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Trichodinids (Protozoa: Ciliophora: Peritrichida) of Nile Tilapia (*Oreochromis niloticus*) in the Philippines

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Abstract

During a survey of the trichodinids of wild and cultured Nile tilapia *(Oreochromis niloticus)* throughout the Philippines, a total of eight species belonging to two genera were encountered. Among these was *Trichodina velasquezae* n. sp., from the skin and gills of brackishwater cultured tilapia from Leganes, Iloilo. Other species identified include *T. centrostrigata* Basson, Van As, and Paperna, 1983; *T. acuta* Lom, 1970; *T. heterodentata* Duncan, 1977; *T. siluri* Lom, 1970; *Trichodina* sp.; *Tripartiella clavodonta* Basson and Van As, 1987; and *Tripartiella tilapiae* (Duncan, 1977) n. comb.

Trichodina equatoralis Kazubski, 1986 is considered a synonym of *T. heterodentata*, while *Trichodinella lechridens* Basson and Van As, 1987 and *T. macrosoma* Basson and Van As, 1987 are regarded as synonyms of *Tripartiella tilapiae*.

Introduction

Nile tilapia *(Oreochromis niloticus*[1]) originating from Egyptian and Ugandan stocks, were first introduced into the Philippines from Thailand and Israel in 1973 (see Natividad 1987). This species has since gained considerable acceptance as a food fish and its culture has spread throughout much of the country.

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[1]The occurrence of genetically pure stocks of *O. niloticus* in the Philippines is doubtful. Macaranas et al. (1986) have found evidence of hybridization with wild populations of *O. mossambicus* in virtually all stocks examined.

Because of its importance to aquaculture, the Bureau of Fisheries and Aquatic Resources (BFAR), Fish Health Unit initiated in 1985 a survey of the parasites of wild and cultured tilapia throughout the Philippines. This paper reports on the identity of trichodinid ciliates encountered, and includes a description of one species new to science.

Only a few publications report on the Trichodinidae of Nile tilapia. In the only study to date of trichodinids infecting this species within its natural distribution, El-Tantawy and Kazubski (1986) reported *Trichodina centrostrigata* Basson, Van As, and Paperna, 1983; *Paratrichodina africana* Kazubski and El-Tantawy, 1986; and two unidentified species of *Trichodina* from tilapia examined in Egypt. The only report of trichodinids from introduced Nile tilapia is that of Natividad et al. (1986), who reported *T. centrostrigata; T. acuta* Lom, 1970; and *T. heterodentata* Duncan, 1977 from fish examined in the Philippines. Other reports on trichodinids from other species of African cichlids are those of Duncan (1977) for the Philippines; Van As and Basson (1986) for Taiwan; Kazubski (1986) for Kenya; and Basson et al. (1983), Van As et al. (1984), and Basson and Van As (1987) for South Africa.

Materials and Methods

As part of a larger survey of the parasites of Nile tilapia in the Philippines conducted from 1985 to 1987 by the BFAR Fish Health Unit, trichodinids were identified from tilapia collected from the following localities:

1. Culture ponds at the University of the Philippines in the Visayas Brackishwater Aquaculture Center (UPV-BAC), Leganes, Iloilo Province (brackishwater) (n = 210)
2. Culture ponds at the Bureau of Fisheries and Aquatic Resources, National Freshwater Fish Hatchery (BFAR-NFFH), Muñoz, Nueva Ecija Province (freshwater) (n = 100)
3. Private culture cages at Sampaloc Lake, San Pablo City, Laguna Province (freshwater) (n = 180)
4. Department of Agriculture culture ponds at Barangay Calarian, Zamboanga City, Zamboanga Del Sur Province (freshwater) (n = 30)
5. Calarian Lake, Barangay Calarian, Zamboanga City, Zamboanga Del Sur Province (wild, freshwater) (n = 30)

6. Culture ponds at Iwahig Penal Colony, Puerto Princesa, Palawan Province (freshwater) (n = 30)
7. Lake Buhi, Buhi, Camarines Sur Province (wild, freshwater) (n = 30)

Air-dried smears of living ciliates infecting fish from freshwater localities were made from the skin and gills, stained with a 2% aqueous solution of silver nitrate ($AgNO_3$) for 10 minutes, rinsed in tap water and exposed to UV light for 30 minutes (Klein's dry silver impregnation technique) prior to mounting in Canada balsam. For brackishwater samples, Klein's technique was modified by presoaking slides in distilled water for 30 minutes to one hour prior to staining in warm (60°C) $AgNO_3$ solution for 30 minutes.

Terminology and methods of measurement follow those given by Lom (1958) and Arthur and Lom (1984b).

Results

Eight species of Trichodinidae were recovered from Philippine Nile tilapia. These include six species of *Trichodina* and two species of *Tripartiella*. Their identity, location and locality, and comments on their geographic distribution, taxonomic status and morphological variability follow:

Trichodina velasquezae n. sp.

Location: skin, gills

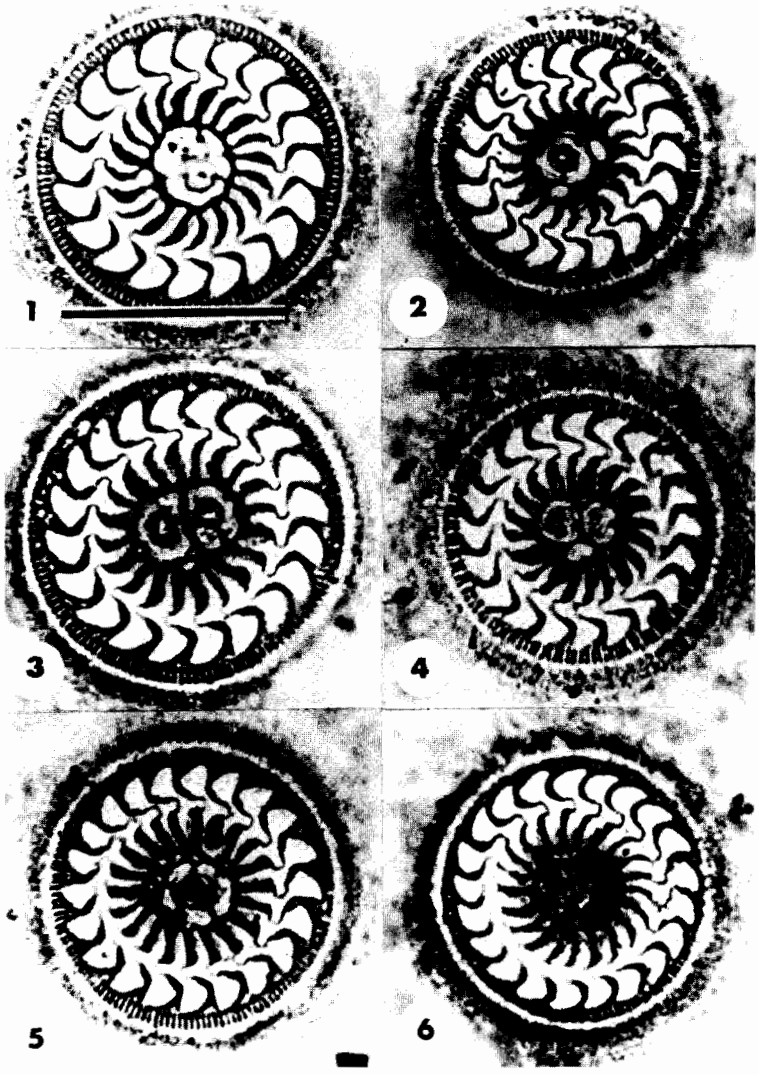
Locality: UPV-BAC, Leganes, Iloilo

Syntypes: Two slides, designated as syntypes, are deposited in the United States National Museum Helminthological Collection as USNM Helm. Coll. No. 80407. Additional material is contained in the collection of the BFAR Fish Health Unit, Quezon City.

Description: *Trichodina velasquezae* n. sp. Relatively small, (see Table 1), denticles few (19-23). Adhesive disc central portion divided into a variable number of clear areas of irregular shape and size often containing dark argentophilic granules. Blade of denticle broad, with rounded anterior margin and slightly concave posterior, tip being bluntly pointed. Posterior margin of blade of some denticles with

small notch. Thorn relatively short, stout, tip being usually blunt, appearing pointed occasionally. Thorn of denticles of some specimens appears to possess central axis. Thorn attached to central portion of denticle slightly anterior to attachment of the blade.

Comments: *Trichodina velasquezae* n. sp. is a common parasite of Nile tilapia collected from brackishwater culture ponds at Leganes, Iloilo Province, occurring in mixed infection with *Trichodina* sp.



Figs. 1-6. *Trichodina velasquezae* n. sp. Note variation in the appearance of the center of the adhesive disc. (Scale bar = 20 μm).

Table 1. Data summary for trichodinid species from Nile tilapia in the Philippines.[a]

	Trichodina velasquezae n. sp. (n = 17)		*Trichodina centrostrigata* (n = 26)		*Trichodina acuta* (n = 8)		*Trichodina heterodentata* (n = 31)	
Diameter of:								
Body	27.0-35.0	(29.9 ± 2.3)[b]	33.0-52.0	(42.6 ± 4.7)	39.0-48.0	(43.0 ± 3.2)	39.2-53.0	(47.1 ± 3.8)
Adhesive disc	22.0-29.0	(26.0 ± 2.3)	28.8-45.6	(35.1 ± 4.2)	29.0-36.5	(32.7 ± 2.8)	32.8-45.0	(39.4 ± 3.9)
Denticular ring	19.0-25.0	(22.4 ± 2.1)	18.4-25.6	(21.4 ± 2.1)	25.0-31.0	(28.0 ± 2.1)	19.2-28.4	(24.3 ± 2.5)
Number of:								
Denticles	19-23	(21.0 ± 1.2)	24-29	(27.0 ± 1.3)	17-18	(17.4 ± 0.5)	21-25	(22.3 ± 1.1)
Radial pins/denticle	7-8		8-10		9		10-13	
Dimension of denticle:								
Length	4.6- 6.0	(5.2 ± 0.5)	3.2- 4.8	(3.9 ± 0.5)	6.0- 7.5	(6.6 ± 0.5)	4.8- 8.8	(7.0 ± 1.0)
Blade	3.0- 5.0	(3.8 ± 0.7)	4.8- 7.2	(5.5 ± 0.6)	4.0- 5.0	(4.1 ± 0.4)	4.0- 5.6	(4.6 ± 0.5)
Thorn	2.0- 6.0	(3.3 ± 1.0)	3.6- 8.8	(4.5 ± 1.1)	3.0- 4.0	(3.7 ± 0.5)	4.0- 6.4	(5.6 ± 1.2)
Center	1.0- 2.0	(1.2 ± 0.3)	0.8- 2.4	(1.4 ± 0.4)	1.5- 2.0	(1.0 ± 0.2)	1.6- 2.4	(2.1 ± 0.3)
Span	7.0-12.0	(8.3 ± 1.2)	9.6-16.0	(11.6 ± 1.4)	9.0-10.0	(9.8 ± 0.5)	10.4-13.6	(12.6 ± 0.9)
Width of border membrane	1.0- 2.0	(1.8 ± 0.4)	3.2- 4.0	(3.7 ± 0.4)	4.0- 5.0	(4.3 ± 0.5)	3.1- 4.8	(2.9 ± 6.3)
Location	skin, gills		skin, gills		skin		gills, rarely skin	
Locality	Leganes, Iloilo		Calarian, Zamboanga		San Pablo City, Laguna		Muñoz, Nueva Ecija	

[a]All measurements in micrometers (μm)
[b]Range (X ± S.D.)

Table 1. Continued.

	Trichodina siluri (n = 6)		*Trichodina* sp. (n = 5)		*Tripartiella clavodonta* (n = 16)		*Tripartiella tilapiae* (n = 3)	
Diameter of:								
Body	45.8-53.0	(49.0 ± 3.0)	31.0-40.0	(35.8 ± 3.5)	17.0-24.0	(21.2 ± 2.0)	18.4-23.2	(20.8 ± 2.4)
Adhesive disc	37.1-45.0	(41.5 ± 3.0)	28.0-35.0	(32.0 ± 2.7)	15.0-22.0	(18.3 ± 2.0)	15.2-18.4	(16.8 ± 1.6)
Denticular ring	22.1-26.1	(24.2 ± 1.7)	26.0-32.0	(29.0 ± 2.2)	7.5-13.0	(10.1 ± 1.5)	8.4-10.4	(9.2 ± 1.0)
Number of:								
Denticles	24-27	(25.5 ± 1.0)	22-24	(22.6 ± 0.9)	19-24	(22.0 ± 1.4)	26-28	(27.3 ± 1.1)
Radial pins/denticle	10-11		8		5		4	
Dimension of denticle:								
Length	5.9- 6.3	(6.0 ± 0.2)	5.0- 6.0	(5.6 ± 0.7)	2.5- 4.0	(3.5 ± 0.6)	3.2	(3.2 ± 0.0)
Blade	4.7- 6.3	(5.4 ± 0.5)	4.0- 4.5	(4.1 ± 0.2)	2.0- 4.0	(2.9 ± 0.5)	3.2	(3.2 ± 0.0)
Thorn	5.5- 6.5	(5.8 ± 0.3)	2.5- 4.0	(3.4 ± 0.7)	1.0- 4.5	(2.0 ± 0.9)	0.8	(0.8 ± 0.0)
Center	1.2- 1.9	(1.6 ± 0.3)	1.0- 2.0	(1.5 ± 0.4)	0.5- 2.5	(1.3 ± 0.7)	0.8- 1.6	(1.1 ± 0.5)
Span	12.6-13.4	(12.9 ± 0.4)	8.0-10.0	(9.0 ± 0.7)	5.0-10.0	(6.3 ± 1.3)	4.8- 5.6	(5.1 ± 0.5)
Width of border membrane	4	(4.0 ± 0.0)	2.0- 3.0	(2.2 ± 0.4)	2.0- 3.0	(2.4 ± 0.5)	1.6	(1.6 ± 0.0)
Location	skin		gills		gills		gills	
Locality	Muñoz, Nueva Ecija		Leganes, Iloilo		Buhi, Camarines Sur		Leganes, Iloilo	

Trichodina velasquezae n. sp. is distinguished by its small size (adhesive disc dia. 22.0-29.0), low number of denticles (19-23), and the appearance of the central area of the adhesive disc, which is unique among members of the genus. A number of other *Trichodina* species have similar size, denticle number and also have adhesive discs with a clear or subdivided central area. These include *T. jadranica* Haider, 1964; *T. partidisci* Haider, 1964; *T. jadranica noblei* Lom, 1970; *T. micromaculata* Shtein, 1975; *T. tenuiformis* Shtein, 1979; *T. elegans* Shtein, 1979; *T. cotticomephori* Shtein, 1979; and *T. elegini* sensu Shtein, 1979. *Trichodina jadranica; T. micromaculata;* and *T. elegini* sensu Shtein, 1979 differ from our species in possessing adhesive discs with typically clear and not subdivided central areas (see Shtein 1979b, 1984; Arthur and Lom 1984a). *Trichodina partidisci* has a clear central area of the adhesive disc, divided in most cases into two areas of unequal size. The shape of its denticles also differs from those of *T. velasquezae* n. sp., the blades being more spatulate and possessing a broadly rounded tip. *Trichodina jadranica noblei, T. elegans, T. cotticomephori,* and *T. tenuiformis* also possess adhesive discs whose central areas may be subdivided (see Lom 1970; Shtein 1979a, 1979b), but these subdivisions differ in appearance and extent with that of our material. They also show different denticle shapes from *T. velasquezae* n. sp. The denticles of *T. tenuiformis* and *T. elegans* have much less robust thorns; those of *T. jadranica noblei* have blades which are straighter and more spatulate and thorns which are shorter and less robust; the blades of the denticles of *T. cotticomephori* are more falciform. A number of other species have adhesive discs which are either clear or subdivided (e.g., *T. domerguei* Wallengren, 1897; *T. tenuidens* Fauré-Fremiet, 1943; *T. baicaliensis* Dogiel, 1957; *T. reticulata* Hirschmann and Partsch, 1955; *T. acuta* Lom, 1970; and *T. puytoraci* Lom, 1962). *Trichodina velasquezae* n. sp. is readily distinguished from them by its much smaller body size, denticle number and shape, and the central area of its adhesive disc. A few other species of *Trichodina* have similar small size and denticle number (e.g., *T. modesta* Lom, 1970; *T. cubanensis* Arthur and Lom, 1984; *T. hoffmani* Wellborn, 1967; *T. ovonucleata* Raabe, 1958; and *T. caspialosae* sensu Lom, 1970) but are easily distinguished from our material by the uniformly dark central areas of their adhesive discs.

Trichodina velasquezae is named for Philippine parasitologist Dr. Carmen C. Velasquez.

Trichodina centrostrigata Basson, Van As, and Paperna, 1983

Fig. 7. *T. centrostrigata*. (Scale bar = 30 μm).

Location: gills and skin

Localities: BFAR-NFFH, Muñoz, Nueva Ecija
Sampaloc Lake, San Pablo City, Laguna
Calarian Lake, Zamboanga City, Zamboanga del Sur

Comments: Trichodina centrostrigata is a common freshwater parasite of cultured and wild Nile tilapia from the above localities.

This species was originally described by Basson et al. (1983) from *Pseudocrenilabrus philander, O. mossambicus, Tilapia rendalli, T. sparrmani* and *Cyprinus carpio* from South Africa and has since been reported from *O. mossambicus* from Taiwan (Van As and Basson 1986) and from *O. niloticus* from Egypt (El-Tantawy and Kazubski 1986) and the Philippines (Natividad et al. 1986).

Our specimens from *O. niloticus* agree well with the descriptions of Basson et al. (1983), Van As and Basson (1986) and El-Tantawy and Kazubski (1986), differing only in the extent of the adoral ciliary spiral (360° in our specimens *vs.* 410-455° in other descriptions), and in the number of clear "bars" in the center of the adhesive disc (12-22 in our material *vs.* 12-16 in that of previous authors).

The clear "bars" in the center of the adhesive disc have been termed "centre ridges" by Basson et al. (1983). However, these are internal structures which are probably remnants of the denticles of the preceding generation which have not been reabsorbed.

Trichodina centrostrigata appears to be highly specific to cichlid fishes, the only report of this species from noncichlids being that of Basson et al. (1983) from common carp.

Tricodina acuta Lom, 1970

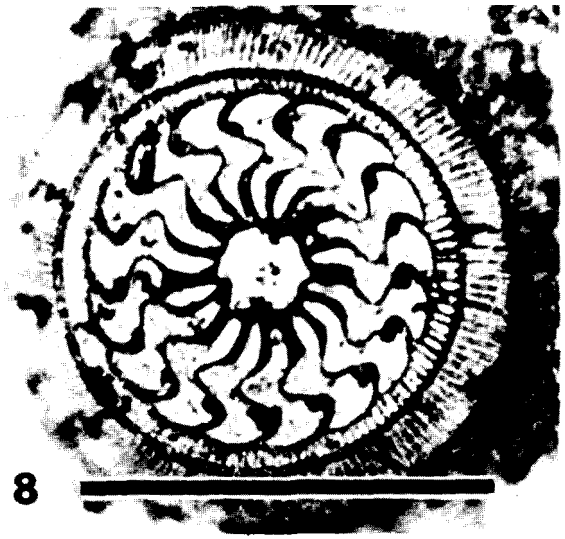


Fig. 8. *T. acuta*. (Scale bar = 30 μm).

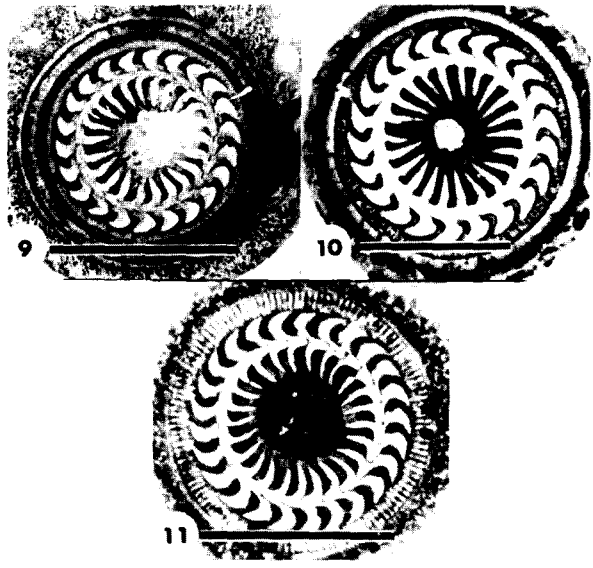
Location: skin

Localities: BFAR-NFFH, Muñoz, Nueva Ecija
Sampaloc Lake, San Pablo City, Laguna

Comments: This species, originally described under the name *T. domerguei* form *acuta* by Lom (1961) and established as distinct species by Lom (1970), has been reported widely from many species of freshwater fishes of North America, the USSR, Eastern Europe, and the Far East (see Shtein 1984). Basson et al. (1983) reported this ciliate from the cichlids *P. philander, T. rendalli* and *T. sparrmani* from South Africa and *T. aurea* from Israel. Previous reports from the Philippines are those of Duncan (1977) on *T. zillii* and *O. mossambicus* and Natividad et al. (1986) for *O. niloticus,* both from Muñoz, Nueva Ecija.

Measurements and the shape of the denticles of our specimens of *T. acuta* (see Table 1) correspond well to those given by Lom (1961). (Compare our measurements with those given in Table 1 of Lom, and our Fig. 8 with Lom's Fig. 9.) Dimensions given by Lom (1961), particularly for his population of *T. acuta* from *Gobio gobio* are somewhat larger than those reported from cichlid fishes. (Compare the measurements given in Table 11 of Lom with our material and with that of Duncan (1977) and Basson et al. (1983)). However, we consider the above as various populations of a single species.

Trichodina heterodentata Duncan, 1977



Figs. 9-11. *T. heterodentata* (from Muñoz, Nueva Ecija). (All scale bars = 30 μm).

Synonym: *Trichodina equatoralis* Kazubski, 1986

Location: gills, rarely skin

Localities: BFAR-NFFH, Muñoz, Nueva Ecija
Sampaloc Lake, San Pablo City, Laguna
Iwahig Penal Colony, Puerto Princesa, Palawan
Calarian Lake, Zamboanga City, Zamboanga del Sur
Lake Buhi, Camarines Sur

Comments: This species was originally described by Duncan (1977) in three separate populations, all from Muñoz, Nueva Ecija, the Philippines. Population "A" was reported from the skin of *O. mossambicus;* population "B" on the gills and skin of *O. mossambicus* and *T. zillii,* and population "C" on the skin of three-spot gourami *(Trichogaster trichopterus).* This species has been subsequently reported from various cichlid and cyprinid fishes from South Africa and Israel by Basson et al. (1983), from *O. mossambicus* from Taiwan by Van As and Basson (1986) and from *O. niloticus* from the Philippines by Natividad et al. (1986).

The appearance of the silver impregnated adhesive disc of *Trichodina heterodentata* is highly variable. In our specimens collected from Nile tilapia from a single locality (Muñoz) we have observed individuals whose adhesive discs correspond to Duncan's populations "A", "B", and "C" occurring in mixed infection on the same host specimen (see Figs. 9-11). Body dimensions for all three of these morphological variations in our material are considerably less than those given by Duncan (1977) for their corresponding "populations" (see Table 1).

Recently, Kazubski (1986) proposed that *T. heterodentata* of Basson, Van As and Paperna, 1983 represented a distinct taxon, *T. equatorialis* Kazubski, 1986 which he recorded from *Tilapia* sp. from Lake Victoria, Kenya. The description and photomicrographs of this species as presented by Basson et al. (1983) appear to fall well within the variability of *T. heterodentata* as described by Duncan (1977) and as encountered by us. Therefore, we can see no justification for recognizing the African populations as a distinct species.

The very high variability in the character of the adhesive disc of *T. heterodentata* is unusual for members of this genus, making the relationship of this species to other trichodinids possessing a darkly staining central area of the adhesive disc, moderate denticle number, and denticles with falciform blades, as in *T. hypsilepis* Wellborn, 1967, unclear. A detailed study of experimental infections is required to obtain conclusive evidence for the identity of *T. heterodentata* and to determine the possibility that more than one species may be masquerading under this name.

Trichodina siluri Lom, 1970

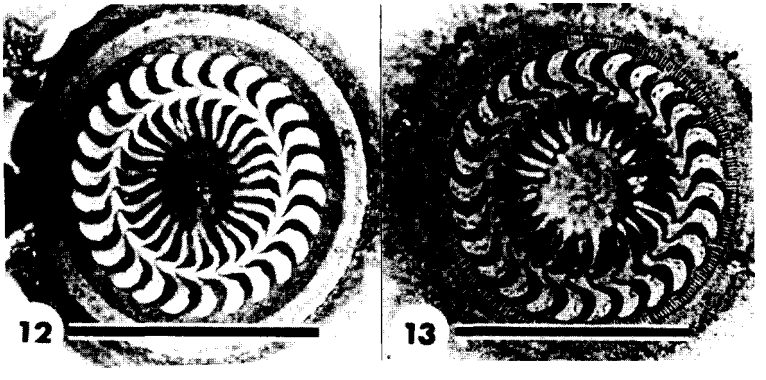


Fig. 12. *T. siluri* (from Muñoz, Nueva Ecija). Fig. 13. *T. siluri,* different specimen. (Scale bars = 30 µm).

Location: skin

Locality: BFAR-NFFH, Muñoz, Nueva Ecija

Comments: A few specimens of *T. siluri* were found in mixed infection with *T. heterodentata* on cultured Nile tilapia from Muñoz, Nueva Ecija.

Trichodina siluri was described (as *T. nigra siluri*) from the gills of *Silurus glanis* from Hungary and Czechoslovakia by Lom (1970). Our Philippine material agrees with the original description but with some minor differences, viz. smaller length of denticle (5.9-6.3 *vs.* 8-9) and length of thorn (5.5-6.3 *vs.* 6.5) in our material, and higher number of radial pins (10-11 *vs.* 7-9). Also, the anterior margin of the denticle blade in our specimens is perhaps slightly more rounded than that of the specimens illustrated by Lom (1970). Because of the above differences and those of host species and geographical locality, we tentatively assign our material to *T. siluri.*

Trichodina sp.

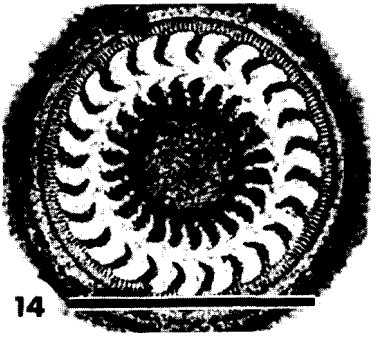


Fig. 14. *Trichodina* sp. (Scale bar = 30 μm).

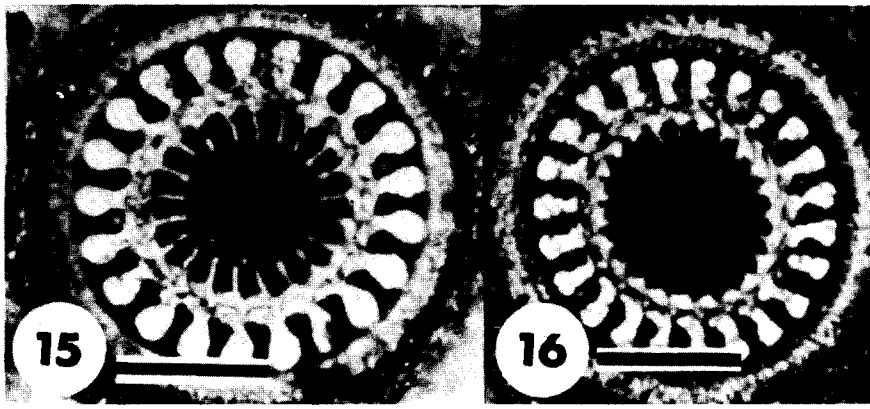
Location: gills

Locality: UPV-BAC, Leganes, Iloilo

Description: *Trichodina* sp. is a small trichodinid (see Table 1) with a uniformly dark central area of the adhesive disc and a relatively low denticle number (22-24 denticles). The blade of the denticle is short and spatulate, while the thorn is short, straight and robust.

Comments: Due to the low number of specimens observed and difficulty in obtaining well impregnated material for photomicrography, specific designation is not possible.

Tripartiella clavodonta Basson and Van As, 1987



Figs. 15-16. *Tripartiella clavodonta,* Fig. 16 is poorly impregnated specimen. (Scale bars = 30 μm).

Synonym: *Tripartiella spatula* Van As and Basson, 1986

Location: gills

Localities: Lake Buhi, Buhi, Camarines Sur
UPV-BAC, Leganes, Iloilo

Comments: *Tripartiella clavodonta* was originally described from the gills of *O. mossambicus, P. philander* and *Neobola brevianalis* from South Africa by Basson and Van As (1987). Our material from *O. niloticus* agrees with the description of these authors. This is only the second report of *T. clavodonta.*

Tripartiella clavodonta is very similar to a second species, *T. spatula* Van As and Basson, 1986, also described from the gills of *O. mossambicus* which were examined in Taiwan. It appears to differ only in minute differences in the shape of the denticle, the blades of those of *T. clavodonta* being more rounded, and the extent of the adoral ciliary spiral, which is somewhat shorter (125-170° *vs.* 185-190 in *T. spatula*). Specimens from our material of *T. clavodonta* which are impregnated poorly (see Fig. 16) appear almost identical to the photomicrograph of *T. spatula* given in Fig. 1D of Van As and Basson (1986).

Tripartiella tilapiae (Duncan, 1977) n. comb.

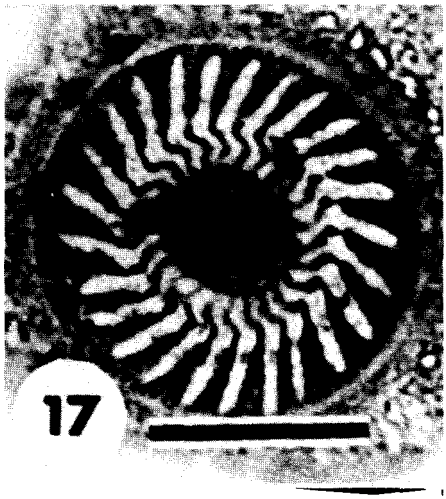


Fig. 17. *T. tilapiae*. (Scale bar = [illegible]).

Synonyms: *Trichodinella tilapiae* Duncan, 1977
Tripartiella lechridens Basson and Van As, 1987
T. macrosoma Basson and Van As, 1987
Tripartiella bulbosa auctorum (nec *Trichodina bulbosa* Davis, 1947)
Trichodina oviformis (sic) of Anon., 1973 (nec *T. ovaliformis* Chen, 1955)
Trichodina leucisci of Shtein, 1968 (nec *Cyclochaeta leucisci* Suzuki, 1950)

Location: gills

Locality: UPV-BAC, Leganes, Iloilo

Comments: Our specimens closely resemble silver impregnated material described under the names *Tripartiella bulbosa* by Ivanova (1966), Kashkovsky (1974), Golemansky and Grupcheva (1975), and Shtein (1984); *Trichodina oviformis* by Anon. (1973); and *Tripartiella leucisci* by Shtein (1968). Lom and Haldar (1977) considered *T. ovaliformis* Chen, 1955 a synonym of *T. bulbosa* (Davis, 1947) and thought *T. leucisci* (Suzuki, 1950) a probable synonym of this species, while Shtein (1984) listed these names, as well as *Trichodinella tilapiae* Duncan, 1977 as synonyms of *T. bulbosa*.

Tripartiella bulbosa was described by Davis (1947) from the gills of the cyprinid fish *Margariscus margarita* from West Virginia, USA. Unfortunately, the description of Davis pre-dates the use of silver nitrate impregnation technique. In an attempt to clarify the relationship of our Philippine material with *T. bulbosa,* we have examined material from the collection of the late H.S. Davis deposited in the United States National Museum Helminthological Collection by Dr. Glen Hoffman upon which the original description of *T. bulbosa* was based. However, our examination of these hematoxylin stained specimens did not provide additional insight on the morphology of this species. Until an adequate description is published based on silver impregnated specimens collected from the original host and locality, we consider *T. bulbosa* as an unrecognizable *nomen dubium.* Similarly, in our opinion the descriptions of *Cyclochaeta leucisci* Suzuki, 1950 and *T. ovaliformis* Chen, 1955 (see Suzuki 1950; Chen 1955), both of which are similarly based on hematoxylin stained preparations, are inadequate to permit positive re-identification and these names should also be considered *nomina dubia.*

The conspecificity of the original North American material of Davis upon which description of *T. bulbosa* was based and subsequent material reported under this name, as well as under the names *T. ovaliformis, T. leucisci,* and *Trichodinella tilapiae* from Asia (see Pai 1950; Suzuki 1950; Chen 1955, 1956a, 1956b; Anon. 1973; Duncan 1977); the Soviet Union (see Ivanova 1966; Shtein 1968, 1984; Kashkovsky 1974) and Europe (see Golemansky and Grupcheva 1975; Lom and Haldar 1977; Migala 1978) is questionable.

We identify our material as *T. tilapiae,* as this taxon is the oldest for which confident reidentification is possible. Duncan (1977) described this species under the name *Trichodinella tilapiae* from the gills of Zill's tilapia *(Tilapia zillii)* from Muñoz, Nueva Ecija, the Philippines. The morphology of the adhesive disc and measurements for our specimens from *O. niloticus* agree well with that presented by Duncan. In our specimens, the appearance of the blade of the denticle differs somewhat from that of Duncan's specimens in having sides which are more or less parallel or tapering slightly from the base to the tip, whereas those described by Duncan increase in size from base to tip. Duncan's specimens also possess slightly larger body size (30-45 *vs.* 18.4-23-2 μm in our material), and thorn length (2.5 *vs.* 0.8 in our specimens), and slightly lower denticle number (22-25 *vs.* 26-28 in our specimens).

Basson and Van As (1987) recently described two closely related species from South Africa, *Tripartiella lechridens* Basson and Van As, 1987 from the gills of seven species of freshwater fishes, among them *Oreochromis mossambicus,* and *T. macrosoma* Basson and Van As, 1987 from the gills of *Barbis eutaenia.* The dimensions of these two species and the shapes of their denticles fall within the variation displayed by *T. tilapiae* and we consider them junior synonyms.

Discussion

The trichodinid fauna of Nile tilapia in the Philippines appears to include a number of species which are part of the native parasite fauna of African cichlids which have been introduced into new areas along with their hosts, and a number of species of probable Asian origin which have adapted to tilapia from native Philippine fishes. Among the former are *Trichodina centrostrigata, Tripartiella clavodonta,* and possibly *T. heterodentata,* which have all been described from African cichlids, while the latter includes the brackishwater species *T. velasquezae* and *Trichodina* sp. and possibly the freshwater species *T. siluri.* The other two species encountered, *T. acuta* and *Tripartiella tilapiae,* are widely distributed species which probably occur naturally in both Africa and Southeast Asia.

Although trichodinids are common and often abundant parasites of Nile tilapia, they do not appear to cause problems in the culture of this hardy species.

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