

***Oesophagotrema mediterranea* n. gen., n. sp.**
(Platyhelminthes, Digenea, Zoogonidae),
parasite of the needlefish *Tylosurus acus imperialis*
(Beloniformes, Belonidae) from off Tunisia

Manel CHAARI
Hela DERBEL
Lassad NEIFAR

Laboratoire de Biodiversité et Écosystèmes aquatiques,
Département des Sciences de la Vie, Faculté des Sciences de Sfax,
BP 1171, 3000 Sfax (Tunisie)
htchaari.m@gmail.com
h_derbel@yahoo.fr
lassad.neifar@fss.rnu.tn

Chaari M., Derbel H. & Neifar L. 2011. — *Oesophagotrema mediterranea* n. gen., n. sp. (Platyhelminthes, Digenea, Zoogonidae), parasite of the needlefish *Tylosurus acus imperialis* (Beloniformes, Belonidae) from off Tunisia. *Zoosystema* 33 (3): 281-286. DOI: 10.5252/z2011n3a2.

KEY WORDS
Platyhelminthes,
Digenea,
Zoogonidae,
Oesophagotrema
mediterranea n. gen, n. sp.,
vomer teeth,
Teleostei,
Belonidae,
parasite,
Tylosurus acus imperialis,
Tunisia,
new genus,
new species.

ABSTRACT

Oesophagotrema mediterranea n. gen., n. sp. (Digenea, Zoogonidae) is described from the needlefish *Tylosurus acus imperialis* (Beloniformes, Belonidae) off the Tunisian coast. *Oesophagotrema* n. gen. is distinguished from all other Lepidophyllinae genera by the combination of a prominent rounded ventral sucker, caeca reaching to the anterior edge of the posterior testis, testes arranged in tandem in the middle third of the hindbody and the vitellarium in symmetrical lateral bunches located between the ovary and anterior testis. This species shows a typical specific site of infection within the digestive tract, i.e., the oesophagus and vomer teeth. The position of this zoogonid digenean on the oesophagus is discussed.

RÉSUMÉ

Oesophagotrema mediterranea n. gen., n. sp. (Platyhelminthes, Digenea, Zoogonidae), parasite de la grande aiguille *Tylosurus acus imperialis* (Beloniformes, Belonidae) en Tunisie.

MOTS CLÉS
Platyhelminthes,
Digenea,
Zoogonidae,
Oesophagotrema
mediterranea n. gen, n. sp.,
dents vomériennes,
Teleostei,
Belonidae,
parasite,
Tylosurus acus imperialis,
Tunisie,
genre nouveau,
espèce nouvelle.

Oesophagotrema mediterranea n. gen., n. sp. (Digenea, Zoogonidae) est décrit chez la grande aiguille *Tylosurus acus imperialis* (Beloniformes, Belonidae) des côtes tunisiennes. *Oesophagotrema* n. gen. se distingue de tous les autres genres de Lepidophyllinae par une combinaison de caractères: ventouse ventrale arrondie et saillante, caeca intestinaux atteignant l'extrémité antérieure du testicule postérieur, des testicules arrangés en tandem dans le tiers moyen de l'espace post-acétabulaire et des vitellogènes latérales, symétriques, disposées en grappe entre l'ovaire et le testicule antérieur. Cette espèce montre une spécificité typique vis-à-vis du site d'infection, l'œsophage et les dents vomériennes. La position de ce Digène Zoogonidae dans l'œsophage est discutée.

INTRODUCTION

Tylosurus acus imperialis (Rafinesque, 1810) is a relatively localised belonid, restricted mainly to the Mediterranean Sea (Collette 2003). It is an epipelagic teleost marine fish occasionally caught off the Tunisian coast (south-western Mediterranean Sea) between May and July. As far as we are aware, this is the first report of the digenean fauna of this needlefish subspecies.

Recently, specimens of *T. a. imperialis*, collected during a parasitological survey of belonid fishes in Tunisian waters revealed the presence of four undescribed species of Digenea infecting different parts of the digestive tract. One of these species found in the oesophagus and on the vomer teeth was assigned to the Zoogonidae Odhner, 1902, but it could not be allocated to any of the recognized genera. In this paper, a new genus is proposed within this family to accommodate the species.

MATERIAL AND METHODS

Between May and July of 2006 to 2009, 87 specimens of *T. a. imperialis* were caught in the Mediterranean Sea off the coast of Tunisia. Specimens were identified using Bauchot (1987). Fishes were dissected and digestive tracts were examined. Digenean species were collected using a stereomicroscope under incident light. Living parasites were partially compressed beneath a slide and coverslip and examined using an optical microscope. Some parasites were slightly compressed between slide and coverslip and fixed in 70% alcohol or in Bouin's fluid. Fixed specimens were stained with Semichon's acetic carmine, dehydrated using a graded ethanol series then cleared in clove oil and mounted in Canada balsam.

Drawings and measurements were made using a light microscope equipped with drawing tube then scanned and redrawn on a computer with Corel Draw Software. All measurements are given in μm as: mean \pm standard deviation with the range and the number of measurements (n) in parentheses.

ABBREVIATIONS

BMNH The Natural History Museum, London;
MNHN Muséum national d'Histoire naturelle, Paris.

SYSTEMATICS

Family ZOOGONIDAE Odhner, 1902
Subfamily LEPIDOPHYLLINAE Stossich, 1903

Genus *Oesophagotrema* n. gen.

TYPE SPECIES. — *Oesophagotrema mediterranea* n. sp.

ETYMOLOGY. — The generic designation in part derives from the combination of the site of infection in the fish host, *oesophagus* in Latin, and *trema* for trematoda.

DIAGNOSIS. — Zoogonidae, Lepidophyllinae. Body fusiform. Tegument spinous, spines decreasing in number to posterior level of body. Oral sucker globular, subterminal. Ventral sucker prominent, rounded, with mid-ventral aperture and small papillae. Prepharynx short. Pharynx oval. Oesophagus elongate, with slightly thickened wall. Intestinal bifurcation in posterior forebody. Caeca long, reaching anterior edge of posterior testis. Testes 2, oval to subspherical, tandem, postequatorial in middle third of hindbody. Cirrus sac claviform, curved, extending to intestinal bifurcation. Internal seminal vesicle sacular. Pars prostatica short, narrow. Ejaculatory duct straight. Genital pore in sinistral submarginal forebody, at level of pharynx. Ovary subspherical pretesticular, in hindbody. Seminal receptacle immediately postovarian, ovoid elongate. Vitellaria follicular, in two symmetrical lateral bunches, 9 follicles on poral side, 8 on antiporal side, between ovary and anterior testis. Eggs small, tanned and operculate. Excretory pore terminal. Parasitic in oesophagus and on vomer teeth of *T. a. imperialis* (Belonidae).

Oesophagotrema mediterranea n. sp.
(Figs 1; 2)

TYPE MATERIAL. — Holotype: MNHN HEL 199 Tf 218. Paratypes: MNHN HEL 200 Tf 219, HEL 201 Tf 220, HEL 202 Tf 221, HEL 203 Tf 222, HEL 204 Tf 223; BMHN NHMUK 2011.4.4.1-5.

TYPE HOST. — *Tylosurus acus imperialis* (Rafinesque, 1810) (Beloniformes, Belonidae).

TYPE LOCALITY. — Coast of Sfax, Tunisia (34°46'N, 10°48'E).

OTHER LOCALITIES. — Kerkennah (34°45'N, 11°17'E), Skhira (34°18'N, 10°10'E), Mahdia (35°30'N, 11°4'E), Chebba (35°13'N, 11°8'E), Jideriyah (33°21'N, 11°09'E).

SITE OF INFECTION. — Oesophagus, vomer teeth.

PREVALENCE. — 10.34% (9/87).

MEAN INTENSITY. — 7.11 (64/9).

MEAN ABUNDANCE. — 0.73 (64/87).

DESCRIPTION

Based on 14 whole mounted specimens. Body fusiform, longer than wide, 2481 ± 159 (2000-3050; $n = 13$) long by 759 ± 51 (550-875; $n = 14$) wide at level of ventral sucker; length/width ratio 1:3.28 (1:2.66-4.36; $n = 13$). Body surface covered with spines that decrease in number from anterior to posterior end of body. Oral sucker globular 172 ± 15 (105-200; $n = 13$) by 184 ± 13 (150-230; $n = 13$), subterminal. Ventral sucker prominent, undivided, 377 ± 19 (320-450; $n = 14$) by 362 ± 26 (290-440; $n = 14$), with mid-ventral aperture and small papillae on lips. Oral/ventral sucker ratio 1:2.21 (1.71-1.64; $n = 13$) length by 1:1.94 (1.64-2.34; $n = 13$) width. Forebody 630 ± 98 (300-1000; $n = 14$) occupies $26 \pm 2\%$ (19-33%; $n = 13$) of body length. Prepharynx short, 36 ± 8 (20-50; $n = 8$) long. Pharynx oval, 130 ± 6 (120-155; $n = 11$) by 104 ± 8 (80-135; $n = 12$). Oesophagus elongate, with slightly thickened wall, 152 ± 28 (75-220; $n = 10$) long. Intestinal bifurcation in posterior quarter of forebody. Caeca blind, ending at beginning of posterior third of body. Testes 2 oval to subspherical, tandem to slightly oblique, postequatorial in middle third of hindbody; anterior testis 278 ± 27 (225-400; $n = 11$) by 354 ± 42 (200-450; $n = 12$); posterior testis 291 ± 40 (235-425; $n = 8$) by 344 ± 56 (270-475; $n = 8$); post-testicular space $21 \pm 3\%$ (10-29%; $n = 11$) of body length. Cirrus-sac elongated, curved, claviform, 287 ± 24 (225-365; $n = 12$) by 93 ± 10 (50-115; $n = 12$) in maximum width; cirrus-sac overlapping dorsally intestinal bifurcation. Seminal vesicle saccular, oval, undivided. Pars prostatica short, narrow. Ejaculatory duct straight and opening in genital atrium. Genital pore ventral, in sinistral submarginal forebody, at level of pharynx. Ovary subspherical, in anterior hindbody, pretesticular, 159 ± 23 (110-200; $n = 9$) by 175 ± 16 (140-220; $n = 10$). Oviduct connected to seminal receptacle, to common vitelline duct and surrounded by developed

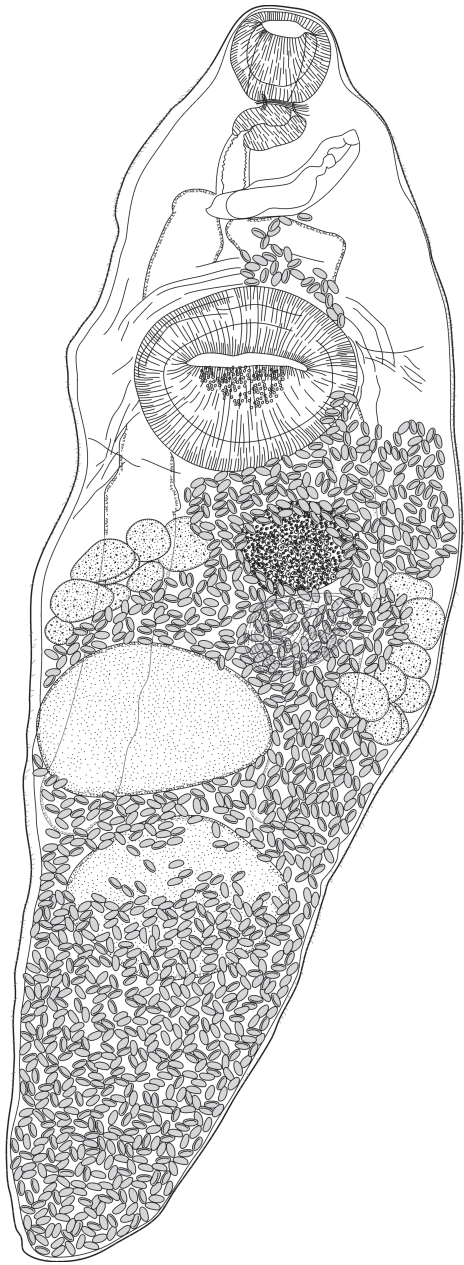


FIG. 1. — *Oesophagotrema mediterranea* n. gen., n. sp., composite drawing of whole worm (ventral view). Scale bar: 500 μ m.

Mehliss' gland. Seminal receptacle immediately postovarian, ovoid, elongate, 188 ± 43 (150-225; $n = 3$) by 110 ± 34 (80-140; $n = 3$). Laurer's canal

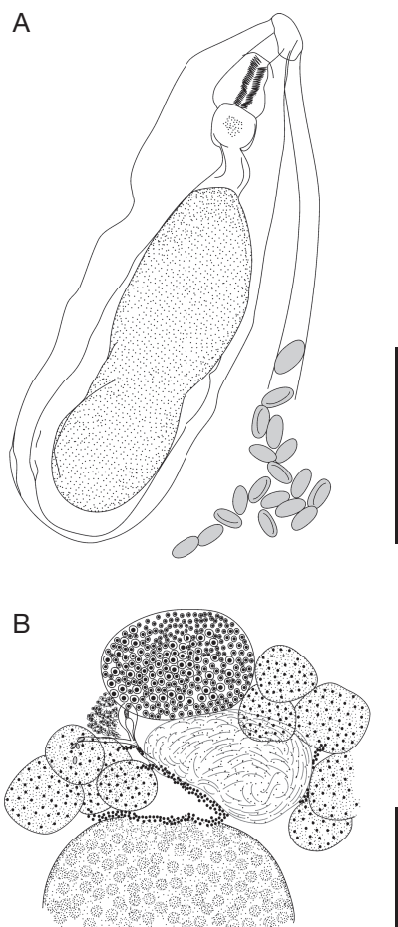


FIG. 2. — *Oesophagotrema mediterranea* n. gen., n. sp.: **A**, terminal genitalia; **B**, proximal female system. Scale bars: A, 100 µm; B, 200 µm.

not seen. Vitelline follicles in two symmetrical lateral bunches, 9 on poral side, 8 on antiporal side; extending between ovary and anterior testis. Uterine duct occupying all inter- and posttesticular spaces ventrally, looping dorsally in forebody region. Eggs small, 35 ± 2 (30-40; n = 15) by 21 ± 1 (20-25; n = 15), tanned and operculate.

DISCUSSION

According to the description above, our specimens are placed in the family Zoogonidae, on the basis of a

spinous body surface, a submarginal sinistral genital pore, a pretesticular ovary and an uterus reaching to the posterior extremity. By having the vitellarium follicular in paired fields and the eggs tanned, this species belongs to the subfamily Lepidophyllinae. Within this subfamily, 21 valid genera are now recognized (Bray 2008; Jezewski *et al.* 2009).

Oesophagotrema n. gen. can be distinguished from all other Lepidophyllinae genera by the following combination of diagnostic characteristics: prominent rounded ventral sucker, caeca reaching to the anterior edge of the posterior testis and the testes in tandem in the middle third of hindbody.

Comparison of the genera in the subfamily Lepidophyllinae reveals that a few genera bear a resemblance to *Oesophagotrema* n. gen. in having narrow caeca reaching well into the hindbody or to the restriction of the testes and vitellarium to the hindbody. They are: *Steganoderma* Stafford, 1904, *Lecithostaphylus* Odhner, 1911 and *Prosteganoderma* Hassanine, 2007. *Steganoderma* clearly differs in possessing a sessile ventral sucker and symmetrical or oblique testes. In species of *Lecithostaphylus* the ventral sucker is pedunculate, the vitelline fields are lateral in symmetrical fields and the testes are symmetrical or oblique. The type and only species of *Prosteganoderma*, *P. brayi* Hassanine, 2007, is easily distinguished by a large prominent fleshy fold of the body wall around the ventral sucker, a pre-testicular uterus winding between ovary and testes and the symmetrical testes (Hassanine 2007).

By having testes in tandem, *Oesophagotrema* n. gen. also resembles the type and only species of *Whitegonimus*, *W. ozoufae* Jezewski, Zdzitowiecki & Laskowski, 2009, described from sub-Antarctic fish. However, the 2 symmetrical lateral vitelline fields of *Whitegonimus* extend from the anterior part of the ventral sucker to the posterior margin of the anterior testis and the caeca reaching to the mid-level of the posterior testes (Jezewski *et al.* 2009). *Whitegonimus* is mainly different to the three genera cited above by having the vitelline fields just reaching the forebody, in addition to the tandem testes.

We found that *O. mediterranea* n. gen., n. sp. shows strict specificity for infection sites, the oesophagus and the vomer teeth. Other unde-

scribed species of Digenea were also found in others parts of the digestive tract: *Lecithostaphylus* sp. and *Sclerodistomum* sp. from the anterior part of the intestine and *Sclerodistomoides* sp. from the gall bladder. This diversity may be attributable to the ecological characteristics of the host's migratory behaviour. Members of *T. a. imperialis* occur in coastal water during the period between spring and summer and leave the coasts for the remainder of the year (Froese & Pauly 2010). This behaviour, therefore, induces dietary variation associated with variations in the ingestion of intermediate hosts needed for the life cycle of most endoparasites. Moreover, the large size of the host is also considered an important factor for species diversity of parasites (Munoz & Cribb 2005).

The oesophagus of fishes has been reported as an infection site of Digenea on several occasions. Muruges & Madhavi (1995) redescribed specimens of the didymozoid *Didymocystis dissimilis* Yamaguti, 1938 from inner surface of the oesophagus of the scombrid fish *Katsuwonus pelamis* in Bay of Bengal. This species was first described from the oesophagus and stomach of the scombrid fish *Euthynnus pelamis* from Hawaii, and later transferred to the genus *Oesophagocystis* Yamaguti, 1970. Muruges & Madhavi (1995) considered *Didymocystis* and *Oesophagocystis* synonymous, but *Oesophagocystis* is considered valid by Pozdnyakov & Gibson (2008).

Chambers *et al.* (2001) described the hemiurid *Lecithocladium invasor* Chambers, Carlisle, Dove & Cribb, 2001 (Digenea, Hemiuridae) from the oesophagus of the acanthurid fish *Naso annulatus*, *N. tuberosus* and *N. vlamingii* off eastern Australia.

Digenea in the oesophagus have also been reported from snakes and birds. For example, Yamaguti (1933) described the opisthorchiid *Oesophagicola laticaudae* Yamaguti, 1933 from the oesophagus of the sea snake *Laticauda laticauda* off Japan. Matthews & Cribb (1998) mentioned that adult worms of the family Clinostomidae Lühe, 1901 reside typically in the mouth cavity or oesophagus of ardeiform birds, cormorants and pelicans. The Clinostomidae is a major family of trematodes of fish-eating water birds (Matthews & Cribb 1998).

Oesophagotrema mediterranea n. gen., n. sp. is the first report of a member of the family Zoogonidae in the oesophagus of its fish host.

Acknowledgements

We are grateful to Dr R. A. Bray for useful comments and linguistic revision. We want also to thank the referees and the Editor for valuable comments on the manuscript.

REFERENCES

- BAUCHOT M. L. 1987. — Méditerranée et Mer Noire, Zone de pêche 37, in FISHER W., BAUCHOT M. L. & SCHEINDER M., *Poissons osseux*, Fiches FAO d'Identification des Espèces pour les Besoins de la Pêche. Vertébrés, Vol. 2. FAO, Rome: 976-980.
- BRAY R. A. 2008. — Family Zoogonidae Odhner, 1902, in BRAY R. A., GIBSON D. I. & JONES A. (eds), *Keys to the Trematoda*. Volume 3. CAB International and Natural History Museum, Wallingford: 605-629.
- CHAMBERS C. B., CARLISLE M. S., DOVE A. D. M. & CRIBB T. H. 2001. — A description of *Lecithocladium invasor* n. sp. (Digenea: Hemiuridae) and the pathology associated with two species of Hemiuridae in acanthurid fish. *Parasitology Research* 87: 666-673.
- COLLETTE B. B. 2003. — Family Belonidae Bonaparte, 1832: needlefish. *California Academy of Sciences Annotated Checklists of Fish* 16: 1-22.
- FROESE R. & PAULY D. 2010. — *Fishbase*. World Wide Web electronic publication, www.fishbase.org, version 09/2010.
- HASSANINE R. M. E.-S. 2007. — Trematodes from Red Sea fishes: *Prosteganoderma brayi* gen. nov., sp. nov. (Zoogonidae Odhner, 1902) and *Forticulcita mugilis* sp. nov. (Haploporidae Nicoll, 1914). *Helminthologia* 44: 183-187.
- JEZEWSKI W., ZDZITOWIECKI K. & LASKOWSKI Z. 2009. — Description of a new digenean (Zoogonidae) genus and species from sub-antarctic fish *Patagonotothen tessellata*. *Journal of Parasitology* 95 (6): 1489-1492.
- MATTHEWS D. & CRIBB T. H. 1998. — Digenetic trematodes of the genus *Clinostomum* Leidy, 1856 (Digenea: Clinostomidae) from birds of Queensland, Australia, including *C. wilsoni* n. sp. from *Egretta intermedia*. *Systematic Parasitology* 39: 199-208.
- MUNOZ G. & CRIBB T. H. 2005. — Parasite communities and diet of *Coris batuenensis* (Pisces: Labridae) from Lizard Island, Great Barrier Reef. *Memoirs of the Queensland Museum* 52: 191-198.
- MURUGESH M. & MADHAVI R. 1995. — Some new and

- known species of the genus *Didymocystis* Ariola, 1902 (Trematoda: Didymozoidae) from Scombrid fishes of the Visakhapatnam coast, Bay of Bengal. *Systematic Parasitology* 31: 11-24.
- POZDNYAKOV S. E. & GIBSON D. I. 2008. — Family Didymozoidae Monticelli, 1888, in BRAY R. A., GIBSON D. I. & JONES A. (eds), *Keys to the Trematoda*. Volume 3. CABI Publishing and the Natural History Museum, Wallingford: 631-734.
- YAMAGUTI S. 1933. — Studies on the helminth fauna of Japan. Part 1. Trematodes of birds, reptiles and mammals. *Japanese Journal of Zoology* 5: 1-134.

*Submitted on 8 December 2010;
accepted on 21 March 2011.*