Contribution to the Study of Mealy Bugs of the Tribe Pseudococcini (Coccidae). With Special Reference to the Genus Pseudococcus.

by.

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Introduction.

Mealy-bugs may, under certain conditions, become pests of the highest economic importance. This fact was well illustrated in the case of D. filamentosus (Ckll.) in 1909, when this insect attacked the Lebbek trees in the streets of Cairo and became so numerous that large trees were killed by their ravages in a few months.

In addition to the actual loss of plants, or the damage caused to them by large numbers of the insects sucking their sap, the fruit or fruit clusters are often rendered quite unfit for market by the vast number of ♀♀ with ovisacs which infest them.

Very few Coccidologists, however, have paid particular attention to this group, and our knowledge of even the most common species is very imperfect.

The only reference to many of the mealy bugs is found in the original descriptions of the species, and it is unfortunate that many of these descriptions are quite inadequate for the determination of material. This inadequacy may be due to the shortness and incompleteness of the descriptions themselves, or to the unsuitability of the characters used.

I have endeavoured to collect the most important facts concerning all the species described to the end of 1913, and to arrange the matter in a manner suitable for fur-

-ther study. To do this it has been necessary to refer to more than fifty different journals and periodicals for the original descriptions of species alone.

The only Catalogue of the Coccidae which has been published is that by Mrs. Fernald which appeared in 1903. In this work all the genera which are dealt with in the present thesis are included in the Tribe Dactylopiini, but since it can be shown that they are closely related to one another, and are distinct from the other Dactylopiini genera, a new tribe,i.e.Pseudococcini, has been established for them.

The genera included in the Pseudococcini as here constituted illustrate, I believe, a phylogenetic series, the chief line of development being illustrated by the production of additional antennal segments. Thus Ripersia has 6-jointed antennae, Pseudococcus 8-jointed, and Phenacoccus 9-jointed, while a new genus, which I have named Dactopesudococcus, contains the 7-jointed forms.

A large number of new species have been described since Mrs. Fernald's Catalogue was published, and it has been found necessary to make a number of alterations, so that a provisional list of species has been added as an attempt to bring this part up to date.

Two new species of Pseudococcus are here described for the first time, both from South Africa.

A suggested scheme for the full description of species is included, together with particulars of a chart which I have found of great use in the rapid comparison of those characters which are considered of the greatest specific significance. A large number of these charts are included with the original descriptions of the insects.

A careful study of the literature dealing with the parasites of the mealy bugs has been made, and the results indicate, I think, that this branch of the study would well repay scientific investigation.

The study of the intracellular symbionts of the Insecta is so recent that it is not surprising to find that very little attention has yet been paid to those of the Pseudococcini.

I am particularly indebted to Professor F.W.Gamble F.R.S. for his kindness in bringing this extremely fascinating branch of study to my notice, and for his assistance during the time I have spent with him.

It is too early to predict what the results of the study of the intracellular symbionts of animals will be, but it is a subject of the greatest interest, and one which may have far-reaching results.

My own studies on this subject are not yet complete, but it is hoped to include them in an Introduction to the

Study of the Intracellular Symbionts of the Coccidae to be published later.

I have included a brief outline of the work done on the symbiont of Pseudococcus citri, and a plate of drawings illustrating the chief points connected with the organism concerned. Three new words are used, one of which is adopted from the work of Dr. Büchner, while the other two are after Dr. Pierantoni. They are "mycetom", "sferule" and "sferette".

The mycetom is the particular tissue, usually modified fat-body, which always contains the symbiont. A definite mycetom is not always present throughout the Insecta as a whole, although it appears to be essential in the Pseudococcini.

The other two terms are explained in the section dealing with symbionts, where they first occur.

Acknowledgements.

Acknowledgements.

During the last eight years my studies in South Africa, United States, and England, have enabled me to see practically all the original descriptions of species, and a large number of slides of type, or topotype material of mealy bugs of the genus Pseudococcus and closely related genera.

Without the kind assistance of many friends, however, this would have been impossible, and I have pleasure in expressing my sincere gratitude to the following entomologists : Mr. C.P.Lounsbury, Chief of the Division of Entomology for the Union of South Africa, and to Messrs C.Fuller and C.W.Mally also of that Division: to my former teacher and esteemed friend Professor Herbert Osborn of Ohio State Universoty; Professors T.D.A. Cockerell and R.H.Pettit of Colorado and Michigan respectively; Dr.L.O.Howard, Chief of the U.S.Bureau of Entomology; Mr.E.M.Ehrhorn, Entomologist, Honolulu; Mr.E.O.Essig, Secretary of the Horticultural Commission of California; Dr.Leonardi of Portici; Dr.Marchal and M.P.Vayssière of the Department of Agriculture of France; Professor R.Newstead F.R.S. of the Liverpool School of Tropical Medicine; Mr.E.E.Green, former Entomologist of Ceylon; and finally, to whom my debt is greatest, to Professor F.W.Gamble F.R.S.

Abbreviations to Literature.

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Ag.Gaz.N.S.W.-Agricultural Gazette of New South Wales.

Am.Nat.- The American Naturalist.

Ann.di Agr. - Annali della Ministero di Agricoltura, Industria e Corrercio, Portici.

Ann.Mag.N.H. - Annals and Magazine of Natural History.

Ann.Mus.Zool.Ac.Imp.Sci.St.P.-Annuaire Musée Zoologique Académie Impériale des Sciences de St. Petersbourg.

Ann.Soc.Ent.Am.- Annals of the Entomological Society of America.

Ann.Soc.Ent.Fr. - Annales de la Société Entomologique de France.

Arch.f.Prot.- Archiv für Protistenkunde.

Bol.Zool.Sc.Sup.Port.-Bollitino del Laboratorio di Zoologia generale e agraria della R.Scuola Superiore d'Agricoltura di Portici.

Bul.Soc.Ent.Fr.- Bulletin de la Société Entomologique de France.

Bul.Soc.Zool.Fr.- Bulletin de la Société Zoologique de France.

Bul.U.S.Bur.Ent.t.s.- Bulletin,Technical Series,Bureau of Entomology,U.S.Dept. of Agriculture.

Can.Ent.- Canadian Entomologist.

Cocc.Cat.(T-T.) Coccidarum Catalogus (Targioni-Tozzetti) February, I868.

Catalogue,Fernald.- A Catalogue of the Coccidae of the World. Amherst,I903.

Cocc. Cey.- Coccidae of Ceylon.(Green).

Com.Mus.Buen.Aires.- Communicationes del Museo Nacional di Buenos Aires.

Comp.Rend.Ac.Sci.P.- Comptes rendus hebdomadaires des séances de l'Académie des Sciences.Paris.

Deut.ent.Zeits.- Deutsche entomologische Zeitschrift.

Die Schildl.- Die Schildläuse (Coccidae)Europas etc. (Lindinger), Stuttgart, I9I2.

Entom.- The Entomologist.

Ent.News.- Entomological News.

Ent.Mon.Mag.- The Entomologists' Monthly Magazine.

Ent.Rec.Jn.Var.- The Entomologists' Record and Journal of variation.

Essai Hist.Nat.Or.- Essai sur l'Histoire Naturelle des Orangers.(Risso).

Gard.Chr.- The Gardener's Chronicle.

Ind.Mus.Notes.- Indian Museum Notes.

Jahrb.Hamb.wiss.Anst.- Jahrbuch der Hamburgischen wissenschaftlichen Anstalten.

Jn.Econ.Biol.- The Journal of Economic Biology.

Jn.Econ.Ent.- The Journal of Economic Entomology.

Jn.Inst.Jam.- Journal of the Institute of Jamaica.

Jn.N.Y.Ent.Soc.- Journal of the New York Entomological Society.

Jn.Trin.Nat.Club.- Journal of the Trinidad Field Naturalists' Club.

Kiliman.-Meru Exp.- Schwedischen zoologischen Expedition nach dem Kilimandjaro, dem Meru und den umgebenden Massaisteppen Deutsch-Ostafrikas.

Mem.Dept.Ag.India.- Memoirs of the Department of Agriculture in India.

Mitt.zool.Mus.Berlin.- Mitteilungen aus den zoologischen Museum in Berlin.

N.Z.Trans.- Transactions of the New Zealand Institute.

Pom.Jn.Ent.- Pomona College Journal of Entomology, Claremont, California.

Pr.Ac.Nat.Sci.Phil.- Proceedings of the Academy of Natural Sciences, Philadelphia.

Pr.Cal.Ac.Sci.- Proceedings of the California Academy of Science.

Pr.Dav.Ac.Sci.- Proceedings of the Davenport Academy of Natural Science.

Rep.Ins.Ill.- (I4.)- The I4th Annual Report on the Noxious and Beneficial Insects of Illinois.

Rep.U.S.Ent.Com.- Report of the U.S.Entomological Commission.

Rev.Chil.Hist.Nat.- Revista Chilena de Historia natural.

Rev.Mus.Paul.- Revista do Museu Paulista.

Sch.Gart.Ins.- Naturgeschichte der Schadlichen Garten Insecten.(Bouché).I833.

Sci.Gossip.- Science Gossip.

Stett.Ent.Zeit.- Stettiner Entomologische Zeitung.

Syn.Gen.Br.Ins.- Synopsis of the Genera of British Insects.(Westwood.)

West Am.Sci.- The West American Scientist.

Wien.Ent.Zeit.- Wiener Entomologische Zeitung.

Wombat.- The Wombat.

Vict.Nat.- The Victorian Naturalist.

List of Authors, and Chief Papers dealing with

The Pseudococcini.

List of Authors, with Reference to the Chief Papers dealing with the Pseudococcini.

N.B. When a page reference is given it generally indicates the original description of a species, and may not denote the first page of the article.

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Methods and Technique.

Methods of Staining and General Technique.

Specimens of mealy bugs which have been merely boiled in KOH and cleared do not make suitable mounts for purposes of study. The chitin is then too transparent and colourless; the distinction between the antennal segments and the delicate connecting membrane is not sufficiently conspicuous; and the extremely thin extremities of the anal lobe, and anal ring setae, are not distinct enough for measurement.

Picric acid in Xylol, or beechwood creosote, is the simplest stain for chitin, giving a sulphur yellow tinge to it, but while this is quite satisfactory for the armoured scale insects, it does not give sufficient contrast for use in the Pseudococcini.

The best results have been obtained by using Ziehl-Nielsen Solution of Carbol fuchsin, full strength. After boiling the specimens in KOH they are transferred to water to which a trace of Acetic acid is added. They are then washed in distilled water and transferred to the stain. They are left in this for some hours if used cold, but are well stained in ten minutes if the solution is warmed to steaming point and then allowed to stand. They are then transferred to 70 p.c. alcohol, and on through the alcohols to Canada balsam.

I have received some excellently stained slides from

Dr. Marchal, of Paris, so I give his method too, which is a rather quicker one than the Carbol fuchsin method already given, as the specimens are not stained until they have reached the 95 p.c., or the absolute alcohol. All his slides are of hollow wood, with the specimens mounted between cover-glasses.

The method is given as follows:-

"a. Ébullition dans la potasse à 10 p.c., jusqu'à éclaircissement.

b. Lavage à l'eau chaude.

c. Traitement par les alcools à 40°, 70°, 90°.

d. Coloration dans une solution de rouge de Magenta dans l'alcool absolu.

e. Lavage à l'alcool absolu. Éclaircissement au xylol et montage dans le baume de Canada entre deux lames minces, de façon à pouvoir examiner les préparations sur les deux faces avec un fort grossissement."

This is practically the same method as the one suggested by Professor R. Newstead in Vol. II, of his Monograph.

For the study of the internal anatomy of the insects, or for the study of their intracellular symbionts, it is necessary to make dissections, and also to cut sections and stain for the particular organisms.

Gross dissections are best made in normal salt solution. For this purpose I find the Zeiss dissecting microscope

practically indispensable.

The experience of several years 'work in the dissection of various insects shows that the most suitable dish, for use on the microscope stage,is made from an ordinary Syracuse solid watch glass.Wax is melted and poured in,sufficient being used to fill it level full. When cold it should be scraped so that the surface resembles the inside surface of an ordinary watch glass, level with the edges,but considerably lower in the middle. The killed insect for dissection is held in position by placing it in a shallow spot of melted wax which is prepared by touching the surface with a heated knife point.A little normal salt solution is placed in the dish to float out the organs on dissection.

Delicate,and fine pointed instruments are essential, and I find that one of the most useful is a fine straight Hagedorn needle,mounted in an ordinary needle holder. The cutting edge is small,and can easily be kept in good condition.

For the isolation of the mycetom,the "corpo ovale" of Berlese,a longitudinal,median cut is made on the ventral surface,when the body may be floated out with ease. For the study of this body in situ,serial sections are the most satisfactory,also for the study of the symbiont in the egg.

I obtained the best results from material which was fixed in full strength Picro-nitric solution. If used at a temperature of about 90° C. the adult ♀ insect is completely fixed in about three minutes.

From this fixative the specimens should be transferred direct to 70 p.c. alcohol, which will extract most of the picric acid in about thirty minutes if kept warm. The specimens should then be passed quickly through the stronger alcohols, into cedar wood oil, and then into paraffin.

Sections which have been stained with iron haematoxylin should be counter-stained with water-eosin or Orange G, or some such stain, as the symbionts of the Coccidae do not appear to retain much of the haematoxylin.

Systematic Position of Genera.

Systematic position of Genera under consideration.

The most comprehensive scheme of classification of the Coccidae which has yet appeared is that given by Cockerell in the "Canadian Entomologist",Vol.XXXI,1899. As we are only concerned with his Tribe Dactylopiini I give this part in full for reference:

"♀ not enclosed in a hard shell or waxy or horny sac; or if enclosed (Porococcus,Cryptoripersia), antennae and legs present. Newly hatched larva without rows of dorsal spines .....Dactylopiini.

Dactylopiini.

Anal ring without hairs. . . . . 1.
Anal ring with hairs . . . . . 2.

1.Adult ♀ with all the legs present; first four small, hind pair very large; margin with spines Sphaerococcopsis Ckll.
Adult ♀ with the antennae minute, conical; legs entirely absent; skin with many circular glands Sphaerococcus Mask.
Adult ♀ with the antennae reduced to a mere tubercle; spiracles small, legs absent; skin tuberculate, but without conspicuous glandsCkll. Phaeniococcus Ckll.

2.Adult with well formed legs and antennae . . . . 3.
Adult with legs and antennae absent or rudimentary . . . . . .15.

3.Antennae 9-jointed . . . . . 4.
Antennae 8- sometimes 7-jointed . . . . . 6.
Antennae not more than 7-jointed . . . . . 10.

4.Anal ring with 8 hairs . . . . . Puto Signoret.
Anal ring with 6 hairs . . . . . 5.

5.♀ having the aspect of a Dactylopius . Phenacoccus C.
♀ covered with waxy lamellae, like an Orthezia . . . . . Ceroputo Šulc.

6.Insect with large projecting marginal tubercles . . . . . Tylococcus Newst.
Without projecting marginal tubercles . . . . . 7.

7.Anal ring of ♀ with more than 8 hairs
Lachnodius Mask.
Anal ring of ♀ with 6 hairs . . . . . 8.
8.♂ with 4 caudal filaments . . . . *Oudablis* Sign.
♂ with 2 caudal filaments . . . . . 9.
9.Body very elongate; antennae 8-jointed, shorter and stouter than in Dactylopius; eyes present; mentum short . . . . . *Pergandiella* Ckll.
Body oval, usually with cottony tassel
Dactylopius Costa.
Body subglobular, enclosed in a cottony sac
Erium Crawford.
10.Antennae 6- or 7-jointed, distinguished from Dactylopius by the stouter legs and usually subterranean habitat . . . . . 11.
Antennae 5-jointed; form elongate; anal tubercles prominent . . . . . *Rhizaecus* Kunc.
11.♂ apterous, with relatively short antennae . . . . . *Fonscolombia* Linn.
Not so . . . . . 12.
12.Legs extremely thick, like crab's claws
Pseudoripersia Ckll.
Not so, legs ordinary . . . . . 13.
13.♀ enclosed in a waxy sac . . . *Cryptoripersia* Ckll.
Not so . . . . . 14.
14."Antennae very close together".*Ripersiella* Tins.
Antennae normally placed . . . . . *Ripersia* Sign.
15.Newly hatched larva elongate, with 6-jointed antennae . . . . . 16.
Newly hatched larva oval and suboval . . . . . 17.
16.Terminal segment of newly hatched larval antenna oval, little longer than the one before . . . . . *Pseudolecanium* Ckll.
This segment as long as the 3 before.*Chaetococcus* M.
17.Larva with 5-jointed antennae; anal ring of adult with only 4 hairs . . . . *Cryptococcus* Doug.
Larva with 6-jointed antennae, joint 6 long; anal ring of adult with 6 hairs.*Antonina* Sign.
Larva with 7-jointed antennae, sides very hairy; anal ring of adult and larva with 17 hairs . . . . . *Kermicus* Newst."

The genera to which I wish to refer at present are :- *Phenacoccus*, *Ceroputo*, *Tylococcus*, *Oudablis*, *Pergandiella*, *Dactylopius*, *Erium*, *Pseudoripersia*, *Cryptoripersia*, *Ripersiella*, and *Ripersia*.

The genus Phenacoccus Ckll. includes those forms in which the adult ♀♀ have 9-jointed antennae. The name used by Signoret for these was Pseudococcus Westwood. Westwood, however, based his genus on the common mealy-bug, and on the commercial cochineal. The species first cited was adonidum, which has 8-jointed antennae, so that this really belonged to the genus Dactylopius of Signoret.

The genus Pseudococcus Signoret, (non Westwood) is described in the "Essai" as follows:-

"Cette division se caracterise par la présence de neuf articles aux antennes de la femelle adulte, six à la larve et sept à la larve mâle. De plus, les tarses n'offrent pas de digitules longs comme la majeure partie des espèces, excepté dans le Coccus hederae. Tous les autres caractères sont ceux des Dactylopius, dont ce groupe n'est qu'un demembrement pour faciliter l'étude."

A sub-genus, Paroudablis, was suggested by Cockerell, in The Entomologist, 1900, to include the forms in which the ♂ has 4 caudal filaments, but this was not generally accepted, probably because so few of the ♂♂ are known.

The genus Ceroputo Šulc is in many ways unsatisfactory. It includes twelve species at present, and the chief characteristic seems to be that the female is covered with waxy lamellae, like an Orthezia.

The type species is C. pilosella Šulc, which has, according to Lindinger (Die Schildläuse,p.180,I9I2.) antennae 9- or 10-jointed. In C. mexicanus Ckll, the ♀ has 8-jointed antennae, and the ♂ is winged, while in C. volynicus Nassonow the ♀ has 9-jointed antennae and the ♂ apterous.

The genus Tylococcus was established by Newstead in 1897 for an insect received from Madagascar, where it was found in the nests of Crematogaster Schenki For. The type species, T. madagascarensis Newst. has 8-jointed antennae, anal ring with six haira, and legs well developed. The genus is defined :"♀ adult with a series of large, projecting, marginal tubercles; anal tubercles large. Anal ring and antennae as in Dactylopius."

Oudablis was created by Signoret in 1881 for the forms which differed from Dactylopius only in so far as the males had four caudal filaments instead of two. This was discarded by Mrs. Fernald in her Catalogue (1903) owing to the fact that so few of the males are known. The name Pergandiella of Cockerell (1899), had to give way to Trionymus Berg., which preceded it by a few months only. Other synonyms for this are Westwoodia Sign. Signoretia Kraatz, Bergrothia Kraatz, and Bergrothiella Reit., all of which were pre-occupied.

The type species is perrisi, which was described by Signoret as Westwoodia perrisi (Essai,p.337.) The characters given for the genus are:-

"Nous caracterisons cette division par les antennes de la femelle adulte et celles de la larve mâle composées de huit articles, la larve femelle n'en offrant que six. Menton très-court, filets rostraux très-courts, dont l'anse depasse à peine les jambes anterieures. Le reste comme dans les Dactylopius. La longueur du corps de l'espèce qui sert a former cette coupe est très-remarquable et dépasse de beaucoup l'ordinaire car elle est plus de trois fois plus grande que la largeur."

It is always unfortunate when a name which has become well known, by use for many years, has to be discarded or replaced by another,as happened in the case of Dactylopius. Signoret used the name, which he called Dactylopius Costa, in the following sense:-

"Ce genre se distinguera par la présence de huit articles aux antennes dans la femelle, de six dans la larve, et de sept pour la larve mâle avant les metamorphoses, de quatre digitules et d'un anneau genito- anal de six poils."

This term, with others such as Dactylopiid and Dactylopiine, became general for such forms, and since no other work was used to such an extent as Signoret's Essai, by workers on the Coccidae, the word acquired

a world-wide significance.

Dactylopius Costa (1836), was founded (Fauna del Regno di Napoli VI, p.15) on two species, D. coccus Costa, and D. polynicus Costa. The latter belonged to the already founded genus Margarodes, the former, which is the first mentioned, is to be regarded as the type of the genus. D. coccus is said to be Coccus cacti Linn., but instead of being a synonym of that, it is the first available name for the cochineal insect. This insect has the antennae with 7 segments and the anal ring hairless, the latter character separating it at once from the form under consideration, which all agree in having the anal ring with six hairs. This genus must now be known as Pseudococcus Westwood, with the type species P. adonidum (Linn.) Westw.

Erium globosum Crawford is the type of the genus Erium. It was first described by Maskell in the N.Z.Trans. 34, p.34, 1891, under the name Dactylopius globosus.

"Adult ♀ enclosed in a mass of white, or sometimes greyish, rather loose cotton, which, when separate, takes a more or less globular form, but may be aggregated in large masses covering the twigs. Insect sub-globular, flat beneath and convex above; colour red, or purple, or brown; distinctly segmented: length sometimes reaching 1/8 inch. Antennae properly of 8 joints, but sometimes of 7; the 4th, 5th, 6th, and 7th the shortest,

the last the longest and cylindrical. Mentum rather large , pointed, trimerous. Feet usually normal, sometimes rather short. Ano-genital ring with six hairs. Epidermis bearing large numbers of simple circular spinnerets and fine hairs.

Larva not observed.

Male pupa brown, enclosed in a sac of white cotton smaller and more elongate than that of the ♀. Adult ♂ unknown.

Hab. In Australia, on Acacia armata and A. decurrens. Another of Mr. Crawford's species, to which he originally attached the name of Erium globosum. My specimens on Acacia decurrens were sent by Mr. French."

The above is the only mention of the genus Erium Craw. which was really established by Cockerell in the Amer. Naturalist XXXI,p.590,1897. His main points seem to be the sub-globular body and the enclosing sac. These characters are found throughout the series now under consideration, and cannot, in the estimation of the writer, be given generic importance. The species given under this genus by Mrs. Fernald, in the Catalogue, are now included in the new genus Dactopseudococcus,n or under Pseudococcus.

Pseudoripersia was first given generic rank by Mrs. Fernald. Professor Cockerell, in his Check List of the Coccidae (1899), suggested making a sub-genus with this

name, to include the insect described by Maskell under the name of Eriococcus turgipes. This insect was found in Australia, and was distinguished principally by its legs which were "extremely thick, like crab's claws." The genus Cryptoripersia of Cockerell, founded on the character of the ovisac, was not accepted, and was merely given as a synonym of Ripersia by Mrs. Fernald. In 1899 Tinsley separated a few species from the genus Ripersia, in which the antennae were very close together, and formed the genus Ripersiella to contain them. The type was given as R. rumicis Mask., a New Zealand insect found underground on the roots of Rumex acetosella. It has 6-jointed antennae, and anal ring of 6 hairs.

Ripersia Signoret was described in the Essai, p.335, as follows:-

"Nous avons crée ce genre pour les espèces de Dactylopites qui offrent six articles aux antennes pour la larve embryonnaire et pour la femelle arrivée à l'état adulte, la larve mâle conservant le nombre sept, le plus ordinaire dans le groupe. Les autres caractères sont ceux des Dactylopius; cependant nous pouvons ajouter l'absence des digitules des tarses."

With the exception, possibly, of Ceroputo, of which our knowledge is very imperfect, I am convinced that the genera discussed above constitute a phylogenetic

series, of which Ripersia forms the stem. From this, by following very definite lines of development, the whole series may be derived.

Ripersia is not the starting point, the root, as it were, for below this we should find the more primitive types showing relationship with the Coccidae as a whole, but it is from this genus that the series is moulded. The main line of development seems to be indicated in the production of an additional number of segments in the antennae of the adult females. The males (not considering possible variations in the genus Ceroputo) seem to have undergone comparatively little change from the usual Coccid type, and possess 10-jointed antennae. One difference found in the males has been mentioned in connection with the genera Oudablis and Paroudablis,- in the production of four instead of two caudal filaments,-but this modification is looked upon as slight. In Ripersia the ♀ larva has 6-jointed antennae, and, for ♀ larvae, this number is normal throughoutt the series. During metamorphosis, however, there appear, with ecdysis, additional segments, from one to three, in all the genera except Ripersia. In this genus the original larval number,(six), persists throughout. In Phenacoccus, where the adult ♀ has 9-jointed antennae, the larva still has six, the additional segments appearing gradually with the ecdyses.

It will have been observed that the number of joints in the antennae forms the cheif basis for classification in this group, and in many ways this appears to me very unsatisfactory, especially, as will be shown later, that variation in this character may be seasonal. I am not in a position, unfortunately, to suggest any single character to remedy this, but I have attempted, by utilising the comparative lengths of the setae of the anal lobes, and those of the anal ring, and also of the legs, to facilitate the determination of species. These, and the other characters used in descriptions of species are discussed in a special section, later. The number of segments in the antennae appears at first to be a simple means for determination, and while the species to be described conformed to Signoret's genera having 6-, 8-, or 9-jointed antennae it was simple enough.

Specimens were found, however, which had forms in the same generation of adults, which proved to have six or seven jointed antennae; others with six and seven jointed forms together. These are all included in the genus Ripersia. In the same way generations of adult forms were found, in which 7- and 8-jointed forms were found, and likewise others which exhibited 8- and 9-segmented antennae.

There is still a further class which must be mentioned

here. In Pseudococcus agrifoliae Essig, and P. trifolii Forbes, we find two distinct generations, a Summer form in which all the adult females have 8-jointed antennae, and a Winter generation in which the adult females all have 7-jointed antennae.

In Phenacoccus acericola King we have a similar seasonal dimorphism, the Summer generation with 9-jointed antennae and the Winter form with antennae of 8 segments.

It is quite possible that this phenomenon may be much more common than is now recognised, for in the majority of cases nothing is known of the species beyond what was written concerning the type material.

It is obvious that two seasonal forms such as are mentioned above, cannot represent different species, in different genera, as would be the case if the present classification were adhered to, and I suggest the following scheme to obviate such difficulties.

Tribe Pseudococcini (nov.)

Adult♀.-

Legs and antennae present, well developed.

Anal ring with 6 hairs.

Antennae of six, six or seven, seven, seven or eight, eight, eight or nine, or nine segments. Terminal segment long,generally the longest.

The variation in the number of antennal segments may be

seasonal and constant, as in Dactopseudococcus trifolii (Forbes), D. agrifoliae (Essig), and Pseudococcus acericola (King), or the two varieties may be found together in the same generation as in Pseudococcus aurilanatus (Maskell).

All the segments bear hairs more or less long, the longest being usually on the terminal segment.

Length of body varies from 1 mm to 7.5 mm (Ps.grandis Hempel), but 2 mm to 4 mm is the most common range.

Body usually more or less oval, or elongate, but it may be somewhat sub-globular, the segmentation showing more or less distinctly through the mealy secretion.

Mealy secretion usually white or whitish, but may be yellowish, or buff coloured. Amount of secretion varies considerably. Lateral and caudal filaments present or absent.

Colour of body, after secretion is removed, as after boiling in KOH, usually reddish, pinkish or purplish, but may be blackish or dark bluish green.

Caudal tubercles more or less developed, each bearing a long seta and several shorter hairs, in addition to the two or more (usually two) short conical spines, and glandular pores.

Similar conical spines are usually found on the lateral margins of the segments, together with the ceriferous gland-pores. In the genus Tylococcus these lateral

spine areas are produced on conical or rounded tubercles.

Eyes generally present, simple, on the anterior lateral margins, slightly posterior to the insertion of the antennae.

Ovisac: A more or less complete ovisac is usually formed, which may be but loosely woven of cottony filaments, or may be densely felted; "glassy" filaments may be included in the ovisac. (e.g.P. virgatus Ckll.)

Some species, especially those which are viviparous, secrete merely a thin film of wax on the ventral surface, and do not form a true ovisac.

The completed ovisac may partially, or entirely, enclose the adult ♀, while other species rest upon the surface of the sac in such a manner as to suggest the appearance of a Pulvinaria. (e.g.P. vovae Nassonow.)

Some adult females (P. saccharifoliae Green,) are said to drop off the plant and die when the ovisac is completed, i.e. when the full complement of eggs has been deposited.

Adult ♀ usually stationary, but some are said to move about freely in the evenings. (Ph. aceris Sign.)

Occurrence: Commonly found on various parts of plants; on or under the bark of trees; clustered at the nodes or on the under side of leaves; in flowers or fruit clusters; on the lower stems near the surface of the

ground, or on the roots below the ground. A few species are known to inhabit galls, which may be made by the insects themselves, as in P. subterraneus Hempel, or by some other insect as is the case where P. cualatensis Ckll. is always found in the galls constructed by the Coccid Akermes colimae.

Some again are only known from ants' nests, such as P. cockerelii King, P. claviger King, etc, while forms such as P. citri Risso, the common mealy bug, have also been found in close relation with ants. (See King and Tinsley, Psyche VIII, p.297,1898.)

♂ puparium.- usually small, elongate, closely felted; often mixed up with, or hidden beneath, the masses of ♀ ovisacs.

♂.- The males of comparatively few species are known.

♂ normally winged; legs normal; antennae of 10 joints. wings (two), well developed, generally white, mealy. Caudal filaments usually two in number, but a few forms have four, which may be equal in length, or the inner pair may be longer than the outer ones, or vice versa.

The tribe Pseudococcini, as above defined, will include eight genera viz. Ripersia Signoret, Pseudoripersia Ckll. Ripersiella Tins., Dactopseudococcus gen.nov. Pseudococcus Westwood, Tylococcus Newst., Phenacoccus Ckll., and possibly Ceroputo Šulc.

Four of these, Ripersia, Dactopseudococcus, Pseudococcus,

and Phenacoccus are established chiefly on antennal characters, while the remainder have additional striking characteristics to distinguish them.

These are briefly illustrated in the following Key.

Key to Genera.

Tribe Pseudococcini.

1. Adult ♀ with 6- or 6- and 7-jointed antennae . . .

Ripersia Signoret.
Type: R. corymbosa Sign.

Legs very thick . . . . . Pseudoripersia Ckll.
Type: P. turgipes Mask.

Antennae very close together. Ripersiella Tinsley.
Type: R. rumicis Mask.

2. Adult ♀ with 7- or 7- and 8-jointed antennae . .

Dactopseudococcus g.n.
Type: D. bromeliae Bouché(?).

3. Adult ♀ with 8- or 8- and 9-jointed antennae .

Pseudococcus Westw.
Type P. adonidum Westw.

Lateral margins with projecting tubercles .

Tylococcus Newstead.
Type: T. madagascariensis N.

4. Adult ♀ with 9-jointed antennae. Phenacoccus Ckll. .
Type: P. aceris Sign.

(♀ covered with waxy lamellae . . Ceroputo Sulc.)
Type C. pilosellae Sulc.

It is interesting to notice that Pseudoripersia, Ripersiella, Tylococcus and Ceroputo are not distinguished by characters which appear only in these genera, but represent rather, the extreme cases of development along the lines which are more or less common to all the series. In Ripersia, for instance, many of the species are subterranean, and it is in this genus that we find most cases of short, stout legs. In a few species of the genus Pseudococcus we find a tendency in the same direction, too, but in the genus Pseudoripersia the character is developed to an extreme.

The shape of the body varies greatly in all the genera. The most common shape is elongate oval, but in some species the insects are short and thick, almost circular in outline, while others taper to the extremities. The distance between the antennae varies, of course, to some extent, with the shape of the body. In the sub-globular species they are generally further apart than in those which become narrow towards the anterior extremity. Ripersiella represents the extreme in this particular direction. The orginal description of the type species, R. rumicis Maskell, N.Z.Trans.,1891, gives the shape as irregularly elliptical, but the figure shows that the body is considerably narrowed anteriorly.

In Tylococcus the case is slightly different. Anal

tubercles are present throughout the series, and are developed to a more or less degree in the larval forms too. The well developed lateral spinneret areas are confined to the adult forms, and these are much better developed in some species than in others. These areas are furnished with numerous gland openings, and usually bear two or more short thick spines. In Tylococcus these areas are especially well developed, and are produced on lateral tubercles.

A single case of still further localised glandular areas is presented by the insect described by Mr. E. E. Green in the Mem.Dept. Agr. India, 1908, under the name Phenacoccus insolitus Green. The ♀ has 9-jointed antennae, but the 8th and 9th segments are fused together. The body is oblong-oval, and has "a complete marginal and three longitudinal series of conspicuous spinous tubercles, the median series absent on the abdominal segments, the spines short, stout and sharply pointed.. During oviposition the insect deposits first a mass of cottony filaments (upon which it rests), and constructs later an elongate white ovisac." This insect will now stand as Tylococcus insolitus (Green).

The waxy lamellae as found in the genus Ceroputo, are easily derived from the waxy covering found throughout the series, through an intermediate stage such as is found in Dactopseudococcus nipae Maskell.

Study of Specific Characters.

Study of the Specific Characters used in the Pseudococcini.

In the majority of the descriptions of species of the Pseudococcini the adult ♀ only is given, and the facts recorded usually follow more or less closely the following plan:-

Size; shape; mealy covering; segmentation; lateral and caudal filaments; colour in boiling KOH; antennae, of which a formula only is given; legs, usually comparative size, not actual measurements; anal ring; host plant; locality.

I propose to deal with each of these headings separately, and endeavour to indicate the relative importance of each as a means of determination.

a. Size: As a rule, the size stated represents, I think, an average, rather than an actual measurement, as it is most often expressed in terms such as "about 3 mm long", or "from 2.6 to 4 mm long" etc. Quite often a range of variation is indicated, as in the latter example.

It may be difficult to state with any degree of accuracy the precise measurements of living insects, as they will not remain still for measuring, and the mealy covering, and caudal filaments tend to obscure the extremities.

It is desirable, of course, to be sure that the smaller specimens are really adult forms, and not merely second

stage nymphs, and for this reason only those which are spinning ovisacs should be reckoned as adults when dealing with the living material. In mounted specimens the number of joints in the antennae obviate this difficulty. (except in 6-jointed Ripersia.)

My own observations seem to show that a slight variation in size may be caused by difference of food plant, and also by the season of the year, so that I think it is desirable, when describing new species, to give the date of collection, and merely to indicate, from the living material, the approximate size of the largest specimens.

When dealing with old adult females which have completed oviposition, the measurements of the living specimens may be very misleading, as the bodies are often shrunken, and an insect which then measures 2 mm in length may be 4 or 5 mm long when cleared and mounted.

Some writers always give the length of the rostral loop after the measurement of the insect, but this appears to be quite useless as a character. As an illustration of this point I give measurements of two ♀♀ of Pseudococcus citri Risso, (mounted).

Length of body.	Length of rostral loop.
3.2 mm.	180μ.
2.6 mm.	390μ.

b. Shape : The descriptions of the shape of the body are generally given in such terms as elongate-oval, rounded-oval etc. which are nearly synonymous.

The normal shape is elongate oval, and it is only in a few cases that there is any important variation from this. A few species are short, and more or less sub-globular, while a few others are exceptionally long, with tapering extremities.

It may be seen that such variations from the normal would assist in determination, where they are constant, especially as they are found in but a few of the species.

c. Colour: The descriptions of colour apply really to three distinct phases, (1) the colour of the mealy secretion, (2) that of the body through the secretion, and (3) that of the body in boiling KOH.

The colour of the mealy secretion is generally white, but it may be grayish white, or yellow, as in D. nipae Mask., D. filamentosus Ckll, and D. aurilanatus Mask., or it may be decidedly buff, as in P. iceryoides Mask.

The colour of the body through the secretion varies, of course, with the colour of the body, and of the mealy covering, and also with the amount of waxy secretion. Some dark-coloured species have such a dense coat of secretion that they appear quite white on the dorsal surface, and, until the secretion is removed, their

true colour is only seen on the ventral side, where the secretion is always scant.

On first dropping into boiling KOH the true colour of the body is seen. This may change considerably in a few minutes, as some of the colours found in this group are rapidly changed by the action of any strong alkali.

By far the most common colour in the Pseudococcini is pinkish, or purplish pink, but the following variations are met with:-

Light yellow, P. crawi Coq., and P. solani Ckll. etc.

Pink: P. agrifoliae Essig, P. roseotinctus Ckll. etc.

Red: P. cocotis Mask.

Reddish brown: P. claviger King and Tins., etc.

Yellowish brown: P. formicarii Ehrh. etc.

Olive brown: D. aphyllonis Ckll.,P. olivaceus Ckll.,etc.

Cardinal: P. bakeri Essig.

Light brown: P. ryani Coquillet.

Greenish brown: P. quercus Ehrh.

Dark grayish brown: D. quaintancii Tins.

Gray: P. salinus Ckll.

Lead gray: P. andersoni Coleman.

Purplish gray: P. azaleae Tins.

Slate colour: P. muraltiae Brain.

Purplish black: D. filamentosus Ckll.

Dark green: D. aurilanatus Mask., etc.

Pale greenish: P. atriplicis.Ckll.

In writing on the colouring matter found in the Lebbek scale, D. perniciosus Newst., (=D.filamentosus Ckll.?) Mr. Hughes, Bull. Ent. Res.I,p.141, writes:-

"A colouring matter of a reddish crimson is present. This can be extracted with water, or better, alcohol. In the latter solvent the absorption spectrum resembles, though it is not identical with, that of cochineal. Acids have little effect on the colour nor has ammonia. it is, however, changed to a brownish green by the addition of a large excess of alkali."

Most species clear easily by boiling in KOH, or merely leaving in a cold 10 p.c. solution for 24 hours, but some of the dark green or blackish forms are extremely difficult to clear.

As a means of determination the colour of the adult ♀ is quite inadequate, as may be illustrated by the fact that all the common forms in the British Isles are of the same pinkish hue, but, where the colour varies from the normal, it may, at least, furnish a very significant clue.

d. Segmentation: It is usual, for some reason or other, to state whether the segmentation of the body is conspicuous or not. In the majority of cases this merely amounts to whether the mealy secretion is abundant or scant. The segmentation of the body is always more

distinct in the second nymphal stage than in the adult. The distinctness gradually diminishes as the adult becomes replete. It varies, too, in the same species, on the position of the females, as insects sheltered from the wind usually have a more complete covering of meal than those in exposed positions.
As a character for determination this is quite useless.

e. Lateral and caudal filaments:

The presence or absence of lateral and caudal filaments in the species in this series is a character which may assist considerably, in a preliminary way, in the determination. It would be better, perhaps, to say that the length and thickness of the filaments often give a clue to the identity of the species.
There is a relation, of course, between these filaments and the glandular spine areas, which gives the point significance. The two common species, P. citri Risso, and P. adonidum Westw., which have now a world-wide distribution, may be readily distinguished from one another by the character of these filaments. In P. adonidum they are more slender, and the caudal ones are very long, sometimes reaching more than the length of the body. This insect became well known in many countries under the name of Dactylopius longispinus.
A few species are described as having caudal, but no lateral filaments.

f. Antennae:

The number of segments of the antennae is a generic character, so does not call for attention here, and I wish to draw attention to the usual practice of giving the antennal formula as a specific character. This is done in a large percentage of the original descriptions, and it is only when one has endeavoured to determine specimens with the aid of them that the impossibility of the task is realised.

A formula is composed of numbers indicating the joints the largest, i.e. longest, being given first, the shortest last, with the others in order of their length. When several segments vary so much that the sequence may be altered the numbers are placed in brackets.

The formula given by Newstead, (Monograph of British Coccidae, II.) for P. adonidum Westw. is as follows:-

(2.3.8.)(1.4.5.6.)7.

This indicates that joints 2, 3, and 8, are longest, and any one may be longer than the other two, or that the three are of equal length. Joint 7 is shortest, and its position outside the brackets would indicate that it is always the shortest.

I am inclined to think that many, if not most of the antennal formulae have been made on simple comparisons of the segments under the microscope, and not by actual measurements.

If we remember, too, that most of the descriptions are made from mounts which are merely boiled in potash, and cleared, the difficulty of observing the comparative lengths of the segments will be obvious.
Under these conditions the dermis is colourless, and becomes very transparent in Canada balsam, and the exact point at which the segments begin, and terminate, is difficult to determine.
With material which is suitably stained the task is much easier, and the results are, consequently, more reliable. Methods of staining are given in the section on Methods and Technique.
Antennal formulae, constructed from stained specimens, however, are quite unsatisfactory for the determination of species. That this is the case may best be illustrated by a few measurements with the formulae constructed from them. The following are made from specimens of P.adonidum Westw.,collected at the Edgaston Botanical Gardens in November 1913.

Antennal segments:-

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
	65.	72.	76.	38.	42.	38.	46.	104.
Formula:-	8.	3.	2.	1.	7.	5.	(6.	4.)
	58.	65.	63.	36.	41.	38.	43.	96.
Formula:-	8.	2.	3.	1.	7.	5.	6.	4.
	74.	72.	74.	48.	62.	43.	43.	101.
Formula:-	8.	(1.	3.)	2.	5.	4.	(6.	7.)

It will be seen that no two of the formulae are alike. It is not an uncommon occurrence for the two antennae of the same individual to give different formulae, and from this one collection of material, about 40 specimens, I constructed the given formulae of five distinct species. The measurements were made from specimens stained by the Carbol fuchsin method, with the Zeiss microscope, obj.D, and 7.5 measuring ocular. The results are more accurate by this method than plotting from camera lucida drawings.

The lengths of the antennal segments are, nevertheless, of great importance in the determination of species if they are accurately made from stained specimens, and properly tabulated.

I have received several letters from workers in this group, expressing the usefulness of the scheme I used first in my description of new South African species of Pseudococcus, in 1912, which gives the measurements, in μ, in three lines, as follows:-

a. Range of measurements.

b. Most common measurements.

c. Average of 10, 20, or 30 measurements, according to the amount of material available.

This method has the disadvantage of requiring a good deal of time, but I think the results are sufficiently

useful to repay one for the time spent.
The average measurements are then used by the writer in preparing the chart for determination of species, which is described later.

Legs:

The remarks concerning the uselessness of an antennal formula as a specific character apply equally well to general remarks on the legs, such as are commonly made in descriptions of species of Pseudococcini. In order to be of use, the measurements should be carefully made and tabulated, and use should be made of the three pairs of the same specimen. If only one set of measurements is to be given I would suggest that the mesothoracic leg be made use of, as this is usually a more or less reliable clue to the other two pairs.
The scheme formulated by the writer (1912), gives the measurements, in μ, in the following order:-

1. Length of coxa.
2. Breadth of coxa across base.
3. Length of trochanter plus femur.
4. Breadth of femur.
5. Length of tibia.
6. Breadth of tibia.
7. Length of tarsus plus claw.

This scheme was the outcome of an endeavour to obtain

measurements in direct lines from points which remain fixed although the legs are folded in different ways in mounting.

Considered alone, the character of the legs would not form a satisfactory character for specific determination, but taken in conjunction with the antennal segments, and the comparative lengths of the setae of the anal lobes and the anal ring, it is an important factor.

h. Anal ring:

The only mention of this character in the majority of the descriptions is to give the number of hairs which it bears. All the series which I now include in the Pseudococcini, however, have the anal ring with six hairs. It was observed that the length of the anal ring hairs remained fairly constant throughout all the ♀♀ of the species, but this did not furnish a satisfactory specific character in itself, because there was not sufficient difference between the length in different species. The anal lobes are furnished with conical spines, glandular pores, and each bears one long seta. These also remain fairly constant in length for the species, so that the comparative length of the setae of the anal lobes with those of the anal ring, forms, I think, quite a good character if taken in conjunction with the antennal segments and the legs.

i. Host plant and Locality.

A few species, such as the common mealy bug, P. citri Risso, and the long-tailed mealy bug, P. adonidum Westw. are found on a great variety of host plants, and have a very wide distribution, but the majority of species yet described have only been found on a single host plant, and have only been recorded from the one locality. The species which are most common on nursery stock are the ones which have been spread most widely in recent years. An illustration of this is furnished by the conspicuous species D. nipae Maskell. This was first described in 1892 from Demerara, where it was found on Nipa fruticans. It became very common on palms of different kinds and was soon known as a nursery pest in Mexico and the United States.

About 1903 it was found in Europe, and has since been sent on palms to many parts of the world. It was first noticed in greenhouses near Cape Town about 1906 or 1907, but it is quite common there now.

It has also been reported recently from India, Australia and New Zealand.

Dr. Signoret established a number of species apparently on this character (i.e. host plant) alone. A number of these will be found in the synonymy of P. citri and P. adonidum.

Development of the Pseudococcini.

Development of the Pseudococcini.

Very little attention has been given to the development of the mealy bugs. The majority of the descriptions refer only to the adult female; the males of few species are known, and the early stages of practically all the insects have been entirely ignored.

I am able to record some personal observations on the ♀ series of Pseudococcus citri Risso, but unfortunately I have not had an opportunity to observe the ♂ transformations.

Some observations on P. saccharifolii Green, which were made in India by Mr. Maxwell Lefroy, are added for comparison.

After hatching from the egg the ♀ of P. citri moults four times before the adult stage is reached, so that the following instars are passed through:-

Pseudococcus citri Risso.

1. Egg, hatching in 8 to 13 days.
2. 1st larval stage, with 6-jointed antennae.
   First moult.
3. 2nd larval stage, larger, with 6-jointed antennae.
   Second moult.
4. 1st nymphal stage, with 7-jointed antennae.
   Third moult.
5. 2nd nymphal stage, antennae also 7-jointed.

Fourth moult.

6. Adult, with 8-jointed antennae.

In P. saccharifolii Mr Lefroy did not find the two larval stages, so that it is probable that they do not occur in that species. I observed them in P. muraltiae in a generation which hatched from eggs on October 25, 1910, at Cape Town.

Both ♂ and ♀ were observed by Mr. Lefroy, so that I shall draw somewhat fully from his description given in the Memoirs of the Dept. of Agr. in India,II,p.124,1908. The ♂ and ♀ are alike up to the second moult, when the ♂, after the moult, enters a period of rest, during which it assumes a chrysalis form, while the ♀ passes through another instar before attaining maturity.

P. saccharifolii Green.

1. Eggs laid, hatching in about 11 days.

2. First instar, in which both sexes are similar and active, lasting 4 to 6 days.

3. First moult, occurring 15 to 17 days after the eggs were laid.

4. Second instar, in which both sexes are similar, and active on occasion, lasting about 4 days.

5. Second moult, 19 to 21 days after hatching.

6. Third instar; ♂♂ enter pupal stage; ♀♀ remain as before and continue feeding, lasting 6 to 7 days.

7. Third moult; ♂♂ emerge winged.

8. ♂♂ fertilise ♀♀, about 2 days after emerging.

9. ♂♂ die, usually within 2 days of emergence.

10. ♀♀ lay eggs and then die.

The total duration of life in this particular generation lasted 29 or 30 days for the ♂♂, and about 34 days for the ♀♀. This represents the period from the time the eggs were laid until the insects died as adults. Other generations were observed in which the life of the ♀♀ occupied 41, 35, and 50 days respectively. Mr. Lefroy considered that there would be as many as eight distinct generations in the year, but as there is a good deal of irregularity in the behaviour of the broods they overlap until all stages are found together. Little is known as to how the different species pass the winter, but in the common forms of greenhouses, all stages may usually be found throughout the year.

In Pseudococcus capensis, which was extremely numerous on Phytolacca trees at Rosebank, (South Africa), adult females were always to be found in the cracks of the bark during the Cape winter.

Scheme for Description of Species,

and

Chart to aid in Determination.

Suggested Scheme for the full description of Species, and a suggested Chart to facilitate the Rapid Comparison of one Species with others.

The unsatisfactory nature of many of the existing descriptions of the Pseudococcini cannot be denied. The fact that I have received letters from Entomologists in other parts of the world asking if I have a "workable" scheme for the determination of species proves that this is recognised. The reason for this cannot be shown to lie with the workers themselves, but is to be found entirely in the characters which were most often used.
Characteristics which we may consider essential now were not considered at all by the early workers, who, I imagine, were not entirely satisfied, nor am I sure that any single character used now is entirely satisfactory.
All that can be done, at any time, however, is to endeavour to find the most constant characters for the species, and to consider these as the essentials for the time being. Characters such as can only be proved by breeding cannot always be awaited.
Descriptions should be made, as far as possible, on the same lines, at any rate care should be taken that all the more important characteristics are given. When given always in the same sequence the work of comparison is simplified.

A definite scheme, suited to the particular class of insects, has several advantages, one of which is that it ensures that no point of importance is omitted.
For a full scheme, to be used in the description of the Pseudococcini, I would suggest the following:-

Name:- . . . . . .

Ovisac: size, shape, colour, texture, whether adult ♀ is enclosed or not.

Ova: size, shape, colour, (hatch in . . . days.)

Larva: size, form, colour, waxy secretion, antennae, number of segments.

Male puparium: size, shape, colour, texture, emergence of adult ♂.

Male: size, colour, wings, eyes, antennae, caudal filaments.

Female: size of largest specimens observed, shape, colour, waxy secretion, lateral and caudal filaments.
colour in boiling KOH, liquid stained?.
♀. cleared and mounted:
size, shape, method of staining,
antennae: number of segments, range of measurements, most common measurements, average of 10, 20, or 30 measurements, hairs.
legs: measurements in μ, of
(a) length of coxa, (b) breadth of coxa across base, (c) length of trochanter plus femur, (d) breadth of femur, (e) length of tibia, (f) breadth of tibia, (g) length of tarsus plus claw.
digitules:
setae of anal lobe: range of measurements in μ, mode,
setae of anal ring: range of measurements in μ, mode.
distribution of spines, hairs, and chief clusters of glandular pores.

(Symbiont: position of mycetom, character of organism, infection of eggs, cultural characteristics,etc.)

Parasites:

Relationship with ants:

Host plants:

Locality:

Date of collection:

Possible:relationships:

Observations:

. . . . . .

To obviate the necessity of referring to the descriptions of species in detail, as a preliminary step in determination, I make use of charts such as those given with the descriptions which follow.

On receipt of material I make careful notes on the living insects, noting the ovisacs, ova, larvae, etc and on the adult insects.

After clearing and staining the specimens I proceed at once on the particulars required to complete the chart, making the measurements of antennae, legs, anal lobessetae and anal ring setae, from the mounted specimens.

A curve is plotted for the antennal segments, red ink being used. This is the character which is first compared after the living material characters have been

considered. In some cases the first clue to the identity of the species is obtained from the fresh material, from its general size, colour, secretion, or perhaps the lateral or caudal filaments. Its colour in boiling KOH may give the first clue, but these are exceptional cases when dealing with species which have not been seen alive before, and most often the antennal curve is the first means of showing where the insect belongs. The similarity of antennal curves is not conclusive evidence that the insects are identical, however, but the ease with which the character may be figured,and the figures compared, makes this method extremely valuable. The anal lobe and anal ring setae should also be compared, and finally the leg characters. If all these characters are found to approximately agree the full description should be consulted for the minor points.

Unfortunately the requisite details are not supplied in most of the original descriptions to enable one to compile charts for many species, and it takes a good deal of time to secure the type, or at best topotype material, and make the necessary measurements.

I add a number of copies of original descriptions, which are indicated by the use of inverted commas,and a number of others, abbreviated, but presenting all the main points mentioned, with charts wherever possible.

Descriptions and Charts of the Pseudococcini.

Pidersia aurantia Cockerell, 1901.

P. aurantia Ckll. Ann.Mag.Nat.Hist.(7),VIII,p.51,1901.

"♀.- Bright orange, with very little mealy powder; very convex, almost hemispherical.

Long. 2 mm, lat. 1.5 mm.

Legs and antennae reddish brown. Antennae 6-jointed, fifth joint cup-shaped; joints measuring as follows in μ :- (1) 33, (2) 39, (3) 48, (4) 18, (5) 30, (6) 80.

Formula: 6.3.2.(1.5.)4.

Anal ring with six bristles; caudal tubercles not at all produced, each bearing a bristle about the size of the bristles of the anal ring.

Hab. Las Vegas, New Mexico. April. rarely with Lasius americanus.

I have seen an ant wildly rushing about with one in its jaws.

By its convex shape, together with the orange colour, this species is very different from all the others.

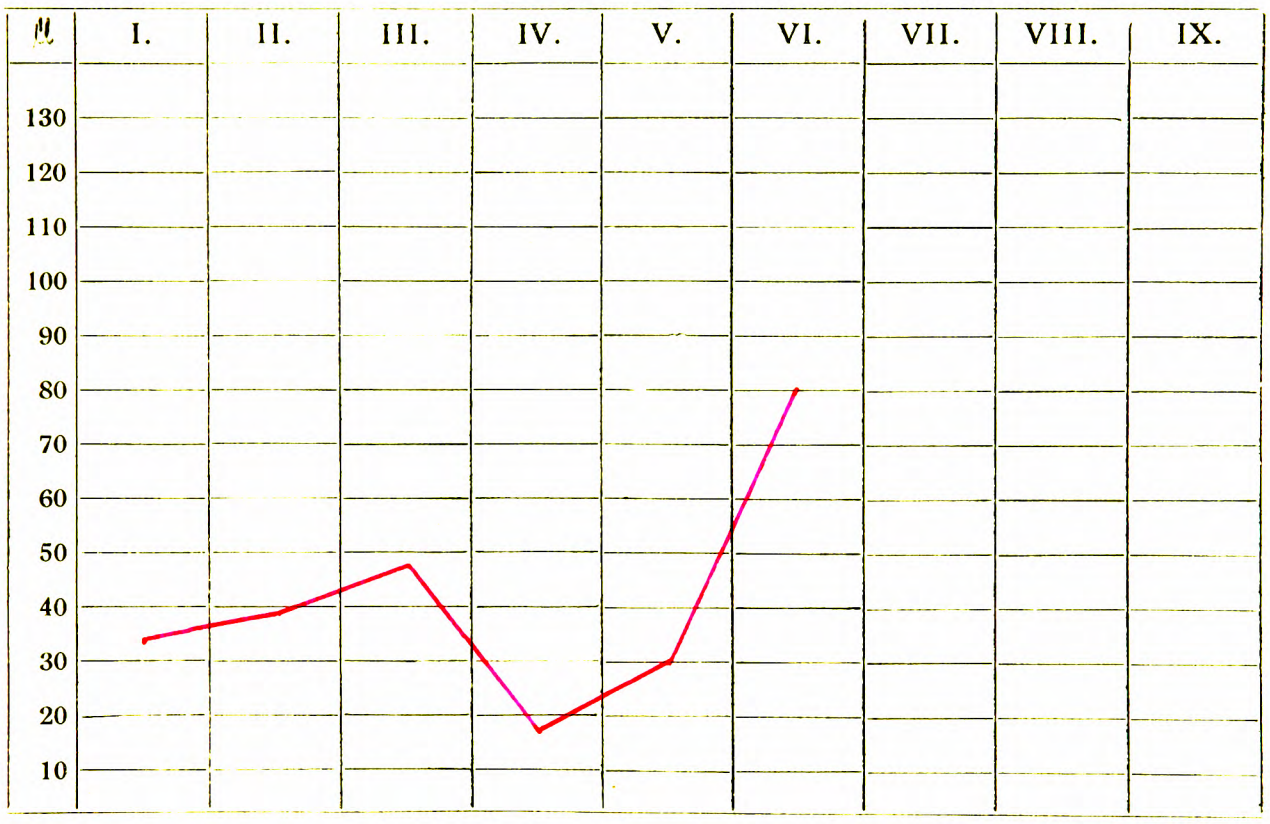
First found by W.P.Cockerell."

Chart for:— Ripersia aurantia Cockerell, 1901.

Size:—(*a*) Fresh material:— 2 mm long and 1.5 mm broad.

(*b*) Mounted:—

Antennal curve:—



33. 39. 48. 18. 30. 80.

Legs:—

Measurements in :—

Setæ of Anal lobes:— About the same length as those of the anal ring.

Setæ of Anal ring:—

Host plant:— In nests of Lasius americanus.

Locality:— Las Vegas, New Mexico.

Ripersia confusella Cockerell, 1901.

R. confusella Ckll. Ann.Mag.Nat.H.(7),VIII,p.52,1901.

"♂.- Length of body 1300 to 1550μ; antennae 660μ; wing 1150μ; cottony tails about 700μ. Dull greyish brown to pale pink, antennae and legs almost white; dorsum of thorax pale, with a yellowish tinge, no distinct vittae; wings very white; mesosternum whitish; middle of abdomen pale. Head seen from above large, triangular, broadest behind the eyes, which are small and dark crimson.

♀. pale pink, varying to pale yellowish, without lateral tassels; small caudal tassels present.

Adult (with eggs forming) about 3 mm long; antennae 6-jointed, formula 6.3.1.2.5.4.; joints (1) 33, (2) 30, (3) 45, (4) 21, (5) 27, (6) 60. Middle legs:- femur + trochanter 150μ; tibia 105; tarsus 66μ.

♀. penultimate stage, (1) 36, (2) 33, (3) 39, (4) 24, (5) 33, (6) 75. Middle legs:- femur + trochanter 132; tibia 65; tarsus 60μ. The antennae and tarsus of this stage are about as in the adult, but the femur and tibia are shorter. The antennal measurements are variable to some extent, but on the whole remarkably constant in a considerable series.

Egg: pale ferruginous, oval; 650μ long.

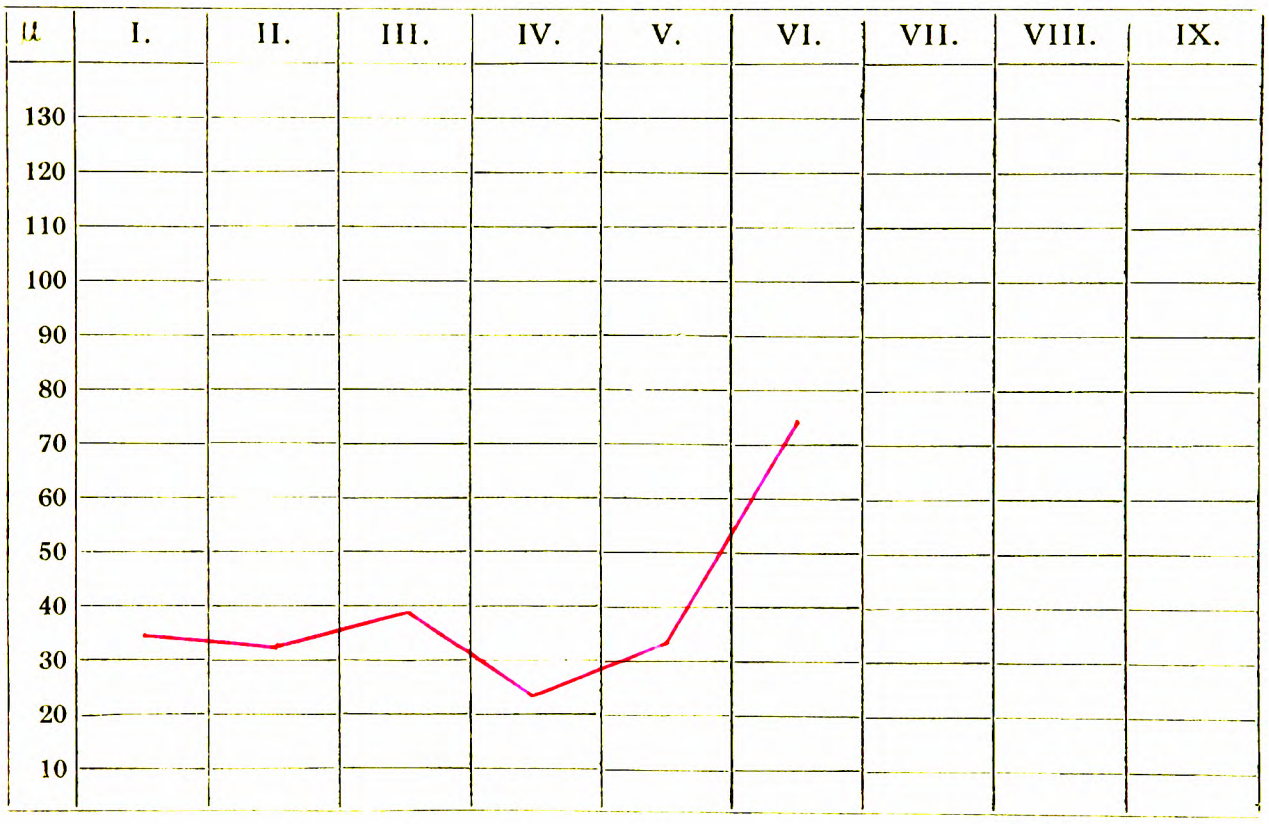
Hab. Las Vegas, New Mexico, about 6400 ft.in nests of Lasius americanus."

Chart for:— Ripersia confusella Cockerell, 1901.

Size:—(*a*) Fresh material:— About 2 mm long.

(*b*) Mounted:—

Antennal curve:—



36. 33. 39. 24. 33. 75.

Legs:—

Measurements in μ:— Mesothoracic leg:-
Femur + trochanter 132μ; tibia 65μ;
tarsus 60μ.(penultimate stage.)
150μ; 105μ; and 66μ in adult.

Setæ of Anal lobes:— About 117μ long.

Setæ of Anal ring:—

Host plant:— In nests of [illegible].

Locality:— Las Vegas, New Mexico, 6.400 ft.

Ripersia porterae Cockerell, 1901.

P. porterae Ckll. Ann.Mag.Nat.Hist.(7) VIII,p.53,1901.

"♀.- Globose, very pale pinkish or sometimes yellowish; mounted specimen 2.4 mm long and 2.3 mm broad; enclosed in a snow-white sac just like that of Dactylopius lichtensioides.

Labium not elongated; hairs of anal ring remarkably short; legs ordinary, middle leg with femur + trochanter 135μ, tibia 70μ, tarsus 60μ. Antennae 6-jointed: (1) 35-39, (2) 39, (3) 42-45, (4) 24-27, (5) 33-36, (6) 60-66.

Hab. Las Vegas, on roots of grass, April 25.

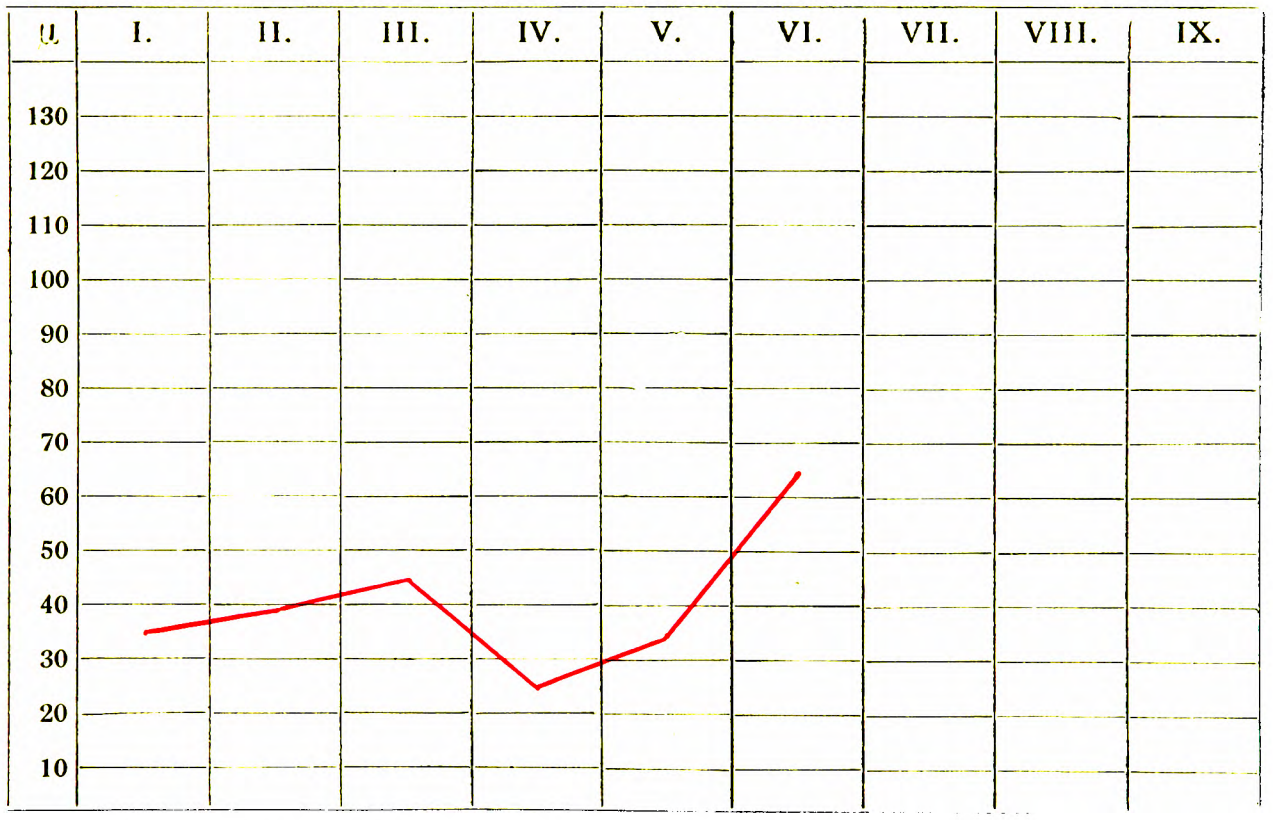
A very distinct species, with its pale colour and snow-white sac."

Chart for:— Ripersia porterae Cockerell, 1901.

Size:—(*a*) Fresh material:— About 2.4 mm long and 2.3 mm broad.

(*b*) Mounted:—

Antennal curve:—



36. 39. 44. 26. 35. 64.

Legs:—

Measurements in μ:— Mesothoracic leg:-

Femur + trochanter 135μ; tibia 70μ;

tarsus 60μ.

Setæ of Anal lobes:—

Setæ of Anal ring:— About 72μ long.

Host plant:— On roots of grass.

Locality:— Las Vegas, New Mexico.

Ripersia trichura Cockerell, 1901.

R.trichura Ckll.,Ann.Mag.N.H.(7),VIII,p.55,1901.

"♀.- Longer than usual, pinkish, but covered with white mealy secretion.

Skin unusually crowded with round glands; cephalic region somewhat bristly; caudal region very bristly; caudal lobes not prominent, their bristles are about 165μ long; six bristles on the anal ring, 135μ long; legs not unusually slender; anterior femur 105μ; middle leg with femur + trochanter 138μ (femur alone 105μ, width 36μ), tibia 84μ; tarsus 57μ.

Antennae 6-jointed. Joints: (1) 39-45, (2) 33-36, (3) 30-42, (4) 25-27, (5) 30, (6) 60.

Formulae 6.1.2.(3.5.)4. and 6.1.3.2.5.4.

Hab. Las Vegas, April 29th, (W.P.Cockerell.)

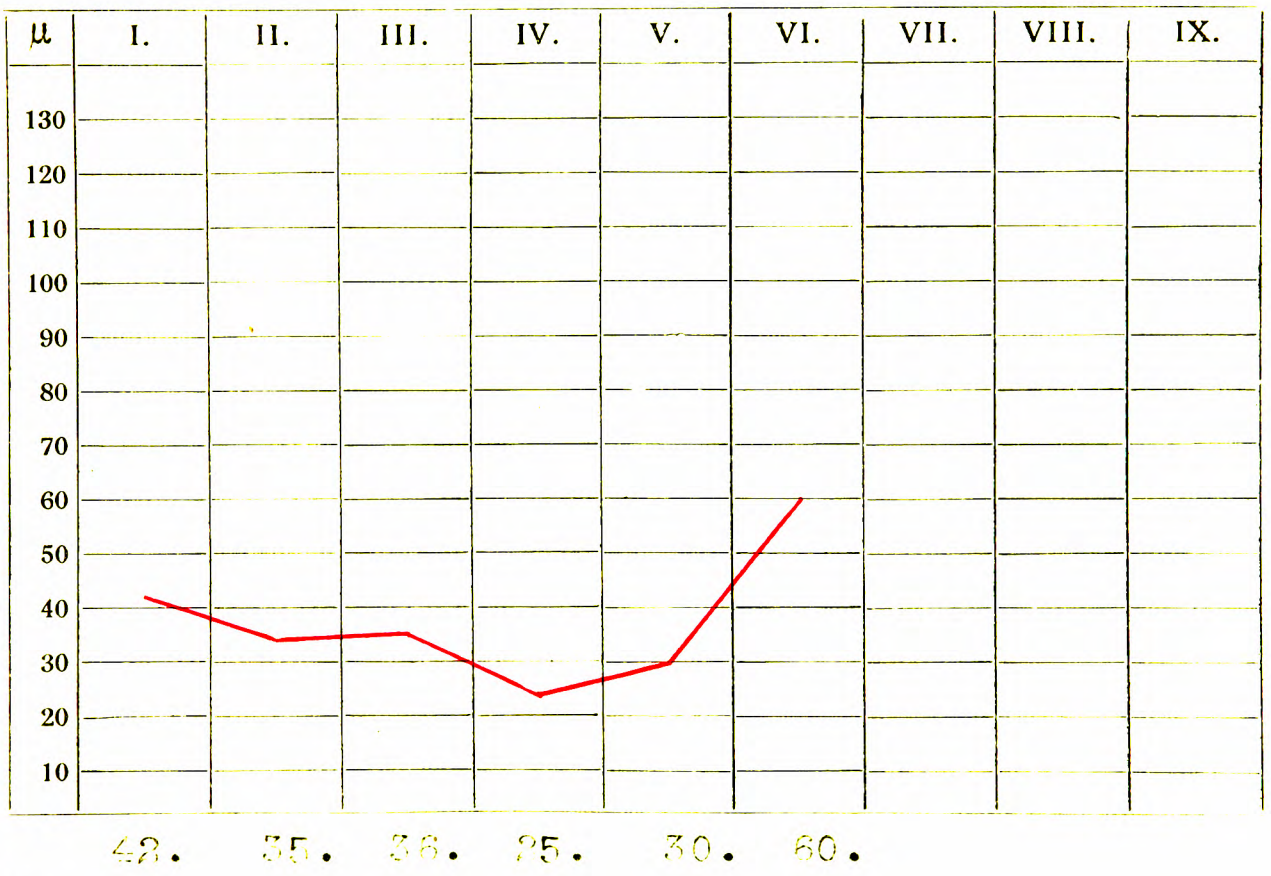
My wife brought this in with the remark that it seemed to be new; but I thought it was confusella, until I saw the extraordinary long bristles of the anal ring and caudal tubercles. The caudal bristles of confusella measure about 117μ, of trivittata 114μ. The bristles of the anal ring in most of the species are under 100μ;- for instance, 72μ in porterae, 45μ in trivittata. The legs of R. trichura are similar to those of confusella."

Chart for:— Piersia trichura Cockerell, 1901.

Size:—(*a*) Fresh material:—

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 138μ; tibia 84μ;

tarsus 57μ.

Setæ of Anal lobes:— About 165μ long.

Setæ of Anal ring:— About 135μ long.

Host plant:—

Locality:— Las Vegas, New Mexico.

Ripersia trivittata Cockerell, 1901.

P. trivittata Ckll.,Ann.Mag.N.H.(7),VIII,p.55,1901.

"♂.-Body 950-1050μ long; antennae about 600μ, 10-jointed, joints cylindrical, with short whorls of hairs; wings 1100μ; two white caudal filaments, short, about 150μ. General colour, including legs and antennae, light straw-yellow; head, prothorax, extreme base of antennae, and abdomen suffused with lilac; mesothorax with three purplish brown longitudinal stripes; sides of thorax purplish brown; eyes black, relatively large, prominent, shiny; head seen from above widest in region of eyes.

♀.- About 1.5 mm long; of ordinary form. Pale yellowish, with a slight pink tinge, some decidedly pink; sparsely mealy; turning dark brownish red on boiling in KOH. Antennae and legs pale brown; antennae 6-jointed, (1) 30, (2) 30, (3) 30, (4) 18-24, (5) 24, (6) 72.

Formula 6.(1.2.3.)5.4.

Anterior tibia about 80; tarsus 63μ.

Hab. Las Vegas, under a rock with Lasius americanus.

♂♂ and ♀♀ together in numbers, apparently copulating.

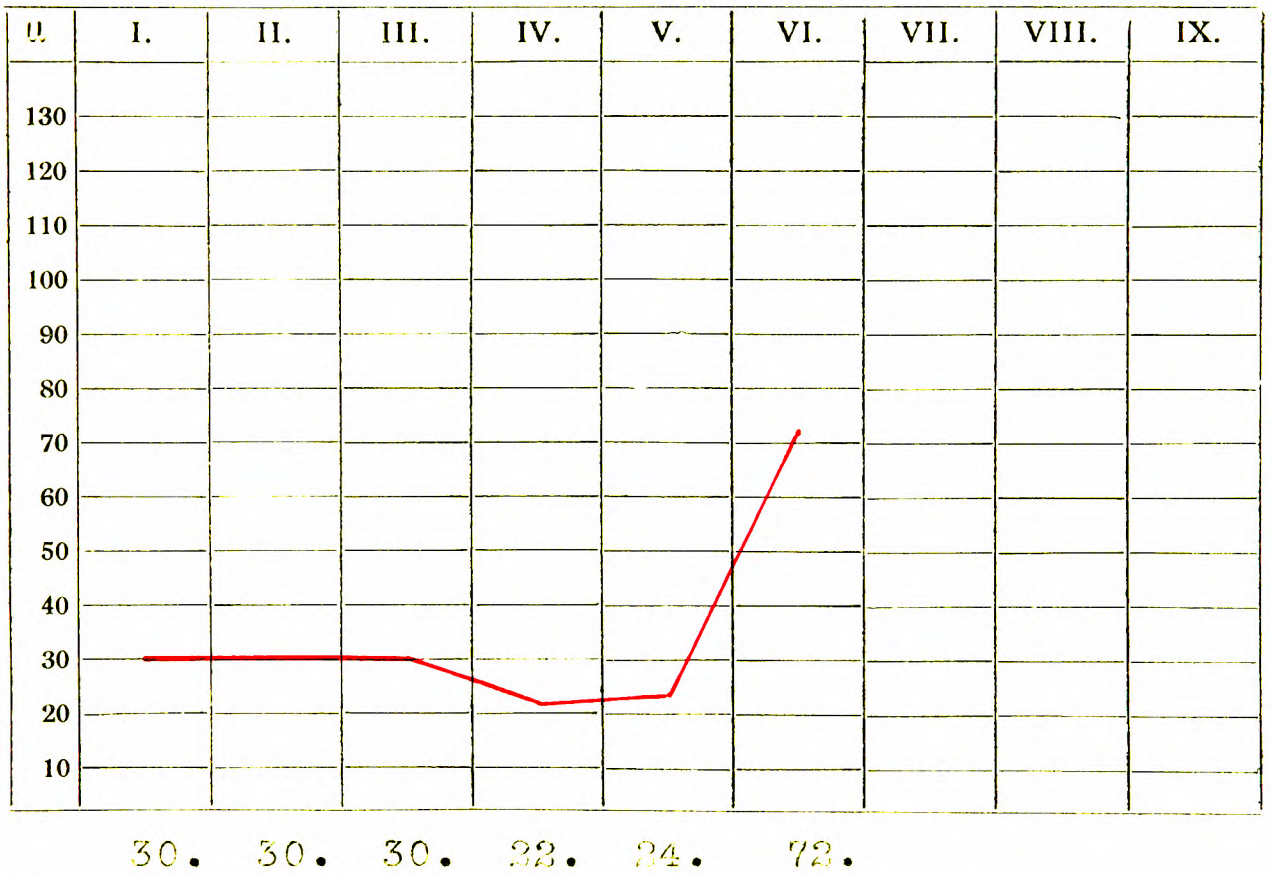
This is known from confusella by the first three antennal joints being of about equal length; but I should have thought it only a variety but for the essentially different ♂."

Chart for:— Ripersia trivittata Cockerell, 1901.

Size:—(*a*) Fresh material:— About 1.5 mm long.

(*b*) Mounted:—

Antennal curve:—



30. 30. 30. 22. 24. 72.

Legs:—

Measurements in μ :—

Anterior tibia about 60; tarsus 63μ.

Setæ of Anal lobes:— About 114μ long.

Setæ of Anal ring:— About 45μ long.

Host plant:— Under a rock with Lasius americanus.

Locality:— Las Vegas, New Mexico.

Dactopseudococcus filamentosus (Ckll.),1893.

D. filamentosus Ckll. Entom.XXVI,p.268,1893.

D. vastator Mask.N.Z.Trans.XXVII,p.74, 1894.

"♀.- About 3 mm long, shape of Coccus cacti, grey, but covered with white secretion. The ♀, boiled in KOH, turns black and gives off a purplish colour. By transmitted light it appears not black, but violet. The margin has a series of short hairs. The caudal tubercles emit the usual filaments, which, however, are very short. Between the tubercles, when the secretion is removed, four hairs, longer than the tubercles, can be seen.

The legs are very small. Tibia not nearly twice as long as tarsus. Claw slender with a very short knobbed digitule. Tarsus with two long knobbed hairs as usual. Inner side of tarsus with a long, rather stout hair, which extends as far as end of claw.

Femur as long, or nearly as long, as tibia and tarsus. Trochanter with a long hair. Colour of legs brownish.

Antennae very short, with only seven joints; 1 and 2 about equal; 3 and 4 equal, shorter than 2; 5 and 6 subequal, shorter still; 6 shortest; 7 long.

Larva reddish. Eggs oval, with contents partly of a verdis-green colour.

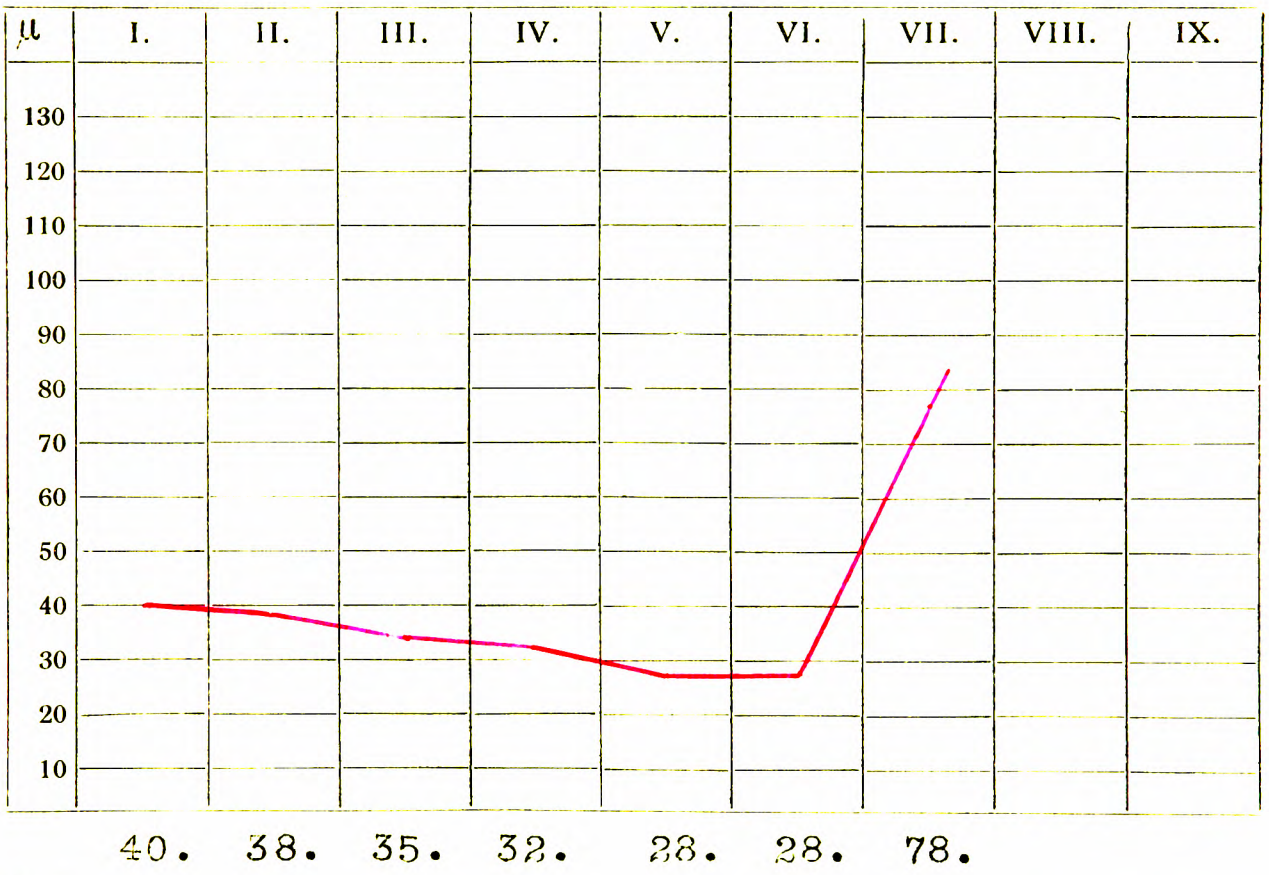
Hab. On a plant resembling a Vaccinium, Bahamas."

Chart for:—Dactopseudococcus filamentosus (Ckll.),1893.

Size:—(*a*) Fresh material:— About 3 mm long.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ:—

Femur about 140μ; tibia about 100μ;
tarsus about 70μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Citrus etc.

Locality:— Japan, Mauritius, Hawaii, South Africa.

Dactopseudococcus indecisus (Ckll.),1901.

D. neomexicanus var. indecisus Ckll. Can.Ent. XXXIII, p. 209, 1901.

"♀.p 1 2/3 mm long. Pink, varying to pale sage green; mealy; no lateral or caudal tufts; no well-defined ovisac; legs and antennae very pale.

Middle leg, with femur and trochanter 174μ; tibia 108 μ, tarsus (without claw) 60μ.

Antennae 8-jointed, varying to 7; one ♀ full of eggs had one antenna with 8 joints, the other with 7.

Formulae:- 8.1.2.(3.7.)(5.6.)4. and

8.2.1.(3.7.)6.(4.5.)

Measurements of joints in μ:-

(1) 36-45, (2) 36-40, (3) 24-25, (4) 15, (5) 14-18, (6) 18-21, (7) 24, (8) 63-69.

7-jointed form:- (1) 45, (2) 45, (3) 30, (4) 36, (5) 24, (6) 27, (7) 63.

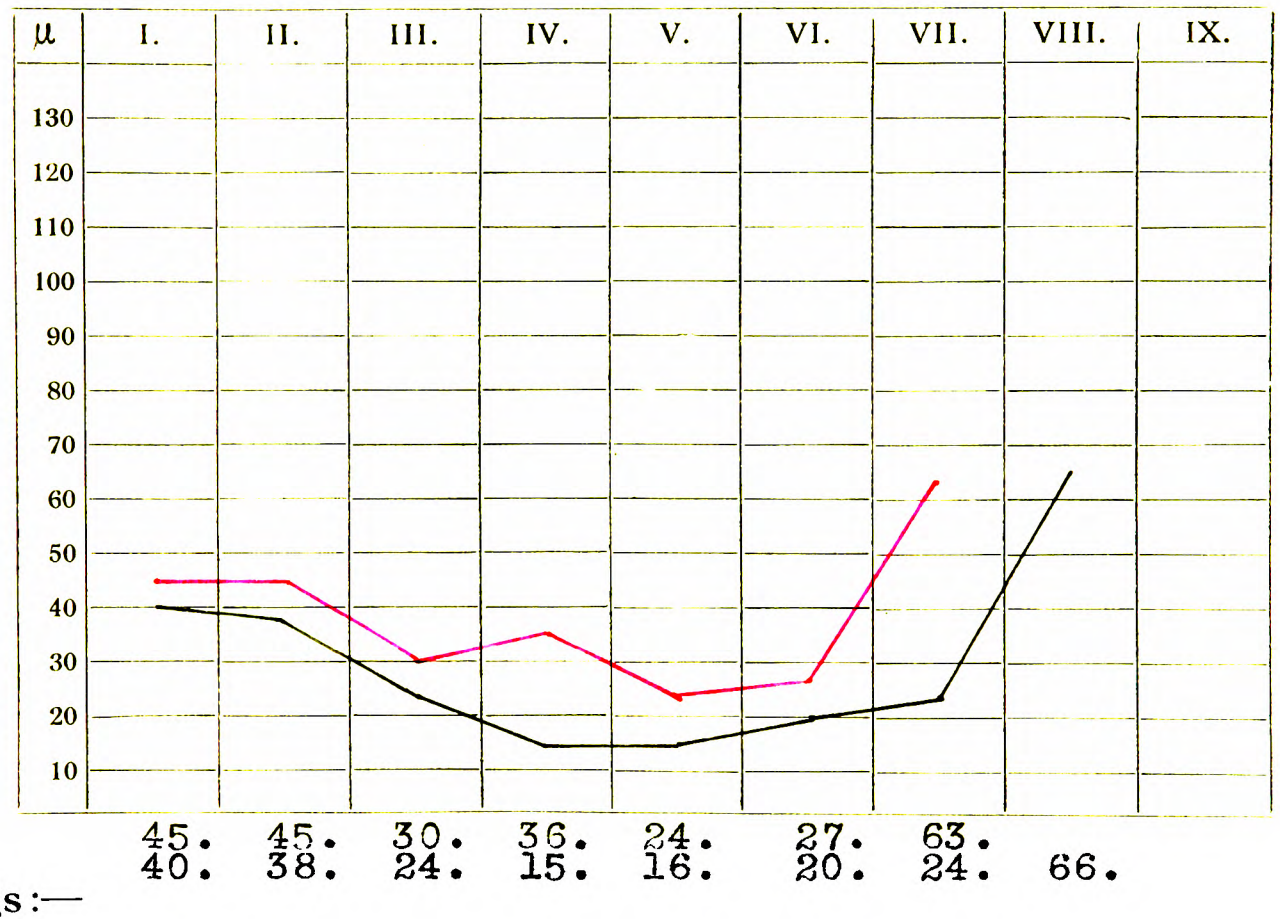
Hab. In nests of Lasius americanus, Las Vegas, New Mexico. April 22, (W.P.Cockerell)."

Chart for:— Dactopseudococcus indecisus (Ckll.),1901.

Size:—(*a*) Fresh material:— About 1.7 mm long.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 174μ; tibia 108μ;
tarsus 60μ;

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— In nests of Lasius americanus.

Locality:— New Mexico.

Dactopseudococcus missionum (Ckll.), 1910.

Ps. missionum Ckll., Entom. XLII,p.113, 1910.

"About 2 mm long, of ordinary form. Apparently with little mealy secretion; legs stout, lively ferrugineus; antennae 7 or 8 jointed. Anal ring ordinary, with six short hairs. Females studied full of eggs, which are 275μ long and 170μ broad.

The species is especially distinguished by its small robust red legs, and small pale antennae. The following measurements are in μ:- Hind leg: length of trochanter 105μ; of femur 222; width of femur 92; length of tibia 182; of tibia 95, bristles of hind tibia 15. Apical bristle of trochanter about 62.

Antennae 7-jointed, joints (1) 37-50, (2) 47-55, (3) 40-52, (4) 37-55, (5) 30-45, (6) 37-42, (7) 75-85.

Antennae 8-jointed, (1) 50-55, (2) 52-55, (3) 50, (4) 22-30, (5) 32-42, (6) 30-35, (7) 32-42, (8) 87-90.

The 7 and 8 joints do not indicate two species; in one case a specimen was 7-jointed on one side and 8 on the other.

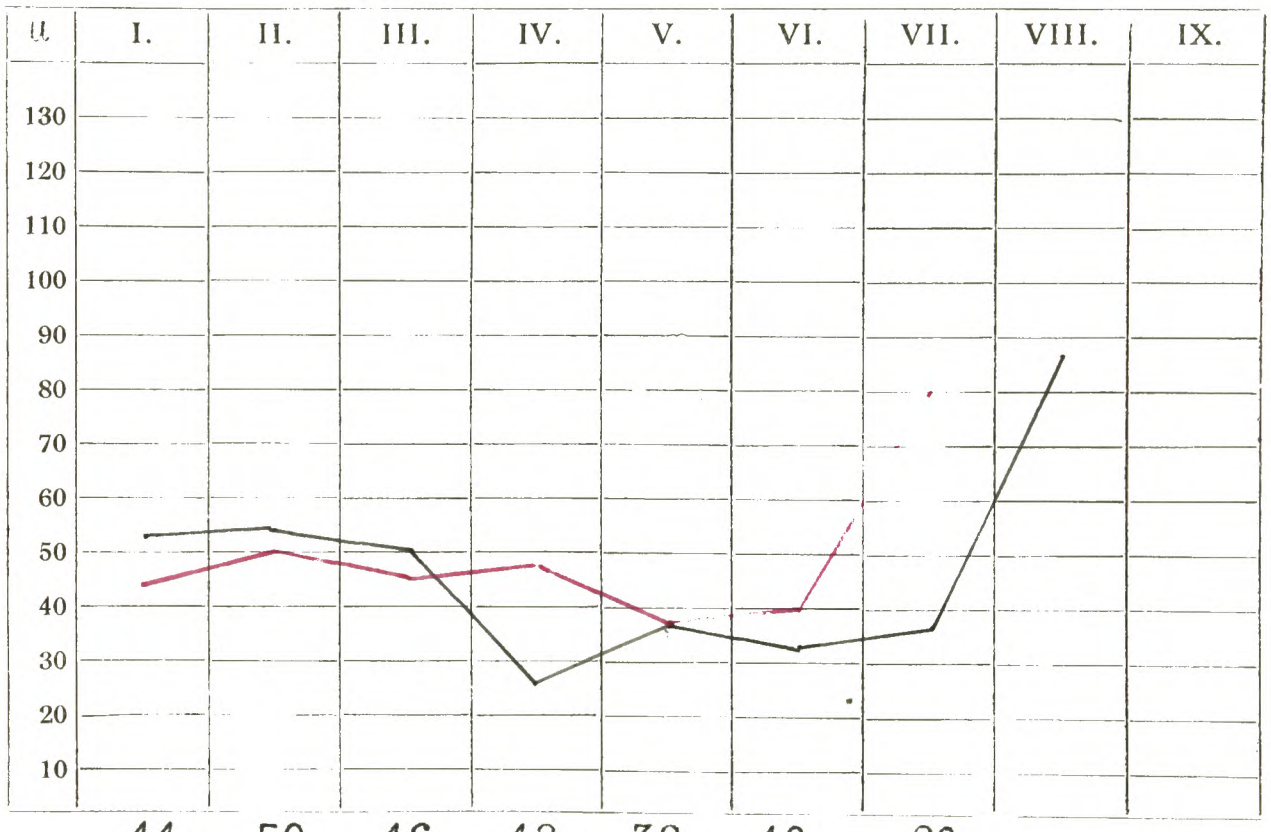
Hab. Santa Ana Misiones, Argentine, No.13,(Lahille)."

Chart for:— Dactopseudococcus missionum (Ckll.), 1910.

Size:—(*a*) Fresh material:— About 2 mm long.

(*b*) Mounted:—

Antennal curve:—



Legs:— 44. 50. 46. 48. 38. 40. 80.
52. 54. 50. 27. 38. 33. 37. 88.

Measurements in μ :— Mesothoracic leg:-

Trochanter 105μ; femur 222μ; tibia 182μ; tarsus 95μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:—

Locality:— Argentine.

Dactopseudococcus quaintanci (Tinsley),1898.

D. quaintancii Tins. Can.Ent.XXX,p.220,1898.

" Adult ♀.- Length 2 mm. Width 1.5 mm. Shape, ellipsoidal, much flattened. Colour, dark grayish-brown, the body is so covered with white meal that its true colour only shows on the ventral surface, the colour of the dorsum appearing quite white. The white secretion mealy, projecting slightly on the lateral margins, but not forming well-marked filaments; posteriorly it is produced into two short, but well defined, caudal filaments; on the dorsum it is alightly raised into a longitudinal ridge. In addition to the mealy secretion, there is some waxy, threadlike secretion as in D. virgatus Ckll. They produce no well-defined ovisac, only a fluffy mass of secretion.

Boiled in caustic soda they become, at first, almost black, and on further boiling they become purplish. Legs and antennae brownish, but much lighter than the body.

Antennae 7-jointed: 7 longest, slightly longer than 2 + 3 (90 - 100μ); 2 and 3 next longest, usually subequal, but twice as long as broad; 1 and 6 next longest, often subequal, 1 sometimes the longer; 4 and 5 shortest and usually subequal. The antennae are fairly stout, espec-

ially joints 1, 2, and 3; all joints are hairy, the hairs being long and slender. Antennae of formula:-

7.(2.3.)(1.6.)(4.5.)

Legs.- Femur very stout, being only about twice as long as broad, with scattered, long, slender hairs; tibia stout, its width about 1/2 that of the femur, with a few, long, slender hairs; tarsus stout, quite hairy, bearing a pair of long, slender digitules; claw stout, bearing a pair of knobbed digitules. Leg resembles that of a Ripersia.

♂ unknown.

Hab. Lake City, Florida, Feb. 9th, 1898.

On Rhus copallina Linn., collected by Mr. A.L.Quaintance.

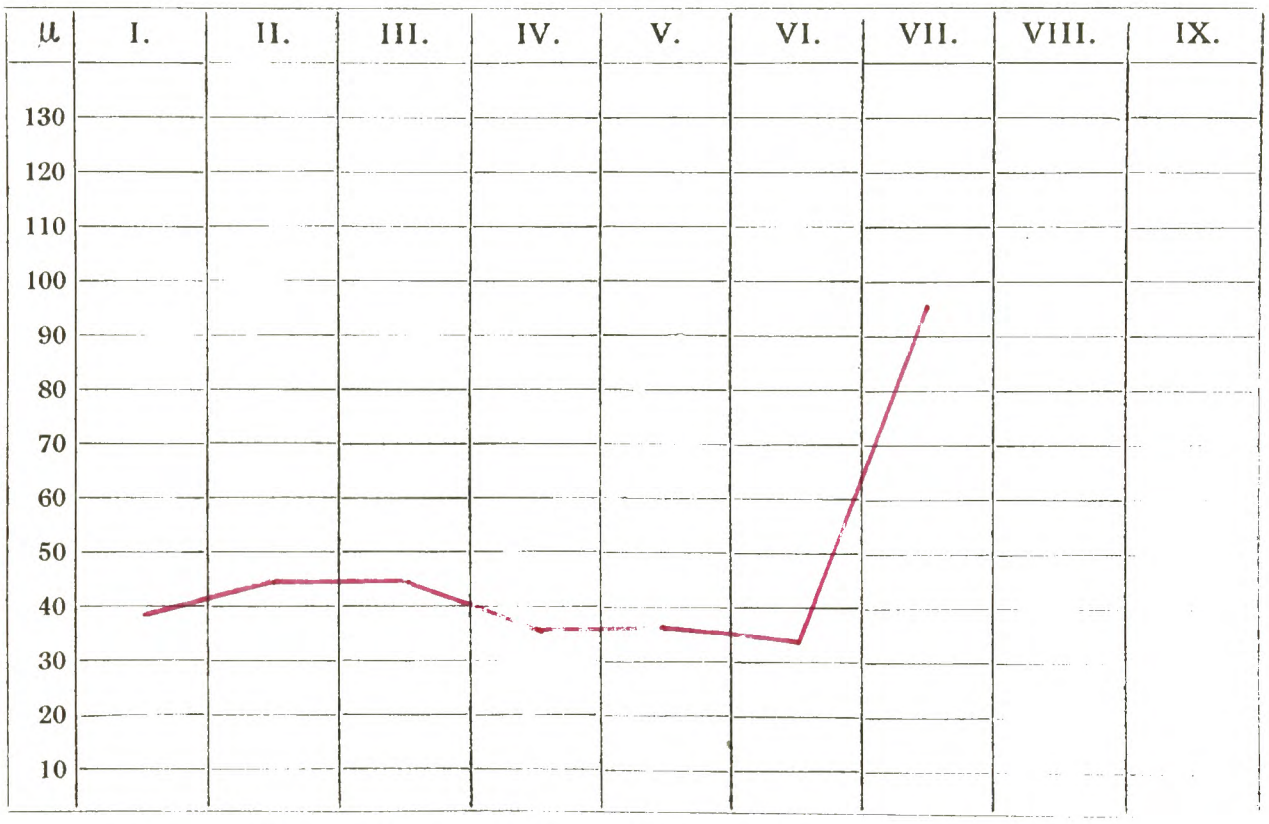
Remarks: The most prominent characteristics of this species are: its small size, stoutness of legs and antennae, and the comparative great length of the terminal joint of the antennae."

Chart for:— Dactopseudococcus quaintanci (Tinsley),1898.

Size:—(*a*) Fresh material:— About 2 mm long, and 1.5 mm broad.

(*b*) Mounted:—

Antennal curve:—



39. 45. 45. 37. 37. 54. 97.

Legs:—

Measurements in μ :—

Trochanter 90μ; femur 165μ; tibia 120μ; tarsus 110μ; claw 31μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Rhus copallina.

Locality:— Florida.

Dactopseudococcus sacchari (Ckll.), 1895.

D. sacchari Ckll. Jn.Trin.Nat.Club.II,p.195,1895.

"♀. in alcohol, pale olivaceous or pinkish, sparsely mealy, plump, length 4, breadth 2 mm; segmentation distinct.

Antennae 7-jointed, sometimes 6-jointed from the obscurity of the joint (i.e. suture) between 2 and 3. Joint 7 much longest; 3, 4, 5 and 6 shortest and subequal; 2 distinctly longer than 3; 7 a little longer than 4 + 5; joints with sparse whorls of hairs. Antennae pale brown, small. Legs small. Trochanter with three bristles; a very long hair at its tip, and a short spine behind; femur not swollen, longer than tibia. Tarsus about 2/3 length of tibia. Femur and tibia with only a few bristles. Claw large, curved, without any denticle on inner side.

Digitules of claw filiform. Tarsal digitules ordinary.

Posterior tubercles not noticeable.

Mentum dimerous.

Anogenital ring with 6 hairs.

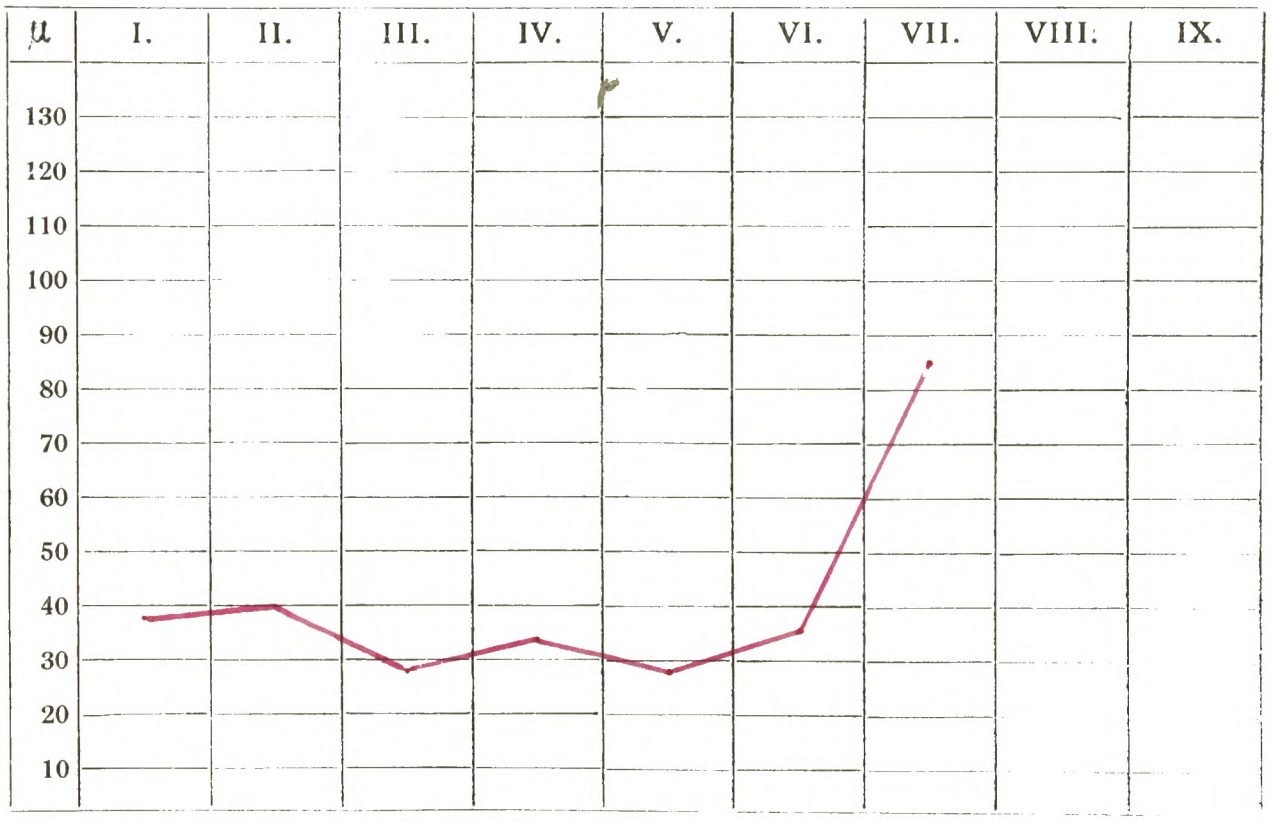
Hab.- St. Anns, Trinidad, under leaf axils of sugarcane."

Chart for:— Dactopseudococcus sacchari (Ckll.), 1895.

Size:—(*a*) Fresh material:— About 4 mm long and 2 mm broad.

(*b*) Mounted:—

Antennal curve:—



38. 40. 28. 34. 28. 36. 86.

Legs:—

Measurements in μ :— Mesothoracic leg:-

Coxa 133μ; femur + trochanter 236μ; tibia 146μ; tarsus 73μ; claw 30μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Sugarcane.

Locality:— Trinidad; Porto Rico.

Dactopseudococcus zapotlanus (Ckll.),1902.

Erium zapotlanum Ckll.Ann.Mag.N.H.(7),p.465,1902.

" " Fernald, Catalogue,p.113,1903.

"♀. Gregarious on the leaves, in loose globular snow-white sacs, about 3 mm diameter, which adhere to anything they touch. Boiled in KOH turns crimson, but only slightly stains the liquid. ♀ cleared and mounted about 1.8 mm long, and 1 mm broad. Anal ring with six bristles; dorsal surface with small spines (about 18μ long) in rows, far apart; sides with many minute glands; ventral surface with fewer but larger circular glands and a very few bristles.

Labium dimerous, about 100μ long, and 81μ broad; legs and antennae pale, no denticle on inner side of claw; antennae 7-jointed. Measurements of legs and antennae in μ:÷ Femur + trochanter 186μ; tibia 150μ; tarsus 69μ; claw 27μ. Antennal joints (1) 30, (2) 30, (3) 33, (4) 27, (5) 25, (6) 27, (7) 66.

Hab. Zapotlan, July 7th, 1902, on "Huele de Noche."

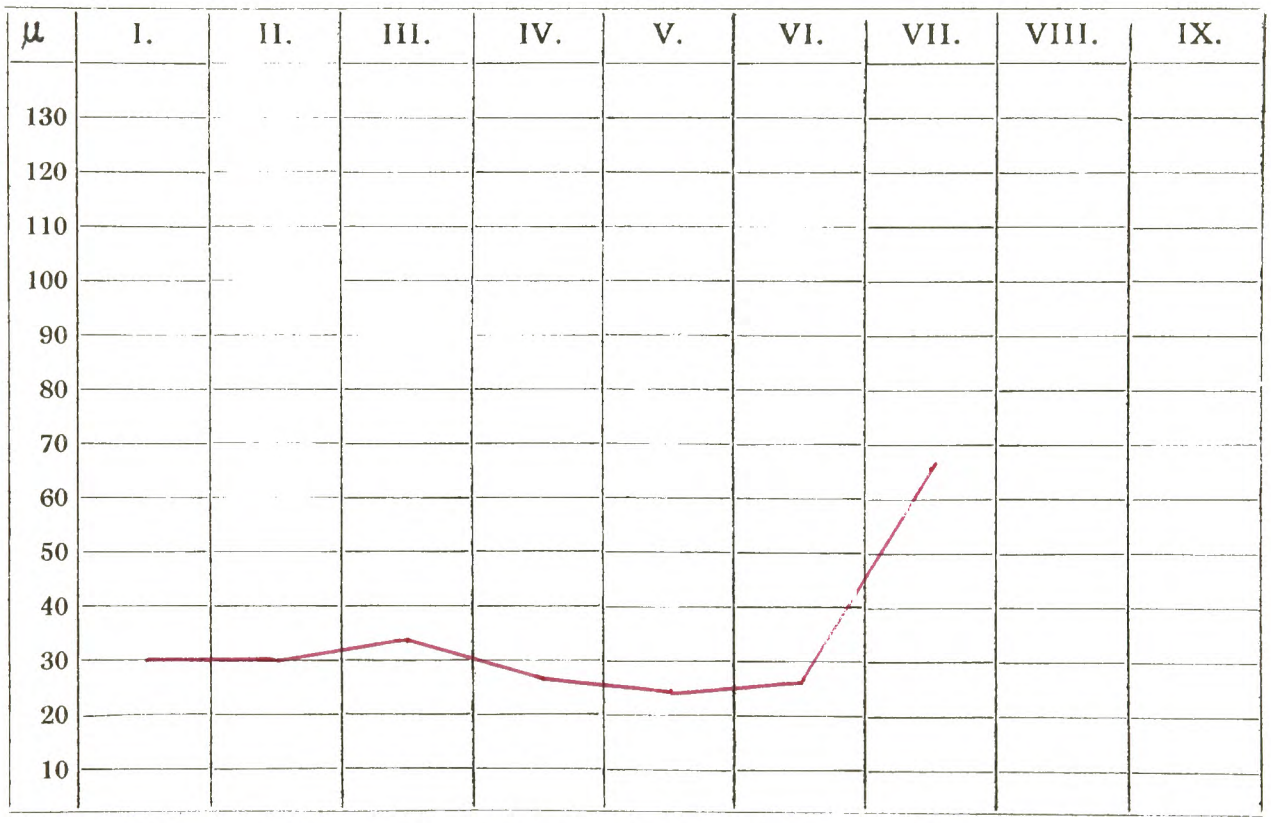
Remarks:- Allied to Erium eriogonum Ehrh. from California, but the ♀ is of a different colour, and there are other differences obvious on close comparison."

Chart for:— Dactopseudococcus zapotlanus (Ckll.), 1902.

Size:—(*a*) Fresh material:—

(*b*) Mounted:—About 1.8 mm long, and 1 mm broad.

Antennal curve:—



30. 30. 33. 27. 25. 27. 66.

Legs:—

Measurements in μ :—

Femur + trochanter 186μ; tibia 150μ; tarsus 69μ; claw 27μ; claw without denticle.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— "Huele de Noche."

Locality:— Mexico.

Pseudococcus adonidum (Linn.) Westwood,1839.

Coccus adonidum Linne, 1767, edit.XII,p.140.

Ps. adonidum Westwood.Mod.Class.Ins.I,p.118,1839.

D. longispinus Targ. Catalogue,p.32,1869.

D. adonidum Signoret, Essai,p.306,1875.

D. hoyae Sign, ibid, p. 317.

D. lilacearum Sign. ibid, p. 319.

D. robiniae Sign. ibid, p. 322.

D. tuliparum Sign. ibid, p. 323.

D. zamiae Sign. ibid, p. 328.

Coccus laurinus Bdv. Ent.Hort. p.353, 1869.

Boisduvalia lauri Sign, Essai, p.338,1875.

D. longifilis Comst. Report,p.341, 1881.

This species has often been confused with Ps. citri, but may usually be readily distinguished by its general appearance. The waxy secretion is more evenly distributed so that there is no dorsal band as in citri. The lateral filaments are more slender and thus have the appearance of being further apart, while the caudal ones often attain a length equal to or even greater than the length of the body. This species is viviparous, while citri is oviparous. Adult ♀. In size the adult ♀ is similar to citri; the largest specimen observed measured when alive 4.1 mm, and had caudal filaments 5.5 mm long.

The colour is purplish pink; and usually shows quite distinctly through the white secretion.

Antennae 8-jointed, the average length of the segments from 20 measurements being as follows:- (1) 64, (2) 70, (3) 71, (4) 39, (5) 50, (6) 40, (7) 45, (8) 101.

The setae of the anal lobes vary from 110 to 130μ in length, with 124μ the most common length; those of the anal ring range from 122μ to 148μ, with 134 the mode.

Host plants: Like citri, this species has a large variety of food plants. Some of the most common are ferns, mango, guava, fig, plum, Croton spp., Cycas revoluta, Strangeria schizoden, Flaccourtia separia, and Nephrodium amplum.

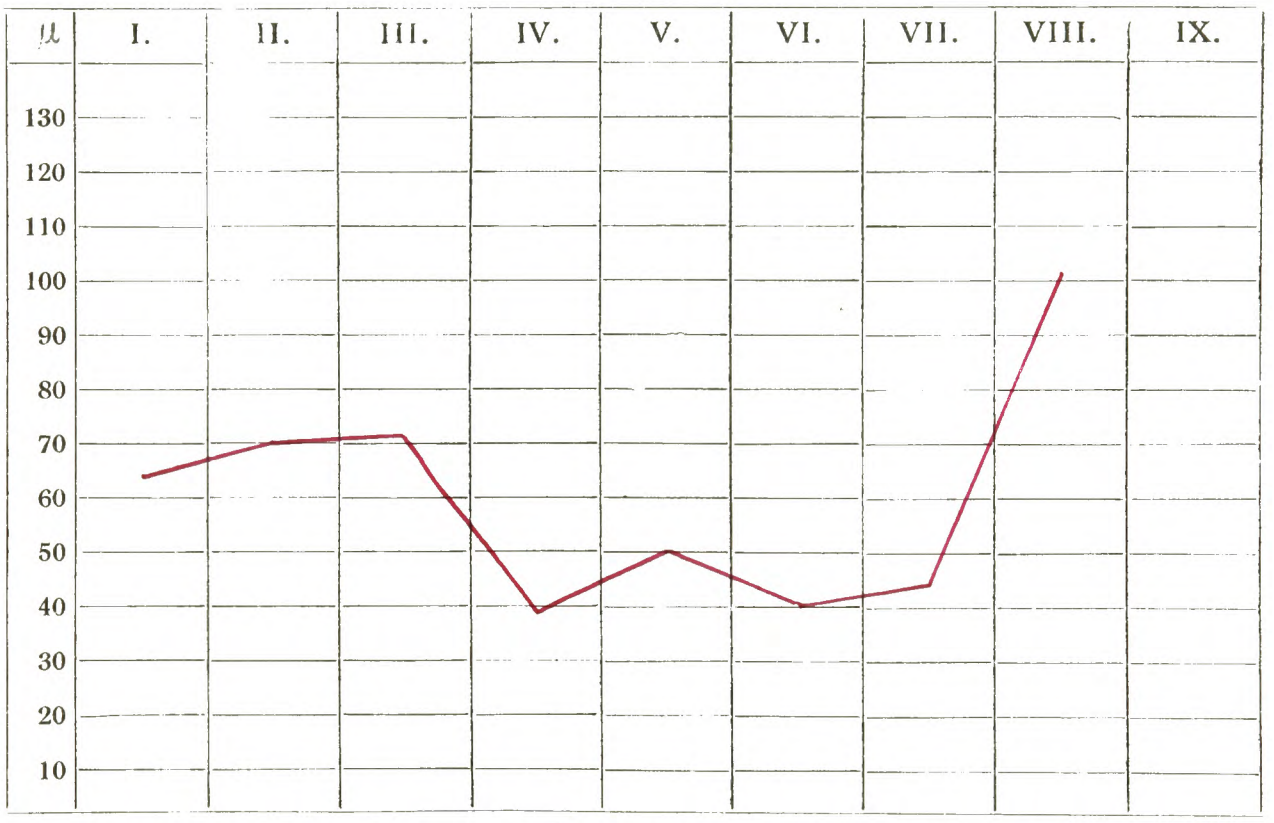
Distribution:- The natural habitat of this species is probably Southern Europe, but it has gradually extended its range until it is now a well known pest in green-houses and nurseries in all parts of the world.

Chart for:— Pseudococcus adonidum (Linn.) Westwood, 1839.

Size:—(*a*) Fresh material:— Largest specimen seen was 4.1 mm long, and had caudal filaments 5.5 mm long.

(*b*) Mounted:—

Antennal curve:—



64. 70. 71. 39. 50. 40. 45. 101.

Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 350μ; tibia 230μ; tarsus 108μ; claw 24μ.

Setæ of Anal lobes:— About 124μ long.

Setæ of Anal ring:— About 145μ.long.

Host plant:— Ferns etc.

Locality:— Cape Town.(has world-wide distribution.)

Pseudococcus ananassae (Kuwana), 1909.

D.(Ps.) ananassae Kuwana, Journ.N.Y.Ent.Soc.XVII,p. 162, (Pl.X,Figs.6-9,) 1909.

"Adult ♀. Broadly oval in form;reddish brown in colour; covered with white powder; abdominal segments distinct. Antennae very long; 8-jointed, joint 8 the longest,joint 1 always very broad; formula 8.3.(1.2.)7.6.5.4.; each joint with many strong hairs. Legs sub-equal, very stout, hairy; tarsus much shorter than tibia; claw large, curved; digitules of tarsus long hairs, those of claw could not be recognised by the writer.

Anal lobes distinct, each lobe with one long and a few fine hairs.

Anal ring with six prominent hairs.

Dorsum with fine hairs and many small circular spinnerets.

Length about 3 to 4 mm, width about 2 to 2.5 mm.

Hab. On pineapple, Japan.

This species closely resembles in form and general characters of antennae and legs Dactylopius bromeliae Bouche, but the latter is smaller."

Pseudococcus alkalinus Cockerell, 1902.

Ps. neomexicanus var. alkalinus Ckll, Can.Ent.XXXIV, p. 315, 1902.

" ♀.- About 2.5 mm long and 1.25 mm broad, covered with mealy-white secretion, with short, thick, cottony caudal tassels, and lateral tassels posteriorly; secreting a thin but dense white sac, which covers all the hind end of the insect. These sacs are often stained irregularly with bright yellow.

♀ (after boiling in water and mounting in oil of cloves) bright orange; antennae and legs yellowish-brown; no produced caudal tubercles; labium 130μ long and about 70μ broad; eyes prominent; caudal bristles about 75μ long; bristles of anal ring about 66μ; legs quite stout, breadth of anterior tibia 36μ; claw with no denticle on inner side; claw digitules very slender; no distinctly knobbed tarsal digitules; antennae 8-jointed.

Measurements of legs and antennae in μ: Anterior leg:- Femur + trochanter 310μ; tibia 155μ; tarsus 68μ; Hind leg: Femur + trocharter 331μ; tibia 174μ; tarsus 78μ. Antennal segments: (1) 45-54. (2) 48-54. (3) 36-41. (4) 24-30. (5) 24. (6) 22-24. (7) 24-25. (8) 66-78.

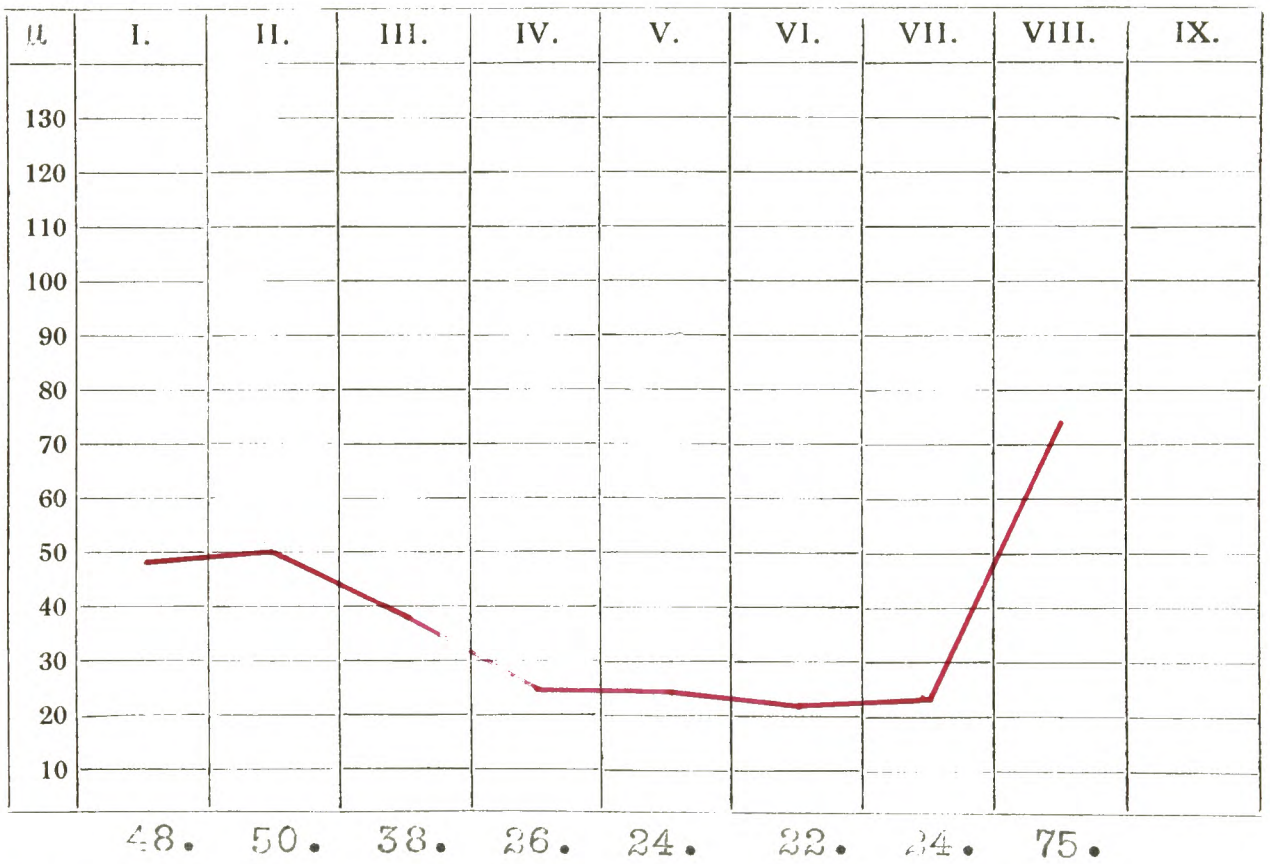
Hab. Roswell, New Mexico, on a low grass in an alkaline spot, abundant on the leaves and stems, August 24, 1902."

Chart for:— Pseudococcus alkalinus Cockerell, 1902.

Size:—(*a*) Fresh material:— About 2.5 mm long and 1.25 mm broad.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :— Prothoracic leg:-

Femur + trochanter 210μ; tibia 135μ;

tarsus 70μ.

Setæ of Anal lobes:— About 75μ long.

Setæ of Anal ring:— About 66μ long.

Host plant:— Grass.

Locality:— Roswell, New Mexico.

Pseudococcus americanus (Cockerell),1899.

Pergandiella americanus Ckll. Pr.Acad.Nat.Sci.Phil. p. 266, 1899.

Trionymus americanus (Ckll.),Fernald,Cat.p.96,1903.

Ovisac large, elongate, when completed enclosing the adult ♀.

Adult ♀: About 3.6 mm long, and 1.25 mm broad, eyes distinct, caudal tubercles not produced, each with many small round glands and a pair of short, stout spines, and also about 15 short hairs and one long one. This is like the hairs of the anal ring, but longer.

The derm is covered with gland pits and scattered hairs; the rostral loop reaches to about midway between the first and second pair of legs.

Rostum about 92μ long and 104μ wide. Legs very sparsely hairy.

Antennae of 8 joints, the joints measuring:- (1) 52, (2) 44-48, (3) 36-32, (4) 20-24, (5) 32, (6) 22-24, (7) 28-32, (8) 76-88.

Mesothoracic leg: coxa 116μ; femur + trochanter 240μ; tibia 168μ; tarsus 84μ: claw 22. Width of femur 72μ; of tibia 36μ.

Host plant: Ash.

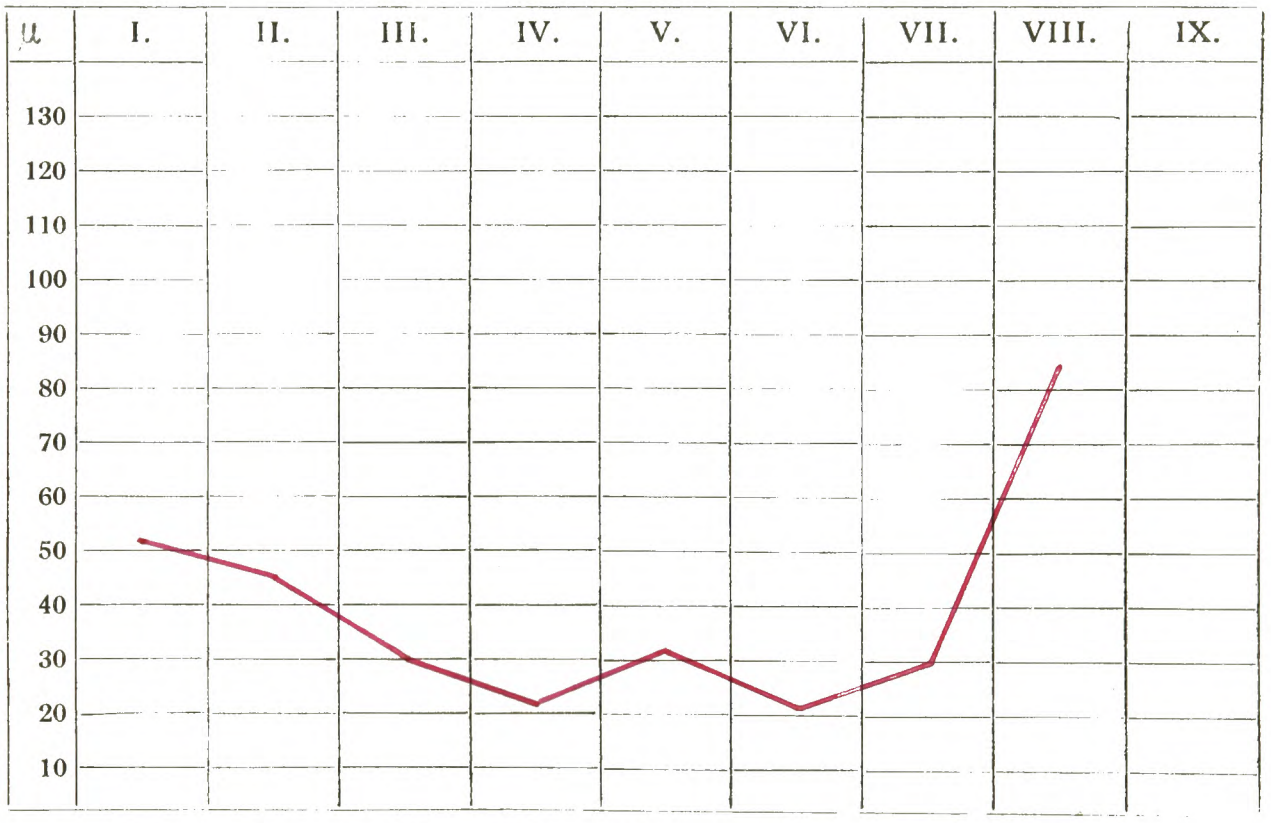
Locality: Washington D.C.

Chart for:— Pseudococcus americanus (Cockerell), 1899.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— 3.6 mm long and 1.25 mm broad.

Antennal curve:—



52. 46. 30. 22. 32. 22. 30. 84.

Legs:—

Measurements in μ:— Mesothoracic leg:-

Femur + trochanter 240μ; tibia 168μ; tarsus 84μ; claw 32μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Ash.

Locality:— Washington D.C.

Pseudococcus burneri n.sp.

On March 9th, 1914, a tree of Viburnum was found badly infested with mealy bugs at Lydenburg, Transvaal. A number of twigs were collected and packed in tissue paper, and sent to me by Mr. Claude Fuller, Assistant Chief of the Division of Entomology. On arrival ar was found that all the specimens were dead, and many had been devoured by parasites and predaceous larvae. Many ovisacs remained intact, but all ova had hatched and the larvae dead and dry.

The only living material found consisted of :-

Two Coccinellid larvae; two lepidopterous larvae; and a number of dipterous puparia, of apparently two species. An attempt is being made to rear this material so that determination of species may be possible.

Several large clusters of ovisacs were placed in boiling KOH and sufficient insects recovered to enable me to make up slides of many larvae, one adult ♂, and 30 ♀♀. The male was observed, fortunately, almost as soon as the material was placed in potash, so this was mounted at once, while the remainder was cleared and stained.

It may be mentioned that Dr. Signoret described a mealy bug from Viburnum sp. in France, in his Essai, 1875,p. 323. This insect was undoubtedly P. citri Risso, but as the Transvaal insect is entirely different I prefer not to adopt Signoret's name P. viburni.

Description of Pseudococcus burneri n.sp.

Ovisac: About 3 mm long and 2 mm broad, regular oval in shape, white, of a fine cottony texture. The adult ♀ is entirely enclosed in the completed sac.

Ova: No ova were found in the material received, but numbers of dried larvae were still in the ovisacs.

Larva: When cleared, stained, and mounted, the larvae were about 320μ long. The shape was normal, and the antennae 6-jointed.

Male puparium: This was not found, and only one male was seen.

Male: as mounted from potash, purplish red in colour. The length of the body is 1 mm, while the width of the thorax, the widest part of the body, is 320μ. There are 4 caudal setae, but as the specimen was not seen alive it is impossible to say whether these were all covered with cotton or not.

Female: Length of largest mounted specimens about 2.5 mm, breadth 1.8 to 2 mm. The colour of the specimens in boiling KOH was purplish pink, and the liquid became quite dark-coloured.

Antennae: always 8-jointed. Plate I, fig.2.

Range of measurements:-

I.	II.	III.	IV.	V.	VI.	VII.	VIII.
42-48.	38-42.	38-42.	24-28.	24-32.	22-26.	28-34.	88-94.

Most common measurement:-

I.	II.	III.	IV.	V.	VI.	VII.	VIII.
44.	40.	40.	28.	30.	26.	34.	90.

Average of 20 measurements:-
44. 40. 40. 26. 30. 26. 34. 90.

Legs: The measurements for the legs are as follow:-

Prothoracic leg: 72. 96. 214. 56. 130. 30. 98.

Mesothoracic leg:80. 110. 220. 64. 160. 30. 110.

Metathoracic leg:84. 118. 234. 68. 186. 30. 120.

Setae of anal lobes: These vary from 165μ to 200μ; with about 190μ the most common length.

Setae of anal ring: These are usually about one half the length of the anal lobe setae, and vary from 88μ to 100μ. Plate I, fig. 3.

The distribution of gland pores and hairs is normal, and regular over the body.

(Symbiont: This has not yet been investigated as the material was not in a suitable condition.)

Parasites: Among the material sent were puparia of two species of Diptera, two larvae of a lepidopteron, and two Coccinellid larvae.

Host plant: Viburnum sp.

Locality: Lydenburg District, Transvaal.

Date of Collection: March 9th, 1914.

The antennal chart will be noticed to show some likeness to that of P. irishi, P. neomexicanus, and P. steeli, but other characters do not agree.

This species is named in honour of Miss O. Burner of New York, whose assistance has been invaluable.

Chart for:— Pseudococcus burneri n.sp.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— About 2.5 mm long and 2 mm broad.

Antennal curve:—

44. 40. 40. 26. 30. 26. 34. 90.

Legs:—

Measurements in μ :— Mesothoracic leg:-

80. 110. 220. 64. 160. 30. 110.

Setæ of Anal lobes:— About 200μ long.

Setæ of Anal ring:— About 95μ long.

Host plant:— Viburnum sp.

Locality:— Lydenburg District, Transvaal.

Pseudococcus calluneti Lindinger, I912.

Ps. calluneti Ldgr. Die Schildläuse, p.90, I912.

"Tier sehr klein, onhe Wachs rötlich, 1 mm lang,eiförmig, vor der Mitte am breitesten, ziemlich flach,an Seitenrand mit undeutlich plättchenartigen, sehr kleinen Wachsfortsätzen, anfanfs freibeweglich, spater in ziemlich fester, weisser, lang-elliptischer oder eiförmiger, I I/2 mm langer Hülle.

Unterirdisch an den Stämmchen und stärkeren Wurzeln.

n. w. Deutschland.

Pseudococcus calluneti Ldgr. sp. nov. I78.

Mikro.: Seitenrand der Abdominalsegmente mit je 2 kurzen, kräftigen Dornen. Analsegment mit sehr zahlreichen, ventralen, runden, grossen Dr.n.

Unterlippe 3-gliedrig. Klaue kurz, kräftig, ziemlich stark gekrümmt, mit Zahn auf der Innenseite nahe der Spitze.

Fühler 8-gliedrig.

Auf Calluna vulgaris."

Pseudococcus capensis Brain, 1912.

Ps. capensis Brain, Ann.Ent.Soc.Amer.V.2,p.182,1912.

Ovisac large, 4.2 mm long and 3 mm broad, white, fibrous. Ovisacs often clustered together especially in the fruits of the host plants. This was especially noticeable in the case of Phytolacca and grapes.

Ova, about 360μ long and 180μ broad, bright orange yellow in colour.

Adult ♀: largest specimen seen was 4.2 mm long and 3.4 mm broad. Waxy secretion usually scant; lateral filaments are short and slender; caudal ones, (2), when the insect is in a sheltered position, sometimes attaining half the length of the body.

Antennae 8-jointed, the average lengths, from 20 measurements: (1) 68, (2) 81, (3) 81, (4) 42, (5) 59, (6) 39, (7) 44, (8) 105.

The setae of the anal lobes varied from 117μ to 152μ, with 138μ the most common length; those of the anal ring were 154μ to 180μ, with 160μ the mode.

The measurements of the mesothoracic leg in the type slide were 98, 129, 327, 91, 258, 38, and 121.

Host plants: Phytolacca dioica, Albizzia lophantha, Malva parviflora, Sonchus oleraceus, Senecio vulgaris, vines, and Pumpkins.

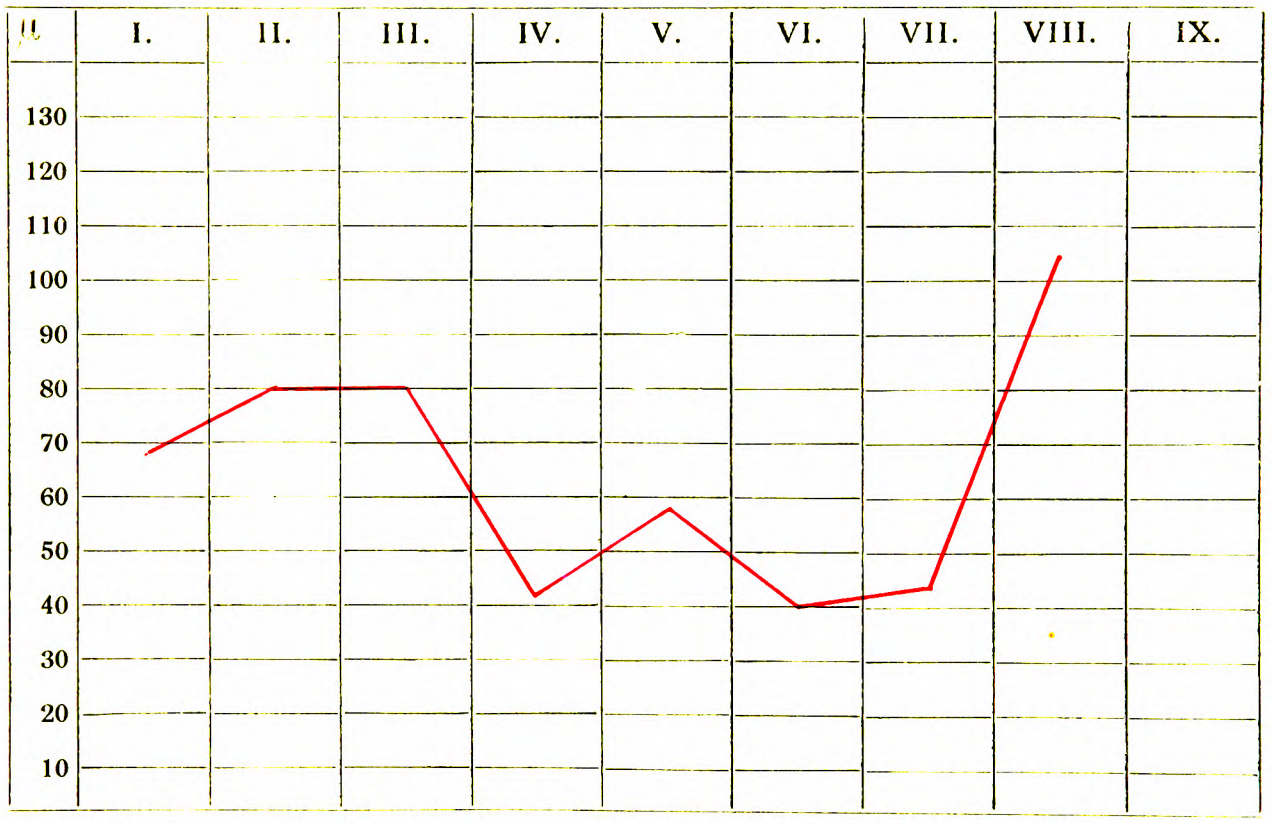
Locality: Western Province of Cape Colony.

Chart for:— Pseudococcus capensis Brain, 1912.

Size:—(*a*) Fresh material:— Largest specimen was 4.2 mm long, and 3.4 mm broad.

(*b*) Mounted:—

Antennal curve:—



68. 80. 80. 42. 58. 40. 44. 105.

Legs:—

Measurements in μ:— Mesothoracic leg:-

98. 129. 327. 91. 258. 38. 120.

Setæ of Anal lobes:— About 128μ long.

Setæ of Anal ring:— About 160μ long.

Host plant:— Phytolacca dioica etc.

Locality:— Cape Peninsula, South Africa.

Pseudococcus citri (Risso), 1813.

Dorthesia citri Risso Essai Hist.Nat.des Orangers,1813.

Dactylopius vitis Niediel, Bull.Soc.d'Acclim,p.328,1870.

" alaterni Sign.Essai, p.309, 1875.

" citri Sign. ibid, p.312.

" ficus Sign. ibid, p.315.

" indicus Sign. ibid, p.317.

" lavandulae Sign.ibid, p.318.

" viburni Sign. ibid, p.323.

Boisduvalia quadricaudata Sign.ibid,p.339.

Lecanium phyllococcus Ashm.Can.Ent.XI,p.160,1879.

Dactylopius brevispinus Targ.Ann.di Agr.p.137,1881.

" destructor Comst.Rep.U.S.Dept.Agr.p.342,1881.

Ovisac small, more or less spherical, at first covered by the body of the ♀. As the mass increases it is generally seen as a rounded mass protruding beneath, and in front of the insect.

Ova orange yellow, 320-350μ long, and about 150μ broad.

Adult ♀, with ovisac completed, may attain 4.5 mm in length and 2.7 mm broad. Colour usually purplish-pink but the colour is more or less obscured by the mealy white secretion. There is generally a distinct median dorsal band on which the secretion is less dense or finer, so that there is a longitudinal band which appears

slightly darker in colour. There are distinct lateral filaments, which are comparatively thick, and number seventeen on each side. The caudal ones are longer, but are also thick; these never attain a length of more than half the length of the body.

Antennae of 8 joints, the average length of the segments from 30 measurements, are as follows: (1) 63, (2) 64, (3) 64, (4) 40, (5) 43, (6) 43, (7) 47, (8) 106.

The setae of the anal lobes vary in length from 180μ to 225μ, with 225μ the most common length. Those of the anal ring vary from 108μ to 138μ, with 115μ the mode.

Intracellular symbiont: Coccidomyces dactylopii Buchner lives in a definite mycetom, the "corpo ovale" of Berlese. The organism is elongate, usually more or less sickle-shaped, ten or twelve of which are enclosed in a cell, or "sferette". Infection of the ovum takes place by means of several "sferettes".

Host plants: Orange, lemon, citron, coffee, tobacco, ivy, oleander, and large numbers of other plants are badly infected by this insect in different parts of the world.

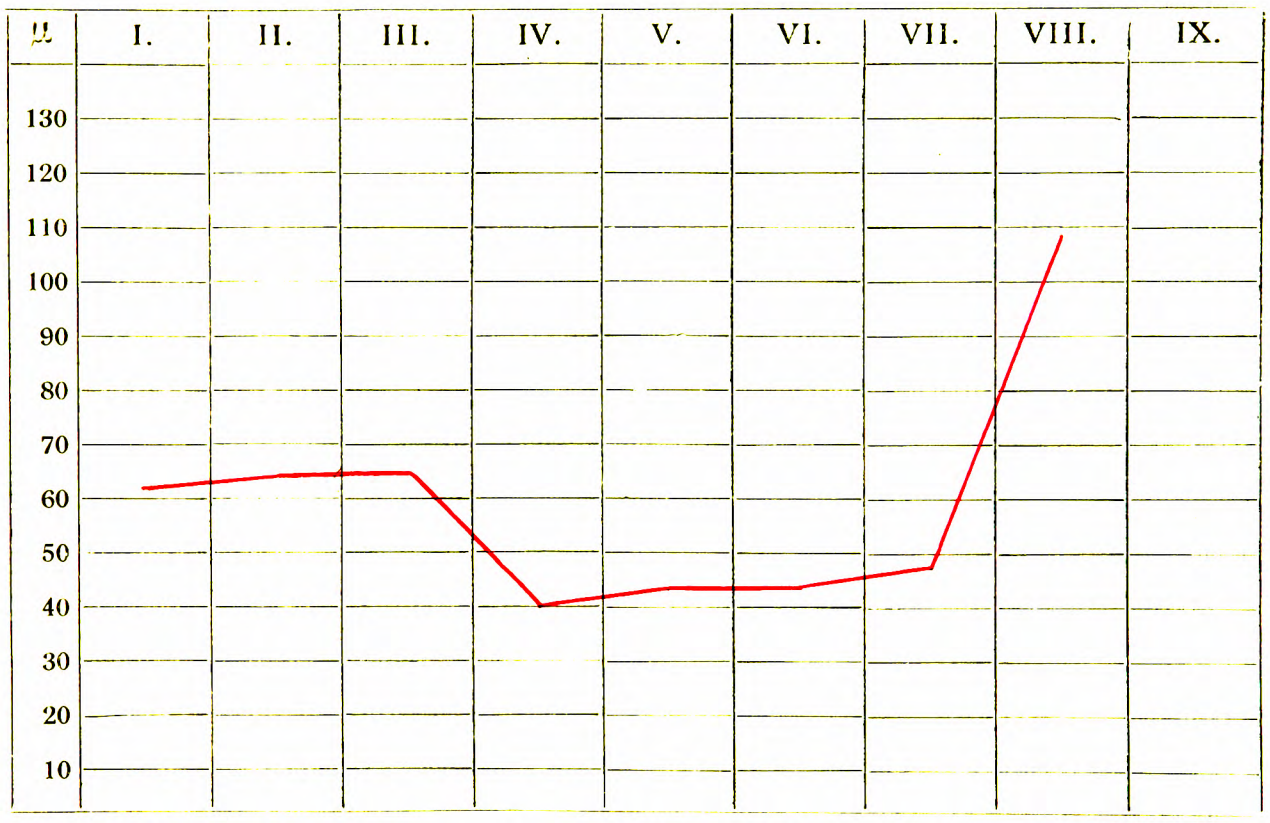
Distribution: Southern Europe appears to be the original home of this species, but owing to its wide range of food-plants, and the adaptability of the insect to different climatic conditions, it is now found in all countries which have temperate or sub-tropical climates.

Chart for:— Pseudococcus cibri (Risso), 1813.

Size:—(*a*) Fresh material:— Largest specimen seen was 4.4 mm long and 2.6 mm broad.

(*b*) Mounted:—

Antennal curve:—



38. 64. 64. 40. 43. 45. 48. 108.

Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 340μ; tibia 230μ; tarsus 100μ; claw 36μ.

Setæ of Anal lobes:— About 225μ long.

Setæ of Anal ring:— About 120μ long.

Host plant:— Oleander etc.

Locality:— Cape Town. (has world-wide distribution.)

Pseudococcus coffeae (Newstead), 1908.

D. coffeae Newst. Journ.Econ.Biol. III,2,p.37, 1908.

"Adult ♀ covered with densely felted plates of white secretion, but this covering was so much injured as to render it impossible to give a correct description of its arrangement. Form rather short, ovate. Antennae long, setose, of eight segments, terminal segment much the longest and some of the hairs upon it are longer and stouter than the rest.
Legs normal. Margins with an equidistant series of spines, usually in pairs, each surrounded by a group of rather large spinnerets. Dermal spinnerets minute; spines few and scattered. There are two pairs of large ventral glands, the first pair are placed near the margin immediately below the insertion of the antennae, the other pair also sub-marginal, are situated a little anterior to the anal opening; each gland has a long transverse slit and a bilateral lunular patch of chitine thickly studded with spinnerets and minute hairs. Anal orifices with 6 hairs. Anal lobes normal, each with a few short spine-like hairs and a single long stout hair.
Hab. On Liberian coffee; Java, 7. I. '03.
This species may be distinguished chiefly by the densely felted plates of white secretion which cover the dorsum. In the form of the waxy covering it resembles D. nipae, but it is a much larger insect."

Pseudococcus comstocki (Kuwana), 1902.

D. comstocki Kuw. Pr.Cal.Acad.Sci.(3)III,p.52,1902.

The adult ♀ is long oval in outline, about 4 mm long and 2 mm broad. The colour of the body is purple, while the legs and antennae are brown.

The antennae are 8-jointed, the average lengths of four measurements being:- (1) 44, (2) 56, (3) 51, (4) 31, (5) 34, (6) 34, (7) 39, (8) 101.

Mouthparts large; rostral loop long.

Legs normal; coxa longer than wide, with several spines. Trochanter as usual, bearing one long, and several short hairs; femur thick, with the outer margin convex, with many scattered hairs; tibia as long as femur, tapering posteriorly, with many hairs.

Tarsal digitules fine and knobbed; those of the claw short, gradually widening into large knobs.

Dorsum with fine scattered hairs and round pits.

Anal ring round, prominent, with six hairs.

Host plants:- In cracks of the trunk of a mulberry tree, near the ground, and covered by a covering made by ants. Also similarly on the trunk of a kind of maple.

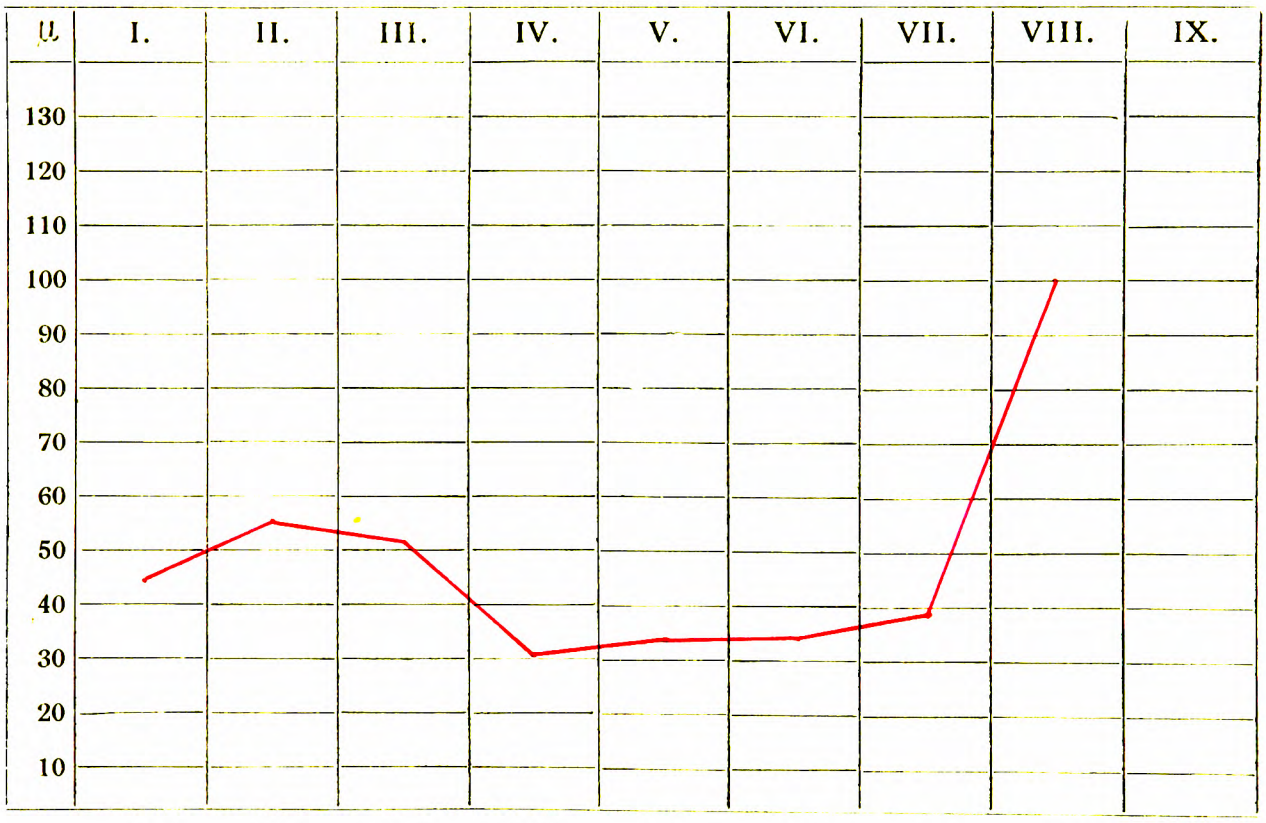
Locality: Tokyo, Japan.

Chart for:— Pseudococcus comstocki (Kuwana), 1902.

Size:—(*a*) Fresh material:— About 4 mm long and 2 mm broad.

(*b*) Mounted:—

Antennal curve:—



44. 56. 51. 31. 34. 34. 39.. 100.

Legs:—

Measurements in :— Tibia as long as the femur, tarsus about one-third as long as the tibia.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— On trunk of mulberry tree.

Locality:— Japan.

Pseudococcus cualatensis Cockerell, 1903.

Ps. cualatensis Ckll.,Entom.XXXVI, p.47, 1903.

"Adult ♀ about 2 mm long, entirely covered dorsally with dense white secretion; on boiling in KOH the colour is very pale pink, and the legs and antennae are light-brown.

Dermis furnished with the usual glands and with many small hairs. The setae of the anal lobes are about 120μ in length, while those of the anal ring measure about 75μ.

Antennae 8-segmented, the measurements of the joints being as follow:- (1) 39-48, (2) 36, (3) 28-30, (4) 15-18, (5) 18-27, (6) 21-24, (7) 30-33, (8) 57-60.

The prothoracic leg measures:- femur + trochanter 198μ; tibia 90μ, tarsus 51μ.

The legs are rather stout and short, with the claws a little longer than is usual in the group; the tibia and tarsus bear numerous hairs; digitules fine hairs bearing small knobs."

This species was found inhabiting the same galls as the Coccid described by Cockerell as Akermes colimae.

Ants, Azteca longiceps, were found in association with these insects.

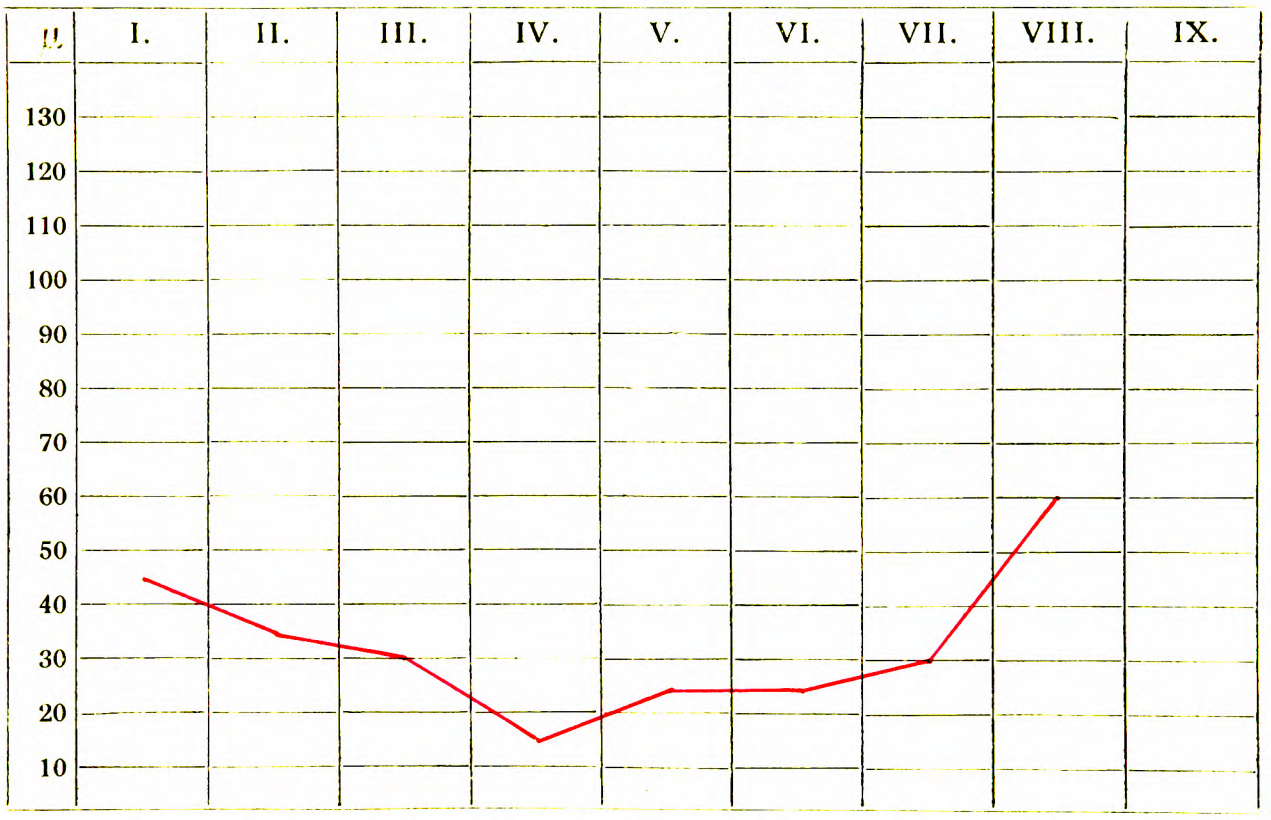
Locality: Cualata, Colima.

Chart for:— Pseudococcus cualatensis Cockerell, 1903.

Size:—(*a*) Fresh material:— About 2 mm long.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :— Prothoracic leg:-

Femur + trochanter 198μ; tibia 90μ; tarsus 50μ.

Setæ of Anal lobes:— About 120μ long.

Setæ of Anal ring:— About 75μ long.

Host plant:— In galls made by Kermes colimae.

Locality:— Cualata, Colima.

Pseudococcus cyperi (Signoret),I875.

D. cyperi Signoret, Essai,p.3I4, I875.

"Ressemble et est généralement confondu avec le C.adonidum. D'un brun marron clair dans les vieux individus, d'un jaune clair pour les jeunes; d'une longueur atteignant quelquefois 4 mm sur 2.25 mm de large; les antennes proportionnellement plus courtes que dans les espèces voisines, les deuxième, troisième et huitième articles les plus longs, ce dernier le plus longs de tous, puis le 3e et le 2e; le 4e est très-court, à peine la moitié du suivant; les 5e, 6e et 7e égaux; les pattes sont courtes et épaisses; le tarse est très-court, à peine le tiers de la longueur des tibias.

Tels sont les caractères les plus faciles a distinguer.

L'abdomen est légèrement ponctué, avec quelques rares poils; les lobes lateraux et ceux de l'extrémité comme dans adonidum.

La larve erbryonnaire est comme les autres especes, ainsi que la larve male.

Le ♂ est d'un brun jaunâtre plus clair sur l'abdomen, les articulations segmentaires plus claires.

La tête est globuleuse, pubescente, plus foncée que le reste, avec 4 yeux et 4 ocelles. Les antennes sont très-longues, le 3e article le plus long, puis le I0e, les autres à peu pres égaux, très-pubescents."

Hab. France.

Pseudococcus dasylirii (Cockerell), 1896.

D. dasylirii Ckll. Journ. N.Y.Ent.Soc. IV,p.202, 1896.

"♀. Length 4 mm or slightly less, dark olivaceous, covered with white meal. No lateral tufts, but sides very mealy; thick caudal tufts like those of P.virgatus, not very long. Antennae very slender, 8-jointed. Formula 8.3.(1.2.)(4.5.6.) 7. All the joints longer than broad; 8 with three whorls of hairs; 3 very slender, nearly as long as 8; 1 longer than its breadth at base; 8 about, or nearly as long as 6 - 7. Joints with sparse whorls of long hairs. Colour of antennae brown.

Legs ordinary, small, slender, pale-brown. Tarsus about 1/2 as long as tibia. Claw short, moderately curved. Tarsal digitules extremely slender, filiform, with minute knobs. Digitules of claw about as long as claw, stout, bulbous at base. Tibia with 4 strong bristles on outer margin. Caudal tubercles low, rounded, with a rather long bristle, some short bristles, and a couple of short stout spines.

The ♀ does not stain the liquid in which it is boiled.

Young larva light yellow.

Hab. Organ, New Mexico, 5,100 ft, in great numbers at bases of leaves of Dasylirion wheeleri.

The larvae live at the extreme base of the leaf, which is pallid; the adults a little further up."

Pseudococcus ephedrae (Coquillet), 1890.

D. ephedrae Coq. West Amer. Sci. VII, p. 43, 1890.

The adult is viviparous, and secretes a layer of white cottony matter on the ventral surface, and this gradually extends upward until the whole insect is enclosed.
Adult ♀ about 4 mm long, elongate, dark olive coloured, almost black. The mealy secretion is white, and the lateral filaments are only present on the posterior segments.
Antennae 8-jointed, the measurements varying as follow:- (1) 68-75, (2) 86-95, (3) 84-95, (4) 60-75, (5) 60-77, (6) 54-60, (7) 54-58, (8) 108-114.
The anterior leg measures approximately:- Femur + trochanter 344μ; tibia 249μ; tarsus 98μ.
In the form described as a variety from Mexico, Cockerell found that the 4th antennal segment was smaller, the range being 60-75, while the 4th joint of the specimen from California measured 75μ. The mesothoracic leg of this variety measured : femur - trochanter 390μ; tibia 300μ; and tarsus without claw 100μ.
The tarsal digitules in both forms are said to be simple hairs.
Host plant: Ephedra californica.
Localities: California and Mexico.

Chart for:— Pseudococcus ephedrae (Coquillet), 1890.

Size:—(*a*) Fresh material:— About 4 mm long.

(*b*) Mounted:—

Antennal curve:—

70. 86. 86. 75. 77. 60. 56. 112.

Legs:—

Measurements in μ:— Prothoracic leg:-

Femur + trochanter 344μ; tibia 250μ; tarsus 100μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Ephedra californica.

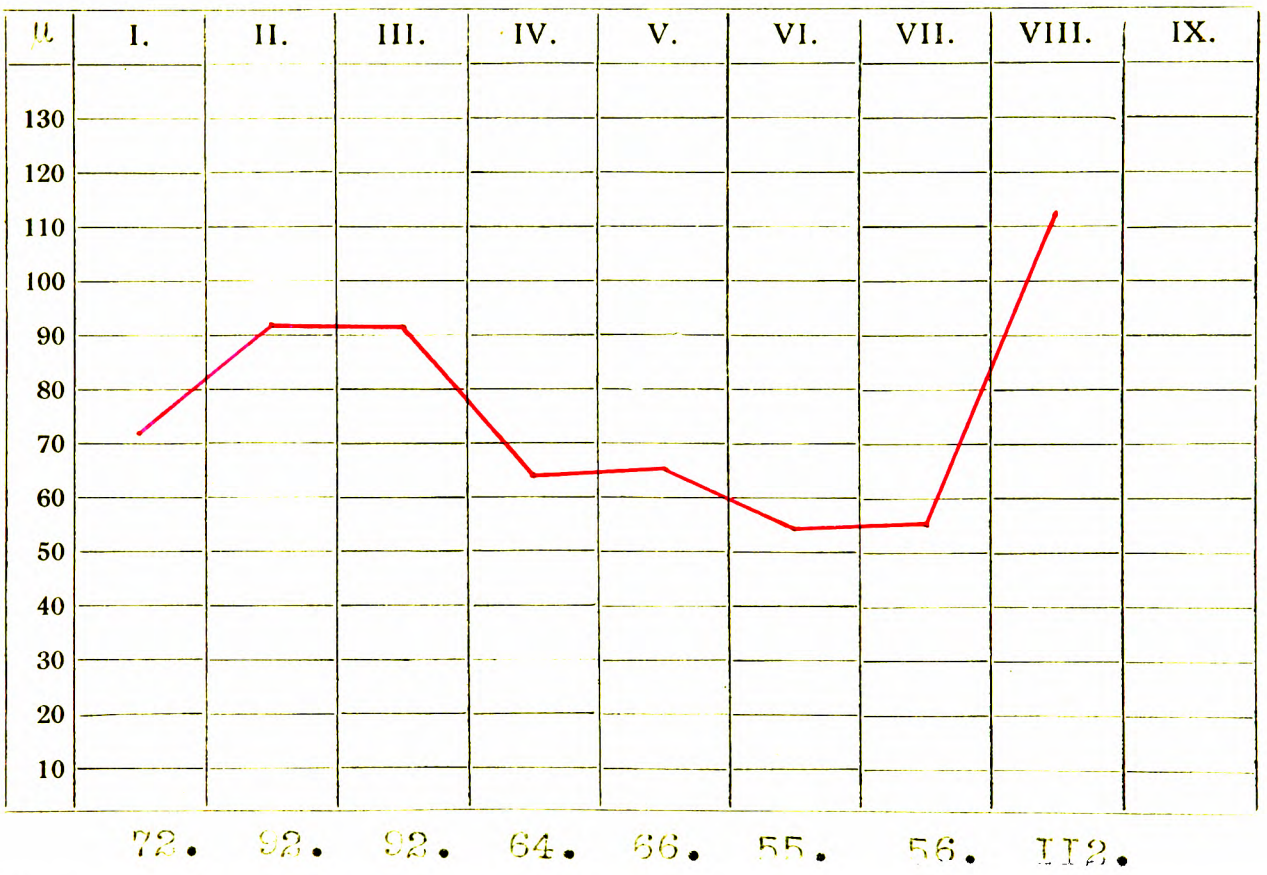
Locality:— California.

Chart for:— Pseudococcus ephedrae (Coq.) var. Ckll.

Size:—(*a*) Fresh material:— About 3.5 mm long and 2 mm broad.

(*b*) Mounted:—

Antennal curve:—



72. 92. 92. 64. 66. 55. 56. 112.

Legs:—

Measurements in μ:— Prothoracic leg:-

Femur + trochanter 315μ; tibia 250μ; tarsus 96μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Agave.

Locality:— Mexico.

Pseudococcus farnesianae (Targioni),1888.

D. farnesianae Targ.Annali di Agr. p.436, 1888.

" Corpo della femmina minuto, rosso villoso; margini, lobi laterali, lobi anali terminati da setole.
Antennae filiformi, alla base ingrossate; 1 articolo discoidale, assai largo; 2 anulare piu stretto; 3 , 4 cilindrici, piu lunghi del 5 , 6 , 7 , 8 alquanto piu lunghi dei precedenti, ultimo appena gradatamente ingrossato verso l'extremita, lungo quanto il 7 e l' 8 insieme, tutti lateralmente, verso l'estremo terminale, guarniti di una minuta placca con peli.
Zampe robuste, dalla 1 alla 3 gradatamente piu lunghe,
Tibie, tarsi lineari, lungo il margine interno ed esterno spinulosi; tarsi circa I/3 delle tibie.
Labro breve triangolare.
Lungh. del corpo ..... mill. 2.66.
Lungh. delle antenne ..... mill. 0.87.

Dactyl. Farnesianae (n. sp.)"

Pseudococcus formiceticola (Newstead),1900.

D. formicarius Newst.The Entom.Mon.Mag.XXXVI,p.249,1900.

D. formiceticola Newst. ibid, XXXVII,p.86,1901.

" ♀ adult viviparous, very short ovate, convex above, and flat beneath. Colour whitish, thoracic and abdominal areas with several distinct narrow, transverse, yellow brown bars, which are confluent in the middle forming a strong median line.

Antennae of 8 joints, the width of 1 about equal to the length of 8. Formula: 8.(1.2.)(6.7.) 3.(4.5.).

Derm thickly set with short stiff hairs, forming tufts at the margin of each segment; there are also numerous circular spinnerets, and near the anal opening two large eye-like glands.

Legs short and very stout, equal in length to the antennae.

Anal ring of 6 long hairs. Anal lobes abnormally large, placed closely together, and thickly set with long stiff hairs and spines.

Long, 2 to 3 mm.

Larva elongate. Anal lobes very slightly indicated, and furnished with very long hairs. Antennae of 6 joints.

Hab. Matheran Hill, N. Konkan, 2,000 ft altitude, with Crematogaster sp, ex coll. Wasman."

Pseudococcus fragilis Brain, I9I2.

Ps. fragilis Brain, Ann.Ent.Soc.Amer.V,2,p.186,I9I2.

Adult ♀: The largest specimen, mounted, measures 4 mm long and 2.4 mm broad. The integument, hairs and spines are unusually delicate, and the antennae long.

The gland-pores are scant, and the hairs few in number, but some of the latter, on the dorsal surface, near the anterior part of the body, are exceptionally long, some reaching 160u or more.

Antennae 8-jointed, the average lengths of segments, from ten measurements being:- (1) 66, (2) 80, (3) 90, (4) 57, (5) 70, (6) 53, (7) 55, (8) 114.

The setae of the anal lobes are about 230u in length, while those of the anal ring are about 192u long.

The mesothoracic leg measures: 129, 167, 417, 102, 304, 38, 144.

Host plant: Orange.

Locality: Cape Peninsular, South Africa.

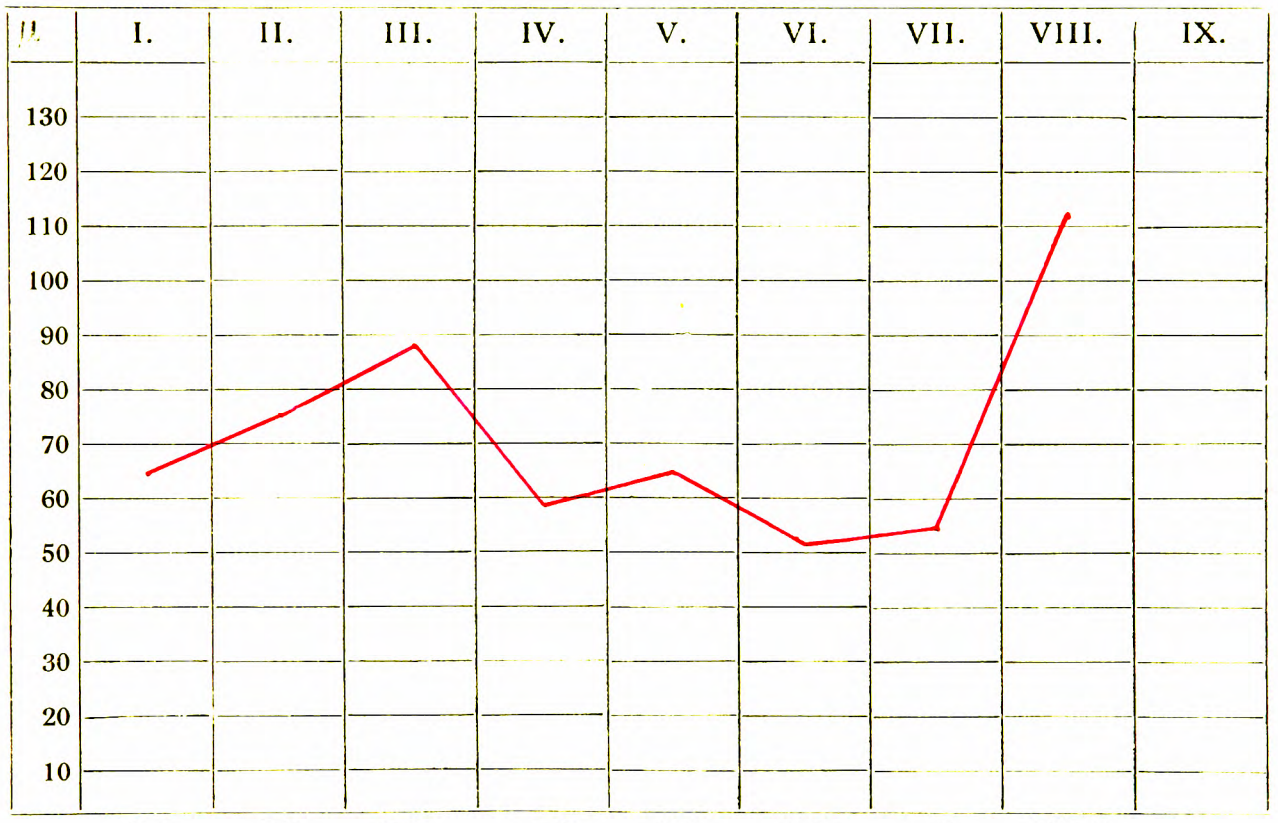
This material was collected by Mr. C.P.Lounsbury, and I described the species from slide material, so that I know nothing of the ovisac, and characters of the living insect, such as lateral and caudal filaments etc. I hope to complete these particulars on my return to the Cape this year.

Chart for:— Pseudococcus fragilis Brain, 1912.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— 4 mm long, and 2 mm broad.

Antennal curve:—



64. 76. 88. 58. 64. 52. 56. 112.

Legs:—

Measurements in μ :— Mesothoracic leg.

129. 167. 417. 103. 324. 38. 144.

Setæ of Anal lobes:— About 224μ long.

Setæ of Anal ring:— About 199μ long.

Host plant:— Orange.

Locality:— Cape Peninsula, South Africa.

Pseudococcus glaucus (Maskell), I878.

D. glaucus Maskell, N.Z.Trans.,XI,p.2I9,I878.

" This species differs from the last (P. calceolariae,) in its colour, which is light green, and in having a less regular oval line, (outline ?) ; the abdominal region runs more to a point.
The antennae, feet etc. resemble those of D. calceolariae.
My specimens are from Pittosporium engenioides and Pubus australis.
I have one specimen which appears to me to be a male in an early stage. In outline it resembles a female, but the rostrum is absent, and at each side there is a protuberance which seems to me to be the rudiments of the wings.
The abdominal segments overlap each other, tending to the form of abdomen of the male Coccidae.
The antennae which are thick have 6 joints. The claw of the foot is very small."

Pseudococcus gutierreziae (Cockerell),1896.

D. gutierreziae Ckll. Journ.N.Y.Ent.Soc,IV,p.203,1896.

"Slate colour, small, (when flattened under cover glass, after boiling in KOH, 2 mm long and 1 mm broad.), forming a long firm snow-white ovisac, 4 to 6 mm long, and about 1 mm broad, on the narrow leaves of the Gutierrezia.

♀. Elongate-oval, does not stain the liquid in which it is boiled; antennae and legs pale. Antennae 8-jointed, of the usual Dactylopius type. Formula 8.1.2.(3.7.)(4.6.)5.

5 is broader than long; 3 is conspicuously shorter than 2; 1 is very large; 8 has three whorls of hairs.

Anal ring with the usual 6 hairs. Caudal tubercles very low with the usual hairs, the longest a little longer than those of the anal ring.

Legs ordinary. Trochanter with a rather short bristle. Tibia almost as long as femur; tarsus rather more than 1/2 as long as tibia. Claw small, not much curved. Tarsal digitules filiform, without knobs. Digitules of claw stout, but very short, shorter than claw.

Hab. Mesilla Valley, between Las Cruces and Organ, abundant on Gutierrezia sarothrae var. Also abundant on Gutierrezia sarothrae near the Muscalero Agency, at the type locality Icerya townsendi.

It has a Chalcidid parasite."

Pseudococcus hibernicus (Newstead), 1895.

D. hibernicus Newst.,Ent.Mon.Mag.,XXXI,p.167,1895.

"♀ Adult oviparous, elongate-ovate, covered with a sac at gestation. Antennae of 8 joints, of which 8 is the longest and about equal in length to 5, 6, and 7 together; 1 and 2 about equal to 8 together; 3, 4, 5, 6 and 7 shortest and subequal; all with many fine hairs.

Mentum biarticulate; on either side of apex several (?5) rather long hairs, arranged close together; rostral filaments, unexpanded, shorter than anterior legs.

Legs long, posterior pair longest; tarsi with claw about half the length of tibiae, with four slender digitules.

Anal lobes large, studded with numerous short stiff spines and hairs, each terminated with a single long hair.

Anal ring of six hairs.

Dermis with short scattered hairs; and at margin in front many scattered circular discs.

Long, 4.5 mm, wide, 1.55 mm.

Sac of ♀ white, closely felted and complete, but easily ruptured. Long 4.5 mm, wide 2.55-3 mm.

Hab. In the "crowns" of a species of grass in sandy soil, on a chalk cliff close to the sea, at Ballington, County Antrim, Ireland.

One specimen examined was badly parasitised, but did not differ from any of the perfect examples."

Pseudococcus irishi (Cockerell), 1900.

D. irishi Ckll., Can.Ent.XXXII,p.129,1900.

Erium irishi Fernald, Catalogue,p.113,1903.

"♀. Adult dark red, forming a very convex chalk-white ovisac about 3 mm long and 2.5 mm high, the sacs clustered on the twigs of the plants at the nodes, from two to ten at the nodes. Eggs and newly hatched larvae pale yellow. Adult ♀, after being boiled and flattened on the slide, nearly circular, almost 2 mm long. The insects do not stain the liquid on boiling, but the body contains a dull crimson pigment, partly retained in boiled specimens. Skin with many small round glands, which in lateral view look like truncate spines. Dermal hairs very few and small. No lateral patches of spines. Caudal lobes completely obsolete, marked only by a pair of short stout spines on each side. Hairs on anal ring comparatively short and inconspicuous, much smaller than in D. townsendi.

Legs and antennae pale yellowish. Middle leg measuring about as follows in μ :- Coxa 111; femur + trochanter 231; tibia 180μ; tarsus μ; claw 30μ; width of femur 57μ.

Antennae 8-jointed, the joints measuring in μ:-
(1) 45-51, (2) 36-40, (3)33-42, (4) 18-27, (5) 25-37, (6) 16-24, (7) 27, (8) 69-78. Formula varying from 8.1.3.2.(4.7) 5.6. to 8.1.2.3.(5.7.)4.6.

Hab. Tempe, Arizona, on Lanea tridentata, Oct, 1899."

Chart for:— Pseudococcus irishi (Cockerell),1900.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— About 2 mm long.

Antennal curve:—

48. 38. 38. 24. 25. 20. 27. 75.

Legs:—

Measurements in μ:— Mesothoracic leg:-

Femur + trochanter 230μ; tibia 180μ; claw 30μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Larrea tridentata.

Locality:— Tempe, Arizona.

Pseudococcus juniperi (Ehrhorn),1906.

D. juniperi Ehrhorn, Can.Ent.XXXVIII,p.333,1906.

"Adult ♀ oval, about 2 mm long and I mm broad, convex, slightly covered with secretion. Egg-sac small. Young larva reddish. Adult ♀, when boiled in KOH turns dark crimson. Derm colourless, with numerous short, straight spines on the dorsum.

Antennae 8-jointed. Joint 8 longest, I and 7 sub-equal; 4, 5 and 6 about equal, and shortest. Formula:- 8.3.2.(I.7.)(4.5.6). Also 8.3.2.7.I.(4.5.6). Legs long and slender. Femur and tibia about equal. Tarsus about I/2 of tibia. Tarsal digitules fine knobbed hairs. Claw small, slender and curved, with curved club-like digitules reaching to end of claw. Measurements of leg-joints in μ:- Coxa 96; trochanter 48; femur I92; tibia I92; tarsus 95; claw 24. Caudal lobes rounding, with one very long, stout bristle (200-2I2μ,) and three short stout spines on the outer and one on the inner margin.

Each lobe has numerous round gland orifices. Anal ring large, oval, about 80 by 60μ, with 6 long hairs, about 220μ.

Hab. On Juniperus virginiana, Ashforks, Arizona."

Pseudococcus kraunhiae (Kuwana), 1902.

D. kraunhiae Kuw. Pr.Cal.Acad.Sci.(3),III,p.55,1902.

"Adult ♀. - Enclosed in a cottony sac of irregular shape; colour reddish brown. When boiled in KOH and spread out under coverglass measures 2 mm. in length and 1.5 mm in width; broad elliptical in form.There is a transverse row of spines on the dorsal aspect of each segment; ventral aspect with fine hairs; dorsum covered with small round pits. Antennae and legs large, brown in colour.

Antennae 8-segmented, .5 mm long, hairy.

Formula 8.3.2.1.5.(4.6.7.), measurements of joints in μ:- (1) 69, (2) 77-80, (3) 83, (4) 55, (5) 56, (6) 53, (7) 55, (8) 111.

Mouthparts comparatively large; rostral loop long, extending down to the first or second abdominal segment.

Legs subequal, hairy; coxa much wider than long; trochanter as usual, bearing a few spiny hairs; femur thick, outer margin convex; tibia slightly shorter thar femur, and three times as long as tarsus; tarsal digitules fine and knobbed, digitules of claw stout, short and knobbed. Claw as usual, curved.

Each of the marginal lobes of the posterior segment bears a single long hair with two spines at the base.

Anal ring large, prominent, with 6 hairs.

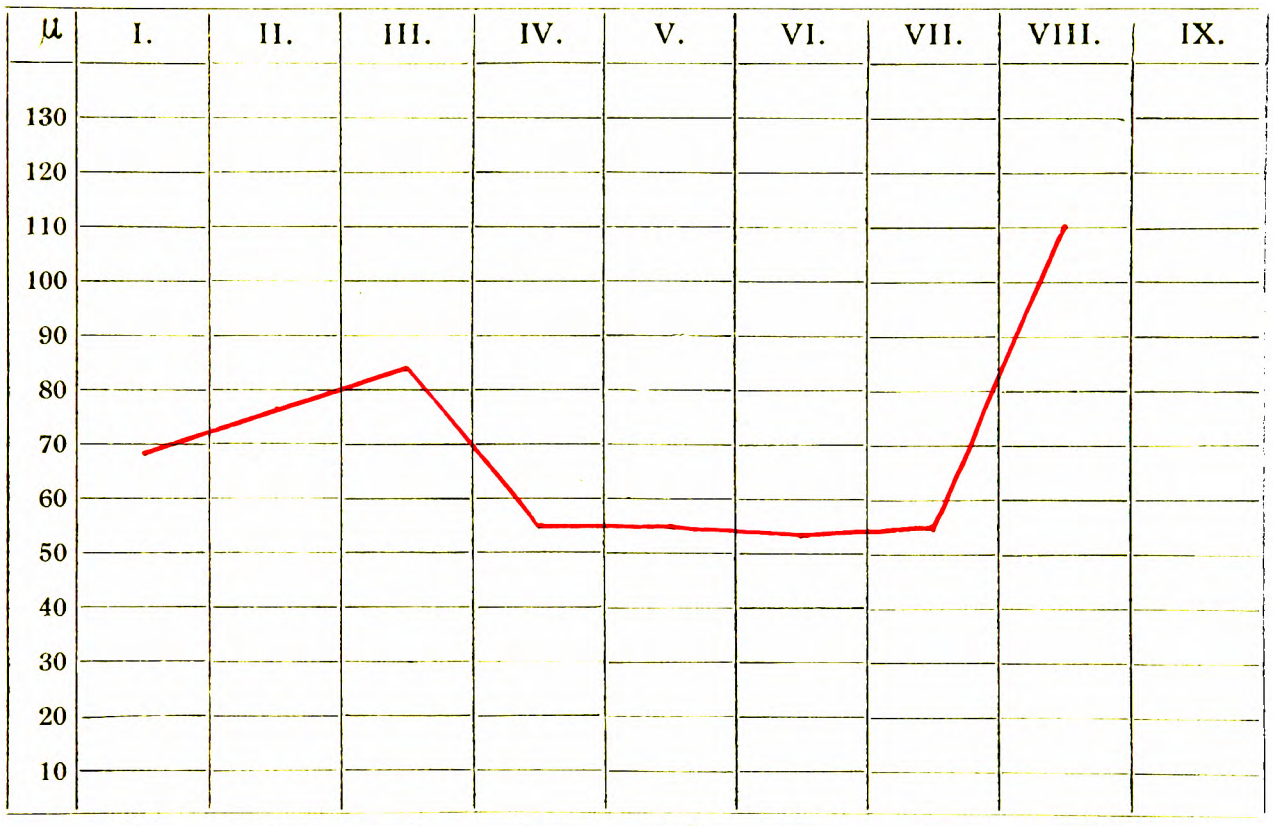
Hab. On Kraunhia floribunda, Yokohama."

Chart for:— Pseudococcus kraunhiae (Kuwana), 1902.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— 3 mm long, and 1.5 mm broad.

Antennal curve:—



Legs:—

Measurements in :— Coxa wider than long; femur thick; claw curved.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Kraunhia floribunda.

Locality:— Japan.

Pseudococcus lilacinus Cockerell, 1905.

Ps. lilacinus Ckll. Pr.Dav.Acad.Sci.X,p.128,1905.

" ♀ globose, densely covered with white meal; when mounted subglobular, about 1800μ long; after boiling in KOH the colour is lilac; legs fairly short, anterior leg with the femur - trochanter 300μ long, tibia 100μ, tarsus 65μ. Hind leg with femur + trochanter 345μlong, tibia 150μ, tarsus 70μ; width of femur 65μ; claw stout, simple. Antennae 8-jointed, length of joints in μ :- (1) 25-55, (2) 32-52, (3) 37-50, (4) 20-45, (5) 25-42, (6) 27-30, (7) 30, (8) 80.

In one instance joint 3 measured 73μ, evidently being combined with 4.

Larva in body of ♀ about 375μlong.

Hab. Lucban, Tayabas, Philippine Islands, on cultivated orange.

I supposed at first that this species must be Ps. filamentosus, but that is quite different by the blue-green pigment after boiling, and the antennae are also different. On account of the pigment it is equally excluded from Ps. albizziae. By the purplish pigment and general appearance it resembles Ps. quaintancii (Tinsley).

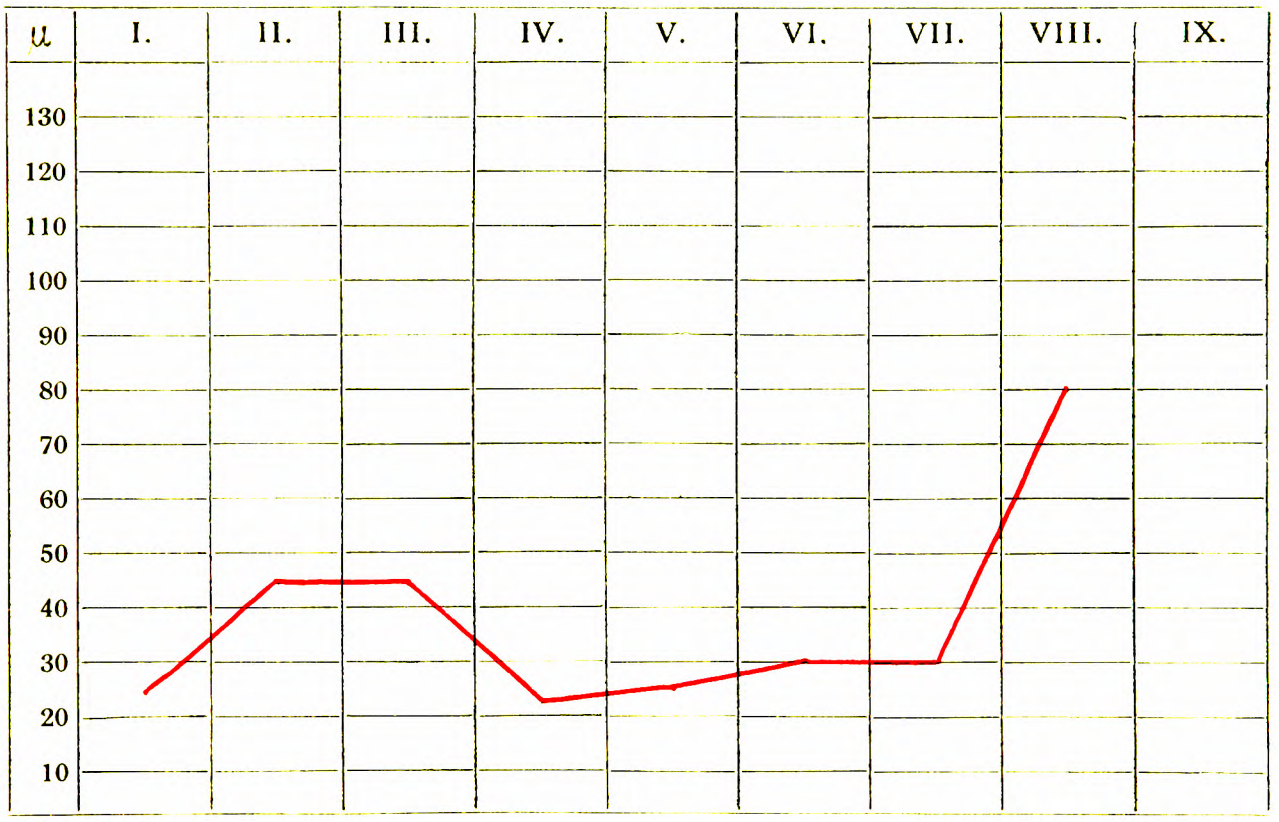
The antennae are very variable, but the series 25, 45, 45, 22, 25, 30, 30, 80, expresses what I take to be the normal lengths of the joints."

Chart for:— Pseudococcus lilacinus Cockerell, 1905.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— About 1.8 mm long.

Antennal curve:—



35. 45. 45. 32. 25. 30. 30. 80.

Legs:— Fairly short.

Measurements in μ :— Prothoracic leg:-

Femur + trochanter 200μ; tibia 100μ; tarsus 65μ.

Claw stout, simple.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Cultivated orange.

Locality:— Lucban, Tayabas, Philippine Islands.

Pseudococcus lobulatus (Maskell),1893.

D. lobulatus Maskell, N.Z.Trans.,XXVI,p.91,1893.

"Adult ♀ yellowish-brown or sometimes reddish-brown, covered dorsally with white cotton, and having a marginal fringe of white cottony processes which are somewhat longer on the abdominal segments. Length variable; the specimens seen average I/II in. Antennae of 8 joints, of which the last is fusiform and the longest, the sequence of the rest being 2.3.6.4.5.7.1. Feet rather long; femur strong; trochanter bearing one long hair;tibia cylindrical, with several fine hairs,and with two spines at the extremity; tarsus tapering,pubescent; the tibia is 2 I/2 times as long as the tarsus; upper digitules short fine hairs,the lower pair only very short fine bristles lying along the claw. Mentum conical, dimerous;the abdomen is truncate, and terminates in four inconspicuous anal tubercles, each bearing conical spines and short setose hairs;

Anal ring large, compound, with 6 hairs.

Epidermis bearing some very small circular spinnerets and hairs; the spinnerets and hairs are more numerous near the margin.

Larva and ♂ not observed.

Hab. In Australia, under loose strips of bark of Eucalyptus globosus. My specimens were sent by Mr. Froggatt from Bendigo, Victoria. E. globosus is a Tasmanian tree."

Pseudococcus lounsburyi Brain, 1912.

Ps. lounsburyi Brain, Ann.Ent.Soc.Amer. V,p.179,1912.

Ovisac, when completed, entirely enclosing the adult ♀, 4.5 mm long, elongate, oval, composed of threads which, under the microscope, have a "glassy" appearance.

Ova.- Closely surrounded by fibres of the ovisac, orange-yellow, 340μ long.

Larva nearly transparent, 680μ long; antennae of 6 joints.

♂ puparium small, brownish white. Adult ♂ of the usual Pseudococcus type, antennae of 10 segments.

Adult ♀ about 3.7 mm long, elongate, narrow, purplish in colour. There are no lateral filaments, but four caudal ones are generally present, of which the inner pair are slightly the longer.

Antennae of 8 joints. Average of 10 measurements in μ:- (1) 61, (2) 69, (3) 47, (4) 28, (5) 42, (6) 28, (7) 37, (8) 92.

The setae of the anal lobes are from 144 to 160μ long, while those of the anal ring are 104 to 128μ in length.

The measuremenst of the mesothoracic leg are as follow:

83. 121. 304. 76. 205. 40. 106.

Host plant: Agapanthus umbellatus L'Herit.

Remarks: This species was first found by Mr. C.P.Lounsbury on the leaf bases of this plant at Kenilworth,S.A.

Chart for:— Pseudococcus lounsburyi Brain, 1912.

Size:—(*a*) Fresh material:— 3.7 mm long and 1.6 mm broad.

(*b*) Mounted:—

Antennal curve:—

60. 68. 46. 28. 42. 28. 36. 92.

Legs:—

Measurements in μ :— Mesothoracic leg:-

83. 121. 304. 76. 305. 40. 106.

Setæ of Anal lobes:— About 150μ long.

Setæ of Anal ring:— About 130μ long.

Host plant:— Agapanthus umbellatus L'Herit.

Locality:— Cape Peninsula, South Africa.

Pseudococcus luffi (Newstead), 1901.

D. luffi Newstead, Ent. Mon. Mag., XXXVII, p. 85, 1901.

"Ovisac of ♀ rather closely fitted, long, cylindrical, and of equal width throughout; ♀ remaining uncovered at the cephalic extremity. Long. 3 to 4 mm. diameter .75 mm. ♀ adult very active, constructing ovisac at period of gestation; mealy, but without marginal appendages; segmentation distinct; form rather short, ovate, anal extremity emarginate. Anal lobes indicated by a single hair. Anal ring of six long hairs, intervening spaces with irregular ovate glands. Dermis thickly set with circular spinnerets, forming broad bands on the abdominal segments; there are also numerous short hairs but these are fewer in number than the spinnerets.

Antennae of 8 joints, of which the last is much the longest; formula, 8.1.2.3.4.(5.6.7.) all the joints with fine hairs.

Rostrum biarticulate, rather pointed, joints with minute hairs on both surfaces.

Legs rather long, hairy; digitules to claw slightly dilate, those of tarsus simple.

Long. 1.5 to 2 mm.

Hab. On the lower stem and roots of Lepigonum rupestre, Guernsey, "near the west coast of the island", Sept, 1899. Discovered by Mr. W.A.Luff."

Pseudococcus macrozamiae (Fuller), 1897.

D. macrozamiae Fuller, Notes on Cocc. W. Austr.p.10,I897.
Tr.Ent.Soc.Lond.p.454,I899.

"Adult ♀ active; light yellowish-brown; elongate, flattish, segmented; with dorsal meal and short lateral tassels.
Antennae of 8 joints, basal wide and stout, remainder cylindrical, apical longest and almost fusiform; sequence :-

8.1.2.(3.5.)4.(6.7.)

Legs ample, spined. Tubercles small.
Anal ring conspicuous with 6 strong hairs.
Dorsum clothed with many hair-like spines and with numerous multiocular pores and raised spinnerets.
Mentum conical, apex haired, monomerous (?).
Eyes sub-conical. Length 0.16 inch. Eggs yellow, deposited in thin cottony webs.
Larva yellowish-brown. Antennae 6-jointed, anal tubercles small.
On Macrozamia frazeri.
Locality: Swan River, Western Australia.
Generally found at the bases of the fronds."

Pseudococcus mamillariae (Bouché). I844.

Coccus mamillariae	Bouché, Stett.Ent.Zeit., V, p.302, I844.
" "	Boisduval, Ent.Hort., p.353, I867.
Dactylopius "	Signoret, Essai, p.320, I875.
Pseudococcus "	Fernald, Catalogue, p.I06, I903.

Signoret, loc. cit. writes:-

"C'est sur diverses Mamillaria que l'on trouve cette espèce qui resemble beaucoup au D. adonidum, mais en général plus petite que lui, ce qui ne suffrait certainement pas pour établir une espèce; mais nous trouvons aussi une différence dans l'antenne: ainsi, composée de huit articles comme les autres, elle diffère par le 2nd article qui est le plus long, tandis que c'est le 3e dans l'adonidum; de plus, les 5e, 6e, et 7e sont les plus petits et le 4e plus grand que ceux-ci; dans l'adonidum, ce dernier est aussi court que les autres. Cette différence de longueur du 4e article et le 2nd article plus long la distinguent aussi du D. pteridis; également le 4e article dans D. cyperi est très-petit et le 8e article le plus grand, ce qui fait qu'on ne peut les confondre ensemble. De plus, l'antenne ici est plus courte en.général; le reste comme dans les autres Dactylopius.

Avec les auteurs qui ont parlé de cette espèce nous trouvons la sécrétion moins abondante sur les côtés.

Nous ne connaissons pas le ♂, que Bouché decrit comme suit:

"♂. D'un brun rouge foncé; ailes blanches, nervures fortement saillantes en arrière; pattes pâles, filets blancs. Semblable à l'adonidum, mais plus petit et plus foncé.""

Pseudococcus mesembrianthemi n. sp.

Ovisac: elongate oval, but more or less irregular in outline, white, cottony, loosely felted. Under the microscope the threads have a "glassy" appearance. When the ovisac is completed it contains large numbers of ova, and also the shrunken body of the ♀.

Ova: elongate, oval, about 390μ long and 170μ in diameter. When seen in the ovisac they appear orange yellow, but under the microscope they are amber yellow in colour.

Larvae, newly emerged: about 480 to 500μ long, elongate, seen under a low power the caudal extremity appears to be rather pointed. The colour of the body is orange yellow, but the legs and antennae are paler, almost colourless, in fact, and transparent. Antennae 6-jointed.

♂ unknown.

♀ adult: when taken from the ovisac, small, about 2 mm long and 1.25 mm broad, with the two extremities curved inwards, ventrally, so that the dorsum is rounded. The colour is pinkish red and the waxy secretion scant. The lateral and caudal filaments are irregular and usually bent; they are of median length and thickness, and have a felted appearance.

When placed in boiling KOH the colour is reddish, and the liquid is only slightly stained. After boiling the body becomes distended and straightened out. The largest ♀

then measured approximately 3 mm long and 2 mm broad. The cleared dermis shows the usual gland-pores and bristles, but near the anterior end are a number of scattered hairs the largest of which were found to measure 150μ.

The caudal tubercles showed development normal for the genus.

Antennae 8-jointed. Plate I, fig. I.

Joints:- I. II. III. IV. V. VI. VII. VIII.

Range of measurements:-

78-82. 82-90. 82-90.40-48.64-76.42-46.46-52.108-116.

Most common measurements:-

80. 84. 86. 42. 68. 44. 48. 112.

Average of 10 measurements:-

79. 85. 86. 43. 71. 44. 48. 111.

Setae of anal lobe: 124 to 140μ long, with 130μ as mode.

Setae of anal ring:- 160 to 176μ long, with 164μ the mode.

Legs: measurements according to the scheme given in the Annals of the Ent. Soc. of America, V. p.181,1912:-

Prothoracic leg:- 84. 144. 304. 100. 218. 40. 120.

Mesothoracic leg:- 100. 150. 344. 112. 260.52.140.

Metathoracic leg:- 120. 170. 385. 118. 340.60.150.

Intracellular symbiont: Coccidomyces sp. see p.188.

Host plant: Mesembrianthemum edule Linn.

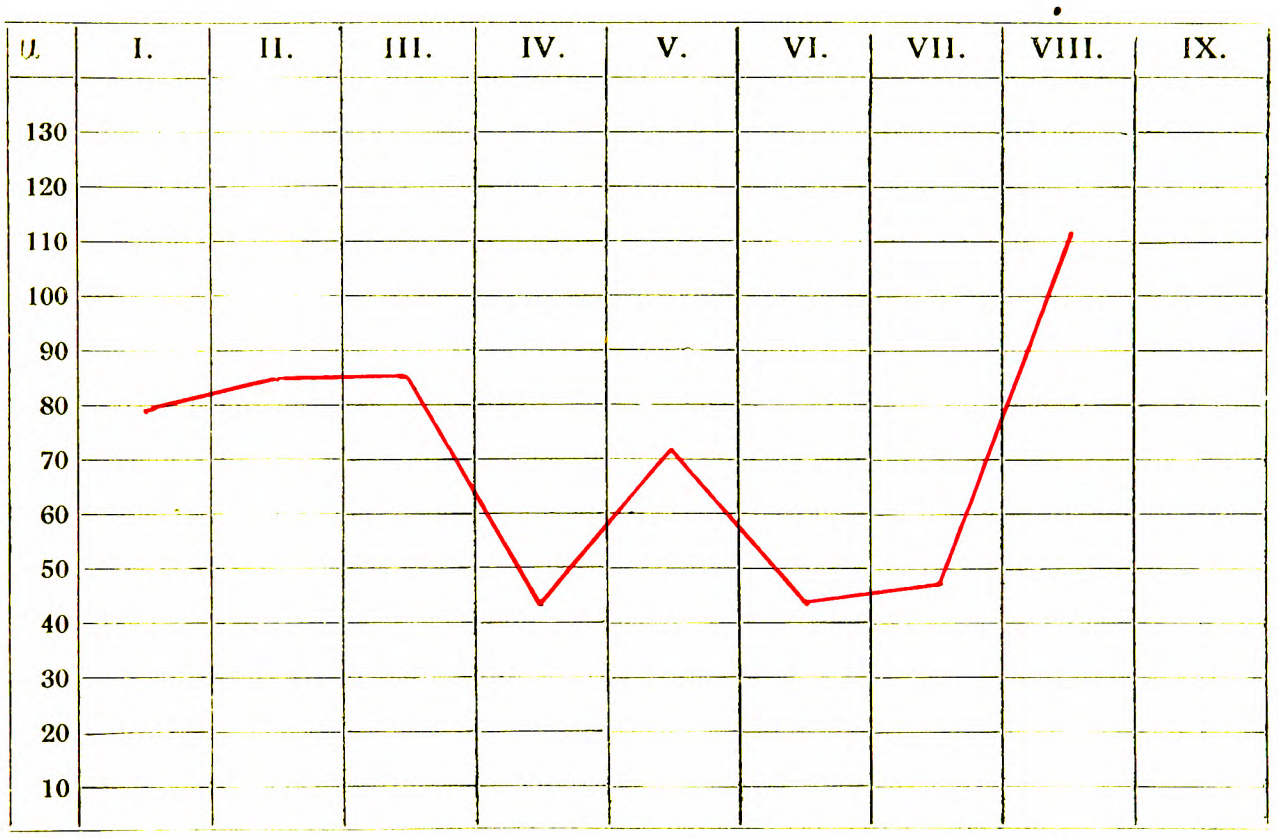
Locality: Rosebank, Cape Peninsula, South Africa. The material was collected by Mr.C.W.Mally, Feb.21, 1914.

Chart for:— Pseudococcus mesembrianthemi n. sp.

Size:—(*a*) Fresh material:— 2 mm long and 1.25 mm broad.

(*b*) Mounted:— About 3 m. long and 2 mm broad.

Antennal curve:—



79. 85. 86. 43. 71. 44. 48. 111.

Legs:—

Measurements in u :—

84. 144. 304. 100. 218. 40. 120.
100. 150. 344. 112. 260. 52. 140.
120. 170. 385. 118. 340. 60. 150.

Setæ of Anal lobes:— About 130u long.

Setæ of Anal ring:— About 164u long.

Host plant:— Mesembrianthemum pomeridianum Linn.

Locality:— Cape Peninsula, South Africa.

Pseudococcus muraltiae Brain, 1913.

Ps. muraltiae Brain, Ann.Ent.Soc.Amer.V.p.185,1912.

Ovisac spherical, 2.3 mm in diameter, white, fibrous.The ovisacs were not found singly, but aggregated in masses on the twigs of the plant.

Ova: Orange yellow in colour, oval, averaging 240µ long and 180u broad.

Larva: Newly hatched specimens are very active, oval, of an orange yellow colour, 358u long.Antennae of 6 joints. The ♂ was not observed.

Adult ♀ small; largest specimen seen, with completed ovisac was 1.9 mm long and 1.13 mm wide, slate-grey in colour, with a scanty covering of waxy secretion.

Lateral filaments wanting, caudal ones, usually 4, short.

Colour in boiling KOH black, then purple.

Antennae 8-jointed. Average length of segments from ten measurements : (1) 39, (2) 38, (3) 31, (4) 30, (5) 23, (6) 22, (7) 29, (8) 82.

Setae of anal lobes varied from 120 to 150u, with 130µ the most common length; those of the anal ring were 96 to 120µ, with 108u the mode.

Measurements for the mesothoracic leg in µ :- 45, 76, 170, 60, 98, 30, 98.

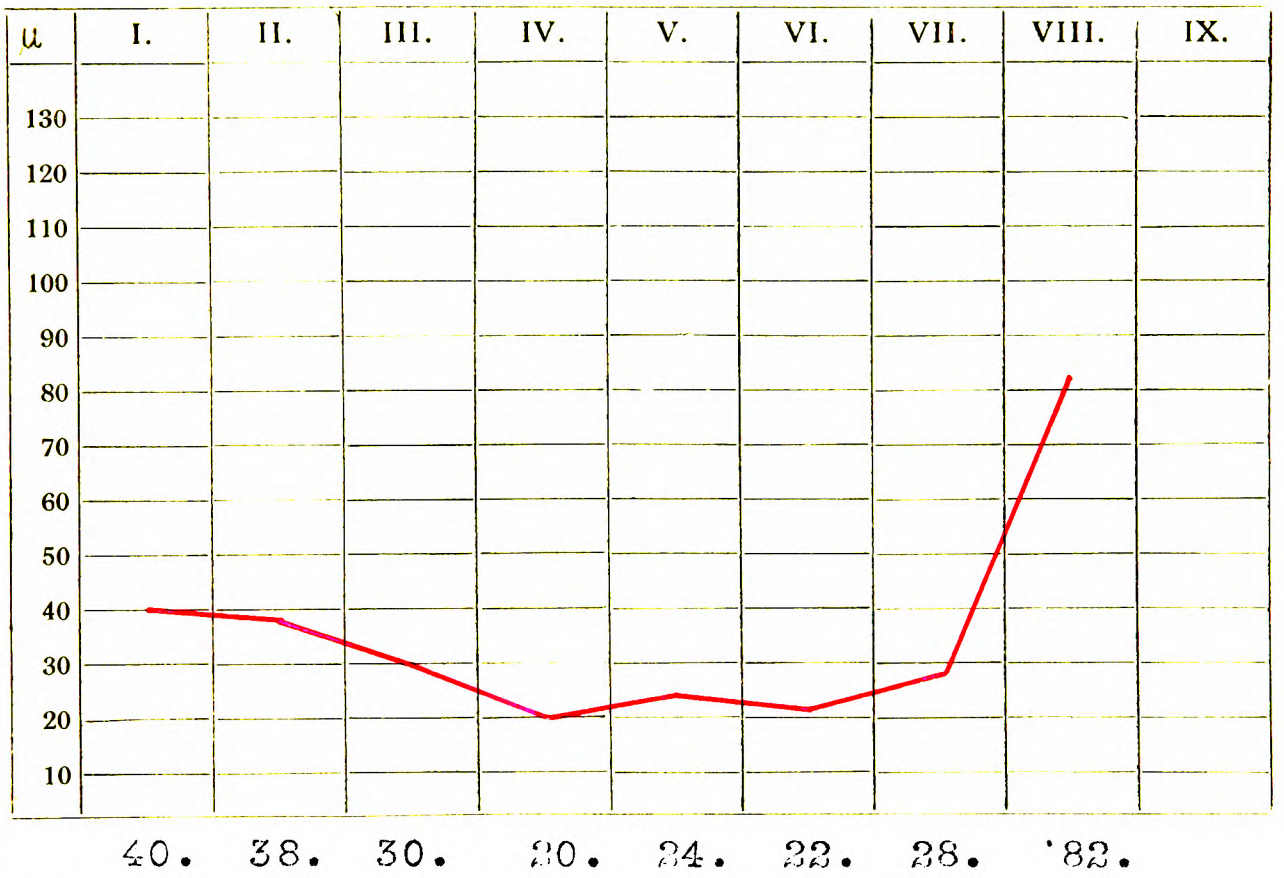
Hab. On Muraltiae heisteria D.C., Cape Flats, near Cape Town.

Chart for:— Pseudococcus puraltiae Brain, 1912.

Size:—(*a*) Fresh material:— Largest ♀ with completed ovisac was 1.9 mm long and 1.13 mm broad.

(*b*) Mounted:—

Antennal curve:—



40. 38. 30. 20. 24. 22. 28. '82.

Legs:—

Measurements in μ:— Mesothoracic leg:-

45. 76. 170. 60. 98. 30. 98.

Setæ of Anal lobes:— About 130μ long.

Setæ of Anal ring:— About 108μ long.

Host plant:— Puraltia heisteria D.C.

Locality:— Cape Peninsula, South Africa.

Pseudococcus neomexicanus (Tinsley), I898.

D. Kingii Ckll,var Neo-Mexicana Tins. Can.Ent.XXX, p.3I8,I898.
D. neomexicanus Ckll.Ann.Mag.N.H.(7),VII,p.334,I90I.
D. neomexicanus var. B,ibid,X,p.82,I902.

Ovisac compact, elliptical, very little larger than the adult ♀, partly enclosing the ♀.

Adult ♀ about 2 mm long and 1 mm broad, ellipsoidal, and rather plump. Colour yellowish; body nearly naked, but the dorsum is sparsely mealy. Lateral and caudal filaments wanting.

Antennae 8-jointed, segments measuring as follows:- (1) 39, (2) 39, (3) 33-35, (4) 21-24, (5) 24-27, (6) 24-27, (7) 27, (8) 72.

Setae of anal lobes about I80μ long, while those of the anal ring are about 90μ in length.

Legs rather smaller than in Kingii; femur I30μ long; tibia about 140μ long and tarsus 75μ.

Hairs and digitules about as in D. Kingii.

Hab. On the roots of Gutierrezia sarothrae at an altitude of about 5,000 feet in the Organ Mts, New Mexico.

The insects were in all cases attended by ants.

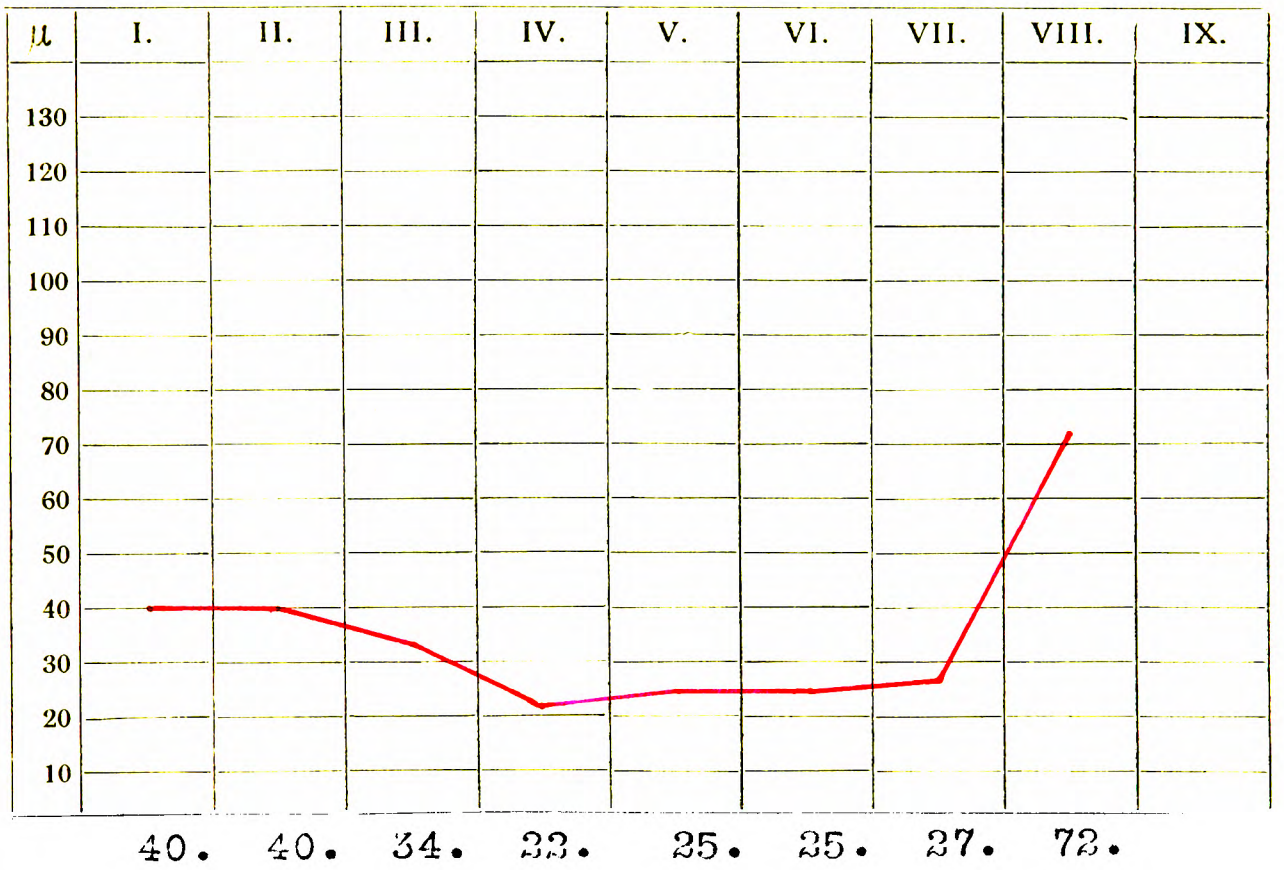
Remarks: Cockerell states that the ovisac of D.Kingii is a loose, fluffy, shapeless mass, while that of this species resembles that of an Eriococcus very much.

Chart for:— Pseudococcus neomexicanus (Tinsley), 1898.

Size:—(*a*) Fresh material:— About 2 mm long and 1 mm broad.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :— Mesothoracic leg :-

Femur + trochanter 180μ; tibia 130μ; tarsus 66μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Gutierrezia sarothrae.

Locality:— Organ Mts. New Mexico, alt. 5,000 ft.

Pseudococcus obtectus (Maskell),1899.

D. obtectus Maskell, N.Z.Trans.,XXII,p.152,1899.

"Adult ♀ sheltering itself beneath a leaf, or bud-scale of the food-plant; excreting in this position much white cotton, in which the eggs are laid. Colour red; body elliptical, convex, segmented, shrivelling after gestation; length about 1/30 in.; the last segment of the abdomen is slightly produced cylindrically, with inconspicuous setiferous anal tubercles. Mentum dimerous, with several short hairs at the tip. Antennae of 8 joints, subequal except the first, which is irregularly fusiform and longer than any two others. Anogenital ring compound, with six hairs. Spinnerets scattered all over the body - some simple circular orifices, others small cylindrical tubes.

♀ of second stage, and larva, unknown.

♂ unknown.

Hab. In New Zealand, on Fagus fusca (black-birch), near Fufton; apparently only on the twigs."

Pseudococcus olivaceus (Cockerell), I895.

D. olivaceus Ckll. Psyche, VII,Suppl.I,p.I6,I895.

"Long. 3.5 mm, lat. 2.5 mm, alt. I.5 mm, (in alcohol.)
Dark olive brown, with mealy powder. Legs shorter than their distance from one another, very stout, coxa extremely large, digitules all filiform.
Antennae brown, slender, 8-jointed, 8 very long.
Formula 8.(I.2.3.) (6.7.) 5.4.
Hairs of anal ring very small.
Posterior tubercles obsolete.
On Yucca, Cindad, Perfirio Diaz, Mexico.
Rather like D. glaucus Maskell."

Pseudococcus poae (Maskell), 1878.

D. poae Maskell, N. Z. Trans. XI, p. 220, 1878.

"This species is found on the roots of the common tussock grass, or rather on the stems close to the ground. It is a rather large insect, bright pink in colour, covered with a white meal, and with a very regular outline, flat on the underside, convex above.

The mentum has a few hairs at the tip; the setae are long.

The antennae are very short; the second and third joints are the longest; the last joint has a few hairs.

The legs are short; the coxae thick, the femur somewhat thinner, the tibiae and tarsi still less and about equal in length. The upper digitules are not long, the lower inconspicuous, if not wanting.

There are a few hairs on the tarsus. The anal tubercles are extremely small, scarcely perceptible; each has three conical spines but no hairs and a few other spines are visible on the abdomen.

The anal ring has, I think, six hairs.

All over the body are numbers of small circular spinnerets.

I have not seen the ♂ of this species, which is, I think, certainly new.

Hab. On grass, New Zealand."

Pseudococcus quercus (Ehrhorn), 1900.

D. quercus Ehrh. Can. Ent. XXXII, p.315, 1900.

" ♀ slightly covered with white secretion, about 2.5 mm long and 1.5 mm broad, tapering at both ends.
Colour of body greenish brown, concealed more or less by secretion. Segmentation very distinct. Each segment bears a white filament on the margin. Caudal setae about 1/3 as long as the body, white and quite stout. Antennae and legs dark brown.
When placed in boiling KOH body turns crimson, derm becomes colourless after boiling. Antennae 8-jointed. Joint 8 longest, joint 7 generally shortest. Formula approximately : 8.3.2.(1.5.) 6.4.7.
Each joint has a ring of stout hairs. Joint 8 has numerous very long hairs. Legs long and stout, with numerous long fine hairs. Femur about as long as tibia; tarsus about 1/3 as long as tibia; claw slender and well curved. Digitules long fine knobbed hairs. Anal ring small, with six fine hairs. Caudal lobes well developed, with very long setae (280μ). Groups of spinnerets, conical spines and long slender hairs scattered over the dorsum.
Hab. On Quercus chrysolepis, on the leaves and in the cracks of bark, California."

Pseudococcus roseotinctus (T. and W.Cockerell), '01.

D. roseotinctus Cklls. Can.Ent., XXXIII,p. 336, 1901.

" Form and size about as in D. pini; distinctly segmented, with a slight covering of mealy powder; caudal tassels short but well developed; lateral fringe of tassels very short, irregular, but plainly visible in fresh specimens. ♀♀ full of young show no signs of producing ovisacs.

Antennae 8-jointed, joints measuring in μ :-

(1) 45-66, (2) 51-60, (3) 45-48, (4) 39-45,(5) 42-45

(6) 30-36, (7) 3[illegible]-[illegible]6, (8) 84-93.

Middle leg :- Femur + trochanter 240μ; tibia 210μ; tarsus (without claw) 78μ. Breadth of femur 84μ.

Labium,- length 135μ, breadth 90μ.

Caudal bristles and bristles of anal ring of the same length, 120μ.

Boiled in KOH the ♀♀ turn bright red.

Hab. Romeroville, New Mexico, on roots of grass.

Closely allied to D. salinus Ckll. (from California), but the femora are stouter, the labium is broader, and the caudal bristles are much longer.

The antennae are curiously like those of the Brazilian D.secretus Hempel. D. roseotinctus is also very similar to D. trifolii Forbes, which has a lateral fringe, but there are various small differences, and the colour is not the same."

Chart for:—Pseudococcus roseotinctus (T. and W.Cockerell),I90I.

Size:—(*a*) Fresh material:— About 4 mm long and 2 mm broad.

(*b*) Mounted:—

Antennal curve:—

54. 52. 46. 42. 42. 34. 34. 88.

Legs:—

Measurements in μ :— Mesothoracic leg.

Femur + trochanter 340μ; tibia 2I0μ; tarsus, without claw, 78μ.

Setæ of Anal lobes:— About I30μ long.

Setæ of Anal ring:— About I30μ long.

Host plant:— On roots of grass.

Locality:— Romeroville, New Mexico.

Pseudococcus salinus (Cockerell), 1902.

D. salinus Ckll. Ann.Mag.Nat.Hist.(7),IX,p.21,1902.

"♀. Grey, with white secretion; 6 caudal tassels and two cephalic ones. Boiled in liquor potassae turns crimson; legs and antennae ferrugineus. Mounted specimen about 2.8 mm long, and 1.35 mm broad. Skin with numerous small round glands, and a very few hairs; no distinct caudal tubercles; bristles of anal ring very short, about 42μ long; caudal bristles very short, not, or hardly longer than the spines. Legs quite hairy; claw with no denticle on inner side;claw digitules filiform.

Middle leg: femur + trochanter 255μ; tibia 195μ; tarsus 75μ; width of femur 57μ.

Labium dimerous, long and narrow; length 135μ, breadth 75μ.

Antennae 8-jointed, about 285μ apart; measurements of joints: (1) 60. (2) 54-60. (3) 51-54. (4) 36. (5) 39-42. (6) 39-45. (7) 36-39. (8) 75-78.

Larvae in ♀ very long and narrow; length 396μ, breadth 162μ. Half grown examples are still long and narrow. Length 1.5 mm, breadth .66mm.

Hab. On grass on cliffs by the sea, La Jolla, California. August 6th, 1901.

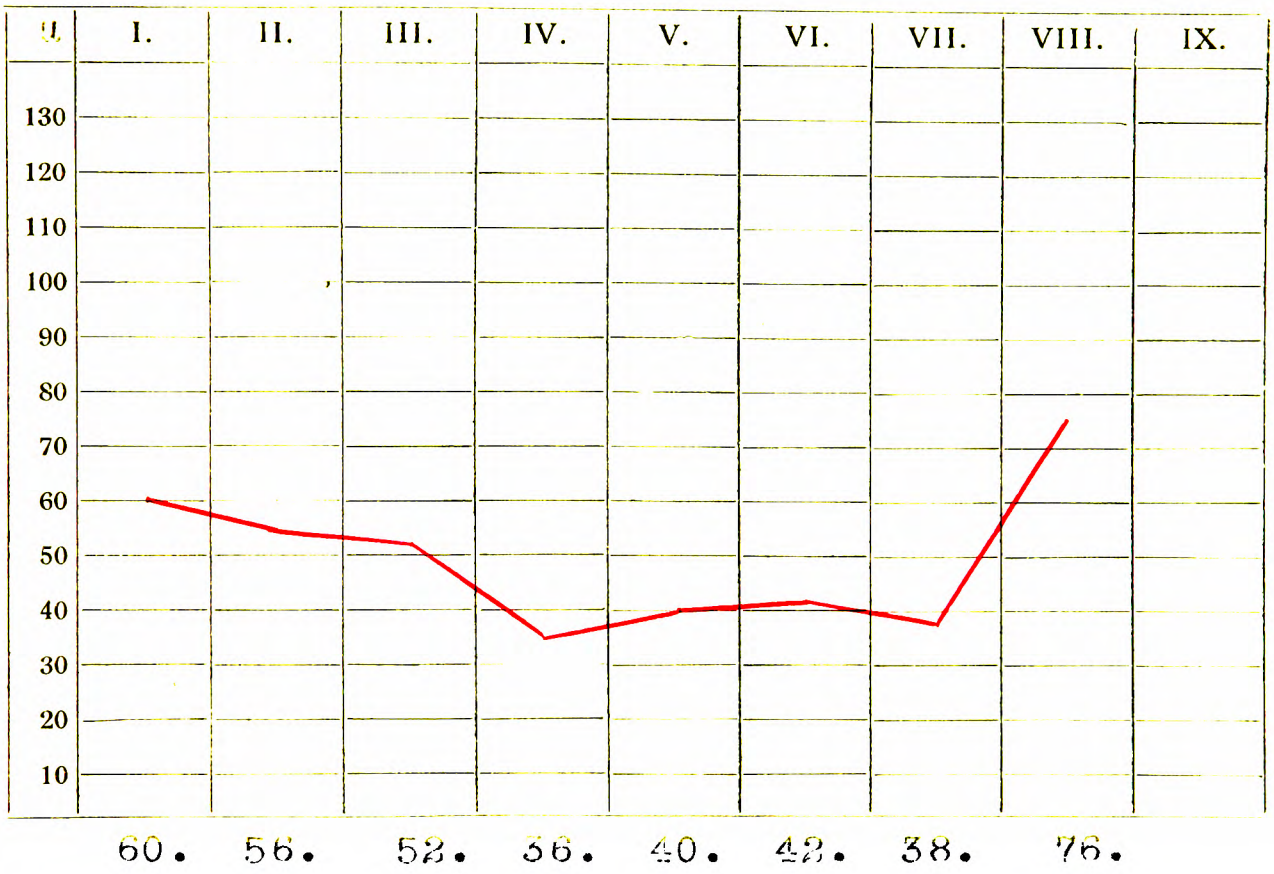
A distinct species having the shape of a Pergandiella when young."

Chart for:— Pseudococcus salinus (Cockerell), 1902.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— About 2.8 mm long and 1.35 mm broad.

Antennal curve:—



Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 255μ; tibia 195μ; tarsus 75μ.

Setæ of Anal lobes:— About 50μ long.

Setæ of Anal ring:— About 42μ long.

Host plant:— Grass.

Locality:— Cliffs by the sea at La Jolla, California.

Pseudococcus scrobicularum Green, 1896.

Ps. scrobicularum Green, Ind.Mus.Notes,IV,I,p.8,1896.

" In glandular pits at base of leaves of Elaeocarpus. Dark slaty-gray, sparsely covered with whitish powder. Abdominal segments only with stout white processes, which protrude from the opening of the cell in which the insect lives.
Locality Punduloya."

Pseudococcus segregatus (Cockerell). 1893.

D. segregatus Ckll.Journ.Inst.Jam.I,p.254,1893.

" D. segregatus was found on grass in East Street, Kingston. It is very close to D. virgatus, but smaller,(the adult ♀ with eggs 2.5 mm long, without counting the caudal filaments.), the back has a couple of longitudinal blackish bands, which are due to pigment, and are not, like the bands of virgatus, areas free from the mealy secretion.

Younger individuals show two or three filaments covered with white secretion, on each side of the long caudal filaments.

Antennae orange brown, 8-jointed. Joints 4, 5, 6, and 7 sub-equal, 5 a little longest. 8 about as long as 6 and 7 together; 3 and 8 about equal, but if anything 8 is a little longer; 2 shorter than 3, but longer than 4 or 5.

Tarsal knobbed hairs, and digitules of claw both very slender, with almost invisible knobs."

Pseudococcus similans (Lidgett), 1898.

D. similans Lidg. The Vorbat, III, p. 91, 1898.

"Adult ♀ reddish-brown in colour, powdered with pure white meal, so thick in most cases as to obscure the ground colour and to leave the impression that the insect is pure white, body deeply and distinctly segmented, elliptical; rather flattish. A marginal fringe of cylindrical cottony filaments projects at each side, being half as long as the width of the body, one such filament springing from each segment; the two on the last abdominal segment being twice as long as the rest, and between them there is generally much cotton.

Anal tubercles small and inconspicuous, forming at gestation a large white cottony ovisac containing brown oval eggs.

Feet long and slender, the second pair projecting beyond the body when walking, dark red in colour; upper digitules fine hairs, lower pair much shorter.

Antennae of 8 joints, sub-equal, each joint bearing several hairs.

Length 1/6 to 1/5 inch. Width 1/16 inch.

♂ unknown.

Hab. In Victoria, underground on roots of Daphne, at Kyrnlong."

Pseudococcus simplex (Cockerell), I893.

D. simplex Ckll., The Entom. XXVI,p.267, I893.

"Forming scattered patches of white secretion, quite irregular in outline, on the upper side of leaf of Pancratium caribaeum.

♀.-About 3 mm long, oval, brown, with mealy white secretion; segmentation distinct. No lateral processes or caudal filaments. Tibia nearly as long as femur; tarsus about I/3 length of tibia. Claw with knobbed digitules. Legs brownish yellow, hairy; trochanter with two short hairs.

Antennae 8-jointed; 4, 5, and 6 sub-equal, and shortest; 7 next shortest, then I, then 2, 3, and 8 longest. These differences are rather insignificant, except the decided shortness of 4, 5, and 6. Joint 8 emits several hairs, none as long as itself.

Boiled in soda they do not colour it red or brown. ♀ after soda-treatment is yellowish red. The white secretion is in the form of long straight threads.

Larva.- Elongate-oval, with parallel sides; two caudal filaments, not so long as diameter of body, and joined together by secretion. Colour of larva yellowish brown.

This species was found by Dr. Strachan, in his garden in Kingston, Jamaica, August I892."

Pseudococcus steeli (Ckll. and Towns.).I894.

Bergrothia steeli C. and T. Ent.News,V,p.263,I894.

" townsendi var steelii Ckll. ibid,p.282,I894.

Erium steelii Ckll. Ann.Mag.N.H.(7),X,p.466,I902.

" " Fernald, Catalogue, p.113, I903.

Ovisac elongate, 5 to 6 mm long, felted, nearly enclosing the adult ♀.

Adult ♀ elongate, of a light reddish brown colour. Length about 4 mm; width about 2 mm.

Antennae 8-jointed, the joints measuring :- (1) 42-45, (2) 40-45, (3) 36-42, (4) 21-27, (5) 24-33, (6) 27, (7) 36-40, (8) 84-87.

Derm with numerous round gland-spots. Anal ring with six hairs; mentum trimerous.

Hind legs with femur slightly longer than tibia; tarsus less than half the length of tibia. Claw fairly large, curved; trochanter with a long hair.

Posterior tubercles very inconspicuous, bearing a pair of short stout spines and a long hair.

Larvae are of the same colour as the adult, and have the antennae of six joints.

Food plant: This species was found in large numbers on the leaves of the "creosote bush", Larrea mexicana.

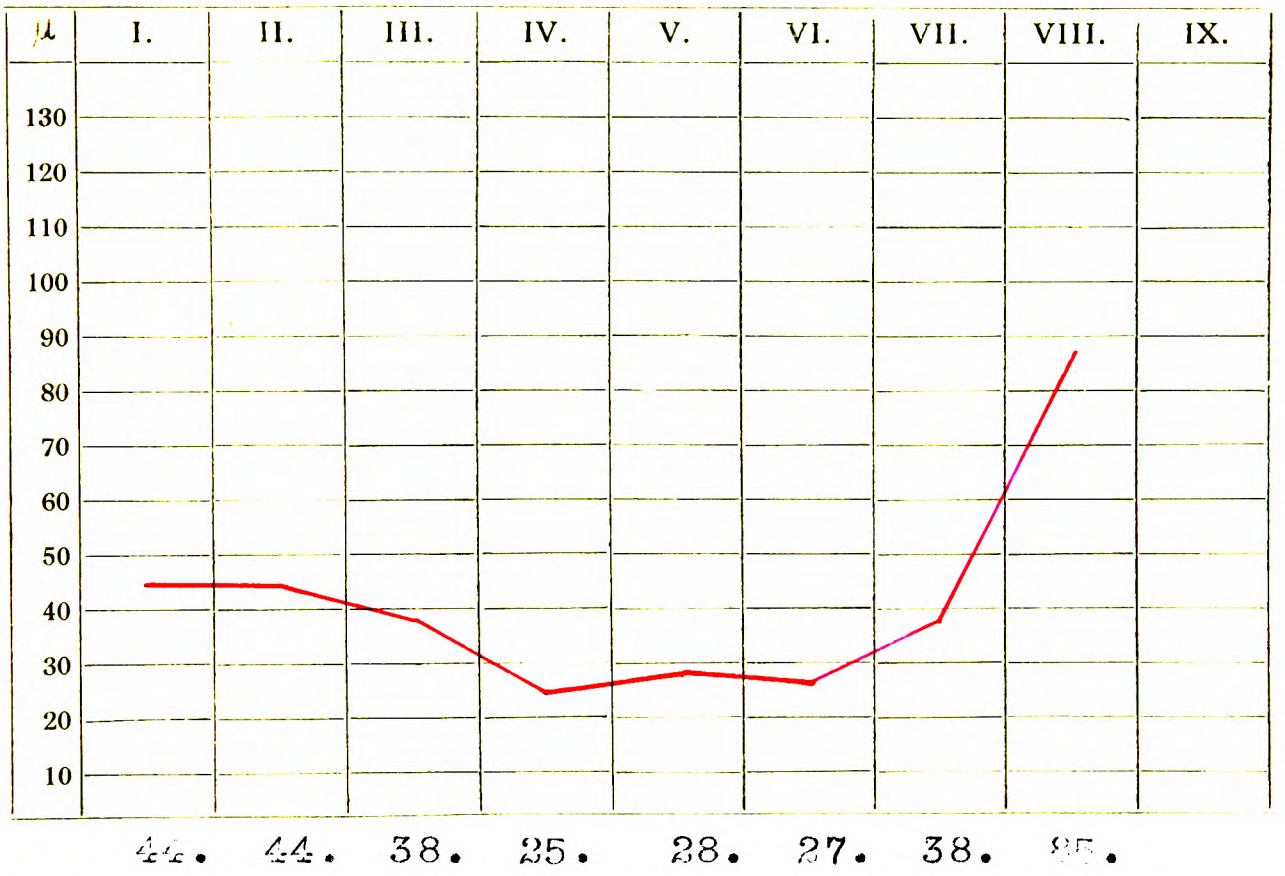
Locality: Las Cruces, New Mexico.

Chart for:— Pseudococcus steeli (Ckll. and Towns.),1894.

Size:—(*a*) Fresh material:— Length about 4 mm, width 2 mm.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in :—

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Larrea mexicana, ("Creosote bush").

Locality:— Las Cruces, New Mexico.

Pseudococcus subterraneus (Hempel), 1901.

D. subterraneus Hempel, Ann.Mag.Nat.Hist.(7)VII,p.388, 1901.

"♀, probably immature, oval-convex, length of prepared specimen 2.52 mm; width 1.5 mm. Antennae of 8 joints, all bearing hairs; joint 8 longest. Length of antenna about ,38 mm. Length of joints in μ: (1) 56, (2) 42, (3) 56, (4) 31, (5) 31, (6) 35-38, (7) 38, (8) 84-91. Approximate formula: 8.(1.3.)2.(7.6.)4.5.

Two small conical eyes present. Rostrum large, situated between the first pair of legs. Rostral loop extending half way between the 2nd, and 3rd pair of legs. Legs long. Length of joints of first pair of legs in μ: coxa 91, femur + trochanter 245, tibia 140, tarsus and claw 91. Claw small, well curved; both pair of digitules small, with slightly expanded ends. Anal ring with six hairs. Anal tubercles inconspicuous, each ending in one seta. On the dorso-lateral surface of the body, including the anal tubercles, there is a series of 34 groups of spines; . . .

Gall-producing, on roots of cultivated grapes. Galls irregularly globose, 3 - 5 mm in diameter, forming a mass encircling the entire root. The interior is smooth and lined with a white powder.

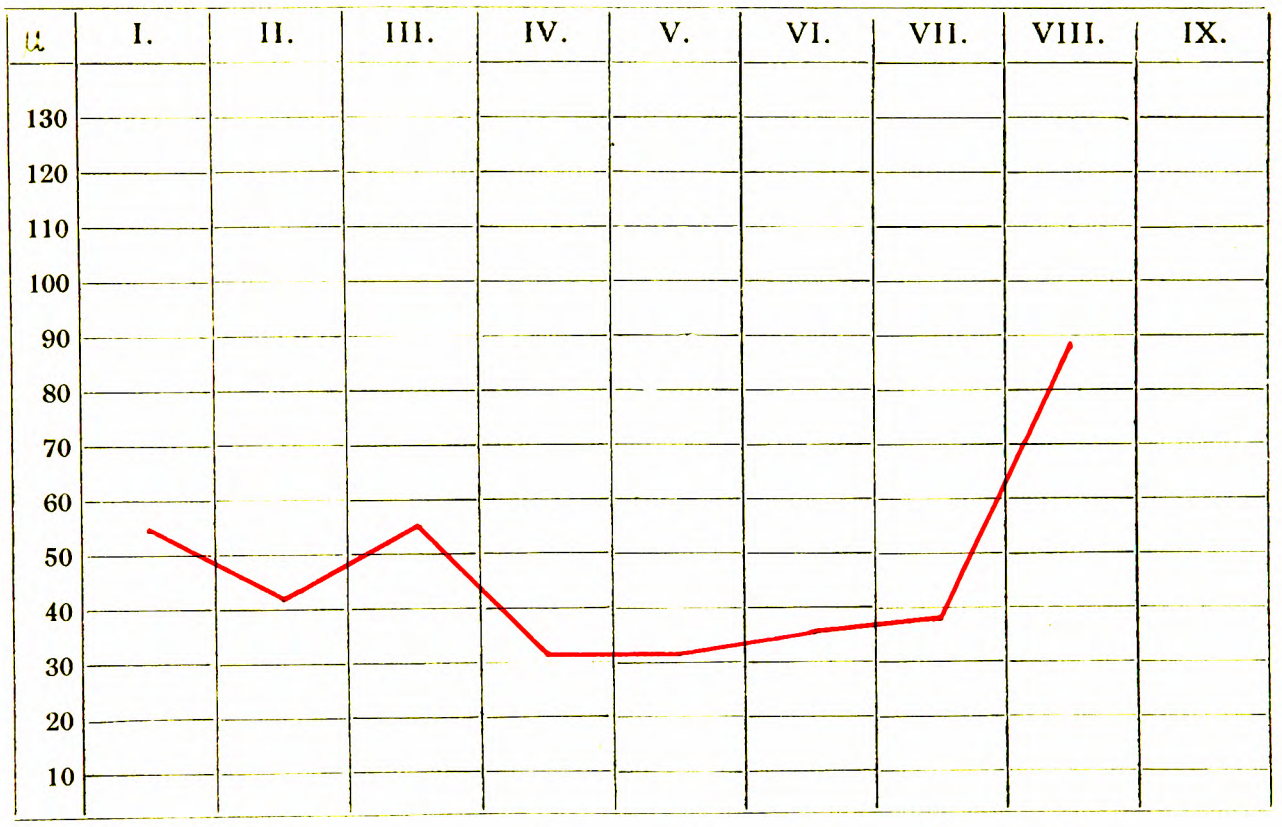
Hab. La Plata, Argentine Republic."

Chart for:— Pseudococcus subterraneus (Hempel), 1901.

Size:—(*a*) Fresh material:— 2.5 mm long and 1.5 mm broad.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ:— Prothoracic leg:-

Femur + trochanter 245μ; tibia 140μ; tarsus with claw 91.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Gall-forming on roots of grape-vines.

Locality:— La Plata, Argentine Republic.

Pseudococcus syringae (Haskell),I897.

D. syringae Haskell, N.Z.Trans.,XXX,p.246,I897.

"Adult ♀♀ enclosed in very loosely woven snow-white sacs aggregated in a mass on the plant. ♂ pupae in similar but smaller sacs.

Adult ♀ yellow; length about I/I6 inch. Antennae of 8 joints, the 8th being the longest, and fusiform; the antennal formula is 8.2.I.3.(4.5.)(6.7.), there are 2 or 3 hairs on each joint. Feet moderate; the trochanter bears a long seta; the tibia and tarsus have a few hairs on the inner margins; the tarsal digitules are fine hairs, those of the claw very slightly dilated. Anal tubercles rather broad, but not very prominent; each bears a seta and several short conical spines; anal ring with 6 hairs. Epidermis covered with numerous small simple circular spinnerets, and with a rather dense pubescence, many of the hairs, especially on the cephalic region, being rather strong and long. In two of the specimens examined there were three transverse elongated irregular spots on the dorsum, one on each of the anterior abdominal segments.

Larva not observed.

Adult ♂ brown; wings grey; length about I/20 in. Antennae and feet presenting no special characters. Abdominal spike short and conical; setae and cottony "tails" rather long.

Hab. In Japan, on Syringa amurensis."

Pseudococcus tayabanus Cockerell, 1905.

Ps. tayabanus Ckll. Pr. Dav. Ac. Sci. V, p. 189, 1905.

"♀. Covered with mealy secretion, distinctly segmented, looking, when dry, like minute specimens of commercial cochineal; when mounted oval, about 1500μ long; after boiling, the body is seen to contain much dull crimson pigment, especially in the embryonic young; eyes well developed; anal ring with six hairs, and placed in a wide squared incision; lateral margins of segments projecting so that the margin is strongly undulated, the projecting points bear stout spines, about 130μ long; skin greatly crowded with round glands; labium long and narrow, about 150μ long and 70μ broad; legs stout, length of tibia about 125μ, tarsus 75μ; claw stout, simple.

Antennae 8-jointed, joints measuring in μ :-

(1) 50, (2) 50-62, (3) 50-52, (4) 25-27, (5) 33-40, (6) 40-45, (7) 37-40, (8) 87. The smaller measurement (50), for 2 seems to be normal.

Larva with longitudinal rows of bristles (not spines), the middle row double; six stout hairs on anal ring; claw long, simple; antennae 6-jointed, joints measuring (1) 20, (2) 22, (3) 17, (4) 17, (5) 32, (6) 52-55.

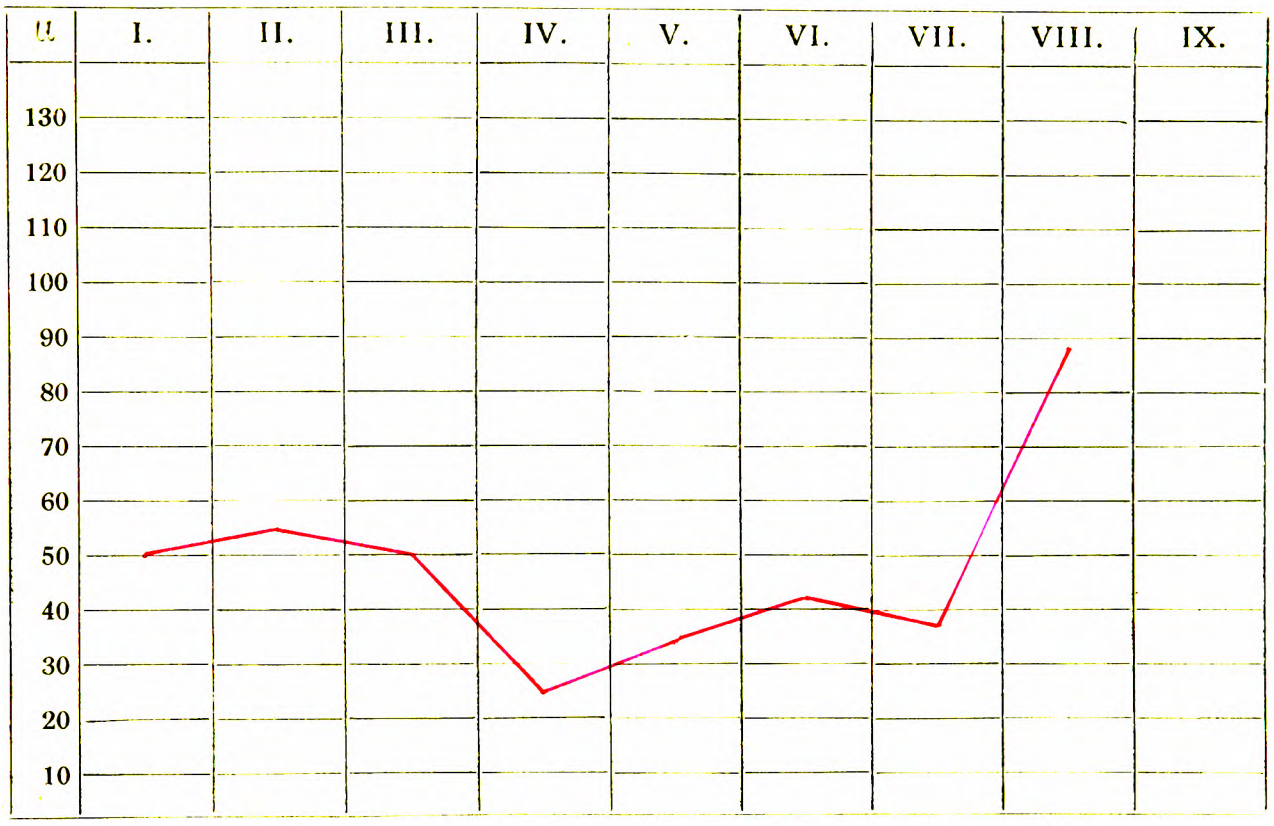
Hab. Lucban, Tayabas, Philippine Islands, April, 1904, on cultivated cacao."

Chart for:— Pseudococcus tayabanus Cockerell, 1905.

Size:—(*a*) Fresh material:— About 1.5 mm long.

(*b*) Mounted:—

Antennal curve:—



50. 55. 50. 25. 35. 42. 38. 88.

Legs:— Stout.

Measurements in μ :—

Length of tibia 125μ; tarsus 75μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— On cultivated cacao.

Locality:— Tayabas, Philippine Islands.

Pseudococcus theobromae (Douglas), I889.

D. theobromae Dougl., Ent.Mon.Mag.,XXV,p.3I7,I889.

"♀ adult. Broad-short-oval, slightly narrow in front, turgid, pale-yellowish, antennae and legs concolorous; body on the upper surface covered with fine white powder, but leaving the segmentation visible; margin with short hairs and a series of long, sub-conical, granular, white projections all round; anal processes evident, rounded; hairs of anal ring normal; caudal setae (denuded) very fine, short.

Antennae short, of 8 joints, I very stout, not short; 2 and 3 longer, in length sub-equal, strong, but each consecutively thinner; 4 shortest of all; 5 and 6 each a trifle longer than 4, sub-equal; 7 a trifle longer than 6; 8 pointed, longest of all, equal to 5, 6, and 7 together, all with fine projecting hairs, the terminal ones on 8 longest.

Legs strong, with few projecting hairs; tarsi half the length of tibiae; claw short; digitules of tarsi and claw long, very fine.

Length 3 mm.

♂ unknown.

Hab. On Theobroma cacao, in gardins of Royal Botanic Society (England).

Collected by Mr. P.T.Lewis, April I889."

Pseudococcus vovae Nassonov, 1909.

Ps.(D.) vovae Nass.,Ann.Mus.Zool.Acad.Imp.Sci.St.Pet. XIII,p.484,1909.

The adult♀ with the completed ovisac looks very much like a Pulvinaria, owing to the similar position of the insect on the white sac.

Adult ♀ about 2 mm long, brown in colour, or yellowish brown, covered with mealy, white, secretion. Glands most numerous on the four caudal segments. Eyes black, situated at the base of the antennae. Rostrum biarticulate.

Antennae of 8 joints, the range of measurements, from 9 specimens being:- (1) 49-52, (2) 46-52, (3) 44-50, (4) 29-35, (5) 34-41, (6) 27-31, (7) 35-39, (8) 88-95.

Newly emerged larva is oval in outline, the anterior end being somewhat truncate, while the posterior is bilobed. Length about 0.2 mm. Antennae with six joints, the formula being 6.2.1.(3.4.5.)

The ♂ is not known.

Host plant: On the leaves of Juniperа communis.

Locality: Skolimor, in the province of Varsoviensi.

Collected June, 1906.

Chart for:— Pseudococcus vovae Nassonow, 1909.

Size:—(*a*) Fresh material:— Length about 2 mm.

(*b*) Mounted:—

Antennal curve:—

Legs:—

Measurements in :—

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Juniperus communis.

Locality:— Russia.

Pseudococcus wachendorfiae Brain, 1912.

Ps. wachendorfiae Brain, Ann.Ent.Soc.Amer.V,p.183,1912.

Ovisac: No definite ovisac was found although large numbers of adults were seen. There was a distinct layer of white wax on the plant beneath the insects.

Adult ♀. Largest specimen found measured 4.1 mm when living, and was 1.9 mm broad. The body was finely covered with a white powdery secretion, but segmentation was nevertheless conspicuous. Lateral filaments were absent, but there was generally a caudal tuft.

Antennae 8-jointed. The average lengths of the segments, from 10 specimens, were as follow:- (1) 64, (2) 56. (3) 43, (4) 23, (5) 36. (6) 34, (7) 31, (8) 78.

The setae of the anal lobes were from 154 to 180 μ in length with 160μ the commonest length. Those of the anal ring varied from 115 to 144μ in length, with 136μ the mode.

Mesothoracic leg: measurements in μ:-

106. 136. 342. 91. 335. 45. 98.

Hab. On Wachendorfia paniculata Linn., usually between the leaf-bases below the surface of the soil.

Newlands Flats, near Cape Town.

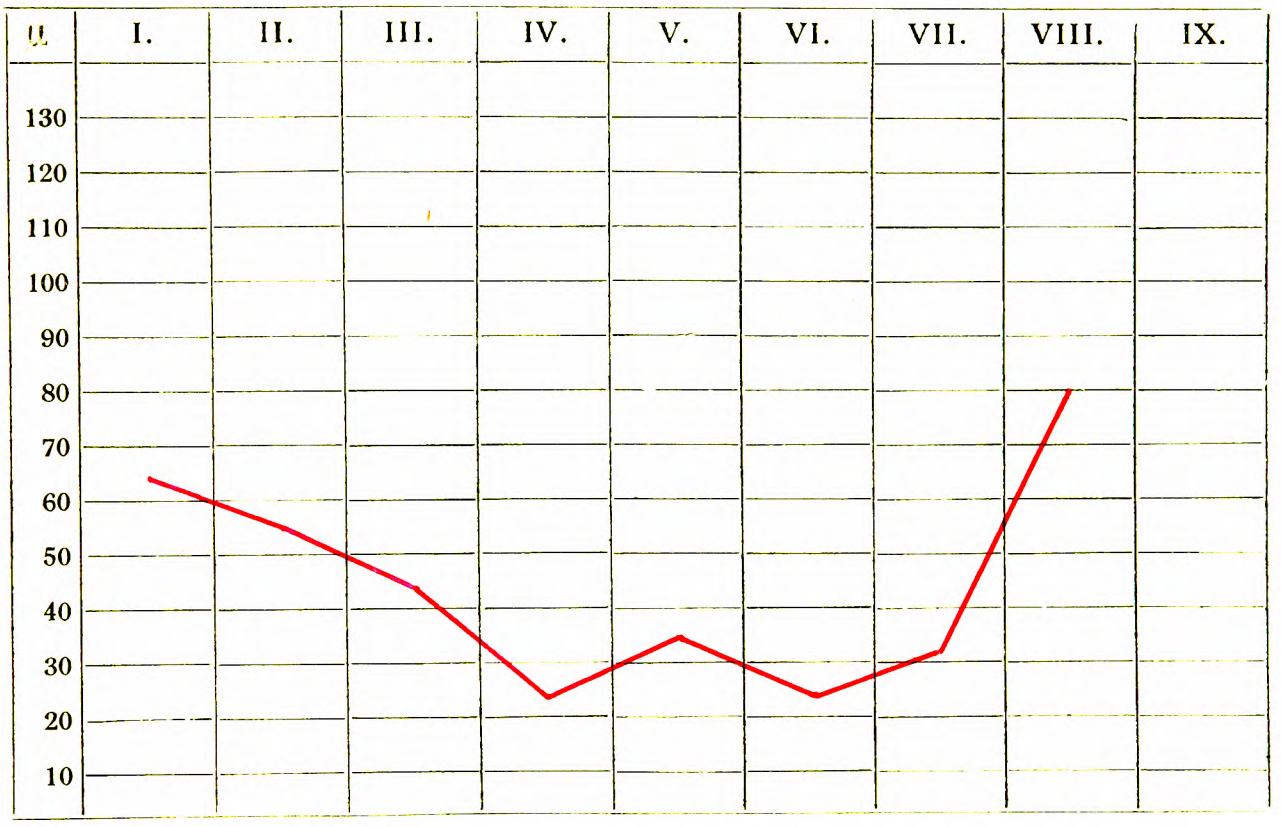
A small black ant was always in attendance, and built up small mounds of sand round the stems which held the insects.

Chart for:— Pseudococcus wachendorfiae Brain, 1912.

Size:—(*a*) Fresh material:— Largest specimen was 4.1 mm long. and 1.9 mm broad.

(*b*) Mounted:—

Antennal curve:—



64. 56. 44. 24. 36. 24. 32. 80.

Legs:—

Measurements in μ :— Mesothoracic leg:-

106. 136. 342. 91. 235. 45. 98.

Setæ of Anal lobes:— About 160μ long.

Setæ of Anal ring:— About 136μ long.

Host plant:— Wachendorfia paniculata Linn.

Locality:— Cape Peninsula, South Africa.

Pseudococcus wilmattae (Ckll.),1901.

Ph. wilmattae Ckll. Ann.Mag.N.H.(7),VIII,p.57,1901.

"♀.-Brownish olivaceous; without lateral tassels; no ovisac observed; surface sparsely mealy; length when mounted 2.5 mm; body pinkish after boiling in potash; legs and antennae pale brown; legs very sparsely hairy; middle leg with femur + trochanter 213μ, width of femur 87μ; tibia 150μ; tarsus 89μ; claw with a small denticle on inner side near tip; hind tibia 180μ long, 42μ broad; hind tarsus 75μ long, 21μ broad. body not hairy; bristles of anal ring about 90μ long; caudal lobes not at all produced; rostral loop short, not nearly reaching to middle legs; 2nd joint of antennae conspicuously broader than 3rd, and always longer.

Antennae: 9-jointed phase, formula 2.9.3.1.5.(4.6.7.8.) segments, (1) 39, (2) 54, (3) 45, (4) 30, (5) 36, (6) 30, (7) 30, (8) 30, (9) 48.

8-jointed phase: formula: 8.2.(1.3.)(5.7.)(4.6.)

segments: (1) 42, (2) 54-60. (3) 42, (4) 27, (5) 30-33, (6) 27, (7) 27, (8) 81-87.

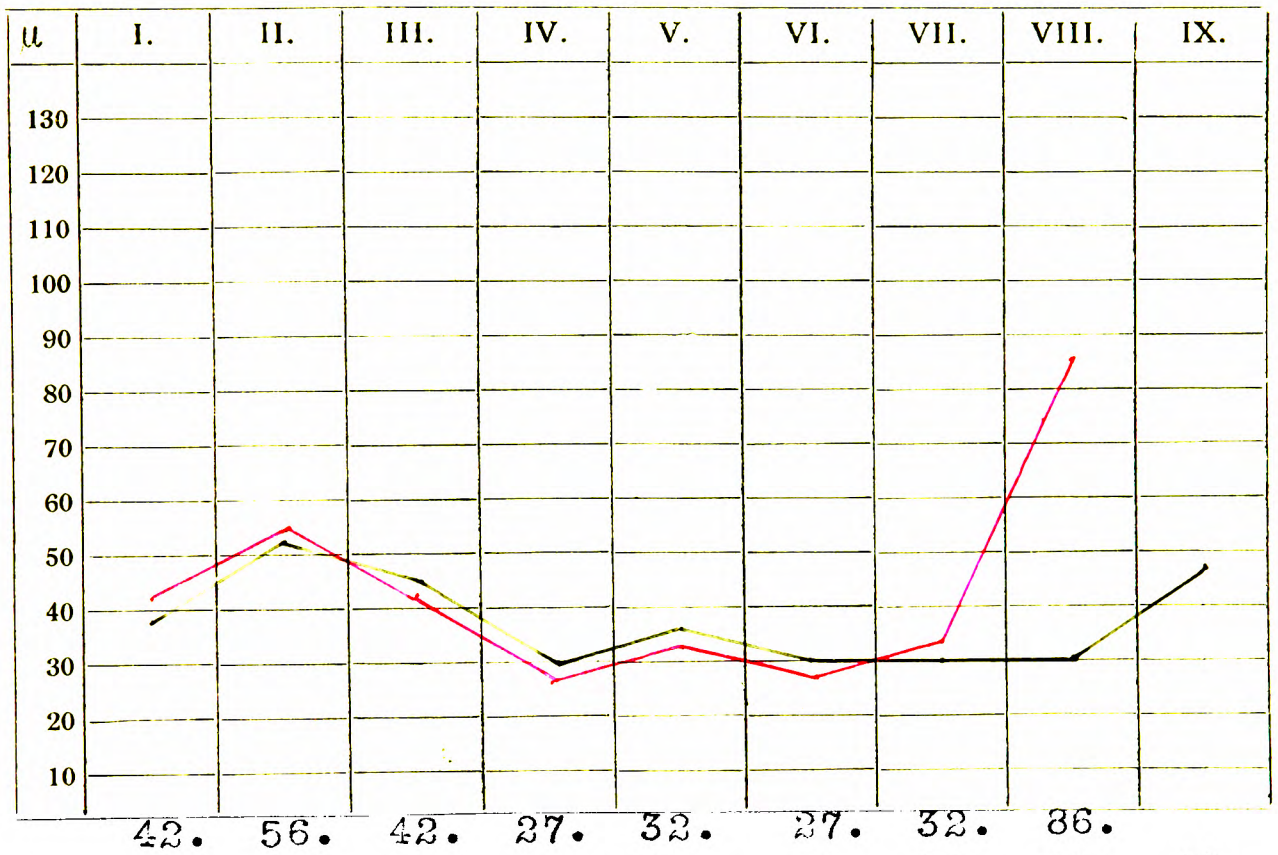
Hab. Beulah, New Mexico. 8000 ft. on Viola aff. pedatifida, May 11, (W.P.Ckll.)

Chart for:— Pseudococcus wilmattae (Ckll.),1901.

Size:—(*a*) Fresh material:—

(*b*) Mounted:— About 2.5 mm long.

Antennal curve:—



Legs:—	42.	56.	42.	27.	32.	27.	32.	86.	
	39.	54.	45.	30	36.	30.	30.	30.	48.

Measurements in μ:— Mesothoracic leg:-

Femur + trochanter 213μ; tibia 150μ;

tarsus 89μ.

Setæ of Anal lobes:—

Setæ of Anal ring:— About 90μ long.

Host plant:— Viola sp.

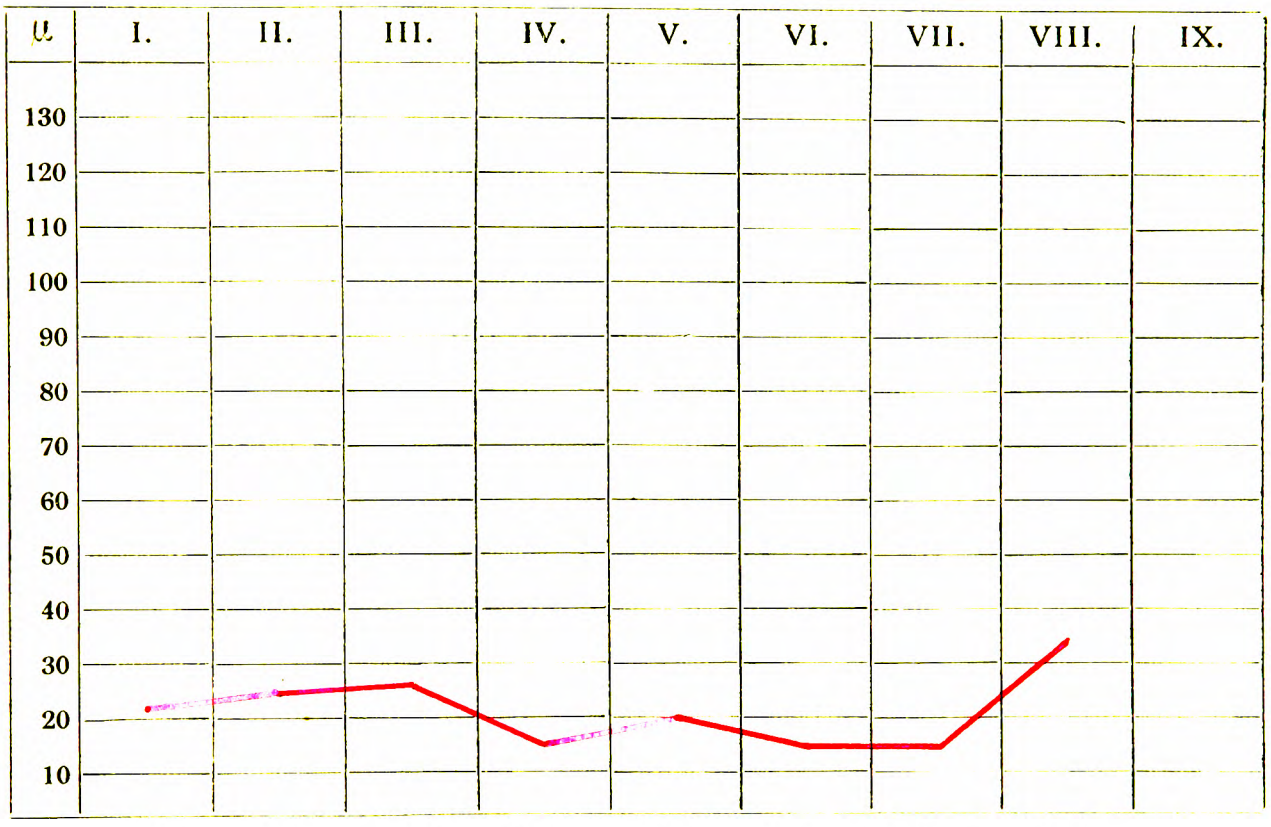
Locality:— Beulah, New Mexico.

Chart for:— Pseudococcus andersoni (Coleman), 1903.

Size:—(*a*) **Fresh material:—** 3.3 mm long and 1.6 mm broad.

(*b*) **Mounted:—**

Antennal curve:—



22. 26. 27. 16. 20. 15. 15. 35.

Legs:— Short and stout.

Measurements in :— Tarsus one-third as long as the tibia.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Cupressus goveniana.

Locality:— California.

Chart for:— Pseudococcus azaleae (Tinsley).1898.

Size:—(*a*) Fresh material:— About 3 mm long and 2 mm wide.

(*b*) Mounted:—

Antennal curve:—

56. 62. 53. 34. 5I. 40. 45. II2.

Legs:—

Measurements in μ :—

Femur 2I5μ; tibia 2I5μ; tarsus II2μ, claw 33μ.

Setæ of Anal lobes:— About 250μ long.

Setæ of Anal ring:— About I40μ long.

Host plant:— Azalea.

Locality:— In Japanese Nursery, California,

Chart for:— Pseudococcus calceolariae (Maskell), 1878.

Size:—(*a*) Fresh material:—

(*b*) Mounted:—

Antennal curve:—

60. 70. 40. 32. 43. 35. 44. 100.

Legs:—

Measurements in μ :— Mesothoracic leg:-

Femur + trochanter 330μ; tibia 223μ;

tarsus 90μ; claw 30μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Sugarcane.

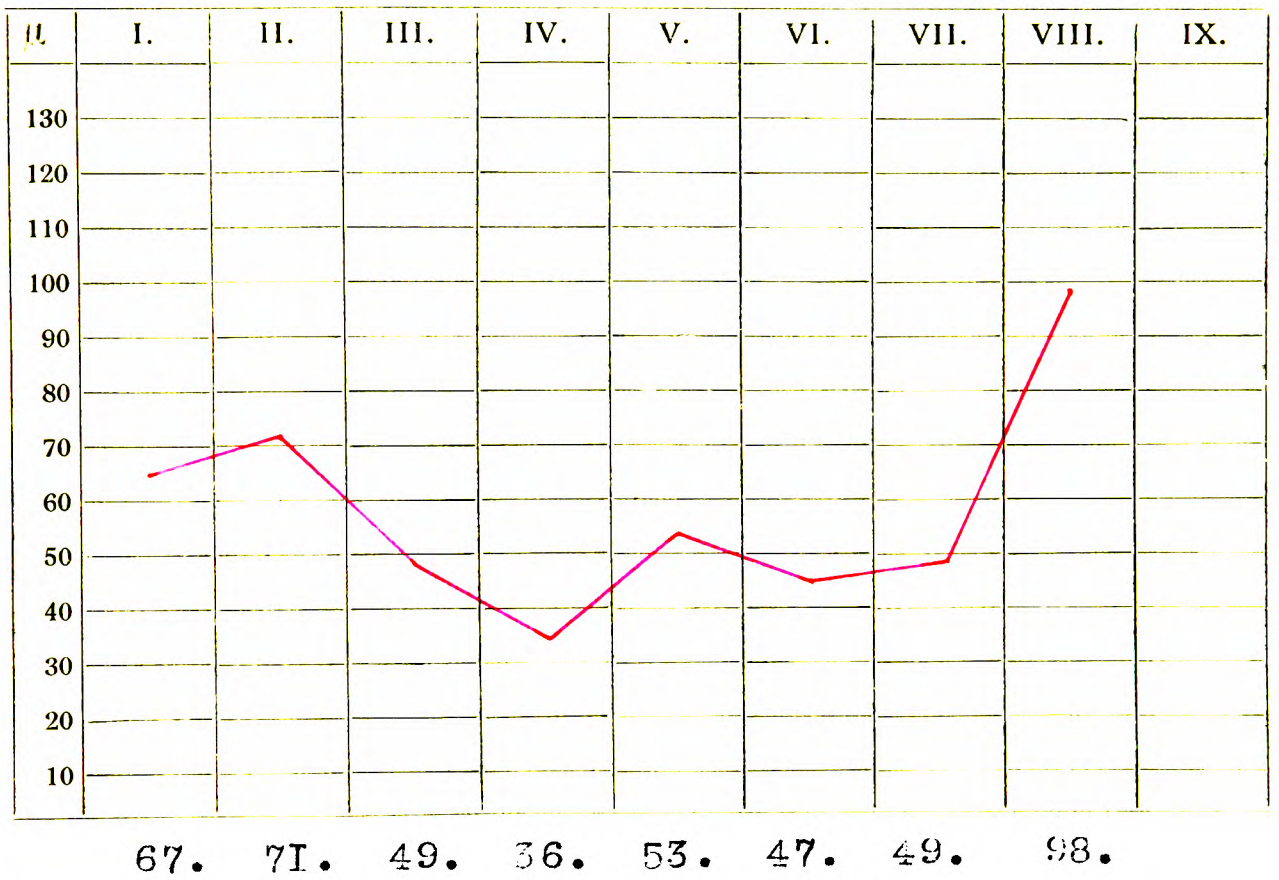
Locality:— Florida.

Chart for:— Pseudococcus grandis (Hempel), 1900.

Size:—(*a*) Fresh material:—May attain 7.5 mm long and 5 mm broad.

(*b*) Mounted:—

Antennal curve:—



67. 71. 49. 36. 53. 47. 49. 98.

Legs:—

Measurements in :—

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— One of the Myrtaceæ.

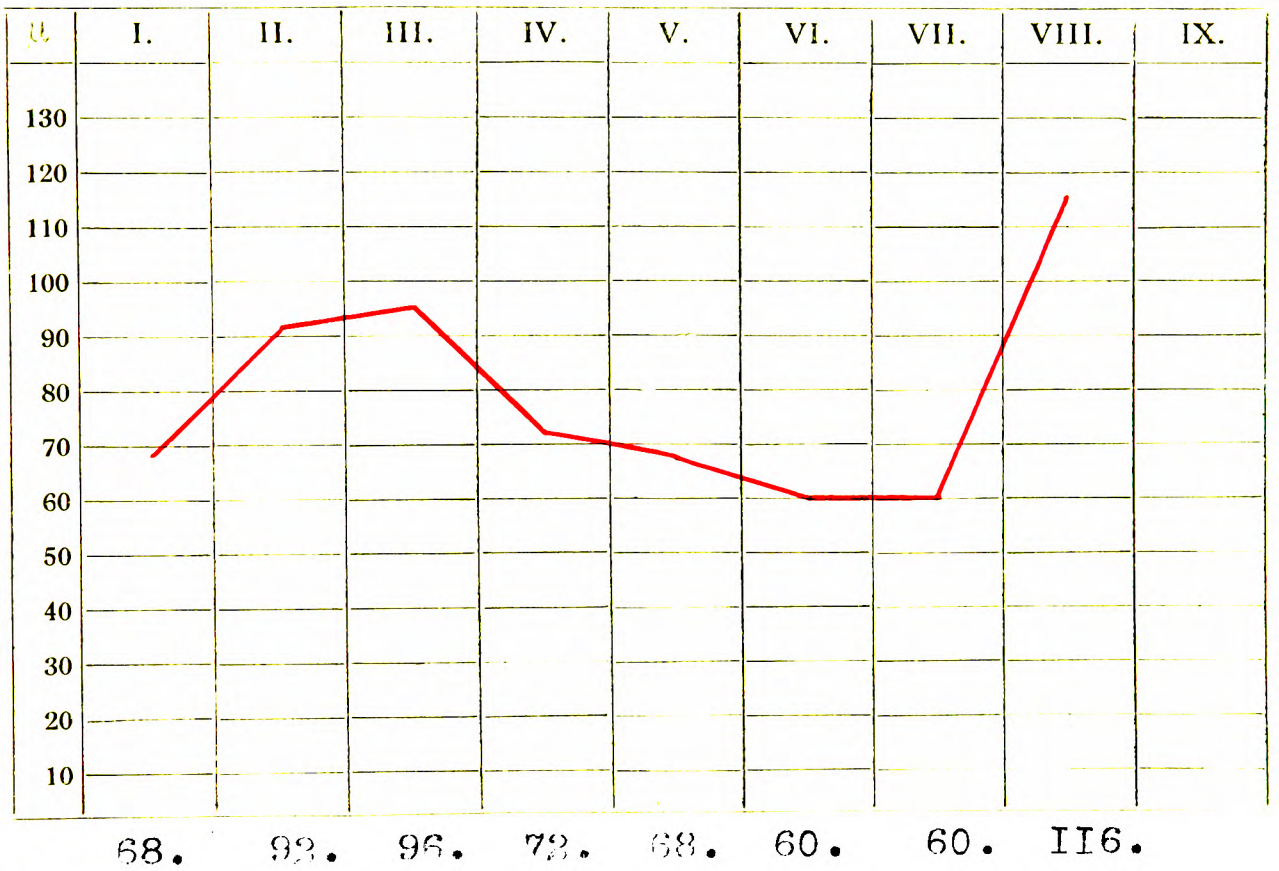
Locality:— Brazil.

Chart for:— Pseudococcus magnolicida ("von Iher",King),1903.

Size:—(*a*) Fresh material:—

(*b*) Mounted:—

Antennal curve:—



68. 92. 96. 72. 68. 60. 60. II6.

Legs:—

Measurements in μ:—

Coxa I60μ long and 248μ wide; femur + trochanter 520μ; tibia 408μ; tarsus I40μ; claw 40μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:—

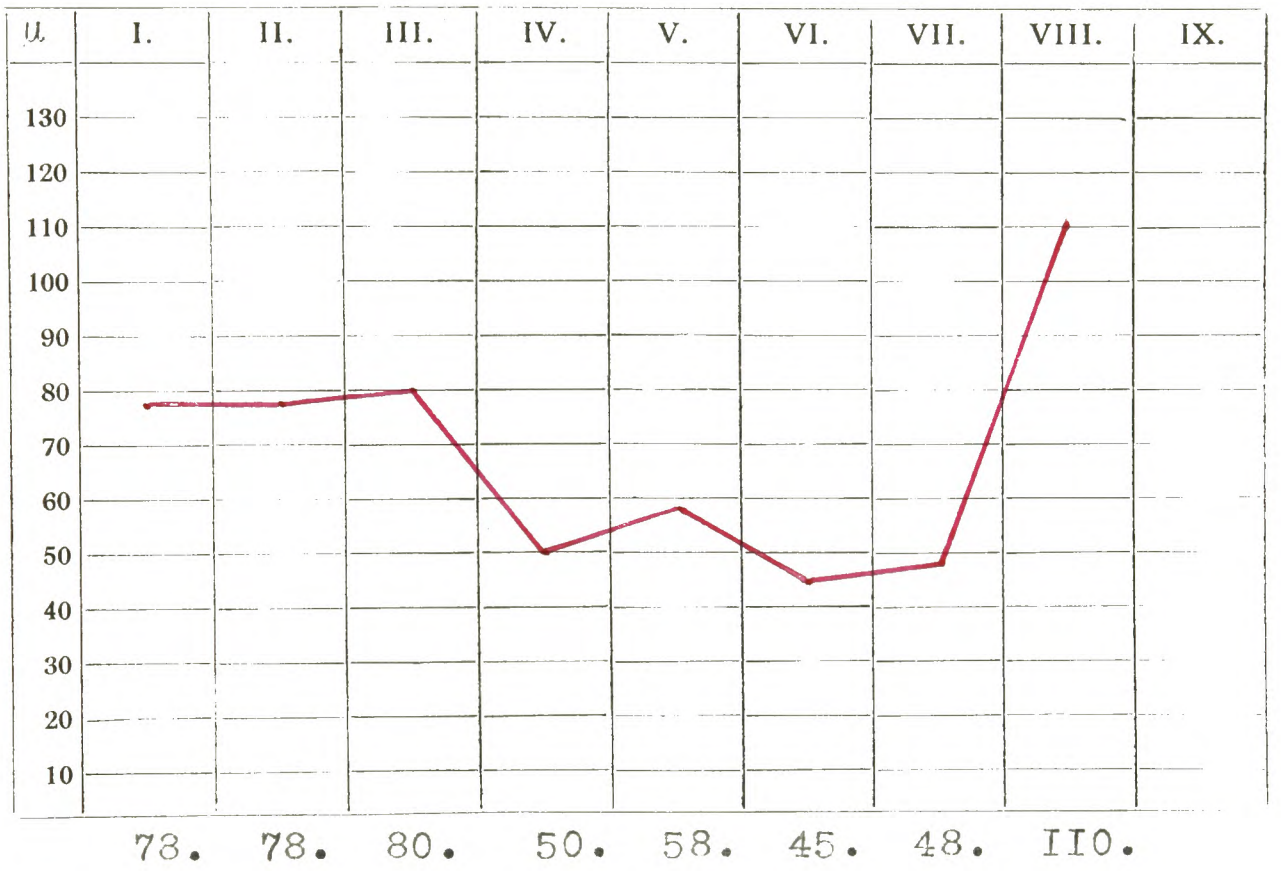
Locality:— Brazil.

Chart for:— Pseudococcus pini (Kuwana),1902.

Size:—(*a*) Fresh material:— About 4 mm long and 2 mm broad.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in :—

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Pinus pentaphylla.

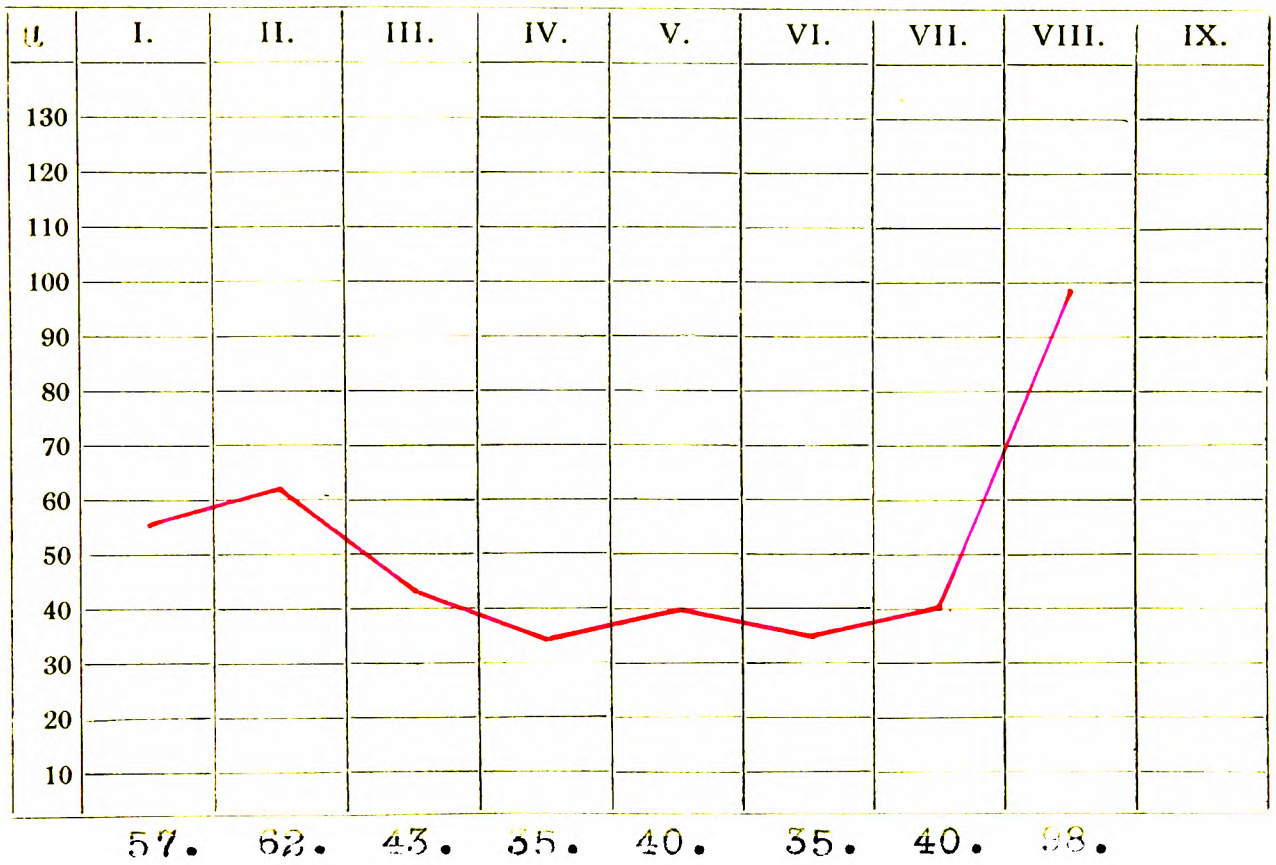
Locality:— Japan.

Chart for:— Pseudococcus secretus (Hempel),1900.

Size:—(*a*) Fresh material:— About 2.25 mm long and 1.25 mm broad.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ:— Mesothoracic leg.

Femur 191μ; tibia 182μ; tarsus with claw 103μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— One of the Solanaceae.

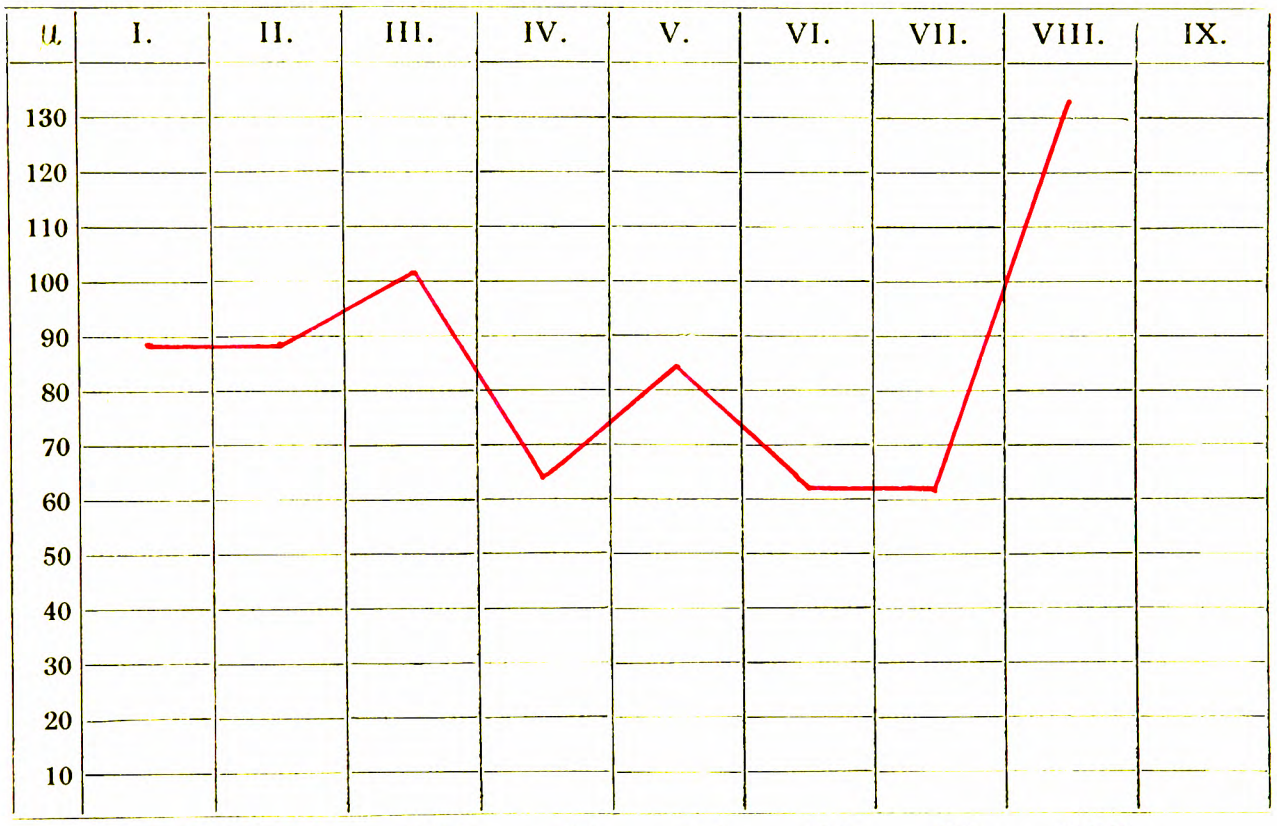
Locality:— Ypiranga, Brazil.

Chart for:— Pseudococcus setosus (Hempel), 1900.

Size:—(*a*) Fresh material:— Largest specimens were 5 mm long, and 2.75 mm broad.

(*b*) Mounted:—

Antennal curve:—



89. 89. 102. 64. 84. 62. 62. 133.

Legs:—

Measurements in μ:— Mesothoracic leg.

Femur 333μ; tibia 312μ; tarsus with claw 135μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Ficus sp.

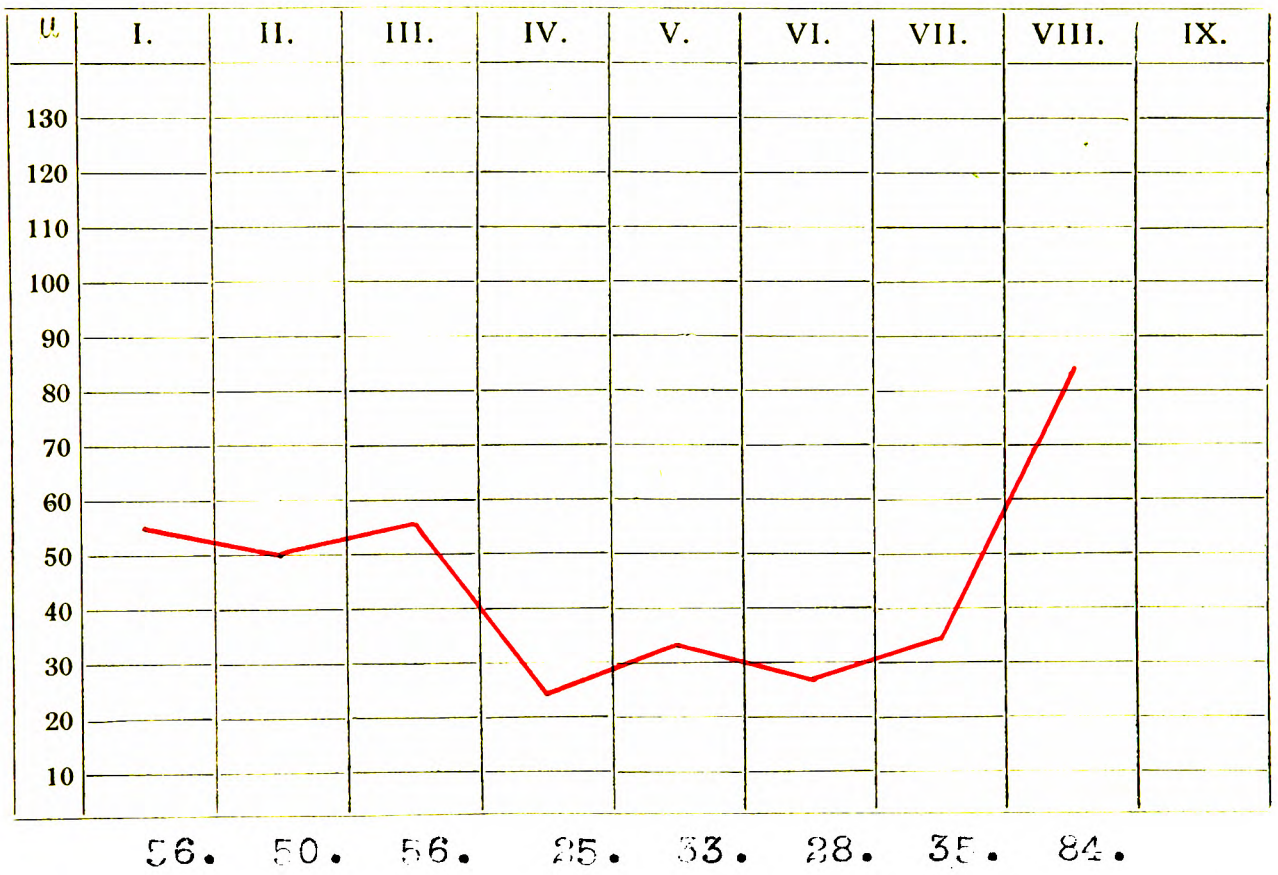
Locality:— Santa Paula, Brazil.

Chart for:—Pseudococcus texensis (Tinsley),1900.

Size:—(*a*) **Fresh material:**— Length about 3 mm, and nearly as wide as long.

(*b*) **Mounted:**—

Antennal curve:—



Legs:—

Measurements in μ:—

Femur about 183μ long and 82μ wide; tibia 132μ long and 35μ wide; tarsus 65μ long.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Acacia farnesiana,Willd.

Locality:— San Diego, Texas.

Chart for:— Pseudococcus virgatus (Cockerell),1893.

Size:—(*a*) Fresh material:— 4.5 mm long; caudal filaments about 2 mm long.

(*b*) Mounted:—

Antennal curve:—

Legs:—

Measurements in :—

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— On leaves of a tree (sp. inlet.)

Locality:— Jamaica.

Phenacoccus cevalliae Ckll., 1902.

Ph. cevalliae Ckll.Can.Ent.XXXIV,p.315,1902.

"♀. Oval, 4 to 5 mm long, pale olive green, but covered with white secretion, with lateral tassels and thick caudal tassels; placed in alcohol, they stain the liquid pale green; alcoholic specimens appear strongly segmented, with two longitudinal blackish bands, best marked in rather immature specimens. Eyes prominent; skin with many small circular glands; the lateral patches consist of about 12 glands each, but are without spines; a few rather large bristles scattered over the body; legs and antennae reddish yellow; denticle on inner side of claw rudimentary, just visible; antennae 9-jointed, the club 2-jointed.

Measurements of antennae and legs in μ: Anterior legs, femur and trochanter 470, tibia 330, tarsus 130; hind legs: femur and trochanter 540, tibia 440, tarsus 135. Antennal joints: (1) 45-60, (2) 108-111, (3) 63-66, (4) 60, (5) 72-75, (6) 51, (7) 51, (8) 45, (9) 67.

Newly hatched larva very pale lemon-yellow, about twice as long as broad; eyes conspicuous.

Hab. In enormous numbers on Cevallia sinuata, near Lea Lake, east of Roswell, New Mexico, Aug. 21, 1902."

Chart for:— Phenacoccus cevalliae Cockerell, 1902.

Size:—(*a*) Fresh material:— 4 to 5 mm long.

(*b*) Mounted:—

Antennal curve:—

48. 108. 65. 60. 74. 50. 50. 45. 67.

Legs:—

Measurements in μ :— Prothoracic leg:-

Femur + trochanter 470μ; tibia 330μ;

tarsus 130μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— Cevallia sinuata.

Locality:— Near Roswell, New Mexico.

Phenacoccus gossypii Towns. and Ckll.,1903.

Ph. gossypii var. psidarum Ckll, Ann,Mag.N.H.(7), p. 164, 1903.

"♀. On leaves and bark; entirely covered by white cottony sacs about 4 mm long, not at all waxy in appearance. They look like an Eriococcus, except that the sacs are more cylindrical with broadly rounded, instead of tapering ends. Boiled in KOH does not stain the liquid; eyes large and prominent; skin transparent, colourless, with many small round glands (4-5 μ diam.) and rather numerous bristles, some fully 105μ long.

Lateral bristle patches small. Labium ordinary. Legs and antennae very pale brownish; legs quite bristly. Claw with the usual denticle on the inner side.

Femur + trochanter 360μ long, tibia 276μ, tarsus 95μ.

Antennae 9-jointed, the joints measuring in μ:- (1) 60, (2) 90, (3) 81-84, (4) 45-51, (5) 57-63, (6) 45-48, (7) 33, (8) 35, (9) 66.

Larva (after boiling) bright magenta, elongate, long .405 mm , lat. .180 mm.Legs, including femur, slender. The six bristles of the anal ring thick and yellowish brown, about 24μ long.

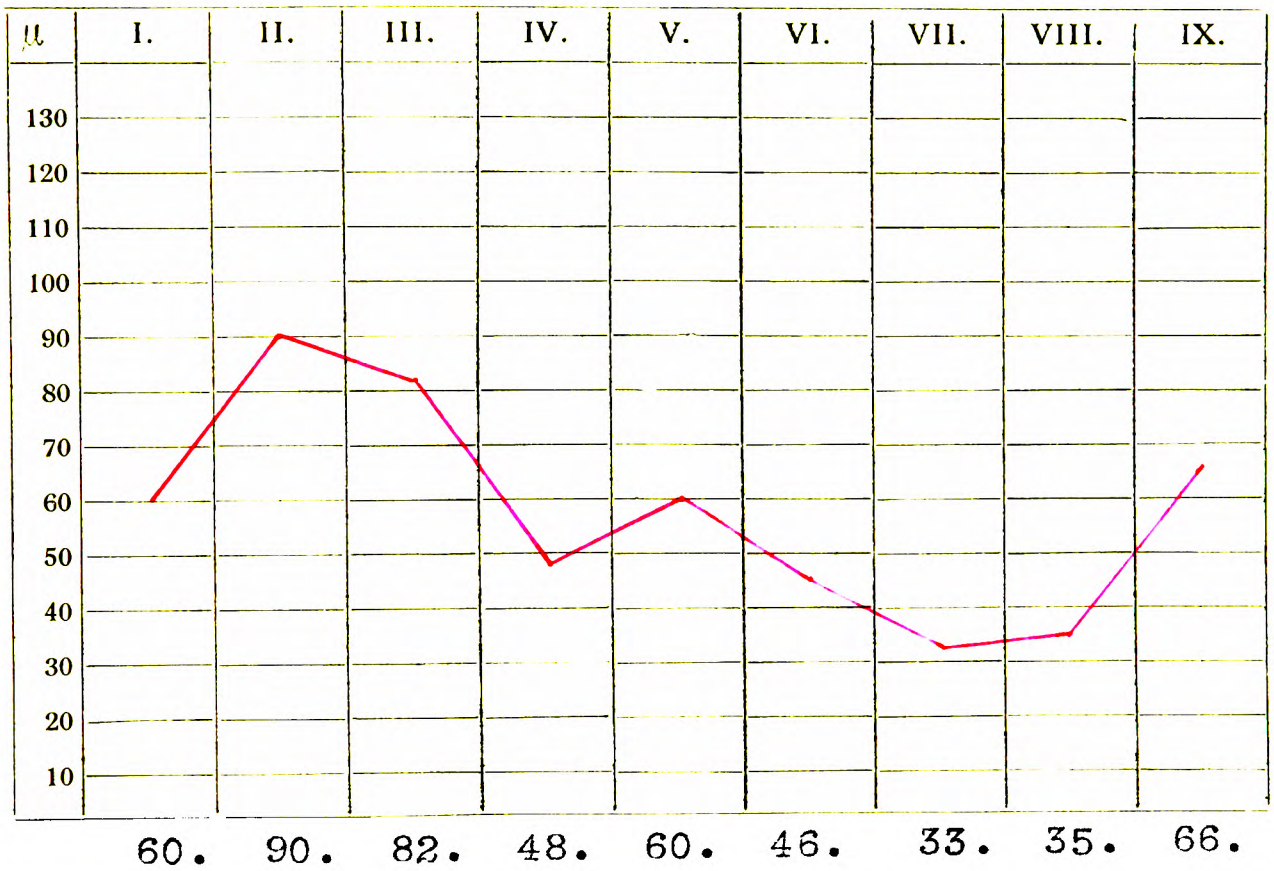
Hab. Zapotlan, Jalisco, Mexico, on wild guava, July 6, 1903."

Chart for:— Phenacoccus gossypii Towns. and Ckll.,1903.

Size:—(*a*) Fresh material:— About 4 mm long.

(*b*) Mounted:—

Antennal curve:—



Legs:—

Measurements in μ :—

Femur + trochanter 360μ; tibia 276μ;

tarsus 95μ.

Setæ of Anal lobes:—

Setæ of Anal ring:—

Host plant:— On wild guava.

Locality:— Zapotlan, Mexico.

Phenacoccus obtusus (Newstead),1911.

D.(Ps.) obtusus Newst.Mit.Zool.Mus.Berl.V,p.164,1911.

"♀ adult. Length 4, width 2.75 mm.
Segmentation strongly pronounced. Antennae (Pl.I,fig.4.) of nine segments; proximal end of last segment narrower than distal end of the penultimate; all the segments with long fine hairs; 7th and 8th each with a strong curved spine near the articulations; 9th with two similar spines near the apex, the rest of the apical hairs considerably shorter than those on the remaining segments. Marginal spines truncated forming large conspicuous groups on the thoracic and abdominal segments, but coalescing in front from the insertion of the anterior pair of spiracles.
Anal orifice with the normal number of hairs; surrounding this organ is a conspicuous fold in the integument presenting a ringlike boundary within which are 10 similar long hairs. Legs normal, hairs extremely fine and very long.
Embryo larva: Hairs to anal lobes about two thirds the length of the body; legs and antennae furnished with very long hairs.
Hab. On Baobabrinde. German East Africa."
This species is remarkable for the truncate spines, the terminal joint of the antennae, and the anal fold.

Parasites of the Pseudococcini.

Parasites of the Pseudococcini.

The Coccidae, as a whole, are known to be preyed upon by a large number of insect enemies. A distinction must be made between the kinds which move about freely and devour the scale insects, or suck their juices, and those whose growth and development take place inside the Coccid body at the expense of the tissues or body fluids. The first class might be called "predators", and the second parasites.

The predaceous enemies have received more attention than the internal parasites, and some have been shown to be of considerable economic importance. Vedalia, (Novius cardinalis), is a good example of a Coccinellid which proved of immense importance in the control of Australian bug, Icerya purchasi. So great was the success with this insect in California, that it was later introduced into South Africa, where the results were equally satisfactory.

No other country in the world has taken such interest in the rearing and spread of beneficial insects as California has done, and the lead which this State obtained is being well maintained.

For the introduction, breeding and dissemination of beneficial predaceous and parasitic insects a special department has been created in the office of the State

Commissioner of Horticulture, known as the insectary division. The officers of this division are provided for by law, the chief of which is known as the Superintendent of the State Insectary.

The State Insectary was constructed especially for the rearing and breeding of beneficial insects, and is located in the Capitol Park at Sacramento. It is supported by appropriations of the State Legislature, and is, therefore, a free institution to all the citizens of the State.

The operations of the insectary are briefly as follows:- Expert entomologists are maintained in the fields in California and in other states and countries, who collect the natural enemies of the destructive insects. These are sent to the insectary, where they are supplied with the proper host-insects, and are reared in large numbers, when they are distributed to sections of the country where the destructive pests, upon which they prey, are plentiful.

The work, to the present time, has been chiefly concerned with the check or control of such forms as Australian bug, San Jose Scale, the Soft and Black Scale of citrus trees etc.

Predaceous insects, chiefly Coccinellids, have received the greatest attention, possibly because of the ease with which they can be collected and bred.

Very little attention has been paid, so far, to the enemies of the Pseudococcini. While there are numerous references to parasites having been observed, these were, in the majority of cases, not determined, and no further attention given to them.

A study of these references, however, convinces me that this branch of the subject should receive attention, and my experience shows that predaceous and parasitic insects may, and do, at times, operate to control mealy bugs.

Newstead, Ent.Mon.Mag.XXXIV,p.99, 1898, records a case in which he received specimens of the common long tailed mealy bug,P. adonidum Westw. from Zomba, when he found that quite 90 p.c. of the females were parasitised. Unfortunately the parasite was not determined.

As mentioned previously, the best known species in the Pseudococcini is the common mealy bug, P. citri Risso, which has a very wide range of food plants, and a very wide distribution. Naturally this species has received the greatest amount of attention, so I thought it would be interesting to make a careful study of the literature, and make a list of the predaceous and parasitic insects which have been found in connection with this mealy bug.

The following is the list obtained:-

Predaceous and parasitic enemies of P. citri Risso.

a. Predaceous insects:

Lady-bird beetles (Coccinellidae).

Cryptolaemus montrouzieri, introduced into California by Mr.A. Koebele; also preys upon P.adonidum and P. nipae.

Rhizobius ventralis, which was introduced into California to combat the black scale of citrus trees, Saissetia oleae.

Lindorus lophanthae, (introduced into California).

Scymnus guttulatus, native of California; also preys upon P. adonidum.

Scymnus sordidus, native of California.

Scymnus marginicollis, native of California.

Cryptogonus orbiculus, a native of the Philippine Is., introduced into California in 1910, also preys upon P. adonidum.

Hyperaspis lateralis, (California.)

Exochomus nigromaculatus and at least two other small species, which are native of South Africa. An attempt was made to introduce these into the U.S.A. in 1901. (See Can.Ent. for June, 1901, p. 183.)

Green lacewing.

Chrysopa californica Coq., in California.

Brown lacewing.

Sympherobius angustus Banks, in California.

b. Parasitic insects:

1. Hymenopterous insects:

Chrysoplatycerus splendens Howard, in California.

Cheiloneurus dactylopii Howard.

Coccophagus flavoscutellum Ashmead.

Zarhopalus inquisitor Howard.

Leptomastrix dactylopii Howard.

2. Dipterous parasite:

Leucopis bella Loew. (Fam. Agromyzidae.)

It will be observed that no less than 18 different species are included in this list, and when it is considered that very little attention has been paid to the subject, except in California, it will be realised that this number represents, probably, only a part of a much larger number.

No other species of mealy bug has been given so much attention as the one mentioned above, but the long-tailed species, P. adonidum Westw. is the one which is almost equally wide spread, and well known. As one would expect, the enemies of this insect are better known than are those of any insect except P. citri R.

In fact it is probably for only 1 or 2 p.c. of the other species that enemies have been recorded or even mentioned.

The following list gives the names of the predaceous or parasitic insects which have been found in relation with the Pseudococcini, as far as I have been able to ascertain. Those which have been recorded only for P. citri are not included.

Enemies of the Pseudococcini.(except P.citri.)

Predaceous insects:

Larva of Eublemma (Lepidoptera) sp.indet. preys upon D. nipae Mask. in India.

Geocoris tricolor (Lygaeidae), preys upon D. nipae Mask. in India.

Larva of fly grub sp. indet. also feeds on the eggs of D. nipae in India.

A Hemerobiid sp. indet. preys upon the larvae and adults of this species in India.(See M.Lefroy, Mem.Dept.Agr. of India,II,7,p.134,1908.)

The larva of a Syrphid fly, Bacca stenogaster Williston, preys upon Phenacoccus gossypii and Ph. gossypii var. psidiarum Ckll, in Mexico. (See Cockerell, 1903.)

Coccinellidae.

Chilocorus bivulnerus Mulsant, the common "two stabbed lady beetle" of California, preys upon P. adonidum Westw.

and many other Coccids.

Cryptogonus orbiculus Schon., a native insect of the Philippine Islands, preys upon P. adonidum Westw.

Cryptolaemus montrouzieri Mulsant might be called the "Mealy bug destroyer". It preys upon a number of species, including P. citri Risso, P. adonidum Westw. and D. nipae Mask.

Scymnus guttulatus Lec. preys upon P. adonidum Westw.

Scymnus nebulosus Lec. feeds on a number of species.

Scymnus nobilis Mulsant, and

Scymnus xerampelinus Muls. both prey upon D. nipae Mask. in India,

Rhizobius ventralis Er. The larvae of this species are particularly beneficial, as their chief food consists of young mealy bugs of various species.

Parasitic insects: Chalcids etc.

Aphycus townsendi Howard has been bred from a species of Phenacoccus on cotton.(Ashmead, 1900,p.388.)

Cheiloneurus dactylopii Howard,

Signiphora dactylopii Ashmead, and

Blepyrus phenacocci Ashmead, three distinct species of Chalcids, were reared by Mr.W.H.Ashmead, from material of Phenacoccus cevalliae Ckll, collected at Roswell, New Mexico in October 1902. A hyperparasite, Tetrastichus

blepyri Ashmead, was further reared from one of these parasites, (Blepyrus phenacocci Ashm.) Can.Ent.XXXIV, 2, p.301, 1902.

Two Chalcids, one belonging to the genus Cerchysius, and the other to an apparently new genus, have been reared from Ripersia sp. (Newstead, Mon. Br. Coccidae, I, p. 32.)

Coccophagus orientalis Howard and
Eucomys (Encyrtus) albicoxa Ashmead have been reared from P. adonidum Westw., the former from Ceylon, and the latter from North America.

Aphycus dactylopii Howard, has been bred from material of D. filamentosus Ckll, collected at Hong Kong.

Signiphora dactylopii Ashmead, was reared from specimens of P. ephedrae Coq., collected in California.

Blepyrus texanus Howard, and
Aphycus texanus Howard, were reared from P. virgatus from Texas.

Perissopterus mexicanus Howard, and
Blastothrix yuccae Coquillet were bred from Ceroputo yuccae Coq., collected in Mexico and California respectively.

Coccophagus lecanii Smith, and
Rhopus (Acerophagus) coccois E.A.Smith, were obtained from Phenacoccus aceris Signoret.

From mealy bugs, probably Pseudococcus spp, but spp. indet. the following have been reared:-

Coccophroctonus dactylopii Ashmead, from Australia.

Aphycus angelicus Howard, from North America.

Aphycus australiensis Howard, from Australia.

Tetracnemoidea australiensis Howard, from Australia.

Aphycus nigritus Howard, from California.

Chrysoplatycerus splendens Howard, from California.

An interesting, and important characteristic of some of these insects is that they will attack more than one kind of Coccid, and this makes them especially valuable from an economic point of view. For instance, the larvae and adults of the Coccinellid, Chilocorus bivulnerus Muls. are voracious feeders upon the San Jose Scale,(Aspidiotus perniciosus), young of the black scale,(Saissetia oleae), mealy bugs,(P. citri and adonidum), oyster shell scale, (Lepidosaphes ulmi), European elm scale,(Gossyparia spuria), and other scale insects.

The small hymenopterous parasite, Aphelinus mytilaspidis Le Baron, (Fam.Eulophidae), preys upon a number of scale insects, among which are the oyster shell scale, (Lepidosaphes ulmi), pine scale, (Chionaspis pinifoliae), San Jose Scale (A. perniciosus), and Diaspis carueli. The fact that so little is known concerning the predaceous and parasitic insects is probably due to the

obscure manner in which they work; to the small size of most of them; and to the great resemblance between the larval forms of the Coccinellidae and many of the insects upon which they prey.

Whilst working with the Division of Entomology in Cape Colony we often received letters from farmers and fruit growers, asking that a colony of Vedalia lady-bird beetle might be sent at once, as the Australian bug, Icerya purchasi, was becoming alarmingly numerous. This course was only adopted, however, after we had been assured that the Coccinellid was not already there, and the usual procedure was to ask that twigs bearing the pest should be sent to the office.

In many cases the result was that we obtained splendid colonies of Vedalia, which could be sent elsewhere.

On several occasions I have been invited to a farm to see what splendid results had been obtained by using some particular brand of tobacco extract against mealy bugs in vines etc., to find on examination that some hundreds of Coccinellid larvae and pupae, usually Exochomus nigromaculatus, had been killed.

These beneficial insects had already brought the mealy bugs down in number, and the waxy larvae had been mistaken for the pest they were devouring.

If good results are to be expected from predaceous and

parasitic insects they must be given an opportunity to breed, and artificial remedied must be resorted to with caution, and the time to apply such must be carefully chosen.

Intracellular Symbionts in the Pseudococcini.

Intracellular Symbionts of the Pseudococcini.

When we consider that it is only within the last four years that serious attention has been paid to the subject of the intracellular symbionts in the Insecta, and that this study really had its origin in the investigation of the so-called "pseudo-vitellus" in Aphides, it is not surprising that little is known relating to the symbionts of the Pseudococcini.

When it was ascertained that this "pseudo-vitellus" was of a distinctly different nature from what the earlier workers suspected, and that it was found to present an entirely new field for investigation, it was natural that other bodies which had been referred to in insect anatomy, but whose function was not clear, should be regarded in a new light.

In "Revista di Patologia Vegetale",1893, Dr. Berlese gives an excellent account of the two common species of mealy bugs, P. citri Risso, and P. adonidum Westwood. He refers, p.74, to a body which he names the "corpo ovale", a broadly rounded mass richly supplied with tracheae. It was upon this that Dr. Pierantoni worked in 1910. In the same year Dr. K.Sulc investigated the similar body in Phenacoccus farinosus, and the work of these two constitutes the foundation of our knowledge of the intracellular symbionts in this group.

The account given by Dr. Berlese is as follows:-

"Tutto il tubo digerente riposa (nelle femmine di qualunque stato) su un ammasso di forma ovale, di cellule rotonde di 35-36μ di diametro, con nucleo di 11-12 μ di diametro, ed uno o più nucleoli che pero si dilatano il piu delle volte notevolmente, per infiltrazione di grasso, in gocciole.

Tutti questi elementi sono racchuisi nella guaina unica, abbastanza disgregati fra loro, e immersi in detriti granulosi gialli, che col carmino si colorano intensamente, negli interstizii delle cellule.

Questo corpo ovale è collocato in contatto della epidermide del ventre, e non sembra contornato da membrana alcuna. Quale sia il suo ufficio, e cosa rappresenti, mi e ignoto. Certo e che esiste sempre, molto piu grosso nel D. citri, dove occupa gran parte del ventre, piu ridotto nel D. longispinus. Numerose trachee, provenienti dal ramo longitudinale ventrale, che parte dall' ultimo stigma, vi penetrano, e colle tinture carminiche si colora abbondantemente, più di tutti gli altri tessuti, eccetto i glandulari. Non ho osservato che quest' organo sia in rapporto con alcuna apertura, oppure coll' intestino.

Questo vi si appoggia per quasi tutto il suo decorso, ma non sembra avere altre relazioni. Quando il corpo

nell' adulto e pieno d'uova, queste si infossana entro le cellule del detto corpo ovale, che in questo caso occupano i vani esistenti fra le uova stesse. E molto probabile che sia un ammasso di sostanza nutritiva, derivata dall' intestino, oppure abbia rapporti, di difficile rilievo, colla secrezione della cera.
E certo, che non ne hanno tenuto parola gli autori, che mi hanno preceduto in queste ricerche."

This "corpo ovale" has been studied by Dr. Pierantoni, who found it to be what Dr. Buchner terms a mycetom, in which are large numbers of elongate, sickle-shaped organisms.

The symbiont was named Coccidomyces dactylopii Buchner in 1911. It was fully described, and figured, by Dr. Pierantoni in the Archiv fur Protistenkunde, 1913.
An organism living in a similar mycetom in Phenacoccus farinosus was described in "Sitz.d.kon.bohm.Ges.d.Wiss." for 1910, by Dr. Sulc. This was named Saccharomyces pseudococci farinosi Sulc.
It might be mentioned that Dr. Buchner named an organism which was found in the mycetom of Icerya purchasi Mask. as Coccidomyces pierantonii in 1911, but this is not similar to the one found in P. citri Risso, while the one from Ph. farinosus is quite similar, except that the nucleus was distinct in the latter symbiont.

Coccidomyces rosae Buchner, 1911, is an organism which lives in the body cavity of Lecanium corni Bouché. It does not occupy a definite mycetom, and is obviously different from those which have been found in the Pseudococcini.

It appears that C. rosae is the first species described in the genus Coccidomyces so that a new genus should be made for the forms found in the Pseudococcini.

Dr. Šulc named the symbiont of Phenacoccus farinosus as Saccharomyces pseudococci farinosi in 1910, but the facts that (a) the production of endospores is never indicated, and (b) the infection of the egg takes place by sferettes containing ten or more organisms, and not by single individuals, show that the organism is not a Saccharomyces.

The life history of a symbiont, which seems to be typical for the Pseudococcini, may be illustrated by the form found in Pseudococcus citri. Plate III refers to this species.

The mycetom ia a large, roundly oval mass of tissue occupying a ventral position in usually the first five abdominal segments. When dissected out in fresh material it is generally of a greenish yellow colour, and is seen to be richly supplied with tracheae. Examined under a high power it is seen to be composed of large numbers of large rounded cells.

Figure 2, of Plate III, shows a transverse section of an adult ♀ of P. citri, from about the third abdominal segment. It will be seen that the mycetom is a comparatively large body, in fact it is much larger in P. citri than in any of the other species I have examined.
Figure 3 shows a portion of the mycetom further enlarged. The large cells, or sferules, contain a number of smaller rounded sferettes, which in turn contain a number of elongate bodies as shown in Figure 4. These sickle-shaped bodies stain readily with water eosin.
The most remarkable fact concerning this type of symbiont seems to be that the sferettes, and not the individual organisms, act as the units. It is the sferettes which infect the developing ova.(Figs.5 and 6.)
I have made observations on the intracellular symbionts of the following species:-

Pseudococcus citri Risso.

Pseudococcus adonidum Westw.

Pseudococcus capensis Brain.

Pseudococcus mesembrianthemi n.sp.

These studies are not yet completed, but I hope to have them ready to include in a paper dealing with the symbionts of the Coccidae to be published shortly.

Literature dealing with the Symbionts of the Pseudococcini.

1893.- Berlese, Ant.: Le cocciniglie italiane viventi sugli agrumi. Parte I: Dactylopius. Riv. Patol. Veget. II,p.1.

1911.- Buchner, P.: Uber intracellulare Symbionten bei zuckersaugenden Insekten und ihre Vererbung. Sitz.-Ber. Ges. Morph.Phys. Munchen.P.1.

1912.- --: Studien an intracellularen Symbionten. I, Die intracellularen Symbionten der Hemipteran. Arch. Protistenk. Bd. 26,P.1.

1910.- Pierantoni,U.: Origine e struttura del corpo ovale del D. citri, e del corpo verde dell' Aphis brassicae. Boll. Soc.Natur.Napoli,XXIV,P.1.

1911.- : --Sul corpo ovale del D. citri. Boll. Soc. Natur. Napoli. XXIV, p.303.

1913.-:-- :Struttura ed evoluzione dell'organo simbiotico di P. citri Risso, e ciclo biologico del Coccidomyces dactylopii Büchner. Arch. f. Protistenk. XXXI,pp. 300-316.Pl. 3.

Catalogue of Species of the Pseudococcini.

Catalogue of Species of the Pseudococcini, giving Host-plants and Localities.

Genus Ripersia Signoret, 1875.

Ripersia agasawarensis Kuwana, 1909.	
On Miscanthus sp.	Japan.
Ripersia anomala Newstead, 1908.	
Under bark, accompanied by Pheidole megacephala.	Kilimandjaro.
Ripersia arizonensis Ehrhorn, 1899.	
In nest of ants.	Arizona.
Ripersia aurantia Cockerell, 1901.	
In nest of Lasius americanus.	New Mexico.
Ripersia blanchardi King and Ckll.,1897.	
In nest of Lasius claviger.	Massachusetts.
Ripersia confusella Cockerell, 1901.	
With ants, sp.indet, and	
In nest of L. americanus.	New Mexico.
Ripersia corynephori Signoret, 1875.	
On Corynephorus canescens,	France.
Agrostis alba,	Denmark.
Grass, sp. indet.	Guernsey,
Ripersia donisthorpei Newstead, 1907.	
In nest of Ponera contracta.	England.
Ripersia europea Newstead, 1897.	
In nests of ants.	Europe.
Ripersia fagi Maskell, 1890.	
On Fagus menziesii.	New Zealand.
Ripersia festucae Kuwana, 1901.	
On Festuca scabrella.	California.
Ripersia filicicola Newstead, 1898.	
On Trichomanes spicatum.	England.
Ripersia fimbriatula Ckll.,and King.1901.	
In nest of L. americanus.	New Mexico.

Ripersia flaveola Cockerell, 1896.	
In nests of L. claviger,	Massachusetts,
and of L. interjectus.	New Mexico.
Ripersia formicicola Maskell, 1891.	
In ants' nests.	New Zealand.
Ripersia formicarii Newstead, 1907.	
In nests of Lasius flavus.	England.
Ripersia glandulifera Newstead, 1912.	
On Adiantum sp.	S.W.Africa.
Ripersia halophila (Hardy), 1860.	
On Ligusticum scoticum,	England.
Radiola linoides,	England.
Statice armeria, and grass,	Hebrides.
Armeria maritima,	England.
Erica cinerea,	England.
Ripersia hypogea Leonardi, 1908.	
On ? ,(underground),	Italy.
Ripersia inquilina Leonardi, 1908.	
In nest of ants, sp.indet.	Sardinia.
Ripersia japonica Kuwana, 1907.	
On Miscanthus sp.	Japan.
Ripersia kingii Cockerell, 1896.	
In ants' nests.	Massachusetts.
Ripersia lasii Cockerell, 1896.	
On roots of Asters, in the nest of ants, sp. indet.	Canada, and Mass.
Ripersia leptospermi Maskell, 1888.	
On Leptospermum laevigatum.	S. Australia.
Ripersia magna T. and W. Cockerell, 1901.	
?.	New Mexico.
Ripersia minima Tinsley and King, 1899.	
In nest of L. americanus.	Massachusetts.
Ripersia montana Newstead, 1898.	
On roots of grass,and of a composite,	France.
In nest of ants.	Italy.

Ripersia myrmecophila Maskell, 1897.	
?.	Michigan.
Ripersia oryzae Kuwana, 1907.	
On roots of rice etc.	Japan.
Ripersia porterae Cockerell, 1901.	
On roots of grass,	New Mexico.
Ripersia pupifera (Lichtenstein), 1879.	
On Elm.	France.
Ripersia sacchari Green, 1900.	
On sugarcane.	India.
Ripersia salmonacea Cockerell, 1901.	
On roots of grass,	New Mexico.
Ripersia sardiniae Leonardi, 1908.	
In nests of ants.	Sardinia.
Ripersia serrata Tinsley, 1900.	
?.	Trinidad.
Ripersia smithii Essig, 1910.	
On Elymus condensatus.	California.
Ripersia sporoboli Cockerell, 1902.	
On Sporobolus deporperatus.	New Mexico.
Ripersia subterranea Newstead, 1893.	
On roots of Nardus stricta.	
In nests of F. flava.	England.
Ripersia tenuipes Cockerell, 1901.	
On roots of grass.	New Mexico.
Ripersia trichura Cockerell, 1901.	
On roots of grass.	New Mexico.
Ripersia trivittata Cockerell, 1901.	
In nest of L. americanus.	New Mexico.
Ripersia tumida Newstead, 1897.	
In nest of Camponotus sp.	Algeria.
Ripersia villosa Ehrhorn, 1899.	
On Quercus agrifolia.	California.
Ripersia viridula Cockerell, 1901.	
In nest of L. americanus.	New Mexico.

Ripersia wasmanni Newstead, 1900.
In nest of L. alienus. France.

Genus Ripersiella Tinsley, 1899.

Ripersiella kelloggi Ehrh., and Ckll.,1901.
On roots of bunch-grass. California.

Ripersiella leucosoma Cockerell, 1901.
In nest of L. americanus. New Mexico.

Ripersiella maritima (Cockerell), 1894.
On roots of Spartina. Long Is. N.Y.

Ripersiella rumicis (Maskell), 1891.
On Rumex acetosella. New Zealand.

Genus Pseudoripersia Ckll.,1899.

Pseudoripersia turgipes (Maskell),1892.
On Casuarina suberosa. Australia.

Genus Dactopseudococcus n.g.

Dactopseudococcus acaciae (Maskell),1891.
On Acacia linearis, and
Acacia lophantha. Australia.

Dactopseudococcus agrifoliae (Essig),1909.
On Querous agrifolia. California.

Dactopseudococcus albizziae (Maskell), 1891.
On Albizzia lophantha. Australia.

Dactopseudococcus aphyllonis (Ckll.),1895b.
On Aphyllon fasciculatum. Washington State.

Dactopseudococcus arecae (Maskell),1889.
On roots of Areca sapida. New Zealand.

Dactopseudococcus artemisiae (Essig),1909.
On Artemisia californica. California.

Dactopseudococcus aurilanatus (Mask.),1889.
On Araucaria excelsa, New Zealand,
Araucaria bidwilli, California,South
Africa.
Dammara ovata, and
D. vitiensis California.

Dactopseudococcus australiensis (Gn. and Lidg.)1900.

On Acacia dealbata. Australia.

Dactopseudococcus boninsis (Kuwana),1909.
On sugarcane. Japan.

Dactopseudococcus bromeliae (Bouche),1833.
On pineapple, Canna, Zanzibar,
Mulberry andHibiscus, India, S. Af,
and Mass.

Dactopseudococcus californicus (Ehrhorn),1911.
On Festuca sp. California.

Dactopseudococcus claviger (King and Tins.),1897.
In nests of L. claviger, and
of L. americanus. Massachusetts.

Dactopseudococcus edgeworthiae (Ckll.),1897.
On Edgeworthia papyrifera. Japan.

Dactopseudococcus ericicola (Mask.),1892.
On Erica autumnalis. Australia.

Dactopseudococcus eriogoni (Ehrhorn),1899.
On roots of Eriogonum sp. California.

Dactopseudococcus filamentosus (Ckll),1893.
On a plant resembling
Vaccinum. Bahamas.
On Citrus trees. Jamaica, Japan,
Mauritius,and
South Africa.
On Albizzia lebbek,
Gossypium spp.,
Zizyphus spina-christa,
and Acacia arabica. Egypt.

Dactopseudococcus formicari (Ehrhorn),1899.
On the roots of Artemisia
sp. in ants' nests. Arizona.

Dactopseudococcus globosus (Maskell),1891.
On Acacia armata, and
Acacia decurrens. Australia.

Dactopseudococcus graminis (Maskell),1891.
On grass. Natal.

Dactopseudococcus grevilleae (Fuller),1899.
On Grevillea bipinnatifida. Australia.

Dactopseudococcus herbicola (Maskell),1891.b.
On Aristida vagans. Australia.

Dactopseudococcus hibbertiae (Maskell),1891.
On Hibbertia linearis and
Hibbertia virgata. Australia.

Dactopseudococcus hymenocleae (Ckll.),1899.
On Hymenoclea monogyra. Arizona.

Dactopseudococcus indecisus (Ckll.),1901.c.
In nests of L. americanus. New Mexico.

Dactopseudococcus libera (Leonardi),1908.
On Grass. Italy.

Dactopseudococcus ledi (Ckll.),1911.
On Ledium groenlandicum. New York State.

Dactopseudococcus lichtensoides (Ckll),1897.b.
On Artemisia frigida. Colorado.

Dactopseudococcus missionum (Ckll.),~~1897~~ 1910.b.
?. Argentine Rep.

Dactopseudococcus nanus (Cockerell),1905.
On roots of grass. Colorado.

Dactopseudococcus nipae (Maskell),1892.
On Nipa fruticans Demerara.
On Palms. Mexico, Mass.,
California,
Europe, S. Africa,
and India.
On Guava. California.

Dactopseudococcus orientalis (Maskell),1897.
On Grass. China.

Dactopseudococcus pseudonipae (Ckll.), 1897.b.
On Kentia and Cocos Palms. New Mexico,and California.

Dactopseudococcus quaintanci (Tinsley),1898.
On Rhus copallina. Florida.

Dactopseudococcus sacchari (Ckll.),1895.c.
On sugarcane. Trinidad and Porto Rico.

Dactopseudococcus theaecola (Green),1897.
On roots of tea plants. India.

Dactopseudococcus townsendi (Ckll.),1893.b.
On leaves of Fouquiera. New Mexico.

Dactopseudococcus trifolii (Forbes),1885.
On clover. U.S.A.

Dactopseudococcus tumida (Newstead),1897.
In nests of Camponotus etlii. Algeria.

Dactopseudococcus violascens (Ckll.),1913.
On Agropyron sp. Colorado.

Dactopseudococcus viridis (Newstead),1894.
On Hygrophylia spinosa. India.

Dactopseudococcus wheeleri (King),1902.
In nests of Camponotus maculatus var. sansabeanus Buckton. Texas.

Dactopseudococcus zapotlanus (Ckll.),1902.b.
On "Huele de Noche". Mexico.

Genus Pseudococcus Westwood, 1839.

Pseudococcus adonidum Westwood, 1839.
On ferns; mango; guava; fig; plum; Croton sp; Cycas revoluta; Flacourtia sepiaria; Nephrodium amplum; Strangeria schizodont. — Europe, India, Australia, N.Z. Chili, Jamaica, U.S.A., and South Africa.

Pseudococcus affinis (Maskell), 1893.
On tubers of dahlia and potato. — Australia.

Pseudococcus alkalinus Ckll., 1902.c.
On grass. — New Mexico.

Pseudococcus alpinus (Maskell),1883.
On Veronica sp. — New Zealand.

Pseudococcus americanus (Ckll.),1899.b.
On Ash. — Washington,D.C.

Pseudococcus ananassae (Kuwana),1909.
On Pineapple. — Japan.

Pseudococcus andersoni (Coleman),1903.
On Cupressa goveniana, and Libocedrus decurrens. — California.

Pseudococcus aridorum Lindinger, 1911.
On Argyranthemum frutescens, Cystisus prolifer var. palmensis, Grass, and Trifolium panormitanum. — Canary Islands.

Pseudococcus armatum (Hempel), 1901.
?. — South America.

Pseudococcus atriplicis (Ckll.),1895.d.
On Atriplex canescens. — New Mexico.

Pseudococcus azaleae (Tinsley),1898.
On Azalea sp. — California.

Pseudococcus bakeri Essig, 1910.
On Sambucus glauca, Apple, Pear, and Juglans regia. — California.

Pseudococcus brevipes (Cockerell),1893.	
On Pineapple.	Jamaica.
Pseudococcus burneri n. sp.	
On Viburnum sp.	Transvaal.
Pseudococcus calceolariae (Maskell),1878.	
On Calceolaria sp, Traversia sp, and Cassinia sp.	New Zealand.
Pseudococcus californicus Ehrhorn, 1911.	
On Festuca sp.	California.
Pseudococcus calluneti Lindinger, 1912.	
On Calluna vulgaris.	Germany.
Pseudococcus capensis Brain, 1912.	
On Phytolacca dioica, Albizzia lophantha, Solanum sodomaeum, Clematis vitalba, Pelargonium sp. Sonchus oleraceus, Senecio vulgaris. Malva parviflora, Oxalis cernua, Vines, pumpkins, Apples and Pear.	Cape Colony.
Pseudococcus citri (Risso), 1813.	
On Orange, lemon, citron, Coffee, tobacco, cotton, ivy, peony, Ipomoea sp, Solanum spp. Calistemon lanceotatus, and Habrothamnus sp.	Europe, India, Sandwich Islands, Mauritius, S. Af. Brazil, U.S.A. Canada, and Australia.
Pseudococcus coccineus (Newstead),1908.	
On Acacia sp.	Africa.
Pseudococcus cocotis (Maskell), 1889.	
On Cocos nucifera.	Fiji.
Pseudococcus cockerelli King and Tins.,1898.	
In nests of L. flavus.	Massachusetts.

Pseudococcus coffeae (Newstead), 1908.b.
On Liberian coffee plants. Java.

Pseudococcus comstocki (Kuwana),1902.
On mulberry and maple. Japan.

Pseudococcus crawi (Coquillet), 1889.
On Audibertia polystachya. California.

Pseudococcus crotonis Green, 1905.
On Castilloa elastica,
Codiaeum variegatum,
Terminalia catappa, and
Erythrina lithosperma etc. India.

Pseudococcus cualatensis Cockerell, 1903.b.
In galls formed by Akermes
colimae Ckll. Mexico.

Pseudococcus cyperi (Signoret),1875.
On cypress. Europe.

Pseudococcus dasylirii (Cockerell), 1896.b.
On Dasylirion wheeleri. New Mexico.

Pseudococcus dearnessi (King), 1901.
On hawthorn. Canada.

Pseudococcus dudlryi (Coleman),1903.
On Cupressus macnabiana. California.

Pseudococcus ephedrae (Coquillet), 1890.
On Ephedra californica. California, and
Mexico.

Pseudococcus farnesianae (Targioni),1888.
On Acacia farnesiana, and
Olea europaea . Italy and
North Africa.

Pseudococcus fragilis Brain, 1912.
On orange trees. Cape Colony.

Pseudococcus formicetícola (Newstead), 1900.
In nests of Crematogaster sp. China.

Pseudococcus glaucus (Maskell), 1878.
On Rubus australis and
Pittosporium engenioides. New Zealand.

Pseudococcus grandis (Hempel), 1900.
On one of the Myrtaceae. Argentine Rep.

Pseudococcus gutierreziae (Cockerell), 1896.b.
On Gutierrezia sarothrae. New Mexico.

Pseudococcus hibernicus (Newstead), 1895.
On Grass. Ireland.

Pseudococcus hirsutus (Newstead), 1897.
In nests of Cremastogaster sp. India.

Pseudococcus iceryoides (Maskell),1891.
On Fagus fusca. New Zealand and India.

Pseudococcus irishi (Cockerell), 1900.
On Lamea tridentata. Arizona.

Pseudococcus juniperi Ehrhorn, 1906.
On Juniperus virginiana. Arizona.

Pseudococcus kraunhiae (Kuwana), 1902.
On Kraunhia floribunda. Japan.

Pseudococcus lilacinus Cockerell, 1905.
On orange. Philippine Is.

Pseudococcus lobulatus (Maskell), 1893.
On Eucalyptus globosus. Australia.

Pseudococcus longipes Leonardi, 1909.
On Alocasia macrorica. Italy.

Pseudococcus lounsburyi Brain, 1912.
On Agapanthus umbellatus L'Herit.
Cape Colony.

Pseudococcus luffi (Newstead),1901.
On Lepigonum rupestre. Guernsey.

Pseudococcus macrozamiae (Fuller), 1897.
On Macrozamia frazeri. Australia.

Pseudococcus magnoliaida (King), 1902.
?. Brazil.

Pseudococcus mamillariae (Bouche), 1844.
On Mamillaria spp. Europe.

Pseudococcus marchali Vayssière, 1912.
On Mango. N.Africa.

Pseudococcus maritimus (Ehrhorn), 1900.
On Eriogonum latifolium. California.

Pseudococcus mendozinus Leonardi, 1911.
On Hyalis argentea. Argentine Rep.

Pseudococcus mesembrianthemi n. sp.
On Mesembrianthemum edule L. Cape Colony.

Pseudococcus minor (Maskell),1896.
On roots of grass. Mauritius.

Pseudococcus muraltiae Brain, 1912.
On Muraltia heisteria D.C. Cape Colony.

Pseudococcus myrmecarius Leonardi, 1909.
In nests of Camponotus sp. Sardinia.

Pseudococcus neomexicanus (Tinsley), 1898.
On roots of Gutierrezia sarothrae.
New Mexico.

Pseudococcus obscurus Essig, 1909.
On Sambucus glauca. California.

Pseudococcus obtectus (Maskell), 1899.
On Fagus fusca. New Zealand.

Pseudococcus olivaceus (Cockerell),1895.
On Yucca. New Mexico.

Pseudococcus osborni (Sanders), 1902.
On Platanus occidentalis. Ohio.

Pseudococcus pandani (Cockerell), 1895.
On Pandanus sp. Washington Is.

Pseudococcus perocrosus Leonardi, 1911.
On Gourliea decorticans. Argentine Rep.

Pseudococcus perrissi (Signoret), 1875.
On Calamagrostis sp, and
Sphagnum sp. France.

Pseudococcus pini (Kuwana), 1902.
On Pinus sp. and
Pinus pentaphylla. Japan.

Pseudococcus poae (Maskell), 1878.
On Grass. New Zealand.

Pseudococcus prosopidis (Cockerell),1896.
On Prosopis sp. New Mexico.

Pseudococcus pulverarius (Newstead), 1903.
On Agrostis vulgaris, and
Agrostis intermedium. Europe.

Pseudococcus quercus (Ehrhorn), 1900.
On Quercus chrysolepis. California.

Pseudococcus roseotinctus (T.and W. Ckll.),1901.
On roots of grass. New Mexico.

Pseudococcus ryani (Coquillet), 1889.
On Cupressa macrocarpa,
Thuja orientalis, and
Araucaria excelsa. California.

Pseudococcus saccharifolii (Green), 1908.
On Sugarcane. India,

Pseudococcus salinus (Cockerell), 1902.
On Grass. California.

Pseudococcus scrobicularum Green, 1896.
On Elaeocarpus sp. India.

Pseudococcus secretus (Hempel), 1900.
On one of the Solonaceae. Brazil.

Pseudococcus segregatus (Cockerell), 1893.
On Grass. Jamaica.

Pseudococcus sequoiae (Coleman), 1901.
On Redwood. California.

Pseudococcus setosus (Hempel), 1900.
On Ficus sp. Brazil.

Pseudococcus similans (Lidgett), 1898.
On roots of Daphne. Australia.

Pseudococcus simplex (Cockerell), 1893.
On Pancratium caribaeum. Jamaica.

Pseudococcus solani (Cockerell), 1894.
On Solanum tuberosum. New Mexico.

Pseudococcus sorghiellus (Forbes), 1885.
On ?. in nests of Lasius
americanus and L.claviger. Massachusetts.

Pseudococcus steeli (Ckll. and Towns.),1894.
On Lamea mexicana. New Mexico.

Pseudococcus subterraneus (Hempel), 1901.
On grape vines. Argentine Rep.

Pseudococcus syringae (Maskell), 1897.
On Syringa amurensis. Japan.

Pseudococcus tayabanus Cockerell, 1905.
On cultivated cacao. Philippine Is.

Pseudococcus texensis (Tinsley), 1900.
On Acacia farnesiana. Texas.

Pseudococcus theobromae (Douglas), 1889.
On Theobroma cacao. England.

Pseudococcus virgatus (Cockerell), 1893.
On Prosopis juliflora,
Tribulus cistoides,
Acalypha sp.
Cocoanut palm,
Cotton, and
violets. Jamaica,
Philippine Is.
Ceylon, Mexico,
Mauritius, and
Texas.

Pseudococcus vovae Nassonow, 1909.
On Junipera communis. Russia.

Pseudococcus wachendorfiae Brain, 1912.
On Wachendorfia paniculata Linn.
Cape Colony.

Pseudococcus walkeri (Newstead), 1901.
On Agrostis vulgaris. England.

Pseudococcus wilmattae (Cockerell), 1901.
On "Viola aff. pedatifida". New Mexico.

Genus Tylococcus Newstead, 1897.

Tylococcus madagascariensis Newst., 1897.
In nests of Cremastogaster schenki, For.
Madagascar.

Tylococcus cycliger (Leonardi), 1908.
In nest of ants. Italy.

Tylococcus insolitus (Green), 1908.
On Sida cordifolia. India.

Genus Phenacoccus Cockerell, 1893.

Phenacoccus acericola (King), 1902.
On maple, hornbeam, lime, and horse chestnut. U.S.A.

Phenacoccus aceris (Signoret), 1875.
On maple. Europe.

Phenacoccus americanae King and Ckll. 1897.
In nests of L. americanus. Massachusetts.

Phenacoccus artemisiae Ehrhorn, 1900.
On Artemisia californica. California.

Phenacoccus asteliae (Maskell), 1883.
On Astelia sp. New Zealand.

Phenacoccus brunnitarsis (Signoret), 1875.
On Borage. Europe.

Phenacoccus casuarinae (Maskell), 1892.
On Casuarina sp. Australia.

Phenacoccus cevalliae, Cockerell, 1902.
On Cevallia sinuata. New Mexico.

Phenacoccus colemani Ehrhorn, 1906.
On Rubus sp. California,

Phenacoccus comari (Kunow), 1880.
On Comarum palustre. Germany.

Phenacoccus farinosus (Modeer), 1778.
On Alder. Europe.

Phenacoccus formicarum Leonardi, 1908.
In nests of Pheidole pallidula. Italy.

Phenacoccus glacialis (Newstead), 1900.
"Associated with ants". Italy.

Phenacoccus gossypii Towns. and Ckll., 1898.
On Cotton and other Malvaceous plants. Mexico.

Phenacoccus gossypii var. psidiarum Ckll.,1903.
On wild guava. Mexico.

Phenacoccus graminis (Reuter), 1903.
On Phleum pratense. Europe.

Phenacoccus helianthi (Cockerell), 1893.
On Helianthus sp. New Mexico,and Arizona.

Phenacoccus hirsutus Green, 1908.
?. with ants. India.

Phenacoccus hystrix (Bärensprung), 1849.
On Pinus sylvestris. Europe.

Phenacoccus iceryoides Green, 1908.
On mango,
Boswellia sp,
Capparis horrida. India.

Phenacoccus kuwanae Coleman, 1903.
On lichen on Picea breweriana. California.

Phenacoccus mangiferae (Green), 1896.
On Mangifera indica. India, and Ceylon.

Phenacoccus mespili (Signoret), 1875.
On medlar. Europe.

Phenacoccus minimus Tinsley, 1898.
On Picea pungens. Colorado.

Phenacoccus obtusus (Newstead), 1911.
On Baobabrinde sp. Ger.E.Africa.

Phenacoccus parietariae (Lichtenstein),1881.
On Parietaria officinalis. Europe.

Phenacoccus pergandei Cockerell, 1896.
On Diospyros kaka. Japan.

Phenacoccus piceae (Loew),1883.
On Abies excelsa. Austria.

Phenacoccus ripersioides T.and W.Ckll.,1903.
In nests of Lasius niger. New Mexico.

Phenacoccus rubivorus Cockerell, 1901.
On Rubus strigosus. New Mexico.

Phenacoccus simplex King, 1902.
On Atriplex sp. California.

Phenacoccus solenopsis Tinsley, 1898.
In nests of Solenopsis geminata Fab.
New Mexico.

Phenacoccus spiniferus Hempel, 1900.
?. Brazil.

Phenacoccus stachyos Ehrhorn, 1900.
On Stachyos bullata. California.

Genus Ceroputo Sulc, 1897.

Ceroputo ambigua Fullaway, 1909.

Ceroputo bahiae (Ehrhorn), 1900.
On Bahia sp. California.

Ceroputo barberi (Cockerell), 1895.
On Thunbergia grandiflora.
Allamanda sp,
Coleus, and
Croton, Antigua, and
New Mexico.

Ceroputo calcitectus (Cockerell), 1901.
On Grass, New Mexico.

Ceroputo lasiorum Cockerell, 1901.
In nests of L. interjectus. New Mexico.

Ceroputo orthezioides Cockerell, 1903.
On roots of dockweed. Mexico.

Ceroputo pilosellae Šulc, 1897
On Hieracium pilosella. Europe.

Ceroputo volynicus Nassonow, 1909.
On Dactylidis glomerata. Russia.

Ceroputo yucca Coquillet, 1900.
On Yucca whipplei,
Lantana,
Fibulus glutinosum.
Coanthus oliganthus.
Banana, orange, lime, etc. Mexico,
California,
Antigua.

Ceroputo mexicanus (Cockerell), 1893.
On ?. Mexico.

PLATES.

PLATE I.

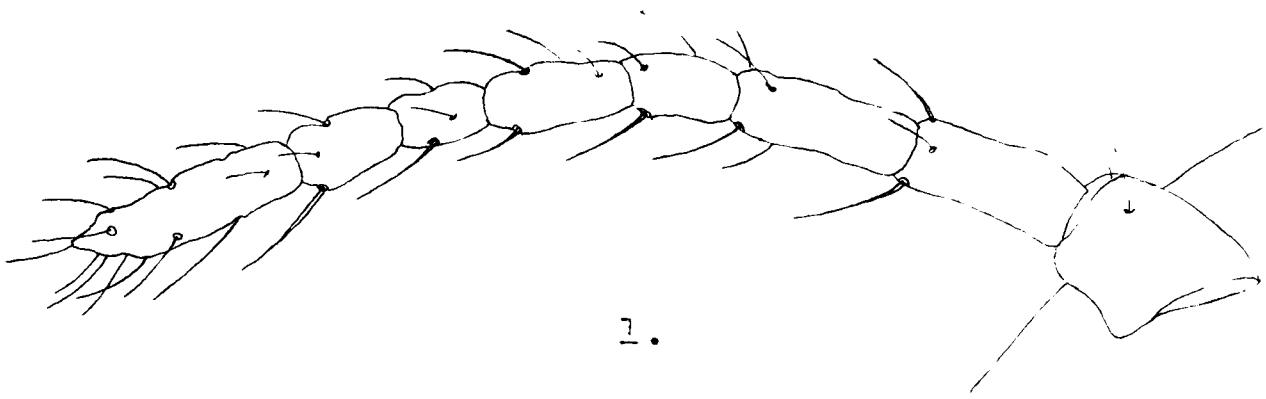
1. Antenna of Ps. mesembrianthemi n.sp. (p. 126.)

2. Antenna of Ps. burneri n.sp., same magnification as Fig. 1. (p. 86).

3. Caudal extremity of Ps. burneri, showing comparative length of setae.

4. Antenna of Ph. obtusus (Newst.), showing truncate spines on derm. (p. 172).
(Fig. 4 after Newstead.)

PLATE I.



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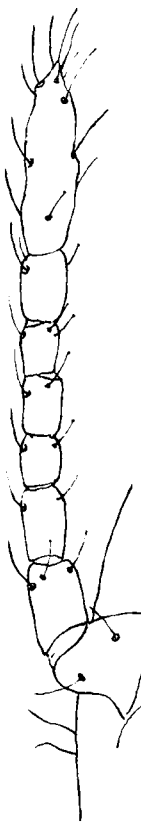

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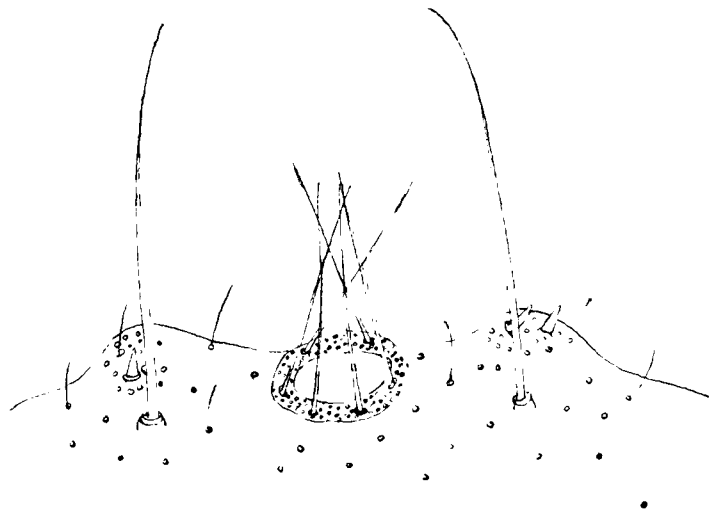

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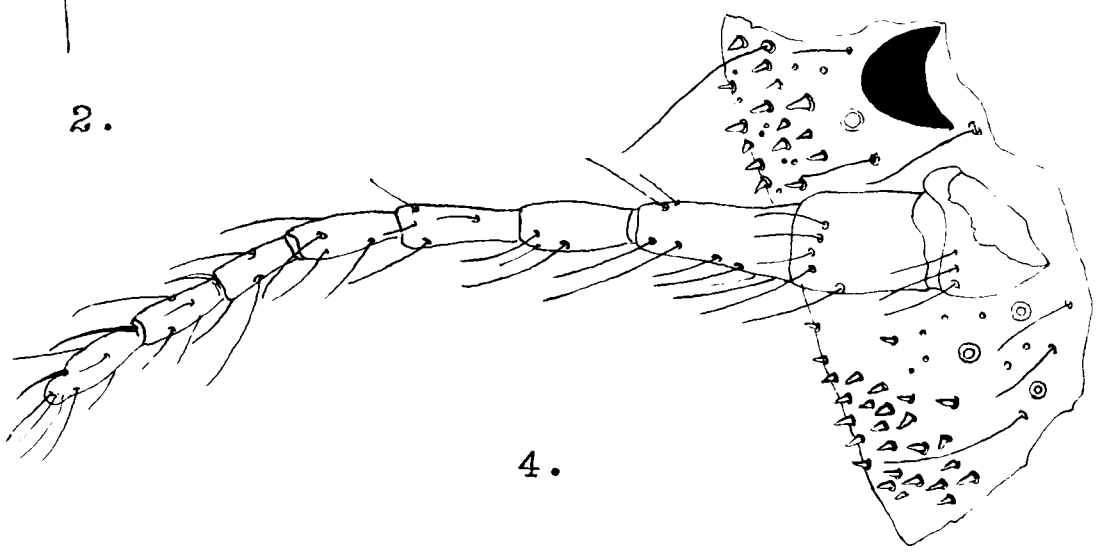


4.

6.X.B

PLATE II.

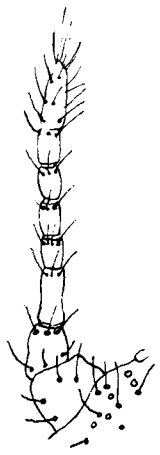
Genus TYLOCOCCUS.

(See p. 34.)

1. Antenna of T. madagascariensis Newst.
2. Ventral view of adult ♀ of same species.
3. Marginal tubercle of same insect, further enlarged.
4. Spinous tubercle of T. insolitus (Green).
5. Antenna of T. insolitus (Green).
6. Ventral view of T. cycliger (Leonardi).
7. Marginal tubercle, further enlarged.
8. Antenna of T. cycliger (Leonardi).
9. Leg of adult ♀ of T. cycliger, with claw further enlarged.
10. Caudal extremity of T. cycliger.

(Figs. 1 - 5 after Newstead, 6 - 10 after Leonardi.)

PLATE II.



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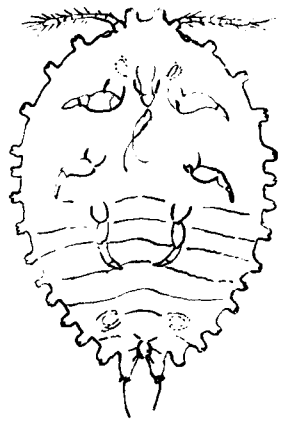

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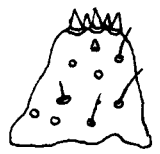

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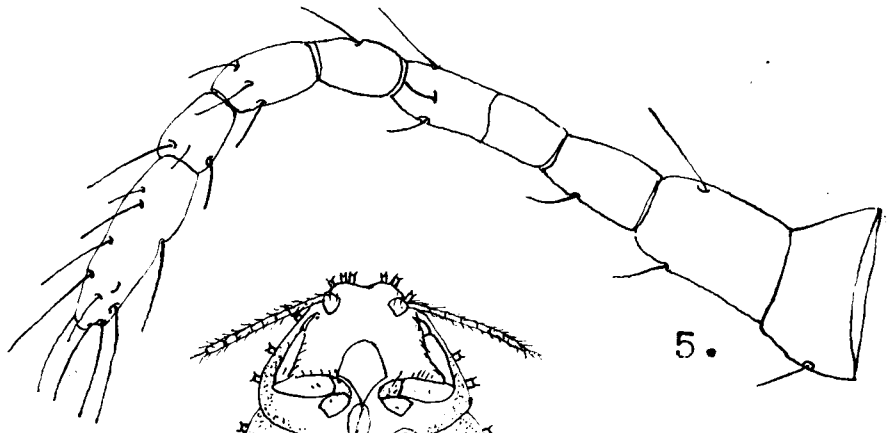

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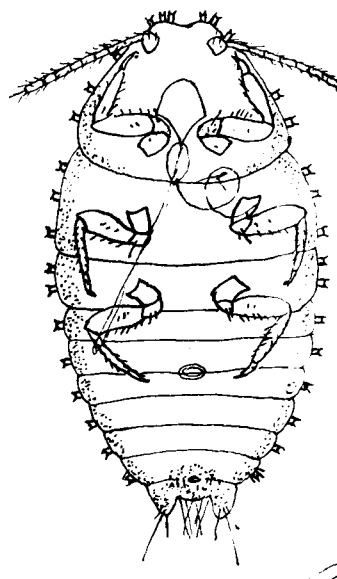

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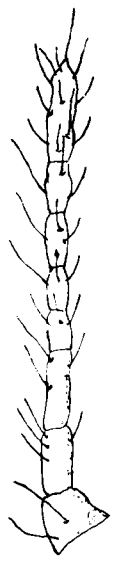

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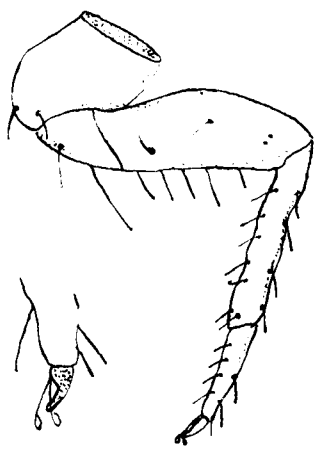

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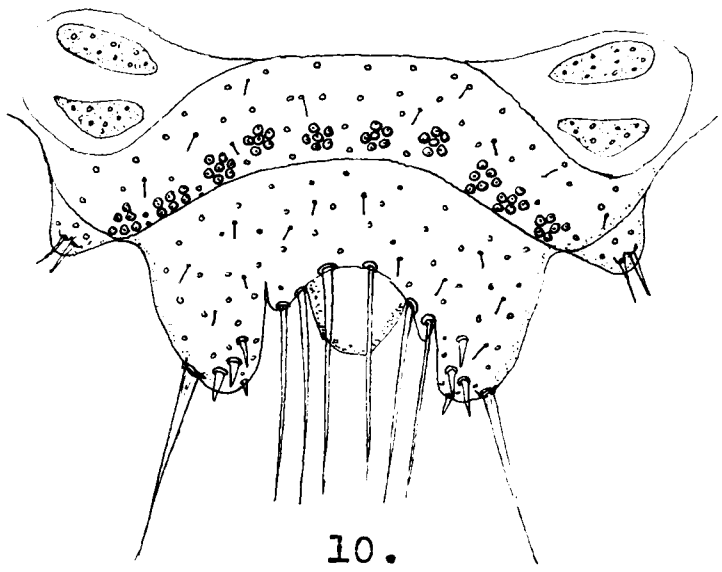


10.

6 x 8.

PLATE III.

1. Pseudococcus citri (Risso), dorsal view of adult ♀. × 15. (See p. 187)

2. Transverse section through 3rd abdominal segment of Ps. citri, showing position of mycetom. my.

3. Portion of mycetom further enlarged, showing each sferule with nucleus and sferettes.

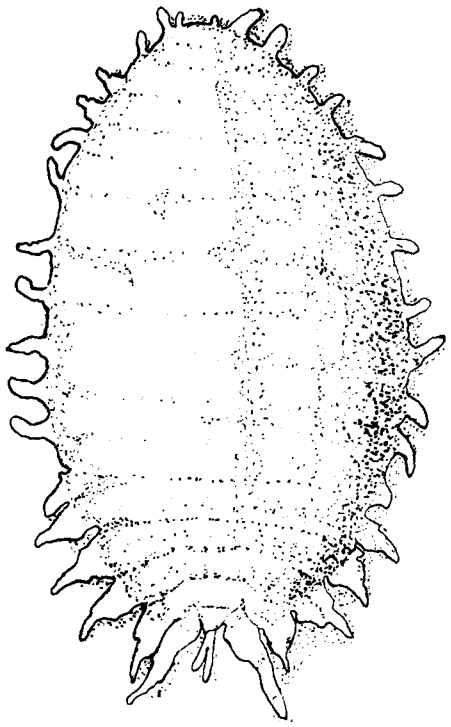
4. Sferettes containing Coccidomyces dactylopii Büchner. (See p. 188)

5. Early stage in the infection of the egg with sferettes.

6. Later stage; sferettes within the egg.

(Figs. 1 and 2 original, others after Pierantoni.)

PLATE III.



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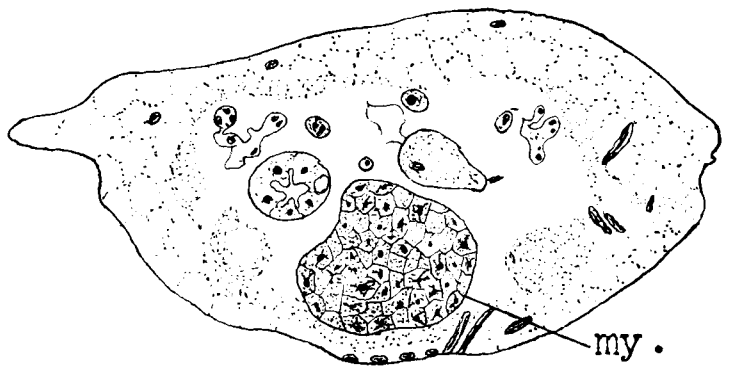

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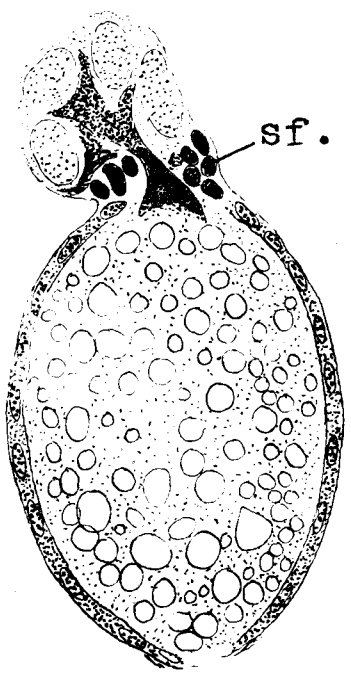

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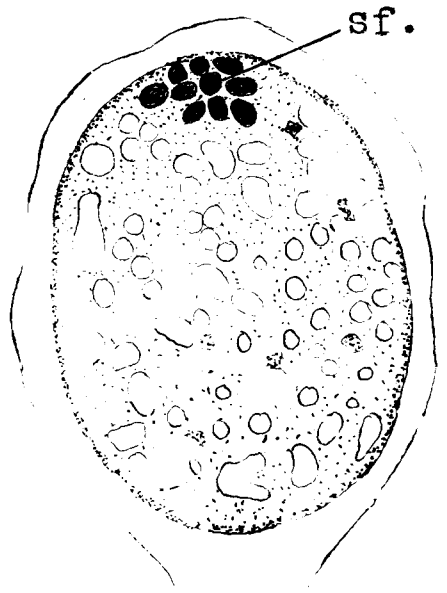

6.

E.W.S.