

**THE SEA OF MARMARA: NEW LOCALITY FOR *LEPEOPHTHEIRUS EUROPAENSIS* ZEDAM, BERREBI, RENAUD, RAIBAUT AND GABRION, 1988 (COPEPODA, SIPHONOSTOMATOIDA, CALIGIDAE) FROM TURKEY**

Ali ALAŞ \*, Ahmet ÖKTENER \*\* and Dilek TÜRKER \*\*\*

\* Necmettin Erbakan University, Ahmet Keleşoğlu Education Faculty, Department of Biology, B Block, Meram, Konya, Turkey, TR-42090, alasali@hotmail.com

\*\* Sheep Research Station, Department of Fisheries, Çanakkele Street 7 km, Bandırma, Balıkesir, Turkey, TR-10200, ahmetoktener@yahoo.com, mothocya@hotmail.com

\*\*\* Department of Biology, Science Faculty, Balıkesir University, Cagis Campus, Balıkesir, Turkey, TR-10300, dturker@balikesir.edu.tr

DOI: 10.1515/trser-2017-0019

**KEYWORDS:** *Lepeophtheirus*, *Platichthys*, the European flounder, Sea of Marmara, morphology, Turkey.

**ABSTRACT**

*Lepeophtheirus europaensis* Zeddám, Berrebi, Renaud, Raibaut and Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae) an ectoparasite of flatfishes, was reported for the first time in the Sea of Marmara Coasts.

Some morphological characters of this parasitic copepod are given using original photographs and drawings. The general morphology, the mouth parts (antenna, mandible, maxillule, maxilla, and maxilliped), the outgrowth developed between the post-antennary process and the antenna, the setal and spinal formula from first leg to fourth leg in this study are compatible according to the specific literature.

**RESUMEN:** El Mar de Mármara: nueva localidad de *Lepeophtheirus europaensis* Zedam, Berrebi, Renaud, Raibaut, Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae) de Turquía.

*Lepeophtheirus europaensis* Zeddám, Berrebi, Renaud, Raibaut y Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae), un ectoparásito de peces planos, fue encontrado por primera vez en las costas del Mar de Mármara.

Algunos caracteres morfológicos de este copépodo parásito se dan utilizando fotografías y dibujos originales. La morfología general, las partes de la boca (antena, mandíbula, maxila, maxilar y maxilipedio), la extensión desarrollada entre el proceso post-antenar y la antena, la fórmula setal y espinal del primero al cuarto pie en este estudio son compatibles de acuerdo con la literatura específica.

**REZUMAT:** Marea Marmara: o nouă semnalare pentru *Lepeophtheirus europaensis* Zedam, Berrebi, Renaud, Raibaut, Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae) din Turcia.

*Lepeophtheirus europaensis* Zedam, Berrebi, Renaud, Raibaut, Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae), un ectoparazit la speciile de calcan, a fost raportat pentru prima oară pe coastele Mării Marmara.

Anumite caractere morfologice ale acestui copepod parazit sunt indicate cu ajutorul unor fotografii și desene originale. Morfologia generală, piesele bucale (antena, mandibulă, maxilulă, maxilă și maxiliped), excrescența apărută între procesul post-antenar și antena, formula setală și spinală de la piciorul unu la piciorul patru prezentate în acest articol sunt compatibile cu cele din literatura de specialitate.

## INTRODUCTION

Copepods of the family Caligidae (Siphonostomatoida) are commonly known as sea lice among fish culturists. It is the largest family of marine copepods comprising over 450 species (Ho, 2004).

Bailly (2008) listed the occurrence of 14 parasitic copepod species that occur on the European flounder *Platichthys flesus* (Linnaeus, 1758) (Pisces, Pleuronectidae) globally, which include: *Acanthochondria cornuta*, *Acanthochondria depressa*, *Acanthochondria limandae*, *Acanthochondria soleae*, *Caligus diaphanus*, *Caligus elongatus*, *Caligus musaicus*, *Chondracanthus depressus*, *Ergasilus sieboldi*, *Holobomolochus confusus*, *Lepeophtheirus europaensis*, *Lepeophtheirus pectoralis*, *Lernaeocera branchialis*, *Lernaeocera luscii*.

*Platichthys flesus* is a widely distributed species in coastal and brackish waters, naturally occurring in the Black Sea, the Mediterranean Sea, the European Atlantic Coast (including the British Isles and Ireland), the North, the Baltic, the Barents and the White Sea (Nielsen, 1986; Cabral et al., 2007). There are a few studies about the copepod parasites of the European flounder in Turkey (Oğuz, 1991; Aydoğdu and Öztürk, 2003; Öztürk, 2005; Oğuz and Ökten, 2007).

In this study we present the morphological characters of the parasitic copepod *Lepeophtheirus europaensis* found on European flounder from Turkey. We aimed to confirm the occurrence of *Lepeophtheirus europaensis* (Zeddiam et al., 1988) from the previously unstudied location of Bandırma Bay in the Sea of Marmara, Turkey, with drawings and photos including morphological characters. The morphological characters given in the study highlight the possibility of comparing our findings with those of other countries in the future. Thus, those who would like to use these methods, can obtain these samples from the Museum National d'Histoire Naturelle (MNHN), Paris, France.

## MATERIAL AND METHODS

14 of the European flounder, *Platichthys flesus* (Linnaeus, 1758) (Pisces, Pleuronectidae) were collected by local fishermen from Bandırma Bay (Fig. 1) of Turkey in 2015. The parasites collected from these fish were fixed in 70% ethanol. Mouthparts and pleopods of the parasites were dissected using a Wild M5 stereo microscope. Some of the copepod specimens were later cleared in lactic acid before dissection of the appendages. Appendages were drawn with the aid of a lucida (Olympus BH-DA) camera. Photographs 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 scientific names, synonyms of parasite and host were checked with WoRMS (2016), Froese and Pauly (2016). The parasite (MNHN-IU-2013-18735) was deposited in the collections of the Museum National d'Histoire Naturelle (MNHN), Paris, France.

## RESULTS AND DISCUSSION

In this study, parasites of *Platichthys flesus* was examined from the Sea of Marmara (Fig. 1c). *Lepeophtheirus europaensis* Zeddiam, Berrebi, Renaud, Raibaut and Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae) was found as ectoparasite. All parasites were firmly attached to the inner wall of operculum of the the european flounder. The prevalence of parasite was 21.4%. Total and dissected parasite number were found as 10, three respectively.

*Lepeophtheirus europaensis* Zeddiam, Berrebi, Renaud, Raibaut and Gabrion, 1988 (Copepoda, Siphonostomatoida, Caligidae) (Figs. 2-6; Tab. 1).



Figure 1a: Turkey satellite image (Google Earth).

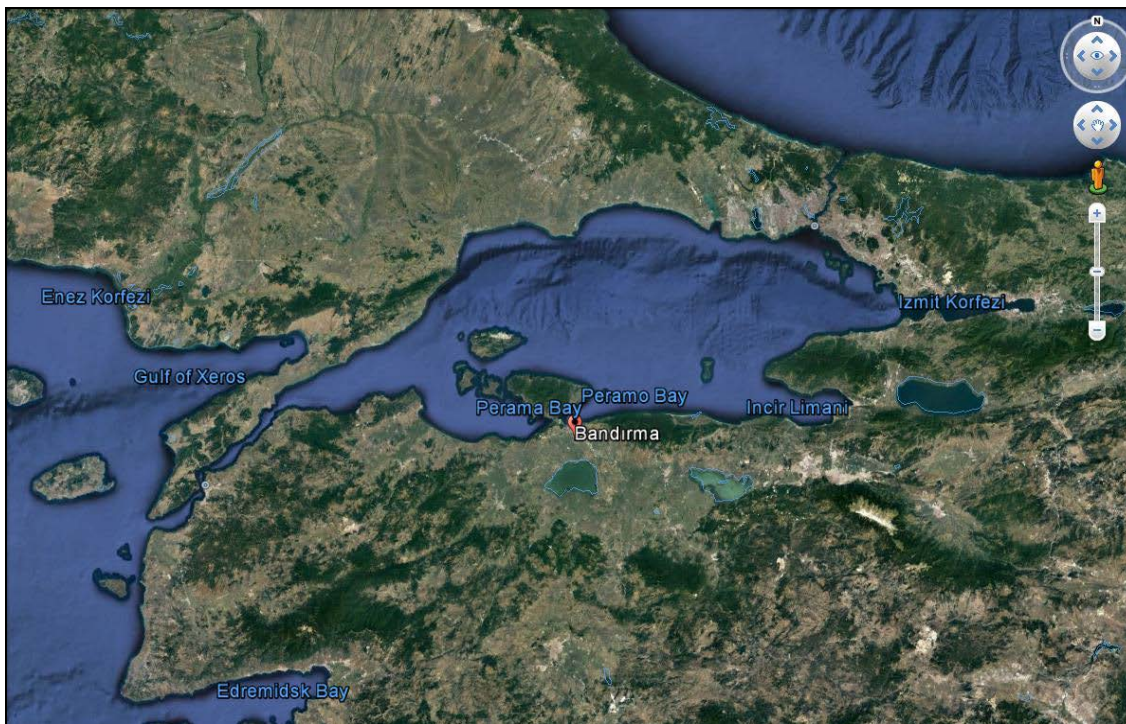


Figure 1b: Bandırma Bay (Google Earth).





Figure 1c: Image of sampling area, Bandırma Bay (Sea of Marmara).



Figure 1d: Sampling area, Bandırma Bay (Sea of Marmara).



Figure 2: *Lepeophtheirus europaensis* ♀  
(scale two mm).

Host: *Platichthys flesus*; Total parasite: 10 females; Dissected material: three.  
 All parasites were firmly attached to the inner wall of operculum of the host.  
 The prevalence of parasite was 21.4%.

Female morphology: Body length varies from 4.5 to 5.5 mm. Antennule two-segmented; distal segment shorter than proximal, distal segment with 15 setae and one subterminal seta on distal margin, proximal segment carrying on anterodistal surface 20-24 plumose setae. Antenna three-segmented; proximal segment smallest; second segment nearly quadrangular and unarmed; distal segment long, curved claw bearing one seta. Postantennal process a small, bent claw bearing three papillae in basal region, each tipped with three setules. The outgrowth developed between the post-antennary process and the antenna. Distal of maxillule bifurcated and basal papilla with three unequal setae. Maxilla two-segmented and brachiform; proximal segment (lacertus) thick and unarmed; slender distal segment (brachium) with subterminal hyaline membrane on outer margin and terminal calamus distinctly longer than subterminal canna. Distal segment longer than proximal segment. Maxilliped two-segmented; proximal segment (corpus) largest and unarmed; middle segment (shaft) unarmed and distal segment (claw) fused to form a claw with small medial seta. Sternal furca with subrectangular boxbearing large, parallel and sharpened tines. Caudal rami consisted with three unequal long setae and three unequal short setae. Mandible bearing 12 teeth on medial margin of distal blade. Fifth leg represented by four short plumose setae.

Table 1: The setal and spinal formula of from first leg to fourth leg are follows.

Legs	Endopod	Exopod
First leg		I-0; III-4
Second leg	1-0; 2-0; 6-0	I-1; I-1; 6-II
Third leg	1-0; 6-0	0-I; 1-I; 4-III
Fourth leg		I-0; I, III

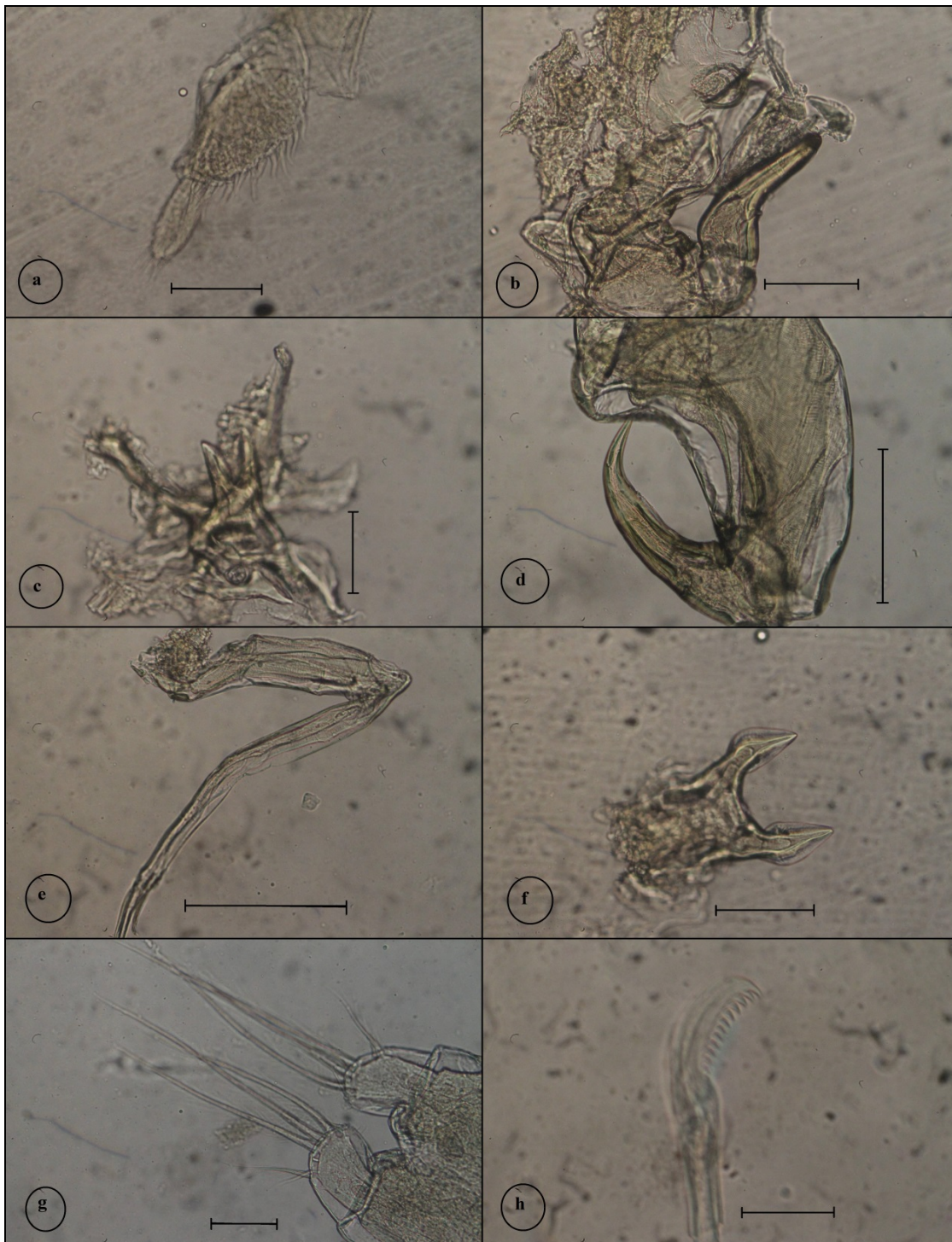


Figure 3: *Lepeophtheirus europaensis* ♀, a) Antennule (0.16 mm), b) Antenna (0.17 mm), c) Maxillule (0.16 mm), d) Maxilliped (0.28 mm), e) Maxilla (0.33 mm), f) Sternal furca (0.18 mm), g) Caudal rami (0.13 mm), h) Mandible (0.05 mm).



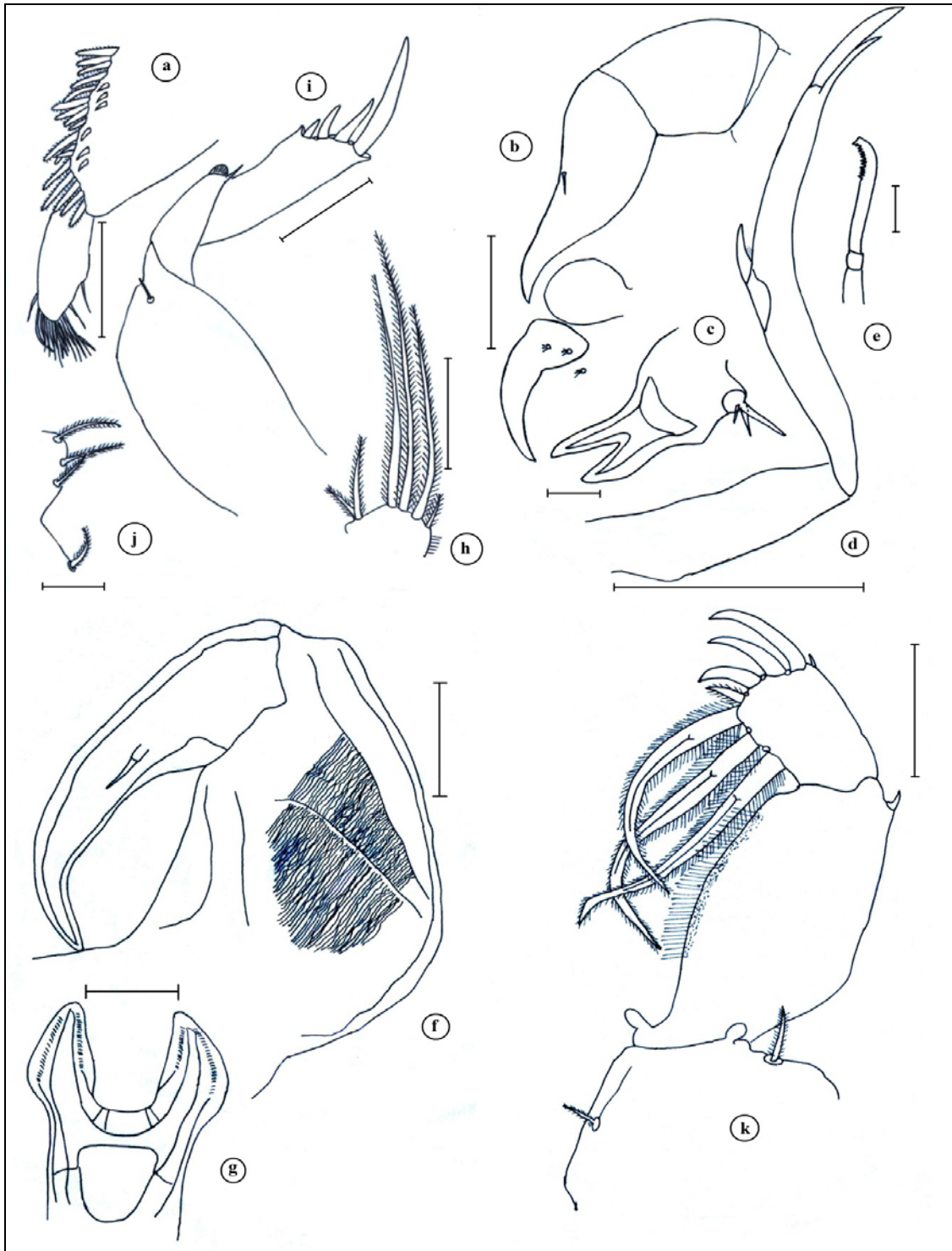


Figure 4: *Lepeophtheirus europaensis* ♀, a) Antennule (0.16 mm), b) Antenna and postantennal process (0.17 mm), c) Maxillule (0.07 mm), d) Maxilla (0.33 mm), e) Mandible (0.05 mm), f) Maxilliped (0.14 mm), g) Sternal furca (0.18 mm), h) Caudal ramus (0.20 mm), i) Fourth leg (0.15 mm), j) Fifth leg (0.11 mm), k) First leg (0.19 mm).



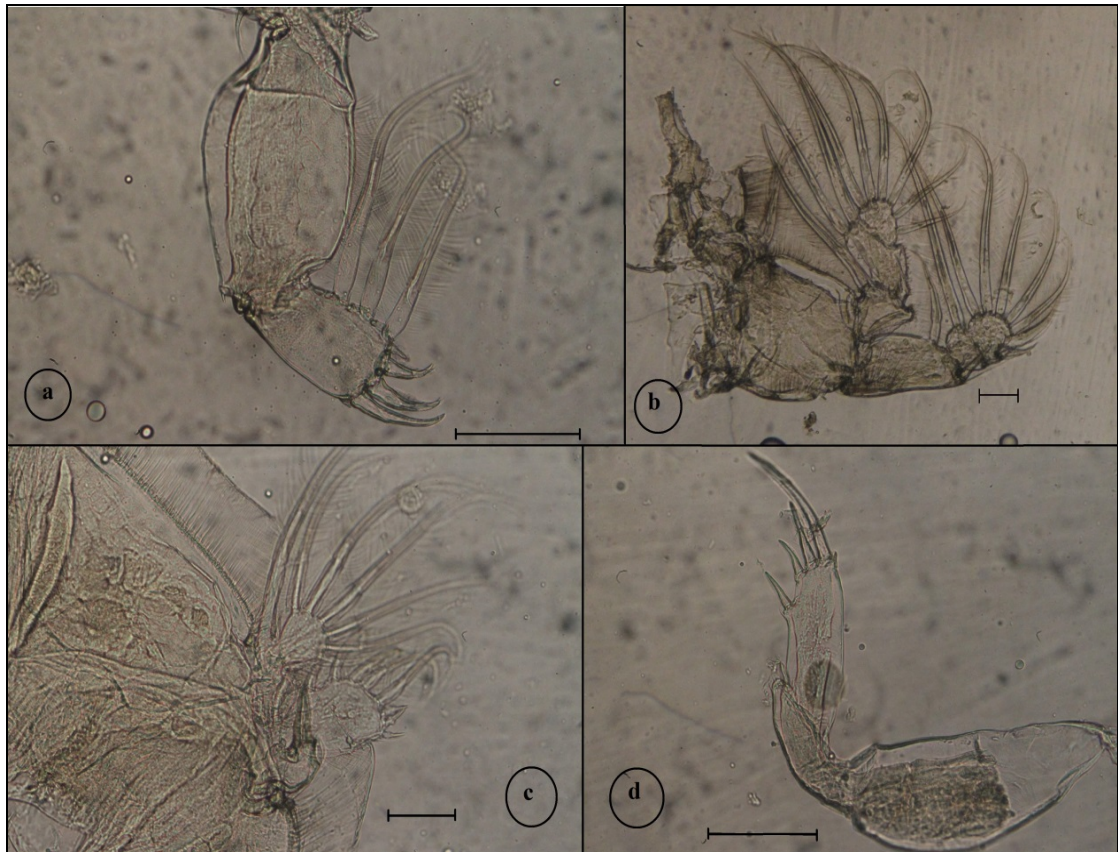


Figure 5: *Lepeophtheirus europaensis* ♀, a) First leg (0.19 mm), b) Second leg (0.10 mm), c) Third leg (0.15 mm), d) Fourth leg (0.15 mm).

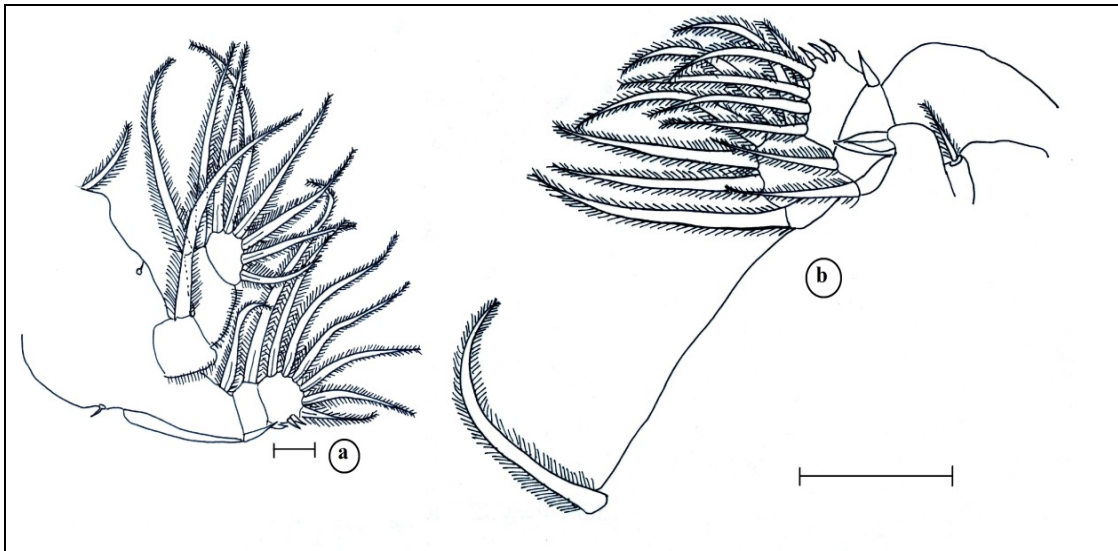


Figure 6: *Lepeophtheirus europaensis* ♀, a) Second leg (0.10 mm), b) Third leg (0.15 mm).

*Lepeophtheirus europaensis* has been reported in the North Atlantic Ocean (Boxshall, 2015), with the most common hosts being flatfishes *Platichthys flesus* (Linnaeus, 1758) (Pleuronectidae) and *Scophthalmus rhombus* (Linnaeus, 1758) (Scophthalmidae) (Zeddám, 1988). From these reports, It can be said that this parasite selects carnivorous and demersal fishes as hosts for habitat and feeding habits. In this study, we examined *Platichthys flesus* which is a carnivorous and a demersal fish and therefore fit to be a host preferring of *Lepeophtheirus europaensis*.

The morphological characters of *Lepeophtheirus europaensis* found in this study are compared with Zeddám et al. (1988). The general morphology, the mouth parts (antenna, mandible, maxillule, maxilla, maxilliped), the outgrowth developed between the post-antennary process and the antenna, the setal and spinal formula of from first leg to fourth leg in this study are compatible according to this literature.

There are limited studies concerning the geographical distribution and hosts of *Lepeophtheirus europaensis* (Zeddám et al., 1988). It was reported from Ekinli Lagoon, Turkey, on *Platichthys flesus* by Oğuz and Öktener (2007). In our study, the presence of this species elsewhere in Turkey was also confirmed with dissection of parasitic copepod on *Platichthys flesus* living in the Sea of Marmara (Bandırma Bay). We have presented the morphological characters of the first recorded specimens of *Lepeophtheirus europaensis* located within the Sea of Marmara.

#### **ACKNOWLEDGEMENTS**

The authors would like to thank to the anonymous reviewers and Mrs. Curtean-Bănăduc A. and Mr. Bănăduc D., the editors of Transylvanian Review of Systematical and Ecological Research for the valuable, critical and helpful comments on the manuscript.



**REFERENCES**

1. Aydoğdu A. and Öztürk M. O., 2003 – Occurrence of *Ligula intestinalis* and *Cucullanellus minutus* in flounder, *Platichthys flesus* L., in Dalyan Lagoon (Karacabey, Bursa, Turkey) from September 1997 to December 1998, *Bulletin of the European Fish Pathologists*, 23, 287-290.
2. Bailly N., 2008 – *Platichthys flesus* (Linnaeus, 1758), in Froese R. and Pauly D. (eds), (2016). FishBase, accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=127141> on 2017-01-02.
3. Boxshall G., 2015 – *Lepeophtheirus europaensis* Zeddham, Berrebi, Renaud, Raibaut and Gabrion, 1988, in Walter T. C. and Boxshall G., World of Copepods database, accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=135775> on 2016-02-11.
4. Cabral H. N., Vasconcelos R., Vinagre C., França S., Fonseca V., Maia A., Reis-Santos P., Lopes M., Ruano M., Campos J., Freitas V., Santos P. T. and Costa M. J., 2007 – Relative importance of estuarine flatfish nurseries along the Portuguese coast, *Journal of Sea Research*, 57, 209-217.
5. Froese R. and Pauly D., 2016 – FishBase, available on line at: [www.fishbase.org](http://www.fishbase.org), last accessed 11 December 2016.
6. Ho J. S., 2004 – Invasiveness of Sea Lice (Copepoda, Caligidae) in Marine Aquaculture, *Journal of the Fisheries Society of Taiwan*, 31, 2, 85-99.
7. Nielsen J., 1986 – Pleuronectidae, in Whitehead P. J. P. et al., (eds), Fishes of the North-eastern Atlantic and the Mediterranean (FNAM), Unesco, Paris, III, 1299-1307, Wheeler A. – 1978, Key to the Fishes of Northern Europe. A guide to the identification of more than 350 species, Frederick Warne (Publishers) Ltd., London, 380.
8. Oğuz M. C., 1991 – A parasitological investigation on flounders (*Pleuronectes flesus luscus* L. 1758) which were caught in Ekinli Lagoon, *Turkish Journal of Zoology*, 15, 150-163.
9. Oğuz M. C. and Öktener A., 2007 – Four parasitic Crustacean species from marine fishes of Turkey, *Turkish Journal of Parasitology*, 31, 79-83.
10. Öztürk T., 2005 – Determination of parasite fauna of flounder *Platichthys flesus* L., 1758 and toothcarp *Aphanius chantrei* Gaillard, 1895 living in Sarıkum Lagoon (Sinop, Türkiye), Ph.D. Thesis, Ondokuz Mayıs University, Institute of Science, 255. (in Turkish)
11. WoRMS (eds), 2016 – World Register of Marine Species. Available on line at: <http://www.marinespecies.org>, last accessed 11 December 2016.
12. Zeddham J. L., Berrebi P., Renaud F., Raibaut A. and Gabrion C., 1988 – Characterization of two species of *Lepeophtheirus* (Copepoda, Caligidae) from flatfishes, Description of *Lepeophtheirus europaensis* sp. nov, *Parasitology*, 96, 1, 129-144.