Observations on Tripartiella bursiformis, Trichodina nigra and a Pathogenic Trichodinid, Trichodina fultoni

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Observations on *Tripartiella bursiformis*, *Trichodina nigra* and a Pathogenic Trichodinid, *Trichodina fultoni*

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ABSTRACT

A series of epizootics caused by *Trichodina fultoni* is reported. Fish kept in running water at 12°c showed severe signs of trichodiniasis. At 12 °C *T. fultoni* lacked strict host specificity, but demonstrated some preference.

A redescription of *Tripartiella bursiformis*, using the silver impregnated techniques, is given. This ciliate is reported from *Acantharchus pomotis*. *Trichodina nigra* is reported from the same host.

The aim of this short communication is to draw attention to the study of trichodinids which occur on North American fish and to the pathogenicity they exert on their hosts. Little is known about these subjects and so we think it useful to publish our observations, although we realize that these problems deserve more extensive studies.

I. PATHOGENICITY OF T. fultoni

Trichodinid protozoa may cause disease in fish kept in hatcheries, aquaria, and sometimes in nature [1 2 3 12]. In most instances the fish culturist or hatchery biologist recognizes it as "*Trichodina*", but does not identify it further. The symptoms include "blue slime", flashing, and debility. The epizootics in aquaria and hatcheries are usually controlled, and the parasite is often eradicated with the proper chemotherapy[3 6].

Davis[2] described a large trichodinid, *Trichodina fultoni*, from fish at what is now the Eastern Fish Disease Laboratory. He believed that *T. pediculus* reported by Mueller[11] and the form described from *Necturus* by Fulton[5] represent the same species. Recently we [10] have found *T. fultoni* on some other fishes (*Lepomis cyanellus, Micropterus salmoides, Rhinichthys atratulus*) which indicates that the parasite is common in the U.S.A. The former are the only specific identifications of this parasite, which is probably more common than the records indicate.

There is the possibility that some species of *Trichodina* may not be pathogenic to fish whereas others are. Hence we believe it highly desirable to identify the species involved. Further, it is probable that some species are very host specific[3], although others, including *T. fultoni*, are not.

T. fultoni caused epizootics at the

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Leetown station prior to 1947[2], and because it has apparently existed at Leetown all this time, we kept a record of its occurrence on the experimental fish at Leetown from 1963 to 1965. Unfortunately, no records were kept of the number of mortalities. Of the 6 trichodinid epizootics observed during this period, *T. fultoni* was the cause, despite the fact that many wild collections of fish had been brought in which could have introduced other species. Identification was made from the living parasite, but was verified from silver impregnated specimens. All observations were made on fish held in 12°C running spring water. Fish, 1 to 2 years old, removed to non-running water at room temperature, did not become diseased.

The following exhibited symptoms of trichodiniasis and were heavily infested with *T. fultoni*:

May 2, 1963 — one collection of *Semotilus margarita* which had been kept in tanks several days.

May 23, 1963 — a small lot of *Lepomis macrochirus* that had been kept similarly 3 years.

December 4, 1963 — one trough of *Rhinichthys cataractae*.

December 30, 1963 — several troughs containing *Carassius auratus, Catostomus commersoni, Lepomis cyanellus, L. gibbosus, L. macrochirus, L. macrochirus* x *L. gibbosus, Micropterus dolomieui, M. salmoides, Notropis rubellus, N. spectrunculus, Pomoxis sparoides* and *Salvelinus fontinalis*.

January 8, 1964 — one trough of *Ictalurus punctatus* which had been kept several weeks.

April 1-9, 1964 — although the fish of December 30, above, had been treated with formalin, the disease recurred on the *C. commersoni, M. salmoides* and also on *Rhinichthys atratulus*. However, in one trough which contained an assortment of fish, some were diseased and some were healthy — of 9 surviving fish 2 *C. auratus*, 2 *L. cyanellus* and 2 *S. gairdneri* were healthy, but 2 *C. commersoni* and 1 *R. atratulus* were heavily infested and the *C. commersoni* were moribund.

April 15, 1965 — the *M. salmoides, L. gibbosus* and *L. macrochirus* of December 30 were moribund.

June 15, 1965 — a new collection of *L. macrochirus* kept similarly.

In another trough a spot check showed that the *H. salmoides, L. gibbosus* and *L. macrochirus* were heavily infested whereas the *C. auratus* and *L. cyanellus* were not.

December 6, 1965 — one lot of *R. cataractae*.

The fish showed typical symptoms of trichodiniasis in all these cases; no other agent could be found which could be responsible for the disease conditions. Similar lots of fish in similar circumstances, but without trichodiniasis, survived satisfactory. There was no evidence of the presence of *T. fultoni* on similar lots of fish kept in aquaria at room temperature.

The conclusions that can be drawn from these observations on *T. fultoni* are: (1) that it has little host specificity, but apparently has a preference for certain species or certain fish perhaps in a weakened condition, (2) the 12°C temperature is suitable for the development of the disease. Since we could not make more extensive studies with these infections under different temperatures, we can not say whether it is because these relatively low temperatures are unfavorable for the hosts in question, making them more susceptible for the infection, or if the temperature is favorable for the ciliate, or both. The optimum temperature of this parasite is probably near 12°C, or this relatively low temperature is unfavorable for the host, making it more susceptible to massive infestation, (3) it probably exists on fish in the hatchery complex and/or small fish which have gotten into the water supply from the adjacent warmwater ponds, (4) other trichodinids (*T. nigra, T. reticulata, T. subtilis*) did not cause serious epizootics under the same conditions.

II. DESCRIPTION OF Tripartiella bursiformis AND Trichodina nigra

Tripartiella bursiformis

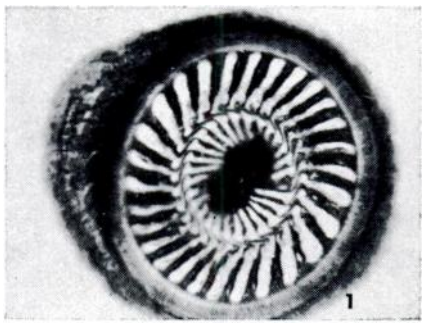

FIGURE 1. Tripartiella bursiformis *from the gills of* Acantharchus pomotis, *silver impregnated specimen.*

This ciliate, originally described from *Ambloplitis rupestris* from W. Va., was found on the gills of *Acantharchus pomotis,* the mud sunfish, collected by Dr. Frank Roberts, University of Maine, from White Marsh Swamp, Columbus County, N. Carolina. This trichodinid was not on *Lepomis macropeterus* from the same collection and held in the same trough. No severe pathogenicity was observed.

In silver impregnated specimens, the diameter of the body is about 38 to 44 μ; the diameter of the adhesive disc 32 μ (29 to 38 μ); denticulate ring 14 μ (12 to 17 μ). (Measurements were made according to Lom [9]). The slender denticles have long blades (hooks): the junction of the blades with the central conical portion protrudes forward in a small, rounded projection similar to that in *T. lata*[9]. The inner thorns (rays) of the denticles taper gradually to their ends. There is no clear area in the center of the adhesive disc. Number of denticles 29 (26 to 32).

Dimensions of denticles: thorn length 2.5 to 4 μ, blade 6.5 to 8 μ, width of central conical part 2 μ, and length of denticle (=tip of blade to tip of the conical part) is 5 μ. There are 6 to 7 radial striations to each denticle. The border membrane surrounding the adhesive disc is about 2 to 3 μ wide.

The diameter of the horseshoe-shaped macronucleus is about 17 μ. The elipsoid micronucleus is 1.5 to 1.7 x 2 to 3 μ wide, is situated adjacent to one arm of the macronucleus; the distance from the end of the arm ("y" value of Dogiel [4]) is 10 to 15 μ.

The adoral spiral makes an incomplete turn of about 250 to 290 degrees on the oral surface before plunging into the vestibulum.

Differential diagnosis. Because of the short adoral zone and shape of denticles, the ciliate belongs to the genus *Tripartiella* subgenus *Tripartiella* s. str. It is here compared with the most closely related species:

1. *Tripartiella lata*[9] — its denticles are fewer than those of *T. bursiformis* and different in shape. It also has a different host and area of distribution which are not adequate for establishing a new species.

2. *Tripartiella leucisci*[13] — from *Leuciscus hakuensis* from Japan, differs considerably in shape of denticles.

3. *Tripartiella bulbosa*[2] — described from the pearl minnow *(Semotilus margarita)* from Kearneysville, W. Va., differs from *T. bursiformis* in having a markedly fewer denticles (19-24), and smaller diameter of the adhesive disc and denticulate ring (22-26 and 10-12 μ, respectively). However, the denticle shape, as drawn by Davis, is similar.

Our material is similar to that described by Davis. The difference in hosts is probably insignificant, because many trichodinids are not host specific. The slight dimensional differences are probably due to population variability.

In addition to *Tripartiella bursiformis* described above, *T. nigra* was found on the surface of the same *Acantharcus pomotis.* No evidence of pathogenicity was observed.

Trichodina nigra

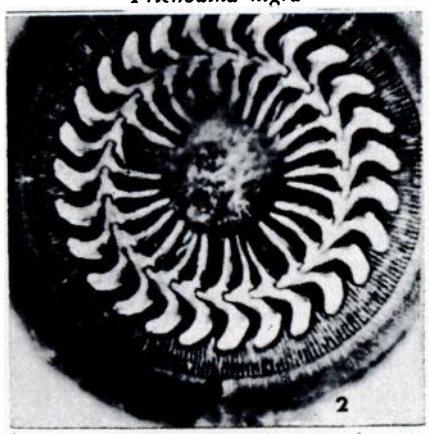

FIGURE 2. *Trichodina nigra from the body surface of* Acantharchus pomotis, *silver impregnated specimen.*

In a previous paper[10] we recorded the presence of a trichodinid on *L. macrochirus* and *M. salmoides,* which we tentatively identified as *T. nigra.* It corresponsed closely to the *T. nigra cobitis* described previously[8] from *Cobitis taenia* in Czechoslovakia. This trichodinid from *Acantharchus pomotis* resembles the type subspecies of *T. nigra,* found particularly on *Rutilus rutilus.* It has a similar denticle shape, but has a thicker central axis of the thorn. The number of denticles varies between 24 and 29, the average being 26; diameter of the adhesive disc varies from 52 to 65 μ, the average being 57; the diameter of the denticulate ring is 35 μ (30 to 40). These data agree with the nominate subspecies of *T. nigra* from *Rutilus.* Also, the dimensions of denticles agree; thorn length 7 to 8 μ, blade length 6.5 to 7 μ, width of the central conical part about 3 μ, length of the denticle (= from the anterior border of the blade to the posterior tip of the central part) being 10 to 11 μ. There are 10 to 11 radial striations per denticle. Diameter of the horseshoe-shaped macronucleus is about 26 to 56 μ; the oval micronucleus, 2 x 3 μ in size, lies close to one arm of the macronucleus, the distance "y" (between micronucleus and end of the arm of macronucleus) being 5 to 20 μ. Length of the adoral zone slightly more than 360°.

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