

ON SOME AUSTRALIAN INSECTS OF THE FAMILY PSYLLIDÆ.*

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[Read December 7, 1897.]

Plates I.-III.

The Australasian Psyllidæ have not, as far as I am aware, been sufficiently studied. T. Dobson, in the Papers and Proceedings of the Royal Society of Van Diemen's Land, in 1850, wrote upon the waxy secretion, or "manna," produced by some Tasmanian insects, and gave some figures both of this manna and of adult insects; but he seems to have known of only three species. I possess some waxy shields corresponding to his figures 3 and 5, but have not their adults; and it is not possible to make out from his figures 4 and 6 exactly what genera or species are represented by them. Since his time I do not know of any systematic attempt to describe Psyllidæ in this part of the world, except my own paper in the Transactions of the New Zealand Institute, 1889, in which I reported four new species, one of which was probably an importation from Australia. Mr. E. Rübsaamen, in the Berlin Entom. Zeitschrift, 1893, has a paper on some galls on Eucalyptus, amongst a number of which he mentions one from Australia which contained a Psyllid pupa; but no adult was found. I gathered from a letter a few years ago from the late Mr. Olliff that he proposed to form a new genus, "*Xylolyma*," for some of the species which have waxy shields; but the specimens which I possess of four of these would belong rather to Signoret's proposed genus "*Spondylaspis*." Probably, however, the adults of these forms, when found, would not be separable from the ordinary Psyllid genera, like *Asphalara tecta* of the present paper; and both *Spondylaspis* and *Xylolyma* would be abandoned. I think that Mr. Olliff never actually published anything on his suggested genus. If any other papers exist on Australasian Psyllidæ, I have not seen them, nor can I find references to any in the "Zoological Record." But there must be many fine species yet to be discovered in these regions.

The principal character for generic separation in this family is the venation of the forewing of the adult. In order to illustrate

* This is a posthumous article, the author having died before receipt of proofs.—[Ed.]

this point in the present paper I have inserted in the figures of wings letters denoting the parts referred to in the text. Although I could not, on account of the dark patches, put such letters in fig. 3, but the letters of figs. 10 and 17 will serve also for them. I have also placed letters to the figures of the male genitalia.

GENUS PSYLLA, Geoffr.

Head prolonged anteriorly in two processes. Stalk of the cubital vein in the forewing shorter than the stalk of the subcostal vein.

Psylla Lidgetti, sp. nov. Pl. i., figs. 1-4. *Acizzia*

Insects not forming any gall or shield.

Pupa naked, active (Fig. 1). Colour, dorsally, dark brownish-yellow, with a dark-brown patch on the head on each side of a longitudinal light stripe; thorax with an anterior brown patch and six others in two rows; abdomen transversely banded with brown. Wing-cases dark-brown, almost black. Ventrally, the general colour is dark-red. Antennæ and feet greenish, the terminal joints of each dark-brown. Eyes red. The general form of the insect in this stage is elliptical, the head smoothly rounded in front, the abdomen terminating in a minute projection. Antennæ as long as the whole body, rather thick, with eight joints, six of which are ringed and bear numerous hairs, and on the last are two unequal spines. Feet thick and swollen, rather short; the dimerous tarsus, claws and pad are normal of the genus. The margin of the whole body and head is fringed with numerous short hairs, and a number of these are also scattered over all the dorsum. Length of the pupa about $1\frac{1}{2}$ mm. = $\frac{1}{16}$ inch.

The adult insect (fig. 2) is of a general brown colour with some irregular patches of reddish-yellow; the antennæ and feet yellow; eyes red. Head broader than long, somewhat depressed in front and produced beneath in two short roundly-conical processes. Eyes semi-globular, sessile, numerously faceted. Antennæ moderately long and slender, with ten joints, of which eight are ringed. Feet presenting no special characters. In the forewings the sides are nearly parallel, each side very slightly concave in the middle, the ends broadly rounded. The primary stalk of the veins reaches to about one-fourth of the length of the wing; the stalk of the cubitus* is about one-half the length of the stalk of the sub-costa; the sub-costa forks close to the margin

* On account of the dark bands on the wing in fig. 3 the veins cannot be well distinguished by lettering; but the letters in figs. 10 and 17 will answer also for this.

with one short branch and another almost parallel to the margin, but there is no pterostigma in the enclosed space; the radius is wavy, joining the costal margin about the apex; the upper main branch of the cubitus is convex, forking at two-thirds of its length and its upper secondary branch reaches the margin a little below the apex; the lower main branch forks at about three-fourths of its length, the shorter secondary branch turning sharply to the margin, the longer extremely convex; the claval vein is short and very slightly concave. On the surface of the wing are several brown patches; a few, small and scattered, near the base of the wing; one across the middle, much broader near the costal margin and narrow near the dorsal margin; a third, towards the extremity, very broad at the dorsal margin; and a fourth, very small, separated from the third by a crescent-shaped hyaline space, just above the apex. The hind wings are hyaline, with only the usual three longitudinal faint veins. The genitalia of the male insect (fig. 4) consists of the usual dorsal processes; the genital-plate (*a*) is curved slightly backwards, with its basal portion very broadly rounded posteriorly; the forceps (*b*) consists of two narrow cylindrical processes bent slightly forwards; between these organs is the penis (not shown in the figure); the abdominal extremity (*c*) is blunt and turned upwards. The genitalia of the female have not been observed, but in all probability they do not differ greatly from those of the next species.

Habitat.—In Australia, on *Acacia implexa*. My specimens were sent by Mr. Lidgett, of Myriong, Victoria, from whom I have ventured to name the insect.

The differences between this and *P. acacia* will be readily seen by comparison of the wings and the genitalia, although in colour and in habit the two do not greatly differ. The brown bands on the forewing of *P. Lidgetti* are much more close and conspicuous than the scattered patches on *P. acacia*, and the dorsal hairs of the pupa are also distinctive.

GENUS APHALARA, Förster.

Head either swollen or produced in conical processes; stalk of cubitus in forewing longer than the stalk of the subcosta; radius curved.

I follow F. Löw in including amongst the generic characters the processes of the head. Scott (Trans. Entom. Soc., London, 1876) says:—"Face not lobate."

Aphalara tecta, sp. nov. Pl. ii., figs. 5-10. ?*Glycaspis*

Insects covered in the pupal stage by a waxy scale or shield. The colour of this shield is reddish-yellow; the form is sub-

elliptical or pear-shaped, tapering anteriorly, somewhat convex, the secretion exhibiting very fine transverse striations, and in some specimens also a few obscure corrugations radiating from the pointed end; the margin is smooth all round; the average length is about 4 mm. = $\frac{1}{4}$ inch, with a width at the broadest part of about 3 mm. The texture of the dorsal part is thin and not very solid; the marginal part is thickened by an accretion which, on turning over the shield, is seen to form a ventral scale not extending over the whole median space.

The enclosed pupa is yellow, both dorsally and ventrally, and the antennae and feet are likewise yellow; the wing-cases are dark-brown. On the dorsum there is a short transverse black band at about the separation of the thorax and the abdomen; on the head and thorax are two longitudinal rows of black quadrangular spots, and on the abdomen two similar rows of short black bands in pairs; the extremity of the abdomen bears a black patch. On the abdominal margin is a quantity of white cottony secretion, not forming a fringe. Antennae moderate, with eight joints, of which six are ringed. Feet short and thick.

The adult female is yellow, with the thorax and abdomen marked dorsally with a few black patches; eyes reddish, faceted, semiglobular, sessile. Head broader than long, depressed in front, produced beneath in two rather long sub-cylindrical processes. Antennae yellow, with brown tips, of the usual ten joints. Feet yellow, normal. Forewings hyaline, without spots or bands; the primary stalk of the veins (*a b*) is very short, only about one-sixth the length of the wing; the stalk of the cubitus (*b c*) is a little longer than the stalk of the sub-costa (*b d*); the sub-costa (*d g*) forks close to the margin; the radius (*d f*) is rather convex, and reaches the margin near the apex, and a little above it; the upper branch of the cubitus (*c e, c h*) forks at some distance from the margin, its branches bending sharply downwards; the lower cubital branch (*c k, c m*) forks at a short distance from its source, and its longer branch is not very convex; the clavus (*a n*) is concave. Hindwings hyaline, with the normal three longitudinal veins. Genitalia of the male (fig. 14) with a sub-conical genital-plate, the sides straight, the end truncate; the forceps is very broadly dilated at its tips, and is bent sharply forward beyond the genital-plate. Genitalia of the female formed of two simple conical valves enclosing the ovipositor.

Habitat.—On *Eucalyptus stuartiana*. My specimens were sent by Mr. French from Victoria, the exact locality not mentioned.

The appearance of the pupal shield in this species might cause it to be easily mistaken for a coccid of the genera *Chionaspis* or

Mytilaspis, but examination of the enclosed pupa shows it to be undoubtedly a Psyllid.

GENUS TRIOZA, Förster.

Head produced in two conical processes; stalk of the cubitus in forewing entirely wanting.

Trioza multitudinea, Tepper. Pl. iii., figs. 11-17.

Ascellis (?) *multitudinea*, Tepper, Trans. Roy. Soc. South Australia, 1893. Figs. 15-21.

Insects forming large galls on leaves, in the pupal stage. These galls, in the fresh state, have a greenish colour, but when quite mature or old they become red, or reddish-yellow; the normal form is subglobular; rarely, specimens are slender and cylindrical; the outer surface is rough and wrinkled; the texture is soft and leathery. Each gall usually contains a single cavity—sometimes there are two or three cavities; the interior walls are always quite smooth. The gall is attached to the leaf by a narrow base, and on the other side of the leaf there is usually a depression, but this is not entirely constant. The galls vary in size from a diameter of 3 mm. = $\frac{1}{12}$ inch, to 12 or more mm. And I have seen a few almost 1 inch.

Within the galls are found the pupæ, which when alive have dorsally a palish-brown colour, banded with faint yellow bars; dead specimens are dark-brown, and the bands almost obsolete; ventrally the colour is pale yellow, the feet and antennæ the same. Dorsally the wing-covers are plainly visible, also the eyes, which in fresh specimens are bluish. The margin of the pupa all round bears a fringe of short yellow hairs. The general form is elliptical, with a length of about 2 mm. = $\frac{1}{12}$ inch. There is no special character in the antennæ and feet, which indeed do not vary greatly in the genus *Trioza*.

The larva has not been observed.

The adult female is almost entirely yellow, with a darker tinge on the thorax, dorsally, and at the extremities of the antennæ and feet; the eyes are red, semi-globular, faceted, placed on a short tubercular base. The head is broader than long, depressed in front and produced beneath in two moderately long sub-conical processes; the rostrum is cylindro-conical. The antennæ have 10 joints, all elongated, sub-equal and ringed, except the two first, which are short and smooth; on the last joint are two short sub-equal spines. Feet normal, with dimerous tarsi and double claws. The genitalia of the female (fig. 19) consist of two longish, sharply-pointed processes enclosing the ovipositor; one of these is rather shorter than the other; both are numerous ringed, the

outer margins of the rings smooth to the tip; the inner margins are also smooth for about halfway, but those near the tip are very sharply serrulate. Forewings hyaline, with a very minute sparse punctuation and without marginal hairs; the dorsal margin (fig. 21, *a m h*) is slightly concave in the middle, the costal margin (*a g e*) is nearly regularly convex; the primary stalk of the veins (*a b*) extends to nearly one-third of the wing; the cubitus (*b e*, *b k*) has no stalk, forking directly with the subcosta (at *b*); the upper branch of the cubitus (*b e*, *b k*) is convex, forking near the apex, the terminal branches reaching the margin at about equal distances from the apex; the lower branch forks near the dorsal margin with one short branch (to *m*) and one longer and convex (to *k*); the radius (*d f*) is very slightly wavy, and leaves the subcosta (*b g*) at about half the length of the latter; the clavus (*a n*) is nearly straight; the costal vein (*a g e h n*) runs all round the margin. The hindwings are hyaline, with three faint longitudinal veins, of which the posterior one is forked. The genitalia of the male have the usual dorsal processes; the genital plate (*a*) is broad at the base, with slightly emarginate tapering sides ending in two divergent sub-conical teeth; the forceps (*b*) is somewhat similar, but narrower, and is bent forwards almost to the plate.

The length of this insect is about 2 mm = $\frac{1}{12}$ inch, with an expanse of wings about 5 mm.

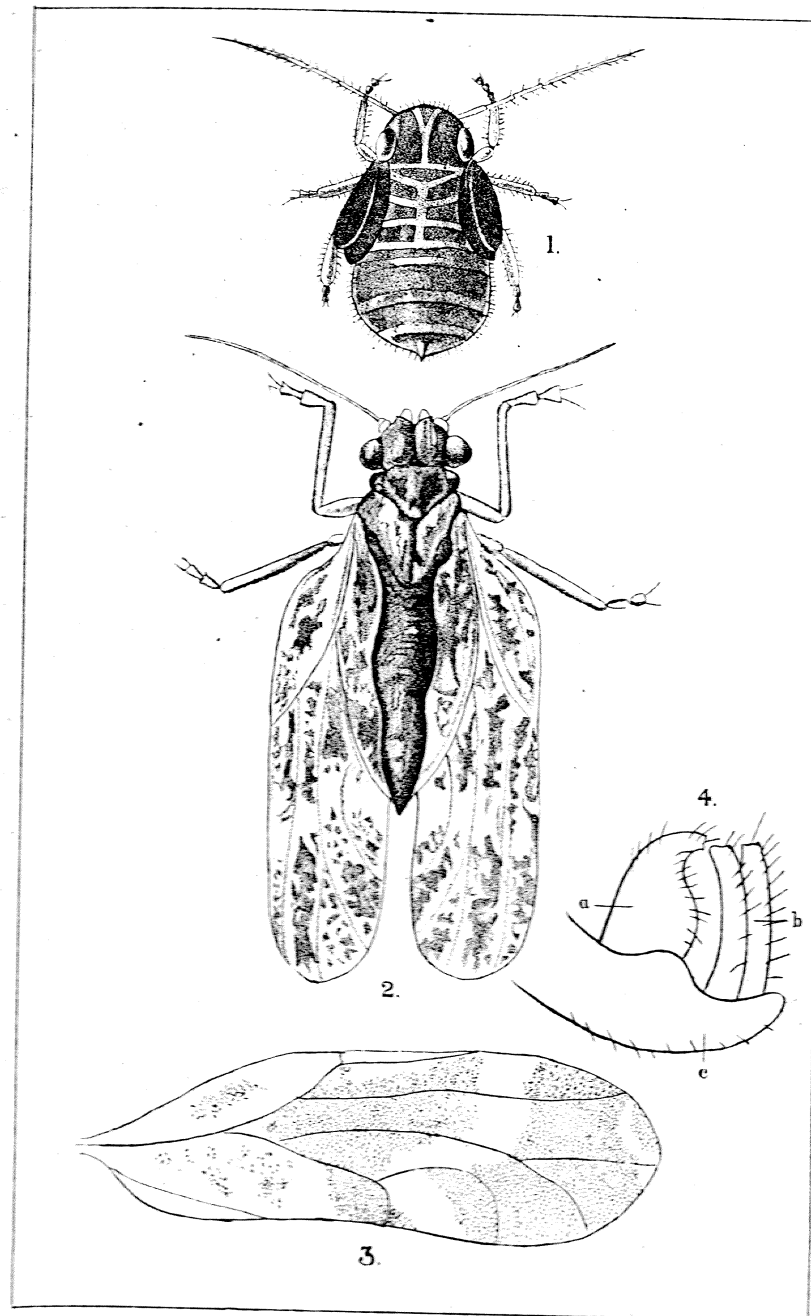
Habitat.—In Australia, on various species of *Eucalyptus*; principally, I believe, on what is known as "*Stringybark*." Mr. Tepper sent me specimens from Marino, South Australia; Mr. Froggatt, from New South Wales; Mr. French, from Victoria; and Mr. H. S. Dove, from Tasmania.

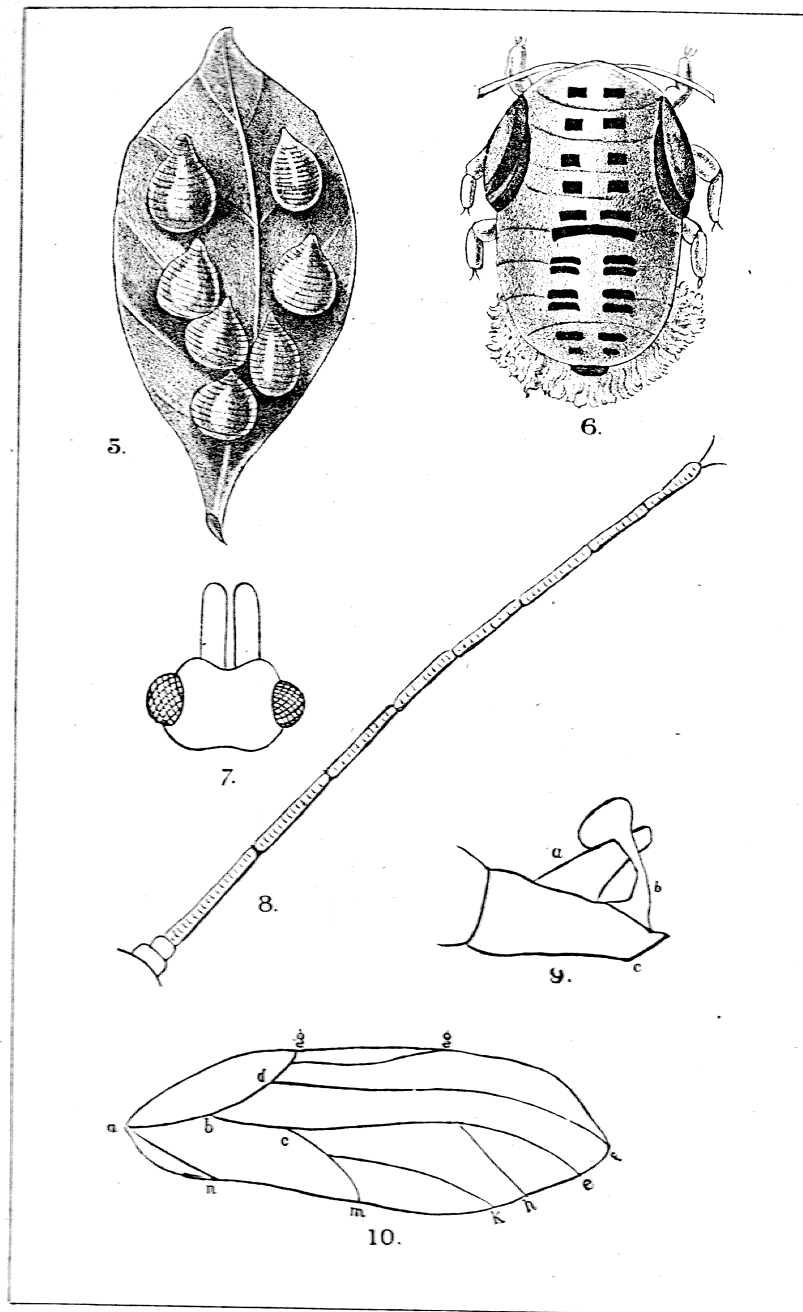
The generic position of this insect is clearly defined by the character of the wings, which are quite normal of the genus *Trioza*. Specifically, it may be distinguished by the genitalia of the female, which seems to be different from any hitherto reported, as well as by the character of the galls which the pupæ inhabit. Psyllidæ, as has been found of late years, are almost as varied as Coccidæ in their ways of covering themselves; and this seems to be especially the case with the Australasian forms, for I do not find that Low and Scott or Riley draw particular attention to this point respecting Psyllidæ of other regions. In this part of the globe, however, we have some uncovered (e.g. *Rhinocola fuchsiae* in New Zealand), some with cottony secretion (as *Rhinocola eucalypti* in N.Z.), some excavating pits for themselves (as some undetermined Australian forms), some forming elaborate waxy tests of elegant design (as the species described from Tasmania by Dobson in 1850 and others not yet fully worked out), and some again, such as the one now under dis-

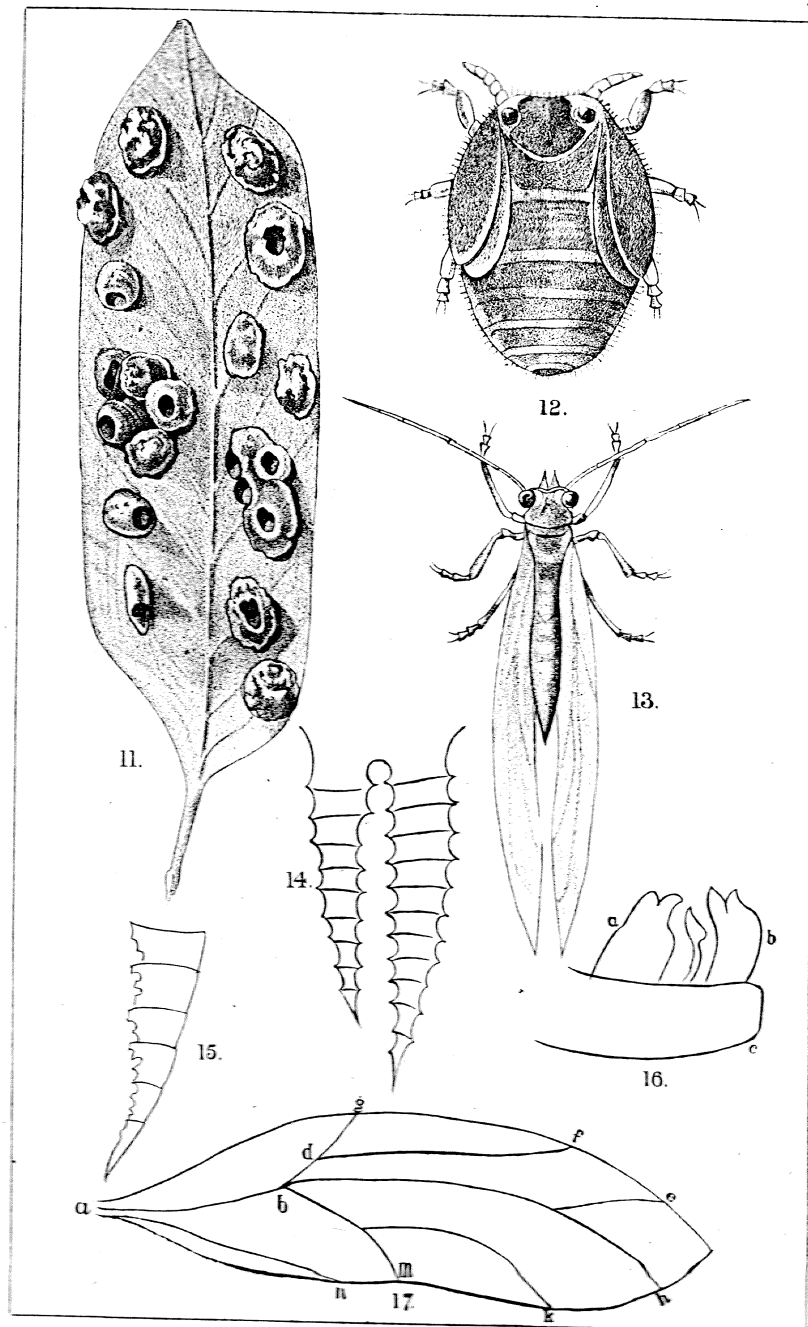
cussion, forming large and conspicuous galls. I possess several specimens of very beautiful waxy pupa-cases, of which one is certainly that for which Signoret founded his genus *Spondylaspis* in 1879; but some of these are empty, and in others there are only dead pupæ, so that I cannot well describe them. It would be worth while for an Australian entomologist to take up the study of these forms, and to describe the adults.

In 1893 Mr. J. G. O. Tepper published in the Transactions of this Society a paper on "South Australian Brachyscelid Galls," in which he described one species as of the genus *Ascelis*, namely, *A. multitudinea*. Having previously had galls of this (sent by Mr. French), and having extracted from them only Psyllid pupæ, I was convinced that Mr. Tepper's description of them to the Coccidæ could not be correct, and I asked him to let me have specimens, which he very kindly did at once. From the galls which he sent me I bred four adult insects, which are those described above. Mr. Tepper must have been led into his error on account of a principle which he laid down in his paper. Speaking of some of my Coccid genera—*Frenchia*, *Cylindrococcus*, &c.,—he said:—"On account of a general similarity of habit, I consider that they also should be included in the family [Brachyscelidæ]. They form woody galls similar in structure to those of *Brachyscelis*." Undoubtedly, the galls of *Trioza multitudinea* might easily be taken as very closely allied to those of such species as *Brachyscelis nux* or *Opisthoscelis subrotunda* or others, as long as the enclosed insects are not examined. But the study of these at once shows that the principle embodied in the words just quoted (and which I have italicised) is essentially erroneous. Clearly both Psyllidæ and Coccidæ have a "general similarity of habit;" yet it is quite impossible to unite the two. There is only one point as to which I am in doubt. Mr. Tepper describes not only the gall of his species, but also the enclosed insect. This, he says, is "yellow, rather flat, elliptical, with long hairs . . . antennæ dorsal . . . legs none . . . last segment of abdomen deeply emarginate, the sides forming thick, obtusely acuminate appendages, without bristles or setæ." What was this insect? The description does not seem like that of a Coccid, and the figure given by Mr. Tepper (in his Plate V., fig. 4d) has no Coccid features. In all the galls of this species opened by me I have found Psyllid pupæ, in which the legs are a very conspicuous character; but in some I found also yellow, elliptical things, with dorsal antennæ, which were pupæ of parasites, and from one of which emerged a long-bodied, long-winged fly of some Hymenopterous genus.

I think, on the whole, that I have rightly attached Mr. Tepper's insect to *Trioza*. The specific name given by him is quite appropriate, and I have not disturbed it.







INDEX TO FIGURES.

NOTE.—In the figures of wings *a b* is the "primary stalk;" *b c* is the "stalk of the cubitus;" *b d* is the "stalk of the subcosta;" *b g, b f*, is the "subcosta;" *a f* is the "radius;" *c e, c h* is the "upper branch of the cubitus;" *c k, c m* is the "lower branch of the cubitus;" *a n* is the clavus."

In the figures of genitalia, *a* is the "genital-plate;" *b* is the "forceps;" *c* is the "abdominal extremity."

All the figures are highly magnified, except fig. 16.

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| Fig. | | |
| 1. | <i>Psylla Lidgetti</i> , | pupa. |
| 2. | " " | adult insect, dorsal view. |
| 3. | " " | forewing. |
| 4. | " " | genitalia of male, side view. |
| 5. | <i>Aphalara tecta</i> , | shields on leaf. |
| 6. | " " | pupa. |
| 7. | " " | head of adult. |
| 8. | " " | antenna. |
| 9. | " " | genitalia of male. |
| 10. | " " | forewing. |
| 11. | <i>Trioxa multitudinea</i> , | galls on leaf. |
| 12. | " " | pupa. |
| 13. | " " | adult insect. |
| 14. | " " | genitalia of female. |
| 15. | " " | " " more highly magnified. |
| 16. | " " | genitalia of male. |
| 17. | " " | forewing. |

