

## SOME CESTODES AND NEMATODES PARASITIZING GALLINACEOUS AND COLUMBIIFORM BIRDS IN NEPAL\*)

V. BARUŠ, B. RYŠAVÝ and M. DANIEL

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

**Abstract.** The birds from the valley of the Barun Khola River (Great Himalaya, Eastern Nepal), *Tetraogallus tibetanus aquilonifer*, *Ithaginis cruentus cruentus*, *Lophophorus impejanus*, *Columba leuconota* and *Gallus gallus f. dom.*, were examined for helminths. Ten species of parasitic worms (3 of the class Cestoidea and 7 of the class Nematoda) were found in their digestive tract. One of them, *Ascaridia nepalensis*, is described as a new species.

During the Czechoslovak expedition to the region of the mount Makalu (Great Himalaya, Eastern Nepal) among others also captures and parasitological examinations of birds were carried out. A collection of helminths of the classes Cestoidea and Nematoda was obtained from the hosts belonging to the orders Galliformes and Columbiformes. The systematical and faunistical evaluation of this material is an important contribution to the knowledge of helminth fauna of birds from Nepal.

### MATERIAL

The collections were carried out in the valley of the Barun Khola River in spring 1973, before the arrival of the summer monsoon. This river is a right tributary of the river Arun (its estuary lies at 87°22' E and 27°42' N) and constitutes an axis of the valley reaching up to the Nepal-Tibet boundary between Mount Everest and Makalu massifs.

### BRIEF CHARACTERISTICS OF BIRD SPECIES EXAMINED

Due to the character of their distribution area, all species are distinct mountain elements (Dies-  
selhorst 1968).

*Tetraogallus tibetanus* is a faunistic element of Tibet and occurs at elevations of 5000–5400 m in the Nepal Himalaya. It does not descend below this level, but may occasionally be encountered even at the level of permanent snow.

*Lophophorus impejanus* is an element of the Himalaya, living mostly near the upper border of forest at elevations of 3300–4500 m. Its distribution is not limited only to the main mountain range of the Great Himalaya, but it occurs also in the highest sites of the Lesser Himalaya.

*Ithaginis cruentus* is an element of the Himalaya and China. It lives primarily in the subalpine forest, both on the high trees and sporadic islets of dwarf trees. In Eastern Nepal it is distributed in the zone at elevations of 3500–4200 m. Similarly as *L. impejanus*, it may be encountered also in the Lesser Himalaya.

*Columba leuconota* is a mountain element of the fauna of Middle Asia, distributed at the upper border of forest at elevations from about 4000 m up to 5000 m. It may occasionally fly up to the level of permanent snow.

\*) Scientific results of the Czechoslovak expeditions to the Hindu Kush and Himalaya. Communication No. 16.

## BRIEF CHARACTERISTICS OF THE LOCALITIES

1. Yanle, 3600 m a.s.l. A hollow depression, the bottom of which is covered with river terraces. Around the depression there is a moist coniferous mountain forest with rhododendrons.
2. Tadosa, 3900 m a.s.l. A gorge joining two differently formed layers of the Barun valley. At this site runs the upper boundary of the forest with sporadic islets of dwarf firs and bushy rhododendrons.
3. Shershon, 4500 m a.s.l. A lacustrine terrace at the site where the Lower Barun glacier leads into the Barun valley. By its vegetation it belongs to the zone of Alpine meadows.
4. The environs of the front of the Upper Barun glacier (4900 m). The birds were captured on extensive fossil moraines; the valley bottom was filled with lacustrine terrace. At this altitude the elements of the zone of Alpine meadows are disappearing.
5. Sedoa (on a special map transcribed as Seduwa), 1580 m a.s.l. A community lying in region of the junction of the Great and Lesser Himalayas (87°15' E, 27°35' N).

## SYSTEMATICAL PART

### CESTOIDEA

#### Fam. Hymenolepididae

##### 1. *Echinolepis carioca* (Magalhaes, 1898)

Host: *Gallus gallus* f. *dom.* location: small intestine; locality: Sedoa 1580 m, 31 May 1973.

This species was found in all 4 *G. gallus* f. *dom.* and in 2 of the 4 *I. c. cruentus* examined. Our material contained two complete strobilae and a large number of fragments. *E. carioca* has already been reported from Nepal by Ryšavý et al. (1975), who found it in the host *Ithaginis cruentus cruentus*.

##### 2. *Hispanolepis fedtschenkowi* (Solowiov, 1911)

Fig. 1

Host: *Tetraogallus tibetanus aquilonifer*; location: small intestine; locality: a moraine near the front of the Upper Barun glacier, 4900 m, 25 April – 3 May 1973.

This species was found in all 3 *T. tibetanus* examined. The material consisted of 16 strobilae (the scolex was preserved in one specimen only). *H. fedtschenkowi* has recently been found in the hosts *Tetraogallus himalayensis*, *T. caucasicus*, *Lyrurus tetrix*, *Tetrastes*

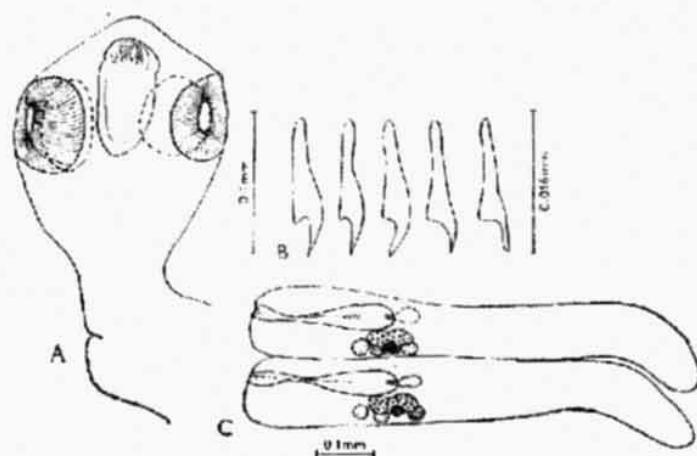


Fig. 1. *Hispanolepis fedtschenkowi* (Soloviov, 1911). A – scolex; B – rostellar hooks in various positions; C – hermaphrodite proglottides. (Original)

*bonasia*, *Megaloperdix nigelli* and *Numida meleagris* in the mountainous regions of Kazakhstan, Georgia, Azerbaidzhan and Urals (Spasskaya 1966).

Our specimens recovered from the new host are described as follows: Strobila 22–27 mm long, 1.1 mm maximum width. Scolex 0.164 mm in diameter, with four rounded suckers measuring 0.048–0.056 mm in diameter. Rostellum oval, 0.044 mm in transverse diameter. Rostellar sheath oval, 0.180 mm long by 0.084 mm wide. Rostellar hooks 14 in number, 0.016 mm long. Strobila consists of proglottides typical of the genus *Hispanolepis*. They are asymmetrical, with long processes on aporal side. Genital organs on poral side, reaching about 1/3 of proglottis width. Testes 3, rounded, 0.028–0.036 mm in diameter, arranged in one row or forming a low triangle near posterior margin of proglottides. Cirrus sac opens into clearly visible genital atrium near upper margin of proglottides. It is thick-walled, 0.264–0.344 long by 0.080–0.092 mm wide, reaching the first third of proglottis width. External seminal vesicle 0.038–0.050 × 0.030–0.046 mm. Ovary compact, slightly lobate, situated under external seminal vesicle, 0.104–0.132 mm in transverse diameter. Vittelline gland lobate, in middle of ovary near its lower margin, 0.032–0.044 mm in transverse diameter. Uterus saccular, filling entire proglottis. Mature eggs not found.

### 3. *Raillietina (Raillietina)* sp.

Fig. 2

Host: *Gallus gallus* f. *dom.*; location: small intestine; locality: Sedoa, 1580 m, 31 May 1973.

Two scoleces and numerous fragments of strobilae with mature proglottides of cestodes of the genus *Raillietina* were recovered from one of the four hosts examined. At dissection of intestines fixed in formalin no complete strobilae could be obtained and no mature proglottides were found. For this reason the material cannot be exactly determined. We are describing our material, for it was a form with small hooks, rather different from most of the hitherto known species of the genus *Raillietina*.

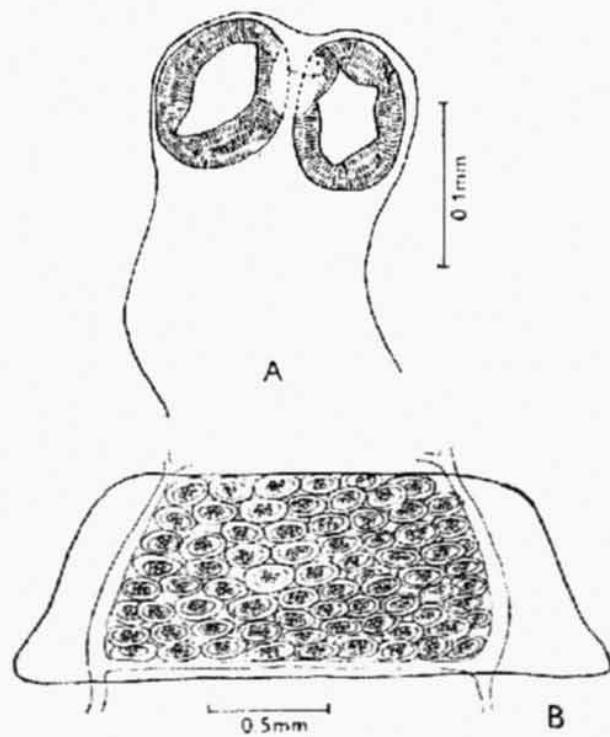


Fig. 2. *Raillietina (Raillietina)* sp. A — scolex; B — gravid proglottis. (Original)

**Description:** Scoleces spherical, 0.172 and 0.164 mm in diameter. Suckers rounded, 0.084 to 0.090 mm in diameter. Margins of suckers armed with 4 rows of hooks measuring 0.010–0.012 mm in length. Rostellum 0.040 mm in diameter and bearing about 80 hooks 0.008 mm long. Gravid proglottides 2 mm wide by 0.6–0.7 mm long, completely filled with egg capsules of oval shape, measuring 0.088–0.116 × 0.048–0.072 mm. Each capsule contains 4–8 eggs.

1. *Ascaridia galli* (Schrank, 1788)

Host: *Gallus gallus* f. *dom.*; location - small intestine, locality: Sedoa 1580 m, 31 May 1973.

This species was found in all 4 *G. gallus* f. *dom.* examined. Intensity of infection was 2—6 nematodes per host. The total number of nematodes consisted of 5 males, 7 females (all adult) and 4 larvae. Our material corresponds both in its morphology and measurements to the known diagnosis of this cosmopolitan species.

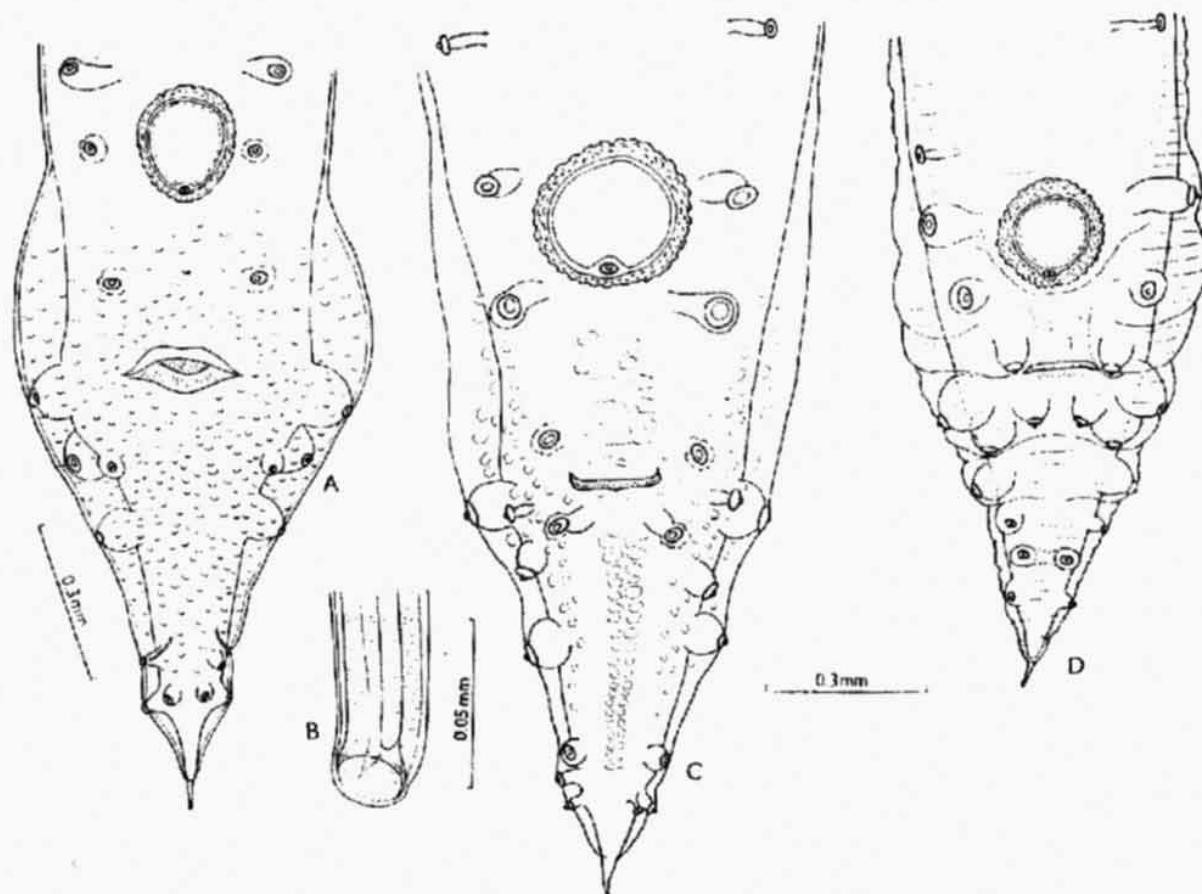


Fig. 3. A, B — *Ascaridia galli* (Schrank, 1788). A — posterior end of male body (ventral view); B — distal end of spicule; C — *A. skrjabini* Fedjuschin, 1952 — posterior end of male body (ventral view); D — *A. nepalensis* sp. n. — posterior end of male body (ventral view). (Original)

2. *Ascaridia skrjabini* Fedjuschin, 1952

Host: *Tetraogallus tibetanus aquilonifer*; location: small intestine; locality: a moraine near the front of the Upper Barun glacier, 4900 m, 25 April — 3 May 1973.

This species was found in 2 of the 3 *T. tibetanus* examined. Incidence of infection was 1 and 5 nematodes per host. Total number of nematodes consisted of 2 males and 4 females. This species has been known only from *Tetraogallus himalayensis* from Alpine regions of the Kirghiz SSR (Fedyushin 1952) and the Kazakh SSR (Gvozdev 1958).

Our material was compared with the original description by Fedyushin (1952) and redescription by Gagarin (1954) and Gvozdev (1958). There are some differences

in the number and distribution of caudal papillae of males. We have observed 12 pairs of papillae (and 1 odd papilla near lower margin of pseudosucker). The above authors found only 9 or 10 pairs of papillae. Distribution of papillae in our specimens (Fig. 3C): 1 pair in front of pseudosucker, 2 pairs on sides of pseudosucker, 1 pair a small distance in front of cloaca, 4 pairs (2 lateral and 2 subventral) at level of cloaca and a small distance under it, 1 pair in middle of tail length and 3 pairs in posterior third of body length. A characteristic feature of this species is the distribution of cuticular bosses on ventral side of male body. This character has not been mentioned either in the original description or in the following redescriptions. In *A. skrjabini* the cuticular bosses are arranged in two lateral and one medial row, unlike in *A. galli*, where they are distributed on the whole ventral side of posterior end of male body (Fig. 3A). Measurements of *A. skrjabini* males in our material were the following: length of body 42—47 mm, width at level of cloaca 0.56 mm. Cloaca 0.76 mm from tail end. Pseudosucker 0.26 mm in external diameter, 0.19 mm in internal diameter. Lower margin of pseudosucker 0.34 mm from cloaca. Spicules 2.40—3.10 mm long, width of their proximal end 0.109 mm.

### 3. *Ascaridia nepalensis* sp. n.

Fig. 3D

Host: *Lophophorus impejanus*; location: small intestine; locality: Tadosa, 3900 m, Barun Khola valley, 14 April 1973.

A single male specimen of the genus *Ascaridia* Dujardin, 1845 was found in one host examined. The morphology of the nematode is very characteristic and cannot be identified with any of the known species of this genus. It is considered a new species and its description is given below.

Description: Male body of whitish colour, slightly tapering to both ends. Cuticle with distinct transverse striations; cervical alae absent. Length of body 42 mm, width at base of lips 0.26 mm, at level of oesophagus end 0.94 mm. Mouth with three lips, interlabia absent. Fine denticles (5—8 in number) arranged in one row on inner side of lips near their upper margin. Pulp of lips rounded, undivided. Dorsal lip bears two double papillae and lateral lips one double papilla each. Oesophagus cylindrical, 2.34 mm in length and 0.31 mm in maximum width. Excretory pore and nerve ring 0.65 mm and 0.55 mm, respectively, from anterior end of body. Posterior end of body with narrow caudal alae. Precloacal sucker rounded, 0.182 mm in external diameter and 0.131 mm in internal diameter. There is one odd papilla near its lower margin. Spicules 2.18 mm long. There are 11 pairs of caudal papillae; first pair asymmetrical, a short distance in front of pseudosucker, other 2 pairs on sides of pseudosucker. Another pair of precloacal papillae lateral, in front of upper lip of cloaca. The first three pairs of postcloacal papillae form a group situated latero-ventrally. In middle of tail length is another pair of papillae (lateral). The last 3 pairs of papillae are situated in regular intervals in caudal direction. The middle pair is more medial. Cloaca 0.61 mm from end of body. Lower margin of precloacal sucker 0.15 mm from cloaca. Body at level of cloaca 0.59 mm wide. Cuticle on ventral side of posterior end of body without cuticular bosses, but with distinct transverse striation.

Differentiation of *A. nepalensis* sp. n. from other species of the genus *Ascaridia*: The genus *Ascaridia* Dujardin, 1845 is very rich in species. At the present time it includes 58 species parasitizing definitive hosts of the class Aves (Mozgovoy 1973). A single exception is *A. rodhaini* Gedoelst, 1922 described from the elephant *Loxodonta africana* from Africa. However, its detailed morphology is not known and it is possible that this species belongs to another genus.

The definitive hosts of the order Galliformes have been reported to harbour 21 members of the genus *Ascaridia* (Mozgovoy 1953, 1973). In the opinion of some authors

the validity of some of these taxons is uncertain. Our specimen of *A. nepalensis* sp. n. from *Lophophorus impejanus* (Phasianidae) exhibits the following characteristic features: 5—8 small denticles arranged in one row near upper margin of lips, 11 pairs of distinctly muscular caudal papillae (of these the middle group consisting of 3 pairs of papillae is situated close to cloaca, slightly postcloacal), no cuticular bosses on ventral side of tail end of male. The species *L. impejanus* has not yet been reported as definitive host of *Ascaridia*. It is an endemic element of the avifauna of the Himalayan region at high altitudes.

The species *A. nepalensis* sp. n. described by us differs from *A. galli*, *A. skrjabini*, *A. alectoris* Gagarin, 1954 and some other species possessing cuticular bosses on the ventral side of caudal end of males, just in the absence of this character (and also in other morphological and metrical details).

*A. nepalensis* differs from other species found in gallinaceous birds, namely *A. bonasae* Wehr, 1940, *A. alata* Scota et Chatuverdi, 1970, *A. borealis* (Linstow, 1884), *A. brasiliensis* (Magalhaes, 1892), *A. numidae* (Leiper, 1908), *A. catheturina* (Johnston, 1912), *A. cordata* (Linstow, 1906), *A. compar* (Schrank, 1790) = *A. cylindrica* (Blome, 1909), *A. dissimilis* Pérez Vigueras, 1931, *A. francolina* (Linstow, 1899), *A. ketzhoreli* Kurashvili, 1949, *A. magnipapilla* (Linstow, 1906), *A. neocordata* Kreis, 1938, *A. petrensa* Canavan, 1929 and *A. serrata* (Schneider, 1866), primarily in the number of caudal papillae and their topography. All above species have at least 10 pairs (or less) of caudal papillae, whereas in *A. nepalensis* 11 pairs were found.

In the presence of denticles near upper margin of lips *A. nepalensis* resembles the group of species comprising *A. australis* (Linstow, 1898), *A. compressa* (Schneider, 1866), *A. amblymorpha* (Dasche, 1883), *A. francolina* (Linstow, 1899) and *A. serrata* (Schneider, 1866) (see the key published by Mozgovoy 1973). The denticles arranged in one row and undivided pulp of lips was found only in the species *A. compressa* described from the host *Gallus gallus* f. *dom.* from southern Australia. Frenzen (1956) studied type specimens of this species from the collection of Schneider and new collections from terra typica and proved the identity of *A. compressa* and *A. galli*. Our species *A. nepalensis* differs from *A. galli* in many other morphological characters (Fig. 3A, C).

Holotype (male) of *A. nepalensis* sp. n. described in the present paper is deposited in the collections of the Humboldt Museum, Berlin (Coll. No. 6901).

## Fam. Heterakidae

### 4. *Heterakis altaica* Spaul, 1929

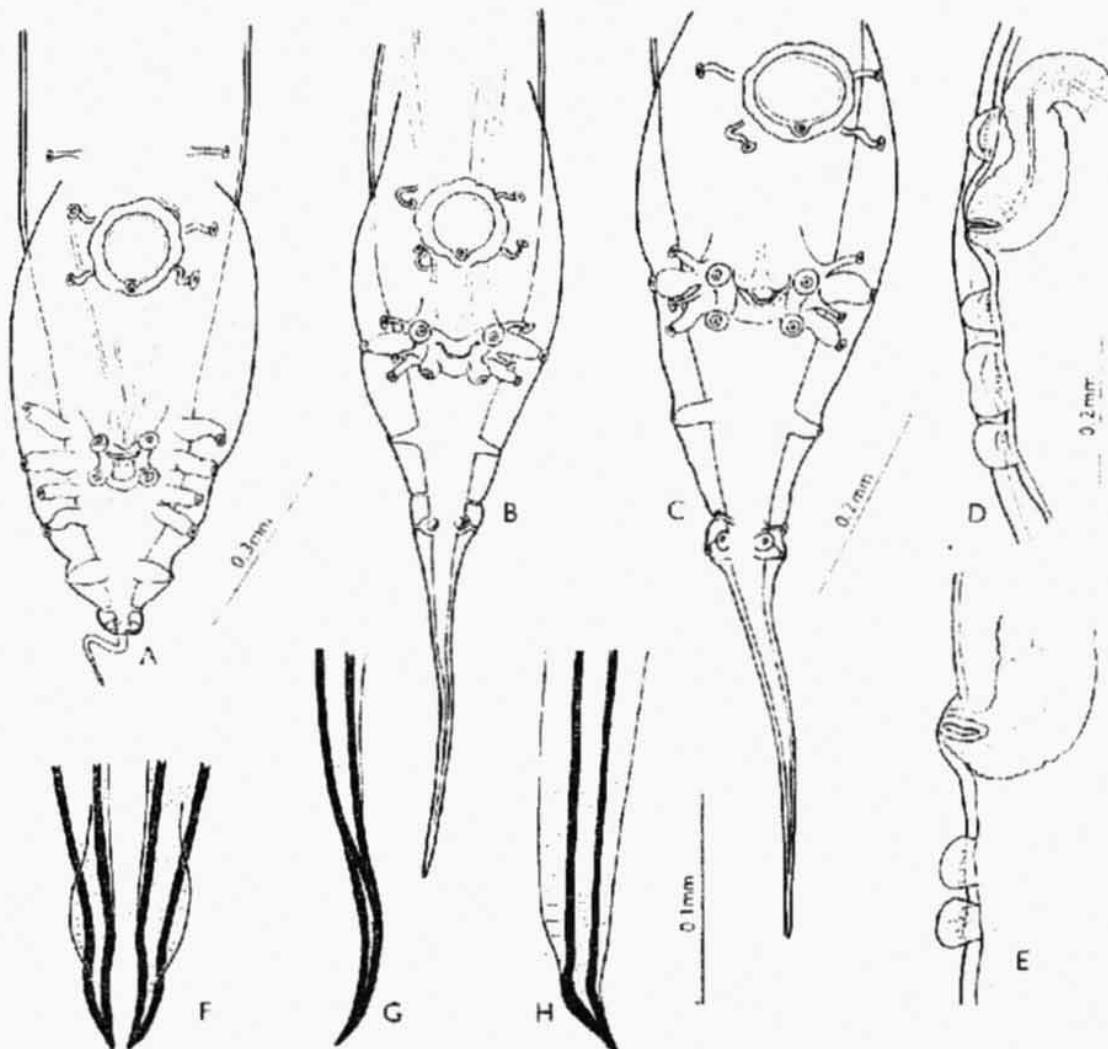
Fig. 4A, F

Host: *Tetragallus tibetanus aquilonifer*; location: caecum; locality: a moraine near the front of the Upper Barun glacier, 4900 m, 29 April and 3 May 1973.

This species was found in 2 of the 3 *T. tibetanus* examined (7 and 3 nematodes). The total number consisted of 3 males and 7 females.

*H. altaica* parasitizes the hosts *T. altaicus*, *T. caspius*, *T. caucasicus*, *T. himalayensis*, *T. tibetanus*, *Alectoris graeca* and *Phasianus colchicus* in the high-altitude regions of the Asian part of the U.S.S.R. (Tuva SSR, Kazakhstan, Azerbaidzhan, Georgia) and in China (Tien Shan) (Spaul 1929, Kasimov 1956, Kasimov and Feyzullaev 1965, Kurashvili 1957, Gvozdev 1958, Bondarenko 1963). The original description of this species was supplemented by a detailed redescription by Shmelev (In: Skryabin and Shikhobalova 1949). Our material fully conforms to these data both in the morphology and measurements.

Inglis et al. (1971) have placed *H. altaica* in the *H. dispar* group belonging to the genus *Heterakis*. They regard the length of spicules (0.42—0.51 mm in our material) and the presence of small cuticular alae on the distal end of spicules (Fig. 4F) as characteristic features of this species.



**Fig. 4.** A, F — *Heterakis altaica* Spaul, 1929. A — posterior end of male body (ventral view); F — distal ends of spicules; B—H — *Heterakis isolonche* (Linstow, 1906). B, C — posterior end of male body (ventral view); D, E — vulva region (lateral view); G — distal end of long spicule; H — distal end of short spicule. (Original)

### 5. *Heterakis isolonche* Linstow, 1906

Fig. 4B—E, G, H

Host: *Ithaginis cruentus cruentus* and *Lophophorus impejanus*; location: caecum; locality: Yanle (3600 m) and Tadosa (3900 m), the Barun Khola valley, 8—14 April 1973.

This species was found in 3 of the 4 *I. c. cruentus* (3—5 nematodes per host) and 1 *L. impejanus* (156 nematodes) examined. The material comprised 39 males and 128 females. *H. isolonche* has already been reported from both of the above definitive hosts (Kasimov 1956). This species has a very wide geographic distribution due to the introduction of several species and subspecies of pheasants to new regions. It has been known from many species of gallinaceous birds from Europe, Asia and North America. Our material conforms in its morphology to the redescriptions published by Li (1933) and Madsen (1950). Ryšavý et al. (1975) recorded this species from *I. cruentus* from Nepal.

## Fam. Trichostrongylidae

### 6. *Ornithostrongylus quadriradiatus* (Stevenson, 1904)

Fig. 5

Host: *Columba leuconota*; location: small intestine; locality: Shershon (Barun Khola valley), 4500 m, 2 May 1973.

We have found 2 specimens of this species (fragments of 1 male and 1 female) in 1 of the 2 hosts examined. It is an almost cosmopolitan parasite of birds of the order Columbiformes (especially of the genera *Columba* and *Streptopelia*). Our material is fully conformable to the redescriptions published by Cram (1927), Gilbert (1927) and Solonitsin (1928).

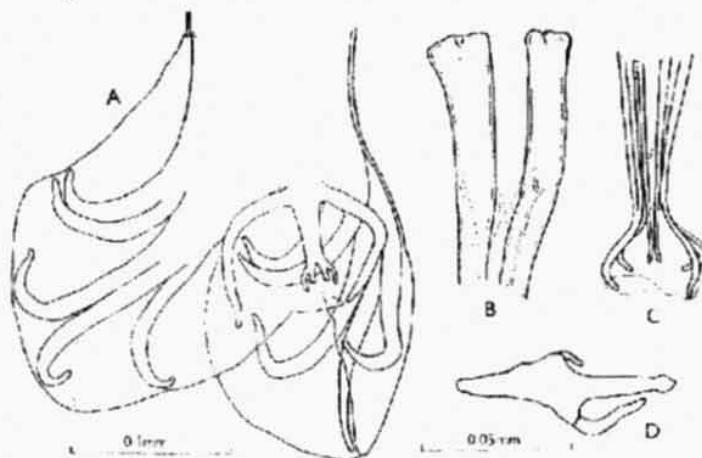


Fig. 5. *Ornithostrongylus quadriradiatus* (Stevenson, 1904). A — bursa copulatrix (dorsal view); B — proximal ends of spicules; C — distal ends of spicules; D — gubernaculum (dorsal view). (Original)

## Fam. Capillariidae

### 7. *Thominx phasianina* (Kotlan, 1940)

Host: *Ithaginis cruentus cruentus*; location: caecum; locality: Yanle (3600 m), Tadosa (3900 m) — the Barun Khola valley, 8—14 April 1973.

We have found this species (1—2 nematodes per host) in 3 of the 4 *I. c. cruentus* examined. The material comprised 1 male specimen and fragments of 3 females. Similarly as *H. isolonche*, also *T. phasianina* has a very wide geographic distribution. It has been reported both from the free-living and domestic gallinaceous birds from Europe, Asia and South America. The specimens from *I. cruentus* are described in the paper by Ryšavý et al. (1975).

НЕКОТОРЫЕ ЦЕСТОДЫ И НЕМАТОДЫ, НАРАЗИТИРУЮЩИЕ У ПТИЦ ОТРЯДОВ GALLIFORMES И COLUMBIFORMES НЕПАЛА

В. Баруш, Б. Рышавы и М. Даниел

**Резюме.** Сообщается о результатах гельминтологического обследования птиц долины реки Барун Кхола (Высокие Гималаи, восточный Непал): *Tetraogallus tibetanus aquilonifer*, *Ithaginis cruentus cruentus*, *Lophophorus impejanus*, *Columba leuconota* и *Gallus gallus* f. dom. В их пищеварительном тракте было найдено 10 видов паразитических червей (в том числе 3 вида цестод и 7 видов нематод), один из которых, *Ascaridia nepalensis*, описывается в качестве нового вида.

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Received 31 January 1975.

V. B., Parasitologický ústav ČSAV,  
Flemingovo n. 2, 166 32 Praha 6,  
ČSSR