FOLIA PARASITOLOGICA (PRAHA) 32: 305–316, 1985.

SOME FISH NEMATODES FROM FRESH WATERS IN HOKKAIDO, JAPAN

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Abstract. A collection of parasitic nematodes, recovered from fishes from three freshwater localities (Lake Toro, Lake Shirarutoro and Chitose Salmon Hatchery) in Hokkaido, Japan, in the years 1979—1983 comprized a total of 5 species; two of them (*Hysterothylacium aduncum* and *Rhabdochona oncorhynchi*) parasitized fishes as adults, while four (*Hysterothylacium aduncum*, *Contracaecum osculatum*, *Anisakis simplex*, *Agamospirura* sp.) occurred as larvae. The most frequent parasite was *H. aduncum*, whose heavy infections were mainly found in salmonids and plaice; these new materials made it possible to elucidate the species appurtenance of both the adults and larvae of *Hysterothylacium* occurring in various fishes from Japanese fresh waters as also to point out that *H. aduncum* (a marine parasite) was probably capable to develop in fresh waters. All the parasites found have been briefly described and illustrated.

In spite of the numerous papers dealing with fish helminths in Japan, the present knowledge on the composition of the freshwater nematode fauna of fishes remains still inadequate in this country. It is mainly due to the difficulties in nematode determination as a result of the chaotic situation in the taxonomy of some groups, principally anisakids, that even in recent papers these parasites are often designated by generic name only or are identified with uncertainty (see e.g. Seki 1975, Margolis 1982). The main cause is the large number of species described from the fresh waters of Japan and nearby oceanic waters, mainly by T. Fujita in the years 1921—1940; many of these species were reported from identical or closely related hosts and the descriptions were often inadequate and drawings very schematic, leaving the validity of some species in doubt. This situation can be solved only by studying new nematode collections from the territory of Japan and their exact taxonomic evaluation. The present paper gives an account of the nematode parasites recorded by us from fishes of the fresh waters of Japan in the years 1979—1983.

MATERIALS AND METHODS

Helminth materials were collected by two of us (K. N. and S. U.) in 1979—83 from a number of salmonid and other fishes from two lakes, Lake Toro and Lake Shirarutoro near Kushiro, and from Chitose Salmon Hatchery in Hokkaido. These nematodes were fixed in hot 70 % alcohol. For examination they were cleared in glycerine. All specimens have been deposited at the Meguro Parasitological Museum, Tokyo. In the following account of the species encountered, measurements are given in millimeters and the names of hosts are in accordance with those used by Nakamura (1975).

REVIEW OF SPECIES

1. *Hysterothylacium aduncum* (Rudolphi, 1802) Figs. 1 and 2 A—D

Syn.: *Ascaris adunca* Rudolphi, 1802; *Contracaecum benimasu* Fujita, 1932; *C. hippoglossi* Fujita, 1932; *C. hypomesi* Fujita, 1932; *C. ochotense* Fujita, 1932; *C. crassicaudatum* Fujita,

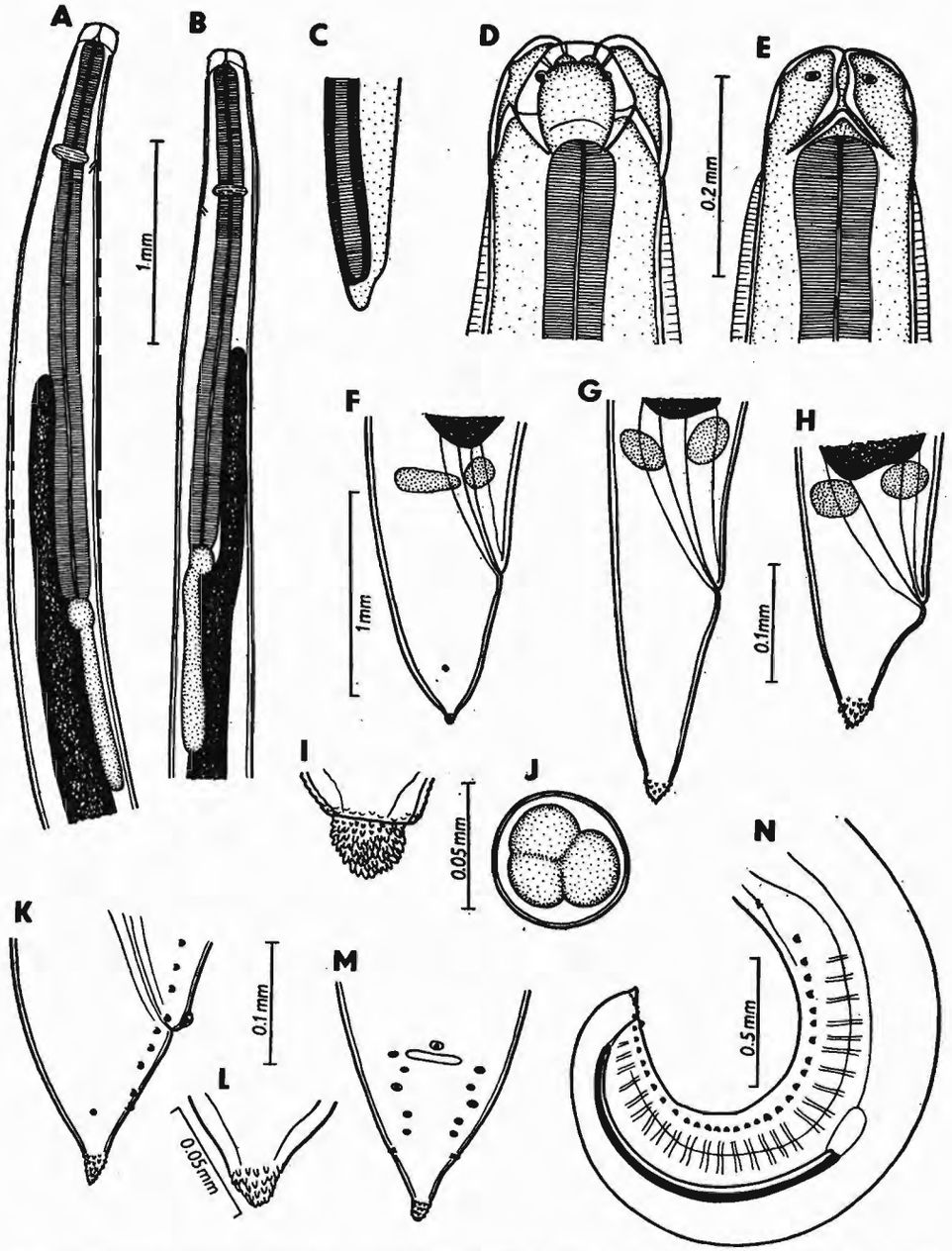

Fig. 1. *Hysterothylacium aduncum* (Rudolphi, 1802) from digestive tract of Japanese salmonids; A — head end of gravid female; B — head end of fourth-stage larva; C — distal end of spicule; D, E — anterior extremity of male, dorsal and ventral views; F — tail of gravid female; G — tail of female fourth-stage larva; H — tail of male fourth-stage larva; I — caudal process of female; J — egg; K, M — tail of young male, lateral and ventral views; L — male caudal process; N — posterior end of male. (A—B and D—N — from *S. leucomaenis*, C — from *O. keta*.)

1939; *C. elongatum* Fujita, 1939; *C. longispiculum* Fujita, 1940; *C. mesopi* Fujita, 1940; *C. okadai* Fujita, 1940; *C. oshoroensis* Fujita, 1940; *C. salvelini* Fujita, 1940.

Description (based on adults from *S. leucomaenis*): Nematodes of medium size, females somewhat larger than males. Cuticle with very fine transverse striation, longitudinal striae also present. Lips of approximately equal size, provided with wide membraneous flanges, these being broadest near their base; dorsal lip bearing two subdorsal double papillae; each subventral lip with one double subventral papilla and small simple papilla and amphid situated laterally; pulp of lips provided at either side with small rounded lobe at its anterior margin. Interlabia broad, provided with distinct cuticular margin. Cervical alae present, starting short distance below level of base of subventral lips, gradually becoming wider and extending posteriorly to some oesophagus end level. Oesophagus narrow, long; ventriculus globular, ventricular appendix approximately as long as anterior intestinal caecum (usually somewhat shorter, rarely longer); intestinal caecum representing about 30—40 % of oesophagus length. Nerve ring encircling oesophagus approximately at border of first and second fifths of its length; excretory pore just below level of nerve ring. Intestine dark, straight. Rectum short, hyaline, surrounded by three large unicellular rectal glands. Tail of both sexes conical, ending in small process covered by fine rudimentary spines.

Male (10 specimens): Length of body 17.25—50.73, maximum width 0.326—0.680. Lips 0.078—0.114 long, length of interlabia 0.030—0.039. Maximum width of cervical alae 0.021 to 0.027. Length of oesophagus 2.19—3.24, distance of nerve ring from anterior extremity 0.503—0.734, of excretory pore 0.571—0.775. Size of ventriculus 0.082—0.190 × 0.068—0.150, length of ventricular appendix 0.707—1.061; anterior intestinal caecum 0.816—0.925 long. Testis usually anteriorly reaching posterior end of ventricular appendix. Posterior end of body of older males ventrally bent. Spicules almost equal, alate except for their distal ends, 0.911 to 1.632 long and 0.020—0.027 wide; length of spicules representing 3.2—5.9 % of body length. Total of 32—34 pairs of subventral papillae present, 27—29 being preanals and 5 postanals; papillae of several most posterior preanal and postanal pairs very small. Additional pair of small lateral papillae (outlets of phasmids) situated below level of last subventrals. Besides paired papillae, large unpaired papilla present on anterior cloacal lip (well developed in larger males only). Tail conical, 0.147—0.180 long, ending in small process 0.033—0.042 long, covered by rudimentary cuticular spines.

Female (10 specimens): Body of gravid females 27.85—65.00 long, maximum width 0.544—1.496. Lips 0.114—0.195 long, length of interlabia 0.045—0.084. Maximum width of cervical alae 0.033—0.045. Length of oesophagus 2.92—4.83, distance of nerve ring from anterior end 0.680 to 0.979, of excretory pore 0.748—1.074. Size of ventriculus 0.122—0.272 × 0.109—0.272, length of ventricular appendix 0.639—1.333; anterior intestinal caecum 0.979—1.904 long. Vulva situated 10.65—19.04 (33—38 % of body length) from head end. Vagina pointing backwards and dividing into two posteriorly directed uterine branches filled in with eggs. Ovaries forming numerous coils at vagina region. Eggs almost spherical, 0.054—0.060 in diameter, with thin translucide walls. Content of eggs in utero uncleaved or cleaved into only several blastomeres. Tail conical, 0.367—0.503 long, ending in small spinose process 0.036 long. Pair of small lateral papillae (outlets of phasmids) present near posterior end of tail.

Smallest four-stage larvae from intestine of *S. leucomaenis*:

Male larva: Body length 8.64, width 0.163. Length of lips 0.033, of interlabia 0.015. Oesophagus 1.12 long, distance of nerve ring from anterior end 0.326, of excretory pore 0.353. Diameter of ventriculus 0.068, length of ventricular appendix 0.408, length of intestinal caecum 0.476. Length of tail 0.120, of caudal process 0.030; latter covered with rudimentary spines.

Female larva: Body length 9.81, maximum width 0.218. Length of lips 0.042, of interlabia 0.015. Maximum width of cervical alae 0.006. Oesophagus 1.27 long, distance of nerve ring 0.313, of excretory pore 0.367. Size of ventriculus 0.068 × 0.054, length of ventricular appendix 0.476, of intestinal caecum 0.530. Distance of vulva from anterior extremity 4.53 (46 % of body length). Anlage of genital tube developed, vulva covered by cuticle. Length of tail 0.190, of caudal process 0.021; latter with rudimentary spines.

Hosts: adults including gravid females from intestine and stomach: *Salvelinus leucomaenis*, *Salmo gairdneri*, *Oncorhynchus keta* (fry) (all Salmonidae), *Tridentiger obscurus* (Gobiidae) and *Platichthys stellatus* (Pleuronectidae); juvenile forms from intestine: *Cottus nozawae* (Cottidae) (young adults), *Rhodoniichthys laevis* (Gobiidae) and *Tribolodon ezoe* (Cyprinidae) (advanced third-stage larvae); advanced third-stage larvae from abdominal cavity and mesentery: *Tridentiger obscurus*, *Chaenogobius annularis* (both Gobiidae) and *Hypomesus transpacificus nipponensis* (Osmeridae).

Localities: Lake Toro (*S. leucomaenis* 15. V. 1981, 30. IV. and 2. V. 1982; *O. keta* 22. V. 1983; *Ch. annularis* 19. IX. 1981; *T. obscurus*, *P. stellatus*, *R. laevis*, *C. nozawae*, *T. ezoe* and *H.*

Table 1. Measurements (in mm) of *H. aduncum* from different hosts (own material)

Host	*Salvelinus leucomaenis* ♂♂	*Salvelinus leucomaenis* gr. ♀♀	*Oncorhynchus keta* ♂♂	*Oncorhynchus keta* gr. ♀♀	*Salmo gairdneri* gr. ♀	*Tridentiger obscurus* ♂	*Tridentiger obscurus* gr. ♀	*Platichthys stellatus* ♂♂	*Platichthys stellatus* gr. ♀♀
Length of body	17.25–50.73	27.85–65.00	10.01–20.51	15.71–21.20	frag. 28.0	22.44	25.43	20.27–32.75	36.22–58.79
Width of body	0.326–0.680	0.544–1.496	0.326–0.558	0.612–0.666	1.088	0.653	0.666	0.326–0.490	0.653–1.020
Length of lips	0.078–0.090	0.114–0.195	0.066–0.120	0.141–0.159	0.163	0.114	0.108	0.117–0.138	0.150
Length of interlabia	0.030–0.039	0.045–0.084	0.033–0.057	0.039–0.060	0.068	0.054	0.051	0.051–0.054	0.060
Width of cervical alae	0.021–0.027	0.033–0.045	0.015–0.030		0.033	0.015	0.021	0.015–0.030	0.036–0.045
Length of oesophagus	2.19–3.24	2.92–4.83	1.36–2.05	2.33–2.34	4.54	2.39	2.35	2.12–2.48	2.12–2.48
Size of ventriculus	0.082–0.190 × 0.068–0.150	0.109–0.272 × 0.109–0.272	0.095–0.150 × 0.095–0.136	0.136–0.177 × 0.150–0.163	0.245 × 0.177	0.122 × 0.109	0.122 × 0.109	0.082–0.068	0.136–0.204 × 0.095–0.204
Length of ventral appendix	0.707–1.061	0.639–1.330	0.625–1.170	0.694–0.707	1.292	1.074	1.00	0.707	1.034–1.374
Length of int. caecum	0.748–0.925	0.979–1.564	0.843–0.952	0.680–0.857	1.224	0.966	0.911	0.680	1.156–1.591
Distance of excr. pore	0.571–0.775	0.748–1.074	0.476–0.653	0.571–0.598		0.680	0.530	0.639–0.721	0.762–1.047
Distance of nerve ring	0.503–0.734	0.680–0.979	0.462–0.625	0.490–0.503		0.625	0.503	0.558–0.666	0.694–0.979
Length of tail	0.147–0.180	0.367–0.503	0.099–0.150	0.218–0.299		0.190	0.272	0.135–0.150	0.340–0.475
Preanal papillae (pairs)	27–29	–	28–34	–	–	31		27–40	–
Postanal papillae (pairs)	6	–	5–6	–	–	6		5–6	
Length of spicules	0.911–1.632	–	0.495–0.822	–		0.966	–	1.238–1.496	–
Size of eggs	–	0.054–0.060	–	0.048–0.069	0.054–0.063	–	0.060	–	0.060–0.063
Locality	Lake Toro		Lake Toro		Chitose Salmon Hatchery	Lake Toro		Lake Toro	

transpacificus nipponensis — all 10. X. 1981) and Chitose Salmon Hatchery (*S. gairdneri* 4. X 1979).
Specimens: Meguro Parasitological Museum Nos. 19442—450, 19456.

Comments: — Adult nematodes from all the above mentioned hosts are quite identical in their morphology and there cannot be any doubts as to their conspecificity; certain metrical differences (Table 1) are probably associated with the state of development of these parasites and are also influenced by different numbers of the specimens examined from individual fish host species; different numbers of preanal papillae in males can be taken for the intraspecific variability that is usually considerable in ascaridoid nematodes. On the basis of the data obtained, all the nematodes can be assigned to the species *H. aduncum*, as described e.g. by Hartwich (1975), Soleim and Berland (1981) and Fagerholm (1982). *Hysterothylacium* has only recently been found (Deardorff and Overstreet 1981) to be the valid genus to include those species previously considered as members of the junior synonym *Thynnascaris*; these species were considered members of *Contracaecum* in the past.

In Japan, Fujita (1932, 1939, 1940) described numerous new species of *Contracaecum* from salmonids and some other fishes from Hokkaido and the nearby Okhotsk Sea; their descriptions were poor, containing many errors and, moreover, most species were established on the basis of larvae or juvenile specimens. These species have never been found since and many authors consider them doubtful (e.g. Margolis 1982). Only lately Sheenko and Pozdnyakov (1981), trying to solve this confused situation, have made a comparison based on the literary data and their own materials from fishes from the boreal waters of the north-western Pacific to synonymize the following 11 Fujita's species with *Thynnascaris adunca* (= *Hysterothylacium aduncum*): *Contracaecum benimasu* Fujita, 1932, *C. hippoglossi* Fujita, 1932, *C. hypomesi* Fujita, 1932, *C. ochotense* Fujita, 1932, *C. crassicaudatum* Fujita, 1939, *C. elongatum* Fujita, 1939, *C. longispiculum* Fujita, 1940, *C. mesopi* Fujita, 1940, *C. okadai* Fujita, 1940, *C. oshoroensis* Fujita, 1940 and *C. salvelini* Fujita, 1940. However, the authors had not at their disposal materials from the proper territory of Japan from where these species had originally been described; most of the above mentioned species were described by Fujita just from the fresh waters of Japan.

Own materials of these nematodes were obtained from fresh waters in Hokkaido from the fish host species either identical or related to those from which Fujita's materials originated; moreover, one our locality (Chitose Salmon Hatchery) is almost identical with the type locality (Chitose River) of two Fujita's species, *C. okadai* and *C. salvelini*, both described here from *Salvelinus leucomaenis** (Fujita 1940). It is indicated by the comparison of the three Fujita's species described from adults with own material that there are no major differences among these forms (position of the vulva in *C. okadai* was an obvious error). Also the comparison of the encysted larvae from the abdominal cavity and mesentery from the present material with *C. mesopi* and *C. oshoroensis* (Table 2) and other Fujita's species described from larvae shows that all these forms are conspecific. Accordingly, we consider the synonymizing of Fujita's species with *H. aduncum*, as proposed by Sheenko and Pozdnyakov (1981), to be fully justified.

It is indicated by the analysis of our materials that all the recovered larvae and juvenile specimens of *Hysterothylacium* (differing from *Contracaecum* larvae

* Although Fujita (1940) identified the host with *S. malma*, this fish is not distributed there and can be regarded as *S. leucomaenis*.

Table 2. Comparison of measurements (in mm) of the encysted larvae of *H. aduncum* with *Contracaecum mesopi* and *C. oshoroensis*

	C. mesopi after Fujita 1940	*C. oshoroensis* after Fujita 1940	*H. aduncum* own material		
Length of body	12.5		9.52	8.58–17.00	8.20–12.40
Width of body	0.44		0.204	0.163–0.326	0.122–0.340
Length of oesophagus	1.35	0.59	0.952	0.966–1.809	1.088–1.360
Length of vent. appendix	0.59	0.51	0.476	0.435–0.680	0.530–0.598
Length of int. caecum	0.44	0.48	0.449	0.340–0.694	0.435–0.571
Distance of nerve ring	0.40	0.30	0.299	0.272–0.435	0.313–0.367
Distance of excr. pore	0.40		0.326	0.286–0.462	0.354–0.408
Length of tail	0.23	0.15	0.190	0.150–0.249	0.109–0.176
Length of caudal spike	present	present	0.012	present	present
Length of lips			0.027	0.039–0.045	0.027–0.041
Size of ventriculus			0.068 × 0.054	0.081–0.095 × 0.068–0.095	0.054–0.082 × 0.054–0.082
Localization	body cavity	body cavity	body cavity	body cavity and mesentery	body cavity
Host	*Hypomesus olidus*	*Hypomesus olidus*	*Tridentiger obscurus*	*Hypomesus transpacificus nipponensis*	*Chaenogobius annularis*
Locality	Ishikari River, Hokkaido, Japan		Lake Toro, Hokkaido, Japan		

mainly in the location of the excretory pore) are conspecific with *C. aduncum*; third-stage larvae are noted for a very long cuticular spike on the tail, while the tail of fourth-stage larvae is similar to that in adults, its tip being provided with numerous rudimentary spines. Variously advanced third- and fourth-stage *H. aduncum* larvae were recorded, in addition to adults, from the stomach and intestine of *Salvelinus leucomaenis* which made it possible to compare these with the larvae found in other host species. The fishes harbouring encysted *H. aduncum* larvae probably serve as paratenic or perhaps also intermediate hosts for this parasite.

Although *H. aduncum* is parasitizing mainly marine fishes, it is frequently found in freshwater fish species in brackish water areas (see e.g. Fagerholm 1982). Of the hosts of *H. aduncum* recorded in this study, only two species (*S. leuco-*

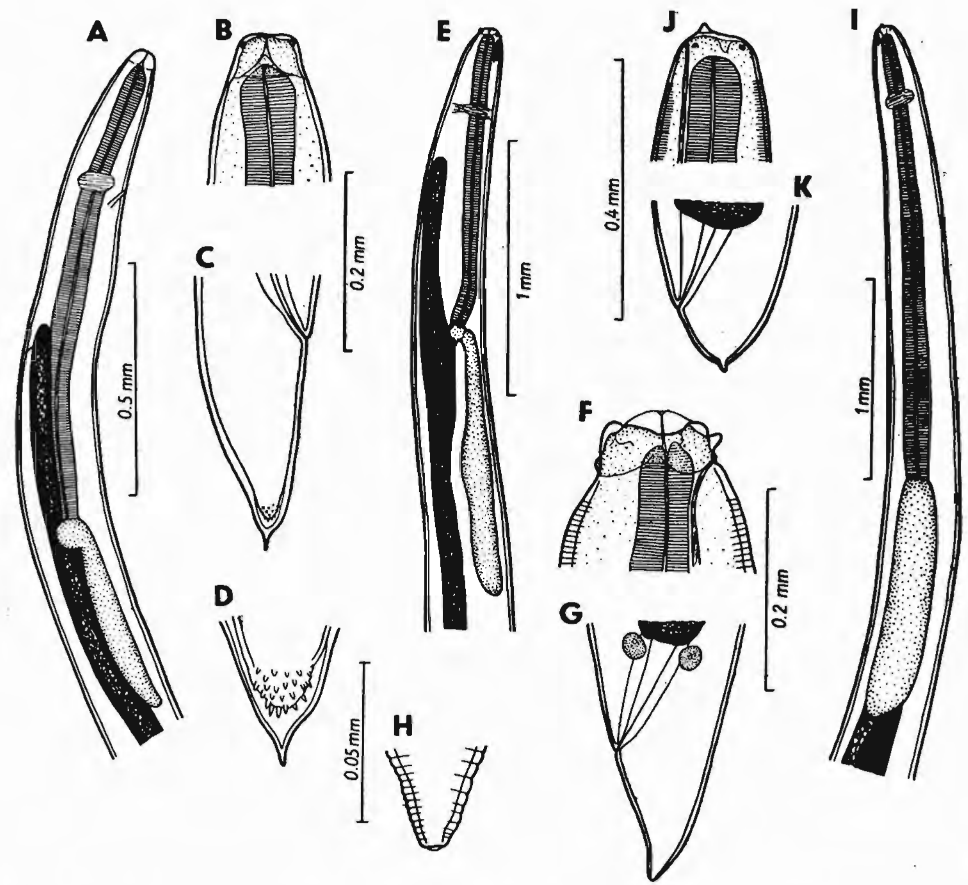

Fig. 2. A—D — *Hysterothylacium aduncum* (Rudolphi, 1802) third-stage larva from abdominal cavity of *T. obscurus* (A — head end; B — anterior extremity; C — tail; D — tip of tail). E—H — *Contracaecum osculatum* (Rudolphi, 1802) third-stage larva from swim bladder of *G. aculeatus* (E — head end; F — anterior extremity; G — tail; H — tip of tail). I—K — *Anisakis simplex* (Rudolphi, 1809) third-stage larva from mesentery of *T. hakonensis* (I — anterior extremity; J — head end; K — tail).

maenis and *P. stellatus*) are migratory, whereas the remaining fishes are exclusively freshwater ones. It suggests that new *H. aduncum* infections can be acquired by fishes also in the freshwater environment. According to Markowski (1937), the second-stage larvae of *H. aduncum* develop in eggs in the fresh water as quickly as in the sea water. The eggs containing these larvae are already able to infect intermediate hosts that are various benthic and planktonic invertebrates and probably also small fishes.

H. aduncum is a common parasite not only of marine fishes throughout most of the world but also of fishes in some brackish water areas; frequently it is brought into fresh waters by migratory fish species (see Bykhovskaya—Pavlovskaya et al. 1962). From the fresh waters of the Far East it was reported mainly from salmonids e.g. by Dogiel and Akhmerov (1959) from the River Amur, Zhukov (1960) from the Putyatin and Shikotan Islands (South-Kurile shallow waters of the Okhotsk Sea) and Trofimenko (1962) from the rivers of Kamchatka; probably, the nematodes designated as *Contracaecum* sp. or *C. clavatum* from *Salvelinus* spp. from the rivers and lakes in Kamchatka, reported by Mozgovoy (1953), Butorina (1975, 1980) and Butorina et al. (1980), belonged to the same species.

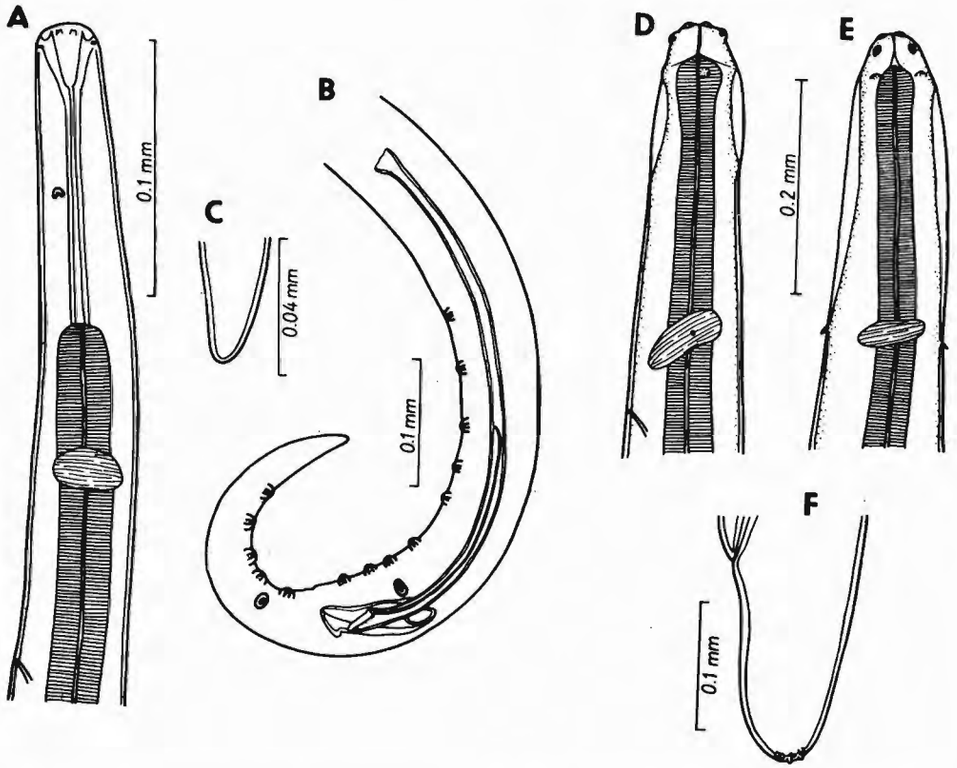

Fig. 3. A—C — *Rhabdochona oncorhynchi* (Fujita, 1921) from *O. masou* (A — head end; B — posterior end of male; C — tip of male tail). D—F — *Agamospirura* sp. from mesentery of *P. pungitius* (A, B — head end, lateral and dorsoventral views; F — tail).

2. *Contracaecum osculatum* (Rudolphi, 1802) larva — Fig. 2 E—H

Syn.: *Ascaris osculata* Rudolphi, 1802; *A. stenocephala* Railliet et Henry, 1907; *Contracaecum tridentatum* Fujita, 1939; *C. unidentatum* Fujita, 1939; *C. gypsophocae* Johnston et Mawson, 1941; *C. ogmorhini* Johnston et Mawson, 1941; *C. hydrurgae* Johnston et Mawson, 1941.

Description (third-stage larva): Body whitish, cuticle with dense transverse striation. Length of body 14.28, width 0.408. Anlagen of lips 0.054 long; small round mouth papillae and larval boring tooth, 0.018 long, present. Excretory pore situated ventrally between bases of both subventral lips, just below boring tooth. Length of oesophagus 1.32; ventriculus small, spherical; length of posterior ventricular appendix 1.25, of anterior intestinal caecum 0.75. Nerve ring encircling oesophagus 0.367 from anterior end. Tail conical, with obtuse tip; length of tail 0.147.
Host: *Gasterosteus aculeatus* (Gasterosteidae); location: swim bladder.
Locality: Lake Shirarutoro (19. IX. 1981).
Specimen: Meguro Parasitological Museum No. 19454.

Comments: The only recorded larva corresponds to the third-stage larva of *C. osculatum*, as described e.g. by McClelland and Roland (1974), Fagerholm (1982) and Valter et al. (1982). Adults of this cosmopolitan nematode species are parasitic in marine mammals; the planktonic and benthic crustaceans (copepods, amphipods) and possibly also fishes in the internal organs of which third-stage larvae of *C. osculatum* are found serve as intermediate hosts (Fagerholm 1982); probably, fishes may become also paratenic hosts.

In Japan, these larvae from fishes (*Oncorhynchus* spp.) were described by Fujita (1939) as two independent species, *Contracaecum tridentatum* and *C. unidentatum*; these have only recently been synonymized with *C. osculatum* (Sheenko and Pozdnyakov 1981).

3. *Anisakis simplex* (Rudolphi, 1809) larvae — Fig. 2 I—K

Syn.: *Ascaris simplex* Rudolphi, 1809; *A. angulivalvis* Creplin, 1851; *A. bicolor* Baird in Murie, 1868; *A. kükenthalii* Cobb, 1889; *A. rosmari* Baylis, 1916; *A. similis* Baird, 1853; *Anisakis alata* Hsü, 1933; *A. catodontis* Baylis, 1929; *A. kogiae* Johnston et Mawson, 1939; *A. pegreffii* Campana-Rouget et Biocca, 1955; *A. tridentata* Kreis, 1938.

Description (third-stage larva): Two larvae obtained in the present study measure 32.96—35.66 in length, maximum width 0.598; cuticle with fine transverse striation. Excretory pore situated just below ventrally oriented boring tooth; latter 0.012 long. Anlagen of lips 0.039 long. Length of oesophagus 2.58, distance of nerve ring from anterior extremity 0.326—0.394. Ventriculus fairly long, 1.16—1.52, width 0.204—0.245. Renette cell some 8.25 long. Tail conical, 0.120 long, ending in sharp cuticular spike 0.015 long.
Host: *Tribolodon hakonensis* (Cyprinidae); location: mesentery.
Locality: Lake Toro (15. V. 1981).
Specimens: Meguro Parasitological Museum No. 19451.

Comments: Larvae of the present material correspond in their morphology to the species *A. simplex* (see Pippy and Banning 1975, Fagerholm 1982). Adult *A. simplex* are the stomach parasites of marine mammals, cetaceans and pinnipeds, while conspecific third-stage larvae occur largely in various fish species in the colder marine regions of the world, but also in crustaceans, cephalopods and other invertebrates. In the northern Pacific it is widely distributed (see e.g. Oshima 1972). In Japan, *A. simplex* larvae (designated as *Anisakis* sp. Type I) have already been recorded from *T. hakonensis* by Ichihara (1973) and Shimazu (1976); apparently, this migratory fish acquires *A. simplex* infection in the sea. The larvae of *A. simplex* from fishes are known both from Japan and other countries as the causative agents of human anisakiasis ("herringworm disease").

4. *Rhabdochona oncorhynchi* (Fujita, 1921) — Fig. 3 A—C

Syn.: *Cystidicola oncorhynchi* Fujita, 1921; *C. fujiii* Fujita, 1921; *Rhabdochona salvelini* Fujita, 1927; *Rh. oncorhynchi* Fujita, 1940; *Rh. amago* Yamaguti, 1953.

Description: Three young males: Length of body 4.83—5.03, width 0.081. Prostom 0.021 long and 0.015—0.018 wide; basal teeth present. Length of vestibule including prostom 0.114—0.123, of muscular oesophagus 0.210—0.249, of glandular oesophagus 1.50—1.61. Distance of nerve ring 0.174—0.195, of excretory pore 0.246—0.273, of deirids 0.066—0.075. Subventral preanal papillae in numbers 7 + 7 or 9 + 9; additional lateral pair of postanal papillae present at level of third subventral pair (counting from cloaca). Six pairs of postanal papillae present, second pair laterals, remaining subventrals. Left spicule 0.429—0.471 long, length of its shaft 0.233—0.249. Right spicule 0.096—0.123 long. Tail measuring 0.225—0.237, with obtusely conical tip. Only juvenile females 3.85—3.94 long present.
Host: *Oncorhynchus masou* (Salmonidae); location: intestine.
Locality: Lake Shirarutoro (19. IX. 1981).
Specimens: Meguro Parasitological Museum No. 19453.

Comments: Only young males and juvenile females of *Rh. oncorhynchi* were obtained from the above host. This freshwater nematode is parasitic in various species of salmonids in the Far East (Moravec 1975). The taxonomic status of this species and its occurrence in Japan have already been dealt with in the paper by Moravec et al. (1981).

5. *Agamospirura* sp. Fig. 3 D—F

Description: Larval body whitish, cuticle with dense, fine transverse striation; length of body 10.40, width 0.245. Head end rounded, provided with two circlets of 4 dome-shaped papillae each; head end bearing four rounded processes (dorsal, ventral and two lateral); from them, longitudinal bands of inflated cuticle run backwards, lateral bands reaching level of deirids, remaining two being of only half length. Otherwise structure of head end indistinct. Oesophagus divided into anterior muscular and posterior glandular sections; length of glandular oesophagus not established. Muscular oesophagus starting 0.045 from anterior extremity, its length being 1.39; distance of nerve ring 0.340, of excretory pore 0.394, of simple deirids 0.408. Genital primordium tubular; vulva, still covered by cuticle, 4.98 from anterior end, developing vagina pointing backwards. Tail 0.177 long, rounded, bearing at tip several minute papilla-like processes.
Host: *Pungitius pungitius* (Gasterosteidae); location: mesentery.
Locality: Lake Toro (10. X. 1981).
Specimen: Meguro Parasitological Museum No. 19452.

Comments: Only a single larva was obtained, representing probably the fourth larval stage. Due to a poor condition of the specimen, it was not possible to study some features and, accordingly, a closer identification was impossible; therefore, we designate it only as *Agamospirura* sp. It can be supposed that this belongs to a spirurid nematode species parasitic as adults in birds. Fishes probably serve as only paratenic hosts.

Acknowledgements. We wish to thank Mr. Yoshinori Tosa and Miss Kozue Yoshiyama of Toro Fisheries Cooperative Association, and Dr. Teruhiko Awakura of Hokkaido Fish Hatchery, for their kind help in collecting the fishes.

НЕКОТОРЫЕ НЕМАТОДЫ РЫБ ИЗ ПРЕСНЫХ ВОД ИЗ ХОККАИДО, ЯПОНИЯ

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Резюме. Паразитические нематоды рыб, собранные в 1979—1983 гг. в трех пресноводных местонахождениях (Lake Toro, Lake Shirarutoro и Chitose Salmon Hatchery) на Хоккаидо в Японии, включали 5 видов; 2 из них (*Hysterothylacium aduncum* и *Rhabdochona oncorhynchi*) паразитировали в рыбах как половозрелые экземпляры, тогда как 4 (*Hysterothylacium aduncum*, *Contracaecum osculatum*, *Anisakis simplex*, *Agamospirura* sp.) встречались в них как личинки. Чаще всех встречался вид *H. aduncum*, заражающий здесь при высокой интенсивности инвазии главным образом лососевые рыбы и камбалы. На основе этого нового материала можно было объяснить видовую принадлежность половозрелых нематод и личинок рода *Hysterothylacium* встречающихся в разных рыбах пресных вод Японии и показать, что *H. aduncum* (морской паразит) вероятно может развиваться в пресных водах. Дано краткое описание и рисунки всех обнаруженных паразитов.

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Received 21 February 1984.

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FOLIA PARASITOLOGICA (PRAHA) 32: 316, 1985.

I. Andrássy: Klasse Nematoda: (Ordnungen Monhysterida, Desmoscolecida, Araeolaimida, Chromatorida, Rhabditida). *Gustav Fischer Verlag, Stuttgart 1984, 509 pp., 182 Figs. Price 118.00 DM.*

The nematodes (Nematoda) are a very comprehensive group of animals inhabitting bottoms of fresh- and salt-waters, soil and organic substance rotting in it; many of them became parasites of plants and animals. In the past, the studies on the nematodes were directed mostly to parasitic forms, particularly those infecting the vertebrates, but in the recent years, also nematology, studying free-living nematodes in the soil and fresh-water and those parasitic in plants, has recorded unprecedented development. In spite of the large number of papers concerning this topic, a compilation of data enabling a reliable identification of all free-living nematodes has been lacking. Therefore the publication of the book written by Prof. István Andrássy from Budapest, a prominent specialist in the taxonomy of free-living nematodes, is welcome. The volume appears in the series Bestimmungsbücher zur Bodenfauna Europas, edited by Herbert Frantz.

The book begins with short introductory chapters dealing with the morphology of nematodes (pp. 9—19), their biology and ecology (pp. 20—21), distribution (pp. 22—23), collection and preservation (pp. 24—26), preparation (p. 27), and determination (pp. 28 to 30) and a chapter on their taxonomy (pp. 31 to 38) in which the author gives a systematical survey of all families of free-living nematodes. Higher taxonomic units are evaluated according to the recently proposed new system of nematodes (Andrássy 1976) based on their evolution. According to this Nemathelminthes include only the classes Nematoda and Nematomorpha, and Nematoda are represented by 3 subclasses: Torquentia, Secernentia and Penetrantia. The volume further deals with the members of 5 orders, of which the orders Monhysterida, Desmoscolecida, Araeolaimida and Chromatorida represent the subclass Torquentia, whereas Rhabditida is the first order of the subclass Secernentia. The five orders include 39 families with 180 genera and approximately 1 100 valid species.

The major part of the book contents (pp. 39—435) is devoted to keys for the determination of taxons of the five abovementioned nematode orders including their diagnosis; for each species, in addition to their characters, also data on their occurrence, distribution and complete synonymy are given. The book contains also descriptions of many new taxons and numerous new nomenclatoric combinations. The most important characters of all groups of genera are summarized in tables. The list of references covers 27 pages. The volume concludes with indeces of Latin names of genera and species of nematodes. The graphical arrangement of the book is at a high level.

The book, the edition of which has been needed for a long time, is well written and there is no doubt that it will become an invaluable tool for the determination of free-living nematodes not only in Europe, but also in other parts of the world. It will be highly appreciated particularly by specialists studying free-living nematodes, but also by those dealing with parasitic nematodes, as well as by zoologists, soil biologists, hydrobiologists and other related professions. We may only wish that further volumes concerning the remaining groups of nematodes would appear in the near future.

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