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FIRST RECORD OF AN EXOTIC TRICHODINID CILIOPHORAN (CILIOPHORA: TRICHODINIDAE) *Trichodina modesta* Lom, 1970 FROM AN INDIAN GANGETIC LEAFFISH *Nandus nandus* (HAMILTON, 1822)

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AUTHOR'S CONTRIBUTION

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Nandus nandus, often known as the Gangetic leaffish, is an Asian leaffish species native to South Asia and Indochina. They are commonly found in slow-moving or stagnant bodies of water such as ponds, lakes, ditches, and flooded fields. The species is also known as speckled nandus and mud perch. This species was tested for parasite infestations in various species of freshwater fish in the river Ganges. For taxonomic evaluation, parasite smears were treated with silver nitrate. Disc-shaped trichodinids were discovered with a body diameter of 28.5-31.6 µm, adhesive disc diameter of 19.3-25.5 µm, and denticulate ring diameter of 11.2-16.8 µm. The physical traits were similar to those of *Trichodina modesta* Lom, 1970, a species with a strong host preference for Cypriniformes. Until recently, it was only found in the Eurasian region. The current study reports a new host for *T. modesta* and thus the first occurrence of this species in India. The parasite may have entered the Oriental region via the exotic fish trade, specifically Cypriniformes utilized by aquarists.

Keywords: *Trichodina modesta*; ectoparasite; fish; *Nandus nandus*; West Bengal.

1. INTRODUCTION

Trichodina Ehrenberg, 1830, is an important genus of protozoan ciliates in terms of economic and ecological importance. As of now, 400 *Trichodina* species have been detected on diverse aquatic aquatic species around the world in a variety of conditions, including freshwater, brackish water, and marine [1-14].

Nandus nandus, also known as the Gangetic leaffish, is a type of Asian leaffish in South Asia and Indochina. It's common to find them in slow-moving or stagnant water, like ponds and lakes. They can also

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be found in ditches, flooded fields, and ditches. The species is also known as speckled nandus and mud perch, but these aren't the only names. During an icthyo-parasitological survey in West Bengal, we came across a species of *Trichodina* Ehrenberg, 1830. Later, it was found to be *Trichodina modesta* Lom, 1970 and it was found for the first time in India. The taxonomic and morphological description of *Trichodina modesta*, which was found for the first time in West Bengal, India, is in this paper. It was found on *Nandus nandus* Lom, 1822, which is an unusual host for *T. modesta*.

2. MATERIALS AND METHODS

Live host fish were obtained from cultured ponds and kept in stocking vats with a steady flow of water. On grease-free slides, gill and skin smears were formed. Klein's [15] dry silver impregnation technique was used to impregnate slides containing trichodinid ciliophorans. Preparation slides were examined using an Olympus research microscope (Model CX 33) at 1000X magnification with an oil immersion lens, and images were taken using an Olympus digital camera. Line drawings were made using CorelDraw 12 image processing software. All measurements are taken in micrometres and adhere to the consistent specific characteristics specified by Lom, Wellborn [16], and Arthur and Lom [17]. In each case, the minimum and maximum values are presented, followed by the arithmetic mean and standard deviation in parentheses. The mode is given instead of the arithmetic mean in the case of denticles and radial pins. The denticle's span is measured from the tip of the blade to the tip of the ray. Body diameter is calculated by adding the sticky disc and the border membrane. The denticle elements are described in accordance with Van As and Basson's standards [2]. The sequence and method of describing denticle elements adhere to Van As and Basson's suggestions [3].

3. RESULTS

Trichodina modesta Lom, 1970 (Figs. A, B, 1-6, Table 1)

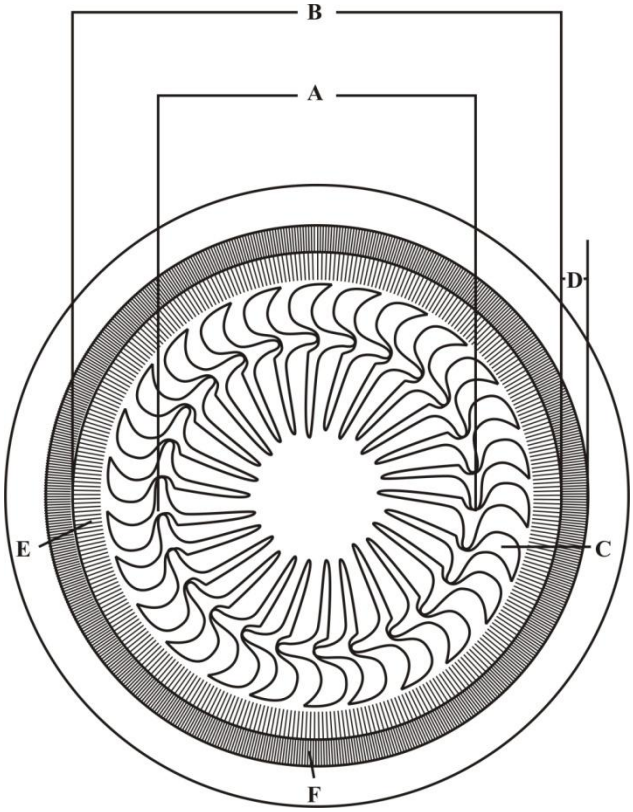


Fig. A. Measurements and structures of adhesive disc used as specific characteristics: A= diameter of denticulate ring, B= diameter of adhesive disc, C= denticle, D= width of border membrane, E= radial pins, F= border membrane (method of Lom)

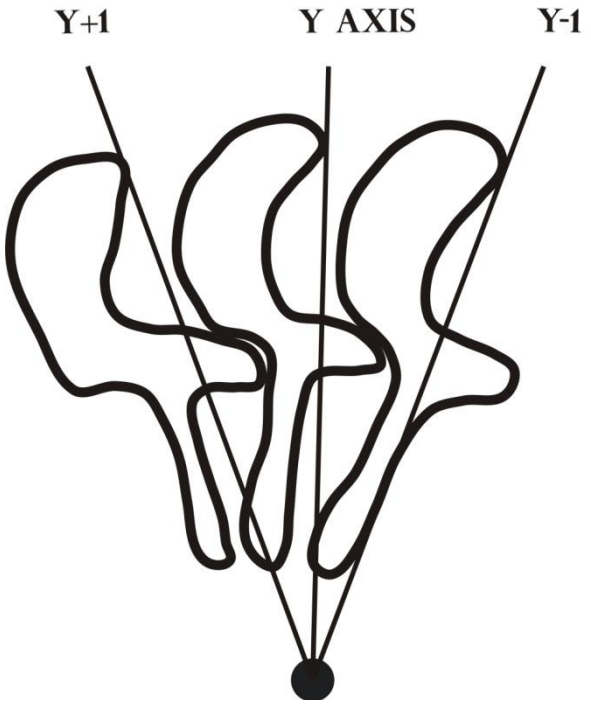
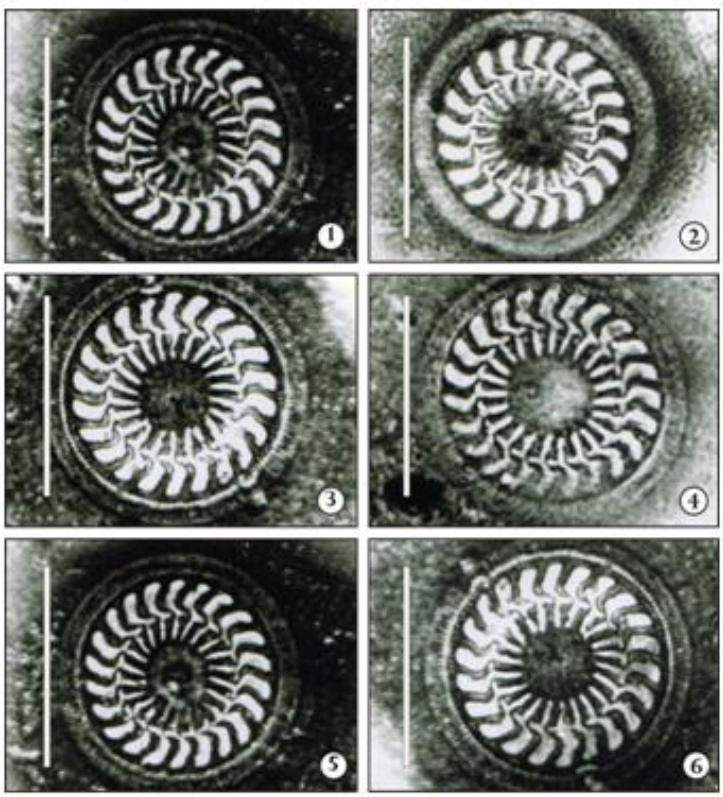


Fig. B. Diagrammatic drawings of the denticles of *Trichodina modesta* Lom, 1970 obtained from gills and skins of *Nandus nandus* (Hamilton 1822)



Figs. 1-6. Silver impregnated adhesive discs of *Trichodina modesta* Lom, 1970, obtained from gills and skins of *Nandus nandus* (Hamilton 1822). (Scale bars: 10 µm)

Table 1. Measurements of *Trichodina modesta* (Lom, 1970) found from the gills and skins of a freshwater fish *Nandus nandus* (Hamilton 1822) The mean is followed by standard deviation, and in parenthesis the minimum and maximum values

Species	*Trichodina modesta* Lom, 1970
Host	*Nandus nandus* (Hamilton 1822)
Locality	West Bengal, India
Location	Gills, skin
References	Present study
Diameter of	
body	28.5-31.6 (28.2±2.3)
adhesive disc	9.3-25.5 (22.7±2.1)
Dimension of body	
denticulate ring	11.2-16.8 (13.7±1.6)
central area	-
Width of the border membrane	2.0-3.0 (2.7±0.3)
Number of denticles	19-22 (22±1.5)
Number of radial pins/denticle	5-8 (6±0.9)
Dimension of denticle	
span	6.4-8.0 (6.9±0.4)
length	2.5-3.8 (8.1±0.3)
Dimension of denticle components	
length of the ray	2.0-3.0 (2.3±0.2)
length of the blade	2.9-3.5 (3.1±0.2)
width of the central part	1.1-1.5 (1.3±0.1)
Adoral Ciliature	390-400°

This ciliophoran is of medium size. Blade, keep it restricted between the y-axes. The blade's distal surface is flat and parallel to the border membrane. The tangent point to the y-axis is blunt and lower in elevation than the distal surface. The anterior blade surface is nearly straight and parallel to the y-axes. The front blade surface of certain specimens is rounded and lacks a noticeable apex, but the apex is evident in the majority of specimens. There is no blade apophysis. The surface of the posterior blade curves to form a somewhat deep semilunar curve. The connection between the blade and the central component is not visible, and both appear to be one unit. The central section is delicately conical, fits loosely to the preceding denticle, and reaches halfway to the y-1 axis (Figs. B, 1-6). The region above and below the x-axis has a similar shape. The Ray link is really brief. Ray apophysis is not present. Rays are constant in thickness along their length and end with a blunt or slightly rounded tip pointing towards the y+1 axis in the majority of cases.

Intraspecific Variability: Denticular structural variation was identified in the current investigation. The distal margin of the blade is truncated in the majority of cases, but only a handful have a slightly rounded distal margin (Figs. B, 1-6). The tangent point is rounded in some circumstances, but flat in others. The majority of the specimens have a rectangular blade with anterior and posterior margins that run parallel, while the distal end of the blade is wider in certain specimens. The rays in the majority of the specimens are directed towards the y+1 axes (Figs.B, 1-6), although in certain cases they are directed towards the geometrical centre of the adhesive disc. Future research will be needed to determine if these discrepancies are related to trichodinid adaptation to unfavourable conditions within the host body or to differences in their ages.

4. DISCUSSION AND CONCLUSION

The current study demonstrates the presence of *T. modesta*, a parasite previously reported from the Neotropical and Eurasian regions that has now been discovered in India with a novel and uncommon host (*Nandus nandus*). *T. modesta* has since been found in several more Eurasian nations since Lom [18] initially reported it in Hungary, Slovakia, and the Czech Republic. *T. modesta'*s morphological and morphometric traits are similar to those given in the

original description by Lom [18] and additional records (Wierzbicka [19]; Gaze and Wotten [20]; Özer, [21]). *T. modesta* is categorised as a small-sized (Basson and Van As [22]; Gaze & Wootten; Zhao & Tang [23], current study) or medium-sized trichodinid (Wierzbicka; Özer; Öztürk & Özer [24]) or large sized trichodinids (Wierzbicka; Özer; Öztürk & Özer).

Morphometric variation in this ciliate group may occur as a result of environmental and ecological causes (Kazubski [25]). Previous research discovered the parasite only on the gills (Lom; Arthur and Lom; Wierzbicka). In contrast, in the current study, we found this parasite on both the gills and the body surface, similar to what Basson and Van As, Özer, and Öztürk & Özer. *T. modesta* has a high degree of host specificity, according to Gaze and Wootten, when compared to other global trichodinids, such as *T. heterodentata*. Based on the reports in the literature, it appears that *T. modesta* has a preference for the order Cypriniformes. Nonetheless, the parasite was detected in an atypical fish in the current investigation, comparable to that described by Basson & Van As, who also found *T. modesta* in Perciformes fish. Kibria et al. [26] and Liu & Zhao [27] discovered two Silurifomes hosts, which is a rare occurrence.

Nandus nandus is an Asian and Indochina native that has been observed to be parasitized by *T. modesta* in India. These are natural species in the *T. modesta* endemic area, and multiple studies have shown that this ciliate parasitizes these ornamental fish (Basson and Van As; Özer ; Öztürk & Özer; Zhao and Tang; Han and Zhao [28]); Tang et al.[29]).

According to the remarks above, the introduction of *T. modesta* into the Oritental region could be linked to large-scale commercial fish introductions. Van As and Basson. also proposed that *T. heterodentata* has become spread globally as a result of cichlid introductions into new areas. Dispersal of fish and their parasites into new areas may increase host diversity for parasitic infestations, validating recent *T. modesta* results in non-Cypriniformes species such as those described by Kibria et al., Liu & Zhao, and in the current work.

According to the findings of this study, the majority of trichodinid parasites in India require more investigation. It contributes to a better understanding of the parasite fauna of an important freshwater fish (*Nandus nandus*). Nonetheless, this is the first time *T. modesta* has been found in the Oriental region, and *Nandus nandus* is a new host for this ciliate. These findings raise the possibility of parasite introduction into India via ornamental cyprinid importation which parasitizes the wild fish fauna.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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