

**NEW HOST RECORD FOR  
*CALIGUS DIAPHANUS* VON NORDMANN, 1832  
WITH MALE MORPHOLOGICAL CHARACTERS  
FROM THE AEGEAN SEA (KÜÇÜKKUYU PORT OFF)  
AND THE SEA OF MARMARA, TURKEY**

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**Abstract:** *Caligus diaphanus* von Nordmann, 1832 is reported for the first time on *Chelidonichthys lastoviza* (Bonnaterre, 1788) from the Aegean Sea and the Sea of Marmara, Turkey in 2018. This study aims to present the second host of *Caligus diaphanus* from Turkey and male morphological characters with photos and drawings.

**Keywords:** *Caligus diaphanus*, *Chelidonichthys lastoviza*, male, Sea of Marmara, Turkey

**Introduction:**

The streaked gurnard is present in Atlantic, Mediterranean Sea, Marmara Sea. This demersal fish is found in depth range 10 - 150 m. It is the important fish among trawling fish species (Froese and Pauly 2017).

WoRMS Editorial Board (2018) listed the occurrence of 4 parasitic copepod species in streaked gurnard, *Chelidonichthys lastoviza* (Bonnaterre, 1788), which include: *Caligus diaphanus* von Nordmann, 1832, *Lernentoma asellina* (Linnaeus, 1758), *Thysanote impudica* (Nordmann, 1832), *Parabrachiella triglae* (Claus, 1860).

This study aims to report a new geographic distribution as Sea of Marmara being inner sea and new host as *Chelidonichthys lastoviza* for *Caligus diaphanus* in Turkey. It also

presents male samples of *Caligus diaphanus* with some morphological characters from Turkey.

**Materials and methods:**

Fifty eight of *Chelidonichthys lastoviza* (Bonnaterre, 1788) (Pisces; Triglidae) were collected by trawling from the Aegean Sea (Küçükkyu Port off) and one sample from the Sea of Marmara in 2018. The parasites collected were fixed in 70% ethanol. They were later cleared in lactic acid for 1 to 2 h before dissection. Dissected parts were mounted on slides in glycerin-gelatine mounting medium. Sides of coverslip were coated with colourless nail polish. The drawings of appendages were carried out with

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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 (Proway). Scientific names, synonyms of the parasite and the host were checked through WoRMS Editorial Board (2018), Froese and Pauly (2017). The identification, scientific names, their synonyms of parasite were checked with Brian (1935), Kabata (1979), Cressey and Cressey (1980), Herrera-Cubilla (1985), WoRMS Editorial Board (2018). Parasites were deposited in the collections of Ege University, Aquatic Products Museum (ESFM- COP/2017-6, ESFM- COP/2017-7), Izmir, Turkey.

## Results and discussion:

*Caligus diaphanus* von Nordmann, 1832 (Fig. 1, Annexes) were identified on *Chelidonichthys lastoviza* from Turkey.

All samples of *Caligus diaphanus* were collected from the inner wall of operculum of the streaked gurnard, *Chelidonichthys lastoviza*. The prevalence of parasites was 25.86%.

Locality: the Aegean Sea (Küçükkyu Port off) and the Sea of Marmara  
Total parasite: 25 female and 5 male;  
Dissected material: 5 females, 3 males

Description of female: Total length (excluding egg sac) is 2.37 mm (2.13-2.94). Cephalothorax slightly wider 1.17 mm (1.03-1.46) than length 1.14 mm (1.01-1.4). Third segment wider 0.2 mm (0.11-0.24) than length 0.14 mm (0.11-0.16). Genital segment wider 0.86 mm (0.74-1.05) than length 0.68 mm (0.55-0.85). Abdominal segment longer 0.62 mm (0.53-0.74) than width 0.31 mm (0.26-0.43). Antennule (Figs. 2a, 3a, Annexes) two-segmented; 2-segmented, distal segment distinctly longer than proximal segment. Proximal segment armed with 24 plumose setae. Distal segment bearing 12 setae (1 of which is subdistal) plus one aesthetasc. Antenna (Figs. 2b, 3b, Annexes) 3

segmented; proximal segment and middle segments unarmed; distal segment with claw bearing one small seta at basal region. Postantennal process (Figs. 2b, 3b, Annexes) small, bearing 2 basal papillae each with 3 setules, one papilla located nearby sternum. Maxillule (Figs. 2e, 3e, Annexes) comprising slightly longer dentiform process and basal papilla with 3 unequal setae. Mandible (Fig. 2h, Annexes) comprised of 12 teeth on distal part. Maxilla 2 (Figs. 2d, 3c, Annexes) segmented and brachiform; proximal segment unarmed; distal segment with small hyaline membrane on outer edge and a long calamus and a short canna on terminal end. Maxilliped (Figs. 2c, 3d, Annexes) three segmented; proximal segment large and unarmed; middle segment shorter distal segment; terminal segment fused a claw and with a short seta at base. Box of sternal furca (Figs. 2f, 3f, Annexes) quadrangular and with tines slightly paralleled and tines longer than box. Caudal ramus (Figs. 2g, 3g, Annexes) slightly longer 0.16 mm (0.13-0.18) than width 0.13 mm (0.10-0.16); armed with 1 long plumose setae and 3 medium, 2 short setae. Leg 5 (Figs. 2m, 3h, Annexes) represented by 1 short and 3 medium setae on posterolateral margin of genital complex. First, second, third and fourth legs in Figure 4 (Annexes).

Description of male: Total length is 1.65 mm (1.61-1.69). Cephalothorax slightly wider 0.94 mm (0.92-0.96) than length 0.84 mm (0.82-0.88). Third segment wider 0.16 mm (0.14-0.18) than length 0.12 mm (0.11-0.12). Genital segment longer 0.32 mm (0.28-0.4) than width 0.29 mm (0.26-0.33). Abdominal segment longer 0.28 mm (0.25-0.3) than width 0.15 mm (0.12-0.19). Caudal ramus longer 0.084 mm (0.078-0.093) than width 0.066 mm (0.066-0.068). Appendages as in female except as follows. Antenna (Figs. 5a, 6b, Annexes) 3-segmented; proximal segment large and unarmed; second segment large and two adhesion pads; terminal segment smallest, claw bifid and a seta and an aesthetasc on near of claw. Maxillule (Figs. 5d, 6c, Annexes) with anterior papilla bearing 3 unequal setae and posterior process bearing a long distal tine, a medium tine and smaller

medial tine. Basal part of postantennal process (Fig. 5b, Annexes) carrying 2 papillae with each bearing 3 setules on basal part; one papilla with 3 setules on nearby sternum. Maxilliped (Figs. 5c, 6a, Annexes) three segmented; proximal segment large and narrowed distally, with a small protrusion in myxal region; middle segment shorter distal segment and with 1 longer distal seta than in female; terminal segment fused a claw and with longitudinal surface striations. Fifth leg (Figs. 5e, 5f, 6d, Annexes) with 4 setae at mid-lateral margin of genital segment. Sixth leg (Figs. 5e, 5f, 6d, Annexes) with 3 setae at posterior distal corners of genital segment.

*Caligus diaphanus* was widely distributed from British Isles, European, Atlantic, Mediterranean, Adriatic. The species is reported parasitizing several fishes such as *Belone belone* (Kabata 1979), *Caranx hippos* (Kabata 1979), *Chelidonichthys capensis* (Oldewage 1993), *Chelidonichthys cuculus* (Thompson 1847; Richiardi 1880; Bassett-Smith and Surgeon 1896; Scott and Scott 1913), *Chelidonichthys lastoviza* (Heller 1866; Valle 1880; Richiardi 1880; Brian 1924, 1935; Delamare-Deboutteville and Nunes-Ruivo 1958; Herrera-Cubilla 1985), *Chelidonichthys lucerna* (Thompson 1847; Kroyer 1863; Heller 1866; Richiardi 1880; Valle 1880; Bassett-Smith and Surgeon 1896; Scott and Scott 1913; Brian 1924, 1935; Delamare-Deboutteville 1950; Heegaard 1947; Delamare-Deboutteville and Nunes-Ruivo 1958; Rohde 1980; Herrera-Cubilla 1985; Radujkovic and Raibaut 1989; Benmansour and Ben Hassine 1997, 1998; Öktener et al. 2016), *Dentex dentex* (Gonzalez et al. 2004), *Eutrigla gurnardus* (Kroyer 1863; Olsson 1869; Richiardi 1880; Hamond 1969; Ramdane and Trilles 2010), *Gadus morhua* (Hemmingen and MacKenzie 2001), *Lates calcarifer* (Kirtisinghe 1964), *Lepidorhombus whiffiagonis* (Kabata 1979), *Lepidotrigla cavillone* (Valle 1880), *Lithognathus mormyrus* (Richiardi 1880; Monod 1923; Brian 1935), *Lutjanus argentiventralis* (Morales-Serna et al. 2015), *Lutjanus guttatus* (Morales-Serna et al. 2015), *Merluccius merluccius* (Thompson 1847),

*Molva molva* (Thompson 1847), *Pagellus acarne* (Brian 1935; Boualleg et al. 2010b), *Pagellus bogaraveo* (Thompson 1847), *Pagellus erythrinus* (Richiardi 1880; Ramdane and Trilles 2007; Boualleg et al. 2010a, 2010b; Lazarich 2015; Garcia 2015), *Platichthys flesus* (Richiardi 1880; Cavaleiro and Santos 2007), *Pollachius virens* (Thompson 1847; Palm et al. 1999), *Scomber scombrus* (Thompson 1847), *Scomberomorus tritor* (Cressey and Cressey 1980), *Scophthalmus maximus* (Thompson 1847), *Solea solea* (Brian 1924), *Terapon puta* (Kirtisinghe 1964), *Trachinotus botla* (Oldewage and Van As 1989), *Trachurus trachurus* (Thompson 1847; Kabata 1979; MacKenzie et al. 2004), *Trigla lyra* (Valle 1880).

The hosts parasitising with *Caligus diaphanus* were examined according to family characteristics: 23% of 30 host species belongs to Triglidae; 17% to Sparidae; 7% to Lutjanidae; 10% to Carangidae; 7% to Gadidae; 7% to Scombridae; 7% to Scophthalmidae; 21% to 7 fish species belonging to Merlucciidae, Pleuronectidae, Soleidae, Terapontidae, Belonidae, Latidae, Lotidae (Fig. 7, Annexes).

The hosts parasitising with *Caligus diaphanus* were examined according to habitat selections; 50% of 30 host fish species is demersal; 20% is benthopelagic; 14% is reef-associated; 13% is pelagic-neritic; 3% is bathydemersal (Fig. 8, Annexes).

The hosts parasitising with *Caligus diaphanus* were examined according to feeding habits; 87% of 30 host fish species is carnivorous, 13% is omnivorous.

**Rezumat:**

**O NOUĂ GAZDĂ ÎNREGISTRATĂ  
PENTRU *CALIGUS DIAPHANUS*  
VON NORDMANN 1832,  
CU CARACTERELE MORFOLOGICE  
ALE MASCULULUI, DIN MAREA EGEE  
(PORTUL KÜÇÜKKUYU)  
ȘI MAREA MARMARA, TURCIA**

*Caligus diaphanus* von Nordmann, 1832 a fost semnalat pentru prima dată în 2018 pe *Chelidonichthys lastoviza* (Bonnaterre, 1788) în Marea Egee și Marea Marmara, Turcia. Scopul acestui studiu este de a prezenta a doua gazdă de *Caligus diaphanus* din Turcia și caracterele morfologice ale masculului însoțite de imagini și desene.

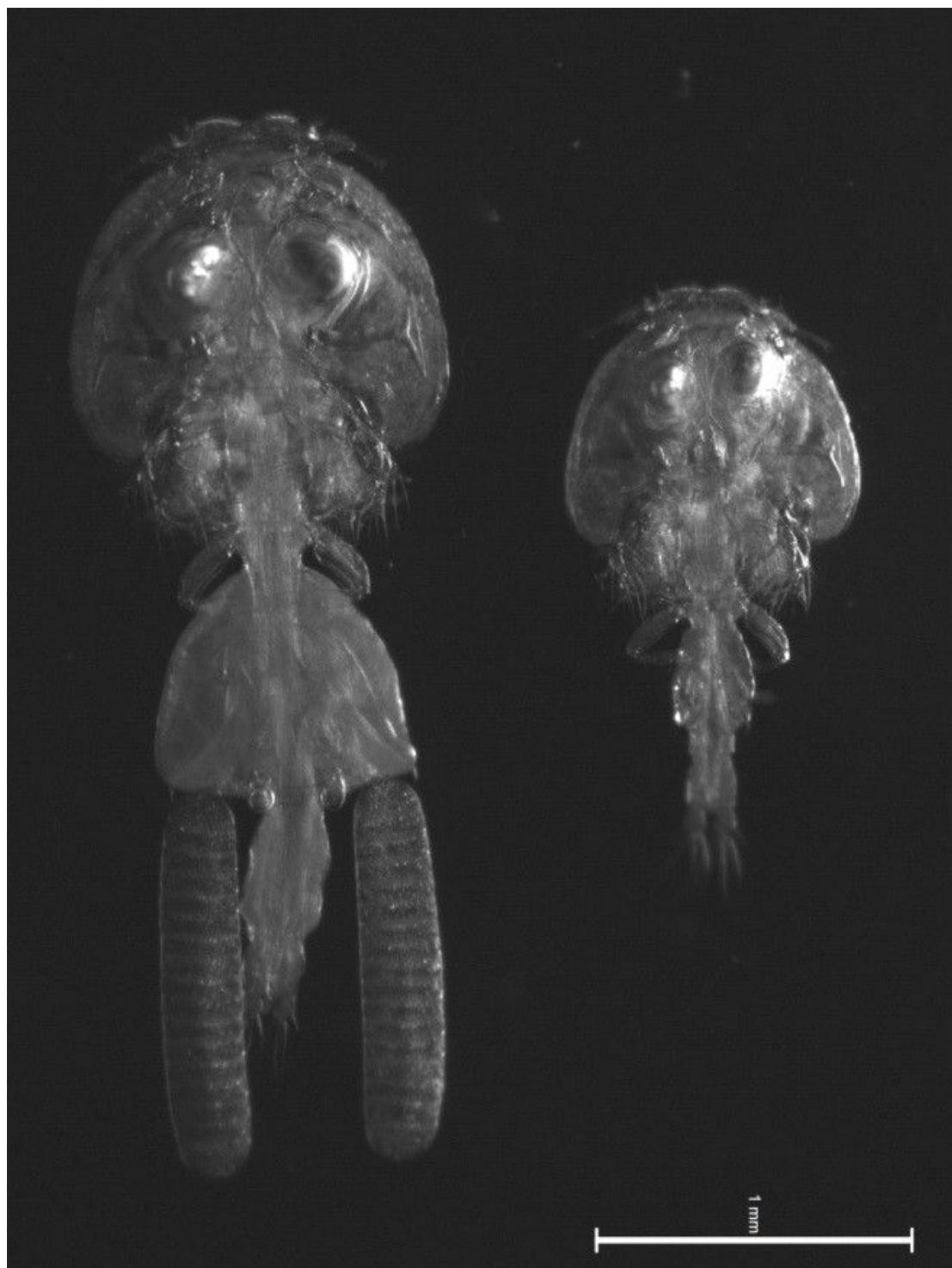
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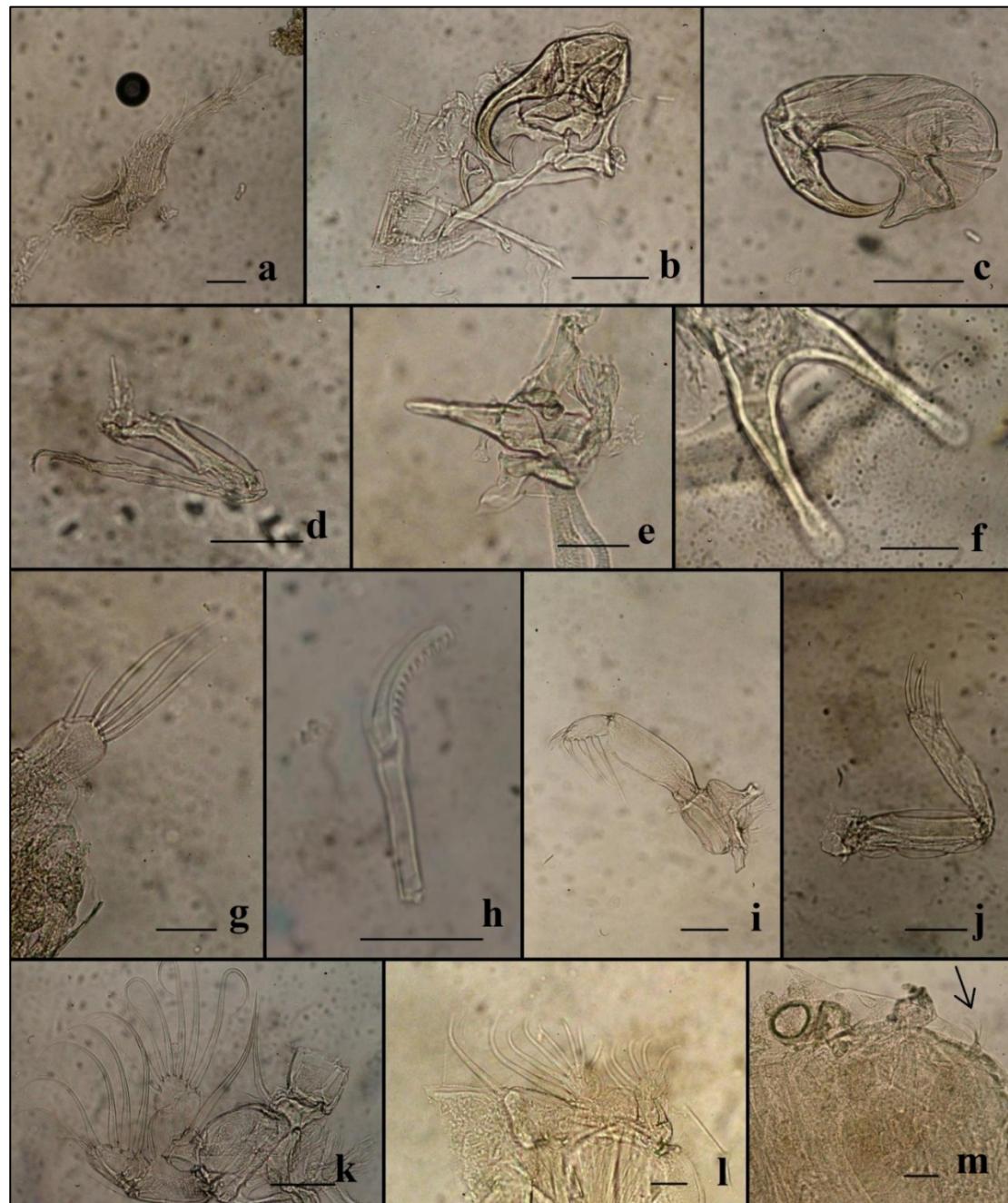
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## Annexes:

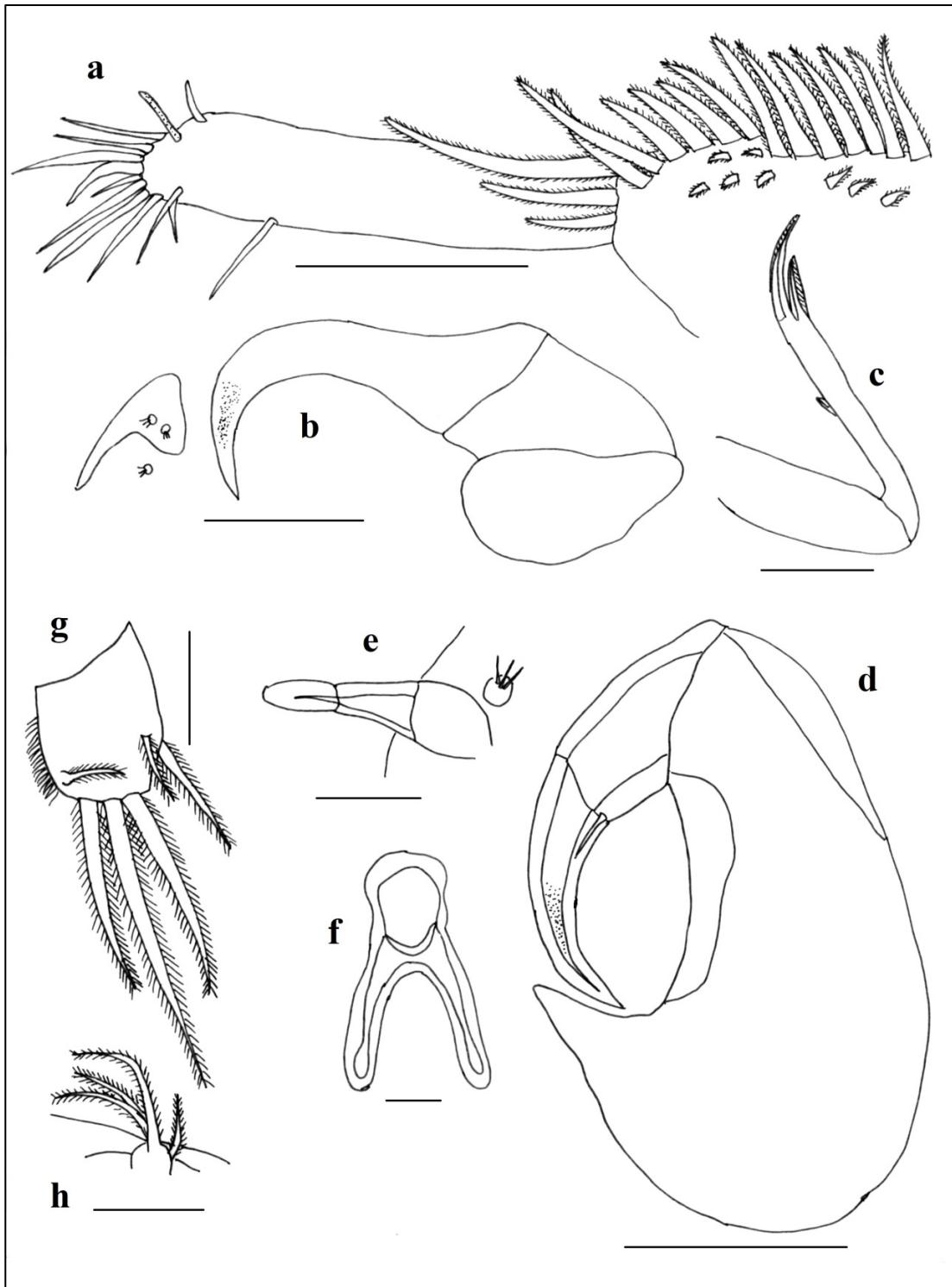
**Figure no. 1** *Caligus diaphanus* (left: female; right: male)



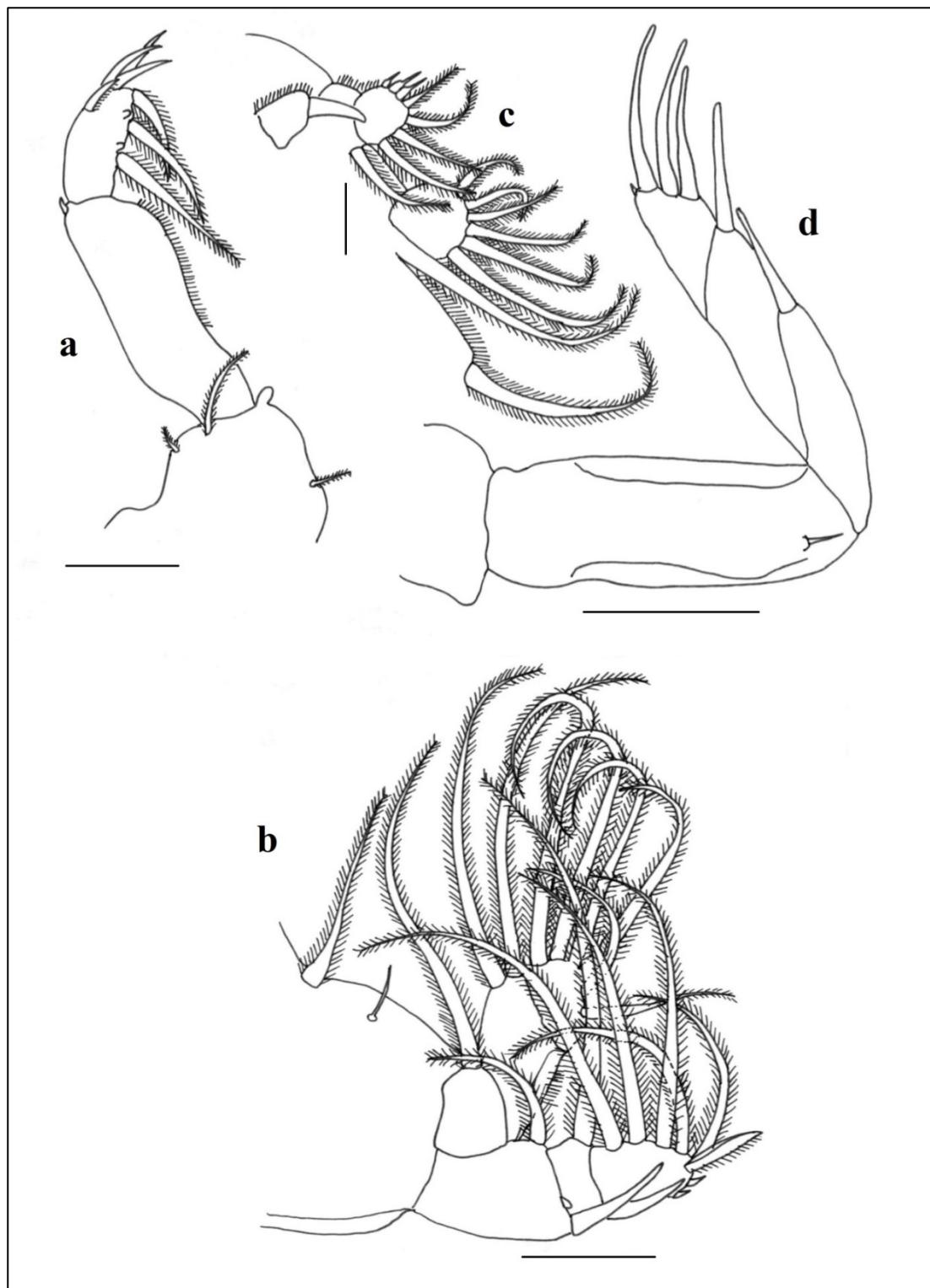
**Figure no. 2** *Caligus diaphanus* ♀: a) Antennule (0.075 mm); b) antenna (0.14 mm) and postantennal process; c) maxilliped (0.18 mm); d) maxilla (0.12 mm); e) maxillule (0.05 mm); f) sternal furca (0.04 mm); g) caudal ramus (0.09 mm); h) mandible (0.05 mm); i) first leg (0.08 mm); j) fourth leg (0.14 mm); k) second leg (0.10 mm); l) third leg (0.06 mm); m) fifth leg (0.04 mm)



**Figure no. 3** *Caligus diaphanus* ♀: a) Antennule (0.075 mm); b) antenna and postantennal process (0.14 mm); c) maxilla (0.12 mm); d) maxilliped (0.18 mm); e) maxillule (0.05 mm); f) sternal furca (0.04 mm); g) caudal ramus (0.09 mm); h) fifth leg (0.04 mm)



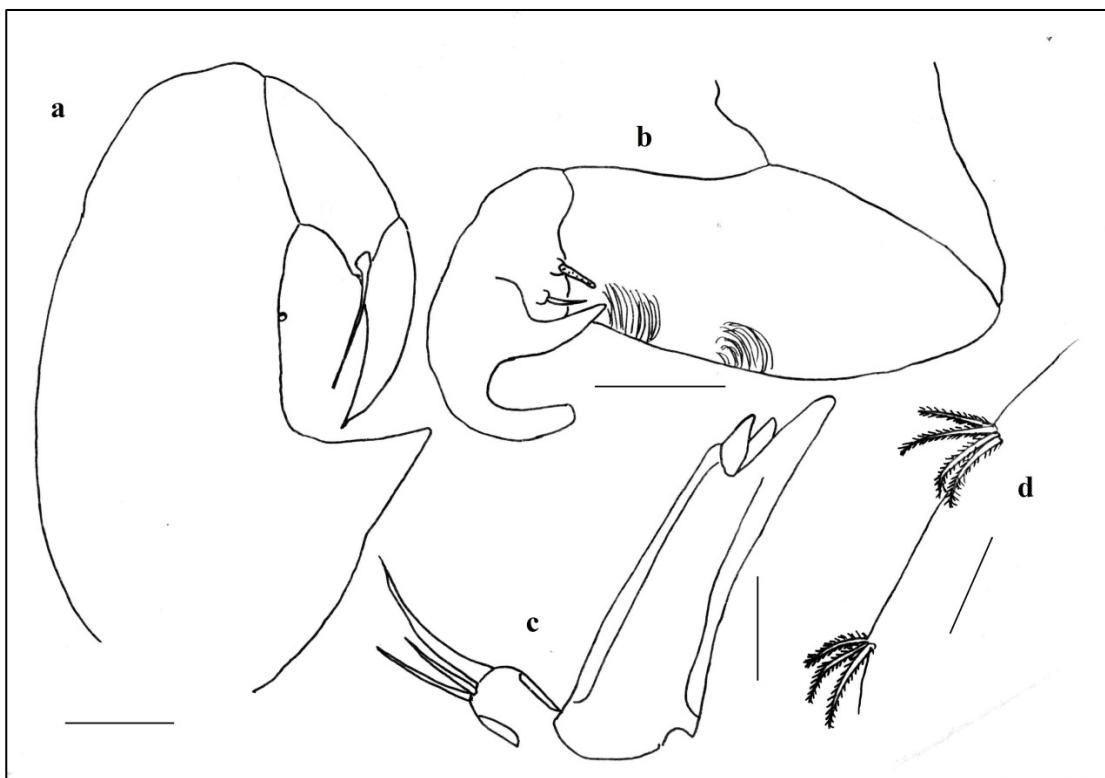
**Figure no. 4** *Caligus diaphanus* ♀: a) first leg (0.08 mm); b) second leg (0.10 mm); c) third leg (0.06 mm); d) fourth leg (0.14 mm)

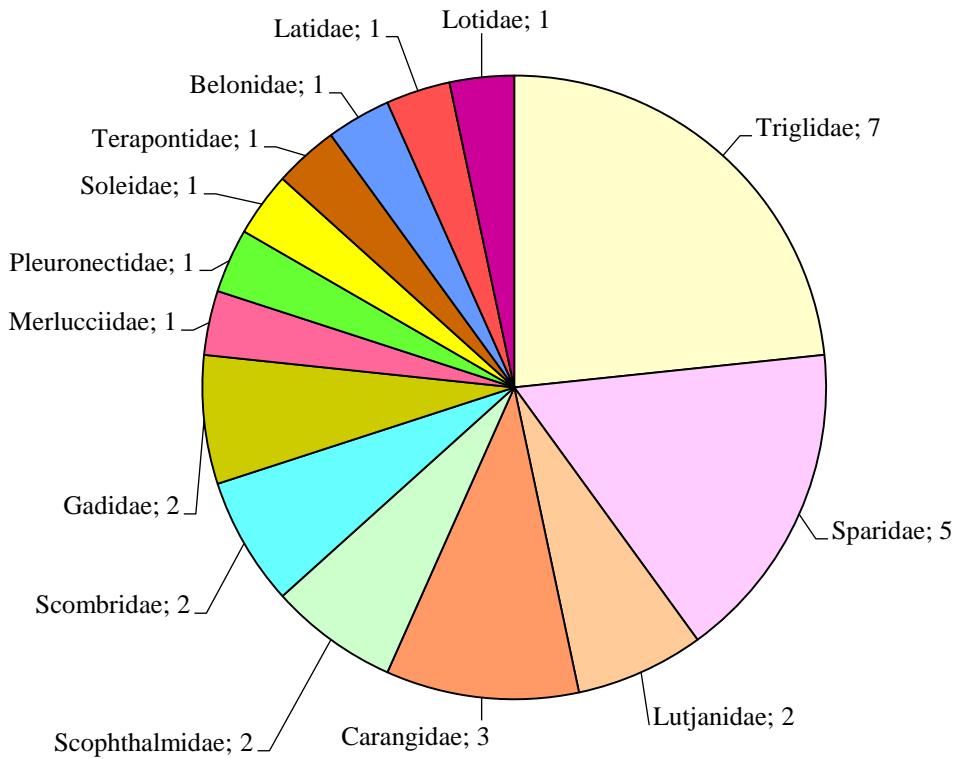


**Figure no. 5** *Caligus diaphanus* ♂: a) antenna (0.14 mm); b) and postantennal process; c) maxilliped (0.18 mm); d) maxillule (0.05 mm); e) fifth and sixth leg; f) fifth and sixth leg (0.04 mm)



**Figure no. 6** *Caligus diaphanus* ♂: a) maxilliped (0.18 mm); b) antenna (0.14 mm); c) maxillule (0.05 mm); d) fifth and sixth leg (0.04 mm)



**Figure no. 7** Family characteristics of hosts parasitising with *Caligus diaphanus***Figure no. 8** Habitat selection of host parasitising with *Caligus diaphanus*