

A New Suctorian, *Flectacineta isopodensis* (Protozoa: Ciliophora) Epibiont on Marine Isopods from Hokkaido (Northern Japan)

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Summary. Specimens of a suctorian ciliate were found as epibionts on the marine isopod *Excirolana chiltoni*. The small suctorians were loricate (10-17 µm long, 8-10 µm wide). The oval or bell-shaped body was covered completely by the lorica, which showed a rim curved outwards, with a lateral furrow. There were 5-9 capitate tentacles in an apical group that protruded through the opening of the lorica. The macronucleus was central. The micronucleus was located anterolaterally near the macronucleus. The contractile vacuole was central and behind the macronucleus. The stalk presented thin transverse striations. This is the first record of a suctorian on an isopod species of the suborder Flabellifera, which contains the majority of the marine isopods living in shallow waters.

Key words: Ciliophora, epibiont, *Flectacineta isopodensis* sp. n., suctorina

INTRODUCTION

An important number of protozoan ciliate species have been described as epibionts on crustaceans (Sprague and Couch 1971, Morado and Small 1995). The ciliate groups showing a larger number of species living on crustaceans are peritrich ciliates (Fernandez-Leborans and Tato-Porto 2000a), suctorian ciliates (Batisse 1994, Fernandez-Leborans and Tato-Porto 2000b), and chonotrich ciliates (Jankowski 1973, Fernandez-Leborans 2001). Ciliate epibionts have been

found in many crustacean groups (branchiopods, cirripeds, copepods, mysids, amphipods, decapods).

Numerous suctorian species have been described living as epibionts on crustaceans (Collin 1912; Guilcher 1950; Batisse 1968, 1969, 1972, 1986, 1992; Evans *et al.* 1979; Hudson and Lester 1994; Fernandez-Leborans and Gomez del Arco 1996; Fernandez-Leborans *et al.* 1996, 1997; Zhadan and Mikrjukov 1996). The order Isopoda is one of the crustacean groups with basibiont species on which suctorian ciliates live, both in freshwater and marine environments; suctorian ciliates of the genera *Ophryodendron*, *Trichophrya*, *Acineta*, *Tokophrya* and *Stylocometes* having been found.

The suborder Flabellifera includes the genus *Excirolana*, in one of their species, *Excirolana chiltoni*, we have found numerous specimens of a suctorian

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ciliate of the genus *Flectacineta*. The characteristics of these ciliates are described below.

MATERIALS AND METHODS

Specimens of *Excirolana chiltoni* (Richardson, 1905) were collected in the intertidal zone (at least >30 cm) of open sandy beaches of Hokkaido (Zenibako, Yufutsu, and Usu) (Fig. 1). Sampling was carried out with a hand-held net (30 cm mouth width, 0.74 mm mesh). All collection was done during daylight. Samples were fixed immediately with 5-10% seawater formalin and transferred later to 70% alcohol. The isopods were examined using a stereoscopic microscope. Epibionts were isolated and treated using the silver carbonate technique, according to the procedure described by Fernandez-Leborans and Castro de Zaldumbide (1986), neutral red and methyl green. Ciliate measurements were performed with an ocular micrometer. Samples for SEM (Hitachi S2460NA) observations were prepared following the procedure of Takayama (1981). Measurements were obtained considering 20% allowance for shrinkage due to fixation and staining (Montagnes *et al.* 1988).

RESULTS

The suctorians observed were small in size (10.3-17.2 μm in length; 8.6-10.8 μm in width), oval or bell-shaped (Figs 2-9). The body was surrounded completely by a lorica, which showed the rim curved outwards. The tentacles sticking out through the opening of the lorica. Laterally, the lorica presented a prolongation, as a furrow, which terminated in an acute angle. This furrow was 3.4-4.3 μm long, with a maximum width of 2-2.2 μm . There were 5-9 capitata tentacles in a one apical group. The distal end of the tentacles had a diameter of 0.9-1.1 μm . The macronucleus was located centrally in the body, and was 3-4.5 in length and 2.5-3.8 μm in width. Near the macronucleus, laterally on the top was a micronucleus (0.6-0.9 μm diameter). The contractile vacuole, rounded, with 1.1-1.7 μm diameter, was located in the middle of the body, behind the macronucleus. The stalk was 8.9-25.2 μm in length, and its outer surface was covered by thin transverse striations. Inside the stalk, in several specimens, there was a central channel (Table 1).

Location on the basibiont. The suctorian ciliates were found in all pereopods, directly attached to the surface, or on its setae. Occasionally, several specimens were observed on the antennae. These ciliates were not found on the pleopods, buccal appendages or any other part of the body.

Taxonomic position. The ciliates observed are assigned to a new species, called *Flectacineta isopodensis*, in reference to the basibionts on which these suctorians were found.

The ciliates studied belong to the genus *Flectacineta* Jankowski, 1978 (subclass Suctorina Claparède & Lachmann 1958, order Podophryida Jankowski 1973, suborder Podophryina Jankowski 1973, family Paracinetidae Jankowski 1978) (Batisse 1994). Like the members of this genus, they were marine loricate ciliates, with a unique group of apical capitata tentacles. The costyle lorica rim is inverted at the apex (Curds 1987). Three species of the genus *Flectacineta* have been described: *F. livadiana* (Mereschkowsky, 1881) Jankowski 1978, *F. dadayi* (Daday, 1886) Curds 1987, and *F. elegans* (Imhoff, 1883) (Curds 1987). The specimens studied differed from *F. livadiana* in the wide opening of the lorica, and in the position of the contractile vacuole (lateral in *F. livadiana*, in contrast it is located centrally behind the macronucleus in the ciliates observed). The specimens studied differed from *F. dadayi* in the location of the contractile vacuole and the presence of a lateral furrow of the lorica. Although *F. elegans* is the largest species of the genus, it had in common with the ciliates observed the union between the stalk and the lorica, which appeared with a ball-like shape in some specimens. However, *F. elegans* had a rectangular body, the lorica with a scalloped rim, and an apical contractile vacuole, characteristics that not found in the ciliates studied (Table 2).

Diagnosis of *Flectacineta isopodensis* sp. n. Small marine loricate suctorian ciliates (10.3-17.1 μm long, 8.6-10.8 μm wide). Oval or bell-shaped body, completely included in the lorica. Lorica with rim curved outwards, prolonged in lateral furrow. 5-9 capitata tentacles in an apical group. Centrally located macronucleus (3.0-4.5 x 2.3-3.7 μm). Micronucleus located laterally on the top near the macronucleus. Contractile vacuole (1.1-1.6 μm) central and posterior to the macronucleus. Stalk (8.9-25.2 μm) with thin transverse striations. Epibiont on the isopod *Excirolana chiltoni* (Richardson, 1905), (type locality: Hokkaido, Northern Japan).

DISCUSSION

Several suctorian species have been described as epibionts on isopods. *Ophryodendron multicapitatum* Kent, 1880 on *Idotea* Fabricius, 1798. *Trichophrya*

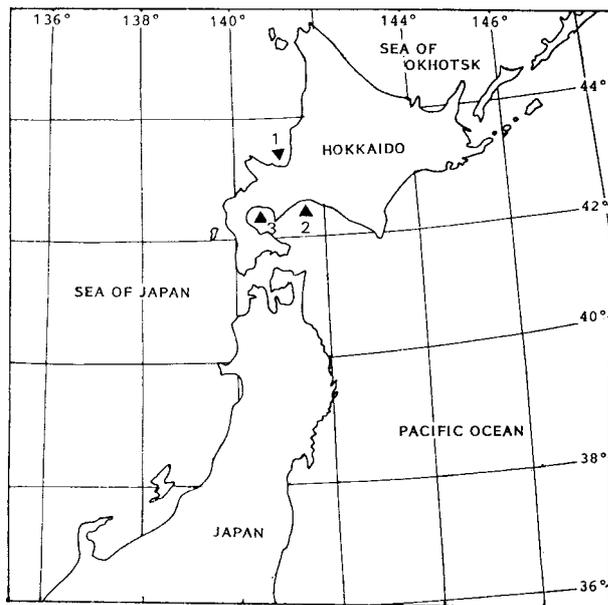


Fig. 1. Map showing the sampling sites. 1 - Zenibako, Otaru (city); 2 - Yufutsu, Tomakomai (city); 3 - Usu, Date (city)

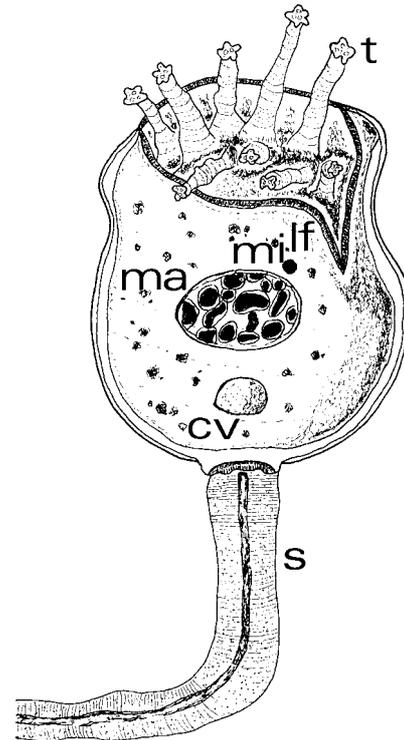


Fig. 2. Scheme of *Flectacineta isopodensis* sp. n. cv - contractile vacuole, lf - lateral furrow, ma - macronucleus, mi - micronucleus, s - stalk, t - tentacles

Table 1. Morphometric characteristics of *Flectacineta isopodensis* sp. n. (n: 42)

	Mean	SD	SE	Minimum	Maximum
Body length	14.36	1.97	0.62	10.32	17.16
Body width	9.29	0.62	0.21	8.64	10.80
Number of tentacles	7.44	1.42	0.47	5	9
Lorica opening max. width	8.30	0.68	0.19	7.65	10.10
Furrow length	3.74	0.36	0.11	3.38	4.32
Furrow max. width	2.08	0.03	0.01	2.04	2.16
Tentacle distal end diameter	1.02	0.05	0.02	0.91	1.09
Stalk length	14.43	3.83	1.10	8.90	25.20
Macronucleus length	4.08	0.41	0.13	3.02	4.54
Macronucleus width	3.27	0.31	0.10	2.52	3.78
Micronucleus diameter	0.75	0.08	0.03	0.64	0.92
Contractile vacuole diameter	1.33	0.15	0.05	1.13	1.68

* Measurements in μm . SD - standard deviation, SE - standard error

astaci Stein, 1859 on *Asellus* Geoffroy, 1762. *Acineta tuberosa* Ehrenberg, 1833 on *Idotea*, *Asellus* and *Microcerberus remyi* Chappuis, 1953. *Tokophrya lemnae* (Stein, 1859) on *Asellus aquaticus* (Linnaeus, 1758). *Stylocometes digitatus* (Stein, 1859) on *Asellus aquaticus*. *Stylocometes stenasselli* (Matjasiè, 1963) on *Stenassellus virei* Dollfus, 1897. Up to now, the presence

of suctorian epibionts on *Excirrolana chiltoni* has not been described and, therefore, this is the first record of the existence of these ciliates as epibionts on the isopod. *Excirrolana chiltoni*.

Excirrolana chiltoni (Richardson, 1905) (Subphylum Crustacea, class Malacostraca, subclass Eumalacostraca, order Isopoda) belongs to the suborder Flabellifera.

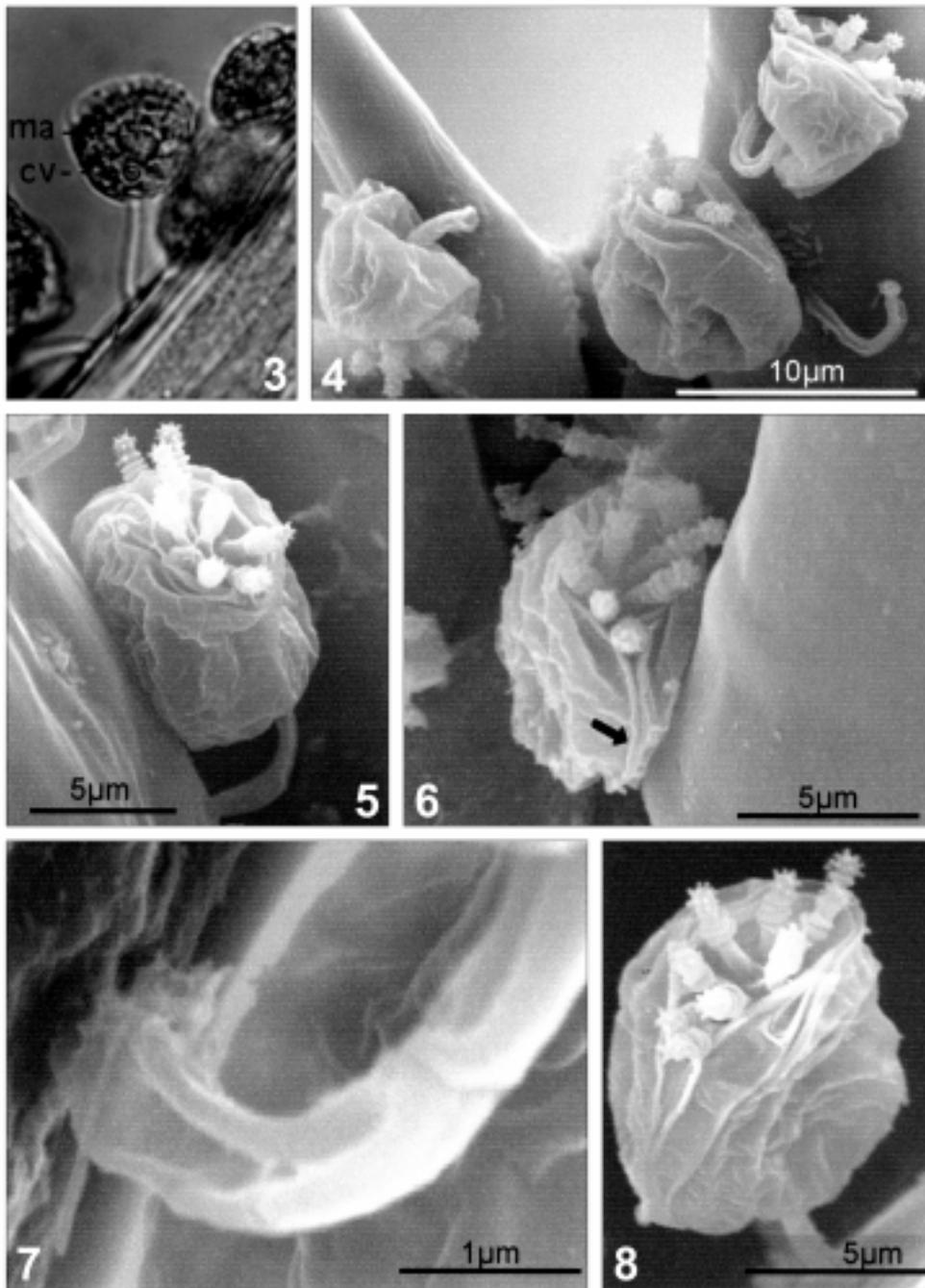


Fig. 3. *Flectacineta isopodensis* sp. n. Light micrograph of a specimen. cv - contractile vacuole, ma - macronucleus (x 1200). **Fig. 4.** Three specimens attached to the surface of a pereiopod and to a seta. The central channel of the stalk can be seen. **Fig. 5.** *F. isopodensis*. The anterior part of the body showing the opening of the lorica and the tentacles. **Fig. 6.** *F. isopodensis*. Anterior part of the body. The lateral furrow (arrow) can be seen. **Fig. 7.** *F. isopodensis*. A detail of the stalk showing its base and the central channel. **Fig. 8.** *F. isopodensis*. A lateral view of an specimen, showing the opening of the lorica, the tentacles and the stalk

Suctorian epibionts have not been found in the species included in this suborder, and the specimens studied corresponded to the first finding of suctorians in this suborder, which contains the main part of the marine isopod species living in shallow waters.

On the other hand, there is not sufficient morphological data to differentiate *Flectacineta livadiana* from *Flectacineta dadayi*, and thus there is a possibility that both species should be included in a unique species: *F. livadiana* (Mereschkowsky, 1881) Jankowski 1978.

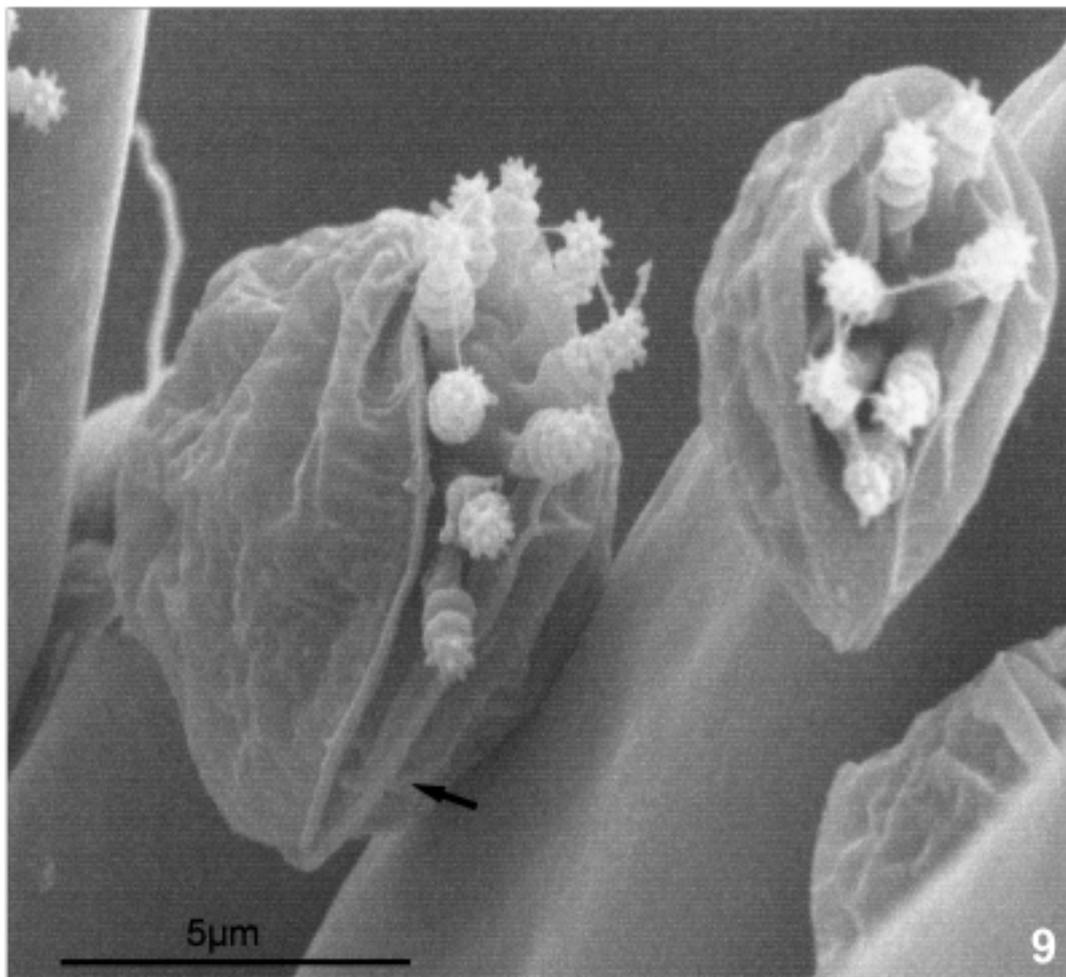


Fig. 9. *Flectacineta isopodensis*. Two specimens showing the opening of the lorica and the tentacles. The lateral furrow (arrow), and the rim curved outwards of the lorica can be seen

Table 2. Comparison between the different species of *Flectacineta*

	<i>F. lividiana</i> Jankowski, 1978	<i>F. dadayi</i> Curds, 1987	<i>F. elegans</i> Curds, 1987	<i>F. isopodensis</i> sp. n.
Size	30-80 μm	45 μm	70 μm	10.3-17.2 μm
Openinglorica	Small	Small	Small	Wide
Lorica with lateral furrow	No	No	No	Yes
Contractile vacuole position	Lateral	Lateral	Apical	Central posterior

F. livadiana and *F. dadayi* are epizoid on hydroids and marine algae. *F. elegans* has been found on the cladoceran *Bythotrepe longimanus* Leydig, 1860.

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