

# Parasitic Nematodes of Birds in Czechoslovakia

## I. Hosts: *Columbiformes*, *Piciformes*, *Falconiformes* and *Strigiformes*

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**Abstract.** The paper analyses the species composition of the nematodes parasitizing 4 orders of birds (*Columbiformes*, *Piciformes*, *Falconiformes* and *Strigiformes*) in Czechoslovakia. In hosts of the order *Columbiformes* 5 species of nematodes were found: *Ascaridia columbae*, *Heterakis gallinarum*, *Amidostomum anseris*, *Capillaria obsignata* and *Physaloptera* sp. In hosts of the order *Piciformes* we found only 1 species of nematodes *Capillaria picorum*. Most nematode species (9) were found in hosts of the order *Falconiformes*: *Porrocaecum angusticolle*, *P. depressum*, *Synhimantus robertdolfjusi*, *Cyrnea (Procyrnea) leptoptera*, *C. (P.) spinosa*, *Microtetrameres* sp., *M. cloacitectus*, *Capillaria falconis* and *Thominx dispar*. In *Strigiformes* only 3 nematode species were found: *C. falconis*, *Capillaria* sp. and *Thominx tenuissima*. 8 of the nematode species are new to Czechoslovakia, one of them, *Microtetrameres cloacitectus*, is new to Europe.

In Czechoslovakia some surveys have been carried out on the incidence of nematodes parasitizing birds of the orders *Columbiformes*, *Piciformes*, *Falconiformes* and *Strigiformes* (VOJTĚCHOVSKÁ-MAYEROVÁ 1952, RYŠAVÝ 1957, ZAVADIL 1958, TENORA and LUSK 1960, BARUŠ 1964, 1966, and ŠKARDA 1964). In Europe systematical and faunistical works on this problem were published by DESPORTES (1948), ZHUKOV (1956), FURMAGA (1957), CHABAUD (1958), HARTWICH (1959) and ZABLOCKY (1962).

Our present work gives a comprehensive evaluation of the parasitic nematodes of birds of the four mentioned orders found in Czechoslovakia, based on our own findings and on information from the literature. Our observations are thus contributing to the knowledge of the helminthofauna of these groups of hosts in Czechoslovakia and also in Europe.

### MATERIAL

During 1955–1964 we examined in autopsy 341 birds of the order *Columbiformes* (nematodes were found in 24 of them), 74 birds of the order *Piciformes* (nematodes were found in 3), 61 birds of the order *Falconiformes* (nematodes were found in 18 of them) and 24 birds of the order *Strigiformes*

(nematodes were found in 16). A survey of the bird species and the numbers examined is given in Tab. 1. The nematodes were determined throughout the investigation. The specimens were deposited in the helminthological collection of the Institute of Parasitology of the Czechoslovak Academy of Sciences in Prague.

Table 1

Hosts	Number of examined birds	Number of positive birds	Hosts	Number of examined birds	Number of positive birds
<b>I. Columbiformes</b>			<b>III. Falconiformes</b>		
1. <i>Columba palumbus</i> L.	5	—	1. <i>Buteo buteo</i> L.	27	9
2. <i>C. oenas</i> L.	4	—	2. <i>B. lagopus</i> (Pontop., 1763)	12	1
3. <i>C. livia f. dom.</i>	135	5	3. <i>Falco tinnunculus</i> L.	8	4
4. <i>Streptopelia turtur</i> L.	58	5	4. <i>F. subbuteo</i> L.	4	1
5. <i>S. decaocto</i> (Friv., 1838)	139	14	5. <i>Accipiter nisus</i> L.	6	1
<b>II. Piciformes</b>			6. <i>A. gentilis</i> L.	3	1
1. <i>Picus viridis</i> L.	8	1	7. <i>Circus cyaneus</i> L.	1	1
2. <i>P. canus</i> Gmelin, 1788	1	—	<b>IV. Strigiformes</b>		
3. <i>Dendrocopus major</i> L.	41	1	1. <i>Tyto alba</i> (Scop., 1769)	2	—
4. <i>D. medius</i> L.	8	—	2. <i>Strix aluco</i> L.	10	2
5. <i>D. minor</i> L.	4	—	3. <i>Athene noctua</i> (Scop., 1769)	4	2
6. <i>D. syriacus</i> (Memp. et Ehr., 1833)	2	—	4. <i>Bubo bubo</i> L.	1	—
7. <i>D. leucotos</i> (Bechts., 1803)	3	—	5. <i>Asio otus</i> L.	4	2
8. <i>Dryocopus martius</i> L.	3	1	6. <i>A. flammeus</i> (Pontop., 1763)	3	—
9. <i>Jynx torquilla</i> L.	4	—			

## RESULTS

### A. Nematodes from *Columbiformes*

Family: *Ascariidae* Skrjabin et Mosgovoy, 1953

#### 1. *Ascaridia columbae* (Gmelin, 1790) Travassos, 1913

Hosts: *Columba livia f. dom.*, *Streptopelia decaocto* (Friv., 1838), *S. turtur* L.

Localisation: small intestine.

Geographical distribution: cosmopolitan.

Localities in the ČSSR: Praha, Ondřejov (Bohemia), Tekovské Lužany (Slovakia).

Extensivity and intensity of invasion: Of the 135 domestic pigeons (*C. livia f. dom.*) examined 2 were positive, i.e. 1.4 % (intensity of invasion 1 and 4 nematodes); of the 58 turtle doves (*Streptopelia turtur*) 1 was positive, i.e. 1.7 % (intensity of invasion 2 nematodes) and of the 139 collared turtle doves (*Str. decaocto*) 2 were positive, i.e. 1.5 % (intensity of invasion 2 and 3 worms).

Family: *Heterakidae* Railliet et Henry, 1914

#### 2. *Heterakis gallinarum* (Schrank, 1788)

(Fig. 1A—E)

Syn.: *Ascaris gallinae* (Gmelin, 1790); *Ascaris vesicularis* Fröhlich, 1791 (ex parte); *Heterakis*

9 *vesicularis* (Fröhlich, 1791) Dujardin, 1845; *H. longicaudata* Linstow, 1879; *H. parisi* Blanc, 1913.  
 Host: *Streptopelia decaocto* (Fris., 1838) — a new host.  
 In Czechoslovakia the incidence of this species is most common in wild and domestic birds of the order Galliformes — VOJTĚCHOVSKÁ—MAYEROVÁ (1952), DVOŘÁK (1956), BIBOVÁ—VOLOSINOVIČOVÁ (1957, 1960a, b, c), RYŠAVÝ (1957), ŠTEFFLOVÁ LEISKÁ (1957), ŠVARCOVÁ—CZÁJI (1957), PÁV, ZAJÍČEK, KOTRLÝ (1961).  
 Localisation: caecum.  
 Geographical distribution: cosmopolitan.  
 Locality in the ČSSR: Bohdaneč (Bohemia).  
 Extensity and intensity of invasion: Of the 139 collared turtle doves (*Str. decaocto*) examined 1 was positive, i.e. 0.7% (intensity of invasion one male and two female worms).

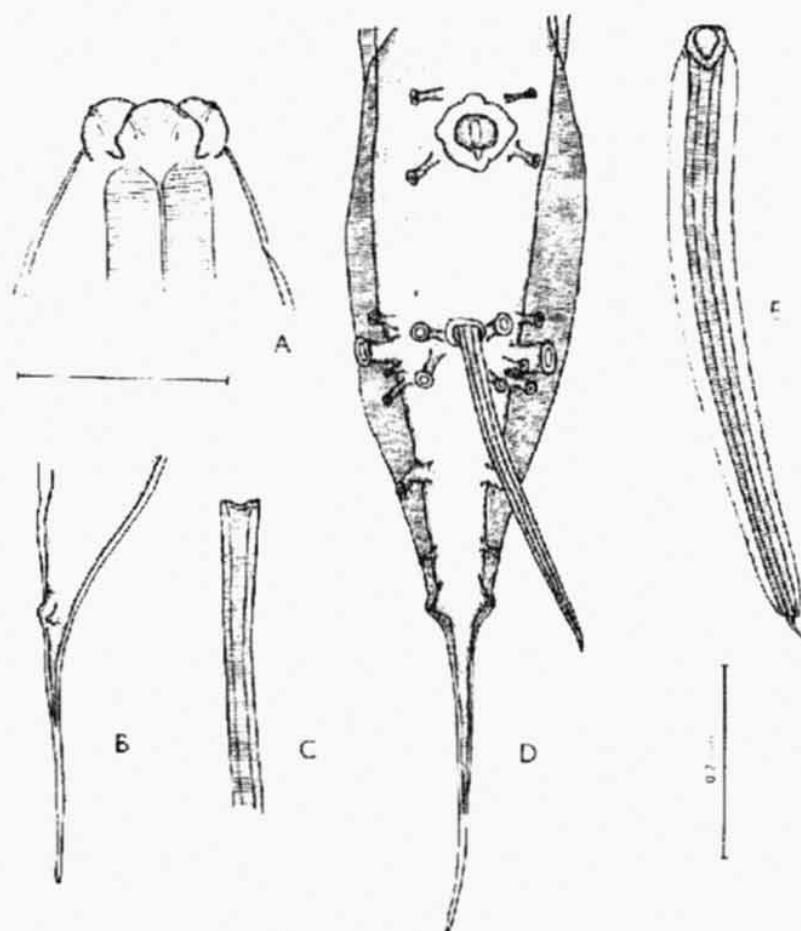


Fig. 1. *Heterakis gallinarum* (Schrank, 1788) from the caecum of *Streptopelia decaocto*. A — anterior body end, B — posterior body end of female (lateral view), C — proximal part of the long spicule, D — posterior body end of male (ventral view), E — short spicule. (Orig.)

**Description:** A small nematode of yellowish colour. Cuticle transversely striated. Mouth opening surrounded by 1 dorsal and 2 lateroventral lips. On each lip one pair of papillae. The pharynx leads into the oesophagus, which has an expressive bulbous at its posterior end.

**Male:** body 10.74—15.70 mm, greatest width 0.375—0.358 mm. Width of anterior end 0.071—0.083 mm. Pharynx 0.046—0.071 mm long, 0.035—0.042 mm wide. Oesophagus 0.760—1.070 mm long, its bulbous 0.161—0.190 mm wide. Distance of the nervous ganglion from the anterior end of body 0.304—0.311 mm. The posterior end tapers into cone shape and terminates in a thin tail. A cuticular border runs along the lateral sides of the posterior end. Two spicules present. The longer spicule measures 1.510—1.578 mm, width of proximal portion 0.039 to

0.043 mm. The shorter spicule measures 0.640—0.697 mm, width of proximal portion 0.046—0.052 mm. The distal portion terminates in a 0.011 mm long thorn. Cuticular borders run along both sides of the shorter spicule. No border has been noticed on the longer spicule. Distance of anus from the tip of the tail 0.490 to 0.590 mm. There are present the 12 pairs of tail papillae (2 preanal — 6 adanal — and 4 postanal pairs).

**Female:** Body 12.54 long, greatest width 0.447 mm. Anterior portion 0.089 mm wide. Oesophagus 1.074 mm long, its bulb is 0.189 mm wide. Pharynx 0.057 mm long, 0.038 mm wide. Distance of the nervous ganglion from anterior end of body 0.358 mm. Distance of anus from tip of tail 1.342 mm. Vulva approximately in the middle of the body 5.370 mm from the anterior end. Oval-shaped ova, thickness of shell 0.004 to 0.005 mm, size 0.061—0.068 mm by 0.039—0.046 mm.

The nematodes *H. gallinarum* are principally found in hosts of the order *Galliformes*, seldom in *Anseriformes* (viz. RYZHIKOV, TIMOFFEYVA 1961, CZAPLINSKI 1962, RYZHIKOV 1962/63, 1963). Their occurrence in hosts of the order *Columbiformes* (*Streptopelia decaocto*) is influenced by their close contact with fowl on the runs of fowl breeding farms where about 100 % of the chickens were infected with *H. gallinarum*. Keymer et al. (1962) reported the occurrence of *H. gallinarum* in hosts of the order *Passeriformes* (*Sturnus vulgaris*) in Great Britain; PAVLOV, SERGEYEVVA (1961) observed this nematode in *Ralliformes* (*Gallinula chloropus*) in the USSR.

RYŠAVÝ, MICHÁLEK, FIEDLER (1955) and RYŠAVÝ, MICHÁLEK (1957) also explain the passage of *Amidostomum anseris* from hosts of the order *Anseriformes* to hosts of the order *Columbiformes* (*Str. decaocto*) as a consequence of the effect of alimentary and spatial factors.

Family: *Amidostomatidae* Baylis et Daubney, 1926

### 3. *Amidostomum anseris* (Zeder, 1800) Railliet et Henry, 1909

Syn.: *Ascaris mucronata* Fröhlich, 1791 nec Schrank, 1780; *Strongylus anseris* Zeder, 1800 (ex parte); *S. nodulosus* Rudolphi, 1803; *S. nodularis* Rud., 1809; *Sclerostomum mucronatum* Stossich, 1899; *Strongylus orispinus* Molin, 1861; *S. mucronatus* Railliet, 1893; *Sclerostomum anseris* Neumann, 1908; *Trichostrongylus nodularis* (Rud., 1803) Shipley, 1909; *Amidostomum nodulosum* (Rud., 1803) Seurat, 1918; *Spiroptera uncinata* Eberth, 1863; *Amidostomum leucopareiae* Solonizin, 1928.

Host: *Streptopelia decaocto* (Friv., 1838).

This nematode is a common and very pathogenic parasite of domestic ducks and geese in Czechoslovakia (ŠTEFFLOVÁ—LEISKÁ 1957, BUŠA 1957, 1961, 1962, ZAJÍČEK 1960 a.o.).

Location: under the hard mucous tissue of the muscular stomach.

Geographical distribution: cosmopolitan.

Locality in Czechoslovakia: Libuš near Prague (Bohemia).

Extensivity and intensity of invasion: of the 139 collared turtle doves (*Str. decaocto*) examined 3 were positive, i.e. 2.1 % (extensivity of invasion 1—2 worms).

These findings together with a morphological analysis of these nematodes from *Str. decaocto* and the results from experimental invasions were published by RYŠAVÝ, MICHÁLEK, FIEDLER (1955), RYŠAVÝ, MICHÁLEK (1957) and RYŠAVÝ (1957).

11 Family: *Capillariidae* Neveu-Lemaire, 1913

4. *Capillaria obsignata* Madsen 1945

(Fig. 2A—K, 3)

Syn.: *Trichosomum tenuissimum* Diesing, 1851 sensu Eberth, 1863; nec *Calodium tenue* Dujardin 1845; nec *Trichosomum (Calodium) tenuissimum* Diesing, 1851; *Trichosoma columbae* Rudolphi,

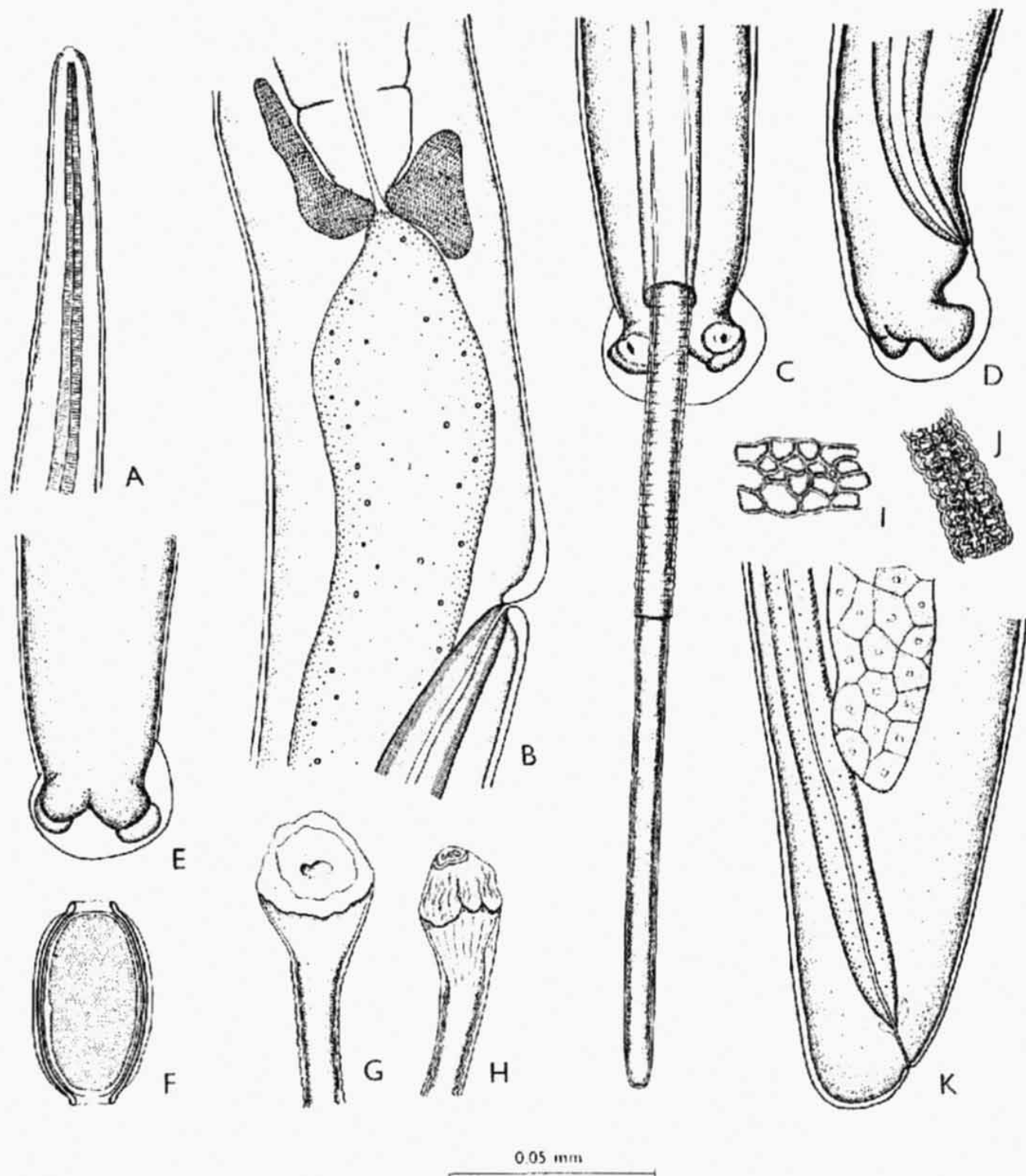


Fig. 2. *Capillaria obsignata* Madsen, 1945 from the small intestine of *Streptopelia decaocto*. A — anterior body end, B — vulva region (lateral view), C — pseudobursa (ventral view), D — pseudobursa (lateral view), E — pseudobursa (dorsal view), F — egg, G — proximal spicule end (ventral view), H — proximal spicule end (lateral view), I — part of the bacillary cordon, J — distal part of spicule sheath, K — posterior body end of female (lateral view). (Orig.)

1819 sensu Stossich, 1895 p.p.; *Capillaria dujardini* Travassos, 1915 sensu Madsen, 1945; *Capillaria columbae* (Rud., 1819) Grayhill, 1924. 12

Hosts: *Columba livia f. dom.*, *Streptopelia turtur* L. a *Str. decacto* (Friv., 1838). Ryšavý (1957) reported this species from *Str. turtur* and Zavadil (1958) from *C. livia f. dom.* Bírová Volosino-vičová (1960a, b, c) found this species frequently in turkeys (*Meleagris gallopavo f. dom.*) and hens (*Gallus gallus f. dom.*).

Location: small intestine, seldom large intestine.

Geographical distribution: cosmopolitan.

Localities: Praha, Klánovice, Horoměřice, Zeleneč near Praha (Bohemia), Tovačov (Moravia) Tekovské Lužany (Slovakia).

Extensivity and intensity of invasion: of the 135 domestic pigeons (*C. livia f. dom.*) examined 2 were positive, i.e. 1.4% (intensity of invasion 3 and 9 nematodes); of the 58 turtle doves (*Streptopelia turtur*) 1 was positive, i.e. 1.7% (16 nematodes) and of the 139 collared turtle doves (*Str. decacto*) 7 were positive, i.e. 5% (intensity of invasion 1–7 worms).

**Description:** Thread-like worms of whitish colour, cuticle slightly transversely striated. Two prominent lateral bacillar stripes on the entire length of the body. Anterior portion protruding in its middle part. Mouth opening terminal on this small obtuse protrusion.

**Male:** Body 6.50–11.64 mm, greatest width 0.053–0.062 mm. Anterior portion 0.009 mm wide. Width at oesophagus level 0.038–0.042 mm. Oesophagus 4.117 to 7.212 mm long, its anterior glandular part 0.328–0.378 mm. Greatest width of

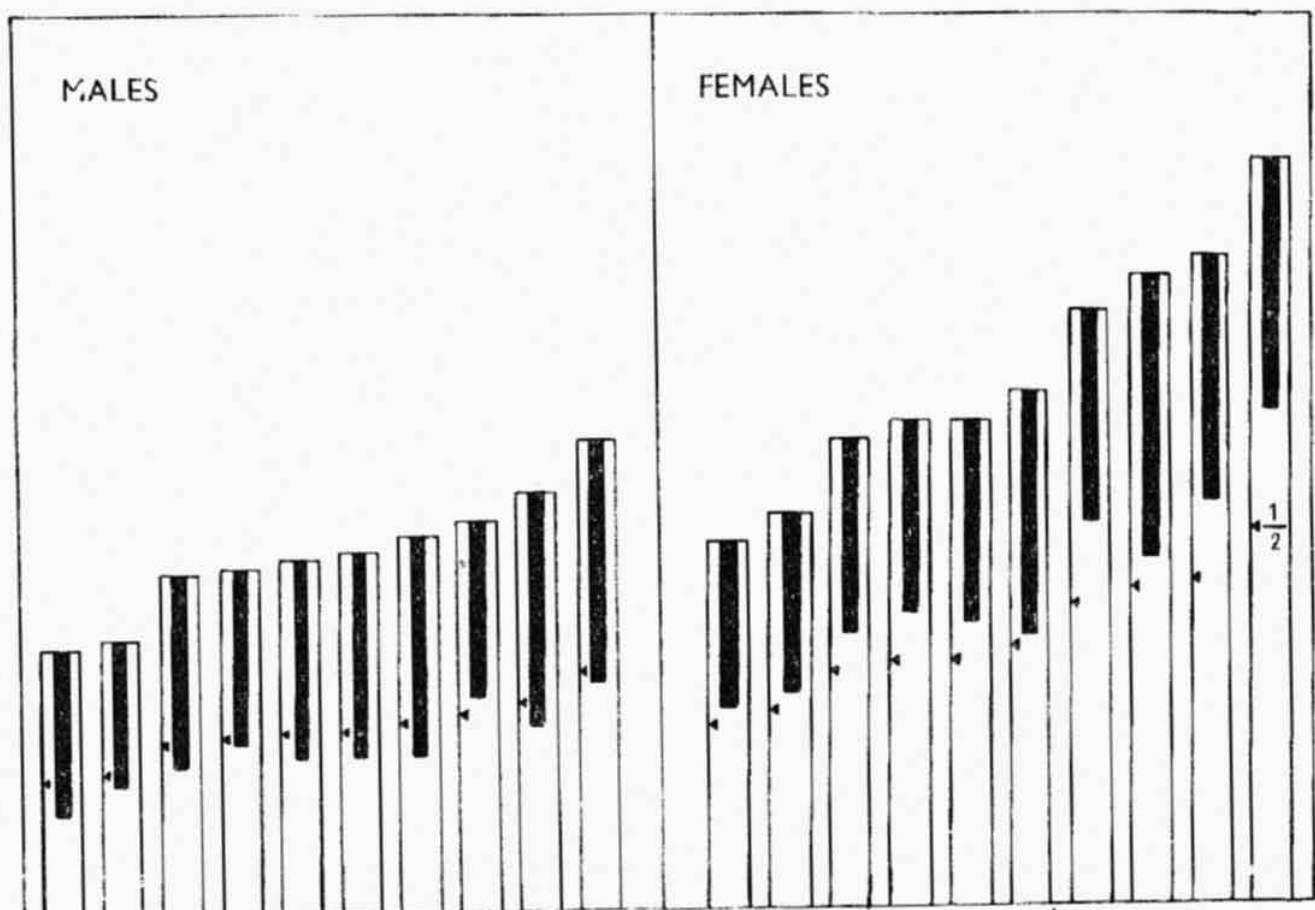


Fig. 3. Diagram of the relation between the length of the oesophagus and the body length in *Capillaria obsignata* Madsen, 1945. (Orig.)

13 oesophagus 0.027—0.035 mm. 37—47 stichocytes. Nervous ganglion 0.111 to 0.132 mm from anterior end of body. A rounded membrane supported by two dorsolateral papillae forms a pseudobursa on the posterior end. Pseudobursa 0.022—0.027 mm high, 0.033—0.038 mm wide. Spicule 1.186—1.529 mm long, in its proximal part slightly extended, 0.019 mm wide. Distal portion rounded, width 0.005—0.008 mm. Spicule sheath 1.604—2.450 mm long, with prominent vertical waves on its surface. Relation of anterior portion of oesophagus to posterior part of body 1 : 0.63—1 : 1.18.

**Female:** Body 9.13—18.64 mm long, greatest width 0.062—0.079 mm. Anterior part 0.009—0.011 mm wide. Width of body at oesophagus level 0.046—0.057 mm. Oesophagus 4.117—7.212 mm long, its anterior glandular portion measures 0.380 to 0.425 mm. Greatest width of oesophagus 0.035—0.050 mm. Nervous ganglion 0.114—0.144 mm from anterior end of body. 43—48 stichocytes. Vulva with slightly swollen borders 0.008—0.015 mm from posterior end of body. Ova 0.047 to 0.053 mm by 0.027—0.033 mm, thick shells, no prominent polar plugs. Relation of anterior portion of oesophagus to posterior part of body 1 : 1.21—1 : 2.0.

Family: *Physalopteridae* Leiper, 1908

5. *Physaloptera* sp.

(Fig. 4A, B)

Host: *Streptopelia decaocto* (Friv., 1838).

Localisation in the host: small intestine.

Localities in the ČSSR: Praha (Bohemia), Tekovské Lužany (Slovakia).

Two juvenile female of this nematode were found in 2 specimens of collared turtle doves (*S. decaocto*). Extensity of invasion 1.5 %. The nematode species could not be precisely determined. We listed it to the subgenus *Physaloptera* (Rud., 1819) Schulz, 1927 because of the determined two uterinal branches.

**Description:** Worms of yellowish colour, cuticle prominently transversely striated.

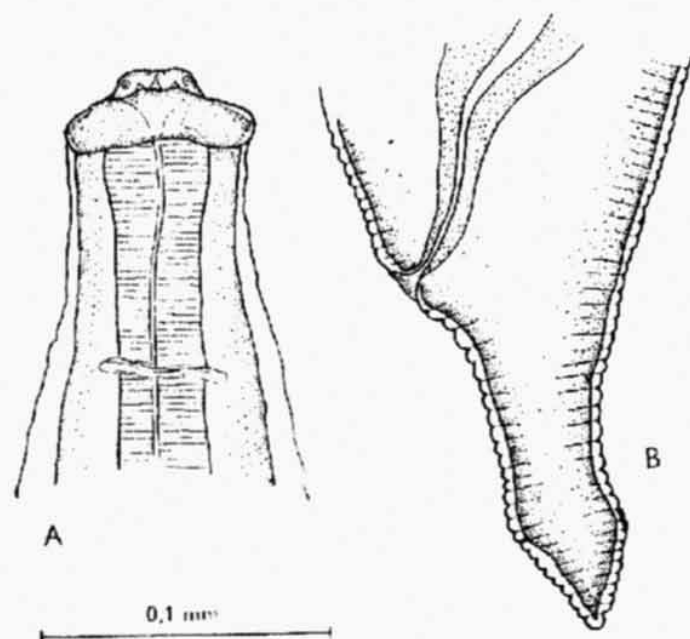


Fig. 4. *Physaloptera* sp. from the small intestine of *Streptopelia decaocto*. A — anterior body end, B — posterior body end of female (lateral view). (Orig.)

Mouth opening surrounded by two rounded lateral lips with teeth. On each lip one pair of laterally situated papillae. Mouth capsule short. Cervical papillae present.

Body 8.2—10.7 mm long, greatest width 0.268—0.322. Width of anterior part 0.042—0.057 mm. Length of oesophagus 1.52 to 1.79 mm, its anterior glandular part measures 0.360—0.520 mm. Vulva 3.41—4.62 mm from anterior end of body. Ova not developed.

Furthermore, the following species were found in *Columbiformes* of Czechoslovakia:

6. *Capillaria caudinflata* (Molin, 1858), recorded by ZAVADIL (1958) from *Columbia livia f. dom.*

7. *Pelecitus clava* (Wedl, 1856), recorded by VOJTĚCHOVSKÁ-MAYEROVÁ (1952) from *Columbia livia f. dom.*

## B. Nematodes from *Piciformes*

Family: *Capillariidae* Neveu-Lemaire, 1936

1. *Capillaria picorum* (Rudolphi, 1819) Travassos, 1915 (?) (Fig. 5A—E)

Syn.: *Trichosoma picorum* Rudolphi, 1819.

Hosts: *Picus viridis* L., *Dendrocopos major* L., *Dryocopus martius* L.

Localisation in the host: small intestine.

Geographical distribution: Europe.

Localities in Czechoslovakia: Veltrusy, Kutná Hora (Bohemia), Květná (Moravia).

Extensivity and intensity of invasion: of the 8 green woodpeckers (*P. viridis*) examined 1 was positive, i.e. 12.5 % (intensity of invasion 6 female worms); of the 41 great spotted woodpeckers (*D. major*) examined 1 was positive, i.e. 2.4 % (intensity 1 female nematode) and of the 3 black woodpeckers (*D. martius*) examined 1 was positive (intensity of invasion 8 female worms).

**Description:** The thread-like body of the female is of whitish colour. Cuticle fine transversely striated. Two lateral bacillary lines run along the entire body. Length of body 23.27—30.43 mm, maximal width 0.089—0.136 mm. Width of anterior part of body 0.011 mm. Width of the body at the level of the oesophagus end 0.063—0.091 mm. Length of the muscular part of the oesophagus 0.380—0.572 mm. Entire length of oesophagus 8.77—8.95, maximum width 0.046—0.063 mm. Vulva slightly posterior to termination of oesophagus 0.057—0.061 mm from its posterior end, with campanuliform appendage, measuring 0.064—0.114 mm in length. The ova measure 0.049—0.053 by 0.024—0.027 mm. Anus subterminal at a distance of 0.015—0.019 mm from the termination of the body.

DUJARDIN (cit. ex SKRJABIN, SHIKHOBALOVA, ORLOV 1957) presumed that after finding a female worm of the species *Capillaria picorum* (Rudolphi, 1819) this species could be listed as a synonym to the species *C. corvorum* (Rudolphi, 1819), or to the species *C. fringilae* (Rudolphi, 1819) = *C. angusta* (Dujardin, 1845). Our material of nematodes of the genus *Capillaria* Zeder, 1800 consisting only of female worms from typical hosts (*C. picorum*) shows, however that because of the presence

- 15 of an impressive vulval appendage we cannot list *C. picorum* to any of the species mentioned by Dujardin (1845). With regard to this feature found in our material of nematodes which most probably are representatives of the species *C. picorum*, these worms can be differentiated from *C. caudinflata* (Molin, 1858) by the form

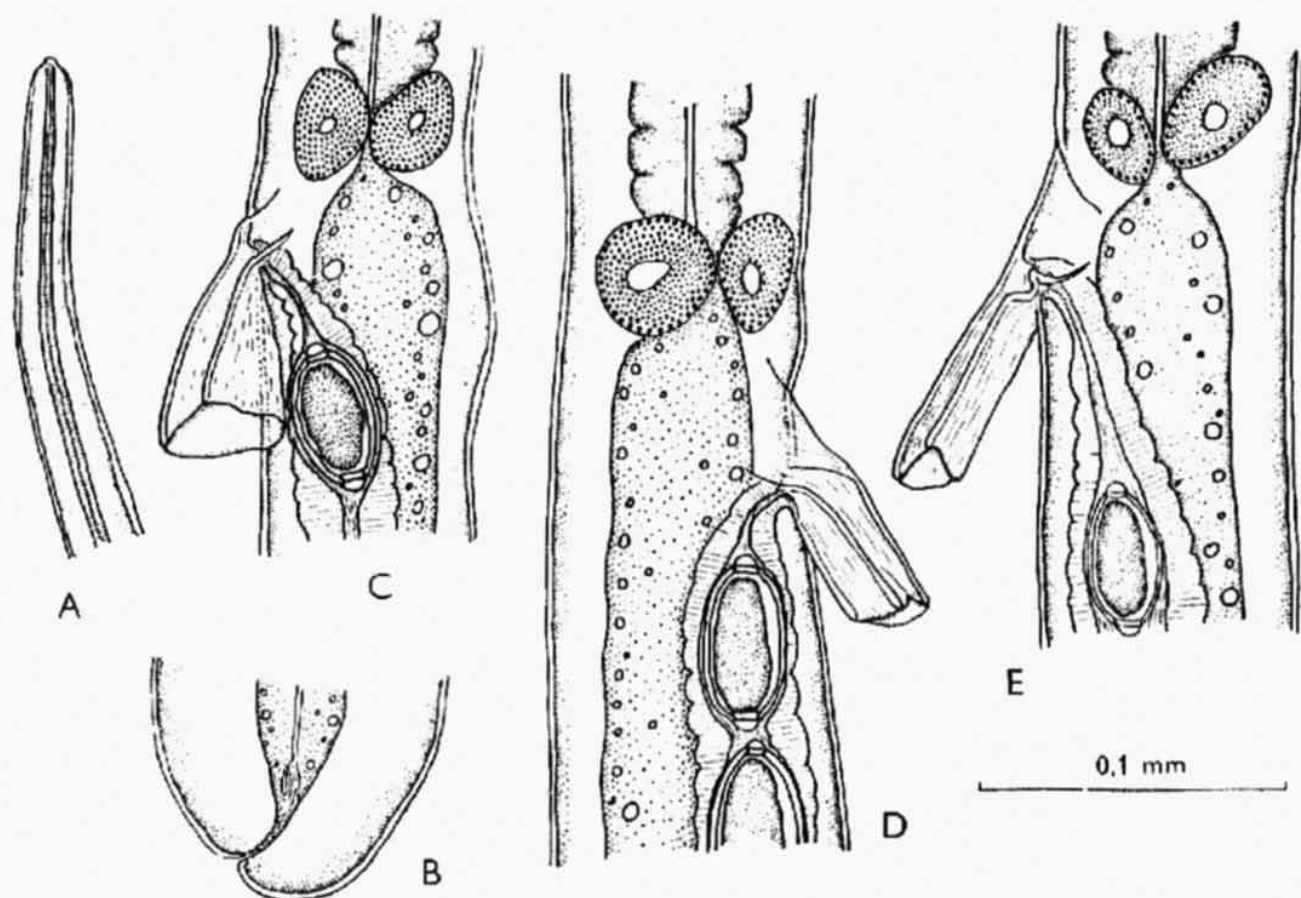


Fig. 5. *Capillaria picorum* (Rudolphi, 1819)? from the small intestine of *Picus viridis* (A - D) and *Dryocopus martius* (E). A - anterior body end, B - posterior body end of female (lateral view), C to E - vulva region (lateral view). (Orig.)

and structure of the vulval appendage, from *C. inflexa* (Rudolphi, 1819), *C. resecta* (Dujardin, 1845) and *C. ovopunctata* (Linstow, 1873) by the size of their ova. The systematic position of this species will be evaluated only after a detailed redescription of the male worms (Rudolphi's description is only very scanty). To the species *C. picorum* we have also listed the finding of RYŠAVÝ (1957) who designated the nematodes of the genus *Capillaria*, observed in *Dryocopus martius* L., *C. caudinflata*.

### C. Nematodes from *Falconiformes* and *Strigiformes*

Family: *Anisakidae* Skrjabin et Karokhin, 1945

1. *Porrocaecum angusticolle* (Molin, 1860) Baylis et Daubney, 1922

Syn.: *Ascaris angusticollis* Molin, 1860.

Hosts: *Buteo buteo* L., *B. lugopus* (Pontop., 1763).

Localisation: small intestine.

Geographical distribution: Europe, Asia, North America.

Localities in Czechoslovakia: Ondřejov (Bohemia), Rožňava (Slovakia).

Extensivity and intensity of invasion: of the 27 buzzards (*B. buteo*) examined 1 was positive, i.e. 3.7 % (intensity of invasion 5 worms), of the 12 rough-legged buzzards (*B. lagopus*) examined 1 was positive, i.e. 8.3 % (intensity of invasion 6 worms).

In Czechoslovakia this species was also reported by VOJTĚCHOVSKÁ-MAYEROVÁ (1952) from *Accipiter gentilis* and ŠKARDA (1964).

2. *Porrocaecum depressum* (Zeder, 1800) Baylis 1920 (Fig. 6A–E)

Syn.: *Fusaria depressa* Zeder, 1800; *Ascaris depressa* (Zeder, 1800) Rudolphi, 1809.

Hosts: *Accipiter gentilis* L., *A. nisus* L., *Buteo buteo* L., *Circus cyaneus* L., *Falco subbuteo* L., *F. tinnunculus* L.

Localisation: small intestine, stomach.

Geographical distribution: cosmopolitan.

Localities in Czechoslovakia: Sázava nad Sáz., Chotěboř, Vojetín u Doks, Luka u Doks, Praha, Lysá nad Labem, Škvorec u Prahy (Bohemia), Květná u Uh. Brodu (Moravia), Gabčíkovo (Slovakia).

Extensivity and intensity of invasion: of the 3 goshawks (*A. gentilis*) examined 1 was positive (intensity of invasion 1 male worm), of the 6 sparrow hawks (*A. nisus*) examined 1 was positive (intensity of invasion 1 female worm), of the 4 hobbies (*F. subbuteo*) examined 1 was positive (2 worms), of the 8 kestrels (*F. tinnunculus*) examined 1 was positive (1 female worm) of the 27 buzzards (*B. buteo*) examined 6 were positive, i.e. 22.2 % (intensity of invasion 1–5 worms) and in the 1 hen harrier (*Circus cyaneus*) examined we found 3 nematodes of the species *P. depressum*.

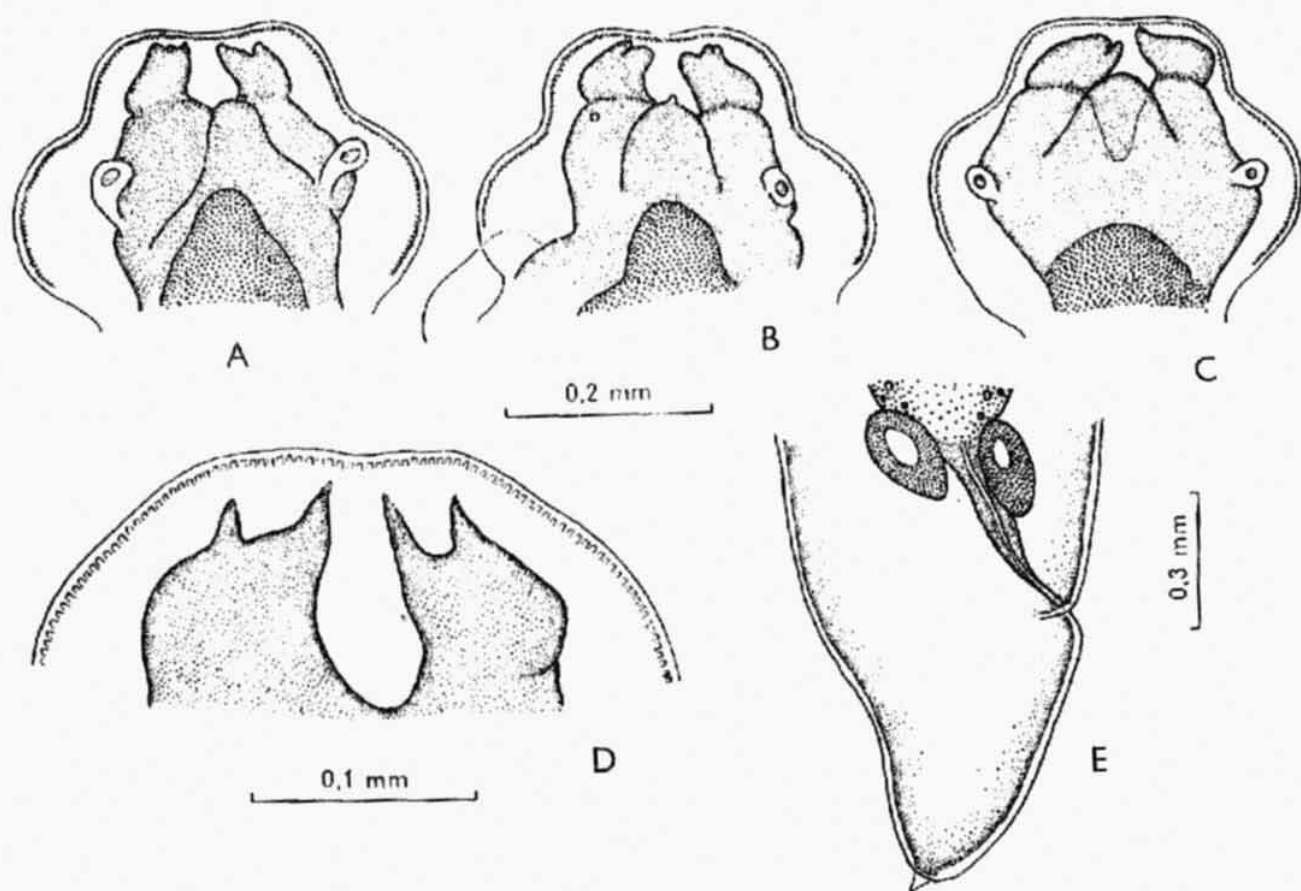


Fig. 6. *Porrocaecum depressum* (Zeder, 1800) from the small intestine of *Buteo buteo*. A, C – dorsal lip, B – lateroventral lip, D – detail, E – posterior body end of female (lateral view). (Orig.)

- 17 In Czechoslovakia this species was also reported by VOJTĚCHOVSKÁ-MAYEROVÁ (1952), RYŠAVÝ (1957), TENORA and LUSK (1960) and ŠKARDA (1964). Larvae of this species of this shrew (*Sorex araneus* L.) were found by PROKOPIČ (1956).

Family: *Acuariidae* Seurat, 1913

3. *Synhimantus robertdolfusi* Desportes, 1948

(Fig. 7A—F)

Host: *Falco tinnunculus* L.

Localisation: oesophagus.

Geographical distribution: Europe.

Localities in Czechoslovakia: Tekovské Lužany (Slovakia).

Extensivity and intensity of invasion: of the 8 kestrels (*F. tinnunculus*) examined 2 were positive i.e. 25% (intensity of invasion 1 male and 1 female worm).

**Description:** The body is whitish in colour, the cuticle is finely transversely striated. Laterally the mouth opening is surrounded by one triangular lip with an apical pointed tooth on its summit. Dorsally and ventrally between the commissures of the cutaneous cordons there are marked cuticular prominences, which are one of the main differentiating features of this species (Desportes 1948). Caudally the cutaneous cordons extend to a distance of 0.260—0.300 mm. The tricuspid cervical

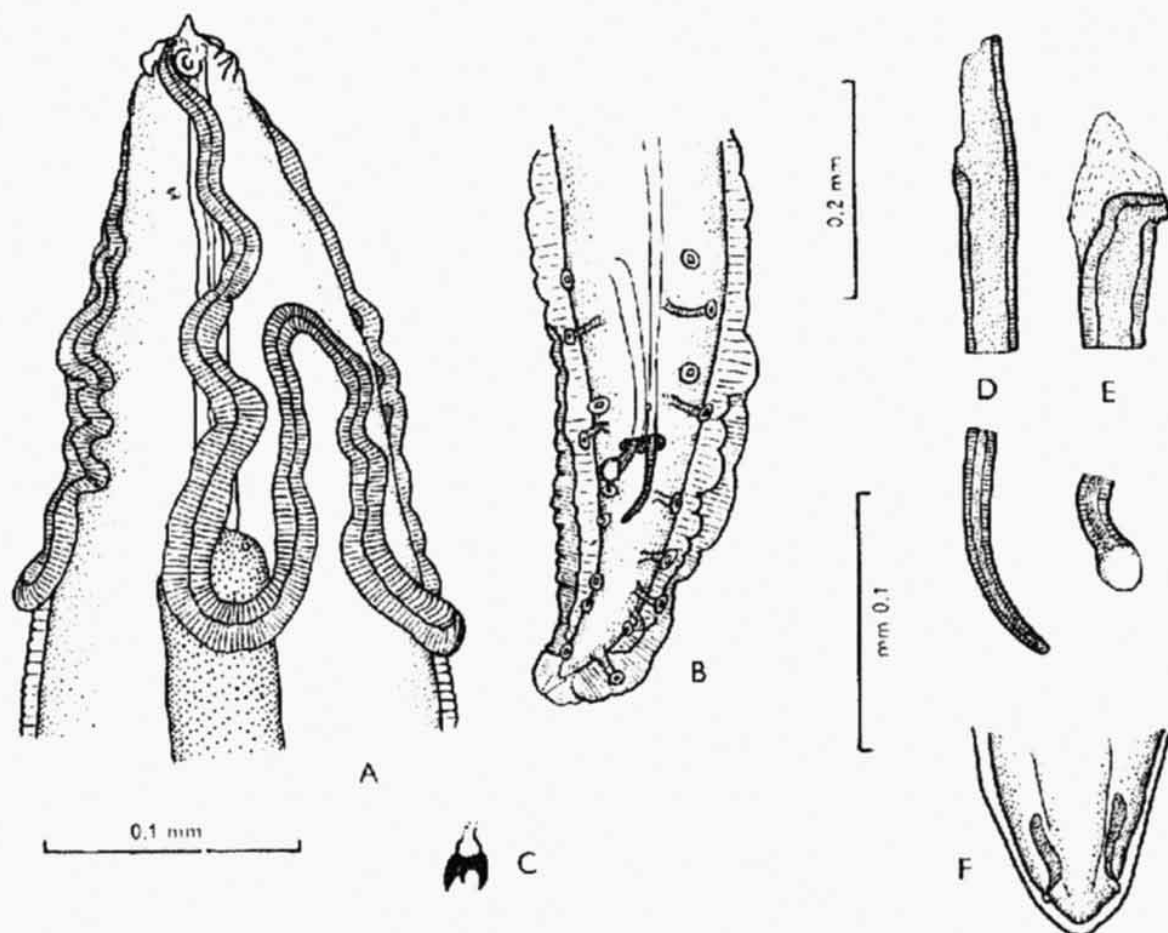


Fig. 7. *Synhimantus robertdolfusi* Desportes, 1948 from the oesophagus of *Falco tinnunculus*. A — anterior body end, B — posterior body end of male (ventral view), C — cervical papilla, D — proximal and distal end of the longer spicule, E — proximal and distal end of the shorter spicule, F — posterior body end of female (ventral view). (Orig).

papillae are situated at a distance of 0.304—0.380 mm from the anterior part of the body. 18

**Male:** The body is 5.37 mm long, the maximum width is 0.250 mm. The pharynx is 0.170 mm long, its maximum width is 0.020 mm. The muscular part of the oesophagus is 0.680 mm long, its maximum width is 0.064 mm. The length of the glandular part of the oesophagus is 1.85 mm, its maximum width is 0.125 mm. Of the 9 pairs of caudal papillae 4 are situated pre-cloacally and 5 post-cloacally. The 2 spicules are dissimilar and unequal. The longer spicule measures 0.640 mm. The width of its proximal part is 0.022 mm, of its distal part 0.006 mm, the tip is rounded. The shorter spicule measures 0.198 mm, its proximal part is 0.038 mm, its distal part 0.015 mm wide, the tip is covered by a cuticular sack.

**Female:** The body is 7.69 mm long, its maximum width is 0.286 mm. The length of the pharynx is 0.165 mm, its maximum width 0.020 mm. The muscular part of the oesophagus is 0.760 mm long, its maximum width is 0.061 mm. The glandular part of the oesophagus is 1.98 mm long, its maximum width is 0.194 mm. The vulva is 3.56 mm from the anterior end. The anus is 0.173 mm from the posterior end. The ova measure 0.037—0.039 mm by 0.019—0.022 mm.

**Family:** *Spiruridae* Oerley, 1885

4. *Cyrnea (Procyrnea) leptoptera* (Rudolphi, 1819) Chabaud, 1958 (Fig. 8A—C)

Syn.: *Spiroptera leptoptera* Rudolphi, 1819; *Filaria leptoptera* (Rudolphi, 1819) Schneider, 866; *Habronema leptoptera* (Rudolphi, 1819); *H. cirsi* Li, 1934.

Host. *Buteo buteo* L.

Localisation: glandular stomach.

Geographical distribution: Europe, Asia, Africa.

Locality in Czechoslovakia: Zadiel (Slovakia).

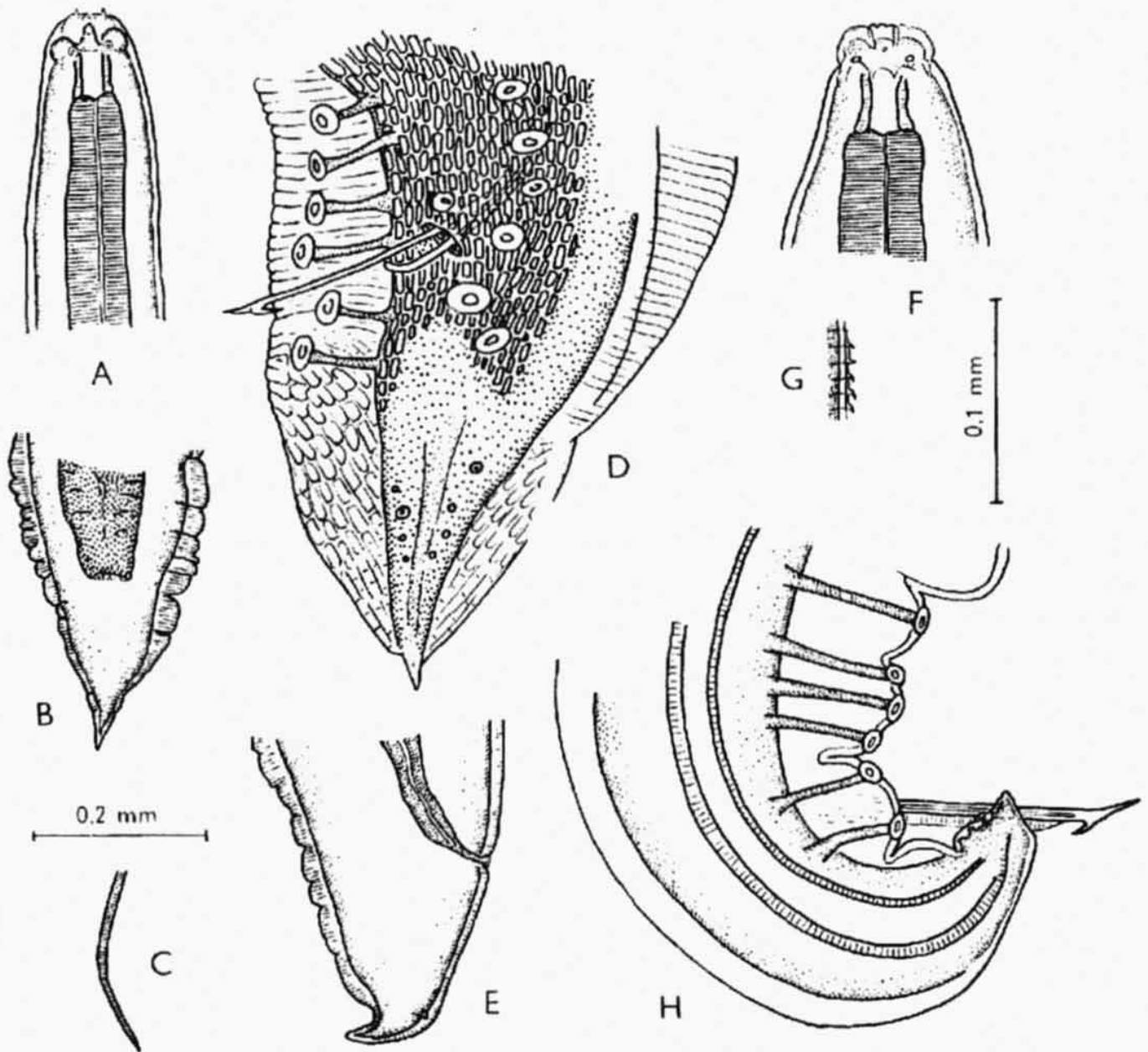
Extensivity and intensity of invasion: of the 27 buzzards (*Buteo buteo*) examined 1 was positive, i.e. 3.7% (intensity of invasion 2 worms — 1 male and 1 female).

**Description:** The body is yellowish in colour. The cuticle bears a fine transverse striation. The head portion is divided from the rest of the body by a marked groove. The big lateral lips are divided into 3 lobes of which each bears 3 teeth on the internal side. A medial comb projects from the dorsal and ventral lip. The cervical cuticular alae are present.

**Male:** The body is 6.26 mm long, its maximum width is 0.232 mm. The mouth capsule is 0.026 mm deep. Its internal diameter is 0.019 mm, the external diameter 0.014 mm. The anterior muscular part of the oesophagus is 0.358 mm long, its maximum width is 0.035 mm. The posterior glandular part of the oesophagus is 2.50 mm long, its maximum width is 0.107 mm. The posterior part of the body bears wide cuticular alae, which are supported by 6 pairs of pedunculated papillae (4 pairs are pre-cloacal and 2 pairs post-cloacal). At the end of the tail are ventrally 4 pairs of small caudal papillae. The 2 spicules are unevenly long. One measures 0.849. Its proximal part is 0.022 mm wide, the distal part 0.004 mm, ending in a sharp tip. The smaller spicule is 0.228 mm long, its proximal part is 0.014 mm

19 wide, the distal part 0.004 mm, the tip is rounded. The gubernaculum is 0.038 mm long.

**Female:** The body is 9.48 mm long, its maximum width is 0.239 mm. The buccal capsule is 0.026 mm deep. The internal diameter is 0.022 mm, the external diameter 0.011 mm. The anterior muscular part of the oesophagus is 0.411 mm long, its maximum width is 0.035 mm. The posterior glandular part of the oesophagus is 2.32 mm long, its maximum width is 0.107 mm. The distance of the vulva from the anterior end is 3.75 mm. The distance of the anus from the end of the tail is 0.228 mm. The eggs measure 0.035—0.038 mm by 0.015—0.018 mm.



**Fig. 8.** *Cyrnea (Procyrnea) leptoptera* (Rudolphi, 1819) from the glandular stomach of *Buteo buteo*. A — anterior body end, B — posterior body end of female (ventral view), C — distal end of longer spicule; D to H — *Cyrnea (P.) spinosa* (Gendrec, 1922) from the glandular stomach of *Falco tinnunculus*. D — posterior body end of male (ventral view), E — posterior body end of female (lateral view), F — anterior body end, G — part of cuticle, H — posterior body end of male (lateral view). (Orig.)

5. *Cyrnea (Procyrnea) spinosa* (Gendre, 1922) Chabaud, 1958 (Fig. 8D—H)

Syn.: *Habronema spinosa* Gendre, 1922

Host: *Falco tinnunculus* L.

Localisation: glandular stomach.

Geographical distribution: Europe, Asia.

Localities in Czechoslovakia: Tekovské Lužany (Slovakia).

Extensity and intensity of invasion: of the 8 kestrels (*F. tinnunculus*) examined 4 were positive i.e. 50 % (intensity of invasion 2—6 worms).

**Description:** The body is of whitish till yellowish colour. The cuticle bears a marked transverse striation with many small spine-shaped prominences. The head-portion is divided by a slight groove from the rest of the body. The 2 lateral lips are divided into three lobes, each bearing 2 teeth with double tops. There is one small lateral wing. The dorsal and the ventral lip are small.

**Male:** The body is 4.83—7.16 mm long, its maximum width is 0.232 to 0.250 mm. The buccal capsule is 0.026—0.029 mm deep. Its external diameter is 0.015 to 0.026 mm, its internal diameter 0.008—0.010 mm. The anterior muscular part of the oesophagus is 0.268—0.365 mm long, its maximum width is 0.030—0.046 mm. The glandular part of the oesophagus is 2.32—2.86 mm long, its maximum width is 0.107—0.143 mm. The very wide caudal alae have a marked transversely striated cuticle. The ventral part of the posterior end is covered by longitudinal cuticular shields. The 6 pairs of caudal papillae are long and pedunculated, 4 are situated pre-cloacally, 2 postcloacally. There is one solitary papilla just anterior to the cloacal opening. Four to six pairs of very small papillae are present on the ventral side at the end of the tail. The 2 spicules are unequal. The longer measures 1.45 to 1.52 mm, the width of its proximal part is 0.015—0.018 mm. The distal part of the spicule forms an expressive hook which tapers backwards into a long spine. The entire length of the hook and spine is 0.028—0.033 mm. The shorter spicule measures 0.323—0.380 mm in length, its proximal part is 0.018—0.022 mm wide. The distal end of this spicule is bluntly rounded, its width is 0.006—0.008 mm. The gubernaculum is 0.042—0.053 mm long.

**Female:** The body is 6.13—9.84 mm long, its maximum width is 0.232—0.429 mm. The buccal capsule is 0.026—0.037 mm deep, its outer diameter is 0.026—0.038 mm, the inner diameter 0.008—0.019 mm. The muscular part of the oesophagus is 0.242—0.355 mm long, its maximum width is 0.037—0.053 mm. The glandular part of the oesophagus is 1.85—3.04 mm long, its maximum width is 0.103 to 0.196 mm. The vulva opens at a distance of 2.24—3.58 mm from the anterior end. The distance of the anus from the end of the tail is 0.125—0.179 mm. The tail bears ventrally one small papilla. The oval ova measure 0.038—0.045 by 0.023 to 0.028 mm.

Family: *Tetrameridae* Travassos, 1914

6. *Microtetrameres cloacitectus* Oschmarin, 1956

(Fig. 9A—C)

Host: *Buteo buteo* L.

Localisation: glandular stomach.

Geographical distribution: Europe, Asia.

Localities in Czechoslovakia: Ondřejov, Vlašim (Bohemia).

Extensivity and intensity of invasion: of the 27 buzzards (*Buteo buteo*) examined 2 were positive, i.e. 7.4% (intensity of invasion 1 male and fragments of 2 female worms).

**Description of the male:** The body is 2.82 mm long, its maximum width is 0.080 mm. The width of the head portion is 0.011 mm. The buccal capsule is 0.022 mm deep, its maximum width is 0.010 mm (inner diameter). The anterior muscular part of the oesophagus is 0.266 mm long, its maximum width is 0.011 mm. The posterior glandular part of the oesophagus is 0.640 mm long and 0.046 mm wide. The nervous ganglion is 0.152 mm from the anterior end. There are two unequally long spicules. The longer measures 1.070 mm, its proximal width is 0.011 mm. The distal end is sharply pointed and covered by a cuticular sack of 0.012 mm in length. The shorter spicule is 0.222 mm long, its proximal width is 0.008 mm. There are 5 pairs of papillae at the posterior end, 3 are pre-cloacal (Oschmarin 1956 observed only 2 pairs), 2 are post-cloacal. The width of the body anterior to the cloaca is 0.061 mm, behind it only 0.038 mm. A tongue-shaped

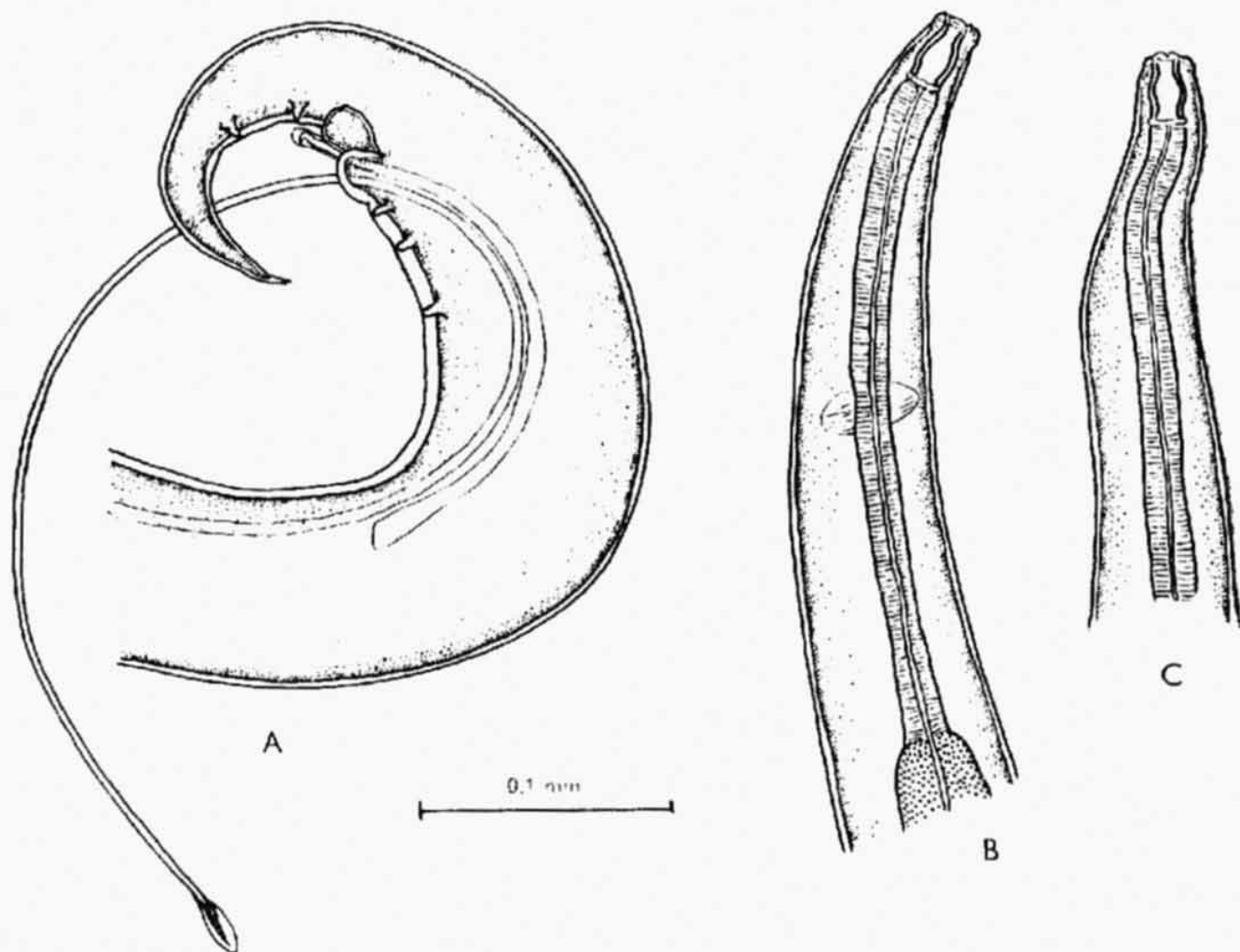


Fig. 9. *Microtetrameres cloacitectus* Oschmarin, 1956 from the glandular stomach of *Buteo buteo*. A — posterior body end of male (lateral view), B, C — anterior body ends of female and male. (Orig.)

prominence of tissue, 0.022 mm long and 0.015 mm is situated close to the cloaca. 22  
The tail terminates in a sharp tip.

**Female:** The body is coiled into a spiral of 2 windings (0.630 mm in diameter). The maximum width of the body is 0.249 mm. The anterior end is 0.015 mm wide. The buccal capsule is 0.026 mm deep, its maximum internal width is 0.009 mm. The thickness of the walls of the buccal capsule is 0.002 mm. The muscular part of the oesophagus is 0.114 mm long, its maximum width is 0.019 mm. The eggs measure 0.042—0.046 by 0.026—0.029 mm. Inside the egg is a coiled larva.

This species was described by OSCHMARIN (1956, 1963) from the host *Buteo buteo* L. from the Asian part (Far East) of the USSR. The finding of *M. cloacitectus* in Czechoslovakia is the first report of this species in Europe.

7. *Microtetrameres* sp.

(Fig. 10A—D)

Host: *Falco tinnunculus* L.

Localisation: glandular stomach.

Locality in Czechoslovakia: Tekovské Lužany (Slovakia).

Extensivity and intensity of invasion: of the 8 kestrels (*F. tinnunculus*) examined 2 were positive, i.e. 25 % (intensity of invasion 4 and 6 female worms).

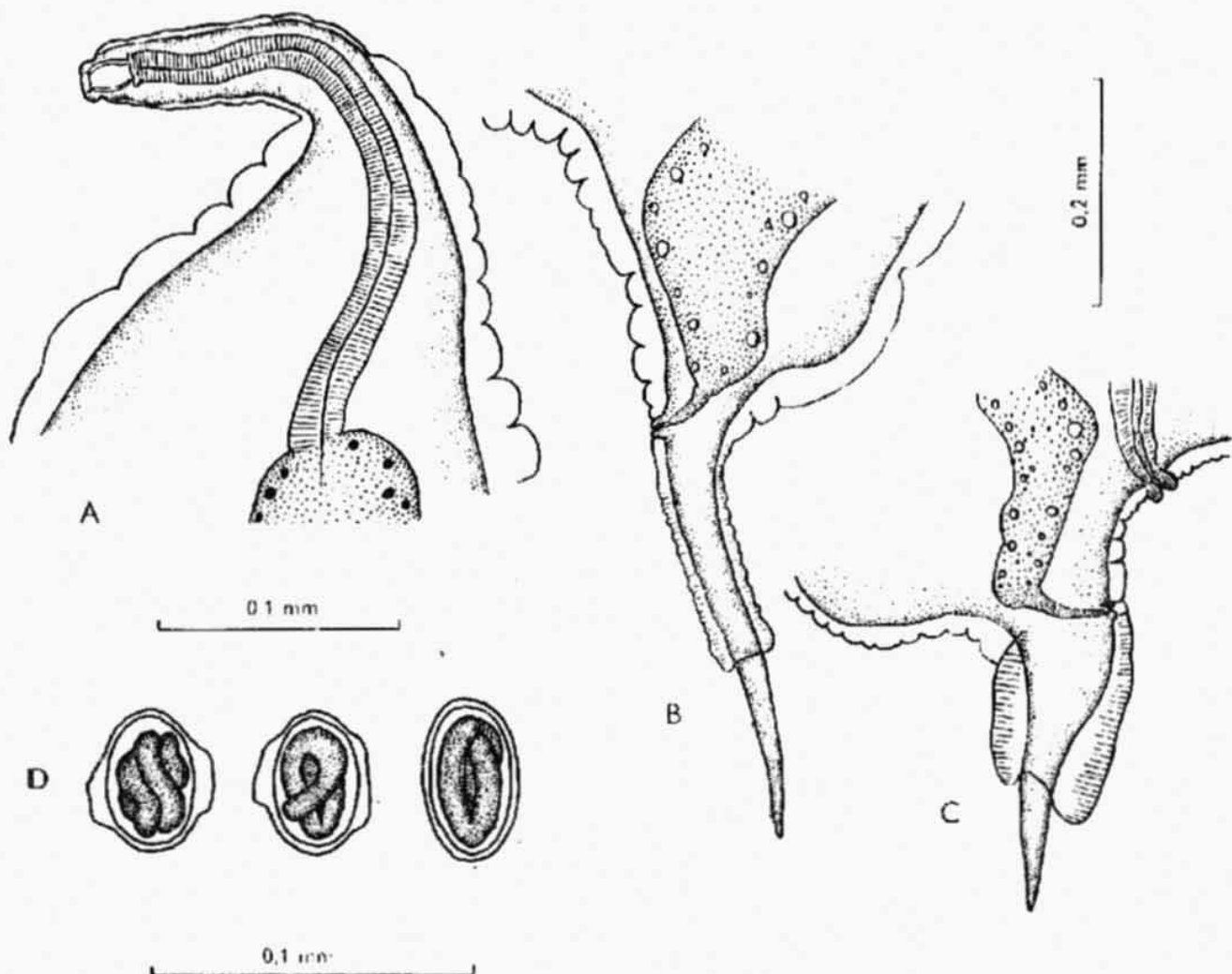


Fig. 10. *Microtetrameres* sp. from the glandular stomach of *Falco tinnunculus*. A — anterior body end of female, B, C, — posterior body end of female (lateral view), D — eggs. (Orig.)

23 **Description:** The body is coiled in a spiral of 0.984 mm in width. The maximum width of the body is 0.441—0.447 mm. The head part of the body is 0.015 mm wide. The buccal capsule is 0.015—0.019 mm deep, its maximum width is 0.008 to 0.011 mm. The muscular part of the oesophagus is 0.247 mm long, its maximum width is 0.026 mm. The glandular part of the oesophagus is 1.780 mm long, its maximum width is 0.057 mm. The distance of the vulva from the termination of the tail is 0.387—0.456 mm, of the anus 0.266—0.304 mm. The eggs measure 0.049—0.053 by 0.025—0.033 mm and contain one coiled larva. The shells bear laterally thickened alae.

Family: *Capillariidae* Neveu-Lemaire, 1936

8. *Capillaria falconis* (Goeze, 1782) Lopez-Neyra, 1946 (Fig. 11A—B)

Syn.: *Cucullanus falconis buteonis* Goeze, 1782; *C. buteonis* Gmelin, 1790; *Trichosoma falconum* Rudolphi, 1819; *Tr. falconis-nisi* (Dujardin, 1845) Diesing, 1851; *Tr. falconis-pygargi* (Dujardin, 1845) Diesing, 1851; *Tr. striatum* Linstow, 1879; *Capillaria falconum* (Rudolphi, 1819); *C. striatum* Linstow, 1879); *Filaria strigis* Froelich, 1802; *Trichosoma obtusum* Rudolphi, 1819; *Tr. parile* Kowalewsky, 1903; *Capillaria strigis* (Froelich, 1802) Lopez Neyra, 1946.

Hosts: *Falconiformes* — *Buteo buteo* L., *Falco tinnunculus* L., *Accipiter nisus* L., *Strigiformes* — *Athene noctua* L. and *Asio otus* L.

Localisation: small and large intestine.

Geographical distribution: Europe, America.

Localities in Czechoslovakia: Vlašim, Škvorec u Prahy, Bydžov, Stránčice, Lysá nad Labem

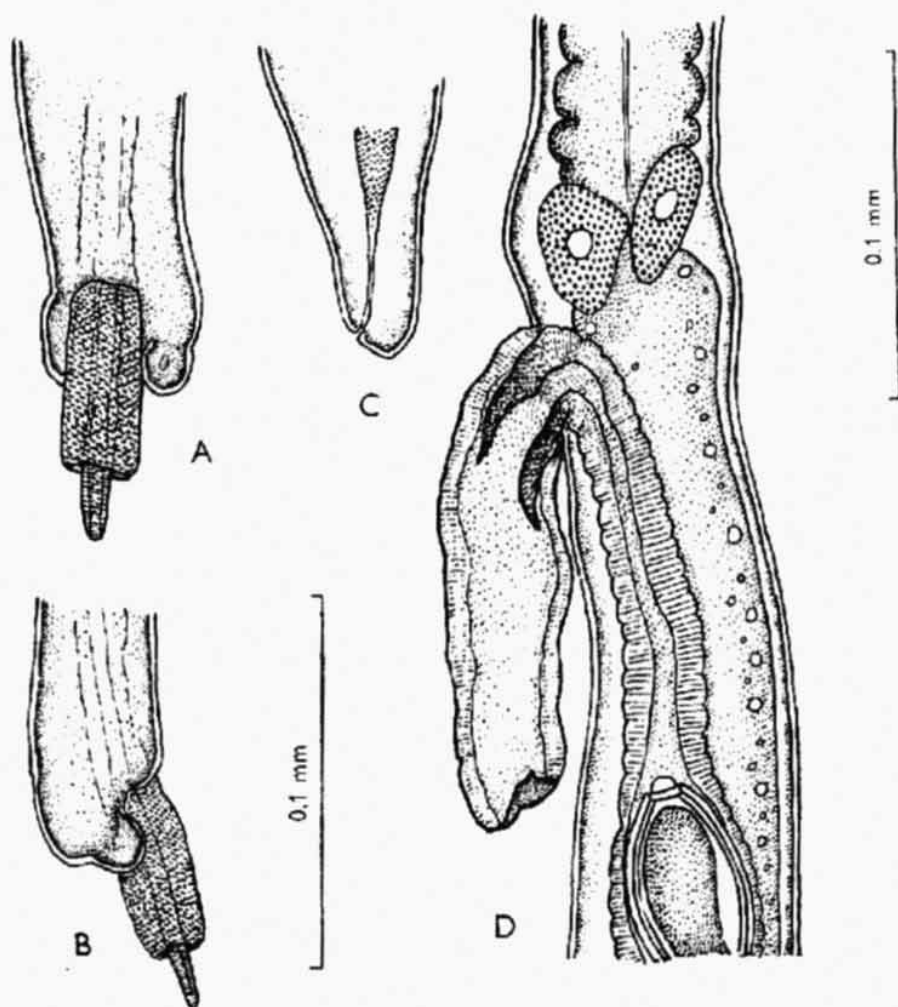


Fig. 11. A, B — *Capillaria falconis* (Goeze, 1782) from the small intestine of *Athene noctua*. Posterior body end of male (ventral end lateral view). C, D — *Capillaria* sp. from the small intestine of *Strix aluco*. C — posterior body end of female (lateral view), D — vulva region (lateral view). (Orig.)

(Bohemia), Gabčíkovo, Tekovské Lužany (Slovakia).

Extensity and intensity of invasion: *Falconiformes* of the 27 buzzards (*Buteo buteo*) examined 2 were positive, i.e. 7.4 % (intensity of invasion 2 male and 3 female worms); of the 8 kestrels (*F. tinnunculus*) examined 2 were positive, i.e. 25 % (intensity of invasion 1 male and 1 female worm). Of the 6 sparrow hawks (*A. nissus*) examined 1 was positive (intensity of invasion 2 female worms). *Strigiformes* — Of the 4 little owls (*A. noctua*) examined 1 was positive (1 male and 8 female worms), of the long-eared owls (*A. otus*) examined 2 were positive (5 and 3 worms).

In 1946 LOPEZ—NEYRA reported on the morphological relationship of *C. falconis* (Goeze, 1782) and *C. strigis* (Froelich, 1802). In his opinion the independence of *C. strigis* is justified by the little difference in the form of the eggs and principally by the host specificity. In analysing our material of nematodes of the genus *Capillaria* Zeder, 1800, collected from hosts of the order *Strigiformes* and *Falconiformes* we observed their complete morphological identity (BARUŠ 1964). With regard to the same type of food, which is reflected by the composition of their helminthofauna (TENORA and LUSK, 1960) the host specificity cannot be considered as conclusive evidence. We therefore suggest to place *C. strigis* (Froelich, 1802) Lopez—Neyra, 1946 in synonymy under the species *C. falconis* (Goeze, 1782) and present this suggestion for further discussions.

### 9. *Capillaria* sp.

(Fig. 11C—D)

Host: *Strix aluco* L.

Localisation: small intestine.

Locality in Czechoslovakia: Klánovice near Prague (Bohemia).

Extensity and intensity of invasion: of the 10 tawny owls (*S. aluco*) only 1 was positive, i.e. 10 % (intensity of invasion 1 female worm).

**Description:** The body of the female is of whitish colour, 7.16 mm long, its maximum width is 0.063 mm. The anterior part is 0.008 mm wide, at the level of the termination of the oesophagus 0.057 mm wide. The muscular part of the oesophagus is 0.266 mm long. The entire length of the oesophagus is 2.89 mm, its maximum width is 0.038 mm. The distance of the vulva from the termination of the oesophagus is 0.038 mm. The vulval protrusion is campanulate, its length is 0.132 mm, its width 0.033 mm. The anus is subterminal, situated at a distance of 0.006 from the top. The eggs measure 0.055—0.061 by 0.026—0.029 mm.

Our species is morphologically very close to the species *Capillaria* (*s.l.*) *cylindrica* (Eberth, 1863) from the host *Buteo buteo*. The only difference is the localisation in the host. *C. cylindrica* was found in the oesophagus.

### 10. *Thominx dispar* (Dujardin, 1845) Skrjabin et Shikhobalova, 1954

Syn.: *Trichosomum dispar* Dujardin, 1845; *Tr. contortum* Dujardin, 1845 nec Creplin, 1839; *Capillaria* (*Thominx*) *dispar* (Dujardin, 1845) Travassos, 1915; *Eucoleus dispar* (Dujardin, 1845), Lopez—Neyra, 1946; *Capillaria* sp. Furmaga, 1957 (ex parte).

Host: *Buteo buteo* L.

Localisation in the host: under the mucous membrane of oesophagus.

Geographical distribution: Europe.

Localities in ČSSR: Škvorec u Prahy (Bohemia), Zadiel (Slovakia).

Extensivity and intensity of invasion: of the 27 buzzards (*B. buteo*) examined 2 were positive, i.e. 7.4 % (intensity of invasion 10 and 4 worms).

This species was redescribed in detail by BARUŠ (1964). ŠKARDA (1964) found many of these capillariae in the mentioned host and designated them *Th. contorta* (Creplin, 1839) Travassos, 1915. In our opinion, his material contained *Th. dispar*, a typical parasite of the oesophagus of *B. buteo*.

### 11. *Thominx tenuissima* (Rudolphi, 1809) Travassos, 1915

Syn.: *Trichocephalus tenuissimus* Rudolphi, 1809; *Capillaria tenuissima* (Rudolphi, 1803) Yamaguti, 1941.

Hosts: *Strix aluco* L., *Athene noctua* (Scopoli, 1769).

Localisation in the hosts: small intestine.

Geographical distribution: Europe, Asia.

Localities in ČSSR: Lysá nad Labem, Praha-Petřín (Bohemia).

Extensivity and intensity of invasion: of the 10 tawny owls (*S. aluco*) examined 1 was positive (1 female worm); of the 4 little owls (*A. noctua*) examined 1 was positive (intensity of invasion 4 male and 4 female worms).

The morphology of this species was described in detail by BARUŠ (1964).

In addition to the nematode species from hosts of the order *Falconiformes* and *Strigiformes* TENORA and LUSK (1960) found in Czechoslovakia:

### 12. *Contracecum* sp. Tenora et Lusk, 1960

Host: *Buteo buteo* L.

These authors described the finding of 1 juvenile female worm; it was not possible to carry out a more exact determination.

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