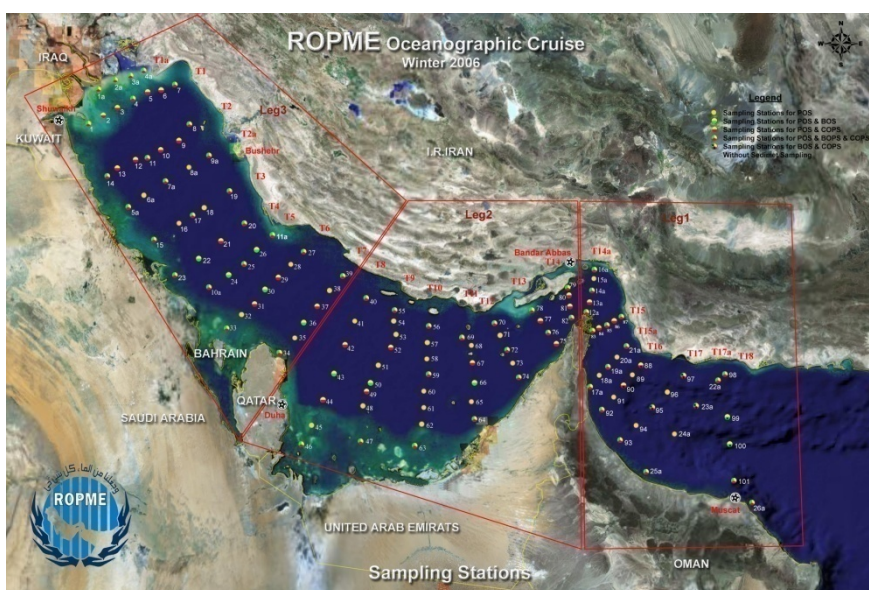




Regional Organization for the Protection of the Marine Environment

ROPME Oceanographic Cruise – Winter 2006



Monograph Series

Monograph : No. 2

Zooplankton in the ROPME Sea Area

January 2013

ROPME Oceanographic Cruise - Winter 2006

Monograph Series:

1. Phytoplankton
2. Zooplankton
3. Meiobenthos
4. Foraminifera
5. Macrobenthos

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Preface

In recognition of the importance of the oceanographic Cruises in the ROPME Sea Area to understand the state of the marine environment, ROPME Council has assigned high priority to the ROPME scientific Cruises. In pursuance of the Council Decision CM12/7, ROPME was mandated to coordinate a comprehensive oceanographic Cruise in Winter 2006. The Cruise was planned in such a way that the results and reports of the studies can find their way into the synthesis of ROPME State of the Marine Environment Report.

As a result of sustained efforts, cooperation of Member States, guidance of the designated scientific committee for the Cruise, encouragements from the Executive Committee of ROPME and the generous provisions made by the Council, the historic Winter Cruise was carried out successfully on board of M/V Ghods of I.R. Iran during 1st February and 11th March 2006.

Totally, 115 stations covering the RSA have been surveyed and 97 experts from ROPME Member States participated in the Cruise. The survey covered most of the main oceanographic disciplines.

The samples collected during the Cruise were distributed on a competitive basis to the competent laboratories in the Region and elsewhere for detailed analyses while sub-sample sets were kept in ROPME Marine Sample Bank to enable repetitive analyses in future, when required.

To enhance benefits from the reproduced results of the Cruise among Regional scientific community towards a better understanding of the marine environment in the RSA and to enable furtherance of marine researches, ROPME Secretariat decided on the publication of the results in a series of Monographs as follows:

1. Phytoplankton
2. Zooplankton
3. Meiobenthos
4. Foraminifera
5. Macrobenthos

The present Monograph is devoted to the taxonomy of zooplankton in the RSA. The analyses of samples and reporting have been conducted by a team of scientists led by Prof. M.M. Dorgham of Department of Oceanography, Alexandria University, under a contract with ROPME.

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1. Introduction

Zooplankton is one of the most fascinating, diverse and abundant group of animals living in the world seas. They demonstrate wide variety of size, from microscopic unicellular of few microns (foraminiferans and radiolarians) to millimeter (Copepods) or the clearly seen and large jelly fish (*Physalia physalia*). In addition to size variations, zooplankton play an important role in the biological diversity of the marine ecosystem, as it include representatives of almost all taxonomic phyla of the animal kingdom.

According to their mode of life, zooplankters are grouped into holoplankton that live their entire life in the plankton and meroplankton, which temporary found in plankton and include the eggs and larvae of numerous fishes and invertebrates, like worms, molluscs (gastropods and bivalves), decapods (crabs and shrimp) and echinoderms (starfish and sea urchins). In many occasions, meroplankton constitute important component of zooplankton, particularly in the coastal waters, and has important ramifications to the dynamics of benthic invertebrates and on fish species. The meroplankton experienced variable seasonal occurrence relative to the spawning time of different benthic animals. Holoplankton comprise two main groups; the first one includes the protozoans which composed of unicellular animals like forminifera, radiolarian, tintinnids and the second group is represented by metazoan zooplankton. Among metazoan holoplankton crustacean copepods (1-2 mm long) are generally the most abundant zooplankton species. Other crustaceans are also zooplankton components, such as water fleas (Cladocerans), mussel shrimp (Ostracods), opossum shrimp (Mysids), krill (Euphausiids), sand fleas (Amphipods) true shrimps (Decapods) and Isopods. The molluscan pteropods are also planktonic. Cnidarian medusae (jellyfish) including hydromedusae, siphonophores and scyphomedusae and the ctenophores (comb jellies) are among the major holoplankton components. Arrow worms (or Chaetognaths) are an important planktonic group, as active predators on other zooplankton. In addition, chordates include some holoplanktonic representatives, including larvaceans and thaliaceans (salps).

Zooplankton distribution and abundance influence pelagic fishery potentials, whereas fishes, particularly plankton feeders, mostly breed in areas with plenty of planktonic organisms. Since the zooplankton constitute the principal diet for most of the larger pelagic animals,

including commercially important fish and whales, their study is essential to understand the functioning of marine ecosystems.

Zooplankton are intermediate component in marine food webs, as a carrier of energy from phytoplankton to higher trophic levels such fish, whales, sea birds, and therefore play a key role in the biogeochemical cycle of the ocean. Knowing the biology of each zooplankton species is important to follow up the dynamic of zooplankton population.

Numerous zooplankton species are important food for larval fish, such as rotifers, cladocerans or copepods, and they are widely used as food in fish culture. The copepod *Calanus finmarchicus* is important as food for the herring, and the euphausiid *Euphausia superba*, commonly known as krill, is the main food source for blue and fin whales in the Antarctic Ocean. Other species of copepods, mysids, euphausiids and Scyphomedusae are commercially fished and utilized as food or feed in several countries over the world. There is a possibility of utilizing plankton as a food source for mankind, whereas much interest has focused recently on the fishing of Antarctic krill. Plankton fisheries utilizing crustaceans and jellyfish have existed for many years in various parts of the world. The copepods *Pseudocalanus moultoni*, *P. newmani*, *Centropages hamatus*, *C. typicus* and *Temora longicornis* are commonly used as food for fish in the shallower regions of the Gulf of Maine, on Georges Bank, on the Southern New England Shelf, and on the inner Middle Atlantic Bight Shelf.

Individual copepod species can serve as indicators of the long-term changes in overall species composition when certain species disappeared over time and other species appeared, compared throughout several years. Regardless of the great number of zooplankton investigations in the oceans numerous studies are still needed to know the real zooplankton diversity and abundance in the oceans, particularly away from coastal regions, and in the subsurface waters. Although thousands of species of different zooplankton groups are known to occur in the marine habitat, many species are still unknown, waiting to be discovered.

The ROPME Sea Area is one of the most productive sea area among the world seas. It is characterized by relatively high zooplankton diversity, where a total of 470 species have been recorded, of which 235 species were found during the ROPME oceanographic cruise Winter 2006. This monograph deals with the zooplankton species found in the ROPME Sea Area during the oceanographic cruise Winter 2006, particularly those which are widely distributed

and occurred in relatively high count. However, several of the described species in the monograph were less frequent or rare in the area.

The monograph includes representatives of the Protozoan tintinnids, the metazoan cnidarians, ctenophores, copepods, other planktonic crustaceans (euphausiids, amphipods and mysidaceae), chaetognaths, planktonic adult polychaetes and molluscs (Pteropods), in addition to holoplanktonic chordates (larvaceans and thaliaceans). The protozoans were represented by 35 species, mainly tintinnids (27 species). Among metazoan holozooplankton, copepods were the most diversified, comprising 94 species, distributed between calanoids (56 species), cyclopoids (33 species) and harpacticoids (5 species). Cnidarians were the second diversified group, represented by 34 species, including 16 siphonophores, while planktonic polychaetes and molluscs comprised 11 species each, and the holoplanktonic chordates comprised 9 species for larvaceans and 11 species for Thaliaceae. The chaetognaths were represented by 8 species.

2. Material and Methods

The materials of this monograph were obtained from zooplankton samples collected by the scientific team of the Regional Organization for the Protection of the Marine Environment (ROPME) from the ROPME Sea Area during oceanographic cruise Winter 2006. The zooplankton samples were collected by coarse plankton net of 110 μ m mesh size and the mouth of the net was fixed with a flowmeter. The net hauls were carried out obliquely at variable depths (6-14 m) and variable angles (20° - 50°) at the different sampling stations. The time of net towing varied from 1 to 4 minutes at Research Vessel speed of 2 knots/hr at most stations and 1-2 knots/hr at some stations. As shown in Figure (1), the sampling stations were chosen to cover all parts of the the inner RSA, Straits of Hormuz and the northern part of the Sea of Oman.

A total of 59 samples collected from various sites of RSA (Table 1) were analysed by the Department of Oceanography, Faculty of Science, University of Alexandria (AUDO). These samples were examined for species identification. Each zooplankton sample was examined carefully under the microscope and all taxa were identified to the species level, following the

methods of Giesbrecht (1891; 1892; 1897), Cleve (1901), Thompson and Scott (1903), Burfield (1927), Kofoed and Campbell (1929; 1939), Hada (1932; 1937), Lohmann (1931), Rose (1933), Sewell (1948), Tregouboff and Rose (1957), Marshall (1969) and Paulmier (1997).

For the identified zooplankton species, clear specimens were selected and photographed. Three sets of photographs were taken in three different laboratories. Photos of large number of specimens were taken under a 3D microscope at the Research Centre of Qatar University, Qatar. A number of photos were taken under a scanning electronic microscope at the Faculty of Science, Alexandria University, Egypt, while some photos were taken under a research microscope fitted with a digital camera at the laboratory of Biological Oceanography in Oceanography Department, Faculty of Science, Alexandria University. The representatives of each group are described with photographic illustrations as given in the following pages.

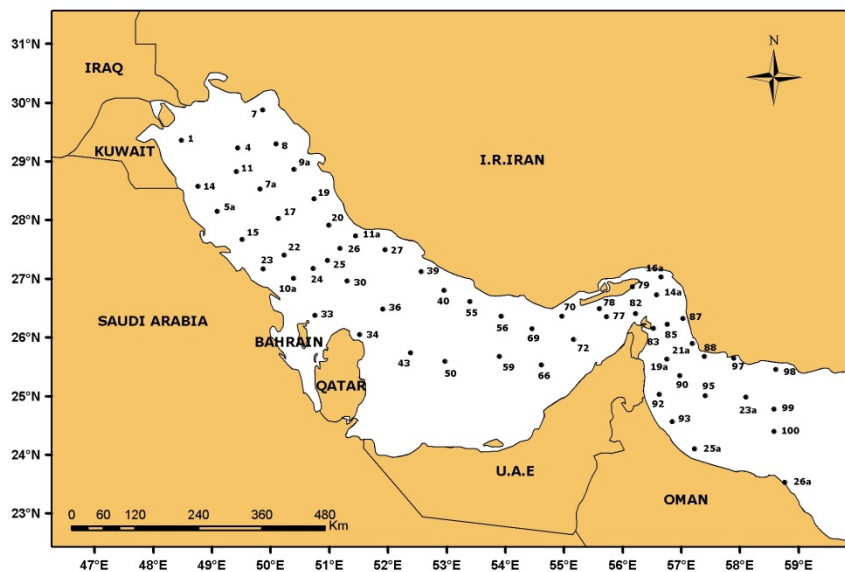


Figure 1. ROPME's map of sampling stations, for the Winter 2006 Cruise

Table 1. List of sampled stations in the RSA

Stations	Latitude (N)	Longitude (E)	Stations	Latitude (N)	Longitude (E)
1	48° 28' 59.90"	29° 21' 0"	72	55° 10' 5"	25° 57' 15"
4	49° 26' 29"	29° 13' 15"	78	55° 36' 28"	26° 28' 46"
7	49° 52' 3"	29° 52' 6"	79	56° 10' 23"	26° 51' 3"
8	50° 5' 29"	29° 17' 35"	82	56° 13' 35"	26° 23' 46"
11	49° 25' 7"	28° 49' 7"	83	56° 31' 46"	26° 8' 46"
14	48° 45' 42"	28° 33' 53"	85	56° 46' 0"	26° 13' 0"
15	49° 30' 56"	27° 39' 51"	87	57° 1' 48"	26° 18' 54"
17	50° 7' 54"	28° 1' 7"	92	56° 37' 48"	25° 1' 20"
19	50° 44' 19"	28° 21' 2"	93	56° 50' 44"	24° 33' 9"
20	50° 59' 31"	27° 54' 25"	95	57° 24' 45"	24° 59' 36"
22	50° 13' 57"	27° 23' 53"	97	57° 53' 60"	25° 38' 12"
23	49° 52' 22"	27° 9' 34"	98	58° 36' 55"	25° 26' 48"
24	50° 43' 30"	27° 10' 6"	99	58° 35' 6"	24° 46' 8"
25	50° 58' 24"	27° 18' 17"	100	58° 35' 15"	24° 23' 24"
26	51° 11' 4"	27° 30' 30"	5a	49° 5' 30"	28° 8' 30"
27	51° 57' 0"	27° 29' 12"	7a	49° 49' 19"	28° 31' 9"
30	51° 18' 30"	26° 57' 6"	9a	50° 24' 12"	28° 51' 12"
33	50° 45' 30"	26° 21' 48"	10a	50° 23' 42"	26° 59' 48"
34	51° 31' 12"	26° 2' 30"	11a	51° 27' 5"	27° 43' 11"
36	51° 54' 54"	26° 28' 11"	14a	56° 34' 54"	26° 43' 12"
39	52° 34' 6"	27° 7' 0"	16a	56° 39' 18"	27° 1' 24"
40	52° 57' 24"	26° 47' 48"	19a	56° 45' 29"	25° 37' 23"
43	52° 23' 10"	25° 43' 31"	21a	57° 11' 18"	25° 53' 24"
50	52° 58' 14"	25° 35' 6"	23a	58° 6' 18"	24° 58' 13"
55	53° 24' 3"	26° 36' 3"	25a	57° 13' 49"	24° 5' 30"
56	53° 55' 52"	26° 20' 54"	26a	58° 46' 6"	23° 31' 0"
59	53° 53' 57"	25° 39' 53"	77	55° 43' 34"	26° 20' 40"
66	54° 37' 9"	25° 31' 5"	88	57° 24' 3"	25° 40' 3"
69	54° 27' 30"	26° 8' 23"	90	56° 58' 32"	25° 20' 19"
70	54° 57' 57"	26° 21' 6"			

3. Results

3.1 Phylum: Ciliophora

Class: Ciliata

Sub-class: Spirotrichia

3.1.1 Order: Tintinnida

Tintinnids are planktonic unicellular animals, mainly marine, with conical or trumpet-shaped pelagic forms bearing shells (loricae). The lorica is composed of a gelatinous or pseudochitinous secretion, containing foreign materials, such as sand grains or organic debris. Its shape may range from trumpet- or bell-form to cylindrical, subspherical, bowl, vase or tube, within which the ciliate cell can withdraw. The exact structure and the dimensions of the lorica are greatly different among the hundreds of tintinnid species, and the taxonomic arrangement of forms within the order has been based solely on characteristics and properties of the lorica.

Family: Codonellidae

Genus: Tintinnopsis Stein

Scientific Name: *Tintinnopsis beroidea* Stein

Synonyms:

Tintinnopsis beroidea var. *acuminata* (part), Daday, 1887, *Tintinnopsis karajacensis* Edt., Merkle, 1909.

References:

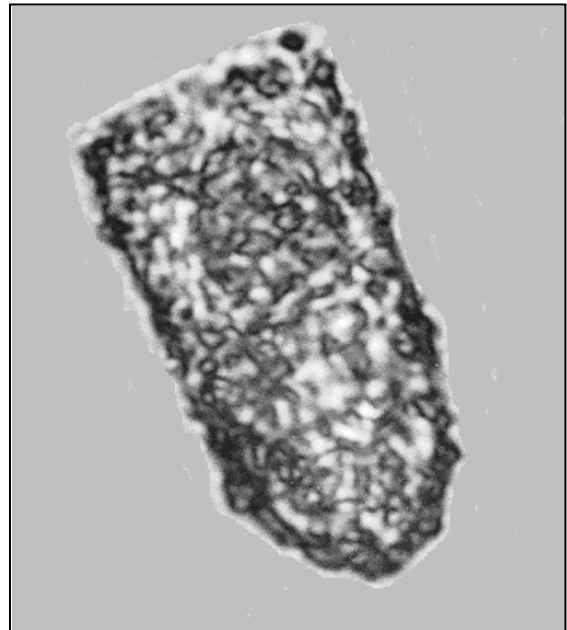
Stein, 1867; Entz, 1884; Entz, 1908; Meunier, 1910; Kofoid and Kampbell, 1929; 1939; Hada, 1932; 1937; 1938; Duran, 1953.

Description:

Lorica bullet-shaped, usually cylindrical in the anterior part, and conical poster; aboral end acute or bluntly pointed; wall with a faint spiral structure, moderate agglomeration and without spiral structure. The lorica is about 2.3µm oral diameters.

Distribution:

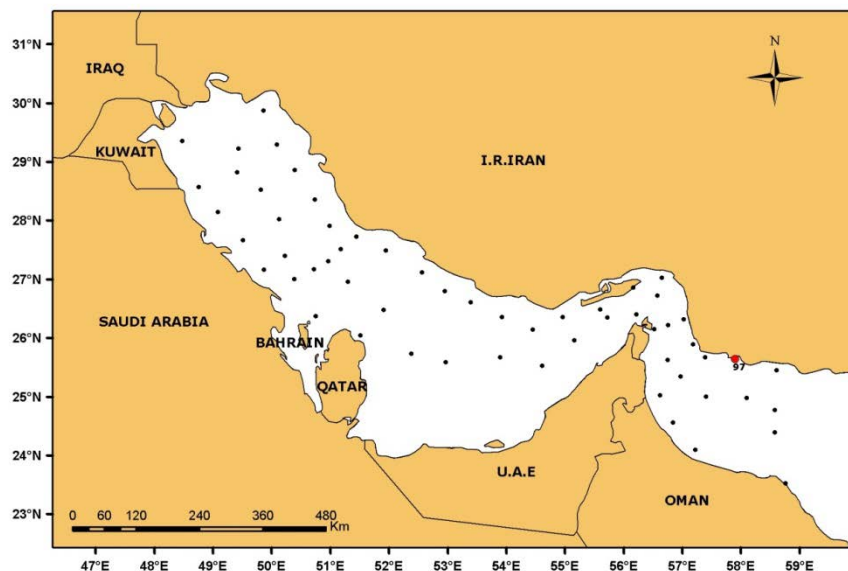
Cosmopolitan, distributed in the neritic zone of temperate seas.



Tintinnopsis beroidea (200x)

Sites of occurrence in RSA:

Sea of Oman on Iranian Coast (Present study, refer site map), ROPME Sea Area and Sea of Oman (Dorgham, 1990), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz 2001), Kuwait waters, Bubyen Island (Skryabin and Al-Yamani, 2007).



Site of occurrence of *Tintinnopsis beroidea* in RSA

Family: Codonellidae

Genus: Tintinnopsis Stein

Scientific Name: *Tintinnopsis cylindrica* Daday, 1887

References:

Balech, 1959; Burns, 1983; Agatha and Riedel- Lorje, 2006.

Description:

Lorica large, cylindric, aboral end produced to a straight horn, lorica is coated by grains from the internal side.

Distribution:

Widely distributed in the plankton of marine and brackish coastal waters, Indian Ocean, Atlantic, and Pacific, Netherland, Mediterranean, Nervión River estuary, Basque Country, Spain, Northwest Atlantic Ocean.



Tintinnopsis cylindrica (200x)

Sites of occurrence in RSA:

Occasionally found in a mixed sample from several samples inside the inner RSA. Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz 2001), Kuwaiti waters (Al-Yamani *et al.*, 2004).

Family: Codonellidae

Genus: Tintinnopsis Stein

Scientific Name: *Tintinnopsis lobiancoi* Daday, 1887

Synonyms:

Tintinnopsis radix f. *cyrt-subrotundata* Laackmann, 1913; *Tintinnopsis radix* f. *subrotundata* Laackmann, 1913; *Tintinnopsis Lobiancoi* Daday, 1887b; *Tintinnopsis* sp.; Brandt, 1906-1907; *Tintinnopsis lobiancoi*: Kofoid and Campbell, 1929; Balech, 1945; Souto, 1979; Barría de Cao, 1981; *Tintinnopsis brasiliensis*: Kofoid and Campbell, 1929; Souto, 1979; Barría de Cao, 1981; *Tintinnopsis lata*: Balech, 1945.

References:

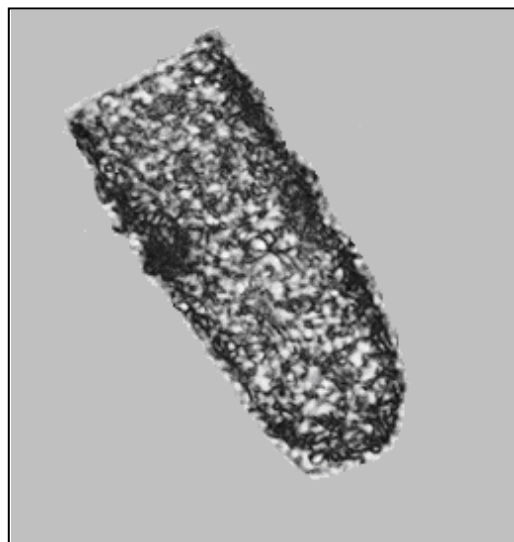
Meunier, 1910; Meunier, 1919; Müller, 2004; Scott and Marchant, 2005.

Description:

Lorica elongate, tubular, usually straight, with length 4.5µm oral diameters and ragged oral rim; aboral end rounded; wall agglomerated roughly, without a spiral structure; bowl sometimes more or less flaring orally.

Distribution:

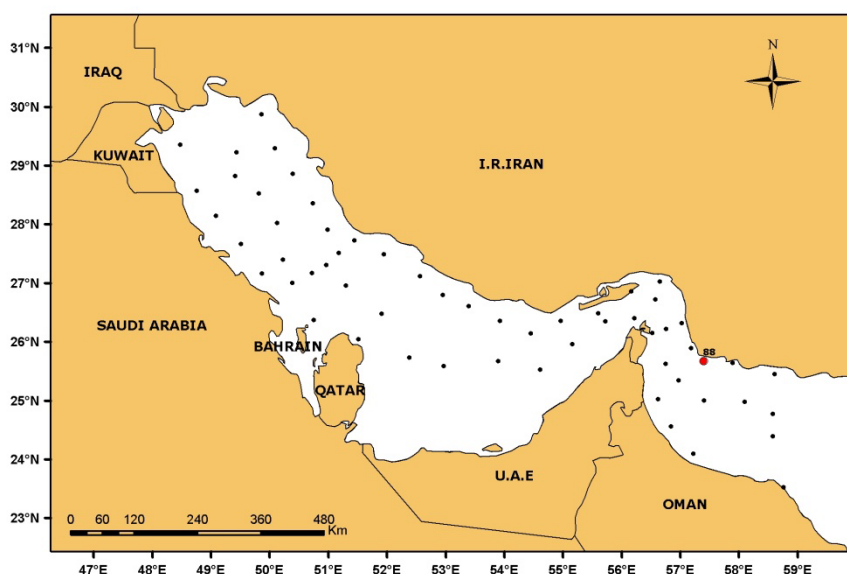
Red Sea, Caribbean Sea, S.W. Netherlands, Black Sea, Atlantic Ocean, Brazil.



Tintinnopsis lobiancoi (200x)

Sites of occurrence in RSA:

Sea of Oman near Iranian Coast, St. 88 (Present study, refer site map), ROPME Sea Area and Sea of Oman (Dorgham, 1990), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz 2001).



Sites of occurrence of *Tintinnopsis lobiancoi* in RSA

Family: Codonellidae

Genus: Tintinnopsis Stein

Scientific Name: *Tintinnopsis radix* (Imhof, 1886) Brandt, 1907

Synonyms:

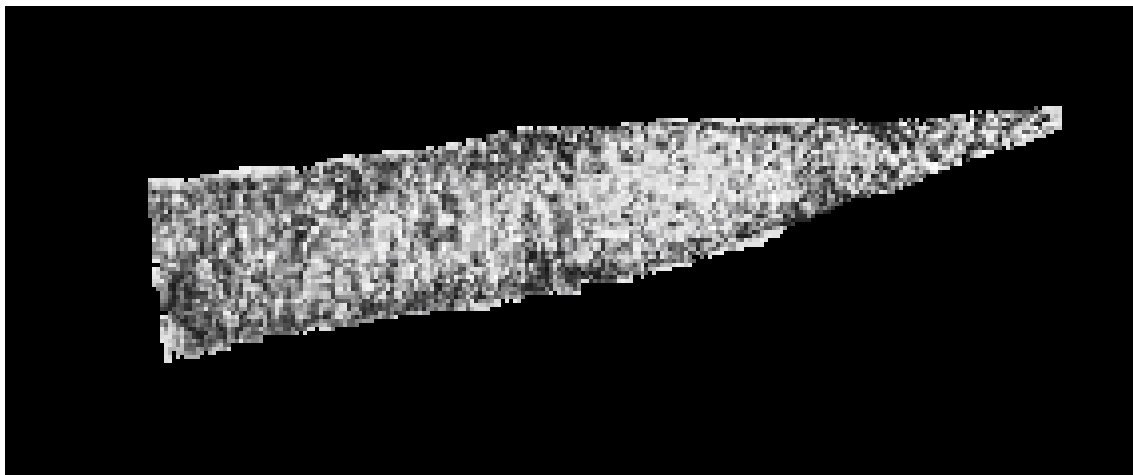
Codonella radix Imhof, 1886; *Tintinnopsis curvicauda* Daday, 1887; *Tintinnopsis davidoffii* Daday, 1887; *Tintinnopsis davidoffii* var. *cylindrica* Daday, 1887; *Tintinnopsis davidoffii* var. *longicauda* Daday, 1887; *Tintinnopsis fracta* Brandt, 1906; *Tintinnopsis radix* f. *cylindrica* Laackmann, 1913; *Tintinnopsis radix* f. *curta* Laackmann, 1913; *Tintinnopsis radix* f. *typica* Laackmann, 1913.

References:

Balech, 1959; Parker (Ed.), 1982; Naidu, 1985; Krishnamurthy *et al.*, 1986; Godhantaraman, 1994; 2001. Patterson, 2001; Agatha and Riedel-Lorje, 2006.

Description:

Lorica elongate, tubular, length 6-7µm oral diameters; bowl cylindrical, oral rim generally entire, aboral region tapering gradually into an aboral horn; usually more or less curved, wall more or less thin, with a weakly developed spiral structure.



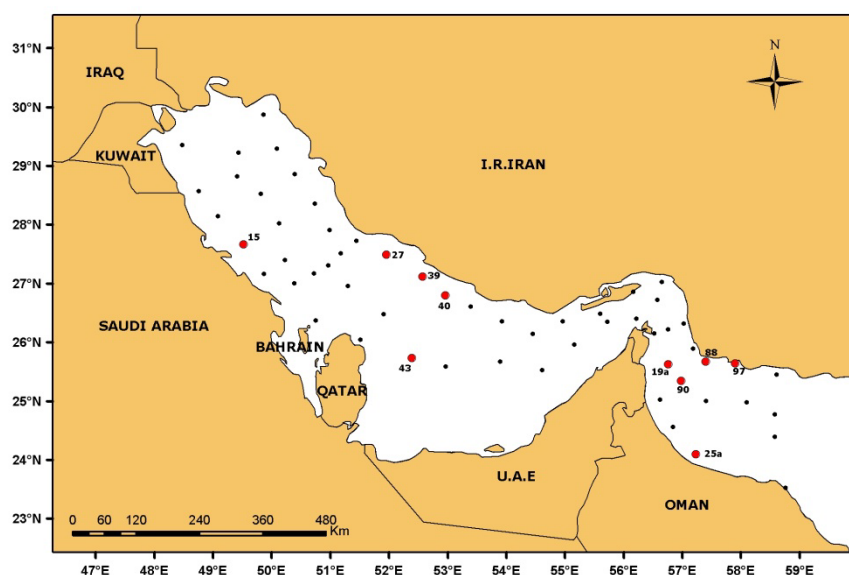
Tintinnopsis radix (200x)

Distribution:

Arctic and Antarctic seas, Northern Ionian Sea, Porto Novo, India, Chesapeake Bay, Buzzards Bay (USA), Korea, Arabian Sea, Arctic and Antarctic Seas, Sea of Japan, Brazil, North Pacific, Atlantic Ocean, Mediterranean Sea.

Sites of occurrence in RSA:

Saudi coast, Iranian coast, central inner RSA, and Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and Abdel-Aziz 2001); Kuwait waters, Bubyah Island (Skryabin and Al-Yamani, 2007).



Sites of occurrence of *Tintinnopsis radix* in RSA

Family: Dictyocystidae

Genus: Dictyocysta

Scientific Name: *Dictyocysta elegans* Ehrenberg

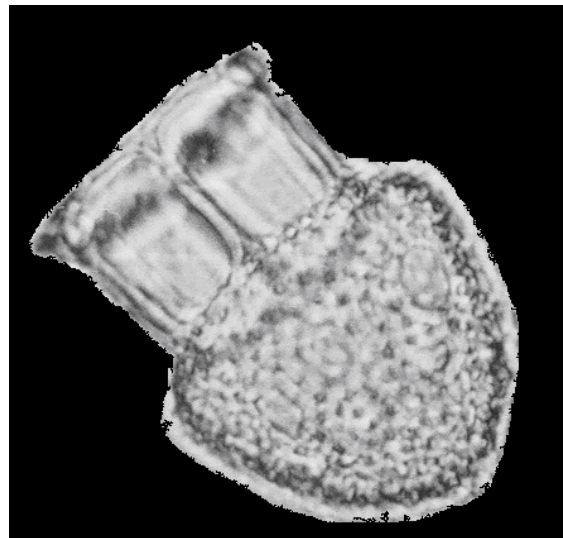
Synonyms:

Dictyocysta speciosa Kofoid and Campbell, 1929; *Dictyocysta ampla* Kofoid and Campbell, 1929, 1939; *Dictyocysta inaequalis* Kofoid and Campbell, 1929; *Dictyocysta magna* Kofoid and Campbell, 1929; *Dictyocysta lepida* Ehrenberg, 1854b; Jörgensen, 1924; Kofoid and Campbell, 1929; *Dictyocysta templum* Haeckel, 1873; *Dictyocysta tiara* Haeckel, 1873;

Dictyocysta templum var. *indica* Laackmann, 1910; *Dictyocysta lata*: Kofoid and Campbell, 1929; *Dictyocysta nidulus* Kofoid and Campbell, 1929; *Dictyocysta mexicana* Kofoid and Campbell, 1929, 1939; *Dictyocysta occidentalis* Kofoid and Campbell, 1929, 1939; *Dictyocysta reticulata* Kofoid and Campbell, 1929, 1939.

References:

Balech, 1959; Zavodnik and Kovacic, 2000; Gustavo *et al.*, 2002; Gomez and Gorsky, 2003; Fernades, 2004; Raffaella *et al.*, 2007; Sitran *et al.*, 2007; 2009.



Dictyocysta elegans (200x)

Description:

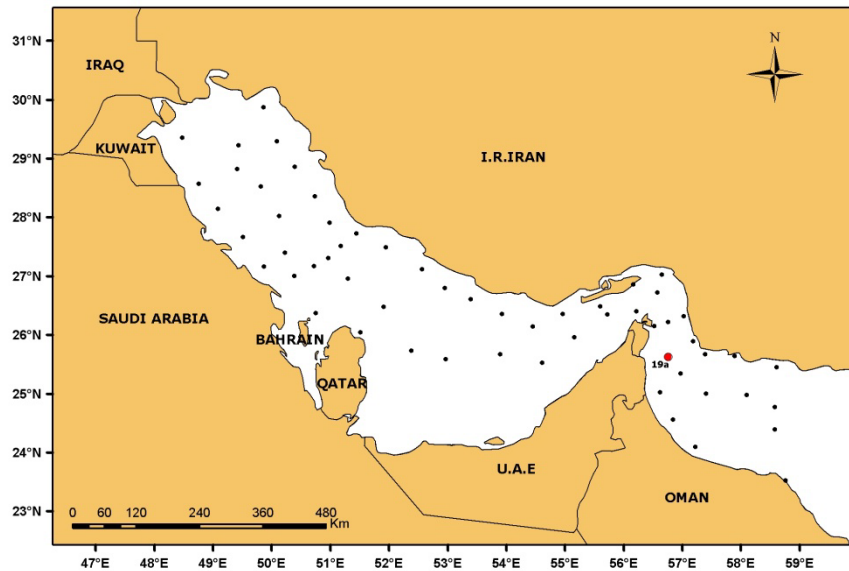
Lorica consists of a cylindrical collar and a subspherical bowl, the collar is a little more than a third of the whole length, and the bowl is widest just below the collar, and is bluntly pointed aborally; wall of the bowl with a rather uniform reticulation which is not seen in the collar, sometimes bearing coccoliths on the surface, having one row of 6-7 μ m large ovate fenestrae in its middle and a posterior row of a few small ones. The rest of the bowl is made up of very regular polyhedral reticulations.

Distribution:

Southwestern Pacific, Indian Ocean, Tasinan Sea, Mediterranean Sea, Baltic Sea, North and south Atlantic, New Zealand.

Sites of occurrence in RSA:

Restricted to the northern Sea of Oman, St. 19a (Present study, refer sites map).



Site of occurrence of *Dictyocysta elegans* in RSA

Family: Undellidae

Genus: *Favella*

Scientific Name: *Favella azorica* (Cleve) Jorgensen

Synonyms:

Undella azorica Cleve, 1900; *Favella azorica* (Cl.) Jorgensen, 1924; *Favella azorica* var. *campanula* Kofoed & Campbell, 1929; *Favella azorica* var. *composita* Kofoed & Campbell, 1929; 1939; Marshal, 1934; Campbell, 1942; Duran, 1951; *Favella composita* Kofoed & Campbell, 1929; *Favella azorica* var. *punaensis* (Cleve) Jorgensen Tazan, 1965.

References:

Balech, 1959; Dorgham 1990.

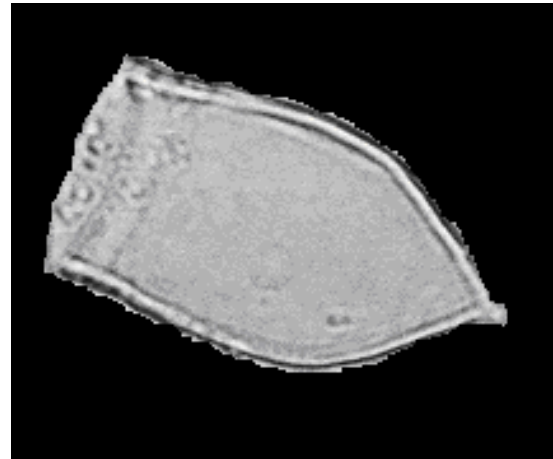
Description:

Lorica inverted bell-shaped, 1.4-1.8µm suboral diameters in length; oral margin entire with a slight brim; oral annular band usually single, single-layered; bowl cylindrical in the anterior half of the lorica, posteriorly convex conical (80-85 degrees) to a rounded end; wall hyaline,

distinctly separated in the dilated band below the suboral annular ring and in the aboral end, but scarcely in the other part.

Distribution:

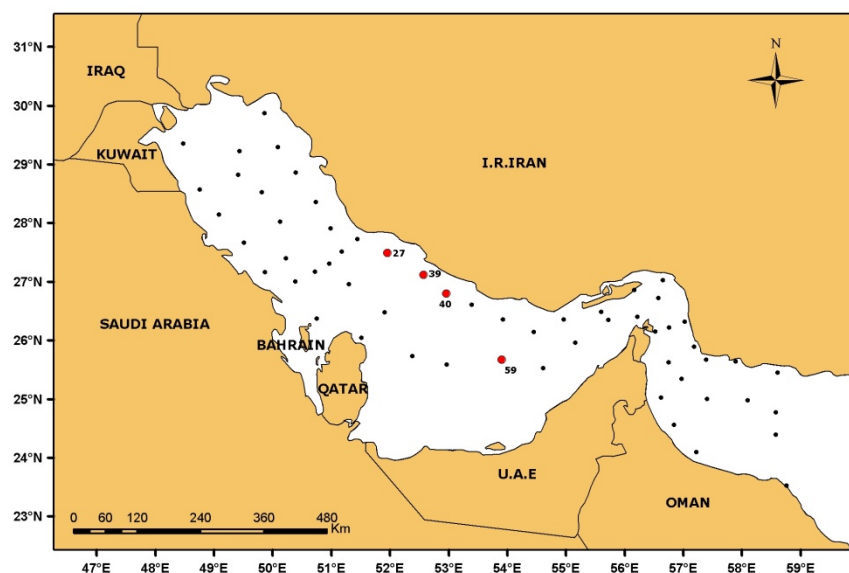
Mediterranean Sea, Southampton, Black Sea, Red Sea, Gulf of Guataquil (Pacific).



Favella azorica (200x)

Sites of occurrence in RSA:

Inner RSA, near Iranian Coast and in the central area, St. 59 (Present study, refer sites map), ROPME Sea Area and Sea of Oman (Dorgham 1990), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and Abdel-Aziz, 2001).



Site of occurrence of *Favella azorica* in RSA

Family: Undellidae

Genus: *Parafavella*

Scientific Name: *Parafavella gigantea* (Brandt, 1896)

Synonyms:

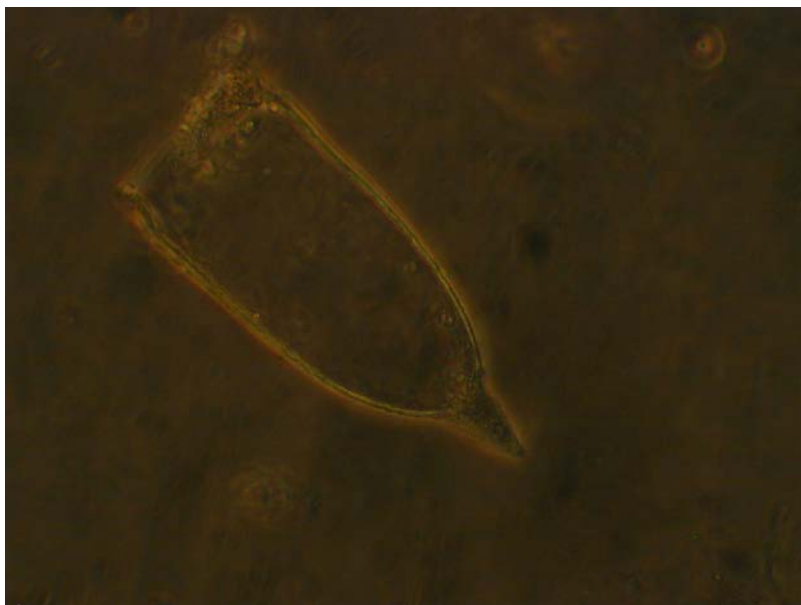
Cyttarocyclus gigantean Brndt 1896; *Cyttarocyclus denticulata* var. *δ gigantea* Jorgensen 1899; *Cyttarocyclus denticulata* var. *gigantea* Cleve 1899; Jorgensen 1901; Brandt 1906; *Cyttarocyclus denticulata* var. *elongata* Jorgensen 1901; *Cyttarocyclus cuspedata* Meunier 1910, *Parafavella gigantea* Kofoed and Kampbell, 1929.

References:

Hedin, 1974; Marshall, 1969; Hada, 1932b.

Description: (After Hada,1932 b).

Lorica elongated tubular, oral margin denticulated with about 45 teeth, bowl nearly cylindrical, somewhat expanding in the suboral part, its greatest transdiameter 1-1.1 μ m oral diameter, constricted slightly at the middle, aboral region convex conical , tapering into a long slender horn, aboral horn straight or more or less curved, with a pointed tip.



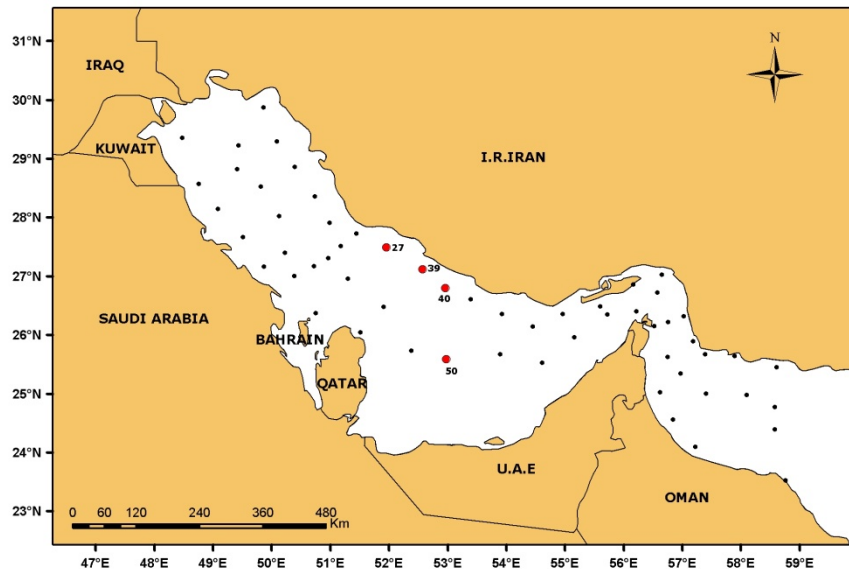
Parafavella gigantea (200x)

Distribution:

North Atlantic, North Pacific, Arctic, Mediterranean , Southern Bering Sea, Baltic Sea.

Sites of occurrence in RSA:

Inner RSA, near Iranian Coast and in the central area (refer sites map).



Site of occurrence of *Parafavella gigantea* in RSA

Family: Codonellopsidae

Genus: *Codonellopsis*

Scientific Name: *Codonellopsis americana* (Kofoid & Campbell)

Synonyms:

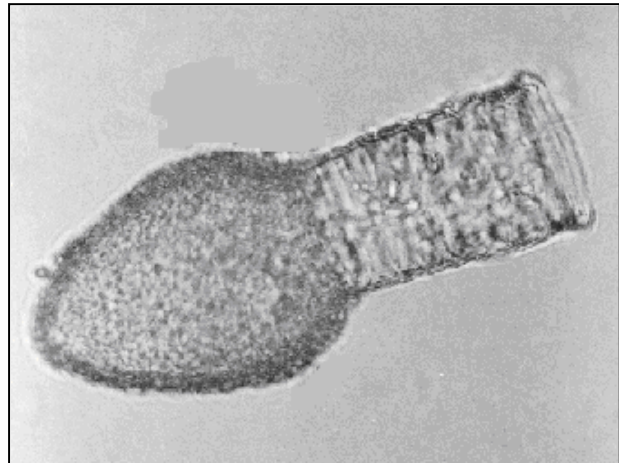
Codonella morchella var. *schabi* Brandt 1906; *Codonella morchella* Brandt 1906; *Codonella morchella* var. *erythraensis* Brandt, 1906; *Codonellopsis morchella* (Cleve) Jorgensen, 1924; *Codonellopsis schabi* (Bdt.) Kofoid & Campbell, 1929; *Codonellopsis erythraensis* (Bdt.) Kofoid & Campbell ; *Codonellopsis americana* Kofoid & Campbell, 1929; Kofoid & Campbell, 1939; Campbell, 1942; *Codonellopsis indica*, Kofoid & Campbell, 1939; *Codonellopsis globosa*, Kofoid & Campbell, 1929; *Codonellopsis orientalis*, Hada, 1932).

References:

Kofoid and Campbell, 1929; 1939; Hada, 1938; Campbell, 1942; Dorgham, 1990.

Description:

Lorica elongated, length 3.0-3.8µm oral diameters; oral rim abruptly flaring, everted; collar slightly shorter than the bowl, 0.41-0.45µm of the total length in length, very slightly dilated in its middle, with 11-15µm spiral turns and a few transversely oval fenestrae on some median ones; bowl ellipsoidal, 1.45-1.56µm oral diameters in greatest diameter; aboral region rounded; wall generally agglomerated with comparatively small particles.



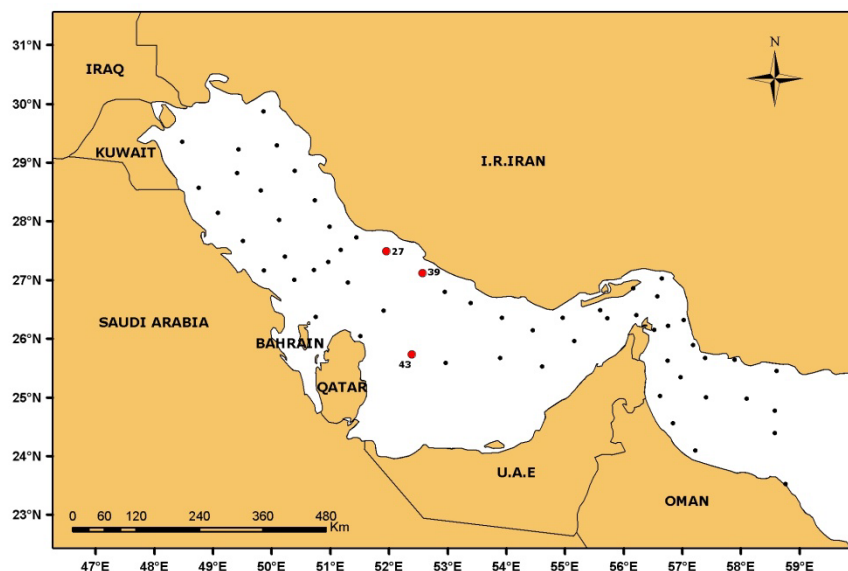
Codonellopsis americana (200x)

Distribution:

Atlantic, Pacific, Inter-tropical species, Mediterranean.

Sites of occurrence in RSA:

Inner RSA, near Iranian Coast and off Qatari coast, St. 43 (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz, 2003).



Sites of occurrence of *Codonellopsis americana* in RSA

Family: Codonellopsidae

Genus: *Codonellopsis*

Scientific Name: *Codonellopsis morchella* (Cleve) Jörgensen, 1924

Synonyms:

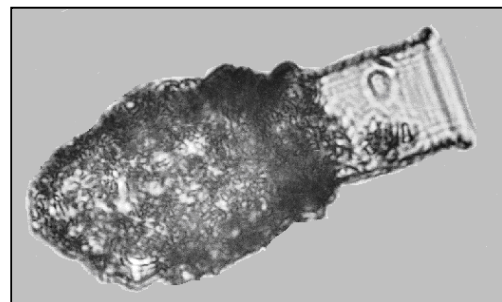
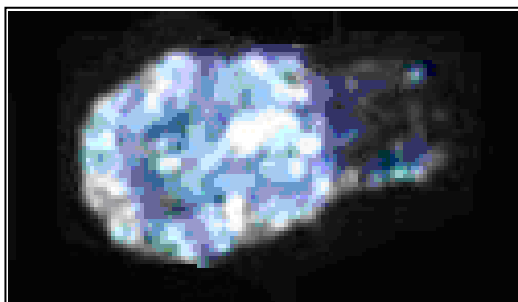
Codonellopsis morchella, forma *typica* Alder; *Codonella ecaudata* Brandt, 1906-1907; *Codonellopsis ecaudata* Kofoid and Campbell, 1929; *Codonellopsis turgescens* Kofoid and Campbell, 1929; *Codonellopsis obconica* Kofoid and Campbell, 1929; *Codonella morchella* var. *erythraensis* Brandt, 1906-1907; *Codonella morchella* var. *schabi* Brandt, 1906-1907; *Codonellopsis schabi*: Kofoid and Campbell, 1929; Balech, 1959; Souto, 1970a; *Codonellopsis erythraensis* Kofoid and Campbell, 1929; *Codonellopsis globosa* Kofoid and Campbell, 1929; *Codonellopsis americana* Kofoid and Campbell, 1929; *Codonellopsis indica* Kofoid and Campbell, 1939.

References:

Jörgensen, 1924; Hada, 1938; Duran, 1951; Balech, 1959.

Description:

Lorica 2.2-3.2 μ m oral diameters in length; collar with a somewhat flaring rim, slightly bulging near its middle, usually lower than the bowl, its height 0.22-0.34 μ m of the total length, composed of 4-11 μ m spiral turns with a few elliptical fenestrae; bowl generally ovate, 1.5-1.7 μ m oral diameters in greatest diameter; aboral region convex conical; aboral end usually round or rarely bluntly pointed; wall of the bowl thick, coarsely agglomerated.



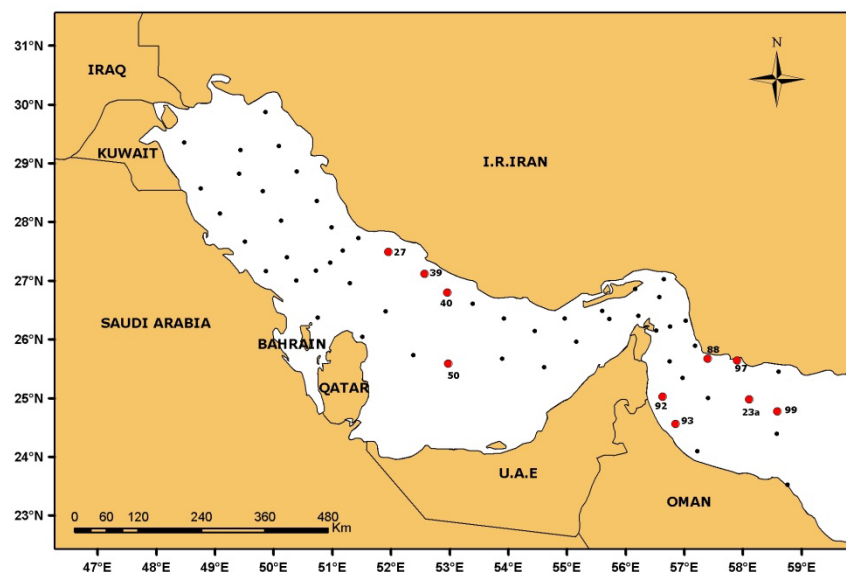
Codonellopsis morchella (200x)

Distribution:

Indo-Pacific, Mediterranean, Black Sea, Red Sea.

Sites of occurrence in RSA:

Central region of inner RSA, near Iranian Coast, Sea of Oman (New record, refer sites map).



Sites of occurrence of *Codonellopsis morchella* in RSA

Family: Codonellopsidae

Genus: *Codonellopsis*

Scientific Name: *Codonellopsis orthoceras* Jörgensen, 1924; Kofoid and Campbell, 1929

Synonyms:

Codonella orthoceras: Haeckel, 1873; *Codonella orthoceras* var. *a tessellata*: Brandt, 1906-1907; *Codonella orthoceras* var. *minor*: Brandt, 1906-1907; *Codonella orthoceras* var. *pacifica*: Brandt, 1906-1907; *Codonella orthoceras* var. *pura*: Brandt, 1906-1907; *Codonellopsis pacifica*: Kofoid and Campbell, 1929, 1939; *Codonellopsis pura*: Kofoid and Campbell, 1929, 1939; *Codonellopsis tessellata*: Kofoid and Campbell, 1929, 1939; *Codonellopsis longa*: Kofoid and Campbell, 1929, 1939; *Codonellopsis meridionalis* Kofoid

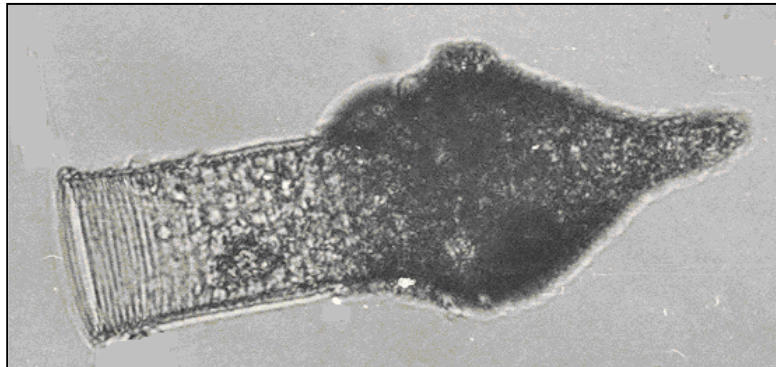
and Campbell, 1929, 1939; *Codonellopsis speciosa*: Kofoid and Campbell, 1929, 1939; *Codonellopsis californiensis* Kofoid and Campbell, 1929, 1939; *Codonellopsis inflata*: Kofoid and Campbell, 1929, 1939; *Codonellopsis parva* Kofoid and Campbell, 1929, 1939.

References:

Brandt (1906-1907), Jörgensen (1924), Balech (1959).

Description:

Lorica with elongated collar and egg-shaped ball, with irregular outline, covered with agglutinated foreign bodies, and ended by short caudal prolongation.



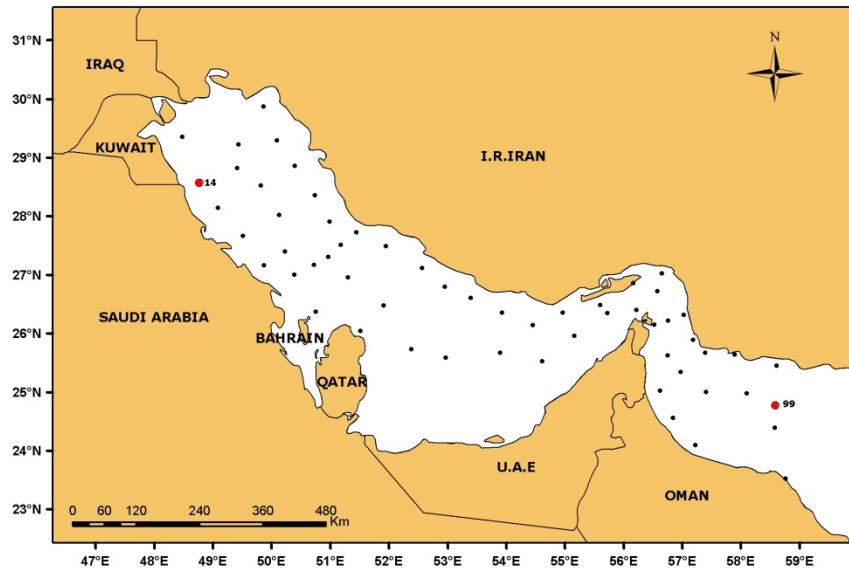
Codonellopsis orthoceras (200x)

Distribution:

Gulf of Aqaba, Red Sea, Mediterranean, Indian Ocean, southwestern Atlantic Ocean, Gulf of Mexico, Pacific Ocean, Baltic Sea, subtropical waters of the southern Brazil.

Sites of occurrence in RSA:

New record (refer sites map).



Sites of occurrence of *Codonellopsis orthoceras* in RSA

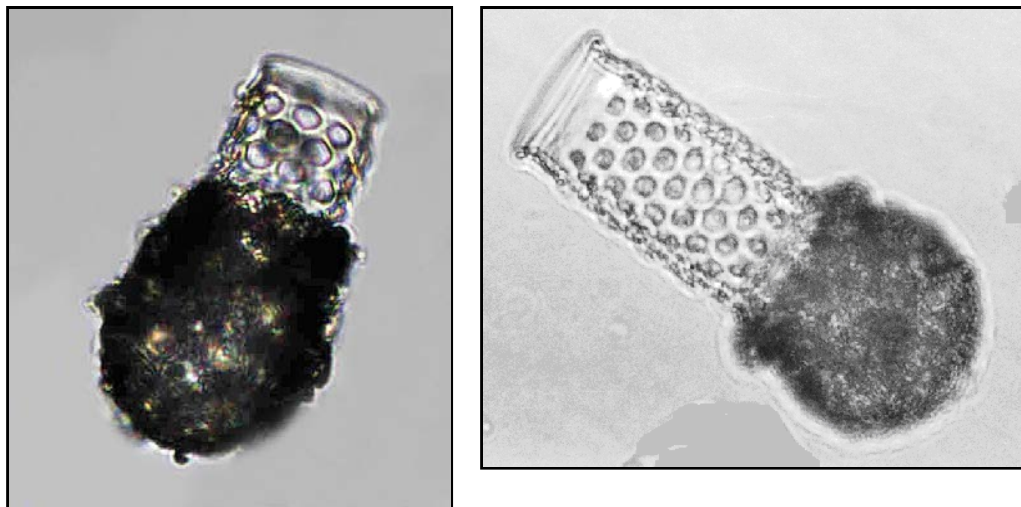
Family: Codonellopsidae

Genus: *Codonellopsis*

Scientific Name: *Codonellopsis ostenfeldi* Schmidt, 1901

Description:

Lorica flask-shaped, 2.7-3.0 μ m oral diameters in length; oral margin entire, slightly flaring; collar sub cylindrical, 0.40-0.43 μ m of the total length in height, bowl globose, aboral end broadly rounded; wall agglomerated with coarse foreign particles.



Codonellopsis ostenfeldi (200x)

References:

Kofoed & Campbell, 1929; Zhong, 1989; Prabhu *et al.*, 2005.

Distribution:

Indian Ocean, Chinese Seas, Mediterranean Sea, Brazil, Red Sea.

Sites of occurrence in RSA:

Occasionally found in a mixed sample from several samples inside the inner RSA. Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz 2001), Kuwaiti waters (Al-Yamani *et al.*, 2004; Skryabin and Al-Yamani, 2007).

Family: Codonellopsidae

Genus: *Stenosemella* Jörgensen

Scientific Name: *Stenosemella nivalis* Fol, 1884

Synonyms:

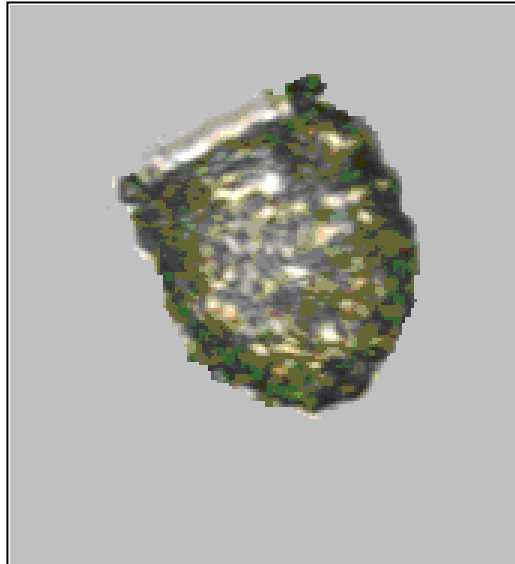
Codonella ventricosa Entz, 1884; *Stenosemella nucula* Jorgensen, 1927; *Tintinnopsis nivalis* Meunier, 1910; *Tintinnopsis nucula* Laackmann, 1906; *Tintinnopsis ventricosa* Daday, 1887.

References:

Fol, 1884; Meunier, 1910; Kofoed & Campbell, 1929.

Description:

Lorica ovate, its length 1.81-2.15µm oral diameters, collar low, without windows; bowl expanding upwards to form a shoulder, its greatest transdiameter 1.75-2.00µm oral diameters, conical in the lower region; aboral end bluntly pointed; wall of the bowl with coarse agglomerated materials.



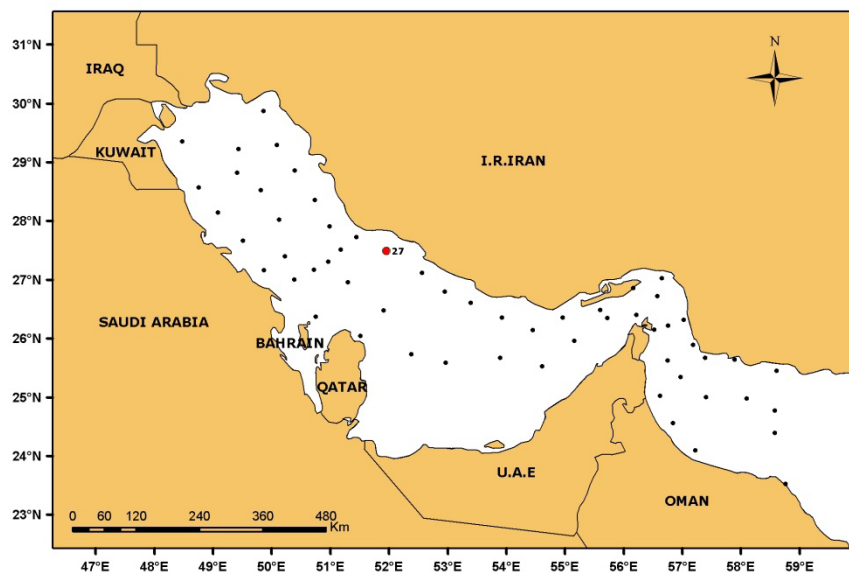
Stenosemella nivalis (200x)

Distribution:

Black Sea, Mediterranean, New Zealand, East Atlantic, North Sea, Sea of Japan, Southeast Pacific, China Sea, Baltic.

Sites of occurrence in RSA:

Inner RSA, near Iranian coast (Present study, refer site map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz, 2001).



Site of occurrence of *Stenosemella nivalis* in RSA

Family: Tintinnidae

Genus: Eutintinnus Kofoid & Campbell

Scientific Name: *Eutintinnus fraknoii* (Daday) Kofoid et Campbell 1929

Synonyms:

Tintinnus elongatus, (Jorg.) Kofoid et Campbell, 1929; Sousa & Silva, 1950; *Tintinnus latus* (Jorg.) Kofoid et Campbell, Sousa & Silva, 1950; *Eutintinnus elongatus* (Jorg.) Kofoid et Campbell, 1939; Campbell, 1942.

References: (Daday)

Kofoid & Campbell, 1939; Campbell, 1942; Duran, 1953; Dorgham, 1990; Fernandes, 2004.

Description:

Lorica forming a slender conical shaft 5.0-9.1µm oral diameters in length; oral border gradually flaring funnel-shaped with a conspicuous brim; aboral region provided with a slight flare, 0.33-0.51µm oral diameters in aboral diameter.

The tubular, hyaline lorica is characterized by flares at both ends. The thinness of the wall is visible in SEM. No reticular structure was evident by light microscopy or in SEM. This probably accounts for their collapse during critical point drying.



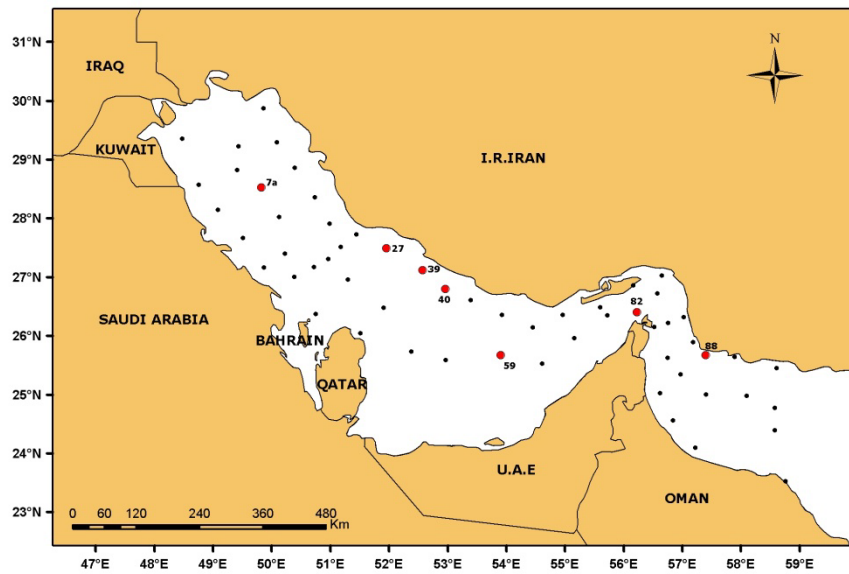
Eutintinnus fraknoii (200x)

Distribution:

Indian Ocean, Pacific Ocean, Mediterranean Sea, South Brazil, Red Sea.

Sites of occurrence in RSA:

Inner RSA, at the north eastern end, Iranian Coast, near the Straits of Hormuz, and Sea of Oman, near Iranian Coast (Present study, refer sites map), ROPME Sea Area and Sea of Oman (Dorgham, 1990), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz 2001).



Sites of occurrence of *Eutintinnus fraknoii* in RSA

Family: Tintinnidae

Genus: *Eutintinnus* Kofoid & Campbell

Scientific Name: *Eutintinnus lusus undae* Entz, 1885

Synonyms:

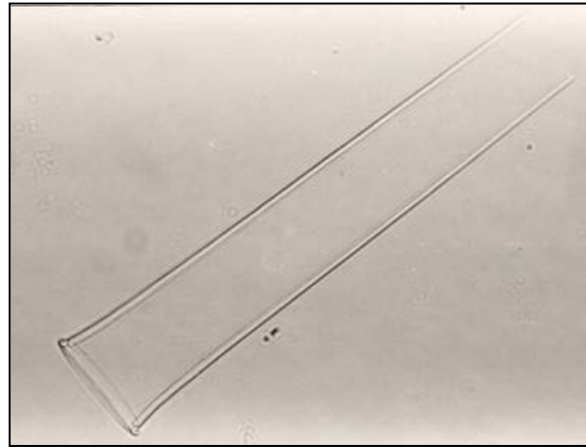
Tintinnus lusus undae Entz, Sr., 1885; Daday, 1887b; Brandt, 1906-1907; Kofoid and Campbell, 1929; *Tintinnus lusus-undae* Jörgensen, 1924.

References:

Kofoid and Campbell, 1939; Campbell, 1942; Balech, 1945; 1959; Souto, 1979; Komarovsky, 1956; Fernandes, 2004.

Description:

Lorica comparatively stout, 3.5-4.0µm oral diameters in length, consisting of a truncated cone of 2-4 degrees; oral margin flaring outwardly to a brim; sides always nearly straight, sometimes very slightly dilated; aboral end usually without a flare, occasionally with a hardly visible one, 0.5-0.7µm oral diameters in aboral diameter.



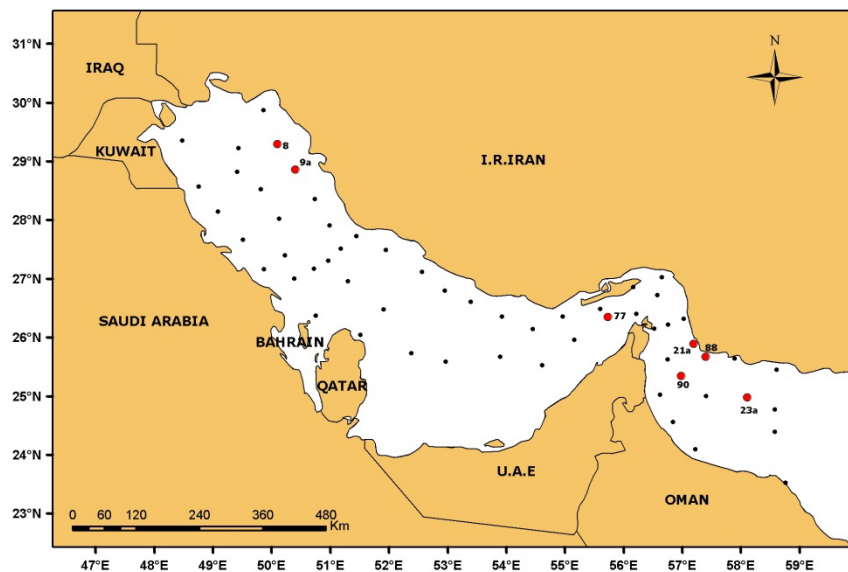
Eutintinnus lusus undae (200x)

Distribution:

Black Sea, Mediterranean, Red Sea, Atlantic Ocean, Arabian Sea, Tropical, temperate and intertropical, Indian Ocean, Pacific Ocean.

Sites of occurrence in RSA:

Inner RSA, at the northeastern side, near Straits of Hormuz, and off Iranian coast in the Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz, 2001).



Sites of occurrence of *Eutintinnus lusus undae* in RSA

Family: Tintinnidae

Genus: *Salpingella* Jørgensen

Scientific Name: *Salpingella attenuata* (Jørgensen)

Synonyms:

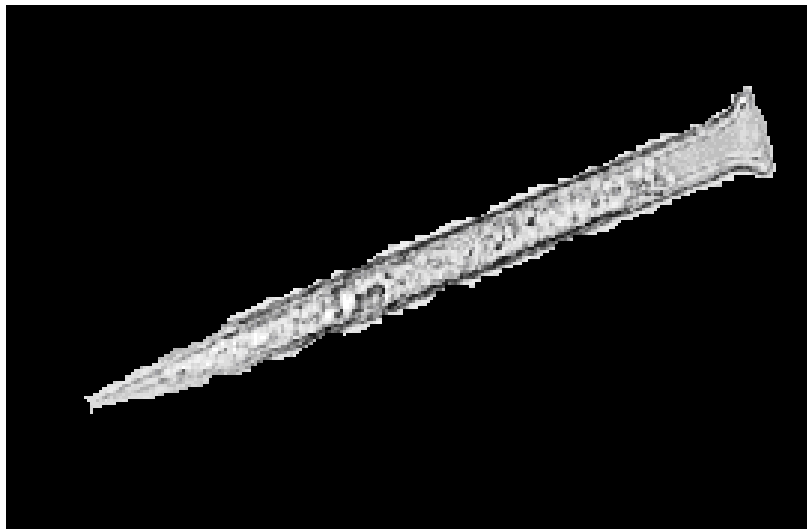
Salpingella acuminata subsp. *glockentogeri* var. *attenuata* Jørgensen, 1924; *Salpingella attenuata* Kofoid & Campbell, 1929; *Tintinnus acuminatus* Entz, 1885.

References:

Komarovsky, 1959; Dorgham, 1990.

Description:

Lorica much elongated, slender, 9µm oral diameters in length; consisting of a funnel-shaped collar and a long tubular bowl; collar a wide inverted concave cone of 60 degrees; bowl cylindrical in the posterior half, 0.5µm of the oral diameter in length, sharply conical in the posterior half, distally convex conical; aboral end open, truncate; aboral region with 6 somewhat dextrotropic fins on the posterior 0.29µm of the total length.



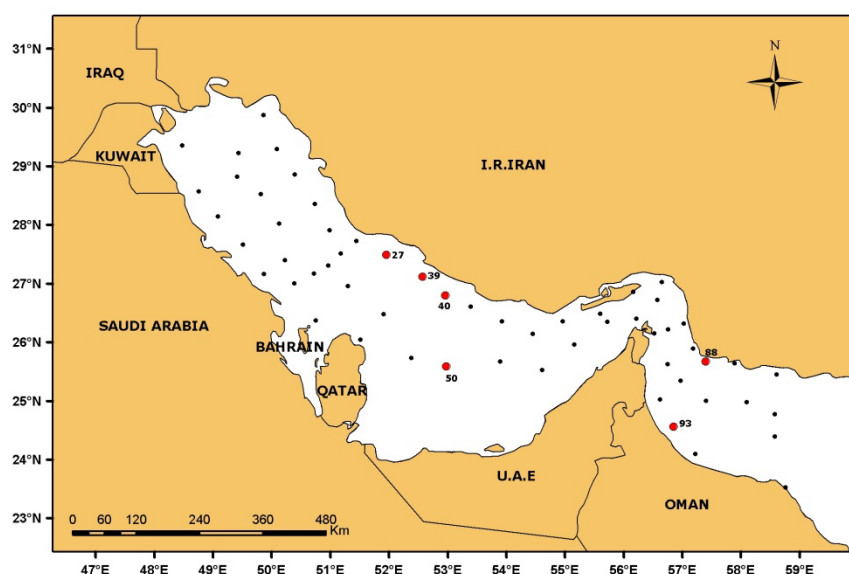
Salpingella attenuata (200x)

Distribution:

Western and eastern Tropical Pacific, Bay of Bengal, Mediterranean Sea, Atlantic, Red Sea.

Sites**of occurrence in RSA:**

Inner RSA, near Iranian Coast and the central region, Sea of Oman off Iranian and Omani coasts (Present study, refer sites map), RSA and Sea of Oman (Dorgham, 1990), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz, 2001).



Site of occurrence of *Salpingella attenuata* in RSA

Family: Tintinnidae

Genus: *Leprotintinnus* (Jørgensen, 1900)

Scientific Name: *Leprotintinnus nordqvisti* (Brandt, 1906) Kofoid and Campbell, 1929; Barría de Cao, 1986

Synonym:

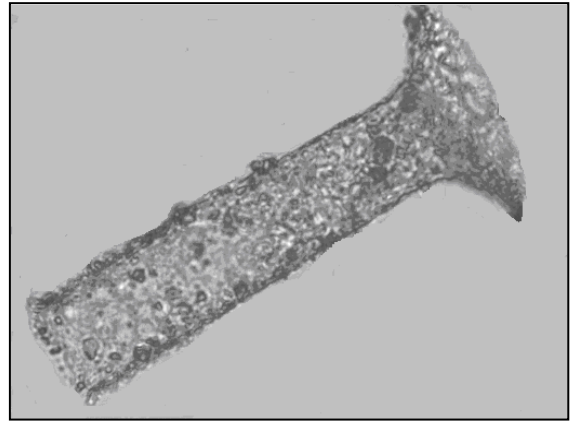
Tintinnopsis nordqvisti Brandt, 1906-1907

References:

Marshall, 1969; Corliss, 1979; Margulis *et al.*, 1991; Margulis & Schwartz, 1988; Lee *et al.*, 1985.

Description:

Lorica consisting of a tubular shaft and an inverted funnel-shaped aboral flare, 4.3-10.5µm oral diameters in length; oral rim irregular, usually slightly flaring (80-85 degrees); shaft more or less tapering (15 degrees), expanding near the posterior region to form a distinct aboral conical flare (50-110 degrees); aboral aperture large, 1.2-2.3µm oral diameters; aboral margin very ragged; wall showing a faint spiral structure, made of rather scarce particles aggregated more thickly on the surface of the aboral flare than on that of the shaft.



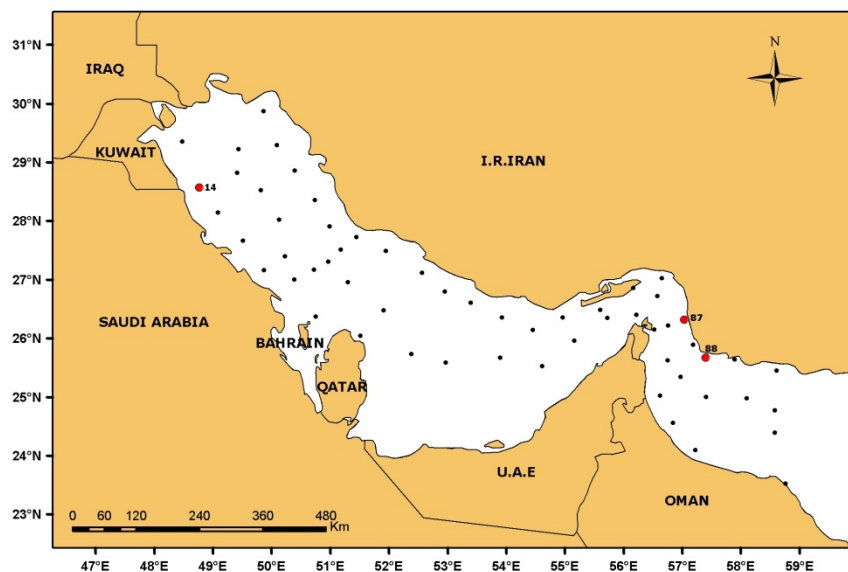
Leprotintinnus nordgvisti (200x)

Distribution:

Indo-Pacific, Intertropical, Brazil, Japan.

Sites of occurrence in RSA:

Inner RSA, near Saudi coast, Sea of Oman, on Iranian coast.



Sites of occurrence of *Leprotintinnus nordgvisti* in RSA

Family: Tintinnidae

Genus: *Amphorides* (Strand, 1929)

Scientific Name: *Amphorides quadrilineata* Claparède & Lachmann, 1858

Synonyms:

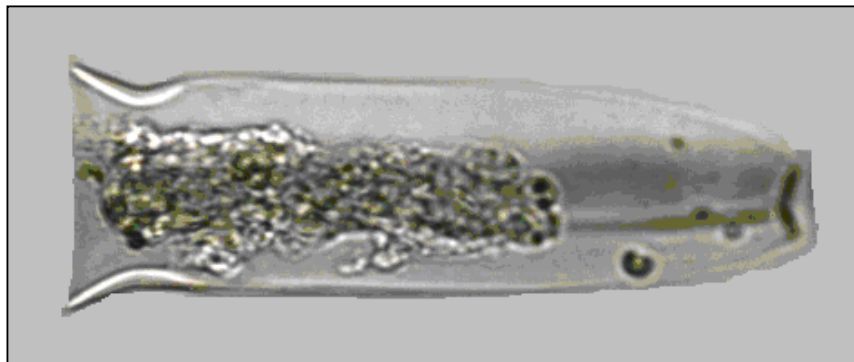
Tintinnus quadrilineatus Claparède and Lachmann, 1858-1859; *Amphorella quadrilineata* Jörgensen, 1924; Kofoed and Campbell, 1929; 1939; *Amphorides laackmanni*: Sassi and Melo, 1986; *Amphorides quadrilineata* var. *brasiliensis* (Laackmann); *Tintinnus amphora* var. *brasiliensis*: Laackmann, 1910.

References:

Marshall, 1969; Corliss, 1979; Corliss, 1979; Margulis *et al.*, 1991; Margulis & Schwartz, 1988; Lee *et al.*, 1985; Zavodnik and Kovacic, 2000.

Description: (After Marshall, 1969).

Vase-shaped, with flaring collar and truncated aboral end, variable in form, greatest width above or below middle of bowl, 3-4 fins running 1/2 to 1/3 way up bowl.



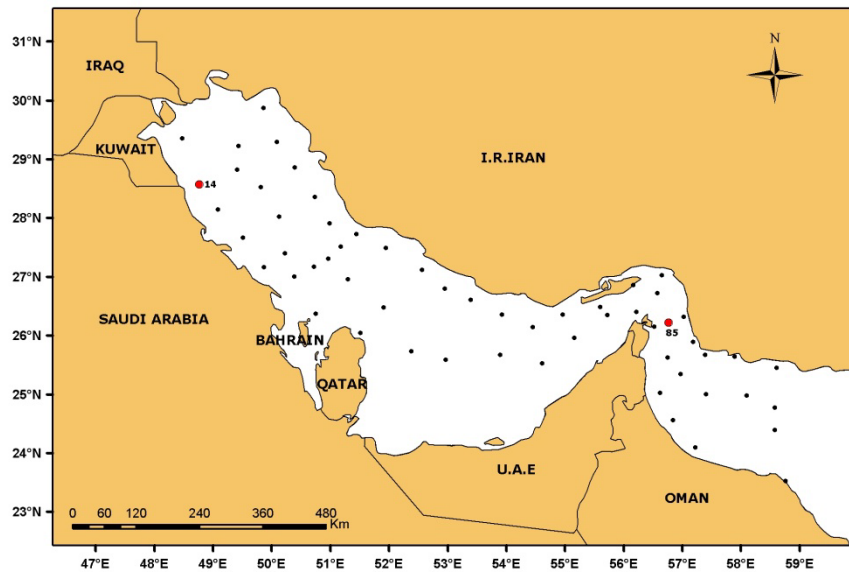
Amphorides quadrilineata (200x)

Distribution:

Red Sea, Mediterranean, southwestern Atlantic, Pacific Ocean, Philippine Sea and Celebes Sea.

Sites of occurrence in RSA:

Inner RSA, on Saudi coast and in Sea of Oman near the entrance Strait of Hormuz (Present study, refer sites map), ROPME Sea Area and Sea of Oman (Dorgham 1990).



Sites of occurrence of *Amphorides quadrilineata* in RSA

Family: Epiplocylidae

Genus: *Epiplocylis* Jorgensen

Scientific Name: *Epiplocylis brandti* Kofoid and Campbell

Synonyms:

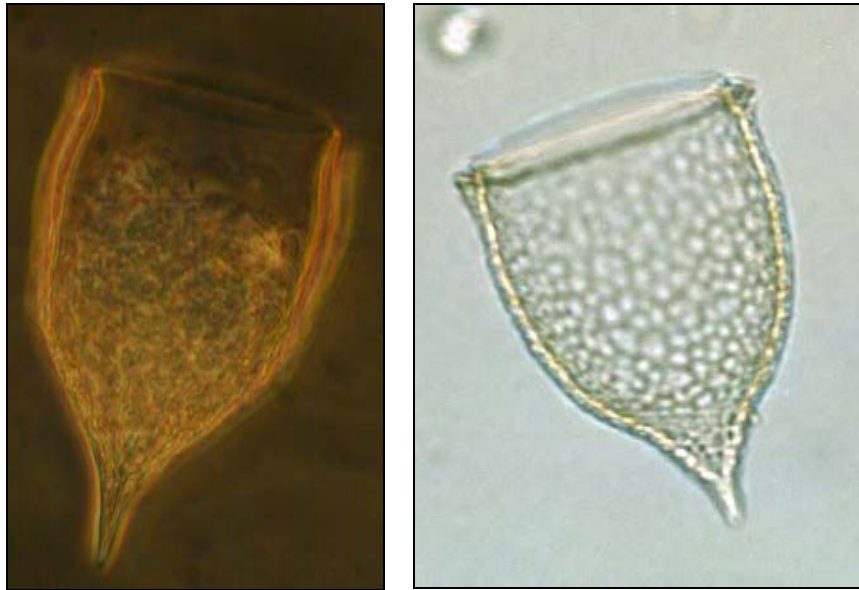
Epiplocyloides reticulata Ostenfeld & Schmidt, 1902; Hada, 1938; *Cyttarocylis reticulata*: Ostenfeld and Schmidt, 1901; *Ptychocylis reticulata*: Brandt, 1906-1907; *Epiplocylis reticulata* Jörgensen, 1924; Hada, 1938; Balech, 1962b; Souto, 1970b; 1979.

References:

Marshall, 1969; Brownlee, 1977; Lee *et al.*, 1985; Corliss, 1979; Margulis *et al.*, 1991; Hausmann & Hülsmann, 1996; Dolan *et al.*, 2006.

Description:

Lorica acorn-like, 1.36-1.75µm inner oral diameters in length; outer oral rim flaring (50-67 degrees), 1.2µm inner oral diameters; bowl sub cylindrical in its anterior half, broadly rounded or convex conical (90-115 degrees) in the aboral region; aboral horn forming an inverted cone of 18-48 degrees, stout, 0.09-0.18µm of the total length; reticulation usually covering the surface of the aboral region, sometimes stretching out beyond the middle of the lorica.



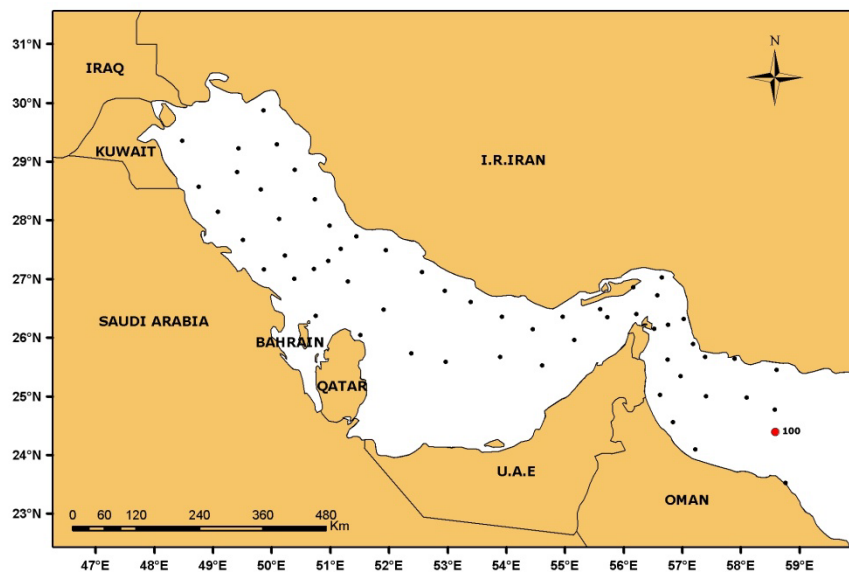
Epiplocylis brandti (200x)

Distribution:

South Atlantic, Mediterranean, Red Sea, Oyashio and Kuroshio Currents, Philippine, Sulu, Celebes and South China Seas, and the western and central equatorial Pacific, Indian Ocean.

Sites of occurrence in RSA:

Sea of Oman (New record, refer sites map).



Site of occurrence of *Epiplocylis brandti* in RSA

Family: Metacylididae

Genus: *Helicostomella* (Jorgensen, 1924)

Scientific Name: *Helicostomella subulata* (Ehrenberg, 1833)

Synonyms:

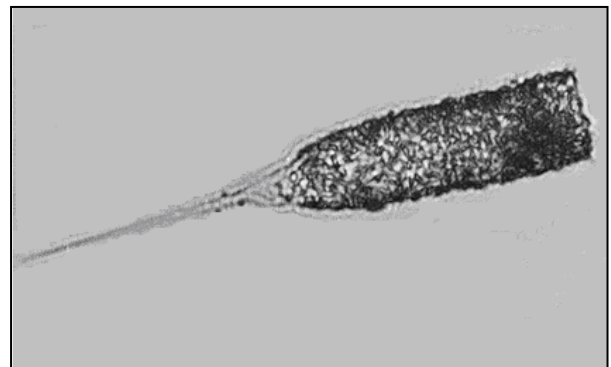
Helicostomella edentata Faur-Fremiet, 1924; *Helicostomella fusiformis* Meunier, 1919; *Helicostomella kiliensis* Laackmann, 1906; *Amphorella subulata* Daday, 1887; *Tintinnus subulatus* Ehrenberg, 1833; *Tintinnus ussowi* Mereschkowsky, 1879; *Cyttarocyliis annulifera*: Ostenfeld and Schmidt, 1901; *Tintinnus patagonicus* Brandt, 1906-1907; *Helicostomella kiliensis* Kofoed and Campbell, 1929; *Helicostomella fusiformis* Kofoed and Campbell, 1929; *Helicostomella edentata* Kofoed and Campbell, 1929; *Helicostomella longa* Kofoed and Campbell, 1929; *Metacyliis annulifera* Kofoed and Campbell, 1929; *Helicostomella Lemairei* Balech, 1944.

References:

Jörgensen, 1924; Kofoed & Campbell, 1929; Hada, 1932b; 1937; Gaarder, 1946; Duran, 1953; Sousa & Silva, 1956; Balech, 1959; Souto, 1970a, 1979; Barría de Cao, 1986; Dorgham, 1990.

Description:

Lorica slender, 7.0-9.8µm oral diameters in length; oral rim with 24-32 flaring teeth; bowl cylindrical, wound with 5-25 spiral bands in the suboral part, tapering posteriorly to an aboral horn, its length 0.13-0.35µm of the total length.



Helicostomella subulata (200x)

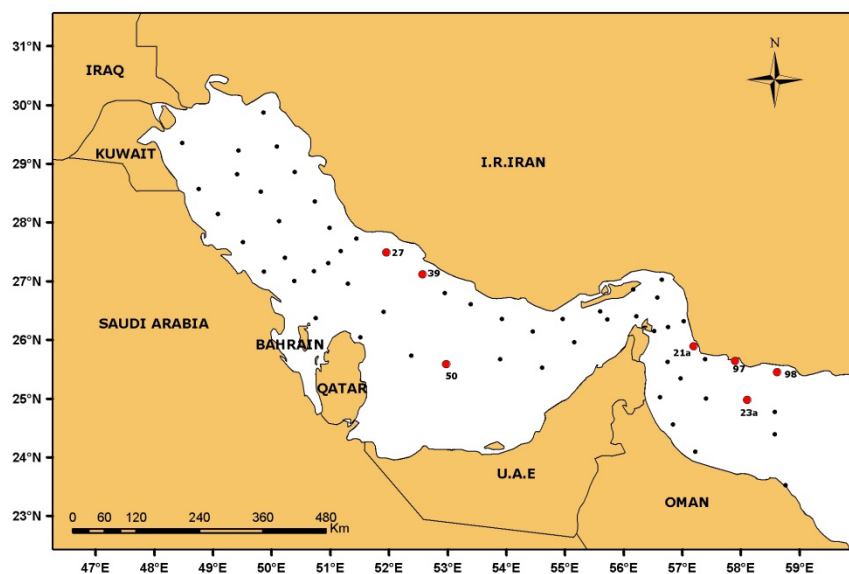
Lorica elongated, slender pipette-shaped, 9.1-11.3µm oral diameters in length; bowl cylindrical in the anterior half of the lorica; aboral region conical, tapering distally into a long, somewhat oblique aboral horn with a pointed tip; suboral bands 10-20 in number, denticular, fading posteriorly, but most prominent on some one of the more anterior bands.

Distribution:

North Atlantic, Japan Sea, Baltic Sea, North Sea, Black Sea, Adriatic Sea, Log Island, Pacific Ocean, Narragansett Bay, Red Sea.

Sites of occurrence in RSA:

Inner and outer RSA (Present study, refer sites map), ROPME Sea Area and Sea of Oman (Dorgham, 1990), Doha Harbour (Dorgham and Abdel-Aziz, 2001).



Sites of occurrence of *Helicostomella subulata* in RSA

Family: Petalotrichidae (Kofoid & Campbell, 1929)

Genus: *Petalotricha* (Kent, 1882)

Scientific Name: *Petalotricha ampulla* (Lundbeck, 1910)

Synonyms:

Tintinnus ampulla Fol, 1881; *Petalotricha ampulla* var. *major* Jörgensen, 1924; *Petalotricha serrata* Kofoid and Campbell, 1929; *Petalotricha major* Kofoid and Campbell, 1929, 1939; *Petalotricha pacifica* Kofoid and Campbell, 1929, 1939.

References:

Kent 1882; Jörgensen, 1924; Kofoid & Campbell, 1929; Gaarder, 1946; Duran, 1951; Balech, 1959.

Description:

Lorica stout bag-like, $0.84\mu\text{m}$ oral diameter in length; oral margin irregularly serrated; oral shelf length (48 degrees), with four waves; collar $0.2\mu\text{m}$ of the total length in height including a shelf, forming a low funnel (40 degrees); nuchal constriction distinct, $0.94\mu\text{m}$ oral diameter; a single row of elliptical spots appearing at the conjunction of the collar and the oral shelf; bowl shallow cup-shaped, with numerous small circular fenestrae in its anterior region; aboral end broadly rounded; wall composed of a single layer.



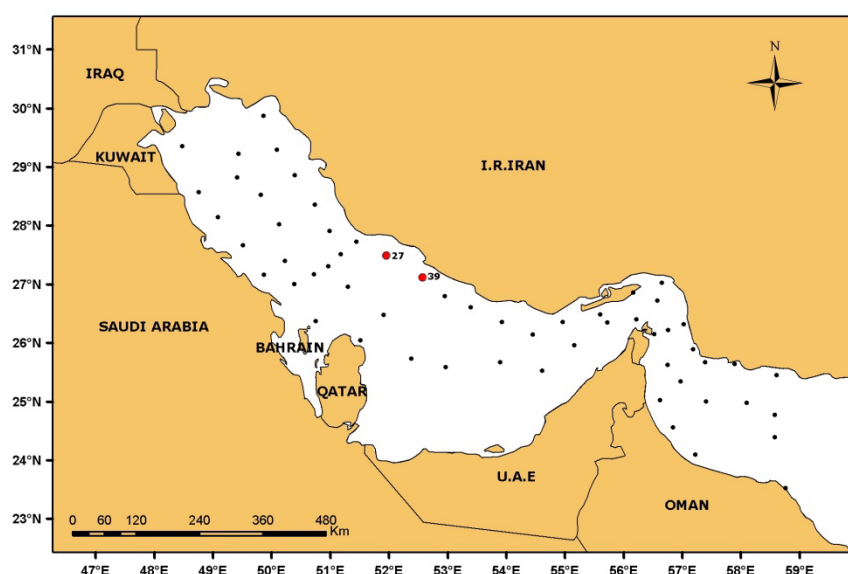
Petalotricha ampulla (200x)

Distribution:

South Atlantic, Indian and Pacific, Mediterranean, Red Sea.

Sites of occurrence in RSA:

Inner RSA, particularly on Iranian coast (New record, refer sites map).



Site of occurrence of *Petalotricha ampulla* in RSA

Family: Xystonellidae

Genus: *Parundella*

Scientific Name: *Parundella aculeata* (Jorgensen) Kofoid and Campbell, 1929

Synonyms:

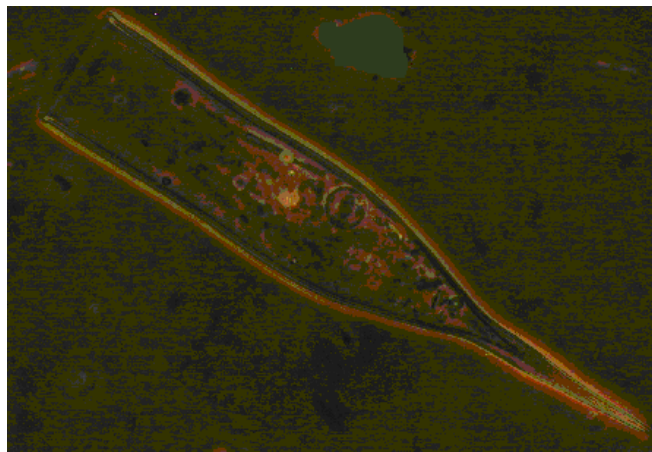
Undella (*Parundella*) *aculeata*, Jorgensen, 1924; *Undella lohmanni* var. *Caudata*, Brandt, 1906; *Parundella inflata* Kofoid and Campbell, 1929; 1939.

References:

Kofoid and Campbell, 1929; Kofoid and Campbell, 1939; Balech, 1969.

Description: (Marshall, 1969).

Cylindrical, with very slight expansion in lower bowl, contracting to a more or less long pedicel which is solid at tip.



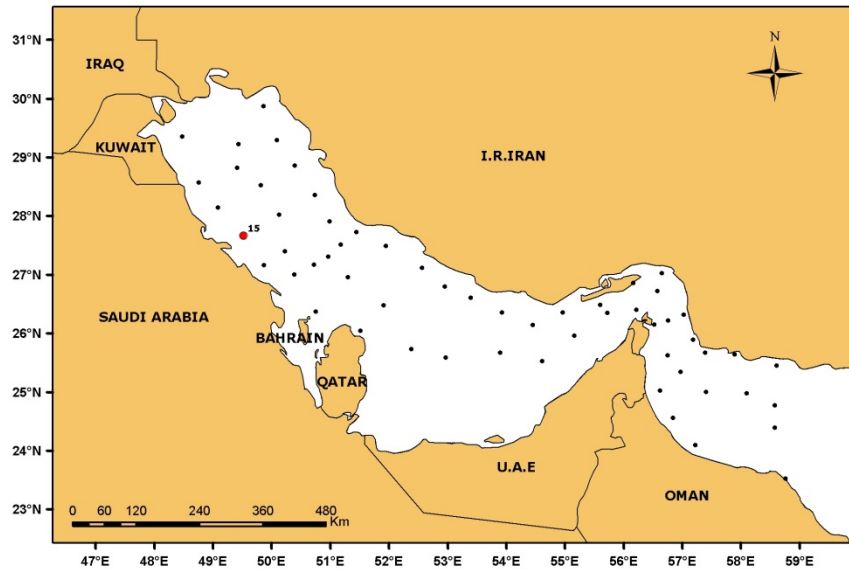
Parundella aculeata (200x)

Distribution:

Atlantic, Indian and Pacific oceans, Mediterranean, Red Sea.

Sites of occurrence in RSA:

Found at station 15 only on Saudi Coast (New record, refer site map).



Site of occurrence of *Parundella aculeata* in RSA

Family: Xystonellidae

Genus: *Xystonella* Brandt, 1907

Scientific Name: *Xystonella treforti* Daday, 1887

Synonyms:

Xystonella treforti, forma *typica* Alder; *Cyttarocyliis Treforti* Daday, 1887b; *Cyttarocyliis (Xystonella) treforti* Brandt, 1906-1907; *Xystonella trefort*, forma *coxliella* Alder; *Cyttarocyliis fasciata* Kofoid, 1905; *Cyttarocyliis (Coxliella) fasciata* var. *procera* Brandt, 1906-1907; *Coxliella fasciata* Kofoid and Campbell, 1929.

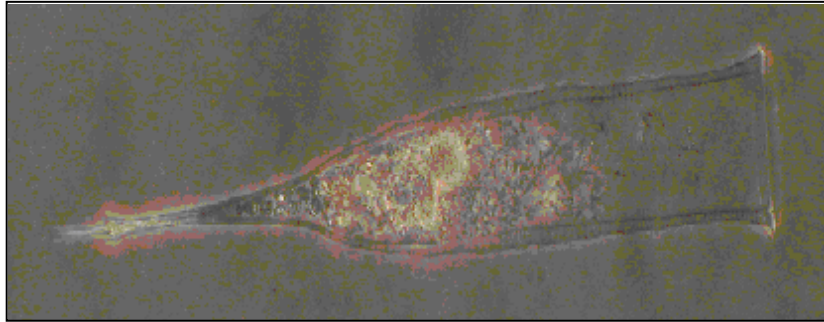
References:

Jørgensen, 1924; Kofoid & Campbell, 1929; 1939; Marshal, 1934; Hada, 1938; Campbell, 1942; Gaarder, 1946; Duran, 1951; Balech, 1959; Komarovsky, 1956.

Description:

Lorica elongate chalice-shaped, 4.60-5.65µm outer oral diameters in length; outer oral margin flaring, minutely dentate, 1.20-1.25µm inner oral diameters; bowl sub cylindrical or conical,

sometimes very slightly bulging below its middle, convex conical in the aboral region; pedicel tapering, provided with a knob and an apical lance, about 0.25µm of the total length without a lance; knob conical, skirted with an acute edge; reticulation of the wall regularly hexagonal, most coarse near the middle of the bowl.



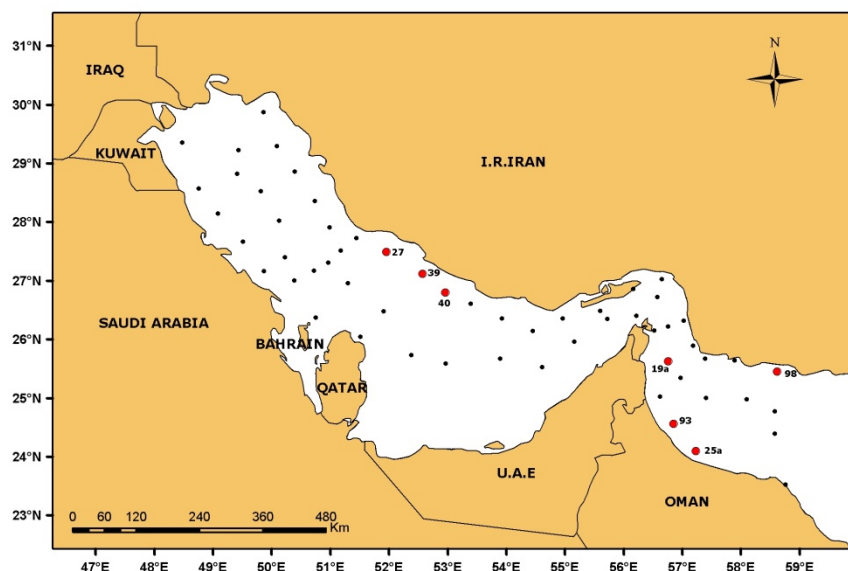
Xystonella treforti (200x)

Distribution:

Mediterranean, North Pacific, North Atlantic, South Adriatic, Indian Ocean.

Sites of occurrence in RSA:

Inner RSA, on Iranian coast, Sea of Oman (New record, refer sites map).



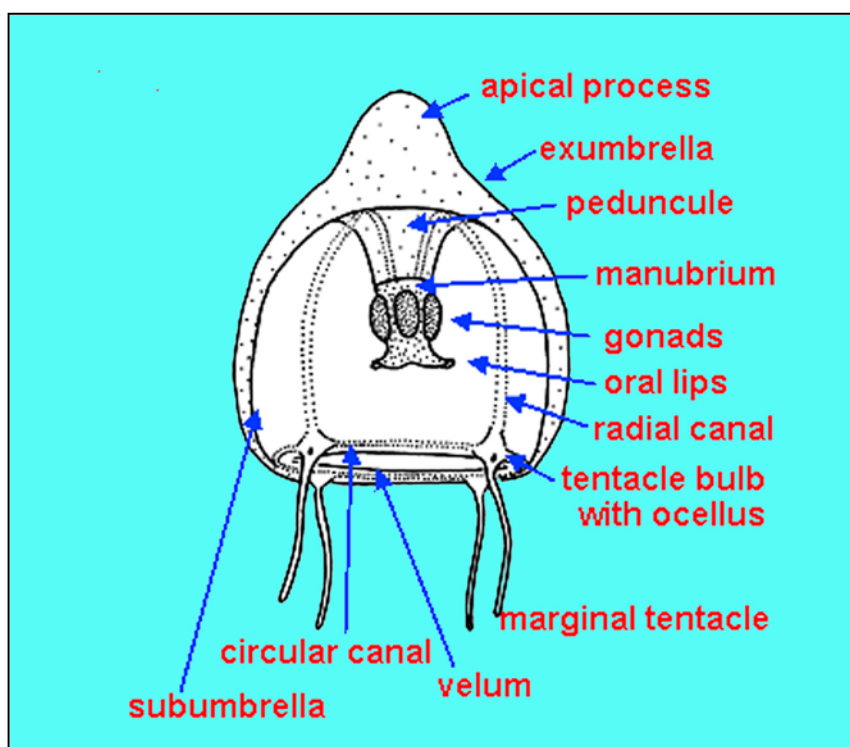
Sites of occurrence of *Xystonella treforti* in RSA

3.2 Phylum: Cnidaria

Class: Hydrozoa

Hydrozoa comprise either polymorphic, wholly polypoid, or wholly meduzoid stages. The medusae are planktonic, bell or dome shaped with tetramerous radial symmetry. A quadrangular manubrium hangs from the internal surface of the medusa. The manubrium in some species bears lobes and oral tentacles with nematocysts. At its free end manubrium bears the stomach, from which four or more radial canal extend to the ring canal in the bell margin. In most medusae velum is present. The margin of the bell usually bears sense organs in addition to few or numerous tentacles, enlarged at their bases to form tentacular bulbs which bear sensory structures.

Hydrozoa is divided into five orders: Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae, and Narcomedusae.



Morphology of a hydrozoan medusa

3.2.1 Order: Leptomedusae

Leptomedusae are characterized by a number of features: Their [polyps](#) are always living in colonies with the hydranths set in hydrotheca which are usually permanent and often long enough so the animal can fully retract into it; some have very reduced hydrothecae resembling Anthomedusae.

Medusae forming on fully developed hydranths are extremely rare; usually the gonophores develop into medusae or into sessile sporosacs. The medusae have a shallow bell, bear the gonads on the radial canals, and usually have statocysts and numerous tentacles

Family: Aequoreidae

Genus: *Aequorea*

Scientific Name: *Aequorea aequorea*

Synonym:

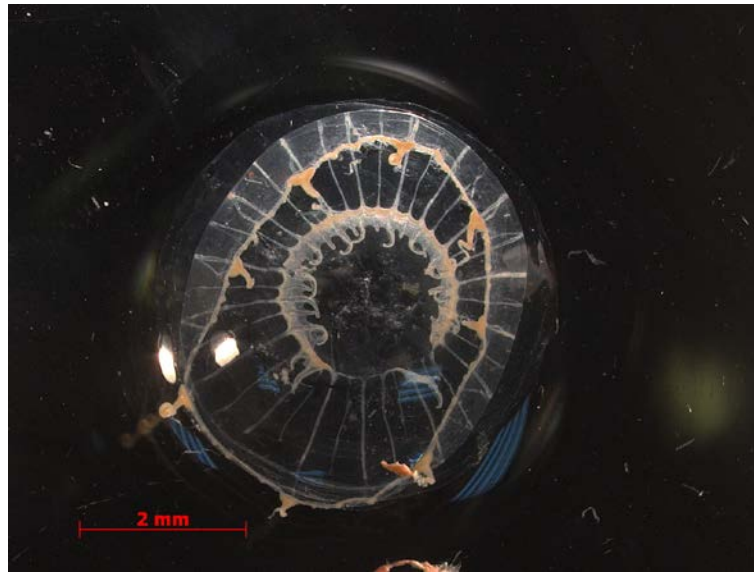
Medusa aequorea Forsskal, 1775

References:

Kramp, 1961; Mills, 2001; Brierley *et al.*, 2001; Buecher *et al.*, 2001; Dawson, 2004; Faeron *et al.*, 1992; Bisby *et al.*, 2005.

Description: (After Laurence, 1991).

Disk shape, thicker in center, usually 60-80 radial canals, tentacles usually fewer than canals, with elongated bulbs, stomach half width of umbrella.



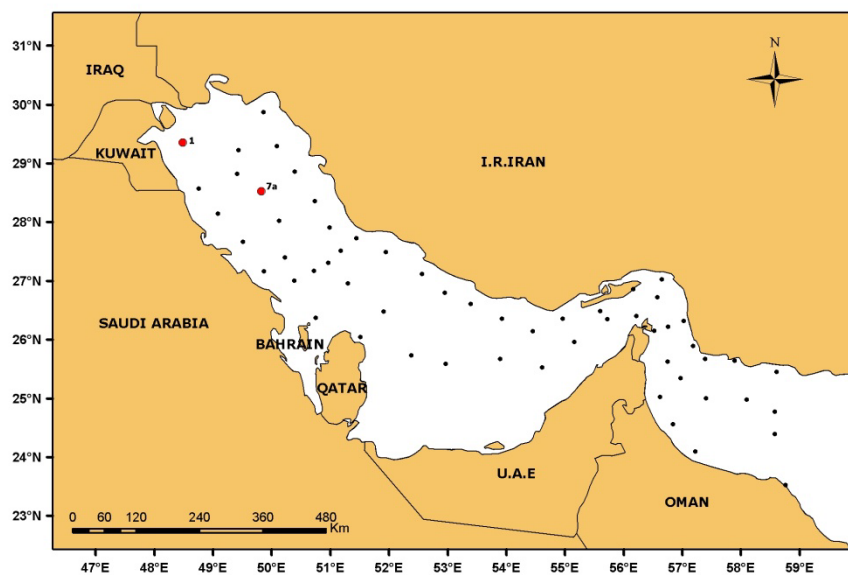
Aequorea aequorea

Distribution:

Atlantic, Mediterranean, South Africa, north Pacific.

Sites of occurrence in RSA:

Confined to Kuwaiti and Iranian coasts at the northern end of the inner RSA (Present study, refer sites map), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004) western RSA (Michle *et al.*, 1986a).



Sites of occurrence of *Aequorea aequorea* in RSA

Family: Campanulinidae

Genus: *Eirene*

Scientific Name: *Eirene hexanemalis* Goette 1886

Synonym:

Irenopsis hexanemalis Goette, 1886.

References:

Kramp, 1961; Jia *et al.*, 2004; Bisby *et al.*, 2005; Vannucci and Navas, 1973; Beebe, 1910; Santhakumari, 1993; Kramp, 1928; Michel *et al.*, 1986; Panikkar, 1973; Santhakumari and Nair, 1999; Zhong, 1989.

Description:

Bell nearly hemispherical, with very thick jelly; gastric peduncle short, with broad base, conical in shape; stomach very small; gonads six along distal portion of six radial canals; 30-50 marginal tentacles with large, swollen buds; excretory papillae present; one to three rudimentary bulbs and about two to four statocysts (containing two statoliths) between every two tentacles.



Eirene hexanemalis (Ventral view)



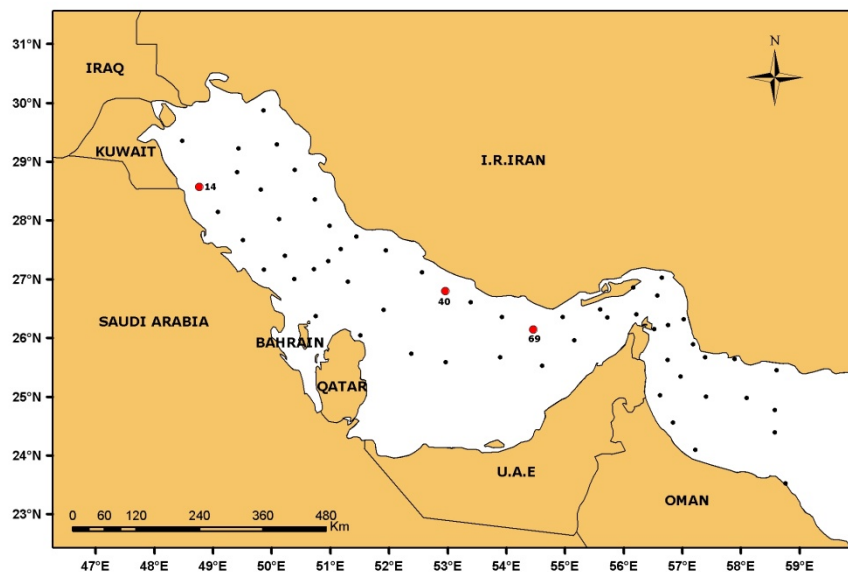
Eirene hexanemalis (Side view)

Distribution:

East China; India; Mediterranean, west Indian Ocean.

Sites of occurrence in RSA:

Inner RSA on Saudi and Iranian coasts (Present study, refer sites map), western RSA (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004).



Sites of occurrence of *Eirene hexanemalis* in RSA

Family: Geryoniidae

Genus: *Liriope*

Scientific Name: *Liriope tetraphylla* Chamisso and Eysenhardt, 1821

Synonyms:

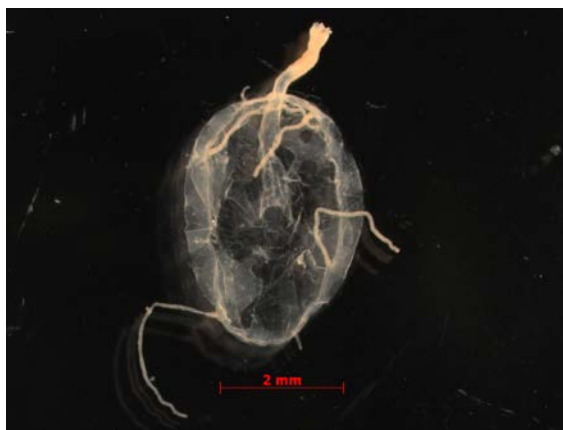
Liriope catharinensis Muller, 1859; *Liriope conirostris* Haeckel, 1879; *Liriope eurybia* Haeckel, 1864; *Liriope scutigera* McCrady 1859; *Geryonia tetraphylla* Chamisso & Eysenhardt, 1821; *Liriope indica* Bigelow, 1904.

References:

Russell and Nagabhushanam 1996; Beebe, 1910; Santhakumari, 1993; Michel *et al.*, 1986; Santhakumari and Nair, 1999; Santhakumari *et al.*, 1999; Haldar and Choudhury, 1995; Myers *et al.*, 2006; Ramesh *et al.* 2008; Vannucci *et al.*, 1970; Johnson and Allen, 2005; Newell and Newell, 1963, Conway *et al.*, 2003.

Description: (Chamisso and Eysenhardt, 1821).

Umbrella 10-30 mm wide, hemispherical; manubrium on gastric peduncle of varying size; mouth with 4 lips; 1-3 (or more) centripetal canals in each quadrant; 4 long hollow perradial tentacles with cnidocyst rings and 4 small solid interradial tentacles with adaxial cnidocyst clusters; gonads variable in shape and size; 8 statocysts.



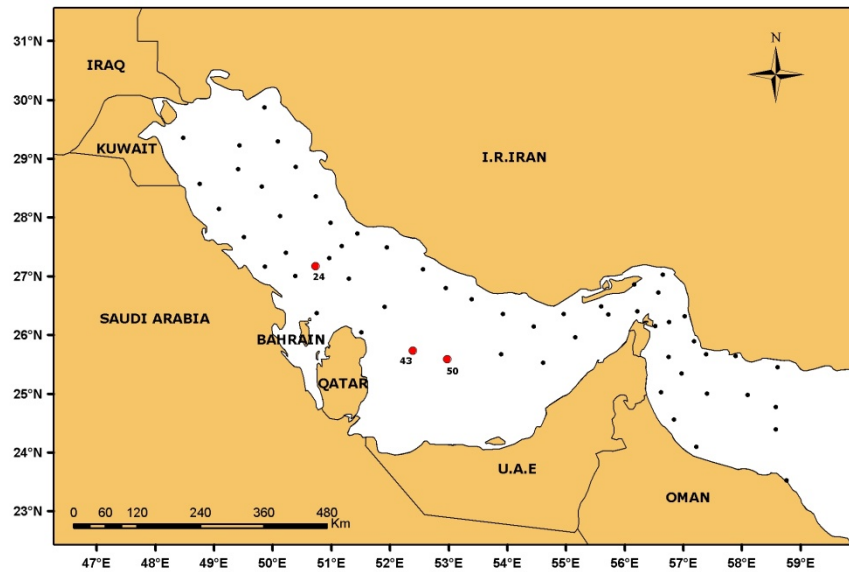
Liriope tetraphylla

Distribution:

Worldwide distribution, common in temperate regions of all oceans and the Mediterranean.

Sites of occurrence in RSA:

Inner RSA, near Saudi coast and off UAE, Sea of Oman (Refer sites map).



Sites of occurrence of *Liriope tetraphylla* in RSA

Family: Campanulariidae

Genus: *Phialidium*

Scientific Name: *Phialidium hemisphericum* Wright, 1858

Synonyms:

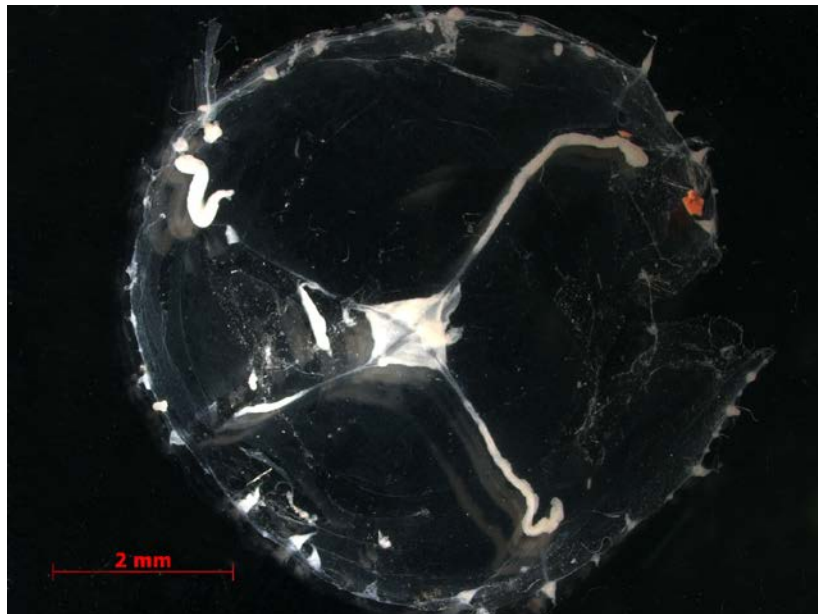
Campanularia johnstoni Alder, 1856; *Campanularia raridentata* Alder in Hincks, 1861; *Clytia bicophora* Agassiz, 1862; *Clytia coronata* Clarke, 1879; *Clytia edwardsi* Nutting, 1901; *Clytia johnstoni* Sars, 1851; *Clytia minuta* Nutting, 1901; *Clytia raridentata* Alder, 1862; *Clytia similis* Fraser, 1947; *Laomedea gigantea* Hincks, 1868; *Phialidium bicophorum* Agassiz, 1862.

References:

Leloup, E. 1934; Navas-Pereira and Vannucci, 1991; Cornelius, 1995; Bisby *et al.*, 2005; Greve *et al.*, 2004; Müller, 2004; Nicholas and Frid, 1999; Santhakumari, 1993; Panikkar, 1973; Santhakumari and Nair 1999; Santhakumari *et al.*, 1999; Zhong, 1989.

Description:

The identification of this medusa is only tentative, as there are several *Clytia* species producing medusae that cannot be distinguished with the currently available knowledge. They can be identified in their hydroid phase only.



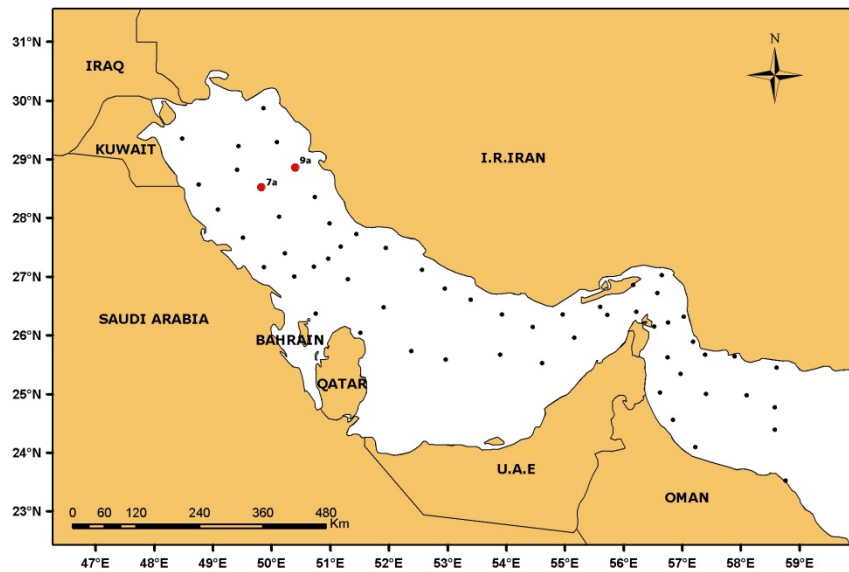
Phialidium hemisphericum

Distribution:

Hemisphaerica Belgian Exclusive Economic Zone; England South Coast; Mediterranean Sea; North Sea; North-West Atlantic; Wadden Sea; Wimereux ; New Zealand.

Sites of occurrence in RSA:

Inner RSA, northern part near and off Iranian coast (Present study, refer sites map), Saudi Coast (Baker and Hosney 2005).



Sites of occurrence of *Phialidium hemisphericum* in RSA

3.2.2 Order: Limnomedusae

Medusa mostly with 4 complete radial canals, sometimes 6, often with incomplete centripetal canals not reaching manubrium; with or without marginal nematocyst ring; marginal tentacles peripheral, hollow, without true basal bulb, marginal sense organs as internal enclosed statocysts of endo-ectodermal origin, embedded in the mesogloea near ring canal or in the velum; no ocelli; exceptionally reduced medusoids (Monobrachium).

Family: Olindiidae

Genus: *Olindias*

Scientific Name: *Olindias singularis* (Browne, 1905)

References:

Kramp, 1961; Bisby *et al.*, 2005; Vannucci and Navas, 1973; Russell and Nagabhushanam, 1996; Beebe, 1910; Michel *et al.*, 1986; Panikkar, 1973; Dr. Ramesh *et al.*, 2008.

Description:

13-36 mm wide, height half of diameter; 4-12 centripetal canal in each quadrant; gonads along distal half of radial canals or slightly longer; 28-86 primary tentacles; adhesive pads rudimentary; 16-50 secondary tentacles; 32 to more than 100 clubs. Usually only one statocyst base of each primary tentacle.



Olindias singularis (Ventral view)



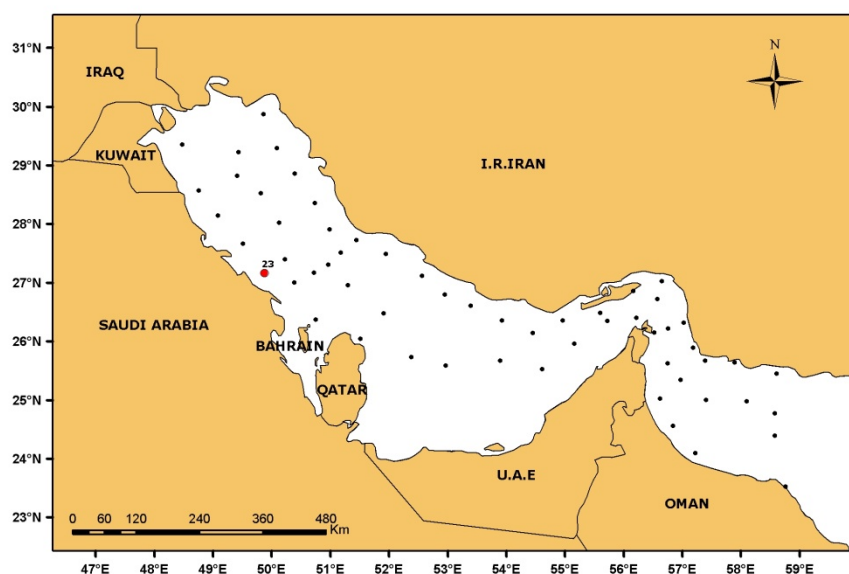
Olindias singularis (Side view)

Distribution:

Indo-Pacific, ROPME Sea Area, Pakistan, Maldives, Chagos, India, Australia and Philippines, Mediterranean.

Sites of occurrence in RSA:

Inner RSA, on Saudi coast (Present study, refer site map); Western RSA (Michle *et al.* 1986; Kuwaiti waters (Michel *et al.*, 1986); Kuwaiti waters (Al-Yamani *et al.*, 2004).



Site of occurrence of *Olindias singularis* in RSA

3.2.3 Order: Trachymedusae

Trachymedusae are small medusae with hemispherical to heightened bells, without hydroid stage. They have smooth and straight margin of thick tissue with ample nematocysts. Radial canals are mostly 8, but they may be 4, 6, or more. The gonads found at the radial canals or where these meet the manubrium. The statocysts composed of both endoderm and ectoderm. The marginal tentacles are solid in some species and hollow in others. The margin of the umbrella is not lobed. Velum is muscular and large.

Family: Oenonidae

Genus: *Aglaura*

Scientific Name: *Aglaura hemistoma* Péron and Lesueur, 1809

Synonyms:

Aglantha hemistoma Péron and Lesueur, 1809; *Aglaura hemistoma* var. *nausicaa* Haeckel, 1879; *Aglaura hemistoma* var. *prismatica* Mass, 1897; *Aglaura hemistoma* var. *laterna* Mass, 1893; *Aglaura hemistoma* var. *octagona*, Bigelow, 1904; *Aglantha globuligera*, Haeckel, 1879.

References:

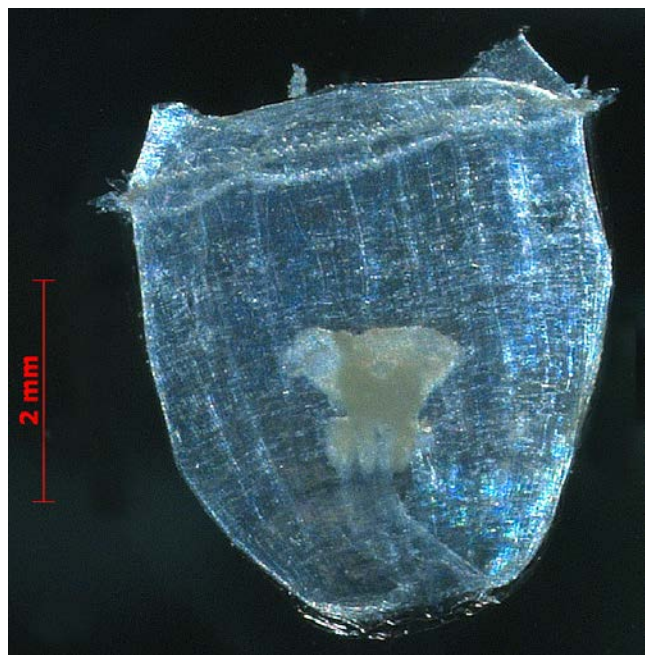
Bisby *et al.*, 2005; Cairns *et al.*, 2003; Jia *et al.*, 2004; Kramp, P.L. 1961; Migotto *et al.*, 2002; Segura-Puertas *et al.*, 2003; Vannucci *et al.*, 1970; Santhakumari and Nair, 1999; Panikkar, 1973; Michel *et al.*, 1986; Conway *et al.*, 2003; Santhakumari, 1993.

Description:

4-6 mm high, 3-4 mm wide, with flat apex, jelly very thin; peduncle somewhat shorter than bell cavity; stomach small, mouth with four small, simple lips; gonads on the peduncle near stomach; 48-85 tentacles, eight statocysts.

Distribution:

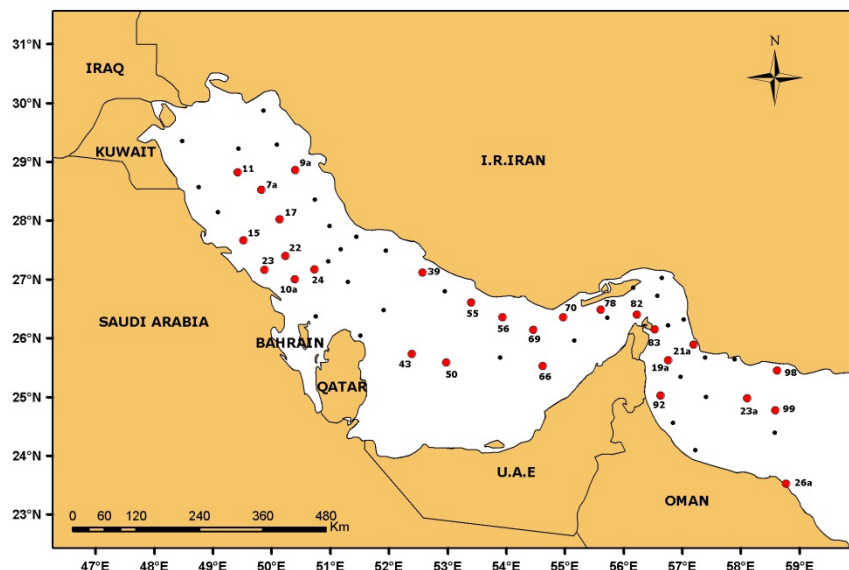
Cosmopolitan, Worldwide in warm and warm temperate near surface waters. Mediterranean, Adriatic, Red Sea, Brazil, Taiwan, Indian Ocean, Atlantic, Australia, China Sea, NE Pacific.



Aglaura hemistoma

Sites of occurrence in RSA:

Widely distributed in both inner RSA and Sea of Oman (Present study, refer sites map), Western ROPME Sea Area (Michle *et al.* 1986, Kuwaiti waters (Michel *et al.*, 1986, Al-Yamani *et al.*, 2004).



Sites of occurrence of *Aglaura hemistoma* in RSA

3.2.4 Order: Narcomedusae

Medusae with a thick, relatively stiff umbrella, with lobed margin, because its sides is divided by peronial grooves; stomach broad with entire circular periphery or with rectangular peripheral pouches; radial canals absent and peripheral canal system present or absent; gonads on stomach walls; primary tentacles solid, established at some distance above the umbrella margin; marginal sense organs as free sensory clubs with endodermal axes.

Family: Ieginidae

Genus: *Solmundella*

Scientific Name: *Solmundella bitentaculata* (Quoy and Gaimard, 1833)

Synonyms:

Charybdea bitentaculata, Quoy and Gaimard, 1833; *Aeginopsis mediterranea* Muller 1851; *Solmundella mediterranea* Haekel 1879; Browne, 1910; *Aeginella bitentaculata* Haekel 1879.

References:

Migotto *et al.*, 2002; Cairns *et al.*, 2003; Segura-Puertas *et al.*, 2003; Dawson, 2004; Jia *et al.*, 2004; , Bouillon *et al.*, 2004; Bisby *et al.*, 2005; Fuentes and Pagès, 2006; Ramesh *et al.*, 2008; Santhakumari *et al.* , 1999; Santhakumari and Nair, 1999; Michel *et al.* 1986; Conway *et al.*, 2003.

Description:

Umbrella up to 0.4 in (12 mm) wide, usually much smaller, rounded apex, keel-shaped along the axis leading to tentacles, apical mesoglea very thick, lateral walls thin; velum well developed; manubrium short, lenticular, with eight rectangular manubrial pouches with rounded edges; mouth circular, simple; two long, tapering, opposite tentacles issuing from umbrella above manubrium, near apex; gonads in subumbrellar wall, under manubrial pouches; four peronia in deep grooves; no peripheral system or otoporphae; 8–32 statocysts. Monotypic genus.



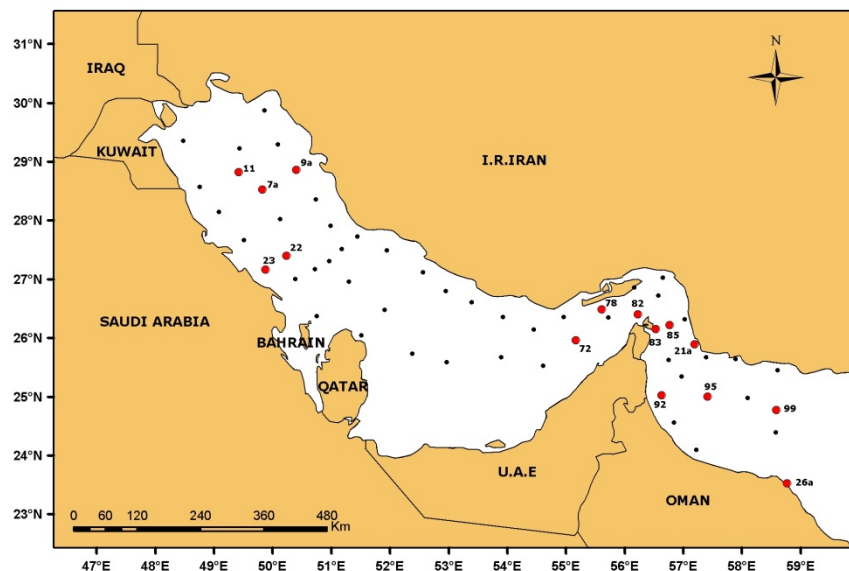
Solmundella bitentaculata

Distribution:

Widely distributed in Mediterranean Sea, Atlantic, Indian and Pacific oceans, Antarctic, Adriatic Sea, Caribbean Sea, Gulf of California and Gulf of Mexico.

Sites of occurrence in RSA:

Inner RSA, the northern part and southern end, Sea of Oman (Present study, refer sites map), western RSA (Michle *et al.* 1986), Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Solmundella bitentaculata* in RSA

3.2.5 Order: Siphonophora

Siphonophores are extraordinarily complex colonial organisms. The individuals composing the colony - modified polyps and medusae - are highly polymorphic and adapted to their specific function. The integration of the individual zooids into one system is so much advanced, that we have to consider the siphonophore colony as superorganism that shows all characteristics of an individual.

The above scheme of a physophorid siphonophore explains their anatomy. The siphonophores are best imagined (and likely they were derived like this) as a reversed

solitary polyp that forms the axis (stem). The oral pole is below, the aboral pole (the basal region of a polyp in normal orientation) is at the top, where some forms develop an air-filled chamber that acts as a buoy (pneumatophore, for righting reaction). Below the pneumatophore is a region where medusae bells develop. These nectophores allow the colony to move by their propulsions. There are usually several nectophores, their ensemble is called the nectosome. The nectophores offer taxonomically very important traits. Below the nectosome there is a budding region from where the elements following below are being produced. The whole region below, also called siphosome, is composed of repeated units, the cormidia.

At the top of each cormidium there are one or more bracts, modified medusae that act as protective shields. Another element are the palpons (dactylozooids). These polyp-like (manubrium-like) zooids with a filiform tentacle serve as defensive zooids. The nutritive function is provided by the gastrozooids. They have usually one tentacle provided with characteristic side-branches, the tentillae. The tentacles can be extremely expanded, and because there are great number of gastrozooids per colony, a large number of tentillae with their powerful nematocysts can be distributed in an extensive body of water, and hence fishing efficiently for prey. The reproductive function is provided by medusoid gonophores that originate from branched structures, the gonodendra. The gonads are produced on the manubrium. The medusoids are NOT liberated like in other hydrozoans (e. g. *Velella*). However, the entire cormidium can detach at the end of the stem, thus allowing the colony to disperse reproductive units (e. g. eudoxids of the Calycophorae).

Sub-order: Physophorae

Family: Agalmatidae

Genus: *Agalma*

Scientific Name: *Agalma elegans* Fewkes, 1880

Synonyms:

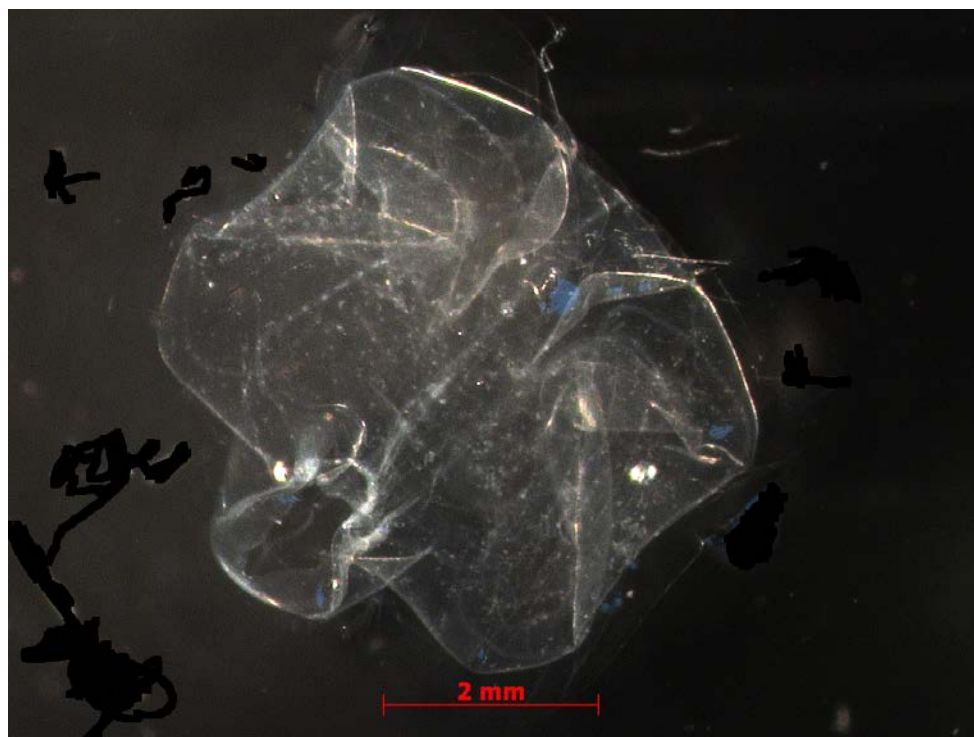
Agalmopsis elegans Sars, 1846; *Agalmopsis sarsi* K  lliker, 1853; *Agalma clavata* Leuckart, 1853; *Agalma sarsii* Fewkes, 1880.

References:

Migotto *et al.*, 2002; Cairns *et al.*, 2003; Jia *et al.*, 2004; Bisby *et al.*, 2005; Ramesh *et al.* 2008; Daniel and Daniel 1969; Conway *et al.*, 2003; Daniel, 1985.

Description: (Sars, 1846).

Pneumatophore small, ovoid, usually with red-pigmented cap. Nectophore: with large truncated lateral processes which surround the nectosomal stem. Latero-vertical ridge runs perpendicularly up from the infra-lateral ridge and delimits a triangular facet apical ridge and runs alongside of nectophore in its distal half. Bracts: thin and leaf-like, ending in three small projections.



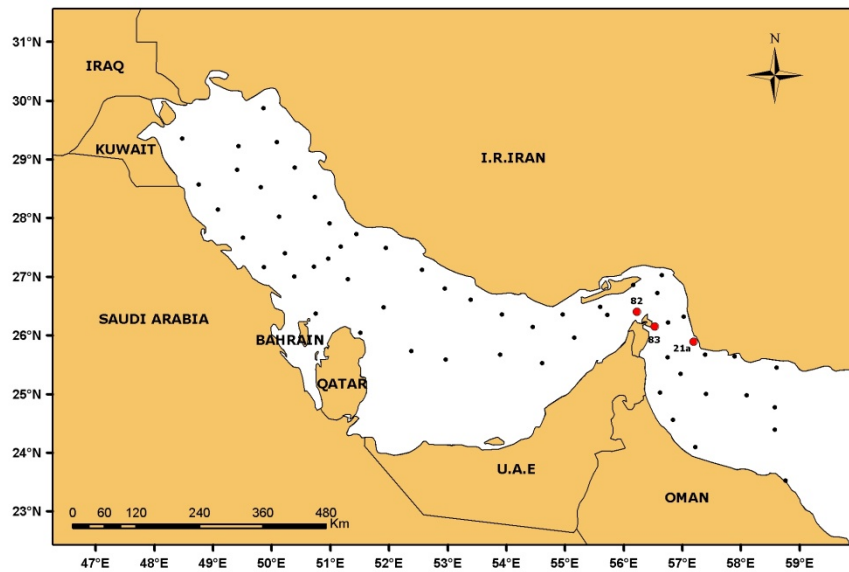
Agalma elegans

Distribution:

Cosmopolitan in the World's oceans, but records are infrequent (Kirkpatrick and Pugh, 1984], Red Sea, Mediterranean.

Sites of occurrence in RSA:

Straits of Hormuz, Southern end of the inner RSA Northern end of the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Agalma elegans* in RSA

Sub-order: Calycophorae

Family: Sphaeronectidae

Genus: *Bassia*

Scientific Name: *Bassia bessensis* (Quoy & Gaimard, 1833, 1834)

Synonyms:

Bassia bassensis Bigelow, 1911; *Bassia bassensis* Daniel, 1974; *Diphyes bassensis* Quoy & Gaimard, 1834.

References:

Quoy & Gaimard, 1833, 1834. Daniel, 1985; Conway *et al.*, 2003; Daniel and Daniel, 1969; Ramesh *et al.*, 2008.

Description: (After Bioinformatics Centre, National Institute of Oceanography, Goa, India).

Polygastric phase: Both nectophores characteristically opaque with white ridges. Anterior nectophore: Size: 3.9 mm in length; 2.5 mm in breadth; Somatocyst-1.75 mm; hydroecium-1.85 mm nectosac-1.6 mm in length. With 7 facets-dorsal and ventral facets pentagonal in shape; baso-lateral facets elongate and broad; apico-lateral facets rectangular in shape. The

somatocyst has no apical projection. Somatocyst globular, without any other branches and with a short stalk, occurring anterior to nectosac and hydroecium. Hydroecium small, conical, with broad opening. Nectosac small, lying beside hydroecium with 4 simple radial canals; lateral canals not arched.



Bassia bessensis

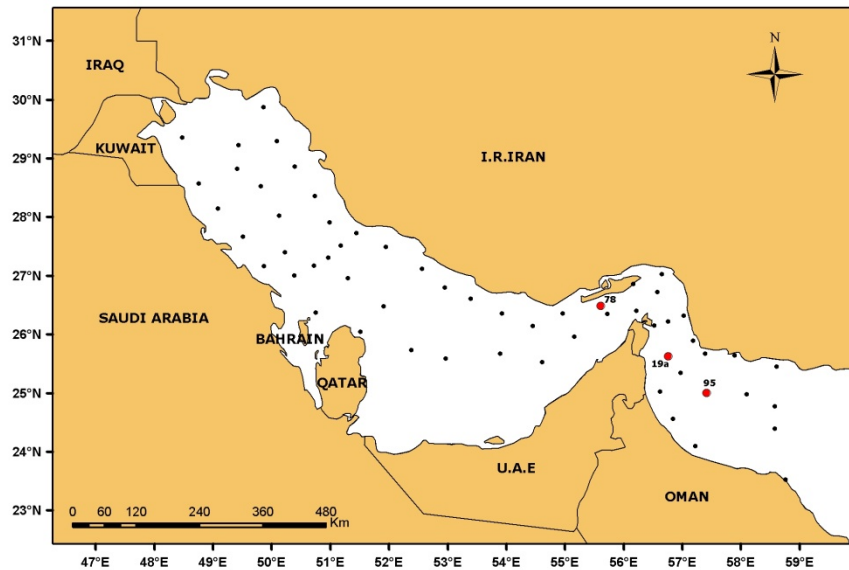
Posterior nectophore: Length-9.35 mm; breadth 6.75 mm. With 4 whitish ridges, dorsal ridge being absent. Ridges not prominent in well developed nectophores, and therefore, smooth and barrel-like in shape. Ostial end twisted, displacing right lateral ridge and left ventral tooth. Ventral ridges forming hydroecial wings not fused, two flaps from these wings overlap, firmly held in place.

Distribution:

Cosmopolitan, temperate; mainly epipelagic; abundant.

Sites of occurrence in RSA:

The central part of the Sea of Oman and the southern Straits of Hormuz at station 78 (New record, refer sites map).



Sites of occurrence of *Bassia bessensis* in RSA

Sub-order: Calycophorae

Family: Diphyidae

Genus: *Chelophyes*

Scientific Name: *Chelophyes appendiculata* (Eschscholtz, 1829)

Synonyms:

Diphyes appendicularia; Eschscholtz, 1892; *Diphyes elongata* Hyndman, 1841; *Diphyes sieboldii* Kölliker, 1853; *Diphyes acuminata* Leuckart, 1953; *Diphyes gracilis* Gegenbaur, 1854; *Diphyes bipartita* Costa, 1836.

References:

Migotto *et al.*, 2002; Cairns *et al.*, 2003; Jia *et al.*, 2004; Bouillon *et al.*, 2004; Bisby *et al.*, 2005; Daniel, 1985; Conway *et al.*, 2003; Daniel and Daniel, 1969.

Description: (After bioinformatics Centre, National Institute of Oceanography, Goa, India).

The anterior nectophore of the polygastric stage is very rigid, up to 20 mm in height. There are 5 ridges but only 3 reach the apex. The hydroecium is quite deep, directed outwards. The

basal lamella is divided into 2 square wings. The somatocyst is long and spindle shaped, varying between narrow and thin, reaching two-thirds to three-quarters the length of the nectosac.



Chelophyes appendiculata

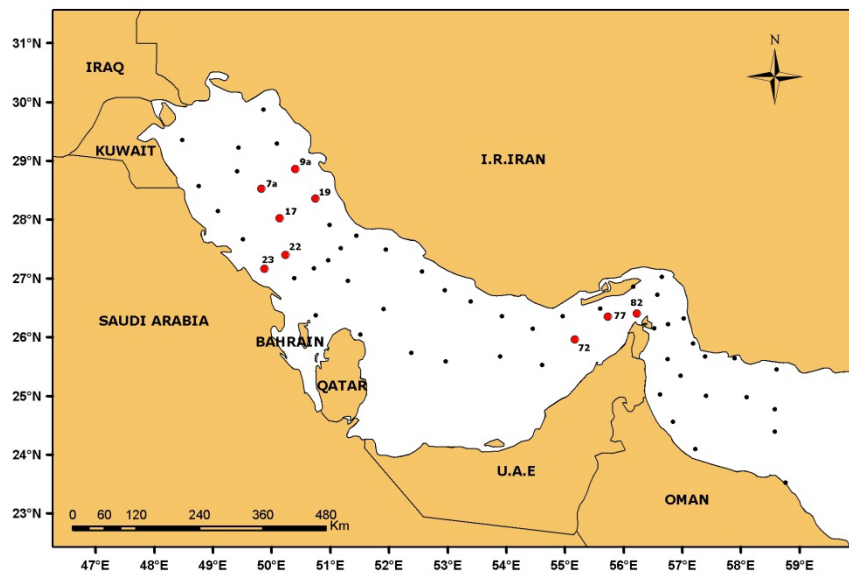
Posterior nectophore: About 7.7 mm long, 2.7 mm wide, slender, ridges present. No ostial teeth. Ventral ridges extended to form hydroecial wings and end in two serrated teeth of which left one is larger; triangular flap from left hydroecial wing cover hydroecium completely.

Distribution:

Cosmopolitan, warm/temperate; mainly epi-mesopelagic; abundant.

Sites of occurrence in RSA:

Inner RSA, northern and southern parts (New record, refer sites map).



Sites of occurrence of *Chelophyes appendiculata* in RSA

Family: Diphyidae

Genus: *Chelophyes*

Scientific Name: *Chelophyes contorta* Daniel, 1974; Lens & Van Riemsdijk, 1908.

Synonym:

Diphyes contorta Lens & van Riemsdijk, 1908.

References:

Daniel, 1985; Zoological Survey of India (Eds.), 1991; Conway *et al.*, 2003; Sharaf and AlGhais, 1997; Daniel and Daniel, 1969; Ramesh *et al.*, 2008.

Description: (After bioinformatics Centre, National Institute of Oceanography, Goa, India). The anterior nectophore of the polygastric phase is up to 4.6 mm in height by 1.7 mm in width. 5 slightly serrated ridges on nectophore, 1 very short, only 3 reaching the apex. Somatocyst characteristically twisted to the right, as are also the ridges close to the somatocyst. Somatocyst is around two thirds of the length of the nectosac. Hydroecium bends outwards. Basal lamella divided into two wings with a small tooth on either side in the lower central part.



Chelophyes contorta

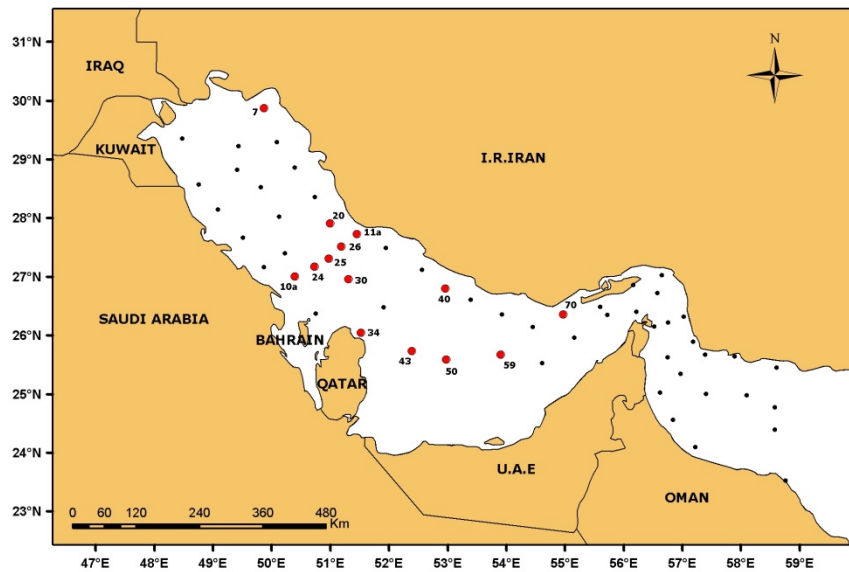
Posterior nectophore bowed in appearance, 3.5 mm long and 2 mm wide, no ostial teeth. Hydroecial wings serrated, broad at proximal end tapering into 2 pointed teeth; hydroecial groove open above and closed below with a flap-like extension from hydroecial wing. Eudoxid phase small, bract with pointed apex. Bract 2 mm long, slender and pointed. Gonophores small, 2.5-3 mm long.

Distribution:

Alboran Sea, Mediterranean Sea, Red Sea, Indian Ocean.

Sites of occurrence in RSA:

This species occurred in at few sites in the inner RSA (Refer sites map).



Site of occurrence of *Chelophyes contorta* in RSA

Family: Diphyidae

Genus: *Eudoxoides*

Scientific Name: *Eudoxoides mittra* Huxley 1859

Synonyms:

Diphyes mitra Huxley 1859; *Diphyopsis mitra* Bigelow 1911.

References:

Daniel, R (1985); Zoological Survey of India (Eds) (1991; Conway *et al.*, 2003; Daniel and Daniel, 1969; Society for the Management of European Biodiversity Data, 2009; Ramesh *et al.*, 2008.

Description: (After bioinformatics Centre, National Institute of Oceanography, Goa, India).

The polygastric stage anterior nectophore is rigid and not spiralled, up to 7.4 mm high by 2.5 mm wide. There are 5 ridges on the nectophore which all reach the apex, serrated on the lower nectophore. Hydroecium has a rounded apex. The basal lamella is divided into 2 serrated wings, the left wing with a central tooth-like projection. The somatocyst is sausage shaped, starting off very narrow and reaches halfway up the nectosac. Posterior nectophore

$\frac{2}{3}^{\text{rd}}$ length of anterior nectophore; ridges and dorsal tooth present. Apical-dorsal notch present between apex and pedicel. Hydroecial groove open except near upper end; broad right hydroecial flap overlapping longer tongue shaped extension of left wing, forming a closed canal; right and left hydroecial wings end in pointed serrated teeth below ostium, left tooth longer; deeply curved tooth occur on each hydroecial wing at level of ostium.



Eudoxoides mittra

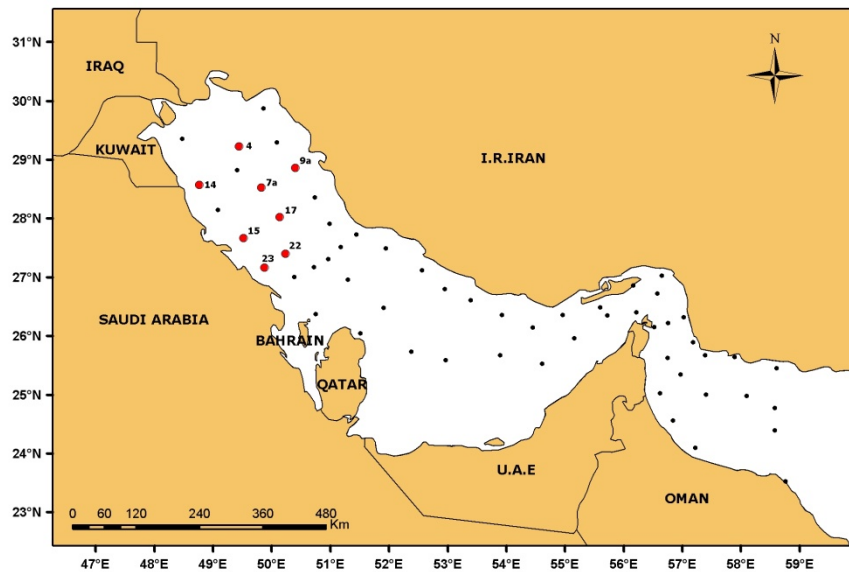
Eudoxid phase about 8 mm in length, bract and gonophores nearly equal in length. Bract with pointed apex, sutural surface forming acute angle with dorsal wall of deep, conical bracteal cavity. Ridges and edges of neck-shield serrated; with small pointed teeth at distal edge. Phyllocyst pear-shaped. Pedicel of gonophores long, with four prominent flared serrated ridges ending in two teeth. Mouth plate with concave edge and two lateral teeth. No special nectophore; manubrium shrinks completely after shedding sperms or eggs.

Distribution:

Indian Ocean.

Sites of occurrence in RSA:

This species occurred in at few sites in the inner RSA (Refer sites map).



Sites of occurrence of *Eudoxoides mittra* in RSA

Family: Diphyidae

Genus: *Lensia*

Scientific Name: *Lensia conoidea* (Keferstein & Ehlers, 1860)

Synonyms:

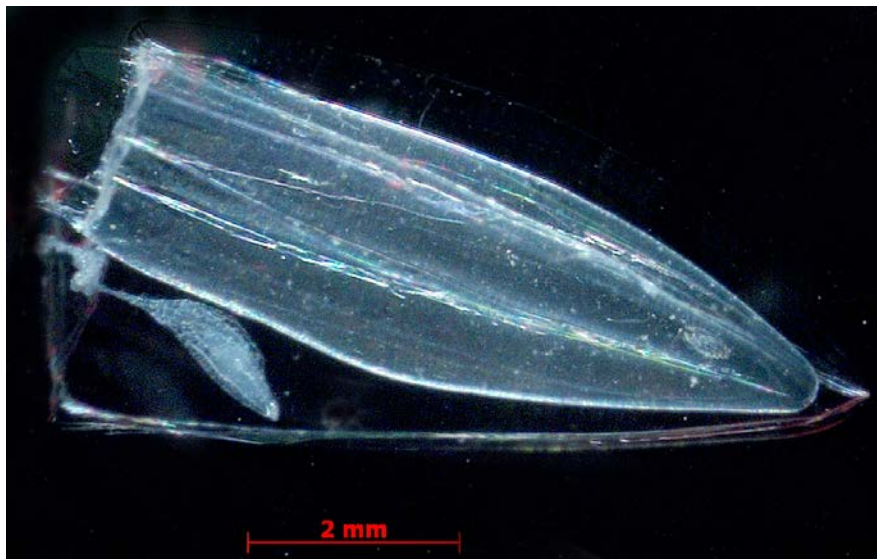
Diphyes conoidea Kefferstein and Ehlers, 1860; *Diphyes truncata* Sars, 1846; *Galeolaria truncata* Sars; *Lensia truncata* Totton, 1932.

References:

Palma and Aravena 2001; Migotto *et al.*, 2002; Cairns *et al.*, 2003; Zheng *et al.*, 2003; Bouillon *et al.*, 2004; Bisby *et al.*, 2005.

Description:

Anterior nectophore with five complete ridges and a minute, basal hydroecium. Mesogloea thickened ventrally, surrounding the long thickened somatocyst, which extends to half the height of the nectophore. Posterior nectophore five-ridged, with an asymmetrical mouthplate which is indented centrally.



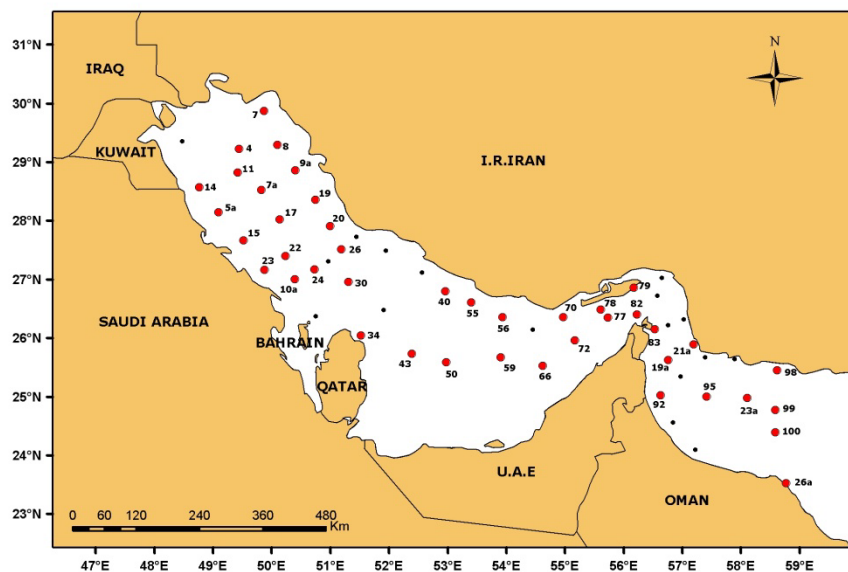
Lensia conoidea

Distribution:

Common and cosmopolitan species most frequently encountered in the N. Atlantic Ocean.

Sites of occurrence in RSA:

Widely distributed over the inner RSA as well as in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Lensia conoidea* in RSA

Family: Diphyidae

Genus *Lensia*

Scientific Name: *Lensia subtilis* (Chun, 1886)

Synonym:

Diphyes subtilis Chun, 1886; *Lensia tiwarii* Daniel, 1970.

References:

Mapstone, 2001; Khalil & Abd El-Rahman, 1997; Costello *et al.*, 2001; Migotto *et al.*, 2002; Cairns *et al.*, 2003; Jia *et al.*, 2004; Bouillon *et al.*, 2004; Bisby *et al.*, 2005.

Description:

Fragile anterior nectophore, up to 10 mm in height, apparently ridgeless, but with folds. Small mouth plate with oblique basal facet and shallow hydroecium. Somatocyst spherical borne on a long stalk. Small, rounded bract with small phyllocyst. The posterior nectophore is hard to distinguish. In general form the anterior nectophore resembles that of *Lensia meteori*, but the shape of the somatocyst clearly distinguishes them.



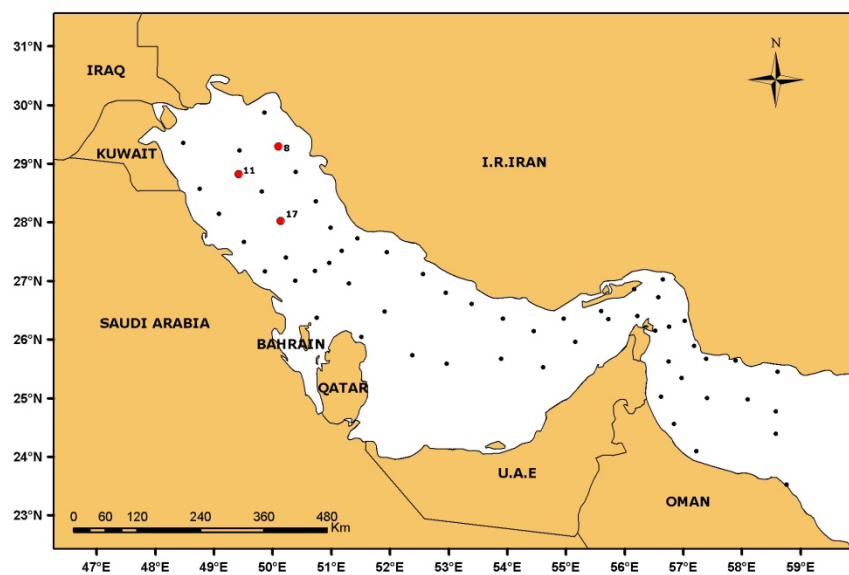
Lensia subtilis

Distribution:

Mediterranean, Atlantic, Adriatic Sea, Pacific, Gulf of Mexico.

Sites of occurrence in RSA:

Occurred at 3 stations in the northern part of the inner RSA (New record, refer sites map).



Sites of occurrence of *Lensia subtilis* in RSA

Family: Diphyidae

Genus: *Muggiaea*

Scientific Name: *Muggiaea atlantica* (Cunningham, 1892)

References:

Fraser, 1950; Totton, 1965; Totton and Fraser, 1956a; Kirkpatrick and Pugh, 1984; Lindley *et al.*, 1990; Greve, 1994; Båmstedt *et al.*, 1998; Palma and G. Aravena 2001; Mills, 1995; 2001; Migotto *et al.*, 2004; Jia *et al.*, 2004; Greve *et al.*, 2004; Cairns *et al.*, 2003; Bouillon *et al.*, 2004; Bisby *et al.*, 2005.

Description:

Anterior nectophore: small, with five complete but relatively straight longitudinal ridges. The hydroecium is deep and extends to about one third of the height of the nectophore. The long, thin somatocyst reaches the apex of the nectosac.

Eudoxid: the bract is roughly conical, with a flattened facet, an asymmetrical basal process, and a shallow hydroecial depression. The phyllocyst is club-shaped. The gonophore has four longitudinal ridges which spiral to the right. There is a short, curved mouth plate.



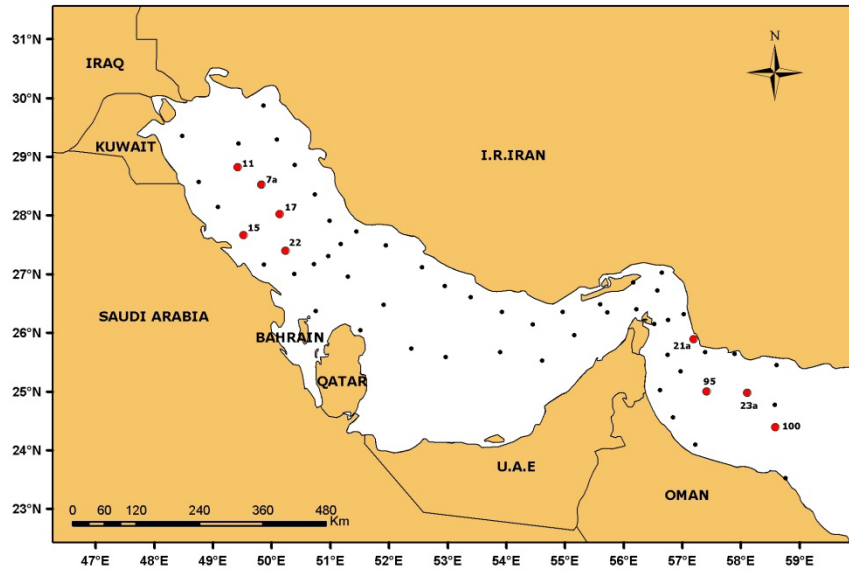
Muggiaea atlantica

Distribution:

Atlantic Ocean, Mediterranean Sea, English Channel, cosmopolitan.

Sites of occurrence in RSA:

The northern part of the inner RSA and in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Muggiaea atlantica* in RSA

Family: Diphyidae

Genus: *Muggiaea*

Scientific Name: *Muggiaea kockii* (Will, 1844)

References:

Laurence, 1991.

Description:

Anterior nectophore with 5 ridges, somatocyst reaches halfway up nectosac, no posterior nectophore.

Distribution:

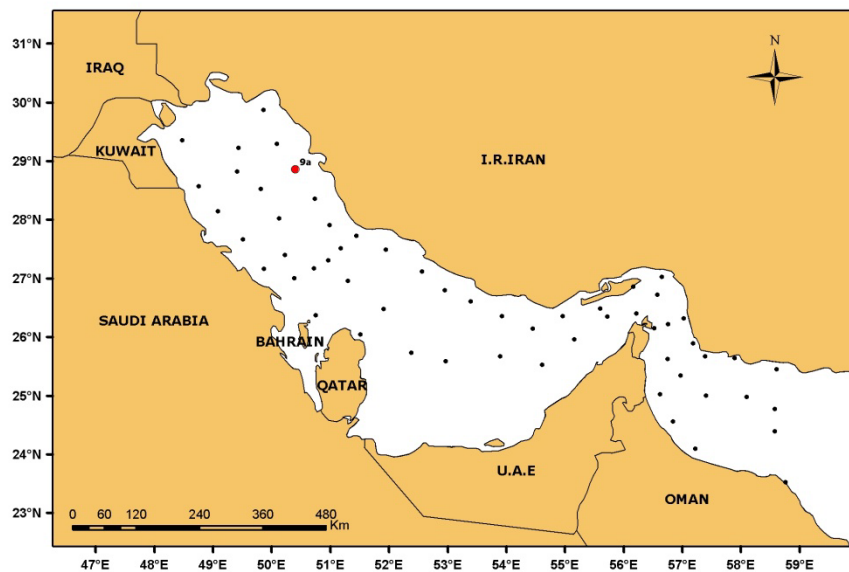
Atlantic, Pacific, Indian, Mediterranean, common.



Muggiaea kockii

Sites of occurrence in RSA:

Recorded once only at station 9a in the northern part of the inner RSA (New record, refer sites map).



Site of occurrence of *Muggiaea kockii* in RSA

Family: Diphyidae

Genus: *Sulculeolaria*

Scientific Name: *Sulculeolaria biloba* (Sars, 1846)

Synonyms:

Galeolaria australis Bigelow, 1911; *Diphyes biloba* Sars, 1846.

References:

Daniel, 1985; Migotto *et al.*, 2004; Jia *et al.*, 2004; Cairns *et al.*, 2003; Bouillon *et al.*, 2004; Bisby *et al.*, 2005.

Description: (After bioinformatics Centre, National Institute of Oceanography, Goa, India).

Polygastric phase: Anterior nectophore: Large 26 mm long; absence of ridges and hydroecium. Somatocyst short, ovoid, with long axis oblique. Dorsal side with a tooth-like projection extending beyond level of ostium. Lateral teeth absent. Mouth plates long, broad, divided without vertical thickened pads. Characteristic pit-like depression at base of somatocyst. Oblique commissural canal exceptionally long joining lateral radial canals at mid-length of nectosac. Reserve bud of both anterior and posterior nectophores present.

Posterior nectophore: 26 mm in length, 6.5 mm in breadth. No dorsal or lateral teeth around

ostium. Mouth plate characteristically shaped, consisting of two side pieces distinctly separated in middle by a raised thickened notch.



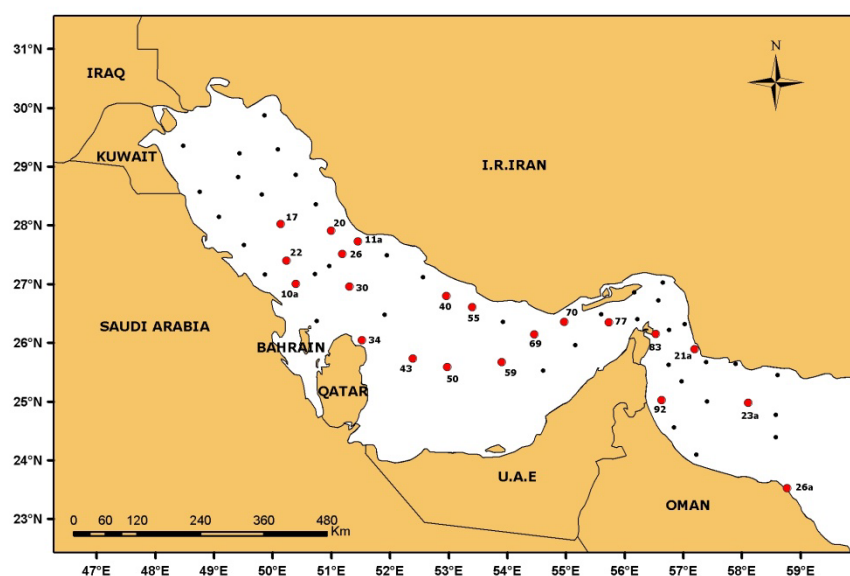
Sulculeolaria bilobata

Distribution:

Warm water species, rarely found in temperate waters, Atlantic, Sea of Oman, Mediterranean, Brazil, Canada, USA, China.

Sites of occurrence in RSA:

Found at numerous stations throughout the whole RSA (New record, refer sites map).



Sites of occurrence of *Sulculeolaria bilobata* in RSA

Family: Diphyidae

Genus: *Sulculeolaria*

Scientific Name: *Sulculeolaria quadrivalvis* Blainville, 1834; Daniel, 1974

Synonyms:

Galeolaria quadridentata Quoy & Gaimard, 1834; *Sulculeolaria brintoni* Alvarino, 1968.

References:

Daniel 1985; Cairns *et al.*, 2003; Migotto *et al.*, 2004; Jia *et al.*, 2004; Bouillon *et al.*, 2004; Bisby *et al.*, 2005; Ramesh *et al.*, 2008.

Description: (After bioinformatics Centre, National Institute of Oceanography, Goa, India).

Polygastric phase: Anterior nectophore: 18 mm in length, smooth, devoid of ridges, with blunt apex and broad base. Nectosac large sub-cylindrical, slightly bent, with blunt apex and well developed musculature; all canals arise near baso-ventral corner of nectosac from pedicular canal; lateral canals connected by oblique commissural canal. Hydroecium absent. Somatocyst thin long, characteristically curved, reach up to middle of nectosac on dorsal side. Sub-ostial lamellae or mouth plate occur as two basolateral wings due to deep division between wings; inner margin of mouth plate thick and raised into oval shaped vertical pads. Reserve buds of anterior and posterior nectophores often present.

Posterior nectophore: Up to 19 mm long, sub-cylindrical in shape, with truncated broad apical end, smooth, devoid of any ridges. Nectosac with two characteristic constrictions at right angles to one another. Two dorsal and two lateral teeth present around ostium. Lateral radial canal form a long loop extending from base to apex before joining ring-canal. Mouth-plate, long, large occur as two baso-ventral wings with thickened vertical pads as in anterior nectophore. Hydroecium is a shallow open groove.



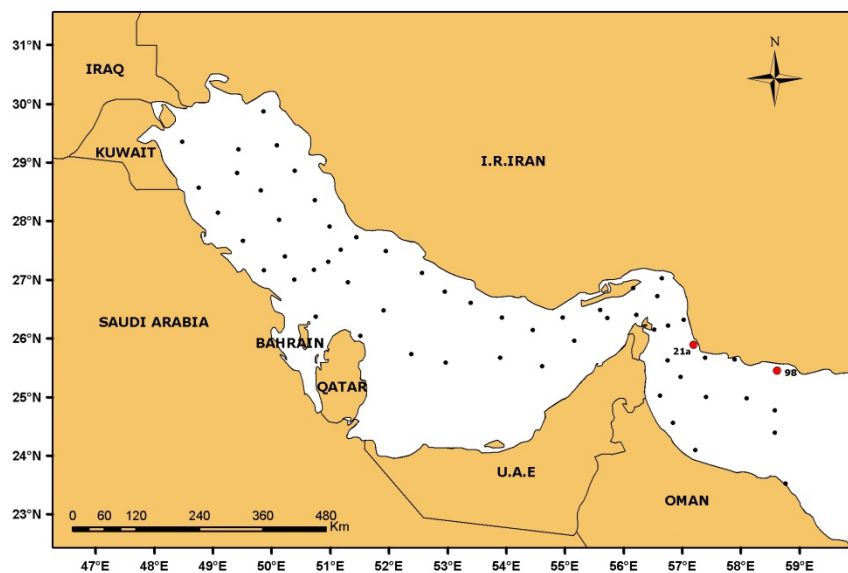
Sulculeolaria quadrivalvis

Distribution:

Atlantic, Indian and Pacific Oceans, Sea of Oman, Mediterranean Sea, Black Sea, Red Sea.

Sites of occurrence in RSA:

Found at two stations only (Sts. 21a & 98) in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Sulculeolaria quadrivalvis* in RSA

3.3 Phylum: Ctenophora

Ctenophores variously known as comb jellies, sea gooseberries, sea walnuts, or Venus's girdles. They have eight "comb rows" of fused *cilia* arranged along the sides of the animal. These cilia beat synchronously and propel ctenophores through the water. Many ctenophores have two long tentacles, but some lack tentacles completely.

Like cnidarians, their bodies consist of a mass of jelly with one layer of cells on the outside and another lining the internal cavity, but they lack stinging cells, and instead, possess sticky cells called colloblasts.

Class: Nuda

3.3.1 Order: Beroida

Family: Beroidae

Genus: *Beroe*

Scientific Name: *Beroe ovata* Mayer 1912

Synonyms:

Beroe capensis Chamisso & Eysenhardt, 1821; *Beroe clarkii* Agassiz, 1860; *Beroe punctata* Chamisso & Eysenhardt, 1821; *Beroe shakespearei* Benham, 1907; *Idya mertensii* Mertens, 1833; *Idyiopsis affinis* Agassiz, 1860.

References:

Bigelow, 1912; Bishop, 1972; Hernandez-Nicaise *et al.*, 1980; Madin, 1991; van der Land, 2001; Kideys and Romanova, 2001; Cairns *et al.*, 2003; Finenko *et al.*, 2001; 2003; Mills, 2003; Zheng *et al.*, 2003; Kideys *et al.*, 2004; Bisby *et al.*, 2005; Streftaris *et al.*, 2005); Madin, L.P. 1991; Shiganova *et al.*, 2003; 2005.

Description: (Chamisso and Eysenhardt, 1821).

Body mitten-shaped. Lateral compression very marked. Four meridional canals of each broad side connected orally by oral forks of paragastric canal. Eight meridional canals interconnected by loose network of numerous diverticulae, with a few anastomoses forming a

wide meshwork. Young *Beroe ovata* cannot be distinguished from *Beroe cucumis*. Color dull milky, pink or reddish brown. Height: up to 115 mm, usually 60-70 mm.



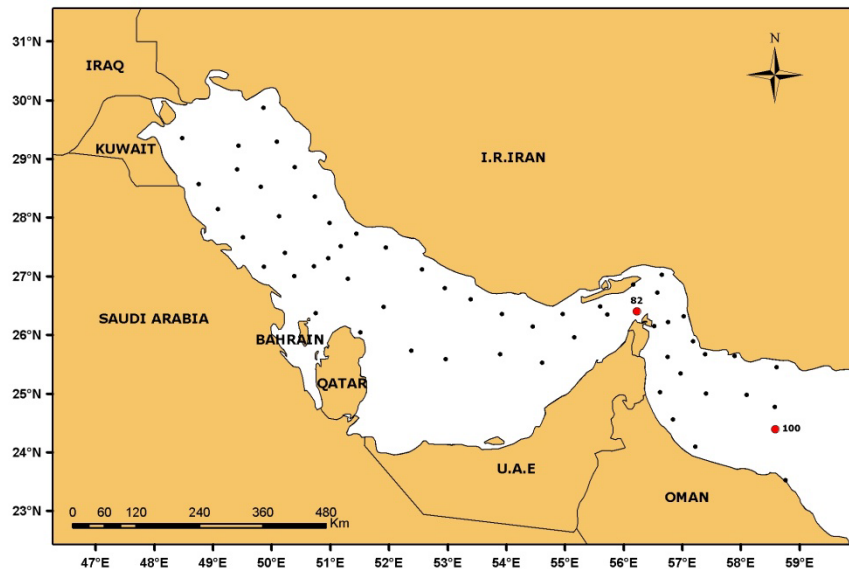
Beroe ovata

Distribution:

Mediterranean, South Atlantic, Black Sea, Caspian Sea, Belgium, Russian Fed, Canada, China, USA.

Sites of occurrence in RSA:

Southern part of the inner RSA, Sea of Oman (Present study, refer sites map), West coast of UAE, Inner RSA (Gibreel *et al.*, 1997).



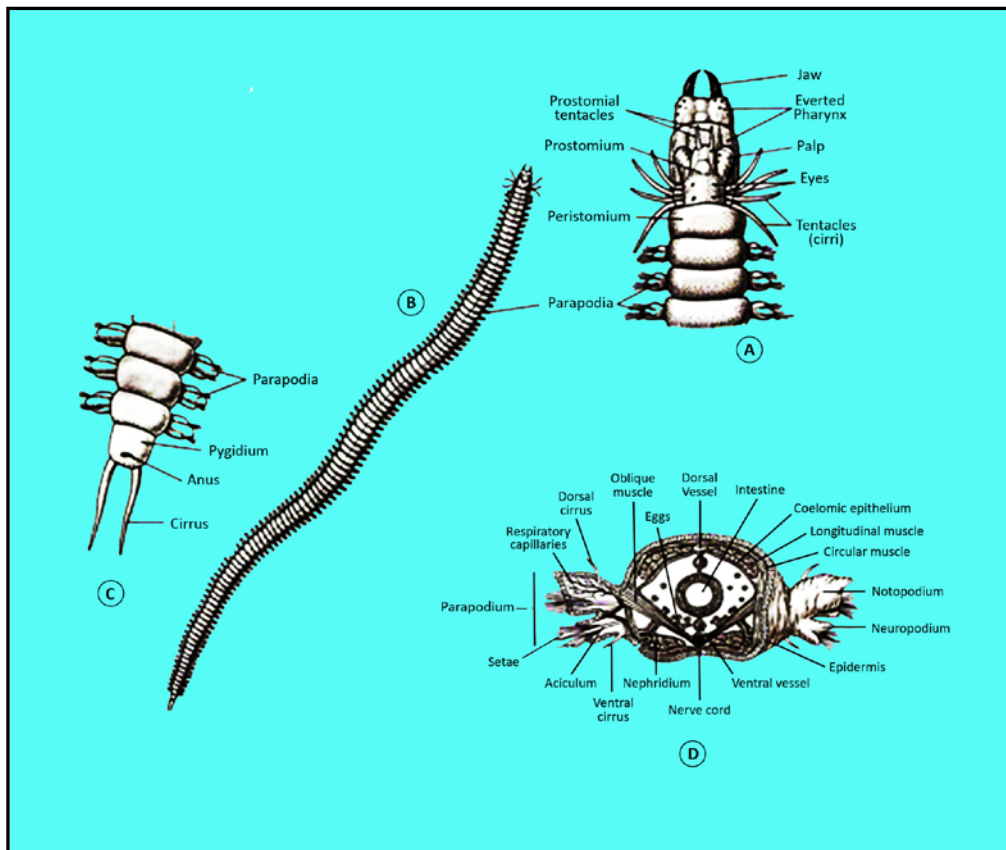
Sites of occurrence of *Beroe ovata* in RSA

3.4 Phylum: Annelida

Class: Polychaeta

Polychaetes, the bristle worms, are characterized by wide array of adaption in body form to colonise different habitats, including active burrowers, sedentary burrowers, tube-dwelling in sediment as well as on a hard substrate; errant, beneath stones etc. However, there are also pelagic forms.

Polychaetes have well developed, paired, paddle-like appendages (parapodia), well developed sense organs, and numerous setae (usually on the parapodia). They usually have a well-developed head, often complete with well-developed eyes, antennae, and sensory palps. They lack permanent sex organs; gonads appear as swellings during the breeding season.



The general morphological features of an errant polychaete: A, anterior end with pharynx everted; B, external structure; C, posterior end; D, generalized transverse section through region of the intestine (after Hitchman *et al.*, 2001).

Sub-class: Palpata

3.4.1 Order: Aciculata

Sub-order: Phyllodocida

Family Alciopidae

Genus *Alciopina* Claparede and Panceri, 1867

Scientific Name: *Alciopina parasitica* Claparede and Panceri, 1867

Synonyms:

Alciopina Pancerii Buchholtz, 1869; *Corynocephalus albo-maculatus* Fauvel, 1916, 1923, 1951; Wesenberg-Lund, 1939; *Corynocephalus albomaculatus* Levinsen, 1885; Apstein, 1900; Granata, 1911b, Fauvel, 1951; *C. paumotanus* Chamberlin 1919; Treadwell, 1943; , *C. Gazellae* Apstein, 1893, 1900.

References:

Bisby *et al.*, 2005; Wehe, and Fiege 2002; Salazar-Vallejo, 1996; Dales and Peter 1972; Salazar-Vallejo and Londoño-Mesa 2004; Zheng *et al.*, 2003; Paxton and Chou 2000; Shen, 1978; Wehe and Fiege, 2002; Khan and Murugesan 2005; Srikrishnadhas *et al.*, 1998; Jimenez-Cueto and Suarez-Morales 2008.

Description:

Body relatively short; prostomium projecting forward in front of the eyes, with two pairs of short frontal antennae. Median antenna represented by a carina with the tip prolonged into a short papilla. Eyes large, directed sideways; four or five pairs of tentacular cirri. First segment following those contributing tentacular cirri, chaetigerous, with well-developed foliaceous cirri; dorsal cirri imbricated over the back. Chaetae of two kinds, both simple: Heavy acicular chaetae, and slender capillaries. No cirriform appendage at the tip of the chaetigerous lobe.

Four species have been described. Of these, Apstein's (1900) *Corynocephalustenuis* has been thought to be an *Alciopina* by Stop-Bowitz (1948), though here it is interpreted as a *Plotohelmis*. The three species included in the list of synonyms above are all very similar as far as can be judged from published descriptions and illustrations. There certainly seems to be no difference between *A. parasitica* and Chamberlin's (1919) species; Apstein's (1893) *C. gazellae* may be conspecific with this species, but it is desirable that the type-specimen be reexamined.



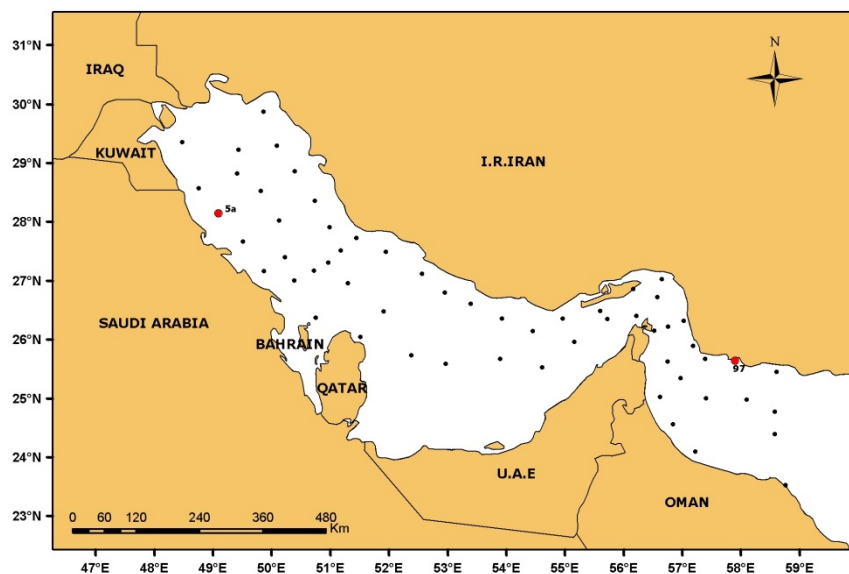
Alciopina parasitica

Distribution:

Atlantic and Mediterranean, European waters, most widespread species in the Pacific.

Sites of occurrence in RSA:

Found once at station 7a in the north eastern end of the inner RSA and once at station 97 in the Sea of Oman.



Sites of occurrence of *Alciopina parasitica* in RSA

3.4.2 Order: Phyllodocida

Family: Tomopteridae Grube

Genus: *Rhynchonerella*

Scientific Name: *Rhynchonerella angelini* (Kinberg)

Synonyms:

Kronia Angelini Kinberg, 1866; *Callizona Grubei* Greeff, 1876; Apstein, 1891, 1892, 1900; *C. Angelini*, 1900; Southern, 1911; Fauvel, 1916, 1923, 1932; Monro, 1930, 1936; WesenbergLund, 1939; *C. Henseni* Apstein, 1900; *Rhynchonerella pycnocera* Chamberlin, 1919; Treadwell, 1928, 1943; *R. parva* Chamberlin, 1919; *R. Angelini* Greeff, 1876,; Stop-Bowitz, 1948; Dales, 1955b.

References:

Carl, 1948; Hartman, 1956; Dales, 1957; Dales and George, 1972; Eduardo *et al.*, 2005; Fauchald, 2007.

Description: (After Dales, 1957).

Long and 6 mm. broad; larger specimens yellowish or brown in color when preserved, with heavy deposits of dark pigment on the dorsal side of each segment and prostomium. Prostomium forming a cushion in front of the eyes and bearing four frontal antennae, all short and fat; median antenna more slender and arising posteriorly between the eyes. Proboscis short, with twelve similar papillae around the rim. Parapodia with large foliaceous dorsal and ventral cirri; ventral cirri often thick and stout; dorsal cirri more foliaceous and more or less imbricated over the back. Segmental glands dark and conspicuous, occurring from the 15th segment or thereabouts, posteriorly; chaetae borne on the first segment following that contributing the most posterior cirri; each sheaf consisting of long, slender, compound chaetae, and stout compound acicular chaetae with slender, simple end pieces. These are most numerous in the anterior segments, twelve to fifteen in the first few, but only one or two farther back.



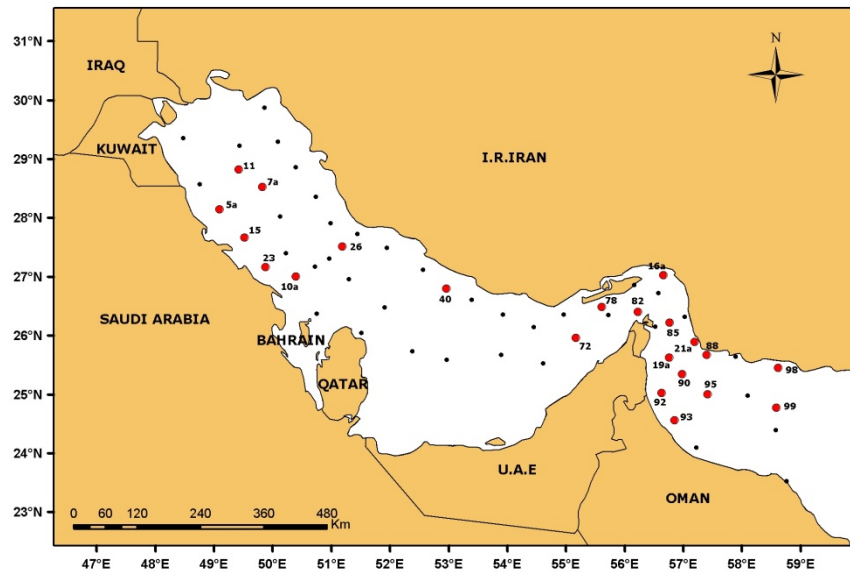
Rhynchonerella angelini

Distribution:

Cosmopolitan.

Sites of occurrence in RSA:

Widely distributed in both the inner RSA and the Sea of Oman.



Sites of occurrence of *Rhynchonerella angelini* in RSA

Family: Lopadorhynchidae

Genus: *Pelagobia*

Scientific Name: *Pelagobia longicirrata* Gravier, 1911

Synonyms:

Pelagobia Vigueri Gravier, 1911; Chamberlin, 1919; Benham, 1921, 1927; Treadwell, 1943; Uschakov, 1952.

References:

Greeff, 1879a; Viguer, 1886; Reibisch, 1893, 1895, 1905; Southern, 1909; Bergstrom, 1914; Ehlers, 1912, 1913; Fauvel, 1916, 1923, 1936, 1951; Okuda, 1937; 1938; Augener, 1929;

Monro, 1936; Stęp-Bowitz, 1948, 1949; Williams, 1954; Dales, 1955b; Salazar-Vallejo, 1996; Wehe and Fiege 2002; Zheng *et al.*, 2003; Dauvin *et al.*, 2003; Müller, 2004; Salazar-Vallejo and Londoño-Mesa, 2004; Bisby *et al.*, 2005.

Description: (Dales, 1957).

Prostomium with two pairs of very short antennae, and closely applied to the first segment, which bears two pairs of cirri of equal length and some short chaetae. First two pairs of parapodia lack dorsal cirri, but the third and following pairs of parapodia with relatively long dorsal and ventral cirri. Each parapodium bears a sheaf of compound chaetae in which the distal part is clearly serrated.



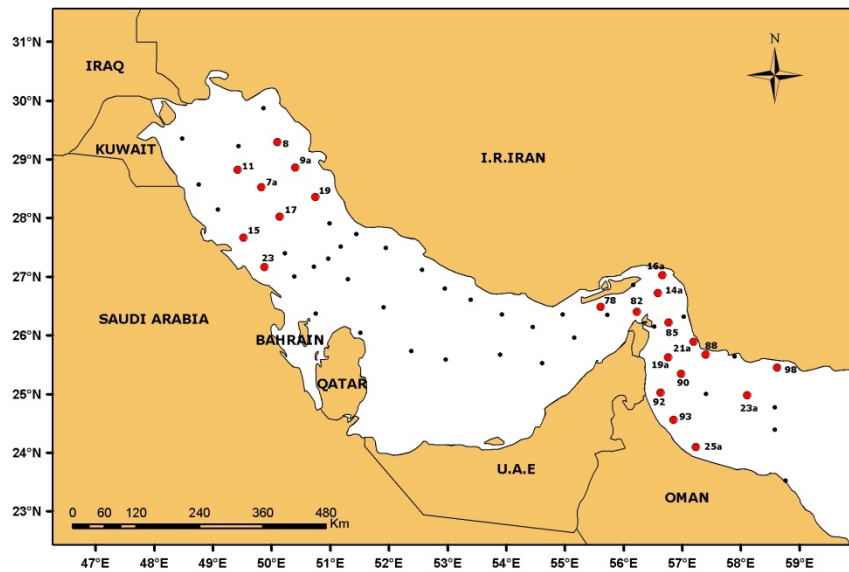
Pelagobia longicirrata

Distribution:

Cosmopolitan species, widely distributed in all the oceans, but with a greater affinity for cold waters (Day, 1975), Atlantic, Mediterranean, Arctic, Antarctic, Indian and Pacific oceans.

Sites of occurrence in RSA:

Northern and southern parts of inner RSA, Sea of Oman (New record, refer sites map).



Sites of occurrence of *Pelagobia longicirrata* in RSA

3.4.3 Order: Phyllodocida

Family: Tomopteridae

Genus: *Tomopteris*

Scientific Name: *Tomopteris pacifica* Izuka, 1914

Synonyms:

T. (Tomopteris) elegans Rosa, 1908b, 1912; Fauvel, 1923; Caroli, 1933; Terio, 1947a; Stop-Bowitz, 194-8, 1951; Fyfe, 1952; *T. oniseiformis*, 1825; Quatrefages, 1865; *T. Kefersteinii* Apstein, 1900; Lo Bianco, 1901, 1904; Schwartz, 1905 (not *T. Kefersteinii* Greeff 1879a).

References:

Chun, 1887; Izuka, 1914; Ehlers, 1917; Malaquin & Carin, 1911, 1922; Caroli, 1928a, b, 1930; Benham, 1929.

Description: (Dales, 1957).

Small, delicate; parapodia slender, with well-developed anterior cirri. Disposition of hyaline glands characteristic: these are restricted to the dorsal pinnules of the third and fourth pairs of parapodia. Gonads in the dorsal rami only; tail absent.



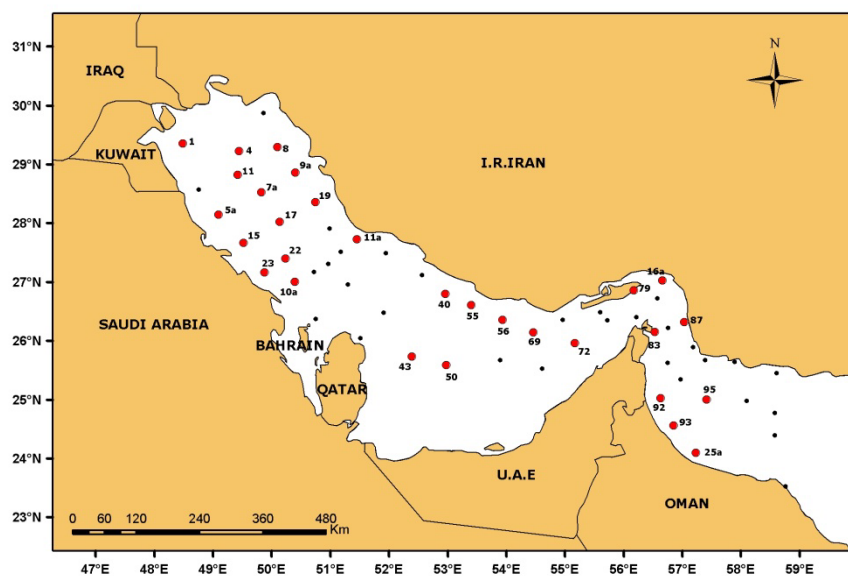
Tomopteris pacifica

Distribution:

California current, Pacific, New Zealand, Indian Ocean, Atlantic, Red Sea, Mediterranean.

Sites of occurrence in RSA:

Southern part of the inner RSA (New record, refer sites map).



Sites of occurrence of *Tomopteris pacifica* in RSA

Family: Tomopteridae

Genus: *Tomopteris*

Scientific Name: *Tomopteris helgolandica* Greeff 1879

Synonyms:

Tomopteris pagenstecheri Quatrefages 1866; *Tomopteris quadricornis* Leuckart & Pagenstecher in Quatrefages 1866.

References:

O'Connor, 1981; Salazar-Vallejo, 1996; Greve *et al.*, 2004; Bisby *et al.*, 2005; Khan and Murugesan, 2005; Fauvel, 1953.

Description: (After Muue, 1953).

First pair of Setigerous appendages lacking in adult specimen, second pair two third of the body, chromatophore gland voluminous inferiorly to the ventral ramus, gonads in both rami.



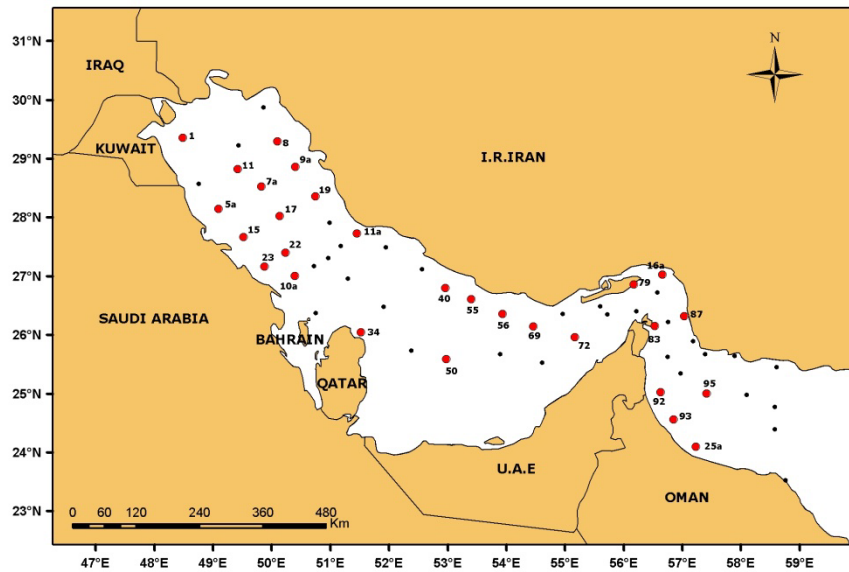
Tomopteris helgolandica

Distribution:

Atlantic, RSA Coast, Chesapeake Bay, North Sea, Plymouth, Roscoff, West Coast of England, Wimereux.

Sites of occurrence in RSA:

Found in the inner RSA and less so in the Sea of Oman.



Sites of occurrence of *Tomopteris helgolandica* in RSA

Family : Tomopteridae Grube

Genus: *Enapteris*

Scientific Name: *Enapteris euchaeta* Chun, 1888 Rosa, 1908

Synonym:

Tomopteris Eschscholtz, 1825, Chun, 1888, Hartman, O. 1959.

References:

Hartman, 1959; Fauchald, 1977; 2007; Bellan, 2001; Dauvin *et al.*, 2003; Müller, 2004.

Description: (Chun, 1887).

Pinnules broad with an inner clear area and a narrow frilly outer margin containing the glands. Glandular outer edge not extending between the rami in juveniles. Hyaline glands present towards the distal end of the inferior part of the ventral Pinnules from the third foot onwards. Chromophil glands swollen from fourth parapodia. Parapodia with rectangular pinnules which do not border the inner edges of the rami.



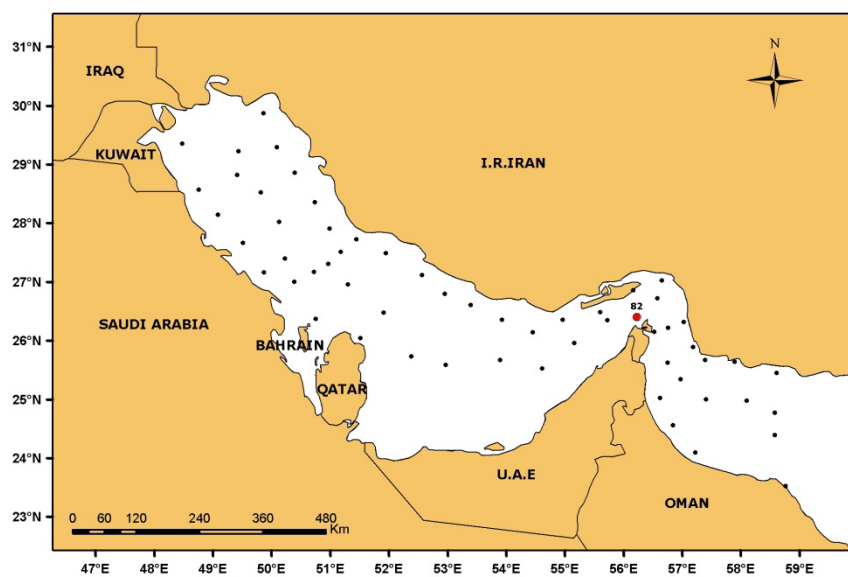
Enapteris euchaeta

Distribution:

East Atlantic, Belgium, Pacific, English Channel, North European Seas.

Sites of occurrence in RSA:

Occurred once inside the inner RSA near the Straits of Hormuz (New record, refer site map).



Site of occurrence of *Enapteris euchaeta* in RSA

Family Phyllodocidae

Genus: *Phalacrophorus* (Greeff, 1879)

Scientific Name: *Phalacrophorus uniformis* (Reibisch, 1895)

Synonyms:

Iospilopsis antillensis Augener, 1922, *Phalacrophorus attenuatus* Treadwell, 1943; *P. attenuatus* Treadwell, 1943.

References:

Reibisch, 1895; Ehlers, 1913; Fauvel, 1916, 1923; Salazar-Vallejo, 1996; Salazar-Vallejo and Londoño-Mesa, 2004; Zheng *et al.*, 2003.

Description: (Reibisch, 1895).

Body long, slender, transparent when preserved, apparently in life with a thin scattering of reddish or brownish chromatophores. First seven chaetigers reduced only with small lobes and few short setae. large number of anterior segments with rudimentary parapodia .



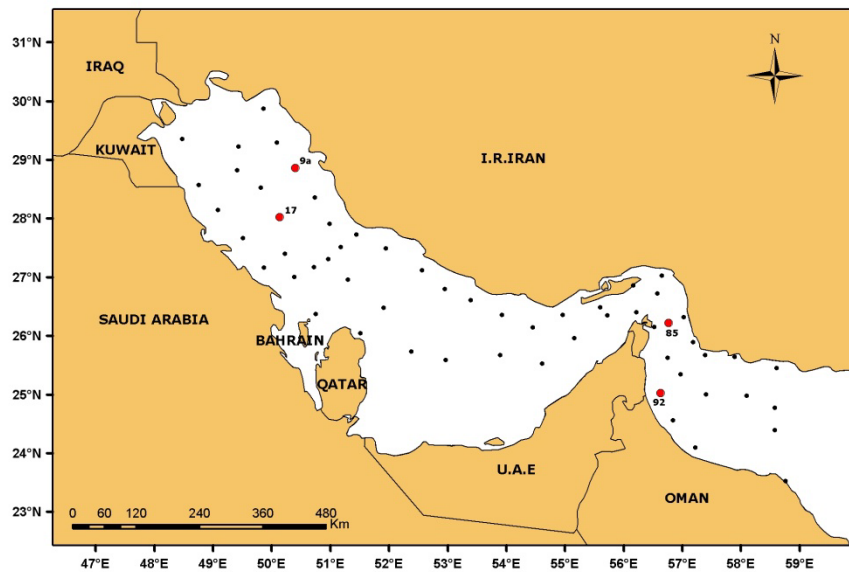
Phalacrophorus uniformis

Distribution:

Atlantic Ocean, tropical section, California, equatorial and Southern Pacific.

Sites of occurrence in RSA:

Inner RSA, northern and central parts, Sea of Oman (New record, refer sites map).



Sites of occurrence of *Phalacrophorus uniformis* in RSA

Family: Phyllodocidae

Genus: *Phalacrophorus* (Greeff, 1879)

Scientific Name: *Phalacrophorus pictus* Greeff, 1879

Synonyms:

Phalacrophorus borealis Reibisch, 1895; *P. maculatus* Treadwell, 1943.

References:

Bellan, 2001; Day, 1967; Fauchald 2007; Greeff, 1879; Hartman, 1956; Dales and Peter, 1972; Sicinski, 2008; Fauchald *et al.*, 2009; Suarez-Morales *et al.*, 2005.

Description:

Body long, slender, transparent when preserved, apparently in life with a thin scattering of reddish or brownish chromatophores. Most specimens 3-6 mm. long. *P. pictus* may be distinguished from *P. uniformis* by having only the first four segments with rudimentary parapodia.



Phalacrophorus pictus

Distribution:

Mediterranean, Atlantic Ocean, South Atlantic off Rio de Janeiro, Pacific, in Japanese waters as well as off the coasts of California and Peru.

Sites of occurrence in RSA:

Occasionally found in a mixed sample from several samples inside the inner RSA.

Family: Typhloscolecidae

Genus: *Sagitella*

Scientific Name: *Sagitella kowalevskii* Wagner 1872

Synonyms:

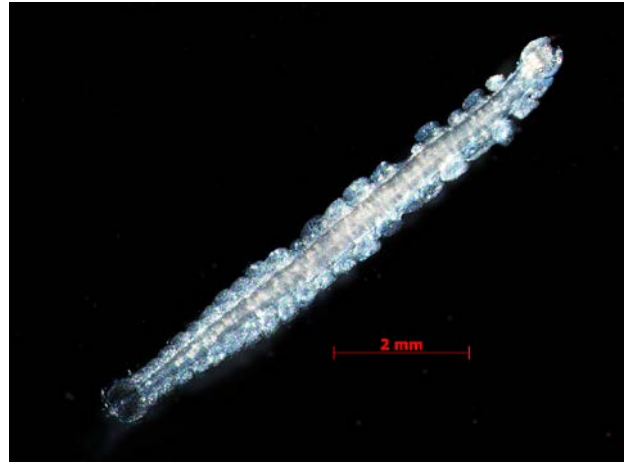
Sagitella Kowalevskii IDjanin, 1878; Reibisch, 1895; Southern, 1910, 1911; Gravier, 1911; Fauvel, 1916, 1923; Stop-Bowitz, 1948; Uschakov, 1952; Dales, 1955b; *Acicularia Virchowii* Langerhans, 1877; Greeff, 1878, 1879a; *Typhloscolex Miilleri* Greeff, 1879c; *Plotobia paucichaeta* Treadwell, 1943.

References:

Fernandez-Alamo, 2004; Suarez-Morales *et al.*, 2005; Johnson, 2002; Conway *et al.*, 2003; Wehe and Fiege, 2002.

Description:

Body short, slender, fusiform, transparent. Prostomium prolonged anteriorly into a slender papilla, but not raised into ciliated lobes as in *Typhloscolex*. Nuchal organs conspicuous, forming two boomerang-shaped ridges on the posterior part of the prostomium. No caruncle as in *Travisioopsis*, but the large retort-shaped organ may be seen by transparency of the body wall. Parapodial cirri large and



Sagitella kowalevskii

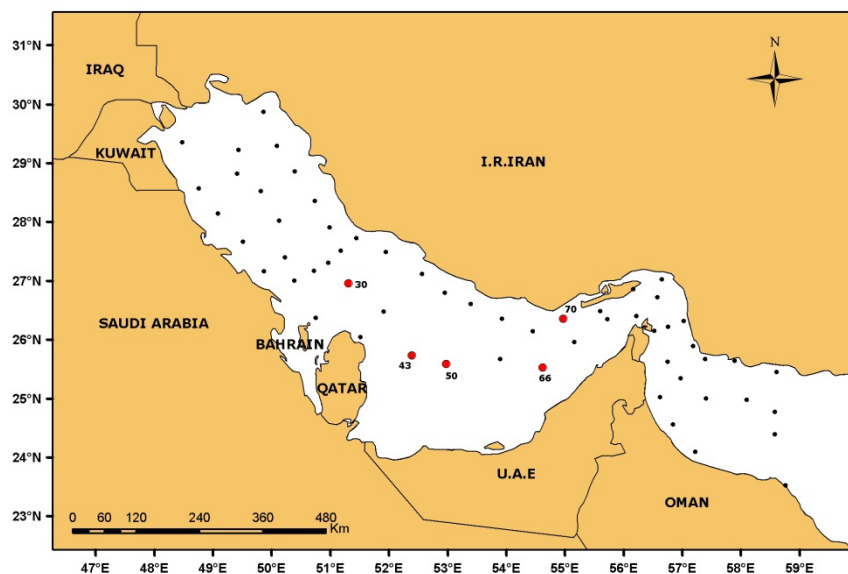
foliaceous, the two anal cirri being particularly well developed and reminiscent of the terminal fin of the chaetognath, *Sagitta*. Usually 1 mm across and about 15 mm in length; distinguished from other typhloscolecids by the absence of the caruncle and ciliated cushions, and by the characteristic shape of the nuchal organs.

Distribution:

True cosmopolitan species, and has been reported from the Pacific Ocean.

Sites of occurrence in RSA:

Occurred in the southern half of the inner RSA (refer sites map).



Sites of occurrence of *Sagitella kowalevskii* in RSA

Family: Lopadorhynchidae

Genus: *Pedinosoma*

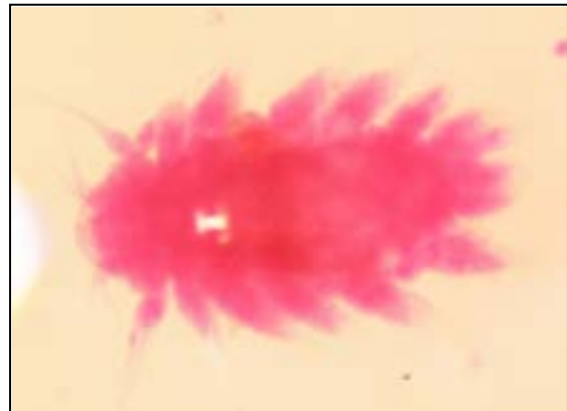
Scientific Name: *Pedinosoma curtum* Reibisch, 1895

References:

Shen, 1978; Paxton and Chou 2000; Bellan, 2001; Bisby *et al.*, 2005.

Description: (After Reibisch, 1895).

Body small and flattened with few segments. Round prostomium with two pairs of lateral antennae. Tentacular cirri without setae. All subsequent parapodia with cordate dorsal cirri, conical setigerous lobes and lanceolate ventral cirri. Setae all fine and compound.



Pedinosoma curtum

Distribution:

The South China Sea, Northeast Pacific, Indian Ocean.

Sites of occurrence in RSA:

Occasionally found in a mixed sample from several samples inside the inner RSA.

Family: Magelonidae Cunningham and Ramage, 1888

Genus: *Magelona* Mueller, 1858

Scientific Name: *Magelona papillicornis* Muller 1858

Synonym:

Magelona mirabilis Johnston, 1865

References:

Jones, 1977; Johnston, 1865; Harms, 1993; Hayward and Ryland, 1995b; Hayward *et al.*, 1996, Fish & Fish, 1996; Kühne and Rachor 1996; Salazar-Vallejo, 1996; Howson and Picton, 1997; Fiege *et al.*, 2000a; 2000b; Bellan, 2001; Gusso *et al.*, 2001; Wehe and Fiege 2002; Vittor, 2002; Müller, 2004; Salazar-Vallejo and Londoño-Mesa, 2004; Bisby *et al.*, 2005; Fauchald, 2007.

Description:

Palps fringed with papillae down one side and inserted ventrally at base of prostomium. However, the palps are rarely present. 8 anterior chaetigers bear only hair-like chaetae. Chaetiger 9 has greatly developed dorsal lappets almost meeting at the mid-line and paddle shaped chaetae forming a broad fan. Remaining chaetigers have smaller, incurved parapodial lappets and relatively few, short, hooded chaetae with double hooks. Terminal segment bears 2 small, anal cirri.



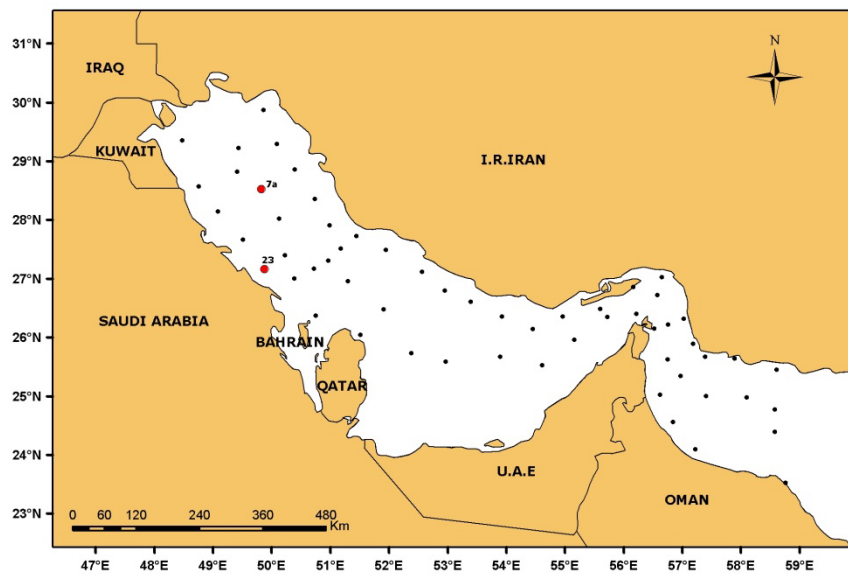
Magelona papillicornis

Distribution:

Indo-Pacific, Atlantic Ocean and the Mediterranean, Brazil and Belgium.

Sites of occurrence in RSA:

Confined to the northern inner RSA at stations 7a and 23 (New record, refer sites map).



Sites of occurrence of *Magelona papillicornis* in RSA

3.5 Phylum: Mollusca

The molluscs include several benthic groups like gastropods, bivalves, cephalopods, and chitons. They also include adult several planktonic forms, described below.

Class: Gastropoda

Heteropods are marine free-swimming gastropods, and relatively common members of the plankton in tropical and subtropical seas, particularly in the Indo-Pacific region. The body is adapted to pelagic life, the familiar creeping gastropod foot being modified as a more or less single, fin-like swimming organ. The spiral shell may be present, well-formed, reduced, or even absent. They possess well developed eyes. Some species have an obvious coiled shell (Family Atlantidae); others have lost it completely (Family Pterotracheidae). The mantle cavity, if present, may have a single gill or lack it completely. A few species have adopted planktonic lifestyles, with some barely different from benthic forms, while others are highly modified for life in the water column. Some utilize paired modified extensions of the foot (the "wings") to swim by flapping.

3.5.1 Order: Thecosomata

Thecosome pteropods possess relatively large wings for swimming, mantle cavity, usually with a single small gill; cilia on posterior and lateral footlobes. The mouth typically has lateral jaws and a radula.

Family: Cavoliniidae

Representatives of Family Cavoliniidae generally have a symmetrical cone-shaped or globular shell that may be slightly curved.

Family: Cavoliniidae

Genus: *Creseis* Rang, 1828

Scientific Name: *Creseis chierchiae* Boas, 1886

Synonyms:

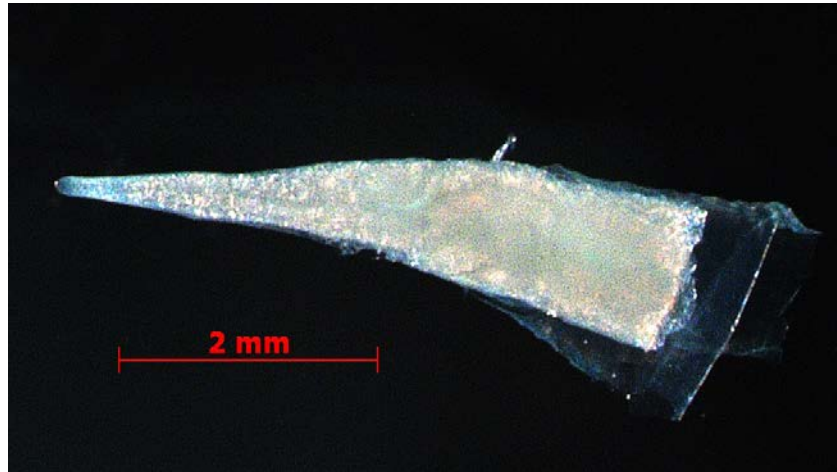
Cleodora chierchiae Boas, 1886; *Clio (Cleodora) chierchiae* Pelseneer, 1888a; *Creseis chierchiae* Meisenheimer, 1905c; *Creseis (Boasia) chierchiae* Johnson, 1934; *Hyalocylis striata* in part Van der Spoel, 1967.

References:

Boas, 1886; Pelseneer, 1888; Van der Spoel and Newman, 1990; Bhattacharjee, 2005.

Description:

Shell straight, but clearly becoming broader towards the aperture. Aperture oval without a beak. Shell usually transversely striated, the striae becoming more prominent towards the aperture. The shell aperture is round. (*Creseis chierchiae* 1). The embryonic shell, with anteriorly convex and posteriorly concave sides, has a blunt anterior end. A clear incision separates the embryonic and adult shell. A wing protrusion is present. Shell length 1.4-1.6 (exceptionally 2.7) mm, width 0.2 mm, embryonic shell 0.4-0.5 mm long.



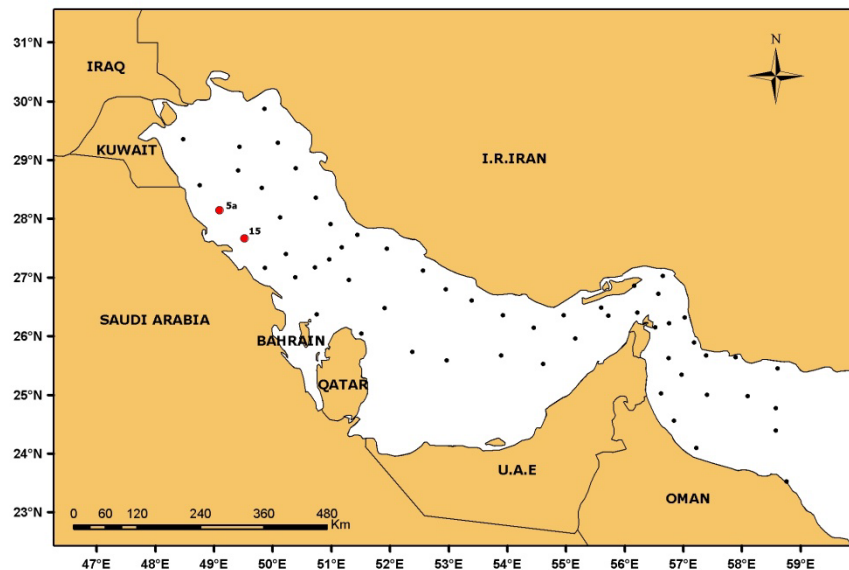
Creseis chierchiae

Distribution:

This species occurs in warm and temperate waters of all oceans including the Mediterranean and Red Sea.

Sites of occurrence in RSA:

Inner RSA, on Saudi coast (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Creseis chierchiae* in RSA

Family: Cavoliniidae

Genus: *Creseis* (Rang, 1828)

Scientific Name: *Creseis acicula* (Rang, 1828)

Synonyms:

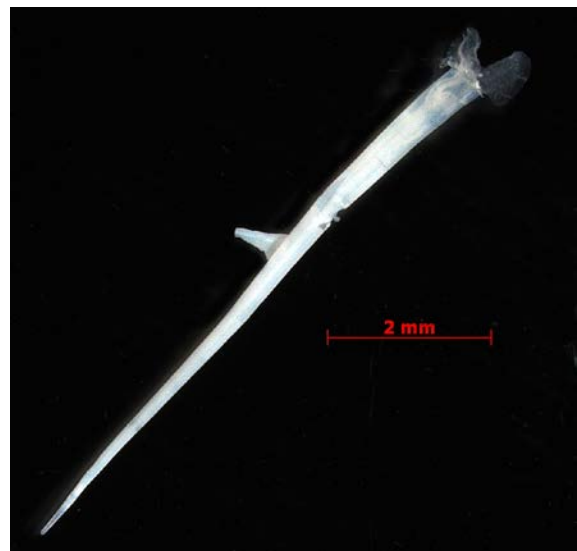
Cleodora (*Creseis*) *acicula* Rang, 1828b; *Creseis acus* Eschscholtz, 1829; *Hyalaea aciculata* d'Orbigny, 1836; *Cleodora acicula* Deshayes and Edwards, 1836; *Hyalaea subula* d'Orbigny, 1936; *Creseis aciculata* Gray, 1842; *Cresis acus* Gray, 1846; *Styliola recta* Gray, 1850; *Cleodora* (*Creseis*) *aciculata* Woodward, 1854; *Clio* (*Creseis*) *acicula* part Pelseneer, 1888a; *Creseis recta* Dall, 1889a; *Creseis virgula* part Tesch, 1908; *Clio acicula* Hedley, 1907a; *Creseis acicula acicula* Tesch, 1913c.

References:

Abbott, 1974; Albergoni, 1975; Almogi-Labin, 1984; Almogi-Labin and Reiss, 1977a; Almogi-Labin *et al.*, 1988; Barash and Danin, 1971a ; Bé and Gilmer, 1977; Biekart, 1989; Boas, 1886a; Boltovskoy, 1973; Boltovskoy, 1975a; Burgi and Devos, 1962; Casanova *et al.*, 1973; Chen and Bé, 1964b; Wells, 1978a; Wormuth, 1986; Yamaji, 1991; Zhang, 1966; Zhong *et al.*, 1989; Subba Rao, 2003; Conway *et al.*, 2003.

Description:

This is a shelled pelagic snail, up to 4 cm long, with a transparent uncoiled shell. The cross-section is round. The surface is smooth. The shell is extremely long and narrow, tube-shaped and not curved. The visceral mass is seen through the shell. It lives in the warmer waters of all oceans in the upper water layers.



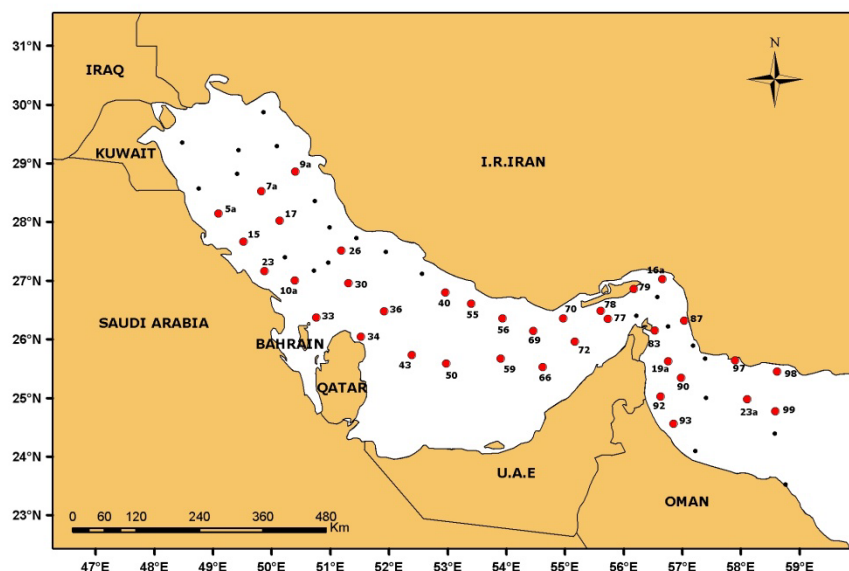
Creseis acicula

Distribution:

Circum-global 50°N-45°S; shows a continuous distribution in warm waters, Sargasso Sea and the Benguela Current, North Atlantic.

Sites of occurrence in RSA:

Widespread in the whole ROPME Sea Area (Present study, refer sites map); Western ROPME Sea Area (Michle *et al.* 1986); Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004); West coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Creseis acicula* in RSA

Family: Limacinidae

Genus: *Limacina*

Scientific Name: *Limacina inflata* (d'Orbigny, 1836)

Synonyms:

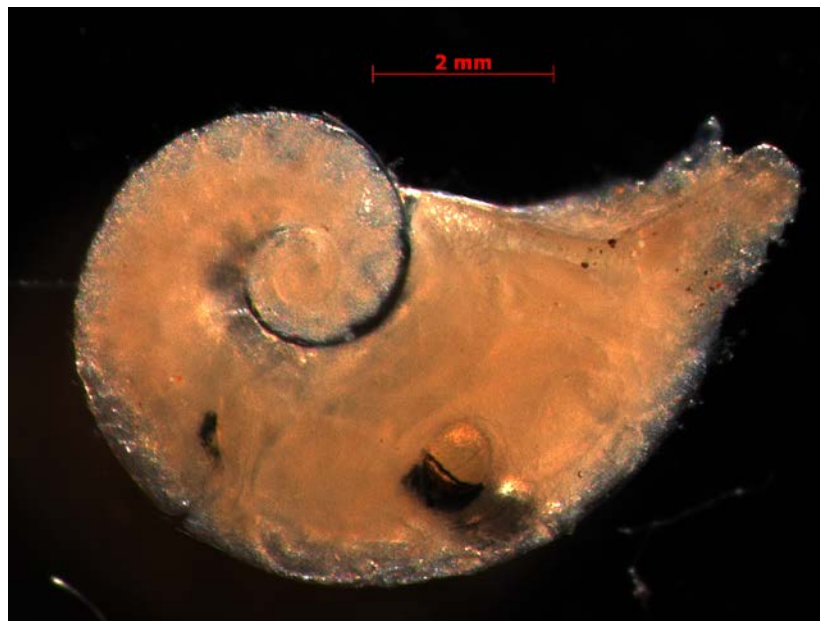
Spiratella inflata D'Orbigny, 1836; *Atlanta inflata* d'Orbigny, 1834; *Embolus inflata* d'Orbigny, 1834; *Spiratella inflata* d'Orbigny, 1834; *Spirialis inflata* d'Orbigny, 1834; *Protomedea rostralis* Eydoux and Souleyet, 1840; *Embolus rostralis* Eydoux & Souleyet, 1840; *Spirialis rostralis* Eydoux and Souleyet, 1840; *Limacina scaphoidea* Gould, 1852; *Protomedea elata* Costa, 1861; *Spirialis appendiculata* Pelseneer, 1888; *Spiratella volhinica* Stancu, 1979.

References:

d'Orbigny, 1834; Eydoux and Souleyet. 1840; Gould, 1852; Bisby *et al.*, 2005; Burn, 2006; Jia *et al.*, 2004; Solis and von Westernhagen, 1978; Suarez-Morales and Gasca, 1998; Turgeon *et al.*, 1998.

Description:

Shell with up to 3 whorls coiled at one level (involute). Last whorl swollen, aperture heart-shaped with blunt tooth extending on last whorl as faint keel or rib. Rostrum, or aperture tooth, variable in shape. Umbilicus deep. Embryonic shell with rough granulated surface both on proximal zone and first whorl (Boltovskoy, 1974b). Maximum diameter 1.5 mm.



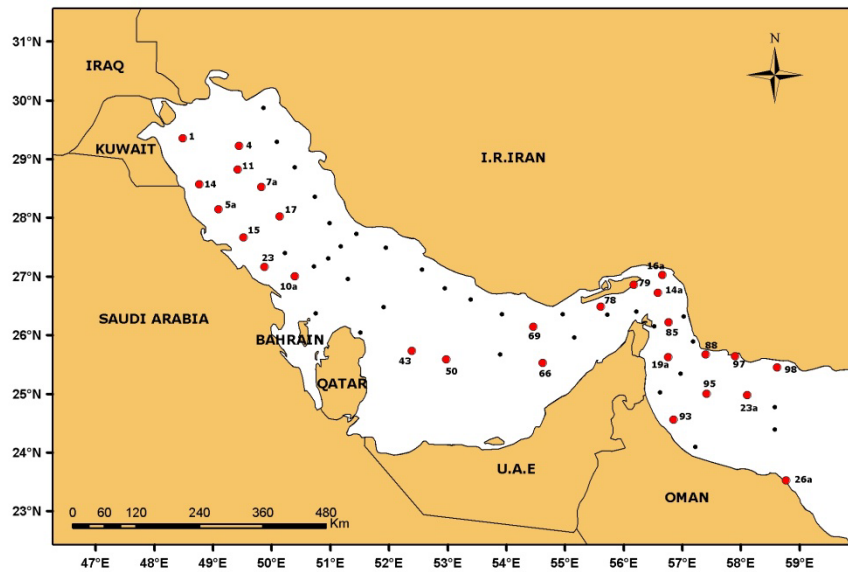
Limacina inflata

Distribution:

Atlantic, Indian and Pacific oceans, Mediterranean, Red Sea.

Sites of occurrence in RSA:

Widespread in both inner RSA and Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and AbdelAziz, 2003).



Sites of occurrence of *Limacina inflata* in RSA

3.5.2 Order: Gymnosomata

These naked pteropods (Order Gymnosomata) lack any kind of shell or mantle cavity. They have a pair of swimming fins located near the head, well-defined head with two pairs of tentacles. The body is covered by a somewhat tough elastic skin, and there is terminal mouth which may be equipped with specialized mouthparts, including a radula, hooks, adhesive tentacles (some with suckers), and a jaw to grasp.

Family: Clionidae (Rafinesque, 1815)

Genus: *Clione* Pallas, 1774

Scientific Name: *Clione limacina* Phipps, 1774

Synonyms:

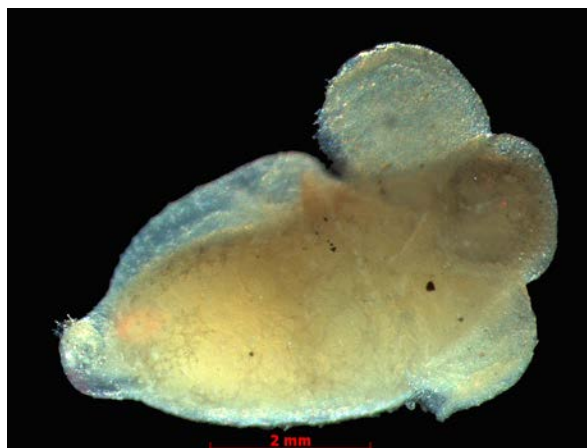
Clione filifera n. sp. Pruvot-Fol, 1926; *Clione limacina limacina* forma *filifera* Van der Spoel, 1972.

References:

Morton, 1958; Lalli, 1970; Lalli and Gilmer, 1989; Gilmer and Lalli, 1990; Hermans and Satterlie, 1992.

Description:

The buccal apparatus consists of three pairs of buccal cones. These tentacles grab the shell of *Limacina helicina*. When the prey is in the right position, with its shell opening facing the radula of *Clione limacina*, it then grasps the prey with its chitinous hooks, everted from hook sacs.



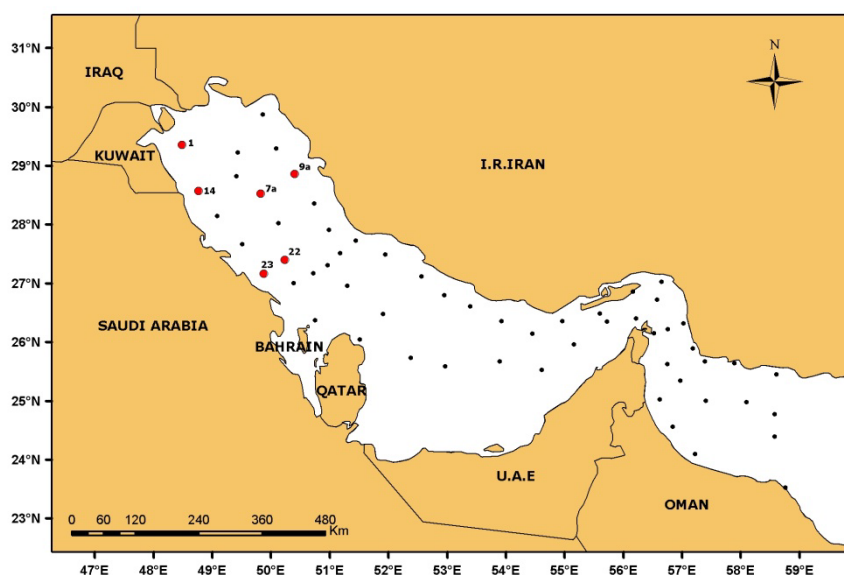
Clione limacina

Distribution:

mostly in cold waters, as the Arctic Ocean and Antarctic waters; also in Northern Atlantic and Eastern Pacific temperate waters.

Sites of occurrence in RSA:

Confined to the northern part of the inner RSA (New record, refer sites map).



Sites of occurrence of *Clione limacina* in RSA

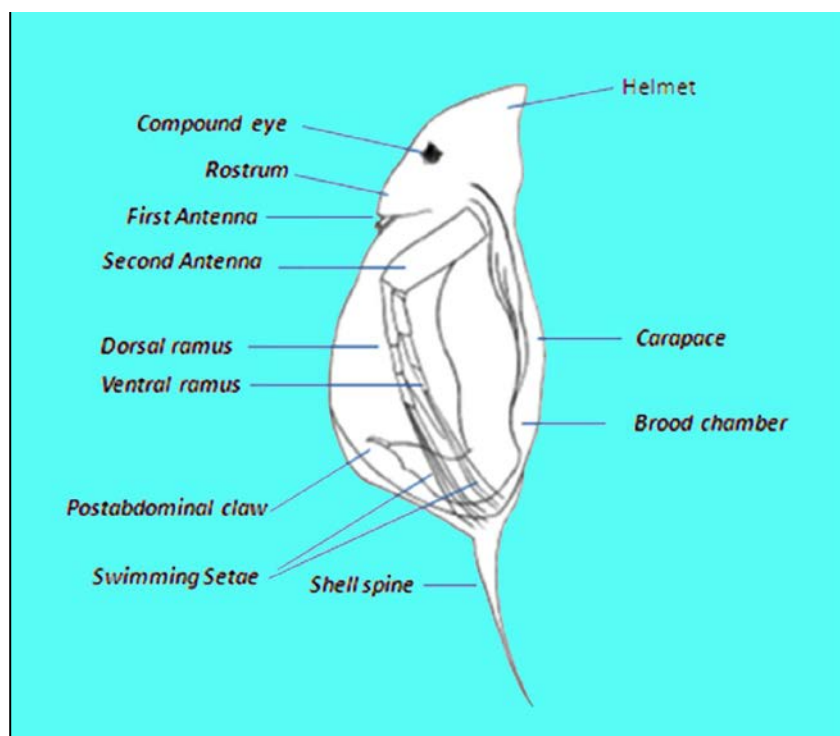
3.6 Phylum: Arthropoda

Sub-phylum: Crustacea

Class: Branchiopoda

3.6.1 Order: Cladocera

Cladocerans are small free-swimming crustaceans, with a distinct head and bivalve carapace covering most of the body except the appendages. The head is typically separated from the body by a deep indentation, but also may not be separated. It projects forward as a beak or rostrum. The first pair of antennae that contains sensory organs is quite small and is attached to the rostrum. The second pair, however, is disproportionably large compared to the body.



General Morphology of Cladocera

They have few feet (4-6 pairs), which are mostly respiratory, carrying the branchiae. Two pairs of antennae are present, the larger pair being of large size, branched, and acting as natatory organs. On the forehead is an unpaired compound eye, and in most species, a simple naupliar eye. The thorax of water fleas is very short and consists of 4 to 6 segments. In

females, there is a large space between the back and the dorsal side of the carapace that functions as a brood pouch. Most species also have a tail, or spiny projection of the carapace, while some have hairs projecting.

Sub-order: Eucladocera

Family: Polyphemidae

Genus: *Podon* Liljeborg, 1853

Scientific Name: *Podon polyphemoides* (Leuckart, 1859)

Synonyms:

Evadne polyphemoides Leuckart, 1859; *Pleopsis polyphemoides* Leuckart, 1859; *Pleopsis minutus* Sars, 1862; *Podon mecznikovii* Cerniavski, 1868.

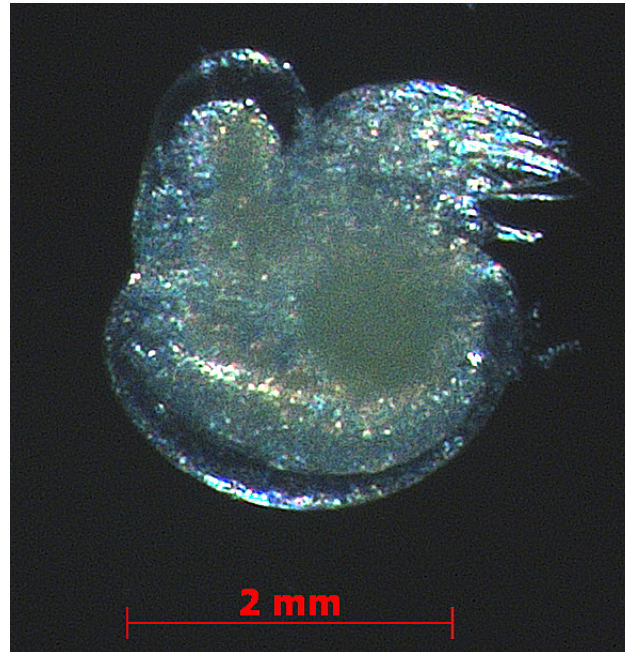
References:

Brunel *et al.*, 1998; Gerber, 2000; Gosner, 1971; Linkletter, 1977; Della Croce, 1974; Flößner, 1972; Rammer, 1939.

Description:

Female Carapace faintly reticulate. Head round. Eyes very large, occupying almost the whole forehead. Lower edge of labrum rounded. The antennulae are very small and unable to move; they are situated on a common protuberance and are fused partially with this protuberance and the lower side of the head; the antennulae bear at the end four sensory papillae. Exopodite of antenna with seven setae; the distal segment of both antennal branches are very small. Exopodite of legs 1-3 with three long setae that are unequal in length; exopodite of leg 4 with two setae. Distal segment of endopodite of leg 1 with two, very large setae, about the same length as the whole leg.

Male with small conical carapace. Head and eyes larger than in the female. Distal segment of endopodite of leg 1 situated on a small peduncle, bearing a long hook; the preceding segment with only one seta. The copulatory organ is rounded off distally.



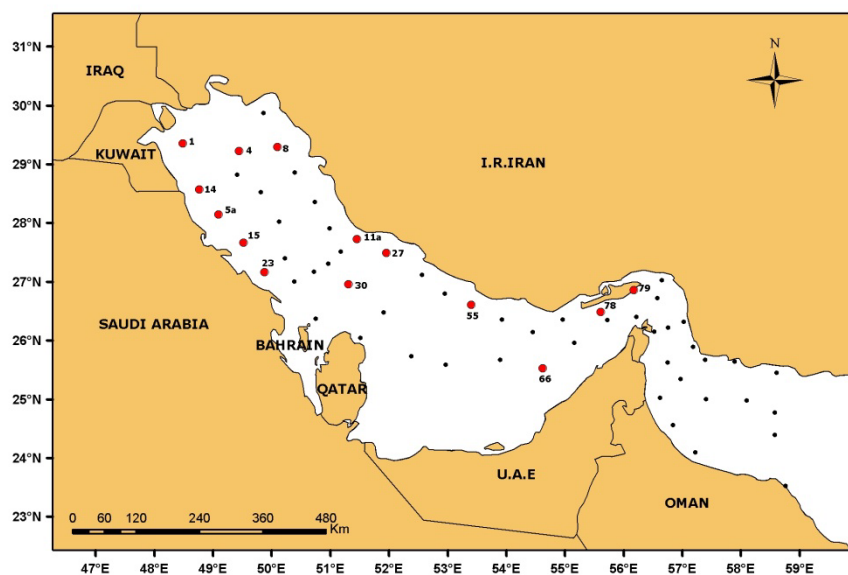
Podon polyphemoides

Distribution:

NE Atlantic, All European coasts from Lofoten (Norway) to Black Sea, Sea of Asov, Caspian Sea, NW Atlantic, South Atlantic and Pacific.

Sites of occurrence in RSA:

Inner RSA (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Podon polyphemoides* in RSA

Family: Sididae Baird, 1850.

Genus: *Penilia* Dana, 1849.

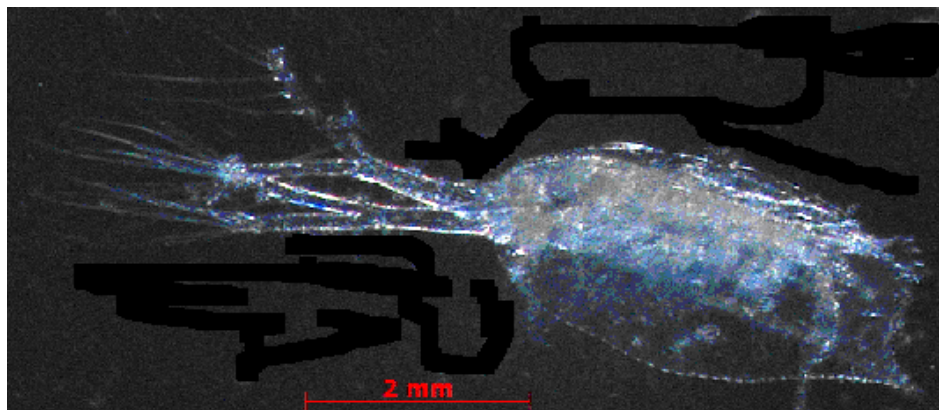
Scientific Name: *Penilia avirostris* Dana, 1849.

References:

Rammer, 1939; Della Croce, 1974; Carlton, 1985; Vine, 1986; Båmstedt *et al.*, 1998; Boxshall, 2001; Zheng *et al.*, 2003; Greve *et al.*, 2004; Bisby *et al.*, 2005.

Description: (Dana, 1852).

Free edges of carapace spined, the inferior-posterior angle of carapace bears a larger spine. Six pairs of legs, the most posterior reduced. Antenna projected forward. Adult copulatory organs longer than the postabdomen. Female head with prominent rostral point; antennulae small and truncated. Male head rounded; antennulae as long as carapace. Male first leg with a strong distal hook.



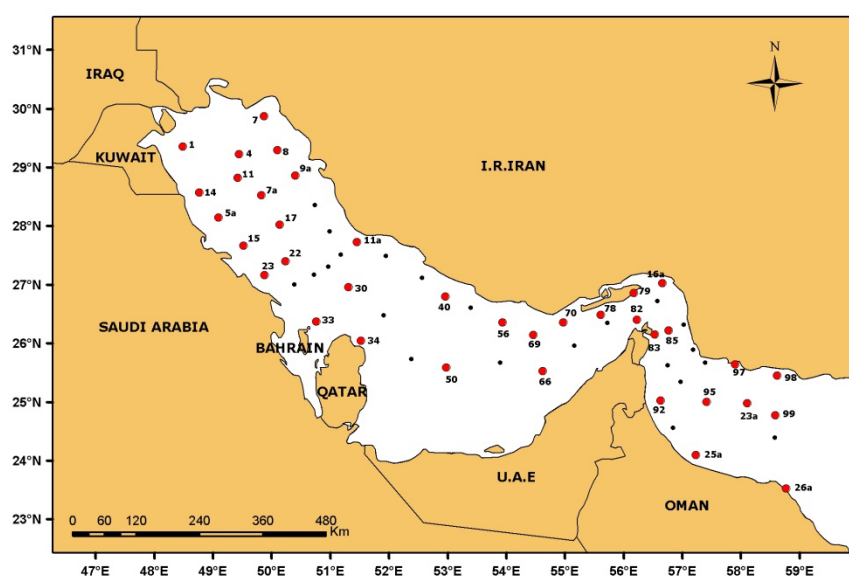
Penilia avirostris

Distribution:

Coastal waters of the tropical and subtropical oceans and warm, temperate regions, Atlantic Ocean, Mediterranean, Black Sea, Australia, Brazil, Jamaica, California, Bering Sea, Arabian Sea, North Sea, New Zealand, Korea, Japan, Chukchi Sea.

Sites of occurrence in RSA:

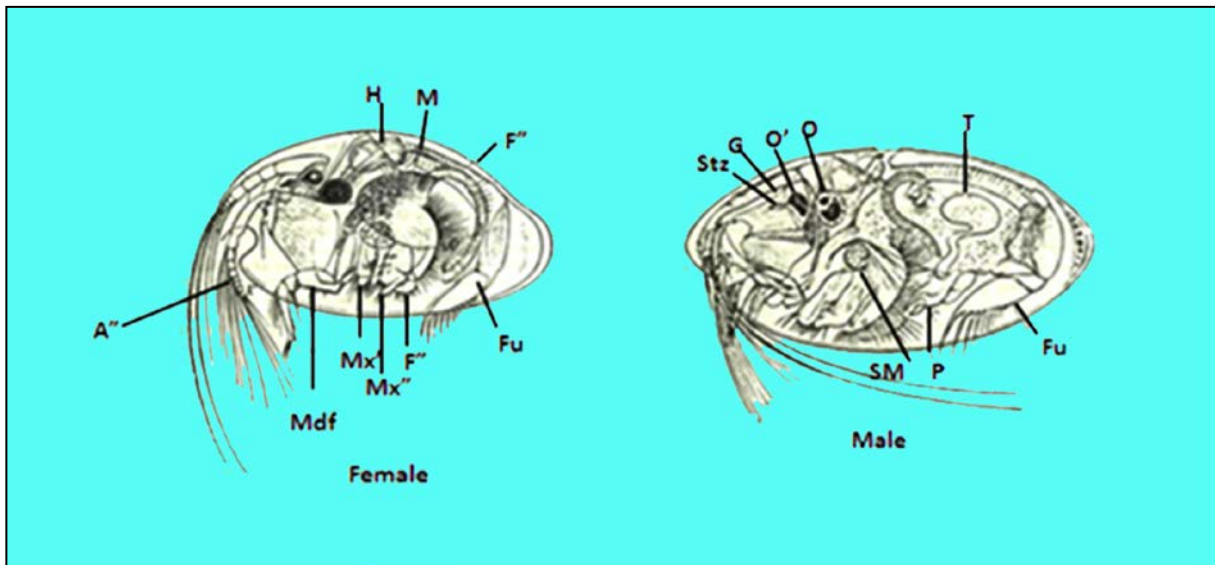
Widespread throughout the whole RSA (Present study, refer sites map), Western ROPME Sea Area (Michle *et al.*, 1986), Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004), West coast of UAE (Gibreel *et al.*, 1997), Saudi waters (Basson, 1977).



Sites of occurrence of *Penilia avirostris* in RSA

Class: Ostracoda

Ostracods are generally small, consisting of little more than a head. They have the typical five pairs of appendages on their head but only 1-3 pairs of appendages on the rest of the body. Their bivalved carapace encloses the entire body, but it lacks growth rings on its surface.



Ostracod morphology: A'': antenna, F'' (below): fourth post-oral limb, F'' (above): fifth post-oral limb, Fu: caudal furca, G: brain, H: heart, M: mid gut, Mdf: mandibular palp, Mx': maxillula, Mx'': third post-oral limb (maxilla), O: paired eye, O': median eye, P: penis, SM: adductor muscle of shell, Stz: frontal tentacle, T: testis (From Claus's Textbook).

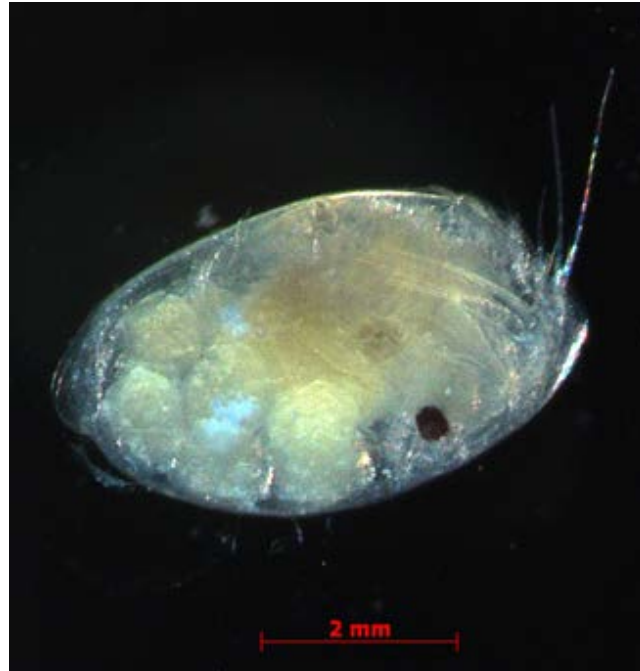
3.6.2 Order: Myodocopa Sars, 1866

Sub-order: *Myodocopina* Sars, 1866

Family: Cypridinidae Baird, 1850

This family contains two subfamilies the Cyprininae and the Azygocyprininae. The carapace ranges in length from 1 to 32mm. The surface is usually smooth but is ornate in some species. The posterior end can be rounded or with a caudal process or siphon. There is always a rostral incisure present. The first antenna has two well developed setae on the eighth segment and in males there are suckorial discs on two of the setae. The exopodite of the second antennae is similar in the two sexes, and in the females the endopodite consists of 1 to 3 segments. The seventh limb is well developed and shows considerable variation in the numbers of setae and the types of end combs. The frontal organ is generally short and bulbous or peg-like, but it is never elongate as in most species of the other families. Each lamella of the caudal furca carries between 4 and 28 claws. The lateral eye is well developed with many ommatidia in shallow-living species. The naupliar eye is usually large and well pigmented.

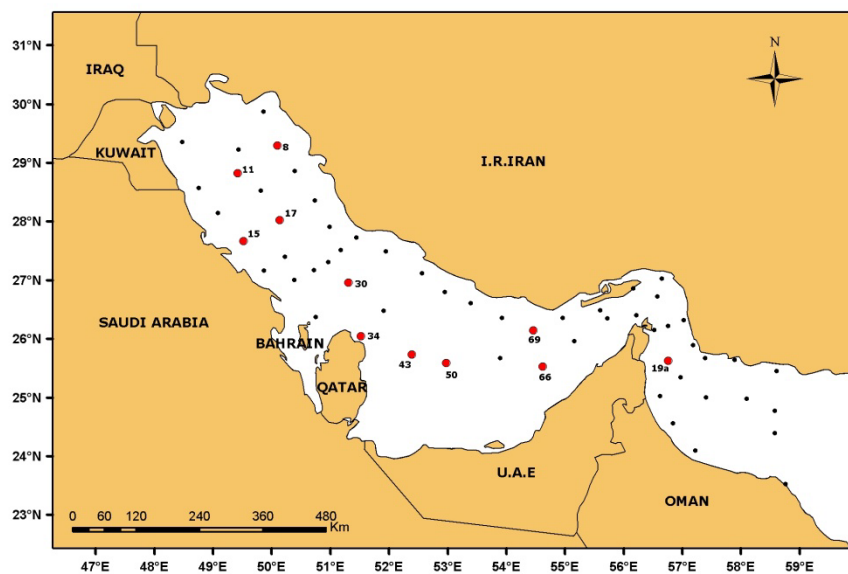
Genus: *Cypridina* (Milne Edwards, 1840)



Cypridina sp.

Sites of occurrence in RSA:

Found at 10 scattered stations over the inner RSA, and once at station 19a in the Sea of Oman.



Sites of occurrence of *Cypridina* sp. in RSA

3.6.3 Order: Halocyprida

Sub-order: Halocypridina

Family: Halocypridida

Genus: *Conchoecia*

Scientific Name: *Conchoecia elegans* Sars, 1866 (*Disconchoecia elegans*)

Synonym:

Paraconchoecia elegans Poulsen, 1973.

References:

Brady and Norman, 1896; Deevey, 1968; Martens, 1979; Müller, 1906; Poulsen, 1973; Sars, 1865; Skogsberg, 1920.

Description:

Male carapace length longer than female. Carapace tapers anteriorly and shoulder vaults are well developed in both sexes. Posterodorsal corner, angle slightly greater than 90°, right valve carries a small spine. Carapace sculpturing absent. Right asymmetrical gland opens at the postero-ventral corner, the left at the postero-dorsal corner.

Female, frontal organ undifferentiated, straight, round-ended and 10-20% projects beyond the end of first antenna. The first antenna with minute dorsal seta in some populations, "e" seta twice the length of the other sensory setae. Male, frontal organ partially differentiated, almost straight, capitulum with a sparse patch of spinules on the central ventral surface. First antenna with convoluted "a" seta slightly longer than the second podomere, "c" seta short, "b" seta shorter than the "d" seta, "e" seta armature characteristic oval patch of hairs of the *elegans* group.



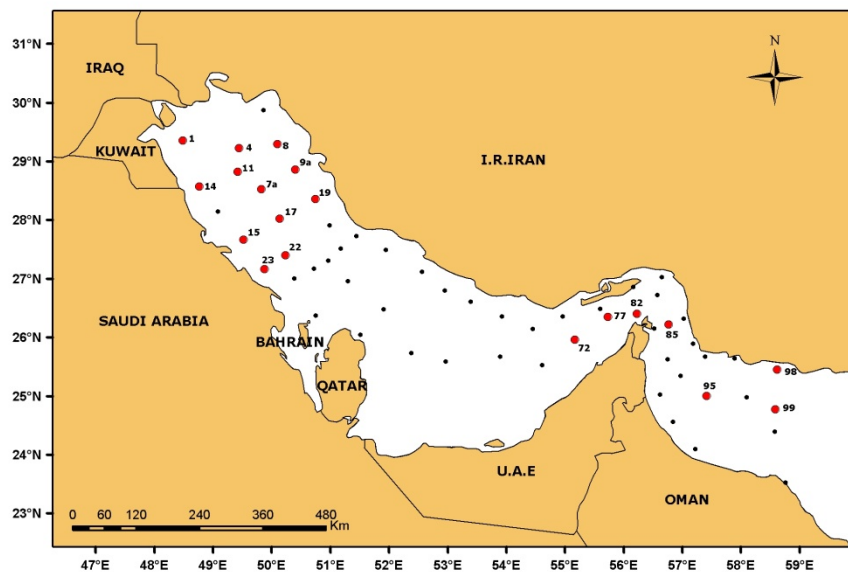
Conchoecia elegans

Distribution:

Recorded from all oceans, 80°N - 55°S in Atlantic. Shallow to deep mesopelagic.

Sites of occurrence in RSA:

Inner RSA, northern part, Straits of Hormuz and Sea of Oman, new record (Refer sites map).



Sites of occurrence of *Conchoecia elegans* in RSA

Family: Halocypridida

Genus: *Obtusoecia* Martens, 1979

Scientific Name: *Obtusoecia obtusata*

Synonyms:

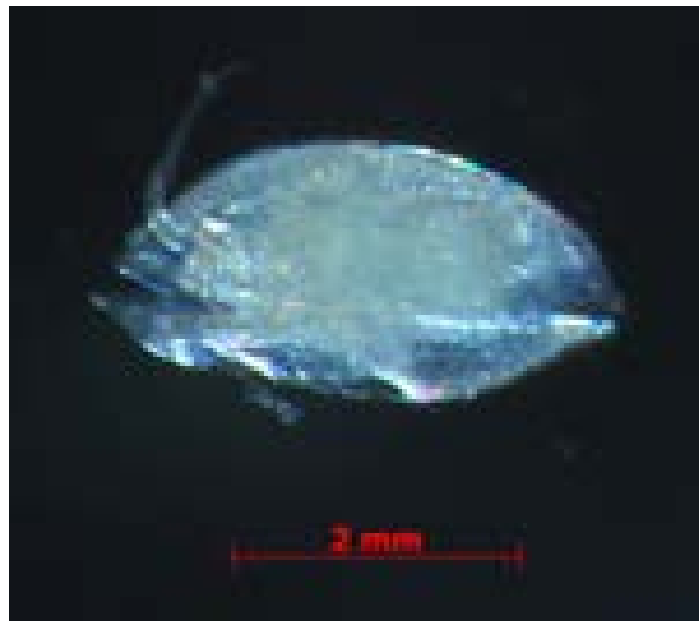
Conchoecia obtusata (Sars, 1866).

References:

Klie, 1944b; Müller, 1906; Skogsberg, 1920; Poulsen, 1969b; 1973; Martens, 1979; Angel, 1993; 2000; Horne *et al.*, 2001; Brunel *et al.*, 1998.

Description: (Sars,1866).

Female, frontal organ straight, undifferentiated, ending in a sharp point, with a few spines on the ventral surface near the end. First antenna segmentation obscure, a long hirsute dorsal seta extending almost to the end of the capitulum, "e" seta with a sparse fringe of long hairs along its anterior edge; it is just over twice the lengths of the sensory setae. Second antenna endopodite, "a" and "b" setae with short hairs [*C.obtusata*-2], the "h", "i" and "i" setae are only slightly shorter than the "f" and "g" setae.



Obtusoecia obtusata

Male, frontal organ stem similar in length to first antenna, capitulum down-turned, hirsute on basal half, with rounded end [*C.obtusata*-3]. First antenna "a" seta convoluted but similar in

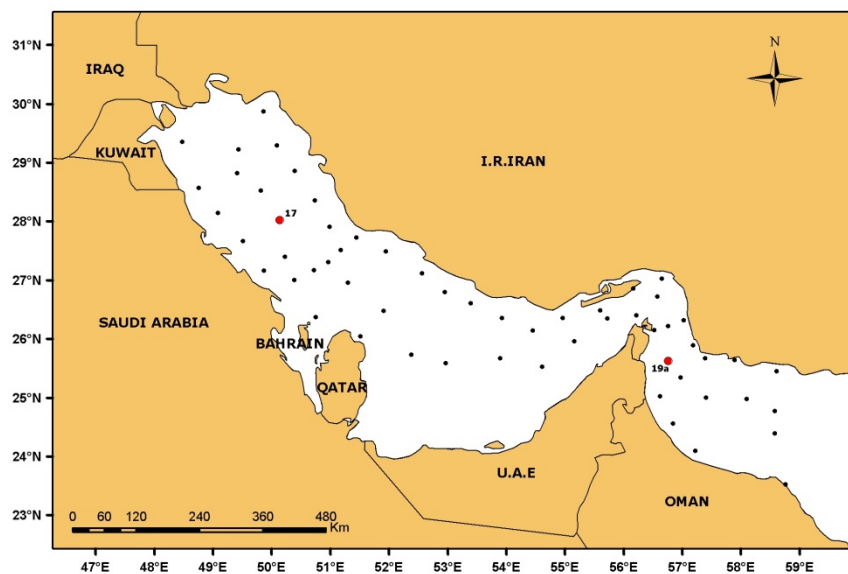
length to "c" seta and the second podomere, "b" and "d" setae sub-equal, little shorter than "e" seta, armature of "b" seta about seven pairs of very fine pointed spines giving way basally to a further 17 or so alternating spines [*C.obtusata*-4]. Second antenna right-hand endopodite with spinose "b" seta and relatively large hook appendage bent through two angles [*C.obtusata*-5]. The left-hand hook appendage reduced to a single straight shank. Copulatory appendage, large relative to most other *Conchoecia* species, has 8-13 transverse muscles.

Distribution:

High latitude (>40°N) northern hemisphere endemic species, recorded >60°N according to Poulsen (1977). Northern North Sea, Skagerrak (Klie, 1944b).

Sites of occurrence in RSA:

Shallow mesopelagic. Very rare, recorded once in the northern inner RSA and once in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Obtusoecia obtusata* in RSA

Family: Halocypridida

Genus: *Euconchoecia* Müller, 1890.

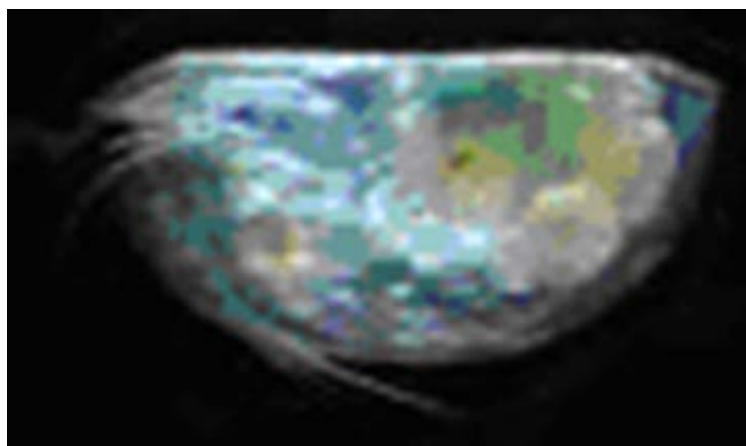
Scientific Name: *Euconchoecia chierchiaie* Muller, 1890.

References:

George, 1977; George and Nair, 1980; Poulsen, 1969; Stephen and Meenakshikunjamma, 1996; Zheng *et al.*, 2003; Bisby *et al.*, 2005.

Description:

The carapace is unornamented and pellucid. It has a long undifferentiated frontal organ that projects beyond the end of the first antenna. It is characterized by having around 20 setae on the pad on the fifth segment of the first antenna. Males have a hook appendage on the endopodite of the right second antenna only. The height of the shell is 55% of the length for Males and 46% for female. Posterodorsal corner of right valve with moderately long spine, and left one with a minute spine and rostrum broad and rounded. The stem in first antenna of male built of 7 joints, the 5th joint bearing about 25 sensory filaments. The well defined end-joint with 4 longer bristles, then is the 7th joint. A small process dorso-proximally of 7th joint bears 9 ringed bristle with short marginal hairs and is considered as the 6th joint. In the second antenna, the 1st endopodite joint has numerous exceedingly short hairs on its proximal part. The longest seta of the endopodite of the male second antenna is considerably longer than the shell. The anterior margin of the copulatory limb is straight and posterior margin convex. Frontal organ is uniformly thin with a pointed end reaching the disto-dorsal boundary of the second segment. Furca has seven claws.



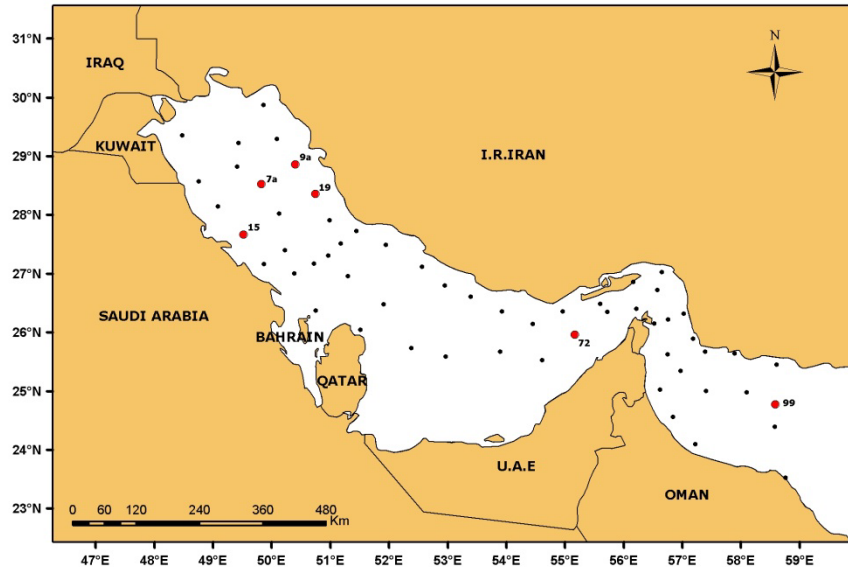
Euconchoecia chierchiae

Distribution:

All oceans, Arabian Sea, Gulf of Aden, Bay of Bengal.

Sites of occurrence in RSA:

Northern inner RSA, north to the Straits of Hormuz, Sea of Oman (St. 99) (New record, refer sites map).



Sites of occurrence of *Euconchoecia chierchiae* in RSA

Class: Crustacea

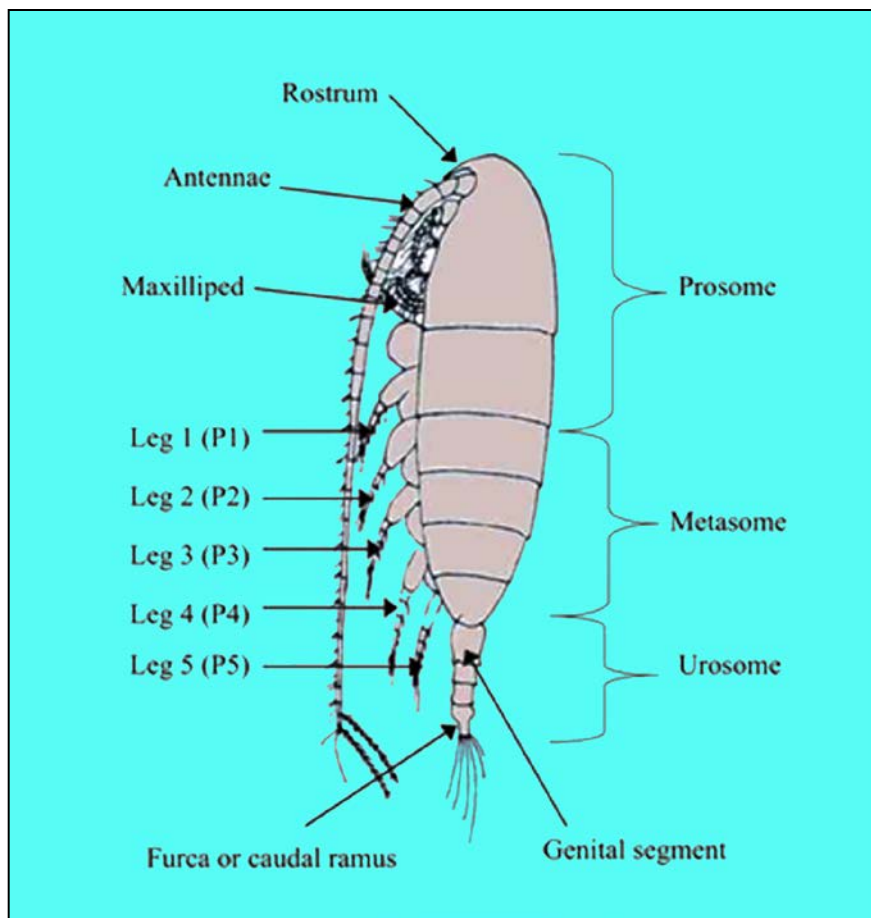
Sub-class: Copepoda

Copepods are with a teardrop shaped body, large antennae, forked tail, and totally transparent exoskeleton. They have a compound, median bright red single eye, usually in the centre of the transparent head. The first pair of antennae is long, uniramous and well developed; the second pair is smaller and short.

The body is usually short and cylindrical, the 10-segmented trunk comprising a thorax and an abdomen. The head may bear a pointed rostrum, or be rounded anteriorly. The first pair of thoracic appendages are feeding structures and are modified to form maxillipeds. With the exception of the last one or two pairs, the remaining thoracic appendages are similar, and symmetrically biramous. The posterior of the head is fused to the first thoracic segment and also, occasionally, to the second. The tapered thorax comprises 3-5 unfused segments with appendages. The narrow, cylindrical abdomen is devoid of appendages; the anal segment bears two caudal rami.

3.6.4 Order: Calanoida

Head. Rostrum present or absent; eyes absent; eyes naupliar eyes present, or naupliar eyes absent. Antennules (antenna 1) uniramous; geniculate in males; peduncle and flagellum indistinguishable; exopod well developed, whip-like, with 21-27 articles. Antennae (antenna 2) biramous; with 10 articles; endopod with 4 articles. Mandible biramous; palp present, or absent. Maxillipeds, 1 pair, or 2 pairs; uniramous. Thorax. Carapace absent. Thorax and abdomen differentiated, boundary between fifth pedigerous somite and genital somite (gymnoplean tagmosis). Peraeopods (legs) 5 pairs; biramous; non-phyllopodous; undifferentiated (simple); each article joined by intercoxal sclerite; anterior peraeopods (swimming legs) with 1 robust seta on outer margin of exopod article 1. Abdomen with 5 somites (or fewer). Epimera absent. Pleopods absent. Uropods well developed, 1 pair, positioned terminally or subterminally; rami absent; subrectangular to subquadrate. Telson absent.



Morphology of a calanoid copepod

Family: Acartiidae Sars, 1903

Female. *Rostrum* with 2 filaments, or without filaments; *rostral margin not extended*. *Cephalosome* and *pedigerous somite 1* separate; *pedigerous somites 4 and 5* separate. *Posterior corners of prosome* in lateral view bluntly rounded, or with 1 acute point, or triangular or obtusely pointed; dorsal view symmetrical. *Urosome* with 3 free somites. *Genital double-somite* symmetrical in dorsal view; gonopores close together and partially covered by single cuticular flap, or separate and each covered by cuticular fold; with pair of seminal receptacles, or without seminal receptacles; with pair of copulatory pores that are completely covered by genital operculum, or without copulatory pores. *Caudal rami* symmetrical.

Mouthparts. *Antenna 1* with 17-22 free segments; ancestral segments X and XI separate. *Antenna 2* exopod with 4 free segments; 8 setae; basis and endopod fused. *Mandible* basis with 1 seta, or with 2 setae; endopod terminal segment with 8-9 setae. *Maxilla 1* basal exite seta present, or absent; exopod elongate relative to endopod. *Maxilla 2* coxal epipodite seta absent. *Maxilliped* with coxa large, but basis and endopod reduced; coxal endite 2 with 2 setae, or with 3 setae.

Legs. *Leg 1* basis inner distal seta absent; outer seta present, or absent; endopod with 2 segments; exopod with 3 segments; exopod segment 1 with outer distal spine; exopod segment 3 with 4 inner setae. *Leg 2* endopod with 2 segments; exopod with 3 segments; *exopod segment 3 with 1 outer spine*. *Leg 3* basis outer distal spine absent. *Legs 3 and 4* endopod with 2 segments; exopod with 3 segments; exopod segment 3 with 1 outer spine; exopod segment 3 with 5 inner setae. *Legs 2-4* surfaces naked; *exopods with outer edge spines completely fused to their segment*; terminal spine with outer border serrated. *Leg 5* present; very dissimilar from legs 2-4; coxa inner border without seta; usually uniramous, small, symmetrical, not natatory; coxae and intercoxal sclerite fused, or coxae, intercoxal sclerite and basis fused (*Paracartia*); basis with outer seta; exopod in form of spine with swollen base or elongate seta; small endopod present in *Acartiella*.

Family: Acartiidae Sars, 1903

Genus: *Acartia* (Dana)

Scientific Name: *Acartia (Odontacartia) bispinosa* Carl, 1907

Synonyms:

Acartia amboinensis Carl, 1907; *Acartia amboinensis* Sewell, 1914; *Acartia tokiokai* Mori, 1942; *Acartia hamata* Wilson, 1950; Walter and Pasamonte, 1981 (1982).

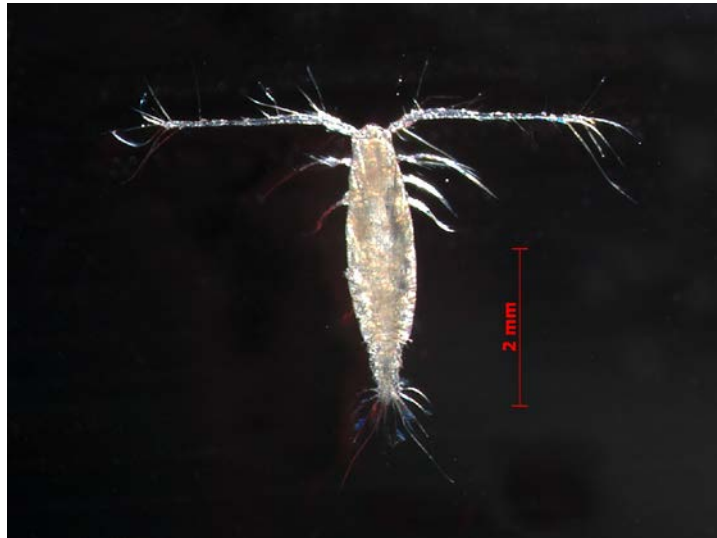
References:

Carl, 1907; Pesta, 1912a; Sewell, 1914a; Steuer, 1923; Sewell, 1932; Grice, 1964; Nishida, 1985; Ueda, 1986a; Chihara & Murano, 1997; Conway Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Corners of posterior metasome segment produced into a strong spine on either side laterally and with 2 small spines dorsolaterally. The first segment of the A1 has two strong spines and a minute spine on the posterior margin. The second segment has a moderate sized spine on the distal posterior margin and 4 minute spines on posterior margin. The third and fourth segments each have a small spine on the posterior dorsal margin and the fifth segment has 4 small spines. The genital segment has two spines on the dorsal distal margin. The following segment has 4 tiny spines on the distal margin. In the P5, the terminal spiny segment has 2 slight swellings near the base and bends abruptly inwards in the distal half. The external seta is over 1.5 times as long as the terminal spine.

Male: Posterior metasome segment with two strong lateral spines. A pair of small spines on each side of the dorsal posterior metasome margin. Strong spines on the posterior margin of urosome segment 2 with a smaller lateral spine each side; third segment with 2-4 small marginal spines and the fourth segment with 4-6 small marginal spines. P5 basis segments with long strong external setae.



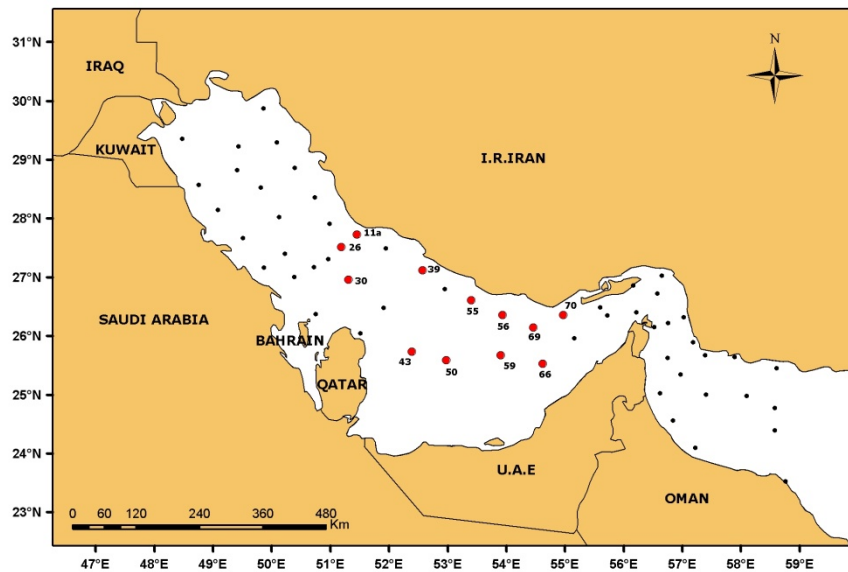
Acartia (Odontacartia) bispinosa

Distribution:

Madagascar, inner RSA, Indian Ocean, Seychelles, Ceylon, Indonesia, Malaysia, Vietnam, Japan, Australia.

Sites of occurrence in RSA:

Inner RSA, southern and northern parts (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Acartia (Odontacartia) bispinosa* in RSA

Family: Acartiidae Sars, 1903

Genus: *Acartia*

Scientific Name: *Acartia clausi* (Giesbrecht, 1889)

References:

Giesbrecht, 1892; Sars, 1903; 1925; Farran, 1908b; 1926; Lysholm, 1913; Willey, 1920a; Pesta, 1920; Steuer, 1929; Esterly, 1924; Campbell, 1929; Rose, 1929; 1933a ; Gurney, 1931a; Jespersen, 1940; Marques, 1973; Conover, 1956; Chiba *et al.*, 1957; Chen & Zhang, 1965; Vilela, 1965; Faber, 1966; Shih *et al.*, 1971; Razouls, 1972; Carillo *et al.*, 1974; Sullivan *et al.*, 1975; Bradford, 1976; Dawson & Knatz, 1980; Brylinski, 1981; Klein Breteler, 1982; Schnack, 1982; Gardner Szabo, 1982; Kurashova & Abdullaeva, 1984; Brylinski, 1984; Roe, 1984; Sazhina, 1985; Kos, 1985; Coen & Mazzocchi, 1985; Ueda, 1986; Kang & Lee, 1990; Huys & Boxshall, 1991; Shadrin & Popova, 1994; Cervelli *et al.*, 1995; Belmonte, 1998a; Bradford-Grieve, 1999; Barthélémy, 1999; Bucklin *et al.*, 2000; Castro-Longoria, 2001; Boxshall & Halsey, 2004; Seuront, 2005; Conway, 2006; Vives & Shmeleva, 2007.

Description:

Female: Corners of the last thoracic segment rounded. 4-5 very small spines on the corners of the last thoracic segment. Second segment of P5 as wide as long and bearing a setae as long or slightly longer than the third segment. Third segment of P5 forming a strong spine 3x as long as the second segment.

Male: Corners of the last thoracic segment rounded, without spine. Small P5. Right part of P5 ending with 2 short spines. Second and third segment of left P5 with a bump



Acartia clausi

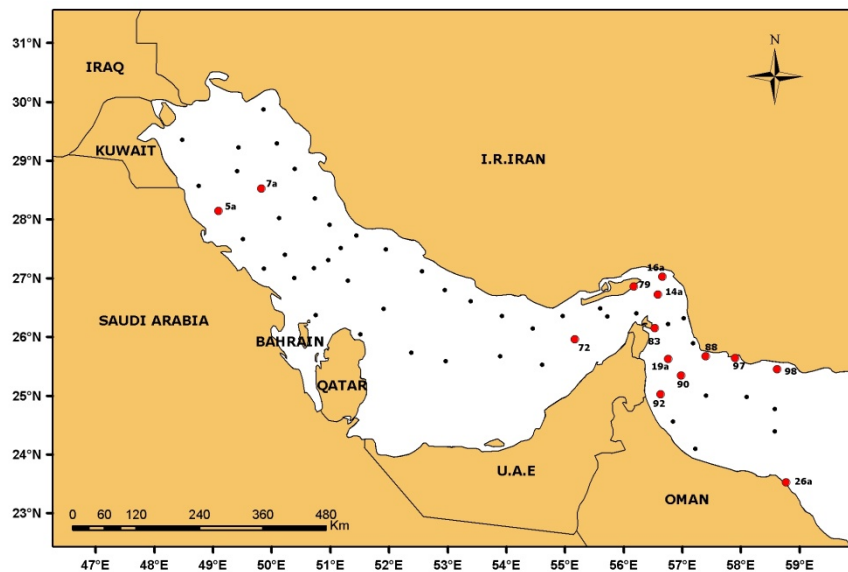
Distribution:

N & S Atlantic, Congo, Casamance, Dakar, Bermudes, Chesapeake Bay, Delaware Bay, Narragansett Bay, off Woods Hole, Nova Scotia E, Islande S, Portugal, Arcachon, Ireland, Bristol Channel, North Sea, Norway, Black Sea, Barents Sea, Morecious Bay, Mediterranean, Caspian Sea, Red Sea, Suez Canal, Indien Ocean, China Sea, Japan Sea, Alaska, Icy Strait, British Colombia, Bay of San Francisco, California, Australia, Chile.

Sites of occurrence in RSA:

Rare in the the inner RSA, well known in the Straits of Hormuz and Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997; Dorgham and Abdel-Aziz,

2003), Qatari waters (Nour & Ghobashi 1999, Nour & Al-Khayat, 2005), Saudi Coast , inner RSA (Baker and Hosney 2005).



Sites of occurrence of *Acartia clausi* in RSA

Family: Acartiidae Sars, 1903

Genus: *Acartia*

Scientific Name: *Acartia erythraea* (Giesbrecht, 1889)

Synonyms:

Acartia erythräa Giesbrecht, 1889; 1892; *Acartia laxa* Dana, 1849; Brady, 1883.

References:

Giesbrecht & Schmeil, 1898; Scott, 1909; Sewell, 1947; Pesta, 1913; Steuer, 1923; Früchtl, 1924; Chiba, 1956; Chiba *et al.*, 1957; Chen & Zhang, 1965; Kasahara *et al.*, 1974; Marques, 1982; Nishida, 1985; Ueda, 1986a; Chihara & Murano, 1997; Conway *et al.*, 2003; Ferrari & Ueda, 2005.

Description: (After Conway *et al.*, 2003).

Female: Rostral filament present; 2 strong spines on segment 1 of A1, a smaller spine on the second segment, 3 small spines on the third and 2 larger spines on the fourth segment. A very

strong spine on each corner of the posterior metasome segment and a pair dorsally, towards the posterior edge of the same segment. A pair of spines on the dorsal rear edge of the genital segment and a tiny pair of the following segment. The P5 is simple, with a curved terminal spiny segment.

Male: No strong spines at the base of the A1. The same spine arrangement on the last metasome segment as the female. The second urosome segment is wider than long, with a pair of prominent spines either side on the posterior margin, of the same size. Two tiny dorsal medial spines on the rear edges of urosome segments 3 & 4.



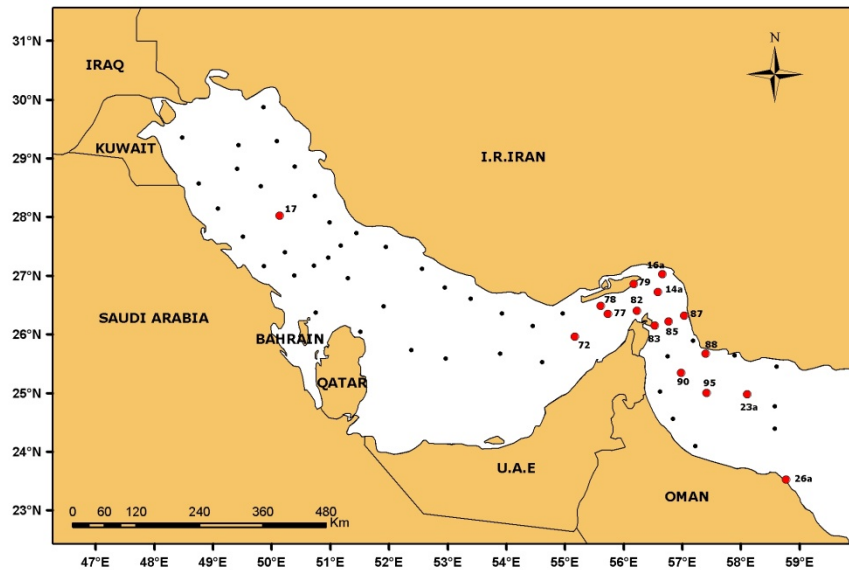
Acartia erythraea

Distribution:

Suez Canal, Red Sea, Arabian Sea, inner RSA, Indian Ocean, Ceylon, Gulf of Bengale, Australia, Indonesia-Malaysia, Vietnam, China Sea, Koria Sea, Japan Sea, West Pacific (Razouls *et al.*, 2005 -2009).

Sites of occurrence in RSA:

Inner RSA, Straits of Hormuz and Sea of Oman (Present study, refer sites map), West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Acartia erythraea* in RSA

Family: Acartiidae Sars, 1903

Genus: *Acartia*

Scientific Name: *Acartia negligens* (Dana, 1849)

Synonyms:

Acartia neglecta Car & Hadzi, 1914a.

References:

Moore, 1949; Chiba *et al.*, 1957; Tanaka, 1965; Fish, 1962; Grice, 1962; Vervoort, 1965; Chen & Zhang, 1965; Owre & Foyo, 1967; Vidal, 1968; Park, 1968; Corral Estrada, 1970; Ramirez, 1971; Razouls, 1972; Crisafi & Crescenti, 1972 (1974); Björnberg, 1972; Goswami & Goswami, 1973; Marques, 1982; Dawson & Knatz, 1980; Greenwood, 1978; Sazhina, 1985; Yoo *et al.*, 1991; Chihara & Murano, 1997; Bradford-Grieve, 1999; Bradford-Grieve *et al.*, 1999; Barthélémy, 1999; Bradford-Grieve, 1999b; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

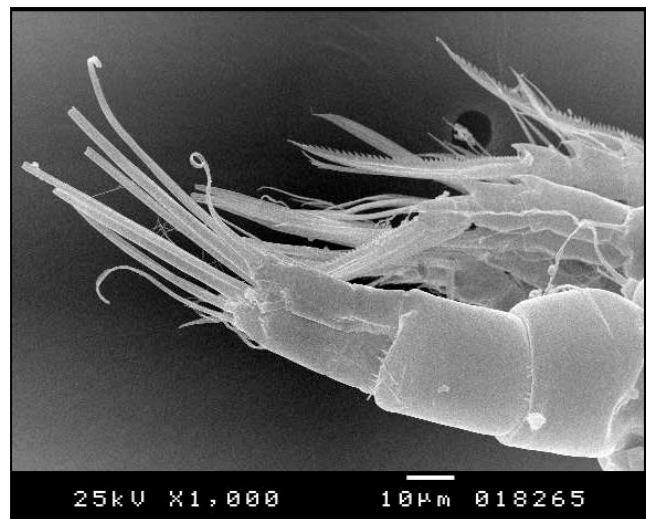
Description: (After Conway *et al.*, 2003).

Females: Rostral filament present. One or sometimes more small spines on the [Posterior](#) corner of the last metasome segment. A row of tiny hairs may also be present dorsally. A1 reaches to furca, its first segment with a small slender spine. The first two urosome segments have a dorsal row of fine spicules on the Posterior border. The P5 is very simple, terminating in a very short, straight, spiny segment with serrated outer edges and a very long outer seta at least 5 times longer than the spine.

Males: A1 shorter than body. The male also has a tiny spine on either side of the last body segment. Urosome segment 1& 2 hairy, laterally, segments 2,3& 4 with tiny dorso-posterior spinules. Left P5 Exp 2 with 3 terminal spines as well as another plumose spine inserted just distal to midlength (Conway, 2003).



Acartia negligens (Full view)



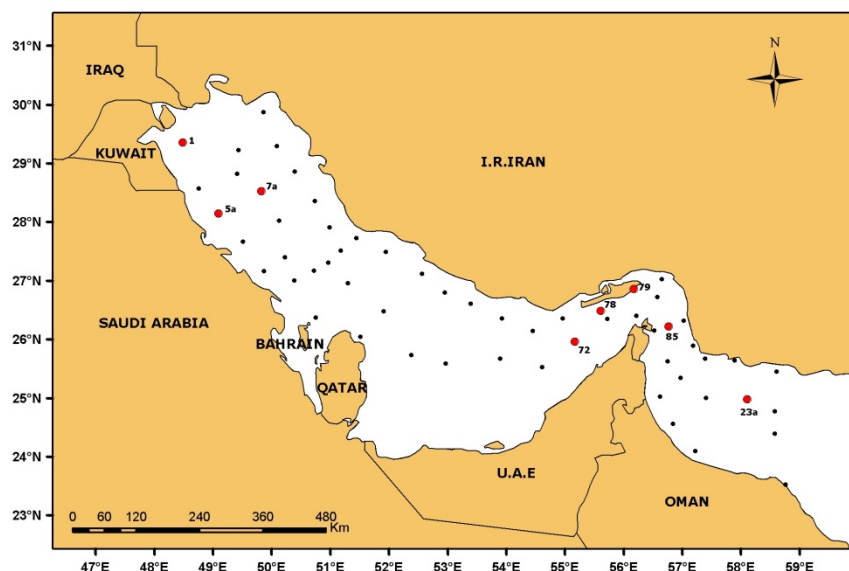
Acartia negligens (Enlarged lower part)

Distribution:

Sub-Antarct., South Africa, Atlantic, Pacific, Dakar, Argentina, Brazil, off Amazon, Canaries, Caribbean Sea, Sargasso Sea, off Bermuda, Mediterranean, Suez Canal, Red Sea, Gulf of Aden, Arabian Sea, Indian Ocean, Australia, Thailand, China Sea, Juan Sea, Japan Sea, Philippines, Indonesia-Malaysia, Tasman Sea, New Zealand, California (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found at a few stations in the northern and southern parts of the inner RSA, and in the Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour & Ghobashi 1999; Nour & Al-Khayat, 2005).



Sites of occurrence of *Acartia negligens* in RSA

Family: Calanidae Dana, 1849

Genus: *Canthocalanus* (A. Scott, 1909)

Scientific Name: *Canthocalanus pauper* (Giesbrecht, 1888)

Synonyms:

Calanus pauper Giesbrecht, 1888; 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Wolfenden, 1905; 1911; A. Scott, 1909; Pesta, 1912a; 1913; Farran, 1929; 1936a ; Dakin & Colefax, 1933; Chiba *et al.*, 1957; 1957a; Vyshkvartzeva, 1976; 1977a; Cervantes-Duarte & Hernandez-Trujillo, 1989; Yoo, 1991; Palomares Garcia & Vera, 1995; Dolganova *et al.*, 1999; Madhupratap *et al.*, 2001.

References:

Scott, 1909; Früchtl, 1924b; Gurney, 1927; Sewell, 1947; Dakin & Colefax, 1940; Vervoort, 1946; Wilson, 1950; Tanaka, 1960; Brodsky, 1962c; Kasturirangan, 1963; Chen & Zhang, 1965; Grice, 1972; Bradford & Jillett, 1974; Greenwood, 1976; Marques, 1982; Fleminger, 1985; Bradford, 1988; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

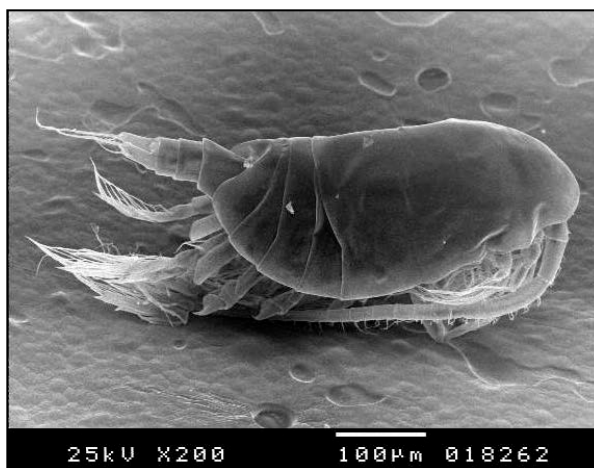
Description: (After Conway *et al.*, 2003).

Females: Urosome is not deeply inset into metasome, and the inner margins of the P5 coxa are not denticulate. Head and pedigerous segment 1 fused. Anterior cephalosome and posterior metasome rounded. Described as having a slightly asymmetrical last metasome segment. Urosome 4-segmented. Strong setae on furca.

Males: Right P5 assymetric, exopodite no inner marginal spines; left endopodite with 2 terminal setae; left exopodite with elongated segments with long outer distal setae on segment 2 & 3. Inner margins of the P5 coxa are not denticulate.



Canthocalanus pauper (Dorsal view)



Canthocalanus pauper (Side view)

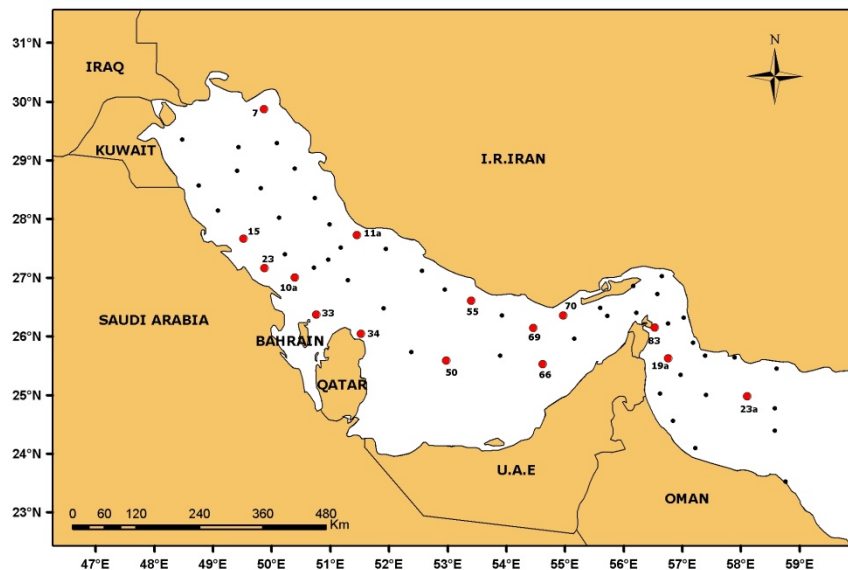
Distribution:

South Africa, Atlantic, Mediterranean, Suez Canal, Red Sea, Arabian Sea, ROPME Sea Area, Madagascar, Seychelles, India, Bay of Bengal, Indonesia-Malaysia, Philippines, Vietnam, Hong Kong, China Sea, Jaune Sea, Okinawa, Korea, Japan Sea, Baring Sea, Alaska, off

British Colombia, California, Gulf of California, Pacific, (equatorial), Australia, New Zealand, Hawaii, Peru, Chile. Epipelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found at several scattered stations in the inner RSA and less so in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a) Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Canthocalanus pauper* in RSA

Family: Calanidae Dana, 1849

Genus: Nannocalanus Sars, 1925

Scientific Name: *Nannocalanus minor* (Claus, 1863)

Synonyms:

Cetochilus minor Claus, 1863; *Calanus valgus* Brady, 1883; *Calanus minor* Giesbrecht, 1892; Cleve, 1904a; Scott, 1909; Sewell, 1914a; Pesta, 1920; Farran, 1936a; Rose, 1927; *Calanus (Nannocalanus) minor* : Fleminger, 1967a; *Calanus caroli* Wolfenden, 1905; *Undinula caroli* Sewell, 1912; *Canthocalanus minor* Brodsky, 1972.

References:

Sars, 1925; Rose, 1929; Sewell, 1951; Wilson, 1950; Vervoort, 1963b; Marques, 1976; Tanaka, 1964; Brodsky, 1962c; Chen & Zhang, 1965; Owre & Foyo, 1967; Vilela, 1968; Vidal, 1968; Pallares, 1968; Park, 1968; Ramirez, 1969; Corral Estrada, 1970; Grice, 1972; Björnberg *et al.*, 1981; Alvarez-Marques, 1984; Sazhina, 1985; Fleminger, 1985; Bradford, 1988; Suarez & Gasca, 1991; Bradford-Grieve, 1994; Bucklin *et al.*, 1996; Chihara & Murano, 1997; Bucklin & Wiebe, 1998; Lapernat, 1999; Bradford-Grieve *et al.*, 1999; Andronov, 2001; Bucklin *et al.*, 2003; Conway *et al.*, 2003; Conway, 2006; Andronov *et al.*, 2006; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Short stubby urosome, which is characteristically inset into the metasome, the rounded last metasome segment extending almost halfway down the genital segment. The genital segment bulges strongly when viewed from the side, with a small projection low on the surface. In fresh specimens the edges of the prosome segments are sometimes tinged with red. The female has 5 swimming legs which are all the same size and of similar structure. The P5 coxa has serrations on the inner surface. These serrations separate it from a closely related species that also occurs in this region, *Canthocalanus pauper*, which does not have these serrations. The A1 reach almost to the end of the urosome.



Nannocalanus minor

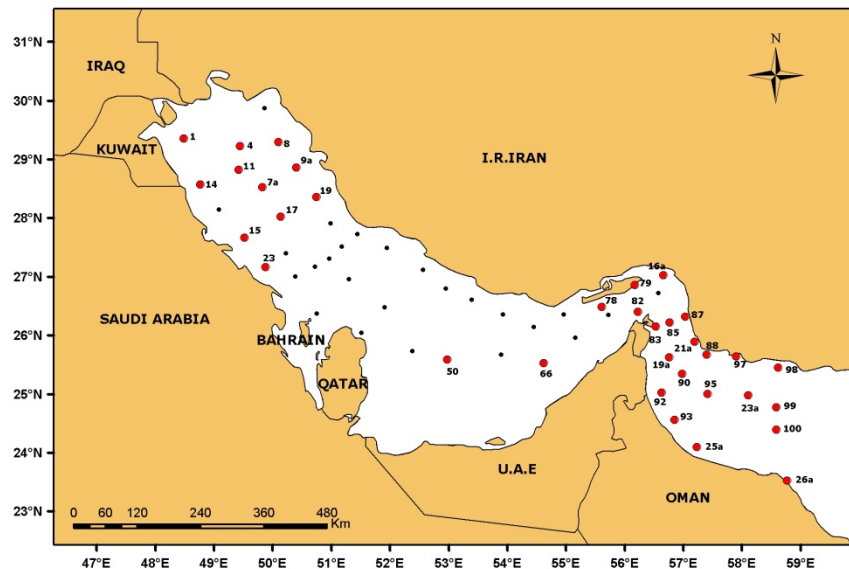
Male: Similar in appearance to the female but with a longer urosome. Furca divergent in dorsal view. P5 slightly asymmetric, right P5 similar to other swimming legs, with spines on the inner border of the exopodite; left endopodite with no spines on internal edge, left exopod with elongated outer edge spines. The P5 coxa has serrations on the inner surface.

Distribution:

Cosmopolitan, (principalement tropical, temperate): Antarctic, Atlantic, sub-Antarctic, Indo-Pacific, Sargasso Sea, North Sea, Mediterranean, Red Sea, Arabian Sea, ROPME Sea Area, Australia, Indonesia-Malaysia, Philippines, China Sea, Jaune Sea, Okinawa, Korea, Japan Sea, Alaska, Bering Sea, New Zealand, California, Hawaii, Peru, Chile. Epipelagic-mesopelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found in the northern half of the inner RSA and common in the Straits of Hormuz and Sea of Oman (New record, refer sites map).



Sites of occurrence of *Nannocalanus minor* in RSA

Family: Calanidae Dana, 1849

Genus: *Mesocalanus* (Bradford & Jillett, 1974) (*Neocalanus*)

Scientific Name: *Mesocalanus tenuicornis* (Dana, 1849)

Synonyms:

Calanus tenuicornis Dana, 1849; Sewell, 1948; Rose, 1933a; Marshall & Orr, 1972; *Neocalanus tenuicornis* Sars, 1925; Wilson, 1942a; Brodsky *et al.*, 1983; Padmavati *et al.*, 1998; Hwang *et al.*, 1998; Mauchline, 1998; Bragina, 1999; Ashjian *et al.*, 2005.

References:

Gardner & Szabo, 1982; Fleminger, 1985; Bradford, 1988; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bucklin *et al.*, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Females: Prosome quite slender. The lateral angles of the last metasome segment are rounded. The furca and seta are symmetrical. The A1 are around twice the length of the prosome. The internal margin of the P5 coxa is not denticulate.

Male: The A1 are around twice the length of the prosome. The p5 are slightly asymmetric, left P5 terminal segment with spine almost as long as the segment. Furca divergent.



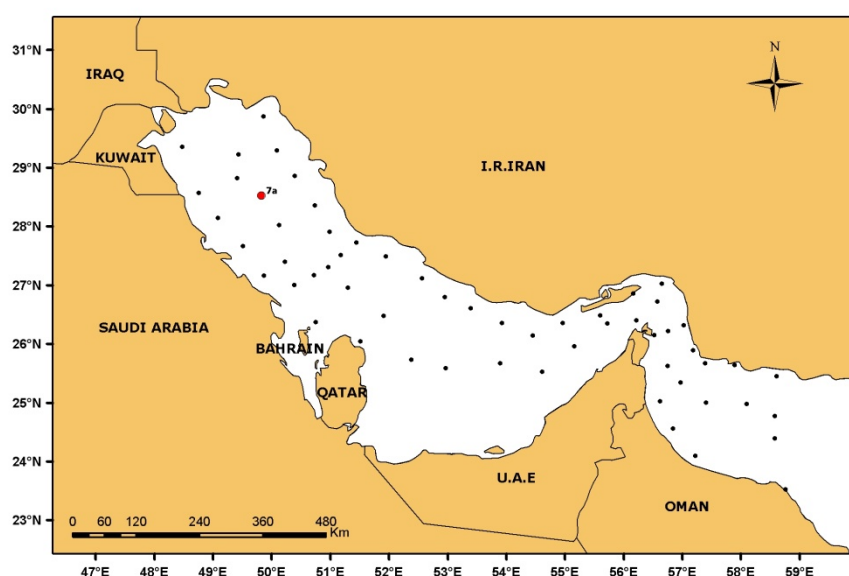
Mesocalanus tenuicornis

Distribution:

Cosmopolitan, (sub-Antarctic, Pacific, sub-Arctic), principalement tropical and temperate), Atlantic, Caribbean Sea, Gulf of Mexico, North Sea, Mediterranean, Red Sea, Arabian Sea, Madagascar, India, Indonesia-Malaysia Pacific (equatorial), China Sea, Japan, Gulf of Alaska, British Colombia, California. Epi- to bathypelagic.

Sites of occurrence in RSA:

Restricted to the inner RSA (New record, refer site map).



Site of occurrence of *Mesocalanus tenuicornis* in RSA

Family: Candaciidae Giesbrecht, 1892

Genus: Candacia (Dana, 1846)

Scientific Name: *Candacia armata* (Boeck, 1872)

Synonyms:

Candace armata Boeck, 1872; *Candace pectinata* Brady, 1878; Giesbrecht, 1892; Sewell, 1948; *Candacia pectinata* Greze, 1963a; Kovalev & Shmeleva, 1982.

References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Sars, 1925; Farran, 1948b; Rose, 1933a; Lysholm *et al.*, 1945; Mazza, 1962; Crisafi, 1963; Grice, 1963; M. Bernard, 1964; De Decker, 1964; Razouls, 1972; Grice & Lawson, 1977; Nival & Nival, 1978; Schnack, 1982; Sazhina, 1985; Bradford-Grieve *et al.*, 1999; Boxshall & Halsey, 2004; Conway, 2006; Vives & Shmeleva, 2007.

Description: (Boeck, 1872).

Females: In dorsal view, protrusion on ventral surface of 2nd segment of urosome visible on right side of somite; in dorsal view, lateral margins of genital segment with knob-like protrusions; apex of leg 5 ends in long saber-like point.

Males: In lateral view, right posterior Pr corner reaching posterior border of genital segment and turned slightly downwards; tip of "thumb" of chela on right P5 reaching to about midlength of "finger".



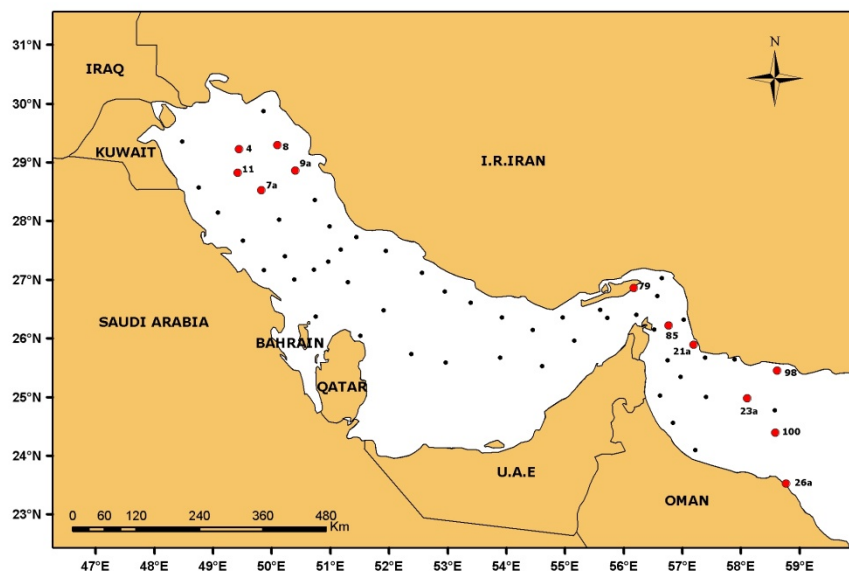
Candacia armata

Distribution:

South Africa, Namibia, Canaries, off Mauritania, off Maroco-Mauritania, Portugal, Florida, Chesapeake Bay, Gulf of Main, Long Island, off Woods Hole, Bay of Fundy, Norway, North Sea, off Ireland, Spagne Manch, Mediterranean, Red Sea, Indian Ocean (SE, sub-equatorial), Australia, Philippines, Pacific. Epi-mesopelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Occuring in the Northern inner RSA, Sea of Oman (Present study, refer sites map), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Candacia armata* in RSA

Family: Candaciidae Giesbrecht, 1892

Genus: Candacia (Dana, 1846)

Scientific Name: *Candacia bradyi* (A. Scott, 1902)

Synonyms:

Candacia curva (F) Mori, 1932; *C. bradyi* Carl, 1907; *C. bradyi* A. Scott, 1909; 1912; Sewell, 1912; 1914a; Tanaka, 1935; 1964c; Mori, 1937 (1964); Krishnaswamy, 1953; Grice, 1963; Chen & Zhang, 1965.

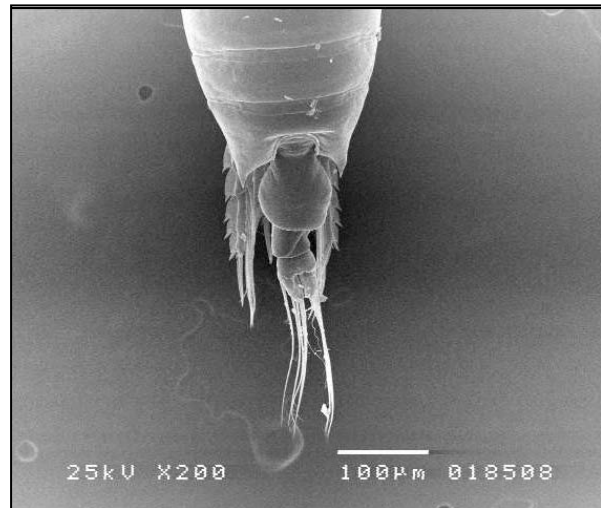
References:

Thompson & Scott, 1903; Grice, 1963; Lawson, 1977; Greenwood, 1978; Mulyadi, 1997a; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Posterior metasome segment corners each end in a short spine. Genital segment broad and almost symmetrical in dorsal view, with a slight anterior protrusion on right side. Urosome segment 2 has a pointed protrusion on the mid ventral surface. P5 segment 3 curved slightly inwards, with 2 setae on inner margin and three spines on the distal outer edge with an additional spine further back.

Male: Genital segment produced into a small toothed process on right side. Left P5 segment 3 is produced at outer distal angle into a short stout pigmented tooth-like process, which is divided into 3 blunt points, segment 4 is elongated and narrow with 3 small terminal spines.



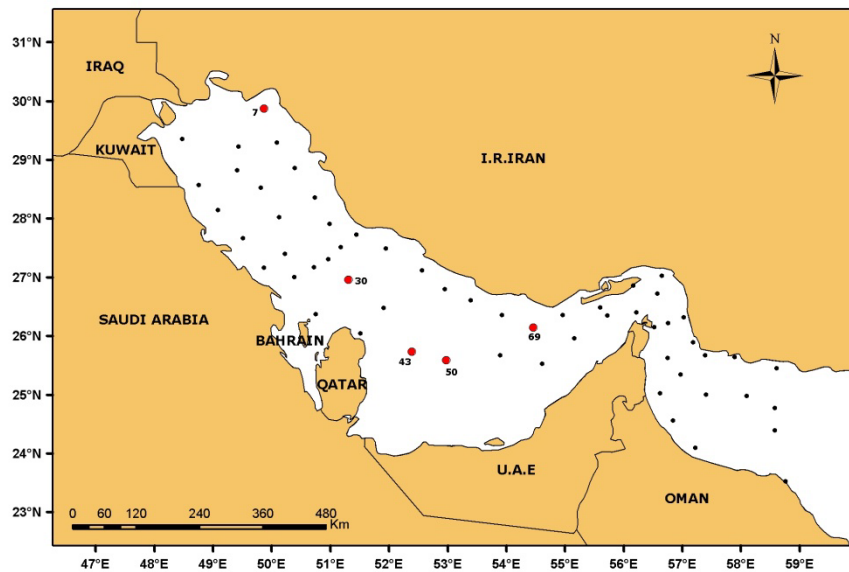
Candacia bradyi

Distribution:

South Africa, Red Sea, Gulf of Aden, inner RSA, Arabian Sea, Indian Ocean, Thailand, Vietnam, China Sea, Taiwan, Korea, Pacific, Australia (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Inner RSA (Present study, refer sites map), Western RSA (Michle *et al.* 1986), Kuwaiti waters (Michel *et al.* 1986; Al-Yamani *et al.*, 2004) Qatari waters (Nour & Ghobashi 1999), West coast of UAE, inner RSA (Gibreel *et al.* 1997).



Sites of occurrence of *Candacia bradyi* in RSA

Family: Candaciidae Giesbrecht, 1892

Genus: *Candacia* Dana, 1846

Scientific Name: *Candacia longimana* Claus, 1863

Synonyms:

Candace longimana Claus, 1863; Giesbrecht, 1892; *Paracandacia longimana* Webber *et al.*, 1996.

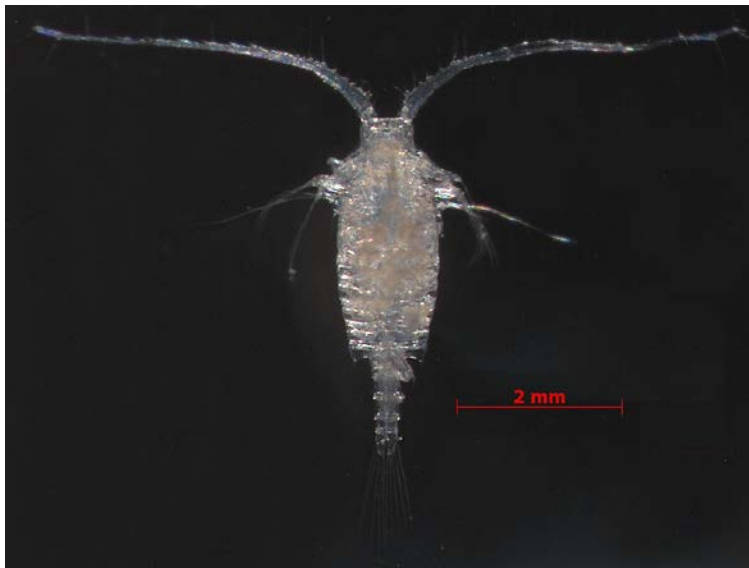
References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; A. Scott, 1909; Sars, 1925; Farran, 1948; Rose, 1933a; Sewell, 1947; Fleminger & Bowman, 1956; Chiba *et al.*, 1957; Grice, 1963; Crisafi, 1963; Tanaka, 1964c; Vervoort, 1965; Owre & Foyo, 1967; Park, 1968; Ramirez, 1969; Björnberg *et al.*, 1981; Van der Spoel & Heyman, 1983; Chihara & Murano, 1997; Mulyadi, 1997a; Vaupel Klein & Gassmann, 1998; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Posterior metasome segment with small points. Genital segment swollen and symmetrical. Segment 3 of P5 terminated by 3 short teeth of similar length and a further tooth set half way back along the segment.

Males: Can be identified by the spiny process on the right posterolateral margin of the asymmetric metasome, the knob-like process on the right side of the genital segment, and the structure of P5. There is a fine-toothed comb on the right geniculate A1.



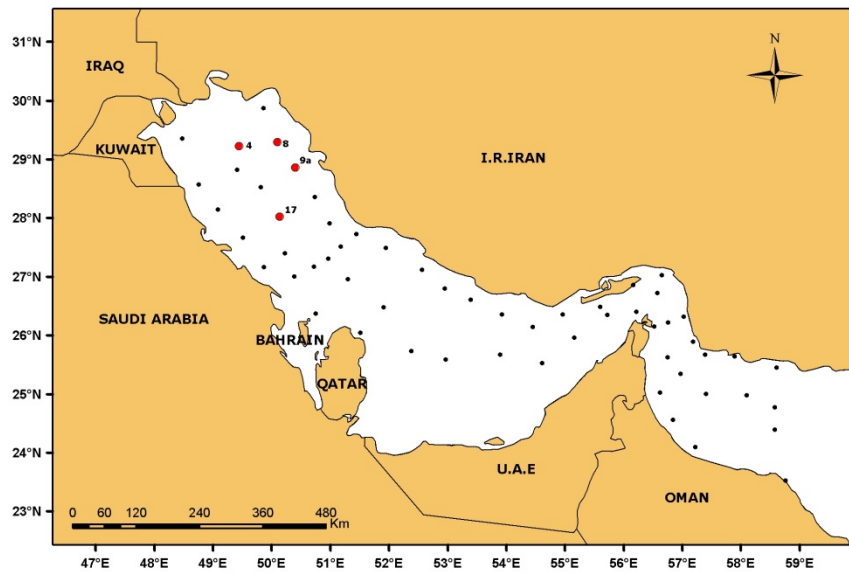
Candacia longimana

Distribution:

South Africa., off Liberia, off Maroco-Mauritania, Canaries, Portugal, off Ireland, Argentina, Brazil, off Amazon, Jamaïca, Gulf of Mexico, Cuba, Florida, Sargasso Sea, off Bermuda, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, Madagascar, Indian Ocean, Australia, Indonesia-Malaysia, Philippines, China Sea, Taiwan, Japan Sea, Pacific New Zealand, Hawaii, California, central America, west Equatour. Epi-mesopelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Restricted to northern part of inner RSA (Present study, refer sites map), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Candacia longimana* in RSA

Family: Centropagidae Giesbrecht, 1892

Genus: Centropages (Kröyer, 1849)

Scientific Name: *Centropages furcatus* (Dana, 1849)

Synonyms:

Catopia furcata Dana, 1849; *Centropages lenuculari* Oliveira, 1945; *Manaia velificata* Oliveira, 1946 (1947); *Centropages furcatus* : Björnberg, 1963.

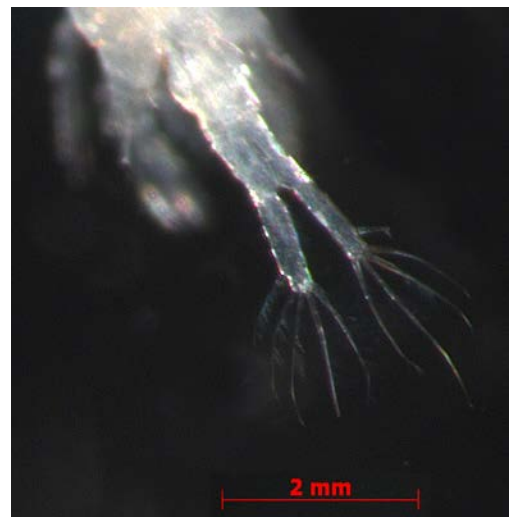
References:

Thompson & Scott, 1903; Wolfenden, 1911; Scott, 1909; Sewell, 1933; Farran, 1936a; Pesta, 1943; Brodsky, 1962c; Gaudy, 1963; Kasturirangan, 1963; Ramirez, 1966; Neto & Paiva, 1966; Owre & Foyo, 1967; Björnberg, 1972; Lee, 1972; Fleminger & Hulsemann, 1973; Goswami & Goswami, 1974; Fleminger, 1975; Greenwood, 1977; Marques, 1982; Sazhina, 1985; Chihara & Murano, 1997; Mulyadi, 1998; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Quite transparent species. Cephalosome has a conspicuous ventral ball-like eye, obvious even in young stages. Prominent second spines between the lateral spines on the last metasome segment and the urosome. Strong spine on segment 1, 2 & 5 of the A1. P5 exopodite segment 2 inner edge spine does not reach the distal border of exopodite segment 3. No spines on genital segment. Anal segment not quite symmetrical, long, around twice the length of urosome segment 2. The furca are long and slender.

Male: Posterior metasome border asymmetrical. Prominent second spines between the lateral spines on the last metasome segment and the urosome. P5 right extension on exopodite segment 2 has a rounded protrusion on the proximal portion; exopodite segment 3 claw is stout and has a spine on inner margin and 2 spines on outer margin; left exopodite segments 2 & 3 with long terminal fixed appendages. The furca are very long and slender.



Centropages furcatus

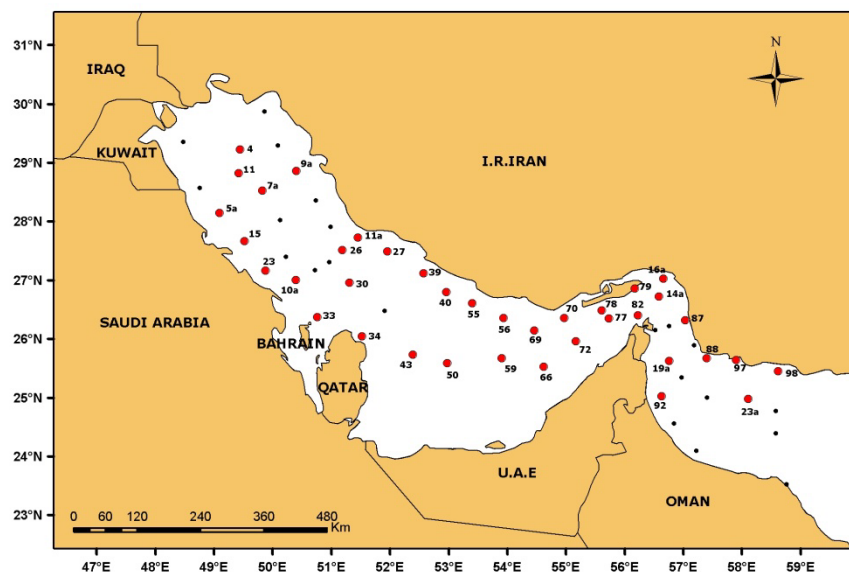
Distribution:

Cosmopolitan, (equatorial-subtropical): Antarctic, sub-Antarctic, SW Pacific, South Africa, Angola, Congo, Dakar, Maroco-Mauritania, Argentina, Brazil, off Amazon, Porto Rico, Jamaica, Gulf of Mexico, Florida, Long Island Sound, Mediterranean, Suez Canal, Red Sea, ROPME Sea Area, Madagascar, Seychelles, Arabian Sea, India, Bay of Bengal, Australia, Thailand, Indonesia-Malaysia, Philippines, Hong Kong, China Sea, Taiwan, Jaune Sea,

Korea, Japan Sea, California, Costa-Rica, off Equator, off Chile. Epipelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the whole ROME Sea Area, but more common in the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986), Qatari waters (Nour & Ghobashi 1999; Nour & Al-Khayat, 2005).



Sites of occurrence of *Centropages furcatus* in RSA

Family: Centropagidae Giesbrecht, 1892

Genus: *Centropages*

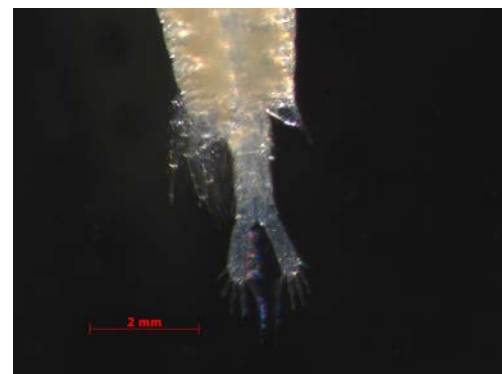
Scientific Name: *Centropages kroyeri* (Giesbrecht, 1892)

References:

Giesbrecht, 1892; Thompson & Scott, 1903; Pesta, 1920; Sars, 1925; Rose, 1933a; Pesta, 1943; Crisafi, 1960; Vervoort, 1964b; Sazhina & Kovalev, 1971; Razouls, 1972; Soler *et al.*, 1988; Mulyadi, 1998; Bradford-Grieve *et al.*, 1999; Corni *et al.*, 2000; Vives & Shmeleva, 2007.

Description:

Female: Corners of the last thoracic segment are symmetrically and horizontally pointed. Genital segment without spines but with lateral bulge and bristles. Genital pore prominent. Using a microscope. P5 exopodite: the inner spine on the second segment is shorter than the segment.



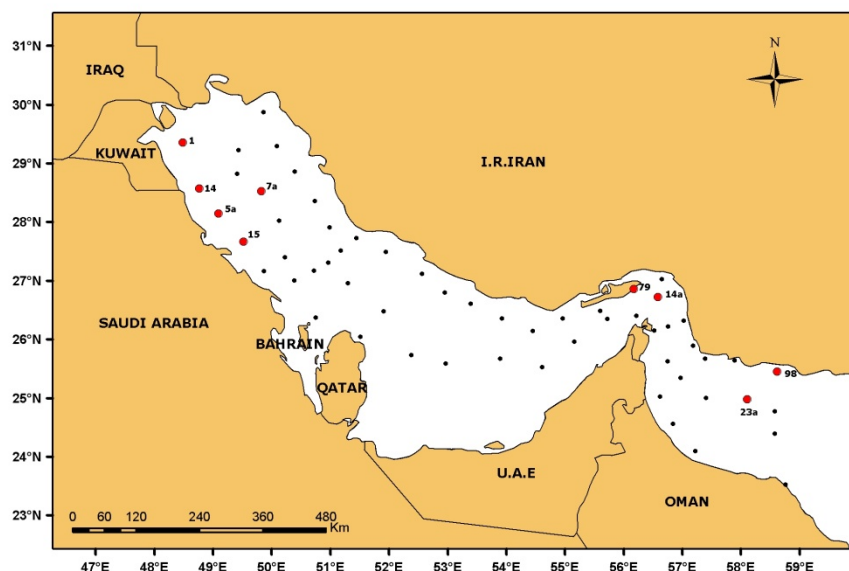
Centropages kroyeri

Distribution:

Namibia, Maroco-Mauritania, Canaries, Portugal, Mediterranean, Red Sea, NW Indian, Indonesia-Malaysia, Philippines, SW Mexico. Epipelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found at 9 stations distributed in the whole ROPME Sea Area (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997).



Sites of occurrence of *Centropages kroyeri* in RSA

Family: Centropagidae Giesbrecht, 1892

Genus: *Centropages*

Scientific Name: *Centropages orsinii* (Giesbrecht, 1889)

References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Scott, 1909; Sewell, 1947; Pesta, 1913; Mori, 1929; Dakin & Colefax, 1933; Farran, 1936a; Pesta, 1943; Tanaka, 1963; Kasturirangan, 1963; Vervoort, 1964a; Chen & Zhang, 1965; Greenwood, 1977; Chihara & Murano, 1997; Mulyadi, 1998; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Females: The last metasome segment corners are pointed, but not sharply. The furca are around twice as long as wide. The genital segment is symmetrical and has an offset spine on

the ventral surface, which points backwards. The A1 does not have spines on segment 1,2 & 5 and reaches the end of the furca. P5 are nearly symmetrical and the inner marginal spine on exopodite 2 is curved, usually covered in small spines and does not reach the end of segment 3.

Males: The last metasome segment corners are weakly pointed. The terminal claw of the grasping right P5 is longer than the thumb. The terminal portion of exopodite segment 3 of the left P5 projects into a spine.



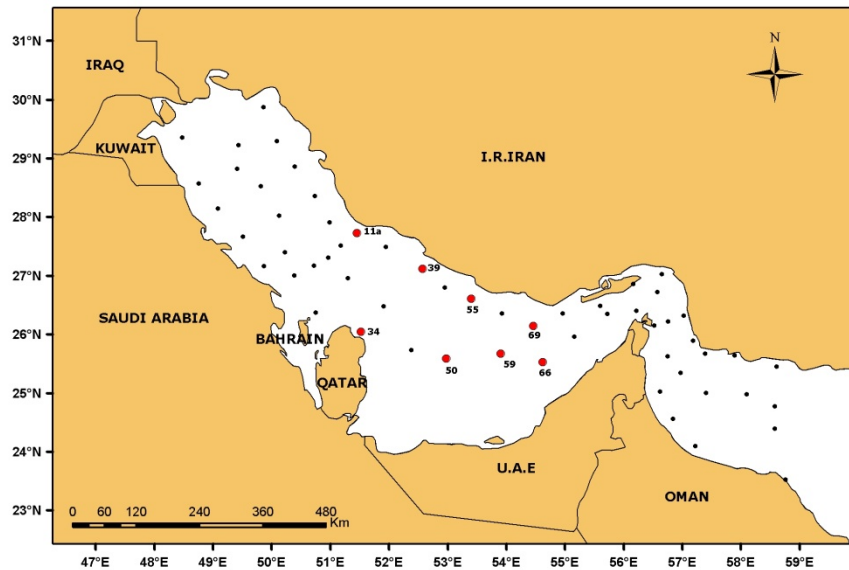
Centropages orsinii

Distribution:

South Africa, Red Sea, Arabian Sea, Ceylon, Madagascar, Seychelles, Indian Ocean, Thailand, Indonesia-Malaysia, Vietnam, China Sea, Taiwan, Jaune Sea, Korea, Japan, Pacific (equatorial), Australia. Epiplagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Confined to the southern inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.* 1986a), Kuwaiti waters (Michel *et al.*, 1986b), Qatari waters (Nour & Ghobashi, 1999), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Centropages orsinii* in RSA

Family: Centropagidae Giesbrecht, 1892

Genus: *Centropages*

Scientific Name: *Centropages tenuiremis* (Thompson & Scott, 1903)

Synonyms:

Centropages arabicus Cleve, 1904; *Centropages yamadai* Tanaka, 1963; *Centropages kroyeri* (M) Mori, 1929; *Centropages orsinii* (F) Mori, 1929.

References:

Thompson & Scott, 1903; Sewell, 1932; Shen & Bai, 1956; Shen & Lee, 1963; Kasturirangan, 1963; Vervoort, 1964b; Chen & Zhang, 1965; Chihara & Murano, 1997; Mulyadi, 1998; Al-Yamani & Prusova, 2003.

Description:

Posterior margin of metasome without additional spines; no teeth present on the anterior margin of 1st antennae; eye not in movement.



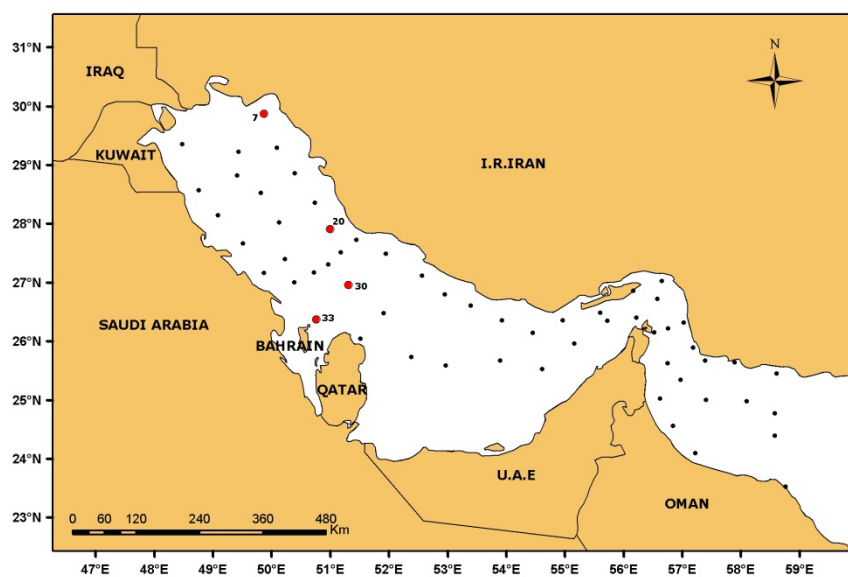
Centropages tenuiremis

Distribution:

Arabian Sea, ROPME Sea Area, Maldives & Laquedives, Ceylon, India, Bay of Bengal, Indonesia, Hong Kong, China Sea, Taiwan, Jaune Sea, Korea, Sea of Japan, South Pacific (equatorial). Neritic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found only at 4 stations in the northern half of the inner RSA (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Centropages tenuiremis* in RSA

Family: Clausocalanidae Giesbrecht, 1892

Genus: Clausocalanus Giesbrecht, 1888.

Scientific Name: *Clausocalanus minor* Sewell, 1929.

Synonyms:

Clausocalanus (arcuicornis) minor Sewell, 1929; Tanaka, 1956c; Brodsky, 1962c; *Clausocalanus arcuicornis* Früchtl, 1924b; Farran, 1936a; Dakin & Colefax, 1940; Tanaka, 1960; Brodsky, 1962c; *Clausocalanus arcuicornis* sp.4 Fleminger, 1964a; 1967.

References:

Frost & Fleminger, 1968; Chen Zhang, 1974; Greenwood, 1977; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bucklin *et al.*, 2003; Al-Yamani & Prusova, 2003.

Description: (After Conway *et al.*, 2003).

Females: Rostrum in lateral view short, bifurcated, thick at its base, usually straight or slightly curved and directed ventrally. Genital segment in lateral view straight or, more often slightly concave in the region of the seminal receptacle; 1.5 times as long as urosome segment 3. The third segment of the simple P5 as long as the two preceding segments together. Terminal points of segment 3 of leg 5 bifurcated, sometimes with tiny spinules on inner and outer margins.



Clausocalanus minor

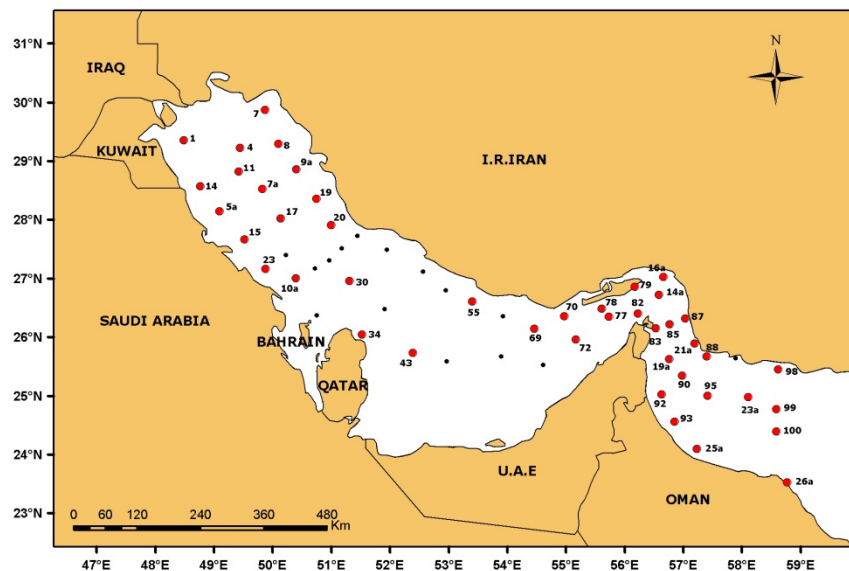
Males: Second urosome segment as long as the two following segments together. Rostrum in lateral view knoblike and protruding ventrally. P5 uniramous and asymmetrical, right leg short, usually 3-segmented; left leg robust, longer than urosome, armed distally with long slender straight setae.

Distribution:

South Africa, Red Sea, ROPME Sea Area, Indian Ocean, Indo-Malaysia, China Sea, Taiwan, Japan, Hawaii, Australia, Tasman Sea, New Zealand, Pacific (equatorial, tropical), California. Offshore (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

One of the most common zooplankton species throughout the whole ROPME Sea Area (Present study, refer sites map), Qatari waters (Nour & Ghobashi 1999; Nour & Al-Khayat, 2005), Saudi waters of the RSA (Basson 1977; Baker and Hosney 2005), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Clausocalanus minor* in RSA

Family: Clausocalanidae Giesbrecht, 1892

Genus: Clausocalanus (Giesbrecht, 1888)

Scientific Name: *Clausocalanus furcatus* (Brady, 1883)

Synonyms:

Drepanopus furcatus Brady, 1883; *Clausocalanus pergens* Tanaka, 1960.

References:

Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Scott, 1909; Sewell, 1914a; Pesta, 1920; Sars, 1925; Sewell, 1951; Farran, 1936a; Rose, 1933a; Wilson, 1942a; Vervoort, 1946; Carvalho, 1952a; Tanaka, 1960; Chiba *et al.*, 1957; Heinrich, 1961b; Fagetti, 1962; Grice, 1962; Brodsky, 1962c; Björnberg, 1972; Vervoort, 1963b; Paiva, 1963; Vilela, 1965; Gonzalez & Bowman, 1965; Chen & Zhang, 1965; Owre & Foyo, 1967; Vidal, 1968; Vilela, 1968; Frost & Fleminger, 1968; Corral Estrada, 1970; Razouls, 1972; Marques, 1982; Chen & Zhang, 1974; Williams & Wallace, 1975; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Sazhina, 1982; Brodsky *et al.*, 1983; Ferrari, 1984; Sazhina, 1985; Lin & Nakamura, 1993; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bucklin *et al.*, 2003; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Females: Rostrum in lateral view usually thick, short, and slightly curved, bifurcated at tip. Genital segment profile in lateral view rather uneven, generally shorter in length than the second or third segments. The 2 distal segments of P5 are of similar length, the coax very short; terminal points of bifurcated segment 3 never with tiny spinules.

Males: Rostrum in lateral view not well developed and not protruding ventrally. Longer P5 usually on the right side, occasionally on the left, longer than the urosome, shorter leg usually 2-segmented, tiny distal segment spine-like.



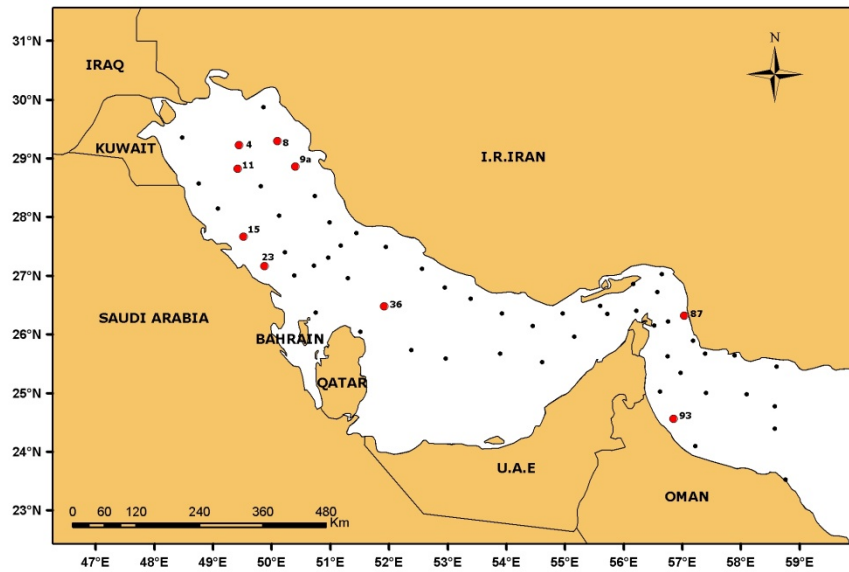
Clausocalanus furcatus

Distribution:

Cosmopolitan (equatorial, sub-tropical): South Africa, Angola, Gulf of Guiny, Ivorian shelf, Dakar, Maroco-Mauritania, Canaries, Portugal, Brazil, off Amazone, Jamaica, Gulf of Mexico, Caraïbian Sea, Florida, Sargasso Sea, off Bermuda, Long Island, Gulf Stream, off Nova Scotia, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, Maldives, Ceylon, Madagascar, Indian, Australia, Indonesia-Malaysia, Philippines, China Sea, Taiwan, Okinawa, Jauna Sea, Korea, Japan Sea, Pacific (equatorial, subtropical), California, Costa Rica, off Guatemala, New Zealand (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Northern inner RSA, Sea of Oman (Present study, refer sites map), Western ROPME Sea Area (Michle *et al.*, 1986a), Qatari waters (Nour El-Din & Ghobashi 1999; Nour El-Din & Al-Khayat, 2005).



Sites of occurrence of *Clausocalanus furcatus* in RSA

Family: Eucalanidae Giesbrecht, 1892

Genus: *Eucalanus* (Dana, 1852)

Scientific Name: *Subeucalanus (Eucalanus) crassus* (Giesbrecht, 1888)

Synonyms:

Eucalanus crassus Giesbrecht, 1888; Thompson & Scott, 1903; Cleve, 1904a; Esterly, 1905; Farran, 1936a; Scott, 1909; Sewell, 1947; With, 1915; Pesta, 1920; Sars, 1925; Rose, 1956; Chen & Zhang, 1965; *Eucalanus setiger* Brady, 1883; Giesbrecht, 1892; T. Scott, 1894b; Giesbrecht & Schmeil, 1898.

References:

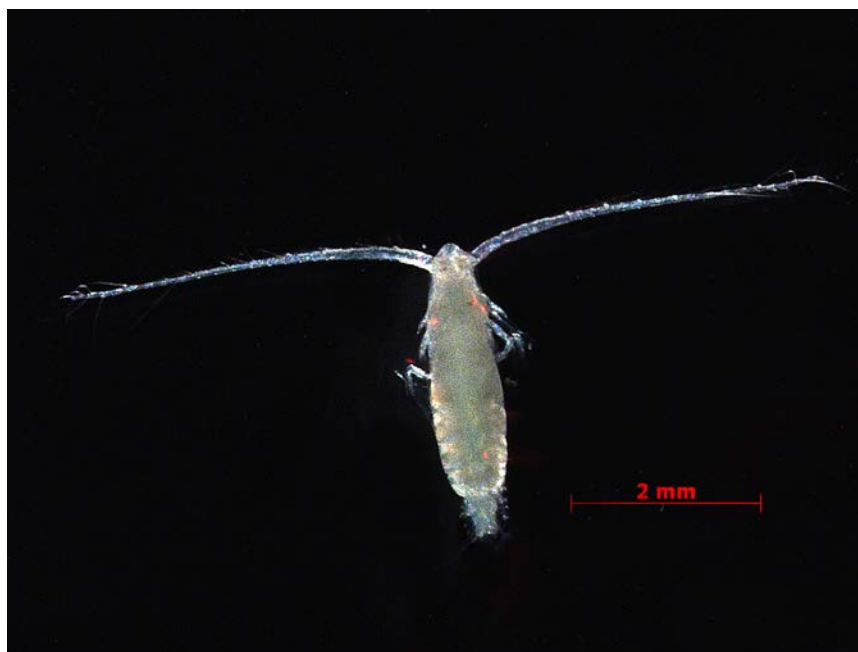
Bradford-Grieve, 1994; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Goetze, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Body robust, anterior cephalosome rounded and short. A1 reaches just beyond the furca. Urosome 3-segmented, genital segment wider than long and markedly onion shaped.

Furca slightly assymetrical, anal segment fused with the furca. The left second terminal seta of the furca is slightly longer than that of the right.

Male: Does not have distinct secondary sexual characters. A1 reaches around the end of the furca. Genital segment longer than wide. P5 right foot absent, left foot uniramous, 4-segmented, with terminal spine.



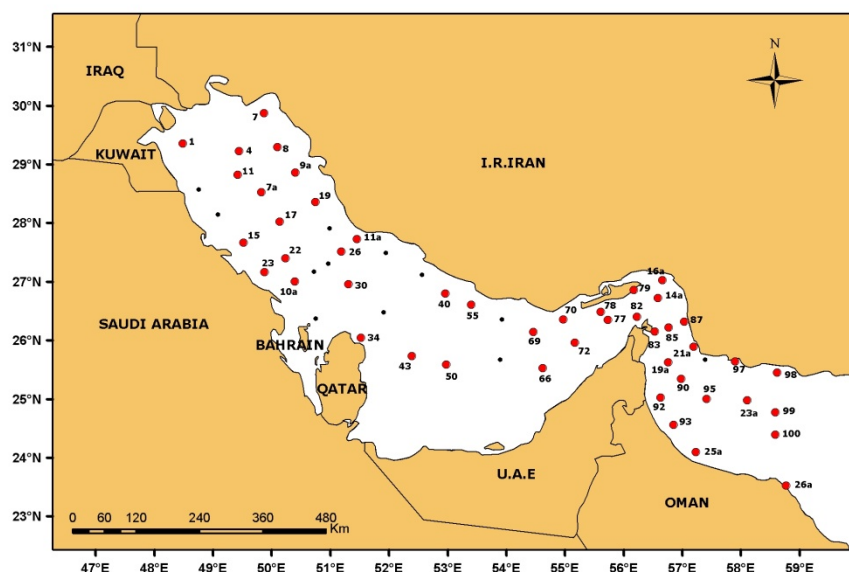
Subeucalanus (Eucalanus) crassus

Distribution:

South Africa, Namibia, Angola, Congo, Dakar, off Mauritania, Canaries, Portugal, Brazil, Gulf of Mexico, Florida, Sargasso Sea, off Bermuda, off Nova Scotia, Ireland, Norway, North Sea, Mediterranean, Red Sea, Gulf of Aden, Sea of Oman, Arabian Sea, Madagascar, India, Ceylon, Madras, Bay of Bengal, Indonesia-Malaysia, Philippines, Vietnam, Hong Kong, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan Sea, California, off Guatemala, Pacific (equatorial), New Zealand, Hawaiï, off Peru, Chile. epipelagic, sometimes mesopelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the whole ROPME Sea Area (Present study, refer sites map), western ROPME Sea Area (Michle *et al.* 1986a), Kuwaiti waters (Michel *et al.* 1986b), Qatari waters (Nour El-Din & Ghobashi 1999), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney 2005).



Sites of occurrence of *Subeucalanus (Eucalanus) crassus* in RSA

Family: Eucalanidae Giesbrecht, 1892

Genus: *Eucalanus*

Scientific Name: *Eucalanus elongatus* (Dana, 1848)

Synonyms:

Calanus elongatus Dana, 1849; *Calanus erythrochilus* Leuckart, 1859; *Eucalanus spinifer* T. Scott, 1894b; *Eucalanus atlanticus* Wolfenden, 1904; Rose, 1933a; *Eucalanus elongatus* Esterly, 1905; Campbell, 1929; *Eucalanus elongatus hyalinus* Morris, 1970; *Eucalanus elongatus* Park, 1968.

References:

Giesbrecht, 1892; Cleve, 1904a; Sewell, 1929; Rose, 1956; Marques, 1959; Vervoort, 1957; Brodsky, Deevey, 1971; Kovalev & Shmeleva, 1982; Brodsky *et al.*, 1983; Sazhina, 1985; Sarkar *et al.*, 1986; Lozano Soldevilla *et al.*, 1988; Timonin, 1990; Hattori, 1991; Suarez, 1992; Seguin *et al.*, 1993; Kouwenberg, 1994; Shih & Young, 1995; Kotani *et al.*, 1996; Siokou-Frangou, 1997; Lopez-Salgado & Suarez-Morales, 1998; Mauchline, 1998; Lopez-Salgado *et al.*, 2000; Madhupratap *et al.*, 2001; Beaugrand *et al.*, 2002; Sameoto *et al.*, 2002;

Conway *et al.*, 2003; Hsiao *et al.*, 2004; Isari *et al.*, 2006; Koppelman & Weikert, 2007; Cabal *et al.*, 2008.

Description: (After Conway *et al.*, 2003).

Female: The metasome corner postero-lateral pointed, body transparent, anterior cephalosome triangular, urosome 4-segmented, genital segment longer than wide. Left furca wider and longer than the right. A1 extending beyond the furca by around the last 4 segments. Second inner seta of right furca elongated.



Eucalanus elongatus

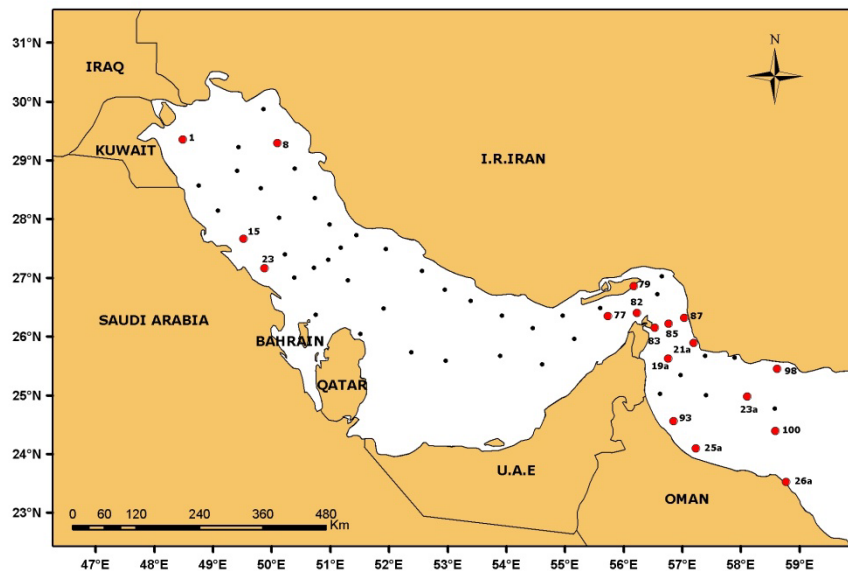
Male: Has lateral points on the posterior metasome, body transparent, anterior cephalosome bluntly rounded. A1 extending beyond the furca by around the last 4 segments. Urosome 5-segmented, genital segment slightly wider than long. Both P5 legs 4-segmented, terminating in spines; right leg shorter than the left, terminal segment reaching around the third segment of the left leg.

Distribution:

South Africa, Gulf of Aden, Sea of Oman, Arabian Sea, Maldives Islands, Madagascar, India, Bay of Bengal, Australia, Indonesia-Malaysia, Vietnam, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, central Pacific, California, off Guatemala, West Pacific (equatorial), New Zealand, Chile. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Rare in the inner RSA, widespread in the Straits of Hormuz and Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Eucalanus elongatus* in RSA

Family: Eucalanidae Giesbrecht, 1892

Genus: *Rhincalanus* (Dana, 1852)

Scientific Name: *Rhincalanus nasutus* (Giesbrecht, 1888)

Synonyms:

Rhincalanus gigas T. Scott, 1901; A. Scott, 1909; Sewell, 1914a; *Eucalanus nasutus* Sars, 1912; Massuti Alzamora, 1942.

References:

Giesbrecht, 1892; Thompson & Scott, 1903; Esterly, 1905; Farran, 1936a; Sars, 1925; Sewell, 1947; Rose, 1929; Tanaka, 1935; Jespersen, 1940; Pesta, 1943; Vervoort, 1957; Fagetti, 1962; Grice, 1962; Chen & Zhang, 1965; Owre & Foyo, 1967; Marques, 1968a; Vilela, 1968; Ramirez, 1969; Corral Estrada, 1970; Minoda, 1971; Razouls, 1972; Vives *et al.*, 1975; Goswami & Goswami, 1979; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Schnack, 1982; Brodsky *et al.*, 1983; Roe, 1984; Sazhina, 1985; Zheng Zhong *et al.*, 1989; Huys & Boxshall, 1991; Bradford-Grieve, 1994; Mazzocchi *et al.*, 1995; Chihara & Murano, 1997; Hure & Krsinic, 1998; Lapernat, 1999; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Strongly pointed anterior cephalosome, but less so than in *R. rostifrons*. Prosome long and slender with lateral spines and dorsal pairs of spines on the posterior margin of the first 3 metasome segments. A1 around 1.5 times the length of the whole body. Urosome 3-segmented, with pair of small spines on dorsal surface of genital segment. Rostral filaments situated under the frontal projection and are hardly visible from above. P5 are uniramous and 3-segmented, with one seta on the second segment internally and three terminal setae.

Male: Prosome similar to female, but A1 considerably shorter. Spines on the metasome segments and on the first urosome segment similar to the female. Right P5 is uniramous, 3-segmented with a slender curved terminal spine. Left P5 biramous, endopodite 3-segmented with segments of almost equal length, exopodite 1-segmented with a long terminal plumose seta and outside of it a naked, very short seta.



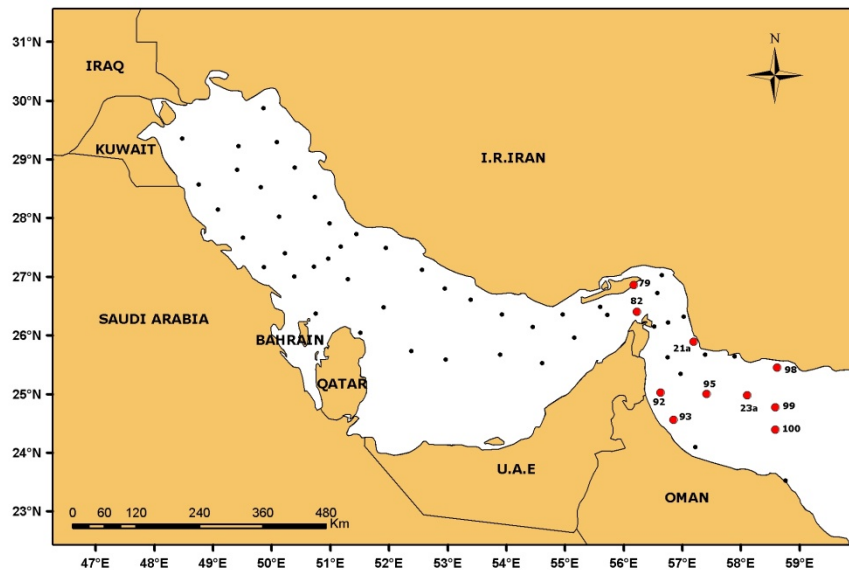
Rhincalanus nasutus

Distribution:

Antarctic (SW Atlantic, SE Pacific), sub-Antarctic (SW Atlantic, Indian, SW & SE Pacific), South Africa, Namibia, Angola, Dakar, off Mauritania, Maroco-Mauritania, Canaries, Portugal, Brazil, Argentina, Gulf of Mexico, Caraïbian Sea, off Bermuda, Chesapeake Bay, Long Island, Gulf of Main, off Woods Hole, off Nova Scotia, Danemark, Norway, Ireland, Norrh Sea, Gibraltar Strait, Mediterranean, Red Sea, Gulf of Aden, Sea of Oman, Arabian Sea, Maldives Islands, India, Indian Ocean, off Madagascar, Indonesia-Malaysia, Philippines, Vietnam, China Sea, Taiwan, Jaune Sea, Korea, Japan, Britsh Colombia, California, Australia, New Zealand, off Guatemala, Pacific (equatorial, tropical & subtropical), off Panama, off Peru, Chile. Epi- to bathypelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Well known in the Straits of Hormuz and Sea of Oman, but completely absent from the inner RSA (Present study, refer sites map), Qatari waters (Nour El-Din & Ghobashi 1999).



Sites of occurrence of *Rhincalanus nasutus* in RSA

Family: Eucalanidae Giesbrecht, 1892

Genus: *Rhincalanus*

Scientific Name: *Rhincalanus cornutus* (Dana, 1849)

Synonyms:

Calanus rostrifrons (F) Dana, 1849; *Rhincalanus cornutus atlantica* Schmaus, 1917; 1927; *R. gigas* Sewell, 1914a; *R. cornutus* Tanaka, 1956; *Rhincalanus cornutus* f. *typica* Mazza, 1967.

References:

A. Scott, 1909; Wolfenden, 1911; Sewell, 1929; Sars, 1925; Farran, 1936a; Rose, 1933a; Wilson, 1942a; Krishnaswamy, 1953; Grice, 1962; Kasturirangan, 1963; Vervoort, 1963b; Dawson, 1966; Grice & Hulsemann, 1967; Mullin, 1966; Owre & Foyo, 1967; Mazza, 1967; Itoh, 1970; Morris, 1970; Rader, 1970; Shih *et al.*, 1971; Bowman, 1971b; Björnberg, 1972; Heinrich, 1973; Marques, 1976; Goswami & Goswami, 1979; Björnberg *et al.*, 1981; Sazhina, 1982; Brodsky *et al.*, 1983; Roe, 1984; Jimenez-Perez & Lara-Lara, 1988; Yoo, 1991; Park & Choi, 1997; Chihara & Murano, 1997; Wong *et al.*, 1998; Bradford-Grieve *et al.*, 1999; Goetze, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (Dana, 1849).

Anterior projection of head distinctly anchor-shaped and the rostral filaments visible in dorsal view, the sexes distinguished by the form of the 5th legs; P5 in female terminal segment with smooth outer terminal spine, shorter than its segment.



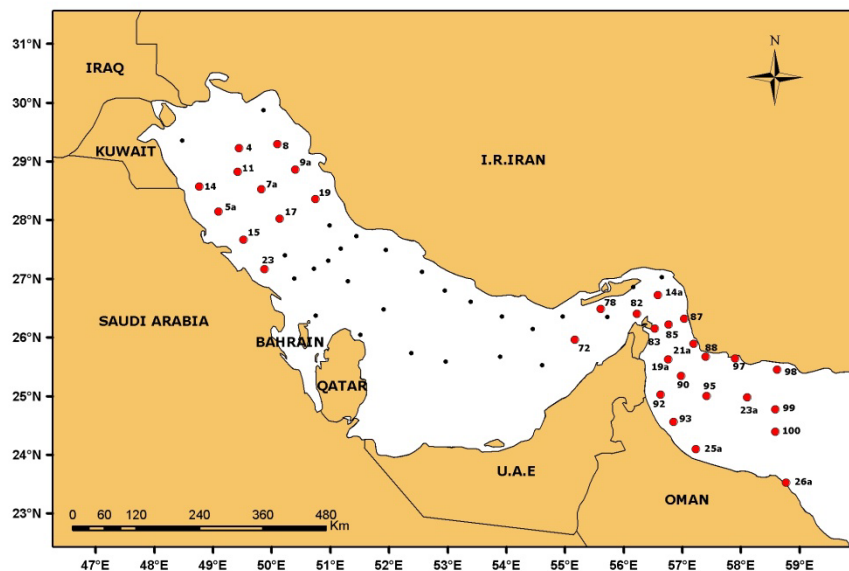
Rhincalanus cornutus

Distribution:

South Africa, Namibia, Angola, Congo, Atlantic (central equatorial), Gulf of Guiny, Dakar, off Mauritania, Maroco-Mauritania, Canaries, Brazil, Jamaica, Gulf of Mexico, Caraibbean Sea, Florida, off Bermuda, Sargasso Sea, Gulf of Main, off Woods Hole, off Nova Scotia, Ireland, North Sea, Mediterranean, Red Sea, Madagascar, Pakistan, India, Madras, Bay of Bengal, Indonesia-Malaysia, Philippines, Vietnam, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan, Bering Sea, W. Pacific (equatorial), Australia, New Zealand, Pacific (equatorial, Subarctic), off Hawaii, Gulf of California, W Central America, off Peru. Mesobathypelagic, sometimes near the surface (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Common in the northern part of the inner RSA , Straits of Hormuz and Sea of Oman (Present study, refer sites map), Qatari waters (Nour El-Din & Ghobashi, 1999).



Sites of occurrence of *Rhincalanus cornutus* in RSA

Family: Euchaetidae Giesbrecht, 1892

Genus: Euchaeta (Philippi, 1843)

Scientific Name: *Euchaeta concinna* Dana, 1849

Synonyms:

Euchäta concinna Giesbrecht, 1892; *Paraeuchaeta concinna* Bradford *et al.*, 1983; Chihara & Murano, 1997; *Pareuchaeta concinna* McKinnon *et al.*, 2008; *Euchaeta consimilis* Farran, 1936a; Sewell, 1948; Rose, 1956; *E. concinna* (F) Wilson, 1950.

References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Sewell, 1929; Farran, 1936a; Dakin & Colefax, 1940; Pesta, 1943; Chiba *et al.*, 1957; Tanaka, 1973; Grice, 1962; Kasturirangan, 1963; Chen & Zhang, 1965; Tanaka & Omori,

1968; Chen & Shen, 1974; Greenwood, 1977; Kimmerer *et al.*, 1985; Zheng Zhong *et al.*, 1989; Park, 1995; Bradford-Grieve *et al.*, 1999.

Description: (Dana, 1849).

Females: Genital segment right side with strongly developed projection at about midlength.

Males: On left P5 Exopod 2 segment 1 without a gap between medial and distal portions of distal part of lamella.



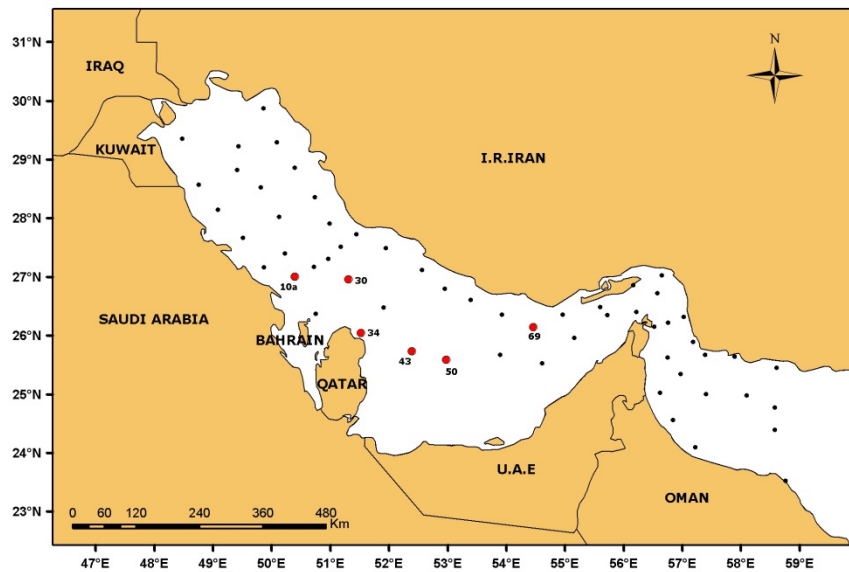
Euchaeta concinna

Distribution:

South Africa, Atlantic, Mediterranean, Gulf of Aden, Red Sea, Arabian Sea, ROPME Sea Area, off Cochin, Bombay, Ceylon, India, Bay of Bengal, Indonesia-Malaysia, Vietnam, Hong Kong, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan, Pacific (equatorial), Australia, Peru (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Rare in the inner RSA, southern half (Present study, refer sites map), western ROPME Sea Area (Michle *et al.* 1986), Qatari waters (Nour El-Din & Ghobashi 1999).



Sites of occurrence of *Euchaeta concinna* in RSA

Family: Euchaetidae Giesbrecht, 1892

Genus: *Euchaeta*

Scientific Name: *Euchaeta marina* Prestandrea, 1833

Synonyms:

Cyclops marinus Prestandrea, 1833; *E. prestandreae* Philippi, 1843; Claus, 1863; Thompson, 1888d; *E. communis* Dana, 1849; Dahl, 1894c; *Euchäta marina* Giesbrecht, 1892; *E. atlantica* Lubbock, 1856; *E. sutherlandii* Lubbock, 1856; *E. marina* A. Scott, 1909; Dakin & Colefax, 1940; Krishnaswamy, 1953; Grice, 1962; Tanaka Omori, 1968; Greenwood, 1977; Chen Q-c, 1980; Arinardi, 1991; He *et al.*, 1992.

References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Sars, 1925; Farran, 1929; Rose, 1929; Pesta, 1943; Sewell, 1947; Vervoort, 1957; Fish, 1962; Gaudy, 1963; Owre & Foyo, 1967; Mazza, 1968; Ramirez, 1969; Shih *et al.*, 1971; Razouls, 1972; Tanaka, 1973; Marques, 1974; Bradford, 1974; Björnberg *et al.*, 1981; Sazhina, 1985; Bradford *et al.*, 1983; Baessa de Aguiar, 1987; Blades-Eckelbarger, 1991; Park, 1995; Hure & Krsinic, 1998; Mauchline, 1999; Bradford-Grieve *et al.*, 1999; Braga *et al.*, 1999; Conway, 2006; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Females: The basis of female maxilliped has both long and short spines along the proximal half of the medial margin. The two endopodal setae of maxillule 2 are armed with both long and short spines.

Males: The serrated lamella of left P5 exopodite reaches or extends beyond a tuft of stiff hairs. Exopod of the left P5 has 3 lobes, one which is next to the tuft of hairs.



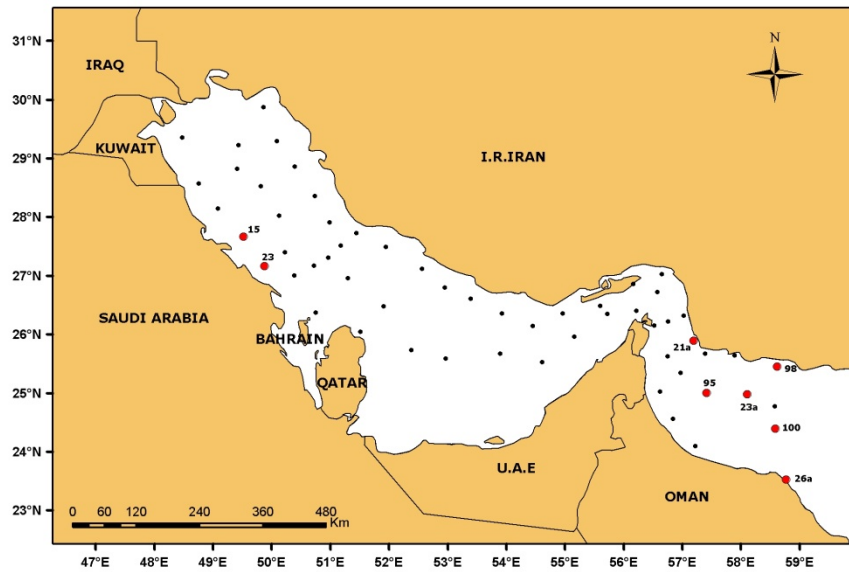
Euchaeta marina

Distribution:

South Africa, Atlantic (central equatorial, tropical, sub-tropical), Namibia, Gulf of Guinea, Dakar, Mauritania, Canaries, Açores, Gibraltar, Argentina, Brazil, off Amazon, Jamaica, Gulf of Mexico, Louisiana, Florida, Sargasso Sea, off Bermuda, off Woods Hole, Ireland, North Sea, Mediterranean Sea, Red Sea, Arabian Sea, ROPME Sea Area, Madagascar, India, Bay of Bengal, Australia, east and west Pacific (equatorial) China Sea, Korea, Japan, Okinawa, California, off Guatemala, Costa Rica, Peru, Chile. epi-mesopelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Reported at two stations only in the inner RSA, and at six stations in the Sea of Oman (Present study, refer sites map), Qatari waters (Nour El-Din & Ghobashi 1999), West coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Euchaeta marina* in RSA

Family: Euchaetidae Giesbrecht, 1892

Genus: *Euchaeta*

Scientific Name: *Euchaeta spinosa* Giesbrecht, 1892

Synonyms:

Euchäta spinosa Giesbrecht, 1892; *Undeuchaeta major* (M) Esterly, 1905; *Paraeuchaeta spinosa* Bradford *et al.*, 1983; Chihara & Murano, 1997.

References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Esterly, 1905; Pesta, 1920; Sars, 1925; Farran, 1926; Rose, 1933a; Wilson, 1932a; Sewell, 1947; Tanaka, 1973; Grice, 1962; Vervoort, 1963b; Mazza, 1964b; Crisafi, 1965a; Mazza, 1967; Razouls, 1972; Chen & Shen, 1974; Björnberg *et al.*, 1981; Gardner & Szabo, 1982; Park, 1995; Mauchline, 1999; Bradford-Grieve *et al.*, 1999; Vives & Shmeleva, 2007.

Description: (Giesbrecht, 1892).

Females: Mx1 Li1 with 2 posterior setae; Mx1 Enp1 with 4 setae.

Males: Left P5 Exp much shorter than right. Terminal spine of left P5 Exp relatively short.



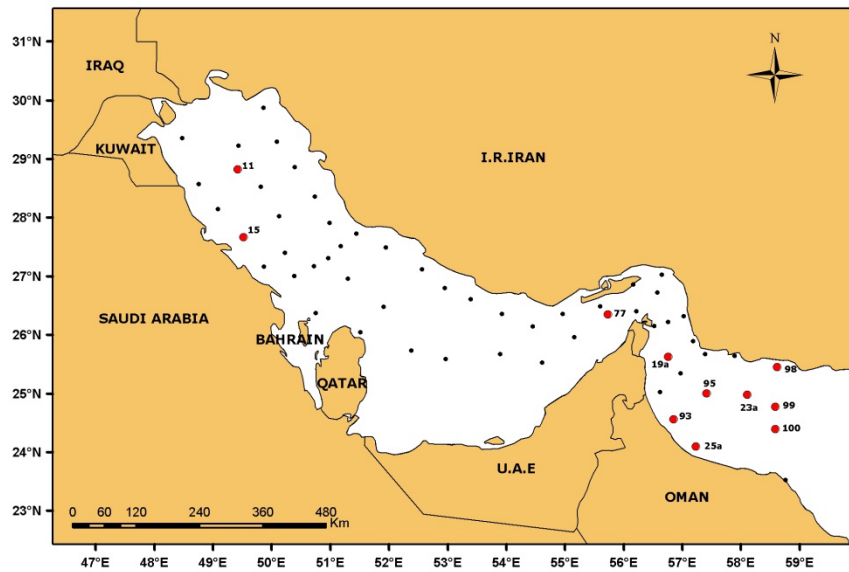
Euchaeta spinosa

Distribution:

South Africa, Gulf of Guiny, off Maroco-Mauritania, Canaries, off Ireland, Brazil, off Amazon, Gulf of Mexico, Caraïbes, Florida, off Bermuda, off Woods Hole, Atlantic, Mediterranean, Gulf of Aden, Arabian Sea, off Ceylon, India, Philippines, Vietnam, China Sea, Taiwan, Japan, Bering Sea, Gulf of Alaska, British Colombia, California, Pacific (equatorial, central subtropical), Hawaii, off Guatemala, Gulf of Panama, off Chile. Epi-bathypelagic (After Razouls *et al*, 2005-2009).

Sites of occurrence in RSA:

Rare in the inner RSA, but widely distributed in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Euchaeta spinosa* in RSA

Family: Pontellidae Dana, 1853

Genus: *Calanopia* Dana, 1853

Scientific Name: *Calanopia elliptica* (Dana, 1846, 1849)

Synonyms:

Pontella elliptica Dana, 1849; *Calanopia* sp. Pesta, 1912 a.

References:

Brady, 1883; Giesbrecht, 1892; Thompson & Scott, 1903; Pesta, 1913; Sewell, 1914a; Gurney, 1927; Sewell, 1947; Farran, 1936a; Mori, 1937; Dakin & Colefax, 1940; Wilson, 1942a; Chiba *et al.*, 1957; Bowman, 1957; Kasturirangan, 1963; Tanaka, 1964c; Chen & Zhang, 1965; Silas & Pillai, 1976; Greenwood, 1979; Lakkis, 1984; Bundy & Paffenhöfer, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Females: The prosome nearly twice as long as combined length of the urosome. Long points on posterior metasome. Urosome segment 2 as long as genital segment. Furca nearly 3 times as long as broad. P5 assymetrical, each limb uniramous of 4 segments. Left leg longest, exopodite of 2 segments

Males: Urosome segment 2 right side distal border produced into a well defined tooth. P5 terminal segment of the left exopodite with a pad of fine hairs, pointed at the distal end with three seta on the outer margin and a seta on the posterior side. The flattened margin of the right exopodite segment 1 with 3 blunt teeth, while the claw-like third segment has 3 small pointed teeth.



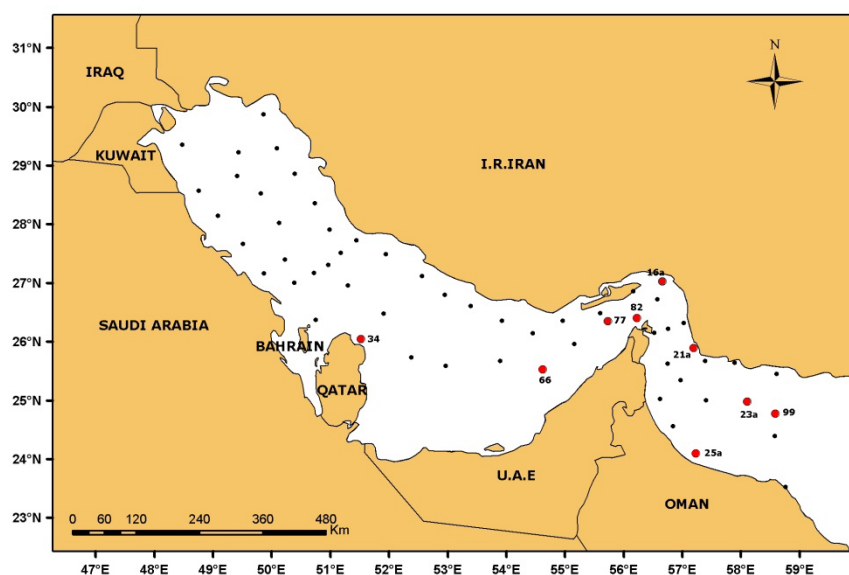
Calanopia elliptica

Distribution:

South Africa, Gulf of Mexico Bermuda, Mediterranean Sea, Suez Canal, Red Sea, Gulf of Aden, Arabian Sea, inner RSA, Ceylon, Madagascar, Indian Ocean, Bay of Bengal, Thailand, Indonesia-Malaysia, Philippines, Vietnam, Gulf of Tonkin, Hong Kong, China Sea, Taiwan, Sea of Jaun, Japan, Australia, Atlantic, off Georgia epi-mesopelagic, (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Very rare in the inner RSA, more spread in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986), Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004), Qatari waters (Nour & Ghobashi 1999); North and south Hormuz Strait (Gibson *et al.*, 1980), west coast of UAE, inner RSA (Gibreel *et al.*, 1997) Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Calanopia elliptica* in RSA

Family: Pontellidae Dana, 1853

Genus: *Calanopia*

Scientific Name: *Calanopia minor* (Scott, 1902)

References:

Scott, 1902; 1909; Thompson & Scott, 1903; Pesta, 1912a; Sewell, 1914a; 1932; Bowman, 1957; Brodsky, 1962c; Kasturirangan, 1963; Tanaka, 1964c; Chen & Zhang, 1965; Silas & Pillai, 1976; Marques, 1976; 1982; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Females: Superficially resembles a small *Calanopia elliptica*. The last metasome segment produced on each side into an acute spine, the rostrum pointed. Urosome 2-segment. The second segment distinctly longer than the genital segment. The P5 is quite symmetrical with 4 segments; the distal segment terminates in a long inner spine (not stout as in *Calanopia elliptica*) and one short spine, with a further spine on outside mid segment.

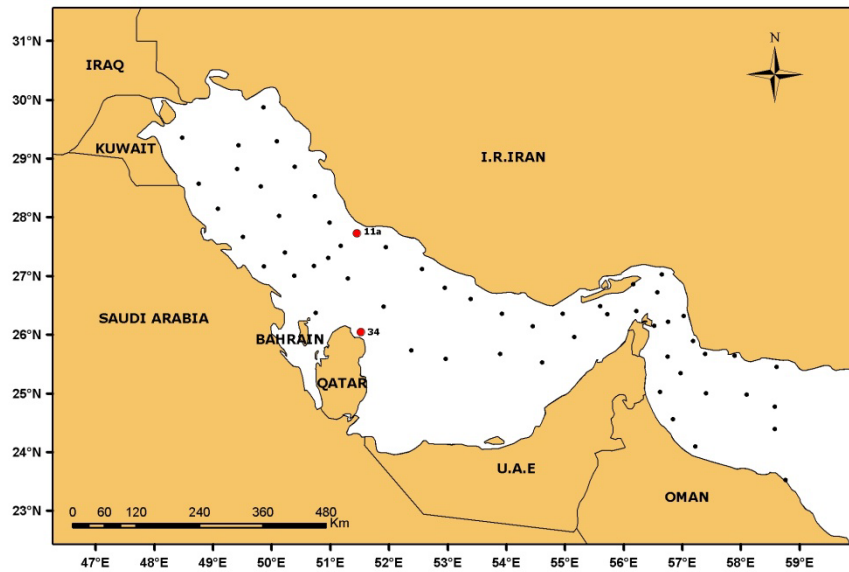
Males: The second urosome segment has no spiny process. A1 extends to the end of the third thoracic segment; the right A1 is geniculate. The bases of the left P5 is swollen towards the proximal end of the inner margin, the swollen part produced into a small tooth-like spine. The basis of the right exopodite is also swollen. Flattened joint of the first exopodite segment, with a seta on the inner margin; outer thumb is short and naked. The claw-like second segment is spoon-shaped and without any teeth, but with 2 inner marginal setae.



Calanopia minor

Sites of occurrence in RSA:

Rare in the inner RSA (Present study, refer sites map), Qatari waters (Nour & Ghobashi 1999), Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004), Western ROPME Sea Area (Michle *et al.*, 1986).



Sites of occurrence of *Calanopia minor* in RSA

Family: Pontellidae Dana, 1853

Genus: Labidocera Lubbock, 1853.

Scientific Name: *Labidocera acuta* Dana, 1849

Synonyms:

Pontella acuta Dana, 1849; *Labidocera acutum* Giesbrecht, 1892; Dakin & Colefax, 1940; De Decker, 1964; De Decker & Mombeck, 1964.

References:

Brady, 1883; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Wolfenden, 1911; Sewell, 1912; 1914a; 1932; 1947; Pesta, 1912a; 1913; Früchtl, 1924b; Mori, 1929; Dakin & Colefax, 1933; Farran, 1936a; Wilson, 1942a; Chiba, 1956; Heinrich, 1960a; Brodsky, 1962c; Voronina, 1962a; Kasturirangan, 1963; Tanaka, 1964c; Chen & Zhang, 1965; Goswami & Goswami, 1974; Fleminger, 1975; Marques, 1976; Greenwood, 1979; Marques, 1982; Kimmerer *et al.*, 1985; Ohtsuka & Onbé, 1991; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Females: Sharp spine on front of cephalosome, directed slightly downwards. No lateral cephalic hooks; Posterior metasome symmetrical with large lateral points. Urosome 3-segmented, genital segment asymmetrical, with a projection on the posterior right side which extends half way along the next segment, visible from the dorsal side. P5 with a rather variable exopodite, with relatively large spines on the outer border; endopodite claw-like.

Males: Posterior metasome border symmetric, right side longest and bent outwards. Urosome segment 1 with a small spine on the right. Left P5 with 3 terminal and 1 outer spines; right P5 without a thumb on the claw, but with a curved triangular flap.



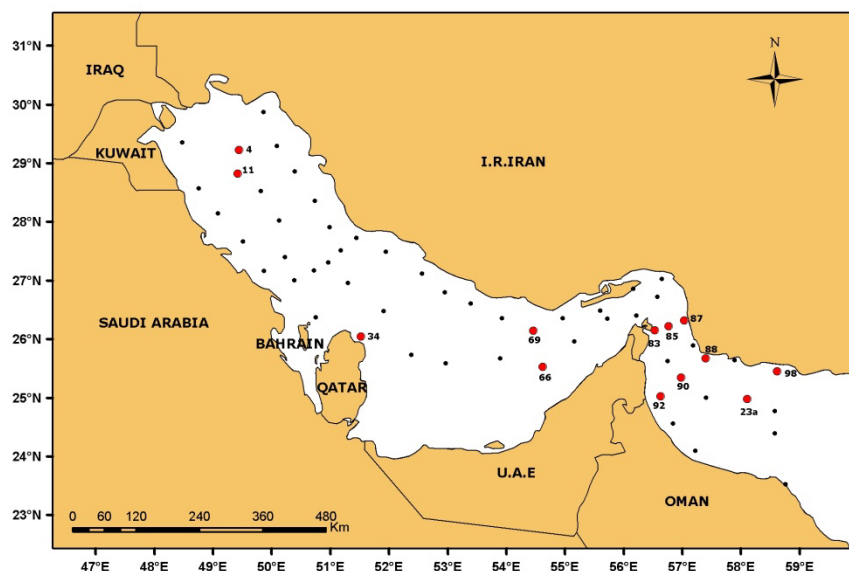
Labidocera acuta

Distribution:

South Africa, Gulf of Guinea, Brazil, Ireland, Sporadic in the Atlantic, Mediterranean, Suez Canal, Red Sea, Gulf of Aden, Sea of Oman, ROPME Sea Area, Arabian Sea, Maldives, off Madagascar, Seychelles, Ceylon, India, Australia, Thailand, Indonesia-Malaysia, Philippines, Vietnam, Hong Kong, China Sea, Taiwan, Japan Sea, Bering Sea, Pacific (equatorial), California, Mexico, central America, Hawaii, Peru, off Chile. Epipelagic.

Sites of occurrence in RSA:

Rare in the inner RSA, more known in the Sea of Oman (Present study, refer sites map), Kuwaiti waters (Michel *et al*, 1986a) Qatari waters (Nour El-Din & Ghobashi 1999) north and south Hormuz Strait (Gibson *et al*, 1980), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Labidocera acuta* in RSA

Family: Pontellidae Dana, 1853

Genus: *Labidocera*

Scientific Name: *Labidocera acutifrons* Dana, 1849

Synonyms:

Pontella acutifrons Dana, 1849; Brady, 1883; *Pontella agilis* Dana, 1849; *Pontella bairdii* Lubbock, 1853b; *Pontia Edwardsii* Kröyer, 1849 (in Damkaer & Damkaer, 1979); *L. agilis* : Giesbrecht & Schmeil, 1898; C.B. Wilson, 1950; Weikert, 1975; Lakkis, 1984; Mauchline, 1998; *L. albatrossi* C.B. Wilson, 1950.

References:

Giesbrecht & Schmeil, 1898; Sars, 1925; Farran, 1936a; Wilson, 1942a; Dakin & Colefax, 1940; Rose, 1933a; Sewell, 1947; Heinrich, 1960a; Tanaka, 1964c; Vervoort, 1965; Owre & Foyo, 1967; Vidal, 1968; Greenwood, 1979; Björnberg *et al.*, 1981; Sazhina, 1982;

Chahsavar-Archad & Razouls, 1982; Sazhina, 1985; Land, 1988; Ohtsuka & Onbé, 1991; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Females: Anterior cephalosome with dorsal lenses and median spine, without lateral hooks; posterior metasome segment produced into points on each side, the corners of which are slightly divergent. Urosome 3-segmented, genital segment asymmetrical, with a small lump on the right side; second segment with a dorsoposterior spine on the right side, pointing towards a large anal flap. P5 asymmetrical, left leg slightly larger, exopodite with three spines, endopodite reduced to aspiny process.

Males: Anterior cephalosome with a median spine as in female, dorsal lenses well developed and placed close together; urosome 5-segmented; posterior metasome symmetrical. Left P5 with a rudimentary endopodite, exopodite segment 2 with 3 terminal spines; right P5 exopodited claw with an extra small segment bearing 2 setae and with a spine.



Labidocera acutifrons

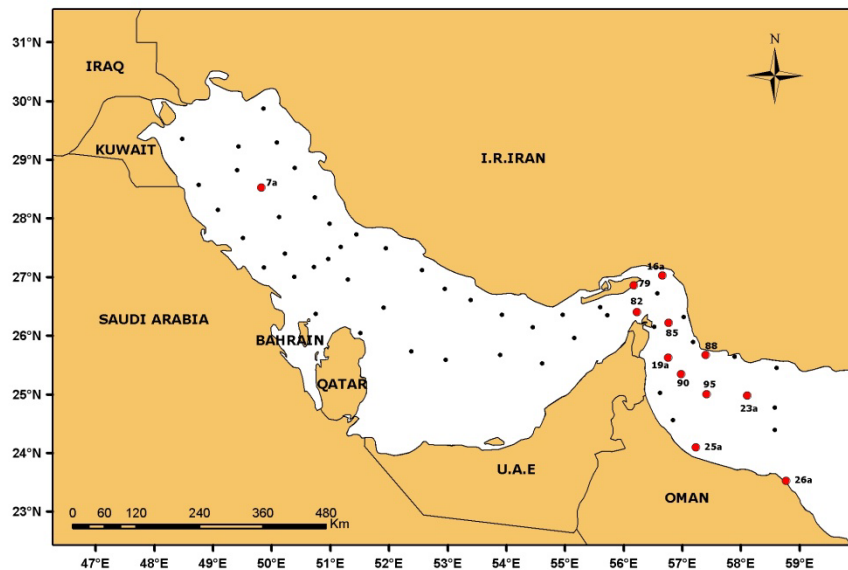
Distribution:

Antarct, sub-Antarct, South Africa, Namibia, Angola, Congo, Gulf of Guinea, Dakar, off Mauritania, off Canaries, Brazil, Venezuela, Gulf of Mexico, Florida, Woods Hole,

Mediterranean, Arabian Sea, Madagascar, India, Indonesia-Malaysia, Philippines, China Sea, Vietnam, Japan, Pacific (equatorial, central subtropical), Australia, off California, central America, Hawaii, off Peru, Chile. Epipelagic.(After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Restricted to the Straits of Hormuz and Sea of Oman (Present study, refer sites map), Kuwaiti waters (Michel *et al.*, 1986b), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Labidocera acutifrons* in RSA

Family: Pontellidae Dana, 1853

Genus: *Labidocera*

Scientific Name: *Labidocera minuta* (Giesbrecht, 1889)

Synonyms:

Labidocera minutum Giesbrecht, 1889; 1892; Dakin & Colefax, 1940; De Decker, 1964; De Decker & Mombeck, 1964; Carter, 1977 (1978); *Labidocera chubbi* (M) Brady, 1915.

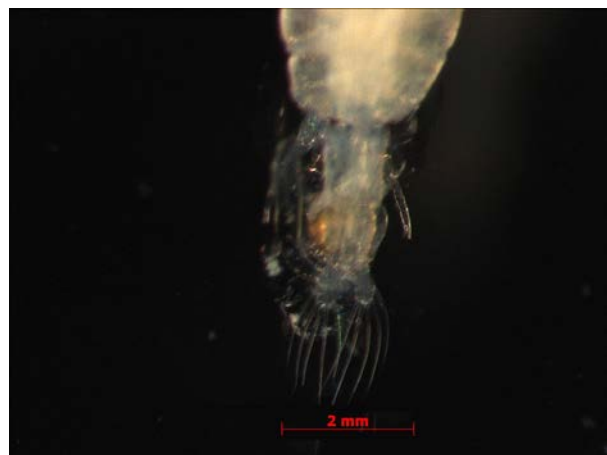
References:

Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; A. Scott, 1909; Pesta, 1912a; Sewell, 1947; Früchtl, 1924b; Gurney, 1927; Farran, 1936a; C.B. Wilson, 1950; Voronina, 1962a; Kasturirangan, 1963; Tanaka, 1964c; Chen & Zhang, 1965; Fleminger, 1965; Greenwood,

1979; Goswami & Goswami, 1979a; Kimmerer *et al.*, 1985; Ohtsuka & Onbé, 1991; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Females: Cephalosome narrow and rounded, small dorsal eye lenses; small lateral hooks present. Lateral posterior margin of metasome rounded, but extended on the right side with a ventrally pointing spine; left side without any spine; urosome 3-segmented, genital segment elongated and half the length of urosome; right anterior and also posterior corner of genital segment with lateral swellings, in the proximal centre of the ventral surface is a small chitinous outgrowth. Right ventral surface of urosome and second urosome segment with chitinous knobs along right margin; furca asymmetrical, right side larger. P5 symmetrical, exopodite bifurcate at tip; the endopod is normally bent outwards over the exopodite, short broad based and ends in an apical spine plus a rather shorter spine on the inner margin. Two minute spines on outside margin of exopod.



Labidocera minuta

Males: Cephalosome similar to female, but dorsal eye lenses are very large and close together. Last metasome segment asymmetrical, shorter point on left, extended into a longer flat curved tip on right. Urosome 5-segmented, genital segment broader than long, with a small lobe at the right posterior margin. Right A1 geniculate. Right P5 with a claw on the first exopod segment, thumb short with a seta at the base, terminal segment curved, with 3 setae

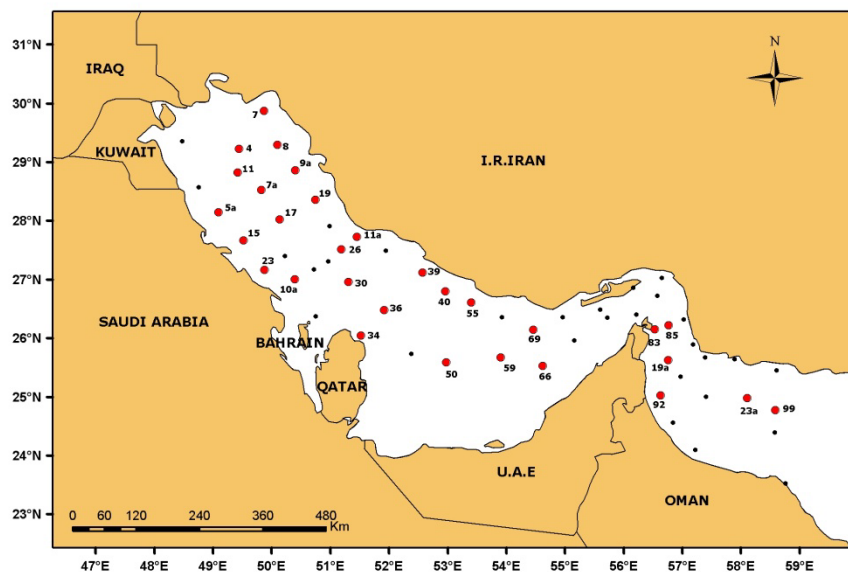
along internal margin and two setae distally. Left leg terminal segment at least 3 lobe-like processes.

Distribution:

South Africa, Suez Canal, Red Sea, ROPME Sea Area, Arabian Sea, Maldives Islands, Ceylon, Madagascar, Seychelles, Madras, Hooghly estuary, Bay of Bengal, Indonesia-Malaysia, Vietnam, Hong Kong, China Sea, Taiwan, Korea, Japan, Pacific (equatorial, tropical), Australia, California. Inshore; Coastal, epipelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the inner RSA and less so in Sea of Oman (Present study, refer sites map), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), north and south Hormuz Strait (Gibson *et al.*, 1980), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Labidocera minuta* in RSA

Family: Pontellidae Dana, 1853

Genus: *Labidocera*

Scientific Name: *Labidocera pavo* Giesbrecht, 1889

References:

Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Sewell, 1914a; 1924; 1932; Gurney, 1927; Mori, 1932a; C.B. Wilson, 1950; Krishnaswamy, 1953; Kasturirangan, 1963; Sherman, 1964; Tanaka, 1964c; Chen & Zhang, 1965; Goswami & Goswami, 1974; Greenwood & Othman, 1979; Lakkis, 1984; Chihara & Murano, 1997; Conway *et al.*, 2003; Ferrari & Ueda, 2005; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Body robust, no lateral hooks on cephalosome; dorsal eyes quite well developed; posterior metasome segment pointed and symmetrical; urosome short, 2-segmented, right side of genital segment has a process with a spine on the end, ventrally the posterior margin produced into a long lobe, second urosome segment short. Furca nearly symmetrical; P5 almost symmetrical, exopod with 2 outer marginal spines and terminates in 3 spines, endopod is simple and not bifurcated, left endopod quite rounded and right ending in a sharp point.



Labidocera pavo

Male: dorsal eye lenses arranged close together. Posterior metasome segment symmetrical with lateral points. Urosome 5-segmented. Urosome and furca quite symmetrical. Right A1 geniculate. P5 asymmetrical; right exopod claw-like with well developed thumb, towards inner base of thumb is a robust seta; terminal segment elongated, curved, with a blunt conical

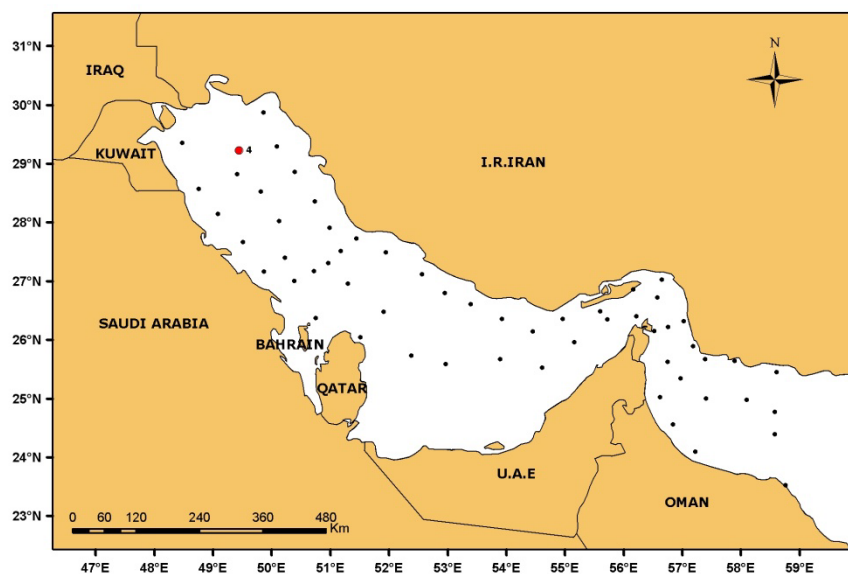
projection on proximal inner margin, with 2 inner mid-marginal seta, terminates in a point with one terminal seta; left leg terminal segment with 1 outer marginal spine and 3 terminal sub-equal spines, all curving inwards.

Distribution:

Mediterranean, Red Sea, Arabian Sea, ROPME Sea Area, Ceylon, Madagascar, India, Philippines, Vietnam, China Sea, Taiwan, Jaune Sea, Korea, Japan Sea, Hawaii. Inshore, also brackish. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Recorded once only in the extreme northern end of the inner RSA (Present study, refer sites map), north and south Hormuz Strait (Gibson *et al.*, 1980), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Labidocera pavo* in RSA

Family: Paracalanidae Giesbrecht, 1892

Genus : *Acrocalanus* Giesbrecht, 1888

Scientific Name: *Acrocalanus gibber* Giesbrecht, 1888

Synonyms:

Acrocalanus pediger (F) Cleve, 1901

References:

Cleve, 1901; Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Scott, 1909; Sewell, 1912; 1914a; 1929; 1933; Früchtl, 1924b; Gurney, 1927; Farran, 1936a; Dakin & Colefax, 1940; Vervoort, 1946; Tanaka, 1956c; Bowman, 1958; Kasturirangan, 1963; Chen & Zhang, 1965; Tanaka, 1965c; Marques, 1976; Greenwood, 1976; Hiromi, 1987; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Females: Deep body in the lateral view, with a pronounced hump on the dorsal cephalosome; distinct though partial line of separation of the cephalosome from the first pedigerous segment is obvious; A1 reaches just to the furca, or slightly beyond. 4 pairs of swimming legs, the distal toothed outer border of exopodite segment 3 of P4 is about 60% of the length of the proximal part of the toothed border; the distal teeth are strong. Genital segment longer than any of the others, with a prominent ventral swelling.



Acrocalanus gibber

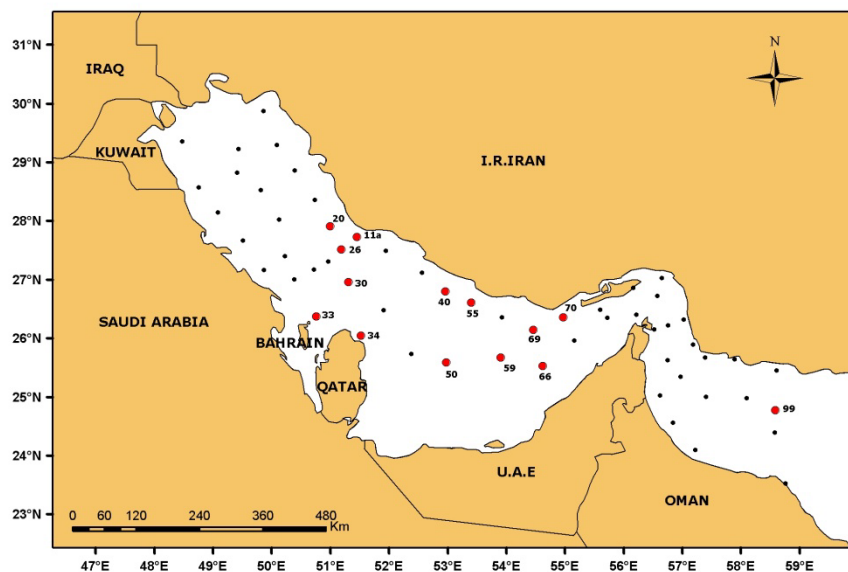
Males: Distinct hump on the dorsal cephalosome; P5 is only present on the left and extends to the end of the urosome segment 3, or middle of urosome segment 4 when this leg is fully extended; very simple limb, composed of four segments with tiny spines on the last segment.

Distribution:

South Africa, off Bermuda, Mediterranean, Suez canal, Red Sea, Gulf of Aden, Arabian Sea, Indian Ocean, Bay of Bengal, Indonesia-Malaysia, Philippines, Vietnam, China Sea, Juan Sea, Japan Sea, Pacific, California, off Washington, Hawaii, off Peru, Chile (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Central and souther parts of inner RSA, Sea of Oman (Present study, refer sites map), West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Western ROPME Sea Area (Michle *et al.*, 1986), Kuwaiti waters (Michel *et al.*, 1986; Al-Yamani *et al.*, 2004), Qatari waters (Nour & Ghobashi 1999).



Sites of occurrence of *Acrocalanus gibber* in RSA

Family: Paracalanidae Giesbrecht, 1892

Genus: *Paracalanus* Boeck, 1864

Scientific Name: *Paracalanus parvus* Claus, 1863

Synonyms:

Calanus parvus Claus, 1863; *Paracalanus parvus* : Giesbrecht, 1892; T. Scott, 1894b; *Paracalanus parvus* Boeck, 1864; *Paracalanus parvus borealis* Wolfenden, 1905 (1906); *Paracalanus parvus perplexus* Norman & Scott, 1906; *Piezocalanus lagunaris* Grandori, 1912; Carazzi & Grandori, 1912; Pesta, 1920; *Paracalanus mariae* (M) Brady, 1918; *Scolecithrix ancorum* Oliveira, 1947; *Paracalanus intermedius* Shen & Bai, 1956; *Paracalanus parvus* Dakin & Colefax, 1940; Bradford, 1972; *Calocalanus parvus* Hopcroft *et al.*, 1998; *Paracalanus parvus* s.l: Chihara & Murano, 1997.

References:

Bourne, 1889; Canu, 1892; Sars, 1901a (1903); 1925; Thompson & Scott, 1903; Esterly, 1924; Farran, 1936a; Sewell, 1951; With, 1915; Pesta, 1920; Lysholm & Nordgaard, 1921; Früchtl, 1924b; Rose, 1933a; Gurney, 1927; Campbell, 1929; Wilson, 1932a; Jespersen, 1940; Lysholm *et al.*, 1945; Oliveira, 1946; Vervoort, 1963b; Davis, 1949; Farran & Vervoort, 1951c; Carvalho, 1952a; Chiba *et al.*, 1957a; Marques, 1974; Tanaka, 1964; Shen & Lee, 1963; Paiva, 1963; Unterüberbacher, 1964; Gonzalez & Bowman, 1965; Chen & Zhang, 1965; Ramirez, 1966; 1969; Deevey, 1966; Mazza, 1967; Park, 1968; Vilela, 1968; Itoh, 1970; Shih *et al.*, 1971; Greenwood, 1976; Andronov, 1977; Bradford, 1978; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Schnack, 1982; Brodsky *et al.*, 1983; Campaner, 1985; Hiromi, 1987; Kim *et al.*, 1993; Mazzocchi *et al.*, 1995; Kang, 1996; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Giesecke & Gonzalez, 2004; Conway, 2006; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Cephalosome fused with the first pedigerous segment. Al reaches around the middle of the 4-segmented urosome. Urosome around a third the length of the prosome, genital and anal segments about the same length. P5 uniramous and symmetrical, 2-segmented (one leg sometimes 3- segmented), terminal segment with a slender spine at the tip and a much smaller spine outside this.

Male: Slight ridge along the dorsal surface of the prosome. Al quite robust. Urosome 5-segmented, second segment the longest. P5 asymmetrical, uniramous, the right foot 2-segmented, similar to the female P5 legs and the left 1- segmented. The right foot reaches the middle of segment 2 of the left foot. Both feet terminating in 2 sub-equals pines.



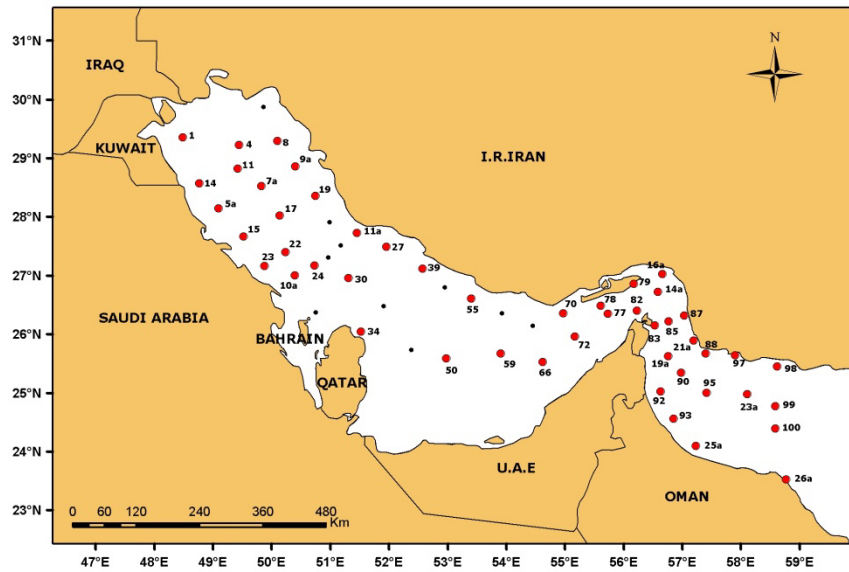
Paracalanus parvus

Distribution:

Cosmopolitan, Antarctic, sub-Antarctic, Indian, Pacific (tropical, sub-tropical), South Africa, Saldanha, Atlantic (tropical, temperate), Argentina, Gulf of Mexico, Maroco-Mauritania, Canaries, Chesapeake Bay, Narragansett Bay, Long Island Sound, off Nova Scotia, Labrador, SW Island, Ireland, Manch, Norway, North Sea, Barents Sea, Portugal, Mediterranean, Suez canal, Red Sea, Arabian Sea, ROPME Sea Area, Maldives Islands, Madagascar, India, China Sea, Taiwan, Hong Kong, Okinawa, Jaune Sea, Korea, Japan Sea, Bering Sea, British Colombia, California, Chile, New Zealand. Epi-bathypelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

One of the most common copepod species throughout the whole ROPME Sea Area (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi 1999; Nour El-Din & Al-Khayat, 2005), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Paracalanus parvus* in RSA

Family: Paracalanidae Giesbrecht, 1892

Genus: *Paracalanus*

Scientific Name: *Paracalanus aculeatus* (Giesbrecht, 1888)

Synonyms:

Paracalanus parvus T. Scott, 1894b; *Acrocalanus pediger* (M) Cleve, 1901; *Paracalanus aculeatus plumulosus* Wolfenden, 1905 (1906); *Paracalanus clevei* Carl, 1907; Früchtl, 1923; 1924 b.

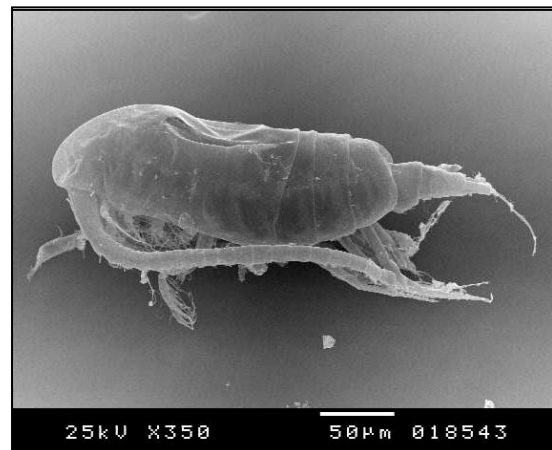
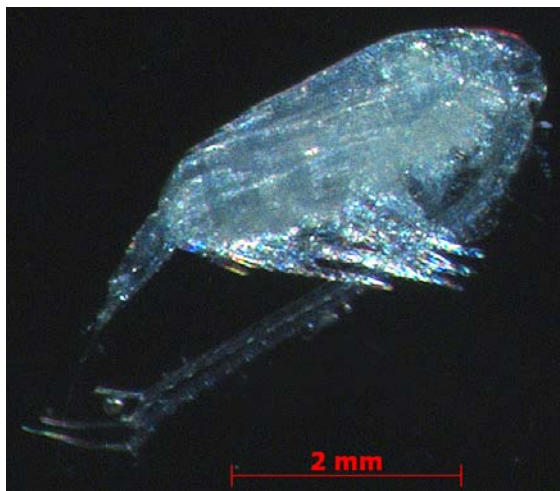
References:

Giesbrecht, 1892; A. Scott, 1909; Sewell, 1951; Pesta, 1913; Sars, 1925; Farran, 1929; Mori, 1932a; Rose, 1933a; Farran, 1936a; Dakin & Colefax, 1940; Wilson, 1942a; Vervoort, 1963b; Carvalho, 1952a; Tanaka, 1960; Grice, 1962; Brodsky, 1962c; Kasturirangan, 1963; Chen & Zhang, 1965; Owre & Foyo, 1967; Wellershaus, 1969; Ramirez, 1971; Marques, 1976; Björnberg, 1980; Campaner, 1985; He *et al.*, 1992; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Paffenhöfer & Loyd, 2000; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Urosome roughly a third of the length of the prosome. The longest furcal setae, when intact, are longer than the urosome. Similar to *P. parvus*, but the A1 extends beyond the furca. P5 symmetrical, uniramous, 5 segmented, the distal segment cylindrical, with a terminal spine longer than it and an outer distal spine almost half its length.

Male: Furca almost as long as wide, anal segment shorter than urosome segment 4. A1 extends almost as far as the furca. P5 extends beyond the posterior border of urosome segment 3; the 3- segmented right leg is similar to the female P5 legs and extends well beyond the distal border of segment 2 of the 5-segmented left leg.



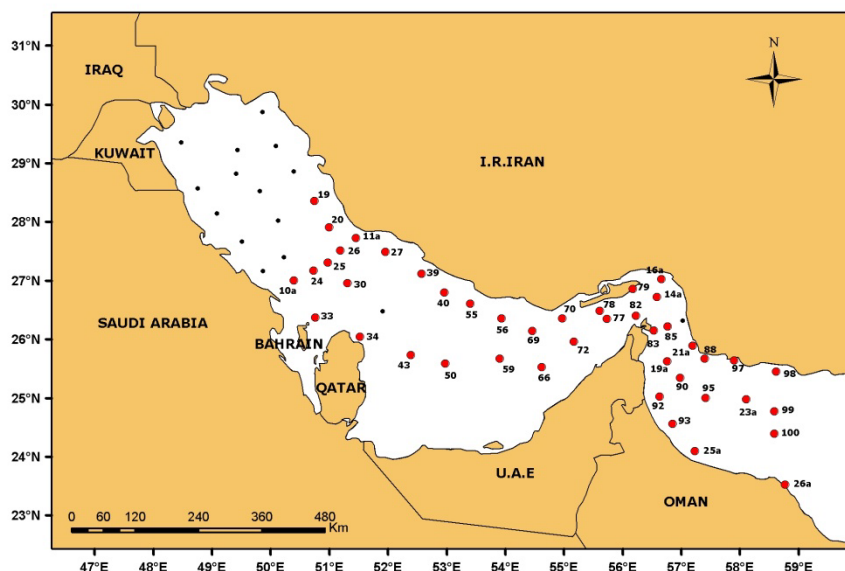
Paracalanus aculeatus

Distribution:

Sub-Antarctic (Indian), South Africa, Namibia, Congo, Atlantic (central equatorial), Dakar, off Maroco-Mauritania, off Canaries, Brazil, off Amazone, Jamaïqua, Cuba, Gulf of Mexico, Florida, off Bermuda, New York, off Nova Scotia, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea Area, Maldives, Ceylon, Madagascar, India, Indonesia-Malaysia, Philippines, Vietnam, Hainan, Hong Kong, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan Sea, Bering Sea, West Pacific (equatorial), Australia, off New Zealand, off California, off Hawaii, Panama, off Peru, Chile. Epipelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the ROPME Sea Area, except the northern part of the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b), Qatari waters (Nour El-Din & Ghobashi 1999; Nour El-Din & Al-Khayat, 2005), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Paracalanus aculeatus* in RSA

Family: Paracalanidae Giesbrecht, 1892

Genus: *Parvocalanus*

Scientific Name: *Parvocalanus* (*Paracalanus*) *crassirostris* (F. Dahl, 1894)

Synonyms:

Paracalanus crassirostris F. Dahl, 1894c; Thompson & Scott, 1903; Sewell, 1933; Gurney, 1927; Rose, 1956; Deevey, 1960; Grice, 1956; Tanaka, 1960; Vervoort, 1962a; Faber, 1966a; Wellershaus, 1969 (f. *cochinensis*); Kim *et al.*, 1993; Webber *et al.*, 1996; Park & Choi, 1997; Suarez-Morales & Gasca, 1998a; Lopes *et al.*, 1999; Neumann-Leitao *et al.*, 1999; Ueda *et al.*, 2000; *P. crassirostris* f. *typica* Fruchtl, 1923; 1924b; De Decker, 1964; *P. crassirostris* var. *nudus* Davis, 1944; *Paracalanus crassirostris* forma *nudus* Davis, 1944; *Paracalanus brevispinatus* Shen & Lee, 1966.

References:

De Decker, 1964; Andronov, 1970; Hiromi, 1981; Kovalev & Shmeleva, 1982; Turner & Dagg, 1983; McKinnon, 1991; Checkley *et al.*, 1992; Bradford-Grieve, 1994; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Vives & Shmeleva, 2007.

Description: (Dahl, 1894).

Female: P1 Enp 2-segmented. P5 terminal segment just under 0.5 times as wide as long with 2 subequal strong terminal spines.

Male: Right P5 2-, or 3-segmented (*Parvocalanus*); P5 2-segmented, does not extend as far as distal border of left leg segment 1.



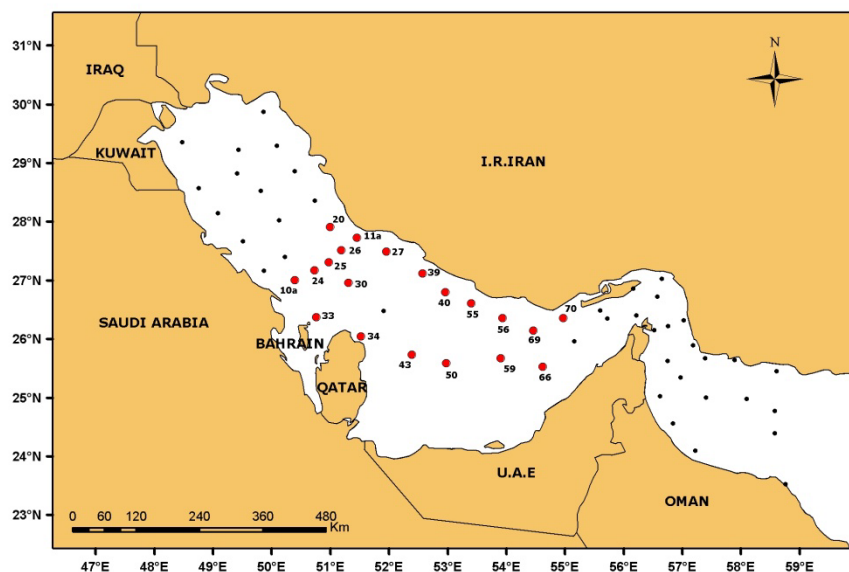
Parvocalanus (Paracalanus) crassirostris

Distribution:

South Africa, Namibia, Angola, Dakar, Brazil, Caribbean Sea, Jamaica, Gulf of Mexico, Porto Rico, Florida, North Carolina, New York, Long Island Sound, Cap Cod, Mediterranean, Suez Canal, Red Sea, Arabian Sea, ROPME Sea Area, Bombay, India, Malaysia, Vietnam, Hong Kong, China Sea, Taiwan, Jaune Sea, Korea, Japan, Australia, Hawaii, Gulf of California. Brackish, estuary and littoral. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Restricted to the central region of the the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Qatari waters (Nour El-Din & Ghobashi, 1999), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Parvocalanus (Paracalanus) crassirostris* in RSA

Family: Pontellidae Dana, 1853

Genus: *Pontella* Dana, 1846

Scientific Name: *Pontella fera* Dana, 1849

Synonyms:

Pontella fera (F) Dana, 1849; *Pontellina (Eupontellina) fera* Claus, 1893.

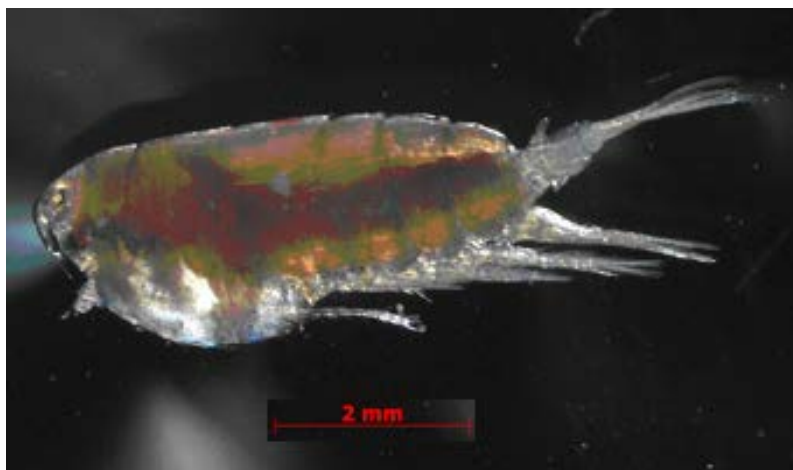
References:

Giesbrecht, 1892; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Sewell, 1947; Farran, 1936a; C.B. Wilson, 1950; Tanaka, 1964c; Chen & Zhang, 1965; Marques, 1982; Ohtsuka & Onbé, 1991; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Mulyadi, 2000; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Rostrum slender and pointed with weakly developed rostral lens, dorsal eye lenses moderately large; posterior corners of last metasome segment asymmetrically produced into wing-like processes, which extend beyond middle of genital segment; urosome2 –segmented, genital segment asymmetrical, bulging laterally on left side; ventrally the genital segment has 2 knob-like processes, varying in size and shape. Furca asymmetrical, left furca larger. P5 symmetrical, endopodite short and bifurcated at tip, variable in appearance. Exopodite elongated, with 3 spines on both inner and outer margins, terminating in another spine, outer marginal spines more widely spaced.

Male: Cephalosorne as in female; last metasome segment ending in bluntly rounded posterior projections of more or less equal size. Al geniculate; urosome5-segmented, genital segment with a small lateral bulge on right side, furca asymmetrical slightly broader on right. Right P5 with claw. Base of claw with a large projecting thumb with a small process at its base and a short and a large process between this and the terminal segment. Terminal segment initially almost straight, but the distal half curves backward, the tip bearing a small seta. Left P5 terminating in 3 unequal processes.



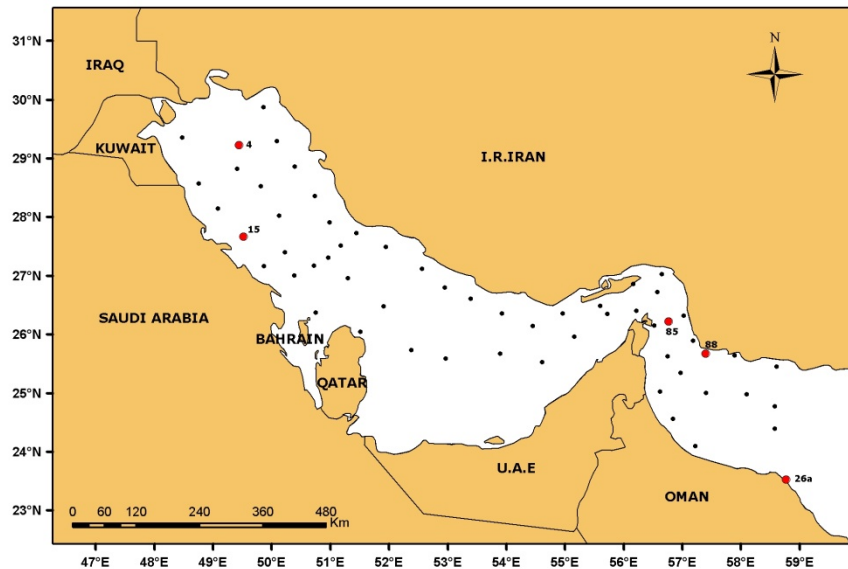
Pontella fera

Distribution:

South Africa, Red Sea, Arabian Sea, Maldives Islands, Ceylon, Seychelles, Indian Ocean, Indonesia-Malaysia, Java Sa, Philippines, China Sea, Taiwan, Jaune Sea, Korea, Japan, Pacific (equatorial), off Mexico, Australia, Hawaii. Epiplagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Rarely found in the northern inner RSA and Sea of Oman (New record, refer sites map).



Sites of occurrence of *Pontella fera* in RSA

Family: Pontellidae Dana, 1853

Genus: *Pontella*

Scientific Name: *Pontella karachiensis* (Rehman, 1973)

References:

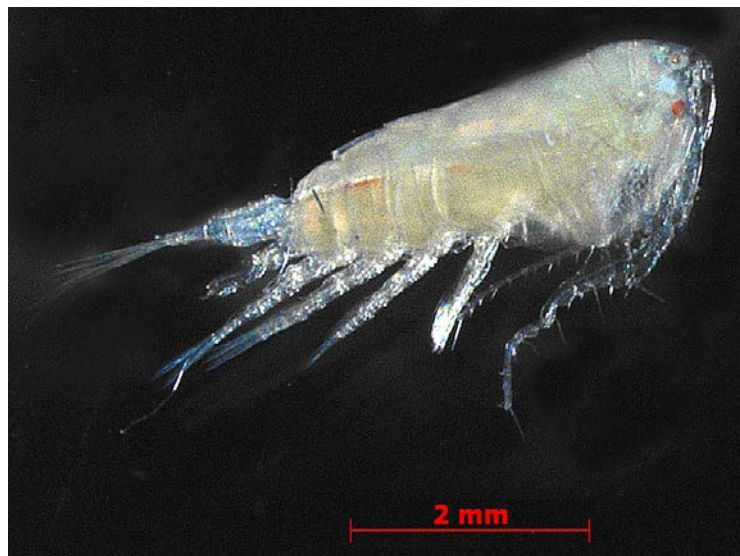
Rehman, 1973; Silas & Pillai, 1973 (1976); El-Sherbiny & Ueda, 2008.

Description: (El-Sherbiny & Ueda, 2008).

Female: Body robust; prosome about 3.7 times as long as urosome; posterior corner of fifth pediger produced posteriorly into symmetrical, somewhat acuminate lobes extending one-third of urosome length. Rostrum bifid, thickened basally, tapering distally and directed ventrally. Urosome 3 free somites; genital compound somite asymmetrical, with small, slightly bi- or trilobed dorsolateral process on left side, large posterodorsal elevation directed

posterodorsally and protrusion on right side. Genital operculum located distally without any processes. Second free urosomite symmetrical and as long as genital compound somite; anal somite considerably shorter and narrower than second urosomite. Caudal rami symmetrical, each ramus nearly 1.9 times as long as its maximum width.

Male. Body robust; prosome about 3.4 times as long as urosome; fifth pediger with symmetrical lateral expansions. Rostrum bifid; bulbous with 2 lenses. Urosome 5-segmented; genital somite asymmetrical with 2 sensilla on each side; left side weakly swollen with genital aperture located ventrolaterally at posterior rim; second urosomite with 2 dorsal sensilla on each side; third urosomite longer than following 2 somites combined; caudal rami symmetrical and approximately 1.9 times as long as its maximum width.



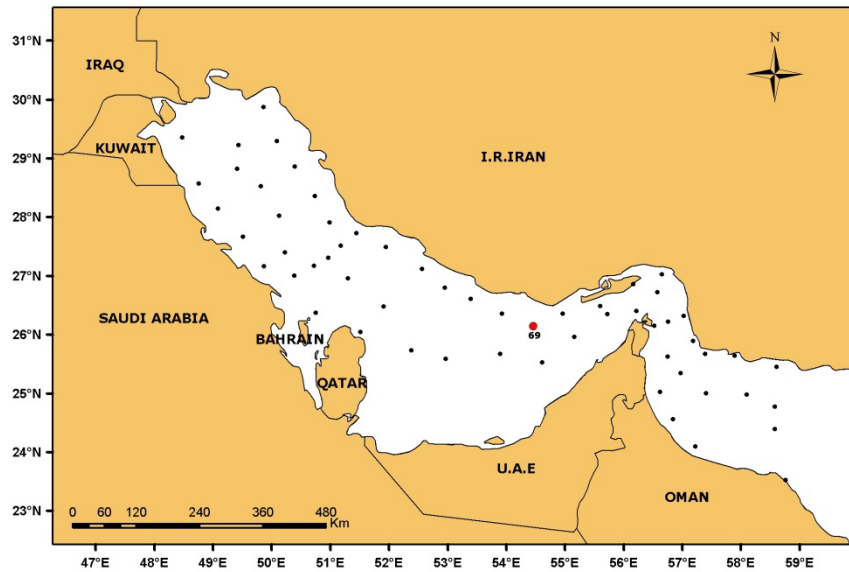
Pontella karachiensis

Distribution:

Arabian Sea (Karachi), ROPME Sea Area, Red Sea (El-Sherbiny & Ueda, 2008, establish the *karachiensis* group) (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Reported only at station 69 in the inner RSA (Refer sites map).



Site of occurrence of *Pontella karachiensis* in RSA

Family: Pontellidae Dana, 1853

Genus: *Pontellina* Dana, 1853

Scientific Name: *Pontellina plumata* Dana, 1849

Synonyms:

Pontella plumata Dana, 1849; Brady, 1883; Kim *et al.*, 1993; *Calanops messinensis* Claus, 1863; *Pontella plumata* Brady, 1883; *Pontellopsis speciosus* Brady, 1915; *Pontellopsis aequalis* Mori, 1932a; *Pontellina navalium* Oliveira, 1946; Vervoort, 1965; *Pontella plumata* Webber & Roff, 1995.

References:

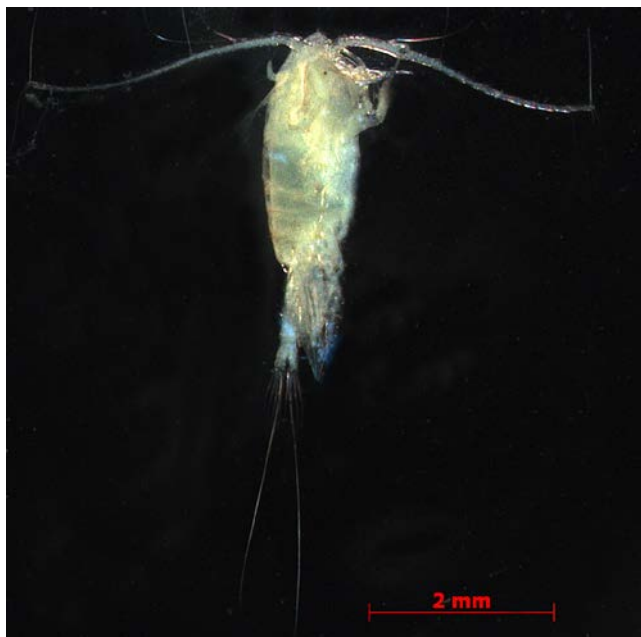
Giesbrecht, 1892; Thompson, 1888d; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Sewell, 1947; Sars, 1925; Rose, 1933a; Farran, 1936a; Wilson, 1942a; Voronina, 1962a; Gaudy, 1963; Tanaka, 1964c; Vervoort, 1965; Vidal, 1968; Corral Estrada, 1970; Marques, 1982; Lakkis, 1984; Hulsemann & Fleminger, 1990; Chihara

& Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

Description: (After Conway *et al.*, 2003).

Female: Prosome in dorsal view quite oval; posterior metasome segments almost symmetrical and conspicuously pointed in lateral view; cephalosome without lateral hooks, without cuticular lenses, with inconspicuous ventral eye without a lens. The A1, A2 and furca bear very long plumose setae. Urosome 2-segmented, right furca fused to anal segment; P5 with 1-segmented exopodite, bearing one lateral and 3 terminal seta as well as 1 medial seta; endopodite is bifurcated, or may come to a single point.

Male: Posterior metasome segments symmetrical, less pointed than in the female when viewed laterally; one pair of cuticular lenses. A1 geniculate. P5 uniramous right P5 ending in a claw, base of claw broad, with a conical tooth-like elevation on inner margin and a seta. Left leg distal segment with prominent outer marginal spine and 3 terminal subequal spines, inner margin with a tuft of hairs.



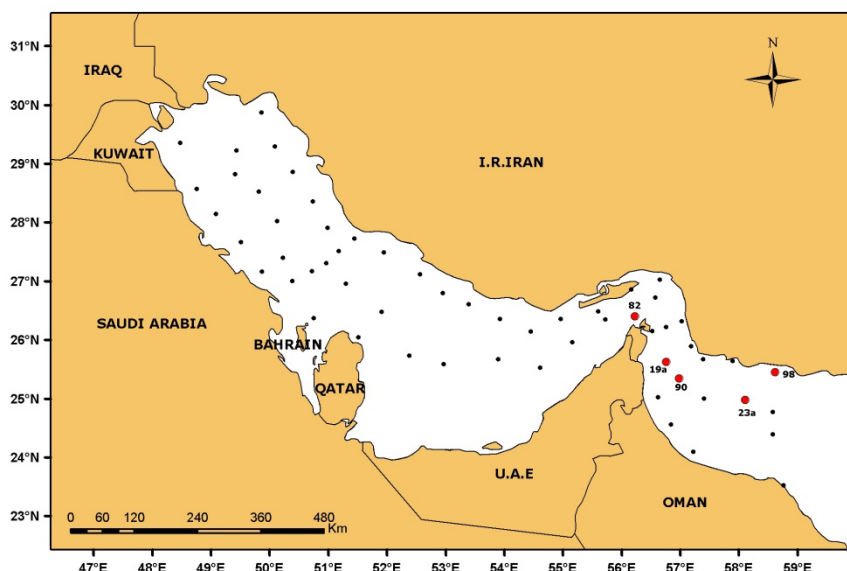
Pontellina plumata

Distribution:

Indo-Pacific, Atlantic, Mediterranean, Red Sea, Sub Arctic. South Africa, off Angola, Congo, Gulf of Guiny, Argentina, Brazil, off Amazone, Dakar, off Maroco-Mauritania, Canaries, Venezuela, Jamaica, Gulf of Mexico, Cuba, Florida, Sargasso Sea, off Bermuda, Woods Hole, Ireland, Gibraltar, Mediterranean, Red Sea, Arabian Sea, ROPME Sea Area, Maldives Islands, Ceylon, Madagascar, Seychelles, India, Australia, Indonesia-Malaysia, Philippines, Hong Kong, China Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan Sea, off New Zealand, California, central America, off Equator, Chile. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Restricted to Sea of Oman (Present study, refer sites map), North and south Hormuz Strait (Gibson *et al.*, 1980).



Sites of occurrence of *Pontellina plumata* in RSA

Family: Pontellidae Dana, 1853

Genus: *Pontellopsis* Brady, 1883

Scientific Name: *Pontellopsis krameri* Giesbrecht 1896

Synonyms:

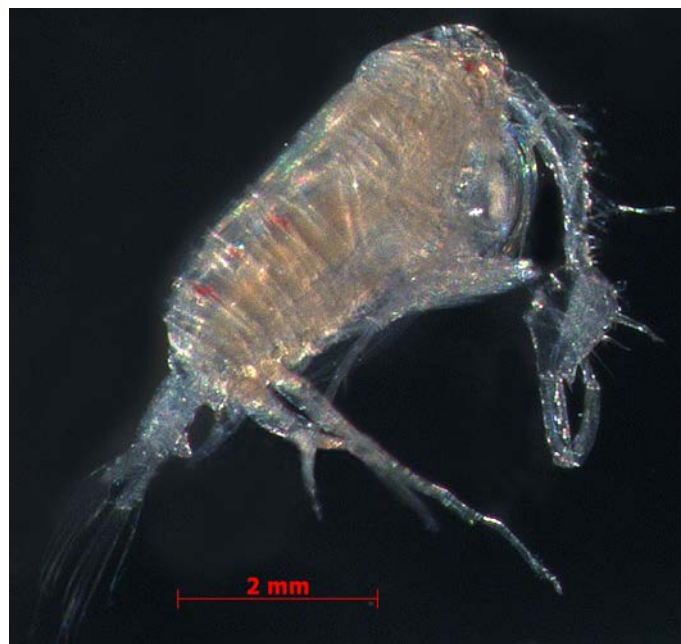
Monops krämeri Giesbrecht, 1896 (1897); *P. strenua* C.B. Wilson, 1950.

References:

Giesbrecht & Schmeil, 1898; A. Scott, 1902; Thompson & Scott, 1903; Wolfenden, 1905 (1906); A. Scott, 1909; Sewell, 1912; 1914a; 1932; Farran, 1936a; Dakin & Colefax, 1940; Ohtsuka & Onbé, 1991; Bradford-Grieve, 1999b.

Description: (Silas and Pillai, 1973).

Female Prosome narrowed anteriorly ; rostral base not well defined as in other species of the genus; rostrum narrowed terminally; T-IV and T-V fused together, T-V produced posteriorly into lobes with acuminate tips, tips of **lobes** reaching to posterior margin of genital segment; urosome **two** segmented genital segment large, produced at its left distal margin into a blunt rounded process extending by side of anal segment; proximal margin of genital segment on either side provided with a band of small setules; anal lamina **well** developed; **CR** distinctly asymmetrical, right ramus twice longer and nearly 1.5 times broader than left ramus, A-I of 16 segments; **P** 5: asymmetrical, right leg longer than left; right Re with three outer marginal spines and two terminal spines; inner terminal spine being longer; inner distal margin of Re produced into a spinous process which falls short of terminal spines; left Re with three outer marginal spines and two distal spines; inner distal margin is provided with a spinous process which far exceeds terminal spines by two-thirds its length; Ri subequally bifid at tip and is nearly half length of **Re**.



Pontellopsis krameri

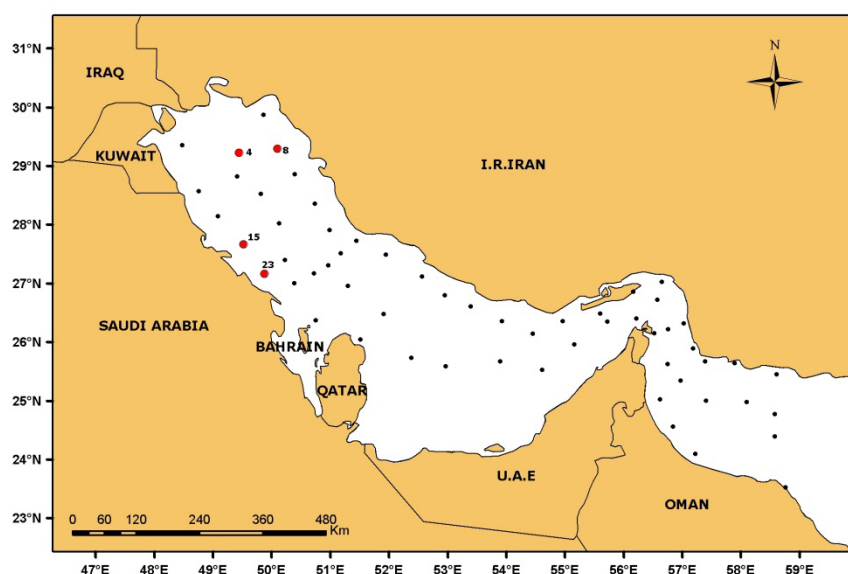
Male: Cephalon resembles that of female, rostrum base prominent; **T-V** posteriorly modified into a rounded lobe on left side and a more or less straight spine on its right side, tip of spine reaching **U-III**; **U-I** with two short spinuous setae on its right distal corner; **U-II** with a band of denticles on its right margin and **U-III** with a prominent protuberance on its right side, carrying very minute spinules at its apex; CR symmetrical. Right geniculate **A-1**, as in genus, a stout spine present on segment 13; segments **17** with a dorsal denticulated plate; segment 18 with dosely packed triangular teeth on its dorsal margin; segments 19-21 with a row of 6-8 small flagellar setae; **P 5**: Right leg chelate, thumb of chela well developed, elongated and with striations at apex; claw recurved at its tip and with two setae along its inner margin; left **P 5** with terminal segment carrying two distal spines and one outer marginal' spine; inner margin of segment provided with short hairs; subterminal segment with an outer distal spine.

Distribution:

Red Sea, Arabian Sea, ROPME Sea Area, Maldives & Laccadives, Indian Ocean, Bengal Bay, Malay Archipelago, Andaman Sea, Indonesia-Malaysia, China Sea, West Pacific (equatorial), Australia. Epipelagic, neritic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Recorded at four stations only in the northern inner RSA (Present study, refer sites map), North and south Hormuz Strait (Gibson *et al.*, 1980).



Sites of occurrence of *Pontellopsis krameri* in RSA

Family: Pseudodiaptomidae Sars, 1902

Genus: Pseudodiaptomus (Herrick, 1884)

Scientific Name: *Pseudodiaptomus arabicus* (Walter, 1998)

Synonyms:

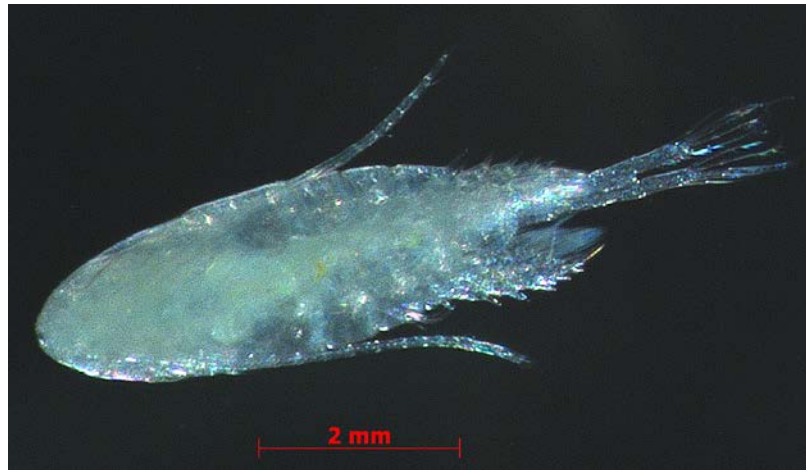
Pseudodiaptomus marinus Michel & Herring, 1984; *P. salinus* Michel & al., 1986; 1986a; Walter, 1986a.

References:

Sato, 1913; Walter, 1986; 1998; Grindley and Grice, 1969; Al-Yamani & Prusova, 2003.

Description: (After Grindley and Grice, 1969).

Head and 1st thoracic segment separate, 4th and 5th fused. Genital flaps prominent with 1 seta on each side near their distal ends. The first three urosome segments furnished with rows of coarse teeth on their posterodorsal margins. Caudal rami symmetrical, divergent and 4 times as long as wide. A1 21-segmented. A2 with basipod bearing 2 lateral and 2 terminal setae and 1 seta on a small medial protuberance; exopod 1-segmented bearing 7 terminal and 6 sub-terminal setae and a lateral fringe of fine hairs; endopod apparently 4-segmented, 3rd segment small and indistinct, bearing 1 seta on segment 1, 3 lateral and 2 distal on segment 2, 2 on segment 3 and 1 lateral and 3 terminal on segment 4. Basipod of mandibular palp with 4 inner marginal setae; exopod apparently 1-segmented bearing 4 lateral and 7 terminal setae; there are some fine hairs on the medial surface of the exopod and the middle terminal seta is markedly crooked. Mx1 with 1st inner lobe (gnathobase) bearing 10 strong spines, small 2nd inner lobe with 2 setae, 3rd inner lobe with 4 terminal setae; outer lobe (coxal epipodite) with 8 long setae; exopod with 9 marginal setae; 1 small marginal seta arises between outer lobe and exopod; 2nd basal segment with 5 setae; endopod 2-segmented with 2 setae medially on the 1st segment and 6 terminal setae on the 2nd. Mx2 with 5 large medial lobes (endites) and 2 smaller terminal lobes; the terminal lobes bear 5 setae and 1 seta, the marginal lobes 4, 3, 3, 3 and 4 setae, and there is 1 separate proximal seta.. Mxp 6-segmented, 2 basal segments large, 4 distal segments small; 1st segment bearing on its medial border, 2 plumose setae, 3 plumose setae, and 4 fine setae and 1 spine; 3rd segment bearing 2 setae proximally and 2 peculiarly divided setae distally (each bear a short spatulate branch near their middle fringed with fine bristles).



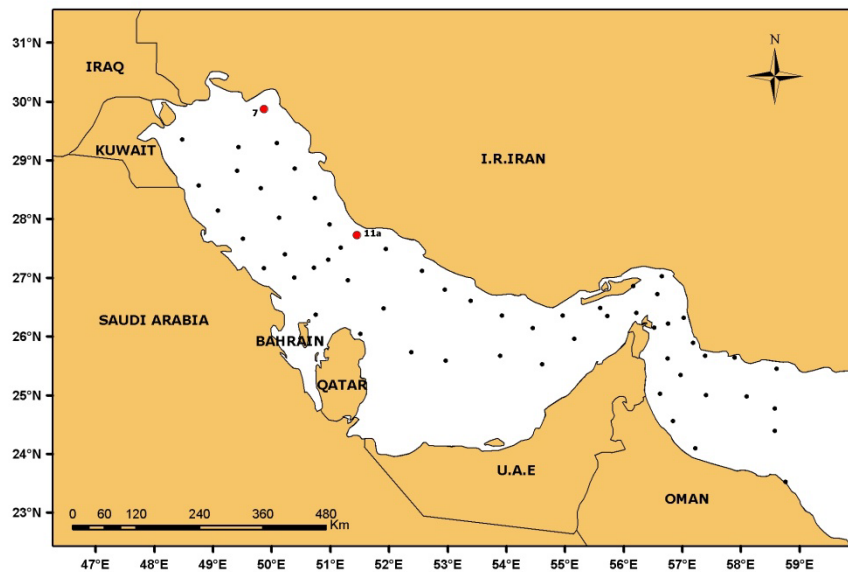
Pseudodiaptomus arabicus

Distribution:

Arabian Sea (Pakistan), ROPME Sea Area (Kuwait), Red Sea (After Razouls *et al.*, 2005-2009), China seas, Vietnam.

Sites of occurrence in RSA:

Found at two stations only in the northern inner RSA (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Pseudodiaptomus arabicus* in RSA

Family: Temoridae Giesbrecht, 1892

Genus: *Temora* Baird, 1850

Scientific Name: *Temora discaudata* Giesbrecht, 1889

Synonyms :

Temora stylifera Mori, 1937 (1964); Dakin & Colefax, 1933; 1940; Wilson, 1942a; 1950; Fagetti, 1962; Chiba, 1953 e; 1953c; Tanaka, 1963; *T. dubia* Brady, 1883.

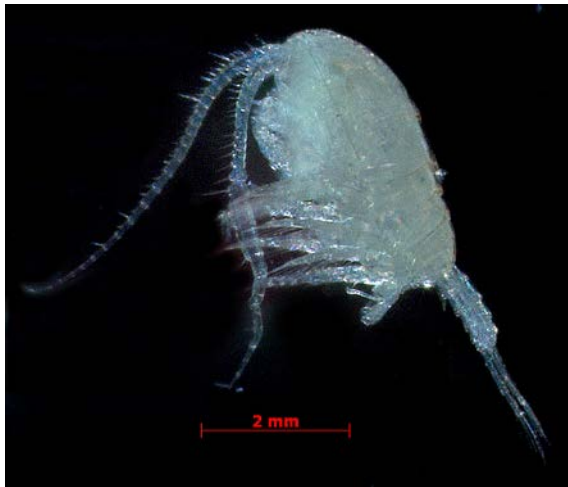
References:

Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; A. Scott, 1909; Pesta, 1912a; Sewell, 1914a; Früchtl, 1924b; Gurney, 1927; Mori, 1929; Sewell, 1947; Dakin & Colefax, 1933; Farran, 1936a; Wilson, 1942a; Pesta, 1943; C.B. Wilson, 1950; Chiba *et al.*, 1957; 1957a; Tanaka, 1963; Brodsky, 1962c; Kasturirangan, 1963; Chen & Zhang, 1965; Vervoort, 1965; Gonzalez & Bowman, 1965; Itoh, 1970; Fleminger & Hulsemann, 1973; Fleminger, 1975; Marques, 1976; Goswami & Goswami, 1978; Greenwood, 1978; Dawson & Knatz, 1980; van der Spoel & Heyman, 1983; Koga, 1984; Kimmerer *et al.*, 1985; Arcos & Fleminger, 1991; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (Giesbrecht, 1889).

Female: Quite a large robust species; posterior metasome segments produced into spines. The anal segment and long slender furca are asymmetrical. Inner spine of segment 3 longer than the 2 terminal spines, which are almost equal in length.

Male: Lateral angles of the last metasome segment pointed and slightly asymmetrical. Urosome of 5 segments, almost symmetrical, with long slender furca. The terminal segment of the right P5 is hook-like and sharply bent backwards.



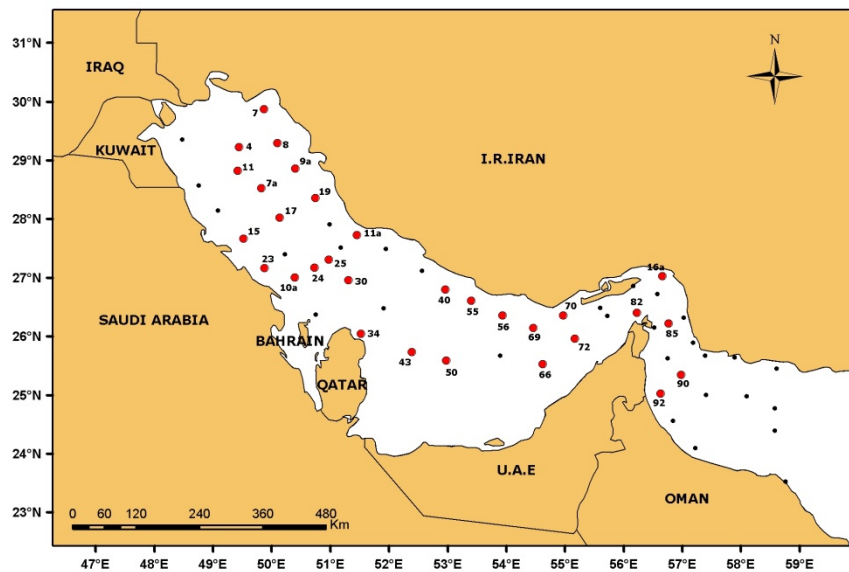
Temora discaudata

Distribution:

South Africa, Chesapeake Bay, Mediterranean, Suez Canal, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea Area, Maldives Islands, Ceylon, Madagascar, Seychelles, India, Bay of Bengal, Australia, Thailand, Indonesia-Malaysia, Vietnam, Hong Kong, China Sea, Taiwan, Jaune Sea, Korea, Japan Sea, W. Pacific (equatorial), New Zealand California, Costa Rica, Peru, off Chile. Nearshore-off shore. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widespread in the inner RSA, less frequent in the Dtraits of Hormuz and Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi, 1999) west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Temora discaudata* in RSA

Family: Temoridae Giesbrecht, 1892

Genus: *Temora*

Scientific Name: *Temora longicornis* (O. F. Müller, 1785)

Synonyms:

Cyclops longicornis Müller, 1785; *Halitemora longicornis* Giesbrecht, 1881; *T. longicornis* T. Scott, 1894b; Marukawa, 1921; C.B. Wilson, 1950; Rose, 1956.

References:

Brady, 1878; Bourne, 1889; Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Wheeler, 1901; Sars, 1902; Thompson & Scott, 1903; Farran, 1908b; Lysholm, 1913; Adler & Jespersen, 1920; Pesta, 1920; Sars, 1925; Rose, 1929; 1933a; Wilson, 1932a; Jespersen, 1940; Wiborg, 1954; Marques, 1966; Faber, 1966; Vilela, 1968; Corkett, 1968; Fleminger, 1975; Klein Breteler, 1982; Schnack, 1982; van der Spoel & Heyman, 1983; Sazhina, 1985; Gill, 1986; Pessotti *et al.*, 1986; Bannister, 1993; Karlson & Bamstedt, 1994; Boxshall & Huys, 1998;

Bradford-Grieve *et al.*, 1999; Braga *et al.*, 1999; Ferrari & Markhaseva, 2000; Boxshall & Halsey, 2004; Ferrari & Ueda, 2005; Conway, 2006; Vives & Shmeleva, 2007.

Description: (Muller, 1792).

Females: One caudal seta longer than other but not especially thickened; inner spine on terminal segment of P5 shorter than both terminal spines.

Males: P5 left terminal segment (including stout terminal spine) shorter than penultimate segment, armed with 1 stout terminal spine, 2 small inner distal spines, and 1 terminal plumose seta.



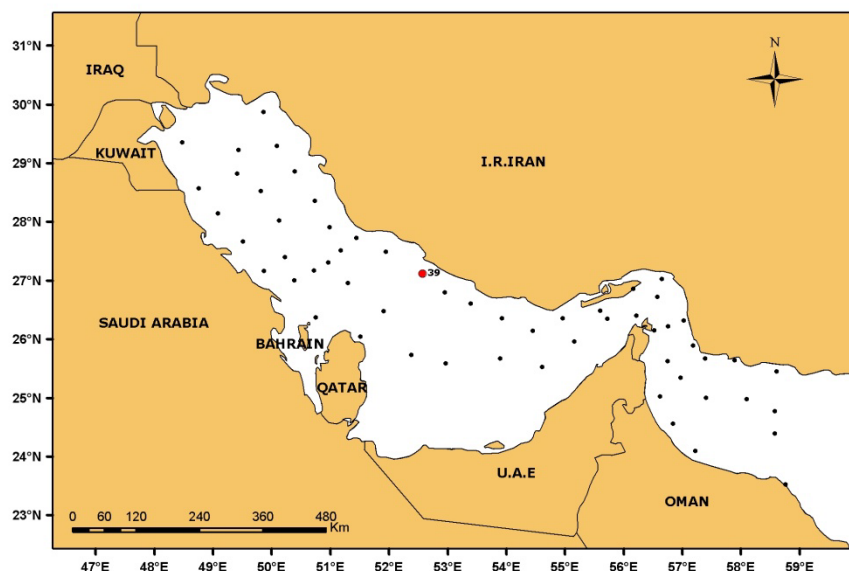
Temora longicornis

Distribution:

Angola, Congo, off Mauritania, Portugal, Gulf of Mexico, Chesapeake Bay, Narragansett Bay, Long Island Sound, Woods Hole, George's Bank, Gulf of Maine, Bay of Fundy, off Nova Scotia, Labrador, Ireland, Norway, Barent Sea, Pechora Sea, Black Sea, Manch, North Sea, Bay of Kiel, Baltic Sea, Mediterranean, Indian Ocean, Bay of Bengal, Mozambique, Mombasa, Philippines, Vietnam, China Sea, Japan. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found once on Iranian Coast of the inner RSA (Present study, refer site map), Qatari waters (Nour El-Din & Al-Khayat, 2005), Saudi waters of the RSA (Baker and Hosney, 2005).



Site of occurrence of *Temora longicornis* in RSA

Family: Temoridae Giesbrecht, 1892

Genus: *Temora*

Scientific Name: *Temora stylifera* (Dana, 1849)

Synonyms:

Temora armata Claus, 1863 (p.195); Brady, 1883 (p.80); *T. stylifera* : Chiba, 1953 c (p.695, figs.M); 1953e (p.722, figs.M); Chiba *et al.*, 1957 (p.308); 1957a (p.11); *T. stylifera* : Mori, 1937 (1964) (p.66, figs. juv.F); Tanaka, 1963 (p.14, Rem.F,M).

References:

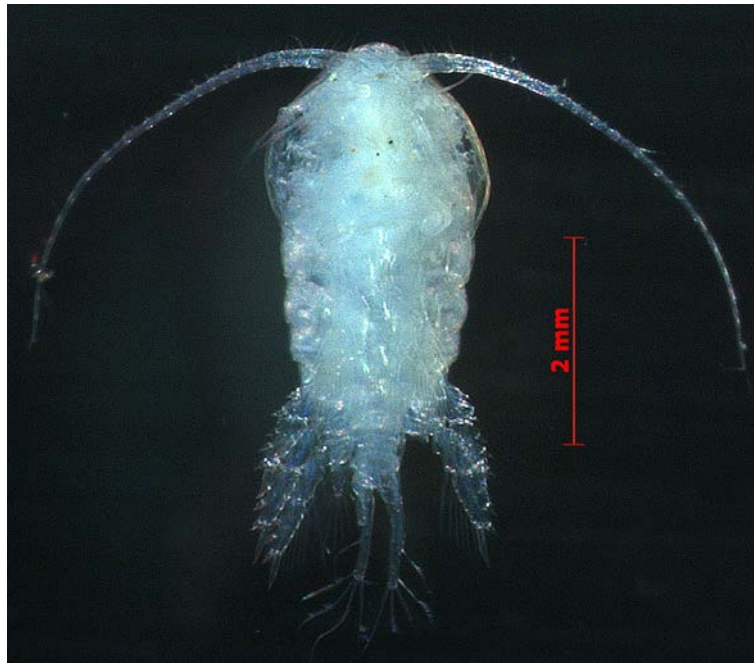
Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; Wolfenden, 1911; Pesta, 1920; Sars, 1925; Gurney, 1927; Farran, 1929; Rose, 1929; 1933a; Sewell, 1933; Wilson, 1932a; Lysholm *et al.*, 1945; Carvalho, 1952a; Marques, 1982; Gaudy, 1962; Fish, 1962; Kasturirangan, 1963; Paiva, 1963; Vervoort, 1965; Gonzalez & Bowman, 1965; Owre & Foyo, 1967; Vilela, 1968; Corral Estrada, 1970; Ramirez, 1971; Björnberg, 1972; Razouls, 1972;

Fleminger & Hulsemann, 1973; Fleminger, 1975; Greenwood, 1978; Schnack, 1982; Sazhina, 1982; Riera, 1972; Riera, 1983; Nival & Nival, 1978; Goswami & Goswami, 1978; Björnberg *et al.*, 1981; Koga, 1984; Sazhina, 1985; Razouls S. *et al.*, 1986; 1987; Arcos & Fleminger, 1991; Kim *et al.*, 1993; Bundy & Paffenhöfer, 1993; Bradford-Grieve *et al.*, 1999; Paffenhöfer & Loyd, 1999; Paffenhöfer & Loyd, 2000; Conway, 2006; Vives & Shmeleva, 2007.

Description: (Dana, 1849).

Female: CR symmetrical.

Male: P5 inner appendix on left B, narrow; bend in right terminal hook does not extend to distal border of right segment 2, bend at about proximal 1/5.



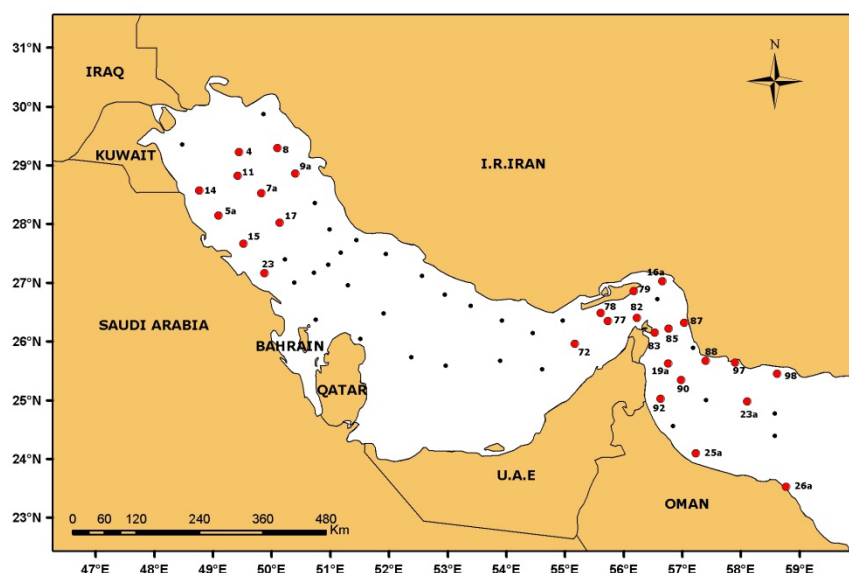
Temora stylifera

Distribution:

South Africa, Angola, Congo, Gulf of Guiny, Ivorian shelf, Argentina, Brazil, off Amazon, Dakar, Mauritania, Canaries, Portugal, Caribian Sea, Jamaïca, Gulf of Mexico, Cuba, Florida, Sargasso Sea, off Bermuda, Long Island, Bay of Fundy, Labrador, Mediterranean, Suez Canal, Red Sea, Maldives, Ceylon, Madras, Bay of Bengal, Malaysia, Philippines, Vietnam, China Sea, Taiwan, Jaune Sea, Korea, Japan Sea, Pacific (tropical, equatorial). Epipelagic. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the northern RSA, Straits of Hormuz and Sea of Oman (Present study, refer sites map), Qatari waters (Nour El-Din & Al-Khayat, 2005), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Temora stylifera* in RSA

Family: Temoridae Giesbrecht, 1892

Genus: *Temora*

Scientific Name: *Temora turbinata* (Dana, 1849)

Synonyms:

Calanus turbinatus Dana, 1849; *T. longicornis*; T. Scott, 1894b; *T. tenuicauda* Brady, 1899; *T. africana* Brady, 1914.

References:

Giesbrecht, 1892; Giesbrecht & Schmeil, 1898; Thompson & Scott, 1903; A. Scott, 1909; Pesta, 1913; Bigelow, 1926; Farran, 1929; Wilson, 1932a; Dakin & Colefax, 1933; Dakin & Colefax, 1940; Sewell, 1947; Tanaka, 1960; 1963; Kasturirangan, 1963; Chen & Zhang, 1965; Gonzalez & Bowman, 1965; Vervoort, 1965; Marques, 1973; Fleminger, 1975; Bradford, 1977; Li & Fang, 1983; Kimmerer *et al.*, 1985; Kim *et al.*, 1993; Chihara &

Murano, 1997; Bradford-Grieve *et al.*, 1999; Bradford-Grieve, 1999b; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Vives & Shmeleva, 2007.

Description: (Dana, 1849).

Female: One terminal caudal seta conspicuously thickened; inner spine on terminal segment of P5 considerably shorter and thinner than both terminal spines. Terminal seta 2 of the caudal rami is thick and asymmetrical. Swimming legs compact. 5th leg with the inner spine on the terminal segment considerably shorter and thinner than the 2 terminal spines.

Male: P5 left terminal segment (including stout terminal spine) longer than penultimate segment; armed with 2 stout terminal spines and 2 subterminal spines. Urosome segment 4 is longer than the anal segment. 5th leg 5 terminal segment relatively long and rather broad.



Temora turbinata

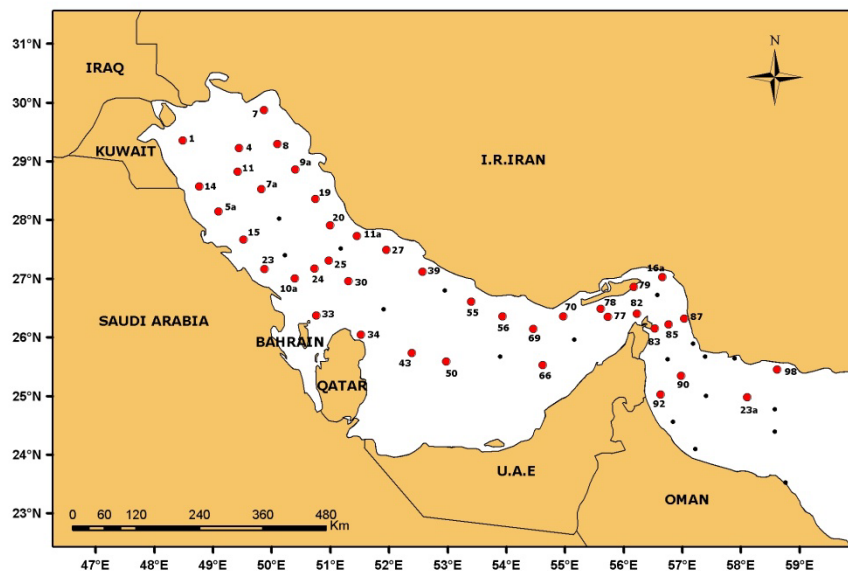
Distribution:

Recorded from tropical, subtropical and temperate coastal waters of the Indian Ocean, Pacific and Atlantic Oceans. South-eastern Tasmania, New Zealand, sub-Antarct. (SW Pacific), South Africa, Namibia, Congo, Gulf of Guinea, Dakar, Mauritania, Canaries, Brazil, Venezuela, Porto Rico, Jamaica, Gulf of Mexico, Cuba, Florida, off Bermuda, Chesapeake

Bay, Long Island, Woods Hole, Gulf of Main, Red Sea, ROPME Sea Area, Arabian Sea, Ceylon, Madagascar, India, Bay of Bengal, Indonesia-Malaysia, Vietnam, Gulf of Tonkin, Hong Kong, Chinese seas, Taiwan, Jaune Sea, Korea, Japan Sea, Australia, New Zealand, Gulf of California. Epipelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed throughout the inner RSA and strait of Hormuz, and less spread in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Qatari waters (Nour El-Din & Ghobashi, 1999), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Temora turbinata* in RSA

Class: Crustacea

Sub-class: Copepoda

3.6.5 Order: Cyclopoida

Cyclopoids belong to an order of small copepod Crustacea. They are abundant in fresh-water as well as in sea water. The cephalothorax of the cyclopoid body is oval and sharply separated

from the tubular hind end. The abdomen end bears two caudal rami with distinctly unequal setae. Usually 10 body segments are present in the male, and 9 in the female because of fusion of two to form a genital segment.

In Head, rostrum present or absent; eyes absent. Antennules (antenna 1) uniramous; geniculate in males; peduncle and flagellum indistinguishable; exopod well developed, whip-like, with 9-23 articles. *Antennae (antenna 2) uniramous*; exopod vestigial or absent; endopod with 3 articles. Mandible biramous, or uniramous; palp present, or absent. Maxillipeds, 2 pairs, or 1 pair; uniramous. In thorax, *Carapace absent*. boundary between last thoracic somite and first abdominal somite or boundary between fourth and fifth pedigerous somites. *Peraeopods 5 pairs*; biramous, or uniramous (fifth leg uniramous); anterior peraeopods with 1 robust seta on outer margin of exopod article 1. Abdomen with 5 somites (or fewer). Pleopods absent. Uropods well developed or vestigial or absent, 1 pair, positioned terminally or subterminally; rami absent; subrectangular to subquadrate. Telson absent.

Family: Corycaeidae Duna, 1852

Genus: *Corycaeus* Dana, 1845

Scientific Name: *Corycaeus dahli* Tanaka, 1957

Synonyms:

Corycaeus tenuis Farran, 1911a; *C. lubbocki* Farran, 1936a; *C. (Ditrichocorycaeus) lubbocki* M. Dahl, 1912; Dakin & Colefax, 1940; *C. (Ditrichocorycaeus) africanus* Sewell, 1947; *Ditrichocorycaeus dahli*: McKinnon *et al.*, 2008.

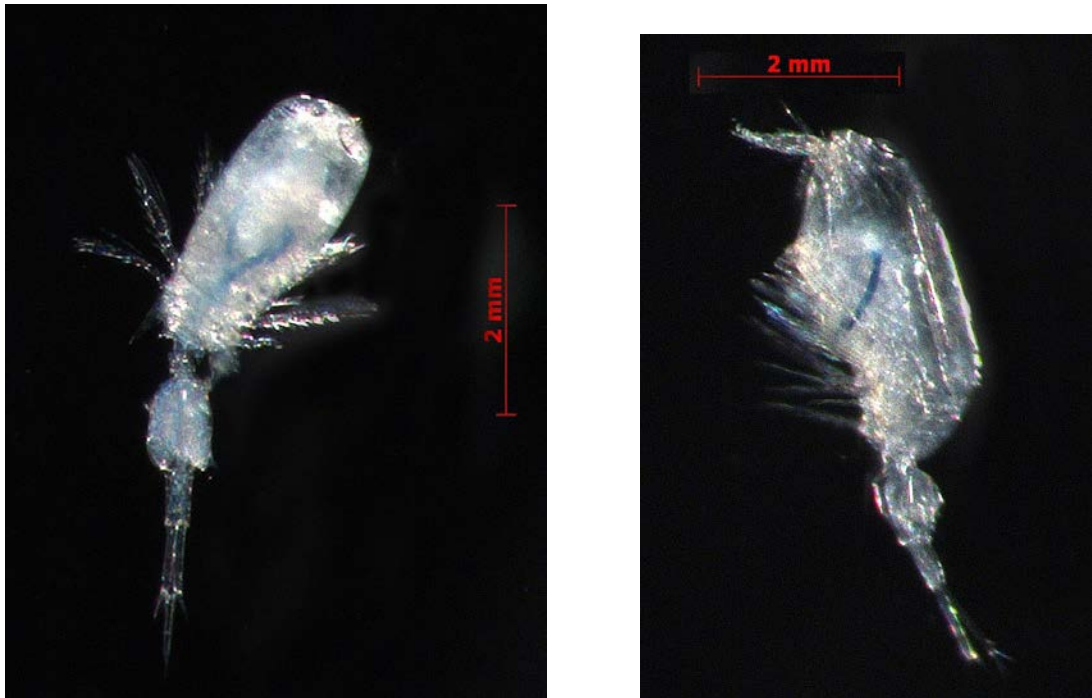
References:

Tanaka, 1960; Chen *et al.*, 1974; Bradford, 1978; Chihara & Murano, 1997; Al-Yamani & Prusova, 2003; Boxshall & Halsey, 2004.

Description: (After Tanaka, 1957).

Female: Apical spine of exopod of P2 viewed in two different aspects. Anterior segment 1.83 times as long as wide. The abdominal segments and furca in the proportional lengths 35:23:42; Posterior corners of 3rd thoracic segment extend beyond the middle of genital segment. Genital segment about 1.3 times as long as wide, dorsal surface

vaulted, with a folding on the distal 2/3 of the dorsal surface, the ventral surface rather flat. Anal segment 2.6 times as long as it is wide at the distal. Furca divergent, about 16 times as long as it is wide at the distal.



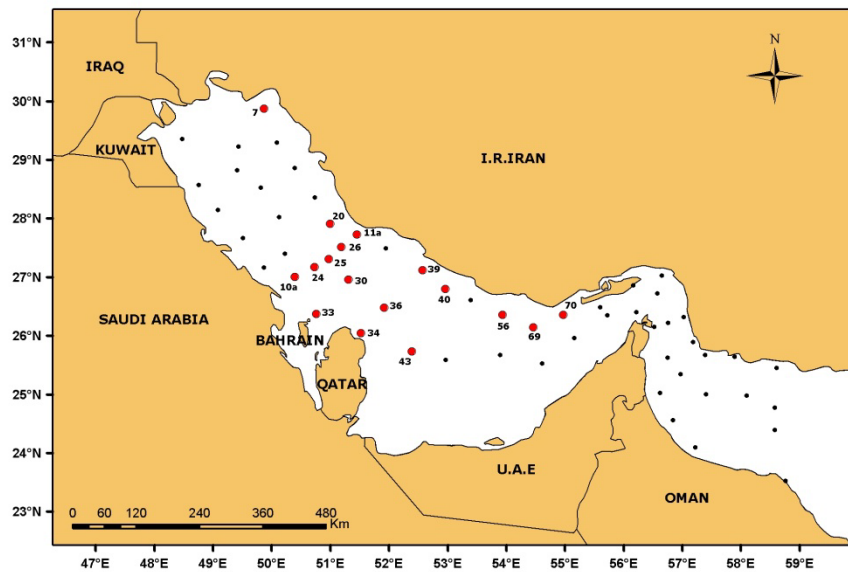
Corycaeus dahli

Distribution:

South Africa, ROPME Sea Area, India, Hong Kong, Chinese Seas, Taiwan, Jaune sae, Korea, Japan, Australia. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Common in the central part of the inner RSA, missed from other parts of the RSA (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Corycaeus dahli* in RSA

Family: Corycaeidae Duna, 1852

Genus: *Corycaeus*

Scientific Name: *Corycaeus (Ditrichocorycaeus) andrewsi* Farran, 1911

Synonyms:

Corycaeus trukicus Mori, 1937; Chiba *et al.*, 1955; Delalo, 1968; Suvapapun & Suwanrumpha, 1970; Palomares-Garcia & Vera, 1995; Suarez-Morales & Gasca, 1998; *Ditrichocorycaeus andrewsi*: Binet, 1985; McKinnon *et al.*, 2008.

References:

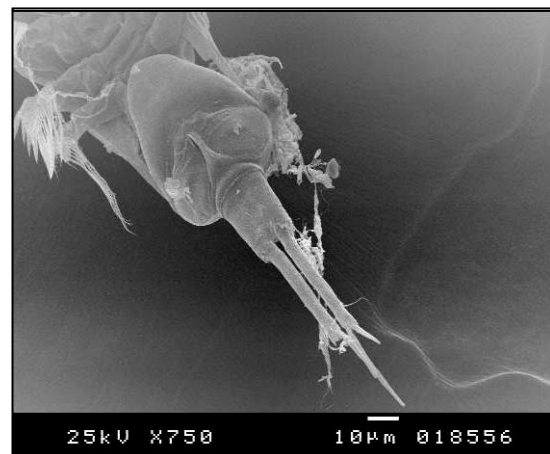
Farran, 1911a; Dahl, 1912; Früchtel, 1924b; Dakin & Colefax, 1933; Farran, 1936a; Wilson, 1942a; Tanaka, 1960; Chen *et al.*, 1974; Kang *et al.*, 1990; Chihara & Murano, 1997; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (After Conway *et al.*, 2003).

Female: Prosome 4-segmented, and twice as long as the Urosome. The outer lateral points at the end of the prosome are short (not reaching the genital openings) and are notched on the inner margin. The inner lateral points are short and pointed at the tip. Urosome 2-segmented. The genital segment has a characteristic shape in lateral view. The antero-ventral angle is

almost a right angle, and at the apex there is a small patch of spinules, there is no ventral hook. The genital segment is about 1.5 times longer than the anal segment. Furca about 5 times longer than wide and less than 1/3 the length of the rest of the Urosome. The spine at the distal end of the 1st segment of A2 is about 1.3 times longer than the length of the spine at the proximal end of the 2nd segment.

Male: Prosome 4-segmented, and is about 1.5 times longer than the Urosome. Segment immediately following the cephalosome has a slight swelling at the central lateral margins. The outer lateral points at the end of the prosome extend 1/3 the way down the genital segment. Urosome is 2-segmented. Genital segment broadly oval with a small ventral hook. Anal segment about 1.5 times longer than wide.



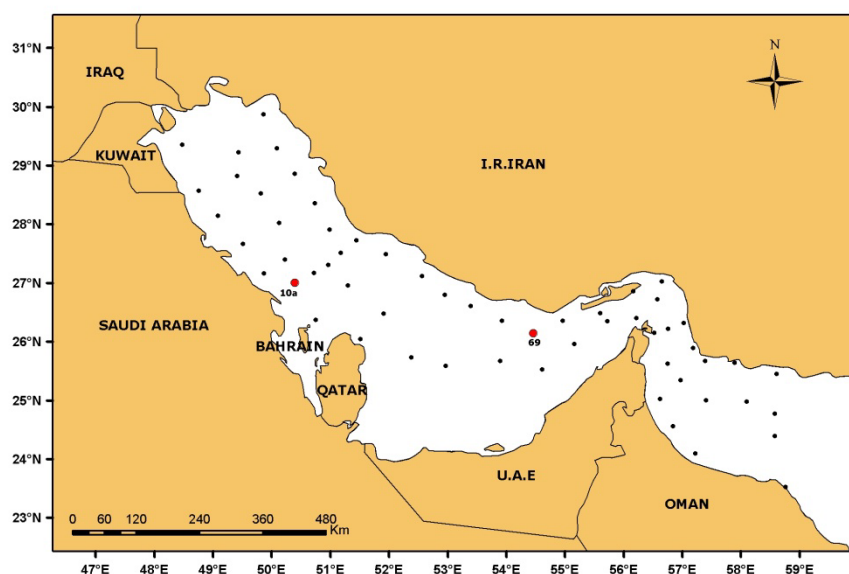
Corycaeus (Ditrichocorycaeus) andrewsi

Distribution:

Mediterranean, Red Sea, ROPME Sea Area, Madagascar, Seychelles, India, Indonesia-Malaysia, Thailand, Chinese Seas, Taiwan, Jaune Sea, Korea, Japan, Gulf of California, Australia. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found only at stations 10a and 69 in the inner RSA (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Corycaeus (Ditrichocorycaeus) andrewsi* in RSA

Family: Corycaeidae Duna, 1852

Genus: *Corycaeus*

Scientific Name: *Corycaeus (corycaeus) speciosus* Dana, 1849

Synonyms:

Corycaeus longicaudis Dana, 1849; Tanaka, 1960; Chen *et al.*, 1974; *Corycaeus speciosus* Giesbrecht, 1892; *Corycaeus longicaudis* Giesbrecht, 1891; 1892; *Corycella speciosus* Moore, 1949; *Corycaeus speciosus* Corral Estrada & Pereiro Muñoz, 1974; Böttger-Schnack, 1995; McKinnon *et al.*, 2008; *Corycaeus (Corycella) longicaudis* Zuo *et al.*, 2006.

References:

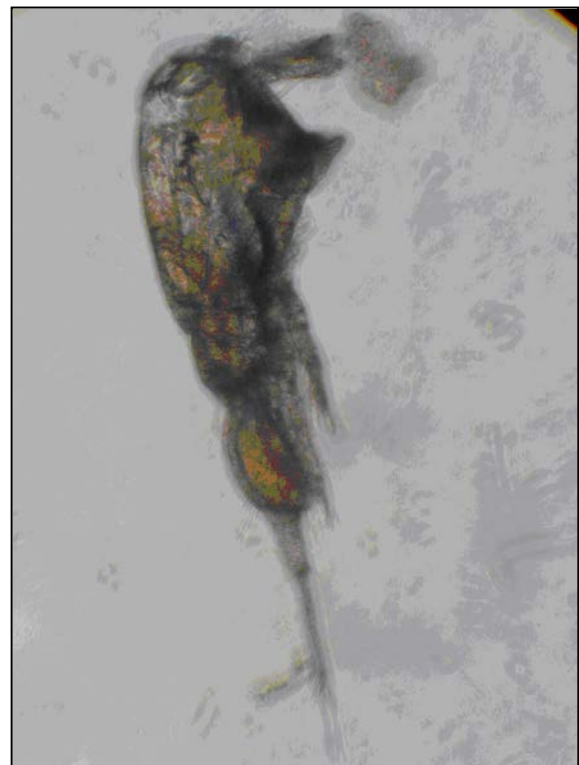
Brady, 1883; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Farran, 1929; Früchtl, 1924b; Rose, 1929; Wilson, 1932a; Dakin & Colefax, 1933; Dakin & Colefax, 1940; Wilson, 1942a; Lysholm *et al.*, 1945; Oliveira, 1946; Sewell, 1947; Krishnaswamy, 1953; Chiba *et al.*, 1957a; Tanaka, 1960 Marques, 1958a; Motoda, 1963; Cervigon, 1964; Owre & Foyo, 1967; Corral Estrada, 1970; Ramirez, 1971; Björnberg, 1972; Chen *et al.*, 1974; Björnberg *et al.*, 1981; Sazhina, 1985; Kang *et al.*, 1990; Kim *et al.*, 1993; Chihara &

Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003 ; Boxshall & Halsey, 2004.

Description: (After Conway *et al.*, 2003).

Female: The female is easily recognized by its large size and the moderately long and divergent furca. The prosome is 3-segmented. The outer lateral points at the end of the prosome extend beyond the end of the genital segment. The Urosome is 2-segmented. The furca are divergent and as long as the rest of the Urosome. The spine at the distal end of the 1st segment of A2 is more than twice the length of the spine at the proximal end of the 2nd segment

Male: prosome narrower than the female and 3-segmented. The outer lateral points at the end of the prosome reach the centre of the genital segment. Urosome 2-segmented. Genital segment with a seta on each postero-lateral margin. Anal segment more than twice as long as wide. Furca as long as the urosome, slender, and about 12 times longer than wide.



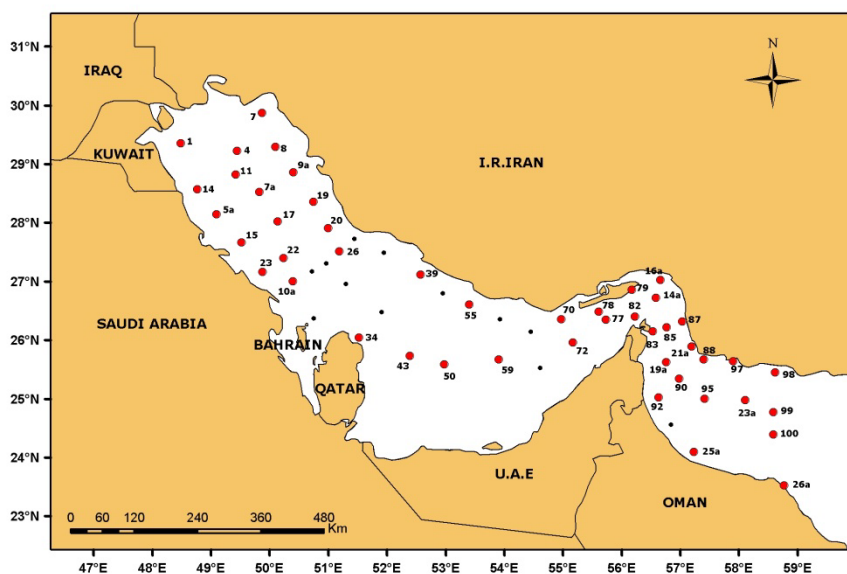
Corycaeus (corycaeus) speciosus

Distribution:

Antarctic, South Africa, Angola, Congo, Gulf of Guinea, off Mauritania, Canaries, Argentina, Brazil, Jamaica, Gulf of Mexico, Cuba, Florida, Chesapeake Bay, Sargasso Sea, off Bermuda, New York, Long Island, off Woods Hole, Ireland, Mediterranean, Suez Canal Red Sea, Gulf of Aden, Arabian Sea, Maldives Islands, Madagascar, Seychelles, Ceylon, India, Bay of Bengal, Indonesia-Malaysia, Philippines, Vietnam, Chinese Seas, Taiwan, Okinawa, Japan Sea, Korea, Japan Sea, Bering Sea, W. Pacific (equatorial), Australia, off New Zealand, off Hawaii, off Washington, California, Gulf of California, Panama, Ecuador, Chile. Epi-mesopelagic, sometimes bathypelagic. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widespread in the whole ROPME Sea Area. (Present study, refer sites map), Qatari waters (Nour El-Din & Ghobashi, 1999).



Sites of occurrence of *Corycaeus (corycaeus) speciosus* in RSA

Family: Corycaeidae Duna, 1852

Genus: Farranula Farran, 1911

Scientific Name: *Farranula rostrata* Claus, 1863

Synonyms:

Corycaeus rostratus Claus, 1863; Giesbrecht, 1892; Thompson, 1900c; Thompson & Scott, 1903; Rose, 1925; Tanaka, 1965a; *C. pellucidus* Brady, 1883; Brian, 1914a; Sewell, 1948; *Corycella rostrata* Farran, 1929; Rose, 1933a; Klevenhusen, 1933a; Moore, 1949; *Corycaeus* (*Corycella*) *rostratus* M. Dahl, 1912; Pesta, 1920; Dakin & Colefax, 1933; Sewell, 1948; *Corycaeus* (*Farranula*) *rostrata* Böttger-Schnack, 1988; 1989; *Corycaeus rostrata* Scotto di Carlo *et al.*, 1984.

References:

Wilson, 1942a; Sewell, 1948; C.B. Wilson, 1950; Fagetti, 1962; Duran, 1963; Deevey, 1971; Corral Estrada & Pereiro Muñoz, 1974; Vives *et al.*, 1975; Deevey & Brooks, 1977; Dessier, 1979; Lozano Soldevilla *et al.*, 1988; Böttger-Schnack, 1996; Hure & Krsinic, 1998; Lapernat, 1999; Seridji & Hafferssas, 2000; Moraitou-Apostolopoulou *et al.*, 2000; Lapernat & Razouls, 2001; Rezai *et al.*, 2004; Lakkis *et al.*, 2005; Isari *et al.*, 2006; Zervoudaki *et al.*, 2006; Fernandez de Puellas *et al.*, 2007.

Description: (Claus, 1863).

Female: Ur 4 times as long as CR which are nearly 2 times as long as wide in dorsal view.
Male Ur more than 3 times as long as CR which are at most only 2 times as long as wide in dorsal view.



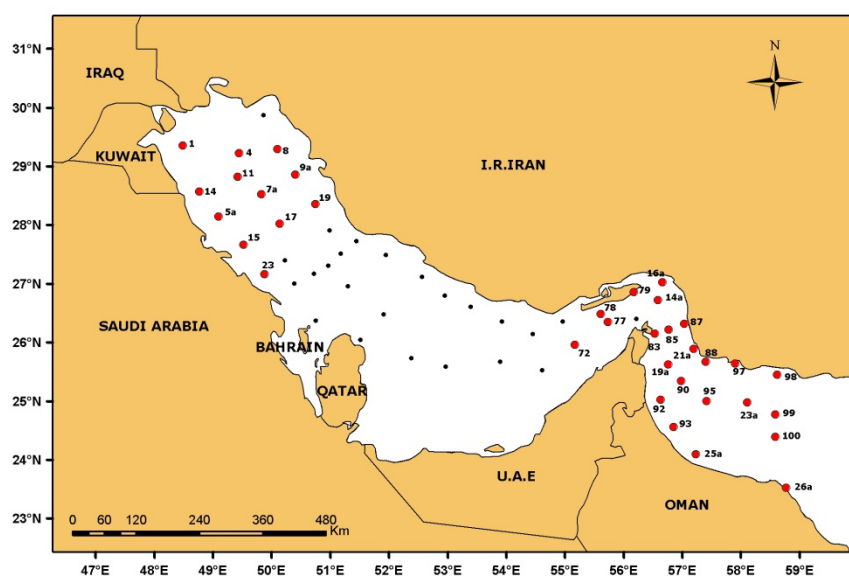
Farranula rostrata

Distribution:

Off South Africa, Namibia, Angola, Congo, Ivorian shelf, Canaries, off Maroco-Mauritania, Brazil, Venezuela, Cuba, Gulf of Mexico, Florida, Sargasso Sea, off Bermuda, Chesapeake Bay, Portugal, Mediterranean, Red Sea, Arabian Sea, off Madagascar, India, Philippines, Chinese Seas, Taiwan, Korea, Japan Sea, Bering Sea, W. Pacific (equatorial), Australia New Zealand, Gulf of California, off Washington, off Hawaii, Chile. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely spread in the northern and southern inner RSA, near Straits of Hormuz and Sea of Oman (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Farranula rostrata* in RSA

Family: Oithonidae Dana, 1853

Genus: *Oithona* Baird, 1843

Scientific Name: *Oithona attenuata* Farran, 1913

Synonyms:

Oithona attenuata var. *latithoracica* Früchtl, 1923; 1924b; *Oithona ovata* Lindberg, 1950; Lindberg, 1955a; Shuvalov, 1980.

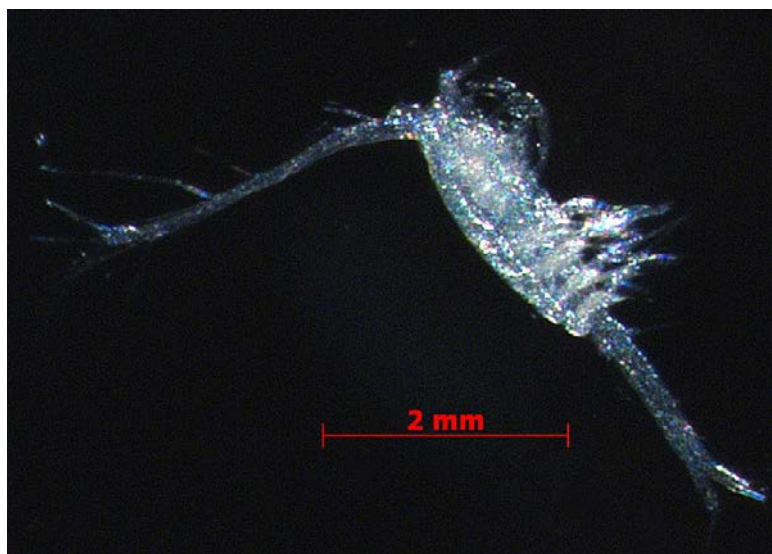
References:

Farran, 1913a; Rosendorn, 1917a; Früchtl, 1924b; Kiefer, 1929g; Farran, 1936a; Sewell, 1947; Tanaka, 1960; Wellershaus, 1970; Chen *et al.*, 1974; Nishida *et al.*, 1977; Shuvalov, 1980; Nishida, 1985a; Böttger-Schnack, 1988; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; McKinnon, 2000; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Prosome ovoid. Cephalosome truncate anteriorly. Rostrum blunt and not visible dorsally. Urosome longer than prosome. Genital segment three times longer than wide, with a prominent lateral processes approximately 1/3 down the genital segment. Anal segment 1.5 times longer than wide. Furca slender and long, four times longer than wide. AI reaches the end of the prosome.

Male: Cephalosome truncate anteriorly. Prosome just shorter than urosome. Furca longer than anal segment.



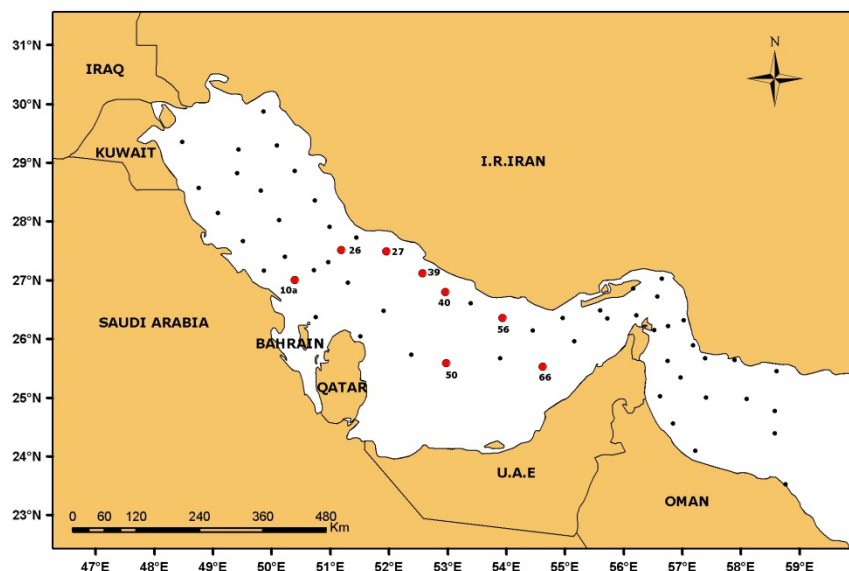
Oithona attenuata

Distribution:

South Africa, Atlantic, Mediterranean, Red Sea, Arabian Sea, ROPME Sea Area, Maldives, Madagascar, Seychelles, India, Indonesia-Malaysia, Chinese Seas, Taiwan, Jaune Sea, Korea, Japan, West and central tropical Pacific, Australia, off Chile. Epipelagic. (Razouls *et al.*, 2005- 2009).

Sites of occurrence in RSA:

Reported at 8 stations scattered over the whole (Present study, refer sites map), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Oithona attenuata* in RSA

Family: Oithonidae Dana, 1853

Genus: *Oithona*

Scientific Name: *Oithona nana* (Giesbrecht, 1892)

Synonyms:

Oithona helgolandica Claus, 1863; *Oithonina nana* Sars, 1913; Wilson, 1932a; Fagetti, 1962; Haq, 1965a; Shih *et al.*, 1971; *Oithona plumosa* Lindberg, 1947; 1950e; Wellershaus, 1970; Shuvalov, 1980; *O. plumosa pseudoplumosa* Lindberg, 1950 e.

References:

Giesbrecht, 1892; Karavaev, 1894; Thompson & Scott, 1903; Esterly, 1905; Burckhardt, 1913; Rosendorn, 1917a; Pesta, 1920; Murphy, 1923; Sewell, 1947; Früchtel, 1924b; Gurney, 1927; Dakin & Colefax, 1933; Rose, 1933a; Marques, 1951a; Carvalho, 1952a; Tanaka, 1960; Vilela, 1965; Gonzalez & Bowman, 1965; Vilela, 1968; Corral Estrada, 1970; Björnberg, 1972; Chen *et al.*, 1974; Nishida *et al.*, 1977; Dawson & Knatz, 1980; Nishida,

1985a; Björnberg *et al.*, 1981; Dussart & Defaye, 1985; Sazhina, 1985; Huys & Boxshall, 1991; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; McKinnon, 2000; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Conway, 2006.

Description: (Conway *et al.*, 2003).

Female: Cephalosome truncate anteriorly. Rostrum blunt and not visible dorsally, Prosome short and stout, approximately the same length as the urosome. Genital segment approximately twice as long as wide and very rounded in the anterior quarter. Anal segment as long as wide. Furca twice as long as wide. Al as long as the prosome.

Male: Prosome shorter and stouter than female. Genital segment longer than wide. Al geniculate. Anal segment as long as wide. Furca twice as long as wide.



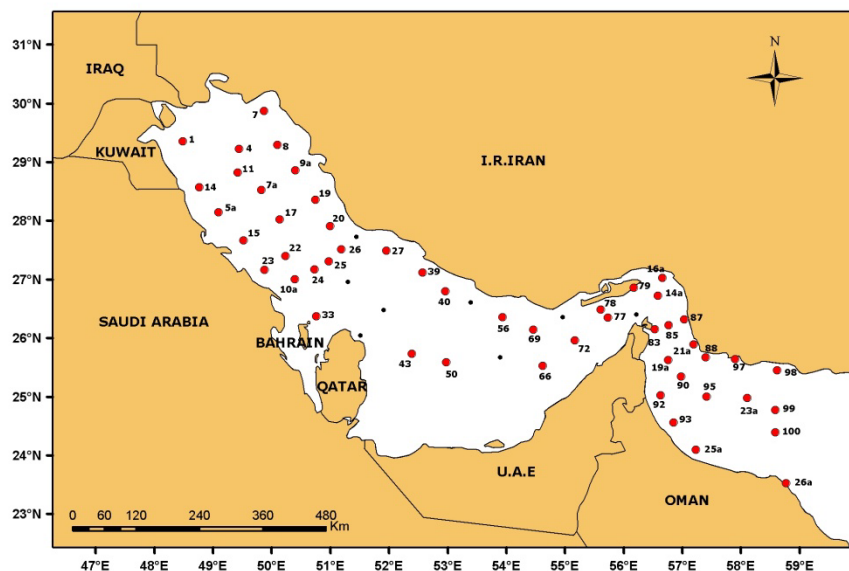
Oithona nana

Distribution:

South Africa, Namibia, Angola, Gulf of Guiny, off Mauritania, Canaries, Portugal, Buenos Aires, Brazil, Gulf of Mexico, Porto Rico, Jamaica, Cuba, Florida, Bermuda, Woods Hole, off Nova Scotia, Island, Ireland, Manch, North Sea, Mediterranean, Suez Canal, Red Sea, Arabian Sea, ROPME Sea Area, Ceylon, Madagascar, Indian Ocean, India, Indonesia-Malaysia, Vietnam, Chinese Seas, Taiwan, Jaune Sea, Korea, Japan Sea, tropical Pacific, Hawaii, California, Gulf of California, New Zealand, off Chile. Euryhaline, epipelagic, neritic, estuaries, coastal Harbours. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found throughout the whole ROPME Sea Area (Present study, refer sites map), western RSA (Michle *et al.*, 1986a), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi, 1999; Nour El-Din & Al-Khayat, 2005), West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Oithona nana* in RSA

Family: Oithonidae Dana, 1853

Genus: *Oithona*

Scientific Name: *Oithona plumifera* (Baird, 1843)

Synonyms:

Oithona plumifera var. *atlantica* Früchtl, 1923a; *O. plumifera* Mori, 1937 (1964).

References:

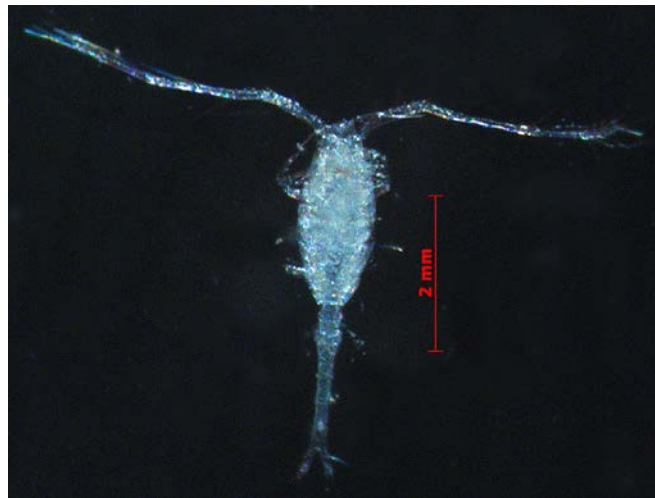
Giesbrecht, 1892; Wheeler, 1901; Thompson & Scott, 1903; Esterly, 1905; Farran, 1908b; A. Scott, 1909; Wolfenden, 1911; Pesta, 1912a; Burckhardt, 1913; Lysholm, 1913; Rosendorn, 1917a; Früchtl, 1924b; Gurney, 1927; Rose, 1933a; Dakin & Colefax, 1940; Lysholm *et al.*, 1945; Sewell, 1947; Davis, 1951; Krishnaswamy, 1953; Lindberg, 1955a; Chiba *et al.*, 1957a; Tanaka, 1960; Fish, 1962; Vilela, 1965; Owre & Foyo, 1967; Vilela, 1968; Ramirez, 1969; Corral Estrada, 1970; Minoda, 1971; Razouls, 1972; Marques, 1975; Nishida *et al.*, 1977;

Séret, 1979; Shuvalov, 1980; Björnberg *et al.*, 1981; Nishida, 1985a; Nishida, 1986; Lin & Nakamura, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003.

Description: (Conway *et al.*, 2003).

Female: Anterior section of cephalosome narrowed into the pointed rostrum. Rostrum visible in dorsal view. Genital segment twice as long as wide. Genital segment swollen laterally on the anterior third, with a characteristic tuft of hairs on the ventral side. Furca shorter than anal segment and three times longer than wide. Al long, reaching the anal segment. Segments of Al fringed with small spinules. Plumose setae arise from swimming legs of some specimens, not always present.

Male: Anterior of cephalosome very different to female, it is not pointed and the rostrum is blunt. Al is twice geniculate, with a sheath just beyond the proximal elbow and a semicircular process on the 1st segment beyond the distal elbow. Genital segment large, about as wide as it is long. The anal segment is similar in length to the two preceding segments.



Oithona plumifera

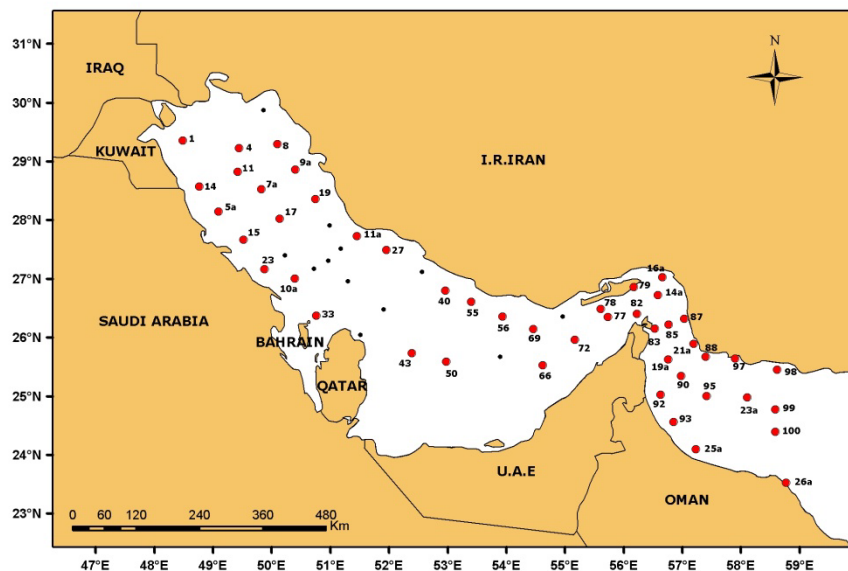
Distribution:

Antarctic (SW Atlantic, SE Indian), sub-Antarctic (Indian, SW Pacific), South Africa, Angola, Congo, Gulf of Guiny, Brazil, Argentina, Dakar, off Mauritania, Marocco-Mauritania, Canaries, Portugal, off Amazon, Venezuela, Jamaica, Caribbean Sea, Gulf of Mexico, Florida, Sargasso Sea, off Bermuda, Chesapeake Bay, Gulf of Main, Bay of Fundy, Ireland, North Sea, Gibraltar, Mediterranean, Suez Canal, Red Sea, Gulf of Aden, Arabian

Sea, ROPME Sea Area, off Madagascar, Seychelles, Indian Ocean, India, Thailand, Sulu Sea, Chinese Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan Sea, Bering Sea, W. Pacific (equatorial), W & E Australia, New Zealand, tropical Pacific, California, Gulf of California, Chile. Marine, sometimes brackish. Epi-mesopelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in both the inner RSA and Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi, 1999; Nour El-Din & Al-Khayat, 2005), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Oithona plumifera* in RSA

Family: Oithonidae Dana, 1853

Genus: *Oithona*

Scientific Name: *Oithona setigera* (Dana, 1849)

Synonyms:

Scribella setiger Dana, 1849; *Oithona setiger* Dana, 1852; Wilson, 1942a; *O. spinirostris* Claus, 1863; Wilson, 1932a; *O. challengerii* Brady, 1883; T. Scott, 1894b; Krishnaswamy, 1953; *O. tropica* Wolfenden, 1905 (1906); *O. pelagica* Farran, 1908a.

References:

Giesbrecht, 1892; T. Scott, 1894b; Thompson & Scott, 1903; Farran, 1913a; Rosendorn, 1917; Pesta, 1920; Kiefer, 1929g; Dakin & Colefax, 1933; Rose, 1933a; Sewell, 1947; Moore, 1949; Carvalho, 1952a; Chiba *et al.*, 1957a; Marques, 1958a; Crisafi, 1959b; Owre & Foyo, 1967; Corral Estrada, 1970; Razouls, 1972; Chen *et al.*, 1974; Nishida *et al.*, 1977; Shuvalov, 1980; Björnberg *et al.*, 1981; Marques, 1982; Sazhina, 1985; Nishida, 1985a; 1986; Huys & Boxshall, 1991; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003.

Description: (After Conway *et al.*, 2003).

Female: Allied to *O. phumifera*, but the body is larger and A2 is shorter. Cephalosome narrows anteriorly to sharp pointed rostrum that is visible dorsally. Anterior third of genital segment swollen laterally. Genital segment twice as long as wide. Anal segment approximately twice as long as wide. Posterior margin of anal segment lined with spinules, Anterior ventral section of anal segment with long setae. Furca approximately three times longer than wide. A1 longer than prosome.

Male: Rostrum not pointed. Prosome longer than urosome. Furca just longer than anal segment.



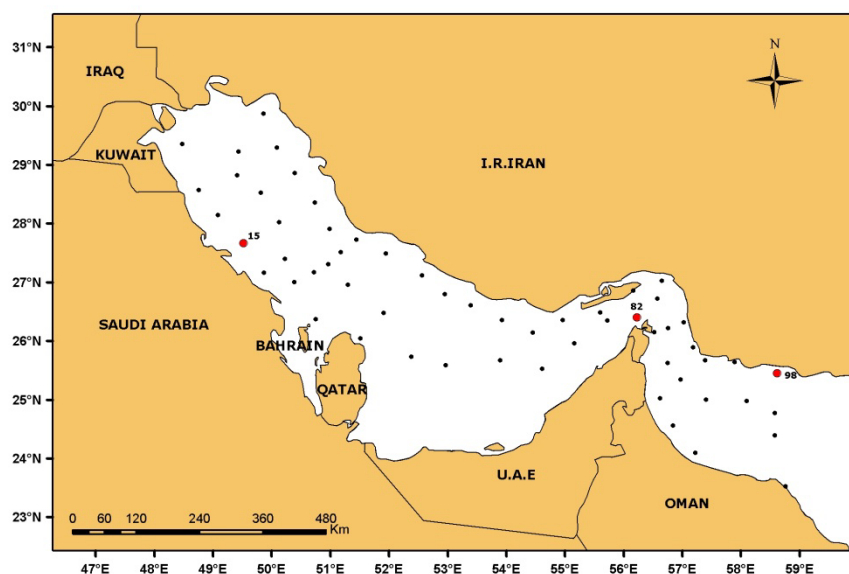
Oithona setigera

Distribution:

South Africa, Angola, Congo, Gulf of Guinea, Canaries, off Morocco-Mauritania, Brazil, off Amazon, Venezuela, Jamaica, Gulf of Mexico, Cuba, Sargasso Sea, off Bermuda, Gulf of Main, Island, Ireland, North Sea, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, Maldives, Madagascar, Indian Ocean, India, Indonesia-Malaysia, Philippines, Chinese Seas, Taiwan, Japan Sea, Korea, Japan Sea, W. Pacific (equatorial), Australia, New Zealand, tropical Pacific, British Columbia, Bay of San Francisco, California, Chile. Epi-mesopelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Very rare, found at one station in the northern inner RSA and one station in the Sea of Oman (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Al-Khayat, 2005).



Sites of occurrence of *Oithona setigera* in RSA

Family: Oithonidae Dana, 1853

Genus: *Oithona*

Scientific Name: *Oithona similis* (Claus, 1866)

Synonyms:

Oithona helgolandica Claus, 1863; *O. spinifrons* Boeck, 1864; Brady, 1878; Thompson & Scott, 1903; *Oithona helgolandica* Sars, 1900; T. Scott, 1914; Pesta, 1920; Campbell, 1929; Rose, 1933a; Davis, 1949.

References:

Claus, 1866; Giesbrecht, 1892; Wheeler, 1901; Thompson & Scott, 1903; Farran, 1908b; Wolfenden, 1911; Lysholm, 1913; Rosendorn, 1917a; Sars, 1918; Willey, 1920a; Lysholm & Nordgaard, 1921; Rose, 1929; Wilson, 1932a; Jespersen, 1934; Hardy & Gunther, 1935; Dakin & Colefax, 1940; Vervoort, 1951; Lindberg, 1955a; Shen & Bai, 1956; Vervoort, 1957; Crisafi, 1959b; Tanaka, 1960; Kasturirangan, 1963; Marques, 1966; Pallares, 1968b; Wellershaus, 1970; Minoda, 1971; Bradford, 1972; Chen *et al.*, 1974; Sullivan *et al.*, 1975; Nishida *et al.*, 1977; Shih & Laubitz, 1978; Séret, 1979; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Schnack, 1982; Nishida, 1985a; Nishida, 1986; Kim *et al.*, 1993; Mazzocchi *et al.*, 1995; Menshenina & Melnikov, 1995; Chihara & Murano, 1997; Schnack-Schiel *et al.*, 1998; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Conway, 2006.

Description: (After Conway *et al.*, 2003).

Female: Cephalosome narrowed anteriorly but not to a point. Rostrum present but not visible dorsally. Urosome approximately the length of the prosome. Anterior third of genital segment swollen laterally. Genital segment more than twice as long as wide. Anal segment just longer than width. Furca shorter than anal segment and divergent, more than twice as long as wide. Second furcal seta is longer than the urosome. Segments of A1 fringed with small spinules. A1 doesn't reach the genital segment. Ovisacs when present usually with a single row of very large eggs.

Male: Rostrum short and blunt. A1 twice geniculate, with a sheath just beyond the proximal elbow and a semicircular process on the 1st segment beyond the distal elbow, as in *O.plumifera*. Furca about as long as wide.



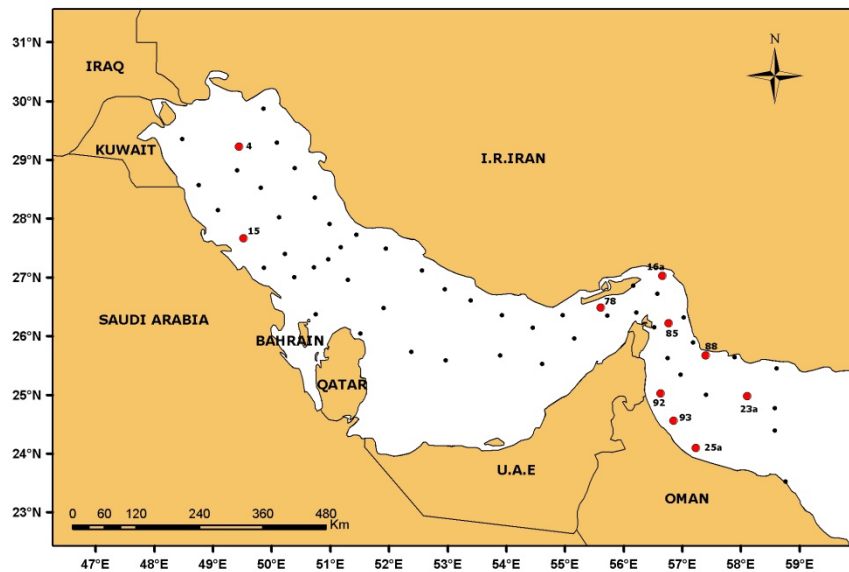
Oithona similis

Distribution:

Antarctic, SW Atlantic, Indian, Ellis fjord, SW, S, SE Pacific, sub-Antarctic, SW, SE Atlantic, Indo-Pacific, South Africa, Namibia, Congo, off Marocco-Mauritania, Canaries, Brazil, Gulf of Mexico, Cuba, Bermuda, Chesapeake Bay, Woods Hole, Bay of Fundy, off Nova Scotia, Labrador, Greenland, Island, Ireland, Norway Sea, Black Sea, Barent Sea, Arctic, Canadian abyssal plain, off Alaska, Kara Sea, North Sea, Bay of Kiel, Baltic Sea, Manch, Portugal, Mediterranean, Suez Canal, Gulf of Suez, Red Sea, Madagascar, Indian, India, Indonesia-Malaysia, Philippines, Chinese Seas, Taiwan, Jaune Sea, Korea, Japan Sea, NW & NE Pacific, Bering Sea, Alaska, British Colombi, Oregon, California, W & E Australia, New Zealand, Ecuador, Chile. Epi- to bathypelagic. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Occurred at 10 stations distributed over the Whole ROPME Sea Area (Present study, refer sites map), Qatari waters (Nour El-Din & Ghobashi, 1999).



Sites of occurrence of *Oithona similis* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Oncaea* (Philippi, 1843)

Scientific Name: *Oncaea conifera* Cleve, 1901

Synonyms:

Oncaea clevei Früchtl, 1923.

References:

Früchtl, 1923; 1924b; Farran, 1936a; Sewell, 1947; Tanaka, 1960; Chen *et al.*, 1974; Malt, 1983b; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Böttger-Schnack, 2001; Al-Yamani & Prusova, 2003; Böttger-Schnack *et al.*, 2004.

Description: (Conway *et al.*, 2003).

Female: In lateral view, the 2nd free pedigerous segment of the prosome has a prominent projection. The genital segment is nearly twice as long as the rest of the urosome. The 3rd urosome segment is longer than the 4th segment. The furca is as long as the anal segment. Maxilliped, the 2nd segment has two spines, the distal spine is thicker and longer than the

proximal spine, and the inner margin of the terminal claw is lined with spinules. P5 is cylindrical, the inner seta is twice as long as the outer one.

Male: Considerably small than the female, there is no dorsal hump on the 2nd free pedigerous segment of the prosome. The genital segment is 3 times longer than the rest of the urosome. The lappets at the posterior corners of the genital segment are large, triangular and pointed outwards. The apical setae on P5 are unequal in length.



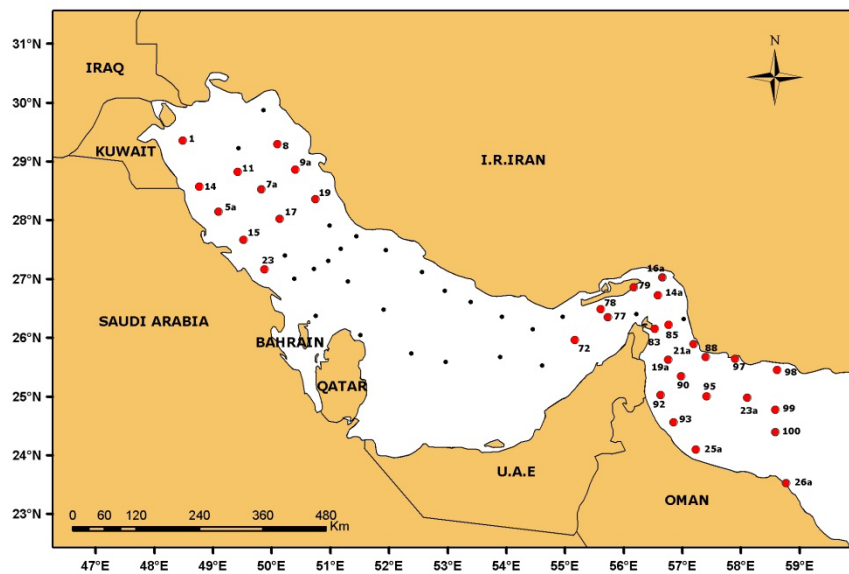
Oncaea conifera

Distribution:

South Africa, Mediterranean, Gulf of Aqaba, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea Area, Madagascar, SW Indien, Vietnam, Chinese Seas, Taiwan, Jaune Sea, Japan, W. Pacific (equatorial), Australia . Epipelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Well known in the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Oncaea conifera* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Oncaea*

Scientific Name: *Oncaea media* Giesbrecht, 1891

Synonyms:

Oncäa media Giesbrecht, 1891; 1892; *O. media* Giesbrecht, 1892; *O. curta* Corral Estrada & Genicio de Corral, 1970.

References:

Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Pesta, 1912a; Früchtel, 1924b; Farran, 1926; Rose, 1929; Dakin & Colefax, 1933; Sewell, 1951; Chiba *et al.*, 1957; Tanaka, 1960; Vilela, 1965; Corral Estrada, 1970; Silas, 1972; Razouls, 1972; Björnberg, 1972; Ferrari, 1975; Boxshall, 1977a; Dawson & Knatz, 1980; Sazhina, 1982; Malt, 1983a; Sazhina, 1985; Kim *et al.*, 1993; Heron & Bradford-Grieve, 1995; Chihara & Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Böttger-Schnack, 2001; Conway *et al.*, 2003; Boxshall & Halsey, 2004 (f. *minor*); Conway, 2006.

Description: (Conway *et al.*, 2003).

Female: The widest part of the prosome is at the base of the cephalosome. The genital segment is twice the length of the rest of urosome. The furca is nearly twice as long as wide. The distal spine of the 2nd segment of maxilliped is thicker but of a similar length to the proximal spine. Approximately half of the inner margin of the terminal claw is lined with spinules. P5 is short, apical setae unequal in length.

Male: Genital segment is 3 times longer than the rest of the urosome. The lappets are large, rounded with a pointed projection directed outwards. The terminal claw on the maxilliped is not as long as the preceding segment. The apical setae on P5 are unequal in length. The furca are approximately twice as long as wide.



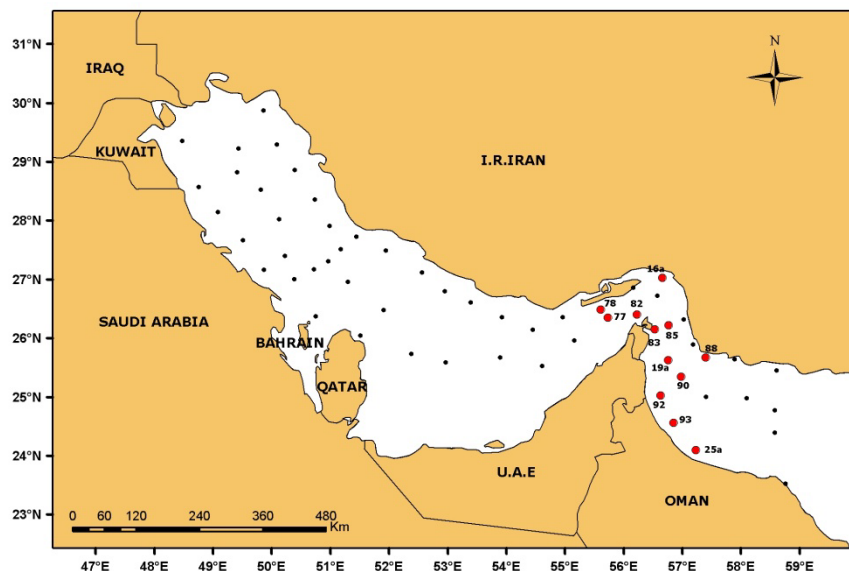
Oncaea media

Distribution:

Cosmopolitan, (tropical, sub-tropical); Antarctic, South Africa, Gulf of Guinea, Brazil, off Bermuda, off Nova Scotia, North Sea, Mediterranean, Suez Canal, Gulf of Aqaba, Red Sea, Gulf of Aden, ROPME Sea Area, Arabian Sea, Maldives, Ceylon, Madagascar, Seychelles, India, Bay of Bengal, Indo-Malaysia, Chinese Seas, Taiwan, Japan Sea, Korea, Japan Sea, Oregon, California, Gulf of California, Chile, W. Pacific (equatorial), Australia, New Zealand. Epi-mesopelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Restricted to the Straits of Hormuz and Sea of Oman (Present study, refer sites map), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Oncaea media* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Oncaea*

Scientific Name: *Oncaea mediterranea* (Claus, 1863)

Synonyms:

Antaria mediterranea Claus, 1863; *Oncäa mediterranea* Giesbrecht, 1892; *O. mediterranea* var. *flava* Giesbrecht, 1892; *Oncaea mediterranea* Bourne, 1889; T. Scott, 1894 b.

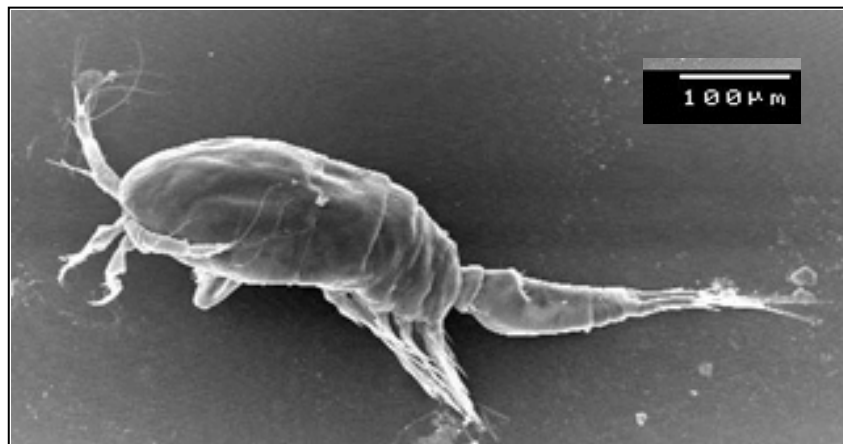
References:

Thompson & Scott, 1903; Farran, 1908b; Wolfenden, 1911; Pesta, 1920; Farran, 1929; Rose, 1933a; Dakin & Colefax, 1940; Lysholm *et al.*, 1945; Sewell, 1947; Vervoort, 1957; Owre & Foyo, 1967; Corral Estrada, 1970; Björnberg, 1972; Razouls, 1972; Chen *et al.*, 1974; Ferrari, 1975; Heron, 1977; Dawson & Knatz, 1980; Marques, 1982; Heron & Bradford-Grieve, 1995; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Böttger-Schnack, 2001; Conway *et al.*, 2003; Böttger-Schnack *et al.*, 2004.

Description: (Conway *et al.*, 2003).

Female: Posterior of last prosome segment not smoothly rounded, tips directed slightly outwards. Genital segment elongate and more than twice the length of the rest of the urosome. Furca is longer than the anal segment and approximately three times longer than wide. The outer seta on the furca arises in the first third of the outer margin.

Male: Smaller than female. Genital segment nearly three times as long as the rest of the urosome. Lappets at the distal corners of the genital segment have prominent backward directed projections.



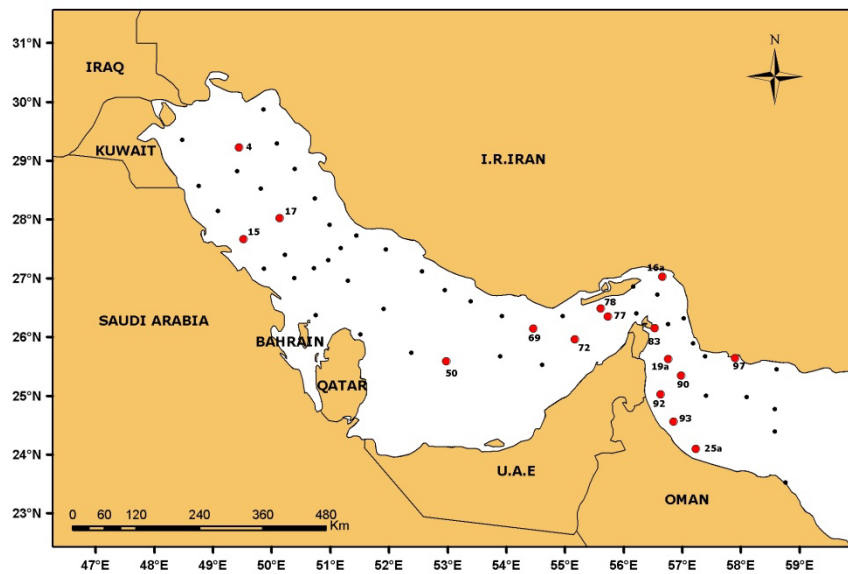
Oncaea mediterranea

Distribution:

Cosmopolitan (tropical, sub-tropical), sub-Antarctic (Indian, SW Pacific), Atlantic), Mediterranean, Barents Sea, Red Sea. Epi- to mesopelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found at 8 stations scattered in the inner RSA and 8 stations throughout the Hormuz Straits and Sea of Oman (New record, refer sites map).



Sites of occurrence of *Oncaea mediterranea* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Oncaea*

Scientific Name: *Oncaea venusta* (Philippi, 1843)

Synonyms:

Non *Antaria gracilis* Dana, 1849; 1852; *Oncaea pyriformis* Lubbock, 1860; *Antaria coerulescens* Claus, 1866; *Oncaea obtusa* Brady, 1883; Thompson, 1888d; Kovalev & Shmeleva, 1982; *Oncäa venusta* Giesbrecht, 1892; Razouls, 1972; 1974b; *Oncaea praeclara* Humes, 1988; Suarez-Morales & Gasca, 1998a.

References:

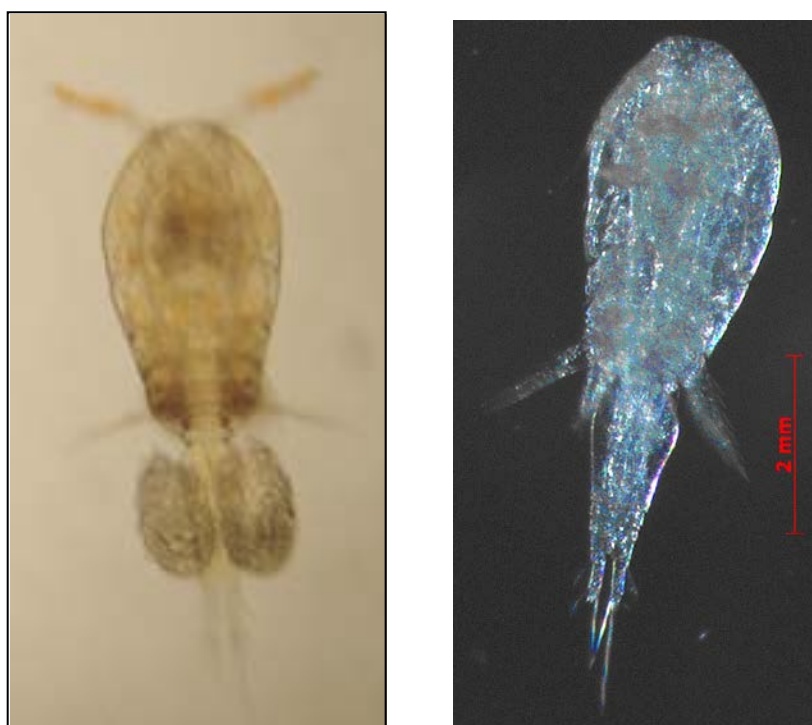
Wheeler, 1901; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Pesta, 1920; Früchtl, 1924b; Farran, 1936a; Rose, 1929; Wilson, 1932a; Rose, 1933a; Dakin & Colefax, 1933; Mori, 1937; Lysholm *et al.*, 1945; Sewell, 1947; Krishnaswamy, 1953; Marques, 1958a; Tanaka, 1960; Fish, 1962; Vilela, 1965; Owre & Foyo, 1967; Ramirez, 1969; Björnberg, 1972; Ferrari, 1975; Boxshall, 1977a; Dawson & Knatz, 1980; Malt, 1983; J-s. Ho, 1984a; Huys & Boxshall, 1991; Heron & Bradford-Grieve, 1995; Chihara & Murano, 1997;

Boxshall, 1998; Böttger-Schnack, 2001; Heron, 2002; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Elvers *et al.*, 2006.

Description: (Conway *et al.*, 2003).

Female: Prosome widest at the base of cephalosome. Last prosome segment rounded at the distal corners. The genital segment is longer than the rest of the urosome and is more rounded than in *O. mediterranea*. The furca is longer than the anal segment, and nearly 4 times longer than wide. P5 is very small, same width as length, the two apical setae are not equal in length.

Male: The body is narrower than the female. The three segments between the genital segment and the anal segment are very short. The genital segment is more than 3 times longer than the rest of the urosome. The lappets at the base of the genital segment have small lateral points turned outward. The furca is shorter than 3 times longer than wide.



Oncaea venusta

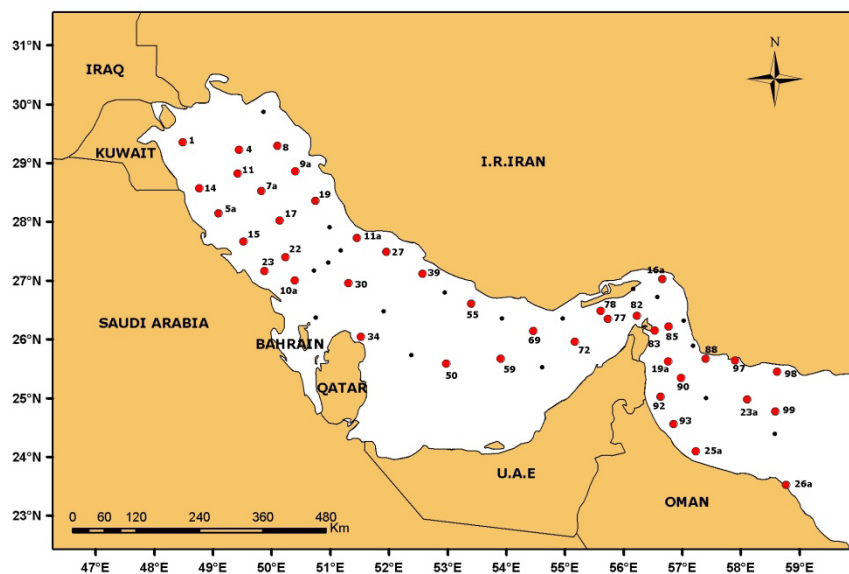
Distribution:

Cosmopolitan, (equatorial, tropical, sub-tropical, temperate). N Pacific, Bering Sea, Gulf of Alaska, Australia, New Zealand, Chile, N Atlantic, Labrador, north Hudson Bay, South Africa, Buenos Aires, Brazil, Antarctic (Weddell Sea), sub-Antarctic (Indian, SE Pacific),

Arctic (Indian), Pacific Rise, Gulf of California, Australia. Epi- to mesopelagic, also demersal and semi-parasitic. After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Common over the whole RSA (Present study, refer sites map), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi, 1999; Nour El-Din & Al-Khayat, 2005).



Sites of occurrence of *Oncaea venusta* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Triconia* Böttger-Schnack, 1999

Scientific Name: *Triconia minuta* Giesbrecht, 1892

Synonyms:

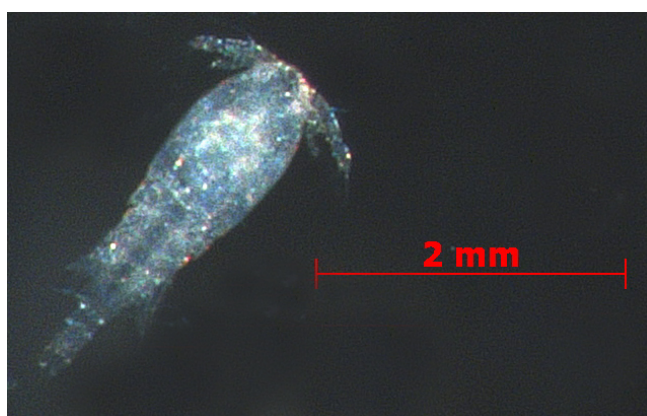
Oncaea minuta Giesbrecht, 1892; *Oncaea minuta* Thompson & Scott, 1903; Farran, 1908b; A. Scott, 1909; Pesta, 1912a; Wilson, 1942.

References:

Böttger-Schnack, 1999; Di Capua & Boxshall, 2008.

Description: (Conway *et al.*, 2003).

Female: A very small copepod with a slender body. The prosome is more than twice as long as wide. The urosome is less than half the length of the prosome. The furca is shorter than the anal segment, and is approximately twice as long as wide. The outer seta on the furca arises midway up the outer margin. P5 is as wide as long, the inner apical seta is twice as long as the outer seta.



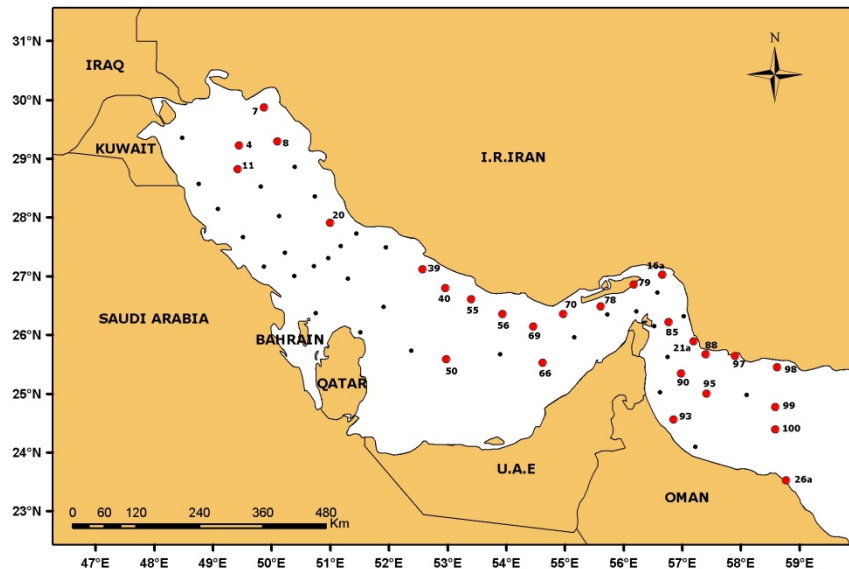
Triconia minuta

Distribution:

Congo, off Morocco-Mauritania, Argentina, Brazil, Venezuela, Florida; Sargasso Sea, off Bermuda, Chesapeake Bay, Greenland, off Ireland, Norway, North Sea, Mediterranean, Suez Canal, Gulf of Aqaba, Red Sea, , Gulf of Aden, Arabian Sea, NW, E. Indian, Bay of Bengal, Indonesia-Malaysia, Philippines, Chinese Seas, Taiwan, Japan, Bering Sea, Canadian abyssal plain, Gulf of Alaska, California, Mexico, Gulf of Panama, off Hawaii, Peru, off Chile. Mesobathypelagic. Epipelagic in the Gulf of Naples. (Razouls *et al.* 2005-2009).

Sites of occurrence in RSA:

Known at 28 stations in both the inner RSA and Sea of Oman.



Sites of occurrence of *Triconia minuta* in RSA

Family: Oncaeidae Giesbrecht, 1892

Genus: *Triconia*

Scientific Name: *Triconia furcula* Farran, 1936

Synonyms:

Oncaea conifera var. *furcula* Farran, 1936a; Bradford, 1972; *Oncaea conifera* Moulton, 1973; *Oncaea furcula* Heron & Bradford-Grieve, 1995.

References:

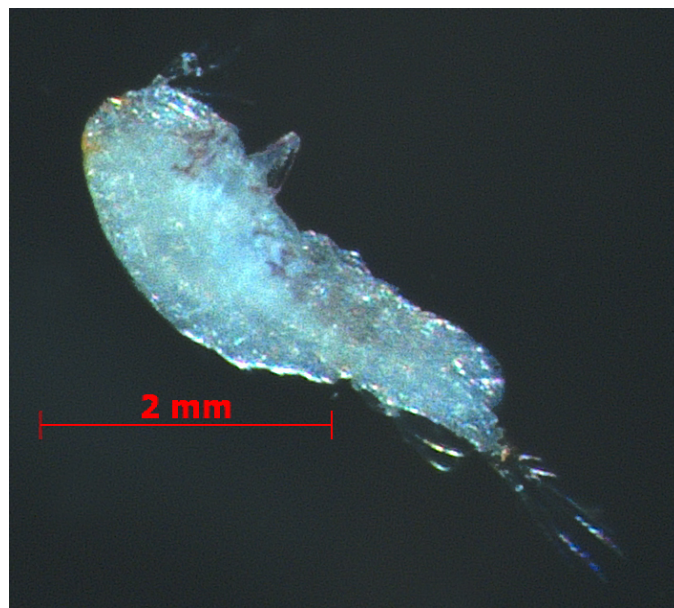
Saraswathy, 1966; Michel *et al.*, 1986a,b; Thompson, 1986; Martin, 1991; Böttger-Schnack, 1999; Conway *et al.*, 2003; Sazhinar, 2006.

Description:

Size: Length 0.75-1.25 mm (female) 0.60-0.80 mm (male).

Female: In lateral view, the 2nd free pedigerous segment of the prosome has a prominent projection. The genital segment is nearly twice as long as the rest of the urosome. The 3rd

usosome segment is longer than the 4th segment. The furca is as long as the anal segment. Maxilliped, the 2nd segment has two spines, the distal spine is thicker and longer than the proximal spine, and the inner margin of the terminal claw is lined with spinules. Male: Considerably smaller than the female. There is no dorsal hump on the 2nd free pedigerous segment of the prosome. The genital segment is 3 times longer than the rest of the urosome. The lappets at the posterior corners of the genital segment are large, triangular and pointed outwards.



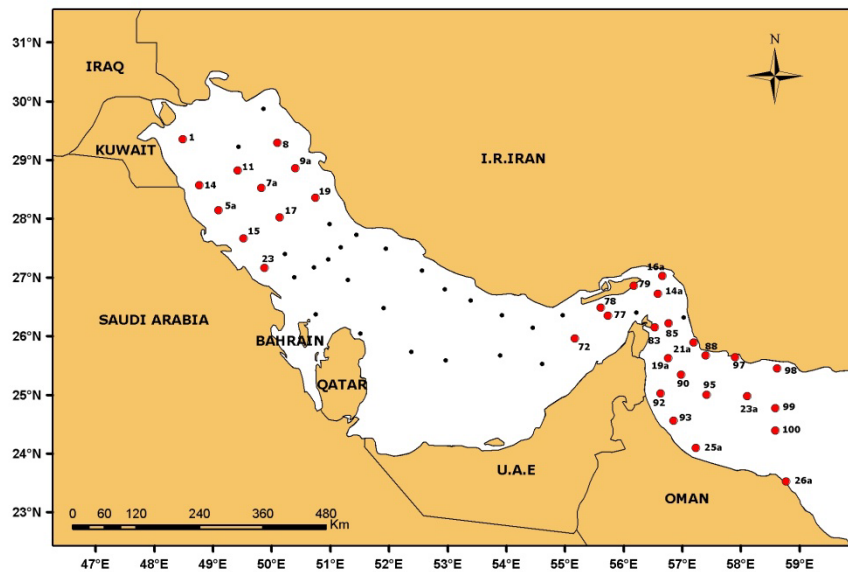
Triconia furcula

Distribution:

Bermuda, Mediterranean, Australia, New Zealand.

Sites of occurrence in RSA:

Less frequent in the inner RSA, Common in the Straits of Hormuz and Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b), Qatari waters (Nour El-Din & Ghobashi, 1999; Nour El-Din & Al-Khayat, 2005).



Sites of occurrence of *Triconia furcula* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Copilia* Dana, 1849

Scientific Name: *Copilia mirabilis* Dana, 1849

Synonym:

Copelia mirabilis Saraswathy, 1966 (1967).

References:

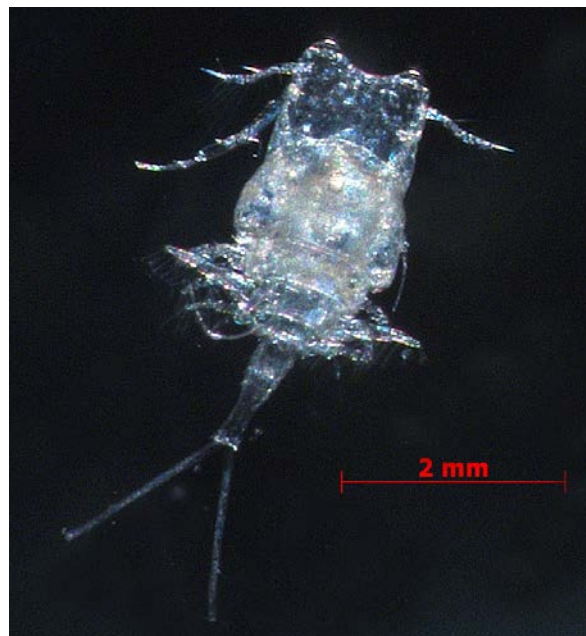
Giesbrecht, 1892; Thompson & Scott, 1903; Wolfenden, 1911; Farran, 1929; Wilson, 1932a; Rose, 1933a; Sewell, 1947; Carvalho, 1952a; Krishnaswamy, 1953; Chiba *et al.*, 1957a; Marques, 1958a; Fish, 1962; Owre & Foyo, 1967; Stander & De Decker, 1969; Ramirez, 1971; Chen *et al.*, 1974; Björnberg *et al.*, 1981; Baessa de Aguiar, 1991; Chae & Nishida, 1994; Chihara & Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (Conway *et al.*, 2003).

Female: The Cephalosome is longer than broad; it is as long as the rest of the body (not including furca) with the widest part at the posterior margin. The space between the two cuticular lenses is nearly twice the diameter of the lens. First segment of A2 with many short

spines, and a large spine at the distal end covered in spinules. A large characteristic spine with several large spinules on the mid-section of the 2nd segment. The posterior margins of the urosome segments have rows of spinules. The anal segment is longer than the rest of the urosome, and wider posteriorly. The furca is longer than the urosome, with short setae near tip.

Male: Cephalosome is very rounded, and shorter than wide. The first two metasome segments are wider than the cephalosome, and the remainder of the segments taper backwards. A2 is slender, the 1st segment is longer than the 2nd and the 2nd segment is longer than the 3rd. The 4th segment is almost twice as long as the 3rd.



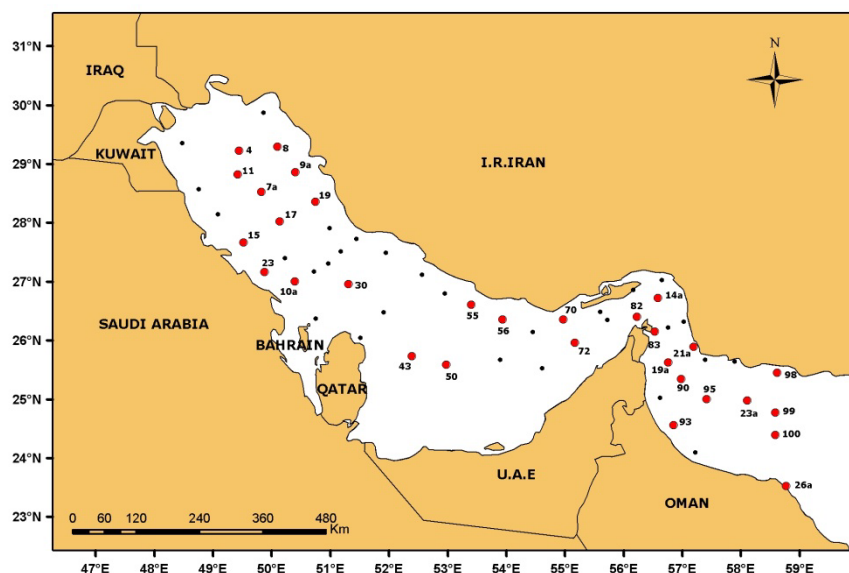
Copilia mirabilis

Distribution:

South Africa, Namibia, Angola, Congo, Gulf of Guinea, off Mauritania, Canaries, Argentina, Brazil, Jamaica, Gulf of Mexico, Cuba, Florida, Sargasso Sea, off Bermuda, Woods Hole, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea Area, Ceylon, Madagascar, Seychelles, Indian Ocean, India, Thailand, Indonesia-Malaysia, Philippines, Vietnam, Hong Kong, Chinese Seas, Taiwan, Japan Sea, W. Pacific (equatorial), Australia, Pacific (tropical), Hawaii, California, off Guatemala, Peru, Chile. Epi-mesopelagic (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Widely distributed in the northern and southern Parts of the inner RSA and in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a) Kuwaiti waters (Michel *et al.*, 1986b) West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Copilia mirabilis* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Sapphirina* Thompson, 1829

Scientific Name: *Sapphirina angusta* Dana, 1849

Synonyms:

Sapphirina fulgens Claus, 1863; *S. opaca* Lubbock, 1856; Brady, 1883; Thompson, 1888d; T. Scott, 1894b; *S. clausi* Haeckel, 1864.

References:

Giesbrecht, 1892; Wolfenden, 1911; Pesta, 1912a; Farran, 1929; Lehnhofer, 1929; Wilson, 1932a; Dakin & Colefax, 1933; Lysholm *et al.*, 1945; Sewell, 1947; Pucher, 1952; Chiba *et al.*, 1957a; Tanaka, 1960; Fish, 1962; Fagetti, 1962; Tanaka, 1964; Crisafi & Mazza, 1966; Crisafi, 1966; Owre & Foyo, 1967; Ramirez, 1969; Paiva, 1971; Chen *et al.*, 1974; Björnberg

et al., 1981; Marques, 1982; Zheng Zhong *et al.*, 1989; Chae & Nishida, 1994; Chihara & Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (Conway *et al.*, 2003).

Female: Body elongate. Cephalosome approximately 1.5 times longer than wide. Cuticular lenses are adjacent, visible dorsally, and make up the anterior section of the cephalosome. Urosome elongate, approximately 1/3 the length of the prosome. Furca is twice as long as wide with a broad and bluntly rounded process on the distal end of the inner margin. A1 is 5-segmented, the 2nd segment is at least as long as the next three segments together. A2 has a long spine at the distal end of the 1st segment, the 2nd segment is longer than the last two segments (3rd and 4th) together. The endopod of P4 is shorter than the exopod, with two foliaceous spines of equal length at the tip.

Male: body elongate, more than twice as long as wide. Cuticular lenses not visible dorsally. First four metasome segments wider than the cephalosome. Furca similar to that of the female. Last endopod segment of P2 with three inner setae, three foliaceous spines and two claw-like spines at the tip.



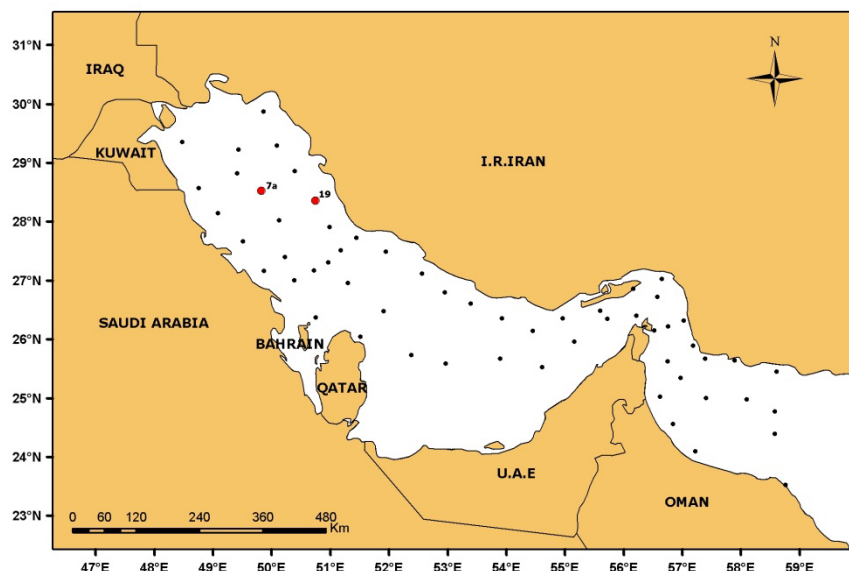
Sapphirina angusta

Distribution:

Sub-Antarctic, South Africa, Namibia, Congo, Gulf of Guinea, Dakar, Canaries, Argentina, Brazil, Gulf of Mexico, Florida, Sargasso Sea, off Bermuda, Woods Hole, NW Spain, Mediterranean, Arabian Sea, ROPME Sea Area, Madagascar, Indian, W Australia, Indonesia-Malaysia, Thailand, Philippines, Vietnam, Chinese Seas, Taiwan, Japan, W. Pacific (equatorial), New Zealand, Hawaii, California, Chile. Epi- to mesopelagic, also demersal and semi-parasitic. (Razouls *et al.*, 2005-2009)

Sites of occurrence in RSA:

Very rare, found only at two stations in the northern part of the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Qatari waters (Nour El-Din & Ghobashi, 1999).



Sites of occurrence of *Sapphirina angusta* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Sapphirina*

Scientific Name: *Sapphirina gemma* (Dana, 1849)

Synonyms:

Sapphirina Edwardsii Haeckel, 1864; *S. gemma* Brady, 1883; *S. gemma* Mori, 1937 (1964).

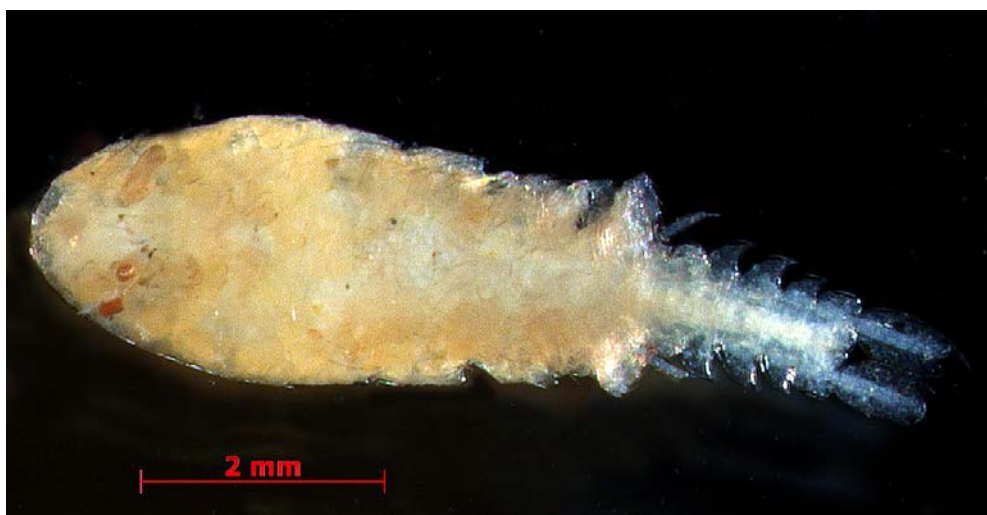
References:

Giesbrecht, 1892; Wheeler, 1901; Wolfenden, 1911; Pesta, 1920; Farran, 1929; Rose, 1929; Wilson, 1932a; Rose, 1933a; Dakin & Colefax, 1940; Lysholm *et al.*, 1945; Chiba *et al.*, 1957a; Tanaka, 1964; Crisafi & Mazza, 1966; Crisafi, 1966; Shih *et al.*, 1971; Razouls, 1972; Chen *et al.*, 1974; Chihara & Murano, 1997.

Description:

Female: Head a little wider than long, the greatest width just behind the center; corneal lenses invisible in dorsal view; metasome segments squarely truncated posteriorly, with projecting corners; fifth segment half the width of the fourth; considerably delated through its center; caudal rami about twice as long as wide. Third and fourth segments of second antenna the same length; the two together much shorter than the second segment; fourth endopod longer than the exopod, its two apical setae subequal. Total length 1.9 – 3.15 mm.

Male: Head a little wider than long, corneal lenses on the ventral surface some distance behind the frontal margin; urosome as wide as metasome; Terminal segment of second endopod with three large Inceolate flanged spine; three setae and four small spine around she apex. Total length 2.15 – 3.15 mm.



Sapphirina gemma

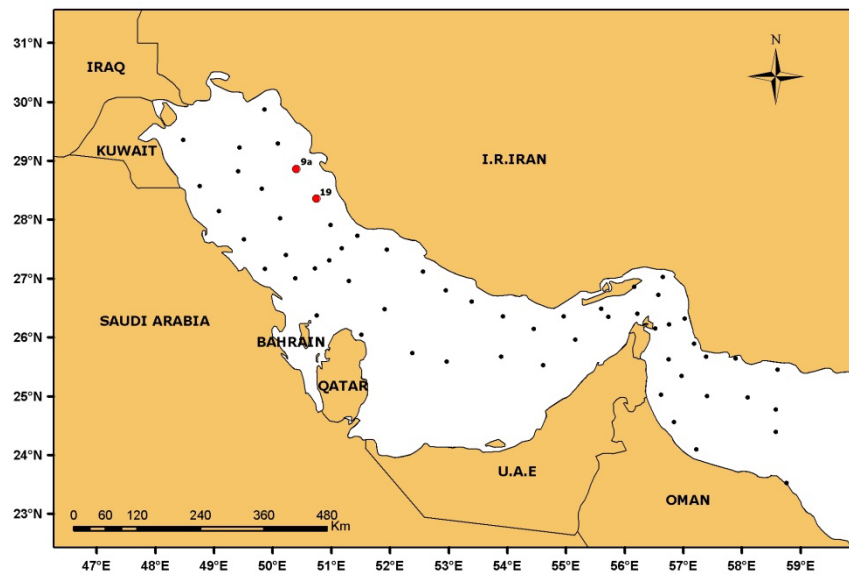
Distribution:

South Africa, Congo, off Mauritania, Canaries, Portugal, Brazil, Venezuela, Cuba, Gulf of Mexico, Chesapeake Bay, Bay of Fundy, Mediterranean, Red Sea, Arabian Sea, Madagascar, Indian, West Australia, Hong Kong, Chinese Seas, Taiwan, Jaune Sea, Japan, Hawaii, West

Pacific (equatorial), New Zealand, California, Gulf of California, Chile (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Very rare, found only at two stations in the northern part of the inner RSA (New record , refer sites map).



Sites of occurrence of *Sapphirina gemma* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Sapphirina*

Scientific Name: *Sapphirina intestinalis* Giesbrecht, 1891

Synonyms:

Sapphirina intestinalis Wolfenden, 1911; Wiebe, 1970.

References:

Giesbrecht, 1892; Thompson & Scott, 1903; A. Scott, 1909; Farran, 1929; Lehnhofer, 1929; Rose, 1933a; Dakin & Colefax, 1940; Lysholm *et al.*, 1945; Sewell, 1948; Chiba *et al.*, 1957; Tanaka, 1960; Crisafi & Mazza, 1966; Corral Estrada, 1970; Chen *et al.*, 1974; Björnberg *et*

al., 1981; Chihara & Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (Conway *et al.*, 2003).

Female: Cephalosome wider than long. Cephalosome makes up over half the length of the prosome. Cuticular lenses adjacent and visible dorsally. Urosome 6-segmented. Furca more than twice as long as wide, small pointed projection at the distal inner margin, superficial seta in front of the 1st marginal seta. A1 is 5-segmented, 2nd segment is longer than the three following segments. Segment 1 of A2 with a long spine at the distal end. Segment 2 of A2 as long as the two following segments, the last segment is nearly three times longer than the terminal claw. Segment 3 of exopod of P2 with three foliaceous spines. Endopod of P4 is less than half the length of the exopod.

Male: Cephalosome wider than long. Cuticular lenses visible dorsally. Furca similar to female. The 3rd segment of the exopod of P2 with two foliaceous spines.



Sapphirina intestinata

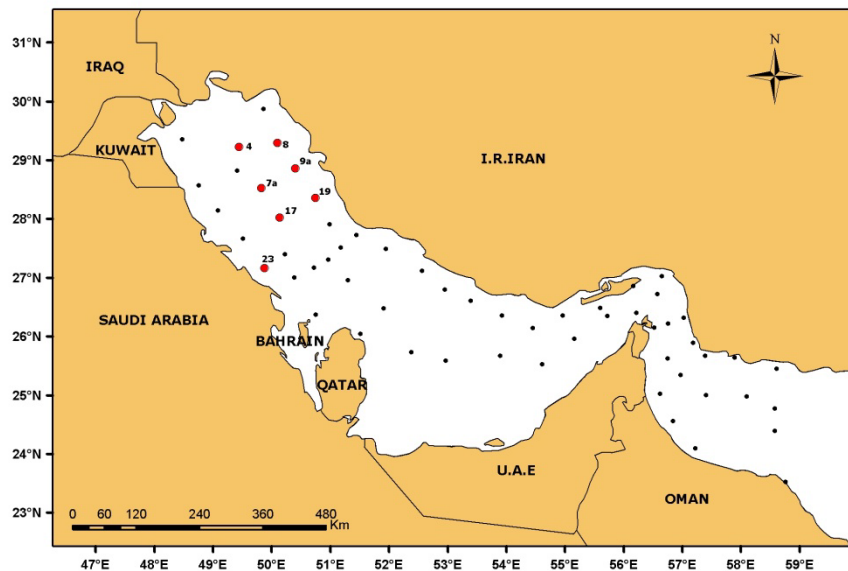
Distribution:

Congo, Gulf of Guinea, off Mauritania, Canaries, Brazil, Venezuela, Gulf of Mexico, off Bermuda, Mediterranean, Red Sea, Bab al Mandab, off Ceylon, Madagascar, Indian, Australia, Indonesia-Malaysia, Hong Kong, Chinese Seas, Taiwan, Okinawa, Korea, Japan

Sea, Gulf of Alaska, off Hawaii, California, W. Pacific (equatorial), off New Zealand. Epipelagic (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Found only at seven stations in the northern inner RSA (New record, refer sites map).



Sites of occurrence of *Sapphirina intestinata* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Sapphirina*

Scientific Name: *Sapphirina nigromaculata* (Claus, 1863).

Synonyms:

Sapphirina inaequalis Brady, 1883; *S. lomae* Esterly, 1905.

References:

Claus, 1863; Giesbrecht, 1892; Thompson & Scott, 1903; A. Scott, 1909; Wolfenden, 1911; Pesta, 1920; Farran, 1926; Lehnhofer, 1929; Rose, 1929; Wilson, 1932a; Rose, 1933a; Dakin & Colefax, 1940; Lysholm *et al.*, 1945; Sewell, 1947; Pucher, 1952; Krishnaswamy, 1953; Chiba *et al.*, 1957; Marques, 1958a; Fish, 1962; Crisafi & Mazza, 1966; Owre & Foyo, 1967; Corral Estrada, 1970; Razouls, 1972; Chen *et al.*, 1974; Björnberg *et al.*, 1981; Chae &

Nishida, 1994; Chihara & Murano, 1997; Boxshall, 1998; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description:

Maxillipeds in the female turned forward outside the other mouth parts and more or less fused with the head, the apical claws S shaped; in the male not fused to the head.



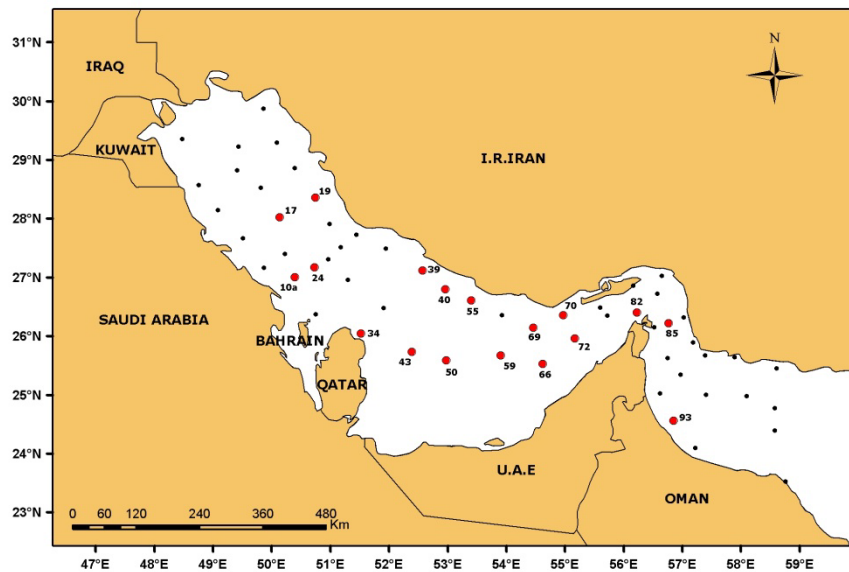
Sapphirina nigromaculata

Distribution:

Antarctic, South Africa, Angola, Congo, Gulf of Guiny, Marocco, Canaries, Sargasso Sea, off Bermuda, Brazil, Argentina, Gulf of Mexico, Cuba, Florida, Mediterranean, Red Sea, ROPME Sea Area, Arabian Sea, Maldives, Ceylon, Madagascar, Seychelles, Indian, India, Bay of Bengal, Nicobar, Australia, Indonesia-Malaysia, Hong Kong, Chinese Sea, Taiwan, Jaune Sea, Japan, W. Pacific (equatorial), Australia, California, Gulf of California, Gulf of Panama, Chile. Epiplagic. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Recorded fequently in the central and southern parts of the inner RSA, rare in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Qatari waters (Nour El-Din & Ghobashi, 1999), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Kuwaiti waters (Al-Yamani *et al.*, 2004).



Sites of occurrence of *Sapphirina nigromaculata* in RSA

Family: Sapphirinidae Thorell, 1860

Genus: *Sapphirina*

Scientific Name: *Sapphirina ovatolanceolata* (Dana, 1849)

Synonyms:

Sapphirina Gegenbauri Haeckel, 1864; Claus, 1866; *Sapphirina gemma* Dana, 1849; Mori, 1937.

References:

Wilson, 1942a; Sewell, 1947; Carvalho, 1952a; Krishnaswamy, 1953; Fish, 1962; Crisafi & Mazza, 1966; Crisafi, 1966; Owre & Foyo, 1967; Corral Estrada, 1970; Razouls, 1972; Marques, 1973; Chen *et al.*, 1974; Marques, 1975; 1976; 1982; Chihara & Murano, 1997; Boxshall, 1998; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (Conway *et al.*, 2003).

Female: Cephalosome wider than long. Cuticular lenses adjacent and visible dorsally. 2nd metasome segment longer than 1st segment. A1 is 5-segmented. 3rd and 4th segments of A2 of

similar length, and together shorter than the 2nd segment. Furca twice as long as wide, superficial seta just behind the 1st marginal seta.

Male: Cephalosome wider than long and pointed on the frontal margin. Cuticular lenses not visible dorsally, positioned on the anterior ventral surface. A2 very different to female, longer and more slender. Furca similar to female. Recorded: Seychelles.



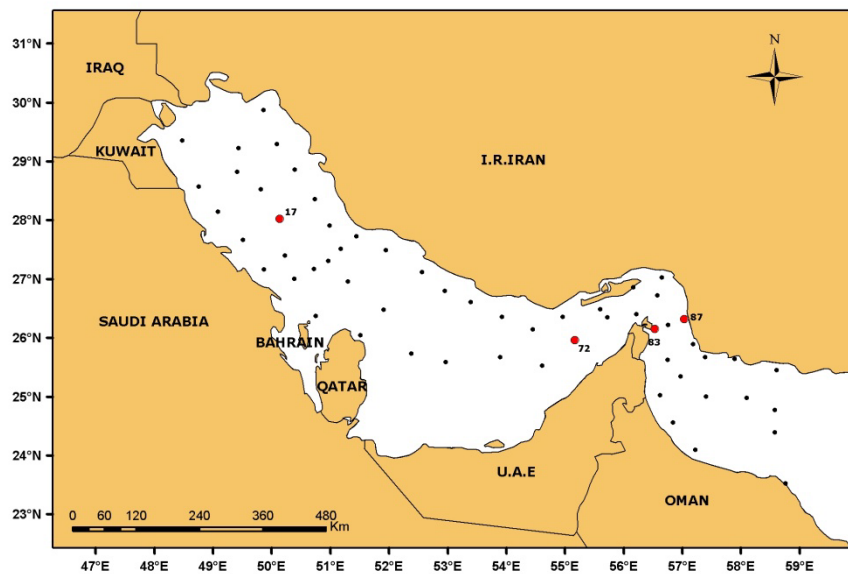
Sapphirina ovatolanceolata

Distribution:

South Africa, Namibia, Congo, Gulf of Guinea, Dakar, off Mauritania, Canaries, Rio de Janeiro, Brazil, Caribbean Sea, Gulf of Mexico, Cuba, Florida, off Bermuda, Sargasso Sea, Mediterranean, Red Sea, Indian, Seychelles, India, Australia, Indonesia-Malaysia, Philippines, Vietnam, Chinese Seas, Taiwan, Japan, W. Pacific, (equatorial), New Zealand, Hawaii, Gulf of California, Chile. (Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Reported at two stations in the inner RSA and two stations in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Sapphirina ovatolanceolata* in RSA

Sub-phylum: Crustacea

Class: Copepoda

3.6.6 Order: Harpacticoida

Description:

Head: Rostrum present; articulated, or fused to head; eyes absent but naupliar eyes present. **Antennules (antenna 1) uniramous;** geniculate in males; peduncle and flagellum indistinguishable; exopod well developed, whip-like, with 5-14 articles. **Antennae (antenna 2)** biramous, or uniramous, or reduced, vestigial or absent; **exopod with 1, 2, 3, 4 or 8 articles, or it vestigial or absent;** endopod with 3 articles. Mandible biramous, or uniramous; palp present, or absent. Maxillipeds, 1 pair; uniramous. **Thorax.** Carapace absent. Thorax and abdomen differentiated, boundary between fourth and fifth pedigerous somites (podoplean tagmosis). **Peraeopods (legs) 6 pairs;** biramous, or uniramous; non-phyllopodous; differentiated; each article joined by intercoxal sclerite; anterior peraeopods with 1 robust seta on outer margin of exopod article 1. Abdomen with 5 somites (or fewer). Pleopods absent. Uropods well developed, 1 pair, positioned terminally or subterminally; rami absent; subrectangular to subquadrate. Telson absent.

Family Euterpinidae Brian, 1921

Genus: *Euterpina* (Norman, 1903)

Scientific Name: *Euterpina acutifrons* (Dana, 1848)

Synonyms:

Harpacticus acutifrons Dana, 1848; *Euterpe gracilis* Claus, 1863; *Euterpe gracilis armata* T. Scott, 1894b; *Euterpe acutifrons* Giesbrecht, 1892; Esterly, 1905; van Breemen, 1908a; Farran, 1929; Shih & Young, 1995.

References:

Thompson & Scott, 1903; A. Scott, 1909; Pesta, 1920; Sars, 1921; Sewell, 1924; Früchtl, 1924b; Monard, 1928; Rose, 1929; Dakin & Colefax, 1933; Farran, 1936a; Wilson, 1942a; Klie, 1943a; Lang, 1948a; Marques, 1951; Carvalho, 1952a; Krishnaswamy, 1957; Tanaka, 1960; M. Bernard, 1963; De Decker, 1964; Vilela, 1965; Dussart, 1967; Ramirez, 1969; Corral Estrada, 1970; Björnberg, 1972; Razouls, 1972; Chen *et al.*, 1974; Goswami, 1976; Boxshall, 1979; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Sazhina, 1985; Huys & Boxshall, 1991; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003; Boxshall & Halsey, 2004; Conway, 2006.

Description: (Conway *et al.*, 2003).

Female: The rostrum is stout. The anterior of cephalosome is sharply pointed. Body widens to the posterior of the cephalosome then narrows posteriorly. A1 is 7-segmented. P5 is symmetrical and 1-segmented. Body articulation is distinct.



Euterpina acutifrons

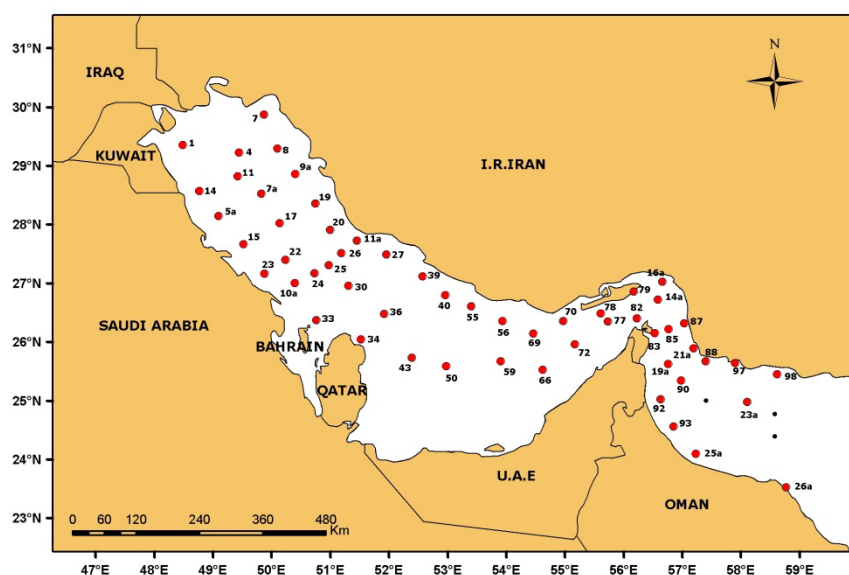
Male: Body similar in shape to female. Both sides of A1 is geniculate; the 4th and 5th segments are fused and much thickened; 6th and 7th segments are fused and make up the last segment. P5 is symmetrical and rudimentary.

Distribution:

Cosmopolitan, South Africa, Namibia, Angola, Congo, Gulf of Guiny, Dakar, Marocco-Mauritania, Canaries, Argentina, Brazil, Caribbean Sea, Jamaïca, Porto-Rico, Cuba, off Bermuda, Florida, North Sea, Portugal, Mediterranean, Suez Canal, Red Sea, Bab al Mandab, Arabian Sea, Madagascar, Seychelles, ROPME Sea Area, Madras, India Bengal, Indonesia-Malaysia, Thailand, Vietnam, Hong Kong, China, Taiwan, Jaune Sea, Korea, Japan Sea, Australia, New Zealand, California, Gulf of California, Mexico, Chile. Mainly inshore, occasionally oceanic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

One of the most widespread species throughout the whole ROPME Sea Area, found at 56 stations (Present study, refer sites map), reported earlier by Basson, 1977; Michle *et al.*, 1986a; 1986b; Dorgham & Hussein, 1997; Gibreel *et al.*, 1997; Nour El-Din & Ghobashi, 1999; Al-Yamani *et al.*, 2004; Al-Yamani *et al.*, 2004; Nour El-Din & Al-Khayat, 2005; Al-Yamani *et al.*, 2004.



Sites of occurrence of *Euterpina acutifrons* in RSA

Family: Clytemnestridae A. Scott, 1909

Genus: *Clytemnestra* (Dana, 1848)

Scientific Name: *Clytemnestra scutellata* (Dana, 1848)

Synonym: *Clytemnestra rostrata* T. Scott, 1894 b.

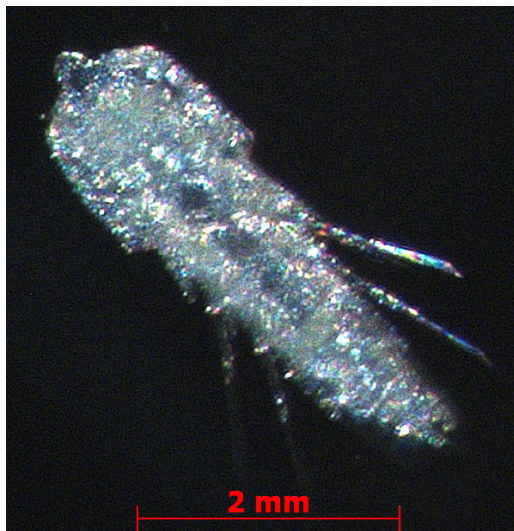
References:

Huys & Conroy-Dalton, 2000; Boxshall & Halsey, 2004.

Description: (After Conway *et al.*, 2003).

Female: Body shape as for the family. A1 is 8-segmented; 4th, 5th and 8th segments with long sensory hairs. The last segment is twice as long as the preceding one. The furca is approximately twice as long as wide, and the 2 longest setae are plumose.

Male: Body similar to female. Both A1 are geniculate. 6th segment of A1 is short and has a spine. The longest furcal setae are longer than those of the female.



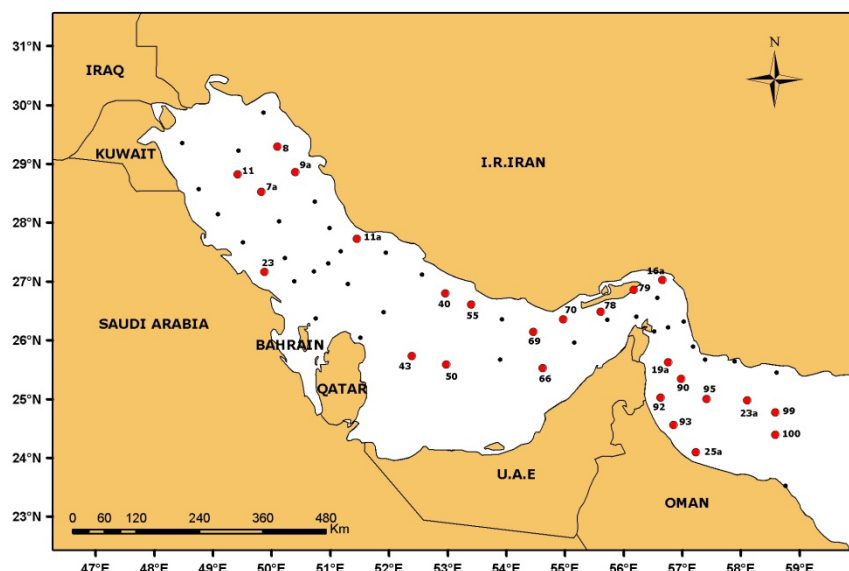
Clytemnestra scutellata

Distribution:

Indo-Pacific, Australia. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Represented throughout the whole ROPME Sea Area, but more widespraed in the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a) Kuwaiti waters (Michel *et al.*, 1986b, Al-Yamani *et al.*, 2004), Qatari waters (Nour El-Din & Ghobashi, 1999), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Clytemnestra scutellata* in RSA

Family Miraciidae Dana, 1846

Genus: *Macrosetella* (A. Scott, 1909)

Scientific Name: *Macrosetella gracilis* (Dana, 1848)

Synonyms:

Setella gracilis Dana, 1848; Claus, 1863; Brady, 1883; Giesbrecht, 1892; Wheeler, 1901; I.C. Thompson, 1903a; T. Scott, 1894b; Wolfenden, 1911; Farran, 1929; Steuer, 1935; Chen *et al.*, 1974; Guangshan & Honglin, 1984; Shih & Young, 1995; *Setella longicauda* (M) Dana, 1848.

References:

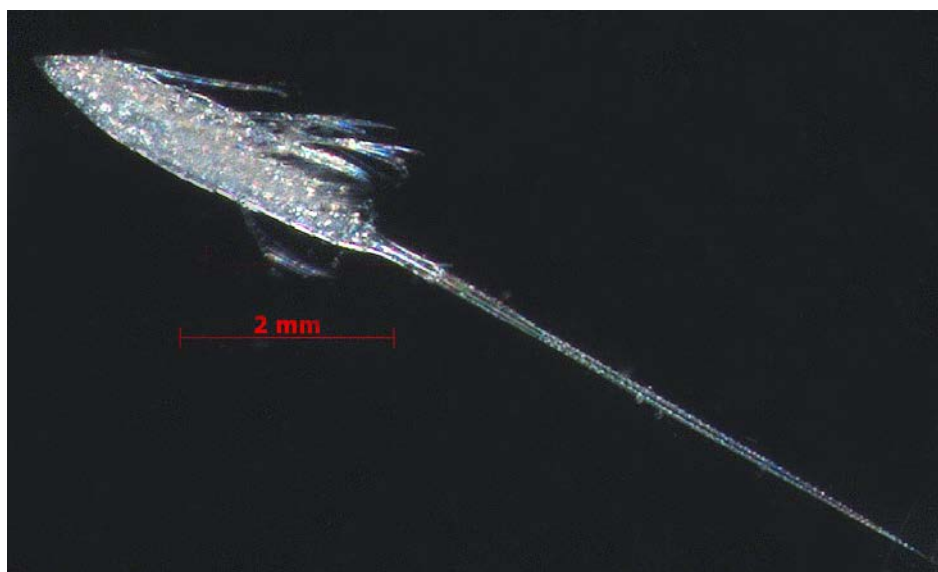
A. Scott, 1909; Pesta, 1913; Früchtl, 1924b; Rose, 1929; Wilson, 1932a; Dakin & Colefax, 1933; Steuer, 1935a; Farran, 1936a; Sewell, 1940; Lang, 1948a; Moore, 1949; Carvalho, 1952a; Marques, 1958a; Tanaka, 1960; Owre & Foyo, 1967; Ramirez, 1969; Razouls, 1972;

Björnberg *et al.*, 1981; Boxshall, 1979; Sazhina, 1985; Böttger-Schnack, 1989; Huys & Boxshall, 1991; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Al-Yamani & Prusova, 2003; Conway *et al.*, 2003; Boxshall & Halsey, 2004.

Description: (Conway *et al.*, 2003).

Female: Body is slender, elongate and without paired cuticular lenses. Cephalosome relatively large, about 1/3 of body length (excluding furca), and as wide as the following segment. Prosome and urosome without distinctive constriction between segments. Ventral margin of penultimate segment, and ventral and lateral margins of anal segment with spinules. Anal segment narrow. Furca about 11 times longer than wide, narrowest halfway its length. Setae V very long, distinctly longer than total body length. The rostrum is relatively large and elongate. A1 is 8-segmented. P5 is large, and P6 is rudimentary.

Male: Body shape similar to female. A1 is 10-segmented with the geniculation between segments 7 and 8. P6 are weakly developed and symmetrical. Post-genital segments with rows of spinules at the ventral posterior margin.



Macrosetella gracilis

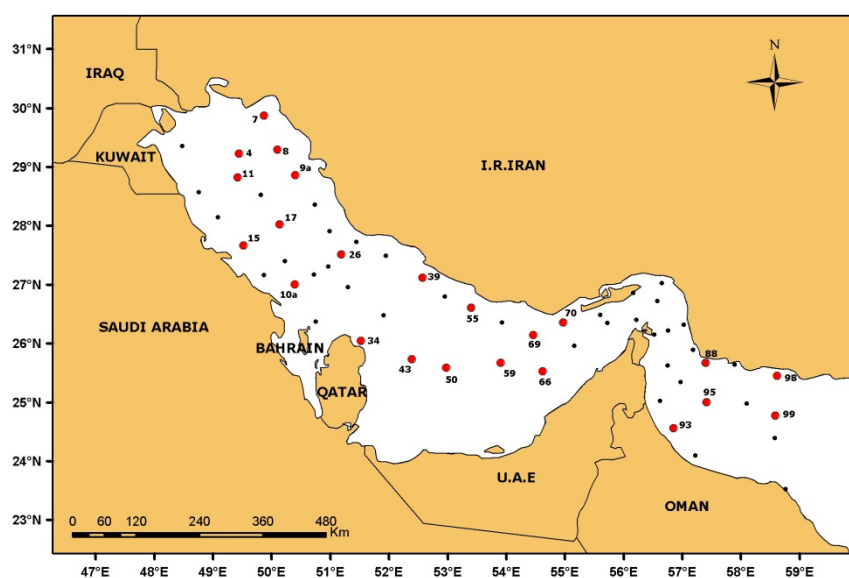
Distribution:

sub-Antarctic (Indian), South Africa, Namibia, Angola, Congo, Gulf of Guinea, Dakar, off Mauritania, Canaries, Argentina, Brazil, off Amazon, Jamaica, Gulf of Mexico, Cuba, Florida, Sargasso Sea, off Bermuda, Chesapeake Bay, Long Island, Gulf of Maine, off Woods Hole, Island, North Sea, Mediterranean, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea

Area, off Madagascar, Mauritius, Seychelles, Indian, India, Indonesia-Malaysia, Philippines, Vietnam, Chinese Sea, Taiwan, Okinawa, Jaune Sea, Korea, Japan Sea, Bering Sea, W. Pacific (equatorial), Australia, New Zealand, Hawaii, Gulf of California, off Chile. Epipelagic. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Reported at 23 stations over the whole area, more common in the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Qatari waters (Nour El-Din & Ghobashi, 1999; Nour El-Din & Al-Khayat, 2005), West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Macrosetella gracilis* in RSA

Family: Ectinosomatidae Sars, J 903

Genus: *Microsetella* Brady & Robertson, 1873

Scientific Name: *Microsetella rosea* Dana, 1848

Synonyms:

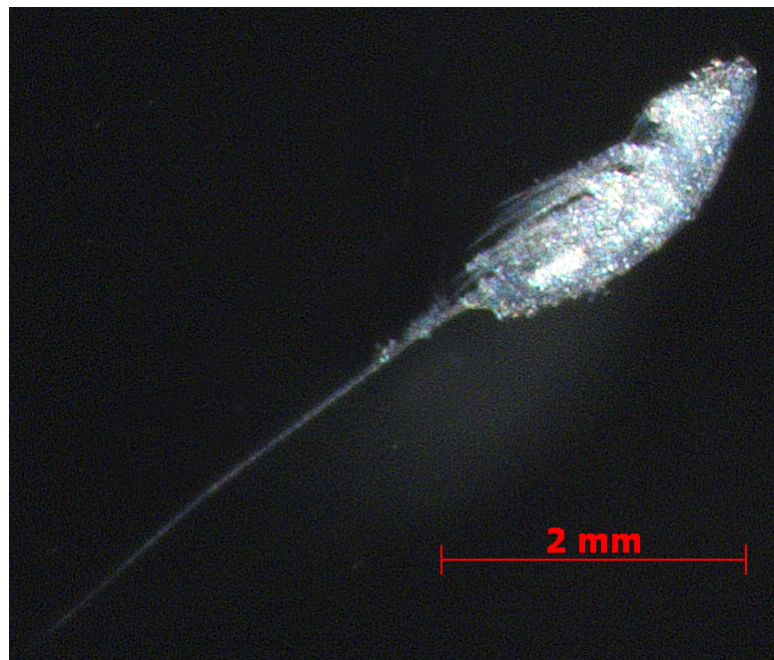
Harpacticus roseus Dana, 1848; *Canthocamptus roseus* Dana, 1852; *Ectinosoma roseum* Thompson & Scott, 1903.

References:

Giesbrecht, 1892; Esterly, 1905; Farran, 1908b; A. Scott, 1909; Pesta, 1913; Monard, 1928; Campbell, 1929; Rose, 1929; Wilson, 1932a; Dakin & Colefax, 1933; Johnson, 1942b; Klie, 1943a; Sewell, 1947; Lang, 1948a; Davis, 1949; Carvalho, 1952a; Vervoort, 1957; Krishnaswamy, 1957; Marques, 1958a; Tanaka, 1960; Fish, 1962; Owre & Foyo, 1967; Wells, 1970; Razouls, 1972; Chen *et al.*, 1974; Boxshall, 1979; Dawson & Knatz, 1980; Björnberg *et al.*, 1981; Sazhina, 1985; Kim *et al.*, 1993; Chihara & Murano, 1997; Bradford-Grieve *et al.*, 1999; Conway *et al.*, 2003.

Description: (Conway *et al.*, 2003).

Female: Body sometimes has a rosy or reddish tinge. Body similar in shape to *Microsetella norvegica*, but almost twice the length. The 2nd, 3rd and 4th metasome segments, and the three urosome segments with transverse rows of spinules near the anterior margins. The longest seta of the furca is nearly twice as long as the body. P5 with the inner setae approximately equal in length.



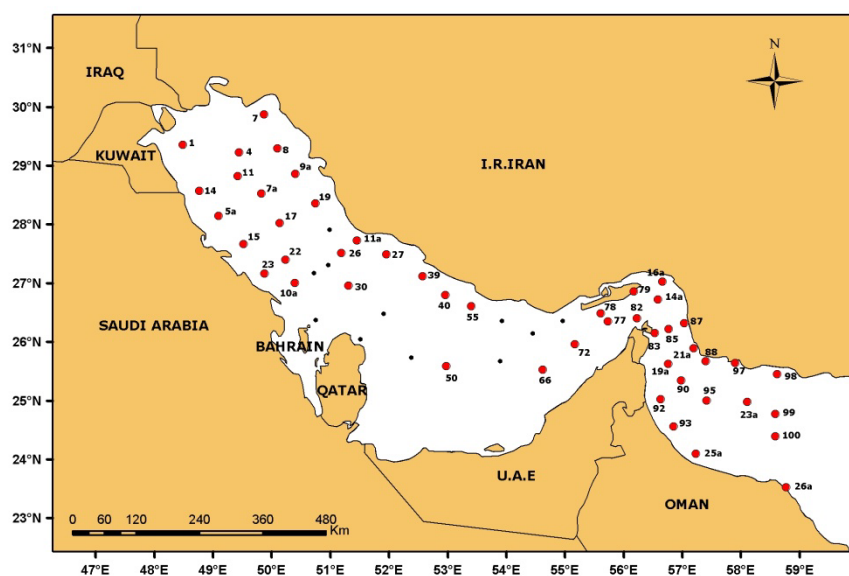
Microsetella rosea

Distribution:

Sub-Antarctic (Indian), South Africa, Namibia, Angola, Gulf of Guiny, Dakar, Canaries, Portugal, Brazil, Venezuela, Caraïbes, Jamaica, Cuba, Gulf of Mexico, Florida, Sargasso Sea, off Bermuda, Narragansett Bay, Woods Hole, Ireland, North Sea, Manch, Mediterranean, Gulf of Suez, Red Sea, Gulf of Aden, Arabian Sea, ROPME Sea Area, Maldives, Mozambic Canal, madagascar, Seychelles, Ceylon, India, Indonesia-Malaysia, Philippines, Vietnam, Chinese Sea, Okinawa, Jaune Sea, Korea, Japan Sea, Bering Sea, W. Pacific (equatorial), Australia New Zealand, Hawaii, Vancouver, California, Mexico, Peru, Chile. Epipelagic Sampling depth (sub-Antarct.) 0-250-500 m. (After Razouls *et al.*, 2005-2009).

Sites of occurrence in RSA:

Very common throughout the ROPME Sea Area (Present study, refer sites map) reported earlier at estern ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b), Doha Harbour (Dorgham & Hussein, 1997), Qatari waters (Nour El-Din & Ghobashi, 1999), Nour El-Din & Al-Khayat, 2005), West coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977; Baker and Hosney, 2005).



Sites of occurrence of *Microsetella rosea* in RSA

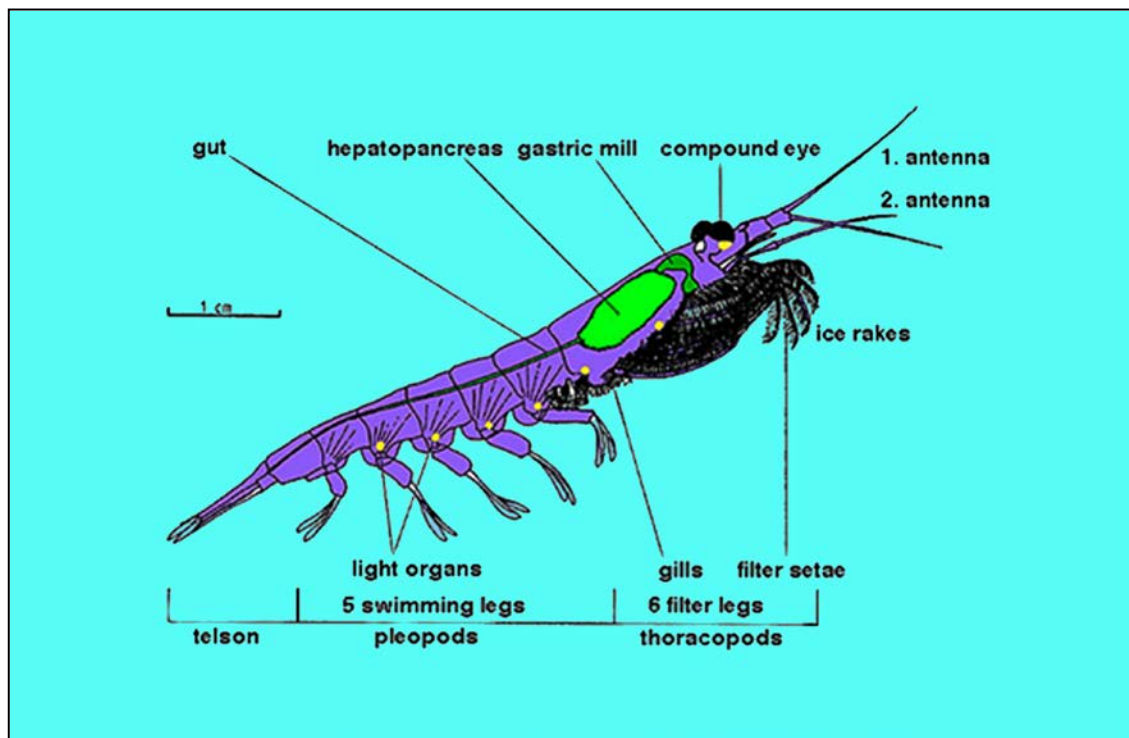
Sub-phylum: Crustacea

Class: Malacostraca

3.6.7 Order: Euphausiacea

Family: Euphausiidae

Euphausiaceans or Krill are crustaceans and have a chitinous transparent exoskeleton made up of three segments: the cephalon, the thorax, and the abdomen. The first two segments are fused into one segment, the cephalothorax. Krill possess compound eyes, two antennae and variable number of pairs of thoracic legs (among genera and species) called pereopods or thoracopods. These thoracic legs include the feeding legs and the grooming legs. Additionally all species have five swimming legs called pleopods. Krill can be easily distinguished from other crustaceans such as true shrimp by their externally visible gills.



Morphology of Euphausiacea

Family: Euphausiidae

Genus *Euphausia* (Dana, 1850)

Scientific Name: *Euphausia brevis* (Hansen, 1905)

References:

Baker *et al.*, 1990; Baker, 1970; Boden *et al.*, 1955; Brinton, 1975; Costanzo and Guglielmo, 1976a; Hansen, 1912; Hirota, 1987; Mauchline and Fisher, 1969; Mauchline, 1980; Bisby *et al.*, 2005; Boden *et al.*, 1955; Zheng *et al.*, 2003.

Description:

Brightly shining; the eye is round and large in size. The 1st segment of peduncle of 1st Antenna bears a slender distally-bifurcate lappet reaching upward. Occasionally the lappet is nearly vertical, though the paired acute tips may bend somewhat forward over part of the 2nd segment. The 2nd segment bears a forward-directed spine at the outer anterior margin. This spine is straight and distinctly acute. The 3rd segment has a low, poorly-defined dorsal keel.



Euphausia brevis

Rostrum is straight, acute, reaching just beyond the anterior limit of the eyes. Carapace has two pairs of lateral denticles. Abdomen bears no dorsal spines. The pleura on the 5th segment terminate acutely at their posterior-lateral limits. In petasma, the trunk of the terminal process tapers to a slender, slightly curved tip. The base of this tip is the point of origin for a slender, straight, distally-directed spine which is nearly parallel to the slender tip. The proximal

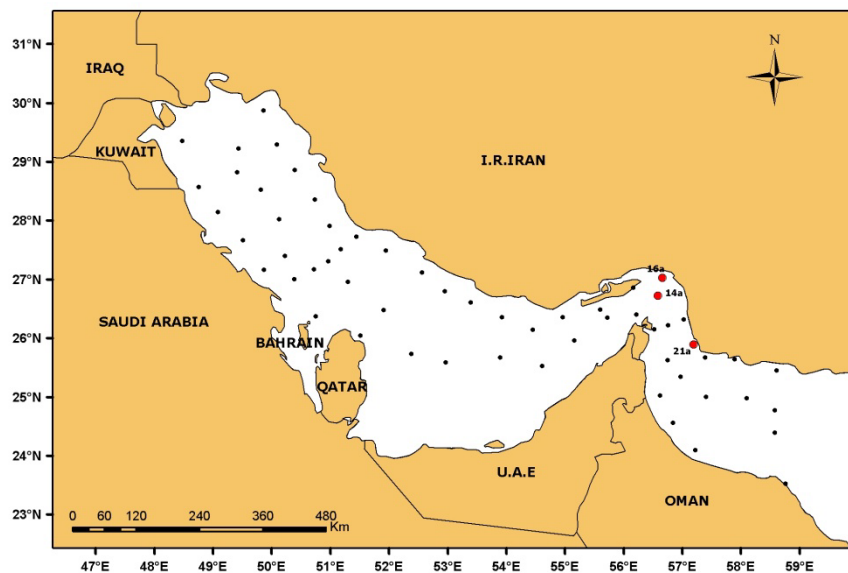
process is curved through 90°, ending as a flat, rounded oblong plate which appears to be acute in lateral view. A short obliquely-pointing tooth-like process is situated at the base of this plate.

Distribution:

subtropical in all ocean basins, Indian Ocean, western Atlantic and Pacific. Adults are above about 100 m at night and below 300 m in daytime.

Sites of occurrence in RSA:

Rare, occurred at two stations inside the Straits of Hormuz and one station in the Sea of Oman (New record, refer sites map).

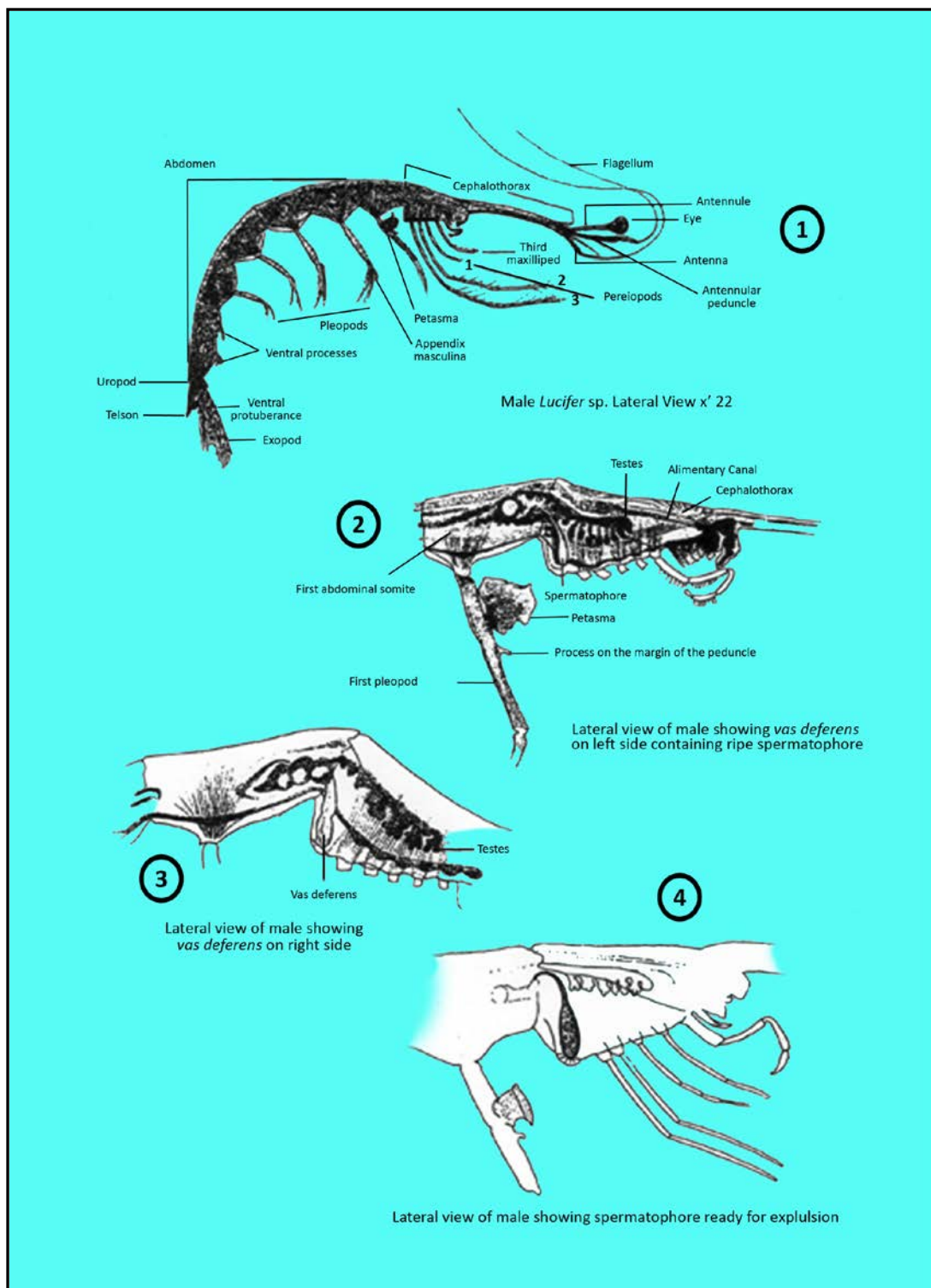


Sites of occurrence of *Euphausia brevis* in RSA

3.6.8 Order: Decapoda

All decapods have ten legs; these are the last five of the eight pairs of thoracic appendages characteristic of crustaceans. The front three pairs function as mouthparts and are generally referred to as maxillipeds, the remainder being pereopods. In many decapods, however, one pair of legs has enlarged pincers; the claws are called *chelae*, so those legs may be called *chelipeds*. Further appendages are found on the abdomen, with each segment capable of

carrying a pair of biramous pleopods, the last of which form part of the tail fan (together with the telson) and are called uropods.



External morphology of adult male *Lucifer* sp. (Bate, 1888)

Family Luciferidae (De Hann, 1849)

Genus: *Lucifer* (Thompson, 1829)

Scientific Name: *Lucifer ancestra* Dana 1852

Synonyms:

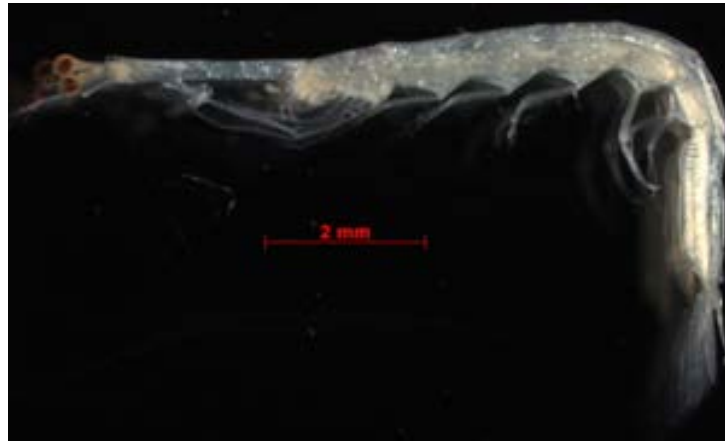
Lucifer pacificus Dana 1852; *Lucifer reynaudi* Dohrn 1871; *Lucifer typus* H. Milne Edwards and Borradaile 1915; *Lucifer reynaudii* Bate 1888; *Lucifer typus* Milne Edwards and Hansen 1919; *Lucifer typus* Dakin and Colefax 1940; *Lucifer typus* Gordon 1956; *Lucifer typus* Kensley 1971; *Lucifer typus* Omori 1992.

References:

Naomi *et al.*, 2006; Karuppasamy and Menon, 2005; Antony, 2005; Conway *et al.*, 2003; Zhong, 1989.

Description:

Somite (a) of an adult male, showing the first abdominal foot (PI. 1) and the basal joints of the third maxilliped, and the first, second, and third thoracic limbs (Pi: 1, Pi: 2, Pr. 3). The testis consists of a series of about eight pouches or follicles, which hang down into the body cavity under the anterior end of the intestine. The body of the animal is so thin that it is almost impossible to get a good dorsal view without crushing the specimen; but a very careful examination of the side view seems to show that there is only a single organ on the median line of the body, as SEMPER states. On each side of the intestine, along the line where the testis joins its wall, a small tubular vas deferens (vd) arises, and runs backwards along the side of the intestine nearly to the end of the first abdominal somite, to which it seems to be attached (at I) by a ligament. It then bends outwards and forwards upon itself to form a second much larger portion (sp), which is parallel to and outside of the first portion, and reaches nearly to the anterior edge of the first abdominal somite. The third or terminal portion (sv) has a large cavity, thick walls, and it runs down to an external opening which is situated on the outer edge of the sternal surface of the thoracic region, behind the basal joint of the third pereopod, and therefore in the position which would be occupied by the basal joints of the fourth or fifth pereopods if they were present.



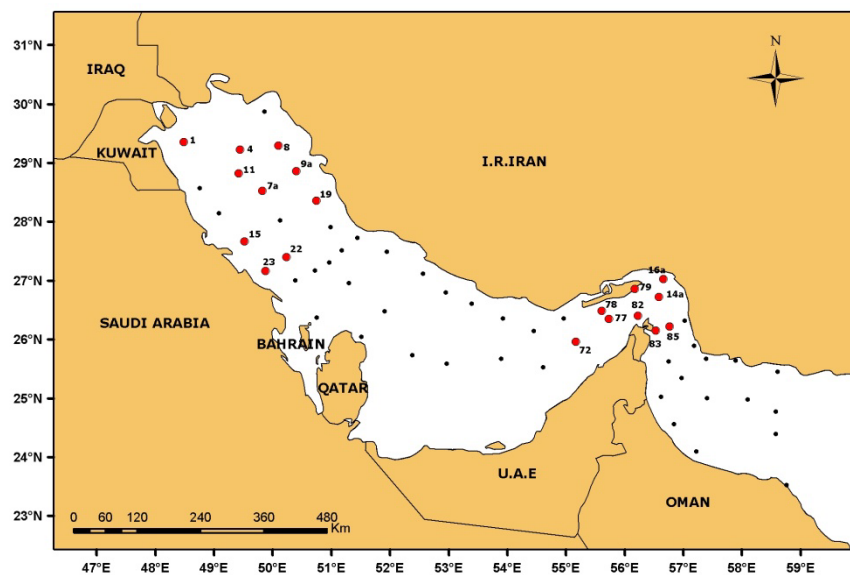
Lucifer acestra

Distribution:

India (Bay of Bengal, Arabian Sea, Andaman and Nicobar Islands, Goa), Turkey.

Sites of occurrence in RSA:

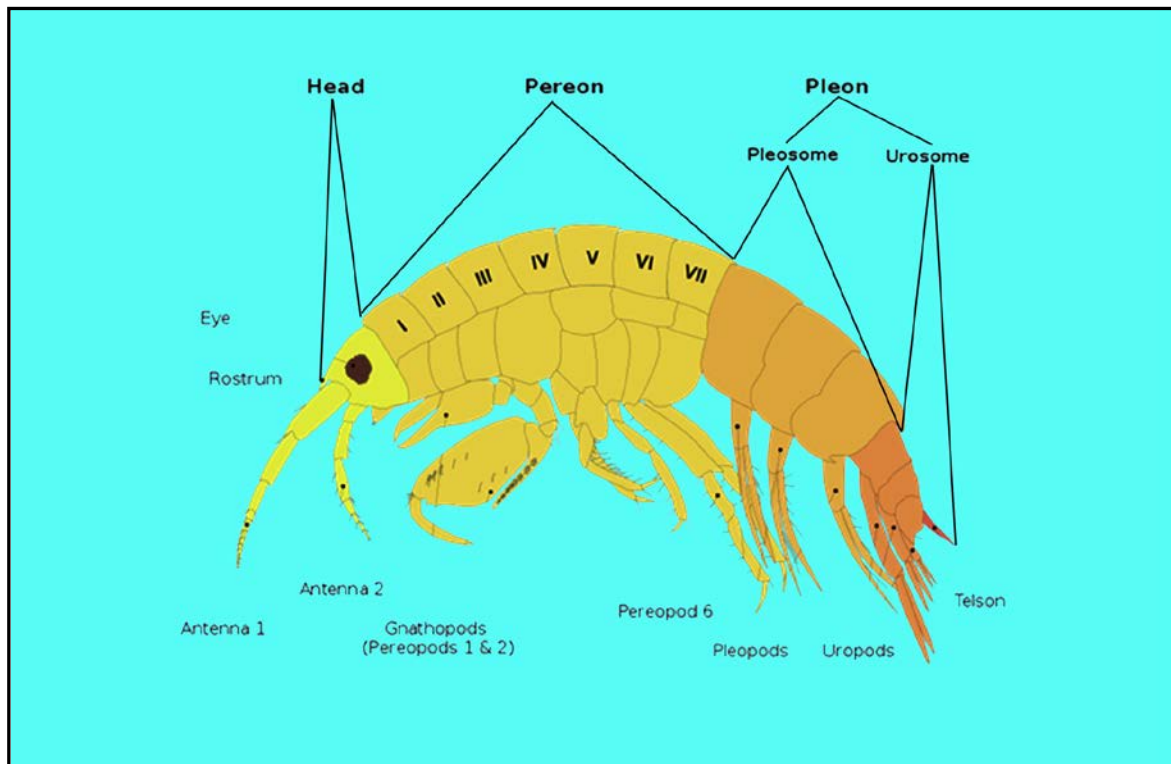
Northern and southern parts of the inner RSA , Straits of Hormuz and Sea of Oman (New record, refer sites map).



Sites of occurrence of *Lucifer acestra* in RSA

3.6.9 Order: Amphipoda Latreille, 1816

Amphipods are elongate and more or less compressed laterally. They lack the crustacean carapace, thoracic segments make up most of the body, and seven (rarely six) of them are distinct and bear leglike appendages. The abdominal segments are more often or less fused. Amphipods have two pairs of antennae, with one pair usually very small. The eyes are well developed, sometimes reduced or absent.



Morphology of an amphipod (Wikipedia)

Family: Oxycephalidae Dana, 1853

Genus: *Streetsia* Stebbing, 1888

Scientific Name: *Streetsia challenger* Stebbing, 1888

References:

Bisby *et al.*, 2007; Brands, (comp.) 1989-2005; Lowry and Stoddart, 2003.

Description:

Body elongated, cephalon regularly narrowing towards the tip of the rostrum, rostrum long with well-spaced spinules. First three pleon segments successively becoming shallower backwards, their postero-lateral parts angular but not produced. Double pleon segment as long as telson. Carpus of pereopod 1st long as broad, widening distal wards, its distal border nearly transverse, inner distal part expanded with feebly serrate borders and setose surface. Carpus of 2nd pereopod broader than long, its inner and distal border serrate, inner distal part drawn out into a triangular thumb terminating in a spine. Pereopods 3rd and 4th moderately flattened. Basis of 5th pereopod with straight inner border and convex outer border; basis of 6th pereopod with convex side narrowing distal wards, its lower distal part prolonged into a prominent conical process.

Male: The 1st segment of the flagellum of antenna 1 has a characteristic projection in the distal part of the anterior margin.

Female: First antenna reduced, second absent.



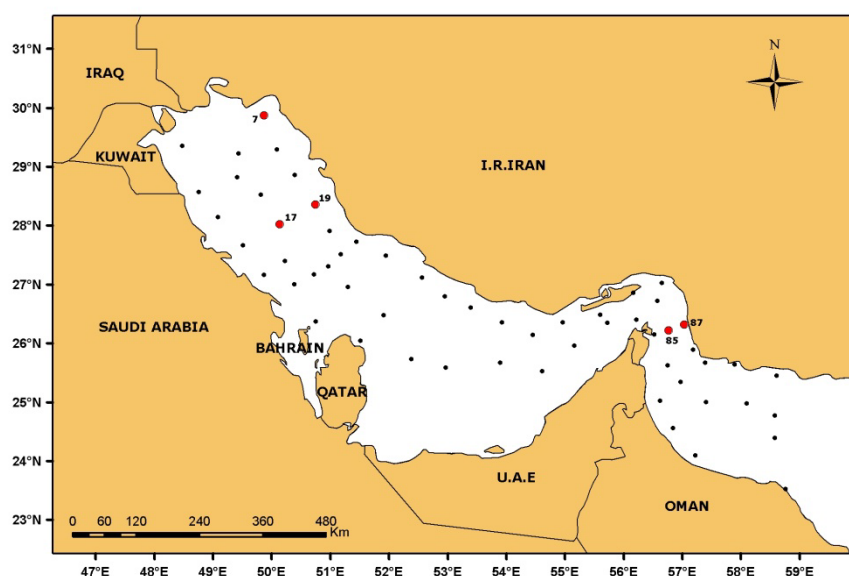
Streetsia challengerii

Distribution:

Warm waters of all oceans, Mediterranean, Australia, India, New South Wales.

Sites of occurrence in RSA:

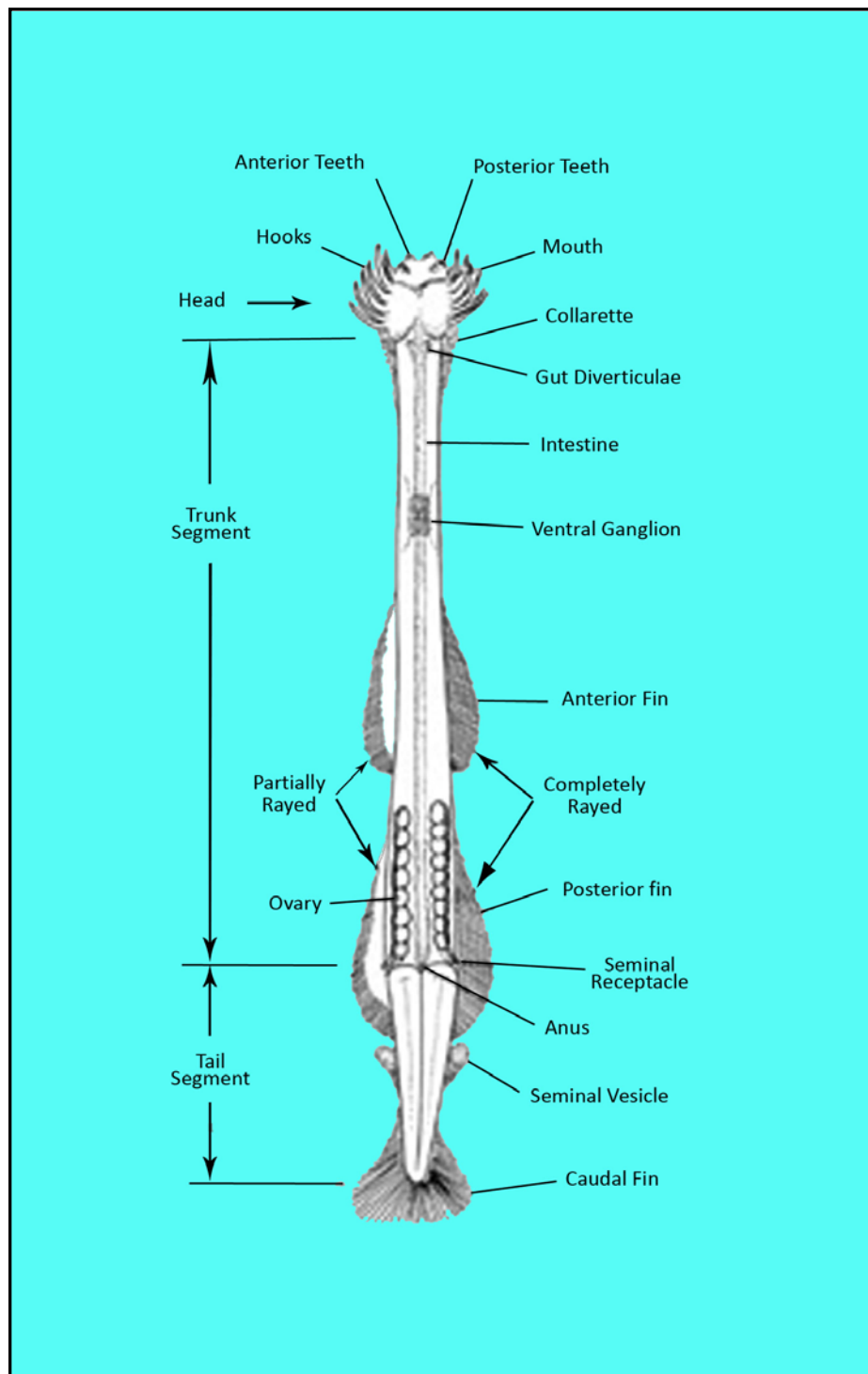
Found at three stations (7, 17 & 19) in the inner RSA and two stations (85 & 87) in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Streetsia challengerii* in RSA

3.7 Phylum: Chaetognatha

Chaetognaths are predatory marine worms. Most of them are transparent, torpedo shaped and usually known as Arrow Worms, covered by a cuticle. The body is divided into a distinct head, trunk and tail. They have fins and a pair of hooked, chitinous, grasping spines on each side of their heads. The spines are covered with a hood when swimming. They have a mouth with one or two rows of tiny teeth, compound eyes, and a nervous system.



Morphology of *Sagitta* sp. (After McLelland, 1989 and Michel, 1984)

Class: Sagittoidea (Claus and Grobben, 1905)

3.7.1 Order: Aphragnophora (Tokioa, 1965)

Family: Krohnittidae Tokioa, 1965

Genus: *Krohnitta* (Ritter-Záhony, 1910)

Scientific Name: *Krohnitta subtilis* (Grassi, 1881)

References:

Van der Land & Kapp, 2001; Khalil & Abd El-Rahman, 1997; Fraser, 1957; UNESCO-IOC Register of Marine Organisms (look up in IMIS); Alvariño, 1965; Alvariño, 1967; Bisby *et al.*, 2005; Dakin and Colefax, 1940; Hansson, 1998; Jia *et al.*, 2004; Johnson and Terazaki, 2003; Jumao-as and von Westernhagen, 1975; Kehayias, 2003; Lutschinger, 1993; Naranjo Padilla, 2000; Pierrot-Bultz, 2004; Pierrot-Bultz and Chidgey, 1988; Stone, 1969; Suarez-Caabro and Madruga, 1960; Sudarsan, 1961; Sund and Cummings, 1966; Tokioa, 1940; Ulloa *et al.*, 2000.

Description: (Grassi, 1881).

Hooks: 6-9; anterior teeth: 10-13; posterior teeth: none. Maximum adult body length: 16 mm; tail: 30-40 %. Body slender; transversal musculature absent; head fairly large; hooks not serrated. Fin bridge absent; one pair of short lateral fins both on trunk and tail; posterior fins short, partially rayed or no rays, rounded. Collarete absent; gut diverticula absent. Small eyes with star-shaped pigment spot. Seminal vesicles with knob and trunk; position of seminal vesicles: touching both posterior fins and tail fin. Ovaries short; ova fairly large. Adhesive papillae and adhesive organs absent. Apical glands absent.

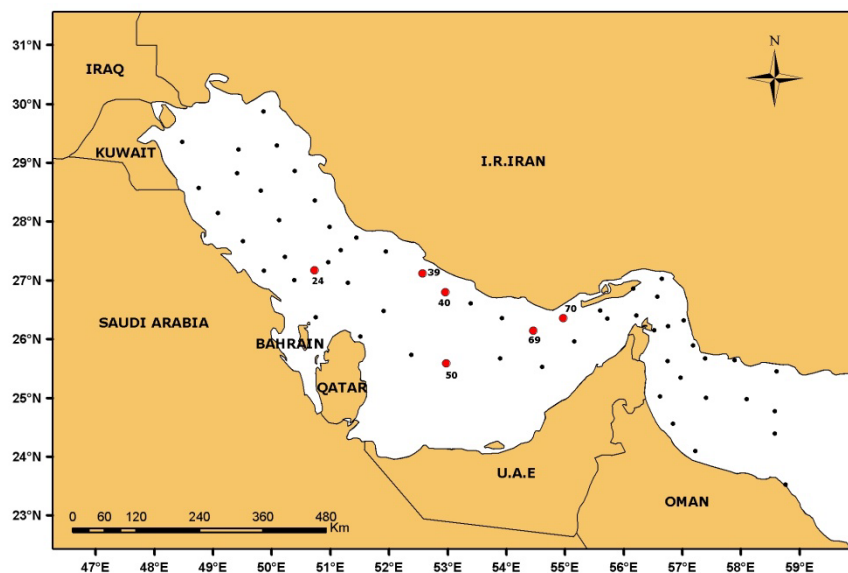


Krohnitta subtilis

Distribution:

Epi- and mesopelagic; tropico-equatorial species, global between 40°N and 40°S. Mediterranean, Atlantic, Caribbean Sea, Indian Ocean, Pacific Ocean.

Sites of occurrence in RSA: Southern inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Krohnitta subtilis* in RSA

Family: Sagittidae (Claus and Groben, 1905)

Genus: *Flaccisagitta* Tokioka, 1965

Scientific Name: *Flaccisagitta enflata* (Grassi, 1881)

Synonyms:

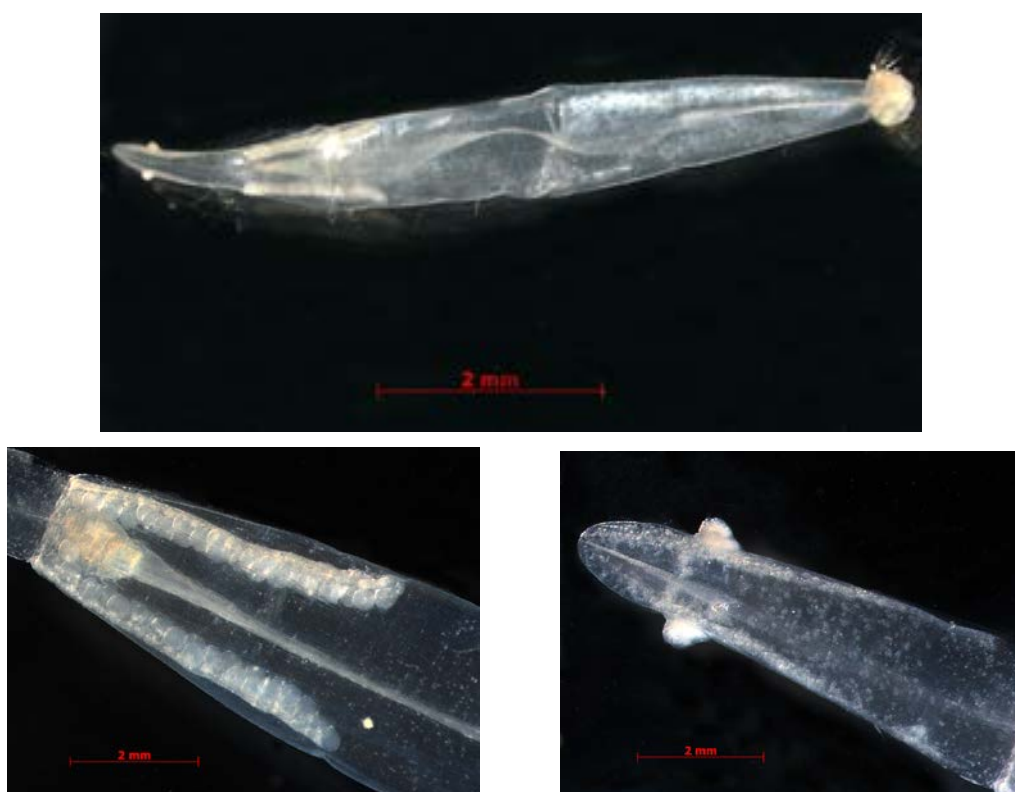
Sagitta inflata, Baldasseroni, 1915; Germain & Joubinn, 1916; Scaccini & Ghirardelli, 1941; Ramault & Rose, 1945; Ghirardelli, 1947; Hamon, 1950; Rose, 1953; Silas and Srinivasan, 1968; *Sagitta gardineri*, Doncaster, 1903; Doncaster, 1903; John, 1933; Lele & Gae, 1936; *S.enflata f. Gardineri*, Tokioka, 1959; *Sagitta australis*, Johnston, 1909; *Sagitta australis*, Johnston&Taylor, 1919; *S. Gazellae*, Burfield, 1930.

References:

Hamon, 1950; Rose, 1953; Silas and Srinivasan, 1968; van der Land, and Kapp, 2001; UNESCO-IOC; Bainbridge, 1972; Bieri, 1959; Bisby *et al.*, 2005; Bisby *et al.*, 2007; Crelrier and Daponte, 2004; Dakin and Colefax 1940; Du *et al.*, 2003; Grant, 1963; Hansson, 1998; Johnson and Terazaki 2003; Jumao-as, and von Westernhagen 1975; Kehayias, 2003; Liang and Vega-Perez 2002; Naranjo Padilla, 2000; Pierce, 1953; Pierce, 1958; Pierrot-Bultz, 2004; Stone, 1969; Suarez-Caabro, 1955; Tokioka, 1940.

Description:

Individuals have 8–10 hooks, 4–10 anterior teeth, and 4–15 posterior teeth. Maximum adult body length is 0.98 in (25 mm), and the relative tail length is quite short at 14–17% of total body size. The body is flaccid and transparent. There are two pairs of lateral fins and no fin bridge. Anterior fins are very short, partially rayed, and round. Posterior fins are short, partially rayed, and round. There is no collarete, nor are there gut diverticula. Eyes are small, with star-shaped pigment spots. Seminal vesicles are round, touch the tail fin, and are well separated from the posterior fins. Ovaries are small, reaching to the middle of the post fins; ova are large.



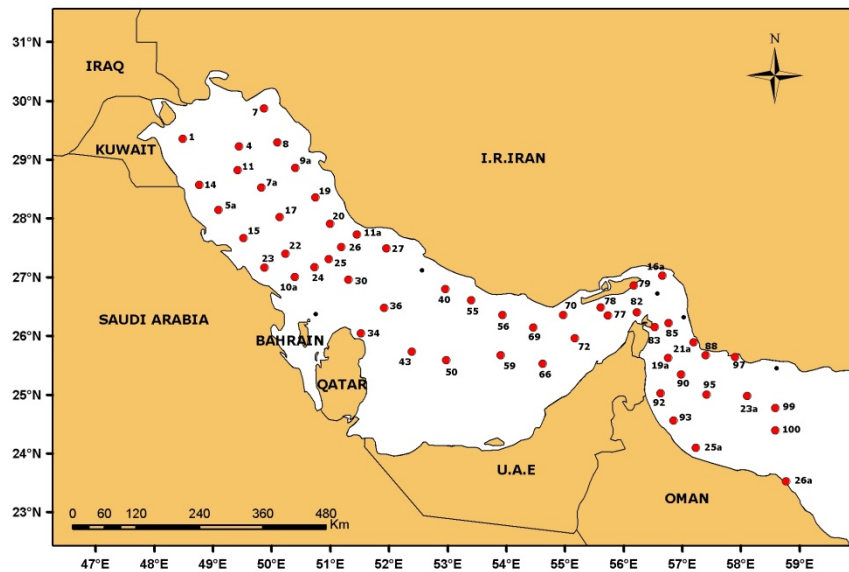
Flaccisagitta enflata

Distribution:

This is a cosmopolitan epiplanktonic species of temperate and warm oceanic waters. Dominant epiplanktonic species of the Indian Ocean extending southwards to 43°S. Epiplanktonic, 0-200, seldom penetrates below 250m (After Census of Marine Zooplankton).

Sites of occurrence in RSA:

One of the most common zooplankton species in the ROPME Sea Area (Present study, refer sites map), found earlier in the western ROPME Sea Area (Michle *et al.*, 1986a) Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004), Doha Harbour (Dorgham & Hussein, 1997), west coast of UAE, inner RSA (Gibreel *et al.*, 1997), Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Flaccisagitta enflata* in RSA

Family: Sagittidae (Claus and Groben, 1905)

Genus: *Aidanosagitta* Tokioka and Pathansali, 1963

Scientific Name: *Aidanosagitta neglecta* (Aida, 1897)

Synonyms:

Sagitta neglecta (Aida, 1897); *Sagitta trichodermis* Oye 1918; *Sagitta tenuis* John, 1913.

References:

Thomson, 1947; Chacko, 1950; Sudarsan, 1961; Vijayalakshmi Nair, 1977; Lutschinger, 1993; Du *et al.*, 2003; Pierrot-Bultz, 2004; Bisby *et al.*, 2007.

Description: (Aida, 1897).

Hooks: 3-7; anterior teeth: 7; posterior teeth: 18. Maximum adult body length: 8 mm; tail: 26-30 %. Body firm, opaque; transversal musculature absent; head narrow; hooks not serrated. Fin bridge absent. Anterior fins of medium length, fully rayed, rounded. Posterior fins of medium length, fully rayed, rounded. Long and narrow collarete; gut diverticula present.

Large eyes, with star-shaped pigment spot. Seminal vesicles with knob and trunk; position of seminal vesicles: touching, or close to, posterior fins, but separated from tail fin. Ovaries long, reaching to neck region; ova large. Adhesive papillae and adhesive organs absent.



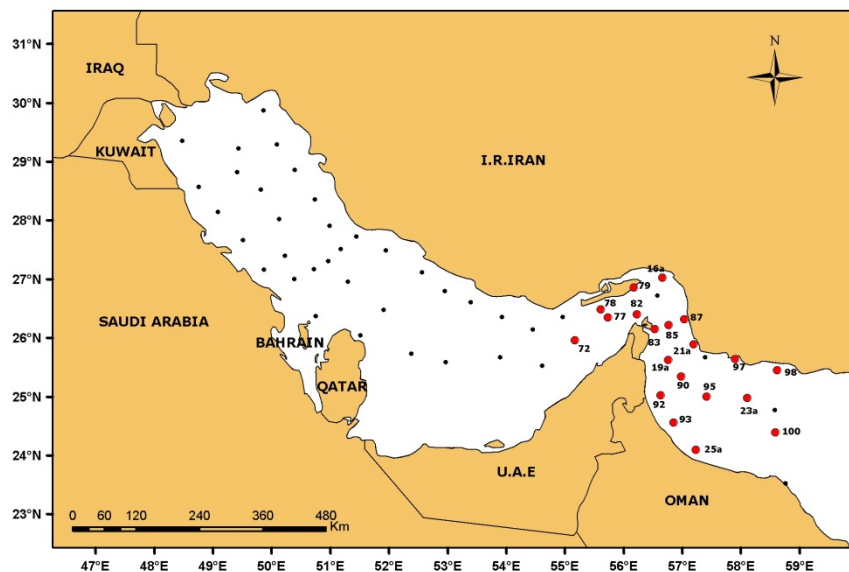
Aidanosagitta neglecta

Distribution:

Epipelagic; tropico-equatorial Indo-Pacific between 30° and 30°N, Archipelago, Red Sea, more numerous in the coastal waters than in the central areas of the oceans, Chinese seas, Philippines, eastern north Pacific (California, Oregon, Washington), Mediterranean Sea, Red Sea, ROPME Sea Area.

Sites of occurrence in RSA:

Widely distributed in the Sea of Oman, Straits of Hormuz and its adjacent waters in the inner RSA (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), Kuwaiti waters (Michel *et al.*, 1986b; Al-Yamani *et al.*, 2004).



Sites of occurrence of *Aidanosagitta neglecta* in RSA

Family: Sagittidae (Claus and Groben, 1905)

Genus: *Serratosagitta* Tokioka, 1965

Scientific Name: *Serratosagitta serratodentata* (Krohn, 1853)

Synonyms:

Sagitta serratodentata (Krohn, 1853)

References:

Van der Land and Kapp, 2001; Gosner, 1978; Linkletter, 1977; Miner, 1950.

Description: (Krohn, 1853).

Hooks: 5-9; anterior teeth: 6-10; posterior teeth: 12-20. Maximum adult body length: 13 mm; tail: 22-30 %. Body slender, needle-like and firm, opaque; transversal musculature absent; head fairly narrow; hooks serrated both in juveniles and in adults. Fin bridge absent. Anterior fins of medium length, reaching to posterior end of ventral ganglion, partially rayed, angular;

posterior fins long, partially rayed, angular. Collarette absent or very small; gut diverticula absent. Small eyes, with T-shaped pigment spot. Seminal vesicles with knob and trunk; position of seminal vesicles: between fins, nearly touching both posterior fins and tail fin when mature. Ovaries long, reaching anterior end of ventral ganglion or neck region; ova small. Adhesive papillae and adhesive organs absent. Apical glands absent.



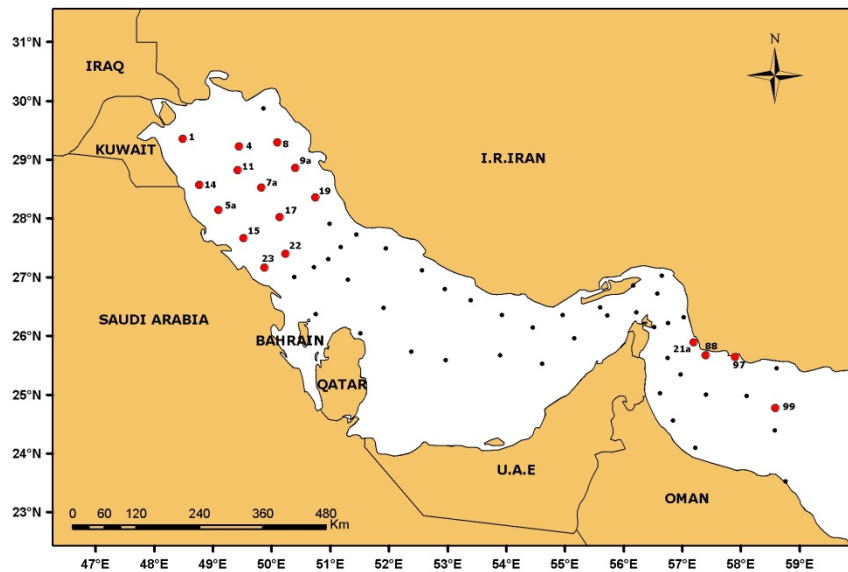
Serratosagitta serratodentata

Distribution:

Epipelagic, All oceans, Philippines, Canada, Caribbean Sea, Mexico, Agulhas Current, Mediterranean, Celtic Biscay Shelf, Guinea current, NE USA Continental shelf.

Sites of occurrence in RSA:

Common in the northern part of the inner RSA, rare in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Serratosagitta serratodentata* in RSA

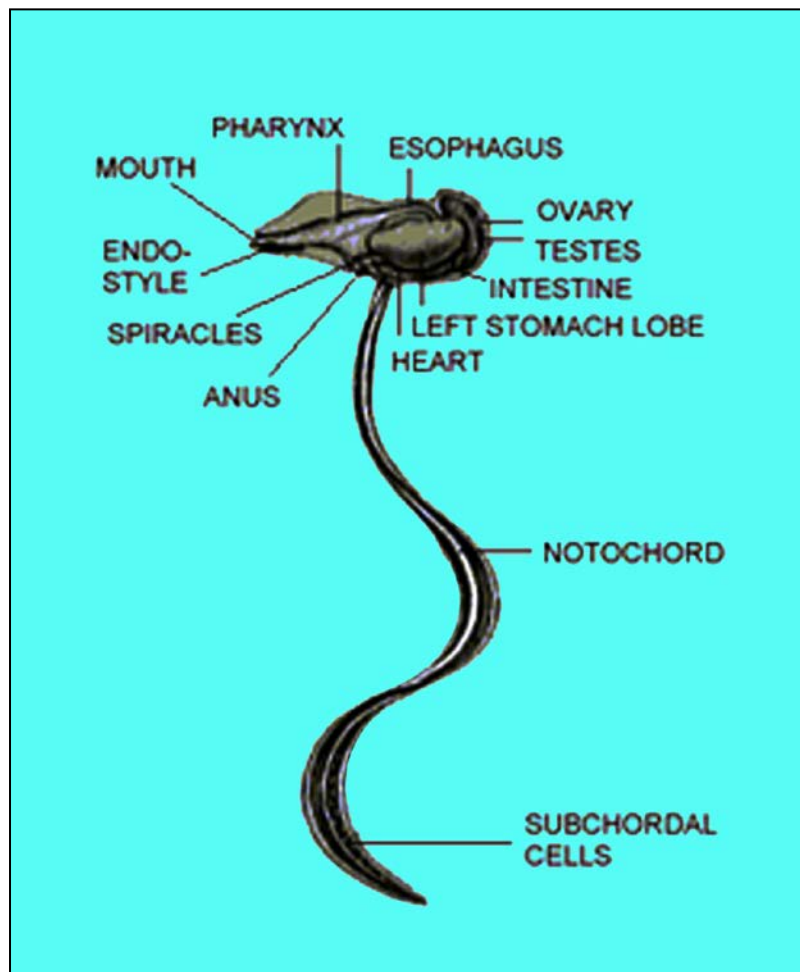
3.8 Phylum: Chordata

Sub-phylum: Urochordata

Class: Larvacea

The Larvacea, sometimes called the Appendicularians are small planktonic animals, quite different in form to the rest of the Urochordata. Their body consists of an oval trunk and a long thin tail. The tail is retained all through the animal life, unlike the rest of the Urochordates where it is lost before maturity. They secrete a gelatinous 'house' around them, encasing the trunk or body, but not the tail, which has muscle cells attached to it and the Larvacean uses it to swim. The house contains some very fine filtering equipment. The larvaceans house is quite a complex structure ensuring water flows through in only the desired channels. The water flows in through two inhalent openings on either side of the animals head, these two streams flows down near the edges of the house, up through the filter system and then down again, now as one single stream, and out through the single exhalent opening. The tail of appendicularians contains a central notochord, a dorsal nerve cord, and a

series of striated muscle bands enveloped either by epithelial tissue (Oikopleurids) or by an acellular basement membrane (Fritillariids).



Morphology of *Oikopleura* sp. (www.informaworld.com/index/908106127.pdf)

3.8.1 Order: Copelata

Family: Fritillariidae

The members of the family Fritillariidae Seeliger, 1895 (as amended by Lohmann, 1915) have dorsoventrally compressed or spindle-shaped trunks. The endostyle is curved upwards. The pharyngeal perforations (spiracles) are in the anterior part of the pharynx and each (with its ring of cilia) opens directly to the exterior, rather than through a tubular passage. The

stomach wall consists of few large cells. The oikoplast epithelium lacks a row of conspicuous oikoplast cells (Fol's fibroblasts) dorsally, and ventrally is a small anterior area only.

Family: Oikopleuridae (Lohmann, 1915)

Oikopleuridae have ovoid bodies, straight endostyles, and the spiracles have tubular passages from the internal pharyngeal openings to the external ones in the vicinity of the rectum. Stomach walls have numerous small cells and a row of only a few large cells. A row of large (Fol's) fibroblasts is on both parts of the antero-dorsal oikoplast epithelium.

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Oikopleura* (Fol, 1872)

Scientific Name: *Oikopleura dioica* (Fol, 1872)

Synonyms:

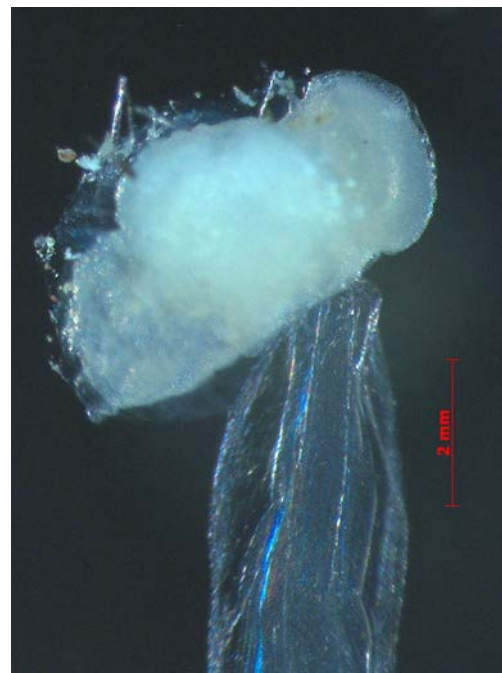
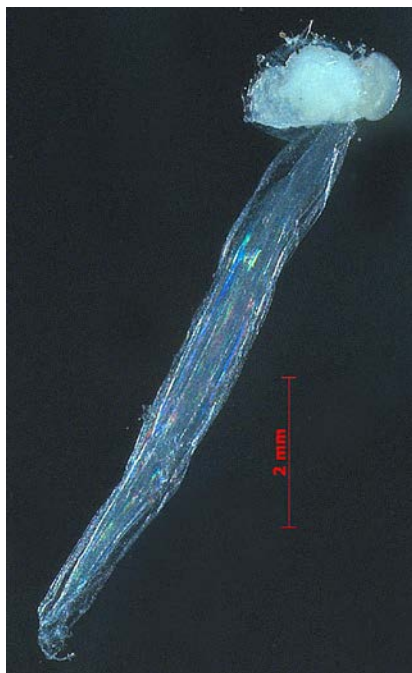
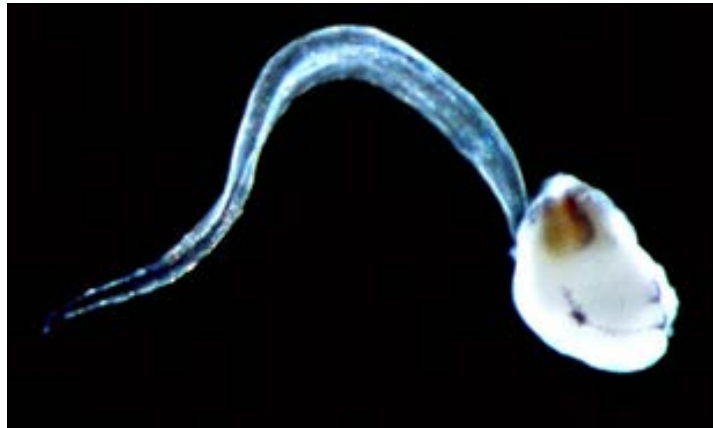
Vexillaria flabellum Müller, 1846; *Appendicularia flabellum* Huxley, 1856; *Vexillaria speciosa* Eisen, 1873; *Oikopleura malmy* Hartmann, 1878; *Oikopleura flabellum* Müller, 1887; *Oikopleura flabellum* Huxley, 1887; *ekopleura dioica* Carus, 1889-1893; *Oikopleura (Vexillaria) dioica* Lohmann, 1933.

References:

Bückmann and Kapp, 1975; Fenaux, 1967; 1998; Flood and Deibel, 1998; Fraser, 1981; Lohmann, 1896; 1901; Newell and Newell, 1977; Wyatt, 1973.

Description: (Fol, 1872).

A small appendicularian. The trunk is ovoid. The tail is narrow, being 2-4 mm; the length of the tail is about four times the body length; the tail has a narrow tail muscle and two distinct, characteristic sub-chordal cells at about 1/2 to 2/3 down the length of the tail (well distinguishable even in unstained material). In this species the sexes are separated (which is not the case in all other known species of Appendicularia). Ovary or testis posteriorly. Mouth with a small lower lip. The endostyle is rather voluminous, posteriorly prolonged to just near the anus. The buccal glands are small and spherica. The right stomach lobe forms a cloacal sac behind the entrance to the intestine.



Oikopleura dioica

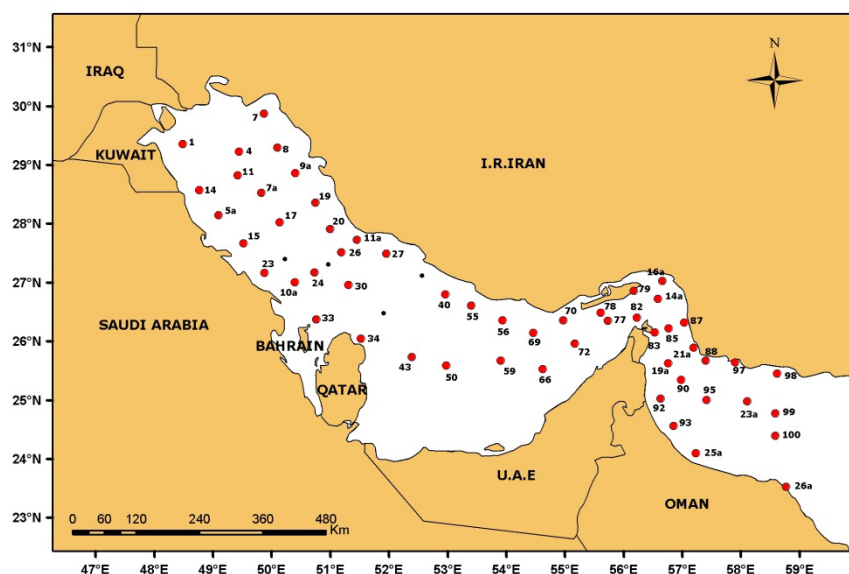
Distribution:

A semi-cosmopolitan, neritic species from warm and temperate waters. Atlantic, Indian and Pacific Oceans. Also present in Mediterranean Sea and Red Sea. From all Appendicularia, *O. dioica* is the most eurytherm and euryhaline species.

Sites of occurrence in RSA:

Reported throughout the whole ROPME Sea Area (Present study, refer sites map), found earlier in Doha Harbour (Dorgham & Hussein, 19970), west coast of UAE, inner RSA

(Gibreel *et al.*, 1997), Kuwaiti waters (Al-Yamani *et al.*, 2004) and Saudi waters of the RSA (Baker and Hosney, 2005).



Sites of occurrence of *Oikopleura dioica* in RSA

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Oikopleura*

Scientific Name: *Oikopleura intermedia* (Lohmann, 1896)

References:

Zheng *et al.*, 2003; Bhavanarayana and Ganapati 1971; Bisby *et al.*, 2005; Bückmann, 1973; Fenaux, 1973; Kott, 2005; Madin, 1991; MarineSpecies.org 2007.

Description: (Lohmann, 1896).

Trunk up to 2.5 mm long (*Oikopleura intermedia*). Postcardial caecum arising dorso-genitally, describing a wide bend. Wide bay between the genital parts of left and right lobes of the stomach. Rectum extending beyond the oral wall of the stomach. Gonads arising between the stomach lobes, later surpassing them genitally and laterally. Tail musculature broad.



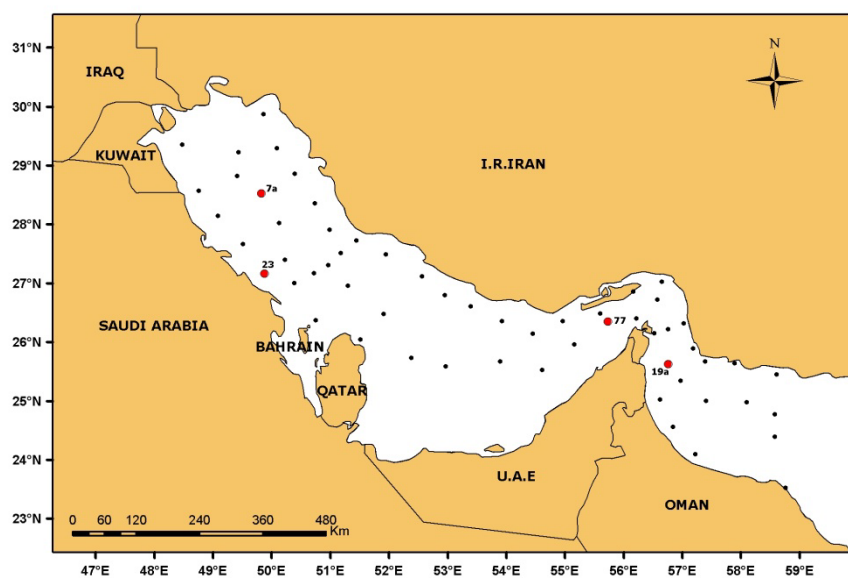
Oikopleura intermedia

Distribution:

Gulf of California, Florida current, Peru, Mediterranean, South Atlantic, Gulf of Mexico, Brazil.

Sites of occurrence in RSA:

Rare, recorded at three scattered stations in the inner RSA and one station in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Oikopleura intermedia* in RSA

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Oikopleura*

Scientific Name: *Oikopleura longicauda* (Vogt, 1854)

Synonyms:

Appendicularia longicauda Vogt, 1854.

References:

Bisby *et al.*, 2005; Aravena and Palma, 2002; Bückmann, 1973; Esnal and Castro, 1977; Fenaux, 1973; Hansson, 1989; Jia *et al.*, 2004; Kott, 2005; Madin, 1991; MarineSpecies.org 2007; Scheinberg *et al.*, 2005; Tomita *et al.*, 2003.

Description: (Vogt, 1854).

Trunk compact, up to 1.4 mm long (*Oikopleura longicauda*). Postcardial caecum pointing dorsally, adjoining the genital wall of the esophagus. A long velum (often torn) extending dorsally over the oral part of the trunk. Rectum extending scarcely beyond the oral wall of the stomach. Gonads adjoining the coil of the gut, and embracing it laterally when ripe. Tail musculature broad.



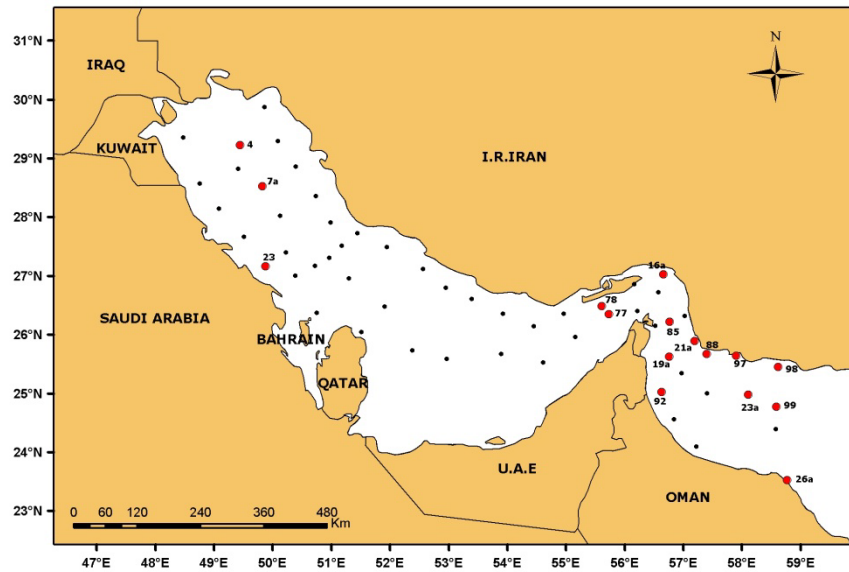
Oikopleura longicauda

Distribution:

Japan Sea, Indian Ocean, Gulf of Mannar, Australia, Indian Ocean, Red Sea and ROPME Sea Area has evolved, Pacific, Hawaii, Black Sea, Mediterranean.

Sites of occurrence in RSA:

Observed occasionally at two stations (7a & 23) in the northern part and two stations (77 & 78) in the southern part of the inner RSA, more common in the Sea of Oman (Present study, refer sites map), reported also is Saudi waters of the RSA (Basson, 1977).



Sites of occurrence of *Oikopleura longicauda* in RSA

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Oikopleura*

Scientific Name: *Oikopleura parva* (Lohmann, 1896)

Synonyms:

Oikopleura najadis Uebel, 1913; *Oikopleura (Vexillaria) parva* Lohmann, 1933.

References:

Bückmann and Kapp, 1975; Fenaux, 1967; 1998; Fraser, 1981; Lohmann, 1896; 1901.

Description: (Lohmann, 1896).

A small species, with an allongated but small trunk compared to the very long and broad tail. The tail is weak because the broad chordal muscles are poorly developed; at the left distal part are four fusiform sub-chordal glands in one line. In mature specimens, the ovary and the two lateral testes form a round mass restricted in the genital part, giving a characteristic aspect to the trunk. The mouth has a short lower lip. The endostyle is short and narrow, situated about half way the mouth and anus. There are two voluminous and rounded buccal glands. The left lobe of the stomach is rounded, with a very small post cardiac caecum, appearing reniform.



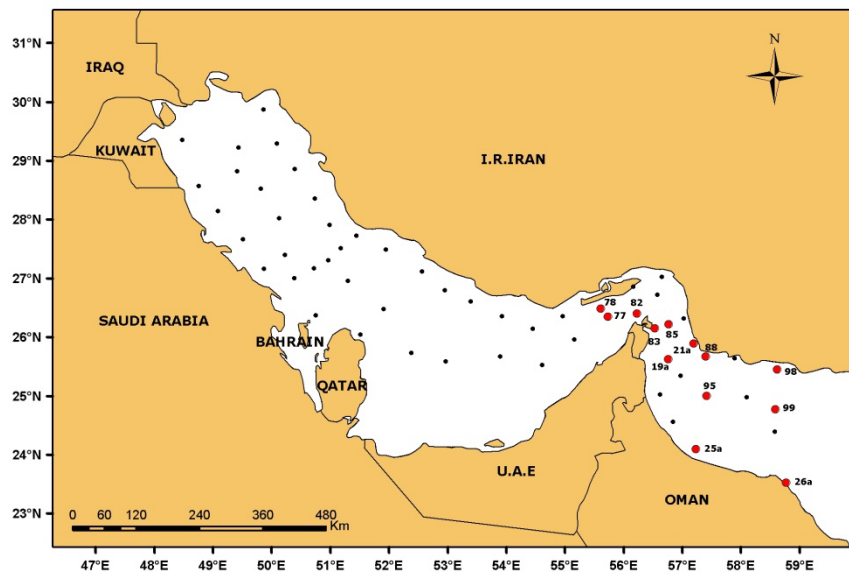
Oikopleura parva

Distribution:

Semi-cosmopolitan in cold and warm waters of the North and South Atlantic and Pacific Oceans, Mediterranean Sea, NE Atlantic.

Sites of occurrence in RSA:

Completely missed from most of the inner RSA, except near the Straits of Hormuz, widespread in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Oikopleura parva* in RSA

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Oikopleura*

Scientific Name: *Oikopleura vanhoeffeni* Lohmann, 1896

Synonyms:

Oikopleura rufescens (Fol, 1872).

References:

Bückmann and Kapp, 1975; Fenaux, 1967; 1998; Flood, and Deibel, 1998; Fraser, 1981; Lohmann, 1896; 1901; Bisby *et al.*, 2005; Capitanio *et al.*, 2003; Hansson, 1989.

Description: (Lohmann, 1896).

A rather large appendicularian species. The trunk is compact. The left lobe of the stomach is round. A lower lip only present in juveniles, adults with a membraneous circumoral lip. Ovary and testes together forming a round structure behind the stomach and oesophagus. The endostyle is long and narrow, at each side accompanied by an ovoid buccal gland. The tail is long, with a strong chord and medium sized muscular bands; at the right side of the proximal third part of the tail are numerous small sub-chordal glands.



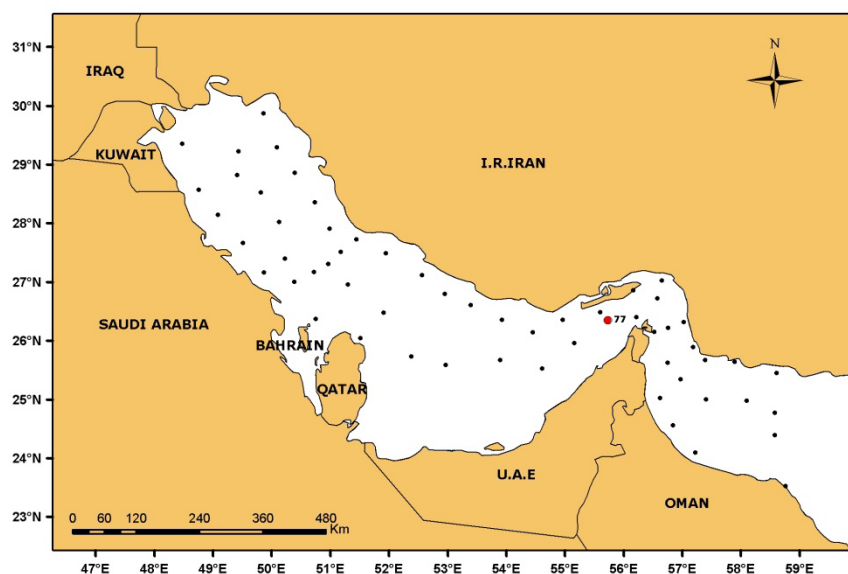
Oikopleura vanhoffeni

Distribution:

Typical cold water appendicularian species for the Arctic, the northern North Atlantic and northern North Pacific Oceans (being most abundant north of 60°N).

Sites of occurrence in RSA:

Extremely rare, reported once only at station 77 near the Straits of Hormuz on Iranian Coast (New record, refer site map).



Site of occurrence of *Oikopleura vanhoffeni* in RSA

Family: Oikopleuridae (Lohmann, 1915)

Genus: *Stegosoma* (Chun, 1888)

Scientific Name: *Stegosoma magnum* (Langerhans, 1880)

Synonyms:

Oikopleura magnum (Langerhans, 1880)

References:

Bhavanarayana, 1974; Bhavanarayana and Ganapati, 1971; Bisby *et al.*, 2005; Bückmann, 1973; Esnal and Castro, 1977; Kott, 2005; Madin, 1991; MarineSpecies.org 2007; van der Land, 2001; Fenaux, 1973; UNESCO-IOC Register of Marine Organisms.

Description: (Chun, 1888).

Trunk up to 4.0 mm long, elongate, laterally compressed (*Stegosoma magnum*). Mouth terminal. Buccal glands spherical and small (*Stegosoma magnum* 2). Spiracles small and round, at both sides of the rectum. Esophagus short. Left part of the stomach suspended from the middle part of the digestive tract. Right part of the stomach reduced to a duct connected to intestine. Intestine long and tubular. Gonads adjoining the coil of the gut, extending laterally when ripe. Tail with about 8 bladder-like subchordal cells arranged in a line, musculature rather narrow.



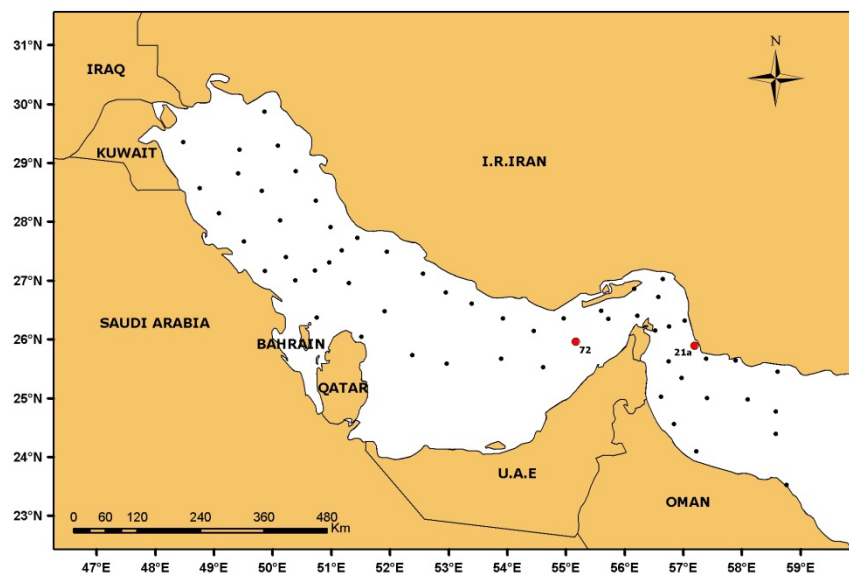
Stegosoma magnum

Distribution:

Indian Ocean, Red Sea, ROPME Sea Area, south Atlantic, Arabian Sea, Mediterranean, Bay of Bengal, Pacific Ocean, Australia, Japan Sea, Black Sea, Sea of Marmara, off Peru.

Sites of occurrence in RSA:

Very rare, found at station 72 at the southern inner RSA and station 21a in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Stegosoma magnum* in RSA

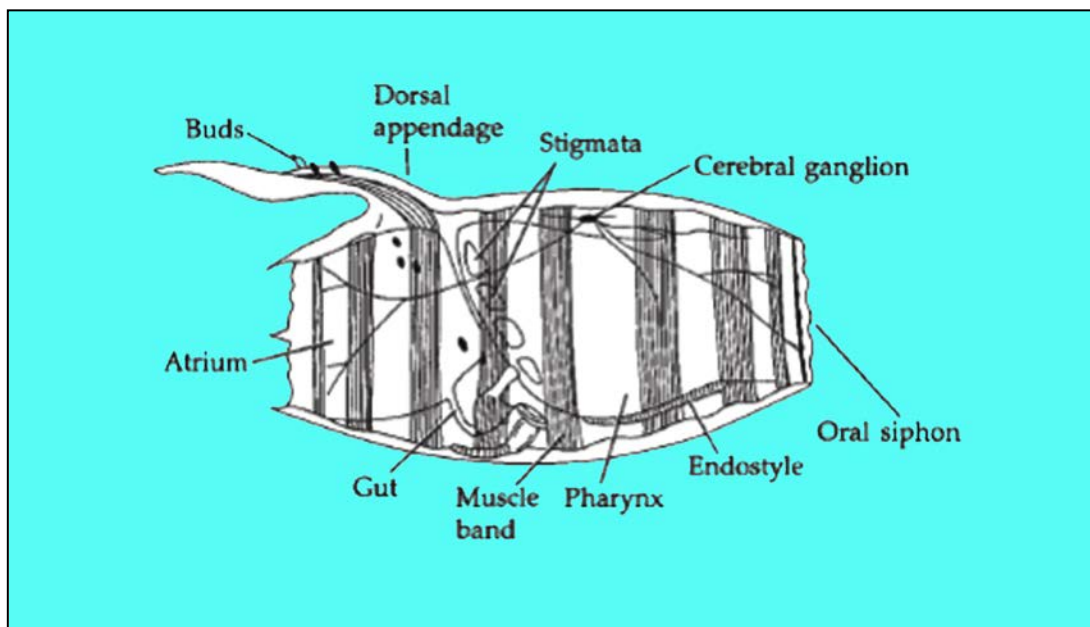
Sub-phylum: Urochordata

The Urochordata, sometimes known as the Tunicata, are commonly known as "sea squirts." The body of an adult tunicate is quite simple, being essentially a sack with two siphons through which water enters and exits. Water is filtered inside the sack-shaped body. There are two classes of tunicates, both consisting of small planktonic animals, the salps (Thaliacea) and the larvaceans (Larvacea).

Class: Thaliacea

3.8.2 Order: Doliolida

Doliolids generally inconspicuous pelagic tunicates, that swim using rapid contractions of the circumferential muscle bands. They are small marine animals (1-2 cm long), barrel-shaped with two wide siphons, one at the front and the other at the back end, and eight or nine circular muscle strands reminiscent of barrel bands. Doliolids are capable of quick movement. They have a complicated life cycle consisting of sexual and asexual generations.



Morphology of *Doliolum*

Family: Doliolidae

Genus: *Doliolum* Quoy & Gaimard, 1835

Scientific Name: *Doliolum denticulatum* Quoy & Gaimard, 1834

References:

Godeaux *et al.*, 1998; Godeaux, 1998; Neumann, 1906. Bisby *et al.*, 2005; Berner, 1968; Godeaux, 1972; Jia *et al.*, 2004; Khalil and Abd El-Rahman 1997; Kott, 2005; Tew and Lo.

2005; Tokioka, 1967; van der Land and van Soest, 2001; UNESCO-IOC Register of Marine Organisms (look up in IMIS).

Description: (Quoy and Gaimard, 1834).

- Gonozooid with eight muscle bands; Dextral arched intestine; branchial septum strongly arched from M2 dorsally to M5, then curving at 2/3 and running to M3 ventrally. The endostyle is short, from M2 to M4. The testis is long and swollen, situated horizontally in front of M3, sometimes beyond M2.
- Oozoids with nine muscle bands, four pairs of gill slits; the dorso-ventral process is in relation to M7. The endostyle is from M2 to M5. The oesophagus concavity is downwards; the intestinal tube is stretched sagittally.
- Nurses are barrel shaped, without visceral mass, except for a heart. Budding on the dorso-ventral process. M2-M8 fused in a continuous sheet. Length up to 2 mm. Nurses of *Doliolum denticulatum* and *Doliolum nationalis* cannot be separated.



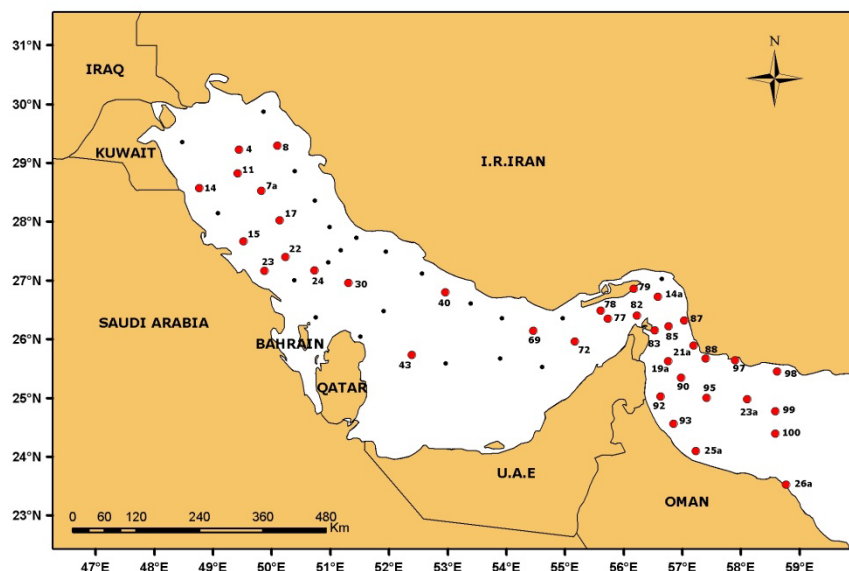
Doliolum denticulatum

Distribution:

Widespread in all Oceans from 40°N to 40°S (following approximately the 10°C isotherm in the north and the 15°C isotherm in the south). Red Sea, Taiwan, sub-arctic, California current, off southern California, Australia, Japan, China Sea, Mediterranean, Pacific. [After Godeaux *et al*, 1998].

Sites of occurrence in RSA:

Widely distributed in the Sea of Oman, the Straits of Hormuz and southern part of the inner RSA (Present study, refer sites map), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Doliolum denticulatum* in RSA

Family: Doliolidae

Genus: *Doliolum*

Scientific Name: *Doliolum (Dolioletta) gegenbauri* Harant and Vernières, 1938

Synonyms:

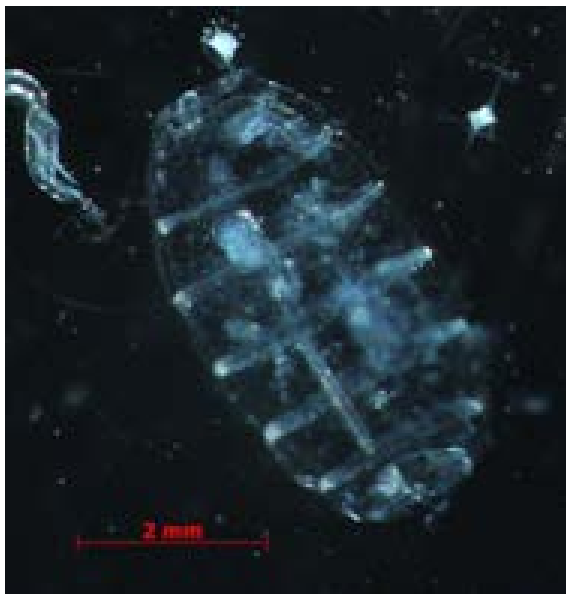
Doliolum gegenbauri Uljanin, 1884; *Doliolum (Dolioletta) gegenbauri* Harant and Vernières, 1938; *Doliolum tritonis* Herdman, 1888; *Doliolum (Dolioletta) tritonis* Harant and Vernières, 1938; *Doliolum ehrenbergi* Uljanin, 1884.

References:

Edwards *et al.*, 1999; Fraser, 1964; 1947; 1981; Godeaux *et al.*, 1998; Godeaux, 1998; Hunt, 1968; Lindley *et al.*, 1990. Bisby *et al.*, 2005; Kott, 2005; Madin, 1991; Hansson, 1989; MarineSpecies.org 2007; Hirose *et al.*, 1999; Tew and Lo., 2005; Berner, 1968; Godeaux, 1972.

Description: (Uljanin, 1884).

Gonozooid rather small, 3-9 mm with thin and delicate test. Intestine dextrally coiled, anus median. The testis is in an oblique line forward and upward, reaching to almost M2 (however, there is large variation in the position of the frontal end, it may reach only M5 but can extend also to M1). The developing testis extends forward in the body cavity, growing gradually to the left and pressing between M3 and the body wall, eventually outside M2 also. Ovary ventro-lateral near M7. Gills in numerous pairs, attached anteriorly and dorsally behind M3, extending rearwards, curving just before M6 and turning forwards to the attachment point at M5. Endostyle long, from between M2 and M3 to almost M5. Dorsal nerve ganglion just behind M3. Anterior aperture with a twelve lobed fringe, posterior aperture with an eight lobed fringe.



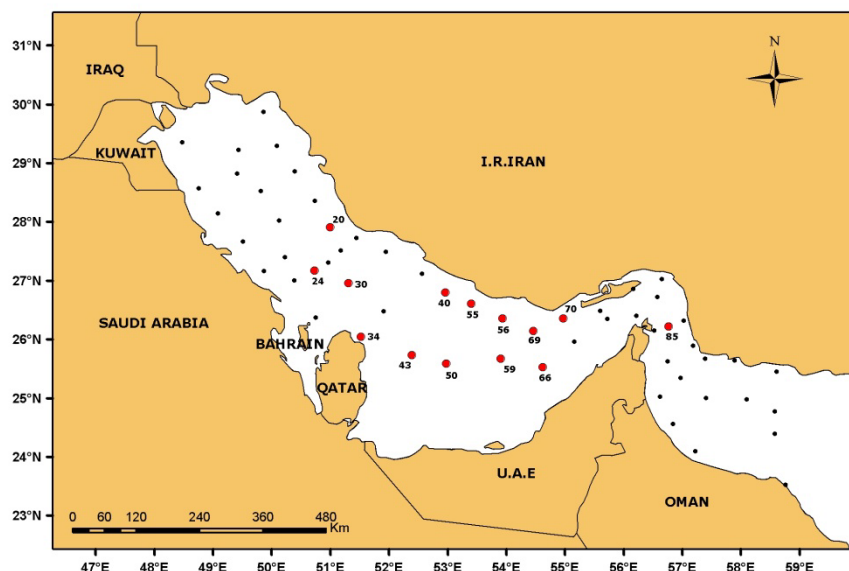
Doliolum (Dolioletta) gegenbauri

Distribution:

Northern, Central and subtropical S Atlantic Ocean; NE Atlantic, tropical and temperate SW Indian Ocean, tropical W and SW Pacific Ocean; Mediterranean Sea, Red Sea, China Sea, Japan Sea, Portugal, North Sea, English Channel, Chile, off Peru, Chesapeake Bay, Bay of Bengal, California current, Taiwan.

Sites of occurrence in RSA:

Concentrated in the central and southern parts of the inner RSA, rare in the Sea of Oman (Present study, refer sites map), west coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Doliolum (Dolioletta) gegenbauri* in RSA

Family: Doliolidae

Genus: *Doliolum*

Scientific Name: *Doliolum mulleri* Krohn, 1852

Synonyms:

Doliolina muelleri var. *krohni* Borgert, 1933

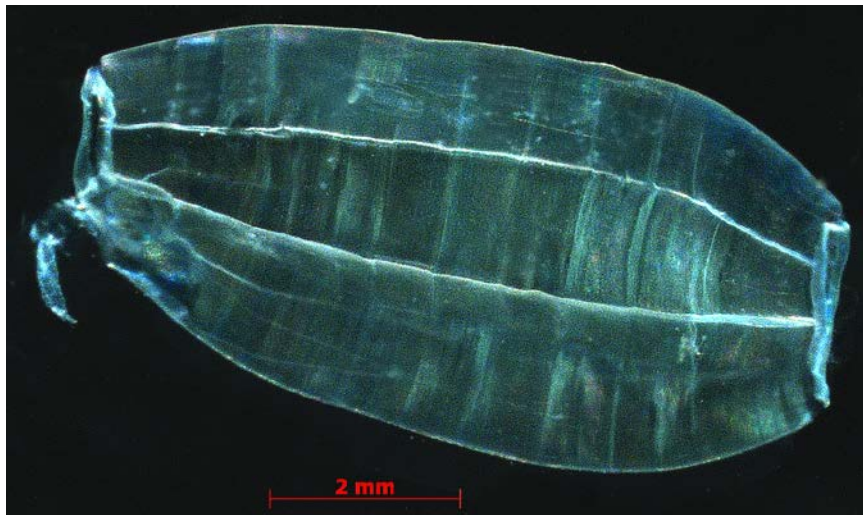
References:

Godeaux, J. 1960.; MarineSpecies.org 2007; Fraser, 1981; Godeaux *et al.*, 1998; Godeaux, 1998.

Description: (Krohn, 1852).

Larval stage tailed, with elongate envelope and intermediate vesicle between tail and cephalo-enteron. Old nurse large, up to 12 mm long; M3, M4, M5, and M6 wider than the rest, M4

and M5 predominant. Gastrozooids with main axis up to 1 mm long, with few gill-slits (less than 12), digestive tract U-shaped, anus located more ventrally than the entrance of the esophagus, fixation peduncle slender, without expansions. In both phorozooids and gonozooids, endostyle running from M23/4 to M42/3. Neural ganglion at M31/4. Gill-septum slightly arched, extending dorsally and ventrally to M5, its posterior bend extending to M51/2. With 10 to 14 pairs of gill-slits. Ovary before M6. Testis pear-shaped, bulging ventrally between M5 and M6. Gonozooids up to 4 mm long; the gonozooids of the variety *krohni* Borgert, 1894 are bigger, up to 7 mm long (endostyle from M2 to M43/4, gill-septum strongly arched, its posterior bend surpassing M6, with 40 to 45 pairs of gill-slits).



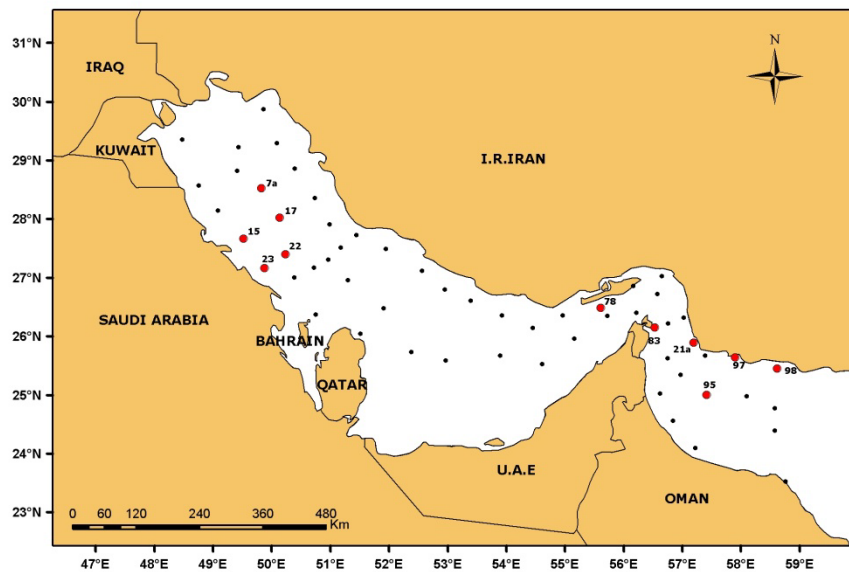
Doliolina mulleri

Distribution:

Philippines, Red Sea, Mediterranean, Bay of Bengal, California current, North Sea, Northern, Central and temperate SE Atlantic Ocean, tropical and temperate SW Indian Ocean, E Central Pacific, Mediterranean Sea.

Sites of occurrence in RSA:

Reported at 5 stations in the northern RSA and at five scattered stations in the Sea of Oman (New record, refer sites map).

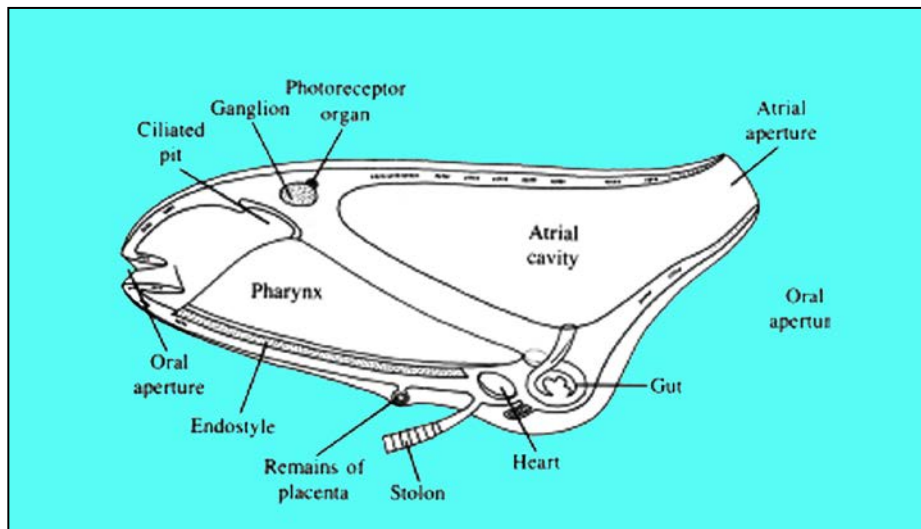


Sites of occurrence of *Doliolina mulleri* in RSA

Class: Thaliacea

3.8.3 Order: Salpida

A solitary salp is transparent barrel-shaped bodies that are. For propulsion, muscle contractions can rapidly expel jets of water from the body and drive the animals forward. Salps have a complex life cycle, with an obligatory alternation of generations, each known as oozoid. Both portions of the life cycle exist together in the seas - they look quite different, but both are mostly-transparent, tubular, gelatinous animals. Each oozoid is a single barrel-shaped animal girdled by muscle bands and open at each end. Oozoid reproduces asexually by producing a chain of tens to hundreds of individuals, which are released from the parent at a small size. The chain of salps is the *aggregate* portion of the life cycle. The aggregate individuals are also known as blastozooids, which remain attached together while swimming and feeding. Each blastozooid in the chain reproduces sexually. The growing oozoids are eventually released from the parent blastozooids, then they continue to feed and grow as the solitary asexual phase, thus closing the life cycle of salps.



Morphology of Salp (From: Kozloff, E. N. 1990)

Family: Salpidae

Genus: *Soestia*

Scientific Name: *Soestia zonaria* Pallas, 1774

Synonyms:

Holothurium zonarium Pallas, 1774; *Iasis zonaria* Pallas, 1774; *Jasis zonaria* Pallas, 1774.

References:

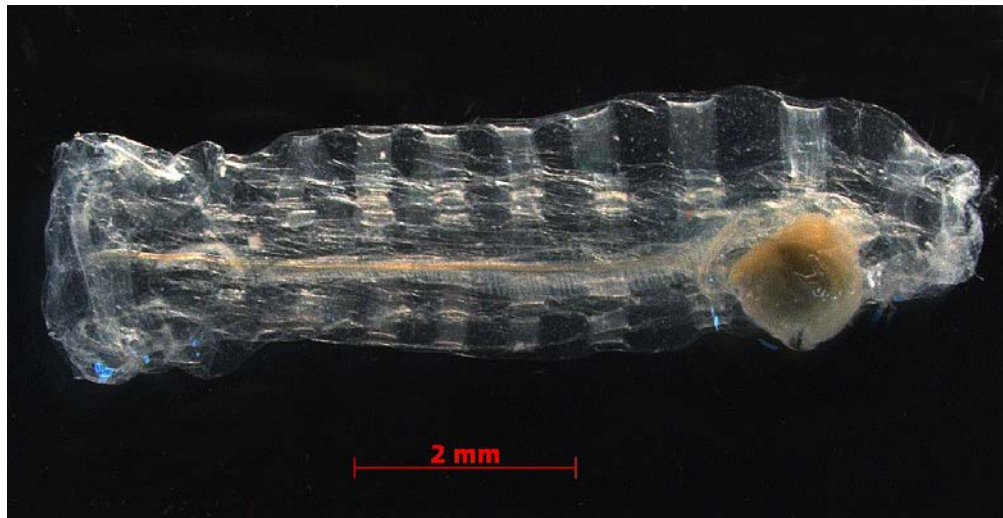
Apstein, 1905; Bone, (ed.), 1998; Godeaux, 1998; Kott, 1998; Soest, 1975b; Bisby *et al.*, 2005; Kott, 2005; Hansson, 1989; Bhavanarayana and Ganapati, 1971; Bhavanarayana, 1974; MarineSpecies.org 2007; Hirose *et al.*, 1999; Madin *et al.*, 1996; Tew and Lo, 2005; Hereu *et al.*, 2006; Berner, 1968; van Soest, 1975.

Description: (Pallas, 1774).

Aggregate form with rather large, prismatic body. Test very tough. Posteriorly asymmetrical and with a deep groove both dorsal and ventral. At the posterior end is a single, acentric projection. Very clear and wide muscle bands; all are ventrally interrupted, only M1 is also dorsally interrupted. M4 and M5 are dorsally united.

Solitary form with large body, that is conspicuously prismatic; tough and firm test. Muscle bands are extremely wide, almost touching each other laterally. All muscle bands are dorsally

and ventrally interrupted. The posterior end of the body with a marked pointed projection. The stolon encircles the intestine.



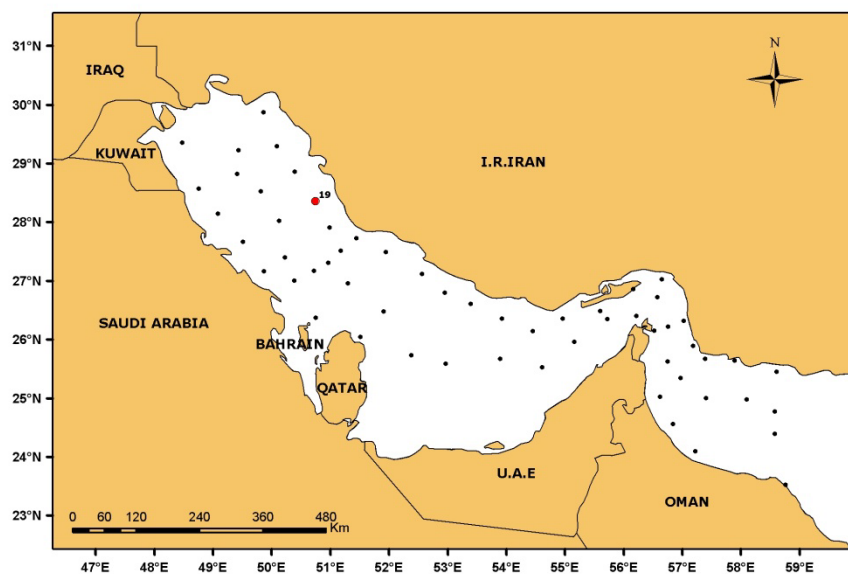
Soestia zonaria

Distribution:

Cosmopolitan, North and South Atlantic, Argentine, North Sea, eurythermic species from all oceans, except for Antarctic and Arctic.

Sites of occurrence in RSA:

Found once only at station 19 on the Iranian Coast of the inner RSA (New record, refer site map).



Site of occurrence of *Soestia zonaria* in RSA

Family: Salpidae

Genus: *Salpa* (Forskål, 1775)

Scientific Name: *Salpa fusiformis* (Cuvier, 1804)

Synonyms:

Salpa maxima var. Forskål, 1775; *Salpa runcinata* Chamisso, 1819; *Biphora depressa* Sars, 1829; *Biphora tricuspidata* Sars, 1829; *Salpa maxima* Meyen, 1832; *Salpa coerulea* Quoy and Gaimard, 1833.

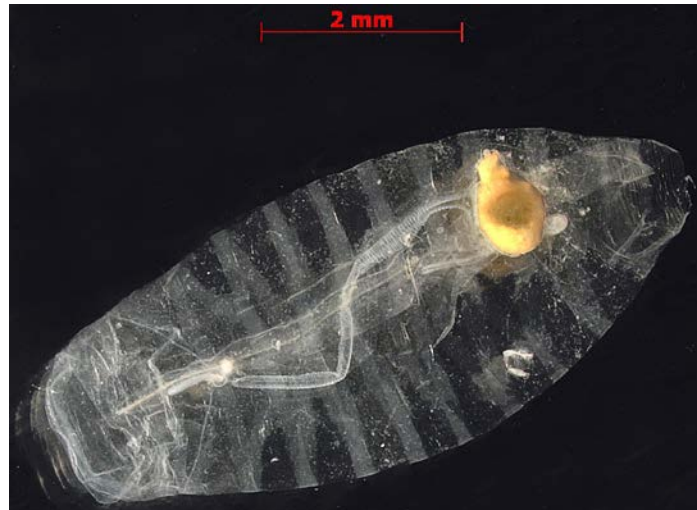
References:

Båmstedt *et al.*, 1998; de Visser, J. and R.W.M. van Soest, 1987; Foxton, 1961; Fraser, 1950; Fraser, 1964; Godeaux *et al.*, 1998; Godeaux, 1998; Hunt, 1968; Soest, 1974; 1975b; Berner, 1968; Bhavanarayana, 1974; Bhavanarayana and Ganapati, 1971; Bisby *et al.*, 2005; Hansson, 1989; Hereu *et al.*, 2006; Hirose *et al.*, 1999; Jia *et al.*, 2004; Kott, 2005; Madin, 1991; Madin *et al.*, 1996; MarineSpecies.org 2007; Matthews, 1954; Tew and Lo, 2005; van Soest, 1975.

Description: (Cuvier, 1804).

Solitary zooids elongate, with slightly convex anterior and a squarely cut off posterior. Test entirely smooth, moderately thick to thin. Muscles (M) 1-3 strongly fused over a wide area in the mid-dorsal region, M8 and M9 are likewise strongly fused. M1-M9 with 136-296 fibres, except for M4 with 14-40 fibres. Number of muscle fibers is due to clinal variation, in the NE Atlantic ranging from 30 to 40 in M4 and from 206 to 281 in M1-M9. Dorsal tubercle is small and C-shaped. Nucleus relatively small, compact, not causing a swelling of the test. Rudimentary elaioblast disappears in a young stage.

Aggregate zooids: body barrel shaped and typically fusiform, with conical anterior and posterior protuberances of the test that are typically long in relation to the body, giving it a slight asymmetry. Test entirely smooth, moderately thick to thin. Six body muscles; M1-M4 strongly fused over a wide area in mid-dorsal region; M4-M5 laterally fused; M5-M6 strongly fused in the mid-dorsal region. Fibre number of M1-M6 is 25-68 and is due to clinal variation. Dorsal tubercle is a simple slightly arched stick. Nucleus pale green in live specimens, relatively small and oval, not causing a swelling of the test.



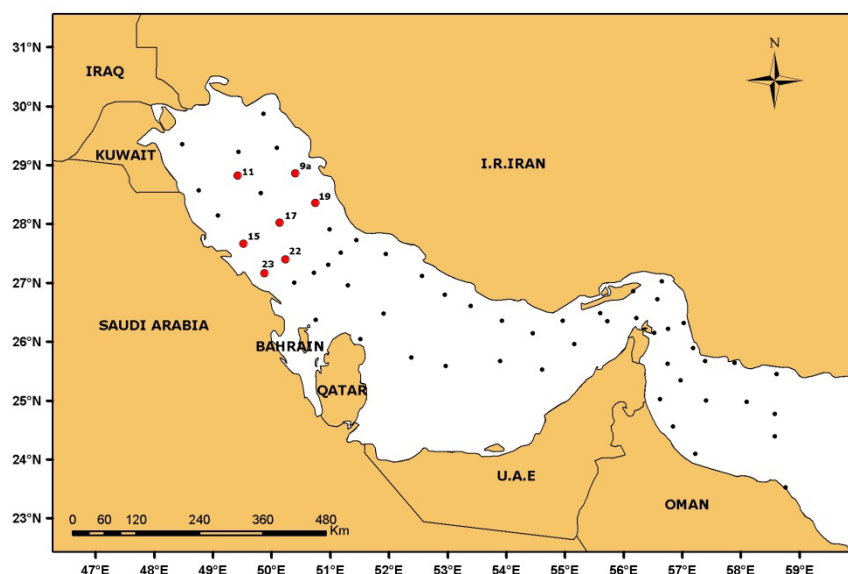
Salpa fusiformis

Distribution:

Cosmopolitan, eurythermic species, occurring from 70°N to 45°S in the Atlantic Ocean, to 45°S in the Indian Ocean and from 50°N to 45°S in the Pacific Ocean. *S. fusiformis* has the widest distribution of all salp species, and is also one of the most abundant ones, California current, North Atlantic, Philippines, Mozambique, Mediterranean, Korea, Australia, Spain, English channel, Ceylon waters, Antarctic, subantarctic, Eastern tropical Atlantic.

Sites of occurrence in RSA:

Reported at seven stations in the northern inner RSA (New record, refer sites map).



Sites of occurrence of *Salpa fusiformis* in RSA

Family: Salpidae

Genus: *Salpa*

Scientific Name: *Salpa maxima* (Forskål, 1775)

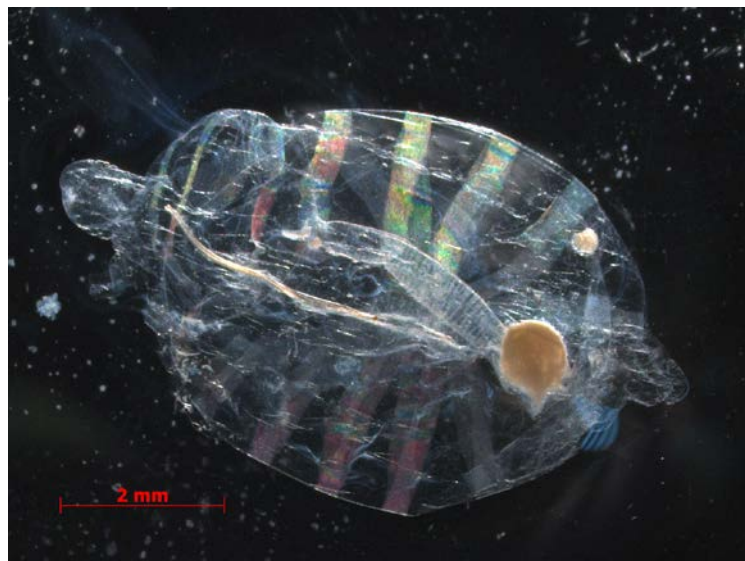
References:

Berner, 1968; Bhavanarayana, 1974; Bhavanarayana and Ganapati 1971; Bisby *et al.*, 2005; Godeaux, 1960; Godeaux, 1972; Hereu *et al.*, 2006; Jia *et al.*, 2004; Kott, 2005; Madin, 1991; Madin *et al.*, 1996; MarineSpecies.org 2007; van der Land and van Soest, 2001; Godeaux, 1960; UNESCO-IOC Register of Marine Organisms.

Description: (Forskål, 1775).

Solitary zooids: up to 137 mm long (*Salpa maxima*). Test entirely smooth. All the body muscles dorsally parallel. Dorsal tubercle resembling a large and elaborate letter G.

Aggregate zooids: up to 150 mm long, excluding projections (*Salpa maxima* 1). Test entirely smooth. MI to MII and MIII to MIV fused dorsally; MII and MIII meeting in the mid-dorsal region. MIV and MV converging but not fused laterally.



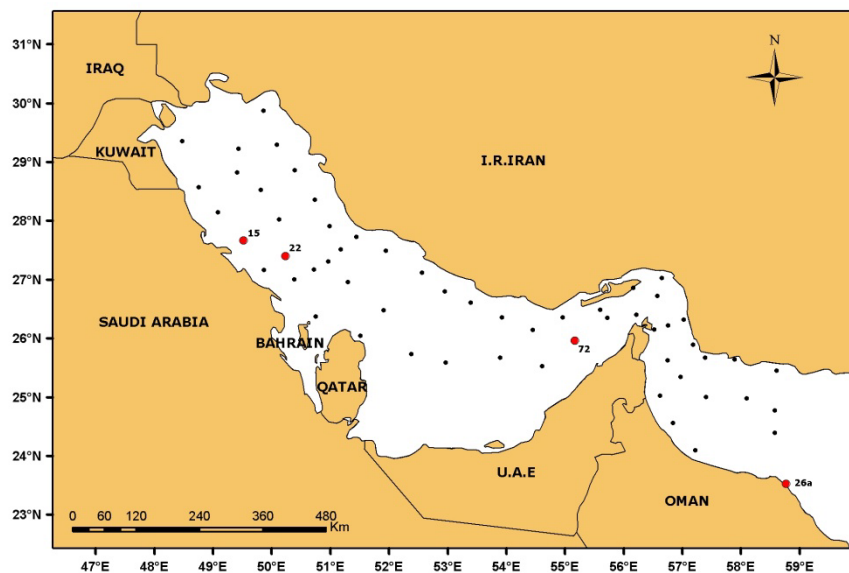
Salpa maxima

Distribution:

Bahamian Slope, Red Sea, Eastern tropical pacific, western part of the Bay of Bengal, Antarctic Peninsula, California Current, Gulf of California, Black Sea, Sea of Marmara, and the Mediterranean, Australia, Malaysia.

Sites of occurrence in RSA:

Occurred at three stations scattered in the northern (15 & 22) and southern (72) parts of the inner RSA, and one station (26a) in the Sea of Oman (New record, refer sites map).



Sites of occurrence of *Salpa maxima* in RSA

Family: Salpidae

Genus: *Weelia* Yount, 1954

Scientific Name: *Weelia cylindrica* Cuvier, 1804

Synonyms:

Salpa cylindrica (Cuvier. Cassie 1956).

References:

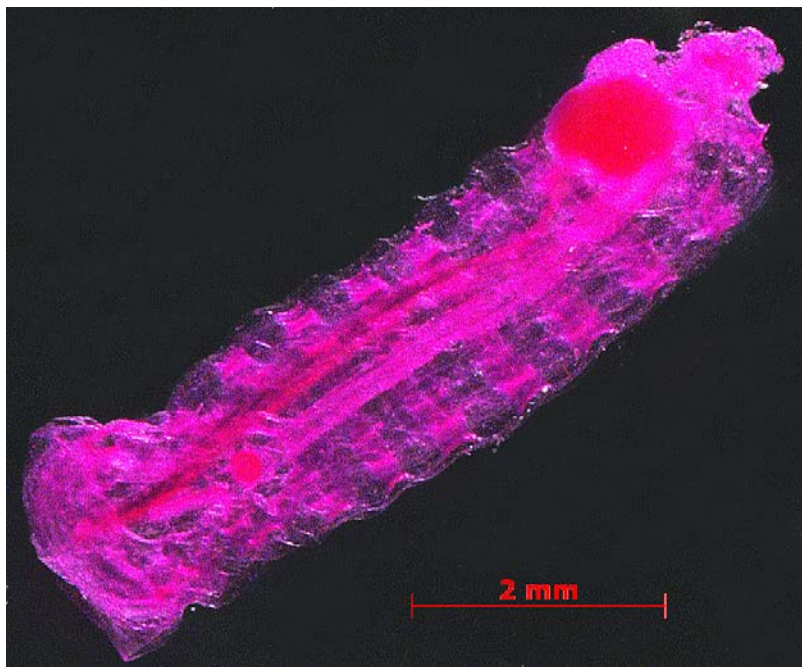
Van der Land and van Soest 2001; Bhavanarayana, 1974; Bhavanarayana *et al.*, 1971; Godeaux, 1972; Hereu *et al.*, 2006; Jia *et al.*, 2004; Madin *et al.*, 1996; MarBEF, 2006; MarineSpecies.org 2007; Tew and Lo, 2005.

Description: (Cuvier, 1804). (Diagnosis corresponding to that of the genus *Weelia*, since only a single species has been recognized).

In both generations, the transverse ribs of the gill bar meet dorsally, narrowing sharply toward the ventral surface, so that they are far apart from one another ventrally.

Solitary zooids: up to 45 mm long (*Weelia cylindrica*). Test soft and smooth. Body elongate and cylindrical. Eight or 9 body muscles that extend rather far ventrally and are usually separated. MI to MIV converging, contiguous, or fused in the mid-dorsal line. A great variation is also found in the number of muscular fibers.

Aggregate zooids: up to 17 mm long, excluding projections (*Weelia cylindrica* 1). Body fusiform because of the presence of short anterior and posterior projections. Five body muscles, all of them meeting in the mid-dorsal region. Embryo between MIV and MV.



Weelia cylindrica

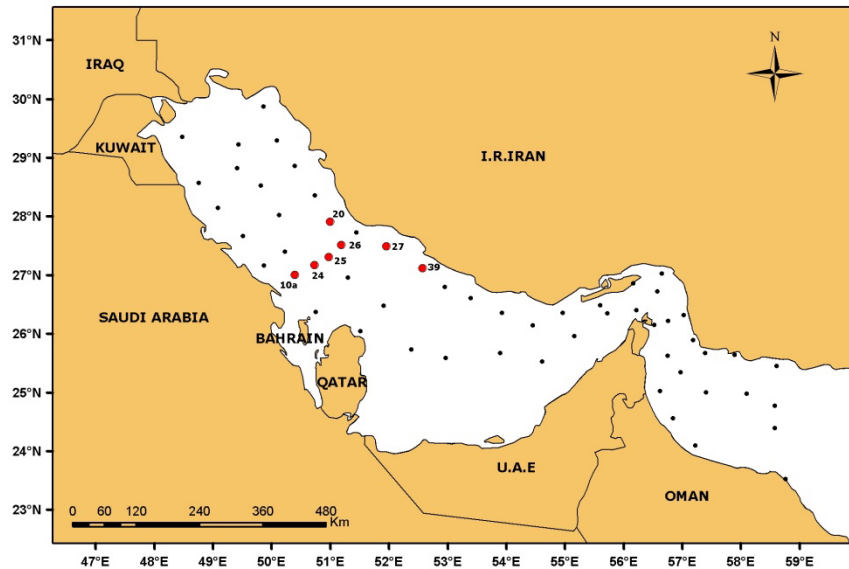
Distribution:

Red Sea, Med Atlantic bight, Bay of Bngal, Philippines, California current, Northwestern Atlantic and Gulf of Mexico, Arabian Sea, Peru, north and. south the equator, Central Pacific.

Sites of occurrence in RSA:

Recorded at seven stations inside the sections extending between Qatar-Bahrain and Iranian coasts in the inner RSA (Present study, refer sites map), western RSA (Michle *et al.* 1986a),

Kuwaiti waters (Michel *et al*, 1986b; Al-Yamani *et al.*, 2004), west coast of UAE, inner RSA (Gibreel *et al*, 1997).



Sites of occurrence of *Weelia cylindrica* in RSA

Family: Salpidae

Genus: *Thalia* (Linnaeus, 1753)

Scientific Name: *Thalia democratica* (Forskål, 1775)

Synonyms:

Salpa democratica Forskål, 1775; *Salpa mucronata* Forskål, 1775; *Salpa spinosa* Otto, 1823; *Dubreuillia cirrhosa* Lesson, 1830; *Salpa caboti* Desor, 1848; *Thalia democratica* var. *orientalis* Tokioka, 1937; *Thalia democratica* f. *typica* Sewell, 1953; *Thalia democratica* ssp. *democratica* .Borgelt, 1968.

References:

Apstein, 1905; Bone, 1998; Fraser, 1981; Godeaux, 1998; Sewell, 1953; Soest, 1973; 1975b; Berner, 1968; Bisby *et al.*, 2005; Gibbons, 1997; Godeaux, 1972; Hansson, 1989; Hereu *et al.*, 2006; Hirose *et al.*, 1999; Jia *et al.*, 2004; Kott, 2005; Madin, 1991; MarineSpecies.org 2007; Tew and Lo 2005.

Description: (Forskål, 1775).

Aggregate form with anterior end of body rounded, the posterior end is somewhat fusiform. The test is bluntly pentagonal and never echinate. M1-M3 and M4-M5 are fused mid-dorsally; both groups of muscle bands are separated in lateral view. The nucleus has a posterior projection. The test is pentagonal posteriorly. The number of muscle fibres in M1-M5 is 15-17, normally 16. The atrial opening is not central and there is a posterior lateral protuberance on one side only.

Solitary form with smooth test, atrial palps simple and straight; lateral projections small, medioventral projections are small and of unequal length, the anterior ones are the smallest. All test projections are echinate. M1-M4 are continuous dorsally and ventrally; M5 is narrowly interrupted ventrally. M2-M4 and M5-M6 are converged mid-dorsally over a short distance only. The stomach partly extends into the middle posterior projection.



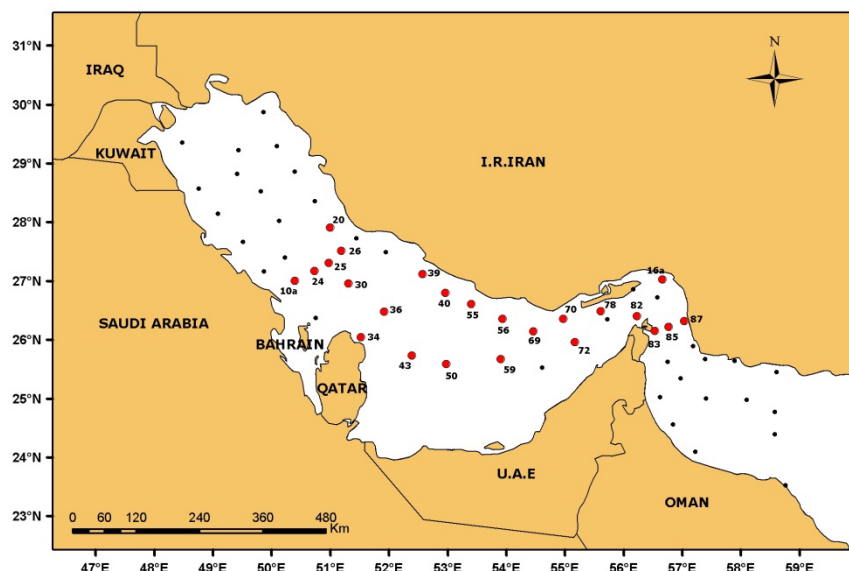
Thalia democratica

Distribution:

Cosmopolitan, eurythermic species from warmer waters; roughly occurring between ca. 60°N and ca. 40°S. Mediterranean Sea, Great Barrier Reef of Australia, equatorial atlantic, South Africa, Australia, North Sea, China Sea, north Pacific, Taiwan.

Sites of occurrence in RSA:

Wide spread in the central and southern inner RSA, less frequent in the Sea of Oman (Present study, refer sites map), western ROPME Sea Area (Michle *et al.*, 1986a), West coast of UAE, inner RSA (Gibreel *et al.*, 1997).



Sites of occurrence of *Thalia democratica* in RSA

Family: Salpidae

Genus: *Thetys*

Scientific Name: *Thetys vagina* (Hardwick, 1970)

References:

Fraser, 1981; Godeaux, 1998; Sims, 1996; Bisby *et al.*, 2005; Hansson, 1989; Hirose *et al.*, 1999; Kott, 2005; Madin, 1991.

Description: (Tilesius, 1802).

Aggregate form a very large animal, with a thick and firm test that has a broad dorsal depression. The five muscle bands are interrupted dorsally and ventrally. M1-M3 converge dorsally but do not join. The gut is rather compact and is located in a ventral swelling of the test.

Solitary form a very large animal, with a thick and firm test that is somewhat triangular in section; it has two distinct posterior projections. There are numerous, weakly developed muscle bands, about 20 or more. The muscle bands are often broken and interrupted dorsally

and ventrally. The rather compact gut is located at about one third of the body length from the posterior end. The stolon extends forwards before it turns posteriorly to the left of the gut.



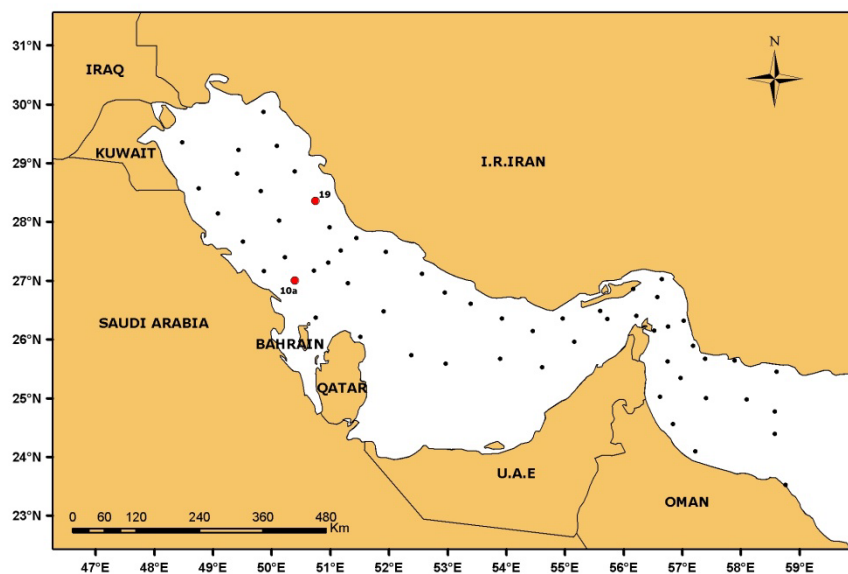
Thetys vagina

Distribution:

Cosmopolitan, eurythermic species occurring in all oceans, except the Red Sea, the Arctic, Antarctic and Subantarctic waters, Japan Sea, Philippines, Bermouda, New Zealand, Australia, India, North Pacific, Scottish waters, north Atlantic.

Sites of occurrence in RSA:

Found at two stations only (10a & 19) in the northern part of the inner RSA (New record, refer sites map).



Sites of occurrence of *Thetys vagina* in RSA

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5. Glossary

A1: (copepods) First sensory projection arising from the dorsal, lateral or frontal surface of the prostomium.

A2: (copepods) Second sensory projection arising from the dorsal, lateral or frontal surface of the prostomium.

Aboral diameter: Diameter of the tintinnid shell (lorica) at the broader end (mouth).

Adaxial cnidocyst: (Cnidarians) Located on the side nearest to the axis of an organ or organism, facing towards the main axis; in a medusa marginal tentacle.

Anal cirri: sensory appendage; usually slender and cylindrical pertaining to the anal region or pygidium.

Anal segment: the segment which carries the anus.

Anastomoses: branched structure in which some branches rejoin and fuse with others to form a network.

Ancestral: inherited from, or derived from ancestors

Antennal exopodite: (Crustacea) The outer main branch of the sensory projection (antenna).

Anterior peraeopods: the swimming legs in front of the thorax.

Basal lamella: A thin layer of ectoderm lining the interior of the hydrotheca.

Bell: umbrella-shaped body of cnidarian medusa

Biramous: with two branches.

Blastozooids: The aggregate individuals of salps are also known as blastozooids. Each blastozooid in the chain reproduces sexually (the blastozooids are sequential hermaphrodites, first maturing as females, and are fertilized by male gametes produced by older chains).

Bowl: A swallow part in the loricae of several tintinnid species.

Bracts: (Cnidarians) Protective or buoyant siphosomal element, usually containing much mesoglea and gastrovascular expansions.

Branchia: extension of the body wall with a loop of the vascular system; usually well equipped with capillary blood-vessels.

Brim: The edge of tintinnids lorica.

Brood pouch, or marsupium: (Amphipoda, Isopoda, Cumacea) An egg chamber in Peracarida.

Buccal: related to mouth parts

Capitulum: An inflorescence typical of the family Compositae. It is made of a large number of unstalked florets inserted on the flattened disclike end of the peduncle and surrounded by a ring of sterile bracts.

Carapace: is a dorsal (upper) section of the exoskeleton or shell in a number of animal groups like crustaceans.

Carina: A large ventral platelike extension of the breast bone (sternum) in birds and bats, to which the wing muscles are attached.

Caruncle: projection from the posterior end of the prostomium carrying nuchal organs.

Caudal rami: branch, in relation to the dorsal or ventral branch of a parapodium in the tail region.

Cellular basement membrane: a thin sheet of fibers that underlies the epithelial tissues which line the cavities and surfaces of structures throughout the body.

Cephalon: Head.

Cephalosome: The anterior region or head of crustaceans and other arthropods.

Cephalothorax: Comprising the head and the thorax fused together in crustaceans.

Chaetigerous: bearing bristles or setae.

Chaetigers: Segment bearing Chelae

Chela: (also named claw, nipper or pincer) is pincer-like organ terminating certain limbs of some arthropods, like crabs.[[]

Chelipeds: Legs bearing a chela are.

chromophile gland: contains Chromaphil **or chromaffin** cells, so-called because they stain yellow or brownish with chromium salts, are associated with the ganglia of the sympathetic nervous system.

Chromatophores: are pigment-containing and light-reflecting organelles in cells found in numerous marine animals.

Cnidocyst: (Cnidaria) Stinging organelle, consisting of a capsule secreted by a cell called a cnidocyte.

Collar: (Tintinnids) The cylindrical part of lorica in agglomerated forms.

Collarette: (Chaetognatha) Thickened layer of large epithelial cells.

Colloblasts: Are a cell type widespread in the tentacles of ctenophores used to capture prey.

Conical setigerous lobe: Rounded part of parapodium that bears the setae.

Cormidium: (Siphonophores) A single iteration of the repeating pattern of zooids in the siphosome.

Coxa: (Arthropods) The first or proximal segment of the leg.

Coxal endite: A lobe issuing from the inner margin of the coxa in crustaceans.

Coxal epipodite: (Podobranch) Lateral branch of limb attached sometimes with gill to coxa, coxal endite.

Cuticle: any of a variety of tough but flexible, non-mineral outer coverings of an organism, or parts of an organism, that provide protection.

Denticulate: Finely toothed or notched; minutely dentate.

Endopodite: (Crustacea) The innermost of a two processes attached to the basal process of the limbs.

Endostyle: (urochordates) A longitudinal ciliated groove on the ventral wall of the pharynx which produces mucus to gather food particles

Epimera (Epimeron): (Crustacean) The part of the side of a somite external to the basal joint of appendage.

Epithelial tissue: Epithelial tissue covers the whole surface of the body. It is made up of cells closely packed and ranged in one or more layers. This tissue is specialised to form the covering or lining of all internal and external body surfaces.

Exopod (Exopodite): (Crustacea) The external branch of the appendages.

Fenestrae: in tintinnids, Pores.

Footlobes: parts of the foot; the footlobes form in pteropods the wings.

Frontal organ: Sensory cells or setae on front surface of heads on some branchiopods, copepods, and decapods:

Gastric peduncle: In some medusae, a cone-shaped thickening projecting downwards from the subumbrellar mesoglea into the subumbrellar cavity, bearing the manubrium; radial canals run down the peduncle to reach the manubrium.

Gastrozooids: (Siphonophora) Feeding polyp, situated on the siphosome, bearing a tentacle usually with several tentilla.

Genital operculum: The plate derived from the sixth legs that close off the genital aperture(s) or gonopore (s).

Gonophores: is a reproductive organ in Hydrozoa that produces gametes.

Gonozooid: A sexual zooid, or medusoid bud of a hydroid; a gonophore.

Gymnoplean tagmosis: (in copepods) The anterior tagma of the body, up to the major articulation; comprising the cephalosome and either four (podoplean tagmosis) or five (gymnoplean tagmosis) free pedigerous somites.

Hydranth: (cnidarian) An individual polyp of a hydroid colony.

Hydroecial flap: (Siphonophora) Ventral cavity of calycophoran nectophore into which the siphosome may be wholly or partly retracted.

Hydroecium: The closed, funnel-shaped tube at the upper end of cnidarians belonging to the Siphonophora.

Intercoxal sclerite: A flat chitinous plate, connecting the coxae of a pair of swimming legs in copepods.

Keel: (Gastropoda general) calcareous or cartilaginous flat ridge in heteropods on the outside of the shell along the body whorl.

Lanceolate: Shaped like a spearhead: elongate and tapering to a point at both ends.

Lappets: (Cubo-/Scyphomedusae) Flaps on the margin of the scyphozoan disc.

M1-M8: First to eight muscle bands in Thaliacea.

Mandible: (Polychaeta) Ventral jaw plate. (Crustacea) Third pair of appendages; first pair of mouthparts; having a feeding function.

Manubrial poche: (Hydromedusae) Lateral perradial or interradian extensions of the manubrial wall.

Manubrium: (Hydromedusae) Median projection of the subumbrella surrounding the gastric cavity, distally bearing the terminal mouth and proximally leading to the radial canals.

Maxilla: (Crustacea) Fifth pair of appendages; third pair of mouthparts.

Maxillipeds: (Crustacea) Sixth to eighth pair of appendages; the three most posterior pairs of mouthparts, the first two of which are used for swimming in zoeal stages.

Mesoglea (Hydromedusae) The acellular substance lying between the ectoderm and the endoderm and forming the gelatinous bulk of the umbrella in the Hydromedusae.

Metasome: is the posterior part of the body, or tagma, of arthropods.

Natatory: Swimming

Nectophore: (Siphonophora) Swimming bell.

Nectosac: (Siphonophora) Central cavity of nectophore; opening to exterior via the ostium and having muscular walls with propulsive function.

Nectosome: (Siphonophora) Section of stem which bears nectophores.

Nematocysts: (Cnidaria) Stinging cells, chiefly carried on tentilla and used to immobilize prey.

Notochord: A primitive type of skeletal rod of turgid cells, the forerunner of the backbone in chordates.

Nuchal (Tintinnids) Pertaining to the neck

Nuchal organs: (Polychaeta) Paired chemosensory structures usually situated posterolaterally on the prostomium, variously developed as pits, grooves, lappets, or elongated ridges.

Oikoplast: (Appendicularia) Epidermal glands which secrete the gelatinous house in which *Oikopleura* lives.

Ommatidia: The compound eyes of insects, mantis shrimp and millipedes are composed of units called ommatidia (singular: ommatidium).

Oozoids: An individual which reproduces asexually.

Ostium: (Cubo-/Scyphomedusae) In rhizostome medusae, a genital ostium is a gap between adjacent mouth-arm bases, proximal to their point of fusion.

Palpon: (Siphonophora) A cormidial element, probably a reduced gastrozoid, which may have sensory or excretory functions.

Palps: (Polychaeta) Paired sensory or feeding structures arising from the ventro-lateral surface of the prostomium.

Papilla: (Ciliophora) Pellicular or extrapellicular wart-like bumps or small protuberances on cell surface.

Papillae: (Cubo-/Scyphomedusae) minute to small protrusions from the surface, for example from the exumbrella.

Parapodia: Paired lateral, fleshy, paddle-like appendages that bear one or more cirri; usually consisting of two main divisions, the notopodium and the neuropodium

Parapodial cirri: (Polychaeta) Appendages, often sensory, of the parapodium.

Pedigerous: Bearing or having feet or legs

Peduncle: (Crustacea) Proximal or basal articles of antennae, pleopods and uropods. Antenna 1 has a peduncle of three articles, antenna 2 of five. The peduncle of the uropods consists of only one article.

Peraeopods: (Crustacea) Ninth to thirteenth pair of appendages; the chelipeds plus four pairs of walking legs.

Peronia: (Hydromedusae) In Narcomedusae the tentacles leave the umbrella at some distance along the margin just above the clefts separating the marginal lappets. At the edges of the clefts the subumbrellar and exumbrellar ectoderm fuse without interposition of mesoglea, forming the peronial grooves, which are invaded by tentacular ectoderm, together making up ectodermal strands rich in cnidocysts, muscles, and nerves: the peronia

Phorozoids: A stage in Doliolid life cycle.

Phyllocyst: (Siphonophora) The reduced gastrovascular canal system in a eudoxid bract.

phyllopodous: A member of the Phyllopoda, a group of entomostracous crustaceans, having lamellate or foliaceous swimming feet; a leaf-footed crustacean.

Pinnules: (Polychaeta) Small side branches, in a feather-shaped process such as the radioles of sabellids and serpulids.

Pleopods: (Crustacea) Biramous swimming appendage of pleosome.

Plumose spine: Feather-like spine

Pneumatophores: (Siphonophora) Apical, gas-filled float, present in Cystonectae and Physonectae.

Podomere: (crustacean) One segment of a crustacean appendage.

Polygastric phase: [Siphonophora] Complete animal bearing both asexual and reproductive elements.

Proboscis: (Cubo-/Scyphomedusae) of a scyphistoma, the mound on which the mouth is situated. (Polychaeta) Eversible, non-muscular part of the pharynx; often used interchangeably with pharynx. (Pteropoda) Usually elongated part of the mouth and esophagus with or without buccal organs.

Prosome: Anterior region of body, commonly limited behind by major articulation.

Prostomium: (Polychaeta) Anteriormost, pre-segmental region of the body, anterior to mouth, may bear eyes, antennae and palps, and encloses part of the brain.

Radula: (Pteropoda) Series of chitinous teeth in the buccal mass used in catching prey.

Rectum: Posterior terminal part of the alimentary canal.

Rim see **Brim** (Tintinnids)

Rostral incisure: (Ostracoda) The deep indentation in the anterior region of the carapace of myodocopid ostracods beneath the rostrum.

Rostrum: (Pteropoda) (a) Anterior part of the dorsal shell lip projecting as a snout in Thecosomata, (Crustacea) Anterior projecting median extension of carapace between eyes or ocular peduncles.

Shoulder vault: (Ostracoda) Enlargement of the carapace valves overlying the large protopodites of the second antennae which in some species may also be developed into "wings" or even spines.

Siphon: (Mollusca) The mantle structure through which water (rarely air) can flow in and out of the mantle cavity. (Crustacea: Ostracoda).

Somatocyst: (Siphonophora) Prominent extension of gastrovascular system in calycophoran nectophore.

Statocysts: (Hydromedusae) See ectodermal statocyst and ecto-endodermal statocyst.

Statoliths The **statocyst** is a balance sensory receptor present in some aquatic invertebrates, including bivalves, cnidarians, echinoderms, cephalopods, and crustaceans .

Stolon: (Tunicata: Pyrosomatida, Doliolida, and Salpida) The ribbon-like organ on which the chains, or whorls, of aggregate (sexual) forms are produced by budding.

Suctorial discs: Having organs or parts adapted for sucking or clinging

Telson: (Crustacea) The unpaired appendage on the hindmost abdominal somite which bears the anus.

Tentacular cirri: (Polychaeta) Cirri situated on cephalized segments, or any anterior dorsal cirri that are better developed than the other dorsal cirri.

Tubercle: (Ostracoda) A rounded, wart-like protuberance on the external surface of a valve, often with a corresponding depression on the internal surface.

Umbilicus: (Pteropoda) Hollow canal or opening on the underside of the shell in the centre of the spire.

Umbrella: (Hydromedusae) Main body of the medusa (= bell) , generally resembling a bell, excluding manubrium and tentacles.

Uropod: [Crustacea 3] One of the pair of pleopods of the sixth abdominal somite.

Urosome: [Crustacea] Posterior 3 segments of the pleon bearing biramous uropods.

Uniramous: (Polychaeta) Parapodial lobe with only branch present, usually the neuropodium, with a single branch or ramus. (Crustacea) Single-branched.

Velum: (Hydromedusae) Horizontal fold projecting inwards from the umbrellar margin leaving a central, circular aperture, the velar opening.

Whorls: (Gastropoda) A coiled shell is made of one or more coils, each coil is called a whorl; the last one is the body whorl, the first ones are the embryonic whorl(s) or protoconch whorl(s).