

**WARDULA SARGUICOLA N. SP. (DIGENEA, MESOMETRIDAE),
A RECTAL PARASITE OF *DIPLODUS SARGUS*
(TELEOSTEI, SPARIDAE)
IN THE WESTERN MEDITERRANEAN**

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SUMMARY. *Wardula sarguicola* n. sp. is reported from the rectum of *Diplodus sargus* off the western coast of Corsica (the Scandola Nature Reserve). It is the only mesometrid species which has been recorded from a fish other than *Sarpa salpa*. Among the numerous features which distinguish *W. sarguicola* n. sp. from *W. capitellata* (Rud.), the type and only other species of the genus, we draw special attention to its smaller size, the absence of buccal ridges within the oral sucker, the presence of uterine coils between the gonads and even posterior to the ovary, a well-developed prostatic sac and a genital pore remote from the oral sucker.

Key-words: *Wardula*. Mesometridae. Digenea. *Diplodus*. Mediterranean.

***Wardula sarguicola* n. sp. (Digenea, Mesometridae), parasite rectal de *Diplodus sargus* (Teleostei, Sparidae) de Méditerranée occidentale.**

RÉSUMÉ. *Wardula sarguicola* n. sp. a été trouvé dans le rectum de *Diplodus sargus*, sur la côte occidentale de la Corse (Réserve Naturelle de Scandola). C'est le seul Mésométridé qui soit signalé chez un poisson autre que *Sarpa salpa*. Parmi les nombreux caractères qui distinguent *W. sarguicola* n. sp. de *W. capitellata*, la seule espèce qui existait dans ce genre, nous retenons essentiellement sa plus petite taille, l'absence de crêtes buccales dans la ventouse orale, la présence de boucles utérines entre les différentes gonades ainsi qu'en arrière de l'ovaire, une poche prostatique bien individualisée et un orifice génital éloigné de la ventouse orale.

Mots-clés : *Wardula*. Mesometridae. Digenea. *Diplodus*. Méditerranée.

Introduction

The Mesometridae Poche, 1926 is a family of monostome digenean parasites of marine teleosts. This family is a very discrete unit, containing only five species. These are divided among four genera: *Mesometra* Lühe, 1901, *Centroderma* Lühe,

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1901, *Wardula* Poche, 1926 and *Elstia* Bray, 1984. Despite its size, the Mesometridae has been the subject of numerous studies, such as those of Stossich (1883), Monticelli (1892), Lühe (1901), Timon-David (1937), Palombi (1937, 1952), Dollfus (1947), Orecchia and Paggi (1964), Paggi and Orecchia (1964), Bray (1984) and Bartoli (1987). One unique feature of the mesometrids is that they have been believed to be parasitic exclusively in a single fish species¹, the herbivorous sparid *Sarpa salpa*.

During the course of our studies of the digenean parasites of sparid teleosts off the Scandola Nature Reserve in Corsica, we discovered a new species of mesometrid which differs from all other species in this family in that it is not a parasite of *Sarpa salpa* but of the carnivorous sparid *Diplodus sargus*. The following is a study of this new form.

Materials and methods

The parasites were collected alive from their host, immediately relaxed in Hypnodil (metomidate) and then fixed in Bouin-Hollande fluid on a slide under coverslip pressure. The specimens were stained in Grenacher's borax carmine and mounted in Canada balsam.

The drawings were made with the aid of a drawing apparatus, and the measurements are given in micrometres as the range followed by the mean in parentheses.

The type-specimens are deposited in the British Museum (Natural History). Registration numbers: holotype 1988.2.24.1, paratypes 1988.2.24.2-4.

Description

MATERIAL STUDIED: Five ovigerous worms.

GENERAL MORPHOLOGY

Body very elongate with parallel sides and regularly rounded extremities; dorso-ventrally flattened, rendering worm relatively transparent and delicate in appearance. Entire anterior quarter of worm slightly concave ventrally; concavity forms antero-ventral organ of attachment. In some specimens slight constriction of body occurs laterally at level of junction between attachment organ and remainder of body.

1. Yamaguti (1971) listed *Wardula capitellata* (Rud., 1819) as occurring in the mackerel *Scomber scombrus*, but did not indicate the source of his data. We have managed to trace two 19th Century records in this host to Kroyer (1938-1940) and Diessing (1850) and consider it very likely that these were misdeterminations.

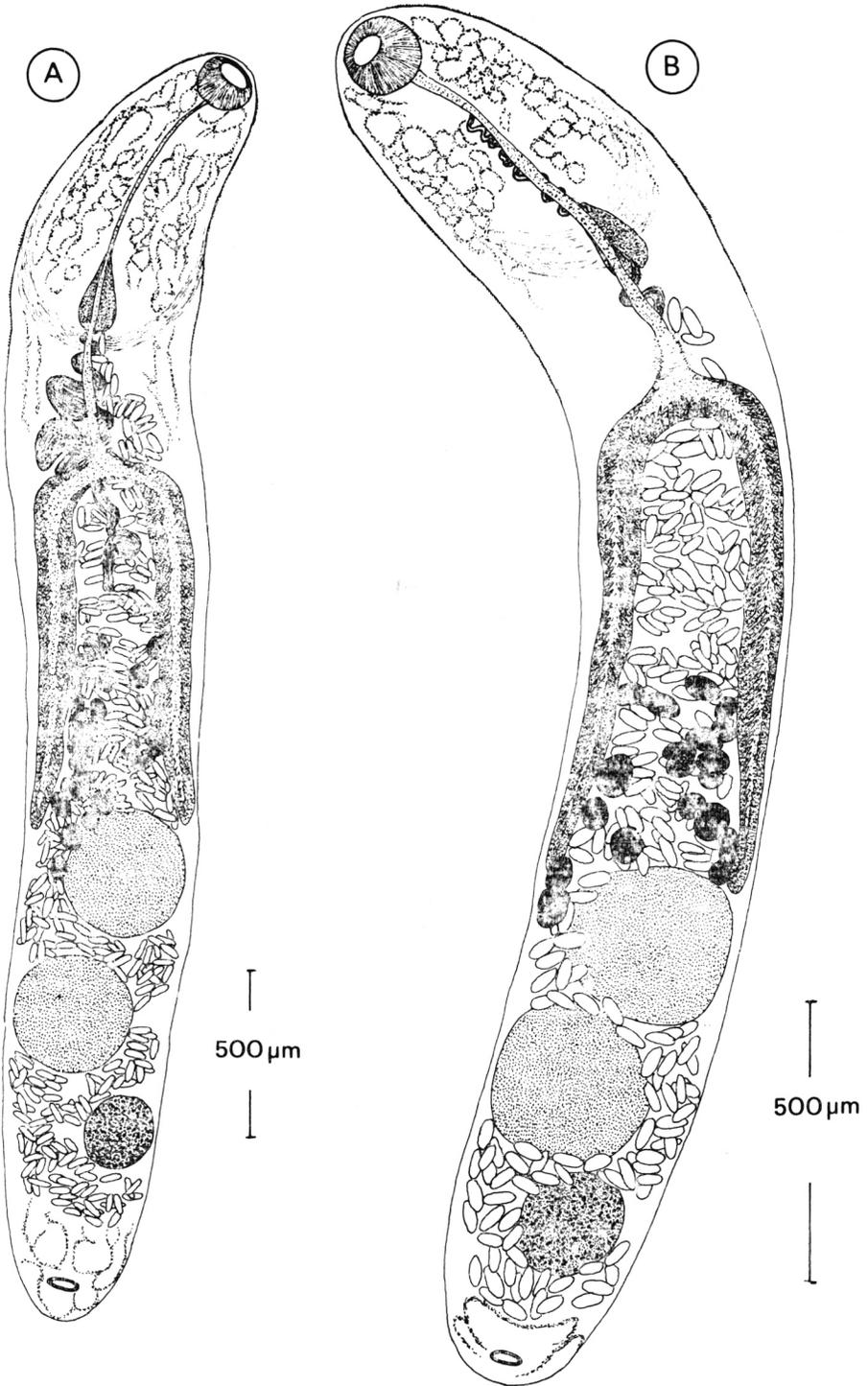


FIG. 1. — *Wardula sarguicola* n. sp. from the rectum of *Diplodus sargus* off Scandola, Corsica.
A. Holotype, dorsal view. B. Paratype, dorsal view.

MUSCULATURE

At level of attachment organ lateral regions of body are traversed by network of longitudinal muscle fibres; these follow margin of attachment organ and gradually curve inwards as they run posteriorly, then pass transversely and unite medially. Attachment organ presumably functions as sucker.

TEGUMENT

Body spinous over entire surface. Spines in pharyngeal region dense and squat; mean length about 10 μm ; at level of intestinal caeca slightly less densely distributed, thicker and longer (16 μm); at level of testes more sparsely distributed, more delicate and shorter (11 μm); in post-testicular region even more sparsely distributed but no shorter.

EYE-SPOTS

Fragmented eye-spots in form of numerous pigmentary granules present throughout parenchyma of prepharyngeal region (*Fig. 2 a*).

SUCKER

Oral sucker terminal or slightly ventrally subterminal and regularly rounded. Buccal aperture ventral. Buccal cavity lacks sclerified denticular ridges. Ventral sucker absent.

DIGESTIVE SYSTEM

Oral sucker opens into extremely long, narrow prepharynx (*Fig. 2 a*). Anterior half of prepharynx with relatively thick wall; posterior half with wider lumen and walls containing longitudinal muscle fibres. Pharynx (sometimes referred to as « œsophageal bulb ») at posterior extremity of prepharynx beyond slight constriction; wall thick; distinguished from longitudinal muscles of prepharynx by numerous distinct circular muscle fibres. Numerous small gland-cells surrounding periphery of pharynx visible in some preparations. Oesophagus absent. Intestinal caeca two, voluminous, without anteriorly oriented diverticula in « shoulder »-region; pass back close to sides of body, narrowing gradually towards extremities; end blindly at level of anterior margin of anterior testis; wall thick because of presence of numerous villous projections which also fill much of caecal lumen.

MALE REPRODUCTIVE SYSTEM

Testes occupy anterior part of posterior third of body; globular, entire, median, tandem or slightly oblique—in latter case anterior testis is more dextral and posterior more sinistral; never contiguous, always separated by loops of uterus. Vasa efferentia emerge from anterior border of testes, that of anterior testis being very

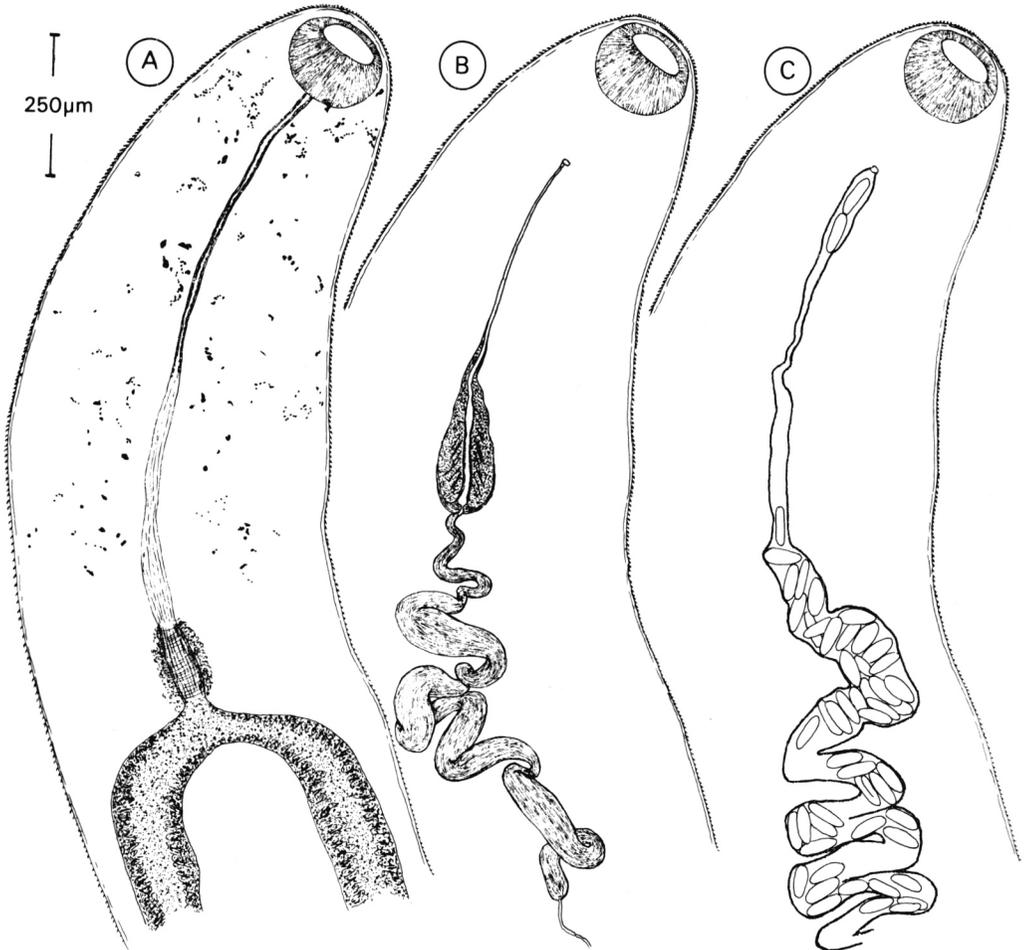


FIG. 2. — *Wardula sarguicola* n. sp. from the rectum of *Diplodus sargus* off Scandola, Corsica. Holotype, dorsal view. A. Digestive system (in dorsal plane). B. Male terminal genitalia (in a more ventral plane). C. Female terminal genitalia (in a ventral plane). The pigmentary granules of the eye-spots were present throughout the anterior part of the body but are only included in illustration A.

short as it soon unites with longer duct from posterior testis. Vas deferens sinuous; passes forward medially; just anterior to anterior limit of vitelline follicles swells to form seminal vesicle. Seminal vesicle external; long, tubular, strongly convoluted in median field (Fig. 2 b); tapers towards distal extremity. Pars prostatica occurs at level close to posterior limit of antero-ventral attachment organ. Gland-cells of pars prostatica enclosed in pyriform, muscular prostatic sac; anterior region of sac tapers and leads into long, narrow, tubular ejaculatory duct. Cirrus absent. Genital atrium virtually absent. Genital pore mid-ventral and distinctly posterior to posterior margin of oral sucker (Fig. 2 c).

FEMALE REPRODUCTIVE SYSTEM

Ovary spherical, entire; situated posterior to posterior testis and separated from it by loops of uterus; dextrally submedian or occasionally median. Oocytes large. Oviduct receives Laurer's canal, which appears to be blind, then efferent duct of vitelline reservoir (*Fig. 3*). Mehlis' gland and ootype posterior to ovary. Proximal region of uterus is full of spermatozoa, forming uterine seminal receptacle. Uterine loops fill much of post-ovarian field; then pass anteriorly on left side of body and cross to right between ovary and posterior testis; subsequently they pass between testes to return to left side of body; in pre-testicular region coils are entirely inter-caecal; in prepharyngeal region uterus becomes more or less straight (*Fig. 2 c*) and its diameter diminishes gradually until it is reduced to that of a single egg. Metraterm absent. Vitellarium follicular; follicles number about 30; situated in dorsal and ventral fields, occupying posterior part of inter-caecal region. Common vitelline duct very long, running posteriorly on right side of body to post-ovarian region where it enlarges to form vitelline reservoir (*Fig. 3*).

EXCRETORY SYSTEM

Not studied in live material, but in whole-mounts excretory system was clearly of reticular type. Excretory pore wide, dorsally subterminal.

DIMENSIONS

These measurements are based upon five adults:

Length of body	2,231-4,038	(3,060)
Breadth of body	319- 638	(468)
Prepharyngeal region	511-1,169	(839)
Postpharyngeal region	1,412-2,933	(2,063)
Oral sucker	98-165 × 93-173	(132 × 137)
Prepharynx	506- 999	(735)
Pharynx	109-152 × 76- 96	(126 × 85)
Distance between oral sucker and genital pore	54- 132	(90)
Anterior testis	245-394 × 245-378	(291 × 300)
Posterior testis	229-362 × 213-368	(292 × 285)
Prostatic sac	109-239 × 63-100	(167 × 81)
Ovary	144-213 × 149-213	(175 × 179)
Eggs	65- 78 × 24- 35	(71 × 28)
Length of attachment organ	630- 960	(764)
Pre-testicular region	1,470-2,550	(1,913)
Post-testicular region	309-1,039	(571)
Post-ovarian region	171- 656	(336)
Body-length/attachment organ ratio	1 : 0.22-0.29	(1 : 0.25)
Body-length/pre-testicular region ratio	1 : 0.61-0.65	(1 : 0.63)

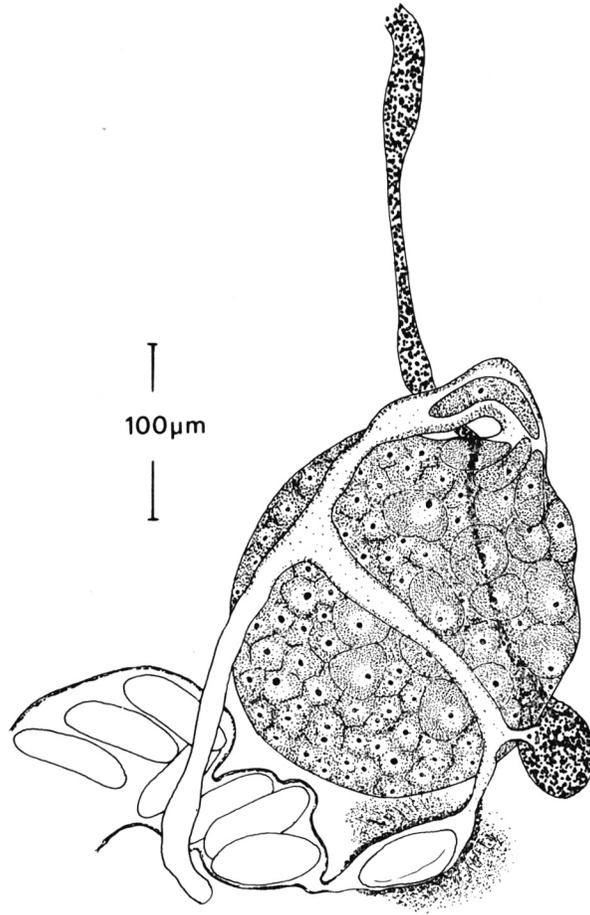


FIG. 3. — *Wardula sarguicola* n. sp. from the rectum of *Diplodus sargus* off Scandola, Corsica. Holotype, dorsal view. Proximal female reproductive system.

Aspects of ecology

DEFINITIVE HOST: *Diplodus sargus* (L.) (Sparidae).

MICROHABITAT: Rectum.

OCCURRENCE:

Prevalence: 4 of 31 fish examined (12.9 %).

Abundance: 0.16.

Mean intensity: 1.66.

DISTRIBUTION: Found so far only off the Scandola Nature Reserve (west coast of Corsica). If this parasite is restricted to *D. sargus*, then its distribution will be limited to the Mediterranean basin.

Systematic position

The species which we have described above belongs to the family Mesomertridae Poche, 1926. The diagnostic features of this family were given by Yamaguti (1971) and recently modified by Bartoli (1987). They are as follows:

Ventral sucker absent; tegument spinous; eye-spots present; excretory system reticulate; ventral concavity of anterior region of body or entire body forming organ of attachment; pharynx (« œsophageal bulb ») present; prepharynx very long; cirrus-sac absent; seminal vesicle free in parenchyma, long, tubular, convoluted; genital pore median and very anterior; ovary post-testicular, situated close to posterior extremity of body; vitellarium follicular; uterus median; uterine seminal receptacle present; metraterm absent.

This species of parasite from *Diplodus sargus* must be allocated to the sub-family Wardulinae Paggi and Orecchia, 1964 due to the following characters:

Body elongate; caeca close to sides of body, not reaching close to posterior extremity; testes in tandem; number of vitelline follicles small; uterus intercaecal.

The species which we have described belongs to the only genus of the Wardulinae, namely *Wardula* Poche, 1926, which until now has been considered monotypic, containing only the type-species *W. capitellata* (Rudolphi, 1819). This new species, which we are calling *W. sarguicola*, is distinguished from *W. capitellata* by its smaller dimensions, the different definitive host and microhabitat and above all in various features of the following organ-systems (cf. Bartoli, 1987).

ATTACHMENT ORGAN. This is less powerful in *W. sarguicola* n. sp., since it is limited to only about one quarter of the length of the body. In *W. capitellata* it approaches half of the body-length.

SUCKER. The oral sucker of *W. sarguicola* n. sp. lacks buccal ridges with sclerified denticles.

DIGESTIVE SYSTEM. The œsophagus is absent in *W. sarguicola* n. sp., and the intestinal caeca are both shorter and lack anterior diverticula in the « shoulder »-region.

MALE REPRODUCTIVE SYSTEM. The testes of *W. sarguicola* n. sp. lie well apart from the posterior extremity of the body and are not contiguous. The seminal vesicle is not totally post-bifurcal. A prostatic sac is present.

FEMALE REPRODUCTIVE SYSTEM. The ovary of *W. sarguicola* n. sp. is not terminal, since uterine loops occur in the post-ovarian region. Uterine loops also occur between the ovary and the posterior testis and between the testes. The vitelline follicles are few in number and almost exclusively inter-caecal. The genital pore is not contiguous with the posterior margin of the oral sucker.

Final comments

The species which we have described can be accommodated in the family Mesometridae and the genus *Wardula*. It differs in numerous characters from the single previously known species of this genus. *W. sarguicola* n. sp. is the only species of mesometrid which parasitizes a fish other than the herbivorous teleost *Sarpa salpa*. In addition, all other mesometrids possess on the internal surface of the oral sucker (buccal cavity) two ridges bearing a large number of sclerified denticles (Bartoli, 1987). These unusual structures have been interpreted as microfilters which prevent the entry into the digestive system of fibrous vegetable material which abounds among the gut-contents of the host. These multi-denticulate ridges do not occur in *W. sarguicola* n. sp. Their absence in this trematode is probably due to the very different nature of the contents of the rectum of its carnivorous host.

All mesometrids lack a ventral sucker (and have thus been referred to as « monostomes »). They have, however, developed an alternative type of attachment organ which permits them to maintain their position effectively on the relatively smooth mucous membrane lining the intestinal wall of *Sarpa salpa* (see Bartoli, 1987). Part of the ventral surface or in some cases its entirety has been transformed into a sucker-like concavity. In contrast to the gut lining of *S. salpa*, the rectal mucosa of *Diplodus sargus* is endowed with numerous distinct villous projections. The irregular surface of this microhabitat reduces the efficiency of this type of attachment organ, such that its ability to function effectively is much reduced. This means that in order to maintain its position in the host the parasite is obliged to take refuge at the base of the villous projections amongst which it is able to retain its position. *W. sarguicola* n. sp. is consequently a parasite which would appear to be poorly adapted to the physical nature of the microhabitat in which it lives. The retention of the antero-ventral concavity, along with its apparent scarcity and local distribution suggest that this species has been only recently derived from a form found in *Sarpa salpa*.

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