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ENDOHELMINTHS OF A SNAKE MACKEREL, *GEMPYLUS SERPENS* (TRICHIUROIDEA: GEMPYLIDAE), FROM THE GULF OF MEXICO

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ABSTRACT: Endohelminths are reported from a female snake mackerel, *Gempylus serpens* (Trichiuroidea: Gempylidae), captured from a depth of 61 m in the Gulf of Mexico 140 km south of the mouth of Mobile Bay, AL, in August 1998. A diverse endohelminth parasite fauna was found: 29 plerocercoid type I tetraphyllideans from the lower intestine; 4 didymozoid metacercariae allocated to the collective group *Monilicaecum* and one didymozoid metacercaria of the collective group *Torticaecum* from the pyloric cecum; one juvenile *Gonocerca phycidis* from the stomach; and 5 larvae (L3 stage) comprising 3 species of *Anisakis* from the pyloric cecum. These nematodes were identified as species of *Anisakis* due to the presence of an oblong ventriculus lacking an appendix, no intestinal cecum or interlabia, 3 lips with dentigerous ridges, and an excretory pore located between the lateroventral lips. Differences in overall size and in the lengths of the ventriculus and esophagus in relation to total body length were used to distinguish the 3 species of *Anisakis* collected. Seven specimens of a possibly unnamed species of parasitic copepod representing *Bomolochus* infected the gill chamber. Stomach contents included 6 early-juvenile flatfish (Pleuronectiformes). All of the helminths are measured and illustrated, and for some of the parasites recovered, we are unaware of any reports from this host species.

INTRODUCTION

The snake mackerel, *Gempylus serpens* Cuvier (Trichiuroidea: Gempylidae), is the sole member of *Gempylus* Cuvier, representing one of 16 genera within Gempylidae (Nakamura and Parin 1993, Nelson 2006, Froese and Pauly 2009). Like many gempylids, *G. serpens* reportedly is a cosmopolitan, solitary, meso– or bathypelagic fish that ranges in tropical and subtropical seas to 600 m (Nakamura 1990, Nakamura and Parin 1993, Froese and Pauly 2009). *Gempylus serpens* exhibits diel vertical migration and feeds on fishes (myctophids, exocoetids, sauries, scombrids), squids, and crustaceans (Nakamura and Parin 1993). The species sporadically appears as bycatch in the tuna longline fishery, but there is reportedly no directed fishery for *G. serpens* (Nakamura and Parin 1993).

Prior to this study, only 5 parasite species have been reported from *G. serpens* (Table 1). As *G. serpens* is neither sought after nor kept by fishermen and there are no reports of parasites of *G. serpens* from the Gulf of Mexico, the purpose of this study was to survey the parasites of a snake mackerel captured in the Gulf of Mexico.

MATERIALS AND METHODS

A mature female *G. serpens* was obtained at a fishing tournament in Destin, FL, and examined for metazoan parasites. The fish was captured 1 August 1998 from 140 km south of Mobile Bay, AL, (29°00'N, 87°50'W; time of capture = 0400 h; depth of fish = 61 m; total length = 78.5 cm; weight = 452.6 g) and placed on ice for 2 days until necropsy and removal of parasites in the laboratory. While fixation of worms *in situ* is not ideal, we found that the quality of the specimens was good and features of taxonomic importance could easily be identified. Platyhelminths were stained in Van Cleave's hematoxylin, dehydrated in a graded ethanol (EtOH) series, cleared in clove oil, and mounted in Canada balsam. Nematodes were cleared in a solution of 5 parts glycerin with 95 parts 70% EtOH, and mounted in glycerin jelly. Copepods were placed in 70% EtOH. Drawings were made with the aid of a drawing tube. Measurements are in micrometers (µm), except where indicated in the text, and the mean followed by range and number of measurements (n) follow in parentheses where appropriate. Identification of the fish was based on Nakamura and Parin (1993) and fish systematics and taxonomic authorities follow FishBase 2009 (Froese and Pauly 2009). Endohelminths were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), University of Nebraska–Lincoln, Lincoln, NE, USA.

RESULTS AND DISCUSSION

We observed 6 early juvenile flatfish (Pleuronectiformes) in the stomach of the snake mackerel; 4 partially digested with lengths of 1.8 cm, 1.9 cm, 2.2 cm, and 2.8 cm and 2 almost completely digested with lengths of 1.8 cm and 2.0 cm, respectively. Small pieces of unidentifiable debris and tissue, including 1 vertebra, were also removed from the stomach.

TABLE 1. *Records of parasites from the snake mackerel,* Gempylus serpens Cuvier, *1829.*

Parasite	Infection Site	Locality	References
Cestoda			
Plerocercoid type I tetraphyllideans	Lower intestine	Northern Gulf of Mexico	Present study
Digenea			
Didymozoid metacercaria type I [collective group type *Monilicaecum*]	Pyloric cecum	Northern Gulf of Mexico	Present study
Didymozoid metacercaria type II [collective group type *Torticaecum*]	Pyloric cecum	Northern Gulf of Mexico	Present study
Dinurus barbatus (Cohn, 1902)	Stomach	Indian Ocean, SW Pacific Ocean off NW Australia	Korotaeva and Koryakovtseva 1983
Gonocerca phycidis Manter, 1925 juvenile	Stomach	Northern Gulf of Mexico	Present study
Acanthocephala			
Bolbosoma heteracanthe larvae (Heitz, 1920)	Body cavity & internal organs	E & W Equatorial Pacific Ocean	Kovalenko 1981, Klimpel et al. 2001
Gorgorhynchus robertdollfusi Golvan 1956	Small intestine	Port-Etienne, Mauritania	Golvan 1956, Yamaguti 1963a, Golvan and Houin 1964, Kovalenko 1981, Vassiliadès 1985
Nematoda			
Anisakis larvae type I	Body cavity & internal organs	Philippine Sea	Bagrov 1982
Anisakis sp. 1, 2, 3	Mesenteries, pyloric cecum	Northern Gulf of Mexico	Present study
Copepoda			
Bomolochus sp.	Gill chamber	Northern Gulf of Mexico	Present study
Sarcotretes gempyli (Horst, 1878)	Penetrating outer body wall	Unknown*	Horst 1878, Wilson 1917, Yamaguti 1963b

*Hosts were museum-stored specimens lacking locality data.

Helminths found included 29 plerocercoid type I tetraphyllideans from the lower intestine, 4 didymozoid metacercariae type I and one didymozoid metacercaria type II from the pyloric cecum, one juvenile *Gonocerca phycidis* Manter, 1925 (Digenea: Derogenidae) from the stomach, and 5 larvae (L3 stage) comprising 3 species of *Anisakis* Dujardin, 1845 (Nematoda: Ascaridoidea) from the pyloric cecum. Seven specimens of a seemingly unnamed species of *Bomolochus* von Nordmann, 1832 (Poecilostomatoida: Bomolochidae) infected the gill chamber and will be detailed in a separate paper (G. Benz, personal communication).

Descriptions of Species

CESTODA

ORDER TETRAPHYLLIDEA CARUS, 1863

PLEROCERCOID TYPE I (Figure 1A)

*Description***:** Based on 23 specimens. Small subglobular to conical plerocercoids, no visible segmentation. Length 218 (161–300; n = 21); width at midbody 59 (49–72; n = 21). Scolex with 4 subspherical, undivided bothridia; simple apical sucker. Scolex length from posterior edge of bothridia to anterior tip 59 (49–74; n = 22); width at level of widest point along scolex length 71 (62–85; n = 21). Bothridia 36 (29–47; n = 88) long, 28 (17–43; n = 88) wide. Apical sucker 32 (27–55; n = 22) long, 41 (37–50; n = 22) wide.

Site of infection: Lower intestine.

Deposited specimens: HWML voucher 49132 (6 slides).

Remarks: The collective group name *Scolex pleuronectis* Müller, 1780 (and *Scolex polymorphus* Rudolphi, 1819) is assigned for unidentifiable larvae as is generally accepted when describing tetraphyllidean plerocercoids for which the adult form is unknown (Overstreet 1978). These unidentified larvae labeled by the collective group name *S. pleuronectis* have

been reported from many localities world-wide and infect the intestine of many marine teleosts before maturing in the gut of elasmobranchs. Probably because the collective group *S. pleuronectis* includes many species, these larvae vary in size and shape (Caira and Reyda 2005).

When compared with larval cestodes reported by Dollfus (1964), these specimens appear superficially similar to *Scolex polymorphus unilocularis* Olsson, 1869 reported from the cuttlefish *Sepia officinalis* Linnaeus in overall appearance including 4 sessile, undivided, spherical bothridia and a single apical sucker. These specimens also bear resemblance to the tetraphyllidean metacestode identified by Chambers et al. (2000) as type 4 metacestode, obtained from 12 families of teleosts collected along the Great Barrier Reef, in having a conical shape, a single apical sucker and 4 simple unilocular bothridia.

The valid collective group name *Scolex pleuronectis* represents an indeterminate number of species, the life cycles of none of which have been elucidated or studied in any great detail. Therefore, we caution against presenting a collective group name as comprising a new host record because it does not represent a species; however, we are unaware of any prior report of a cestode from *G. serpens*.

DIGENEA

FAMILY DIDYMOZOIDAE MONTICELLI, 1888

DIDYMOZOID METACERCARIA TYPE I (Figure 1B)

Description: Based on 4 specimens; 2 intact, 2 damaged. Unencysted. Body elongate, dorso–ventrally flat, with

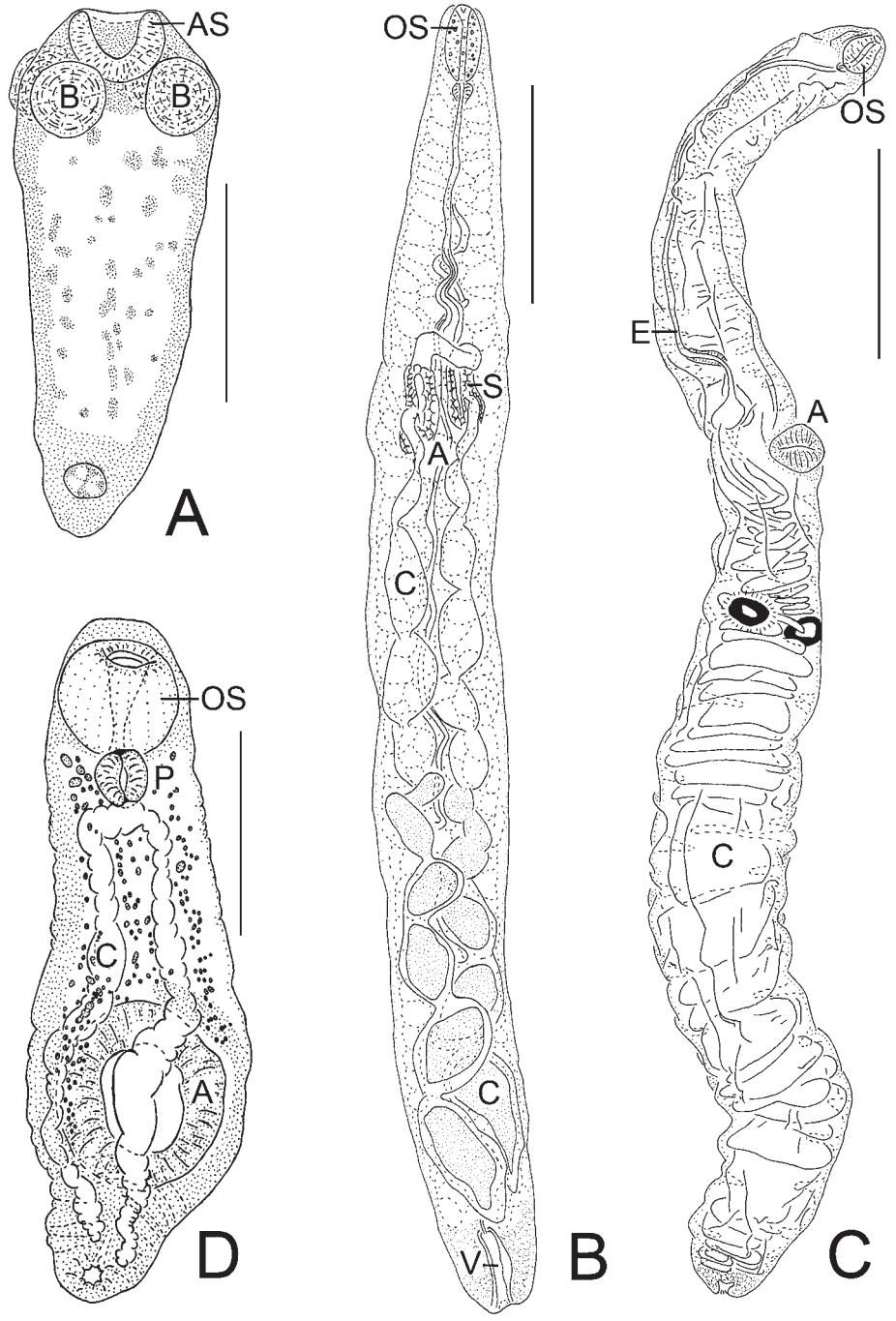

Figure 1. *Illustrations of cestode and digenean parasites from Gempylus serpens.*

A. Plerocercoid type I, entire, lateral view. Scale bar 100 µm.

B. Didymozoid metacercaria type I, entire, dorsal view. Scale bar 300 µm.

C. Didymozoid metacercaria type II, entire, dorsolateral view; note 2 thick black rings denoting holes at midbody where specimen was damaged. Scale bar 3.475 mm.

D. Juvenile of Gonocerca phycidis, entire, dorsal view. Scale bar 1 mm.

Abbreviations: A, acetabulum; AS, apical sucker; B, bothridium; C, cecum; E, esophagus; OS, oral sucker; P, pharynx; S, stomach; V, excretory vesicle.

bluntly-rounded to truncated ends, 1,817 (1,575–2,211; n = 3) long, 87 (74–104; n = 3) wide at level of pharynx, 185 (169–229; n = 4) wide at level of acetabulum, and 123 (99–140; n = 4) wide at level of distal ends of ceca. Forebody tapering to round or truncate anterior extremity, 598 (516–721; n = 3) long, 124 (109–135; n = 3) wide at level of midpoint of forebody; 32 (32.6–33.4%; n = 3) of body length. Hindbody of uniform width, round at posterior extremity, 1,226 (1,058–1,491; n = 4) long. Tegument smooth. Body filled with vesicular parenchyma. No eyespots or eye pigment observed. Oral sucker oval to panduriform, sometimes protruding, 105 (96–112; *n* = 3) long, 55 (52–62; n = 3) wide, composed of outer longitudinal muscles and inner circular muscles; large vesicular transparent cells throughout interior of sucker; mouth terminal. Acetabulum muscular, sessile, subspherical, small, 65 (59–72; n = 4) long, 68 (62–72; n = 4) wide, pre-equatorial along longitudinal axis near junction of anterior and middle thirds of body. Oral sucker to acetabulum length ratio, 1:0.6 (1:0.6–0.7; n = 3); oral sucker to acetabulum width ratio, 1:1.2 (1:1.1–1.4; n = 3). Distance between suckers, 498 (422–622; n = 3); ratio of distance between suckers to body length, 1:3.7 (1:3.6–3.7; *n* = 3). Prepharynx not observed. Pharynx spherical, 28 (24–32; n = 3) long, 28 (27–33; n = 3) wide. Esophagus long, 364 (312–454; n = 3) long, 13 (7–23; n = 3) wide at midpoint; either thin-walled anteriorly becoming more thick-walled and sinuous posteriorly or entirely thick-walled; thickness of esophageal wall at posterior end, 8 (7–10; n = 2) wide. Cecal bifurcation preacetabular, forming thick-walled 'Drüsenmagen' (= stomach) lined with glandular cells, extending anteriorly from acetabular level to region immediately preacetabular, 212 (146–261; n = 4) long, 89 (84–92; n = 4) wide at anterior end and 115 (79–149; n = 4) wide at posterior end. Ceca wide, descending in undulating moniliform fashion, consisting of series of smooth, thin-walled, inflated chambers filled with fluid that is clear to tan in smaller, anterior chambers, becoming darker in larger, more-developed posterior chambers. Total number of cecal chambers, 22–24; number of chambers per cecum, 11–12. Anterior cecal chamber smallest, 65 (47–105; n = 8) long, 24 (12–38; n = 8) wide; middle cecal chamber intermediate in size, 82 (71–107; n = 8) long, 72 (52–105; n = 8) wide; posterior cecal chamber largest, 234 (181–305; n = 8) long, 94 (71–132; n = 8) wide. Ceca ending blindly, 99 (89–114; n = 4) long from posterior end of body. Genital anlagen not observed. Excretory vesicle I–shaped, posterior portion sac–like, 97 (89–110; n = 4) long, 25 (9–50; n = 4) wide, narrowing into long, thin tube running anteriorly up to about midpoint of forebody; bifurcation of excretory vesicle not confirmed. Numerous numbers of parenchymal cells around excretory vesicle and posterior end of worm. Excretory pore terminal.

Site of infection: Pyloric cecum.

Deposited specimens: HWML voucher 49133 (2 slides).

Remarks: These didymozoid metacercariae belong to the collective group type *Monilicaecum* in that they possess a stomach and acetabulum as well as ceca with moniliform chambers or conspicuous swellings. *Monilicaecum*, first given generic status by Yamaguti (1942), is now regarded as a collective larval group name for the first free didymozoid juvenile stages that form in fish hosts (Yamaguti 1970, 1971). These specimens also appear similar to members within the collective group *Paramonilicaecum* Kurochkin and Nikolaeva, 1978 in possessing an acetabulum, pharynx and stomach yet lacking gland cells around the distal region of the esophagus, stomach and/or ceca (see Pozdnyakov and Gibson 2008).

As stated earlier, we caution against presenting a collective group name as comprising a new host record because it does not represent a valid species; however, we are unaware of a prior report of a didymozoid from *G. serpens*.

Didymozoid metacercaria type II (Figure 1C)

Description: Based on one contracted and damaged specimen. Unencysted. Body elongate, flattened dorso-ventrally, with bluntly-rounded ends, 3,345 long, 159 wide at level of pharynx, 258 wide at level of acetabulum, and 194 wide at level of distal end of ceca. Forebody long, equal in width, 1,218 long or 36% of body length, 169 wide at level of midpoint, with rounded anterior extremity. Hindbody length 2,127 long, about equal to 2/3 of body length, widest at level of junction of middle and posterior thirds of body, with rounded posterior extremity. Tegument smooth. Body filled with vesicular parenchyma; parenchymal cells apparent in forebody. No eyespots or eye pigment observed. Oral sucker pyriform, slightly protruding, 119 long, 94 wide, composed of outer longitudinal muscles and inner circular muscles, inner area containing large vesicular transparent cells; mouth terminal. Acetabulum muscular, triangular in lateral view, small, 119 long, 124 wide, pre–equatorial along longitudinal axis near junction of anterior and middle thirds of body. Oral sucker to acetabulum length ratio, 1:1.0; oral sucker to acetabulum width ratio, 1:1.3. Distance between suckers, 1,099; ratio of distance between suckers to body length, 1:3.0. Prepharynx not observed. Pharynx small, 20 long, 27 wide. Esophagus 1,054 long, 9.9 wide at midpoint, straight, running almost entire length of forebody along dorsal wall of worm; esophageal wall muscular, 7 wide at posterior end. Cecal bifurcation 186 anterior to acetabulum. 'Drüsenmagen' (= stomach) not observed. Ceca voluminous, tortuous, consisting of series of smooth, inflated chambers filled with tan fluid, which begin anteriorly as smaller, round chambers becoming much larger, cuboidal chambers posteriorly before narrowing slightly again at posterior end. Anterior cecal chamber smallest, 123 (109–136; n = 2) long, 29 (25–32; n = 2) wide; middle cecal chamber largest, 182 (166–198; n = 2) long, 246 (236–255; n = 2) wide; posterior cecal chamber intermediate in size, 141 (131–151; n = 2) long, 164

(149–179; n = 2) wide. Ceca ending blindly near posterior end of body. Genital anlagen not observed. Excretory vesicle short, 50 long, 67 wide, saccular, V–shaped, surrounded by numerous gland cells; excretory arms not evident. Excretory pore terminal.

Site of infection: Pyloric cecum.

Deposited specimen: HWML voucher 49134 (1 slide).

Remarks: The tegument of this specimen unfortunately is contracted and damaged (2 puncture marks around midbody). In lacking a stomach and in possessing tortuous ceca and an acetabulum, this worm appears to be a member of the didymozoid collective group type *Torticaecum*. Like *Monilicaecum*, *Torticaecum* was first given generic status by Yamaguti (1942) and is now regarded as a collective larval group name for the first free didymozoid juvenile stages that form in fish hosts (Yamaguti 1970, 1971). *Torticaecum* is distinguished from *Monilicaecum* principally by the absence of a stomach and the presence of tortuously–winding ceca in the former larval group as opposed to moniliform ceca that resemble beads on a string in the latter larval group. This specimen also can be identified as a member of *Torticaecum* in the key of Pozdnyakov and Gibson (2008) in that it possesses a pharynx and has an acetabulum that is posterior to the intestinal bifurcation, yet it lacks a stomach and gland cells around the esophagus and anterior parts of the ceca.

Superfamily Hemiuroidea Looss, 1899

Family Derogenidae Nicoll, 1910

Juvenile of Gonocerca phycidis (Figure 1D)

Description: Based on one specimen. Body cylindrical, widest at level of acetabulum, anterior extremity somewhat truncated, posterior extremity conical, 3,422 long, 791 wide at level of pharynx, 1,167 wide at level of acetabulum, 633 wide at posterior end. Escoma lacking. Forebody 1,929 long or 56% of body length, with round anterior extremity, 811 wide at level of cecal bifurcation. Hindbody wide, narrowing posterior to acetabulum, 1,493 long. Tegument smooth. Preoral lobe not observed. Oral sucker muscular, subspherical, subterminal, 596 long, 641 wide. Acetabulum muscular, round, postequatorial, large, 979 long, 900 wide. Ratio of diameter of oral sucker to acetabulum 1:1.4. Prepharynx not observed. Pharynx subspherical, 293 long, 273 wide. Esophagus not observed; cecal bifurcation immediately posterior to pharynx, 934 anterior to acetabulum. Ceca voluminous, terminating 162 or 5% of body length from posterior body end. Genital pore and other components of reproductive systems not observed. Excretory vesicle Y–shaped, with voluminous arms seen in preacetabular region running anteriorly along lateral sides of worm, ventrolateral to ceca, uniting dorsally over oral sucker. Excretory pore terminal.

Site of infection: Stomach.

Deposited specimen: HWML voucher 49135 (1 slide).

Remarks: This juvenile digenean was identified as the derogenid *Gonocerca phycidis* due to the absence of an escoma, a large acetabulum located in the posterior half of the body, ceca that end blindly, and its strikingly similar appearance to adult specimens of this species previously collected (Manter 1925, 1934). This report comprises the first record of *G. phycidis* in *G. serpens*.

Nematoda

Family Anisakidae (Railliet and Henry, 1912)

Anisakis sp. 1 (Figure 2A)

Description: Based on 2 specimens. Body fusiform, robust, stout-bodied, 19.7 mm (16.2–23.2; n = 2) long, 300 (233–366; n = 2) wide at level of junction of esophagus and ventriculus, 451 (308–593; n = 2) wide at midbody, 115 (112–119; n = 2) wide at anus. Cuticle smooth, lacking lateral alae. Head width at base, 96 (82–109; n = 2). Three lips, with dentigerous ridges, 38 (32–45; n = 4) long, 43 (37–52; n = 4) wide. Interlabia not observed. Prominent boring tooth (spine) 19 (12–25; n = 2) long, 31 (20–42; n = 2) wide at base. Esophagus muscular, 1,474 (1,347–1,600; n = 2) long or 7% (7–8%; n = 2) of body length, 107 (94–119; n = 2) wide at level of midpoint. Nerve ring present, 261 (194–328; n = 2) from anterior tip. Ventriculus oblong, 527 (472–582; n = 2) long, 189 (149–229; n = 2) wide. Ventricular appendage and intestinal cecum absent. Excretory pore between lateroventral lips, opening below boring tooth on ventral side. Intestine simple. Tail length (anus to posterior tip) 157 (144–169; n = 2) long. Rectal glands oval to nearly spherical, prominent. Anus subterminal. Conical mucron (caudal spine) observed in 1 specimen, 30 long, 15 wide at base.

Site of infection: 1 encysted in mesenteries near junction of lower intestine and rectum; 1 unattached in pyloric cecum.

Deposited specimens: HWML voucher 49136 (2 slides).

Remarks: The presence of an oblong ventriculus lacking an appendix, no intestinal cecum, 3 lips with dentigerous ridges, no interlabia, and an excretory pore location between the lateroventral lips distinguished these nematodes as representatives of a species of *Anisakis*, and both specimens are L3 stage larvae. One appeared to have the L4 stage larva developing inside, but the lips of the latter had not erupted through the cuticle.

Anisakis sp. 2 (Figure 2B)

Description: Based on 2 specimens. Body fusiform, robust, stout-bodied, 8,524 (8,096–8,951; n = 2) long, 170 (161–179; n = 2) wide at level of junction of esophagus and ventriculus, 265 (243–288; n = 2) wide at midbody, and 77 (74–79; n = 2) wide at anus. Cuticle smooth, lacking lateral alae. Head width at base, 58 (52–65; n = 2). Three lips, with dentigerous ridges, 24 (20–27; n = 5) long, 27 (20–32; n = 5) wide. Interlabia not observed. Prominent boring tooth (spine) 16 (15–17; n = 2) long, 22 (20–25; n = 2) wide at base. Esophagus muscular, 970 (945–995; n = 2) long or 11% (10–12%; n = 2) of body length, 87 (74–99; n = 2) wide at level of midpoint. Nerve ring present, 207 (196–218; n = 2) from anterior tip. Ventriculus cylindrical, 641 (603–680; n = 2) long,

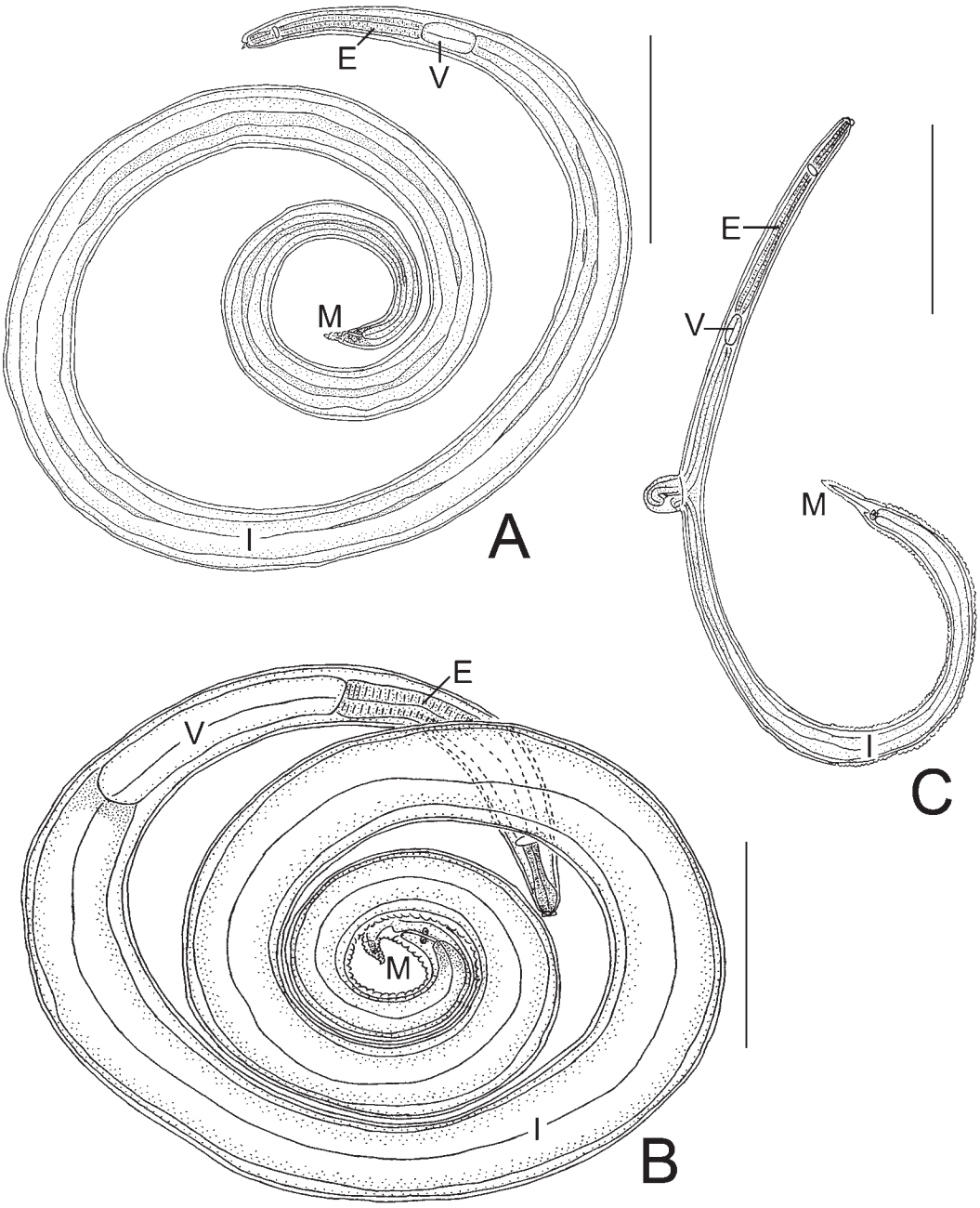

Figure 2. *Illustrations of larval Anisakis spp. from Gempylus serpens.*
A. Anisakis sp. 1, entire, lateral view. Scale bar 2 mm.
B. Anisakis sp. 2, entire, lateral view. Scale bar 700 µm.
C. Anisakis sp. 3, entire, lateral view. Scale bar 400 µm.
Abbreviations: E, esophagus; I, intestine; M, mucron; V, ventriculus.

165 (139–191; n = 2) wide. Ventricular appendage and intestinal cecum absent. Excretory pore between lateroventral lips, opening below boring tooth on ventral side. Intestine simple. Tail length (anus to posterior tip) 169 (166–171; n = 2) long. Rectal glands oval to nearly spherical, prominent. Anus subterminal. Conical mucron (caudal spine) observed in one specimen, 10 long, 7 wide at base.

Site of infection: Unattached in pyloric cecum.

Deposited specimens: HWML voucher 49136 (2 slides).

Remarks: The presence of a ventriculus lacking an appendix, no intestinal cecum, 3 lips with dentigerous ridges, no interlabia, and an excretory pore location between the lateroventral lips characterized these nematodes as representatives of a species of *Anisakis*, and both specimens are L3 stage larvae. *Anisakis* sp. 2 differs from *Anisakis* sp. 1 in its overall smaller size and its larger ventriculus in relation to total body length; 7.5% of body length in *Anisakis* sp. 2 compared to only 2.8% of body length in *Anisakis* sp. 1.

ANISAKIS SP. 3 (Figure 2C)

Description: Based on one damaged specimen. Body slightly

curved anteriorly, prominently curved posteriorly, fusiform, small, 2,942 long, 77 wide at level of junction of esophagus and ventriculus, 69 wide at midbody, and 42 wide at anus. Cuticle smooth, lacking lateral alae. Head width at base, 25. Three lips, tiny, with dentigerous ridges. Interlabia not observed. Boring tooth (spine) 5 long, 17 wide at base. Esophagus muscular, 583 long or 19.8% of body length, 25 wide at level of midpoint. Nerve ring 171 from anterior tip. Ventriculus oval, small, 62 long, 37 wide. Ventricular appendage and intestinal cecum absent. Excretory pore not observed. Intestine simple. Tail length (anus to posterior tip) 114 long. Rectal glands oval to nearly spherical, prominent. Anus subterminal. Mucron (caudal spine) tiny, conical, 5 long, 3 wide at base.

Site of infection: Unattached in pyloric cecum.

Deposited specimen: HWML voucher 49136 (1 slide).

Remarks: The presence of a ventriculus lacking an appendix, no intestinal cecum, 3 lips with dentigerous ridges, and no interlabia characterized this specimen as a representative of a species of *Anisakis*, and the specimen is either an extremely young L3 or L2 stage larva. *Anisakis* sp. 3 differs from *Anisakis* sp. 1 and *Anisakis* sp. 2 in its longer esophagus in relation to total body length; 19.8% of body length in *Anisakis* sp. 3 compared to 7.6% and 11.5% of body length in *Anisakis* sp. 1 and *Anisakis* sp. 2, respectively. *Anisakis* sp. 3 also differs from *Anisakis* sp. 2 in its smaller ventriculus in relation to total body length; 2.1% of body length in *Anisakis* sp. 3 compared to 7.5% of body length in *Anisakis* sp. 2.

Summary

This report documents several endohelminths not previously reported from G. *serpens*, including a cestode and a didymozoid from G. *serpens* as well as a new host record for derogenids in general and G. *phycidis* in particular. All helminths collected in this study were larvae or juveniles. We think that listing the parasites herein (Table 1) of even a single marine fish (G. *serpens*), in this case a host rarely studied for endohelminths (i.e. only 5 parasite species known from G. *serpens*), is important. This study now adds to our knowledge of marine parasites, which is quite limited compared to that of terrestrial and freshwater parasites (see Bray et al. 1999). This study also provides information regarding the diet of G. *serpens*. Stomach examination revealed 6 early juvenile flatfish (Pleuronectiformes), suggestive of pelagic feeding by G. *serpens* (Moyle and Cech 1988).

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