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DEPARTMENT OF THE INTERIOR—U. S. GEOLOGICAL SURVEY
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THE AMERICAN TERTIARY APHIDÆ

BY

SAMUEL HUBBARD SCUDDER

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DEPARTMENT OF THE INTERIOR—U. S. GEOLOGICAL SURVEY.

THE AMERICAN TERTIARY APHIDÆ,

WITH

A LIST OF THE KNOWN SPECIES AND TABLES FOR THEIR DETERMINATION.

BY

SAMUEL HUBBARD SCUDDER.

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THE AMERICAN TERTIARY APHIDÆ.

By Samuel H. Scudder.

INTRODUCTION.

Of all insects large enough to be readily seen with the unaided eye, plant-lice, from the delicate gauzy texture of their wings and the softness of their bodies, would seem least adaptable to preservation in the rocks. Yet that they are by no means infrequent therein will appear from the fact that from a single locality, Florissant, Colorado, I have seen no less than a hundred and seven specimens, which leave not the least doubt that they belong in this group; and they have been found at two other localities in America (Green River, Wyoming, and Quesnel, British Columbia), and in Europe they are reported from Aix and Ambérieux in France, Oeningen in Baden, and Radoboj in Croatia, as well as from the Baltic amber. From the last source eleven nominal species are recorded, but only two are of perfect-winged insects; Menge's collection of amber insects contained, in 1856, fifty-six specimens, but their preservation in this gum is not in any way so remarkable as their occurrence in rock strata. They have been found even in Mesozoic rocks, for in Brodie's work on the Insects of the secondary rocks of England two wingless creatures from the Wealden are figured (pl. 2, figs. 9,10), each of which Westwood thought "possibly an Aphis," a conclusion that is probable, since another specimen (pl. 4, fig. 3) is recorded from the Purbecks of the Vale of Wardour with the characteristic venation of the wings.

In the Tertiary deposits of Europe, including the amber, there have been found in all nineteen nominal species, of which nine are based on the winged forms, nine on the wingless, and one on a gall characteristic of Pemphigus. Except this last all the species have been referred either to Aphis or to Lachnus, both of the sub-family Aphidinæ, having two branches to the cubital vein. In America, only a single immature plant-louse has been found fossil, all the others being winged and belonging to thirty-two species, divided into fifteen genera, of which eleven fall into the Aphidinæ, the remaining four, with only five of the thirty-two species, into the Schizoneurinæ, which have but a single branch to the cubital vein. The necessity for so considerable a num-

ber of genera to express the features of their relationship is due to the extraordinary variation in the neuration of their wings, which is strikingly greater than among living forms in either of these subfamilies.

But there is another feature in the neuration which is more surprising and more interesting than this, for it is one which is characteristic of all our American Tertiary plant-lice, and in which they differ, as a whole, from our modern types. This feature is the great length and slenderness of the stigmatic cell, due to the removal of the base of the stigmatic vein to the middle (or anterior to the middle, sometimes even to the base) of the long and slender stigma, and its slight curvature. It is a fact of particular interest in this connection that in the only wing we know from the Mesozoic rocks, already alluded to, precisely this feature occurs, as illustrated in Brodie's work (see his pl. 4, fig. 3). The cubital space, too, is largely coriaceous, so that the postcostal vein may be considered as exceedingly broad and merging eventually, without the intervening lack of opacity, into the stigma proper. As a general rule, the wings are also very long and narrow and the legs exceedingly long. In all these characteristics the American fossil plant-lice appear as a rule to differ from the winged forms so far described from the European Tertiaries with the single exception of the species figured by Berendt from amber under the name of *Aphis transparens*, which shows precisely the same characters as ours as far as the length of the stigmatic cell is concerned, which is about two-fifths the length of the wing. The species is indeed an Anconatus, differing from ours principally in the nearer clustering of the oblique and cubital veins at their bases. It will be interesting to know whether the other species from the Baltic, hardly described by Menge, presents the same characteristics, which, it should be added, prevents placing our American Tertiary plant-lice in any of the existing genera.

The only other European plant-lice which have the neuration of the wings fairly preserved come from Radoboj and Oeningen, horizons of a later period than either that of the Baltic amber or probably that of our own western deposits from which plant-lice have been recovered. All these species, five or six in number, have a short stigmatic cell as in modern Aphididæ, so that the grounds for separating them from modern genera are in so far reduced, and I have made no attempt to discover their precise affinities in that direction. But a comparison with the genera founded on the forms discovered in our own rocks shows that, *were the stigmatic cell long enough* (which it is not), Heer's *Aphis pallescens* from Radoboj would fall in Sbenaphis in the vicinity of *S. lassa*, his *Lachnus pectorosus* from Radoboj in the same genus in the vicinity of *S. quesneli*, and his *Aphis morloti* from Radoboj in Siphonophoroides; possibly his *Aphis macrostyla* from Radoboj would then fall in Cataneura, but of the others the representation of the neuration is too imperfect to justify any conclusion.

In the following list of the American species, I have revised the several tables for the determination of the genera and species published when most of the species were first described, changed somewhat their order within the genera, and in one instance transferred a species to a different genus from that in which it was first placed through oversight of a part of its structure. Figures of such species as have not been illustrated before are given in the plates, to which have been added others, where the fore wing of each known species is figured upon an identical scale, reversed when necessary to represent all of them as left wings, and where necessary, with the outline of the wing and the completion of neuration filled out with conjectural dotted lines. In this way their study is rendered simpler and their diversity made more apparent.

All the drawings for the illustrations in this paper are by J. Henry Blake.

LIST OF AMERICAN FOSSIL PLANT-LICE.

All the genera and species entered in this list are described in full in my Tertiary Insects of North America (Vol. XIII of the Reports of the Hayden Survey, Vol. II of my Fossil Insects of North America), as recorded below, but references are also given to all other places where they are described or figured.

TABLE OF THE GENERA OF APHIDIDÆ.

A¹. Cubital vein twice forked ..... *Aphidinæ.*

b¹. Cubital vein arising at less than half the distance from the first oblique to the stigmatic vein.

c¹. Stigmatic vein arising midway between the first and second forks of the cubital vein or distinctly nearer the second fork.

d¹. Origin of the stigmatic vein midway between the first and second forks of the cubital vein.

e¹. Apex of first discoidal cell about three times as broad as its base. *Cataneura.*

e². Apex of first discoidal cell about six times as broad as its base. *Archilachnus.*

d². Origin of the stigmatic vein scarcely or not before that of the second fork of the cubital vein.

e¹. Base of second oblique vein several times nearer the first oblique than the cubital vein ..... *Gerancon.*

e². Base of second oblique vein midway or nearly midway between the first oblique and the cubital vein ..... *Shenaphis.*

c². The stigmatic vein arising opposite the first fork of the cubital vein or distinctly nearer it than the second.

d¹. First cubital branch nearly or quite four times as long as the basal stem of the cubital vein ..... *Aphantaphis.*

d². First cubital branch at most three times as long as the basal stem of the cubital vein.

e¹. First oblique vein parting from the main vein at an angle of less than 55° ..... *Siphonophoroides.*

e². First oblique vein parting from the main vein at an angle of more than 70° ..... *Lithaphis.*

b². Cubital vein arising at about half or more than half the distance from the first oblique vein to the stigmatic vein.

c¹. Main veins arising at nearly equal distances apart ..... *Tephraphis.*

c². Main veins arising at distinctly unequal distances apart.

d¹. Second oblique vein at base rarely so much as twice as near the first oblique as the cubital vein; at least a third of the neuration in the basal half of the wing ..... *Aphidopsis.*

d². Second oblique vein at base four or almost four times as near the first oblique as the cubital vein; the neuration almost wholly confined to the apical half of the wing.

e¹. The first oblique vein straight and considerably divergent from the second oblique vein ..... *Oryctaphis.*

e². First oblique vein curved outward and hardly divergent from the second oblique vein ..... *Sychnobrochus.*

A². Cubital vein once forked ..... *Schizoneurinæ.*

b¹. Cubital vein arising at more than half the distance from the first oblique vein to the stigmatic vein ..... *Schizoneuroides.*

b². Cubital vein arising at half or less than half the distance from the first oblique vein to the stigmatic vein.

c¹. Cubital vein forking beyond the base of the stigmatic vein .... *Amalancon.*

c². Cubital vein forking before the base of the stigmatic vein.

d¹. Base of second discoidal cell less than three times the width of that of the first ..... *Anconatus.*

d². Base of second discoidal cell more than five times the width of that of the first ..... *Pterostigma.*

Subfamily APHIDINÆ.

CATANEURA Scudder.

Tert. ins. N. A., 245.

Table of the species of Cataneura.

Second oblique vein as transverse as longitudinal; main cubital vein very distant from the stigmatic, approaching the second oblique vein..... *C. absens.*
Second oblique vein more longitudinal than transverse; main cubital vein approximating the stigmatic rather than the second oblique vein..... *C. rileyi.*

CATANEURA ABSENS.

Pl. CII, 1; Pl. CV, 1.

Cataneura absens Scudd., Tert. ins. N. A., 245.
Florissant, Colo.

CATANEURA RILEYI.

Pl. CII, 2; Pl. CV, 2.

Cataneura rileyi Scudd., Tert. ins. N. A., 245–246.
Florissant, Colo.

ARCHILACHNUS Buckton.

Monogr. Brit. Aphides, IV, 177.

Table of the species of Archilachnus.

Cubital vein very strongly arcuate, its convexity uppermost ..... *A. bucktoni.*
General course of the cubital vein nearly straight.
Large and stout species. Cubital vein bent at its first furcation, otherwise straight..... *A. pennatus.*
Small and slender species. Cubital vein gently arcuate throughout the first two-thirds of its course ..... *A. mudgei.*

ARCHILACHNUS BUCKTONI.

Pl. CII, 3; Pl. CV, 3.

Anconatus bucktoni Scudd., Tert. ins., N. A., 272–273.
The double forking of the cubital vein was overlooked when this species was first studied. It falls in the Aphidinæ under Archilachnus and not in the Schizoneurinæ.
Florissant, Colo.

ARCHILACHNUS PENNATUS.

Pl. CV, 4.

Archilachnus pennatus Buckt., Monogr. Brit. Aphides, IV, 177, Pl. 133, Fig. 3; Scudd., Tert. ins. N. A. 247, Pl. 18, Figs. 1, 15–17.
Florissant, Colo.

ARCHILACHNUS MUDGEI.

Pl. CII, 4; Pl. CV, 5.

Archilachnus mudgei Scudd., Tert. ins. N. A., 247–248.
Florissant, Colo.

GERANCON Scudder.

Tert. ins. N. A., 10, 248.

Table of the species of Gerancon.

Cubital vein running through the middle of its area, its branches straight, *G. davisii.*

Cubital vein running above the middle of its area, its branches arcuate. *G. petrorum.*

GERANCON DAVISII.

Pl. CII, 5; Pl. CV, 6.

Gerancon davisii Scudd., Tert. ins. N. A., 10, 248–249.
Florissant, Colo.

GERANCON PETRORUM.

Pl. CV, 7.

Lachnus petrorum Scudd., Rep. Progr. Geol. Surv. Can., 1875–'76, 279.
Gerancon petrorum Scudd., Tert. ins. N. A., 10, 249–250, Pl. 2, Fig. 6; Contr. Can. Pal., II, 7–8.
Quesnel, British Columbia.

SBENAPHIS Scudder.

Tert. Ins. N. A., 250.

Table of the species of Sbenaphis.

Second oblique vein arising midway, or about midway, between the first oblique and cubital veins ..... *S. quesneli.*

Second oblique vein arising much nearer the first oblique than the cubital vein.

Base of second discoidal cell twice as wide as that of the first; main cubital vein running barely nearer the stigmatic than the second oblique vein *S. uhleri.*

Base of second discoidal cell nearly thrice as wide as that of the first; main cubital vein running much closer to the stigmatic than to the second oblique vein ..... *S. lassa.*

SBENAPHIS QUESNELI.

Pl. CV, 8.

Lachnus quesneli Scudd., Rep. Progr. Geol. Surv. Can., 1876–'77, 461–462.
Sbenaphis quesneli Scudd., Tert. Ins. N. A., 250–252, Pl. 2, Figs. 4–5, Pl. 18, Fig. 12; Contr. Can. Pal., II, 8–9.
Quesnel, British Columbia; Florissant, Colo.

SBENAPHIS UHLERI.

Pl. CII, 6; Pl. CV, 9.

Sbenaphis uhleri Scudd., Tert. Ins. N. A., 252.
Florissant, Colo.

SBENAPHIS LASSA.

Pl. CIII, 1; Pl. CV, 10.

Sbenaphis lassa Scudd., Tert. Ins. N. A., 253.
Florissant, Colo.

APHANTAPHIS Scudder.

Tert. Ins. N. A., 253.

APHANTAPHIS EXSUCA.

Pl. CIII, 2; Pl. CV, 11.

Aphantaphis exsuca Scudd., Tert. Ins. N. A., 254.
Florissant, Colo.

SIPHONOPHOROIDES Buckton.

Monogr. Brit. Aphides, IV, 176.

Table of the species of Siphonophoroides.

Second discoidal cell narrow and narrowing below ..... *S. propinqua.*
Second discoidal cell broad and equally so throughout.
Stigmatic cell much broader at apex than at base ..... *S. antiqua.*
Stigmatic cell as broad at base as at apex ..... *S. rafinesquei.*

SIPHONOPHOROIDES PROPINQUA.

Pl. CIII, 4; Pl. CV, 12.

Siphonophoroides propinqua Scudd., Tert. Ins. N. A., 257.
Florissant, Colo.

SIPHONOPHOROIDES ANTIQUA.

Pl. CV, 13

Siphonophoroides antiqua Buckt., Monogr. Brit. Aphides, IV, 176, Pl. 133, Fig. 1; Scudd., Tert. Ins. N. A., 255-256, Pl. 18, Figs. 3, 5, 7, 10.
Florissant, Colo.

SIPHONOPHOROIDES RAFINESQUEI.

Pl. CIII, 3; Pl. CV, 14.

Siphonophoroides rafinesquei Scudd., Tert. Ins. N. A., 256-257.
Florissant, Colo.

LITHAPHIS Scudder.

Tert. Ins. N. A., 257-258.

LITHAPHIS DIRUTA.

Pl. CIII, 5; Pl. CVI, 1.

Lithaphis diruta Scudd., Tert. Ins. N. A., 258.
Florissant, Colo.; (Green River, Wyo.?).

TEPHRAPHIS Scudder.

Tert. Ins. N. A., 258-259.

Table of the species of Tephraphis.

First discoidal cell only half as broad again at apex as at base, the first and second oblique veins very nearly parallel ..... *T. simplex.*
First discoidal cell twice as broad at apex as at base, the first and second oblique veins distinctly divergent ..... *T. walshii.*

TEPHRAPHIS SIMPLEX.

Pl. CVI, 2.

Siphonophoroides simplex Buckt., Monogr. Brit. Aphides, IV, 176–177, Pl. 133, Fig. 2.
Tephraphis simplex Scudd., Tert. Ins. N. A., 259–260, Pl. 18, Fig. 4.
Florissant, Colo.

TEPHRAPHIS WALSHII.

Pl. CVI, 3.

Tephraphis walshii Scudd., Tert. Ins. N. A., 260, Pl. 18, Fig. 19.
Florissant, Colo.

APHIDOPSIS Scudder.

Tert. Ins. N. A., 260–261.

Table of the species of Aphidopsis.

a^1. First discoidal cell at base hardly broader than the second discoidal cell. *A. lutaria.*
a^2. First discoidal cell at base much broader than, generally twice as broad as, the second discoidal cell.
b^1. Second oblique vein not closely parallel to the cubital vein and its first branch *A. hargeri.*
b^2. Second oblique vein distinctly parallel to the cubital vein and its first branch.
c^1. Cubital vein distinctly and considerably bent at the origin of the first or of the second branch.
d^1. Fore wings less than three millimeters long; cubital vein bent at origin of second, but not of first branch..... *A. emaciata.*
d^2. Fore wings more than three millimeters long; cubital vein bent at origin of first, but not of second branch..... *A. margarum.*
c^2. Cubital vein straight or almost straight throughout.
d^1. Cubital vein gently arcuate, its curve opening above..... *A. dalli.*
d^2. Cubital vein straight or in a part of its course slightly convex above *A. subterna.*

APHIDOPSIS LUTARIA.

Pl. CIII, 6; Pl. CVI, 4.

Aphidopsis lutaria Scudd., Tert. Ins. N. A., 263.
Florissant, Colo.

APHIDOPSIS HARGERI.

Pl. CIV, 1; Pl. CVI, 5.

Aphidopsis hargeri Scudd., Tert. Ins. N. A., 262–263.
Florissant, Colo.

APHIDOPSIS EMACIATA.

Pl. CIV, 2; Pl. CVI, 6.

Aphidopsis emaciata Scudd., Tert. Ins. N. A., 265.
Florissant, Colo.

APHIDOPSIS MARGARUM.

Pl. CVI, 7.

Aphidopsis margarum Scudd., Tert. Ins. N. A., 264, Pl. 18, Fig. 8.
Florissant, Colo.

APHIDOPSIS DALLI.

Pl. CIV, 3; Pl. CVI, 8.

Aphidopsis dalli Scudd., Tert. Ins. N. A., 264–265.
Florissant, Colo.

APHIDOPSIS SUBTERNA.

Pl. CIV, 4; Pl. CVI, 9.

Aphidopsis subterna Scudd., Tert. Ins. N. A., 261–262.
Florissant, Colo.

ORYCTAPHIS Scudder.

Tert. Ins. N. A., 266.

Table of the species of Oryctaphis.

Second oblique vein strongly sinuous, arising well before the end of the basal third of the wing ..... 1. *O. recondita.*
Second oblique vein straight, arising at the end of the basal third of the wing ..... 2. *O. lesueurii.*

ORYCTAPHIS RECONDITA.

Pl. CVI. 10.

Oryctaphis recondita Scudd., Tert. Ins. N. A., 266–267, Pl. 18, Fig. 14.
Florissant, Colo.

ORYCTAPHIS LESUEURII.

Pl. CIV, 5; Pl. CVI, 11.

Oryctaphis lesueurii Scudd., Tert. Ins. N. A., 267.
Florissant, Colo.

SYCHNOBROCHUS Scudder.

Tert. Ins. N. A., 268.

SYCHNOBROCHUS REVIVISCENS.

Pl. CVI, 12.

Sychnobrochus reviviscens Scudd., Tert. Ins. N. A., 268–269, Pl. 18, Fig. 6.
Florissant, Colo.

Subfamily SCHIZONEURINÆ.

SCHIZONEUROIDES Buckton.

Monogr. Brit. Aphides, IV, 178.

SCHIZONEUROIDES SCUDDERI.

Pl. CVI, 13.

Schizoneuroides scudderi Buckt., Monogr. Brit. Aphides, IV, 178, Pl. 133, Fig. 5; Scudd., Zittel, Handb. Palaeont., I, ii. 78, Fig. 988; Tert. Ins. N. A., 269, 270, Pl. 18, Fig. 2; Lesl., Dict. Foss. Penn., III, 943, Fig.
Florissant, Colo.

AMALANCON Scudder.

Tert. Ins. N. A., 270.

AMALANCON LUTOSUS

Pl. CVI, 14.

Amalacon lutosus Scudd., Tert. Ins. N. A., 270–271, Pl. 18, Fig. 13.
Florissant, Colo.

ANCONATUS Buckton.

Monogr. Brit. Aphides, IV, 177.

ANCONATUS DORSUOSUS.

Pl. CVI, 15.

Anconatus dorsuosus Buckt., Monogr. Brit. Aphides, IV, 177–178, Pl. 133, Fig. 4; Scudd., Tert. Ins. N. A., 272, Pl. 18, Fig. 9.
Florissant, Colo.

PTEROSTIGMA Buckton.

Monogr. Brit. Aphides, IV, 178.

Table of the species of Pterostigma.

Cubital vein forking at but little distance from its origin; stigmatic cell excessively long and slender..... *P. recurvum.*
Cubital vein not forking before the middle of its course; stigmatic cell very broad and relatively short..... *P. nigrum.*

PTEROSTIGMA RECURVUM.

Pl. CVI, 16.

Pterostigma recurvum Buckt., Monogr. Brit. Aphides, IV, 178, Pl. 133, Fig. 6; Scudd., Tert. Ins. N. A., 274, Pl. 18, Fig. 18.
Florissant, Colo.

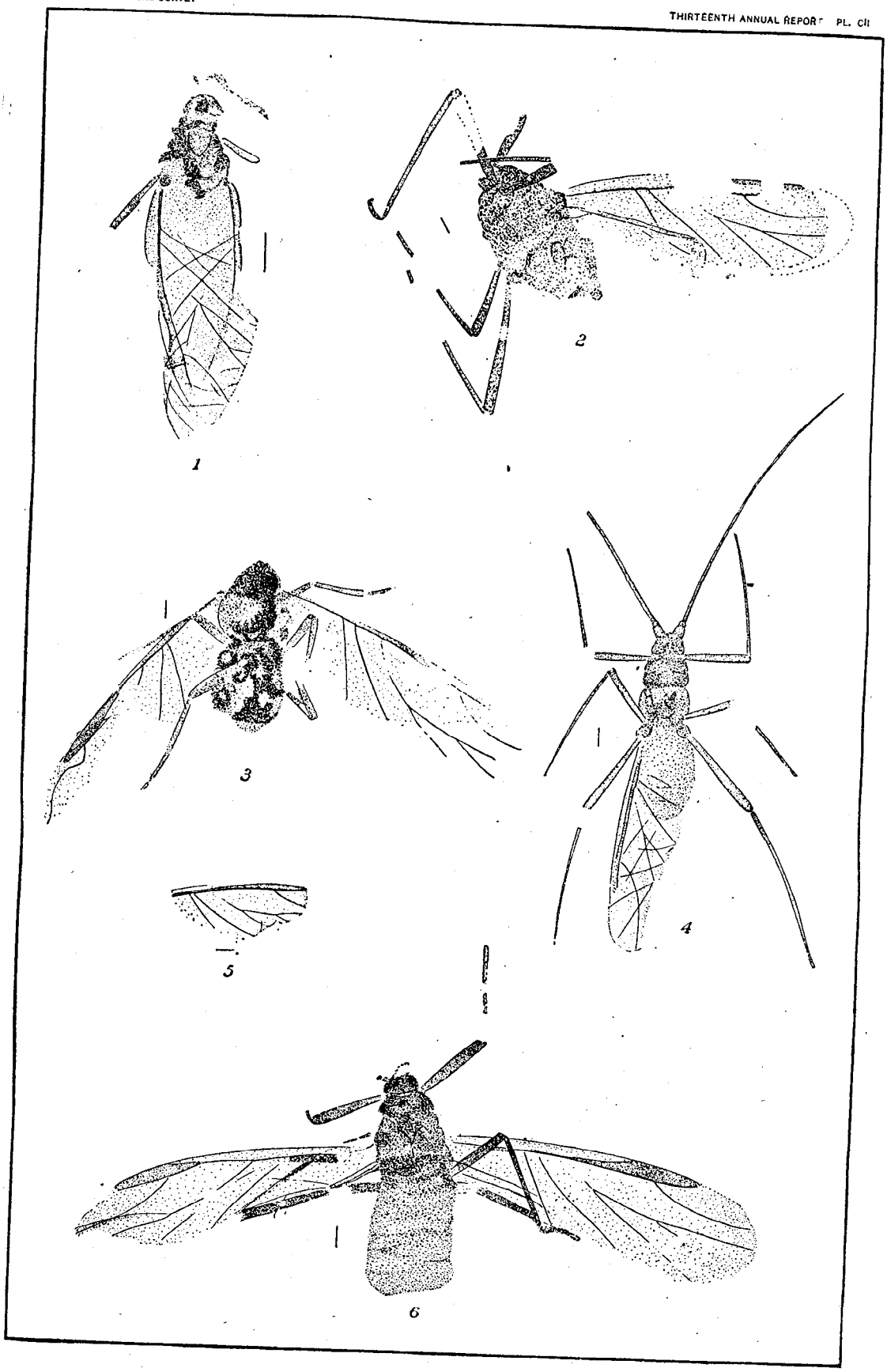
PTEROSTIGMA NIGRUM.

Pl. CIV, 6; Pl. CVI, 17.

Pterostigma nigrum Scudd., Tert. Ins. N. A., 275.
Florissant, Colo.

EXPLANATION OF PL. CII.

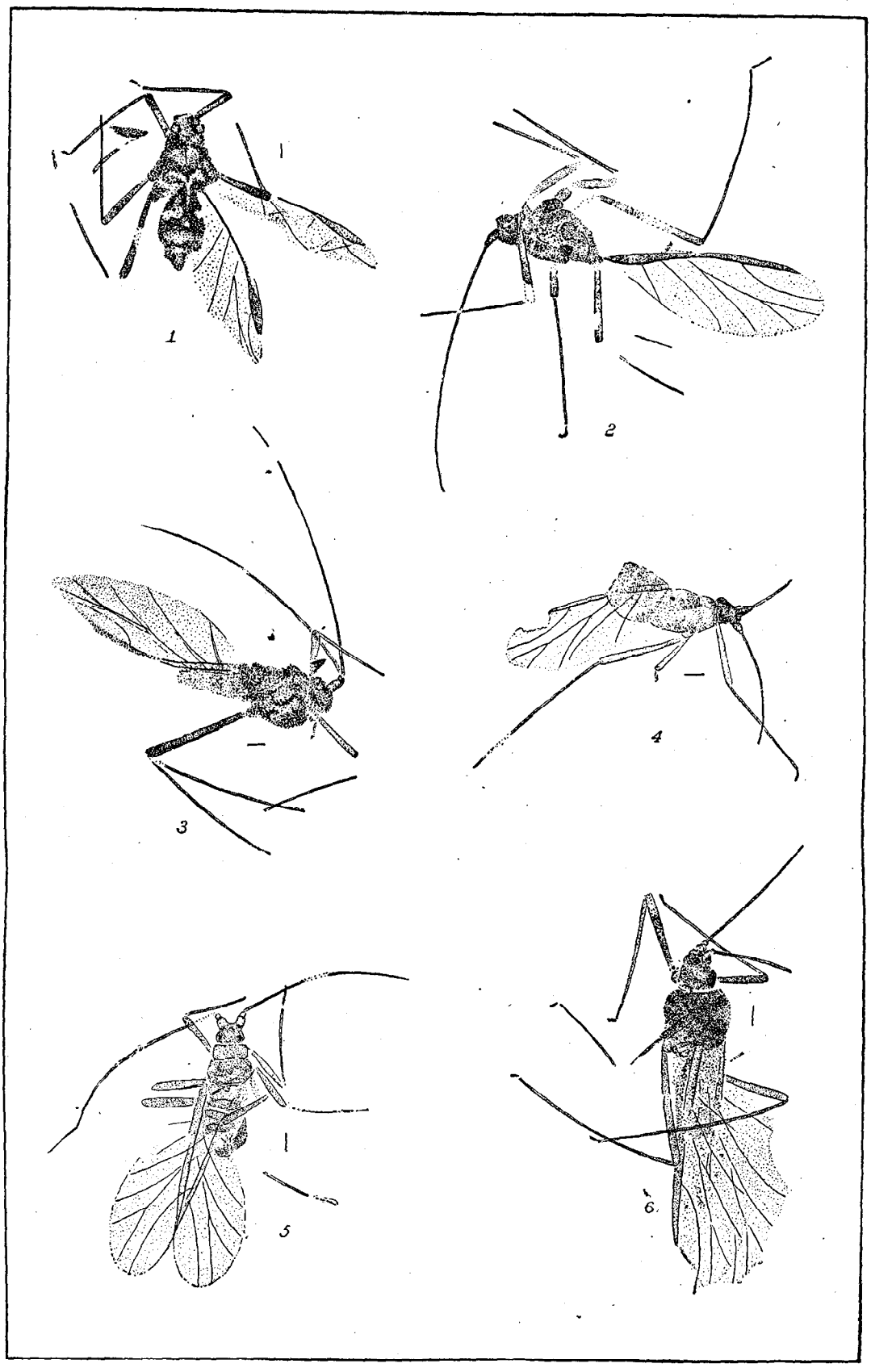
1. (607) $\frac{8}{1}$ Cataneura absens.
2. (2916) $\frac{8}{1}$ Cataneura rileyi.
3. (2067) $\frac{8}{1}$ Archilachnus bucktoni.
4. (13328) $\frac{8}{1}$ Archilachnus mudgei.
5. (14053) $\frac{20}{3}$ Gerancon davisii.
6. (11202) $\frac{8}{1}$ Sbenaphis uhleri.



AMERICAN TERTIARY APHIDÆ.

EXPLANATION OF PL. CIII.

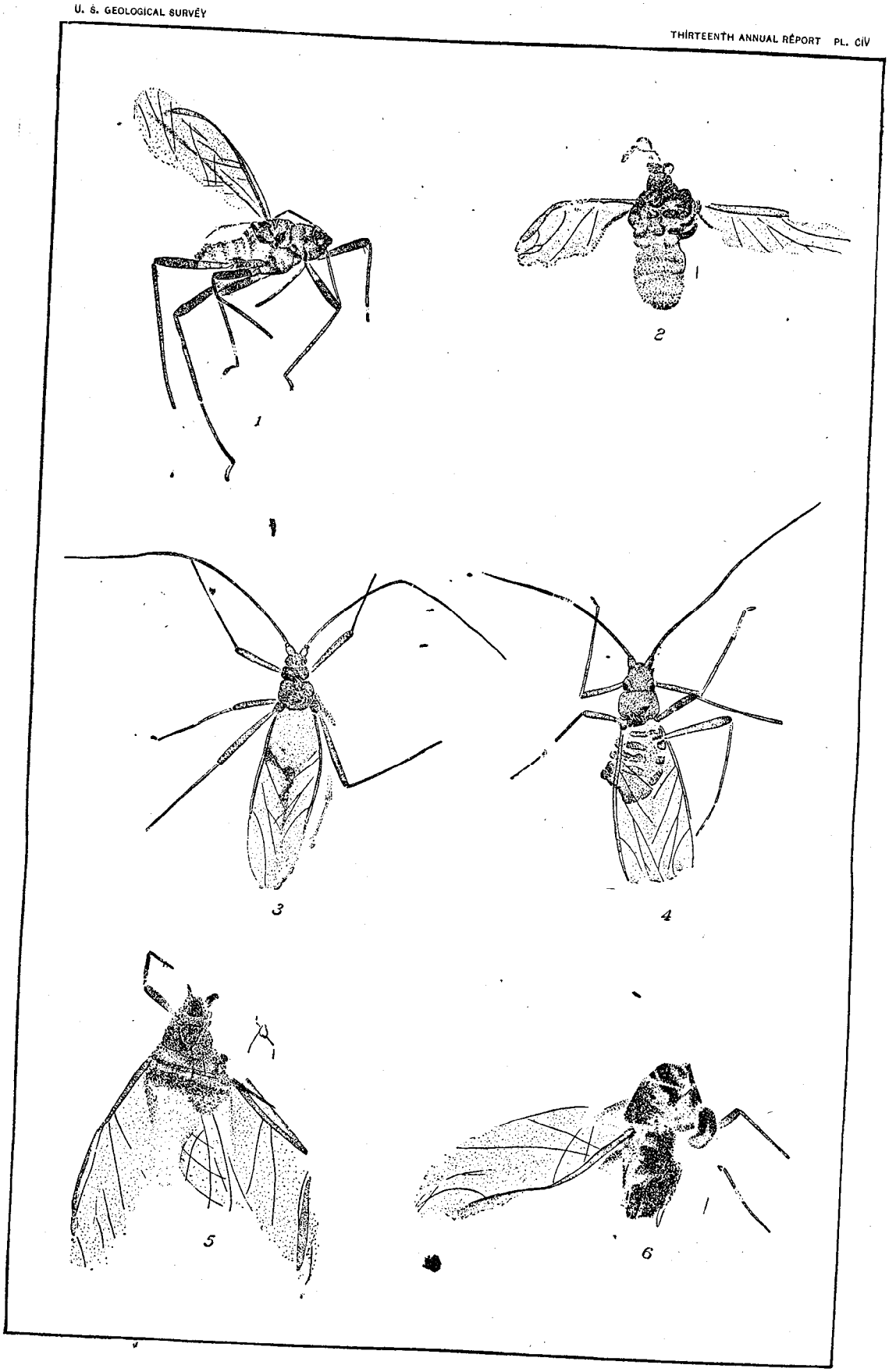
1. (12994) $\frac{8}{1}$ Sbenaphis lassa.
2. (1215) $\frac{8}{1}$ Aphantaphis exsuca.
3. (1667) $\frac{8}{1}$ Siphonophoroides rafinesquei.
4. (3738) $\frac{20}{3}$ Siphonophoroides propinqua.
5. (12476) $\frac{20}{3}$ Lithaphis diruta.
6. (1.834) $\frac{8}{1}$ Aphidopsis lutaria.



AMERICAN TERTIARY APHIDÆ.

EXPLANATION OF PL. CIV.

1. (11360) $\frac{2}{3}$♀ Aphidopsis hargeri.
2. (6405) $\frac{1}{1}$♀ Aphidopsis emaciata.
3. (9135) $\frac{2}{3}$♀ Aphidopsis dalli.
4. (8896) $\frac{2}{3}$♀ Aphidopsis subterna.
5. (9405) $\frac{8}{1}$ Oryctaphis lesueurii.
6. (6090) $\frac{8}{1}$ Pterostigma nigrum.

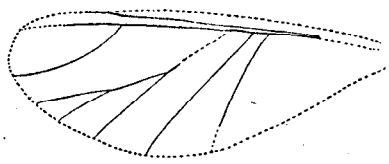


AMERICAN TERTIARY APHIDÆ.

EXPLANATION OF PL. CV.

All the drawings are magnified eight diameters. The dotted lines show the restored portions.

1. Cataneura absens.
2. Cataneura rileyi.
3. Archilachnus bucktoni.
4. Archilachnus pennatus.
5. Archilachnus mudgei.
6. Gerancon davisii.
7. Gerancon petrorum.
8. Sbenaphis quesneli.
9. Sbenaphis uhleri.
10. Sbenaphis lassa.
11. Aphantaphis exsuca.
12. Siphonophoroides propinqua.
13. Siphonophoroides antiqua.
14. Siphonophoroides rafinesquei.



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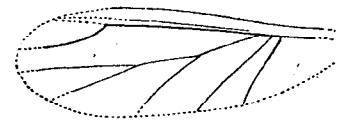

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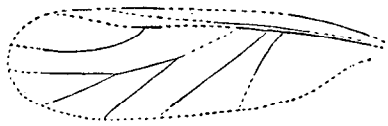

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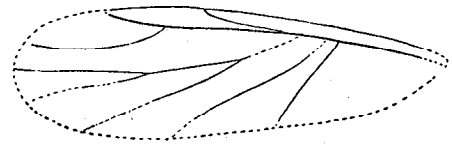

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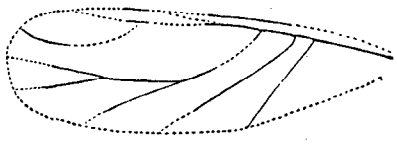

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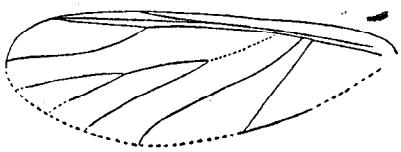

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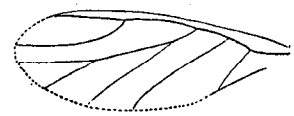

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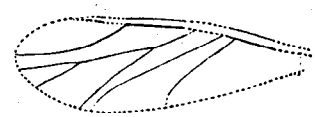

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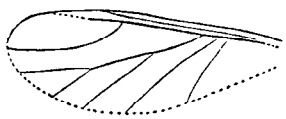

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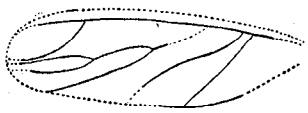


7

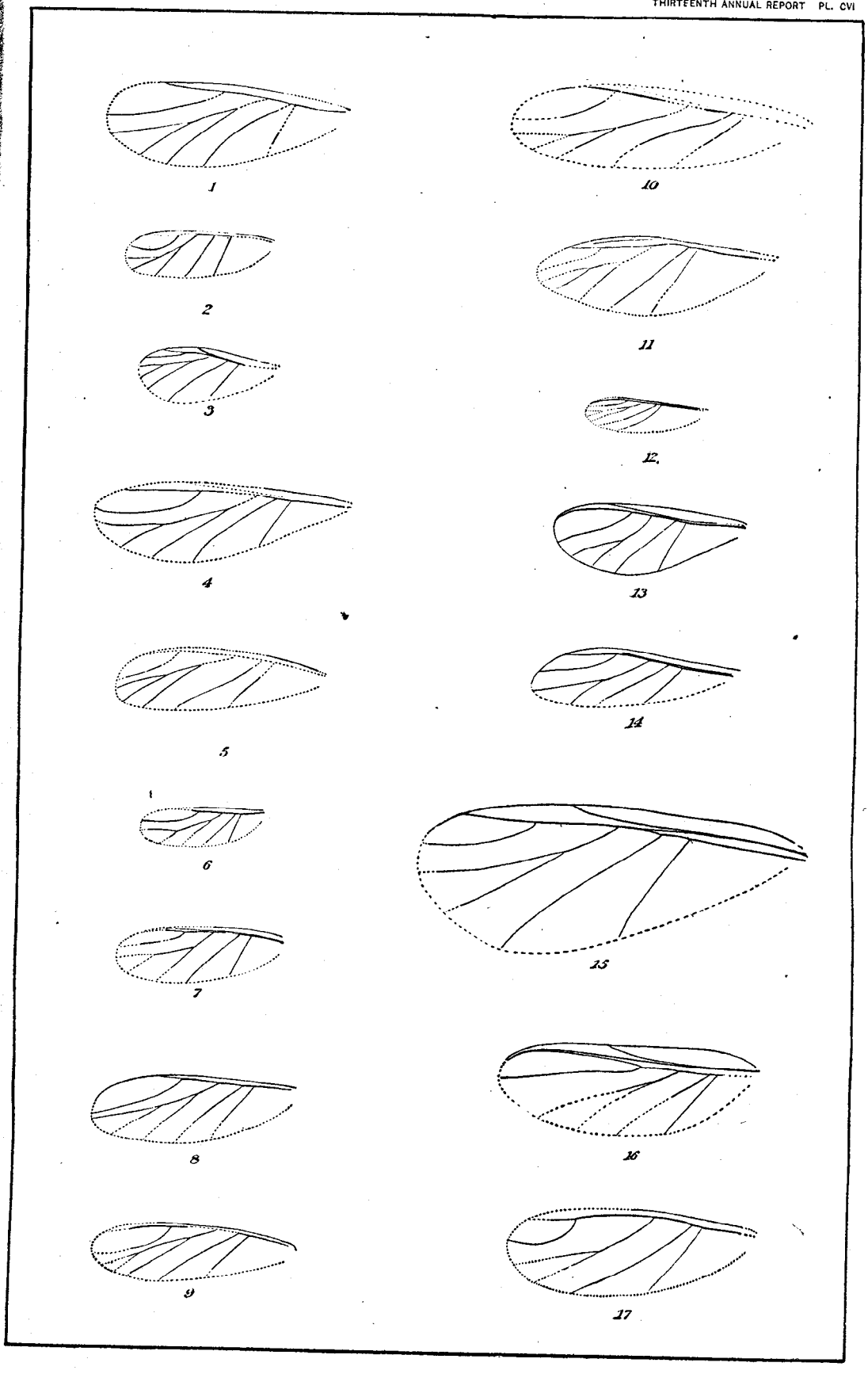
14

AMERICAN TERTIARY APHIDÆ.

EXPLANATION OF PL. CVI.

All the drawings are magnified eight diameters. The dotted lines show the restored portions.

1. Lithaphis diruta.
2. Tephraphis simplex.
3. Tephraphis walshii.
4. Aphidopsis lutaria.
5. Aphidopsis hargeri.
6. Aphidopsis emaciata.
7. Aphidopsis margarum.
8. Aphidopsis dalli.
9. Aphidopsis subterna.
10. Oryctaphis recondita.
11. Oryctaphis lesueurii.
12. Sychnobrochus reviviscens.
13. Schizoneuroides scudderi.
14. Amalancon lutosus.
15. Anconatus dorsuosus.
16. Pterostigma recurvum.
17. Pterostigma nigrum.



AMERICAN TERTIARY APHIDÆ.