**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 Abdal-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, Socotrapseudoconradiosa (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 Staatsammlung 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 Trapezioidea; [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.

| 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°41.569 N 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. |

Table 1: Names of the six sites on Socotra Archipelago, coordinates and description the habitats in these sites:
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. 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 hawaiensis* 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 Dhalak 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, Dhalak 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 subtidal sand and 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).

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                       | -      | -      | -      | -      | -      | -      |
|          | Ascidiphilus caphyraformis                 | -      | ▲      | -      | -      | -      | -      |
|          | Epigodromia granulata                      | -      | -      | -      | -      | -      | -      |
|          | Lewindromia unidentata                     | -      | ▲      | -      | -      | -      | -      |
| Carpillidae| Carpilius convexus                       | -      | -      | +      | -      | -      | -      |
| Erphidae | Eriphia smithii                            | +      | -      | -      | -      | -      | -      |
| Majidae  | Micippa platipes                           | -      | +      | -      | -      | -      | -      |
| Pseudociidae| Pseudocius caystrus                    | -      | +      | -      | -      | -      | -      |
| Potamidae| Socotrapotamon socotrensis                 | -      | -      | -      | +      | -      | -      |
| Trapezidae| Trapezia cymodoce                         | -      | +      | -      | -      | -      | -      |
| Tetraliidae| Tetraloides nigrifrons                   | -      | ▲      | -      | -      | -      | -      |
| Xanthidae| Atergatis latisimus                        | -      | -      | ▲      | -      | -      | -      |
|          | Xanthias sinensis                          | -      | +      | -      | -      | -      | -      |
|          | Leptodius exaratus                         | -      | +      | -      | -      | -      | -      |
|          | Cyclodias granulatus                       | -      | +      | -      | -      | -      | -      |
|          | Atergatopsis granulata                     | -      | ▲      | -      | -      | -      | -      |
|          | Actaeus savignii                           | -      | +      | -      | -      | -      | -      |
|          | Actaeodes hisutissimus                     | -      | ▲      | -      | -      | -      | -      |
|          | Epiactaeus margaritifera                   | -      | ▲      | -      | -      | -      | -      |
|          | Cymo andreossyi                            | -      | +      | -      | -      | -      | -      |
|          | Cymo quadrilobatus                         | -      | +      | -      | -      | -      | -      |
|          | Laniella spinipes                          | -      | +      | -      | -      | -      | -      |
| Grapsidae| Grapsus albolineatus                       | -      | +      | -      | -      | -      | +      |
|          | Grapsus granulosus                         | -      | +      | -      | -      | -      | -      |
|          | Grapsus tenuicrassatus                     | -      | +      | -      | -      | -      | -      |
|          | Metopograpsus messor                       | -      | +      | -      | -      | -      | +      |
|          | Geograpsus cinipes                         | -      | -      | -      | -      | -      | +      |
| Varunidae| Thalassograpsus harpax                     | -      | -      | +      | -      | -      | -      |
| Ocypodidae| Ocypode saratan                           | -      | -      | +      | -      | -      | +      |
|          | Austruca albimana                          | -      | +      | -      | -      | -      | -      |
| Macrophthalmidae| Chaenostoma bosci                    | -      | +      | -      | -      | -      | -      |
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 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 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 [29, 19, 17]. 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.

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. *Asciophilus caphryaeformis*, ♀ CL 8 mm, CW 6.1 mm; C. *Filumnum 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.  
*Acta (Actaana) 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.
The dominant species in corals habitat were the two species *Cymo androssyi* 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 najidensis* 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).

### 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].

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

| Superfamily       | Family       | Taxon                                                                 |
|-------------------|--------------|----------------------------------------------------------------------|
| Dromioidea        | Dromiidae    | *Cryptodromia fallax* (Lateille in Milbert, 1812)                     |
|                   |              | *Asciophiles caphyraeformis* Richters, 1880                          |
|                   |              | *Epigodromia granulata* (Kossman, 1878)                              |
|                   |              | *Lewindromia unidentata* (Rüppell, 1830)                             |
| Carpiioidea       | Carpiidae    | *Carpiulus convexus* (Forskål, 1775)                                 |
| Eriphioidea       | Eriphiiidae  | *Eriphia smithii* MacLeay, 1838                                      |
| Majoidea          | Majidae      | *Micippa platipes* Rüppell, 1830                                     |
| Pseudoioidea      | Pseudoizidae | *Pseudozius caystas* (Adams & White, 1849)                           |
| Pilumnoidea       | Pilumnidae   | *Pilumnus propinquus* Nobili, 1906                                   |
| Potamooidea       | Potamiidae   | *Socotrapotamon socotrensis* (Hilgendorf, 1883)                      |
| Trapeziidea       | Trapezidae   | *Trapezia cymodoce* (Herbst, 1801)                                   |
|                   | Tetraliidae  | *Tetraloides nigfrons* (Dana, 1852)                                  |
| Xanthoidea        | Xanthidae    | *Atergatis latissimus* (H. Milne Edwards, 1834)                     |
|                   |              | *Xanthias sinensis* (A. Milne-Edwards, 1867)                        |
|                   |              | *Leptodius exaratus* (H. Milne Edwards, 1834)                       |
First Record of Eight Brachyuran Crabs’ Species (Crustacea-Decapoda) in Socotra Archipelago in the Indian Ocean-Yemen

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]+, [15]+, [9]+, [16]+, [17]+, [40]+, [41]+, [13]+, [12]+. 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)          | + | -  | -  | - |    |
|             | Acididiophus caphyraeformis Richters, 1880      | + | -  | -  | - |    |
| Carpiliidae | Carpilus convexus (Forskål, 1775)               | + | -  | -  | - | +5|
| Eriphidae   | Eriphia smithii MacLeay, 1838                   | + | +  | -  | - | +5|
| Menippidae  | Menippe rumphii (Fabricius, 1798)               | - | +  | -  | - | +5|
| Oziidae     | Epicaxthus frontalis (H. Milne Edwards, 1834)   | - | +  | -  | - | +5|
|             | Epicaxthus corrus A. Milne-Edwards, 1873        | - | +  | -  | - | +5|
|             | Epicaxthus 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|
| Leucosidae  | Leucostra sp.                                   | - | +  | -  | - |    |
|             | Rypilla cancellus (Herbst, 1783)                | - | +  | -  | - |    |
| Family       | Species                                                                 | Presence |
|-------------|--------------------------------------------------------------------------|----------|
| Majidae     | Philyra sp [aff. platyceir de Haan, 1841]                                | - + - - - |
|             | Philyra globus (Fabricius, 1775)                                         | - - - - +$^{e}$ |
|             | Philyra sp.                                                               | - - + - - |
|             | Micippa platipes Rüppell, 1830                                           | + + - - +$^{e}$ |
|             | Micippa thalia (Herbst, 1803)                                            | - + - - +$^{e}$ |
|             | Pseudomicippus griffini Kazmi & Tirmizi, 1999                            | - + - - - |
|             | Schizophrys aspera H. Milne Edwards, 1834                                | - - - - +$^{e}$ |
| Inachidae   | Achaenus sp.                                                             | - + - - - |
|             | Macropodia formosa Rathbun, 1911                                         | - + - + +$^{e}$ |
| Epialtidae  | Huenia heraldica (De Haan, 1837)                                         | - + - - - |
|             | Cyphocarcinus sp.                                                        | - - + - - |
|             | Cyphocarcinus minutus A. Milne Edwards, 1868                             | - - - - +$^{e}$ |
|             | Huenia grandidierii A. Milne-Edwards, 1865                               | - + - - - |
|             | Huenia sp.                                                               | - + - - - |
|             | Menaethiops contiguicornis (Klunzinger, 1906)                            | - + - - - |
|             | Menaethiops nodulosa (Nobili)                                            | - + - - - +$^{e}$ |
|             | Menaethiops sp. [aff. fascicularis (Krauss, 1843)]                       | - + - - - |
|             | Menaethius monoceros (Latreille, 1825)                                   | - + + - +$^{e}$ |
|             | Menaethius orientalis (Sakai, 1969)                                      | - + - - - +$^{e}$ |
|             | Menaethius sp.                                                           | - + - - - |
|             | Menaethius sp.2                                                          | - + - - - |
|             | Acanthonyx limbatus A. Milne Edwards, 1862                               | - - - - +$^{e}$ |
|             | Simocarcinus pyramidatus (Heller, 1861)                                  | - + - - - |
|             | Stilbognathus erythraeus von Martens, 1866                               | - + - - - |
|             | Stilbognathus cervicornis (Herbst, 1803)                                 | - - - - +$^{e}$ |
|             | gen. sp.                                                                 | + - + + - |
| Pseudoziidae| Pseudozius caystrus (Adams & White, 1849)                                | + + - + +$^{e}$ |
| Parthenopidae| Furtipodia petrosa (Klunzinger, 1906)                                   | - + - - +$^{e}$ |
|             | Daldorfia horrida (Linnaeus, 1758)                                       | - - - - +$^{e}$ |
|             | Daldorfia spinosissima (A. Milne-Edwards, 1862)                          | - - - - +$^{e}$ |
| Portunidae  | Carupa tenuipes Dana, 1852                                               | - + - - +$^{e}$ |
|             | Portunus (Portunus) segnis (Forskål, 1775)                                | - + + - - |
|             | Portunus (Monomia) euglyphus (Laurie, 1906)                               | - - - - +$^{e}$ |
|             | Portunus (Xiphonectes) hastatoides Fabricius, 1798                       | - - - - +$^{e}$ |
|             | Portunus (Xiphonectes) tenuicaudatus Stephenson, 1961                    | - - - - +$^{e}$ |
|             | Portunus longispinosus (Dana 1852)                                       | - - - - +$^{e}$ |
|             | Portunus orbitosinus Rathbun 1911                                       | - - - - +$^{e}$ |
|             | Portunus pubescens (Dana 1852)                                           | - - - - +$^{e}$ |
|             | Portunus convexus De Haan, 1833                                         | - - - - +$^{e}$ |
|             | Portunus (Portunus) sanguinolentus (Herbst, 1783)                        | - - - - +$^{e}$ |
|             | Portunus sp.                                                             | - - + - - |
|             | Scylla serrata (Forskål, 1775)                                          | - + - - +$^{e}$ |
|             | Thalamita admete (Herbst, 1803)                                         | - + + - +$^{e}$ |
|             | Thalamita spinifera Borradale, 1902                                      | - - + - +$^{e}$ |
|             | Thalamita bandusia Nobili, 1906                                          | - - - - +$^{e}$ |
### Pilumnidae

| Species                                    | Author                                      | Notes |
|--------------------------------------------|---------------------------------------------|-------|
| Thalamita crenata                         | Rüppell, 1830                               | +     |
| Thalamita prymna                         | (Herbst, 1803)                              |       |
| Thalamita quadrilobata                    | Miess, 1884                                 | +     |
| Thalamita cf. stephensi                     | Crosnier 1962                                | -     |
| Thalamita auaensis                       | Rathbun 1906 ssp. margaritima               |       |
| Thalamita philippinensis               | Stephenson & Rees 1967 ssp.                 |       |
| Lissocarcinus laevus                      | Miess 1886                                  |       |
| Lopocyclus tugelae                        | Barnard 1950                                |       |

### Potamidae

| Species                                    | Author                                      | Notes |
|--------------------------------------------|---------------------------------------------|-------|
| Socotrapotamon socotrensisi               | Hilgendorf, 1883                           | +     |
| Socotrapotamon nojindensis               | Apel & Brandis, 2000                       |       |
| Socotra pseudocardiosoma                   | Cumberland & Wranik, 2002                  |       |

### Trapeziidae

| Species                                    | Author                                      | Notes |
|--------------------------------------------|---------------------------------------------|-------|
| Trapezia cymodoce                         | (Herbst, 1801)                             |       |
| Trapezia tigrina                          | Eydoux & Souleyet, 1842                    |       |
| Trapezia rugopunctata                     | (Herbst, 1799)                             |       |

### Tetraliidae

| Species                                    | Author                                      | Notes |
|--------------------------------------------|---------------------------------------------|-------|
| Tetruloides nigrifrons                    | Dana, 1852                                  |       |
| Tetralia caviwama                         | Heller, 1861                                |       |
| Tetralia mata                             | Linnaeus, 1758                              |       |

### Xanthidae

| Species                                    | Author                                      | Notes |
|--------------------------------------------|---------------------------------------------|-------|
| Xanthias sinensis                         | (Milne-Edwards, 1867)                      | +     |
| Xanthias punctatus                        | (Milne-Edwards, 1834)                      |       |
| Leptodius exaratus                        | (Milne-Edwards, 1834)                      | +     |
| Leptodius sanguineus                      | (Milne-Edwards, 1834)                      | +     |
| Leptodius gracilis                       | (Dana, 1852)                                |       |
| Lybia plumosa                             | Barnard 1947                                |       |
| Actaeodes tomentosus                      | (Milne-Edwards, 1834)                      |       |
| Actaeoa savignyi                          | (Milne-Edwards 1834)                       |       |
| Actaeoa cf. spinississima                 | Borradaile 1902                            |       |
| Paraactaea rufopunctata f. illusoria      | Guinot 1969                                 |       |
| Actaeoa sp.                               |                                             | +     |
| Actaeodes hirratissimus                   | (Rüppell, 1830)                            | +     |
| Atergatis latisimus                       | (Milne-Edwards, 1834)                      | +     |
| Atergatis granulata                       | A. Milne-Edwards, 1865                     | +     |
| Atergatis alcocki                         | Laurie 1906                                | +     |
| Epiactaeoa margaritifera                  | Odlum, 1925                                | +     |
| Cymo quadriobatus                         | Miess, 1884                                | +     |
| Cymo androssyi                            | Audouin, 1826                              | +     |
| Cymo deplanatus A. Milne-Edwards          | 1873                                       | +     |
| Chlorodiella cytherea                     | Dana, 1852                                 | +     |
| Genus                              | Species                                                                 | Location                          | Notes     |
|------------------------------------|--------------------------------------------------------------------------|-----------------------------------|-----------|
| Chlorodiella nigra                 | (Forskål, 1775)                                                         |                                   | -         |
| Etisus anaglyptus                  | H. Milne Edwards, 1834                                                  |                                   | - + - + 4^5 |
| Etisus electra                     | (Herbst, 1801)                                                          |                                   | - + - + 4^3 |
| Gaillardiellus rueppelli           | (Krauss, 1843)                                                          |                                   | - - - + 4^5 |
| Paraxanthodes cumatodes            | (Macgilchrist, 1905)                                                    |                                   | - - - + 4^4 |
| Forestiana depressa                | (White, 1848)                                                           |                                   | - + - -    |
| Lachnopodus subscutatus            | (Stimpson, 1858)                                                        |                                   | - + - -    |
| Liomeria rugata                    | (H. Milne Edwards, 1834)                                                |                                   | - + - -    |
| Liomeria rugipes                   | (Heller 1861)                                                           |                                   | - - - + 4^1 |
| Pseudoliomera helleri              | (A. Milne-Edwards 1865)                                                 |                                   | - - - + 4^4 |
| Paractaea rufopunctata             | (H. Milne Edwards, 1834)                                                |                                   | - + - -    |
| Paractaeopsis quadriareolatus      | (Takeda & Miyake, 1968)                                                 |                                   | - + - -    |
| Pilodius areolatus                 | (H. Milne Edwards, 1834)                                                |                                   | - + - -    |
| Pilodius sp.                       |                                                                         |                                   | - - + -    |
| Demania aff. mortenseni            | (Odhner 1925)                                                           |                                   | - - - + 4^1 |
| Laniella spinipes                  | (Heller, 1861)                                                          |                                   | + + + - 4^5 |
| Cycloydus granulatus               | (Targioni-Tozzetti, 1877)                                               |                                   | - + - - 4^3 |
| Cycloydus paumotensis              | (Rathbun, 1907)                                                         |                                   | - + - -    |
| Lophozozymus anaglyptis            | (Heller, 1861)                                                          |                                   | - + - - 4^4 |
| Lophozozymus dodone                | (Herbst 1801)                                                           |                                   | - - - + 4^1 |
| Lophozozymus guerezi               | Guinot 1977                                                             |                                   | - - - + 4^4 |
| Pseudoliomera remotula             | (Rathbun, 1907)                                                         |                                   | - + - -    |
| Zoymodes cavipes                   | (Dana, 1852)                                                            |                                   | - + - - 4^5 |
| Psamnis cavipes                    | (Dana, 1852)                                                            |                                   | - - - + 4^3 |
| Zoymodes xanthoides                | (Krauss, 1843)                                                          |                                   | - + - -    |
| Grapsidae                          |                                                                         |                                   | -         |
| Cyclograpsus integer               | H. Milne Edwards, 1837                                                  |                                   | - + - -    |
| Grapsus albolineatus               | Latreille in Milbert, 1812                                              |                                   | + + + + 4^4 |
| Grapsus granulosus                 | H. Milne Edwards, 1853                                                  |                                   | + + - - 4^3 |
| Grapsus tenuicrustatus             | (Herbst, 1783)                                                          |                                   | + + - - 4^5 |
| Grapsus longitarsus                | Dana, 1851                                                              |                                   | -         |
| Grapsus sp.1                       |                                                                         |                                   | - + - -    |
| Grapsus sp.2                       |                                                                         |                                   | - - + -    |
| Metopograpsus messor               | (Forskål, 1775)                                                         |                                   | + + + - 4^3 |
| Metopograpsus thukahar             | (Owen, 1839)                                                            |                                   | + + - - 4^5 |
| Geograpsus crinipes                | (Dana, 1851)                                                            |                                   | + + - -    |
| Pachygrapsus minutus               | A. Milne-Edwards, 1873                                                  |                                   | - + - - 4^5 |
| Plagusidae                         |                                                                         |                                   | -         |
| Percnon guinotae                   | Crosnier, 1965                                                           |                                   | - + - - 4^5 |
| Percnon planissimum                | (Herbst, 1804)                                                          |                                   | - + - - 4^3 |
| Plagista tuberculata               | Lamarck, 1818                                                           |                                   | - + - - 4^5 |
| Varunidae                          |                                                                         |                                   | -         |
| Thalassograpsus harpas             | (Hilgendorf, 1892)                                                      |                                   | + + - - 4^5 |
| Pseudohelice subquadrata           | (Dana, 1851)                                                            |                                   | - + - - 4^2 |
| Gecarcinidae                       |                                                                         |                                   | -         |
| Cardisoma carnifex                 | (Herbst, 1796)                                                          |                                   | - + - +    |
| Macrophthalmidae                   |                                                                         |                                   | -         |
| Chaenostoma boscii                 | (Audouin, 1826)                                                         |                                   | + + - +    |
| Dotillidae                         |                                                                         |                                   | - + - - 4^3 |
| Ocypodidae                         |                                                                         |                                   | + + + + 4^5, 4^6, 4^8 |

### Notes:
- Numbers in superscript indicate the presence of certain characteristics or traits associated with each species.
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مقالة بحثية

تسجيل أول لثمانية انواع من السرطانات قصيرات البطن (فشاريات- عشريات الأرجل) في أرخبيل سقطرى

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الملتزم:

تمتلك اليمن عدد كبير من الجزر في البحر الأحمر تشمل جزيرة كمران، عقبان، أرخبيل حنيش وميون (كانت تسمى قديما جزيرة بريم)، وجزر أخرى في خليج عدن. على المحيط الهندي تملك اليمين أرخبيل سقطرى الذي يقع شرق القرن الافريقي بـ240 كم، وعن جنوب اليمن بـ380 كم. أرخبيل سقطرى لديه تنوع كبير في البيئات، حيث توجد البيئات الرملية، الصخرية، المسطحات الطينية، بيئة النبات، الشعاب المرجانية، وبينها المياه العذبة.

هدف هذه الدراسة إلى تسجيل وحصر أنواع السرطانات قصيرات البطن في مختلف البيئات في جزر سقطرى. تم جمع العينات باليد، الشبكة اليدوية، الغوص باستخدام السنورلك حتى عمق 3 متر. العينات جمعت من ست مواقع في سقطرى خلال فترات زمنية متقطعة من 1984 إلى 2000، حفظت هذه العينات في جامعة روستوك الألمانية ومنتحف ميونخ لعلم الحيوان في المانيا. تم تسجيل 32 نوعًا من السرطانات قصيرات البطن في هذه الدراسة تندرج تحت 29 جنسا، 11 فوق عائلة و14 عائلة. ثمانية أنواع منها تسجل لأول مرة في أرخبيل سقطرى. العائلات السائدة في هذه الدراسة هي عائلة الزانثيدا بنسبة 35% و11 نوع سجل فيها، ثانية عائلة الجرابسيدا بنسبة 19% و6 أنواع سجلت فيها.

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

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