NEW FUR MITES (ACARI) FROM MAMMALS COLLECTED IN PAKISTAN

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----- ABSTRACT—Nine species of fur mites, distributed among three families are reported from Pakistani rodents and hares, including 1 new subgenus, 4 new species and 2 new subspecies. The following taxa are recorded: *Radfordia* (*Microtimyobia*) *cricetulus pakistanensis* n. ssp. and *Radfordia* (*Radfordia*) *lancearia* (Poppe, 1909) (*Myobiidae*); *Spalacarus mediolineatus nesokia* n. ssp.; *Afrolistrophorus pakistanensis* Fain, 1976, and *A. musculus* Wilson & Lawrence, 1967 (Listroporidae); *Listrophoroides* (*Listrophoroides*) *pakistanicus* n. sp., *L.* (*L.*) *exilis* n. sp. and *L.* (*Paklistrophoroides*) *decoratus* n. sg., n. sp. (*Atopomelidae*); *Dermacarus ochotonae* n. sp. (Glycyphagidae). -----

INTRODUCTION

The mites included in this study are a portion of those taken from a group of twenty-three species of small mammals from Pakistan. The mammals were collected in 1975-76 by the Vertebrate Pest Control Centre, Food and Agriculture Organzation of the United Nations. Those reported herein are distributed among the families Myobiidae, Atopomelidae and Glycyphagidae, and were collected from a variety of rodent and lagomorph hosts. They comprise 9 species of which 4 are new species, and 2 are new subspecies. A new subgenus of *Listrophoroides* is created to contain *L. decoratus* n. sp.

In the descriptions the length of the body was made along the midline and includes the gnathosoma; measurements are in micrometers (μm).

Holotype and allotypes of the new species are deposited in the U. S. National Museum of Natural History, Washington, D. C. Paratypes when available are in the collections of the authors.

Family MYOBIIDAE Megnin, 1877
Genus *Radfordia* Ewing, 1938
Subgenus *Radfordia* Ewing, 1938

1. *Radfordia* (*Radfordia*) *lancearia* (Poppe, 1909).

This species is a parasite of *Apodemus sylvaticus* L. in Europe. We found a single female from the same host in Ziarat, Pakistan, 30 May 1976, No. MZ 0953.

Subgenus *Microtimyobia* Fain & Lukoschus, 1976

2. *Radfordia* (*Microtimyobia*) *cricetulus* spp. *pakistanensis* nov. subsp.

Radfordia (*Microtimyobia*) *cricetulus* Fain, 1973 (and 1974) was described from *Cricetulus migratorius* (Pallas) in Iran. Our material from Pakistan consists of a female which agrees with most of the characters of that species, but the specimen is distinctly shorter and wider than in the typical females of *R.* (*M.*) *cricetulus*, plus some of the setae differ slightly in length. It was collected from *Ochotona rufescens* Gray, 1842 (Lagomorpha), in Ziarat, 30 May 1976, No. MZ 0954. We consider it separable into a new subspecies.

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FEMALE—Holotype 366 μm long, 243 μm wide (in the typical form the length is 429 to 465μm, the width 220 to 225 μm). Lengths of dorsal setae: *v e* 90 μm; *v i* 75 μm; *sc i* 110 μm; *sc e* 80 μm; *l* 1 75μm; *d* 1, *d 2*, *l 2* 60 to 70μm. In the typical form *v i* is 60 μm; *l* 1 63μm. Posterior dorsal setae short. Setae *ic* 1 and *ic 4* short; *ic 2* 90μm; *ic 3* 80 μm. Setae *ic 2* 123μm apart; *ic 3* 130μm apart. Claws I 17μm long (12 μm in the typical form). Leg chaetotaxy: Coxae (I-IV) 3-2-0-0. Other segments (II-IV): Trochanters 3-3-3; femora 5-3-3; genua 7-6-5; tibiae 5-5-5; tarsi 7-6-6. Gnathosoma 34 μm wide (base) with the anterior pair of ventral setae slightly membranous.

REMARKS—This is the first time that a myobiid has been found on a lagomorph. Possibly this host was accidentally infested and the true host is a rat (Microtidae or Cricetidae).

LISTROPHOROIDEA
Family LISTROPHORIDAE Megnin & Trouessart, 1884
Genus *Afrolistrophorus* Fain, 1970

1. *Afrolistrophorus musculus* Wilson & Lawrence, 1967

This species was described from *Mus musculus* L. in Hawaii. In the material from Pakistan we have identified 4 females and 1 male of this species collected from the typical host (MZ No. 1361-65) and 1 female from *Millardia meltada* MZ No. 1366-69 both from Thatta Distr., 3 miles S. of Gharo, 18 August 1976.

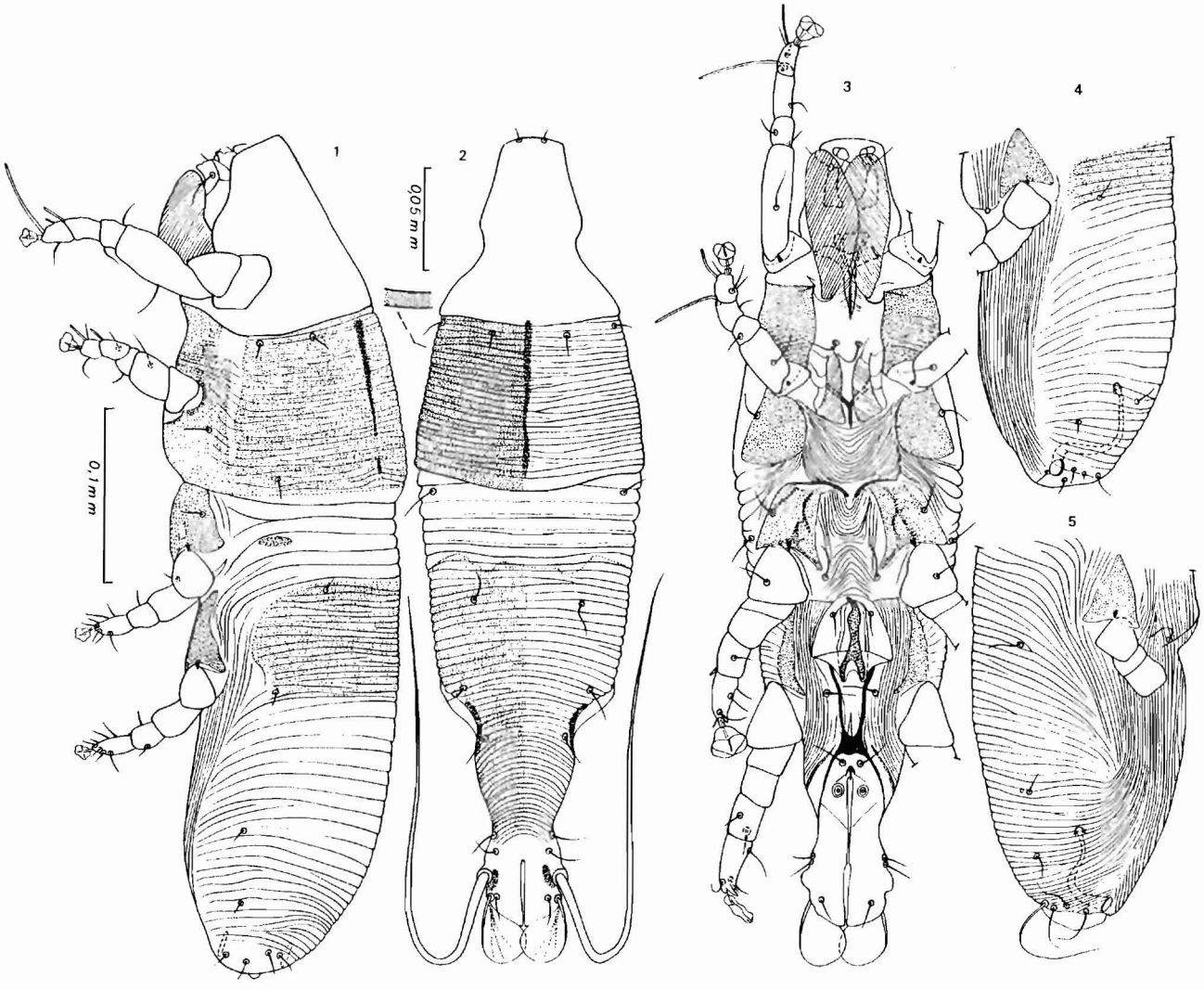
2. *Afrolistrophorus pakistanensis* Fain, 1976

This species was briefly described but without figures and only from the female. We can now complete the description and describe the male for the first time.

FEMALE (Figs. 1, 4)—Holotype 460μm long (gnathosoma included) and 129μm wide (in lateral view). DORSUM-Prescapular shield 105 μm long. Postscapular shield 106μm long in midline with 35-40 thin and close transverse median striations. In its anterior two-thirds or three-quarters this shield bears a narrow sclerotized subcuticular longitudinal median band. Anterior part of hysteronotum soft with 5 widely separated striations followed by a sclerotized shield 66μm long, with 18-20 narrow striations close to each other. The cuticle behind this shield bears 25-30 more widely-spaced striations. A pair of small punctate plates wider (20μm) than long (6μm) is present lateral to and not far from coxae III. VENTER-Opisthogaster with longitudinal striations without scales. Bursa with a small internal sclerite; its external orifice is ventro-lateral and close to the posterior extremity. Posterior legs relatively short. Epimera I fused into a short sternum. Striated pilicolous membranes of coxae II short (30μm). Posterior extremity bearing only very short setae.

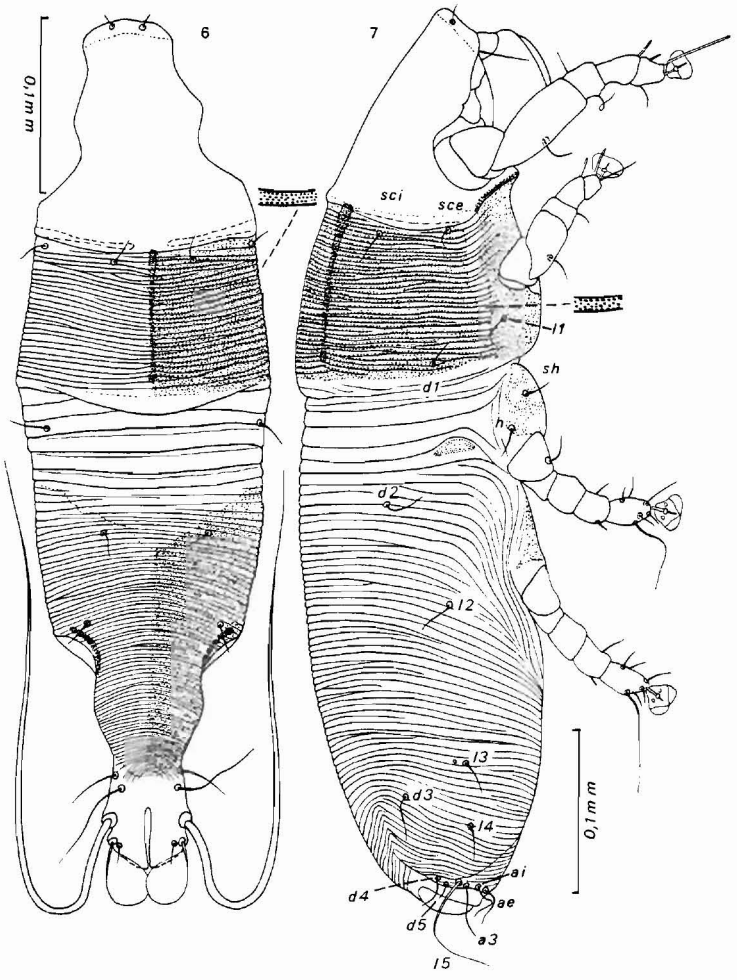
MALE (Figs. 2,3)—Allotype 405μm long and 123 μm wide in ventral view. DORSUM—The prescapular and postscapular shields are fused for a short distance along the midline. Postscapular shield as in the female but 78μm long and with 28-30 striations in the midline. Hysteronotal shield with the anterior border irregular and slightly concave; it bears 48-50 striations medially. Opisthosoma with a constriction. Posterior extremity ending in 2 large lobes bearing a pair of large foliaceous setae (*d 5*) and a pair of very long normal setae (*l 5*). VENTER-Epimer I larger than in the female. Coxae III punctate and united in the midline by a punctate band. Adanal suckers small, situated behind an "H" shaped sclerotized frame. Aedeagus thick, about 40 μm long (base included) with a small, very narrow, apical portion (6μm long), slightly curved and ending in a fine point. Legs stout. Legs IV (4 apical segments) as long as the opisthosoma.

HOSTS AND LOCALITIES—The holotype has been described from *Mus* sp. at Swat State, 4 miles S. Kulam Rest House, Pakistan, 13 August 1966. Type in Bishop Museum, Honolulu. Allotype male was selected from the host *Tatera indica* collected in Malir Cant., 23 October 1976, No. MZ 1650-69.



Figs. 1- : *Afrolistrophorus pakistanensis* Fain, 1976—1, female holotype in dorsolateral view; 2, male, dorsal view; 3, male, ventral view; 4, female holotype in ventrolateral view (opisthosoma); Fig. 5: *Spalacarus mediolineatus* (Fain, 1976)—female paratype in ventrolateral view (opisthosoma).

Numerous specimens of both sexes were collected during 1976 by the Vertebrate Pest Control Centre in Pakistan from the following hosts, all Muridae and Cricetidae (all with MZ prefix): (1) *Millardia meltada* Gray, 1837 (Muridae, Murinae): No. 1378-80, Thatta Distr., 3 miles S. Gharo, 19 August (3 females and 2 males); No. 1385-92, Sejawal Distr., Mahro Bula Khan, 26 August; and No. 1877-80, Ghana District, 18 Nov.; (2) *Mus musculus* L., 1758: No. 1361-65, 3 miles S. Gharo, 18 August (1 male); (3) *Rattus rattus* L., 1758: No. 0021, Karachi TPX (1 nymph); (4) *Meriones hurrianae* Jerdon, 1867: No. 1584-93 and 1596-1600, Korangi Rd., Karachi outskirts, 20 Oct.; No. 1639-45 and 1682-90, Malir Cant., Karachi outskirts, 22 and 27 Oct. respectively; (5) *Tatera indica* Hardwicke, 1807: No. 0772-0776 and 1650-69, Malir Cant., 20 Apr. and 23 Oct. respectively; No. 1615-30, Korangi Rd., Karachi outskirts, 20 Oct. ; No. 1723-30, 1748-60, and 1776-85, Hub River, Lashela Dist., 2,3, and 4 Nov. respectively. Total mites 16 females and 18 males; (6) Mixed collections. These are from a mixture of two host species, *R. rattus* and *T. indica*: No. 0244-54, 0348-0363, 0364-0377, all from TPX on 20 Jan., and 12, 13 Feb., respectively. Three females, 2 males.



Figs. 6,7: *Spalacarus mediolineatus* Fain, 1976–6, male holotype, dorsal view; 7, female paratype in dorsolateral view.

Genus *Spalacarus* Fain, 1980
Spalacarus mediolineatus (Fain, 1976) nov. comb.

This species from a bandicoot rat in Laos was briefly described, but not figured. In our material from Pakistan we have found 4 specimens belonging to a new subspecies of this species. A complete description of the typical form and the first figures are given below. As in *Afrolistrophorus pakistanensis*, this species possesses a median sclerotized band on the postscapular shield but differs from the latter by the following characters: In the female: (1) The striations on the postscapular shield differ in that they are very thin and are 30-42 in number in the midline but laterally they become thicker and less numerous (25-30); (2) The prescapular shield is longer (135 μm) than the postscapular (105 μm); (3) There is no median hysteronotal shield and the striations on hysteronotum are more numerous (total 65-75); (4) The posterior extremity bears a pair of long setae (75 μm) while in *A. pakistanensis* all the opisthosomal setae are very short; (5) The legs are thicker and wider; (6) The body is much larger. In the male: Striations of hysteronotal shield more numerous, dorsal shields and body much longer, opisthosomal setae longer.

MALE (Fig. 6)—Holotype 481 μm long and 142 μm wide (in ventral view). DORSUM-Prescapular shield 130 μm long. Postscapular shield 83 μm long with about 35 striations in the midline and a longitudinal sclerotized median stripe. Anterior part of hysteronotum with 6 widely spaced striations; behind this area there is a shield covering the rest of hysteronotum and bearing 70 striations

the anterior margin of this shield is strongly concave. Opisthosoma 105μm long, ending in two large lobes which bear a long *l 5* seta (200-250μm) and a large membranous *d 5* seta. The opisthogaster bears an "H" shaped sclerotized sclerite between the aedeagus and the anus. Adanal suckers small. Aedeagus thick 39μm long. Legs strong.

FEMALE (Figs. 5,7)—Allotype 556μm long and 146μm wide (in ventral view). DORSUM—Prescapular shield 135μm long. Postscapular shield 105μm long with 35-42 thin striations in the midline, in the lateral part of the shield the striations are thicker and less numerous (about 25-30). This shield bears in the midline a sclerotized longitudinal subcuticular stripe. There is no median shield on hysteronotum but only 2 very small anterolateral shields. Hysteronotum with 6-7 anterior striations widely separated and posteriorly there are 60-70 striations all of which are close together. VENTER—Longitudinally striated without scales. Orifice of bursa at or near the midline and 20-25μm from posterior border. Long *l 5* setae (75μm) on posterior extremity. Legs strong.

HOST AND LOCALITY—The typical series was found on a "Bandicoot rat" from Laos. Types in Bishop Museum, Honolulu.

Spalacarus mediolineatus spp. *nesokia* nov. subsp.

This species is distinctly smaller than the typical form, and the striations on postscapular shield are thicker and less numerous.

FEMALE—Holotype 423μm long and 150μm wide (lateral view). Prescapular shield 114μm long. Postscapular shield 75μm long with 30-35 striations in the midline and a sclerotized median stripe which reaches almost to the posterior border of the shield; these striations become relatively thick dark bands in the lateral parts of the shield. Hysteronotum as in the typical form but with 50-60 striations in the midline. The lateral small punctate plates are also present here. The long posterior setae are 50μm in length.

MALE—Allotype 375μm long and 135μm wide (in lateral view). Prescapular shield 100 long. Postscapular shield 60μm long with a sclerotized longitudinal subcuticular stripe and about 20 thin striations in the midline. Along a line joining setae *sc e* and *d* 1 the number of striations on the shield is also 20. Hysteronotal shield convex anteriorly as in the typical form. Venter as in typical form.

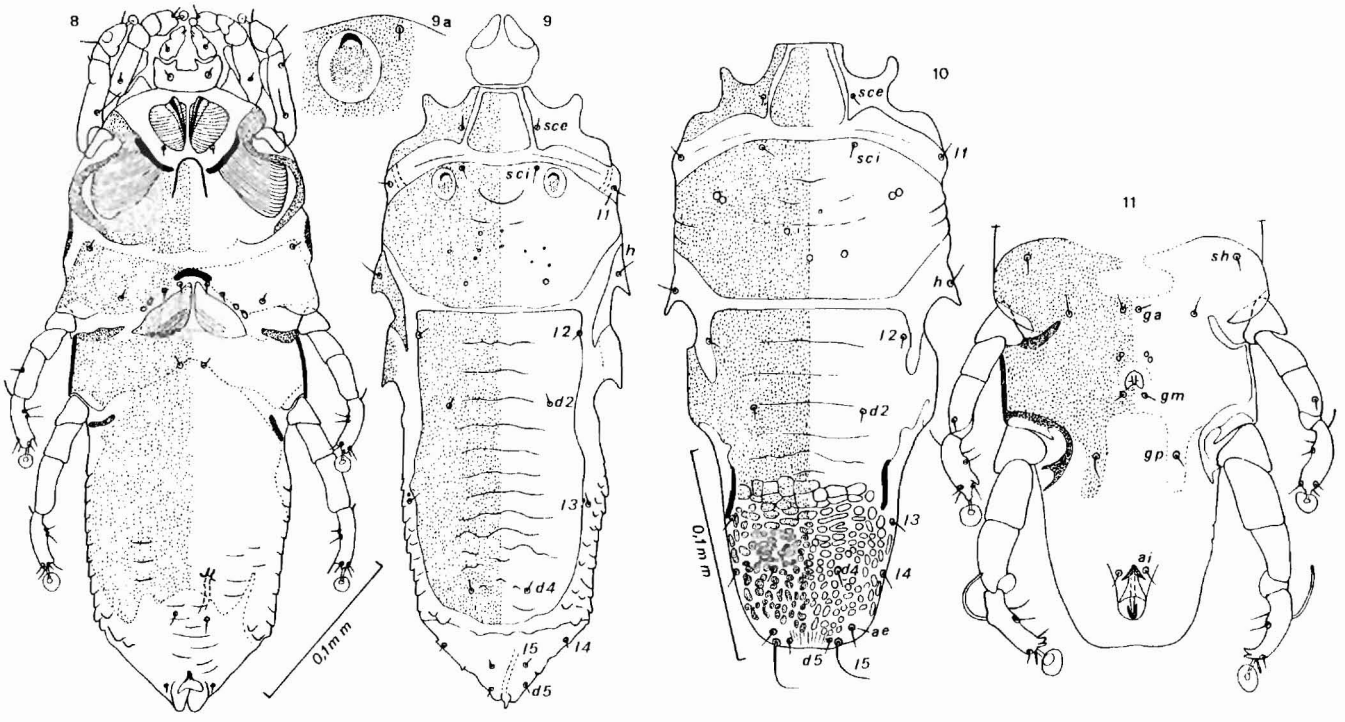
HOST AND LOCALITY—From *Nesokia indica* Gray & Hardwicke, 1832: MZ 1342-53, Sujawal Distr. Shah Yaki, Pakistan, 3 August 1976 (Holotype and 1 paratype female, allotype and 1 paratype male).

Family ATOPOMELIDAE Günther, 1942
Genus *Listrophoroides* Hirst, 1923
Subgenus (*Listrophoroides*) Hirst, 1923

Listrophoroides (*Listrophoroides*) *pakistanicus* nov. spec.

This species is clearly distinguished from all the other described species in the subgenus: in the female by the shape of the "scutal organs" on the postscapular shield, and in the male by the characteristic scaly aspect of the posterior part of the opisthonotum.

FEMALE (Figs. 8-9)—Holotype 386μm long and 138μm wide. DORSUM—Postscapular shield with a pair of "scutal organs" situated outside of the *sc i* setae. These organs are oval in shape and 17μm long, less punctate than the dorsal shield, and bear anteriorly a small crescentic sclerite which partially covers a very small glandular orifice (scutal gland). The postscapular shield bears from 1 to 3 small and short curved striations. Hysteronotum with a rectangular

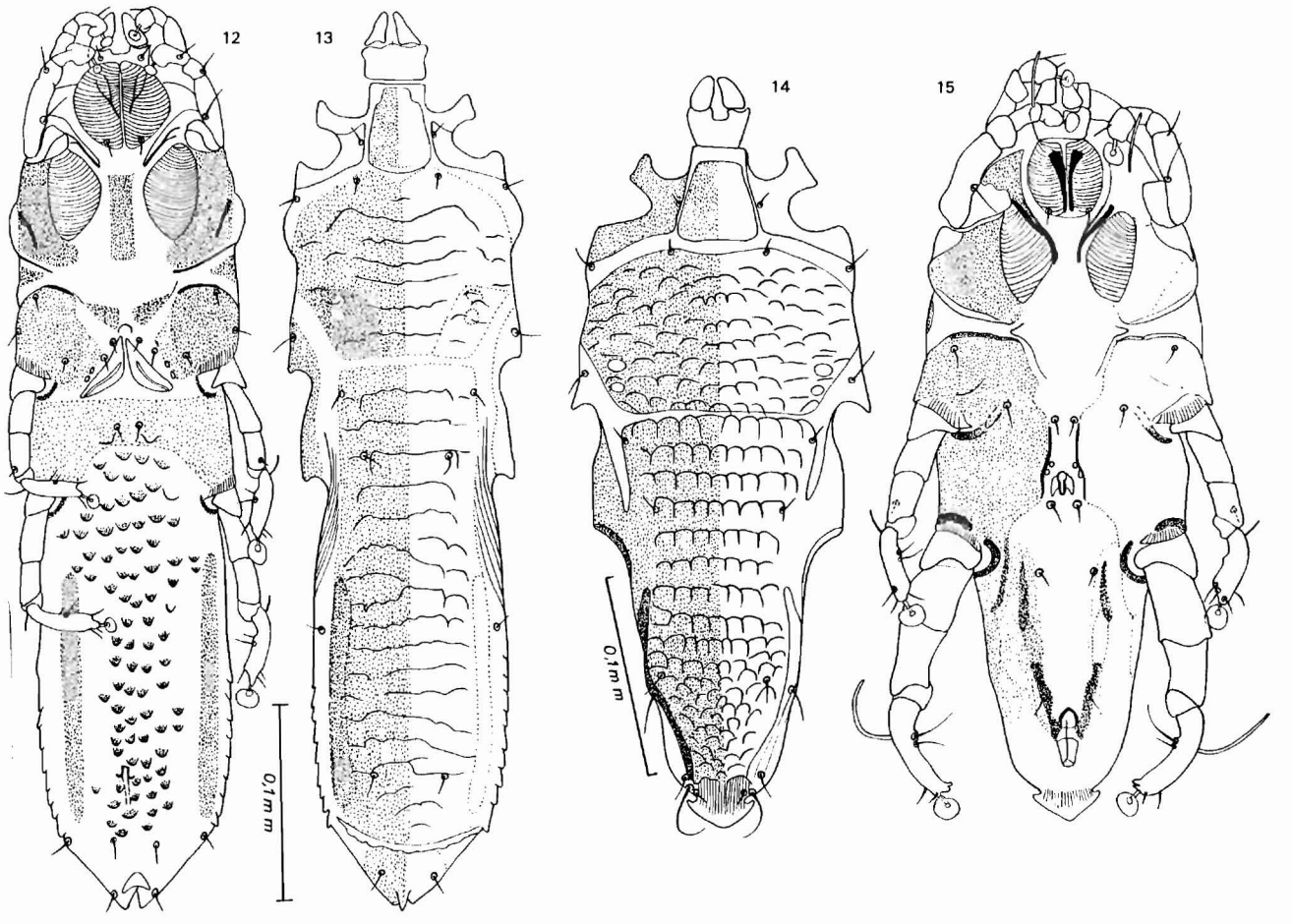


Figs. 8-11: *Listrophoroides* (*L.*) *pakistanicus* n. sp.—8, female, ventral view; 9, female dorsal view; 9a, female, detail of scutal organ; 10, male dorsal view; 11, male, ventral view (hysterogaster).

shield bearing 9 short and sinuous median striations and more posteriorly some much shorter sinuous striations. Lateral surfaces of opisthosoma bearing scales. There is a small terminal copulatory papilla. VENTER—Striated membranes of coxae I small, those of coxae II are widely separated in the midline by a punctated area. The median part of this area bears a thin sclerite in the shape of an inverted U. Epigynium and vulvar lips well developed. Coxal shields IV fused in the midline. Opisthogaster almost entirely covered by a punctate shield. Legs narrow. Gnathosoma small.

MALE (Figs. 10-11)—Allotype 321μm long and 132μm wide. DORSUM—Postscapular shield as in the female but without "scutal organs". Hysteronotum with a large anterior shield bearing 5 median striations. Opisthonotum covered by numerous elevated scaly-like irregular formations. Posterior margin of body truncate. VENTER—Propodosoma as in the female. Coxae III and IV covered by punctate shields. The anterior border of this area is deeply incised in the midline. Genital sclerite very small with a very short aedeagus. Legs IV thicker and longer than legs III.

HOSTS AND LOCALITIES—All specimens and hosts were collected in 1976 and are in the MZ series. (1) *Millardia meltada* Gray, 1837 (Muridae, Murinae): No. 1385-92, Sujawal Distr., Mahro Bula Khar, 26 August (Holotype and 10 paratypes female, 3 paratypes male, 1 nymph); No. 1356-60, 1366-69, 1343-48, and 1878-80, Thatta Distr., 3 miles S. Gharo, 18-19 August (18 paratypes female, allotype and 12 paratypes male, 6 paratypes nymphs); No. 1856-59, 1901-04, Gharo District 17, 19 Nov. (4 females, 2 males, 2 nymphs). (2) *Mus musculus* L., 1758 (Murinae): No. 1361-65, Thatta Distr., 3 miles S. Gharo (4 females, 1 male and 2 nymphs, all paratypes). (3) *Tatera indica* Hardwicke, 1807 (Cricetidae): No. 1382-84, Sujawal Distr., Mahro Bula Khan, 26 August (1 male and 1 nymph, paratypes). (4) From unidentified host: No. 1849-52 (1 female, 3 males).



Figs. 12-13: *Listrophoroides* (*L.*) *exilis* n. sp. (female)—12, ventral view; 13, dorsal view. Figs. 14-15: *Listrophoroides* (*Paklistrophoroides*) *decoratus* n. sp. (male)—14, dorsal view; 15, ventral view.

Listrophoroides (*Listrophoroides*) *exilis* nov. spec.

Only the female is known. It differs from all the other known species in the subgenus by the following characters: the very long and narrow shape of the body, the absence of "scutal organs" on the postscapular shield, the structure of the region between coxae II in the form of a long, narrow punctate shield, and the large distance between the striated membranes of coxae II.

FEMALE (Figs. 12-13)—Holotype 444 μm long and 118 μm wide. In the paratype the length is 450 μm, the width 125 μm. DORSUM—Postscapular shield with 7 unequal sinuous transverse striations. The posterolateral parts of the shield are more sclerotized than the rest of the shield. Hysteronotal shield with 14 sinuous, irregular transverse striations. In its posterior half the shield is bordered laterally on each side by a sclerotized band. The hysteronotal shield is followed by a transverse stripe with a scaly posterior margin. Behind this stripe the opisthonotum bears a median punctate shield. VENTER—Striated membranes of coxae I large; those of coxae II widely separated in midline. Between these membranes there is a rectangular rather long punctate shield. Shields of coxae III small, those of coxae IV meeting in the midline. Opisthogaster bearing numerous punctate scales in the median region and more laterally a pair of sclerotized longitudinal bands. Legs thin and short; gnathosoma small. Internal sclerite of bursa small.

MALE—Unknown.

HOST AND LOCALITY—The holotype was collected from *Bandicota bengalensis* Gray, 1835 (Muridae, Murinae) Thatta Distr., 3 miles S. Gharo, 12 August, No. MZ 1341. The paratype female was collected from *Mus musculus* L. in the same locality, 18 August. 1976, MZ 1361-65.

Subgenus *Paklistrophoroides* nov. subg.

The genus *Listrophoroides* Hirst, 1923 has been divided into 15 subgenera. All these subgenera are represented in the Afrotropical Region, Madagascar included. Among these 8 are endemic to the Afrotropical Region, 6 are endemic to Madagascar and 1 is represented in both regions (Fain, 1972 and 1976).

In Asia, so far only 2 subgenera are represented, *Listrophoroides* s. str. and *Marquesania* Womersley, 1943.

In the material from Pakistan we found a new species of *Listrophoroides* which cannot be included in any of the known subgenera, and consequently we are erecting the new subgenus *Paklistrophoroides* for it.

DEFINITION—In this subgenus (both male and female) the epimera II are distinctly separated (approximately 12 μm apart) by a bare area devoid of any punctate shield. The posterior legs are inserted laterally and the gnathosoma is narrow.

TYPE SPECIES—*Listrophoroides* (*Paklistrophoroides*) *decoratus* n. sp.

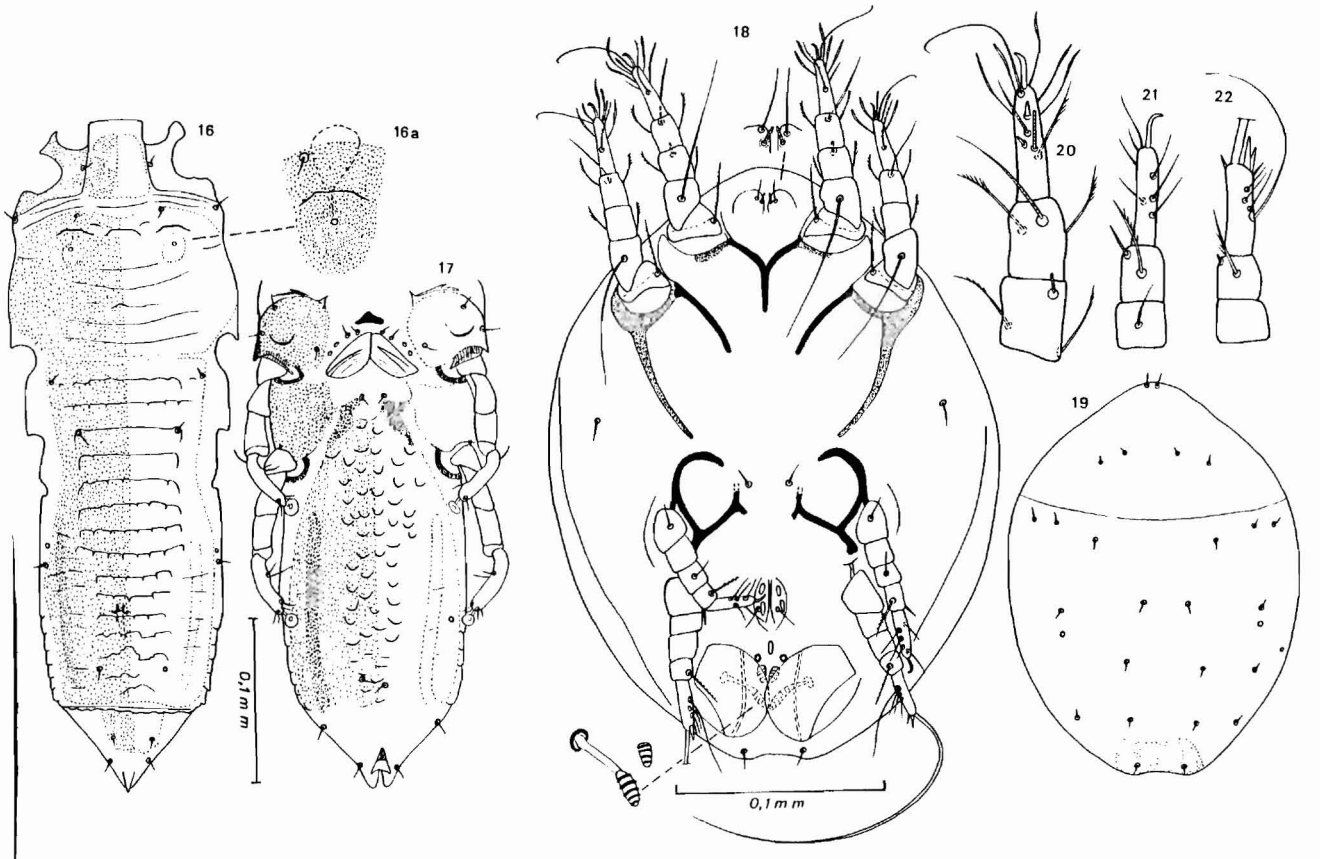
REMARKS—This subgenus is somewhat intermediate between *Colistrophoroides* Fain, 1972 and *Crilistrophoroides* Fain, 1972, both described from Central Africa. It differs from the former by the more median position of epimera II, the paramedian situation of epimera I and the narrow shape of the gnathosoma. It differs from the latter by the greater separation of the epimera II, the more elongated shape of the body especially the opisthosoma and the basal situation of the solenidion of tibia-tarsus IV.

Listrophoroides (*Paklistrophoroides*) *decoratus* nov. spec.

MALE (Figs. 14-15)—Holotype 372 μm long and 147 μm wide. Opisthosoma about 1. 5 times longer than wide, with a narrow constriction near its extremity forming a triangular caudal appendix. DORSUM—Postcapular shield with 7 to 8 transverse rows of interrupted striations. Hysteronotal shield covering almost completely the hysteronotum and bearing 10 transverse rows of striations. Each of these striations possesses a number of small regular posterior prolongations. In the posterior part of the opisthonotum these striations are replaced by scales. VENTER—Epimera I close together, nearly contiguous. Epimera II 12 μm apart with a bare area between the striated membranes of coxae II. Coxae III-IV covered by punctate shields which do not meet the midline. Genital organ very small with a very short aedeagus. In front of the anus there are 2 lateral punctate bands reaching to the bases of trochanters IV.

FEMALE (Figs. 16-17)—Allotype 455 μm long and 150 μm wide. DORSUM—Postscapular shield with 6 irregular transverse striations but only the first striation is deep and well marked. There is a pair of "scutal organs" (= orifices of scutal glands) located 20 μm behind the anterior margin of the shield. They consist of a very small pit surrounded by an area of very fine punctations. Hysteronotal shield with 13 well marked transverse striations. VENTER—Proposodoma as in the male. The punctate coxal shields III and IV are separate in the midline. Opisthogaster with poorly developed scales in the median region. Legs thin but relatively long.

HOST AND LOCALITIES—(1) *Meriones hurrianae* Jerdon, 1867: No. MZ 1639-1645, Malir Cant. 22 Oct. 1976 (holotype male). (2) *Rattus rattus* L., 1758; No. 1607-14, Korangi Road, Karachi outskirts, 20. Oct. 1976 (allotype female).



Figs. 16-17: *Listrophoroides (Paklistrophoroides) decoratus* n. sp. (female)–16, dorsal view; 16a, scutal gland; 17, ventral view (hysterogaster). Figs. 18-22: *Dermacarus ochotonae* n. sp. (hypopus)–18, ventral view; 19, dorsal view; 20, leg I, dorsal view; 21, leg III, dorsolateral view; 22, leg IV, lateral view.

Family GLYCHPHAGIDAE Berlese, 1887
Genus *Dermacarus* Haller, 1880
Dermacarus ochotonae nov. spec.

This species is represented by the hypopus only. It is characterized by the presence of a small dorsal spine in the subapical region of the tarsi I-II, by the shape of the setae of femora I-II which are long (50-70 μm) and smooth, and by the palposomal setae which are longer than the solenidions alpha. At first glance this species resembles *D. mongolicus* Fain and Lukoschus, 1979 but it differs from it by the much smaller size of the body, the narrower shape of the external claspers, the smaller length of the seta of femur II, the different situation of the *sc i* and *sc e* setae on a slightly curved line, the character of the tibial setae with barbs confined to the apical half.

HYPOPUS (Figs. 18-22)–Length 276 μm, width 216 μm. Measurements in 3 paratypes: 247 μm x 184 μm; 249 μm x 190 μm; 270 μm x 205 μm. DORSUM–Sejugal furrow situated 100 μm behind the anterior extremity. Absence of sculpture or shields. Setae very short. VENTER–Palposoma with a pair of short solenidions (3 μm), and a pair of longer setae (12-15 μm). Epimera I fused into a sternum 18 μm long. Epimera III and IV long and free. Clasping organ small. Anterior clasper 7-8 μm long and 4 μm wide with 4 ridges. Posterior clasper 24 μm long and 5 μm wide (maximum) with 5-6 ridges. Tarsi I-IV 26 μm-24 μm-24 μm and 22 μm long respectively. CHAETOTAXY OF LEGS–Tarsi 8-8-7 (8)-8, tibia 2-2-1-1, genua 2-2-1-0, femora 1-1-0-0, trochanters 1-1-1-0. Femora I and II each with a simple thin and smooth seta 60-70 μm and 50 μm long respectively. Tarsi IV with a very long apical seta (150 μm long). The subapical dorsal

seta of tarsi I-II is a small spine. All tibial setae are barbed on one side in their apical half or third. Solenidion ω1 is situated in the middle of tarsus I, solenidion ω3 is slightly more apical. Solenidion of tibia I is 24-26μm long; of tibia II 18μm long. Solenidion of tarsus II 15-16μm long.

HOST AND LOCALITY—From *Ochotona rufescens* Gray, 1842: No. MZ 0954, Ziarat, Pakistan, 30 May 1976 (Holotype and 5 paratypes, all hypopi).

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