Ten papers on WESTERN FLEAS in which are erected two new genera and fourteen new species

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Recommended Citation

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Description
This text is a collection of original papers published in Volume 37 (1940-1941) of the Pacific Bulletin.

Disciplines
Animal Sciences | Life Sciences

Publisher
Pacific University

Comments
Version Discrepancies:

*History of the Flea Genus Micropsylla*, listed in this volume as being published in May 1941, also exists with a printed publication date of May 1940. The 1940 date is likely a misprint.

*The Fleas of Rare Western Mice*, listed in this volume as No. 9A (April 1941), also exists with a printed publication number of No. 12 (April 1941). The typesetting of the title information is slightly different (author is listed in No. 9A, but not No. 12), but the content appears to be identical.

*Fleas of the Yakima Ground Squirrel*, listed in this volume as No. 7A (February 1941), also exists with a printed publication number of No. 13 (February 1941). The content appears to be identical.
Ten Papers on Western Fleas in which are erected two new genera and fourteen new species.

by

Mr. C. AndreSEN Hubbard, ScD.

Professor of Biology

and

Head of the Department.

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Errors and corrections appearing in the above bulletins are listed on the back of cover.
WEST COAST CRESTED FLEAS
CORYPSYLLA AND NEARCTOPSYLLA
(THREE NEW SPECIES.)

by

Mr. C. Andresen Hubbard, Sc.D.
Professor of Biology and Head of the Department

First printing 500 copies. Mailed out April 1940. Holotypes, allotypes and paratypes dispatched to depositories April 1940.
WEST COAST CRESTED FLEAS
Corypsylla and Neartopsylla

Broadly speaking, fleas of the genera Corypsylla and Neartopsylla could be included under the common name of Crested fleas. The two genera have much in common. Fox says of the abdomen of Corypsylla ornatus (page 454, Ent. News Dec. 1908), "the abdominal tergites from the first to sixth, have in the median line of the dorsal surface a distinct saddle-shaped chitinous patch (called by present writers "heavy transverse incassation") and a set of short, stout teeth or spines. These spines overhang the chitinous patch of the next posterior segment". In a key used on page 173 of his "A Manual of External Parasites" H. E. Ewing says "10.................. ; abdominal tergites without incrassations Neartopsylla Rothschild ................ ; abdominal tergites with a heavy transverse incassation Corypsylla Fox"

There is some doubt about the taxonomic value of this incassation because although the thickening is prominent in C. ornatus in the first of the species of Corypsylla described below as new this thickening has lost much of the prominence and in the second described as new the thickening is almost if not entirely absent. Thus the incassation does not necessarily divide the two genera. Rothschild stated when he set up the genus Neartopsylla that the frontal tubercle was absent. This stood as a distinguishing character between the two genera as long as Corypsylla ornatus was the only species in the genus since ornatus does have a distinct point or tubercle on the head. But the two Corypsyllas listed below as new species do not have this point on the head; the head outline being as rounded as any Neartopsylla. In both genera the genal comb is like a crest, the eyes are absent, the labial palpus is of five segments, the male has but one antepygidial bristle, the female two. The writer feels, in enumerating these points, and by describing the two new species of Corypsylla below the small distance that once separated the two genera is considerably lessened and the two genera come very close to one another, close enough at least to have them both considered under the common name of Crested fleas.

According to the belief of the writer, the fleas in each of the known species of these genera and the fleas in the species described herewith as new all have for their normal hosts Insectivora of one type or another. The Crested fleas can occasionally be found on small Carnivora which capture the Insectivora for food, and once in a while the Crested fleas can be taken from mice and pocket gophers which run along the Insectivoran burrows, these occurrences doubtless being accidental,
In the West, Insectivora are of three distinct types, the moles, Gibb’s mole or shrew mole, and the shrews. Perhaps so few records of Crested fleas exist because of the difficulty of securing these hosts. If the habits of the Insectivora are studied carefully, no involved technique is required to secure them for their fleas. Moles are most easily trapped with the “Out O’ Sight” Mole Trap manufactured by the American Trap Company of America, Lititz, Pennsylvania. The Bureau of Biological Survey recommends this trap. If, however, the small Macabee Gopher Traps made by the Macabee Gopher Trap Company, Los Gatos, California, are used, in pairs, one facing each way in the mole runs, many of the animals can be caught. In so far as both of these types of traps kill the victims in short order, frequent visits must be made to the sets to remove the animals before they cool and their fleas leave. Some shrews can be trapped in small live-catch box traps baited with oatmeal and fried bacon. A very successful method is to sink a wide mouth half gallon fruit jar beneath well established burrows under boards which have lain in place for periods of time. Shrews and small mice will fall into these pitfalls by the dozens. Generally only the last victim to enter the pit is found whole, since an animal exhausted by trying to get out of the pit is always killed and partially eaten by a newcomer. The fleas of all the victims will be on the last animal to fall into the jar. There is no loss of fleas, but where mice and shrews fall into jars together, there is no definite way to determine the positive hosts for the fleas. The jars should not be baited and need not be visited oftener than twice a week.

The first of the Crested fleas to come into prominence were the Nearctopsylla, listed in the earlier days as species of Ctenopalthalmus by Baker, and Ctenopsyllus by Rothschild. According to publication dates, these two pioneers in the study of American fleas described Crested fleas in 1904. The Honorable N. A. Rothschild, noted British Siphonapterist, described in Novitates Zoologicae Vol. XI, 1904, under the title of “Further Contributions to the Knowledge of the Siphonaptera”, three species, as follows:

Ctenopsyllus brooksi (page 649) from fifteen specimens (both sexes) collected by Dippie and Brooks in Alberta and British Columbia, Canada, during 1900, 1901, 1902, off various weasels.

Ctenopsyllus hygini (page 650) from eleven specimens (both sexes) from Alberta, Canada, during 1901, off weasels.

Ctenopsyllus hyrtaci (page 652) from four specimens (both sexes) collected by Brooks and Wenmann during 1901 in British Columbia, Canada, off weasels and shrew.

Dr. Carl Baker, at Stanford University, in his “Revision of American Siphonaptra” published in Proceedings of the National Museum Vol. XXVII, page 424, described Ctenopalthalmus genalis and states, “A species collected on Geomys bursarius at the agricultural College of Michigan, and formerly supposed to be a variety of fraterna, is now considered wholly distinct and described herewith from a single male.”
In Novitates Zoologicae 22:307, 1915, N. A. Rothschild erected and established the genus *Nearctopsylla*, named *Ctenopsyllus brooksi* Rothschild as the genotype and listed the above named species as belonging to this genus.

In 1936, in the Canadian Entomologist, Vol. LXVIII, September, Dr. Julius Wagner, renowned European Siphonapterist of Belgrade, Germany, in "The Fleas of British Columbia" lists those species of *Nearctopsylla* described by Rothschild in 1904, but merely compiles the records, adding no new data. He says, however, on page 203, "According to the scanty information which we possess to date *Nearctopsylla* is a purely Canadian genus."

During 1938 Dr. Karl Jordan, British authority on world fleas, at the Tring Branch of the British Museum, informed the writer by letter that Baker's *Nearctopsylla genalis* was the same flea as Rothschild's *Nearctopsylla hygini*. Whether Wagner knew of this synonomy, the writer does not know, but early in 1940 Irving Fox in his book entitled "Fleas of the Eastern United States" lists *N. genalis* Baker as being a flea of the eastern United States with range as far south as Iowa and as far east as New Hampshire. It seems then that Wagner's statements about these fleas being purely Canadian is not correct, and seems even less so with the description in this paper of the following new species of *Nearctopsylla* from western Oregon:

*Nearctopsylla jordani* new species

This flea is close to *Nearctopsylla genalis* Baker (=*Nearctopsylla hygini* Rothschild), difference being primarily in modified segments.

Head: male and female, head well rounded, without frontal tubercle, the genal comb is of 5 spatulate teeth, the outer ones shorter, the inner ones longer. A row of 4 spines above the genal comb with an additional 5th spine of the same rank between the posterior two but dropped ventrally slightly. Frons with a long spine close to the anterior border and opposite the base of the 3rd genal tooth. Post-antennal region of the head with 3 rows of 3 to 6 spines each.

Pronotal Comb: male about 26 teeth, female about 24 teeth.

Abdomen: male 1 antepygidial bristle, female 2 antepygidial bristles, lower one shorter than upper one.

Tergite teeth not constant in number but usually 1-6-6-4-0-0 in male and 4-6-4-4-0-0 in female, counting both sides.

Spines: each tergite with a marginal row of long spines and on most segments an anterior row of shorter spines. Sternites with 1, 2, or 3 spines on each side.

Modified segments: male—process P not armed apically with a number of bristles of various sizes as in *N. genalis*, but instead with 3 marginal spines and 1 of same weight slightly lateral and to the anterior. Shape distinctly different from *N. genalis*. Spine below movable Finger F. But 1 long spine and about 5 short ones on posterior border of Finger F, not 5 long ones and a few short ones as in *N. genalis*. Sternite IX male with only 4 or 5 spines on posterior border as compared to 7 or 8 in *N. genalis*. Shape distinctly different from *N. genalis*. See plate.
Female—in the VII sternite of the female what appears as the upper lobe in *N. genalis* is represented in *N. jordani* by what looks almost like a sharp hook, the point of the hook varying in sharpness with the wear upon it; sometimes it is blunt, sometimes long and pointed. Spermatheca large; the appendix appears almost hooked. See illustrations for further details.

Normal size. Male 2.50 mm., female 3.00 mm.

Normal host. Known by the writer only from *Scapanus townsendi* (Townsend's Mole) at Forest Grove, Oregon and Cannon Beach, Oregon, but probably can also be found upon *Scapanus orarius orarius*, the Coast mole, which has about the same range as the Townsend mole.

Type Locality: Forest Grove, Oregon.

Range: Probably that of the Townsend mole which is west of the Cascade Mountains in Oregon and Washington.

History: Holotype male and allotype female taken from a Townsend mole (*Scapanus townsendi*) on May 1, 1937 at Forest Grove, Oregon.

Biology: *N. jordani* seems to be a true mole flea, as is *C. ornatus*. *Jordani*, however, seems relatively scarce as compared to *ornatus*. There seems to be no sex predominance in *N. jordani*, the writer having collected 12 even pairs over a period of three years. From the few specimens of *N. jordani* at hand it appears that the egg laying season begins about mid March and by the last of the month most of the females have, ready for laying, generally not more than two very large eggs which almost fill the abdomen. Nothing is known at the present time about seasonal distribution.

Deposites: The holotype male and allotype female are mounted on one slide which bears the writer's number 685 and are deposited in the Academy of Natural Sciences of Philadelphia. The first 20 males and 20 females collected beyond the holotype and allotype at the type locality will be mounted 1 male and 1 female to the slide and designated by the writer as paratypes. These will be distributed to depositories established and listed by the writer elsewhere.

This flea bears the name of Dr. Karl Jordan, Tringo Branch, British Museum, Hertshire, England, who has given many hours of his time to help the writer over many of the pitfalls which confront the beginner of the study of fleas.

Due to the fact that but one species of *Corypsylla* has been described to date the history is rather brief. In Entomological News for December, 1908, Vol. 19, page 452, Carroll Fox erected the genus to hold a new flea which had been taken off a mole. The genal teeth were 6 in number, and had the appearance of being a crest, hence the name *Corypsylla*, which comes from the Greek and means Cory or crested and psylla or flea. *C. ornatus* is the genotype. In so far as Irving Fox combed the eastern museums while writing his "Fleas of the Eastern United States" without finding a *Corypsylla* listed in the east, *Corypsylla* is evidently a strictly western United States genus of fleas. Wagner does not record the genus from British Columbia. Apparently fleas of the genus are not found north of the Frazier River.
Genus Corypsylla Fox 1909.

This genus was erected by Carroll Fox after N. A. Rothschild had examined the material and pronounced the specimens representatives of a new genus. The material had been taken off Scapanus californicus in San Francisco, California, the date and collector not mentioned.

The characteristic features given were:

"Spines on the head, structure of head, spines on back of abdomen, mesothorax not divided by a vertical suture, episternum of metathorax fused with the metanotum. Hind coxae with a patch of spines on inside. All tarsi with four pairs of lateral spines on fifth segments" (page 452).

The three species of Corypsylla listed below are strikingly constant in many features.

Head: male and female, shape characteristic for species, but each species bears a genal comb of six spatulate teeth, the main difference in the comb of each species is the shape of the 3rd tooth from the bottom. In front of the base of 2nd, 3rd and 4th genal tooth, counting from the bottom and close to the frons, rises a short spine, the three pointing downward and slightly overlapping one another. Above the genal teeth a row of 5 spines and an additional one between the posterior two, but out of line, being slightly to the ventral. The original description for C. ornatus reads, "Just above the first genal spine is a row of four bristles running obliquely upward . . ." It seems hard to believe Fox would have overlooked 2 large spines, but several hundred specimens of the 3 species of Corypsylla listed below and in the collection of the writer all have 6 spines above the genal teeth.

Postantennal region of head with about 14 spines of three lengths in what might be 3 rows, but the rows not as definite as in some fleas. Up to 10 minute bristles scattered over lateral surfaces.

Pronotal Comb: Number of teeth characteristic of the species.

Abdomen: Antepygidial bristles: 1 in male, 2 in female.

Spines: About midway between dorsal and ventral or tergites and running lengthwise of abdomen 2 rows of major spines with spiracle in between. 1, 2 or 3 spines on either side of sternites.

Modified segments: male, shape of Process P and its Finger F characteristic for the species. Female, VII st. similar in all species—no taxonomic value. Shape of spermatheca characteristic for each species.

Corypsylla ornatus Fox 1909

Described by Fox in Entomological News, December 1908 from 2 males and 5 females which were obtained from Scapanus californicus (mole) taken in San Francisco, California. The date of collection is not given by describer. Fox describes the shape of the head as follows: "very gently sloping towards the front to just above the root of the first genal spine where it rather abruptly changes its direction and curves downward and backward forming an angle". The writer prefers to say somewhat bullet shaped like a pointed steel jacket. The following description of C. ornatus is offered from some 200 specimens in the collection of the writer. Some of the details differ from the original description of Fox.
Head: male and female, shape somewhat bullet like as in a steel jacket bullet, 3rd genal tooth from the bottom characteristic, i.e. much longer than the others, sharply pointed, but not bisymetrical, swelling on upper lateral margin much greater than the swelling on the lower lateral margin. Chaetotaxy as mentioned for the genus.

Pronotal Comb: male about 36 teeth, female about 36 teeth of which the lower 8 or 9 are modified, reduced, plate-like ("indistinct pseudo-spines"). See illustrations.

Abdomen: in female outer antepygidial bristle slightly shorter than the inner one, in male 1 antepygidial bristle.

Tergites with heavy transverse incrassation.

Tergite teeth not constant in number but usually 8-8-8-8-6-2 in male and 6-8-10-10-8 in female, counting both sides.

Chaetotaxy as for the genus plus two rows of minute bristles running length of abdomen on the tergites.

Modified segments: male, Process P somewhat rounded, dorsal margin with a series of about 10 short bristles followed posteriorly by 8 spines, a short one, then 2 longer ones and most posterior another bristle. Below Finger F a curved spine. Finger F characteristically shaped and with 4 spines. See illustrations.

Female, spermatheca small for the size of the flea, its body small in comparison to the size of the appendix.

Average size: male 2.00 mm., female 2.30 mm. Some variation.

Normal host: Various species of western moles (Scapanus) and occasionally on shrews (Sorex).

Accidental occurrences: found once in a while on pocket gophers (Thomomys) and mice of one type or another which run in the burrows of the moles.

Range: Apparently this flea is found only in Western Washington, Oregon west of the Great Basin and in California. The writer has records from sea level up to an elevation of 6000 feet in the high Cascades, off Scapanus townsendi, Scapanus orarius, Scapanus latimanus dilatus, Scapanus latimanus alpinus.

Biology: While articles have appeared upon the sex ratio of fleas, the writer has discounted most of these, feeling, at least in his own experiences, that over periods of years of collecting most fleas will be found to be very evenly divided between males and females. However, in C. ornatus there does seem to be a large predominance of females, which at times may reach a ratio of 4 females to 1 male. There is, though, no real season why the rest of the males could not be in the nest of the host. In the lower levels of the range of this flea eggs begin to appear in the females about the middle of February and practically all females are with fully formed eggs during March. While flea eggs are always large in comparison to the size of the body, the eggs of C. ornatus are undersize and appear from 1 to 4 at a time. This flea can be taken off moles in small numbers, up to half dozen, at almost any season the host can be trapped but the seasonal maxima seems to occur during March when the writer has records of as many as 100 from a single mole.
*Corypsylla jordani* new species

This flea is close to *Corypsylla ornatus* Fox 1909. Major differences are shape of head and 3rd genal tooth from the bottom, number of pronotal teeth, shape of Process P and its Finger F, shape of spermatheca.

Head: male and female, without tubercle, thus contour of head quite different from that of *C. ornatus*, well rounded in shape, 3rd genal tooth from bottom longer than others and sharply pointed as in *C. ornatus*, but bisymmetrical. Chaetotaxy as mentioned for the genus. See illustrations.

Promotal Comb: Similar to *C. ornatus* but with fewer teeth. Female about 32 teeth of which the lower 8 or 9 are as in *C. ornatus* modified, reduced, plate-like (“indistance pseudo-spines”). Male about 30 teeth but as in the male of *C. ornatus* the lower 8 are normal.

Abdomen: the 2 antepygidal bristles in the female about the same length, male 1 antepygidal bristle.

Tergite teeth not constant in number but usually 8-12-10-10-10-8 in the female and 6-8-8-8-6-6 in the male, counting those on both sides.

Tergite incrassation much less prominent than in *C. ornatus*.

Spines: Chaetotaxy as mentioned for the genus plus a row of major spines and a row of minor spines running lengthwise of the abdomen on tergites close to the lower tergite tooth. Sternites with 1 or 2 bristles on either side.

Modified Segments: male, Process P of clasper differs from that of *C. ornatus* in that the dorsal margin is flat. Spine arrangement about as for *C. ornatus*. Below Finger F a curved spine. Finger F characteristic in shape and with 3 spines on posterior margin. See illustrations for comparison with *C. ornatus*.

Female, spermatheca characteristic in shape, body medium in comparison with appendix. See illustration Sp.

Average size: Male 1.60 mm., female 2.00 mm.

Normal host: *Neurotrichus gibbsi* gibbsi Baird, the so called shrew mole or Gibbs mole.

Type locality: Gaston, Oregon, 6 miles east and south.

History: Holotype male and allotype female were taken from a Deer mouse nest (*Peromyscus maniculatus rubidus*) with which were collected the five occupying mice, a mother and four full grown young. The nest was found on March 16, 1935 in an old grain bin on a deserted farm known as the Manchester Place, 6 miles southeast of the post office of Gaston, Oregon. There were 103 fleas in the nest, of which 3 were *Corypsyllas*, the two *C. jordani* and a female *C. ornatus*. Although every species of rodent in the vicinity was trapped repeatedly during the following five years and many moles and shrews were taken during this time, no paratypes were taken. On the 14th of January 1940, the writer placed 4 half-gallon jar pitfalls beneath small burrows all within 100 feet of the original grain bin. The following morning 2 *Neurotrichus gibbsi* gibbsi were taken from the jars and when their fleas were removed they were found to be 4 males and 5 females *Corypsylla jordani*. During the fol-
lowing 30 days 25 of these small 2 inch jet black moles fell into the jars and off them the writer took only *C. jordani* and to the number of 29 males and 38 females. A few of the shrew moles were clean, some had as many as 12 fleas. There also fell into the jars during the period 10 Gray-tailed meadow mice (*Microtus canicaudus*) and 6 Trowbridge shrews (*Sorex trowbridgi*) but on no occasion did these carry *C. jordani*, nor did the shrew moles carry the mouse or shrew fleas. This data leads the writer to list the true and normal host of this flea as the shrew mole.

Range: This flea is known to the writer only from the type locality but it can probably be found all through the range of the shrew mole which is west of the crest of the Cascade Mountains in Washington, Oregon and probably northern California.

Biology: Little is known about the biology of this flea. During the month in which the writer has collected numbers of them it seems that there might be a small predominance of females. Eggs begin to appear in the females about the beginning of March and all females taken by and after the middle of the month are with them. The eggs are the average Corypsylla size and are more often than not in pairs. Nothing is known at present about the seasonal distribution of this flea.

Deposites: The holotype male and the allotype female are mounted on one slide which bears the writer’s number 238 and are deposited in the Academy of Natural Sciences of Philadelphia. The first 20 males and 20 females taken during February 1940 and at the type locality are designated by the writer as paratypes. These are mounted 1 male and 1 female to the slide and distributed to depositories established and listed by the writer elsewhere. This flea bears the name of Dr. Karl Jordan.

*Corypsylla kohlsi* new species

This flea is close to *Corypsylla jordani* Hubbard 1940. Major differences are shape of the head and 3rd genal tooth from the bottom, number of pronotal teeth, shape of Process P and its movable Finger F, and shape of spermatheca.

Head: male and female, without tubercle, shape not so well rounded as in *C. jordani*. All 6 of the genal teeth spatulate, the 3rd from the bottom not pointed and not longer than the others as in *C. ornatus* and *C. jordani*. Chaetotaxy as stated for the genus. See illustrations.

Pronotal Comb: In male similar to *C. jordani* but with fewer teeth the number being about 26. In female about 26 teeth all similar, the lower 8 or 9 not modified as in *C. ornatus* and *C. jordani*.

Abdomen: female, 2 antepygidial bristles, the outer one 2/3 rds the length of the inner one. Male 1 antepygidial bristle.

Tergite incrassation faint if present at all.

Tergite teeth not constant in number but usually 4-8-4-2-2-2 in male and 4-10-6-4-2-2 in female, counting both sides.

Spines: Chaetotaxy as mentioned for the genus plus 1 row of major spines directly below the lower tergite teeth, then 2 incomplete rows of minute bristles running lengthwise of the abdomen. Sternite with 2 to 4 spines on either side.
Modified Segments: male, dorsal margin of Process P with fewer but more prominent bristles than in C. jordani and below Finger F a curved spine. Finger F different in shape from either C. ornatus or C. jordani and characteristic, 2 bristles on posterior border. See illustrations for comparisons.

Female, spermatheca large for a Corypsylla, the body very large in comparison to the size of the appendix. See illustrations Sp.

Average size: male 1.30 mm., female 1.50 mm.
Normal host: Sorex obscurus bairdi Merriam.
Type locality: Cannon Beach, Oregon, swale along highway at Warren’s Hotel.

History: Holotype male and allotype female taken March 29, 1937 off a specimen of Baird’s shrew (Sorex o. bairdi) captured by the writer in a small live-catch box trap in a small road side swale along the Cannon Beach, Oregon highway at Warren’s Hotel. Palmer’s Water shrews, moles and Deer mice taken in the immediate vicinity the same day did not carry this flea. To secure paratypes the writer again made a week’s settings in the same swale late in February, 1940. 12 Baird’s shrews were taken alive from the swale or from under boards about the swale. These shrews carried but 4 specimens of C. kohlsi. Townsend’s mole, Ruddy deer mice, and Tillamook long-tailed meadow mice also taken in the swale or under the boards did not carry this flea. This data leads the writer to believe that Baird’s shrew is the true host of this flea. The apparent scarcity of the flea was probably due to the writer’s inability to find the seasonal maxima. During the week of March 27, 1939 at Tillamook, Oregon, 50 miles south of the type locality for this flea, 6 Baird’s shrews, 1 Trowbridge shrew and 11 Vagrant shrews were captured alive, but none of these carried C. kohlsi although they were lightly infested with other Insectivoran fleas. This might suggest a very limited range for C. kohlsi, although the range of Baird’s shrew is almost everywhere west of the crest of the Cascade Mountains in Oregon.

Range: Cannon Beach, Oregon is a narrow strip of land south of Tillamook Head and bordering the ocean in northwest Oregon. The type locality is within 500 feet of the ocean, and only a few feet above sea level. At present this flea is known only from the type locality.

Deposites: Holotype male and allotype female mounted on one slide bearing the writer’s number 659 and deposited in the Academy of Natural Sciences of Philadelphia. Only four other specimens of this flea are in the collection of the writer. These are listed as paratypes and deposited as follows: 1 male to Dr. Karl Jordan, Tring Branch, British Museum, for the N. A. Rothschild collection, 1 female to Mr. Glen Kohls, Rocky Mountain Spotted Fever Laboratory, Hamilton, Montana for the Public Health Service collection, 1 female deposited in the United States National Museum, 1 female deposited in the California Academy of Sciences.

This flea bears the name of Mr. Glen M. Kohls, Assistant Entomologist, Federal Rocky Mountain Spotted Fever Laboratory, Hamilton, Montana, who has been a constant help to the writer through past years.
Remarks and Conclusions: The Insectivora hold a fertile and unexplored field for the Siphonapterist. While many of these animals have been taken in snap traps for museum specimens, few of them have been sought for their fleas. Too often when taken in traps the animals are cold and the fleas gone when the collector secures the specimens. New ways must be devised to catch the Insectivora alive, and with the coming about of new ways to catch them more fleas will be added to our lists.

In the far west these Insectivora are parasitized by at least one Nearctopsylla and three Corypsyllas, those listed herewith, and how many more fleas of their own we do not know.

DEPOSITORIES

In order that this paper and those of the writer to follow, may be of more value to the general public, the students, and the specialist, collections of the fleas known to the writer will be placed in the entomology or biology departments of the following colleges, universities and museums at home and abroad.


ROCKY MOUNTAINS: United States Rocky Mountain Spotted Fever Laboratory, Hamilton, Montana. University of New Mexico, Albuquerque, New Mexico.

CENTRAL STATES: University of Minnesota, St. Paul, Minnesota. Iowa State College, Ames, Iowa. Ohio State University, Columbus, Ohio.


SOUTHERN STATES: Rice Institute, Houston, Texas.

AMERICAN MOLE AND SHREW FLEAS  
(A NEW GENUS, THREE NEW SPECIES)  

by  

Mr. C. Andresen Hubbard, Sc.D.  
Professor of Biology, and Head of the Department
# West Coast Crested Fleas

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AMERICAN MOLE AND SHREW FLEAS

Two monumental works on American fleas have appeared to date (February 1940), that of Dr. Carl F. Baker, and the work just issued by Mr. Irving Fox. Baker, working at Stanford University, published his first big work under the title “A Revision of American Siphonaptera”, in Proceedings of the U. S. National Museum, Vol. XXVII—No. 1861, 1904, beginning on page 365. His second paper, entitled “The Classification of the American Siphonaptera”, appeared in the Proceedings of the U. S. National Museum, Vol. XXIX—No. 1417, 1906, beginning on page 121. Both papers contain a host index, the two for all practical purposes can be considered as one. In this particular paper the only portions of the host index of interest are those on Insectivora. Under the Family Talpidae Baker lists three moles, the European with eight species of fleas, none of which were then recorded found in the United States. The two American moles listed are 2 subspecies of Scalops aquaticus of the Central and Eastern States. From these moles Baker lists but two fleas, *Ctenophthalmus (Nearctopsylla) genalis* Baker 1904 described from a gopher or mole from Michigan, and *Ctenophthalmus pseudagyrites* Baker 1904, also described from material off gophers in Michigan although known at the time from moles in Iowa.

Under the heading of the Family Sorcidae Baker lists in 1904 no American species of shrews but records five fleas from European shrews, all of which were also listed for the European mole. In the paper of 1906, however, Baker lists two American shrews, both records of N. C. Rothschild for 1904 and 1905; *Sorex obscurus* from Alberta, Canada, off which was taken and described *Ctenophthalmus (Nearctopsylla) hygini*; *Sorex richardsoni*, from British Columbia, off which was taken and described *Ceralophyllus (Malaraeus) telchinum*. In the collection of the writer are several hundred specimens of *Malaraeus telchinum* all off mice, by far the greater number off Deer Mice. This leads the writer to believe the finding of *M. telchinum* on a shrew could be nothing but an accidental occurrence.

While Baker was working at Stanford, the Hon. N. C. Rothschild of England was securing many specimens from Canada through experienced collectors. From these sources Rothschild was able to describe during 1904 in Novitates Zoologicae Vol. XI, under the title of “Further Contributions to the Knowledge of the Siphonaptera” *Nearctopsylla hyrtaci* (page 652) off shrew and weasel from British Columbia, Canada in 1901. *Nearctopsylla hygini* (page 650) off weasels from Alberta, Canada in 1901. *Nearctopsylla brooksi* (page 649) off weasels in Alberta and British Columbia, Canada in 1900, 1901, 1902.
By the end of 1906, then, only two American mole and shrew fleas were definitely known, Neartopsylla genalis Baker 1904, (Neartopsylla hygini Rothschild 1904 is now known to be the same fleas as N. genalis) and, Ctenophthalmus pseudagyrtes Baker 1904.

During December of 1908 an addition to the known mole and shrew fleas was made from the West Coast. Carroll Fox in Entomological News, December 1908 described Corypsylla ornatus, the description being based upon 2 males and 5 females taken from Scapanus californicus at San Francisco, California.

During 1914 Carroll Fox in Hygienic Laboratory, United States Public Health Service, Bulletin No. 97, October 1914, in a paper entitled “Some New Siphonaptera”, describes on page 11 Doratopsylla blarinae from “one specimen of this flea (male) in the collection at the United States National Museum, collected by G. S. Miller, in Washington, D. C., off Blarina brevicauda.” (page 12).


Thirteen years elapse then during 1928 Dr. Karl Jordan of the British Museum, Tring Branch, described Leptopsylla catatina in Novitates Zoologicae Vol. 34, page 186, off a Virginia Opossum at Rolling Rock Club, Ligonier, Pennsylvania. This flea has since been found on the Short-tailed shrew and the Hairy-tailed mole.

During 1929 Dr. Jordan described in Novitates Zoologicae, Vol. 35, page 172, Catallagia onaga from two males that were taken off Short-tailed shrews at Adirondack Lodge, Essex County, New York and on page 173, Hystrichopsylla gigas tahawuna from a male and a female taken off a Short-tailed shrew from New York state.

During 1933 Dr. Jordan described in Novitates Zoologicae, Vol. 39, page 68, Atyphloceras bishopi from a male off a Short-tailed shrew from New York state.

The next paper on shrew and mole fleas seems to have appeared when Dr. Julius Wagner of Belgrade, Europe, published his “The Fleas of British Columbia” in Canadian Entomologist, Vol. LXVIII, September, 1936, based upon a series of fleas which were handed him by Professor Spencer of the University of British Columbia, and the works of N. C. Rothschild. Wagner compiles the data for N. brooksi, N. hyrtaci, now known to be synonymous with Neartopsylla genalis Baker, without adding any new collection records, but in listing Corrodopsylla (Doratopsylla) curvata Rothschild 1915, new records are offered from Kamloops and Abbotsford, British Columbia off Sorex sp.? In the material supplied by Professor Spencer, Wagner found an undescribed male flea taken off a mole and described it in a very short description as Neopsylla scapani in “Neve Nordamerikanische Floharten” Zeitschrift für Parasitenkunde, 8 Band, 6 Heft. Sept. 1936, pp. 654-658.
In literature one next encounters the monumental work of Irving Fox. This is his "Fleas of the Eastern United States" which was issued from the Iowa State College Press during February of 1940. It is the understanding of this writer that Fox spent several years examining the records of eastern collections of fleas, the volume apparently being a compilation of these records. Of the several hundred records compiled by Fox in this volume only 40 are of insectivora, 3 of these the original records of the descriptions without additional collection data, and 4 mentions without collection records.

Of the 14 fleas listed in these 40 records only *Epitedia wenmanni* and *Foxella ignotus* are found on the West Coast.

These 40 records are as follows:

**THE SHORT-TAILED SHREW—BLARINA BREVICAUDA**

In the host index of the work of Fox, Blarina brevicauda has by far the greatest number of entries of the Insectivora. The fleas found upon this Short-tailed shrew are according to Fox, and listed by this writer according to prevalence.

*Ctenophthalmus pseudagyrtes* Baker 1904.

Fox says about this flea, "Exceedingly common on various small mammals", and as one studies the records of Fox one realizes that this flea must be of the vicariating species, preferring no special animal as its special host, enjoying any it might come in contact with. Fox has about 40 compiled records for this flea, 7 of which are for the Short-tailed shrew, from the states of Iowa, Maryland, Massachusetts, Minnesota, and Ohio.

*Doratopsylla blarinae* C. Fox 1914

Fox presents 9 compiled records for this flea, of which 7 are for the Short-tailed shrew, from the states of Connecticut, the rest from Maryland and he says, "During spring and summer this species occurs abundantly on shrews in the east. In the middle west, however, it is replaced by the following species."

*Doratopsylla curvata* Rothschild 1915

Fox lists 4 records for this flea of which 3 are for the Short-tailed shrew, from the states of Iowa, Minnesota, and Montana.

*Nearctopsylla genalis* Baker 1904

Fox lists but 4 records for this flea, 3 of which are from the Short-tailed shrew, from the states of Iowa, New Hampshire, and Minnesota.

**ACCIDENTAL OCCURRENCES ON SHORT-TAILED SHREW**

Although Fox does not use the words Accidental Occurrence in his work, this writer after thoroughly weighing the evidence as regards to the hosts of fleas uses the term to indicate that the flea is on an animal which normally it does not infest.

*Epitedia wenmanni* Rothschild 1904

Fox lists 27 records for this species. He states an opinion with which this writer concurs, that is "This species seems to be pre-eminently a flea of the white-footed mouse". All records that this writer has for this species on the West Coast are from white-footed mice, therefore this writer feels that the 2 records Fox records for this flea from Short-tailed shrews are doubtless of accidental occurrence. The 2 records come from Maine and Tennessee.
Cediopsylla simplex Baker 1895

There is little doubt that this species is a true rabbit flea. The many compiled records offered by Fox for this species surely proves this even though there is a sprinkling in the records of Carvivora of one type or another that use the rabbit for food. Therefore, the 1 record for the presence of this flea upon a Short-tailed shrew is surely an accidental occurrence. The record comes from Waukon, Iowa.

Odontopsylla multispinosus Baker 1898

This species like the preceding is a true rabbit flea. Of the 14 records offered by Fox 11 are from cottontail rabbits, 1 from a raccoon, 1 from a bobcat, and 1 from a Short-tailed shrew; the shrew record from Waukon, Iowa is surely accidental occurrence.

Orchopeas leucopus Baker 1904

Practically all of the 38 records offered by Fox for this flea are from the eastern white-footed mouse. The single record for Short-tailed shrew comes from Waukon, Iowa. This flea is generally found on white-footed mice, once in a while on Microtus, therefore, its occurrence upon a Short-tailed shrew must have been accidental.

Orchopeas wickhami Baker 1895

Although Fox lists this flea from the Short-tailed shrew under his caption "Eastern Hosts", the record is missing. This flea should be considered a true tree squirrel flea, although Fox presents records from a variety of other animals and a bird nest.

Peromyscopsylla (Leptopsylla) catatina Jordan 1928

Fox lists the presence of this flea upon Short-tailed shrew in his "Eastern Hosts" but fails to include the record.

LISTED BY FOX FROM TYPE MATERIAL WITH NO ADDITIONAL RECORDS

Atyphloceras bishopi Jordan 1933

Male from Fairport, New York, on Blarina brevicauda talpoides.

Catallagia onaga Jordan 1929

Two males from Blarina brevicauda at New York.

Hystrichopsylla gigas tahauana Jordan 1929

From a male and female off Blarina brevicauda at New York.

THE EASTERN MOLE—SCALOPS AQUATICUS

The Eastern mole, listed under various sub-species of Scalops aquaticus comes second in the host index of Fox with 6 listed records and 1 mention.

Ctenophthalmus pseudagyrttes Baker 1904

Of the 40 records listed for this vicariating flea only 5 are off the mole, these being from the District of Columbia, and the states of Iowa, Indiana, Maryland, and Virginia.

Foxella ignotus Baker 1895

This flea is a true gopher flea. Fox lists only 5 records for this rather common western species, 1 for Scalopus from Iowa, which this writer would be inclined to consider an accidental occurrence.

Nearctopsylla genalis Baker 1904

Fox lists under his caption of "Eastern Hosts" and "Type Material" the terms "Moles" and "Scalops" but there are no actual records listed and actual collection records for moles under this species seem in doubt.
HAIRY-TAILED MOLE—*PARASCALOPUS BREWERI*

*Ctenophthalmus pseudagyrtes* Baker 1904

But a single record from Concord, New Hampshire.

In the caption of “Eastern Hosts” Fox lists this mole under *Epitedia wernanni* Rothschild 1904 and *Peromyscopsylla catatina* Jordan 1928 but the actual records are missing.

**STAR-NOSED MOLE—CONDYLURA CRISTATA**

This mole is listed in the host index of *Ctenophthalmus pseudagyrtes* and *Orchopeas wichhami* Baker 1895 but actual records are not given.

**THE WATER SHREW—*NEOSOREX PALUSTRIS ALBIBARBIS***

Fox lists but 1 mention for the Water shrew. This is in the host index for *Doratopsylla blarinae* C. Fox 1914. The actual record is not present.

By the end of February 1940, then, 11 fleas were known to habitually infest American moles and shrews. Fox compiles records for most of these in his 40 records from the U. S. east of Ravalli County, Montana.

During March of 1940 this writer issued in Pacific University Bulletin, Vol. XXXVII, No. 1 West Coast Crested Fleas, in which he described *Nearctopsylla jordani* off moles from Cannon Beach and Forest Grove, Oregon, redescribed *Corypsylla ornatus* Fox 1909 from several hundred specimens in his collection, and added further to the list of West Coast Insectivora fleas in describing *Corypsylla jordani* off *Neurotrichus gibbsi gibbsi*, from Gaston, Oregon, and *Corypsylla kohlsi* off *Sorex obscurus bairdi* from Cannon Beach, Oregon. In this paper the writer also compares *Corypsylla* with *Nearctopsylla* and differences between *Corypsylla ornatus*, *Corypsylla jordani* and *Corypsylla kohlsi*. That a distinct difference exists is very apparent especially when one examines the specimens or the comparative illustrations with the article. At this time, then, the writer separates *Corypsylla kohlsi* from the genus *Corypsylla* and erects for it

*CORYPSYLLOIDES* new genus this name suggesting the
intimate relation between this new genus and the genus *Corypsylla*.

The genotype is *Corypsylloides (Corypsylla) kohlsi* Hubbard 1940.

The male and female agree with *Corypsylla C. Fox* 1909 in nearly all particulars, but differs in: Head: rounded, no frontal tubercle, genal teeth, all about same length, spatulate.

Thorax: Pronotal comb in female without “indistinct pseudospines”, the teeth of the comb in both male and female all normal.

Abdomen: Abdominal tergites without heavy transverse incrassation. Spermatheca different in shape. See two plates herewith for comparisons. *Corypsylloides kohlsi* Hubbard 1940

In addition to the data given in a previous paper the writer would like to add at this time the taking of a female of this flea off a specimen of Baird's shrew at Forest Grove, Oregon, 65 miles east and south of the type locality. This suggests greater range than originally expressed.

The writer has in his collection 3 additional undescribed Insectivora fleas from the West Coast, the description of these follow.
Doratopsylla jellisoni new species

This flea is close to Doratopsylla curvata Rothschild 1915, difference being primarily in the modified segments.

Head: Male and female, well rounded, no tubercle. Genal comb of 4 teeth, genal process visible above upper genal tooth. Frons with upper row of 6 medium spines, below these but above base of genal teeth 3 heavy spines and a number of small bristle. Postantennal region with 3 definite rows of about 6 spines each, and a series of small bristles.

Pronotal Comb: in male and female about 20 teeth.

Abdomen: Seventh abdominal tergite produced into a rather strongly chitinized process between the two sets of antepygidal bristles. Antepygidal bristle, 3 in both male and female, the middle one several times as long as the outer and inner one. The apical edges of the abdominal segments scalloped, but no teeth on the tergites, which are armed with a row of heavy spines, a row of medium spines, and a row of small bristles. Sternites generally with 2 heavy spines on either side.

Modified Segments: male. Clasper is divided into two processes, between which there is a very small lobe. The upper process P1 is slender and bears two long spines at the apex. This species differs from C. curvata in that the lower process P2 is shorter than P1, but much wider, the shape being different from that of C. curvata, and there may or may not be one or two hairs at the apex. At the insertion of the movable finger F there is a long stout spine and a thin bristle. The movable finger F is not "of nearly even width from near the base to the apex" (original description page 27) but sickle-shaped and longer than both P1 and P2. See Illustrations. Sternites IX different in shape and with different bristle arrangement than in D. curvata.

Female. The apical margin of the VII sternite is quite different from that of D. curvata, but spermatheca is similar. See plate.

Average size: Male 1.90 mm., Female 2.15 mm.
Normal host: Various species of western shrews.
Accidental occurrences: Sometimes found on meadow mice.
Type locality: Forest Grove, Oregon.
Range: Taken by the writer off various shrews in Washington, Oregon and northern California west of the crest of the Cascade mountains.
History: At this time of describing there are 100 specimens of this flea before the writer. The holotype male and allotype female were taken off a Trowbridge shrew, captured under a new hay cock on June 20, 1935, three miles northeast of Forest Grove. Since that time this species has been taken off the following shrews: S. v. vangans, S. o. bairdi, S. t. trowbridgi, S. p. yaquinae, S. p. pacificus and from Microtus oregoni oregoni, and M. townsendi from Seattle, Wn. to Crescent City, Calif.
Deposites: The holotype male and allotype female mounted on one slide bearing the writer's number 255 and deposited in the Academy of Natural Sciences of Philadelphia. The first 20 males and 20 females beyond the holotype and allotype are mounted 1 male and 1 female to the slide and designated by the writer as paratypes and deposited in depositories established and listed by the writer elsewhere.
This flea bears the name of Mr. William L. Jellison, Assistant Parasitologist, United States Public Health Service, Hamilton, Montana, who has helped the writer in many ways during the past years.

_Epitedia jordani_ new species

Dr. Karl Jordan informs the writer that this flea is “superficially similar to _E. wenmanni_, but easily distinguished in both sexes by the shortness of the lower and upper antepygidial bristles, in the male by the undivided Process P of the clasper and the IX sternite, in the female by the very different spermatheca”. This statement comes from the pen of Dr. Jordan in a letter dated February 1940.

Head: male and female, well rounded, no tubercle. Genal comb of 2 teeth, the outer overlapping the inner and being only about half as long, but about twice as wide. Genal process visible above inner tooth. Frons with anterior row of 6 medium sized spines, then midway between these and base of genal teeth a row of 4 spines, 3 stout ones extending out to the tip of the longest genal tooth, the second from the antennal groove much shorter, extending only to about the base of the genal teeth. Patch of small bristles anterior and dorsal to base of genal teeth. Postantennal region with 3 definite rows of about 6 spines each.

Pronotal comb: male and female about 14 teeth.

Abdomen: 3 antepygidial bristles in male and female, the middle one being about 3 times as long as the others.

Tergite teeth constant in number, 1 on each side.

Spines: row major spines, row minor spines and some small bristles on each tergite, sternites with varying number of spines.

Modified Segments: male. Process P not divided. See illustration for shape and structure of Process P and its movable finger F. Sternite IX characteristic, a stout arm with 5 or 6 stout black conical teeth at the apex and what appears like a series of long fine hairs on posterior border. Female. Apical margin of sternite VII characteristics, as is the shape of the spermatheca. See plate.

Average size: Male, 2.00 mm. Female, 2.15 mm.

Normal host: This flea is a vicariating species which seems to be able to make itself at home on almost any small mammal it can contact. 75 records of the writer for this flea show a slight preference for Insectivora. The writer has taken this flea off of Townsend’s mole in numbers, off Yaquina shrew, Palmer’s shrew, Trowbridge’s shrew, and Baird’s shrew, sometimes in numbers, sometimes singly, off Gibb’s shrew mole on two occasions and in single numbers off Mountain Beavers, Ruddy Deer mice, Gray-tailed meadow mice, Tillamook Long-tailed meadow mice, and Townsend’s meadow mice. A specimen was taken off a Chipmunk at Spirit Lake, Washington and out of a Pine Squirrel nest at Sisters, Oregon.

Type locality: Newberg, Oregon.

Range: Taken by the writer from Seattle, Washington south to Brookings, Oregon and from points in Oregon and Washington west of the Great Basin region, but no records from the desert region.
History: Holotype male and allotype female taken from the nest of a Trowbridge shrew, in which were a female with her 5 half grown young. The nest was under an old hay cock that had been left in the field over winter for the writer. It was uncovered April 1, 1934 on Chehalem mountain, Newberg, Oregon. This flea was known to the writer as early as June, 1921, when he took it off Aplodontia rufa rufa on the Campus of the University of Washington where he was writing a thesis upon the Mountain Beaver. These early mounted flea specimens were all ruined for taxonomic purposes by the use of too strong bleach.

Deposites: The holotype male and allotype female mounted on one slide bearing the writer's collection date of April 1, 1934 are deposited in the Academy of Natural Sciences of Philadelphia. Of the 75 specimens before the writer at the time of describing, the first 20 males and 20 females beyond the collection date of the holotype and allotype will be mounted 1 male and 1 female to the slide and listed by the writer as paratypes, and deposited in depositaries established and listed by the writer elsewhere.

This flea bears the name of Dr. Karl Jordan.

*Epitedia stewarti* new species

This species is very close to *Epitedia jordani* Hubbard 1940 from which it differs primarily in the shape of the IX sternite in the male and the apical margin of the VII sternite in the female.

Head: male and female. Shape, structure, genal comb and chaetotaxy as for preceding species.

Pronotal Comb: male and female about 14 teeth.

Abdomen: 3 antepygidial bristles in male and female, the middle one three times as long as the others.

Tergite teeth constant in number, 1 on each side.

Spines: row major spines, row minor spines and some small bristles on each tergite, sternites with varying number of spines.

Modified Segments: Male. Finger F much more slender than in preceding species. IX Sternites differently shaped at apex but still armed with 4 or 5 stout black teeth, fine hairs on posterior boarder.

Female. Apical margin of the VII Sternite different from preceding species, spermatheca similar. See plate.

Average size: Male 2.10 mm. Female 2.30 mm.

Normal host: Known only from Pacific Shrew.

Type locality: Smith River, California.

History and Deposites: Holotype male and allotype female taken off a pair of Pacific shrews from under same log at Smith River, June 16, 1939. These mounted separately, bearing the writer's number 1445 are deposited in the Academy of Natural Sciences of Philadelphia. A second male, the only other specimen known to the writer is listed as a paratype and is deposited in the U. S. National Museum.

This flea bears the name of Dr. M. A. Stewart, Entomologist, University of California, Davis, who has been of much assistance to the writer in the past.

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INDEX OF AMERICAN MOLE AND SHREW FLEAS

Canada
1. Nearctopsylla brooksi Rothschild 1904
   Off weasels, Mable Lake, B. C., but doubtless an Insectivora flea.
2. Nearctopsylla hyrtraci Rothschild 1904—off S. obscurus, B. C.
4. Doratopsylla curvata Rothschild 1915—off Sorex, Kamloops, B. C.
5. Neopsylla scapani Wagner 1936—off S. orarius, Vancouver, B. C.

Central and Eastern United States
   Off Short-tailed shrew, Eastern, Hairy-tailed and Star-nosed mole.
3. Doratopsylla blarinae C. Fox 1914—off Short-tailed, Water shrew.
4. Doratopsylla curvata Rothschild 1915—off Short-tailed shrew
5. Leptopsylla catatina Jordan 1929—off Short-tailed shrew.
6. Hystrichopsylla g. tahavuana Jordan 1929—off Short-tailed shrew.
7. Atyphloceras bishopi Jordan 1933—off Short-tailed shrew.

West Coast of the United States
(Personal records of the writer)
1. Corypsylla ornatus C. Fox 1909
   Off 25 specimens of Scapanus townsendi, orarius, latamanus.
2. Corypsylla jordani Hubbard 1940.
   Off 35 specimens of Neurotrichus gibbsi gibbsi, the shrew mole
   Off 50 records for Baird’s shrew.
3. Corypsylloides kohlsi Hubbard 1940
   Off 50 records for Baird’s shrew.
4. Nearctopsylla jordani Hubbard 1940
   From 25 specimens of Scapanus townsendi.
5. Doratopsylla jellisoni Hubbard 1940
   From 90 Trowbridge, Vagrant, Baird, Yuquina and Pacific shrews.
6. Epitedia jordani Hubbard 1940
   From 10 records of Townsend mole, 25 records of Yaquina, Palmer
   Baird and Pacific shrews and 2 records Gibb’s shrew mole.
7. Epitedia stewarti Hubbard 1940
   From 2 records of Pacific shrew.

Accidental Occurrences

Eastern States—
Epitedia wenmanni
Cediopsylla simplex
Odontopsylla multispinosus
Orchopeas leucopus and wickhami
Foxella ignotus

West Coast—
Catallagia charlottensis
Monopsyllus wagneri ophidius
Leptopsylla selenis
Leptopsylla musculi (segnis)

12
WEST COAST CATALLAGIAS

(THREE NEW SPECIES)

by

Mr. C. Andresen Hubbard, Sc.D.

Professor of Biology and Head of the Department

The genus Catallagia was established and erected by the Hon. N. C. Rothschild in Ectoparasites Vol. 1, 1915, page 41 in a paper entitled "On Neopsylla and Some Allied Genera of Siphonaptera" to hold a series of fleas which agreed with Neopsylla Wagn. (1902) in nearly all particulars, but differed in the total absence of genal teeth. The genotype named was charlottensis Baker (1898, as Pulex), Charlottensis although originally described as a Pulex, was later shifted to Ceratophyllus Curtis 1832, then to Odontopsyllus Baker 1905. Besides charlottensis there was placed in the new genus telegoni Rothschild 1905, wymani Fox 1909 and the then newly described decipiens Rothschild 1915. In 1937 Dr. Karl Jordan erected the genus Delotelis to hold telegoni, this taking it from the Catallagias.

In the collection of the writer are 5 Catallagias from the West Coast, the two old standbys charlottensis and decipiens and 3 undescribed species which are described below. The constancy of many features found in these five is remarkable. The similar features follow.

Head: Well rounded, but not quite so well in male as in female. No genal teeth. Heavy pigmented triangular spot on gena adjacent to antennal groove. On frons a row of 5 or 6 medium spines, and just anterior to pigment spot a row of 4 spines, 3 stout and as long as the genal flap, the 2nd below the antennal groove extending only beyond the pigment spot, 2 or 3 small spines ventral to the pigment spot. Some minute bristles scattered over gena. Postantennal region with 3 very distinct rows of 6 spines and a fringe of small bristles along antennal groove.
Pronotal Comb: Both sexes in all species 14 teeth.

Abdomen: Antepygidial bristles 3 in both sexes, some difference in ratio of lengths. Tergite teeth not constant in number but generally 1, 2, or 3 on either side of the first 4 tergites. A row of major spines, a row of medium spines to the anterior and a row of small spines situated in line with and in between the major spines on tergites. 2 or 3 major and 2 or 3 minor spines on the anterior 5 sternites.

Modified Segments: Process P of the male and its movable Finger F fairly constant in shape but the IX sternite characteristic for the species. In the females there is some difference in the outline of the VII sternite, the spermatheca similar in 4 of the species, quite distinct in the 5th. In the species with similar spermatheca the appendix has its neck extending deep into the body, a characteristic seen nowhere else except in Epitedia wenmanni Rothschild 1904.

In habits these Catallagias are similar in that many more of them can be found in the hosts' nest than upon the hosts themselves. They are, then, what might be called nest fleas and probably leave the host just as soon as the host makes ready to leave its nest. All these Catallagias seem to prefer Deer mice for their hosts but frequently they can be found upon Meadow mice and shrews. There is little doubt that the species have different seasonal distribution. The range is individual for each of the species.

Catallagia charlottensis Baker 1898

This flea was described from females sent Baker by the Rev. J. H. Keen, taken from a mouse nest at Masset, Queen Charlotte Islands. During 1905 Rothschild pictured and described what he thought was the male but the identification was in error and he reported in 1915 that this male represented an unnamed species, which he then described as C. decipiens. To clear up this matter the writer illustrated the male and female of both C. charlottensis and C. decipiens in the paper in which the new genus was erected.

In the west this flea ranges from the crest of the Cascade mountains to the Pacific ocean and can be taken off Deer mice, Meadow mice and shrews during late winter and spring. A host may carry one or two but if the nest of the host can be found during March large numbers can be collected as is expressed in the writer's record of 5 Meadow mouse nests, Corvallis, Oregon, March 24, 1939, 60 males and 75 females of this flea. The records of the writer lead him to believe the seasonal maxima comes for this flea about the middle of March. Eggs are formed about 3 at a time, are more rounded and smaller than the average run of flea eggs and are layed during March.

While the original length for the female given by Baker was 2.50 mm. those in the writer's collection average about 2.00 mm. for both sexes.

In this species the antepygidial bristles are, inner and outer, about the same length, the middle one slightly more than twice as long as the others. The apical margin of the VII sternite of the female represents almost a flat surface, the spermatheca is typical. In the male the IX sternite is armed with 4 stout, black, conical teeth at the apex and slightly below 2 isolated bristles. See plate.
Catallagia scullenii new species

This species is close to the preceding from which it differs in:

Antepygidal bristles. Inner 1/3rd shorter than the outer, the outer 1/2 as long as the middle one. The margin of VII sternite of female has what might be called three lobes, none of them prominent. The IX stern­ite of the male is armed with 4 stout, black, conical teeth at the apex, the most distal the longest, augmented slightly below with a forest-like patch of stout bristles. See illustrations. Length of male is 2.20 mm., female 2.25 mm. Normal host is the Deer mouse. Type locality is Forest Grove, Oregon. The range extends from the Pacific ocean east over the Coast Range into the Puget Sound Trough in Oregon and Washington. Season: This species generally comes into collections during late spring and sum­mer.

This species bears the name of Dr. H. A. Scullen, Assistant Ento­mologist, Oregon State College, who has been a help to the writer.

Deposites: At the time of describing there are 35 specimens of this species before the writer. The holotype male and the allotype female are mounted on one slide bearing the writer’s number 1303 and deposited in the Academy of Natural Sciences of Philadelphia. 20 other specimens are listed as paratypes to be distributed to depositories listed elsewhere.
Catallagia decipiens Rothschild 1915

Described from collections off Red-backed mice, Deer mice and Wood-rats taken in British Columbia and Alberta, Canada, 1901-1903.

The spermatheca is broader than in the preceding and the VII abdominal sternite has a well developed lobe on the free margin. The IX sternite of the male is armed with 3 apical stout, black teeth, all recurved, the most distal the longest, augmented proximally with 2 spiniform bristles, also recurved at the tip. 1 small bristle above and 1 small one below the spiniforms. See illustrations. The inner antepygidal bristle is slightly shorter than the outer, the middle one more than twice as long as the outer. Length of male 1.80 mm., of female 1.65 mm. Hosts are Deer mice and Meadow mice. Range: From crest of the Cascade mountains east, throughout the Great Basin.

Catallagia chamberlini new species

This species is close to *C. decipiens* Rothschild 1915.

Antepygidal bristles, middle one not quite twice as long as the outer one, the outer one being about 1/3rd longer than the inner. The margin of the VII sternite of the female with a single lobe, which is different in shape from the other species. In the male the IX sternite bears 4 or 5 stout, black, conical teeth at the apex, the most distal longest and slightly recurved; slightly below a plateau upon which are 3 stout spiniform bristles, then slightly lower a small patch of stout bristles. The plateau is fringed with shorter bristles. See illustrations. Length of male 2.00 mm., of female 2.10 mm. Normal host is the Deer mouse. Type locality: Rocky Point (north of Klamath Falls), Oregon. Range: Cascade and Siskiyou mountains of Oregon, with encroachments into the Willamette valley.

Deposites: At the time of describing there are 25 specimens before the writer. Holotype male and allotype female mounted on one slide bearing writer’s number 1515 are deposited in the Academy of Natural Sciences of Philadelphia. 20 other specimens are designated as paratypes and distributed to depositories listed elsewhere.

This species bears name of Dr. J. W. Chamberlin, Associate Entomologist, Oregon State College, who has been a help to the writer.

Catallagia motei new species

Known to the writer only through 10 females in his collection, all having the characteristics of the Catallagias, but the spermatheca is quite distinct. For its structure and the outline of the margin of the VII abdominal sternite see illustrations. Length 2.10 mm. Range: Puget Sound Trough in Oregon and Washington.

History: The first specimen of this flea was taken out of a deserted Microtus nest in a hollow log beside a small lake at Banks, Oregon (Type locality), on April 7, 1937. Next day a second specimen was taken from a Deer mouse trapped close to the nest. Since that time the writer has taken 1 from a chipmunk at Spirit Lake, Washington, 3 from Microtus nests at Corvallis, Oregon, and 4 others from Deer mice.

This species bears the name of Dr. Don C. Mote, Entomologist, Oregon State College, who has constantly encouraged the writer.

Deposites: The holotype female bears the writer’s number 666 and is deposited in the Academy of Natural Sciences of Philadelphia. 7 other specimens listed as paratypes are deposited one each in the U. S. National Museum, and Tring Branch British Museum.
A CHECK LIST OF
THE FLEAS OF THE PACIFIC NORTHWEST
(Washington, Oregon, Northern California and Northwestern Nevada)
With Notes from Southern California

by

Mr. C. Andresen Hubbard, Sc.D.
Professor of Biology and Head of the Department

In this list of the fleas of the northwest the order used is that suggested to the author by Dr. Karl Jordan of the British Museum. For the most part the records are taken at random from many hundreds in the writer's private collection which he has personally collected over a period of years. Records from other sources are given full credit. In case specific host data is wished for the records below turn to Provisional List of Land Mammals of the State of Washington by Taylor and Shaw, The Mammals and Life Zones Of Oregon by Bailey or the various publications in Zoology, University of California. These sources give the range of the various species listed below under common names.


13. Orchopeas caedens caedens Jordan 1925. An Alberta, Canada subspecies thought by some authorities to be in California.

Calif., Dilley, Oreg., Pine Creek, Calif., Coleman’s Ranch, Nev., 1937.
15. *Opisodasys keeni* Baker 1896. Off Deer Mice at Spirit Lake, Wash., 1938,
Dilley, Oreg., Pine Creek, Calif., Coleman’s Ranch, Nev., 1937.
17. *Thrassis acamantis* Rothschild 1905. Off Ground Hogs at White Salmon, Wash., 1938. The writer does not believe this species is an Oregon form but Dr. Stewart seems to feel that it is found in California.
33. *Malaraeus sinusoidus* Jordan 1925. Known by the writer only from 3 specimens taken off Deer Mice at Mitchell, Oreg., 1939.

46. Monopsyllus exilis exilis Jordan 1937. Known to the writer only from specimens taken off Grasshopper Mice in central Oregon.


51. Ctenophyllus terrificus Rothschild 1906. Off Cones. Taken by the writer all through the Cascade Mountains of Oregon and at Goose Lake, Wash. Although there is no natural barrier between the range of Oregon and California, this species has not been reported from California.


65. Epitedia wenmanni Rothschild 1904. Off Deer Mouse at Parkdale, Oreg., 1934. Opinions differ as to presence of this species in California.


71. Catallagia chamberlini Hubbard 1940. Off Deer Mice at Rocky Point, Oreg., 1939.


73. Delotelis teleogeni Rothschild 1905. Apparently a nest flea, difficult to collect and scarce in collections. 20 specimens in the collection of the writer from mouse nests in Oregon. No California records.

74. Rectrofrontia fraterna Baker 1895. Apparently not found in California, and but 1 record from Oregon off a Cony by the author.


76. Micrupsylla peromyseus D. and P. 1923. Said in some sources to be synonymous with the above, but ranges distinct in Oregon. Off Deer Mice on many occasions in northwest Oregon.

77. Trichopsylloides oregonensis Ewing 1938. Also described by Jordan as Phaneris hubbardi, the latter description showing better the relations of the flea. Off Mt. Beaver by the author as early as 1920 at Seattle, Wash., Otis, Oreg., 1939, Fort Dick, Calif., 1939.


84. Corypsylloides kohlsi Hubbard 1940. Off Baird's Shrew at Cannon Beach, Oreg., 1939.


The Following Are Listed or Described From California

South of San Francisco Bay.

Hoplopyllus anemalous Baker 1904 off California Ground Squirrel
Hoplopyllus tenuidigitus Stewart 1940 off Cottontail at Jamaburg
Anomiopsyllus nudatus Baker 1898 off California Ground Squirrel
Anomiopsyllus falsicalifornicus C Fox 1929 off Wood Rat, Los Angeles
Orchopeas sexdentatus sexdentatus Baker 1904 off Wood Rat, Boulder Creek
Orchopeas latens Jordan 1925 off Gray Squirrel at Santa Cruz
Tihassis desertorum Stewart 1937 off Antelope Ground Squirrel, Riverside
Amphillus necopinus Jordan 1925 off Cony at Pine City
Foxella ignota aednus Stewart 1940 off Pocket Gopher, Jamaburg
Dactylopylla blul C Fox 1909 off Weasel
Monopsyllus ciliatus ciliatus Baker 1904 off Chipmunk at Mountain View
Monopsyllus fornasis Jordan 1937 off Gray Squirrel at Seven Oaks
Leptopsylla ebrirgini Fox 1926 off Wood Rat at Los Angeles
Leptopsylla hemisphaerius Stewart 1940 off True's Deer Mouse
Caruterella carleri Fox 1927 off Wood Rat at Los Angeles
Atheropsylla bakeri Stewart 1940 off Kangaroo Rat, Jamaburg
Trirachipsylla digitiformis Stewart 1940 off Pocket Mouse, Jamaburg
Catallada wymanii Fox 1909 off Meadow Mouse
Corypsylla setosifrons Stewart 1940 off Mole at Jamaburg
Atyploceras felix Jordan 1933 off Deer Mice, Jamaburg
Atyploceras longipalpus Stewart 1940 off Skunk, Jamaburg
Hystrichopsylla schefferi mammoth Chaplin 1921 off Mt. Beaver, Pine City
Thrassis arizonensis arizonensis Baker 1898 off Citellus s. Calif.
Thrassis arizonensis littoris Jordan 1929 off Citellus s. Calif.
Orchopeas dieferi C. Fox 1929 off Bobcat at Los Angeles
Monopsyllus ciliatus mononis Jordan 1929 off chipmunks at Pine City
Amphillsylla neotomae i. Fox 1940 off wood rat at Dos Palos
A Review of
the Fleas of the Genus Meringis
With Two New Species

by
Mr. C. Andresen Hubbard, Sc.D.
Professor of Biology and Head of the Department

This review of Meringis comes from 500 specimens personally collected by
the writer off Kangaroo rats, Pocket mice, Gnome mice, and as strays off other
desert mice in the states of Washington, Oregon, California and Nevada.

Meringis like fleas first made their way into literature when the Hon.
N. C. Rothschild erected the genus Phalacropsylla on page 39 of Ectoparasites I,
1915 to hold a new species paradisea collected by O. C. Duffner off Epimys
spec., Mus spec., and a Civet Cat at Paradise, Arizona during 1913. In 1926
C. Fox added cunningi, in 1929 Jordan added shannoni and arachis. Here the
matter rested until 1937 when Dr. R. R. Parker of the Rocky Mountain Spotted
Fever laboratory sent to Dr. Karl Jordan of the British Museum specimens
of fleas from Powderville, Montana. Upon examination Jordan found them
to be Phalacropsylla like. In reviewing the forms then included in this genus
Jordan decided to split it, so was erected the genus Meringis, established on
page 268 of Novitates Zoologicae XL, 1937. Dr. Jordan says “The species now
contained in Phalacropsylla Roths. 1915 fall into two natural groups which I
regard as generically distinct, the main differences being as follows: In Phala-
cropsylla the rostrum reaches to apex of forecoxa, in Meringis at most to three-
fourths; in the former the anterior abdominal terga bear apical spines, which
are absent from Meringis; the hind coxa of Phalacropsylla has, on the inner
surface a patch of small bristles and small spiniforms, and in the new genus
a row of short but rather stout spiniforms; the hindtarsal segment III has only
in Meringis a long apical bristle which reaches beyond the middle of V. In the
male of Meringis sternite IX has a lateral process which is absent from Phala-
cropsylla, and in the female the sensillum of tergum IX is posteriorly not con-
 vex and not sharply defined, as it is in Phalacropsylla.”

Into Meringis Jordan moved cunningi Fox, arachis Jordan, shannoni Jor-
dan and his newly described parkeri. No new additions were made to this genus
until July of 1938 when Mr. Glen M. Kohls of the Rocky Mountain Laboratory
staff described hubbardi and dipodomys.

First printing 500 copies. Mailed out November 15, 1940. Holotypes dis-
patched to depository November 15, 1940.
Generic characteristics which are common to the above mentioned and to the two species described below as new are:

Head: Two genal teeth, the outer short and broad, the inner narrow, more pointed and about one-half again as long as the outer. Two rows of bristles on the gena, an anterior row of 3 medium and a lower row of 4 heavy ones, 3 extending slightly beyond the genal teeth, the 2nd from the antennal groove extending only about half way down the shorter genal tooth. Few small bristles scattered on gena. Post-antennal region with 3 rows of about 5 bristles each and along antennal groove some minute bristles.

Pronotal comb with 14 teeth.

Abdomen: No apical spines on tergites. Bristles on tergites a row of major, posterior; a row of medium, anterior, and between the major bristles a minor bristle. Antepygidal bristles, number and ratio of lengths different for the species. Manubrium, IX sternite, Process P and its movable finger F of male all distinct for the species. In female the spermatheca is of a general shape for all but the ratio of the tail differs with the species as does the apical margin of the VII sternite.

The species of *Meringis* are here enumerated in order of the complexity of the IX sternite of the male.

**Sternite IX of Male without Proximal Ventral Lobe.**

*Meringis arachis*. Jordan was described from 30 miles southeast of Tucson, Arizona, where Vernon Bailey took it off *Dipodomys spectabilis* January 30, 1921. Jordan says in Notes On North American Fleas, Novitates Zoologicae XXXV, 1929, January, page 37, "Chaetotaxy essentially as in Ph. cummingi* Fox (1926), but the bristles of sternite VIII more distal; clasper with fewer bristles; exopodite narrower, without any bristles in lower two-fifths; apex of sternite IX more pointed and the two spiniforms nearer the point. Female. Apical margin of sternite VII slanting, somewhat undulate, with a shallow bay at some distance above the ventral angle, which is rounded off; apex of tergite VIII pointed. Head of spermatheca as broad anteriorly as posteriorly, but thinner in the middle."

The range of this more eastern of the *Meringis* is not known to the writer.

*Meringis dipodomys* Kohls is described in Public Health Reports Vol. 53, No. 28, July 1938, p. 1219 where Kohls states that this species is closely allied to *Meringis arachis* but is distinguished from it by the modified abdominal segments. The paratypes are reported from Imperial and Inyo counties, California, the collections made off Kangaroo Rats and a wood rat during 1935 and 1936.

Male and female both with 3 antepygidal bristles. Female agrees with *M. arachis* but apex or tergite VIII is truncate not pointed as in *arachis*. The spermatheca is not typical. In male posterior margin of clasper nearly straight, process P very short in relation to F, which is long, much broader than in *M. arachis*, and with the apex broadly rounded. Apical portion of sternite IX similar to *M. arachis*; a very small pale cone shaped spine and a hair situated at the apex. Two or three spiniforms, the more distal one of which is the smaller, on the ventral apical margin of this sternite.

From the distribution of the paratypes the range of this flea should be east of the Sierra and San Bernardino Mountains and south of Mono Lake in California and probably on into Nevada, Arizona and New Mexico.

*Meringis cummingi* C. Fox was described on page 182 of Pan-Pacific Entomologist, Vol. 11, No. 4 April 1926 from 1 male taken off *Dipodomys agilis* at Los Angeles, Calif., during 1925. Since the time of the description nothing more has been heard of this species. The writer has in his collection 100 specimens personally gathered off *Dipodomys heermanni californicus* Merriam in Oregon and California. In both male and female there are 3 antepygidal bristles. The IX sternite of the male is without a proximal ventral lobe, the posterior border bearing 2 spiniforms at the apex, the lower one the stoutest and blacker, and below these about 5 bristles. The spermatheca of the female is typical but the tail is long in comparison to the body. The VII sternite of the female shallows off anteriorly towards the ventral. This flea ranges from Los Angeles north through California and into Oregon where its northern range and that of its northern host the Northern California Kangaroo Rat is stopped by Sprague River and Klamath and Sycan marshes to the north, Quartz and Winter mountains to the east, and the Cascade mountains to the west.
Meringis walkeri new species

Like the preceding forms this flea has no proximal ventral lobe on the IX sternite of the male. Insofar as the male has but two antepygidal bristles this Meringis could be closely related to M. shannoni and M. hubbardi. The IX sternite of the male is different from other Meringis and has at its ventral apical margin a black spiniform below which are two bristles, slightly curved, followed ventrally by 4 hairs, then where the proximal ventral lobe should be a slight elevation from which rises a stout bristle which is directed posteriorly; 3 bristles, all minor, but of unequal length, at dorsal apical margin. The VIII sternite of the male bears 2 major, 2 medium and 2 minor bristles. The female is not known to the describer. The holotype male, the only specimen before the writer to this date is large for a Meringis, measuring 2.4 mm. This flea was taken by the writer off an Oregon Pocket Mouse, Perognathus parvus parvus Peale at a point in the Central Oregon desert 15 miles south of Boardman, Oregon (type locality) on May 12, 1939. Nothing is known at the present time about the range of this flea. The holotype male bearing the writer's number 1938a is deposited in the United States National Museum. This flea bears the name of Mr. Alex Walker, Tillamook, Oregon, one of the northwest's foremost rodentologists, a long time friend of the writer and a constant help to him in the determination of rare rodents.

Sternite IX of Male with Proximal Ventral Lobe.

Meringis jewelli new species

In this flea the proximal ventral lobe of sternite IX of the male makes its first appearance, being somewhat different from the one found in M. parkeri, or those swollen lobes found in M. shannoni and M. hubbardi. In this species the ventral boundary of this lobe is at almost right angles with the posterior face of the IX sternite. This IX sternite of the male which marks this species off from the other Meringis, has an apex which is much more rounded than in M. walkeri; a black spiniform at ventral apical margin, and ventral to this 5 fine hair-like bristles of equal length, then rising from the angle where the ventral face of the proximal ventral lobe meets the posterior face a stout bristle which is directed ventrally, not posteriorly as in M. walkeri; dorsal apical margin with 3 minor bristles. VIII sternite of male differing from that of

3
M. walkeri in bearing 5 major and 4 medium bristles. The 2 antepygidal bristles in the male are much shorter than in M. walkeri and the inner one is less than half the length of the outer. Female not known to the describer. Average length of 3 males before the writer at this time 2.2 mm. These males were taken off Oregon Pocket Mice, Perognathus parvus parvus Peale, at the south city limits of Baker, Oregon (type locality), July 12, 1939. Nothing is known at present about the range of this flea. The holotype male, bearing the writer's number 1616, is deposited in the United States National Museum. The two other specimens before the writer are listed as paratype. This flea bears the name of Mr. Stanley Jewett Sr., Bureau of Biological Survey, Portland, Oregon, chief of the students of northwest rodents, a long time friend of the writer and a constant help to him in pointing out probable locations of rare northwest rodents.

Meringis parkeri Jordan is described on page 268 of Novitates Zoologicae XI, 1937. The material was sent Jordan by Dr. Parker from Powderville, Montana off Dipodomys sp. Both male and female have 3 antepygidal bristles. The IX sternite of male distinct with a black spiniform at ventral apical margin, and ventral to this 4 or 5 bristles; proximal ventral lobe not swollen as in the following species, but like them armed with a black spiniform; dorsal apical margin with 2 bristles. The female can be told from other Meringis by the almost flat apical margin of the VII sternite. The average length of the male is 2.00 mm., the female 2.30 mm. The normal host of this flea is the Kangaroo Rat, but the writer has taken specimens off Pocket Mice, Gnome Mice, Deer Mice and Wood Rats. The range of this flea is wide. In Oregon and Washington the northern limit is the Columbia and the Snake Rivers, west to the foothills of the Cascades in Oregon, south in Oregon to the Winter Mountains, all through southeastern Oregon thence into Nevada, and east probably as far as Kangaroo Rats are found.

Meringis shannoni Jordan was described from specimens taken from the central part of eastern Washington during 1920 off various mice. Jordan describes the flea on page 38 of Novitates Zoologicae XXXV, January, 1929. The great majority of 100 specimens personally collected by the writer are from Pocket mice which seem to be the normal host. This species is occasionally taken off Kangaroo Rats, Deer Mice, Gnome Mice and Grasshopper Mice. The writer's records are from all over the Great Basin region of Washington and Oregon, and northern Nevada. The IX sternite of the male is quite distinct with a black spiniform at the ventral apical margin and close to this ventrally 2 stout bristles, then still more to the ventral 3 bristles; the posterior ventral lobe is swollen and bears a black hook-like spiniform; the dorsal apical margin bears 2 bristles. The female can be told from other Meringis by having a VII sternite which has a slightly rounded outline to towards the ventral where it dips or shallows off to the anterior. The male has 2 antepygidal bristles, the female 3. The average length of the male is 2.00 mm., the female 2.30 mm.

Meringis hubbardi Kohls is described on page 1217 of Public Health Reports Vol. 53, No. 28, July 15, 1938 where Kohls states that this species is close to M. shannoni Jordan. Holotype male is from Mayfield, Idaho, allotYPE female from Elko, Nevada. 10 specimens belonging to the writer were before the describer at the time of describing, these being listed as paratypes, and being off Kangaroo Rats and Deer Mice from all over the Great Basin region of Oregon, and northern Nevada. Apical portion of sternite IX with a black spiniform at the ventral apical margin and 2 bristles at the dorsal apical margin, along the posterior margin 6 bristles and on the swollen posterior ventral lobe a black claw-shaped spiniform. Posterior margin of female VII sternite distinct with a pointed lobe. Antepygidal bristles 2 in male and 3 in female. Average length of male 1.90 mm., of female 2.30 mm. Since the release of the description the writer has collected about 75 additional specimens in Oregon east of the Cascade Mountains, Winter Ridge and Quartz Mountains, and in Northern Nevada. The species seem to show no host choice between Kangaroo Rats and Deer Mice.

The range for this species seems to extend from the east foothills of the Cascade mountains north of Walker Rim and south of the Columbia River in Oregon, thence to the east into Idaho, then south throughout Nevada.
A REVIEW OF THE WESTERN FLEAS OF THE GENUS MALARAEUS
With One New Species
and
THE DESCRIPTION OF A NEW THRASSIS FROM NEVADA.

by

Mr. C. Andresen Hubbard, Sc.D.
Professor of Biology and Head of the Department

This review of *Malaraeus* comes from 200 specimens personally collected by the writer off various mice and Cones and as strays off Wood-rats and carnivora in Oregon, Washington, California and Nevada.

The genus *Malaraeus* was established by Jordan in *Novitates Zoologicae* XXXIX:76. The genotype is *M. telchinum* Roths. 1905. Generic characteristics, eye distinctly reduced, longest diameter shorter than the distance from eye to apex of angle of the strongly chitinized portion of the genal lobe; bristles of segment II of antennae short in male, reaching beyond middle of club or being shorter in female. In the male the VIII tergite at most with a trace of spiculose area at dorsal margin; VIII sternite quite reduced (*telchinum*, *simonius*), or long and slender, bearing one apical bristle and a fringed membranous flap (*bitterrootensis*, *debbsi*); apex of vertical arm of IX sternite rounded on posterior side, not or little dilated. In the female the stylet is without a dorsal lateral bristle, the stout bristles on the anal sternite are markedly curved, head of spermatheca broad, more or less barrel-shaped, but concave beneath, widest either near the orifice or in the middle, much longer than broad, twice as wide as tall.

*Malaraeus telchinum* was described by Rothschild in *Novitates Zoologicae* XII:153 (1905), from specimens received from O.F. Dipple who collected two males, one off *Evotomys gapperi*, the other off *Sorex richardsoni*, from Kicking Horse Canyon, B.C., Canada, October 1903.

Chaetotaxy of head as illustrated. Modified segments for species distinct. Finger of clasper of male broad and almost oblong, and bears close to the distal edge one stout bristle at the lower corner, a longer one at the upper corner, and between them three short stout spine-like bristles. In the female the spermatheca is typical, the apical margin of the VII sternite is but a single lobe, a small swelling at the dorsal angle.

Length: male 1.8 mm., female 2.5 mm.

Seasonal distribution: From evidence of 100 specimens in the collection of the writer, this flea seems to prefer the cooler season of the year, collections fairly common during fall, winter and spring with a marked absence during the summer months.
Hosts: Chiefly off Deer Mice (Peromyscus), occasionally off Red-backed Mice (Clethrionomys), Meadow Mice (Microtus) and Harvest Mice (Reithrodontomys) and as strays off Wood-rats, shrews and weasels.

Range: Throughout the Siskiyou Mountains and the Cascade–Sierra Range and east through Washington, Oregon, California and Nevada. Not definitely a desert flea but preferring the higher elevations.

Malaraeus sinomus Jordan 1925 was described from materials gathered by O. C. Duffner off "Mys" during December of 1913 at Paradise, Arizona. The description appears in Notitates Zoologicae XXXII:110. Jordan states that this species is very close to the preceding from which it is marked off by the characteristic modified segments. In the male the finger F is roughly triangular, reaching only to the apex of the process P, the posterior margin rounded, apex pointed, directed capitad, at the lower angle which is rounded off, a long stout straight sharp spine, from this blackish spine upwards a row of four stiff bristles, all much thinner than the spine, the lower three also shorter, the upper one longer. In female spermatheca typical, the apical margin of the VII sternite has a distinct hook-like lobe at the dorsal angle.

Length: Specimens in collection of writer, male 2 mm., female 2.2 mm.

Seasonal distribution: The few specimens of this species in the collection of the writer were collected during May and July, but the types were collected during December. These three dates might suggest a year around distribution.

Hosts: In the collection of the writer there are but six specimens of this flea. Three males and one female were taken from a Deer Mouse (Peromyscus maniaculatus gambeli Baird), at Mitchell, (Bridge Creek School,) Oregon, May 13, 1939, and two females were taken from a Grasshopper Mouse (Onychomys leucogaster fuscogriseus Anthony), in northwest Nevada, 4 miles south of Deno, Oregon, July 5, 1939. While the writer has trapped the same school yard at Bridge Creek, time and again during all seasons of the year more specimens of this flea were not taken.

Range: Sweeping northwest through Arizona, Nevada and into Oregon, through the Great Basin region, perhaps as far north as the Columbia River.

Malaraeus bitterrootensis was described by Dunn and Parker of the Rocky Mountain Spotted Fever Laboratory at Hamilton, Montana from materials collected in the Bitterroot Mountains west of Darby, Montana where two males were taken off a Wood-rat (Neotoma). The description appears on page 2771 of United States Public Health Reports 38:47. During 1925 from materials which were handed him by A. D. Gregson who took a small series of both sexes off "Mus" in Alberta, Canada, Dr. Karl Jordan described both sexes of this flea as Ceratophyllum isus, the description appearing on page 110 of volume XXXII Novitates Zoologicae.

In this species the armature of the head is similar to the two preceding species.

In the male this species can be distinguished from the preceding forms by the complexity of the VIII and IX sternites, by the shape and armature of the finger F of process P, and in the female by the outline of the apical margin of the VII sternite.

In the male the VIII sternite is long and slender, bearing one bristle and a fringed membranous flap, the IX sternite bears a long proximal ventral lobe, the apical portion of which is strongly excised ventrally before the apex to be hook-shaped. The finger F of the process P is somewhat scythe-blade shaped with the lower half of the posterior border armed with three stout blackish bristles which approach spiniforms, all about the same length and generally pointing downwards and backwards, upper half armed with one long bristle, one medium bristle below it and several smaller ones above it. Process P is well rounded with two or three small bristles at the apex and where it joins with F two long bristles. The apical margin of the VII sternite of the female is deeply sinuate, the upper lobe narrow, variable, much shorter than the lower lobe, which is rounded subcuneate.

Length: Original lengths are male 2.3-2.9 mm., female 2.8-3.3 mm.

Seasonal distribution: Even through the summer months. Conies generally cannot be taken from November till June because of the deep snow upon their rock slides, therefore what the distribution of this species is during these months must remain unknown.
Hosts: While the original description of this species was made from materials off a Wood-rat and Jordan described from material off "Mus" this writer feels that these occurrences were accidental, that the true host of this species is the Cony, (Ochotona). Of the twelve even pairs of this flea in the collection of the writer 10 males and 11 females are from the various species of Conies in Oregon and Washington, 1 male is from a Cascade Pine Squirrel, and 1 male and 1 female were from a Wood-rat which made their homes in Cony rock slides.

Range: Described from the Rocky Mountains of Montana and Alberta, Canada, this species ranges westward through the entire cony populations of Washington, Oregon and probably northern California.

This species seems rather scarce. Seldom can more than two be removed from a cony, many are without them. This might suggest that the flea is either a nest flea, staying in the nest of the cony most of the time, or that the seasonal maxima has not been found for the species.

Malaraeus dobbsi new species
Dr. Karl Jordan informs the writer that this species is close to M. penicilliger. While distinctly different from the preceding three species it resembles more M. bitterrootensis.

Head: Well rounded, frontal tubercle small, eye present, lower genal row of 3 stout bristles, the middle the shorter, upper row of six or seven medium sized bristles, in male a few minute bristles above eye, post-antennal region with minute bristles all along antennal groove and what appears to be three distinct rows of bristles, the most anterior row of two medium bristles, the second and third each with five or six, the one closest to the groove in each case stout.

Pronotal comb of about 24 teeth.

Abdomen: Tergites with a row of major bristles anterior, a row of medium bristles posterior and a small bristle between each major bristle. Tergite teeth not constant but may run 1-2-2-1-1 to the side. Modified segments: Male. The VIII sternite is long and more slender than in the preceding species and has a slight bend in the apical region, which is slightly swollen and bears a long bristle and a fringed apical membranous flap. The IX sternite bears
a proximal ventral lobe armed apically with a stout black spiniform and below this on the posterior-ventral face a series of short bristles, then a series of longer ones. Process P of the clasper has its anterio-dorsal margin gradually rounded to a high apex, this face being armed with a small bristle at the apex and anterior to this a longer bristle followed by a shorter one. From the apex P falls off vertically to the junction with F where there are two long bristles. The finger F is very prominent and in the shape of the blade of a fire axe, armed at the posterior-dorsal angle with three short, stout, black spiniforms all on the posterior border, two close together, the third a slight distance to the ventral, two short bristles below the spiniforms, one above.

Female. Spermatheca as illustrated. Apical margin of VII sternite with well rounded upper lobe, then a shallow bay to the ventral and a much less rounded lower lobe.

Length: male 2.1 mm, female 2.4 mm.

Nothing is known about the seasonal distribution or range of this species. The only specimens known to the writer are ten males and six females taken off *Microtus organi organi* Bachman (*Oregon Creeping Meadow Mouse*) at Tillamook, Oregon (type locality), August 30, 1937. The holotype male and allotype female are mounted on one slide bearing the writer's number 992 and deposited in the United States National Museum. The other 14 specimens are listed as paratypes and distributed to depositories elsewhere listed.

This species bears the name of Dr. John F. Dobbs, President Emeritus of Pacific University whose encouragement and patience with the writer while gathering western fleas will never be forgotten.

A New *Thrassis* From Nevada

Eight males and 10 females of this species were collected off 3 Oregon Ground Squirrels which had failed to be in hibernation on July 4, 1939 and which the writer shot in a high cool canyon on Franklin's Ranch, northwest Nevada, 15 miles south of Denio, Oregon.

*Thrassis jellisoni* new species

This species is close to *Th. pandorae* Jellison 1937, but from which it is best distinguished by the modified abdominal segments.

Head: Frontal tubercle present, lower genal row of 3 stout bristles, middle one shortest and closest to inner one, upper row of 2 or 3 medium bristles, post-antennal region with minute bristles along antennal groove, posterior row of about 4 bristles and 1 stout bristle close to groove and midway along it. Eye present.

Pronotal comb of about 17 teeth.

Abdomen: Tergites with two rows of bristles. Tergite teeth usually 1-2-2-2 on a side.

Modified segments: Male: The shape and armature of the finger F of the process P are characteristic. The finger has a well rounded posterior face with a slight indentation at the third bristle from the apex. At this apex a tiny cone-shaped spine, then towards the ventral a medium bristle, then a bristle about three times as long followed by one one-third shorter, then a fourth almost as long as the second and at the ventral angle two stout bristles close together, the upper one longer and curved, about three very small bristles on surface. The anterior face with concave dip from apex for one-third the distance of the face, the ventral two-thirds about parallel with the posterior face. Spiculose area and armature of VIII sternite about as in *Th. pandorae* but the smaller bristles closer to the long bristle. Female: Spermatheca as in most other *Thrassis*. The apical margin of the VII sternite consists of a long slanting outline at about the middle of which is a distinct shallow bay, while the dorsal lobe of the VII sternite in *Th. pandorae* is angular, that of *Th. petiolatus* well rounded.

Length: male 2.00 mm., female 2.5 mm.

Nothing is known about the seasonal distribution or the range of this species. The type locality is Franklin's Ranch, northwest Nevada, the type host *Citellus oregonus* Merriam. The holotype male and the allotype female are mounted on a slide bearing the writer's number 1582 and are deposited in the United States National Museum. The other specimens before the writer are listed as paratypes and are deposited in depositories elsewhere listed.

This species bears the name of Mr. William Jellison, Assistant Parasitologist at the Rocky Mountain Spotted Fever Laboratory at Hamilton, Montana who has rendered the writer invaluable assistance from time to time.
Fleas of the Yakima Ground Squirrel

A REVIEW OF THE NORTHWEST GROUND SQUIRREL FLEAS

with

REMARKS UPON VARIATION IN THE VII STERNITE
OF THE FEMALE OF THRASSIS PETIOLATUS

By

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The Yakima ground squirrel or sage rat Citellus mollis yakimensis Merriam is a sage brush and plains dweller of the State of Washington which ranges west of the Columbia River, and east of the Cascade Range foothills. The north and south limits of range are not so easily defined. This investigator believes that to the west the south boundary is the foothills of the Simcoe Mountains, following these to about Toppenish (15 miles south), then angling to the southeast in an arc which may include Bickleton to about Yellepit in the Big bend of the Columbia. To the north the writer has records as far as Tampico, Wiley City and Naches but apparently there are records as far north as Ellensburg.

The writer has personally collected these squirrels at Naches, Tampico, Wiley City, Donald, Donald (10 miles east), Wapato, White Swan, Toppenish, Zillah, Satus, Toppenish (15 miles south), Mabton, Prosser (15 miles south), Kennewick, Kennewick (15 miles south), Pinley and Hoover.

These sage rats are like others of the mollis group which live in the Great Basin region of Oregon and Nevada in that they sun themselves at their burrow openings and often when shot simply tumble into the burrow and slide down out of reach. When up in sage brush or away from their burrow the slightest disturbance causes them to rapidly seek shelter under the closest sage bush or in the nearest hole. Curiosity, however, soon causes their head to pop out from under cover, then if the collector will give a loud sucking-in sound through the lips, frequently the squirrel will pop out, stand erect on its back legs and can be blasted away from its shelter with a charge from a .410 gauge shot gun. The writer prefers hunting these small sage rats with a small shot gun because the fine shot causes less bleeding and a vital shot is more assured. The squirrels must be instantly killed or they crawl into their burrow to die.

Seventy-five of these squirrels have been collected by the writer. From them he removed 315 fleas. The average number of fleas per squirrel was about 4, five specimens were without fleas, the greatest number from any one was 85 fleas removed from an old male shot at White Swan. 54 squirrels examined during May of 1939 carried 185 fleas; 4 during March of 1940 carried 85 (all on one animal), and 12 during June of 1940 carried but 45.

While this writer well realizes that 75 Yakima ground squirrels is a very small number in a rodent which may often have as many as ten to twelve young, nevertheless, in a small way it does show the tendencies throughout the range of this squirrel. Of the 315 fleas removed from these 75 specimens, by a ratio of almost 3 to 1 there comes first in abundance with 200 specimens...
Thrassis petiolatus Baker, 67 males, 133 females followed by not a very close second with 63 specimens

Opisocrostis washtingtonensis G. and P., 22 males, 42 females then in third place with 41 specimens

Opisocrostis tuberculatus Baker, 19 males, 22 females

Tailing the list of the true sage rat fleas comes with what seems to be a rare flea in the far west, and with but one specimen per collection

Opisocrostis labis J. and R., 3 males, 1 female.

Besides the above mentioned the 75 sage rats also carried

Oropsylla Idahoensis Baker, 5 females, and

Meringis shannoni Jordan, 1 male (Pocket Mouse Flea).

In so far as the widest breadth of the range of this squirrel is under 100 miles it would seem unlikely that much difference would exist in the ratio of the occurrence of the fleas carried or the seasonal distribution of them. The data at hand seems to show no difference.

These sage squirrels appear in the spring during late February or early March and go into hibernation during late June or July. Through the months of March to July Thrassis petiolatus is always present as the major flea parasite. During these months Opisocrostis washtingtonensis is also always present but only about one-third as prevalent as the preceding. Opisocrostis tuberculatus is less prevalent than Op. washtingtonensis and seems to be a flea which is carried early in the season and disappears early, there being large numbers during March, but few for May and none for June.

Perhaps the most interesting of these sage rat records is a series of four taken at White Swan, Washington, March 15, 1940. Three of the four were pregnant females, one carrying eleven full term embryos. The three females were without a flea, but the one male shot out of a sage bush close to where the females were shot carried a total of 85 fleas as follows:

Thrassis petiolatus Baker—12 males, 25 females

Opisocrostis tuberculatus Baker—17 males, 21 females

Opisocrostis washtingtonensis G. and P.—4 pairs

Opisocrostis labis J. and R.—1 male

It is not often that a collector finds so many fleas upon a rodent, although the writer does have a record of 200 fleas removed from a single Gray Digger (Cittellus douglasii) at Valsesia, Oregon during August 1937.

Thrassis petiolatus Baker 1904 was described in Proc. U.S. Nat. Mus. 27:415 from Moscow, Idaho, a point which seems today to be almost the center of its range. This flea has been found by the author as far west as the foothills of the Cascade Mountains in both Washington and Oregon. It is not only the chief flea of the Yakima ground squirrel, but also of the Red Digger (Cittellus columbianus) which carries it as far south as almost to Burns, Oregon, as far north, perhaps as the Columbian Highlands of northern Washington. It is found commonly also on Townsend's ground squirrel (Cittellus townsendi) which ranges in Oregon and Washington, on the Gray sage rat (Cittellus mollis caatus) ranging through central Oregon and on those Oregon ground squirrels (Cittellus hellingi oregonusus) which range along side of the Red Diggers. To the east this flea has penetrated into Montana but Fox does not list it in his "Fleas of the Eastern United States". Although Holland publishes records for the Red Digger from Kimberly, British Columbia he does not list this species. The species is replaced in California and Nevada by other Thrassis.

Both Jordan and Jellison have remarked about variation in the VII sternite of the female of this species but their remarks were moderate in comparison to that variation found by this writer in the female of this species collected at White Swan, Washington. This locality is at the base of the Cascade foothills, as far west as Thrassis petiolatus is found. The writer wishes again to recall a male Yakima sage rat shot March 15, 1940 at White Swan from which he removed 85 fleas. Twenty-five of these were females of Thrassis petiolatus. In these 25 the apical margin of the VII sternite in no two is alike, all are individual. They range from the typical outline with the swollen upper lobe, down, down, until only a small lower angular lobe remains. The remarkable thing about this study in variation is that all specimens came off the same host, out of the same nest, all collected at the same examination. This variation is better illustrated than described, so glance at the accompanying plate. So that this study in variation will become a record the 25 females with their accompanying 12 males are mounted on two slides bearing the writer's number 1795 and deposited in the United States National Museum.
Opisocrostis washingtonensis Good and Prince 1939 was described on page 1691, U.S. Public Health Reports 54:37. This species is a true ground squirrel flea which is confined principally to the state of Washington although there are records from central Oregon around the Columbia River. The range of this flea extends from the east foothills of the Cascade mountains in Washington, confining itself to the range of the Yakima ground squirrel, thence east across the Yakima and Columbia rivers into the range of the Townsend ground squirrel, which carries it as far north as the Okanogan or Columbia Highlands, south across the Snake river into the Big Bend country of Oregon where it has been taken in Gilliam, Morrow and Umatilla counties. Personal records on seasonal distribution leads the writer to believe that this species is carried by ground squirrels within its range as long as they are out of hibernation.

Opisocrostis tuberculatus Baker 1904 was described in Proc. U.S. Nat. Mus. 27:393 from materials off Citellus columbianus (Red Digger) taken at Moscow, Idaho. This common species of northwest ground squirrel flea ranges from the Cascades of Oregon and Washington east, penetrating through the Rocky mountains as far as Montana. It is listed by Holland from Kimberly, British Columbia and Alberta, Canada. To the south the writer has no records from Nevada, and there are none from California. In Oregon the writer has records for the species as far south as Canyon City, there off Red Diggers and Oregon ground squirrels. In the western portion of its range this species is an early season flea, prevalent during March, April and May, but farther east in the higher elevations the season is later.

Opisocrostis labis Jordan and Rothschild 1922 was described in Ectoparasites 1:275 from materials collected at Calgary, Alberta, Canada off Putorius longicaudatus (Weasel). This species is doubtless a true ground squirrel flea, although it is occasionally found upon prairie dogs, mice and other rodents and their carnivores. Although the general range of this species seems to lay in the central Rocky mountain region, this writer has specimens from the base of the Cascades in Washington and from Narrows, in central Oregon, these seeming to show that the species has probably followed the ground squirrels as far west as the Cascade mountains of Oregon and Washington. To the south there are records from Wyoming, to the north the type locality is Calgary. The species has probably not penetrated into California or Nevada. Too few records are available to suggest a seasonal distribution.

Oropsylla idahoensis Baker 1904 was described in Proc. U.S. Nat. Mus. 27:413 from materials off Citellus columbianus taken at Moscow, Idaho.
This writer is inclined to believe this species is a true *Callosperrmophilus* flea and is transferred to *Citellus* where their ranges meet or coincide. In the west *Callosperrnophilus* carries these fleas always, wherever this squirrel is found west of the Rockies, seldom carrying other fleas, *Citellus* however, carries several other species of fleas, only occasionally this one. The range of this species is the range of *Callosperrmophilus*, which is from the crest of the Cascade mountains in British Columbia, Washington, Oregon and California, through the Siskiyous to the Pacific ocean, to the east through all areas where *Callosperrmophilus* is found. This species of flea seems to be carried by its favored host during the entire season the squirrel is out of hibernation.

**Other Northwest *Citellus* Fleas**

While it is difficult to say where the northwest begins and ends, here the term is used to include extreme northern California, and Nevada, Oregon, Washington and British Columbia south of the Fraser river.

In the state of Washington, besides those fleas already enumerated for the Yakima ground squirrel there is *Diamanus montanus* Baker 1895 (*Ceratopsyllus acutus* (California Ground Squirrel Flea) which made its way into the northwest on the Gray Digger (*Citellus douglasi*) which as it has spread has come up both sides of the Cascade mountains from California, the major route being between the mountains and the Pacific ocean, thence up the Columbia river to the Deschutes; across the Columbia, at about White Salmon, Washington.

Today it has jumped the Deschutes in Oregon and is spreading beyond into the Oregon sage rat country, has spread in Washington from Cooks to beyond Maryhill and back into the mountains almost to the summit of the Simcoes. All through this territory this ground squirrel has carried *Diamanus montanus*. This writer removed this flea also from Red Diggers (*Citellus columbianus*) at Lowden, Washington and Umapine, Oregon, the farthest known northwest records, which are on the Oregon-Washington state line approximately 125 miles of desert east of Maryhill. This flea species is always abundant during the non-hibernating season of the Gray Digger.

**Thrassis pandorae** Jellison 1937 was described in U.S. Public Health Reports 52:726 off *Citellus elegans* at Beaverhead county, Montana. In Washington the writer has a record from Waitsburg off a Red Digger showing that the species is found south of the Snake River and east of the Columbia in this state. The species has not jumped the Columbia river to the north but ranges east from half way through Oregon into Idaho, Montana and Wyoming. In eastern Oregon this species is carried by the Red Digger and the Oregon ground squirrel.

In Oregon besides those *Citellus* fleas mentioned above as ranging in this state are *Thrassis francisi* C. Fox *Opiscrostis oregonensis* Good and Prince and *Neopsylla inopina* Rothschild and in northern Nevada comes in as new *Thrassis jellisoni* Hubbard.

**Thrassis francisi** C. Fox 1927 was described in Trans. Amer. Ent. Soc. 53:210 from material taken off *Citellus mollis* in Utah. The species follows well the range of the *mollis* group coming into Oregon from Nevada. The various sage rats and the Oregon ground squirrel carry this species practically all over Oregon east of the Cascade mountains. The Columbia river seems to act as a temporary barrier to the north, the species seems not to be in the states of Washington, or California.

*Opiscrostis oregonensis* Good and Prince 1939 was described in U.S. Public Health Reports, 54:1687. The dense population of this species seems to be in the Blue mountains and the Wallowa mountains of northeastern Oregon. From this region the range reaches out into Idaho and there are records as far west as Deschutes county, Oregon. This species is carried by *Citellus columbianus*, *C. mollis*, *C. oregonus*, and *C. townsendi*.

*Neopsylla inopina* Rothschild 1915 was described in *Extoparasites* I:30 from material taken off Richardson's ground squirrel at Calgary, Alberta, Canada. This species seems to be one of the rare far west *Citellus* fleas, the writer having collected it only three times in central Oregon off the Oregon ground squirrel and the Red Digger, and once in northwest Nevada off an Oregon ground squirrel, which records probably represent the western limits of the range, the bulk of the population being in the Rocky Mountains.

**Thrassis jellisoni** Hubbard 1940 was described in Pacific Univ. Bull. 37:6:4 off *Citellus b. oregonus* from northwest Nevada. Nothing is known about the seasonal distribution or range of this species.
Ectoparasites of Western Lagomorpha

Part I. The Ectoparasites of 100 Western Conies
(Ochotona)

Part II. The Ectoparasites of Western Rabbits
(Lepus-Sylvilagus-Brachylagus)

By

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Professor of Biology and Head of the Department

It is generally felt among naturalists that conies are very abundant in their colonies in rock slides of the high mountainous regions of the West. Seldom are these small rock rabbits found below the 3000 ft. elevation level. If one persistently shoots or traps in one of these colonies shortly all the members are bagged and the colony comes to an end. This writer feels after considerable experience in cony colonies that conies are not abundant, that their families are small, therefore personal records covering the external parasites of 100 conies west of the Rocky Mountains gives a good cross section of the ectoparasites of their western populations.

Conies, Rock Rabbits or Little Chief Hares, as they are commonly called, belong to the genus Ochotona. They are not rodents but are closely allied to the rabbits and hares so belong to the order Lagomorpha. Taylor and Shaw in "Provisional List of Land Mammals of the State of Washington" lists Ochotona princeps cuppes Bangs from northeastern Washington, O. p. fenisex Osgood from the northern Cascades of Washington and O. p. brunnescens Howell from south of Whatcom Pass in the Cascades of Washington. Vernon Bailey in "The Mammals and Life Zones of Oregon" lists Ochotona schisticeps taylori Grinnell from south central Oregon, O. s. jewetti Howell from northeast Oregon, O. princeps brunnescens Howell from the Cascades of Oregon, and O. fenisex fumosa Howell from south of Mt. Hood, Oregon. Gerrit Miller Jr. in "North American Recent Mammals" lists from California Ochotona schisticeps albatrus Grinnell from Sierra Nevadas of Inyo County, O. s. schisticeps Merriam from Placer County, O. s. muiri G. and S. Yosemite National Park, O. s. sheltoni Grinnell from Mono County and O. s. taylori Grinnell from Modoc County.

The Fleas

The above conies are seldom heavily infested with fleas. One hundred personally collected and examined by the writer have added to his collection only 88 fleas. The records show that at the time of examination 50% of these conies carried no fleas, so the average for the 50 infested conies was less than 2 each or for the entire 100, less than 1 each. Of the 88 fleas collected only 50% of these were true cony fleas, the other 50% were stray fleas dropped by rodent inhabitants of the cony rock slides and picked up by the conies as they run about and under the rocks of the slides. In other words 1 cony out of about every 2 1/2 collected carries 1 true cony flea and 1 out of every 2 1/2 collected carries a stray flea. Occasionally an investigator does find a cony which is carrying over the average. The writer secured a nursing female during a July field trip from which he removed 12 fleas, and G. A. Augustson removed an average of 7 each from 3 conies taken in Fresno County, California.
This scarcity of true cony fleas upon conies might suggest that the seasonal maxima of the fleas was during winter, or spring, seasons in which conies cannot be collected because of the heavy blanket of snow over their rock slides.

While no natural barrier seems to exist between the cony populations of Washington and Oregon to the north and California to the south, their fleas seem to be distinctly divided at about the range of *Ochotona schisticeps taylori* Grinnell or in other words somewhat not far south of the Oregon-California State line. It seems likely that Pit River whose valley cuts the Cascade Mountains from the Sierra Nevada Mountains is probably this barrier, for no collector reports north of this zone the fleas of the southern conies and no collector reports south of this zone the fleas of the northern conies.

North of this line, wherever it may be, conies regardless of species, or subspecies are regularly infested with—

**Malaraeus bitterrootensis** Dunn and Parker 1923 and **Ctenophyllus terribilis** Rothschild 1903

and south of this line with—

**Amphalius neocopinus** Jordan 1925 and **Geusibia asherafti** Augustsori 1941

These, then, are the four true cony fleas of the western United States and Canada.

**The True American Cony Fleas**

**Malaraeus bitterrootensis** Dunn and Parker 1923 is the more common of the northern cony fleas. The male was described from Darby, Montana where the type was taken off *Neotoma* (Wood-rat). The description appears on page 2771 of *U. S. Public Health Reports* 38:27. Dr. Karl Jordan described both sexes of this flea as *Ceratophyllus isus* in 1925 on page 110 Novitates Zoologicae Volume 32. Jordan's material came off “Müs” collected by Gregson in Alberta, Canada. In this flea the male has characteristic VIII and IX sternites and finger, the female apical margin of VII sternite. Apically the IX sternite of the female is hook like, the shape of the finger is somewhat scythe-blade like, being armed on posterior face with three black spiniforms. The apical margin of the VII sternite of the female is deeply sinuate, the upper lobe being variable, but often triangular, much shorter than the lower lobe which is rounded subacuminate. The flea is medium sized, males averaging 2.5 mm., the females 3.00 mm. The color is medium brown. Specimens in the collection of the writer were collected during each month from June till early November. The species ranges in the Rocky Mountains and to the west through British Columbia, Washington, and Oregon wherever there are cony colonies. One hundred conies have added to the writer's collection 17 males and 13 females of this species.

From some 50,000 flea records personally collected by the writer, only on two occasions has he taken this flea off of other than conies, these are a male from a Pine squirrel living in a cony slide and a male and a female off a Wood-rat also taken in a cony slide. This writer feels then, that this data proves this flea to be a true cony flea.

**Ctenophyllus terribilis** Rothschild 1903 is the second of the true northern cony fleas. The species was described from four males and six females collected by G. F. Dipple in the Canadian National Park, Alberta, Canada off Lagemmys *Ochotona* *princeps* on July 28, 1899. The description appears on page 318 of Volume 10 Novitates Zoologicae. A characteristic which marks this species off from all other western fleas is the modification of the 7 or 8 bristles of the frontal row of the head into stout black spiniforms in the female, and heavy black spine-like bristles in the male. This diagnosis is all that is necessary for this species. The original length is given as 3.3 mm. The flea is heavily pigmented, almost black. From the type locality in the Rocky Mountains of Alberta, Canada, the species ranges southward through the Rocky Mountains and southwestward throughout British Columbia, Washington, and Oregon wherever there are cony colonies. The writer has collected specimens during each month from June to November. One hundred conies have added to the writer's collection only 4 males and 10 females of this species.

The writer has never found this flea on other than conies but in time it will doubtless be found upon carnivora which feed upon them.
Amphalinus necopinus Jordan 1925 was described from a male and a female collected by Howell off Ochotona schisticeps mutri G. and S. at Pine City, California during July 1922. The description appears on page 110, volume 32, Novitates Zoologicae. In the male the finger F is characteristic, being unlike any other American flea; in the female the apical margin of the VII sternite is different as is the shape of the spermatheca. It is next to impossible to describe these outstanding characteristics, they are better illustrated in drawings. This species is medium sized, the males averaging 2.90 mm., the females 3.10 mm. The color is medium to heavy brown. Nothing is known about the seasonal distribution. The species is evidently confined to cony colonies of the Sierra Nevada Mountains of California. Records made available to the writer are:

From Ochotona schisticeps mutri G. and S collected by A. B. Howell Pine City, Mono Co., Calif., July 1922, 1 male, 1 female (types).


Geusibia aschertafi Augustson 1941 was described from 17 females taken off 3 Ochotona schisticeps albatis Grinnell at Dusy Lakes, Fresno County, California, August 23, 1938. The description appears upon page 203, Volume 39, Bulletin of the Southern California Academy of Sciences. There seems to be no record of a male of the species ever having been collected. The female is as distinct from the other cony fleas as they are distinct from one another. The head seems to have all the characteristics of an Odontopsyllus, but the apical outline of the VII sternite and the shape and structure of the spermatheca mark this species off from all other American fleas. The spermatheca is hand sickle shaped, the apical margin of the female VII sternite much easier to illustrate than describe. The length averages 3.10 mm. The color is dark brown.

Nothing is known as yet about the definite range of this flea but specimens have been collected as far north as Mammoth Meadows, in Mono County, California and as far east as San Juan County, Colorado, which is about 700 miles of desert east of the California range. It is quite possible that this species has migrated northward out of Mexico where the Rocky Mountains and the Sierra Madres approach each other closely to send one line of invasion northward into the Rockies, the other northward through the San Bernardinos and the Sierra Nevadas of California.

Records for this species made available to the writer are:

From Ochotona schisticeps albatis Grinnell collected by G. Augustson Dusy Lakes, Fresno Co., Calif., Aug. 23, 1938, 17 females

Ochotona schisticeps mutri G. and S. collected by R. Rutherford Mammoth Meadows, Mono Co., Calif., August 27, 1940, 3 females

Ochotona princeps saxatalis Bangs (Plague Suppressive Mes. Lab.) San Juan County, Colorado, June 1939, 3 females.

Considerable difference of opinion exists among American flea men in regards to the generic placement of Geusibia aschertafi Augustson the latest described of the cony fleas and apparently the most common found upon southern conies. Augustson held that the flea was convincingly like Geusibia which Dr. Jordan established on page 289, Volume 38 (1932), Novitates Zoologicae to hold fleas taken off conies in China. Dr. William Jellison of the Rocky Mountain Spotted Fever Laboratory feels that the flea is close to Frontopsylla Wagner and Joff, but represents a new genus very close to it. Dr. Newell Good of the Plague Suppressive Measures Laboratory at San Francisco concurs with Jellison. Dr. H. E. Ewing and Dr. Irving Fox hold that this flea is either a new species of Odontopsyllus Baker or the flea represents a new genus very close to it. This writer, after studying the specimen at hand, expressed this opinion to Dr. Good before knowing of the opinion of Ewing and Fox, so believes as they do, and after thoroughly studying the paratypes of Mr. Augustson which he kindly loaned the writer for study creates here to hold this species

AUGUSTSONIUS a new genus

The Genotype: Geusibia aschertafi Augustson 1941

This genus is close to Odontopsyllus Baker 1905.

Head: Frontal tubercle present. Eye prominent, long and narrow. Frontal row of about 8 bristles, genal row of 3 heavy bristles, well above eye and all longer than genal flap. Occiput with 3 rows of about 5 bristles each, where there are but two rows in Odontopsyllus. Minute bristles along antennal groove. In female segment II of antennae with few short bristles, while in Odontopsyllus these are more numerous and almost as long as the club.
Thorax: Pronotal comb of about 24 long teeth rounded blunt at apex and anterior to these 1 row of stout bristles, in Odontopsyllus 26 long sharply pointed teeth, and anterior to these 2 rows of bristles.

Abdomen: Tergites 1-2-3 with 1 apical spinlet to the side, while in Odontopsyllus there are more than 1 on all tergites. Antepygidal bristles 3 to the side in the female.

Stylet: Twice as long as wide, armed apically with 2 bristles, the ventral one shorter and slightly to the anterior and ventral, while in Odontopsyllus about 5 times as long as wide with 1 long apical bristle and 1 lateral one about half way back from the apex.

The spermatheca is hand sickle shaped.

While the lower anterior region of the hind coxa is armed in Odontopsyllus with a heavy series of small bristles approaching a spiculose condition and area, this portion in this genus is clothed only with some fine bristles.

This genus differs from Geusibia Jordan among other features in the shape and armature of the coxae.

This genus bears the name for Mr. Gus. A. Augustson who described the genotype from 17 specimens he personally took off 3 conies at Dusy Lakes, California.

Stray Fleas Found Upon Western Conies

Investigators well realize that conies are not the only inhabitants of these western rock slides. There are several species of rodents which also live in the cony rock slides. The writer has on several occasions seen conies rubbing noses with Golden-mantled ground squirrels and chipmunks, and while the conies are out calling in the full moon, a habit they all seem to have, they are rubbing elbows with Deer mice and pack-rats. Occasionally a Douglas pine squirrel plays over the rocks. So conies as they play about their rock slides pick up as strays the fleas of these rodent inhabitants of the rock slides, the data in the collections of the writer showing that the strays are as common on conies as are their true fleas.

The most common of these strays, particularly adjacent to the Rocky Mountains is

Orchopoeas sexdentatus agilis Rothschild 1905

the common Wood-rat flea, and this is not particularly startling when one
realizes that the writer took 140 specimens of this flea off 3 Wood-rats in a cony slide at Wallowa Lake, Oregon. The writer has removed 7 males and 10 females of this flea from the 100 conies here recorded.

The Golden-mantled ground squirrel comes second in this study of the stray fleas of conies. As these Golden-mants or Callies play in the cony rock slides, they drop their true flea. *Oropsylla idahoensis* Baker 1904 which is picked up by the conies. From the 100 conies the writer removed 4 males and 2 females of this species.

Deer mice (*Peromyscus*) drop several species of fleas to be picked up by the conies. The species the writer most often found upon conies was *Megabothris abantis* Rothschild 1905. Three males and 5 females of this species were removed by the writer from the 100 conies. The next most common species was *Monopsyllus wagneri wagneri* Baker 1904 the common Great Basin Deer Mouse flea. From the 100 conies in question 3 males and 1 female were removed. The third of the Deer mouse fleas removed from these conies was *Catalallia chamberlini* Hubbard 1940 of which there were 3 males.

In the Cascade Mountains there are generally two species of Chipmunks found playing about the rock slides of the conies. These are the Townsend chipmunks from which the conies pick up

*Monopsyllus ciliatus protinus* Jordan 1929

the writer having 1 male and 1 female from the 100 conies, and the Amoenus Chipmunks from which the conies become infested with

*Monopsyllus eumolpi cyrturus* Jordan 1929

the writer having 1 male and 1 female of this subspecies from the 100 conies.

On one occasion a cony picked up a stray from a Pine Squirrel in

*Orchopeas nepos* Rothschild 1905

and on one occasion the writer removed from a cony a female of

*Rectrofronia fraterna* Baker 1895.

The above list of 44 specimens of stray fleas from the 100 conies is just 50% of the entire 88 fleas removed from them.
Host Index of 100 Western Conies
Localities listed from north to south.

m. = male, f. = female

From Ochotona princeps brunneccns Howell (Cascade Cony)
15 specimens examined, 10 without fleas.

1 m., 1 f. C. terribilis, and 1 m. O. nepos each from a different cony. 1 m., 1 f. M. bitterrootensis from 1 cony, 1 m., 1 f. M. abantis from 1 cony.

Mt. Hood Region of Oregon.

Cooper Spur Road, Parkdale Oregon.
8 specimens examined, 5 without fleas, June 1-3, 1934.

1 f. C. malpierii from 1 cony, 1 m. C. terribilis, 1 m. C. chamberlini each from 1 cony.
2 specimens examined July 3, 1935.

1 m., 1 f. M. bitterrootensis on 1 cony, 1 m. M. abantis on 1 cony.
11 specimens examined, 8 without fleas, August 4, 1935.

1 m., 1 f. M. bitterrootensis on each of 2 conies, 1 m. M. ciliatus protinus, 1 m. M. abantis on 1 cony.
2 specimens examined, no fleas, August 10, 1935.
3 specimens examined, 2 without fleas, October 5, 1935.

1 m. C. terribilis, 1 f. M. bitterrootensis from 1 cony.
7 specimens examined, 4 without fleas, August 4-5, 1935.

1 f. C. terribilis, 1 m. M. bitterrootensis from 1 cony, 1 m., 2 f. M. bitterrootensis from 1 cony, 1 m. C. chamberlini from 1 cony.
2 specimens examined, 1 without fleas, Sept. 11, 1937.
1 f. M. bitterrootensis from 1 cony.

Cloud Cap Inn, Parkdale, Oregon.
6 specimens examined, 3 without fleas, August 3, 1935.

1 f. M. ciliatus protinus, 1 f. C. terribilis, 1 f. M. bitterrootensis each from a different cony.

Look Out Mountain, 15 mi. s.e. of Mt. Hood, Oregon.
1 specimen examined, no fleas, August 9, 1935.

Flag Point Mountain, 20 mi. s.e. of Mt. Hood, Oregon.
6 specimens examined, 4 without fleas, August 11, 1935.

1 m., 1 f. M. bitterrootensis on 1 cony, 1 m. C. chamberlini on 1 cony.

South of the Mt. Hood Region of Oregon.

Frog Lake, 12 mi. s.e. Government Camp, Oregon.
3 specimens examined, 1 without fleas, October 3, 1931.

1 m. O. idahoensis, 1 f. C. terribilis, each from a different cony.
Ollalie Lake, 25 mi. n.e. Detroit, Oregon.
5 specimens examined, 1 without fleas, August 7, 1938.

1 m., 1 f. M. bitterrootensis from 1 cony, 1 m. from another, 1 f. C. terribilis, 1 f. M. abantis each from a different cony.
Lava Lake, Santiam National Forest, Oregon.
2 specimens examined, September 30, 1939.

1 m., 1 f. M. bitterrootensis, 1 f. C. terribilis each from a different cony, 2 f. O. sexdentatus agilis from 1 cony.
Crater Lake, Oregon.
2 specimens examined, August 15, 1933.
1 f. C. terribilis, 1 m. O. idahoensis each from a different cony.
Lake O’the Woods, 25 mi. n.w. Klamath Falls, Oregon.
1 specimen examined June 24, 1939.

1 f. O. idahoensis taken from the cony.
From Ochotona scllisticeps taylori Grinnell (Warner Mountain Cony)
Fish Lake, Santiam National Forest, Oregon.
5 specimens examined, 2 without fleas, July 24, 1938.

1 m. M. bitterrootensis, 1 m. M. wagneri wagneri from 1 cony, 1 m. M. bitterrootensis, 1 f. C. terribilis from 1 cony, 1 m. M. bitterrootensis from 1 cony.

Summit of the McKenzie Pass, Oregon.
6 specimens examined, 3 without fleas, July 20, 1937.

1 f. M. bitterrootensis, 1 m. O. idahoensis from 1 cony, 1 m. M. bitterrootensis, 1 m. M. wagneri wagneri each from a different cony.
2 specimens examined, 1 without fleas, July 24, 1938.
1 m. M. bitterrootensis on each of 2 conies, 1 f. R. fraterna, 1 f. M. wagneri wagneri on 1 cony.
Spark's Lake, south Three Sisters Mountains, Oregon.
1 specimen examined July 25, 1936.
1 m., 1 f. M. eumolpi cyrturus, 1 m. M. wagneri wagneri on the cony.
From Ochotona schisticeps, taylori, Grinnell (Warner Mountain Cony)
Wallowa Lake, Joseph, Oregon.
1 specimen examined August 8, 1938.
1 m. C. terribilis, 1 m., 1 f. O. sexdentatus agilis on the cony.
2 specimens examined, 1 without fleas, July 14, 1939.
5 m., 7 f. O. sexdentatus agilis, 1 m. M. bitterrootensis from female cony with nursing young.
From Ochotona schisticeps taylori Grinnell (Warner Mountain Cony)
Old Fish Hatchery site, junction Adel-Plush Roads, Oregon.
5 specimens examined, 1 without fleas, July 1, 1939.
1 m. O. idahoensis on each of 2 conies, 1 f. O. idahoensis on 1 cony,
3 f. M. abantis on 1 cony.
Total from the 100 northwest Conies 88 fleas distributed as follows:
Malraeus bitterrootensis Dunn and Parker 1923, 17 males, 13 females
Ctenophyllus terribilis Rothschild 1903, 4 males, 10 females
Ochophaes sexdentatus agilis Rothschild 1905, 7 males, 10 females
Megabothris abantis Rothschild 1905, 3 males, 5 females
Oropsylla idahoensis Baker 1904, 4 males, 2 females
Monopsyllus wagneri wagneri Baker 1904, 3 males, 1 female
Monilopsyllus chamberlini Hubbard 1940, 3 males
Monopsyllus ciliatus protinus Jordan 1929, 1 male, 1 female
Monopsyllus eumolpi cyrturus Jordan 1929, 1 male, 1 female
Oropsylla nepos Rothschild 1905, 1 male
Rectrofrontia fraterna Baker 1885, 1 female.
Other Records of Cony Fleas
Ctenophyllus terribilis Rothschild 1905
United States National Museum reports a single female in its collection
from Okanogan, British Columbia, Canada, by Munro, during 1916 off
Ochotona princeps cuppes Bangs.
Dr. M. A. Stewart reporting for the collection of the University of Cali-
Ochotona princeps cuppes Bangs, Okanogan Landing, British Columbia
Ochotona saxatilis saxatilis Bangs, Alberta, Canada, July 26, 1899.
Ochotona princeps subsp?, Salmon Arm, British Columbia, Banff, Alberta, Can-
ada, July 12, 1939; Reno Mine, British Columbia, May 25, 1936.
Diamanus montanus Baker 1885, 2 pairs collected by Mr. G. Augustson off
Ochotona schisticeps albatis Grinnell, Dusy Lakes, Calif., Aug. 23, 1938.
This infestation is doubtless accidental and from ground squirrels.
The Mites
With the exception of the two mites listed, these acarinas are seldom
found upon conies. Practically all conies which come to hand for examination
are heavily infested with a bright orange ear mite of the genus Neoschongastia,
commonly known as Trombicula larvae and Harvest Mites or Chiggers. In
conies (and practically all rodents) these larval mites live in the ears, some-
times their numbers are so great as to entirely plug this organ. In severe cases
of infestation the mites can be found in the skin of the belly and around the
anus. As the cony cools off after death these mites dissociate themselves from
their host and wander restlessly over the cold body. The adults do not live
upon the cony.
The second mite found upon conies is a tiny Clam-shell hair mite. This
Listrophorid glues its eggs to the fine hairs of the cony and the larva and
adults cling to the hairs by means of a hair clamping apparatus which is clam-
shell like in its shape. Although the author has seen these tiny Listrophorids
turn the pelage of rodents a shiny gray by their vast numbers, they are only
occasionally seen upon conies.
The Ticks
The writer can record no adult ticks from conies. In the spring however,
or other season when tick eggs are hatching, many larval ticks make their
way upon conies. These can be found wandering over the hair, often imbedded
in the skin. Frequently the entire rim of the ear will be studded with them.
These larvae with a goodly sprinkling of nymphs have proved to be of the
genus Ixodes and Dermacentor.
The writer has never removed lice from conies.
Although conies are closely related to the rabbits and hares they do not
seem to carry the true tick (H. leporis-palustris) or the four true fleas of these.
Part II: The Ectoparasites of Western Rabbits

The Fleas

In many non-desert regions jack rabbits, snowshoe rabbits and cottontails; in many desert locations jack rabbits, cottontails and Idaho Pigmy rabbits can be collected side by side in the West. It is not surprising, then, that these western rabbit populations carry for the most part, the same true rabbit fleas.

West of the crest of the Cascade-Sierra Mountains with their range increasing towards the east into the Great Basin region is to be found upon practically all rabbits.

Cediopsylla (inaequalis) interrupta Jordan 1925

Although Jordan described this flea on page 103, Vol. 32, Novitates Zoologicae as a subspecies of C. inaequalis Baker 1895, and American authorities seem to so hold, Jordan informed this writer by letter in 1939 that the sub-species should be elevated to the rank of a full species. This species can be told from other rabbit fleas by the presence of from 3 to 8 black, blunt genal teeth and the interrupted condition of the bristles of the clasper in which there is a group of 2 or 3 distally and a proximal group of 4 to 6; in the female VII sternite with at times a slightly rounded lobe.

East of the crest of the Cascade-Sierras but in the limits of this study, west of the foothills of the Rockies rabbits are generally infested with

Cediopsylla (inaequalis) inaequalis Baker 1895

which is described on page 164, Vol. 27, Canadian Entomologist. In this species the blunt, black genal spines vary from 3 to 8 but there is no interrupted condition in the bristles of the clasper, there being 10 to 12 in the row; in the female the VII sternite is almost flat.

In the western portion of the Great Basin region of Oregon this species can be collected on the same rabbit with the preceding, and at times off the nest building cottontails several hundred can be removed from a single specimen. The non-nest building rabbits generally carry but few if any at all.

With light but general infestation of practically all western rabbits is

Odontopsyllus dentatus Baker 1904

described on page 390, Vol. 27, Proc. U.S. Nat. Mus. This is the large western black rabbit flea. It possesses no genal teeth, has 3 heavy genal bristles high above the eye and a frontal row of about 7 medium bristles. Finger VII sternite and spermatheca of female are very characteristic.

The fourth of the true western rabbit fleas is

Hoplopsyllus (glacialis) foxi Ewing 1924

which has also been described as H. powersi C. Fox and H. minutus C. Fox. The original description appeared in Volume 16 of Parasitology as H. foxi but Dr. M. A. Stewart informs this writer by letter 2/11/41 that Ewing has sunk the species to a subspecies of H. glacialis. This is the smallest of the western rabbit fleas (pin head size), the one with most restricted range. It is migrating northward on both sides of the Cascades of California into Oregon. The writer has taken it off cottontails and jack rabbits from Modoc Lava Beds, Calif., Brownsboro and Waldo, Oreg.; it is listed as far south as Los Angeles. The finger, IX and VIII sternites of the male and the VII sternite and spermatheca of the female are more easily drawn than described.

Other Western Rabbit Fleas


In so far as rabbits become the general food of many carnivors, the above fleas can frequently be taken from coyotes, foxes and bob cats.

The Ticks

Rabbits carry many ticks. In the west the most common is the true rabbit tick Haemaphysalis leporis-palustris which the writer has collected in Washington, Oregon and California; west of the Cascades in Oregon Dermacentor occidentalis, Ixodes spinipalpis and Ixodes angustus, east of the Cascades Dermacentor andersoni and Dermacentor parumapertus.

The Lice

In the west upon cottontails and jack rabbits this writer has collected the common western wild rabbit louse Haemodipus setoni Ewing. Mites have been recorded from rabbits but this writer has found none to record in the west.
The Fleas of Rare Western Mice
By C. Andresen Hubbard, Sc. D.

There are a small series of western wild mice which naturalists have always had difficulty in securing for skins and study. Whether these mice are actually rare or whether they are just hard to secure is difficult to say. It is the fleas of these western mice which seem to be difficult to secure that this paper is about. Their rareness is judged here from their only occasional occurrence in the some 25,000 personal rodent records of the writer.

The Tree Mice seem to hold first place in this consideration for over a period of years the writer has examined only two specimens with their nests. These mice live in trees, their homes being canopied bird-like nests which seem to be used year after year by the same family. The mice apparently live entirely upon the evergreen needles of the tree in which the nest is located. They cannot be trapped but must be taken with their nests by climbing into the trees for them. The writer’s records from two mice (Phenacomys silvicola How­­ell) with their nests taken at Newberg, Oregon during 1938, one female Megabothris quirini Rothschild 1905, the determination having been made by Dr. Karl Jordan.

Gnome Mice are second cousins to kangaroo rats and dwellers of the desert regions of Oregon, Nevada and California. They are very scarce in collections, unusually hard to trap. These small gray mice have large heads and fleshy tails. It has always been thought that they were hard to secure because their small size failed to spring traps and because baits tried had not appealed to them. The writer’s specimens, eight in all, were secured on quick cooker rolled oats in small box traps set so select a bit; of sand would spring them. Four taken in northwest Nevada were without fleas but four taken at Blitzen, Oregon, July 4, 1939 gave the record:

From Microdipodops megacephalus oregonus Merriam (Gnome Mouse) Meringis hubbardi Kohls 1938, 2 males 2 females.

Jumping Mice are occasionally abundant in places but more generally they are scarce in numbers and scattered in distribution. They are marsh and meadow dwellers, living in the midst of plenty, which makes it difficult to coax them into box traps. Four of the ten specimens of which the writer has records were without fleas, the remaining six were carrying fifteen fleas, all of which were Megabothris abantis Rothschild 1905, from

Zapus princeps oregonus Preble (Blue Mountain Jumping Mouse) Parkdale, Oregon, August 5, 1937—1 male
Zapus trinitatus pacificus Merriam (Pacific Jumping Mouse) Devils Lake, Oregon, August 10, 1937—2 females
Zapus princeps oregonus Preble (Blue Mountain Jumping Mouse) Lostine, Oregon, August 6, 1938—1 male, 2 females August 7, 1938—7 females August 8, 1938—1 male
Wallowa Lake, Oregon, July 14, 1939—1 male, which data suggests that Zapus is one of the favored hosts for this flea.
Grasshopper Mice are dwellers of the hottest desert regions of the west. They are small vicious mice with gray backs, white bellies and short tails. They are carnivorous, freebooters, robbers, all of which tells in their fleas, for upon them can be found practically all of the desert species, fleas picked up from their victims, as they rob and kill them. Meat in traps does not seem particularly to attract these mice, they seem to enter box traps primarily to investigate the smells left by other mice. Frequently they are caught in adjacent traps, a male and a female apparently hunting together, or a mother and a youngster, the youngster receiving its early training. The numbers of fleas found upon them would lead one to believe that they had not learned to dust themselves well. Thirteen specimens collected by the writer over a period of years carried 91 fleas. None of them were without fleas. All records are from:

Onychomys leucogaster fuscogriseus Anthony (Oregon Grasshopper Mouse)
Narrows, Oregon, December 8, 1936
Monopsyllus wagneri wagneri Baker 1904—3 pair (Deer Mouse Flea)

Foxella ignotus recula J. and R. 1915—1 pair (Pocket Gopher Flea)
Narrows, Oregon, December 11, 1936

Foxella ignotus recula J. and R. 1915—2 females (Pocket Gopher Flea)

Micropsylla sectilis J. and R. 1923—1 female
Crane, Oregon, July 17, 1937

Meringis shannoni Jordan 1929—1 pair (Pocket Mouse Flea)

Monopsyllus wagneri wagneri Baker 1904—1 male (Deer Mouse Flea)
Mabton, Washington, May 29, 1938

Meringis shannoni Jordan 1929—3 females (Pocket Mouse Flea)

Monopsyllus wagneri wagneri Baker 1904—2 females (Deer Mouse Flea)
Mabton, Washington, May 29, 1938

Meringis shannoni Jordan 1929—8 males, 15 females (Pocket Mouse Flea)

Monopsyllus wagneri wagneri Baker 1904—2 males, 1 female
Two Rivers, Washington, May 11, 1939

Thrassis petiolatus Baker 1904—1 male, 5 females (Ground Squirrel Flea)
Two Rivers, Washington, May 11, 1939

Monopsyllus wagneri wagneri Baker 1904—1 female (Deer Mouse Flea)
Boardman, Oregon, May 12, 1939

Meringis shannoni Jordan 1929—2 males, 6 females (Pocket Mouse Flea)

Thrassis petiolatus Baker 1904—3 females (Ground Squirrel Flea)
Southwest, Nevada—Denio, Oregon, July 5, 1939

Monopsyllus wagneri wagneri Baker 1904—2 females (Deer Mouse Flea)

Malaraeus sinomus Jordan 1925—2 females (Deer Mouse Flea?)

Meringis shannoni Jordan 1929—1 female (Pocket Mouse Flea)

Thrassis francisi C. Fox 1927—1 female (Ground Squirrel Flea)
Blitzen, Oregon, July 6, 1939

Meringis hubbardi Kohls 1938—3 males, 1 female (Kangaroo Rat Flea)

Monopsyllus exilis exilis Jordan 1937—2 males, 1 female

Foxella ignotus recula J. and R. 1915—1 pair (Pocket Gopher Flea)
Fields, Oregon, July 6, 1939

Thrassis pandorae Jellison 1937—1 pair (Ground Squirrel Flea)

Monopsyllus exilis exilis Jordan 1937—1 male

Monopsyllus wagneri wagneri Baker 1904—1 female (Deer Mouse Flea)

Foxella ignotus recula J. and R. 1915—1 female (Pocket Gopher Flea)
Ontario, Oregon, July 11, 1939

Thrassis francisi C. Fox 1927—1 pair (Ground Squirrel Flea)

From the above data upon Grasshopper mice it becomes apparent that their chief victims are Deer mice from which they become infested with Monopsyllus w. wagneri and Malaraeus sinomus and the defenseless Pocket mice which contribute Meringis shannoni; that they readily explore all burrows which accounts for the ground squirrel fleas Thrassis petiolatus, Th. francisi and Th. pandorae and the Pocket gopher fleas Foxella i. recula. Monopsyllus exilis exilis is probably a true Grasshopper mouse flea.

Totals: from 13 specimens 91 fleas; average 7 per specimen

Meringis shannoni Jordan, 18 males, 8 females (Pocket Mouse Flea)
Monopsyllus w. wagneri Baker, 5 males, 10 females (Deer Mouse Flea)
Thrassis petiolatus Baker, 1 male, 8 females (Gr. Squirrel Flea)
Foxella i. recula J. and R., 2 males, 5 females (Gopher Flea)
Monopsyllus e. exilis Jordan, 3 males, 1 female
Meringis hubbardi Kohls, 3 males, 1 female (Kangaroo Rat Flea)
Thrassis francisi C. Fox, 1 male, 2 females (Gr. Squirrel Flea)
Malaraeus sinomus Jordan, 2 females (Deer Mouse Flea)
Micropsylla sectilis J. and R., 1 female (Deer Mouse Flea)
Thrassis pandorae Jellison, 1 pair (Ground Squirrel Flea)
Red-backed Mice while apparently well distributed through the timbered areas of the west, seem to seldom make their way into box traps. Those which the writer can record have been trapped in a variety of places, the most common, boulder masses in which they doubtless find shelter. The traps were set for what would enter; the bait, quick cooker rolled oats. Of twenty-one records of these mice four were without fleas when examined, two others were dead, cold and without fleas. The remaining fifteen carried 47 fleas, an average of about 3 fleas each. The records are

From Clethrionomys californicus mazama Merriam (Mazama Red-back Mouse)
Locality listed from north to south in Cascade Mountains
Government Camp, Oregon, October 19, 1935
Leptopsylla selenis Rothschild 1906—1 male
Government Camp, Oregon, October 10, 1935
Opisodasys keeni Baker 1896—1 female
Summit Mcspoon Pass, Oregon, July 19, 1936 and July 24, 1938
2 specimens dead in traps—no fleas
Crater Lake, Oregon, August 29, 1933
Malariaeus telchinum Rothschild 1905—1 male, 1 female
Leptopsylla selenis Rothschild 1906—1 male, 1 female
Crater Lake, Oregon, August 30, 1933
Malariaeus telchinum Rothschild 1906—1 female
Catallagia chamberlini Hubbard 1940—1 male
Leptopsylla selenis Rothschild 1906—1 female
Lake o’ the Woods, Oregon, June 21, 1939
4 specimens but only 1 with a flea
Leptopsylla selenis Rothschild 1906—1 female
Lake o’ the Woods, June 25, 1939
Leptopsylla selenis Rothschild 1906—2 males, 1 female
Catallagia chamberlini Hubbard 1940—2 females
Rocky Point, Oregon, June 25, 1939—3 specimens
Leptopsylla selenis Rothschild 1906—3 males, 6 females
Catallagia chamberlini Hubbard 1940—2 males

From Clethrionomys gapperi saturus Rhoads (B.C. Red-backed Mouse)
Lostine, Oregon, August 7, 1938
Megabothris abantis Rothschild 1905—1 male, 1 female
Lostine, Oregon, August 8, 1938
Megabothris abantis Rothschild 1905—1 female
Mitchell, Oregon, August 18, 1939
Catallagia decipiens Rothschild 1915—2 males, 1 female

From Clethrionomys californicus obscurus Merriam (Dusky Red-back)
Estacada, Oregon, August 6, 1938
Leptopsylla selenis Rothschild 1906—7 males, 7 females
Monopsyllus wagneri opidius Jordan 1929—1 male
Detroit, Oregon, August 8, 1938, 1 specimen—no fleas

From Clethrionomys californicus californicus Merriam (Cal. Red-back)
Florence, Oregon, August 19, 1937
Leptopsylla selenis Rothschild 1906—1 female

The above data seems to reveal Leptopsylla selenis as the chief flea of western Red-backed mice, there being 14 males, and 18 females out of the possible 47, the remaining 15 being of 6 other species.

The Tillamook Long-tailed Meadow Mouse is another of the rare western rodents. Described in 1922 by Howell from Tillamook, Oregon, nothing more was heard of this large long-tailed microtus until the writer began catching them for their fleas. This writer has extended their actual range from the Pacific ocean eastward into the Willamette watershed and from Tillamook Head to the north to Florence, Oregon on the south. Like most meadow mice these are hard to coax into box traps because of the ever present supply of favored food about them. Of ten of these recorded by the writer, five were without fleas, the remaining five carried but nine fleas. Three specimens from Forest Grove, Oregon of Microtus mordax abditus Howell during 1937 carried
Epitedia jordani Hubbard 1940—2 females
Monopsyllus ciliatus protinus Jordan 1929—1 pair
Megabothris abantis Rothschild 1905—1 female

Two specimens taken at Cannon Beach, Oregon during 1940 carried
Epitedia jordani Hubbard 1940—3 males
Atyphloceras multidentatus C. Fox 1909—1 female
Oregon Creeping Meadow Mice are not particularly rare but like other meadow mice they seldom enter box traps. During August of 1937 along the coastal belt of Tillamook County, Oregon their shyness towards box traps seemed to have vanished temporarily and the writer succeeded in securing

From 15 Microtus oregoni oregoni Bachman (Oregon Creeping Meadow Mouse)
- Malaranaeus dobsi Hubbard 1940—5 males, 6 females
- Leptopsylla selenis Rothschild 1906—4 males, 1 female
- Doratopsylla jellisoni Hubbard 1940—1 female
- Epitedia jordani Hubbard 1940—4 females
- Catallagia charlottensis Baker 1898—2 females
- Atypiloceras multidentatus C. Fox 1909—2 females
- Hystrichopsylla, gigas dippiei Rothschild 1902—1 male
- Megabothris abantis Rothschild 1905—1 female

Gray-tailed Meadow Mice are small meadow mice about which very little is known by naturalists. They always seem scarce, but are probably not so. A few can be taken in box traps early in the year when the breeding season begins and they are hurridly looking everywhere for mates. The writer accidentally discovered while pit-falling shrews that many more can be taken by placing gallon jars under their tiny runways as pit falls. They fall in, cannot escape. No bait is needed. Twenty-seven specimens examined carried 88 fleas; only two being without. The records come from four localities west of the crest of the Cascade Mountains in Oregon. These are from

Microtus canicaudus Miller (Gray-tailed Meadow Mouse)
- Odell, Oregon, March 11, 1939, from 3 specimens
- Leptopsylla selenis Rothschild 1906—1 male, 1 female
- Catallagia chamberlini Hubbard 1940—2 males, 5 females
- Detroit, Oregon, May 21, 1938, from 1 specimen
- Catallagia charlottensis Baker 1898—1 male
- Salem, Oregon, December 16, 1938, from 1 specimen
- Leptopsylla selenis Rothschild 1906—1 male
- Salem, Oregon, March 24, 1940, from 1 specimen
- Leptopsylla selenis Rothschild 1906—1 pair
- Opisodasys keeni Baker 1896—1 male
- Micropsylla sp. nov.—1 male
- Forest Grove, Oregon, March 22, 1940, from 2 specimens
- Leptopsylla selenis Rothschild 1906—2 males
- Micropsylla sp. nov.—1 male
- Catallagia charlottensis Baker 1898—1 female
- Gaston, Oregon, February 1940, from 6 specimens
- Leptopsylla selenis Rothschild 1906—5 males, 7 females
- Atypiloceras multidentatus C. Fox 1909—3 pairs
- Hystrichopsylla gigas dippiei Rothschild 1902—4 females
- Catallagia charlottensis Baker 1898—1 pair
- Epitedia jordani Hubbard 1940—3 females
- Micropsylla sp. nov.—1 male
- Gaston, Oregon, March 1940, from 6 specimens, 2 without fleas
- Leptopsylla selenis Rothschild 1906—5 males, 6 females
- Hystrichopsylla gigas dippiei Rothschild 1906—1 pair
- Micropsylla sp. nov.—1 female
- Gaston, Oregon, December 1940, from 5 specimens
- Leptopsylla selenis Rothschild 1906—2 males, 4 females
- Hystrichopsylla gigas dippiei Rothschild 1902—4 pairs
- Atypiloceras multidentatus C. Fox 1909—1 male, 4 females
- Micropsylla sp. nov.—1 female
- Catallagia charlottensis Baker 1898—1 female
- Gaston, Oregon, February 27, 1941, from 1 specimen
- Atypiloceras multidentatus C. Fox 1909—1 pair
- Leptopsylla selenis Rothschild 1906—1 female
- Hystrichopsylla gigas dippiei Rothschild 1902—1 male
- Catallagia charlottensis Baker 1898—2 females

The above data on Gray-tailed meadow mice shows L. selenis as the major flea parasite with 37 specimens. H. d. gigas follows second with 15 specimens, A. multidentatus next with 13 specimens, and then trailing far behind C. chamberlini and C. charlottensis with 7 specimens each; Micropsylla sp., with 5, E. jordani with 3 and O. keeni with 1.

Note: The Micropsylla mentioned above as sp. nov. is being described for May release as Micropsylla goodi Hubbard 1941.
History of the Flea Genus Micropsylla

WITH ONE NEW SPECIES

by

Mr. C. Androsen Hubbard, D. Sc.

Professor of Biology and Head of the Department

The only valid species of the siphonapteran genus Micropsylla to this date is M. sectilis. This species was described in an article "New American Siphonaptera" by Jordan and Rothschild on page 314, Entomologists' Monthly Magazine, 1923. In this article the species was described as Rhadinopsylla sectilis from three females taken off Peromyscus (Deer Mouse) and Mus by A. Tate who collected the specimens during December of 1908 and March of 1909 at Kelowna, British Columbia, Canada.

In the short original description covering the female only the authors state that the new species is close to Rhadinopsylla sectilis. Baker, that the genital comb has four teeth, first and fourth teeth shorter than second and third, the first thinner than fourth; in between third and fourth the genital process which resembles the teeth of the comb, but which is narrower and paler; this process reaching the apex of the tooth or is shorter. Pronotal comb with sixteen spines. Abdominal tergites I to V with one apical spine on each side. VII sternite with a very narrow but deep sinus in the middle of the side. Spermatheca gradually narrowed, apex of tail concave on the anal side. The original length is given as 1.8 to 2.1 mm.

During November of the same year (1923) Dunn and Parker of the Rocky Mountain Spotted Fever Laboratory issued their work on the fleas of Montana in U.S. Public Health Reports, Vol. 38, Pt. 2 and on page 2767 established a new genus, Micropsylla which was erected to hold an extremely small male flea taken off a field mouse. The new genus was said to be near Neopsylla and Rhadinopsylla, differing from the former mainly by having four pairs of spines on each fifth tarsal segment, and from the latter by the overlapping of some of the genital spines.

The small flea upon which the genus was based was called Micropsylla peromyscus and was designated as the genotype. The chief characteristic of the new species seemed to be 5 genital teeth vertically placed, the third one pale and overlapped by the second. The specimen was taken three miles west of Woodman, Montana, May 6, 1922 off a white-foot mouse.

During September of 1929 the species sectilis was again featured in literature when Wagner in his "Fleas of British Columbia" found in The Canadian Entomologist, Vol. LXVIII lists this species on page 203 as Rectrofrontia sectilis and states that the American species are little known, then compares the description with specimens found in the Spencer Collection at the University of British Columbia, and states the consideration with "The male not being described I give a drawing of its genitalia as well as of the genital comb, both of the male and the female." These illustrations are found on page 204.

During 1937 Dr. Karl Jordan in Novitates Zoologicae, Vol. 40 on page 270 reduced Micropsylla peromyscus Dunn and P. 1923 to a synonym of M. sectilis. It seems that Dunn and Parker had described the male of M. sectilis rather than the male of a new species, that they had mistaken the pale genal process for a genal spine, so the 5 genital teeth mentioned in their description. Dr. Jordan accepted the genus Micropsylla and moved sectilis into it.
During 1938 this writer sent to Dr. Karl Jordan of the Tring Branch of the British Museum a male and a female of a Micropsylla taken just east of the Cascade Mountains in central Oregon. The head was armed with four genal teeth. The writer asked Dr. Jordan to verify his determination of M. sectilis. After careful consideration Dr. Jordan returned the specimens as true M. sectilis. A male and female with 5 genal teeth were also sent to Dr. Jordan. These had been taken by the writer west of the Cascade Mountains. This pair was returned to the writer with the notation "Micropsylla sp. nov. This species with 5 genal spines is not M. sectilis J. & R. 1923, but the one erroneously recorded and figured by Wagner, from British Columbia."

Above, then, is the evidence upon which the following paragraphs are based.

**Micropsylla Dunn and Parker 1923**

A western genus of fleas found in the Rocky Mountains and west to the Pacific ocean in the United States and Canada.

Head: A genal comb of four or five stout black teeth; above these a row of three stout bristles, all extending beyond the end of the shortest genal teeth; then most anterior a row of five medium bristles. Postantennal region of head armed with three distinct rows of medium bristles. The genal comb does not always have overlapping teeth, the overlapping generally occurs only in the presence of five teeth when crowding may cause the most dorsal of the five to sometimes slightly overlap the tooth next to it. No eye. Frons with tip.

The Pronotal comb consists of 16 or 18 normal black teeth.

Abdominal tergites I to V with one apical spinlet to the side.

Modified segments: Antepygidal bristles absent in male, two in female. At posterior margin of pygidium a tassel like organ. Spermatheca gradually narrowed, apex of tall concave on the annal side. VII sternite of female with apical margin sinuate.

**Key to the Species of Micropsylla**

1. Genal comb with four black teeth ........ M. sectilis
2. Genal comb with five black teeth ........ M. goodi sp. nov.

**Micropsylla sectilis** Jordan and Rothschild 1923

This species can be distinguished from the following, which is described as new, by the presence of but four black genal teeth in the genal comb and the structure and shape of the modified abdominal segments.

The following description is based upon a male and a female examined by Dr. Karl Jordan and verified as true M. sectilis and six other females in the collection of the writer.

Pronotal teeth number sixteen in both male and female.

Male: Process P of the clasper with the upper and lower borders about parallel, apex somewhat hooked, at lower junction with finger F a small bristle; along the middle of dorsal border two bristles and slightly lateral to them a long stout bristle; apically a few minute ones. Finger gracefully concave along its entire posterior border, apex notched anteriorly; anterior border parallel with posterior border; armed with three small bristles on posterior border. IX sternite long, slender and gradually pointed; posteriorly and apically with about six very definite bristles, the lower the longest, anteriorly with a few small bristles along entire border. Tassel at posterior border of pygidium flared at apex and armed upon sides with a long bent bristle posteriorly and a short straight bristle anteriorly. Pygidium extending from tassel to point where antepygidal bristles should be had the male of this species possessed them.

Female: Apical margin of the VII sternite deeply sinuate, the lower lobe relatively narrow when compared with the long upper slanting lobe. Spermatheca typical. Pygidium covering entire area from antepygidal bristles to tassel and stylet.

Length: The original description gave the length of the female as 1.8 to 2.1 mm. for the three. No length has been issued for the male. The writer's specimens average, male 1.2 mm., female, 1.8 mm.

Range: East of the crest of the Cascade Mountains in Oregon, Washington and British Columbia and apparently as far east, as the east base of the Rocky Mountains. Not listed by Fox in his Fleas of the Eastern United States.

Host Preference: The few records available for this species leads the writer to believe this flea favors the Deer Mouse as a host.

Seasonal Distribution: This species seems to be a winter flea.

Deposites: The two specimens verified by Dr. Jordan bear the writer's numbers 648 and 650 and are deposited in the United States National Museum.
From *Peromyscus* sp. and *Mus* sp. (Deer Mouse and Mouse) (By A. Tate) Kelowna, British Columbia, Oct. 1908, Mch. 1909—3 females

*Peromyscus* sp. (Deer Mouse) (Rocky Mountain Laboratory Staff) Woodman, Montana, May 6, 1922—1 male.

The writer's Records

From *Peromyscus maniculatus gambelli* Baird (Gambel's Deer Mouse) Sisters, Oregon, March 19, 1937—1 female

Mitchell, Oregon, March 5, 1940—1 female

Shaniko, Oregon, December 8, 1940—2 females

Accidental Occurrences

*Onychomys leucogaster fuscogriseus* Anthony (Grasshopper Mouse) Narrows, Oregon, December 11, 1936—1 female

*Thomomys quadratus quadratus* Merriam (The Dalles Pocket Gopher) Sisters, Oregon, March 19, 1937—1 male.

*Citellus moilis canus* Merriam (Gray Sage Rat) Shaniko, Oregon, March 3, 1940—2 females

*Micropsylla goodi* new species

This species is close to *M. sectilis* J. and R. 1923 from which it can be distinguished by the presence of five normal black teeth in the genal comb of both male and female, and by the structure and shape of the modified abdominal segments.

The following description is made with 70 specimens before the writer, all personally collected west of the Cascade Mountains in Oregon and Washington. Of these 70, 30 are males, 40 females. A pair of these sent to Dr. Karl Jordan during 1938 were returned with the notation that they represented a new species.

Pronotal teeth number 16 in the male, 18 in the female.

Male: Although the male of this species is larger than that of the preceding species, the clasper is smaller although very similar in shape. The upper and lower borders are parallel, the apex somewhat hooked; at lower junction with the finger a small bristle; along the middle of dorsal border
two bristles and slightly lateral to them a long stout bristle (position of which varies slightly with individual); apically a few small bristles. The finger is much shorter and broader than in the preceding species and the apex is nicely rounded and without a notch; armed with a few small bristles posterior and apically. IX sternite distinctly different from preceding, being in the shape of a stout hook, armed apically and posteriorly with some small bristles; anterior face with three small bristles. Tassel at posterior border of pygidium not flared at apex; armed upon sides with long curved bristle posteriorly and shorter, straight bristle anteriorly. The pygidium differs from that in the preceding species in that it does not entirely fill the space between the tassel and the point where antepygidial bristles should be had the male of this species possessed them.

Female: The apical margin of the VII sternite is not, so deeply or narrowly sinuate as in the preceding species but the relative size of the lower and upper lobe is about the same. Shermaidea is typical. The pygidial area of this species differs from the preceding in that it covers only about half the space between the tassel and stylet to the posterior and antepygidial bristles to the anterior.

Length: Males average 1.6 mm., females 2.00 mm.

Variation: There is little variation in the 70 specimens at hand: In one instance a male has 6 genal teeth; on one side. In two specimens there are two apical spinlets on a tergite; one, four bristles in the lower genal row.

Range: West of the crest of the Cascade Mountains to Pacific ocean in Oregon, Washington and British Columbia.

Host Preference: Of the 70 specimens at hand 60 are from Deer Mouse (Peromyscus), which seems to be the favored host.

Seasonal Distribution: With few exceptions this is a winter species.

Deposites: The holotype male and the allotype female taken off a Deer Mouse (Peromyscus maniculatus rubidus Osgrad) at Forest Grove, Oregon, the type locality, on March 12, 1937 are mounted on one slide bearing the writer's number 644 and are deposited in the United States National Museum. Twenty of the males and 20 of the females before the writer at this time are designated as paratypes and distributed as elsewhere listed.

This species bears the name of Dr. Newell Good of the Plague Suppressive laboratory, Sán Francisco, California.

Records

From Peromyscus maniculatus austreus (Deer Mouse)
Spencer Collection, University of British Columbia
August 11, 1928 at Vancouver, British Columbia, Canada.

The Writer's Records

(Only those records are included which establish range)

From Peromyscus maniculatus rubidus Osgood (Ruddy Deer Mouse)
Huber, Oregon, March 2, 1935—1 male
Forest Grove, Oregon, March 12, 1937—1 male, 1 female
Salem, Oregon, January 14, 1938—1 male, 1 female
Gaston, Oregon, December 11, 1938—1 female
Odel, Oregon, January 15, 1939—1 male, 1 female
Gold Beach, Oregon, June 13, 1939—2 females

From Peromyscus maniculatus oreas Bangs (Washington Deer Mouse)
Carson, Washington, August 17, 1935—1 female
Washougal, Washington, February 23, 1940—1 female

From Microtus townsendi Bachman (Townsend Meadow Mouse)
Newberg, Oregon, February 22, 1939—1 male, 2 females

From Microtus caniculus Miller (Gray-tailed Meadow Mouse)
Forest Grove, Oregon, March 22, 1939—1 male
Gaston, Oregon, December 5, 1940—1 female

Accidental Occurrences

From Sciurus douglasi douglasi Bachman (Douglas Pine Squirrel)
Gaston, Oregon, March 7, 1932—1 female

From Citellus douglasi Richardson (Gray Digger)
Wheatland, Oregon, March 6, 1939—1 female.

An Apology and a Correction

Although the source from which the information was gathered seemed unimpeachable, Dr. William Jellison wishes his name retracted from the statement on page 3, Pacific University Bulletin, Volume 37, No. 8.
ERRORS AND THEIR CORRECTIONS

Obvious typographical errors are not listed.

In bulletins Nos. 1, 2 and 3 where the term "spine" is used it should be interpreted as meaning bristle.

No. 1. The genus Corypsylla and its species ornatus were erected by C. Fox in 1908, not 1909 as listed.
   Page 3 line 6, page 4 last line, Belgrade, Jugoslavia, not Germany.
   Page 3 line 37, 4-6-4-4-0-0 should read 1-6-4-4-0-0.
   Page 6 line 27 delete the "The first".
   Page 7 line 31 "or" should read "on".
   Page 8 line 39-40 "season" should read "reason".
   Page 9 line 11 "indistance" should read "indistinct".

Page 12 Regarding Depositories

Due to the scarcity of microscope slides and cover glasses, automobile tires and gasoline due to war conditions the depositories listed will be established only as soon as specimens can be collected and mounted.

In so far as Professor Spencer of the University of British Columbia has retired from the field of fleas the depository listed for that institution will be delivered to the Canadian Entomological Laboratory, Kamloops, B. C. An additional depository will be established at the University of Arizona, Tucson, and at the University of Southern California, Hancock Foundation, Los Angeles.

No. 2. Page 3 line 27 "Ceralophyllus" should read "Ceratophyllus".
   Page 6 line 4 "Carnivora" should read "Carnivora".
   Page 12 delete line 24.

No. 4. It is obvious that Meringis dipodomys and 51. Odontopsyllus dentatus are out of place Read in correct position.
   Item 1. "gallinacea" should read "gallinacea".
   Item 3. "Bauche" should read "Bouche".
   Item 20. Thrassis pandorae—Record should read Lowden, Washington off Red Digger, not Toppenish off Yakima Ground Squirrel.
   Item 22. Diamentus montanus should read "23. Diamentus montanus".
   Item 36. "Nosopsyilla" should read "Nosopsyllus".
   Item 53. "Leptopsyilla" should read "Leptopsyllus".
   Item 76. Micropsylla peromyseus is Micropsylla goodi Hubbard 1941.
   Page 4 line 45 "Orchopeas desertorum" should read "Thrassis desertorum".
   Page 4—Last five lines on the page should be over-printed.