

Some Acanthocephalans from Marine Fishes of Northern Japan,
with Descriptions of Two New Species, *Acanthocephaloides*
ichiharai and *A. claviformis*

By

Jun ARAKI

Daito College of Medical Technology, Tokyo

and

Masaaki MACHIDA

Department of Zoology, National Science Museum, Tokyo

Abstract Fourteen species of acanthocephalans including 2 new echinorhynchid species were collected from 54 species of marine fishes in the cold Oyashio Current around northern Japan. *Acanthocephaloides ichiharai* n. sp. from *Physiculus maximowiczi* and *Paralichthys olivaceus* is distinguished from the related species by size of body and eggs, shape of proboscis, and arrangement of proboscis hooks. *A. claviformis* n. sp. from *Physiculus maximowiczi* differs from the related species by claviform trunk with anterior swelling, the arrangement of proboscis hooks, and length of lemnisci. *Yamagutisentis* is synonymized with *Acanthocephaloides*. *Allorhadinorhynchus segmentatus* from *Hyporhamphus sajori* is redescribed and transferred to *Micracanthorhynchina*. *Allorhadinorhynchus* is synonymized with *Micracanthorhynchina*.

The acanthocephalans described below were mostly collected by one of us (M. M.) from marine teleost fishes in the cold Oyashio Current around northern Japan between November 1968 and October 1984. This report concerns 14 species of acanthocephalans including 2 new species from 54 species of fishes. The worms were washed in saline, fixed in 70% ethanol or alcohol-formalin-acetic acid (AFA) under slight pressure, stained with alum carmin or Heidenhain's hematoxylin, dehydrated and mounted in balsam.

The specimens are deposited in the collection of the National Science Museum, Tokyo (NSMT).

We wish to thank Dr. S. KAMEGAI of the Meguro Parasitological Museum, Tokyo, for lending specimens.

Family Echinorhynchidae

1. *Echinorhynchus gadi* ZOEGA in MÜLLER 1776

Host and locality. *Chlorophthalmus albatrossis* from Onahama; *Physiculus*

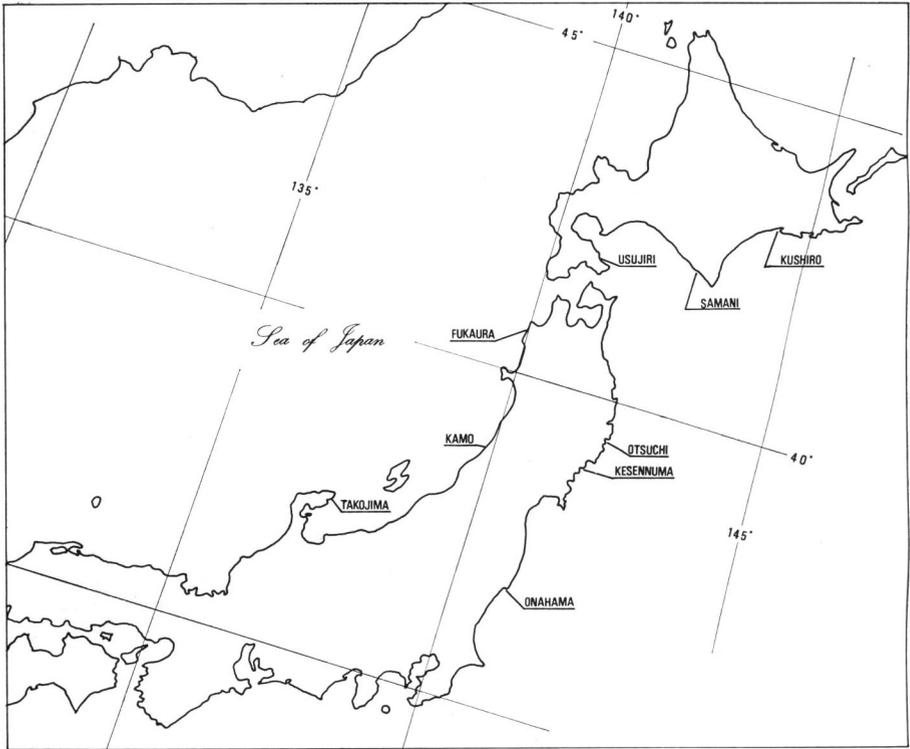


Fig. 1. Map showing localities mentioned in the text.

maximowiczi from Otsuchi; *Gadus macrocephalus* from Samani; *Theragra chalcogramma* from Samani, Kamo and Takojima; *Lophius litulon* from Samani; *Arctoscopus japonicus* from Samani and Kamo; *Stichaeus grigorjewi* from Samani; *Stichaeus nozawai* from Samani; *Sebastes owstoni* from Kamo; *Sebastes oblongus* from Samani; *Sebastes vulpes* from Kesennuma; *Hexagrammos otakii* from Kesennuma; *Hexagrammos stelleri* from Samani; *Pleurogrammus azonus* from Samani and Kamo; *Ainocottus ensiger* from Samani; *Hemitripterus villosus* from Samani, Otsuchi and Kesennuma; *Myoxocephalus jaok* from Kushiro; *Gymnocanthus herzensteini* from Kushiro and Samani; *Dasycottus setiger* from Kamo; Liparidae gen. sp. from Fukaura; *Aptocyclus ventricosus* from Usujiri; *Liparis tanakai* from Otsuchi; *Careproctus trachysoma* from Kamo; *Careproctus* sp. from Takojima; *Atheresthes evermanni* from Samani; *Reinhardtius hippoglossoides* from Samani; *Hippoglossus stenolepis* from Samani; *Hippoglossoides dubius* from Samani; *Cleisthenes pinetorum herzensteini* from Samani; *Verasper moseri* from Samani and Otsuchi; *Lepidopsetta mochigarei* from Samani; *Limanda punctatissima* from Samani; *Glyptocephalus stelleri* from Kamo; and *Microstomus achne* from Kushiro.

Site. Intestine.

Remarks. Our specimens have the proboscis hooks in 18 to 22 longitudinal rows of 10 to 15 each.

Echinorhynchus gadi of EKBAUM (1938) from Canadian Pacific salmon was considered as a distinct species by GOLVAN (1969). And GOLVAN proposed *E. ekbaumi* for the name. MARGOLIS and ARTHUR (1979) regarded it as a synonym of *E. gadi*. GOLVAN (1969) also separated *E. vancleavei* for *E. gadi* of VAN CLEAVE (1924) in *Morrhua americana* (= *Gadus callaris*) from Atlantic coast of the United States, and *E. yamagutii* for *E. gadi* of YAMAGUTI (1939) in *Conger myriaster* and *Bothrocara zesta* from the Sea of Japan, by the differences of their hosts and their localities. Morphologically, there is no remarkable difference between them, so we consider them to be synonyms of *E. gadi*.

2. *Echinorhynchus dissimilis* YAMAGUTI, 1939

Host and locality. *Physiculus maximowiczi* from Otsuchi, Kesennuma and Onahama; *Gadus macrocephalus* from Samani; *Lophius litulon* from Kesennuma; *Sebastes oblongus* from Kesennuma; *Hexagrammos otakii* from Kesennuma; *Paralichthys olivaceus* from Otsuchi; and *Verasper moseri* from Samani.

Site. Intestine.

Remarks. The proboscis hooks were originally described to be 27 longitudinal rows in male and 30 in female by YAMAGUTI (1939), but they were observed to vary from 22 to 30 rows in male and from 23 to 31 in female in our specimens.

3. *Echinorhynchus lotellae* YAMAGUTI, 1939

Host and locality. *Physiculus maximowiczi* from Otsuchi; *Lophius litulon* from Kesennuma; *Sebastes macrochir* from Otsuchi; *Liparis tessellatus* from Onahama; and *Verasper moseri* from Otsuchi.

Site. Intestine.

Remarks. The proboscis hooks of our specimens are arranged in 14 to 17 longitudinal rows of 13 to 16 each. YAMAGUTI (1939) described *Echinorhynchus lotellae* as a new species on the basis that the proboscis bears 16 to 19 rows of 16 hooks each. Our examination on his unpublished specimens labeled as *E. lotellae* from *Crystallias matsushimae* on April 11, 1943 (MPM Coll. No. 22426) showed the proboscis hooks to vary from 14 to 18 rows of 12 to 16 each.

Recently, KOVALENKO (1986) reported *E. Sebastolobi* as a new species, which differed from the closely related *E. lotellae* in the proboscis having 17 to 18 rows of 15 to 16 hooks each. Because of considerable variation in the arrangement of proboscis hooks, we consider *E. Sebastolobi* to be synonymous with *E. lotellae*.

4. *Metechinorhynchus salmonis* (MÜLLER, 1784)

Host and locality. *Sebastes oblongus* from Samani; *Hexagrammos stelleri* from

Samani; *Hemitripteris villosus* from Kushiro; *Myoxocephalus jaok* from Kushiro; *Enophrys diceraus* from Kushiro; *Podothecus sachi* from Kushiro; *Liparis tanakai* from Kushiro; and *Verasper moseri* from Samani.

Site. Intestine.

Remarks. PETROCHENKO (1956) erected *Metechinorhynchus* with *M. salmonis* as the type species and including *Echinorhynchus*-like species, all having 6 cement glands arranged in different orders: sometimes anterior 2 to 3 form a chain along the body and the others are compressed, sometimes the opposite; sometimes anterior 2 glands form a pair, followed by two, one behind the other then posterior glands also form a pair. We designate here the specimens having 6 cement glands, and proboscis hooks in 11 to 16 longitudinal rows of 9 to 12 each as *M. salmonis*, but in some specimens the cement glands are arranged in a single chain along the midline of the body as those in *Echinorhynchus*. We provisionally place our these specimens in *M. salmonis*.

BAEVA (1965) described *Echinorhynchus hexagrammi* as a new species, which has chained 6 cement glands and a proboscis with 14 longitudinal rows of 10 hooks each. *E. hexagrammi* is probably a synonym of *M. salmonis*.

5. *Acanthocephaloides ichiharai* n. sp.

(Figs. 2–4)

Host and locality. *Physiculus maximowiczi* (HERZENSTEIN) from Otsuchi (holotype NSMT-As 136 a, 4–XI–1968; NSMT-As 130 b, 137 a, 149, 473 a) and Kesenuma (NSMT-As 179 b); and *Paralichthys olivaceus* (TEMMINCK et SCHLEGEL) from Otsuchi (NSMT-As 131 b).

Site. Intestine.

Description. Proboscis subcylindrical, sometimes slightly swollen in posterior half. Proboscis hooks largest at the middle and smallest at the apex or the base. Basal 3 hooks in each row lie at close intervals. Trunk nearly cylindrical, tapering posteriorly and covered anteriorly with exceedingly minute spines embedded in cuticular folds. Proboscis sheath claviform and double-walled, with a cephalic ganglion at the base. Lemnisci cylindrical, extending near the base of proboscis sheath or a little further back of it.

Male. Based on 10 specimens. Body 5.8–10.5 mm long. Proboscis 0.53–0.70 × 0.18–0.25 mm. Proboscis hooks usually in 13–14 longitudinal rows, rarely 12 or 16 rows, of 10–12 each. Largest proboscis hooks 62–72 μm long and smallest ones 28–35 μm long. Neck 0.13–0.20 mm long. Trunk 5.10–9.68 × 0.50–0.90 mm. Proboscis sheath 0.61–1.15 × 0.18–0.30 mm. Lemnisci 0.80–1.40 × 0.05–0.25 mm. Tests elliptical, contiguous, situated at middle of trunk; the anterior 0.50–1.20 × 0.25–0.53 mm and the posterior 0.55–1.08 × 0.25–0.45 mm. Cement glands 6, pear-shaped, just behind posterior testis, in rather irregularly one behind another or in two longitudinal rows of 3 each. Three cement ducts on each side. Säfftigen's pouch elliptical, 0.12–0.23 mm in diameter Säfftigen's pouch, seminal vesicle and cement ducts

overlapping each other. Ejaculatory duct without definite sphincter. Muscular bursal cap with about 20 finger-like rays. Genital pore terminal.

Female. Based on 10 specimens. Body 10.3–22.9 mm long. Proboscis 0.60–0.80×0.15–0.35 mm. Proboscis hooks in 14 longitudinal rows, rarely 13 or 15 rows of 10–13 each. Largest proboscis hooks 62–79 μm long and smallest ones 28–40 μm long. Neck 0.15–0.25 mm long. Trunk 9.45–21.70×0.55–1.35 mm. Proboscis sheath 0.90–1.25×0.15–0.35 mm. Lemnisci 0.55–1.75×0.07–0.13 mm. Uterus 1.95–5.20 mm long and vaginal bulb 0.07–0.14 mm in diameter. Genital pore terminal. Eggs elongated elliptical, three-shelled; outer shell 83–118×20–30 μm ; middle shell with prominent polar prolongations.

Remarks. By reason of having trunk spines in *Acanthocephaloides rhinoplagusiae* YAMAGUTI, 1935 and *A. neobythitis* YAMAGUTI, 1939, CABLE and QUICK (1954) transferred these species from *Acanthocephaloides* to *Neoacanthocephaloides*. For the same reason, PETROCHENKO (1956) transferred only *A. neobythitis* to *Pseudorhadinorhynchus*, unaware of the presence of trunk spines in *A. rhinoplagusiae*. YAMAGUTI (1963) considered *Neoacanthocephaloides* to be synonymous with *Pseudorhadinorhynchus*, and placed *A. rhinoplagusiae* in *Pseudorhadinorhynchus*. GOLVAN (1969) erected *Yamagutisentis* as a new genus to include these two species. He also stated the cement glands to be 6 in *Acanthocephaloides* and *Yamagutisentis*, and 8 in *Pseudorhadinorhynchus*. *Yamagutisentis* closely resembles *Acanthocephaloides* except that the trunk is armed anteriorly with minute spines in the former, whereas it is covered throughout with them in the latter. The trunk spines are difficult to see in many wholemounts and have not previously been described for some species in *Acanthocephaloides*. This character is too little for a generic feature. So we consider *Yamagutisentis rhinoplagusiae* and *Y. neobythitis* to be placed in *Acanthocephaloides* as originally described by YAMAGUTI (1935, 1939). Consequently *Yamagutisentis* is synonymized with *Acanthocephaloides*.

The present species resembles *A. rhinoplagusiae* YAMAGUTI, 1935 in the arrangement of proboscis hooks, but differs from the latter in the size of body and eggs, and the shape of proboscis. *A. rhinoplagusiae* has trunk 2.0 to 3.1 mm long in male and 2.5 to 6.4 mm long in female, and has eggs 42 to 63 by 9 to 12 μm . Furthermore, the present species is like *A. neobythitis* YAMAGUTI, 1939 in the size of body and eggs and in the shape of proboscis, but differs from the latter in the arrangement of proboscis hooks. *A. neobythitis* has proboscis hooks arranged in 17 to 18 longitudinal rows of 10 to 13 each.

Pseudorhadinorhynchus sp. of ICHIHARA (1971) from *Lophiomus setigerus* is thought to be identical with the present new species. The specific name of the new species, *ichiharai*, was donated to him.

6. *Acanthocephaloides claviformis* n. sp.

(Figs. 5-7)

Host and locality. *Physiculus maximowiczi* (HERZENSTEIN) from Otsuchi (holotype NSMT-As 136 b, 4-XI-1968; NSMT-As 137 b, 473 b).

Site. Intestine.

Description. Proboscis slightly enlarged near the middle. Proboscis hooks lying at equal intervals in each longitudinal row; largest hooks at the middle and smallest ones at the apex or at the base. Neck conical. Trunk claviform with anterior swelling, armed anteriorly with exceedingly minute spines embedded in cuticular folds. Proboscis sheath subcylindrical, double-walled, with cephalic ganglion at the base. Lemnisci nearly twice as long as proboscis sheath.

Male. Based on 3 specimens. Body 3.7-9.3 mm long. Proboscis $0.35-0.52 \times 0.19-0.27$ mm. Proboscis hooks in 14 longitudinal rows of 6-8 each; largest hooks $53-65 \mu\text{m}$ long, and smallest ones $33-38 \mu\text{m}$ long. Neck $0.12-0.25$ mm long. Trunk $3.20-8.50 \times 0.41-1.25$ mm. Proboscis sheath $0.14-0.82 \times 0.18-0.27$ mm. Lemnisci $0.64-1.95 \times 0.10-0.29$ mm. Testes oval to elliptical, contiguous, the anterior $0.57-1.70 \times 0.49-0.82$ mm, lying just behind posterior end of lemnisci and the posterior $0.65-1.83 \times 0.46-0.68$ mm, at the middle of trunk. Cement glands 6, pear-shaped, directly behind posterior testis and irregularly arranged one behind another or in two longitudinal rows of 3 each. Cement ducts 3 on each side. Seminal vesicle not clear. Säftigen's pouch fusiform, $0.34-0.51 \times 0.13-0.30$ mm, overlapping partly cement ducts. Thick muscular walled ejaculatory duct without definite sphincter. Genital pore terminal.

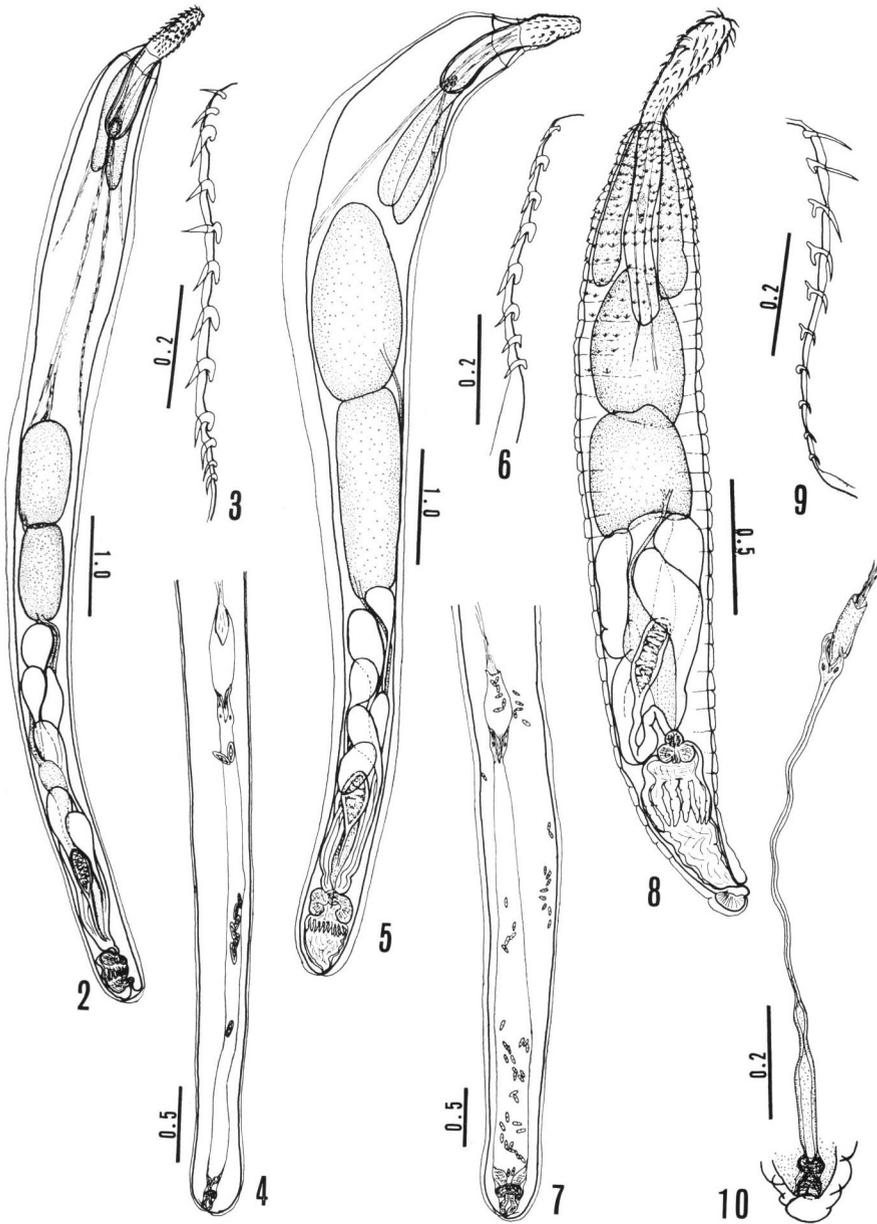
Female. Based on 3 specimens. Body 10.30-14.80 mm long. Proboscis $0.42-0.55 \times 0.25-0.33$ mm. Proboscis hooks in 14 longitudinal rows of 7-8 each; largest hooks $60-70 \mu\text{m}$ long, and smallest ones $33-45 \mu\text{m}$ long. Neck $0.18-0.23$ mm long. Trunk $9.29-14.05 \times 1.23-1.43$ mm. Proboscis sheath $0.75-0.95 \times 0.32-0.37$ mm. Lemnisci $1.20-1.53 \times 0.20-0.40$ mm. Genital pore terminal. Eggs elongated elliptical, three-shelled; outer shell $63-93 \times 18-30 \mu\text{m}$; middle shell with prominent polar prolongations.

Remarks. The present species is most like the foregoing *Acanthocephaloides ichiharai* n. sp. in the size of body, eggs and proboscis hooks, but differs from the latter in the following points: 1) The trunk is claviform with anterior swelling. 2) The proboscis hooks are arranged in 6 to 8 at equal intervals in each longitudinal row. 3) The lemnisci are nearly twice as long as the proboscis sheath.

7. *Acanthocephalus japonicus* (FUKUI et MORISITA, 1936)

Host and locality. *Hexagrammos agrammus* from Kesenuma.

Site. Intestine.



Figs. 2-4. *Acanthocephaloides ichiharai* n. sp. 2. Male. 3. Proboscis hooks. 4. Female terminal genitalia.

Figs. 5-7. *Acanthocephaloides claviformis* n. sp. 5. Male. 6. Proboscis hooks. 7. Female terminal genitalia.

Figs. 8-10. *Micracanthorhynchina segmentata* (YAMAGUTI, 1959), n. comb. 8. Male. 9. Proboscis hooks. 10. Female terminal genitalia. Bars are expressed in mm in all figures.

8. *Metacanthocephalus ovicephalus* (ZHUKOV, 1960)

Host and locality. *Acantholumpenus mackayi* from Kushiro; *Limanda herzensteini* from Otsuchi; and *Limanda yokohamae* from Fukaura.

Site. Intestine.

Family Micracanthorhynchinidae

9. *Micracanthorhynchina segmentata* (YAMAGUTI, 1959), n. comb.

(Figs. 8–10)

Allorhadinorhynchus segmentatus YAMAGUTI, 1959

Host and locality. *Hyporhamphus sajori* from Otsuchi.

Site. Intestine.

Description. Proboscis claviform, broadest subapically, with largest hooks at the subapex and smallest ones at the base. Larger hooks with well developed roots. Neck very short, often unrecognizable. Trunk subcylindrical, covered anteriorly with minute spines which are almost embedded in cuticular folds, often curved ventrally near the posterior end, and terminating posteriorly in a rounded knob. Trunk pseudosegmentation obscure in macerated specimens. Proboscis sheath cylindrical, double-walled, with cephalic ganglion near the middle. Lemnisci cylindrical to claviform, almost as long as or slightly shorter than proboscis sheath.

Male. Based on 6 specimens. Body 2.64–3.56 mm long. Proboscis 0.28–0.50 × 0.10–0.16 mm. Proboscis hooks in 12 longitudinal rows of 9–10 each; largest subapical hooks 58–79 μm long and smallest basal hooks 13–18 μm long. Trunk 2.36–3.26 × 0.40–0.58 mm, pseudosegmented at intervals of 20–95 μm, and covered anteriorly with spines 10–15 μm long. Proboscis sheath 0.70–0.78 × 0.08–0.13 mm. Lemnisci 0.46–0.74 × 0.01–0.20 mm. Testes oval to ellipsoidal, contiguous, 0.38–0.66 × 0.24–0.42 mm; the anterior immediately behind or overlapping proboscis sheath in part; the posterior near middle of trunk. Cement glands 4, claviform, arranged closely side by side and with anterior tips just behind posterior testis. Säftigen's pouch 0.05–0.23 mm in diameter. Wall of seminal vesicle not distinct. Muscular bursal cap with 9–10 rays. Genital pore ventro-subterminal.

Female. Based on 10 specimens. Body 3.16–4.82 mm long. Proboscis 0.32–0.60 × 0.14–0.18 mm. Proboscis hooks in 12 longitudinal rows of 9–11 each; largest hooks 79–90 μm long and smallest hooks 13–18 μm long. Trunk 2.84–4.20 × 0.56–0.72 mm, pseudosegmented at intervals of 40–150 μm, and covered anteriorly with spines 13–18 μm long. Proboscis sheath 0.82–1.14 × 0.08–0.16 mm. Lemnisci 0.58–0.92 × 0.09–0.19 mm. Uterus very slender, 0.94 mm long, comprising 1/3 of trunk length in one specimen. Genital pore ventro-subterminal. Eggs elongated elliptical, three-shelled; outer shell 45–53 × 13–16 μm; middle shell with prominent polar prolongations.

Remarks. YAMAGUTI (1959) described *Allorhadinorhynchus segmentatus* as a new genus and species from *Hyporhamphus sajori* captured in the Inland Sea of Japan, on the ground that having trunk spines, pseudosegmentation of the trunk, two cement glands, etc. Our examination on the type specimens (MPM Coll. No. 22041) revealed that the number of cement glands is not 2 but 4 as seen in our specimens. Pseudosegmentation of the trunk was not clear in some macerated specimens. Consequently *A. segmentatus* is closely like the members of *Miracanthorhynchina* and it should be transferred to the latter genus as *Miracanthorhynchina segmentata* n. comb. So, *Allorhadinorhynchus* is synonymized with *Miracanthorhynchina*. *M. segmentata* closely resembles *M. hemirhamphi* (BAYLIS, 1944) from *Hemiramphus intermedius* in Australasian waters except the length of proboscis hooks. The longest hooks measure 58 to 79 μm long in the male and 79 to 90 μm long in the female in our specimens, whereas 90 μm long in the male and 110 to 120 μm long in the female in *M. hemirhamphi*.

10. *Pseudorhadinorhynchus leuciscus* (KROTOV et PETROCHENKO, 1956)

Host and locality. *Spirinchus lanceolatus* from Samani; and *Tribolodon hakonensis* from Samani and Otsuchi.

Site. Intestine.

Remarks. MACHIDA and ARAKI (1982) redescribed this species in detail on the material from *Tribolodon hakonensis*.

Family Polymorphidae

11. *Corynosoma strumosum* (RUDOLPHI, 1802), (immature form)

Host and locality. *Hypomesus japonicus* from Samani; *Ainocottus ensiger* from Samani; *Gymnocanthus herzensteini* from Samani; and *Verasper moseri* from Samani.

Site. Body cavity.

Remarks. In northern Japan, the adult of this species was previously known from *Eumetopias jubata* from Rebun Island by ORIHARA (1962), from *Histriophoca fasciata*, *Phoca kurilense* and *P. vitulina* from Nemuro by MIYAMOTO *et al.* (1979).

FUJITA (1921) described *Corynosoma osmeri* as a new species from *Osmerus lanceolatus* of Hokkaido. VAN CLEAVE (1953) and MARGOLIS (1954) regarded *C. osmeri* as a synonym of *C. strumosum*.

12. *Corynosoma villosum* VAN CLEAVE, 1953, (immature form)

Host and locality. *Sebastes trivittatus* from Samani; and *Hippoglossus stenolepis* from Samani.

Site. Body cavity.

Remarks. The adult of this species was reported from *Callorhinus ursinus* caught off Sanriku District by MACHIDA (1969), from *Eumetopias jubata* in Uchiura Bay (unpublished data by MACHIDA), northern Japan.

13. *Bolbosoma nipponicum* YAMAGUTI, 1939, (immature form)

Host and locality. *Hemitripteris villosus* from Samani.

Site. Body cavity.

Family Rhadinorhynchidae

14. *Rhadinorhynchus* sp.

Host and locality. *Conger myriaster* from Otsuchi; *Physiculus maximowiczii* from Otsuchi; and *Scomber japonicus* from Samani.

Site. Intestine.

Remarks. Two mature males were obtained from *Scomber japonicus*. Trunks measure 9.4 to 13.0 mm long and 0.8 to 1.3 mm wide, and proboscis hooks are arranged in 11 to 16 longitudinal rows. A fully evaginated proboscis bears 27 to 28 hooks in each row. Two mature females were obtained from *Conger myriaster* and one immature female from *Physiculus maximowiczii*. Trunks measure 17.7 to 23.0 mm long and 0.9 mm wide, and proboscises have 16 longitudinal rows of 25 to 26 hooks each in two mature females.

Based on a single female, FUJITA (1920) described *Rhadinorhynchus japonicus* as a new species from *Scomber japonicus* obtained from a fish market in Sapporo. FUKUI and MORISITA (1937) reported *R. pristis* (RUDOLPHI, 1802) from *Seriola quinqueradiata* from Mie Prefecture, and suggested the possibility that *R. pristis* is synonymous with any of *R. japonicus*, *R. selkirki* VAN CLEAVE, 1921 and *R. trachuri* HARADA, 1935. The proboscis hooks are arranged in 14 to 16 longitudinal rows of 26 each in *R. pristis*, 10 rows of 17 to 18 each in *R. japonicus*, 12 to 14 rows of 24 each in *R. selkirki*, and 12 rows of 22 to 24 each in *R. trachuri*.

YAMAGUTI (1963) regarded these species as valid and renamed *R. pristis* of FUKUI and MORISITA (1937) as *Nipporhynchus seriolae*. GOLVAN (1969) also regarded all these species as valid.

Our specimens show certain resemblance with *R. pristis* except for one male from *Scomber japonicus* having 11 rows of *ca.* 20 hooks each on a proboscis, which seems rather identical with that of *R. japonicus*.

Additional specimens should be examined for the specific determination including the validity of these *Rhadinorhynchus* spp.

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