

NEMATODES PARASITIZING DOMESTIC RUMINANTS IN AFGHANISTAN

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Abstract. A total of 12 nematode species were determined in the collection recovered from domestic ruminants in Afghanistan. Ten of them were found for the first time in this region: *Trichocephalus globulosus*, *Trichostrongylus probolurus*, *Cooperia bisonis*, *Nematodirus spathiger*, *N. abnormalis*, *Thelazia rhodesi*, *Bunostomum phlebotomum*, *Haemonchus contortus*, *Dictyocaulus filaria* and *Oesophagostomum radiatum*. Morphological and metrical characteristics of *T. globulosus*, *T. skrjabini* and *C. bisonis*, based on our own material, are added.

The negative influence of nematode infections on the animal production received little attention in Afghanistan and the data available on helminthiases are incomplete and fragmentary. For this reason, a planned investigation of the helminth fauna of domestic animals in Afghanistan has been lately initiated to create prerequisites for an organized control of helminthiases. On the basis of an agreement, the Institute of Parasitology, Czechoslovak Academy of Sciences in co-operation with the Veterinary Faculty, University of Kabul, are working on this task. The results obtained during the studies on nematodes collected by the Czechoslovak-Afghan expedition in 1974 are presented in this paper.

MATERIAL

The nematodes were collected in the slaughter-house in Kabul in September and October 1974. A total of 74 domestic ruminants belonging to 5 species were autopsied and examined for helminths: 37 goats (*Capra hircus* L.), 21 sheep (*Ovis aries* L.), 9 cattle (*Bos taurus* L.), 6 buffaloes (*Bubalus arnee f. bubalis*) and 1 camel (*Camelus dromedarius* L.). The hosts examined originated from various provinces of Afghanistan. Nematode infection was found in 16 goats (50 %), 4 sheep (19 %), 3 cows (50 %), 3 buffaloes (50 %) and 1 camel. It is of interest that the intensity of infection was not high in most species in that season (the findings were mostly occasional, only in some cases the intensity was several tens of nematodes per host).

RESULTS

Family Trichocephalidae

1. *Trichocephalus globulosus* Linstow, 1901

Host: *Camelus dromedarius*. Location: large intestine.

Two specimens (male and female) of this species were found in 1 camel examined. This nematode is known to infect some domestic and wild ruminants of Europe, Asia and Africa. Brief morphological (Fig. 1) and metrical characteristics of our material are given.

Description: The total length of male body is 43.68 mm; the anterior, slender portion measures 31.20 mm, the posterior, thick portion measures 12.48 mm. The muscular oesophagus is 0.88 mm long. The nerve ring is situated at the distance of 0.096 mm from the anterior extremity. A cuticular swelling in form of a vesicle is present at the head part. It measures 0.030 mm in length and 0.039 mm in width. The head is 0.015 mm wide. Cuticular bosses, arranged in a longitudinal line, are present in the oesophageal region of the body. The testis begins 2.18 mm from the posterior end of the body. The canal of cloaca is connected with the spicule sheath at the distance of 0.78 mm from the posterior end of the body. The opening of cloaca is situated on the ventral side of the body, a small distance

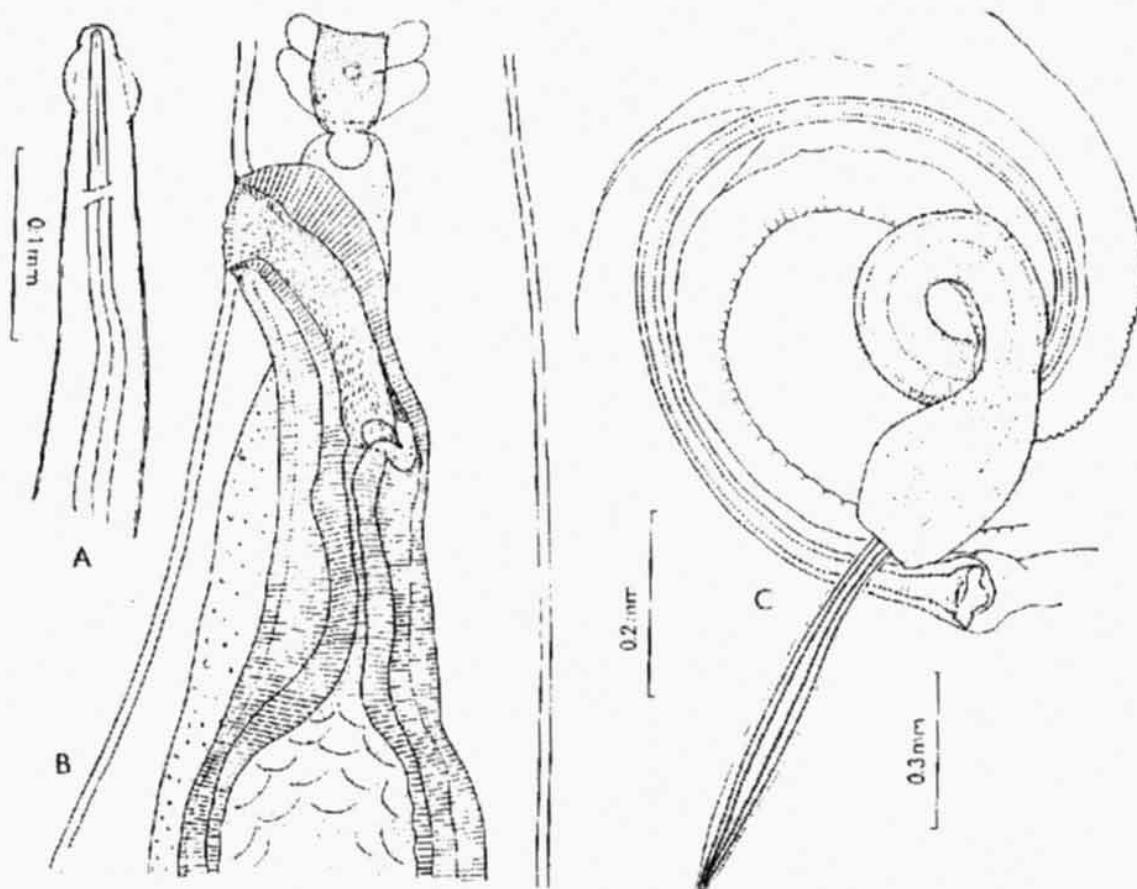


Fig. 1. *Trichocephalus globulosus* Linstow, 1901. A — anterior end of female body; B — vulva region (lateral view); C — posterior end of male body (lateral view). Orig.

from its end. It has a small round papilla on each side. The length of not fully evaginated spicule sheath is 0.98 mm. It has a bulbous swelling in its distal part, 0.29 mm in diameter. The tubular portion of the spicule sheath measures 0.12 mm in width. The spicule measures 3.70 mm in length and 0.11 mm in width at its proximal end. The middle portion of the spicule is 0.037 mm wide. The distal end of the spicule is distinctly widened (0.076 mm in width) and terminated by a sharp point. There are 3 groups of spines of different size on the spicule sheath. Relatively small, scarce spines (size 0.005 mm) on the anterior portion and more densely distributed and larger spines (size 0.014 mm) on the posterior portion of the bulbous widening. The spines on the tubular portion of the spicule sheath are arranged approximately in 66 longitudinal rows and measure 0.007—0.008 mm in length.

The female body is 45.23 mm long; the anterior, slender portion measures 34.94 mm and the posterior one 10.29 mm. The muscular oesophagus measures 0.92 mm in length. The nerve ring is situated at the distance of 0.096 mm from the anterior end of the body. At this level begins also the so-called bacillary band. The head end is 0.016 mm wide. The vesicular swelling is 0.023 mm long and 0.045 mm wide. The vulva is situated 0.12 mm from oesophagus end and its margins are not elevated. The anterior part of vagina is 0.26 mm long and covered inside with short spines. The eggs measure 0.058—0.061 × 0.026—0.029 mm. The anus is almost terminal.

2. *Trichocephalus skrjabini* (Baskakov, 1924)

Hosts: *Capra hircus*, *Ovis aries* and *Bos taurus*. Location: large intestine.

This species was found in 3 sheep from the province Jalalabad (intensity of infection 2—48 nematodes per host), 2 cows from the province Kunduz (1 nematode each), and 6 goats from the provinces Jalalabad and Ghazni (intensity of infection 1—28 nematodes).

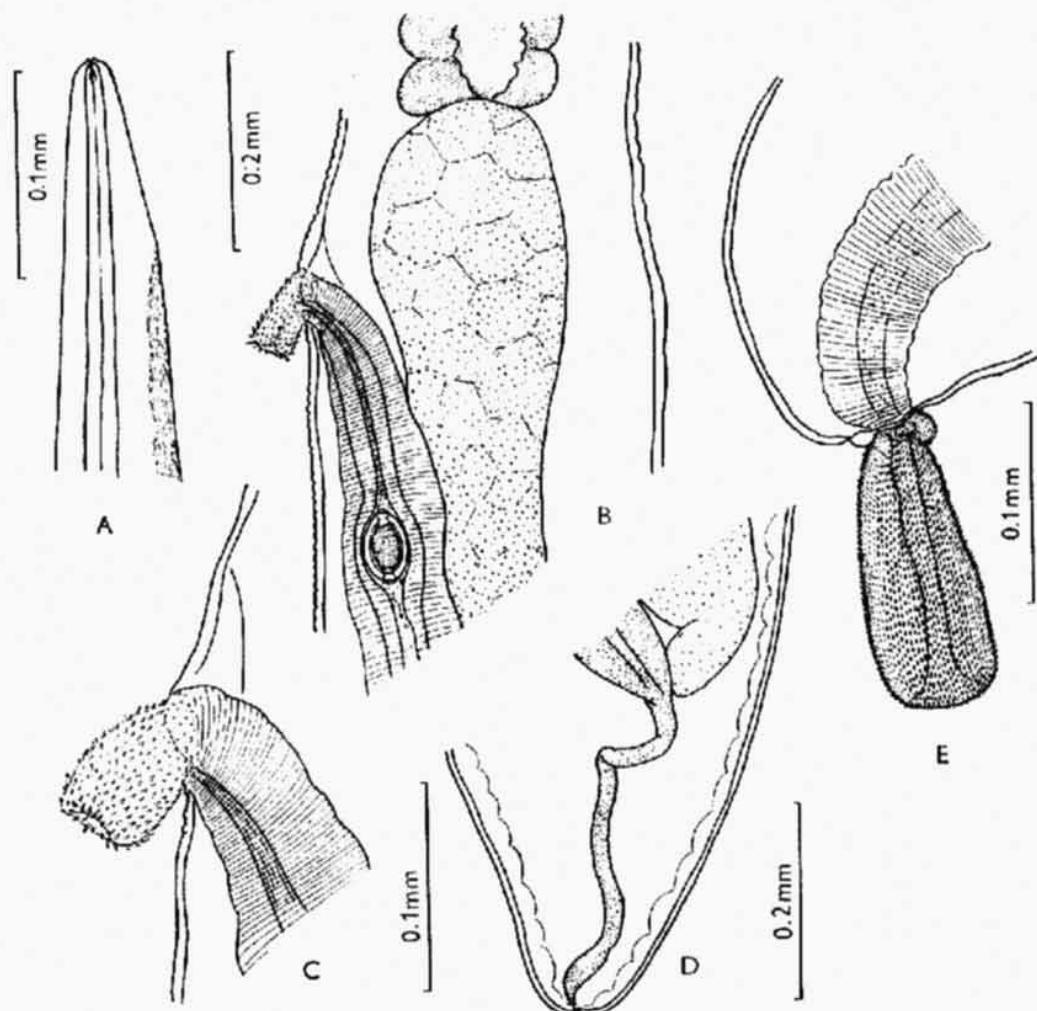


Fig. 2. *Trichocephalus skrjabini* (Baskakov, 1924). A — anterior end of female body; B — vulva region (lateral view); C — vulval appendage (lateral view); D — posterior end of female body (lateral view); E — spicule sheath (lateral view). Orig.

This trichocephalid species belongs to the most frequently occurring and most widely distributed helminths in Afghanistan. It has already been reported from *Gazella subgutturosa* from the vicinity of Herat (Baruš et al. 1972). It is a parasite of various species of domestic and wild ruminants in its distribution area (Europe and Asia). We are giving its morphological and metrical characteristics (Figs. 2 and 3) based on the rich collection of specimens recovered from goats, in order to complete the present knowledge of the variability of this species.

Description: The total length of the male body is 42.70—48.88 mm; the anterior, slender portion measures 30.02—34.15 mm and the posterior, thick portion measures 12.68—14.40 mm. The muscular oesophagus is 0.49—0.61 mm. long. The nerve ring is situated 0.11—0.17 mm from the anterior end of the body. The head part is 0.014—0.016 mm wide. The vesicle is absent. The width of the body is 0.28—0.39 mm at the level of oesophagus end. The testis begins 1.75—2.50 mm from the posterior end of the body. The canal of clonca is connected with the spicule sheath at the distance of 0.80 to

0.85 mm from the posterior end of the body. The cloacal opening is situated on the ventral side of the body, a small distance from the end. There is one papilla about 0.014 mm high on each side of the opening. The evaginated spicule sheath has a more or less cylindrical form and always covers completely the distal end of the spicule. It is densely covered with small spines, measuring about 0.003 mm in length. The spicule measures 1.11—1.47 mm in length, its width being 0.014—0.016 mm in the proximal, 0.008 mm in the middle and 0.008 mm in the distal portions. The spicule tip is rounded.

The female body measures 47.73—52.66 mm in length; the slender, anterior portion is 34.32 to 38.10 mm and the posterior, thick portion is 13.41—14.56 mm long. The muscular oesophagus measures 0.66—0.85 mm in length. The nerve ring is situated at the distance of 0.11—0.18 mm from the anterior end of the body. The head part is 0.018—0.025 mm wide. The vulva is situated at the distance of 0.11—0.28 mm from the end of oesophagus. A bell-shaped vulval appendage, measuring 0.037—0.077 mm in length and 0.033—0.044 mm in width is present. It is densely covered with spines, measuring 0.005 to 0.008 mm in length. The anterior portion of vagina is 0.25—0.37 mm long. The eggs measure 0.066—0.074 × 0.030—0.037 mm. The anus is almost terminal; the rectum is 0.29 to 0.35 mm long.

Fig. 3. *Trichocephalus skrjabini* (Baskakov, 1924) — posterior end of male body (lateral view). Orig.

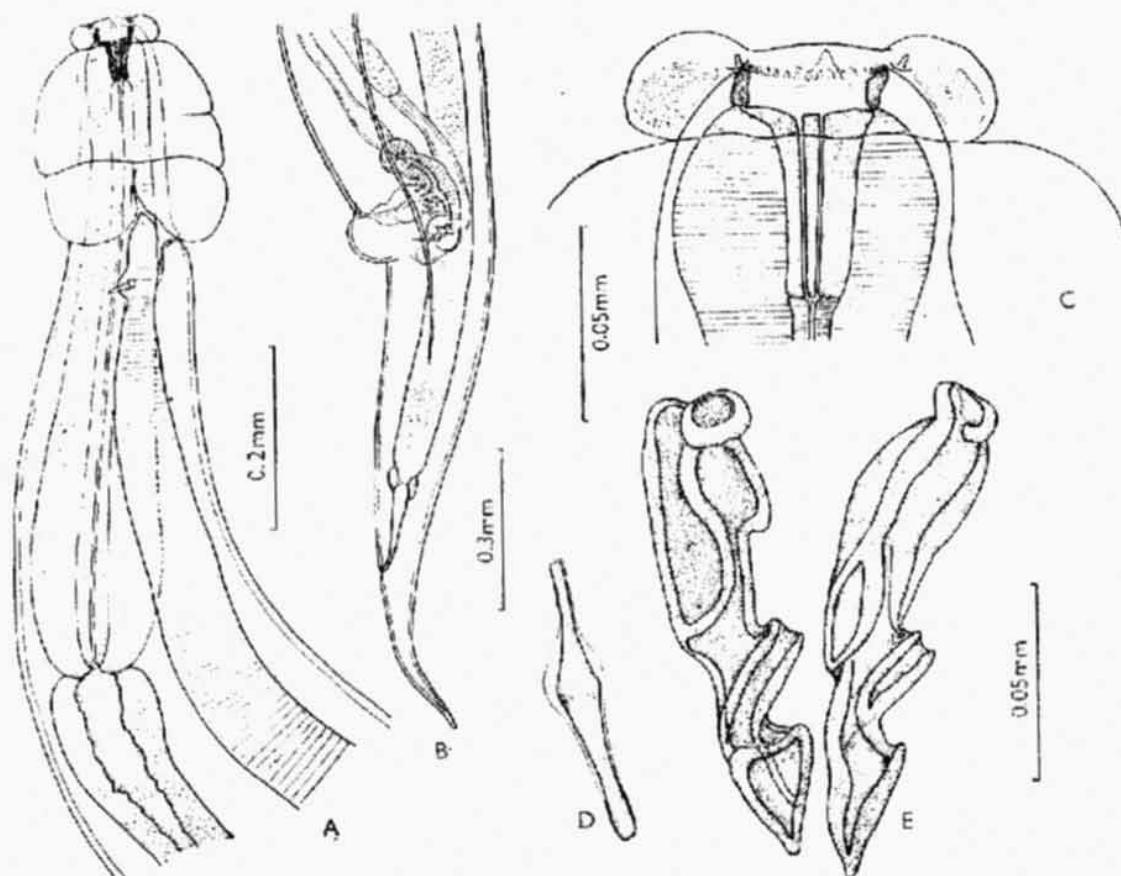
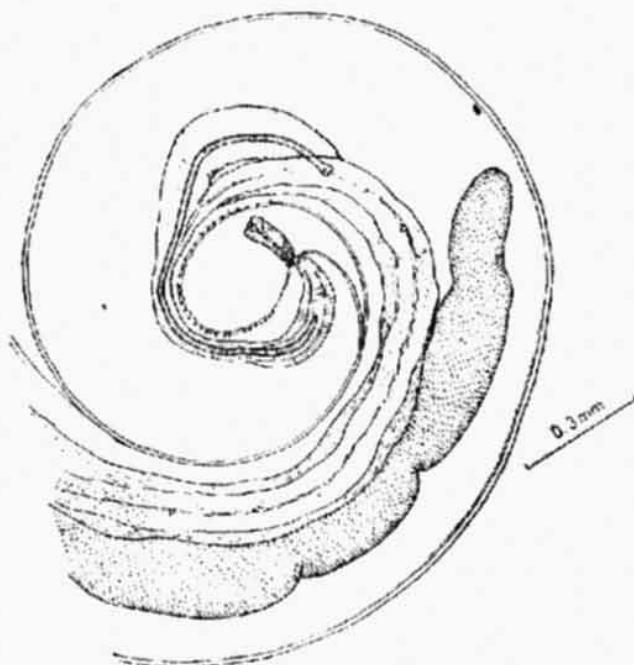


Fig. 4. *Oesophagostomum radiatum* (Rudolphi, 1803) — A, B, C; *Trichostrongylus probolurus* (Railliet, 1896) — D, E. A — anterior end of female body (lateral view); B — posterior end of female body (lateral view); C — anterior end of body (detail); D — gubernaculum; E — spicules. Orig.

Family Trichostrongylidae

3. *Trichostrongylus probolurus* (Railliet, 1896)

Hosts: *Bos taurus*, *Capra hircus* and *Ovis aries*. Location: small intestine.

This species was found in 2 goats from the provinces Jalalabad and Badakhshan (intensity of infection 1 and 28 nematodes per host), 1 cow from the province Kundúz (15 nematodes) and 1 sheep from the province Jalalabad (2 nematodes). This species (Fig. 4D, E) is a widely distributed parasite of domestic and some wild ruminants. It was also recorded in some rodents (*Citellus citellus* and *Lepus tolai*) and rarely in man.

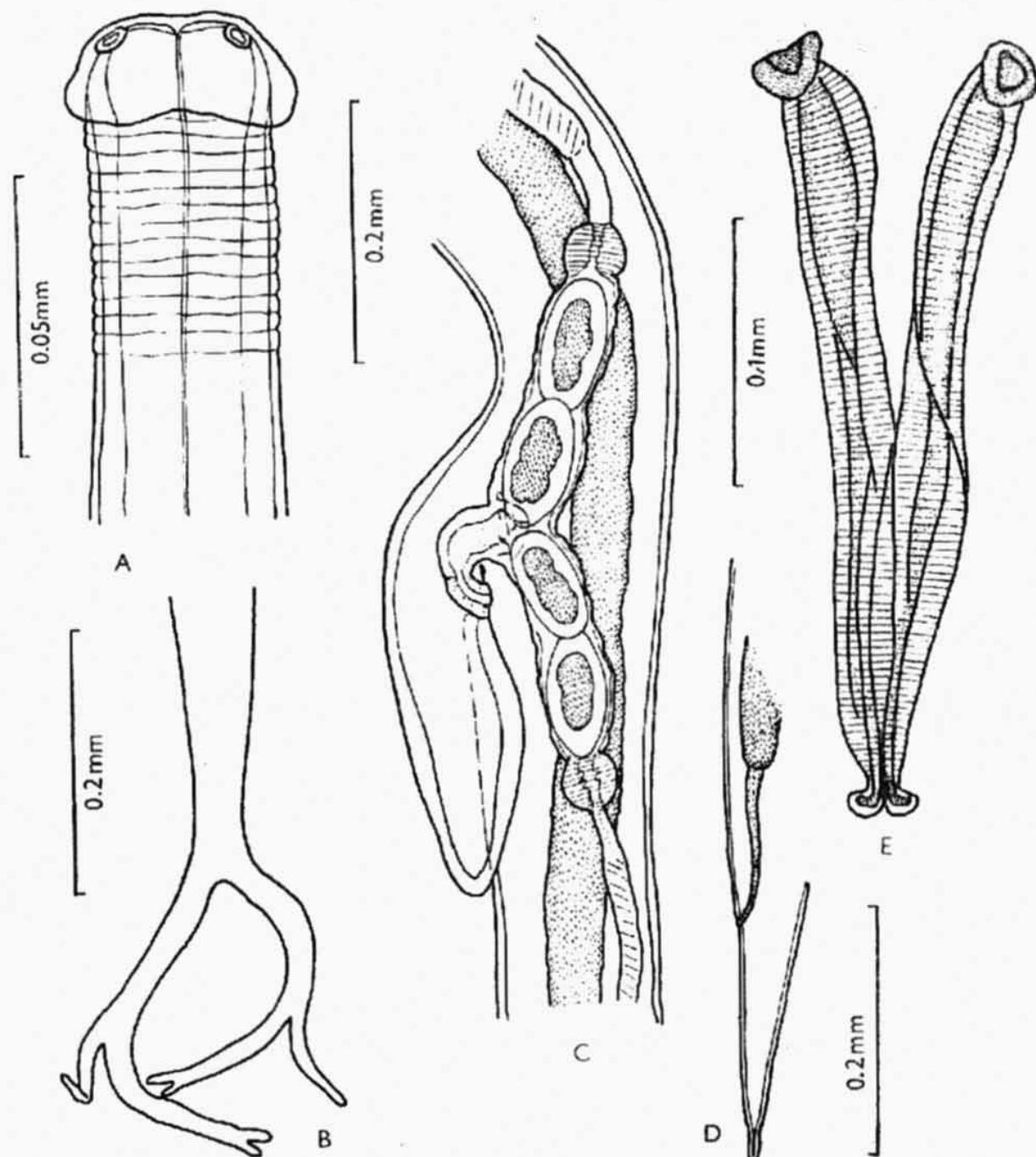


Fig. 5. *Cooperia bisonis* Cram, 1925. A — anterior end of female body (lateral view); B — dorsal rib; C — vulva region (lateral view); D — posterior end of female body (lateral view); E — spicules (ventral view). Orig.

4. *Cooperia bisonis* Cram, 1925

Host: *Bos taurus*. Location: maw.

This species was found in 1 cow from the province Kundúz (intensity of infection 18 nematodes).

The original description was published by Cram (1925) from *Bison bison* L. from Canada. Later on, this species was reported also from Europe (Prokopič 1954) and the Asian part of the U.S.S.R. and Mongolia (Ivashkin 1955) in the cattle and camels. This species occurs relatively rarely and we are, therefore, giving its morphological and metrical characteristics based on our material (Fig. 5).

Description: The nematodes are of whitish colour; their cuticle has very fine transverse striae. The head part is surrounded by a vesicle. Its anterior, widened portion is 0.020—0.026 mm long and 0.042—0.055 mm wide. Longitudinal cuticular bands run throughout the body length, numbering 12—14 in males and 22—30 in females. Pairs of these bands begin at a different distance from the anterior end of the body. The first one about 0.14—0.16 mm and the last one 0.50—0.70 mm from the anterior extremity.

The body of males measures 5.60—7.82 mm in length and 0.17—0.20 mm in maximum width. The oesophagus measures 0.42—0.51 mm in length and 0.037—0.049 mm in maximum width. The nerve ring is situated 0.32—0.36 mm and the excretory pore 0.48—0.55 mm from the anterior end of the body (always postoesophageal). The bursa copulatrix has two wide lateral lobes and one inconspicuous median lobe. The topography of bursal rays in our material is identical with that in the original description. There are two equal spicules, 0.26—0.29 mm long.

The body of females measures 8.15—10.95 mm in length and 0.18—0.22 mm in maximum width. The oesophagus measures 0.45—0.67 mm in length and 0.052—0.076 mm in maximum width. The nerve ring is 0.32—0.37 mm and the excretory pore 0.47—0.71 mm from the anterior end of the body (always postoesophageal). The vulva is situated at the distance of 2.74—3.15 mm from the posterior end of the body. Its upper margin forms a linguiform projection, measuring 0.22—0.34 mm. The anus is situated 0.19—0.23 mm from the tip of the tail. The eggs measure 0.088—0.096 × 0.051 to 0.059 mm.

5. *Haemonchus contortus* (Rudolphi, 1802)

Host: *Capra hircus*. Location: maw.

This species was found in 2 hosts from the province Kundúz (intensity of infection 1 and 2 nematodes per host). It has a cosmopolitan distribution and parasitizes many species of domestic and wild ruminants, occurring rarely also in rodents of the genus *Citellus* and others.

6. *Nematodirus abnormalis* (May, 1920)

Host: *Capra hircus*. Location: small intestine.

This species was found in 2 goats from the province Kundúz (intensity of infection 2 and 10 nematodes per host). It is a common parasite of goats, sheep, camels and some species of wild ruminants in North America, Europe, the Asian part of the U.S.S.R. and Mongolia.

7. *Nematodirus spathiger* (Railliet, 1896)

Hosts: *Bos taurus* and *Ovis aries*. Location: small intestine.

This species was found in 1 cow from the province Kundúz (intensity of infection 5 nematodes per host) and 2 sheep from Jalalabad and Kabul (intensity of infection 1 and 2 nematodes per host). It has a cosmopolitan distribution and parasitizes many species of domestic and wild ruminants. It was reported also from rodents of the genus *Citellus* (Ivashkin 1955).

Family *Dictyocaulidae*

8. *Dictyocaulus filaria* (Rudolphi, 1809)

Host: *Capra hircus*. Location: bronchia and trachea.

Respiratory organs of 305 goats were examined; 10 % of hosts were found to be infected with *D. filaria* (low to medium intensity of infection).

Besides *D. filaria*, the ruminants in Afghanistan are supposed to be infected also with *D. viviparus* (cattle), *D. cameli* (camels) and *D. arnfieldi* (horses).

Family *Trichonematidae*

9. *Oesophagostomum radiatum* (Rudolphi, 1803)

Host: *Bubalus arnee f. bubalis*. Location: large intestine.

This species was found in 2 buffaloes (intensity of infection 3 and 15 nematodes per host) (Fig. 4 A - C). It has a cosmopolitan distribution and parasitizes also cattle and zebu.

The sheep and goats in Afghanistan are supposed to be infected also with other two species of the genus *Oesophagostomum* Molin, 1861, namely *O. venulosum* and *O. columbianum*.

Family *Ancylostomatidae*

10. *Bunostomum phlebotomum* (Railliet, 1900)

Host: *Bubalus arnee f. bubalis*. Location: small intestine.

A single specimen (female) was found in 1 buffalo imported from Pakistan. This species has a cosmopolitan distribution.

11. *Bunostomum trigonocephalum* (Rudolphi, 1803)

Host: *Capra hircus*. Location: small intestine.

This species was found in 3 goats from the province Kundúz (intensity of infection 5—20 nematodes per host). *B. trigonocephalum* has a cosmopolitan distribution and has already been reported from the same host from the vicinity of Kabul in Afghanistan (Baruš et al. 1972).

Characteristic morphological features differentiating *B. phlebotomum* from *B. trigonocephalum* are the form of mouth capsule and number of teeth (Fig. 6).

Family *Thelaziidae*

12. *Thelazia rhodesi* (Desmarest, 1827)

Host: *Bos taurus*. Location: conjunctival sac.

This species is very frequent in Afghanistan. During our examinations of eyes of 22 host specimens we found 18 of them to be infected (intensity of infection 1—25 nematodes per host).

Besides *T. rhodesi*, also other species of the genus *Thelazia* Bosc, 1819 are supposed to cause eye thelaziooses in domestic ruminants, horses and camels in Afghanistan (*T. galosa*, *T. skrjabini*, *T. lacrymalis* and *T. leesei*).

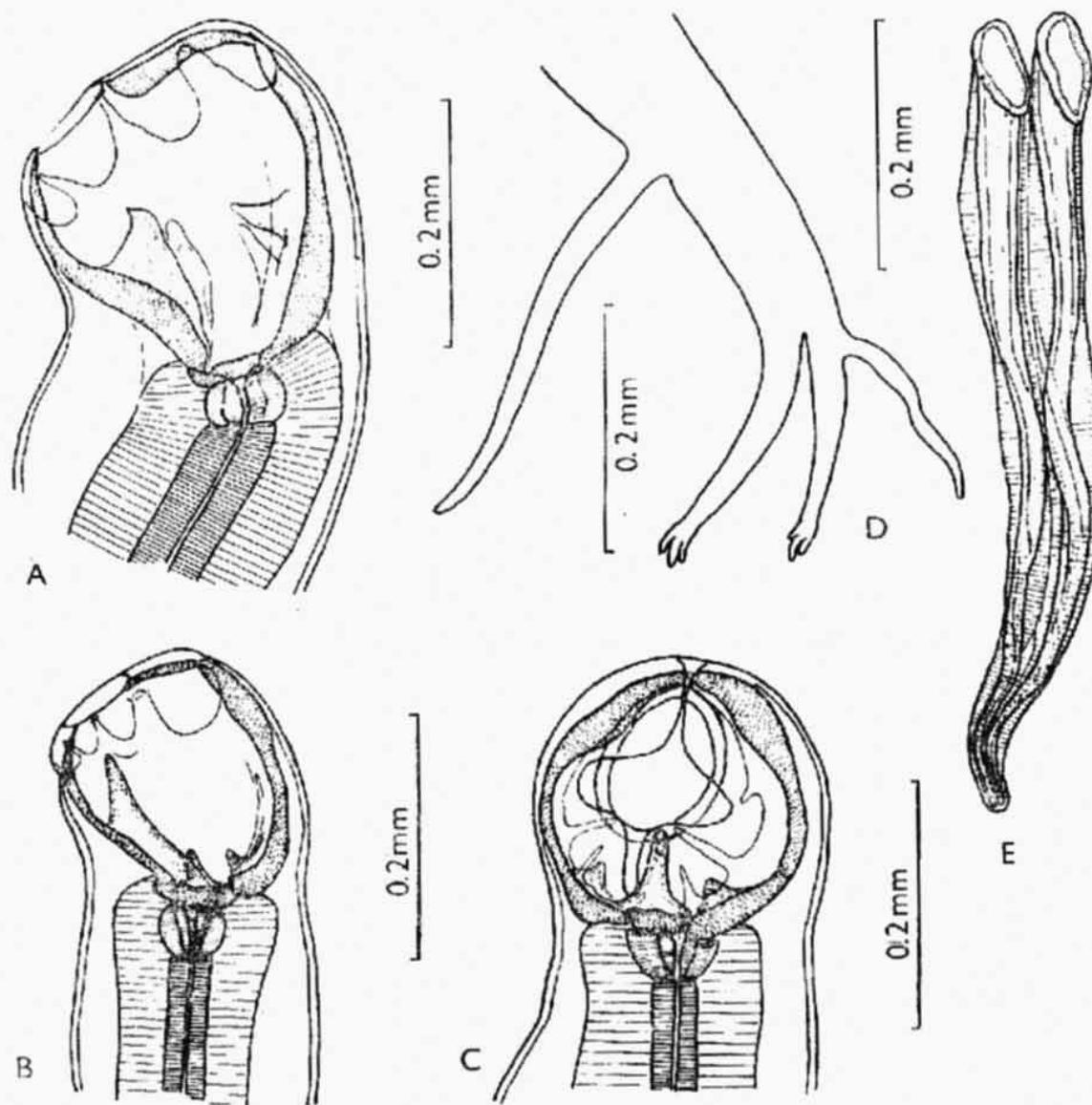


Fig. 6. *Bunostomum phlebotomum* (Railliet, 1900) — A; *Bunostomum trigonocephalum* (Rudolphi, 1803) — B, C, D, E. A — anterior end of female body (lateral view); B — anterior end of female body (lateral view); C — anterior end of body (ventral view); D — dorsal rib; E — spicules. Orig.

DISCUSSION

The records of nematode fauna parasitizing domestic and wild ruminants in Afghanistan have been only fragmentary. The first findings of the causative agents of nematodoses of these definitive hosts (*Bos taurus*, *Capra hircus*, *Bubalus arnee* f. *bubalis* and *Gazella subgutturosa*) from this region were reported by Tenora and Baruš (1968) and Baruš et al. (1972). These authors found 5 species of nematodes in the above hosts: *Trichocephalus skrjabini*, *Bunostomum trigonocephalum*, *Trichostrongylus* sp., *Setaria digitata* and *Onchocerca linealis*.

We have determined 12 nematode species in our collection, 10 of them are the first records from Afghanistan. They are *Trichocephalus globulosus*, *Trichostrongylus probolu-*

rus, *Cooperia bisonis*, *Nematodirus spathiger*, *N. abnormalis*, *Thelazia rhodesi*, *Bunostomum phlebotomum*, *Haemonchus contortus*, *Dictyocaulus filaria*, and *Oesophagostomum radiatum*. There are only 15 nematode species known to infect this group of hosts in Afghanistan. A majority of them are the causative agents of important nematodoses of domestic and wild ruminants, with a cosmopolitan distribution. Only 3 species belong to the epizootological group of biohelminths (*O. linealis*, *S. digitata* and *T. rhodesi*), the others are geohelminths.

In spite of this, the present knowledge of the nematode fauna of domestic ruminants from Afghanistan should be considered preliminary. With regard to the reports on the helminth fauna of domestic animals from Uzbekistan (e.g., Sultanov et al. 1971, Irgashev 1973), a more detailed investigation will undoubtedly reveal other originators of nematodoses even in Afghanistan. Sultanov et al. (1971) found a much wider spectrum of nematode species in the Fergan valley, namely 31 species in sheep, 23 species in goats and 13 species in cattle. Irgashev (1973) recorded 56 species of nematodes in his monograph dealing with helminths of karakul sheep in Uzbekistan. Asadov et al. (1965) recorded 9 nematode species in a survey of helminths of camels.

Of importance are the nematodes of the genus *Thelazia* (*T. rhodesi*), which occurred frequently and in large numbers. Attention should be paid also to the members of the genus *Trichocephalus*. According to our preliminary results, *T. skrjabini* is the most frequently occurring helminth of domestic ruminants in Afghanistan. The nematodes of this genus parasitizing domestic ruminants are widely distributed even in the Soviet Asian republics (Gadzhiev and Saidov 1969, Mamedov 1969).

Nematode species found hitherto in domestic ruminants in Afghanistan (according to different authors)

Bos taurus L.

1. *Trichocephalus skrjabini*
2. *Trichostrongylus probolurus*
3. *Cooperia bisonis*
4. *Nematodirus spathiger*
5. *Thelazia rhodesi*
6. *Onchocerca linealis*

Capra hircus L.

1. *Trichocephalus skrjabini*
2. *Trichostrongylus probolurus*
3. *Trichostrongylus* sp.
4. *Bunostomum trigonocephalum*
5. *Haemonchus contortus*
6. *Nematodirus abnormalis*
7. *Dictyocaulus filaria*

Ovis aries L.

1. *Trichocephalus skrjabini*
2. *Trichostrongylus probolurus*
3. *Nematodirus spathiger*
- Bubalus arnee* f. *bubalis* (L.)
1. *Oesophagostomum radiatum*
2. *Bunostomum phlebotomum*
3. *Setaria digitata*

Camelus dromedarius L.

1. *Trichocephalus globulosus*

ГЕЛЬМИНТЫ, ПАРАЗИТИРУЮЩИЕ У ДОМАШНИХ ЖВАЧНЫХ АФГАНИСТАНА

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Резюме. В коллекции нематод от домашних жвачных Афганистана было определено 12 видов; 10 видов было найдено в первый раз в этой области: *Trichocephalus globulosus*, *Trichostrongylus probolurus*, *Cooperia bisonis*, *Nematodirus spathiger*, *N. abnormalis*, *Thelazia rhodesi*, *Bunostomum phlebotomum*, *Haemonchus contortus*, *Dictyocaulus filaria* и *Oesophagostomum radiatum*. Даны морфологико-метрическая характеристика видов *T. globulosus*, *T. skrjabini* и *C. bisonis* на основе нашего материала.

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B. A. Frolov: Ektoparazity ptits i borba s nimi (Ectoparasites of birds and their control)
Publ. House Kolos, Moskva 1975, 128 pp., 6 Figs., 18 Tables. Price 23 cop.

Along with the progressing transition to the mass breeding of poultry it is necessary to pay more attention to the control of ectoparasites, which might considerably decrease the total meat and egg production in case of their mass occurrence. For example, the losses caused by them in the U.S.S.R. are estimated to attain up to 90 million roubles in some years. The book summarizes the most important results and experiences obtained in this field. The first part deals with the main morphological and biological characteristics of the most important ectoparasites, namely *Dermanyssus gallinae*, *Argas persicus*, *Cimex lectularius* and *Mallophaga*, and methods of their collection. The following part contains characteristics of mostly applied insecticides and acaricides, the data on acute, residual and ovicide effects of individual preparations on the

mentioned four groups of ectoparasites, as well as the data on the toxicity of various preparations to both chicken and adult birds. Another chapter is devoted to the results of application of the preparations in the control of ectoparasites in various farms, economic evaluation of the sanitary measures and a survey of measures recommended for the prophylaxis and control of ectoparasites. Possibilities of the biological control are briefly discussed. The list of references includes the most important Soviet papers dealing with this subject.

The book is not very comprehensive, but it presents many important data which are well arranged and tabulated. It will be helpful to all those concerned with the animal production and control of parasitic arthropods.

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