# T H E S I S

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Submitted by

Miriam Augusta Palmer

for the Degree of Master of Science

Colorado Agricultural College

Fort Collins, Colorado

July 7, 1925.

THIS THESIS HAS BEEN READ

APPROVED AND RECOMMENDED

FOR CREDIT

C. R. Gillette

Head of the Department of Zoology

Colorado Agricultural College

Fort Collins, Colorado

July 14, 1925

THIS THESIS HAS BEEN APPROVED AND RECOMMENDED FOR

THE DEGREE OF MASTER OF SCIENCE.

C. P. Gillette
Chairman and Professor of Zoology

E. P. Sandsten
Professor of Horticulture

L. E. Newsom
Professor of Veterinary Pathology

Committee on Advanced Degrees
Colorado Agricultural College
Fort Collins, Colorado.

LIFE HISTORY STUDIES OF SEVEN SPECIES OF THE GENUS LACHNUS.

The following species have been more or less incompletely described and most of them have not been illustrated fully, if at all. Much work has been done by the author on each of these species in the way of rearing the different forms in the insectary. Five species have been reared from the egg, thru successive generations to the summer forms. Sexual forms of all, except pseudotsugae, have been reared from summer forms captured in nature and cared for in the insectary. In practically every case the forms have been checked up by comparison with specimens taken in nature, and never has any noticeable difference been detected aside from size, and that in only a few cases.

Technic: These forms were reared on branches of conifers kept fresh in water for a number of weeks in the insectary. When the branches failed the aphids were transferred to fresh ones. A tree on the campus was also used, and on it one species was kept going for more than a year.

For assistance in collections taken out of doors, which corroborated reared specimens and also furnished material for many of the drawings, the writer is indebted to L.C.Bragg, C.P.Gillette, F.C.Hottes, C.A.Bjurman, J.L.Hoerner, and E. Bethel. Mr. F.C.Hottes also deserves special mention for a large amount of assistance rendered in rearing and many valuable suggestions for devices and apparatus to be used in the work. Acknowledgements are also, most of all, due to Dr.C.P.Gillette under whose direction the work was undertaken and whose encouragement and aid made its accomplishment possible.

## Lachnus pseudotsugae Wilson

Lachnus pseudotsugae Wilson

1912, Wilson, Can. Ent., vol. 44,p. 191, 302.(Orig. desc.)
1919, Swain, Univ. of Calif. Tech. Bull. Ent., vol.3, p. 48.(record)

Egg (Not illustrated), Taken on needles of Pseudotsuga taxifolia (Poir.) Britt., in Estes Park, Colo., April 12, 1922. Found on dorsal side of needles, in rows of two or three, laid end to end, hatching with open end toward tip of needle. Color black, with very little powdery covering.

Fundatrix. Young, newly hatched: From eggs above mentioned.

Color; dull yellowish brown shading to dusky on dorsum of abdomen, head shining black, legs light brown, two dorso-lateral shining black spots on prothorax.

2nd instar; Above mentioned examples, feeding on bark of twig.

Color; pale cinnamon brown, shading into yellowish brown on head and prothorax, a pair of dark splashes on metathorax, legs and antennae pale yellowish thruout; entire dorsum of thorax and abdomen covered with slight pulverulence.

Adult( Plate I, fig. 1). Described from one specimen taken on bark of twigs of Pseudotsuga taxifolia, in Estes Park, Colorado, July 1, 1915, two specimens taken in hills near Bellevue, Colorado, June 3,1922, and four specimens taken in Estes Park, Colorado, June 27, 1924. Examples were all quite old.

Color; shining dark brown to blackish, lighter cephalad, sometimes a pair of dark patches on thoracic segments, dorsum without evident pow-

der; legs and antennae brownish yellow, with tips of antennal joints and tibiae, distal one third to one half of hind tibiae and entire tarsi and cornicles dusky to black.

Measurements; body, 3 - 3.5mm, robust, hind tibia, 1.9mm, antenna, 1.1 mm; joints of antenna as follows; I, .10 mm; II, .09 mm; III, .38 mm; IV, .14 -.18 mm; V, .20 mm; VI, .13+ .03 mm. Cornicles apparently without conical base, arising as hardly more than mere rims, .01 mm, above the body surface. In some cases they are surrounded by a chitinized zone, hardly raised, about .02 mm wide, visible in cleared specimens. Hairs as in apterous virgogene.

Apterous Virgogene. Described from four specimens taken on bark of twigs of Pseudotsuga taxifolia , July 2 - 12, 1915, reared from first collection of fundatrices above-mentioned, and eleven specimens taken June 16 - 20, 1922, reared from second collection above-mentioned.

Young, 1st instar (Plate I, fig. 2).

Color; yellowish brown thruout, lighter on medio-dorsum, with darker patch on middle of abdomen. Head and prothorax darker to dusky brown lightly covered with white powder, which is heavier on margins of first two thoracic segments and medium of prothorax; antenna pale with only tip dusky; legs pale except tips of femora and knees, which are brownish, and tips of first two pairs of tibiae, one third to one half hind tibiae, and entire tarsi, which are dusky to blackish.

Later instars (Plate I, fig. 3 ).

Color; pale yellowish tinged with greenish on posterior half of abdomen, abdomen with two longitudinal green stripes on dorso-lateral por-

tion, head and first two thoracic segments brown; dorsum marked with white secretion on intersegmental lines, median portion of thorax, and lateral patches covering entire width of segment on three thoracic and third and fifth abdominal segments; antennae pale excepting tip, legs pale with usual dusky markings. Just before becoming adult color is often rather a dirty white with only slight brownish markings.

Adult (Plate I, fig. 9, and Plate II, fig. 1, 2, and 4)

Color; pale brownish shading to whitish on medio-dorsum of first four segments of abdomen, a pair of dusky areas on dorsum of each thoracic and first abdominal segments; head and prothorax medium brown, slight dusky dashes on segments two, three, and five, in some individuals; slight traces of powder on lateral portions of meso- and metathorax and and fourth abdominal segment, and on all intersegmental lines; antennae pale brownish yellow with tips of joints and entire terminal joint dusky; legs pale brownish yellow with entire tarsi, tips of first two pairs of tibiae , and one third to one half hind tibiae dusky to black; cornicles black but showing as little more than mere rims, chitinized area sometimes present but hardly elevated and visible only in cleared specimens. Red coloration in balsam, mentioned by Wilson hardly noticeable in our balsam mounts, but very slight traces observed in alate mounts in gum arabic and glycerine medium.

Measurements; body rather robust, 3 mm in length, 2 mm in width, hind tibia, 2 mm, antenna, 1.1 mm; joints of antenna as follows; I, .10 mm; II, .10 mm; III, .37 -.42 mm; IV, .15 - . 18 mm; V, .18 - . 20 mm; VI, .12 + .04 mm; no secondary sensoria evident; unguis conical. Hairs on

hind tibia rather stout, set at an angle of 45 degrees, .07 - .08 mm in length, hardly equalling diameter of tibia, moderately numerous; hairs on antenna similar to those on tibia, .05 mm in length, exceeding diameter of joint; hairs on body stout, rather sparse, and .04 mm in length. Beak short, attaining no farther than second coxae, terminal joints .15, .15, and .05 mm respectively, rather robust in appearance.

Sexuparæ, observed in Estes Park, Colorado, Sept. 1, 1924, were distinctly reddish in color and with pronounced blackish cross bands, and presented a much more striking appearance than the summer virgogenia.

Alate Virgogene ( Plate I, fig.5, Plate II, fig. 3, 5, and 6.) Described from a single specimen reared along with above apterous from fundatrices of second collection mentioned above, maturing June 20, 1922, and from twelve specimens taken in nature as full grown pupae, progeny of fundatrices of the same date, matured June 27, 1924 on twigs of Pseudotsuga taxifolia near Estes Park, Colorado.

Color; abdomen yellow brown, fading to whitish on median portions of first and second abdominal segments, sometimes tinged with greenish in two dorso-lateral stripes, head and thorax brown to dusky brown; cornicles appearing as mere rims, very slightly raised; slight powdery markings on intersegmental lines and on dorso-median portion of abdomen, and grooves in thorax marked with white; antennae light brownish yellow, with tips of third, fourth, and fifth, and entire sixth dusky; legs pale brownish yellow with entire tarsi, tips of first two pairs of tibiae, and distal third of hind tibiae, and two thirds of hind femora dusky to black.

Measurements; body, 3 mm long, hind tibia, 2 mm, antenna, 1 mm; joints of antenna as follows; I, .08mm.;II, .08 mm.; III, .35 - .42 mm.; IV,.18 mm.; V,.18 - .21 mm.; VI, .12 mm. + .04 mm.; secondary sensoria as follows; III, 2 - 7 ; IV, 1 - 2 ; V, 0; unguis conical. Beak attaining first segment of abdomen. Hairs on middle of hind tibia spine-like, set at an angle of about 60 degrees, .10 - .12 mm. in length, equalling diameter of tibia, rather numerous; hairs on antenna of same character, .05 mm. long, exceeding diameter of joint, moderately numerous; hairs on body finer .05 mm. in length. Wings hyaline except subcostal area,which is dusky brownish, stigma brownish, media twice branched and faint; hind wing with two cross veins.

Male (Plate I, fig. 7, and Plate II, fig. 7). Described from five specimens reared from pupae taken on twigs of Pseudotsuga taxifolia in Estes Park, Colorado, Sept. 1 ,1924.

Pupae pale green on dorsum of abdomen with a pair of darker green longitudinal rows of spots; head and thorax slightly dusky.

Adult: Color , pale sordid green on dorsum of abdomen, with two longitudinal rows of dusky green spots; head dusky brown to blackish, thorax the same; eyes reddish brown; legs pale orange yellow except hind and middle femora which are brownish distally, and knees, tarsi and tips of first and second pairs, and distal one third to one half of hind tibiae, which are black or blackish; antenna pale yellowish except first, second, sixth, and tips of remaining joints which are dusky; wings hyaline, stigma and stigmal vein dusky brown, costal cell smoky, especially distally. Entire dorsum lightly covered with powder.

Measurements; body slender, 2.5 mm. in length, .75 mm. in width; hind tibia 1.6 mm.; antenna 1.2 mm.; joints of antenna as follows; I, .06 mm.; II, .08 mm.; III, .40 - .50 mm.; IV, .18 - .21 mm.; V, .13 + .04 mm. ; secondary sensoria as follows; III 26 - 36; IV, 6 - 15; V, 5-11; unguis rather long conical. Hairs on middle of hind tibia same texture and length as alate virgogene, but equalling two to three times diameter of tibia. All other characters as in alate virgogene.

Oviparous Female (Plate I, fig. 6 and Plate II, fig. 8). Described from eight specimens taken near Glenn Haven, Colorado Sept. 27,1924, on twigs of Pseudotsuga taxifolia.

Color; light brown with slight reddish tinge, especially in abdomen; a pair of areas on second and third thoracic, first to third and eighth abdominal segments and faint line between cornicles dusky to blackish; white markings as follows; lateral and median portions of intersegmental lines conspicuous, lateral areas of abdominal segment four and thoracic segments two and three, and entire dorsum of abdominal segments six, seven and eight more or less white.* Other characters as in apterous virgogene, except hind tibiae which are slightly shorter and stouter, about 1.75 - 1.9 mm. in length and bearing scattered flat, faint sensoria thru-out its entire length.

Collections were made as follows, all on bark of twigs of Pseudotsuga taxifolia(Poir.) Britt.

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* Two specimens reared from young taken in Estes Park Sept. 1, 1924 did not show the white tip to the abdomen. H.F.Wilson does not mention it in his description.

Fundatrix:

Estes Park, Colo., alt. 8000, June 26, 1915, M.A.Palmer.
Bellevue, Colo., alt. 6000, June 3, 1922, M.A.Palmer.
Estes Park, Colo., alt. 6000, June 27, 1924, M.A.Palmer.

Apterous Virgogene:

Estes Park, Colo., alt. 8000, July 6, 1915,* M.A.Palmer.
Estes Park, Colo., alt. 8000, July 24, 1921, M.A.Palmer
Bellevue, Colo., alt. 6500, June 16, 1922, ** M.A.Palmer
Estes Park, Colo., alt. 8000, July 20, 1922, C.P.Gillette.
Estes Park, Colo., alt. 6500, June 27, 1924, M.A.Palmer.
Estes Park, Colo., alt. 8000, Sept. 1, 1924, M.A.Palmer

Alate Virgogene:

Bellevue, Colo., alt. 6500, June 20, 1922, ** M.A.Palmer.
Estes Park, Colo., alt. 6500, June 27, 1124 M.A.Palmer.

Male:

Estes Park, Colo., alt. 8000, Sept. 2 - 26, 1924, ***M.A.Palmer.

Oviparous Female:

Estes Park, Colo., alt. 8000, Sept. 8 - 26, 1924, *** M.A.Palmer.
Glenn Haven, Colo., alt. 7000, Sept. 27, 1924. M.A.Palmer.

Notes on Habits and Life History.

This species is moderately active and seems to have a periodic instinct to wander off. Whole colonies would simultaneously leave the twig just before they were ready to reproduce.

The appearance of alate in the second generation seems to vary. In the case of the fundatrix taken July 1, 1915, neither alate nor pupae appeared in the progeny of the next generation. In the case of fundatrices taken June 3, 1922 two alate appeared among about 25 apterous. In

* Reared from fundatrices taken June 26, 1915, above-mentioned.
** Reared from fundatrices taken June 3, 1922, above-mentioned.
*** Reared from young taken Sept. 1, 1924.

the case of a fundatrix, taken June 27, 1922, with a colony of descendants, nearly all the progeny at the time of capture were full grown pupae, twelve in number, with no apterous evident.

In the appearance of the sexuales, the males were observed to appear first, and the mature oviparous females appeared about the time the males disappeared.

This species seems to be rather rare in this part of the state and no heavy infestations have been noted.

Lachnus taxifoliae Swain.

Lachnus taxifoliae Swain

1918, Swain, Trans. Am. Ent. Soc., vol. 44, p. 11, 1918 (Orig.desc)
1919, Swain, Univ. of Cal. Tech. Bull. vol. 3, p. 50.

Egg (Plate I, fig. 15). Described from eggs taken Mar. 31, 1922, on needles of Pseudotsuga taxifolia (Poir.) Britt. , on campus at Ft.Collins, Colorado. Found on dorsal side of needles, laid end to end, from one to three in a row. Just hatching at this date, with open end of egg toward base of needle. Eggs taken in Estes Park April 20, 1921 were arranged in rows of three to four, also hatching with open end toward base of needle. Color, black covered with light pulverulence.

Fundatrix (Plate I, fig. 8. ). Young described from examples hatched from both collections of eggs described above.

1st instar, newly hatched (Plate I, fig.8 ).

Color; dark olive or rusty brown to black thru-out, with legs dark dusky. No powdery secretion apparent. Young four to five days old same color, but covered with even coat of powder on body with head black and naked except a median and two lateral stripes of white.

2nd instar. Color ,black to brownish with powder broken into bands and patches.

3rd instar. Color dark brown with patches of powder.

Adult (Plate I, fig. 9.). Described from one specimen taken near Bellevue, Colo., in hills altitude 6000 , on same host as above, May 19, 1921, the progenitor of the colony from which eggs and young fundatrices above-mentioned were taken, twenty four specimens reared from young described above.

Color; dark brown to black thru-out dorsum, with powdery secretion reduced to mere dashes on median and intersegmental lines, head, most of prothorax, and lateral portions of thoracic and fourth abdominal segments more or less white in young examples; older individuals may show hardly any pulverulence; antennae pale brownish yellow , with entire first, second, and sixth, and tips of third, fourth and fifth dusky; legs pale sordid yellow with entire tarsi, knees,and tips of first two pairs of tibiae and femora, all of hind tibiae, all of hind tibiae except ring below knee, and all of hind femora except base dusky to black; cornicles black and hardly visible.

Measurements; Body,2.5mm - 3 mm. in length, robust, 1.5 - 2.5 mm. in width; hind tibia,1.5 - 2 mm.; antenna,1 mm.; other characters same as apterous virgogene described below. Legs appear short and stout.

Apterous Virgogene.

Young(Plate I, fig.12 ).Described from numerous specimens, born from all of the above-mentioned lots of fundatrices.

1st instar. (Plate I, fig. 12.)

Color; water white tinged with brownish and marked with two longitudi-

nal rows of green spots on dorsum of abdomen; dusky markings as follows; entire head, a pair of areas on prothorax, lateral portions of first, second, third, and eighth abdominal segments, and cornicles; dorsum mottledwith white pulverulence especially pronounced on median, intersegmental lines, and lateral areas on thoracic segments and head. Antennae and legs colorless, with knees, tips of antennae, tarsi, and tibiae dusky.

Later instars (Plate I, fig. 13.)

Color; sordid brownish shading to yellowish brown onfifth abdominal segment or on dorsum of entire abdomen, a pair of longitudinal rows of green areas on abdominal segments often coalescing so as to form two irregular longitudinal lines, dusky markings on lateral areas of thoracic and abdominal segments; dorsum marked with pulverulence on median and intersegmental lines, entire head, and dorso-lateral areas of fourth abdominal segment; antenna pale brownish yellow, with tips of joints and entire sixth dusky; legs same color with tarsi, knees, and tips of first two pairs of tibiae, and almost entire tibiae and femora of hind pair dusky to black.

Adult (Plate I, fig. 11 and Plate II, fig. 12, 13, 14, and 15). Described from twenty two specimens above described as young and ten specimens at Larimie-Poudre Tunnel, Colorado, altitude 8000, Aug. 12, 1922.

Color; dark brown to blackish shading to yellowish brown on median line, paler on head and thorax; white markings appearing as broken areas on median and intersegmental lines, a large patch on dorso-lateral parts of fourth abdominal segment, one patch covering entire head and prothorax; antennae pale brownish yellow, dusky on entire first, second and

sixth, and tips of third, fourth, and fifth joints; legs pale brownish yellow with tarsi, knees, tips of first two pairs of tibiae, almost entire hind tibiae and femora dusky to black; cornicles black; eyes dark reddish brown to black.

Measurements; body 3 by 1.5 mm. to 3.5 by 2 mm., robust, hind tibia 2 to 2.5 mm., antenna 1.1 to 1.4 mm.; joints of antenna as follows; I, .08 mm.; II, .09 mm.; III, .40 - .50mm; IV, .15 - .21 mm.; V, .22 - .25 mm.; VI, .13 + .04 mm.; secondary sensoria none; unguis conical. Hairs on middle of hind tibia fine, numerous, set at an angle of about 35 degrees, .06 mm. long, less than diameter of tibia; hairs on antenna similar to those on tibia but exceeding diameter of joint; hairs on body .06 mm. in length, fine, upright, and moderately numerous. Cornicles mere rims, .01 mm. in height, without perceptibly raised base, tho a small surrounding area may be darkened. Beak attaining first segment of abdomen, terminal joints rather robust, measuring .19, .16, and .08 mm. respectively.

Alate Virgogene (Plate I, fig. 10 and Plate II, fig. 16.). Described from ten specimens reared on tree on campus taken during June and July 1921, progeny of fundatrix taken in hills near Bellevue, May 19, 1921, and one specimen taken in Estes Park, Colorado, July 26, 1922.

Color; amber to dusky brown on abdomen shading to dark brown or black on head and thorax, mottled with pulverulence on median and intersegmental lines , and lateral portions of all segments, and entire dorsum of head and thorax; antennae pale brownish yellow on bases of joints, especially the third, otherwise dusky; legs same color, except tarsi, knees,

tips of first two pairs of tibiae and almost entire tibiae and femora of hind legs; cornicles black; eyes dark brown to black.

Measurements; body,2.9 mm in length; hind tibia,2.3 mm, tarsus,3 mm.; antenna,1.2 mm.; joints of antenna as follows; I, .09 mm.; II, .08 mm.; III, .50 mm.,IV, .16 mm.; V, .22 mm.; VI, .12 mm. + .04 mm.; sensoria as follows; III, 3 - 7 ; IV, 0 - 2 ; V, 0 -1 ; unguis conical. Hairs on middle of hind tibia same length and character as apterous but equalling diameter of tibia, hairs on antenna and body same as apterous. Wings hyaline, stigma and stigmal vein dusky brown, subcostal area slightly smoky.

Oviparous Female.(PlateII, fig.9 and 10). Described from fourteen specimens reared on tree on campus, taken Oct. 18, 1916, progeny of fundatrix from Bellevue hills , taken May 19, 1921,above-mentioned, and four specimens taken in Estes Park, Colorado, Sept. 18, 1921.

Color; rusty brown marked with four rows of black patches extending from prothorax to cornicles, dark brown on head and prothorax; marked with pulverulence on dorso-lateral portions of thorax and abdomen, on median line, and covering entire dorsum of sixth, seventh,and eighth abdominal segments. That on posterior segments of abdomen is used to cover freshly laid eggs, being transferred to eggs by hind feet of female just after laying egg; legs and antennae colored as in apterous virgogene.

Measurements; body, 2.5 mm.; hind tibia 1.2 mm - 1.5 mm.; hind tibiae 1.2 - 1.5 mm. in length, slightly swollen and covered with slightly raised sensoria. Other characters as in virgogene.

Alate Male (Plate II, fig. 11.). Described from two specimens in same collection as above-mentioned oviparous female, taken Oct. 18, 1916, and three examples taken in Estes Park, Colorado, Sept. 18, 1921.

Color markings as in alate virgogene.

Measurements; body, 2 mm. in length; hind tibia, 1.5 mm; antenna, 1.3 mm.; joints of antenna as follows; III, .40 - .50 mm.; IV, .14 - .22 mm.; V, .21 mm.; VI, .13 + .03 mm.; secondary sensoria as follows; III, 24; IV, 6; V, 5; all other characters as in alate virgogene.

Notes on Habits and Life History.

Eggs hatched in Ft. Collins, Colorado, altitude 5000, Mar. 31 to after Apr. 4 in 1922. In Estes Park, Colorado they were found hatching April 20, in altitude 8000, in the same year.

First fundatrices, from above eggs hatched in Ft. Collins, began to reproduce May 9, became shrunken May 26 and were removed. Time from hatching to maturity about 30 to 39 days. They were found reproducing for 15 days. Reared on little tree on campus. First fundatrices, from above-mentioned eggs taken in Estes Park, matured May 16, taking 34 days after hatching. Reared in natural temperature house in Ft. Collins.

Second generation in two cases consisted, apparently, of apterous only. Alate appeared in third generation but were few in number or left the tree soon. The colonies moved frequently and rather simultaneously, to other parts of the tree.

Sexuales appeared about the middle of October in Ft. Collins, but in the middle of September in Estes Park, 3000 ft higher.

Collections were made as follows, all on Pseudotsuga taxifolia(Poir.)

Britt., feeding on bark of twigs;

Fundatrix:

Estes Park,Colo.,alt. 8000,June 26,1915, M.A.Palmer.
Bellevue, Colo., alt. 6000, May 19, 1921, M.A.Palmer.
Ft.Collins,Colo.,alt. 5000, May 15, 1922, M.A.Palmer.
Estes Park, Colo.,alt. 8000, May 16, 1922,* M.A.Palmer.
Bellevue, Colo.,alt. 6000, May 28, 1923, F.C.Hottes.

Apterous Virgogene:

Estes Park, Colo.,alt. 8000, July 2 - 8, 1915 ** M.A.Palmer.
Log Cabin, Colo.,alt. 8500, Aug.2, 1917, L.C.Bragg.
Ft. Collins,Colo. alt. 5000, June 8 - 16, 1921,** M.A.Palmer.
Lar.-Poudre Tunnel,Colo., alt. 8000, Aug. 12, 1922, C.P.Gillette.
Bellevue, Colo.,alt. 8000, Aug. 21, 1922, C.P.Gillette.
Estes Park, Colo.,alt. 8000, July 23,1922, C.P.Gillette.

Alate Virgogene:

Ft.Collins,Colo.,alt.5000, June 20 to 30, 1921, M.A.Palmer.
Estes Park, Colo., alt. 8000, July 26, 1922, M.A.Palmer.
Estes Park, Colo. alt. 8000, July 22, 1922, C.P.Gillette.

Oviparous Female:

Ft.Collins,Colo.,alt. 6000, Oct. 18, 1916, L.C.Bragg.
Estes Park, Colo., alt. 8000, Sept. 18, 1921, M.A.Palmer.
Ft.Collins, Colo., alt. 5000, Sept. 12 to Nov. 10, 1921,M.A.Palmer.
Ft. Collins, Colo.(hills) alt. 6000, Oct. 10, 1918, L.C.Bragg.

Alate Male:

Estes Park, Colo., alt. 8000, Sept. 18, 1921, M.A.Palmer.
Ft.Collins,Colo., alt. 5000, Sept. 12, 1921, M.A.Palmer.
Ft. Collins, Colo.,(hills),alt.6000, Oct. 10, 1918,M.A.Palmer.

## Lachnus occidentalis Davidson

Lachnus occidentalis Davidson

1909,Davidson, Jr. Econ. Ent., vol. 2, p.300 (orig. desc.,apterae).
1910, Davidson, Jr. Econ. Ent., vol. 3, p. 374.(list).
1912, Essig, Pom. Jr. Ent., vol. 4, p.773 (list).
1912, Wilson, Can. Ent., vol. 44, p. 193(desc. all forms).

*Reared in insectary from young. ** Reared from fundatrix of May,19,1921.

1919, Swain, Univ. of Cal., Tech. Bull.Ent.,vol.3,no.1, p.47(record)

Egg (Plate III, fig. 1 and 2.) Described from numerous examples taken on needles of Abies lasiocarpa (Hook.) Nutt.,above Laramie-Poudre Tunnel, Colo., April 8, 1922, several examples taken with oviparous females, south of Long's Peak, Colo., Oct. 21, 1922, and a number of examples taken in insectary, laid by oviparous females, descendants of virgogenia taken at Laramie-Poudre Tunnel Aug.12, 1922, by F.C.Hottes. Found singly and lengthwise on ventral side of needles, rarely more than one on a needle. Hatched with open end of egg toward base of needle.

Color; light brownish yellow when first laid, changing to jet black in a few days; covered with very slight powder. Measurement; 1.2 - 1.3 mm. by .5 mm.

Fundatrix (Plate III, fig.3 and 4.)

Young. Hatched from first collection of eggs mentioned above.

1st. instar: Color; dark or dusky brown thru-out body; legs and antennae pale yellowish, before feeding. After feeding(Plate III, fig.3) head chocolate (Ridgway 1912), prothorax dusky brown, rest of dorsum bluish black, with six longitudinal rows of pulverulent spots which coalesce later, producing flocculence over entire dorsum except head; legs yellowish, marked with dusky on tips of tarsi; antennae pale yellowish, dusky at tip.

3rd instar: Same as above except that flocculence covers entire body, including head and is caught on hairs of legs and on adjacent parts of twig, giving the appearance of a colony of Schizolachnus

tomentosus De Geer. Body color just after moulting yellow olive green.

Adult (Plate III, fig 4.) Described from thirty examples reared from young above-described, hatched from collection of eggs first-mentioned, maturing May 20, 1922.

Color; soon after moulting, dusky olive green shading to brownish on prothorax and head, with two longitudinal rows of dark areas on dorsum extending to cornicles and with white secretion as follows; entire head, patch covering most of prothorax, a smaller one o n median portion of mesothorax and six longitudinal rows of spots extending from mesothorax to tip of abdomen. In a day or so after moulting these spots coalesce and the insect is covered with rather abundant flocculent secretion, which catches on the long hairs of the legs and is spread to the surrounding portions of the twig.

Measurements; body, 2.5 mm- 3 mm. by 1.5 - 2 mm; hind tibia, 1.1 mm.; tarsus, .36 mm; antenna, 1 mm.; joints of antenna as follows; III, .27 - .33 mm.; IV, .12 - .16 mm; V, .15 -.19 mm.; VI, .13 - .15 + .03 mm.; secondary sensoria none. Beak attaining second abdominal segment, terminal joints rather stout in appearance, measuring, .16, .13, and .05 mm. respectively. Cornicles small, .17 mm in diameter at base. Unguis conical, moderately slender. Hairs on middle of outer side of hind tibia, fairly numerous, fine, erect, long, attaining .18 - .22 mm. in length, two to three times the diameter of the tibia ; hairs on third joint of antenna similar to above, attaining length of .13mm, or three times the diameter of the joint; hairs on body fairly abundant, erect, fine, and attaining .10 mm in length; ocular tubercles not evident.

Apterous Virgogene: (Plate II, fig. 17.) Described from numerous examples reared from above fundatrices and maturing June 14, 1922, and twenty specimens taken Aug. 12, 1922, at same locality as eggs above-mentioned by F.C.Hottes. Both young and adults of same color and measurements as fundatrix after first moult .

Alate Virgogene: (Plate III, fig. 5, and Plate II, fig. 20 and 21.) Described from thirty two examples reared along with above apterous virgogenia from above-mentioned fundatrices, and matured June 10 to 14, 1922; and from a single specimen taken Aug. 12,1922 along with the apterous virgogenia above-mentioned for same date.

Color;head and thorax cinnamon brown to blackish, abdomen light olive green, cornicles concolorous with abdomen but with black tips; entire dorsum and venter developing flocculent pulverulence. This catching on the long hairs of the antennae and legs causes a very tomentose appearance. Legs and antennae very pale yellowish brown, dusky on distal half of tarsi and on knees. Wings hyaline; stigma, stigmal and costal veins pale dusky yellowish; costal cell pale yellowish.

Measurements; body 2 mm.; hind tibia, 1.3 mm.; tarsus,. 37 mm; antenna,1 - 1.1 mm., joints of antenna as follows;III, .30 - .35 mm; IV, .15 - .17 mm; V, .17 - .20 mm; VI, .15 mm + .04 mm. Beak attaining second to fourth segment of abdomen, terminal joints rather stout, measuring .16, .13, and .05 mm. respectively; cornicles small, .15 mm. in diameter at base of cone; length of wing 3.5 - 4 mm. Secondary sensoria small, located as follows; on joint III, 1 - 3; IV, 2-3 ; V, 0; unguis slender conical. Hairs on outside of middle of hind tibia fairly numerous, fine,

erect or nearly so, long, attaining .20 mm. in length, or three times the diameter of the tibia; hairs on third joint of antenna moderately numerous, nearly erect, attaining lenght of .10 mm. or twice the diameter of the joint; hairs on body and cornicles same as on antenna. Fore wing with media very faint, twice forked. A few exceptions to this occurred, four out of twenty nine had one or both wings once forked and one out of twenty nine had media simple. Hind wing with two cross veins. Eyes prominent, without evident ocular tubercles.

Alate Male(Plate II, fig. 22.). Described from five examples reared in insectary from apterous virgogenia taken at Laramie -Poudre Tunnel, Aug. 12, 1922, by F.C.Hottes, and maturing Sept. 16, 1922.

Color; same as alate virgogene.

Measurements; body, 1.6 mm., slender; wing, 2.9 mm; hind tibia, .90 mm; tarsus, .28 mm.; antenna, .90mm.; joints of antenna as follows; III, .30 - .33 mm.; IV, .12 - .14 mm.; V, .14 mm.; VI, .13 + .03mm.; secondary sensoria as follows; III, about 18; IV, 12; V, 5; unguis slender conical. Hairs on hind tibia rather numerous, fine, erect, long, attaining .15 mm. in length or three times diameter of tibia; hairs on antenna similar to those on hind tibia, .07 mm. long, rather numerous. Beak attaining middle of abdomen; cornicles .08 mm. in diameter at base of cone. Eyes without ocular tubercles. Wing with media twice branched, though a few were found once branched.

Apterous Oviparous Female (Plate II, fig. 23 and Plate III, fig. 6. ). Described from twelve examples reared along with above males, progeny of apterous virgogenia taken Aug. 12, 1922, on Abies, at Laramie-Poudre Tunnel, by F.C.Hottes and maturing Sept. 16 - 27, 1922, and twenty

six examples taken on Abies lasiocarpa , in Wild Basin south of Long's Peak, Colorado,altitude 9000, Oct. 21, 1922.

Color; light yellowish olive, shading to cinnamon, darker on head and lateral and posteroir portions of abdomen, marked by two longitudinal rows of dark green spots, which sometimes coalesce into two stripes heaviest over thorax and first three abdominal segments, broken or missing on segments four and five;entire dorsum covered with a powdery bloom or slight flocculence; cornicles green to black; legs pale yellowish with distal half of tarsi and extreme tips of tibiae black or blackish, antennae pale with only tips dusky.

Measurements; same as apterous virgogene and fundatrix, or slightly smaller, except that hind tibiae are slightly swollen and covered wit h numerous convex sensoria thru-out entire length. Hairs as in fundatrix.

Collections were taken as follows, all on bark of twigs of Abies lasiocarpa (Hook.)Nutt.;

Eggs: (on needles)

Lar.-Poudre Tunnel, Colo.,alt. 8500, Apr. 10,1922, Mrs.A.H.Gaylord.
Wild Basin,Longs Peak, Colo.,alt.9000, Oct. 21, 1922,M.A.Palmer.
Lar.-Poudre Tunnel,Colo., alt. 8500, Sept. 16 - 27, 1922,*F.C.Hottes.

Fundatrix:

Lar.-Poudre Tunnel,Colo.,alt.8500, May 20, 1922, M.A.Palmer.
Estes Park,Colo., alt. 9500, June 11, 1923, F.C.Hottes.
Estes Park, Colo., alt., 9500, JUly 7, 1923, M.A.Palmer.

Apterous Virgogene:

Estes Park,Colo., alt. 9500, July 12,1923, * F.C.Hottes.
Estes Park, Colo. alt. 8500, Aug. 10,1923, M.A.Palmer.
Lar.-Poudre Tunnel, Colo.,alt.8500, Aug. 12,1922, F.C.HOttes.
Lake Eldora, Colo.,alt. 8730, Aug. 28,1911 , E.Bethel.
Lar.-Poudre Tunnel,Colo.,alt. 8500, * Sept. 16,1922, F.C.Hottes.

Alate Virgogene:

Lar.-Poudre Tunnel,Colo., June 10 - 14, 1922* M.A.Palmer.
Estes Park, Colo.,alt. 9500,July 12, 1922, * F.C.Hottes.
Lar.-Poudre Tunnel,Colo., Aug.,12, 1922, F.C.Hottes.
Lake Eldora, Colo.,alt. 8730, Aug.28, 1911, E.Bethel.
Lar.-Poudre Tunnel,Colo.,Sept. 16, 1922, * F.C.Hottes.

Apterous Oviparous Female:

Lar.-Poudre Tunnel,Colo.,Sept. 16,1922, * F.C.Hottes.
Lar.-Poudre Tunnel,Colo., Sept. 27, 1922* F.C.Hottes.
Wild Basin(Long's Peak),Colo.,** alt. 9000,Oct.21,1922,M.A.Palmer.

Alate Male:

Lar.-Poudre Tunnel,Colo., Sept. 16, 1922,* F.C.Hottes.

Notes on Habits and Life History.

Egg laying habit differs from that of most other Lachnids in that eggs are laid singly on ventral side of needle, rarely more than one on a needle, instead of five to eight in a row on dorsal side of needles. First hatching record, altitude 5000, was April 20, 1922. Fundatrices matured from said eggs May 20, or in 30 days from hatching. Second virgogenia, both alate and apterous, matured June 14, or in 25 days from birth. Alate were quite numerous, equalling, if not exceeding the numbers of the apterous . The first sexuales appeared in the insectary Sept. 16, 1922, reared from apterous virgogenia taken Aug. 12 of same year. Sexuales taken in nature appeared Oct. 21, 1922 at altitude of 9000.

This species is very quiet in habit, not easily disturbed, nor given to much wandering about, even if the twig upon which they feed becomes rather dry. They are found in quite large colonies and are a rather common species. They have the peculiar habit of migrating on to needles when ready to moult so that empty skins are found on needles,

*Reared in insectary. ** Region south of Long's Peak.

while the insects, themselves, are always found feeding on bark of twig. These skins, together with scattered flocculent material give the twig an ashy appearance by which the colony may easily be detected.

Lachnus oregonensis Wilson

Lachnus oregonensis Wilson

1915, Wilson, Trans. Am. Ent. Soc.,vol. 41, p. 103 (orig. desc.).
1919, Swain, Univ. of Cal. Tech. Bull.,vol. 13, p. 48 (record).

Egg (Plate III, fig. 12 ). Described from numerous examples taken on cones of Pinus Murrayana Eng., in Bellevue foot hills, alt. 8000, Apr. 22, 1922, by J.L.Hoerner, and several laid in insectary Sept. 10 - 26, 1922, on cones taken in Estes Park, Colo., Sept. 1, 1922. Found on young cones, mostly on under side and at bases of scales.

Color; light yellowish brown when first laid, turning black in a few days, shining. Size; 1.5 by .5 mm.

Fundatrix.

Young, 1st instar (Plate III, fig. 7). Described from a number of specimens hatched Apr. 22, 1924, from first collection of eggs above- mentioned. Feeding on young cones where eggs were laid.

Color; deep flesh or cinnamon rufous, head and diagonal lines extending dorso-laterally over prothorax dark brown, dorsum of segments three to six of abdomen dusky brown; antennae and legs dark brown, tarsi and tips of antennae blackish; eyes black; body, except head, slightly pulverulent. Beak but little surpassing hind coxae.

Adult (Plate III, fig. 8. ). Described from twenty five specimens reared from first collection of eggs above-mentioned, maturing from May 13 - 22, 1922. Feeding on same cones as above.

Color;yellowish brick red or ferruginous tinged with dusky dark dashes on dorsum of meso and metathorax and first, seventh, and eighth segments of abdomen; eyes dark brown; legs and antennae light honey yellow or pale yellow tinged with ochre, with tarsi, and sixth joint of antenna black, knees and distal two thirds of femora brownish, tips of pro and mesothoracic and distal one third to one half of metathoracic tibiae, cornicles, tips of antennal joints three, four, and five, and entire sixth dusky to blackish, dorso-lateral portion of abdomen with two longitudinal rows of black dots; no pulverulence, surface shining.

Measurements; body, 2.5 - 2 mm. by 1.3 - 1 mm., pyriform; length of hind tibia, 1.5 - 1.6 mm; antenna, .9 mm in length; joints of antenna as follows; III, .30 - .35 mm; IV, .09 - .11 mm.; V, .11 - .14 mm; VI, .10 - .13 mm. + .04mm.; secondary sensoria located as follows; III, 0 - 1; IV, 0 -1 ; V, 0 - 1; unguis bluntly conical; cornicles very small, base .10 - .13 mm in diameter; beak about same length as body, terminal joints measuring .19, .22, and .09 mm. respectively. Hairs on hind tibiae fairly numerous, fine , erect, moderately long, .09 mm. in length, or exceeding diameter of tibia; hairs on antennae similar to those on tibia, but somewhat shorter, .07 - .08 mm in length, or more than twice the diameter of the joint; hairs on body same as those on antennae.

Apterous Virgogene (Plate V, fig.1, 3, and 4) Described from four examples taken on cones of Pinus Murrayana, in Estes Park, Colo., Aug. 25, 1921, six examples of second generation reared from fundatrices described above and matured June 10 to 16, 1922. Feeding on same cones as fundatrices.

Young. 1st instar: In newly born, color lemon yellow thru-out. After feeding, color pale dusky yellow with slight pulverulence, head and

pair of spots on prothorax brown. Color very much the same as young fundatrix, except that the legs are without dusky.

Adult. Color; light brick red to ferruginous thru-out dorsum, with less inclination to dusky than fundatrix; legs ochraceous buff(Ridgway 1912)or antimony yellow(Ridgway 1912), deeper on knees and distal ends of femora, otherwise pale, except tarsi and tips of pro- and meso-, and one third to one half metathoracic tibiae, which are black or blackish; antennae same color as legs with tips of joints and entire sixth dusky; cornicles hardly darker than body.

Measurements; body 2.5 by 1.2 mm.; hind tibia 1.4 - 1.8 mm.; hind tarsus .30 - .33 mm.; antenna 1 mm.; joints of antenna as follows; III, .29 - .39 mm.; IV,.12 - .15 mm; V, .14 -.19 mm.;VI,. 09 - .11 + .04mm.; secondary sensoria as follows; III, 0 - 1; IV, 0 - 1 ; V, 0 - 1 ; unguis bluntly conical. Hairs on outside of hind tibia erect, fairly numerous, fine, .09 mm. long, or once and a half the diameter of the tibia; hairs on third joint of antenna attaining .08 mm in length, or twice the diameter of the joint, erect and only fairly numerous; hairs on body similar to those on antenna,; hairs on cornicles same as those on body. Beak attaining tip of abdomen, terminal joints slender, .19, .22, and .09 mm. respectively; cornicles very small, .10 - .13 mm in diameter at base of cone.

Alate Virgogene (Plate III, fig. 9, and Plate V, fig. 2,5,and 6). Described from thirty six examples reared from fundatrices described above. Fed on same cones as fundatrices till maturity then flew away in search of the new cones then forming.

Color; abdomen light brick to ferruginous as in apterous, cornicles hardly darker than abdomen, head and thorax dark brown to black, two anterior sclerites of metathorax covered with white powdery secretion; legs dusky to black thru-out except proximal one fourth of femora and proximal half of pro- and mesothoracic tibiae which are ochraceous buff (Ridgway 1912);antenna same color but paler with entire sixth and tips of third, fourth and fifth joints dusky; stigma, stigmal vein and costal veins cinnamon brown, costal cell smoky.

Measurements; body 2.5 by .9 mm.; wing 3.4 - 3.9 mm. long; hind tibia,1.6 - 2 mm.; hind tarsus,.33 mm.; antenna,.8 - 1 mm.; joints of antenna as follows; III, .28 - .40 mm.; IV, .10 - .16 mm.; V, .12 - .19mm.; VI,.09 - .11 mm + .04 mm.; secondary sensoria as follows;III, 2 - 6; IV, 0 - 2; V, 0 - 1; unguis conical. Beak distinctly surpassing tip of abdomen in length, cornicles .12 mm - .15 mm in diameter at base of cone. Hairs on outer side of hind tibia fine,fairly numerous,, erect, .05 - .07 mm. in length, or twice as much as the diameter of tibia; hairs on third joint of antenna fairly numerous, erect, .05 - .07 mm. in length, or twice as long as diameter of joint; hairs on body and cornicles same as on antennae. Secondary sensoria about as large as primary sensoria. Media of fore wing faint and twice branched, i.e. with three forks; hind wing with two cross veins.

Apterous Male (PlateIII, fig. 10 and Plate V, fig. 7 ) Described from twelve specimens reared from sexuparae on cones of Pinus Murrayana, taken in Estes Park, Colorado, Sept. 1, 1924, and maturing Sept 10 to 15. Feeding on young cones.

Color; same as apterous virgogenia in general, but head and entire

legs dusky and antenna slightly more dusky. Dorsum covered with light coat of powdery secretion.

Measurements; body,1.5 by .6 mm; hind tibia,1 - 1.1 mm.; hind tarsus,.27 mm.; antenna,.7 mm; joints of antenna as follows; III, .27 mm.; IV,.11 mm.; V,.13 mm.;VI, .09 mm. + .04 mm; secondary sensoria as follows; III, 2; IV, 2; V,2. Hairs onhind tibia rather sparse, .07 mm in length, or twice as long as the diameter of the tibia. Beak surpassing tip of abdomen about as much as half of the body. Other characters as in virgogene.

Oviparous Female (Plate III, fig.11) Described from two examples taken on little cones of Pinus Murrayana, in hills near Bellevue,altitude 8000, Oct. 2, 1921 and six examples reared along with males described above.

Color; same as apterous virgogenia, being distinguished from the latter only by the powdery tip to the abdomen, covering dorsum of seventh and eighth segments.

Measurements; same as in virgogenia, excepting the slightly longer abdomen. The hind tibiae show no perceptible swelling nor any evident sensoria. If sensoria are present they are very flat and indistinct.

Collections were taken as follows, all on young cones of Pinus Murrayana Eng.;

Egg :

Bellevue, (hills) Colo.,alt. 8000, Apr. 22, 1922, J.L.Hoerner.
Estes Park,Colo., alt. 8000, Sept. 26,1924,† M.A.Palmer.

Fundatrix:

Bellevue(hills),Colo.,alt. 8000, May 13, 1922* J.L.Hoerner.

*Reared from eggs taken Apr. 22, 1922. † Laid by females taken Sept.26,'24.

Apterous Fundatrigenia:

Bellevue(hills) Colo.,alt. 8000,June 16, 1922, * J.L.Hoerner.

Apterous Virgogenia:

Estes Park, Colo.,alt. 8000, Aug. 25, 1921, M.A.Palmer.
Estes Park, Colo., alt. 8000, July 30, 1922, C.P.Gillette.
Bellevue (hills), Colo., alt. 8000, Aug. 21, 1922, C.P.Gillette.
Estes Park, Colo., Sept. 1 - 10, 1924, M.A.Palmer.

Alate Virgogenia:

Bellevue, Colo.,alt. 8000, June 5 - 14, 1922, * J.L.Hoerner.
Eldora,Colo., alt 8730, June 23, 1911, L.C.Bragg.

Apterous Male:

Estes Park, Colo., alt. 8000, Sept. 15, 1924, ** M.A.Palmer.

Oviparous Female:

Bellevue,(hills), Colo., alt. 8000, Oct.2, 1921, M.A.Palmer.
Estes Park, Colo.,alt.8000,Sept. 26, 1924, ** M.A.Palmer.

Notes on Habits and Life History.

This species is comparatively rare, but where present, it occurs in large crowded colonies. They are quite difficult to find on account of the perfect protective coloration, making necessary the closest inspection unless the presence of the aphids is betrayed by attendant ants. They have been found feeding only on the youngest growth of cones.

Eggs were found hatching at altitude of 8000 on April 22 in 1922. When reared at altitude 5000 in natural temperature house fundatrices matured May 13, i.e. in 23 days. Adult fundatrigeniae, alate and apterous, appeared June 5, i.e.in 23 days. The fundatrigeniae were almost all alate. The apterous were so few as to raise the question as to wheth-

* Reared in insectary from fundatrices mentioned above.
** Reared in insectary from sexupara taken Sept. 1, 1924.

er they might be belated fundatrices, which, however, seemed rather unlikely as they were taken a week after the alate fundatrigeniae had been starting to migrate. The alate all left the cones, evidently in search for the new cones which would be appearing in nature simultaneously with the development of this generation. After settlement on the new cones probably only apterous forms occur, as four collections taken in July and August contained no alate. The males matured Sept. 15 in the natural temperature insectary in Ft. Collins, appearing before the oviparous females matured sufficiently to be distinguished and disappearing by the time the oviparous began to show the white tip to the abdomen. The females matured in this case Sept. 26 and eggs were found on this date.

Lachnus edulis Wilson.

Lachniella edulis Wilson.

1919, Wilson, The Can. Ent., vol. 51, p. 44

Egg (Plate IV, fig. 2 and 2 a ). Described from numerous examples taken needles of Pinus edulis (Engelm.) Small., in Owl Canon, Larimer County, Colo., Mar. 26, 1922, by C.P.Gillette, J.L.Hoerner, and the author. Found laid on the upper side of needles, in longitudinal rows of six to eight in a row, placed end to end. Hatching with open end toward [illegible] of needle.

Color, jet black, without powder. Length, 1.35 mm.

Fundatrix.

Young. Reared from above-mentioned eggs.

1st instar. Before feeding (Plate fig.3.) color dark olive green or

black thru-out dorsum; legs, antennae, and beak pale dusky yellowish; tarsi, terminal joints of beak, tips of antennae darker. After a few days (Plate IV, fig. 4.) dorsum covered evenly with white powder on thorax and abdomen; head black with only median and lateral lines white; legs legs pale orange yellow(Ridgway 1912) tinged with dusky, darker on tarsi and tips of tibiae.

2nd instar; with decided median white line thru-out dorsum, remainder of body bare in spots, giving mottled effect.

3rd instar; about the same color as adult.

Adult. Described from eleven examples reared from above eggs and maturing Apr. 18, 1922.

Color; shining black, more or less polished on thorax, lateral margins and terminal segments of abdomen, and cornicles, white secretion evident only on median line; legs light orange yellow, with knees, tarsi, distal ends of pro- and mesothoracic and two thirds of metathoracic tibiae black; antennae same color as legs, with tips of joints three, four, and five and entire sixth dusky.

Measurements;body, 3 - 3.5 mm by 1.5 - 2 mm.; hind tibia, 2.2 - 2.5 mm.; hind tarsus, .3 mm; antenna, 1.5 mm; other characters as in apterous virgogenia.

Apterous Fundatrigene(Plate IV fig. 6 and Plate V, fig. 8,9,11,and 12). Young (plate IV, fig. 5 ) Described from numerous examples born from fundatrices described above.

1st instar: Color; when just born, dark brown mottled with rusty brown on abdomen; later, similar with light, almost flesh colored med-

ian stripe extending form head to tip of abdomen; head black and shining except median and lateral lines which are pale; prothorax pale with two pairs of dorso-lateral black areas, meso- and metathorax pale; tarsi, knees, tips of tibiae, antennae , and terminal joints of beak black or blackish; legs pale yellow, almost colorless; entire dorsum slightly pulverulent, white more pronounced on median line, black areas on head and thorax naked. Beak extending beyond tip of abdomen by as much as a quarter of the body.

Adult (Plate IV, fig.6, and Plate V, fig. 8,9,11, and 12.) Described from numerous examples reared from fundatrices described above and matured May 27, 1922.

Color; same as fundatrix.

Measurements; body, 2.5 - 3 mm.; hind tarsus,.3 mm.; antenna 1.3 - 1.5 mm.; joints of antenna as follows; III,.42 - .55mm.; IV,.22 -.25mm.; V, .20 - .25mm.; VI,.08 - .11 mm. + .05 mm.; secondary sensoria as follows; III, 0 - 1;* IV,0 - 1; V, 1; unguis short and thick conical; hind tibia 2.5 - 3 mm. Hairs on outside of hind tibia, fine numerous, drooping, set at an angle of 45 degrees, attaining .08 mm. in length, or 1 length hardly the same as the diameter of the tibia; hairs on third joint of the antenna attaining .05 - .07 mm. in length, not very numerous, set at an angle of 45 - 60 degrees; hairs on body and cornibles same as on antenna. Cornicles .55 mm. in diameter at base; beak attaining cornicles, terminal joints measuring .19, .16, and .06 mm.

* This differs from original description by Wilson, which gives three sensoria for the third antennal joint of apterous viviparous. The three sensoria must be an exception as they do not appear in any of the twenty five examples,in the Colo.Exp.Sta. collection, taken in same lot as those submitted to Mr. Wilson, and from which he made his description.

Apterous Virgogene. Described from eleven examples taken on twigs of Pinus edulis, in Owl Canon, Larimer County, Colo., Aug. 6, 1922, by C.A.Bjurman, and eighteen examples taken in same location Sept. 25, 1921, by C.P.Gillette.

Characters same as apterous fundatrigene.

Alate Fundatrigene(Plate IV, fig. 7, and Plate V, fig 10.). Described from ten examples reared from young born of fundatrices described above.

Color; thorax and abdomen black or bluish black, head dark brown; abdomen with median line of white secretion; legs brownish yellow with knees, tarsi, tips of pro- and mesothoracic tibiae and distal three quarters of metathoracic tibiae black; antennae pale yellowish with entiresixth and tips of third,fourth,and fifth joints dusky; stigma and costal vein dusky brown, costal cell smoky.

Measurements; body, 3 - 3.5 mm. by 1.4 mm; hind tibia, 2.5 mm. to 3 mm.; hind tarsus, .3 mm.; antenna, 1.2 mm.; joints of antenna as follows; III, .34 - .60 mm.; IV, .20 - .30 mm.; V, .22 - .30 mm.; VI, .13 + .04 mm.; secondary sensoria as follows; joint III, 3 - 6 ; IV, 2- 3 ; V, 1; unguis short, thick , and conical. Hairs as in apterous,or slightly shorter. Beak attaining cornicles, measurement of joints same as in apterous; cornicles .30 - .40 mm. in diameter at base, darkening more pronounced in diameter of .20 mm. Fore wing with media twice forked, i.e. with three branches; hind wing with two cross veins.

Alate Virgogene. Described from thirteen examples taken in Owl Canon, Larimer County, Colo., Aug. 6, 1922, by F.C.Hottes.

Characters same in all respects as in alate fundatrigene.

Alate Male(Plate V, fig. 13 ) Described from a single specimen taken on bark of twigs of Pinus edulis, in Owl Canon, Larimer County, Colo., Oct. 27, 1921, by C.P.Gillette.

Color; from description in manuscript by C.P.Gillette,"Color thruout black, wings slightly smoky, costal margins and stigma smoky brown. Length of wing 2.80 mm."

Measurements; body 1.5 mm.; antenna 1.05 mm; joints of antenna as follows;III, .43 mm.; IV, .21 mm.; V, .25; VI,.12 - .03 mm.; secondary sensoria as follows; III,50; IV,20; V,10; hairs as in alate virgogeniae.

Apterous Oviparous Female (PlateIV, fig. 1, and Plate V,fig. 14 and 15.). Described from thirty eight examples taken on twigs of Pinus edulis, in Owl Canon, Larimer County, Colo., Oct. 27, 1921, byC.P.Gillette.

Color; same as apterous virgogenia.

Measurements; body, rather elongate,3 - 4 mm. by 1.75 mm.; hind tibia, 1.8 - 2.2 mm., bearing numerous small convex sensoria thru-out entire length. Hairs as in virgogeniae.

Collections were made as follows, all on bark of twigs and branches of Pinus edulis (Engelm.) Small.;

Egg: (on needles)

Owl Canon,Larimer County, Colo.,alt.5600, Mar.26,1922,C.P.Gillette, J.L.Hoerner, and M.A.Palmer.

Fundatrix:

Owl Canon,Lar. Co.,Colo.,alt 5600, Apr. 18, 1922* J.L.Hoerner.
Owl Canon, Lar.Co.,Colo.,alt 5600, May 24, 1823, M.A.Palmer.
Owl Canon,Lar.Co.,Colo.,alt. 5600, June 8,1923, M.A.Palmer.

*Reared in insectary from eggs above-mentioned.

Apterous Fundatrigene and Virgogene:

Owl Canon,Lar.,Co.,Colo.,alt.5600, May 27, 1922,* M.A.Palmer.
Walsenburg, Colo., alt.6187,June 15, 1907, C.P.Gillette.
Trinidad, Colo.,alt. 5994, June 18, 1911, L.C.Bragg.
Manitou, Colo., alt. 6318, July 3, 1919, L.C.Bragg.
Owl Canon, Colo., alt. 5600, Aug.6, 1922, C.A.Bjurman.
Owl Canon,Lar.Co., alt. 5600, Sept. 1, 1922, C.P.Gillette.
Owl Canon,Lar.Co., alt. 5600, Sept. 24, 1922, F.C.Hottes.
Owl Canon,Lar.Co., alt. 5600, Sept. 25, 1921, M.A.Palmer.

Alate Fundatrigene and Virgogene:

Owl Canon, Lar. Co.,Colo., alt. 5600,May 27, 1922,* M.A.Palmer.
Grand Junction, Colo., alt. 4594, Aug. 5, 1923, F.C.Hottes.
Owl Canon, Lar.Co.,Colo., alt. 5600, Aug. 6, 1922, F.C.Hottes.
Manitou, Colo., alt. 6318, July 3, 1919, L.C.Bragg.
Salida, Colo., alt.7050, Sept. 1, 1922, C.P.Gillette.
Grand Junction, Colo., Sept.18, 1923, F.C.Hottes.

Alate Male:

Owl Canon, Lar. Co., Colo.,alt.5600, Oct. 27, 1921, C.P.Gillette.

Oviparous Female:

Owl Canon,Lar. Co.,Colo., alt.5600, Oct. 18, 1922, F.C.Hottes.
Owl Canon, Lar. Co., Colo., alt.5600, Oct. 28, 1921, C.P.Gillette.

Notes on Habits and Life History.

This is the most common and generally distributed species of aphid on Pinus edulis, and it occurred in injurious number at Sweetwater,California in August 1922, where it was reported by E.Bethel as killing thousands of trees.

Eggs were found hatching March 26, 1922, from these fundatrices matured April 18, i.e. in 23 days, in altitude of 5000. Fundatrigeniae matured May 27, 39 days later, but probably were not descended from the earliest fundatrices as these were mounted when found. The earliest date for taking sexuales was Oct. 18. Fundatrigeniae consisted of both apter-

* Reared in insectary from fundatrices.

terous and alate in about equal numbers.

Lachnus vandykei Wilson.

Lachniella vandykei Wilson

1919, Wilson, Can. Ent., vol. 51, p. 19.(orig. desc.) (alate and apt.)

Egg. Described from several examples taken on needles of Picea engelmanni(Parry) Engelm., in Estes Park, Colo., altitude 9000, by F.C. Hottes. Found singly or in twos on the needles, mostly at the very bases.

Color, shining black, without pulverulence. Size, .50 by 1.15 mm.

Fundatrix.

Young, 3rd instar, taken with the above-mentioned eggs. Color same as adult.

Adult. Described from two specimens taken on Picea engelmanni,at Chamber's Lake, Colo.,alt. 9000, June 30, 1923 and from seven specimens taken on Fall River, Estes Park, Colo., alt. 10000, July 7, 1923, on same host.

Color; dark rufous brown to metallic black thru-out, dorsum entirely without pulverulence; legs mostly black shading to dusky yellowish near bases of tibiae and femora; antenna dusky thru-out except basal two thirds of third joint; cornicles black.

Measurements; body, 2 - 3 mm. by 1.75 - 2 mm, robust; hind tibia, 1.3 mm.; antenna, 1.2 mm; joints of same as follows; III, .40 - .53 mm.; IV, .13 - .16 mm.; V, .19 mm.; VI, .14 + .02 mm.; sensoria as follows; III, 1 - 4; IV,1 - 3; V, 1; unguis conical. Hairs as in apterous fundatrigenia; cornicle medium sized, conical; beak attaining fourth abdominal segment.

Apterous Fundatrigene.

Young.Born from above-mentioned fundatrices, taken in Estes Park, Colorado. Ist instar, head and thorax very pale, abdomen somewhat pink, with two green lines down dorsum. 2nd and 3rd instars, color similar to adult, or slightly more yellowish.

Adult (Plate IV,fig. 8, and Plate V, fig 18 and 19.). Described from ten specimens, progeny of fundatrices above-mentioned from Estes Park, reared in the insectary, and seven specimens taken on Flat Top Mountain, Estes Park, Colorado, altitude 9500. July 16, 1923,

Color; same as fundatrix, unless lighter and more brownish.

Measurements; body 2.5 by 1.5 mm., robust; hind tibia 1.7 mm.; hind tarsus .35 mm.; antenna 1.25 mm.; joints of the same as follows; III, .50 mm.; IV, .19 mm.; V, .20 - .25 mm.; VI, .16 + .03 mm.; secondary sensoria as follows; III, 2; IV, 1 - 2 ; V,1; unguis conical. Hairs on middle of hind tibia nearly erect to erect, fine, numerous, .10 mm. long, exceeding diameter of tibia; hairs on antenna similar, length equalling twice the diameter of joint; hairs on body and cornicles similar. Cornicles from .30 - .50 mm in diameter.

Alate Fundatrigene (Plate IV, fig. 9 and Plate V, fig. 16 and 17). Described from four specimens reared in the insectary, from young born of fundatrices above-mentioned, taken in Estes Park, Colorado, maturing July 17, 1923, and ten specimens taken,along with apterous fundatrigenia above-mentioned, on Flat Top Mountain, Estes Park, Colorado, July 16, 1923.

Color; thorax black, abdomen mottled with yellowish, sometimes with

large yellowish area on median portion of first and second abdominal segments; legs black except bases of femora and small proximal portion of first and second pairs of tibiae; cornicles and eyes black; pulverulence appearing in slight dashes on intersegmental lines, large white area on dorso-lateral portions of fourth abdominal segment, just anterior to cornicles, entire dorsum of seventh abdominal segment, cauda, and entire scutellum.

Measurements; body 3 mm. long; hind tibia, 1.6 mm; hind tarsus, .37 mm.; antenna, 1.2 mm; joints of same as follows; III, .45 - .55 mm.; IV, .18 mm.; V, .21 - .25 mm.; VI, .15 + .04 mm.; secondary sensoria as follows; III, 6 - 10; IV, 3 -2; V, 1 - 2 ; unguis conical. Hairs as in apterous form, those on outer side of tibia almost twice the diameter of tibia in length; cornicles moderately large, .50 mm. in diameter at base. Wing hyaline except subcostal area, which is dusky, stigma, stigmal vein, and costal vein dark dusky.

Oviparous Female (Plate IV, fig. 10 and Plate V, fig. 20). Described from eight specimens reared in insectary descendants of fundatrices taken in Estes Park, Colorado, above-mentioned, and four specimens taken in Pingree Park, Colo., Aug. 24, 1923, and one specimen taken along Fall River, Estes Park, Colo., July 27, 1923.

Color; same as viviparous, except dorsum of entire tip of abdomen posteroir to cornicles is thickly covered with pulverulence; cornicles black.

Measurements; body 2 - 2.25 mm., pyriform; hind tibia 1.2 mm., covered with numerous flat sensoria. Other characters as in viviparous.

Apterous Male (Plate IV, fig. 11 and Plate V, fig. 21.). Described from a single specimen taken July 20, 1923, in same colony as oviparous mentioned above, reared as descendants of fundatrices from Estes Park, above-mentioned.

Color; dark brown thru-out, without pulverulence; legs and antennae as in oviparous female.

Measurements; body,1.9 by 1 mm., slender; hind tibia,1.2 mm.; hind tarsus,.30 mm; antenna,1.1 mm;joints of the same as follows; III,.40 mm.; IV,.16 mm.; V,.20 mm.; VI,.14 + .03 mm.; secondary sensoria numerous, rather thickly covering III, IV, and V, about eight to a joint. Hairs and other characters as in other forms.

Notes on Habits and Life History.

Fundatrices became mature in Estes Park, altitude 9000, about June 15 in 1923 and were found still reproducing at Chamber's Lake, Poudre River, Colo, same altitude, June 30, 1923. Adult apterous and alate fundatrigeniae were taken in the insectary July 17, 1923, the alate forms appearing in the proportion of about 50%. Sexuales appeared in this same colony July 21, 1923, apparently in second generation. The oviparous female taken on Flat Top Mountain, Estes Park, altitude 9500, on July 27, same year,must have been second generation also.

This early appearance of sexuales was very unusual, but the collection of the same in nature within a week of their appearance in the insectary precludes the possibility of it being the effect of unnatural conditions.

This species occurs in small colonies, but is not common.

Collections were made as follows, on bark of twigs of Picea engelmanni (Parry) Engelm.;

Egg: ( on needles, hatched)

Loch Vale,Estes Park,Colo., alt. 9500, June 11,1923, F.C.Hottes.

Fundatrix:

Loch Vale,Estes Park,Colo., alt. 9500, June 11,1923, F.C.Hottes.
Chamber's Lake,Poudre River,Colo.,alt.9100,June 30,1923,M.A.Palmer.
Fall River,Estes Park,Colo.,alt.10,000, July 7,1923, M.A.Palmer.

Apterous Fundatrigene:

Loch Vale,Estes Park,Colo.,alt. 9500, July 26, 1921, C.P.Gillette.
Fall River,Estes Park,Colo.,alt. 10,000,July 16,1923,* M.A.Palmer.
Flat Top Mt.,Estes Park,Colo.,alt.9500, July 28,1923, M.A.Palmer.

Alate Fundatrigene:

Loch Vale,Estes Park,Colo.,alt.9500, July 26,1923, C.P.Gillette.
Fall River,Estes Park,Colo.,alt.10,000, July 16,1923, M.A.Palmer.

Apterous Oviparous Female:

Fall River,Estes Park,Colo.,alt. 10,000,July 20,1923,* M.A.Palmer.
Pingree Park,Colo.,alt. 9500, Aug. 24, 1923, M.A.Palmer.

Apterous Male:

Fall River,Estes Park,Colo.,alt. 10,000* July 20,1923,M.A.Palmer.

## Lachnus schwarzii Wilson.

Lachniella schwarzii Wilson.

1919, Wilson, Can. Ent., vol.51, p.46. (orig. desc).

Egg (Plate VI, fig. 1.). Described from numerous examples taken on needles of Pinus scopulorum(Engelm.) Lemmon., in Owl Canon, Larimer Co., Colorado, March 26, 1922. Found laid in rows lengthwise of the needles,

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* Reared in insectary, descendants of fundatrices taken July 7,1923.

end to end. Hatching with open end toward tip of needle.

Color, shining black, without powder. Size; 1 by .47 mm.

Fundatrix.

Young. 1st instar (Plate VI, fig.2.) Hatched from above-mentioned eggs. When newly hatched, color, very dark cinnamon brown, nearly black, sometimes with greenish tinge; legs and antennae at first pale yellowish, then turning very dark and shining. Beak very long, exceeding the length of the body by over half. When two or three days old, (Plate VI, fig.3 and 4.) color, slightly lighter brown, and covered with white powdery secretion, which is often broken into patches giving a mottled effect; head dark with median stripe, lateral portions, and band across face ventral to compound eyes covered with white secretion; two black areas on dorsum of prothorax and four rows of black dots on dorsum of abdomen; legs blackish except yellowish ring just below knees; antennae pale except entire first, second, and sixth and tips of remaining joints, which ar blackish. Covered with numerous fine hairs.

Adult (Plate VI,fig. 5. ) Described from twenty examples reared from eggs described above and maturing April 28 to May 4.

Color; cinnamon brown, mottled with blackish and marked with scattered patches and streaks of powder, broken median line of white from fifth abdominal segment to cauda; cornicles black; legs black or blackish, except proximal ends of femora and pale yellow band just below knees on tibiae; antennae pale yellow, with entire first, second, and sixth and tips of third, fourth, and fifth joints dusky to black.

Measurements; body,3 - 4 mm.by 1.5 - 2 mm.;hind tibia,1.6 - 1.9 mm.;

hind tarsus, .28 mm.; antenna 1 - 1.2 mm; joints of same as follows; III, .42 - .48 mm.; IV,.15 - .20 mm.; V,.19 - .25 mm.; VI,.11 - .13 mm. + .05 mm; secondary sensoria as follows; III, 0; IV, 0; V, 1; unguis short and bluntly conical. Hairs on outside of middle of hind tibia numerous, fine, drooping, at an angle of 30 degrees or less, short, .03 - .05 mm. in length, shorter than diameter of tibia; hairs on third joint of antenna rather sparse, at angle of 45 degrees to erect, .05 - .07 mm. in length, longer than diameter of joint; hairs on body and cornicles about the same as on antenna. Beak attaining to between first and fifth abdominal segments, terminal joints rather stout, measuring .20, .20, and .07 mm. in length, respectively. Cornicles medium in size, .35 - .40 mm. in diameter at base of cone.

Apterous Fundatrigene.

Young. Described from numerous examples born from above-mentioned fundatrices April 27, 1922.

1st instar.(Plate VI, fig. 6.).

Color; straw yellow (Ridgway 1912) to cream color (Ridgway 1912), tinged with greenish on areas on dorso-lateral portions of first and second abdominal segments, and tinged with brownish on median portion of abdomen, also on lateral and posterior portions; head dark brown excepting median line and lateral portions which are same color as body; prothorax with a pair of dark brown diagonal areas; bases of cornicles, eyes, lateral portions to almost entire dorsum of eighth abdominal segment, anal plate, and four longitudinal rows of dots on dorsum of abdomen black; legs and antennae very pale yellowish or water

white with knees, tarsi, tips of tibiae and of antennal joints and entire sixth dusky to black; slight coat of powdery secretion appears later, after feeding. Beak exceeding tip of abdomen by about one half the length of the body, pale colorless, with two distal joints dusky.

2nd instar.

Color; dusky or rusty brown, mottled with darker brown or blackish spots, especially on lateral portions of body, and covered thru-out with a light coat of powdery secretion; legs pale with tarsi, knees, distal half to three quarters of tibiae dusky to blackish, sometimes distal portion of hind femora more or less dusky. Cornicles black. Beak extending extending beyond tip of abdomen as far as one fourth the length of the body.

3rd instar. (plate VI, fig. 7.)

Color; brown or black thru-out, covered with mottled or reticulated pattern of white secretion, heavier on median line and on lateral portions of occiput and prothorax; legs brown to black thru-out, excepting pale yellow portion distad to knees; antennae pale yellowish to colorless, except entire first, second, and sixth and tips of third, fourth , and fifth joints dusky to black; eyes dark brown to black.

Adult. (Plate VI, fig.11 and Plate V, fig. 23, 24, and 25.). Described from seventeen examples matured May 13 to 19, 1922, from above-mentioned young born of fundatrices described above.

Color; dark brown to black on dorsum, powdery secretion mostly confined to broken medio-dorsal line and whitish areas on lateral margins of thorax and abdomen; almost no white evident in older examples; legs

black thru-out except pale yellowish area below knees; antennae pale yellowish with usual parts dusky to black.

Measurements; body,3 - 4 mm.; hind tibia 2.1 - 3 mm.; hind tarsus ,35 mm.; antenna, 1.2 - 1.6 mm.; joints of the same as follows; III, .45 - .65 mm.; IV, .20 - .32 mm.; V,.20 - .33 mm.; VI,.10 - .15 mm. + .04mm.; secondary sensoria as follows; III, 0 - 1; IV, 1 - 2; V, 1; unguis short and thick conical. Hairs as in fundatrix. Beak attaining middle of abdomen. Cornicles about .50 mm. at base of cone.

Apterous Virgogene. Described from two examples taken Aug.15, 1916, in hills near Ft. Collins and three others taken Aug. 2, 1917 at Log Cabin, Colorado by L.C.Bragg and fourteen taken at Log Cabin Colorado Aug. 21, 1919 by L.C.Bragg.

All characters as in apterous fundatrigene.

Alate Fundatrigene and Virgogene.

Young. In early instars indistinguishable from young of apterous form, later distinguished by the presence of wing pads.

Pupa (PlateVI, fig. 8 and9.) Described from many examples reared as progeny of fundatrices described above and others as progeny of apterous virgogeniae, Aug. 15, 1916.

Color; rusty brown to gray on abdomen and with mesothorax pale dirty white to pale brownish; head blackish with median and lateral lines of white secretion and light covering or reticulation over remainder of occiput; prothorax black lateraly with broad median pale area, more or less covered thru-out with secretion; abdomen mottled with black, especially on median portions of fourth and fifth abdominal segments, and

lateral patches on all abdominal segments; wing pads and cornicles black; abdomen with slight powdery markings, especially on median line; legs colorless or pale yellowish on area distad of knees, pro- and mesothoracic femora, and base of metathoracic femora, remaining parts of legs black or blackish. Eyes dark brown. Beak exceeding body by about one third length of abdomen.

Adult. (Plate VI, fig. 10 and Plate V, fig. 26 and 22.). Described from thirty seven examples, reared as progeny of above-mentioned fundatrices, five examples taken in hills near Ft. Collins, Aug. 15, 1916, by L.C.Bragg, and ten examples taken at Log Cabin, Colorado by the same collector, Aug. 16,1917.

Color; abdomen yellowish brown to black, head and thorax black; very slight powdery secretion present, often evident only in depressions on head and thorax, and median line and lateral dashes on abdomen; legs black except pale yellowish area below knees; antennae black except bases of third, fourth,and fifth joints; stigma, costa, and subcosta dusky brown; costal cell, and small area at tips of radial sector and at tips of first and second discoidals slightly smoky.

Measurements; body, 2.6 - 4 mm.; Wing 3.5 - 4 mm.; hind tibia,2.7 - 3 mm.; hind tarsus, .32 mm.; antenna, 1.2 mm; joints of the same as follows; III,.43 - .54 mm.; IV, .21 - .29 mm.; V,.20 - .30 mm.; VI,.10 - .15 mm. + .04 mm.;secondary sensoria irregular and somewhat tuberculate, distributed as follows; III, 3 - 7 ; IV, 1 - 2 ; V, 1; unguis short and conical. Hairs as in apterous. Beak attaining or extending slightly beyond tip of abdomen, terminal joints measuring .23, .23, and .06 mm. in

length respectively. Cornicles .35 - .40 mm in diameter at base of cone. Fore wing twice branched, i. e., with three branches; hind wing with two cross veins. Hind tibia sometimes strongly bent and other times only gently curved.

Alate Male )Plate VI, fig. 12 and Plate V, fig. 27.) Described from two examples taken in Poudre Canon, Colorado, Sept 19, 1920, and three examples in Ft.Collins foothills, Oct. 9, 1917 , by L.C.Bragg.

Color; dark brown to black on abdomen and prothorax, head and meso- and metathorax black; slight powdery markings evident in depressions on dorsum of thorax, median and intersegmental lines on abdomen; antennae black or blackish; legs black or blackish except bases of femora and area distad of knees, which are pale yellow. Eyes and cornicles black. Wing markings as in alate viviparous.

Measurements; body, 3 - 3.5 mm.; wing, 3.5 - 3.9 mm.; hind tibia 2. mm.; antenna 1.4 mm.; joints of the same as follows; III .52 - .57 mm.; IV,.23 - .28 mm.; V,.28 - .31 mm.; VI,.14 + .04 mm.; secondary sensoria as follows; III, about 60; IV, 17 - 23; V,10. Hairs on hind tibia fine, rather numerous, at an angle of 30 - 45 degrees, .05 mm. in length, about the same as the diameter of tibia. Cornicles .20 mm. in diameter at base of cone.Wing venation and other characters as in alate viviparous.

Apterous Oviparous Female (Plate V, fig. 28.). Described from nine examples taken with second collection of males above-mentioned.

Same in color and appearance as apterous viviparous, but with great variation in size, 3 - 5 mm in length; hind tibia,2 - 3.5 mm. Hind tibia slightly swollen and covered with numerous small sensoria.

Collections were taken as follows, all on bark of twigs and small branches of Pinus scopulorum (Engelm.) Lemmon.

Egg: (on needles )

Owl Canon,Lar.Co., Colo., alt. 5600, Mar. 26,1922, M.A.Palmer.

Fundatrix:

(foothills) Ft.Collins,Colo.,alt. 6000, Apr.8,1916, L.C.Bragg.
(foothills) Ft.Collins,Colo.,alt. 6000, Apr. 23,1911, L.C.Bragg.
Owl Canon,Lar.Co.,Colo. alt. 5600, Apr. 28, 1922, M.A.Palmer.
Gem Lake,Estes Park,Colo.,alt.9000, May 3,1922, * M.A.Palmer.
(foothills)Ft.Collins,Colo.,alt.6000,May 4,1922, M.A.Palmer.

Apterous Fundatrigene and Virgogene:

(foothills)Ft.Collins,Colo.,alt.5600, May 13,1922, M.A.Palmer.
Walsenburg,Colo., alt. 6187, June 18, 1909, E.Bethel.
Boulder,Colo. June 24, 1913, L.C.Bragg.
La Porte,Colo. alt. 5500,July 1, 1898, C.P.Gillette.
(foothills)Ft.Collins,Colo.,alt. 6000,July 15,1898, C.P.Gillette.
Livermore,Colo., alt. 7000, July 18,1916, M.A.Palmer.
Log Cabin, Colo., alt 7760, Aug.2 1917, M.A.Palmer.
Estes Park,Colo., alt 8000, Aug.7, 1919, C.P.Gillette.
(foothills)Ft.Collins,Colo.,Aug. 15,1916, C.P.Gillette.
Log Cabin,Colo.alt. 7760, Aug. 16, 1917, L.C.Bragg.
Masonville,Colo.,alt. 6000, Aug.20,1922, M.A.Palmer.
(foothills)Bellevue,Colo., alt. 8000, Aug. 21,1922,F.C.Hottes.
Log Cabin,Colo.,alt.7760, Aug.21,1919, L.C.Bragg.
EstesPark,Colo.,alt.9000, Aug.24,1921, M.A.Palmer.
Poudre Canon,Colo., Sept.19,1920, M.A.Palmer.
(foothilld)Ft.Collins,Colo.,Sept.19,1922, C.A.Bjurman.
Owl Canon,Lar.Co.,Colo.,alt.5600, Sept.24,1922, M.A.Palmer.
Owl Canon, Lar.Co.,Colo.,alt. 5600,Sept.25,1921, C.P.Gillette.

Alate Fundatrigene and Virgogene:

(foothills)Ft.Collins,Colo.,alt.6000,May 13, 1922,M.A.Palmer.
Walsenburg,Colo.,alt.6187, June 18,1909, E.Bethel.
Boulder, Colo., June 24,1913, L.C.Bragg.
(foothills)Ft.Collins,Colo.,alt.6000,June 25,1921,M.A.Palmer
Estes Park,Colo.,alt. 8000, Aug. 7,1919, C.P.Gillette,
(Foothills)Ft.Collins,Colo., Aug.15, 1916, C.P.Gillette.
Log Cabin,Colo.,alt.7760, Aug. 16,1917, L.C.Bragg.
Salida,Colo.,alt.7050, Sept.1, 1922, C.P.Gillette.

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* Reared in insectary from eggs taken Mar. 26, 1922.

Apterous Oviparous Female;

Salida,Colo.,alt.7050,Sept. 1,1922, C.P.Gillette.
Bellvue,Colo., Oct.2,1921, C.P.Gillette.
(foothills)Ft.Collins,Colo., Oct. 9,1917, L.C.Bragg.
(foothills)Ft.Collins,Colo., Oct.13,1910,L.C.Bragg.
So.St.Vrain Canon,Colo., alt.6000,Oct.21,1922, M.A.Palmer.
(foothills)Ft.Collins,Colo.,alt.6000, Oct. 22,1922,F.C.Hottes.

Alate Male:

Poudre Canon,Colo., Sept.19,1920, M.A.Palmer.
(foothills)Ft.Collins,Colo.,alt.6000, Oct. 9,1917,L.C.Bragg.
So.St.Vrain Canon,Colo., Oct. 21, 1922, M.A.Palmer.
(foothills)Ft.Collins,Colo.,alt 6000, Oct.22,1922,C.A.Bjurman.

Notes on Habits and Life History.

Eggs were found hatching March 30, 1922, in natural temperature house, alt. 5000, Mature fundatrices were found April 27, or 28 days after hatching. Mature individuals have been taken as early as April 8. Fundatrigeniae, both alate and apterous appeared May 13, or 14 days after birth. Sexuales were taken from Sept. 1 to Oct. 22.

This species is very common and is found in quite large colonies.

Note on Taxonomy.

This species resembles quite closely Lachnus edulis Wilson(described in an earlier page in the same volume). It differs, however, in the following particulars, namely usually slightly shorter hairs,cornicles generally appearing larger, legs lacking the orange yellow color, femora more dusky; powdery markings on dorsum generally less confined to median line, and general color of body with more tendency to brown. The newly born differ in being straw yellow in color instead of brown. These character,however, are not sharply drawn and overlapping occurs, but

since they differ in food plants, in which respect the genus seems to be quite specific, it seems advisable to consider them as distinct species until they can be united by further study.

## EXPLANATION OF PLATES.

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### Plate I.

Lachnus pseudotsugae Wilson.1,fundatrix; 2, young virgogene, 1st instar; 3, young virgogene, later instars; 4, adult apterous virgogene; 5, alate virgogene; 6,apterpus oviparous female; 7, alate male.

Lachnus taxifoliae Swain. 8, newly hatched fundatrix; 9, adult fundatrix; 10, alate virgogene; 11, apterous virgogene, adult; 12, young virgogene, 1st instar; 13, young virgogene, 3rd instar; 14, apterous oviparous female; 15, egg.

### Plate II.

Lachnus pseudotsugae Wilson. 1, antenna of apterous virgogene; 2, cornicle; 3, antenna of alate virgogene; 4, middle of hind tibia of apterous virgogene; 5, middle of hind tibia of alate virgogene; 6. terminal joints of beak; 7, antenna of alate male;8, hind tibia of oviparous female.

Lachnus taxifoliae Swain. 9, antenna of oviparous female; 10, tibia of same; 11, antenna of alate male; 12, antenna of apterous virgogehe; 13, cornicle; 14, middle of hind tibia of apterous virgogene; 15; terminal joints of beak; 16, antenna of alate virgogene.

Lachnus occidentalis Davidson. 17, antenna of apterous virgogene; 18, cornicle; 19, terminal joints of beak; 20, antenna of alate virgogene; 21, middle of hind tibia of the same;22, antenna of alate male; 23, hind tibia of oviparous female.

### Plate III.

Lachnus occidentalis Davidson. 1, egg; 2, freshly laid egg; 3, newly hatched fundatrix; 4, adult fundatrix; 5, alate virgogene; 6, apterous oviparous female.

Lachnus oregonensis Wilson. 7, young fundatrix, 1st instar; 8, adult fundatrix; 9, alate virgogene; 10,apterous male; 11, apterous oviparous female; 12, freshly laid egg.

### Plate IV.

Lachnus edulis Wilson. 1, apterous oviparous female; 2, egg; 2 a, needle with eggs; 3, newly hatched fundatrix; 4, young fundatrix, a few days old; 5, young fundatrigene; 6, adult apterous virgogene; 7, alate virgogene.

Lachnus vandykei Wilson. 8, apterous virgogene; 9, alate virgogene; 10,

apterous oviparous female; 11, apterous male.

Plate V.

Lachnus oregonensis Wilson. 1, antenna of apterous virgogene; 2, antenna of alate virgogene; 3, terminal joints of beak; 4, middle of hind tibia of apterous virgogene; 5, middle of hind tibia of alate virgogene; 6, cornicle; 7, antenna of apterous male.

Lachnus edulis Wilson. 8, antenna of apterous virgogene; 9, terminal joints of beak; 10, antenna of alate virgogene; 11, middle of hind tibia of apterous virgogene( same as alate); 12 cornicle; 13, antenna of alate male; 14,antenna of oviparous female;15, hind tibia of the same.

Lachnus vandykei Wilson. 16, antenna of alate virgogene; 17, middle of hind tibia of the same; 18,antenna of apterous virgogene; 19, terminal joints of beak; 20, hind tibia of oviparous female; 21, antenna of apterous male.

Lachnus schwarzii Wilson. 22, terminal joints of beak; 23, middle of hind tibia of apterous virgogene; 24, antenna of apterous virgogene; 25,cornicle; 26, antenna of alate virgogene; 27, antenna of alate male; 28, hind tibia of apterous oviparous female.

Plate VI.

Lachnus schwarzii Wilson. 1, portion of needle of Pinus scopulorum with eggs; 2, newly hatched fundatrix; 3, young fundatrix, a few days old; 4, same a few days older; 5, adult fundatrix; 6, young virgogene,newly born; 7, young virgogene, 3rd instar; 8, young alate virgogene, just before development of wing pads; 9, same showing wing pads; 9, same showing wing pads; 10, alate virgogene; 11, adult apterous virgogene; 12, alate male.

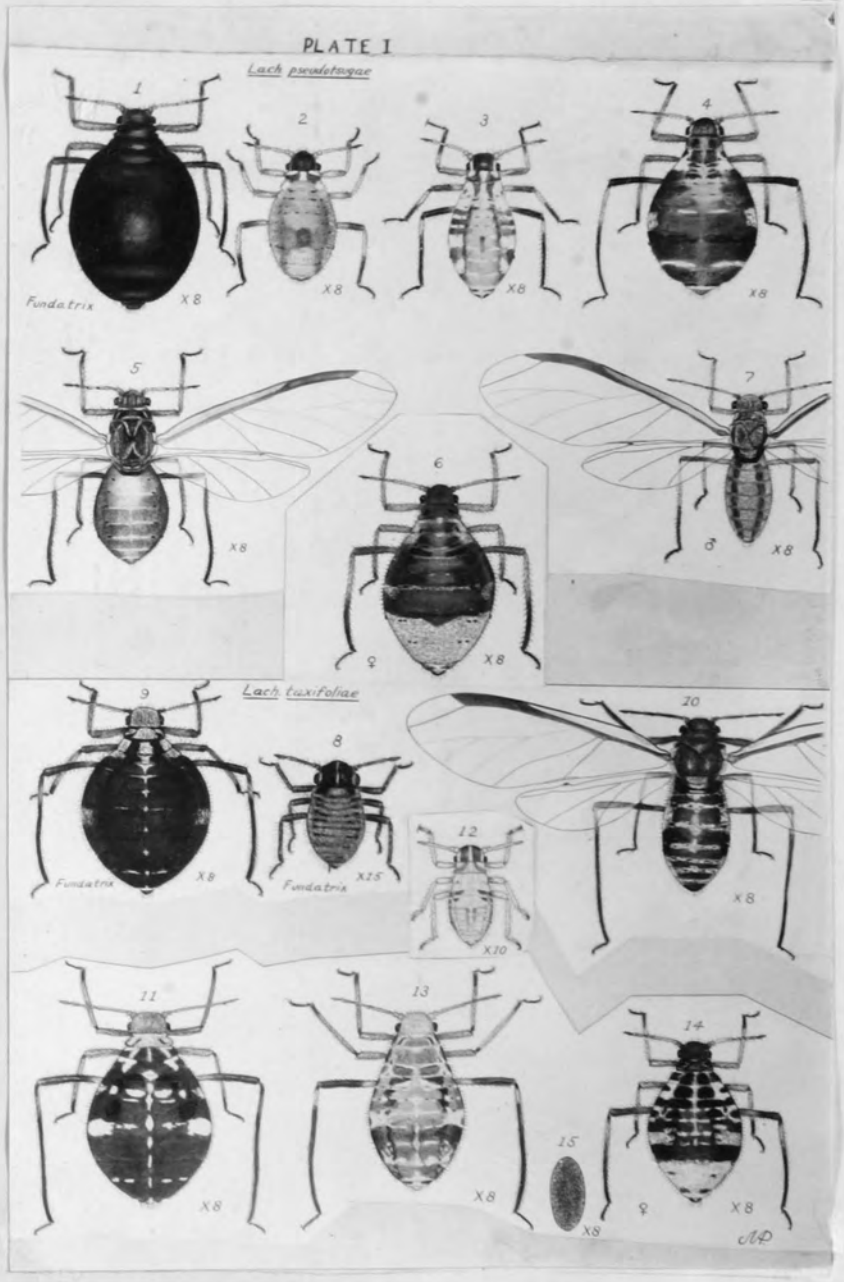
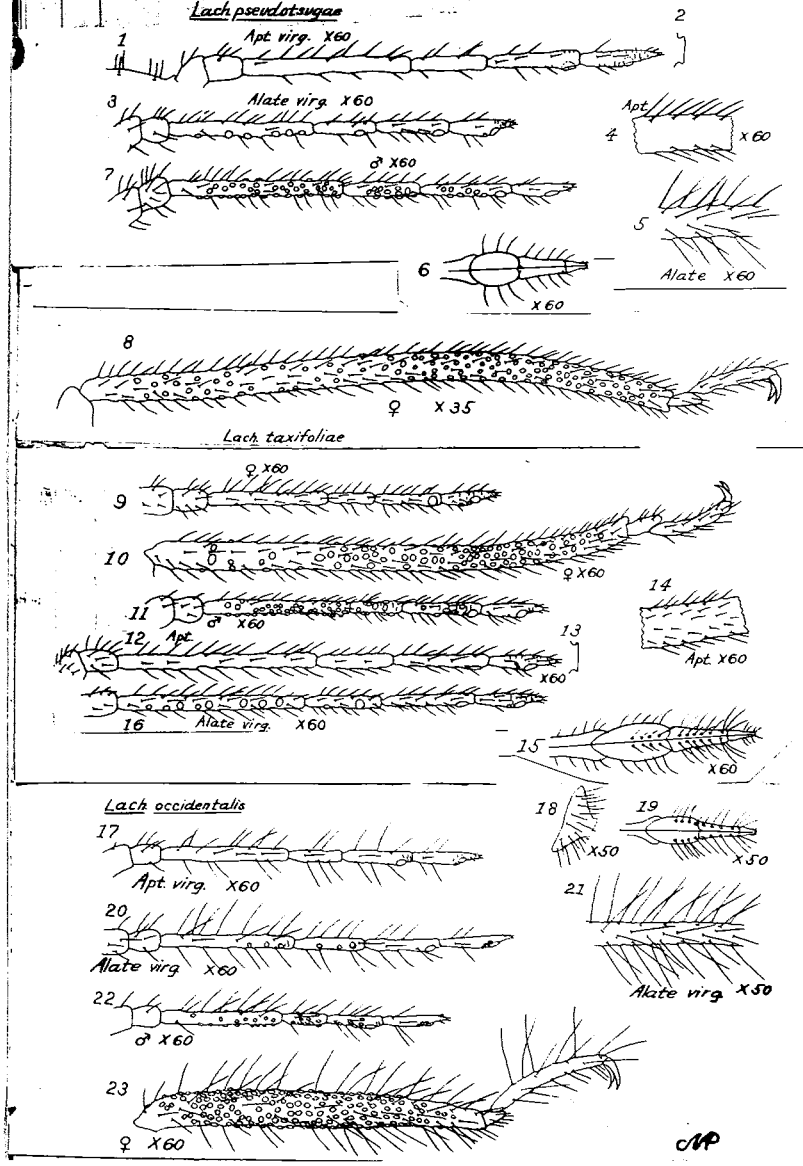


PLATE I
Lach. pseudotsugae
1
Fundatrix
X8
2
X8
3
X8
4
X8
5
X8
6
♀
X8
7
♂
X8
Lach. tuxifoliae
9
Fundatrix
X8
8
Fundatrix
X15
12
X10
10
X8
11
X8
13
X8
15
X8
14
♀
X8
MP

# PLATE II


Lach. pseudotsugae
1
Apt. virg. X60
2
3
Alate virg. X60
Apt.
4
X60
♂ X60
7
5
Alate X60
6
X60
8
♀ X35
Lach. taxifoliae
♀ X60
9
10
♀ X60
11
♂ X60
14
12
Apt.
13
X60
Apt. X60
16
Alate virg. X60
15
X60
Lach occidentalis
18
X50
19
X50
17
Apt. virg. X60
21
20
Alate virg. X60
Alate virg. X50
22
♂ X60
23
♀ X60

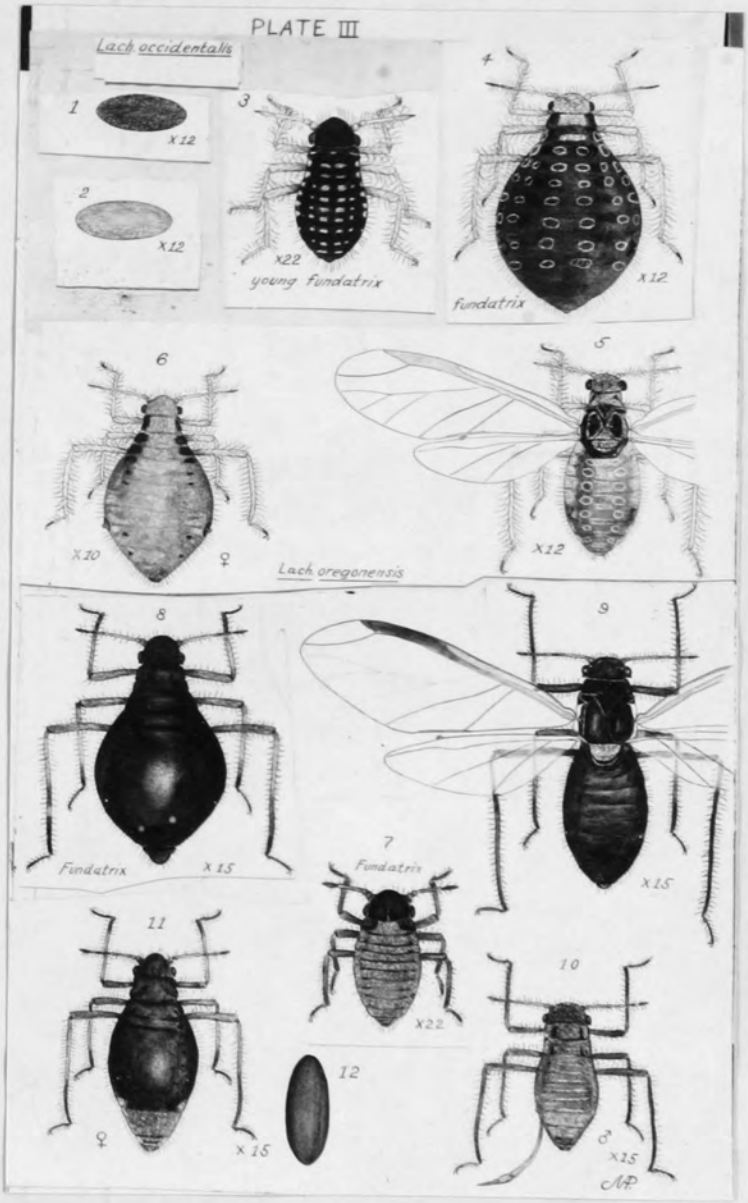


PLATE III
Lach occidentalis
1
x12
2
x12
3
x22
young fundatrix
4
fundatrix
x12
5
x12
6
x10
♀
Lach oregonensis
8
Fundatrix
x15
9
x15
7
Fundatrix
x22
11
♀
x15
12
10
♂
x15
MP

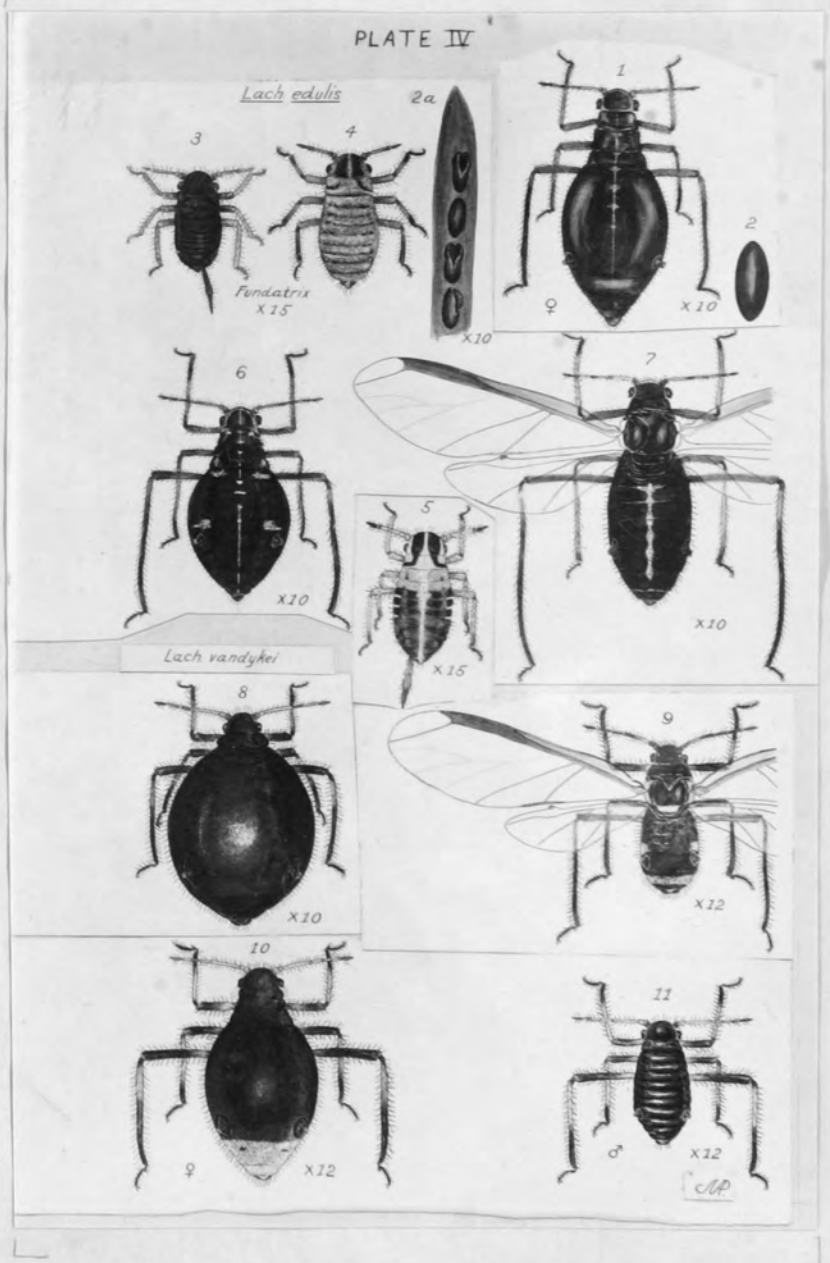
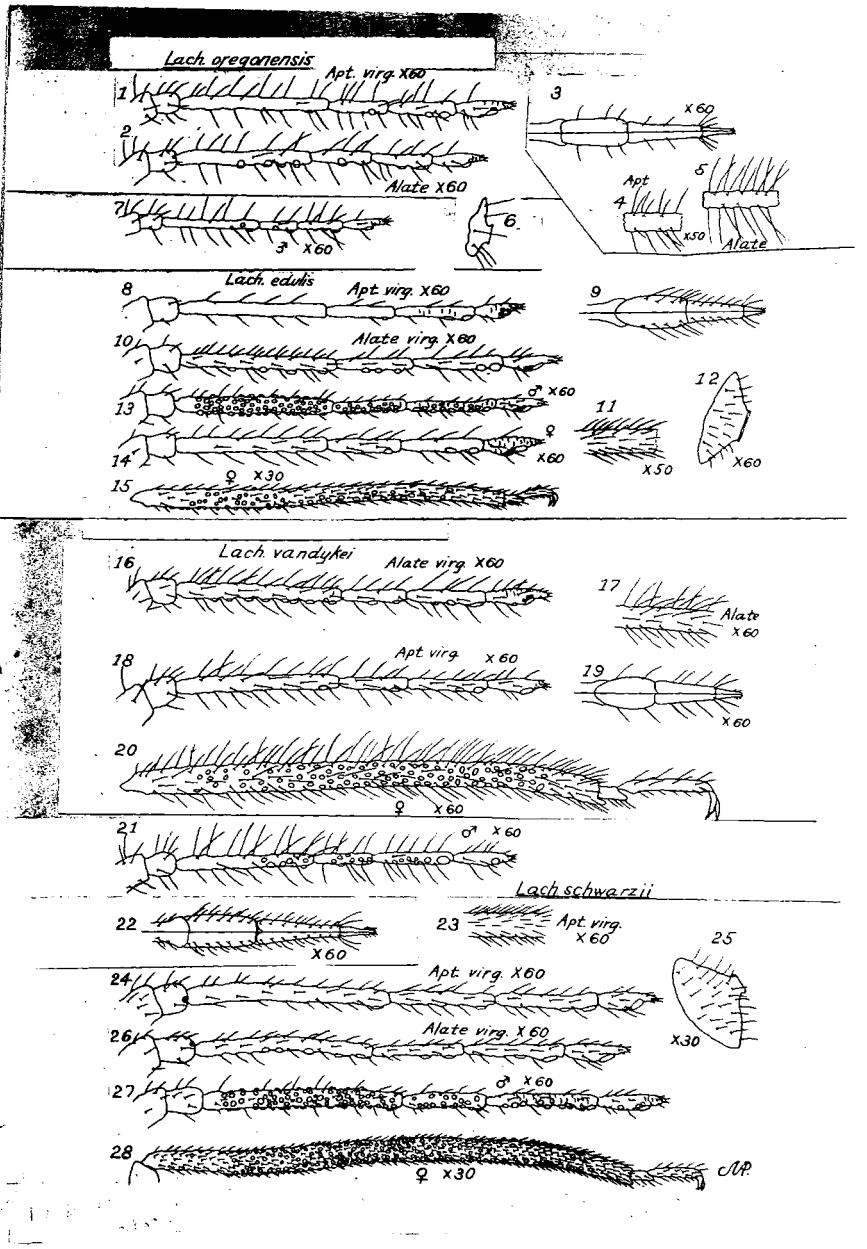


PLATE IV
Lach edulis
2a
1
3
4
2
Fundatrix
X15
X10
♀
X10
6
7
X10
X10
5
X15
Lach vandykei
8
9
X10
X12
10
11
♀
X12
♂
X12
AP


Lach. oregonensis
Apt. virg. X60
1
2
Alate X60
3
X60
Apt
4
5
X50
Alate
7
3 X60
6
Lach. edulis
Apt. virg. X60
8
9
Alate virg. X60
10
♂ X60
13
♀
14
X60
♀ X30
15
12
11
X50
X60
Lach. vandykei
Alate virg. X60
16
17
Alate
X60
Apt virg. X60
18
19
X60
20
♀ X60
21
♂ X60
Lach schwarzii
22
X60
23
Apt. virg.
X60
25
Apt. virg. X60
24
Alate virg. X60
26
X30
♂ X60
27
28
♀ X30
MP.

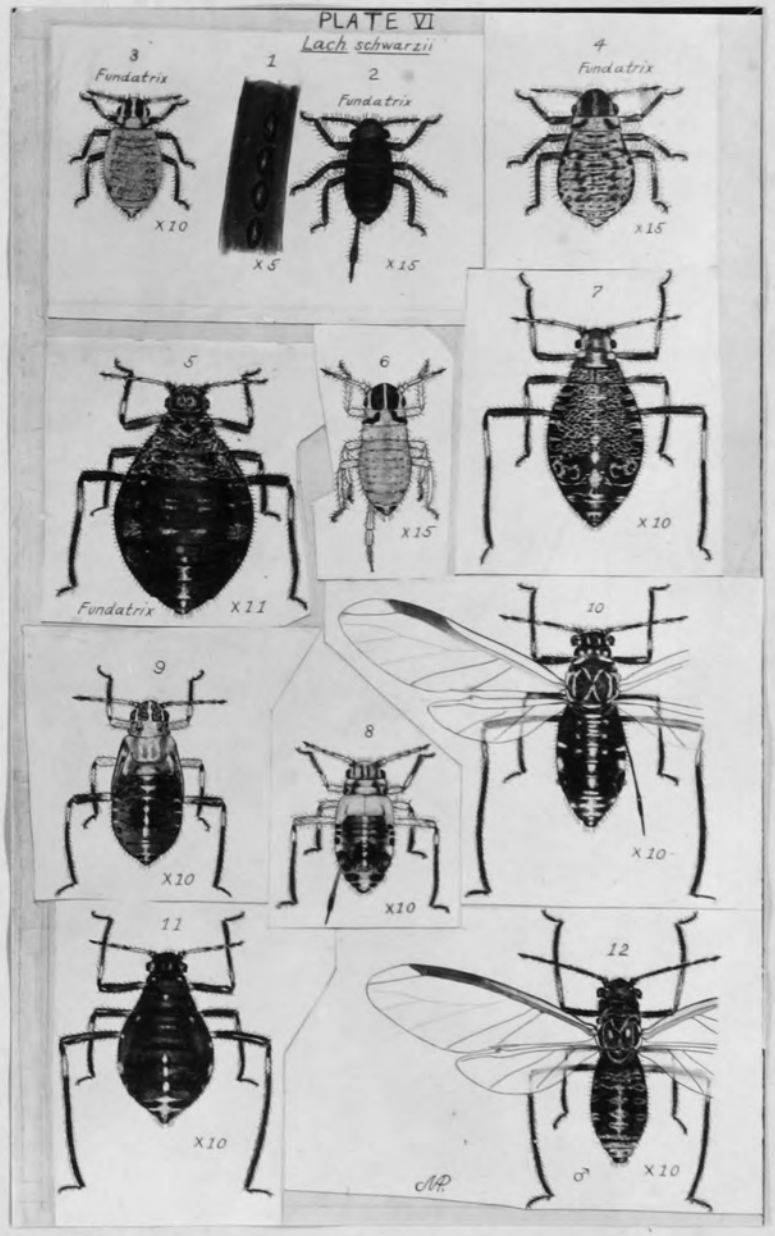


PLATE VI
Lach schwarzii
3
Fundatrix
X10
1
X5
2
Fundatrix
X15
4
Fundatrix
X15
5
Fundatrix
X11
6
X15
7
X10
9
X10
8
X10
10
X10
11
X10
12
♂
X10
MP