Catalog of ophiuroidea from southeastern coast of Iran 
(Northern parts of Oman sea)

Beygmoradi A.; Attaran-Fariman G.*

Received: July 2016                         Accepted: August 2019

1-Chabahar Maritime University, Faculty of Marine Sciences, Department of Marine Biology, Chabahar, Iran. 
*Corresponding author's Email: gilan.attaran@gmail.com

Keywords: Ophiuroidea, Morphology, Chabahar Bay, Iran

Introduction
Chabahar Bay is located in southeastern coast of Iran and the northern part of the Oman Sea in the geographic area of 25°22 47˝N and 60°39 40˝E. This bay with a variety of coverings, such as, muddy, stone, sandy and rocky, has provided possibility of life for different taxa, such as, shellfish, mollusks, echinoderm (Nikouyan and Savari, 1999; Ghanbarifardi and Malek, 2009; Yazdani et al., 2009; Sadeghi and Loghmani, 2010; Khaleghi and Owfi, 2011; Fazeli et al., 2013; Attaran et al., 2014). Echinoderms with around 7,000 species can be found at every ocean depth of the marine ecosystems (Mirzaei et al., 2019). Ophiuroids are relatively small echinoderms that all live in marine habitats, such as, sandy, rocky, stony, muddy, on sponge and corals (Barnes et al., 2001). Ophiuroids, with more than 2,000 species, are one of the largest group of echinodermata that are distributed in all marine environments (from polar to equatorial regions and from the intertidal to subtidal zones) (Pawson, 2007).

Materials and methods
Ophiuroidea specimens have been collected from four stations of intertidal and subtidal areas located in eastern part of Chabahar Bay by grab, hand and scuba diving from October 2013 to July 2014 (Fig. 1). Sampling stations were selected according to the accessibility to the beach, geomorphological varieties and ecological diversities. The samples were placed into plastic jars contain seawater and transferred to the zoology laboratory of Chabahar Maritime and Marine Sciences University. All ophiuroids specimens were examined under microscope and photographed by Cannon camera model C-DS and also stereo-microscope equipped with a Cannon camera model T4AL250 V. Species identification to the species level was carried out by using the following sources: Clark (1953); Clark and Rowe (1971); Clark and Courtman-Stock (1976);
Cherbonnier and Guille (1978); Price (1983); and Pomory (2007). Subsequent to the laboratory procedures, the specimens were stored in 4% buffered formalin and some frizzed for further analysis.

Results and discussion

In the present study, 11 species of Brittle Star belonging to three families including Ophiociridae with nine species, Ophionereidae with one species and Amphiphiuridae with 1 species were identified from intertidal and subtidal zone of Chabahar Bay (Table 1).

Table 1: List of identified ophiuroidea species from Chabahar bay in different sites (1: Tis Port; 2: Lipar area; 3: Shahid Kalantary Port; 4: Shahid Beheshti Port, and S: Subtidal zone, I: Intertidal zone).

<table>
<thead>
<tr>
<th>Ophiuroidea species</th>
<th>Sites</th>
<th>Figs no.</th>
<th>Comment and Substratum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ophiociridae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ophiothela venusta (de Loriol, 1900)</td>
<td>2, 4; S</td>
<td>2-6</td>
<td>10 color pattern attached to the Gorgonians (class Anthozoa; Cnidaria)</td>
</tr>
<tr>
<td>Ophiothela tigris Lyman, 1871</td>
<td>2; S</td>
<td>7-8</td>
<td>2 color pattern ; attached to the Gorgonians</td>
</tr>
<tr>
<td>Ophiothela sp.</td>
<td>2; S</td>
<td>9</td>
<td>attached to the Gorgonians</td>
</tr>
<tr>
<td>Macrophiuris sp.</td>
<td>3; S</td>
<td>10</td>
<td>between Gorgonians</td>
</tr>
<tr>
<td>Macrophiothrix sp.</td>
<td>1; I</td>
<td>11</td>
<td>stone</td>
</tr>
<tr>
<td>Macrophiuris longipedia (Lamarck, 1816)</td>
<td>1; I</td>
<td>12</td>
<td>Under stone</td>
</tr>
<tr>
<td>Macrophiothrix elongata HL Clark, 1938</td>
<td>1; I</td>
<td>13</td>
<td>Under stone</td>
</tr>
<tr>
<td>Ophiothrix sp.</td>
<td>1; I</td>
<td>14</td>
<td>Under stone</td>
</tr>
<tr>
<td>Ophiothrix savignyi Müller and Troschel, 1842</td>
<td>1; I</td>
<td>15</td>
<td>Under stone</td>
</tr>
<tr>
<td><strong>Ophionereidae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ophionereis dubia Müller and Troschel, 1842</td>
<td>1; I</td>
<td>16</td>
<td>Under stone</td>
</tr>
<tr>
<td><strong>Amphiuridae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphipholis squamata (Delle Chiave, 1829)</td>
<td>4; S</td>
<td>17</td>
<td>Collected by grab from sand</td>
</tr>
</tbody>
</table>
Based on this research, seven brittle stars is recorded for the first time; *O. venusta*, *O. tigris*, *Ophiothela* sp., *Ophiothrix* sp., *Macrophiothrix* sp₁, *Macrophiothrix* sp₂, and *M. longipeda* from study locations. Morphology of identified species from Chabahar bay is shown in Figs. 2-17.

Figure 2: *Ophiothela venusta*; Chabahar Bay (North of Oman Sea, Iran). A: The full view B: dorsal view C: ventral view D: dorsal view of an arm E: ventral view of an arm with ventral arm plates. Scale bars = A 5 mm; B and E 400 µm.

Figure 3: *Ophiothela venusta*, (showing color pattern), A: The full view with 6 arms B: dorsal view, detail of the radial shields C: ventral view D: dorsal view of an arm E: ventral view of an arm with ventral arm plates. Scale bars = A 5 mm; B 400 µm; C and E 200 µm.

Figure 4: *Ophiothela venusta*; (showing color pattern), A: The full view B: dorsal view, detail of the radial shields C: ventral view D: dorsal view of an arm E: ventral view of an arm with ventral arm plates. Scale bars = A 2 mm; B and E 200 µm.
Figure 5: *Ophiothela venusta*; (showing color pattern), A: The full view B: ventral view C: dorsal view of an arm D: ventral view of an arm with ventral arm plates. Scale bars = A 5 mm; B and D 200 µm.

Figure 6: Other color patterns in *Ophiothela venusta* in Chabahar bay Scale Bars= A and E 5mm; F 200 µm.

Figure 7: *Ophiothela tigris*; A: The full view B: dorsal view C: ventral view D: dorsal view of an arm E: ventral view of an arm with ventral arm plates. Scale bars = A 9 mm; B 600 µm; C and E 400 µm.
Figure 8: *Ophiothela tigris* with dark color pattern. Scale bar = 9 mm.

Figure 9: *Ophiothela* sp.; A: dorsal view, showing radial shields B: ventral view C: dorsal view of an arm D: ventral view of an arm with ventral arm plates. Scale bars = A 2 mm; B 300 µm; C and D 200 µm.

Figure 10: *Macrophiothrix* sp1.; on *Gorgonian* A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A 20 mm; B and C 400 µm; D 200 µm.
Figure 11: *Macrophiothrix* sp2.; A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A 5 mm; B and D 400 µm.

Figure 12: *Macrophiothrix longipeda*; A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A 2 cm; B 5 mm; C and D 200 µm.

Figure 13: *Macrophiothrix elongate*; A: dorsal view, detail of the radial shield B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A 20 mm; B 7 mm; C and D 400 µm.
Figure 14: *Ophiothrix* sp.; A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A and B 5 mm; C and D 200 µm.

Figure 15: *Ophiothrix savigny*; A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates. Scale bar = A and B; 5 mm; C and D; 400 µm.

Figure 16: *Ophionereis dubia*; A: dorsal view B: ventral view C: dorsal view of an arm with dorsal arm plates D: ventral view of an arm with ventral arm plates, tentacle scales and banded spines visible. Scale bars = A and B 1 mm; C 400 µm; D 250 µm.
Ophiuroids echinoderms are well distributed in the tropical regions. Price and Rowe (1996), reported 44 species of brittle stars from the Indian Ocean.

The identification of this species is not, generally, easy due to their similar morphological characteristics and their accurate identification based on morphological features need to be assessed in detail and carefully (Stöhr et al., 2012). In the present study 11 species of brittle star recorded from Chabahar Bay located in northern part of Oman Sea, which has been presented in this catalog. Of which M. elongata and O. savignyi reported for the first time by Khaleghi (2010), and subsequently by Khaleghi and Owfi (2011) from Chabahar Bay. Attaran-Fariman et al. (2014) recorded O. dubia from that area for the first time. A. squamata has also been documented from Chabahar Bay (Attaran-Fariman and Beymoradi, 2016). Ophiothrix and Macrophiothrix genera occupy dominantly the shallow habitats of the tropical zones (Stöhr et al., 2012). Price (1981) encountered O. venusta between Gorgonians of Persian Gulf. in the present study this species also found on the gorginians (coral; order: Alcyonacea) bed in sutida zones of hotel Lipar and Shahid Behashti stations. This is the first record of O. venusta for this location. In the Chabahar Bay Ophiothela species were found with multiple color patterns and morphological variety. Generally O. venusta has been reported with 5 arms, however, is rarely observed with 6 arms (Price, 1981). In this study, a specimen was found with 6-arms (Fig. 3A) from the subtidal zone of hotel Lipar (site 2). Since all the species belonging to the genus Ophiothela recorded from Chabahar Bay (during the present study) were collected from gorgonians substratum, it seems that gorgonians could be an appropriate and sustainable habitat for them. Due to the position of Chabahar Bay along the Oman Sea and open waters of the Indian Ocean and also presence of the variety of biological substrates, such as sandy,
muddy, stone, rocky, coral and spongy for distribution of Ophiuroids, findings a variety of ophiuroids in Chabahar Bay would not be so surprising and unexpected.

Acknowledgements
The present work is part of the MSc work of A.B. at the Chabahar Maritime University. Hereby, we would like to express our deep appreciations to laboratory members.

References


Clark, A.M. and Rowe, F.W., 1971. Monograph of Shallow-water Indo-west Pacific Echinoderms. Trustees of the British Museum (Natural History), London. 234 P.


Khaleghi, M., 2010. Echinoderms species of Chabahar Bay. MSc thesis. University of Khoramshahr, Iran, 80 P.


Lamarck, J.P.B.A., 1816. Histoire naturelle des animaux sans


**Lyman, T., 1871.** Supplement to the Ophiuridae and Astrophytidae. *Illustrated Catalogue of the Museum of Comparative Zoölogy at Harvard College*, 6, 1-17.


**Müller, J. and Troschel, F.H., 1842.** System der Asteriden. Braunschweig: Verlag Friedrich Vieweg und Sohn. 134 P.


