

***Licnophora rosa* sp. n. (Ciliophora: Heterotrichea) from the Gills of *Oxystelesinensis* (Gmelin, 1791) (Prosobranchia: Trochidae), South Africa**

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Summary. During surveys on the symbionts of intertidal invertebrates along the rocky shores of South Africa, a heterotrichous ciliophoran was found on the gills of *Oxystelesinensis* (Gmelin, 1791). This ciliophoran species comprises an oral and basal regions connected by a neck region. It is characterised by four macronuclear segments and is described as a new species, *Licnophora rosa* sp. n.

Key words: heterotrichous ciliophoran, *Licnophora rosa* sp. n., marine mollusc, top shell.

INTRODUCTION

Five species of the top shell genus *Oxysteles* Philippi, 1847 occur within the South African marine zoogeographical province. All of these host trichodinid and scyphidiid peritrichs on their gills (Fantham 1930, Sandon 1965, Basson and Van As 1992, Basson *et al.* 1999). During surveys for an ongoing project on the symbionts of intertidal invertebrates, another ciliophoran was found associated only with *Oxystelesinensis* (Gmelin, 1791). This heterotrichous ciliophoran conforms to the mor-

phological features of the monotypic family Licnophoridae Bütschli, 1881 and the genus *Licnophora* Claparède, 1867. It differs from the known species based on general body morphology, characteristics of the nuclear apparatus and host preference and is described as a new species. The description is based on Bouin's fixed specimens stained with hematoxylin, specimens impregnated with Protargol as well as scanning electron microscopy.

MATERIAL AND METHODS

Specimens of *Oxystelesinensis* (Gastropoda: Prosobranchia) were collected from the De Hoop Nature Reserve, South Africa and taken to a field laboratory where wet smears were prepared and examined.

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Positive smears were fixed in Bouin's and transferred to 70% ethanol. Some smears were stained with Mayer's hematoxylin (Humason 1979) for studying the nuclear apparatus and for obtaining body measurements. Other smears were impregnated with Protargol (Lom and Dyková 1992) to obtain data on the internal structures.

For scanning electron microscopy (SEM), lichenophorids were fixed in 2.5% glutaraldehyde, transferred to 5 µm nucleopore filters and prepared further using standard SEM techniques.

Body and micronucleus measurements and number of macronuclear segments were obtained from microscope projection drawings, using fixed material. Measurements of specimens are presented in the following way: minimum and maximum values are given, followed in parentheses by the arithmetic mean (mode in the case of the number of macronuclei), standard deviation (only in $n > 9$) and lastly number of specimens measured. The type material is in the collection of the National Museum, Bloemfontein, South Africa.

RESULTS AND DISCUSSION

Lichenophora rosa sp. n. (Figs. 1-6)

Hosts: *Oxystele sinensis* (Gmelin, 1791)

Position on host: gills.

Localities: De Hoop Nature Reserves on the south coast of South Africa.

Type-specimens: holotype slide S99/11/09-30 (NMBP 271), paratype slides, S99/11/09-27 (NMBP 272), 97/04/09-12 (NMBP 273) in the collection of the National Museum, Bloemfontein, South Africa, other material in the collection of the authors.

Type host and locality: *O. sinensis* De Hoop Nature Reserve (34°28' S; 20°30' E).

Etymology: *rosa* is Latin for pink. The common name for the type host is pink-lipped top shell.

Description

Body squat, total length 35-70 µm (52.1 ± 8.5 , 84), consists of three distinct regions; oral and basal region connected with short neck region (Fig. 3). Oral region diameter at broadest part 15-40 µm (23.1 ± 5.2 , 84). Adoral side of oral region fringed by broad band of adoral zone of membranelles (AZM) describing spiral of 270°, before plunging into infundibulum. AZM comprising 61-87 (72.7 ± 5.8 , 45) rows of membranelles (Figs. 1, 4), between 16 and 20 kinetosomes wide. Rows of membranelles separated by sharply pointed endoplasmic ribs. Centre of aboral surface smooth without cilia, fringed by AZM. Small area on margin with lateral cilia (Figs. 1, 3). Neck short, diameter 10-33 µm (20.0 ± 3.9 , 84), clearly distinguishable from adjacent oral and basal regions. Basal region round, surface slightly concave,

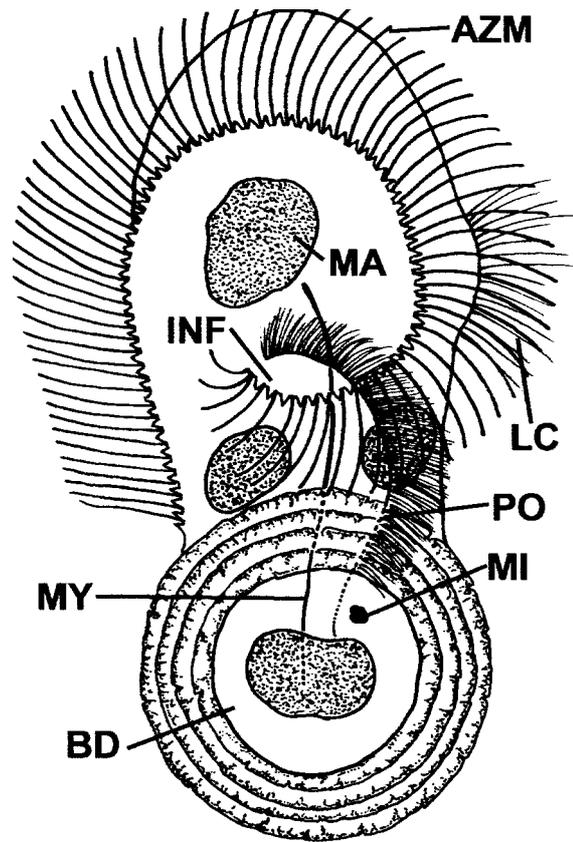
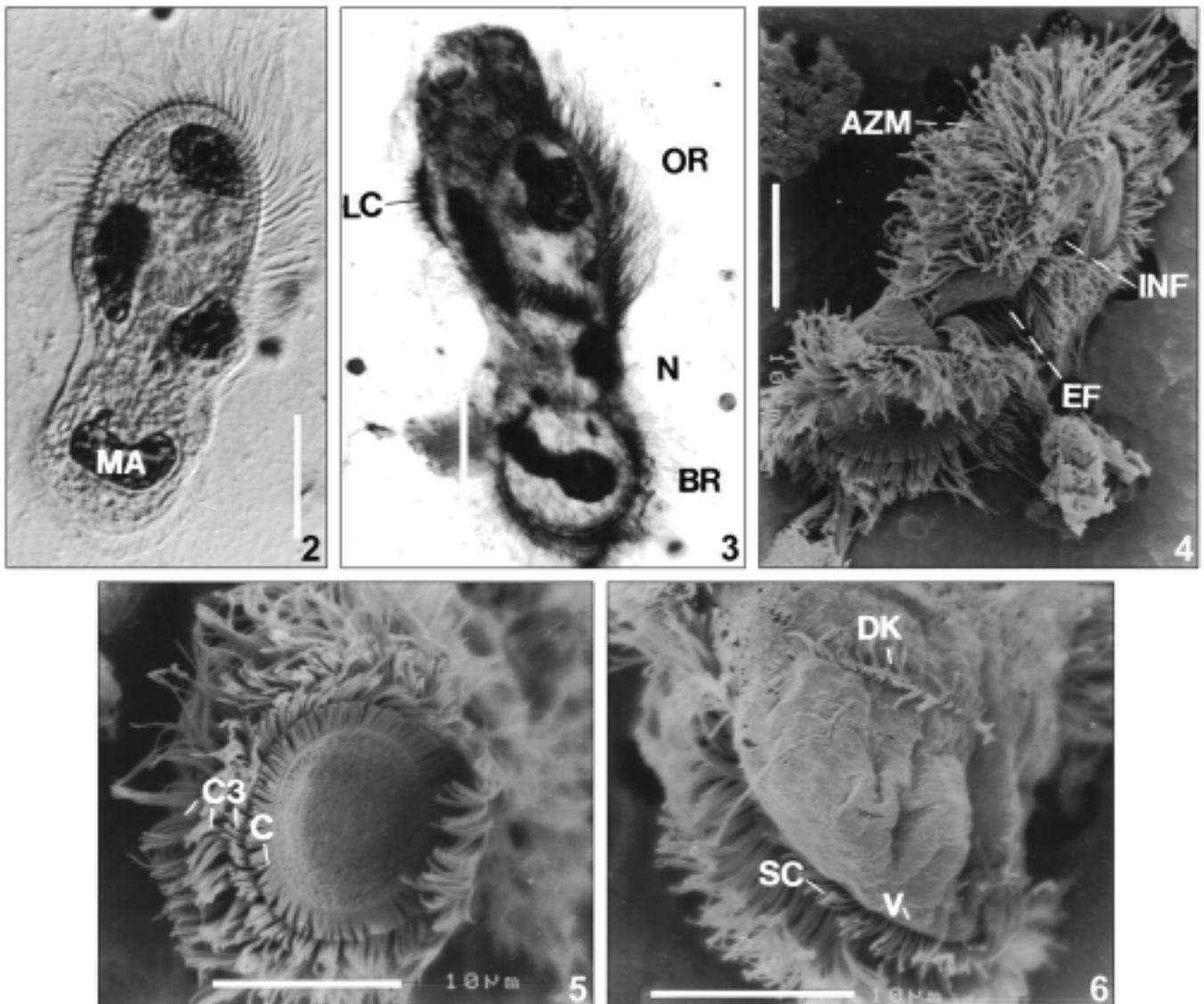


Fig. 1. Microscope projection drawing of *Lichenophora rosa* sp. n. occurring on the gill filaments of *Oxystele sinensis* (Gmelin, 1791) collected from the De Hoop Nature Reserve, South Africa. AZM - adoral zone of membranelles, BD - basal disc, INF - infundibulum, LC - lateral cilia, MA - macronucleus, MI - micronucleus, MY - myoneme, PO - paroral organelle. Scale bar - 15 µm

diameter 14-34 µm (20.7 ± 3.0 , 84). Basal disc diameter 8-20 µm (14.9 ± 3.3 , 56), disc surrounded by a single circular ring of short cilia, of uniform lengths (Fig. 5). Three additional rings of cilia extend around basal disc, proximal row shorter, distal row longer (Fig. 5). Anterior part of basal region separated from membranelles by velum, with one row of short cilia between velum and fourth row of membranelle (Fig. 6). Single row of between 20 and 25 ciliferous kinetosomes on dorsal side of basal disc (Fig. 6). Myoneme extends from centre of basal disc, stretching directly upwards past infundibulum, into centre of oral region (Fig. 1). Paroral organelle extends from periphery of basal disc, towards infundibulum, not always visible in light microscopy. Paroral organelle consisting of single row of densely packed kinetosomes from which a single row of long cilia



Figs. 2-6. Photomicrographs of hematoxylin stained specimens (2, 3) and scanning electron micrographs (4-6) of *Licnophora rosa* sp. n. collected from top shells from the De Hoop Nature Reserve, South Africa. **2** - adoral view: macronuclear segments (MA); **3** - aboral view: basal region (BR), lateral cilia (LC), neck (N), oral region (OR); **4** - adoral view: adoral zone of membranelles (AZM), ectoplasmic furrow (EF), infundibulum (INF); **5** - basal region with membranelles: single, circular ring of short cilia (C), three additional cilia rings (C3); **6** - basal region: dorsal ciliferous kinetosomes (DK), short cilia (SC), velum (V). Scale bars - 15 μ m (2, 3), 10 μ m (4-6)

originates, aborally visible in an ectoplasmic furrow (Fig. 4).

Macronucleus consists of large, round to oval-shaped separate nuclei, varying in number between 4 and 6 (4, 84) (Figs. 1, 2). Number of macronuclear segments in oral region 1-2 (1, 84), in neck region 1-3 (2, 84) and in basal region 1-2 (1, 84). Micronucleus irregular in form, diameter 2-4 μ m (3, 4) if visible situated near centre of basal disc. No food vacuoles observed, endoplasm with granular appearance. No contractile vacuole found.

Remarks

Nine of the eleven known *Licnophora* species have more nuclear segments than the newly described *L. rosa*, including the two species described from South Africa (Van As *et al.* 1999, Van As and Van As 2000). The nuclear information of the tenth species, i.e. *L. cohnii* Claparède, 1867, recorded from Italian polychaetes, is unknown. The only species with a comparable number of nuclei is *L. conklini* Stevens, 1904. This

species was originally found by Dr Conklin on the egg capsules of a slipper limpet (*Crepidula plana* Say, 1822) from Woods Hole, USA, but it was described by Calkins (1901) as a variety of *L. macfarlandi* Stevens, 1901. Stevens (1904) found specimens of a licnophorid again on *C. plana* also from Woods Hole. She considered this licnophorid with five nuclei to be a new species and named it *L. conklini*. Villeneuve-Brachon (1940), found licnophorids on the keyhole limpet *Fissurella gibberula* Lamarck, 1822, (currently known as *Diodora gibberula* (Lamarck, 1822)) at Sete, France, which she considered to be the same species as *L. conklini*. The population of *L. conklini* from the USA described by Calkins (1901) had five to six macronuclear segments in the body. The other material from the USA described by Stevens (1904) has a body length of 100-135 µm, two nuclear segments in the oral disc, two in the neck region and one large segment in the basal disc, all of which are connected to one another. The material collected by Villeneuve-Brachon (1940) from France had four macronuclear segments in the body, with the two nuclei in the neck region connected.

Licnophora rosa differs from *L. conklini* in overall body size. The largest specimen of *L. rosa* collected was 70 µm long, with a mean of 52.1 µm. This is almost half the size of the smallest specimens of *L. conklini* recorded. *Licnophora rosa* has lateral cilia on the oral region, which has not been recorded for *L. conklini*. The only other species with lateral cilia is *L. auerbachii* (Cohn, 1866) (Owen 1980, Silva Neto 1994). Furthermore *L. rosa* is restricted to a single host species, which is endemic to the southern African marine coastal province. *Licnophora rosa* was found only on the gills of the host, whereas *L. conklini* appears to be less host and site specific.

During investigations of the five *Oxysteles* species occurring in southern Africa, *L. rosa* was found only on *O. sinensis*, where it co-existed on the gills with

Trichodina oxystelis Sandon, 1965 and *Mantoscypthidia fanthami* Basson, Botha and Van As, 1999. *Licnophora rosa* is found attached to the gill filaments of the host and occurs in smaller numbers than the other two ciliophorans. Of the hosts examined, 66% were epifaunated.

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