6-1981

**Raphidascaris camura sp. n., Hysterothylacium eurycheilum** (Olsen) comb. n. and Comments on *Heterotyphlum* Spaul (Nematoda: Ascaroidea) in Marine Fishes

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RAPHIDASCARIS CAMURA SP. N., HYSTEROTHYLACIUM EURYCHEILUM (OLSEN) COMB. N., AND COMMENTS ON HETEROTYPHLUM SPAUL (NEMATODA: ASCARIDOIDEA) IN MARINE FISHES

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ABSTRACT: Raphidascaris camura sp. n. infected the stomach and intestine of Pomatomus saltatrix (type host), from the northern Gulf of Mexico. It is characterized by having the following combination of features: 31 to 40 pairs of preanal papillae, 10 pairs of postanal papillae with the third papilla from the posterior extremity doubled, nearly equal spicules 1.8 to 2.7% of the body length, and lateral alae abruptly curved near their anterior extremity. Additional species of Raphidascaris were examined and are discussed. Hysterothylicum eurycheilum (Olson, 1952) comb. n. (=Heterotyphlum e.) from Epinephelus itajara in Florida and the Lesser Antilles, previously known from female worms only, is redescribed as is the anterior end of Heterotyphlum himantolophi Spaul, 1927.

Several ascarid nematodes infect fishes in the Gulf of Mexico and Lesser Antilles. This paper reports on species of Raphidascaris Railliet and Henry, 1915, and adds another species of Hysterothylicum Ward and Magath, 1917, to the six already reported from the Gulf (Deardorff and Overstreet, 1980).

In most cases, worms were removed from their hosts, fixed in glacial acetic acid, stored in a solution of five parts glycerin and 95 parts 70% ethyl alcohol, and examined in glycerin after evaporation of the alcohol. Other worms fixed by a variety of methods, some unknown, were lent or donated to us. Representative worms were sectioned at 8 µm and stained with Harris' hematoxylin and eosin. All measurements are in micrometers unless stated otherwise. Figures were drawn with the aid of a drawing tube.

Raphidascaris camura sp. n.
(Figs. 1–11)

Diagnosis
Cuticle without conspicuous annulations; lips having ratio of length to width 1:0.9 to 1:2; with pulp not pedunculated; preanal caudal papillae numbering 31 to 40 pairs; postanal papillae numbering 10 pairs with third papilla pair from posterior extremity doubled; spicules 1.8 to 2.7% of body length; spicule-ratio 1:1.0 to 1:1; tip of female tail multispinous; tail of male smooth.

Received 9 June 1980; accepted 30 December 1980.
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Description
Based on specimens from the bluefish. Body reaching greatest width near midbody. Cuticle with fine inconspicuous annulations. Lateral alae extending nearly entire length of body, with minute supports; cervical alae terminating bluntly near base of lips, curving sharply toward dorsoventral axis. Lips approximately equal in size, widest at base; each with length to width ratio 1:0.9 to 1:2; inner margins minutely papillated; dorsal lip with two lateral double papillae; subventral lips each with single lateral papilla, amphid, and mediolateral double papilla; internal pulp not pedunculated. Interlabia absent. Esophagus 8 to 11% of total body length. Ventriculus nearly spherical, narrower than widest level of esophagus, broader than long. Nerve ring located at level within anterior 17 to 29% of esophagus. Excretory pore located slightly posterior to level of nerve ring; excretory system with duct extending posteriorly from pore toward esophagus before entering lateral cord; lateral (=longitudinal) canal extending posteriorly at least past ventriculus.

Male (based on five specimens): Body 5.5 to 10.0 mm long by 148 to 315 wide at greatest width; ratio of greatest width to length 1:32 to 47. Lips 36 to 62 long by 43 to 48 wide. Nerve ring with center 190 to 236 from anterior extremity, 14 to 19 in breadth. Esophagus 593 to 819 long by 84 to 137 wide. Ventriculus 43 to 108 long by 72 to 113 wide. Ventricular appendage 216 to 339 long by 45 to 72 wide; ratio for lengths of ventricular appendage to esophagus 1:2.0 to 2.7. Spicules similar, 1.8 to 2.7% of body length; left spicule 138 to 230 long by 5 wide; right spicule 145 to 246 long by 5 wide, longer than left in three specimens; spicule ratio (left:right) 1:1.0 to 1:1.2. Nerve system absent. Caudal papillae numbering 41 to 50 pairs; preanal 31 to 40, with those near anus considerably smaller and more parallel than prespicular ones; postanal 10, with third papilla from posterior extremity doubled; para-anal papillae in rows distinct from preanal papillae; para-anal papillae lacking. Medioventral preanal
organ inconspicuous, papillated. Phasmids not visible but presumably present. Tail flexed ventrad, conical, 72 to 79 long, with unspined tip.

**Female** (based on 10 specimens): Body 5.2 to 9.4 mm long by 157 to 346 wide; ratio of greatest width to length 1.24 to 36. Lips 36 to 65 long by 55 to 68 wide. Nerve ring with center 120 to 288 from anterior extremity, 16 to 24 in breadth. Esophagus 482 to 929 long by 80 to 148 wide. Ventriculus 40 to 80 long by 79 to 142 wide. Ventricular appendage 241 to 457 long by 36 to 88 wide; ratio for lengths of ventricular appendage to esophagus 1:1.8 to 2.6.

Vulva without salient lips, opening 1.1 to 1.7 mm or 18 to 21% of body length from anterior extremity. Vagina extending posteriorly from vulva; uterus didephic, opisthodelphic; ovaries usually extending anterior to level of vulva. Eggs 26 to 53 in diameter, not containing larvae. Phasmids not visible. Tail 250 to 444 long, gradually tapering, more slender than on male, terminating as multispinous distal process 16 to 36 long.

**Holotype:** Male, USNM Helm. Coll. No. 75956.

**Allotype:** Female, USNM Helm. Coll. No. 75957.

**Paratypes:** USNM Helm. Coll. No. 75958 (pair).

**Host:** Pomatomus saltatrix (Linnaeus) bluefish (type host), (Pomatomidae); also see remarks below.

**Locality:** Louisiana: East Bay (type locality); also see Remarks below.

**Sites of infection:** Stomach and intestine.

**Etymology:** The Latin specific name *camura*, meaning "turned inward," refers to the anterior-most portion of the cervical alae.

**Remarks**

Additional adult specimens provisionally identified as *Raphidascaris camura* infected the inshore lizardfish, *Synodus foetens* (Linnaeus), and the snakefish, *Trachinocephalus myops* (Forster), at depths of 27 to 66 m on the continental shelf off the Alabama coast; the sargassum fish, *Histrio histrio* (Linnaeus), off Horn Island, Mississippi; the Atlantic croaker, *Micropogonias undulatus* (Linnaeus), in estuaries and offshore in the Gulf of Mexico; the striped bass, *Morone saxatilis* (Walbaum), in Fort Bayou (low salinity estuary), Ocean Springs, Mississippi; and the spotted whiff, *Citharichthys macrops* Dresel, in 40 m at 20°3’N, 91°51’W. All had alae curved anteriorly, caudal papillae similar to specimens from the bluefish, and a spined female tail. However, they were longer than specimens from the bluefish, females reaching 25.5 mm in length and males 14.5 mm. With the exception of the synodontids collected off Alabama, all possessed one or two specimens and the prevalence of infection was low. Those specimens from synodontids had dried out, and consequently, could not be described adequately.

*Raphidascaris camura* differs from all others in the genus by purported numbers and arrangement of caudal papillae. On the basis of a pair of doubled postanal papillae, it is similar to *R. acus* (Bloch, 1779). However, the anteriormost papillar pair, or fifth from the rear, is doubled on *R. acus* compared with the third from a series of 10 on *R. camura*. Cervical alae sharply curved at their anterior extent also occur in *R. lophii* (Wu, 1949), *R. chirocentri* Yamaguti, 1935, as described by Yamaguti (1941), *R. alius* Lyster, 1940 (a species of questionable status by Margolis and Arthur, 1979), and possibly other species. Even though its taxonomic significance has not been established for species of *Raphidascaris*, a multispinous tail exclusively on the female is unusual for ascaridoids.

The number of species of *Raphidascaris* in the Gulf of Mexico remains uncertain. *Raphidascaris lutiani* Olsen, 1952, from the mutton snapper, *Lutjanus analis* (Cuvier), at Tortugas, Florida, apparently has nine to 11 pairs of preanal papillae plus three pairs of postanal ones and its vulva opens 33% of the body length from the anterior end (Olsen, 1952). We confirmed from the holotype (USNM Helm. Coll. No. 37244) that inconspicuous cervical alae do not bend anteriorly and the tail is unspined. D. R. Brooks (pers. comm.) examined the female allotype for us in the USNM Helm. Coll. and confirmed the same features. Total length reaches at least 7 cm for females. As for the second species, *R. camura*, additional well-fixed specimens from the bluefish, synodontids, and other fishes should confirm whether all northern Gulf specimens with anteriorly curved alae and a spined female tail are the same species. The absence of adult ascaridoids in 387 adult and 51 juvenile bluefish from Sandy Hook, New Jersey, to St. Petersburg, Florida (Anderson, 1970), suggests that *R. camura* may not extend up the western North Atlantic coast. The third nominal Gulf species, *R. anchoviellae* Chandler, 1935, was described from immature specimens in *Anchoa hepsetus* (Linnaeus) (as *Anchoviella epsetus*) from Galveston Bay, Texas (Chandler, 1935). Based on four 4.7- to 6.0-mm-long paratypes (USNM Helm. Coll. No. 39538) (early L₄ within L₃ cuticle) with
lips forming, the ratio of the ventricular appendix to the esophagus is 1:1.7 to 2.1 and the stubby conical tail is 120 to 253 μm long including a terminal, pointed, unspined projection 16 to 36 μm long. Cervical alae appear inconspicuous, unlike R. camura. Specimens of L₄’s from the mesentery and intestine of Micropogonias undulatus in the northern Gulf exhibit three types. Those (1) with alae curved anteriorly and spined tails (possibly R. camura), (2) without alae curved anteriorly or a spined tail, and (3) without alae curved anteriorly but with a spined tail (one or both of the latter two could be R. anchovettai which may be a senior synonym of R. lutilan). We examined a few fishes containing numerous L₃’s and L₄’s of Raphidascaris spp. (sensu lato) in the Gulf of Mexico, but members of this nematode group did not occur as commonly as those of some other ascaridoid taxa. Of 1,091 fish comprising 16 species examined from Maine to Georgia, Cheng (1976) reported raphidascarine infections in one species only. Jackson et al. (1978) found 11 of 23 species of 1,010 fish purchased from markets in Washington, D. C., infected with larvae and considered all the specimens R. acus because the elongated ventricular appendix extended posterior to the midbody. Species of Raphidascaroides Yamaguti, 1941, are presently differentiated from those of Raphidascaris by having interlabia, features not evident on L₃’s, so few larvae (e.g., R. acus) can be identified. Nevertheless, most workers consider larvae of both genera as Raphidascaris sensu lato.

**Hysterothyacium eurychelum** (Olsen, 1952)

_comb. n._

_Figs. 12–22_


**Diagnosis**

Cuticle with shallow plicated annulations; lips with ratio of length to width 1:1.5 to 1.7, with flanges indented equatorially; interlabia relatively small; caudal papillar pairs; preanal 13; postanal three; para-anal one; spicules 2% of body length; spicule-length ratio 1:1.0; tail gradually tapering, terminating without ornamentation.

**Redescription**

Body reaching greatest width near midbody. Cuticle with shallow plicated annules along entire length. Lateral alae extending equally along entire length of body. Lips approximately equal in size, with length to width ratio of 1:1.5 to 1.7, bearing transparent cuticular flanges on lateral margins; flanges indented equatorially, with posterior half more than two times wider than anterior; dorsal lip with two lateral double papilae; subventral lips each with single lateral papillae, amphid, and mediolateral double papilla; internal pulp slightly pseudulated. Dentigerous ridges lacking. Interlabia relatively small, 16 to 26 long by 36 to 43 wide (on 3 specimens); interlabial grooves lacking. Esophagus 13 to 16% of body length. Ventriculus nearly spherical, narrower than widest level of esophagus, usually broader than long; ventricular appendage descending from near middle of ventriculus without conspicuous angulation. Nerve ring at anterior 11 to 15% of esophagus. Excretory pore immediately anterior or posterior to level of nerve ring; excretory system with duct extending posteromesial from pore toward esophagus before entering left lateral cord; lateral (=longitudinal) canal extending posteriorly past ventricular appendage. Tip of tail without ornamentation.

**Male** (based on one specimen): Body 41.0 mm long by 1.1 mm at greatest width; ratio of greatest width to length 1:37. Lips 271 long by 426 at greatest width. Nerve ring with center 780 from anterior extremity, 36 in breadth. Esophagus 5.5 mm long by 525 wide. Ventriculus 278 long by 463 wide; ventricular appendage 760 long by 92 wide; ratio for lengths of ventricular appendage to esophagus 1:7.2. Intestinal cecum 55 long by 55 wide; ratio of cecal to ventricular appendage lengths 1:14; ratio of cecal to esophageal lengths 1:100. Spicules blunt at tip, similar, 2% of body length, both 860 long by 14 wide; spicule ratio 1:1.0. Gubernaculum lacking. Caudal papillae numbering 17 pairs, becoming closer together and more medial as approaching anus; preanal pairs 13; postanal pairs three; para-anal pair one. Medioventral preanal organ conspicuous, papillated. Tail flexed ventrad, 314 long.

**Female** (based on three mature specimens plus holotype; measurements of latter in parentheses): Body 26.2 to 33.0 (36.0) mm long by 0.6 to 0.9 (1.4) mm wide; ratio of greatest width to length 1:36 to 45 (1:40). Lips 195 to 222 (265) long by 370 to 376 (468) wide. Nerve ring with center 724 to 740 from anterior extremity, 29 to 36 in breadth. Esophagus 4.3 to 4.8 (7.5) mm long by 330 to 488 (835) wide. Ventriculus 185 to 309 (394) long by 302 to 401 (614) wide; ventricular appendage 0.7 to 0.9 (1.2, indistinct) mm long by 43 to 67 (241) wide; ratio for lengths of ventricular appendage to esophagus 1:5.3 to 6.1 (6.4). Intestinal cecum 278 to 321 (504) long by 111 to 196 (630) wide; ratio of cecal to ventricular appendage lengths 1:2.3 to 3.1 (1:2.3); ratio of cecal to esophageal lengths 1:14 to 17 (1:15). Vulva without salient lips, opening 9.5 to 11.7 (19.5) mm or 35 to 36 (35)% of body length from anterior extremity. Ovary extending anteriorly to level of vulva in one of three specimens. Eggs in proximal uterus up to 43 in diameter, without larvae. Tail 061 to 709 (914) long including conical extremity 21 to 24 (31) long.

Specimens deposited (one male and two females):

USNM Helm. Coll. No. 75959 (tail mount of male in glycerin jelly on separate slide).

Host: Epinephelus itajara (Lichtenstein) jewfish (Serranidae).

Sites of infection: Stomach and intestine.

Locality: Lesser Antilles: Virgin Gorda: Anguilla Pass, 11 m deep.

Remarks

Olsen (1952) considered the single known mature female and six immature ones as Heteroagyptum eurycheilum rather than in Contracecum sensu lato because they "com-
completely lack interlabia.” Examination of the holotype (USNM Helm. Coll. No. 37245) from *Epinephelus itajara* (as *Promicrops itajara*) in Tortugas, Florida, however, revealed relatively small, but distinct, interlabia as does our similar material from the same host in Virgin Gorda. Because the species has these interlabia and other diagnostic characteristics of *Hysterothylacium* as reviewed by Deardorff and Overstreet (1981), we consider *Heterotyphlum eurycheilum* as *Hysterothylacium eurycheilum* (Olsen) comb. n.

*Hysterothylacium eurycheilum* differs from others in the genus by having lips with equatorially notched flanges which have the greatest width of the posterior half twice that of the anterior half.

**Heterotyphlum Spaul, 1927**
(Figs. 23–24)

Remarks

To confirm the absence of interlabia in the genus *Heterotyphlum*, we examined seven syntypes of the type-species, *H. himantolophi* Spaul, 1927 (British Museum [Natural History] Reg. No. 127.7.22 31–38). The two species of *Paraheterotyphlum* Johnston and Mawson, 1948, from sea snakes were considered by Sprent (1978) to differ from those of *Heterotyphlum himantolophi* in a fish by having much more elongated lips and a typically shaped body, rather than a slender, coiled anterior half and a thicker posterior half. We agree with Sprent. Others (e.g., Schmidt and Kuntz, 1973) assumed differences to be restricted to spicule-length ratios. In contrast to the lips for species in both *Paraheterotyphlum* and *Hysterothylacium*, those of *H. himantolophi* are conspicuously shorter. Our figures (Figs. 23, 24) differ from the ventrolateral view by Spaul (1927) in that lips are shorter, internal pulp extends higher, and the nerve ring does not occur as far anteriorly. No interlabia exist. The location of the nerve ring and excretory pore of *H. himantolophi* are situated similar to that in species of *Hysterothylacium* rather than as stated in the original description. The nerve ring was 1.4 mm from the anterior end of a 10.5-mm-long specimen with the excretory pore 0.21 mm posterior to it, compared with averages of 0.24 and 0.27 mm (nerve ring) and 0.32 and 0.36 mm (excretory pore) from the anterior end of worms 226 and 150 mm long, respectively, as described (Spaul, 1927). Because of questionable state of the syntypes, the entire digestive tract and excretory system of additional specimens of *H. himantolophi* from the deep-sea angler, *Himantolophus groenlandicus* Reinhardt, should be investigated.

ACKNOWLEDGMENTS

We express appreciation to Robert G. Yager at Tulane University School of Medicine (and the National Marine Fisheries Service Laboratory at Pascagoula, Mississippi) for specimens from synodontids off Alabama collected aboard the R/V Oregon II; Thomas Fraser and C. Richard Robins for specimens from C. macrops; William Davin for specimens of H. eurycheilum; D. I. Gibson and R. A. Bray for loaning syntypes of H. himantolophi deposited in the British Museum (Natural History); J. R. Lichtenfels for loaning several specimens deposited in the U.S. National Museum Helminthological Collection; and Joan D. Durfee for sectioning specimens. Texaco, Inc., provided R.M.O. facilities on one of its platforms to aid in collecting parasites. This study was conducted in cooperation with the U.S. Department of Commerce, NOAA, NMFS, under PL 88-309 Project No. 2-325-R.

LITERATURE CITED


