International Journal of Zoological Research

ISSN 1811-9778

Academic Journals Inc.

www.academicjournals.com

International Journal of Zoological Research 2 (4): 369-375, 2006
ISSN 1811-9778

First Record of *Trichodina compacta* Van As and Basson, 1989 (Protozoa: Ciliophora) from Cultured Nile Tilapia in the State of Santa Catarina, Brazil

[1]Luciana Ghiraldelli, [1]Maurício Laterça Martins,
[2]Washington de Barros Adamante and [1]Marcela Maia Yamashita
[1]Laboratory of Diagnosis and Pathology in Aquaculture,
[2]Laboratory of Biology and Culture of Freshwater Fishes,
Department Aquaculture, UFSC, Florianópolis, SC, Brazil

Abstract: Trichodinids are important freshwater fish parasites in Brasil, but nothing is known about the species. This study describes *Trichodina compacta* Van As and Basson (1989) (Protozoa: Ciliophora: Peritrichia) from Nile tilapia (*Oreochromis niloticus*) cultured in fish ponds situated in three regions of Santa Catarina State, Brazil from October 2004 through June 2005. Wet smears of the skin and gills prepared in the field were air dried and impregnated with Klein's dry silver impregnation method and Giemsa's solution. From a total of 146 examined fish, 36 were parasitized on the skin, 14 in the gills and 33 on the skin and gills. The mean diameter of the body of this ciliate was 50.8+8.0 µm, adhesive disc 32.8+4.7 µm, denticulate ring 21.9+3.1 µm provided by 17 (15 to 19) denticles with central circle 8.5+1.1 µm in diameter. It differs from the original description of *T. compacta* in having shorter central area of adesive disc, smaller diameter of adhesive disc and number of denticles, but greater length of denticle and ray. In spite of these differences, the denticles morphology and its position in relation to y and y+1 axes from the original description this is not sufficient to create a new species. *Trichodina truncata* Ghiraldelli 2005 is therefore another population and synonym of *T. compacta.*

Key words: *Oreochromis niloticus*, trichodinid, *Trichodina compacta*, Brazil

Introduction

According to Özer and Öztürk (2004) more than 112 species of trichodinids were described from the freshwater fishes. This ciliated protozoan has been considered the main primary agent that causes disease in cultured tilapia and eels respectively in Brazil and Denmark (Vargas *et al*., 2000; Madsen *et al*., 2000; Martins *et al*., 2002). This cosmopolitan parasite of the genus *Trichodina* Ehrenberg, 1830 have been described in Prague (Lom, 1970), North America (Wellborn, 1967), Cuba and Russia (Arthur and Lom, 1984a, b), South Africa (Basson and Van As, 1991), Japan (Imai *et al*., 1991), India (Asmat and Haldar, 1998), Turkey (Özer and Erdem, 1998), Egypt (Al-Rasheid *et al*., 2000), China and Korea (Xu *et al*., 2001). In pond-reared fishes they have been found in *Clarias gariepinus* (Basson and Van As, 1991), in *Perca fluviatilis* and *Rutilus rutilus* (Halmetoja *et al*., 1992), in *Tilapia rendalli rendalli*, *Oreochromis andersoni*, *Tilapia sparrmanii* (Van As and Basson, 1992), in *Aristichthys nobilis* (Nikolic and Simonovic, 1998; Özer and Erdem, 1998), in *Anguilla anguilla* (Madsen *et al*., 2000) and in marine cultivated fishes, *Lateolabrax japonicus*, *Agrammus agrammus*, *Acantopagrus macrocephalus*, *Paralichthys olivaceus*, *Kareius bicoloratus*, *Sebastes schlegeli* (Xu *et al*., 2001).

Corresponding Author: Maurício Laterça Martins, Departamento de Aqüicultura, CCA, Universidade Federal de Santa Catarina, C P 476, 88040-900, Florianópolis, SC, Brazil Tel: 55-48-3331 9923 Fax: 55-48-3331 5473

In tilapia, *Trichodina pediculus* Ehrenberg, 1838 (Basson *et al*., 1983); *T. nigra* Lom, 1960; *T. acuta* Lom, 1961; *T. heterodentata* Duncan, 1977; *Trichodinella tilapiae* Duncan, 1977; *T. centrostrigeata* Basson, Van As and Paperna, 1983; *T. minuta* Basson *et al*., 1983; *Paratrichodina africana* Kazubski and El-Tantawy, 1986; *Trichodina magna* Van As and Basson, 1989; *T. velasquezae* Bondad-Reantaso and Arthur, 1989; *T. compacta* Van As and Basson, 1989; *T. migala* Van As and Basson, 1989; *T. linyanta* Van As and Basson, 1992; *T. kalimbeza* Van As and Basson, 1992 and *T. canton* Basson and Van As, 1994 were described. In Brazil, Vargas *et al*. (2000), Tavares-Dias *et al*. (2001) and Azevedo *et al*. (2006) reported its presence in cultured tilapia and Ranzani-Paiva and Silva-Souza (2004) in mullet. This study describes *T. compacta* found on the skin and gills of cultured tilapia collected in three regions in the State of Santa Catarina, Brazil.

Materials and Methods

The fish utilized in this experiment were collected in farms situated in the cities of Blumenau (26°55'10''S, 49°03'58''W) (n = 48), Joinville (26°18'16''S, 48°50'44''W) (n = 63) and Ituporanga (27°24'52''S, 49°36'09''W) (n = 35), Santa Catarina, Brazil for a period of October 2004 to June 2005. Wet smears of the skin and gills were prepared in the field and examined under microscope. When parasites were present the smears were air dried and impregnated with Klein's dry silver impregnation method for adhesive disc observation as suggested by Lom (1958). Other smears were stained with Giemsa's solution to reveal the nuclear apparatus. The span of denticle is measured from the tip of blade to the tip of ray (Arthur and Lom, 1984b). The body diameter is the dimension of adhesive disc plus border membrane and the striated membrane is the distance from the outer border of the adhesive disc to denticulate ring. Wet mounts from the specimens preserved in 5% formalin solution were studied for the observation of adoral ciliature. All measurements are in micrometers and followed the recommendations of Lom (1958), Van As and Basson (1989). Arithmetic means±standard deviation followed by minimum and maximum values and the number of specimens and structures measured are in parentheses. To compare the measurements of our material with those until then described the t-test was applied.

Results

Trichodina compacta Van As and Basson, 1989
Synonyms: *Trichodina truncata* Ghiraldelli, 2005
Host: *Oreochromis niloticus* Linnaeus, 1758
New localities: Cities of Blumenau, Joinville and Ituporanga, SC, Brazil

From a total of 146 examined fish, 36 were parasitized by trichodinids on the skin, 14 in the gills and 33 on the skin and gills. Characterized as a small trichodinid with disc-shaped body 50.8±8.0 (31-71, 54) in diameter; convex adoral surface with ciliature of about 373°±6.4 (370-384) measured in 10 fresh-mounted specimens; contractile vacuole central. Its body is surrounded by thin border membrane 5.6±2.2 (2-8, 34) wide; width of striated membrane 6.8±1.9 (2-14, 43). Aboral side with adhesive disc concave 32.8±4.7 (19-40, 54) in diameter. Central area of the adhesive disc well defined and clear, delimited by a central circle 8.5±1.1 (6-10, 23) in diameter containing darker spots, in which the edges of rays of denticles are frequently supported. Denticulate ring diameter 21.9±3.1 (16-32, 51) provided by 17±0.9 (15-19, 54) denticles (Fig. 1).

The denticles are characterized by blade truncate not completely filling the sector between y and y+1 axes, with an apophysis in the anterior margin. Central part long and sharp-pointed in Giemsa-stained specimens, but shorter, robust and tip bluntly in silver-impregnated specimens not passing the half way between y and y+1 axes (Fig. 2). The connection of the central part of denticle is little

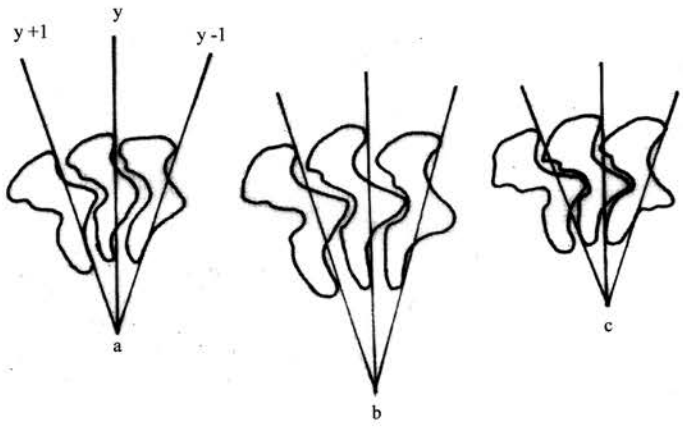

Fig. 1: Diagrammatic representation of the denticles of *Trichodina compacta* from *Oreochromis niloticus* cultured in the State of Santa Catarina, Brazil (a), Israel (b) and South Africa (c) redrawn from Van As and Basson (1989)

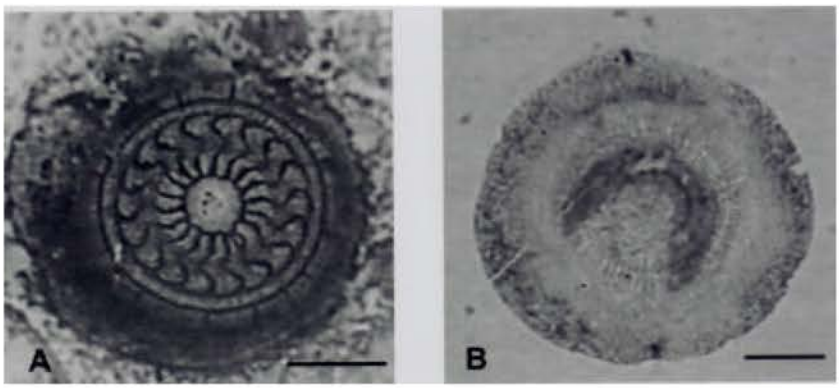

Fig. 2: Photomicrographs of *Trichodina compacta* Van As and Basson, 1989 from *Oreochromis niloticus* cultured in the State of Santa Catarina. Silver impregnated (A) and stained by Giemsa (B) specimens. Scale-bars = 20 μm

distinguishable from blade or ray. Ray short and stout anteriorly directed but do not pass y+1 axes, slightly curved, point of ray rounded. The anterior apophysis of the prominent ray was clearly visible only in Giemsa stained specimens while apophysis of blade is easily visible in silver-impregnated ones. Radial pins per denticle 7.0±0.7 (6-8, 42); length of denticles 9.8±2.5 (6-19, 67), length of blade 3.5±1.2 (1-6, 67), width of central part 1.9±0.9 (1-3, 67), length of ray 5.9±0.9 (3-7, 67), length of ray apophysis 0.9±0.3 (0.6-1.3, 12); denticle span 13.7±2.5 (9-19, 67). Macronucleus horseshoe-shaped 30.0±2.9 (25-38, 21) in diameter, 7.0±1.1 (6-9, 21) thickness, length between the terminations of macronucleus 10.7±2.4 (7-16, 21). Micronucleus not detected. The specimens are in the collection of author.

Discussion

This research studied again *Trichodina truncata* Ghiraldelli, 2005 especially on its denticle morphology and position in relation to y and y+1 axes. The original description showed the following

characteristics in comparison to other species. The material collected at three different localities in the State of Santa Catarina was similar to *T. nigra luciopercae* Lom, 1970; to *T. heterodentata*; to *T. compacta* and to *T. acuta* Lom, 1961 (Duncan, 1977; Imai *et al*., 1991) in its diameter of body and denticulate ring. From *T. nigra luciopercae*, *T. heterodentata* and *T. acuta* our specimens showed smaller number of denticles. From *T. canton* differs in having shorter adhesive disc diameter, denticulate ring, denticle dimensions, low number of denticles and by absence of central circle. The number of denticles is an important differential diagnosis and was similar to *T. microspina* Van As and Basson, 1992; *T. kalimbeza* and *T. minuta*, but did differ in the morphology of denticles and other measurements. According to Van As and Basson (1989) the number of denticles may present a slight variation between the species and is also related to the evolution of the parasites in its life cycle. During the binary fission trichodinids show reduced to half the number of denticles, but present the formation of peripheral new denticulate ring. This fact was not observed in our material concluding that the specimens were in its advanced stage of development. Present material showed the largest measurements and different morphology of denticle when compared to *T. giurusi* Mitra and Haldar, 2005 and *T. molae* Mitra and Haldar, 2005 from freshwater Indian fishes. In spite of the similar measurements of the body, denticulate ring and ray of *T. notopteridae* Mitra and Haldar, 2004 the present description showed different number of denticles and blade morphology, as well as the fish host and locality.

There was a very similar measurements of the denticles blade length when compared to *T. jadranica* Haider, 1964 (Arthur and Lom, 1984a), *T. microspina*, *T. minuta* and *T. compacta*; and in denticle length compared to *T. domerguei* (Lom, 1960). Apophysis in the anterior margin near base of blade was also observed in *T. heterodentata*, *T. acuta* and *T. compacta*. The most similar specimen was *T. compacta* originally described by Vans As and Basson (1989) in *Oreochromis andersoni*, *O. mossambicus*, *Tilapia rendalli rendalli*, *T. rendalli swerstrae*, *T. sparrmanii* in South Africa; *O. aureus* and the hybrid *O. aureus* × *O. niloticus* in Israel. Present material showed similar dimensions of body diameter, border membrane width, denticulate ring diameter and blade length (Table 1). On the other hand, it differs from *T. compacta* in having smaller adhesive disc diameter; smaller number of denticles and pins per denticle, but larger denticle length and ray. Important characteristic was the fact that the central circle into denticulate ring was smaller than in *T. compacta*. Present specimens showed blade truncate not completely filling the sector between y and y+1

Table 1: Comparative measurements of *Trichodina compacta* from Santa Catarina, Brazil and the descriptions of Van As and Basson (1989) from South Africa (a) and Israel (b)

Characters	Present study	*T. compacta*[a]	*T. compacta*[b]
Body diameter	50.8 (31-71)a	45.0 (37.9-55.5)a	48.8 (43.0-55.5)a
Adhesive disc diameter	32.8 (19-40)a	38.1 (30.9-48.4)b	40.1 (35.2-46.9)b
Border membrane width	5.6 (2-8)a	3.5 (2.7-4.5)a	4.3 (3.6-5.7)a
Denticulate ring diameter	21.9 (16-32)a	23.2 (18.0-30.1)a	24.8 (20.0-28.9)a
Central circle diameter	8.5 (6-10)a	11.7 (6.5-17.1)b	12.3 (9.0-15.5)b
Denticle number	17.0 (15-19)a	20.0 (18-22)b	20.0 (18-22)b
Radial pins/denticle	7.0 (6-8)a	10.0 (8-11)b	9.0 (8-10)b
Denticle span	13.7 (10-19)a	-	-
Denticle length	9.8 (6-19)a	6.9 (5.5-11.3)b	7.1 (6.3-8.4)b
Blade length	3.5 (1-6)a	3.8 (2.8-4.5)a	3.6 (3.0-4.3)a
Central part width	1.9 (1-3)a	2.7 (1.9-3.8)b	2.6 (2.1-3.6)b
Ray length	5.9 (3-7)a	3.2 (2.2-4.1)b	4.6 (3.5-5.4)b
Macronucleus diameter	30.0 (25-38)a	35.8 (24.0-49.4)b	39.5 (32.5-43.3)b
Macronucleus thickness	7.0 (6-10)a	6.4 (3.3-10.1)a	5.4 (3.9-6.9)a
Macronucleus[LT]	10.7 (7-16)	15.7 (5.4-33.1)a	11.9 (7.1-26.0)a
Adoral ciliature	373.0° (370-384)	More than 360.0°	360-410°

[LT]Distance between terminations of macronucleus. Different letters indicate significant difference between the specimens Values in parenthesis shows variation amplitude

while *T. compacta* from Israel the blade is broad filling that sector and in specimens from South Africa the blade passes the y+1 axis (Fig. 1). The central part of denticle in *T. compacta* described by Van As and Basson (1989) is slightly sharp pointed while our material is robust. In the original description of *T. compacta* the posterior tip of central part extends to halfway to y-1 axis such as in the present specimens. In spite of the shortest denticulate ring, adhesive disc, slightly lower number of denticles, largest measurements of denticle length and ray and a very similar denticle shape (Fig. 1) when compared to the original description of *T. compacta*, we suggest that the present material it does not a new species. The considerable variation within the population of trichodinids on cultured tilapia was discussed by Van As and Basson (1989) and can be well adapted to the present description.

Although the number of denticles was different the specimens belongs to another population of *T. compacta* in Brazil based on its denticle morphology. This study re-evaluate previously described *T. truncata* by Ghiraldelli (2005) in tilapia based on denticle morphology and its position in relation to y and y+1 axes. *Trichodina truncata* fall within the characteristics of *T. compacta*, being a new record in the Brazilian cultured tilapia. The authors emphasize the importance of the Brazilian trichodinid identification as being an opportunistic and sometimes pathogenic parasite. In spite of a great number of trichodinid species over the World this work present significant contribution to the knowledge of the Brazilian trichodinid species.

Acknowledgments

To CAPES and CNPq for granting a Master Science and Research scholarship, respectively to the first, second and third authors. To Roberto Hoppe (Fundação 25 de Julho), Sérgio Tamassia (Epagri), Pesque-pague Erimar, Pesque-pague Fernandão, Pesque-pague Divisa, Nilotica Aquacultura, Amilton Luiz, Aurima Knaul, Jair Curti Vegge, João Carlos Desordi, Valério Burini for fish donation. To Gastão Reis and Heloisa Laterça for correction of the manuscript translation.

References

Al-Rasheid, K.A.S., M.A. Ali, T. Sakran, A.A.A. Baki and F.A.A. Ghaffar, 2000. Trichodinid ectoparasites (Ciliophora: Peritrichida) of some River Nile fish, Egypt. Parasitol. Intl., 49: 131-137.

Arthur, J.R. and J. Lom, 1984a. Some trichodinid ciliates (Protozoa: Peritrichida) from Cuban fishes, with a description of *Trichodina cubanensis* n.sp. from the skin of *Cichlasoma tetracantha*. Trans. Am. Microsc. Soc., 103: 172-184.

Arthur, J.R. and J. Lom, 1984b. *Trichodinid protozoa* (Ciliophora: Peritrichida) from freshwater fishes of Rybinsk Reservoir, USSR. J. Protozool., 31: 82-91.

Asmat, G.S.M. and D.P. Haldar, 1998. *Trichodina mystusi*, a new species of Trichodinid ciliophoran from Indian estuarine fish, *Mystus gulio* (Hamilton). Acta Protozool., 37: 173-177.

Azevedo, T.M.P., M.L. Martins, F.R. Bozzo and F.R. Moraes, 2006. Haematological and gill responses in parasitized tilapia from Valley of Tijucas River, SC, Brazil. Sci. Agric., 63: 115-120.

Basson, L., J.G. Van As and I. Paperna, 1983. Trichodinid ectoparasites of cichlid and cyprinid fishes in South Africa and Israel. Syst. Parasitol., 5: 245-257.

Basson, L. and J.G. Van As, 1991. Trichodinids (Ciliophora: Peritrichia) from a calanoid copepod and catfish from South Africa with notes on host specificity. Syst. Parasitol., 18: 147-158.

Basson, L. and J.G. Van As, 1994. Trichodinid ectoparasites (Ciliophora: Peritrichida) of wild and cultured freshwater fishes in Taiwan, with notes on their origin. Syst. Parasitol., 28: 197-222.

Bondad-Reantaso, M.G. and J.R. Arthur, 1989. Trichodinids (Protozoa: Ciliophora: Peritrichida) of Nile tilapia (*Oreochromis niloticus*) in the Phillipines. Asian Fish. Sci., 3: 27-44.

Duncan, B.L., 1977. Urceolariid ciliates, including three new species, from cultured Phillipine fishes. Trans. Am. Microsc. Soc., 96: 76-81.

Ghiraldelli, L., 2005. Parasitology and haematology of cultivated fishes in three regions of the State of Santa Catarina, Master in Aquaculture, Department of Aquaculture, Federal University of Santa Catarina, Florianópolis, pp: 82.

Halmetoja, A., E.T. Valtonen and J. Taskinen, 1992. Trichodinids (Protozoa) on fish from central finnish lakes of differing water quality. Aqua Fenica, 22: 59-70.

Imai, S., H. Miyazaki and K. Nomura, 1991. Trichodinid species from the gill of cultured Japanese eel, *Anguilla japonica*, with the description of a new species based on light and scanning electron microscopy. Eur. J. Protistol., 27: 79-84.

Kazubski, S.L. and S.A. El-Tantawy, 1986. The ciliate *Paratrichodina africana* sp. n. (Peritricha, Trichodinidae) from tilapia fish (Cichlidae) from Africa. Acta Protozool., 25: 433-438.

Lom, J., 1958. A contribution to the systematics and morphology of endoparasitic trichodinids from amphibians, with a proposal of nniform specific characteristics. J. Protozool., 5: 251-263.

Lom, J., 1960. *Trichodina reticulata* Hirschmann and Partsch 1955 from crucian carp and *T. domerguei* f. *latispina* Dogel 1940 from *Diaptomus*. Vest. Cesk. Zool. Spolec., 24: 246-257.

Lom, J., 1970. Observations on trichodinid ciliates from freshwater fishes. Archiv für Protistenk., 112: 158-177.

Madsen, H.C.K., K. Buchmann and S. Mellergaard, 2000. *Trichodina* sp. (Ciliophora: Peritrichida) in eel *Anguilla anguilla* in recirculation systems in Denmark: Host-parasite relations. Dis. Aquat. Org., 42: 149-152.

Martins, M.L., E.M. Onaka, F.R. Moraes, F.R. Bozzo, A.M.F.C. Paiva and A. Gonçalves, 2002. Recent studies on parasitic infections of freshwater cultivated fish in the State of São Paulo, Brazil. Acta Scientiarum, 24: 981-985.

Mitra, A.K. and D.P. Haldar, 2004. First record of *Trichodinella epizootica* (Raabe, 1950) Sramek-Husek, 1953, with description of *Trichodina notopteridae* sp. n. (Ciliophora: Peritrichida) from freshwater fishes of India. Acta Protozool., 43: 269-274.

Mitra, A.K. and D.P. Haldar, 2005. Descriptions of two new species of the genus *Trichodina* Ehrenberg, 1838 (Protozoa: Ciliophora: Peritrichida) from Indian freshwater fishes. Acta Protozool., 44: 159-165.

Nikolic, V.P. and P.D. Simonovic, 1998. Seasonal dynamics of carp infestation by *Trichodina nobilis* Chen. 1963 (Peritrichida, Ciliata) in two fish-ponds in Banat. Tiscia, 31: 59-61.

Özer, A. and O. Erdem, 1998. Ectoparasitic protozoa of the common carp (*Cyprinus carpio* L., 1758) caught in the Sinop region, of Turkey. J. Natl. Hist., 32: 441-454.

Özer, A. and T. Öztürk, 2004. *Trichodina puytoraci* Lom, 1962 and *Trichodina lepsii* Lom, 1962 (Peritrichida: Ciliophora) infestations on Mugilids caught at the Black Sea Coast of Sinop in Turkey. Turk. J. Zool., 28: 179-182.

Ranzani-Paiva, M.J.T. and A.T. Silva-Souza, 2004. Co-infestation of gills by different parasite groups in the mullet, *Mugil platanus* Günther, 1880 (Osteichthyes, Mugilidae): Effects on relative condition factor. Braz. J. Biol., 64: 677-682.

Tavares-Dias, M., M.L. Martins and F.R. Moraes, 2001. Parasitic fauna of cultivated fishes in feefishing farm of Franca, São Paulo, Brazil. I. Protozoans. Rev. Bras. Zool., 18: 67-79.

Van As, J.G. and L. Basson, 1989. A further contribution to the taxonomy of the Trichodinidae (Ciliophora: Peritrichia) and a review of the taxonomic status of some fish ectoparasitic trichodinids. Syst. Parasitol., 14: 157-179.

Van As, J.G. and L. Basson, 1992. Trichodinid ectoparasites (Ciliophora: Peritrichida) of freshwater fishes of the Zambesi River System, with a reappraisal of host specificity. Syst. Parasitol., 22: 81-109.

Vargas, L., J.A. Povh, R.P. Ribeiro and H.L.M. Moreira, 2000. Ectoparasite prevalence in Nile tilapia (*Oreochromis niloticus*) of Thailand origin in Maringá, Paraná. Arq. Ci. Vet. Zool. Unipar, 3: 32-37.

Xu, K., W. Song, A. Warren and J.K. Choi, 2001. Trichodinid ectoparasites (Ciliophora: Peritrichida) of some marine fishes from coastal regions of the Yellow Sea and Bohai Sea. Syst. Parasitol., 50: 69-79.

Wellborn, T.L., 1967. *Trichodina* (Ciliata: Urceolariidae) of freshwater fishes of the Southeastern United States. J. Protozool., 14: 399-412.