

On the status and identity of the cochineal insects (Homoptera: Coccoidea: Dactylopiidae)

by

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The status and identity of the cochineal insects currently assigned to the genus *Dactylopius* O. Costa, 1835 are discussed. Altogether nine species, five old and four new, are dealt with: *D. austrinus* spec. nov.; *ceylonicus* (Green, 1896); *coccus* O. Costa, 1835; *confertus* spec. nov.; *confusus* (Cockerell, 1893); *opuntiae* (Cockerell, 1896); *salmianus* spec. nov.; *tomentosus* (Lamark, 1801) and *zimmermanni* spec. nov.

In the author's view *Dactylopius greenii* Cockerell, 1929 (= *Coccus confusus capensis* Green, 1912 [non: Linnaeus, 1764]) is a synonym of *confusus*.

INTRODUCTION

The cochineal insects are a small batch of species which—unique amongst all coccoids—have twice been in the limelight of economic entomology: first as real or supposed sources of a dyestuff, and later as actual or potential agents for the control of certain pest species of *Opuntia* or prickly pears. In both instances they acquired a notoriety as a puzzling and difficult group of insects to work with. To some extent this is ascribable to their own nature, yet the existing confusion about their status and uncertainty as to their identity, largely results from man's careless and at times irresponsible actions. Though indirectly, the situation has been—and still is—complicated by taxonomic questions concerning the host plants.

Problems with the cochineal insects arose fairly early in the course of their history, perhaps first when it became evident that the dye produced by the so-called "true cochineal" or "grana fina" was to attain an increasingly valuable place in trade and industry. Thereafter, repeated attempts were made to get hold of the insect and from time to time living samples were smuggled in spite of the strict surveillance and severe penalties set up by the Spaniards to protect their lucrative monopoly. From the literature it would appear that in all cases an inferior form was involved, the product of which could not commercially compete with the genuine dyestuff. Hence it came to be known as the "wild cochineal" or "grana silvestre". The material thus obtained—or its offspring—was shipped from country to country, in a sort of zigzag world traffic which accounts for the introduction of species into South Africa, Australia, India, Ceylon, etc., where they are now naturalized. However, only at the turn of the last century did authors become aware that the wild form was actually a complex of several closely related species. In recent times more and more samples of cochineal insects were dispatched from North and South America to Australia and/or exchanged between the latter and other countries as part of an extensive campaign for the reclamation of farming and grazing land from pest prickly pears. Very often identifications rested on the external appearance of living specimens which is of little or no diagnostic reliability because the

pattern of the covering cottony matter, besides being much alike in some species, is frequently and easily torn apart by ants, wind, etc. Such a practice, together with occasional misidentifications by taxonomists, led workers to refer to the same species by different names, or to use the same name for different species. Moreover, names were given to species that had not even been seen by authors, whilst a species long in use for the control of one of the most serious *Opuntia* pests still awaits naming. Many changes in classification and nomenclature have been made, and yet even today two of the older species are referred to by names which, by strict application of the principle of priority, would be invalid. Last but not least is the question of certain types: as though by tacit agreement, authors (or later workers) gave type status to specimens which did not belong to the original material. Luckily in no instance was the identity of the relevant species affected.

This was the situation gathered by the writer when, following the approval by this Institute of a project for a search in South America for natural enemies of the jointed cactus *Opuntia aurantiaca* Lindley, he was requested by Dr D. P. Annecke to identify the cochineal insects, to undertake a re-appraisal of questions about which taxonomists and biologists alike were at variance, and if possible to revise the group. Despite initial misgivings that the status of some species might be upset, no major changes have been necessary. In fact the conclusions presented in this paper on the whole corroborate those drawn by Ferris (1955). If doubts and confusion persisted even after Ferris' account was published, it was because his work did not cover all the species (valid and otherwise) then known and because he ignored a few thorny problems altogether.

SYSTEMATICS AND MORPHOLOGY

All valid species, old and new, dealt with here are retained in, or assigned to the genus *Dactylopius* O. Costa, 1835, as it is currently understood. It would serve no practical purpose to go over the history of this genus because, following the writer's finding (De Lotto, 1971) that the type-species *D. coccus* O. Costa, 1835, was first fixed by Costa himself in 1835, most of what has been written on this matter is now null and void.

In its turn the genus *Dactylopius* has been designated type of group names of higher taxa, on the rank, characters and composition of which there has hardly ever been full agreement amongst authors. An assessment of their diverging opinions is, however, beyond the aim of this paper.

The main body structures distinguishing the species of *Dactylopius* from those of other genera with which they are otherwise more or less related, are: the absence in all stages of their development of a setigerous, cellular anal ring*, and the occurrence of clusters of quinquelocular pores surrounded by a strongly sclerotized rim and with which are normally associated one or more tubular ducts. Other significant features are the presence of a red pigment in the body contents and a host specificity to cactaceous plants, particularly to those of the genus *Opuntia*.

Two comprehensive accounts of the genus *Dactylopius* have been published in the past: one by Green (1912), another by Ferris (1955). Green, reluctant to depart from

* This very feature was used by Balachowsky (1942) for placing the cochineal insects in a family by themselves, to which he also assigned the genus *Epicoccus* Cockerell, 1902. Obviously this was a casual oversight because the type-species *Coccus acaciae* Maskell, 1897, is provided with a well developed setigerous, cellular anal ring (Morrison & Morrison, 1922).

the old pre-Fernald nomenclature, retained all species in the Linnaean genus *Coccus*, the type-species of which was then thought (quite improperly) to be the cochineal insect of commerce. In accordance with the methods prevalent at that time, his descriptions dwelt on structures such as legs, eyes and antennae, which have scarcely any taxonomic value; the drawings of the body setae and clusters of pores, being presented out of context, are also of little help for the recognition of the species. Ferris' account is unquestionably sounder and of a higher standard, even though his diagrams are somewhat sketchy and based on specimens at a rather advanced stage of maturity.

Though not complex, the taxonomy of the cochineal insects presents some serious difficulties due to distortions of the adult specimens when mounted on slides. Such distortions, often conspicuous, are caused partly by the convexity of the body which is remarkably high even at the beginning of the stage, and partly by the strong sclerotization of legs, stigmas, etc., which tends to pull the adjacent derm out of shape. A comparative study of the dermal structures and their distributive patterns is therefore particularly laborious and tiresome, and quantitative analyses which may supply significant data for the separation of species or the recognition of forms are utterly unfeasible.

The general organization of the cochineal insects is the same of that of the mealybugs (Pseudococcidae), but the body segmentation, especially on the prosoma, is more poorly marked. The outline of the body of immature adult females is broadly elliptical or oboval with the abdominal extremity evenly rounded with no trace of anal lobes and no apical seta. In common with other insects, the gonopora or vulva opens intersegmentally between the (viii) and (ix) urosternites. The anal ring, which is here recognized as a modification of the (x) abdominal segment, is situated dorsally, slightly removed from the apex of the abdomen. Its anterior portion is very narrow, crescentic in form and moderately to fairly strongly sclerotized; the posterior half is further reduced and looks like a faint suture of the derm*. From the anal ring the derm extends inwards to the body cavity, forming a sort of funnel-shaped invagination at the inner end of which the anus opens. In *tomentosus* the ring is obsolete.

The main body features used in this paper for the diagnoses of species are: the body setae, the quinquelocular pores, the tubular ducts and the thoracic spiracles.

Setae. The dorsum as well as the lateral and sublateral areas of the venter are covered by numerous modified setae. They are all short (the longest ones hardly attaining 35–40 μ in length), but very variable in shape, ranging from slender, nearly setose as most of those of *D. coccus*, to very stout with their base greatly enlarged as in *ceylonicus*, or else cylindrical or slightly tapering toward the apex which is either truncate or rounded. On the lateral, latero-median and median areas of the dorsum are usually recognizable some larger setae, set singly or in groups of two or three in longitudinal rows reminiscent of the cerarii of some mealybugs. Their arrangement is, however, very irregular. Apart from *ceylonicus* in which the dorsal body setae are practically all alike, in other species their variations in size follow two major patterns: thus in *opuntiae*, *salmianus*, etc., the setae regardless of their size, are more or less evenly distributed; while in *austrinus*, *confusus*, etc., they tend to be progressively smaller toward the head.

* It is worth noticing that just in front of and around the ring are inserted a few pointed setae which suggest more a connection with the anal ring organ than with the body vestiture. If this were true, then their association with the ring would represent either a primitive stage in the development of the organ or its vestige resulting from a process of reduction.

The drawings of the modified body setae inserted on each diagram have been made to the same scale in all species.

Very small, finely pointed setae occur on the mid-area of the venter, mostly on the postsoma. In *coccus* they are more or less similar to those of the dorsum. Being taxonomically valueless, no reference to this kind of seta is made in the descriptions and, in order to avoid a superfluous overcrowding of structural details, they have been omitted from the drawings.

Pores. There are two kinds of dermal pores, both of the quinquelocular type, though at times their inner structure is obscure. Those here called "wide-rimmed pores" are fairly thick and provided (as the term suggests) with a wide strongly sclerotized rim (figs 1a and 1d) which is very conspicuous in those occurring in *coccus*. They may be set singly, but far more commonly, they are fastened together in clusters of up to 30 or 40, each of which normally incorporates one or more tubular ducts. As a rule the clusters of the wide-rimmed pores are distributed on the dorsum and on the lateral and sub-lateral areas of the venter, intermingled with the modified body setae. However, in a few species, some clusters extend across the ventral mid-area of the thorax as in *confertus*, or across the first segments of the abdomen as in typical specimens of *austrinus*, or all over the venter as in *coccus*. The number of pores in a cluster is very variable in most species. Normally the largest clusters occur on the last segments of the abdomen, particularly on their marginal area. For descriptive and comparative purposes the average number of pores in clusters occurring on the dorsal median and submedian areas of the thorax has been chosen.

The other pores are flat or flattish with a narrow rim (fig. 1b), hence the term "narrow-rimmed pores" is here applied to them. They occur singly or in loose groups or are joined together in small clusters, among which (but never embodied in them) are some tubular ducts of the type described below. These pores are present only on the mid-area of the venter and tend to be more numerous on the abdomen, especially on the last segments. In *coccus* they are entirely missing.

In all diagrams the wide-rimmed pores are represented as black dots and the narrow-rimmed ones as small circles, which are shown slightly larger than the dots: actually the opposite is the case.

Ducts. In all species the ducts not associated with the quinquelocular pores are structurally similar to those of the clistostomatic type common to coccids and eriococcids, except that their outer ductlet projects a little from the body wall and the orifice is very slightly sclerotized (fig. 1c). They are present only on the mid-area of the venter on which they are rather numerous and randomly distributed. In *coccus* and *confertus* they are missing.

In the accompanying diagrams the ducts are represented as small dotted lines.

Spiracles. The anterior and posterior thoracic spiracles are large, being at times longer than the combined length of the femur and trochanter, with the atrial wall strongly sclerotized and provided with a sort of closing apparatus. The latter consists of a sclerotized triangular or sub-triangular operculum with its base fastened on, or near the atrial orifice and having the lateral edges smooth, rough or provided with minute indentations or spiniform processes. The apparatus may be rudimentary as in *zimmermanni* or well developed as in *coccus*.

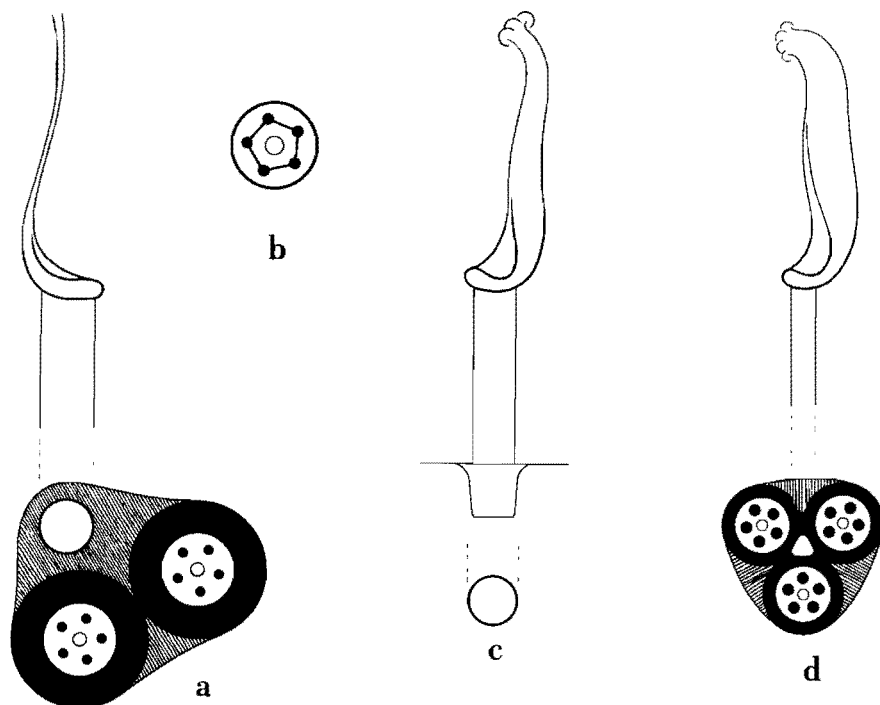


Fig. 1. Glandular structures of the derm in species of the genus *Dactylopius*. **a.** Cluster with two wide-rimmed pores incorporating a tubular duct as occurring in *D. coccus*. **b.** Ventral narrow-rimmed pore. **c.** Ventral tubular duct. **d.** Cluster with three wide-rimmed pores incorporating a tubular duct as found in species other than *coccus*.

Other structures. Although no other body structures could be used by the writer for diagnostic purposes, a few notes on their main characteristics are given here.

All legs are moderately to well developed with all podites strongly sclerotized; the tarsal and unguinal digitules are very slender and slightly knobbed at the apex; the claws are devoid of denticle. The antennae are short and stout, tapering toward the apex, with 6 or 7 segments, but the articulations are often incomplete and/or obscure. The eyes are rather large, roughly hemispherical or truncate conical. The rostrum is always large and three-segmented.

TYPES AND THEIR LOCATION

As soon as all original and other relevant papers were at hand, it emerged that the collecting data accompanying the descriptions at times did not tally with those of the labels on the type specimens. While the circumstances which led Green to switch the type status from the original specimens of *ceylonicus* to those of *indicus* are understandable, in the case of *confusus* it is not clear why (short of an oversight) Cockerell (or a later worker) gave type status to some supplementary specimens and not to those of the original series.

As is often the case when dealing with old species, the condition of the types was from poor to appalling. Most of the specimens were old and in a very advanced stage of maturity, with the derm badly distorted, folded and refolded; the body cavity either full of embryonic larvae or not properly cleared of its contents, or both; the condition was aggravated by the poor quality of Canada balsam which, besides being much darkened by age, at times incorporated fragments of debris. After a very wearisome process of clearing, restoring and restaining, all type specimens have been remounted singly and the best of them chosen as the "lectotype" of its respective series; each of the remainder was designated "syntype" and provided with a xerox copy of the original label. All series have been numbered.

The types of the old species, and those of the new ones described in this paper, are at present located as follows:

	B.M.(N.H.)*	P.P.R.I.	U.S.N.M.
<i>Acanthococcus confusus</i> Cockerell . . .	—	—	1 + 6 (†)
<i>Coccus cacti ceylonicus</i> Green . . .	1 + 2	—	—
<i>Coccus cacti opuntiae</i> Cockerell . . .	—	—	1 + 1
<i>Coccus confusus capensis</i> Green . . .	1 + 3	—	—
<i>Coccus indicus</i> Green . . .	1 + 4	—	—
<i>Coccus tomentosus newsteadi</i> Cockerell .	—	—	1 + 3 (‡)
<i>Dactylopius austrinus</i> spec. nov. . . .	3	1 + 10	3
<i>Dactylopius confertus</i> spec. nov. . . .	2	1 + 7	2
<i>Dactylopius salmianus</i> spec. nov. . . .	1	1 + 5	1
<i>Dactylopius zimmermanni</i> spec. nov. .	3	1 + 11	3

* B.M.(N.H.) = British Museum (Natural History), London.

P.P.R.I. = Plant Protection Research Institute, Pretoria.

U.S.N.M. = United States National Museum, Washington.

† The first figure indicates the holotype or lectotype specimen, the second one the number of paratypes or syntypes.

‡ These specimens have been re-mounted separately on a single slide because, owing to the fading of the ink, the original label could not be xeroxed.

LIST AND KEY TO SPECIES

Altogether nine species are recognized in this paper, four of which are described as new. The following is an alphabetical list of their valid names, synonyms, etc. known to date.

- argentinus* Dominguez, in: Autran, 1907 *nomen nudum*
argentinus Dominguez, 1915 = *ceylonicus* Green, 1896
austrinus spec. nov.
bassi Targioni Tozzetti, 1866 *nomen nudum*
= *cacti bassi* Targioni Tozzetti, 1866
blanchardii Targioni Tozzetti, 1868 *nomen nudum*
cacti auctorum [non: Linnaeus, 1758] = *coccus* O. Costa, 1835
cacti bassi Targioni Tozzetti, 1866 = *bassi* Targioni Tozzetti, 1866
cacti ceylonicus Green, 1896 = *ceylonicus* Green, 1896
cacti confusus Cockerell, 1893 = *confusus* Cockerell, 1893
cacti opuntiae Cockerell, 1896 = *opuntiae* Cockerell, 1896
ceylonicus Green, 1896
= *argentinus* Dominguez, 1915
= *cacti ceylonicus* Green, 1896
= *indicus* Green, 1908

coccus O. Costa, 1835	
= <i>cacti auctororum</i> [non: Linnaeus, 1758]	
= <i>mexicanus</i> Lamark, 1801— <i>nomen oblitum</i>	
= <i>sativus</i> Lancry, 1791— <i>nomen oblitum</i>	
= <i>signoreti</i> Cockerell, 1900	
confertus spec. nov.	
confusus Cockerell, 1893	
= <i>cacti confusus</i> Cockerell, 1893	
= <i>confusus capensis</i> Green, 1912 [non: Linnaeus, 1764]	
= <i>confusus newsteadi</i> Cockerell, 1898	
= <i>greenii</i> Cockerell, 1929	
= <i>newsteadi</i> Cockerell, 1898	
= <i>tomentosus confusus</i> Cockerell, 1893	
= <i>tomentosus newsteadi</i> Cockerell, 1898	
<i>confusus capensis</i> Green, 1912 [non: Linnaeus, 1764]	= <i>confusus</i> Cockerell, 1893
<i>confusus newsteadi</i> Cockerell, 1898	= <i>confusus</i> Cockerell, 1893
<i>greenii</i> Cockerell, 1929	= <i>confusus</i> Cockerell, 1893
<i>indicus</i> Green, 1908	= <i>ceylonicus</i> Green, 1896
<i>mexicanus</i> Lamark, 1801— <i>nomen oblitum</i>	= <i>coccus</i> O. Costa, 1835
<i>newsteadi</i> Cockerell, 1898	= <i>confusus</i> Cockerell, 1893
opuntiae Cockerell, 1896	
= <i>cacti opuntiae</i> Cockerell, 1896	
= <i>tomentosus</i> : Cockerell, 1896	
salmianus spec. nov.	
<i>sativus</i> Lancry, 1791— <i>nomen oblitum</i>	= <i>coccus</i> O. Costa, 1835
<i>signoreti</i> Cockerell, 1900	= <i>coccus</i> O. Costa, 1835
<i>silvestris</i> Lancry, 1791— <i>nomen oblitum</i>	= <i>tomentosus</i> Lamark, 1801
tomentosus Lamark, 1801	
= <i>silvestris</i> Lancry, 1791— <i>nomen oblitum</i>	
= <i>tomentosus newsteadi</i> Cockerell, 1898— <i>partim</i>	
<i>tomentosus</i> : Cockerell, 1896	= <i>opuntiae</i> Cockerell, 1896
<i>tomentosus confusus</i> Cockerell, 1893	= <i>confusus</i> Cockerell, 1893
<i>tomentosus newsteadi</i> Cockerell, 1898	= <i>confusus</i> Cockerell, 1893
<i>tomentosus newsteadi</i> Cockerell, 1898— <i>partim</i>	= <i>tomentosus</i> Lamark, 1801
zimmermanni spec. nov.	

The nine species can be separated by using the following key:

- 1 Clusters of wide-rimmed pores extending across the ventral mid-area of the abdomen and/or thorax 2
- Clusters of wide-rimmed pores never occurring on the mid-area of the venter 4
- 2 All clusters of wide-rimmed pores provided with one or more long ducts; narrow-rimmed pores always present on the ventral side of the last abdominal segments 3
- Clusters of wide-rimmed pores normally devoid of ducts, except for a few provided with a single duct having the inner ductlet very slender; narrow-rimmed pores entirely absent **coccus**
- 3 Ducts and narrow-rimmed pores entirely absent from the ventral prosoma; the latter being replaced by clusters of wide-rimmed pores; dorsal spines rather few **confertus**
- Ducts and narrow-rimmed pores present on the ventral prosoma; clusters of wide-rimmed pores set across the ventral mid-area of the first three or four abdominal segments; dorsal spines longish and rather numerous **austrinus**
- 4 Dorsal body spines tending to become progressively shorter and more slender towards the head 7
- Dorsal spines on the head practically attaining same size as those of the abdomen 5
- 5 Clusters of wide-rimmed pores (especially those formed by less than four pores) normally devoid of ducts **salmianus**
- Clusters of wide-rimmed pores always provided with one or more ducts 6

- 6 Dorsal spines somewhat variable in size; ratio between the overall length and the diameter of the enlarged base ranging from 1,3 to 1,6; narrow-rimmed pores very numerous on the ventral side of the last three abdominal segments; a few are scattered on the ventral prosoma and along the outer margin of the posterior spiracles **opuntiae**
- Dorsal spines all practically attaining the same size, except for a few set dorsally on the marginal and median area of the abdominal segments which are rather larger; ratio between the overall length and the diameter of the enlarged base ranging from 0,7 to 1,2; narrow-rimmed pores crowded on the ventral side of the last four abdominal segments; other are distributed on the ventral mid-area of the prosoma as well as all around the posterior spiracles **ceylonicus**
- 7 Anterior part of the anal ring well marked 8
- Anal ring obsolete **tomentosus**
- 8 With some large dorsal spines distributed as far as the thorax and head; sclerotized flap on the inner side of the atrium of the posterior spiracles rounded **zimmermanni**
- Large dorsal setae present only on the last three or four abdominal segments; sclerotized flap on the inner side of the atrium of the posterior spiracles variously dentate **confusus**

DESCRIPTIONS OF SPECIES

Of the five old species which are recognized as valid, only three, *ceylonicus*, *confusus* and *opuntiae*, are fully redescribed and illustrated here. For the remaining two, *coccus* and *tomentosus*, there is no need to give new diagnoses and diagrams because those presented by Ferris (1955), together with the few minor amendments appended by the writer, will prove adequate for their identification.

The references listed under the heading of the old species are limited to their original source, synonyms and changes in their classificatory and nomenclatural status.

Enlargements of the dermal structures (the details of which are shown in fig. 1) have been omitted from the diagrams.

Dactylopius austrinus spec. nov., fig. 2

Living adults not seen but from pictures presented by Dodd (1940), Pettey (1948) and Mann (1970) the insect looks fully covered by cottony matter, the pattern of which has never been described in detail.

Immature adult females, when mounted, broadly elliptical or oboval in outline; dimensions of the graphotype: length 2,7 mm; width 1,8 mm. Dorsal and ventral lateral modified body setae cylindrical or very slightly tapering toward the apex, rather slender and tending to be progressively smaller anteriorly (fig. 2a-b), not very numerous. Wide-rimmed pores set in clusters, with each of which are associated one or more ducts. On the dorsal median and submedian areas of the thorax the clusters are mostly built up with three, four or five pores. Small clusters are arranged in irregular rows across the ventral mid-area of the first three abdominal segments. Narrow-rimmed pores crowded on the ventral side of the last three or four abdominal segments, others are scattered on the prosoma. Ducts rather numerous on the ventral mid-area of the thorax and head. Anterior and posterior spiracles large with the sclerotized operculum well developed and provided with some minute indentations or spiniform processes on the lateral edges. Legs rather short and slender. Antennae with six short, stout segments. Anal ring presenting nothing distinctive.

MATERIAL EXAMINED. SOUTH AFRICA. Cape Province, Bedford: 23.viii.1966, ♀ holotype and 3 ♀♀ paratypes, coll. No. H.C. 2290. Uitenhage: 21.i.1966, 5 ♀♀ paratypes,

coll. No. H.C. 2031; 26.viii.1966, 4 ♀♀ paratypes, coll. No. 2294. Cookhouse: 14.ii.1966, 4 ♀♀ paratypes, coll. No. 2566; all from *Opuntia aurantiaca* Lindley (*W. A. Burger*).

Other records of the same species from the same host plant are as follows: ARGENTINA. Mendoza, Mendoza: 18.ii.1972 (*H. Zimmermann*). AUSTRALIA. New South Wales, Bingara: 20.ii.1967 (*V. H. Gray*). Queensland, Ipswich: 10.vii.1967 (*B. W. Willson*).

This species was originally discovered in Argentina by Australian entomologists and subsequently referred to by Dodd (1940), Mann (1969; 1970) and Pettey (1948) as *Dactylopius* sp. near *confusus* (Cockerell), and by Karny (1972) as "species J".

Specimens are at hand from Argentina and Australia which differ from the typical ones in that the clusters of wide-rimmed pores on the ventral mid-area of the first abdominal segments are strongly reduced in number or missing altogether and replaced by narrow-rimmed ones. Very likely they are referable to the strain introduced in Australia in 1934 which according to Dodd was not "as vigorous as the earlier stocks". This strain, or form, does not seem to occur in South Africa where the present populations are the descendants of a single parent stock introduced in 1932, which was part of the first consignment en route to Australia.

Dactylopius ceylonicus (Green, 1896), fig. 3

Coccus cacti ceylonicus Green, 1896: 7

Coccus indicus Green, 1908: 28

Dactylopius ceylonicus (Green); Sanders, 1909: 38

Dactylopius argentinus Dominguez, 1915: 3

Dactylopius indicus (Green [*non*: Signoret]); Green, 1922: 358

The name *Coccus cacti ceylonicus* was introduced by Green (1896) in an annotated catalogue of the coccoids of Ceylon for designating a new cochineal insect collected on an unidentified species of *Opuntia* at Hambantota, a village on the south coast of that island. Except for a few remarks on features of the antennae of the two sexes, no formal description was then given. A few years later he (Green, 1908) re-named the species *Coccus indicus* and described it from specimens collected by I. H. Burkill at Kangra, a town lying at the foothills of the western Himalaya. The specimens of the two lots, though from localities so far apart, were indeed referable to the same taxonomic species, the nomenclatural status of which was, however, open to question. Thus Sanders (1909), deeming adequate the few notes originally appended by Green, recorded the insect with the name of *ceylonicus* (which he raised to specific rank) and listed *indicus* as a synonym of it. A similar view was later explicitly advanced by Cockerell (1929). The writer fully concurs with both authors on the ground that the alternative course would raise another nomenclatural problem, namely that of the junior homonymy between Green's species and *Dactylopius indicus* Signoret, 1875.

The status of *Dactylopius argentinus*, too, has been surrounded by some uncertainty. The name was first presented by Autran (1907) in a catalogue of the coccids of Argentina. He credited the species to J. A. Dominguez and as a reference to its original source he cited a paper by the latter author which would have been issued the same year in volume 17 of the *Trabajos del Instituto de Botánica y Farmacología*. Actually the paper was written in 1908 and the magazine published in 1915; moreover its text was exclusively concerned with the chemical properties of the dyestuff produced by the insect. Lizer (1922) regarded *D. argentinus* a *nomen nudum* and placed it in synonymy with Green's species.

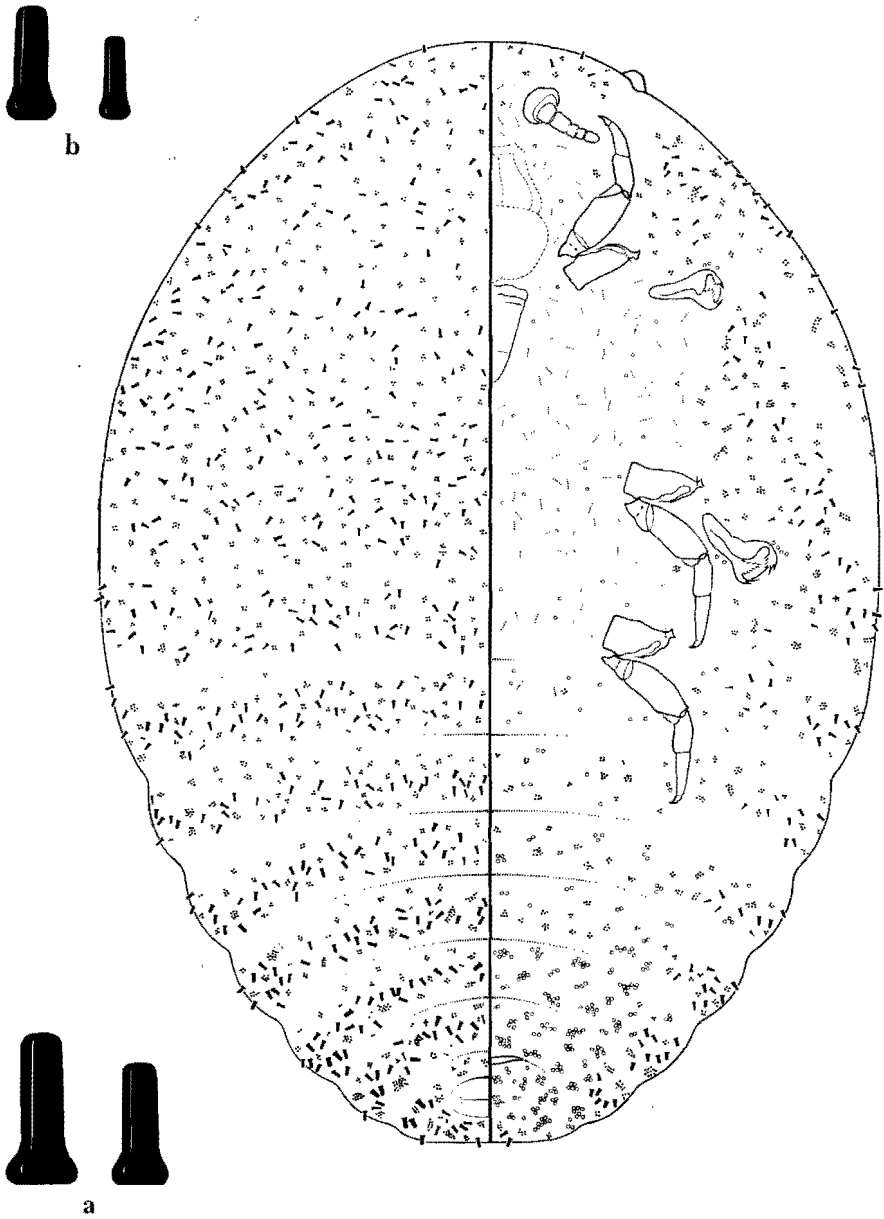


Fig. 2. *Dactylopius austrinus* spec. nov.

The original material of *ceylonicus*, which had been incorporated by Green with that of *indicus* (presumably at the time when he described the latter), consisted of one slide with three specimens labelled: "*Coccus indicus* Green; on *Opuntia* sp.; Hambantota, Ceylon" without any indication of their pristine status. The original material of *indicus* was represented by two slides labelled: "*Coccus indicus* Green; from *Opuntia dillenii*. Kangra, India; coll. Burkill No. 15487", one of which, with five specimens, was hand-marked "TYPE". The specific name of the host plant was deleted with a crossing ink line, very likely following Burkill's remark (*in*: Green, 1912) that in India the insect infested *O. monacantha* and neglected *dillenii*.

Living adult females have not been seen by the writer; Green (1912) briefly described them as "densely covered with white mealy wax". The young adult females, when mounted, are broadly oboval or elliptical to nearly circular in outline; the graphotype is a fairly large specimen 3,3 mm long; 2,5 mm wide. Dorsal and ventral lateral modified body setae (fig. 3b) very short and very stout, cylindrical, with their base much enlarged; all more or less attaining the same size and shape; very numerous and evenly distributed. On the lateral and median dorsal areas of the last abdominal segments are often present a few setae noticeably larger (fig. 3a), set either singly or in groups of two or three; others may occasionally be scattered elsewhere on the dorsum. Wide-rimmed pores occurring singly or in small clusters; in either instance at least one duct is associated with them. On the dorsal median and submedian area of the thorax the clusters are mostly formed with three pores. Rather numerous narrow-rimmed pores are crowded on the median and submedian ventral areas of the last four abdominal segments; others are set in very irregular rows or groups all around the spiracles, and scattered on the ventral prosoma. Ducts present all over the mid-area of the venter. Anterior and posterior spiracles large with the sclerotized operculum well developed and provided with minute spiniform processes on the lateral margins. Legs short and robust. Antennae short with six or seven segments; the articulation between the third and fourth segments is often obscure or incomplete. Anal ring normal.

MATERIAL EXAMINED. ARGENTINA. Santa Fe, Vera: 15.ii.1971, on *Opuntia retrorsa* Spegazzini (*H. Zimmermann*). AUSTRALIA. Queensland, Sherwood: 26.vii.1967 on *Opuntia monacantha* Haworth (*B. W. Willson*). BOLIVIA. Santa Cruz, Camira: 7.vii.1972, on *Opuntia canina* Spegazzini (*H. Zimmermann*). PARAGUAY. Capital, Asunción: 15.vi.1970, on *Opuntia* sp. (*do.*). SOUTH AFRICA. Cape Province, Port Alfred: 18.vii.1968, on *Opuntia monacantha* Haworth (*M. Karmy*).

In the course of his search for natural enemies of prickly pears in Argentina, Mr H. Zimmermann forwarded numerous lots of *ceylonicus* which seems the species predominant in that country. Among the material examined were found specimens showing noticeable variations in some structures suggesting the presence of forms or strains: biological, ecological, etc. However, all attempts to sort them out were fruitless. The variations mainly concern the number of wide-rimmed pores which, on the dorsal median and submedian areas of the thorax may be set mostly singly, or in clusters the majority of which formed with two, or three, or four pores; the number of the dorsal modified body setae which may at times be roughly reduced to half of that typical of the species; finally the shape of the setae may occasionally be rather slender and their base somewhat narrower.

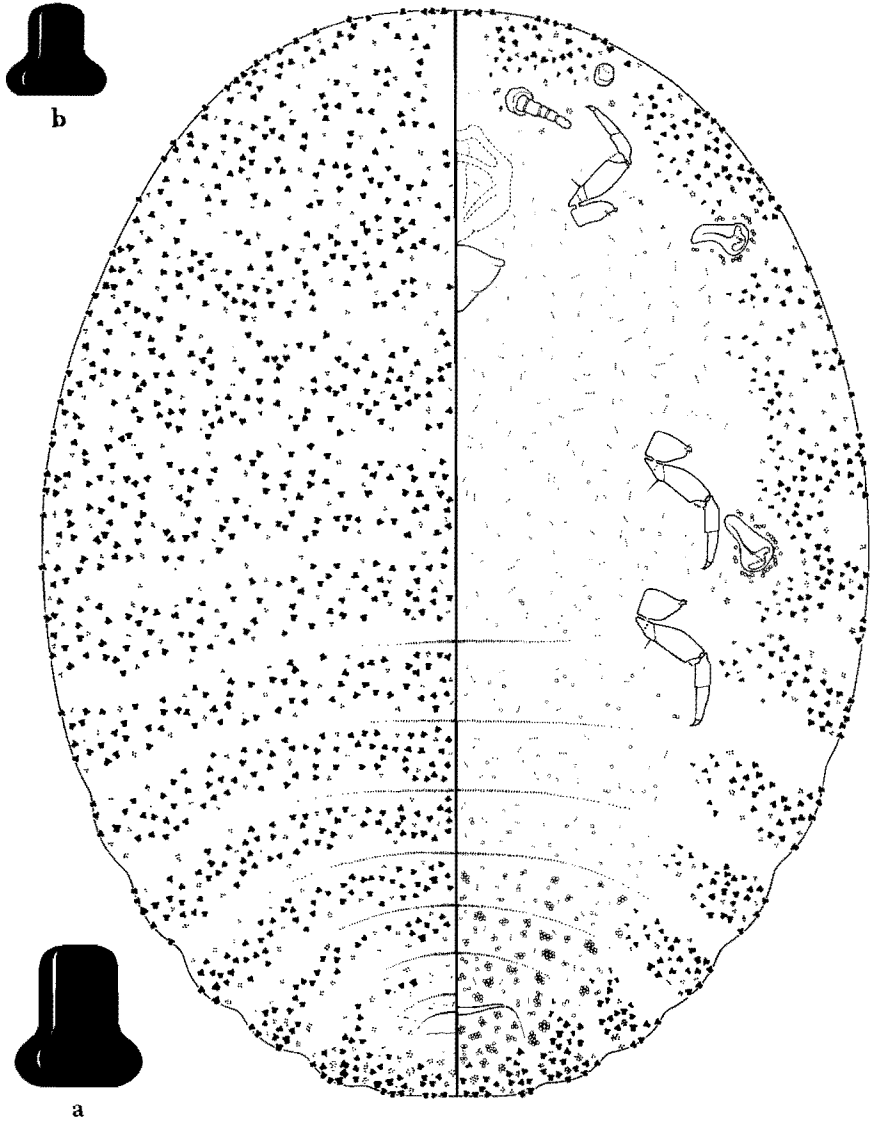


Fig. 3. *Dactylopius ceylonicus* (Green).

Dactylopius coccus O. Costa, 1835

- Coccus cacti** auctorum [*non*: Linnaeus, 1758]
Coccus sativus Lancry, 1791: 486—*nomen oblitum*
Coccus mexicanus Lamark, 1801: 299—*nomen oblitum*
Dactylopius coccus O. Costa, 1835: 16
Pseudococcus cacti (auctorum); Westwood, 1840: 448
Pseudococcus signoreti Cockerell, 1900: 992

On this species there is available an exuberant literature, the interest of which is now mainly historical. The insect was first noticed at the beginning of the XVI century in Mexico by the Spaniards who subsequently introduced it to other parts of their overseas possessions as well as to Spain. Following the discovery of the aniline dyes, the cochineal industry rapidly declined to negligible amounts still in demand for the manufacture of certain cosmetics, beverages, etc. Having lost its commercial value, the insect did not find any relevant rôle in the control of prickly pears because its host specificity is restricted to plants none of which rank as pests.

For nearly a century and a half the species was referred to as *Coccus cacti* Linnaeus, 1758, which Cockerell (1899a) made quite clear was actually a margarodid. After some understandable indecision in his quest for a substitute, Cockerell's choice happened to fall on *Dactylopius coccus* O. Costa, 1835, which, as Lindinger (1943; 1949) disclosed, is actually a junior synonym, the insect having been previously described in 1791 by Lancry as *Coccus sativus* and 1801 by Lamark as *C. mexicanus*. However, in consideration that Costa's name has by now become well established and widely used in systematic and economic literature alike, a change as suggested by Lindinger is utterly undesirable. To this end, an application has been presented by the writer to the International Commission of Zoological Nomenclature for placing the two senior synonyms on the official index of rejected names as *nomina oblita*.

The description and diagram of *coccus* presented by Ferris are fairly adequate for the identification of the species, so there is no need to treat it again in this paper. However, to his diagnosis the following few amendments should be appended. The ventral ducts and narrow-rimmed pores are always absent; the wide-rimmed pores, whether singly or in clusters, are distributed over both sides of the body and are devoid of ducts, except a few occurring on the last abdominal segments; the segmentation between the 3rd and 4th antennal articles is often incomplete or obscure, and specimens with six articles to the antennae are rather common; the spiracles are very large and strongly sclerotized with the operculum well developed; the latter is bluntly pointed with the lateral margins smooth and it covers nearly the whole atrial orifice, leaving only a small transverse slit; the rostrum is three-segmented.

MATERIAL EXAMINED. PERU. Cuzco, Cuzco: 18.iv.1971, on *Opuntia* sp. (*H. Zimmermann*). SOUTH AFRICA. Cape Province, Cape Town: 15.xi.1910, on *Opuntia* sp. (*C. K. Brain*).

According with a statement made to Johnston & Tryon (1914) by Dr L. Péringuey, then Director of the South African Museum in Cape Town, the true cochineal was introduced in the Cape Colony about 1880 from the Azores. During a visit to the Cape Town Municipal Gardens they found it still thriving on *Opuntia tomentosa*, *O. decumana* and *Nopalea cochenillifera*, but it existed "rather as a curiosity". Following the removal of all non-indigenous plants, all traces of the insect have disappeared. Small

populations may perhaps be found in isolated plants in private gardens, but more probably the species has died out, as happened in other countries whenever the insect and its host plants were not assiduously looked after.

Dactylopius confertus spec. nov., fig. 4

Living adults not seen by the writer. Immature adult females, when mounted on slides, rather broadly elliptical in outline; dimensions of the graphotype specimen: length 2,4 mm; width 1,8 mm. Dorsal and ventral lateral modified body setae on the last abdominal segments (fig. 4a) ranging from stoutly cylindrical to fairly slender, both becoming progressively smaller and set widely apart toward the head (fig. 4b), not numerous. On the dorsal side of the prosoma among the modified setae are scattered a few small finely pointed ones. Wide-rimmed pores occurring singly or in irregular clusters all over the dorsum, lateral and sublateral areas of the venter and extending across the ventral mid-area of the prosoma and first two or three abdominal segments. All single pores and part of the clusters formed by two to four pores are devoid of ducts. Narrow-rimmed pores crowded on the ventral mid-area of the last four or five abdominal segments; on the prosoma they are lacking. Ventral ducts entirely missing. Anterior and posterior spiracles moderately developed with the sclerotized operculum provided with some minute irregular pointed processes along the free margins. Legs short and robust. Antennae formed with seven short segments; the articulation between the 5th and 6th segments is often obscure or incomplete. Anal ring presenting nothing distinctive.

MATERIAL EXAMINED. ARGENTINA. Salta, Morillo: 15.iii.1972, ♀ holotype and 11 ♀♀ paratypes collected on *Cleistocactus* sp. (*H. Zimmermann*); coll. No. H.C. 4619.

This new species very closely resembles *austrinus* and *confusus*, but it differs from both in having clusters of wide-rimmed pores across the ventral mid-area of the thorax. In typical specimens of *austrinus*, clusters of the same kind of pores occur only on the ventral mid-area of the first abdominal segments, while in *confusus* they are lacking altogether.

Dactylopius confusus (Cockerell, 1893), fig. 5

- Acanthococcus confusus*** Cockerell, 1893a: 366
- Coccus confusus*** (Cockerell); Cockerell, 1893b: 1043
- Coccus cacti confusus*** (Cockerell); Cockerell, 1896b: 34
- Coccus tomentosus newsteadi*** Cockerell, 1898: 675
- Coccus tomentosus confusus*** (Cockerell); Cockerell, 1898: 675
- Pseudococcus tomentosus newsteadi*** (Cockerell); Cockerell, 1899b: 5
- Pseudococcus confusus*** (Cockerell); Cockerell, 1899b: 6
- Pseudococcus confusus newsteadi*** (Cockerell); Cockerell, 1899c: 284
- Dactylopius confusus*** (Cockerell); Cockerell, 1902: 454
- Dactylopius confusus newsteadi*** (Cockerell); Cockerell, 1902: 454
- Coccus confusus capensis*** Green, 1912 [*non*: Linnaeus, 1764]: 91
- Dactylopius greenii*** Cockerell, 1929: 329—**syn. nov.**
- Dactylopius newsteadi*** (Cockerell); Cockerell, 1929: 329

This wild cochineal insect has been twice described by Cockerell as a new species under two different genera, in two different papers (1893a; 1893b) which, though written at different dates, happened to be published simultaneously; namely in December 1893. Fernald (1903), who in compiling her catalogue of the coccids of the world relied to a large extent on Cockerell's help and was well acquainted with his numerous

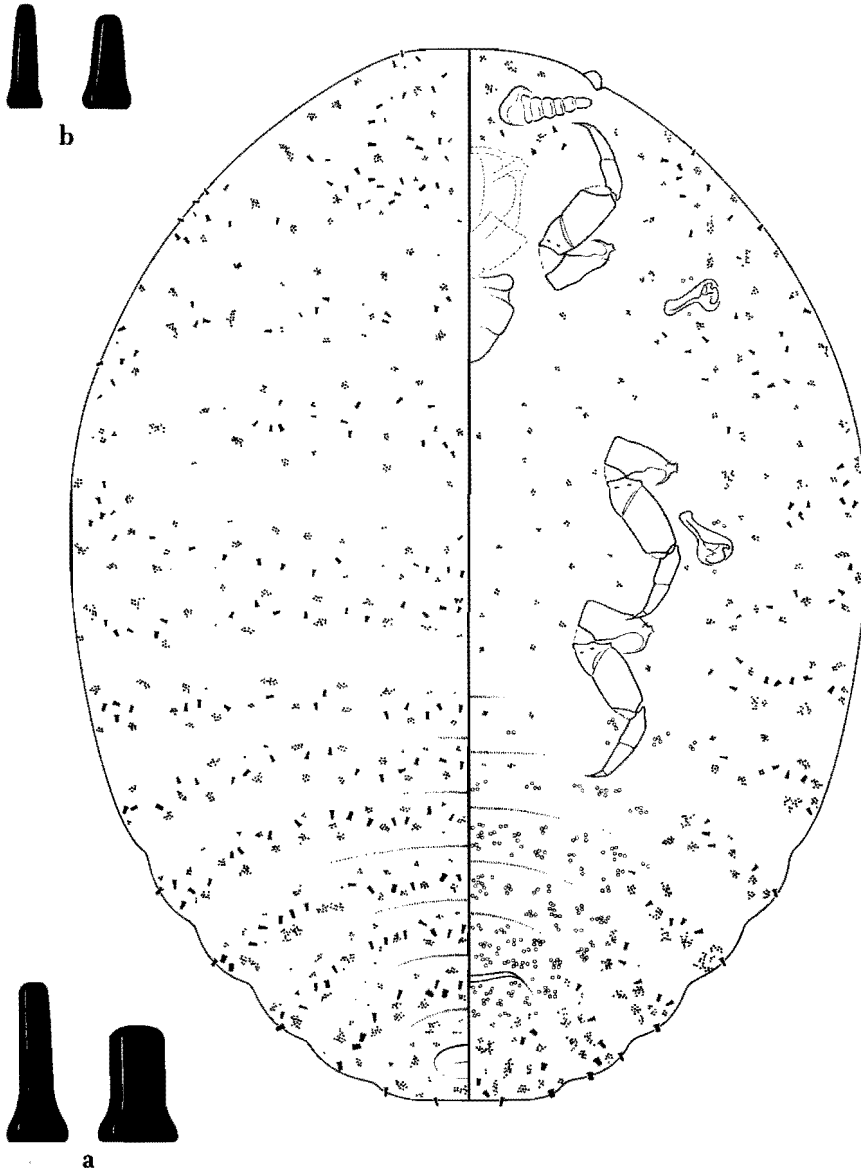


Fig. 4. *Dactylopius confertus* spec. nov.

papers, listed first that issued in the *Transactions of the American Entomological Society* which we should thus acknowledge has priority. Either by an oversight or, more likely, on Cockerell's advice, she recorded the species under the genus *Coccus*, instead of *Acanthococcus* to which it was assigned by the author in that paper.

More important is the question of the types deposited in the collection of the U.S. National Museum of Natural History, Washington, D.C. The five specimens labelled: "*Dactylopius confusus* (Ckll.); *Opuntia* sp. ?; Las Cruces, N.M.: Jan. 4, '94 (Ckll.)", though marked "type" do not actually belong to the type series because they were collected at a date subsequent to that of the publication of the original diagnosis of the species. Their assignment to *Dactylopius* attests furthermore that the slide has been labelled at a still later date, certainly not earlier than 1902 when Cockerell first brought that genus into use for the cochineal insects. What does belong to the original lot are seven specimens whose data: "*Coccus confusus*; *Cactus*; Las Cruces, N.M.: June 25, '93 (Cockerell)" tally with those given by the author (Cockerell, 1893a) in the footnote dated July 5th. These specimens have been used by the writer for setting up the valid series of types of *Acanthococcus confusus*. No nomenclatural or taxonomic problem will result from this action inasmuch as the specimens of the two lots are structurally identical.

A few years later Cockerell (1898) gave the name *newsteadi* to a supposed new form of cochineal insect which he then treated as a subspecies of *tomentosus*. To it he assigned Newstead's record (*in*: Green, 1897) of *tomentosus* which was based on specimens from *Opuntia fulgida* introduced to Kew (England) from Arizona; and three lots of specimens from unidentified cacti collected in Arizona by E. M. Ehrhorn, and in Mexico and Texas by C. H. T. Townsend. Present evidence shows that the material listed by Cockerell is referable partly to *tomentosus* and partly to *confusus*. This, compounded with Cockerell's omission to designate the type series, accounts for the existing confusion on the identity of the insect which burdens systematic and economic literature alike. Of the material Cockerell had at hand from his country, only four specimens from the lot collected in Arizona by Ehrhorn are extant in his collection. They now form the newly set series of types of *newsteadi* which, being structurally identical with *confusus*, should be placed in synonymy with the latter, as suggested by Ferris (1955) who examined specimens from the type material in Ehrhorn's collection.

The reference of *tomentosus* included by Cockerell in the original description of *newsteadi* should be recorded as a misidentification of the former species. From the context of his paper it is plain that his conclusions on the identity of the specimens intercepted in England merely rested on the account given by Newstead.

Another wild cochineal insect identical with *confusus* is *Coccus confusus capensis* Green, 1912, later re-named by Cockerell (1929) *Dactylopius greenii* on the ground of its junior homonymy with *Coccus capensis* Linnaeus, 1764. The parent stock of *greenii* had originally been collected by C. P. Lounsbury on *Opuntia monacantha* at the Cape of Good Hope ten years earlier, during which time it bred on an isolated cactus tree in Green's home garden in Ceylon. The finding came as a surprise because there have never been records of the occurrence of *confusus* in South Africa. In all likelihood it may be the species introduced by a certain Baron Ludowigne in about 1832 from Hamburg (Tryon, 1910), the identity of which had never been previously investigated.

Living adult specimens not seen by the writer. According to Cockerell (1893a) "the secretion of the individuals [is] very abundant, so that they cannot easily be separated from one another, the white cottony matter from several being fused together".

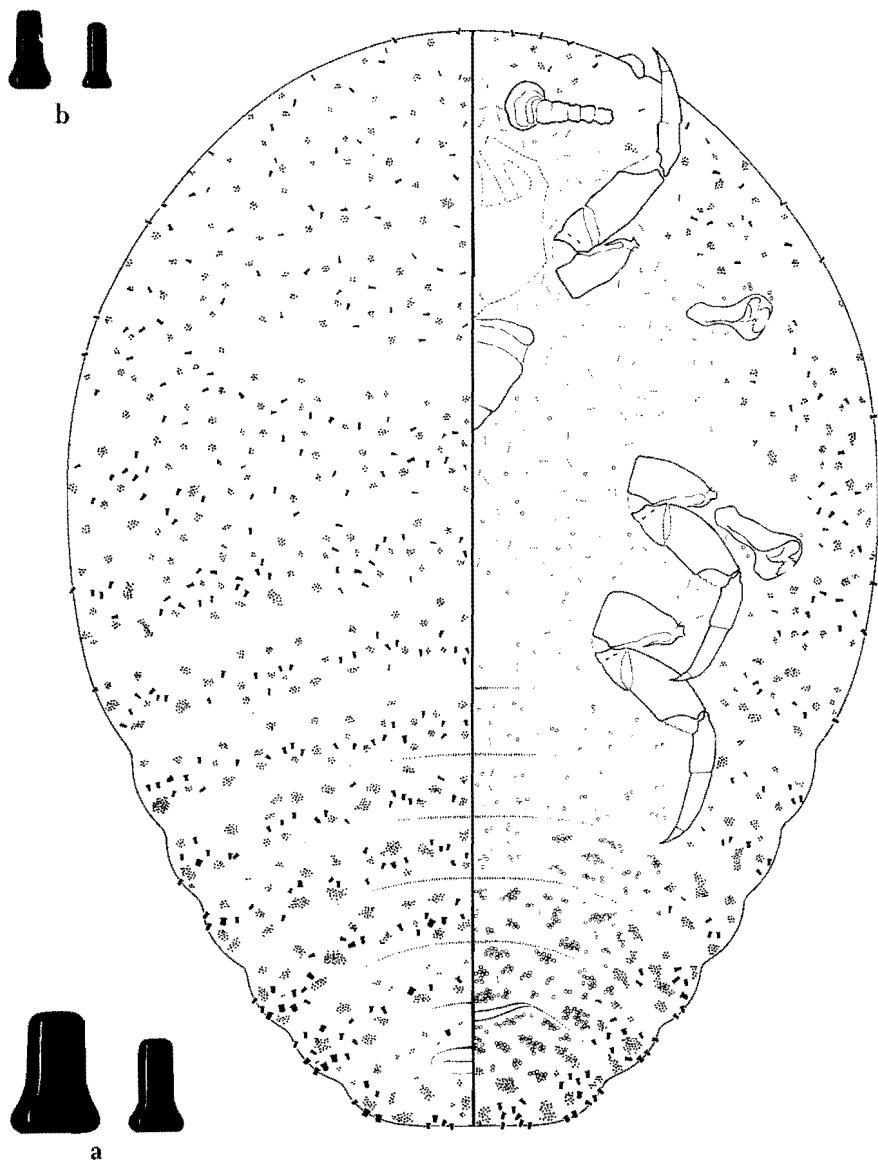


Fig. 5. *Dactylopius confusus* (Cockerell).

Immature adult females, when mounted, oboval in outline; dimensions of the graphotype specimen: length 2,2 mm; width 1,6 mm. Dorsal and ventral lateral modified body setae on the last abdominal segments rather stout, cylindrical or very slightly tapering at the apex (fig. 5a), becoming progressively shorter and more slender toward the head (fig. 5b); not very numerous. Wide-rimmed pores set in clusters each of which incorporates one or more tubular ducts. On the dorsal median and submedian areas of the thorax the clusters are mostly formed with four to six pores. On the lateral area of the last abdominal segments some clusters may be built up with as many as 30 or more pores. Narrow-rimmed pores crowded on the ventral mid-area of the last three or four abdominal segments; others are scattered on the ventral mid-area of the first abdominal segments and on the prosoma. Ducts rather numerous on the ventral mid-area of the prosoma, intermingled with the narrow-rimmed ducts. Anterior and posterior spiracles large with the sclerotized operculum well developed and having the lateral margins rough or bearing a few minute spiniform processes. Legs well developed and stout. Antennae with seven segments, at times reduced to six, owing to the fusion of the 3rd and 4th segments. Anal ring normal.

MATERIAL EXAMINED. AUSTRALIA. Queensland, Rockhampton: 15.v.1967, on *Opuntia stricta* Haworth (*B. W. Willson*). SOUTH AFRICA. Cape Province, Gamtoos Ferry: 11.viii.1938, on *Opuntia monacantha* Haworth (*F. W. Petley*).

No material of *confusus* has been collected in South Africa in recent years. This is probably due to the extensive destruction of *O. monacantha* brought about by *ceylonicus* since its introduction in 1913.

Dactylopius opuntiae (Cockerell, 1896), fig. 6

Coccus tomentosus: Cockerell, 1896a: 35

Coccus cacti opuntiae Cockerell, 1896a: 35

Dactylopius opuntiae (Cockerell); Cockerell, 1929: 328

Since the beginning of his work on the taxonomy and systematics of the cochineal insects, Cockerell had some misgivings about the identity and status of *tomentosus* (q.v.). In 1896 he also questioned whether the so-called "grana silvestre" collected by A. Dugès at Guanajuato (Mexico) could be referred to the Lamarkian species as hinted by Lichtenstein (1884). Owing to the uncertainty about *tomentosus*, he suggested the Guanajuato form be called *Coccus cacti opuntiae*, a manuscript name he ascribed to Lichtenstein who plainly disavowed it. In two subsequent papers, Cockerell (1898; 1899b)—without giving any explanation for doing so—recorded *tomentosus* as a valid species, associating with it the name *opuntiae* so to imply that the latter was actually a synonym of the former. And so it has been treated by later authors like Fernald (1903) and Green (1912). In 1929 Cockerell however reversed his views on the ground that "*opuntiae* is probably the correct name for what is called *tomentosus*", which certainly did not help to improve the already tangled situation. In fact, due to causes entirely unknown to the writer, it became a practice to call *opuntiae* a wild cochineal insect morphologically well distinct from *tomentosus*, the status and identity of which have never been settled.

In the absence of a true description, the writer suggests basing the validity of the name *opuntiae* on the differentiating notes about the pattern of the covering cottony secretion observed by Cockerell in living adult females from Guanajuato; whilst the

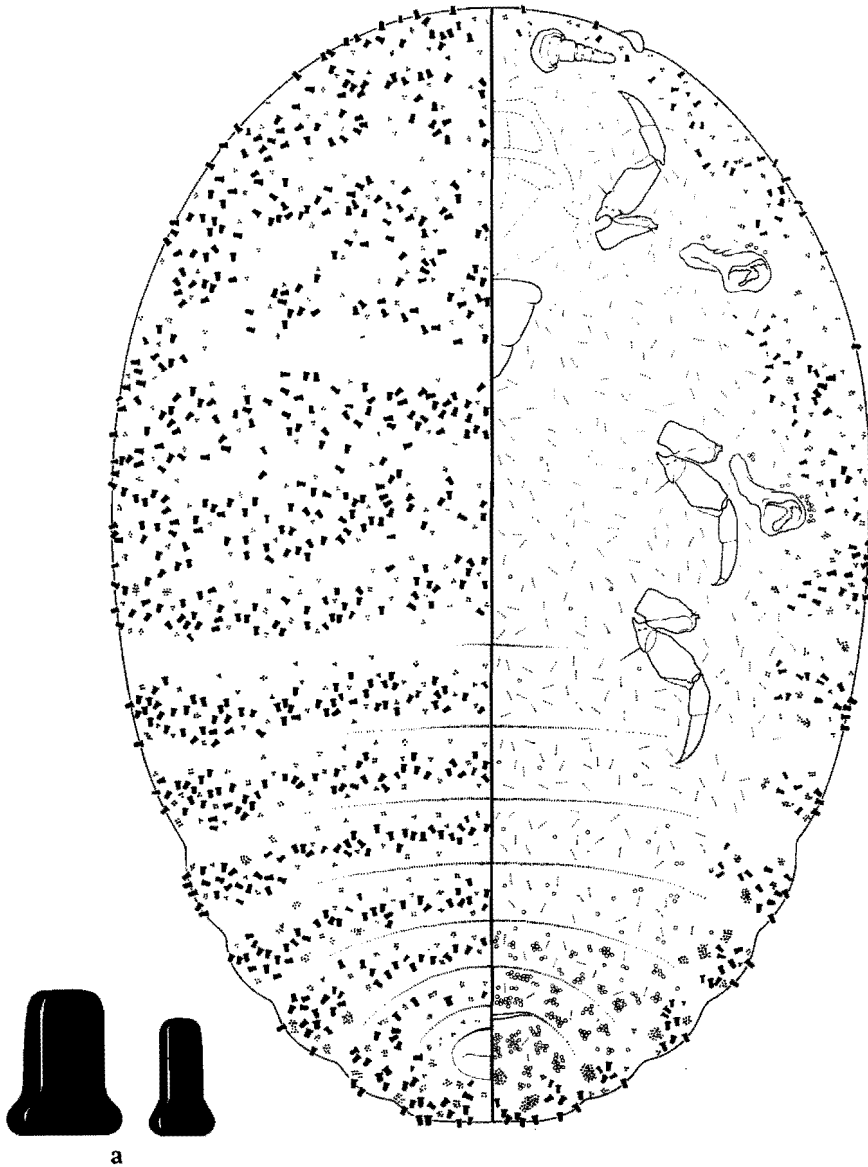


Fig. 6. *Dactylopius opuntiae* (Cockerell).

identity of the species should rest on two mounted specimens available in his collection bearing the following data: "*Coccus tomentosus*; cactus; Guanajuato, Mex.: July 24, '93 (Cockerell)". Being the only extant specimens of those actually examined by Cockerell, they have been utilized for setting up the type series of *Coccus cacti opuntiae* Cockerell, 1896. The record of *tomentosus* under which Cockerell (1896b) first discussed the question of *opuntiae* is to be understood as a misidentification of the latter.

In conclusion, apart from a minor change in the authorship of the species, its nomenclatural status and identity, as they have long been understood by Australian and South African entomologists, will not be altered.

The living adult "females are not imbedded in profuse secretion as in *confusus*, but are clearly separable, being nevertheless each one enveloped in secretion, and not almost naked as in typical *cacti*" (Cockerell, 1986b). Immature adult females, when mounted, broadly oboval or elliptical in outline; dimensions of the graphotype specimen: length 2,3 mm; width 1,5 mm. Dorsal and ventral lateral modified body setae (fig. 6a) short, cylindrical, moderately to strongly stout; rather numerous. The setae on the head are similar in shape and size to those occurring at the extremity of the abdomen. Wide-rimmed pores set in clusters each of which embodies a tubular duct; on the dorsal median and sub-median areas of the thorax most of the clusters are formed with two to four pores. Narrow-rimmed pores crowded on the ventral mid-area of the last three abdominal segments; others are scattered on the preceding segments and on the prosoma. Ventral tubular ducts rather numerous on the mid-area of the post- and prosoma, intermingled with the tubular ducts. Anterior and posterior spiracles large with the sclerotized operculum well developed and having the lateral edges rough or provided with a few minute indentations. Legs short and stout. Antennae with seven segments, at times reduced to six, due to the fusion of the 3rd and 4th segments. Anal ring as common to the genus.

MATERIAL EXAMINED. AUSTRALIA. New South Wales, Inverell: 15.ii.1967, on *Opuntia tomentosa* Salm-Dyck (*V. H. Gray*); Tamworth: 15.ii.1967, on *O. inermis* De Candolle (*do.*). Queensland. Rockhampton: 15.v.1967, on *O. streptacantha* Lemaire (*B. W. Willson*). CEYLON. Eastern Province, Batticaloa: 25.iv.1972, on *Opuntia* sp. (*P. R. Dharmachikan*). INDIA. Madras Province, Madras: 12.xii.1971, on *Opuntia* sp. (*T. Sankaran*). KENYA. Naivasha: 7.ii.1973, on *Opuntia* sp. (*G. W. Oloo*). SOUTH AFRICA. Cape Province, Grahamstown: 14.xi.1966, on *O. megacantha* Salm-Dyck (*W. A. Burger*). Orange Free State, Winburg: 8.xi.1966, on *O. tardospina* Griffiths (*G. De Lotto*). Transvaal, Naboomspruit: 10.i.1966, on *O. megacantha* Salm-Dyck (*do.*). U.S.A. Texas, Mercedes: 7.x.1972, on *O. ? lindheimeri* Engelmann (*H. A. Dean*).

***Dactylopius salmianus* spec. nov., fig. 7**

According to Mr H. Zimmermann, who first discovered the species, the living adult females are sparsely covered with very thin and very brittle threads of cottony matter, which may attain a length of 30 mm.

Mounted immature adult females broadly elliptical or oval to nearly circular in outline; dimensions of the graphotype specimen: length 2,5 mm; width 1,9 mm. Dorsal and ventral lateral modified body setae (fig. 7a) moderately to strongly stout, cylindrical, not very numerous; those on the head are similar in size and shape to those of the last abdominal segments. Wide-rimmed pores occurring singly or in small clusters.

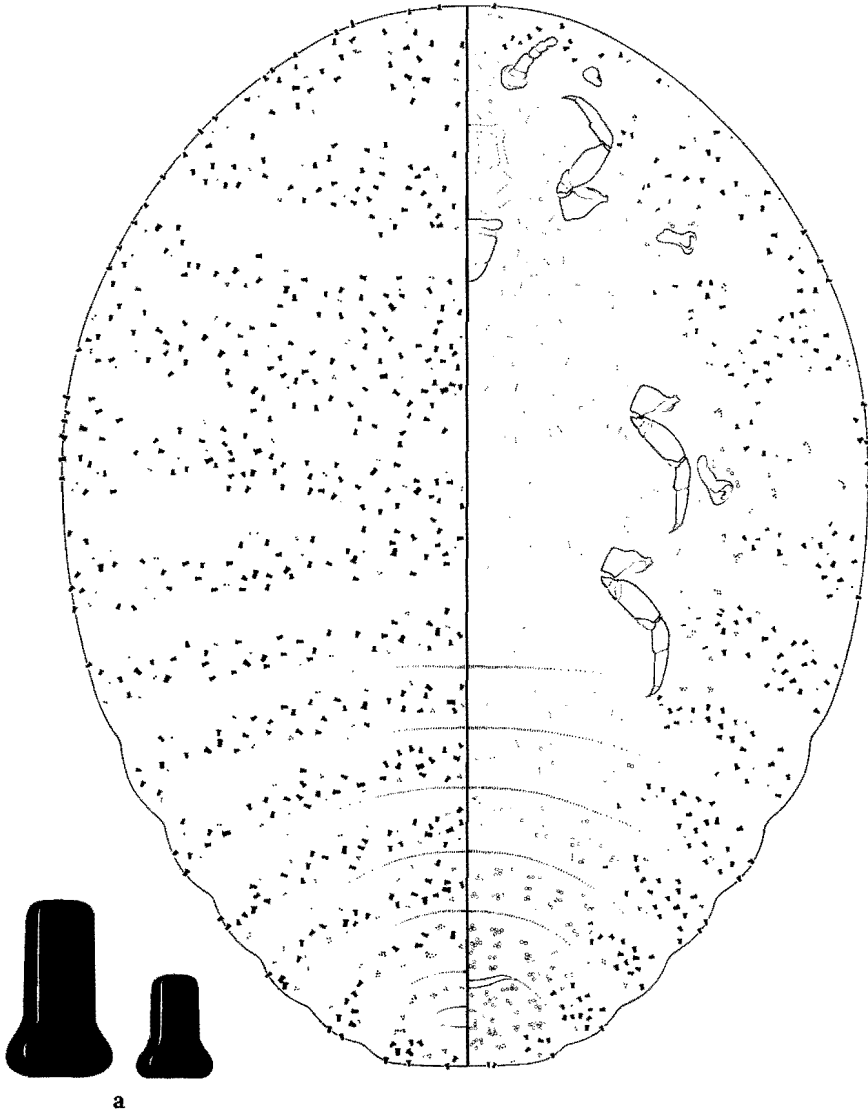


Fig. 7. *Dactylopius salmianus* spec. nov.

both rather few and set wide apart; all single pores as well as the clusters formed with two, and some of those formed with three or more pores, are devoid of tubular ducts. On the dorsal median and submedian areas of the thorax the pores are mostly set singly or in clusters of two, seldom three, pores. Narrow-rimmed pores crowded on the ventral mid-area of the last three or four segments of the abdomen; others are scattered on the first segments; on the mid-area of the thorax and head they are very few and at times they may be missing altogether. Ducts on the ventral mid-area rather few. Anterior and posterior spiracles fairly strongly developed; sclerotized operculum with the lateral free margins rough or occasionally provided with a few minute spiniform processes. Legs short and rather stout. Antennae seven-segmented, except one specimen in which both antennae were reduced to six segments. Anal ring normal.

MATERIAL EXAMINED. ARGENTINA. Chaco, Santa Sylvina: 15.ii.1971, ♀ holotype and 7 ♀♀ paratypes collected on *Opuntia salmiana* Parmentier (*H. Zimmermann*); coll. No. H. C. 4628.

Dactylopius tomentosus (Lamarck, 1801)

Coccus silvestris Lancry, 1791: 486—*nomen oblitum*

Coccus tomentosus Lamarck, 1801: 299

Acanthococcus tomentosus (Lamarck); Cockerell, 1893a: 366

Coccus tomentosus newsteadi Cockerell, 1898: 675—*partim*

Pseudococcus tomentosus (Lamarck); Cockerell, 1899b: 5

Dactylopius tomentosus (Lamarck); Cockerell, 1902: 454

In the notes accompanying the redescription of this species, Ferris (1955) emphasized that its identification rested on the conclusions presented by Green in 1912. The latter author in his turn pointed out that he relied on material studied by Newstead (*in*: Green, 1897). Cockerell (1893a) at first stated that Signoret considered *tomentosus* a synonym of *cacti* (= *coccus*), which he did not; later, though uncertain which insect Lamarck alluded to, he did not make the slightest effort to settle the problem. On the contrary, things became really confused when he (Cockerell, 1896b; 1929) suggested calling it *opuntiae* (q.v.). Earlier workers like Targioni Tozzetti (1868), Signoret (1875), Lichtenstein (1884), etc., apparently referred to *tomentosus* any cochineal insect commercially unsuitable for the production of dyestuff. To investigate any further backward, matters will certainly get more and more tangled. A case in point is to be found in Lancry's (1791) article: among the references listed under the heading of *Coccus silvestris* he included that of Linnaeus' *Coccus cacti*, the name in use for the cultivated form.

In the writer's opinion the only and most practical way out of such an intricate situation, and in the absence of types, is to endorse the identity of the species as defined and illustrated by Ferris.

Lindinger's (1943; 1949) proposal to refer to the species as *D. silvestris* (Lancry, 1791), on the ground of its priority over *D. tomentosus* (Lamarck, 1801), should be rejected because the former name has never been used by subsequent authors. To this effect an application has been presented by the writer to the International Commission of Zoological Nomenclature for placing *Coccus silvestris* Lancry, 1791, in the official index of rejected names as a *nomen oblitum*.

To Ferris' description a few amendments should be made, namely: the sclerotized occluding flap of the spiracles is moderately developed and provided with a few pointed processes on the apex and on the lateral free margins; the anal ring is entirely

obsolete; and the narrow-rimmed pores on the ventral mid-area of the thorax and head are normally very few and at times they are missing altogether.

MATERIAL EXAMINED. AUSTRALIA. New South Wales, Bingara: 15.ii.1967, on *Opuntia imbricata* (Haworth) De Candolle (*V. H. Gray*). U.S.A. Nevada, Alamo: 28.vi.1960, on *Opuntia* sp. (*T. R. Haig*). SOUTH AFRICA. Cape Province, Barkly West: 18.vii.1973, on *O. imbricata* (Haworth) De Candolle (*D. E. Malan*); Douglas: 20.vii.1973, on *O. tunicata* (Lehmann) Knuth (*D. E. Malan*).

All Australian and South African specimens examined were provided with very small, cup-like sclerotized pits, very variable in number and size, set in a loose group near the inner and anterior margins of the coxa of each hind leg. No trace of them has been found in the material from North America.

In South Africa, the species became established in the field following release of stocks in April 1970 that were imported from Queensland, Australia.

***Dactylopius zimmermanni* spec. nov., fig. 8**

No information is available on the external appearance of the living adults. Immature adult females, when mounted, oboval in outline; dimensions of the graphotype specimen: length 2,9 mm; width 1,8 mm. Dorsal and ventral lateral modified body setae (fig. 8b) short, slender and slightly tapering toward the apex; not very numerous. The setae on the head are similar in size and shape to those of the last abdominal segments. On the dorsum are present some setae noticeably larger, cylindrical (fig. 8b), set either singly or in groups of two or three, which tend to be arranged in longitudinal rows; however, their distributive pattern is very irregular and their size somewhat variable, the largest being those occurring on the marginal and median areas of the last abdominal segments. Wide-rimmed pores fastened in clusters each of which incorporates one or more ducts. On the dorsal median and sub-median areas of the thorax the clusters are mostly formed with four to six pores. Narrow-rimmed pores rather numerous on the ventral mid-area of the last four abdominal segments; others are scattered on the first segments and on the prosoma. Ducts rather numerous on the ventral mid-area of the thorax and head. Anterior and posterior thoracic spiracles fairly large with the sclerotized operculum moderately developed and having the margins smooth. Legs well developed and stout. Antennae with seven segments. Anal ring large with the anterior portion narrow and strongly sclerotized.

MATERIAL EXAMINED. ARGENTINA. Mendoza, Vargas: 15.iii.1970, ♀ holotype and 17 ♀♀ paratypes collected on *Tephrocactus ovatus* (Pfeiff) Backbg. (*H. Zimmermann*); coll. No. H. C. 4146.

The species is named after Mr H. Zimmermann of this Institute as a token of gratitude for the help and co-operation given to the writer in collecting and forwarding material of cochineal insects during his search in Argentina for the natural enemies of the prickly pears.

UNKNOWN SPECIES

The following three names should be discarded as *nomina nuda* because they have been introduced without giving any formal description or indication as to their identity.

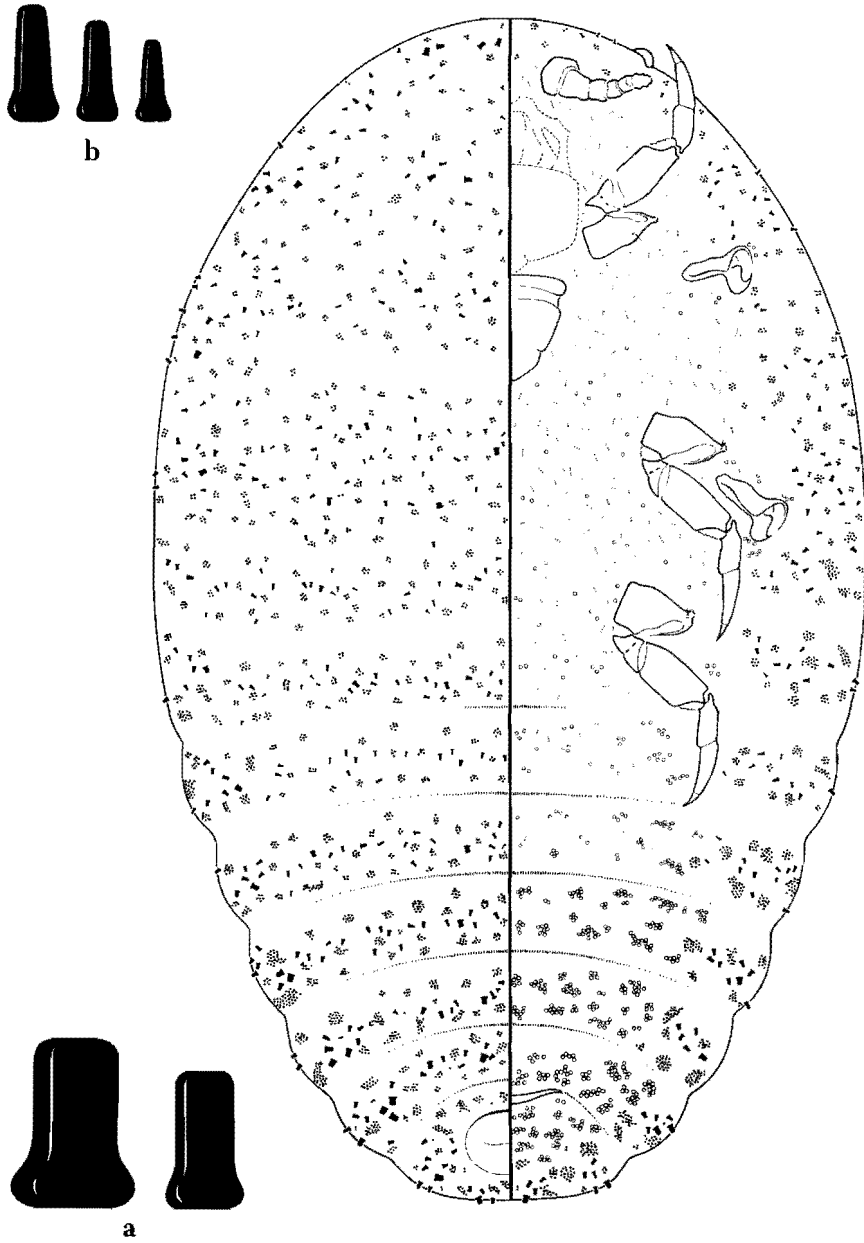


Fig. 8. *Dactylopius zimmermanni* spec. nov.

Coccus bassi Targioni Tozzetti, 1866. In a footnote appended to an article dealing with the honey-dew and wax produced by certain soft scales, Targioni Tozzetti (1866) gave notice of a new species of cochineal insect from Mexico, similar to that of commerce which he named *C. bassi* after the collector. Cockerell (1896a) listed it as a likely variety of *cacti* (= *coccus*).

Coccus blanchardii Targioni Tozzetti, 1868. This name was given to a species from Australia in the collection of the Muséum National d' Histoire Naturelle, Paris. Signoret (1875), though aware of the insect, refrained from studying it. From Mann (1969; 1970) we understand that at that time the only cochineal insect occurring in that country was probably *ceylonicus*, introduced from Brazil in 1788 by A. Phillip, Governor of the New South Wales.

Dactylopius argentinus Dominguez, in: Autran, 1907. About the first introduction of this name see discussion under the heading of *ceylonicus*.

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