

## NOTES ON SOME MEXICAN ALEYRODIDS

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### *Introduction*

**I**N 1902 Professor T. D. A. Cockerell published a brief synopsis of the *Aleyrodidae* of Mexico. At that time, the family was composed of two genera, *Aleyrodes* and *Aleyrodicus*, the adults of the former having an unbranched vein in the forewing, and those of the latter having the vein branched. Ten species were then recorded for México. Since that time considerable work has been done on this family resulting in the description of a large number of species and the segregation of many genera. The study initiating this activity and still forming the basis of classification was the monographic work of *Quaintance and Baker* covering the primitive groups but unfortunately only a few of the higher genera. Little interest however, has developed in the Mexican fauna, with the result that a very inadequate knowledge exists.

The family as a whole shows several centers of dispersal or development. The primary one is undoubtedly tropical America, where most of the primitive types are to be found. Much of the Mexican fauna naturally falls into this category. A second large center is in the Orient. And of the oriental forms only a few imported species are recorded for Mexico, the most recent being the black-fly of citrus, *Aleurocanthus woglumi* Ashby, discovered on the West Coast. In temperate regions, the common types are illustrated by the genus *Aleyrodes*, the first to be described but a rather specialized type.

The *Aleyrodidae* constitute a family of the *Homoptera* closely related to the *Aphididae*, *Coccidae*, etc. The immature stages are inactive and scale-like. The adults, on the other hand, are both flying insects, some dusted with whitish powder and very minute in size, others with bluish or slate-colored wings and reddish colored bodies. The male possesses a pair of clasping forceps. Perhaps the most characteristic feature, however, is the armature about the anal opening, composed of a number of different structures which have been termed the "vasiform orifice", the "lingula", and the "operculum". The presence of these structures identifies the family and easily distinguishes the sedentary forms from the similar forms of aphids, coccids, or psyllids, which otherwise may superficially greatly resemble aleyrodids and may be easily confused with them.

Both immature and adult stages of the *Aleyrodidae* feed on plant juices by means of long setae, looped into a storage pouch in the immature stages. The feeding mechanism results in abundant water and sugar content in the food, which accounts for the liquid honey-dew as excrement. The process of excretion seems somewhat obscure since no Malphigian tubes are reported. Absorption from the alimentary tract by the blood and subsequent excretion by tubules would therefore be excluded. While the mid-intestine, according to most authors, presents two large diverticula, there is apparently not a specialized filtering mechanism for direct disposal of the excess fluids. Little appears to be definitely known about the digestive enzymes, about special excretory cells, or about the function of those bodies usually considered as symbionts. It would seem possible that different effects produced by different species in feeding are not due to important differences in the salivary secretion, but to viruses or similar causes.

In egg-laying, the female of many species keeps the setae of the mouth parts inserted during much of the process, so that resulting deposition is in circles or spirals. What the nature of this and of the most of the other observed behavior is, we are in apparent ignorance. The nervous system in its general structure is of the usual insect type, but neurology in its accepted sense remains very largely an untilled field as far as aleyrodids are concerned.

One of the most striking features of the family concerns the abundant and varied ectodermal secretion occurring both in adults and in immature stages. This varies from a mealy powder to a semi-transparent gelatinous mass on the one hand, and to an enormous pile of white cottony wax-like material on the other. Indeed, the form of the ectodermal secretion is often characteristic of groups or even of species.

While the form of the waxy coating in the different species has been used in descriptive taxonomic literature, and while the external structure of the dermal pores and their arrangement have been used in classification, the nature of these secreting organs and their physiological bearing is quite unknown. One thing, however, is easily apparent. Parasitism quite modifies the dermal secretion. In referring to these "wax pores" in a taxonomic consideration such as that which follows, it should be understood that the designation is merely one of convenience. It carries no implication of function nor even of the nature of the secretion.

The items, therefore, which may be considered in a brief faunistic review of the family as distinct from those closely related, concern the structure of the wings, genitalia, etc. of the adults, the methods of feeding and quiescent habits, the relative form of the anal structures called the vasiform orifice, and the structure and arrangement of the external openings of the ectodermal glands.

The family is divided into a number of subfamilies. Due to the fact that the sedentary immature stages are very easily noticed, whereas the adult forms are often overlooked, the classification has grown up largely based on the final nymphal stage, which has been called the "pupa" and the integument thereof the "pupa-case". This custom has probably arisen because of the inactive nature of the stage, and the fact that the adult emerges by the opening of the thoracic sutures of the dorsal integument.

In the following paper several new species are credited to *Quaintance and Baker*. This is due to the fact that a large part of the monographic work by these authors still remains in manuscript form, and I have been given the privilege of incorporating the descriptions based on Mexican material.

## Family Aleyrodidae

Three subfamilies are recognized. These are distinguished by the venation in the forewing of the adult. Two are represented in Mexico, and may be recognized as follows.

- 1.—Forewing with radial sector and media present ..... Aleurodicinae.
- 2.—Forewing with radial sector and cubitus present .... Aleyrodinae.

Members of these two subfamilies can usually be distinguished also in that the pupa cases of the *Aleurodicinae* often possess large compound pores, whereas those of the *Aleyrodinae* do not. Four genera of the *Aleurodicinae* are recorded for México. They are represented in the following key.

- 1.—Antennae of adult with seven segments. Forewing with radius 1 and media well developed ..... 2.
- Antennae of adult with four segments. Radius 1 absent, media reduced. Pupa case with compound pores ..... Paraleyrodes.
- 2.—Pupa case without compound pores, lingula of pupa case included ..... Dialeurodicus.
- Pupa case with compound pores, lingula variable ..... 3.
- 3.—Pupa case with large compound pores forming more or less of a submarginal row; simple pores not grouped but usually forming a submarginal band; lingula of case exerted; forewings of adult rather elongate ... Aleurodicus.
- Pupa case compound pores; simple pores in submarginal groups, dorsal pores forming roseate figures; lingula included; forewing of adult distinctly broad near tip and markedly pigmented ..... Radialeurodicus.

One species of *Dialeurodicus* has been recorded.

# I. *Dialeurodicus silvestrii* (Leonardi) 1910.

*Aleurodicus silvestrii* Leonardi, Bollettino del Lab, di Zool. General e Agraria della R. Scuola d'Agricoltura in Portici, vol. 4, pp. 320-322.

The species was collected in Jalapa on the leaves of an undetermined plant. The pupa-case possesses a band of simple pores around the case some distance mesad the margin, from which six long bands of wax arise

*Genus Aleurodicus*

In the genus *Aleurodicus*, four species are recorded from Mexico. These may be distinguished as follows:

- 1.—Sides of pupa case rolled under on the ventral surface so that from below, the case looks boat-like ..... *mirabilis*.  
—Sides of pupa case not so rolled under, but straight ... 2.
- 2.—Pupa case with five pairs of compound wax pores, four abdominal and one cephalic pair, all the same size ... *coccolobae*.  
—Pupa case with more than five pairs of such pores ... 3.
- 3.—Lingula of pupa case long and spatulate, much extended beyond orifice; forewings of adult with numerous markings ..... *dugesii*.  
—Lingula of pupa case rather short and conical, not extending a great way beyond the orifice; forewing of adult with a faint broken spot ..... *cocois*.

II. *Aleurodicus mirabilis*, Cockerell, 1899.

Psyche, Vol. 8, p. 225 (1898) and p. 360 (1899).

This species was taken by Dr. C. H. T. Townsend at Boca del Usumacinta, Tabasco, in 1897, on a "Laurel" and at Minatitlán, México, in 1898 on *Anona*. The pupa cases are embedded in an enormous quantity of white secretion. I have what is probably the same thing from Tabasco, (Dampf), although the adults appear not to possess the faint grey markings mentioned by Professor Cockerell. When such markings are very faint in Aleyrodids, however, it is sometimes difficult to see them without perfect specimens.

III. *Aleurodicus coccolobae*, Quaintance and Baker, 1913.

Classification of the Aleyrodidae, Part. I, U. S. Department of Agriculture, Bureau of Entomology, Technical Series, No. 27, Part 1. pp. 46-47.

Collected by Samuel Henshaw on *Coccoloba uvifera* in 1904 at Progreso, Yucatán.

IV. *Aleurodicus dugesii* Cockerell, 1896.

Can. Ent. Vol. 28, p. 302.

This species is rather common in México on *Hibiscus* and has been reported also on *Anona*, Begonia, Mulberry and "other plants". It was named after Dr. Alfred Dugés, the well known Mexican naturalist. It is known from the States of Oaxaca, Guanajuato, and Jalisco. Collections by Dr. Alfons Dampf have added the Federal District and Hidalgo.

Since the species has not been described in its earlier stages, and since abundant material is available to me, I am giving some notes on the earlier larvae, especially since the arrangement of pores is very interesting.

From the point of view of sequence in *dugesii*, six stages other than the adults are at once apparent. These are quite distinct in size, although it should be remembered that they do not represent intermolt stages. The first is the newly hatched crawling larva. It is devoid of compound pores of any description.

The second stage is fully twice the length of the first larva, and the legs are reduced. Here three pairs of compound pores appear. One pair is located just mesad of the eye spots, one pair caudad of the first pair of legs, and one pair near the posterior margin. All of these pores are very similar in structure, being composed of a cup with a central rod-like process without other prominent wax rods.

In the third stage, the compound pore arrangement has become quite modified. The pair near the eye spots has quite disappeared, and there is no pair near the posterior margin in the region of the vasiform orifice. There are, however, two pairs of pores near the two posterior pairs of legs. These appear wider and more shallow than those of the preceding stage, and they possess besides the central rod, a basal row of pore rods surrounding the central one and of about half its length.

Forms of practically the same structure, the fourth stage, but in which the pores appear relatively smaller in comparison to the body may now be observed. This, however, may be due merely to the fact that the forms are better fed, although for comparison it is given as a separate stage.

The fifth larval stage appears quite similar to that just described. The two pairs of pores remain the same, but on the



abdomen and on the anterior part of the insect, there are differentiated spots, granular in nature, which mark the site of the future compound pores of the pupa case.

The interesting fact is, therefore, that anterior and caudal compound pores are developed in the early second stage, that these are then lost to be replaced by two pairs of median pores. And when in turn these median pores are lost, the caudal and anterior pores reappear associated with the four pairs of abdominal pores. A detailed description of these stages follows:

First stage larva. Length 0.325 mm., width 0.16 mm. Shape elliptical. Color of mounted specimen examined under microscope very pale yellow, transparent; deep red eyes on lateral border of head distinctly divided, anterior medial division of eye being larger than posterior lateral division. Margin entire. No compound wax pores. Legs long with prominent claws. Antennae very slender. Vasiform orifice cordate. Operculum subrectangular. Lingula setose, long, exserted, protruding beyond caudal end of larva; neck of lingula constricted, middle swollen, tapering suddenly to blunt point. Rostrum prominent. Three spines on each side of posterior part of abdomen, most posterior pair short and thick.

Second stage larva. Length 0.525 mm. Width 0.30 mm. Outline elliptical. Color of mounted specimen examined under microscope pale yellow, translucent. Eye spots dark, more medial than in first stage. No minute papillae-like pores around margin as on pupa; margin a continuous narrow band. Total of twelve hairs on each side: ten hairs on each side of margin projecting beyond lateral edge; one pair at posterior extremity longer than other ten; one pair at anterior extremity same length as other ten. Vasiform orifice cordate; operculum subrectangular; lingula long, exserted, extending beyond posterior end of larva, its neck constricted, middle swollen end tapering suddenly to blunt point. Lingula minutely setose; two pairs of short hairs on either side of tip. Legs reduced, with claws. One pair of compound wax pores mesad of eye spots, one pair between first and second legs, and one pair at posterior end on either side of projecting lingula, pores cup shaped with single slender central process.

Third stage larva. Length 0.75 mm. Width 0.45 mm. Shape elliptical. Color of mounted specimen examined under microscope very pale yellow, eye spots reddish black, one on each side more medially placed than in previous stage. Margin a narrow continuous band, refractile; a few pore-like papillae around the margin as in pupa, but sparsely scattered. Ten hairs on each side, as well as three long hairs on either side on posterior margin. No wax pores near eye spots as in second stage larva; none near posterior margin as in second stage larva; two pairs, however, near posterior pairs of legs. Wax pores cup shaped. Legs reduced with claws. Vasiform orifice cordate; operculum subrectangular, lingula long, exserted, extending to caudal end of larva; neck of lingula constricted, middle swollen, end tapering suddenly to blunt point; two pairs of hairs near tip.

Fourth stage larva. Length 0.815 mm. Width 0.625 mm. Shape elliptical. Color of mounted specimen examined under microscope very pale yellow, transparent; eye spots black, much closer together than in third stage larva. Margin not clearly marked in this specimen; pore-like papillae around margin becoming denser approaching the appearance of the pupal stage. Three pairs of long hairs on posterior end. Wax pores same as third larval stage but smaller, i. e., two pairs near posterior pair of legs. Legs much reduced, claws prominent. Antennae much reduced. Vasiform orifice cordate; operculum subrectangular; lingula long, exserted, extending to caudal end of larva; neck of lingula slightly constricted, middle swollen, end tapering to blunt point, two pairs of hairs near tip of lingula.

Fifth stage larva. Length 0.826 mm. Width 0.56. Shape elliptical. Color of mounted specimen examined under microscope pale brown, translucent; eye spots black. Margin fairly well marked; pore-like papillae around margin denser than fourth stage, three rows along lateral border. Five pairs of hairs laterally distributed, as well as two pairs of longer hairs on posterior margin. Two pairs of wax pores near posterior pairs of legs as in fourth stage; four spots on anterior part of abdomen marking location of future compound pores of pupa, spots densely granular. Legs reduced with prominent claws. Vasiform orifice cordate; operculum subrectangular; lingula long, extruded, extending to caudal end of larva; neck of lingula slightly constricted,



middle swollen, end tapering to blunt point; two pairs of hairs near tip of lingula. Three rows of hairs on each side of dorsum. Shape elliptical. Color of mounted specimen examined under microscope pale yellow, transparent. Margin a wide entire band, irregular edge; no hairs except one pair on caudal margin. Minute pore-like papillae all around just within margin except at caudal extremity, ventrally located, six to eight rows at cephalic end, five rows laterally, none at caudal end, a few of the pores bearing hairs. One pair of large compound wax pores at cephalic end; four pairs of large compound wax pores in abdominal region, and two pairs of reduced wax pores on caudal end. Vasi-form orifice cordate; operculum subrectangular; lingula long, exserted; neck of lingula constricted, middle swollen, end tapering suddenly to blunt point; lingula minutely setose. Two pairs of spines arise near distal end of lingula. Lingula does not extend to end of pupa, becoming shorter in proportion to the whole than in previous stages. Legs reduced, with claws.

Adult male. The adult male has a long organ at the base of the abdomen which I have not seen described. For this reason I have figured the organ, although I do not know its function.

V. *Aleurodicus cocois* (Curtis) 1846.

*Aleurodes cocois* Curtis. Gardener's Chronicle 1846, p. 284.

*Aleurodicus iridescens* Ckll. Psyche Vol. 8 p. 226.

Described very early as a pest of the cocoa-nut in the West Indies. Quaintance and Baker have placed *iridescens* Ckll. as a synonym. Of the latter from the type material was taken by Dr. C. H. T. Townsend on the Ocean beach between El Faro and San Pedro, Tabasco in 1892 on "Jicaco". This is no doubt *Chrysobalanus icaco* L.

### *Genus Radialeurodicus.*

In 1900 Dr. Quaintance described *Aleurodes altissima*, and stated that "when the adult is discovered it will very likely prove to be an *Aleyrodicus*". In 1913 Quaintance and Baker placed the species in the subgenus *Metaleurodicus* along with *cardini* Back and *minimus* Quaintance, basing this placing on

the pupa cases of the original material. Obviously it was somewhat out of place with these species. Thus matters rested until 1923 when Bondar (Aleyrodideos do Brasil) erected the genus *Radialeurodicus* with his *cinereus* as type. Of his other species in the genus, *R. octifer* and especially *R. bakeri* show quite a striking resemblance to *altissima* as far as the pupa is concerned. It seems quite evident, therefore, that *altissima* should be placed in this genus.

*Radialeurodicus altissimus* is known only from the original material since it differs from any of the species described by Bondar. However, during the present year 3, vi. 35, Dr. Alfons Dampf obtained on *Inga* at El Vergel, Chiapas, a form very close to *altissimus*. Fortunately, adults as well as pupae were obtained, and the former leave no doubt about the placing of *altissimus*. Were it not for the structure of the pores of the pupae, the *Inga* material might well be classified as *altissimus*. But I am forced to distinguish the two as varieties as follows:

- Pupa case with five pairs of abdominal compound pores, these pores being relatively small and of equal size .. **altissimus.**
- Pupa case with five pairs of abdominal compound pores, these pores being relatively large with the exception of the caudal pair which is much reduced ..... **ingae.**

#### VI. *Radialeurodicus altissimus* (Quaintance) - 1900.

*Aleurodes altissima* Quaintance. Tech. Ser. 8, Div. Ent. U. S. Dept. Agr. p. 20; Collected by Dr. C. H. T. Townsend in 1897 at San Francisco del Peal, Tabasco, on "*Palo de Gusano*". *Lippia myriocephala*?

#### VII. *Radialeurodicus altissimus ingae* new variety.

*Pupa case* 1.65 mm. long and 1.05 mm. wide. Shape oval, narrow cephalad. Color of mounted specimen examined under microscope yellowish white marked with brown areas as shown in the photograph. Three pairs of short hairs dorsally placed in a row, one pair on each thoracic segment, as well as one on either side of vasiform orifice. Narrow marginal run crenulated. Fifteen hairs on each side projecting from margin. One group of about sixteen small pores on either side of vasiform orifice;

a larger group of about forty pores in second and third abdominal segment. This larger group consists of small pores placed irregularly around a central figure which resembles the steering wheel of a boat with thirteen to fourteen spokes. Four pairs of large brown compound pores, cup shaped, with very long projecting processes, are found, the most cephalad one being on the fourth abdominal segment. Caudal to vasiform orifice is one pair of much smaller brown compound pores about one third the size of the larger ones and in these the process does not project outside. Vasiform orifice cordate, operculum subrectangular, twice as wide as long. Lingula large, slightly constricted at neck, widening at middle, then tapering gradually to a point, extending slightly past caudal margin of orifice, bearing usual two pairs of hairs near tip and covered with minute setae. Orifice reticulate within. Legs reduced, claws present. Antennae reduced.

Pupa is convex, resting on an upright wall of wax. There is no lateral fringe, but a series of about twenty-six groups containing four to six waxen rods, within the margin, projecting laterally and upward. Rods are short, glisten like spun glass, and may curl at tip. A broad band of matted wax secretion extends from vasiform orifice to cephalic end in seven woolly bunches. A curved and narrower series of eight woolly bunches extends on either side of the broad central band from a point lateral to vasiform orifice, to cephalic end.

*Adult female.* Length 2 mm. Forewing 2.55 mm.  $\times$  1.45 mm. Hindwing 1.5 mm  $\times$  1 mm. Leg spiny. Hind femur 0.5 mm.; hind tibia 0.75 mm.; hind tarsus 0.3 + 0.15 mm.; claws 0.075 mm. Body brownish yellow. Forewings irregularly marked with brown spots, hindwings less marked; radial sector and media present; position of cubitus merely indicated. Antennae finely imbricated; first segment 0.045 mm.; second segment 0.1 mm.; third segment 0.35 mm.; fourth segment 0.175 mm.; fifth segment 0.14 mm.; sixth segment 0.09 mm; seventh segment 0.1 mm.

Type material will be deposited in the U. S. National Museum and in the Instituto de Biología, México, D. F.

Genus *Paraleurodes*VIII. *Paraleurodes perseae* (Quaintance) 1900.

*Aleurodes perseae* Quaintance. Tec. Ser. 8, Bur. Ent. U. S. Agr. p. 32.

*Paraleurodes perseae* Quaintance, Tech. Ser. 12, Bur. Ent. U. S. Dept. Agr. p. 170.

This species was originally described from the United States, and has been recorded on Orange, *Persea carolinensis*, persimmon (?) and avocado. Recently in April of this year it was located on Orange in Compostela, Nayarit, by Sr. Pedro León of the Mexican Department of Agriculture.

Subfamily <sup>\*</sup>Aleyrodinae

In this subfamily representatives of ten genera have been recorded in Mexico. These genera may be segregated as follows:

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|--|-----------------------|
| 1.—Pupa case with a submarginal row of papillae, and with the dorsal disk not distinctly separated from the submarginal area .....   | <b>Trialeurodes.</b>  |
| —Pupa case without such row of prominent submarginal papillae .....  | 2.                    |
| 2.—Pupa case with the dorsal disk distinctly separated from the submarginal area by a fold or suture, so that there is a central area and a distinct submarginal band; wax prominent ..... | <b>Tetraleurodes.</b> |
| —Pupa case without these definitely differentiated areas   | 3.                    |
| 3.—Pupa case with the edge rolled under, giving a boat-like appearance from below; wax absent .....  | <b>Tetralecia.</b>    |
| —Pupa case with the margin not rolled under in this way  | 4.                    |
| 4.—Pupa case with prominent thoracic tracheal folds present ending in a pore or in prominent teeth .....   | 5.                    |
| —Pupa case without these structures .....  | 7.                    |
| 5.—Vasiform orifice of pupa case very elongate triangular with caudal furrow often present, operculum short and transverse with lingula much exposed .....                                 | <b>Bemesia.</b>       |
| —Vasiform orifice of pupa case short and rounded, transverse, operculum filling the orifice and obscuring the lingula .....  | 6.                    |

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|---|-------------------------|
| 6.—Thoracic tracheal folds ending in a pore .....   | <b>Dialeurodes.</b>     |
| —Thoracic tracheal folds ending in a comb of teeth ....   | <b>Aleuroplatus.</b>    |
| 7.—Dorsum of pupa case covered with many prominent<br>spines; margin with a series of teeth ..... | <b>Aleurocanthus.</b>   |
| —Dorsum of pupa case without many prominent spines .  | 7.                      |
| 8.—Vasiform orifice of pupa case small, rounded, and<br>almost filled by the operculum .....      | 9.                      |
| —Vasiform orifice somewhat triangular or elongate, not<br>nearly filled by the operculum .....    | <b>Aleyrodes.</b>       |
| 9.—Dorsum of pupa case with a central ridge; margin with<br>a double row of teeth .....           | <b>Aleurotrachelus.</b> |
| —Dorsum without this definite ridge, heavy flocculent<br>wax secretion present .....              | <b>Aleurothrixus.</b>   |

### *Genus Aleurocanthus*

Only one species of *Aleurocanthus*, i. e., *woglumi*, has been located in México. This is not surprising since the genus is oriental and the species found is the well known pest of citrus and other subtropical fruits.

#### IX. *Aleurocanthus woglumi* Ashby, Ann. Rept. Dept. Agr.

Jamaica, 1914-15, p. 31 Quaintance and Baker - Journal of Agricultural Research, Vol. VI, p. 463-5.

The species was first recorded in literature by Ashby, using the manuscript supplied by Quaintance. The first technical description, however, was the description cited above by Quaintance and Baker. A considerable literature on the species exists dealing with its biology, its control by parasites and otherwise, and the quarantines placed against it by various countries. Taken February 17, 1935, at Eldorado, Sinaloa, by Dr. Baker and Dr. Dampf, on citrus.

### *Genus Aleuroplatus*

Two species of this genus are recorded for México. They may be distinguished as follows:

- Suture between abdomen and thorax of pupa case curving cephalad beyond the third thoracic segment .. **berbericolus.**
- Suture between abdomen and thorax not curving cephalad in this way ..... **vinsonioides.**

X. *Aleuroplatus berbericolus* Quaintance and Baker 1917.

Proc. U. S. Nat. Mus. Vol. 51, p. 383.

Taken in Toluca, México, on *Ilex*, June 24, 1897, by A. Koebele; also collected in México City.

XI. *Aleuroplatus vinsonioides* (Cockerell) 1898.

*Aleyrodes vinsonioides* Ckll. Psyche Vol. 8, p. 225.

Taken in Frontera, Tabasco, by Dr. C. H. T. Townsend on an unknown tree. ,

*Genus Aleurothrixus.*

This genus was erected by Quaintance and Baker with *howardi* Quaintance as type. This species as described possesses a series of long hair-like projections on the caudal margin of the vasiform orifice. A very similar species was described by Maskell as *Aleurodes floccosa* from Jamaica.

Maskell's type was studied by Quaintance and Baker and seen to lack these structures. On these data the two were retained as distinct.

XII. *Aleurothrixus floccosa* (Maskell) 1896.

*Aleurodes floccosa* Mskll Trans. & Proc. N. Zealand Inst. Vol. 28 (N. S. Vol. ii) p. 432.

First recorded for México by Professor T. D. A. Cockerell in 1902 in his "Synopsis" by reason of specimens received from Dr. C. H. T. Townsend sent from Zapotlán, Jalisco from orange.

The question of the Mexican species of this genus should receive further study. None of the material examined lacks armature on the vasiform orifice, and therefore it could not be



classified as *floccosus* on the present understanding of that species. On the other hand, none of it possesses the long spine-like processes of *howardi*. Specimens obtained in Eldorado during the present year by my husband, found feeding on orange, posses two setose lobes, one along either side of the caudal margin of the orifice. Specimens from Veracruz, on the other hand, not feeding on orange (host unknown), have three or four small setose lobes occupying the same locations. One might describe both of these as new species, but it seems preferable to delay this until an examination of all possible material has been made. In the meantime, figures of the two Mexican types are presented.

*Genus Aleurotrachelus*

XIII. *Aleurotrachelus trachefer* (Quaintance) 1900.

*Aleyrodes trachefer* Quaintance, Tech. Ser. 8, Div. Ent., U. S. Dept. Agr. p. 38.

This species was described from material taken on "Escabillo" at Las Minas, Tabasco, by Dr. C. H. T. Townsend, June, 1897.

*Genus Aleyrodes*

It is not improbable that several species of this genus may be found in México. The only one, however, that I have seen is representend by material taken on the grounds of the Department of Agriculture in San Jacinto by Dr. Alfons Dampf, on *Myoporum*. The specimens are most of them parasitized or attacked by fungi, so that I am unable to determine them specifically at this time. The nature of the vasiform orifice, however, quite definitely places the forms in this genus.

XIV.—*Aleyrodes* sp. Taken in the federal District on *Myoporum* by Dr. Alfons Dampf, 15, viii, 35.

*Genus Bemesia*

The only species of this genus we have recorded from México is apparently undescribed.

XV.—*Bemesia cauda-sculptura* Quaintance and Baker, new species. Collected at Cholula in Dec., 1910, on Ash. and also at Puebla.

"*Pupa case*. Size 1.95 x 1.28 mm. Shape elliptic, dorsum slightly rugose; abdominal segments distinct. Vasiform orifice 0.16 mm. long and 0.08 mm. wide, caudal extremity about 0.24 mm., from margin of case. Operculum in some specimens slightly indented on its caudal margin; lingula not tapering distad but of almost a uniform width, in this character being different from most of the other species in the genus. Comb of thoracic tracheal pore very distinct, uniform, or semicircular and composed of three or four teeth, heavily chitinized. Caudal comb composed of usually two irregular chitinized ridges, one on each side of the median channel. Two short setae present. Margin minutely crenulate with fine suture like markings extending some distance mesad. Color under the microscope pale yellowish, the combs of the tracheal folds dark brown".

On the leaf the pupa cases appear yellowish brown. They lie flat oppressed against the under surface without any waxy secretion whatever.

*Adults*.—Unknown.

Described from pupa cases in balsam mounts and dry upon the foliage. Type material Aleyrodid No. 6517, Bureau of Entomology and Plant Quarantine Washington, D. C.

*Genus Dialeurodes*

Two species of this genus have been recorded from México, but I am unable to locate references to exact localities and dates on which the records were based. Dr. Dampf in his publication on pests and diseases has listed *citri*, but I have not located Mexican material of either species for study. They may be distinguished as follows:

- Tracheal folds of pupa case covered with many minute dots, tracheal pores without prominent teeth ..... citri.
- Caudal tracheal fold with polygonal marking instead of with dots, tracheal pores with rather definite teeth . citrifolii.

# XVI. *Dialeurodes citri* (Ashmead) 1885.

*Aleyrodes citri* Ashmead. Florida Dispatch, new ser. Vol. II.

This species, the "citrus white fly" is discussed in quite an extensive economic literature due to its importance as a citrus pest.

# XVII. *Dialeurodes citrifolii* Morgan, 1893.

*Aleyrodes citrifolii* Morgan, Spec. Bull. Louisiana, St. Expt. Stn. p. 70.

This species possesses a rather characteristically sculptured egg, and thinking *citrifolli* to be a synonym of *citri*, Berger re-described the species as *nubifera* in 1909. Quaintance and Baker in 1917 established the synonymy in their review of the genus.

## Genus *Tetraleyrodes*

One of the most common species in this genus, *mori* Quaintance, is probably rather widely distributed in México. Several other species are known, two of them apparently as yet undescribed. They may be distinguished as follows:

- 1.—Pupa case with a series of elevated pores forming a row all about the case ..... acaciae.
- Pupa case without such pores ..... 2.
- 2.—Marginal teeth of pupa case blunt ..... 3.
- Marginal teeth of pupa case not blunt ..... 4.
- 3.—Secretion of wax abundant ..... mori.
- Secretion of wax scant ..... ursorum.
- 4.—Dorsum and submargin narrowly separated ..... pringlei.

—Dorsum and submargin widely separated ..... *fici*.

XVIII. *Tetraleurodes acaciae* (Quaintance) 1900.

*Aleurodes acaciae* Quaintance. Tech. Ser. 8, Div. Ent. U. S. Dept. Agr. p. 19.

Probably widely distributed in México. Taken in Hermosillo in 1897 by Koebele on a legume. Found also in Puebla and México.

XIX.—*Tetraleurodes mori* (Quaintance) 1899.

*Aleurodes mori* Quaintance. Can. Ent. Vol. 31, p. 1.

Taken at Rosario, Sinaloa, in 1897, by Rose on *Argemone mexicana*; in México City by Herrera on orange; common in the border town of Laredo, and known also from Monterrey and San Luis Potosí.

XX.—*Tetraleurodes ursorum* (Cockerell) 1910.

*Aleurodes ursorum* Cockerell, Can. Ent. Vol. 42, p. 171.

Common on various plants in different parts of the United States, but especially on rose and not unusual at Laredo.

XXI.—*Tetraleurodes fici*, Quaintance and Baker, new species.

This species was obtained in Veracruz, collector and date unknown. It is similar to Cuban and Florida material on *Ficus*.

"The pupa case appears on the leaf, shiny black with a white uneven fringe about 0.60 mm. in width. The fringe is made up of white coalesced wax filaments which lie out flat from the pupa case. A great number of cases are found on the under side of each leaf.

*Egg* — pedicle short, unmarked.

*Larva*, 1st. stage — Appearance on leaf: light iridescent, without wax secretion. Under transmitted light: size 0.25 mm. in length, 0.080 mm. in width, almost transparent in color with 10 marginal spines. Abdominal segments distinct extending to the margin. A slight ridge separates a small submarginal area from the rest of the dorsum. Vasiform orifice sub-cordate, operculum subquadrate filling almost all of the orifice with the

exception of the caudal end. Tip of globular lingula visible below the caudal end of the operculum.

*Larva second instar*: Size, 0.36 mm. by 0.16 mm.; shape, broadly elliptical; color, almost transparent. Margin finely crenulate with a small ridge separating the submargin from the dorsum. The rest of the dorsum is the same as in the first stage.

*Larva third instar*: Size, 0.51 mm. by 0.36 mm.; shape, broadly elliptical; color, light brown with a darker submarginal area. Margin crenulate, teeth slender, pointed at apex. Submargin 0.32 mm. in width and with the same pattern as in the pupa case. A narrow ridge separates the submarginal area from the rest of the dorsum. Abdominal and thoracic segments distinct. Vasiiform orifice sub-cordate; operculum of the same shape only more acute at the caudal portion, and filling three-fourths of the orifice. Lingula not visible. Dorsal and caudo-marginal setae present.

*Pupa*: Size, 0.832 mm. in length, 0.060 mm. in width; color, very dark brown; shape, broadly elliptical; margin crenulate, the submarginal teeth being slender and pointed at apex, dark in color, this color extending down into the submarginal area the length of the teeth. Sub-marginal area 0.08 mm. in width, narrowest at the cephalic and caudal ends, light semi-circular areas below each marginal tooth and indistinct dark longitudinal lines extending to the marginal ridge. A wide and high marginal ridge separates the sub-marginal area from the rest of the dorsum. This ridge extends around the entire dorsum being widest along the sides. Dorsum smooth in texture and color, abdominal segments not very distinct except along the meson which is raised in a slight rhachis. Thoracic segments much more distinct, each suture colored with dark brown. Vasiiform orifice small, sub-cordate, operculum of the same shape and completely filling the orifice, lingula not visible. The usual dorsal setae are present, but the marginal ones are lacking".

Type material Aleyrodid No. 8856, Bureau of Entomology and Plant Quarantine, Washington, D. C.

XXII.—*Tetrалеurodes pringlei*, Quaintance and Baker, new species.

This species was collected in Oaxaca, México, on *Caulthus hispites* by G. C. G. Pringle.

"On the leaf, the pupa of this species appears as a shiny black object surrounded by a lateral fringe of white wax. The fringe consists of white waxy filaments as long as the width of the case and overlaid with flocculent white wax.

*Pupa*: Size, 1.16 mm. in length, 0.81 mm. in width; shape elliptical; color dark yellow brown. Submargin crenulate 0.11 mm. in width. Marginal teeth rounded at apex, as wide as long, dark in color, a light spot at the base of each submarginal tooth. The rest of the submargin is marked by many longitudinal dark lines. The submargin is separated from the rest of the dorsum by a high narrow ridge which extends around the entire dorsum. Laterad of the ridge is a slight area which appears striated. Dorsum slightly corrugated, abdominal segments in the form of a rhachis. Vasiform orifice small, subcircular. Operculum the same shape and almost fills the entire orifice. Lingula not visible. The usual dorsal setae are present, those caudal of the orifice being very small and set up half way into the submarginal area. There are two round apertures laterad of each compound eye".

*Adults* unknown.

Type material Aleyrodid No. 8884. Bureau of Entomology and Plant Quarantine, Washington, D. C.

### *Genus Tetralecia.*

Two species of this genus are so far recorded from México. These may be distinguished as follows:

Deflexed margin of the pupa case broad, about one quarter of the diameter of the case at its center .....	<i>nigrans.</i>
—Deflexed margin of the pupa case narrow, about one eighth of the diameter of the case at its center .....	<i>rotunda.</i>

### XXIII. *Tetralecia nigrans* (Bemis) 1904.

*Aleyrodes nigrans* Bemis, Proc. U. S. Nat. Mus. Vol. 27, p. 522.



What is assumed to be this species has been taken in Puebla and in the west in Sonora. The figure is from the Sonora material taken early this season by Dr. Baker.

XXIV. *Tetralecia rotunda* new species.

This species is represented by a fair supply of material dry upon the foliage. It was obtained, I believe, in Veracruz, but exact data regarding the material is not now available. Pupa cases only are represented.

*Pupa case.* Length 0.925 mm. Width 0.70 mm. On the leaf jet black, decolorized only after much bleaching by the chlorine method, scattered upon the leaf, and with just a very small ring of wax visible when the insect is lifted up.

When the pupa case is bleached, it becomes an amber color with darker spots on the abdomen. This is due to the fact that the surface possesses differentiated areas, especially toward the margin and on the sides of the abdominal segments which do not bleach as well. The separation between the abdomen and thorax is distinctly curved downward from the center and upward toward the margin. The longitudinal thoracic suture is distinct. There are two pairs of tubercles in this region.

The margin of the case is turned under as is characteristic of this genus, but this part of the case is only about one eighth the total width. The rolled-under portion is fluted, and the inner edge is crenulate. A pair of prominent hairs exists at the caudal extremity. Type material will be deposited in the U. S. National Museum and in the Instituto de Biología, México, D. F.

*Genus Trialeurodes*

In this genus three species are recorded from México, and these may be distinguished as follows:

- |   |              |
|---|--------------|
| 1.—Pupa case with a series of pores on the dorsum and with a chitinized ridge segregating this area ..... | varia.       |
| —Pupa case not so formed .....  | 2.           |
| 2.—Pupa case without papillae on dorsum and with a fine series of submarginal papillae .....              | vitrinellus. |

—Pupa case with papillae on dorsum and with the sub-marginal papillae not fine and close ..... *vaporariorum*.

XXV. *Trialeurodes vaporariorum* (Westwood) 1856.

*Aleurodes vaporariorum* Westwood, The Gardeners' Chronicle 1856, p. 852.

The common "greenhouse whitefly" is often abundant about México on various plants in the open, sometimes very heavily infesting native *Crataegus*. Probably it is quite wide spread. In his synopsis, Professor Cockerell listed *erigerontis* Mskll. from *Erigeron* at Escalon, and *nicotianae* Mskll. from tobacco Guanajuato taken by Dugés. This last species I take to be *vaporariorum*, and judging from a drawing of *erigerontis* made from the type by my husband, I believe it is a synonym also.

XXVI. *Trialeurodes varia* Quaintance and Baker, new species.

Known only from Puebla; host and collector unknown.

"Pupa case. Size about 0.738 mm. by 0.48 mm. Dorsum with a somewhat distinct chitinized line mesad of the submarginal papillae and which appears to separate the dorsal disc from the submarginal area. The species, however, is typically a *Trialeurodes*, as indicated by the vasiform orifice, papillae, etc. It bears very much the same relation to the type of *Trialeurodes* that *giffarii* does to the type of *Bemesia*. Margin slightly crenulate, the teeth being shallow and rounded, and at the caudal extremity forming an evident comb, some distance mesad from the margin to the submarginal row of papillae-like pores, which are situated some distance apart. A few papillae are situated on the chitinized ring extending about the case mesad of the submarginal pores. Just within this ring is a series of large pore-like structures extending around the case, one on each segment of the abdomen and eight or ten on the thorax. Vasiform orifice typical for the genus, somewhat longer than wide and with quite a distinct furrow extending nearly to the caudal margin of the case.

Color on the leaf pale yellowish brown, by transmitted light yellowish. Dorsum devoid of any waxy secretion in the material available for study. Pupa case lying somewhat close to the leaf".

*Adults.* Unkown.

Described from two pupa cases studied on the leaf and later mounted in balsam.

Type material Aleyrodid No. 8785, U. S. Bureau of Entomology and Plant Quarantine.

XXVII. *Trialeurodes vitrinellus* (Cockerell) 1903.

*Aleyrodes vitrinellus* Ckll. Ent. News. Vol. 14, p. 241.

This species has been taken at Texcoco, Puebla and Cuernavaca and no doubt occurs elsewhere on orange.

Trough the kindness of Dr. Quaintance and Baker I have been permitted to include several of their unpublished illustrations.

#### RESUMEN

El presente trabajo fué hecho por su autora como una colaboración especial para los Anales del Instituto de Biología.

Comprende una revisión de las Aleyrodidae de la República Mexicana hasta donde han sido conocidas por su autora, incluyendo descripciones de algunas especies antes no descritas y claves para los géneros y especies.

### Plate I

Fig. 1.—*Aleurodicus dugesii*, fifth larval stage. — Fig. 2.—*Aleurodicus dugesii*, pupa case. — Fig. 3.—*Aleurodicus dugesii*, abdominal organ of male. — Fig. 4.—*Aleurodicus mirabilis*, papae upon the leaf. — Fig. 5.—*Radialeurodicus altissimus*, pupa case. — Fig. 6.—*Radialeurodicus ingae*, pupa case. — Fig. 7.—*Radialeurodicus ingae*, caudal part of pupa case showing comparative size of pores. — Fig. 8.—*Radialeurodicus ingae*, groups of peculiar thoracic pores.

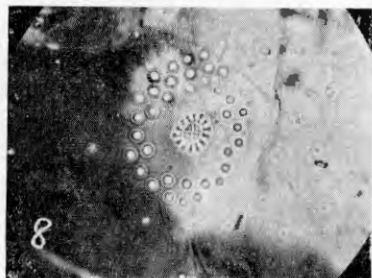
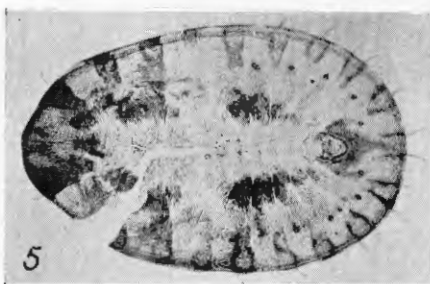
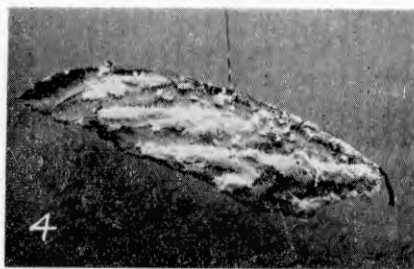
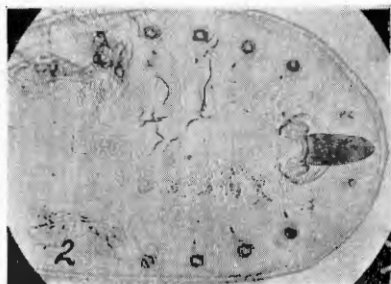
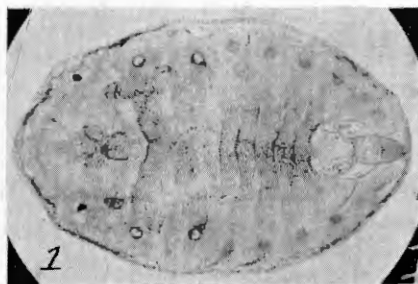


Plate I

## Plate II

Fig. 1.—*Radialeurodicus ingae*, pupae on the leaf. — Fig. 2.—*Radialeurodicus ingae*, forewing. — Fig. 3.—*Paraleurodes perseae*, pupae on leaf. — Fig. 4.—*Paraleurodes perseae*, pupae showing wax rods. — Fig. 5.—*Aleurocanthus woglumi*, pupae on leaf. — Fig. 6.—*Aleurocanthus woglumi*, forewing. — Fig. 7.—*Aleurothrixus* sp., (broken lobes) on leaf. — Fig. 8.—*Aleuroplatus berbericolus*, pupa case (after Quaintance & Baker).



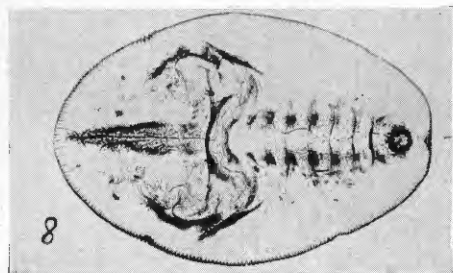
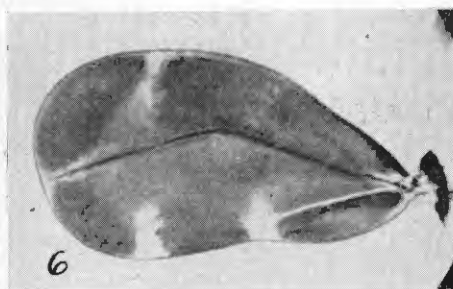
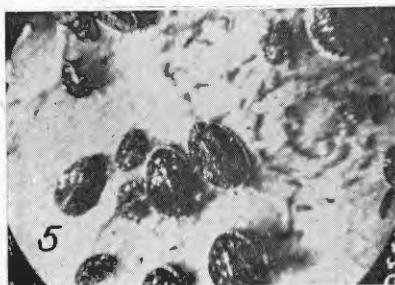
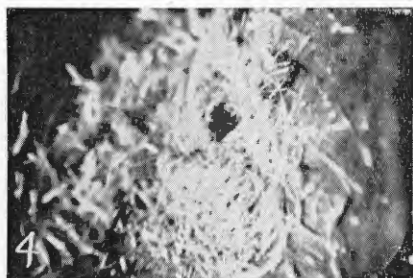
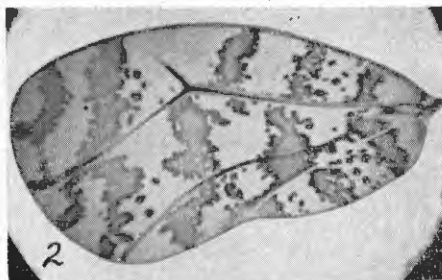


Plate II

### Plate III

Fig. 1.—*Aleurothrixus* sp. (entire lobes), vasiform orifice. — Fig. 2.—*Aleurothrixus* sp. (broken lobes), vasiform orifice. — Fig. 3.—*Aleyrodes* sp., caudal part of pupa case. — Fig. 4.—*Aleyrodes* sp. pupae upon the leaf. — Fig. 5.—*Bemesia cauda-sculptura*, pupa case. — Fig. 6.—*Dialeurodes citri*, pupae on leaf. — Fig. 7.—*Dialeurodes citri*, pupa case (after Quaintance & Baker). — Fig. 8.—*Tetralecia nigrans*, pupa case.

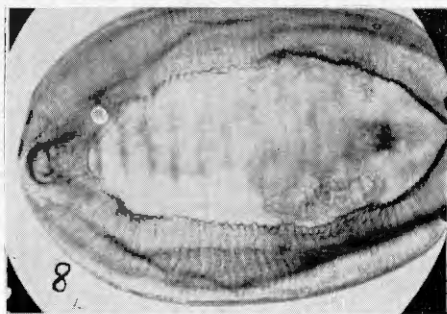
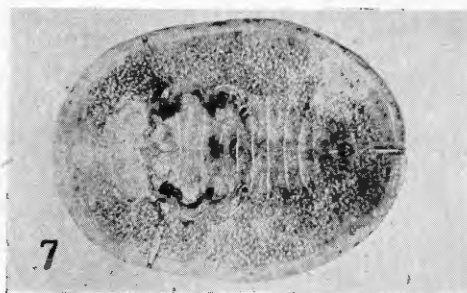
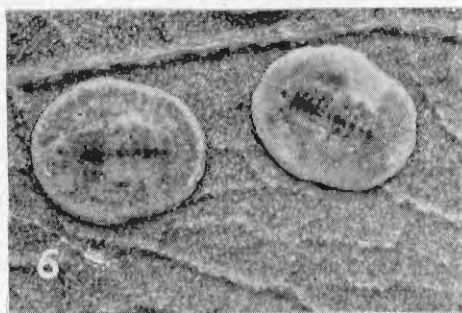
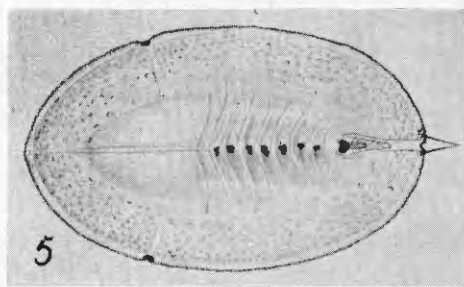
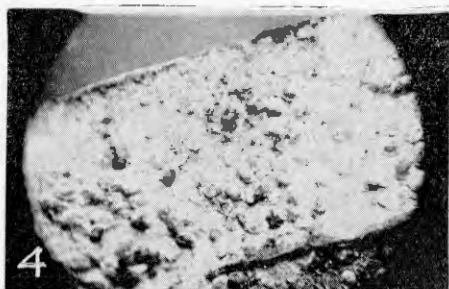
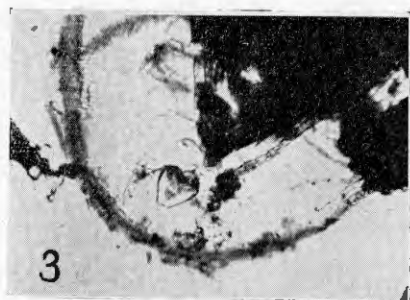
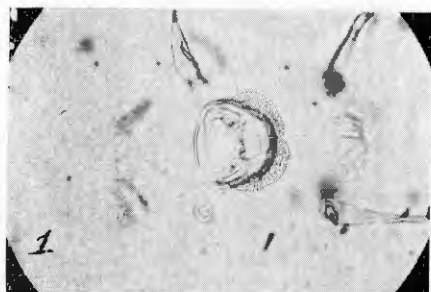


Plate III

#### Plate IV

Fig. 1.—*Tetralecia rotunda*, pupa case. — Fig. 2.—*Tetralecia rotunda*, pupae upon the leaf. — Fig. 3.—*Tetraleurodes acaciae*, pupa case. — Fig. 4.—*Tetraleurodes fici*, pupa case. — Fig. 5.—*Tetraleurodes pringlei*, pupa case. — Fig. 6.—*Tetraleurodes ursorum*, pupa case. — Fig. 7.—*Trialeurodes varia*, pupa case. — Fig. 8.—*Trialeurodes vitrinellus*, pupa case.

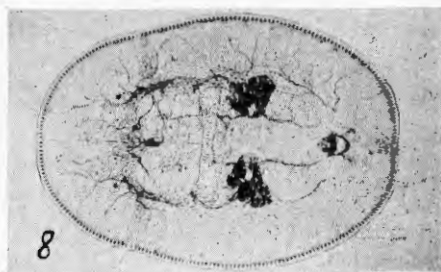
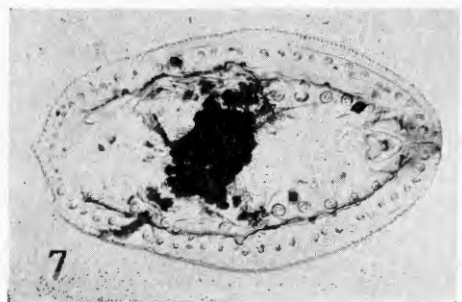
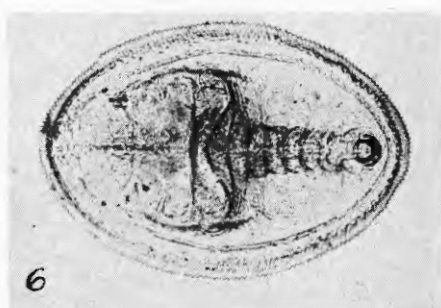
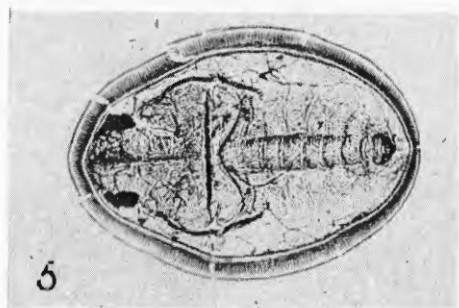
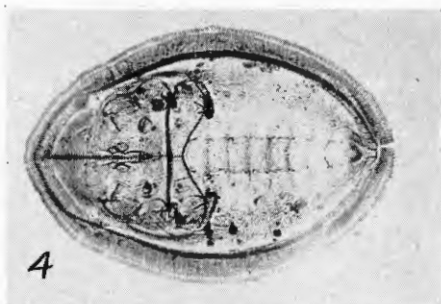
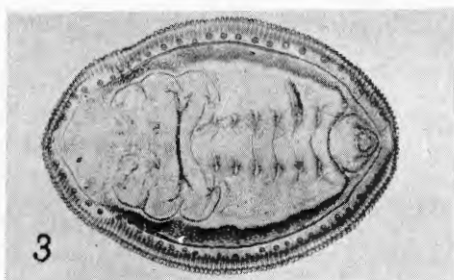
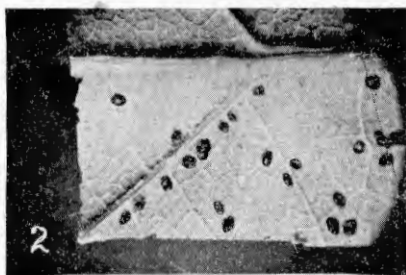
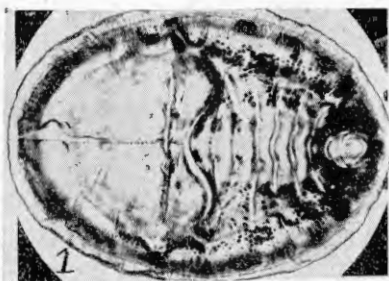


Plate IV