

***Tokophrya sibirica* sp. nov. (Ciliophora: Acinetida), a symbiont of freshwater ostracods in Irkutsk Province*****Tokophrya sibirica* sp. nov. (Ciliophora, Acinetida), симбионт пресноводных остракод в Иркутской области**

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Freshwater ostracods, even in seasonally drying and freezing ditches, are inhabited by a variety of ciliates, possibly with rapid encysting. Loricates are represented by the genus *Lagenophrys*, stalked peritrichs, by solitary and colonial species of both Vorticellida and Operculariida; no suctorians have been found so far. The epifauna near St Petersburg and Irkutsk is the same, except for the common occurrence of a small tokophryid suctorian on the shell surface of *Herpetocypris incongruens* along the Angara River and along Listvenka – Irkutsk road; this species may be a regional endemic. A similar but not the same tokophryid inhabits the few examined Baikalian ostracods. This new species, *Tokophrya sibirica* sp. nov., associated with *H. incongruens*, is very similar but not identical to *T. cyclosum*.

Пресноводные остракоды, даже во временно высыхающих и замерзающих канавах, заселены разными инфузориями, вероятно с быстрым инцистированием. Лорикаты представлены родом *Lagenophrys*, стебельчатые перитрихи – одиночными и колониальными видами обоих отрядов, Vorticellida и Operculariida; суктории пока не отмечались. Эпифауна Иркутска совпадает с таковой Санкт-Петербурга, но вдоль берега реки Ангары и вдоль шоссе Иркутск – Байкал обычно встречается мелкая токофриидная суктория на поверхности раковины *Herpetocypris incongruens*; вероятно, это региональный эндемик. Сходная, но не идентичная токофриида обитает на немногих осмотренных остракодах Байкала. Этот новый вид, *Tokophrya sibirica* sp. nov., ассоциированный с *H. incongruens*, очень близок, но не идентичен *T. cyclosum*.

**Key words:** symbionts, Irkutsk Province, Ciliophora, Ostracoda, Suctorea, *Tokophrya*, new species

**Ключевые слова:** симбионты, Иркутская область, Ciliophora, Ostracoda, Suctorea, *Tokophrya*, новый вид

**INTRODUCTION**

Marine and freshwater ostracods have dissimilar symbionts of different origin, except *Lagenophrys* Stein, 1852, a loricate peritrich that lives in discoid loricae on the surface of both kinds of hosts. In sea water ostracods also have suctorians (paracinetids and vermigemmid) and loricate peritrichs of the genus *Cothurnia* Ehrenberg, 1831;

freshwater ones are inhabited by 3 kinds of sessilid peritrichs. *Lagenophrys* occurs on several host species, with small rounded brown *Cypria ophthalmica* (Jurine, 1820) as its preferred host. Entocytherids, a family of ostracods adapted to obligate symbiosis with cambaroid crayfishes (not with European astacids), also may bear *Lagenophrys*. Scattered on the shell surface, especially along the ventral slit of common freshwater

ostracods, are small solitary cells or very low colonies with restricted branching, on discs or short stalks – *Scyphidia* Dujardin, 1841, *Orbopyxidiella* Guhl, 1979, *Rhabdostyla* Kent, 1881, *Intranstylum* Fauré-Fremiet, 1904, *Haplocaulus* Precht, 1935, *Opercularia* Goldfuss, 1820. If diluted neutral red stain is added to a rich sample, large internal symbionts can be easily seen through the shell in *Candona* Baird, 1845, *Cypria* Zenker, 1854, *Herpetocypris* Brady et Norman, 1889 (*Bezedniella* Stloukal et Matis, 1994, *Nuchterleinella* Matthes, 1990). The large dark blue-green ostracod *Eucypris virens* (Jurine, 1820) is inhabited by the colonial peritrich *Epistylis helicostylum* Vavra, 1962, which I regard as generically distinct (*Allomeron* Jankowski, 1967) due to its atypical “allometric” stalk: thick, twisted, enlarged and discoid in its upper half; the stalk is frequently pigmented by absorption of shell pigments of the molted host. This species may be one of the best objects for studying peritrich encystment; sometimes the entire colony contains, instead of zooids, only cysts with a complicated pattern on their surface.

While working with the Baikalian fauna, I have also examined invertebrates in the rivers flowing into the lake and into the mighty Angara river, as well as those in small lakes, ponds, roadside channels and temporary small ditches that are dried and frozen during the long severe winter and nevertheless are populated again in late spring by copepods, ostracods, oribatid mites, small molluscs and insect larvae, bearing ciliates. Ostracod species have wide distribution, so that in the Irkutsk Province I have found the hosts and symbionts well known to me by studies in St Petersburg, except for unexpected common occurrence of small tokophryid suctorians on the shell surface of the large orange ostracod *Herpetocypris incongruens* (Ramdohr, 1808). This species is described below and compared with a similar copepod symbiont *Tokophrya cyclopum* (Claparede & Lachmann, 1859), common everywhere on cycloids.

## MATERIAL AND METHODS

In various years between 1965 and 1998 I was a research guest in the Limnological Institute of the Siberian Division of the Russian Academy of Sciences, with its main building in Listvenka village, on the Baikal shore near the outflow of the Angara river; samples were taken by washing stones from Baikal and by collecting the swimming ostracods in a variety of freshwater bodies near Listvenka, Nikola, Bolshya Rechka and near Irkutsk city. Crustaceans were examined alive for symbionts and fixed in the field in 4–8% formalin, in iodine-formol (mixture of 5% formalin and 5% solution of crystalline iodine in KJ) and in diluted (50%) Bouin’s picro-aceto-formol mixture. *Bezedniella* Stloukal & Matis, 1994 was discovered there before it was described in Europe; other symbionts found in this region were also identical to those in St Petersburg area. Specimens of *Herpetocypris incongruens* were specially examined, and about 70 specimens on which suctorians were found were fixed for further study. All the drawings in this article were made from living ciliates. Macronuclei were stained by purified methyl-green.

### Order ACINETIDA

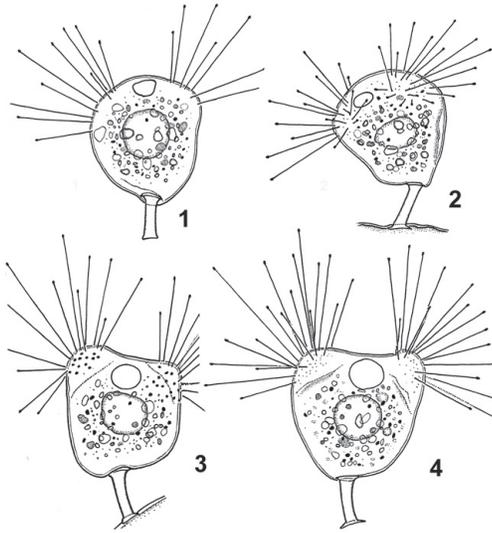
#### Family TOKOPHYRIDAE

Genus *Tokophrya* Butschli, 1889

#### *Tokophrya sibirica* sp. nov.

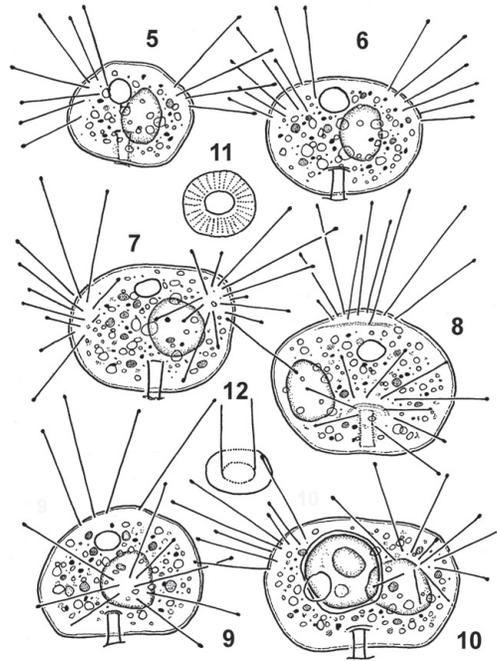
(Figs 5–12)

*Type material.* The type slide BK-132 contains a single isolated left valve of *Herpetocypris incongruens* with 12 suctorians on its surface, unstained, in formol-sugar mixture framed with black bituminous varnish; such a slide may be called a “hapantotype”. The xenotype is a single host specimen, undissected and intact, also with many tokophryans, preserved in a 1.5-ml plastic centrifugal tube. This material is stored in the Zoological Institute of the Russian Academy of Sciences, St Petersburg. Since my term *xenotype* was proposed before the widely used term *symbiotype* of the sporozoan specialist D. Duszynski, the former term will be used here.



**Figs 1–4.** *Tokophrya cyclopus* (Claparede et Lachmann, 1859) from antennae of *Acanthocyclops vernalis* (Fischer, 1853), drawings of living cells with oil immersion.

**Description.** Very small species, as might be expected from its occurrence on a small host. Body size (in micrometers, ten measurements)  $17\text{--}36 \times 20\text{--}32$ , stalk size  $4\text{--}6 \times 3$ , width of attachment disc of stalk  $5\text{--}5.5$ . Body wide, relatively low, distended laterally; cytoplasm dark, granular (abundant mitochondria and glycogen), filled with lipid spherules and food vacuoles. Macronucleus ovoid or irregular, rarely spherical (in young cells). Single contractile vacuole located slightly below cell apex. Tentacles straight and long,  $8\text{--}35\ \mu\text{m}$ , thin, needle-like, arranged in 2 indistinct loose groups, each one occupying significant space on opposite body sides; actinophores or cortical folds at their bases absent; each fascicle with  $8\text{--}12$  tentacles. Lower cell surface wide, nearly flat, somewhat invaginated at cell apex. Stalk very short; cells appear stalkless at low magnification but stalks can be detected using oil immersion lens, especially in lateral view. Three typical regions of stalk can be recognized: adhesive disc, stalk column proper and wide epicone; radial striation of epicone and fibers in proximal part of dense refractile stalk may be seen in



**Figs 5–12.** *Tokophrya sibirica* sp. nov. from shells of *Herpetocypris incongruens*. 5–10, drawings of living cells with oil immersion; 11, 12, epidisc and attachment disc of stalk.

some specimens. Tomite single, in large embryonal chamber.

**Comparison.** The genus *Tokophrya* Butschli, 1889 was reviewed by Curds (1985), Matthes (1988) and Dovgal (2002). The only similar tokophryid is *Tokophrya cyclopus* (Claparede & Lachmann, 1859), equally common in Petersburg and Irkutsk areas (Figs 1–4). Although some authors indicate it for the periphyton, this is a mistake resulting from misidentification of the earliest stages of *Podophrya* Ehrenberg, 1834 like *P. fixa* (O.F. Müller, 1786), *Tokophrya* like *T. infusioformis* (Stein, 1859) or *Acineta* like *A. lacustris* Stokes, 1886, which look like *T. cyclopus* except for the presence of a longer stalk. *T. cyclopus* inhabits the antennae of various cyclopoids and is not host specific; outside the antennae, a few specimens are scattered over the host body and appendages. The body is usually inclined on one side. Other tokophry-

ids on *Cyclops* Muller, 1785 are larger, with longer stalks, with a complicated epidisc of the stalk (*T. actinosyla* Collin, 1912), or with several indistinct bundles of tentacles (*T. multifasciculata* Kormos, 1938, the species overlooked by Curds and Matthes). The new species is not smaller than *T. cyclosum* (compare Figs 1–4 and 5–10), but there is stable difference in their body shape, stalk length and arrangement of tentacles, which is evident in the drawings. The specimens of antennal *T. cyclosum* shown in Figs 1–4 have body length 24.5–31.5  $\mu\text{m}$ , width 21–27  $\mu\text{m}$ , stalk length 12–17  $\mu\text{m}$ . The other known tokophryans with 2 fascicles of tentacles (subgenus *Tonophrya* Jankowski, 2007; see Jankowski, 2007) are much larger, with longer stalks and with a triangular body shape (*T. infusionum* (Stein, 1859), *T. lemnae* (Stein, 1859), etc.).

**Etymology.** The species name *sibirica* reflects the author's opinion that this species is a local (regional) endemic, absent in Europe.

**Host and locus.** The shell surface of *Herpetocypris incongruens*; scattered on shells, but with some concentration near rim of valves; unlike peritrichs, not on the rim itself (shell edge), but at some distance from it. They also occur in the wide shallow groove following the thick valvular edge (rim). The host is common in the research area, many independent populations being infested; within the same ditch, some ostra-

cods have numerous suctorians while others lack them; the small tomites possibly have a restricted swimming ability and usually settle on the same host.

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