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Five crabs of the families Xanthidae and Pilumnidae (Crustacea: Decapoda: Brachyura) from Abu-Musa Island, Iran; new records for the Persian Gulf

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Abstract

Background: The families Xanthdiae and Pilumnidae are two common families of the brachyuran crabs in the Persian Gulf. These families are represented with 25 and 23 species, respectively, in the Gulf.

Methods: Brachyuran crabs from Abu-Musa Island, Iran, Persian Gulf have been collected and examined for a biodiversity project conducted during 2014 and 2015. The material was mostly collected from the intertidal and shallow subtidal using hand and snorkeling.

Results: In total, 16 Xanthidae species were identified, of which four are new records for the Persian Gulf and include *Atergatis integerrimus* (Lamarck, 1801), *Zosimus aenus* (Linnaeus, 1758), *Zozymodes cavipes* (Dana, 1852), *Macromedaeus crassimanus* (A. Milne-Edwards, 1867). One further new record for the Persian Gulf is the pilumnid *Cryptopilumnus pereiodontus* (Davie and Ghani, 1993).

Conclusion: The present five new records increase recognised species of the families Xanthidae and Pilumnidae of the Persian Gulf to 29 and 24, respectively.

Keywords: Persian Gulf, Taxonomy, Brachyura, Xanthidae, Pilumnidae, New records

Background

In comparison to other crustacean groups, brachyuran crabs have been well studied in the Persian Gulf (Stephensen, 1946; Apel, 2001; Titgen, 1982; Naderloo & Sari, 2007; Naderloo & Türkay, 2012). The family Xanthidae is one of the most common families in the region. Apel (2001) listed 22 xanthid species from the Gulf, of which five were new records to the region. Naderloo & Türkay (2012) added *Macromedaeus voeltzkowi* (Lenz, 1905) and two new species of *Palapedia* Ng, 1993, were recently described by Naderloo (2015). The Pilumindae is another common family in the region and represented by 23 species in the Persian Gulf (Apel, 2001; Naderloo & Türkay, 2012). One more species, namely *Cryptopilumnus pereiodontus* (Davie and Ghani, 1993) is added in this study.

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Methods

The biodiversity project is concentration on four main taxa of Abu-Musa Island: Crustacea, Mollusca, Polychaeta and Echinodermata. Sites sampled were intertidal and shallow subtidal habitats around the whole Island. The tidal range along the coast of the Island is low at around two meters (2.25 m recorded during spring tide), therefore the tidal zones, in comparison to other part of the Persian Gulf, are not exposed during the low tide and sampling has been mainly undertaken by snorkeling. Specimens have been preserved in Ethanol 75 % and shipped to the University of Tehran and the material was deposited in the Zoological Museum, University of Tehran (ZUTC) where it is available for further examination.

Results and discussion

Order DECAPODA Latreille, 1802

Superfamily XANTHOIDEA MacLeay, 1838

Fig. 1 *Atergatis integerrimus* (Lamark, 1801). Male (ZUTC 5483), CL = 34.88, CB = 56.21 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, 25.12.2014, Photo credit: R. Abdollahi

Family XANTHIDAE MacLeay, 1838

Atergatis integerrimus (Lamark, 1801)

(Fig. 1)

MATERIAL EXAMINED: 1♂ (ZUTC 5483), CL = 34.88, CB = 56.21, Park-Qadir, Abu-Musa Island, Persian Gulf, 25° 53.751′N, 055° 02.643′E, rocky/cobble, taken by snorkeling, coll. S. Ebrahimnezhad & R. Abdollahi, 25.12.2014.

TYPE LOCALITY: Australia.

REGIONAL RECORDS: Stephensen (1946) recorded the species from Larak Island in the Iranian territory and Apel (2001) from UAE in the Gulf of Oman.

DISTRIBUTION: Zanzibar, Persian Gulf, Gulf of Oman, Strait of Hormuz, Pakistan, South India, Taiwan, Philippines and Japan.

REMARKS: Three species of *Atergatis* have been recorded from the region, *A. laevigatus* A. Milne-Edwards 1865, *A. integerrimus*, and *A. ocyroe* (Herbst, 1801). The two latter species have not previously been recorded from the inner Gulf.

Macromedaeus crassimanus (A. Milne-Edwards, 1867)

(Fig. 2)

MATERIAL EXAMINED: 2♂ (ZUTC 5477), CL = 18.14–21.47, CB = 28.51–34.36 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, 25° 53.751′N, 055° 02.643′E, rocky/cobble, corals, by snorkeling, coll. S. Ebrahimnezhad & R. Abdollahi, 29.12. 2014.

TYPE LOCALITY: New Caledonia.

REGIONAL RECORDS: This is the first record of the species from the Persian Gulf, furthermore there is no report of this species from the Gulf of Oman.

DISTRIBUTION: Red Sea, Persian Gulf, Pakistan, India, Sri Lanka, Andaman Islands, Taiwan, China, Indonesia, Sumatra, Palau, Christmas Islands, Australia and New Caledonia.

REMARKS: *Macromedaeus* is represented by three species from the region namely *M. crassimanus*, *M. quinquedentatus* (Krauss, 1843), and *M. voeltzkowi* (Lenz, 1905). The two latter species have been recorded from the Gulf of Oman by Ghotbeddin & Naderloo (2014), but this is the first record of *M. crassimanus* for the region.

Zosimus aenus (Linnaeus, 1758)

(Fig. 3)

MATERIAL EXAMINED: 1♂ (CL = 26.03, CB = 37.25 mm), 2♀ (CL = 25.76–44.10, CB = 38.23–64.39) (ZUTC 5479), Park-Qadir, Abu-Musa Island, Persian Gulf, 25° 53.751′N, 055° 02.643′E, rocky/cobble, by snorkeling, coll. S. Ebrahimnezhad & R. Abdollahi, 22–29.12.2014.

TYPE LOCALITY: East India.

Fig. 2 *Macromedaeus crassimanus* (A. Milne-Edwards, 1867). Male (ZUTC 5477), CL = 21.47, CB = 34.36 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, 29.12.2014. Photo credit: R. Abdollahi

Fig. 3 *Zosimus aeneus* (Linnaeus, 1758). Female (ZUTC 5479), CL = 44.10, CB = 64.39 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, Persian Gulf, 22.12.2014. Photo credit: R. Abdollahi

REGIONAL RECORDS: This is the first Persian Gulf record of the species, however there are no records from the neighboring regions of Arabian coast, Gulf of Oman and Pakistan.

DISTRIBUTION: South Africa, Madagascar, Réunion, Mayotte, Seychelles, Tanzania, Mozambique, Somalia, Red Sea and Persian Gulf.

Zozymodes cavipes (Dana, 1852)

(Fig. 4)

MATERIAL EXAMINED: 1♂ (CL = 11.84, CB = 17.74), 3♀, (CL = 9.76–14.19, CB = 14.77–20.39 mm) (ZUTC 5478), Park-Qadir, Abu-Musa Island, Persian Gulf, 25° 53.751′N, 055° 02.643′E, rocky/cobble, by snorkeling, coll. S. Ebrahimnezhad & R. Abdollahi, 23–26.12.2014.

TYPE LOCALITY: East India.

REGIONAL RECORDS: This is the first record of this species from the Persian Gulf and there are no records from the Gulf of Oman.

WORLD DISTRIBUTION: East Africa, Madagascar, Aldabra Islands, Red Sea, Gulf of Aden, Persian Gulf, Gulf of Oman, Pakistan, Andaman Islands, Chagos Archipelago, Mergui Archipelago, Malaysia, Indonesia, Taiwan, China, Japan, Christmas Island and Australia.

REMARKS: *Zozymodes xanthoides* (Krauss, 1843) is a common species in the rocky/cobble intertidal habitats along the northern Indian Ocean including the Persian Gulf and the Gulf of Oman, while *Z. cavipes* is a comparatively rare xanthid in the region. This species has already been listed under the known species of Xanthidae from the Persian Gulf by Guinot (1967) and Titgen (1982), but the provenance for their record is uncertain.

Superfamily PILUMNOIDEA MacLeay, 1838

Family PILUMNIDAE MacLeay, 1838

Cryptopilumnus pereiodontus (Davie & Ghani, 1993)

(Fig. 5)

Fig. 4 *Zozymodes cavipes* (Dana, 1852). Female (ZUTC 5478), CL = 14.19, CB = 20.39 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, 23.12.2014. Photo credit: R. Abdollahi

Fig. 5 *Cryptopilumnus pereiodontus* (Davie & Ghani, 1993). Female (ZUTC 5480), CL = 3.76, CB = 4.90 mm, Park-Qadir, Abu-Musa Island, Persian Gulf, 31.12.2014. Photo credit: R. Abdollahi

MATERIAL EXAMINED: 5♂, 9♀ (ZUTC 5535), Park-Dowlat, Abu-Musa Island, Persian Gulf, rocky/cobble intertidal, coll. R. Naderloo, S. Ebrahimnezhad & R. Abdollahi. 29.04.2014; 1♀ (ZUTC 5535), Park-Qadir, Abu-Musa Island, Persian Gulf, coll. S. Ebrahimnezhad & R. Abdollahi, 31.12.2014; 3♂, 7♀ (ZUTC 5480), Park-Qadir, Abu-Musa Island, Persian Gulf, rocky/cobble intertidal, coll. S. Ebrahimnezhad & R. Abdollahi, 25.04.2014.

TYPE LOCALITY: Pakistan.

REGIONAL RECORDS: This is the first record of the species from the Persian Gulf, while there is no record from the Gulf of Oman.

DISTRIBUTION: Persian Gulf and Pakistan.

REMARKS: *Cryptopilumnus pereiodontus* was originally described from Karachi in Pakistan and referred to *Pilumnopeus* A. Milne-Edwards, 1867, but Hsueh et al. (2009) assigned this species to *Cryptopilumnus*. The genus is distinguishable from *Pilumnopeus* by the merus of walking legs having distinct denticles on the posterior margin.

Conclusion

The families Xanthidae and Pilumnidae are among the most diverse intertidal crabs in the region (Apel, 2001; Naderloo & Türkay, 2012; Naderloo et al. 2015). The four xanthid records recorded by the present study increases recognised Xanthidae species in the Persian Gulf to 29 (Table 1). *Cryptopilumnus pereiodontus* (Davie & Ghani, 1993) collected from the Abu-Musa Island, is a new pilumnid record for the Persian Gulf and increasing the number of recognised species of the Pilumnidae in the Persain Gulf to 24. The number of species from both families are probably still underestimated, and this is partly due to complex taxonomy of the two taxa.

Table 1 Brachyuran crabs of the family Xanthidae currently recorded from the Persian Gulf. References for every record are provided in the table, precise locality not indicated

Species	References
Actaea jacquelinae Guinot, 1976	Nobili (1906) as *Actaea granulata*; Evans et al. (1973) *A. savignyi*; Titgen (1982) as *A. savignyi*; Jones (1986) as *Actaea savignyi*; Apel 2001; Stephensen (1946) as *A. savignyi*; Apel 2001; Naderloo and Sari 2007; present study
Atergatis integerrimus (Lamark, 1818)	Present study
Atergatis laevigatus A. Milne-Edwards, 1865	Heller (1861) as *Atergatis roseus*; Stephensen (1946) as *Atergatis integerrimus*; Apel 2001
Chlorodiella nigra (Forskål, 1775)	Nobili 1906; Stephensen 1946; Evans et al. 1973; Basson et al. 1977; Apel 2001; present study
Cyclodius drachi (Guinot, 1964)	Nobili (1906) as *Phymodius ungulatus*; Stephensen (1946) as *P. granulatus*; Titgen (1982) as *P. granulatus*; Apel 2001; Naderloo and Türkay 2012; Naderloo et al. 2013;
Cymo andreossyi (Audouin, 1826)	Nobili 1906; Stephensen (1946) as *C. andreossyi* var *melanodactylus*; Apel 2001)
Cymo melanodactylus Dana, 1852	Nobili 1906; Stephensen 1946; Apel 2001; present study
Epiactaea margaritifera (Odhner, 1925)	Alcock (1898) as *Actaea nodulosa*; Stephensen (1946) as *Actaea margaritifera*;
Etisus anaglyptus H. Milne Edwards, 1834	Stephensen 1946; Basson et al. 1977; Apel 2001; present study
Etisus electra (Herbst, 1801)	Nobili 1906; Basson et al. 1977; Titgen (1982) as *Etisus frontalis*; Apel 2001
Etisus laevimanus Randall, 1840	Alcock 1898; Nobili 1906; Basson et al. 1977; Apel 2001
Gaillardiellus rueppelli (Krauss, 1843)	Alcock 1898; Nobili 1906
Leptodius exaratus (H. Milne Edwards, 1834)	Nobili 1906; Stephensen 1946; Basson et al. 1977; Titgen 1982; Jones 1986; Hornby 1997; Apel 2001; Naderloo and Türkay 2012; Naderloo et al. 2013
Liagore erythematica Guinot, 1971	Kemp (1923) and Chopra (1935) as *Liagore rubromaculata;* Stephensen (1946) as *Liagore rubromaculatus*; Naderloo and Sari 2007a
Macromedaeus crassimanus (A. Milne Edwards, 1867)	Present study
Macromedaeus voeltzkowi (Lenz, 1905)	Naderloo and Türkay 2012
Medaeops neglectus (Balss, 1922)	Naderloo and Türkay 2012
Neoliomera nobilii Odhner, 1925	Apel 2001
Palapedia apeli Naderloo 2015	Naderloo 2015
Palapedia persica Naderloo 2015	Naderloo 2015
Paraxanthodes cumatodes (MacGilchrist, 1905)	MacGilchrist 1905; Guinot 1967
Pilodius spinipes Heller, 1861	Titgen 1982; Apel 2001
Platypodia anaglypta (Heller, 1861)	Alcock 1898; Apel 2001; present study
Psaumis cavipes (Dana, 1852)	Alcock (1898) as *Actaea cavipes*; Nobili (1906a) as *Actaea fossulata*; Apel 2001; present study
Xanthias punctatus (H. Milne Edwards, 1834)	Apel 2001
Xanthias sinensis (A. Milne-Edwards, 1867)	Naderloo and Türkay 2012; Naderloo et al. 2013
Zozymodes cavipes (Dana, 1852)	Present study
Zozymodes xanthoides (Krauss, 1843)	Stephensen 1946; Titgen 1982; Naderloo and Türkay 2012; Naderloo et al. 2013; present study
Zosimus aeneus (Linnaeus, 1758)	Present study

Abbreviations
CL: carapace length; CB: carapace breadth; Coll: collected.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
RN and SE preformed the sampling and preliminary sorting the material. AD and MM carried out the identification of the material. RN drafted the manuscript and SE participated in compiling the data. All authors read and approved the final manuscript.

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