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Trichodinid ectoparasites (Ciliophora: Peritrichida) from gills of some marine fishes of Sinop Coasts of the Black Sea, with the first report of *Trichodina rectuncinata*

Türkay ÖZTÜRK[1], **Arzu GÜVEN**[2]

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[1] Sinop University, Faculty of Fisheries and Aquatic Sciences, Sinop, Türkiye

[2] Malatya Turgut Özal University, Vahap Küçük Vocational High School, Malatya, Türkiye

ORCID IDs of the author(s):
T.Ö. 0000-0001-5568-3214
A.G. 0000-0002-8220-5282

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Correspondence:
Türkay ÖZTÜRK
E-mail: turkay.ozturk@gmail.com

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ABSTRACT

Four species of marine fishes, turbot *Scophthalmus maeoticus*, common sole *Solea solea*, shore rockling *Gaidropsarus mediterraneus*, and rusty blenny *Parablennius sanguinolentus* from Sinop coasts of the Black Sea were examined for ectoparasitic trichodinids. A total of four trichodinid species, *Trichodina rectuncinata, T. ovonucleata, T. jadranica,* and *T. domerguei* were described using the silver nitrate impregnation technique and morphologically studied. All morphometric data and photomicrographs of these trichodinids were presented along with details of their host preferences, prevalence and intensity of infestation. This study is the first report on the trichodinid ectoparasites on *Scophthalmus maeoticus*, *Solea solea*, *Gaidropsarus mediterraneus*, and *Parablennius sanguinolentus* in Türkiye. Moreover *Trichodina rectuncinata* is as a new record for Turkish fish parasite fauna.

Keywords: Ectoparasite, *Trichodina rectuncinata, T. ovonucleata*, *T. jadranica, T. domerguei,* Black Sea

Introduction

Trichodinidae is a family of ciliates of the order Mobilida, and is consist of eleven genera, which are *Dipartiella* Stein, 1961; *Hemitrichodina* Basson and Van As, 1989; *Heterobladetrichodina* Hu, 2011; *Pallitrichodina* Van As and Basson, 1993; *Paratrichodina* Lom, 1963; *Semitrichodina* Kazubski, 1958; *Trichodina* Ehrenberg, 1830; *Trichodinella* Raabe, 1950; *Trichodoxa* Sirgel, 1983; *Tripartiella* Lom, 1959; and *Vauchomia* Mueller, 1938 (Van As and Basson, 1989; Hu, 2011, Kibria and Asmat, 2019). The largest group within this family is the genus *Trichodina* Ehrenberg, 1838 that consists of more than 300 described species to date (de Jager and Basson, 2019). Trichodinids are well known as the ectoparasites of numerous aquatic invertebrate and vertebrate hosts, especially both cultured and wild fish (Van As and Basson, 1989).

Trichodinid species have some specific characteristic structures called the adhesive disc and the denticle. The taxonomy and identification of trichodinid species are based on the appearance and the size of these structures. Klein's silver impregnation technique is the only method used to reveal these structures of trichodinids (Lom, 1958).

The first report on trichodinid species in Türkiye was presented by Özer and Erdem (1998), up to present a total of 21 trichodinid species have been recorded at the species level (excluding genus level) in various fish species living in the freshwater, lagoon, and marine environments.

Most of the trichodinid species reported in our country have been identified from freshwater fish, but the trichodinids of marine fish have not been adequately studied (see Table 1 for details). *T. claviformis*, *T. gobii*, T. *ovonucleata* and *Paratricodina obliqua* have so far been reported only from the marine environment, while *T. domerguie* and *T. puytoraci* have also been reported from marine fish as well as freshwater and lagoon environments.

The objective of this study is to investigate the trichodinid species of four marine fish collected from the Sinop region of the Black Sea, and to present information about the distribution of the trichodinid species in Türkiye.

Material and Methods

Study area and Sampling

The study was conducted between May 2015 and April 2017 in in the Sinop coast of the Black Sea (Figure 1). The host fish were caught by gill net from local fishermen. All the fish specimens were maintained in Faculty of Fisheries and Aquatic Sciences at Sinop University for examination. A total of 223 fish specimens, turbot *Scophthalmus maeoticus* (8), common sole *Solea solea* (140), shore rockling *Gaidropsarus mediterraneus* (70), and rusty blenny *Parablennius sanguinolentus* (5) were examined for trichodinids.

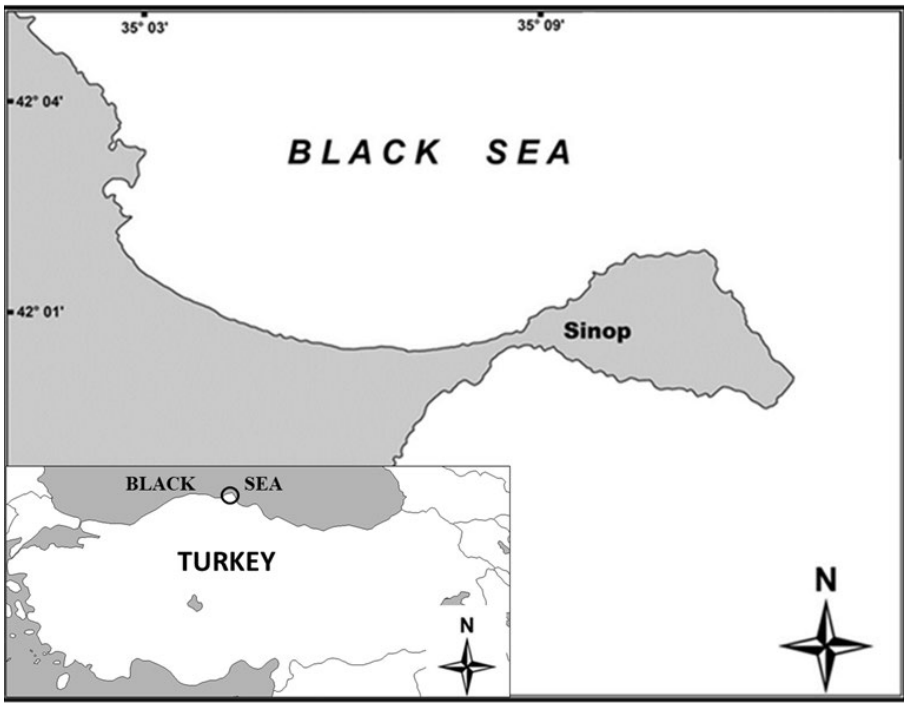

Figure 1. Map of sampling area

Searching for Trichodinids and Identification

At necropsy, the gills of the hosts were scraped and wet smears were prepared on several slides. These slides were examined using a microscope for the presence of trichodinids, later slides with trichodinids were air-dried and impregnated with silver nitrate technique to examine the details of the adhesive disc (Lom and Dykova, 1992). Examinations of prepared and stained slides and morphological measurements of trichodinids were made under a light microscope (Model Olympus BX53) with an oil immersion lens (100X) and their photographs were taken with a digital camera (Model Olympus DP25). The description of denticle structure followed the format recommended by Van As and Basson (1989) and Lom and Dykova (1992). All measurements were presented in micrometers (μm). Measurement values of trichodinids are given as minimum and maximum, followed by the arithmetic mean and standard error in parentheses. Radial pins and thread counts were presented as modes instead of arithmetic mean.

The prevalence of infestation value was determined according to Bush et al. (1997), while the density of infestation was evaluated as low (<10 individuals/slide), moderate (10–100 individuals/slide), high (>100 individuals/slide) and very high (>1000 individuals/slide).

The prevalence and intensity of infestation in host fish infested with more than one trichodinid species were presented as pooled data rather than for each trichodinid species.

Results and Discussion

In the present study, four known species of trichodinids were identified from the gills of four marine fishes from the Sinop coast of the Black Sea. These are *Trichodina rectuncinata, T. ovonucleata, T. jadranica,* and *T. domerguei.* Trichodinids list, their hosts and presence in their hosts are presented in Table 2 and representatives of the trichodinid species are illustrated in Figure 2 to Figure 5.

***Trichodina rectuncinata* Raabe, 1958**
(Figure 2, 5A, Table 3)

Host: shore rockling, *Gaidropsarus mediterraneus,* and rusty blenny, *Parablennius sanguinolentus*

It is a medium-sized trichodinid and body is disc-shape. The centre of adhesive dics is dark-stained (Figure 2A). The blade of the denticle is triangular with straight edges and a triangular or pyriform cavity in the center of each blade (Figure 5A). The distal blade surface is prominently rounded. The blade's distal margin touches the border membrane. The apex is rounded and the tangent point is not clear. The posterior blade surface extends straight and parallels to y axes, touching y axes almost along its full length in some blades. The anterior margin of the blade is straight in a population of *P. sanguinolentus*, and slightly curved in a population of *G. mediterranneus* (Figure 2). The posterior blade margin is straight and parallel to the anterior blade margin. Blade apophysis is not visible. The blade connection is not thin. The central part of the denticle is narrow, with a round point fitting tightly into the preceding denticle and extending three-fourths to the y-1 axis. Rays are very variable in shape, direction, and thickness. They are relatively short and curved backward, tapering slightly pointed (Figure 5A). Ray apophysis is not visible. The morphometrical data are presented in Table 3.

Previous comparative studies based on morphometric data have noted significant morphological variations among *T. rectuncinata* populations from different hosts (Loubser et al., 1995). In this study, it was determined that the populations from *G. mediterranneus* and *P. sanguinolentus* were almost similar to each other, with no obvious differences.

Trichodina rectuncinata is one of the trichodinids most widely distributed in marine fish. It has been recorded from more than 20 host species belonging to 17 fish families worldwide. To date, it has been frequently reported in Balistidae, Cottidae, Lotidae, Sygnathidae, Blennidae, Moridae, Gadidae, Hexagrammidae, Gobiesocidae, Scorpaenidae, Labridae, Gobiidae, Serranidae, Lateolabracidae, Mullidae, Scianidae, and Tripterygiidae (Lom and Dykova, 1992; Xu et al. 2001; Aguilar-Aguilar and Islas-Ortega, 2015; Islas-Ortega et al. 2020). In the Black Sea, it has been reported from fish belonging to 10 families, predominantly Bleniidae and Labridae (Zaika, 1968; Grupcheva et al. 1989; Gaevskaya and Korniychuk, 2003). This trichodinid, in addition to having a broad host spectrum, has been reported mostly in demersal or benthic fish.

Although *T. rectuncinata* has been previously reported from marine fish in many regions of the world, this is the first record of this species in Türkiye.

Table 1. Records of Trichodinid parasites in Turkish waters

Trichodinid species	**Fish host(s)**	**Environment/Locality**	**Reference(s)**
Trichodina acuta Lom, 1961	*Cyprinus carpio*	Freshwater / BS	Özer and Erdem (1998), Özer and Öztürk (2015)
Trichodina claviformis Dobberstein & Palm, 2000	*Merlangius merlangus*	**Marine / BS**	Öğüt and Palm (2005)
Trichodina cobitis Lom, 1960	*Cobitis taenia*	Freshwater / BS	Özer and Öztürk (2015)
Trichodina domerguei Wallengren, 1897	*Merlangius merlangus*	**Marine / (BS)**	Özer et al. (2012)
	Mullus barbatus ponticus	**Marine / (BS)**	Öztürk and Yeşil (2019)
	Platichthyes flesus	Freshwater / BS	Öztürk and Özer (2010)
	Aphanius danfordii	Freshwater / BS	Öztürk and Özer (2007)
	Gasterosteus aculeatus	Freshwater / BS	Özer (2003a)
	Neogobius melanostomus	Freshwater / BS	Özer (2003b)
	Sparus aurata	Lagoon / MS	Canlı (2010)
	Dicentrarchus labrax	Lagoon / MS	Canlı (2010)
	Gambusia holbrooki	Freshwater / BS	Özer and Öztürk (2015)
	Neogobius fluviatilis	Lagoon / BS	Öztürk and Çam (2013)
	Pomatoschistus marmoratus	Lagoon / BS	Öztürk and Çam (2013)
Trichodina fultoni Dawis 1947	*Oncorhynchus mykiss*	Freshwater / (AS)	Şimşek and Aldemir (2020)
Trichodina gobii Raabe, 1959	*Merlangius merlangus*	**Marine / (BS)**	Özer et al. (2015)
Trichodina heterodentata Duncan, 1977	*Neogobius fluviatilis*	Lagoon / BS	Öztürk and Çam (2013)
	Pomatoschistus marmoratus	Lagoon / BS	Öztürk and Çam (2013)
	Proterorhinus marmoratus	Freshwater / BS	Öztürk and Çam (2013)
	Aphanius danfordii	Freshwater / BS	Özer and Öztürk (2015)
	Sander lucioperca	Freshwater / BS	Özer and Öztürk (2015)
	Sciaenochromis fryeri	Freshwater / (aquarium)	Çelik and Korun (2018)
	Poecilia sphenops	Freshwater / (aquarium)	Çelik and Korun (2018)
Trichodina jadranica Raabe, 1958	*Platichthyes flesus*	Freshwater / (BS)	Öztürk and Özer (2010)
Trichodina lepsii Lom, 1962	*Mugil cephalus*	Lagoon (BS)	Özer and Öztürk (2004)
	Liza aurata	Lagoon (BS)	Özer and Öztürk (2004)

Table 1. (contiuned)

Trichodinid species	Fish host(s)	Environment/Locality	Reference(s)
Trichodina luciopercae Lom, 197	*Sander lucioperca*	Freshwater / BS	Özer and Öztürk (2015)
Trichodina modesta Lom, 1970	*Aphanius danfordii*	Freshwater / BS	Öztürk and Özer (2007), Özer and Öztürk (2015)
Trichodina mutabilis Kazubski & Migala, 1968	*Cyprinus carpio*	Freshwater / BS	Özer and Erdem (1998)
Trichodina nigra Lom, 1960	*Cyprinus carpio*	Freshwater / BS	Özer and Erdem (1998)
	Cyprinus carpio	Freshwater / MS	Cengizler et al. (2001), Kılınçaslan and Cengizler (2008)
	Silurus glanis	Freshwater / MS	Kılınçaslan and Cengizler (2008)
	Leuciscus cephalus	Freshwater / MS	Kılınçaslan and Cengizler (2008)
Trichodina ovonucleata Raabei, 1958	*Mullus barbatus ponticus*	**Marine / (BS)**	Öztürk and Yeşil (2019)
Trichodina pediculus	*Cyprinus carpio*	Freshwater / MS	Çelik and Korun (2018)
	Labidochromis caeruleus	Freshwater / (aquarium)	Çelik and Korun (2018)
	Pseudotropheus socolofi	Freshwater / (aquarium)	Çelik and Korun (2018)
	Poecilia velifera	Freshwater / (aquarium)	Çelik and Korun (2018)
	Poecilia sphenops	Freshwater / (aquarium)	Çelik and Korun (2018)
Trichodina puytoraci Lom, 1962	*Liza aurata*	Freshwater / BS	Özer and Öztürk (2004), Öztürk (2013)
	Mugil cephalus	Freshwater / BS	Özer and Öztürk (2004)
	Merlangius merlangus	**Marine (BS)**	Öğüt and Palm (2005)
Trichodina tenuidens Faure-Fremiet, 1944	*Gasterosteus aculeatus*	Freshwater / BS	Özer (2003a), Özer and Öztürk (2015)
	Gasterosteus aculeatus	Lagoon / (BS)	Özer and Öztürk (2015)
Tripartiella macrosoma Basson & Van As, 1987	*Aphanius danfordii*	Freshwater (BS)	Öztürk and Özer (2007), Özer and Öztürk (2015)
Trichodinella subtilis Lom, 1959	*Cyprinus carpio*	Freshwater / BS	Özer and Erdem (1998)
Paratrichodina corlissi Lom & Haldar, 1977	*Neogobius fluviatilis*	Lagoon / BS	Öztürk and Çam (2013)
	Pomatoschistus marmoratus	Lagoon / BS	Öztürk and Çam (2013)
Paratrichodina obliqua Lom 1963	*Mullus barbatus ponticus*	**Marine** (BS)	Öztürk and Yeşil (2019)

BS: Black Sea, MS: Mediterranean Sea, AS: Aegean Sea, MS: Marmara Sea, CA: Central Anatolia Region

Table 2. List of identified trichodinid species at study and presence in their hosts

Host	P (%) (Nin/Nex)	Trichodinid species	Intensity of infestation
Gaidropsarus mediterraneus	11.4 8/70	*Trichodina rectuncinata* *T. ovonucleata*	high moderate
Parablennius sanguinolentus	80.0 (4/5)	*T. rectuncinata* *T. ovonucleata*	high moderate
Scophthalmus maeoticus	100 (8/8)	*T. jadranica* *T. ovonucleata*	high moderate
Solea solea	7.9 (11/140)	*T. jadranica* *T. domerguei*	very high low

Nin, Number of fishes infested. Nex, Number of fishes examined

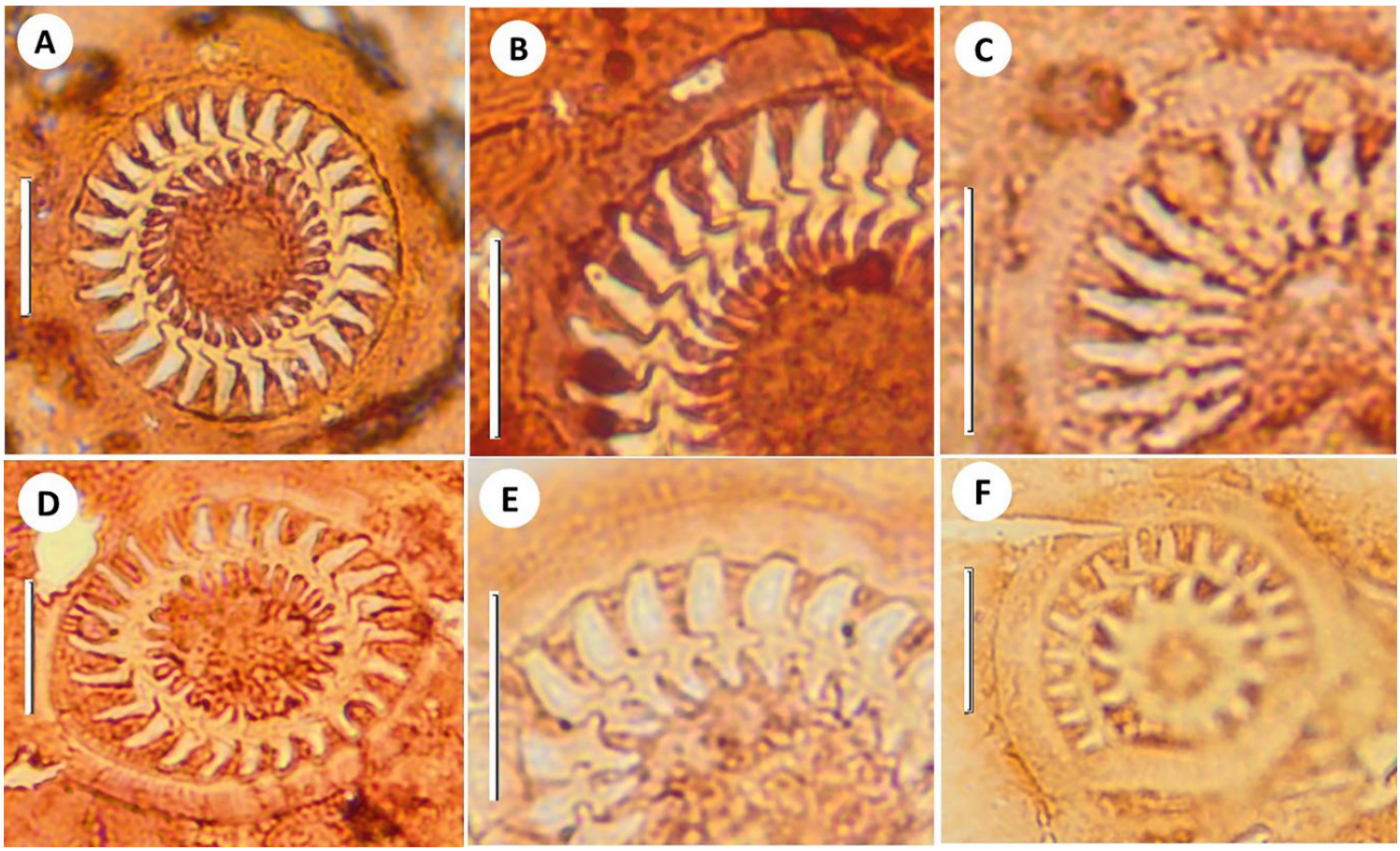

Figure 2. *Trichodina rectuncinata* Raabe, 1958. A-C: *T. rectuncinata* from *P. sanguinolentus,* D-E: *T. rectuncinata* from *G. mediterraneus*. F. An adhesive disc of *T. rectuncinata* during binary fission. Specimens stained with silver-nitrate. Scale bar 10 µm.

Table 3. Morphometric (in micrometers) data on populations of *Trichodina rectuncinata*, *T. ovonucleata* and *T. jadranica*

Trichodinidid species	*Trichodina rectuncinata*		*Trichodina ovonucleata*			*Trichodina jadranica*	
Hosts	*G. mediterraneus*	*P. sanguinolentus*	*G. mediterraneus*	*P. sanguinolentus*	*S. maeoticus*	*S. maeoticus*	*S. solea*
Body diameter	34.5-39.1 (36.1±1.6)	29.3 – 37.9 (34.3 ±1.8)	26.2 - 28.6 (26.9 ±0.4)	25.4 – 27.7 (26.3 ±0.3)	26.7 – 29.1 (28.1 ±0.4)	27.7 -34.6 (31.0 ±1.2)	25.4 – 28.3 (26.4 ±0.4)
Adhesive disc diameter	22.4 – 24.2 (23.4 ±0.5)	22.8 - 30.3 (27.5 ±1.7)	18.8 – 21.9 (20.8 ±0.5)	20.5 – 22.8 (21.6 ±0.4)	20.2 – 24.3 (21.6 ±0.7)	22.8 – 30.3 (26.0 ±1.3)	18.4 – 22.8 (20.5 ±0.6)
Border membrane width	2.9 – 3.0 (3.0 ±0.05)	2.1 – 3.2 (2.6 ±0.2)	2.4 – 2.8 (2.6 ±0.08)	2.1 – 2.6 (2.5 ±0.07)	2.3 – 2.9 (2.6 ±0.09)	2.0 – 2.8 (2.5 ±0.1)	2.4 – 2.8 (2.6 ±0.06)
Denticle ring diameter	13.5 – 15.8 (14.3 ±0.8)	13.6 – 19.3 (16.6 ±1.4)	11.9 – 15.6 (14.1 ±0.7)	11.5 – 14.3 (13.4 ±0.5)	13.3 – 15.5 (14.5 ±0.4)	13.4 – 16.9 (15.9 ±0.5)	12.3 – 13.3 (12.3 ±0.4)
Denticle span	3.1 – 3.8 (3.3 ±0.2)	2.1 – 3.4 (2.8 ±0.4)	2.8 – 3.6 (3.3 ±0.1)	2.6 – 3.9 (3.4 ±0.3)	3.1 – 3.7 (3.5 ±0.1)	3.7 – 4.6 (4.2 ±0.2)	3.4 – 4.0 (3.7 ±0.09)
Denticle length	7.1 -7.7 (7.4 ±0.2)	7.2 – 9.3 (8.7 ±0.6)	4.2 – 6.3 (5.5 ±0.4)	5.9 – 6.9 (6.5 ±0.2)	5.2 – 6.0 (5.8 ±0.1)	6.0 -6.6 (6.3 ±0.08)	5.3 – 6.0 (5.6 ±0.2)
Blade length	3.5 - 3.7 (3.3 ±0.08)	3.1 – 4.5 (3.9 ±0.3)	1.7 – 2.2 (2.0 ±0.07)	2.1 – 2.6 (2.3 ±0.1)	1.5 – 2.0 (1.8 ± 0.08)	2.2 – 2.8 (2.5 ± 0.08)	2.4 – 2.6 (2.6 ±0.02)
Central part width	1.3 -2.2 (1.6 ±0.3)	1.7 – 2.3 (1.9 ±0.2)	0.7 – 1.5 (1.2 ±0.2)	0.9 – 2.1 (1.3 ±0.2)	1.4 – 2.0 (1.7 ± 0.1)	1.2 -2.0 (1.6 ±0.1)	1.0 – 1.7 (1.5 ±0.1)
Ray length	2.1 – 2.4 2.2 ±0.1)	2.3 – 2.8 (2.6 ±0.1)	2.1 – 2.8 (2.4 ±0.1)	2.6 – 3.0 (2.8 ±0.07)	2.1 – 2.6 (2.4 ± 0.07)	1.7 – 2.8 (2.2 ±0.2)	1.7 – 1.9 (1.8 ±0.1)
Denticle number	24 - 27	26 - 29	20-22	20-23	22-24	21 - 23	19 - 21
Radial pins per denticle	6	5-6	6	6	6-8	6-8	6
n	10	10	10	10	10	10	10

n: number of specimens measured

Trichodina ovonucleata Raabe, 1958

(Figure 3, 5B, Table 3)

Host: Shore Rockling, *Gaidropsarus mediterraneus,* rusty blenny, *Parablennius sanguinolentus* and Turbot, *Scophthalmus maeoticus*

It is a small to medium-sized trichodinid with body disc-shape. The centre of the adhesive dics is dark-stained (Figure 3). The blade of denticle is sickle-shaped and fill most of space between Y-axes. The anterior margin of blade is curved than posterior blade surface. Blade distal margin touches the border membrane in some. Blade apophysis is not visible. Blade connection is evident. The central part of denticle is narrow, rounded end and fitted loosely into preceding denticle, not extending to y-1 axis, shapes of the central part above and below the x-axis similar (Figure 5B). Ray is longer than the blade. Ray is straight and pointed. There is no ray apophysis. Rays are extends straight and parallel to Y-axes, touching Y-axes almost along its full length in some. The morphometrical data are presented in Table 3.

Trichodina ovonucleata was originally described by Raabe (1958) from Adriatic blennies. Since then, it shows a broad host preference and has been reported by a number of authors from various marine fish in worldwide, including the Pacific and the Atlantic Oceans, the Mediterranean and the Black Seas (Zaika, 1968; Stein, 1979; Grupcheva et al. 1989; Xu et al. 2002). In the Black Sea, *T. ovonucleata* has so far been reported in *Parablennius sanguinolentus*, *P. tentacularis*, *Gaidropsarus mediterraneus*, *Merlangius merlangus euxinus*, *Lisa saliens*, *Trachurus mediterraneus ponticus, Spicara smaris, Diplodus annularis, Gobius cobitis, G. niger, Mullus barbatus ponticus, Symphodus cinereus, S. tinca, S. roissali, Ophidion rochei, Psetta maxima maeotica, Sciaena umbra, Serranus scriba, Scorpaena porcus, Syngnathus typhle, S. abaster, Solea nasuta* (Lom, 1970; Zaika, 1968; Grupcheva et al. 1989; Gaevskaya and Korniychuk, 2003). As can be seen from Table 1, *T. ovonucleata* was reported from the Black Sea coast of Türkiye, only in *M. barbatus ponticus*.

T. ovonucleata, which was previously recorded in *G. mediterraneus*, *P. sanguinolentus* and S. *maeoticus* in the Black Sea, had not been previously recorded from these hosts in Turkish coasts of the Black Sea. There fore, this study is first report on trichodinids of *G. mediterraneus*, *P. sanguinolentus* and *S. maeoticus* in Turkish coasts.

***Trichodina jadranica* Raabe, 1958**

(Figure 4A-B, 5C, Table 3)

Host: Turbot *Scophthalmus maeoticus*, Common Sole *Solea solea*

It is a medium-sized trichodinid and body is disc-shaped. The centre of the adhesive dics is an unstained, clear circle with several dark granules close to each other (Figure 4A-B). The blade of denticle is broad, sickle-shaped, filling most of space between Y-axes, even, extending beyond Y-axes (Fig. 5C). Blade apophysis is present, but is not clearly visible. The central part of denticle is ovoid end and fitted firmly into preceding denticle. Ray is short and rounded end. Ray apophysis is present. The morphometrical data are presented in Table 3.

Trichodina jadranica has a wide geographical distribution including the Adriatic, Baltic, Black, and Azov seas as well as the Atlantic and Pacific Oceans. To date, have been reported from a large number of fish species living marine, brackish and freshwater environments worldwide (Arthur and Lom, 1984; Grupcheva et al. 1989; Loubster et al. 1995; Su and White, 1995; Dobberstein and Palm, 2000; Madsen et al. 2000; Xu, 2007; Öztürk and Özer, 2010; Islas-Ortega et al. 2020). Although this trichodinid has been reported in Perciformes, Pleuronectiformes, Scorpaeniformes, Tetraodontiformes and Anguilliformes to date, it is noteworthy that it has been reported more frequently, especially in flatfish. Similarly, *T. jadranica* has previously been reported from a flatfish, *P. flesus* in the Black Sea coast of Türkiye (Table 1). In this study, *Trichodina jadranica* was also detected from two flatfish, *S. maeoticus* and *S. solea*. Besides, the current study is the first report on trichodinids of turbot and common sole fish captured from Turkish coasts of the Black Sea.

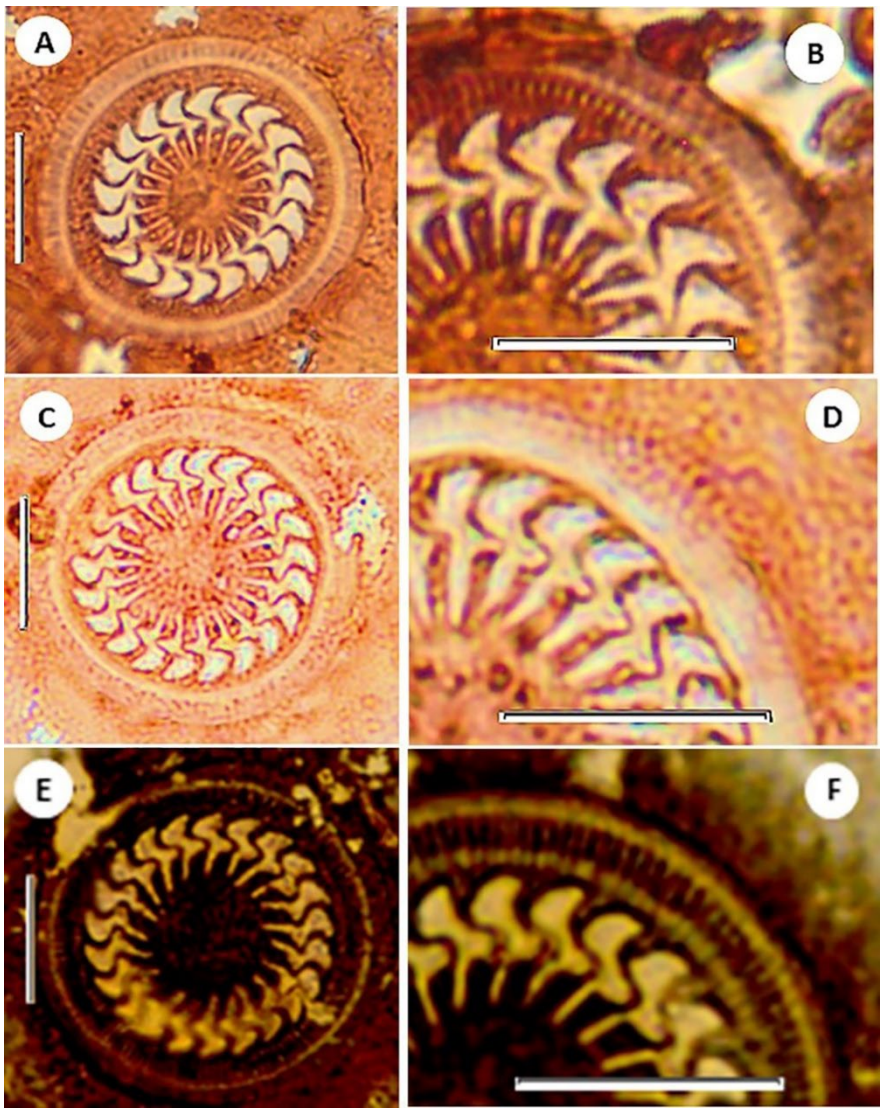

Figure 3. *Trichodina ovonucleata* Raabei, 1958. A-B: *T. ovonucleata* from *P. sanguinolentus,* C-D: *T. ovonucleata* from *G. mediterraneus,* E-F: *T. ovonucleata* from *S. maeoticus.* Specimens stained with silver-nitrate. Scale bar 10 µm.

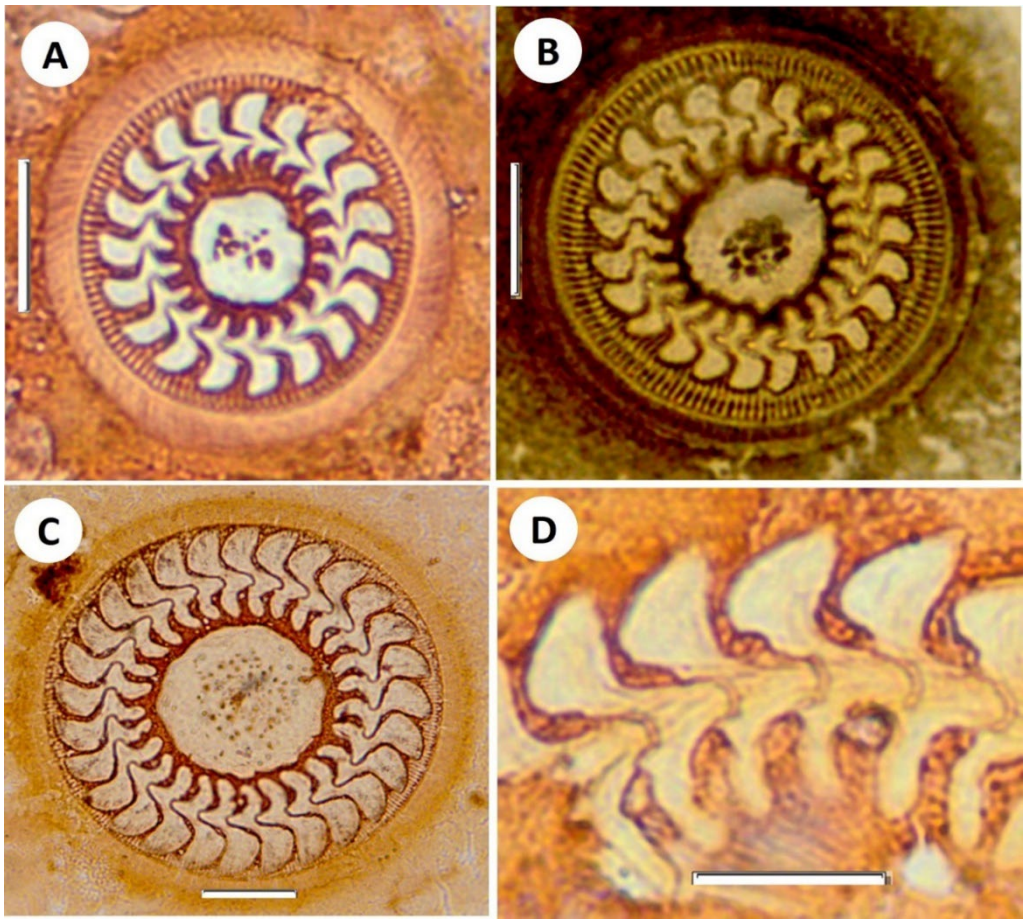

Figure 4. *Trichodina jadranica* Raabe, 1958 and *Trichodina domerguei* Wallengren, 1897. A: *T. jadranica* from *S. solea*, B. *T. jadranica* from *S. maeoticus,* C: *T. domerguei*, D: the denticles of *T. domerguei*. Specimens stained with silver-nitrate. Scale bar 10 µm.

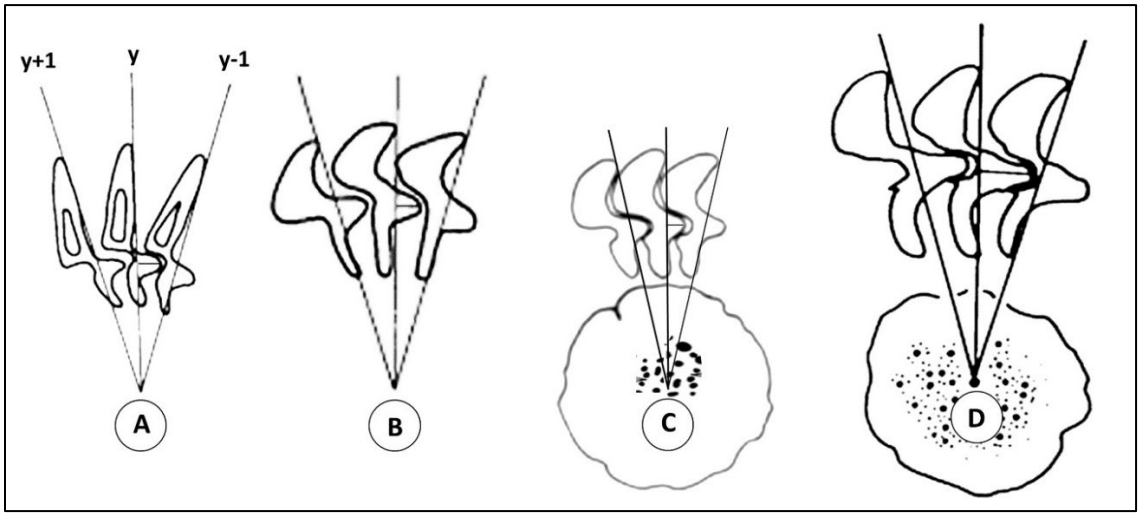

Figure 5. Diagrammatic drawings of the denticles of trichodinids in the present study. A. *Trichodina rectuncinata* Raabe, 1958, *Trichodina ovonucleata* Raabei, 1958, *Trichodina jadranica* Raabe, 1958, *Trichodina domerguei* Wallengren, 1897 (y+1, y, y-1. Y axes).

***Trichodina domerguei* Wallengren, 1897**

(Figure 4C-D, 5D)

Host: Common Sole, *Solea solea*

Only three *T. domerguei* specimens were found in stained slides. All morphological measurement were carried out of three specimens.

Trichodina domerguei (Figure 4C-D) is a large-sized species with body diameter 65–75 (70.6) µm. The adhesive disc 51–65 (58.6) µm in diameter and the centre of the adhesive disc of the specimens impregnated with silver nitrate is clear with numerous dark granules (Figure 4C). Adhesive disc surrounded by a border membrane of 4.0–5.0 (4.5) in width. Diameter of denticulate ring 35–45 (39.3) µm, number of denticles 23-29 and number of radial pins per denticle 9-10. Span of denticle 12–16 (15), length of denticle 9–11 (10.5) µm. Length of blade 7–9 (8) µm and it is broad and sickle-shaped, filling a large area between the y axes (Figure 5D). The distal margin of the blade is close to the border membrane (Figure 4C). Posterior blade margin is fairly curved. Blade apophysis is present (Figure 4D). The central part of denticle is well developed, but thin and long tapering to rounded point fitting tigthly into preceding denticle (Figure 4D). Rays is short, length of its 4-5 (4.7) µm and curved in posterior direction with tips extending beyond y axes (Figure 5D).

Trichodina domerguei is a cosmopolitan species and it has been reported to be one of the most widest distrubition with low specifitiy, able to infest variety of fish hosts living in freshwater, brackish and marine habitats (Lom 1970; Xu et al. 1999; Özer, 2003a; 2003b; Öztürk and Özer 2007; 2010). As can be seen from Table 1, it is one of the most frequently reported trichodinid species in our country. *Trichodina domerguei* has so far been reported from *Mullus barbatus ponticus* and *Merlangius merlangus* living marine habitat excluding hosts found in freshwater and brackishwater habitats (Table 1). This is the first report of the presence of *T. domerguei* on *Solea solea*.

Conclusion

The trichodinid ectoparasites of *S. maeoticus*, *S. solea*, *G. mediterraneus*, and *P. sanguinolentus* in Turkish Black Sea coasts firstly reported with this study. *Trichodina rectuncinata* is new record for Turkish parasite fauna, while *T. jadranica* and *T. domerguei* are parasite records for *Solea solea.* This paper is the first report on present of *T. ovonucleata* in *G. mediterraneus*, *P. sanguinolentus* and *S. maeoticus* hosts in Türkiye.

Compliance with Ethical Standard

Conflict of interests: The authors declare that for this article they have no actual, potential, or perceived conflict of interests.

Ethics committee approval: Ethics committee approval is not required for this study.

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