

First Record of *Chilodonella* spp. (Ciliophora: Chilodonellidae) in Cultured Nile Tilapia (*Oreochromis niloticus*) in the Central Region of Saudi Arabia

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Abstract.- Saudi Arabia has a growing aquaculture industry that farms mainly tilapia. Ectoparasites, including ciliates of the genus *Chilodonella*, are known to be a major problem in fish farms. Nothing, however, is known about this genus from pond-reared fishes in Saudi Arabia. In the present study, 400 Nile tilapia (*Oreochromis niloticus*) were collected from farms in Riyadh, in the central region of Saudi Arabia, and examined for the incidence of *Chilodonella* infestation. Twenty out of the 400 examined fish were found infected (prevalence 5%), two species, *Chilodonella piscicola* and *Chilodonella hexasticha* were identified. The findings presented here are very important for the fishery sector, since this parasite can cause mass mortality, therefore, further study should be concentrated on the impact of *Chilodonella* spp. on the cultured fish in Saudi Arabia.

Keywords: *Chilodonella*, ciliates, Nile tilapia, ectoparasite.

INTRODUCTION

Aquaculture in Saudi Arabia is a rather new activity: with the first forays into aquaculture in the kingdom dating back to the early 1980s, when Nile tilapia was reared in inland water bodies in the capital, Riyadh. Nile tilapia (*Oreochromis niloticus*) remains the main freshwater fish cultured in the country, with production in 2004 of 2 276 tonnes, or about 20 percent of the total aquaculture production (Fisheries Statistics, 2006). Worldwide, during the past five years, aquaculture has expanded and intensified rapidly (FAO, 2012). Productivity in fish aquaculture is restricted, however, especially due to the impact of infectious agents, such as parasitic infection and diseases (Omeji *et al.*, 2010). Ectoparasitic ciliates represent one of the most hazardous threats to fish health (Pádua *et al.*, 2013). These parasites attack the fish and cause massive destruction of the skin and gill epithelium (Qasim and Ayub, 2012). *Chilodonella* is a ciliated protozoan which can cause infected fish to secrete excessive mucus. Infected fish may flash and show similar signs of irritation and many fish die when infestations become moderate (*i.e.*, five to

nine organisms per low power field on the microscope) to heavy (greater than ten organisms per low power field). Nothing is known, however, about *Chilodonella* species from pond-reared fishes in the central region of Saudi Arabia. This study, therefore, describes *Chilodonella piscicola* (Zacharias, 1894) Jankowski, 1980 (syn. *C. cyprini* Moroff, 1902) and *Chilodonella hexasticha* (Kiernik, 1909) Kahl, 1931 found on the skin and gills of tilapia, *Oreochromis niloticus* Linnaeus, 1758, in Saudi Arabia.

MATERIALS AND METHODS

In the present study a total of 400 Nile tilapia (*Oreochromis niloticus*) were collected from farms in Riyadh (24° 38' 26" N/46° 46' 22" E), Saudi Arabia, during the year 2011-2012. The collected fish were transported to the laboratory for investigation. Wet smears of the skin and gills were examined for the presence of ectoparasitic chilodonellid ciliophorans. In order to study details of the ventral ciliature, positive smears were air dried and impregnated with a 2% aqueous solution of silver nitrate (AgNO₃) for 8 min (Klein, 1958) then rinsed thoroughly in distilled water and exposed to ultraviolet light for 20-25 min. The morphometric and the specific characteristics of the recorded chilodonellid were observed with an

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Olympus microscope using an oil immersion lens. All measurements were expressed in micrometres (μm) and data is presented as Mean \pm SD (range).

RESULTS

During the present study two types of *Chilodonella* were reported simultaneously in the same fish with a prevalence of 5% (20/400), and are described as follows:

Chilodonella piscicola (Zacharias, 1894) Jankowski, 1980 (*syn. C. cyprini* Moroff, 1902)

The body of this *Chilodonella* species was asymmetrically oval and dorsoventrally flattened (Figs. 1A,B). The body dimensions were 50 ± 2.5 (46-54) μm in length and 45 ± 3.2 (40-48) μm in width. The dorsal side was without any cilia. The ciliature of the ventral side was composed of two systems, the right and left ciliary kineties, with 10 (9-13) kineties in the right system and 6 (5-7) in the left (Figs. 1A,B). These two systems were separated by a non-ciliary zone (Figs. 1A,B). The cytostome was observed at the anterior part of the non-ciliary zone and led to a conspicuous cytopharynx (Fig. 1B). The macronucleus was subspherical and measured 14 (12-15) μm in length \times 10 (9-11) μm in width (Fig. 1B).

Chilodonella hexasticha (Kiernik, 1909) Kahl, 1931

The body was oval and dorsoventrally flattened (Figs. 1C,D). It was characterized by the presence of a notch at the anterior end of the body (Fig. 3) and measured 35 ± 3.4 (30-47) μm in length \times 28 ± 2.3 (23-35) μm in width. The cytoplasm was granulated and the dorsal surface of the body had no cilia. The ciliature of the ventral surface of the body composed of two ciliary systems; the right and the left ciliary kineties separated by a non-ciliary zone (Figs. 1C,D). The right ciliary system was composed mostly 4 (4-6) kineties while the left ciliary system was straight and composed of 3 (3-5) kineties. The cytostome occurred at the anterior part of the naked zone and led to a conspicuous cytopharynx (Fig. 1D). The macronucleus was subspherical and measured 12 (11-13) μm in length \times 9 (8-10) μm in width (Fig. 1D). There was no notch in the posterior end of the body.

DISCUSSION

Hitherto, despite their known significance in fish aquaculture, and the growth of this industry (Hassan, 1999), there have been no studies of *Chilodonella* species in Saudi Arabia. Furthermore, until the 1970s, the taxonomic status of the *Chilodonella* species was in question, since *C. hexasticha* had been confused with the closely related *C. piscicola* (Mitra and Haldar, 2004). An extensive morphological study and a comprehensive review of the preceding literature was made by Kazubski and Migala (1974) through which they concluded that *C. piscicola* and *C. hexasticha* differ mainly in the number of kineties, of which there are more in *C. piscicola* and fewer in *C. hexasticha*. In addition, in *C. piscicola*, the kineties are arranged both close and nearly equidistant from each other while, in *C. hexasticha*, the kineties are loosely arranged and the distances between them are not equal (El-Tantawy and El-Sherbiny, 2010). In this study, the criteria established by this previous work were used to identify *C. piscicola* and *C. hexasticha* from the skin and gills of the cultured tilapia, *Oreochromis niloticus*, in Saudi Arabia.

If one considers the data from other studies, however (e.g. Kazubski and Migala, 1974; Hoffman *et al.*, 1979; Wiles *et al.*, 1985; Lom and Dykova, 1992; Rintamaki *et al.*, 1994; Mitra and Haldar, 2004; El-Tantawy and El-Sherbiny, 2010; Reda, 2011; Hu, 2012; Mitra *et al.*, 2013; Pádua *et al.*, 2013), it is apparent that both the range and number of kineties are still overlapping between these two species (Table I). It is suggested, here, therefore, that the distinction between these two *Chilodonella* species remains questionable and is deserving of further attention. In our opinion, molecular taxonomy is the only definitive way to answer these continuing questions regarding the identity of *Chilodonella*.

The present study limits itself to the presentation, for the first time, of morphometric data for *Chilodonella* species found on the skin and gills of the cultured tilapia, *Oreochromis niloticus*. The evidence provided here of the presence of *Chilodonella* species is very important for the fishery sector in Saudi Arabia, however, since this parasite causes the disease chilodonellosis, which

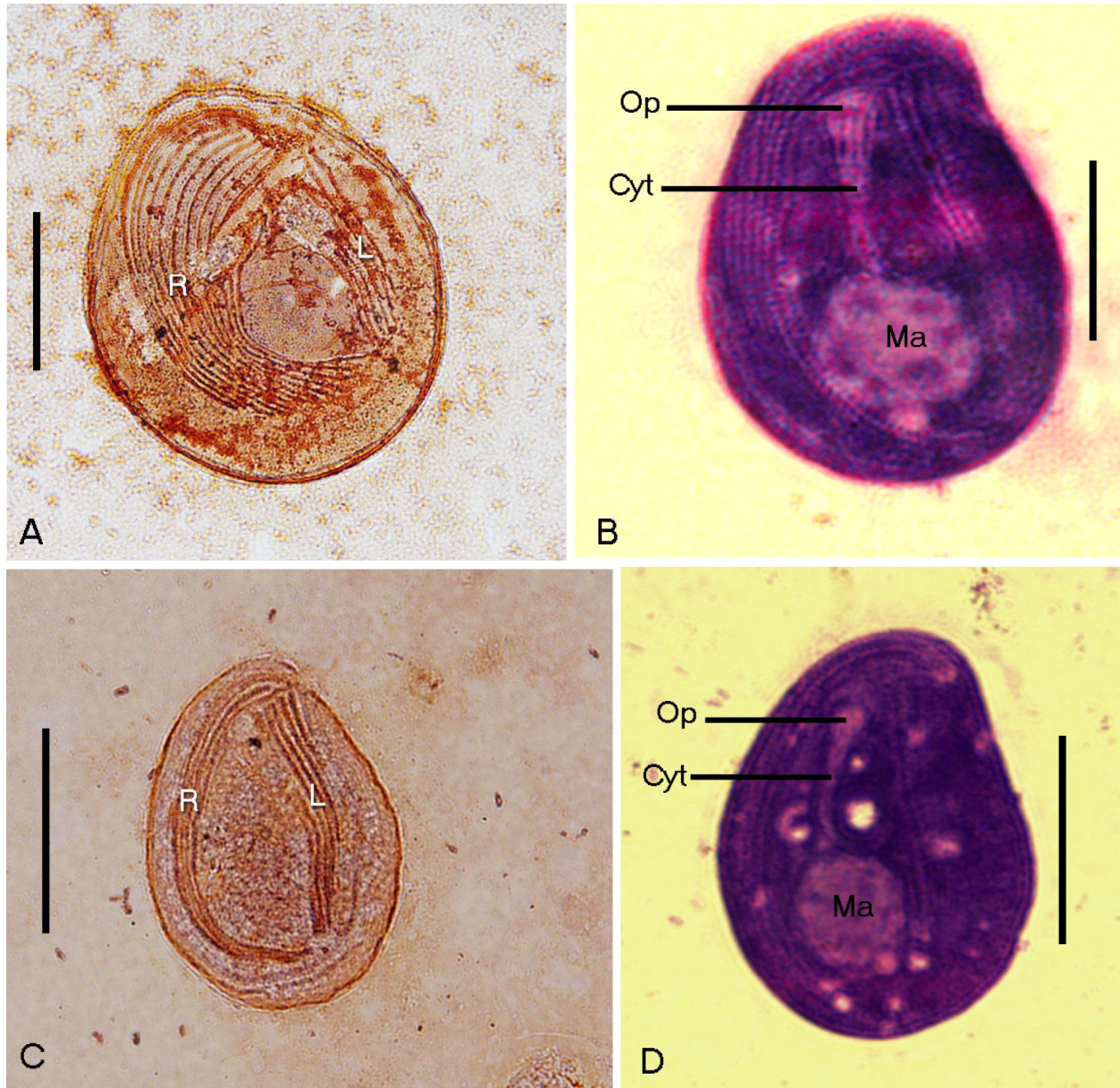


Fig. 1. *Chilodonella piscicola* (A, B) and *Chilodonella hexasticha* (C, D) showing left ciliary kineties (L), right kineties (R), cytopharynx (Cyt) and its opening (Op) and macronucleus (Ma). (A, C) sliver-impregnated specimens, while (B, D) are Giemsa-stained specimen Scale bar = 20 μ m.

leads to mass mortality (Paperna and Van As, 1983). We conclude, therefore, by arguing that there is a need for further study on the impact of *Chilodonella* spp. on cultured fish in Saudi Arabia, as well as a need for the application of molecular taxonomic techniques so as to provide greater certainty in regard to species identification within this genus.

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Table I.- Comparison of the numbers of kineties in the right and the left ciliary systems of *Chilodonella piscicola* and *Chilodonella hexasticha* obtained in the present study with other studies.

Number of right kineties	Number of left kineties	References
<i>Chilodonella piscicola</i>		
10-11	9-12	Kazubski and Migala (1974)
8-15	8-15	Hoffman <i>et al.</i> (1979)
10-11	10-11	Wiles <i>et al.</i> (1985)
7-15	12-13	Lom and Dykova (1992)
12	12	Ogut and Akyol (2007)
9-13	6-8	Present study
<i>Chilodonella hexasticha</i>		
5-10	5-10	Hoffman <i>et al.</i> (1979)
5-9	6-11	Rintamaki <i>et al.</i> (1994)
5-7	6-8	Mitra and Hadlar (2004)
7-8	8-10	El-Tantawy and El-Sherbiny (2010)
6-8	7-9	Reda (2011)
7-9	7-8	Hu (2012)
5-7	6-8	Mitra <i>et al.</i> (2013)
Population A: 4-9,	Population A: 3-6,	Pádua <i>et al.</i> (2013)
Population B: 5-10,	Population B: 5-9,	
Population C: 6-7	Population C: 5-11	
4-6	3-5	Present study

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