

FAMILY DOLICHOPSYLLIDAE BAKER

- 1905 Dolichopsyllinae Baker, Proc. United States Nat. Mus., 29:127.
 1909 Dolichopsyllidae Oudemans, Nov. Zool., 16:156.
 1915 Ceratophyllidae Rothschild, Ent. Mo. Mag., 51:58.
 1926 Ceratophyllidae Dampf, Ent. Mitt., 15:380.
 1929 Dolichopsyllidae Ewing, Manual External Parasites, p. 165.
 1936 Ceratophyllidae Wagner, Tierwelt Mitteleuropas, Bd. 6, Abt. 17, s. 4.

In this family there are two or more rows of bristles on each abdominal tergite. The eye is well developed except in *Conorhinopsylla* and *Foxella* where it is vestigial. A pronotal ctenidium is present in all cases except in *Rhopalopsyllus* and *Trichopsylla* where both the genal and pronotal ctenidium are absent. Two genera, *Ctenophthalmus* and *Rectofrontia* are armed with both a pronotal and a genal ctenidium.

This family is the largest in our fauna and in the East is represented by fourteen genera which are rather difficult to separate. Until 1933 many of the separate genera now recognized were included in the complex *Ceratophyllus*. The name *Ceratophyllus* is now limited to a large group whose members are normally parasitic only on birds.

Key to the Eastern Genera of Dolichopsyllidae

1. Pronotal ctenidium absent2
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2. Ocular row consisting of three bristles*Rhopalopsyllus*, p. 30
 Ocular row consisting of four bristles*Trichopsylla*, p. 32
3. Genal ctenidium present4
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4. Genal ctenidium horizontal*Ctenophthalmus*, p. 34
 Genal ctenidium vertical*Rectofrontia*, p. 38
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 Eye well developed7
6. Pronotal ctenidium consisting of about ten slender spines on a side*Foxella*, p. 39
 Pronotal ctenidium consisting of six broad spines on a side*Conorhinopsylla*, p. 41
7. Labial palpus extending beyond the apex of the fore coxa by about a segment8
 Labial palpus not extending beyond the apex of the fore coxa or extending only slightly beyond9

8. Frontal tubercle prominent. Females with two antepygidial bristles *Opisocrostitis*, p. 42
Frontal tubercle small and acuminate. Females with three antepygidial bristles *Oropsylla*, p. 44
9. Fifth tarsal segment of each leg armed with four pairs of lateral plantar bristles and a basal ventral pair 10
Fifth tarsal segment of each leg armed with five pairs of lateral plantar bristles (the basal pair may be slightly displaced toward the median line) 11
10. Postantennal region armed with one or no bristles in addition to those of the marginal row. Frontal tubercle small *Opisodasys*, p. 56
Postantennal region armed with two or three bristles in addition to those of the marginal row. Frontal tubercle large, *Orchopeas*, p. 58
11. Pronotal ctenidium consisting of twelve or more spines on a side ... 12
Pronotal ctenidium consisting of less than twelve spines on a side ... 13
12. Head of the receptaculum seminis globular; movable finger as wide as long *Odontopsyllus*, p. 46
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13. Movable finger with spiniforms; tail of the receptaculum seminis not long and not curved about head *Megabothris*, p. 67
Movable finger without spiniforms; tail of the receptaculum seminis long and curved about head *Nosopsyllus*, p. 73

RHOPALOPSYLLUS BAKER

Rhopalopsyllus Baker, 1905, Proc. United States Nat. Mus., 29:128.

Genotype: *Pulex lutzii* Baker

Genal and pronotal ctenidium absent. Frontal tubercle large and conspicuous, acuminate, directed dorsad. Two large bristles on the gena below the eye. Postantennal region of the head with three rows of bristles. Posterior margin of the antennal groove with a dense row of short spiniform bristles. One long antepygidial present on a side. Fifth tarsal segment armed with four pairs of lateral plantar bristles and an apical submedian pair.

This genus is represented in the East by a single species which may have been introduced into this country from South or Central America by rats. It is now well established in our southern states.

Rhopalopsyllus gwyni C. Fox

(Plate VII, figs. 28, 32, 33)

1914 *Rhopalopsyllus gwyni* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, p. 10, Pl. III, figs. 1-6.

1923 *Rhopalopsyllus gwyni* Jordan and Rothschild, Ectoparasites, 1:333.

1932 *Rhopalopsyllus gwyni* Jordan, Nov. Zool., 38:292.

MALE. Preantennal region of the head with two rows of bristles and a series of small setae along the anterior margin of the antennal groove. Upper row consisting of six bristles of which the one closest to the antenna is small and weak while the other five are longer and more robust. Lower row with three long stout bristles. Eye large, heavily pigmented, and prominent. Labial palpus not reaching to the apex of the fore coxa. Postantennal region of the head with three rows of bristles, the first consisting of five stout bristles, the second of six, and the third of seven which alternate with small setae (Plate VII, fig. 28). Pro- and mesonotum each armed with two rows of bristles. Metanotum armed with three rows of bristles. Each abdominal tergite with two rows of bristles. Tibia and tarsus of the hind legs richly supplied with stout bristles. **MODIFIED SEGMENTS:** Clasper heavy, roughly quadrangular, the dorsal margin armed with a number of heavily pigmented bristles of various sizes. Movable finger curved, with a number of small setae on the margins. Manubrium finger-like, much shorter than the penis, blunt terminally. Penis broad and heavy, terminating bluntly; the spring short, not completing a single turn. Posterior arm of sternite IX with numerous bristles apically. For further details concerning the structure of the male genitalia, see Plate VII, fig. 32.

FEMALE. General structure and chaetotaxy essentially as in the male, except that the labial palpus extends beyond the fore coxa. Posterior margin of sternite VII rounded, without a sinus. Head of the receptaculum seminis slightly longer than broad; tail longer than the head. For further details concerning the structure of the female genitalia, see Plate VII, fig. 33.

RECORDS. FLORIDA—Osceola County, January 5, 1937, on "opossum," two males (B. V. Travis); Fort Lauderdale, February 18, 1919, on "*Oryzomys palustris* (Harlan)," female (A Wetmore); Tallahassee, January 21, 1937, on "cotton rat," two males, two females. GEORGIA—Thomasville, July-August, 1934, on *Sigmodon hispidus hispidus* Say and Ord, numerous specimens; Grady County, August 16, 1934, on "cotton rat," two females; Newton County, July 8, 1936, on "*Didelphis virginiana*," female (E. V. Komarek). LOUISIANA—Jeanerette, February 2, 1929, on "opossum" (Dikeman).

EASTERN HOSTS. Opossum ("*Didelphis virginiana*"), Rice-rat ("*Oryzomys palustris* (Harlan)"), Cotton-rat (*Sigmodon hispidus hispidus* Say and Ord), "Rats."

EASTERN LOCALITIES. Florida, Georgia, Louisiana.

TYPE MATERIAL. Male and female from Brunswick, Georgia, on "rats" in the United States National Museum.

This species was once thought to be a synonym of the South American *Rhopalopsyllus bohlsi* (Wagner) but is now regarded as distinct.

TRICHOPSYLLA (KOLENATI) JORDAN AND ROTHSCILD

Trichopsylla Kolenati, 1863, Hor. Soc. Ent. Ross., 2: 32.

Trichopsylla Jordan and Rothschild, 1920, Ectoparasites, 1: 63.

Genotype: *Vermipsylla homoeus* Rothschild

Genal and pronotal ctenidium absent. Eye well developed. Ocular row consisting of four bristles. Frontal tubercle large and conspicuous. Antepygidial bristles absent. Fifth tarsal segment of each leg armed with four pairs of lateral plantar bristles.

This genus is represented in the East by two species which may be separated by the following key.

Key to the Eastern Species of *Trichopsylla*

- Middle of the three rows of bristles on the postantennal region consisting of three bristles *T. lotoris*
 Middle of the three rows of bristles on the postantennal region consisting of five bristles *T. floridensis*

Trichopsylla floridensis I. Fox

(Plate VIII, figs. 34, 36, 39)

1939 *Trichopsylla floridensis* I. Fox, Proc. Ent. Soc. Washington, 41:45, Pl. 6, fig. 6.

MALE. Preantennal region of the head with two rows of bristles; the upper row consisting of six, the lower row consisting of four much stouter ones arranged in an oblique line. Genal process heavily pigmented and pointed. First segment of the antenna with numerous small setae in a longitudinal row; apically with eight or nine larger setae in a transverse row of about eight small setae and several long bristles about as long as the third segment. Postantennal region armed with three irregular rows of bristles; the first consisting of three stout bristles, the second of five, and the third or marginal row of about nine long bristles which alternate with about seven small setae. Labial palpus reaching to about two-thirds the length of the fore coxa. Dorsal region of the head and thorax with a conspicuous pubescence. Pronotum with a marginal row of

about eight bristles. Meso- and metanotum each with two irregular rows of bristles. Metepimeron armed on its posterior margin with about six long bristles anterior to which is an irregular row of five or six shorter ones (Plate VIII, fig. 36). Each abdominal tergite with two rows of bristles, the posterior made up of long bristles reaching to the middle of the next segment. MODIFIED SEGMENTS: Clasper broad and flat, the margins with numerous long bristles. Process of the clasper not distinctly separated from the body proper. Movable finger long and curved. Manubrium finger-like, ending bluntly. Penis blunt terminally; spring not completing a turn. For further details of the male genitalia, see Plate VIII, fig. 39.

FEMALE. Chaetotaxy of the head (Plate VIII, fig. 34) and general structure essentially as in the male except that the pubescence on the head and thorax is absent. Tail of the receptaculum seminis longer than the head which is oval and longer than wide. Genitalia essentially as in *T. lotoris* Stewart (Plate VIII, fig. 38).

EASTERN HOST. Unknown.

EASTERN LOCALITY. Florida.

TYPE MATERIAL. Two males and two females from "garden truck leaf mold" at Gainesville, Florida, in the United States National Museum.

Trichopsylla lotoris Stewart

(Plate VIII, figs. 35, 37, 38; Plate IX, fig. 42)

1926 *Trichopsylla lotoris* Stewart, Insec. Insc. Menst., 14:122, 1 textfig.

1928 *Trichopsylla lotoris* Stewart, Cornell Univ. Ag. Exp. Sta., Mem. 101, p. 869.

1929 *Trichopsylla lotoris* Jordan, Nov. Zool., 35:176.

1933 *Trichopsylla lotoris* Stewart, Jour. New York Ent. Soc., 41:258.

MALE. Chaetotaxy of the head differing from that of *T. floridensis* in several noteworthy respects. Upper of the two preantennal rows of bristles consisting of three bristles rather than six, the middle of the three postantennal rows with three bristles rather than five. Metepimeron without a row of five or six bristles anterior to the marginal row (Plate VIII, fig. 37). MODIFIED SEGMENTS: Clasper narrower than in *T. floridensis* and very different in general shape. Manubrium much narrower, tapering to a blunt point. For further details concerning the structure of the male genitalia, see Plate IX, fig. 42.

FEMALE. General structure and chaetotaxy of the head essentially as in the male (Plate VIII, fig. 35). For details con-

cerning the structure of the female genitalia, see Plate VIII, fig. 38.

RECORDS. IOWA — Clayton County, March 27, 1939, on *Procyon lotor lotor* (Linnaeus), male (B. B. Morgan). MAINE —Lucerne-in-Maine, November 1, 1928, on same host, female (F. Harper). NORTH CAROLINA—Pisgah National Forest, March 2, 1936, on "raccoon," female (J. H. Stone).

EASTERN HOST. Raccoon (*Procyon lotor lotor* (Linnaeus)).

EASTERN LOCALITIES. Iowa, Maine, New York, North Carolina.

TYPE MATERIAL. Male and female from Olcott, New York, on *Procyon lotor lotor* (Linnaeus) in the Cornell University Collection.

CTENOPHTHALMUS KOLENATI

Ctenophthalmus Kolenati, 1856, Die Parasiten der Chiropteren, p. 33.

Genotype: *Ctenophthalmus bisocodentatus* Kolenati

Frontal tubercle prominent, acuminate, projecting far beyond the anterior border of the head. Eyes vestigial. Genal ctenidium consisting of three spines. Labial palpus not extending beyond the apex of the fore coxa; the distal segment armed with a curved apical bristle. Fifth tarsal segment of the fore and middle legs armed with four pairs of lateral plantar bristles and a basal and a distal submedian pair. Fifth tarsal segment of the hind legs armed with three pairs of lateral plantar bristles and a basal and a distal submedian pair. Three antepygidial bristles present on a side, the middle the longest and the lowermost much longer than the uppermost.

This genus is represented in the East by a single species which is exceedingly common on various small mammals.

Ctenophthalmus pseudagyrtis Baker

(Plate X, figs. 45, 46, 49)

- 1904 *Ctenophthalmus pseudagyrtis* Baker, Proc. United States Nat. Mus., 27: 421, Pl. XI, figs. 7-12.
- 1895 *Typhlopsylla assimilis* Baker, Can. Ent., 27: 190 (not *T. assimilis* Taschenberg).
- 1896 *Typhlopsylla assimilis* Osborn, United States Dept. Agric. Div. Ent., Bull. 5, p. 153, fig. 85 (not *T. assimilis* Taschenberg).
- 1898 *Typhlopsylla assimilis* Baker, Jour. New York Ent. Soc., 6: 55 (not *T. assimilis* Taschenberg).
- 1904 *Ctenophthalmus pseudagyrtis* Rothschild, Nov. Zool., 11: 641, Pl. XIV, figs. 73, 78; Pl. XV, fig. 81.
- 1905 *Ctenophthalmus pseudagyrtis* Baker, Proc. United States Nat. Mus., 29: 135.

- 1914 *Ctenophthalmus pseudagyrtes* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. XVI, fig. 28; Pl. XX, fig. 61.
1925 *Ctenophthalmus pseudagyrtes* C. Fox, United States Public Health Ser., Rep. 40 (3): 1922.
1928 *Ctenophthalmus pseudagyrtes* Stewart, Cornell Univ. Agric. Exp. Sta. Bull., Mem. 101, p. 869.
1928 *Ctenophthalmus pseudagyrtes* Jordan, Nov. Zool., 34: 186.
1929 *Ctenophthalmus pseudagyrtes* Jordan, Nov. Zool., 35: 171.
1930 *Ctenophthalmus pseudagyrtes* Jordan, Trans. IV Intern. Congress Ent. (1928), p. 493, fig. 1.
1933 *Ctenophthalmus pseudagyrtes* Stewart, Jour. New York Ent. Soc., 41: 258.
1933 *Ctenophthalmus pseudagyrtes* Jordan, Nov. Zool., 39: 62.
1934 *Ctenophthalmus pseudagyrtes* Shaftesbury, Jour. Elisha Mitchell Sci. Soc., 49: 254.
1937 *Ctenophthalmus pseudagyrtes* Jordan, Nov. Zool., 40: 285.

MALE. Preantennal bristles of the head arranged in two rows, the upper with five bristles, the lower with three much longer ones. Three spines of the genal ctenidium obliquely directed posteriorly; the first the shortest, the second somewhat wider than the other two, and the third the longest and most acuminate. Maxilla long, tapering to a long slender point. Numerous small setae along the posterior margin of the antennal groove. Postantennal bristles usually arranged in three irregular rows of which the first consists of two bristles, the second of three, and the third of five to seven (Plate X, fig. 45). Pronotum armed with a single row of alternating long bristles and weak setae, and a ctenidium of six or seven spines on a side. Mesonotum armed with three or four irregular rows of bristles. Metanotum and each abdominal tergite armed with two or three rows of bristles. Some of the abdominal tergites further armed with a short stout dorsal tooth on a side. **MODIFIED SEGMENTS:** Process of the clasper bifurcate, the posterior lobe extending further dorsad than the anterior, and curved anteriorly, the posterior margin armed with a stout bristle; anterior lobe armed distally with four or five stout bristles. Movable finger long and broad, curved anteriorly, armed with four or five short bristles on the posterior margin and a number of short hairlike setae (Plate X, fig. 49). Manubrium short and broad, tapering to a curved point extending anteriorly as far as, or further than, the penis. Penis slender, not tapering to a long point; spring short, not completing a turn.

FEMALE. Chaetotaxy and general structure essentially as in the male. Head of the receptaculum seminis much longer than

wide, tail much shorter than the head. For further details concerning the structure of the female genitalia, see Plate X, fig. 46.

RECORDS. ALABAMA—Dale County, April 5, 1937, on "wood rat," female (R. E. Dyer). DISTRICT OF COLUMBIA—Brookland, November, 1912, in "nest of mole," numerous specimens. GEORGIA—Thomasville, December 5-6, 1937, on "*Pitymys pinetorum*," male and female (Komarek and Travis); February 8, 1937, in nest of *Peromyscus polionotus polionotus* (Wagner), female (E. V. Komarek). INDIANA—Chesterton, June 8, 1935, on *Scalopus aquaticus machrinoides* Jackson, female, two males (R. Komarek). IOWA—Osceola, August 23, 1935, on "field mouse," two males; July 15, 1934, on "mole," two males, two females; July 24, 1935, on "cottontail rabbit," two females (G. S. Cantonwine); Ames, July 4, 1936, nest of "*Blarina brevicauda*," numerous specimens; July, 1934, on "*Citellus tridemlineatus*," female (R. L. Roudabush); Ruthven, June-July, 1938, on *Microtus pennsylvanicus pennsylvanicus* (Ord), female (E. R. Becker and P. C. Waters). MARYLAND—Burnt Mills, March 24 and 29, 1932, on "pine mouse," numerous specimens; same date and locality, on "*Blarina brevicauda*," female, two males; Chillum, May 17, 18, 1932, on "pine mouse," female, two males (R. Greenfield); Plummer Island, September 3, 1921, in nest, probably of "*Scalopus aquaticus*," female; same locality, May 2, 1927, on "young *Microtus*," male and female (H. S. Barber); Silver Springs, February 23, 1932, on "pine mouse," six males (R. Greenfield); same locality, April 25, 1928, on "*Blarina brevicauda*," male and female (Ewing and East); College Park, May, 1929, on "pine mouse," four males (H. E. Ewing and H. S. Peters); Beltsville, May 10, 1935, on *Scalopus aquaticus aquaticus* (Linnaeus), female (T. Lehto). MASSACHUSETTS—Fall River, June 7, 1936, on *Peromyscus leucopus noveboracensis* (Fischer), female (F. C. Bishopp); Edgartown, September 22, 1937, on *Peromyscus leucopus fusus* Bangs, female (C. N. Smith); same locality, June, 1936, on *Microtus pennsylvanicus pennsylvanicus* (Ord), numerous specimens (F. C. Bishopp and C. N. Smith); West Tisbury, June 9, 1936, on *Blarina brevicauda aloga* Bangs, male (F. C. Bishopp); Squibnocket, June 11, 1936, on "*Microtus pennsylvanicus*," female (C. N. Smith); Newton Center, January 28, 1926, on *Blarina brevicauda talpoides* (Gapper), male (F. Harper); Scraggy Neck, June 18, 1936, on *Microtus pennsylvanicus pennsylvanicus* (Ord), female (C. N. Smith). MINNESOTA—Cloquet, September 12, 1933, on "*Blarina brevi-*

cauda," female. NEW HAMPSHIRE—Concord, June 14, 1927, on *Parascalops breweri* (Bachman), male (F. B. White). NEW YORK—Ithaca, April 6, 1936, on *Microtus pennsylvanicus pennsylvanicus* (Ord), male (W. J. Hamilton); Adirondack Lodge, Essex County, July 31, 1925, on *Tamias striatus lysteri* (Richardson), female (F. Harper); Long Lake, July 25, 1926, on "*Sciurus hudsonicus*," male (R. T. Hatt). NORTH CAROLINA—Oconalufy, April 18, 1931, on "*Microtus montanus*," three females (R. L. Boke). OHIO—Fairfield County, April 2, 1935, on *Blarina brevicauda talpoides* (Gapper), female (R. Goslin). VIRGINIA—Fall's Church, on "*Scalopus aquaticus*," two males; East Fall's Church, August 20, 1919, "runway of field mouse," male (H. E. Ewing); Prospect Hill, in "field mouse nest," two females (W. M. Mann); Petersburg, April 6, 1933, on "Albemarle meadow mouse," two males, two females (H. S. Peters); Winchester, October, 1922, on "skin of *Microtus pennsylvanicus*," female (E. A. Chapin).

EASTERN HOSTS. Hairy-tailed Mole (*Parascalops breweri* (Bachman)), Mole (*Scalopus aquaticus aquaticus* (Linnaeus), etc.), Short-tailed Shrew (*Blarina brevicauda talpoides* (Gapper), etc.), Star-nosed Mole (*Condylura cristata* (Linnaeus)), Musk-rat (*Ondatra zibethica zibethica* (Linnaeus)), White-footed Mouse (*Peromyscus leucopus noveboracensis* (Fischer), etc.), Meadow-mouse (*Microtus pennsylvanicus pennsylvanicus* (Ord)), Pine-mouse ("*Pitymys pinetorum*"), House-mouse ("*Mus musculus*"), Red-backed Mouse ("*Evotomys gapperi*"), Wood-rat (*Neotoma pennsylvanicus* Stone), Red Squirrel ("*Sciurus hudsonicus*"), Flying Squirrel (*Glaucomys volans volans* (Linnaeus)), House-rat (*Rattus norvegicus* (Erxleben)), Chipmunk (*Tamias striatus lysteri* (Richardson)), Pocket Gopher (*Geomys bursarius* (Shaw)), "Cottontail Rabbit," Thirteen-striped Ground Squirrel ("*Citellus tridecemlineatus*"), Skunk ("*Mustela frenata*"), Screech Owl ("*Megascops asio*").

EASTERN LOCALITIES. Alabama, District of Columbia, Georgia, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New York, North Carolina, Ohio, Pennsylvania, Virginia.

TYPE MATERIAL. Female from Agricultural College, Michigan, on "mole" (according to the slide), and a female from Ames, Iowa, on "*Scalops argentatus*" in the United States National Museum.

This species is one of the most abundant of the flea parasites

of small mammals. It very frequently occurs in company with *Doratopsylla blarinae* C. Fox as a parasite of shrews, but the mole is probably its most favored host.

RECTOFRONTIA WAGNER AND ARGYROPOLO

Rectofrontia Wagner and Argyropolo, 1934, Zeitschr. Parasit., 7: 230.

Genotype: *Typhlopsylla pentacanthus* Rothschild

Anterior border of the head produced into a prominent tooth. Eye vestigial. Genal ctenidium consisting of four to six spines. Ocular row made up of two bristles. Labial palpus five-segmented. Males without antepygidial bristles, females with two or three on a side. Fifth tarsal segment of each leg armed with four pairs of lateral plantar bristles, without a basal submedian pair.

This genus is represented in the East by a single species which is parasitic on various small mammals.

Rectofrontia fraterna (Baker)

(Plate X, figs. 44, 47, 48)

1895 *Typhlopsylla fraterna* Baker, Can. Ent., 27:189.

1904 *Ctenophthalmus fraternus* Baker, Proc. United States Nat. Mus., 27:423.

1905 *Ctenophthalmus fraternus* Baker, Proc. United States Nat. Mus., 29:135.

1913 *Rhadinopsylla fraterna* Rothschild, The Entomologist, 46:297.

1937 *Rectofrontia fraterna* Jordan, Nov. Zool., 40:270.

MALE. Bristles of the preantennal region of the head arranged in two rows. Upper row consisting of five or six bristles of which the one closest to the antennal groove is the weakest; lower row consisting of two long, stout bristles. Postantennal region armed with three rows of bristles of which the most anterior consists of four bristles, the middle of five, and the most posterior or marginal row of seven or eight. Spines of the genal ctenidium variable in number, when five are present they are arranged as in Plate X, fig. 44, the middle three being longest. Pronotum with a single row of alternating short and long bristles and a ctenidium of ten or eleven spines on a side. Meso- and metanotum each armed with two rows of bristles anterior to which there may be another row consisting of two or three bristles. Each abdominal tergite with two rows of bristles. Some of the abdominal tergites further armed with two to four teeth on a side. **MODIFIED SEGMENTS:** Process of the

clasper wide and heavy, more or less triangular. Movable finger narrower, with the outer margin convex, and the inner concave. Manubrium short and wide tapering to a point. Penis broad and bladelike; spring short, not completing a turn. For further details concerning the structure of the male genitalia, see Plate X, fig. 47.

FEMALE. Chaetotaxy of the head and general structure essentially as in the male (Plate X, fig. 44). Sternite VII without a sinus, its posterior margin irregular. Receptaculum seminis distorted in the specimens available. For further details concerning the structure of the female genitalia, see Plate X, fig. 48.

RECORD. MARYLAND—Kensington, February 22, 1924, on "*Microtus pennsylvanicus*," male (H. S. Barber) (the genal ctenidium of this specimen consists of four spines on one side and five on the other).

EASTERN HOST. Meadow-mouse ("*Microtus pennsylvanicus*"). (Known from various small mammals in the West.)

EASTERN LOCALITIES. Maryland, South Dakota (Montana, Wyoming, Canada).

TYPE MATERIAL. Female holotype from Brookings, South Dakota, host unknown, and male specimen from Kensington, Maryland, described above, in the United States National Museum.

FOXELLA WAGNER

Foxella Wagner, 1930, Konowia, 8: 314.

Genotype: *Pulex ignotus* Baker

Eye rudimentary. Ocular row consisting of four to six bristles, the ocular bristle situated well above the eye rudiments. Pronotal ctenidium consisting of ten or eleven spines on a side. Females with three antepygial bristles on a side, of which the middle is the longest and the uppermost the shortest. Males with one long and one short antepygial bristle on a side. Other details essentially as in *Ceratophyllus* Curtis.

This genus is represented in the East by a single species whose favorite host seems to be the pocket gopher. So far it has not been found further east than Illinois.

***Foxella ignotus* (Baker)**

(Plate XI, figs. 52, 54, 55)

1895 *Pulex ignotus* Baker, Can. Ent., 27: 110.

1895 *Typhlopsylla americana* Baker, Can. Ent., 27: 189.

- 1896 *Typhlopsylla americana* Osborn, United States Dept. Agric. Div. Ent., Bull. V (n.s.), p. 154, figs. 86, 87.
- 1904 *Ceratophyllus ignotus* Baker, Proc. United States Nat. Mus., 27:416, Pl. XXI, figs. 1-6.
- 1905 *Ceratophyllus ignotus* Baker, Proc. United States Nat. Mus., 29:134.
- 1914 *Ceratophyllus ignotus* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. XII, fig. 16.
- 1915 *Ceratophyllus ignotus* Jordan and Rothschild, Ectoparasites, 1:54, fig. 57.
- 1929 *Ceratophyllus ignotus ignotus* Jordan, Nov. Zool., 35:32.
- 1930 *Ceratophyllus ignotus* Jordan, Trans. IV Intern. Cong. Ent. (1928), p. 498, figs. 10, 11.
- 1930 *Foxella ignotus* Wagner, Konowia, 8:314.
- 1933 *Foxella ignotus* Jordan, Nov. Zool., 39:75.
- 1938 *Foxella ignotus ignotus* Jordan, Nov. Zool., 41:123, figs. 74, 75.

MALE. Preantennal region of the head armed with two rows of bristles, each consisting of four to six. Genal process sharply pointed. Labial palpus reaching to or almost to the apex of the fore coxa. A series of about twelve small bristles along the posterior edge of the antennal groove. Postantennal region armed with one stout bristle located near the second antennal segment below which are one or two shorter ones, and a marginal row of six to eight long bristles (Plate XI, fig. 55). Pronotum with a row of alternating long and short bristles and a ctenidium of ten or eleven spines on a side. Meso- and metanotum each with two rows of bristles. Each abdominal tergite similarly armed, the bristles long and conspicuous. **MODIFIED SEGMENTS:** Process of the clasper more or less triangular, armed at the apex with three bristles. Movable finger long, armed with four long bristles and several shorter ones on the posterior margin. Penis long and wide, terminating in a long curved process; spring long but not completing a turn. Sternite VIII with a long, curved, heavily pigmented bristle. For further details concerning the structure of the male genitalia, see Plate XI, fig. 54.

FEMALE. Chaetotaxy of the head and general structure essentially as in the male. Sternite VII with a deep sinus. Head of the receptaculum seminis spherical, much wider than the tail (Plate XI, fig. 52).

RECORDS. IOWA—Ames, August 8, 1937, on *Geomys bursarius* (Shaw), three males, three females; Jewell, September 29, 1938, on *Scalopus aquaticus machrinus* (Rafinesque), male; Dubuque, November 2, 1937, on *Peromyscus leucopus noveboracensis* (Fischer), male (T. Scott); November 11, 1934, on same

host, two males, three females (E. F. Knipling). MINNESOTA—St. Paul, on "pocket gopher," two males.

EASTERN HOSTS. Pocket Gopher (*Geomys bursarius* (Shaw)), White-footed Mouse (*Peromyscus leucopus noveboracensis* (Fischer)), Mole (*Scalopus aquaticus machrinus* (Rafinesque)).

EASTERN LOCALITIES. Illinois, Iowa, Minnesota.

TYPE MATERIAL. Female holotype from Ames, Iowa; male and female from Fort Collins, Colorado, (as *Typhlopsylla americana*), and a male from Ames, Iowa, (as *Typhlopsylla americana*), in the United States National Museum.

CONORHINOPSYLLA STEWART

Conorhinopsylla Stewart, 1930, Can. Ent., 62:178, Pl. 15, figs. 3-5.

Genotype: *Conorhinopsylla stanfordi* Stewart

Frontal notch absent. Eye rudimentary. Frontogenal angle of the head extended to form a protuberance. Maxilla broad, triangular, not ending in a long point. Pronotal ctenidium consisting of about six unusually broad and heavily pigmented spines on a side. Segments I and II of the hind tarsus of the male with long hairlike bristles. Fifth tarsal segment of each leg with four pairs of lateral plantar bristles and a basal submedian pair.

This genus is represented in the East by a single species which is parasitic on squirrels. It has also been found in the West.

Conorhinopsylla stanfordi Stewart

(Plate XXVIII, figs. 148, 149, 150)

1930 *Conorhinopsylla stanfordi* Stewart, Can. Ent., 62:178, Pl. 15, figs. 3-5.

1933 *Conorhinopsylla stanfordi* Stewart, Jour. New York Ent. Soc., 41: 257.

1937 *Conorhinopsylla stanfordi* Jordan, Nov. Zool., 40:267, figs. 51-53.

FEMALE. Bristles of the preantennal region of the head arranged in two rows; the lower row consisting of two to four bristles of various lengths of which the third is the longest; upper row indefinite consisting of about four small bristles. Labial palpus six-segmented, extending beyond the trochanters. A number of small setae along the posterior margin of the antennal groove. Postantennal region of the head with a slender bristle near the first antennal joint, a much stouter one near the base of the third antennal segment and a marginal row of four or five bristles of which the most ventral is the longest

(Plate XXVIII, fig. 148). Pronotum armed with a single row of bristles and a ctenidium of about six spines on a side. Meso- and metanotum and each abdominal tergite armed with a posterior row of unusually long bristles anterior to which there may be another row of much shorter bristles. Anterior tergites further armed with one to four short stout dorsal teeth on a side. Three antepygial bristles present on a side of which the middle is longest. Sternite VII without a sinus. Head of the receptaculum seminis very large, about twice as long as wide, much longer than the tail. For further details concerning the structure of the female genitalia, see Plate XXVIII, fig. 149.

MALE. General structure essentially as in the female. Two of the three antepygial bristles aborted. MODIFIED SEGMENTS: Sternite VII and posterior arm of sternite IX so close together as to give the impression of two processes of a single structure. The former with four spiniform bristles at the apex. Clasper projecting above the dorsal margin of the abdomen, its process hidden by the wide, diamond-shaped movable finger. Manubrium broad, ending in a curved point. Penis broad and terminating bluntly; spring not long and not completing a turn. For further details concerning the structure of the male genitalia, see Plate XXVIII, fig. 150.

RECORDS. IOWA—Luxemburg, November 13, 1937, two females; November 23, 1937, on *Glaucomys volans volans* (Linnaeus), two females (T. Scott). (UTAH—Salina, May 29, 1929, on "*Citellus mollis*," male.)

EASTERN HOSTS. Red Squirrel ("*Sciurus hudsonicus*"), Gray Squirrel ("*Sciurus carolinensis*"), Flying Squirrel (*Glaucomys volans volans* (Linnaeus)).

EASTERN LOCALITIES. Illinois, Iowa, New York, (Utah).

TYPE MATERIAL. Two males and two females from "*Sciurus hudsonicus*" in addition to the holotype in the Collection of Dr. M. A. Stewart.

OPISOCROSTIS JORDAN

Opisocrostis Jordan, 1933, Nov. Zool., 39: 73.

Genotype: *Ceratophyllus hirsutus* Baker

Frontal tubercle prominent, extending beyond the anterior margin of the head. Labial palpus reaching well beyond the apex of the fore coxa. Bristles of the second antennal segment very long. Pronotal ctenidium consisting of eight or nine spines

on a side. Males with one long antepygidial bristle and one or two minute ones; females with two antepygidial bristles of which the lower is the shorter. Other structural details essentially as in *Ceratophyllus* Curtis.

This genus is represented in the East by a single species which occurs rather commonly on ground squirrels.

***Opisocrostis bruneri* (Baker)**

(Plate XI, figs. 50, 51, 53)

1895 *Pulex bruneri* Baker, Can. Ent., 27:131.

1896 *Pulex bruneri* Osborn, United States Dept. Agric. Div. Ent., Bull. V (n.s.), p. 149, fig. 82.

1898 *Pulex bruneri* Baker, Jour. New York Ent. Soc., 6:55.

1904 *Ceratophyllus bruneri* Baker, Proc. United States Nat. Mus., 27:413, Pl. XXV, figs. 1-5.

1905 *Ceratophyllus bruneri* Baker, Proc. United States Nat. Mus., 29:135.

1914 *Ceratophyllus bruneri* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. X, fig. 9; Pl. XVII, fig. 35.

1930 *Oropsylla bruneri* Wagner, Konowia, 8:313.

1933 *Opisocrostis bruneri* Jordan, Nov. Zool., 39:73.

MALE. Preantennal region of the head with two rows of bristles; lower row with three robust bristles, upper row with one to three much more slender ones. Posterior margin of the antennal groove with a series of small setae. Postantennal region armed with a marginal row of four or five bristles and one or two stout bristles near the second and third antennal segments (Plate XI, fig. 50). Pronotum with a single row of alternating stout and weak bristles. Mesonotum armed with two or three rows of bristles; metanotum armed with about five rows. Each abdominal tergite with two rows of bristles. Metanotum and the anterior three or four abdominal tergites each armed with one or two short stout dorsal teeth on a side. **MODIFIED SEGMENTS:** Process of the clasper more or less rounded, not prominent, moundlike, with three slender bristles apically and two stouter ones at the side. Movable finger large and heavy, anterior margin concave, posterior margin with one long bristle and five or six shorter ones distally. Manubrium curved, finger-like, blunt distally. Penis broad, ending in a very short process; spring long but barely completing a single turn. For further details concerning the structure of the male genitalia, see Plate XI, fig. 51.

FEMALE. Chaetotaxy of the head and general structure essentially as in the male. Head of the receptaculum seminis more or less rounded, much wider than the long tail. For

further details concerning the structure of the female genitalia, see Plate XI, fig. 53.

RECORDS. ILLINOIS—Lamont, April 22, 1935, on "*Citellus tridecemlineatus*," male and female (R. Komarek); Savoy, April 23, 1933, on "*Citellus franklini*," male, two females; Urbana, April 10, 1934, on "*Citellus tridecemlineatus*," female, two males; Rock Island, June 8, 1932, on same host, male (Ross and Mohr); Aledo, May 8, 1932, on same host, female (H. Ross). IOWA—Ames, July, 1935, on "Franklin's ground squirrel," male and female; July, 1935, on "13-striped ground squirrel," three males, three females (R. L. Roudabush); same locality, May 1, 1938, on "gray squirrel," male and female (Mahoney); Luxemburg, November 23, 1937, on *Glaucomys volans volans* (Linnaeus), female (T. Scott); Ruthven, July, 1938, on "13-striped ground squirrel," numerous specimens (E. R. Becker and P. C. Waters); Lake Okoboji, August 15, 1916, on same host, male (L. L. Buchanan). MINNESOTA—Rapidan, 1937, no host given, male, eight females (W. P. Mohr). WISCONSIN—Kenosha, October 8, 1936, on "*Citellus tridecemlineatus*," male, two females (R. Komarek).

EASTERN HOSTS. Thirteen-striped Ground Squirrel ("*Citellus tridecemlineatus*"), Franklin's Ground Squirrel ("*Citellus franklini*"), "Gray Squirrel," Flying Squirrel (*Glaucomys volans volans* (Linnaeus)).

EASTERN LOCALITIES. Illinois, Iowa, Minnesota, Nebraska, Wisconsin, (Idaho, Colorado).

TYPE MATERIAL. Two females from Lincoln, Nebraska, female from Fort Collins, Colorado, and a male from Ames, Iowa, in the United States National Museum.

OROPSYLLA WAGNER

Oropsylla Wagner and Ioff, 1926, Rev. Microbiol. and Epidemiol., 5: 86.

Genotype: *Ceratophyllus silantiewii* Wagner

Frontal tubercle small and acuminate. Labial palpus long, extending beyond the apex of the coxa by more than a segment. Pronotal ctenidium consisting of about nine spines on a side. Other general structural details as in *Ceratophyllus* Curtis. Movable finger of the males with long bristles but without spiniforms.

This genus is represented in the East by a single species which has the woodchuck as its normal host.

Oropsylla arctomys (Baker)

(Plate IX, figs. 40, 41, 43)

- 1904 *Ceratophyllus arctomys* Baker, Proc. United States Nat. Mus., 27:388.
1905 *Ceratophyllus arctomys* Baker, Proc. United States Nat. Mus., 29:134.
1928 *Ceratophyllus arctomys* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
1928 *Ceratophyllus arctomys* Jordan, Nov. Zool., 34:183.
1929 *Ceratophyllus arctomys* Jordan, Nov. Zool., 35:176.
1929 *Oropsylla arctomys* Wagner, Konowia, 8:315.
1933 *Oropsylla arctomys* Stewart, Jour. New York Ent. Soc., 41:258.
1933 *Oropsylla arctomys* Jordan, Nov. Zool., 39:73.
1937 *Oropsylla arctomys* Jordan, Nov. Zool., 40:284.

MALE. Preantennal region of the head armed with two rows of bristles, each consisting of three. A number of small setae near the anterior and posterior margins of the antennal groove. Posterior margin of the head armed with three or four bristles; one located at the lower angle, the other two or three situated dorsad. Postantennal region further armed with a robust bristle situated near the second antennal joint. Pronotum with a single row of alternating long bristles and weak setae. Meso- and metanotum each armed with two rows of bristles anterior to which there may be several other bristles. Metanotum and anterior abdominal tergites further armed with one or two stout dorsal teeth on a side. Each abdominal tergite with two rows of bristles. **MODIFIED SEGMENTS:** Process of the clasper broad and lobular, its dorsal margin armed with three or four slender bristles. Movable finger large, convex at both margins, the posterior margin armed with four or five bristles. Manubrium short, ending in a curved point. Penis broad and heavy, terminating in a slender curved process; spring long, completing a turn. Sternite VIII armed with five or six stout bristles on the posterior margin and two or three curved bristles apically. For further details concerning the structure of the male genitalia, see Plate IX, fig. 40.

FEMALE. General structure and chaetotaxy of the head essentially as in the male (Plate IX, fig. 41). Sternite VII without a deep sinus. Head of the receptaculum seminis longer than wide, longer than the tail. For further details concerning the female genitalia, see Plate IX, fig. 43.

RECORDS. **CONNECTICUT**—No specific locality, July, 1892, on "woodchuck," male; Monroe, on same host, two females, two males (G. Dimmock). **IOWA**—Ames, July, 1935, on "woodchuck," two males, five females (R. L. Roudabush); Jewell,

September, 1937, on "*Mephitis* sp.," four males, five females (T. Scott); Mt. Pleasant, December 25, 1937, on "badger," female, two males (H. E. Jacques). MASSACHUSETTS—Abington, April 12, 1924, on "woodchuck," male (T. D. Smith); Charles River Village, June 13, 1928, on *Marmota monax preblorum* Howell, female (F. Harper); Holbrook, May 13, 1924, on "woodchuck," male and female; Needham, March 26, 1927, on same host, male and female (T. D. Smith); Newton Center, September 20, 1926, on "*Arctomys monax*," male and female (F. Harper). MINNESOTA—Cloquet, September 4, 1936, on "*Marmota monax*," female; Thief Lake, March 29, 1937, on "woodchuck," six females, three males (K. Krumm). NEW HAMPSHIRE—Concord, May 15, 1926, on "red fox," female (F. B. White). NEW JERSEY—Vincentown, June 4, 1934, in "skunk nest," two males, two females (R. J. Sim). NEW YORK—Keesville, May 29, 1918, on "*Marmota monax*," male and female (N. Dearborn); North Elba, July 17, 1926, on same host, female (F. Harper).

EASTERN HOSTS. Woodchuck (*Marmota monax preblorum* Howell, etc.), Red Squirrel (*Sciurus hudsonicus loquax* Bangs), "Opossum," Skunk (*Mephitis nigra* (Peale and Beauvois)), White-tailed Deer (*Odocoileus virginianus borealis* Miller), Gray Fox (*Urocyon cinereoargenteus*), "Red Fox," Barred Owl (*Syrnium nebulosum*).

EASTERN LOCALITIES. Connecticut, Iowa, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania.

TYPE MATERIAL. Male and female from "*Arctomys monax*" at Peterboro, New York, in the United States National Museum.

ODONTOPSYLLUS BAKER

Odontopsyllus Baker, 1905, Proc. United States Nat. Mus., 29:129.

Genotype: *Pulex multispinosus* Baker

Frontal tubercle prominent, acuminate. Eye large, pigmented heavily at the margins. Labial palpus reaching almost to the apex of the fore coxa. Pronotal ctenidium consisting of fourteen to nineteen long spines on a side. Females with three antepygidial bristles present on a side of which the lowermost is well separated from the other two. Anterior margin of the hind coxa armed with numerous small bristles. Other details essentially as in *Ceratophyllus* Curtis.

This genus is represented in the East by a single species which parasitizes rabbits in particular.

Odontopsyllus multispinosus Baker

(Plate VII, figs. 29, 30, 31)

- 1898 *Pulex multispinosus* Baker, Jour. New York Ent. Soc., 6: 54.
1904 *Ceratophyllus multispinosus* Baker, Proc. United States Nat. Mus., 27: 389, Pl. XII, figs. 1-5.
1905 *Odontopsyllus multispinosus* Baker, Proc. United States Nat. Mus., 29: 131.
1928 *Odontopsyllus multispinosus* Jordan, Nov. Zool., 34: 185.
1929 *Odontopsyllus multispinosus* Jordan, Nov. Zool., 35: 175.
1934 *Odontopsyllus multispinosus* Shaftesbury, Jour. Elisha Mitchell Sci. Soc., 49: 254.

MALE. Bristles of the preantennal region arranged in two rows. Upper row consisting of four to six bristles, lower row consisting of three much longer and more robust ones. Genal process prominent, acuminate. First antennal segment with numerous small setae, second antennal segment with five or six bristles which are not longer than the third joint. Numerous small setae located along the posterior margin of the antennal groove. Postantennal region armed with three bristles located in the region of the second antennal segment and a marginal row of about eight bristles of which two located at the lower angle are very stout and prominent. Pronotum with a posterior row of alternating weak setae and stout bristles, anterior to which there is a row of about three bristles. Middle region of the lower pronotum further armed with a long stout bristle. Meso- and metanotum each armed with three or four rows of bristles. Each abdominal tergite armed with two rows of bristles anterior to which there may be another row consisting of about three short bristles. The abdominal tergites further armed with one or two short, stout black teeth on a side. **MODIFIED SEGMENTS:** Clasper more or less rectangular in shape, the process not distinctly set off from the remainder. Movable finger more or less quadrangular, armed with a number of bristles of various sizes along the margins. Most conspicuous among these are four, long, stout ones located ventrally. Manubrium tapering to a sharp point. Penis broad and heavy; spring short, not completing a single turn. Posterior arm of sternite IX expanded apically where it is armed with seven or eight short bristles. For further details concerning the structure of the male genitalia, see Plate VII, fig. 30.

FEMALE. Bristles of the upper preantennal row weaker than in the male (Plate VII, fig. 29). Sternite VII not divided by a deep sinus. Receptaculum seminis large and conspicuous, the

head globular and striated. For further details concerning the structure of the female genitalia, see Plate VII, fig. 31.

RECORDS. ALABAMA—Dale County, March 30, 1937, on "rabbit," female (R. E. Dyer). GEORGIA—Newton, April 28, 1937, on *Sylvilagus floridanus mallurus* (Thomas), male. IOWA—Osceola, December 16, 1935, on "cottontail rabbit," male (G. S. Cantonwine); Ames, May, 1933, on same host, two males, two females (R. L. Roudabush); Waukon, November 12, 1937, on *Blarina brevicauda brevicauda* (Say), female (T. Scott). MARYLAND—Bowie, December 4, 1924, on *Sylvilagus floridanus mallurus* (Thomas), two females (A. Hassall). MASSACHUSETTS—W. Tisbury, June 9, 1936, on *Sylvilagus transitionalis* (Bangs), male and female (F. C. Bishopp); Cohasset, February 29, 1924, on "cottontail rabbit," male and female (J. D. Smith); Harvard, April 11, 1912, on same host, male (J. L. Peters). NORTH CAROLINA—Halifax, January 11, 1936, on "cottontail," male (E. B. Marshall); Pisgah National Forest, March 8, 1936, on "bobcat," female; March 2, 1936, on "raccoon," female (J. H. Stone). SOUTH CAROLINA—Branchville, February 8, 1931, on "rabbit," female (W. E. Dove and Schroeder).

EASTERN HOSTS. Cottontail Rabbit (*Sylvilagus floridanus mallurus* (Thomas), etc.), Short-tailed Shrew (*Blarina brevicauda brevicauda* (Say)), "Bobcat," "Raccoon."

EASTERN LOCALITIES. Alabama, Georgia, Iowa, Maryland, Massachusetts, North Carolina, South Carolina, Virginia.

TYPE MATERIAL. Male holotype from Raleigh, North Carolina, on "*Lepus sylvaticus*" in the United States National Museum. Female allotype from Waukon, Iowa, on *Blarina brevicauda brevicauda* (Say), described above, in the Iowa State College Collection.

With *Cediopsylla simplex* (Baker), this species is one of the most abundant flea parasites of the rabbit.

CERATOPHYLLUS CURTIS

Ceratophyllus Curtis, 1832, British Entomology, 9: 417.

Genotype: *Ceratophyllus hirundinus* Curtis

Eye well developed. Ocular bristle placed on a level with or above the upper margin of the eye. Preantennal region of the head with two rows of bristles of which the upper consists of three to six, while the lower consists of three much longer ones. Labial palpus not reaching beyond the apex of the fore

coxa, usually about as long as the maxillary palpus. Pronotal ctenidium consisting of not less than twelve spines on a side. Males with one long antepygidial bristle and two minute ones on a side; females similarly armed or with three antepygidial bristles on a side of which the middle is the longest. Fifth tarsal segment of each leg armed with five pairs of lateral plantar bristles and an apical submedian pair.

This genus is represented in the East by seven closely related species all of which have various birds as their normal hosts. While these species are easily distinguished, the characters do not lend themselves well to a key. Males may be readily identified by the shape of the movable finger and the process of the clasper, and females by the form of sternite VII and of the receptaculum seminis. These structures are illustrated in Plates XII to XIV, to which the reader is referred.

***Ceratophyllus celsus* Jordan**

(Plate XII, figs. 56, 57)

1926 *Ceratophyllus celsus* Jordan, Nov. Zool., 33:387, fig. 3.

MALE. Upper row of the preantennal region consisting of three or four bristles and several small setae. A series of small setae situated along the anterior and posterior edges of the antennal groove. Postantennal region with three bristles, one much longer than the other two, and a marginal row of four or five bristles of which the most ventral is large and well developed. Pronotum with a single row of bristles and a ctenidium of about fourteen spines on a side. Mesonotum armed with four or five irregular rows of small bristles; metanotum with two or three irregular rows of small bristles. Each abdominal tergite armed with two or three irregular rows of bristles. Some of the abdominal tergites further armed with one to three stout teeth on a side. **MODIFIED SEGMENTS:** Process of the clasper long and narrow, at least three times as long as wide at the middle, armed with one long bristle and two much shorter ones at the apex. Movable finger similar in general structure to that of *C. niger* C. Fox; widest at about the middle where the anterior border is expanded to form a spinelike protuberance; armed on the posterior margin with two or three long bristles and several others of various sizes. Manubrium wide, terminating bluntly. Posterior arm of sternite IX with numerous short robust bristles distally. Sternite VIII armed with six or seven long bristles at the apex and two membranous projections. Penis long and tapering to a fine curved point; spring long and

conspicuous, completing one or two turns. For further details concerning the structure of the male genitalia, see Plate XII, fig. 56.

FEMALE. General structure essentially as in the male. Sternite VII usually without a distinct sinus, and the posterior border not divided into lobes. Head of the receptaculum seminis slender, more than twice as long as the tail. For further details concerning the structure of the female genitalia, see Plate XII, fig. 57.

RECORDS. NEW YORK — Altamont, June-July, 1936, in "northern cliff swallow's nest," numerous specimens; Oneida Lake, July 23, 1931, on "cliff swallows," male; Troy, June 2, 1935, two females; July 1, 1935, on same host, female (D. Stoner).

EASTERN HOST. "Northern Cliff Swallow."

EASTERN LOCALITY. New York.

TYPE MATERIAL. Male holotype from Okanagan Falls, British Columbia, on "*Riparia riparia*" in the N. C. Rothschild Collection (British Museum). Female allotype, described above, from Altamont, New York, in the United States National Museum.

Ceratophyllus diffinis Jordan

(Plate XII, figs. 58, 59)

1925 *Ceratophyllus diffinis* Jordan, Nov. Zool., 32: 111, fig. 44.

1928 *Ceratophyllus diffinis* Jordan, Nov. Zool., 34: 182, fig. 7.

1933 *Ceratophyllus diffinis* Jordan, Nov. Zool., 39: 75.

1935 *Ceratophyllus rileyi* Liu, Ann. Ent. Soc. America, 28: 123, Pl. I, figs. 4, 5, 6.

1937 *Ceratophyllus diffinis* Jordan, Nov. Zool., 40: 263.

MALE. Upper row of the preantennal region consisting of six or seven bristles, of which the anterior are quite long, while the others are reduced in size. Pronotum with a single row of bristles and a ctenidium of twelve spines on a side. Other details of general structure as in *C. celsus* and other species of the genus. **MODIFIED SEGMENTS:** Process of the clasper prominent, about twice as long as broad in the widest place; its apex provided with three bristles, of which the middle is the longest, while the other two are very short. Movable finger widest at the middle where the anterior border is not produced into a distinct spinelike protuberance. Posterior margin of the movable finger armed with three or four conspicuous long bristles and several smaller ones; anterior and dorsal borders armed

with a number of small setae. Sternite VIII armed at the apex with two robust bristles on a side. Spring of the penis not long, not completing a single turn. For further details concerning the structure of the male genitalia, see Plate XII, fig. 59.

FEMALE. General structure essentially as in the male. Head of the receptaculum seminis broad, about as long as the tail. Sternite VII divided into two lobes by a broad sinus; the upper lobe acutely pointed and projecting slightly more distad than the lower lobe. For further details concerning the structure of the female genitalia, see Plate XII, fig. 58.

EASTERN HOSTS. Ruffed Grouse ("*Bonasa umbellus*"), Catbird ("*Galeoscoptes carolinensis*"), Ovenbird (*Seiurus aurocapillus* (Linnaeus)), Veery (*Hyclocichla fuscescens fuscescens* (Stephens)), Robin (*Planesticus migratorius migratorius* L.), Bluebird (*Sialia sialis sialis* (Linnaeus)), House-wren (*Troglodytes aedon aedon* Vieillot).

EASTERN LOCALITIES. Massachusetts, Minnesota, New York, New Hampshire.

TYPE MATERIAL. Male holotype from Okanagan Falls, British Columbia, on "*Colymbus holboellii*" in the N. C. Rothschild Collection (British Museum). A female paratype of *C. rileyi* Liu from Minnesota, a synonym, in the United States National Museum.

***Ceratophyllus idius* Jordan and Rothschild**

(Plate I; Plate XII, figs. 60, 61)

1920 *Ceratophyllus idius* Jordan and Rothschild, Ectoparasites, 1:73, figs. 70, 71, 72.

1928 *Ceratophyllus idius* Jordan, Nov. Zool., 34:183.

1933 *Ceratophyllus idius* Jordan, Nov. Zool., 39:75.

1937 *Ceratophyllus idius* Jordan, Nov. Zool., 40:285.

MALE. Chaetotaxy of the head as in *C. diffinis*. Pronotum armed with a single row of bristles and a ctenidium consisting of about sixteen spines on a side. General structure not differing in any noteworthy respects from the other species of the genus. **MODIFIED SEGMENTS:** Process of the clasper broad, rounded distally, about four-fifths as long as the movable finger, its apex armed with one robust bristle and several smaller ones. Movable finger three times as long as broad, the posterior margin strongly rounded apically, armed with three or four stout bristles and several smaller ones. Posterior border of sternite VIII with numerous weak bristles distally, the apex armed with two or three long stout bristles on a side. For further details

concerning the structure of the male genitalia, see Plate I, and Plate XII, fig. 61.

FEMALE. General structure and chaetotaxy as in the male. Head of the receptaculum seminis long and slender, much longer than the tail. Sternite VII divided into two lobes by a deep sinus, the upper lobe acutely pointed, the lower lobe variable in shape, its termination either pointed or rounded. For further details concerning the structure of the female genitalia, see Plate XII, fig. 60.

RECORDS. CONNECTICUT—Pomfret, June, 1933, in "tree swallow nest," numerous specimens (K. B. Wetherbee). ILLINOIS—Clarksville, January 5, 1933, in "bird nest," numerous specimens, (Frison and Ross). MAINE—No specific locality, July, 1930, in "swallow nest," male, two females (E. C. Grant). MARYLAND—Bell, September 23, 1926, in nest of "*Progne subis*," male, two females (W. L. McAtee); August 16, 1927, on "martin," male, two females (H. P. Sheldon). MASSACHUSETTS—Groton, June 14, 1933, in "nest of tree swallow," male and female (W. P. Wharton); Worcester, June 28, 1931, in "tree swallow nest," two males (Mrs. K. B. Wetherbee). MICHIGAN—McMillan, May 15, 1935, on "purple martin," female (O. M. Bryens).

EASTERN HOSTS. Tree Swallow (*Iridoprocne bicolor* (Vieillot)), House-wren (*Troglodytes aedon aedon* Vieillot), Eastern Bluebird (*Sialia sialis sialis* (Linnaeus)), Purple Martin ("*Progne subis*").

EASTERN LOCALITIES. Connecticut, Illinois, Maine, Maryland, Massachusetts, Michigan.

TYPE MATERIAL. Male and female from Okanagan Landing, British Columbia, in the N. C. Rothschild Collection (British Museum).

Ceratophyllus gallinae (Schränk)

(Plate XIII, figs. 62, 63)

1803 *Pulex gallinae* Schränk, Fauna Boica, 3: 195.

1895 *Pulex avium* Baker, Can. Ent., 27: 111.

1896 *Pulex avium* Osborn, United States Dept. Agric. Div. Ent., Bull. V (n.s.), p. 147

1920 *Ceratophyllus gallinae* Jordan and Rothschild, Ectoparasites, 1: 70.

1924 *Ceratophyllus gallinae* Ewing, Parasitology, 16: 342, Pl. XIV, fig. 1.

1927 *Ceratophyllus gallinae* Stewart, Jour. Econ. Ent., 20: 132.

1928 *Ceratophyllus gallinae* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.

1928 *Ceratophyllus gallinae* Garman, Connecticut Exp. Sta., Bull. 294, p. 279, Pl. XXIX, fig. B.

- 1928 *Ceratophyllus gallinae* Jordan, Nov. Zool., 34:182.
1929 *Ceratophyllus gallinae* Jordan, Nov. Zool., 35:171.
1933 *Ceratophyllus gallinae* Jordan, Nov. Zool., 39:75.
1933 *Ceratophyllus gallinae* Stewart, Jour. New York Ent. Soc., 41:255.
1937 *Ceratophyllus gallinae* Jordan, Nov. Zool., 40:285

MALE. Chaetotaxy of the head and general structure essentially as in the other species of the genus. Pronotal ctenidium consisting of about fourteen spines on a side. MODIFIED SEGMENTS: Process of the clasper short, less than half as long as the movable finger; armed at the apex with one long bristle and two much shorter ones. Movable finger widest apically, where the anterior margin is concave, the posterior convex; posterior margin armed with three long bristles and several much shorter ones; anterior and dorsal margins armed with a number of small setae. Penis slender, terminating in a long curved process; spring long and conspicuous, completing one or two turns. For further details concerning the structure of the male genitalia, see Plate XIII, fig. 62.

FEMALE. General structure and chaetotaxy essentially as in the male. Head of the receptaculum seminis wider and more prominent than in other species of the genus. Sternite VII without a sinus, the posterior margin convex. For further details concerning the structure of the female genitalia, see Plate XIII, fig. 63.

RECORDS. CONNECTICUT—Fairfield, August 16, 1916, in "stomach of *Sturnus vulgaris*," male and female; Pamfret, June, 1934, in "bluebird nest," female, three males (Mrs. K. B. Wetherbee). MAINE—Eliot, August 21, 1923, in "henhouse," two females (M. A. Stewart). MASSACHUSETTS—Boston, January, 1928, on "clothes in laboratory," three males, two females (M. Hertog). MICHIGAN—Sanilac County, November, 1925, in "poultry house," male, two females.

EASTERN HOSTS. "Man," English Sparrow (*Passer domesticus domesticus* Linnaeus), "Henhouse," Eastern Bluebird (*Sialia sialis sialis* (Linnaeus)), Tree Swallow (*Iridoprocne bicolor* (Vieillot)), Chipmunk (*Tamias striatus*).

EASTERN LOCALITIES. Connecticut, Iowa, Maine, Massachusetts, Michigan, New York.

TYPE MATERIAL. Location of types not ascertained. "Wohnort: an Hühnen, Mäusen, Fledermäusen, Maulwürfen."

This species is quite capable of becoming a serious pest of chickens and has already caused damage during one or two outbreaks in our northeastern states. It may be immediately

separated from the sticktight flea, *Echidnophaga gallinacea*, by the presence of a pronotal ctenidium.

***Ceratophyllus niger* C. Fox**

(Plate XIII, figs. 64, 65)

- 1908 *Ceratophyllus niger* C. Fox, Ent. News, 19: 434.
1914 *Ceratophyllus niger* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. VII, fig. 2; Pl. XIX, fig. 46.
1920 *Ceratophyllus niger* Jordan and Rothschild, Ectoparasites, 1: 70.
1924 *Ceratophyllus niger* Ewing, Parasitology, 16: 343, Pl. XIV, fig. 1.
1928 *Ceratophyllus niger* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
1929 *Ceratophyllus niger* Jordan, Nov. Zool., 35: 175.
1933 *Ceratophyllus niger* Jordan, Nov. Zool., 39: 75
1933 *Ceratophyllus niger* Stewart, Jour. New York Ent. Soc., 41: 255.

MALE. Upper row of the preantennal region armed with six bristles, of which two located near the antennal groove are much weaker than the others. Pronotum armed with thirteen or fourteen spines on a side. Other details of general structure as in other species of the genus. **MODIFIED SEGMENTS:** Process of the clasper roughly triangular in shape, as wide at the base as long, armed at the apex with one long bristle and two shorter ones. Movable finger wide distally where the anterior margin forms a spinelike protuberance; posterior margin armed with two or three stout bristles and several much weaker ones. Penis slender, ending in a curved process; spring very long, completing at least one turn. For further details concerning the structure of the male genitalia, see Plate XIII, fig. 64.

FEMALE. General structure and chaetotaxy essentially as in the male. Head of the receptaculum seminis slender, much longer than the tail. Sternite VII without a distinct sinus, its posterior margin convex. For further details concerning the structure of the female genitalia, see Plate XIII, fig. 65.

EASTERN HOST. Eastern Bluebird (*Sialia sialis sialis* (Linnaeus)).

EASTERN LOCALITY. New York.

TYPE MATERIAL. Three females and two males on "Man" and one male on "*Mus decumanus*," locality not given. Location of the specimens not ascertained.

This species is not uncommon in the West where it is often taken from henhouses. The only record of its occurrence in the East was published by Stewart (1928, 1933). Jordan has doubted the record (1929), and until further discoveries are made, its presence in the East is questionable. The above

descriptions and the accompanying figures were made from a male and a female taken from a chicken nest at Astoria, Oregon, (H. H. Stage).

***Ceratophyllus riparius* Jordan and Rothschild**

(Plate XIII, figs. 66, 67)

- 1920 *Ceratophyllus riparius* Jordan and Rothschild, Ectoparasites, 1:71, figs. 67, 68, 69.
1928 *Ceratophyllus riparius* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
1929 *Ceratophyllus riparius* Jordan, Nov. Zool., 35:177.
1933 *Ceratophyllus riparius* Stewart, Jour. New York Ent. Soc., 41:256.
1933 *Ceratophyllus riparius* Jordan Nov. Zool., 39:75.

MALE. Upper of the preantennal rows armed with four to six bristles. Pronotum armed with about sixteen spines on a side. Other details of general structure essentially as in the other species of the genus. **MODIFIED SEGMENTS:** Process of the clasper more than three-fifths as long as the movable finger, blunt distally where it is armed with two or three short bristles. Posterior process of sternite IX armed distally with numerous heavily-pigmented bristles. Apex of sternite VIII armed with about eight stout bristles on a side. Penis slender, ending in a curved process; spring long but not completing a turn in the specimen described. For further details concerning the structure of the male genitalia, see Plate XIII, fig. 67.

FEMALE. General structure essentially as in the male. Receptaculum seminis similar to that of other species of the genus. Sternite VII divided by a deep sinus into two lobes, of which the lower is acutely pointed and projects further distad than the upper lobe (Plate XIII, fig. 66).

RECORDS. MINNESOTA—No specific locality, May 29, 1930, on "bank swallow," female, two males. NEW YORK—West Albany, July 12 to 19, 1933, in "barn swallow burrow," three males (D. Stoner); Freeville, May 22, 1933, same host, two males, two females (W. J. Hamilton); Oneida Lake, May, June, and July, 1931, in "nests of bank swallows," numerous specimens (D. Stoner).

EASTERN HOSTS. Bank Swallow (*Riparia riparia riparia* Linnaeus), Belted Kingfisher ("*Ceryle alcyon*"), "Barn Swallow."

EASTERN LOCALITIES. New York, Wisconsin, Virginia.

TYPE MATERIAL. A series from nest of "*Riparia riparia*" at Bay View, Milwaukee, Wisconsin, in the N. C. Rothschild Collection (British Museum).

Ceratophyllus swansonii Liu

(Plate XIV, figs. 70, 71, 73)

1935 *Ceratophyllus swansonii* Liu, Ann. Ent. Soc. America, 28:121, Pl. 1, figs. 1-3.1937 *Ceratophyllus swansonii* Jordan, Nov. Zool., 40:262, fig. 44.

MALE. Upper row of the preantennal region consisting of four to eight bristles, of which four are robust and in line while the others are weak and more or less irregular in arrangement (Plate XIV, fig. 73). Pronotum armed with about fourteen spines on a side. Other details of general structure as in the other species of the genus. **MODIFIED SEGMENTS:** Somewhat similar in appearance to those of *C. riparius* but differing particularly in the shape of the process of the clasper which is triangular or conical, the apex blunt and armed with three bristles. Posterior margin of the movable finger rounded, armed with three stout bristles and several weaker ones. Sternite VIII armed at the apex with two or three stout bristles on a side. Penis slender, ending in a long curved process; spring long, completing one or two turns. For further details concerning the structure of the male genitalia, see Plate XIV, fig. 70.

FEMALE. General structure essentially as in the male. Head of the receptaculum seminis long and slender, much longer than the tail. Sternite VII without a sinus, broadly rounded posteriorly. For further details concerning the structure of the female genitalia, see Plate XIV, fig. 71.

EASTERN HOST. Long-eared Owl (*Asio wilsonianus* (Lesson)).

EASTERN LOCALITY. Minnesota. (The above descriptions and the figures were made from a male and female specimen taken from the nest of *Asio wilsonianus* (Lesson) at Beaverhead County, Montana, (W. L. Jellison).)

TYPE MATERIAL. Male holotype from Fertile, Minnesota, on *Asio wilsonianus* (Lesson) in the University of Minnesota Collection. Female allotype bearing the same data in the United States National Museum.

OPISODASYS JORDAN*Opisodasys* Jordan, 1933, Nov. Zool., 39:72.

Genotype: *Ceratophyllus vespertalis* Jordan

Eye well developed. Labial palpus extending slightly beyond the apex of the fore coxa. Frontal tubercle small, acuminate. Pronotal ctenidium consisting of ten to twelve spines on a side.

Fifth tarsal segment of each leg armed with four pairs of lateral plantar bristles, a basal and an apical submedian pair. Movable finger of the male with two or three heavily pigmented spiniforms.

This genus is represented in the East by a single species which seems to parasitize the flying squirrel in particular.

***Opisodasys pseudarctomys* (Baker)**

(Plate XIV, figs. 68, 69, 72)

- 1904 *Ceratophyllus pseudarctomys* Baker, Proc. United States Nat. Mus., 27: 399, Pl. XXIV, figs. 1-7.
1905 *Ceratophyllus pseudarctomys* Baker, Proc. United States Nat. Mus., 29: 133.
1905 *Ceratophyllus acasti* Rothschild, Nov. Zool., 12: 168, Pl. 7, figs. 19, 20.
1928 *Ceratophyllus pseudarctomys* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
1929 *Ceratophyllus pseudarctomys* Jordan, Nov. Zool., 35: 28, 176.
1933 *Ceratophyllus pseudarctomys* Stewart, Jour. New York Ent. Soc., 41: 256.
1933 *Opisodasys pseudarctomys* Jordan, Nov. Zool., 39: 72.

MALE. Preantennal region of the head armed with an ocular row of three long bristles; above this row near the antennal groove are two or three weak bristles. Anterior and posterior margins of the antennal groove armed with numerous small setae. Posterior margin of the head with a row of about six stout bristles; above the most ventral bristle of this row is a single small bristle (Plate XIV, fig. 68). Pronotum with a single row of bristles and a ctenidium of about twelve spines on a side. Meso- and metanotum each armed with three rows of bristles anterior to which there may be a number of irregularly scattered ones. Each abdominal tergite armed with two rows of bristles. Anterior abdominal tergites further armed with two or three stout teeth on a side. Three antepygial bristles present on a side, the outer two well developed, the middle aborted. **MODIFIED SEGMENTS:** Movable finger long and curiously formed, the upper and lower angles produced posteriorly; the upper angle with a long curved spiniform, the lower angle with two much smaller ones. Acetabular bristles situated on an elongate process. Process of the clasper long and finger-like. Manubrium long and broad, reaching almost to the termination of the penis, and ending bluntly. Penis broad, tapering to a point; spring unusually short, not completing a turn. For further details concerning the structure of the male genitalia, see Plate XIV, fig. 72.

FEMALE. In the specimen regarded as the female type there is an ocular row of three bristles, but the series of weak bristles along the anterior margin of the antennal groove is lacking. Three well-developed antepygidial bristles present on a side, the middle one the longest. Sternite VII bisinuate, the upper sinus very broad and shallow (Plate XIV, fig. 69).

RECORD. MAINE—Windy Pitch, Mount Katahdin, August 23, 1928, on *Glaucomys sabrinus macrotis* (Mearns), male and female (Harper and Hamilton).

EASTERN HOSTS. Flying Squirrel (*Glaucomys sabrinus macrotis* (Mearns) and *G. volans volans* (Linnaeus)), Woodchuck (*Arctomys monax*).

EASTERN LOCALITIES. New York, Maine, (British Columbia).

TYPE MATERIAL. Male and female from Newport, Herkimer County, New York, on "*Arctomys monax*," in the United States National Museum.

ORCHOPEAS JORDAN

Orchopeas Jordan, 1933, Nov. Zool., 39:71.

Genotype: *Pulex wickhami* Baker

General structure essentially as in *Ceratophyllus* except that the pronotal ctenidium consists of nine or ten spines on a side and the fifth tarsal segment of each leg is armed with four pairs of lateral plantar bristles and a basal and an apical submedian pair. Movable finger of the male ham-shaped, much narrower basally than distally where it is armed with a row of four to seven heavily pigmented spiniforms. Head of the receptaculum seminis of the female more or less barrel-shaped. Males with two stout antepygidial bristles and one minute bristle on a side; females with three stout antepygidial bristles, the middle the longest, on a side.

This genus is represented in the East by four species which parasitize the common small mammals. They may be separated by the illustrations in Plates XV and XVI and by the following key:

Key to the Eastern Species of *Orchopeas*

1. Preantennal region with two distinct rows of bristles2
Preantennal region with but one distinct row of bristles3
2. Postantennal region with three bristles in addition to those of the marginal row*O. leucopus*
Postantennal region with but two bristles in addition to those of the marginal row*O. sexdentatus*

3. Labial palpus barely reaching to the apex of the fore coxa; process of the clasper narrow distally *O. wickhami*
 Labial palpus reaching to the middle of the fore trochanter; process of the clasper very broad distally *O. caedens*

***Orchopeas wickhami* Baker**

(Plate XV, figs. 75, 76, 77)

- 1895 *Pulex wickhami* and *P. gillettei* Baker, Can. Ent., 27:109.
 1895 *Pulex howardii* Baker, Can. Ent., 27:110.
 1896 *Pulex wickhami*, *P. gillettei*, and *P. howardii* Osborn, United States Dept. Agric. Div. Ent., Bull. V (n.s.), p. 149, fig. 81.
 1898 *Pulex gillettei* and *P. howardii* Baker, Jour. New York Ent. Soc., 6:54.
 1904 *Ceratophyllus wickhami* Baker, Proc. United States Nat. Mus., 27:403, Pl. XXVI, figs. 1-7.
 1905 *Ceratophyllus wickhami* Baker, Proc. United States Nat. Mus., 29:133.
 1914 *Ceratophyllus wickhami* C. Fox, United States Public Health Ser., Bull. 97, Pl. XI, fig. 13; Pl. XVIII, fig. 44.
 1928 *Ceratophyllus wickhami* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
 1928 *Ceratophyllus wickhami* Jordan, Nov. Zool., 34:183.
 1929 *Ceratophyllus wickhami* Jordan, Nov. Zool., 35:176.
 1933 *Ceratophyllus wickhami wickhami* Stewart, Jour. New York Ent. Soc., 41:257.
 1933 *Orchopeas wickhami* Jordan, Nov. Zool., 39:71.
 1934 *Orchopeas wickhami* Shaftesbury, Jour. Elisha Mitchell Sci. Soc., 49:255.
 1937 *Orchopeas wickhami* Jordan, Nov. Zool., 40:284.

MALE. Preantennal bristles of the head arranged in one distinct row, the ocular row, consisting of three robust bristles. Above these in an oblique line are three or four much shorter ones. Labial palpus reaching to the apex of the fore coxa. A series of small setae along the posterior margin of the antennal groove. Postantennal region armed with a stout bristle and two or three small ones in addition to the marginal row of about six bristles (Plate XV, fig. 77). Pronotum armed with a single row of alternating weak and strong bristles. Meso- and metanotum each armed with two rows of bristles. Each abdominal tergite similarly armed. Metanotum and anterior four abdominal tergites with one or two stout dorsal teeth on a side. **MODIFIED SEGMENTS:** Process of the clasper more or less triangular but sclerotized in such a way as to give the appearance of being very slender in the middle region and widened distally. Movable finger heavy, the posterior margin with four stout spiniforms, one long bristle, and one or two shorter ones (Plate XV, fig. 75). Manubrium scimitar-like, ending in a curved point. Penis slender, ending in a curved point; spring short,

not completing a single turn. Posterior arm of sternite IX expanded distally, its posterior margin armed with a stout spiniform located above a very short bristle.

FEMALE. Preantennal region with only one or two bristles in addition to those of the ocular row. Otherwise, chaetotaxy of the head and general structure essentially as in the male. Sternite VII divided by two sinuses into three lobes, of which the most dorsal is least distinct; the second is more or less triangular and acuminate, between it and the third lobe the sinus is very deep. Head of the receptaculum seminis about twice as long as wide, longer than the tail. For further details concerning the structure of the female genitalia, see Plate XV, fig. 76.

RECORDS. DISTRICT OF COLUMBIA—Washington, December 31, 1937, on "*Sciurus carolinensis*," female (J. Silver). **FLORIDA**—Tallahassee, July 12, 1937, on "*Rattus alexandrinus*," male; on "*Rattus rattus*," female, three males; January 17, 1937, on "*Peromyscus gossypinus*," male and female; January 20, 1937, on "*Mus musculus*," male, two females. **GEORGIA**—Beachton, December 30, 1925, in "stomach of *Didelphis virginiana*," male, three females (C. C. Sperry); Charleston County, March 20, 1936, on *Lynx rufus floridanus* (Rafinesque), female; Folkstown, January 18, 1936, on *Sciurus carolinensis carolinensis* Gmelin, three females; Camden County, February 29, 1936, on "*Sciurus niger*," male, two females (F. Harper); Grady County, December 6, 1935, on "gray squirrel," male and female (E. V. Komarek); Moorestown, on *Sciurus carolinensis carolinensis* Gmelin, four females (R. J. Sim); Tallula Falls, on "squirrel," female; Thomasville, November 13 and December 13, 1937, on *Sciurus carolinensis carolinensis* Gmelin, numerous specimens (E. V. Komarek); Nashville, April 23, September 18, March 13, and June 18, 1936, on "fox squirrel," numerous specimens; Taylor County, May, 1936, on same host, two males (H. Hixson). **ILLINOIS**—Urbana, January 26, 1933, on "gray squirrel," numerous specimens (M. D. Farrar); same locality and host, February 16, 1932, numerous specimens (C. O. Mohr); Metropolis, June 10, 1932, on same host, three males, three females (B. Harper); Olive Branch, December 5, 1934, on "fox squirrel," numerous specimens (H. H. Ross). **IOWA**—Ames, January, 1937, on "*Sciurus niger*," two males (G. Hendrickson); Luxemburg, November 23, 1937, on *Glaucomys volans volans* (Linnaeus), male and female; Eldon, November 12, 1937, on *Sciurus carolinensis leucotis* (Gapper), female (T. Scott). **MARYLAND**—

Bell, July 7, 1928, in "bird's nest," female; Plummer Island, April 25, 1915, on "man," female (R. C. Shannon); same locality, May 19, 1913, on "woodchuck," three males (H. S. Barber); Takoma Park, July 15, 1930, on "flying squirrel," female (H. E. Ewing); Bladensburg, March 31, 1901, in "nest of white-footed mouse," female; Laurel, February 21, 1930, on "weasel," two males, two females (E. B. Marshall). MASSACHUSETTS—Amherst, June 7, 1907, on "*Sciurus carolinensis*," male (E. A. Chapin); Muskegett, June 18, 1926, on *Peromyscus leucopus noveboracensis* (Fischer), male and female (F. Harper); Wenham, October 12, 1923, on "red squirrel," two females. MINNESOTA—Rapidan, March, 1935, no host given, two females (W. P. Moore). NEW YORK—Adirondack Lodge, Essex County, July 31, 1925, on *Peromyscus maniculatus gracilis* (LeConte), female; Avalanche Lake, Essex County, July 30, 1926, on "*Peromyscus maniculatus*," female, two males; Cornwall, July 9, 1925, on *Peromyscus leucopus noveboracensis* (Fischer), male (F. Harper); Ithaca, on "red squirrel," female (MacGillivray). NORTH CAROLINA—Pisgah National forest, March 2, 1936, on "raccoon," female (J. H. Stone); Asheville, July 18, 1935, on "opossum," male (F. J. Ruff). SOUTH CAROLINA—Clemson College, November 1, 1929, on "squirrel," female (R. B. Casey). VIRGINIA—East Falls Church, May 11, 1930, from "nest," male and female; January 30, 1918, on "*Sciurus hudsonicus*," male and female; February 27, 1934, on *Glaucomys volans volans* (Linnaeus), numerous specimens (E. A. Chapin); Difficult Run, September 14, 1913, in "nest of flying squirrel," male, four females (R. C. Shannon).

EASTERN HOSTS. Gray Squirrel (*Sciurus carolinensis carolinensis* Gmelin, etc.), Flying Squirrel (*Glaucomys volans volans* (Linnaeus)), Red Squirrel (*Sciurus hudsonicus loquax* Bangs), Fox Squirrel ("*Sciurus niger*"), Chipmunk ("*Tamias striatus*"), Mink ("*Mustela vison* subsp."), Woodchuck ("*Marmota monax* subsp."), Weasel (*Mustela noveboracensis noveboracensis* (Emmons)), "Opossum," Bobcat (*Lynx rufus floridanus* (Rafinesque)), White-footed Mouse (*Peromyscus leucopus noveboracensis* (Fischer), etc.), Roof-rat ("*Rattus alexandrinus*"), Black Rat ("*Rattus rattus*"), House-mouse ("*Mus musculus*"), Short-tailed Shrew ("*Blarina brevicauda* subsp."), Star-nosed Mole (*Condylura cristata* (Linnaeus)), Cottontail Rabbit ("*Sylvilagus* sp."), "Man," Raccoon ("*Procyon lotor*"), Screech Owl ("*Megascops asio*"), "Dog."

EASTERN LOCALITIES. District of Columbia, Florida, Georgia, Illinois, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, New Hampshire, New York, North Carolina, South Carolina, Virginia.

TYPE MATERIAL. Female from Iowa City, Iowa, on "*Sciuropterus volans*"; two females (types of the synonym, *Pulex gillettei*) from Portland, Michigan, on "*Sciurus canadensis*," and two males and two females (types of the synonym, *Pulex howardii*) from Tallula Falls, Georgia, on "squirrel," in the United States National Museum.

This species is among our most abundant eastern fleas. Its favorite hosts seem to be the various squirrels.

***Orchopeas caedens* (Jordan)**

(Plate XVI, figs. 80, 81, 82)

1925 *Ceratophyllus caedens* Jordan, Nov. Zool., 32:104, fig. 16.

1929 *Ceratophyllus caedens durus* Jordan, Nov. Zool., 35:29, fig. 3.

1930 *Ceratophyllus caedens durus* Jordan, Trans. IV Intern. Cong. Entomology (1928), 2:495, fig. 3.

1932 *Ceratophyllus caedens durus* Jordan, Nov. Zool., 38:253.

1933 *Ceratophyllus caedens caedens* Stewart, Jour. New York Ent. Soc., 41:257.

1933 *Orchopeas caedens* Jordan, Nov. Zool., 39:71.

1937 *Orchopeas caedens durus* Jordan, Nov. Zool., 40:284.

MALE. Chaetotaxy of the head essentially as in *O. wickhami*. Preantennal region of the head armed with only one distinct row of three stout bristles; two or three much weaker ones located above this row. A number of small setae along the anterior and posterior margins of the antennal groove. Posterior margin of the head with a row of four or five bristles, anterior to which are three or four bristles near the antennal groove (Plate XVI, fig. 80). Labial palpus extending beyond the apex of the fore coxa. **MODIFIED SEGMENTS:** Process of the clasper broad and truncate. Movable finger similar in shape to that of *O. sexdentatus*, armed on the posterior margin usually with four stout spiniforms. Posterior arm of sternite IX expanded distad into a sharply pointed lobe which bears a stout spiniform below which is a long bristle. For further details concerning the structure of the male genitalia, see Plate XVI, fig. 82.

FEMALE. Chaetotaxy of the head essentially as in the male except that the bristles above the ocular row may be reduced in size and number. Receptaculum seminis essentially as in other species of the genus. Sternite VII variable in shape,

usually with a deep sinus dividing the posterior margin into two lobes (Plate XVI, fig. 81), but sometimes with the sinus exceedingly shallow or absent.

RECORDS. MINNESOTA—No specific locality, September 13, 1933, on *Glaucomys sabrinus canescens* Howell, male. NEW YORK—Long Lake, July, 1926, on "*Sciurus hudsonicus*," two males, two females (R. T. Hall); Adirondack Lodge, Essex County, August 12, 1925, on same host, male and female (F. Harper); Vulcan Island, Lake Champlain, September 10, 1936, on same host, male and female.

EASTERN HOSTS. Flying Squirrel (*Glaucomys sabrinus canescens* Howell), Red Squirrel (*Sciurus hudsonicus loquax* Bangs, etc.), Gray Squirrel (*Sciurus carolinensis leucotis* (Gapper)).

EASTERN LOCALITIES. Massachusetts, Minnesota, New York, (Canada).

TYPE MATERIAL. A series from Banff, Alberta, on *Mustela americana* in the N. C. Rothschild Collection (British Museum). Male and female from this lot in the United States National Museum.

***Orchopeas sexdentatus pennsylvanicus* (Jordan)**

(Plate XVI, figs. 79, 83, 84)

1928 *Ceratophyllus sexdentatus pennsylvanicus* Jordan, Nov. Zool., 34:184, figs. 8, 9.

1929 *Ceratophyllus sexdentatus pennsylvanicus* Jordan, Nov. Zool., 35:31.

1933 *Orchopeas sexdentatus* Jordan, Nov. Zool., 39:72.

MALE. Preantennal region of the head armed with two rows of bristles; the upper row with three in addition to those near the antenna, the lower row consisting of three much stouter ones. Postantennal region differing from the other eastern species of the genus in that there are but two bristles in addition to the marginal row of five or six (Plate XVI, fig. 79). Other general structural details essentially as in *O. wickhami*. MODIFIED SEGMENTS: Process of the clasper prominent, thumblike, rounded at the apex. Posterior margin of the movable finger usually armed with five spiniforms, but sometimes with four or six. For further details concerning the structure of the male genitalia, see Plate XVI, fig. 84.

FEMALE. Chaetotaxy of the head essentially as in the male except that the bristles of the upper preantennal row are more irregular and weaker. Receptaculum seminis as in *O. wickhami*. Sternite VII divided into two lobes by a deep sinus; the upper

one long and clearly defined, truncate, the lower one rounded or acuminate distad. For further details concerning the structure of the female genitalia, see Plate XVI, fig. 83.

RECORDS. ALABAMA—Sand Mountains, April 15, 1914, on "*Neotoma floridana*," male and female (A. H. Howell). GEORGIA—Okefinokee Swamp, November 13-15, 1935, on *Neotoma floridana floridana* (Ord), male and female (E. V. Komarek); Blood Mountain, January 3, 1934, two males, two females; Frogtown Gap, May 30, 1934, male and female (F. Harper); Neel Gap, May 31, 1933, on "wood rat," female (A. H. Howell). KENTUCKY—Mammoth Cave, August 6, 1929, on "*Neotoma species*," male (L. Giovannoli). MARYLAND—Plummer Island, September 26, 1921, on *Neotoma pennsylvanica* Stone, male (A. Wetmore). NEW YORK—Schunemunk Mountain, Orange County, July 10, 1925, on *Neotoma pennsylvanica* Stone, male and female (F. Harper). PENNSYLVANIA—Reading, October 24, 1938, on same host, male and female; same locality and host, September 3, 1938, two females (E. L. Poole). VIRGINIA—Shore opposite Plummer Island, November 18, 1915, on "*Neotoma species*," male, three females (R. C. Shannon).

EASTERN HOST. Wood-rat (*Neotoma pennsylvanica* Stone, etc.).

EASTERN LOCALITIES. Alabama, Georgia, Kentucky, Maryland, New York, Pennsylvania, Virginia.

TYPE MATERIAL. Male and female from Boulder Creek, California, on "*Neotoma species*" in the United States National Museum.

Jordan (1928) has separated this species into a number of subspecies of which his *O. sexdentatus pennsylvanicus* is the only one that occurs in the East. This subspecies was based on numerous specimens from *Neotoma pennsylvanica* Stone at Rolling Rock Club, Ligonier, Pennsylvania, which are now in the N. C. Rothschild Collection (British Museum).

Orchopeas leucopus (Baker)

(Plate XV, figs. 74, 78)

1904 *Ceratophyllus leucopus* Baker, Proc. United States Nat. Mus., 27:387.

1905 *Ceratophyllus leucopus* Baker, Proc. United States Nat. Mus., 29:133.

1905 *Ceratophyllus aeger* Rothschild, Nov. Zool., 12:166, Pl. 6, figs. 5, 7, 9.

1914 *Ceratophyllus leucopus* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. XVIII, fig. 45.

1928 *Ceratophyllus leucopus* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.

- 1928 *Ceratophyllus leucopus* Jordan, Nov. Zool., 34:179.
1929 *Ceratophyllus leucopus* Jordan, Nov. Zool., 35:28, 170, 176.
1933 *Ceratophyllus leucopus* Stewart, Jour. New. York Ent. Soc., 41:257.
1933 *Ceratophyllus leucopus* Jordan, Nov. Zool., 39:62.
1933 *Orchopeas leucopus* Jordan, Nov. Zool., 39:72.
1934 *Orchopeas leucopus* Shaftesbury, Jour. Elisha Mitchell Sci. Soc., 49:255.
1937 *Orchopeas leucopus* Jordan, Nov. Zool., 40:284.

MALE. Bristles of the preantennal region of the head very similar in arrangement to those of *O. serdentatus*. Postantennal bristles arranged as in *O. wickhami*. Labial palpus barely reaching to the apex of the fore coxa (Plate XV, fig. 74). MODIFIED SEGMENTS: The genitalia closely resemble those of *O. wickhami*, the main differences being in the shape of the movable finger. These differences may be readily appreciated by an examination of Plate XV, figs. 75 and 78.

FEMALE. Chaetotaxy of the head essentially as in the male; the bristles of the upper preantennal row may be reduced in number and size. The structure of sternite VII and of the receptaculum seminis as in *O. wickhami*.

RECORDS. DISTRICT OF COLUMBIA—Washington, March 16, 1932, on "*Peromyscus leucopus*," female (R. Greenfield). GEORGIA—Blood Mountain, June 3, 1934, on *Peromyscus maniculatus nubiterrae* (Rhoads), male, three females; Tray Mountain, June 13, 1934, on *Peromyscus leucopus leucopus* (Rafinesque), female, two males; Okefinokee Swamp, January 28, 1936, on *Peromyscus gossypinus gossypinus* (LeConte), four males, four females (F. Harper). IOWA—Ames, March 3, 1938, on "white-footed mouse," male (I. Fox); same locality, 1935, on "*Microtus pennsylvanicus*," female (R. L. Roudabush); Dubuque, November 11, 1937, on *Peromyscus leucopus noveboracensis* (Fischer), female; Peru Bottoms, November 10, 1938, on same host, numerous specimens; Waukon, November 12, 1937, on *Blarina brevicauda brevicauda* (Say), two males, three females (T. Scott). MAINE—Mount Katahdin, August-September, 1928, on *Peromyscus maniculatus abietorum* (Bangs), numerous specimens (W. J. Hamilton, Jr.). MARYLAND—College Park, May, 1929, on "*Peromyscus leucopus*," numerous specimens (H. E. Ewing and H. S. Peters); February 17, 1932, same host and locality, three females (R. Greenfield); Riverdale, July 4, 1934, on "white-footed mouse," female (F. C. Bishopp); Burnt Mills, March 22, 1932, on "*Peromyscus leucopus*," two females; Chevy Chase, June, 1932, on same host, male and female (R. Greenfield); Dorchester

County, May 13, 1933, on "wood mouse," female, three males (F. R. Smith); Dorsey, April 28, 1933, on "meadow mouse," female (G. R. Lunz); Plummer Island, 1904, on "*Peromyscus leucopus*," female, two males; Silver Spring, April 3, 1934, on "*Microtus pennsylvanicus*," male (H. E. Ewing). MASSACHUSETTS—Musekeget Island, July, 1924, on "*Peromyscus leucopus*," female (W. S. Brooks); Squibnocket, June 11, 1936, on *Peromyscus leucopus fuscus* Bangs, male and female (C. N. Smith); Sturbridge, May 28, 1928, on *Peromyscus leucopus noveboracensis* (Fischer), female (F. Harper); W. Tisbury, June 9, 1936, on same host, male, three females (F. C. Bishopp). NEW HAMPSHIRE—Ossipee, July 17, 1927, on *Peromyscus maniculatus gracilis* (LeConte), female; Mount Washington, July 1, 1928, on same host, two females (F. Harper). NEW JERSEY—Beach Haven, September 10, 1934, on "*Peromyscus leucopus*," female (F. Harper); Moorestown, April 16, 1933, on "white-footed mouse," two females (G. R. Lunz). NORTH CAROLINA—Oconalufy R., on *Peromyscus leucopus leucopus* (Rafinesque), two females (R. L. Boke). OHIO—Fairfield County, April 23, 1935, on "white-footed mouse," male (R. Goslin). TENNESSEE—Greenbriar, April 18, 1931, on *Peromyscus leucopus leucopus* (Rafinesque), male; LeConte, April 12, 1931, on "*Microtus montanus*," female (R. L. Boke). VERMONT—Morgan, September 4, 1932, on *Peromyscus maniculatus gracilis* (LeConte), two males, two females (F. Harper); Pittsford Mills, August 13, 1927, on same host, female; East Barnet, August 21, 1927, on same host, female (G. M. Allen); Jay Peak, August 14, 1927, on same host, female (F. Harper). VIRGINIA—Dismal Swamp, April 5, 1931, on "white-footed mouse," male (H. S. Peters); East Falls Church, October 21, 1928, on *Peromyscus leucopus noveboracensis* (Fischer), male, two females. WISCONSIN—Fish Creek, September 14, 1930, on *Peromyscus leucopus novaboracensis* (Fischer), male and female (F. J. W. Schmidt).

EASTERN HOSTS. White-footed Mouse (*Peromyscus leucopus leucopus* (Rafinesque), etc.), Meadow-mouse ("*Microtus pennsylvanicus*"), House-mouse ("*Mus musculus*"), Short-tailed Shrew (*Blarina brevicauda brevicauda* (Say)).

EASTERN LOCALITIES. District of Columbia, Georgia, Iowa, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, North Carolina, Ohio, Rhode Island, Tennessee, Vermont, Virginia, Wisconsin, (Canada).

TYPE MATERIAL. Female holotype from Peterboro, New York,

on "*Peromyscus leucopus*," in the United States National Museum.

MEGABOTHRIS JORDAN

Megabothris Jordan, 1933, Nov. Zool., 39:77.

Genotype: *Ceratophyllus walkeri* Rothschild

General structure very similar to that of *Ceratophyllus*. Pronotal ctenidium with about ten spines on a side. Fifth tarsal segment of each leg with the basal pair of plantar bristles noticeably displaced toward the median line, the other four pairs of lateral plantar bristles unchanged. Movable finger of the male with several heavily pigmented spiniforms on the posterior margin.

This genus is represented in the East by five species which occur on various rodents. They may be separated by the illustrations on Plates XVII, XVIII, and XIX, and by the following key:

Key to the Eastern Species of *Megabothris*

1. Postantennal region of the head with but three bristles in addition to those of the marginal row2
Postantennal region of the head with five bristles in addition to those of the marginal row*M. asio*
2. Movable finger of the male with two spiniforms apically*M. acerbus*
Movable finger with one spiniform apically, or with none3
3. Movable finger without spiniforms distally; receptaculum seminis vermiform*M. wagneri*
Movable finger with a spiniform or heavily pigmented bristle distally; receptaculum seminis not vermiform4
4. Posterior margin of the movable finger expanded apically into a process which bears a heavily pigmented bristle or spiniform; head of the receptaculum seminis rounded apically*M. quirini*
Posterior margin of the movable finger not as above; head of the receptaculum seminis narrowed apically and at the base*M. vison*

Megabothris asio (Baker)

(Plate XVII, figs. 85, 86, 88, 89)

- 1904 *Ceratophyllus asio* Baker, Proc. United States Nat. Mus., 27:338.
 1905 *Ceratophyllus asio* Baker, Proc. United States Nat. Mus., 29:132.
 1929 *Ceratophyllus asio* Jordan, Nov. Zool., 35:33, Pl. I, figs. 10, 11; p. 176.
 1930 *Ceratophyllus asio* Jordan, Trans. IV Intern. Cong. Ent. (1928), 2:495, fig. 2.
 1933 *Ceratophyllus asio* Stewart, Jour. New York Ent. Soc., 41:255.
 1933 *Ceratophyllus asio* Jordan, Nov. Zool., 39:62.
 1933 *Megabothris asio* Jordan, Nov. Zool., 39:77.
 1939 *Megabothris asio* I. Fox, Proc. Ent. Soc. Washington, 41:47, Pl. 6, fig. 3.

MALE. Preantennal region of the head armed with two rows of bristles; the upper row consisting of about six bristles, the lower row consisting of three long and stout ones. Genal process acutely pointed posteriorly. First antennal joint with about ten small setae; second antennal joint with about five bristles, some of which may exceed the third joint in length. A series of about a dozen irregularly arranged bristles along the posterior margin of the antennal groove. Postantennal region armed with a marginal row of about six bristles; anterior to this is another row of about six bristles which are sometimes irregularly arranged; above this row there is usually a single bristle close to the antennal groove. Pronotum armed with two rows of bristles. Meso- and metanotum each armed with three or four rows of bristles, the bristles of the posterior row being long and robust, the other small and weak. Each abdominal tergite with two or three rows of bristles; the anterior tergites further armed with one to three stout dorsal teeth on a side. **MODIFIED SEGMENTS:** Process of the clasper much longer than in other species of the genus, tapering gradually to a blunt termination where it is armed with two small bristles. Movable finger with two short spiniforms at the apex and a longer, more robust one at the outer angle. Manubrium short and broad, not ending in a point. Penis long and slender, ending in a curved process; spring not long, completing one or two large circles about the distal third of the penis. Sternite VIII expanded apically and armed with a number of slender curved setae and two large bristles. For further details concerning the structure of the male genitalia, see Plate XVII, fig. 85.

FEMALE. Chaetotaxy of the head essentially as in the male (Plate XVII, figs. 88, 89). Sternite VII divided by a broad sinus into two lobes, of which the upper is rounded and extends further distad than the pointed lower lobe. Head of receptaculum seminis oval, less than twice as long as wide. For further details concerning the structure of the female genitalia, see Plate XVII, fig. 86.

RECORDS. MASSACHUSETTS—Edgartown, October 2, 1937, on *Microtus pennsylvanicus pennsylvanicus* (Ord), two males; Chilmark, on same host, September 2, 1937, male and female (C. N. Smith).

EASTERN HOSTS. Meadow-mouse (*Microtus pennsylvanicus pennsylvanicus* (Ord)), Screech Owl ("*Megascops asio*").

EASTERN LOCALITIES. Iowa, Massachusetts, New York.

TYPE MATERIAL. Female holotype from Wellesley, Massachu-

setts, on "*Megascops asio*" in the United States National Museum.

Megabothris acerbus (Jordan)

(Plate XVIII, figs. 91, 92, 93)

1925 *Ceratophyllus acerbus* Jordan, Nov. Zool., 32:111, fig. 43.

1929 *Ceratophyllus acerbus* Jordan, Nov. Zool., 35:170, fig. 5.

1933 *Ceratophyllus acerbus* Stewart, Jour. New York Ent. Soc., 41:255.

1933 *Megabothris acerbus* Jordan, Nov. Zool., 39:77.

1937 *Megabothris acerbus* Jordan, Nov. Zool., 40:284.

MALE. Preantennal region of the head armed with two rows of bristles; the upper row consisting of about five, the lower row consisting of three much longer and more robust ones. Posterior margin of the antennal groove with about a dozen weak bristles. Postantennal region with a marginal row of about five bristles, anterior to which are three bristles of which one is much stouter than the others. Pronotum armed with a single row of alternating strong and weak bristles. Mesonotum armed with a marginal row of long bristles, anterior to which are three rows of much weaker ones. Metanotum and each abdominal tergite with a marginal row of long bristles, anterior to which are one or two rows of weaker ones. Metanotum and first four abdominal tergites further armed with one or two teeth on a side. **MODIFIED SEGMENTS:** Process of the clasper broad and short, truncate, its apex with three weak bristles. Movable finger about three times as long as broad with the anterior margin produced into an angle at about the middle. Apex rounded, with four or five weak bristles and two small heavily pigmented spiniforms. Posterior margin armed with a long bristle. Penis bladelike, acutely pointed; spring long, but not completing a turn in the single specimen available. For further details concerning the structure of the male genitalia, see Plate XVIII, fig. 92.

FEMALE. Chaetotaxy of the head essentially as in the male except that the bristles of the upper preantennal row may be reduced in number (Plate XVIII, fig. 91). Sternite VII divided by a deep sinus into two more or less triangular lobes. Receptaculum seminis as in other members of the genus. For further details concerning the structure of the female genitalia, see Plate XVIII, fig. 93.

EASTERN HOST. Chipmunk (*Tamias striatus lysteri* (Richardson)).

EASTERN LOCALITIES. Massachusetts, Michigan, New York, (Canada).

TYPE MATERIAL. Female holotype from Canada, on "*Tamias striatus*" in the N. C. Rothschild Collection (British Museum).

***Megabothris quirini* (Rothschild)**

(Plate XVII, fig. 87; Plate XVIII, figs. 90, 94)

- 1905 *Ceratophyllus quirini* Rothschild, Nov. Zool., 12:163, Pl. VI, fig. 1.
1905 *Ceratophyllus quirini* Baker, Proc. United States Nat. Mus., 29:133.
1929 *Ceratophyllus quirini* Jordan, Nov. Zool., 35:174.
1933 *Ceratophyllus quirini* Stewart, Jour. New York Ent. Soc., 41:256.
1933 *Megabothris quirini* Jordan, Nov. Zool., 39:77.
1937 *Megabothris quirini* Jordan, Nov. Zool., 40:284.

MALE. Preantennal region of the head armed with two rows of bristles; the upper row consisting of about seven bristles, the lower row of three much longer ones. Posterior margin of the antennal groove with a series of small setae. Postantennal region armed with three bristles in addition to those of the marginal row (Plate XVIII, fig. 90). Other details of general structure essentially as in *M. asio*. **MODIFIED SEGMENTS:** Process of the clasper long and finger-like, its apex rounded. Movable finger large, concave between the outer angle and the apex, and bearing on the angle a long heavy spiniform in front of which is another much shorter one. Another distinct heavily pigmented bristle at the apex. For further details concerning the structure of the male genitalia, see Plate XVII, fig. 87.

FEMALE. General structure and chaetotaxy essentially as in the male. Sternite VII in the single specimen available without a deep sinus, receptaculum seminis essentially as in other species of the genus. For further details regarding the structure of the female genitalia, see Plate XVIII, fig. 94, which is drawn from a single specimen taken at Atlin, British Columbia, on "*Microtus pennsylvanicus drummondi*" loaned through the courtesy of Dr. Karl Jordan.

RECORD. MAINE—Windy Pitch, Mount Katahdin, August 23, 1928, on *Glaucomys sabrinus macrotis* (Mearns), male (W. J. Hamilton, Jr.).

EASTERN HOSTS. Jumping Mouse (*Zapus hudsonius campestris* Preble, and "*Zapus insignis*"), Flying Squirrel (*Glaucomys sabrinus macrotis* (Mearns)).

EASTERN LOCALITIES. Maine, Minnesota, New York, (Canada).

TYPE MATERIAL. Five males from Red Deer, Alberta, on "*Evotomys gapperi*" and "*Evotomys satturatus*" in the N. C. Rothschild Collection (British Museum).

Megabothris wagneri (Baker)

(Plate XIX, figs. 96, 97)

- 1904 *Ceratophyllus wagneri* Baker, Proc. United States Nat. Mus., 27:387, Pl. XV, figs. 3-7.
1905 *Ceratophyllus wagneri* Baker, Proc. United States Nat. Mus., 29:133.
1914 *Ceratophyllus wagneri* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. X, fig. 11; Pl. XIX, fig. 48.
1923 *Ceratophyllus wagneri* Dunn and Parker, United States Public Health Ser., Rep. 38:2774.
1928 *Ceratophyllus peromysci* Stewart, Can. Ent., 60:148, figs. 1, 2.
1929 *Ceratophyllus wagneri* Jordan, Nov. Zool., 35:35.
1930 *Ceratophyllus wagneri* Jordan, Trans. IV Intern. Cong. Ent. (1928), p. 498, figs. 7-9.
1930 *Ceratophyllus wagneri* Stewart, Can. Ent., 62:152.
1933 *Monopsyllus wagneri* Jordan, Nov. Zool., 39:78.

MALE. Preantennal region of the head armed with two rows of bristles, the upper row consisting of five or six bristles, the lower row of three much stouter and longer ones. Labial palpus reaching to the apex of the fore coxa. Posterior margin of the antennal groove with a series of small setae. Postantennal region of the head armed with a marginal row of about five bristles anterior to which are three more bristles near the second antennal segment. Pronotum with a single row of alternating bristles and small setae. Meso- and metanotum each with two rows of bristles anterior to which are several others either forming another row or irregularly arranged. Each abdominal tergite with two rows of bristles. Metanotum and anterior abdominal tergites with one to three stout dorsal teeth on a side. MODIFIED SEGMENTS: Process of the clasper broad and long, almost as long as the movable finger, armed apically with one or two slender bristles. Movable finger broad and heavy, armed on the posterior margin with three stout heavily pigmented spiniforms of which the lowest is the longest, being about four times as long as the others. Manubrium short and broad, ending bluntly. Penis long and slender, ending distally in a long curved process; spring long, completing one or two turns. For further details concerning the structure of the male genitalia, see Plate XIX, fig. 97.

FEMALE. General structure and chaetotaxy essentially as in the male. Receptaculum seminis vermiform, the head slightly more expanded than the tail. For further details, see Plate XIX, fig. 96, which was drawn from a specimen on "*Mus* species" at Kelowna, British Columbia (A. Gate), loaned through the courtesy of Dr. Karl Jordan.

RECORD. IOWA—Dubuque, November 6, 1937, on *Glaucomyss volans volans* (Linnaeus), male (T. Scott).

EASTERN HOST. Flying Squirrel (*Glaucomyss volans volans* (Linnaeus)). (Known also from various rodents in the West.)

EASTERN LOCALITIES. Iowa, (Western United States and Canada).

TYPE MATERIAL. Male cotype from Moscow, Idaho, on "*Peromyscus leucopus*" in the United States National Museum.

This species has hitherto been found only in the western half of the country, where it is thought to break into several subspecies. These subspecies have been established by Jordan (1929) almost entirely on the basis of the female genitalia, hence it is not possible to place subspecifically the Iowa male. It is believed, however, that this specimen is referable to *M. wagneri wagneri* (Baker).

***Megabothris vison* (Baker)**

(Plate XIX, figs. 95, 98, 99)

1904 *Ceratophyllus vison* Baker, Proc. United States Nat. Mus., 27:388.

1904 *Ceratophyllus lucidus* Baker, Proc. United States Nat. Mus., 27:388, Pl. XX, figs. 5-9.

1905 *Ceratophyllus lucidus* Baker, Proc. United States Nat. Mus., 29:132.

1905 *Ceratophyllus vison* Baker, Proc. United States Nat. Mus., 29:133.

1928 *Ceratophyllus vison* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.

1929 *Ceratophyllus vison* Jordan, Nov. Zool., 35:35, 170.

1933 *Ceratophyllus vison* Stewart, Jour. New York Ent. Soc., 41:256.

1933 *Monopsyllus vison* Jordan, Nov. Zool., 39:78.

MALE. Frontal notch distinct, much lower on the head than in *M. wagneri*. Labial palpus reaching beyond the middle of the fore trochanters. Chaetotaxy of the head (Plate XIX, fig. 95), and general structure essentially as in *M. wagneri*. MODIFIED SEGMENTS: Process of the clasper rather slender and finger-like, much shorter than the movable finger. Movable finger large and broad, the posterior margin concave; armed apically with two slender bristles and one long stout spiniform, the lower angle armed with another long stout spiniform. Manubrium short, blunt terminally. Penis rather long, not ending in a curved process; spring not completing a single turn. For further details concerning the structure of the male genitalia, see Plate XIX, fig. 99.

FEMALE. Chaetotaxy of the head essentially as in the male except that the bristles of the upper preantennal row may be reduced in size and number. Other general structural details

as in the male. Sternite VII divided by a wide shallow sinus into two lobes of which the upper is more prominent than the lower. Head of the receptaculum seminis longer than the tail, about twice as long as wide. For further details concerning the structure of the female genitalia, see Plate XIX, fig. 98.

RECORDS. MASSACHUSETTS—Amherst, October 14, 1916, on "*Sciurus hudsonicus*," male. MINNESOTA—Itasca Park, May 6, 1933, on "red squirrel," female. NEW YORK—Clear Lake, Essex County, July 28, 1926, on *Sciurus hudsonicus gymnicus* Bangs, female (W. J. Shoonmaker); Heart Lake, July 22, 1922, on "*Sciurus hudsonicus*," male and female (F. Harper); Long Lake, July 23, 1926, on same host, male and female (R. T. Hatt).

EASTERN HOSTS. Weasel (*Mustela noveboracensis noveboracensis* (Emmons)), Mink ("*Putorius vison*"), Red Squirrel (*Sciurus hudsonicus loquax* Bangs, etc.), Chipmunk ("*Tamias striatus*").

EASTERN LOCALITIES. Maine, Massachusetts, Minnesota, New York.

TYPE MATERIAL. Two males from Peterboro, New York, on "*Putorius vison*" in the United States National Museum.

NOSOPSYLLUS JORDAN

Nosopsyllus Jordan, 1933, Nov. Zool., 39: 76.

Genotype: *Pulex fasciatus* Bosc.

Eye well developed. Ocular bristle on a level with or slightly above the upper margin of the eye. Labial palpus extending to or slightly beyond the apex of the fore coxa. Frontal tubercle small and acuminate. Pronotal ctenidium consisting of nine or ten spines on a side. Fifth tarsal segment of each leg armed as in *Ceratophyllus*. MALES: Posterior process of sternite IX dilate, divided into two lobes by a sinus; movable finger without spiniforms. FEMALES: Tail of the receptaculum seminis long and curved about the head.

This genus is represented in the East by a single species which is parasitic on the rat.

Nosopsyllus fasciatus (Bosc)

(Plate XX)

1801 *Pulex fasciatus* Bosc, Bull. de. Sci. p. Soc., Philo. No. 44, Vol. II, p. 156.

1895 *Pulex fasciatus* Baker, Can. Ent., 27: 111.

1896 *Pulex fasciatus* Osborn, United States Dept. Agric. Div. Ent., Bull. V (n.s.), p. 148.

- 1904 *Ceratophyllus oculatus* Baker, Proc. United States Nat. Mus., 27:387, Pl. XIX, figs. 10-14.
- 1904 *Ceratophyllus canadensis* Baker, Proc. United States Nat. Mus., 27:388, Pl. XX, figs. 1-4.
- 1905 *Ceratophyllus oculatus* and *canadensis* Baker, Proc. United States Nat. Mus., 29:133.
- 1910 *Ceratophyllus fasciatus* C. Fox, United States Public Health and Mar. Hosp. Ser., Bull. 30, p. 136, Pl. II, figs. 1-4.
- 1914 *Ceratophyllus fasciatus* C. Fox, United States Public Health Ser. Hyg. Lab., Bull. 97, Pl. VI, fig. 1; Pl. XVII, fig. 30.
- 1921 *Ceratophyllus fasciatus* Jordan and Rothschild, Ectoparasites, 1:178, figs. 165, 166.
- 1925 *Ceratophyllus fasciatus* C. Fox, United States Public Health, Ser., Rep. 40:1917.
- 1928 *Ceratophyllus fasciatus* Stewart, Cornell Univ. Agric. Exp. Sta., Mem. 101, p. 869.
- 1928 *Ceratophyllus fasciatus* Jordan, Nov. Zool., 34:183.
- 1929 *Ceratophyllus fasciatus* Jordan, Nov. Zool., 35:33.
- 1929 *Ceratophyllus fasciatus* Hasseltine, United States Public Health Ser., Rep. 44:583.
- 1931 *Ceratophyllus fasciatus* C. Fox, United States Public Health Ser., Rep. 46:574.
- 1933 *Ceratophyllus fasciatus* Stewart, Jour. New York Ent. Soc., 41:255.
- 1933 *Nosopsyllus fasciatus* Jordan, Nov. Zool., 39:76.
- 1934 *Nosopsyllus fasciatus* Shaftesbury, Jour. Elisha Mitchell Sci. Soc., 49:255.
- 1935 *Ceratophyllus fasciatus* Vogel and Cadwallader, United States Public Health Ser., Rep. 50:1953.

MALE. Bristles of the preantennal region variable in arrangement. There is always an ocular row of three bristles; above this there are usually four to six bristles near the antennal groove. Genal process acutely pointed posteriorly. A series of small setae along the posterior margin of the antennal groove. Postantennal region of the head armed with a long stout bristle near the second antennal joint; dorsal to this there may be another shorter bristle, and a marginal row of four to six bristles (Plate XX, fig. 101). Pronotum with a single row of bristles. Mesó- and metanotum each armed with two or three rows of bristles. Each abdominal tergite armed with two rows of bristles. In addition, the anterior three or four abdominal tergites and the metanotum armed with one or two short stout teeth on a side. Three antepygial bristles present on a side; the middle long, about three times as long as the upper bristle; the lower bristle reduced to a small seta. MODIFIED SEGMENTS: Process of the clasper broad, with a prominent posterior angle, bearing two or three weak bristles apically. Movable finger more or less evenly rounded posteriorly, the posterior margin

with two stout bristles, between which is a much weaker bristle, and one or two others near the apex. Manubrium reaching to about two-thirds the length of the penis, terminating more or less bluntly. Penis bladeliike, ending in a curved process; spring very long and completing several turns. For further details concerning the structure of the male genitalia, see Plate XX, figs. 100, 102.

FEMALE. Chaetotaxy of the head differing somewhat from that of the male (Plate XX, fig. 103). Three antepygial bristles present on a side, of which the uppermost is much shorter than the other two. Sternite VII without a sinus, its posterior margin irregularly rounded or slanting. Head of the receptaculum seminis globular; tail about one and one-half times as long as the head. For further details concerning the structure of the female genitalia, see Plate XX, fig. 104.

RECORDS. FLORIDA—Jacksonville, January 25, 1934, on *Rattus norvegicus* (Erxleben), female. IOWA—Osceola, July 7, 1934, on same host, female (G. S. Cantonwine); Des Moines, June, 1937, male, seven females (R. L. Roudabush). ILLINOIS—Champaign, June 14, 1938, on "house-rat," male, three females (W. P. Mohr). MARYLAND—Baltimore, on *Rattus norvegicus* (Erxleben), six females; Dorchester County, June 5, 1933, on "rat," male, two females (F. R. Smith); Takoma Park, on same host, September 18, 1938, female (H. E. Ewing). MASSACHUSETTS—Vineyard Haven, June 11, 1936, on *Rattus norvegicus* (Erxleben), female (C. N. Smith); West Barnstable, May 10, 1913, host unknown, female (W. F. Jenkins); Edgartown, October 15, 1937, on "Norway rat," female; November-December, 1937, four females (C. N. Smith). OHIO—Lancaster, November 26, 1935, on "brown rat," female; May 30, 1935, on same host, female (R. Goslin). PENNSYLVANIA—Philadelphia, November 14, 1932, on "rat," male and female (C. Fox). RHODE ISLAND—Providence, November 27, 1912, on "rats," male and female (S. H. Robinson).

EASTERN HOSTS. House-rat (*Rattus norvegicus* (Erxleben)); "Mink," Wood-rat ("*Neotoma pennsylvanica*"), White-footed Mouse ("*Peromyscus leucopus*"), Weasel (*Mustela noveboracensis noveboracensis* (Emmons)).

EASTERN LOCALITIES. District of Columbia, Florida, Georgia, Iowa, Illinois, Kentucky, Louisiana, Maryland, Massachusetts, New York, Ohio, Pennsylvania, Rhode Island, Wisconsin, Virginia.

TYPE MATERIAL. On the garden dormouse ("*Myoxus nitela* Linn"). Type locality not indicated. Location of type material not ascertained.