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DETECTION OF AN ALIEN SPECIES OF THE PILUMNIDAE FAMILY OFF THE COAST OF SEVASTOPOL (BLACK SEA)

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In July 2018, during Black Sea hydrobionts sampling, a crab of the family Pilumnidae was detected in the coastal area of the southwestern Crimea. Bottom sediments in the spot of crab finding are represented by a solid substrate. At the time of sampling, the water temperature was +24 °C, and the salinity was 18.0‰. According to morphological characteristics, the specimen we found was classified as a hairy crab *Pilumnus* cf. *vespertilio* (Fabricius, 1793) – a representative of the Indo-Pacific. In the work, photographs of alive and fixed crab are given.

Keywords: crab, alien species, Pilumnidae, *Pilumnus* cf. *vespertilio*, Black Sea

Over the last century, a marked intensification in all areas of human activity throughout the world resulted in sharp transformation of local ecosystems and distribution of alien species. For modern ecology, their introduction has become one of the global problems.

Out of decapods, crabs account for the highest number of alien species detected. About 7,100 species of crabs and craboids (representatives of the orders Brachyura and Anomura) have been recorded worldwide; out of them, 73 species are regarded as invasive [Brockerhoff, McLay, 2011]. These hydrobionts penetrate mainly with ship ballast water and ship-bottom fouling.

To date, there are 5 species of alien crabs in the Sea of Azov–Black Sea basin: *Rhithropanopeus harrisi* (Gould, 1841), *Callinectes sapidus* Rathbun, 1896, *Eriocheir sinensis* H. Milne Edwards, 1853, *Dyspanopeus sayi* (Smith, 1869), and *Hemigrapsus sanguineus* (De Haan, 1835) [in De Haan, 1833–1850] [Zalota, 2017; Guchmanidze et al., 2017]. Out of them, one species, *Rh. harrisi*, can be classified as fully naturalized in this area [Slynko et al., 2017; Zalota et al., 2016]. The crab *C. sapidus* is caught regularly [Gül et al., 2021]. For *E. sinensis*, several records are described in the Sea of Azov and Black Sea [Murina, Antonovsky, 2001]. Crabs *D. sayi* and *H. sanguineus* are known due to their single findings in the Black Sea waters (Romanian coast) [Micu et al., 2010a, b].

The detection of another crab species, which is an inhabitant of the Indo-Pacific and was not previously recorded in the Mediterranean basin, in the Black Sea off the Crimean coast is interesting and unusual. For the Black Sea, the Mediterranean basin is often a donor of new species [Boltachev, Karpova, 2014; Galil et al., 2002].

MATERIAL AND METHODS

The material for the study was a crab specimen caught in July 2018 in the southwestern Crimea area (Sevastopol, Karantinnaya Bay) (Fig. 1) during the sampling of Black Sea hydrobionts. The crab was transported alive to the Sevastopol Marine Aquarium Museum and lived there until April 2020.

The dimensional characteristics of the crab were determined using a caliper with an accuracy of 0.1 mm. The individual weight was measured in an electronic balance with an accuracy of 0.01 g. The detected specimen was identified according to the species guides [Awaad et al., 2019; Emmerson, 2016; Naderloo, 2017]. The crab specimen fixed in 96% ethanol is stored in the World Ocean hydrobionts collection at IBSS.

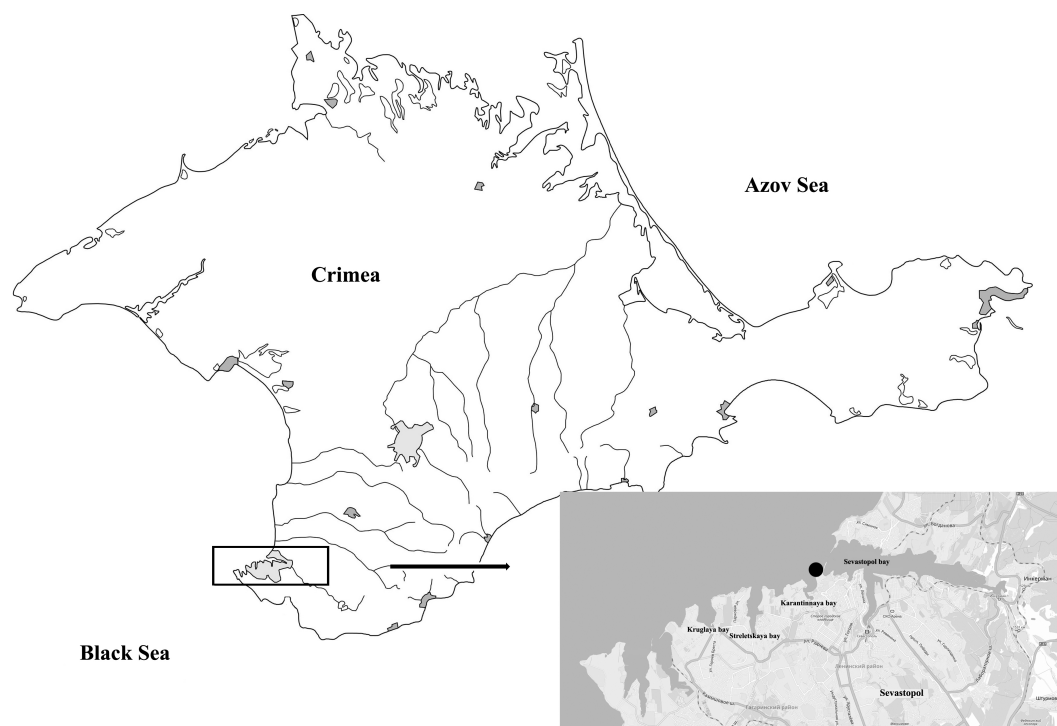


Fig. 1. Map of the crab finding spot (the location is marked with a black dot)

RESULTS AND DISCUSSION

Material. The crab was detected on 11.07.2018 in the coastal area of the southwestern Crimea near Sevastopol ($44^{\circ}37'02.12''N$, $33^{\circ}30'12.38''E$) on a rocky bottom among thickets of seagrasses and algae. The water temperature at the time of sampling was $+24^{\circ}C$, and the water salinity was about 18.00‰. The crab specimen found is a mature female (Fig. 2a, b), with a carapace width of 39.4 mm and a length of 27.2 mm, with a total weight of 31.7 g.

Description. The carapace is hexagonal, with rounded edges (Fig. 2c, d). Its front is convex; the back is flatter. The width of the carapace is about 1.4 times the length. The body surface is densely covered with setae of various length, with longer ones at margins. The frontal lobe is divided by a medial notch into two parts, with each having a distinct supraorbital angle. The eye orbits are small, with two notches on the dorsal margin. The anterolateral margin is slightly shorter than the posterolateral margin and is armed with three teeth (without an external orbital).

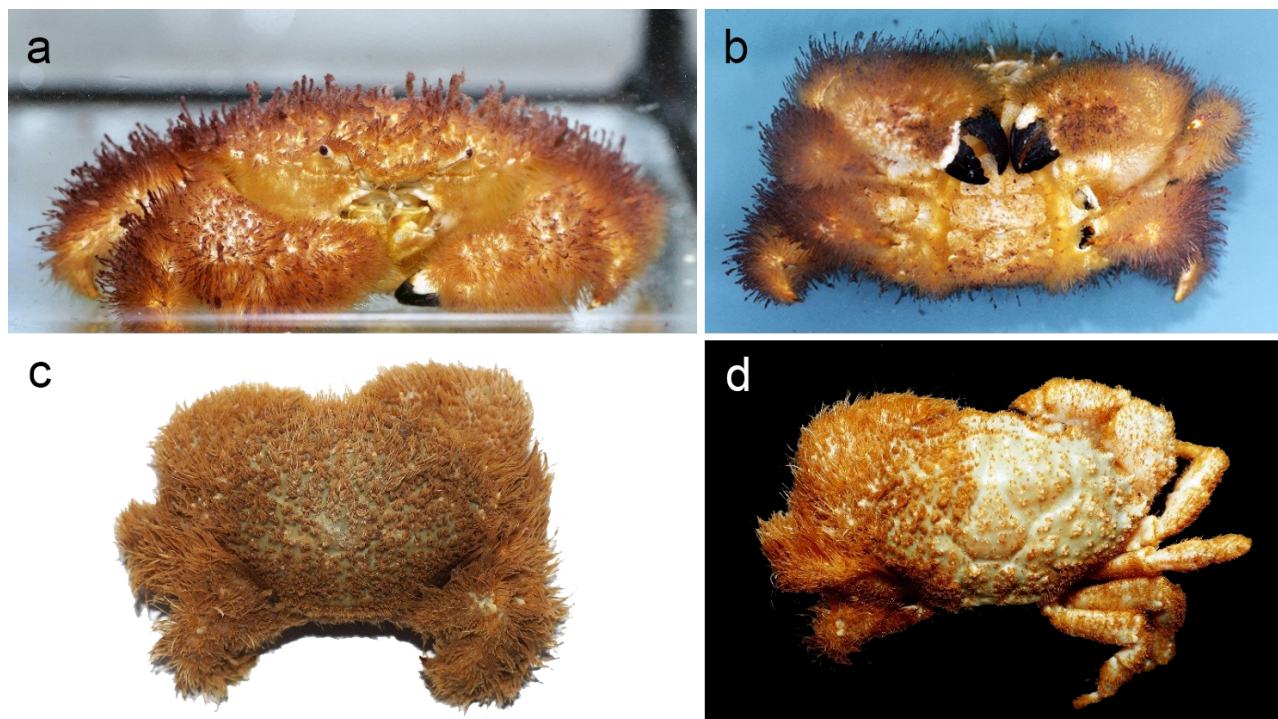


Fig. 2. Hairy crab: a, general view; b, ventral side; c, d, dorsal side

Chelipeds are asymmetrical, with long setae (Fig. 2b). Claw fingers are black, with blunt teeth along the cutting edge. II–V pairs of walking limbs are flattened, abundantly covered with setae (Fig. 2d). The setae are brown to golden yellow.

The caught specimen belongs to the genus *Pilumnus* Leach, 1816 (hairy crabs), the family Pilumnidae. Among the representatives of this genus, there are several species with similar morphological structure and setae coverage.

The detected specimen was classified by us as the hairy crab *Pilumnus* cf. *vespertilio* (Fabricius, 1793) based on the following peculiarities:

- The only representative of the family in the Black Sea – *Pilumnus hirtellus* (Linnaeus, 1761) – has short club-shaped setae on the dorsal surface of the carapace, while the caught crab has the carapace densely covered with even setae of different length. In *P. hirtellus*, the anterolateral margin of the carapace is armed with four teeth (without an external orbital); in *P. vespertilio*, there are three teeth (without an external orbital).
- From the closely related species *Pilumnus minutus* De Haan, 1835 [in De Haan, 1833–1850], the found specimen differs in a longer setae coverage, maximum size, and some structural features. Unlike *P. vespertilio*, the crab *P. minutus* is a small species, with a carapace length of about 10 mm; moreover, it has thin, elongated pereopods [Galil et al., 2002; *Pilumnus minutus*, 2020].
- Another representative of the genus – *Pilumnus scabriusculus* Adams & White, 1849 – also has a dense setae coverage; its carapace is covered with long yellowish hairs. In *P. scabriusculus*, the anterolateral margins of the carapace have three rounded low teeth (the first and second are almost equal, and the third is the smallest, triangle-shaped). In *P. cf. vespertilio*, the lateral margins have three teeth; out of them, the first is triangle-shaped, and the second and third are sharp (the last tooth is sharper) [Ng, Clark, 1849].

The crab *P. scabriusculus* inhabits the coast of Australia, New Guinea, the Philippines, and the Seychelles; moreover, it was registered for the Sea of Japan. The crab *P. vespertilio* is widely distributed in the warm-water areas of the Indo-Pacific; it is found from the coast of East Africa to the Philippines [Awaad et al., 2019; Emmerson, 2016; Kyomo, 2002], recorded off the coast of Australia and Singapore [Siddiqui, Tirmizi, 1992], and detected in New Caledonia [Emmerson, 2016]. Also, this species was registered in the Red Sea, the Gulf of Suez, and the Suez Canal [Awaad et al., 2019], and this makes the detection of the crab off the Crimean coast possible.

P. vespertilio is an inhabitant of sublittoral rocky areas and mangroves. It occurs in the coastal areas from the water edge to a depth of 10 m, under stones, in crevices, and among coral fragments. This crab, due to its dense setae coverage, becomes almost invisible on the substrate. It spends most of time in burrows, which it builds on both hard and soft bottoms [Emmerson, 2016; Kyomo, 1999, 2001]. It is most active at night. The name of the crab species was inspired by the name of the genus of bats *Vespertilio* Linnaeus, 1758 – due to external similarity of the setae coverage of these animals [Emmerson, 2016].

Males are larger than females and can reach 25.5–30.8 mm in width and 18.0–25.5 mm in length; females are up to 25 mm in width and 18.1 mm in length [Dai, Yang, 1991]. Some individuals can reach 40.1 mm in length [Teddy bear crab, 2020]. They are continuous breeders, with maximum activity during summer months [Kyomo, 1999; Litulo, 2005]. In temperate latitudes, the breeding season is shorter and lasts May to October [Kyomo, 1999]. In the coastal area near Okinawa Island (Japan), the duration of embryogenesis for hairy crabs averages 21.2 days [Kyomo, 2002]. This species has four larval stages – three zoeal and one megalope [Clark, Paula, 2003; Siddiqui, Tirmizi, 1992]. Off the coast of Japan, the hairy crab mainly feeds on algae, most often red *Gelidium pusillum* (Stackhouse) Le Jolis, 1863 (Rhodophyta), and on small invertebrates [Kyomo, 1999]. Moreover, *P. vespertilio* can feed on toxic Zoantharia (coral polyps), and the poisons accumulated while feeding on these coral polyps make the crabs toxic [*Pilumnus vespertilio* – Hairy crab, 2021]. Interestingly, when catching the specimen considered, the second author of the article suffered burns to his fingers.

The occurrence of the hairy crab in the Black Sea can be explained by economic activity. Specifically, larvae (planktonic stage of crab development) could be transferred through ballast water. An indirect confirmation of this fact is that the crab was detected in the immediate vicinity of the Sevastopol Bay mouth, where various ships are based for many years.

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ОБНАРУЖЕНИЕ ЧУЖЕРОДНОГО ВИДА КРАБА СЕМЕЙСТВА PILUMNIDAE У БЕРЕГОВ СЕВАСТОПОЛЯ (ЧЁРНОЕ МОРЕ)

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В июле 2018 г. в прибрежной зоне Юго-Западного Крыма во время сбора образцов черноморских гидробионтов обнаружен краб семейства Pilumnidae. Донные отложения в районе поимки краба представлены твёрдым субстратом. На момент сбора материала температура воды составляла +24 °С, солёность — 18,0 ‰. Пойманный экземпляр по морфологическому строению был идентифицирован нами как волосатый краб *Pilumnus* cf. *vespertilio* (Fabricius, 1793), представитель Индо-Тихоокеанского региона. В работе приведены фотографии живого и фиксированного краба.

Keywords: crab, alien species, Pilumnidae, *Pilumnus* cf. *vespertilio*, Black Sea