

# Description of *Paratrichodina yangtzeus* sp. n. (Ciliophora: Trichodinidae) from the freshwater fishes in the Yangtze River, China

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**ABSTRACT.** *Paratrichodina* Lom, 1963 comprises more than ten species. *Paratrichodina* has been found so far in various freshwater, marine fishes and amphibians worldwide. This report provides the first record of *Paratrichodina* from freshwater fishes in China. Smears with trichodinids were air-dried and then the slides with trichodinid ciliates were impregnated with Klein dry silver impregnation technique in order to reveal details of the adhesive disc. All measurements are presented in micrometres and follow the system proposed by Lom. Detailed descriptions of the denticles are presented in accordance with the method proposed by Van As and Basson. Denticulate ring of the studied specimens is constituted by loosely arranged denticles and the adoral ciliary spiral is between 180 to 200°. So the studied specimens were assigned to *Paratrichodina*. The presently described trichodinid resembles *P. erectispina* Lom et Haldar, 1977 and *P. voikarensis* Kashkovsky et Lom, 1979, but it is clearly distinguished from *P. erectispina* by the shape of denticle and some other measurements. Based on its unique characteristics, a new *Paratrichodina* species is erected, and named *Paratrichodina yangtzeus* sp. n.

**Key words:** Ciliophora, Trichodinidae, *Paratrichodina yangtzeus* sp. n., *Silurus asotus*, Yangtze River, China

## Introduction

*Paratrichodina incisa* (syn: *Trichodinella* sp., *Tripartiella* sp.) has been found on the gills of *Nemachius barbatulus* by Lom in 1959 [1], though he defined *Paratrichodina* (Trichodinidae: *Paratrichodina*) in 1963 [2]. More than ten species in *Paratrichodina* have been found so far from various freshwater and marine fishes throughout the world, such as *P. globonuclea* Lom, 1963 [2], *P. obliqua* Lom, 1963 [2], *P. phoxini* Lom, 1963 [3, 4], *P. alburni* (Vojtek, 1957) Lom, 1963 (Syn: *Trichodina alburnui* Vojtek, 1957) [4]; *P. degiustii* Lom et Haldar, 1976 [4], *P. corlissi* Lom et Haldar, 1977 [5], *P. erectispina* Lom et Haldar, 1977 [5], *P. uralensis* Kashkovsky et Lom, 1979 [6], *P. voikarensis* Kashkovsky et Lom, 1979 [6], *P. africana* Kazubski et El-Tantawy, 1986 [7, 8], *P. lizae* Asmat, 2002 [9], *P. bassonae* Amlan et Probir, 2006 [10], and so on. In China, *Paratrichodina globonuclea* and *P. obliqua* have been found from marine fishes [11, 12].

The *Paratrichodina yangtzeus* sp. n. was found

by the author on the gills of *Silurus asotus* Linnaeus, 1758 collected in the year 2006 from the Yangtze River at Luzhou, Sichuan, China (28°51'20.41"N 105°23'25.43"E), which is the longest river in China (Fig. 1). The collected *Silurus*



Fig 1. Map of sampling localities where fishes were collected from the Yangtze River

*asotus* Linnaeus, 1758 are infected only by this kind of trichodinid, with a 100% infection rate. Each fish contains a large number of trichodinids.

## Materials and methods

The host fishes, *Silurus asotus* Linnaeus, 1758 were collected from the Yangtze River at Luzhou, Sichuan, China in 2006. Gill scrapings were made from the hosts. Smears with trichodinids were air-dried and then the slides with trichodinid ciliates were impregnated with Klein dry silver impregnation technique [13] in order to reveal details of the adhesive disc. All photomicrographs and illustration drawings were made with the help of camera (Motic DM-BA300-B) at 100× magnification with oil immersion lens and computer software Motic Images Advanced 3.2 and CorelDRAW X3. The statistics were obtained with

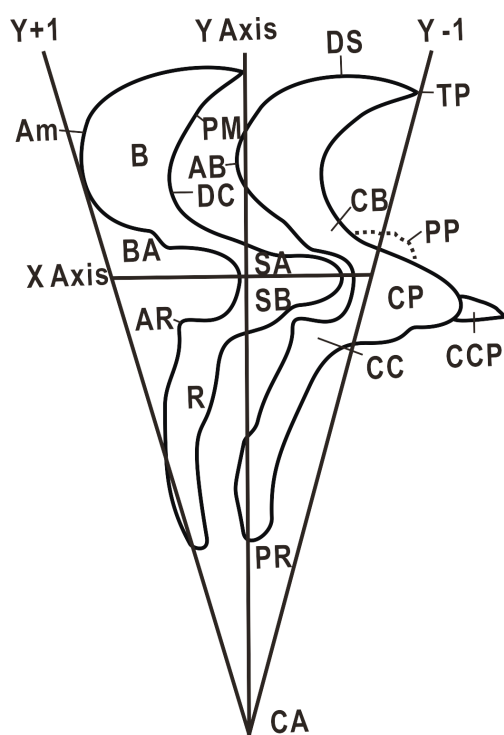


Fig. 2. Denticle structure and construction of X and Y axes as fixed references for description of denticles (after Van As and Basson 1989)

Explanations: **AB**, apex of blade; **AM**, anterior margin of blade; **AR**, apophysis of ray (= thorn); **B**, blade; **BA**, apophysis of blade; **CA**, central of adhesive disc; **CB**, section connecting blade and central art; **CC**, section connecting central part and ray; **CCP**, central conical part; **CP**, central part; **DC**, deepest point of curve; **DS**, distal surface of blade; **PM**, posterior margin of blade; **PP**, posterior projection; **PR**, point of ray; **R**, ray; **SA**, section of central part above x axis; **SB**, section of central part below x axis; **TP**, tangent point

Microsoft Excel 2003. All measurements are presented in micrometres and follow the system proposed by Lom [14]. Minimum and maximum values are given, followed in parentheses by the arithmetic mean and standard deviation. In the case of the denticles and radial pins, the mode is given rather than the arithmetic mean with the number of specimens examined given in parentheses. The span of the denticle is measured from the tip of the blade to the tip of the ray. Body diameter is measured as the adhesive disc plus the border membrane. Detailed descriptions of the denticles are presented in accordance with the method proposed by Van As and Basson [15] (Fig. 2).

## Results and discussion

### Taxonomic summary

Species: *Paratrichodina yangtzeus* sp. n.

Type host: *Silurus asotus* Linnaeus, 1758

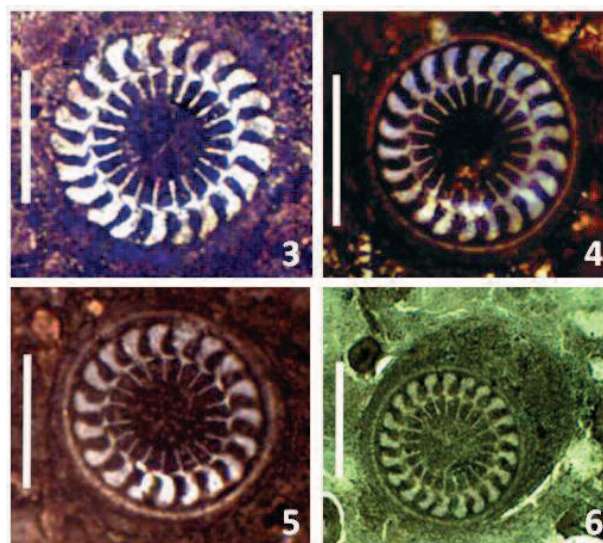
Fish family: Siluridae

Location: gills

Type locality: Luzhou, Sichuan, China (28°51'20.41"N 105°23'25.43"E)

Etymology: The specific name is coined from the name of the Yangtze River

Reference material: Holotype, slide LZY-664/2006 and paratype slides LZY-640/2006, LZY-668/2006, deposited in the Biological Laboratory of Luzhou Vocational Technical College.



Figs. 3–6. Photomicrographs of the silver nitrate impregnated adhesive discs of *Paratrichodina yangtzeus* sp. n. from the gills of *Silurus asotus*. Fig.6. Also displays the shape of the whole cell of it. Scale bars=20  $\mu$ m

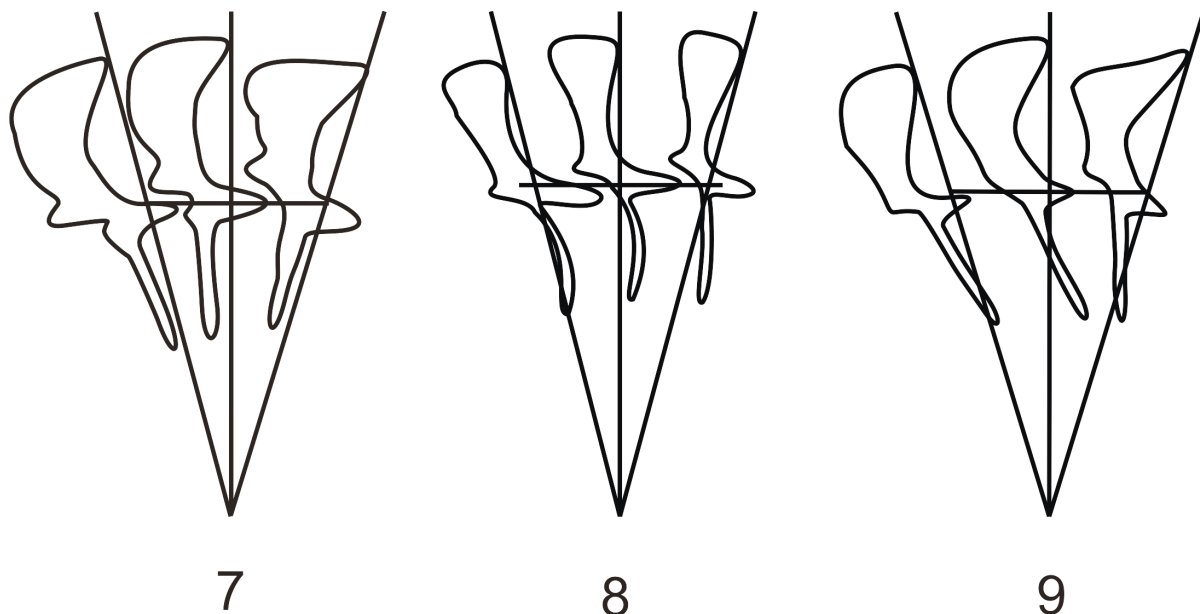
Table 1. Comparison of *Paratrichodina yangtzeus* n. sp. with *P. erectispina* Lom et Haldar, 1977 and *P. voikarensis* Kashkovsky et Lom, 1979

Trichodinid species	<i>P. yangtzeus</i> sp.n.	<i>P. erectispina</i>	<i>P. voikarensis</i>	
Host	<i>Silurus asotus</i>	<i>Pimephales vigilax</i>	<i>Coregonus nasus</i>	<i>Coregonus peled</i>
Locality	Luzhou, Sichuan, China	Vicinity of Detroit USA	Russia	Russia
Site	gills	gills	gills	gills
Reference	present study	Lom and Haldar (1977)	Kashkovsky and Lom (1979)	
No. of specimens measured	20	—	—	—
Body diameter	25.8–31.1 (28.1±1.9)	30 (23–36)	34 (29–44)	37 (33–48)
Adhesive disc	20.4–26.3 (23±1.9)	25 (20–31)	24 (23–25)	24 (18–26)
Denticulate ring	12.8–17.8 (14.9±1.6)	15 (12–19)	15 (15–16)	26 (20–39)
Border membrane	2.0–3.0 (2.5±0.3)	2	2–3	1.8–2.4
Denticle number	20–22 (21)	25 (24–27)	23–25	22–25
Radial pins per denticle	5 (5)	4–5	6	6
Denticle span	5.6–7.8 (6.6±0.7)	—	—	—
Denticle length	2.0–3.5 (2.5±0.4)	—	—	—
Blade length	2.1–2.9 (2.9±0.2)	3–3.5	3–4	3 (2.8–4.6)
Central part width	0.5–1.2 (1±0.2)	1.2–1.4	3 (2–4)	1–2.5
Ray length	1.8–3.8 (2.7±0.6)	2–2.5	1–2	0.6–1.3
Adoral ciliary spiral	180–200°	230–280°	240–260°	240–260°

**Description (Figs. 3–7, Table 1)**

Small, freshwater trichodinid with long cylinder or cone shape (Fig. 6). Body diameter 25.8–31.1 (28.1±1.9). Diameter of adhesive disc 20.4–26.3 (23±1.9). Diameter of denticulate ring 12.8–17.8 (14.9±1.6). Centre of disc clear and without any granules. Border membrane 2.0–3.0 (2.5±0.3) in width. Number of denticles 20–22 (21). Number of radial pins (mode) per denticle 5. Span of denticle 5.6–7.8 (6.6±0.7). Length of denticle 2.0–3.5 (2.5±0.4). Denticulate ring constituted by loosely

arranged denticles. Blade length 2.1–2.9 (2.9±0.2). Blade narrow sickle shaped and tangent point tapering or slightly rounded. Apophysis of blade almost close to Y+1 axis. Width of central part 0.5–1.2 (1±0.2). Central part narrow with triangle or bluntly-rounded point, extending less than halfway towards the Y–1 axis. Shape of the central part above and below the X axis almost the same. Ray straight, long and thin, and directed towards the center of adhesive disc. Ray length 1.8–3.8 (2.7±0.6). Adoral ciliary spiral 180–200°.



Figs. 7–9. Diagrammatic drawings of the denticles of trichodinid ciliophorans

Fig. 7. *Paratrichodina yangtzeus* sp. n.

Fig. 8. *P. erectispina* Lom et Haldar, 1977

Fig. 9. *P. voikarensis* Kashkovsky et Lom, 1979

### Remarks (Figs. 7–9, Table 1)

Among all *Paratrichodina* species, the *Paratrichodina yangtzeus* sp. n. collected from the gills of *Silurus asotus* Linnaeus, 1758 in the Yangtze River at Luzhou, China only resembles *P. erectispina* Lom et Haldar, 1977 obtained from the gills of *Pimephales vigilax* found in West Birginis, USA [5] and *P. voikarensis* Kashkovsky et Lom, 1979 obtained from the gills of *Coregonus nasus*, *C. peledamong* found in Russia [6].

*Paratrichodina yangtzeus* sp. n. is clearly distinguished from *P. erectispina* by the shape of denticle and some other measurements such as morphometric data. The apophysis of blade in the new species is almost close to the Y+1 axis, but that of *P. erectispina* is far away from the Y+1 axis. The central part of the new species extends less than halfway towards the Y–1 axis, but that of *P. erectispina* stretches far more than halfway to the Y–1 axis. In the *P. erectispina*, the rays are curved, the concavity of this arch being directed forwards (i.e., anticlockwise in the aboral view), but in case of the new species the rays are straight and directed towards the center of adhesive disc. In the diagrammatic drawing of the denticles of trichodinid, the ray of the *P. erectispina* is situated between Y and Y–1 axis, but the new species' ray is situated between Y and Y+1 axis. Moreover, morphometric data are different. For instance, the new species has fewer denticles (20–22 vs 24–27) and more radial pins per denticle (5 vs 4–5), shorter blade (2.1–2.9 vs 3–3.5) and central part width (0.5–1.2 vs 1.2–1.4). The adoral ciliary spiral is quite different too: 180–200° in the new species, but 230–280° in *P. erectispina*.

*Paratrichodina yangtzeus* sp. n. and *P. voikarensis* also demonstrate dissimilarities. The apophysis of blade in the new species is almost close to the Y+1 axis, but that of *P. voikarensis* is far away from the Y+1 axis. The central part of the new species is longer than that of the *P. voikarensis*. It extends less than halfway towards the Y–1 axis, but in *P. voikarensis* it just stretches across the Y axis. In the new species the ray is straight and parallel to Y axis, while in the *P. voikarensis* the whole denticle is slanted backward and its ray crosses the Y axis. Some morphometric data are different too. The new species. has smaller body diameter (25.8–31.1 vs 29–48) and denticulate ring (12.8–17.8 vs 15–39), and it has fewer denticles (20–22 vs 22–25), fewer radial pins per denticle (5 vs 6), and shorter blade (2.1–2.9 vs 3–4.6). And the

adoral ciliary spiral is also quite different for both species (180–200° vs 240–260°).

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