

First record of *Parabrachiella hostilis* (Heller, 1868; Copepoda: Lernaepodidae) from *Umbrina cirrosa* (Linnaeus, 1758; Pisces: Sciaenidae) in Turkey

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Abstract

Parabrachiella hostilis (Heller, 1868; Copepoda: Lernaepodidae) was reported for the first time from the gill filaments and gill rakers of the shi drum, *Umbrina cirrosa* (Linnaeus, 1758; Pisces: Sciaenidae) in Turkey. Also, some of morphological characters of this parasitic copepod are given using photographs and drawings.

Introduction

The family Lernaepodidae includes over 260 species, of which 90% are marine. A characteristic feature of lernaepodids is the bulla that female implants in the fish and to which its second maxillae are attached. Attachment to gill filaments, as well as pressure from parasites within the buccal cavity, damages the gills and leads to a loss of respiratory surface area (Lester and Hayward, 2006).

Johnson et al. (2004) and Piasecki et al. (2004) emphasised the importance of parasitic copepods for marine and freshwater aquaculture. About 8% of parasitic copepod species reported from cultured fishes in marine and brackish waters throughout the world belong to members of the family Lernaepodidae

(Johnson et al., 2004). Likewise, members of the freshwater genus *Salmincola*, especially *S. californiensis* induce health issues in farmed salmonids (Modin and Veek, 2002), while *Alella macrotrachelus* is reported to be one of the most harmful gill parasites in cultured sparids (Ueki and Sugiyama, 1979; Kawatow et al., 1980).

Paul et al. (2013) observed local hyperplasia, lymphocytic, eosinophilic granulated and rodlet cells infiltration, and atrophy in the epithelium of the attachment site (nasal cavity) of Lebranche mullet infested with *Parabrachiella* sp in Argentina.

Castro Romero and Baeza Kuroki (1987) proposed a key to differentiate three groups of females

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according to their number of posterior processes; group 1 (2 pairs), group 2 (1 pair) and group 3 (more than 2 pairs), although the number of species belonging to the genus *Parabrachiella* is still debated; 67 and 73 according to Piasecki et al. (2010) and World Register of Marine Species (WoRMS) Editorial Board (2015), respectively.

Raibaut et al. (1998) reviewed the occurrence of 226 parasitic copepod species distributed in 88 genera and 20 families in fish of the Mediterranean Sea and also 8 *Parabrachiella* species (*P. chevreuxi*, *P. bispinosa*, *P. triglae*, *P. insidiosa*, *P. merlucii*, *P. exigua*, *P. hostilis*, *P. richiardi*) in 12 fish species.

Aquaculture of trout and carp in inland waters and sea bream and sea bass in marine waters has been an important economic factor for Turkey, while tuna farming represents a more recent activity. In order to diversify aquaculture production, introduction of other valuable fish species in aquaculture has been attempted or is ongoing. Likewise, since 2005 breeding activities are present for the sturgeon (*Acipenser* sp), eel (*Anguilla anguilla*), crayfish (*Astacus leptodactylus*), striped bass (*Morone saxatilis*), shrimp (*Penaeus* sp), turbot (*Scophthalmus maximus*), common sea bream (*Pagrus pagrus*) and shi drum (*Umbrina cirrosa*) (Yavuzcan et al., 2010; Akpınar et al., 2012). Therefore, knowledge on epidemiology, particularly of parasitic diseases of those fish is important for a sustainable fish farming and this study aims to report novel geographic distribution of *P. hostilis* (Heller, 1868).

Material and methods

Twenty shi drum *Umbrina cirrosa* (Linnaeus, 1758) (Pisces: Sciaenidae) were collected by local gears from Aegean Sea of Turkey in 2014. The

collected parasites were fixed in 70% ethanol. Some specimens were later cleared in lactic acid before dissection of the appendages of copepods. Dissected parts were mounted on slides in glycerin-gelatine mounting medium. Side of coverslip were coated with colourless nail polish. The drawings of appendages were carried out with the aid of a camera lucida (Olympus U-DA). The photos were taken using a Canon EOS 1100D camera connected to a microscope. Measurements were taken in millimetres (mm), with a micrometrical programme (Pro-way). Scientific names, synonyms of the parasite and the host were checked through WoRMS (2015) and terminology was used according Kabata (1979). Parasites (MNHN-IU-2013-18736) were deposited in the collections of the Muséum National d'Histoire Naturelle (MNHN), Paris, France.

Results

Subclass Copepoda

Class Maxillopoda

Order Siphonostomatoida

Family Lernaeopodidae

Parabrachiella hostilis (Heller, 1868) (Figure 1)

Infestation parameters: All parasites were firmly attached to the gill filaments. The prevalence, mean intensity and mean abundance of parasite were 20%, 1 and 0.2, respectively. The total number of parasites isolated and used for morphological measurements was 4.

The length and width with standard errors were measured as 2.08 ± 0.11 and 0.66 ± 0.02 for cephalothorax, 1.34 ± 0.13 and 0.92 ± 0.14 for trunk, 0.71 ± 0.07 and 0.38 ± 0.03 for second maxilla, respectively.

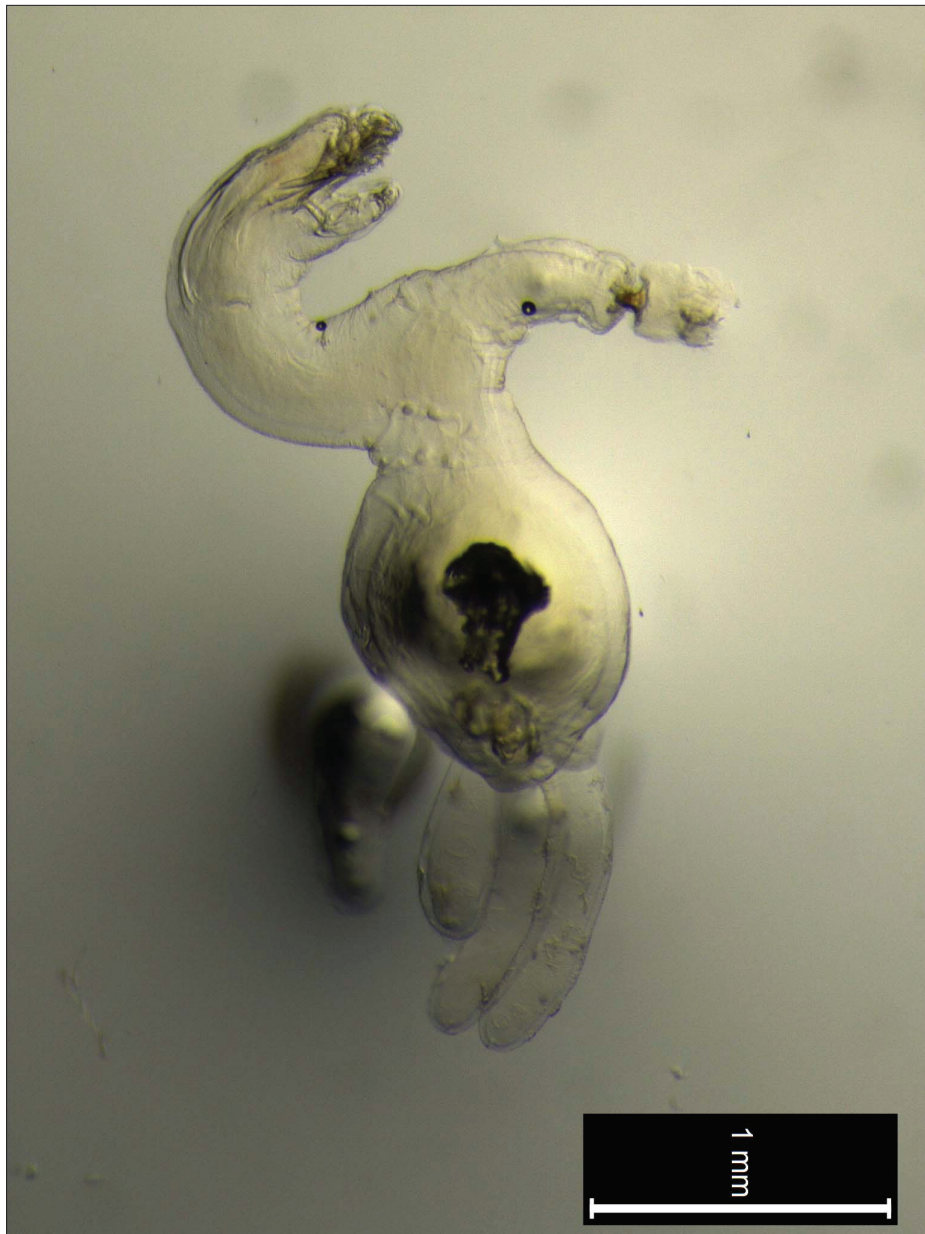


Figure 1. Fresh mount of female *Parabrachiella hostilis* (scale bar = 1 mm).

Female: Second maxillae shorter than trunk and cephalothorax. Second maxilla short, about one third of cephalothorax length, fused at tip; bulla (Figure 2F) small, mushroom-shaped, with short manubrium. First maxilla (Figure 2C, H) biramous with small endopod and prominent tripartite exopod. Endopod composed of short digitiform process surmounted with two setae. Exopod tripartite with two big fingerlike processes and short third one. Mandible (Fig.

2B, I) with dental formula P1, S1, P1, S1, P1, S1, B5. Maxilliped (Figure 2A, G) with strong corpus, moderately elongated, with 2 swellings and small denticulated patch in its myxal area; proximal swelling covered with small, sharp denticles; distal 1 with strong terminal spine. Shaft bearing large spine on its side. Claw large with secondary tooth and auxiliary seta at base of claw. First antenna (Figure 2D, K) incompletely 4-segmented; basal segment unarmed;

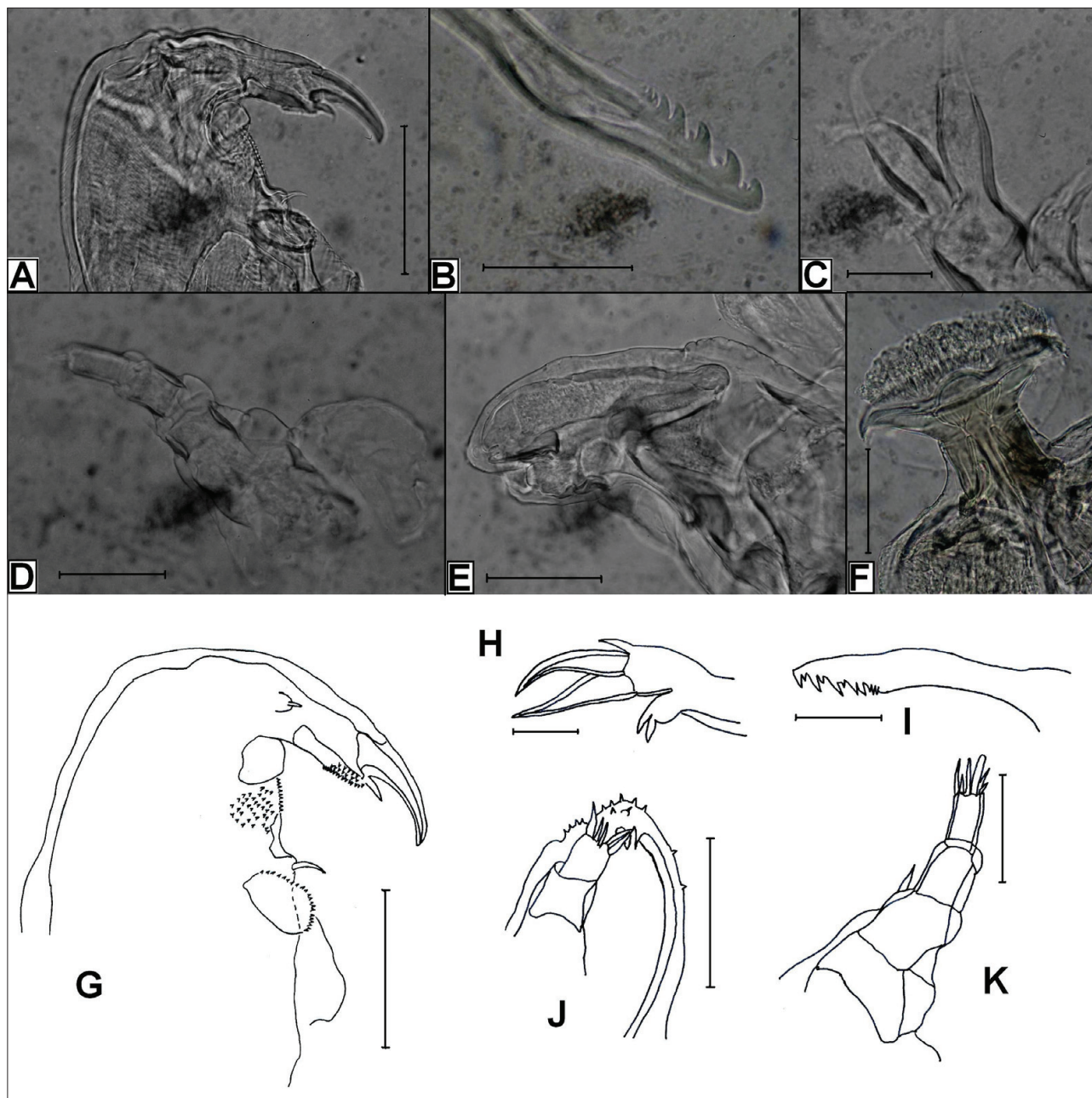


Figure 2. A, G: Maxilliped (scale bar =0.08mm), B, I: Mandible (scale bar =0.04 mm), C, H: First maxilla (scale bar =0.02 mm), D, K: First antenna (scale bar =0.05mm), E, J: Second antenna (scale bar =0.08 mm), F: Bulla (scale bar =0.05 mm).

second segment armed with seta (whip) on medioventral margin; third segment unarmed; apical segment with terminal armature consisting of six setae. Second antenna (Figures 2E, J) typical biramous, bulbous exopod more prominent and longer than endopod, covered with robust spinules on rounded tip. Endopod

two-segmented, armed apically with four setae, two long and two short. Spine numbers on second antenna were found as 4-5 on exopod apex, 7 on endopod apex; 2 spines medially of endopod. Female has 2 dorsal and 2 ventral processes.

Male: unknown

A histopathological evaluation of the parasite attachment site was not performed; however, intensive mucous accumulation was observed on gill filaments and cavity.

Discussion

Raibaut et al. (1998) listed parasitic copepods of sciaenids from the Mediterranean Sea, *Caligus affinis* Heller, 1866; *Lernaenicus vorax* Richiardi, 1877; *Lernanthropus gisleri* Van Beneden, 1852; *P. hostilis*; *P. richiardi*; *Sphaerifer corvinae* (Leydig, 1851) and *Sphaerifer leydigi* Richiardi, 1877, while only four parasitic copepods of the Lernaepodidae family; *Brachiella thynni* Cuvier, 1830, *P. chevreauxii* (Van Beneden, 1891), *Parabrachiella hostilis* (Heller, 1868), *P. richiardi* (Ben Hassine and Raibaut, 1978) were identified from Mediterranean sciaenids.

Although this study is not a redescription or revision of the species, it represents a new geographical report for the parasite and summaries morphological characteristics of four lernaepodid species.

P. chevreauxii is a parasite of sciaenid and lutjanid teleosts, wide spread in the Atlantic, the Mediterranean and the Indian Ocean (Kabata, 1966; Kabata, 1979; Piasecki, 1993; Piasecki et al., 2010; WoRMS, 2015). It is differentiated from *P. hostilis* by possessing a short barb not reaching $\frac{1}{2}$ margin length of claw; two secondary teeth close to inner margin of maxilliped claw; mandible with dental formula P1S1P1S1P1S1B4; processes 4 of the second antenna prominent, covered with tubercles; second maxillae very short, apparently fused; and dorsal and ventral of posterior processes approximately of the same length.

P. richiardi is reported in *U. cirrosa* and *U. canariensis* Valenciennes, 1843 from Tunisian Coasts of the Mediterranean Sea (Ben Hassine and Raibaut, 1978; Piasecki, 1993; Raibaut et al., 1998; Piasecki et al., 2010; WoRMS, 2015). Maxillule of *P. richiardi* resembles that of *P. hostilis*. It is differentiated from *P. hostilis* by possessing 7 (two of them are short) setae in the end segment of first antenna; mandible with dental formula P1S1P1S1P1S1B6; secondary teeth on the barb of maxilliped; spines at only one side at myxal region on maxilliped; endopod of second antenna with heavy spines and a trunk that is longer than wide.

P. hostilis is reported from the Eastern North Atlantic and the Mediterranean coasts of Africa. It was reported from three host species belonging to Sciaenidae; *U. canariensis*, *U. cirrosa* and *Sciaena umbra* Linnaeus, 1758 (Brian, 1906; Barnard, 1955; Ben Hassine and Raibaut, 1978; Kabata, 1979; Piasecki, 1993; Raibaut et al., 1998; WoRMS, 2015).

Specimens isolated in this study most closely resemble drawings of *P. hostilis* described by Ben Hassine and Raibaut (1978) from Tunis, characterised by possessing of the same number of setae on endopod and exopod of the first maxilla; dental formula of mandible; denticulation and spine on maxilliped; number of segment and a whip form on the first antenna; ratio of exopod/endopod length and number of setae on endopod; and spinulation of exopod on the second antenna. The present findings are differentiated from Ben Hassine and Raibaut (1978) drawings by possessing dental formulation of mandible and seta on the distal of antennule.

Bakır et al. (2014) reported eight species of the

family Lernaepodidae from marine habitats in Turkey; *P. bispinosa* (von Nordmann, 1832) and *P. exigua* (Brian, 1906) in Sea of Marmara.

Morphologic features of dissected specimens permitted identification of this copepod as *P. hostilis*, which represents its first record in Turkey marine habitats.

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