KOHN & ROBERTSON 1966, ROBERTSON unpublished manuscript (excluding taxa not determined to species level), SMYTHE & PHILLIPS 1972, TAYLOR 1978, BAER 1989, DELSAERDT 2006, 2011). Similar to our results, Conidae, Cypraeidae and Thaididae were the three most diverse families in a Rapid Assessment Survey in Milne Bay (Papua New Guinea) (WELLS 1998). Like in Milne Bay (WELLS 1998) and Koumac (BOUCHET & al. 2002), Veneridae was among the most speciose bivalve families in our collections. Nonetheless, its species diversity at Vavvaru was surpassed by that of Tellinidae, Arcidae and Cardiidae (including Tridacninae), and matched by that of Pectinidae. With about

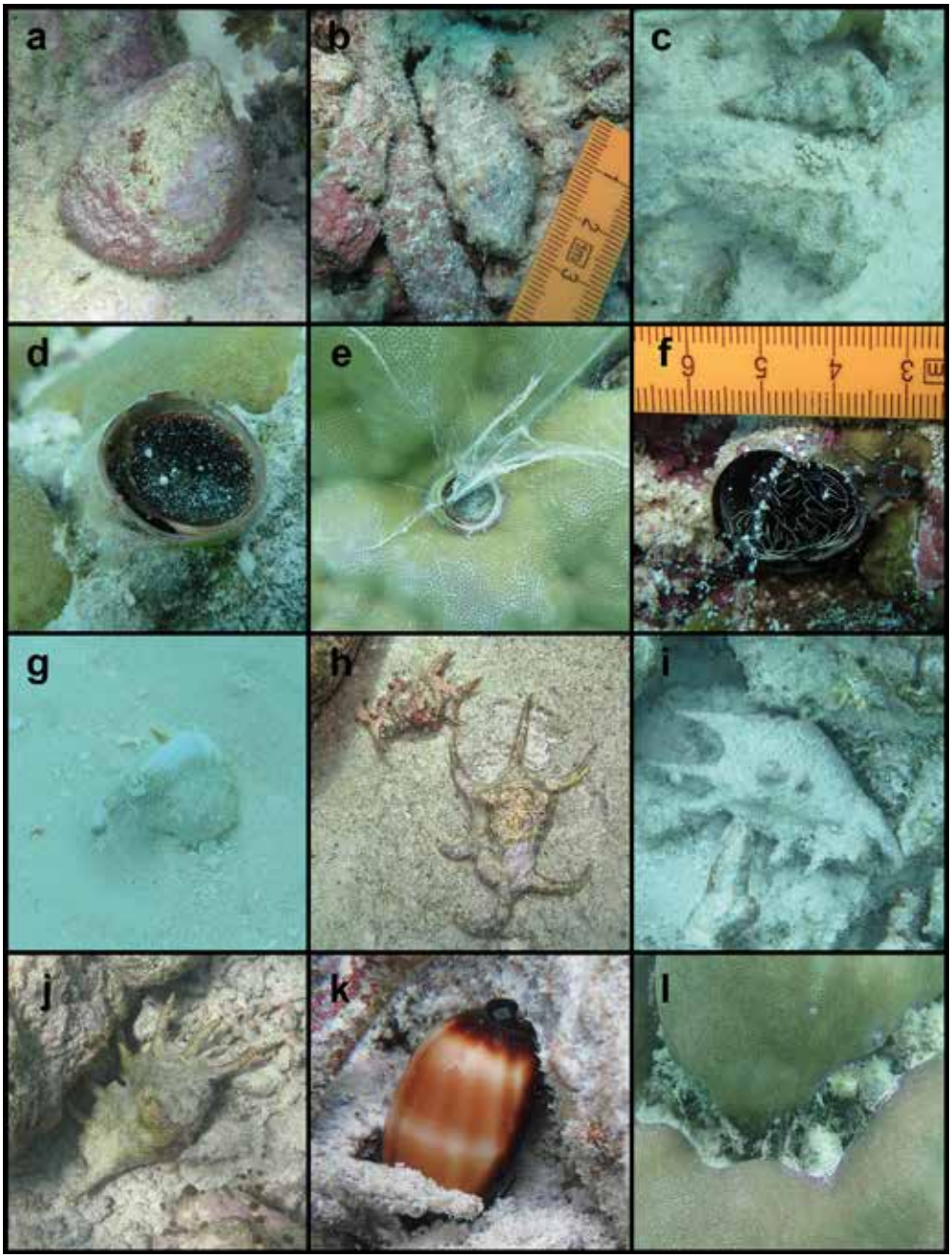


Fig. 11: a) *Tectus pyramis* (Born, 1778); b) *Cerithium echinatum* Lamarck, 1822; c) *Cerithium nodulosum* Bruguière, 1792; d & e) *Ceraesignum maximum* (G. B. Sowerby, I 1825); f) *Thylacodes grandis* (Gray, 1842); g) *Gibberulus gibberulus* (Linnaeus, 1758) (white specimen resembling the Red Sea subspecies *G. gibberulus albus* (Mörch, 1850)); h) *Harpago chiragra* (Linnaeus, 1758); i) *Lambis lambis* (Linnaeus, 1758); j) *Lambis truncata* (Lightfoot, 1786); k) *Talparia talpa* (Linnaeus, 1758); l) *Coralliophila violacea* (Kiener, 1836).

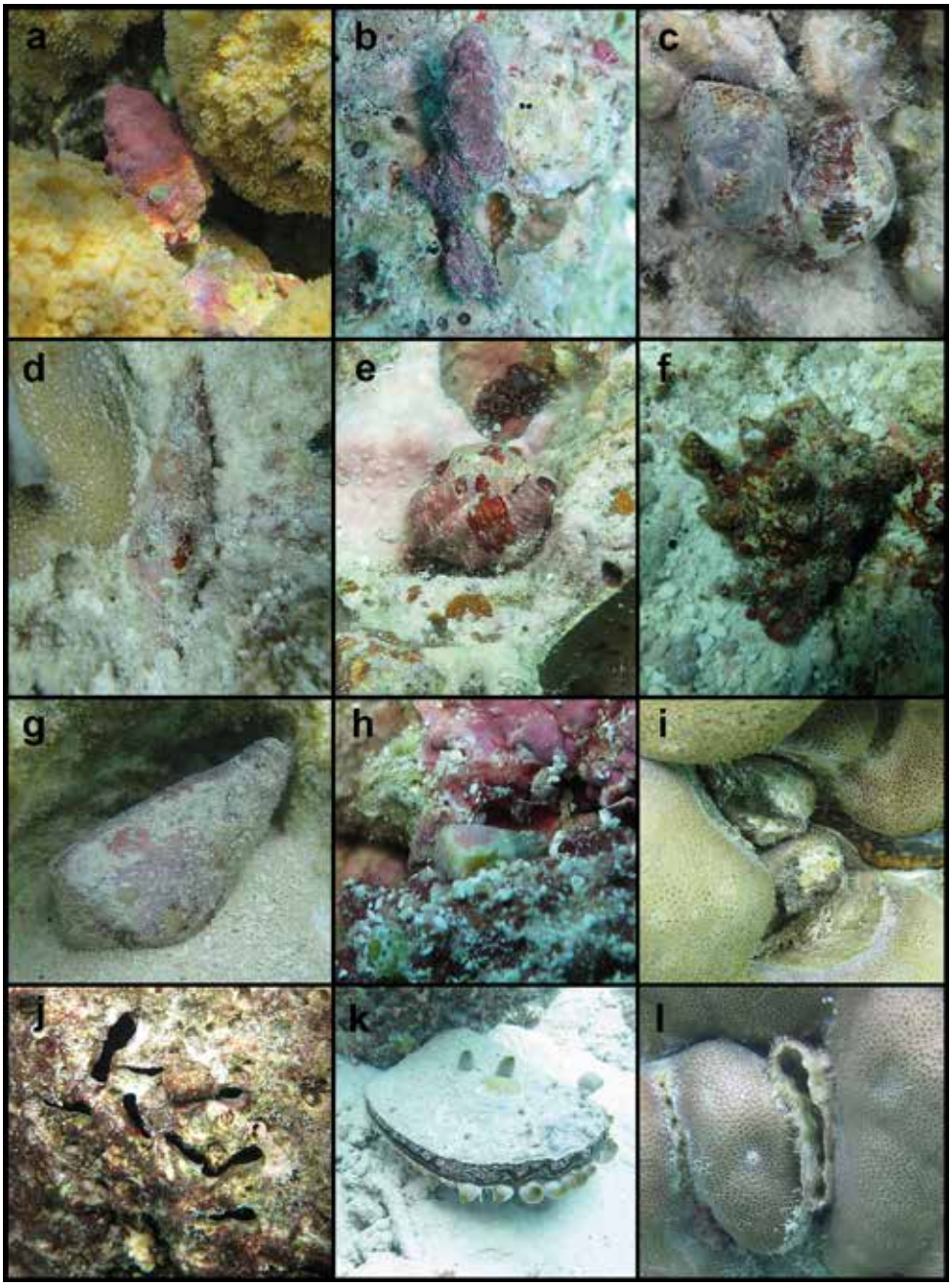


Fig. 12: a) *Drupella cornus* (RÖDING, 1798); b) *Pterynotus bipinnatus* (REEVE, 1845); c) *Latirolagena smaragdulus* (LINNAEUS, 1758); d) *Nodolatirus nodatus* (GMELIN, 1791); e) *Peristernia nassatula* (LAMARCK, 1822); f) *Vasum turbinellus* (LINNAEUS, 1758); g) *Conus* cf. *vexillum* GMELIN, 1791; h) *Conus mcbridei* LORENZ, 2005; i) *Barbatia foliata* (FORSSKÅL in NIEBUHR, 1775); j) *Lithophaga* sp.; k) *Atrina vexillum* (BORN, 1778); l) *Streptopinna saccata* (LINNAEUS, 1758).

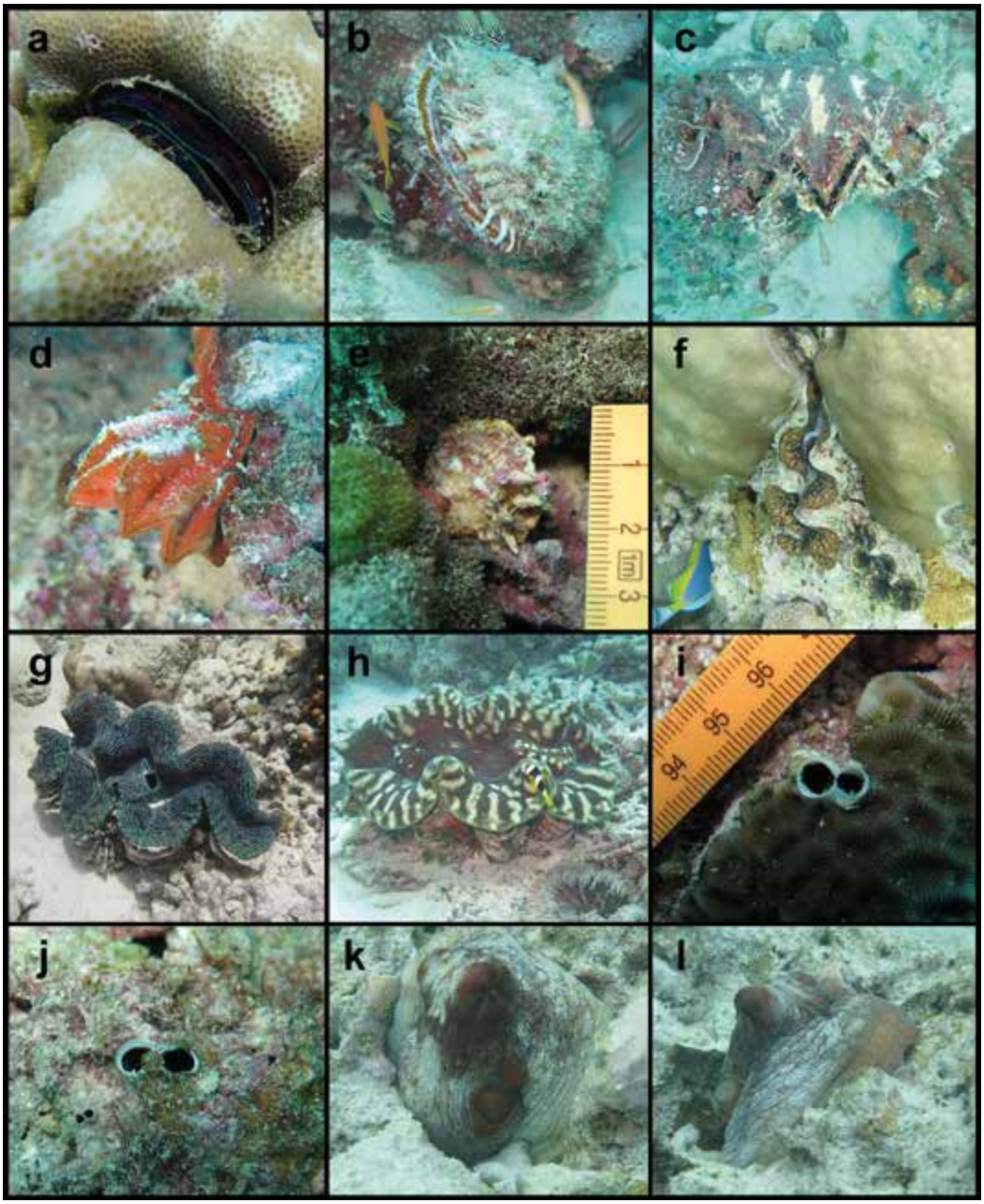


Fig. 13: a) *Pedum spondyloideum* (GMELIN, 1791); b) *Spondylus* sp.; c) *Hyotissa hyotis* (LINNAEUS, 1758); d) *Lopha cristagalli* (LINNAEUS, 1758); e) *Chama* sp. indet.; f) *Tridacna* sp. (probably *T. maxima* (RÖDING, 1798)); g & h) *Tridacna squamosa* LAMARCK, 1819; i & j) Gastrochaenidae sp.; k & l) *Octopus* sp.

765 and 550 species, Veneridae (including Petricolinae and Turtoniinae) and Tellinidae, respectively, also belong to the most diverse bivalve families in the world (Huber 2015).

We did not find any species of Polyplacophora and Scaphopoda among the macromolluscs collected during our field course. However, a single living specimen of *Cryptoplax* sp. Blainville, 1818 was found by participants of a subsequent student course and is not included here. The lack of chitons in our species list is probably largely a sampling artifact, reflecting the cryptic lifestyle of Polyplacophora (Dell'Angelo & al. 2010). In order to reduce impacts on the reef, we did not use destructive collecting methods such as turning boulders or extracting coral in search for molluscs. Currently, 19 species of Polyplacophora are known from the Maldives (Dell'Angelo & al. 2010). In contrast, we are aware of only a single scaphopod species, *Antalis longitrorsa* (Reeve, 1842), so far recorded from the Maldives (Robertson unpublished manuscript). Either the diversity of Scaphopoda in the Maldives is very low, or (larger) representatives are very rare or restricted to deeper water. Similarly, no scaphopods and only two species of Polyplacophora were recorded at Chagos Archipelago, another geographically isolated group of atolls in the Indian Ocean south of the Maldives (Sheppard 1984).

**Size distribution**

Large molluscs > 100 mm contributed only little to the total number of species in our inventory. The median shell size of molluscs in our study was 34 mm; only 4.8 % of the species exceeded 100 mm. This preponderance of small species is a typical finding of molluscan community studies. In a survey in New Caledonia, only 1.96 % of the species were in the largest three size classes, with sizes equal to or exceeding 89 mm (randomly selected adult specimens). McClanahan (2002) observed a similar pattern in the Florida Keys, where only five species with body sizes larger than 100 mm were found. In the northern Red Sea less than 6 % of all bivalve species were larger than 87.4 mm (Zuschin & Oliver 2005) and the vast majority of gastropod species was in the size range of a few millimeters to centimeters only (Zuschin & al. 2009, Janssen & al. 2011).

**Living individuals vs. dead shells**

Only 32.2 % of the species collected were represented by living specimens. Although we cannot be sure that the remaining species are still part of the extant mollusc community of Vavvaru, we included them in our inventory. Death assemblages are an invaluable source of biological information, e.g. on regional diversity, and especially when information on living assemblages is limited – typically the case for tropical settings (e.g. Bouchet & al. 2002, Zuschin & Oliver 2005, for review see Kidwell & Tomasovych 2013). For this reason, empty shells are routinely included in species lists, even in studies involving great sampling effort (Bouchet & al. 2002, Zuschin & Oliver 2005). Despite a major effort involving many different collecting techniques, empty shells represented a considerable proportion of the species found at Koumac, New Caledonia (Bouchet & al. 2002): more than 28 % of the 2738 species could not be found alive. The lack of living specimens can be explained by several, possibly interacting factors. These include strong seasonality of life cycles, sporadic occurrence, cryptic and/or difficult to sample habitats, specialized lifestyles, extreme rarity, transportation of shells by gravity, currents or hermit crabs from another location, or *post mortem* remains of locally extinct

species (Bouchet & al. 2002). The latter factor might be of particular relevance for the study site because shallow water coral reefs in the Maldives were affected by a major coral bleaching event in 1998 (Hameed 2002). This event probably also had an impact on the composition of the local mollusc communities. Mollusc shells, and thus also remains of locally extinct species, can remain well preserved for a long time when buried in sediments. Radiocarbon dating of shells from cave sediments in Okinawa revealed that shells can be preserved in very good condition for centuries (Kitamura & al. 2003 cited in Kano & Kase 2008). This might explain the finding of an empty shell of *Terebralia palustris* (Linnaeus, 1767), a mangrove-dwelling potamidid gastropod (Beesley & al. 1998), at the shore of Vavvaru. At the time of sampling, no mangroves or mud flats were present at Vavvaru. Thus, the shell might indicate the former presence of mangroves on the island. Alternatively, physical transport from an adjacent island by floating plant debris, birds or hermit crabs might have occurred.

**Trophic composition of the mollusc community of Vavvaru**

Considering all molluscs found, the most common trophic category was predatory carnivores, followed by suspension feeders. The dominance of predatory carnivores results from the high share of predatory gastropod species (53.9% of gastropods), a typical feature of coral reef gastropod communities (Taylor 1977, 1983). In Caribbean and east African reefs, between 64 and 72% of gastropod species were carnivorous (McClanahan 2002), and in reefs around Port Sudan, carnivorous neo- and mesogastropods were the most diverse trophic guild (Taylor & Reid 1984). Taylor (1978) found 50 species of predatory prosobranchs in Addu Atoll, southern Maldives, with Muricidae being the most speciose (18 species) and abundant. The mixed herbivorous omnivore/browsing carnivore category was the second most common among gastropods in our study (9.4%), although much less well represented than predatory carnivores. The former category includes all 17 species of Cypraeidae, one of the most speciose families in our species inventory, explaining its relatively high importance. Most bivalves were suspension feeders; families with other feeding modes were less common. Among the latter, surface deposit feeders, dominated by tellinids in terms of species richness, were most important. Tellinidae was the most speciose bivalve family in our survey and also had a high diversity at Koumac, with 51 species (Bouchet & al. 2002). These bivalves have a burrowing lifestyle and inhabit soft substrates (Beesley & al. 1998), which are very common in the lagoon of Vavvaru in the form of coral sand. Chemosymbiotic bivalves, such as Lucinidae, accounted for only about 5% of the bivalves found. Lucinids are often associated with soft bottoms with high organic input, including mangroves and seagrass beds (Frenkiel & al. 1996, Barnes & Hickman 1999, Glover & Taylor 2007, Lebata 2000) – all these habitats are not present at Vavvaru.

**Biogeography of the Maldivian malacofauna**

Most of the mollusc species we found have already been reported from the Maldives by other studies. Accordingly, the previous conclusions on the biogeography of the local molluscan assemblages can be regarded as valid also for Vavvaru. Most Maldivian molluscs are known to have a wide distribution in the tropical Indo-West Pacific, and only few species seem to be endemic to the Maldives (Smith 1903, Melvill 1909/1910, Kohn & Robertson 1966, Turner & al. 2007, Dell'Angelo & al. 2010). Due to a

seasonal change in direction of major surface currents in the Indian Ocean, long-lived veliger stages from Indonesia may arrive at the Maldives with the North Equatorial Current during summer, whereas a transport from the western Indian Ocean may occur in winter (TURNER & al. 2007). About 74 % of SMITH's (1903) species inventory is also known to occur in the West Pacific (including the China Sea, Philippines, Malay Archipelago, N Australia, New Guinea, and ranging as far east as the Solomon Islands). More than 85 % of the mollusc species reported from the Laccadives and Maldives by MELVILL (1909/1910) have also been recorded from Polynesia (including E New Guinea and NE Australia). Furthermore, a large proportion of Maldivian and Laccadivian molluscs is known to occur at islands in the western Indian Ocean: according to SMITH 1903, 47 % also occur at Mauritius, and 85% of MELVILL's (1909/1910) inventory was also found at Mauritius, Réunion, Rodriguez and Madagascar. The polyplacophoran and costellariid faunas of the Maldives were found to be most similar to those of the Seychelles (TURNER & al. 2007, DELL'ANGELO & al. 2010).

**New records for the Maldives and remarks on selected taxa**

Some of the species found in our survey represent new records for the Maldives. Among them is *Conus mcbridei* LORENZ, 2005, an only recently described Indo-Pacific species of Conidae. With sizes barely exceeding 1 cm, *Conus mcbridei* belongs to the smallest species of the family. Due to its small size, it had been mistaken for juvenile specimens of other Conidae or odd specimens of *C. sponsalis* HWASS in BRUGUIÈRE, 1792 in the past, explaining its late description (LORENZ 2005, MOOLENBEEK 2008). *C. mcbridei* has a wide distribution in the tropical Pacific and is known from the Philippines, the South China Sea (Sedimin Reef (03°24'N, 107°50'E) and Pulau Subi Besar), Borneo/Kalimantan (Maratua), Java (Karang Jong and Karimunjawa Island), W- and S-Sulawesi (Okona Point, Ujung Lumpatang and Tengga Tengga Reef off Makassar), Papua New Guinea (Kavieng, New Ireland), New Caledonia (Lifou), Hawaii (western Oahu) and the Society Islands (LORENZ 2005, MOOLENBEEK 2008, POPPE 2008, TRÖNDLÉ & BOUTET 2009). MOOLENBEEK (2008) published the first record for the Indian Ocean – specimens were found in sediment samples from Mauritius (Flic en Flac and Trou aux Biches). We found individuals at depths ranging from 5 to 15 m, shallower than the reported depth ranges of 15-48 m (LORENZ 2005), 20-30 m (MOOLENBEEK 2008) and 15-50 m (POPPE 2008). Our finding of *C. mcbridei* at Vavvaru represents the first record of this species from the northern Indian Ocean, extending its known range in the Indian Ocean almost three thousand kilometers to the north. The wide distribution of many species of Conidae may be explained by their ontogenetic development: the life cycle typically involves planktotrophic veliger larvae, which hatch from egg capsules (BEESLEY & al. 1998). The duration of the planktonic phase varies between species (BEESLEY & al. 1998), but the wide distribution of *C. mcbridei* suggests that it is among those characterized by long-lived veliger stages.

Another interesting finding was a shell of *Spondylus* LINNAEUS, 1758 which appears to be (closest to) *Spondylus gloriosus* DALL, BARTSCH & REHDER, 1938. It was found during a deep dive at the reef drop-off on the western shore of Vavvaru. *Spondylus gloriosus* has been described from off the south coast of Oahu, Hawaii (DALL & al. 1938). According to HUBER (2010), its distribution ranges from Hawaii to Galapagos. LAMPRELL (2006) synonymises *S. gloriosus* with *S. linguafelis* G. B. SOWERBY II, 1847 and reports it to

occur in the Indo-Pacific including Hawaii, NW Australia, the Solomon Islands and the Panamic province. The taxon *Spondylus gloriosus visayensis* Poppe & Tagaro, 2010 was recently described from the Philippines and lives in caves on the outer reef slopes in the Camotes Sea (Poppe 2011). Considering the wide distribution of many Indo-Pacific species, the finding of this or a related *Spondylus* species in the western Indian Ocean does not seem unlikely (P. Graham Oliver, National Museum Wales, pers. comm.). Due to the very limited taxonomic knowledge on spondylids, we did not attempt identification to species level and listed the single shell found as *S.* cf. *gloriosus* in Tab. 5.

We furthermore found a single dead specimen of the vetigastropod *Angaria* sp., inhabited by a hermit crab. Our specimen most closely resembles *Angaria delphinus* (Linnaeus, 1758), but due to its poor preservation we refrained from a species-level assignment. According to the monograph by Poppe & Goto (1993), the genus *Angaria* does not range further westwards than the western coast of southern India. This area is inhabited by *Angaria rugosa* (Kiener, 1838), whereas for *Angaria delphinus*, the Andaman Sea coast of Thailand is mentioned as the western distributional limit (Poppe & Goto 1993). Apart from our own finding of *Angaria*, a literature research revealed further records of the genus from the Maldives: *Angaria delphinus* was already reported by Robertson (unpublished manuscript) and by Baer (1989), the latter author using the synonym *Angaria distorta* (Linnaeus, 1758). Baer (1989) furthermore mentioned '*A. radiata* Röding 1798', but we were unable to unravel the identity of this taxon. Together, these findings confirm the presence of *Angaria* at the Maldives, even though we do not know whether any living specimens have been found so far. They further suggest that the geographical range of *A. delphinus* and the Angarioidea might be larger and range more westwards than previously assumed, as might be the case for several other molluscan taxa in the Indian Ocean.

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Table 5: List of mollusc species collected at Vavvaru. Taxa are listed in systematic order following BOUCHET & al. 2002. For each species, previous literature records, the maximum shell size of the largest specimen found and trophic category are given. Previous records were extracted from BAER 1989 (1), DELSAERDT 2011 (2), ROBERTSON (unpublished manuscript; 3), SMITH 1903 (4; only records from the Maldives) and SMYTHE & PHILLIPS 1972 (5). Trophic classification was based on information from BEESLEY & al. 1998 and TODD 2001 following the system of feeding types by TODD 2001; an additional trophic category – SS/symbiotic suspension feeders – was introduced to distinguish zooxanthellate species of *Tridacna* BRUGUIÈRE, 1797 from purely suspension-feeding bivalves. Living and/or dead specimens are indicated. Dead gastropods inhabited by hermit crabs are indicated. For each species the major habitats (B – beach; D – drop-off; F – reef flat; L – lagoon) and depth range of collection are given.

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Patellidae | *Scutellastra* cf. *chapmani* (TENISON-WOODS, 1876) | | 11 | HR | | + | | + | | | | 0 |
| Haliotidae | *Haliotis ovina* GMELIN, 1791 | 1, 3, 4, 5 | 47 | HR | | + | | + | | + | | 0-3 |
| Fissurellidae | *Diodora* sp. | | 17 | HR/CB | | + | | + | | | | 0 |
| Fissurellidae | *Emarginula* sp. | | 13 | HR/CB | | + | | + | | | | 0 |
| Trochidae | *Clanculus atropurpureus* (GOULD, 1849) | 1, 2, 3, 4 | 7 | HR | | + | | + | | | | 0 |
| Trochidae | *Stomatella auricula* LAMARCK, 1816 | 1, 2, 3, 4 | 9 | UN | | + | | + | | | | 0 |
| Trochidae | *Stomatia* cf. *irisata* DUFO, 1840 | | 7 | UN | | + | | + | | | | 0 |
| Trochidae | *Stomatia phymotis* HELBLING, 1779 | 2, 3 | 24 | UN | | + | | + | | | | 0 |
| Trochidae | *Tectus pyramis* (BORN, 1778) | 1, 2, 3 | 63 | HR | + | + | | + | | + | + | 0-7 |
| Trochidae | *Trochus* cf. *intextus* REEVE, 1848 | | 25 | HR | | + | | | | | + | 1 |
| Trochidae | *Trochus maculatus* LINNAEUS, 1758 | 1, 2, 3, 4, 5 | 48 | HR | + | + | + | + | | + | + | 0-3 |
| Turbinidae | *Astralium rhodostoma* (LAMARCK, 1822) | 2 | 40 | HR | + | + | | | + | | | 7-15 |
| Turbinidae | *Turbo argyrostomus* LINNAEUS, 1758 | 1, 2, 3, 4 | 56 | HR | | + | | | | + | + | 1-3 |
| Turbinidae | *Turbo petholatus* LINNAEUS, 1758 | 1, 2, 5 | 45 | HR | | + | | | | | + | 10 |
| Angariidae | *Angaria* sp. | 1 | 35 | HR? | | + | + | | | | | — |
| Neritidae | *Nerita* cf. *albicilla* LINNAEUS, 1758 | 1, 2, 3, 4, 5 | 24 | HR | | + | + | + | | | | 0 |
| Neritidae | *Nerita* cf. *polita* LINNAEUS, 1758 | 1, 2, 3, 4, 5 | 26 | HR | | + | + | + | | | + | 0 |
| Neritidae | *Nerita plicata* LINNAEUS, 1758 | 1, 2, 3, 4 | 20 | HR | | + | + | + | | | + | 0 |
| Modulidae | *Modulus tectum* (GMELIN, 1791) | 1, 2, 3, 4 | 18 | HR/HP | | + | + | + | | | | 0 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Cerithiidae | *Cerithium* cf. *rostratum* A. ADAMS in G. B. SOWERBY II, 1855 | 3, 4 | 18 | HM/HR | + | | | | | | | — |
| Cerithiidae | *Cerithium columna* SOWERBY I, 1834 | 1, 2, 3, 4 | 34 | HM/HR | | + | | + | | + | | 0-3 |
| Cerithiidae | *Cerithium echinatum* LAMARCK, 1822 | 1, 2, 3, 4, 5 | 42 | HM/HR | + | + | + | | | + | + | 1-20 |
| Cerithiidae | *Cerithium nodulosum* BRUGUIÈRE, 1792 | 1, 2, 3, 5 | 95 | HM/HR | + | + | | + | | + | + | 0-7 |
| Cerithiidae | *Rhinoclavis aspera* (LINNAEUS, 1758) | 1, 2, 3 | 36 | HM | | + | + | | | | + | 1-7 |
| Cerithiidae | *Rhinoclavis* cf. *fasciata* (BRUGUIÈRE, 1792) | 1, 2, 3, 4 | 40 | HM | | + | | + | | | | 0 |
| Cerithiidae | *Rhinoclavis sinensis* (GMELIN, 1791) | 1, 3, 4 | 29 | HM | | + | | + | | | | 0 |
| Potamididae | *Terebralia palustris* (LINNAEUS, 1767) | 1, 2, 3, 4 | 57 | HM | | + | | + | | | | 0 |
| Siliquariidae | *Tenagodus* sp. | | 27 | SU | | + | | + | | | | 0 |
| Vermetidae | *Ceraesignum maximum* (G. B. SOWERBY I, 1825) | 3 | | SU | + | | | | + | + | + | 1-20 |
| Vermetidae | *Petaloconchus* sp. | | | SU | + | | | | | | + | <1 |
| Vermetidae | *Thylacodes grandis* (GRAY, 1842) | | | SU | + | | | | + | | + | 2-20 |
| Strombidae | *Canarium mutabile* (SWAINSON, 1821) | 1, 2, 3, 4, 5 | 31 | HO | | + | | + | | | | 0 |
| Strombidae | *Conomurex* cf. *persicus* (SWAINSON, 1821) | | 60 | HO | + | + | + | | | | + | 1-7 |
| Strombidae | *Conomurex decorus* (RÖDING, 1798) | 1, 2, 3 | 50 | HO | + | | | | | + | | 5 |
| Strombidae | *Euprotomus* cf. *aurisdianae* (LINNAEUS, 1758) | 4 | | HO | | + | | + | | | | 0 |
| Strombidae | *Gibberulus gibberulus* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 46 | HO | + | + | | + | | + | + | 0-3 |
| Strombidae | *Harpago chiragra* (LINNAEUS, 1758) | 1, 2, 4, 5 | 212 | HO | + | | | | | + | + | 1-3 |
| Strombidae | *Lambis lambis* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 147 | HO | + | | | | | | + | 1 |
| Strombidae | *Lambis truncata* (LIGHTFOOT, 1786) | 1, 2, 5 | 322 | HO | + | + | + | | | | + | 1-8 |
| Strombidae | *Lentigo lentiginosus* (LINNAEUS, 1758) | 1, 2, 3, 4 | 78 | HO | + | | | | | | + | 1 |
| Strombidae | *Terestrombus terebellatus* (G. B. SOWERBY II, 1842) | 1, 2, 3 | 31 | HO | | + | | + | | | | 0 |
| Vanikoridae | *Vanikoro cancellata* (LAMARCK, 1822) | 1, 2, 3, 4 | 20 | HR | | + | | + | | + | | 0-3 |
| Hipponicidae | *Cheilea cicatricosa* (REEVE, 1858) | 2, 4 | 39 | HR/SU | | + | | + | | + | | 0-3 |
| Hipponicidae | *Cheilea tectumsinense* (LAMARCK, 1822) | 2 | 17 | HR/SU | | + | | | | | + | 8-10 |
| Hipponicidae | *Sabia conica* (SCHUMACHER, 1817) | 1, 2, 3 | 13 | HR/SU | + | + | | + | | + | | 0-3 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Hipponicidae | *Sabia* sp. | | 9 | HR/SU | | + | | + | | | | 0 |
| Cypraeidae | *Arestorides argus* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 60 | HO/CB | | + | | | | | + | 6-7 |
| Cypraeidae | *Cribrarula cribraria* (LINNAEUS, 1758) | 1, 2, 4 | 16 | HO/CB | | + | | | | + | + | 1-5 |
| Cypraeidae | *Cypraea tigris* LINNAEUS, 1758 | 1, 2, 3, 4, 5 | 91 | HO/CB | + | | | | | + | + | 1-10 |
| Cypraeidae | *Erosaria erosa* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 39 | HO/CB | | + | | + | | + | | 0-3 |
| Cypraeidae | *Erosaria helvola* (LINNAEUS, 1758) | 1, 2, 4, 5 | 18 | HO/CB | | + | | + | | | | 0 |
| Cypraeidae | *Erronea caurica* (LINNAEUS, 1758) | 1, 2, 3, 4 | 44 | HO/CB | | + | | + | | | | 0 |
| Cypraeidae | *Luria isabella* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 28 | HO/CB | | + | | + | | + | + | 0-3 |
| Cypraeidae | *Lyncina* cf. *carneola* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 44 | HO/CB | + | + | | + | | | + | 0-1 |
| Cypraeidae | *Lyncina lynx* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 38 | HO/CB | | + | | + | | + | | 0-3 |
| Cypraeidae | *Lyncina vitellus* (LINNAEUS, 1758) | 1, 4 | 49 | HO/CB | | + | | + | | | | 0 |
| Cypraeidae | *Mauritia histrio* (GMELIN, 1791) | 1, 2, 3, 5 | 51 | HO/CB | | + | | + | | | | 0 |
| Cypraeidae | *Monetaria caputserpentis* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 28 | HO/CB | + | + | | + | | + | | 0-3 |
| Cypraeidae | *Monetaria moneta* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 21 | HO/CB | | + | | + | | + | | 0-3 |
| Cypraeidae | *Nucleolaria nucleus* (LINNAEUS, 1758) | 1, 2, 3, 5 | 16 | HO/CB | | + | | | | + | | 1-3 |
| Cypraeidae | *Palmadusta asellus* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 12 | HO/CB | | + | | + | | + | + | 0-10 |
| Cypraeidae | *Palmadusta ziczac* (LINNAEUS, 1758) | 1, 4 | 11 | HO/CB | | + | | + | | | | 0 |
| Cypraeidae | *Talparia talpa* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 61 | HO/CB | + | + | | | | | + | 1 |
| Velutinidae | *Lamellaria* sp. | | 18 | CB | | + | | + | | | | 0 |
| Naticidae | *Mammilla melanostoma* (GMELIN, 1791) | 1, 2, 3, 4 | 21 | CP | | + | | + | | | + | 0-1 |
| Naticidae | *Mammilla simiae* (DESHAYES, 1838) | 1, 4 | 12 | CP | | + | | + | | | | 0 |
| Naticidae | *Natica* sp. | | 10 | CP | | + | | + | | | | 0 |
| Naticidae | *Polinices* cf. *flemingianus* (RÉCLUZ, 1844) | | 32 | CP | | + | | | | + | | 1-3 |
| Naticidae | *Polinices mammilla* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 29 | CP | | + | | | | + | + | 1-3 |
| Naticidae | *Polinices melanostomoides* (QUOY & GAIMARD, 1832) | | 31 | CP | | + | | | | | | — |
| Tonnidae | *Malea pomum* (LINNAEUS, 1758) | 1, 2, 3, 4 | 41 | CP | | + | + | + | | | | 0 |
| Tonnidae | *Tonna allium* (DILLWYN, 1817) | 1, 4 | 22 | CP | | + | | + | | | | 0 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Tonnidae | *Tonna perdix* (Linnaeus, 1758) | 1, 5 | 70 | CP | | + | | + | | | + | 0-1 |
| Cassidae | *Casmaria* cf. *ponderosa* (Gmelin, 1791) | 2, 5 | 37 | CP | | + | + | + | | | + | 0 |
| Cassidae | *Casmaria erinaceus* (Linnaeus, 1758) | 1, 2, 3, 5 | 42 | CP | | + | | | | + | | 1-3 |
| Cassidae | *Cassis cornuta* (Linnaeus, 1758) | 1, 2, 4, 5 | 270 | CP | + | + | | + | | | + | 0-8 |
| Bursidae | *Bursa* cf. *lamarckii* (Deshayes, 1853) | | 50 | CP | | + | | + | | | | 0 |
| Bursidae | *Bursa* cf. *rosa* (Perry, 1811) | 1, 3, 5 | 25 | CP | | + | + | + | | | | 0 |
| Bursidae | *Bursa granularis* (Röding, 1798) | 1, 2, 3, 4, 5 | 28 | CP | | + | + | + | | | | 0 |
| Bursidae | *Bursa rhodostoma* (G. B. Sowerby II, 1835) | 4 | 21 | CP | + | | | | | + | | 1-3 |
| Bursidae | *Bursa* sp. | | 24 | CP | | + | | | + | | | >10 |
| Bursidae | *Tutufa bubo* (Linnaeus, 1758) | 1, 4 | 180 | CP | + | + | + | | | | + | 1-15 |
| Ranellidae | *Cymatium hepaticum* (Röding, 1798) | 1, 2 | 34 | CP | | + | + | + | | | | 0 |
| Ranellidae | *Cymatium lotorium* (Linnaeus, 1758) | 5 | 104 | CP | + | | | | | + | | 7 |
| Ranellidae | *Cymatium mundum* (A. A. Gould, 1849) | 2 | 58 | CP | | + | + | + | | | | 0 |
| Ranellidae | *Cymatium nicobaricum* (Röding, 1798) | 1, 2, 3, 4, 5 | 44 | CP | | + | + | + | | | | 0 |
| Ranellidae | *Gutturnium muricinum* (Röding, 1798) | 2, 3, 4 | 32 | CP | | + | | + | | | | 0 |
| Ranellidae | *Monoplex aquatilis* (Reeve, 1844) | 2 | 49 | CP | + | + | + | + | + | | + | 0-15 |
| Ranellidae | *Turritriton* cf. *labiosus* (Wood, 1828) | 2 | 20 | CP | | + | + | + | | | | 0 |
| Personidae | *Distorsio anus* (Linnaeus, 1758) | 1, 2, 3, 4, 5 | 71 | CP | | + | | + | | | | 0 |
| Epitoniidae | *Epitonium* sp. 1 | | 11 | CB | | + | | + | | | | 0 |
| Epitoniidae | *Epitonium* sp. 2 | | 13 | CB | | + | | + | | | | 0 |
| Muricidae | *Chicoreus ramosus* (Linnaeus, 1758) | 1, 4 | 149 | CP | + | | | | | | + | 1 |
| Muricidae | *Chicoreus* sp. 1 | | 82 | CP | | | | | | | | — |
| Muricidae | *Chicoreus* sp. 2 | | 70 | CP | + | | | | | | | — |
| Muricidae | *Coralliophila erosa* (Röding, 1798) | 1, 2, 3, 4 | 37 | CB | | + | + | + | | + | + | 0-3 |
| Muricidae | *Coralliophila monodonta* (Blainville, 1832) | 1, 2, 3, 4 | 11 | CB | | + | | + | | | | 0 |
| Muricidae | *Coralliophila violacea* (Kiener, 1836) | 1, 2, 3, 4 | 36 | CB | + | | | | | + | + | 1-10 |
| Muricidae | *Drupa ricinus* (Linnaeus, 1758) | 1, 2, 3, 4, 5 | 27 | CP | + | + | + | + | | + | + | 0-3 |
| Muricidae | *Drupa rubusidaeus* Röding, 1798 | 1, 2, 3, 5 | 30 | CP | + | + | + | | | + | + | 1-3 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Muricidae | *Drupella cornus* (RÖDING, 1798) | 1, 2, 3, 4 | 36 | CB | + | | | | | | + | 1-15 |
| Muricidae | *Drupina lobata* (BLAINVILLE, 1832) | 1, 2, 3, 4 | 22 | CP | + | + | | | | | + | 1 |
| Muricidae | *Maculotriton serriale* (DESHAYES, 1834) | 1, 3, 4 | 11 | CP | | + | | + | | | | 0 |
| Muricidae | *Mancinella alouina* (RÖDING, 1798) | 1, 3 | 21 | CP | + | | | | | + | | 7 |
| Muricidae | *Mancinella armigera* LINK, 1807 | 1, 2, 3, 4 | 90 | CP | + | | | | | + | | 1-3 |
| Muricidae | *Mancinella echinulata* (LAMARCK, 1822) | | 49 | CP | + | + | + | | | + | + | 1-7 |
| Muricidae | *Menathais tuberosa* (RÖDING, 1798) | 1, 2, 3, 4 | 45 | CP | + | | | | | + | + | 1-3 |
| Muricidae | *Morula* cf. *aspera* (KIENER, 1836) | | 11 | CP | + | | | | | + | | 1-3 |
| Muricidae | *Morula* cf. *biconica* (BLAINVILLE, 1832) | 1, 2, 3, 4 | 23 | CP | + | + | | + | | | + | 0-1 |
| Muricidae | *Naquetia triqueter* (BORN, 1778) | 2, 5 | 48 | CP | + | | | | + | | | 14 |
| Muricidae | *Nassa francolina* (BRUGUIÈRE, 1789) | 1, 2, 3 | 50 | CP | | + | + | | | | | — |
| Muricidae | *Pterynotus bipinnatus* (REEVE, 1845) | | | CP | + | | | | | | + | 15 |
| Buccinidae | *Engina lineata* (REEVE, 1846) | 3 | 8 | CP | + | | | | | | + | 1 |
| Buccinidae | *Pisania ignea* (GMELIN, 1791) | 1, 2 | 28 | CP | | + | + | + | | | | 0 |
| Buccinidae | *Pollia fumosa* (DILLWYN, 1817) | 2 | 24 | CP | | + | | | + | | | >10 |
| Buccinidae | *Pollia incarnata* (DESHAYES in LABORDE & LINANT, 1834) | | 14 | CP | + | | | | | + | | 5 |
| Nassariidae | *Nassarius distortus* (A. ADAMS, 1852) | 1, 2, 3, 4 | 21 | CP | | + | | | | + | | 1-3 |
| Nassariidae | *Nassarius echinatus* (A. ADAMS, 1852) | 1, 2, 4 | 16 | CP | | + | + | | | + | + | 1-7 |
| Nassariidae | *Nassarius graniferus* (KIENER, 1834) | 1, 2, 3, 4 | 18 | CP | | + | | | | | + | 20 |
| Nassariidae | *Nassarius papillosus* (LINNAEUS, 1758) | 1 | 43 | CP | | + | | + | | | | 0 |
| Fasciolariidae | *Latirolagena smaragdulus* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 42 | CP | + | | | | | + | + | 1-3 |
| Fasciolariidae | *Latirus gibbulus* (GMELIN, 1791) | 1, 2, 3 | 72 | CP | + | | | | | + | | 7 |
| Fasciolariidae | *Nodolatirus nodatus* (GMELIN, 1791) | 2, 3 | 47 | CP | + | + | | | | + | + | 1-7 |
| Fasciolariidae | *Peristernia nassatula* (LAMARCK, 1822) | 1, 2, 3, 4 | 29 | CP | + | + | + | | | + | | 1-5 |
| Fasciolariidae | *Turrilatirus craticulatus* (LINNAEUS, 1758) | 4 | | CP | | + | + | | | + | | 1-3 |
| Fasciolariidae | *Turrilatirus turritus* (GMELIN, 1791) | 1, 2 | 33 | CP | + | | | | | + | | 7 |
| Colubrariidae | *Colubraria muricata* (LIGHTFOOT, 1768) | 2 | 90 | CB | + | | | | | | + | 22 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Columbellidae | *Euplica turturina* (Lamarck, 1822) | 1, 2, 3, 4 | 12 | HO | + | | | | | | + | 10-15 |
| Columbellidae | *Graphicomassa albina* (Kiener, 1841) | | 13 | CP | | + | + | | | + | | 1-3 |
| Turbinellidae | *Vasum ceramicum* (Linnaeus, 1758) | 1, 2, 3, 5 | 89 | CP | + | | | | | | + | 1 |
| Turbinellidae | *Vasum turbinellus* (Linnaeus, 1758) | 1, 2, 3, 4, 5 | 47 | CP | + | | | | | + | + | 2-10 |
| Harpidae | *Harpa amouretta* Röding, 1798 | 1, 2, 3, 4, 5 | 36 | CP | | + | + | + | | + | + | 0-3 |
| Harpidae | *Harpa major* Röding, 1798 | 1, 5 | 56 | CP | | + | + | + | | | | 0 |
| Costellariidae | Costellariidae sp. | | | CP/CB | | | | | | | + | ca. 1 |
| Costellariidae | *Vexillum exasperatum* (Gmelin, 1791) | 1, 2, 3, 4 | 20 | CP/CB | + | + | | | | + | + | 1-15 |
| Mitridae | *Domiporta granatina* (Lamarck, 1811) | 1, 2, 3 | 26 | CP | + | + | | | | + | + | 1-3 |
| Mitridae | *Mitra aurora floridula* G. B. Sowerby II, 1874 | | 15 | CP | | + | | | | + | | 1-3 |
| Mitridae | *Mitra coffea* Schubert & Wagner, 1829 | 1, 2 | 47 | CP | | + | | | | + | | 1-3 |
| Mitridae | *Mitra imperialis* Röding, 1798 | 1, 2, 3, 4, 5 | 43 | CP | | + | | + | | | | 0 |
| Mitridae | *Mitra mitra* (Linnaeus, 1758) | 1, 2, 3, 4, 5 | 44 | CP | | + | + | | | | + | 1-2 |
| Mitridae | *Mitra vexillum* Reeve, 1844 | 1, 2 | 24 | CP | + | | | | | + | | 5 |
| Mitridae | *Neocancilla papilio* (Link, 1807) | 3, 4 | 28 | CP | | + | | + | | | | 0 |
| Olividae | *Oliva annulata* Gmelin, 1791 | 1, 3 | 37 | CP | | + | | | | + | | 1-3 |
| Olividae | *Oliva* cf. *ponderosa* P. L. Duclos, 1840 | 1, 2, 4 | 46 | CP | + | + | | + | | | + | 0-0.5 |
| Turridae | *Lophiotoma* sp.1 | | 53 | CP | | + | + | + | | + | | 0-3 |
| Turridae | *Lophiotoma* sp. 2 | | 34 | CP | | + | | + | | | | 0 |
| Conidae | *Conus arenatus* Hwass in Bruguière, 1792 | 1, 2, 3, 4, 5 | 33 | CP | | | | | | | | 0-3 |
| Conidae | *Conus bandanus* Hwass in Bruguière, 1792 | 1, 2, 3 | 60 | CP | + | + | | | | + | + | 1 |
| Conidae | *Conus* cf. *canonicus* Hwass in Bruguière, 1792 | 1, 2, 3 | 40 | CP | | + | | + | | | | 0 |
| Conidae | *Conus* cf. *capitaneus* Linnaeus, 1758 | 1, 2 | | CP | | + | | | + | | | >10 |
| Conidae | *Conus* cf. *miles* Linnaeus, 1758 | 1, 2, 3, 4, 5 | 26 | CP | + | + | + | | | + | | 5 |
| Conidae | *Conus* cf. *musicus* Hwass in Bruguière, 1792 | 1, 3 | 16 | CP | + | | | | | + | + | 1-3 |
| Conidae | *Conus* cf. *vexillum* Gmelin, 1791 | 1, 2, 3 | 93 | CP | + | | | | | | + | 1 |
| Conidae | *Conus* cf. *violaceus* Gmelin, 1791 | 1, 2, 3, 4 | 43 | CP | | + | | | | | + | 1 |
| Conidae | *Conus ebraeus* Linnaeus, 1758 | 1, 2, 3, 4, 5 | 41 | CP | + | + | | | | + | + | 1-3 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Conidae | *Conus flavidus* LAMARCK, 1810 | 1, 2, 5 | 45 | CP | + | | | | | + | | 1-7 |
| Conidae | *Conus geographus* LINNAEUS, 1758 | 1, 3, 5 | 81 | CP | | + | + | + | | | | 0 |
| Conidae | *Conus imperialis* LINNAEUS, 1758 | 1 | | CP | | + | | | | + | | 1-3 |
| Conidae | *Conus lividus* HWASS in BRUGUIÈRE, 1792 | 1, 2, 3, 4, 5 | 29 | CP | | + | | | | + | | 1-3 |
| Conidae | *Conus mcbridei* LORENZ, 2005 | | 11 | CP | + | | | | + | + | + | 5-15 |
| Conidae | *Conus mustelinus* HWASS in BRUGUIÈRE, 1792 | 1, 2, 3 | | CP | + | | | | | | + | 15-20 |
| Conidae | *Conus pennaceus* BORN, 1778 | 1, 2, 3, 4 | 49 | CP | + | | | | | | + | 1-2 |
| Conidae | *Conus striatus* LINNAEUS, 1758 | 1 | 58 | CP | | + | | | | + | | 1-3 |
| Conidae | *Conus tessulatus* BORN, 1778 | 1, 2, 3, 4, 5 | 23 | CP | | + | | | | | + | 20 |
| Conidae | *Conus virgo* LINNAEUS, 1758 | 1, 2, 3 | 64 | CP | + | | | | | | + | 1 |
| Conidae | *Conus zonatus* BRUGUIÈRE, 1792 | 1, 2, 3, 4 | 40 | CP | + | | | | | + | | 7 |
| Terebridae | *Myurella affinis* (GRAY, 1834) | 1, 2, 3, 4 | 40 | CP | | + | + | + | | | + | 0-7 |
| Terebridae | *Oxymeris crenulata* (LINNAEUS, 1758) | 1, 2, 3, 5 | 74 | CP | | + | + | | | + | + | 1-3 |
| Terebridae | *Oxymeris maculata* (LINNAEUS, 1758) | 1, 2, 3, 4, 5 | 93 | CP | + | + | + | | | + | + | 1-3 |
| Terebridae | *Terebra* cf. *consors* HINDS, 1844 | | 51 | CP | | + | + | | | | + | — |
| Terebridae | *Terebra subulata* (LINNAEUS, 1767) | 1, 2, 3, 4, 5 | 76 | CP | | + | + | + | | | + | 0-1 |
| Architectonicidae | *Psilaxis radiatus* (RÖDING, 1798) | 1, 2, 4 | 20 | CB | | + | | + | | | | 0 |
| Pyramidellidae | *Otopleura nodicincta* (A. ADAMS, 1854) | 1, 2, 4 | 19 | CB | | + | | + | | | | 0 |
| Pyramidellidae | *Pyramidella* sp. | | 18 | CB | | + | | | | + | | 1-3 |
| Bullidae | *Bulla ampulla* LINNAEUS, 1758 | 1, 2, 3, 4, 5 | 26 | HP | | + | | + | | + | + | 0-3 |
| Haminoeidae | *Atys* sp. 1 | | 15 | HP | | + | | | | | + | 1 |
| Haminoeidae | *Atys* sp. 2 | | 11 | HP | | + | | | | | + | 20 |
| Umbraculidae | *Umbraculum umbraculum* (LIGHTFOOT, 1786) | | 56 | CB | | + | | + | | | | 0 |
| Siphonariidae | *Siphonaria* sp. | | 12 | HR | | + | | + | | | | 0 |
| Ellobiidae | *Melampus* cf. *flavus* (GMELIN, 1791) | | 7 | HM | | + | | + | | | | 0 |
| Arcidae | *Acar* sp. | | 24 | SU | | + | | + | | | | 0 |
| Arcidae | *Anadara antiquata* (LINNAEUS, 1758) | 2, 3, 4 | 70 | SU | | + | | + | | + | | 0-3 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Arcidae | *Anadara* cf. *craticulata* (NYST, 1848) | 4 | 35 | SU | | + | | + | | | + | 0-20 |
| Arcidae | *Anadara uropigimelana* (BORY DE SAINT-VINCENT, 1827) | 2, 3, 4 | 49 | SU | + | | | | | | + | 1 |
| Arcidae | *Arca patriarchalis* RÖDING, 1798 | 3, 4 | 24 | SU | | + | | + | | | + | 0-1 |
| Arcidae | *Barbatia foliata* (FORSSKÅL in NIEBUHR, 1775) | 3, 4 | 80 | SU | + | + | | + | + | + | + | 0-16 |
| Arcidae | *Barbatia lacerata* (BRUGUIÈRE, 1789) | 2, 4 | 44 | SU | | + | | | + | | + | >15; 20-22 |
| Arcidae | *Calloarca* cf. *tenella* (REEVE, 1844) | 3, 4 | 26 | SU | | + | | + | | | | 0 |
| Mytilidae | *Botula* sp. | | 21 | SU | | + | | + | | | | 0 |
| Mytilidae | *Lithophaga malaccana* (REEVE, 1857) | 3, 4 | 18 | SU | + | | | | | | + | 1 |
| Mytilidae | *Modiolus auriculatus* (KRAUSS, 1848) | 4 | 29 | SU | | + | | + | | | | 0 |
| Mytilidae | *Septifer* sp. | | 24 | SU | | + | | + | | | | 0 |
| Pinnidae | *Atrina vexillum* (BORN, 1778) | 2, 4 | 290 | SU | + | | | | | | + | ca. 5-22 |
| Pinnidae | *Pinna* cf. *muricata* LINNAEUS, 1758 | 3 | 38 | SU | | + | | + | | | | 0 |
| Pinnidae | *Streptopinna saccata* (LINNAEUS, 1758) | 3, 4 | | SU | + | | | | | | + | — |
| Pteriidae | *Pinctada* cf. *margaritifera* (LINNAEUS, 1758) | 5 | 34 | SU | | + | | + | | | | 0 |
| Pteriidae | *Pteria* cf. *penguin* (RÖDING, 1798) | 5 | | SU | + | | | | + | | | ca. 15 |
| Pectinidae | *Bractechlamys nodulifera* (SOWERBY II, 1842) | 4 | 27 | SU | | + | | + | | | | 0 |
| Pectinidae | *Excellichlamys spectabilis* (REEVE, 1853) | 3 | 21 | SU | | + | | | | + | | 7 |
| Pectinidae | *Gloripallium pallium* (LINNAEUS, 1758) | 2 | 59 | SU | | + | | | | + | + | 1-5 |
| Pectinidae | *Laevichlamys* cf. *cuneata* (REEVE, 1853) | 2, 3, 4 | 21 | SU | | + | | + | | | | 0 |
| Pectinidae | *Laevichlamys* cf. *rubromaculata* (SOWERBY II, 1842) | | 28 | SU | | + | | + | | | | 0 |
| Pectinidae | *Pedum spondyloideum* (GMELIN, 1791) | 3 | 50 | SU | + | + | | | | + | + | 1-5 |
| Plicatulidae | *Plicatula* cf. *plicata* (LINNAEUS, 1767) | 2, 3 | 33 | SU | | + | | + | + | + | | 0-20 |
| Spondylidae | *Spondylus* cf. *gloriosus* DALL, BARTSCH & REHDER, 1938 | | 63 | SU | | + | | | + | | | 32 |
| Spondylidae | *Spondylus nicobaricus* SCHREIBERS, 1793 | 2 | 62 | SU | | + | | + | | | + | 0-1 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Spondylidae | *Spondylus* sp. | | 150 | SU | + | | | | + | | + | 15-21 |
| Anomiidae | *Anomia* sp. | | 25 | SU | | + | | + | | | | 0 |
| Limidae | *Lima lima* (LINNAEUS, 1758) | 3,4 | 54 | SU | | + | | | + | | + | >10-15 |
| Limidae | *Limaria* cf. *fragilis* (GMELIN, 1791) | 3, 4 | 22 | SU | | + | | + | | | | 0 |
| Gryphaeidae | *Hyotissa hyotis* (LINNAEUS, 1758) | 3 | 150 | SU | + | | | | | | + | 1-22 |
| Ostreidae | *Alectryonella* sp. | | 31 | SU | | + | | + | | | | 0 |
| Ostreidae | *Lopha cristagalli* (LINNAEUS, 1758) | | 40 | SU | + | | | | | | + | 15 |
| Ostreidae | Ostreidae indet. | | 39 | SU | | + | | + | | + | + | 0-3 |
| Lucinidae | *Anodontia edentula* (LINNAEUS, 1758) | 3, 4 | 12 | DC | | + | | + | | | | 0 |
| Lucinidae | *Codakia punctata* (LINNAEUS, 1758) | 2, 3, 4, 5 | 66 | DC | + | + | | + | | + | + | 0-3 |
| Lucinidae | *Ctena divergens* (PHILIPPI, 1850) | 2, 3, 4 | 13 | DC | | + | | + | | | | 0 |
| Lucinidae | *Divaricella* sp. | | 29 | DC | | + | | + | | + | + | 0-20 |
| Chamidae | *Chama asperella* LAMARCK, 1819 | 2, 3, 4 | 27 | SU | | + | | + | | + | | 0-3 |
| Chamidae | *Chama lazarus* LINNAEUS, 1758 | 3 | 72 | SU | | + | | + | | + | | 0-3 |
| Chamidae | *Chama pacifica* BRODERIP, 1835 | 2 | 73 | SU | | + | | + | | + | | 0-3 |
| Carditidae | *Cardita variegata* BRUGUIÈRE, 1792 | 2, 3, 4 | 38 | SU | | + | | + | | + | | 0-3 |
| Cardiidae | *Acrosterigma biradiatum* (BRUGUIÈRE, 1789) | 3, 4 | 25 | SU | | + | | + | | | + | 0 |
| Cardiidae | *Acrosterigma simplex* (SPENGLER, 1799) | 2, 4 | 22 | SU | | + | | + | | | | 0 |
| Cardiidae | *Acrosterigma* sp. | | 26 | SU | | + | | + | | | | 0 |
| Cardiidae | *Fragum fragum* (LINNAEUS, 1758) | 2, 3 | 15 | SU | | + | | + | | | + | 0-1 |
| Cardiidae | *Lyrocardium lyratum* (G. B. SOWERBY II, 1840) | 3 | 27 | SU | | + | | | | | + | 20 |
| Cardiidae | *Tridacna maxima* (RÖDING, 1798) | 2, 3, 4 | 110 | SS | + | + | | | | + | + | — |
| Cardiidae | *Tridacna squamosa* LAMARCK, 1819 | 2, 3, 5 | 450 | SS | + | + | | | | | + | — |
| Cardiidae | *Vasticardium luteomarginatum* (VOSKUIL & ONVERWAGT, 1991) | 2 | 78 | SU | | + | | + | | | + | 0-1 |
| Mactridae | *Mactra achatina* HOLTEN, 1802 | | 25 | SU | | + | | | | + | | 1-3 |
| Mesodesmatidae | *Atactodea striata* (GMELIN, 1791) | 2, 3, 4 | 22 | SU | | + | | + | | | | 0 |

| family | species | previous records | max. size [mm] | trophic category | living | dead | hermit crab inhabited | habitat | | | | depth range [m] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | B | D | F | L | |
| Tellinidae | *Loxoglypta rhomboides* (Quoy & Gaimard, 1835) | | 15 | DS | | + | | + | | | | 0 |
| Tellinidae | *Loxoglypta secunda* (Bertin, 1878) | | 20 | DS | | + | | | | + | | 1-3 |
| Tellinidae | *Loxoglypta* sp. | | 17 | DS | | + | | + | | | | 0 |
| Tellinidae | *Tellina clathrata* Deshayes, 1835 | | 17 | DS | | + | | | | + | | 1-3 |
| Tellinidae | *Tellina gargadia* Linnaeus, 1758 | 3 | 25 | DS | | + | | | | + | + | 1-20 |
| Tellinidae | *Tellina perna* Spengler, 1798 | 3 | 50 | DS | | + | | + | | | + | 0-20 |
| Tellinidae | *Tellina scobinata* Linnaeus, 1758 | 3, 4 | 78 | DS | | + | | | | + | | 1-3 |
| Tellinidae | *Tellina* sp. 1 | | 18 | DS | | + | | + | | | | 0 |
| Tellinidae | *Tellina* sp. 2 | | 20 | DS | | + | | | | | + | 1 |
| Tellinidae | *Tellina* sp. 3 | | 35 | DS | | + | | + | | | | 0 |
| Tellinidae | *Tellina* sp. 4 | | 13 | DS | | + | | + | | | | 0 |
| Psammobiidae | *Asaphis deflorata* (Linnaeus, 1758) | 2, 3, 4, 5 | 72 | DS | | + | | + | | | | 0 |
| Psammobiidae | *Gari maculosa* (Lamarck, 1818) | 3 | 42 | DS | | + | | + | | + | | 0-3 |
| Semelidae | *Leptomya rostrata* (H. Adams, 1868) | | 36 | DS | | + | | + | | | | 0 |
| Semelidae | *Semele lamellosa* (Reeve, 1853) | | 31 | DS | | + | | | | | + | 14 |
| Trapezidae | *Trapezium oblongum* Linnaeus, 1758 | 3, 4 | 62 | SU? | | + | | | | | + | — |
| Veneridae | *Callista erycina* (Linnaeus, 1758) | | 39 | SU | | + | | | | | + | 20 |
| Veneridae | *Globivenus toreuma* (Gould, 1850) | 3, 4 | 31 | SU | | + | | + | | + | | 0-3 |
| Veneridae | *Lioconcha* cf. *castrensis* (Linnaeus, 1758) | | 41 | SU | | + | | + | | + | + | 0-3 |
| Veneridae | *Periglypta crispata* (Deshayes, 1853) | | 68 | SU | | + | | + | + | + | + | 0-15 |
| Veneridae | *Pitar* sp. | | 43 | SU | | + | | + | | | | 0 |
| Veneridae | *Timoclea marica* (Linnaeus, 1758) | 2, 3, 4 | 21 | SU | | + | | + | | | + | 0-1 |
| Gastrochaenidae | Gastrochaenidae sp. | | | SU | + | | | | | + | + | ca. 20-22 |
| Sepiidae | *Sepia* sp. | | | CP | | + | | + | | | | 0 |
| Spirulidae | *Spirula spirula* (Linnaeus, 1758) | 3 | 26 | CP | | + | | + | | | | 0 |
| Octopodidae | *Octopus* sp. | | | CP | + | | | | | + | + | — |

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