

A SYSTEMATIC MONOGRAPH OF THE CHALCIDOID HY- MENOPTERA OF THE SUBFAMILY SIGNIPHORINÆ.¹

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INTRODUCTION.

About a year ago Dr. L. O. Howard, at my request, placed a collection of slide-mounted Encyrtidæ of the subfamily Signiphorinæ into my hands for study, sending me later all of the types and the specimens in the collections of the United States National Museum. This combined collection was unique in that it contained, I believe, all of the specimens of the subfamily known to exist in collections. I have received several other specimens from the collections of the Illinois State Laboratory of Natural History but without adding much of value; and have added also a few new species collected in Australia. Having types of all the species with but a single exception, together with a comparatively large miscellaneous collection drawn from all parts of their habitat, an opportunity was presented to make an adequate systematic study of the group.

The species of the single genus of the subfamily seem to be naturally segregated into about six species groups according to general coloration; four of these groups are easily separable but two of them present much difficulty, their coloration becoming variable and their structure nearly identical. However, of the 14 described species all have proved valid, so far as I was able to determine, with the exception of one. This exception proves to be a color variant of the type-species. The remaining 13 forms when divided into their color groups nearly always have some slight structural character which is correlated with their specific coloration. Many of these structural characteristics are marked, but others not so. In the two closely allied groups spoken of above, however, the only structural characteristic separating most of the species is the presence or absence of a bristle from the surface of the fore wing (called the

¹ It will be noticed in this paper that in connection with the data on the slides certain numbers are occasionally given in addition to the type numbers. Most of these refer to the series of biological notes in the Bureau of Entomology of the United States Department of Agriculture. Where these notes have given additional data which seemed of importance to this paper they have been mentioned in footnotes by the undersigned.—J. C. CRAWFORD.

“discal bristle” in this paper). What value this possesses I have been unable to determine, but for the present it has served to make the validity of at least one species (*townsendi* as opposed to *flavopalliata*) To the 13 described species I add 14 others in the pages following, making in all a total of 27 species, all of which, with the possible exception of one or two, I believe are distinct. There are no well-marked varieties.

This paper will again emphasize the importance of either detailed or comparative description and will treat of a group of great interest from whatever standpoint it is viewed. Thus, from the systematic standpoint an isolated group of species may be seen, which, beginning at one end with deep black and at the other with yellow, converge toward each other, so much so as to cause confusion at the middle or therabouts. A genus is seen, the only representative of its subfamily, which has such a peculiar form and bears such peculiar characters that it has been a matter of dispute where to place it in the great complex of which it forms a part, though I consider its present position as nearly right as possible. For ecology, the host relations of these parasites should form a study of great value, since they seem to be entirely dependent for their existence upon one or two specialized groups of insects. The study of specific variation, it seems to me, could be made in this group with much profit and success; thus, the coloration is variable but of more interest is the fact that comparatively very slight structural variation becomes of specific value here, for instance, as mentioned about the isolated bristle arising from the fore wing.

From the systematic standpoint, this paper has significance (1) as showing the relative paucity of our knowledge of the existing specific forms in a previously explored insect group, (2) and as showing the inadequacy for recognition of specific forms of brief, noncomparative descriptions.

For a systematic monograph has several elementary functions: (1) To record every definite variety (species, varieties, and so on of systematic language) known to exist in nature; (2) to make the identification of each of these possible and to determine their proper names. Beyond these, other considerations become of secondary importance.

HISTORY OF THE SIGNIPHORINÆ.

Family ENCYRTIDÆ.

Subfamily SIGNIPHORINÆ.

Signiphorinæ HOWARD, 1894, p. 234.—ASHMEAD, 1899, pp. 236, 248; 1900, p. 324; 1904, pp. 286-287, 311, 497.

Signiphorini SCHMIEDEKNECHT, 1909, pp. 191, 261.

This subfamily was established 18 years ago by Howard (1894) in the following manner. It was in a paper describing *Signiphora*

occidentalis. Referring to the type species (*flavopalliatata*) of the genus, after paraphrasing the original generic description, it was written:

In the Annual Report of the U. S. Department of Agriculture for 1880 (p. 371), we called attention to this remarkable insect and stated that Mr. Ashmead was probably in error in locating the "anomalous five-lobed appendage" upon the hind legs instead of upon the middle legs, since it is probably homologous with the apical spur upon the middle tibia so strongly developed in the Aphelininæ and Encyrtinæ.

Subsequent rearings of specimens from *Mytilaspis* [*Lepidosaphes*] *gloverii*, and *Aspidotus cydoniæ* [*lataniæ*] from Florida, from an Aleyrodes on oak from California, by Mr. Coquillett, and from *Aspidiotus aurantii* [Maskell] by the same gentleman, as well as the deposit of one of Mr. Ashmead's types in the collection of the U. S. National Museum, have enabled us to make a careful study of this peculiar genus. It differs so markedly from all other known Chalcididæ that it must be placed in a subfamily by itself, and we therefore propose for it the subfamily name *Signiphorinæ*. Several important points in the structure of the insect were not made out by Mr. Ashmead, and with more abundant material at our disposal we have drawn up a somewhat closer description of the genus and have characterized the subfamily, adding a description of the new species reared by Mr. Coquillett from the Red Scale.

SIGNIPHORINÆ, Subfam. nov.

Tarsi 5-jointed. Apical spur of middle tibia long and with several long spines on inner edge. Pronotum reaching nearly to tegulæ. Mesoscutum entire. Mesoscutellum represented by a narrow transverse band. Mesopleura short, sharply divided from metapleura. Metascutum with a differentiated triangular central sclerite, resembling the normal mesoscutellum. Antennæ at most 8-jointed. Ovipositor cleft of female abdomen extending back to 3d segment. (p. 234).

Five years later, Ashmead (1899) characterized the group exactly as quoted later for his paper of 1904. In 1900 the same author characterized it thus, quoting verbatim:

Family LXVII. ENCYRTIDÆ.¹

The three subfamilies mentioned above, into which this family is divided, may be separated upon the following characters:

Mesonotum *not* entire, most frequently depressed or concave on disk, rarely convex, the parapsidal furrows distinct, or at least more or less present; marginal vein usually long. Subfamily I. EUPELMINÆ.

Mesonotum entire, convex or subconvex, the parapsidal furrows always entirely wanting.

Marginal vein rarely very long, often punctiform, and always very much shorter than the subcostal vein; stigmal vein usually short but distinct, rarely very long; scutellum normal, the axillæ never closely united to form a transverse linear sclerite at base of scutellum; middle tibiæ without lateral spurs. Subfamily II. ENCYRTINÆ.

Marginal vein long, as long or nearly as long as the subcostal vein; scutellum abnormal, the axillæ closely united without suture between, forming a transverse linear sclerite at base of scutellum proper; middle tibiæ *with* lateral spurs, the lateral apical spur lobed. Subfamily III. SIGNIPHORINÆ.

On a previous page (p. 323) Ashmead had written: "The subfamilies Eupelminæ, Encyrtinæ, and Signiphorinæ, the latter based upon

¹ The footnote is omitted as irrelevant.

my genus *Signiphora*, established in 1880, as I have already published elsewhere, constitute a distinct family in the subfamily¹ Chalcidoidea, to which the family name Encyrtidæ should be applied." He gives nothing further concerning it excepting a table of the species (quoted beyond), followed by a catalogue of the species, 12 of which are briefly described for the first time. However, four years later (Ashmead, 1904) the following synopsis of the subfamily was given, at first giving the table of the subfamilies of the Encyrtidæ quoted herewith:

TABLE OF SUBFAMILIES.

1. Mesonotum entire, convex or subconvex, the parapsidal furrows entirely absent. . 2.
Mesonotum not entire, usually depressed or impressed, rarely convex, the parapsidal furrows distinct or at least more or less distinct, never entirely wanting; marginal vein usually long. Subfamily I. EUPELMINÆ.
 2. Marginal vein rarely very long, often punctiform, and always much shorter than the submarginal or subcostal vein; stigmal vein usually short, rarely long; scutellum never short or transversely linear; middle tibiæ without lateral spurs.
Subfamily II. ENCYRTINÆ.
- Marginal vein long, as long as the submarginal or subcostal vein; scutellum very short, transversely linear; middle tibiæ with lateral spurs, the apical spur lobed.
Subfamily III. SIGNIPHORINÆ.

The synopsis follows:

Subfamily III. SIGNIPHORINÆ.

1894. *Signiphorinæ*, subfamily, HOWARD, Ins. Life, vol. 6, p. 234.

1899. *Signiphorinæ*, subfamily III, ASHMEAD, Proc. Ent. Soc. Washington, vol. 4, p. 248.

This subfamily was established by Dr. L. O. Howard, in 1894, and was based upon my genus *Signiphora*, described in 1880, from specimens bred in Florida from the purple scale, *Aspidiotus citricola* Packard. Many species have since been discovered from different parts of the world, and the group, although at present represented by a single genus, has evidently a wide distribution. The species destroy scale insects, Coccidæ, and the mealy-winged flies, Aleurodidæ.

Antennæ apparently three-jointed but in reality six-jointed, there being three minute ring-joints easily overlooked; wings with a long marginal fringe, the marginal vein long, about the length of the subcostal vein, the stigmal vein distinct but not long, the postmarginal vein absent; middle tibiæ with a large, lobed apical spur, and with lateral spurs or strong bristles. *Signiphora* Ashmead (type *S. flavopalliat* Ashm.). (p. 311.)

Schmiedeknecht's more recent treatment of the subfamily adds nothing. He gives the group tribal rank. At present, it does not seem advisable to add anything to the subfamily characters, thus tending to limit it.

This history is a brief one. The history of the genus is practically the same. *Signiphora* Ashmead was described 32 years ago (Ashmead, 1880) in the following manner:

¹ Superfamily.

SIGNIPHORA, nov. gen.¹

Form robust, polished, or shining; head much wider than thorax, three ocelli, triangularly arranged, labial palpi three-jointed; antennæ inserted in front between the eyes, rather close together, three-jointed; first joint of scape long, second small and round, third large and fusiform, (Plate 2, fig. 3) thorax broad, not quite as long as abdomen; legs setaceous, with five-jointed tarsi, first joint longest; *hind tibia in place of the usual spine, furnished with an anomalous five-lobed appendage*, (Plate 2, fig. 15). In this respect, differing from any known chalcid. Abdomen somewhat sharply pointed and ending in rather a long ovipositor (Plate 2, fig. 5). Wings well rounded and strongly ciliated (Plate 2, figs. 6 and 8). Coxæ almost touching. (p. 30).

In the year following, Howard (1881), in concluding a discussion of coccid parasites in general, wrote concerning this genus as follows:

The new genus (*Signiphora*, founded for *S. flavopalliatu*s Ashmead), we are not prepared to discuss at present, but would simply state that specimens of an insect corresponding very exactly with his description have been bred from the same scale (*Mytilaspis citricola* Packard), and that the "anomalous five-lobed appendage" which Mr. Ashmead locates upon the hind tibiæ of *Signiphora* is present upon the middle tibiæ, and is homologous with the middle tibial spine of the *Encyrtinæ* and *Aphelininæ*. The genus is also to be placed with the *Mymarinae*.

A decade or so later, Howard (1894) redescribed the genus in this manner,² also redescribing the type species as new:

SIGNIPHORA Ashmead.

Type, *S. flavopalliatu*s Ashm., Orange Insects, 1880, p. 30.

Body robust; ocelli 3, situated in triangle. Antennæ inserted at border of clypeus, six-jointed; scape reaching nearly to top of head; pedicel large, nearly as long as scape; funicle joints 1, 2, and 3 very small; club very long, undivided. Face round; mandibles strong, bidentate; labial palpi rudimentary; maxillary palpi three-jointed. Fore-wings rather broad and short; submarginal and marginal veins subequal in length; marginal thick; stigmal thinner and curved; marginal and stigmal veins with several long, stiff bristles; no discal cilia; marginal cilia very long and delicate, beginning on costal margin just beyond stigmal, and extending around to a point opposite the stigmal. Hind-wings narrow and with very long and delicate cilia beginning beyond marginal vein and extending around nearly to hinder base of wing. Middle tibiæ with a number of stout bristles, apical spurs as long as first tarsal joint and furnished on inner edge with five or six long bristles at regular intervals; front and hind legs unarmed. Abdomen broadly sessile, rounded at tip; ovipositor of female somewhat extruded, apical spiracles facing ventrally; male penis long, cleft at tip.

Some generic characters to be noticed are: The entire absence of discal ciliation and the presence in some species of a bristle from the surface of the fore wing; the varying length of the marginal ciliation; the neckless stigmal vein; the many tined cephalic tibial spur; the bidentate mandibles; the long, solid antennal club.

¹ Immediately preceding this description it was written "Owing to the anomalous character of this fly I can find no genus to which it belongs. I therefore propose a new one, under the name of *Signiphora*, (the token bearer)" (p. 30).

² Insect Life, vol. 6, 1894, p. 235.

In 1896 Johnson recorded a *Signiphora nigrita* Howard MS. as a parasite of *Aspidiotus forbesi* Johnson; this species is a *nomen nudum* and is described beyond. Two years later, De Dalla Torre gave the following catalogue of the group:

21. Subfam. SIGNIPHORINÆ.

Howard, Insect Life, VI, 1894 p. 234.

SIGINPHORA.

Ashmead, Orange Insects, 1880 p. 30.

Signum; φέρω, fero.

(*flavopalliata* Ashm.¹)—Am.: Florida.

Signiphora flavopalliata Ashmead, Orange Insects, 1880 p. 31,

T. 2 F. 2, 3, 6, 8, 12 & 13.

Signiphora flavopalliata Howard, Comstock: Rep. Entomol. U. St. f. 1880, 1881 p. 371.

Signiphora flavopalliata Howard, Insect Life, VI. 1894 p. 235.

(*occidentalis* How.²)—♀ ♂—Am.: California.

Signiphora Occidentalis Howard, Insect Life VI. 1894 p. 234, ♀ ♂.

Ashmead (1900) then made an important contribution to the knowledge of the group, describing 12 new forms and giving the following table of the species. Fourteen species were listed. I quote the table herewith, especially in order to allow a more ready and convenient comparison of it with my own, given later.

TABLE OF SPECIES.

Body not wholly black.....	2
Body wholly black or blue-black.	
Wings fuliginous on basal half; all tarsi white, the middle and anterior tibiae brown, rest of legs black.....	(1) <i>S. nigra</i> Ashmead, new species.
Wings fuscous with a hyaline band across the middle; legs black, a dot on knees and the tarsi whitish.....	(2) <i>S. australiensis</i> Ashmead, new species.
Wings hyaline, with a fuscous band across the middle; tarsi alone white.	(3) <i>S. dactylopii</i> Ashmead, new species.
Wings entirely hyaline; all tarsi white.....	(4) <i>S. noacki</i> Ashmead, new species.
2. Head, thorax, and most of the abdomen yellow.....	4
Head anteriorly and a broad band between the wings ivory white.....	3
Thorax black, with a single narrow yellowish-white band across the base of the scutellum and continued at sides along the posterior margin of the mesopleura and the mesosternal suture; wings hyaline.	(5) <i>S. unifasciata</i> Ashmead, new species.
Thorax black, with two transverse narrow bands between the tegulae; wings hyaline.....	(6) <i>S. bifasciata</i> Ashmead, new species.
Head and abdomen blue-black; thorax except the pronotum, bright yellow; wings hyaline with a dusky band beneath the marginal vein.	(7) <i>S. flavopalliata</i> Ashmead.
Head and thorax mostly brown.	
Mesonotum lemon-yellow; abdomen brown-black; wings hyaline, with a broad fuscous band beneath the marginal vein.....	(8) <i>S. occidentalis</i> Howard.
Mesonotum brown, the lateral margins narrowly yellow; abdomen aenous black; wings clear hyaline.....	(9) <i>S. mexicana</i> Ashmead, new species.

¹ (*Rhynch.*: *Aspidiotus citricola* Pack.) ? [*Lepidosaphes beckii* Newman] (Ashmead).

² (*Rhynch.*: *Aspidiotus aurantii* var. *citrinus*) (Howard). p. 217.

3. Head anteriorly, a broad band between wings including the metathorax, and sutures between abdominal segments, ivory white; wings hyaline with a discoidal cloud beneath the marginal vein. (10) *S. rhizococci* Ashmead, new species.
4. Body mostly yellow; thorax at anterior apex, band across base of abdomen, ovipositor, and band across middle of front wings dark brown.
 Band at base of abdomen narrower, including hardly one-third of its length; club of antennæ entirely yellow. (11) *S. aleyrodii* Ashmead, new species.
 Band at base of abdomen including more than one-third of its length; club wholly yellow; no distinct band between the eyes.
 (12) *S. coquillettii* Ashmead, new species.
 Club of antennæ with its apical half brown. (13) *S. aspidioti* Ashmead, new species.
 Band at base of abdomen including more than one-half of the abdomen, sometimes with only the tip yellow; club of antennæ shorter and wholly yellow.
 (14) *S. townsendi* Ashmead, new species.

Later, in his South American Chalcidoidea, Ashmead (1904, p. 497) included the two species then known to occur in South America. Finally, Schmiedeknecht (1909) gave the treatment of the genus implied already.

DISTRIBUTION OF THE SIGNIPHORINÆ.

The Signiphorinæ appear to be natives of the tropical or semitropical portions of the Western Hemisphere, as far as can be told from our present knowledge of them. Thus, of the 27 species now known 9 occur in Mexico, 8 in Brazil and Peru taken together, 5 in Florida, 5 in California, and 5 in the West Indies. Of the more northern and colder portions of the United States, 1 species occurs in Pennsylvania, 1 in Illinois, and 4 in the District of Columbia. Australia has 4 species and Hawaii 1, all probably introduced forms; the form occurring in Hawaii was described from specimens from the United States, probably California and occurs also in Florida, Brazil, and Mexico. The described Australian species has never been recorded from any other locality. The greatest differentiation of type, then, occurs, so far as yet known, in the tropical and semitropical portions of the Western Hemisphere, notably in Mexico and Brazil. The most common or abundant species, so far as can be told from the proportion of specimens occurring in the collection of this family are confined to the same regions. The most closely related forms occur in Mexico. The first record of a species was from Florida. The data concerning the distribution of their hosts is not available but all of them appear to be tropical or semitropical forms, occurring on plants growing in hot climates.

The genus is distributed from Pennsylvania, Maryland, District of Columbia and Illinois, in the United States in the north, south to Peru and Brazil and west to Australia (New South Wales and Queensland).

HABITS AND HOST RELATIONS.

Little or nothing is known about the habits of the Signiphorinæ other than the gross food habits of their young. The following table summarizes these habits. Ashmead wrote concerning *flavopalliata* in 1880:

I have watched several through my pocket lens, as they are not at all timid. They would run up to a scale, tap it with their antennæ, and if not satisfied with their inspection, would run off to another, and so on until they were suited, then backing around they seemed to insert their ovipositor, probably at the same time depositing an egg into the scale. (p. 30.)

TABLE OF THE HOST RELATIONS OF THE SIGNIPHORINÆ.

On account of the fact that this list was made up later than the rest of the manuscript, I have been unable to bring the nomenclature of the hosts strictly up to date.

Species.	Hosts.
1. <i>flavopalliata</i>	<i>Lepidosaphes beckii</i> . <i>Aspidiotus aurantii citrinus</i> . <i>Chionaspis</i> sp. on magnolia. <i>Aspidiotus camellix</i> on <i>Acacia</i> . <i>Aspidiotus</i> sp. on <i>Hibiscus</i> . <i>Aspidiotus</i> sp. on <i>Celtis occidentalis</i> .
2. <i>nigra</i>	<i>Coccus hesperidum</i> .
3. <i>australiensis</i>	Acanthococcid on <i>Eucalyptus</i> .
4. <i>dactylopii</i>	<i>Pseudococcus ephedræ</i> .
5. <i>noacki</i>	A psyllid on a wild shrub.
6. <i>unifasciata</i>	<i>Ceropsylla sideroxyli</i> .
7. <i>bifasciata</i>	Unknown.
8. <i>mexicana</i>	<i>Aspidiotus hederæ</i> . <i>Aspidiotus</i> sp. on a wild shrub. <i>Aspidiotus</i> sp. on <i>Ciruela</i> and <i>Hibiscus</i> .
9. <i>rhizococci</i>	<i>Rhizococcus</i> sp. on a composite.
10. <i>aleyrodis</i>	<i>Aleyrodes</i> sp. on orange. <i>Lepidosaphes carinata</i> . <i>Chrysomphalus aonidium</i> . <i>Chrysomphalus dictyospermi</i> ?
11. <i>coquilletti</i>	<i>Aleyrodes</i> on <i>Quercus agrifolia</i> . <i>Aleyrodes coronatus</i> . <i>Aleyrodes gelatinosus</i> . <i>Orthezia</i> sp. <i>Aspidiotus subrubrescens</i> . <i>Aspidiotus</i> sp. on a wild shrub.
12. <i>aspidioti</i>	<i>Aspidiotus hederæ</i> .
13. <i>townsendi</i>	<i>Aleyrodes</i> on a coarse grass. <i>Aspidiotus</i> sp. on a soft-wooded tree. <i>Aspidiotus</i> on <i>Hibiscus</i> . <i>Aspidiotus</i> on <i>Celtis occidentalis</i> . <i>Aspidiotus lataniæ</i> . ? <i>Diaspis pentagona</i> . ? <i>Aspidiotus perniciosus</i> .
14. <i>flava</i>	<i>Aspidiotus camellix</i> .
15. <i>flavella</i>	<i>Aspidiotus lataniæ</i> .

Species.	Hosts.
16. <i>basilica</i>	<i>Aspidiotus latanixæ</i> .
17. <i>pulchra</i>	<i>Aspidiotus uvæ</i> .
	<i>Diaspis pentagona</i> .
	<i>Aulacaspis rosæ</i> .
	<i>Chionaspis americana</i> .
18. <i>maxima</i>	Unknown.
19. <i>melancholica</i>	Unknown.
20. <i>fasciata</i>	<i>Pulvinaria</i> sp. on ash.
	<i>Inglisia</i> sp. on cotton.
	<i>Aleyrodes</i> on <i>Hydroxylon</i> .
21. <i>hyalinipennis</i>	<i>Capulinia jaboticabæ</i> .
22. <i>maculata</i>	<i>Lepidosaphes alba</i> .
23. <i>nigrella</i>	<i>Chrysomphalus tenebricosus</i> .
24. <i>fax</i>	<i>Chrysomphalus personatus</i> .

From the above it is readily seen that the species do not confine themselves to a single host but may attack many of them. The hosts of any one species are usually closely related, though in some cases a species attacks one or two hosts in a different family from that of most of its hosts which are usually of the same genus. The hosts of the new Australian species are not known.

Three closely related families in the Hemiptera-Homoptera furnish food for the young of this subfamily, the Coccidæ, however, supplying most of it.

SYSTEMATIC TREATMENT.

Genus SIGNIPHORA Ashmead.

Signiphora ASHMEAD, 1880, p. 30, pl. 2, figs. 2-3, 6, 8, 12, and 15.—HOWARD, 1881, p. 371; 1894, p. 235.—DALLA TORRE, 1898, p. 217 and footnote.—ASHMEAD, 1900, pp. 409-412; 1904, pp. 311, 388, 497.—SCHMIEDEKNECHT, 1909, p. 261.

No synonyms.

Type.—*S. flavopalliata* Ashmead.

1. SIGNIPHORA FLAVOPALLIATA Ashmead.

Signiphora flavopalliatius ASHMEAD, 1880, pp. 29-31, pl. 2, figs. 2-3, 6, 8, 12, and 15.—HOWARD, 1881, p. 371.

Signiphora flavopalliata ASHMEAD, HOWARD, 1894, pp. 233, 235.—DALLA TORRE, 1898, p. 217 and footnote 1.—ASHMEAD, 1900, pp. 409, 411; 1904, pp. 311, 388.

Signiphora occidentalis HOWARD, 1894, pp. 233-235, fig. 10.—DALLA TORRE, 1898, p. 217 and footnote 2.—ASHMEAD, 1900, pp. 409, 411.

The original description of this species is quoted forthwith:

The Blue Yellow-cloaked Chalcid.

(*Signiphora flavopalliatius*, N. Sp.)

[Ord., Hymenoptera. Fam., Chalcididæ.]

This is a very anomalous chalcid fly, discovered by me in September, running over the leaves of orange trees infested with the oval scale.¹

¹ The next three paragraphs are omitted here, as they contain an account of habits and the generic description. In the paragraph immediately following this opening sentence, however, Ashmead wrote: The fly is a beautiful little creature, less than .02 of an inch long, robust, with head wider than thorax, three ocelli, three-jointed antennæ, first joint being long, second small and round, third long and wide, club-shaped; the abdomen is somewhat sharply pointed, with a rather long ovipositor in the end; the head and abdomen are bluish-black, while the thorax is orange yellow; the wings are clear, iridescent, and strongly fringed or ciliated with long hairs, with shorter ones on their surface; the legs are pale yellow, and the hinder pair is furnished with an anomalous five-lobed appendage, where usually is the tibial spur. (p. 30.)

DESCRIPTIVE.

Signiphora flavo-palliatius, n. sp.—Length 0.02 of an inch. Robust, polished; head bluish-black, much wider than thorax, three ocelli, black, two raised curved lines, one on each side of antennæ, eyes prominent, numerous facets; antennæ three jointed, first joint shorter than third, wider and rounded at apex, second joint very small and round; apical, or third joint, longer than first, six or seven times longer than second, and widening very much, claviform; thorax stout, nearly as wide as long, and of an orange-yellow, excepting a crescent-shaped space (collare) next to the head, which is bluish-black; abdomen longer than thorax, bluish-black, and decreasing sharply to a point, ending in a rather long ovipositor; under surface uniform bluish-black, with a few hairs on the different segments; wings hyaline, iridescent and strongly ciliated, well rounded at apex, with short setae on the surface; legs pale yellow, with five jointed tarsi, setaceous, femora somewhat swollen. Instead of a tibial spur on hinder legs, there is a singular anomalous apical five-lobed appendage (See Plate 2, fig. 15,) also two exterior spiny processes—coxæ not quite touching each other. Male not yet discovered. Inhabits Florida. Described from numerous specimens. (pp. 29–31, pl. II, figs. 2–3, 6, 8, 12 and 15).

From the unique type specimen in the United States National Museum collection I make the following corrections and additions to the specific description:

General color not blue-black but brown; a more or less obscure spot on each side of the abdomen at distal two-thirds and the dorsal thorax, lemon yellow, excepting the cephalic half or two-thirds of the mesoscutum and all of the pronotum. Wings not hyaline but distinctly embrowned out to a point slightly beyond (distad of) the venation and including most of the base of the wing; posterior wings with proximal half slightly embrowned; wings entirely without discal ciliation but the fore wing bears an isolated bristle under the distal three-fourths of the marginal vein, which is nearly as stout as some of the bristles borne by the venation but smaller than most of them. Distal half of the venation (marginal and stigmal veins) bearing seven stout bristles, one of which is at the extreme end or apex of the stigmal vein, the other six in pairs along the edges of the marginal vein; the submarginal vein bears a single, smaller bristle before its middle. Stigmal vein short, without a neck; marginal and submarginal veins subequal in length, but the former much broader. Marginal cilia of the fore wing long and slender, slightly longer than the greatest wing width, subequal to those of the posterior wings. Ovipositor slightly exerted. Middle tibial spur about subequal in length to the proximal joint of the intermediate tarsi, not large, with about six spines or lateral spurs. Cephalic tibial spur curved and divided distad into about six unequal tines which lengthen distad. Proximal tarsal joints of the intermediate legs not as long as the combined lengths of the three distal joints but twice the length of the same joint of the tarsi of the other legs. Mandibles bidentate, their tips nearly black. Antennal club slender, the antenna normal.

for the genus. Fore wings long-ovate, very obtusely pointed, narrow. Two distal funicle joints each twice the length of the first one or else all gradually increasing in length, the second intermediate in size. Margins of the blade of the posterior wing parallel, the wing narrow, its marginal cilia very much longer than the greatest width of the blade.

These notes were taken from the single female type specimen, corrected and enlarged from the specimens as listed below.

I have studied the following specimens: (1) The type of *flavopalliata*, a single female mounted in balsam and labeled "Entomological Collection of Wm. H. Ashmead, Jacksonville, Florida. *Signiphora flavopalliata* Ashm. Type, female. No. 2801, U.S.N.M." (2) The original specimens—types but not so designated¹—of *occidentalis*, comprising six slides all labeled, except the sixth, "From San Gabriel Red Scale," and as follows—one slide bearing a pair labeled in addition "*Signiphora occidentalis* How., male, female"; a second slide bearing a male and labeled "*Signiphora* male, *occidentalis*. June 3, 1887"; a third bearing a single female and labeled "*Signiphora* n. sp., June 1, 1887." A fourth bearing a single female and labeled "*Signiphora* n. sp., male, *occidentalis* How. May 30, 1887." A fifth bearing a female and a portion of another specimen, besides two specimens of *Prospaltella aurantii* (Howard), labeled "*Coccophagus aurantii* How. MS. *Signiphora* n. sp., female. May 9, 1887." And lastly, a slide bearing a single female, besides seven specimens of *Aspidiotiphagus citrinus* (Craw) and labeled "*Coccophagus citrinus*. *Signiphora*. From *Aspidiotus aurantii*. March 13, 1889. San Gabriel, Cal." All of these slides, except the sixth, were cut out by hand from window glass and were thick and short. (3) A slide bearing a single female and labeled "Morrill No. 2004. On orange leaf, Orlando, Florida, 6/24, 1907. A. W. Morrill." (4) A slide from the collections of the Bureau of Entomology, United States Department of Agriculture, bearing a single pair and labeled "From eggs of *Horiola arquata*. Tunapunta. F. W. Urich, Feb., 1911"; this host record must be considered a mistake until evidence is forthcoming; it is contrary to the host habits of the group. *Homotypes*. (5) A single female on a slide from the collections of the United States Department of Agriculture, labeled "7572⁰³. *Chionaspis* on *Magnolia*, Savannah, Georgia. Issued June 15, '97." (6) A slide bearing the fragments of a single female specimen labeled "From *Aspidiotus camelliae* on *Acacia* sp. Mex. A. L. Herrera. XII. 15, 1905." (7) Another slide from the same collection, bearing three females with specimens of *mexicana* and *townsendi*, labeled "1768. *Aspidiotus*

¹ But for the convenience of future workers now marked as types, Cat. No. 1473, U. S. National Museum, the three slides as listed below, labeled "May 30, 1887" (1 male), "June 1, 1887" (1 female), and "June 3, 1887" (1 male), all evidently part of the material used in describing *occidentalis*.

on *Hibiscus*, Cuautla, Morelos, Mexico, May 29, '97. Koebele." (8) A final slide from the same source, bearing one male, nine females, together with specimens of *townsendi* and *flavella*, labeled "1744. *Aspidiotus* on *Celtis occidentalis*, Amecameca, Mexico, Mex., June 7, '97. Koebele."

Habitat.—United States of America—Florida (Jacksonville, Orlando); California (San Gabriel); Georgia (Savannah). Mexico—Morelos (Cuautla); Mexico (Amecameca). West Indies—Trinidad (Tunapunta).

Hosts.—*Lepidosaphes beckii* Newman (Florida); *Aspidiotus aurantii citrinus* Coquillett (California); *Chionaspis* sp., on Magnolia (Georgia); *Aspidiotus camelliae* Signoret, on acacia (Mexico); *Aspidiotus* sp., on *Hibiscus* (Mexico); *Aspidiotus* on *Celtis occidentalis* (Mexico).

Type.—The single female specimen as indicated in foregoing. *Homotypes*.—Accession No. 45089, Illinois State Laboratory of Natural History, Urbana, 1 male, 1 female on a single slide (Tunapunta, Trinidad). For types of the synonymic *occidentalis*, see before.

Some years after its original description the author¹ of this species amended his former description as follows: Head and abdomen blue-black; thorax, except the pronotum, bright yellow; wings hyaline, with a dusky band beneath the marginal vein.

As has been intimated, the species was redescribed as new to science by Howard (1894), under the name *occidentalis*. The original description of *occidentalis* agrees closely with the type specimen of *flavopalliat*a Ashmead and because of the fact that the structural characters of the types of both are identical and that the difference in coloration between them is small, other specimens gradating between, it is quite evident that there is some color variation and that *occidentalis* represents the variation bearing a minimum amount of yellow on the thorax; also the brown of the body evidently varies, being very deep in some specimens, nearly, if not, black; usually, however, brown predominates. But it must be remembered that I have not seen specimens in nature. The fumated area of the fore wing may also vary, sometimes breaking into spots disto-cephalad.

I append the original description of *occidentalis* for completeness and convenience.²

SIGNIPHORA OCCIDENTALIS, n. sp.

Female.—Length, 0.53 mm.; expanse, 1.2 mm.; greatest width of fore wing, 0.09 mm. Antennal scape robust, reaching to middle of eyes; pedicel large, stout, rather more than one-third as long as scape; funicle joints 1, 2, and 3 subequal in diameter, very small, together only a little over one-third length of pedicel and considerably less than the tip width of the pedicel; increasing in length from 1 to 3; club nearly as long as scape and pedicel together, long oval when seen from side, twice as wide as pedicel, narrow with parallel sides when seen from above, scarcely wider than funicle joint 3.

¹ Ashmead, 1900, p. 409.

² Insect Life, vol. 6, 1894, p. 235.

Marginal vein with six strong bristles, stigmal with one, submarginal with one. Middle femora with a strong spine near inner side of tip, tibiæ with three strong external spines, two near base and one near tip. Color (from balsam-mounted specimens only): Head, pronotum, metanotum and abdomen, dark brown, nearly black, eyes dark red; mesonotum bright lemon-yellow; all legs and antennæ fuscous; mouth parts light-brown, mandibles tipped with black; wing veins fuscous; fore-wings with an indefinite fuscous patch occupying entire disk except at base and apical fourth.

Male.—Resembles female, except that it is rather larger and has the entire mesoscutum brown, leaving the yellow band to inclose mesoscutellum and metascutum.

Described from two females, three male specimens reared by D. W. Coquillett, from *Aspidiotus aurantii* var. *citrinus* Coquillett, from San Gabriel, Cal., May 30, June 1 and 3, 1887.

2. SIGNIPHORA NIGRA Ashmead.

Signiphora nigra ASHMEAD, 1900, pp. 409, 410.

Ashmead described this species as follows:

Female.—Length, about 0.55 mm. Polished black, impunctate, but with a decided aeneous tinge in certain lights. Flagellum brown-black. Legs black, the anterior and middle tibæ brownish, their tips and all tarsi white. Wings with the basal half or more fuliginous, the apical half or less hyaline.

Type.—Cat. No. 4767, U.S.N.M. (Ashmead collection.)

Habitat.—District of Columbia; Washington.

It has never been mentioned in the literature since. I have the following notes concerning it, taken from the type and other specimens: Original description correct; the body is finely polygonally reticulated and opaque, not metallic; structurally it differs from *flavopalliata* as follows—The discal bristle of the fore wing is absent; the marginal cilia of the fore wing are very much shorter, moderately short, very much shorter than the wing's greatest width (the length about a fourth or less of the wing's greatest width) and slightly shorter than the longest marginal cilia of the posterior wings; the fuscous area of the fore wing extends less farther distad (proximal third of the wing clouded), only to the distal third of the marginal vein but, however, the apical third of the wing may be slightly embrowned; the bristles on the venation are more numerous, on the submarginal vein at least two, but on the marginal but six (not counting several very minute ones) and on the stigmal but one which is not apical; the venation differs—thus the stigmal vein makes but little angle with the marginal; its sides are parallel; it is narrow and straight or else conic, its inner (caudal) margin not forming a distinct concave curve with the inner margin of the marginal vein or but a very slight curve of that sort; the marginal vein is slightly longer and more slender, slightly longer than the submarginal and its caudal margin is less emarginated; the fuscous area of the fore wing is broken by a more or less irregular subquadrate to elongate clear area near the caudal margin under the base of the marginal vein. The distal tarsal joints are dusky; the cephalic tibial spur is long, slender and curved, at tip dividing into two slender tines. The

caudal wings are broad, nearly twice broader than in *flaviopalliata*. Excepting for the uniform blackness of the body, otherwise as in *flavopalliata*. The male is similar to the female.

Nothing was known concerning the hosts of this species, but I add a record beyond. I have studied the following specimens: The types from the United States National Museum collection remounted in balsam from tags labeled "*Signiphora nigra* Ashm., female, type No. 4767, U.S.N.M., Washington, D. C." The single type slide bears in reality three males and two females which comprise the types formerly by implication all females. A slide bearing a single male specimen remounted from a tag in the same collection labeled "Los Angeles, Calif. *Coccus hesperidum* L. 160°. Aug." And a third slide bearing two males remounted from tags in the same collection, labeled "Washington, D. C."

Habitat.—United States—Washington, District of Columbia; California (Los Angeles).

Host.—*Coccus hesperidum* Linnæus.

Types.—The three males, two females as indicated in foregoing.

Homotypes.—Accession No. 45087, Illinois State Laboratory of Natural History, Urbana, the two males from U.S.N.M. collection as noted above (Washington, District of Columbia).

3. SIGNIPHORA AUSTRALIENSIS Ashmead.

Signiphora australiensis ASHMEAD, 1900, pp. 409, 410.

The original description of this species is exactly as follows:

Female.—Length, 0.60 mm. Aeneous black, the mesonotum with a bronzy tinge, the scutellum with a slight bluish tinge; legs black, a spot on knees and tarsi white or yellowish-white, the anterior tibiæ yellowish beneath; wings fuscous with a hyaline band across the disk from apex of the marginal vein.

Type.—Cat. No. 4771, U.S.N.M.

Habitat.—Australia. (Albert Koebele, collector.)

Host.—Rhynch.: Sp. not identified.

By studying the types I am enabled to offer the following additional descriptive details: Like *nigra* but differing colorationally in that the head and thorax are metallic to some extent, the vertex and mesonotum distinctly metallic green (but not in balsam mounts), the latter finely transversely lined; body finely polygonally sculptured, including the abdomen (the sculpturing not distinct in balsam mounts); the fore wings differ as described—they are embrowned throughout, but somewhat distad of the middle there is a broad clear band, subcrescentic in shape and touching the costal margin at the apex of the stigmal vein. This area is broader at the caudal margin than at the cephalic one, barely reaching the latter; the stigmal vein differs in that it is like a short conical prolongation bending off slightly from the marginal; thus it is short and much broader at its point of origin than is the case with that of *nigra*.

Like *nigra*, there is also a clear area proximad, but this is somewhat more prominent with this species. (See beyond.) The male is like the female.

The species has not been mentioned again in the literature; it is variable, as will be shown later.

I have studied the following specimens: The tag-mounted types now remounted in xylol-balsam; these were and are labeled "*Signiphora australiensis* Ashmead, female. Type No. 4771, U.S.N.M. Australia. Koebele. 12." The type consists of three females. Also a slide from the collections of the United States Department of Agriculture, Washington, District of Columbia, bearing 2 males and 12 females and labeled "1849. Acanthococcid on *Eucalyptus*. Gosford, N. S. W., Nov. 1899. A. Koebele." These specimens varied considerably in the fumation of the fore wing and in the length of the marginal fringes. In all of them the latter were distinctly shorter than in the type specimens, while the majority of the specimens showed the clear, subhyaline band at the middle very indistinctly, not clear cut as in the type specimens excepting with several of them. Casually, in most of these specimens, the fore wings appeared to be fumated throughout, the cloudiness gradually fading out distad. I have since captured a female specimen of this species on a window of a barn at Roma, Queensland, October 6, 1911.

Habitat.—Australia—New South Wales (Gosford); Queensland (Roma).

Host.—Acanthococcid on *Eucalyptus*.

Types.—The three females as indicated in foregoing.

4. SIGNIPHORA DACTYLOPII Ashmead.

Signiphora dactylopii ASHMEAD, 1900, pp. 409, 410.

The original description runs as follows:

Female.—Length, 0.58 mm. Blue-black, the mesonotum with an aeneous tinge anteriorly; legs concolorous with the body, except the tarsi, which are white; wings hyaline, with a fuscous band across the middle from beneath marginal vein to the hind margin.

Type.—Cat. No. 4772, U.S.N.M.

Habitat.—District of Columbia.

Host.—Rhynch. *Pseudococcus ephedræ* (Coquillett). Bred at Department of Agriculture.

The following descriptive notes are added, taken from the types and the specimens mentioned beyond: Like *nigra* but differing in that the vertex and mesonotum are metallic green, the former smooth and shining but with scattered pin-punctures; the mesonotum is finely transversely lined; the proximal joint of the posterior tibiæ is as long as the same joint of the intermediate tibiæ; the fore wings are hyaline with the exception of a broad band across them somewhat before the middle, from the marginal vein; the proximal margin of

this band is irregularly concaved and consequently it is narrower near the middle than at either end; the marginal cilia of the fore wing somewhat shorter than in *nigra*; caudal wings broad; submarginal vein with three bristles; stigmal vein intermediate between *nigra* and *australensis*; otherwise like the latter. Cephalic tibial spur 2-tined at apex. Male like the female. Mandibles bidentate, the teeth subequal, small, acute and black at their tips.

These notes from the following specimens: The types, 1 male, 3 females, formerly on tags, now remounted in xylol-balsam (1 slide). They are labeled "*Signiphora dactylopii* Ashm., females. Type No. 4772. 4713°.¹ Par: on *Pseudococcus ephedræ* Coq." Also in the United States National Museum collection, three females in xylol-balsam (1 slide) remounted from tags and labeled "*Signiphora dactylopii* Ashm., female. Roswell, N. Mex. Cockerell," determined by Ashmead; and one female similarly remounted and bearing the label "3821^{xi}."

Habitat.—United States—District of Columbia; New Mexico (Roswell).

Host.—*Pseudococcus ephedræ* Coquillett.

Types.—The one male, three females as indicated above.

Homotypes.—Accession No. 45086, Illinois State Laboratory of Natural History, Urbana, one female on a slide labeled "3821^{xi}" as mentioned above.

5. SIGNIPHORA NOACKI Ashmead.

Signiphora noacki ASHMEAD, 1900, pp. 409, 410; 1904, p. 497.

The original description is:

Female.—Length, 0.50 mm. Coal-black, except a whitish line on the hind margin of the mesopleura, along the suture separating it from the metapleura and the tarsi, which are white; wings wholly hyaline.

Type.—Cat. No. 4773, U.S.N.M.

Habitat.—Brazil: San Paulo. (F. Noack.)

Host.—Rhynch.: *Psylla* sp. on a wild shrub. Bred October, 1897, by F. Noack.

The species is based upon male specimens and is quite as described but the fore wings are not wholly hyaline, the proximal fourth smoky or fuscous, or from the base out as far as a point somewhat beyond the apex of the submarginal vein; the body is finely, polygonally sculptured, finely transversely lined at the mesoscutum. From *nigra*, *australensis*, and *dactylopii*, to which group of species it belongs, this species may be distinguished at once by reason of the fact that the marginal fringes of both wings are long and subequal, those of the fore wing nearly as long as that wing's greatest width (about two-thirds of the greatest width), those of the caudal wing slightly longer than the greatest width of that wing. Again, the venation

¹ The original note says the material came from Los Angeles, Cal., and this instead of the District of Columbia is the correct type locality.—J. C. CRAWFORD.

differs—the caudal margin of the stigmal vein and that of the marginal at apex unite in a distinct concave curve as in *flavopalliata* Ashmead; the discal bristle is absent, as is also the oblique crease.

The proximal tarsal joint of the intermediate legs is much longer than the same joint of the caudal legs, which, however is as long as in *nigra*. The middle tibial spur is long and slender and bears about 10 spines; apparently the cephalic tibial spur is many-tined as in *flavopalliata*; caudal tibial spur single, short, straight. The species may be distinguished from *flavopalliata* structurally through the fact that it is larger and more robust, the caudal wings are much broader, the broader fore wings and their somewhat shorter marginal cilia, the very much longer proximal tarsal joints of the last two pairs of legs and the longer stigmal vein. Colorationally, of course, easily distinguished from *flavopalliata*. Also allied with *maxima*, *pulchra*, and *nigrella*¹; from these species it differs in those points brought out in the table of species given later. Its caudal wings are somewhat broader than those of both *pulchra* and *nigrella*. Female unknown.

The following specimens have been studied: The two type specimens (both males?) in the United States National Museum collection now remounted on a single slide in xylol-balsam; they were and are labeled “*Signiphora noacki* Ashm., female. Type No. 4773, U.S.N.M. 7760°. Par: in Psyllid on wild shrub. San Paulo, Brazil, Oct. 97.”

Habitat.—South America—Brazil (Sao Paulo).

Host.—A psyllid on a wild shrub.

Types.—The two males as indicated above.

6. SIGNIPHORA UNIFASCIATA Ashmead.

Signiphora unifasciata ASHMEAD, 1900, pp. 409, 410, 411.

The original description is as follows:

Female.—Length, about 0.70 mm. Black, with a narrow yellowish-white band across base of scutellum and continued below on the hind margin of the mesopleura and along the mesosternal suture; tarsi white, wings hyaline.

Type.—Cat. No. 4774, U.S.N.M.

Habitat.—Florida: Georgiana. (Dr. Wittfield.)

Host.—Rhynch: *Ceropsylla sideroxyli* Riley.

This species also belongs to the *nigra* group but on account of its coloration is placed in a group of its own; it is correctly described but the wings are not hyaline; the body is opaque black and finely polygonally sculptured. Structurally it resembles *noacki* Ashmead but may be distinguished by these characters; the stigmal vein is shaped differently; its inner or caudal margin is convex rather than concave and does not form a regular concave curve with the inner margin of the marginal vein but only an obtuse angle; its cephalic

¹ All three described later on in this paper.

margin is concave not convex as in *noacki*; moreover its tip points disto-cephalad, not distad; the wings are more robust but the marginal cilia are the same relatively as in *noacki*; the cephalic tibial spur is slender, curved at apex and beneath fimbriate bearing about 16 times which gradually increase in length distad; otherwise, except as already described for color, as in *noacki*. The fore wings are smoky out to the middle of the marginal vein (or proximal third) but the smoky area is fainter caudad.

I have studied the following specimens: Only the single female type specimen found remounted on a tag and placed with a female of *fasciata*.¹ Consequently it was remounted on a slide in xylol-balsam with the latter before the two were known to be distinct. The type bears the following label: "*Signiphora unifasciata* Ashmead. Type No. 4774, U.S.N.M. 350⁰¹. Iss. Dec. 19, '81." As stated it is mounted with a female of *fasciata*.

Nothing more can be added concerning it.

7. SIGNIPHORA BIFASCIATA Ashmead.

Signiphora bifasciata ASHMEAD, 1900, pp. 409, 411.

The original description is as follows:

Female.—Length, about 0.60 mm. Black with two transverse yellow bands on thorax above between the tegulae, or on the hind border of the mesonotum, the other at the base of the scutellum, the latter also continued along the mesopleural suture; legs black or blackish, the knees yellowish, the tarsi whitish; wings hyaline.

Type.—Cat. No. 4775, U.S.N.M.

Habitat.—West Indies: St. Vincent. (H. H. Smith.)

I have not been able to see the type of this species, which is a unique in the collections of the United States National Museum, formerly mounted on a tag, now mounted in balsam. It should be easily recognized though it is perhaps needful to call attention here to the fact that the fore wings are probably infuscated in some manner, probably near base, this being overlooked by the describer (as in the case of some of the other species when the infuscation was proximal). Nothing is known concerning its habits.

After writing the foregoing, Mr. J. C. Crawford of the United States National Museum was kind enough to examine the type for me in regard to certain of its characters and I have learned from him that after remounting in balsam there is no noticeable metallic coloration; the fore wings are lightly fumated out to the end of the stigmal vein; the transverse thoracic bands are contiguous and yellowish white and distinct, more distinct in the tag-mounted specimen than after it was remounted in balsam; the inner margin of the stigmal vein is nearly straight; the marginal cilia of the fore wing are moderate in length, about a third of the wing's greatest width; the discal bristle is present; and that the posterior wing is broad, its margins not parallel but the wing broadening toward the apex.

¹ Described beyond.

8. SIGNIPHORA MEXICANA Ashmead.

Signiphora mexicana ASHMEAD, 1900, pp. 409, 411.

The original description is as follows:

Female.—Length, about 0.45 mm. Head, thorax, antennæ, and legs, except tarsi, brownish-yellow; abdomen æneous black; tarsi white; mesonotum margined with yellow at sides; wings hyaline.

Type.—Cat. No. 4776, U.S.N.M.

Habitat.—Mexico: San Luis.

Host.—Rhynch.: *Aspidiotus nerii* Bouché. (Tyler Townsend.)

On account of its obscure coloration I first thought that this species was synonymic with *flavopalliata* which it resembles, but the following characteristics separate it from that species, aside from coloration, which is more or less difficult to detect, in balsam specimens especially. The narrow fore and posterior wings are replaced in *mexicana* by broad ones; the posterior wings in *mexicana* are twice the width of those in the type species and the same statement is nearly true for the fore wings; the marginal ciliation is long and holds the following relations: The longest of the fore wing are not more than two-thirds as long as the fore wing's greatest width; the longest of the caudal wings are somewhat longer than the greatest width of those wings; thus, of the caudal wings especially, the marginal cilia are not very much longer than the greatest width of the wing as in *flavopalliata*. The discal bristle is present. Otherwise structurally, apparently like the type species; however, the submarginal vein bears two bristles. Coloration of the type specimen as described, excepting that the fore wing at least is not hyaline but distinctly embrowned, very much as in *flavopalliata*, sometimes, as in that species, mottled distad. The mesonotum is finely lined transversely; the color of body is variable; thus, in the specimens noted below, a few are present which had all of the thorax brown, while most of them had all of the mesonotum as dark as the abdomen; in one specimen nearly all of the abdomen was brown, suffused with dusky. A large robust species with broad wings; the antennal club is more roughly longitudinally striated than usual.

I have studied the following specimens: The single female type specimen, remounted in balsam from a tag, labeled "*Signiphora mexicana* Ashm., female. Type No. 4776, U.S.N.M. 470°. = 13 Townsend. 12 Oct., '94. Par. on *Asp. nerii*, San Luis, Mex." The head is missing. Also the following from the collections of the United States Department of Agriculture: Seven females on a slide with *coquilletti* and other coccid parasites, labeled "1725. *Aspidiotus* on common wild shrub on streams: Calif.; Cuautla, Morelos, Mex., July 1, '97. Koebele." One male, seven females with a female of *flavella* and *Perissopterus mexicana* Howard, on a single slide labeled "1722. *Aspidiotus* on *Cirucla*, Cuautla, Morelos, Mex., July

1, '97. Koebele." Another slide bearing a pair together with *flavopalliata* and *townsendi* and several aphelinines labeled "1768. *Aspidiotus* on *Hibiscus*. Cuautla, Morelos, Mex., May 29, '97. Koebele."

Habitat.—Mexico (San Luis; Cuautla, Morelos). United States—California.

Hosts.—*Aspidiotus hederæ* Vall (Mexico); *Aspidiotus* sp. on common wild shrub (California and Mexico); *Aspidiotus* sp. on *Ciruella* and *Hibiscus* (Mexico).

Type.—The single female as indicated above.

Homotypes.—Accession No. 45092, Illinois State Laboratory of Natural History, Urbana, 1 male, 7 females (Cuautla, Mexico) on one slide with homotype female of *flavella*.

9. SIGNIPHORA RHIZOCOCCI Ashmead.

Signiphora rhizococci ASHMEAD, 1900, pp. 409, 411; 1904, p. 497.

This species was described 11 years ago by Ashmead exactly as follows:

Female.—Length, about 0.50 mm. Head anteriorly, a broad band on thorax between the wings and the sutures between abdominal segments, more or less, ivory white; club of antennæ and vertex faintly dusky; anterior orbits narrowly, rest of body and a broad band in middle of front wings, dark brown.

Type.—Cat. No. 4858, U.S.N.M.

Habitat.—Brazil: Minas Geras.

Host.—Rhynch.: *Rhizococcus* sp. on a composite plant. Bred by F. Noack, July, 1897. One specimen."

I have studied only the type of this species, probably a male mounted on a slide labeled "7902°.¹ Par: on *Rhizococcus* on composite plant from F. Noack, Bella Horizonte, Minas Geras, Brazil, July, 1897. *Signiphora* sp. *rhizococci* Ashm. Type 4858." The caudal half of the abdomen is missing.

The species appears to be a well-marked one and should be easily recognized; nevertheless, it is fortunate that its principal structural characteristics can be pointed out. Nothing is known of it excepting what is given with its original description. The following structural characteristics: Like *flavopalliata* excepting as pointed out later in the table of species. The mandibles are bidentate and black at tip; antennæ normal.

10. SIGNIPHORA ALEYRODIS Ashmead.

Signiphora aleyrodis ASHMEAD, 1900, pp. 409, 412.

This species was described at the same time as most of the others:

Female.—Length, about 0.50 mm. Body mostly golden-yellow; vertex of head faintly dusky; thorax anteriorly and very narrowly, and a band across base of abdomen

¹ The host has since been determined as *Eriococcus braziliensis* Cockerell.—J. C. CRAWFORD.

including hardly one-third its length, dark brown; wings hyaline, with a dusky band across the middle just beneath the marginal vein, which is a little narrower at the hind margin than at its origin; antennæ and legs entirely pale yellowish white.

Type.—Cat. No. 4855, U.S.N.M.

Habitat.—West Indies: Trinidad.

Host.—Rhynch.: *Aleyrodes* sp. on orange. Two specimens, Acc. No. 6162, Department of Agriculture.

This species agrees structurally with *flavopalliata* nearly. However, the discal bristle is absent from the fore wing; the stigmal vein is slightly longer and proximad slenderer, thus with more or less of a short neck; the antennal club enlarging distad, clavate. Otherwise I can not distinguish them. The original description of the species is correct, but not only the whole of the pronotum, but over the cephalic third of the mesonotum is dark brown; also, usually, but not always, the extreme tip of the abdomen and valves of the ovipositor. The dark band of the abdomen includes apparently the first and second segments and is at least a third of the length of the abdomen. Eyes naked; mandibles bidentate, the two acute teeth black at tips; cephalic tibial spur many-tined. The male is like the female. The oblique narrow crease of the fore wing is present but not the discal bristle. The species is somewhat variable in color. The tip of the antennal club may be dusky and a second band may be indicated on the abdomen by the presence of a dark spot on each side at distal three-fourths or even a whole convex band at that place.

I have studied the following specimens: The types consisting of three female specimens on a single slide in the collections of the United States National Museum, labeled "Type. *Signiphora aleyrodis* Ashm. Bred from *Aleyrodes* on Orange, etc. Trinidad, W. I. 6162." Relabeled, with type number. Two females on a slide from the collections of the United States Department of Agriculture labeled "1°3 C. Gn. 2, sp. 3. Saman, Peru. May 25. T." and reared by C. H. Tyler Townsend. (Homotypes.) A slide from the same collection bearing 10 males and 9 females together with the type of *Polynema aspidioti* Girault and labeled "1734. *Aspidiotus carinatus* [= *Lepidosaphes carinata* (Cockerell)] on Lime, Cuautla, Morelos, Mex., July 2, '97. Koebele." And fourthly, a slide bearing a single female from the same collection labeled "*Asp. ficus* [= *Chrysomphalus aonidum* (Linnæus)] and *A. dictyospermi?* on *Kentia*, Westgrove, Pa. A. F. Satterthwait, Feb. 8, 1908." Still another specimen, a male, has been seen, remounted on a slide with the homotype of *S. flava* and labeled "*Asp. camelliæ* on *Acacia* sp. Mexico. From A. L. Herrera, Dec. 15, 1905."; and another female on a slide from the United States Department of Agriculture collections, labeled "1453°3a. C. H. T., Lima, Peru. Nov. Gen. 2 d. sp. No. 5, Jan. 16, '10. T." and reared by C. H. Tyler Townsend.

Habitat.—West Indies (Trinidad); Mexico—Morelos and Vera Cruz. United States—Pennsylvania (Westgrove). Peru—(Lima; Payta; Saman).

Hosts.—*Aleyrodes* sp. on orange (Trinidad); *Lepidosaphes carinata* Cockerell on lime and *Aspidiotus camelliæ* on acacia (Mexico); *Chrysomphalus aonidum* Linnæus and *C. dictyospermi* on *Kentia* (Pennsylvania); *Aspidiotus* sp. on *Myrtus* (Mexico).

Types.—The three females indicated above.

Homotypes.—Accession No. 45094, Illinois State Laboratory of Natural History, Urbana, 2 females on a slide (Saman, Peru).

The following additional specimens: A slide from the collections of the United States Department of Agriculture bearing a single female and labeled "14°3a. Payta. Gen. Nov. 2d. sp.3d. C. H. T. Jan. 2, '10. T." and taken in Peru by C. H. Tyler Townsend. A male specimen on a slide with an *Aphelinus* from the same collection, labeled "1705. *Aspidiotus* sp. on *Myrtus* sp. Orizaba, Vera Cruz, Mex. July 15, '97. A. Koebele."

11. SIGNIPHORA COQUILLETTI Ashmead.

Signiphora coquilletti ASHMEAD, 1900, pp. 409, 412.

The original description is as follows:

Female.—Length, hardly 0.50 mm. Bright golden-yellow; vertex of head fuscous; thorax *entirely*, and abdomen, except a dark brown band at base which occupies fully one-third or more of its length, yellow; otherwise as in *Aleyrodis*.

Type.—Cat. No. 4857, U.S.N.M.

Habitat.—Rhynch.: *Aleyrodes* sp. on *Quercus agrifolia*.

Easily distinguished from *S. aleyrodis* by the fuscous vertex and the absence of the brown blotch on the anterior part of the thorax.

This species is like *aleyrodis* nearly but differs more than merely having the brown band across the abdomen slightly longer. Colorationally, it may be distinguished from *aleyrodis* thus and not otherwise: The latter is pallid or lemon yellow whereas *coquilletti* is deep orange in color, a striking difference when compared side by side; consequently, the brown band of the abdomen is more striking in *coquilletti* and has more black in it. Structurally, I am unable to separate the two species with the exception that the body of this species is a little more compact, slightly more robust and the wings perhaps a trifle broader. The mandibles are bidentate and black at tips. It varies considerably in size and some specimens may be twice the size of others. I have seen one specimen (female) among other typical ones which had all the abdomen black.

I have studied the following specimens: The single type female specimen mounted on a thick common glass slide in the United States National Museum collection, labeled "*Signiphora coquilletti* Ashm., female. Bred from *Aleyrodes* on *Quercus agrifolia*. Type 4857. Oct. 4, 1887. (72." and probably reared in California by Coquillett

(judging from the name, label, slide, and date). A slide bearing two females from the collections of the United States Department of Agriculture, labeled "No. 3. *Aleyrodes coronatus* on live oak. Groville, Cal. H. '07." Another slide from the same collection bearing four females, labeled "8183°. Par: on *Orthezia* sp.? Campesas,¹ Brazil. Fritz Noack." Another slide from the same collection bearing two females and the label "416^a. *Asp.* on quince, Fla. Mar. '80." Two females borne on another slide from the same source and bearing the label "(8). Bred from *Aleyrodes* sp. Pasadena, Cal., May, 1908." *Homotypes*. One female on a similar slide, together with two alphelinines, labeled "(18). 2 sps. Bred from *Aleyrodes gelatinosus* on oak, Los Angeles, Cal., April, '08." Five females on a slide from the same source bearing the label "Morrill No. 511" and probably taken in Florida (judging from the label). Another slide from the same source bearing three females, together with a female of *Prospaltella citrella* Howard and labeled "Morrill No. 508 and No. 511. 1 spec. of 508 and 3 specs. of 511" (judging from the label, from Orlando, Florida). A final slide labeled "1813. *Aspidiotus subrubescens* Mask. on Oleander, Honolulu, H. I. A. Koebele. 10.III.99." and bearing two females together with many specimens of an *Aphelinus*. In addition, two females of this species on a slide with *mexicana*, from the United States Department of Agriculture collections, labeled "1725. *Aspidiotus* on common wild shrub on streams: Calif.; Cuautla, Morelos, Mex. July 1, '97. Koebele."

Habitat.—United States—California (originally San Gabriel?; Groville, Pasadena, Los Angeles); Florida (? Orlando). Hawaiian Islands (Honolulu). South America—Brazil (Campesas?). Mexico (Cuautla, Morelos).

Hosts.—*Aleyrodes* sp. on *Quercus agrifolia*, *Aleyrodes coronatus* on live oak and *Aleyrodes gelatinosus* on oak (California); *Orthezia* sp. (Brazil). *Aspidiotus subrubescens* Maskell on oleander (Hawaii). *Aspidiotus* sp. (Mex.; California).

Type.—The single female as noted above.

Homotypes.—Accession No. 45095, Illinois State Laboratory of Natural History, Urbana, two females in xylol-balsam, 1 slide (Pasadena, California).

12. SIGNIPHORA ASPIDIOTI Ashmead.

Signiphora aspidioti ASHMEAD, 1900, pp. 409, 412.

On the same page that *coquilletti* was described, Ashmead described a new species under the name of *aspidioti* in the manner quoted below. This species is identical with *coquilletti* structurally, but differs in that the distal half of the antennal club is dusky, a phenomenon not observed in the series of specimens of *coquilletti* examined by me but which would be expected to occur in a number of specimens if it was

¹ On the label merely this: "Camp.—"

merely an incidental variation. I can not do otherwise than consider *aspidioti* valid. Its original description was in this manner:

Female.—Length, about 0.50 mm. Lemon or golden yellow; head faintly dusky above; apical half of antennal club, anterior half of mesonotum, and a broad transverse band at base of abdomen, including nearly half its length, dark brown; wings with a broad fuscous band, as in previous species.

Type.—Cat. No. 4859, U.S.N.M.

Habitat.—Mexico: San Louis.

Host.—Rhynch.: *Aspidiotus nerii* Bouché. [= *hederæ* Vall.] Bred November, 1894, by Tyler Townsend.

Besides the type specimen, I found another female specimen of it in the collections of the United States National Museum labeled "470⁰². Bred from *Aspidiotus nerii* [= *hederæ* Vall.], San Luis, Mex., November, '94." This specimen is evidently an original one. I have labeled it as a *homotype*. The antennal club in *aspidioti* is more clavate and longer than that of *coquilletti* apparently. The single type female is labeled as the specimen just noted and, additionally, "4859," the type number.

13. SIGNIPHORA TOWNSENDI Ashmead.

Signiphora townsendi ASHMEAD, 1900, pp. 409, 412.

The original description of this insect is as follows:

Female.—Length, about 0.45 mm. Mostly dark brown; a broad band between the wings including the hind margin of the mesonotum, scutellum, and metathorax, and the apical third of abdomen, or less, lemon yellow. Wings hyaline, as in previous species, but the fuscous band has a deep median hyaline emargination on its basal margin. Antennæ and legs pale yellowish, the club rather short, about one-third shorter than in the other species.

Type.—Cat. No. 4856, U.S.N.M.

Habitat.—Mexico: Tabasco.

Host.—Rhynch.: *Aleyrodes* sp. on a coarse grass. Bred by Tyler Townsend, June 19, 1897. Four specimens.

When examining the type of this species I had first thought that it must be synonymic with *coquilletti*, or else *flavopalliata*; it agrees with the former structurally, but differs from the latter in lacking the discal bristle. Colorationally, it differs from *coquilletti* in that the yellow of the body is lemon yellow, not orange yellow; or, in other words, lighter in shade; also there is much more brown or dark brown present. A structural difference is present, too, in that the curve made by the inner margin of the stigmal vein is deeper and somewhat narrower in *townsendi* than in *coquilletti* and the marginal vein at the proximal end of the curve is distinctly broader and obtuse, not narrower and acute at the bristle there as in *coquilletti*. This appears to be characteristic, but I am uncertain whether it is real or not.

The following specimens: The four type females on a single slide labeled "7841⁰¹. Par: on *Aleyrodes* on coarse grass, Tabasco, Mex.

¹ The original note gives the type locality as Sangrillo del Chico Sapote, Tabasco, Mexico.—J. C. CRAWFORD.

June 19, '97. (Townsend.) *Signiphora townsendi* Ashm." Also the following specimens in the collections of the United States Department of Agriculture: A single female on a slide with a *Prospaltella*, labeled "1745. *Aspidiotus* sp. on soft wooded fibrous tree, Cordoba, Mex." One female on a slide with *mexicana* and *flavopalliata* and some aphelinines, labeled "1768. *Aspidiotus* sp. on *Hibiscus*, Cuautla, Morelos, Mex. May 29, '97. Koebele." A third female on a similar slide with *flavopalliata* and *flavella*, labeled "1744. *Aspidiotus* on *Celtis occidentalis*. Amecameca, Mexico, Mex. June 7, '97. Koebele." One male, six females on a single slide labeled "*Hemich. lataniæ* on peach, Whitesboro, Tex. J. M. Buchanan. Let. Jan. 25, 1908. Bred Feb. 23, 1908. E. R. S." A male on a slide labeled "*Diaspis pentagona* Targ. and *Asp. perniciosus* on cherry, Washington, D. C. E. R. Sasser, Aug. 21, 1907." Two females on a slide labeled "C. H. T. Lima, Peru. 219° 3°. Nov. gen. 2d. (2 spms.) sp. 2. Dec. 31, '09. T." Finally, a slide bearing a single male labeled "1629. *Aspidiotus* sp. *Quercus engelmanni*, Amecameca, Mex. 25.5.97. Koebele." And one bearing 5 males, 9 females + 1 of *townsendi* and labeled "1723. *Aspidiotus* on pyramidal willow near city Mexico, July 7, '97."

Hosts.—*Aleyrodes* sp. on coarse grass (Tabasco, Mexico); *Aspidiotus* on soft-wooded fibrous tree (Mexico); the same on hibiscus and *Celtis occidentalis* (Mexico); *Aspidiotus lataniæ* Signoret on peach (Texas); *Diaspis pentagona* Targione and *Aspidiotus perniciosus* Comstock on cherry (District of Columbia, U. S. A.); *Aspidiotus* sp. on *Quercus engelmanni* (Mexico).

Habitat.—Mexico—Tabasco, Cordoba, Cuautla (Morelos), Amecameca (Mexico). United States—Washington, District of Columbia, and Texas (Whitesboro). Peru (Lima).

Types.—The four females as noted above.

Homotypes.—Accession No. 45090, Illinois State Laboratory of Natural History, Urbana, 1 male, 6 females on one slide (Whitesboro, Tex.).

DESCRIPTIONS OF NEW SPECIES.

The following species were discovered while revising the genus. The descriptions were all made from study under equal magnification.

14. SIGNIPHORA FLAVA, new species.

Normal position.

Female.—Length, 0.65 mm. Moderate in size.

General color lemon yellow, immaculate, or nearly, but the vertex and antennæ suffused with dusky as is also the extreme tip of abdomen; the whole body slightly suffused with orange; legs and antennal scape concolorous with body; remainder of antenna dusky; distal tarsal joints concolorous with remainder of legs; tips of mandibles black; eyes dark red; venation lemon yellow suffused with dusky;

fore wings fuscated nearly to tip but the fuscation is pronounced and conspicuous only under the venation or but slightly distad of it; caudal wings nearly hyaline; proximal portion of fore wing clearer or wholly clear; structurally, nearly as in *flavopalliata* from which I am hardly able to distinguish it; the stigmal vein, however, is longer as is also the proximal joint of the cephalic tarsi and the body is more robust. The discal bristle of the fore wing is absent and the antennal club is long and clavate, the pedicel long-obconic, four times longer than its width at apex.

Male.—Unknown.

Described from a single female specimen in the collections of the National Bureau of Entomology, mounted on a balsam slide and labeled "C. H. T., Lima, Peru. 192° 3a. Nov. Gen. 2nd sp. 1. Dec. 31, 09. T." (*Type*.) Also another mounted on a slide with *S. aleyrodīs* and bearing the label "*Asp. camelliæ* on *Acacia* sp. Mexico. From A. L. Herrera, Dec. 15, 1905." (U. S. Department of Agriculture. *Homotype*, female.)

Habitat.—Peru (Lima); Mexico.

Host.—*Aspidiotus camelliæ* Signoret on *Acacia* in Mexico (*homotype*).

Type.—Cat. No. 14195, U.S.N.M., one female in balsam.

Homotype.—Accession No. 45096, Illinois State Laboratory of Natural History, Urbana, 1 female on a slide with a male of *S. aleyrodīs* (Mexico).

15. SIGNIPHORA FLAVELLA, new species.

Normal position.

Female.—Length, 0.48 mm., mean. Small in size.

General color as in *flava* but the abdomen suffused with orange, especially along each side of the middle; differs from *flava* as follows: The stigmal vein forms a less regular and shorter concave curve, along its inner margin, with the apex of the inner margin of the marginal vein, but it is convex instead of concave at its point of origin. The fore wings are distinctly narrower but with the marginal cilia as long in proportion (long, graceful, distinctly longer than the greatest width of the wing). Otherwise the same in all visible details, except the wings, which are nearly similarly embrowned, but less deeply; also the antennal club is dusky at tip or distal fifth instead of being wholly dusky. The pedicel of the antenna is noticeably shorter and stouter, while the antennal club is noticeably shorter.

Male.—Unknown.

Described from four female specimens mounted on a slide with *S. basilica*, new species¹ and from the collections of the National Bureau of Entomology (U. S. Department of Agriculture). The slide bore the label "*Signiphora. Aspidiotus lataniæ. Sapodella. Ochras*

¹ Described next.

sapota. Miami, Fla. E. A. Bessey. Bred June 8, 1908." Also from the same collection, another female with specimens of *mexicana* on a slide bearing the labels "1722. *Aspidiotus* on Ciruela, Cuautla, Morelos, Mex. July 1, '97. Koebele." And a third slide bearing another female with specimens of *flavopalliata* and *townsendi*, labeled "1744. *Aspidiotus* sp. on *Celtis occidentalis*, Amecameca, Mexico, Mex. June 7, '97. Koebele."

Habitat.—United States—Florida (Miami); Mexico—Amecameca, Mexico; Cuautla, Morelos.

Host.—*Aspidiotus lataniæ* Signoret; *Aspidiotus* sp. on *Ciruela* and *Celtis occidentalis*.

Types.—Cat. No. 14196 U.S.N.M. Four females in balsam (1 slide; mounted with type female of *basilica*).

Homotype.—Accession No. 45092 Illinois State Laboratory of Natural History, Urbana, 1 female (Cuautla, Mexico), on a slide with homotypes of *S. mexicana*.

16. SIGNIPHORA BASILICA, new species.

Normal position.

Female.—Length, 0.32 mm. Small for the genus.

Similar to *aleyrodis* but differing in that a second brownish or dusky stripe across the abdomen is indicated by a black spot on each side at distal three-fourths, not reaching across to each other but separated mesially by the yellow of the body by a distance over the diameter of either spot and longitudinally separated from the proximal abdominal band by over its own length. Also the proximal abdominal band is only about half the length of that in *aleyrodis*, not more than a fourth the length of the abdomen. Antennal club shorter and stouter, dusky at distal fourth; proximal joint of intermediate legs shorter. Otherwise as in *aleyrodis* but much smaller.

Male.—Unknown.

Described from a single female specimen mounted with the types of *S. flavella*. (For data see that species.)

Habitat.—United States—Florida (Miami).

Host.—*Aspidiotus lataniæ* Signoret.

Type.—Cat. No. 14197, U.S.N.M. One female in balsam (mounted with the four type females of *S. flavella*).

17. SIGNIPHORA PULCHRA, new species.

Signiphora nigrita HOWARD MS.—JOHNSON, 1896, p. 75.

Normal position.

Female.—Length, 1.0 mm., mean. Large for the genus, variable.

General color sooty black with the fore wings deeply fumated (sooty), nearly out to their tips which are clear; all of legs excepting proximal three tarsal joints of caudal ones, which are yellow, antennæ

and venation concolorous with the body; narrow space beneath submarginal vein of fore wing clear and that wing clearer near base; eyes bright red, naked; mandibles fuscous, their tips black; posterior wings hyaline except proximad under the venation and a slight distance distad of the venation. Body shining black; mesoscutum finely, transversely lined.

Belongs to the *nigra* group and like that species in general form, but differing in the following structural details: The marginal cilia of the fore wing are distinctly longer, about three-fourths the greatest wing width; the discal bristle of the fore wing is present; the stigmal vein differs in shape, forms more of an angle with the marginal and its sides are not parallel; moreover, its inner edge forms a more concave curve with the inner edge of the marginal vein at its apex but of itself is not concave; the caudal wings moderate in width but much broader than in *flavopalliata*, for instance. Easily distinguished from *nigra* colorationally. Agreeing also with *noacki* Ashmead but may be distinguished by means of the different wing fumation, the different coloration of the tarsi and general body color, the somewhat longer marginal fringes of the fore wing in *pulchra* and presence of the discal bristle. Also agreeing structurally somewhat with *maxima* but in that species the marginal cilia are shorter, the caudal wings distinctly narrower, very broad in *maxima*.

In *pulchra* the cephalic tibial spur is short but curved and many tined beneath; the costal cell bears two short bristles proximad, side by side; in the fore wing just distad of the discal bristle is a long, very thin, oblique hairline running caudo-proximad and apparently a fold in the wing. It is more conspicuous in some specimens and then resembles a line of very minute, dark setæ, the individuals of which are not distinguishable; in other specimens there may be several such lines farther distad. The submarginal vein bears two bristles, the marginal and stigmal a total of seven. The marginal cilia of the posterior wing are distinctly longer than that wing's greatest width, which is near apex, the blade subclavate. Fumation of fore wing varies in density, sometimes very dense and conspicuous.

From 11 specimens, $\frac{3}{8}$ -inch objective, 1-inch optic, Bausch and Lomb.

Male.—Same as the female. Genitalia exerted, cylindrical, rather long, bifid.

From 19 specimens, the same magnification.

This very beautiful species appears to be common in the United States. It was described from the following balsam specimens in the collections of the United States National Museum, United States Department of Agriculture and the Illinois State Laboratory of Natural History: Seven slides bearing respectively 1 male, 1 male, 1 male, 2 males (cotypes), 2 males, 1 male and 3 males, 1 female (types), all

labeled "Bred from *Asp. uvæ* Comst. J. F. Zimmer, Washington, D. C., 1911," and respectively "No. 17, May 15;" "No. 15, May 17;" "No. 18, May 15;" "No. 16, May 15;" "No. 24, May 18;" "No. 20, May 16;" and "No. 13, May 19." One slide bearing 1 male and 2 females, labeled "No. 14. Bred from grape scale. C. W. Hooker, Vienna, Va., May 18, 1911." A slide bearing a single male and labeled "*Signiphora. Diaspis pentagona* on lilac. Washington, D. C. Bred by E. R. Sasser. March 8, 1907. Coll. Feb. 12, 1907." Another slide bearing a single female and labeled "From *Aulacaspis rosæ*, Bouché. North Chevy Chase, Md. T. H. Leavering. September 26, 1910." U.S.N.M. A slide bearing a single pair, labeled "*Signiphora. Chionaspis americana* Johnson on *Ulmus americana*. Columbus, Ohio. J. G. Sanders. Coll. Sep. 3, 1906: Bred by E. R. S." From the Illinois State Laboratory of Natural History, Urbana, the following four slides: One bearing a single male specimen, labeled "No. 39119, *Signiphora*." and reared from *Aspidiotus uvæ* Comstock on cultivated grape collected at Anna, Illinois by L. M. Smith and reared July 17, 1908; two slides bearing 1 male, 4 females, and 1 male, 2 females, respectively, labeled "21477" and reared from *Diaspis rosæ*, August 15, 1895 (W. G. Johnson) at Urbana, Illinois. A fourth slide bearing 2 males and the accession Nos. "21458" and "21401" and reared from *Aspidiotus* sp. on currant, and the cherry *Aspidiotus (forbesi?)* at Urbana, Illinois, July 30, August 13, 1895, by W. G. Johnson. Also a probable specimen of this species, in bad condition on a slide, remounted from a tag in the United States National Museum collection, labeled "289. From *Pseudococcus aceris* Geoff. Sep. 4, 1896. W. G. Johnson, Paterson, New Jersey."

Habitat.—United States—District of Columbia (Washington); Maryland (North Chevy Chase); Illinois (Anna, Urbana); Virginia (Vienna); Ohio (Columbus); New Jersey (Paterson).

Hosts.—*Aspidiotus uvæ* Comstock; *Diaspis pentagona* Targione; *Aulacaspis rosæ* Bouché; *Chionaspis americana* Johnson; *Aspidiotus forbesi* Johnson (?) and on *Aspidiotus* on currant.

Types.—Cat. No. 14198, U.S.N.M., 3 males, 1 female, on a single slide (District of Columbia).

Cotypes.—Accession No. 45083, Illinois State Laboratory of Natural History, Urbana, 2 females on one slide (District of Columbia).

18. SIGNIPHORA MAXIMA, new species.

Normal position. .

Male.—Length, 1.05 mm.; large, robust.

General color deep black, the whole body tinged with metallic greenish; tarsi yellowish, all the distal joints and the proximal joints of the intermediate and caudal legs dusky, the last named joints tinged with more or less fuscous. Tips of cephalic tibiae and cephalic tibial spur yellowish; rest of legs concolorous with the body; caudal tibial

spur pallid yellowish; intermediate tibial spur dusky brownish. Fore wings hyaline with the exception of a large suffused smoky area beneath the stigmal vein and apex* of the marginal extending to the caudal wing margin, its distal margin irregular, convexed; and a long moderately broad strip beneath and against the submarginal vein, its caudal edge straight, running out to the bend of the submarginal vein and there giving out an arm caudo-distad which nearly joins a proximal extension of the other sooty area and incloses a more or less ovate, rather large clear spot under the marginal vein (along its proximal half and more). Caudal wings hyaline. Antennæ brown; mandibles black at tip. Eyes dark.

Belongs to the *nigra* group and of the species resembles *noacki* and *pulchra*. From the former it may be distinguished by reason of the fact that the inner edge of the stigmal vein forms less of a regular concave curve with the inner edge of the marginal vein at apex, the body is much more robust, the posterior wings broader, their marginal cilia distinctly not as long as their greatest width; the proximal tarsal joint of the caudal legs is longer. From *pulchra* it differs structurally in lacking the discal bristle of the fore wing and in having much broader fore and posterior wings. The mandibles are bidentate; the bristles of the fore wing venation usual, as in the preceding species; both wings are obtusely pointed; the cephalic tibial spur is many tined beneath; the costal cell bears a single isolated short seta proximad; marginal cilia of both wings longest at middle, or nearly, of caudal margin; the intermediate tibiae are clavate and resemble a barbed club; the intermediate femora are short and convexly swollen beneath and armed with short spines.

From a single specimen, $\frac{3}{8}$ -inch objective, 1-inch optic, Bausch and Lomb.

Female.—Unknown.

Described from a single male specimen in the collection of the United States Department of Agriculture, mounted on a slide with the type of *Acoloides aureus* Girault and bearing the following labels: "248. 1247. Johuaimaja, Feb. '11. C. H. T. March 15, 1910."

Habitat.—South America—Peru (Johuaimaja).

Host.—Not known.

Type.—Type No. 14199, U.S.N.M. One male in balsam (mounted with the type female of *Acoloides aureus* Girault.).

19. SIGNIPHORA MELANCHOLICA, new species.

Normal position.

Female.—Length, 1.15 mm.; large for the genus; body long.

General color black, tinged with aeneous; marked with silvery white thus: A faint narrow band of it across the cephalic margin of the mesoscutum, accented at each side (in balsam most of the band invisible, only the accented portions at each side distinct, appearing

like a subquadrate silvery white area some distance cephalad of the tegulæ at the cephalo-lateral angle of the thorax, but in direct light the whole band is visible); both wings hyaline excepting the fore wing at extreme base under the proximal third of the submarginal vein; venation dusky.

Belongs to the *unifasciata* group; it differs from *unifasciata* structurally in that the fore wings have distinctly shorter marginal cilia at apex which are only about a fourth the greatest wing width, in *unifasciata* over a half; the caudal wings are narrower; the inner edge of the stigmal vein forms no curve with the inner edge of the marginal at its apex, or, in other words, the stigmal vein makes no distinct angle with the marginal. From *fasciata*¹ it differs in the form of the stigmal vein, which in that species makes a concave curve along its inner margin with the apex of the inner margin of the marginal vein, not true with this species; *fasciata* also bears the discal bristle on the fore wing; from both *unifasciata* and *fasciata*, *melancholica* differs in its longer and somewhat narrower abdomen. From *rhizococci* it differs in the broader posterior wing, the shape of the stigmal vein and the absence of the discal bristle, aside from the obvious differences in color.

From 1 specimen, the same magnification.

Male.—Unknown.

Described from a single female specimen in balsam, from the collections of the United States Department of Agriculture and labeled "1° 3 f. Gn. 2, sp. 7. Saman, July 26, 10. T." (Collected by C. H. T. Townsend.)

Habitat.—South America—Saman, Peru.

Host.—Not known.

Type.—Type No. 14200 U.S.N.M. One female in balsam.

20. SIGNIPHORA FASCIATA, new species.

Normal position.

Female.—Length, 0.65 mm., mean. Moderate in size for the genus but variable, sometimes robust.

Like *unifasciata* in general coloration, but considerably smaller and differing as follows: In general coloration the fore wings differ in that they are fumated out to the apex of the venation and the general black of the body is suffused with more brownish. Structurally differing in that the marginal fringes of the fore wing are decidedly shorter, the longest being not more than a third or fourth of the wing's greatest width, whereas in *unifasciata* they are over two-thirds the greatest width of the fore wing in that species; the marginal fringes of the posterior wing are not subequal to those of the fore wing, as in *unifasciata*, but longer; the discal bristle of the fore wing is present,

¹ Described next.

and, as in *pulchra*, also an oblique hair line or narrow crease just distad of the bristle, originating caudo-distad of the apex of the stigmal vein; the latter differs from that of *unifasciata* in forming a somewhat shallow, nevertheless regular, concave curve along the inner margin with the apex of the marginal vein. Also agreeing with *nigra* somewhat, but easily distinguished by the differences in the coloration of the body and wing and the form of the stigmal vein, as well as the longer marginal cilia of the wings. The mandibles are bidentate and black at tips; the tarsi are pallid yellow, their distal joints dusky; the longest marginal fringes (caudad) of the posterior wing are three-fourths or slightly more the greatest width of those wings. The tibial spurs are single, the cephalic ones, as usual, many tined beneath.

From 6 specimens, the same magnification.

Male.—The same.

From 2 specimens, the same magnification.

Described from 2 males and 6 females mounted in balsam: One female in the collections of the United States National Museum, mounted on a tag (now in balsam with the type of *unifasciata*) and labeled "No. 2488⁰¹". From *Aleurodes* on *Hydroxylon*. Issued Dec. 29, '81"; 1 male, 4 females, on a slide in the collections of the United States Department of Agriculture, labeled "1624. Lecanid—*Inglisia* on cotton, Cuautla—Morelos, Mex. July 1, '97. Koebele," *homotypes*; and a male and female from the same collections on a single slide labeled "1755. *Pulvinaria* on ash, Cuautla, Morelos, Mex., May 29, '97. Koebele," *types*.

Habitat.—North America—Mexico (Cuautla, Morelos); one other unknown locality.

Hosts.—*Pulvinaria* sp. on ash; *Inglisia* sp. on cotton; *Aleurodes* sp. on *Hydroxylon*.

Types.—Cat. No. 14201, U.S.N.M. One male, 1 female in balsam, 1 slide (Mexico).

Homotypes.—Accession No. 45088, Illinois State Laboratory of Natural History, Urbana, the 1 male, 4 females as noted above (Mexico).

21. SIGNIPHORA HYALINIPENNIS, new species.

Normal position.

Female.—Length, 0.75 mm.; moderate in size for the genus.

General color black, the mesoscutum finely, transversely lined; legs and antennæ brown, tarsi pallid; wings wholly hyaline or very faintly clouded proximad, their venation brown; a narrow transverse silvery white band across the space between the mesoscutellum and metascutum which narrows so much mesad as to disappear, nearly, at the meson and thus is broadened and accented at each side (dorsal aspect); mesoscutellum brownish.

Belongs between the *nigra* and *unifasciata* groups and may be distinguished by the perfectly clear wings. In the *nigra* group it resembles more closely *pulchra*, *noacki*, and *maxima*; from the former it differs in having shorter marginal fringes, in lacking the oblique crease in the fore wing, in bearing a longer antennal club and somewhat broader wings; from *noacki* in having the discal bristle of the fore wing, shorter marginal cilia of the same wings and much longer antennal club; and from *maxima* in the smaller wings, posterior ones especially, and in the presence of the discal bristle of the fore wing. Of the species of the *unifasciata* group it is more like *fasciata*, being easily distinguished from *melancholica*, *unifasciata*, and *rhizococci* by the different stigmal vein and marginal ciliation of the fore wings. From *fasciata* it differs in having the curve made by the inner margin of the stigmal with that of the marginal at apex shallower and longer, in the absence of the oblique hair line or crease in the fore wing and in having a decidedly longer antennal club. Placed with the *unifasciata* group.

From 1 specimen, the same magnification.

Male.—Unknown.

Described from a single female specimen found tag-mounted in the collections of the United States National Museum, since re-mounted in balsam. The specimen bore the label "Par. on *Capulinia jaboticabæ*, San Paulo, Brazil. A. Hempel, Coll., May 11, '98. H. No. 214x".

Habitat.—South America—Brazil (Sao Paulo).

Host.—*Capulinia jaboticabæ* von Ihering.

Type.—Type No. 14202, U.S.N.M. One female in balsam.

22. SIGNIPHORA MACULATA, new species.

Normal position.

Female.—Length, 0.70 mm., mean. Moderate in size for the genus.

General color brown, the abdomen darker, sometimes wholly blackish but usually with only the sides blackish; fore wings fumated much as in *pulchra*, but the portion of the fumated area distad of the end of the venation is maculate or broken up into small, rounded spots; also the area does not extend quite so far distad as in *pulchra*, half way to the wing apex from the stigmal vein; nevertheless, this clearer apical portion is not hyaline as in the other species, but distinctly though more or less faintly suffused with brownish. The proximal half of the posterior wing is similarly fumated. The clouded area of the fore wing is distinctly clearer under the proximal half of the submarginal vein (sometimes under the whole of that vein), while a longitudinal dark streak divides the proximal half of the wing nearly into longitudinal halves; under (caudad of) the

streak is a conspicuous conico clavate clear area whose head projects directly distad into the clouded area and nearly meets a caudoproximal part of the oblique streak or fold, present in this species. All appendages and venation concolorous with general body color; distal end of antennal club and caudal tibiae often dusky. Lower end of face (the cephalo-ventral aspect) suffused slightly with lemon yellow, which, however, does not stand out conspicuously. Eyes red. Mandibles bidentate, their tips black.

Marginal fringes of the fore wing long and slender, slightly longer than the greatest width of that wing, subequal in length to those of the caudal wings. Discal bristle absent; oblique streak on fore wing present. Caudal wings moderate in width, about twice the width of those in *flavopalliata*.

Belongs near to the *flavopalliata* group by reason of its general coloration (brown). Of the species of this group—*flavopalliata*, *mexicana*, and *townsendi*—it closely resembles none of them. From the first two it differs in having the wings broader, the fore wings fumated further distad and spotted, in lacking the discal bristle and in having the curve along the inner margin of the stigmal and marginal (at apex) vein longer. From *mexicana*, aside from differences in coloration, it may be distinguished by means of the narrower wings (posterior especially), the longer marginal cilia and the absence of the discal bristle and from *townsendi* in general coloration and in bearing longer marginal cilia on the wings. At once separable from all species of the genus by having a portion of the distal half of the fore wing maculate or spotted.¹

From 18 specimens the same magnification.

Male.—Unknown.

Described from 18 female specimens sent to me for identification and study by Dr. L. O. Howard and mounted on three balsam slides, all labeled "7231. Mayo, 1911. *Signiphora* sp. Let. fr. P. Cardin, June 21, 1911. Santiago de las Vegas, Cuba," and bearing, respectively, 3 females, 4 females and 11 females. In a letter dated July 11, 1911, Doctor Howard informed me that this species was reared from *Lepidosaphes alba* (Cockerell) by Patricio Cardin, entomologist, experiment station, Santiago de las Vegas, Cuba.

Habitat.—West Indies—Cuba (Santiago de las Vegas).

Host.—*Lepidosaphes alba* (Cockerell).

Type.—Cat. No. 14203, U.S.N.M. Eleven females in balsam (1 slide).

Cotype.—Accession No. 45084, Illinois State Laboratory of Natural History, Urbana, 4 females in balsam (1 slide).

Homotypes.—(3 females) in the collections of the United States Department of Agriculture.

¹ This maculation, however, sometimes occurs in other species; for instance, the type-species.

23. SIGNIPHORA NIGRELLA, new species.

Normal position.

Male.—Length, 0.60 mm. Moderately small in size for the genus.

Black, suffused slightly with brownish at the thorax; legs and antennæ brownish, the tarsi brownish yellow. Fore wings smoky out nearly to the end of the marginal vein, the area clearer, however, proximad of the bend of the submarginal vein but not wholly clear, not then a distinct smoky band across the wing as in *dactylopii*. Marginal fringes of the fore wing moderate in length, longest along the caudal margin of the posterior wing, there distinctly longer than the greatest width of that wing. Oblique crease in fore wing slightly indicated; discal bristle absent. Longest marginal fringes of the fore wing equal to about half of that wing's greatest width. Antennal club long.

Belongs to the *nigra* group and closely resembles both *nigra* and *dactylopii*. From the former it differs colorationally in not having the distal third of the fore wing more or less infuscated and structurally in having the marginal fringes at the apex of the fore wing twice longer than those of *nigra* at the same place, in having posterior wings which are at least a third narrower and with distinctly longer marginal fringes and in having a stigmal vein which is less straight in relation to the marginal. From *dactylopii* it differs in color in having proximal portions of the fore wing more or less smoky; and in structure in all of the features pointed out for *nigra* but differing even more pronouncedly in them. Also, it is not marked with metallic green.

From single specimen, the same magnification.

Female.—Unknown.

Described from a single male specimen remounted in xylol-balsam from a tag in the U.S.N.M. labeled "471⁰¹. Iss. 16 Jan. '94. Par: *Asp.* [*Chrysomphalus*] *tenebricosus* Comstock, Waco, Tex."

Habitat.—United States—Texas (Waco).

Host.—*Chrysomphalus tenebricosus* (Comstock).

Type.—Cat. No. 14204, U.S.N.M. One male in xylol-balsam (Texas).

24. SIGNIPHORA FAX, new species.

Normal position.

Female.—Length, 0.47 mm., mean. Small in size for the genus.

General color dark or sooty brown, varying to brown, the thorax (dorsal aspect) marked with lemon yellow, excepting the pronotum and cephalic two-thirds of the mesoscutum, the yellow band thus moderate in width. When brown, the abdomen is lighter at tip. Fore wings smoky out to the end of the venation, the smoky area, as usual, lighter proximal. Legs variable, brown in dark specimens, with the knees, tips of tibiæ and all of tarsi pallid yellowish; in light

specimens nearly uniformly pallid yellowish white. Eyes dark red; ocelli ruby red. Antennæ yellowish, the tip (distal third) of the club and a portion of the upper side dusky.

Belongs to the *flavopalliata* group and resembles that species in structure; however, it is smaller, the antennal club is shorter and more clavate, marked with dusky and yellow as described. The two species are readily distinguished upon comparison. It seems to be confined to the West Indies.

Male.—Unknown.

Described, with the same magnification, from the following series of slides from the collections of the Bureau of Entomology, United States Department of Agriculture, Washington, D. C.: Two slides bearing respectively one and three females, each labeled "459°. Par. of *Asp. personatus* on *Mango* and *Guanabana* San Juan Porto Rico, Jan. 99. A. Busck." A third slide bearing six females and labeled "*Chrysomphalus personatus* Comstock on nutmeg, Grenada, Barbados, West Indies. D. Morris, July 25, 1899." And the last, bearing seven females, together with specimens of *Arrhenophagus chionaspidis* Aurivillius, labeled "103e, 103g, 103h. Barbados, Aug. 19, 1910. T." The collector was C. H. Tyler Townsend. The Porto Rican specimens were of the light variety; the others all dark.

Habitat.—West Indies—Porto Rico (San Juan); Barbados (Grenada).

Host.—*Chrysomphalus personatus* (Comstock).

Types.—Cat. No. 14205, U.S.N.M. Six females on a single slide (Grenada, Barbados).

Cotypes.—Accessions No. 45091, Illinois State Laboratory of Natural History, Urbana, Illinois, three females on a single slide (San Juan, Porto Rico, "Guanabana".)

25. SIGNIPHORA FUNERALIS, new species.

Normal position.

Female.—Length, 0.55 mm.; moderately small for the genus.

General color uniformly black, slightly suffused with brownish and distinctly metallic on head and mesoscutum, the metallic coloration being bluish green; antennæ and legs nearly concolorous, sooty black, the tarsi pallid yellow. Eyes dark red. Fore wings distinctly fumated throughout, but the sootiness gradually deepens proximad; there at the caudal wing margin caudal of the distal portions of the submarginal vein is a longitudinal clear area, subrectangular in shape.

Belongs to the *nigra* group and to that section of it including those species bearing short marginal fringes at the apex of the fore wing, namely, *nigra* Ashmead, *australiensis* Ashmead and *dactylopii* Ashmead, and more closely allied with the first. However, it differs

from it as follows: The fore wings are fumated continuously throughout, the body bears metallic coloration, the marginal fringes of the fore wing at apex are somewhat shorter. With the two other species it need not be confused. As concerns the other species of the *nigra* group, namely *noácki* Ashmead, *maxima* Girault, *pulchra*, Girault, and *nigrella* Girault, *funeralis* should not be confusable, since all of these species bear much longer marginal ciliation on the fore wings; specifically, in general coloration it differs from all of these species excepting *pulchra* because the fore wings are nearly uniformly fumated throughout; from *pulchra* it may be distinguished also by means of the pallid tarsi, the broader wings, the absence of the discal bristle and so on.

Antennal club not unusually long, conic-ovate and about four times longer than its greatest width; fore wings moderately broad, their longest marginal cilia somewhat less than half their greatest width; discal bristle absent. Posterior wings moderate in width, not as wide as their longest marginal cilia. Oblique hair-line crease of fore wing slightly indicated, present but faint.

From one specimen, the same magnification.

Male.—Unknown.

Described from a single female specimen mounted in balsam and captured from a window in an empty dwelling, December 28, 1911, at Herberton, North Queensland, Australia.

Habitat.—Australia—Queensland (Herberton).

Host.—Unknown.

Type.—One female in xylol-balsam (mounted with some trichogrammatids—*Abbella*, *Trichogrammatoidea*, and an *Anagrus*) deposited in the Queensland Museum, Brisbane, No. Hy./771.

26. SIGNIPHORA CORVINA, new species.

Normal position.

Female.—Length, 1.10 mm.; large, robust.

General color deep black, tinged on the head and thorax with metallic bluish green, the whole of the mesonotum thus colored; legs, antennæ and venation brownish black, but the tarsi and cephalic tibiæ interiorly yellowish brown. Fore wings hyaline excepting along about the proximal half, or out not quite to the end of the venation. The stained proximal area of the wing is peculiar; thus its distal margin is obliquely (caudo-proximad) truncate, the caudal midlongitudinal (nearly) half being more clear. Hence, somewhat as in *melancholica*, the fumation is under the venation extending caudad somewhat beyond the midlongitudinal line of the blade. It is longer, however, than the clouded area of the species named. Distal tarsal joints only slightly darker.

Belongs to the *nigra* group and to that portion of it including *funeralis*, *australiensis*, *nigra*, and *dactylopii* but is more closely related to the last named two. It differs from *nigra* in that the fore wings are fumated somewhat farther distad (nearly to the apex of the stigmal vein), the body is metallic on the head and thorax, finely, transversely lined at the mesonotum and more robust. From *dactylopii* it differs as much as it does from *nigra*; however, the fumation of the fore wing does not form a band across the wing from the marginal vein but is quite different and distinct.

The fore wings are broad, their marginal cilia very short, subequal in length to the stigmal vein, somewhat shorter at the apex; oblique crease slightly indicated; discal bristle absent; stigmal vein straight, a conical prolongation of the marginal vein. Posterior wings very broad, two-thirds the width of the broad fore wing, which is only twice longer than broad.

Marginal fringes of posterior wings subequal in length to those of the fore wing. Mandibles bidentate. Proximal joint of cephalic tarsus only half the length of the same joint of the caudal tarsus. Antennal club stout, conic-ovate, bearing a number of short longitudinal sulci, which are arranged in three circular groups along the joint, giving the appearance (casually) of three joints; the club only about two and a half times longer than wide (its greatest width at apex of proximal third).

From one specimen the same magnification.

Male.—Unknown.

Described from a single female specimen captured from a window in a granary and barn on a wheat farm at Roma, Queensland, October 6, 1911.

Habitat.—Australia—Queensland (Roma).

Host.—Unknown.

Type.—No. Hy./772, Queensland Museum, Brisbane, one female in xylol-balsam (mounted with the female type of *Gonatocerus huzeleyi* Girault and specimens of *Signiphora australiensis*, *Abbella subflava*, *Ufens* and *Aphelinoidea* all captured at the same time).

27. *SIGNIPHORA AUSTRALICA*, new species,

Normal position.

Male.—Length, 0.54 mm.; moderately small for the genus.

General color black, the vertex and mesonotum metallic bluish green, the antennæ, venation and caudal femur sooty black, the tarsi and remainder of legs pallid yellowish, the distal tarsal joint not much darker if at all; fore wings fumated throughout, the proximal fumation (out nearly to the end of the marginal vein) deeper, the whole divided somewhat distad of the middle of the wing by a moderately broad subhyaline band which is nearly regular in width and joining the costal wing margin at the end of the stigmal vein;

the fore wing is also clear directly beneath the submarginal vein for nearly its whole length.

Belongs to the *nigra* group and that section of it containing those species bearing marginal cilia at the apex of the fore wing which are subequal to or longer than a third of the wing's greatest width, hence allied with *maxima* Girault, *pulchra* Girault, *noacki*, Ashmead, and *nigrella* Girault. However, resembling *australiensis* Ashmead and at first mistaken for that species; the transverse clear band is somewhat farther distad (on the costal margin half or more of it extending beyond the apex of the stigmal vein), more uniform and not coming to a point at the stigmal vein; the longer marginal cilia of the fore wing in *australica*, the narrower fore wings, the pallid legs and other characters easily distinguish the two species. Of the four species with which it is allied, it resembles, perhaps, *pulchra* more than the others because of its moderately narrow fore wings, but the discal bristle is absent and the oblique hair line-like crease but slightly indicated; the legs are much lighter in color. The species need hardly be confused with any other species of the genus, even its closest allies.

Fore wings with the marginal cilia moderately long, those at apex only about slightly over a third of the greatest width and slightly longer than the apical marginal cilia of the posterior wings; stigmal vein forming a regular concave curve with the inner edge of the marginal vein at its apex, but the curve is not as deep as usual. Posterior wings moderately broad, subequal in greatest width to their longest marginal cilia or slightly more or less than subequal. Antennal club long and moderately stout, spindle shaped, slightly over four times longer than its greatest width which is near its middle, with no regularly grouped nor prominent longitudinal sulci.

From two specimens, the same magnification.

Female.—Unknown.

Described from two male specimens mounted in xylol-balsam and captured December 4 and 21, 1911, from a window in men's quarters on a sugar farm near Nelson, North Queensland.

Habitat.—Australia—Queensland (Nelson, near Cairns).

Host.—Unknown.

Type.—No. Hy./773, Queensland Museum, Brisbane, one male in xylol-balsam (mounted with a female of *Aphelinoidea howardii* Girault).

TABLE TO THE SPECIES OF SIGNIPHORA ASHMEAD.—MALES, FEMALES.

Table to the species groups.

Body, excluding appendages, all black, blue-black tinged with greenish or black suffused slightly with brownish. In balsam mounts, body appearing a uniform dead black, unmarked and no yellow. *nigra* group.
 Body, excluding appendages, the same but marked with a transverse band or several spots of silvery or yellowish white (dorsal aspect). *unifasciata* group.

- Body, excluding appendages, brown, marked with a broad band of ivory white between wings and across ventral half of face.....*rhizococci* group.
- Body, excluding appendages, mostly brown or black brown, marked with orange or lemon yellow, the brown predominating.....*flavopalliata* group.
- Body, excluding appendages, uniformly brown, the abdomen marked with brown black, marginal cilia long.....*maculata* group.
- Body, excluding appendages, mostly lemon or orange yellow, marked with brown or brown-black, the yellow predominating.....*aleyrodus* group.

I. *nigra* group.

This group includes the following species which are all uniformly black, or black tinged with metallic greenish, or black suffused slightly with brownish: *nigra* Ashmead, *australiensis* Ashmead, *dactylopii* Ashmead, *noacki* Ashmead, *pulchra* Girault, *maxima* Girault, *funeralis* Girault, *corvina* Girault, *australiana* Girault, and *nigrella* Girault. The species may be identified by the use of the following table:

Marginal cilia of the fore wing at extreme apex short, distinctly much shorter than a third of the greatest width of the fore wing; stigmal vein at inner edge nearly in a straight line with the marginal vein, or making only a slight acute angle. Posterior wings broad.....1.

Marginal cilia of the fore wing at extreme apex moderately long, twice longer than in the first group and distinctly as long as or longer than a third of the greatest width of the fore wing; inner margin of stigmal vein forming a more or less distinct curve with the inner margin of the marginal vein at apex or making an obtuse angle. Posterior wings variable, often moderately narrow.....2.

1. Apical half of the fore wing not clouded or but slightly so, not smoky like the proximal portions.

Proximal third of fore wing smoky, the smoky area not reaching to the end of the marginal vein but ending about the length of the stigmal vein distant from it; distal third of fore wing sometimes slightly clouded; body black. Marginal cilia at apex of fore wing longer, distinctly longer than the stigmal vein.

nigra Ashmead.

Fore wings fumated not quite out to the end of the stigmal vein but the distal margin of the fumation is obliquely truncate, caudo-proximal and the caudal half of the wing under the venation is nearly hyaline; body marked with metallic green; marginal cilia at apex of fore wing very short...*corvina* Girault.

Fore wings with a somewhat irregular, clear-cut, moderately broad smoky band across it from the marginal vein, the band narrowed at its middle; otherwise hyaline. Body black, marked with metallic green on the vertex and mesonotum. Marginal cilia at apex of fore wing subequal in length to stigmal vein.....*dactylopii* Ashmead.

Nearly all of the apical portion of the fore wing (nearly a half), except perhaps at extreme apical margin, clouded nearly as deeply as proximal portions.

Fore wings entirely smoky excepting at extreme apical margin and conspicuously near the middle where a moderately broad elliptical subhyaline band crosses from the apex of the venation (excluding the usual clear spot more proximad, near caudal margin); this band is widest at the middle, its edges irregular. Body black, the vertex and mesonotum metallic green. Marginal cilia at apex of fore wing distinctly longer than stigmal vein but variable, sometimes no longer than the stigmal vein or somewhat shorter.

australiensis Ashmead.

Fore wings fumated throughout, nearly uniformly but the fumation is deeper proximad. Marginal cilia at apex of fore wing nearly twice longer than the stigmal vein.....*funeralis* Girault.

2. Posterior wings very broad, distinctly broader than their longest marginal cilia; fore wings with a delimited clear rounded area against the marginal vein.

Fore wings with a large smoky area crossing them at the apex of the marginal vein and a rectangular smoky area under all of the submarginal vein proximad of its bend, the area then extending disto-caudad to about a point on the midlongitudinal line of the wing and nearly reaching a reciprocal extension from the middle smoky area, these two extensions inclosing a rounded subhyaline area against the marginal vein. Marginal cilia at apex of fore wing only slightly more than a third of that wing's greatest width. Robust, black.

maxima Girault.

Posterior wings only moderate in width or moderately narrow, distinctly narrower than the length of their longest marginal cilia, or slightly more or less than subequal in width to them but usually much narrower; fore wings nearly entirely smoky or smoky at proximal fourth or proximal half, without a delimited clear area under the marginal vein.

Fore wings wholly smoky except at apex; discal bristle present. Longest marginal cilia of fore wing equal to about three-fourths or somewhat more of that wing's greatest width; tarsi brown, excepting proximal three joints of caudal tarsi.....*pulchra* Girault.

Fore wings the same in regard to fuscation but the smokiness is deeper from base out to the end of the marginal vein, the whole divided somewhat distad of the middle of the wing by a moderately broad subhyaline band which is nearly uniform in width and joins the costal margin at the end of the stigmal vein; tarsi and legs, except caudal femur, pallid yellow; discal bristle absent.

australica Girault.

Fore wings with the major portion hyaline; discal bristle absent. Only the proximal fourth (out to base of marginal vein) of the fore wing smoky; longest marginal cilia of fore wing only about two-thirds the wing's greatest width; tarsi pallid to tip.....*noacki* Ashmead.

Fore wings smoky at proximal half (to end of marginal vein). Longest marginal cilia of fore wing about half that wing's greatest width.....*nigrella* Girault.

II. *unifasciata* group.

Like the preceding group but marked with silvery white or yellowish white. The following species: *unifasciata* Ashmead, *bifasciata* Ashmead, *fasciata* Girault, *melancholica* Girault, and *hyalinipennis* Girault. The following table should enable the identification of these forms:

Body unmarked save for a transverse whitish band across the thorax at scutellum.

The inner margin of the stigmal vein forms either a long or short concave curve with the inner margin of the marginal vein at apex; discal bristle present. Tip of stigmal vein pointing distad.

Fore wings fumated out to the end of the venation; marginal cilia at apex not more than a third of the fore wing's greatest width. Curve of inner edge of stigmal vein shorter and more concave.....*fasciata* Girault.

Fore wings nearly hyaline, only a slight suffused cloudiness present proximad; marginal cilia at apex nearly a half the fore wing's greatest width; curve formed by inner edge of marginal and stigmal veins long and shallow.

hyalinipennis Girault.

The inner margin or edge of the stigmal vein does not form a regular concave curve with the inner margin of the marginal vein but the latter is straight, the stigmal vein curved caudo-distad forming an obtuse angle with the marginal vein. Discal bristle absent. Tip of stigmal vein pointing disto-cephalad.

Fore wings fumated only out as far as the middle of the marginal vein (or at proximal third); marginal cilia of fore wing at apex equal to about half of the greatest width of that wing.....*unifasciata* Ashmead.

Body unmarked save for two transverse yellowish white bands across the thorax at scutellum and hind border of mesonotum; fore wings fumated out to end of the stigmal vein. Discal bristle present.....*bifasciata* Ashmead.

Body unmarked save for a subquadrate spot of silvery white on each side at the cephalo-lateral angle of the thorax (in reality joined by a very faint band crossing the thorax at the cephalic margin of the scutum).

Fore wings nearly hyaline but distinctly clouded proximad under the proximal third of the submarginal vein (or at proximal seventh); discal bristle absent; marginal cilia at apex of the fore wing subequal to a fourth of the wing's greatest width. Tip of stigmal vein pointing distad, the inner margin of the stigmal vein nearly in a straight line with the inner margin of the marginal at apex.

melancholica Girault.

III. *rhizococi* group.

This group contains but a single species, *rhizococi* Ashmead, which is characteristically marked but which is likely to be confused with several species in other groups, for instance, the one preceding and the one following. It may be distinguished at once from any species of the *unifasciata* group by reason of the length of the white band across the thorax, which is equal nearly to half of the length of that region; also by reason of its general color, which is a sooty brown, not a pure deep black. In the *flavopalliata* group it is most likely to be confused with *flavopalliata* itself, which it closely resembles in the pattern of general body coloration. However, white differs from yellow and the two species differ that much in coloration; structurally, they may be distinguished readily by reason of the differences in the width of the caudal wings which are about twice broader in *rhizococi* and different in shape, tapering somewhat distad, broadest proximad at apex of the venation, not true in *flavopalliata*, the posterior wings there nearly equal in width throughout and narrow; the fore wings are also somewhat broader in *rhizococi* and differ in shape, being broader distad, broad proximad in *flavopalliata*. It is scarcely probable that the species will be confused with any others aside from the ones mentioned. It is sooty or smoky brown in color, marked with ivory white.

Fore wings clouded out to the end of the venation; longest marginal cilia of fore wing about three-fourths that wing's greatest width; discal bristle present; posterior wings with their longest marginal cilia distinctly longer than the wing is wide; antennal club brown; remainder of antennæ and legs pallid yellowish white.....*rhizococi* Ashmead

IV. *flavopalliata* group.

This group is characterized by having a predominance of smoky brown or dark brown in its general body coloration, marked on the head, thorax or abdomen, or all, with lemon or golden yellow; in other words, yellow is present but this color forms but a small proportion of the whole body pattern. It includes the following species: *flavopalliata* Ashmead, *mexicana* Ashmead, *townsendi* Ashmead, and *fax* Girault, forms which may be identified by the use of the following table. All of these species are closely allied, very similar structurally and hence great care must be exercised in attempting identification in this group. A careful study of the following table should prove of great aid. The species *flavopalliata* and *townsendi* are more nearly structurally identical.

Body marked with a broad band of orange or lemon yellow across the thorax, including the metanotum and most of mesonotum except cephalic half, sometimes excepting the scutum; rest of body sooty brown but sometimes more or less of the head and tip of abdomen is yellow. Fore wings fumated out to end of venation; stigmal vein at inner margin forming a regular curve.

Caudal wings narrow; longest marginal cilia of fore wing as long or slightly longer than the greatest wing width.

Sooty brown, the mesoscutellum alone or all parts of the thorax excepting pronotum and cephalic half or third of mesoscutum, orange yellow; abdomen sometimes lighter brown suffused with yellowish at tip or even to proximal half; discal bristle present. Caudal wings very narrow; antennal club uniformly dusky, subclavate. Distal portion of fumated area caudad, often maculate. Moderately large species.

flavopalliata Ashmead (*occidentalis* Howard).

Sooty brown, the thorax lemon yellow, excepting pronotum and cephalic half of mesoscutum; the distal half of abdomen usually distinctly lighter, suffused with yellowish, the light area with a convex margin proximad; sometimes only tip lighter, sometimes whole distal half yellow crossed in middle by a brown band. Caudal and cephalic wings slightly broader. Antennal club uniformly dusky, subclavate. Moderately large species. The inner margin of the stigmal vein in this species forms a deeper and narrower curve than in the others and the marginal vein just proximad of the curve (at apex of vein) is broader than usual and obtusely rounded. Discal bristle absent.....*townsendi* Ashmead.

Sooty brown or brown, the thorax, except pronotum and cephalic two-thirds of mesoscutum, lemon yellow; in darker specimens abdomen all dark, but lighter distad in lighter brown specimens; discal bristle present; wings as in *flavopalliata*; antennal club shorter, clavate, the antennæ yellowish, the club dusky at distal third. Small species.....*fax* Girault.

Caudal wings broad; longest marginal cilia of fore wing only about three-fourths that wing's greatest width.

Sooty brown, the abdomen darker; mesoscutellum and lateral margins of mesoscutum orange yellow; discal bristle present. Fore wings broad, about twice the width of the posterior wings.....*mexicana* Ashmead.

V. *maculata* group.

Containing but a single species, this group is intermediate between the preceding and the following, though in a sense less related to either than each is to the other. The body of the single species is brown, marked with no yellow, the abdomen either subconcolorous or else dark along each side or almost entirely dark. The group is characterized by the absence of orange or lemon yellow in the general body coloration.

Fore wings fumated out slightly beyond a point between the wing apex and apex of the venation, the portion of the fumated area distad of the apex of the venation (and farther proximad near caudal margin) broken into small spots or maculate; discal bristle absent; longest marginal cilia of fore wing subequal to that wing's greatest width, the cilia long and slender; caudal wings narrow. All of legs and antennæ brown.....*maculata* Girault.

VI. *aleyrodis* group.

The species of this group are characterized by having a predominance of orange or lemon yellow in their coloration but through *townsendi* and to a less extent variations of *flavopalliata*, they are more or less closely related to species group IV. Thus *coquilletti* of this group is nearly structurally identical with *townsendi* of the other; if the distal half of the abdomen of *townsendi* should become wholly orange yellow instead of merely lighter brown or instead of yellow broken by a dark band, the two species could not be told apart. The following species: *aleyrodis* Ashmead, *coquilletti* Ashmead, *aspidioti* Ashmead, *flava* Girault, *flavella* Girault, and *basilica* Girault. In spite of what has just been written, however, I believe all of these species are

valid; nevertheless the possibility of some of them being synonymic with some in the *flavopalliata* group must be held constantly before the mind in dealing with them. This applies especially to those named in this connection. In all of the species of this group, the smoky area of the fore wing has more of a tendency to be a band across the wing at the marginal vein, the proximal portion of the wing clear or nearly, not merely broken as in the *flavopalliata* group. The discal bristle is absent in all of the species.

Body lemon yellow excepting pronotum, cephalic half of mesoscutum and a broad smoky band across the abdomen, which is as long as about a third of the abdomen's length, or slightly less; sometimes a second band indicated distad; fore wings hyaline with the exception of the band across it. Antennal club wholly yellow but sometimes dusky at tip. Abdomen longer than thorax, body long, cylindrical ovate.....*aleyrodis* Ashmead.

The same but basal band of abdomen nearly a half narrower or shorter and a second smoky band across the abdomen is indicated by a distinct spot on each side at distal three-fourths; antennal club much shorter and at distal fourth is dusky. Fore and posterior wings much narrower, narrower than in *flavopalliata*. Very small. Fuscous band of wing not clear. Abdomen subequal to thorax, body ovate.....*basilica* Girault.

The same but nearly immaculate, the body suffused more or less with orange. Fore wings slightly fumated to tip.

The whole body slightly suffused with orange or pinkish; antennal club nearly wholly dusky. Fore wings moderately broad, the smoky band distinct but the wing slightly clouded to tip; pedicel of antenna long-obconic, about four times longer than broad at tip and nearly half the length of the club; curve formed by inner margins of stigmal and marginal (distad) veins long.

flava Girault.

Only the abdomen suffused with orange or pinkish; antennal club lighter, at tip distinctly capped with dusky; fore wings narrower, the smoky band fainter, the wing still more faintly fumated to tip; pedicel of antenna obconic, broader at tip and shorter, only slightly over twice its longest width; the antennal club much shorter. Curve formed by stigmal vein at inner margin short and unequal.....*flavella* Girault.

Body orange yellow, excepting pronotum, cephalic half or more of mesoscutum and a broad band across the abdomen which is as long as about half of the abdomen's length or slightly less, sometimes only slightly more than a third. This band is a dark brown.

Antennal club wholly yellowish, uniform in color.....*coquilletti* Ashmead.

Antennal club half yellowish (base) and half dusky (tip), two distinct colored portions.....*aspidioti* Ashmead.

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