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Trichodinids (Ciliophora: Peritrichia) from a calanoid copepod and catfish from South Africa with notes on host specificity

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Abstract

A case study is presented in which a trichodinid infestation was found on *Clarias gariepinus* (Burchell, 1822) larvae in a hatchery. Upon examination of copepods in the water system, it was found that they too hosted this trichodinid species. After following the infestation for some time it was found that the trichodinids on the catfish disappeared, whilst the infestation on the calanoid copepods persisted. It was concluded that the trichodinid originated from the copepods and could not establish a viable infestation on the catfish larvae. Specimens of catfish fry from the same farm, however, hosted a different trichodinid which is described as a new species. After analysis of published information, it was concluded that the trichodinid from these calanoid copepods belongs to the same species as described by different authors from various localities from Eurasia. In order to provide a specific identification of this trichodinid, a literature review is presented. In a discussion of host specificity, it is concluded that the trichodinid involved is specific to planktonic copepods and cannot establish an infestation on fish.

Introduction

The peritrichian genus *Trichodina* Ehrenberg, 1830 comprises more than 150 species, most of which are associated with freshwater fish as ectoparasites or symbionts. Some species have also been described from marine piscean hosts (e.g. Raabe, 1958, 1959a; Laird, 1961; Lom, 1962; Lom & Laird, 1969; Lom, 1970a,b; Stein, 1973, 1976, 1979, 1982), whilst records are available of trichodinids from amphibians (Fulton, 1923; Lom, 1958, 1959; Raabe, 1959b; Chen, 1963; Kazubski, 1979), a coelenterate (Van As & Basson, 1986), molluscs (Raabe, 1965; Raabe & Raabe, 1959, 1961) and some from planktonic copepods (Dogiel, 1940; Sramek-Husek, 1953; Lom, 1960; Chen, 1963; Haider, 1964; Migala & Grygierek, 1972).

Various reports exist of diseases and mortalities of fish caused by ectoparasitic protozoans in culture conditions (e.g. Fischthal, 1949; Reichenbach-Klinke, 1951; Lombard, 1968; Rogers, 1971; Lom, 1973; Plumb, 1973; Jackson, 1978). Unfortunately most of these reports failed to make accurate identification of the organisms involved. In a case where mass mortalities occurred in a fishery station in northern Transvaal, South Africa, Van As, Basson & Theron (1984) identified the trichodinid species involved as some of the same species which are normally associated with these and other fish under natural conditions (Basson, Van As & Paperna, 1983; Van As & Basson, 1986; Basson & Van As, 1987; Van As & Basson, 1989; Basson & Van As, 1989). A question which has often been addressed in the literature concerns host specificity of trichodinids on which different theories have been put forward. One school of thought, expressed by Lom (1960), is that trichodinids in general are not host specific to species of

fish, but may even be found associated with non-piscean hosts. The opposing school of thought is that at least some species are highly host specific (Haider, 1964). Van As & Basson (1987), addressing the question of host specificity, placed trichodinids into four categories with a varying degree of host specificity. Despite these theories, the question still remains to be answered satisfactorily whether trichodinids from a non-piscean host can successfully establish an infestation on a piscean host and visa versa.

In the case study presented in this paper, *Clarias gariepinus* (Burchell, 1822) fry hosted a trichodinid infestation under hatchery conditions that, despite extensive work carried out by the authors, has so far not been reported from catfish or any other piscean host. Upon examination of the copepods in the catfish culture system, it was found that *Metadiaptomus meridianus* (Van Douwe, 1912) was infested by the same trichodinid. A taxonomic description of this trichodinid is provided. Catfish fingerlings from the same farm, however, hosted a different trichodinid which have subsequently also been found from catfish in another locality in southern Africa. This trichodinid proved to be a new species and is described below.

The trichodinid infestation on the catfish fry only lasted for a few days, where-after it disappeared with no adverse effect on the fry. Against this background, and taking into consideration the already published information, a discussion on host specificity is presented.

Materials and methods

The material examined originated from a small hatchery culturing *Clarias gariepinus* in the vicinity of Bloemfontein. *C. gariepinus* was artificially induced to spawn with the use of pituitary hormones. After hatching of the eggs, the fry were maintained in plastic containers with a continuous supply of borehole water stored in a pressure tank. This tank contained plankton, including *Metadiaptomus meridianus*, which found its way into the fry holding tanks. The water system was never in contact with water in which any species of fish were maintained. Catfish fry were routinely screened under a dissecting microscope for the purpose of following larval development. This examination revealed the presence of trichodinids which was brought to our attention when the larvae were two days old. Specimens of the larvae were taken to the laboratory where microscope preparations of the trichodinids were made according to the method described by Basson *et al.* (1983). Approximately 100 specimens of infested larvae were maintained in holding tanks in the laboratory and screened continuously over a period of one week.

Plankton samples were taken from the water reservoir and examined under a dissecting microscope for the presence of trichodinids. A plankton sample was kept and maintained in the laboratory in a glass aquarium. Catfish fingerlings of approximately 15 cm, maintained in a separate fingerling pond, were collected by seine net and examined for the presence of trichodinids. Preparations of these trichodinids were made in the normal way as described by Basson *et al.* (1983).

The taxonomic descriptions are based on air-dried smears impregnated with silver nitrate in order to study details of the adhesive disc and haematoxylin-stained specimens for studying the nuclear apparatus. All measurements given in the results below are in micrometres and follow the uniform specific characteristic system proposed by Lom (1958). Detailed descriptions of the denticles are presented in accordance with the method proposed by Van As & Basson (1989). Minimum and maximum values are given, followed in parentheses by the arithmetic mean, standard deviation and number of specimens measured. In the case of the number of denticles and radial pins, the mode is given instead of the arithmetic mean. Body diameter is measured as the adhesive disc plus border membrane.

Taxonomic names of copepods quoted in the text may have changed. We use the names as they appear in the original publications.

Results

Clarias gariepinus larvae of approximately two days old maintained in plastic holding tanks were

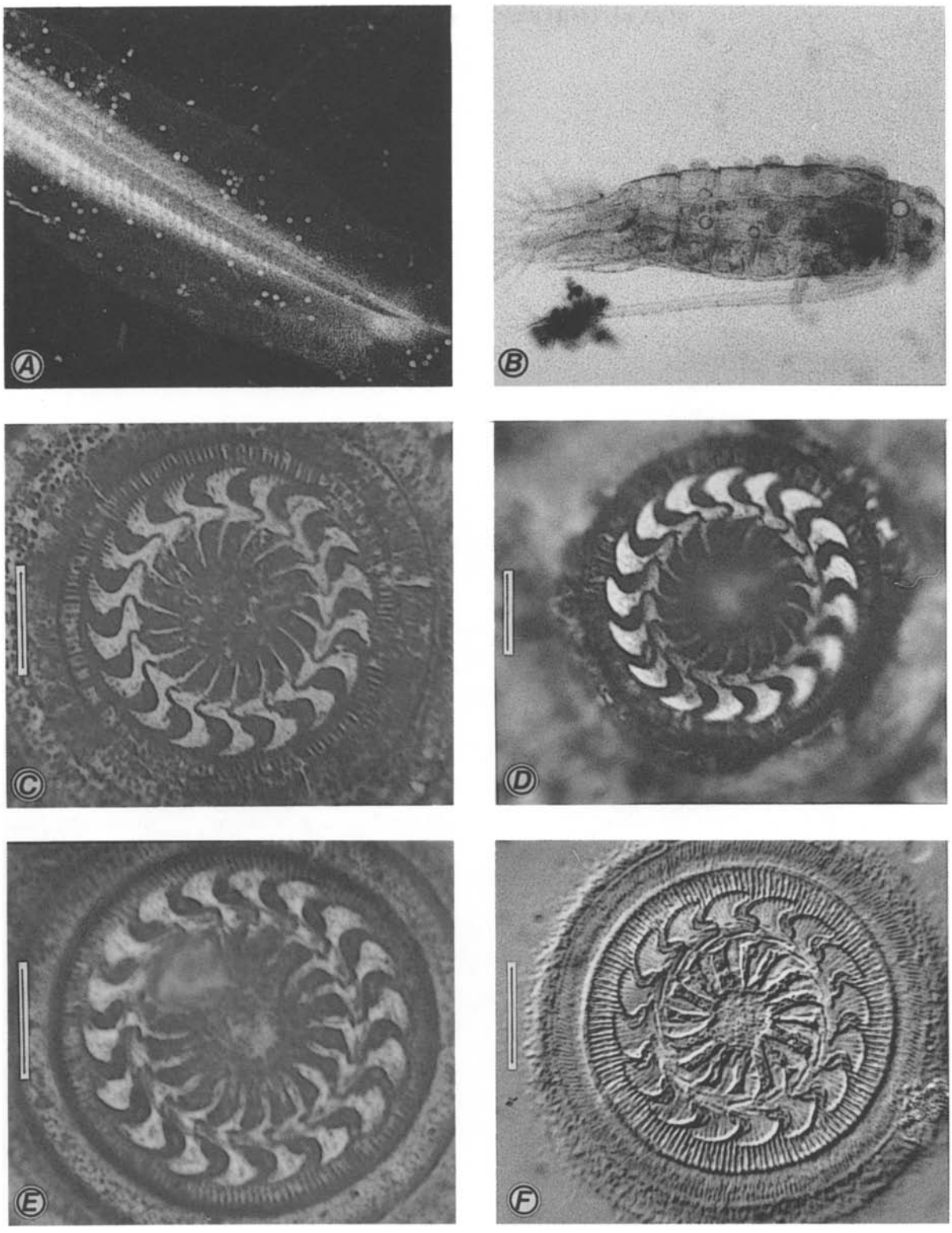

Fig. 1. Photomicrographs of live specimens of *Trichodina diaptomi* on a catfish larva (A) and on *Metadiaptomus meridianus* (B). Silver-impregnated specimens of adhesive discs of *T. diaptomi*; C, Central circle not impregnated; D,E, Central circle slightly impregnated; F, Interference light microscopy showing elevated state of central circle. *Scale-bar*: 10 μm.

found to be infested by a trichodinid mainly on the tail region (see Fig. 1A). All the larvae in the different holding tanks in the hatchery harboured similar infestations. Trichodinids were also found swimming free in the water. The larvae showed no visible signs of stress, fed normally and over the one week period of observation grew at the same rate as non-infested larvae. No mortalities, which could be attributed to the trichodinid infestation, occurred amongst the larvae. The number of trichodinids declined on the second day of observation. By the third day only a few trichodinids were visible on the larvae and by the end of the third day all larvae were free of trichodinids. A similar trend in infestation was observed for the larvae maintained in the laboratory as well as those in the hatchery.

Amongst the plankton used for feeding the larvae, was the copepod *Metadiaptomus meridianus*. These copepods harboured a high infestation of trichodinids (see Fig 1B). The same infestation was also found on copepods from the pressure tank from which the water was supplied. A similar infestation was also found on *M. meridianus* in a cement dam which was used for culturing live feed for the fish larvae. This reservoir, as well as the pressure tank, had no contact at any time with water in which fish were kept. A sample of plankton maintained in the laboratory, harboured a continuous infestation of trichodinids on *M. meridianus* for a period of two weeks. No other species of plankton had an infestation of trichodinids.

After preparation and examination of trichodinids collected separately from the catfish larvae and *M. meridianus*, it was found that both populations belong to the same species of which a taxonomic description is presented below.

Fully grown specimens of *C. gariepinus*, used for breeding stock and collected from impoundments and rivers in the vicinity of Bloemfontein, were kept in plastic dams. The fish were examined and harboured no trichodinids. Some specimens of juvenile catfish (approximately 15 cm in total length) died in grow-out ponds. Upon examination of moribund juvenile fish from this pond, it was found that they harboured a trichodinid infestation on the gills, but no infestation on the skin and fins. It was established that these young catfish were obtained from a catfish farm in the vicinity of Kimberley a few months earlier.

After preparation and examination of these trichodinids, it was found that this trichodinid was a different species from those collected from *M. meridianus*. It was further found that this was an as yet undescribed species of which the taxonomic description is presented below.

Trichodinid from *Metadiaptomus meridianus* (Figs 1C–F, 2A,B)

Host and locality: *M. meridianus* (Van Douwe, 1912), Fish farm in the vicinity of Bloemfontein (29°05′S26°11′E), Orange Free State, South Africa.
Site: Carapace.
Reference-material: Slides 88/12/12-04 and 88/12/13-02 in the collection of the National Museum, Bloemfontein, South Africa.

Description

Medium-sized trichodinid with flattened, disc-shaped body, 33.8–48.7 (41.5 ± 4.4, 27) in diameter. Adhesive disc concave, 27.9–39.9 (33.8 ± 3.5, 27) in diameter; surrounded by a finely striated border membrane, 2.6–5.4 (4.0 ± 0.7, 27) wide. Diameter of denticle ring 14.8–22.6 (19.6 ± 2.3, 27). Centre of adhesive disc shows circle 4.4–7.9 (5.9 ± 1.1, 12) in diameter. Number of denticles 15–20 (18, 27). Length of denticle 4.8–7.7 (6.2 ± 0.8, 27); length of ray 2.8–6.1 (4.4 ± 0.8, 27); width of central part 1.4–2.7 (2.0 ± 0.4, 27); length of blade 2.9–6.9 (3.8 ± 0.7, 27). Distal surface slightly rounded, higher than tangent point. Posterior margin forming semi-lunar curve with deepest point at same level as apex. Apex pointed, in most cases apex not touching $y + 1$ axis. In some cases apex extends to and slightly beyond this line. Blade apophysis prominent. Section connecting blade and central part delicate. Central part tapers to a sharp rounded point, loosely connected to

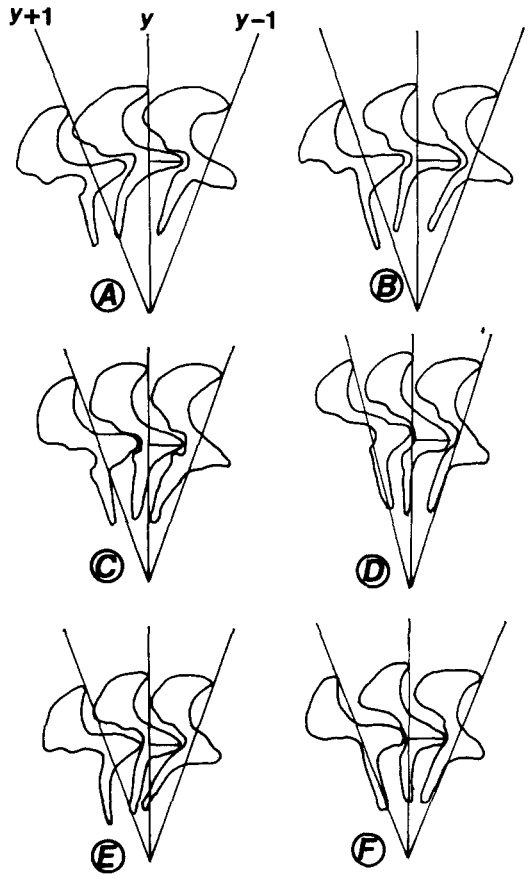

Fig. 2. Diagrammatic drawings of the denticles of trichodinids collected from planktonic copepods: A,B, From Bloemfontein, South Africa, host *Metadiaptomus meridianus*; C, From Poland, host *Eudiaptomus zachariasi* (Migala & Grygierek, 1972); D,E, From Czechoslovakia, host *Diaptomus vulgaris* (Lom, 1960); F, From China, host *Sinodiaptomus sarsi* (Chen, 1963).

previous denticle. Central part extends more than halfway to $y - 1$ axis. Section above x axis triangular, whilst section below x axis parallel for half the distance, then slanting away towards ray. Apophysis of ray not strongly developed and no indentation appears in central part. Central part connecting ray delicate. Ray thin, of same thickness throughout with a rounded sharp point. Ray bent towards $y + 1$ axis. Ratio of section below and above x axis 1. Central circle's border (periphery) not always well defined, does not always impregnate in same way in all specimens, even on same slide. Number of radial pins per denticle 7–11 (9, 27). Nuclear apparatus consists of C-shaped macronucleus; external diameter 32.3–50.2 (38.3 ± 5.1, 20); thickness 4.1–10.2 (6.4 ± 1.3, 20); length of sector between terminations of macronucleus 7.6–19.1 (12.6 ± 3.2, 20). Oval micronucleus lies in $+y$ position; length 4.5–7.6 (5.8 ± 1.0, 9); width 1.7–3.8 (2.8 ± 0.7, 9); value of $+y$ distance 7.0–26.8 (16.0 ± 5.6, 9). Adoral zone of cilia turns about 400°.

Remarks

The species discussed above does not conform to any species so far collected from southern Africa. The material does, however, correspond to trichodinids described by other authors which they collected from calanoid copepods. In order to provide a specific identification, it requires an analysis of the data presented in the literature. This is provided in the discussion of the present paper.

***Trichodina maritinkae* n. sp.** (Figs 3A–C,4A–C)

Host and localities: *C. gariepinus* (Burchell, 1822), Fish farm in Bloemfontein, Orange River System; Hoedspruit in the Olifants River System (Eastern Transvaal).
Site: Gills
Type-specimens: Holotype, slide 88/05/11-10 and paratype, slides 88/05/11-11 and 88/05/11-13, in the collection of the National Museum, Bloemfontein, South Africa.
Type-host and locality: *C. gariepinus*, Fish farm in Bloemfontein, Orange River System (29°05′S 26°11′E).
Etymology: This species was named after Maritinka Uys on whose farm this trichodinid was collected.

Description

Medium to large trichodinid with saucer-shaped body, 36.5–60.5 (51.2 ± 6.3, 17) in diameter. Adhesive disc concave, 31.1–50.2 (42.9 ± 5.4, 17)

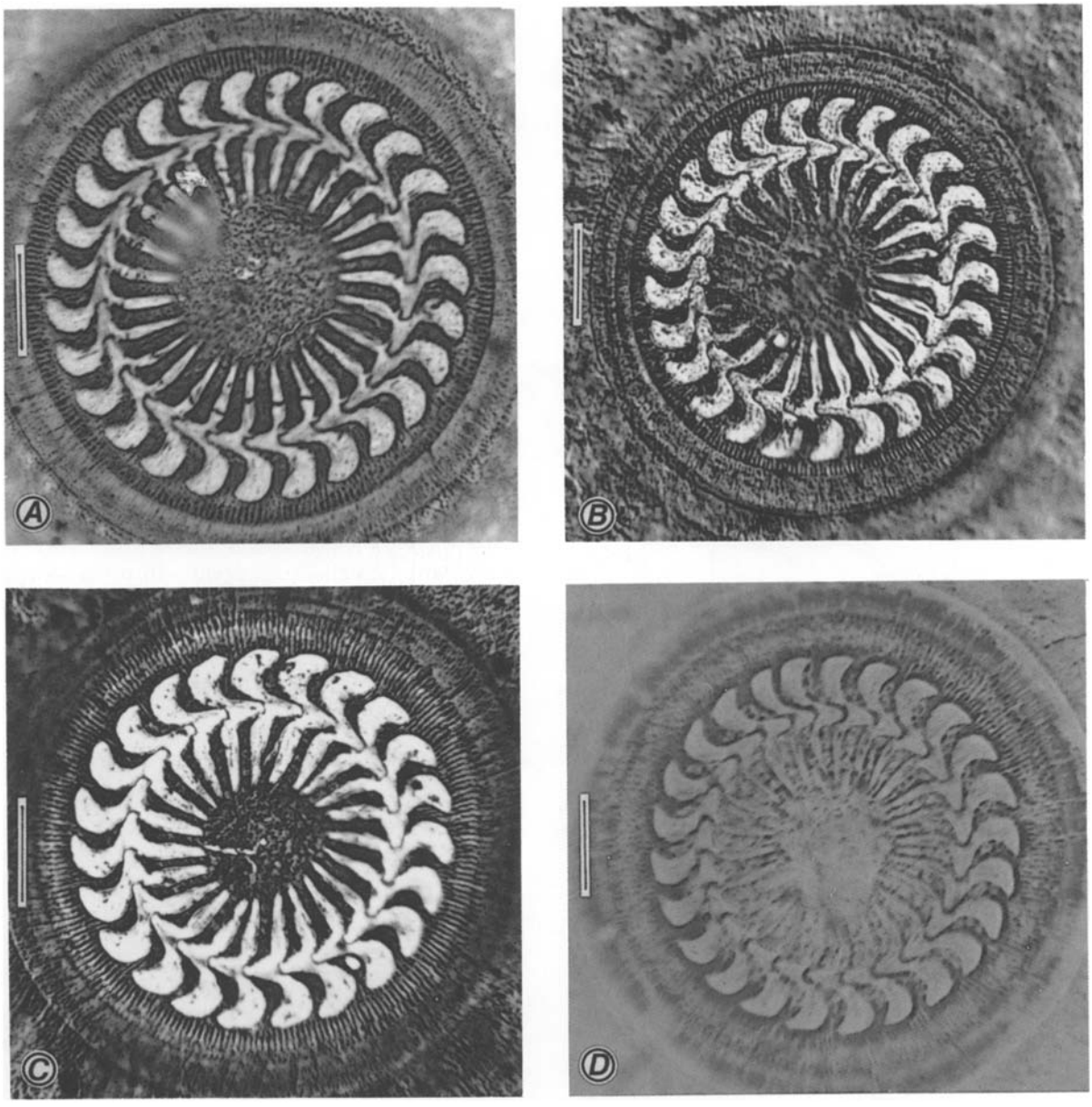

Fig. 3. Photomicrographs of silver-impregnated specimens of adhesive discs of *Trichodina maritinkae*. A–C, Bloemfontein; D, Hoedspruit. *Scale bar*: 10 μm.

in diameter; surrounded by finely striated border membrane 2.2–5.4 (4.2 ± 0.9, 17) wide. Diameter of denticle ring 21.4–31.9 (27.3 ± 2.9, 17). Number of denticles 23–26 (25, 17). Length of denticle 5.3–7.7 (6.6 ± 0.7, 17); length of ray 5.7–8.4 (6.9 ± 0.8, 17); width of central part 1.6–2.7 (2.2 ± 0.3, 17); length of blade 3.8–5.8 (4.8 ± 0.6, 17). Blade broad, filling large portion between y and $y + 1$ axes. Distal surface slightly curved with tangent point lower than distal surface. Posterior margin curves downward with deepest point slightly lower or at same level as apex of blade. Apex of blade rounded, in some specimens extending slightly beyond $y + 1$ axis. Anterior and

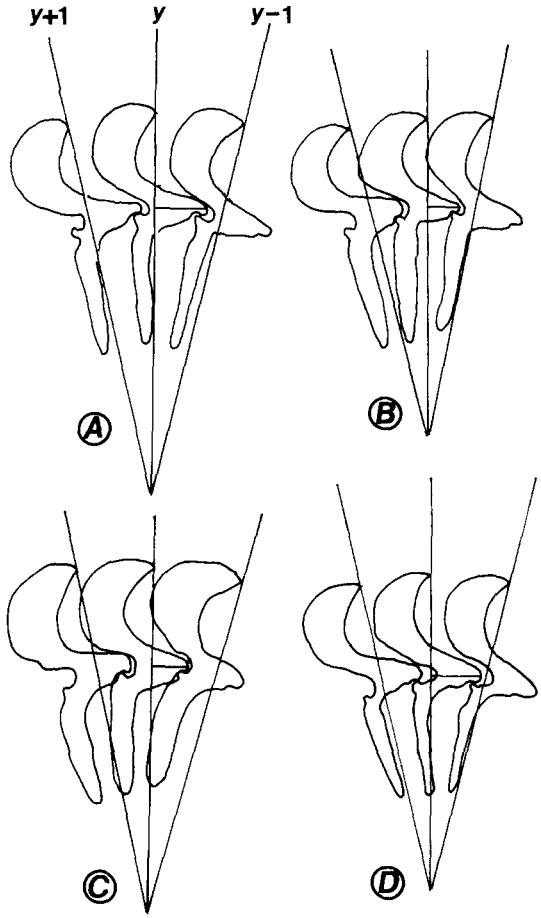

Fig. 4. Diagrammatic drawings of the denticles of *Trichodina maritinkae* from Bloemfontein (A–C) and from Hoedspruit (D).

posterior margin of blade following almost the same curve. Apophysis of blade not very prominent, but nevertheless present. Section connecting blade and central part thin. Central part broad at base, tapering to sharp rounded point, in close association with preceding denticle. Section above x axis slightly more conical than section below. Distinct indentation in central part opposite apophysis of ray. Connecting part between ray and central part thin. Apophysis of ray directed upward towards central part and in most cases prominent. Ray straight, parallel to y axis with indentation directly below apophysis. Ray almost of equal thickness throughout, tapering only slightly towards rounded point. Ratio of denticle above x axis to denticle below x axis 0.7–0.8. Number of radial pins per denticle 9–12 (10, 17) Nuclear apparatus consists of a C-shaped macronucleus. External diameter 26.4–41.9 (35.3 + 5.4, 8); thickness 5.9–9.4 (7.6 ± 1.1, 8) and length of sector between terminations of macronucleus 4.8–12.9 (7.6 ± 2.5, 8). Micronucleus could not be detected in any of specimens studied. Adoral zone of cilia spirals about 405°.

Remarks

T. maritinkae can clearly be distinguished from all freshwater fish trichodinids so far identified from freshwater fish on its size and denticle morphology. This species, like *T. uniforma* Van As & Basson, 1989, has denticles which are constant in form with very little variation in the shape from specimen to specimen. *T. maritinkae* has so far only been recorded from the gills of *C. gariepinus*. Most trichodinids occurring on the gills of their hosts are small, whilst *T. maritinkae* is a relatively large species. Specimens of this species was also collected from the gills of *C. gariepinus* from a fish farm in the north-eastern Transvaal and although not many specimens were available, this population conformed in overall size and shape to the type population (Figs 3,4). The latter locality is situated in the Olifants River System and separated from the Orange River System by a watershed.

Discussion

The trichodinid from *Metadiaptomus meridianus* described above shows resemblance to a number of ciliophorans described by various authors from a variety of calanoid copepods. No species name was proposed in any of these descriptions. In Table I available morphometric data from published records are compared to our data and in Fig. 2 a comparison is made of denticle forms of our material and those of published records. Not only does the present material correspond in overall dimensions, but there is a strong resemblance in denticle shape. An important feature in this material is the presence of a central circle which in some specimens of our material is less clearly defined as in others (see Fig 1 C–F). This is also the case with material from calanoids from the

Table I. Biometrical data of trichodinids described from calanoid copepods.

Country	USSR	Czech.	Czech.	China	Germany	Poland	S Africa
Host	*Diap.* sp.	*D. v.*	*D. v.*	*S. s.*	*Diap* .sp.	*E. z.*	*M. m.*
	T. d. f. *m.*	*T. d.* f. *d.*	*D. c.*	*N. h.*	*Eud.* sp.	T. *d.* s. *m.*	*T. diap.*
			E. g.	*T. d.* f. *l.*	*T. d.* s. *m.*		
Parasite			*T. d.* f. *l.*				
Body diam.			37–55	38–60	50.4–73.4	36–44	33.8–48.7
			(47–49)	(48)		(39.9)	(41.5)
A.d. diam.		30–40	27–38	36–56	33.6–53.5	28–37	27.9–39.9
			(17)	(43)		(31.9)	(33.8)
B.m. width			4				2.6–5.4
							(4.0)
D.r. diam	<37	20–28	13–21	17–28	19.8–30.6	15–21	14.8–22.6
			(17)	(20)		(17.5)	(19.6)
D. no.	19–25	16–27	16–22	19–24	19–22	15–23	15–20
	(22)		(20)	(20–21)		(18.6)	(18)
R.p.d.		6–10	8	8–10		8	7–11
				(9)			(9)
D.l.			2.3			9–11.5	4.8–7.7
						(9.8)	(6.2)
B.l.			4				2.9–6.9
							(3.8)
R.l.			4–5				2.8–6.1
							(4.4)
C.p.w.							1.4–2.7
							(2.0)
Ma. shape			horseshoe				C
Ma.e.d.			34–38				32.3–50.2
							(38.3)
Ma.th.			5–6			4.1–10.2	
						(6.5)	
Ma.x.							7.6–19.1
							(12.6)
Mi. shape			Spindle			oval	
Mi. pos			+Y			+Y	
Y-value			13–19			7–26.8	
Mi. length			3			4.5–7.6	
						(5.8)	
Mi. width			1				1.7–3.8
							(2.8)
Ad.sp.			390°	400°		380°	400°
Reference	Dogiel (1940)	Sramek-Husek (1953)	Lom (1960)	Chen (1963)	Haider (1964)	Migala & Grygierek (1972)	

Hosts: *Diap.*, *Diaptomus*; *D.c.*, *Diaptomus castor*; *D.v.*, *Diaptomus vulgaris*; *Eud.*, *Eudiaptomus*; *E.g.*, *Eudiaptomus gracilis*; *E.z.*, *Eudiaptomus zachariasi*; *M.m.*, *Metadiaptomus meridianus*; *N.h.*, *Neodiaptomus handeli*; *S.s.*, *Sinodiaptomus sarsi*.

Parasite: *T. diap.*, *Trichodina diaptomi*; *T.d.f.d.*, *Trichodina domerguei* f. *diaptomi*; *T. d.* f. *l.*, *T. domerguei* f. *latispina*; *T. d.* f. *m.*, *T. domerguei* f. *megamicronucleata*; *T. d.* s. *m.*, *T domerguei* subsp. *megamicronucleata*.

Biometrical data: A.d., adhesive disc; Ad.sp., adoral spiral; B.l., blade length; B.m., border membrane; C.p.w., central part width; diam., diameter; D.l., denticle length; D.no., denticle number; D.r., denticle ring; e.d., external diameter; Ma., macronucleus; Mi., micronucleus; pos., position; R.l., ray length; R.p.d., number of radial pins per denticle; th., thickness; x., length of sector between terminations of macronucleus.

literature and is even pointed out by Lom (1960) in his figure 3, where he remarks that the degree of clarity of the central circle depends on the success of impregnation.

In earlier works the central circle of trichodinids was referred to as the part of the disc which impregnated lighter than the rest. Although we recognised that some specimens within the same population can impregnate in a different way than others, the central circle (Basson *et al.*, 1983) is a fixed morphological structure of trichodinids which is not present in all species. The elevated nature of the central circle in this species can clearly be seen in interference contrast light microscopy (see Fig. 1F). In our opinion a characteristic of this material is that the central circle, although always present, does not impregnate homogeneously in all specimens, even on the same microscope slide. The presence of this central circle can also clearly be seen in the works of Lom (1960) and Migala & Grygierek (1972), who presented photomicrographs of silver impregnated specimens from trichodinids found on calanoids.

Based on morphometrical data and denticle morphology as presented in Fig. 2, it leaves us with little doubt that the trichodinid described above is the same as those presented by other authors occurring on calanoid copepods in various parts of the world. We further conclude that this is a trichodinid species associated with planktonic copepods of which the host range still requires to be determined. In our observations the trichodinids could not establish an infestation on *Clarias gariepinus* larvae. Similarly Lom (1960) also failed to establish a viable infestation of his trichodinids from diaptomids on fish hosts.

The allocation of a name to the trichodinid from *M. meridianus* provides somewhat of a problem as the literature is rife with conflicting reports. In order to clarify this, it requires a brief historical overview which will be presented in a chronological sequence.

The first report of a trichodinid from a planktonic copepod was published by Dogiel (1940). He described *T. domerguei* f. *megamicronucleata*, which he reportedly collected from goldfish as well as *Diaptomus* sp. In the same paper he also described five other forms of trichodinids, i.e. *T. domerguei* f. *caspialosae*, *T. domerguei* f. *borealis*, *T. borealis*, *T. domerguei* f. *percarum*, *T. domerguei* f. *meridionalis* and *T. domerguei* f. *latispina*, the latter collected from a fish, *Pungitius pungitius*. The next report was that of Sramek-Husek (1953) who described *T. domerguei* var. *diaptomi* from *Diaptomus vulgaris* (Schmeil, 1897). So far no photomicrographs of silver impregnated specimens have been presented. Lom (1960) provides a detailed description and photomicrographs of silver impregnated specimens (although his figure 3A was printed upside down) of a trichodinid from *D. vulgaris*, *D. castor* (Jurine, 1820) and *Eudiaptomus gracilis* (Sars, 1863), which he named *T. domerguei* f. *latispina*. He concluded that Dogiel's material should be separated into two groups, those occurring on the goldfish being representatives of the species *T. reticulata* Hirschmann & Partsch, 1955, and he suggested that *T. domerguei* f. *megamicronucleata* is a *pro parte* synonym for *T. reticulata*. The second group of trichodinids were those from diaptomids which represented a different trichodinid to which he allocated the name *T. domerguei* f. *latispina*. The latter group, according to Lom (1960), also occur on fish. He was, however, unable to establish a viable infestation on crucian carp *Carassius carassius* (Linnaeus, 1758) and could not succeed in transferring the crucian carp trichodinids to the plankton either.

The next report of a trichodinid from calanoids originated from mainland China, where Chen (1963) described a trichodinid from *Cyprinus carpio* Linnaeus, 1758, *Ctenopharyngodon idella* Valenciennes, 1844, *Hypophthalmichthys molitrix* Valenciennes, 1844 and various tadpole species as well as *Sinodiaptomus sarsi* (Rylov, 1923) and *Neodiaptomus handeli* (Brehm, 1921), which he, following Lom (1960), also named *T. domerguei* f. *latispina*. Chen (1963) also conducted cross infestation experiments and succeeded in transferring *T. domerguei* f. *latispina* from his calanoid copepods to different carp species, but was unsuccessful in transferring *T. reticulata*, *T. nobilis* Chen, 1963 and *T. nigra* Lom, 1961 to the cope-

pods. Haider (1964) in his comprehensive monograph on trichodinids, summarised the existing literature on the copepod trichodinids and provided additional observations from his own records. He, however, preferred not to follow Lom (1960) in allocating the name *T. domerguei* f. *latispina*. For the first time the trichodinids from calanoids were put into a separate subspecies, i.e. *T. domerguei* subsp. *megamicronucleata*. Haider (1964) also synonymised *T. domerguei* f. *diaptomi* with *T. domerguei* f. *megamicronucleata*.

The most recent published information on trichodinids from calanoids emanates from Poland, where Migala & Grygierek (1972) found two populations of trichodinids from the same pond, one occurring on *Eudiaptomus zachariasi* (Poppe, 1886) and the other on the stickleback *Gasterosteus aculeatus*. Although they expressed the opinion that these two populations are clearly different and should be regarded as separate taxa, they failed to provide such a differentiation in their taxonomic descriptions and once again described these trichodinids as two subspecies, i.e. in following Haider's proposal as *T. domerguei* subsp. *megamicromucleata* and *T. domerguei* subsp. *domerguei* Wallengren, 1897.

Against this background our conclusion is that, although there may be some doubt as to the host range of trichodinids from calanoid copepods, all the reports represent the same trichodinid, which in view of our new information appears to have a wide geographical distribution. We suggest that this trichodinid be elevated to a separate species. According to the rule of priority, the name *T. domerguei* f. *megamicronucleata* should receive precedence, but in view of the considerable controversy surrounding this name and the fact that it is also synonomised with *T. reticulata*, it would be unwise to do so. The same would apply to the use of the name *T. domerguei* f. *latispina*. Therefore, in order to avoid further confusion, we suggest the name *T. diaptomi* to be elevated to a species and that the description presented above be regarded as a redescription of this species. In our opinion, based on the evidence now available, we believe that all the material so far described from calanoid copepods belong to the same species.

Host-specificity

T. diaptomi from the present study could not successfully establish an infestation on catfish larvae. In comprehensive surveys carried out by the present authors on trichodinids in southern Africa (Basson *et al.*, 1983; Van As & Basson, 1984,1989; Basson & Van As, 1987,1989), we have not yet encountered any specimens of trichodinids resembling *T. diaptomi* on piscean hosts. In various localities fish were examined from waterbodies falling within the geographical range of *M. meridianus* and a variety of other calanoids. We, therefore, conclude that piscean hosts do not provide a suitable substrate for *T. diaptomi* to establish a viable population. A similar deduction was also made by Lom (1960) after unsuccessfully trying to establish a viable infestation of trichodinids from calanoids on fish and visa versa, whilst Haider (1964) and Migala & Grygierek (1972) found separate populations of trichodinids on copepods and fish. Lom (1960) reports the occurrence of *T. domerguei* f. *latispina* on diaptomid and eudiaptomid species and also found this species to occur on different species of fish as well as tadpoles. The biometrical data of these two populations presented by Lom (1960) showed considerable differences. The data presented for the calanoid population falls within the range of *T. diaptomi* from southern Africa, whilst the population from fish and tadpoles far exceed the upper limits. We therefore suggest that Lom (1960) may have been dealing with two different species of trichodinids, as was the case with the two populations of *T. domerguei* f. *megamicronucleata* described by Dogiel (1940). It's not unlikely that the trichodinid from calanoids found by Lom (1960) is in fact a population of *T. diaptomi*, whilst the population from fish and tadpoles may well be *T. domerguei* f. *latispina*, which is a known fish ectoparasite. Chen (1963) provides a similar case where *T. domerguei* f. *latispina* was found on fish, tadpoles

and calanoids. Once again, the population from his copepods are considerably smaller than those from fish and tadpoles. In our opinion it is also likely that the trichodinids in this case occurring on the copepods may also have been a population of *T. diaptomi*.

When the infestation on catfish larvae, on which this paper is based, was brought to our attention, and after examining this material, we, based on our experience, advised against any treatment of the larvae as we postulated at that time that the trichodinids involved is specific to copepods and will not establish a viable infestation on catfish larvae or cause pathology. This calculated risk proved to be correct and after a few days, although *M. meridianus* still remained infected, no infestation was found on the catfish. *T. maritinkae* described in this paper is, however, a trichodinid of fish and, although we have only found it on catfish so far, it may well also parasitise other piscean hosts.

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