PARASITIC WORMS OF SMALL MAMMALS FROM THE REGION OF THE TIRICH MIR (HINDU KUSH, WEST PAKISTAN*)

B. KRHRADOVÁ-KOTRILÁ and M. DANIEL

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

Dedicated to B. Ryšavy D.Sc. to commemorate his 50th birthday

Abstract. A description is given of nine species of cestodes and nematodes recovered from small mammals of the mountains of the Eastern Hindu Kush (West Pakistan — the region of the Tirich Mir Massif—South of the main mountain range) at altitudes from 3,650 — 4,100 m during the summer months of 1967. The helminth species found were these: Hydatigera taenioformis, Taenia tenuiscolis, Aprostodondrya macrocephala, Cestodinae cestorium, Syphacia montana, Aspiculurus rysavyi n. sp., A. dinelli, Trichocephalus muris and T. rhombomydis. The findings were compared with the results of investigations into the helminth fauna of small mammals trapped in the Afghan region of the same mountain range (the Vakhsh) situated North of the main range.

MATERIAL

The material for this study was collected during the 2nd Czechoslovak expedition to the Eastern Hindu Kush (Tirich Mir region) in the summer of 1967; two scientific officers of the Institute of Parasitology of the Czech. Acad. Sci., Dr. M. Daniel C.Sc., Dr. P. Rödl participated in it. The animals were trapped from June to August on two sites in the valley of the Tirich Glacier within altitudes from 3,650 — 4,100 m. Of a total of 127 small mammals, 100 were inspected in post-mortem. Organ samples (liver, kidney, lung, spleen, brain) for histological examination were taken from 114 hosts. The small mammals collected belonged to the species: Alticola argentata (Severtzov, 1879), Apodemus sylvaticus (L., 1758), Cricetulus migratorius (Pallas, 1770) and Crocidura russula (Hermann, 1780). The incidence of parasites in the individual hosts is shown in Table 1.

Brief characteristics of the individual sites

A—(this designation is consistent with that in Table 1 and in the following text). The environment at the confluence of the Upper and Lower Tirich Glacier (4,000 to 4,100 m above sea level). On the slopes opposite the mountain range leading to the East of the Tirich Mir Massif there were three grass strips winding through rock and stone debris. Small brooks fed from the higher situated snow field were flowing through two of these grass strips, the third one was waterlogged in its upper reaches. The vegetation was favourably influenced by the southern exposition of this site.

B—Part of the valley close to the head of the Tirich Glacier (3,650 above sea level) called Shekhnayak. This part was covered with numerous islets of bushy willow and birch forming isolated impermeable patches divided from one another by narrow strips of stone debris fields.

*) Results of the Second Czechoslovak Expedition to the Hindu Kush in 1967. Communication No. 11.
| Trapping site | Host species | Number of trapped hosts | Number of examined hosts | Number of infected hosts | *Aspiculuris macrocephala* | *Catenucleia cricetorum* | *Tenuicola leucobatis* | *Syphacia modesta* | *Aspiculuris diminutus* | *Trichocephalus muris* | *Trichocephalus rhomboides* | *Hylodera laeviformis* | *Aspiculuris rupicola* | *Hylodera laeviformis* | *Aspiculuris rupicola* | *Trichocephalus muris* | *Trichocephalus rhomboides* | *Aspiculuris rupicola* | *Syphacia modesta* | *Aspiculuris rupicola* |
|--------------|--------------|-------------------------|-------------------------|-------------------------|---------------------------|---------------------------|------------------------|------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|------------------------|---------------------------|
| Site A altitude 4,000 to 4,100 m | *Alticola argentina* | 18 | 18 | 4 | 1 | - | - | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - |
|                           | *Cricetulus migratorius* | 1 | 1 | 1 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| Site B altitude 3,650 m | *Alticola argentina* | 61 | 49 | 19 | - | 3 | 1 | 3 | 4 | 2 | - | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|                           | *Apodemus sylvaticus* | 37 | 22 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|                           | *Cricetulus migratorius* | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|                           | *Crocidura russula* | 8 | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total                     | 127 | 100 | 24 | 1 | 3 | 1 | 4 | 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
SYSTEMATICS

1. Hydatigera taeniaeformis (Batsch, 1783)
Host: A. argentata; location: liver (one larva); locality: site “B”; date of collection: July 28, 1967.

2. Taenia tenuicollis Rudolphi, 1819
The larvae of this cestode were found in a variety of rodents and insectivores from the holoarctic region. Gvozdev et al. recovered it from several Ochotonae in the U.S.S.R.

3. Aprostatandrya macrocephala (Douthitt, 1915)
Host: A. argentata (one specimen); location: caecum; locality: site “A”; date of collection: June 30, 1967.
This cestode parasitizes various small mammals of the holoarctic region.

4. Catenotaenia cricetorum Kirschenblatt, 1949
Host: A. argentata (3 specimens); location: small intestine; locality: site “B”; date of collection: July 30 and August 9, 1967.

NEMATODA

5. Syphacia montana Yamaguti, 1943
This species, originally described from Japan, was recorded from the U.S.S.R. and Czechoslovakia (High Tatra Mountains). Baruš et al. (1970) recovered this species from Ellobius fuscocapillus trapped near Kabul in Afghanistan. Our material consisted of female worms only, but the measurements of the females with the typical cephalic vesicula indicated the identity of our species with Syphacia montana. Our measurements are compared with those recorded by Yamaguti (1943) and Baruš et al. (1970) in Table 2.

Table 2. Comparison of measurement of Syphacia montana (female worms) (in mm).

<table>
<thead>
<tr>
<th></th>
<th>Yamaguti (1942)</th>
<th>Baruš et al. (1970)</th>
<th>Our material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body length</td>
<td>3.700-5.900</td>
<td>3.270-4.050</td>
<td>3.500-4.200</td>
</tr>
<tr>
<td>Body width</td>
<td>0.250-0.300</td>
<td>0.270-0.350</td>
<td>0.292-0.330</td>
</tr>
<tr>
<td>Pharynx length</td>
<td>0.300-0.400</td>
<td>0.270-0.320</td>
<td>0.298-0.374</td>
</tr>
<tr>
<td>Bulbus length</td>
<td>0.078-0.102</td>
<td>0.065-0.080</td>
<td>0.057-0.088</td>
</tr>
<tr>
<td>Distance of vulva from anterior body end</td>
<td>0.650-0.775</td>
<td>0.440-0.650</td>
<td>0.396-0.572</td>
</tr>
<tr>
<td>Distance of anus from posterior body end</td>
<td>0.450-0.900</td>
<td>0.580-0.700</td>
<td>0.598-0.604</td>
</tr>
<tr>
<td>Size of eggs</td>
<td>0.108-0.125</td>
<td>0.102-0.109</td>
<td>0.110-0.114</td>
</tr>
<tr>
<td></td>
<td>0.029-0.040</td>
<td>0.036-0.043</td>
<td>0.036-0.039</td>
</tr>
</tbody>
</table>
6. *Aspiculuris dinniki* Schulz, 1927


This species parasitizes rodents from high mountain localities; all other species of this genus except *A. labonica, A. kazakstanica, A. schulzi*, are parasites of synanthropic rodents. We found this species also in *Alticola argenata* from the locality Chap Darrah (Erhardová-Kotrla and Daniel 1970). Akhtar (1955) divided the genus *Aspiculuris* in 4 subgenera on the basis of the determination of the cervical alae and on the presence of lateral alae. He placed species with no lateral alae in the subgenus *Anaspiculuris*, those with a sickle-shaped termination of the cervical alae which did not continue into lateral alae, in the subgenus *Aspiculuris* and those, in which the cervical alae continued into lateral alae, in the subgenus *Paraspiculuris*. The cervical alae of members of the subgenus *Pseudaspiculuris* have no sickle-shaped distal ending. According to Akhtar, the species *A. dinniki*, similar as *A. tetaptera, A. schulzi* and *A. kazakstanica*, are members of the subgenus *Aspiculuris*. By contrast, our material indicates that this sign is not constant and that it shows considerable variation. We have tried to illustrate this in the figure. The cervical alae of *A. tetaptera* terminate mainly at half the bulbous length; sometimes, they may have a sickle-shaped termination. The distance between both alae may be considerable. According to Akhtar there is a large distance between the cervical and lateral alae of *A. dinniki*, but we found individuals with lateral alae extending beyond the termination of the cervical alae. The same applies also to the following species.

7. *Aspiculuris rysavyi* sp. n.

This new species has been named in honour of the Czechoslovak parasitologist Professor Dr. B. Rysavý.


**Male (holotype)**: overall length 5.4 (5.5—5.8 mm), maximum width 0.245 (0.210 mm) Length of pharynx 0.408 mm (0.352—0.490 mm), size of bulb 0.110×0.114 mm (0.114×0.154 mm). The anterior portion of the gut is extended and thus wider than
the bulbus. The well-developed cuticular vesicle surrounding the cephalic portion extends to a length of 0.079 mm (0.128 mm) and bears transverse striation. These are 4 cuticular elevations on the anterior portion. The cervical alae are wide and extend along almost the entire length of the pharynx terminating at the site of its entrance to the gut. Their termination is sickle-shaped. Mostly, the cervical alae pass directly into the lateral alae. The termination of the body is rounded and bent ventrally. It is surrounded by large caudal alae extending to the cloaca level and surrounding the entire end of the body including the tip of the tail. Close to the cloaca placed at 0.180 mm (0.260 mm) from the tip of the tail there are 4 pairs of papillae: one unpaired postanal papilla is situated in midbody. Another pair of papillae lies about midway between the cloaca and the tip of the tail.

Fig. 2. Aspicularis rysavyi sp. n. A—anterior body end of the female; B—posterior body end of the male (side-view); C—caudal alae surrounding the complete tip of the tail (frontal view).

Female: overall length 7.0 (6—8 mm), maximum width 0.320 (0.360 mm). Pharynx length 0.426 (0.506 mm). Length of cervical alae 0.400 mm (0.486 mm). Vulva at 1.9 mm (2.5 mm) from anterior end of body, anal pore at 0.604 (0.810 mm). Length of eggs 0.083 mm (0.079—0.081 mm), width 0.039 (0.047 mm).

Discussion. Aspicularis rysavyi sp. n. may be distinguished from all other members of the genus on the basis of the caudal alae of the male worm surrounding the entire body. Of the species of Aspicularis known from the literature, A. rysavyi sp. n. resembles most closely A. diniki, but may be differentiated on the basis of the caudal alae which in the latter species terminate closely above the tip of the tail which is pointed and bare. The caudal alae of A. pakistanica are paired and the tip of it tail bears an independent pair of caudal alae. In the latter two species the arrangement of the papillae is also different.

The type material is deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, under collection No. 1,035.

8. Trichocephalus muris Schrank, 1788

Host: A. argentata (2 specimens); location: caecum; locality: site “B”; date of collection: July 29 and August 8, 1967.
9. *Trichocephalus rhombomydis* Schulz et Landa, 1934

Host: *Cricetulus migratorius* (one specimen) and *A. argentea* (one specimen); location: caecum; locality: site “A” on July 12, 1967.

Schulz and Landa (1934) described this parasite from *Rhombomys opimus* from the U.S.S.R. In 1960, Tokobayev recovered these parasites from *Meriones tamariscinus* and *M. erythraeourus* from the Kirgiz S.S.R. No findings have been recorded as yet from Pakistan.

**DISCUSSION**

Conditions in the Afghan part of the Eastern Hindu Kush and the vertical distribution of parasites in this high mountain area have been described in an earlier paper (Erhardová-Kotrlá and Daniel 1970). The material for the present paper has been collected at a distance of approximately 80 km by straight line from the original collecting sites, but to the South of the main mountain range. This enables a direct comparison of the results, which is especially interesting for the fact that the peaks of the Eastern Hindu Kush are considered to form the boundary between the palearctic and oriental region.

The results of this comparison are these:

1. Consistent with our earlier work we did not find any trematodes.
2. With the exception of a single finding in *C. migratorius*, all other worms were found in the rodent *Alticola argentea*. This host is typical of the biotope under consideration being the main (and often the only) component of the fauna of small terrestrial rodents of this area. Similar as in our earlier paper, no infection with parasitic worms was found in *Apodemus sylvaticus* and *Crocidura russula*.
3. The findings of the same helminth species in both parts of the Eastern Hindu Kush are restricted either to helminth species with a cosmopolitan pattern of distribution (*Hydatigera taeniaeformis*, *Trichocephalus muris*) or those distributed throughout the holarctic region (*Catenotaenia cricotoma*, *Aspiculuris dinniki*). We found none of the four new species of the Vakhan region, provisionally assigned as endemic species, in the region of the Tirich Mir. These endemites are the nematode species *Citellina hindukushensis*, *Cephaluris vakhania*, *Dermatoxys havliki* and *Aspiculuris ariana* (*Cephaluris vakhania* was found by Baruš et al. 1970 in *Ochotona rufescens* from the locality Unnai (3,000 m above sea level)—Afghanistan). This supports our assumption on the endemic character of this species and its host specificity.
4. On the other hand, the most frequent parasite of *Alticola argentea* was the nematode *Aspiculuris rysary* sp. n., which at present, can also be considered to be an endemite.

**REFERENCES**


ERHARDOVÁ-KOTRLÁ B., DANIEL M.,