Fleas of Venezuela

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# TABLE OF CONTENTS

**ABSTRACT** ........................................................................................................ 1

**INTRODUCTION** .............................................................................................. 1

**FLEA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS** ..... 2

Family Pulicidae .................................................................................................... 2

Genus Pulex Linnaeus, 1758 .................................................................................... 2

  *Pulex irritans* Linnaeus, 1758 ............................................................................ 2
  *Pulex simulans* Baker, 1895 ............................................................................... 2

Genus Echidnophaga Olliff, 1886 .......................................................................... 3

  *Echidnophaga gallinacea* (Westwood, 1875) ....................................................... 3

Genus Ctenocephalides Stiles and Collins, 1930 ................................................... 3

  *Ctenocephalides canis* (Curtis, 1826) ................................................................. 3
  *Ctenocephalides felis felis* (Bouche, 1835) ............................................................ 3

Genus Xenopsylla Glinkiewicz, 1907 ................................................................... 4

  *Xenopsylla brasiliensis* (Baker, 1904) ................................................................. 4
  *Xenopsylla cheopis* (Rothschild, 1903) ............................................................... 4

Genus Hectopsylla Frauenfeld, 1860 .................................................................... 4

  *Hectopsylla psittaci* Frauenfeld, 1860 ................................................................. 4

Genus Rhynchopsyllus Haller, 1880 ..................................................................... 4

  *Rhynchopsylla pulex* Haller, 1880 .................................................................... 4

Genus Tunga Jarocki, 1838 .................................................................................... 5

  *Tunga penetrans* (Linnaeus, 1758) ................................................................. 5

Family Rhopalopsyllidae ......................................................................................... 5

Genus Rhopalopsyllus Baker, 1905 ....................................................................... 5

  *Rhopalopsyllus australis australis* (Rothschild, 1904) ...................................... 5
  *Rhopalopsyllus cecicus sacius* Jordan and Rothschild, 1908 ........................... 5
  *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild, 1908 .................... 10
  *Rhopalopsyllus hutzi cleophontis* (Rothschild, 1904) ..................................... 10

Genus Polygenis Jordan, 1939 ............................................................................. 10

  *Polygenis atopus* (Jordan and Rothschild, 1922) ............................................. 10
  *Polygenis bolbitis bolbitis* (Wagner, 1901) ......................................................... 15
  *Polygenis dunnii* (Jordan and Rothschild, 1922) ............................................. 15
  *Polygenis frustratus* Johnson, 1957 ................................................................ 20
  *Polygenis impavidus* Johnson, 1957 ................................................................ 20
  *Polygenis klagesi klagesi* (Rothschild, 1904) ..................................................... 23
  *Polygenis klagesi samuelis* (Jordan and Rothschild, 1923) ......................... 23
  *Polygenis occidentalis steganus* (Jordan and Rothschild, 1923) .................. 28
  *Polygenis peromis* (Jordan and Rothschild, 1923) .......................................... 28
  *Polygenis roberti haebei* (I. Fox, 1947) ......................................................... 28
  *Polygenis versuta Guimarães, 1942 ................................................................. 35

Family Pygiopsyllidae .............................................................................................. 35

Genus Ctenidiosomus Jordan, 1931 ..................................................................... 35

  *Ctenidiosomus perplexus*, new species .............................................................. 41

Family Hystrichopsyllidae ...................................................................................... 45

Genus Adoratopsylla Ewing, 1925 ....................................................................... 45

  *Adoratopsylla* (Adoratopsylla) *antiquorum antiquorum* (Rothschild, 1904) 45
  *Adoratopsylla* (Adoratopsylla) *antiquorum discreta* (Jordan, 1926) ............ 46
  *Adoratopsylla* (Adoratopsylla) *antiquorum rara*, new subspecies ............... 46
  *Adoratopsylla* (Adoratopsylla) *antiquorum recta*, new subspecies .............. 46
  *Adoratopsylla* (Adoratopsylla) *bicosta* Ewing, 1925 .................................... 56
  *Adoratopsylla* (Adoratopsylla) *dilicata* Jordan, 1938 .................................... 56
  *Adoratopsylla* (Trirhopopsylla) *intermedia intermedia* (Wagner, 1901) ...... 60

Genus Neotyphloceras Rothschild, 1914 ............................................................ 64

  *Neotyphloceras rosenbergi* (Rothschild, 1901) .............................................. 64

Family Stephanocircidae ......................................................................................... 72

Genus Cleopsylla Rothschild, 1914 ..................................................................... 72
<table>
<thead>
<tr>
<th>Page</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>72</td>
<td>Cleopisylla monticola Smit, 1953</td>
</tr>
<tr>
<td>75</td>
<td>Genus Cleopisylla Rothschild, 1911</td>
</tr>
<tr>
<td></td>
<td>Cleopisylla minuta minuta (Rothschild, 1903)</td>
</tr>
<tr>
<td>75</td>
<td>Genus Plecopsylla Jordan, 1931</td>
</tr>
<tr>
<td></td>
<td>Plecopsylla aulaces Hopkins, 1951</td>
</tr>
<tr>
<td>83</td>
<td>Genus Sphinctopsylla Jordan, 1931</td>
</tr>
<tr>
<td></td>
<td>Sphinctopsylla tolmera (Jordan, 1931)</td>
</tr>
<tr>
<td>87</td>
<td>Family Ischnopsyllidae</td>
</tr>
<tr>
<td></td>
<td>Genus Hormopsylla Jordan and Rothschild, 1921</td>
</tr>
<tr>
<td></td>
<td>Hormopsylla cryptica, new species</td>
</tr>
<tr>
<td></td>
<td>Genus Myodopsylla Jordan and Rothschild, 1911</td>
</tr>
<tr>
<td></td>
<td>Myodopsylla wolffsohni salcasis Jordan, 1931</td>
</tr>
<tr>
<td>91</td>
<td>Genus Ptilopsylla Jordan and Rothschild, 1921</td>
</tr>
<tr>
<td></td>
<td>Ptilopsylla leptina Jordan and Rothschild, 1921</td>
</tr>
<tr>
<td>91</td>
<td>Genus Rothschildopsylla Guimarães, 1953</td>
</tr>
<tr>
<td></td>
<td>Rothschildopsylla noctilionis (Costa Lima, 1920)</td>
</tr>
<tr>
<td>91</td>
<td>Genus Sternopsylla Jordan and Rothschild, 1921</td>
</tr>
<tr>
<td></td>
<td>Sternopsylla distincta speciosa Johnson, 1957</td>
</tr>
<tr>
<td>104</td>
<td>Family Ceratophyllidae</td>
</tr>
<tr>
<td></td>
<td>Genus Dasyopsylla Baker, 1905</td>
</tr>
<tr>
<td></td>
<td>Dasyopsylla gallinace perpinnares (Baker, 1904)</td>
</tr>
<tr>
<td></td>
<td>Dasyopsylla lanus venezuelensis (Fox and Anduze, 1947)</td>
</tr>
<tr>
<td></td>
<td>Dasyopsylla stephensi (Jordan, 1929)</td>
</tr>
<tr>
<td>104</td>
<td>Genus Orchopcas Jordan, 1933</td>
</tr>
<tr>
<td></td>
<td>Orchopcas howardi Baker, 1895</td>
</tr>
<tr>
<td>105</td>
<td>Genus Pleochaetis Jordan, 1933</td>
</tr>
<tr>
<td></td>
<td>Pleochaetis appolinaris (Jordan and Rothschild, 1921)</td>
</tr>
<tr>
<td></td>
<td>Pleochaetis dealens (Jordan and Rothschild, 1914)</td>
</tr>
<tr>
<td></td>
<td>Pleochaetis dealens quitanus (Jordan, 1931)</td>
</tr>
<tr>
<td>109</td>
<td>Genus Pleochaetis Jordan, 1954</td>
</tr>
<tr>
<td></td>
<td>Pleochaetis smiti Johnson, 1954</td>
</tr>
<tr>
<td>112</td>
<td>Family Leptopsyllidae</td>
</tr>
<tr>
<td></td>
<td>Genus Leptopsylla Jordan and Rothschild, 1911</td>
</tr>
<tr>
<td></td>
<td>Leptopsylla seguis (Schonherr, 1811)</td>
</tr>
<tr>
<td>112</td>
<td>LITERATURE CITED</td>
</tr>
</tbody>
</table>
FLEAS OF VENEZUELA

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Carlos E. Machado-Allison

ABSTRACT

Forty-three species of fleas were collected in Venezuela by personnel of the Smithsonian Venezuelan Project. Currently there are fifty-two species of fleas known from Venezuela. Four new taxa are described: Hormopsylla cryptica, Ctenidiosomus perplexus, Adoratopsylla antiquorum rara and Adoratopsylla antiquorum recta. The females of Adoratopsylla antiquorum discreta Jordan and Rothschildopsylla noctilionis (Costa Lima) are described. The families Stephano-ciricidae (Cleop Sylvia, Craneanopsylla, Plocopsylla, Sphinctopsylla) and Pygiosyllidae (Ctenidiosomus) are reported from Venezuela for the first time. Two male specimens of the genus Orchopeas constitute the first record of this genus in South America and records of species of the genus Pleochaetis are the first reported for Venezuela. Illustrations are provided to facilitate identification of Venezuelan fleas.

INTRODUCTION

Venezuela, a country of great fascination to zoologists, is geographically located so that elements of the Amazonian, Andean, and Middle American faunas are represented. The rhopalopsyllid genera Rhopalopsyllus Baker and Polygenis Jordan and the hystrichopsyllid genus Adoratopsylla Ewing are characteristic of the Amazonian flea fauna. The Andean flea fauna, virtually unknown heretofore in Venezuela, is represented by the stephanocirid genus Cleop Sylvia Rothschild, Craneopsylla Rothschild, Plocopsylla Jordan and SphINCTopsylla Jordan, the pygiosyllid genus Ctenidiosomus Jordan and the hystrichopsyllid genus Neo-typhloceras Rothschild. The Middle American fauna, also poorly known in Venezuela, is contained primarily in two ceratophyllid genera, Pleochaetis Jordan and Orchopeas Jordan.

Papers published to date have dealt principally with the Amazonian flea fauna in Venezuela. Anduze, et al. (1947) listed 21 species and subspecies, and the list was subsequently enlarged to include 29 species and subspecies by Cova Garcia and Tallaforro (1959). Machado-Allison (1966) recorded 30 species and subspecies, and his list is essentially the same as that provided by Barrera and Diaz-Ungria (1957).

During a three year period from July 1965 to September 1968, approximately forty thousand mammals were collected in Venezuela by personnel associated with the Smithsonian Venezuelan Project (SVP), who had the support and cooperation of several individuals and agencies in Venezuela. Most of the mammals were examined for ectoparasites. This paper is based on 43 species and subspecies of fleas collected from the host animals by SVP. With species previously listed but not collected by SVP the number of species and subspecies known from Venezuela is raised to 52. However, a definitive study of the fleas of Venezuela still is not feasible even though the SVP collection is rather extensive both geographically and ecologically. Several genera, particularly Polygenis Jordan and Pleochaetis Jordan are badly in need of revision. Specific names assigned to some populations in these genera are provisional at best. Large series of specimens from type localities will be required before species can be defined and the limits of subspecific variation determined.

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In addition to reporting species in four genera of the family Stephanocricidae and a species of Ctenidiosomus in the family Pygiosyllidae from Venezuela for the first time, we also report the initial finding of a species of the genus Orchopeas in South America. We have described two new species, two new sub-species, and the females of *Adoratopsylla antiquorum discreta* Jordan and *Rothschildopsylla noctilionis* (Costa Rica).

We express appreciation to Dr. Robert Trumb for his assistance in dealing with taxonomic problems in the genus *Flecochaetis*. Mr. F.C.A.M. Smit studied several populations in the genus *Polygnis* and rendered opinions which were helpful. He looked at specimens in other genera as well, and we are most grateful for his help. Thanks are due to Dr. Charles O. Handley, Jr., for identification of the host animals. Jeanne Thomas, Michael W. Hastriter, Lyndon P. Baum, Peggy Card, and Toni Marriott have been most helpful in the preparation of the manuscript. Lt. Colonel Alexander A. Hubert and the group of artists at the 406th Medical Laboratory, Japan, have been most generous with their assistance; all of the illustrations were prepared by this exceptional group of artists.

This publication is a contribution of the Smithsonian Venezuelan Project, supported by a contract (DA-49-193-MD-2758) of the Medical Research and Development Command, Office of the Surgeon General, U. S. Army.

**FLEA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS**

**Family Pulicidae**

**Genus *Pulex* Linnaeus**

*Pulex* Linnaeus, 1758:614.

Type Species: *Pulex irritans* Linnaeus, 1758.

*Pulex irritans* Linnaeus


Remarks

We did not collect *P. irritans* in Venezuela. Records published by Hopkins and Rothschild (1953) are published by Hopkins and Rothschild (1953) ex *Tamanuha* sp. and Barrera and Diaz-Urrugia (1957) ex *Cerdocyon thous* thous likely represent the same species we have identified as *P. simulans*. (For further discussion see *P. simulans*).

*Pulex simulans* Baker

*Pulex simulans* Baker, 1895:65, 67.—Smit, 1952: 523-526, Fig. 1.—Tipton and Mendez, 1966: 293, Pl. 48, Fig. 1, Pl. 51, Fig. 6. 7.—1968: 178-179.

Type Data: At least 1 male and 2 females ex *Didelphis marsupialis* (= *D. virginiana*), probably Devil's River, Texas, F. M. Webster collector. Smit (1958) has designated a syntype in the Tring collection as lectotype inasmuch as the male type specimen has been lost.

Other Recorded Distribution: USA: ex *Didelphis marsupialis* (= *D. virginiana*) and *Cynomys mexicanus*. Mexico: ex *Cynomys mexicanus*. Panama: ex *Homo sapiens*.

**VENEZUELAN RECORDS** (114 males and 193 females)

Seventy-six males and 126 females ex 14 *Tamanuha longicaudata* in Falcón, Lara, Monagas, and Carabobo. Other collection records include: 14 males and 27 females ex 10 *Cerdocyon thous* from Trujillo, Monagas, Falcón, and Lara; 7 males and 13 females ex 7 *Conepatus semistriatus* from Monagas and Falcón; 5 males and 3 females ex 3 *Didelphis marsupialis* from Miranda, Monagas, and Lara. Additional hosts include: *Procyon cancrivorus* (Guanaco), *Mechinis natalensis* (Barnas), *Galeotis vittata* (Monagas), *Proechimys semispinosus* (Lara), *Echimys spuriolus* (Lara), *Urocyon cinereorufescens* (Lara), Zygopodomys brevicauda (Lara), *Glossophaga soricina* (Falcón), and three unidentified hosts.

Remarks

The aedeagal crochet in our specimen resembles figures given by Smit (1958) but is somewhat more swollen. The dorsal aedeagal sclerite is narrower than that shown by Smit for *P. simulans* and appears to be intermediate between *P. simulans* and *P. irritans*. The median dorsal lobe of the aedeagus is unlike *P. simulans* or *P. irritans*. The apex of the finger of the clasper is truncate, not rounded as in *P. irritans*.

The Venezuelan specimens are very much like material from Cerro Potosí, Mexico, and

*Probably a contamination"
Panama. We suspect that the difference between *P. simulans* and *P. irritans* pointed out by Smit (1958) will not stand if long series from several localities are studied.

Fifteen of our 45 collections are from *Tamandua longicaudata* and 202 (65.8%) of the 307 fleas collected were from this host. The flea index on *Tamandua longicaudata* is 13.5 compared with 4.0 on Cerdocyon thous and 2.8 on Conepatus semistriatus.

Genus *Echidnophaga* Olliff

*Echidnophaga* Olliff, 1886:171.

Type Species: *Echidnophaga ambulans* Olliff, 1886.

*Echidnophaga gallinacea* (Westwood)

*Sarcopsyllus gallinaceus* Westwood, 1875:246.

*Echidnophaga gallinacca*. Jordan and Rothschild, 1906:52, Pl. 1, Fig. 1; Pl. 2, Fig. 14; Pl. 3, Fig. 21; Pl. 4, Fig. 27.


Remarks

We did not collect *E. gallinacca* but other workers have recorded it from Venezuela.

Genus *Ctenocephalides* Stiles and Collins

*Ctenocephalides* Stiles and Collins, 1930:1308.

Type Species: *Pulex canis* Curtis, 1826.

*Ctenocephalides canis* (Curtis)

*Pulex canis* Curtis, 1826:114, Fig. A-E, 8.

*Ctenocephalides canis* Rothschild, 1915:56, 91 Pl. 7, Fig. 4, 10.

*Ctenocephalides canis*, I. Fox, 1940:26, Pl. 6, Fig. 24, 26, 27.—Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:164-170, Fig. 74A, 154, 156, 158-60; Pl. 5A, 24C, D, 27C.—Johnson, 1957:227-229.—Barrera and Diaz-Ungria, 1957:168.—Machado-Allison, 1966:275.-1966:24.

Remarks

Although we collected 154 specimens of *C. felis felis* we did not encounter *C. canis.* Bar-

*Ctenocephalides felis felis* (Bouche)

*Pulex felis* Bouche, 1835:505, Fig. 2.


Type Data: ex "hauskatze," Germany.

Other Recorded Distribution: *C. felis* is cosmopolitan and has been reported from most countries in South America including: Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Surinam, and Uruguay. In Venezuela it has been collected from "rat," man, dog, *Rattus rattus* (R. r. alexandrinus, R. r. frugivorus, R. r. rattus). *R. norvegicus,* Cerdocyon thous thous and "Felis cati domi" (= *F. catus*).

**Venezuelan Records** (50 males and 104 females)

Most specimens were collected ex 10 Cerdocyon thous (18 males and 49 females) in T. F. Amazonas, Trujillo, Apure, Lara and Zulia; ex 13 *Didelphis marsupialis* (13 males and 24 females) in T. F. Amazonas, Lara, Barinas, Monagas, Bolivar, Sucre, Trujillo, and Dto. Federal. Other hosts include: *Zygodontomys brevicauca* (T. F. Amazonas and Sucre), Sigmodon hispidus (Carabobo), *Rattus rattus* (Dto. Federal). *Heteromyus anomalus* (Dto. Federal), *Agouti paca* (Zulia), *Cyclopes didactylus* (T. F. Amazonas), *Scirius ignicentris* (Bolivar), *Monodelphis brevicaudata* (Carabobo), *Felis pardalis* (Bolivar), *Tapirus terrestris* (Apure), *Cebus albifrons* (Zulia), *Homo sapiens* (Bolivar, and T. F. Amazonas), and *Carollia perspicillata* (Falcón).

Remarks

Of the total 154 specimens of *C. felis felis* collected, 67 (43.5%) were associated with *Cerdocyon thous* (Flea index 6.1) and 34 (22.1%) on *Didelphis marsupialis* (flea index 2.6). Johnson (1957) did not give a subspecific designation for South American populations but our specimens appear to be the nominate subspecies.

Genus *Xenopsylla* Glinkiewicz

*Xenopsylla* Glinkiewicz, 1907:385.

Type Species: *Xenopsylla pachysaromys* Glinkiewicz, 1907.
Xenopsylla brasiliensis (Baker)


*Xenopsylla brasiliensis* Rothschild, 1909:332.—
Hecht, 1912:811-820.—Hopkins and Rothschild, 1953:295-300. Fig. 25, 26, 296, 348, 360, 361; Pl. 42B, D. F.—Johnson, 1957:226, Pl. 98, Fig. 2, 7; Pl. 99, Fig. 2, 6.—Barrera and Diaz-Ungria, 1957:171.—Machado-Allison, 1963:275.—1966:24.

**Remarks**

*X. brasiliensis*, an important vector of plague in Venezuela, occurs on *Rattus norvegicus* in urban areas. We did not collect this species in Venezuela.

*Xenopsylla cheopis* (Rothschild)

*Pulex cheopis* Rothschild, 1903a:85, Pl. 1, Fig. 3, 9, Pl. 2, Fig. 12, 19.

*Xenopsylla pachypromyidis* Glinkiewicz, 1907:385, Pl. 2, Fig. 1-4.

*Xenopsylla cheopis*, Rothschild, 1910:92, Fig. 9, 11.—Anduze, Vogelsang, and Pifano, 1947:4.—Jordan, 1950:599.—Trumb, 1950:89, 109, 112, Pl. 53, Fig. 1.—Hopkins and Rothschild, 1953-248-260, Fig. 20A, 76, 199, 220, 246, 255, 259, 266, 286, 305-308, 310, 391; Pl. 2, 22D-F, 39A, 406.—Johnson, 1957:225-227, Pl. 98, Fig. 1, 3, 4, 5, 8, Pl. 2, Fig. 12, 19.—Barrera and Diaz-Ungria, 1957:163, 170, 171, Lam. 11, Fig. 2.—Cova Garcia and Tallaferrro, 1959:328, 331, 340, 347.—Machado-Allison, 1963-275.—1966:24, 30-32, Fig. 10.—Tipton and Mendez, 1966:291, 295, Pl. 52, 53.

Type Data: Holotype male ex *Acomys wucherbyi*, Sudan: near Shendi, 5-11-1901, N. C. Rothschild and A.F.R. Wollaston, collectors

*Venezuelan Records* (4 males and 1 female)

Three specimens were collected from *Rattus rattus* (Dio. Federal and Monagas) and the remaining 2 specimens were collected from *Oryzomys albogularis* (Dio. Federal) and *Sigmodon hispidus* (Carabobo).

**Remarks**

Barrera and Diaz-Ungria (1957) have published records of *X. cheopis* from Caracas ex *Rattus rattus* (R. r. alexandrinus and R. r. ratus), *R. norvegicus* and in the state of Aragua ex "ratus de Campo." During a three year collecting period (1965-1968) more than 102 specimens of the genus *Rattus* were collected from which only 3 specimens of *X. cheopis* were taken, indicating that the widespread use of insecticides may have reduced the population of this flea.

**Genus Hectopsylla Frauenfeld**


Type Species: *Hectopsylla psittaci* Frauenfeld.

**Hectopsylla psittaci* Frauenfeld


**Remarks**

*H. psittaci* is a parasite of birds, and since our major effort was directed toward collecting ectoparasites of mammals it is not surprising that we did not collect it.

**Genus Rhynchopsyllus Haller**

*Rhynchopsyllus* Haller, 1880:72.

Type Species: *Rhynchopsyllus pulex* Haller.

*Rhynchopsyllus pulex* Haller (Fig. 1)

*Rhynchopsyllus pulex* Haller, 1880:82, Pl. 6, Fig. 1.-13.—Trumb and Cameron, 1950:271, Fig. 6. 7.—Johnson, 1957:237-238, Pl. 112, Fig. 3, 5.—Barrera and Diaz-Ungria, 1957:170.—Machado-Allison, 1963:271, 272, 275.—1966:24.—Tipton and Mendez, 1966:296.

Type Data: Descriptions based on females ex *Molossus* species, Brazil.

Other Recorded Distribution: Argentina: ex *Zonotrichia pileata*, *Myotis nigricans* and *Sturnus vulgaris*.

**VENUEZUELAN RECORDS** (3 females)

Our material consists of three females ex Molossus major (SVP 4665 and SVP 4713), Dto. Federal, El Limón, about 400 m. elev., 19, 20-VIII-1966.

**Remarks**

Although based on meager evidence, it appears that R. pulex is associated with molossid bats at low elevations.

**Genus Tunga Jarocki**

*Tunga* Jarocki, 1838:50.

**Type Species: Pulex penetrans (Linnaeus).**

*Tunga penetrans* Linnaeus, 1758:614.

*Tunga penetrans*, Jarocki, 1838:50, Fig. 10-13.—Vogelsang, 1948:145-151.—Hopkins and Rothschild, 1935:39-43, Fig. 21, 22A, 23, 26A, 28, 37, Pl. 6A, B, 7A-C, 8B.—Johnson, 1957:240, Pl. 113, 114.—Barrera and Diaz-Ungria, 1957:172.—Machado-Allison, 1963:275-1966:24.—Tipton and Mendez, 1966:295, Pl. 48, Fig. 1, Pl. 49, Fig. 1, 2.

**Remarks**

Barrera and Diaz-Ungria (1957) record *T. penetrans* from Sus scrofa, Bos taurus, Myrmecophaga tridactyla, and Homo sapiens. We did not collect this species.

**Family Rhopalopsyllidae**

**Genus Rhopalopsyllus Baker**


**Type Species: Pulex hutzi Baker.**

*Rhopalopsyllus australis australis* (Rothschild) (Fig. 2, 3)

*Pulex australis* Rothschild, 1904:613, Pl. 9, Fig. 29, Pl. 10, Fig. 34, 36.

*Rhopalopsyllus australis* australis, Jordan and Rothschild, 1908:71, Pl. 3, Fig. 11, Pl. 4, Fig. 10, 11.


**Type Data**

Type material consists of 3 males and 13 females ex *Dicotyles labiatus* (= *Tayassu pecari*), Mexico: Santa Andrade, Tabasco, 30-V-1897.


**VENUEZUELAN RECORDS** (82 males and 143 females)

There were 17 males and 23 females ex 6 *Dasyprocta aguti* from Bolivar, Carabobo, and the border between Falcón and Yaracuy; 7 males and 16 females ex 10 *Didelphis marsupialis* from Bolivar, Falcón, Miranda, Monagas, Yaracuy, and Zulia; 8 males and 12 females ex 3 *Tayassu tajacu* from A puré, Barinas, and Bolivar; 2 males and 8 females ex 5 *Tayassu pecari* from Bolivar; 7 males and 24 females ex 4 *Tamandua longicaudata* from T. F. Amazonas, A puré, Monagas, and Zulia; 1 male and 4 females ex 3 *Tamandua tetradactyla* from Monagas and Zulia; 5 males and 4 females ex 2 *Myoprocta pratti* from T. F. Amazonas; 2 males and 5 females ex 5 *Cercocyon thous* from Bolivar, Monagas, and Trujillo; 2 males and 5 females ex 3 *Conepatus semistriatus* from Monagas, Zulia, and the border between Carabobo and Yaracuy; and 4 males and 21 females ex 3 *Mazama americana* from A puré and Bolivar. Other hosts include: *Proechimys semispinosus* (Trujillo and Zulia); *Proechimys guayanensis* (Bolivar); Agouti paca (Bolivar and Zulia); *Dasyprocta fuliginosa* (T. F. Amazonas); *Dasyprocta sp.* (A puré); *Procyon cancrivorus* (Zulia and Táchira); *Eira barbara* (Barinas); *Galictis vittata* (Monagas); Felis pardalis (Bolivar and Zulia); Homo sapiens (Bolivar); *Artibeus jamaicensis* (Monagas); *Carollia perspicillata* (Falcón); and *Desmodus rotundus* (Monagas).

**Remarks**

*R. australis australis* was collected from many hosts representing several families, indicating a broad ecological tolerance. More particularly it was collected from hystricomorph rodents (*Dasyproctidae*), edentates, marsupials, carnivores, and two genera of Artiodactyla.

*Rhopalopsyllus caciucus sacius* Jordan and Rothschild (Fig. 4, 5)

*Rhopalopsyllus caciucus* Jordan and Rothschild, 1908:73, Pl. 3, Fig. 13, Pl. 4, Fig. 8.
Fig. 2. *Rhopalopsyllus australis australis* (Rothschild). Male: a, metatibia; b, process and movable tinger of clasper; c, seventh and eighth abdominal terga; d, eighth sternum; e, ninth sternum.
Fig. 3. *Rhopalopsyllus australis australis* (Rothschild). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.
Fig. 4. *Rhopalopsyllus cacusus* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 5. *Rhopalopsyllus caucion saevus* Jordan and Rothschild. Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.
Rhopalopsyllus cunicus saccus Jordan and Rothschild, 1923b:325, Fig. 32.—Jordan, 1939:445, Fig. 328.—Guimaraes, 1940:244.—Ewing and Fox, 1943:21.—Costa Lima and Hathaway, 1946:141.—Traub and Johnson, 1952:131.—Cova Garcia and Tallaferrro, 1959:331, 347.—Johnson, 1957:176.—Barrera and Diaz-Ungria, 1957:164, 183.—Machado-Allison, 1966:26, 32, 35. Fig. 12.—Tipton and Mendez, 1966:301, 303, Pl. 55, Fig. 3; Pl. 59, Fig. 5, 6.

Type Data: Two males, one female ex Felis pardalis mearnisi. Panama: La Cabina, L. H. Dunn collector. One male ex Didelphis marsupialis. Trinidad: Capara, V-1921. S. M. Klages collector.


Venezuelan Records (5 males and 1 female) Four specimens were collected ex 3 Didelphis marsupialis in Falcón, Lara, and Yaracuy; 1 male each from Conepatus semistriatus in Yaracuy, and Procercus semispinus in Carabobo.

Remarks In Panama R. cunicus saccus was collected in large numbers from Dasypus novemcinctus fenestratus and its burrows near sea level. We suspect that it is not so rare in Venezuela as our records indicate but that we failed to discover its optimum locality and host.

Rhopalopsyllus lugubris lugubris Jordan and Rothschild
(Fig. 6, 7)

Rhopalopsyllus lugubris lugubris Jordan and Rothschild, 1908:74, Pl. 3, Fig. 12; Pl. 6, Fig. 9.—Jordan and Rothschild, 1923b:325, 350. Fig. 333, 334c, 336, 337.—Barrera and Diaz-Ungria, 1957:164, 183, 184.

Rhopalopsyllus lugubris lugubris, Johnson, 1957:177, Pl. 92, Fig. 4; Pl. 93, Fig. 4.—Machado-Allison, 1966:35. Fig. 12.—Tipton and Mendez, 1966:302, Pl. 58, Fig. 2; Pl. 59, Fig. 3, 4.

Type Data: Holotype male ex Sphenothrix venaticus, Bolivia: Charaplaya, P. O. Simons collector.


Venezuelan Records (82 males and 153 females) There were 75 males and 131 females ex 16 Agouti paca in Bolivar. Falcón, T. F. Amazons, Apure, and Zulia. An additional 29 specimens were collected from Mazama americana (Bolivar), Didelphis marsupialis (Monagas and T. F. Amazons), Didelphis azarae (T. F. Amazons), Bassaricyon gabbii (T. F. Amazons), Dasypoda aguti (Carabobo), and Procercus semispinus (Zulia).

Over 87% of our specimens were collected from Agouti paca and almost 90% were collected at 150 meters elevation or lower. There were 16 specimens of A. paca from which we collected 206 fleas (flea index almost 13) while there were 29 fleas collected from the remaining 8 hosts (flea index about 3.6).

Rhopalopsyllus lutzi cleophontis (Rothschild)

Pulex cleophontis Rothschild, 1904:614, Fig. 32.

Rhopalopsyllus lutzi cleophontis, Baker, 1905:130.


Remarks It is surprising that we did not collect R. lutzi cleophontis since it is parasitic on Agouti paca and Dasypus novemcinctus, hosts which we encountered frequently in our collecting.

Genus Polygenys Jordan

Polygenys Jordan, 1939:144.

Type Species: Pulex robeni Rothschild.

Polygenys atopus (Jordan and Rothschild)
(Fig. 8, 9)

Polygenys atopus Jordan and Rothschild, 1922:267, Fig. 259, 260.


Type Data: Male holotype, two females ex Didelphis aurita (= D. marsupialis aurita), Brazil: Sta. Catharina, Joinville, Humboldt, 13-X-1913, W. Ehrhardt collector.
Fig. 6. *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 7. *Bhopalopsyllus lugubris lugubris* [Jordan and Rothschild]. Male: a, apex of aedeagus, b, aedeagus. Female: c, spermatheca.
Fig. 8. *Polygenis utopus* (Jordan and Rothschild). Male: a. metatibia. b. process and movable finger of clasper. c. seventh and eighth abdominal terga. d. eighth sternum. e. ninth sternum.
Fig. 9. *Polygenus atopus* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.
Other Recorded Distribution: Argentina: ex Didelphis marsupialis, Didelphis marsupialis aurita, and Felis catus (type of truecat); Panama: Peromyscus n. nitipes, and Oryzomys algibularis.

VENEZUELAN RECORDS (28 males and 20 females)

Eight males and 9 females ex 11 Oryzomys albigularis from Dto. Federal: 5 males and 5 females ex 3 Nezumys tenampae from Dto. Federal and Trujillo; 4 males and 4 females ex 5 Oryzomys concolor from Dto. Federal and Trujillo; and 5 males and 2 females ex 3 Didelphis marsupialis Dto. Federal and Trujillo. Other hosts include: Oryzomys minutus (Dto. Federal). Procchinys semispinosus (Falcón), Monodelphis breviceaduta (Carabobo), and Bradypus infuscatus (Miranda).

REMARKS

Specimens from Venezuela resemble illustrations given by Jordan and Rothschild (1922) except that the sinus in the caudal margin of the seventh sternum of the female is not quite so distinct as they have illustrated it. Our specimens are very close to those illustrated by Tip-ton and Mendez (1966) from Panama. Johnson (1965) studied the Panama specimens and suggested they were P. atopus. P. atopus is the only species in the genus which is not abundant at sea level. Most of our specimens were collected above 1400 meters elevation. Oryzomyines, and perhaps more specifically Oryzomys species, probably represent the preferred hosts of P. atopus. Marsupials may figure prominently in maintaining a link between populations which are more or less isolated at high elevations.

Polygenis bohlsi bohlsi (Wagner)

(Fig. 10, 11, 29f)

Pulex bohlsi Wagner, 1901:21, Pl. 1, Fig. 6.

Rhopalopsyllus bohlsi, Baker, 1905:130, 143.

Rhopalopsyllus bohlsi bohlsi, Guimarães, 1940: 234.

Polygenis bohlsi bohlsi, Guimarães, 1948: 540. Fig. 1d.—Traub and Johnson, 1952:127, Fig. 32-35.—Barrera and Díaz-Ungria, 1957: 164, 187, Lam. 1, Fig. 1-3.—Cova García and Tallaferrro, 1959: 329, 331, 332, 334, 345.—Machado-Allison, 1962:181. — 1963:270, 276.—1966:26, 34, Fig. 5, 12.—Del Ponte, 1967:69.

Type Data: Hosts unknown. Paraguay: J. Bohls collector.


VENEZUELAN RECORDS (51 males and 66 females)

There were 14 males and 21 females ex 15 Akodon urichi in Aragua, Bolivar, Carabobo, Dto. Federal, and Guárico; 12 males and 23 females ex 21 Sigmodon hispidus in Dto. Federal and Carabobo; 5 males and 3 females ex 5 Monodelphis breviceadata in Aragua and Carabobo; and 4 males and 6 females ex 25 Zigodononumys breviceadata in Monagas and Sucre. Other hosts include: Oryzomys albigularis (Aragua), Marmosa murina (Bolivar), Marmosa robinsoni (Lara), Procchinys semispinosus (Carabobo). Mustela frenata (Monagas). Oryzomys fulvescens (Monagas and Carabobo). Sigmodon hispidus (Sucre). Holochilus brasiliensis (Apuene and Carabobo). Didelphis marsupialis (Miranda). Catia parcellus (Carabobo), Sciurus igniventris (Bolivar), and bird (Carabobo).

REMARKS

Our specimens differ considerably from specimens from Brazil loaned to us by Dr. Guimarães, but fit the description and illustrations given by Traub and Johnson (1952). We suggest that the optimum habitat is at elevations between 1,000 and 1,500 meters and the preferred hosts are cricetine rodents and perhaps more specifically akodont stock.

Polygenis duni (Jordan and Rothschild)

(Fig. 12, 13)

Rhopalopsyllus duni Jordan and Rothschild, 1922:269, Fig. 261, 262.—Jordan and Rothschild, 1923b:336, 351.

Rhopalopsyllus (Polygenis) duni, Ewing and Fox, 1943:22.

Polygenis duni, Costa Lima and Hathaway, 1946:144.—Johnson, 1957:160, 161.—Machado-Allison, 1962:183.—1963:273, 276.—1966:19, 26, 34, 35, Fig. 5, 12.—Tip-ton and Mendez, 1966:245, 290, 326-332, Pl. 56, Fig. 1; Pl. 57, Fig. 1, 2.

Polygenis anhelsoni Traub and Johnson, 1952: 112, Fig. 1-4, 6, 9, 10, 12-14, 16.—Barrera and Díaz-Ungria, 1957: 164, 187.—Cova García and Tallaferrro, 1959:331, 341, 344, 346.

Type Data: Male holotype, paratype female ex Sigmodon hispidus chiriquensis. Panama:
Fig. 10. *Polygenis bohlsi bohlsi* (Wagner). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 11. *Polygenis bohlsi bohlsi* (Wagner). Male: a, apex of aedeagus. b, aedeagus.
Fig. 12. Polygenia dunni (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 13. *Polygenis dunni* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.
VENEZUELAN RECORDS (87 males and 144 females)

There were 56 males and 95 females collected from 58 specimens of Sigmodon hispidus of which 48 hosts were collected in Carabobo and 10 in Lara; 9 males and 14 females ex 9. Heteromys anomalus (Zulia, Sucre. Falcón, and Trujillo), and 5 males and 8 females ex 8 Zygodontomys brevicauda (Carabón, Zulia, and Sucre). Other hosts include: Proechimys semispinosus (Zulia, Carabobo, and Lara), Marmosa robinsoni (Falcón), Monodelphis brevicaudatus (Carabobo), Didelphis marsupialis (Guárico and Carabobo), Holochilus brasiliensis (Carabobo), Nectomys squamipes (Carabobo), Oryzomys fulvescens (Carabobo), Cavia porcellus (Carabobo), Scirius granatensis (Carabobo), Phyllotisus hastatus (Falcón), Carollia perspicillata (T. F. Amazonas), Vampyrops helleri (Barinas), and bird (Carabobo).

REMARKS

Male characters resemble very closely illustrations given by Traub and Johnson (1952) (as P. amhersonii). The four long bristles on the distal arm of the ninth sternum (DA9) are almost as long as DA9 itself but there is some variation in this character. There are 6 dorsal notches in the hind tibia and 2 bristles in the penultimate notch, but here again in some specimens there may be 7 notches on one leg and 6 on the other and there may be 3 bristles in the penultimate notch. The shape of the face of the holotype appears to be intermediate between P. dunnii and P. pradoi as illustrated by Traub and Johnson (1952). It is difficult to separate the females from the more closely related species of Polypogynus and thus it is quite possible that some of the females assigned to this species on the basis of association with males or locality actually belong to another species.

Polypogynus frustratus Johnson (Fig. 14, 15, 29d)

Polypogynus frustratus Johnson, 1957:161, 162, Pl. 56, Fig. 1-3, 7, Pl. 57, Fig. 1, 3, 5—Del Ponte, 1967:57, 70. Fig. 21.

Type Data: Male holotype, female allotype, 2 male and 2 female paratypes ex unknown host, Brazil: State of Santa Catarina. Nova Teutonia, VII-1940, P. Plaumann collector. One male paratype ibid, but IV-1942.

Other Recorded Distribution: Argentina: species of the following genera: Scapteromys, Oxymycterus, and Lutreolina.

VENEZUELAN RECORDS (7 males and 14 females)

Nineteen specimens were collected near Caracas, D. O. Federal ex 11 Akodon urichi. A female specimen ex Vampyrops oratus is probably in error. An additional male specimen ex Akodon urichi was collected in Sucre.

REMARKS

Our series probably represents an undescribed subspecies of P. frustratus but we are undecided whether it should be a subspecies of P. frustratus or P. pradoi since it has characters by both of these species. The immovable process and the movable process of the clasper are more like P. pradoi than P. frustratus in shape and setation. However, the incassations of the posterior margin of the immovable process as well as the setae on the distal arm of the ninth sternum are like P. frustratus. The posterior margin of the eighth sternum is not sharply triangular as in P. frustratus and it is divided to about the same point as in P. pradoi. The detailed structure of the aedegus resembles closely the illustrations given by Johnson (1957) for P. frustratus.

Polypogynus impavidus Johnson


Other Recorded Distribution: None.

VENEZUELAN RECORDS (2 males and 2 females)

All 4 specimens were collected from 2 hosts, Oryzomys albignularis, in the state of Miranda near Caracas.

REMARKS

Our specimens key out to P. impavidus in Johnson’s (1957) key. In her diagnosis she indicates that P. impavidus is the only species of
Fig. 14. *Polygenis frustratus* Johnson. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 15. Polycenis frustratus Johnson. Male: a, apex of aedeagus; b, aedeagus.
the genus with 6 dorsal notches on the metatibia and 3 bristles in the penultimate notch. Even though our specimens meet these criteria there are differences major enough to be at least on a subspecific level. For example, the distal arm of the ninth sternum is narrower at the base than at the apex while in \textit{P. impavidus} the reverse is true. In the male the ventral margin of the eighth sternum is divided about half way between the apex and the row of lateral bristles; the division begins about one-fourth of the distance from the row of lateral bristles in our specimens. There are some differences in the details of the aedeagus, particularly the crochet and the distolateral lobe of the aedeagus. Assignment of these specimens to \textit{P. impavidus} is provisional.

\textit{Polygenis klagesi klagesi} (Rothschild)

\textit{Polygenis klagesi} klagesi (Rothschild), 1904:620. Pl. 9, Fig. 28; Pl. 10, Fig. 35, 39.


\textit{Rhopalopsyllus klagesi} klagesi, Jordan and Rothschild, 1923b:332, Fig. 343, 344.

\textit{Polygenis klagesi} klagesi, Jordan, 1939:447.—Tipton and Mendez, 1966:298, Pl. 56, Fig. 3; Pl. 57, Fig. 5, 5a, 6, 6a, 6b.—Del Ponte, 1967:58.

\textit{Polygenis klagesi} klagesi, Costa Lima and Hathaway, 1946:142.—Guimarães, 1948:139, Fig. 1h.—Cova Garcia and Talaferrro, 1959:327, 331, 346.—Johnson, 1957:163, 164.


Type Data: A series of 12 males, 17 females, ex “spring rat” (“spiney rat”?), Venezuela Bolivár, Caura River, La Vuelta, 17-V-1903, S. M. Klages collector.

Other Recorded Distribution: Brazil: ex \textit{Dasypus novemcinctus}, \textit{Metachirus opossum} (= \textit{Philander opossum}), and “rato do mato.” Colombia: ex \textit{Procophilus cayennensis chrysaeolus} (= \textit{P. semispinosus chrysaeolus}) and \textit{Dasypooctra variegata}.

\textbf{Venezuelan Records} (279 males and 339 females)

Since more than 96% of our specimens were collected from 129 specimens of \textit{Procophilus semispinosus} and \textit{Procophilus guayanensis} we have chosen to list records in chart form given in Table 1.

In addition there was one female each from Cara- boba and Sucre on \textit{P. semispinosus}. The remaining 24 specimens of \textit{P. klagesi klagesi} were ex: \textit{Agouti paca} (Zulia), \textit{Akodon urichi} (Bolivar), \textit{Desmodus rotundus} (T. F. Amazonas). \textit{Didelphis marsupialis} (T. F. Amazonas, Bolivar, Trujillo, and Zulia), \textit{Echimys armatus} (Apure), \textit{Felis pardalis} (Bolivar), \textit{Mazama americana} (Bolivar), \textit{Monossus ater} (Monagas), \textit{Monodelphis breviceudata} (Barinas), \textit{Oryzomys minutus} (Táchira), \textit{Sigmodon hispidus} (Cara- boba), \textit{Tupinambis truncatus} (Apure). Bat hosts probably represent contaminations or errors in record keeping and it is possible that this may be the case for some of the other hosts as well.

\textbf{Remarks}

See: \textit{Polygenis klagesi samuelis}

\textit{Polygenis klagesi samuelis} (Jordan and Rothschild)

(Fig. 16, 17, 18, 29c)


Type Data: Male holotype plus paratype specimens ex \textit{Didelphis marsupialis} and \textit{Oryzomys laticeps} (= \textit{O. cupido}), Venezuela: San Este- ban; additional specimens ex \textit{Procophilus}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
State or Territory & No. of Hosts & \textit{P. semispinosus} Males & \textit{P. samueli} Females & Index \\
\hline
T. F. Amazonas & 9 & 18 & 18 & 4.0 \\
Apure & 51 & 118 & 160 & 5.45 \\
Barinas & 19 & 67 & 80 & 7.73 \\
Zulia & 16 & 18 & 19 & 2.31 \\
\hline
Subtotal & 95 & 221 & 277 & 5.24 \\
\hline
T. F. Amazonas & 19 & 14 & 20 & 1.79 \\
Bolivar & 15 & 32 & 28 & 4.0 \\
\hline
Subtotal & 34 & 46 & 48 & 2.76 \\
\hline
Total & 129 & 267 & 325 & 4.59 \\
\hline
\end{tabular}
\caption{Venezuelan Records of \textit{Polygenis klagesi} klagesi (Rothschild) According to Host and Locality.}
\end{table}
Fig. 16. *Polygenis klagesi samuelis* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of chaser. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 17. Polygenis klagesi samuelis (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.
Fig. 18. Scattergraph showing relationship between Polygenis klagesi klagesi and P. klagesi samuelis based on length of bulga of the spermatheca and the distance from the notch to the apex of the movable process of the clasper.
guairae (≡ P. semispinosus), same locality. One male and 2 females ex Felis pardalis mearensi and Proechimys semispinosus panamaensi, Panama: Canal Zone, Pedro Miguel, L. H. Dunn collector.

Other Recorded Distribution: Venezuela: ex Scirius griseogenus meridensis (= S. granatensis meridensis), Orzyomys concolor speciosus. Proechimys cayennensis guairae (≡ P. semispinosus guairae), Akodon u. urichi, Didelphis m. marsupialis, Proechimys cayennensis trinitatis (≡ P. semispinosus trinitatis), Ratitus ravus frugivorus.

Venezuelan Records (353 males and 401 females)

As with P. klagesi klagesi most (91%) of our specimens of P. klagesi samucales were collected from Proechimys semispinosus.

Hosts from which the remaining 61 specimens of P. klagesi samucales were collected were: Artibes cenisius (Do. Federal), Artibes lituratus (Trujillo), Conopithes semistriatus (Falcón), Didelphis marsupialis (Falcón, Lara, and Monagas), Monodelphis brevicaudata (Barinas), Orzyomys minutus (Merida), Proechimys canicollis (Zulia), Sigmodon hispidus (Lara), snake (Carabobo), Tamandua longicaudata (Lara), Uroderma bilobatum (Falcón), Vampyrops hilleri (Yaracuy), and Zygodontomyys brevicauda (Sucre).

Table 2. Venezuelan Records of Polyogenis klagesi samucales (Jordan and Rothschild) from Proechimys semispinosus According to State.

<table>
<thead>
<tr>
<th>State</th>
<th>No. of Hosts</th>
<th>P. semispinosus</th>
<th>Males</th>
<th>Females</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barinas</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Carabobo</td>
<td>19</td>
<td>44</td>
<td>58</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>Falcón</td>
<td>28</td>
<td>55</td>
<td>56</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Guárico</td>
<td>4</td>
<td>14</td>
<td>32</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Lara</td>
<td>14</td>
<td>106</td>
<td>108</td>
<td>15.3</td>
<td></td>
</tr>
<tr>
<td>Monagas</td>
<td>5</td>
<td>21</td>
<td>12</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Sucre</td>
<td>14</td>
<td>59</td>
<td>54</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>Trujillo</td>
<td>10</td>
<td>24</td>
<td>27</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Yaracuy</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Zulia</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102</strong></td>
<td><strong>329</strong></td>
<td><strong>339</strong></td>
<td><strong>6.7</strong></td>
<td></td>
</tr>
</tbody>
</table>

Remarks

We selected 10 female specimens (fewer than 10 in 4 instances) from each of 16 localities and measured the bulga (spermatheca). The average was computed (in microns) and plotted on the Y axis (ordinate) of a scatter graph (Fig. 15). The same procedure was followed for males except the measurements were made of the distance from the notch on the anterior margin of the movable process of the clasper to its apex. The average of these measurements was plotted on the X axis (abscissa).

Specimens from Trujillo (11, Agua Santa), Falcón (12, Mirimire), Guárico (13, San Juan), Carabobo (14, Montalbán), Monagas (15, Caripé), and Sucre (16, Manacal) are clearly samucales. Specimens from Apure (4, Nutila), Zulia (5, Encontrados and 6, Machiques), and Barinas (7, Altamira) are clearly klagesi. Female specimens from Amazonas (1, Esmeralda) and Boli var (2, Icabarí and 3, Ciudad Bolívar) fit the criteria for klagesi but the males are intermediate. Likewise, females from Falcón (8, Socopo), Lara (9, El Tocuyo), and Yaracuy (10, San Felipe) fit the criteria for samucales but the males are intermediate. Machado-Allison and McGurie (1963) found no evidence of hybridization between the two subspecies. Their map showing the distribution of the two subspecies is substantiated by our findings. Based on female specimens alone the Orinoco River appears to be the dividing line between the two subspecies in eastern Venezuela but in western Venezuela a line extending from San Felipe to El Tocuyo, thence to Socopo (in Falcón about 100 km east of Maracaibo) and then west across Lake Maracaibo and Zulia represents the area where the two subspecies meet. An exception to this is represented by a collection of 24 male and 27 female specimens of samucales from the Agua Santa area (Trujillo) which is about 100 km south of Socopo.

Our specimens were collected almost exclusively from Proechimys semispinosus and mostly in dry tropical forests. Polyogenis k. klagesi, on the other hand, seems to be more closely associated with humid tropical forests. If the barrier between the two subspecies is ecological rather than geographical this may help to explain the disjunct distribution in western Venezuela.

Table 3. Measurement and Locality Data Used in Scattergraph.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Female Length of bulga in microns</th>
<th>Male Measurement of movable process of clasper in microns</th>
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<tr>
<td>1. T. F. Amazonas: Esmeralda</td>
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<td>62 (10)</td>
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<tr>
<td>2. Boli var: Icabarí</td>
<td>98 (10)</td>
<td>65 (10)</td>
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<td>3. Boli var: Ciudad Boli var</td>
<td>93 (4)</td>
<td>62 (5)</td>
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<td>4. Apure: Nutila</td>
<td>86 (10)</td>
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<td>5. Zulia: Encontrados</td>
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<td>6. Zulia: Machiques</td>
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<td>16. Sucre: Manacal</td>
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</table>
Polygenis occidentalis steganus
(Jordan and Rothschild)
(Fig. 19, 20, 29b)

Rhopalopsyllus steganus Jordan and Rothschild, 1923b:335, Fig. 356.—1. Fox, 1947:117.


Type Data: Holotype male ex Sturnina lilium, Venezuela: San Esteban, 1-1911, S. M. Klages collector.

Other Recorded Distribution: Trinidad: ex opossum and Orzyomys species (males only). Venezuela: ex Didelphis m. marsupialis (males only), and Sciurus griseogena meridensis (=S. granatensis meridensis).

Venezuelan Records (9 males and 9 females)
Sixteen specimens were collected in Monagas ex 4 Rhipidomys venustus, 2 Didelphis marsupialis, 1 Sturnina lilium, and 1 Sciurus granatensis. The remaining 2 specimens were collected from Prochoimys semispinosus in Venezy and Rhipidomys coesi on Neusa Esparta.

Remarks
A comparison of our male specimens with Figure 356 in Jordan and Rothschild (1923) indicates some differences. The distal arm of the ninth sternum is not quite so robust and the caudal margin of the eighth sternum is more sharply incised in our specimens. We count fewer than 20 bristles on the hind tibia (usually 18 or 19) whereas in Johnson’s (1957) key there are more than 20 bristles on the hind tibia of P. occidentalis steganus.

Polygenis peronis (Jordan and Rothschild)
(Fig. 21, 22, 29g)

Rhopalopsyllus peronis Jordan and Rothschild, 1923b:310, Fig. 353, 359.—1. Fox, 1947:117.

Rhopalopsyllus (Polygenis) peronis, Anduze, Vogelsang, and Pifano, 1946:5.


Type Data: Three males, 2 females, ex Heteromys melanoleucus (=H. anomalus), probably collected from Venezuela or Colombia. Other Recorded Distribution: Venezuela; ex Heteromys anomalus, Sigmodon hispidus, and Akodon u. urichi.

Venezuelan Records (9 males and 7 females)
There were 14 specimens collected from Heteromys anomalus in Dko. Federal and Aragua. The remaining two specimens were from Orzyomys abigularis in Aragua, and Vampyrops oratus in Miranda.

Remarks
Our specimens key to P. occidentalis steganus in Johnson’s (1957) key. The critical character is the position of the acetabular bristle on the posterior margin of the immovable clasper which we have found to be variable. It is slightly above the dorsal margin of the acetabulum in our specimens. The caudal margin of the eighth sternum is not as rounded in our specimens as shown by Jordan and Rothschild (1923, Fig. 338). Most of our specimens were collected from Heteromys anomalus and the type specimens were also collected from the same species in Colombia or Venezuela.

Polygenis robberti beebei (1. Fox)
(Fig. 23, 24, 29c)

Pulex robberti Rothschild, 1905:479, Pl. 13, Fig. 1, 2.

Rhopalopsyllus robberti, Jordan and Rothschild, 1923b:330.

Rhopalopsyllus beebei 1. Fox, 1947:117, 118, Fig. 2.


Polygenis robberti beebei, Traub and Johnson, 1952:123-127, 131, 132, Fig. 18-28, 30.—Johnson, 1957:168.—Barrera and Díaz-Ungria, 1957:164, 186.—Cova García and Tallaférro, 1959:329, 331, 347.—Machado-Allison, 1963:276.—1966:26, 34, Fig. 12.—Tipton and Mendez, 1966:299, 300, Pl. 56, Fig. 2, Pl. 57, Fig. 3, 4.—Del Ponte, 1967:57.

Type Data: Holotype male, ex Didelphis marsupialis, Venezuela: Aragua, Rancho Grande Biological Station, 1098 m in elev. 3-VIII-1946, W. Beebe collector.

Other Recorded Distribution: Panama: ex Philander opossum fusagriceps, Marinosa robinsoni, Metachirus nudicaudatus dentan-
Fig. 19. *Polygenis occidentalis steplanus* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 20. *Polyergus occidentalis steganus* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.
Fig. 21. *Polygenis peronis* (Jordan and Rothschild). Male: a, metatibia; b, process and movable finger of clasper; c, seventh and eighth abdominal terga; d, eighth sternum; e, ninth sternum.
Fig. 22. *Polygenis petonis* (Jordan and Rothschild). Male: a. apex of aedeagus. b. aedeagus.
Fig. 23. Polygenis roberti beechi (I. Fox). Male, a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 24. *Polygonis roberti bachi* (I. Fox). Male: a, apex of aedeagus. b, aedeagus.
Fleas of Venezuela

Polygenis versuta, Machado-Allison, 1962a:23-24, Fig. 1-3.

Type Data. Holotype female ex "raro do mato." Brazil: State of Bahia, Villa Nova, 1908, E. Garbe collector. Subsequent description of male based on male ex Proechimyus albispinus, Brazil: State of Bahia: In addition, 10 males and 15 females with same data. One female ex Rhipidomys earuanus (=R. mastacalis earuanus), Brazil: State of Pernambuco. Other Recorded Distribution: None.

Venezuelan Records (8 males and 15 females)

Nineteen specimens were collected ex 9 Rhipidomysmacconnelli in Bolivar, and T. F. Amazonas. The remaining specimens (1 each) ex Marmosa marina in Bolivar, Didelphis azarae and Akodon urichi in T. F. Amazonas.

Remarks

There are three distinct populations represented in our collections, all of them except 3 females were collected from Rhipidomys macconnelli. They may be subspecies of P. versuta or they may be undescribed species in the occidentalis-peronis-versuta complex. One male (SVP 8550) (Fig. 25-26) from Bolivar differs from males in the other two populations in that the distal arm of the ninth sternum is broad in the middle and has no setae on the proximal half, the movable process of the clasper is somewhat shorter and broader and the details of the aedeagus differ, principally the crochet. The second population of 2 males and 2 females (SVP 8049, 8869) (Fig. 27-28) from Bolivar is like the first male except the distal arm of the ninth sternum is not broad in the middle and it tapers from base to apex, the movable process of the clasper is long and narrow and again the details of the aedeagus differ. The third population, composed of 5 males and 12 females, is entirely from T. F. Amazonas and all ex Rhipidomys macconnelli except 3 females. In this population the distal arm of the ninth sternum is somewhat intermediate between the other two in shape but there are no bristles on the proximal half, the eighth sternum is much more rounded apically than in the other two groups, the movable process of the clasper is intermediate between the two groups, and again there are some differences in the details of the aedeagus.

Family Pygiopsyllidae

Genus Ctenidiosomus Jordan

Ctenidiosomus Jordan, 1931a:311

Type Species of genus: Ctenidiosomus spilmanni Jordan, 1931.
Fig. 25. *Polygene versuta* Gaimardi. Male (SVP 8850): a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.
Fig. 26. *Polygenis versuta* Guimarães. Male (SVP 8550): a, apex of aedeagus. b, aedeagus.
Fig. 27. *Polygonia versata* Guimarães. Male (SVP 8669): a, metatibia; b, process and movable finger of clasper; c, seventh and eighth abdominal terga; d, eighth sternum; e, ninth sternum.
Fig. 28. *Polygonus versuta* Guimarães. Male (SVP 8669): a, apex of aedeagus; b, aedeagus.
Ctenidiosomus perplexus, new species
(Fig. 30-33)

Diagnosis
Very near Ctenidiosomus rex Johnson, 1957, but may be separated from that species by a combination of the following characters. In the male the distal arm of the ninth sternum is subtruncate, not rounded, and more setose than in C. rex. The apex of the proximal arm of the ninth sternum is broadly triangular rather than fingerlike; the median dorsal lobe is shaped like the head of a bird as in C. rex but the beak is not so pointed; the crozet is curved dorsal rather than ventrad; the apex of the process of the clasper is globular not angular; the apex of the aedeagal apodeme is not curved dorsal so far is in C. rex and the penis rods are more highly coiled.

Description
Head (Fig. 30a): Fracticipit. Frontoclypeal margin evenly rounded. Preantennal area with three submarginal discs; micropunctations scattered over surface; first row of 6 medium bristles, first bristle displaced; second row of 3 long bristles which reach beyond caudoventral margin of gena; several small setae in ocular area. Caudoventral margin of gena concave, producing two lobes. Eye reduced, lightly pigmented. Occiput with two submarginal discs plus 1 lateral disc, micropunctations scattered over surface of anterior portion; 3 rows of bristles arranged 4(5)-5(6)-7; with additional very long bristle in caudoventral angle (bristles of first row broken off in male holotype); many small setae scattered along margin of antennal fossa.

Thorax (Fig. 30a, b): Pronotum with anterior row of 9 or 10 medium bristles; second row of about 9 longer bristles, with intercalaries between bases of bristles of second row. Pronotal comb of 13 or 14 spines per side; mesonotum with 3 more or less distinct rows of bristles with several small bristles anterad of these rows. Mesepisternum with 2 or 3 small bristles in posteroventral angle. 2 small bristles and 1 long bristle near ventral margin. Metanotum with 3 distinct rows of bristles caudad of several smaller bristles scattered over surface. Lateral metanotal area with single large apicodorsal bristle. Metepisternum with row of 5 bristles, middle 3 bristles long, dorsal-most bristle small, ventral bristle of medium length. Metepimeron with 2 rows of bristles, first row of 6 medium bristles plus smaller displaced bristle dorsal of row, small bristle between first and second bristles; second row of S or 9 bristles, interspersed with 3 to 4 smaller bristles.

Legs: Mesocoxa with external swordlike ridge extending ventrad to external oblique break. Metatibia with bristles in dorsal notches from base to apex as follows: 2-2-2-2-2-2-4-3.

Abdomen: Female with well-developed comb on terga II to VI (1 female with combs on terga II to VII); number of teeth in each comb highly variable but most frequently 15-14-14-15(15)-11(12)-8. Male with combs on terga II to V. Two large antepygidial bristles, ventral bristle longer than dorsal bristle; in female 2 large bristles ventral of antepygidial bristles.

Modified Abdominal Segments, Male (Fig. 31): Eighth sternum with caudal margin subtruncate; 6 to 8 large, dark submarginal bristles plus several additional submarginal and lateral bristles. Mammarium with base halmike, apex fingerlike. Immovable process of clasper with sinu in caudodorsal margin; anterior lobe with parallel sides, apex rounded; with 3 long lateral bristles plus several smaller marginal and submarginal bristles; caudal lobe with evenly rounded posterior margin bearing 4 stout evenly spaced bristles. Movable process of clasper with subparallel sides gradually tapering to subacuminate apex; 2 long subapical bristles on posterior margin; several smaller bristles ventrad of two larger bristles; lateral vertical row of 5 or 6 smaller bristles; several small lateral and submarginal bristles on anterodorsal portion. Proximal arm of ninth sternum swollen subapically, apex triangular. Distal arm of ninth sternum with subparallel sides but with apex slightly wider than base; apex subtruncate; caudal margin with 4 strong dark bristles; 2 on apex close together, others more widely separated, with numerous additional smaller marginal, submarginal and lateral bristles primarily on caudal half of distal arm of ninth sternum.

Aedeagus (Fig. 32): Aedeagal spodene long and narrow, apex acuminate, slightly upturned. Median dorsal lobe evenly rounded dorsally, with apicoaecdal projection beaklike. Lateral lobes striate to reticulate; apex subtruncate to subacuminate. Crochets narrow, curved dorsal. Aedeagal apodemal rod extends beyond apex of apodeme but not coiled. Penis rods highly coiled, fimbriate for almost entire length.

Modified Abdominal Segments, Female: Seventh sternum with prominent narrow sinuses dividing caudal margin into 2 subequal lobes. Eighth tergum with 11-15 bristles proximad of these; margin well sclerotized. Anal styllet 6 times longer than wide. Spermatheca with no line of demarcation between bulga and hilla, bulga ovoid, reticulate.
Fig. 30. *Ctenidiosomus perplexus*, new species. Male: a, head prothorax and procoxa. b, meso- and meta-thorax and first abdominal segment.
Fig. 31. *Ctenidiosomus perplexus*, new species. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 32. *Ctenidiosomus perplexus*, new species. Male: a, apex of aedeagus; b, aedeagus.
Type Data: Male holotype and female allotype ex *Rhipidomys venustus* (SVP 3885), Venezuela: Trujillo, 14 km E Trujillo near Misisi, 2210 m elev., 26-1-1966, Peterson team collectors. One paratype male with same data as holotype. Ten paratype males and 10 paratype females with data given in Table 4. Male holotype and female allotype deposited in the collection of the U.S. National Museum. One male and 1 female paratype deposited in each of the following collections: British Museum, Robert Traub, the senior and junior authors.

Family Hystrioccephalidae

Genus *Adoratopsyllula* Ewing

*Adoratopsyllula* Ewing, 1925:44.

Type Species: *Adoratopsyllula bisetosa* Ewing.

*Adoratopsyllula* (*Adoratopsyllula*) *antiquorum antiquorum* (Rothschild)

*Ctenophthalmus antiquorum* Rothschild, 1904: 643-645, Pl. 14, Fig. 72, Pl. 15, Fig. 80, 82.

*Adoratopsyllula antiquorum*, Ewing, 1925:44.


Type Data: Three males and 1 female ex *Di-

Table 4  Host and Locality Data for Type Specimens of *Ctenidiosomus perplexus*, New Species.

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<th>Females</th>
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<th>Host</th>
<th>Locality</th>
<th>Elevation in meters</th>
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Fig. 33. *Ctenidiosomus perplexus*, new species. Female: spermatheca. 

*Delphis aurita* (=*Didelphis marsupialis aurita*), Brazil: Tigneti Zech, 1897, Ihering collector.


Remarks

*Adoratopsyllula antiquorum antiquorum* (Rothschild) has been recorded from Venezuela by Barrera and Diaz-Ungria (1957) and Machado-Allison (1964). It is our opinion that this subspecies has not been collected in Venezuela and that specimens herefore called *A. antiquorum antiquorum* are actually *A. antiquorum*.
discreta. Hopkins and Rothschild (1957) refer to an undescribed subspecies of *A. antiquorum* from Venezuela in their key to species and subspecies of the subgenus *Adoratopsylla*. Some records of *A. antiquorum* antiquorum may be this subspecies. We have a series of specimens, most of which are from Falcon, which key out to the undescribed species. A description of this subspecies is given below. Two additional male specimens, unlike any other population of *A. antiquorum*, are also described below. We have described only the modified abdominal segments since characters of the head and thorax are similar in all subspecies of *A. antiquorum*.

*Adoratopsylla* (*Adoratopsylla*) *antiquorum* *discreta* (Jordan)  
(Fig. 34-36)

*Doratopsylla* *antiquorum* *discreta* Jordan, 1926: 392. Fig. 18.


Type Data: Male holotype and male paratype ex *Peramys adustus* (≡ *Monodelphis adusta*): Colombia: Cundinamarca. 1912.

Other Recorded Distribution: None.

**Description**

Female (Fig. 35d). *Modified Abdominal Segments*: Seventh sternum with sinuses in caudal margin broadly V-shaped. Spermaticca with portion of bulga; nearest hilla narrowest, striated; hilla short, broad, without striations; duct of spermaticca convoluted; bursa copulatrix well defined, perula dipperlike.

**Venezuelan Records** (32 males and 40 females)

There were 66 specimens ex *Monodelphis breviscuadala* in Giarico and Barinas, and 2 female specimens ex *Akodon urichi* in T. F. Amazonas. The remaining 4 specimens were from *Proechimys guianensis*, *Didelphis azarae* and *Rhizomys marconelli* in T. F. Amazonas and Sigmodon hispidus in Barinas.

*Adoratopsylla* (*Adoratopsylla*) *antiquorum* *rara*, new subspecies  
(Fig. 37-39)

**Diagnosis**

*Adoratopsylla* *antiquorum* *rara* is distinct from other subspecies in that there is a broad deep sinus in the apicodorsal margin of the process of the clasper, producing 2 prominent lobes and the hood of the aedeagus is broadly rounded apically.

**Description**

Male (Fig. 38). *Modified Abdominal Seg-
Fig. 34. Adoratopsylla antiquorum discreta (Jordan). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 35. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.
Fig. 36. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, apex of aedeagus. b, aedeagus.
Fig. 37. *Adoratopsylla antiquorum ranu*, new subspecies. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 38. *Adoratopsylla antiquorum rara*, new subspecies. Male: a, process and movable finger of clasper. b, eighth sternum. c, ninth sternum.
Fig. 39. Aderatopsylla antiquorum rara, new subspecies. Male: a, apex of aedeagus. b, aedeagus.
Fig. 40. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, head, prothorax and procoxa; b, meso- and metathorax and first abdominal segment.
Fig. 41. Adonatopsylla antiquorum recta, new subspecies. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.
Fig. 42. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, apex of aedeagus. b, aedeagus. Female: c, seventh sternum.
Acrothorax (Fig. 42). Acrothorax spined in a row; apex rounded; penis rod longer than acrothorax spined but not coiled. Apex of hood of acrothorax fingerlike, end chamber a membranous flap. Crochet with broad base, upturned rounded apex.

Female (Fig. 11d). Modified Abdominal Segments: Seventh sternum caudal margin with broad shallow sinus, 7 stout setae near caudal ventral angle. Bulga of spermatheca with almost parallel sides, striations in middle; hilla short, broad, rounded apex.

Type Data: Male holotype, female allotype, ex Monodelphis breviceudata (SVP 14791), Venezuela: Falcón, near Mirimire, 250 m elev., 12-VIII-1967, Peterson team collectors; 3 male paratypes with same data; 17 male and 16 female paratypes as in Table 5.

Adoratopsylla (Adoratopsylla) bisetosa Ewing
(Fig. 43-46)


Type Data: Three males, 3 females ex Monodelphis breviceudata, Brazil: Rio Branco Santa María, 8-IX-1924.

Other Recorded Distribution: Venezuela: ex Monodelphis breviceudata.

VENEZUELAN RECORDS (7 males and 3 females)
Three males and 2 females ex Monodelphis breviceudata from Sucre. 1 male ex Monodelphis breviceudata from Bolívar, and 3 males and 1 female ex Strigomys absoni from Bolívar.

Remarks

Morphological differences in specimens from Sucre and Bolívar are evident but appear to be varietal in nature. A. bisetosa is probably a marsupial flea but our data are inadequate for determining the optimum environment.

Adoratopsylla (Adoratopsylla) diletta Jordan
(Fig. 47-50)


Type Data: Female holotype ex Marmosa marina, Venezuela: Ayantepui Plateau, 1850 m elev., G. H. H. Tate collector.

Other Recorded Distribution: Venezuela: State of Monagas, Caripe, ex Marmosa robainoni.

VENEZUELAN RECORDS (30 males and 33 females)
There were 25 males and 21 females ex 7 Marmosa fascata from Carabobo, Monagas, and Delta Federal. Other hosts include: Strigomys robinsoni (Miranda and Monagas), Marmosa marina (Monagas), Marmosa cayennensis (Aragua), Monodelphis breviceudata (Aragua), Heteromys melanos (Monagas), Orzyomys albigularis (Aragua), Orzyomys minutus (Mérida), Orzyomys fulvicaudis (Monagas), and Procavia peninusulga (Monagas).

Remarks

Specimens illustrated (Fig. 47, 48, 49a, b, 50) are from Monagas and agree with descriptions given by Jordan (1938) and Machado-Allison (1964), except that the sins in the

Table 5. Host and Locality for Type Specimens of Adoratopsylla (Adoratopsylla) antiquorum recta, New Subspecies.

<table>
<thead>
<tr>
<th>Host Species</th>
<th>Host</th>
<th>Location</th>
<th>Elevation in meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monodelphis breviceudata</td>
<td>Trujillo, Valera, nr Isotí</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>Carallia perspicilla</td>
<td>Miranda, 19 km E Caracas</td>
<td>1160</td>
<td></td>
</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Curagao</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, nr Mirimire</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>90</td>
<td></td>
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<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>145</td>
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</tr>
<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>160</td>
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<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>125</td>
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<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
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<tr>
<td>Monodelphis breviceudata</td>
<td>Falcón, Mirimire, nr La Pastora</td>
<td>155</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 43. *Adoratopsylla bisetosa* Ewing. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 44. *Adoratopsylla hisetosa* Ewing. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 45. *Adoratopsylla hisctosa* Ewing. Male: a, apex of aedeagus. b, aedeagus.
posterior margin of the seventh sternum of the female is variable but usually not so triangular as shown by Machado-Allison. A short series from Aragua, Carabobo, Miranda, and Dto. Federal differs from Monagas specimens in details of the male genitalia; the posterior margin of the movable process of the clasper is not evenly rounded but has an irregular outline; the paired setae are on the ventral half of the margin and the hood of the aedeagus is not so long and narrow (Fig. 49c, d). In the female the sinuses of the seventh sternum is narrower and somewhat deeper. Our records, though inadequate, indicate that *Marmosa fuscata* is the preferred host of *A. dilecta* in Venezuela although it was collected on other species of *Marmosa* as well.

*Adoratopsylla* (*Tritopsylla*) *intermedia* (Wagner)  
(Fig. 51-54)

*Typhlopsylla* *intermedia* Wagner, 1901:22, Pl. 1, Fig. 7, 9.

*Stenopsylla* *intermedia intermedia* Jordan, 1926: 301, Fig. 13, 14.

*Tritopsylla* *intermedia*, Pinto, 1930:349, Fig. 138, 181, 182.—Jordan, 1938b:164.—Fox, 1947:119.


*Adoratopsylla* (*Tritopsylla*) *intermedia intermedia*, Johnson, 1957:32, 33.—Smit and Wright, 1965:22.—Hopkins and Rothschild, 1966:117-121, Fig. 175, 176, 178, 180, 183, 184, 187, 188; Pl. 3E, F.

Type Data: Type series ex unknown host, Paraguay: received from A. Poppe (Poppe was not the collector). Two females ex *Metachirus opossum* (= *Philander opossum*), Ecuador: Paracutie, K. Rothschild collector.

Other Recorded Distribution: Argentina, Bolivia, Brazil, Paraguay, Peru, and Venezuela: ex marsupials for the most part.

**Venezuelan Records**  (277 males and 335 females)

There were 171 males and 261 females ex 23 *Didelphis marsupialis* in Aragua, Barinas, Bolivar, Dto. Federal, Miranda, Monagas, and Yaracuy; 49 males and 31 females ex 7 *Didelphis azarae* in Bolivar and T. F. Amazonas. The remaining 70 specimens were collected from: *Rhaphogalea galeata*, *Felis tigrina*, *Aedon urichi*, *Orzonyx minutus* (Dto. Federal); *Caluromys philander* (Dto. Federal and Monagas); *Caluromys sp.* (Monagas); *Artibeus jamaicensis*, *Marmosa murina* and *Oryzomys fulvescens* (Monagas); *Philander opossum* (T. F. Amazonas); *Metachirus mucicandata* (Barinas and Bolivar), and *Monodelphis brevicandata* (Barinas).

**Remarks**

The morphological characters which have been used to separate subspecies of *Adoratop-
Fig. 47. Aclaratopsylla dilecta Jordan. Male: a, head prothorax and procoxa; b, meso- and metathorax and first abdominal segment.
Fig. 48. *Adoratopsylla ditecta* Jordan. Male: a, metatibia. b, process and movable finger of clasper. c, eighth sternum. d, ninth sternum.
Fig. 49. *Adoratopsylla dilecta* Jordan. Male: a, apex of aedeagus. b, aedeagus. c and d, median dorsal lobe of aedeagus.
sylia intermedia are highly variable. Most of our specimens were collected in widely separated localities (Caracas, Monagas, Barinas, T. F. Amazonas, and Bolivar) and from a variety of hosts. In general, lobe 2 of the immovable process of the chasper is longer and narrower and the movable process is wider in specimens from Caracas versus those from Bolivar but in a long series of 47 males and 87 females from a single host the variation is almost as great as in the material from all of Venezuela. We concur with Hopkins and Rothschild (1966) and Guimarães (in litt.) in calling Venezuelan specimens Adoratopsylla intermedia intermedia.

We collected 432 specimens of A. i. intermedia from 25 specimens of Didelphis marsupialis and 50 from 7 Didelphis azarae. Thus of the 582 specimens of A. i. intermedia collected 88% were associated with marsupials of the genus Didelphis and the remaining 12% from other hosts.

Genus Neotyphloceras Rothschild


Type Species: Typhloceras rosenbergi Rothschild.

Neotyphloceras rosenbergi (Rothschild) (Fig. 55-58)

Typhloceras rosenbergi Rothschild, 1904:639. Pl. 13, Fig. 68-69, 71, 74; Pl. 14, Fig. 71, 74.


Neotyphloceras rosenbergi, Rothschild, 1914:244.—Jordan, 1936:510.—Costa Lima and Hathaway, 1946:229.—Macchiavello, 1948:26.—Jordan, 1950:605.—Johnson, 1957:27, Pl. 9, Fig. 3, 4; Pl. 16, Fig. 4.—Machado-Allison, 1964:164, 165.—1966:26.—Hopkins and Rothschild, 1966:131-133, Fig. 115, 198, 199, Pl. 1C, -D.

Type Data: One male, 2 females ex Metachirus opossum (=Philotel Philotel (=Philotel opossum)), Ecuador: Cayambe, 12-VI-1897, W. F. H. Rosenberg collector. One male, 6 females ibid, but ex Didelphis azarae, 21-VI-1897. Two females ibid, but Ibarra, 31-V-1897.

Other Recorded Distribution: Ecuador: thirteen localities, ex species of the following genera: Didelphis, Oryzonmys, Rhipidomys, Thomasomys, Akodon, Sigmodon, Stictomys, and rats and their nests. Peru: three localities, ex species of the following genera: Oryzonmys, Rhipidomys, and Akodon. Colombia: four localities, ex species of the following genera: Marmosa, Sciurus, Oryzonmys, Rhipidomys, Thomasomys, Chilomys, Rhammys, Stictomys, and Mustela. (for more detailed information see Johnson, 1957).
Fig. 51. Adoratopsylla intermedia intermedia (Wagner). Male: a, head, prothorax and procoxal. b, meso- and metathorax and first abdominal segment.
Fig. 52. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 53. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, apex of aedeagus. b, aedeagus.
VENEZUELAN RECORDS (87 males and 112 females). See Table 6.

Remarks

Initially it appeared that there were at least two and perhaps three distinct geographic populations represented in our collections based on the shape and length of the fingerlike apodeme at the base of the claspers, width of and degree to which the manubrium is curved and length of the finger of the clasper. However, in one series of 17 males and 28 females from a single host (Didelphis azarae) there is considerable variation in these characters though not as much as between populations. Venezuelan specimens do not agree in all details with illustrations given

Table 6. Venezuelan Records of Neotyphlocerus rosenbergi (Rothschild).

<table>
<thead>
<tr>
<th>Host Animals</th>
<th>Catatumbo</th>
<th>Trujillo</th>
<th>Merida</th>
<th>Monagas</th>
<th>Falcata</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>147-250 m</td>
<td>220-290 m</td>
<td>2500 m</td>
<td>1200-1300 m</td>
<td>2500-2425 m</td>
</tr>
<tr>
<td></td>
<td>elevation</td>
<td>elevation</td>
<td>elevation</td>
<td>elevation</td>
<td>elevation</td>
</tr>
<tr>
<td>Rhopidomys venustus</td>
<td>(5) 4 2</td>
<td>(9) 9 3</td>
<td>(3) 1 2</td>
<td>(3) 4 2</td>
<td>(6) 3 3</td>
</tr>
<tr>
<td>Ochotonoma abigailis</td>
<td>(13) 8 5</td>
<td>(4) 0 5</td>
<td>(1) 0 1</td>
<td></td>
<td>(1) 1 0</td>
</tr>
<tr>
<td>Ochotonoma concolor</td>
<td>(1) 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ochotonoma minutus</td>
<td>(1) 0 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomasomys laiger</td>
<td>(7) 6 5</td>
<td>(2) 1 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomasomys lycus</td>
<td>(1) 0 1</td>
<td>(7) 18 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomasomys hylophilus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomasomys vestitus</td>
<td>(1) 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heteroromys anomalus</td>
<td>2 2 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didelphis azarae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calateromys philander</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marmosa drayg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The numbers of host animals are represented by the numerals in parentheses.
Fig. 55. *Xenophilocerus rosenbergi* (Rothschild). Male: a. head, prothorax and procoxa. b. meso- and meta-thorax and first abdominal segment.
Fig. 56. Neotyphiloceras rosenbergi (Rothschild). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 57. *Neotyphloceras rosenbergi* (Rothschild). Male: a. apex of aedeagus. b. aedeagus.
by Johnson (1957). This is particularly true of the apical portion of the distal arm of the ninth sternum and the aedeagus. The male genitalia in this species is exceptionally complex and several structures are very delicate and thus susceptible to distortion. Some of the variation may be due to this factor but in addition this species is probably represented by several large, relatively isolated populations each of which occurs on a host species.

According to Smit (1967) the genital spines of our specimens are more truncate than in specimens from other areas.

Although N. rosenbergi appears to be promiscuous in its host associations it is likely a marsupial flea. From one host (Didelphis azarae), captured above 2,743 meters elevation, we collected 17 male and 28 female fleas. There were 57 fleas on 26 host animals (four species of *Thomasonys*). 43 fleas on 26 host animals (*Rhipidomys venustus*), and 21 fleas on 20 host animals (*Oryzomys albicaudatus*). Essentially all specimens of *N. rosenbergi* were collected above 1,829 meters elevation.

Family Stephanociridae

Genus Cleopsylla Rothschild

*Cleopsylla* Rothschild, 1914:246.

Type Species: *Cleopsylla townsendi* Rothschild.

*Cleopsylla monticola* Smit

(Fig. 59, 60, 68a)

*Cleopsylla monticola* Smit, 1953:193-197 Fig. 13, 15, 17, 19, 21.—Hopkins and Rothschild 1956:127-130. Fig. 210, 214, 216, 218, 221; Pl. 1 13G, 16A.—Johnson, 1957:61.

Type Data: Male holotype, female allotype, ex *Caenolestes fuliginosus* (= *C. fuliginosus*), Ecuador: Pichincha, 1-X-1931; 1 female and 1 male paratypes ex *Sigmodon* species, Chimborazo, IV-1931; 1 male paratype ex *Thomasonys* species, Illiniza, IV-1931, by Spillmann collector.

Other Recorded Distribution: Colombia: 1 female ex *Rhipidomys* species

VENEZUELAN RECORDS (55 males and 87 females)

There were 26 males and 56 females ex 20 *Oryzomys albicaudatus* in Dto. Federal, Trujillo, Mérida, and Táchira. Also, 8 males and 7 females ex 9 *Oryzomys minutus* in Trujillo, Mérida, and Táchira. There were 5 males and 9 females ex 9 *Rhipidomys venustus* and 1 *Rhipidomys* sp.1 in Trujillo, Mérida, and Táchira. 12 males and 11 females ex *Thomasonys* langer (Trujillo and Mérida), *Thomasonys* biformis (Táchira), *Thomasonys* rigens (Trujillo and Mérida), *Thomasonys* vestitus (Trujillo), and *Thomasonys* sp.1 (Mérida). In addition 8 specimens were collected from Marmosa fasciata (Dto. Federal), Marmosa guayaquilena (Trujillo), Didelphis marsupialis (Trujillo), Chilotomys in stans (Táchira), and birds (Dto. Federal and Mérida).

**Remarks**

There is some intraspecific variation. In our specimens the anterior margin of the frons is convex as in *C. townsendi*. The spine on the genal process and the occipital tubercle are better developed than shown by Smit (1953) for *C. townsendi* and *C. monticola*. Our collection records, though rather meager, suggest that this flea is more ecologically tolerant than other species in the family. The areas in which it was collected varied in elevation from 1,413 meters to 3,170 meters but most specimens were collected at 2,200-2,500 meters and one specimen was collected on Didelphis marsupialis at 120 meters elevation. *Oryzomys albicaudatus* is probably the
Fig. 59. *Cleopsylla monticola* Smit. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 60. *Cleopsis monticola* Sm. Male: a, apex of aedeagus. b, aedeagus. c, process and movable finger of clasper. d, eighth sternum. e, ninth sternum.
preferred host in Venezuela although it occurred on species of *Thomasomys* and *Rhipidomyx* with sufficient frequency to indicate more than an accidental relationship.

**Genus Craneopsylla** Rothschild

*Craneopsylla* Rothschild, 1911:120.

**Type Species:** *Stephanocerus wolffhuegelii* Rothschild.

*Craneopsylla minerva minerva* (Rothschild)  
(Fig. 61-64, 68b)

**Stephanocerus minerva** Rothschild, 1903b:319,  
Pl. 9, Fig. 6, 7.


*Craneopsylla minerva minerva*, Hopkins, 1951:  
537, Fig. 5.—Smit, 1953:201, Fig. 32.—Hopkins  
and Rothschild, 1956:140-142, Fig. 237,  

**Type Data:** Female holotype and paratype fe-  
male ex *Didelphis azarae*, Paraguay: Sapucay,  
1901, W. Foster collector.

Other Recorded Distribution: Brazil: ex *Metachirops opossum quica* (=Philander opossum quica), and *Nectomys squamipes*, Argentina: ex *Deltamys benysparana*, *Oxy-  
mycterus platensis*, *Scapteromys tennentos*, and *Holochilus balnearum* (=*H. brasiliensis  
balnearum*). Peru: ex “wild rat.”

**Venezuelan Records** (23 males and 35 females)

There were 2 males and 4 females specimens ex *Rhipidomyx venezuelae* (Dta. Federal), 2 males and 4 females ex *Rhipidomyx venustus* (Monagas), and 1 male and 6 females ex *Rhipidomyx macconnelli* (Falcón and T. F. Amazonas). In addition 1 specimen each was collected ex *Oryzomys albogularis* in Sucre, and *Akodon trichi* in T. F. Amazonas.

**Remarks**

The key character given by Johnson (1957)  
to separate *C. minerva minerva* from *C. minerv  
na wolffhuegelii* is the number of spines in  
the genital comb: *minerva* has 5 and  
*wolffhuegelii* has 7 or 8. Most of our specimens have 6  
spines but two or three have only 5 spines.

*C. minerva* has been collected from a vari-  
cy of hosts, including marsupials, but 88% (22  
of 25) of our specimens were collected from  
*Rhipidomyx* species. All of our specimens were  
collected between 1520 and 1500 meters elevation.  
This species has been collected at eleva- 
tions of 3505 and 4033 meters in Peru.

We have included illustrations of specimens  
collected from the same host species to indicate  
the variation which occurs in this species.

**Genus Plocopsylla** Jordan


**Type Species:** *Craneopsylla achilles* Roths-  
child.

*Plocopsylla ulyses* Hopkins  
(Fig. 65-67, 68c)

*Plocopsylla ulyses* Hopkins, 1951:  
529, Fig. 1-4.—Hopkins and Rothschild, 1956:167-168, Fig.  

**Type Data:** Male holotype and female allotype ex *Thomasomys* species, Ecuador: Chimborazo, IV-1931, F. Spillmann collector.

**Other Recorded Distribution:** None.

**Venezuelan Records** (23 males and 35 females)

There were 20 males and 32 females ex 10 *Thom  
asonomys laniger* (Merida and Trujillo), 5 *Thomasomys  
inaeus* (Merida), 6 *Thomasomys hylophilus* (Merida),  
and 1 *Thomasomys sp.* (Merida). The remaining 6  
specimens were collected from *Trachops cirrhosus*  
(Cuárico), *Oryzomys minutus* (Merida), *Cryptotis  
thonasi*, *Akodon bogoensis*, and a bird.1 (Táchira).

**Remarks**

Our specimens appear to be sufficiently dif-  
f erent from type specimens to warrant description  
as a new species. However, Smit (1968) has compared our specimens with the holotype and assures us they are conspecific. Apparently the holotype specimen is overcolored and some aspects of the male terminalia are difficult to see. In our specimens there is a considerable amount of variation and there are some aberrant specimens. For example, there are 2 males and 3 females with spines on the genital process (one side only) and there are 3 additional fe-  
males with 3 antepygial bristles on each side. The female allotype and most of our specimens have 4 antepygial bristles per side. In the male holotype the lateral projection of the clasp-  
er is fairly straight and the apex is truncate whereas in our specimens the lateral projection of the clasper is not straight and the apex has the appearance of the head of a railroad spike (somewhat like *P. hector*). Also the movable process of the clasper is not fingerlike as in il- 
ustrations given by Hopkins but the apex is more broadly triangular. The eighth sternum is well developed as in *P. scotinomis* but the apical half is filamentous.

All but 3 males and 4 females were collected  
from species of *Thomasomys*. All of our speci-  
mens were collected at elevations in excess of  
2,200 meters. Of the four species of helmeted  
 fleas in our collection, each representing a  
different genus, *P. ulyses* is the most ecologically  
restricted in terms of hosts and elevation.
Fig. 61. *Grancopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546), Dto. Federal. Male: a, head, prothorax and procoxa; b, meso- and metathorax and first abdominal segment.
Fig. 62. *Craneopsylla minerc minerc* (Rothschild) ex *Bhapidomys venustus* (SVP 342), Dto. Federal. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 63. *Craneopsylla minerva minerva* (Rothschild) ex *Rhipidomus venustus* (SVP 546), Dto. Federal. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. (SVP 342), Dto. Federal. Male: d, process and movable finger of clasper. e, ninth sternum. f, eighth sternum.
Fig. 64  *Craucopsylla minerva minerva* (Rothschuld) ex *Blapodoes venustus* (SVP 546). Dto. Federal. Male: a, apex of aedeagus. b, aedeagus (SVP 342), Dto. Federal. Male: c, apex of aedeagus. d, aedeagus.
Fig. 65. *Plucopsylla ulysses* Hopkins. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 66. *Plocopsylla ulysseae* Hopkins. Male: a, process and movable finger of clasper; b, ninth sternum; c, eighth sternum.
Fig. 67. *Plocopsylla ulysses* Hopkins. Male: a, apex of aedeagus. b, aedeagus.
Genus *Sphinctopsylla* Jordan

*Sphinctopsylla* Jordan, 1931b:141.

Type Species: *Craneopsylla tolmera* Jordan.

*Sphinctopsylla tolmera* (Jordan)  
(Fig. 69-71)

*Craneopsylla tolmera* Jordan, 1931a:314, Fig. 5.

*Sphinctopsylla tolmera*. Jordan, 1931b:141, Fig. 10.—Smit, 1955:324.—Johnson, 1957:69.

Other Recorded Distribution: Ecuador: ex *Oryzomys* species and *Thomasonymys* species. Colombia: ex *Chilomys instans* and *Thomasonymys laniger*.

**Venezuelan Records** (36 males and 76 females)  
There were 32 males and 63 females ex *Oryzomys minutus* in Mérida at 3122-3785 meters elevation and 8 *O. minutus* in Táchira at 2370-2418 meters elevation. An additional 4 males and 13 females were collected from *Thomasonymys laniger* and *Akodon bogotensis* (Mérida); *Oryzomys albigularis*, *Caenolestes obscurus*, *Rhipidomys venustus*, and *Thomasonymys hylopilus* (Táchira), and *Oryzomys fulvescens* (Táchira and Yaracuy). Also there were 4 specimens for which the host data and locality had been lost.

**Remarks**  
Hopkins and Rothschild (1956) indicate there are 15 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb. All of our specimens have 17 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb with the following exceptions: helmet comb—there are 12 males and 5 females with 16 spines, and 1 male and 3 females with 18 spines; pronotal comb—4 males and 6 females have 28 spines, 4 males and 11 females have 32 spines, and 3 females have 34 spines. There may not be as much variation in the pronotal comb as our counts indicate because the orientation of some specimens makes accurate counting difficult.

Our specimens were collected between 2370 and 3785 meters elevation, but more than 80%
Fig. 69. Sphinctopsylla talmera (Jordan). Male. a. head prothorax and procoxa. b. meso- and metathorax and first abdominal segment.
Fig. 70. *Sphinctopsylla tolmera* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 71 *Sphinctopsylla tolmeca* (Jordan). Male: a, apex of aedeagus, b, aedeagus. Female: c, spermatheca.
were collected over 3000 meters elevation. Although S. tolmera has been collected from several host genera, more than 87% of our specimens were collected from Otiria species, principally O. minutus.

**Family Ischnopsyllidae**

**Genus Hormopsylla Jordan and Rothschild**

_Hormopsylla_ Jordan and Rothschild, 1921b:158.

Type species: _Ceratopsylla fosteri_ Rothschild.

**Hormopsylla cryptica**, new species  
(Fig. 72-74)

**Diagnosis**

_Hormopsylla cryptica_, new species, is very near _H. fosteri_ (Rothschild) but the male genitalia differs considerably. In the eighth sternum the apex is truncate, not rounded; there is a well-developed proximal lobe (resembling the proximal lobe of the ninth sternum characteristic of species in other families) shaped like a fishtail; the movable process of the clasper is broadly truncate rather than triangular and the shapes of the crochet and median dorsal lobe are quite different in the two species.

**Description**

**Head** (Fig. 72a): Anterior margin evenly rounded; preantennal area covered with about 45 short, spiniform bristles plus four longer bristles; prominent mesal sclerotization running parallel with anterior margin of head; vertical incassations extending ventrad from dorsal margin. Two genal teeth; anterior tooth broad, about two-thirds length of narrower tooth; preoral tuber distinct. Genal process long, extends well beyond apex of antenna; reticulate; apex rounded. Eye small, lightly pigmented, scarcely discernible. Postantennal area with 5 bristles; 4 vertical incassations between rows of bristles, middle 2 most pronounced, apices globular; diagonal row of bristles along antennal fossa; pale, mesal, triangular area with 5 fairly long and 2 or 3 smaller bristles.

**Thorax** (Fig. 72a, b): Pronotum with 3 rows of bristles arranged 4-3-5; last row with ventral bristle much longer than others, with 5 intercalaries, about 24 teeth in pronotal comb which curves cephalad on ventral end. Mesonotum with 6 rows of bristles, 3 to 4 bristles per row; 5 prominent vertical incassations extending ventrad from dorsal margin. Mesepimeron with mesal row of 3 long bristles; about 5 additional smaller bristles. Mespisternum divided by broad horizontal band; 1 long, 5 shorter bristles above band; lower portion devoid of setae. Metanotum with 5 dorsal incassations; 4 rows of marginal—submarginal bristles plus 2 moderately long and 2 short bristles; apex with comb of about 7 teeth per side.

**Legs**: Procoxa with about 36 mesal bristles plus marginals; 1 long bristle in caudoventral angle; profemur with 3 small bristles on outer lateral surface. Meso-, metacoxae with heavily sclerotized internal rods. Hind tibia with 8 dorsocaudal notches with bristles arranged 2-2-1-2-2-1-2-2. Tarsal segment lengths in microns: 155, 125, 98, 60, 112; 4 pairs lateral plantar bristles.

**Abdomen**: Terga 1-4 with well-developed combs with teeth numbering 20-18-16-16; 5 bristles per segment, ventral pair with spiracle between them. Minute bristle at base of single, long antepygidal bristle. Sterna with darkened, heavily sclerotized areas near ventral margins, 1 bristle per sternum.

**Modified Abdominal Segments, Male** (Fig. 73): Tergum 8 with 4 stout bristles caudad of sensillum; caudal margin rounded. Sternum 8 with well-developed caudal process bearing about 6 medium bristles plus 7 or 8 small bristles on ventral margin; apex subtruncate, undulating dorsal margin; striated; appears to have longitudinal fold with well-developed proximal arm, apex like a fishtail. Distal arm of ninth sternum (DA9) with lobe on caudoventral margin bearing 1 short seta; apex fonnellike; 2 small marginal setae plus 1 mesal bristle about midway between lobe and apex; dorsal margin concave. Immovable process of clasper (P.) broadly truncate; apex reaches dorsal of midpoint of movable process of clasper (F.): F. prominent, with 2 medium bristles on or near dorsal margin plus 9-10 smaller mesal bristles; point of articulation with P. medial.

**Aedeagus** (Fig. 74): Aedeagal apodeme long, slender, swordlike; with upturned; acuminate apex; proximal spur prominent; apex angular. Median dorsal lobe ovoid, membranous flap somewhat troughlike. Lateral lobes with ventrocaudal margin rounded. Crochet very broad basally; width reduced abruptly at apex, slightly sinusous, acuminate.

**Type Data**: Male holotype ex _Eptesicus brasiliensis_ (SVP 6634); T. F. Amazonas. 81 km SSE Esmeralda near Boca Mavaca, 185 m elev.: 13-11-1966. Tuttle team collector. One paratype male ex _Tadarida graciosus_ (SVP 6657) same locality and collectors but 16-11-1966. One paratype male ex _Molossus major_ (SVP 9290); Bolivar. 59 km SE El Dorado near El Manaco, 150 m elev., 13-VI-
Fig. 72. *Hormopsylla cryptica*, new species. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 73. *Hormopsylla cryptica*, new species. Male: a, process and movable finger of clasper; b, ninth sternum; c, eighth sternum.
Fig. 74. *Hormopsylla cryptica*, new species. Male: a, apex of aedeagus. b, aedeagus.

Genus Myodopsylla Jordan and Rothschild

Myodopsylla Jordan and Rothschild, 1911:88.

Type Species: Ceratopsylla insignis Rothschild

Myodopsylla wolffsohni salviasis Jordan (Fig. 75-78)

Myodopsylla wolffsohni salviasis Jordan, 1931c: 261. Fig. 1.—Guimaraes, 1940:220. Fig. 1.—Hopkins and Rothschild, 1956:241-242. Fig. 400; Pl. 18f. 26.—Barrera and Diaz-Ungria, 1957:164, 181.—Machado-Allison, 1966:26, 28.

Type Data: Male holotype ex "bat," Venezuela: State of Merida, VI-1930. A. Hase collector; 1 male and 3 females ex Myotis species, Puerto La Cruz, (6 miles NNE Barcelona), VI-1930, A. Hase collector.

Other Recorded Distribution: None.

Venezuelan Records (9 males and 32 females)

There were 4 males and 23 females ex 4 Myotis keaysi in Aragua and 7 M. keaysi in Miranda. Fourteen specimens were collected from 2 Myotis oxytis in Merida and 3 Myotis nigricans in Monagas.

Remarks

All of our specimens of M. wolffsohni salviasis were collected above 950 meters, primarily on bats of the genus Myotis, especially M. keaysi and to a lesser extent on M. nigricans and M. oxytis. The degree of sclerotization of the crochets is variable which probably influences folding and distortion of this structure and causes it to be highly variable in form. The apical lobe of the distal arm of the ninth sternum also tends to be variable. There are 10-12 bristles on the apical margin of the eighth sternum, but in most specimens there are 12.

Genus Ptilopsylla Jordan and Rothschild

Ptilopsylla Jordan and Rothschild, 1921b:158-160.

Type Species: Ptilopsylla leptina Jordan and Rothschild.

Ptilopsylla leptina Jordan and Rothschild

Ptilopsylla leptina Jordan and Rothschild, 1921b: 160-162. Fig. 142-147.—Guimaraes, 1942: 202.—Costa Lima and Hathaway, 1946:175.—Hopkins and Rothschild, 1956:206, Fig. 351-356.—Johnson, 1957:98.

Type Data: Male holotype ex "bat," Paraguay: Santisserna Trinidad (suburb of Asuncion), L. Zurcher collector.

Other Recorded Distribution: Brazil: ex Darius albiventer (=Noctilio labialis albiventer) and Tadarida europs (=T. gracilis).

Venezuelan Records (1 male)

One male (SVP 15707) ex Tadarida gracilis, near Belen and Rio Guayuma, T. F. Amazonas, 185 m elev., 13-1-1967, Tuttle team collector.

Remarks

P. leptina is said to be "rare" as it has been collected only on four occasions, including our single specimen collection. We have examined several hundred molossid bats but only one was parasitized with this flea. Molossid bats often roost in the space between roof tile and the ceiling and thus are very close to guano deposits. We suggest that fleas of the genus Ptilopsylla have adapted to this habitat and are on the host only for short periods while feeding.

Genus Rothschildopsylla Guimaraes


Type Species: Ischnopsyllus noctilionis Costa Lima.

Rothschildopsylla noctilionis (Costa Lima) (Fig. 79-82)

Ischnopsyllus noctilionis Costa Lima, 1920:56. Fig. 1-2.


Type Data: Ex Noctilio albiventer Spix (=N. labialis albiventer), Brazil: State of Mato Grosso, Corumba, A. de Miranda Ribeiro collector.

Other Recorded Distribution: None.

Venezuelan Records (1 male and 2 females)

One female (SVP 6658) ex Tadarida gracilis, Boca Maya, 84 km SSE. Esmeraldas, Amazonas, 185 m elev. 14-11-1966, Tuttle team collector. One male (SVP 6657) and 1 female (SVP 6658) ex Tadarida gracilis, same locality but 16-11-1966.


Fig. 75. *Mydlopsylla wolfsioli salrasis* Jordan. Male: a, head, prothorax and procoxa, b, meso- and meta-
thorax and first abdominal segment.
Fig. 76. *Myodopsylla wolfschoni salvisis* Jordan. Male: a, process and movable tinger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 77. *Myodopsis fullofsoni salvus* Jordan. Male: a, apex of aedeagus. b, aedeagus.
Fig. 78. *Myodopsylla wolffsolmi salvus* Jordan. Fem. fr.: a. spermatheca. b. bursa copulatrix. c. seventh sternum.
Fig. 79. *Rothschildopsylla nocticonis* (Costa Lima). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.
Fig. 80. Rothschildopsylla noctilionis (Costa Lima). Male: a, process and movable tinger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 81  *Rothschildopsylla noctilionis* (Costa Lima). Male: a, apex of aedeagus. b, aedeagus.
Genus Sterlopsylla Jordan and Rothschild
Sterlopsylla Jordan and Rothschild, 1921b:158.
Type Species: Ischnopsylla texanus L. Fox

Sterlopsylla distincta speciosa Johnson
(Fig. 83-86)
Sterlopsylla distincta speciosa Johnson, 1957: 100. Pl. 48, Fig. 3, 4. Pl. 50, Fig. 3, 8.—Tipton and Mendez, 1966:307-308, Pl. 64, 65.
Fig. 83. *Sternopsylla distincta speciosa* Johnson. Male. a. head prothorax and procoxa. b. meso- and metathorax and first abdominal segment.
Fig. 84. *Sternospilus distinctus speciosus* Johnson. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.
Fig. 85. *Sternopylla distincta speciosa* Johnson. Male: a, apex of aedeagus, b, aedeagus.
**Type Data:**
Male holotype, female allotype, 3 paratype females ex *Tadarida brasiliensis*, Peru: Dept. of Cuzco, Quince Mil, 19-VI-1950, C. Kalinowski collector. One male and 3 female paratypes ex *Tadarida* species, Colombia: Dept of Huila, Pitalico, 1350 m elev., 28-XI-1951, P. Hershkovitz collector.

Other Recorded Distribution: Panama: ex *Myotis nigricans nigricans, M., chiloensis, Tadarida brasiliensis*, and *Tadarida yucatanaica*.

**Venezuelan Records** (1 male and 1 female)
- One male (SVP 4017) ex *Tadarida brasiliensis*, La Mucuy, 4 mi. E Tukuy, Mérida, 2107 m elev., 9-III-1966, Peterson team collector. One female (SVP 6912) ex *Tadarida gracilla*, 10 km NW Urama, Yaracuay, 25 m elev., 11-III-1966, Tuttle team collector.

**Remarks**
The distal arm of the ninth sternum and apex of the aedeagus are similar to those illustrated by Tipton and Mendez (1966) for *S. d. speciosa*. Our male specimen from Venezuela differs from illustrations given by Tipton and.
Mendez (1966) and Johnson (1957) in that the finger of the casper is much broader apically. The eighth sternum is much wider in our specimen and the apical patch and the subapical row of pseudostyles are more pronounced. These differences in the eighth sternum may be due to the orientation of the specimen on the slide.

Family Ceratophyllidae

Genus Dasypsyllus Baker

Dasypsyllus Baker, 1905:129.

Type Species: Ceratophyllus perpinnatus Baker.

Dasypsyllus gallinulae perpinnatus (Baker)


Ceratophyllus gallinulae perpinnatus, Jordan, 1926:536.


Type Data: Ex unknown host, Canada: Queen Charlotte Islands, J. K. Keen collector.

Other Recorded Distribution (South America): Argentina: ex nest of bird, Panama: ex Sciurus granatensis chiriquensis, Zonotrichia capensis costaricensis, and Virco leucophys chiriquensis. Venezuela: ex nest of Xanthornus viridis.

Venezuelan Records (23 males and 13 females)

Most of the specimens (16 males and 11 females) were collected from unidentified birds in the state of Mérida between 2150 and 2640 meters elevation. In addition, there were 2 males ex Thomasornis lugens and 1 male ex Sciurus granatensis from the state of Mérida. Two males were collected from 2 unidentified birds in the state of Táchira at about 2400 meters elevation. One female ex Rhipidomus venustus and 1 male ex Atlapetes brunneicincta were collected near Caracas at about 2000 meters elevation. One female ex Atlapetes chui and 1 male ex unidentified bird were collected in the state of Trujillo at 2360 meters elevation. All of our specimens were collected at elevations above 2000 meters.

Dasypsyllus lasius venezuelensis

(Fox and Anduze)

Ceratophyllus lasius Rothschild, 1909:63, Fig. 10.

Dasypsyllus lasius, Jordan, 1933:76.

Arcosypylla venezuelensis I, Fox and Anduze, 1917:108, Pl. 1, Fig. 1-3.


Type Data: Male holotype, female allotype, male and female paratypes ex swallow's nest, Venezuela, Mérida, Apartaderos, 3300 m elev., IX-1944, collector P. Anduze.

Other Recorded Distribution: Panama, Chiriqui, ex Notiochelidon cyanoleuca.

Remarks

We did not collect D. lasius venezuelensis in Venezuela but had we obtained swallow's nests at high elevations it is likely that we would have encountered this species.

Dasypsyllus stejnegeri (Jordan)


Type Data: Male lectotype (Smit, 1961) ex unknown host, Bering Island, Northern Pacific Ocean, 1852-1853.


Venezuelan Records (3 females)


Remarks

D. Stejnegeri has been collected so rarely that it is difficult to comment about its distribution. We suspect that it is a common bird flea in Venezuela at high elevations. Our 3 specimens were collected above 3100 meters.

Genus Orchopeas Jordan

Orchopeas Jordan, 1933:71.

Type Species: Pullex wickhami Baker

Orchopeas howardi (Baker)

Pullex wickhami Baker, 1895:109, 111.

Pullex howardi Baker, 1895:110, 112.
Orchopeas wickhami, Jordan. 1933:71-72.
Orchopeas howardi, Ewing and Fox. 1943:33.—Costa Lima and Hathaway, 1946:259-260.—Traub, 1950:100, 101.—Eads, 1950:46-48; Fig. 1-10.—Barrera, 1955:90-93, Fig. 5-12.

Type Data: Type specimens ex red squirrel (=Tamiasciurus hudsonicus), Ithaca, New York; ex squirrel, Tullula Falls, Georgia; ex gray or fox squirrel and field mouse nest, Lincoln, Nebraska; ex unknown host, Ames, Iowa.

Other Recorded Distribution: Eastern United States and Canada. It has been collected in several localities in the western United States where it may have been introduced with tree squirrels from the eastern states. Subspecies have been described from Texas and Mexico.

Venezuelan Records (2 males)
Two males ex Sciurus granatensis (SVP 22010), Táchira, Buena Vista. 2350 meters elevation.

Remarks
Our specimens are definitely not O. howardi howardi (Baker), O. howardi texensis Eads or O. howardi bolivari Barrera but probably represent an undescribed subspecies. We prefer not to describe this material until additional specimens are available. This is the first collection of a representative of the genus Orchopeas in South America.

Genus Pleochaetis Jordan

Pleochaetis Jordan, 1933:77-79.

Type Species: Ceratophyllum mundus Jordan and Rothschild.

Pleochaetis apollinaris (Jordan and Rothschild) (Fig. 87, 91c)

Ceratophyllum apollinaris Jordan and Rothschild, 1921c:176, Fig. 163, 164.—Traub, 1950:36-37, Pl. 20, Fig. 8-13.—Johnson, 1954:289, 291, Fig. 5.-1957:120.

Type Data: Description based on 2 females ex Mustela affinis (=M. frenata affinis); Colombia: savannah of Bogota; Coll. Apollinaire-Marie; V-1917.

Other Recorded Distribution: Colombia, Río Balcoes, Guasco, Dept. of Cundinamarca, 1 male and 3 females ex Mustela frenata.

Venezuelan Records (3 males and 7 females)
All 10 specimens were collected in Táchira, 2 females ex Thamomys hylophillus and 3 males and 5 females ex Akodon hogotenius.

Remarks
Since the description of P. apollinaris was based on 2 female specimens and there has been only one subsequent collection of one male, it is difficult to adequately define this species. Our specimens conform to the description and illustrations given by Johnson (1954) in that the ventral-most of the four large bristles on the movable process of the clasper is inserted above the notch on the anterior margin of the movable process; the crochet is curved and fingerlike and there are two strong setae on the proximal lobe of the distal arm of the ninth sternum. Our specimens differ in that there is only one ventral bristle on the eighth tergum and in details of the aedeagus.

Pleochaetis dolens (Jordan and Rothschild) (Fig. 88)

Ceratophyllum dolens Jordan and Rothschild, 1914:257, Fig. 1, 2.

Pleochaetis dolens, Jordan, 1933:77.

Type Data: Costa Rica ex Sciurus hoffmanni (=S. granatensis hoffmanni).

Venezuelan Records (5 males and 14 females)
There were 3 males and 6 females ex 6 Rhipidomyus venustus (Dio. Federal); 1 male and 2 females ex 1 Rhipidomyus venezuelae (Dio. Federal); 1 male and 5 females ex 2 Sciurus granatensis (Dio. Federal and Mérida); 1 female ex Rattus norvegicus (Dio. Federal).

Remarks
Our specimens are undoubtedly Pleochaetis dolens but differ somewhat from the nominate subspecies. There are 3 strong setae on the proximal lobe of the distal arm of the ninth sternum rather than 2; the setae on the male eighth sternum are stronger and more numerous and the crochet is more broadly truncate than indicated by Traub (1950) and Tipton and Mende dez (1966) for P. dolens dolens. There are additional differences in details of the aedeagus.

Pleochaetis dolens quitanus (Jordan) (Fig. 89)

Ceratophyllum dolens quitanus Jordan, 1931: 136b, Fig. 2-4.


Pleochaetis dolens quitanus, Jordan, 1950:605.—Traub, 1950:36, Pl. 20, Fig. 1-3.—Johnson, 1954:295.-1957:120-121, Pl. 57, Fig. 2, 4, 6.

Type Data: Male holotype plus 1 female ex Oryzonmys sp. Ecuador, Cerro de Punta,
Fig. 87. *Plechactis apollinaris* (Jordan and Rothschild). Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.
Fig. 88. *Plecochaetus dolens* (Jordan) ex *Rhipidomys venustus* (SVP 0780), Dto Federal. a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.
Fig. 89. *Plectactis dolens quittans* (Jordan) ex *Rhipidomys venustus* (SVP 4264), Merida, La Coromoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.
Coll. F. Spillman. Two females as above except Thomasomys sp. One male ex Thomasomys sp. but Chimboraico. One male ex unknown host near Quito.

Other Recorded Distribution: Peru: 2 ex nects of Akodon mollis orophilus and ex Oligoryzomys longicaudatus stolzmanii (=Oryzomys longicaudatus stolzmanii). Akodon mollis, "nest in field" and human bed.

**Venezuelan Records** (122 males and 150 females). See Table 7.

**Remarks**

In our series the females have no sinus in the caudal margin of the seventh sternum and the tail of the spermatheca near the bulga has no striations. The fourth bristle of the movable process of the clasper of the male is well above the level of the anterior notch. These characters are in agreement with those given by Johnson (1957) for P. dolens quitanus. However, several characters are not in agreement with her illustrations: the caudal margin of the movable process of the clasper is concave, not straight; the dorsocephal margin of the immovable process of the clasper is sharply angular rather than slightly angular; the setae on the proximal lobe of the distal arm of the ninth sternum are in an irregular patch not in a marginal row. Assignment of our specimens to *P. dolens quitanus* is provisional. Further study is required to determine the degree of variation and to establish the relationship between *P. dolens quitanus* and *P. equatorii*.

All specimens were collected near Mérida between 3,048 and 3,658 meters elevation. Nearly 41% of the specimens were collected from *Oryzomys minutus*. Most of the specimens of *P. smiti* were collected from this host at the same elevation and in the same collecting area.

**Plecochaetis smiti** Johnson

(Fig. 90, 91g)

*Plecochaetis smiti* Johnson, 1954: 291-295. Fig. 1, 3, 6, 7, 8, 10, 12, 13, 16, 21, 23, 25, 26, 31-1957:121.


Other Recorded Distribution: None.

**Venezuelan Records** (203 males and 208 females). See Table 8.

**Table 7. Venezuelan Records of Plecochaetis dolens quitanus (Jordan).**

<table>
<thead>
<tr>
<th>Host</th>
<th>Number of host specimens</th>
<th>Males</th>
<th>Females</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Oryzomys minutus</em></td>
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<td>162</td>
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<td><em>Thomasonys laniger</em></td>
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<td>2</td>
<td></td>
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<tr>
<td><em>Cryptotis thomasi</em></td>
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<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><em>Rhipidomys venustus</em></td>
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<td></td>
</tr>
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**Table 8. Venezuelan Records of Plecochaetis smiti Johnson.**

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<td><em>Oryzomys minutus</em></td>
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<td>162</td>
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<td>8</td>
<td>3</td>
<td>1.11</td>
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</table>

**Remarks**

The description of *Plecochaetis smiti* Johnson (1954) was based on 1 male and 2 females from Colombia. Our collections are from three areas in Venezuela (180 males and 197 females from Mérida, 16 males and 8 females from Táchira, and 8 males and 3 females from Trujillo). Specimens from Táchira fit rather well the description and illustrations given by Johnson. In all of the female specimens from Venezuela the caudal margin of the seventh sternum is remarkably like illustrations given by Johnson. However, the juncture of the head and tail of the spermatheca is more pronounced in many of the Venezuelan specimens. In the Venezuelan specimens there are 24 teeth in the pronotal comb (23-26 in type specimens), 5 or 6 dorsal notches on the metatibia (7 in type specimens), no long setae on the proximal lobe of the distal arm of the ninth sternum (DA9) (none in type specimens), the distal lobe of DA9 is swollen (sides parallel in type specimens), the apex of the sclerotized inner tube is rounded (sharply pointed in type specimens) and the caudoventral margin of the crochet is deeply concave (slightly concave in type specimens). The caudal margin of the movable pro-
Fig. 90. *Pleochactus smiti* Johnson ex *Oryzomys minutus* (SVP 04067), Merida, La Cotomoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.
Fig. 91. Spermathecae of *Plectocharis* species: a, *P. asetus* (ex *Microtus mexicanus* subsinus, Cerro Potosi, Mexico); b, *P. aztecs* (ex *Peromyscus melanotis*, Cerro Potosi, Mexico); c, *P. appolinaris* (ex *Akodon hysoperotus*, SVP 21901, Venezuela); d, *P. dolens* (ex *Sciurus granatensis* chiquiequis, Panama); e, *P. mathe-soni* (ex *Reithrodontomys c. chrysops*, Mexico); f, *P. sibanus* (ex *Peromyscus difficilis*, Cerro Potosi, Mexico); g, *P. smitti* (ex *Oryzomys minutus*, SVP 4067, Venezuela).
cess of the clasper is deeply concave in the type specimens and also in the Táchira specimens but in the Trujillo and Mérida specimens the caudal margin is straight.

Each of the three populations from Venezuela may represent a subspecies of *P. smitti*. However, until more specimens are collected from the type locality to determine the degree of variation we prefer to call all of our specimens *P. smitti*.

Approximately 85% of the specimens from Mérida were collected from *Oryzomys minutus*. Essentially all of the specimens were collected above 2286 meters elevation and 96.4% were collected above 3048 meters elevation.

Notes on the genus *Plecochaetis*

The genus *Plecochaetis* is a large and complex genus. The need for a revision is apparent. Johnson (1954) commented on the confusion surrounding the relationship between *P. equatoris equatoris* and *P. apollinarius* and there are similar problems related to other species groups. A thorough study of long series from type localities will be required to resolve these problems. Figure 91 shows spermathecae of seven species of *Plecochaetis* collected from four widely separated geographic areas. Each spermatheca is distinctive but collections in intermediate areas reveal intergradations.

*P. smitti* and *P. dolens quitaunus* parasitize the same host (*Oryzomys minutus*) at the same elevation (3048 to 3810 meters). It would be illuminating to ascertain experimentally the rigidity of the reproductive isolating mechanisms between these two species and the extent that one species may exert an influence on the gene pool of the other. Extreme variation in the Mérida populations of *P. smitti* may be due to competitive pressure or introgression.

**Family Leptopsyllidae**

**Genus Leptopsylla** Jordan and Rothschild

*Leptopsylla* Jordan and Rothschild, 1911:85.

Type Species: *Pulex musculus* Duges, 1832 (=*Pulex segnis* Schöherr, 1811).

*Leptopsylla segnis* (Schöherr)

*Pulex segnis* Schöherr, 1811:98.

*Leptopsylla musculi*, Jordan and Rothschild, 1911:85.


**Type Data:** Ex *Mus musculus*, Sweden.

**Other Recorded Distribution:** Argentina, Brazil, Chile, Ecuador, Peru: ex species of the following genera: Akodon, *Mus*, *Rattus*, and *Cavia*.

**VENEZUELAN RECORDS** (25 males and 31 females)

There were 15 males and 26 females ex 20 *Mus musculus* (from Dto. Federal, Trujillo, and Mérida). In addition there were: 8 males and 4 females ex 4 *Rattus norvegicus* (Dto. Federal and Mérida), 2 males and 2 females ex 2 *Oryzomys albipes* (Dto. Federal), and 2 *Oryzomys minutus* (Mérida).

**Remarks**

More than 71% of our specimens were collected from *Mus musculus* and approximately 93% from *Mus musculus* plus *Rattus rattus*. All of our specimens were collected at elevations above 1770 meters and 60% of the specimens came from elevations in excess of 2743 meters. We suspect that *L. segnis* has become an established component of the South American fauna, particularly at high elevations.

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