

On four species of echinorhynchid acanthocephalans from marine fish in Halong Bay, Vietnam, including the description of three new species and a key to the species of *Gorgorhynchus*

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Abstract Four species of echinorhynchid acanthocephalans were collected from marine fish off Cat Ba Island, Halong Bay, Gulf of Tonkin, Vietnam, in the spring of 2009. *Acanthocephalus halongensis* n. sp. (Echinorhynchidae) from the redtail scad, *Decapterus kurroides* Bleeker 1855 (Carangidae), has a unique proboscis armature with a spiniform basal hook with lateral root and an incomplete receptacle wall posteriorly. *Gorgorhynchus tonkinensis* n. sp. (Rhadinorhynchidae) also from *D. kurroides*, has long, slender, winding lemnisci, many epidermal nuclei, and a narrow anterior trunk with a shoulder armed with 20 circles of tightly packed spines, the posterior four circles of which have abruptly larger spines than those in the anterior circles. *Neorhadinorhynchus atypicalis* n. sp. (Cavisomidae) from the rabbitfish, *Siganus fuscescens* (Houttuyn 1782) (Siganidae), has the largest number of proboscis hooks per row, testes wider than long, and four clustered cement glands. *Micracanthorhynchica kuwaitensis* Amin and Sey 1996 (Rhadinorhynchidae) from the spottail needlefish *Strongylura strongylura* (van Hasselt 1823) (Belonidae) was similar to specimens originally described from the Arabian Gulf off the

Kuwaiti coast. These acanthocephalans were collected in small numbers but stood out as uniquely and considerably different from their closest relatives to warrant their reporting. All species of acanthocephalans and their host and geographic distribution are described, and a key to the species of *Gorgorhynchus* is provided.

Introduction

A number of acanthocephalan species from freshwater fish, amphibians, reptiles, birds, and mammals were previously described in Vietnam by Amin and Ha (2008) and Amin et al. (2000; 2004; 2008a, b, c). Additionally, 11 species of acanthocephalans were collected from marine fish off the eastern seaboard of Vietnam in Halong Bay in 2008 and 2009. Of these, six new species belonging to *Neoechinorhynchus* Stiles and Hassall 1905, one new species of *Heterosentis* Van Cleave, 1931, and two new species of *Rhadinorhynchus* Lühe 1911 were recently described (Amin et al. 2011a, b, c). The remaining four species of acanthocephalans from marine fishes in Halong Bay are described herein; three are new. Three other species of *Rhadinorhynchus* and one species of *Gorgorhynchus* were previously reported from marine fishes in Vietnam; see Arthur and Te (2006).

Materials and methods

Of the 45 species of marine fish netted at Cat Ba Island, Halong Bay, Tonkin Gulf, Vietnam (107° 05'E, 20° 45'N) during the spring of 2008 and 2009, 13 species were found infected with acanthocephalan parasites. Of these, three fish

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species harbored specimens of four species of acanthocephalans of which three are new, in the spring of 2009.

Upon collection, fish were measured and photographed then brought to the laboratory for examination. Worms were placed in water for 2–5 h or until fully extended then fixed in 70% ethanol. Worms were punctured with a fine needle and subsequently stained in Mayer's acid carmine, destained in 4% hydrochloric acid in 70% ethanol, dehydrated in ascending concentrations of ethanol (24 h each), and cleared in graduated concentrations of terpineol in 100% ethanol to 100% terpineol, then 50% terpineol in 50% Canada balsam (24 h each). Whole worms were then mounted in Canada balsam.

Measurements are in micrometers, unless otherwise stated. Range values are followed by the mean in parentheses. Length measurements are given before the width; the latter refers to maximum width. Trunk length does not include the neck, proboscis, or bursa. Eggs refer only to fully developed eggs usually removed from the body cavity. Specimens were deposited in the University of Nebraska's State Museum's Harold W. Manter Laboratory (HWML) collection in Lincoln, NE, USA.

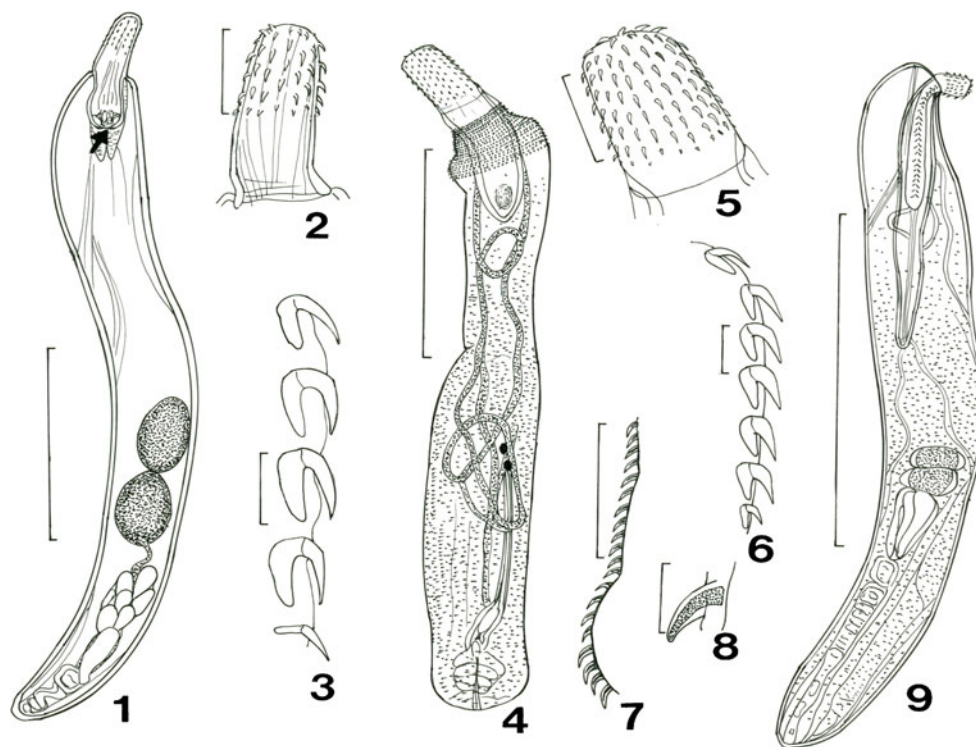
Results and discussion

Acanthocephalus halongensis n. sp.

Two young adult males of a new species of *Acanthocephalus* Koelruther 1771 were collected from the intestine of one infected out of five examined specimens of redbtail scad, *Decapterus kurroides* Bleeker, collected in Halong Bay, Vietnam, in May 2009 (Figs. 1–3). Scads were 18.5 to 22.0 cm long (mean of 20.7 cm). The redbtail scad is a reef-associated pelagic marine fish that occurs in inshore waters of the continental shelf and continental slope into deep waters with a depth range of 100–300 m where it feeds on small planktonic invertebrates. It is an Indo-West Pacific species that extends from East Africa to the Philippines, north to Southern Japan, and south to Western Australia (Paxton et al. 1989).

Description

General With characters of the genus *Acanthocephalus*. Trunk small, cylindrical, with mildly tapering ends



Figures 1–9 *Acanthocephalus halongensis* n. sp., *Gorgorhynchus tonkinensis* n. sp. from *Decapterus kurroides*, and *Neorhadimorhynchus atypicalis* n. sp. from *Siganus fuscescens* collected in Halong Bay, Gulf of Tonkin, Vietnam. 1–3 *A. halongensis*. 1 Holotype male. Note the incomplete receptacle wall (arrow). 2 Proboscis of holotype male. Note the long neck. 3 One lateral row of proboscis hooks of the same specimen. Note the small posterior spiniform hook with lateral root. 4–8 *G. tonkinensis*. 4 Holotype male. Note the narrow anterior trunk with circles of spines at the shoulder, the long filiform winding

lemnisci, and trunk nuclei. The slender tubular cement glands can be seen just posterior to the small testes. 5 Proboscis of the same specimen enlarged. 6 One lateral row of proboscis hooks. 7 One lateral row of trunk spines. Note the larger spines in the posterior four rings. 8 An enlarged posterior trunk spine. 9 *Neorhadimorhynchus atypicalis* holotype male. Note the wide testes, compact cement glands, and trunk nuclei. Measurement bars 1, 4, 9 2 μm ; 2, 5 400 μm ; 3, 6 75 μm ; 7 200 μm ; 8 45 μm

(Fig. 1). Proboscis short, cylindroid, about twice as long as wide, with 13–14 rows of five rooted hooks each. First four hooks with simple posteriorly directed roots about as long as blades and no manubria. Posteriormost hook smallest, spiniform with slender laterally directed root (Fig. 3). Neck prominent, more than half as long as proboscis (Fig. 2). Proboscis receptacle double walled with expanded multi-nucleated cephalic ganglion at base and incomplete wall posteriorly. Lemnisci equal, finger-like, longer than receptacle.

Male (based on two young adults) Trunk 3.80–6.50 (5.15) mm long by 0.40–0.77 (0.58) wide. Proboscis 437 long by 166–281 (223) wide anteriorly. Length of proboscis hooks from anterior 62, 68–72 (70), 70–75 (72), 70–75 (72), 55–56 (55). Neck in larger specimen 302 long by 291 wide. Proboscis receptacle 582–790 (686) long by 187–260 (223) wide near base. Lemnisci 395–894 (673) long by 62–208 (135) wide. Reproductive system in posterior half of trunk. Testes oblong, contiguous, about equal in size. Anterior testis 572–775 (673) long by 260–400 (330) wide. Posterior testis 437–775 (606) long by 281–450 (365) wide. Cement glands six, clavate, in loose cluster of three pairs, 135–275 (203) long by 83–200 (144) wide. Cement ducts in two groups of three each. Saeftigen's pouch in larger specimens 572 long by 260 wide (Fig. 1).

Taxonomic summary

Type host Redtail scad, *Decapterus kurroides* Bleeker, 1855 (Carangidae).

Type locality Cat Ba Island, Halong Bay, Gulf of Tonkin, Vietnam (107° 05'E, 2045'N).

Site of infection Intestine.

Type specimens HWML collection no. 49343 (holotype male).

Etymology The new species is named for Halong Bay from where it was collected.

Remarks

Of the 50 known species of *Acanthocephalus* (see Amin et al. 2008d), 23 are known from Asia, Japan, and Australia of which eight are parasites of amphibians. Based on proboscis armature alone, the new species is not even remotely close to any of the remaining 15 Asian and Australian species parasitizing fish. These are: *Acanthocephalus*

phalus curtus (Achmerov and Dombrowskaja-Achmerova 1941) Yamaguti 1963 in Siberia, *Acanthocephalus echi-goensis* Fujita 1920 (= *Acanthocephalus acerbus* Van Cleave 1931, *Acanthocephalus aculeatus* Van Cleave 1931, *Acanthocephalus oncorhynchi* Fujita 1920) in Japan, *Acanthocephalus elongatus* Van Cleave 1937 in China, *Acanthocephalus goaensis* Jain and Gupta 1981 in India, *Acanthocephalus gotoi* Van Cleave 1925 in Japan, *Acanthocephalus hastae* Baylis 1944 in Australia, *Acanthocephalus japonicus* (Fukui and Morisita 1936) Petrochenko 1956 in Japan, *Acanthocephalus kabulensis* Datta and Soota 1954 in Afghanistan, *Acanthocephalus kashmiriensis* Datta 1936 in India, *Acanthocephalus lizus* Li-Minmin 1984 in Japan, *Acanthocephalus minor* Yamaguti 1935 in Japan, *Acanthocephalus nanus* Van Cleave, 1925; *Acanthocephalus opsariichthydis* Yamaguti 1935 in Japan; *Acanthocephalus parallelotestis* Achmerov and Dombrowskaja-Achmerova 1941 in Siberia; and *Acanthocephalus tenuirostris* (Achmerov Dombrowskaja-Achmerova 1941) Yamaguti, 1963 in Siberia. None of these 15 species has an incomplete proboscis receptacle wall at its posterior end or a spiniform posterior proboscis hook with lateral root like *A. halongensis*.

Actually, the new species is closer to four species from amphibians, two in Europe, one in China, and one in Japan. These are *Acanthocephalus falcatus* (Frölich 1789) Lühe 1911 (11–17 rows of 5–8 hooks each), *Acanthocephalus ranae* (Schrank, 1788) Lühe 1911 (12–20×4–6), *Acanthocephalus sinensis* Van Cleave 1937 (15–19×4–6), and *Acanthocephalus lucidus* Van Cleave 1925 (12–16×4–5), respectively. The proboscis of the nearest species of *Acanthocephalus* from an Asian marine fish to the new species, *Acanthocephalus lizus* Li-Minmin 1984, has 18 rows with 7–8 hooks each.

Gorgorhynchus tonkinensis n. sp

One immature male of a new species of *Gorgorhynchus* Chandler 1934 was collected from the intestine of one infected out of five examined specimens of redtail scad, *D. kurroides*, collected in Halong Bay, Vietnam, in May 2009 (Figs. 4–8). See information on host under *A. halongensis*.

Description

General With characters of the genus *Gorgorhynchus* as emended below. Trunk small, cylindrical, narrow anteriorly with a shoulder and abruptly wider posteriorly, with a blunt posterior end and many fragmented nuclei, armed with one anterior field of tightly packed circles of spines at the shoulder (Fig. 4). Spines in posterior circles markedly larger than anterior ones (Figs. 7–8). Proboscis rectangular with longitudinal rows of few hooks each (Fig. 5). Hook roots

simple, posteriorly directed, about as long as blades (Fig. 6). Proboscis receptacle double walled with a cephalic ganglion at its posterior end. Lemnisci string-like, very long, longer than the trunk, and winding (Fig. 4).

Male (based on one immature adult, holotype) Trunk 5.87 mm long by 0.92 mm wide. Trunk spines in 20 circles each with about 40–42 spines. Anterior spines 30 long. Spines in posterior four circles 45 long. Transition from small to large spines abrupt (Fig. 7). Proboscis 572 long by 406 wide with 22 rows of 7–8 hooks each. Posterior hooks more robust and shorter than anterior hooks; basal hook shortest (Fig. 6). Hook length \times width at base from anterior measure 52–65 \times 12, 72–77 \times 17, 72–77 \times 17, 72–75 \times 22; 65–70 \times 30, 60–67 \times 30, 42–55 \times 30, 32 \times 12. Proboscis receptacle 1.72 mm long by 0.44 mm wide. Reproductive system post-equatorial. Testes small, oblong, slightly oblique, not contiguous. Anterior testis 125 long by 83 wide, posterior testis 114 long by 73 wide. Cement glands four, in two pairs, tubular, 135 long.

Taxonomic summary

Type host Redtail scad, *D. kurroides* Bleeker, 1855 (Carangidae).

Type locality Cat Ba Island, Halong Bay, Gulf of Tonkin, Vietnam (107° 05'E, 20° 45'N).

Site of infection Intestine.

Type specimens HWML collection no. 49344 (holotype male).

Etymology The new species is named for the Gulf of Tonkin from which it was collected.

Remarks

There are 11 valid species of *Gorgorhynchus* known from marine fish including the new species. They are:

- Gorgorhynchus celebensis* (Yamaguti, 1954) Golvan 1969 (= *Rhadiorhynchus celebensis* Yamaguti, 1954)
- Gorgorhynchus clavatus* Van Cleave 1940 (= *Gorgorhynchus cablei* Golvan 1969)
- Gorgorhynchus lepidus* Van Cleave 1940
- Gorgorhynchus medius* (Linton, 1907) Chandler 1934 (= *Echinorhynchus medius* Van Cleave, Linton 1907; *Gorgorhynchus gibber* Chandler 1934 (type))
- Gorgorhynchus nemipteri* Parukhin 1973

Gorgorhynchus ophioccephali Furtado and Lau 1971

Gorgorhynchus polymixiae Kovalenko 1981

Gorgorhynchus robertdollfusi Golvan 1956

Gorgorhynchus satoi Morisita 1937

Gorgorhynchus tonkinensis n. sp.

Gorgorhynchus trachinotus Noronha, Vicente, Pinto, and Fabio 1986

Invalid species that were relegated to other genera include *Gorgorhynchus epinepheli* (Yamaguti, 1939) Golvan 1960 which is a synonym of *Pseudauchen epinepheli* Yamaguti, 1963.

The new species is unique in the shape of its long filamentous lemnisci, smaller number of proboscis hooks per row, and the abrupt enlargement of the trunk spines in the posterior four circles. It bears superficial similarities, especially in the shape of the proboscis, to *G. medius* juveniles also reported from the bigeye scad *Selar crumenophthalmus* (Bloch, 1793) (Carangidae) in the Gulf of Tonkin by Parukhin (1976). *G. medius*, however, has digitiform lemnisci only about twice as long as the receptacle, irregular trunk spines of equal size, and a proboscis with 20 rows of 13–14 hooks each. The new species is differentiated from the other and more dissimilar species of *Gorgorhynchus* in the following key.

Diagnosis and emendation of *Gorgorhynchus*

The diagnosis of *Gorgorhynchus* specifies that the trunk is bent ventrally in the anterior third, trunk spines are irregularly arranged in one anterior field, proboscis hooks not dorso-ventrally differentiated, testes in the anterior half of body, and the four cement glands are very long and slender, among other characteristics (Yamaguti 1963; Golvan 1969). The diagnosis of *Gorgorhynchus* needs to be emended to show that the trunk of most species is not ventrally bent, trunk spines are sometimes regular in definite circles, e.g., *G. polymixiae*, *G. robertdollfusi*, and *G. tonkinensis* n. sp., and occasionally in two fields separated by an unarmed zone, e.g., *G. celebensis*, ventral proboscis hooks may be larger than dorsal hooks, e.g., *G. robertdollfusi*, testes are also in the posterior half of the trunk, e.g., *G. tonkinensis* n. sp.; the cement glands may be short, oblong, in two side by side pairs, e.g., *G. trachinotus*, and large nuclei may be present in the epidermis, e.g., *G. tonkinensis* n. sp.

Key to species

The following key to species of *Gorgorhynchus* emphasizes the proboscis and trunk armature because of the incomplete development of the reproductive system in our specimen as well as in specimens of other species, e.g., *G. celebensis*,

and in species where such information is not available, e.g., *G. clavatus*.

1. Trunk spines in anterior field of 20–22 vertical rows of up to ten spines each, and posterior field of two incomplete circles of 10–12 larger spines separated by an unarmed zone. Proboscis hooks in 20 rows of 11–12 hooks each. In Celebes....*G. celebensis*—trunk spines in one field only. Proboscis armature variable.....2
2. Proboscis hooks 7–8 per row. Trunk spines in 20 tight circles; spines in the posterior four circles larger than others. Lemnisci filamentous, winding, very long, longer than trunk. In Vietnam.....*G. tonkinensis*—Proboscis with 8–20 hooks per row. Trunk spines of the same size in regular or irregular pattern. Lemnisci not filamentous, shorter.....3
3. Proboscis with 14 rows of 11–12 small hooks (17–46 long) each. Trunk spines randomly distributed over a large area. Cement glands, four; oblong; in two side by side pairs. In Brazil.....*G. trachinotus*—Proboscis armature variable but hooks larger. Trunk spines in random or regular pattern, restricted to within the receptacle level or slightly posterior to it. Cement glands, four; long; cylindrical; slender; parallel.....4
4. Proboscis with 17–18 rows of 8–9 hooks each. Trunk spines in rows or circles.....5—Proboscis with 20–36 rows of 12–20 hooks each. Trunk spines in random pattern.....6
5. Proboscis hooks not dorso-ventrally differentiated, 63 long anteriorly, and 28–34 long basally. Lemnisci twice as long as the receptacle. Trunk spines extend past the receptacle. In tropical Pacific.....*G. polymixiae*—Proboscis hooks dorso-ventrally differentiated, 65 and 95 long anteriorly, and 43 and 70 basally on dorsal and ventral sides, respectively. Lemnisci shorter than the receptacle. Trunk spines not reaching end of the receptacle. In Mauritania.....*G. robertdollfusi*
6. Proboscis with 32–36 rows of 12–14 hooks each; hooks abruptly change from large, 82–102 long, anteriorly to small, 41–69 long, posteriorly. Lemnisci extend to anterior testis. Trunk spines in a very small field of about one sixth to one fourth the length of the receptacle. In Malaysia.....*G. ophiocephali*—Proboscis with 20–24 rows of 12–20 hooks each. Hook size variable. Lemnisci usually shorter. Trunk spines more widely distributed.....7
7. Proboscis hooks in two discrete size groups: anterior hooks very large, posterior hooks much smaller and spiniform. Lemnisci reaching anterior testis.....8—No discrete size differences in proboscis hooks. Lemnisci shorter.....9
8. Males and females 23 mm and 32 mm long, respectively. Proboscis with posterior constriction and 24 rows of 12–13 hooks each. Egg 93–110×33. In Indian Ocean.....*G. nemipteri*—Males and females 35 mm and 65 mm long, respectively. Proboscis without constriction and with 24 rows of 15 hooks each. Eggs 140×40. In China.....*G. satoi*
9. Proboscis rectangular with 22–24 rows of 18–20 hooks each. Anterior, middle, and posterior hooks 75–80, 65, and 59–75 long, respectively. In Gulf of Mexico, Veracruz, Texas, Bermuda, and Vietnam.....*G. medius*—Proboscis cylindrical with 20 rows of 13–16 considerably larger hooks each. In the Galapagos.....10
10. Females 26.0×1.8–2.4 mm. Proboscis with 13–15 hooks per row. Apical hooks 120–142 long. Receptacle 3.23 mm long.....*G. clavatus*—Trunk 7.0–10.0×0.8–0.9 mm. Proboscis with 14–16 hooks per row. Median hooks 106–120 long. Receptacle 1.7–2.2 mm long.....*G. lepidus*

Neorhadinorhynchus atypicalis n. sp

One immature adult male specimen was collected from one of seven examined rabbitfish, *Siganus fuscescens* (Houttuyn, 1782) (Siganidae) in May 2009 (Fig. 9). The rabbitfish inhabits algal and seagrass flats, shallow lagoons, coastal reefs, and large estuaries. Juveniles feed on filamentous algae, and adults feed on leafy algae and seagrass (Woodland 1990). The usual macrophyte diet of the rabbitfish may account for the observed low level of infection.

The proboscis was largely invaginated; only the posterior portion carrying the posterior four hooks was not. Armature and measurements of the proboscis and hooks took into account the readily discernable invaginated portion.

Description

General With characters of the genus *Neorhadinorhynchus* Yamaguti, 1939. Trunk small, cylindrical, aspinose, with

many nuclei throughout the epidermis, especially posteriorly. Proboscis long with many rooted hooks in longitudinal rows. Hooks with simple posteriorly directed roots and ventro-dorsal size differentiation. Proboscis receptacle double walled with ganglion near middle. Lemnisci digitiform, equal, shorter than the receptacle.

Male (based on one immature adult) Trunk 4.25 mm long by 0.62 mm wide. Proboscis 1.2 mm long by 0.16 mm wide posteriorly, with 14 rows of 27 hooks each. Anterior hooks 30 long by 9 wide at base ventrally and 22 long by 7 wide at base dorsally. Middle hooks largest, 50 long by 17 wide at base ventrally, and 42 long by 12 wide at base dorsally. Posterior hooks 42 long by 15 wide at base ventrally, and 32 long by 9 wide dorsally. Proboscis receptacle 1.75 mm long by 0.20 mm wide. Lemnisci 718 long. Reproductive system post-equatorial. Testes small, wider than long, contiguous with four tightly packed cement glands longer than both testes. Testes about equal in size, 208–229 (218) long by 291–312 (301) wide. Cement gland 520 long by 229 wide anteriorly. Cement reservoir 198 long by 156 wide (Fig. 9).

Taxonomic summary

Type host Rabbitfish, *Siganus fuscescens* (Houttuyn, 1782) (Siganidae).

Type locality Cat Ba Island, Halong Bay, Gulf of Tonkin, Vietnam (107° 05'E, 20° 45'N).

Site of infection Intestine.

Type specimens HWML collection no. 49345 (holotype male).

Etymology The new species is named for its atypical structures that are so unlike those noted for other species of *Neorhadiorhynchus*.

Remarks

There are six known valid species of *Neorhadiorhynchus* that have already been keyed out by Amin and Nahhas (1994). *N. atypicalis* n. sp. is the seventh. The other six species invariably have larger ovoid, longer than wide testes, markedly longer and non-compact cement glands, usually in two side by side pairs, fewer proboscis hooks per row that are usually not dorso-ventrally differentiated by size, and no marked nuclei in the trunk epidermis. The nearest species to *N. atypicalis* is *N. nudum* (Harada, 1938)

Yamaguti, 1939 which has 24–25 proboscis hooks per row that are however slightly longer dorsally than ventrally. See the key by Amin and Nahhas (1994) for further differentiating characteristics from the other six species.

Micracanthorhynchina kuwaitensis Amin and Sey 1996

Four gravid females were collected from two of two examined spottail needlefish *Strongylura strongylura* (van Hasselt, 1823) (Belonidae) from the same collecting site in Halong Bay in May 2009. The same acanthocephalan species was originally described from four of seven examined specimens of *Hemiramphus marginatus* Forskal 1775 (Hemiramphidae) from the Arabian Gulf off the coast of Kuwait (Amin and Sey 1996). The distribution of both species of fish between the Arabian Gulf to the west and east to the West Pacific is associated with the presence of *M. kuwaitensis* off the coast of Kuwait to the west and off the coast of Vietnam at Halong Bay to the east. *S. strongylura* is an omnivorous pelagic Indo-West Pacific fish found in the Arabian Gulf eastward along the coasts of Pakistan, India, and Sri Lanka, then extending east to southern China, the Philippines, northern Australia, and north into Vietnamese waters (Collette 1984; Randall and Lim 2000). *H. marginatus* is also an omnivorous pelagic Indo-West Pacific fish that is primarily found in the Red Sea and the Arabian Gulf area from where it has recently spread to the Mediterranean by way of the Suez Canal since its construction in 1869 (Ben-Tuvia 1966) but have also been found in the Indian Ocean (Jones et al. 1981) and farther east to the Indo-Australian region and the West Pacific (Collette and Su 1986; Weber MWC. undated).

Description (based on four gravid females)

Trunk 3.50–5.05 (4.49)mm long by 0.5–0.95 (0.77)mm wide. Proboscis 700–780 (733) long by 187–208 (196) wide with 12 rows of 13–14 hooks each. Length of hooks from anterior 42–50 (47), 64–67 (66), 62–71 (67), 52–66 (60), 47–56 (53), 35–52 (43), 27–47 (39), 25–40 (34), 21–42 (29), 19–27 (24), 17–25 (22), 17–25 (20), 16–20 (18). Ventral hooks slightly longer than dorsal hooks. Average length of 13 dorsal and 13 ventral hooks in a row from all four specimens, 39.8 and 43.5, respectively. Proboscis receptacle 0.91–1.15 (1.01)mm long by 0.20–0.28 (0.24) mm wide. Ventral trunk spines slightly larger than dorsal spines, 17–19 (18) and 13–16 (15), respectively; most posterior spines smallest. Eggs 45–53 (50) long by 10–12 (11) wide.

The above hook and spine measurements are new. Other features are comparable to those reported in the original description by Amin and Sey (1996) except that in the Vietnamese specimens, the size of the trunk was slightly

smaller, the younger eggs were not as wide, and the position of the female gonopore varied between the terminal and near the terminal.

Voucher specimens HWML collection no. 49346.

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