

Coccinellidæ and appear to be similar to those of *Chilocorus similis* Rossi (Marlatt, 1906). Fiske (1903) states that they are brown in color.

Literature Referred To

1859. **Glover, Townend.** Report Commissioner of Patents for the year 1858. (Executive Document No. 105, House of Representatives, 2d session 35th U. S. Congress), Washington, p. 261. "The eggs of this lady-bug being deposited by the female on the leaves or trunks of trees infested, hatch in from three to six days."
1897. **Smith, John Bernhard.** Report of the Entomologist (for 1896), in 17th Annual Report, New Jersey Agric. Experiment Station, for year ending Oct. 31, 1896, p. 522. "The eggs are bright yellow in color, and quite large in proportion to the size of the beetle. They are elongate-oval in shape, set on end in little groups, something like those of the Potato Beetle, and in a general way resembling the eggs of other lady-birds, which are not uncommonly found on leaves infested by plant lice."
1902. **Marlatt, Charles Lester.** Proceedings of the 14th Annual Meeting of the Association of Economic Entomologists, Pittsburg, Pa., June 28, 1902. Bull. No. 37, N. Series, Div. Ent., United States Department of Agriculture, Washington, D. C., p. 81.
1903. **Fiske, William F.** Proceedings of the 15th Annual Meeting of the Association of Economic Entomologists, Washington, D. C., Dec. 26, 1902. Bull. No. 40, N. series, Div. Ent., United States Department of Agriculture, Washington, D. C., p. 31.
1906. **Dimmock, George W.** Algunas Coccinellidæ de Cuba. Primer Informe Anual de la Estación Central Agronómica de Cuba, Habana, pp. 291-292. Mentions the observations of Glover (1859), Smith (1897), and Fiske (1903).
1906. **Marlatt, Charles Lester.** The San José or Chinese Scale. Bull. No. 62, Bureau Ent., United States Department of Agriculture, Washington, D. C., fig. 11, d-g.

NOTES AND DESCRIPTIONS OF SOME ORCHARD PLANT LICE OF THE FAMILY APHIDIDAE¹

By C. P. GILLETTE

The Aphididæ have been the most destructive family of insects attacking Colorado orchards for several years past. Consequently they have been objects of special study by the writer and his assistants for the last two or three years. I am giving here some of the more technical information, especially descriptions, that would be of little interest to the fruit grower.

¹This paper is supplemental to Bull. 133 of the Colorado Agricultural Experiment Station, which deals more specially with the life habits and the means of control of orchard plant lice.

I am specially indebted to Mr. L. C. Bragg and Mr. E. P. Taylor for many of the life-history and food-plant records, and Miss M. A. Palmer has made all the drawings for the illustrations.

APHIDS INFESTING APPLE AND PEAR TREES

The Green Apple Aphis, *Aphis pomi*, DeGeer; Plate 5, figs. 1-8.

Some of the More Important Literature

Aphis pomi, n. sp. DeGeer, Memoires, III, 1773.

Aphis pyri mali, Fab. Systema Entomologica, 1775.

Aphis mali, Kaltenbach, Mon. der Fam. Pflanzenlouse, p. 72, 1843.

Aphis mali, Koch, Die Pflanzenlouse, p. 107, 1857.

Aphis mali, Buckton, Mon. British Aphides, II, p. 44, 1879.

Aphis mali, J. B. Smith, Bull. 143, N. J. Exp. Sta., 1900.

Aphis padi, Sanderson, 12th Rep. Del. Exp. Sta., p. 191, 1901.

Aphis pomi, Sanderson, 13th Rep. Del. Exp. Sta., p. 130, 1902.

Aphis mali, Quaintance, Circular 81, Bureau of Ent., 1907.

Eggs—The eggs vary little from .60 mm. in length by .26 mm. in transverse diameter. When first deposited, they are light green in color, but in the course of a few days change to deep polished black. They are scattered promiscuously over the smooth bark of the twigs. Upon hatching the shell splits longitudinally at one end, as shown on Plate 6, Fig. 20. Hatching begins several days before the apple buds open at all, or with the opening of the earliest apricot blossoms in the same neighborhood.

Young Stem-mother—Plate 5, fig. 1.

The young stem-mothers, before the first molt, are very dark green in general color; antennæ and legs dusky yellowish green; cornicles very short and black; antennæ stout, 5-jointed,¹ and with sensoria at the distal ends of joints 3 and 4. Length of body, in specimens described, .60 mm.; length of antennæ .28 mm. From eggs taken at Paonia, Colorado, on apple, March 2, 1907.

Adult Stem-mother—Plate 5, fig. 2; and plate 6, fig. 1.

From the same source as the preceding and hatched and reared in the insectary, probably a little under size.

Color a bright green with a little tinge of yellow, head more or less conspicuously dusky brown; cornicles, cauda, eyes, base and tip of beak, tarsi, distal portions of tibiæ, and antennæ, the knees and genital plates, black or blackish; remaining portions of legs and antennæ a little dusky. The lateral thoracic tubercles are present, and similar ones occur on part or all the abdominal segments to the 7th; cornicles nearly straight and gradually tapering to their distal ends. The antennæ are short and 6-jointed, as is usually true with stem-mothers in this genus. The third joint is very much the longest (Plate 6, fig. 1) and is really the union of joints 3 and 4. Sometimes the suture is present, cutting this joint into two. Length of body varying little from 1.50 mm.; width, .80 to .90 mm.; antenna, .75 mm.; antenna joints: three, .26 mm.; four, .13 mm.; five, .11 mm.; six, .14 mm.; cornicles, .25 mm.

Young of Stem-mothers—Plate 5, fig. 4.

¹For convenience I shall refer to the flagellum of the last joint of the antenna as a separate joint.

The young lice of the second generation, before their first molt, are a very pale yellowish green with light to dark red eyes and with legs and antennæ pale dusky. Antennæ with third joint longest, nearly equaling joints four and five together, whole number of joints five, sensoria at distal ends of joints three and four. The head is large and broad, the thoracic tubercles are well developed and about five similar tubercles occur along either lateral margin of the abdomen; the cornicles are very stout, being about as broad as long and about parallel sided. Length of body, .60 to .65 mm.; antenna .35 to .40 mm.

Adult Apterous Viviparous Female—Plate 5, fig. 3; and Plate 6, fig. 2.

Described from same lot as preceding young.

General color light green or yellowish green with head, or head and thorax, distinctly yellowish, the head in some specimens somewhat dusky; cornicles, eyes, tarsi, genital plates, cauda, knees, distal ends of tibiæ and more or less of the distal ends of joints four, five and six of the antennæ dusky brown to deep black. Thoracic tubercles distinct, about four to six similar but smaller lateral abdominal tubercles upon either side; cornicles straight and slightly tapering to the outer ends, where there is a moderate flange; cauda upturned, tail-like; vertex gently rounded, antennal tubercles very slight; body pyriform in general shape. Length varying from 1.60 to 2 mm.; length of antenna, 1.20 mm., joint seven usually a little the longest, joints four and five sub-equal (Plate 6, fig. 2); length of cornicles somewhat variable but differing little from .40 mm.; cauda, .19 mm. The orange color at base of cornicles as described by Sanderson in Thirteenth Annual Report, Del. Experiment Station, 1901, I have never seen at any time of the year in this species.

Pupa of Viviparous Female—Plate 5, fig. 6.

In third generation, bred from stem-mothers described above.

Color of abdomen green, more or less tinged with yellow; thorax, above and below, yellowish brown, to pale carneous, the color being deepest on prothorax and middle portion of mesothorax; head of same color with more or less dusky brown that is separated into two lateral patches more or less distinctly by a median lighter line; distal ends of antennæ, eyes, cornicles, wing pads, tarsi, distal ends of tibiæ, most of the femora, and beak, and genital plates black or blackish; cauda green, more or less infuscated about the margins; thoracic and abdominal tubercles as in Apterous Viviparous female. Length of body about 1.80 to 2 mm.; antenna, 1 to 1.10 mm.; cornicles, .32 mm.

Winged Viviparous Female—Plate 5, fig. 6; and Plate 6, fig. 3.

Third generation as in case of pupa described above.

Color of abdomen deep green, without black markings above,¹ head, thorax above and below, cornicles, cauda, genital plates, tarsi and distal ends of tibiæ and femora, black or blackish; costal vein and stigma dusky; venation normal; eyes a very dark red, usually appearing black; lateral tubercles present on prothorax and most of the abdominal segments; middle ocellus upon vertex rather prominent, antennæ upon slight tubercles, third joint with about 6 to 9 rather large flat circular sensoria in a single row, cornicles very gradually tapering to the distal ends, where there is a moderate flange. Length of body, 1.50 to 1.60 mm.; antenna, 1.15 to 1.25 mm. Joints of antenna about

¹In some of the specimens there are, upon either lateral margin of the abdomen, three or four darker green or dusky spots, but not the good black spots that occur in many species.

as follows: Three, .25 mm.; four, .20 mm.; five, .19 mm.; six, .12 mm.; seven, .30 mm. (Plate 6, fig. 3). The antennæ and cornicles of seven alate females from Mr. J. T. Monell taken at St. Louis, Missouri, June 10, 1908, measured as follows in hundredths of millimeters:

Joint 3.	Joint 4.	Joint 5.	Joint 6.	Joint 7.	Cornicle.
26	20	20	12	33	31
29	19	20	11	33	31
29	20	20	11	31	29
27	19	19	11	29	29
26	20	19	11	31	26
27	20	20	11	34	29
31	20	20	12	33	29

The antennæ and cornicles of nine alate females taken at Fort Collins, Colorado, July 10 to August 14, 1908, measured as follows:

Joint 3.	Joint 4.	Joint 5.	Joint 6.	Joint 7.	Cornicle.
27	20	20	12	29	30
26	20	20	11	30	29
34	23	21	11	34	30
28	20	20	11	29	30
29	20	20	11	34	29
27	21	20	12	31	29
29	20	20	11	31	29
31	21	21	12	34	30
29	21	20	11	31	29

Oviparous Female—Plate 5, fig. 8; and Plate 6, figs. 5, 6.

Wingless, variable, but usually dull green in general color with a tinge of rusty yellow; head dusky brown, quite dark in some individuals; eyes, distal half of antennæ, cornicles, cauda, knees, distal ends of tibiæ, tarsi and genital plates black or blackish; thoracic tubercles prominent and a row of smaller ones along either lateral margin of the abdomen; cornicles straight and tapering gradually towards distal ends, where there is a slight flange. Length of body varying little from 1.40 mm.; antenna, .85 mm.; seventh joint fully one-third longer than joint three (Plate 6, fig. 5). Sensoria at the distal ends of joints five and six only. About 10 oval sensoria on hind tibiæ (Plate 6, fig. 6).

Apterous Male—Plate 5, fig. 7; and Plate 6, fig. 4.

General color brownish yellow with dusky brown head. Eyes, cornicles, cauda, genital plates, tarsi, distal ends of tibiæ, and more or less of distal ends of antennæ black or blackish; older individuals darker than the younger; length of body, 1.10 mm.; antenna, .90 mm.; cornicles, .15 mm., cylindrical,

moderate flange at distal end. Antenna joints: Three, .19 mm.; four, .17 mm.; five, .14 mm.; six, .09 mm.; seven, .23 mm. long. The sensoria are difficult to see and appear to be variable in number. Near distal end of joint three I have usually found 2 and upon joints four and five about 7 or 8 each (Plate 6, fig. 4). Described from specimens taken September 15, 1907, at Fort Collins.

The Woolly Apple Aphis, *Schizoneura lanigera* Hausm., Plate 5, figs. 9, 10, 11.

Some of the More Important Literature

- Aphis lanigera* Hausm., Illigers Mag. I, p. 229, 1802.
Schizoneura lanigera Hartig, Germar's Zeit. Ent. III, p. 367, 1841.
Pemphigus pyri Fitch, 1st Rep. Ins. N. Y., p. 5, 1856.
Aphis lanigera Harris, Ins. Inj. to Veg., p. 242, 1862.
Eriosoma lanigera Verrill, Pract. Ent. I, p. 21, 1865.
Eriosoma pyri Riley, Ins. Mo. I, p. 118, 1869.
Schizoneura lanigera Lowe, Ann. Rep. N. Y. Exp. Sta., for 1896, p. 570.
Schizoneura lanigera Marlatt, Circ. 20, Second Ser., Div. of Ent., 1897.
Schizoneura lanigera Garman, Bull. 80, Ky. Exp. Sta., p. 208, 1899.
Schizoneura lanigera Alwood, Spec. Bull. (C. P. C. 45), Va. E. S., 1904.
Schizoneura lanigera Smith, R. I., Bull. 23, Ga. State Board of Ent., 1907.

In the warmer fruit growing sections of Colorado this louse lives over winter regularly upon the trunks and limbs as well as on the roots of the trees. Upon the roots it lives in all stages of growth, but upon the top all the lice die except the last brood born in the fall. These leave the places of their birth before molting, and apparently without feeding or growing, to hunt a hiding place that will give them protection for the winter. The hiding places are beneath the dead bodies of the partly or fully grown lice (which all die from the cold), beneath scales of the bark, or about the crown of the tree between the bark and loose dirt. These over-winter lice do not secrete any cottony covering until they begin to feed and grow the following spring. In this respect the woolly aphis has a habit similar to *Chermes coweni*, the last brood of which (var. *coweni*) rest upon the leaves of the red spruce, or (*cooleyi*) on the bark of the blue spruce, without growing or secreting a covering of wax threads from the late summer until they are warmed into activity the following spring. Plate 5, fig. 11, was drawn from one of these over winter young after it had begun to grow in the spring, so it is a little too light in color and a trifle broad across the abdomen for the typical over-winter condition.

We have had no trouble to get the alate females to deposit the true sexual forms in confinement. We have been utterly unable to keep these alate females upon the apple trees to deposit their young. They seem possessed of a controlling instinct to get away from the tree,

so that the sexual forms have always been deposited upon the walls of the breeding cages.¹

NATURAL ENEMIES

The most active natural enemies of the woolly aphis in Colorado have been predaceous insects. We have reared no parasite from it, but, Aug. 21, 1908, Mr. L. C. Bragg brought into my office a female *Aphelinus mali*² busily ovipositing in apterous females of this louse. Among the Coccinellids, *Hippodamia convergens* is by far the most abundant destroyer of this louse both upon the eastern and western slopes of the mountains. Mr. E. P. Taylor also took *H. sinuata*, *Coccinella 9-notata*, *C. monticola* and *C. transversalis* feeding on this louse in the orchards about Grand Junction, and we have noted *H. transversalis*, *C. 9-notata*, *C. monticola*, *C. frigida*, and *C. 5-notata* (*transversalis* and *transversoguttata*) feeding upon it in eastern Colorado.

Mr. Taylor also reared two syrphus flies at Grand Junction on this louse, namely, *Catabomba pyrastris* Linn. and *Eupeodes volucris* O. S.

Lace-wing flies (Plate 5, figs. 15 and 16) are also very destructive to *Schizoneura lanigera* in Colorado, and especially upon the western slope in the Grand Valley, where Mr. Taylor concluded that they did more than all else to subdue the unusually severe outbreak of this louse in that valley during the early summer of 1907. The Capsid, *Camptobrochus nebulosus* Uhl, we have found a common feeder upon this and some other plant lice in Colorado.

Alate Female—Plate 5, fig. 10.

General color nearly black to naked eye, but the abdomen is really a dark yellowish or rusty brown. Leg, eyes and antennæ are black or blackish, proximal ends of femora and tibiæ may be yellowish, nerves of wings black, the subcostal being very heavy, and the stigma dusky brown to the naked eye, but really a dark green. Third cubital vein sub-obsolete half way to the fork. Cauda and cornicles nearly obsolete.

The yellowish brown color of the abdomen is due mainly to the female embryos showing through, the two sexes being present in about equal numbers, usually four or five of each, but the numbers may vary from three to six. Sixteen winged females dissected gave a total of 66 females and 48 males. Joints three to six of the antennæ are strongly annulate, as shown in Plate 6.

¹ Since writing the above, I have succeeded in obtaining numerous examples of light orange yellow sexual females and the smaller dusky brown males, and a few yellow eggs upon leaves and bark of twigs that had been inclosed six weeks before in small cheese cloth sacks in the orchard. The first egg was obtained Sept. 18, at Ft. Collins, Colorado.

² Determined for me by Dr. L. O. Howard.

fig. 19. Length of body, 2.20 mm.; wing, 2.80 mm.; antenna, .80 mm.; joints: three, .40 mm.; four, .12 mm.; five, .13 mm.; six, .07 mm.; joint three with about 21 annulations; four with 3 or 4; five with about 5, and six with 1 or 2, or none.

The sexual females are brown ochre in color; the males are dark green, or a greenish brown; both sexes without beaks.

Over Winter Young—Plate 5, fig. 11.

The following description is from specimens brought from Delta, Colorado, where they were taken March 28, 1908:

General color a dingy yellowish brown, the head and prothorax being darker, and in some specimens almost black, the head being the darkest part. The antennæ, legs and the distal end of the beak are dusky brown. Length of body, .65 mm. to .75 mm.; the width, .35 mm.; length of body to the end of the beak, which projects caudad some distance beyond the abdomen, is .77 mm.; antenna five-jointed and .27 in length, rather stout and set with a few stout hairs. There are very few hairs over the body. There is some variation in the general color, some specimens being considerable darker than others. As soon as these little lice begin to feed, the color of the abdomen becomes much lighter. A pair of hairs arising at the bases of the tarsal claws of each foot are slightly knobbed at the distal ends.

The European Grain Aphis, *Aphis*¹ *avenae* Fab., the Clover Aphis, *A. bakeri* Cowen, the Rosy Apple Aphis, *A. pyri* Boyer, and the Sweet Clover Aphis, *A. medicaginis* Koch, all occur to some extent in Colorado apple orchards. A discussion of these species is deferred for a later number of the JOURNAL.

APHIDS INFESTING THE PEACH

The Black Peach Aphis, *Aphis persicae-niger* Smith; Plate 5, figs. 12, 13, 14.

Some of the More Important Literature

Aphis persicae-niger n. sp. Smith, E. F., Ent. Amer. 1890, pp. 101, 201.

Aphis persicae-niger Smith, J. B., N. J. Exp. Sta., Bull. 72, 1890.

Aphis persicae-niger Johnson, Md. Exp. Sta., Bull. 55, 1898.

Aphis persicae-niger Froggart, Miscel. Pub. No. 760, Agrl. Gaz. N. S. W., 1904.

This louse occurs in a few orchards only in Fremont, Delta and Mesa counties. Early in the spring it attacks the tender bark of small limbs and sprouts and often becomes quite numerous before any of the buds open. We have searched in vain for males, sexual females or eggs of this louse.

¹This louse seems to me to fall readily into the genus *Aphis*. It does not have the very long clavate cornicles characteristic of Passerini's genus *Siphocoryne*. According to Schouten and Kirkaldy *Siphocoryne* becomes a synonym of *Hyadaphis*, Kirkaldy. See Mem., Soc. Entom., Belgium, XII, p. 229.

Adult Apterous Females—Plate 5, fig. 12.

When fully mature these females appear deep shining black, but under a hand lens the margins of the abdomen, the thorax and the basal portions of the antennæ are more or less yellowish or amber brown in color. The legs are dusky yellow with distal ends of tibiæ and tarsi black; cornicles black; cauda dusky brown to blackish, hardly distinguishable; cornicles straight, enlarged slightly towards the base, and with distinct flange at tip. The general shape of the body is very broad for the length, especially in the older individuals. These females are not black until after the final molt. During the nymph stages they vary from very pale to rather dark yellowish brown.

Newly Born, Viviparous Females—Plate 5, fig. 13.

When first born the young lice are very pale, almost a lemon-yellow in color, becoming darker as they grow; eyes dark red; antennæ, cornicles and feet a little dusky. When ready to molt they measure about .70 mm. Cornicles short, stout and with a wide flange; beak extending to a point half way between hind coxæ and tip of abdomen. Length of antenna, .35 to .50 mm.; joints one and two, short, cylindrical, joint one being much the thicker, joint three about as long as one and two together; joint four short, but little longer than two, and with a sensorium at distal end; joint five a trifle longer than four, stout, and with a cluster of sensoria at the distal end; joint six is long spindle-shaped and is about equal to three and four together; division between three and four sometimes wanting.

After first molt the lice become darker, a good salmon color, and measure from 1 to 1.40 mm. in length; antennæ 7-jointed and about two-thirds the length of the body, distal half blackish, cornicles equaling tarsi in length, broad at base and with wide flange.

Winged Viviparous Female—Plate 5, fig. 14; and Plate 6, fig. 7.

General color of body deep shining black; bases of femora, tibiæ, cauda and usually the eighth abdominal segment in front of it, yellowish. No lateral tubercles upon prothorax or abdomen, middle ocellus rather prominent, antennæ upon slight tubercles. Length of body about 1.75 mm.; antenna, 1.80 mm.; cornicles, .23 mm.; the cornicles are a little stouter at base and have a moderate flange; length of wing, 3 mm.; stigma yellowish; venation normal; joints of antenna about as follows: three, .46 mm.; four, .31 mm.; five, .21 mm.; six, .11 mm.; seven, .55 mm.; cauda very small, hardly longer than broad at base; joints three and four of antenna strongly tuberculate with many sensoria, and joint 5 with 2 to 6 similar sensoria (Plate 6, fig. 7).

(Continued in next number.)

EXPLANATIONS OF PLATES

PLATE 5: Figs. 1 to 8, *Aphis pomi*; 1, stem-mother, first instar; 2, adult stem-mother; 3, apterous viviparous female of the second generation; 4, young, first instar, second generation; 5, winged viviparous female of second generation; 6, pupa of third generation; 7, adult male; 8, adult oviparous female. *Schizoneura lanigera*—9 and 10, apterous and alate viviparous females; 11, the small over-winter form. *Aphis persicæ-niger*—12 and 14, adult apterous and alate viviparous females; 13, young viviparous female, first instar; 15, *Chrysopa* sp. and eggs; 16, *Chrysopa* cocoon. The enlargement in each case is marked beneath the figure. This plate is from Bull. 133, Colo. Exp. Sta., by Gillette and Taylor, M. A. Palmer, artist.

PLATE 6: Antennæ, tibiæ and cornicles of *Aphis pomi*, 1 to 6; *Aphis persicæ-niger*, 7; *Myzus cerasi*, 8; *Myzus persicæ*, 9-17; *Schizoneura lanigera*, 18-19; egg shell of *Aphis pomi*, 20. Enlarged 80 diameters in each case, except the shell, which is enlarged 20 diameters. This plate is a modification of Plate IV, Bull. 133, Colo. Exp. Sta., by Gillette and Taylor, M. A. Palmer, artist.

SAW FLY LARVAE IN APPLES

By R. L. WEBSTER, Ames, Iowa

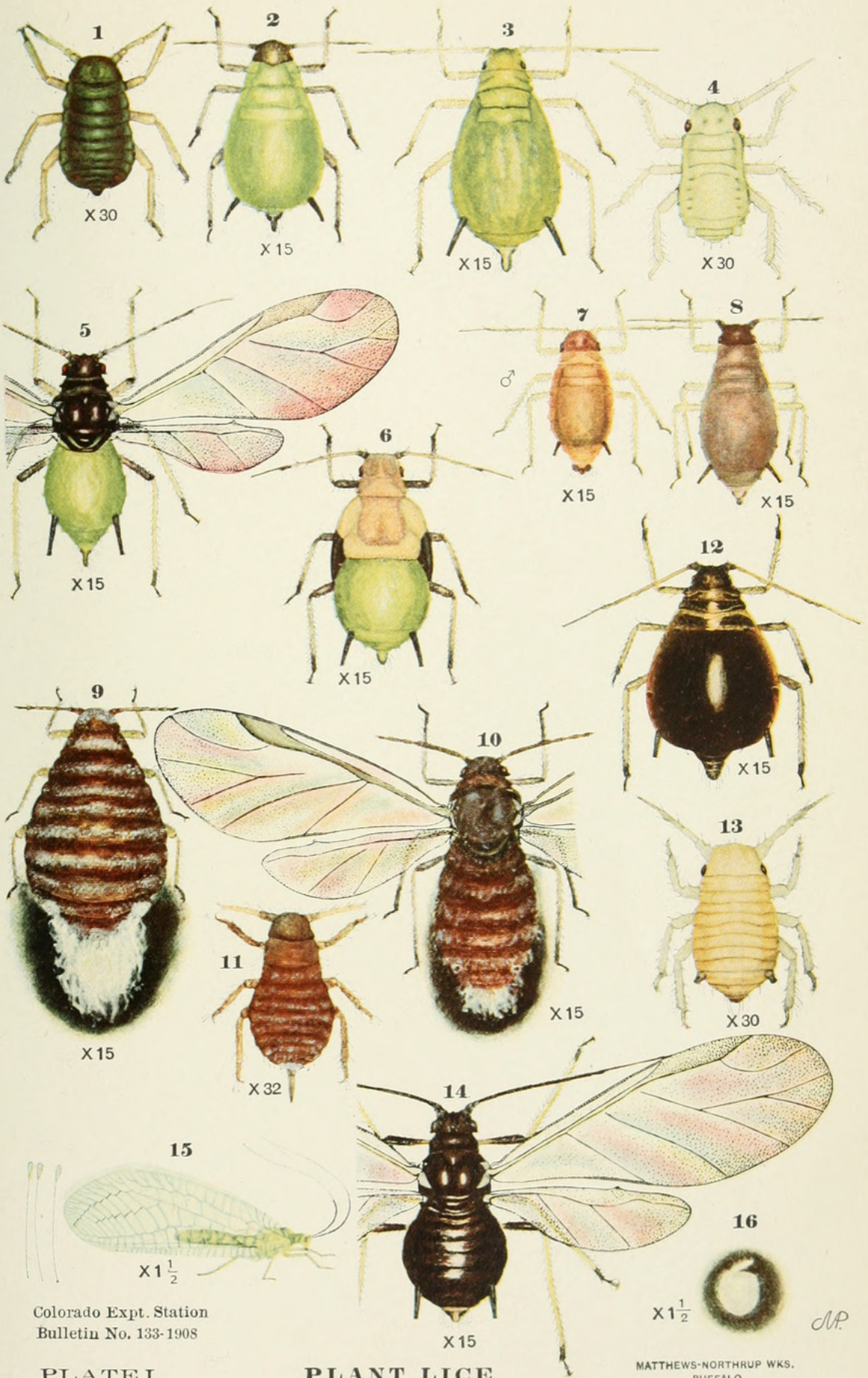
The saw fly, *Taxonius nigrisoma* Nort., sometimes called the "Dock False-worm," has been reported several times as eating into apples. Doctor Fletcher and Professor Lochhead have already noted this rather peculiar habit, so that it is by no means unknown. Three years ago I found several saw fly larvæ in Greening apples, which larvæ turned out to be the above species. The apples were shipped from New York state and were kept in the cellar at my home during the winter. The larvæ were studied in the entomological laboratory at the University of Illinois in March and April, 1905.

The burrow containing the larva extended about half the distance from the skin to the core of the apple. From the exterior the burrow was characterized by a circular, brownish, discolored patch, in the center of which was the small hole made by the larva when entering the apple. The burrow was considerably larger in diameter than the larva itself, and the larva was partially curled up within. None had pupated when they were found early in March.

On March 7th several larvæ were placed in a breeding cage in the laboratory. Small holes were made in the apples, to serve as burrows. The larvæ, however, would not remain in these holes, but pupated, without forming a cocoon, on the damp sand of the breeding cage. Larvæ pupated on the 27th and 29th of March in the laboratory, and the adults emerged the 1st and 3d of April. The average length of the pupal stage was 5.6 days.

Chittenden and Titus have already given an excellent description of the larva in Bulletin 54 of the Bureau of Entomology, so that it is unnecessary to give it here.

About the same time Prof. E. S. G. Titus, then connected with the Bureau of Entomology at Washington, reared this species in the insectary there, from an apple purchased by Mr. Couden in Washington. The adults reared from the apple in Illinois were sent to Professor Titus and were pronounced to be the same species, *Taxonius nigrisoma* Nort.

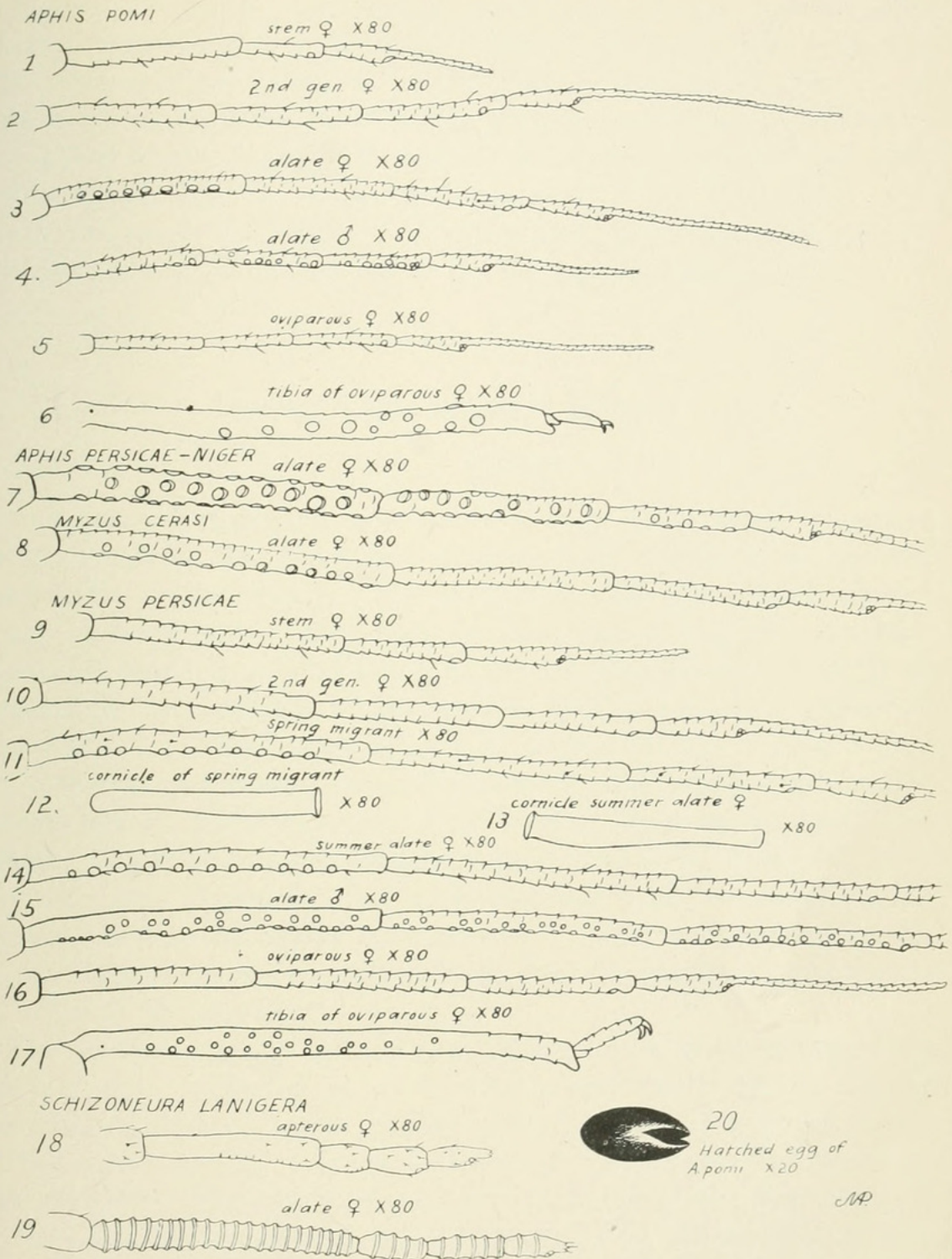


Colorado Expt. Station
Bulletin No. 133-1908

PLATE I

PLANT LICE

MATTHEWS-NORTHROP WKS.
BUFFALO





Gillette, C. P. 1908. "Notes and descriptions of some orchard plant lice of the family Aphididae." *Journal of economic entomology* 1(5), 302–310.

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