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Parasitic Nematodes of Birds of the Order Colymbiformes in Czechoslovakia

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Abstract. In the present paper a detailed description is given of the systematic position and the morphology of four nematode species, parasitic in hosts of the order Colymbiformes. The nematode species *Contracaecum ovale* was found in the hosts *Podiceps cristatus* and *P. nigricollis*, the species *Syncuaria* (*D.*) *decorata* in *P. cristatus*, *P. nigricollis* and *P. ruficollis*, the species *Tropisurus* (*T.*) *gubanovi* in *P. ruficollis*, the nematode *Capillaria podicipitis* (?) in *P. nigricollis* and *P. ruficollis*. The three latter species are new to Czechoslovakia, the nematodes *T. gubanovi* and *C. podicipitis* (?) are new to Central Europe.

In Czechoslovakia, the helminths of birds of the order Colymbiformes, principally parasites belonging to the classes Trematoda and Cestoidea have been studied in detail (MACKO 1959). Some information on parasitic worms of these classes are included in the faunistically systematical works by VOJTĚCHOVSKÁ—MAYEROVÁ (1952), RYŠAVÝ (1957, 1961, 1962), SOMMER (1954) and BARUŠ and LELEK (1961). In Czechoslovakia, the occurrence of parasites of the class Nematoda in these hosts has been only recorded by MACKO (1961) and ŠKARDA (1964). Some data on the occurrence of nematodes in these hosts in Europe can be found in comprehensive works by BEZUBIK (1956), SHIGIN (1957), JOGIS (1962) and HARTWICH (1964).

In this communication, the to date records on nematodes, parasitic in the mentioned host order, have been evaluated comprehensively on the grounds of our own observations and of information from the literature. We have added to the list of helminths of these hosts three more species new to Czechoslovakia and have also revealed some important new information on their zoogeography. Thematically, this communication is closely connected with the paper by BARUŠ (1966).

MATERIAL

In the years 1955—1965, we examined in post mortem during a helminthological survey a total of 145 birds of the order Colymbiformes, belonging to three animal species. Parasitic worms of the

class Trematoda were recovered from 24 birds, Cestoidea from 133 and Nematoda from 32 birds. A detailed survey of the extensity of invasion in the individual hosts is given in Tab. 1.

Table 1. Survey of the number of examined hosts and their worm load in the individual classes

Host	Nr. of examin.	Total of positive	Trematoda		Cestoidea		Nematoda	
			Nr. of positive	% of invasion	Nr. of positive	% of invasion	Nr. of positive	% of invasion
Podiceps cristatus L.	22	20	9	40.9	20	90.9	5	22.7
P. nigricollis (Brehm, 1831)	107	107	10	9.3	106	99.0	24	22.4
P. ruficollis (Pallas, 1764)	14	11	5	35.7	7	50.0	3	21.4

SYSTEMATIC SURVEY

Fam. Stomachidae (Johnston et Mawson, 1945) Hartwich, 1957

GENUS: *CONTRACAECUM* RAILLIET ET HENRY, 1912

1. *Contracaecum ovale* (Linstow, 1907) Fig. 1

Synonyma: *Ascaris ovalis* Linstow, 1907; *Contracaecum ovale* (Linstow, 1907) Baylis, 1920; *C. nehli* Karokhin, 1949; *C. spasskii* Mozgovoj, 1950; *C. ruficolle* Vuylsteke, 1953.
Hosts: *Podiceps cristatus* L., *P. nigricollis* (Brehm, 1831).
Localisation: small intestine.
Localities: České Budějovice, Čejkovice u Č. Budějovic, Třeboň, Lomnice nad Lužnicí, Lužnice, Hluboká nad Vltavou, Jindřichův Hradec, Vlašim, Doksy (Bohemia), Lednice (Moravia). This species was first recorded in Czechoslovakia by MACKO (1961) under the name *C. nehli* Karokhin, 1949 from the hosts *P. cristatus* L., *P. griseigena* (Boddard, 1760) and *P. ruficollis* (Pallas, 1764).
Extensity and intensity of invasion: Of a total of 22 specimens of *P. cristatus* examined, this species was found in two birds, i.e. 9 %, intensity of invasion 2 and 3 nematodes; of the 109 *P. nigricollis* examined 21 were positive, i.e. 19.3 % (intensity of invasion 1—12 nematodes in one host). MACKO (1961) reported a higher extensity and intensity of invasion; in *P. cristatus* 31.4 %, in *P. nigricollis* 31.2 % (intensity of invasion 1—45 nematodes in one host).

The geographical distribution of this species is cosmopolitan and, according to to date knowledge, the species is host-specific to birds of the family Podicipidae, HARTWICH (1964) published a surveying list of all known findings, which should be completed by the observations by SHIGIN (1957), JOGIS (1962) and ZHATKANBAEVA (1964), who recorded the findings of the nematode *C. ovale* under the name of the synonyma *C. nehli* or *C. spasskii*. MACKO (1961) first started to solve these synonymics by placing *C. spasskii* in synonymy with *C. nehli*. Later HARTWICH (1964) proved on

hand of studies of the type material that both mentioned forms (*C. spasskii* and *C. nehli*) and also *C. ruficolle* Vuylsteke, 1953 are in synonymy with the species *C. ovale*. MAWSON (1956) redescribed briefly the species *C. podicipitis* Johnston et Mawson, 1949, found in the host *Podilymbus podiceps podiceps* in Canada.

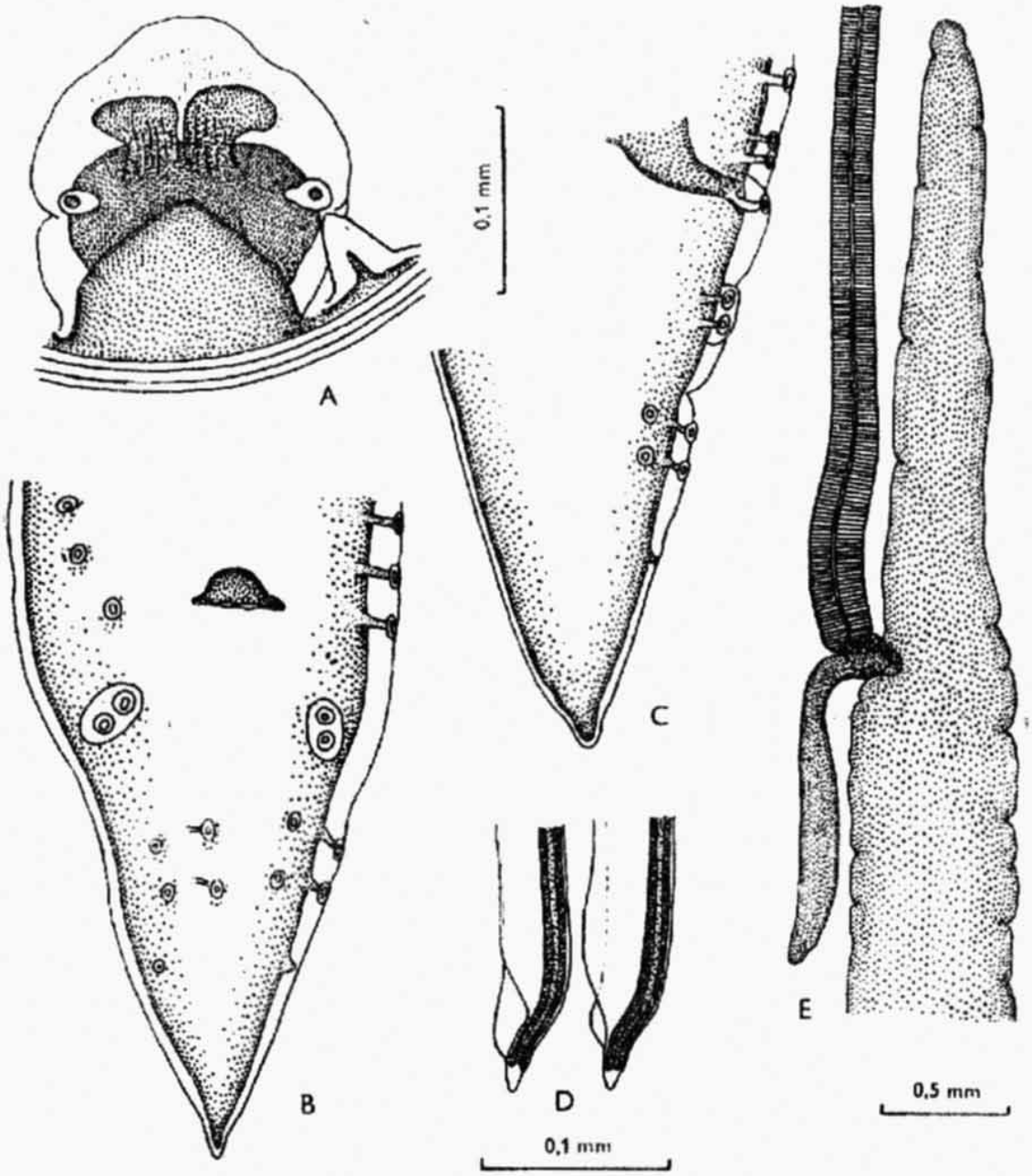

Fig. 1. *Contracaecum ovale* (Linstow, 1907) from the small intestine of *Podiceps cristatus*. A – dorsal lip; B – posterior end of male (ventral view); C – posterior end of male (lateral view); *D* – distal spicule end; E – termination of oesophagus (Orig.)

Originally, this form was described from *Podiceps cristatus* in Australia. A comparison of the morphology and measurements of this species together with to date information on the morphological and metrical variability of *C. ovale* (see MACKO 1961) reveal their remarkable similarity. This fact leads to the assumption that even *C. podicipitis* may be in synonymy with the species *C. ovale*.

According to recent information, the species *C. rudolphii* Hartwich, 1964 (= syn.

C. spiculigerum) and *C. praestriatum* Mönning, 1923 were also found in hosts of the family Podicipidae. The surveying list of findings of these species by HARTWICH (1964) should be completed by the observations by SERKOVA (1948) and ZHATKANBAEVA (1964).

Fam. Acuariidae Seurat, 1913

GENUS: *SYNCUARIA* GILBERT, 1927

2. *Syncuaria (Decorataria) decorata* (Cram, 1927) Fig. 2

Syn: *Echinuria decorata* Cram, 1927; *Acuaria* (*Syncuaria*) *ciconiae* Solonicin, 1828 nec Gilbert, 1927.
Hosts: *Podiceps cristatus* L., *P. nigricollis* (Brehm, 1831) and *P. ruficollis* (Pallas, 1764).
Localisation: glandular stomach and under the cuticle of the muscular stomach.
Locality: Doksy, Vlašim (Bohemia), Lednice (Moravia).
Extensity and intensity of invasion: Of the total of 22 *P. cristatus* examined 4 were positive, i.e. 18 % (intensity of invasion 1—9 nematodes); of the 109 *P. nigricollis* examined one was positive, i.e. 0.9 % (3 nematodes); of the total of 14 P. ruficollis examined one was positive i. e. 7.1 % (one nematode).

Description: Nematodes of medium size, white to yellowish in colour, the cuticle with distinct transverse striation. The buccal cavity bears one triangular lateral lip at each side, at its base is a well developed pair of attached papillae. The pharynx is present, the oesophagus consists of a muscular and a glandular part. The anterior portion of the body is covered from the lateral side with two stripes of very wide cuticular cordons with a transverse striation with dentate inner- and outer borders. The cuticular cordons join at the end of their course in a blunt tip. A pair of spine-shaped cervical papillae is placed close below the point where the cervical cuticular cordons are joining.
Male: Body 13.07—16.37 mm long, maximum width 0.320—0.409 mm. Pharynx 0.350—0.395 mm long. Length of anterior muscular part of oesophagus 0.418—0.810 mm, maximal width 0.053—0.078 mm. Length of posterior glandular part of oesophagus 3.56—4.62 mm, maximum width 0.120—0.146 mm. The cuticular cordons extend to a distance of 1.85—2.40 mm from the anterior end. The distance of the cervical papillae from the end of the cuticular cordons is 0.005—0.007 mm. The posterior end is coiled in a spiral of two to three windings and covered with wide caudal wings, which are supported by 9 or 10 pairs of pedunculate caudal papillae (three precloacal pairs of papillae, 6 to 7 postcloacal pairs). Two spicules of unequal length and shape are present. The longer spicule measures 0.428—0.546 mm, the width of its proximal part is 0.035—0.042 mm. The shorter spicule measures 0.214 to 0.235 mm, its proximal part is 0.031—0.035 mm wide. The distal ends of the spicules are rounded. The gubernaculum is missing.
Female: Length of body 15.10—19.58 mm, maximum width 0.356 to 0.489 mm. Length of pharynx 0.358—0.546 mm. Length of anterior muscular part of oesophagus

0.729—0.890 mm, maximum width 0.081 to 0.094 mm. Length of posterior glandular part of oesophagus 3.56—4.45 mm, maximum width 0.142—0.160 mm. The cuticular cordons extend to a distance of 2.51—3.32 mm from the anterior end of the body, their maximum width is 0.117—0.175 mm. The cervical papillae are situated at a distance of 0.004—0.007 mm from the ending of the cuticular cordons. The anus is placed at a distance of 0.284—0.320 mm from the posterior part of the body. The vulva with its prominently elevated rounded borders is situated at a distance of 0.434—0.569 mm from the end of the body. The elliptic eggs with their relatively thick shell contain a coiled larva. The size of the eggs is 0.030—0.034 mm by 0.019 to 0.023 mm.

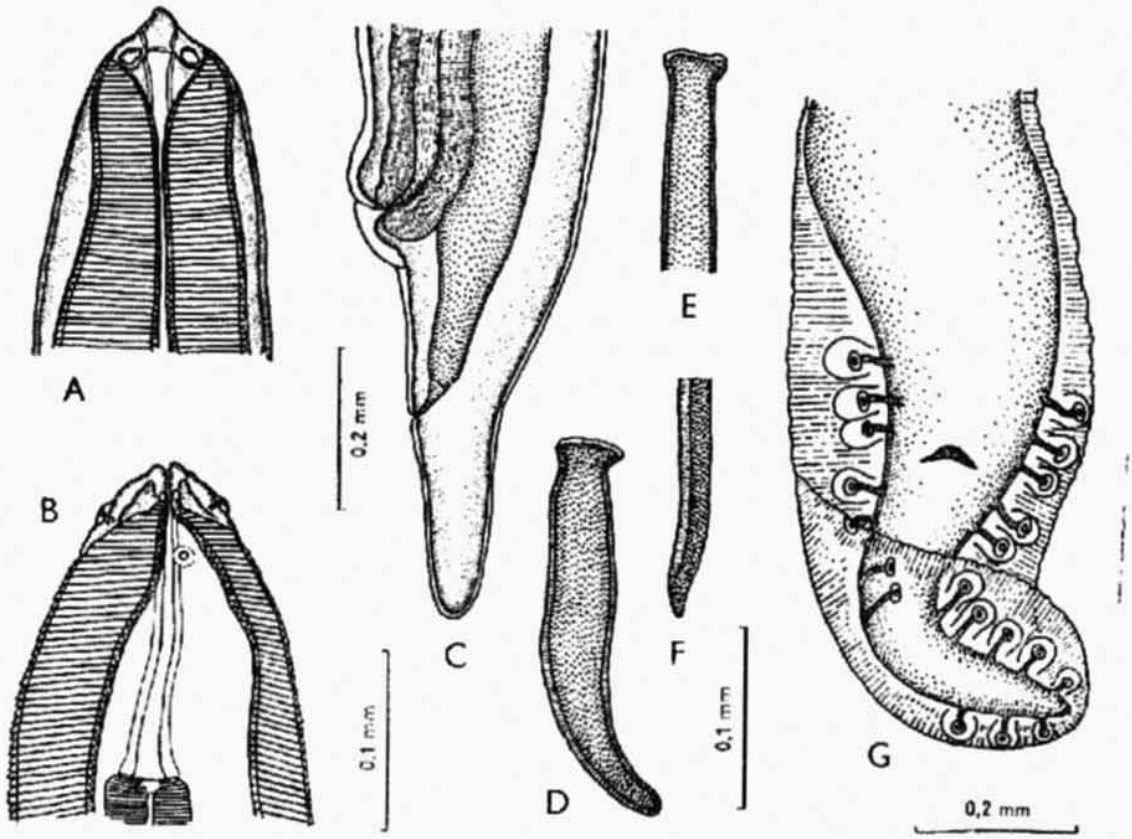

Fig. 2. *Syncuaria (Decorataria) decorata* (Cram, 1927) from the stomach of *Podiceps cristatus*. A — anterior end (lateral view); B — anterior end (dorsal view); C — posterior end of female (lateral view); D — short spicule; E — proximal end of long spicule; F — distal end of long spicule; G — posterior end of male (ventral view). (Orig.)

The geographical distribution of this species comprises the regions of North America, Europe and Asia (the Asiatic part of the USSR). These worms are host-specific to birds of the family Podicipidae. In addition to these hosts, this species was also found in *Podiceps auritus* (see survey by YAMAGUTI 1961), supplemented by SOLONICIN 1928, SHIGIN 1957, SERKOVA 1948, GUSHANSKAYA 1950, KURASHVILI 1957, PANIN 1960, JOGIS 1962 and ZHATKANBAEVA 1964. In Czechoslovakia, ŠKARDA (1964) found 20 specimens of this nematode in *P. cristatus*, designating them *Syncuaria sp.* However, his descriptions are very scanty and incomplete.

In spite of the fact that the sizes recorded by ŠKARDA are beyond the range of the extremely wide variability of the species *S. decorata*, the microphotographs in his paper indicate that his species belongs to *S. decorata*.

Fam. Tropisuridae Yamaguti, 1961

GENUS: *TROPISURUS* DIESING, 1851

3. *Tropisurus (Tropisurus) gubanovi* (Shigin, 1957) Fig. 3

Synonyma: *Tetrameres gubanovi* Shigin, 1957; *Tetrameres (Tetrameres) gubanovi* (Shigin, 1957)
Host: *Podiceps ruficollis* (Pallas, 1764) — a new host
Localisation: glandular stomach
Locality: Lnáře (Bohemia)
Extensity and intensity of invasion: Of a total of 14 specimens of *P. ruficollis* examined this species was found in 2 of them, i.e. 14.2 % (intensity of invasion 1 male and one female in one bird, 2 female nematodes of this species in the other).

Description of the male: Body opaque, cuticle with distinct transverse striation. The entire field of the cervical body part is covered with minute cuticular spines. The buccal cavity is bordered by three rudimentary lips with one small papilla on each of them. Close behind these papillae starts the elevated cuticular cordon extending along the entire length of the body and winding round the cervical papillae, which are placed at a distance of 0.156 mm from the anterior end of the body. The nerve ganglion is situated at a distance of 0.174 mm from the anterior end. Thick cuticular spines are protruding from the cuticular cordons at both sides of the body. The first spine lies at a distance of 0.264 mm from the anterior end, the following spines are placed at intervals of 0.042 mm. Towards the posterior end, the distance between the spines increases moderately. The last spine lies at a distance of 0.132 mm from the anal pore. The body is 5.20 mm long, its maximum width, attained at the level of the oesophagus ending, is 0.120 mm. The buccal cavity is 0.030 mm deep and 0.012 mm wide. Its shape is cylindrical, the walls are distinctly pseudochitinized. The muscular part of the oesophagus is 0.210 mm long, its maximum width is 0.024 mm, the glandular part of the oesophagus is 0.924 mm long, the maximum width is 0.030 mm. The anus is placed at a distance of 0.240 mm from the termination of the tail. Four pairs of postcloacal papillae are placed at the ventral side of the posterior end; concurrently with these papillae, only slightly more laterally, there are situated five pairs of cuticular spines. Two spicules of distinctly unequal length are present. The longer spicule measures 2.60 mm, its proximal end is 0.012 mm wide. The shorter spicule measures 0.216 mm, its proximal end is 0.006 mm wide. The distal end of both spicules is blunt. The gubernaculum is missing.

Description of the female: The shape of the body is typical for this genus. Length of body 3.0—3.5 mm, maximum width 2.5—3.0 mm. The anterior portion of the

body is 0.540—0.600 mm long, maximum width at the transition into the spherical body 0.264 mm. Depth of buccal cavity 0.024 mm, maximum width 0.012 mm. The lips surrounding the buccal cavity are indistinct. The anterior part of the body is covered with minute cuticular spines. The ovoid ova, operculated at both ends, contain a coiled larva. The size of the eggs is 0.054—0.060 mm by 0.018—0.030 mm. No other measurements could be determined without damaging the female worms.

This species was previously found and described only by SHIGIN (1957) from *P. cristatus* in the USSR (the Rybinsk water reservoir). Our measurements differ

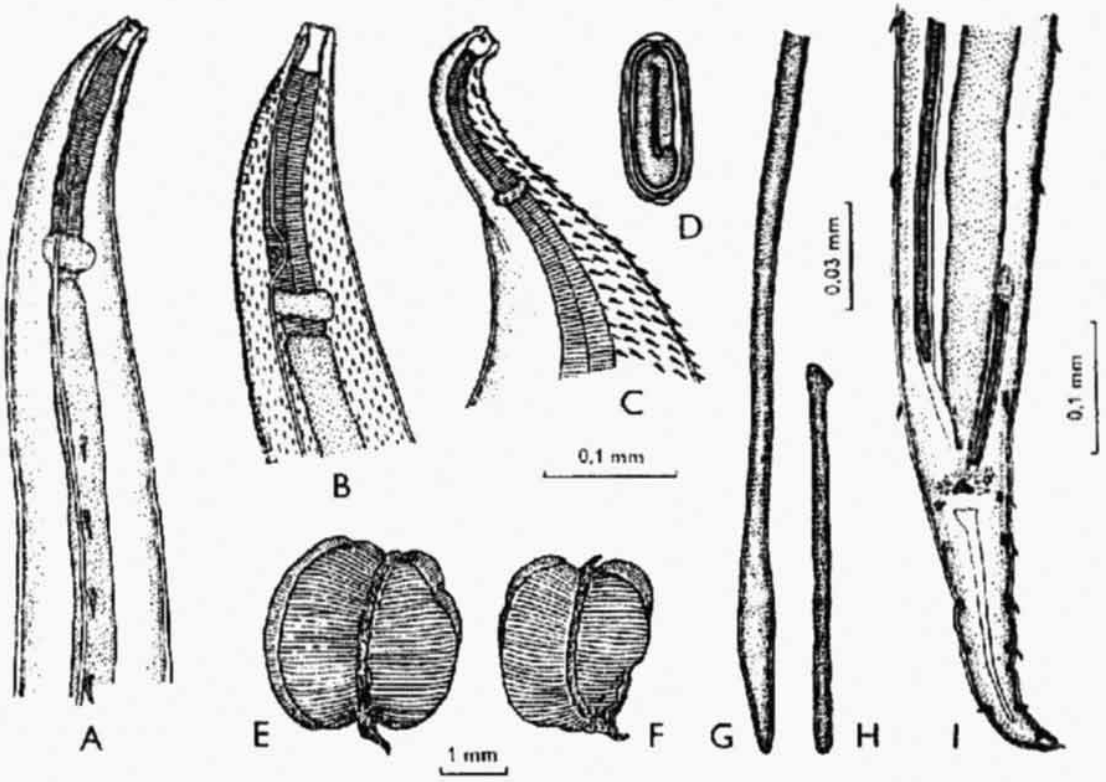

Fig. 3. *Tropisurus (Tropisurus) gubanovi* (Shigin, 1957) from the glandular stomach of *Podiceps ruficollis*. A, B — anterior end of male; C — anterior end of female; D — egg; E, F — shape of female's body (total view); G — distal end of long spicule; H — short spicule; O — posterior end of male's body (ventral view). (Orig.)

from the original description of the males in the length of the muscular oesophagus, in the length of the longer spicule, in the distance of the anus from the posterior end of the body. In addition, we observed two more pairs of postcloacal lateral spines. The comparison is given in Tab. 2.

Note: In Czechoslovakia ŠKARDA (1964) found in the host *Podiceps cristatus* another species, *Tropisurus* (*Petrowimeres*) *fissispina* (Diesing, 1861), but there is no description of these specimens.

Table 2. Most important measurements of the male nematode *Tropisurus (T.) gubanovi*

Author	Shigin (1957)	Our material
Host	*Podiceps cristatus*	*Podiceps ruficollis*
Body length	6.67	5.20
Max. body width	0.127	0.120
Depth of buccal capsule	0.029	0.030
Width of buccal capsule	0.013	0.012
Length of muscular oesophagus	0.313	0.210
Length of glandular oesophagus	0.980	0.924
Length of left spicule	3.996	2.60
Length of right spicule	0.131	0.126
Distance of the anus from posterior end	0.333	0.240
Number of ventral postcloacal papillae	4 pairs	4 pairs
Number of lateral postcloacal spines	3 pairs	5 pairs

Fam. Capillariidae Neveu-Lemaire, 1936

GENUS: *CAPILLARIA* ZEDER, 1800

1. *Capillaria podicipitis* Yamaguti, 1941 (?) Fig. 4

Hosts: *Podiceps nigricollis* (Brehm, 1831), *P. ruficollis* (Pallas, 1764)
Localisation: Vlašim, Lužnice (Bohemia), Lednice (Moravia)
Extensity and intensity of invasion: Of a total of 109 *P. nigricollis* examined, the nematode species was found only in three of them, i.e. 2.7 % (intensity of invasion 1—4 nematodes in one host; in total we obtained 3 male and 3 female worms). Of the 14 *P. ruficollis* examined only one was positive, i.e. 7.1 % (we found only one damaged female worm).

Description: Fine, thread-like worms of opaque colour, cuticle with fine transverse striation. Bacillary cordons were not observed. The number of stichocytes 36—44. **Male:** Body 18.43—22.95 mm long, the anterior portion 0.011 mm wide, width at the level of the oesophagus ending 0.057—0.060 mm. Entire length of oesophagus 10.9 mm, maximum width of its posterior portion 0.017 mm. The posterior end of the body is formed by a small pseudobursa supported from each side by one lateral papilla. Length of pseudobursa 0.011—0.023, maximum width in dorsoventral position 0.026—0.031 mm. The spicule is well pseudochitinized and straight, its proximal part is slightly widened, the distal part blunt. Length of spicule 2.22 to 2.28 mm, width of the proximal end between 0.023—0.026 mm, of the distal end

0.007—0.008 mm. The spicule sheath shows a distinct longitudinal and a fine transverse cuticular structure and is without spines. Its length is 2.02—2.80 mm, the width of the evaginated distal part is 0.017—0.019 mm. The cloaca opens subterminally on the ventral side at a distance of 0.019 mm from the posterior border of the pseudobursa.

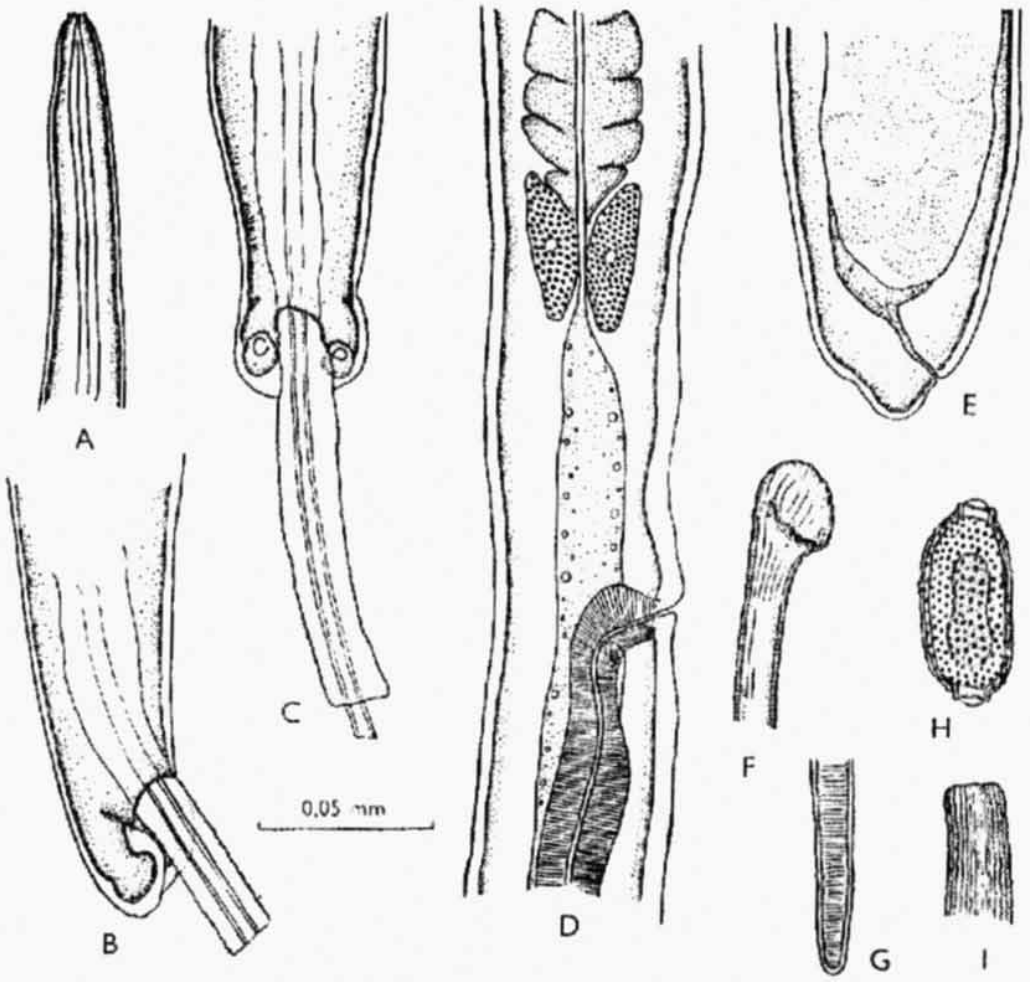

Fig. 4. *Capillaria podicipitis* Yamaguti, 1947 (?) from the small intestine of *Podiceps nigricollis*. A — anterior end; B — posterior end of male's body (lateral view); C — posterior end of male's body (ventral view); D — vulva region (lateral view); E — posterior end of female's body (lateral view); F — proximal end of spicule; G — distal end of spicule; H — egg; I — distal end of spicule sheath. (Orig.)

Female: Length of body 17.90—30.26 mm, width of the anterior portion 0.011 to 0.019 mm, width at the level of the oesophagus ending 0.049—0.053 mm, at the level of the anus 0.043—0.053 mm. Total length of oesophagus 7.60—10.68 mm, maximum width of its posterior portion 0.029—0.038 mm. Vulva opens at a distance of 0.152—0.167 mm from oesophagus ending. In shape, it resembles a transverse slit with rounded unelevated borders. Towards the end of the body it becomes moderately attenuated, ending in a blunt tip. The anus is situated subterminally at a distance of 0.015—0.019 mm from the posterior end. The eggs are of standard capillaroid shape with two plugs and a distinct structure on their surface. Their size is 0.046—0.053 by 0.022—0.029 mm.

The following species of Capillaria were recorded from hosts of the family Podicipidae: *C. pachydermata* (Linstow, 1877) Travassos, 1915 from the hosts *P.*

Table 3. Most important metrical and morphological signs of the male nematodes *C. obsignata, C. anseris and C. podicipitis*

Species	*Capillaria obsignata*		*Capillaria anseris*		*Capillaria podicipitis* (?)
Host	*Gallus gallus dom.*	*Cygnus atratus*	*Anser anser dom.*	*Anser anser dom.*	*Podiceps nigricollis*
Author	Wakelin (1963)	Wakelin (1963)	Gorshkov (1937) ex. Skrjabin et al. (1957)	Czaplinski (1962)	Our material
Body length	9.88 – 11.64	12.35 – 14.79	9.66 – 13.17	9.01 – 13.63	18.43 – 22.95
Spicule length	1.43 – 1.50	1.59 – 1.78	1.109 – 1.991	1.12 – 1.60	2.22 – 2.28
Width of proximal spicule portion	0.017 – 0.022	0.022 – 0.027	0.016 – 0.022	0.018 – 0.024	0.023 – 0.026
Medium width of spicule	0.0067 – 0.0078	0.0045 – 0.009	-	0.009 – 0.012	0.007 – 0.008
Shape of distal spicule termination	Blunt	Blunt	Blunt	Blunt	Blunt
Ratio of spicule length: body length	6.7 : 1 – 8.14 : 1	7.6 : 1 – 8.3 : 1	6.3 : 1 – 8.3 : 1	6.29 : 1 – 8.31 : 1	8.3 : 1 – 10.0 : 1
Structure of spicule sheath	No spines, transverse striation	No spines, transverse striation	No spines, transverse striation	No spines, transverse striation	No spines, longitudinal and transverse striation
Shape of pseudobursa	small bursa 2 lat. papillae	small bursa 2 lat. papillae	small bursa 2 lat. papillae	small bursa 2 lat. papillae	small bursa 2 lat. papillae

Table 4. Most important measurements of the female nematodes *C. obsignata*, *C. anseris* and *C. podicipitis* (?)

Species	*Capillaria obsignata*		*Capillaria anseris*		*Capillaria podicipitis*	
Author	WAKELIN (1963)	WAKELIN (1963)	GORSHKOV (1937)	CZAPLINSKI (1962)	YAMAGUTI (1941)	Our material
Body length	13.05 – 16.23	16.9 – 20.5	14.48 – 17.01	14.2 – 17.7	7.4 – 15.2	17.90 – 30.26
Body width	0.053 – 0.060	0.056 – 0.063	0.068 – 0.080	0.052 – 0.073	0.057 – 0.066	0.049 – 0.053
Distance of vulva from oesophagus end	–	–	0.090	0.035 – 0.112	0.06	0.152 – 0.167
Location of the anus	subterminal	subterminal	subterminal	subterminal	subterminal	subterminal
Size of eggs	0.044 – 0.056 × 0.022 – 0.029	0.042 – 0.051 × 0.022 – 0.027	0.048 – 0.055 × 0.026 – 0.035	0.042 – 0.050 × 0.022 – 0.031	0.042 – 0.051 × 0.018 – 0.024	0.046 – 0.053 × 0.022 – 0.029
Host	Gallus gallus dom.	Cygnus atratus	Anser anser dom.	Anser anser dom.	Podiceps ruficollis japonicus	Podiceps nigricollis P. ruficollis

auritus and *P. fluviatilis* in Germany. SKRJABIN, SHIKHOBALOVA and ORLOV (1957) listed this species to the genus *Eucoleus* Dujardin, 1845, because no spicules were mentioned in the original description and also, because the spicule sheath was armed with cuticular spines. Only female worms of the species *C. podicipitis* Yamaguti, 1941 were described from the host *P. ruficollis japonicus* in Japan. In addition, SHIGIN (1957) and ZHATKANBAEVA (1964) reported findings of the mentioned species from *P. cristatus* (females only) in the USSR, designating them *Capillaria sp.* JOGIS (1962) found species in the same host and named them *Thominx sp.* However, no descriptions were added to the material of these authors.

Our material of nematodes of the genus *Capillaria* differs greatly from the species *C. pachydermata* (Linstow, 1877) Travassos, 1915 in the presence of the spicule and of the spineless spicule sheath. In comparing our material with the species *C. podicipitis* Yamaguti, 1941 we met with certain difficulties because the original description was concerned only with morphological data and with the measurements of the female worms. We found differences in the length of the body, in the distance of the vulva from the oesophagus ending and in the length of the oesophagus. In comparing the morphology of the male worms in our material with the other species within the genus *Capillaria* we observed a close relationship, almost bordering on complete identity with the species *C. anseris* Madsen, 1945. WAKELIN (1953) considers this species in synonymy with *C. obsignata* Madsen, 1945, other writers, e.g. BUŠA (1961), HUAN-SHEN-I (1961), CZAPLINSKI (1962) and RYZHIKOV (1963) consider *C. anseris* a valid species in spite of the evident morphological and metrical agreement among *C. obsignata* and *C. anseris*. In comparing the sizes of the male worms in our material with the foregoing species we observed differences in the size of the body, in the length of the spicule and in the ratio of the spicule to the length of the body. All these measurements are much bigger in our specimens (see Tab. 3 and 4). Because of these observed differences, distinguishing our specimens from the species *C. anseris* and *C. obsignata*, our present stage of knowledge on the metrical variability of these species prevents us from identifying quite exactly our nematode material from the hosts *P. nigricollis* and *P. ruficollis* with these species. For these reasons we have designated them preliminarily as *C. podicipitis* Yamaguti, 1941 (?).

REFERENCES

BARUŠ V., Parasitic Nematodes of Birds in Czechoslovakia I. Hosts: *Columbiformes*, *Piciformes*, *Falconiformes* and *Strigiformes*. Folia parasitol. (Praha) 13: 7—27, 1966.

BARUŠ V., LELEK A., Příspěvek k poznání helmintofauny lysky černé (*Fulica atra* L.) a některých dalších vodních ptáků. Čs. parasitol. 8: 15—30, 1961.

BEZUBIK B., Materialy do helmintofauny ptáków wodnych Polski. Acta Parasitol. Polon. 4: 59—88, 1956.

BUŠA V., Prehľad helmintofauny husi domácej (*Anser anser dom.* L.) na Slovensku (ČSSR). Vet. čas. 10: 354—369, 1961.

CZAPLINSKI B., Nematodes and acanthocephalans of domestic and wild *Anseriformes* in Poland.

II. *Nematoda* (excl. *Amidostomum*) and *Acanthocephala*. Acta Parasitol. Polon. 10: 277—319, 1962.

GUSHANSKAYA L. KH., (Studies on *Spirurata* of water-and swamp birds of the USSR). Tr. gelm. lab. AN SSSR 4: 55—63, 1950. (In Russian.)

HARTWICH G., Revision der vogelparasitischen Nematoden Mitteleuropas. II. Die Gattung *Contracaecum* Railliet et Henry, 1912 (*Ascaroidea*). Mitteilungen aus dem Zoologischen Museum in Berlin 40: 15—53, 1964.

HUAN-SHEN-I, (To the helminthofauna of domestic birds of the Khabarovsk region.) Tr. gelm. lab. AN SSSR 11: 301—308. 1961. (In Russian.)

JOGIS V., Puhtu ümbruse vee-ja rannikulindude paelussidc, ümarussidc ja kidadärssete faunast. Eesti nsv teaduste Akadeemia juures asnva loodusunrijate selsti aastaraamat 55: 94—128, 1962.

KURASHVILI B. E. (Helminths of economically important game birds of Georgia from a faunistical and economic aspect.) Moscow, 1957. (In Russian.)

MACKO J. K., K helmintofaune potápkovitých vtákoch na východnom Slovensku. Čs. parasitol. 6: 127—158, 1959.

, Niektoré pozorovania o premenlivosti druhu *Contracaecum* (*Contracaecum*) *nehli* Karokhin, 1949. Biológia (Bratislava) 16: 740—747, 1961.

MADSEN H., The species of Capillaria (Nematodes *Trichinelloidea*) parasitic in the digestive tract of Danish gallinaceous and anatine game birds, with a revised list of species of *Capillaria* in birds. Dan. Rev. Game Biol. 1: 1—112, 1945.

MAWSON P. M., Ascaroid nematodes from Canadian birds. Can. J. Zool. 34: 35—47, 1956.

PANIN, V. YA, (To the helminthofauna of birds of the Zaysansk valley.) Tr. in-ta zool. Kazakh. AN SSSR 12: 166—172, 1960. (In Russian.)

RYŠAVÝ B., Další poznatky o helmintofauně ptáků v Československu. Čs. parasitol. 4: 299—329, 1957.

, Tasemnice vodního ptactva z rybniční oblasti jižních Čech. I. *Hymenolepididae* Fuhrmann, 1907. Čs. parasitol. 8: 235—363, 1961.

—, Tasemnice vodního ptactva z rybniční oblasti jižních Čech. II. *Diphyllobothriidae* Lühe 1910, *Dilepididae* Fuhrmann 1907, *Amabiliidae* Fuhrman 1908 a *Tetrabothriidae* Linton 1891. Čs. parasitol. 9: 365—374, 1962.

RYZHIKOV K. M., (Helminthofauna of wild and domestic birds of the Khabarovsk region.) Tr. gelm. lab. AN SSSR 13: 78—132, 1963. (In Russian.)

SERKOVA O. P., (Roundworms of birds of the Barabinsk lakes.) Parasitol. Sb. zool. in-ta AN SSSR 10: 209—244, 1948. (In Russian.)

SKRJABIN K. I., SHIKHOBALOVA N. P., ORLOV I. V., Osnovy nematodologii VI. Moscow 1957.

SOLONITSIN J. A., (To the helminthofauna of birds of the Volga-Kamsk region.) Uch. zapiski Kazansk. gos. vet. in-ta 38: 75—96, 1928. (In Russian.)

SOMMER A., Tasemnice vodního ptactva z okolí Velkého Meziříčí. Sb. VŠZ v Brně (řada B: spisy fakulty veterinární) 2: 1—13, 1954.

SHIGIN A. A., (Parasitic worms of herons and of divers the Rybinsk water-reservoir). Tr. Darvinskovo gos. zapovednika 4: 245—289, 1957. (In Russian.)

ŠKARDA J., Helmintofauna některých volně žijících ptáků v ČSSR. Sb. VŠZ v Brně (řada B: spisy fakulty veterinární), 12: 269—293, 1964.

VOJTĚCHOVSKÁ—MAYEROVÁ M., Nové nálezy parasitických červů u našich ptáků. Věst. čs. spol. zool. 16: 71—88, 1952.

WAKELIN D., *Capillaria obsignata* Madsen 1945 (*Nematoda*) from the Black Swan. Helminthol., 37: 381—386, 1963.

YAMAGUTI S., Studies on the helminth fauna of Japan. Part. 36. Avian nematodes, II. Jap. J. Zool. 9: 441—480, 1941.

—, Systema helminthum III. Part 1. New York—London, 1961.

ZHATKANBAEVA D., (The helminthofauna of fish-eating birds of Kazakhstan.) Tr. in-ta zool. AN Kazach. SSR, 22: 110—125, 1964. (In Russian.)

V. B., Parasitologický ústav ČSAV, Flemingovo n. 2. Praha 6, ČSSR.

MIROSLAV FENDRYCH: BIBLIOGRAPHY OF CZECHOSLOVAK PARASITOLOGICAL LITERATURE UNTIL THE END OF 1961

Publishing House of the Czechoslovak Academy of Sciences, Prague, 1966, 252 pp.

The Czechoslovak publications covering the parasitological field are dispersed in many scientific and other technical journals, both local and foreign, which deal with zoology, general biology, human and veterinary medicine. With the great development of this scientific field a necessity has arisen to accumulate the data on parasitological publications and present a survey of the results achieved in this country. On the initiative of the Czechoslovak Parasitological Society affiliated to the Czechoslovak Academy of Sciences this task has been taken up by Miroslav Fendrych, the author of several text books on general biology, whose deep expert knowledge has been a guarantee for a responsible selection of the cited papers.

He excerpted 600 scientific, technical and popular journals and other publications, of which two thirds were of local and one third of foreign origin. In this way he obtained 5500 bibliographical data representing a review of Czechoslovak papers which cover the field of parasitology and the related fields, primarily the papers dealing with natural focality of diseases, dating from the very beginnings of Czechoslovak science until the end of 1961.

This review contains references on: 1) all original papers written by Czechoslovak specialists and published in scientific and technical journals both of local and foreign origin; 2) scientific papers concerning Czechoslovak parasitology written by foreign scientists and published in Czechoslovak scientific journals; 3) other important articles written by Czechoslovak authors such as reports on congresses and conferences, scientific discussions and arguments, papers concerning the organisation of research work etc.; 4) popular articles, primarily those dating from the last century, which are important because of their contents or of cultural and historical interest; 5) books containing articles on animal parasites. Not included are references concerning articles on insects parasitizing other free-living insects (these papers will be listed in the entomological bibliography now in preparation) and articles on plant parasites.

The volume also contains a list of publications excerpted, a list of abbreviations and there are both the author and subject indexes. The latter is especially useful (14 pages printed in petit type) because it includes names of parasites, hosts, diseases caused by parasites and most important parasitological terms in Latin, Czech and Slovak languages. This index will prove helpful to foreign research workers who will use the bibliography as a source of reference.

Dr. Milan Daniel, CSc.