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First record of the epipelagic *Cranocephalus scleroticus* (Streets, 1878) (Amphipoda: Hyperiidea) in the Egyptian Mediterranean waters

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ABSTRACT

This study aims to document the first occurrence of the epipelagic amphipod *Cranocephalus scleroticus* (Streets, 1878) in the Egyptian Mediterranean waters. During the winter of 2019, only one female specimen was collected by a zooplankton net from El-Dabaa sector on the western coast of Egypt. An investigation of systematic position and concise redescription, along with some structural photos, was conducted to confirm the identification. Habitat and distribution are also provided in the study. A new record, that has never been recorded before, is added to the list of species of the Egyptian Mediterranean fauna.

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Introduction

Amphipoda are malacostracan crustaceans that lack a carapace and their bodies are laterally compressed. They are one of the largest Crustacea orders, under the class Malacostraca, with 223 families, 1618 genera, and nearly 10,000 species. Pseudogolfiellidea, Hyperiidea, Colomastigidea, Hyperiopsidea, Senticaudata, and Amphilochidea are the six suborders of Amphipoda, occurring in various habitats. Colomastigidea has a benthic distribution, while Hyperiopsidea occurs in either pelagic or benthic habitats. Senticaudata is distributed in shallow-water marine environments, as well as in fresh and terrestrial environments. Meanwhile, Amphilochidea is distributed in variable major habitats such as coral habitats, shallow-water soft-bottom habitats, or high-energy sand habitats (Lowry & Myers, 2017).

Hyperiids are one of the most numerous crustacean zooplankton and a vital feeding source for commercially valuable fish (Bowman and Gruner, 1973; Vinogradov et al., 1996; Pinnegar et al., 2015). This suborder is a pelagic marine group that can be found from the sea surface to abyssopelagic depths worldwide. This peracarid crustacean group is a diverse component of marine

zooplankton (Burrige et al., 2017), with approximately 280 described species circumglobally (Stenvers et al., 2021). Some authors, such as Harbison et al. (1977), Madin and Harbison (1977), and Laval (1980), found that the majority of hyperiid species are commensals and parasitoids of gelatinous zooplankton in Cnidaria, Ctenophora, and Thaliacea.

However, most previous studies on amphipods in the Egyptian Mediterranean waters focused on the benthic form. Schellenberg (1936) recorded the presence of 43 littoral benthic amphipod species in the coastal waters of the fishery grounds near Alexandria. El-Nassry (1973) identified 13 amphipod species during a one-year investigation of intertidal benthic biota from the Eastern Harbor of Alexandria. Atta (1985) studied the Amphipoda from rocky intertidal zones along the coastline of Alexandria, including sea-grass (*Posidonia*) beds at up to 5 m depth and the sublittoral sandy-mud bottom in El-Mex Bay at 3–7 m depth. A number of 30 amphipod species, including 26 gammarids and four caprellids, were recorded. Ramadan (1986) investigated the fouling community and the associated amphipod fauna at Port Said harbor. Atta (1988) also gave a checklist of amphipods recorded in the Mediterranean waters of Alexandria city. The study lasted for one year, with a scope extending along about 60 km of Alexandria's coastline from Agami to Abu-Kir. The list included 54 species, eight of which were new records to the area—namely *Corophium insidiosum*, *Elasmopus pocillimanus*, *Amphilochus* sp., *Atylus swammerdami*, *Cymadusa filosa*, *Hyale dolfusii*, *Lembos* sp., and *Caprella acutifrons*.

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Collections from rocky areas in Abu Qir, Sidi Gaber, and El-Mex along the shoreline of Alexandria showed six new records of Amphipoda (Soliman, 1997)—namely *Ampelisca serraticaudata*, *Amphilochus neapolitanus*, *Lembos leptochirus*, *Microdeutopus similis*, *Melita palmate*, and *Urothoe intermedia*. Field studies on the composition, population dynamics, and reproductive activity of epifaunal amphipods living among the fouling constituents in the Eastern Harbor of Alexandria were conducted by Zakaria (2001). Abdelsalam (2004) examined the amphipod fauna associated with marine fouling communities in three harbors in Alexandria city.

Except for Zakaria (1992), there is no recent record of pelagic amphipods in the Egyptian Mediterranean waters. Eight pelagic amphipod species under the suborder Hyperiidea were recorded, and they were *Phronima sedentaria* (Forskål, 1775), *Hyperia latissima* Bovallius, 1889, *Hyperia schizogeneios* Stebbing, 1888, *Phronimopsis spinifera* Claus, 1879, *Parathemisto oblivia* (Krøyer), *Euthemisto bispinosa* Boeck, 1876, *Lycaea pulex* Marion, 1874 and *Rhabdosoma whitei* Spence Bate, 1862. This reflects the general poverty in the species richness of pelagic amphipods in the Egyptian Mediterranean waters, which can be attributed to a lack of research. Therefore, this study aims to document the first occurrence of the epipelagic amphipod *Cranocephalus scleroticus* (Streets, 1878) in the Egyptian Mediterranean waters.

Materials and methods

During winter season (February 2019), zooplankton samples were collected from the western coast of the Egyptian Mediterranean waters. The samples were collected by the standard zooplankton net, using the vertical haul method, from 25 m depth up to the surface.

During the examination of specimens, only one pelagic hyperiid amphipod was observed in the sample from El-Dabaa sector (Fig. 1) in surface waters. The specimen was preserved in a 5 % formalin solution for future detailed examinations.

Based on the available literature on Amphipoda and particularly Hyperiidea by Vinogradov et al. (1996) and Zeidler (2016), for example, the specimen was carefully investigated. Some appendages were also separated and photographed by using the digital camera: Nikon D3200 to reach the species level. The systematic position and synonyms of the species were checked according to the World Register of Marine Species (WoRMS) (Horton et al., 2022).

Results and discussion

Materials examined

Only one ovigerous female specimen, with a total length of 7.6 mm, was examined.

***Cranocephalus scleroticus* (Streets, 1878)**

Fig. 2

Systematics accounts

Phylum: Arthropoda
 Class: Malacostraca
 Superorder: Peracarida
 Order: Amphipoda
 Suborder: Hyperiidea
 Family: Oxycephalidae
 Genus: *Cranocephalus*
 Species: *Cranocephalus scleroticus* (Streets, 1878)

Diagnosis

Body

Massive cylindrical body with a total length of about 7.6 mm



Fig. 1. Sampling site at El-Dabaa, western coast of the Egyptian Mediterranean waters; modified from Google Earth.

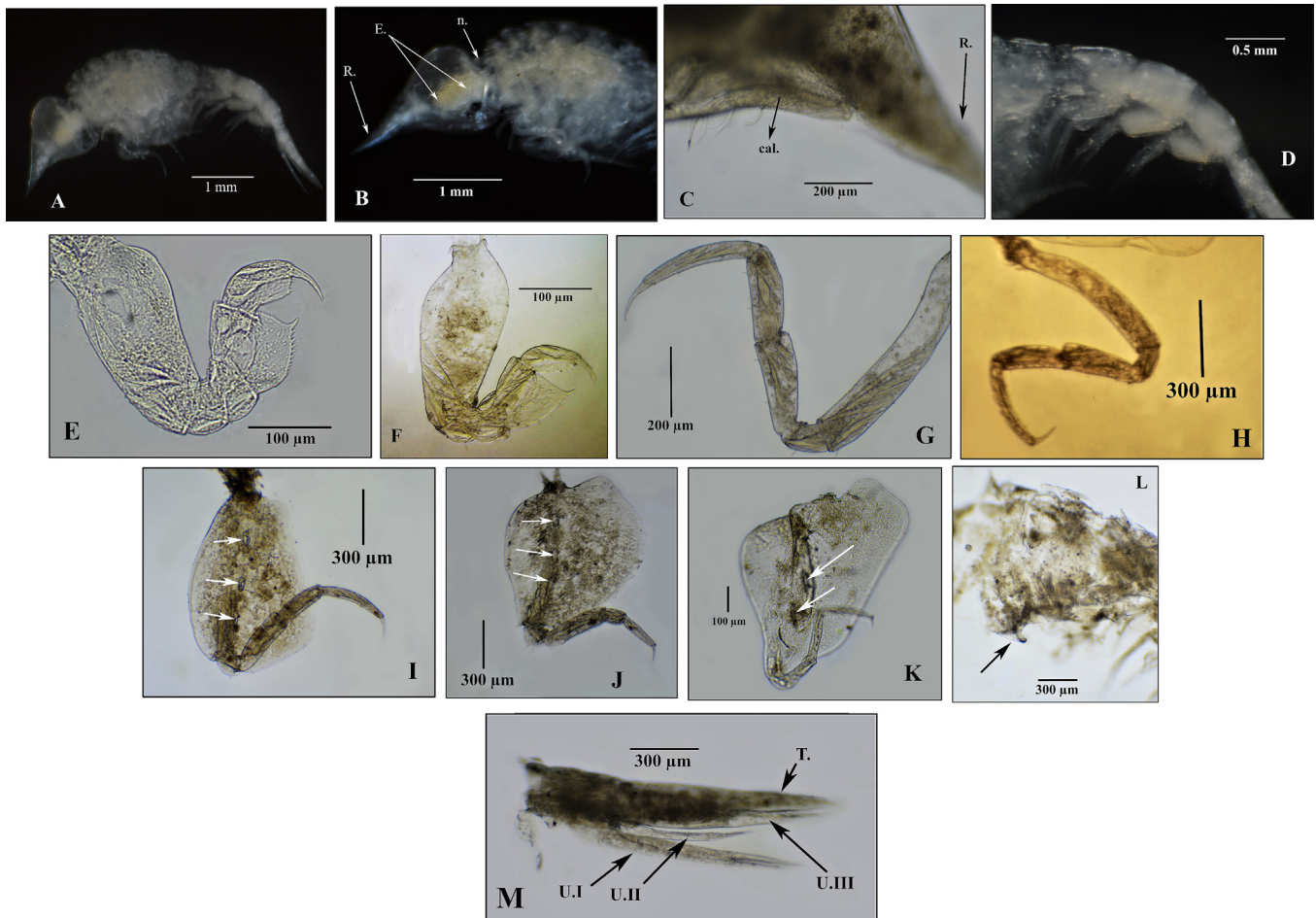


Fig. 2. *Cranocephalus scleroticus* (Streets, 1878). **A.** Whole mount. **B.** Head and Pereon. **C.** Head capsule showing the cal., callynophore of Antenna 1. **D.** Pleon. **E.** Gnathopod 1. **F.** Gnathopod 2. **G.** Pereopod 3. **H.** Pereopod 4. **I.** Pereopod 5. **J.** Pereopod 6. **K.** Pereopod 7. Arrows showing the characteristic pores of the bases in P5, P6, P7. **L.** The backward projecting, spinous process of coxa of the 5th pereopod. **M.** Urosomes. Abbreviations: E., eye facets; R., Rostrum; T., Telson; U.I, Uropod 1; U.II, Uropod 2; U. III, Uropod 3.

Head

Large pointing pear-shaped head, forming about one-quarter of total body length. The base of the head has a short, distinct neck. Eye facets are grouped into two areas, one on each side of the head. With a sharp pointing rostrum occupying, approximately half of the head length, with a weak dorsal keel. Antennae 1 is ventrally situated on the head, with no peduncle, but the callynophore, i.e., the sensory organ, is narrowly rectangular, with two smaller articles terminally attached. Meanwhile, Antennae 2 is absent.

Pereon

The pereon is massive; somewhat swollen and longer than the pleon. The first and last pereonal somites are approximately equal height to the head; however, the middle somites are noticeably higher. Moreover, the border of fusion of the coxal plates and the pereon is remarkable.

Pereopods

All pereopod coxae are partially united with pereonites. A potent, backward-projecting process usually supports the fifth coxae. The basis of the first two pereopods—i.e., the sub-chelate gnathopods 1 and 2—are swollen on both sides and equal in length to the rest of the pereopod, while the carpus has a knife-shaped process with conspicuous teeth. Pereopods 3 and 4 are the same length as pereopods 5 and 6. Pereopods 5–7 have a massive basis, with a bulging posterior border, but never overlap with opposing

pereopoda. Other terminal articles 3–7 are inserted into the basis. The basis of pereopods 5–7 has a heavily calcified cuticle and characteristic pores: 3, 3, and 2, respectively.

Pleon

The pleon is almost cylindrical, tapering posteriorly, but with a shorter height than that of the middle pereonites.

Urosome

The urosome is typically about 1/6–1/5 of the total body length, i.e., shorter than the pleon. Uropods I are longer than uropods II, while uropods III are the shortest of all. Uropods I with basipodite extending beyond the base of the telson and has denticulation in the distal section; the exopodite has denticulate borders, but the endopodite is denticulate on both sides and slightly broader at the base than the exopodite. Uropods II have a shorter basipodite than uropods I, while basipodites of uropods III have equal lengths to both exopodite and endopodite. The tips of rami do not quite reach that of the telson.

Telson

Urosomite III has an equal length to telson, which is narrowly triangular in shape, and united to the urosome.

Table 1

List of the recorded amphipod species along the Egyptian Mediterranean coast (in alphabetic order).

Species/Author	Sources
<i>Ampelisca brevicornis</i> (Costa, 1853)	Schellenberg (1936)
<i>A. diadema</i> (Costa, 1853)	Schellenberg (1936)
<i>A. tenuicornis</i> Liljeborg, 1856	Schellenberg (1936)
<i>A. typica</i> (Spence Bate, 1856)	Schellenberg (1936)
<i>A. unidentata</i> Schellenberg, 1936	Schellenberg (1936)
<i>A. serraticaudata</i> Chevreux, 1888	Soliman (1997)
<i>Amphilocheus neapolitanus</i> Della Valle, 1893	Soliman (1997)
<i>Amphilocheus</i> sp.	Atta (1985)
<i>Ampithoe ramondi</i> Audouin, 1826	Schellenberg (1936)/Atta (1985)/Soliman (1997)
<i>Apherusa bispinosa</i> (Spence Bate, 1857)	Schellenberg (1936)
<i>Atylus swammerdami</i> (H. Milne Edwards, 1830)	Atta (1985)
<i>Bathyporeia guilliamsoniana</i> (Spence Bate, 1857)	Schellenberg (1936)
<i>Caprella liparotensis</i> Haller, 1866	Schellenberg (1936)/Atta (1985)/Soliman (1997)
<i>Caprella equilibra</i> Say, 1818	El-Nassry (1973)/Atta (1985)/Ramadan (1986)/Soliman (1997)
<i>C. acutifrons</i> Latreille, 1802	Atta (1985)/Soliman (1997)
<i>C. acanthifera</i> Leach, 1814	Atta (1985)/Soliman (1997)/Abdelsalam (2004).
<i>C. penantis</i> Leach, 1814	Schellenberg (1936)
<i>Caprella</i> sp.	Schellenberg (1936)
<i>Corophium acherusicum</i> Costa, 1853	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)
<i>C. acutum</i> Chevreux, 1908	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Soliman (1997)/Abdelsalam (2004).
<i>C. bonelli</i> H. Milne Edwards, 1830	Schellenberg (1936)/El-Nassry (1973)
<i>C. sextoni</i> Crawford, 1937	El-Nassry (1973)/Zakaria (2001)/Atta (1985) as <i>C. sextonae</i> /Abdelsalam (2004) as <i>C. sextonae</i>
<i>C. insidiosum</i> Crawford, 1937	Atta (1985)/Soliman (1997)
<i>C. orientale</i> Schellenberg, 1928	Atta (1985)
<i>C. volutator</i> (Pallas, 1766)	Schellenberg (1936)
<i>Cranocephalus scleroticus</i> (Streets, 1878)	Present study
<i>Cymadusa filosa</i> Savigny, 1816	Atta (1985)/Soliman (1997)
<i>Dexamine spinosa</i> (Montagu, 1813)	Schellenberg (1936)
<i>Elasmopus pectenricus</i> (Bate, 1862)	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Ramadan (1986)/Soliman (1997)/Zakaria (2001)/Abdelsalam (2004).
<i>E. pocillimanus</i> (Bate, 1862)	Schellenberg (1936)/Atta (1985)/Ramadan (1986)/Soliman (1997)/Zakaria (2001)/Abdelsalam (2004).
<i>E. rapax</i> Costa, 1853	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Ramadan (1986)/Soliman (1997)/Zakaria (2001)
<i>Erichthonius brasiliensis</i> Dana, 1855	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Ramadan (1986)/Soliman (1997)/Zakaria (2001)/Abdelsalam (2004).
<i>Eriopisa elongata</i> (Bruzellius, 1859)	Schellenberg (1936)
<i>Euthemisto bispinosa</i> Boeck, 1876	Zakaria (1992)
<i>Gammarella fucicola</i> Leach, 1814	Soliman (1997)
<i>Gammarus aequicauda</i> Martynov, 1931	Schellenberg (1936)/Atta (1985)/Soliman (1997)
<i>G. foxi</i> Schellenberg, 1928	Schellenberg (1936)/Atta (1985) as <i>Echinogammarus foxi</i>
<i>Harpinia pectinate</i> Sara, 1891	Schellenberg (1936)
<i>Hyale perieri</i> Lucas, 1849	Soliman (1997)/Zakaria (2001)
<i>Hyale prevosti</i> (H. Milne Edwards, 1830)	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Ramadan (1986)
<i>H. dofjusi</i> Chevreux, 1911	Atta (1985)/Soliman (1997)
<i>H. schmidtii</i> (Heller, 1866)	Schellenberg (1936)
<i>Hyperia latissimi</i> Bovallius, 1889	Zakaria (1992)
<i>H. schizogeneios</i> Stebbing, 1888	Zakaria (1992)
<i>Jassa falcata</i> (Montagu, 1808)	Schellenberg (1936)/El-Nassry (1973)/Ramadan (1986)
<i>Jassa marmorata</i> Holmes, 1903	Atta (1985)/Soliman (1997)/Zakaria (2001)/Abdelsalam (2004).
<i>Lembos</i> sp.	Atta (1985)
<i>Lembos leptocheirus</i> Walker, 1909	Soliman (1997)
<i>Leptocheirus bispinosus</i> Norman, 1908	Schellenberg (1936)
<i>L. guttatus</i> (Grube, 1864)	Schellenberg (1936)
<i>L. pectinatus</i> (Norman, 1869)	Schellenberg (1936)
<i>Leucothoe liljeborgi</i> Boeck, 1861	Schellenberg (1936)
<i>L. spinicarpa</i> (Abildgaard, 1789)	Schellenberg (1936)/Atta (1985)
<i>Lycaea pulex</i> Marion, 1874	Zakaria (1992)
<i>Lysianassa longicornis</i> Lucas, 1846	Schellenberg (1936)
<i>L. pilicornis</i> Heller, 1866	Soliman (1997)
<i>Maera grossimana</i> (Montagu, 1808)	Schellenberg (1936)
<i>M. inaequipes</i> (Costa, 1857)	Schellenberg (1936)/Atta (1985)/Ramadan (1986)/Soliman (1997)
<i>Melita palmata</i> Montagu, 1804	Soliman (1997)
<i>Microdeutopus Gryllotalpa</i> Costa, 1853	Schellenberg (1936)
<i>Microdeutopus similes</i> Myers, 1977	Soliman (1997)
<i>Microdeutopus</i> sp.	Atta (1985)
<i>Nototropis guttatus</i> Costa, 1853	Schellenberg (1936)
<i>Orchestia montagui</i> Audouin, 1826	Schellenberg (1936)/El-Nassry (1973)
<i>Orchestia</i> sp.	Atta (1985)
<i>Parathemisto oblivia</i> (Krøyer)	Zakaria (1992)
<i>Phronima sedentaria</i> (Forskål, 1775)	Zakaria (1992)
<i>Phronimopsis spinifera</i> Claus, 1879	Zakaria (1992)

Table 1 (continued)

Species/Author	Sources
<i>Pleonexes gammaroides</i> Spence Bate, 1857	Schellenberg (1936)
<i>Podocerus variegatus</i> Leach, 1814	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Ramadan (1986)/Soliman (1997)/Abdelsalam (2004).
<i>Pseudoprotella phasma</i> (Montagu, 1804)	Schellenberg (1936)
<i>Rhabdosoma whitei</i> Spence Bate, 1862	Zakaria (1992)
<i>Stenothoe gallensis</i> Reid, 1951	Schellenberg (1936)/El-Nassry (1973)/Atta (1985)/Soliman (1997)/Zakaria (2001)/Abdelsalam (2004).
<i>Stenothoe cattail</i> Stebbing, 1906	Ramadan (1986)
<i>Tritaeta gibbose</i> (Spence Bate, 1862)	Schellenberg (1936)
<i>Urothoe intermedia</i> Bellan-Santini & Ruffo, 1986	Soliman (1997)

Remarks

The morphology of the body, head, gnathopods, pereopods, and urosome can easily distinguish this monospecific genus (*Cranocephalus* Bovallius, 1890) from other genera of the family Oxycephalidae. The heavily calcified cuticle and the characteristic pores seen on the basis of pereopods 5–7 are also distinguishing features. In addition, the potent, backward-projecting process that usually supports the fifth coxae is not observed in any other oxycephalidean. However, the first antennae in females are reduced to three articles, as evident in the genus *Rhabdosoma*, but they differ in morphology.

Habitat and distribution

As indicated by Fage (1960), *C. scleroticus* is epipelagic in habit. There are extremely few records of gelatinous plankton relationships, where the ctenophore *Pleurobranchia* sp. and species of the order Cydippida have been found in association with it (Harbison et al., 1977; Harbison et al., 1978). This species has a widely circumtropical distribution in oceans worldwide (Fage, 1960; Vinogradov et al., 1996). The record in this study is the first for the Egyptian Mediterranean Sea; it represents an addition, that has never been recorded before, to the list of species of Egyptian Mediterranean fauna.

Review of amphipods in Egypt

Table 1 gives a checklist of the recorded amphipod species along the Egyptian Mediterranean coast during the 20th century and afterward, with the most relevant sources of information.

Conclusion

This study confirms the occurrence of the epipelagic amphipod *Cranocephalus scleroticus* (Streets, 1878) for the first time in Egyptian Mediterranean waters. This finding adds to the list of species in the Egyptian Mediterranean Sea. This monospecific genus can be distinguished from other genera of the family Oxycephalidae based on the characteristic morphology of their body, head, gnathopods, pereopods, and urosome, in addition to the heavily calcified cuticles and the characteristic pores seen on the basis of pereopods 5–7. Moreover, the potent, backward-projecting process that usually supports the fifth coxae is not observed in any other oxycephalidean.

Ethical clearance

Not applicable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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