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MESOSTIGMATID MITES OF SMALL MAMMALS FROM THE HINDU KUSH (AFGHANISTAN)*

M. DANIEL

Institute of Parasitology, Czechoslovak Academy of Sciences, Prague

Abstract. During the First Czechoslovak mountaineering expedition to the Hindu Kush (1965) a material of mesostigmatid mites was collected from small mammals, yielding 16 species. Due to the fact that it is the first collection of these parasites studied in Afghanistan, a zoogeographic analysis, altitudinal stratification and epidemiological estimation are appended.

Within the framework of biological research during the First Czechoslovak mountaineering expedition to the Hindu Kush (June—September 1965) free-living small mammals were trapped and their complex parasitological examination carried out (Daniel 1966). Main attention in the field work was paid to the high altitude region of the East Hindu Kush (Ishmurkh Darrah valley). Incidentally collections were also made in other parts of Afghanistan, primarily in the surroundings of Kabul and the Band-i-Amir lakes.

MATERIAL

A total of 173 small mammals (8 species of rodents, 2 species of lagomorphs and 1 species of insectivores) was studied. The number of specimens, on which mesostigmatid mites were found, is indicated with each species in brackets, following the total number of hosts examined: *Alticola roylei* (Ogilby) 65 (15), *Apodemus sylvaticus* (L.) 22 (14), *Cricetulus migratorius* (Pallas) 6 (1), *Microtus afghanus* Thomas 9 (8), *Mus musculus* L. 5 (1), *Meriones meridianus* (Pallas) 3 (1), *Marmota caudata* Geoffroy 7 (0), *Ochotona roylei* (Ogilby) 15 (0), *Ochotona rufescens* Gray 20 (5), *Crocidura russula* Hermann 20 (3).

COLLECTING LOCALITIES

(listed in west-east order, with enumeration of trapping and collecting results)

Band-i-Amir, 34. 49 N; 12 E (surroundings of a series of small lakes, about 80 km W. of Bamiyan, 2,000–2,500 m a.s.l.). Bamiyan province.
26. VI. 1965 — *Ochotona rufescens* 16 (4)

Shibar Pass, 34. 54 N; 14 E (rocky slopes in the pass and its close vicinity, +3,000 m). Parwan province.
25.–27. VI. 1965 — *Ochotona roylei* 1 (0), *Ochotona rufescens* 4 (1)

Kabul, 34. 30 N; 10 E (along irrigation canals and in adjoining fields, +1,800 m). Kabul province.
24. VI.–7. VII. 1965 — *Apodemus sylvaticus* 6 (3), *Microtus afghanus* 9 (8), *Mus musculus* 4 (1)

Faisabad, 37. 05 N; 70. 40 E (fallows among fields on hill slopes, and garden walls). Badakhshan province.
13.–14. VII. 1965: *Meriones meridianus* 3 (1), *Mus musculus* 1 (0), *Neosoria indica* 1 (1).

*) Scientific results of the Czechoslovak expeditions to the Hindu Kush and Himalaya. Communication No. 26.

Chap Darrah, 36. 53 N; 72. 21 E. (a valley parallel to the Ishmurkh Darrah, about 6 km S. of Ishmurkh. The upper part represents a steppe of *Artemisia leucotricha* + *Stipa himalaica* association.)
15.—20. VIII. 1965 — *Alticola roylei* 15 (0), *Marmota caudata* 7 (0), *Ochotona roylei* 11 (0).

Ishmurkh village, 36. 57 N; 72. 22 E (banks of irrigation canals, growths and walls between fields; 2,750 m, biotope indicated as "D" in Table 1 and subsequent text). Badakhshan province.
18.—19. VII. 1965 — *Apodemus sylvaticus* 2 (0), *Cricetulus migratorius* 6 (1).

Ishmurkh Darrah, 36. 50 N; 72. 22 E. (a valley about 10 km SSE of Ishmurkh; 2,850—4,550 m.) Badakhshan province.

Individual biotopes (indicated as in Table 1 and subsequent text):
A) Islet of ice-free rocky terraces at the confluence of eastern and western branches of the Ishmurkh glacier (a place called Shangri La), 4,550 m.
8.—11. VIII. 1965 — *Alticola roylei* 13 (7).
B) Area near the front of Ishmurkh glacier, moraines and scree fields with turf; 3,800—4,000 m.
21.—25. VII., 3.—5. VIII., 28. VIII. 1965 — *Alticola roylei* 13 (3), *Ochotona roylei* 2 (0).
C) Willow coppice (place called "jangal" by natives) 2,850 m.
22.—27. VIII. 1965 — *Alticola roylei* 24 (5), *Apodemus sylvaticus* 14 (11), *Ochotona roylei* 1 (0), *Crocidura russula* 20 (3).

Detailed characteristics of the high-mountain biotopes are given in the paper of Hadač (1970).

SURVEY OF SPECIES

Parasitidae

Parasitus sp.

Material: Kabul, 1 N II on *M. afghanus* (7. 7. 1965).

Sole immature specimen precluded any possibility of species identification.

Macrochelidae

Macrocheles matrius (Hull, 1925)

Material: Kabul, 5♀ on *M. afghanus* (6. 7. 1965).

Common in Europe and Asia; Bregetova (1966) listed it in the group of palearctic ubiquitous species.

Ameroseiidae

Proctolaelaps pygmaeus (Müller, 1860)

Material: Kabul, 8♀ on *M. afghanus* (24. 6. 1965); Ishmurkh Darrah (biotope "C"), 1♀ on *A. sylvaticus* (27. 8. 1965).

After Westerboer (1963) it is widespread in W. Europe, U.S.A. and Canada; Karg (1971) mentions its findings from Indonesia, Australia, New Zealand and South Africa.

Proctolaelaps sp.

Material: Ishmurkh Darrah (biotope "C"), 1♀ on *C. russula* (28. 8. 1965).

Sole, slightly damaged specimen precluded any possibility of a closer species identification.

Dermanyssidae

Laelaps agilis Koch, 1863

Material: Kabul, 2♀ on *A. sylvaticus* (1. 7. 1965); Ishmurkh Darrah (biotope "C"), 85♀ on 10 *A. sylvaticus*, 6♂ on 5 *A. sylvaticus*, 12♀ and 2♂ on *C. russula* (22.—27. 8. 1965).

After Bregetova's classification it is a western palearctic species; Evans and Till (1966) report its occurrence in Britain, Iceland and Europe. After Zemskaya (1973) in the USSR it ranges to the Urals, its eastward occurrence being sporadic. It is missing in the West-Siberian Plain, East Siberia and the Primorye territory in the Far East. From the S. Urals it ranges across N. Kazakhstan to S. Altai. Sartbaev (1975) recorded the occurrence of *L. agilis* in Kirghizia; Ramachandra Rao et al. (1973) found it in the mountain regions of N. India (Kashmir, Jammu, Uttar Pradesh).

Laelaps algericus Hirst, 1925

Material: Kabul, 10♀ on *A. sylvaticus* (1. 7. 1965) and 3♀ on *M. musculus* (7. 7. 1965).

A specific parasite of *M. musculus*, distributed primarily in the Mediterranean region. Northeastwards from there it is abundant in southern regions of the USSR, i.e. in places where *M. musculus* lives all the year round in free nature (Zemskaya 1973). Bregetova (1956) reports its occurrence in Moldavia, Ukraine, the Volgograd and Astrakhan regions, N. Caucasus, Transcaucasia, Azerbaidzhan, the Alma-Ata region and Tadzhikistan; Sartbaev (1975) adds Kazakhstan and Kirghizia. Allred (1969) found this mite in Pakistan, Ramachandra Rao et al. (1973) in the mountain regions of N. India (Kashmir, Jammu, Uttar Pradesh, Sikkim).

Laelaps jettmari Vitzthum, 1930

Material: Kabul, 7♀ and 2♂ on *M. afghanus* (24. 6. 1965), 2♀ and 1♂ on *A. sylvaticus* (1. 7. 1965).

The taxonomic concept of this species is after Bregetova (1956). Strandtmann and Wharton (1958) reports this mite from Japan and Manchuria, Bregetova (1956) from Georgia, Armenia, Moldavia an the Volgograd region. Zemskaya (1973) also lists the Kursk region, Crimea, Turkmenia, Kirghizia and Kazakhstan. Details on the occurrence of this mite from the mountain regions of Kirghizia are given by Sartbaev (1975).

Laelaps turkestanicus Lange, 1955

Material: Faisabad, 2♀ on *N. indica* (14. 7. 1965).

It was described from Tadzhikistan (from *Rattus turkestanicus*). Sartbaev (1975) reports it from the south of the Kirghiz SSR, Allred (1969) from Pakistan and Ramachandra Rao et al. (1973) from the mountain regions of N. India: Himachal Pradesh, Jammu, Kashmir, Uttar Pradesh, West Bengal.

Laelaps sp.

Material: Kabul, 1 N II on *A. sylvaticus* (1. 7. 1965).

Sole immature specimen precluded any possibility of a closer species identification.

Androlaelaps casalis (Berlese, 1887)

Material: Kabul, 1♀ on *A. sylvaticus* (1. 7. 1965); Faisabad, 1♀ on *M. persicus* (13. 7. 1965).

A common species living primarily in nests of birds and mammals. Strandtmann (1958) as well as Evans and Till (1966) consider to be cosmopolitan. In the Central Asiatic region Bregetova (1956) reports this mite from Tadzhikistan, Sartbaev (1975) from Azerbaidzhan, Kazakhstan and Kirghizia, Allred (1969) from Pakistan. Dusbábek (1970) reports a finding of this species in Afghanistan from the bat *Pipistrellus pipistrellus* (Kunduz, 5. 9. 1965, lgt. M. Daniel).

Hypoaspis miles (Berlese, 1892)

Material: Faisabad, 2♀ on *M. persicus* (13. 7. 1965).

A Holarctic species, primarily of steppe character. From Central Asia Bregetova (1956) reports it (under the name *Cosmolaelaps gurabensis* Fox, 1946) from Uzbekistan and Tadzhikistan; Sartbaev (1975) also lists Kazakhstan, Azerbaidzhan and Kirghizia. Allred (1969) found this mite in Pakistan.

Haemogamasus nidiformes Bregetova, 1955

Material: Ishmurkh Darrah (biotope "A"), 1♀ on *A. roylei* (9. 8. 1965).

An East-Siberian species (Bregetova 1968). It was described from the Tian Shan (on *Microtus gregalis* Pallas). In other parts of Central Asia it was reported by Sartbaev (1975) from Kirghizia, and by Senotrusova and Kapitonov (1972) from Kazakhstan. Allred (1969) found this species in Pakistan. It also ranges into the mountains of Central Europe, the High Tatras in Czechoslovakia (Mrciak 1958).

Eulaelaps stabularis (Koch, 1836)

Material: Kabul, 1♀ on *M. afghanus* (24. 6. 1965), 1♀ on *A. sylvaticus* (1. 7. 1965).

A common species throughout the Holoarctic.

Allodermanyssus sanguineus (Hirst, 1914)

Material: Band-i-Amir, 1♀ on *O. rufescens* (26. 6. 1965); Shibar Pass, 1♀, 1 N I on *O. rufescens* (27. 6. 1965); Ishmurkh (biotope "D"), 1 N II, 6 N I on *C. migratorius* (19. 7. 1965), Ishmurkh Darrah (biotope "C"), 3♀ on 3 *A. roylei*, 2 N II on 2 *A. roylei*, 1 N II on *A. sylvaticus*, 4 N I on 2 *A. roylei*, 1 N I on *C. russula* (22.—27. 8. 1965).

According to the classification of Bregetova (1968) it is a circumsubtropical species. Its occurrence in Central Asia has been reported by Zemskaya (1973) from Turkmenia, Uzbekistan and Tadzhikistan, by Sartbaev (1975) also from Kirghizia. Allred (1969) recorded this species from Pakistan.

Hirstionyssus meridianus Zemskaya, 1955

Material: Kabul, 1♀ on *M. afghanus* (24. 6. 1965).

Bregetova (1956) reports its occurrence in Turkmenia, Tadzhikistan and in southern region of the European part of the USSR. Bibikova (1956) also mentions Kazakhstan. Allred (1969) found this species in Pakistan.

Hirstionyssus latiscutatus (de Meillon et Lavoipierre, 1944)

Material: Band-i-Amir, 4♀ on *O. rufescens* (26. 6. 1965).

Strandtmann and Wharton (1958) recorded its occurrence in S. Africa (Republic of South Africa, Transvaal) on *Rattus rattus*. Evans and Till (1966) reported this species from Europe and the USSR after concluding that *H. orcadensis* (Turk, 1946) and *H. musculi* (Johnston, 1949) in Bregetova (1956) are its synonyms. In accordance with this conclusion we further cite the data of Soviet authors concerning *H. musculi* (sensu Bregetova 1956) under the name *H. latiscutatus*. Allred (1969) found this species in Pakistan.

Hirstionyssus criceti (Sulzer, 1774)

Material: Kabul, 3♀ on 2 *M. afghanus* (24. 6. 1965), 4♂ on 2 *M. afghanus*, 1♂ on *A. sylvaticus*, 43 N II on *M. afghanus*, 1 N II on *A. sylvaticus*, 3 N I on *M. afghanus* (4.—7. 7. 1965); Band-i-Amir, 4♀ on 2 *O. rufescens* (26. 6. 1965).

Strandtmann and Wharton (1958) recorded the distribution of this mite in Germany and the USSR; both Bregetova (1956) and Sartbaev (1975) cite this species as common in the USSR.

Hirstionyssus stoliczkai Dusbábek et Daniel, 1975

Material: Ishmurkh Darrah (biotope "B"), 4♀ on 3 *A. roylei* (24.—25. 7. 1965).

Preliminarily we consider this species described from the high mountain region visited to be endemic.

Hirstionyssus transiliensis Bregetova, 1956

Material: Ishmurkh Darrah (biotope "A"), 11♀ on 6 *A. roylei*, 1 N II on *A. roylei* (8.—10. 8. 1965); Ishmurkh Darrah (biotope "C"), 6♀ on 2 *A. sylvaticus*, 2♀ on 2 *C. russula*, 2♂ on *A. sylvaticus*, 1 N II on *A. sylvaticus* (26.—27. 8. 1965).

This species has been described from the mountain region of Kazakhstan (Trans-Ili Ala-Tau). From Central Asia it has been reported by Sartbaev (1975) from the mountains of Kirghizia. Allred (1969) found this mite in Pakistan.

DISCUSSION

As this is the first identified group of mesostigmatid mites, belonging to the most numerous group of ectoparasites of free-living and domestic animals, collected in Afghanistan, we shall try to characterize them briefly from the aspect of zoogeography, altitudinal stratification and medical importance.

ZOOGEOGRAPHIC CHARACTERIZATION

The species found by us in Afghanistan may be divided (according to the supplemented classification of Bregetova 1968) into the following categories:

I. Holarctic species: *Hypoaspis miles, Eulaelaps stabularis*

II. Palearctic — ubiquitous species: *Macrocheles matrius*
— West-Palearctic: *Laelaps agilis*
— Central-Asiatic: *Laelaps turkestanicus, Hirstionyssus criceti*
H. meridianus, H. transiliensis, H. stoliczkai
— Mediterranean: *Laelaps algericus*
— East-Siberian: *Haemogamasus nidiformes*
— Manchurian-Chinese: *Laelaps jettmari*

III. Circumsubtropical species: *Allodermanyssus sanguineus*

IV. Cosmopolitan species: *Androlaelaps casalis, Proctolaelaps pygmaeus,? Hirstionyssus latiscutatus.*

The basic part of the mite group described are Palearctic species, of which the most numerous is the group of Central-Asiatic species. In it the steppe species (*Laelaps turkestanicus, Hirstionyssus meridianus, H. criceti*) and montane species (*Hirstionyssus transiliensis, H. stoliczkai*) are clearly distinguished.

Of a typical character is primarily the group of species indicated as Central-Asiatic-montane. Of these *Hirstionyssus stoliczkai* may be considered, if compared with the present state of knowledge on acarofauna of other Central-Asiatic high altitude regions, to be an East-Hindu Kush endemic species. *H. transiliensis* in the USSR ranges from Armenia to the Trans-Baikal region, with the centre of occurence in the mountain regions of Central-Asiatic Republics, where it reaches even considerable altitudes. (Outside the USSR this mite was found in Pakistan by Allred 1969).

The type of distribution of this species is similar to that of *Haemogamassus nidiformes*, characterized by Bregetova (1968) as east-Siberian taiga element. It ranges from the plains in the north of Siberia (the Jamal peninsula) to higher elevations in southern regions, primarily in the Central-Asiatic Soviet Republic. The tendency towards higher elevations is also well discernible while tracing the western boundary of this range which reaches as far as Central Europe (montane and subalpine zone of the High Tatras — Mrciak 1958).

The group of Palearctic steppe species is represented by the species *Laelaps turkestanicus, Hirstionyssus meridianus* and *H. criceti*, of which the first mentioned species, described according to collections from Tadzhikistan (on *Rattus turkestanicus*) is closely related to the tropical species *Laelaps aethiopicus* Hirst, 1925, collected from rats in Kenya (Bregetova 1956). *L. turkestanicus* from the Central-Asiatic regions ranges far into the mountaint regions of West Bengal (Ramachandra Rao et al. 1973), but does not reach the montane zones.

Hirstionyssus meridianus is a very typical steppe species associated primarily with gerbils (*Rhombomys opimus* Lichtenstein, *Meriones meridianus* Pallas and *M. erythrourus* Gray). In Bregetova's opinion (1956) this mite occurs all over the range of its hosts, i.e. from the lower reaches of the Volga and the territory before Caucasus to Central Asia. Reports of other authors support this opinion.

H. criceti is listed in the Central-Asiatic species, although it occurs almost throughout the Palearctic region, primarily due to its association with the steppe and semi-desert biotopes, alike with its main hosts, the hamsters and susliks (see Zemskaya 1973).

Of the remaining species mentioned in this paper brief comments should be made about the species *Laelaps jettmari*, whose assessment as Manchurian-Chinese element need not be definitive: according to the present knowledge it ranges from Japan across

Central Asia as far as SE Europe (Zemskaya 1973). The placement of *Hirstionyssus latiscutatus* in cosmopolitan species is questionable because when we study literary data on the occurrence of this species we encounter difficulties due to discrepant taxonomic concepts (cf. Evans and Till 1966).

On the basis of the material analyzed by us in conclusion it may be stated that the fauna of mesostigmatid mites parasitizing small mammals in central and north-eastern part of Afghanistan (the Central and East Hindu Kush) are primarily recruited from Palearctic and Holarctic species and the elements of oriental region are not involved. In its composition it corresponds with Central-Asiatic regions situated in the vicinity northwards from Afghanistan. The steppe species strongly assert themselves here, penetrating even into higher situated mountain valleys. Typical montane species are limited within the highest mountain elevations of the East Hindu Kush, still populated by small mammals. This conclusion also corresponds with the zoogeographic assessment of host species and agrees with the general geobotanical characterization of the biotopes visited.

ALTITUDINAL STRATIFICATION OF MESOSTIGMATID MITES OF THE EAST HINDU KUSH

The main attention in the field work was paid to the north-eastern part of Afghanistan (the Vakhan region) situated between the valley of the Ab-i-Pyandj river and the main mountain ridge of the East Hindu Kush. The whole Vakhan region is filled up with the northern part of these mountains with most peaks 5,000—6,000 m high, and some exceeding even 7,000 m. The main ridge, representing the state boundary between Afghanistan and Pakistan, is approximately running along the parallel line, while the whole northern part of the mountain system is divided by valleys with meridian direction and glaciated in their upper parts. One of them, Ishmurkh Darrah, was the main working area of the expedition. It is about 15 km long and is running across all vertical zones occurring in the Hindu Kush and therefore was suitable for the study on altitudinal stratification of small mammals and their parasites. During July and August 1965 small mammals were trapped in the mentioned valley, within the altitudes of 2,750 to 4,550 m in all places where traces of their existence were observed or where their presence could be anticipated.

As for climate the Vakhan region belongs to the province of Central-Asiatic deserts (Linchevsky and Prozorovsky 1949) and climatic conditions are associated with the mountain systems of Central Asia, primarily the Pamir. The main feature of climate is the extraordinary aridity and great fluctuations in temperature. The vegetation conditions agree with the climatic ones. Geobotanically the Vakhan region belongs to the Central-Asiatic desert province. Linchevsky and Prozorovsky (1949) divide it vertically into zones (zone of the desertic semifruticose formation; the subalpine zone with highmountain steppe and the alpine zone), which approximately correspond with conditions observed by us in the region visited (Hadač 1970). The Ishmurkh Darrah Valley may be divided into three ecologically different strata and this division is taken as a basis for the assessment of acarological findings (see Table 1).

The first stratum (from the mouth to the basin of the Ab-i-Pyandj river (2,750 to 3,200 m) is characterized by a wide, flat and only moderately ascending bottom. The slopes are formed by strongly eroded walls of conglomerates. The greater part of this section is quite free from vegetation; plant life is concentrated in places where the glacial stream is slowed down and where fine sand is accumulated (biotope "C"), or where the terrain is artificially irrigated (biotope "D"). The vegetation is of steppe character and likewise is the fauna, particularly entomofauna.

Table 1. Altitudinal stratification of mesostigmatid mites found on small mammals in the Ishmurkh Darrah valley

Vertical zone of the Ishmurkh valley	Locality	Hosts			*Proctolaelaps pygmaeus*		*Laelaps agilis*		*Allodermanyssus sanguineus*		*Hirstionyssus transiliensis*		*Hirstionyssus stoliczkai*		*Haemogamasus nidiformes*	
		Species	total number	number of infested	number of infested hosts	number of mites	number of infested hosts	number of mites	number of infested hosts	number of mites	number of infested hosts	number of mites	number of infested hosts	number of mites	number of infested hosts	number of mites
I. stratum (2,750 to 3,200 m)	Ishmurkh village, 2,750 m (biotope "D")	*Cricetulus migratorius*	6	1	–	–	–	–	1	7	–	–	–	–	–	–
		Apodemus sylvaticus	2	0	–	–	–	–	–	–	–	–	–	–	–	–
	Ishmurkh Darrah, 2,850 m, "jangal" (biotope "C")	*Crocidura russula*	20	3	–	–	1	18	1	1	2	2	–	–	–	–
		Ochotona roylei	1	0	–	–	–	–	–	–	–	–	–	–	–	–
		Alticola roylei	24	5	–	–	–	–	5	13	–	–	–	–	–	–
		Apodemus sylvaticus	14	11	1	1	10	94	1	1	3	9	–	–	–	–
II. stratum (3,200 to 3,900 m)	Vicinity of front of Ishmurkh glacier, 3,800 – 4,000 m (biotope "B")	*Ochotona roylei*	2	0	–	–	–	–	–	–	–	–	–	–	–	–
		Alticola roylei	13	3	–	–	–	–	–	–	–	–	3	4	–	–
III. stratum 3,900 m and higher	Rocky islet "Shangri La" 4,550 m (biotope "A")	*Alticola roylei*	13	7	–	–	–	–	–	–	6	12	–	–	1	1
Total			95	30	1	1	11	112	8	22	11	23	3	4	1	1

The second stratum (about 3,200—3,900 m). The bottom of the valley begins to rise abruptly and higher scarps are formed by crystalline rocks. Beneath the rocky scarps are large scree fields which are in continuous flow. The vegetation is limited to small spots in places where the flow of rock debris is hindered in some way. The flora and fauna in this zone is of transient type and gradually assumes a montane character.

The third stratum (3,900 m and higher elevations) is formed by the part of the valley starting from the front of glacier upwards; this part is of a real high altitude character. But in places with suitable exposure the flora and partly also fauna (particularly entomofauna) are both quantitatively richer than in lower strata. This is apparently due to the amount of precipitation (see also Römer 1964). The biotope "A", which belongs here, is the highest trapping site of small mammals (*Alticola roylei*) in the Ishmurkh Darrah Valley.

Vertical changes in the extensity and intensity of infestation of *Alticola roylei* with mesostigmatid mites (regardless of species) were briefly mentioned in the paper of Daniel (1973). It was stated that external ectoparasites whose development closely depends on their environment (e.g. representatives of the family Ixodidae and Trombiculidae) do not occur in the highest zone of the existence of small mammals, as opposed to nest and hair ectoparasites (Mesostigmata, Siphonaptera). The data on altitudinal stratification of individual species are given in Table 1. The following conclusions may by drawn from it:

1. The occurrence of the mite *Allodermanyssus sanguineus*, which apparently penetrates to higher altitudes in the studied area than those ascertained by other authors in Central-Asiatic regions compared (Table 2), corresponds with the steppe character of the first ecological stratum of the Ishmurkh Darrah Valley.
2. *Laelaps agilis* was the most numerous species in the lowest part of the valley, in full harmony with findings in other regions of the High Asia.
3. Nival fauna is formed by the species *Haemogamasus nidiformes*, *Hirstionyssus stoliczkai* and *H. transiliensis*. The last mentioned species is the only one forming a bridge between the fauna of mesostigmatid mites of the first and third ecological strata of the valley. *H. nidiformes* occurred sporadically only in the highest part of the valley. This corresponds with its classification as an east-Siberian taiga species, which becomes a montane element in the south and west of its range (see zoo-geographic assessment).
4. If the findings from the highest part of the Ishmurkh Darrah Valley are compared with findings from other mountain regions of the High Asia (Table 2) it becomes clear that they are absolutely the highest ones. Ecologically it is interesting that the highest findings come from places 650 m above the front of glacier.

PUBLIC HEALTH IMPORTANCE

The species found may be categorized according to the trophic character in 3 basic groups:

I. Saprophages: *Macrocheles matrius*, *Proctolaelaps pygmaeus*, *Hypoaspis miles*
II. Facultative hematophages: *Laelaps agilis*, *L. algericus*, *L. jettmari*, *L. turkestanicus*, *Androlaelaps casalis*, *Haemogamasus nidiformes*, *Eulaelaps stabularis*
III. Obligatory hematophages: *Allodermanyssus sanguineus*, *Hirstionyssus meridianus*, *H. latiscutatus*, *H. criceti*, *H. stoliczkai*, *H. transiliensis*

The first group is medically insignificant. With species included in the second group Zemskaya (1973) relates the following relationship to pathoergonts: *Laelaps agilis* — isolation of the causative agent of lymphocytic choriomeningitis. *L. algericus* — isola-

Table 2. A comparison between finds of mesostigmatid mites in Afghanistan and their occurrence and altitudinal stratification in other high mountain regions of Asia

Mite	Afghanistan		Kazakhstan (Senotrusova and Kapitonov 1972)		Kirghizia (Sartbaev 1973)					India (Ramachandra Rao et al. 1973)				
	Hindu Kush		Tian Shan							West Himalaya, East Himalaya				
	Central	East	Trans Ili Ala Tau	Karzhan Tau	Kirghiz Ala Tau	Terskey Ala Tau and syrtas *)	Issyk Kul basin	Central Tian Shan	Mountain range of south Kirghizia**)	Himachal Pradesh	Jammu and Kashmir	Uttar Pradesh	Sikkim	West Bengal
	[m]		[m]		[m]					[m]				
Macrocheles matrius	1,800	—	—	—	500 to 2,500	—	—	1,500 to 2,500	—	—	—	—	—	—
Proctolaelaps pygmaeus	1,800	2,850	—	—	—	—	—	—	—	—	—	—	—	—
Laelaps agilis	1,800	2,850	—	2,300 to 2,600	500 to 2,500	—	1,600 to 2,500	—	—	—	1,980 to 2,740	2,740 to 3,500	—	—
Laelaps algericus	1,800	—	2,300 to 2,700	—	500 to 2,500	—	1,650 to 2,500	—	1,500 to 3,000	—	760 to 2,740	910 to 3,200	1,600 to 3,200	—
Laelaps jettmari	1,800	—	—	—	500 to 2,500	—	—	—	—	—	—	—	—	—

Laelaps turkestanicus	—	1,500	—	—	—	—	—	—	1,500 to 3,000	1,070 to 1,220	1,000 to 2,430	1,220 to 2,590	—	1,220 to 2,300
Androlaelaps casalis	1,800	1,500	—	—	500 to 2,500	—	—	—	—	—	—	—	—	—
Hypoaspis miles	—	1,500	—	—	—	—	—	—	—	—	—	—	—	—
Haemogamasus nidiformes	—	4,550	2,300 to 2,700	—	500 to 2,500	2,200 to 3,500	—		1,500 to 3,000	—	—	—	—	—
Eulaelaps stabularis	1,800	—	2,300 to 2,700	2,300 to 2,600	500 to 2,500	—	1,650 to 2,500	1,500 to 2,500	1,500 to 3,000	—	2,590 to 3,200	760 to 3,510	—	—
Allodermanyssus sanguineus	2,000 to 2,500	2,750 to 2,850	—	—	—	—	—	—	—	—	—	—	—	—
Hirstionyssus meridianus	1,800	—	—	—	500 to 2,500	—	—	1,500 to 2,500	—	—	—	—	—	—
Hirstionyssus latiscutatus	2,000 to 2,500	—	—	2,300 to 2,600	500 to 2,500	—	1,650 to 2,500	—	—	—	—	—	—	—
Hirstionyssus criceti	1,800 to 2,500	—	—	—	—	—	—	—	—	—	—	—	—	—
Hirstionyssus stoliczkai	—	3,900 to 4,000	—	—	—	—	—	—	—	—	—	—	—	—
Hirstionyssus transiliensis	—	2,850 to 4,550	2,300 to 2,700	—	500 to 2,500	220 to 3,500	1,650 to 2,500	—	—	—	—	—	—	—

*) In Kirghizia "syrta" means a high altitude plateau in Central Tian Shan, stretching from the mountain system Khan-Tengri to the Arpa valley (altitude ranges from 2,800 to 4,000 m) see Sartbaev (1973).

**) Includes Fergana, Alai, Chatkal and Turkestan massif.

tion*) of LCM, isolation of plague. *Androlaelaps casalis* — transmission of tick-borne encephalitis, isolation*) of ornithosis, isolation of Q fever, isolation of north-Asiatic tick-borne spotted fever (*R. siberica*). *Eulaelaps stabularis* — isolation*) of tick-borne encephalitis, isolation*) and transmission of LCM, transmission of Q fever, isolation*) of tularemia.

This survey may be suplemented by the data of Bregetova (1956) and Strandtmann and Wharton (1958) on the transmission of HNN by mites *Laelaps jettmari* in the Far East.

From the group of obligatory hematophages Zemskaya (1973) cites with the species *Allodermanyssus sanguineus* isolations and transovarial transmission of rickettsial pox and Q fever and transmission of LCM. With *Hirstionyssus latiscutatus* (mentioned as *H. musculi*) the same author records transmission of tick-borne encephalitis, LCM isolation*), transmission of Q fever and isolation of tularemia: with the mite *H. criceti* — isolation and transmission of Q fever and isolation of north-Asiatic tick-borne spotted fever.

While assessing geographic situation of the central and north-eastern Afghanistan and the whole complex of natural environment of this region, the most important of the mentioned diseases appear to be rickettsioses and of the bacterial infections — plague. After Balashov and Daiter (1973) in the three mentioned rickettsioses *Rickettsia siberica*, the causative agent of north-Asiatic tick-borne spotted fever transmitted mainly by Ixodidae, is vaguely related to the mesostigmatid mites. According to the mentioned authors cited frequent isolations of *R. siberica* from mesostigmatid mites only point to the contact between these organisms, but the real epidemiological importance of mites in the foci of north-Asiatic tick-borne fever remains to be obscure. (Henceforward this infection will be not discussed.)

The same authors qualify mesostigmatid mites on the basis of the accumulated experimental and field results as probable links in the circulation of Q-fever in nature. This disease has not yet been recorded in Afghanistan either by Fischer (1968) or by Šerý (1974). The first mentioned author indicates its probable occurrence in Afghanistan, primarily in the northern part, in the steppe regions, where the nomads pasture their herds and biocenotic conditions are similar to those in the neighbouring countries, where Q-fever has been proved as endemic. Our finding of mesostigmatid mite species, with proved relationship to *Coxiella burneti*, makes the question of Q-fever presence in Afghanistan topical again and at the same time shows the direction in which further studies on the causative agent of this infection in free nature might be carried out.

The relationship of the mite *Allodermanyssus sanguineus* to the causative agent of rickettsial pox is explicit and due to the fact that this mite has been proved to be the main vector of *Rickettsia akari* not only within the rodent populations, but also directly to man, its presence is epidemiologically quite important. The proved incidence of rickettsial pox in the Eurasian continent, partly in the Ukraine (Balashov and Daiter 1973), partly in N. Korea (Šerý et al. 1971) supports this opinion.

Plague has not been reported from Afghanistan either (Fischer 1968). However, the incidence of this disease in Afghanistan may be anticipated due to the fact that parasitic arthropods known to be vectors of plague (apart from *Laelaps algericus*, primarily *Xenopsylla cheopis*) — were found in the biocenoses very similar to those in adjoining territories, where plague foci had been demonstrated among rodents (Smit and Rosický 1973). The incrimination of *Laelaps algericus* should be evaluated from this aspect.

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*) Results obtained in isolation tests in mixture with other species of mites

In conclusion, the epidemiological importance of the species *Allodermanyssus sanguineus* should be also emphasized because of its tendency to synanthropization. Within its range this mite shows a great affinity to synanthropic rodents (primarily *Mus musculus*) on which it penetrates in human dwellings and can directly attack man.

CONCLUSIONS

A total of 270 mesostigmatid mites, belonging to 16 determined species, was found on 173 small mammals (8 rodent species, 2 species of lagomorphs and 1 species of insectivores) trapped in central Afghanistan (Kabul and vicinity of the Band-i-Amir lakes; Central Hindu Kush) and in the Vakhan region (E. Hindu Kush—the Ishmurkh Darrah Valley) between June and August 1965. The most abundant was *Laelaps agilis* (107 specimens) found in the Central and East Hindu Kush. The next most numerous were *Hirstionyssus criceti* (59 specimens—Central Hindu Kush), *H. transiliensis* (23 specimens —East Hindu Kush), *Allodermanyssus sanguineus* (21 specimens—Central and East Hindu Kush), *Laelaps algericus* (13 specimens) and *L. jettmari* (12 specimens)—both from Kabul. *Macrocheles matrius*, *Proctolaelaps pygmaeus*, *Laelaps turkestanicus*, *Androlaelaps casalis*, *Hypoaspis miles*, *Haemogamasus nidiformes*, *Eulaelaps stabularis*, *Hirstionyssus meridianus*, *H. latiscutatus* and *H. stoliczkai* were found sporadically.

Zoogeographically, the mite group studied may be characterized by 2 Holarctic species, 10 palearctic species, 1 circumsubtropical and 3 cosmopolitan species. The analysis of altitudinal stratification of mesostigmatid mites in the high mountain region of the East Hindu Kush indicates the penetration of steppe elements into considerable altitudes (*Allodermanyssus sanguineus*). The nival fauna consists of the species *Haemogamasus nidiformes*, *Hirstionyssus transiliensis* and *H. stoliczkai*.

From the aspect of epidemiological and epizootological importance we consider the finding of *Allodermanyssus sanguineus* to be most significant as this mite penetrates along with rodents into human dwellings and may directly attack man.

МЕЗОСТИГМАТИЧЕСКИЕ КЛЕЩИ МЕЛКИХ МЛЕКОПИТАЮЩИХ ИЗ ГИНДУКУША (АФГАНИСТАН)

М. Даниел

Резюме. Во время первой чехословацкой альпинистской экспедиции в Гиндукуш (1965) с мелких млекопитающих был собран материал мезостигматических клещей, относящихся к 16 видам. Ввиду того, что материал представляет собою первую коллекцию этих паразитов изучаемых на территории Афганистана, в работе также даны зоогеографический анализ, высотная стратификация и эпидемиологическая оценка.

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M. D., Parasitologický ústav ČSAV, Flemingovo nám. 2, 166 32 Praha 6, ČSSR