



First report of *Limnoricus ponticus* Dovgal & Lozowskiy (Ciliophora: Suctorea) as epibionts on *Pycnophyes* (Kinorhyncha) from the Indian Ocean with key to species of the genus *Limnoricus*

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Abstract: This article deals with the characteristics of the suctorian *Limnoricus ponticus* Dovgal & Lozowskiy, 2008 that was observed for the first time on Kinorhyncha as a host and in a new locality (the Indian Ocean). In addition to the refined diagnosis of the genus *Limnoricus* Jankowski, 1981, all other species characteristics and identification keys are also presented.

Résumé : Premier signalement de *Limnoricus ponticus* Dovgal & Lozowskiy (Ciliophora : Suctorea) comme épibionte de *Pycnophyes* (Kinorhyncha) de l'Océan Indien, clé des espèces du genre *Limnoricus*. Cet article traite des caractéristiques du suctorien *Limnoricus ponticus* Dovgal & Lozowskiy, 2008, trouvé pour la première fois sur des Kinorhynches et dans une nouvelle région (l'Océan Indien). La diagnose du genre *Limnoricus* Jankowski, 1981 est précisée ainsi que les caractéristiques de l'espèce et les clefs d'identification spécifiques sont présentées.

Keywords: Suctorian ciliates • *Limnoricus ponticus* • Epibionts • Hosts • Kinorhyncha • Distribution • Indian Ocean

Introduction

Different species of suctorian ciliates are common epibionts of benthic marine and interstitial invertebrates. Hence, the observations of suctorians on the halacarid

mites, nematodes, copepod crustaceans, etc are well known (Jankowski, 1981; Dovgal, 1996; Dovgal et al., 2008). However, until now the finds of these ciliates on the kinorhynchs were unknown.

Specimens of Kinorhyncha *Pycnophyes* sp. were collected from the west coast of India as part of benthic environmental surveys (Ingole et al., 2008). A close microscopic examination revealed that specimens of *Pycnophyes* were infested with several specimens of

suctorians which morphologically indistinguishable from the suctorian *Limnoricus ponticus*, recently described from the Black Sea interstitial (Dovgal & Lozowskiy, 2008).

The present article deals with the characteristics of suctorian *L. ponticus* found on a new host group and also from a new locality. The refined diagnosis of genus *Limnoricus* Jankowski, 1981, all species characteristics and keys for the identification of the species are also presented.

Materials and Methods

The suctorian infested Kinorhyncha belongs to the genus *Pycnophyses*, it was collected from Ratnagiri (17°00'38"N, 73°15'34"E), west coast of India, Arabian Sea (Indian Ocean). Collection was part of the sediment sampling conducted using Van Veen grab (0.04 m² area) in the water depth of 14.5 metres on 14th January 2006 (Ingole et al., 2008). Meiofauna was preserved in 5% formalin. The Kinorhyncha belong to *Pycnophyses* sp., they were isolated from the meiofauna. The infested Kinorhynchs were preserved in 90% alcohol. The sediment had very high content of sand (98%), 1.5% silt and low clay content (0.5%). Salinity of the bottom water was 33.8. Dissolved oxygen was 3.7 mg.L⁻¹ and sedimentary chlorophyll was 0.4 µg.g⁻¹. For slide preparing, the material was stained by Boehmer's hematoxylin and mounted in Canada balsam. Permanent slides of infested kinorhynchs were deposited in the collections of the Department of Fauna and Systematic of invertebrate animals of Schmalhausen Institute of Zoology, National Academy of Sciences, Ukraine. Measurements of *L. ponticus* were made from fixed individuals using the computer program ScopePhoto 2.0 for processing of digital images.

Results and Discussion

Specimens of *L. ponticus* found on the kinorhynchs have trapeziform body shape, laterally flattened with spherical macronucleus. In contrast with specimens from copepods of Black Sea the lorica protuberance of Indian ciliates is almost devoid of ruffles. In addition, the dimensions of suctorian specimens from Kinorhyncha were about half the size of the specimens isolated from harpacticoid copepods. Considering the size variability and different characters of *L. ponticus* on the new host, the species is redescribed.

CLASS SUCTOREA Claparède & Lachmann

Subclass Exogenia Collin

Order Metacinetida Jankowski

Family Paracinetidae Jankowski

Limnoricus ponticus Dovgal & Lozowskiy, 2008 (Figs 1 & 2)

Diagnosis

Ciliate with trapeziform body, laterally flattened, covered by thecostyle. Macronucleus is spherical. Tentacles are clavate, short, contractile and placed in several rows at the apical body surface. Thecostyle is thin and laterally flattened. Stalk-like protuberance of the lorica long, slightly curved, with ruffles or without, its diameter is evenly decreased along the lines to substrate. Reproduction in *L. ponticus* is by the semicircumvaginate budding (Dovgal & Lozowskiy, 2008). In contrast to the other species of the genus, the cell body of the *L. ponticus* was covered by thecostyle. The individuals from Kinorhyncha are differs from the type host (harpacticoid copepod) by dimensions. However any differences in morphology neither were nor observed.

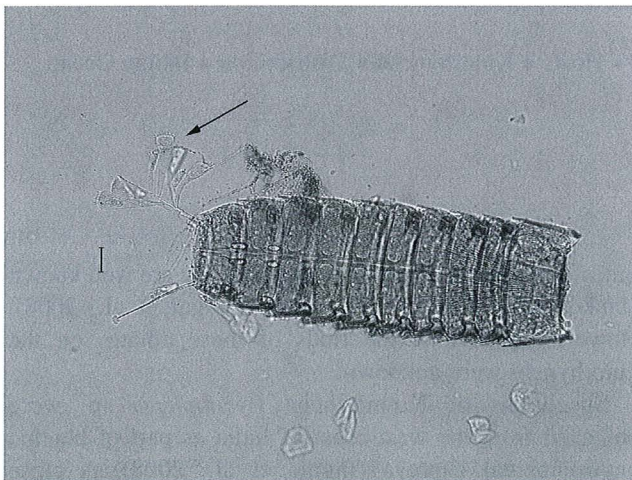


Figure 1. *Limnoricus ponticus*. Individuals found on Kinorhyncha (the arrow indicates the attached individuals). Scale bar: 20 µm.

Figure 1. *Limnoricus ponticus*. Individus observés sur un Kinorhynche (indiqués par une flèche). Echelle : 20 µm.

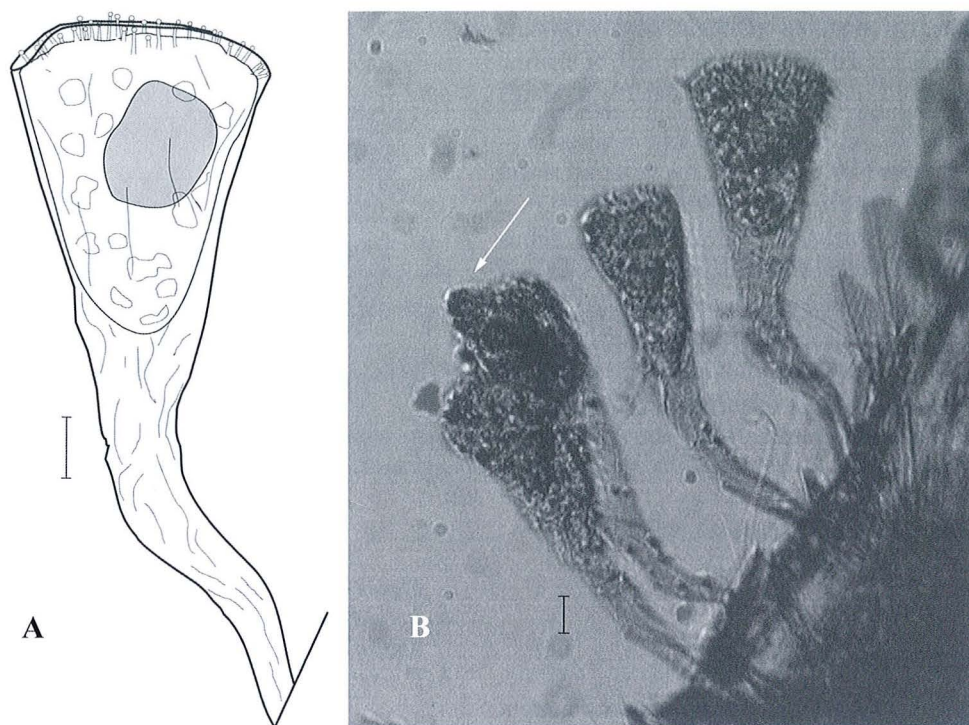


Figure 2. *Limnoricus ponticus*. Individuals collected from harpacticoid copepods (after Dovgal & Lozowskij, 2008). **A.** Trophont. **B.** Photomicrograph of four individuals on the host cephalothorax (arrow indicates the budding individual). Scale bar: 10 μm .

Figure 2. *Limnoricus ponticus*. Individus récoltés sur des copépodes harpacticoides (d'après Dovgal & Lozowskij, 2008). **A.** Trophonte. **B.** Photomicrographie de quatre individus sur le cephalothorax de l'hôte (individu portant une excroissance indiqué par une flèche). Echelle : 10 μm .

Measurements

Measurements (μm) of individuals from Kinorhyncha, in parentheses measurements of individuals from type copepoda host: body length (individuals from Kinorhyncha) 14–24 μm (47–49 μm under colonization of the type copepod host); width in the middle of body 12–17 μm (22–30 μm); macronucleus diameter 6–8 μm (13–16 μm); length of the lorica 44–60 μm (103–164 μm).

Distribution and hosts

The species has been described on the cephalothorax of marine harpacticoid copepod *Tisbe* sp. (type host) from the Black Sea near Sevastopol, Ukraine (type locality) (Dovgal & Lozowskij, 2008). Additional host – kinorhynch: *Pycnophyes* sp. from Ratnagiri, West coast of India, Arabian Sea, Indian Ocean.

Remarks on the genus *Limnoricus*

Jankowski (1981) has described the new monotypic genus *Limnoricus* Jankowski, 1981 with single species *L. ceter* Jankowski, 1981 from the limnoriid isopods and halacarid mites. Another Jankowski's genus *Deltacineta* Jankowski, 1981 was synonymized by Dovgal (2002) with *Limnoricus*.

The revised diagnosis of this genus preparing with regards to the mentioned variations are described in Dovgal & Lozowskij (2008). In the latter article, the clarified diagnosis of the genus recently published by Jankowski (2007) was not analysed. The type species of genus *Limnoricus ceter* Jankowski, 1981 has a true lorica with stalk in contrast with *L. ponticus* which have a thecostyle (the type of lorica without stalk but attached to the substrate by basal stalk-like protuberance). Conceivably, the latter species might replace into another genus after additional investigations of the specimens of type species. For the time being, we adduce the diagnosis of genus after Dovgal & Lozowskij (2008). The diagnoses of other *Limnoricus* species and keys for species identification are also given.

Limnoricus Jankowski, 1981

Diagnosis

Suctorian ciliates with tectinous flattened lorica with narrow fissured aperture. Cell body is laterally flattened, tentacles clavate, contractile and placed in one or several rows at the apical body part. Macronucleus is oval, medial. Lorica attached to the substrate by stalk or stalk-like protuberance (thecostyle or stylothea). Reproduction by

semi-circumvaginate budding (Dovgal & Lozowskiy, 2008). The suctorian is known as commensal of marine isopods, harpacticoid copepods and halacarid mites (Dovgal et al., 2008).

Differential diagnosis

From relative genus *Paracineta* Collin, 1912, genus *Limnoricus* differs by mode of budding (semi-circumvaginate not exogemmy), from genus *Actinocyathula* Corliss, 1960 by flattened thecostyle or lorica and arrangement of the tentacles in one or several rows not in fascicles. Species composition: *Limnoricus ceter* Jankowski, 1981 (type species), *L. seticolus* (Jankowski, 1981) and *L. ponticus* Dovgal & Lozowskiy, 2008.

Limnoricus ceter Jankowski, 1981 (Fig. 3A)

Diagnosis

Type species of the genus. Marine commensal, loricate, suctorian ciliate with stalk delimited from posterior margin of lorica. Both lorica and cell body sharply flattened laterally. Top of lorica orboid. The apical aperture of lorica surrounded by collar-like borders. Stalk long, straight and somewhat enlarged near junction with lorica. Cell body attached to margin of lorica aperture. Macronucleus ellipsoidal, located medially. Contractile vacuole not observed. Specimens from halacarid mites have short and convoluted stalk. Lorica dimensions: 65–74 μm long \times 36–44 μm wide. Stalk length up to 160 μm .

Distribution and host

Limnoricus ceter was described from marine isopods from the Sakhalin and Kunashyr Islands (Jankowski, 1981). It was also found on halacarid mites from Barents Sea (Jankowski 1981 & 2007). Since the specimens from halacarids differ from the individuals from isopods based upon the form of the stalk, Jankowski (1981) proposed that halacarid forms are possibly restricted to a particular/single species.

Limnoricus seticolus (Jankowski, 1981) (Fig. 3B)

Diagnosis

Marine commensal loricate suctorian ciliate with stalk delimited from the bottom of lorica. Lorica flattened, triangular, with thin walls and without ruffles. Ratio between lorica length and lorica aperture width 2.5–3.1 μm . Lorica aperture in the form of wide curved chink. Tentacles are arranged neither in several rows nor in fascicles, clavate

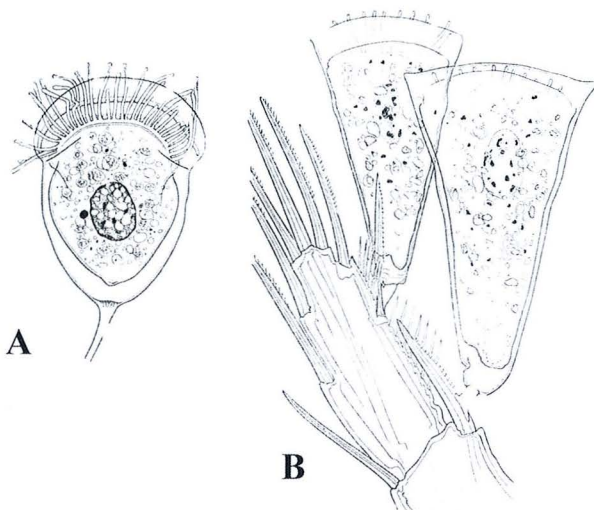


Figure 3. Two species of genus *Limnoricus* Jankowski, 1981. **A.** *L. ceter*. **B.** *L. seticolus* (after Jankowski, 1981).

Figure 3. Deux espèces du genre *Limnoricus* Jankowski, 1981. **A.** *L. ceter*. **B.** *L. seticolus* (d'après Jankowski, 1981).

and contractile. Macronucleus is ellipsoid, axially directed. The contractile vacuole placed over the macronucleus. Stalk very short with length 4.5–5 μm . Lorica size: 50–71 \times 30–40 μm .

Distribution and host

The species was described on the leg setae of marine harpacticoid copepod *Nitocra* sp. from Barents Sea (Jankowski, 1981 & 2007).

Key for identification of suctorian ciliates from genus *Limnoricus* Jankowski, 1981

- 1(4) Lorica as thecostyle.
- 2(3) Lorica triangular, stalk very short *L. seticolus* (Jankowski, 1981)
- 3(2) Lorica rounded, stalk long and straight *L. ceter* Jankowski, 1981
- 4(1) Thecostyle triangular in the upper part with long stalk-like protuberance which gradually converges toward substrate *L. ponticus* Dovgal & Lozowskiy, 2008

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