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OCCURRENCE OF *PARABRACHIELLA INSIDIOSA* (HELLER, 1865) AND *PARABRACHIELLA MERLUCCII* (BASSETT-SMITH, 1896) (COPEPODA; LERNAEOPODIDAE) IN EUROPEAN HAKE IN TURKEY

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ABSTRACT

In this study, Parabrachiella insidiosa (Heller, 1865) and Parabrachiella merluccii (Bassett-Smith, 1896) (Copepoda; Lernaepodidae) found on gill rakers of European hake, Merluccius merluccius (Linnaeus, 1758) (Pisces; Merlucciidae), are reported for the first time from the area of Turkey. Also, some morphological characters of these parasitic copepods are given using photographs and drawings.

Key words: *Parabrachiella*, european hake, Turkey, parasitic, copepod

SEGNALAZIONE DI *PARABRACHIELLA INSIDIOSA* (HELLER, 1865) E *PARABRACHIELLA MERLUCCII* (BASSETT-SMITH, 1896) (COPEPODA; LERNAEOPODIDAE) NEL MERLUZZO IN TURCHIA

SINTESI

Nello studio viene riportata per la prima volta la presenza di Parabrachiella insidiosa (Heller, 1865) e Parabrachiella merluccii (Bassett-Smith, 1896) (Copepoda; Lernaepodidae) sulle branchiospine del merluzzo europeo Merluccius merluccius (Linnaeus, 1758) (Pisces; Merlucciidae) in Turchia. Gli autori riportano inoltre alcuni caratteri morfologici di questi copepodi parassiti, con l'ausilio di fotografie e disegni.

Parole chiave: *Parabrachiella*, merluzzo, Turchia, parassiti, copepodi

INTRODUCTION

The European hake (*Merluccius merluccius*) occurs in the Atlantic coasts of Europe and western North Africa; northward up to Norway and Iceland, southward down to Mauritania. It is also found in the Mediterranean Sea and along the southern coast of the Black Sea. The European hake is an economically important species. It is one of the principal target species of trawl fishery in the Mediterranean. *M. merluccius* is an important component of the shelf and upper part of the continental slope fish assemblage in the western Mediterranean Sea (Biagi et al., 2002; Busalacchi et al., 2010). It is usually found between 70 m and 370 m of depth, but may also occur within a wider depth range, from inshore waters (30 m) to 1000 m (Cohen et al., 1990).

Although *P. insidiosa* and *P. merluccii* have been recorded from various localities throughout the world (Thompson & Scott, 1903; Scott & Scott, 1913; Barnard, 1955; Capart, 1959; Kabata, 1963; Kabata, 1979; Kabata, 1992; Kabata & Ho, 1981; Kabata, 1986; Radujkovic & Raibaut, 1989; Raibaut et al., 1998; Benkirane et al., 1999; Boualleg et al., 2010), there have been no records on these parasitic copepods from Turkey before.

This paper presents the first records of *P. insidiosa* and *P. merluccii* in Turkey.

MATERIAL AND METHODS

One hundred and fifty specimens of *Merluccius merluccius* (Linnaeus, 1758) (Pisces; Merlucciidae) were collected by local gears from Turkey's North Aegean Sea and Bandırma Bay in 2014. The collected parasites were fixed in 70% ethanol. Some of the specimens were cleared in lactic acid before the dissection of their appendages. The photos were taken with a Canon EOS 1100D camera connected to a microscope. Measurements were taken in millimetres (mm), with a micrometric programme (Pro-way). The parasites' scientific names, synonyms and hosts were checked with WoRMS (Eds) (2016), Froese & Pauly (2016). Kabata (1979) was consulted for terminology. *P. insidiosa* (MNHN-IU-2013-18738) and *P. merluccii* (MNHN-IU-2013-18737) were deposited in the collections of the Museum National d'Histoire Naturelle (MNHN), Paris, France.

RESULTS

***Parabrachiella insidiosa* (Heller, 1865) (Copepoda; Siphonostomatoida; Lernaepodidae)**

All parasites were firmly attached to the gill rakers. The prevalence and mean intensity of parasite were 9.33% and 1.35, respectively. The total number of parasites was 19. The body length of *P. insidiosa* varies from 8 to 12 mm (Fig.1). Trunk longer than broader, with 2 pairs of posterior processes. Cephalothorax and second



Fig. 1: *Parabrachiella insidiosa*, ♀ (scale bar 2 mm).
Sl. 1: *Parabrachiella insidiosa*, ♀ (merilo 2 mm).

maxilla shorter than the trunk. Maxilliped (Fig. 2e) with a robust corpus, myxa bearing single seta. Subchela short, slender with a big spine near mid-length, a spine next to claw base and spinulation on distal part of inner margin, claw well-delimited, with slender tip and pair of teeth near mid-length. Mandible (Fig. 2a) with dental formula P1, S1, P1, S1, P1, S1, B5.

First maxilla exopod (Fig. 2b) from ventral to lateral armed with two subapical setae; endopod with two digitiform papillae, each bearing apical long and short seta. First antenna (Fig. 2c) indistinctly four-segmented, division between first and second segments not always discernible; distal armature with 1 tubercle and 5 visible elements. Second antenna endopod clearly two-segmented (Fig. 2d), distal segment with three spines, two of equal size, the third longer and broader. Exopod larger than endopod. Second maxillae with tips expanded with indistinct 5 lobate processes (more or less separate) (Fig. 2f).

***Parabrachiella merluccii* (Basset-Smith, 1896) (Copepoda; Siphonostomatoida; Lernaepodidae)**

All parasites were firmly attached to the gill rakers. The prevalence and mean intensity of parasite were

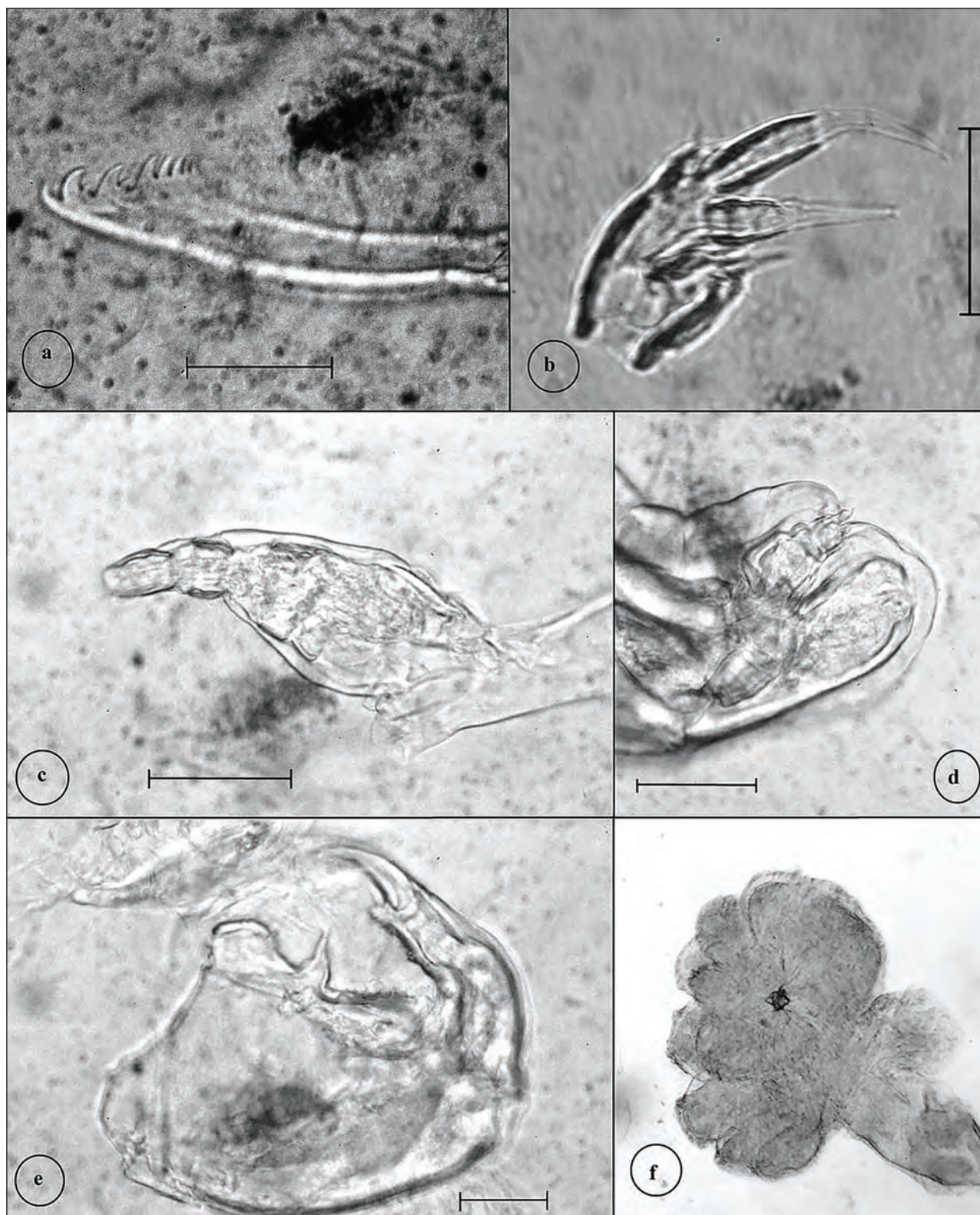


Fig. 2: *Parabradiella insidiosa* (♀): (a) Mandible (0.02 mm); (b) first maxilla (0.02 mm); (c) first antenna (0.05 mm); (d) second antenna (0.04 mm); (e) maxilliped (0.035 mm); (f) bulla.

Sl. 2: *Parabradiella insidiosa* (♀): a) spodnja čeljustnica (0,02 mm); (b) prva zgornja čeljustnica (0,02 mm); (c) prva antena (0,05 mm); (d) druga antena (0,04 mm); (e) čeljustna nožica (0,035 mm); (f) bulla.



Fig. 3: *Parabracchiella merluccii* ♀ (scale bar 2 mm).
Sl. 3: *Parabracchiella merluccii* ♀ (merilo 2 mm).

6.6% and 1, respectively. The total number of parasites was 10.

The body length of *P. merluccii* varies from 4 to 7 mm (Fig. 3). Trunk with 2 pairs of posterior processes. Maxilliped (Fig. 4e, f) with a robust corpus, traces of subdivision near basal end. Myxa with fine small spines and a short seta, barb stout half as long as the claw; near mid-length of inner margin with a secondary tooth, with a pair of teeth on claw some distance above inner margin. Mandible (Fig. 4a) with dental formula P1, S1, P1, S1, P1, S1, B5.

First maxilla (Fig. 4b) long, slender with endopod slightly displaced from ventral to lateral surface, long cylindrical distally with two subequal setae and a short seta, exopod short, narrow with two short setae. First antenna (Fig. 4c) four-segmented with slightly inflated basal part and prominent whip at distal end of second segment, border between first and second indistinct, distal segment with well-developed apical armature comprising one tubercle and 5 setae. Second antenna biramous (Fig. 4d). Exopod more prominent and longer than endopod. Exopod bulbous, covered with robust, conical spinules on rounded tip. Endopod two-segmented, armed apically with a longer and broader seta and two short setae.

Spinulation on the anterior-medial side of endopod. Second maxillae with undivided bulla (Fig. 4g).

DISCUSSION

Raibaut et al. (1998) reviewed the occurrence of 226 parasitic copepod species distributed over 88 genera and 20 families of fishes of the Mediterranean Sea. The seven parasitic copepods related to the European hake were listed as *Chondracanthus merluccii*, *Clavella adunca*, *C. stellata*, *Lernaeocera lusci*, *Thysanote impudica*, *P. insidiosa* and *P. merluccii* (Kabata, 1992; Tirard et al., 1996; Raibaut et al., 1998; Gaglio et al., 2011).

P. insidiosa is a highly polymorphic species, specific to the genus *Merluccius*. It is reported from the Mediterranean, the North Atlantic Ocean and the Pacific Ocean. *P. insidiosa* has been reported mainly on the *Merluccius* genus, such as *Merluccius merluccius* (Radujkovic & Raibaut, 1989; Benmansour & Ben Hassine, 1997; Boualleg et al., 2010), *M. australis* (MacKenzie & Longshaw, 1995), *M. gayi peruanus* (Chero et al., 2014), *M. hubbsi* (Etche-goin & Sardella, 1990), *M. capensis* (Krzeptowski, 1980); *M. paradoxus* (Botha, 1986); *M. bilinearis*, *M. productus* (Kabata & Ho, 1981), *M. gayi gayi* (George-Nascimento, 1996), and less frequently on other fish families, including *Chelidonichthys lucerna*, *Trigla lyra* (Raibaut et al., 1998) and *Dicentrarchus labrax* (Brian, 1906). Its morphological variability has caused several scientists to propose new taxa for the parasite of the South African and Argentinian hake species (*M. capensis*, *M. gayi*). Kabata & Ho (1981) proposed to set the morphology of the posterior extremity as one of the criteria of distinction between the various forms of *P. insidiosa*, the other two being host affiliation and geographical distribution.

P. insidiosa f. insidiosa on *M. merluccius* and other species of this genus from the European and African-Atlantic waters bear well-developed posterior processes, while *P. insidiosa f. lageniformis* (on *M. gayi* from the Atlantic coast of South America) and *P. insidiosa f. pacifica* (on *M. hubbsi* and *M. productus* from the Pacific coasts of South and North America, respectively) are devoid of posterior processes according to the Kabata & Ho (1981) trinomial nomenclature.

The present species were compared with drawings by Kabata (1979) and no major difference was observed. The shape of the trunk was longer than wider, and the morphological features of all the dissected specimens, including structure, size of maxillule exopod and endopod, number of teeth and dental formula of mandible, maxilliped spinulation and location of claw and teeth, size of antenna exopod and endopod, number of segment and seta on antennule, permitted the identification of this copepod as *P. insidiosa*. The second maxillae with 5 lobate processes in our samples are the same as in findings by Kabata (1979) and Barnard (1955).

When the 12 host fish species of the *P. insidiosa* parasite were examined according to family characteristics,

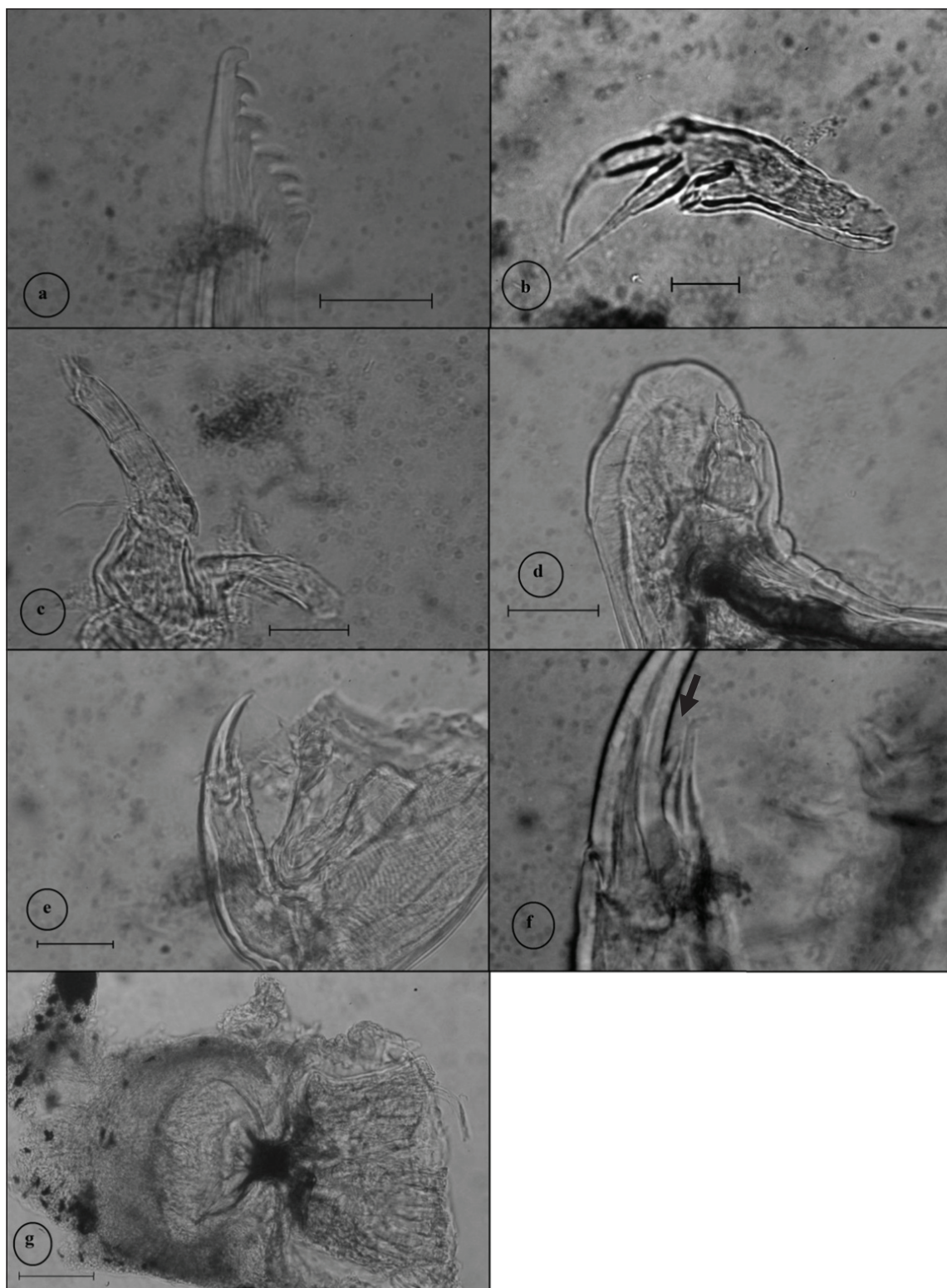


Fig. 4: *Parabradiella merluccii* (♀): (a) Mandible (0.02 mm); (b) first maxilla (0.04 mm); (c) first antenna (0.04 mm); (d) second antenna (0.05 mm); (e) maxilliped (0.035 mm); (f) distal part of maxilliped; (g) bulla (0.8 mm).
Sl. 4: *Parabradiella merluccii* (♀): (a) spodnja čeljustnica (0,02 mm); (b) prva zgornja čeljustnica (0,04 mm); (c) prva antena (0,04 mm); (d) druga antena (0,05 mm); (e) čeljustna nožica (0,035 mm); (f) distalni del čeljustne nožice; (g) bulla (0,8 mm).

75% were found to belong to the Merlucciidae, 17% to the Triglidae, 8% to the Moronidae; in terms of habitat 42% of the fish were bathydemersal, 33% demersal, 17% benthopelagic and 8% pelagic-oceanic; as to their feeding habits, all the 12 fish species were denoted in literature as carnivores.

P. merluccii has been reported from the Mediterranean and the North Atlantic Ocean and only on the Merluccius genus, such as *M. merluccius* (Brian, 1906; Scott & Scott, 1913; Delamare Deboutteville, 1950; Papoutsoglou, 1976; Radujkovic & Raibaut, 1989; Benmansour & Ben Hassine, 1998; Benkirane et al., 1999; Boualleg et al., 2010), *M. polli*, *M. paradoxus* (Nunes-Ruivo, 1956; Capart, 1959), *M. capensis* (Grabda & Soliman, 1975). Kabata (1979) found the Thompson & Scott (1903) record on *Sciaena diacanthus* from the Indian Ocean strange. The morphological characters in

the present species are similar to those of Kabata (1963; 1979). For example, the secondary tooth found at near mid-length inner margin of claw, as indicated by the arrow in figure 4f, resembles Kabata's records.

When the 4 host fish species of the *P. merluccii* parasite were examined according to family characteristics, all of them were denoted in literature as belonging to the Merlucciidae family; in terms of habitat, 75% were defined in literature as bathydemersal and 25% as demersal; and according to their feeding habits, all 4 host species were carnivores.

Ten species of the family Lernaepodidae are reported from marine habitats in Turkey, namely, *Clavellotis fallax*, *C. strumosa*, *C. briani*, *Clavellisa scombri*, *Clavella alata*, *Lernaepoda galei*, *T. impudica*, *Parabrachiella bispinosa*, *P. exigua*, *P. hostilis*. They are reported for the first time from Turkey in this study.

POJAVLJANJE VRST *PARABRACHIELLA INSIDIOSA* (HELLER, 1865) IN *PARABRACHIELLA MERLUCCII* (BASSETT-SMITH, 1896) (COPEPODA; LERNAEOPODIDAE) NA OSLIČIH V TURČIJI

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POVZETEK

Avtorji poročajo o prvem zapisu o dveh vrstah zajedalskih ceponožcev in sicer o Parabrachiella insidiosa (Heller, 1865) in Parabrachiella merlucii (Bassett-Smith, 1896) (Copepoda; Lernaepodidae), ki so jih našli na škrgah osličev Merluccius merluccius (Linnaeus, 1758) (Pisces; Merlucciidae) v Turčiji. Podajajo tudi nekatere morfološke značilnosti teh zajedalskih ceponožcev skupaj z ilustracijami in fotografijami.

Ključne besede: *Parabrachiella*, oslič, Turčija, zajedalci, raki ceponožci

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