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Lelia Ann Williams

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Williams — Fleas of Rodents in the Albuquerque Area

A STUDY OF FLEAS OF RODENTS IN THE ALBUQUERQUE, NEW MEXICO, AREA

A Thesis
Presented to
the Faculty of the Biology Department
University of New Mexico

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Lelia Ann Williams
June 1949

This thesis, directed and approved by the candidate's committee, has been accepted by the Graduate Committee of the University of New Mexico in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

France V. Scholes
DEAN

May 27- 1949
DATE

A STUDY OF FLEAS OF RODENTS IN THE ALBUQUERQUE, NEW MEXICO, AREA

by

Lelia Ann Williams

Thesis committee

C. Clayton Hoff
CHAIRMAN

William J. Koster

Howard J. Dittmer

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Thesis committee

[illegible]
CHAIRMAN

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A sincere expression of gratitude is extended to Dr. Frank M. Prince of the Plague Suppressive Measures Laboratory, San Francisco, California, and to Major Robert Traub of the Army Medical Center, Washington, D. C., for checking the species determinations of fleas in my collections.

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CHAPTER I

INTRODUCTION

In spite of the fact that Pasturella pestis, the etiological organism of plague, has been reported from fleas and rodents in eleven counties of New Mexico, our knowledge of the fleas of the State has remained very incomplete and extremely meager. Recognizing the marked deficiency regarding our information of the Siphonaptera of New Mexico, I began in the spring of 1948 an investigation that has resulted in adding considerable information to our knowledge of the flea population of our State.

The present study includes a report of 36 species and subspecies of fleas recovered from several nests and by means of examinations of over 137 rodents belonging to 12 species and subspecies. In addition, it has appeared advisable to outline the characteristics used in recognition of the five families and the 27 genera of fleas now recorded from New Mexico. As an aid for future work I have given a brief discussion of each species now known from the State with complete descriptions and drawings of one genus and three species previously unknown in the literature.

CHAPTER II

HISTORY

Hubbard in his book, Fleas of Western North America, published in 1947, reports 21 species and subspecies of fleas from New Mexico. These flea species are all confined to rodents except one skunk flea, one bat flea, and the stick-tight flea Echidnophaga gallinacea (Westwood), which is found on a wide variety of domestic and wild animals and birds. I have been unable to find any New Mexican flea records that have not been reported in Hubbard's treatise.

The United States Public Health Service has been studying fleas from New Mexico for several years but their results are not as yet published. A comparison of my studies with the partly completed and unpublished studies of this government Agency indicates that the present study does not duplicate, but rather supplements, the work of the United States Public Health Service.

Due to the impracticability, or even the impossibility, of readily securing all of the scattered papers published prior to the time of Hubbard's compilation, it has been thought advisable to concentrate on the body or text of this report rather than on a history of workers previously reporting on the flea fauna of New Mexico.

CHAPTER III

MATERIAL AND METHODS

The rodent hosts examined during the course of this study were captured by both snap and live trapping. Each host captured was placed as soon as collected in a cellophane bag and transported to the laboratory. In the event that it was impossible to examine the rodent immediately, the bag containing the rodent was placed in the refrigerator. Before examination, a small piece of absorbent cotton saturated with either ether or chloroform was placed in the cellophane bag with the rodent in order to immobilize the fleas. The rodent at the time of examination was shaken from the bag into a white pan. Any debris found in the bag was also shaken into the pan since fleas often leave the hosts and are found in the debris at the bottom of the bag. The rodent was then combed with a fine-toothed comb in order to remove the fleas that might still remain on the animal. The fleas were picked up with either a camel-hair brush moistened in alcohol or with a dissection needle bent and flattened at the end. The fleas were preserved in 80% ethyl alcohol.

Fleas were secured from rodent nests and food stores by means of Berlese funnels. The nest and food materials were spread on the inverted funnels and the fleas, in reacting negatively to light and heat, fall into a jar of 80% alcohol at the apex of the funnel.

In preparing the fleas for study, they are moved from the alcohol, washed briefly in water, and then placed in a 10% solution of either potassium or sodium hydroxide. A convenient container for the caustic is a small test tube, especially since successful treatment of the flea is more rapidly carried out if the caustic is kept hot. With this in mind, it is frequently advantageous to place one or more test tubes with their contained fleas in a water bath. Treatment with caustic should continue until the fleas become cleared. The fleas are then transferred to a watch glass containing water and the contents of the body pressed out by means of a needle bent and flattened at the end. After this operation, the fleas are treated either with water or a weak acid solution to replace the caustic and then dehydrated by being placed in beechwood creosote. After dehydration in beechwood creosote, the fleas are mounted in Canada balsam.

In preparing the fleas for study, they are taken from the alcohol, washed briefly in water, then placed in a 10% solution of either potassium or sodium hydroxide. A convenient container for the treating is a small test tube, especially since successful treatment of the fleas is more readily carried out if the caustic is kept hot. With this in mind, it is frequently advantageous to place one or more test tubes which contain the fleas in a water bath. Treatment with caustic should continue until the fleas become cleared. The fleas are then transferred to a watch glass containing water and the contents of the body pressed out by means of a needle bent at right angles at the end. After this operation, the fleas are treated either with water or a weak acid solution to neutralize the caustic and then dehydrated by being placed in absolute alcohol. After clearing in beechwood creosote, the fleas are mounted in Canada balsam.

CHAPTER IV

TAXONOMIC CONSIDERATION

During the course of my survey of the fleas found associated with rodents of the Albuquerque region, I studied the fleas from more than 137 animals, six nests, and one food store. A list of the numbers of each kind of rodent, rodent nest, and food store, along with the kinds of fleas associated with each species or subspecies of rodent is given in the list below. After the name of each kind of flea, I have inserted the number of females (F) and the number of males (M) secured from the hosts indicated.

A LIST OF HOSTS, NESTS, AND FOOD STORAGE

Family SCIURIDAE

- *Citellus variegatus grammurus* (Say); one examined
    - *Hoplopsyllus anomalus* (Baker); 20 F, 12 M
    - *Diamanus montanus* (Baker); 14 F, 10 M
    - *Echidnophaga gallinacea* (Westwood); 6 F, 1 M
- *Citellus spilosoma major* (Merriam); 106 examined
    - *Thrassis pansus* (Jordan); 95 F, 61 M
    - *Echidnophaga gallinacea* (Westwood); 27 F, 1 M

Family MURIDAE

- *Mus musculus* Linnaeus; one examined
    - No fleas present.

Family CRICETIDAE

Onychomys leucogaster melanophrys Merriam; three examined

Meringis parkeri Jordan; 1 F, 1 M

Meringis, species undetermined; 3F

Onychomys leucogaster (Wied); five examined

Echidnophaga gallinacea (Westwood); 1 F

Thrassis pansus (Jordan) ; 1F

Peromyscus maniculatus rufinus (Marriam); one examined

No fleas present

Peromyscus maniculatus; eight examined

(?) *Malaraeus sinomus* (Jordan); 2 F

Monopsyllus wagneri (Baker), subspecies undetermined; 5 F

Megarthroglossus bisetis Jordan and Rothschild; 1 M

Peromyscopsylla hesperomys (Baker); 1 F, 1 M

Phalacropsylla allos Wagner; 1 F

Peromyscus nasutus (Allen); one examined

Stenoponia americana (Baker); 1 F

Neotoma micropus canescens Allen; one examined

Orchopeas sexdentatus Baker, subspecies undetermined; 1 F, 1 M

Meringis parkeri Jordan; 1 F

Neotoma micropus canescens Allen, nests; four examined

Anomiopsyllus novomexicanensis, new species; 730 F, 397 M

Orchopeas sexdentatus Baker, subspecies undetermined; 1 F, 2 M

Megarthroglossus bisetis Jordan and Rothschild; 10 F, 10 M

Neotoma micropus canescens Allen; one nest and numerous animals (Collected by Mr. Ferd Sumrell, who kept no account of the number of hosts examined.)

Anomiopsyllus novomexicanensis, new species; 4 F, 16 M

Orchopeas sexdentatus Baker, subspecies undetermined; 32 F, 15 M

Atyphloceras echis Jordan and Rothschild; 42 F, 15 M

Megarthroglossus bisetis Jordan and Rothschild; 2 F, 6 M

Epitedia stanfordi Traub; 1 F

Meringis parkeri Jordan; 1 M

Family HETEROMYIDAE

Dipodomys ordii (Woodhouse); nine examined

Thrassis campestris Prince; 1 M

Meringis dipodomys Kohls; 2 M

Dipodomys spectabilis Merriam, nest; one examined

Thrassis campestris Prince; 2 F, 3 M

Meringis nidi, new species; 70 F, 28 M

Proximorectofrontia unica new genus and new species; 8 F, 8 M

Dipodomys spectabilis Merriam, food store; one examined

Thrassis campestris Prince; 1 F

Meringis nidi, new species; 8 F, 3 M

Perognathus flavus flavus Baird; one examined

No fleas present.

The fleas secured from these rodents, nests, and food storage brings to a total of five families, 27 genera, and 36 species and subspecies of fleas known from New Mexico. These fleas are systematically given in the following list. Species or subspecies that have been reported previously from New Mexico are indicated in the list by the letter a immediately preceding the species or subspecies name. The species and subspecies occurring in my collection are indicated by the letter b. Thus any species or subspecies previously reported for New Mexico and also found in the present material will be preceded in the list by both the letter a and b.

A LIST OF FLEAS REPORTED FROM NEW MEXICO

Family HECTOPSYLLIDAE Baker, 1904

Genus Echidnophaga Olliff, 1886

ab Echidnophaga gallinacea (Westwood, 1875)

Family PULICIDAE Stephens, 1829

Genus Xenopsylla Glinkiewicz, 1907

a Xenopsylla cheopis (Rothschild, 1903)

Genus *Hoplopsyllus* Baker, 1905

ab *Hoplopsyllus* *anomalus* (Baker, 1904)

Genus *Cediopsylla* Jordan, 1925

a *Cediopsylla* *inaequalis* *inaequalis* (Baker, 1895)

Genus *Anomiopsyllus* Baker, 1904

b *Anomiopsyllus* *novomexicanensis*, new species

Family DOLICHOPSYLLIDAE Baker, 1905

Genus *Orchopeas* Jordan, 1933

a *Orchopeas* *sexdentatus* *neotomae* Augustson, 1943

b *Orchopeas* *sexdentatus* Baker, 1904, subspecies undetermined

Genus *Opisodasys* Jordan, 1933

a *Opisodasys* *robustus* (Jordan, 1925)

Genus *Thrassis* Jordan, 1933

ab *Thrassis* *pansus* (Jordan, 1925)

a *Thrassis* *fotus* (Jordan, 1925)

a *Thrassis* *aridis* Prince, 1944

b *Thrassis* *campestris* Prince, 1944

Genus *Diamanus* Jordan, 1933

ab *Diamanus* *montanus* (Baker, 1895)

Genus *Opisocrostis* Jordan, 1933

a *Opisocrostis* *hirsutus* (Baker, 1895)

Genus *Oropsylla* Wagner and Joff, 1926

a *Oropsylla* *idahoensis* (Baker, 1904)

Genus *Dactylopsylla* Jordan, 1929

a *Dactylopsylla neomexicana* Prince, 1945

Genus *Malaraeus* Jordan, 1933

b (?) *Malaraeus sinomus* (Jordan, 1925)

Genus *Nosopsyllus* Jordan, 1933

a *Nosopsyllus fasciatus* (Bosc, 1801)

Genus *Monopsyllus* Kolenati, 1857

b *Monopsyllus wagneri* (Baker, 1904); subspecies undetermined

Genus *Pleochaetis* Jordan, 1933

a *Pleochaetis sibynus* (Jordan, 1925)

Family HYSTRICHOPSYLLIDAE Tiraboschi, 1904

Genus *Atyphloceras* Jordan and Rothschild, 1915

b *Atyphloceras echis* Jordan and Rothschild, 1915

Genus *Megarthroglossus* Jordan and Rothschild, 1915

ab *Megarthroglossus bisetis* Jordan and Rothschild, 1915

Genus *Stenistomera* Rothschild, 1915

a *Stenistomera alpina* (Baker, 1895)

Genus *Epitedia* Jordan, 1938

a *Epitedia wenmanni* (Rothschild, 1904)

b *Epitedia stanfordi* Traub, 1944

Genus *Meringis* Jordan, 1937

a *Meringis arachis* (Jordan, 1929)

b *Meringis dipodomys* Kohls, 1938

b *Meringis parkeri* Jordan, 1937

b *Meringis nidi*, new species

b *Meringis*, species undetermined

Genus *Peromyscopsylla* I. Fox, 1939

b *Peromyscopsylla hesperomys* (Baker, 1904)

Genus *Phalacropsylla* Rothschild, 1915

b *Phalacropsylla allos* Wagner, 1936

Genus *Leptopsylla* Jordan and Rothschild, 1911

a *Leptopsylla segnis* (Schonherr, 1811)

Genus *Proximorectofrontia*, new genus

b *Proximorectofrontia* unica, new species

Genus *Stenoponia* Jordan and Rothschild, 1911

b *Stenoponia americana* (Baker, 1899)

Family ISCHNOPSYLLIDAE Wahlgren, 1907

Genus *Sternopsylla* Jordan and Rothschild, 1921

a *Sternopsylla carlsbadensis* Ewing, 1940

HECTOPSYLLIDAE Baker, 1904

Members of this family can be recognized by a reduced thorax, the combined tergites being shorter than the first abdominal tergite. One genus and one species has been reported from New Mexico. This species is represented in my collections.

Echidnophaga Olliff, 1886

This genus is characterized by the presence of a group of spinelets on the inner surface of coxa III. A single species of the genus is recorded from Western North America.

Echidnophaga gallinacea (Westwood, 1875)

The males of this species can be recognized by the clasper having two processes, a longer one with several bristles on the anterior margin and a smaller one. The finger is rounded apically and curved toward the smaller process and is armed with one long bristle and several smaller ones. The females of this species can be recognized by a spermatheca that is broader ventrally than dorsally.

This species is called the tropical hen flea and is very common on chickens, dogs, and cats in the southern and southwestern parts of the United States. It also occurs on a wide variety of wild birds and wild mammals. In my collections, there are records as follows: six females and one male from one Say's rock squirrel (Citellus variegatus grammurus) collected at Juan Tabo Recreation area 15 miles northeast of Albuquerque on June 26, 1948; 24 females and one male from 95 large spotted ground squirrels (Citellus spilosoma major) collected two miles northwest of the University of New Mexico during the period from March 26 to July 14, 1948; three females from one large spotted ground squirrel (Citellus spilosoma major) collected one and one-half miles northwest of the University of New Mexico on July 25, 1948; one female from two grasshopper mice (Onychomys leucogaster) collected on the mesa east of Albuquerque on September 25, 1948.

Previously this species was reported by Hubbard (1947, 51) for New Mexico as follows: "The writer has specimens of this flea taken off ground squirrels at Sherman, Grant County, New Mexico, and it is reported off Alexandrian and Norwegian rats from this state."

PULICIDAE Stephens, 1829

Members of this family can be recognized by the absence of a dorsal sulcus and the presence of a single row of bristles on each abdominal tergite. These same characters are found in the genus *Megarthroglossus* Jordan and Rothschild, 1915, of the family HYSTRICHOPSYLLIDAE, but the genus *Megarthroglossus* can be recognized by the pronotal comb and the vestigial eyes. With the exception of the genus *Anomiopsyllus* Baker, 1904, members of the family PULICIDAE have well-developed eyes. In *Anomiopsyllus* the absence of a pronotal comb will make possible separation from and prevent confusion with the genus *Megarthroglossus*.

This family is represented by two genera and two species in my collections. In addition, two other genera and two species of this family have been reported from New Mexico

Xenopsylla Glinkiewicz, 1907

This genus can be separated from other genera in New Mexico by the presence of eyes and the absence of both pronotal and genal combs.

Previously this species was recorded by Hubbard (1947, p.
51) for New Mexico [illegible]. The writer has specimens of
this flea taken off ground squirrels at [illegible], Grant County,
New Mexico, and it is reported [illegible] and wood-
rats from this state.

[illegible]

Members of this family can be recognized by the presence of a dorsal sulcus and the presence of a single row of bristles on each abdominal tergite. These same characters are found in the genus *Megarthroglossus* Jordan and Rothschild [illegible] of the family HYSTRICHOPSYLLIDAE, but the genus *Megarthroglossus* can be recognized by the pronotal comb [illegible]. With the exception of the genus [illegible], members of the family PULICIDAE have well-developed eyes. [illegible] *psyllus* the absence of a pronotal [illegible] tion from and prevent [illegible].

This family is [illegible] in my collections. [illegible] species of this family have been reported from New Mexico.

[illegible]

This genus [illegible] New Mexico by the presence of [illegible] and genal combs.

Xenopsylla cheopis (Rothschild, 1903)

Males of this species can be recognized by two processes of the clasper, one narrow and curved outward, the other flat and with a row of bristles on its upper margin. Females can be recognized by a large and prominent spermatheca.

This flea is the Oriental rat flea, the only member of this genus in western North America. Prince, according to Hubbard (1947, 67), reports this flea from Albuquerque, New Mexico. This flea is of great medical importance since it is one of the most efficient vectors of bubonic plague.

Hoplopsyllus Baker, 1905

This genus can be separated from other genera in the State by the absence of a genal comb and the presence of a pronotal comb. A single species of the genus is recorded from western North America.

Hoplopsyllus anomalus (Baker, 1904)

This flea, the only member of its genus in New Mexico, although found on a variety of hosts, seems to be typically a flea of ground squirrels. Males of this species can be recognized by upper claspers that have an elongated inverted plowshare shape, with the point directed cephalad and with a few weak hairs on the posterior border. Females can be recognized by the characteristic apical outline of sternite VII, its weakly rounded lobe having a slightly flattened apex. The spermatheca has a pear-shaped body with a very strong tail crooked apically.

Previously this species has been reported by Hubbard (1947, 73) from Bernalillo County and Grant County, New Mexico. In my collection this flea is recorded as follows: 20 females and 12 males from one Say's rock squirrel (Citellus variegatus grammurus) collected at Juan Tabo Recreation area 15 miles northeast of Albuquerque on June 26, 1948.

Cediopsylla Jordan, 1925

The fleas in this genus are parasitic on rabbits. This genus can be separated from other genera of the family PULICIDAE reported for the State of New Mexico by the presence of both genal and pronotal combs.

Cediopsylla inaequalis inaequalis (Baker, 1895)

This species can be recognized by the stout genal teeth. The males can be separated from other species by the presence of from seven to 12 bristles evenly spaced along the ventral margin of the male clasper. The female can be recognized by the absence of a distinct lobe on the apical margin of sternite VII.

This species has been reported by Hubbard (1947, 76) from Grant County and is the only species of the genus from New Mexico.

Anomiopsyllus Baker, 1904

This genus can be separated from other genera of the PULICIDAE in the State of New Mexico by the absence of eyes.

Anomiopsyllus novomexicanensis, new species

Figures 1 - 4

Head: Frontal tubercle present, angulate apically. Genal armature consisting of two slender bristles, one at the edge of antennal groove and the other at the outer edge of gena at about eye position, with a short weak bristle midway between the two. Postantennal region nude with exception of small setae at lower marginal angle. Bristles of the second antennal segment are short in both the male and female. The antenna of the male is long and slender while in the female it is shorter and stouter. Labial palpus of four segments extends slightly beyond fore coxae.

Thorax: Pronotal comb absent.

Legs: Coxa II and coxa III each with a posterioventral spinelike lobe separated from coxa proper by a deep incision. Coxa III without a row or patch of spinelets on inner surface. Each femur has a single lateral bristle. Segment 5 of tarsi I and II with five pairs of plantar bristles, the first pair being situated between setae of second pair; fifth segment of tarsus III with only four pairs of plantar bristles, all being lateral and forming two parallel rows.

Abdomen: Two anterior tergites with apical spinelets and all tergites with a single row of weak bristles. One well-developed antepygidial bristle to each side.

Modified segments, male: Sternite IX (Fig. 1) of male without anterior apophysis, with a long posterior process

containing six subevenly spaced long bristles, then a sinus, and at the posterior tip two black spiniforms and below them one longer clear spiniform. Finger (Fig. 2) of male wide at base and becoming narrow at tip. There are three weak bristles at tip of finger and an evenly scattered row over the anterior border. There are three black spiniforms evenly speced on the posterior border. Process of clasper bent anteriorly, posterior border rounded and with three bristles.

Modified segments, female: Sternite VII as shown in figure 3. Spermatheca (Fig. 4) has a rounded body and a crooked tail. Stylet about three times longer than wide, with a long bristle and two very short ones at apex.

Type locality: Six miles west of Albuquerque, Bernalillo County, New Mexico; at west foothills of Sandia mountains. Male holotype, female allotype, one male paratype and three female paratypes from a nest of the hoary wood rat (Neotoma micropus canescens) collected on October 10, 1948. Also from nests of the same rodent, 10 male paratypes and 22 female paratypes collected on October 10, 1948; 321 male paratypes and 580 female paratypes collected on October 10, 1948; 62 male paratypes and 126 female paratypes collected on February 28, 1948; 16 male paratypes and four female paratypes from both a nest and animals collected in December, 1947.

Remarks: The known species of Anomiopsyllus Baker fall into two groups. The species of the first group which contains

nudatus (Baker, 1898), falsicalifornicus C. Fox, 1929, congruens Stewart 1940, and hiemalis Eads and Menzies 1948, have three spiniforms on the movable finger of clasper. The species of the second group, to which belong montanus Collins, 1936, and amphibolus Wagner, 1936, have two spiniforms on the movable finger. My new species resembles the species of the first group in the nature of finger of the male. This new species appears to be most closely related to hiemalis. In hiemalis there are three spiniforms equally spaced along the posterior border, while in the new species they are equally spaced but confined to the distal half of finger. In hiemalis there are four bristles between the second and third spiniform while in novomexicanensis no bristle occurs between the second and third spiniforms.

DOLICHOPSYLLIDAE Baker, 1905

Members of this family can be recognized by the absence of a dorsal sulcus that separates the frons from the posterior portion of the head. Members of this family have two or more rows of bristles on each abdominal tergite; there is no genal comb. This family is represented by five genera, including six species and subspecies in my collections. In addition, six other genera, with nine species and subspecies, of this family have been reported from New Mexico.

Orchopeas Jordan, 1933

In members of this genus, femur I never has more than a single lateral bristle on outer surface. In males the movable finger has a submarginal row of four to seven short, black, subequal spiniforms directed upward. In the females of this genus the ventral margin of sternite X is angulate near the middle.

Orchopeas sexdentatus neotomae Augustson, 1943

The males of this species can be separated from other males of the genus *Orchopeas* by the finger which is more or less pointed at apex and armed with five to seven black spiniforms. The males of this subspecies can be recognized by the finger of clasper that is roughly rectangular in shape and armed on the posterior edge with four black spiniforms, two below close together at heel and two above equally spaced. Sternite IX of the male is armed with a black spiniform and three bristles. Females can be recognized by sternite VII with its upper angular lobe, which may or may not be expanded at tip. Spermatheca typical for genus with body more or less barrel-shaped and with a crooked appendix.

This flea is reported in Hubbard (1947,99) from New Mexico.

Orchopeas sexdentatus (Baker, 1904), subspecies undetermined

The subspecies of this group often lack well-marked characteristics and so are identified with great difficulty. This

along with the great variation that may be observed in specimens from the same host and locality prevents subspecific assignment of this lot of specimens.

In the males of this subspecies, the finger of the clasper is pointed apically. The number of spiniforms on the posterior border of finger is variable, out of 16 males in my collections, 15 males have four spiniforms on posterior border equally spaced and one above. In the other male there are three spiniforms on the posterior border equally spaced and one above. Sternite IX of the male has one black spiniform and three bristles. In the female of this subspecies, the apical outline of sternite VII is variable. Of the two lobes, there is a large amount of variation in the upper lobe. In some females the upper lobe may be longer than the lower lobe and the upper lobe may be pointed or round at the tip. The spermatheca is typically that of the species with the body barrel-shaped and with a crooked appendix.

In my collections there are records of this flea as follows: one female and one male from one hoary wood rat (Neotoma micropus canescens) collected about two miles northeast of U. S. Route 66 bridge over the Rio Puerco on February 28, 1948; 15 males and 32 females from one hoary wood rat nest and animals collected in the foothills of the Sandia Mountains, Albuquerque in December 1947; one male from one hoary wood rat nest collected at the base of Sandia mountains on October 10, 1948; one male and one female from one hoary wood rat nest collected at base of Sandia Mountains on October 10, 1948.

Opisodasys Jordan, 1933

In members of this genus femur I never has more than a single lateral bristle on the outer surface. In the males of this genus the movable finger has a submarginal row of three to four unequal and black spiniforms directed downwards. In the females of this genus the ventral margin of sternite X is not distinctly angulate.

Opisodasys robustus (Jordan, 1925)

The males of this species can be recognized by the clasper that has a finger roughly triangular in shape and armed on the posterior border with two black spiniforms, distal one longer and bent dorsally, proximal one much shorter and straight; between them a pale weak spiniform or bristle. In the male sternite IX has two pale spiniforms on the proximal lobe and the distal lobe has numerous pale spiniforms along the posterior border. The female can be recognized by sternite VII having the upper lobe longer than the lower, quadrate and sometimes expanded at apex. The lower lobe is triangular and the sinus between lobes is deep and broad.

This flea is the only member of this genus reported from New Mexico. Hubbard (1947, 116) reports this flea from Ritu (sic!) de los Frijoles, Sandoval County, New Mexico.

Opisodasys Jordan, 1933

In members of this genus there is more than a single lateral bristle on the outer surface. In the males of this genus the movable finger has a marginal row of three to four unequal and bluntly spiniform [illegible]. In the females of this genus the ventral margin of [illegible] is not distinctly angulate.

Opisodasys robustus (Jordan, 1925)

The males of this species can be recognized by the clasper that has a finger roughly triangular in shape and armed on the posterior border with two black spiniforms, distal one longer and bent dorsally, proximal one much shorter and straight, between them a pale weak spiniform or bristle. In the male sternite IX has two pale spiniforms on the proximal lobe and the distal lobe has numerous pale spiniforms along the posterior border. The female can be recognized by sternite VII having the upper lobe longer than the lower, truncate and sometimes [illegible] at apex. The lower lobe is triangular and the sinus between lobes is deep and broad.

This flea is the only member of this genus reported from New Mexico. Hubbard (1947, 116) [illegible] Rito (Rito) de los Frijoles, Sandoval County, New Mexico.

Trassis Jordan, 1933, *sensus lato*

In members of this genus, femur I has several small lateral bristles on outer surface. Inner surfaces of coxae II and III with thin bristles from base to apex (apart from bristles on anterior margin). The labial palpus extends to or beyond apex of trochanter I. In the male sternite VIII is broad, unreduced, bearing several to many setae. Basal abdominal sternum of female without patch of lateral setae.

Thrassis pansus (Jordan, 1925)

In the males of this species the finger has three bristles on the posterior dorsal margin, the lowest is the longest and stoutest. Between it and the base there are five marginal bristles. On proximal ventral lobe of sternite IX in males, there is an apical bristle, behind this two flattened bristles, proximal to these several smaller bristles. In the female of this species, the head of the spermatheca is globular and pigmented, tail broadest in distal half and with a sclerotic appendage on the tip. In the females of this species the posterior face of sternite VII is slightly slanting. The stylet of the female is short and broad, with an apical and three lateral bristles.

In my collections there are records of this flea as follows: one male from one large spotted ground squirrel (*Citellus spilosoma major*) collected on the mesa, west of the Rio Grande River

opposite Bernalillo on February 21, 1948; 80 females and 55 males from 95 large spotted ground squirrels (*Citellus spilosoma major*) collected two miles north and northwest of the University of New Mexico during the period from March 26 to July 14, 1948; one female from two grasshopper mice (*Onychomys leucogaster*) collected on the mesa east of Albuquerque on September 25, 1948; and numerous individuals taken at various times from large spotted ground squirrels (*Citellus spilosoma major*) collected on or near the University of New Mexico golf course, Albuquerque, New Mexico. These last include one male and one female flea from a ground squirrel on July 21, 1948; one male from one ground squirrel on July 21, 1948; three males and one female from one ground squirrel on July 28, 1948; one female from one ground squirrel collected on July 23, 1948; three females and one male from one ground squirrel collected on July 28, 1948; one female from one ground squirrel collected on July 21, 1948; one female from one ground squirrel collected on July 21, 1948; one female from one ground squirrel collected on July 21, 1948; one female from one ground squirrel collected on August 2, 1948.

Previously Prince took this species from New Mexico according to Hubbard (1947,141).

Thrassis fotus (Jordan, 1925)

In the males of this species the finger is plump and the posterior margin is rounded on entire length and armed with four

bristles, apical one longest, lower two much shorter, stout and spinelike. Apex of finger is rounded with anterior margin slightly concave. The proximal ventral lobe of sternite IX of male is rounded and armed with three spinelike bristles, one long stout bristle and two shorter ones. In the females of this species the spermatheca has characteristically a flattened somewhat oval body and a crooked long tail without an appendage. This serves to separate *fotus* from females of other species in the State. The apical margin of sternite VII is variable, sometimes the lobe is angular with posterior margin undulate, at other times the lobe is low and rounded.

This species was reported by Hubbard (1947, 144) from Catron County, New Mexico.

Trassis aridis Prince, 1944

Thrassoides aridis Hubbard, 1947: 145-146

In males of this species, the finger is nearly symmetrical with four bristles on posterior border, basal two largest. The proximal lobe of sternite IX has four pale bristles; distal lobe with numerous setae. In the females of this species sternite VII has a sinus, and the upper lobe is small and attenuated. The stylet is about three times as long as broad with one apical and two lateral bristles. Spermatheca has a globular body and long slender tail that is conspicuously bent and has apically a small appendage.

This species was reported in Hubbard (1947, 146) from Hidalgo County, New Mexico.

Thrassis campestris Prince, 1944

Thrassoides campestris Hubbard, 1947: 146

In males of this species the finger is more plump than in aridis and the apex is more blunt. The finger is armed with four stout bristles on posterior border, the upper one is the longest. The males of this species can be separated from other males of the genus Thrassis occurring in New Mexico by the presence of one long acetabular bristle while the males of this species have two acetabular bristles. In the females of this species the apical outline of sternite VII has an upper prominent knoblike lobe and below it a shallow sinus. The spermatheca has a small appendage on apex of tail.

In my collections there are records of this flea as follows: one male from three kangaroo rats (Dipodomys ordii) collected five miles east of U. S. 66 bridge over the Rio Puerco on February 28, 1948; two females and three males from one kangaroo rat nest (Dipodomys spectabilis) collected on the mesa east of Albuquerque on March 6, 1948; one female from food storage in a kangaroo rat burrow collected on mesa east of Albuquerque on March 6, 1948.

Diamanus Jordan, 1933

In members of this genus, femur I has several small lateral bristles on outer surface. Inner surfaces of coxa II and III with thin bristles from base to apex (apart from bristles on anterior margin). Labial palpus extends beyond apex of trochanter I. Sternum VIII of male is quite small. In the males the bristles of antennal segment II are short. In females there are two antepygidial bristles of about equal length and the dorsal lateral bristles of stylet are much smaller than the ventral ones.

Diamanus montanus (Baker, 1895)

This is the only species of this genus west of the Rocky Mountains. The males of this species can be recognized by the finger which extends far beyond the process dorsally and is long and slender. The finger curves toward the anterior and is shaped like the blade of a hand sickle or scythe. There are about six weak bristles on its posterior border, five on the upper half. Females can be recognized by the spermatheca that has a slightly flattened bulbous body and a distinctly crooked tail, which in some specimens has a tendency to be slightly bulbous at the tip. In other specimens the free end of the tail of the spermatheca is cut off at an angle. Apical margin of sternite VII of female varies somewhat, sometimes being angular, at other times somewhat rounded.

In my collections there is a record of this flea as follows: 10 males and 14 females from one Say's rock squirrel (Citellus variegatus grammurus) collected at Juan Tabo Recreation area 15 miles northeast of Albuquerque on June 26, 1948.

Previously this species was reported, according to Hubbard (1947, 150), from Grant County, New Mexico.

Opisocrostis Jordan, 1933

In members of this genus femur I has several small lateral bristles on outer surface. Inner surface of coxae II and III with thin bristles from base to apex (apart from bristles on anterior margin). Labial palpus extending beyond apex of coxa I. Bristles of segment II of antenna are long. Basal abdominal sternite has a number of slender bristles on upper anterior half. In the male, sternite VIII is reduced to a slender horizontal sclerite that bears two long bristles and an apical long filamentous appendage. In females there are two antepygidial bristles of which the lower is distinctly shorter. Head of spermatheca is higher than long.

Opisocrostis hirsutus (Baker, 1895)

Males of this species can be recognized by the process of the clasper being small in comparison with the finger and being dome-shaped but flattened posteriorly, and armed with three medium apical bristles. Finger is long and slender, narrowed in diameter toward the middle by two concave surfaces.

In my collection there [illegible] of this species [illegible]
10 males and 14 females from [illegible] Citellus
variegatus grammurus] collected at [illegible]
miles northeast of Albuquerque [illegible]

Previously [illegible]
Hubbard (1947, 1954) [illegible] Texas, New Mexico.

Orchopeas [illegible] 1915

In members of this genus [illegible] several small lateral bristles on outer surface. [illegible] III with thin bristles [illegible] on anterior margin). Labial palpi extending [illegible] coxa I. Bristles of [illegible] abdominal sternites [illegible] anterior half. In the male, [illegible] slender horizontal [illegible] apical long filamentous [illegible] antepygidial bristles of which the lower [illegible] Head of spermatheca [illegible].

Opisocrostis [illegible] (Baker, 1895)

Males of this species may be recognized by [illegible] of the clasper being [illegible] in comparison with [illegible] being dome-shaped [illegible] three median [illegible] rowed in diameter toward [illegible].

Armature made up of four bristles on posterior margin close to apex, two lower ones longest and stout. In the male, sternite VIII is long and slender with a median pair of ventral bristles, three pairs of subterminal bristles, and a pair of long terminal filaments that are branched at the end. Females can be recognized by sternite VII with one lobe that is angulate with posterior margin slightly concave. Upper angle of lobe is rounded to angulate, lower angle well rounded. Spermatheca with globular body and tail that is long and crooked at almost a right angle.

This is the only species of this genus represented in New Mexico. Hubbard (1947, 160) reports this flea from Catron, Rio Arriba, and McKinley Counties.

Oropsylla Wagner and Joff, 1926

In members of this genus femur I has several small lateral bristles on outer surface. Inner surface of coxae II and III with thin bristles from base to apex (apart from bristles on anterior margin). Labial palpus extending beyond trochanter I. In males bristles of segment II of antenna are short, not reaching to middle of club. Basal abdominal sternite is without patch of bristles on side, at most with one or two in or below the middle (besides the usual ventral bristles). In the male, sternite VIII is narrow, rodlike and has no membranous apical appendage. The apex of sternite VIII is sharply defined with long bristles. In the female the stylet has two or more lateral

bristles, head of spermatheca is longer than broad, the tail is not much longer than head and always has a long appendage.

Oropsylla idahoensis (Baker, 1904)

In the males of this species the finger is distinct, having a broadly rounded posterior border armed with two stout bristles and several smaller ones. The anterior border of the finger is almost straight with apex being nicely rounded. In females, the margin of sternite VII is almost a flat surface, only slightly concave. Spermatheca has a body almost round in outline, yet slightly oval, a short tail bent slightly toward body at apex, and a long appendage at apex bent in general contour with tail.

This is the only species of this genus represented in New Mexico. Hubbard (1947, 166) reports this flea from Colfax County, New Mexico.

Dactylopsylla Jordan, 1929

Members of this genus have several lateral bristles on femur I. This genus can be separated from other genera of the family DOLICHOPSYLLIDAE in New Mexico by the absence of eyes.

Dactylopsylla neomexicana Prince, 1945

The males can be recognized by the finger of clasper being long, curved distad, and acuminate. The finger has the appearance of a walking stick. Finger is armed with an apical bristle and three bristles on posterior border. Sternite VIII of male

is concave on dorsal apical half and armed with four large bristles on ventral border, upper bristle at apex. In the female the head of the spermatheca is well pigmented and slightly longer than broad. The tail of the spermatheca is shorter than head, being broadest near apex, tip sclerified but not prominent.

This flea was recorded by Hubbard (1947, 193) from 20 miles south of Las Vegas, San Miguel County, New Mexico.

Malaraeus Jordan, 1933

In members of this genus femur I has several small lateral bristles on outer surface. Inner surfaces of coxae II and III with thin bristles at most on distal half. Labial palpus does not reach apex of trochanter I. In the male sternite VIII is reduced or long and narrow, bearing a long apical bristle and fringed membranous flap. In this genus the eye is distinctly reduced; its longest diameter being shorter than distance from eye to apex of angle of strongly chitinized portion of genal lobe. Bristles of segment II of antenna reaching beyond middle of clubs or shorter in female. Stylet of female without a dorsal lateral bristle.

(?) Malaraeus sinomus (Jordan, 1925)

The females of the species sinomus (Jordan, 1925) and eremicus (Baker, 1904) cannot be separated with certainty, identification depending upon characteristics of the males. Since there are no males in my collection, identification is only tentative.

According to the literature the males of this species can be recognized by the somewhat triangular finger armed with one blackish spine below and four stiff bristles above. The bristles are thinner than the spine and the lower three are short, upper one longest. In the male sternite VIII is vestigial, without bristles. In the females the stylet with one long lateral bristle and the apical outline of sternite VII with a pointed lobe.

In my collection there is a record of this flea as follows: two females from one deer mouse (Peromyscus maniculatus) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948.

Nosopsyllus Jordan, 1933

In members of this genus, femur I has several small lateral bristles on outer surface. Inner surfaces of coxae II and III with thin bristles at most on distal half. Labial palpus scarcely reaching apex of trochanter I. Similar to Malaraeus but segment I of hind tarsus is a little shorter than II and III taken together, no bristles of segment II and III reaching beyond the segment following. Eye well developed. Sternal plate VIII of male vestigial, without bristles.

Nosopsyllus fasciatus (Bosc, 1801)

This common species is found wherever there are house rats and mice. In both male and female the species can be

differentiated from all other fleas by characteristically modified abdominal segments and the presence upon the house rats and mice.

In the male, process of clasper is broad, with a prominent posterior angle, armed at apex with two or three small bristles. Finger is evenly rounded posteriorly, the posterior margin bearing two stout bristles, between which there is a much smaller bristle and one or two others at the apex. In the female, apical margin of sternite VII is irregularly rounded or slanting. Head of spermatheca is globular, tail about one and one-half times as long as head and partly encircling it.

This species is reported by Hubbard (1947, 209) from Los Lunas and State Line.

Monopsyllus Kolenati, 1857

In members of this genus, femur I has several small lateral bristles on outer surface. Inner surfaces of coxae II and III with thin bristles at most on distal half. Labial palpus not extending beyond apex of trochanter I. Eye not reduced. Bristles of segment II of antenna reaching to or beyond apex of club in female. In male, bristles of segment II of antenna not reaching beyond the middle of club. Stylet of female with two lateral bristles. In males sternite VIII is narrow, with or without a mambranous apical flap.

Monopsyllus wagneri (Baker, 1904), subspecies undetermined

The males of this species can be recognized by three black spiniforms on posterior border of finger. The finger is not ham or scythe-blade shaped, and the levers of the genital armature are rolled into a spiral, thus separating the species from other species of the genus Monopsyllus. In the female the body of the spermatheca has a diameter less than the diameter of the tail.

A determination of the subspecies has not been attempted since this is difficult and very uncertain when based entirely on females.

In my collections there are five females taken from four infested deer mice (Peromyscus maniculatus) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948.

Pleochaetis Jordan, 1933

In members of this genus femur I has several small lateral bristles on outer surface. Inner surfaces of coxae II and III with thin bristles at most on distal half. Labial palpus does not reach apex of trochanter I. Bristles on second segment of antenna are short in female, not reaching apex of club. In male, sternite VIII is slender, with one or more subapical bristles and sometimes with a membranous flap. Stylet of female with one or two lateral bristles. Spermatheca with body subglobular to oblong. Eye well developed.

Pleochaetis sibynus (Jordan, 1925)

The female of this species is unknown. The male can be recognized by a fairly broad clasper, rounded at apex, incurved posteriorly and armed apically with a few short bristles. Different authors vary in the descriptions of the finger.

This species was reported by Hubbard (1947, 247) from the Mogollon Mountains in New Mexico.

HYSTRICHOPSYLLIDAE Tiraboschi, 1904

Members of this family can be recognized by the dorsal sulcus that separates the frons from the posterior portion of the head. This sulcus is well developed and permits movement between the two parts of the head. This family is found chiefly on rodents and is represented by eight genera and eleven species in my collections. In addition, two other genera and four species of this family have been reported from New Mexico.

Atyphloceras Jordan and Rothschild, 1915

The members of this genus can be separated from other genera in the State of New Mexico by the absence of a genal comb and the presence of prominent apical spinelets on the abdominal tergites. Females have two spermatheca. This genus is represented by only one species in New Mexico.

Atyphloceras echis Jordan and Rothschild, 1915

In the males of this species, process, finger and sternite IX are similar to the same structures of *Atyphloceras longipalpus* Stewart, 1940. Sternite VIII of this species is much broader and more evenly rounded than *longipalpus*, thus serving to separate the two males. Males of this species can be separated from other species of this genus except *longipalpus* by the finger that has both margins convex on apical half, posterior margin armed with three long thin bristles. Process of clasper is bilobed with apices rounded, armed with seven bristles, three of which are large and are situated on apical margin of upper lobe. The external or posterioventral arm of sternite IX is rounded ventrally, being spoon-shaped or ladle-shaped but not triangular. The females can be recognized by the apical margin of sternite VII which consists of a lower well-rounded lobe, above which the margin is slightly convex in outline without a sinus.

In my collection there is a record of this flea as follows: 18 males and 42 females from several hoary wood rats (*Neotoma micropus canescens*) and one nest, all collected at the base of the Sandia mountains east of Albuquerque in December, 1947.

Megarthroglossus Jordan and Rothschild, 1915

The members of this genus can be separated from other genera of the family HYSTRICHOPSYLLIDAE in the State of New Mexico by the presence of typical abdominal tergites with but one transverse row of bristles.

Megarthroglossus bisetis Jordan and Rothschild, 1915

Figures 5 and 6

Hubbard (1947, 302) reduces this species to a subspecies of M. divisus (Baker, 1895). The males of this species previously have not been described.

Head: Eyes vestigial but slightly pigmented. One row of four bristles on gena, short ones alternating with very long ones, these bristles are not always in a straight row. There are a few small bristles above this row. Postantennal region with a strong bristle half way up antennal groove and another at posterior angle. Setae along antennal groove. The antenna of the male is long and slender while in the female it is shorter and rounder. Labial palpus of five segments, last one very long, slightly curved, apex more produced posteriorly than anteriorly. Labial palpus extending beyond tip of trochanter I.

Thorax: Pronotal comb present.

Legs: Mid- and hind-femora with a lateral row of bristles on inside. Tibiae without lateral bristles on inner surface. Fifth segment in all tarsi with a proximal ventral pair and four lateral pairs of plantar bristles.

Abdomen: Abdomen with a few apical spinelets on anterior tergites. Abdominal tergites with but one row of bristles. Two antepygidial bristles on each side of the female, the upper one being a little longer than the lower one. Some variation is noticed in the number of antepygidial bristles, since one female

Megarthroglossus bisetis Jordan and Rothschild, 1915

Figures 5 and 6

Hubbard (1947, 302) reduces this species to a synonym of M. divisus (Baker, 1895). The males of this species previously have not been described.

Head: Eyes vestigial but slightly pigmented. One row of four bristles on gena, short ones alternating with very long ones, these bristles are not always in a straight row. There are a few small bristles above this row. Postantennal region with a strong bristle half way up antennal groove and another at posterior angle. Setae along antennal groove. The [illegible] of the male is long and slender while in the female it is shorter and rounder. Labial palpus of five segments, [illegible] very long, slightly curved, apex more [illegible] than anteriorly. Labial palpus extending beyond tip of [illegible] I.

Thorax: Pronotal comb present.

Legs: Mid- and hind-femora with [illegible] row of bristles on inside. Tibiae without lateral [illegible]. Fifth segment in all tarsi with a [illegible] and four lateral pairs of plantar bristles.

Abdomen: Abdomen with a few spinelets [illegible] on anterior tergites. Abdominal tergites with [illegible]. Two antepygidial bristles on each side of [illegible], the uppermost being a little longer than the lower one. Some variation was noticed in the number of antepygidial bristles [illegible] in my collection has two antepygidial bristles on one side and three on the other side. The males have two antepygidial bristles on each side, the dorsal one long and stout, the ventral one short.

Modified segments, male: Sternite IX (Fig. 5) broad at base, narrowed at apex, curving upward and bearing on the curved posterior edge three or four slender bristles and on anterior edge and apex a few small bristles. Finger (Fig. 6) slightly convex on both anterior and posterior borders, being broader at base than at the rounded apex. Finger has small bristles all around edge. Process with three long bristles and a few shorter bristles on posterior border.

Modified segments, female: Spermatheca has a swollen collar, tail is short and hooked. Sternite VII of female slants anteriorly with a slight bulge toward the dorsad.

In my collections there are records of this flea as follows: four males and three females from one wood rat (Neotoma micropus canescens) nest collected at the base of the Sandia mountains east of Albuquerque on February 28, 1948; one male from three deer mice (Peromyscus maniculatus) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; six males and two females from one hoary wood rat (Neotoma micropus canescens) nest and animals collected at the base of the Sandia mountains east of Albuquerque in December, 1947; six males and seven females from three hoary wood rat (Neotoma in my collection has two antepygidial bristles on one side and three on the other side. The males have two antepygidial bristles on each side, the dorsal one long and narrow, the ventral one short.

Modified segments, males: Sternite IX (Fig. 5) broad at base, narrowed at apex, curving upward and bearing on the curved posterior edge three or four slender bristles and on anterior edge and apex a few small bristles. Finger (Fig. 6) slightly convex on both anterior and posterior borders, being broader at base than at the rounded apex. Finger has small bristles all around edge. Process with three long bristles and a few shorter bristles on posterior border.

Modified segments, female: Spermatheca has a swollen collar, tail is short and hooked. Sternite VII of female sinuate anteriorly with a slight sulcus toward the dorsal.

In my collections there are records of this flea as follows: four males and three females from one wood rat (*Neotoma micropus canescens*) nest collected at the base of the Sandia mountains east of Albuquerque on February 28, 1948; one male from three deer mice (*Peromyscus maniculatus*) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; six males and two females from one bushy wood rat (*Neotoma micropus canescens*) nest and trap collected at the base of the Sandia mountains east of Albuquerque in December, 1947; six males and seven females from three bushy wood rat (*Neotoma* *micropus canescens*) nests collected on October 10, 1948, in the same locality as given above.

Hubbard (1947, 302) mentions this flea as being collected from Beulah, New Mexico.

Stenistomera Rothschild, 1915

The members of this genus can be separated from other genera of the family HYSTRICHOPSYLLIDAE by the absence of a genal comb. Apical spinelets on abdominal tergites normal and each abdominal tergum with more than one transverse row of bristles.

Stenistomera alpina (Baker, 1895)

This species can be separated from other species of the genus by the presence of five rows of enlarged bristles on the preantennal region and three on the postantennal region of head in both sexes.

This species is reported by Hubbard (1947, 306) from Glorieta, Santa Fe County, New Mexico.

Epitedia Jordan, 1938

The members of this genus can be recognized by the presence of two genal teeth overlapping at base. Apical spinelets on abdominal tergites. Frontal notch prominent, frontal tubercle small, acuminate. Fifth segment of tarsi I and II with four pairs of lateral plantar bristles and a basal ventral pair located near median line. Fifth segment of tarsus III with four

pairs of plantar bristles, all of which are lateral. This genus is represented by two species in the State of New Mexico.

Epitedia wenmanni (Rothschild, 1904)

The males of this species can be recognized by the posterior arm of sternite IX being wider at the base than at the apex and armed with about 12 sharp black spiniforms of varying lengths. The females can be recognized by the spermatheca in which the tail projects deeply into body. Sternite VII is divided into two lobes by a wide sinus, the upper lobe more acuminate and extending further distad than the rounded lower lobe.

This species is reported by Hubbard (1947, 312) from Lake Burford, New Mexico.

Epitedia stanfordi Traub, 1944

This species can be separated from other species in the genus Epitedia by a prominent caudally directed process immediately ventral to each group of antepygidial bristles.

In my collection there is a record of this flea as follows: one female in a collection from a wood rat (Neotoma micropus canescens) nest and several animals taken at the base of the Sandia mountains, east of Albuquerque, in December, 1947.

Meringis Jordan, 1937

Members of this genus can be separated from other genera of the family HYSTRICHOPSYLLIDAE in the State of New Mexico by pairs of planter [illegible], all of which are [illegible]. This genus is represented by two species in the State of New Mexico.

[illegible] [illegible] ([illegible]), 1904.

The males of this species [illegible] by the posterior arm of [illegible] III being wide at the base, sharp at the apex and armed with a [illegible] of short black spinules of varying lengths. The females can be recognized by the [illegible] in which the tail projects deeply [illegible]. [illegible] VII is divided into two lobes by a wide [illegible], [illegible] more acuminate and extending further distad than the [illegible].

This species is reported by [illegible] ([illegible]) from Burford, New Mexico.

[illegible]

This species can be separated from [illegible] of the genus Epitedia by a [illegible] immediately ventral to each group of [illegible].

In my collection there is a [illegible] with [illegible] one female in a collection from a [illegible] ([illegible] [illegible]) nest and material [illegible] taken at the same at the Sandia mountains, east of Albuquerque, in [illegible].

[illegible] Jordan, 1937

Members of this genus can be [illegible] from [illegible] of the family HYSTRICHOPSYLLIDAE in the [illegible] of New Mexico by the presence of two genal teeth which overlap at base and the absence of apical spinelets on abdominal tergites.

Meringis arachis (Jordan, 1929)

Males of this species can be recognized by the finger which is narrow, the lower two-fifths of the posterior border without bristles. Sternite IX is without a proximal ventral lobe, pointed at apex and armed with two spiniforms and three evenly spaced bristles on posterior border. Females can be recognized by the apical margin of sternite VII slanting, being somewhat undulate, having a shallow bay at some distance above the rounded ventral angle.

This species was reported by Hubbard (1947, 319) from Sierra and Hidalgo Counties, New Mexico.

Meringis dipodomys Kohls, 1938

Males of this species can be recognized by the process of clasper that is very short in relation to finger, which is long, much broader than in arachis, and with apex broadly rounded. Sternite IX is without a proximal ventral lobe, at apex there is a very small pale cone-shaped spine and hair. Just below the ventral apical angle are two or three spiniforms. The females can be recognized by sternite VII with its upper shallow angular lobe, followed ventrally by angular bay.

In my collection there is a record of this flea as follows: two males from one kangaroo rat (Dipodomys ordii) the presence of the [illegible], and the absence of apical spinelets on [illegible].

[illegible] [illegible] ([illegible], 19[illegible])

Males of this species can be recognized by the clasper which is narrow, the [illegible] without bristles. Sternite IX is without a [illegible] ventral lobe, pointed at apex [illegible] evenly spaced bristles on posterior border. Females can be recognized by the apical margin of sternite VII [illegible] somewhat undulate, having a shallow [illegible] the rounded ventral angle.

This species was reported by [illegible] ([illegible]) from Sierra and Hidalgo Counties, New Mexico.

[illegible] [illegible] [illegible], 1938

Males of this species can be recognized by the [illegible] of clasper that is very short in relation to [illegible] long, much broader than in [illegible], and with apex broadly rounded. Sternite II is without a [illegible] ventral lobe, at apex there is a very small [illegible] and hair. Just below the ventral apical angle are two [illegible]. The females can be recognized by sternite VII with [illegible] angular lobe, followed [illegible].

In my collection there is [illegible] of this [illegible] as follows: two males from [illegible] ([illegible]).

collected on the mesa west of the Rio Grande River opposite Bernalillo on February 21, 1948.

Meringis parkeri Jordan, 1937

Males of this species can be recognized by sternite IX, which is distinct, proximal ventral lobe not swollen, and armed with a clawlike black spiniform. Deeply incurved posterior face of sternite armed with about four evenly spaced bristles, at posteriodorsal angle with a black spiniform and two short bristles at apex. Female can be recognized by the apical flattened margin of sternite VII.

In my collections there are records of this flea as follows: one female from one hoary wood rat (Neotoma micropus canescens) collected about two miles northeast of the bridge over the Rio Puerco River, U. S. Route 66 on February 28, 1948; one male from a grasshopper mouse (Onychomys leucogaster melanophrys) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; one female from two grasshopper mice (Onychomys leucogaster melanophrys) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; one male from a wood rat (Neotoma micropus canescens) nest and animals, collected at the base of the Sandia mountains east of Albuquerque in December, 1947.

Meringis nidi, new species

Figures 7 - 10

Head: Rostrum reaches at most to three-fourths of forecoxa. Head is well rounded. Two genal teeth present, overlapping at base, outer shorter and broad, inner narrow, more pointed and about one-half again as long as the outer. Two rows of bristles present on gena, upper row of three or four medium sized ones and a lower row of four heavy ones, two extending slightly beyond genal teeth, second from antennal groove and bristle on outside of gena extending to tip of shorter tooth. Postantennal region with three rows of about five bristles each; some minute bristles along antennal groove. Eye vestigial.

Thorax: Pronotum with comb and a single row of bristles.

Legs: Coxa III with a row of spinelets on inner surface. Tarsal segment 5 of each leg with four pairs of lateral plantar bristles and a basal, submedian, ventral pair.

Abdomen: No apical spinelets on tergites. Two rows of bristles on tergites, a minor row posterior to which is a row of alternating major and minor bristles. In the male there are three antepygidial bristles of which the dorsal one is the shortest, the middle one the longest, and the ventral one about twice as long as the dorsal bristle. In the female there are three antepygidial bristles, the ventral two long and the dorsal bristle shortest.

Modified segments, male: Sternite IX (Fig. 7) with two and sometimes three black spiniforms on posterior border at apex,

top one shortest, and below these some bristles. On anterior border at apex there is a small clear spiniform. Finger (Fig. 8) is armed on the posterior border with small bristles. Apex is flattened and the finger is notched near apex on anterior border, rest of anterior border of finger straight. Process of clasper has a row of three or four bristles, dorsal two long, ventral bristles short.

Modified segments, female: Sternite VII (Fig. 9) has a sinus on ventral margin, dorsal to which are two small lobes. Spermatheca (Fig. 10) is like that of *arachis* and *dipodomys*, with spermatheca as broad anteriorly as posteriorly and narrower in the middle.

Type locality: Mesa east of Albuquerque, Bernalillo County, New Mexico. Male holotype, female allotype, 27 male paratypes and 69 female paratypes from a nest of a kangaroo rat (*Dipodomys spectabilis*)collected on March 6, 1948. Also three male paratypes and eight female paratypes from the food storage of the same nest.

Remarks: Based on the males only, the species of the genus *Meringis* fall into two groups. In the species of the first group, which contains *arachis* (Jordan, 1929), *dipodomys* Kohls, 1938, *cummingi* (C. Fox, 1926), and *walkeri* Hubbard, 1940, sternite IX is without a proximal ventral lobe. The species of the second group, in which belong *jewetti* Hubbard, 1940, *parkeri* Jordan, 1937, *jamesoni* Hubbard, 1943, *shannoni* (Jordan, 1929), top one shortest, and below these and [illegible]. On anterior border at apex there is [illegible]. [illegible] 8) is armed on the [illegible] border with small [illegible]. [illegible] is flattened and the [illegible] on anterior border, rest of anterior border [illegible]. [illegible] of clasper has a row of three or four bristles, dorsal two long, ventral bristles short.

Modified segments, female: sternite VII (Fig. 9) has a sinus on ventral margin, dorsal to which are two small lobes. Spermatheca (Fig. 10) is like that of *[illegible]* and *[illegible]*, with spermatheca as broad anteriorly as posteriorly and narrower in the middle.

Type locality: [illegible] of [illegible], Bernalillo County, New Mexico. Male holotype, female allotype, 37 male paratypes and 69 female paratypes from [illegible] of a kangaroo rat (*Dipodomys spectabilis*) collected on March 4, 1941. Also three male paratypes and eight female paratypes [illegible] of the same nest.

Remarks: Based on the [illegible], the species of the genus *Meringis* fall into two groups. In the species of the first group, which contains *arctica* (Jordan, 1929), *M. [illegible]* Kohls, 1938, *cummingi* (C. Fox, 1926), and *[illegible]* (Jordan, 1940), sternite IX is without a prominent ventral lobe. The species of the second group, in which belong *[illegible]* (Jordan, 1940), *[illegible]* Jordan, 1937, *jamesoni* Hubbard, 1943, *[illegible]* (Jordan, 1940), and hubbardi Kohls, 1938, have a proximal ventral lobe on sternite IX. Females of those species for which the females are described may be separated into two groups on the basis of the shape of the spermatheca. In one group, including arachis Jordan and dipodomys Kohls, the spermatheca is as broad anteriorly as posteriorly, but more narrow in the middle; while the females of the second group have an inverted pear-shaped spermatheca.

The males of this new species resemble the species of the first group in the nature of sternite IX, and the females resemble the species of the first group in the shape of the spermatheca. This new species is near dipodomys but can be separated from it by the wider sternite IX; the process is not bifid and the cephalic margin of the movable finger is biconcave.

Meringis, species undertermined

Due to the lack of definite species characteristics in the females of this genus Meringis, it is impossible in some instances to determine isolated females. The females mentioned here fall into the Meringis arachis and Meringis dipodomys group and not in the Meringis parkeri group with respect to the nature of the spermatheca.

In my collections there are records of this species as follows: One female from one grasshopper mouse (Onychomys leucogaster melanophrys) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; two females from and *hubbardi* Kohls, 1935, have a proximal ventral lobe on sternite IX. Females of those species for which the females are described may be separated into two groups on the basis of the shape of the spermatheca. In one group, Meringis *arachis* Jordan and *dipodomys* Kohls, the spermatheca is broad anteriorly and posteriorly, but more narrow in the middle, while the females of the second group have an inverted pear-shaped spermatheca.

The males of this new species resemble the species of the first group in the nature of sternite IX, and the females resemble the species of the first group in the shape of the spermatheca. This new species is near *dipodomys* but can be separated from it by the wider sternite IX; the process is not bifid and the cephalic margin of the movable finger is biconcave.

Meringis, species undetermined

Due to the lack of definite specific characteristics in the females of this genus *Meringis*, it is impossible in some instances to determine isolated females. The females mentioned here fall into the *Meringis arachis* and *Meringis dipodomys* group and not in the *Meringis parkeri* group with respect to the nature of the spermatheca.

In my collections there are records of this species as follows: One female from one grasshopper mouse (*Onychomys leucogaster melanophrys*) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948; two females from two grasshopper mice (Onychomys leucogaster melanophrys) collected at the same place and date.

Peromyscopsylla I. Fox, 1939

This genus can be separated from all other genera of the family HYSTRICHOPSYLLIDAE in the State of New Mexico by the presence of two genal teeth which do not overlap at the base.

Permoyscopsylla hesperomys (Baker, 1904)

The members of this species can be recognized by the transparent genal lobe which extends below the genal teeth. The males can be recognized by sternite VIII which is armed apically with four bristles, all of different lengths. The females can be recognized by sternite VII which is deeply sinuate, upper lobe prominent and more or less triangular, lower lobe wider.

In my collection there is a record of this flea as follows: one female and one male from a deer mouse (Peromyscus maniculatus) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948.

Phalacropsylla Rothschild, 1915

Members of this genus can be recognized by two genal teeth overlapping at base. Apical spinelets on abdominal tergites. Frontal tubercle and frontal notch absent. Fifth tarsal segment of each leg with four pairs of lateral plantar bristles and a basal, submedian, ventral pair.

Phalacropsylla allos Wagner, 1936

Males of this species can be recognized by the process which is prominent and broadly rounded apically. Finger long, slender and apically pointed, armed along posterior border with short bristles. Sternite IX is expanded apically and armed at the posterioventral angle with a row of about eight short, heavy black spiniforms. Females can be recognized by sternite VII, which is sinuate, upper lobe much longer than lower, narrow and rounded apically. Lower lobe is small and triangular. Spermatheca with body round to pear-shaped and tail long and slender but not bent back over body.

In my collection there is a record of this flea as follows: one female from one deer mouse (Peromyscus maniculatus) collected on the mesa west of the Rio Grande River opposite Bernalillo on March 12, 1948.

Leptopsylla Jordan and Rothschild, 1911

This genus can be separated from all other genera of the family HYSTRICHOPSYLLIDAE in New Mexico by the presence of four horizontally arranged genal teeth. Only representative of this genus in the west is the common European mouse flea.

Leptopsylla segnis (Schonherr, 1811)

This is the common European mouse flea. The head is bullet shaped with slightly pointed tip at apex of female. Directly posterior to apex are two heavy spiniforms and below

them on the anterior margin five bristles, above them two bristles. Genal comb consists of four teeth, the most dorsal is the broadest, the third is the longest. In the male the finger is rounded at the posterior margin and armed with five or six bristles, of which three are longer than the others. Distal end of posterior arm of sternite IX is expanded, posterior margin bearing a number of hairlike setae. In the females sternite VII is not sinuate, but consists of a single lobe having a somewhat undulate margin. Body of spermatheca somewhat rectangular with rounded corners, broader at base than at apex, and curved.

This species was reported by Hubbard (1947, 348) from the Alexandrian rat at Lordsburg, New Mexico.

Proximorectofrontia, new genus

Diagnosis: Frontal tubercle present; eye vestigial; genal teeth five in number; two heavy genal bristles and more dorsal in position five or six medium ones; five-segmented labial palpus. Pronotal comb with about 16 teeth. Apical spinelets on all abdominal tergites. Antepygidial bristles absent in the male, two in the female. Fifth tarsal segment of each leg armed with usually five, rarely six, pairs of lateral plantar bristles. Known only from the genotype.

Genotype: Proximorectofrontia unica, new genus and new species.

Remarks: This new genus stands between Rectofrontia Wagner and Argyropolo, 1934 and Actenophthalmus C. Fox, 1925.

The nature of the genal comb indicates a close relationship to the genus *Rectofrontia*. The new genus has a smaller number of teeth in the pronotal comb than is common in species of the two related genera. The present genus differs from the genus *Rectofrontia* in the number of lateral plantar bristles on the fifth tarsal segment of each leg. The spermatheca is similar to that of *Actenophthalmus*.

Proximorectofrontia unica, new species

Figures 11 - 14

Head: Frontal tubercle prominent. Genal comb with five teeth, four in a row and one above at about eye position. The teeth of gena increase in length from outer edge of gena toward antennal groove, except for the short tooth at the inner edge of gena at eye position. Genal bristles: two heavy ones at about eye position, one in about the center, other on gena next to antennal groove; there are four to six medium bristles dorsal to these. Postantennal region with three rows of bristles. Labial palpus of five segments, not reaching tip of coxa I.

Thorax: Pronotal comb of about 16 teeth, single row of bristles. Upper sclerite of metepisternum separated from metanotum by internal ridge.

Legs: Coxa III with a patch of spinelets on inner surface. Fifth tarsal segment of each leg has five or six pairs of lateral plantar bristles.

Abdomen: Apical spinelets present on each abdominal tergite. There are two antepygidial bristles on each side in the female and none in the male.

Modified segments, male: Process of clasper (Fig. 11) with one long subapical bristle on outer surface, posterior border is straight except at apex where it is curved toward finger. Finger is narrow, shorter than process, with a rounded posterior border and a slightly concave anterior border, a few small bristles on posterior border. Sternite IX (Fig. 12) of male has a rounded apex and has many small bristles on outer surface.

Modified segments, female: Spermatheca (Fig. 13) with a gradual decrease in diameter from tip of tail to body, without a definite line of demarcation between body and tail; tail bent over body. Sternite VII of female as shown in figure 14.

Type locality: Mesa east of Albuquerque, one male holotype, one female allotype, seven male paratypes and seven female paratypes from a nest of a kangaroo rat (Dipodomys spectabilis) collected on March 6, 1948.

Stenoponia Jordan and Rothschild, 1911

This genus can be separated from other genera in the State of New Mexico by the possession of a genal comb of many long slender black teeth. This genus is represented in the western United States by a single species.

Abdomen: [illegible]

tergite. There are [illegible] the female and none in the male.

Modified segments, male: [illegible] with one long subapical bristle [illegible] border is straight [illegible] finger. Finger [illegible] posterior border and [illegible] small bristles on posterior [illegible] (Fig. 12) [illegible] male has a rounded [illegible] surface.

Modified segment 8, female: [illegible] a gradual decrease in diameter [illegible] a definite line of demarcation between body and [illegible] over body. [illegible] of female as shown in [illegible]

Type locality: [illegible] holotype, one female allotype, [illegible] female paratypes from [illegible] (Dipodomys spectabilis) collected [illegible]

Stenoponia [illegible], 1911

This genus can be [illegible] of New Mexico by the possession of a [illegible] slender black bands. This genus is represented in the [illegible] United States by [illegible] species.

Stenoponia americana (Baker, 1899)

The members of this species have a genal comb of about 26 teeth. The pronotum has a comb of about 26 teeth on each side. Each abdominal tergite has three rows of bristles. First tergite with a comb of 42 teeth. Tergites II to IV with a series of short stout apical spinelets. Males can be recognized by the process of clasper which is broad, apically rounded and armed with a series of medium bristles. The finger is curved, longer than process, and armed with short and medium bristles along posterioventral border. Sternite IX is expanded apically, paddle-shape, and armed with numerous bristles. The females can be recognized by sternite VII, with its deep sinus close to ventrum. Lower lobe narrow, triangular; upper lobe also weak, apically rounded. The head of the spermatheca is spherical with a long crooked tail.

In my collection there is a record of this flea as follows: one female from one long-nosed deer mouse (Peromyscus nasutus) collected in the Jemez mountains on March 27, 1948.

ISCHNOPSYLLIDAE Wahlgren, 1907

The western North America members of this family are recognized by the presence of a pair of highly sclerotic preoral plates on each side of head. These vary in size and shape and represent modified genal teeth. Members of this family are normally parasitic on bats. One genus and one species has been reported from New Mexico.

Sternopsylla Jordan and Rothschild, 1921

Members of this genus can be recognized by the acuminate maxilla and the presence of antepygidial bristles.

Sternopsylla carlsbadensis Ewing, 1940

In the males from New Mexico, the movable finger is about as broad as long and the anterior margin is very broadly incurved; the two lower, posterior, marginal, spinelike setae of the movable finger situated some distance from one another, and the seta adjacent to the third posterior, marginal, spinelike seta is larger and longer than the third seta itself.

This species was reported by Hubbard (1947, 381) from the Carlsbad Cavern, New Mexico.

CHAPTER V

SUMMARY

1. During this study, 275 fleas were removed for study from the 137 rodents examined. The host animals included 12 different species and subspecies of rodents.

2. From six nests, 1,406 fleas were secured. These fleas belonged to nine species and subspecies. Of these, four species and subspecies were also found on the host animals, five species were found only in the nests.

3. In the food storage from one rodent burrow, 12 fleas belonging to two different species were collected.

4. Prior to the present work, there were only 21 species and subspecies of fleas reported in the literature from New Mexico. The present paper brings to 36 the total of species and subspecies reported from New Mexico.

5. Only five of the previously reported species were found in the present collections.

6. Nine species, already described in the literature as occurring in the western part of the United States, are listed as new records for New Mexico. In addition, there is reported the presence of three species, the material of which is insufficient for specific and subspecific determinations.

7. Three species and one genus new to the literature are described from specimens collected in New Mexico.

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PLATE I

EXPLANATION OF FIGURES

Fig. 1. *Anomiopsyllus novomexicanensis*, new species; male, sternite IX.

Fig. 2. *Anomiopsyllus novomexicanensis*, new species; male, finger and process of clasper.

Fig. 3. *Anomiopsyllus novomexicanensis*, new species; female, sternite VII.

Fig. 4. *Anomiopsyllus novomexicanensis*, new species; female, spermatheca.

Fig. 5. *Megarthroglossus bisetis* Jordan and Rothschild, 1915; male, sternite IX.

Fig. 6. *Megarthroglossus bisetis* Jordan and Rothschild, 1915; male, finger of clasper.

Fig. 7. *Meringis nidi*, new species; male, sternite IX.

PLATE II

EXPLANATION OF FIGURES

Fig. 8. *Meringis nidi*, new species; male, finger and process of clasper.

Fig. 9. *Meringis nidi*, new species; female, sternite VII.

Fig. 10. *Meringis nidi*, new species; female, spermatheca.

Fig. 11. *Proximorectofrontia unica*, new genus and new species; male, finger and process of clasper.

Fig. 12. *Proximorectofrontia unica*, new genus and new species; male, sternite IX.

Fig. 13. *Proximorectofrontia unica*, new genus and new species; female, spermatheca.

Fig. 14. *Proximorectofrontia unica*, new genus and new species; female, sternite VII.

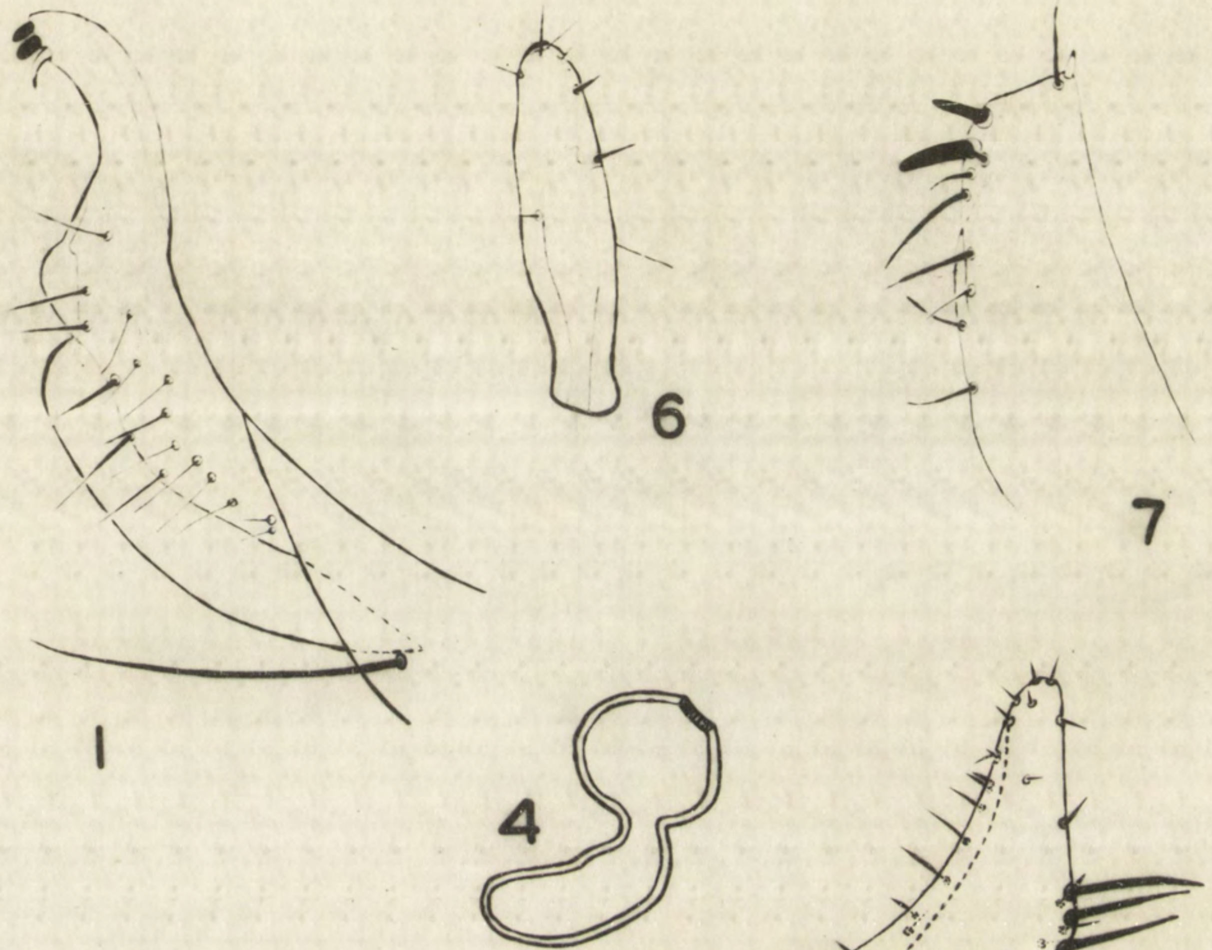
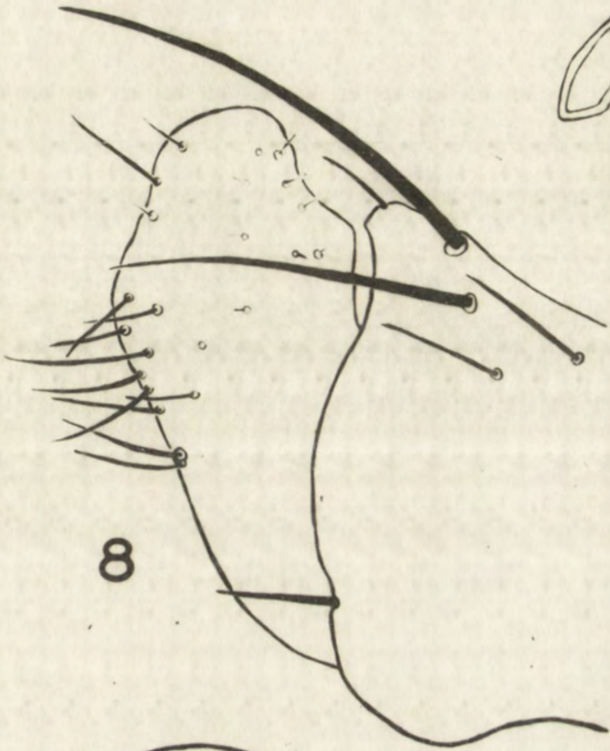


PLATE I



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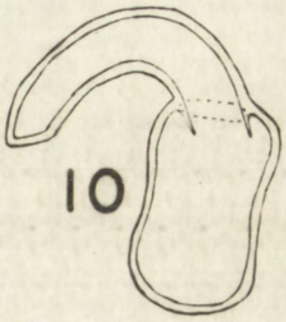

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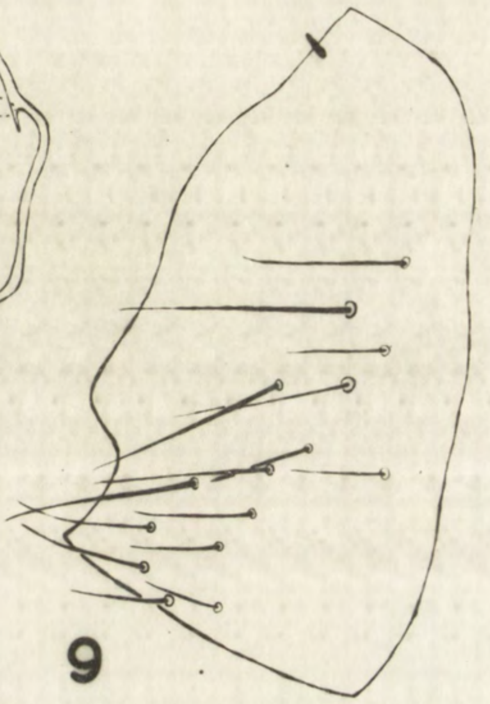

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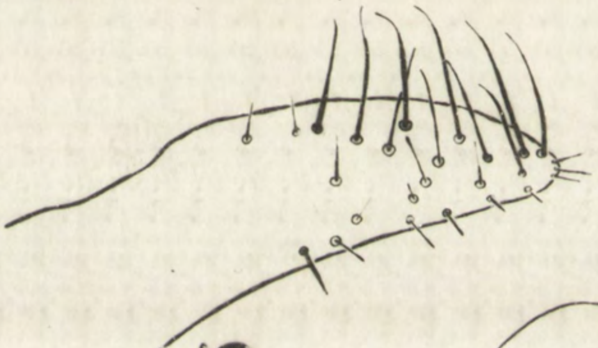

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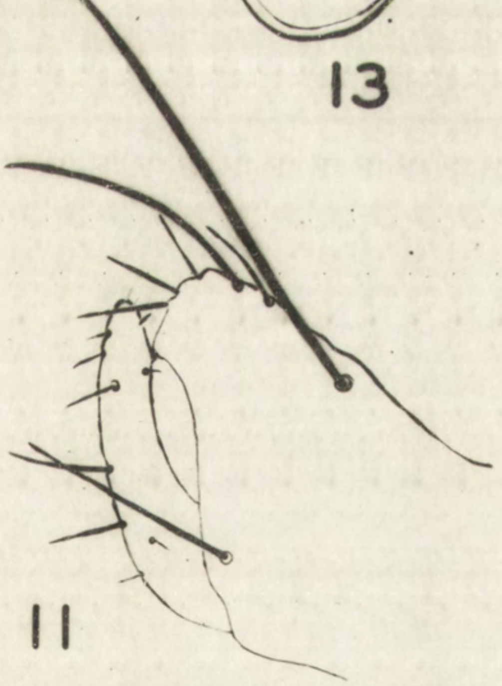

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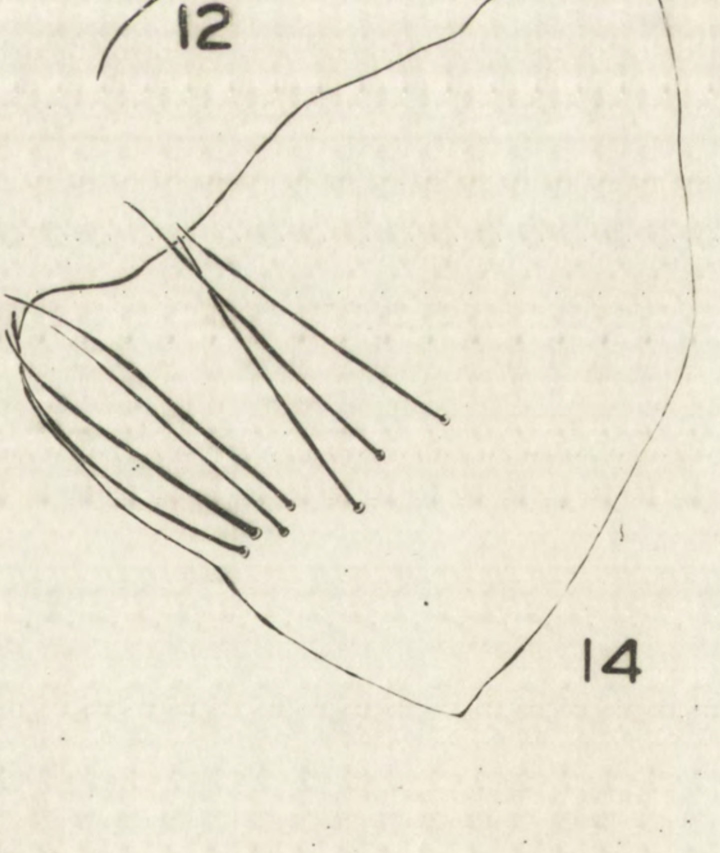

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PLATE II