

Revision of the fur-mite family Listrophoridae (Acari: Astigmata) associated with Philippine mammals

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Abstract

The Philippine species of the family Listrophoridae are revised, with the fauna including six species in five genera: *Sciurochirus philippinensis* FAIN, 1972 from *Sundasciurus philippinensis* (WATERHOUSE, 1839), *Sundasciurus steeri* (GÜNTHER, 1877), and *Petinomys crinitus* HOLLISTER, 1911 (Rodentia: Sciuridae); *Aeromychirus petinomys* sp. nov. from *Petinomys crinitus*; *Afrolistrophorus maculatus* FAIN, 1976 from *Rattus exulans* (PEALE, 1848), *Apomys datae* (MEYER, 1899), *Apomys microdon* HOLLISTER, 1913, *Chrotomys silaceus* (THOMAS, 1895), *Chrotomys whiteheadi* (THOMAS, 1895), *Archboldomys musseri* RICKART *et al.*, 1998, and *Rhynchomys soricoides* THOMAS, 1895 (Rodentia: Muridae); *Asiochirus suncus* (RADFORD, 1947) from *Suncus murinus* (L., 1766) (Eulipotyphla: Soricidae); *Lynxacarus semnopitheci* FAIN, 1970 from *Paradoxurus hermaphroditus* (PALLAS, 1777) (Carnivora: Viverridae), and the previously recorded *Lynxacarus palawanensis* FAIN, 1976 from *Tupaia palawanensis* THOMAS, 1894 (Scandentia: Tupaiidae). Emended generic and subgeneric diagnoses, redescrptions of most recognized species and description of *Aeromychirus petinomys* sp. nov., along with host ranges and distributions, and a key to species are given.

Key words: mites, ectoparasites, Listrophoridae, the Philippines, mammals, systematics

Introduction

The fur-mite family Listrophoridae MEGNIN and TROU-ESSART, 1884 includes permanent parasites living on the hair shafts of mammals belonging to seven orders: Carnivora, Eulipotyphla, Lagomorpha, Macroscelidea, Rodentia, Primates, and Scandentia. These mites attach to the host hair with a pair of enlarged flaps that are derived from extensions of the cuticle between coxae I. The family Listrophoridae is most diverse in the Holarctic Region with fewer genera and species in other regions (FAIN, 1971, 1973; FAIN and HYLAND, 1974). It is present in Australia and Madagascar only on introduced host species (OConnor, 1982; Domrow, 1992).

This work presents a taxonomic revision of the Philippine listrophorids. To date, only two species of this family have been reported from the Philippines, *Sciurochirus philippinensis* FAIN, 1972 from the squirrel *Sundasciurus steeri* (GÜNTHER, 1877) and *Lynxacarus palawanensis* from the tree-shrew *Tupaia palawanensis* THOMAS, 1894 (FAIN, 1972, 1976; CORPUZ-RAROS,

1993). Based on host distributions of these mites in other geographic regions, the Philippine mammal fauna includes 92 species of potential hosts of listrophorids in 40 genera belonging to the families Herpestidae, Mustelidae, and Viverridae (Carnivora), Muridae and Sciuridae (Rodentia), Soricidae and Erinaceidae (Eulipotyphla), Cercopithecidae and Loridae (Primates) (HEANEY *et al.*, 1998). The mammalian fauna of the Philippine Archipelago has one of the highest per-area levels of endemism in the World. Among 175 currently recognized native mammal species inhabiting this archipelago, most species are endemics (HEANEY *et al.*, 1998; ESSELSTYN *et al.*, 2004). Therefore, a potentially rich listrophorid fauna might be expected to be associated with these hosts. However, these mites are poorly known from other insular areas. Only 13 species are known from the Indonesian archipelago and North Borneo, and no native species are known from the Caribbean region, Madagascar or Australia (OCONNOR, 1982; DOMROW, 1992).

More than 50% of the potential host species were examined during this study, but only five listrophorid species were collected, making a total of six species in five listrophorid genera known from the Philippines today. Among these, *Aeromychirus petinomys* sp. nov. and *Lynxacarus palawanensis* are associated exclusively with the Philippine endemics, *Petinomys crinitus* HOLLISTER, 1911 (Rodentia: Sciuridae) and *Tupaia palawanensis*, respectively. Most hosts of other three species are recent migrants on the Philippines which are widely distributed in Southeast Asia. It is interesting that mites of the another fur-mite family Atopomelidae (Listrophoroidea) show much more biodiversity on this archipelago. Eighteen atopomelid species, including 12 newly recognized, were recently recorded from the Philippines. Most of them are specific parasites of the Philippine endemics of the subfamily Murinae (BOCHKOV and OCONNOR, in press).

Below, we re-described most recorded species, and described one new species. The emended generic and subgeneric diagnoses and key to the Philippine species are provided. Hosts and distribution of the Philippine Listrophoridae are summarized in the Table.

Table — Hosts and distribution of the Philippine Listrophoridae

? - contamination; / - host switching

Mite species	Host species	Host family	Locality	Reference
<i>Sciurochirus philippinensis</i> FAIN, 1972	<i>Sundasciurus steeri</i> (GÜNTHER, 1877).	Sciuridae	the Philippines	FAIN, 1979; our data
	<i>Sundasciurus philippinensis</i> (WATERHOUSE, 1839)		the Philippines	our data
	<i>Sundasciurus tenuis</i> (HORSFIELD, 1824)		Thailand	FAIN, 1979
	<i>Callosciurus notatus</i> (BODDAERT, 1785)		Thailand	FAIN, 1979
	<i>Ratufa bicolor</i> (SPARRMAN, 1778)		Thailand	FAIN, 1979
	<i>Ratufa affinis</i> (RAFFLES, 1821)		Malaysia	FAIN, 1979; our data
	<i>Petinomys crinitus</i> HOLLISTER, 1911		the Philippines	our data
<i>Aeromychirus petinomys</i> sp. nov.	<i>Petinomys crinitus</i> HOLLISTER, 1911		the Philippines	our data
<i>Lynxacarus semnopithecii</i> FAIN, 1970	? <i>Presbytis hosei</i> (THOMAS, 1889)	Cercopithecidae	Malaysia	FAIN, 1970
	<i>Tupaia javanica</i> HORSFIELD, 1822	Tupaiidae	Java	FAIN, 1978a
	<i>Paradoxurus hermaphroditus</i> (PALLAS, 1777).	Viverridae	the Philippines	our data
<i>Lynxacarus palawanensis</i> FAIN, 1976	<i>Tupaia palawanensis</i> THOMAS, 1894	Tupaiidae	the Philippines	FAIN, 1978a
<i>Afrolistrophorus maculatus maculatus</i> FAIN, 1976	<i>Leopoldamys sabanus</i> (THOMAS, 1887)	Muridae	Malaysia	FAIN, 1980
	<i>Niviventer niviventer</i> (HODGSON, 1836)		Thailand	
	<i>Rattus exulans</i> (PEALE, 1848),		the Philippines	our data
	<i>Apomys datae</i> (MEYER, 1899)			
	<i>Apomys microdon</i> HOLLISTER, 1913			
	<i>Chrotomys silaceus</i> (THOMAS, 1895)			
	<i>Chrotomys whiteheadi</i> (THOMAS, 1895)			
	<i>Archboldomys musseri</i> RICKART <i>et al.</i> , 1998			
? <i>Rhynchomys soricoides</i> THOMAS, 1895				
<i>Asiochirus suncus</i> (RADFORD, 1947)	<i>Suncus murinus</i> (L., 1766)	Soricidae	Sri Lanka	RADFORD, 1947
			India	FAIN, 1978b
			Java	
			the Philippines	our data

Material and methods

Most specimens examined in this study were collected by BMOC or AVB from dried or fluid preserved host specimens in various institutions. Specimens were cleared in lactophenol and mounted in Hoyer's medium. Drawings were made with a Zeiss microscope with a camera lucida using phase contrast optics. Specimens were also studied using a Leica DMLB microscope equipped with differential interference contrast optics.

In the descriptions below, the idiosomal chaetotaxy follows GRIFFITHS *et al.* (1990) with modifications of NORTON (1998) concerning coxal setae. The leg chaetotaxy follows GRANDJEAN (1939). All measurements are given in micrometers (μm) and were taken as follow: body length = the total length from the anterior extremity of the prescapular shield to the posterior border of the body; body width = maximum width taken at whatever level it occurs; length of dorsal shields = maximum length, measured in the median line of the shields; length

of the posterior legs = length from the most basal point of the trochanter to the apex of the tarsus, excluding pretarsal ambulacrum. In the collection records, names of hosts follow WILSON and REEDER (1993). Specimen depositories and reference numbers are cited using the following abbreviations:

BMNH – British Museum of Natural History, London, England;

BMOC # - B.M. O'CONNOR reference number;

FMNH - Field Museum of Natural History, Chicago, USA;

IRSNB - Institut royal des Sciences naturelles de Belgique, Brussels, Belgium;

MNHN - Muséum National d'Histoire Naturelle, Paris, France;

NMP – National Museum of the Philippines, Manila, the Philippines;

OSAL – The Acarology Laboratory, Ohio State University, Columbus, USA;

UMMZ - Museum of Zoology, University of Michigan, Ann Arbor, USA;

USNM - National Museum of Natural History, Smithsonian Institution, Washington, USA;

ZISP - Zoological Institute, Russian Academy of Sciences, Saint-Petersburg, Russia.

Taxonomy

Family Listrophoridae MEGNIN and TROUËSSART, 1884

Genus *Sciurochirus* FAIN, 1972

Sciurochirus FAIN, 1972: 242, 1979: 270, 1981: 308.

Type species: Sciurochirus philippinensis FAIN, 1972.

DESCRIPTION: Adults. Anterior margin of prescapular shield straight or slightly convex, not dissected in midline. Postscapular shield absent. Median spot (internal apodeme) absent on propodonotum. Cuticle between coxae II distinctly striated and forming auxiliary valves. Setae *se* filiform. Setae *ps2* absent. Setae *d* of all tarsi not longer than this segment. Distinct longitudinal ridge connecting base of apodemes II and prescapular shield absent. Femur I without dorso-apical tooth.

Male. Hysteronotal shield present, entire, without ornamentation, occupying most part of hysteronotum. Apodemes III fused to each other. Opisthosoma wide, not attenuate, with pair of terminal lobes, covered dorsally by hysteronotal shield. Lobar membranes not developed. Adanal shields absent. Para-anal suckers distinctly developed. Pregenital sclerites form inverted U-shaped structure, bearing genital papillae. Dorsal apodeme of aedeagus arch-like, with free posterior projections, inter-

mediate sclerite short. Setae *f2* filiform, slightly thickened. Setae *h3* membranous leaf-like, setae *g* situated on cuticle immediately posterior to aedeagus. Tarsi and tibiae III and IV not thickened. Tarsi IV without apical projections. Setae *dIV* and *eIV* absent.

Female. Dorsum covered by distinct transverse furrows, slightly sclerotized. Hysteronotal shield absent. Opisthogaster with numerous scales. Setae *4b* absent. Setae *h2* longest setae. Basal cap of spermatheca globosely inflated, efferent sperm ducts straight, spatula-like.

OTHER SPECIES INCLUDED: *S. tupaiae* FAIN, 1972 and *S. thailandiae* FAIN, 1979.

HOSTS AND DISTRIBUTION: Three species currently known in the genus *Sciurochirus* are parasites of Southeast Asian arboreal mammals. Two of them, *S. philippinensis* and *S. thailandiae* are associated with Southeast Asian tree squirrels, whereas, *Sciurochirus tupaiae* has been collected from both squirrels of the genus *Callosciurus* and tree-shrews of the genera *Tupaia* and *Dendrogale* (FAIN, 1979). The several records from tree-shrews suggest that this species has successfully colonized these hosts from squirrels.

Sciurochirus philippinensis FAIN, 1972

(Figs. 1, 2)

Sciurochirus FAIN, 1972: 242, 1979: 272, Figs. 1-3. [Holotype in MNHN]

DESCRIPTION: Male (10 specimens from *Sundasciurus philippinensis mindanensis*). Body including gnathosoma 290-300 long, 85-100 wide. Prescapular shield 70-75 long. Hysteronotal shield 100-110 long. Anterior margin of hysteronotal shield widely rounded, setae *d1* situated on the anterior margin of this shield. Idiosomal surface between prescapular and hysteronotal shields striated with 16-18 lines. Setae *h3* small leaf-like, with pointed apex. Aedeagus 12-14 long. Diameter of para-anal suckers about 15. Legs III and IV 60-70 long. Lengths of some setae and solenidia: *c1*, *c2*, *c3* – 10-11, *cp* 20-22, *d2* 10-12, *h2* 60-65, *ps1* 11-12, ϕ I, II 40-45.

Female (10 specimens from *Sundasciurus philippinensis mindanensis*). Body, including gnathosoma, 390-400 long, 115-120 wide. Prescapular shield 75-80 long. Idiosomal surface posterior to prescapular shields striated with 40-45 lines. Legs III and IV subequal, 77-80 long. Lengths of some setae and solenidia: *c1*, *c2*, *d1* 19-20, *c3* 12-13, *cp* 28-30, *d2* 20-22, *e1* 15-16, *e2* 20-22, *f2* 10-11, *h2* 85-90, *ps3* 12-13, ϕ I-II 13-15.

MATERIAL EXAMINED: PHILIPPINES, ex *Sundasciurus philippinensis* (WATERHOUSE, 1839), subspecies *mindanensis*: Two males and 10 females (BMOC 04-0329-050) ex host (FMNH 87452), Mindanao Isl., Misamis Occidental Prov., Mt. Malindag, Gandawan, 08°12'57"N,

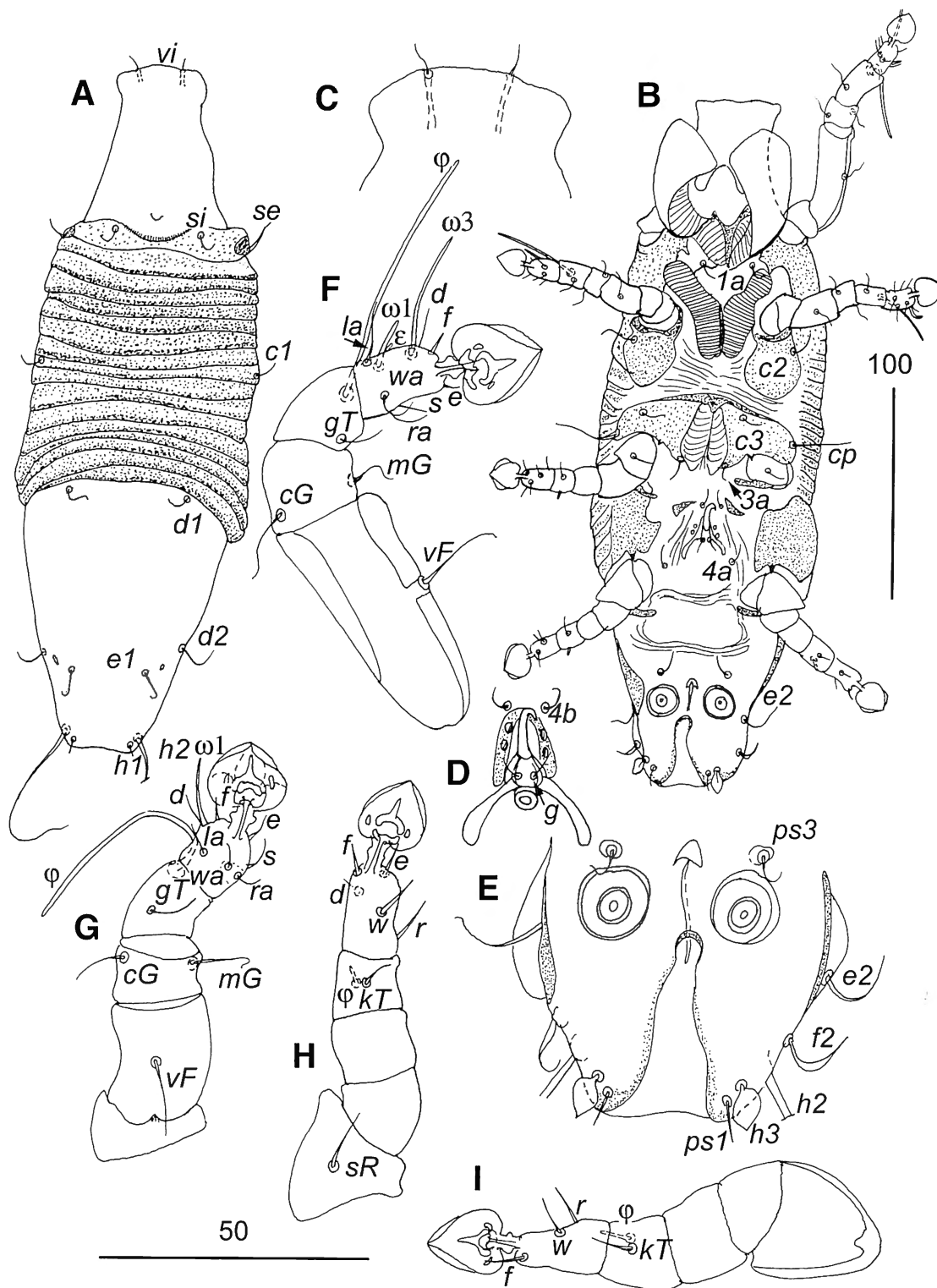


Fig. 1 — *Sciurochirus philippinensis* FAIN, 1972, male. Dorsal view (A), ventral view (B), anterior margin of prescapular shield (C), aedeagus (D), opisthosoma in ventral view (E), legs I-IV in ventral view, respectively (F-I). Scale lines 100 μ m (A, B) and 50 μ m (C-I).

123°38'10"E, 19.IV.1956. Coll. D.S. RABOR; 9 males and 8 females (BMOC 04-0329-051) ex host (FMNH 87453), same locality, 20.IV.1956. Coll. D.S. RABOR; 4 males and 10 females (BMOC 04-0329-053) ex host (FMNH 87455), same locality, Gumay, 14. V. 1956. Coll. D.S. RABOR; 4 males and 16 females (BMOC 04-0329-054) ex host (FMNH 87456), same locality, Buena Suerte, 14.V.1956. Coll. D.S. RABOR; 8 male and 16 females

(BMOC 04-0329-057) ex host (FMNH 87457), same locality, 14.V.1956. Coll. D.S. RABOR; 1 male and 4 females (BMOC 04-0329-056) ex host (FMNH 87458), same locality, 14.V.1956. Coll. D.S. RABOR; 8 males and 10 females (BMOC 04-0329-058) ex host (FMNH 87460), same locality, 14.V.1956. Coll. D.S. RABOR; 3 females (BMOC 04-0329-059) ex host (FMNH 87461), same locality, 30.IV.1956. Coll. D.S. RABOR; 7 females

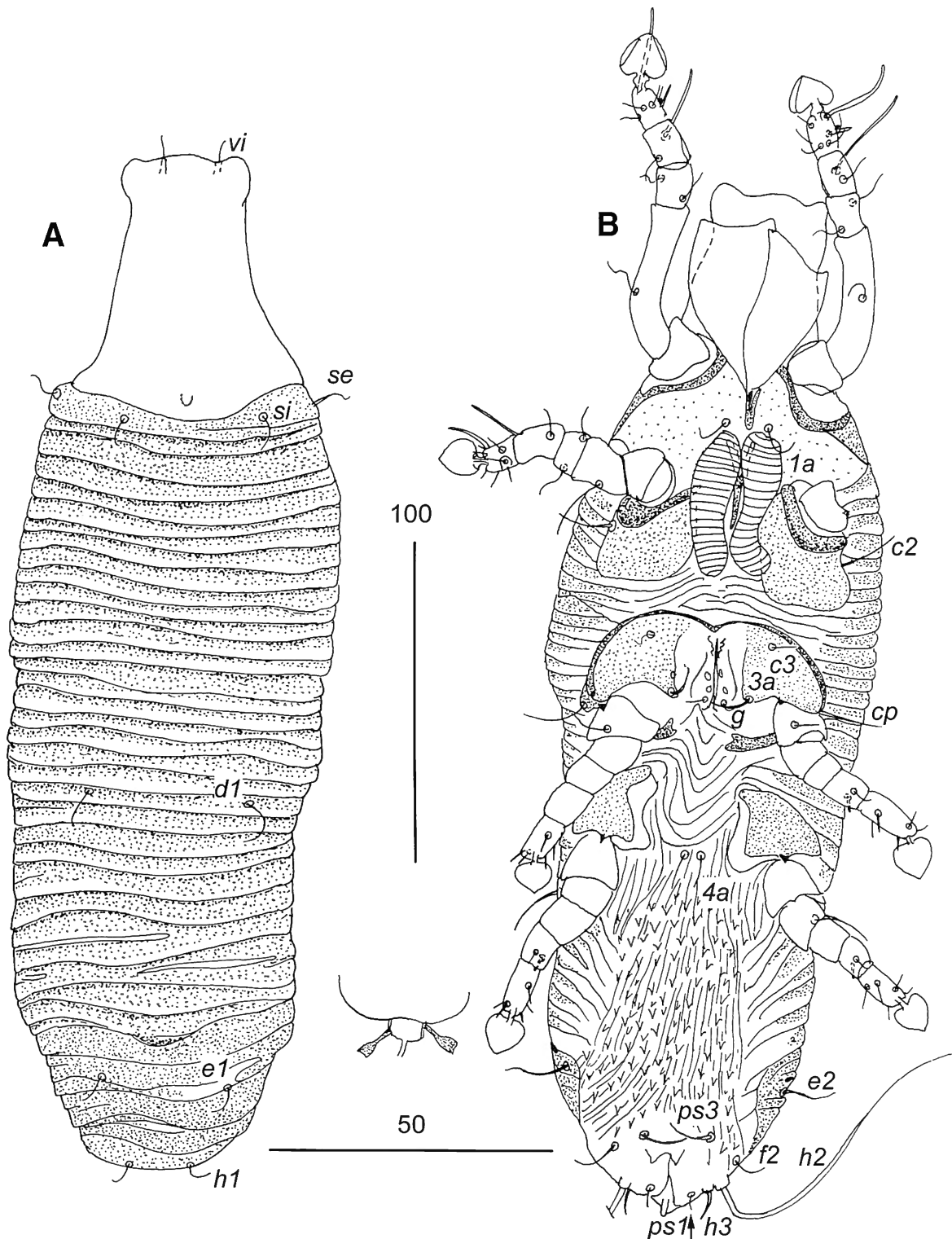


Fig. 2 — *Sciurochirus philippinensis* FAIN, 1972, female. Dorsal view (A), ventral view (B), spermatheca (C). Scale lines 100 μ m (A, B) and 50 μ m (C).

(BMOC 04-0329-060) ex host (FMNH 80347), Mindanao Isl., Zamboanga del Sur Prov., Labao, Dabiak, 07°38'50"N, 123°10'28"E, 21.V.1952. Coll. H. HOOGSTRAAL; 6 females (BMOC 04-0329-061) ex host (FMNH 80348), 2.V.1952. Coll. D.S. RABOR; 1 male and 3 females (BMOC 04-0329-075) ex host (FMNH 80356), Mindanao Isl., Zamboanga del Norte Prov., Katipunan, Miatan, 08°26'N, 123°17'E, 15.V.1952. Coll. D.S. RABOR; 12

females (BMOC 04-0329-080) ex host (FMNH 60835), Mindanao Isl., Davao del Sur Prov., Davao, 07°19'N, 125°26'E, 5.I.1947. Coll. M. CELESTINO; 5 males and 10 females (BMOC 04-0329-082) ex host (FMNH 61389), Mindanao Isl., Davao del Sur Prov., Davao, Mt. Apo, 06°59'N, 123°16'E, 4.XI.1946. Coll. P. CONCOVAK; 12 males and 11 females (BMOC 04-0329-083), same locality, 4.XI.1946. Coll. P. CONCOVAK; 7 males and 9 females

(BMOC 04-0329-084) ex host (FMNH 61392), same locality, 4.XI.1946. Coll. P. CONCOVAK.

ex subspecies *samarensis*: one male and 8 females (BMOC 04-0329-097) ex host (FMNH 87724), Samara Isl., Samar Prov., Matuguinao, 12°08'49"N, 124°53'04"E, 15.IV.1957. Coll. D.S. RABOR; 4 females (BMOC 04-0329-098) ex host (FMNH 87725), same locality, 18.IV.1957. Coll. D.S. RABOR; 2 females (BMOC 04-0329-101) ex host (FMNH 87728), Samara Isl., Samar Prov., Mt. Capotoan, 12°09'10"N, 124°56'06"E, 6.V.1957. Coll. D.S. RABOR; 4 females (BMOC 04-0329-103) ex host (FMNH 87730), same locality, 9.V.1957. Coll. D.S. RABOR; 11 females (BMOC 04-0329-104) ex host (FMNH 87731), same locality, 9.V.1957. Coll. D.S. RABOR; 3 females (BMOC 04-0329-105) ex host (FMNH 87732), same locality, 9.V.1957. Coll. D.S. RABOR; 1 male and 8 females (BMOC 04-0329-106) ex host (FMNH 87733), same locality, 9.V.1957. Coll. D.S. RABOR; 2 males and 9 females (BMOC 04-0329-108) ex host (FMNH 87735), same locality, 9.V.1957. Coll. D.S. RABOR; 1 male, 9 females, and 9 teleonymphs (HK 87-0407-001), Leyte Prov., Leyte Isl., 7.0 km N, 1.5 km E Baybay, 10°45'N, 124°48'E, 100 m, 7.IV.1987, L.R. HEANEY (LRH 3139).

ex *Sundasciurus steeri* (GÜNTHER, 1877): two males and 9 females (BMOC 04-0329-111) ex host (FMNH 63110) Palawan Isl., Palawan Prov., Brooke's Point, 08°50'N, 117°52'E, 28.IV.1947. Coll. M. CELESTINO; 6 males and 9 females (BMOC 04-0329-120) ex host (FMNH 21775), Palawan Is., Palawan Prov. (no further locality), 21.XII.1916. Coll. unknown.

ex *Petinomys crinitus* HOLLISTER, 1911: three males and 4 females (BMOC 04-0329-130) ex host (FMNH 92787), Mindanao Isl., Bukidnon Prov., Mt. Katanglad, Malaybalay, 08°26'48"N, 124°22'17"E, 4.V.1960. Coll. D.S. RASBOR and R.B. GONZALES; 6 males and 14 females (BMOC 04-0329-133) ex host (FMNH 87439), Mindanao Isl., Misamis Occidental, Mt. Malidang, Masawan, 08°50'57"N, 123°38'10"E, 9.IV.1956. Coll. D.S. RABOR.

ADDITIONAL MATERIAL: *Sciurochirus philippinensis*: 5 males and 6 females (BMOC 86-0224-029) ex *Ratufa affinis* (RAFFLES, 1821) (FMNH 105534) MALAYSIA: 3rd Division, Kapit Distr., Sungai Baleh, Sungai Menglong, near Tekalit, 01°35'N, 113°35'E, 29.I.1972. Coll. K.R. FROGNER.

Voucher specimens are deposited in FMNH, NMP, OSAL, UMMZ, ZISP.

Genus *Aeromychirus* FAIN, 1976

Aeromychirus FAIN, 1976: 41, 1979: 275, 1981: 308.

Type species: Afrolistrophorus aeromys FAIN, 1972.

DESCRIPTION: *Adults*. Anterior margin of prescapular shield straight, not dissected in midline. Postscapular shield with distinct transverse striation. Median spot (internal apodeme) absent on propodonotum. Propodo-

soma distinctly wider than hysterosoma. Full set of idiosomal and leg setae present. Cuticle between coxae II distinctly striated and forming auxiliary valves. Setae *se* filiform. Distinct longitudinal ridge connecting base of apodemes II and prescapular shield absent. Femur I without dorso-apical tooth. Setae *d*III shorter than tarsi in both sexes.

Male. Hysteronotal shield present, entire, occupying most part of hysteronotum. Apodemes III fused to each other. Opisthosoma strongly attenuate, with pair of terminal lobes. Lobar membranes present. Adanal shields absent. Para-anal suckers distinctly developed. Pregenital sclerites short, not fused to each other, bearing genital papillae. Dorsal apodeme of aedeagus arch-like, with free posterior projections, intermediate sclerite distinctly developed. Setae *f*2 filiform, slightly thickened. Setae *h*3 wide, membranous. Tarsi and tibiae III and IV slightly thickened or normally developed. Tarsi IV without apical projections.

Female. Dorsum covered by distinct transverse furrows, sclerotized or not. Hysteronotal shield present or absent, entire, if present. Setae *4b* situated anterior to genital papillae. Opisthogaster with numerous scales. Basal cap of spermatheca globosely inflated, efferent sperm ducts straight, spatula-like. Setae *h*2 and *h*3 subequal in length to other idiosomal setae or distinctly longer.

OTHER SPECIES INCLUDED: *A. hylopetes* (FAIN, 1970), *A. petinomys* **sp. nov.**

HOSTS AND DISTRIBUTION: The three species currently known in the genus *Aeromychirus* are parasites of Asian squirrels of the subfamily Pteromyinae.

Aeromychirus petinomys **sp. nov.**

(Figs. 3, 4)

TYPE MATERIAL: HOLOTYPE. Male (BMOC 04-0329-131, #1) ex *Petinomys crinitus* HOLLISTER, 1911 (FMNH 92788), PHILIPPINES: Mindanao Isl., Bukidnon Prov., Mt. Katanglad, Malaybalay, 8°26'48"N, 124°22'17"E, 9.V.1960. Coll. D.S. RABOR & R.B. GONZALES

PARATYPES. 6 male and 11 female paratypes (BMOC 04-0329-131, #2-18), same data as holotype; 3 males and 4 females (BMOC 04-0329-130, #1-7) ex *P. crinitus* (FMNH 92787), same locality as holotype, 4.V.1960. Coll. D.S. RASBOR & R.B. GONZALES [more 30 males and females in alcohol].

Holotype in FMNH, paratypes in FMNH, IRSNB, NMP, UMMZ, and ZISP.

DESCRIPTION: *Male* (holotype). Body including gnathosoma 330 (320-340 in 7 paratypes) long, 110 (110-115) wide. Prescapular shield 77 (75-80) long. Postscapular shield 65 (65-70) long, covered by 8-10 narrow trans-

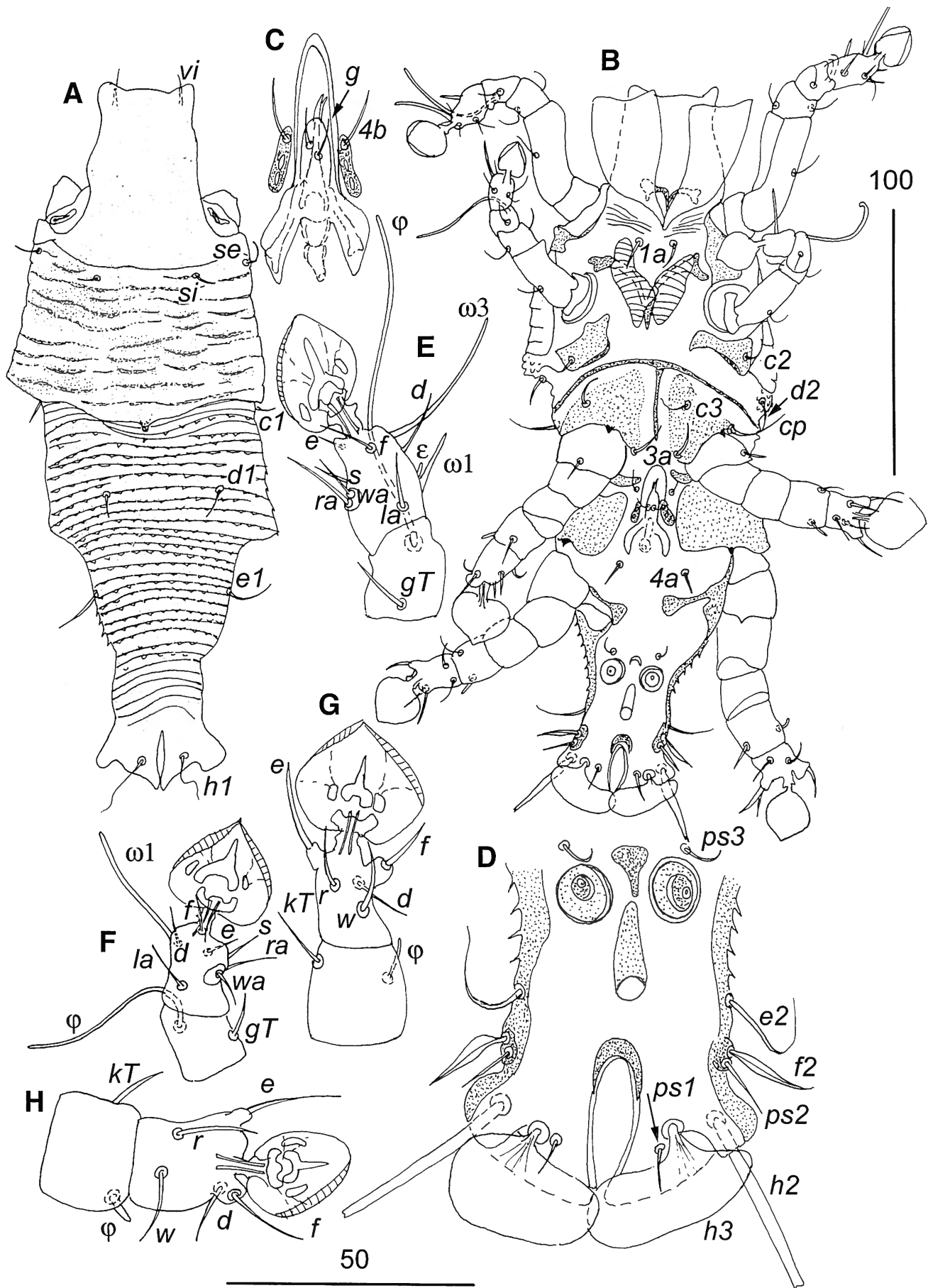


Fig. 3 — *Aeromychirus petinomys* sp. nov., male. Dorsal view (A), ventral view (B), aedeagus (C), opisthosoma in ventral view (D), tibiae and tarsi I-IV in ventral view, respectively (E-H). Scale lines 100 μ m (A, B) and 50 μ m (C-H).

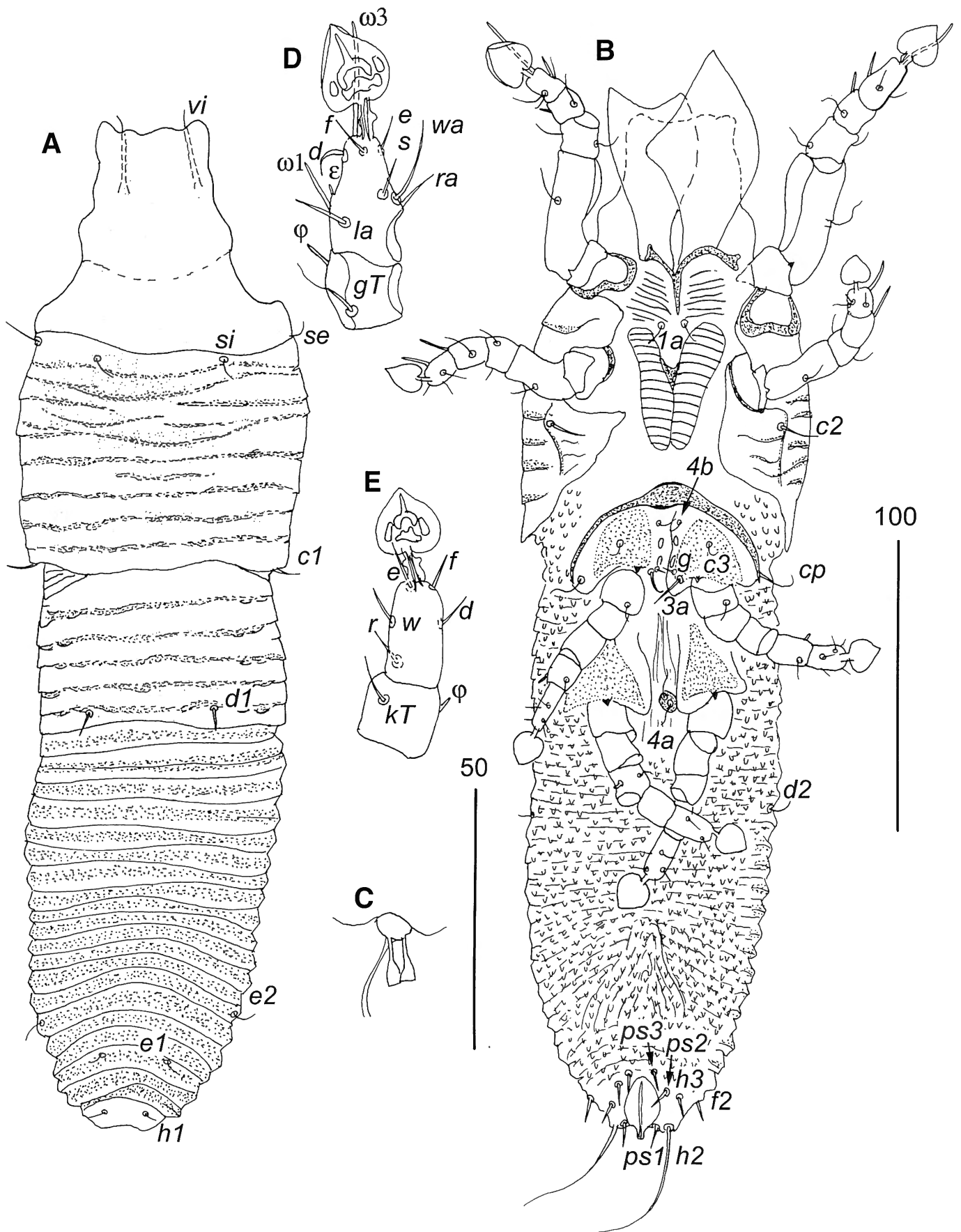


Fig. 4 — *Aeromychirus petinomys* sp. nov., female. Dorsal view (A), ventral view (B), spermatheca (C), tibiae and tarsi I and IV in ventral view, respectively (D, E). Scale lines 100 μ m (A, B) and 50 μ m (C-E).

verse bands. Posterior margin of prescapular shield with median indistinct projection. Hysteronotal shield 130 (125-135) long, covered by 28-30 transverse striations. These striations bearing small teeth spreading from anterior margin of hysteronotal shield to level of setae *e2*. Anterior margin of hysteronotal shield slightly concave, setae *d1* situated on this shield. Idiosomal surface between prescapular and hysteronotal shields striated with 3-6 lines. Coxal fields III sclerotized, without striations. Setae *f2* thickened in median part. Setae *h2* relatively short, about 40 long, and strongly thickened. Setae *h3* membranous, distinctly developed, about 20 wide, 2 times wider than longer, with widely rounded lateral margin. Aedeagus 9-10 long. Setae *g* situated ob base of aedeagus. Diameter of para-anal suckers about 15. Legs III and IV 60-70 long. Setae *d* of all tarsi not longer than this segment. Lengths of some setae and solenidia: *c1*, *c2*, *c3*, *d1*, *d2* - 6-9, *cp*, *f2* 12-13, *e1*, *e2* - 18-20, *h1* 23-26, *ps1* 11-12, ϕ I, II 43-45.

Female (10 paratypes). Body, including gnathosoma, 460-470 long, 110-120 wide. Prescapular shield 95-100 long. Postscapular shield 85-90, covered by 9-10 narrow transverse bands. Hysteronotal shield 68-72 long, situated immediately posterior to prescapular shield, covered by 6-7 transverse lines. Setae *d1* situated on this shield. Opisthonorium posterior to hysteronotal shield striated with 19-21 lines, sclerotized. Setae *4a* situated on common sclerotized patch. Setae *h2* about 40 long, distinctly longer than other idiosomal setae 9-15 long, Legs III and IV subequal, 85-90 long. Setae *d* of all tarsi not longer than this segment. Lengths of solenidia ϕ I-II 10-15.

ETYMOLOGY: The species name is derived from the generic name of the host and is a noun in apposition.

REMARK: This species clearly differ from the two previously recognized species, *A. aeromys* and *A. hylopetes*, by the following characters. In males of *A. petinomys* sp. nov., the hysteronotal shield is covered by numerous teeth, setae *h2* are relatively short and strongly thickened; in females, the hysteronotal shield is relatively short, setae *h2* are distinctly longer than other opisthosomal setae. In males of *A. aeromys* and *A. hylopetes*, the hysteronotal shield is without teeth, setae *h2* are whip-like; in females, the hysteronotal shield covers most of the hysteronotum, setae *h2* are short, not longer than other opisthosomal setae.

Genus *Lynxacarus* RADFORD, 1951
Subgenus *Lynxacarus* RADFORD, 1951

Lynxacarus RADFORD, 1951: 103, DUBININA, 1969: 448; FAIN, 1978a: 11, FAIN and HYLAND, 1974: 40; FAIN and LUKOSCHUS, 1978: 227; FAIN, 1981: 309.

Felistrophorus FOX, 1977: 242.

Type species: Lynxacarus morlani RADFORD, 1951.

DESCRIPTION: *Adults.* Anterior margin of prescapular shield variously shaped. Postscapular shield present, entire, well developed and distinctly ornamented. Small median spot (internal apodeme) well discernible in posterior third of this shield. Full set of idiosomal and leg setae present, excluding *dIV* which absent in males. Cuticle between coxae II distinctly striated and forming auxiliary clasping valves. Setae *se* filiform. Setae *d* of all tarsi not longer than this segment, except in *L. lyncodon*, in which setae *dIII* whip-like in both sexes. Distinct longitudinal ridge connecting base of apodemes II and prescapular shield present. Femur I with dorso-apical tooth in most species.

Male. Hysteronotum with paired shields, distinctly ornamented. Apodemes III fused to each other, forming distinct median crest. Opisthosoma wide, not narrowing behind coxae IV, with pair of posterior lobes. Adanal sclerites present. Para-anal suckers well developed. Pre-genital sclerites fused to each other, forming inverted Y-shape structure, bearing genital papillae. Dorsal apodeme with median projection. Intermediate sclerite relatively short. Setae *g* situated on cuticle immediately posterior to aedeagus. Setae *ps1*, *f2* thickened in most species. Setae *h3* filiform, strongly reduced in most species. Setae *dIV* absent. Tarsi and tibiae III and IV strongly thickened. Tarsi IV without apical projections.

Female. Hysteronotal shield absent. Opisthosoma usually without scales or tubercles (few tubercles present in *L. tupaiae*). Setae *4b* situated posterior to level of genital papillae, at same level as setae *g*. Setae *h2*, *h3* whip-like, much longer than other opisthosomal setae. Basal cap of spermatheca globose, sperm ducts straight.

OTHER SPECIES INCLUDED: *L. mustelae* (MEGNIN, 1885), *L. radovskyi* TENORIO, 1974, *L. tupaiae* FAIN, 1970, *L. lyncodon* FAIN, 1970, *L. semnopitheci* FAIN, 1970, *L. nearcticus* FAIN and HYLAND, 1973, *L. palawanensis* FAIN, 1976, and *L. grandior* FAIN, 1976.

HOSTS AND DISTRIBUTION: Eight species of the subgenus *Lynxacarus* are associated with carnivores and tree-shrews in Eurasia and the New World. Among them, four species, *L. mustelae*, *L. radovskyi*, *L. nearcticus*, and *L. lyncodon* are specific parasites of carnivores in the families Felidae and Mustelidae. Two closely related species are parasites of tree-shrews, *L. tupaiae* and *L. palawanensis*. *Lynxacarus semnopitheci*, which is closely related to the previously mentioned species, was described from an alcohol preserved specimen of *Presbytis hosei* (THOMAS, 1889) (= *Semnopithecus sabanus*) (Primates: Cercopithecidae) originating from northern Borneo (FAIN, 1970). Fain (1978a) reported this species from *Tupaia javanica* HORSFIELD, 1822 from Java and suggested that tree-shrews are the true hosts of this species, and we believe that its finding on *P. hosei* was the result of museum contamination. Our several records of this species on the widely distributed viverrid carnivore,

Paradoxurus hermaphroditus (PALLAS, 1777) indicates that this species may naturally occur on both carnivores and tree-shrews. Finally, the record of *Lynxacarus grandior* based on a single male from an alcohol preserved *Sundamys infraluteus* (THOMAS, 1888) (Rodentia: Muridae) originating from northern Borneo (FAIN, 1970) is probably the result of museum contamination (FAIN, 1976).

***Lynxacarus semnopithecii* FAIN, 1970**
(Figs. 5, 6)

Lynxacarus semnopithecii FAIN, 1970: 275; FAIN and HYLAND, 1974: 42; FAIN, 1976: 23, Figs. 7-9 [Holotype in BMNH].

DESCRIPTION: *Male* (10 specimens from *Paradoxurus hermaphroditus*). Body including gnathosoma 440-450 long, 175-185 wide. Prescapular shield 130-140 long. Anterior margin of prescapular shield widely concave. Postsapular shield 60-65, monotonously ornamented by 8-10 transverse lines. Hysteronotal shields about 65 long, completely striated. Coxal fields II with distinct auxiliary valves. Coxal fields III distinctly striated. Aedeagus about 10. Setae *h3* strongly reduced. Diameter of paranal suckers 10-11. Setae *f2* and *ps2* thickened. Legs III and IV 90-100 and 110-120 long, respectively. Femur I with dorso-apical tooth. Setae *dIII* shorter than segment. Lengths of some setae and solenidia: *c1*, *c2*, *c3*, *e1* – 23-25, *d1* 15-17, *d2* 20-22, *e2* 29-31, *f2* 19-20, *h1* 5-7, *ps1-3* 15-20, ϕ I, II 85-90.

Female (10 specimens from *Paradoxurus hermaphroditus*). Body, including gnathosoma, 490-500 long, 145-160 wide. Prescapular shield 140-145 long. Postsapular shield 65-70 long, monotonously by 9-11 lines. Small sclerotised path observable in median part of postsapular shield. Setae *c1* situated of this shield. Idiosoma posterior to postsapular shield with 37-40 striations, without tubercles. Legs III and IV subequal, about 120 long. Lengths of some setae and solenidia: *c1* 23-26, *c2* 65-70, *c3* and *f2* – 12-15, *cp* 44-50, *d1* 30-35, *d2* 45-50, *e1* 40-45, *e2* 50-53, *h2* and *h3* – 130-140, *ps1* 14-16, *ps2* and *ps3* 20-22, and ϕ II 12-13.

MATERIAL EXAMINED: Nine males and 18 females (BMOC 88-1710-009) ex *Paradoxurus hermaphroditus* (PALLAS, 1777) (USNM 573919), PHILIPPINES: Luzon Isl., Camarines Sur Prov., Mt. Isarog, 4 km N, 21.5 km E Naga, 1550 m, 13°40'N, 123°22'E, 13.III.1988. Coll. E.A. RICKART (EAR 1818); 10 males and 18 females (BMOC 04-0331-029) ex host (FMNH 61037), Mindanao Isl., Davao del Sur Prov., Mt. Apo, 06°20'N, 125°30'E, 19.XI.1946. Coll. M. CELESTINO. Immature Listrophoridae probably belonging to this species were observed on *P. hermaphroditus* (FMNH 628657), Palawan Prov., Puerto Princesa, 09°46'N, 118°45'E, 6.V.1947. Coll. H. HOOGSTRAAL.

Voucher specimens in FMNH, NMP, OSAL, UMMZ, ZISP.

***Lynxacarus palawanensis* FAIN, 1976**

Lynxacarus palawanensis FAIN, 1976: 40; FAIN, 1978a: 27, Figs. 10-13 [Holotype in BMNH].

REMARK: This species was described from *Tupaia palawanensis* THOMAS, 1894 from Balabac Isl. (Palawan Prov.) (FAIN, 1976). It has not been subsequently re-collected.

Genus *Afrolistrophorus* FAIN, 1970
Subgenus *Afrolistrophorus* FAIN, 1970

Afrolistrophorus FAIN, 1970: 282, 1971: 20, 1980: 186; 1981: 310; FAIN and LUKOSCHUS, 1983: 2; FAIN *et al.*, 1986: 372.

Type species: *Listrophorus lophuromys* RADFORD, 1940.

DESCRIPTION: *Adults.* Anterior margin of prescapular shield with median process or straight in African species and species from Rhizomyinae (Rodentia: Spalacidae – see STEPPAN *et al.*, 2004 for relationships of this host family). Postsapular shield present. Median spot (internal apodeme) absent on propodonotum. Hysteronotal shield entire. Cuticle between coxae II smooth or slightly striated, auxiliary clasping valves weakly developed. Setae *se* filiform. Setae *d* of all tarsi usually not longer than this segment (longer in species from Rhizomyinae). Distinct longitudinal ridge connecting base of apodemes II and prescapular shield absent. Femur I without dorso-apical tooth.

Male. Hysteronotal shield occupying most part of hysteronotum. Apodemes III fused to each other or separated in African species. Opisthosoma elongated, with pair of terminal lobes. Lobar membranes indistinct. Adanal shields absent. Para-anal suckers well developed. Pregenital sclerites small, bearing genital papillae. Dorsal apodeme of aedeagus with free posterior projections, intermediate sclerite short. Setae *f2* filiform. Setae *h3* flattened, leaf-like, setae *g* situated on cuticle immediately posterior to aedeagus. Tarsi and tibiae III and IV not thickened. Tarsi IV without apical projections.

Female. Hysteronotal shield shorter than postsapular shield, situated in anterior part of hysteronotum, entire in most species. Opisthogaster without or with scales or tubercles. Setae *4b* absent. Setae *h2* as short as other opisthosomal setae or distinctly longer. Setae *ps1* and *ps2* present in most African species and species from Rhizomyinae; these setae absent in remaining species. Basal cap of spermatheca slightly oblong, efferent sperm ducts widely curved.

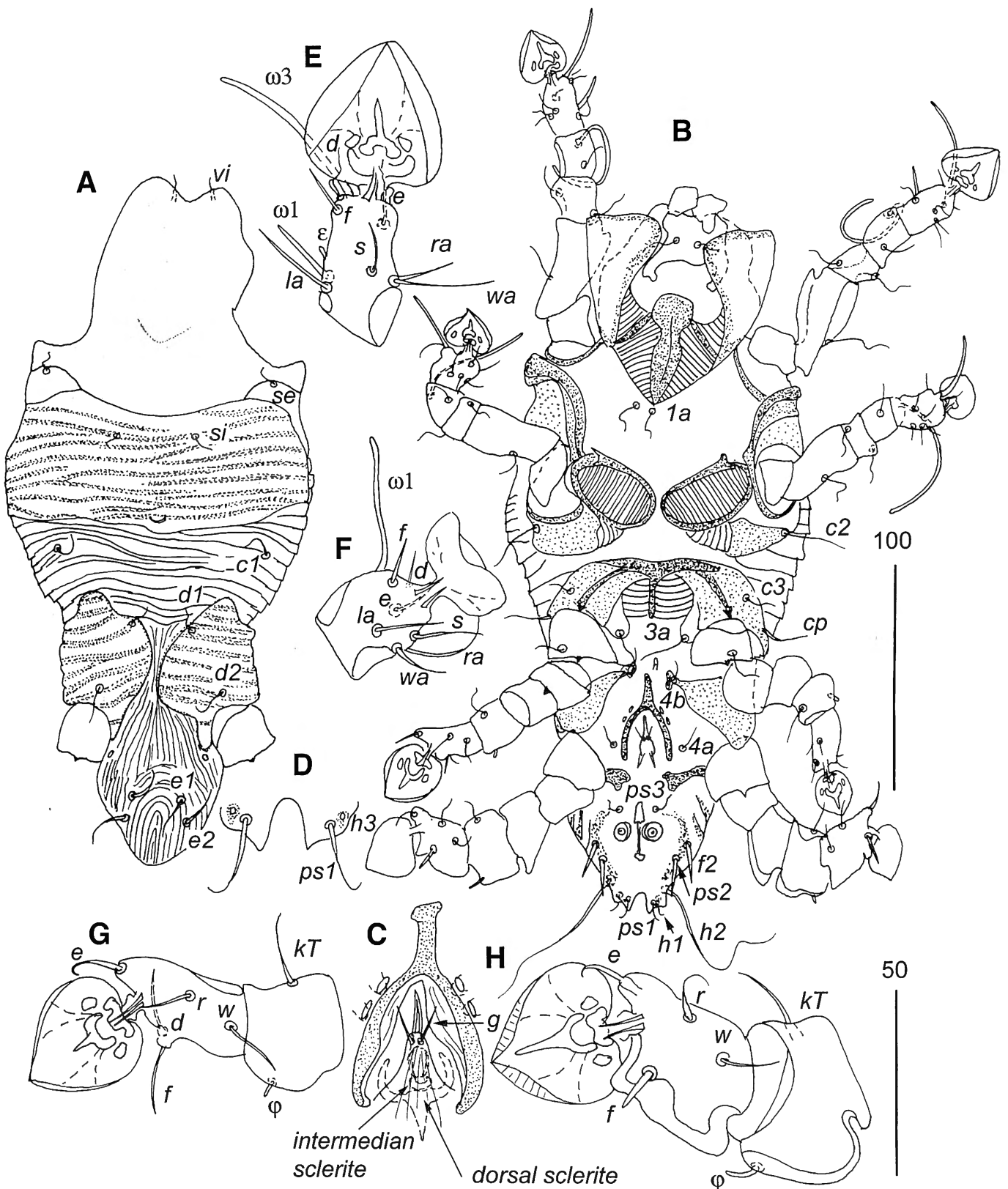


Fig. 5 — *Lynxacarus semnopitheci* FAIN, 1970, male. Dorsal view (A), ventral view (B), aedeagus (C), opisthosomal lobes in ventral view (D), tarsi I-II in ventral view, respectively (E, F), tibiae and tarsi III-IV in ventral view, respectively (G, H). Scale lines 100 μ m (A, B) and 50 μ m (C-H).

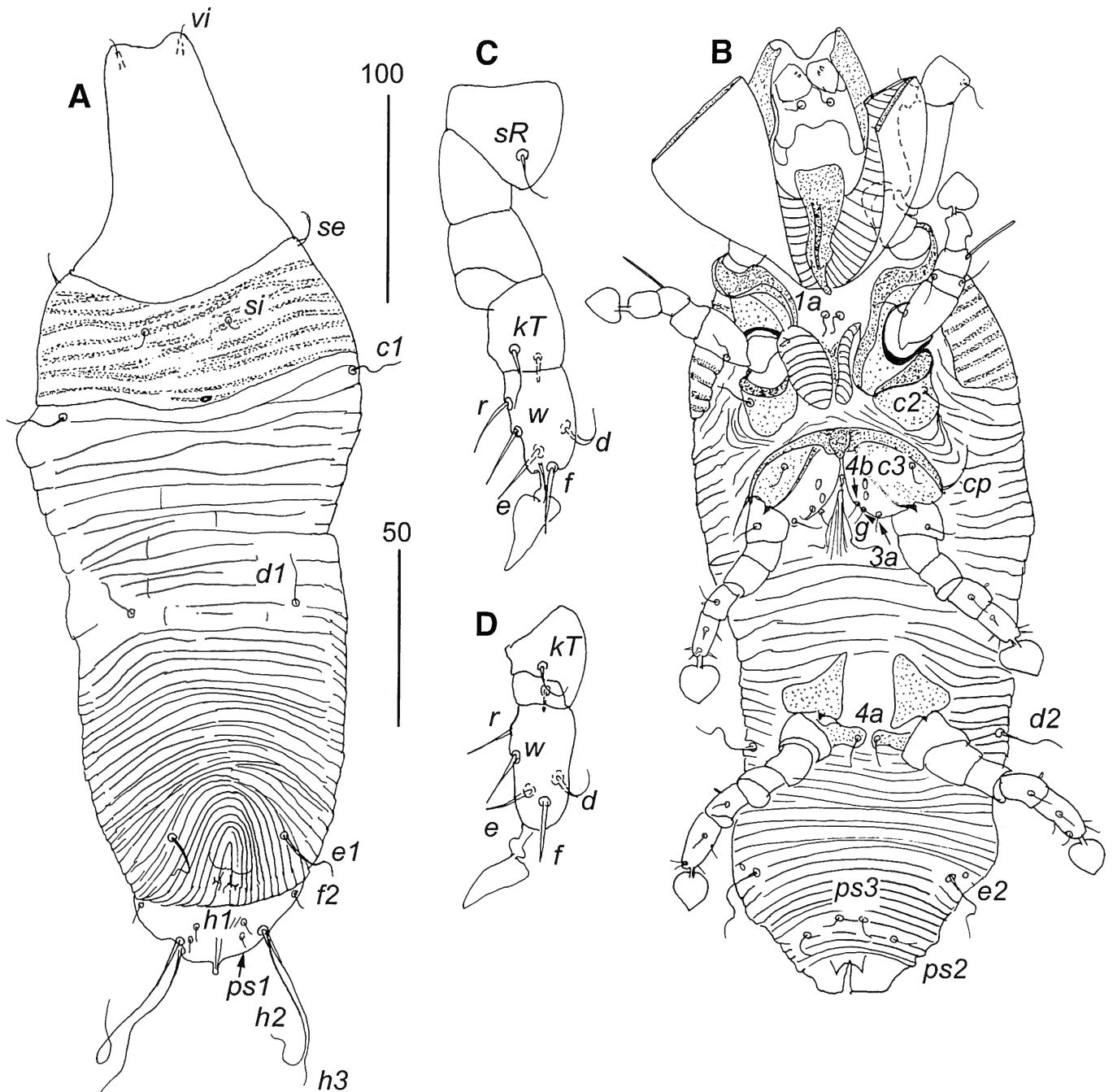


Fig. 6 — *Lynxacarus semnopithecii* FAIN, 1970, female. Dorsal view (A), ventral view (B), leg III in ventral view (C), tibia and tarsus IV in ventral view (D). Scale lines 100 µm (A, B) and 50 µm (C, D).

OTHER SPECIES INCLUDED: This subgenus includes 26 other species (see remark).

HOSTS AND DISTRIBUTION: Twenty-six species of this subgenus are known from rodents of the superfamilies Muroidea and Dipodoidea from Eurasia and Africa. Two species, *A. neacomys* FAIN and LUKOSCHUS, 1983 and *A. venezuelensis* FAIN and LUKOSCHUS, 1983 were described from Central and South America, from *Neacomys spinosus* (THOMAS, 1882) (Rodentia: Cricetidae) and *Monodelphis brevicaudata* (ERXLEBEN, 1777) (Didelphimorphia:

Didelphidae), respectively (FAIN and LUKOSCHUS, 1983). The relationships of the latter two species and those of the Neotropical subgenus *Amlistrophorus* remain to be tested in the context of a thorough taxonomic and phylogenetic review of this subgenus. *Afrolistrophorus maculatus* FAIN, 1976, the single species recovered from the Philippines, was described from *Leopoldamys sabanus* (THOMAS, 1887) from Malaysia and later recorded on *Niviventer niviventer* (HODGSON, 1836) from Thailand (FAIN, 1980). The subspecies *A. maculatus rattus* FAIN, 1976 was described simultaneously with the type subspe-

cies from *Rattus rattus* (L., 1758) from Surinam. From the Philippines, we recorded the type subspecies from *Rattus exulans* (PEALE, 1848), a host widely distributed in the Southeast Asia and Oceania, and from several different species of Old Philippine endemic rodents. Given the association of this species with several lineages of murid rodents, it is not possible to say with certainty if the species colonized the Philippines along with ancestors of the Old Endemics or the more recently arrived *Rattus* species.

REMARKS: The species of the subgenus *Afrolistrophorus* strongly differ from each other. This subgenus is in need of revision and is probably not monophyletic. We provisionally separate it onto three species groups, "apodemi", "bothae", and "rhizomys".

apodemi group: Anterior margin of prescapular shield with median process. Cuticle between coxal fields II without distinct striations. Male apodemes III fused to each other. Setae *ps1* and *ps2* present or absent in females. Setae *h2* in females not longer than other opisthosomal setae. Setae *dIII* and *IV* shorter than this segment. This group includes 10 species parasitizing rodents in Eurasia and the Neotropical *A. neacomys*.

SPECIES INCLUDED: *A. apodemi* FAIN, 1970, *A. chiropodomys* Fain, 1970, *A. maculatus* FAIN, 1976 (and subspecies *rattus* FAIN, 1976), *A. musculus* (WILSON and LAWRENCE, 1967), *A. medius* FAIN and LUKOSCHUS, 1983, *A. neacomys* FAIN and LUKOSCHUS, 1983, *A. obesus* FAIN and LUKOSCHUS, 1983, *A. pakistanensis* FAIN, 1976, *A. punctatus* FAIN and LUKOSCHUS, 1983, and *A. sicista* FAIN, 1970.

bothae group: Anterior margin of prescapular shield with or without median process. Cuticle between coxal fields II with or without distinct striation. Male apodemes III separated from each other. Setae *ps1* and *ps2* present in females. Setae *h2* in females not longer than other opisthosomal setae. Setae *dIII* and *IV* shorter than this segment.

This group includes 13 species parasitizing African rodents.

SPECIES INCLUDED: *A. brevis* FAIN, 1970, *A. bothae* (HIRST, 1923), *A. concinnus* FAIN, 1970, *A. congoicola* FAIN, 1971, *A. dasymys* FAIN, 1970, *A. dipodicola* (TRAGARDH, 1904) (subspecies *tatae* FAIN, 1971 and *theodori* (RADFORD, 1954)), *A. longior* FAIN, HART and RAHM, 1986, *A. lophuromys* (RADFORD, 1940), *A. muricola* FAIN, 1970, *A. otomys* FAIN, 1970, *A. steatomys* FAIN, 1970, *A. stochomys* FAIN, 1971, and *A. tachyoryctes* (COFFEE, 1971).

rhizomys group: Anterior margin of prescapular shield straight. Male apodemes III fused to each other. Setae *ps1* and *ps2* present in females. Setae *h2* in females longer than other opisthosomal setae. Setae *dIII* and *IV* longer than this segment.

This group includes 3 species parasitizing Asian rodents of the subfamily Rhizomyinae.

SPECIES INCLUDED: *A. rhizomys* (FAIN, 1970), *A. cannomys* FAIN, 1980, and *A. sumatrensis* FAIN, 1980.

UNGROUPED SPECIES: *A. venezuelensis* FAIN and LUKOSCHUS, 1983.

Afrolistrophorus maculatus maculatus FAIN, 1976 (Figs. 7, 8)

Afrolistrophorus maculatus maculatus FAIN, 1976: 38, 1980: 419, Figs. 4-6. [Holotype in BMNH]

DESCRIPTION: *Male* (10 specimens from *Rattus exulans*). Body including gnathosoma 360-370 long, 90-95 wide. Prescapular shield 95-100 long. Anterior margin of prescapular shield with median process. Postscapular shield 105-115 long, covered by 8-10 narrow bands slightly widened in lateral parts. Hysteronotal shield 170-180 long, with irregular anterior margin, covered by striation in anterior half, until level of setae *d2*. Idiosomal surface between prescapular and hysteronotal shields striated with 3-4 lines. Setae *h3* about 15 wide. Cuticle between coxal fields II not striated. Cuticle between coxal fields III striated. Coxal apodemes III fused to each other. Aedeagus about 18 long. Diameter of para-anal suckers about 8. Legs III and IV about 90 long and 100 long, respectively. Setae *dIII* and *IV* shorter than respective tarsi. Lengths of some setae and solenidia: *c1* and *h1* 7-9, *c2*, *c3*, *d1*, *d2*, *e1*, *ps1*, and *ps2* – all 9-12, *cp* and *e2* 18-20, *f2* 4-5, *h2* 190-200, ϕ I, II 30-35.

Female (10 specimens from *Rattus exulans*). Body, including gnathosoma, 470-480 long, 110-120 wide. Prescapular shield 105-110 long. Anterior margin of prescapular shield with median process. Postscapular shield 75-80 long, covered by 9-11 narrow bands, slightly widened in lateral parts. Idiosomal surface between postscapular and hysteronotal shields striated with 4-5 lines. Hysteronotal shield 60-65 long, covered with 9-12 transverse partly interrupted lines. Hysteronotum posterior to hysteronotal shield with 29-33 transverse striations. Cuticle between coxal fields II not sclerotized. Setae *h2* short, about 8 long, subequal in length to other opisthosomal setae. Setae *ps1* and *ps2* absent. Legs III and IV subequal, 60-65 long. Lengths of some setae and solenidia: *c1* 12-13, *c2*, *c3*, *d1*, *d2*, *e1*, *e2* – all 9-11, *cp* 13, *f2* 7, and ϕ I-II 8-10.

MATERIAL EXAMINED: PHILIPPINES, ex *Rattus exulans* (PEALE, 1848): 10 males and 6 females (BMOC 01-0920-065) ex host (FMNH 169162), Luzon Is., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Mapa, 1050m, 17°28'30"N, 121°04'30"E, 15.III.2001. Coll. E.A. RICKART (EAR 4547); 10 males and 10 females (BMOC 01-0920-062) ex host (FMNH 169159), Luzon Is., Kalinga Prov., Balbalan Munic., Balbalasang, 900 m, 17°29'15"N, 121°03'45"E, 10.III.2001. Coll. L.R.

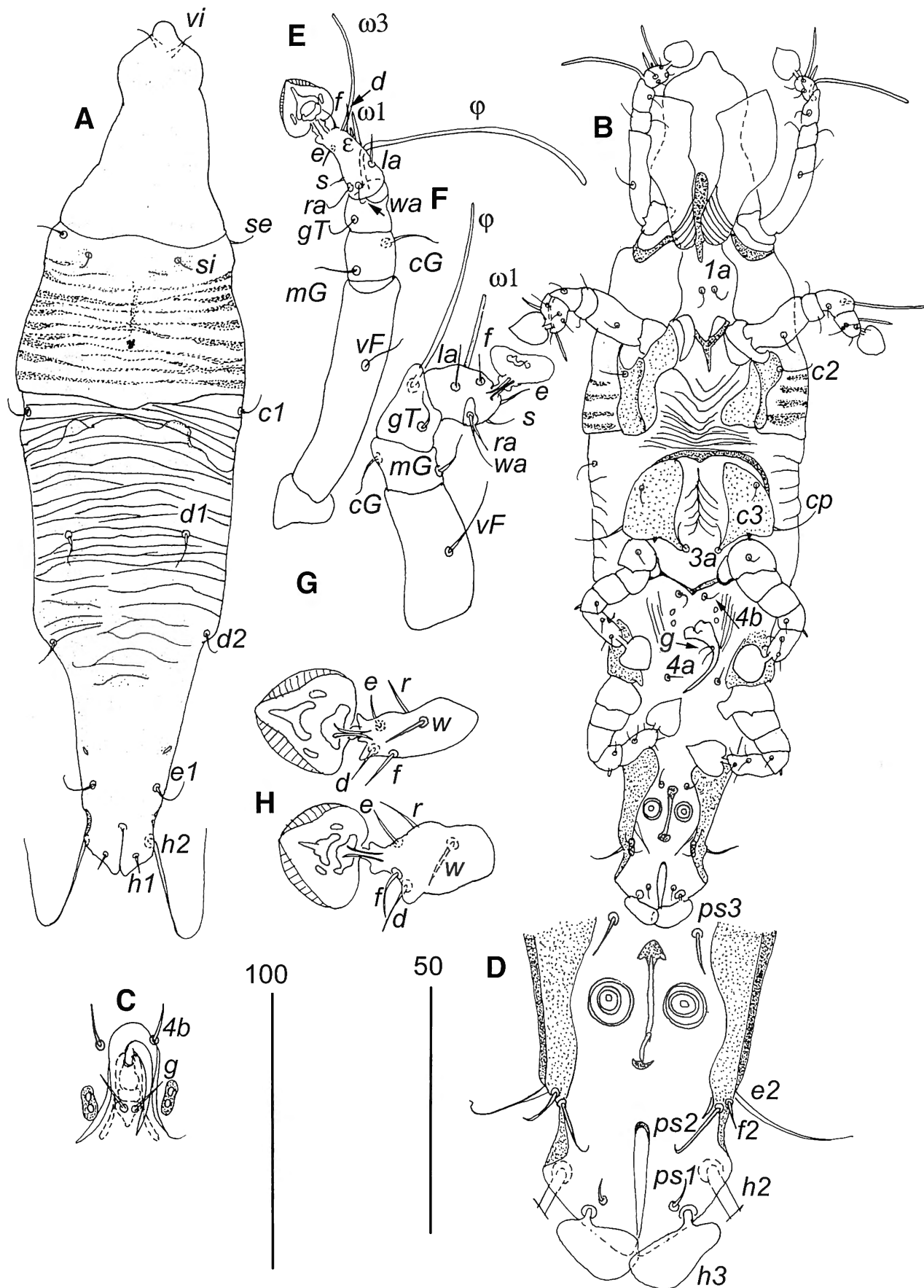


Fig. 7 — *Afrolistrophorus maculatus maculatus* FAIN, 1976, male. Dorsal view (A), ventral view (B), aedeagus (C), opisthosoma in ventral view (D), legs I-II in ventral view, respectively (E, F), tarsi III-IV in ventral view, respectively (G, H). Scale lines 100 μ m (A, B) and 50 μ m (C-H).

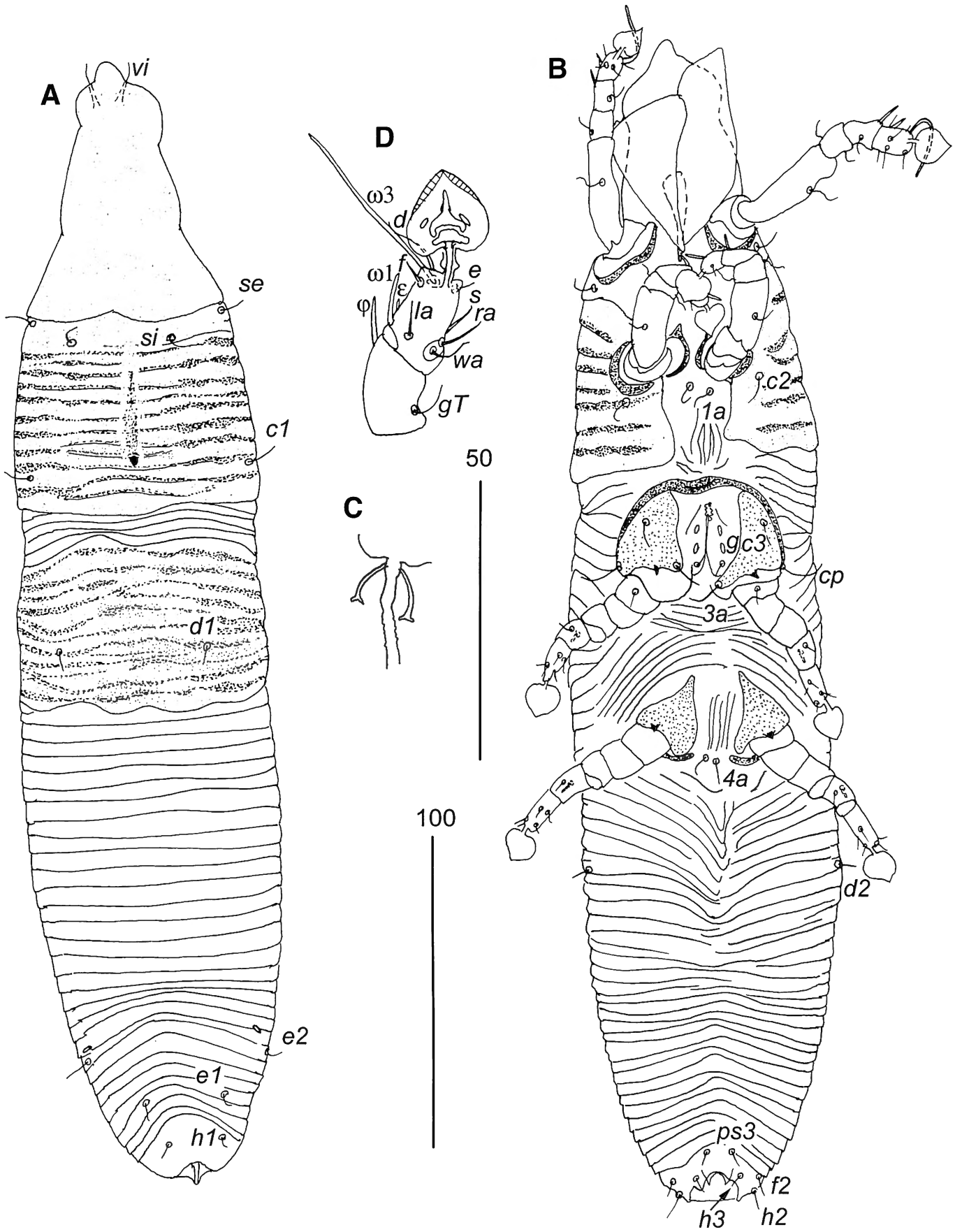


Fig. 8 — *Afrolistrophorus maculatus maculatus* FAIN, 1976, female. Dorsal view (A), ventral view (B), spermatheca (C), tibia and tarsus I in ventral view (D). Scale lines 100 µm (A, B) and 50 µm (C, D).

HEANEY (LRH 6279); 6 males and 11 females (BMO 01-0920-061) ex host (FMNH 169158), same locality, 10.III.2001. Coll. L.R. HEANEY (LRH 6278).

ex *Apomys datae* (MEYER, 1899): 3 males and 7 females (BMO 01-0920-030) ex host (FMNH 169110), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Am-licao, 1800 m, 17°26'30"N, 121°04'15"E, 24.III.2001. Coll. E.A. RICKART (EAR 4604); 5 males and 7 females (BMO 01-0920-031) ex host (FMNH 169111), same locality, 24.III.2001. Coll. E.A. RICKART (EAR 4607); 3 males and 5 females (BMO 01-0920-032) ex host (FMNH 169112), same locality, 25.III.2001. Coll. L.R. HEANEY (LRH 6428); 1 male and 1 female (BMO 01-0920-013) ex host (FMNH 169048), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Mapga, 1050 m, 17°28'30"N, 121°04'30"E, 13.III.2001. Coll. L.R. HEANEY (LRH 6316); 3 males and 3 females (BMO 01-0920-012) ex host (FMNH 169047), same locality, 13.III.2001. Coll. L.R. HEANEY (LRH 6315).

ex *Chrotomys silaceus* (THOMAS, 1895): 1 male (BMO 01-0920-043) ex host (FMNH 169131), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Am-licao, 1800 m, 17°26'30"N, 121°04'15"E, 21.III.2001. Coll. E.A. RICKART (EAR 4587); 1 male (BMO 01-0920-044) ex host (FMNH 169132), same locality, 25.III.2001. Coll. E.A. RICKART (EAR 4614); 1 female (BMO 01-0920-045) ex host (FMNH 169133), same locality, 20. III. 2001. Coll. L.R. HEANEY (LRH 6364); 1 female (BMO 01-0920-046) ex host (FMNH 169134), same locality, 21.III.2001. Coll. L.R. HEANEY (LRH 6391).

ex *Archboldomys musseri* RICKART, HEANEY, BALETE and TABARANZA, 1998: 20 males and 17 females (BMO 01-0920-034) ex host (FMNH 169162), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Am-licao, 1800 m, 17°26'30"N, 121°04'15"E, 19.III.2001. Coll. E.A. RICKART (EAR 4575).

ex *Chrotomys whiteheadi* (THOMAS, 1895): one male and 3 females (BMO 01-0920-049) ex host (FMNH 169137), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Mapga, 1050 m, 17°28'30"N, 121°04'30"E, 13.III.2001. Coll. L.R. HEANEY (LRH 4529); ex *Rhynchomys soricoides* THOMAS, 1895: one male (BMO 01-0920-073) ex host (FMNH 169171), Luzon Isl., Kalinga Prov., Balbalan Munic., Balbalasang Barangay, Mapga, 1050 m, 17°28'30"N, 121°04'30"E, 21.III.2001. Coll. L.R. HEANEY (LRH 4586);

ex *Apomys microdon* HOLLISTER, 1913: three males and 4 females (BMO 04-0909-028) ex host (FMNH 178398), Luzon Isl., Quezon Prov., Mt. Banahaw, Barangay Lalo, 1465 m, 14°03'58"N, 121°30'30"E, 3.III.2004. Coll. L.R. HEANEY (LRH 6985).

Voucher specimens in FMNH, NMP, OSAL, UMMZ, ZISP.

REMARK. The record of a single specimen from *Rhynchomys soricoides* is likely the result of contamination.

Genus *Asiöchirus* FAIN, 1970

Asiöchirus FAIN, 1970: 275, 1978b: 388, 1981: 309; FAIN and BOCHKOV, 2003: 228.

Type species: Listrophorus suncus RADFORD, 1947.

DESCRIPTION: *Adults*. Anterior margin of prescapular shield with small median process. Postscapular shield present. Median spot (internal apodeme) present on propodonotum. Cuticle between coxae II without distinct striations, auxiliary valves indistinct. Setae *se* filiform. Setae *4b* absent. Setae *d* of all tarsi not longer than this segment. Distinct longitudinal ridge connecting base of apodemes II and prescapular shield absent. Femur I without dorso-apical tooth.

Male. Hysteronotal shield entire, without ornamentation, occupying posterior third of hysteronotum. Apodemes III separated from each other. Cuticle between coxal fields III not striated. Opisthosoma wide, not elongated, with pair of terminal lobes, largely covered dorsally by hysteronotal shield. Lobar membranes not developed. Adanal shields absent. Para-anal suckers well developed. Pregenital sclerites indistinct. Dorsal apodeme of aedeagus short, with median posterior projection, intermediate sclerite short. Setae *f2* and *h3* filiform, setae *g* situated on cuticle immediately posterior to aedeagus. Tarsi and tibiae III and IV not thickened. Tarsi IV without apical projections.

Female. Hysteronotal shield absent. Idiosoma posterior to postscapular shield distinctly striated. Opisthogaster with scales. Setae *h2* short, not longer than other opisthosomal setae, setae *ps1* and *ps2* absent. Basal cap of spermatheca slightly elongated, efferent sperm ducts widely curved.

OTHER SPECIES INCLUDED: *A. chimmarogale* FAIN, 1976, *A. soriculus* FAIN and BOCHKOV, 2003, and *A. nepalensis* FAIN and BOCHKOV, 2003.

HOSTS AND DISTRIBUTION: The four species currently known in the genus *Asiöchirus* parasitize Old World shrews of the family Soricidae. We collected *Asiöchirus suncus* (RADFORD, 1947) from the type host, *Suncus murinus* (L., 1766) in the Philippines, where it was introduced by human activity. This species is widely distributed in Asia and also introduced to Africa and Madagascar.

Asiöchirus suncus (RADFORD, 1947)

(Figs. 9, 10)

Listrophorus suncus RADFORD, 1947: 234, Figs. 7-8 [Lectotype in BMNH].

Asiöchirus suncus, FAIN, 1970: 275, 1978b: 390, Figs. 1-2; FAIN and BOCHKOV, 2003: 228.

Asiöchirus suncus montanus FAIN, 1978b: 390, Figs. 3-5 [Holotype in BMNH].

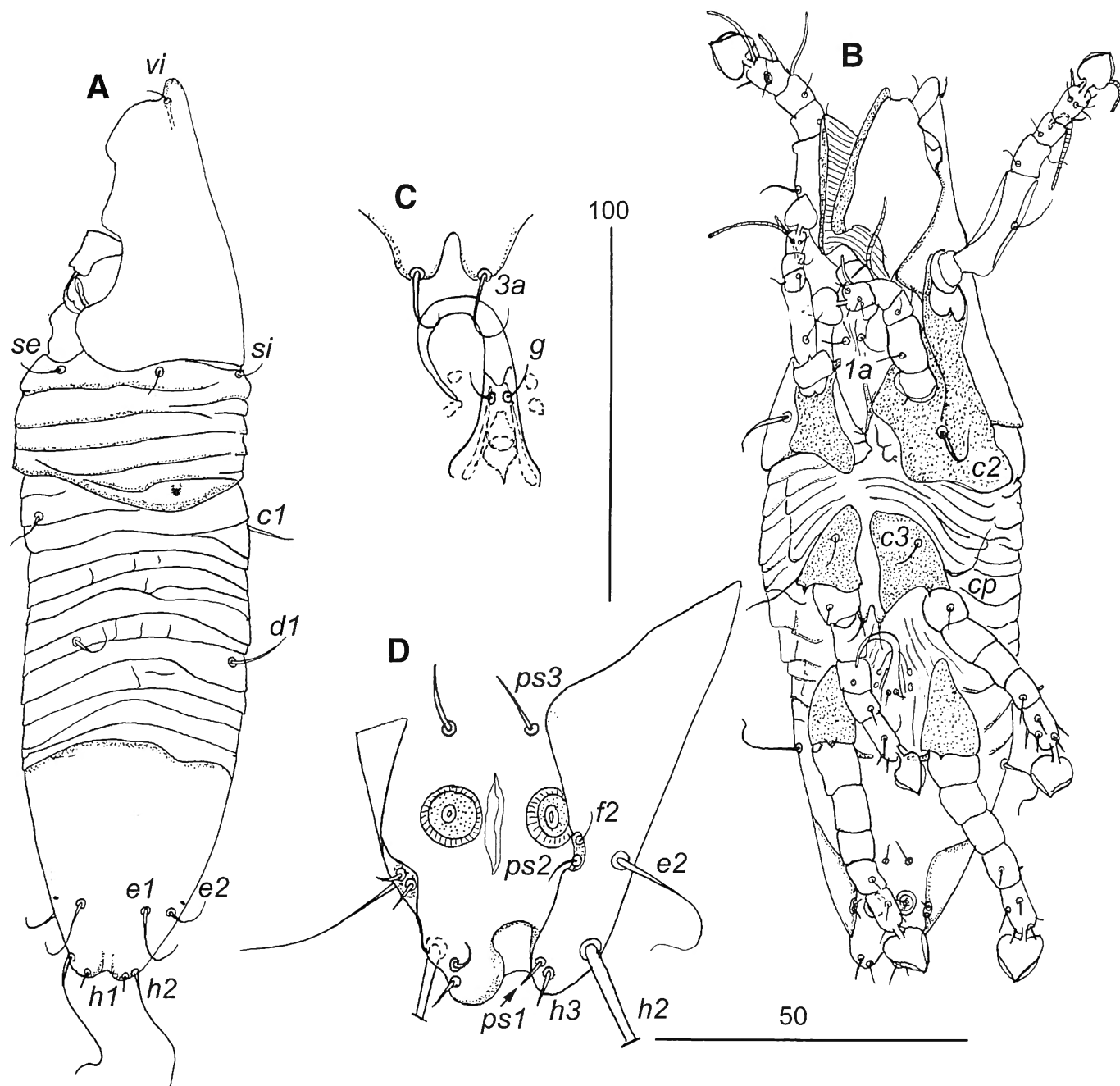


Fig. 9 — *Asiochirus suncus* (RADFORD, 1947), male. Dorsal view (A), ventral view (B), aedeagus (C), opisthosoma in ventral view (D). Scale lines 100 μm (A, B) and 50 μm (C, D).

DESCRIPTION: Male (10 specimens from *Suncus murinus*). Body including gnathosoma 330-335 long, 115-120 wide. Prescapular shield 95-100 long. Postscapular shield 55-58, covered by 4-5 transverse lines. Hysteronotal shield 84-90 long, without striations. Idiosomal surface between postscapular and hysteronotal shields with 10-12 not interrupted striations. Aedeagus 25-28 long. Diameter of para-anal suckers about 9-10 long. Legs III and IV 65-70 long. Lengths of some setae and solenidia: *c1* - 18, *c2*, *d2*, and *e1* - all 22-26, *c3*, *f2*, *h3*, *ps1*, and *ps2* - all 5-8, *cp* - 15, *d1* and *ps3* - 11-13, *h2* 132, ϕ I, II 29-31.

Female (10 specimens from *Suncus murinus*). Body, including gnathosoma, 430-440 long, 110-120 wide. Prescapular shield 105-110 long. Postscapular shield 62-66 long, covered by 12-14 transverse lines. Idiosomal surface posterior to prescapular shields 29-32 lines. Hysteronotum without tubercles or scales. Opisthogaster with distinct teeth. Setae *4a* situated on small common sclerotized patch. Legs III and IV subequal, about 70 long. Lengths of some setae and solenidia: *c1* 16, *c2*, *d1*, *d2*, *e1*, *e2*, *h3*, and *ps3* - all 18-22, *c3*, *f2*, *h1*, and *h2* - all 4-6, *cp* 9-10, ϕ I-II 9-10.

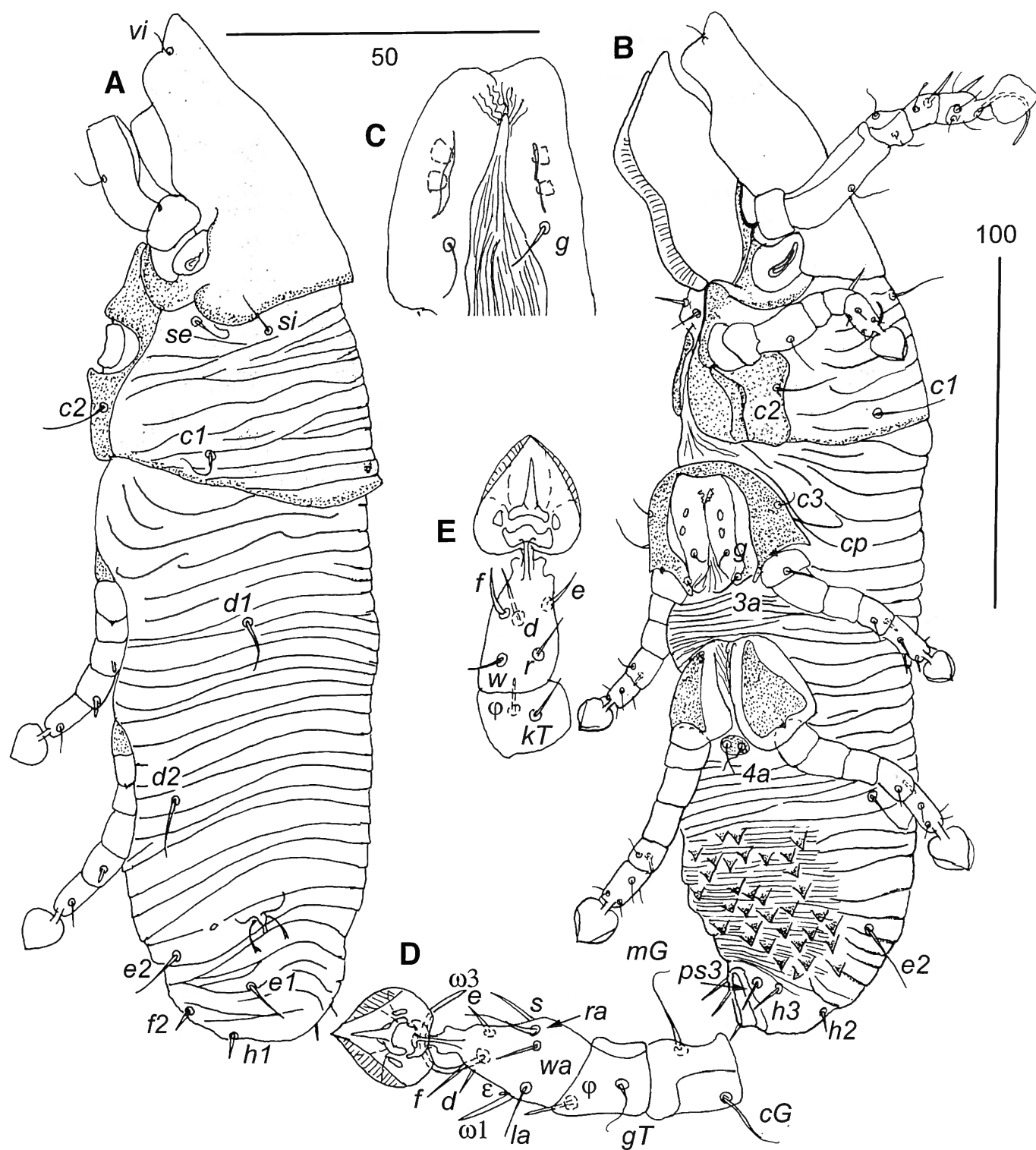


Fig. 10 — *Asiochirus suncus* (RADFORD, 1947), female. Dorsal view (A), ventral view (B), vulva (C), genu, tibia and tarsus I in ventral view (D), tibia and tarsus IV in ventral view (E). Scale lines 100 μ m (A, B) and 50 μ m (C-E).

MATERIAL EXAMINED: Three males and 5 females (HK 87-0507-004) ex *Suncus murinus* (L., 1766), PHILIPPINES: Negros Isl., Negros Oriental Prov., Dumaguete, 09°18'N, 123°18'E, 7.V.1987. Coll. E.A. RICKART (EAR 1551); 12 males and 5 females (BMOC 95-1214-034) ex *S. murinus*

(FMNH 154833), PHILIPPINES: Camiguin Prov., Mt. Timpoong, 2 km N, 6.5 km W. Mahinog, 1275 m, 09°11'N, 124°43'E, 21.V.1995. Coll. L.R. HEANEY (LRH 5405). Voucher specimens in FMNH, NMP, OSAL, UMMZ, ZISP.

Key to the Philippine Listrophoridae

Males

1. Setae *h3* membranous 4
- Setae *h3* filiform 2
2. Anterior margin of prescapular shield concave. Hysteronotal shield paired. Auxiliary valves between coxal fields II distinctly developed. Apodemes of coxae III fused to each other. Setae *4b* present. Setae *dIV* absent *Lynxacarus* RADFORD, 1951 . . . 3
- Anterior margin of prescapular shield with median process. Hysteronotal shield entire. Auxiliary valves between coxal fields II indistinct. Apodemes of coxae III separated from each other. Setae *4b* absent. Setae *dIV* present
- *Asiochirus suncus* (RADFORD, 1947) (Fig. 9)
3. Postscapular shield distinctly striated in median part *Lynxacarus semnopithecii* FAIN, 1970 (Fig. 5)
- Postscapular shield without striations in median part *Lynxacarus palawanensis* FAIN, 1976
4. Hysteronotal shield without scales. Setae *h2* whip-like, filiform 5
- Hysteronotal shield with numerous scales. Setae *h2* steak-like, strongly thickened
- *Aeromychirus petinomys* sp. nov. (Fig. 3)
5. Anterior margin of prescapular shield straight. Postscapular shield absent. Hysteronotal shield without ornamentation. Setae *ps2* absent
- *Sciurochirus philippinensis* FAIN, 1972 (Fig. 1)
- Anterior margin of prescapular shield with median process. Postscapular shield present. Hysteronotal shield striated. Setae *ps2* present
- *Afrolistrophorus maculatus maculatus* FAIN, 1976 (Fig. 7)

Females

1. Hysteronotal shield present 3
- Hysteronotal shield absent 2
2. Anterior margin of prescapular shield with median process. Hysteronotum posterior to hysteronotal shield not sclerotized. Auxiliary valves between coxal fields II indistinct. Setae *4b* and *ps1-2* absent. Setae *h2* distinctly longer other opisthosomal setae.

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Opisthogaster with tubercles *Afrolistrophorus maculatus maculatus* FAIN, 1976 (Fig. 8)

- Anterior margin of prescapular shield straight. Hysteronotum posterior to hysteronotal shield distinctly sclerotized. Auxiliary valves between coxal fields II distinctly developed. Setae *4b* and *ps1-2* present. Setae *h2* short, subequal in length to other opisthosomal setae. Opisthogaster without tubercles
- *Aeromychirus petinomys* sp. nov. (Fig. 4)
- 3. Postscapular shield present. 4
- Postscapular shield absent.
- *Sciurochirus philippinensis* FAIN, 1972 (Fig. 2)
- 4. Anterior margin of prescapular shield concave. Auxiliary valves between coxal fields II distinctly developed. Distinct longitudinal ridge connecting base of apodemes II and prescapular shield present. Setae *4b* and *ps1-2* present. Setae *h2* and *h3* distinctly longer other opisthosomal setae. Opisthogaster without teeth. Dorso-apical tooth of femora I present *Lynxacarus* RADFORD, 1951 . . . 5
- Anterior margin of prescapular shield with median process. Auxiliary valves between coxal fields II indistinct. Longitudinal ridge connecting base of apodemes II and prescapular shield absent. Setae *4b* and *ps1-2* absent. Setae *h2* and *h3* short, subequal in length to other opisthosomal setae. Opisthogaster with distinct teeth. Dorso-apical tooth of femora I absent. *Asiochirus suncus* (RADFORD, 1947) (Fig. 10)
- 5. Postscapular shield monotonously striated by thick lines
- *Lynxacarus semnopithecii* FAIN, 1970 (Fig. 6)
- Postscapular shield striated in median part by numerous fine lines and few thick lines in lateral parts *Lynxacarus palawanensis* FAIN, 1976

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