

Brain 1912

CONTRIBUTION TO THE KNOWLEDGE OF
MEALY BUGS, GENUS PSEUDOCOCCUS,
IN THE VICINITY OF CAPE TOWN,
SOUTH AFRICA

BY

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By CHAS. K. BRAIN, F. E. S.

The material studied was mainly collected by the writer during 1910 and the first part of 1911. Two of the species, however, were collected by Mr. Chas. P. Lounsbury, as mentioned in the descriptions. Sixteen different host plants are involved, but *Pseudococcus capensis* was found on eleven of these, while particular attention was not paid to hosts for *P. longispinus*, which was found exclusively in greenhouses. It should be mentioned that the specimens were collected as noticed while engaged on other entomological work connected with the Department of Agriculture, and it is by no means implied that the seven species mentioned in this paper include all that are present in the Cape Peninsula.

To insure more accurate measurement of the segments of the antennae, and the setae of the anal lobes and anal ring, all specimens were stained by the Carbol Fuchsin method described in a separate section of this article. The photographs and drawings were prepared by the writer hoping that they would facilitate the determination of the species. At this first opportunity I wish to express my gratitude to Mr. Chas. P. Lounsbury, Chief of the Division of Entomology for the Union of South Africa, for much assistance in Entomological work, and also to Prof. Herbert Osborn, of Ohio State University, for his timely criticism and advice.

Pseudococcus longispinus Targ. 1867.

Dactylopius longispinus Targioni. Studi sulle Cocciniglie 1867.

Dactylopius adonidum Signoret. Essai sur les Cochenilles. Ann. Ent. Soc. Fr. 1875.

Dactylopius longifilis Comstock. Ann. Rep. Comm. Agric. 1880. Washington 1881.

This well known insect (Fig. 1) can be readily recognized by its caudal appendages, but the following particulars are added to make the series uniform and to assist in the determination of slide material.

Adult ♀. Largest specimen found measured while alive 4.1 mm., and had caudal appendages 5.5 mm. long.

Antennae: Measurements in μ .

Joints	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	54-80	58-82	64-84	30-50	40-62	30-48	40-50	94-110
Most common meas'rem'ts	60.62	65.67	70.74	36.38	46.48	38.42	44	102
Average of 20 meas'rem'ts	64	70	71	39	50	40	45	101

Fig. 1. *Pseudococcus longispinus* ♀

Setæ of Anal Lobes: 110μ to 130μ , with 124μ the most common length.

Setæ of Anal Ring: 122μ to 148μ with 134μ the most common length.

Remarks: This species is commonly found on ferns, etc., in greenhouses.

***Pseudococcus citri* Risso 1813.**

Dorthesia citri Risso. Essai Hist. Nat. des Oranges, etc. Paris 1813.

Coccus citri Boisduval. Essai sur l'Entom. Hort. 1867.

Dactylopius citri Signoret Essai sur les Cochenilles 1875.

Dactylopius brevispinus (ex. p.) Targioni. Annali di Agricoltura 1881.

Dactylopius destructor Comstock. Ann. Rep. Comm. Agr. 1880. Washington, 1881.

This species—the common mealy-bug of literature—is easily distinguished from *P. longispinus* by the absence of the long caudal filaments, and from the other species of the locality by the fact that the waxy secretion is most scant down the median dorsal line. Its general appearance is well shown in Plate XIV, Fig. 3, which is greatly enlarged. The seventeen lateral wax appendages are often more or less wanting in old rubbed specimens, especially those living in exposed positions.

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

Ova: Amber yellow, 320–350 μ long, and 146–165 μ broad.

Adult ♀: Largest specimen found, with ovisac completed, measured while alive 4.45 mm. long by 2.64 mm. broad.

Antennae: Plate XV, Fig. 5. Antennal segments, measurements in μ .

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements...	52–74	58–76	52–76	34–46	36–48	36–48	40–54	96–120
Most common meas'r'm'ts	60, 66	62, 65	60, 65	42	42	44	46	108
Average of 30 meas'r'm'ts.	62.6	64.5	64	39.3	43.3	42.8	47.5	106.6

Setae of Anal Lobes: 180 μ to 270 μ with 225 μ the commonest length.

Setae of Anal Ring: 108–138 μ with 115 μ the commonest length.

The distribution of spines and pores round the anal lobes is shown in Plate XVI, Fig. 1.

Remarks: *P. citri* is one of the greatest worries of nursery-men on *Coleus*, and was also quite common in the Cape Peninsula on *Oleander*.

Pseudococcus lounsburyi n. sp.

Ovisac: When complete entirely enclosing the adult ♀, large, elongate, oval, composed of threads which, when seen under the microscope have almost a glassy appearance; 4.5 mm. long, by 2.25 mm. broad. Large numbers of ovisacs were often found matted together between leaf-bases, sometimes forming a mass two inches long by almost as wide.

Ova: Closely surrounded by fibres of the ovisac; orange yellow, 340 μ long by 176 μ in diameter.

Larvæ: Newly emerged, are nearly transparent, showing but the slightest tinge of the usual purplish coloring 680 μ long and 260 μ broad; antennae transparent, of 6 joints.

Male: Puparium small, brownish white. Adult of the usual *Pseudococcus* ♂ form (see figure) with body purplish red in color, .9 to 1.020 mm. in length and .255 mm. across the thorax, the widest part of the body; legs and antennae pale yellow, and semi-transparent. Antennae of 10 joints, .564 mm. long, eyes black; caudal appendages, when living, two stout, .255 mm. long, and two more slender, nearly half as long. Males emerge November and early December.

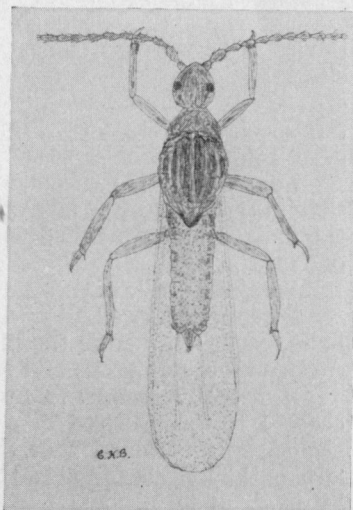


Fig. 2.
♂ of *Pseudococcus lounsburyi*,
greatly enlarged.

Adult Female: At the time of spinning the ovisac, large, 3.7 mm. (4.1 mm. with caudal appendages) by 1.65 mm. broad, becoming somewhat narrower towards the anterior and posterior ends; color purplish, showing distinctly through the ashy white secretion; segmentation very distinct; legs and antennae very pale; lateral wax appendages absent, caudal ones stout at base, somewhat conical, snow white, and appearing granular. Inner pair longer and stouter than the outer ones. Until the females attain approximately the size 2.4 mm. long by 1.1 mm. broad they remain free-moving. (Plate XIV, Fig. 4). After this the ovisac is commenced—a silky mass which ultimately completely envelopes the insect. This is spun from the posterior end forward, as shown in Figs. 5 and 6, until, in the end, it forms a complete covering for the female, and later the ova.

Antennae: Plate XV, Fig. 6.

Segments—measurements in μ .

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	56-66	64-72	43-52	26-36	33-48	26-30	36-42	88-100
Most common meas'r'm'ts	60	68	46	28	42	28	36	88-92
Average of 10 meas'r'm'ts.	61	69	47	28	42	28	37	92

Setae of Anal Lobes. 144 μ to 160 μ long (from 5 measurements).

Setae of Anal Ring. 104 μ to 128 μ long.

Unfortunately, although 35 specimens were mounted, nearly all the setae of the anal lobes were lacking. It commonly happens in clearing specimens in K O H etc., that a number of the hairs, spines, etc., are lost but I have never found it occur to such an extent as in this species. Plate XVI, Fig. 2 shows the distribution of spines and pores round the anal lobes.

Type Slide: On this slide are three specimens, arranged, with the slide in front of one as labeled, in the form of a triangle. The insect at the apex is here described as "a," the one at the left as "b," and the one on the right as "c."

Specimen "a": Size, mounted, 2.8 mm. long by 1.4 mm. broad.

Pores of derm small and scattered, sparingly supplied with small hairs, especially across the middle zones of segments. Hairs on dorsal surface more numerous and longer, sometimes attaining length of 90 μ .

Antennal segments: One antenna folded. Segments of other, in order 1 to 8, measured in μ are 58, 68, 48, 36, 42, 27, 36 and 89. It should be mentioned that Segment IV, measuring, in this specimen 36 μ is the longest found in the whole series. The usual length for joint IV is about 28 μ .

Setae of Anal Lobes. 154 μ , 160 μ .

Setae of Anal Ring: About 128 μ .

Legs: The measurements of the legs on the right side of the insect—left side as mounted with ventral side up are given in μ . It should be noticed that seven measurements are given, and the illustration shows the scheme adopted. The Coxa and trochanter are unsatisfactory as

regards measuring in many instances and the method adopted in the scheme used here is to obtain measurements in direct lines from points which remain definite with different ways of folding of the legs in mounting. Hence the trochanter is measured with the femur.

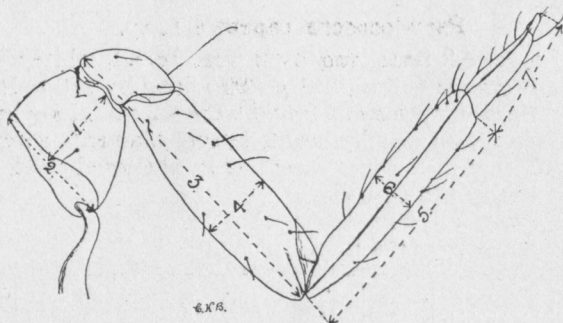


Fig. 3.

Right metathoracic leg of *Pseudococcus lounsburyi* ♀ illustrating scheme of measurements. —

The measurements in μ are given 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.

Prothoracic leg.....	83	129	281	76	190	38	106
Mesothoracic leg.....	83	121	304	76	205	40	106
Metathoracic leg.....	90	129	334	79	243	48	121

Specimen "b": Size mounted 3.2 mm. by 1.6 mm.

The measurements of the segments of the antenna (one lacking) in this insect illustrate a very good average for the material collected. They are: 58, 64, 44, 26, 42, 28, 36 and 91 μ . The Setæ of the anal lobes unfortunately are missing, while those of the anal ring average from 120 μ to 128 μ .

Specimen "c": Size mounted 3 mm. by 1.5 mm.

Antennal Segments: Right—56, 64, 43, 28, 33, 27, 38, 88: Left—62, 64, 43, 27, 38, 28, 36, 88.

The fifth segment of the right antenna in this insect measures only 33 μ . It is a coincidence that this is the least measurement found for this segment, and it is on the same slide as the specimen showing the maximum length for segment IV. One of the setæ of the anal lobes is missing. The one remaining measures 156 μ , while those of the anal ring average about 108 μ .

Host Plant: *Agapanthus umbellatus* L'Hérit.

Remarks: This species was first found by Mr. C. P. Lounsbury on the leaf-bases of this plant in the grounds of Indian House, Kenilworth, on September 10, 1910.

***Pseudococcus capensis* n. sp.**

Ovisac: Large, 4.2 mm. long by 3 mm. broad, white, fibrous.

Ova: Bright orange yellow, 344 μ –390 μ long by 170 μ –190 μ broad.

Adult ♀: Largest specimens found were 4.2 mm. long and 3.4 mm. broad. Waxy secretion usually scant, lateral filaments short and very slender; caudal ones (2), when insect is in sheltered spot, sometimes attaining half the length of body.

Antennae: Plate XV, Fig. 3.

Segments, measurements in μ .

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	60-76	76-90	76-92	36-50	52-64	36-45	40-52	96-115
Most common meas'r'm'ts	68	80	80	40-42	56-62	40	44	104
Average of 20 meas'r'm'ts.	68	81.5	81	42	59	39	44	105.5

Setae of Anal Lobes: 117 μ –152 μ , most common length about 128 μ .

Setae of Anal Ring: 154 μ –180 μ , most common length about 160 μ .

Plate XVI, Fig. 3, shows distribution of glands, etc., round anal ring.

Type: Size mounted 3 mm. by 1.86. Dermis with small scattered pores on ventral surface, with scant short hairs. Dorsal surface with scattered, large pores, some at anterior end with hairs reaching 96 μ in length.

Antennae: Segments, Right—70?, 80, 72, 50, 53, 40, 43, and 110 μ . Left—75?, 80, 75, 45, 56, 42, 43, and 107 μ .

Setae of Anal Lobes about 117 μ long, those of *Anal Ring* about 160 μ long.

Legs: measurements in μ .

Prothoracic leg.....	83	129	304	91	228	38	114
Mesothoracic leg.....	98	129	327	91	258	38	121
Metathoracic leg.....	98	129	357	95	311	53	129

Remarks: This species was found on a number of different host plants, viz.: *Phytolacca dioica* Piper, *Albizzia lophantha*, *Solanum sodomæum* Linn., *Clematis vitalba*, *Pelargonium* sp., *Sonchus oleraceus* Linn., *Senecio vulgaris* Linn., *Malva parviflora* Linn., and *Oxalis cernua* Thunb. It was also found on vines at Constantia and on stored pumpkins at Stellenbosch. The following notes made at the time of collecting the material illustrate some phases of the life-history of this species:

(a) On *Phytolacca dioica* Piper, at Rosebank Station. July 17, 1911. Fruit clusters nearly all fallen. These were heavily infested with Mealy Bug, and on falling to the ground many of the adult females made their way back to the trunks of the trees. At this date many females are to be seen walking about the bark, while the trunks are quite noticeable from the number of ovisacs spun in the cracks of the bark. In the four trees there must be some thousands of ovisacs within five feet of the ground, while in one case they are numerous to a height of 25 to 30 feet.

(b) On *Albizzia lophantha*. In winter this species is commonly clustered on the crowns of young seedling plants of this species immediately below the surface of the ground. Others are found in cracks in the bark of larger trees and later in the season when the leaves and flowers appear the insects are scattered over the whole tree. Large numbers of ovisacs have been found matted together in the seed pods.

(c) On *Stored Pumpkins* at Stellenbosch. Dec. 15, 1910. On this date I collected full-grown females (3-4 mm.) from pumpkins of the Turk's Head variety which had been stored on a roof (galvanized iron) for some months. Numerous completed ovisacs were present. All specimens were below the pumpkins and had the appearance of having remained there for a long time. The pumpkins were exceedingly hard and dry and were on a hot, dry, exposed roof, but the insects were quite healthy looking and lively.

(d) On *Vines at Constantia*. Jan. 3, 1911. This material was collected by Mr. C. P. Lounsbury who states that at this date females of all stages were present in the vines but very few had entered the bunches themselves, which were small at that time.

Pseudococcus wachendorfiæ n. sp.

Ovisac: No definite ovisac was found, although where the adult ♀ was situated a definite white granular patch of waxy secretion was noticed on the plant.

Adult ♀: Largest specimen found measured while alive 4.1 mm. long and 1.9 mm. broad. The body was finely covered with granular secretion, white, but segmentation was still conspicuous. Lateral appendages of wax were absent, but a short caudal tuft was generally noticeable.

Antennæ: Plate XV, Fig. 2.

Segments: Measurements in μ .

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	60-68	44-64	32-56	18-26	28-44	20-28	28-36	66-96
Most common meas'r'm'ts	60	60	44	24	36	24	28.32	80
Average of 10 meas'r'm'ts.	64	56	43	23	36	24	31	78

Setæ of Anal lobes: 154 μ -180 μ with commonest length about 160 μ .

Setæ of Anal ring: 115 μ -144 μ with commonest length about 136 μ .

Plate XVI, Fig. 4, shows distribution of pores etc., round anal lobes.

Type: Specimen mounted measures 2.7 mm. long by 1.8 mm. broad.

Dermis, with numerous scattered pores and numerous short hairs or spines, especially along the median zones of the segments. On the dorsal surface, towards the anterior end, the hairs are numerous and longer, some reaching 72 μ in length.

Antennæ: The segments measured in μ are: ?, 53, 43, 25, 28, 27, 32 and 80 μ on one side, and 64, 56, 44, 22, 32, 26, 31 and 80 μ on the other. The *Setæ* on the anal lobes are 155 μ and 158 μ while those of the anal ring average about 136 μ .

Legs: Measurements in μ .

Prothoracic leg.....	91	121	334	83	212	42	91
Mesothoracic leg.....	106	136	342	91	235	45	98
Metathoracic leg.....	129	152	364	91	281	54	114

Remarks: This species was only found on *Wachendorfia paniculata* Linn. The material was collected by the writer on Newlands Flats, about eight miles from Cape Town, on October 3, 1910. The mealy-bug was found on thirty per cent of the plants of this kind pulled up in an area of about two hundred yards square, but was not once found above the surface of the ground. It was between the leaf-bases, and extended from half to one and a half inches down. The ground was composed of white sand. Ants were in constant attendance and had in some cases raised the sand slightly around the stem of the plant. It was this fact that attracted my attention. It was noticeable that some half-mile away, where the plant was fairly plentiful again, no mealy-bug could be found. It might be suggested that the colonies of ants have something to do with the distribution as the plants are generally somewhat scattered.

Pseudococcus muraltiæ n. sp.

Ovisac: Spherical, 2.3 mm. in diameter, white, fibrous. Large clusters of ovisacs occur sparingly, and are generally overrun by ants. Plate XIV, Fig. 1 shows such a cluster three-fourths natural size.

Ova: Orange yellow in color, oval, averaging 240 μ long by 180 μ wide.

Larvæ: (a) newly hatched, orange yellow, legs and antennæ pale, transparent. The larvæ in this stage are very active, oval in form, measuring $358\ \mu$ long by $170\ \mu$ broad. (b) later, $544\ \mu$ long by $255\ \mu$ broad. Antennæ of 6 joints, about $170\ \mu$ long. Eyes conspicuous, black. Measurements of the larval antennæ in μ gave the following lengths for the segments: 20, 22, 16, 18, 20 and $68\ \mu$. Larvæ began to emerge from ovisacs kept at room temperature on October 25th.

Male: not found.

Adult ♀: (Plate XIV, Fig. 2) small; largest specimen, with completed ovisac, was 1.9 mm. long by 1.13 mm. broad, slatey-gray in color; waxy secretion scant but segmentation conspicuous. Lateral appendages were absent but usually four caudal ones present, the longest of which measured $330\ \mu$. Color in boiling K O H black, then purple.

Antennæ: Plate XV, Fig. 1.

Segments: measured in μ .

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	32-42	34-40	26-34	16-23	21-25	20-24	25-32	72-84
Most common meas'r'm'ts	40	38	30	20	24	22	28	82
Average of 10 meas'r'm'ts.	39	38	31	20	23.5	22	29	82

Setæ of Anal Lobes: $120\ \mu$ – $150\ \mu$, most common length about $130\ \mu$.

Setæ of Anal Ring: $96\ \mu$ – $120\ \mu$, most common length about $108\ \mu$.

Plate XVI, Fig. 5, shows the distribution of spines, etc., round anal lobes.

Type Slide: This slide has two specimens mounted on it, but the one to the left as slide is labeled is considered the type specimen. (Specimen A).

Specimen A: Size mounted 1.6 mm. by 1.14 mm.

Dermis: Pores very scattered. Those on the dorsal surface generally larger than those of ventral surface. On both surfaces are a few scattered hairs. Some of these on the dorsal surface, towards the anterior end are long and very slender, reaching in a few cases $90\ \mu$ long.

Antennæ: Right—34?, 34, 26, 20, 24, 20, 25 and $78\ \mu$. Left—40, 35, 26, 16, 24, 20, 25, and $80\ \mu$.

The setæ of the anal lobes are $128\ \mu$ long, while those of the anal ring average about $112\ \mu$.

Legs, measured according to scheme given with description of *P. lounsburyi* are:

Prothoracic leg.....	45	75	159	60	98	30	84
Mesothoracic leg.....	45	76	170	60	98	30	98
Metathoracic leg.....	53	84	190	60	128	28	106

Specimen B. Size mounted is 1.67 mm. long and 1.18 mm. broad.

Antennæ: Right—?, 36, 32, 17, 24, 22, 30 and $72\ \mu$. Left—?, 38, 31, 16, 24, 20, 27, and $78\ \mu$.

The Setæ of the anal lobes are 128 μ and 134 μ long while those of the anal ring seem to vary between 98 μ and 104 μ .

Host Plant: *Muraltia heisteria*, D. C.

Remarks: As far as is known this small species has only the one host plant. It was found by the writer on the Cape Flats east of Newlands and Rondebosch.

***Pseudoooccus fragilis* n. sp.**

This material was collected on oranges at Constantia by Mr. C. P. Lounsbury on October 19, 1910. Unfortunately, I have no notes with me concerning the living insect, and have no particulars of the ovisac, etc. The insect is so distinct from the other species collected in the district, however, that I will give the measurements from the slide material, and hope to complete the description on my return to the Cape.

Adult ♀: Size of largest mounted specimen 4 mm. long and 2.4 mm. broad. The integument appears exceptionally delicate, the antennæ unusually long, (Plate XV, Fig. 4) and the spines and setæ unusually thin and fragile, and, in mounted specimens, very much bent.

Antennal Segments:

Joints.....	I	II	III	IV	V	VI	VII	VIII
Range of measurements....	64-70	72-90	80-100	56-62	60-84	50-64	48-60	104-120
Most common meas'r'm'ts	64	76	88	58	64	52	56	112
Average of 10 meas'r'm'ts.	66	80	90	57	70	53	55	114

Setæ of Anal Lobes are about 230 μ long.

Setæ of Anal Ring are about 192 μ long.

Plate XVI, Fig. 6, shows the distribution of spines, etc., round the anal lobes.

Type: Size mounted 4.0 mm. by 2.4 mm.

The pores and hairs on the dermis are scant and the latter are very thin. Near the anterior end, on the dorsal surface are a number of long delicate hairs, some of which reach a length of 160 μ or possibly more.

The Antennal Segments measure: Right—64, 84, 96, 58, 74, 54, 51, 118 μ . Left—64, 80, 96, 60, 80, 50, 56, 116 μ .

The Setæ of the anal lobes measure approximately 224 μ long, while those of the anal ring probably average about 196 μ in length.

Legs measured according to scheme given for *P. lounsburyi*.

Prothoracic leg.....	121	167	364	106	250	38	136
Mesothoracic leg.....	129	167	417	102	304	38	144
Metathoracic leg.....	129	159?	432	106	342	45	144

Host Plant: Orange.

STAINING COCCIDAE FOR DETERMINATION, WITH SPECIAL
REFERENCE TO THE GENUS PSEUDOCOCCUS.

During 1910, and the first part of 1911 the writer collected material in the vicinity of Capetown, South Africa, for the purpose of determining what species of the Genus *Pseudococcus* Westwood, were to be found in that locality. Specimens were obtained from twenty-one different kinds of plants, and a series of experiments made to determine which was the most satisfactory way of mounting them for study. Everyone who has worked with this genus will appreciate the difficulties encountered in the determination of species, and also the unsatisfactory nature of the majority of the descriptions given for described species. Most of these descriptions simply give the size, color, amount of waxy covering, antennal formula and host plant. If different descriptions of the same species are available it will at once be seen how variable are the facts given. Smith* (1911) discusses this fact and shows the futility of many of the specific characters generally used.

Notwithstanding the fact that the mere antennal formula is of little value, the relative size of the antennæ as a whole, and of the segments separately, is a very useful character *when the actual measurements are given*. This, together with the average size of the adult ♀ at the time of oviposition, the comparative lengths of the setæ of the anal lobes with those of the anal ring, the nature of the integument and the distribution of pores and spines, furnish, I believe, the best characters obtainable.

For all these characters, except the length of the individuals, specimens cleared and mounted in the usual manner are not the most satisfactory. With regard to the joints of the antennæ especially does this apply, for such specimens are too clear, and the distinction between the joint itself and the conjunctiva is indistinct. Referring to this fact, Smith (loc. cit. p. 313) states: "The chitin is not continuous from one segment to the next and consequently the portion between the chitinous parts of the segments, the conjunctiva, is not visible or only slightly so in well cleared specimens. Consequently, in making

P. E. Smith. "Specific Characters of the Genus *Pseudococcus*." Ann. Ent. Soc. Am. IV, No. 3. Sept., 1911.

measurements, the determination of the end of a segment will be only approximately at the center of the conjunctiva. This difficulty will be increased if there are some bends in the antennæ."

To overcome this difficulty a number of methods of staining were tried, but the one given below proved the most satisfactory and gave excellent mounts.

Puncture the specimens with a coarse needle or the point of a fine scalpel and treat with K O H in the usual manner. After washing in water transfer to strong Carbol fuchsin and leave until deeply stained. Specimens may be left in this for an hour or more, or over night if the stain is diluted. Wash in weak alcohol and bring up to 95% or absolute alcohol. By the time this stage is reached the specimens should be uniformly deeply colored but translucent. Place in clove oil to clear and bleach. The action of this is slow, and the condition of the specimens can be regulated so that any degree of staining can be retained. If left sufficiently long the integument will be quite clear except for the more highly chitinised parts, i. e., antennæ, legs, mouthparts, spines and pores. At this stage the specimens make exceedingly beautiful slides and quite satisfactory mounts to work with. Specimens should be passed from clove oil through xylol into balsam. The illustration shows a photograph from such a mount.

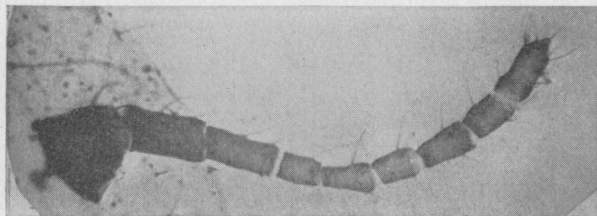


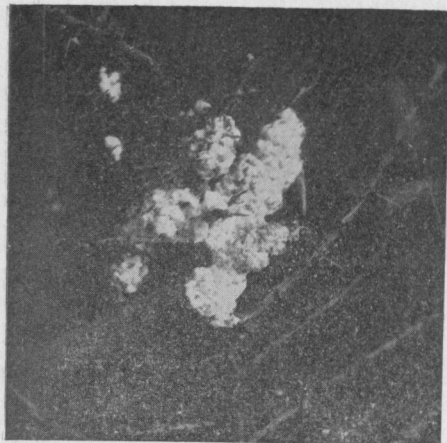
Fig. 4. Microphotograph of right antenna of *Pseudococcus* sp. showing pseudo-articulation of segment viii.

Armoured scales, (also Mallophaga, Pediculidæ and other soft-bodied insects) may also be improved for purposes of study by a very simple method. After treating with K O H and bringing through the alcohols the specimens should be cleared in Beechwood Creosote to which a little Picric Acid has been added. This turns the creosote a bright brown but does

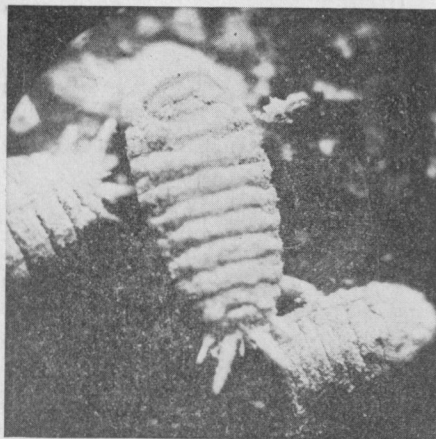
not interfere with its clearing properties. By this means chitin is stained a bright sulphur yellow. From this the specimens may be mounted direct, but are probably better when passed quickly through xylol or clear creosote into balsam.

EXPLANATION OF PLATES.

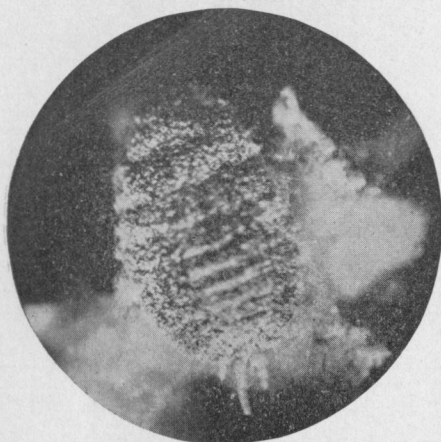
- PLATE XIV. Fig. 1. Cluster of ovisacs of *Pseudococcus muraltiæ* $\frac{3}{4}$ nat. size.
Fig. 2. *P. muraltiæ*, ♀. Fig. 3. *P. citri*. Fig. 4. *P. lounsburyi*, ♀ ♀, before ovisac is begun. Fig. 5. *P. lounsburyi*, ♀, with ovisac begun. Fig. 6. A slightly later stage.
- PLATE XV. Antennae. Camera lucida drawings, all of equal magnification, for comparison of size..
- PLATE XVI. Fig. 1. *Pseudococcus citri*. Fig. 2. *P. lounsburyi*.
Fig. 3. *P. capensis*. Fig. 4. *P. wachendorfiæ*. Fig. 5. *P. muraltiæ*.
Fig. 6. *P. fragilis*.



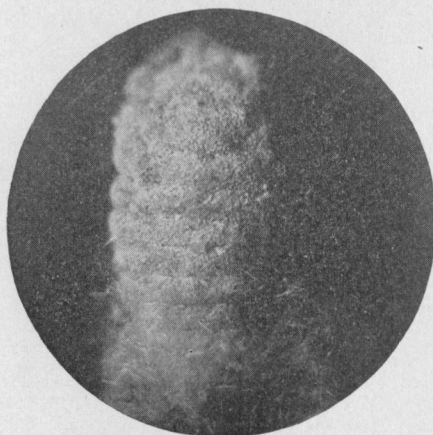
1. Ovisacs of *P. muraliae*.



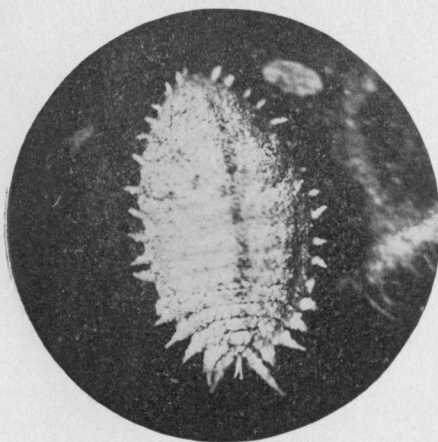
4. *P. lounsburyi*.



2. *P. muraliae*.



5. *P. lounsburyi*.



3. *P. citri*.

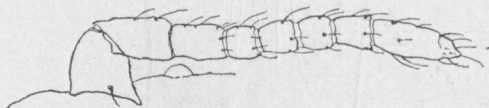
C. K. Brain.



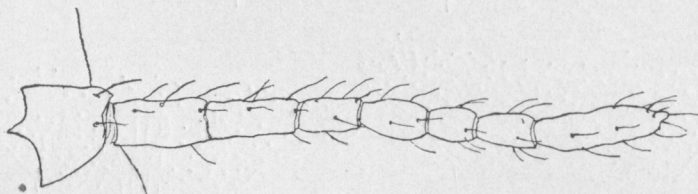
6. *P. lounsburyi*.



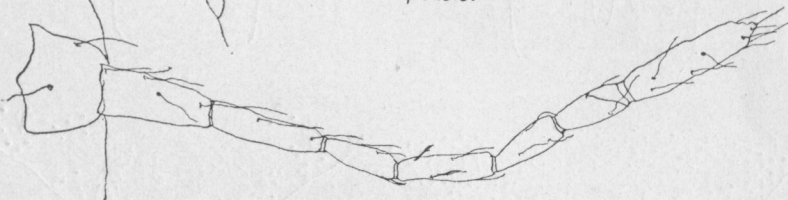
P. muraliae.



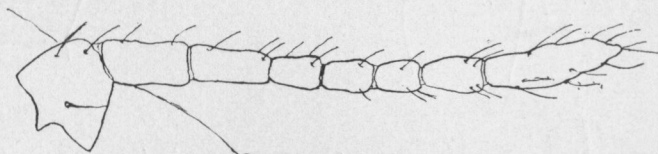
P. wachendorffiae.



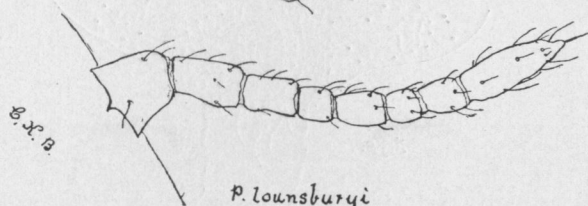
P. capensis.



P. fragilis.



P. citri.



P. lounsburyi

S. K. B.

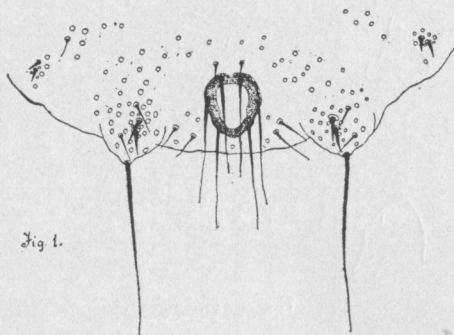


Fig. 1.

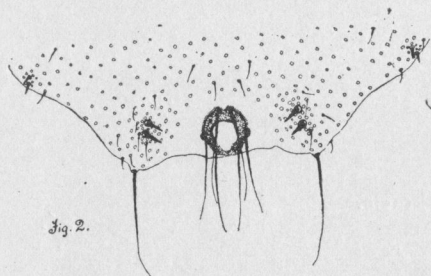


Fig. 2.

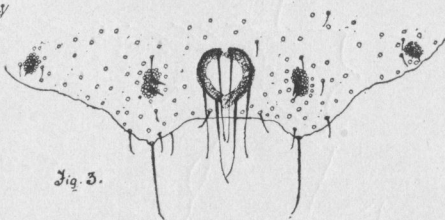


Fig. 3.

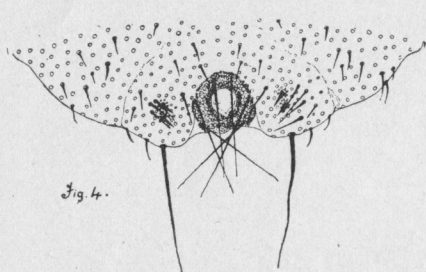


Fig. 4.

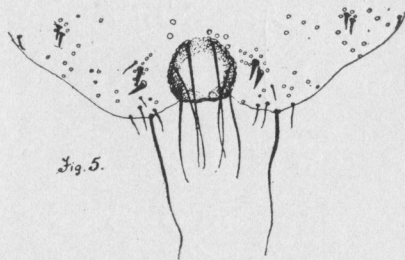


Fig. 5.

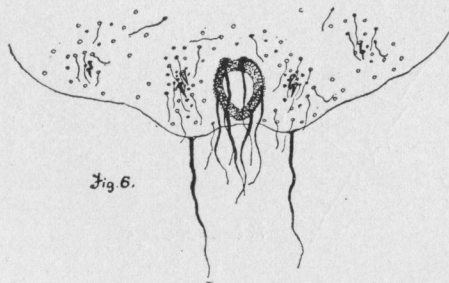


Fig. 6.

B. X. B.

C. K. Brain.

