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RESEARCH ARTICLE

FIRST RECORD OF EIGHT BRACHYURAN CRABS' SPECIES (CRUSTACEA-DECAPODA) IN SOCOTRA ARCHIPELAGO IN THE INDIAN OCEAN-YEMEN

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Abstract

Yemen has a number of islands on the Red Sea, including Kamaran, Uqban, Hanish Archipelago Islands, Mayun (older name: Perim), and many islands at the Gulf of Aden, in the Indian Ocean, this also includes the Socotra Archipelago located 240 km from the east of the Horn of Africa and 380 km from Yemen. Socotra Island has a variety of habitats including sandy shores, rocky shores, mud flats, sponge areas, coral reefs, and freshwaters. This study aims to record the brachyuran crab's species in different habitats in Socotra Archipelago. The specimens of the brachyuran crabs collected by hand, hand nets, and snorkeling up to 3-meter depth. The specimens were collected from 6 sites in Socotra Islands during separate periods time from 1984 to 2000, these specimens were kept in Rostock University and Zoologische Staatssammlung München (ZSM)-Germany. In this present study 32 brachyuran crabs' species were recorded belonging to 11 superfamilies, 14 families, and 29 genera. Eight of these species represent the first records in Socotra Islands. The dominant brachyuran crab families in this region were Xanthidae, 35% with 11 species recorded, followed by Grapsidae, 19% with 6 species.

Keywords: Different habitats, Brachyuran crabs, Socotra Archipelago, Indian Ocean.

1. Introduction

The Republic of Yemen situated on the southern tip of the Arabian Peninsula covers 531000 square kilometers, it shares 1458 km of borderlines with Saudi Arabia and 288 km with Oman [1, 2].

The Yemeni coastline covers 2350 kilometers which has high tourist and economical potentials. The living marine resources are diverse, rich and have high economic value [3]. The coast along the Gulf of Aden with 1690 km includes both 1200 km of mainland coast and 490 km in the Socotra Archipelago [4].

Yemen has a number of islands on the Red Sea, including Kamaran, Uqban, Hanish Archipelago Islands, Mayun (older name: Perim), and many islands at the Gulf of Aden (17 islands in Aden city and four islands in Bir Ali and others). In the Indian Ocean, this also includes the Socotra Archipelago located 240 km from the east of the Horn of Africa and 380 km from Yemen. Socotra Archipelago has four islands. The largest island, called Socotra (130 km long and 40 km wide), and three smaller islands of Abd al-Kuri, Samhah and Darsa [5, 6, 7, 8]. Socotra Islands have high diversity and endemism of significance at the international level. The island has more than 850 species of plants of which 30% are endemic and 8 species have been listed as endangered species by the International Union for Conservation of Nature (IUCN). 120 bird species have been recorded in the island of which 30 species breed on the island and 7 bird species are endemic [3]. On this basis Socotra Islands were designated a UNESCO World Heritage Site in 2008 [7]. Among species with high marine biodiversity in Socotra Islands are crustaceans, especially brachyuran crabs. Scientists have conducted many studies in this field for a long time. The early study first mentioning a freshwater crab from Socotra was by Hilgendorf (in: Taschenberg, 1883), who described *Telphusa socotrensis* from material collected in 1881 by E. Riebeck and G. Schweinfurth. According to Pocock (1903), however, B. Balfour and A. Scott, carrying out zoological and botanical studies on the island in 1880, were actually the first collectors to bring Socotran freshwater crabs to Europe [9].

The last study of coastal and marine habitats in Socotra Island was the most extensive one by [10] covering 185 sites and recording 77 brachyuran crab's species. There are some scattered studies that recorded some brachyuran crab species in Socotra Islands. Among these [11] recorded 29 brachyuran crab species, [12] and [13] recorded 3 species from the genus Ocypode. [14] recorded 23 brachyuran crab species. [15] recorded 2 species from Trapezioidea. [9] recorded a new species, *Socotrapotamon nojidensis*, in addition [16] recorded a new genus and new species which is, *Socotra pseudocardiosoma* (Cumberlidge & Wranik, 2002) furthermore, Potamidae and [17] recorded 78 brachyuran crabs' species in Socotra Archipelago. From the above, it is obvious that Socotra Archipelago needs further research. Therefore, the main objectives of this study as follows.

- Extension of knowledge on brachyuran crab species that exist in Socotra Islands and creation of a first data base in this field and provision of an overview on brachyuran crabs from recorded during previous studies.
- Provide knowledge on the environments appropriate for the presence of these brachyuran crabs in the different marine habitats.

2. Experimental Section

2.1 *Materials and methods*

2.1.1 Samples

In the present study, 105 brachyuran crab specimens were examined. The specimens were collected from 6 sites (Fig. 1 shows the locations on a map of Socotra Islands. See also table 1 which provides the names of the sites, the coordinates and habitat descriptions of these) in Socotra Islands at the Indian Ocean (101 specimens collected by Wolfgang Wranik from Rostock University-Germany (RUWW), and 4 specimens collected by Michael Apel (SMF) during separate periods time from 1984 to 2000. These samples were collected from different habitats such as sandy shores, rocky shores, mud flats, sponge areas, coral reefs and fresh waters.

2.1.2 Methods

One hundred and five specimens of brachyuran crabs were examined which had been collected by hand and hand nets and snorkelling up to 3 meter depth. All the specimens were kept in Rostock University and Zoologische Staatssammlung München, Germany. All the specimens were preserved in 70% Ethanol and labeled in plastic containers with parameters such as location, date of collection and scientific name. Geographical coordinates were recorded with a hand-held Global Positioning System (GPS).

2.2 *Specimen identification*

Two methods were used in the present study to identify brachyuran crab species:

2.2.1 Morphological characteristics

Taxonomic characters of carapace, chelipeds, walking legs, pleon segments and eyestalks.

2.2.2 Morphological characteristics of the gonopods

Male gonopods were examined. These gonopods samples (G1 & G2) were kept in 70% ethanol solution in small plastic jars.
The identification of collected crabs depended on several references such as: [18] for Majidae; [19] for Xanthoidea (Xanthidae, Eriphiidae, Menippidae, Oziidae) and Trapeziidae; [20] Crabs of Pakistan (Xanthidae, Goneplacidae, Pinnotheridae, Ocypodidae, Grapsidae); [21] for Portunidae; [13] for Ocypode; [22] Atlas Crabs of the Persian Gulf, [23] Marine Decapod Crustacea of Southern Australia, A Guide to Identification and [24] for the general classification in this study.

3. The Results

In the present study, 105 specimens of brachyuran crabs were examined. Of these, 68 were females, 33 males, 4 juveniles. Their analyses revealed 32 species belonging to 29 genera, 14 families related to 11 superfamilies recorded in Socotra Island sites 1-6 (see table 2). Eight of these species considered the first records in Socotra Islands. Fig. 2 shows number of species, genera and families in all the superfamilies in Socotra islands.

Table 1: Names of the six sites on Socotra Archipelago, coordinates and description the habitats in these sites:

No	Name of site	Coordinates	Habitats	Description
1	Dilicia	12°41.488 N 54° 06.576 E	Rock.	Rocky shore.
2	Hadibo	12°39.148 N 54°01.518 E	Sand with rock; rock; mud flat; subtidal rock, corals	Sandy rocky shore with gravel and pebble, sublittoral mixed coral.
3	Qualansya	12°41.569N 53°29.240 E	Sand; rock; sand, rock; subtidal rock, corals.	Sandy rocky shore.
4	Homhil	12°33.594 N 54°16.558 E	Fresh water.	Valley in the highlands of Socotra Island has fresh water.
5	Abd al-Kuri	12°12.014 N 52°15.503 E	Sand with rock; mud, rock.	Island has mixed shallow rocks and sand.
6	Samha	12°10.400 N 53°01.312 E	Sand; rock.	Island has sandy rocky shore.

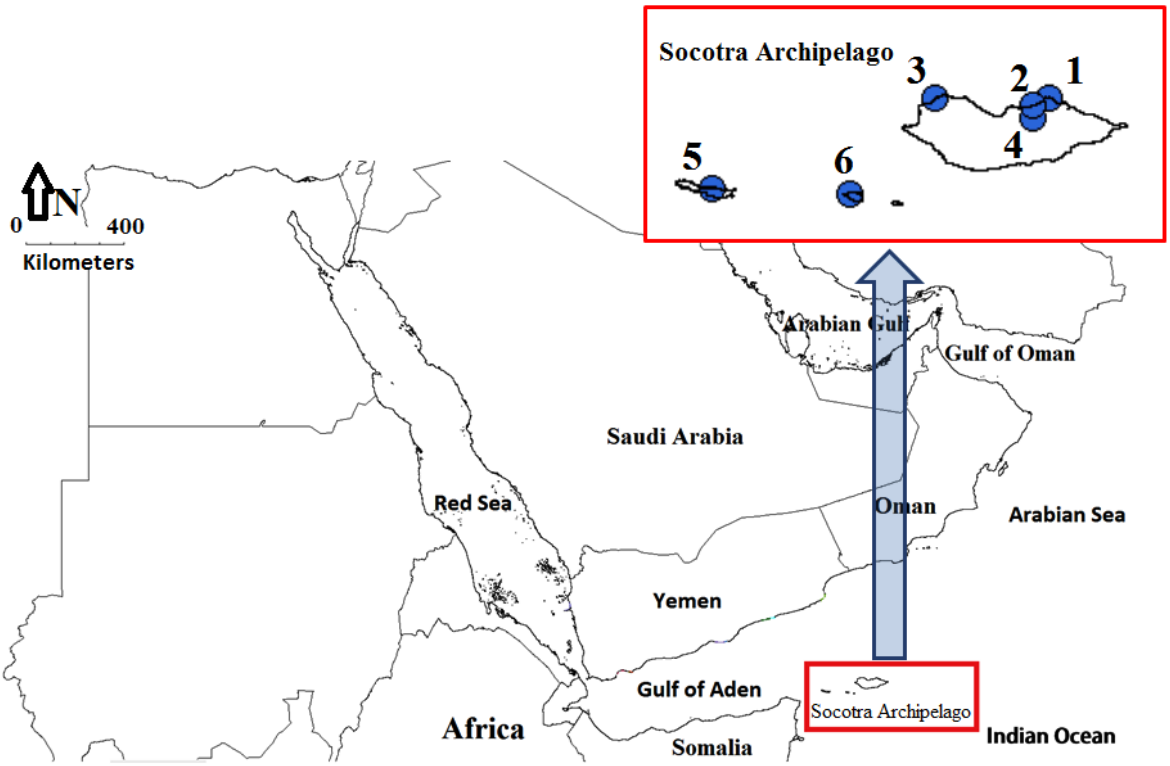

Fig. 1: Collecting sites in Socotra Archipelago

All these species and families were summarized in table 3 indicating their distribution in Yemeni fresh and coastal waters. Four species were recorded exclusively in this region, and have not been recorded in any other region of Yemeni coastal waters in the present study. These species are: Pilumnus propinquus from family of Pilumnidae, site 2; Socotrapotamon socotrensis from family of Potamidae, site 4; Atergatis latissimus and Atergatopsis granulata from family of Xanthidae, sites 4, 5.

Also, the dominant brachyuran crab superfamily in this region was Xanthoidea, 35% with 11 species recorded, followed by Grapsoidea, 19% with 6 species. Carpilioidea, Eriphioidea, Majoidea, Pseudozioidea, Pilumnoidea and Potamoidea were less species-rich and contribute 3% of all species with 1 species only from each superfamily (Fig. 3).

Most brachyuran crab species in Socotra Islands were recorded in four habitats only, subtidal rock with corals, rocky habitat, sand and freshwater. In subtidal rock with corals 25% percent of the total numbers of species were recorded. This corresponds to a total of eight species three of these being dominant in this habitat, i.e. Trapezia cymodoce and Trapezia tigrina from Trapeziidae, and Cymo andreossyi from Xanthidae.

In the rocky habitat, 15.5% percent of the total number of species was recorded, in total five. Two of them were dominant in this habitat, Grapsus albolineatus from Grapsidae and Eriphia smithii from Eriphiidae.

In the habitats of sand and fresh water fewer brachyuran crab species were recorded than in the other habitats, i.e. 3% of all species with one species only per family: Ocypode saratan from Ocypodidae in the sand habitat and Socotrapotamon socotrensis from Potamidae in the fresh water habitat.

In addition, Socotra Island has mangrove trees in five locations in the northern part but, unfortunately, no samples were collected from this habitat in the present study.

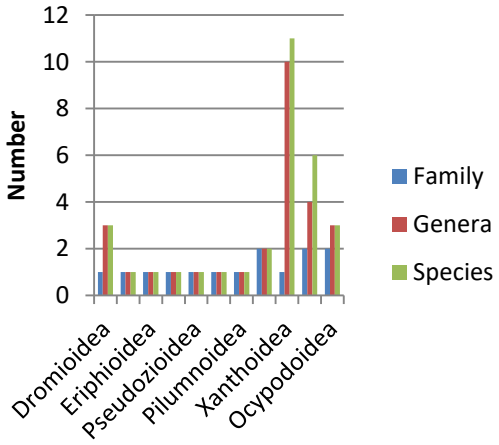

Fig. 2: Number of species, genera and families in all the superfamilies in Socotra islands.

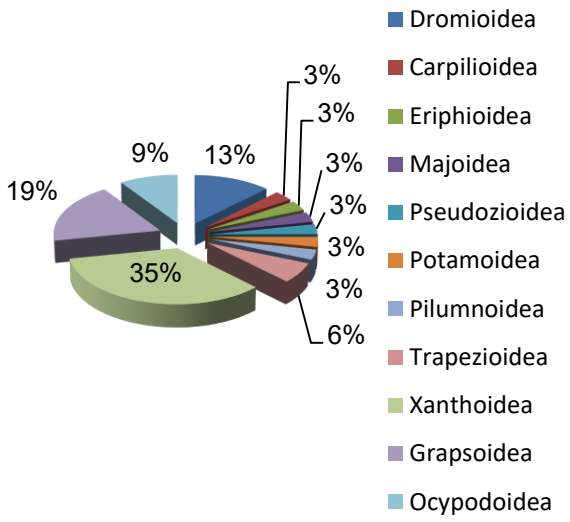

Fig. 3: The percentage of the species counts per superfamilies in Socotra islands.

In the following, 8 brachyuran crabs which record first time in Socotra Islands in this present study are presented including species name, synonyms, type localities and regional distribution, sex of the specimens, collection sites, collectors, local distribution, and some remarks.

Superfamily Dromioidea De Haan, 1833

Family Dromiidae De Haan, 1833

***Lewindromia unidentata* (Rüppell, 1830) Fig 4 A**

Dromia unidentata Rüppell, 1830; H. Milne Edwards, 1837; Laurie, 1915.
Dromidia unidentata Kossmann, 1880; de Man, 1888b Ortmann, 1894; Nobili, 1903: Nobili, 1906; Stephensen, 1946 .
Dromidia unidentata hawaiiensis Edmondson, 1922.
Dromidia unidentata unidentata Garth, 1957a; Retamal, 1981.
Cryptodromia unilobata Campbell & Stephenson, 1970.
Cryptodromiopsis unidentata Rüppell, 1830; McLay, 1993; Wada, 1995; Muraoka, 1998.

Type locality: Red Sea.

State: First record in Socotra Island, at sample locality 2 from subtidal sand and sponge, 1-3 m depth. Not recorded in Gulf of Oman and the Arabian Sea.

Earlier records: Red Sea: Coasts of Sudan under the synonym *Dromidia unidentata* Rüppell, 1830 by [25]; Gulf of Aqaba, Sinai and Dahlak Archipel, Eritrea [26& 27]. Arabian Gulf: under the synonym *Cryptodromiopsis unidentata* Rüppell, 1830 by [17], *Dromidia unidentata* Kossmann, 1880 by [28& 29], *Lewindromia unidentata* Rüppell, 1830 by [22].

Materials examined: ♂ CL 11.1 mm, CW 12.4 mm Site 2 leg. RUWW 01.03.84.

Distribution: Red Sea, Gulf of Aden, Socotra Island, East coast of Africa, Arabian Gulf, Pakistan, India, Sri Lanka, Andaman Islands, Japan, Korea, Philippines, Thailand, Singapore, Indonesia, Australia, New Caledonia, Hawaiian Islands and Easter Island; 0-100 m.

***Ascidiophilus caphyraeformis* Richters, 1880**

Fig 4 B

Pseudodromia integrifrons Nobili, 1906: 147; Laurie, 1915: 40g; Guinot, 1967: 240.
Pseudodromia caphyraeformis Balss, 1922: 110.
Pseudodromia integrifrons Henderson, 1888.
Pseudodromia murrayi Gordon, 1950.

Type locality: unknown.

State: First record in Socotra Island, at sample locality 2 from subtidal sand and sponge, 1-2 m depth. Not recorded in Gulf of Oman, Arabian Sea and the Arabian Gulf.

Earlier records: Red Sea: Gulf of Aqaba, Sinai, Dahlak Archipel, Eritrea under the synonym *Pseudodromia caphyraeformis* Richters, 1880 by [26] and [27] without a specific location.

Materials examined: ♀ CL 8 mm, CW 6.1 mm Site 2 leg. RUWW 01.03.84.

Distribution: Red Sea, Gulf of Aden, Socotra Island, Mozambique, Republic of Mauritius and Tanzania.

Superfamily Pilumnoidea Samouelle, 1819

Family Pilumnidae Samouelle, 1819

***Pilumnus propinquus* Nobili, 1906 Fig 4 C**

Pilumnus propinquus Nobili, 1906: 163.
Pilumnus propinquus Nobili, 1906: 140–142; Nobili, 1906: 277, pl 10, fig 7; Balss, 1933: 12; Stephensen, 1946: 147, 206 (in list); Guinot, 1964: 3 (in list), 7, 95, 97, fig 56a, b; Guinot, 1967: 274 (in list); Titgen, 1982: 252 (in list); Hogarth, 1989: 106; Hogarth, 1994: 101; Apel, 2001: 100; Ng *et al*., 2008: 142 (in list).
Pilumnus? *propinquus* Titgen, 1982: 137.

Type locality: Arabian Gulf and Red Sea.

State: First record in Yemen, Socotra Island, at sample locality 2 from sand, rock, 1-2 m depth. Not recorded in Gulf of Oman.

Earlier records: Red Sea: Egyptian and Sudanese coasts [25]. Gulf of Aden: Djibouti [17]. Arabian Sea: Oman, Dhofar Province [30& 31]. Arabian Gulf: [29, 17, 22].

Materials examined: 2♀♀ CL 5-8.8 mm, CW 6.4-12.3 mm Site 2, leg. RUWW 01.03.84.

Distribution: Red Sea, Gulf of Aden, Socotra Island, Southern Oman, Gulf of Oman, Arabian Gulf and Aldabra.

Superfamily Trapezioidea Miers, 1886

Family Tetraliidae Castro, Ng & Ahyong, 2004

***Tetraloides nigrifrons* (Dana, 1852) Fig 4 D**

Tetralia nigrifrons Dana, 1852a: 83.
Tetralia cavimanus Miers, 1884b: 537 (part) (Indian Ocean). Not *T. cavimana* Heller, 1861.
?*Tetralia glaberrima* Henderson, 1893: 336, 367 (part) (India).
Tetralia glaberrima Borradaile, 1902: 265 (part) (Maldives); Rathbun, 1911: 235 (part) (Seychelles).
Tetralia hetrodactyla heterodactyla Garth, 1971: 185 (Maldives). Not *Tetraloides heterodactyla* (Heller, 1861).
Tetralia heterodactyla Garth, 1974: 205 (part) (Maldives, Sri Lanka); Serène, 1984: 120 (Seychelles); Tsateva, 1980: 121 (Western Australia).
Tetralia heterodactyla lissodactyla Serène, 1984: 285, fig. 189, pl. 42C (Seychelles, îles Glorieuses, La Réunion).
Tetraloides nigrifrons Galil, 1986a: 72 (part) (Seychelles, Christmas Is., Maldives?, Sri Lanka?); Galil and Clark, 1988: 149, figs. 1E, 3D, 4E, 4J, 5B, 6E (Somalia, Kenya, Christmas Is.); Castro 1997a: 72, pl. 1F (Seychelles, îles Glorieuses, La Réunion).

Type locality: East Africa.

State: First record in Socotra Island at sample locality 2 from corals, 1-2 m depth. Not recorded in the Arabian Sea, Gulf of Oman and the Arabian Gulf.

Table 2: Brachyuran crab families and species with their distributions in Socotra Islands; Present (+), Absent (-), first record in Socotra Islands (▲).

Family	Taxon	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Dromiidae	*Cryptodromia fallax*	-	+	-	-	-	-
	Ascidiophilus caphyraeformis	-	▲	-	-	-	-
	Epigodromia granulata	-	+	-	-	-	-
	Lewindromia unidentata	-	▲	-	-	-	-
Carpiliidae	*Carpilius convexus*	-	-	+	-	-	-
Eriphiidae	*Eriphia smithii*	+	-	-	-	-	-
Majidae	*Micippa platipes*	-	+	-	-	-	-
Pseudoziidae	*Pseudozius caystrus*	-	+	+	-	-	-
Pilumnidae	*Pilumnus propinquus*	-	▲	-	-	-	-
Potamidae	*Socotrapotamon socotrensis*	-	-	-	+	-	-
Trapeziidae	*Trapezia cymodoce*	-	+	-	-	-	-
Tetraliidae	*Tetraloides nigrifrons*	-	▲	-	-	-	-
Xanthidae	*Atergatis latissimus*	-	-	▲	-	-	-
	Xanthias sinensis	-	+	-	-	-	-
	Leptodius exaratus	-	+	-	-	-	-
	Cyclodius granulatus	-	+	-	-	-	-
	Atergatopsis granulata	-	▲	-	-	-	-
	Actaea savignii	-	+	-	-	-	-
	Actaeodes hirsutissimus	-	▲	-	-	-	-
	Epiactaea margaritifera	-	▲	-	-	-	-
	Cymo andreossyi	-	+	-	-	-	-
	Cymo quadrilobatus	-	+	-	-	-	-
	Luniella spinipes	-	+	-	-	-	-
Grapsidae	*Grapsus albolineatus*	-	+	-	-	+	+
	Grapsus granulosus	-	+	-	-	-	-
	Grapsus tenuicrustatus	+	-	-	-	-	-
	Metopograpsus messor	-	+	-	-	+	-
	Geograpsus crinipes	-	-	-	-	-	+
Varunidae	*Thalassograpsus harpax*	-	-	+	-	-	-
Ocypodidae	*Ocypode saratan*	-	-	+	-	+	+
	Austruca albimana	-	+	-	-	-	-
Macrophthalmidae	*Chaenostoma boscii*	-	+	-	-	-	-

Earlier records: Red Sea: under the synonym *Tetralia glaberrima nigrifrons* Dana, 1852 by [19].

Somalia: [32].

Materials examined: ovi ♀♀ CL 8.8-12.1 mm, CW 10.2-14 mm Sit 2, leg. RUWW 01.03.96. 4♂♂ CL 6.8-12 mm, CW 7.8-12.9 mm Sit 2, leg. RUWW 01.03.96. 2 Juv CL 3.5-4.2 mm, CW 4.4-5.3 mm Sit 2, leg. RUWW 01.03.96.

Distribution: Red Sea, Gulf of Aden: Aden, Socotra Island and Somalia.

Superfamily Xanthoidea MacLeay, 1838

Family Xanthidae MacLeay, 1838

***Atergatis latissimus* (H. Milne Edwards, 1834)**

Fig 4 E

Zozimus latissimus H. Milne Edwards, 1834: 384.
Cancer (Atergatis) frontalis de Haan, 1833-1849 (1835): 46, pl. 14, fig. 3; Yamaguchi, 1993: 578.
Atergatis sinuatifrons White, 1848a: 224; Adams & White, 1848: 38.
Atergatis latissimus A. Milne Edwards, 1865c: 237, pl. 14, fig. 1; Odhner, 1925: 83; Balss, 1938a: 37; Guinot, 1967: 261; Serène, 1980: 713, pl. 1A.
Atergatis frontalis A. Milne Edwards, 1865c: 238; Shen, 1940b: 72, 85; Sakai, 1976: 410, fig. 215.
Atergatis integerrimus frontalis Paulson, 1875: 14.
Atergatis latissimus frontalis de Man, 1926b: 205; Sakai, 1939: 448, pl. 88, fig. 1.
Non *Atergatis frontalis* de Man, 1879: 54.
= *Atergatis reticulatus* de Haan, 1835.

Type locality: Australia.

State: First record in Yemen, Socotra Island, at sample locality 3 from subtidal rock, corals, 1-2 m depth. Not recorded in the Red Sea, Gulf of Oman and the Arabian Gulf.

Earlier records: Arabian Sea: Oman, Dhofar Province [31].

Materials examined: ♂ CL 54.7 mm, CW 89.1 mm Site 3, leg. SMF 15.03.99.

Distribution: Socotra Island, Arabian Sea: Dhofar, Mauritius, Japan, Taiwan, China Sea, Australia and Marshall Islands.

***Atergatopsis granulata* A. Milne-Edwards, 1865**

Fig 4 F

Atergatopsis granulatus A. Milne-Edwards, 1865: 255, pl 13, figs 2, 2b; Kossmann, 1877: 22; Nobili, 1906:235; Klunzinger, 1913: 156 (60); Serène, 1984: 143, fig 83, pl. 20b.Not *Atergatopsis granulatus* Miers, 1884b: 529 = not *Atergatopsis*, according to Buitendijk (1960).Not *Atergatopsis granulatus* Miers, 1886: 123 = *Atergatopsis tweediei* Balss, 1938b, according to Buitendijk (1960).

Not *Atergatopsis granulatus* Balss, 1924 a: 6, fig. 1 = *Banareia parvula* (Krauss, 1843).

Type locality: Zanzibar.

State: First record in Yemen, Socotra Island sample locality 2 from sand, rock, 1-2 m depth. Not recorded in Gulf of Aden, Arabian Sea, Gulf of Oman and the Arabian Gulf.

Earlier records: Red Sea: Egyptian and Sudanese coasts [25], [19] without a specific location.

Materials examined: 2♂♂ CL 11.3-24.7 mm, CW 16.5-34.8 mm Site 2, leg. RUWW 01.03.84.

Distribution: Red Sea, Socotra Island, Madagascar, Zanzibar, Pakistan (Karachi), Aldabra, South China Sea and New Guinea, 26-46 m depth.

***Epiactaea margaritifera* (Odhner, 1925) Fig 4 G**

Actaea margaritifera Odhner, 1925: 48, pl 3, fig 10.
Actaea nodulosa Henderson, 1893: 356; Alcock, 1898: 148; Nobili, 1906: 257, pl 10, fig 2.
Actaea margaritifera Stephensen, 1946: 152; Guinot, 1967: 261 (in list); Titgen, 1982: 251 (in list).
Epiactaea margaritifera Serène, 1984: 117, fig 70, pl 15b; Hogarth, 1994: 95; Apel, 2001: 84; Ng *et al.*, 2008: 195 (in list).

Type locality: Gulf of Aden: Aden.

State: First record in Yemen, Socotra Island, sample locality 2 from sand, rock, 1-2 m depth. Not recorded in Gulf of Oman.

Earlier records: Red Sea: [19]. Gulf of Aden: Aden and Djibouti [29, 19, 17]. Arabian Sea: Oman, Dhofar Province [30]. Arabian Gulf: [28, 17, 22].

Materials examined: ♂ CL 8.2 mm, CW 11.8 mm Site 2, leg. RUWW 01.03.84.

Distribution: Red Sea, Gulf of Aden, Socotra Island, Southern Oman, Arabian Gulf, Pakistan, Sri Lanka, Thailand, Indonesia, Singapore and Torres Strait.

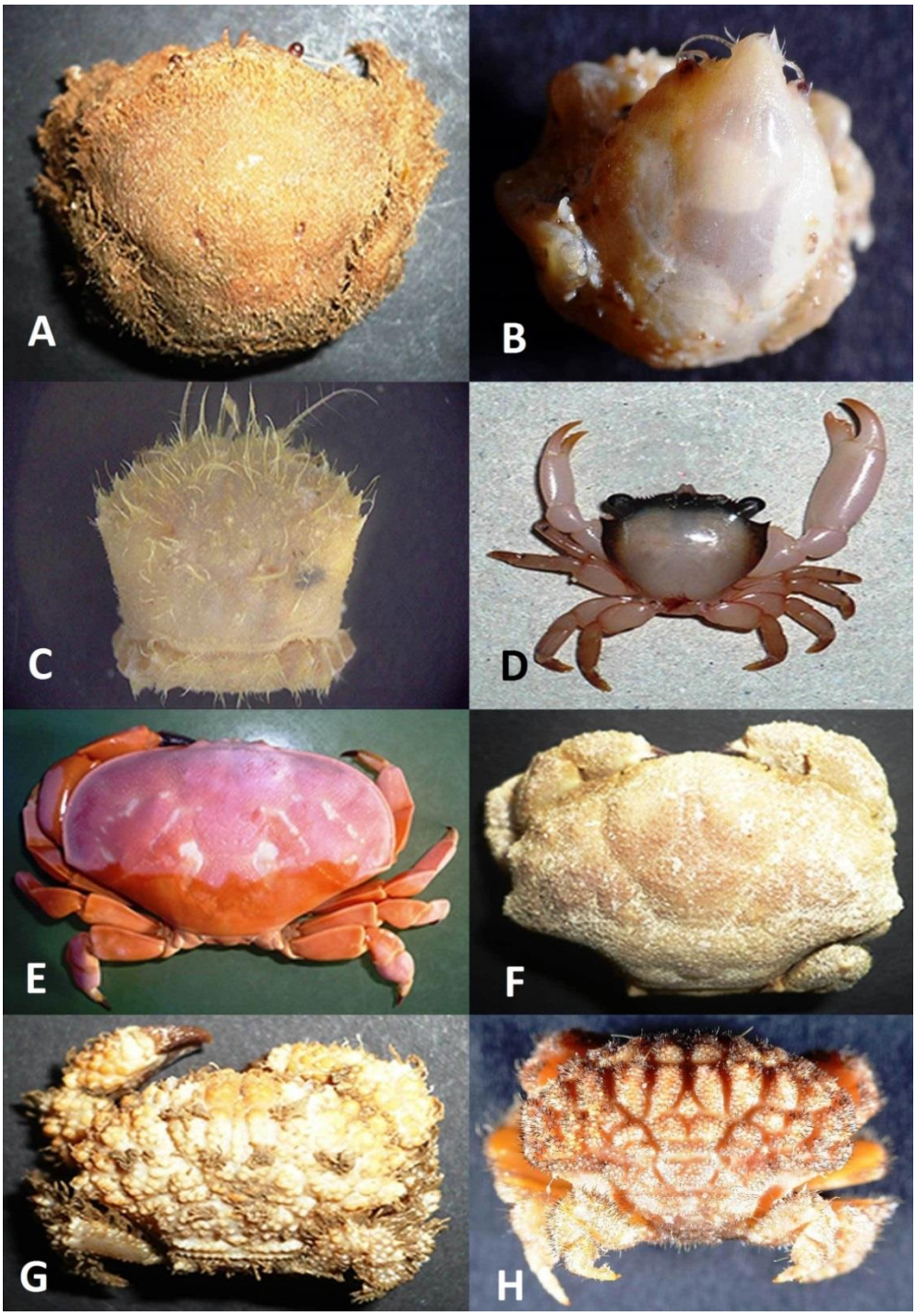

Fig 4: A. *Lewindromia unidentata*, ♂ 11.1 mm, CW 12.4 mm; B. *Ascidiophilus caphyraeformis*, ♀ CL 8 mm, CW 6.1 mm; C. *Pilumnus propinquus*, ♀ CL 8.8 mm, CW 12.3 mm; D. *Tetraloides nigrifrons*, ♂ CL 12 mm, CW 12.9 mm; E. *Atergatis latissimus*, ♂ CL 54.7 mm, CW 89.1 mm; F. *Atergatopsis granulata*, ♂ CL 24.7 mm, CW 34.8 mm; G. *Epiactaea margaritifera*, ♂ CL 8.2 mm, CW 11.8 mm; H. *Actaeodes hirsutissimus*, ♀ CL 6.6 mm, CW 9.3 mm.

***Actaeodes hirsutissimus* (Rüppell, 1830)**
Fig 4 H

Xantho hirsutissimus Rüppell, 1830: 26, pl. 5, fig. 6, pl. 6, fig. 21; H. Milne Edwards, 1834: 389.
Cancer (Actaea) hirsutissima de Haan, 1833-1849 (1833): 18; de Haan, 1833-1849 (1835): pl. D.
Actaea hirsutissima Dana, 1852c: 164; Heller, 1865: 9; A. Milne Edwards, 1865c: 265; Ortmann, 1893b: 453; Alcock, 1898: 141; Guinot, 1967: 259.
Actäa (Actäana) hirsutissima Klunzinger, 1913: 178, 196, fig. 9, pl. 10, fig. 9.
Actaeodes hirsutissimus Guinot, 1967d: 561; Guinot, 1976: 245, fig. 38E, pl. 15, fig. 2; Sakai, 1976: 448, pl.

159, fig. 3; Serène, 1984: 133 (key), 134 (key), 135, fig. 79, pl. 18B.
Non *Actaea hirsutissima* Rathbun, 1906: 852.
= *Gaillardiellus superciliaris* (Odhner, 1925).

Type locality: Red Sea.

State: First record in Yemen, Socotra Island, sample locality 2 from sand, rock, 1-2 m depth. Not recorded in the Arabian Sea, Gulf of Oman and the Arabian Gulf.

Earlier records: Red Sea: Egyptian and Sudanese coasts [25]; Kamaran, Zuukur Islands [33& 34]; Hudaydah coasts [35], [27] without a specific location. Gulf of Aden: Sikha Island [14]. Arabian Sea: Oman, Dhofar Province [30& 31]. Somalia: Gesira [36].

Materials examined: ♀ CL 6.6 mm, CW 9.3 mm Site 2, leg. RUWW 01.03.84.

Distribution: Red Sea, Gulf of Aden, Socotra Island, Somalia, Kenya, Tanzania- Dar es Salaam, Mozambique, Madagascar, Mauritius, Arabian Sea, Andaman Islands, Japan, Taiwan, China, Vietnam, Singapore, Indonesia, New Guinea, Australia, Fiji and Tahiti; coral reef, shallow waters.

4. Discussion

The Socotra Island sites (1-6) have a variety of habitats including sandy shores, rocky shores, mud flats, sponge areas, coral reefs and fresh waters. In these sites, 32 species were recorded belonging to 11 superfamilies, 14 families and 29 genera.

The dominant species in the rocky shore habitat were three species: *Eriphia smithii*, *Lydia tenax* and *Grapsus albolineatus*. According to previous studies these are also widespread in rocky shores all along the Arabian Peninsula [25, 33, 28, 30, 14, 17, 31, 37, 38, 22].

The dominant species in corals habitat were the two species *Cymo andreossyi* and *Trapezia cymodoce*. The sandy shore habitats in Yemeni coastal waters harbour four species of *Ocypode* (ghost crabs), three of them recorded in this present study (*Ocypode saratan*, *Ocypode cordimana* and *Ocypode jousseaumei*), while the fourth species *Ocypode ryderi* Kingsley, 1881 was recorded in Socotra Island by [10] and [13].

A special case in this study is the freshwater habitat. Here we recorded only one endemic species on Socotra Island: *Socotrapotamon socotrensis*. Two more species from this family were recorded in freshwater in Socotra Island by [9] and [16].

The overall most common species in this study are *Leptodius exaratus* from the habitat sand with rock in the intertidal, *Grapsus albolineatus* from rocky intertidal zone, *Ocypode saratan* from sand medio- and supra-littoral and *Austruca albimana* from muddy intertidal flats. According to previous studies these species, along with 23 other ones, are considered widespread around the Arabian Peninsula [25, 32].

Some earlier studies of brachyuran crabs exist in Socotra Islands. [11] recorded 29 species in Socotra, [39] 6 species, [14] 23 species, [15] 2 species. [9] found a previously undescribed species *Socotrapotamon nojidensis* Apel & Brandis, 2000, and also [16] found a new genus and species, *Socotra pseudocardiosoma* Cumberlidge & Wranik, 2002. Moreover, [10] recorded 77 species, [17] 78 species, [40] 2 species, [41] recorded another species of Parthenopidae, [12] recorded one species and [13] two more species of Ocypodidae (see table 4 where details of all the previous studies are summarized).

Table 3: The brachyuran crabs which were recorded in Socotra Island sites in the present study.

Superfamily	Family	Taxon
Dromioidea	Dromiidae	*Cryptodromia fallax* (Latreille in Milbert, 1812)
		Ascidiophilus caphyraeformis Richters, 1880
		Epigodromia granulata (Kossman, 1878)
		Lewindromia unidentata (Rüppell, 1830)
Carpilioidea	Carpiliidae	*Carpilius convexus* (Forskål, 1775)
Eriphioidea	Eriphiidae	*Eriphia smithii* MacLeay, 1838
Majoidea	Majidae	*Micippa platipes* Rüppell, 1830
Pseudozioidea	Pseudoziidae	*Pseudozius caystrus* (Adams & White, 1849)
Pilumnoidea	Pilumnidae	*Pilumnus propinquus* Nobili, 1906
Potamoidea	Potamidae	*Socotrapotamon socotrensis* (Hilgendorf, 1883)
Trapezioidea	Trapeziidae	*Trapezia cymodoce* (Herbst, 1801)
	Tetraliidae	*Tetraloides nigrifrons* (Dana, 1852)
Xanthoidea	Xanthidae	*Atergatis latissimus* (H. Milne Edwards, 1834)
		Xanthias sinensis (A. Milne-Edwards, 1867)
		Leptodius exaratus (H. Milne Edwards, 1834)

		Cyclodius granulatus (Targioni-Tozzetti, 1877)
		Atergatopsis granulata A. Milne-Edwards, 1865
		Actaea savignii (H. Milne Edwards, 1834)
		Actaeodes hirsutissimus (Rüppell, 1830)
		Epiactaea margaritifera (Odhner, 1925)
		Cymo andreossyi (Audouin, 1826)
		Cymo quadrilobatus Miers, 1884
		Luniella spinipes (Heller, 1861)
Grapsoidea	Grapsidae	*Grapsus albolineatus* Latreille in Milbert, 1812
		Grapsus granulosus H. Milne Edwards, 1853
		Grapsus tenuicrustatus (Herbst, 1783)
		Metopograpsus messor (Forskål, 1775)
		Geograpsus crinipes (Dana, 1851)
	Varunidae	*Thalassograpsus harpax* (Hilgendorf, 1892)
Ocypodoidea	Ocypodidae	*Ocypode saratan* (Forskål, 1775)
		Austruca albimana (Kossmann, 1877)
	Macrophthalmidae	*Chaenostoma boscii* (Audouin, 1826)

The total brachyuran species number from these previous studies is 151 species belonging to 81 genera and 26 families, of which 127 species were not found in the present study.

The most recent and intensive study in Socotra Islands was done by [10], in which they recorded 77 species, while in the present study recorded 32 species. Eight of these species are first records in the present study. [10] did not report the families Carpiliidae, Potamidae, Tetraliidae and Trapeziidae) found in the present study on Socotra Islands.

The land crabs *Cardisoma carnifex* of Grapsoidea was recorded in Socotra Island by [39] and [10]. This species was not recorded again in the present study, neither on Socotra nor the Red Sea or the Gulf of Aden.

Table 4: Shows the comparing between the present study* and other studies for Socotra Islands. [10]**, [11]▲, [39]■, [14]$^{+1}$, [15]$^{+2}$, [9]$^{+3}$, [16]$^{+4}$, [17]$^{+5}$, [40]$^{+6}$, [41]$^{+7}$, [13]$^{+8}$, [12]$^{+9}$. Present (+) and absent (-).

Family	Taxon	*	**	▲	■	●
Dromiidae	*Cryptodromia fallax* (Latreille in Milbert, 1812)	+	+	-	-	+[5]
	Epigodromia granulata (Kossman, 1878)	+	+	-	-	-
	Lauridromia dehaani (Rathbun, 1923)	-	-	-	-	+[5]
	Lewindromia unidentata (Rüppell, 1830)	+	-	-	-	-
	Ascidiophilus caphyraeformis Richters, 1880	+	-	-	-	-
Carpiliidae	*Carpilius convexus* (Forskål, 1775)	+	-	-	-	+[5]
Eriphiidae	*Eriphia smithii* MacLeay, 1838	+	+	-	+	+[5]
Menippidae	*Menippe rumphii* (Fabricius, 1798)	-	+	-	-	+[5]
Oziidae	*Epixanthus frontalis* (H. Milne Edwards, 1834)	-	+	-	-	+[5]
	Epixanthus corrosus A. Milne-Edwards, 1873	-	+	-	-	+[5]
	Epixanthus sp.		-	+	-	-
	Lydia tenax (Rüppell, 1830)	-	+	-	-	+[5]
Calappidae	*Calappa gallus* (Herbst, 1803)	-	+	-	-	+[5]
	Calappa dumortieri Guinot, 1962	-	-	-	-	+[5]
Matutidae	*Ashtoret lunaris* (Forskål, 1775)	-	+	-	-	+[5]
	Matuta victor (Fabricius, 1781)	-	-	-	-	+[5]
Leucosiidae	*Leucosia* sp.	-	+	-	-	-
	Ryphila cancellus (Herbst, 1783)	-	+	-	-	-

	Philyra sp [aff. *platycheir* de Haan, 1841]	-	+	-	-	-
	Philyra globus (Fabricius, 1775)	-	-	-	-	+[5]
	Philyra sp.	-	-	+	-	-
Majidae	*Micippa platipes* Rüppell, 1830	+	+	-	-	+[5]
	Micippa thalia (Herbst, 1803)	-	+	-	-	+[5]
	Pseudomicippe griffini Kazmi & Tirmizi, 1999	-	+	-	-	-
	Schizophrys aspera H. Milne Edwards, 1834	-	-	-	-	+[5]
Inachidae	*Achaeus* sp.	-	+	-	-	-
	Macropodia formosa Rathbun, 1911	-	-	-	-	+[5]
Epialtidae	*Huenia heraldica* (De Haan, 1837)	-	+	-	-	-
	Cyphocarcinus sp.	-	-	+	-	-
	Cyphocarcinus minutus A. Milne Edwards, 1868	-	-	-	-	+[5]
	Huenia grandidierii A. Milne-Edwards, 1865	-	+	-	-	-
	Huenia sp.	-	+	-	-	-
	Menaethiops contiguicornis (Klunzinger, 1906)	-	+	-	-	-
	Menaethiops nodulosa (Nobili)	-	+	-	-	+[5]
	Menaethiops sp. [aff. fascicularis (Krauss, 1843)]	-	+	-	-	-
	Menaethius monoceros (Latreille, 1825)	-	+	+	-	+[5]
	Menaethius orientalis (Sakai, 1969)	-	+	-	-	+[5]
	Menaethius sp.1	-	-	+	-	-
	Menaethius sp.2	-	-	+	-	-
	Acanthonyx limbatus A. Milne Edwards, 1862	-	-	-	-	+[5]
	Simocarcinus pyramidatus (Heller, 1861)	-	+	-	-	-
	Stilbognathus erythraeus von Martens, 1866	-	+	-	-	-
	Stilbognathus cervicornis (Herbst, 1803)	-	-	-	-	+[5]
	gen. sp.	-	+	+	-	-
Pseudoziidae	*Pseudozius caystrus* (Adams & White, 1849)	+	+	-	-	+[5]
Parthenopidae	*Furtipodia petrosa* (Klunzinger, 1906)	-	+	-	-	+[6]
	Daldorfia horrida (Linnaeus, 1758)	-	-	-	-	+[6]
	Daldorfia spinosissima (A. Milne-Edwards, 1862)	-	-	-	-	+[7]
Portunidae	*Carupa tenuipes* Dana, 1852	-	+	-	-	+[5]
	Portunus (Portunus) segnis (Forskål, 1775)	-	+	+	-	-
	Portunus (Monomia) euglyphus (Laurie, 1906)	-	-	-	-	+[1]
	Portunus (Xiphonectes) hastatoides Fabricius, 1798	-	-	-	-	+[5]
	Portunus (Xiphonectes) tenuicaudatus Stephenson, 1961	-	-	-	-	+[1]
	Portunus longispinosus (Dana 1852)	-	-	-	-	+[1]
	Portunus orbitosinus Rathbun 1911	-	-	-	-	+[5]
	Portunus pubescens (Dana 1852)	-	-	-	-	+[1]
	Portunus convexus De Haan, 1833	-	-	-	-	+[5]
	Portunus (Portunus) sanguinolentus (Herbst, 1783)	-	-	-	-	+[5]
	Portunus sp.	-	-	+	-	-
	Scylla serrata (Forskål, 1775)	-	+	-	-	+[5]
	Thalamita admete (Herbst, 1803)	-	+	+	-	+[5]
	Thalamita spinifera Borradaile, 1902	-	-	+	-	+[1]
	Thalamita bandusia Nobili, 1906	-	-	-	-	+[5]

	Thalamita crenata Rüppell, 1830	-	+	-	-	+[5]
	Thalamita prymna (Herbst, 1803)	-	-	-	-	+[5]
	Thalamita quadrilobata Miers, 1884	-	-	-	-	+[5]
	Thalamita cf. stephensoni Crosnier 1962	-	+	-	-	-
	Thalamita auaensis Rathbun 1906 ssp. margaritimana Rathbun 1911	-	-	-	-	+[1]
	Thalamita philippinensis Stephenson & Rees 1967 ssp.	-	-	-	-	+[1]
	Lissocarcinus laevis Miers 1886	-	-	-	-	+[1]
	Lupocyclus tugelae Barnard 1950	-	-	-	-	+[1]
Pilumnidae	*Actumnus setifer* (De Haan, 1835)	-	+	-	-	+[5]
	Actumnus asper (Rüppell, 1830)	-	-	-	-	+[5]
	Pilumnopeus sp. 1	-	+	-	-	-
	Pilumnus propinquus Nobili, 1906	+	-	-	-	-
	Pilumnus vespertilio (Fabricius, 1793)	-	-	+	-	-
	Heteropilumnus lanuginosus (Klunzinger, 1913)	-	-	-	-	+[5]
	Pilumnus sp. 1	-	+	-	-	-
	Gen. sp.1	-	-	+	-	-
Potamidae	*Socotrapotamon socotrensis* (Hilgendorf, 1883)	+	-	-	-	-
	Socotrapotamon nojidensis Apel & Brandis, 2000	-	-	-	-	+[3]
	Socotra pseudocardiosoma Cumberlidge & Wranik, 2002	-	-	-	-	+[4]
Trapeziidae	*Trapezia cymodoce* (Herbst, 1801)	+	-	-	-	+[5]
	Trapezia tigrina Eydoux & Souleyet, 1842	-	-	-	-	+[5]
	Trapezia rufopunctata (Herbst, 1799)	-	-	-	-	+[5]
Tetraliidae	*Tetraloides nigrifrons* (Dana, 1852)	+	-	-	-	-
	Tetralia cavimana Heller, 1861	-	-	-	-	+[2],+[5]
	Tetralia muta (Linnaeus, 1758)	-	-	-	-	+[2]
Xanthidae	*Xanthias sinensis* (A. Milne-Edwards, 1867)	+	+	-	-	+[5]
	Xanthias punctatus (H. Milne Edwards, 1834)	-	-	-	-	+[5]
	Leptodius exaratus (H. Milne Edwards, 1834)	+	+	+	-	+[5]
	Leptodius sanguineus (H. Milne Edwards, 1834)	-	+	-	-	+[5]
	Leptodius gracilis (Dana, 1852)	-	-	+	-	-
	Lybia plumosa Barnard 1947	-	-	-	-	+[1]
	Actaeodes tomentosus (H. Milne Edwards, 1834)	-	+	-	-	-
	Actaea savignyi (H. Milne-Edwards 1834)	-	-	-	-	+[5]
	Actaea cf. spinosissima Borradaile 1902	-	-	-	-	+[5]
	Paractaea rufopunctata f. illusoria Guinot 1969	-	-	-	-	+[5]
	Actaea sp.	-	-	+	-	-
	Actaeodes hirsutissimus (Rüppell, 1830)	+	-	-	-	-
	Atergatis latissimus (H. Milne Edwards, 1834)	+	-	-	-	-
	Atergatopsis granulata A. Milne-Edwards, 1865	+	-	-	-	-
	Atergatopsis alcocki (Laurie 1906)	-	-	-	-	+[1]
	Epiactaea margaritifera (Odhner, 1925)	+	-	-	-	-
	Cymo quadrilobatus Miers, 1884	+	-	-	-	+[5]
	Cymo andreossyi (Audouin, 1826)	+	-	-	-	+[5]
	Cymo deplanatus A. Milne Edwards 1873	-	-	-	-	+[5]
	Cymo melanodactylus Dana, 1852	-	-	-	-	+[5]
	Chlorodiella cytherea (Dana 1852)	-	-	-	-	+[5]

	Chlorodiella nigra (Forskål, 1775)	-	-	-	-	+[5]
	Etisus anaglyptus H. Milne Edwards, 1834	-	+	-	-	+[5]
	Etisus electra (Herbst, 1801)	-	+	-	-	+[5]
	Gaillardiellus rueppelli (Krauss, 1843)	-	-	-	-	+[5]
	Paraxanthodes cumatodes (Macgilchrist, 1905)	-	-	-	-	+[5]
	Forestiana depressa (White, 1848)	-	+	-	-	-
	Lachnopodus subacutus (Stimpson, 1858)	-	+	-	-	-
	Liomera rugata (H. Milne Edwards, 1834)	-	+	-	-	-
	Liomera rugipes (Heller 1861)	-	-	-	-	+[1]
	Pseudoliomera helleri (A. Milne-Edwards 1865)	-	-	-	-	+[1]
	Paractaea rufopunctata (H. Milne Edwards, 1834)	-	+	-	-	-
	Paractaeopsis quadriareolatus (Takeda & Miyake, 1968)	-	+	-	-	-
	Pilodius areolatus (H. Milne Edwards, 1834)	-	+	-	-	-
	Pilodius sp.	-	-	+	-	-
	Demania aff. mortenseni (Odhner 1925)	-	-	-	-	+[1]
	Luniella spinipes (Heller, 1861)	+	+	+	-	+[5]
	Cyclodius granulatus (Targioni-Tozzetti, 1877)	+	-	-	-	+[5]
	Cyclodius paumotensis (Rathbun, 1907)	-	-	+	-	-
	Lophozozymus anaglyptus (Heller, 1861)	-	+	+	-	+[5]
	Lophozozymus dodone (Herbst 1801)	-	-	-	-	+[1]
	Lophozozymus guezei Guinot 1977	-	-	-	-	+[1]
	Pseudoliomera remota (Rathbun, 1907)	-	+	-	-	-
	Zozymodes cavipes (Dana, 1852)	-	+	-	-	+[5]
	Psaumis cavipes (Dana, 1852)	-	-	-	-	+[5]
	Zozymodes xanthoides (Krauss, 1843)	-	+	-	-	+[5]
Grapsidae	*Cyclograpsus integer* H. Milne Edwards, 1837	-	+	-	-	-
	Grapsus albolineatus Latreille in Milbert, 1812	+	+	+	+	+[5]
	Grapsus granulosus H. Milne Edwards, 1853	+	+	-	-	+[5]
	Grapsus tenuicrustatus (Herbst, 1783)	+	+	-	-	+[5]
	Grapsus longitarsus Dana, 1851	-	-	+	-	
	Grapsus sp.1	-	-	+	-	-
	Grapsus sp.2	-	-	+	-	-
	Metopograpsus messor (Forskål, 1775)	+	+	+	-	+[5]
	Metopograpsus thukuhar (Owen, 1839)	+	+	-	-	+[5]
	Geograpsus crinipes (Dana, 1851)	+	+	-	-	-
	Pachygrapsus minutus A. Milne-Edwards, 1873	-	+	-	-	+[5]
Plagusiidae	*Percnon guinotae* Crosnier, 1965	-	+	-	-	+[5]
	Percnon planissimum (Herbst, 1804)	-	+	-	-	+[5]
	Plagusia tuberculata Lamarck, 1818	-	+	-	-	+[5]
Varunidae	*Thalassograpsus harpax* (Hilgendorf, 1892)	+	+	+	-	+[5]
	Pseudohelice subquadrata (Dana, 1851)	-	+	-	-	+[5]
Gecarcinidae	*Cardisoma carnifex* (Herbst, 1796)	-	+	-	+	-
Macrophthalmidae	*Chaenostoma boscii* (Audouin, 1826)	+	+	-	+	-
Dotillidae	*Dotilla sulcata* (Forskål, 1775)	-	+	-	-	+[5]
Ocypodidae	*Ocypode saratan* (Forskål, 1775)	+	+	+	+	+[5], +[8], +[9]

	Ocypode cordimana Latreille, 1818	-	+	+	-	+[5]
	Ocypode ryderi Kingsley, 1880	-	+	-	-	+[8]
	Ocypode cf. rotundata Miers, 1882	-	-	+	-	-
	Austruca albimana (Kossmann, 1877)	+	+	-	-	+[5]
	Cranuca inversa (Hoffmann, 1874)	-	+	-	+	+[5]

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مقالة بحثية

تسجيل اول لثمانية انواع من السرطانات قصيرات البطن (قشريات- عشريات الارجل) في ارخبيل سقطرى على المحيط الهندي- اليمن

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المُلخّص

تمتلك اليمن عدد كبير من الجزر في البحر الاحمر تشمل جزيرة كمران، عقبان، ارخبيل حنيش وميون (كانت تسمى قديما جزيرة بريم)، وجزر اخرى في خليج عدن. على المحيط الهندي تملك اليمن ارخبيل سقطرى الذي يقع شرق القرن الافريقي ب240 كم، وعن جنوب اليمن ب380 كم. ارخبيل سقطرى لديه تنوع كبير في البيئات، حيث توجد البيئات الرملية، الصخرية، المسطحات الطينية، بيئة الاسفنج، الشعاب المرجانية وبيئة المياه العذبة. هدفت هذه الدراسة الى تسجيل وحصر انواع السرطانات قصيرات البطن في مختلف البيئات في جزر سقطرى. تم جمع العينات باليد، الشبكة اليدوية، الغوص باستخدام السنوركل حتى عمق 3متر. العينات جمعت من ستة مواقع في سقطرى خلال فترات زمنية متقطعة من 1984 الى 2000، حفظت هذه العينات في جامعة روستوك الالمانية ومتحف ميونخ لعلم الحيوان في المانيا. تم تسجيل 32 نوعا من السرطانات قصيرات البطن في هذه الدراسة تندرج تحت 29 جنسا، 11 فوق عائلة و14 عائلة. ثمانية انواع منها تسجل لأول مرة في ارخبيل سقطرى. العائلات السائدة في هذه الدراسة هي عائلة الزانثيدا بنسبة 35% و ب11 نوع سجل فيها، تليها عائلة الجرابسيدا بنسبة 19% و مع 6 انواع سجلت فيها.

الكلمات الرئيسية: بيئات مختلفة، سرطانات قصيرات البطن، ارخبيل سقطرى، المحيط الهندي.

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