Nematode parasites of marine fishes from Kuwait, with a description of *Cucullanus trachinoti* n.sp. from *Trachinotus blochi*

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ABSTRACT
A survey was made from October 1992 to September 1995 on nematodes parasitizing Kuwaiti fishes. Those most frequently encountered were anisakid larvae, with eleven different types: *Anisakis simplex*, *Terranova* sp. (one type), *Contracaecum* sp. (one type) and *Hysterothylacium* sp. (eight types, KA-KH). Moreover, two adult anisakids and nine other adult and larval species were found: *Iheringascaris inquies* in *Rachycentron canadum*; *Hysterothylacium reliquens* in *Acanthopagrus berda*, *Epinephelus tauvina*, *Ilisha elongata*, *Plotosus anguillaris*, *Polydactylus sextarius*, *Pseudorhombus arsius*, *Synaptura orientalis*, *Therapon puta* and *Trachinotus blochi*; *Cucullanus trachinoti* n.sp. in *Trachinotus blochi*; *Cucullanus armatus* in *Arius thalassinus*; *Cucullanus* sp. in *Caranx kalla*; *Dichelyne* (*D.*) *exiguus* in *Otolithes argenteus*; *Dichelyne* (*D.*) sp. in *Lutjanus coccineus*; *Ascarophis* sp. in *Plectorhinchus* sp.; *Philometra globiceps* in *Caranx kalla*; *Echinocephalus* sp. larvae in *Argyrops filamentosus*, *Pseudorhombus arsius* and *Trachinotus blochi* and *Camallanides* sp. larvae in *Trichiurus lepturus*. All species are described except for *Anisakis simplex* larvae, *Iheringascaris inquies* and *Philometra globiceps*.

KEY WORDS
nematodes,
marine fishes,
Kuwait,
Cucullanus trachinoti n.sp.

RÉSUMÉ

Une enquête sur les nématodes parasitant les Poissons du Koweit a été effectuée d'octobre 1992 à septembre 1995. Les nématodes les plus fréquemment rencontrés sont les larves d'Anisakidés, appartenant à onze types différents : *Anisakis simplex*, *Terranova* sp. (un type), *Contracaecum* sp. (un type), *Hysterothylacium* sp. (huit types, KA à KH). Deux Anisakidés adultes et neuf autres espèces adultes et larvaires ont été trouvées : *Iheringascaris inquies* chez *Rachycentron canadum* ; *Hysterothylacium reliquens* chez *Acanthopagrus berda*, *Epinephelus tauvina*, *Ilisha elongata*, *Polydactylus sextarius*, *Plotosus anguillaris*, *Pseudorhombus arsius*, *Synaptura orientalis*, *Therapon puta* et *Trachinotus blochi* ; *Cucullanus trachinoti* n.sp. chez *Trachinotus blochi* ; *Cucullanus armatus* chez *Arius thalassinus* ; *Cucullanus* sp. chez *Caranx kalla* ; *Dichelyne* (*D.*) *exiguus* chez *Otolithes argenteus* ; *Dichelyne* (*D.*) sp. chez *Lutjanus coccineus* ; *Ascarophis* sp. chez *Plectorhinchus* sp. ; *Philometra globiceps* chez *Caranx kalla* ; larves d'*Echinocephalus* sp. chez *Pseudorhombus arsius*, *Argyrops filamentosus* et *Trachinotus blochi* et larves de *Camallanides* sp. chez *Trichiurus lepturus*. Toutes les espèces sont décrites à l'exception d'*Iheringascaris inquies*, de *Philometra globiceps* et des larves d'*Anisakis simplex*.

MOTS CLÉS
nématodes,
poissons marins,
Koweit,
Cucullanus trachinoti n.sp.

INTRODUCTION

A large amount of work on nematode parasites of fishes from the Indian Ocean and adjacent seas was carried out by workers at the Institute of the Southern Seas in Sevastopol, in particular by Parukhin (see Parukhin 1976, 1985, 1989). Soota (1983) produced a monograph of this fauna and many species have been described since that time, but a large proportion of the existing descriptions are inadequate for the proper identification of the parasites. From fishes of the Persian Gulf, only a few papers have previously been published: Eslami & Mokhayer (1977, 1994) studied the larvae of medical importance in Iranian market fish; from the coasts of the United Arab Emirates, El-Naffar *et al.* (1992) reported the presence of *Anisakis*, *Pseudoterranova* and *Philometra* larvae, Kardousha (1992) described two types of larvae identified as *Anisakis* sp. type I of Berland (1961) and *Hysterothylacium* sp. type MB of Deardorff & Overstreet (1981b), and Al-Ghais & Kardousha (1994) recovered *Anisakis* sp. type I larvae from four fish species of west and east coasts of the U.A.E.

The study on nematodes collected in market fishes from Kuwait has enabled us to add new data to the existing knowledge of this fauna.

MATERIALS AND METHODS

Fishes were bought at the local fish market in Kuwait City from October 1992 to September 1995. Nematodes were fixed in AFA, stored in glycerin-alcohol and cleared in lactophenol for light microscope examination.

Specimens are deposited in the collections of the laboratoire de Biologie Parasitaire, Muséum national d'Histoire naturelle, Paris (MNHN) and in the Department of Zoology of the Faculty of Science of Kuwait University.

All measurements are in µm unless otherwise stated. Measurements were made after fixation and clearing in lactophenol; fixation in AFA causes much contraction, so measurements are certainly less than real.

Apical preparations were cleared in lactophenol and examined by high magnification of light microscopy. All cephalic papillae usually present in ascaridoid third-stage larvae are not always

visible in these preparations.
In descriptions of the male tail, phasmids are included in the number of post-cloacal papillae.

RESULTS

Apart from *Anisakis simplex*, none of the larval forms could be identified beyond the generic level. The eight types of larval *Hysterothylacium* sp. are designated as *Hysterothylacium* types KA up to KH (K for Kuwait).
All species are described, except *Iheringascaris inquies*, *Philometra globiceps* and *Anisakis simplex* larvae, which are well known.

Family ANISAKIDAE
(Railliet *et* Henry, 1912, subfam.)
ADULTS

Iheringascaris inquies (Linton, 1901)

MATERIAL. — 3 ♀♀ No. 252 BF from *Rachycentron canadum*.

REMARKS
These females are similar to those described by Deardorff & Overstreet (1981a) from the same host. *Iheringascaris inquies* is found in all oceans where *Rachycentron canadum* occurs (Bruce & Cannon 1989) and was recorded from the Karachi Coast of Pakistan by Rasheed (1965).

Hysterothylacium reliquens
(Norris *et* Overstreet, 1975)
(Figs 1, 2A-J)

MATERIAL. — 7 ♂♂, 9 ♀♀ No. 82 BF from *Acanthopagrus berda*; 2 ♂♂, 1 ♀ No. 111 BF, 2 ♂♂, 1 ♀ No. 114 BF from *Epinephelus tauvina*; 1 ♂ No. 183 BF from *Ilisha elongata*; 1 ♂ No. 177 BF from *Polydactylus sextarius*, 1 ♂ No. 101 BF from *Plotosus anguillaris*; 1 ♂ No. 250 BF, 1 ♂ No. 251 BF from *Pseudorhombus arsius*; 5 ♂♂, 4 ♀♀ No. 124 BF, 2 ♂♂, 1 ♀ No. 186 BF from *Synaptura orientalis*; 1 ♀ No. 86 BF from *Therapon puta*; 1 ♂ No. 254 BF from *Trachinotus blochi*.

MEASUREMENTS. — ♂♂ (based on 12 specimens). Length 18.00-54.75 (40.28) mm. Oesophagus 2100-6000 (4333), 10.5-14.7% of body length. Intestinal caecum 360-1000 (675), oesophagus/caecum 5.1-8.3. Ventricular appendage 890-2700 (1711), oesophagus/ventricular appendage 1.7-4.2, ventricular appendage/caecum 1.6-3.8. Nerve ring to anterior extremity 450-1050. Excretory pore to anterior extremity 475-1150. Tail 200-250 (207). Spicules 1200-2950 (1859), 3.5-7.2% of body length.

♀♀ (based on 9 specimens). Length 16.30-74.00 (49.49) mm. Oesophagus 1700-7960 (5708), 9.4-13.1% of body length. Intestinal caecum 470-1400 (927), oesophagus/caecum 3.4-8.4. Ventricular appendage 550-2700 (1844), oesophagus/ventricular appendage 2.0-3.8, ventricular appendage/caecum 1.1-2.4. Nerve ring to anterior extremity 500-1150. Excretory pore to anterior extremity 550-1320. Tail 190-550 (455). Eggs 60/55.

DESCRIPTION
Body gradually tapering anteriorly. Cuticle with inconspicuous annulations. Lateral alae very thin (4-20, depending on level), barely visible at base of lips and becoming more apparent at 200-400 from anterior extremity. Lips slightly shorter or slightly longer than wide (120-360 long, 95-360 wide). Cuticular labial flanges constricted near middle of lips. Length of interlabia less than a third of lip length. Excretory pore at level or slightly posterior to level of nerve ring. Ventriculus generally broader than long. Intestinal caecum short. Ventricular appendage shorter than oesophagus. Tail with mucronate extremity covered with minute spines.

Male
Precloacal papillae 22-30 pairs, becoming smaller and closer together posteriorly. Large medio-ventral papilla on anterior lip of cloaca. Ad-cloacal papillae present or absent, sometimes present on one side only. Post-cloacal papillae often not bilaterally symmetrical; number of papillae present on one side varying from four to nine, with one or two pairs lateral, others sub-ventral; third or fourth sub-ventral pair from posterior extremity usually double, sometimes on one side only. Spicules thin, alate, equal or sub-equal.

Female
Vulva without salient lips, opening 33-42% of body length from anterior extremity (three speci-

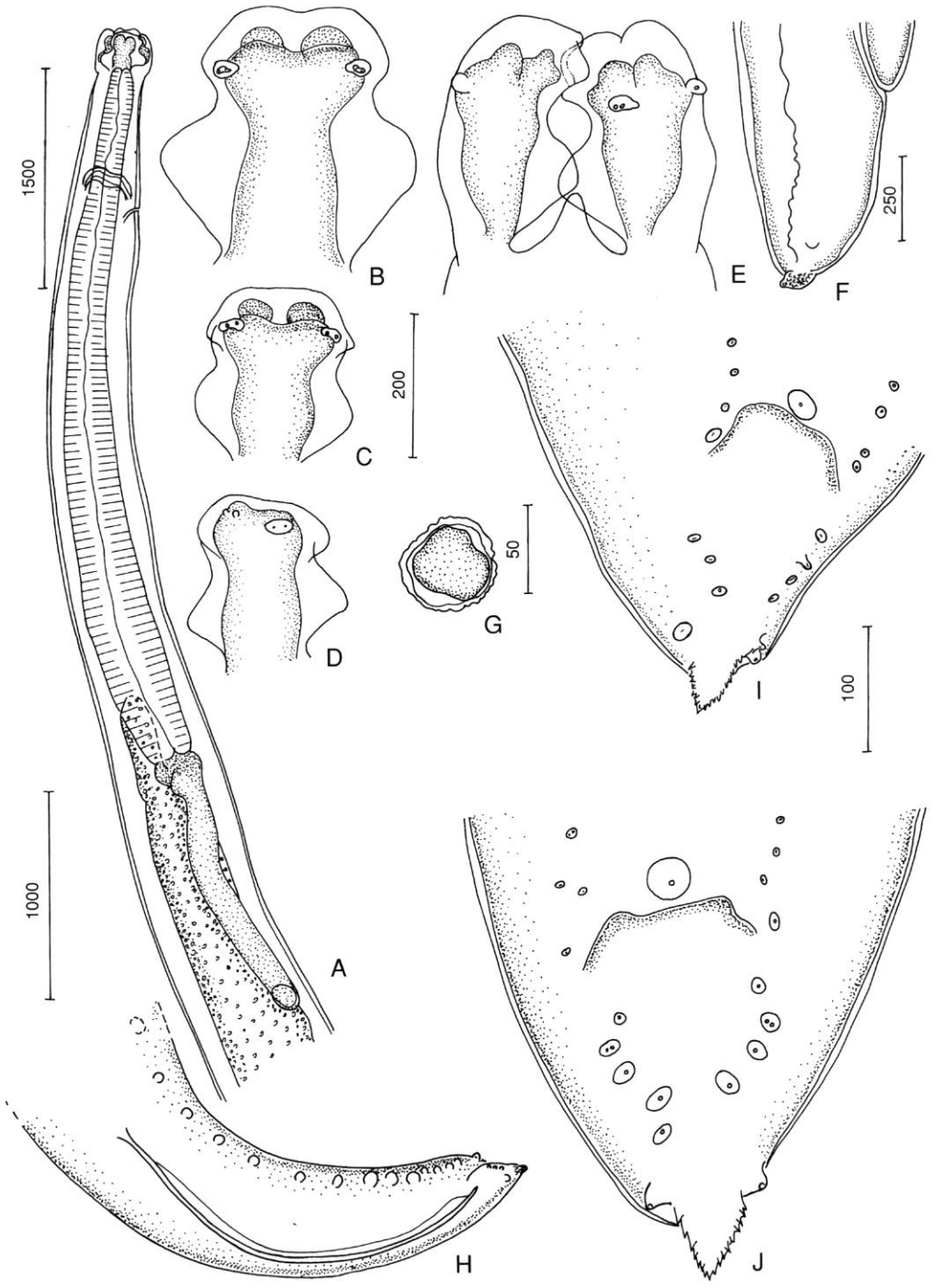

Fig. 1. — *Hysterothylacium reliquens*. Specimens from *Acanthopagrus berda*. **A**, ♂, anterior part, lateral view. **B**, ♀, dorsal lip. **C**, ♂, dorsal lip. **D**, ♂, subventral lip. **E**, ♂, anterior end, lateral view. **F**, ♀, posterior end, lateral view. **G**, egg. **H**, ♂, posterior part, lateral view. **I**, **J**, ♂, posterior end, ventral views. Scale bars (µm): A, 1500; B, C, D, E, 200; F, 250; G, 50; H, 1000; I, J, 100.

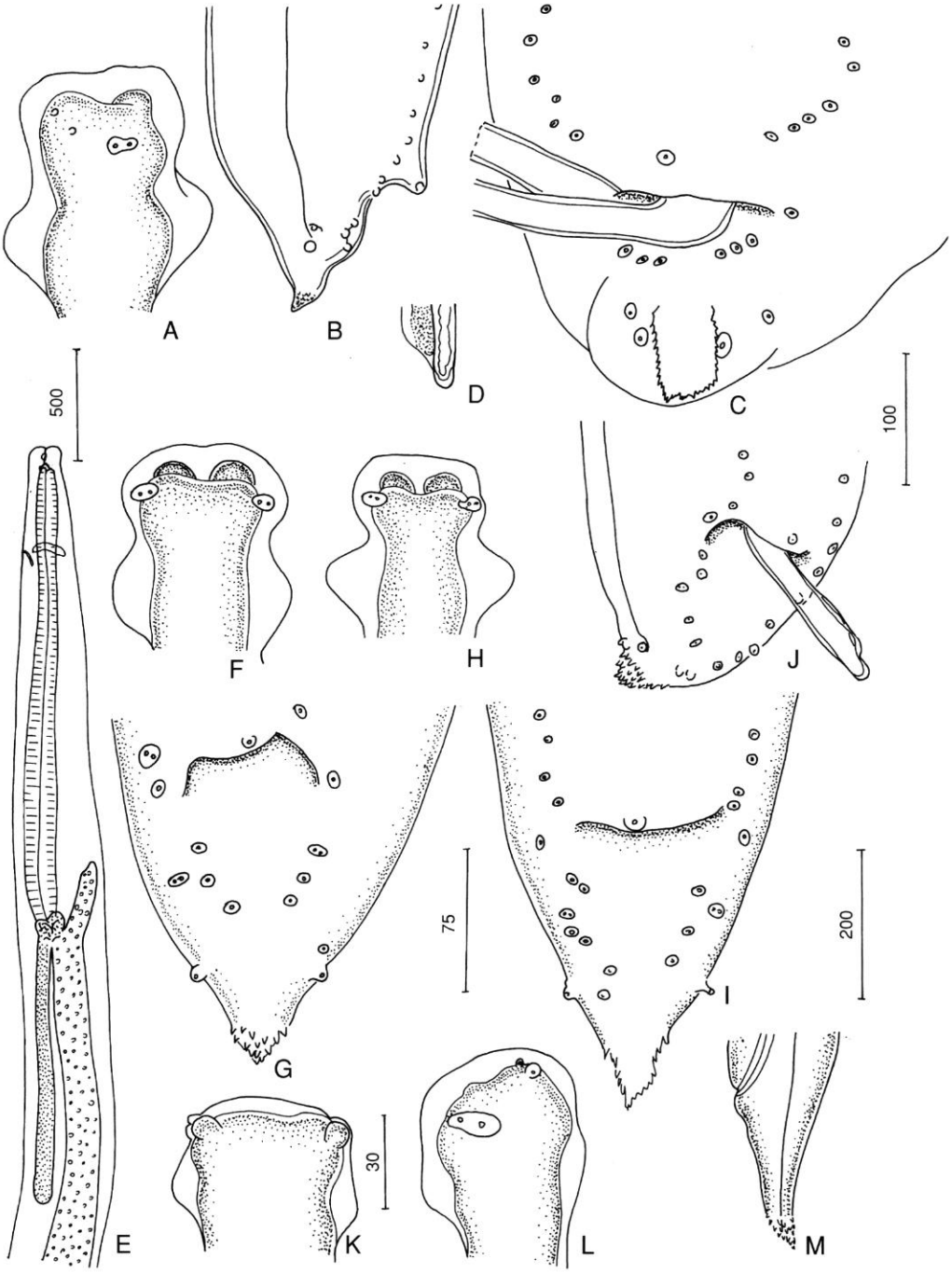

FIG. 2. — *Hysterothylacium reliquens*. **A-D**, specimens from *Epinephelus tauvina*. **A**, subventral lip. **B**, ♂, posterior end, lateral view. **C**, ♂, posterior end, ventral view. **D**, distal end of spicule. **E-G**, specimens from *Plotosus anguillaris*. **E**, anterior part, lateral view. **F**, dorsal lip. **G**, posterior end, ventral view. **H-J**, specimens from *Synaptura orientalis*. **H**, dorsal lip. **I, J**, ♂♂, posterior ends, ventral views. **K-M**, fourth-stage larva. **K**, dorsal lip. **L**, subventral lip. **M**, posterior end, lateral view. Scale bars (µm): A, B, H, M, 200; C, J, 100; D, F, G, I, L, 75; E, 500; K, 30.

mens measured). Uterus dividing at 11.7 mm from vulva in a female 73 mm long.

REMARKS
These specimens agree with the description of *Hysterothylacium reliquens* by Deardorff & Overstreet (1981a). This species occurs both in the eastern Pacific and Atlantic Oceans (Norris & Overstreet 1975; Deardorff & Overstreet 1981a; Petter & Cabaret 1995), but has not yet been recorded from the Indian Ocean and adjacent seas.

Family ANISAKIDAE
(Railliet *et* Henry, 1912, subfam.)
FOURTH-STAGE LARVAE

Hysterothylacium reliquens larva
(Fig. 2K-M)

MATERIAL. — 1 larva No. 124 BF from *Synaptura orientalis*.

MEASUREMENTS. — (1 larva) Length 6.35 mm. Oseophagus 1025, 16.1% of body length. Intestinal caecum 200, oesophagus/caecum 5.1. Ventricular appendage 300, oesophagus/ventricular appendage 3.4, ventricular appendage/caecum 1.5. Tail 220.

DESCRIPTION
The ratios of the lengths of intestinal caecum and ventricular appendage in relation to oesophagus are the same as those of the adults found in the same host (*Synaptura orientalis*). The tail has a mucronate extremity covered with minute spines. Thin lateral alae are present. The lips differ from those of the adults by the shape of the cuticular labial flanges, and the interlabia are very reduced.

Hysterothylacium sp. type KG larvae
(Fig. 3A-H)

MATERIAL. — 3 larvae No. 112 BF from *Epinephelus tauvina*.

MEASUREMENTS. — (2 ♀♀, 1 ♂ larvae) Length 20.80/27.80/18.90 mm. Oesophagus 3000/4200/3400, 14.4/15.1/17.9% of body length. Intestinal caecum 125/300/150, oesophagus/caecum 24/14/22. Ventricular appendage 700/damaged/1800, oesophagus/ventricular appendage 43/-/4.2, ventricular appendage/caecum 5.6/-/5.3. Tail 360/450/225.

DESCRIPTION
Body thin, cylindrical. Cuticle with slightly prominent annulations. Thin cuticular alae present. Dorsal lip wider than long. Latero-ventral lips longer than wide. Labial flanges triangular, restricted to posterior third of lips. Interlabia very reduced. Nerve ring lying at anterior fifth of oesophagus. Excretory pore unobserved. Ventriculus longer than wide. Caecum very short. Ventricular appendage short and slender. Tail conical, lacking spines. In longest specimen, adult tail visible under larval cuticle.
In male larva, cloacal papillae are visible under cuticle: sixteen pre-cloacal, one doubled ad-cloacal and four post-cloacal pairs (two sub-dorsal, one lateral and one sub-ventral); one medio-ventral papilla on the anterior lip of cloaca.

REMARKS
These larvae differ from *Hysterothylacium reliquens* fourth-stage larvae by their shorter intestinal caecum and ventricular appendage and a tail without spines.

Hysterothylacium sp. type KH larva
(Fig. 3I-N)

MATERIAL. — 1 larva No. 120 BF from *Scomberomorus guttatus*.

MEASUREMENTS. — (1 larva) Length 7.40 mm. Oesophagus 800, 10.8% of body length. Intestinal caecum 140, oesophagus/caecum 5.7. Ventricular appendage 570, oesophagus/ventricular appendage 1.4, ventricular appendage/caecum 2.3. Tail 240.

DESCRIPTION
Body small, cylindrical. Cuticle annulated. Lateral alae present. Lips small, rounded. Length of interlabia equal to half length of lip. Nerve ring lying at anterior third of oesophagus. Excretory pore not observed. Ventriculus nearly spherical. Intestinal caecum very short. Ventricular appendage shorter than oesophagus. Tail conical, with numerous terminal short spines arranged in a circle.

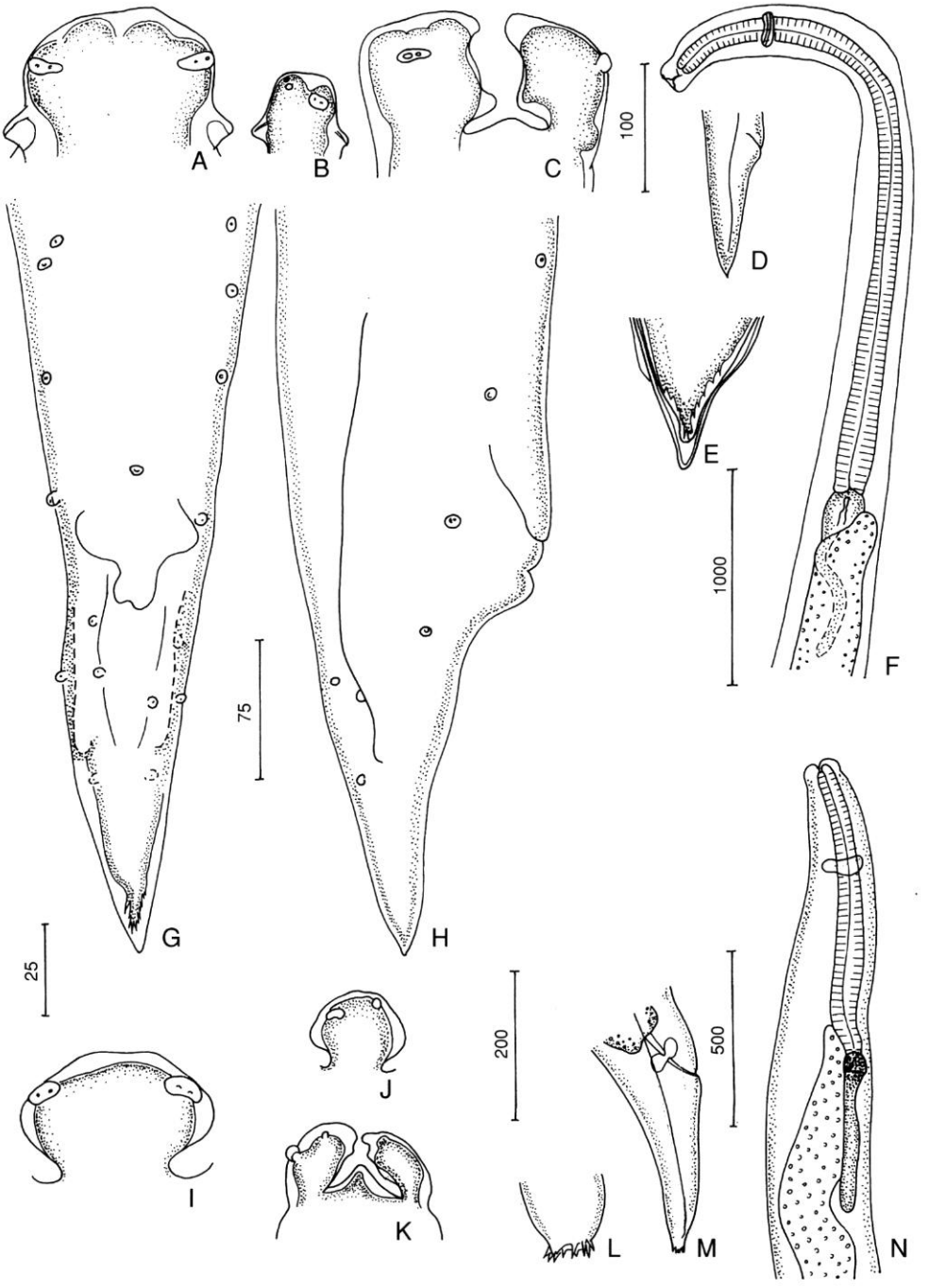

FIG. 3. — **A-H**, *Hysterothylacium* sp. larvae type KG. **A**, dorsal lip. **B**, subventral lip. **C**, anterior end, lateral view. **D**, ♀ larva, tail, lateral view. **E**, ♀ larva, posterior end showing the developing adult tail inside the cuticle of the fourth-stage. **F**, anterior part, subdorsal view. **G**, **H**, ♂♂, posterior ends. **G**, ventral view. **H**, lateral view. **I-N**, *Hysterothylacium* sp. larva type KH. **I**, dorsal lip. **J**, subventral lip. **K**, anterior end, ventral view. **L**, posterior end. **M**, tail, lateral view. **N**, anterior part, lateral view. Scale bars (µm): A, C, 100; B, M, 200; D, N, 500; E, G, H, J, K, 75; F, 1000; I, L, 25.

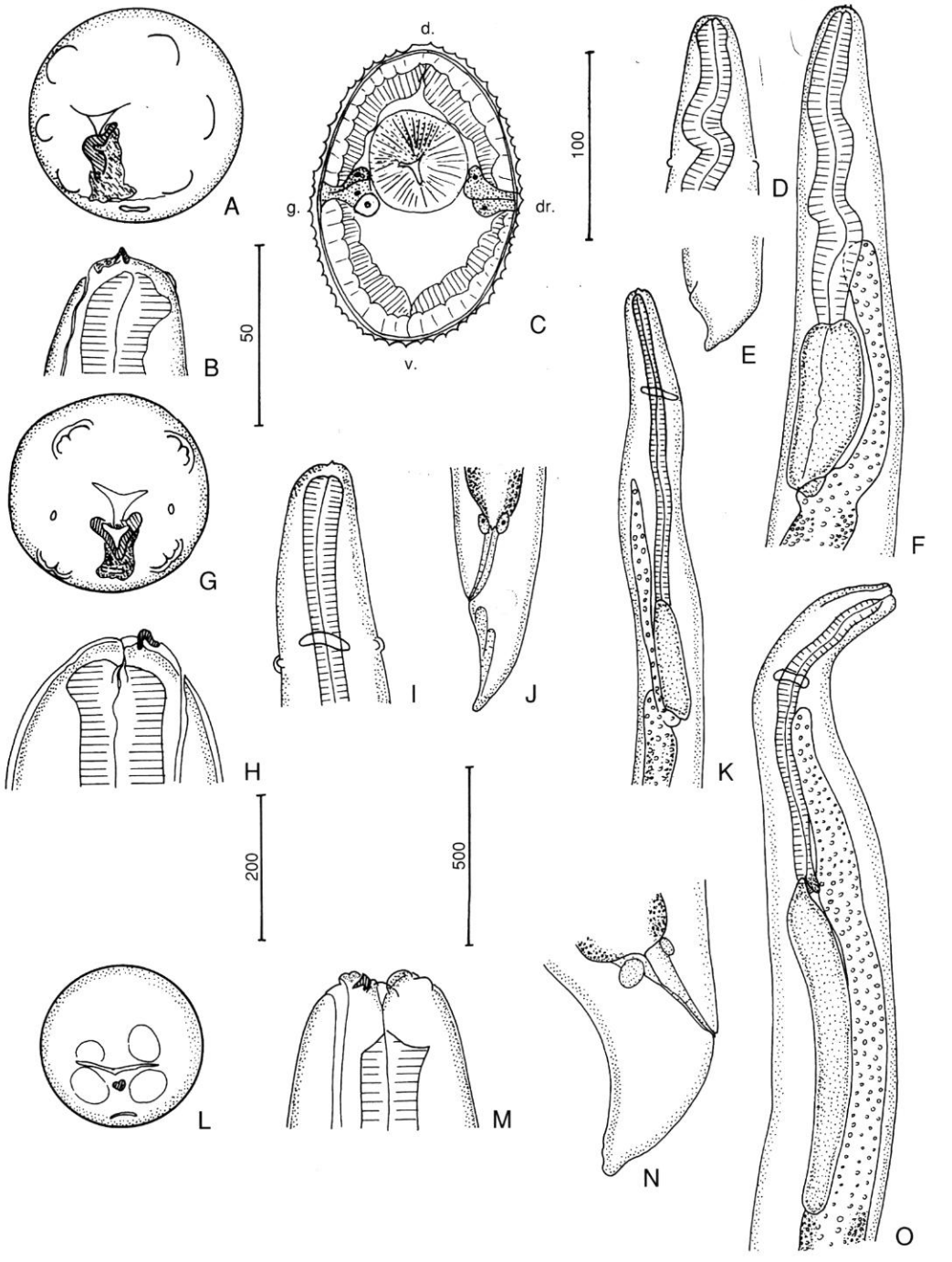

FIG. 4. — **A-K**, *Terranova* sp. larva. **A-F**, specimens from *Trichiurus lepturus*. **A**, apical view. **B**, anterior end, lateral view. **C**, transverse section at level of middle of oesophagus. **D**, anterior part, median view. **E**, tail, lateral view. **F**, anterior part, lateral view. **G-K**, specimens from *Lutjanus coccineus*. **G**, apical view. **H**, anterior end, lateral view. **I**, anterior end, ventral view. **J**, tail, lateral view. **K**, anterior part, lateral view. **L-O**, *Contracaecum* sp. larva. **L**, apical view. **M**, anterior end, lateral view. **N**, tail, lateral view. **O**, anterior part, lateral view. Scale bars (µm): A, G, L, M, 50; B, C, H, N, 100; D, F, E, I, J, O, 200; K, 500.

REMARKS
This larva differs from the fourth-stage larvae described above by the shape of the tail extremity.

Family ANISAKIDAE
(Railliet *et* Henry, 1912, subfam.)
THIRD-STAGE LARVAE

Anisakis simplex (Rudolphi, 1809) larvae

MATERIAL. — 4 larvae No. 182 BF from *Atropus atropus*; 1 larva No. 246 BF from *Caranx malabaricus*; 1 larva No. 117 BF from *Trichiurus lepturus*.

REMARKS
The morphology of these larvae agree with the descriptions given by previous authors (Berland 1961; Beverley-Burton, Nyman & Pippy 1977; Smith 1983; etc).

Terranova sp. *larvae*
(Fig. 4A-K)

MATERIAL. — 1 larva No. 182 BF from *Atropus atropus*; 1 larva No. 180 BF from *Caranx kalla*; 1 larva No. 192 BF, 1 larva No. 244 BF from *Caranx leptolepis*; 2 larvae No. 98 BF, 5 larvae No. 99 BF from *Caranx malabaricus*; 13 larvae No. 123 BF from *Lutjanus coccineus*; 3 larvae No. 249 BF from *Mene maculata*; 1 larva No. 185 BF from *Otolithes argenteus*; 3 larvae No. 116 BF from *Pseudorhombus arsius*; 1 larva No. 106 BF from *Sphyraena obtusata*; 1 larva No. 87 BF from *Therapon therops*; 1 larva No. 189 BF from *Trachurus trachurus*; 1 larva No. 255 BF from *Trachynocephalus myops*; 4 larvae No. 117 BF from *Trichiurus lepturus*.

MEASUREMENTS. — (8 larvae) Length 3.80-8.15 mm. Oesophagus 440-1000, 11.5-19% of body length. Ventriculus 200-400, oesophagus/ventriculus 2.2-2.8. Intestinal caecum 350-825, oesophagus/caecum 1.1-1.6. Tail 60-150.

DESCRIPTION
Small larvae. Cuticle annulated and provided with longitudinal ridges extending entire length of body. Small boring tooth present, lying on basal sclerotized rectangular plate. Four submedian double papillae and two lateral amphids visible. Excretory pore just posterior to larval tooth. Glandular left excretory filament quite narrow at the middle of oesophagus (10% of the body diameter). Ventriculus cylindrical, with oblique ventriculo-intestinal junction. Intestinal caecum not reaching anteriorly the middle of oesophagus. Small rounded deirids located at level of nerve ring. Tail short, conical.

REMARKS
By their glandular left excretory filament quite narrow at the middle of oesophagus, these larvae are closer to adults of the genus *Terranova* than to those of the genus *Pseudoterranova* (see Gibson 1983). They are similar by their measurements and shape of boring tooth to *Terranova* sp. type II larvae of Cannon (1977). According to Cannon, most of these larvae could be third-stages of the species *Terranova galeocerdonis* or *T. scoliodontis*, parasitizing sharks in the adult stage. *T. galeocerdonis* distribution is worldwide in tropical or warm waters (Bruce & Cannon 1990).

Contracaecum or ***Phocascaris*** sp. larvae
(Fig. 4L-O)

MATERIAL. — 3 larvae No. 108 BF from *Mulloidichthys auriflamma*.

MEASUREMENTS. — (2 larvae) Length 2.75/2.80 mm. Oesophagus 440/430, 16.0/15.3% of body length. Intestinal caecum 270/250, oesophagus/caecum 1.6/1.7. Ventricular appendage 440/440, oesophagus/ventricular appendage 1.0/0.9, ventricular appendage/caecum 1.6/1.7. Tail 70/80.

DESCRIPTION
Small larvae. Cuticle with prominent annulations. Minute larval tooth present. Oral opening surrounded by four large submedian elevations (amphids and nerve endings of papillae not visible). Excretory pore just posterior to larval tooth. Oesophagus slender. Small ventriculus nearly spherical. Intestinal caecum longer than one half of oesophagus. Ventricular appendage about same length as oesophagus. Tail conical, rounded at extremity, with prominent annulations.

REMARKS
These larvae belong either to the genus

Contracaecum or to the genus *Phocascaris* as third-stage larvae of these two genera are morphologically indistinguishable (see Nascetti *et al.* 1993). They are close by their measurements and morphology to *Contracaecum* sp. type II larvae of Cannon (1977), which, according to Cannon, could be the larvae of *Contracaecum spiculigerum*, a parasite of cormorants.

Hysterothylacium sp. type KA larvae (Fig. 5A-E)

MATERIAL. — 1 larva No. 83 BF from *Acanthopagrus* sp.; 1 larva No. 102 BF from *Arius thalassinus*; 1 larva No. 182 BF from *Atropus atropus*; 12 larvae No. 180 BF from *Caranx kalla*; 4 larvae No. 95 BF, 13 larvae No. 96 BF, 4 larvae No. 97 BF, 4 larvae No. 192 BF, 5 larvae No. 244 BF from *Caranx leptolepis*;

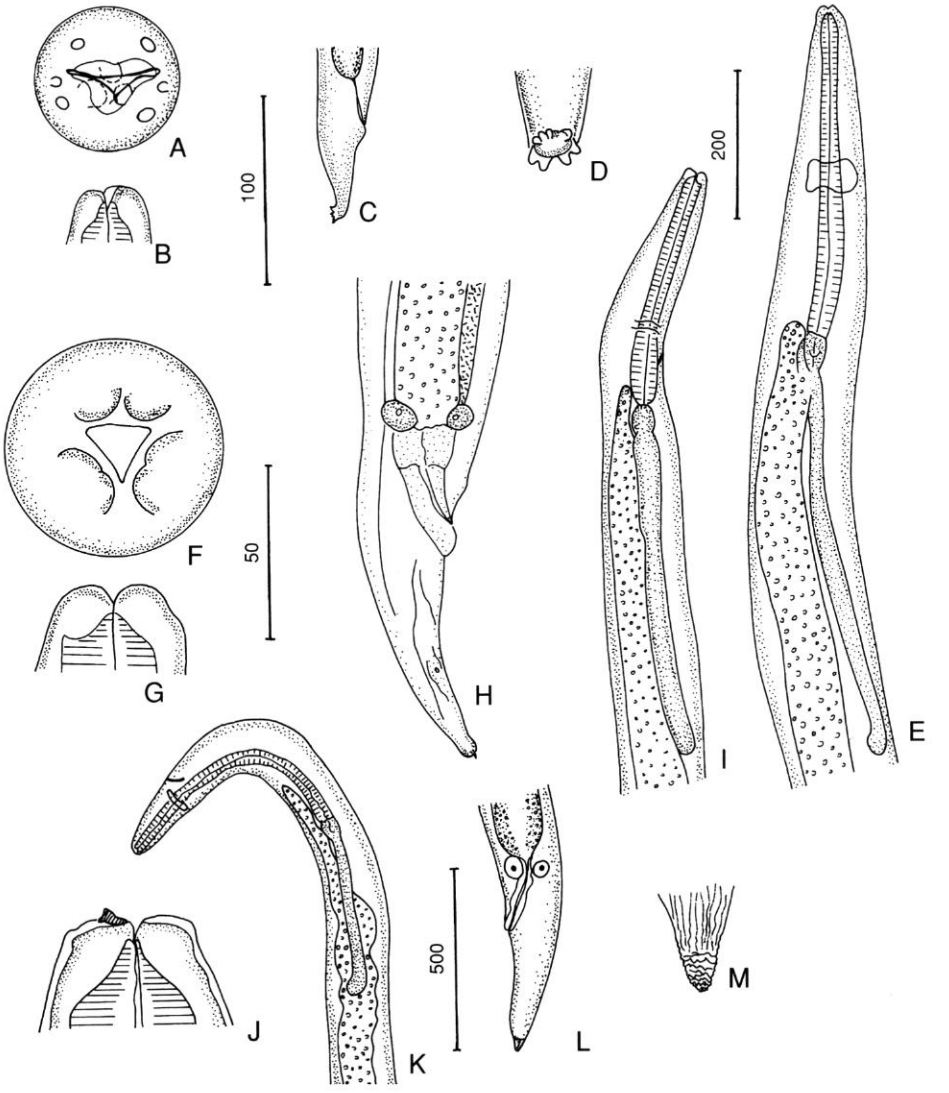

FIG. 5. — **A-E**, *Hysterothylacium* sp. larva type KA. **A**, apical view. **B**, anterior end, lateral view. **C**, tail, lateral view. **D**, posterior end, dorsal view. **E**, anterior part, lateral view. **F-I**, *Hysterothylacium* sp. larva type KB. **F**, apical view. **G**, anterior end, lateral view. **H**, tail, lateral view. **I**, anterior part, lateral view. **J-M**, *Hysterothylacium* sp. larva type KC. **J**, anterior end, lateral view. **K**, anterior part, lateral view. **L**, tail, lateral view. **M**, posterior end. Scale bars (µm): A, D, F, G, J, 50; B, H, M, 100; C, E, I, L, 200; K, 500.

2 larvae No. 245 BF from *Caranx malabaricus*; 1 larva No. 248 BF from *Cypselurus oligolepis*; 4 larvae No. 119 BF, 4 larvae No. 118 BF from *Hemiramphus marginatus*; 1 larva No. 103 BF from *Leiognathus fasciatus*; 17 larvae No. 89 BF, 6 larvae No. 249 BF from *Mene maculata*; 1 larva No. 107 BF from *Mulloidichthys auriflamma*; 2 larvae No. 191 BF from *Otolithes argenteus*; 1 larva No. 116 BF from *Pseudorhombus arsius*; 2 larvae No. 252 BF from *Rachycentron canadum*; 1 larva No. 81 BF, 17 larvae No. 80 BF, 3 larvae No. 79 BF from *Sardinella perforata*; 25 larvae No. 253 BF from *Scomberoides commersonianus*; 2 larvae No. 92 BF from *Sphyraena jello*; 1 larva No. 106 BF, 3 larvae No. 105 BF from *Sphyraena obtusata*; 20 larvae No. 189 BF from *Trachurus trachurus*; 12 larvae No. 117 BF from *Trichiurus lepturus*.

MEASUREMENTS. — (10 larvae) Length 2.40-7.60 mm. Oesophagus 270-720, 8.9-11.2% of body length. Intestinal caecum 70-180, oesophagus/caecum 2.7-7.7. Ventricular appendage 200-590, oesophagus/ventricular appendage 0.8-2.2, ventricular appendage/caecum 1.3-7.1. Tail 110-200.

DESCRIPTION

Small larvae. Cuticle annulated. Very thin lateral alae, inconspicuous anteriorly, widening sligthly posterior to nerve ring and extending up to the middle of tail. Oral opening triangular, two lateral amphids and four rounded submedian papillae visible (no evidence of these papillae being double). Boring tooth lacking. Excretory pore sligthly posterior to nerve ring. Oesophagus narrow. Small ventriculus sligthly longer than wide. Intestinal caecum short. Ventricular appendage sligthly shorter or sligthly longer than oesophagus. Tail long, with 6-8 terminal spines arranged in circle.

REMARKS

These larvae agree by their measurements and morphology with *Contracaecum* type II larvae of Yamaguti (1935) (= type F of Kikuchi *et al.*, 1970) from Japanese fishes.

By their caudal end, they resemble to *Hysterothylacium* type KH fourth-stage larvae described above, but they differ by a relatively longer ventricular appendage. If the ratios of the caecum and appendage vary with the larval stage, these two types of larvae may belong to the same species.

Hysterothylacium sp. type KB larvae (Fig. 5F-I)

MATERIAL. — 1 larva No. 249 BF from *Mene maculata*; 3 larvae No. 107 BF, 1 larva No. 108 BF from *Mulloidichthys auriflamma*; 3 larvae No. 91 BF, 4 larvae No. 185 BF from *Otolithes argenteus*; 2 larvae No. 115 BF from *Pseudorhombus arsius*; 2 larvae No. 92 BF from *Sphyraena jello*; 4 larvae No. 106 BF, 2 larvae No. 105 BF from *Sphyraena obtusata*; 6 larvae No. 84 BF from *Upeneus sulphureus*.

MEASUREMENTS. — (10 larvae) Length 3.40-9.80 mm. Oesophagus 310-675, 6.8-9.5% of body length. Intestinal caecum 35-220, oesophagus/caecum 3.1-8.8. Ventricular appendage 350-780, oesophagus/ventricular appendage 0.7-1.3, ventricular appendage/caecum 2.8-10. Tail 100-240.

DESCRIPTION

Small larvae. Cuticle annulated. Oral opening triangular, surrounded by four submedian elevations (amphids and nerve endings of papillae not visible). Thin lateral alae extending along entire body. Nerve ring lying posterior to the middle of oesophagus. Oesophagus narrow. Small ventriculus slightly longer than wide. Intestinal caecum short. Ventricular appendage slightly longer or slightly shorter than oesophagus. Tail long, rounded at posterior extremity, with minute terminal spine.

REMARKS

These larvae agree by their measurements and the shape of tail with *Contracaecum* type III larvae of Yamaguti (1935).

Hysterothylacium sp. type KC larva (Fig. 5J-M)

MATERIAL. — 1 larva No. 84 BF from *Upeneus sulphureus*.

MEASUREMENTS. — (1 larva) Length 4.20 mm. Oesophagus 650, 15.4% of body length. Intestinal caecum 200, oesophagus/caecum 3.2. Ventricular appendage 450, oesophagus/ventricular appendage 1.4, ventricular appendage/caecum 2.2. Tail 160.

DESCRIPTION

Small larva. Cuticle annulated. Lateral alae lacking. Boring tooth present. Oesophagus narrow.

Small ventriculus almost spherical. Intestinal caecum short. Ventricular appendage shorter than oesophagus. Excretory pore slightly posterior to nerve ring. Tail conical, pointed at posterior extremity, with prominent annulations.

REMARKS

In the length of the ventricular appendage and the presence of a boring tooth, this larva is similar to *Contracaecum* type IV larvae of Yamaguti (1935).

Hysterothylacium sp. type KD larvae (Fig. 6A-D)

MATERIAL. — 1 larva No. 108 BF from *Mulloidichthys auriflamma*; 4 larvae No. 117 BF from *Trichiurus lepturus*.

MEASUREMENTS. — (4 larvae) Length 2.05-2.30 mm. Oesophagus 330-385, 16-17% of body length. Intestinal caecum 100-115, oesophagus/intestinal caecum 3.2-3.5. Ventricular appendage 830-1400, oesophagus/ventricular appendage 0.2-0.4, ventricular appendage/caecum 7.5-14. Tail 55-80.

DESCRIPTION

Small larvae. Cuticle annulated. Thin lateral alae present, originating at 70 from anterior extremity and extending up to 250 from posterior extremity. Minute boring tooth present, lying on sclerotized plate. Oral opening triangular, two lateral amphids and four rounded submedian papillae visible (no evidence of these papillae being double). Small ventriculus almost spherical. Caecum short. Ventricular appendage very long. Nerve ring anterior to middle of oesophagus. Excretory pore slightly posterior to nerve ring. Tail conical, curved dorsally, with six short terminal spines arranged in circle.

REMARKS

The caudal extremities of these larvae resemble those of *Hysterothylacium* type KA larvae described above, but they differ from these larvae in having a shorter body and a very long ventricular appendage.

Hysterothylacium sp. type KE larvae (Fig. 6E-H)

MATERIAL. — 1 larva No. 122 BF from *Argyrops spinifer*; 3 larvae No. 98 BF, 4 larvae No. 99 BF from *Caranx malabaricus*; 3 larvae No. 123 BF from *Lutjanus coccineus*; 1 larva No. 107 BF from *Mulloidichthys auriflamma*; 1 larva No. 121 BF from *Saurida undosquamis*; 1 larva No. 253 BF from *Scomberoides commersonianus*; 1 larva No. 117 BF from *Trichiurus lepturus*.

MEASUREMENTS. — (10 larvae) Length 7.10-20.80 mm. Oesophagus 600-1050, 5.0-8.5% of body length. Intestinal caecum 70-250, oesophagus/intestinal caecum 4.0-11.5. Ventricular appendage 2700-5800, oesophagus/ventricular appendage 0.2-0.3, ventricular appendage/caecum 16.1-43.1. Tail 125-200.

DESCRIPTION

Long larvae. Cuticle annulated. Lateral alae lacking. Oral opening triangular. Four large double submedian papillae and two lateral amphids visible. Boring tooth present. Small ventriculus slightly longer than wide. Caecum short. Ventricular appendage very long. Nerve ring anterior to middle of oesophagus. Excretory pore slightly posterior to nerve ring. Tail short, conical, rounded at posterior extremity; minute terminal mucron present or lacking.

REMARKS

These larvae are conspecific with the *Hysterothylacium* larvae described by Kardousha (1992) from the Persian Gulf, which this author identified with *Contracaecum* larvae type V of Yamaguti (1935). They are also similar to the *Contracaecum* sp. larvae type 2 (PC2) described by Bilqees & Fatima (1986) from the Karachi Coast and probably with the *Contracaecum* sp. 2 larvae described by Gavrilyuk (1978) from the Indian Ocean.

Hysterothylacium sp. type KF larvae (Fig. 6I-M)

MATERIAL. — 1 larva No. 242 BF from *Argyrops filamentosus*; 7 larvae No. 102 BF, 3 larvae No. 179 BF, 3 larvae No. 188 BF from *Arius thalassinus*; 1 larva No. 193 BF from *Leiognathus bindus*; 1 larva No. 123 BF from *Lutjanus coccineus*; 3 larvae No. 116 BF,

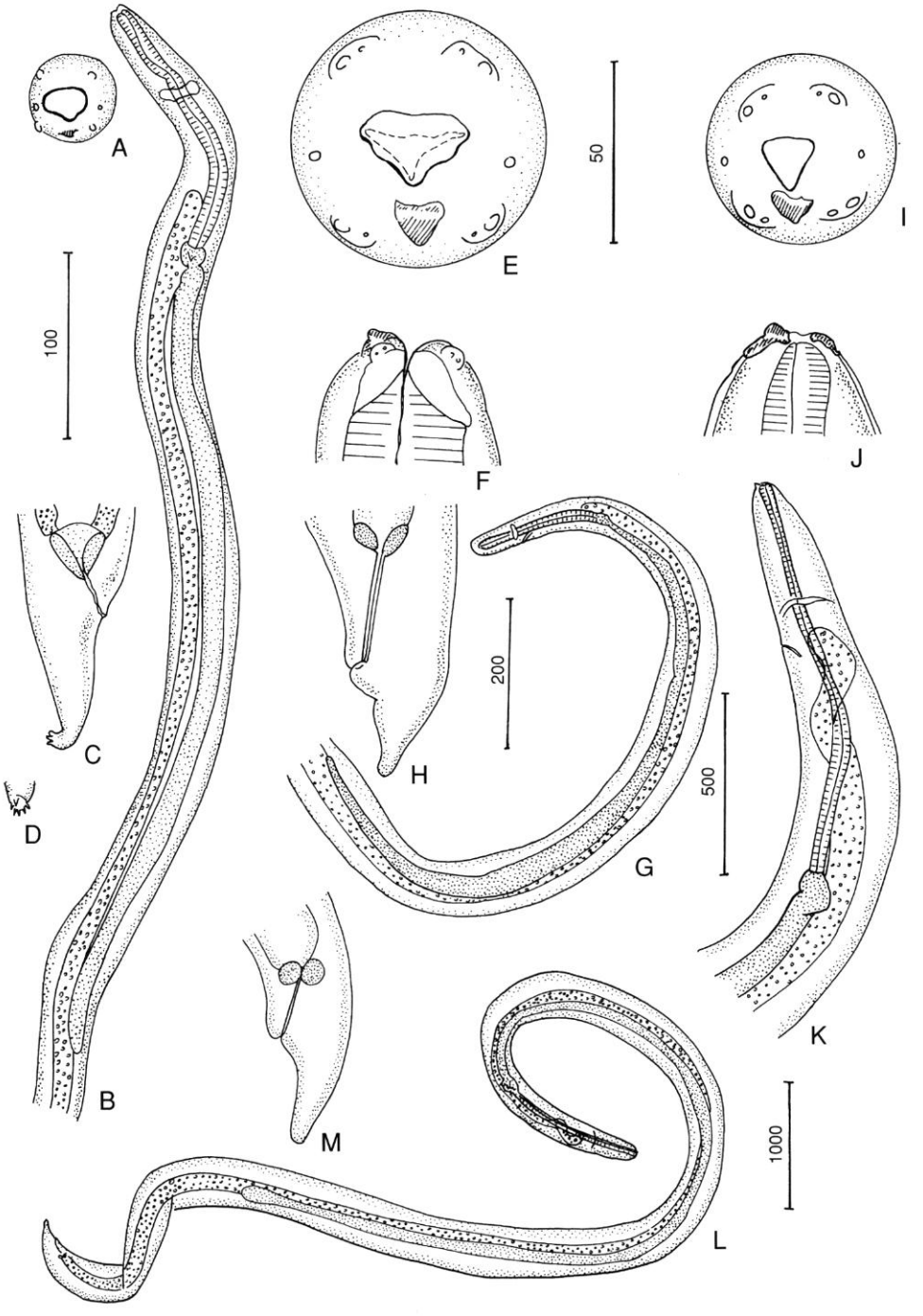

FIG. 6. — A-D, *Hysterothylacium* sp. larva type KD. **A**, apical view. **B**, anterior part, lateral view. **C**, tail, lateral view. **D**, posterior end, dorsal view. **E-H**, *Hysterothylacium* sp. larva type KE. **E**, apical view. **F**, anterior end, lateral view. **G**, anterior part, lateral view. **H**, tail, lateral view. **I-M**, *Hysterothylacium* sp. larva type KF. **I**, apical view. **J**, anterior end, lateral view. **K**, anterior part, lateral view. **L**, general view. **M**, tail, lateral view. Scale bars (µm): A, E, I, 50; B, H, M, 200; C, D, F, J, 100; G, L, 1000; K, 500.

1 larva No. 190 BF, 1 larva No. 250 BF from *Pseudorhombus arsius*; 1 larva No. 261 BF from *Trachinotus blochi*.

MEASUREMENTS. — (6 larvae) Length 8.30-10.50 mm. Oesophagus 750-1080, 9-11% of body length. Intestinal caecum 625-800, oesophagus/intestinal caecum 1.2-1.4. Ventricular appendage 5350-7000, oesophagus/ventricular appendage 0.1-0.2, ventricular appendage/caecum 6.9-8.7. Tail 110-150.

DESCRIPTION

Long larvae. Cuticle annulated. Lateral alae la-

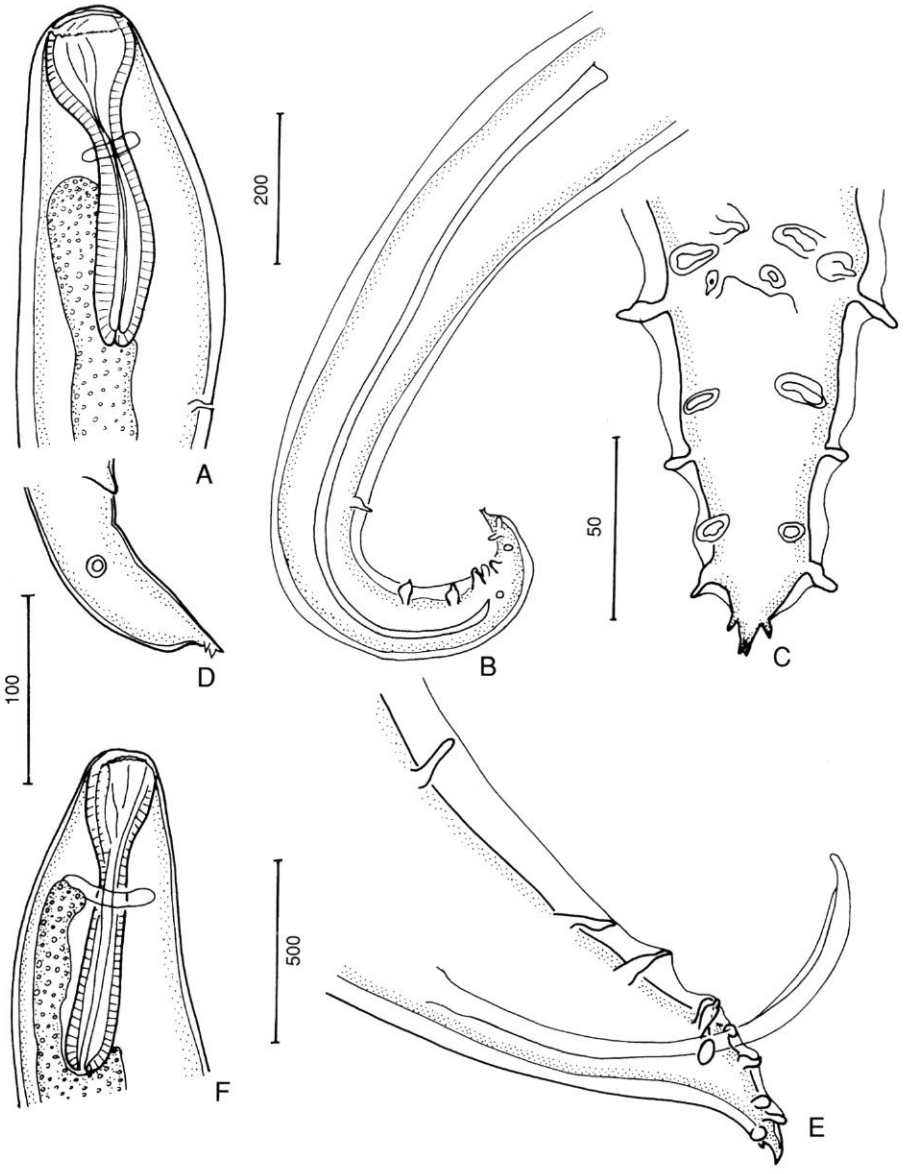

FIG. 7. — **A-D**, *Dichelyne (D.) exiguus*. **A**, anterior part, lateral view. **B**, ♂, posterior part, lateral view. **C**, ♂, posterior end, ventral view. **D**, ♀, posterior end, lateral view. **E-F**, *Dichelyne (D.)* sp. **E**, posterior part, lateral view. **F**, anterior part, lateral view. Scale bars (µm): A, B, E, 200; C, 50; D, 100; F, 500.

cking. Oral opening triangular, four large submedian double papillae and two small lateral amphids visible. Boring tooth present. Oesophagus long and thin. Ventriculus slightly longer than wide. Intestinal caecum longer than one half of oesophagus. Ventricular appendage longer than half body length. Nerve ring lying at junction of first and second thirds of oesophagus. Excretory pore slightly posterior to nerve ring. Tail short, conical, without terminal spine.

REMARKS

In their dimensions and the shape of the tail, these larvae are similar to *Hysterothylacium* larvae China type I of Sun *et al.* (1992).

They resemble to *Contracaecum* larvae (B) of Shiraki (1974) from the Sea of Japan, by the ratios of the intestinal caecum and ventricular appendage to the oesophagus lengths, but they are much shorter.

Family CUCULLANIDAE Cobbold, 1864

Dichelyne (D.) exiguus (Yamaguti, 1954)
(Fig. 7A-D)

MATERIAL. — 3 ♂♂, 2 ♀♀ No. 91 BF, about 20 ♂♂ and ♀ No. 185 BF, 1 ♂, 1 ♀ No. 90 BF, 3 ♂♂, 2 ♀♀ No. 191 BF from *Otolithes argenteus*.

DESCRIPTION

Body stout, 2-3 mm long, with thick cuticle (fiveteen). Oesophagus 20-23% of body length. Intestinal caecum dorsal, usually longer than half of oesophagus. Deirids located between middle and posterior end of oesophagus. Spicules 23-50% of body length. Tail bifid, with two additional lateral spikes slightly anterior to extremity.

Male

Eleven pairs of cloacal papillae: three pairs precloacal subventral; four pairs ad-cloacal, with two pairs sub-ventral just above the cloacal aperture, one pair lateral at level of this aperture and one small pair ventral on anterior lip of cloaca; four pairs post-cloacal, with one anterior pair subventral, followed by one pair lateral, one pair subventral and the posterior pair lateral.

REMARKS

These specimens agree with the description of *Dichelyne (D.) exiguus* given by Rasheed (1968), in the shape of the caudal extremity and the arrangement of cloacal papillae (the small pair on the anterior lip of cloaca is difficult to see and was omitted by Rasheed). This species has not previously been recorded from *Otolithes argenteus*, but was described from two other Perciformes, *Lates calcarifer* and *Pseudosciaena* sp. (see Yamaguti 1954 and Rasheed 1968).

***Dichelyne* (*D.*) sp.**
(Fig. 7E-F)

MATERIAL. — 3 ♂♂, 5 ♀♀ No. 123 BF from *Lutjanus coccineus*.

MEASUREMENTS. — (1 ♂) Length 4.00 mm. Oesophagus 900. Intestinal caecum 550. Nerve ring to anterior extremity 400. Tail 180. Spicules 800.

DESCRIPTION

Body stout, 3-5 mm long. Cuticle detached from the body and swollen owing to the poor fixation. Intestinal caecum dorsal. Tail pointed, without spines. Spicules measuring 20-24% of body length. Pre-cloacal sucker lacking. Eleven pairs of cloacal papillae: three pairs pre-cloacal subventral; five pairs ad-cloacal: three pairs subventral with two anterior pairs at the same transversal level, one pair lateral and one small subventral pair located on the anterior lip of cloaca; three pairs post-cloacal: two anterior pairs subventral and posterior pair lateral.

REMARKS

By the arrangement of cloacal papillae, these specimens are close to *Dichelyne (D.) exiguus* and *D.(D.) indentatus* (Rasheed, 1968). They differ from *D.(D.) exiguus* by the presence of a tail without spines and from *D.(D.) indentatus* by an unserrate cuticle, as far as we can judge on this poorly preserved material.

One species of the subgenus *Dichelyne* was described from fishes belonging to the genus *Lutjanus*, i.e. *Dichelyne (D.) lutjani* described by Schmidt & Kuntz (1969) from *Lutjanus gibbosus* in Philippines, but this species is unsufficiently

described, so we cannot compare it with our specimens. Thus these specimens cannot be identified with certainty with an existing species, however the material is not sufficiently well preserved to permit the establishment of a new species.

Cucullanus trachinoti n.sp.
(Fig. 8)

MATERIAL. — 1 ♂ holotype, 2 ♂♂ and 1 ♀ juvenile paratypes, No. 178 BF.

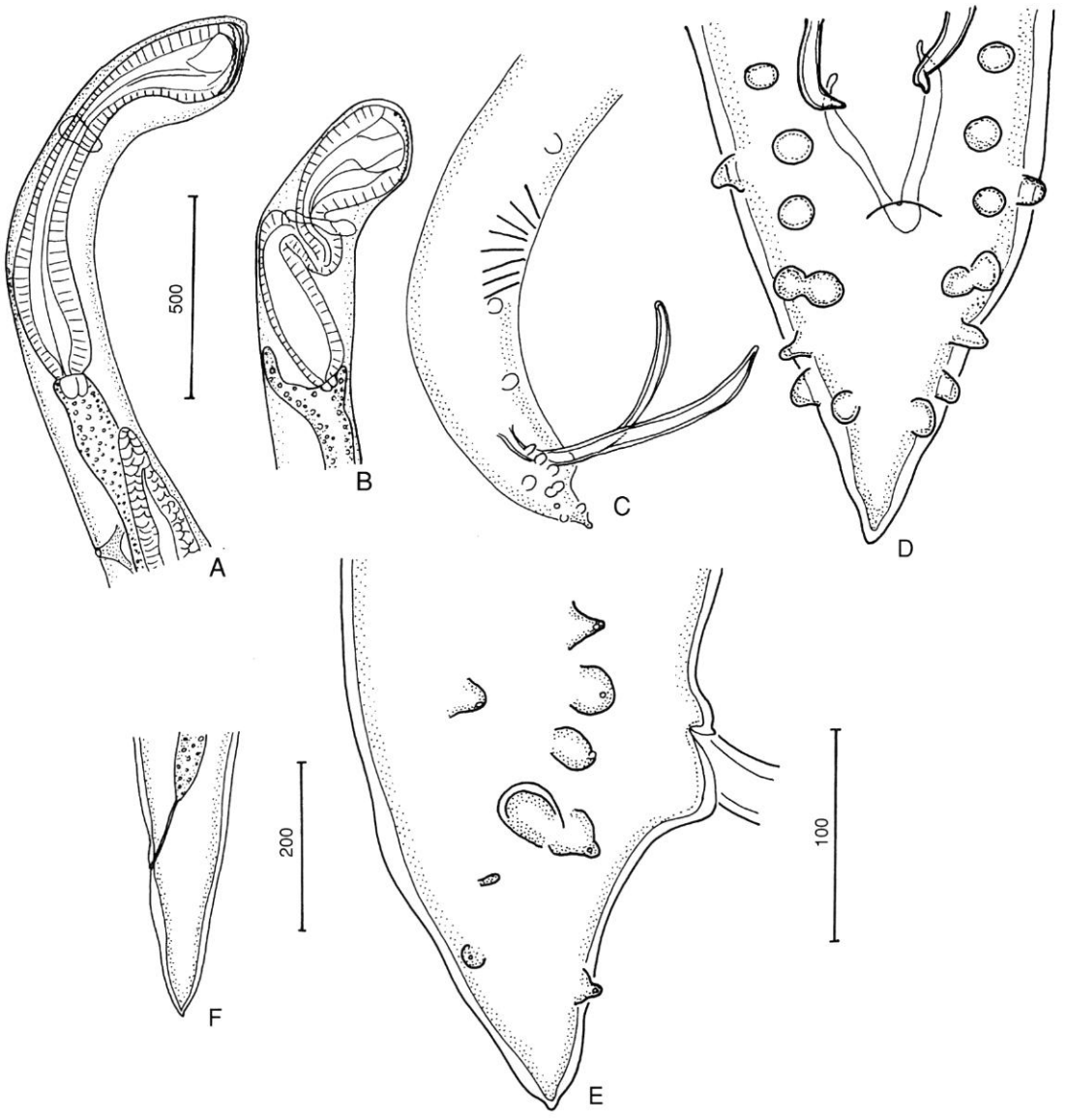

FIG. 8. — *Cucullanus trachinoti* n.sp. **A**, **B**, anterior parts, lateral views. **C**, ♂, posterior part, lateral view. **D**, ♂, posterior end, ventral view. **E**, ♂, posterior end, lateral view. **F**, ♀, tail, lateral view. Scale bars (µm): A, B, C, 500; D, E, 100; F, 200.

TYPE HOST. — *Trachinotus blochi* (Lacépède) (Carangidae).

LOCALITY. — Kuwait.

MEASUREMENTS. — (1 ♂ holotype, 2 ♂♂ paratypes, 1 ♀ juvenile) Length 9.60/8.05/7.80/9.00 mm. Oesophagus 1080/800/950/1000. Nerve ring to anterior extremity 450/350/320/350. Excretory pore to anterior extremity 1500/not seen/1625/not seen. Spicules 740/600/630/-. Vulva to anterior extremity -/-/-/6400. Tail 170/150/160/180.

DESCRIPTION

Body thin, with anterior extremity curved dorsally. Cuticle thin (10). Oesophagus long, with anterior swelling wider than posterior one. Intestinal caecum usually lacking; a small caecum present in one specimen. Excretory pore just posterior to oesophagus. Deirids not seen.

Male

Pre-cloacal sucker present. Eleven pairs of cloacal papillae: three pairs pre-cloacal; five pairs ad-cloacals: four subventral and one lateral, located between the posterior subventral pairs; papilla-like structure without nerve ending present, adjacent to posterior subventral pair; three pairs post-cloacal: posteriormost subventral, next subdorsal and anterior small and lateral (phasmids). Post-deirids present, located at 1.60 mm and 3.75 mm from posterior extremity in male 8.05 mm long. Spicules equal, alate, with pointed tips, 7.5-8.0% of body length. Gubernaculum V-shaped. Tail short, conical.

Female

Vulva posterior to mid-body. Eggs absent in only female available.

REMARKS

The new species differs from all other species of *Cucullanus* recorded from carangid fishes. In *C. decapteri* Parukhin, 1966, from *Decapterus* sp. in the south China Sea and *C. alii* (Kalyankar, 1971), recorded from *Caranx* sp. in India by Soota and Dey Sarkar (1980), the precloacal sucker is lacking. In *C. pulcherrimus* Barreto, 1918, initially described from *Caranx lugubris* in Brasil and recovered by Campana-Rouget (1957) from *Trachinotus maxillosus* in West Africa, and *C. bulbosa* (Lane, 1916) described by Lane (1916) from *Caranx melampygus* in the Indian Ocean, only three pairs of subventral ad-cloacal papillae are present. *C. carangis* (Mac Callum, 1921) from *Caranx hippos* in the New York Aquarium, is a *species inquirenda*. The new species also differs from all other species of *Cucullanus* with a pre-cloacal sucker recorded from the Indian and west Pacific Oceans or adjacent seas in the arrangement of its ad- and post-cloacal papillae or in the length of its spicules. Moreover, the presence of a papilla-like structure adjacent to the posterior pair of subventral ad-cloacal papillae, or of a structure misinterpreted as a sixth pair of ad-cloacal papillae, had never previously been described in *Cucullanus* spp.

Cucullanus armatus Yamaguti, 1954
(Fig. 9A-C)

MATERIAL. — 2 ♂♂ No. 102 BF from *Arius thalassinus*.

MEASUREMENTS. — (2 ♂♂) Length 3.40/4.50 mm. Maximal width 300/320. Oesophagus 800/1000. Spicules 290/340. Tail 190/210.

DESCRIPTION

Body stout. Cuticle thin. Intestinal caecum lacking. Tail ending in fine point. Excretory pore just posterior to the posterior extremity of oesophagus. Deirids located between middle and posterior end of oesophagus. Precloacal sucker lacking. Eleven pairs of cloacal papillae: three pairs pre-cloacal, four pairs ad-cloacal with three pairs subventral and one lateral located between posterior subventrals, four pairs post-cloacal with two subventral, one lateral located between subventrals and one small pair anterior to other pairs (phasmids). Spicules 5-7.5% of body length.

REMARKS

These specimens have the same arrangement of cloacal papillae as *Cucullanus armatus* Yamaguti, 1954, like them a parasite of fishes of the genus *Arius* (see the description of Rasheed 1968). We therefore assign them to this species, although the males of *C. armatus* are slightly longer (8.2-12), and have spicules which are relatively smaller (4.0-5.1% of body length).

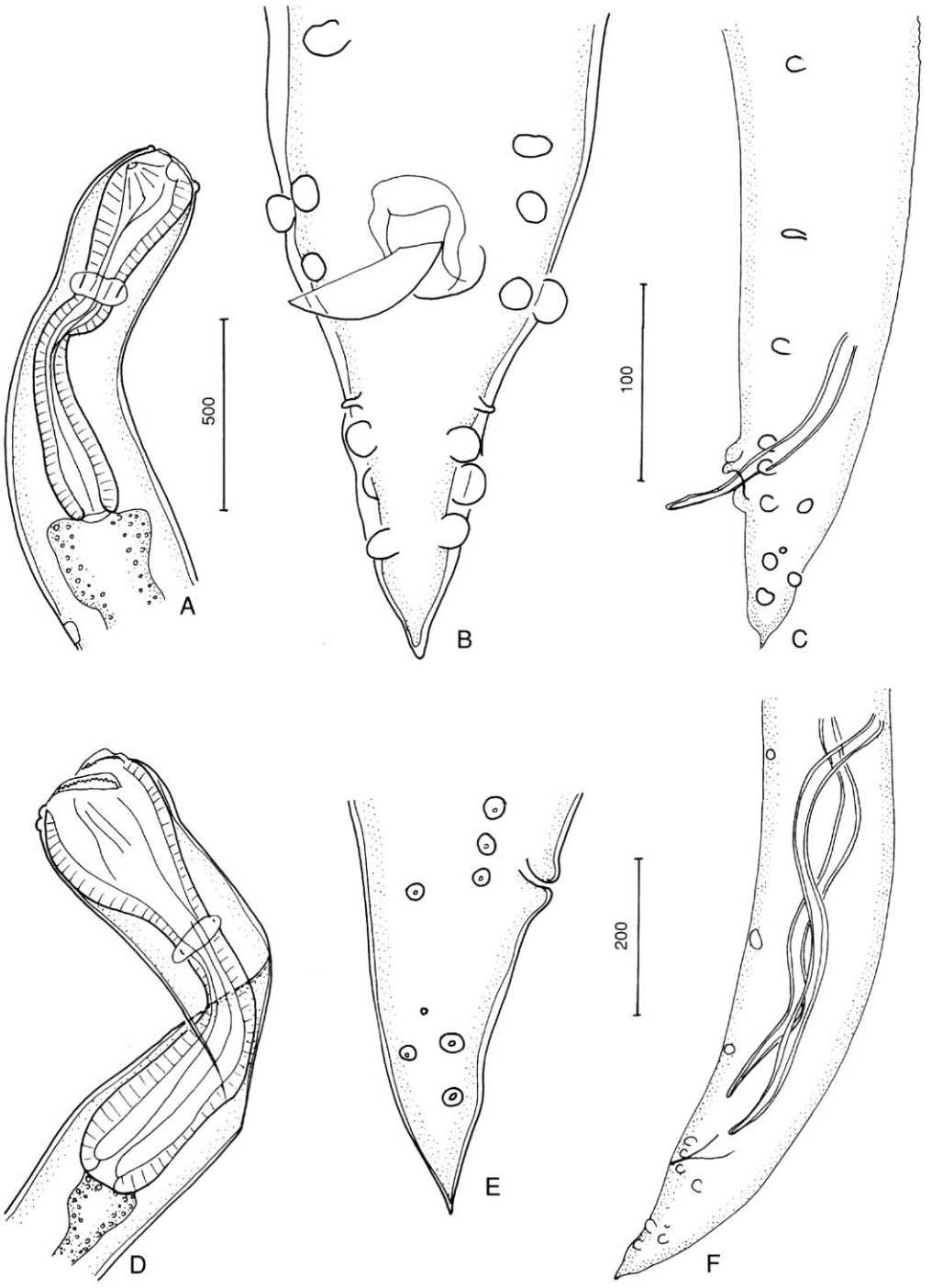

FIG. 9. — **A-C**, *Cucullanus armatus*. **A**, anterior part, lateral view. **B**, ♂, posterior end, ventral view. **C**, ♂, posterior part, lateral view. **D-F**, *Cucullanus* sp. **D**, anterior part, lateral view. **E**, ♂, posterior end, lateral view. **F**, ♂, posterior part, lateral view. Scale bars (µm): A, 500; B, E, 100; C, D, F, 200.

Cucullanus sp.
(Fig. 9D-F)

MATERIAL. — 1 ♂ No. 194 BF from *Caranx kalla*.

MEASUREMENTS. — (1 ♂) Length 5.20 mm. Maximal width 150. Oesophagus 600. Spicules 600. Tail 160.

DESCRIPTION

Body slender. Cuticle thin. Intestinal caecum and pre-cloacal sucker lacking. Excretory pore and deirids not seen. Eleven pairs of cloacal papillae: three pairs pre-cloacal, four pairs ad-cloacal with three subventral and one lateral posterior to subventrals, four pairs post-cloacal with two subventral, one lateral at level of anterior subventral and one small lateral pair more anterior (phasmids). Spicules 11.5% of body length. Tail ending in fine point.

REMARKS

In the arrangement of the cloacal papillae, this specimen is close to *Cucullanus armatus*, but it differs in having a thinner body, a shorter oesophagus and slightly longer spicules.

Of the six species of *Cucullanus* recorded from carangid fishes, two of them lack a pre-cloacal sucker: *C. decapteri* described by Parukhin (1966) differs from our specimen in having more than three pairs of pre-cloacal papillae and shorter spicules; *C. alii* described by Kalyankar (1971) has much longer spicules (24.8% of body length). We cannot therefore assign this specimen to an existing species; however, we prefer not to establish a new species based on a single specimen.

Family CYSTIDICOLIDAE
(Skrjabin, 1946, subfam.)

Ascarophis sp.
(Fig. 10A-E)

MATERIAL. — 1 ♀ No. 77 BF from *Plectorhinchus* sp.

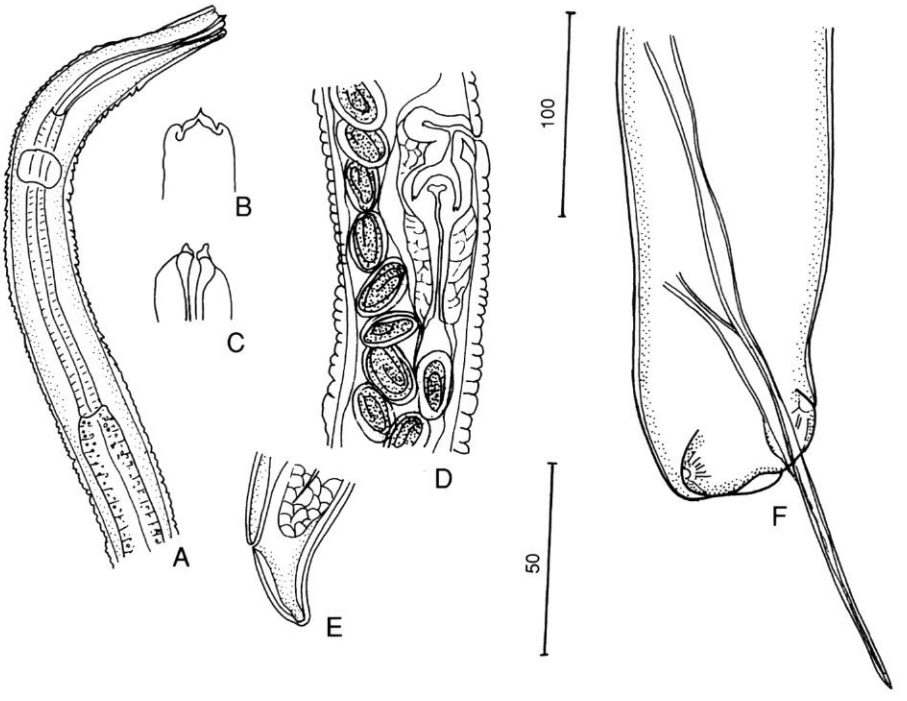

FIG. 10. — **A-E**, *Ascarophis* sp. **A**, anterior part, lateral view. **B**, anterior end, lateral view. **C**, anterior end, median view. **D**, vulvar region. **E**, tail, lateral view. **F**, *Philometra globiceps*, ♂, posterior end, lateral view. Scale bars (µm): A, D, E, 100; B, C, F, 50.

MEASUREMENTS. — (1 ♀) Length 6.40 mm. Maximal width 40. Vestibule 95. Muscular oesophagus 150. Glandular oesophagus 1555. Nerve ring to anterior extremity 120. Vulva to anterior extremity 4300. Tail 40. Eggs 35/20.

DESCRIPTION

Body filiform, becoming thinner anteriorly. Cuticle with prominent transverse striations. Mouth provided with two lateral pseudolabia, each bearing apical tooth. Vestibule long and cylindrical. Muscular oesophagus short. Glandular oesophagus very long. Vulva post-equatorial, without saillant lips. Uterus and ovaries amphidelphic. Ovejector provided with sphincter. Mature eggs oval, embryonated, without filaments. Tail short, conical, rounded at tip.

REMARKS

Judjing by the structure of its apical extremity, this specimen belongs to the genus *Ascarophis*. A specific diagnosis cannot be made on the basis of a single female specimen.

Family PHILOMETRIDAE Baylis *et* Daubney, 1926

Philometra globiceps (Rudolphi, 1819)
(Fig. 10F)

MATERIAL. — 4 ♂♂ No. 194 BF from *Caranx kalla*.

REMARKS

The morphology of these specimens agrees with the descriptions of the males of *Philometra globiceps*, especially the presence of semicircular alae on the distal extremity of the gubernaculum (see Petter, Lèbre & Radujkovic 1984). The males are shorter (2.40-2.95 mm) than the specimens described by Petter, Lèbre & Radujkovic from the Adriatic Sea (5.0-6.2 mm).

This species occurs in the Mediterranean, Adriatic and Black Seas, and was also recorded from the Atlantic Ocean (Bermudes, Massachussets Coast) by Linton (1901, 1907). It has never at our knowledge been recorded from the Indian and Pacific Oceans.

Family CAMALLANIDAE Railliet *et* Henry, 1915

Camallanides sp. larvae
(Fig. 11E-H)

MATERIAL. — 2 larvae No. 117 BF from *Trichiurus lepturus*.

MEASUREMENTS. — (2 larvae) Length 3.40/3.20 mm. Maximal width 130/120. Buccal capsule: length 80/80; width 80/82. Monodents 150/150. Nerve ring-anterior extremity 160/140. Muscular oesophagus 430/460. Glandular oesophagus 520/430. Tail 80/100.

DESCRIPTION

Body cylindrical. Buccal capsule divided into two lateral valves, each supported internally by about twenty longitudinal ribs, some of them incomplete. Ribs on each valve not separated by medio-lateral longitudinal band. Well sclerotized basal ring present. Two sclerotized rods present ventrally and dorsally. Muscular and glandular oesophagus about same length. Tail conical, ending in two inequal processes. Excretory pore and genital anlagen not visible.

REMARKS

Based on the structure of the buccal capsule, with a well sclerotized basal ring, these larvae are considered to be fourth-stage. The presence of sclerotized rods places them in the genus *Camallanides*. However, they differ from this genus in the absence of a longitudinal medio-lateral band on each valve of the buccal capsule. The species of the genus *Camallanides* are parasites of snakes and freshwater fishes, and had never to our knowledge been recorded from marine fishes.

Family GNATHOSTOMATIDAE Railliet, 1895

Echinocephalus sp. larvae
(Fig. 11A-D)

MATERIAL. — 1 larva No. 242 BF from *Argyrops filamentosus*; 1 larva No. 88 BF, 2 larvae No. 247 BF from *Cynoglossus macrolepidotus*; 1 larva No. 116 BF from *Pseudorhombus arsius*; 3 larvae No. 124 BF from *Synaptura orientalis*; 1 larva No. 254 BF from *Trachinotus blochi*.

MEASUREMENTS. — (3 larvae) Length 7.20/8.20/9.65 mm. Maximal width 350/400/400. Oesophagus 1900/2200/2500. Tail 300/300/300.

DESCRIPTION

Body stout, spirally coiled. Cuticle transversely striated. Head bulb armed with six transverse laterally interrupted rows of spines, with about eighteen spines in each row. Spines ten long in first row, twenty in second and third rows and thirty in posterior rows. Anterior to first row, five small spines present dorsally and ventrally, arranged in two rows of two and three spines. Oesophagus widened posteriorly, but not distinctly divided into muscular and glandular portions. Four long cervical sacs (about 150) present. Tail long, conical with distal end curved dorsally.

REMARKS

According to their head morphology, these larvae belong to the genus *Echinocephalus*. At our present stage of knowledge, larvae of the various

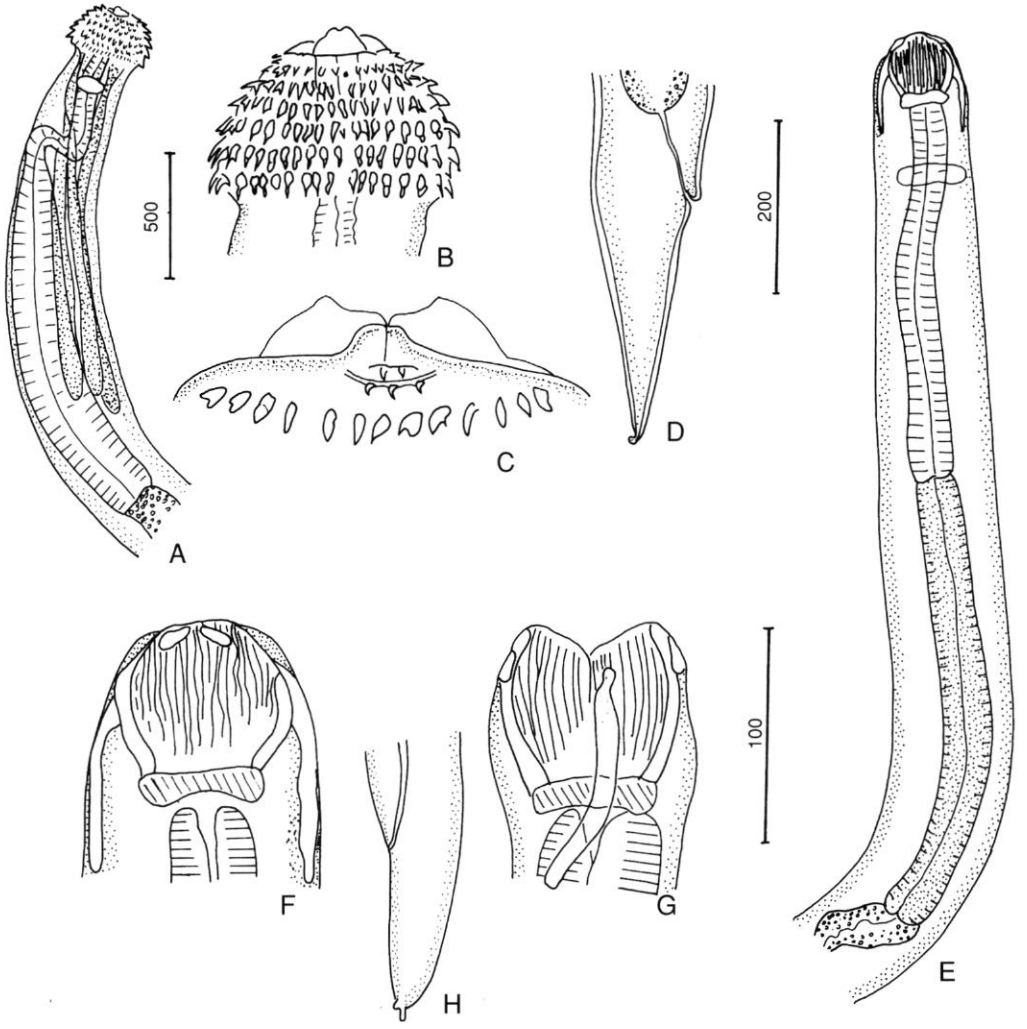

FIG. 11. — **A-D**, *Echinocephalus* sp. larva. **A**, anterior part, lateral view. **B**, head bulb, lateral view. **C**, pseudolabia and anterior end of head bulb, median view. **D**, tail. **E-H**, *Camallanides* sp. larva. **E**, anterior part, lateral view. **F**, buccal capsule, lateral view. **G**, buccal capsule, median view. **H**, tail, lateral view. Scale bars (µm): A, 500; B, D, E, 200; C, F, G, H, 100.

species of this genus cannot be distinguished (see Beveridge 1987).

HOST-PARASITE LIST

ARIIDAE
Arius thalassinus (Rüppell)
Hysterothylacium sp. larvae type KA and KF, *Cucullanus armatus.*

BOTHIDAE
Pseudorhombus arsius (Hamilton-Buchanan)
Hysterothylacium reliquens, *Hysterothylacium* sp. larvae type KA, KB, KF, *Terranova* sp. larva, *Echinocephalus* sp. larva.

CARANGIDAE
Atropus atropus (Bloch *et* Schneider)
Hysterothylacium sp. larva type KA, *Terranova* sp. larva, *Anisakis simplex* larva.
Caranx kalla Cuvier *et* Valenciennes
Hysterothylacium sp. larva type KA, *Terranova* sp. larva, *Cucullanus* sp., *Philometra globiceps.*
Caranx leptolepis Cuvier *et* Valenciennes
Hysterothylacium sp. larva type KA, *Terranova* sp. larva.
Caranx malabaricus (Bloch *et* Schneider)
Hysterothylacium sp. larvae type KA and KE, *Terranova* sp. larva, *Anisakis simplex* larva.
Scomberoides commersonianus Lacépède
Hysterothylacium sp. larvae type KA and KE.
Trachinotus blochi (Lacépède)
Hysterothylacium reliquens, *Hysterothylacium* sp. larva type KF, *Cucullanus trachinoti* n.sp., *Echinocephalus* sp. larva.
Trachurus trachurus (Linnaeus)
Hysterothylacium sp. larva type KA, *Terranova* sp. larva.

CLUPEIDAE
Ilisha elongata (Bennett)
Hysterothylacium reliquens.
Sardinella perforata (Cantor)
Hysterothylacium sp. larva type KA.

CYNOGLOSSIDAE
Cynoglossus macrolepidotus (Bleeker)
Echinocephalus sp. larva.

EXOCOETIDAE
Cypselurus oligolepis (Bleeker)
Hysterothylacium sp. larva type KA.

HEMIRAMPHIDAE
Hemiramphus marginatus (Forsskal)
Hysterothylacium sp. larva type KA.

LEIOGNATHIDAE
Leiognathus bindus (Cuvier *et* Valenciennes)
Hysterothylacium sp. larva type KF
Leiognathus fasciatus (Lacépède)
Hysterothylacium sp. larva type KA.

LUTJANIDAE
Lutjanus coccineus (Cuvier *et* Valenciennes)
Hysterothylacium sp. larvae type KE and KF, *Terranova* sp. larva, *Dichelyne* (*D.*) sp.

MENIDAE
Mene maculata (Bloch *et* Schneider)
Hysterothylacium sp. larvae type KA and KB, *Terranova* sp. larva.

MULLIDAE
Mulloidichthys auriflamma Jones *et* Kumaran
Hysterothylacium sp. larvae type KA, KB, KD, KE, *Contracaecum* sp. larva.
Upeneus sulphureus Cuvier *et* Valenciennes
Hysterothylacium sp. larvae type KA, KB and KC.

PLOTOSIDAE
Plotosus anguillaris (Bloch)
Hysterothylacium reliquens.

POMADASYIDAE
Plectorhinchus sp.
Ascarophis sp.

RACHYCENTRIDAE
Rachycentron canadum (Linnaeus)
Iheringascaris inquies, *Hysterothylacium* sp. larva type KA.

SCIAENIDAE
Otolithes argenteus Kuhl *et* van Hasselt
Hysterothylacium sp. larvae type KA and KB, *Terranova* sp. larva, *Dichelyne (D.) exiguus.*

SCOMBRIDAE
Scomberomorus guttatus (Bloch *et* Schneider)
Hysterothylacium sp. larva type KH.

SERRANIDAE
Epinephelus tauvina (Forsskal)
Hysterothylacium reliquens, *Hysterothylacium* sp. larva type KG.

SOLEIDAE
Synaptura orientalis (Bloch *et* Schneider)
Hysterothylacium reliquens, *Echinocephalus* sp. larva.

SPARIDAE
Acanthopagrus sp.
Hysterothylacium sp. larva type KA.
Acanthopagrus berda (Forsskal)

Hysterothylacium reliquens.
Argyrops filamentosus (Valenciennes)
Hysterothylacium larva type KF, *Echinocephalus* sp. larva.
Argyrops spinifer (Forsskal)
Hysterothylacium sp. larva type KE.

SPHYRAENIDAE
Polydactylus sextarius (Bloch *et* Schneider)
Hysterothylacium reliquens.
Sphyraena jello Cuvier
Hysterothylacium sp. larvae type KA and KB.
Sphyraena obtusata Cuvier
Hysterothylacium sp. larvae type KA and KB, *Terranova* sp. larva.

SYNODONTIDAE
Saurida undosquamis (Richardson)
Hysterothylacium sp. larva type KE.
Trachynocephalus myops (Forster)
Terranova sp. larva.

THERAPONIDAE
Therapon puta Cuvier
Hysterothylacium reliquens.
Therapon therops Cuvier
Terranova sp. larva.

TRICHIURIDAE
Trichiurus lepturus Linnaeus
Hysterothylacium sp. larvae type KA, KD, KE, *Terranova* sp. larva, *Anisakis simplex* larva, *Camallanides* sp. larva.

CONCLUSIONS

COMPOSITION OF THE FAUNA

The nematodes most frequently encountered in this survey were ascaridoid larvae, which were present in 78% of the parasitized fishes. The prevalence of the different types of these larvae will be analysed in another paper (Sey & Petter in press). Only two adult ascaridoid species were found, *Iherinascaris inquies*, a parasite of *Rachycentron canadum* and *Hysterothylacium reliquens*, present in ten different fish species belonging to several orders. However, as six different types of *Hysterothylacium* third-stage larvae were distinguished, several other *Hysterothylacium* species are certainly present as adults in fishes of the Persian Gulf.

Among the other nematode groups, the most frequently encountered are cucullanids, with five different species, each found in one host species only.

AFFINITIES

Of the five species identified in this survey, three of them, *Dichelyne (D.) exiguus*, *Cucullanus armatus* and *Iheringascaris inquies* are known from the Indian and western Pacific Oceans or adjacent seas. *I. inquies* also occurs in the western Atlantic, whereas *Hysterothylacium reliquens* has been reported from the Atlantic and eastern Pacific Ocean and *Philometra globiceps* from the Mediterranean and Black Seas.

Anisakid larvae have been recorded from the Indian Ocean and adjacent seas by many authors, but only a few larval types have been described; at least one of these types, *Contracaecum* type 2 of Gavrilyuk (1978) (= *Contracaecum* PC 2 of Bilqees *et* Fatima, 1986) is conspecific with one of our types (*Hysterothylacium* type KE). These larvae are better known from the western Pacific Ocean and adjacent seas, especially from China (Sun *et al.* 1992), Japan (Yamaguti 1935, 1941; Koyama *et al.* 1969; Kagei *et al.* 1970; Kikuchi *et al.* 1970; Shiraki 1974) and Korea (Chai *et al.* 1986). Of the eight types of *Hysterothylacium* larvae encountered in our survey, five types have similar features and are probably conspecific with larval types described by these authors.

So, from the data presented above, it appears that the nematode fauna of the Persian Gulf shows many similarities with the fauna of the western Pacific Coast and adjacent seas.

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