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Diversity of Ophiuroidea from Lengeh Port and Qeshm Island in the Persian Gulf

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Abstract: We report on result of an investigation along Lengeh Port and Qeshm Island to determine the species of Ophiuroidea in Persian Gulf. Collection of Ophiuroids was done by hand from the total 23 locations at rocky intertidal flats of Lengeh Port and Qeshm Island in 2007. Identification of the collected samples was carried out using several keys. Two Ophiuroids species belonging to a single family Ophiocomidae, including *Ophiocoma erinaceus* (Müller and Troschel, 1842) and *Ophiocoma scolopendrina* (Lamarck, 1816) were identified. *Ophiocoma erinaceus* has not been previously reported from the Persian Gulf (neither North nor South). Single specimen of *O. erinaceus* appeared to be *O. erinaceus* Müller and Troschel, 1842 (*schoenleini* M. and T. 1842, form) due to one tentacle scale in most parts of arms except 6 first segments and three arm spines on fourth segment and disc granules extending into oral interradius of disc. *Ophiocoma scolopendrina* have shown varied color patterns. The present paper is mainly centered around and aimed at representing *O. scolopendrina* which with 83 records, seems to be a common species of Ophiuroidea in rocky and rocky-sandy coast of Lengeh Port and Qeshm Island. This finding indicated that further sampling especially in deeper waters would be probably resulted into finding of additional Ophiuroids taxa.

Key words: Echinodermata, Ophiuroidea, Ophiocomidae, Ophiocoma, *Ophiocoma erinaceus*, *Ophiocoma scolopendrina*, Persian Gulf

INTRODUCTION

The Persian Gulf is a semi-enclosed, marginal sea that is exposed to arid, subtropical climate. The Persian Gulf is ~ 900 km long and a maximum width of 370 km. The average depth of the Gulf is 36 m. Deeper portion, >40 m deep, are found along the Iranian coast continuing into the Strait of Hormuz, which has a width of ~ 56 km and connect the Persian Gulf via the Gulf of Oman with the Northern Indian Ocean (Kämpf and Sadrasab, 2005). Indian Ocean Surface Water (IOSW) normally flows into the Gulf from the open ocean along the Northern side of the Strait of Hormuz and continues Northward along the Iranian coast (Swift and Bower, 2003). Persian Gulf has stressful environmental conditions, in particular marked fluctuations in sea temperatures (<12->30°C) and high salinities (40 to >60 ppt) (Price and Izsak, 2005). Two thousand species have been identified in Class Ophiuroidea. They are carnivores, filter feeders and scavengers. Their arms can easily become food for crabs, some fish and even predatory Asteroids. They are not desirable food for humans, though some fish that are commercially important do often feed on Ophiuroids.

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First major report on the Ophiuroids fauna of the Persian Gulf was published by Mortensen (1940) during the Danish Scientific Investigation in Iran. Six species were recorded by Clark and Le Baron Bowen (1949) at the Tarut Bay, Saudi Arabia. Clark and Rowe (1971) have recorded a few Ophiuroid species for the Gulf. Also, 19 Ophiuroid species have been reported by Price (1981) from the Western Persian Gulf. Price (1982) has compared Echinoderm fauna of this region with SE Arabia, Red sea and Gulf of Aqaba and Suez Canal.

In this study, the species found during an investigation along the intertidal flats of Lengeh Port and Qeshm Island in Persian Gulf are introduced and the morphological characteristics of each species is explained.

MATERIALS AND METHODS

Materials for this study were collected at rocky intertidal flats of Lengeh Port and Qeshm Island in 2007. Collection of specimens was done by hand from the total 23 locations (Fig. 1) and then were preserved in 70% ethanol. Disc diameter was measured for all collected specimen and the proportion of the longest spine of tenth segment to segment length was measured. The number of granules in millimeter length of the disc was counted.

The samples were examined under stereomicroscope and photos were taken. Identification of the collected samples was carried out using the keys of Clark and Rowe (1971), Mortensen (1940) and Price (1983).

RESULTS

The careful examination was led to the identification of two species *Ophiocoma erinaceus* Müller and Troschel, 1842 and *Ophiocoma scolopendrina* Lamark, 1816 from family Ophiocomidae L Jungman 1867 and order Ophiurida Müller and Troschel 1840.

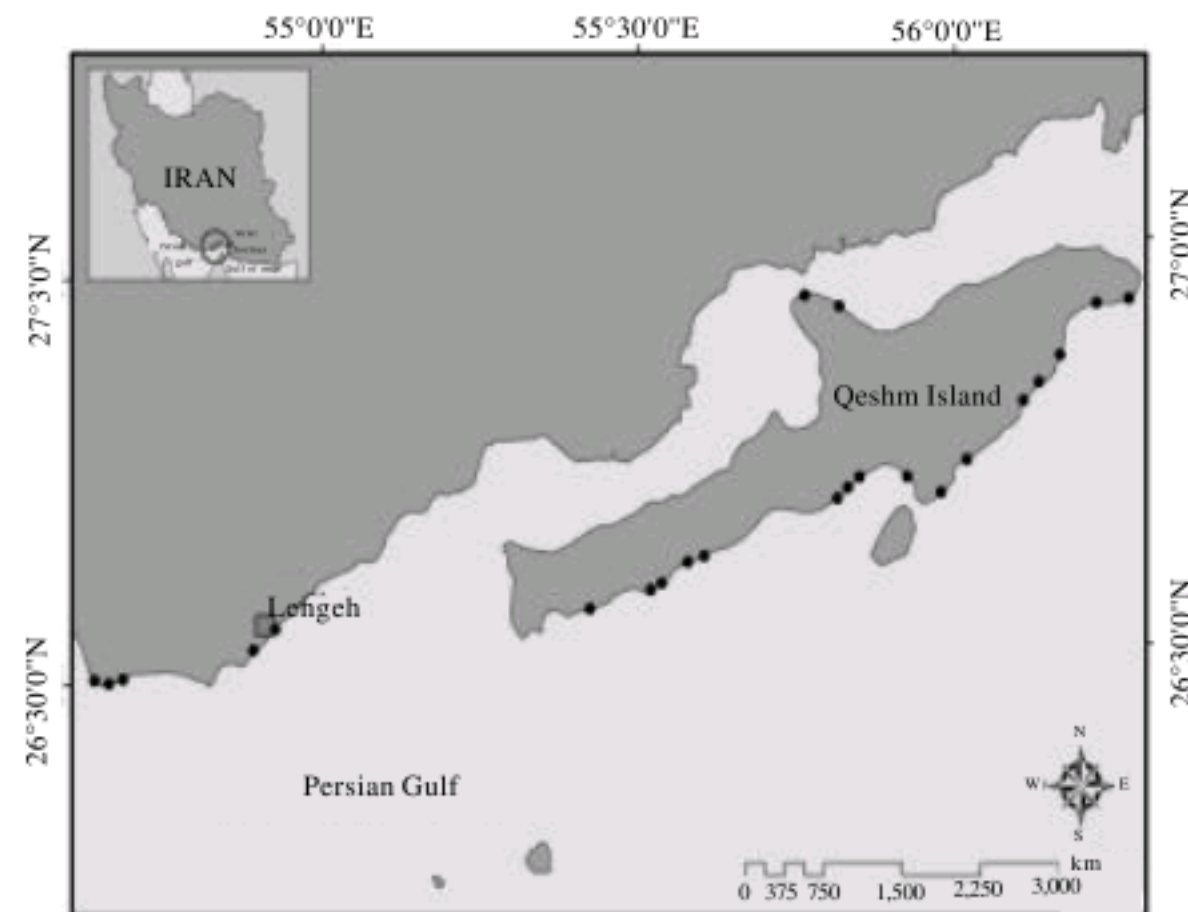


Fig. 1: Sampling locations of Ophiuroids from Lengeh Port and Qeshm Island, North of the Persian Gulf

Systematic

Order OPHIURIDA Muller and Troschel, 1840

Family OPHIOCOMIDAE Ljungman, 1867

Genus *Ophiocoma* L. Agassiz, 1835

Ophiocoma erinaceus Müller and Troschel, 1842

(Fig. 2A-E)

Ophiocoma erinaceus Müller and Troschel, 1842; Devaney, 1970; Clark and Rowe, 1971; Price, 1982; Putchakam and Sonchaeng, 2004; Rowe and Richmond, 2004.

Material Examined

1 specimen (dd = 18.6 mm), Qeshm Island.

Description

Disc

There is a cluster of small tooth papillae on top of each jaw (Fig. 2C). Edges of oral and tooth papillae are smooth. adoral shield restricted to sides of oral shield and not meeting in front of oral shield (Fig. 2C). Buccal tentacles are in contact with both ventral and adoral shields (Devaney, 1970) (Fig. 2C). Dorsal surface of disc covered with rounded granules densely (Fig. 2B). A shallow v-shaped of granules extend below disc (Fig. 2D). Marginal granules are rounded. There are 9-16 granules mm^{-2} of disc surface and no enlarged scales in oral surface of disc.

Arm

There are 5 simple arms upper spines are longest and often thickened (Fig. 2E). Three to five arm spines are on each side of arm segment (five spines basally). Beyond disc, arm spines alternate (three or four) either on opposite sides of same segment or on adjacent segments. There are three spines on each side of both first and third arm segment. Tentacle scales are ovate. Only one to six basal segments have two tentacle scales and the larger part of the arm has one tentacle scale. Oral surface of arm in proximal area are partly brown.

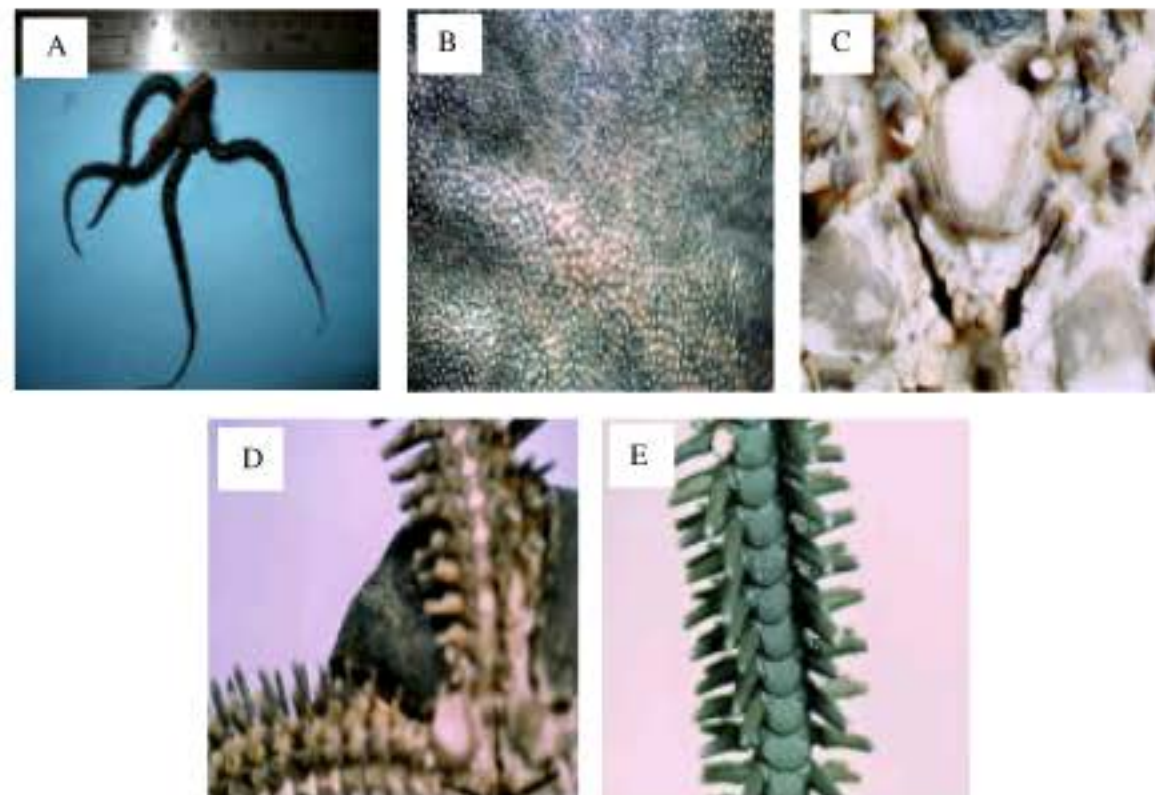


Fig. 2: *Ophiocoma erinaceus* Müller and Troschel, 1842. (dd = 18.6 mm). (A) dorsal view, (B) granules on dorsal surface of disc, (C) Jaws, tooth papillae, Buccal tentacles, adoral shields, (D) shallow v-shaped extended granules below disc and (E) arm spines

Distribution

Indo-Pacific Region

Remarks

One specimen was found at rocky intertidal in Qeshm Island. Color of disc and spines was dark brown (Fig. 2A). Variation in several morphological characters has led some workers to consider some examples of *Ophiocoma erinaceus* Müller and Troschel, 1842 as representing more than a single species (Devaney, 1970). According to Clark and Rowe (1971), possibly *Ophiocoma schoenleini* (Müller and Troschel, 1842) should be ranked as an eastern subspecies of *O.erinaceus* (Muller and Troschel, 1842). The only difference seem to be the number of tentacles. Devaney (1970) has compared contrasting characters of each two forms.

In single specimen, at tenth arm segment, arm spine length to width of oral plate was 2.9, three arm spines on fourth segment and disc granules extending into oral interradius of disc. The single specimen was very similar to specimen with one tentacle scale described by Devaney (1970). We are dealing with polymorphs of the same species having phenotypically linked morphological characters (Devaney, 1970).

Therefore, according to these specifications, we can suggest that the single specimen could be *O. erinaceus* Muller and Troschel, 1842 (*schoenleini* M. And T. 1842, form).

***Ophiocoma scolopendrina* Lamarck 1816 (Fig. 3A-D)**

Ophiocoma scolopendrina Lamarck 1816: (Mortensen, 1940; Devaney, 1970; Clark and Rowe, 1971; Price, 1982; Puthakam and Sonchaeng, 2004).

Material Examined

Eight three specimens (dd = 19.3 ± 3.7 , granules mm^{-1} length of disc = 5.8 ± 0.9 , higher spine length/segment length = 2.2 ± 0.9), Lenghe Port and Qeshm Island.

Description

Disc

There is a cluster of small tooth papillae on top of each jaw (Fig. 3B). Edges of oral and tooth papillae are smooth (Fig. 3B). Adoral shields restricted to sides of oral shield and not

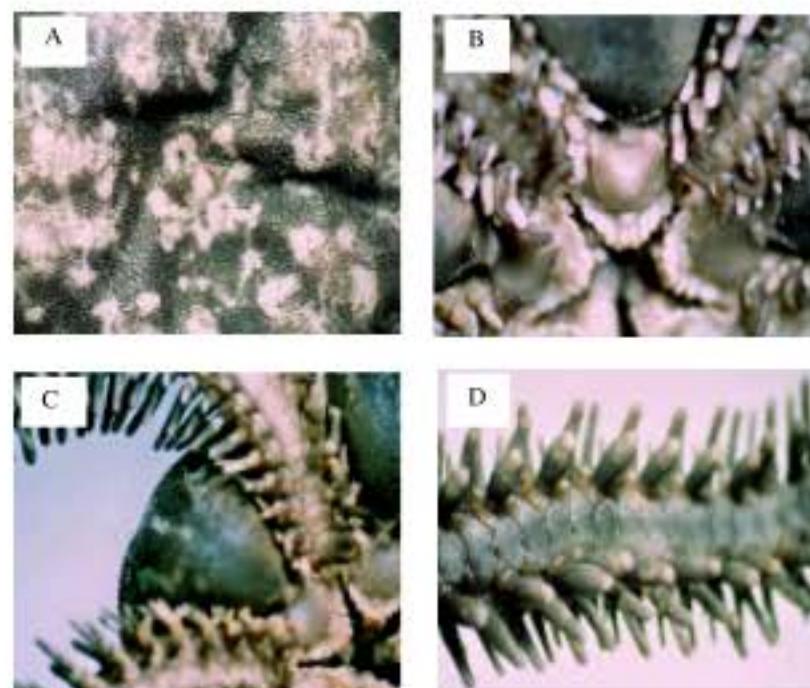


Fig. 3: *Ophiocoma scolopendrina* Lamarck 1816 (dd = 21 mm). (A) granules on dorsal surface of disc, (B) Jaws, tooth papillae, buccal tentacles, adoral shields, (C) shallow v-shaped extended granules below disc and (D) arm spines

meeting in front of oral shield (Fig. 3B). Buccal tentacle scale in contact with both ventral and adoral shields (Devaney, 1970) (Fig. 3B). Dorsal surface of disc was covered with rounded granules densely (Fig. 3A). A shallow v-shaped of granules extends below disc (Fig. 3C). Marginal granules are rounded. There are 3-6 granules mm^{-1} length on dorsal surface of disc. Disc is variegated or uniformly dark in dorsal surface.

Arm

There are five simple arms. Tentacle scales are ovate. There are two tentacle scales typically on each segment pore. There are three to five arm spines on each side of arm segments. Beyond disc, arm spines alternate (three and four) either on opposite sides of the same arm segment or on adjacent segment. Arm spines are spotted. Upper arm spines in each segment are thickened and cigar-shaped or cylindrical (Fig. 3D). The longest spine length is 2-5 times the segment length. There are three spines on each side of third arm segment.

Distribution

Widespread in the Indo-West Pacific region, with the exception of the coast of Pakistan and Western India and Persian Gulf.

Remarks

These specimen were found on rocky and rocky-sandy intertidal flats in Lengeh Port and Qeshm Island. Specimens have shown varied color patterns of dark brown, light brown, cream and olive green.

DISCUSSION

In this study, two species of Ophiuroidea, *O. erinaceus* Müller and Troschel, 1842 (*Schoenleini* M. and T.1842, form) and *Ophiocoma scolopendrina* Lamarck (1816) were found in rocky and rocky-sandy intertidal flats at Lengeh Port and Qeshm Island.

Mortensen (1940) has reported 16 species of Ophiuroidea from the Persian Gulf. Amongst them *O. scolopendrina* has been recorded from the coast of Hengam Island (4 specimens) and coast of Farur Island (2 specimen). Additionally in this study *O. scolopendrina* was recorded from intertidal flats at Lengeh Port and Qeshm Island that is consistent with Mortensen records of this species in Iranian coast of Persian Gulf. Price (1981) has reported 19 species of Ophiuroids from Arabian coast of Persian Gulf without any record of *O. scolopendrina* that is in contradiction with our observations in this study. The difference in distribution and abundance of certain echinoderm species may be due to factors such as sampling methods, change in substrate and change in water quality over the years (Price, 1981). There may also have been long term population changes in the echinoderm fauna of the area (Price, 1981). Hengam Island is so near Qeshm Island and presence of *O. scolopendrina* in Qeshm Island could not be unexpected. Sampling locations by Price (1981) study included the western Persian Gulf. Not observation of *O. scolopendrina* in the western Persian Gulf may be due to difference in substrate and water quality between eastern and western Persian Gulf. It is now therefore *O. erinaceus* is a new record for the entire Persian Gulf basin which had not previously been reported for this region although this species occurs in the Gulf of Oman (Price, 1982). Currents and turbulence cause larval transport and dispersal (Pedrotti and Fenaux, 1992). *Ophiocoma erinaceus* has a planktophoric larvae (McEdward and Miner, 2001). The *O. erinaceus* larvae could be transported to Persian Gulf by Indian Ocean Surface Water (IOSW) which flows into the Gulf from the open ocean along the Northern side of the Strait of Hormuz and continues

Northward along the Iranian coast and also possibly by the tide wave entering the Strait of Hormuz. Qeshm Island is the largest one in the Gulf, situated in the western part of the Strait of Hormuz. Qeshm Island has many different intertidal zones, sandy, mixed and muddy and in the South also rocky. Qeshm is served with fresh oceanic water (Hopner *et al.*, 2000). According to Qeshm properties rocky coast of this island could be a suitable habitat for both recorded ophiuroids in this study. It is possible to find more specimens of *Ophiocoma erinaceus* in other parts of Persian Gulf especially from the Northern part because of lack of research. Taxonomic classification of *O. schoenleini* and *O. erinaceus* may need further re-examination including molecular methods to check how close the forms are related to each other. Taking into account the thorough examination of found 83 specimen of *O. scolopendrina*, we are almost certain about this finding. It seems that this species could be a common species of Ophiuroidea in rocky coasts of Lengeh Port and Qeshm Island and other similar areas in the region. Oak and Scheibling (2006) noted that restricted distribution of *O. scolopendrina* in the intertidal zone not only affords the ability to exploit the nutrient-rich water surface layer but also provides a refuge from predators that are excluded from these habitats at low tide. The present results are not thought to be complete and further sampling especially in deeper waters would be probably resulted into finding of additional Ophiuroids taxa.

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