

THE BRITISH PSEUDOCOCCIDAE
(HOMOPTERA : COCCOIDEA)

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SYNOPSIS

This study of the British Pseudococcidae has necessitated changes in nomenclature of many of the 42 species discussed, resulting in new combinations and new synonymy of names. The species are placed in 21 genera, one of which, *Balanococcus*, is described as new. Twenty-eight species are regarded as native and the remainder are found in greenhouses. Four new species are described: *Atrococcus cracens*, *Balanococcus boratynskii*, *Saccharicoccus penium* and *Trionymus orestes*. Illustrations are given of 29 species, the others having been illustrated elsewhere by other authors.

INTRODUCTION

THE British Pseudococcidae or mealy-bugs discussed here were included in the subfamily Dactylopiinae by Newstead (1903) and later by Green in various accounts of the British species. The group is equivalent to the tribe Pseudococcini as defined by Balachowsky (1948) or to the subfamily Pseudococcinae recognized by Borchsenius (1949). In the present work the group is recognized as that defined by Ferris (1950) as the family Pseudococcidae.

HISTORY

Very few mealy-bugs were known from Britain in the last century and about half of these had been described from greenhouses. One in particular, collected in a greenhouse at the Royal Botanic Gardens, Kew, has still not been found in its natural habitat. The first native record seems to be that of *Coccus halophilus* described by J. Hardy in 1868. Towards the end of the century J. Douglas added other names to the British list but it was R. Newstead who first collected this group seriously. In a monograph of British coccids, Newstead (1903) gave descriptions of 12 mealy-bugs, 7 of which were native species.

During the present century E. E. Green was the one most active in this field adding many new records and describing 15 British species as new to science.

The inadequacy of existing descriptions of British Pseudococcidae makes it impossible, except in a few instances, to identify species from the literature with any degree of certainty. This also applies to many species described from the Continent, although in recent years some effort has been made to describe them more fully.

The purpose of this study is to redescribe and illustrate the British Pseudococcidae and to bring together the somewhat scattered records. Particular attention has been given to a work by Borchsenius (1949) revising the species from Russia. In this work 80 are described as new and many others have since been described from that area. Many of the Russian species will doubtless be found in Western Europe and,

taking as a guide the frequency of new species recently discovered in Western Russia, it would seem safe to assume that many new ones remain to be discovered in Western Europe and even in Britain.

When some of the continental species are known to be identical with those described here then their names have been reduced to synonyms. On the other hand a number of the British names may have to be sunk when the continental species are redescribed.

Holotypes of the four new species are deposited in the British Museum (Natural History).

GEOGRAPHICAL DISTRIBUTION

The species settled on for discussion are given in the distributional list opposite.

Newstead and Green often recorded species as British merely because they had been collected alive on imported plants. In recent years *Ferrisiana virgata* (Cockerell) and *Dysmicoccus brevipes* (Cockerell), two important cosmopolitan species, have found their way into this country but no records of their establishment are known here. A few species, especially some members of the genera *Pseudococcus* and *Rhizoecus*, have become established in greenhouses throughout the country and for purposes of recognition they are included. Some other greenhouse species are discussed where changes in nomenclature are due or where a redescription will save the species from obscurity.

No original material seems to exist of *Dactylopius theobromae* described by Douglas (1889) and it is impossible to recognize it from the meagre description: the name, therefore, must be regarded as a *nomen dubium*.

Although normally regarded as part of the continental fauna, the mealy-bugs of the Channel Islands are included because, of the 9 species now recorded, all but 3 are known to occur in Britain. The paucity of records from Wales, Scotland and Ireland immediately becomes apparent from the list. This is undoubtedly due to a lack of collecting and when the total number of British species is finally known, these areas will probably have the most interesting and varied fauna. The British records included relate only to specimens actually studied during the course of this work.

MORPHOLOGY

All morphological terms mentioned are based on those used by Ferris (1950, 1953). McKenzie (1960) has given an excellent generalized drawing representing the morphological structures of the family Pseudococcidae. Measurements of the labium refer to the two fused and sclerotized segments constituting the cone. The small basal segment is not included. As pointed out by McKenzie, the presence of a denticle on the claw, although a useful character, is now of less significance in placing a species in the *Phenacoccus* series. Some species are now known with a denticle but which are not typical of this series and others have been described recently with an obvious relationship to the *Phenacoccus* series, yet lack the denticle. One species is described here as *Euripersia europaea* (Newstead) from specimens where the denticle is present or entirely lacking.

Distributional List of the British Pseudococcidae

	England	Wales	Scotland	Ireland	Channel Islands	Other localities
<i>Antonina crawi</i> *	×		×			Japan, Formosa, U.S.A., Hawaii, France, Russia.
<i>Atrococcus cracens</i> sp. n.	×	×				
<i>A. luffi</i>					×	
<i>A. paludinus</i>	×					
<i>Balanococcus boratynskii</i> sp. n.	×					
<i>B. scirpi</i>	×					
<i>Chnaurococcus subterraneus</i>	×		×			
<i>Chorizococcus lounsburyi</i> *	×					S. Africa, Kenya, Egypt, Hawaii, U.S.A. Holland.
<i>Dysmicoccus walkeri</i>	×	×	×		×	Spain, France, Germany.
<i>D. wistariae</i> *	×					Japan, U.S.A.
<i>Euripersia europaea</i>	×				×	Holland, Germany.
<i>E. tomlinii</i>	×				×	Corsica, Germany.
<i>Heliococcus minutus</i>					×	Spain.
<i>Heterococcus pulverarius</i>	×					
<i>Nipaecoccus nipae</i> *	×		×			Probably cosmopolitan.
<i>Peliococcus balteatus</i>	×					Russia, Sweden, Czechoslovakia.
<i>Phenacoccus aceris</i>	×		×			Palaeartic and Nearctic.
<i>P. interruptus</i>	×					
<i>P. sphagni</i>	×					Holland.
<i>Planococcus citri</i> *	×					Cosmopolitan.
<i>Pseudococcus adonidum</i> *	×		×			Cosmopolitan.
<i>P. fragilis</i>	×	×	×		×	Cosmopolitan.
<i>P. latipes</i> *	×	×	×		×	Probably cosmopolitan.
<i>Rhizococcus albidus</i>	×					France, Germany.
<i>R. cacticans</i> *	×					North and South America, greenhouses in Germany.
<i>R. dianthi</i> *	×					
<i>R. elongatus</i> *	×					Holland.
<i>R. falcifer</i> *	×			×		Probably cosmopolitan.
<i>R. halophilus</i>	×	×	×	×		
<i>Saccharicoccus penium</i> sp. n.	×					
<i>Spilococcus cactearum</i> *	×					U.S.A., Mexico, greenhouses in Europe.
<i>S. filicicola</i> *	×					
<i>Spinococcus calluneti</i>	×					Sweden, Germany, Russia, Czechoslovakia.
<i>Trionymus dactylis</i>	×				×	France.
<i>T. diminutus</i>					×	New Zealand, U.S.A., Russia, Formosa, Italy.
<i>T. newsteadi</i>	×					Germany, Russia, Czechoslovakia.
<i>T. orestes</i> sp. n.	×					
<i>T. perrisii</i>	×		×	×		France, Germany, Russia, Holland.
<i>T. phalaridis</i>	×					Russia.
<i>T. radicum</i>	×	×				Holland.
<i>T. thulensis</i>	×	×				Iceland, France.
<i>T. tomini</i>	×				×	

* Greenhouse species.

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The writer is grateful to Dr. Harold Morrison of the United States Department of Agriculture, Washington, D.C. for the prompt and generous way he has answered queries, studied specimens submitted to him and given helpful advice. His highly valued opinions on many of the species herein discussed are accepted and included.

Professor H. L. McKenzie of the University of California, Davis, California has co-operated fully in discussing many points of interest and giving the writer valuable information on his latest paper on the Californian mealy-bugs before it was published. His kindness in this respect has been most welcome.

Professor N. S. Borchsenius of the Zoological Institute, Academy of Science of the U.S.S.R., Leningrad, has kindly examined a photograph of the illustration of *Balanococcus scirpi* (Green) and given valuable comments on its relationship to the genus *Kiritshenkella* described by him. He also compared specimens of *Trionymus hibernicus* with Russian specimens of *T. ferrisii* for which the writer is deeply indebted.

Dr. A. Reyne of the Zoölogisch Museum, Amsterdam, Holland, kindly made available Dutch specimens of *Trionymus ferrisii* and *T. radicum* for which thanks are cordially given.

Particular gratitude is expressed to Dr. K. L. Boratynski of Imperial College, London, who has taken a lively interest in this study since its commencement. Dr. Boratynski has made available his collection of British mealy-bugs, adding many new records and two new species which are described herein. His help and encouragement have been much appreciated.

KEY TO GENERA

- | | | |
|-------|---|--------------------------------|
| 1 | Legs entirely lacking | ANTONINA Signoret |
| - | Legs present, although at times reduced in size | 2 |
| 2 | Trilocular pores present somewhere on the body | 3 |
| - | Trilocular pores absent, replaced by quinquelocular pores | HETEROCOCCUS Ferris |
| 3 (2) | With some crateriform ducts present, each with the orifice at the apex of a sclerotized prominence and often with one or more setae attached to the base of the duct prominence | HELIOCOCCUS Şulç |
| - | Without this type of duct | 4 |
| 4 (3) | With some dorsal body setae spine-like and same size or nearly same size as those of cerarii | 5 |
| - | Dorsal body setae never enlarged and spine-like, either slender or minutely lanceolate | 6 |
| 5 (4) | Quinquelocular disc pores present on venter, claw with a denticle, dorsal cerarii present | SPINOCOCCUS Borchsenius |
| - | Quinquelocular disc pores absent, claw without a denticle, dorsal spine-like setae not forming cerarii | NIPAEOCOCCUS Sulç |
| 6 (4) | Dorsal multilocular disc pores present, arranged in clusters of 3-6 and with a minute tubular duct at the centre | PELIOCOCCUS Borchsenius |
| - | Dorsal multilocular disc pores, if present, not arranged in clusters | 7 |
| 7 (6) | Oral rim ducts present somewhere on the body | 8 |
| - | Oral rim ducts lacking | 12 |
| 8 (7) | With 17 pairs of cerarii, each possessing slender auxiliary setae in addition to cerarian setae | PSEUDOCOCCUS Westwood |

—	With 0-17 pairs of cerarii but only anal lobe pair with auxiliary setae	9
9 (8)	Body content black or blue-black, especially apparent when boiling in potash or lacto-phenol	11
—	Body content never black or blue-black, usually yellow	10
10 (9)	With from 0 to 4 pairs of cerarii present	CHORIZOCOCCUS McKenzie
—	With from 6 to 17 pairs of cerarii present, part of	SPILOCOCCUS Ferris
11 (10)	With 1-7 pairs of cerarii, circulus absent	ATROCOCCUS Goux
—	With at least 9 pairs of cerarii, circulus present, part of	SPILOCOCCUS Ferris
12 (7)	Circulus present, longer than wide, hour-glass shaped	SACCHARICOCCUS Ferris
—	Circulus, if present, never longer than wide or hour-glass shaped	13
13 (12)	With a denticle or tooth, either well developed or small, on the plantar surface of the claw	14
—	Claw without a denticle	15
14 (13)	With 9-18 pairs of cerarii	PHENACOCCUS Cockerell
—	With 2-4 pairs of cerarii, part of	EURIPERSIA Borchsenius
15 (13)	Anal lobes without recognizable cerarii, bi- or tritubular pores present somewhere on the body	RHIZOECUS Künckel d'Herculais
—	Anal lobes with cerarii represented by paired conical setae, bi- or tritubular pores lacking	16
16 (15)	With 18 pairs of cerarii	PLANOCOCCUS Ferris
—	With 1-17 pairs of cerarii	17
17 (16)	With 6-17 pairs of cerarii	DYSMICOCCUS Ferris
—	With 1-5 pairs of cerarii	18
18 (17)	With some quinquelocular pores on venter, part of	EURIPERSIA Borchsenius
—	Never with quinquelocular pores on venter	19
19 (18)	Antennae 7-8-segmented	TRIONYMUS Berg
—	Antennae 6-segmented	20
20 (19)	Multilocular disc pores forming marginal zone around dorsum and venter	BALANOCOCCUS Williams
—	Multilocular disc pores on venter of abdomen only, not forming marginal zone	CHNAUROCOCCUS Ferris

NOTES. Although the key is based mainly on morphological characters some difficulty may be encountered with couplet 9 (8) when identifying specimens already prepared on slides. This is due to our incomplete knowledge of the genera *Chorizococcus*, *Spilococcus* and *Atrococcus* and further discussions are given under these genera.

DESCRIPTIONS OF SPECIES

ANTONINA Signoret

Antonina Signoret, 1875 : 24.

Antonina Signoret, Borchsenius, 1949 : 311.

Antonina Signoret, Ferris, 1953 : 289.

Type of genus *Antonina purpurea* Signoret.

The type of the genus was described from France but the genus is represented mainly in the warmer regions. Only *Antonina crawi* Cockerell is known in this country and this is found in greenhouses. It is mentioned here to synonymize the name *A. socialis* Newstead. All members of this genus are devoid of legs and many have the posterior segments of the abdomen sclerotized at maturity. They are found only on grasses.

Antonina crawi Cockerell

- Antonina crawi* Cockerell, 1900 : 70.
- Antonina socialis* Newstead, 1901 : 85 (syn. n.).
- Antonina socialis* Newstead, Newstead, 1903 : 207.
- Antonina crawii* Cockerell, Ferris, 1953 : 292.

The type of *Antonina socialis* is identical with *A. crawi*. Specimens are at hand from ENGLAND, Hertfordshire, Broxbourne, *Arundinaria japonica*, 26.i.1899 and SCOTLAND, East Lothian, Prestonkirk, on bamboo, ii.1905, all taken under glass. Ferris has redescribed and illustrated this species.

ATROCOCCUS Goux

Atrococcus Goux, 1941 : 69.

Type of genus *Atrococcus melanovirens* Goux.

Goux erected this genus for a few species possessing the following characters : cerarii on abdomen only, circulus absent, oral rim ducts on dorsum and usually on lateral areas of venter, presence of a group of oral collar ducts on prothorax in front of anterior spiracles, these often accompanied by a group of multilocular disc pores, body content showing a black pigment after death and especially when placed in potash.

The black or blue-black body content in mealy-bugs is often a preliminary aid in identification and certainly the character has some significance in such genera as *Nipaecoccus* Šulc, *Naiacoccus* Green and *Amonostherium* Morrison & Morrison and others. There seem to be no special external morphological characters associated with the internal body colour. Once a specimen is mounted on the slide it is, so far, impossible to determine the original body colour.

Two genera, *Spilococcus* Ferris and *Chorizococcus* McKenzie, come very close to *Atrococcus*. The genus *Chorizococcus* has 0-4 pairs of cerarii and *Spilococcus* has 6-17 pairs ; these are the only distinguishing characters. The number of cerarii in *Atrococcus* is 1-7 pairs, combining the characters of the other two genera and, indeed, *Chorizococcus brevicurvis* McKenzie with 2 pairs of cerarii and with a noticeable lateral group of tubular ducts and multilocular disc pores on the prothorax could easily be placed in *Atrococcus* except for the absence of the black colour after death. For the purposes of this work the three genera are regarded as distinct but the discovery or redescription of other species in these genera may clarify the position.

The following species, including one from the Channel Islands, may be separated by the key :

- 1 Cerarii on anal lobes only ; oral rim ducts numerous, about 20 on each tergite *luffi* (Newstead)
- Cerarii 3-7 pairs ; oral rim ducts less numerous, about 6 to each tergite 2
- 2 Cerarii 3-4 pairs ; noticeable groups of multilocular disc pores in submedian areas of dorsum ; number of multilocular disc pores on prothorax equals or exceeds that of tubular ducts *cracens* sp. n.
- Cerarii 6-7 pairs ; dorsal multilocular disc pores on margins only of posterior abdominal segments ; multilocular disc pores on prothorax always less in number than tubular ducts *paludinus* (Green)

Atrococcus cracens sp. n.

(Text-fig. 1)

Pseudococcus paludinus Green, Green, 1934 : III. (Misidentification.)

HABIT AND DISTRIBUTION. External appearance not known although Green has recorded it as forming ovisacs in the angles of prominent leaf veins. Material has been examined from the following localities: ENGLAND. Surrey: Guildford, *Centaurea nigra*, 21.vii.1922 (E. E. Green). Kent: Bearsted, *Chrysanthemum leucanthemum*, 16.ix.1932 (E. E. Green). Hampshire: Yateley, *Crepis* sp., 25.ix.1926 (E. E. Green). Berkshire: Silwood Park, *Achillea* sp., 27.vi.1949, (Holotype) *Deschampsia caespitosa*, 27.x.1948, *Veronica* sp., 31.viii.1948 (K. L. Boratynski). WALES. Flintshire: Prestatyn, grass, viii.1918, R. Newstead.

RECOGNITION CHARACTERS. An ovoid-elliptical species about 2.5 mm. long. Antennae 8-segmented, 355-365 microns long. Legs well developed, slender, posterior coxae with a few translucent pores. Trochanter + femur 225-240 microns, tibia + tarsus 240-260 microns. Labium 95 microns long. Circulus absent. Ostioles present with about 8 trilocular pores and 1 or 2 setae on each lip. Anal ring with 6 setae in length about twice diameter of ring. Cerarii on last 3-4 segments of abdomen only; anal lobe cerarii each with a pair of slender conical setae and a loose group of trilocular pores accompanied by 3-4 auxiliary setae and surrounded by a small area of sclerotization. Anterior cerarii similar but cerarian setae smaller and without auxiliary setae.

Dorsal setae not numerous, all short and slender. Multilocular disc pores in small submarginal groups on the abdominal segments anterior to anal lobes and in noticeable submedian groups on all segments including head except segments IX + X. Tubular ducts with oral collar of two sizes, present in small numbers around the abdominal margins and associated with the submarginal groups of multilocular disc pores. Tubular ducts with oral rim arranged in more or less single transverse rows, a common number being about 8. Trilocular pores present.

Ventral surface with a small elongate area of sclerotization on each anal lobe terminating in an apical seta longer than anal ring setae. Other ventral setae slender but longer than those on dorsum. Multilocular disc pores numerous in double or triple rows at posterior edges of segments V-VIII and at anterior edges of segments VII and VIII, numerous on segments IX + X and in a marginal group containing 15-27 pores opposite each anterior coxa; others present between each pair of coxae. Tubular ducts with oral collar of same two sizes as on dorsum, a larger type, numerous in submarginal groups on the posterior abdominal segment, these often extending to the submedian areas; there being also about 10-15 within each group of multilocular disc pores on prothorax. A smaller type of duct situated mainly in a transverse row on each of posterior abdominal segments. Tubular ducts with oral rim arranged in pairs around the margins of prevulvar abdominal segments and in numbers of 1-4 opposite the spiracles. Trilocular pores not numerous.

NOTES. This species may be easily distinguished from others in the genus by the presence of dorsal groups of multilocular disc pores. It comes closest to *A. paludinus* (Green) from which it differs in possessing fewer cerarii and in the larger proportion of multilocular disc pores to tubular ducts opposite the first coxae.

The accompanying illustration has been prepared from material kindly made available by Dr. K. L. Boratynski.

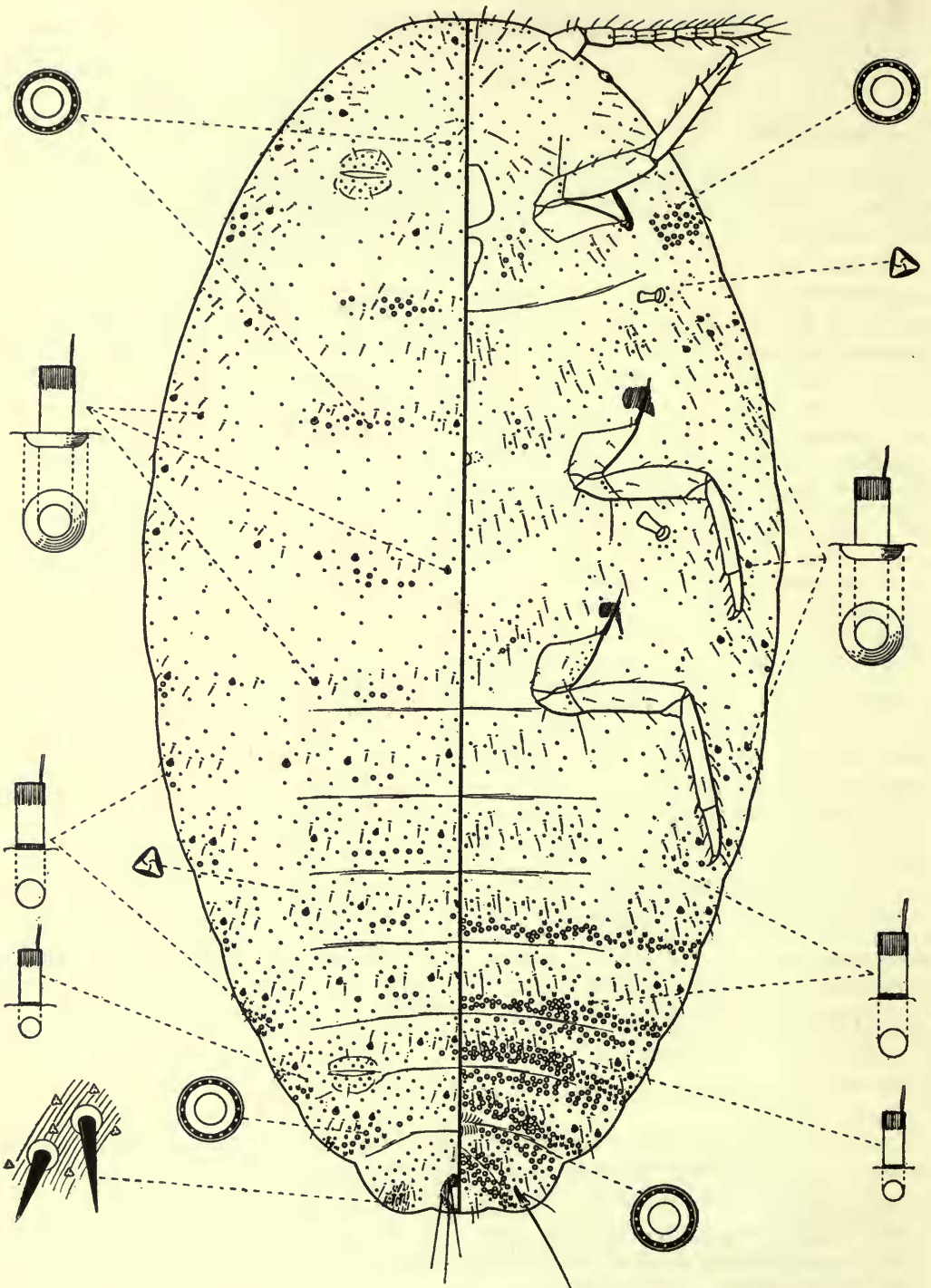


FIG. 1. *Atrococcus cracens* sp. n.

***Atrococcus luffi* (Newstead) (comb. n.)**

(Text-fig. 2)

Dactylopius luffi Newstead, 1901 : 85.*Pseudococcus luffi* (Newstead), Green, 1925 : 520.

HABIT AND DISTRIBUTION. The ovisac is, apparently, rather closely felted, long, cylindrical, and of equal width throughout; female remaining uncovered at the cephalic extremity. Newstead did not mention the colour but Green described it as pale flesh-colour, thinly dusted with white mealy powder. All of this material is now black and the specimens become purple-brown or black in potash. Described originally from CHANNEL ISLANDS, Guernsey, on lower stems and roots of *Lepigonum rupestre*, now *Spergularia rupicola*. Other specimens seen, all from Guernsey, are on *Silene maritima*, Petit Bot, Vazon Bay and on *Armeria vulgaris*, Houmet Benest. This is one of the species described from the Channel Islands which so far has not been collected in Britain.

RECOGNITION CHARACTERS. Shape ovoid, about 2.5 mm. long, anal lobes poorly developed. Antennae 8-segmented, about 415 microns long. Labium 115–120 microns long. Legs normal, posterior coxae with a few translucent pores; trochanter + femur 245–260 microns, tibia + tarsus 260–285 microns. Circulus absent. Ostioles well developed with inner edges of lips sclerotized and a few trilocular pores and an occasional seta on each lip. Anal ring with 6 setae twice length of ring at its greatest diameter. Cerarii represented by a single pair on anal lobes only, each with a pair of slender conical setae and about 8 trilocular pores.

Dorsal setae mainly short and slender, not numerous. Oral rim ducts in more or less single transverse rows on the abdominal segments, a common number being about 20 on each segment; on the thorax they tend to be in double transverse rows but anteriorly they become scattered. Segments III–VIII with small submarginal groups of multilocular disc pores and tubular ducts with oral collar of two sizes, a larger type usually mingled with the disc pores or just posterior to them and a smaller type just anterior to the groups. Trilocular pores evenly distributed. Simple circular pores, slightly larger than a trilocular pore, present in small numbers.

Ventral surface of each anal lobe with a small area of sclerotization and an apical seta longer than anal ring setae. Ventral setae mainly longer and stouter than those on dorsum. Multilocular disc pores rather numerous in the mid-region of the fourth and posterior segments and in submarginal groups on all abdominal segments but these becoming less numerous anteriorly; a noticeable submarginal group of about 12 pores also present opposite each anterior coxa. Tubular ducts with oral collar of two sizes and similar to those on dorsum; a smaller type in transverse rows in the middle of the posterior abdominal segments and a few in the submarginal areas; a larger type present just anterior to the multilocular disc pores in the mid-region of the abdomen and mingled with the submarginal groups, there being also 3–4 associated with the submarginal groups of disc pores on the prothorax. Tubular ducts with oral rim in small numbers around the submargins of abdomen and on the pro- and mesothorax where they occupy the median areas also. Trilocular pores sparse. Simple circular pores present but not numerous.

***Atrococcus paludinus* (Green)**

(Text-fig. 3)

Pseudococcus paludinus Green, 1921 : 191.*Atrococcus paludinus* (Green), Goux, 1941 : 80.

HABIT AND DISTRIBUTION. Described from Wicken Fen, Cambridgeshire, ENGLAND, on the under surface of the foliage of *Eupatorium cannabinum*, *Symphytum*

officinale, *Urtica* sp., *Lysimachia* sp., *Convolvulus* sp., and *Spiraea* sp. This is the only correct record as other specimens collected or recorded under this name are referred to *A. cracens*. Green described the insect as "Adult female brownish pink, masked (on the dorsum) by a thin covering of white pulverulent secretion. Posterior extremity with a pair of short, stout, waxy tassels, with a smaller tassel on the sides of each of the two preceding segments. Younger examples are of a pale olivaceous colour."

RECOGNITION CHARACTERS. An ovoid species attaining a length of 2.5 mm., anal lobes moderately developed. Antennae 8-segmented, 395–475 microns long. Legs slender, well developed, with translucent pores on hind coxae, trochanter + femur 330–370 microns, tibia + tarsus 325–380 microns. Labium 130–140 microns long. Ostioles present, each lip with a few trilobular pores and 1 or 2 setae. Anal ring setae about twice length of diameter of ring. Cerarii numbering 6–7 pairs on posterior abdominal segments only; anal lobe cerarii, each with a pair of slender conical setae surrounded by a loose group of trilobular pores and a few auxiliary setae. Other cerarii similar but cerarian setae becoming more slender anteriorly and without auxiliary setae.

Dorsal setae short and slender, not numerous. Tubular ducts with oral collar and multilobular disc pores in submarginal groups up to segment IV where they become less numerous; always with a larger proportion of ducts to pores; an occasional multilobular disc pore also present in median areas of posterior abdominal segments. Tubular ducts with oral rim on all segments except IX + X, in single transverse rows, a common number being about 6. Trilobular pores evenly distributed.

Ventral surface with a small elongate area of sclerotization on each anal lobe and with a stout apical seta longer than anal ring setae. Ventral setae sparse, all slender but longer than those on dorsum. Multilobular disc pores numerous around margins of second and posterior abdominal segments and abundant in transverse rows on fifth and posterior segments; a few also present in mid-region of some anterior segments. Another group of 2–8 always present lateral to first coxae, these accompanied by a group of 8–45 tubular ducts with oral collar similar to those on dorsum, the number of ducts although variable, always greater than number of multilobular disc pores. Other tubular ducts numerous in submarginal groups on second and posterior segments; present also in median areas of some anterior abdominal segments. A smaller type of duct, with oral collar, sparse in median areas of posterior abdominal segments and occasionally near margins. Tubular ducts with oral rim arranged singly or in pairs around the submargins as far anterior as metathorax and a group of 5–6 opposite each first spiracle. Trilobular pores not numerous.

BALANOCOCCUS gen. n.

Type of genus *Ripersia scirpi* Green.

RECOGNITION CHARACTERS. Pseudococcidae with elongate oval body, anal lobes poorly developed. Antennae 6-segmented. Legs normal. Anterior and posterior ostioles present, poorly developed. Circuli present or absent, up to 3 small oval circuli present in one species. Anal ring with a double band of pores and 6 setae. Cerarii numbering 1 or 2 pairs on abdomen only. Tubular ducts with oral collar on dorsum and venter, in zone around body, these of a distinctive shape, the collar flange-shaped and occupying either half or nearly half of total length of duct. Multilobular disc pores forming zone around entire body on both dorsum and venter, and present in transverse rows on abdomen. Trilobular pores evenly distributed.

NOTES. This genus comes closest to *Kiritshenkella* Borchsenius but differs mainly in having the trilobular pores evenly distributed over the body whereas one of the

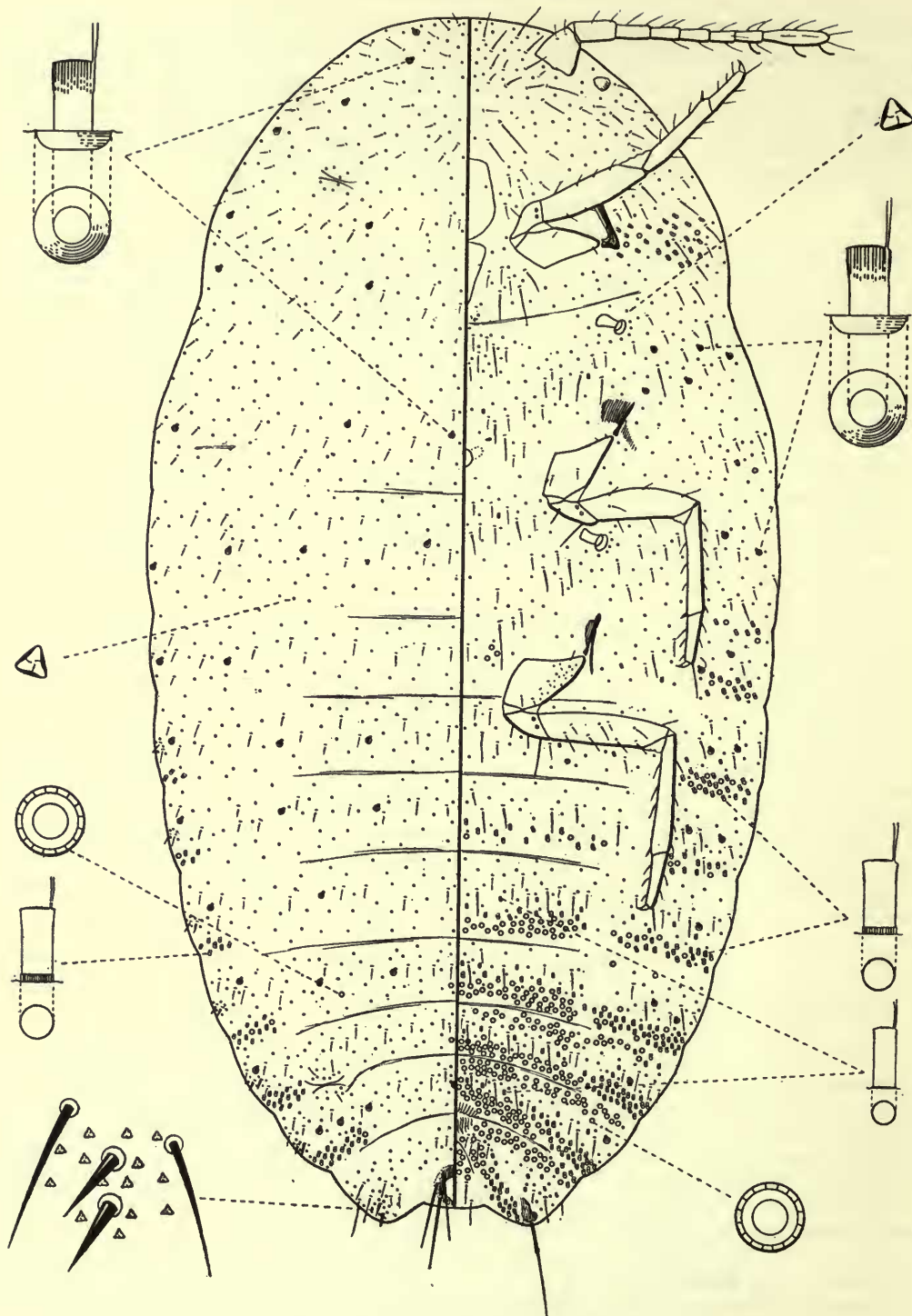


FIG. 3. *Atrococcus paludinus* (Green).

important characters of *Kiritshenkella* is the concentration of trilocular pores on the mid-line of both surfaces. Furthermore, there are in *Kiritshenkella* only posterior ostioles which are well developed, whereas *Balanococcus* possesses 2 pairs and these are poorly developed. Although the tubular ducts of both genera are similar, those of *Kiritshenkella* seem to be much flatter and are described as disc-like.

The writer is much indebted to Professor N. S. Borhsenius for kindly examining a photograph of the accompanying illustration of *B. scirpi* and advising on its differences with *Kiritshenkella*.

The two species of *Balanococcus* may be separated by the following key :

- | | | |
|---|-----------|--------------------------|
| Cerarii present on anal lobes only, circuli absent | | <i>scirpi</i> (Green) |
| Cerarii present on anal lobes and segment VIII, circuli 3 in number | | <i>boratynskii</i> sp. n |

Balanococcus boratynskii sp. n.

(Text-fig. 4)

HABIT AND DISTRIBUTION. External appearance not known. Found under the leaf sheaths of *Deschampsia caespitosa*, ENGLAND, Berkshire, Silwood Park, 31. v. 1945 (K. L. Boratynski).

RECOGNITION CHARACTERS. Body elongate with almost parallel sides, length about 3.5 mm., anal lobes moderately developed. Antennae 6-segmented, 260–310 microns long. Legs rather small and slender, posterior coxae with a few translucent pores; trochanter + femur 190–220 microns, tibia + tarsus 200–240 microns. Labium 70–75 microns long. Circuli 3 in number, small and oval, the posterior circulus much smaller than others. Ostioles poorly developed with 1–3 trilocular pores on each lip. Cerarii on anal lobes and segment VIII only, anal lobe cerarii, each with a pair of slender conical setae accompanied by 5–6 trilocular pores and a single auxiliary seta. Penultimate cerarii usually with a single conical seta and 1 or 2 trilocular pores. Anal ring with 2 rows of pores and 6 setae about twice length of diameter of ring.

Dorsal surface with rather numerous setae, all short and slender. Trilocular pores with an even distribution. Multilocular disc pores in a marginal zone around entire body, more numerous at anterior and posterior ends; present also in transverse rows on segments VI–VIII. Tubular ducts short with large oral collar occupying slightly less than half total length of duct. They are interspersed with the multilocular disc pores around the margins and form transverse rows on abdominal segments; a few scattered on head.

Ventral surface with each apical seta slightly shorter than anal ring setae. Ventral setae similar to those on dorsum but some on head and posterior segments tending to be longer. Trilocular pores evenly distributed. Multilocular disc pores present in a transverse row on segment V and abundant in transverse rows on posterior abdominal segments. Abundant also in a marginal zone around entire body. Tubular ducts of one size only, similar to dorsal ducts, situated in transverse rows on segment V and posterior segments. Present also in a marginal zone among the multilocular disc pores and particularly numerous in marginal groups on segment VI and posterior segments.

The writer has much pleasure in naming this species after Dr. K. L. Boratynski who kindly made available material for study and who has helped in many other ways during the preparation of this work.

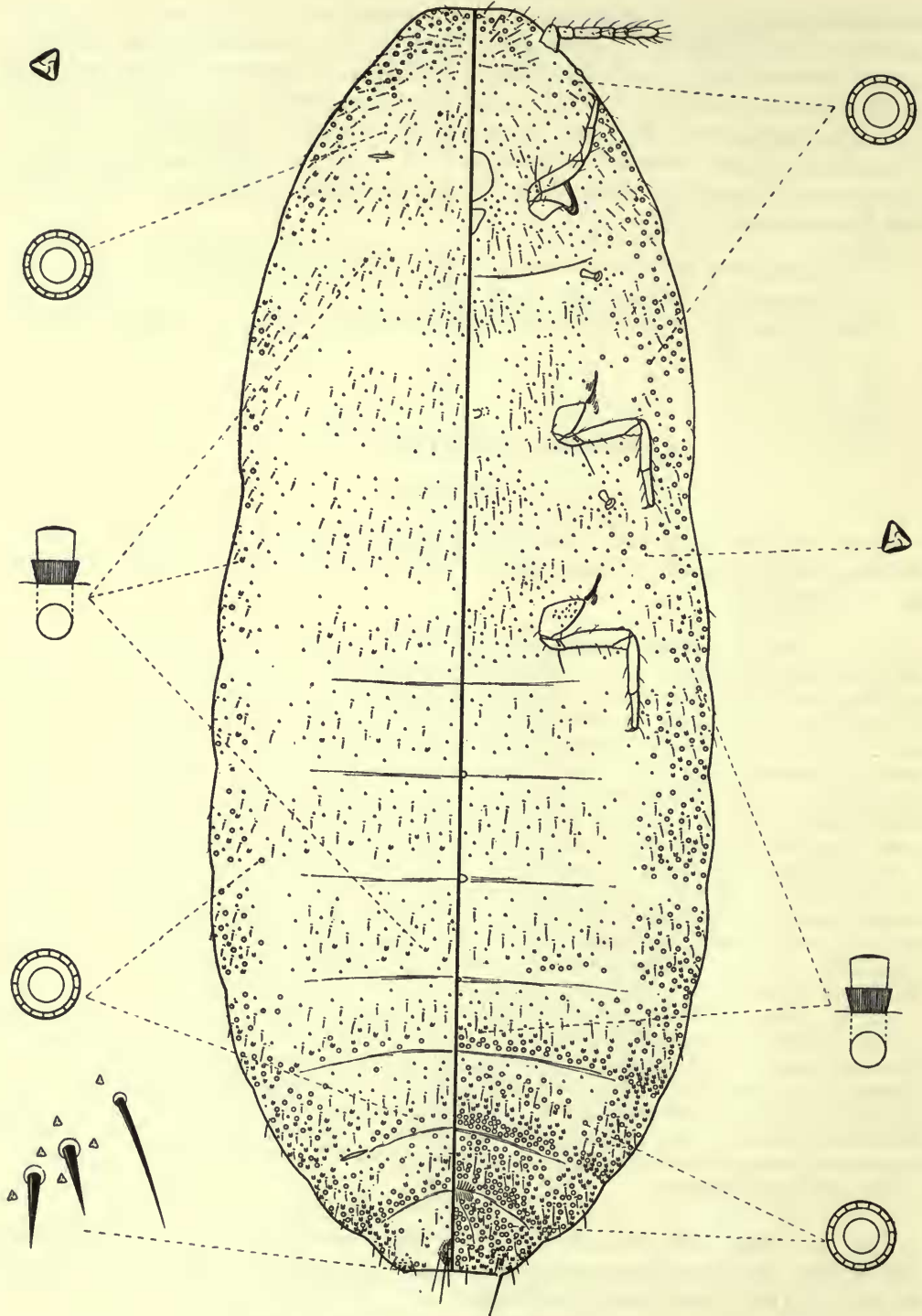


FIG. 4. *Balanococcus boratynskii* sp. n.

***Balanococcus scirpi* (Green) (comb. n.)**

(Text-fig. 5)

Ripersia scirpi Green, 1921 : 192.

HABIT AND DISTRIBUTION. This species was described by Green as "Concealed at base of stems of *Scirpus caespitosus* [= *Trichophorum caespitosum*], in boggy ground ; Camberley." [Surrey, ENGLAND.] The adult is apparently pink coloured and concealed beneath a coating of white mealy secretion.

RECOGNITION CHARACTERS. Adult female elongate, sides subparallel, widest across fourth abdominal segment, length approximately 3.5 mm., posterior end rounded. Antennae 6-segmented, 150–190 microns long. Legs small and slender, posterior coxae with a few translucent pores, trochanter + femur about 130 microns, tibia + tarsus 105–130 microns. Labium 50–60 microns long. Anterior and posterior ostioles represented by mere slits without trilocular pores or setae on the lips. Circulus absent. Anal ring with 2 rows of pores and 6 setae about twice as long as diameter of ring. Anal lobe cerarii present only, each with a pair of conical setae set close together and surrounded by about 4 trilocular pores.

Dorsal surface with small pointed setae, not numerous. Trilocular pores sparse but with an even distribution. Multilocular disc pores situated mainly in a narrow zone around the margins, the heaviest concentrations on the head and posterior abdominal segments. Others extending to median areas of segments VI and VII and occasionally in median areas of some anterior segments. Tubular ducts short, oral collar large, occupying about half total length of duct. A few present on head margins, a few on margins of fourth and posterior segments and small concentrations on segments VII–IX where they also occupy the median areas.

Ventral surface with apical setae shorter than anal ring setae. Body setae small and sparse on each segment but tending to be more numerous towards margins. Trilocular pores in transverse groups in median areas. Multilocular disc pores numerous in a submarginal zone around body. They are also scattered on head and form transverse rows on segments VII–IX. Tubular ducts, similar to those on dorsum, situated around body within zone formed by multilocular disc pores. A smaller type of duct but otherwise similar in all respects, confined to median areas of segments VII, VIII and IX + X.

Chnaurococcus* FerrisChnaurococcus* Ferris, 1950 : 40.Type of genus *Ripersia villosa* Ehrhorn.

This genus was erected for two rotund species each with 6-segmented antennae and with a single pair of cerarii on anal lobes only. The following species seems to belong to this genus although like *C. trifolii* (Forbes), it lacks the dorsal tubular ducts of the type species.

***Chnaurococcus subterraneus* (Newstead) (comb. n.)**

(Text-fig. 6)

Ripersia subterranea Newstead, 1893 : 79.*Ripersia tomlinii* Newstead, Newstead, 1903 : 187 (in part).*Ripersia subterranea* Newstead, Newstead, 1903 : 189.*Ripersia formicarii* Newstead, *In* Donisthorpe, 1907 : 5 (**syn. n.**).*Ripersia europaea* Newstead, Green, 1921 : 191. (Misidentification.)*Ripersia europaea* Newstead, var., Green, 1926 : 183.

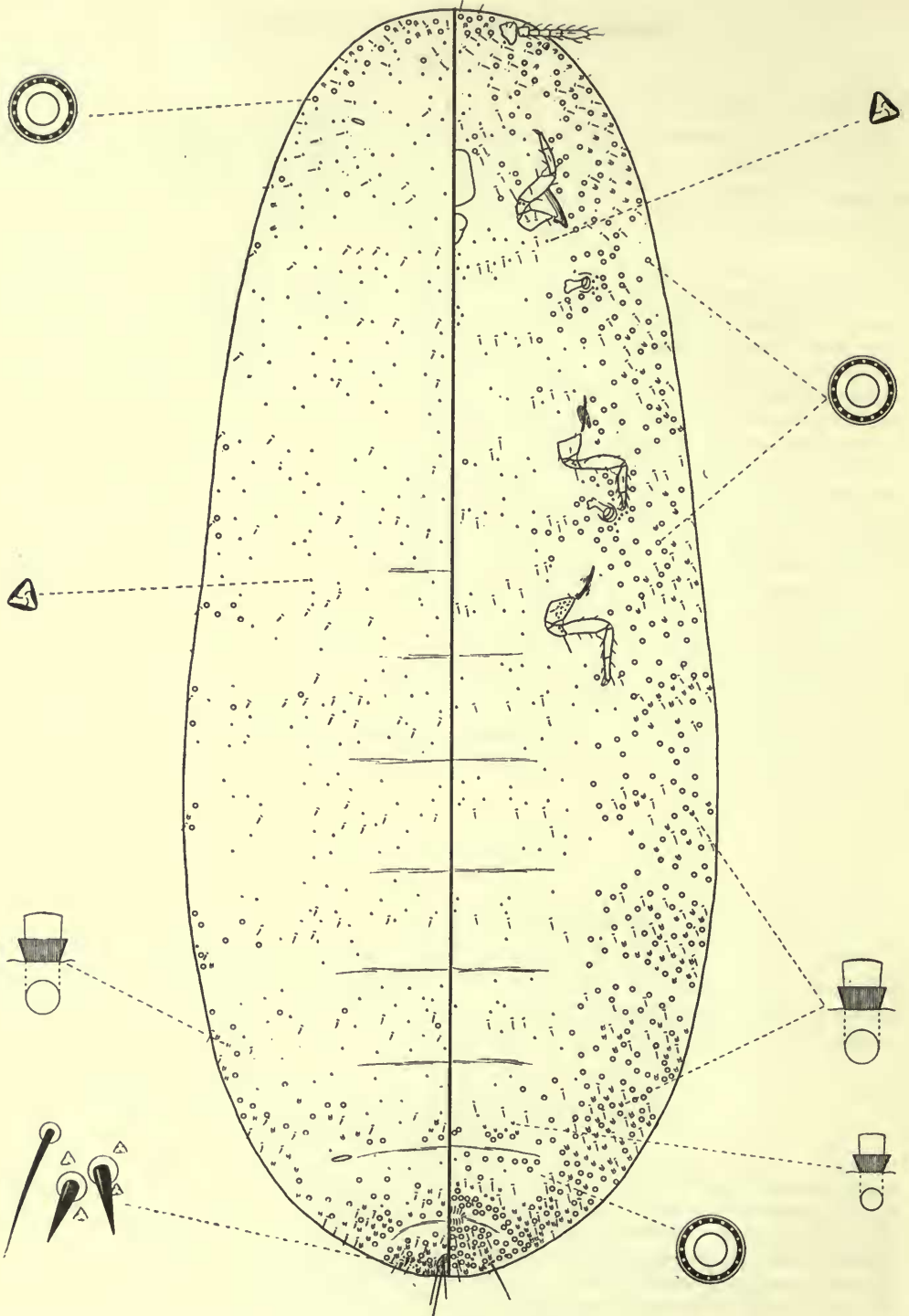


FIG. 5. *Balanococcus scirpi* (Green).

HABIT AND DISTRIBUTION. Newstead described the insect originally as "female adult; dark red-brown, turns dark purple in caustic potash". Specimens have been examined from the following localities: ENGLAND. Norfolk: Ingoldisthorpe, King's Lynn, on roots of *Nardus stricta* in nests of *Formica flava* (types). Dorsetshire: Portland, nest of *Lasius niger*. Cornwall: Pudstone, nests of *Lasius niger*, 8.vii.1920 (H. Donisthorpe); Stepper Point, vii.1920. Somersetshire: Porlock, nests of *Lasius niger*, v.1915 (W. C. Crawley); Minehead, nest of *Lasius niger*, ix.1920 (E. E. Green). Devonshire: Dartmouth, nest of *Lasius niger* (H. Donisthorpe). Gloucestershire: Bristol, in ant's nest, vii.1924 (H. Donisthorpe). Sussex: Eastbourne, nests of *Lasius niger*, 6.xi.1924 (H. Donisthorpe). Kent: Charing, with *Lasius niger* (type of *R. formicarii*). SCOTLAND. East Lothian, North Berwick Law (E. E. Green).

RECOGNITION CHARACTERS. A broadly oval species measuring approximately 2 mm. long; anal lobes moderately developed. Antennae 6-segmented, 235-260 microns long. Legs small and stout, normal, trochanter + femur 180-190 microns, tibia + tarsus 190-200 microns. Labium 105-115 microns long. Circulus absent. Ostioles well developed, with inner edges of lips sclerotized and each lip with 4-5 trilocular pores and an occasional seta. Anal ring with a double band of pores and 6 setae only slightly longer than diameter of ring. Cerarii represented by a pair on anal lobes only, each with a pair of short conical setae, these usually straight but sometimes curved and surrounded by a loose group of 6-7 trilocular pores.

Dorsal and ventral setae short and mainly rather stout. Apical setae longer than anal ring setae. Trilocular pores somewhat numerous and evenly distributed on both surfaces. Ventral surface with multilocular disc pores on fifth and posterior segments only, in single or slightly irregular transverse rows at posterior edges of segments. Tubular ducts of one size, on venter only, situated in single transverse rows at middle of most abdominal segments and in small submarginal groups.

NOTES. This species comes closest to *C. trifolii* (Forbes), another species found in ants' nests and known from U.S.A., but differs in possessing only 6-7 trilocular pores with each cerarius whereas in *C. trifolii* the numbers of trilocular pores are much more numerous.

CHORIZOCOCCUS McKenzie

Chorizococcus McKenzie, 1960: 692.

Type of genus *Chorizococcus wilkeyi* McKenzie.

This genus was erected for species with oral rim ducts, the cerarii numbering from 0-4 pairs without auxiliary setae except those on anal lobes. It differs from *Spilococcus* mainly in possessing fewer cerarii but is almost identical with *Atrococcus* discussed earlier. So far as is known, all species of *Spilococcus* are yellow or pinkish but species of *Atrococcus* are black, especially after death, and turn a distinct black or blue-black in potash. For the purposes of this work the genera are regarded as distinct.

Chorizococcus lounsburyi (Brain)

Pseudococcus lounsburyi Brain, 1912: 179.

Pseudococcus (Trionymus) peregrinus Green, 1925a: 40, 41 (syn. n.).

Trionymus lounsburyi (Brain), Ferris, In Zimmerman, 1948: 260, 261.

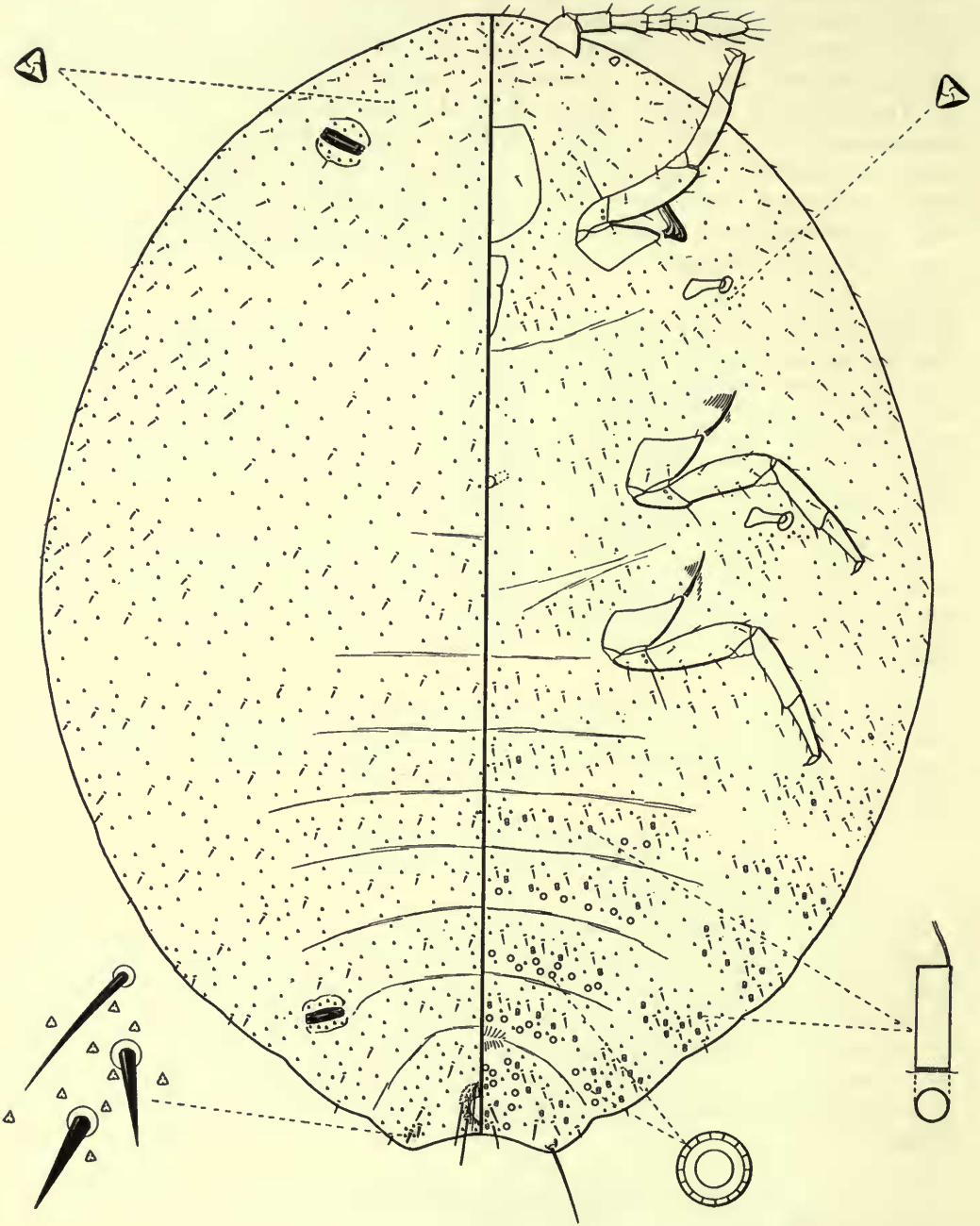


FIG. 6. *Chnaurococcus subterraneus* (Newstead).

Trionymus lounsburyi (Brain), Ferris, 1950 : 271.

Pseudococcus lounsburyi Brain, De Lotto, 1958 : 96, 97.

Chorizococcus peregrinus (Green), McKenzie, 1960 : 701.

This is a difficult species to identify satisfactorily. It has never been figured adequately from the original type material from South Africa and the only illustration available is that prepared by Ferris from material collected in Hawaii. McKenzie has considered, on information received from Dr. H. Morrison, that this material is the same as that described by Green as *Pseudococcus (Trionymus) peregrinus* and differs from *C. lounsburyi*. This distinction is based mainly on the differences in colour and habit of the adult female. The writer has examined many specimens from South Africa, Egypt, Hawaii, Holland and England and, although there is variation in the numbers of multilocular disc pores and oral rim ducts, there is little evidence that the material represents different species. On a request from the author, Dr. H. Morrison has kindly re-examined material at Washington and has come to similar conclusions, although he has stated that the results must be regarded as tentative until more material is studied. As *C. peregrinus* comes within the known range of variation, the name is sunk as a synonym of *C. lounsburyi*. The variation has also been discussed by De Lotto who has examined many specimens from Africa. For the time being the illustration given by Ferris is accepted although the numbers of multilocular disc pores and oral rim ducts tend to be rather high. As pointed out by De Lotto there are often multilocular disc pores on the posterior dorsal abdominal segments.

Although there are exceptions, most of the records are from the plant families Amaryllidaceae and Liliaceae. Material is at hand from ENGLAND, all under glass, from Hampshire, Exbury, *Nerine* roots (*peregrinus* type) and Surrey, Abinger Hammer, on bulbs of *Crinum* sp., *Sprekelia* sp. and *Hippeastrum* sp. Other material has also been examined from England, without locality, from the bulbs of *Amaryllis* sp.

DYSMICOCCUS Ferris

Dysmicoccus Ferris, 1950 : 53.

Type of genus *Dactylopius brevipes* Cockerell.

The writer has accepted the interpretation of this genus given by McKenzie (1960) and a further discussion is given under *Trionymus*. Only two species recorded from Britain belong to the genus and these may be separated as follows :

Body elongate, multilocular disc pores numerous in transverse rows on posterior abdominal segments of venter	walkeri (Newstead)
Body rotund, multilocular disc pores few, situated around vulva only	wistariae (Green)

Dysmicoccus walkeri (Newstead) (comb. n.)

(Text-fig. 7)

Dactylopius walkeri Newstead, 1891 : 164.

Dactylopius walkeri Newstead, Newstead, 1903 : 169.

Pseudococcus walkeri (Newstead), Fernald, 1903 : 112.

Pseudococcus walkeri (Newstead), Green, 1916 : 31.

Pseudococcus walkeri (Newstead), Green, 1925 : 517.

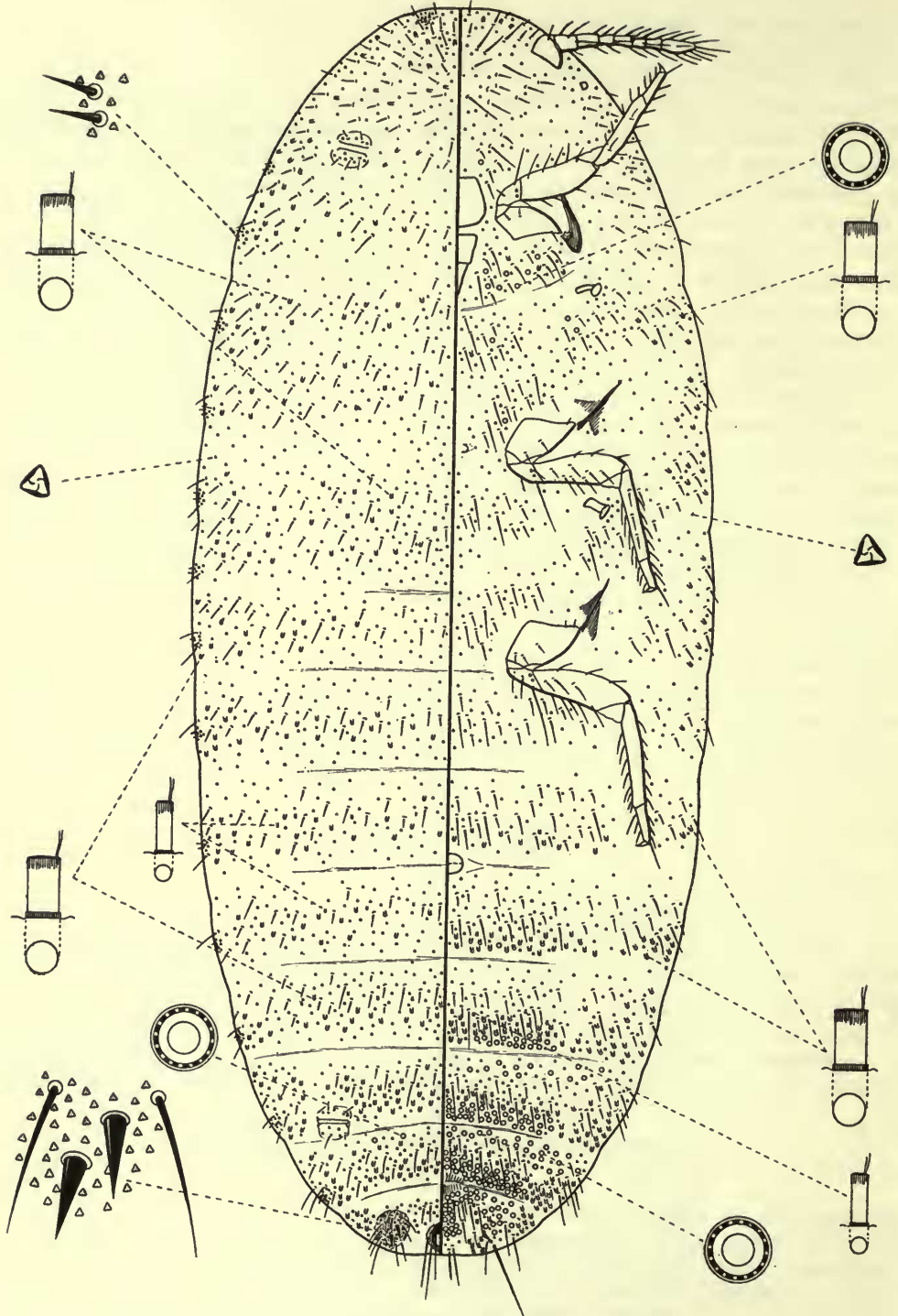


FIG. 7. *Dysmicoccus walkeri* (Newstead).

Pseudococcus walkeri (Newstead), Green, 1926 : 182, 183.

Pseudococcus walkeri (Newstead), Green, 1928 : 30.

HABIT AND DISTRIBUTION. Described as "Elongate brown. Antennae and legs pale yellow-brown, covered with a dense white powder ; the cottony appendages of the margin stout, six of these at the abdominal extremity longer and stouter than the others, the second pair longest and very stout, in length equal to width of body. . . .".

This is normally a grass-infesting species and specimens have been examined from the following localities : ENGLAND. Cheshire : Manley, near base of *Agrostis tenuis*, ix.1890 (R. Newstead). Surrey : Camberley, vii.1915, 13.ix.1920, viii.1922, 5.ix.1922, viii.1926 (*Calluna* sp. stems), 22.viii.1939 (E. E. Green) ; Ashtead, 22.viii.1939. Kent : Bearsted, 14.ix.1926 (E. E. Green). Somersetshire : Cheddar, viii.1926 (E. E. Green). WALES. Brecknockshire : Llangammarch, ix.1925 (E. E. Green). Montgomeryshire : Nant Cwmdu Aberhosan, 20.vii.1919 (R. Newstead). SCOTLAND. East Lothian : Aberlady, viii-1925 (E. E. Green). Aberdeenshire : Monymusk, viii.1920 (F. Laing). CHANNEL ISLANDS. Herm : Petit Bot.

RECOGNITION CHARACTERS. An elongate-oval species measuring up to 4.5 mm. long, anal lobes poorly developed. Antennae 8-segmented, 410-515 microns long. Legs normal, trochanter + femur 370-395 microns, tibia + tarsus 375-440 microns. Labium 125-130 microns long. Circulus not large, rounded. Ostioles with 3-4 trilocular pores and 2-3 setae on each lip. Anal ring with 6 setae twice as long as its diameter. Cerarii numbering 15-17 pairs, usually 15 pairs, those lacking being on the head ; anal lobe cerarii each with a pair of conical setae and numerous trilocular pores accompanied by about 10 auxiliary setae and all borne on a distinct area of sclerotization, larger in area than anal ring. Anterior cerarii each with smaller cerarian setae, a few trilocular pores and one or two auxiliary setae.

Dorsal setae of various sizes but mainly short and slender. One or two multilocular disc pores usually present on penultimate segment. Tubular ducts with oral collar of 2 sizes, a larger type numerous on all segments and a smaller type sparse on some of the posterior abdominal segments. Trilocular pores evenly distributed.

Ventral surface with a small area of sclerotization on each anal lobe terminating at a stout apical seta longer than anal ring setae. Ventral setae rather numerous, all slender but mainly longer than those on dorsum. Multilocular disc pores numerous on posterior abdominal segments, there being double or triple rows on the posterior edges of segments VI-VIII and on the anterior edges of segments VII and VIII ; numerous also on segments IX + X, a few also present behind first coxae, occasionally at random on thorax. Tubular ducts of same sizes as on dorsum, a larger type on fourth and posterior segments and numerous on margins of posterior abdominal segments ; smaller marginal groups present on thorax and head. A smaller type of duct in median areas of fourth and posterior segments only, sparse. Trilocular pores present.

NOTES. This species comes close to *D. timberlakei* (Cockerell), another elongate species on grasses described from U.S.A. and with 17 pairs of cerarii but in this case the circulus is moderately large and divided by a distinct intersegmental furrow. In *D. walkeri* the circulus is oval and not divided.

Dysmicoccus wistariae (Green) (comb. n.)

Pseudococcus wistariae Green, 1923 : 218.

Pseudococcus piricola Siraiwa, 1935 : 69 (syn. n.).

Pseudococcus cuspidatae Rau, 1937 : 195 (syn. n.).

Dysmicoccus cuspidatae (Rau), Ferris, 1950 : 61.

Dysmicoccus piricola (Siraiwa), Takahashi, 1957 : 3.

This species was described from material collected on *Wistaria* sp. at a Japanese nursery garden, presumably under glass, at St. Albans, Hertfordshire, ENGLAND. Dr. Harold Morrison has kindly examined a specimen and he agrees that it is identical with *D. cuspidatae* described from U.S.A. The latter name has already been synonymized by Takahashi with *D. piricola* described from Japan. Ferris has redescribed and illustrated this species under *D. cuspidatae*.

EURIPERSIA Borchsenius

Euripersia Borchsenius, 1948 : 955.

Type of genus *Euripersia amnicola* Borchsenius.

Two British species are included in this genus on the basis of the descriptions of *E. amnicola* Borchs. and *E. brevispina* recently described by Borchsenius & Ter-Gregorian (1956). The essential features of the genus are the oval body ; antennae 6-7-segmented ; claw with a denticle although at times absent ; quinquelocular disc pores usually present on venter although in the type species they are present only in the first stage larva ; cerarii numbering at most 3 pairs, 2 of which confined to segments VIII and IX ; circuli numbering from 1-3 or absent entirely ; multi-ocular disc pores confined to ventral abdominal segments.

Although the two following species were described originally in the genus *Ripersia*, they are excluded from this genus despite certain similarities to *Ripersia corynephorii* Signoret, the type species, redescribed by Reyne (1951). This species has 8-segmented antennae, 2 pairs of cerarii, multilocular disc pores on both dorsum and venter, quinquelocular disc pores absent although present in the first stage larva. As very little else is known about this species and as the following species have no multilocular disc pores on the dorsum, the genus *Ripersia* is disregarded from the present study.

The two British species have been mentioned in the literature under a variety of names and consequently only the original references can be trusted.

Euripersia europaea (Newstead) (comb. n.)

(Text-fig. 8)

Ripersia europaea Newstead, 1897 : 167.

Ripersia tomlinii Newstead, Donisthorpe, 1907 : 5. (Misidentification.)

Ripersia tomlinii Newstead, Green, 1920 : 122. (Misidentification.)

Ripersia tomlinii Newstead, Green, 1925 : 518 (in part).

Ripersia wünni Reyne, 1953 : 235-239 (syn. n.).

HABIT AND DISTRIBUTION. Newstead described this species as "densely clothed with white mealy wax ; segmentation more or less distinct". Its most favoured positions are apparently under stones in ants' nests and they presumably feed on the fine rootlets. Specimens are known from Britain as follows : CHANNEL ISLANDS. Guernsey : Watville, ants' nests (B. Tomlin), (*europaea* types) ; Fort Doyle, under stones with ants, 9. ix. 1924 (E. E. Green) ; 29. xii. 1926, 8. vi. 1947 (R. H. Le Pelley) ; also material without data from other localities in nests of *Lasius niger*. ENGLAND. Isle of Wight : Blackgang, with *Lasius flavus* and *L. niger* (H. Donisthorpe) ; Sandown, nest of *Lasius niger*, 4. v. 1910 (H. Donisthorpe) ; Ventnor, 26. ix. 1922 (H.

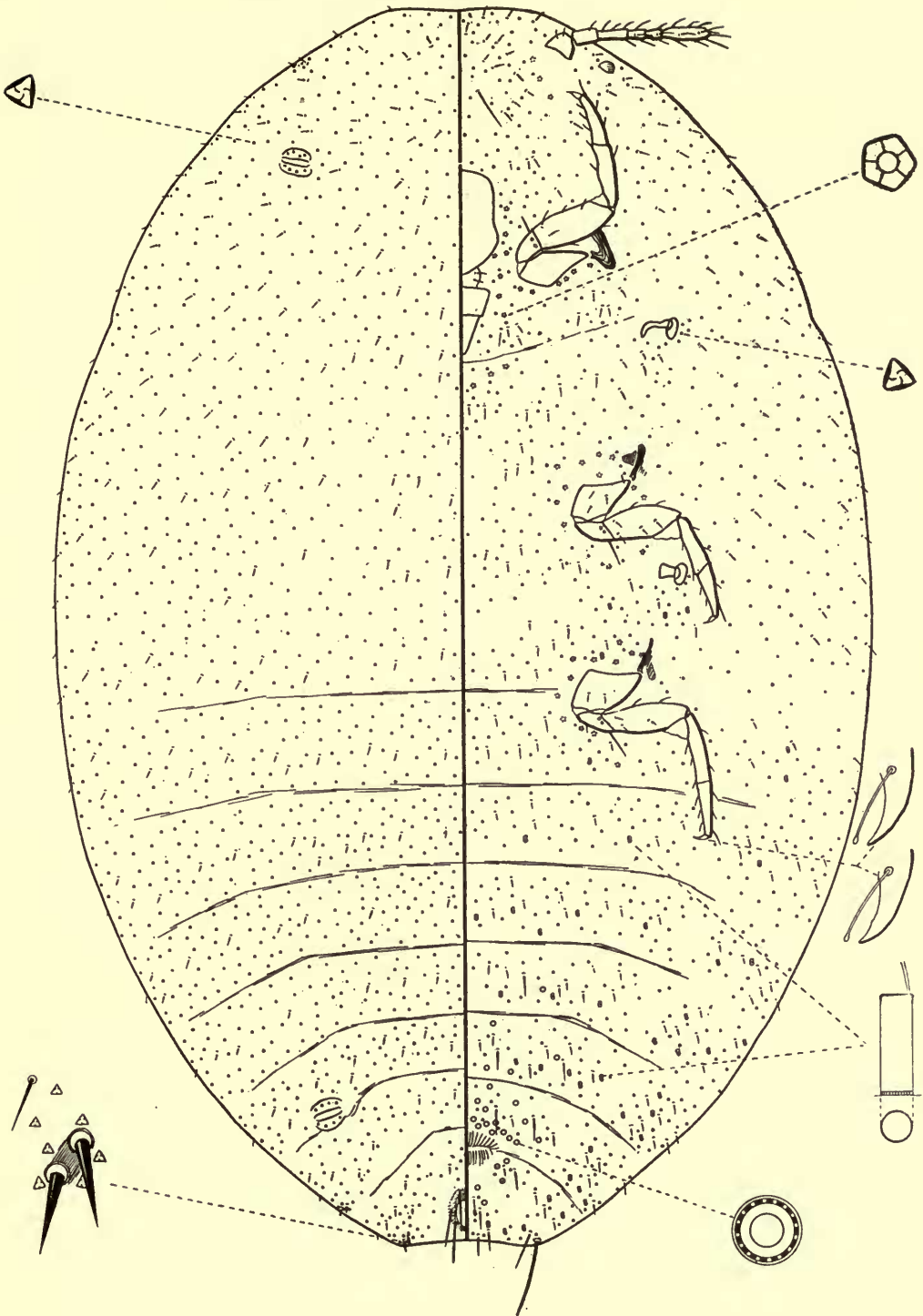


FIG. 8. *Euripersia europaea* (Newstead).

Donisthorpe). Kent: Dover, nest of *Lasius niger* (H. Donisthorpe). Sussex: Eastbourne, with *Lasius niger*, 6.ix.1924 (H. Donisthorpe). Dorsetshire: Swanage, 14.ix.1904 (B. Tomlin). Cornwall: Whitsand Bay, with *Lasius niger* (H. Donisthorpe).

RECOGNITION CHARACTERS. A small broadly oval species approximately 2.5 mm. long, anal lobes poorly developed. Antennae 6-segmented, 225–260 microns long. Legs small, claw with or without a denticle, in some cases only the faintest sign of a denticle or may be present or absent on different claws of same specimen. Trochanter + femur 155–165 microns, tibia + tarsus 170–205 microns. Labium 90–95 microns long. Circulus absent. Ostioles present, each lip with about 4 trilocular pores but apparently without setae. Anal ring with a double band of pores and 6 setae about same length as ring at its greatest diameter. Cerarii numbering 2–4 pairs; anal lobe cerarii each with 2 slender conical setae and about 5 trilocular pores, the space between the setae lightly sclerotized; penultimate cerarii similar but cerarian setae slightly smaller. The preocular cerarii often present, although difficult to see. Their presence can be detected by the paired setae and the small concentration of trilocular pores. Another pair of cerarii sometimes present on thorax.

Dorsal setae sparse, all small and slender. The only pores present on the dorsum are trilocular, rather numerous with an even distribution.

Ventral surface with a stout pair of apical setae longer than anal ring setae. Ventral setae not numerous, all slender and short but tending to be longer than dorsal setae especially on posterior segments. Multilocular disc pores at anterior and posterior edges of segments VII and VIII and present on segments IX + X, there being scarcely more than 50 altogether. Quinquelocular disc pores present in groups around the basal antennal segments and each coxa. Tubular ducts sparse, of one size only, confined to metathorax and abdomen, forming transverse rows. Trilocular pores of similar distribution to those on dorsum.

NOTES. Specimens examined of *Ripersia wünni* Reyne are identical with *E. europaea*. As pointed out by Reyne, the denticle on the claw is, at times, hardly perceptible and in some specimens it is absent entirely.

Euripersia tomlinii (Newstead) (comb. n.)

(Text-fig. 9)

Ripersia tomlinii Newstead, 1892: 146, 147.

Ripersia tomlinii Newstead, Newstead, 1903: 186 (in part).

Ripersia exul Green, 1924: 46, 47 (syn. n.).

Ripersia mesnili Balachowsky, 1934: 67–70 (syn. n.).

Ripersia exul Green, Green, 1934: 111.

HABIT AND DISTRIBUTION. Described by Newstead as "Dull orange-yellow, . . . Sac of the female globose or ovate, composed of close, white waxy material, very compact on the inside;" Green described the ovisac as measuring 5 mm. in diameter. The insect lives on grass roots in association with ants' nests. Material has been examined from the following localities: CHANNEL ISLANDS. Guernsey: Moulin Huet, ix.1891 (Miss Tomlin) (Type); Chappelle dom Hué, 24.vii.1923 (J. R. le B. Tomlin (*exul* Type); viii.1958 (R. H. Le Pelley); Vazon Bay, ix.1924 (E. E. Green); Belle Elizabeth; Lihou, ix.1925 (E. E. Green). Herm: ix.1924 (E. E. Green); Rat Is., viii.1923 (J. R. le B. Tomlin). Alderney: viii.1892 (W. A. Luff). Sark: (W. A. Luff). ENGLAND. Suffolk: ix.1932 (A. S. Watt).

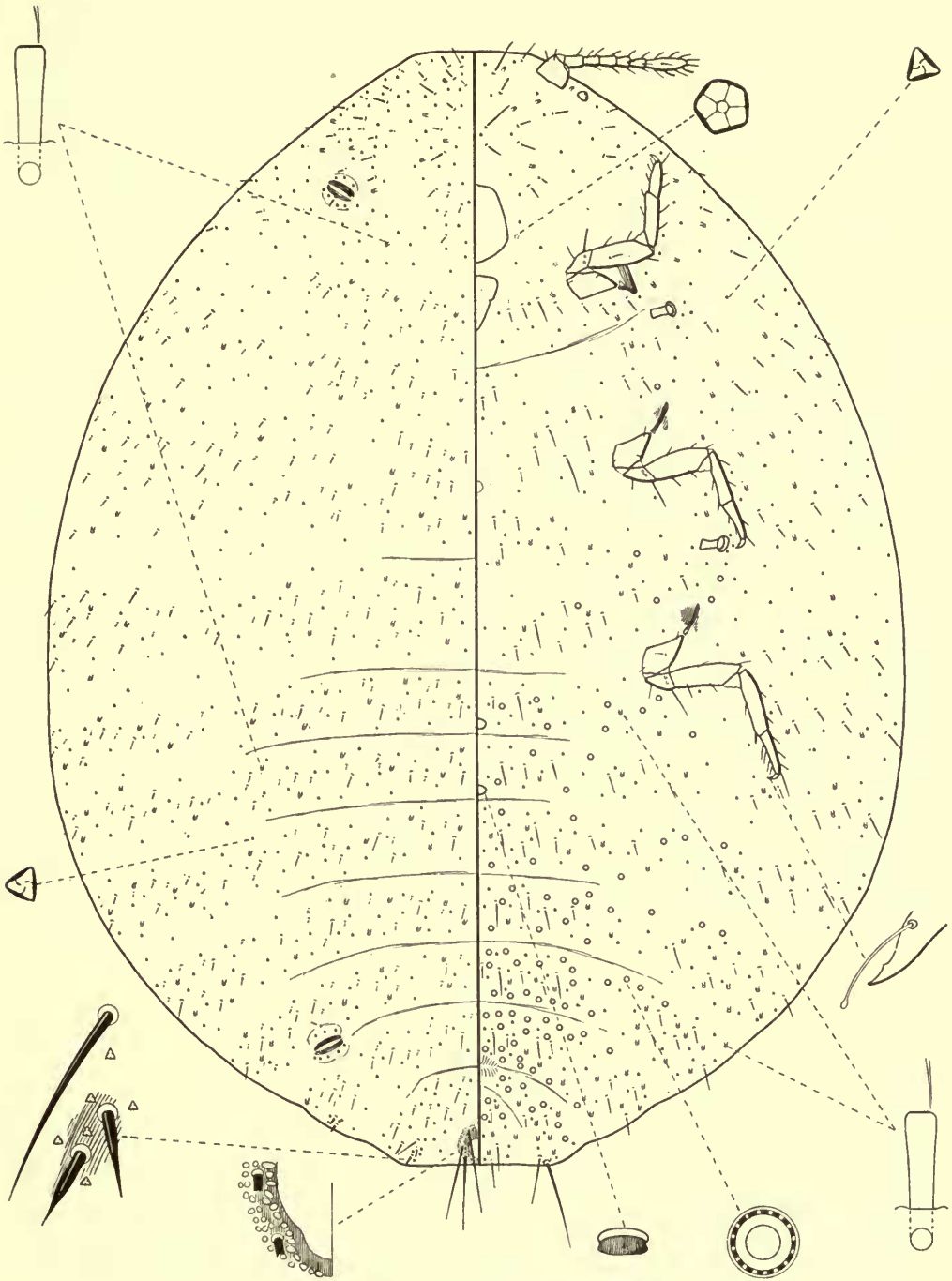


FIG. 9. *Euripersia tomlinii* (Newstead).

RECOGNITION CHARACTERS. Adult female broadly oval about 3.5 mm. long, anal lobes poorly developed. Antennae 6-7-segmented, 230-260 microns long, the third segment often divided into two of equal length and the terminal segment often showing signs of division. Legs small and slender, claw with a distinct denticle; trochanter + femur 145-175 microns, tibia + tarsus 170-205 microns. Labium 70-80 microns long. Circuli 2 or 3 in number, on the second, third and fourth segments, all transversely elliptical and with a flat protuberance; the circulus on the fourth segment much smaller than the others and sometimes absent. Ostioles with inner edges of lips sclerotized and with about 3 trilocular pores and an occasional seta on each lip. Anal ring with 3 rows of pores and 6 setae over twice length of diameter of ring. Cerarii numbering 2 pairs only; anal lobe cerarii each with a pair of small conical setae and about 5 trilocular pores, the space between the setae sclerotized; a single auxiliary seta present anterior to the cerarius. Penultimate cerarii similar but cerarian setae smaller.

Dorsal setae not numerous, a short slender type interspersed with a minute lanceolate type. Tubular ducts present each without noticeable collar, situated more or less in single rows at anterior and posterior edges of abdominal segments but scattered on thorax and head; sparse. Trilocular pores not numerous, evenly distributed.

Ventral surface with apical setae longer than anal ring setae. Ventral setae few, all slender but longer than those on dorsum. Multilocular disc pores arranged in single rows at anterior and posterior edges of abdominal segments, mainly in median areas; a few also present on thorax. Quinquelocular disc pores present between first coxae and clypeus and labium, usually very few, in which case they may number about 6 but sometimes they are more numerous and may be present on the mesothorax. Tubular ducts similar to those on dorsum, situated between the multilocular disc pores on each of abdominal segments and on the lateral areas; on the thorax and head they become scattered. Trilocular pores sparse.

NOTES. Some confusion seems to have arisen in identifying this species. The third antennal segment is often divided into two segments of equal length and the terminal segment often shows signs of division. When Green described *R. exul* he stated that it differed from *R. tomlinii* in having more robust antennae and a broader and shorter labium. It now seems evident that Green based this distinction on misidentified specimens of *Euripersia europaea*. The type of *R. exul* is identical with *E. tomlinii*.

Specimens of *Ripersia mesnili* Balachowsky, described from Corsica, also seem to be identical with *E. tomlinii*. Balachowsky described the tubular ducts as being on the venter only but they are present on both surfaces on specimens examined from Lac de Nino and Bergeries de Paratella mentioned in his original description. The name *R. mesnili* is, therefore, sunk as a synonym of *E. tomlinii*.

HELIOCOCCUS Šulç

Heliococcus Šulç, 1912 : 39-48.

Type of genus *Heliococcus bohemicus* Šulç.

Since Šulç erected this genus, a few more species were added to it by Goux (1934) and a number of new species have been described by Borchsenius (1949). By far the greatest number occurs in the Palaearctic Region but four are known from North America and one from the Ethiopian Region.

Belonging to the *Phenacoccus* group with a denticle on the claw and with quinquelocular pores, the genus is easily recognized by the peculiar crateriform ducts, the larger ducts often with 1-4 minute setae attached to the base of the duct prominence. The following species seems definitely to belong to this genus.

Heliococcus minutus (Green) (comb. n.)

(Text-fig. 10)

Phenacoccus minutus Green, 1925: 519.

HABIT AND DISTRIBUTION. Described as clustered on the underground stems of *Erica cinerea*, CHANNEL ISLANDS, Guernsey, L'Ancrese, September. The adult female is described as dull purplish. Body rather closely dusted with coarse mealy secretion. No marginal tassels but with a pair of divaricating liguliform processes projecting from the anal area. This insect has so far not been found in Britain.

RECOGNITION CHARACTERS. A small oval species measuring approximately 1.5 mm. long, anal lobes well developed, with a dorsal area of weak sclerotization either same size or larger in area than ring. Antennae 9-segmented, 310–370 microns long. Legs normal, claw with a distinct denticle, trochanter + femur 215–220 microns, tibia + tarsus 225–260 microns. Labium 95–105 microns long. Circulus absent. Ostioles present, each with 4–5 trilocular pores, setae often absent, especially on the posterior pair, but usually 2–3 present on each lip of anterior pair. Anal ring with 6 setae about twice length of diameter of ring. Cerarii numbering 18 pairs, each with 2 lanceolate setae; anal lobe cerarii with a small concentration of about 6–8 trilocular pores; anterior cerarii with cerarian setae much smaller and accompanied by 3 or 4 trilocular pores.

Dorsal surface with minute lanceolate setae. Trilocular pores not numerous but evenly distributed. Crateriform ducts present, of 3 sizes. The largest type each with 3 minute setae attached to the base of the duct prominence, situated mainly on the mid-line and around the submargins but their positions not constant. An intermediate type, usually with 2 setae attached to the base of the duct prominence, situated mainly in the submedian areas. Both types often occupying similar positions in different specimens. A small type of duct usually present on the margins and occasionally in the submedian areas, these very sparse, without setae attached to the base of the duct prominence but often a single seta in close association with it.

Ventral surface with a pair of stout apical setae longer than anal ring setae. Anal lobes each with a small elongate strip of sclerotization, not attached to the apical seta. Ventral setae slender and sparse but a few lanceolate setae, similar to those on dorsum, occupying the lateral areas. Multilocular disc pores confined to fifth and posterior segments, very few and present in the median areas at posterior edges of segments. Quinquelocular disc pores in median and submedian areas, scattered on head and thorax, but lying in transverse rows on abdominal segments mainly at anterior edges. Trilocular pores sparse. Tubular ducts with oral collar on abdomen and occasionally on metathorax, situated in single transverse rows but absent in submarginal areas, there being scarcely more than 20 altogether. A few crateriform ducts of the same size as the smallest type on dorsum, present around margins of metathorax and some of abdominal segments.

HETEROCOCCUS Ferris*Heterococcus* Ferris, 1918: 65.*Heterococcus* Ferris, Morrison, 1945: 45.Type of genus *Heterococcus arenae* Ferris.

The important characters of this genus are the 8–9-segmented antennae, claw usually with a denticle, and the presence of quinquelocular disc pores on the dorsum and venter which replace the normal trilocular pores. All the species are found at the bases of grass stems and only one species is known from Britain.

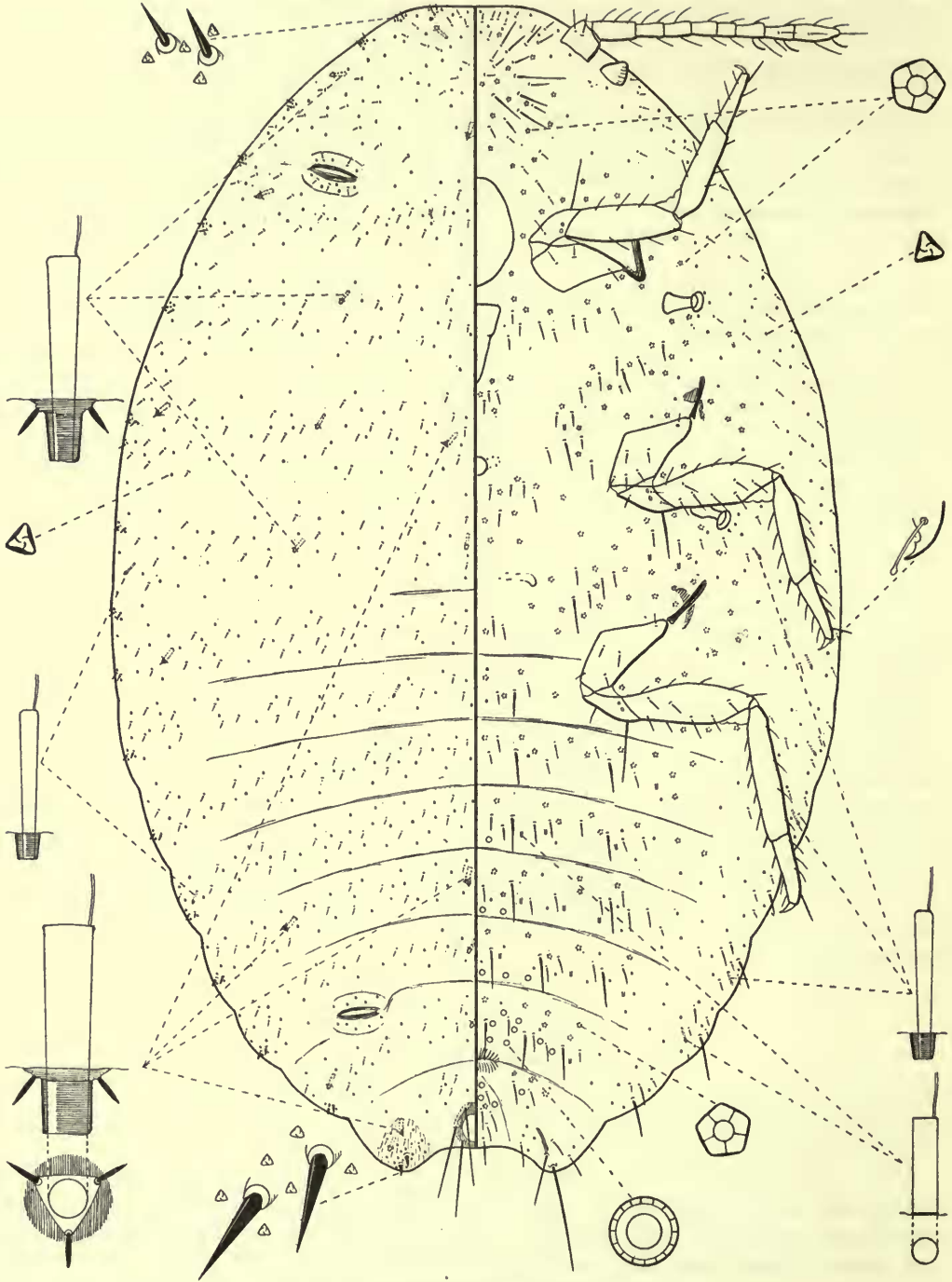


FIG. 10. *Heliococcus minutus* (Green).

***Heterococcus pulverarius* (Newstead)**

Ripersia pulveraria Newstead, 1892 : 145.

Phenacoccus nudus Green, 1926 : 172.

Heterococcus nudus (Green), Green, 1928 : 21.

Heterococcus pulverarius (Newstead), Williams, 1961 : 673.

The name has been given in error to a few species here discussed under *Trionymus*. A redescription and illustration has been given recently by Williams.

ENGLAND. Cheshire : Sandiway, *Agrostis tenuis*, viii. 1891 (R. Newstead). Surrey : Camberley, vi. 1925 (E. E. Green). Berkshire : Silwood Park, *Holcus mollis*, *Festuca* sp. 8.viii. 1949 (K. L. Boratynski).

***NIPAECOCCUS* Šulç**

Nipaecoccus Šulç, 1945 : 1-48.

Nipaecoccus Šulç, Ferris, 1950 : 103.

Type of genus *Dactylopius nipae* Maskell.

The members of this genus are characterized by a peculiar blue-green or brown body content which shows up particularly during the preparation in caustic potash. There are always some dorsal setae of the same size or near the same size as cerarian setae and the antennae are usually 7-segmented.

***Nipaecoccus nipae* (Maskell)**

Dactylopius nipae Maskell, 1893 : 230.

Pseudococcus nipae (Maskell), Fernald, 1903 : 107.

Pseudococcus nipae (Maskell), Green, 1917 : 262, 263.

Pseudococcus nipae (Maskell), Green, 1930 : 10.

Nipaecoccus nipae (Maskell), Šulç, 1945 : 1-48.

Nipaecoccus nipae (Maskell), Ferris, 1950 : 109.

A species recorded from palms in a few greenhouses in Britain. For a description and illustration see the work by Ferris.

ENGLAND. Surrey : Kew, Royal Botanic Gardens, *Cocos*, *Kentiopsis*, *Sabal*, xii. 1916. London : Palm (J. C. F. Fryer). SCOTLAND. Midlothian : Edinburgh, Royal Botanic Gardens, *Calyptrogyne* sp. ix. 1925 (E. E. Green).

***PELIOCOCCLUS* Borchsenius**

Peliococcus Borchsenius, 1948 : 954.

Type of genus *Phenacoccus chersonensis* Kiritchenko.

This genus is probably of world wide distribution although the bulk of the known species is from the Palaearctic Region. The distinguishing features of the genus are clusters of multilocular disc pores, each cluster with one or more slender tubular ducts near the centre ; claw with a denticle ; often with quinquelocular disc pores on the venter.

Peliococcus balteatus (Green)

(Text-fig. II)

Phenacoccus balteatus Green, 1928 : 21.*Peliococcus balteatus* (Green), Borchsenius, 1949 : 244.

HABIT. Described by Green as " Colour of living examples pale yellow with a fringe of very short tassels, with a pair of slightly longer tassels at the posterior extremity." From the under surface of the foliage of various grasses, more particularly on *Arrhenatherum elatius*, Cheddar Gorge, Somerset, ENGLAND, viii.1926. This is the only record for Britain.

RECOGNITION CHARACTERS. Adult female elongate oval attaining a length of 3.5 mm. in the available specimens; anal lobes moderately developed. Antennae 9-segmented, 450-490 microns long. Legs normal, rather large, claw with a denticle, trochanter + femur 315-350 microns, tibia + tarsus 380-425 microns. Labium about 110 microns long. Circulus present, oval. Anterior and posterior ostioles with 2-4 setae and a few trilocular pores on each lip. Anal ring with 6 setae about twice length of its diameter. Cerarii numbering 18 pairs. Anal lobe cerarius usually with a group of 6 lanceolate setae and a few trilocular pores, the middle setae of the group surrounding a small sclerotized area. Anterior cerarii each with 2 smaller cerarian setae except those on head where there are up to 4 setae present; each cerarius accompanied by a few trilocular pores. The cerarii often elevated slightly from the surrounding derm, especially those at the anterior and posterior ends of the body.

Dorsal surface of body with minute setae, sparse, some often with one or two trilocular pores near the base. Trilocular pores very few. On all segments except IX + X, there are pore clusters of 3-6 multilocular disc pores, the commonest number being 4. A single minute tubular duct present in the centre of each cluster. Clusters arranged in transverse rows at posterior edges of segments except on head where they become scattered.

Ventral surface of each anal lobe with a small area of sclerotization and an apical seta longer than anal ring setae. Ventral body setae around the margins, small and similar to those on dorsum; in the median areas they are slender and much longer. Pore clusters arranged mainly on head, in transverse rows on segments III-V and around submargins of third and all posterior segments except IX + X. Multilocular disc pores, smaller than those in clusters, abundant at posterior edges of sixth and posterior segments. Quinelocular disc pores few, present in median areas only between coxae and at anterior edges of segments II-VII. Tubular ducts with oral collar of one size, in transverse rows just anterior to the multilocular disc pores on segments VII and VIII and occasionally on margins of these segments. Trilocular pores sparse.

NOTES. This species seems to come close to *P. venustus* (Green) from Iceland and *P. saratogensis* (Rau) from U.S.A. These two species have clusters of multilocular disc pores consisting mainly of 3 pores, whereas in *P. balteatus* the clusters consist mainly of 4 pores. Furthermore *P. venustus* has 8-segmented antennae and those of the other two species are 9-segmented. Both *P. balteatus* and *P. saratogensis* have a similar distribution of multilocular disc pores in transverse rows on segments VI-VIII but *P. venustus* has an extra row on segment V.

PHENACOCCLUS Cockerell*Phenacoccus* Cockerell, 1893 : 318.*Phenacoccus* Cockerell, Ferris, 1950 : 120.Type of genus *Pseudococcus aceris* Signoret.

Some of the important characters of this genus are the 8-9-segmented antennae, a denticle on the claw, cerarii numbering from 9-18 pairs. Although not always

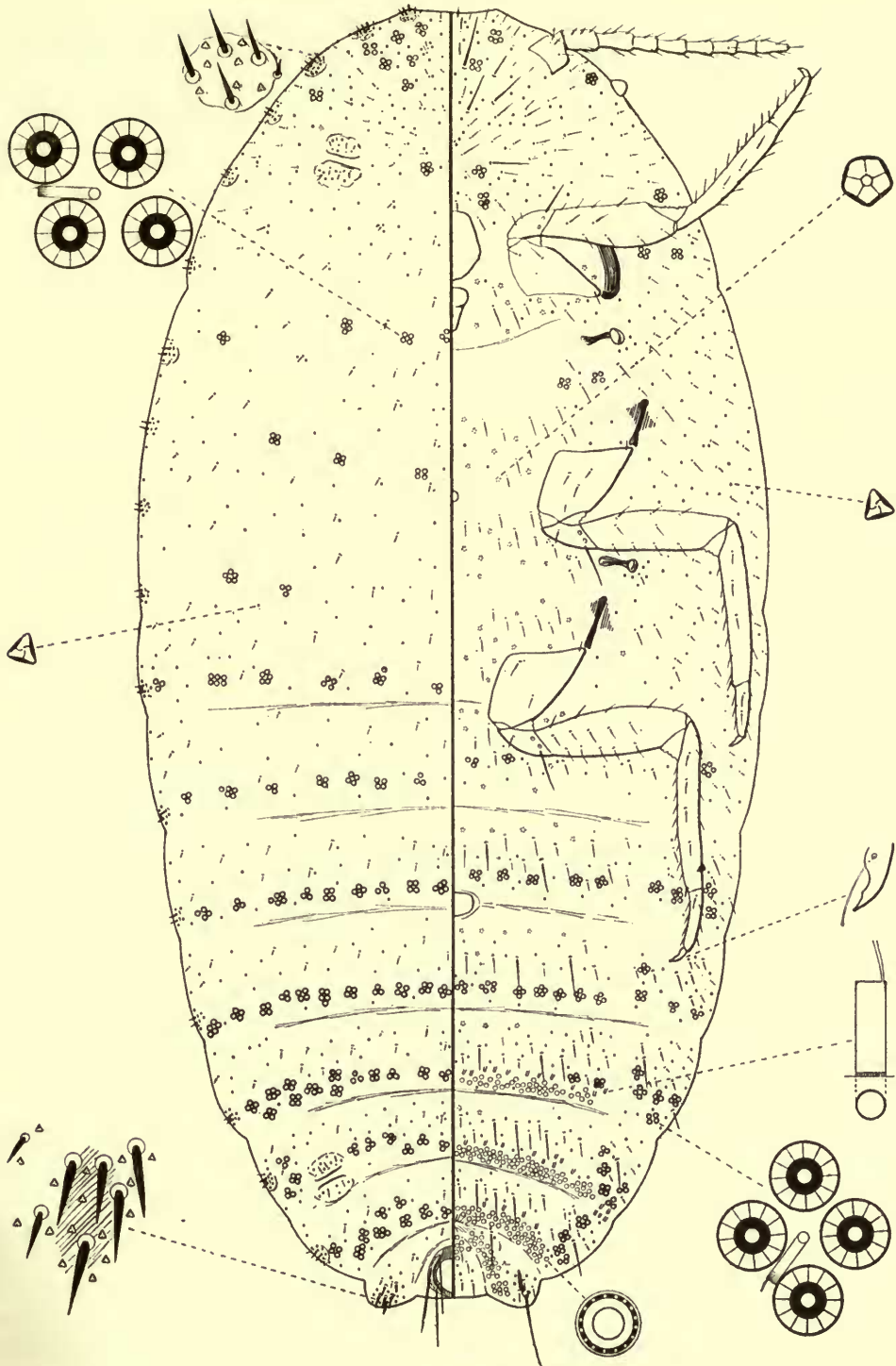


FIG. 11. *Peliococcus balteatus* (Green).

present, there are often quinquelocular disc pores on the venter and the dorsal setae are often minute and lanceolate. Borchsenius (1949) has resurrected the genus *Paroudablis* Cockerell because the type species *Boisdwalia piceae* Loew has larger tubular ducts on the dorsum than on the venter. No such distinction is made here although two British species possess these larger ducts. Only three species are known from Britain and these may be separated by the following key :

- | | | |
|---|---|--------------------------|
| 1 | With 9-14 pairs of cerarii | 2 |
| - | With 18 pairs of cerarii | <i>aceris</i> (Signoret) |
| 2 | Cerarii numbering 9 pairs, circuli absent | <i>interruptus</i> Green |
| - | Cerarii numbering 14 pairs, circuli numbering 2-3, small and with rounded projections | <i>sphagni</i> (Green) |

Phenacoccus aceris (Signoret)

- Pseudococcus aceris* Signoret, 1875 : 329.
Pseudococcus ulicis Douglas, 1888 : 88.
Pseudococcus ulmi Douglas, 1888a : 124.
Pseudococcus aceris Signoret, Douglas, 1890 : 153.
Pseudococcus quercus Douglas, 1890 : 154.
Pseudococcus socius Newstead, 1892 : 144.
Phenacoccus aceris (Signoret), Fernald, 1903 : 90.
Phenacoccus aceris (Signoret), Green, 1915 : 180.
Phenacoccus aceris (Signoret), Green, 1921 : 151.
Phenacoccus aceris (Signoret), Green, 1923 : 215.
Phenacoccus aceris (Signoret), Green, 1926 : 182.
Phenacoccus aceris (Signoret), Green, 1928 : 30.
Phenacoccus aceris (Signoret), Ferris, 1950 : 126.

This is one of the most widely spread mealy-bugs in Britain. It is found on a variety of trees and is, apparently, very common on gorse. Ferris has given an excellent illustration and in his description he stated that there are 2 circuli present. This condition is probably the more common, but specimens at hand collected at Adel, Yorkshire, on gorse have only a single circulus. In other respects they are similar to the specimens with 2 circuli.

Borchsenius (1949) has accepted the name *Phenacoccus quercus* (Douglas) for specimens collected in Armenia on oak, stating that the species differs from *P. aceris* in possessing only a single circulus. Two specimens of Douglas' original material have been prepared and, although they are in poor condition, there is sufficient evidence of the presence of 2 circuli. It seems possible that the Armenian material represents a different species.

The specimens actually seen by the writer are listed below but there are many other records in the literature.

ENGLAND. Berkshire : Windsor, *Quercus* sp., 1930 (H. Donisthorpe) ; Silwood Park, *Quercus* sp., 26.v.1948, *Carpinus betulus*, 26.iv.1949, *Fagus* sp., 3.v.1955 (K. L. Boratynski). Buckinghamshire : Latimer, *Ulmus* sp., 29.v.1929 (F. Laing). Cheshire : Chester, *Sorbus aucuparia*, *Laburnum* sp., *Quercus* sp. (R. Newstead). Dorsetshire : Lyme Regis, *Ulex europaeus*, iv.1920. Essex : Epping Forest, *Quercus* sp., 25.v.1923 (C. L. Wittycombe). Hampshire : Bournemouth, *Ulex europaeus*, 16.iv.1902 ; Beaulieu, *Myrica gale*, vi.1919. Kent : Bearsted, *Ulex europaeus*,

1.vi.1896. London: Lewisham (*ulmi* Type). Norfolk: Ingoldisthorpe, *Ulex europaeus*, viii.1891 (R. Newstead). Northumberland: Riding Mill, Sycamore, vii.1950 (D. J. Williams). Surrey: Camberley, *Ulex minor*, 3.xi.1929 (E. E. Green); Oxshott, *Castanea sativa*, *Fagus sylvatica*, 22.iv.1921 (K. G. Blair); Kew, Apple, 3.v.1955 (K. L. Boratynski); Peach Hill, *Ulex europaeus*, 12.vii.1956 (K. L. Boratynski). Warwickshire: Farnborough, *Buxus sempervirens*, 25.vii.1922 (R. Newstead). Wiltshire: Wootton Bassett, peach, 21.iv.1938. Yorkshire: Wakefield, currant (R. Newstead) (*socius* Type); Adel, *Ulex europaeus*, 24.vi.1956 (D. J. Williams). SCOTLAND. Kincardineshire: Strachan, *Ulex europaeus*, 30.iv.1927 (G. D. Morison).

Phenacoccus interruptus Green

(Text-fig. 12)

Phenacoccus interruptus Green, 1923: 215.

Phenacoccus interruptus Green, Green, 1925a: 43.

Phenacoccus interruptus Green, Green, 1928: 30.

HABIT AND DISTRIBUTION. Described originally as "Colour pale purplish, masked by a rather close covering of white powdery secretion." Found on grasses from the following localities in ENGLAND. Surrey: Camberley, 28.viii.1922 (Type), 15.viii.1923, 3.ix.1934 (E. E. Green). Somersetshire: Cheddar (E. E. Green).

RECOGNITION CHARACTERS. Body elongate elliptical, sides subparallel, length about 3.5 mm. anal lobes well developed. Antennae 9-segmented, 380-405 microns long. Legs well developed, normal; claw with a distinct denticle, trochanter + femur 240-275 microns, tibia + tarsus 320-340 microns. Labium 90-120 microns long. Circulus absent. Ostioles present; posterior pair with about 6 trilocular pores on each lip and apparently without setae; anterior pair with about 6 trilocular pores and 4 setae on each lip. Anal ring with 2 rows of pores and 6 setae over twice length of diameter of ring. Cerarii confined to anterior and posterior ends of body only, there being 9 definite pairs present. Anal lobe cerarii, each with a pair of well-developed lanceolate setae and a loose group of trilocular pores accompanied by about 2 minute auxiliary setae and all borne on a sclerotized plate slightly less in area than anal ring. Cerarii on segments VIII and VII on smaller sclerotized plates, each cerarius with a pair of short lanceolate setae and about 4 trilocular pores. On segments VI and V, cerarii each with a pair of setae and 3-4 trilocular pores but not on sclerotized plates. First 3 cerarii on head each with about 3 setae and fourth with 2 setae, all on sclerotized plates which become progressively smaller posteriorly. Sometimes single setae, a little stouter than dorsal body setae, present in positions of some of thoracic cerarii.

Dorsal surface with numerous minute lanceolate setae. Trilocular pores evenly distributed. Tubular ducts present of one size only, these rather large and without an oral collar, scattered on head and thorax but forming transverse rows on abdominal segments.

Ventral surface with a small elongate area of sclerotization on each anal lobe and an apical seta longer than anal ring setae. Ventral setae mainly slender and much longer than those on dorsum but small lanceolate setae present around margins. Multilocular disc pores on fifth and posterior segments only. Segment V with about 4 pores only, VI with 24-34, VII with 53-62, VIII with 66-84, IX + X with 36-48. Quinelocular disc pores in median areas only. Trilocular pores on abdominal segments and around margins of thorax and head. Tubular ducts narrower than dorsal ducts, without an oral collar, present in transverse rows on all abdominal segments and a few in median and marginal areas of thorax.

NOTES. In his original description, Green described this insect as possessing "A single rather obscure, circular medio-ventral osteole." Furthermore he shows this

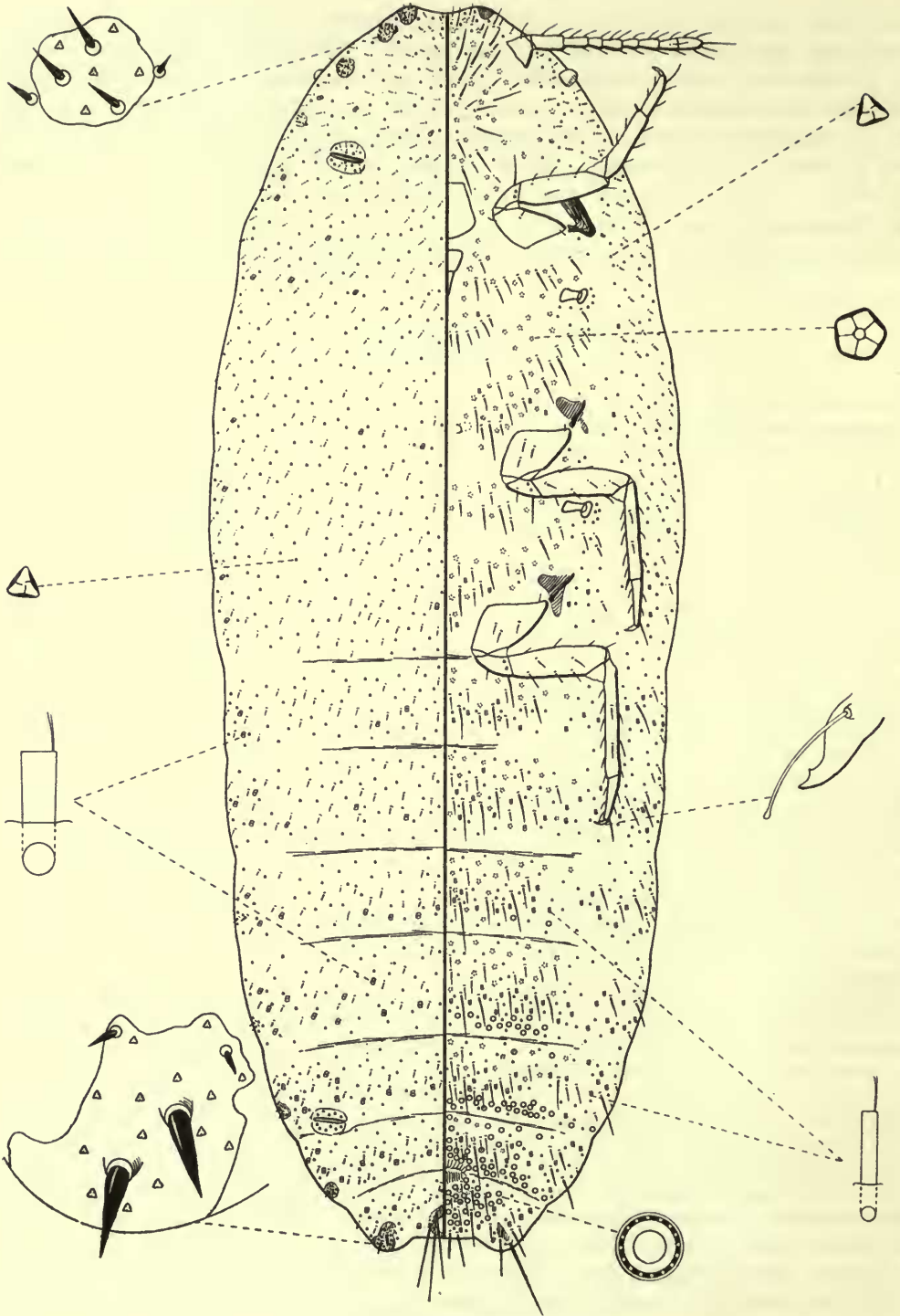


FIG. 12. *Phenacoccus interruptus* Green.

in a figure. The holotype specimen shows a round hole in the position of the circulus but it is evident that it is merely damage, probably caused by a needle as there are similar holes near it. Other specimens examined show no sign of a circulus and the species must be considered as not possessing one. Borchsenius (1949) has recorded this species from Russia as *Paroudablis interruptus* and possessing a large circulus but this is probably a different species. A single distorted specimen is at hand from Dorsetshire collected on sedge which shows a rather large circulus and this is possibly the same as the Russian species. It has not been possible to describe this species and the matter is left in abeyance until more satisfactory material is collected.

Phenacoccus sphagni (Green)

(Text-fig. 13)

Pseudococcus sphagni Green, 1915 : 178, 179.

Pseudococcus sphagni Green, Green, 1920 : 119, 120.

Phenacoccus sphagni (Green), Reyne, 1958 : 20.

HABIT AND DISTRIBUTION. Colour of adult female pinkish or dull red-brown, lightly dusted with wax and with wax projections at anterior and posterior ends of body. Described originally in nests of *Formica picea* amongst sphagnum moss in swampy ground. **ENGLAND.** Hampshire : New Forest, Matley Bog (H. K. Donisthorpe) and again in the New Forest, July, 1918. This is the only record for Britain but Reyne has recently recorded it from Holland.

RECOGNITION CHARACTERS. Body elongate oval about 4 mm. long, anal lobes well developed. Antennae 8-segmented, total length 400-450 microns. Legs normal, claw with a distinct denticle. Trochanter + femur 300-310 microns, tibia + tarsus 335 microns. Labium 75-90 microns long. Anterior and posterior ostioles present, lips each with 2-3 setae and 6-8 trilocular pores. Anal ring with 2 rows of pores and 6 setae about twice length of diameter of ring. Cerarii numbering 14 distinct pairs, those missing being on the meso- and metathorax and second abdominal segment. Each cerarius with 2 lanceolate setae and a group of trilocular pores. Circuli 2-3 in number lying on the third, fourth and occasionally fifth abdominal segments. Circulus on segment III very small with a rounded projection; circulus on segment IV slightly larger with projection flattened apically; circulus on segment V, when present, minute.

Dorsal surface with minute setae. Trilocular pores evenly distributed. Tubular ducts of one size only, each with oral collar barely perceptible, arranged in a wide band across the meso- and metathorax and each abdominal segment.

Ventral surface with a stout pair of apical setae longer than anal ring setae and long single marginal setae on abdominal segments which become progressively shorter anteriorly. Body setae slender but much longer than on dorsum except for a few minute lanceolate setae around margins. Multilocular disc pores on sixth and posterior segments only; numerous on segments IX + X and at anterior and posterior edges of VII and VIII; a transverse row on posterior edge of segment VI. Tubular ducts of two sizes. A larger type, similar to those on dorsum, arranged singly or in pairs on margins of segments VI-VIII. A smaller type in marginal groups on segment IV and posterior segments, becoming fewer anteriorly. Small numbers also around margins of anterior abdominal segments and thorax and in median areas of thorax. Quinquelocular disc pores very few between anterior coxae, clypeus and labium and an occasional pore on mesothorax. Trilocular pores evenly distributed.

NOTES. The distinguishing features of this species are the 8-segmented antennae, the reduced number of cerarii and the small peculiar circuli which are variously knobbed.

PLANOCOCCUS Ferris

Planococcus Ferris, 1950 : 164.

Planococcus Ferris, Ezzat & McConnell, 1956 : 60.

A genus erected by Ferris for a number of species, the essential characters being the presence of an anal bar on the ventral surface of each anal lobe, 18 pairs of cerarii, these without auxiliary setae, tubular ducts with oral rim entirely lacking.

Planococcus citri (Risso)

Dortheisia citri Risso, 1813 : 416-418.

Pseudococcus citri (Risso), Fernald, 1903 : 99.

Planococcus citri (Risso), Ferris, 1950 : 165.

Planococcus citri (Risso), Ezzat & McConnell, 1956 : 65.

Newstead (1903) described an insect under the name *Dactylopius citri* but the specimens are undoubtedly *Pseudococcus latipes* Green. The only specimens seen from Britain are from greenhouses in ENGLAND from various localities and hosts. Excellent illustrations are available in the works by Ferris and Ezzat & McConnell.

PSEUDOCOCCUS Westwood

Pseudococcus Westwood, 1840 : 118.

Pseudococcus Westwood, Ferris, 1950 : 170.

Type of genus *Coccus adonidum* Linnaeus.

The limits of this genus were defined by Ferris and the essential features are the presence of oral rim ducts, at least on dorsum, and 16 or 17 pairs of cerarii with auxiliary setae.

There are no native British species and, although *P. fragilis* Brain occurs in the open in the southern counties, it has been introduced. The others are all greenhouse species. After remounting most of the specimens at hand, it is evident that all those identified and recorded as *P. comstocki* (Kuwana) from imported bananas should be referred to *Dysmicoccus alazon* recently described by Williams (1960). Specimens identified as *P. maritimus* (Ehrhorn) should be referred to *P. latipes* Green (= *P. malacearum* Ferris). Evidence in recent years suggests that *P. latipes* is a widespread species and may have been confused with *P. maritimus* and *P. comstocki*. A key to the British species is given below.

- | | | |
|---|--|----------------------------|
| 1 | With not more than a single oral rim duct dorsally near each of most of cerarii. Multi-ocular disc pores in transverse rows on most abdominal segments | 2 |
| - | With 2-3 oral rim ducts of different sizes dorsally near each of most of cerarii. Multi-ocular disc pores about vulva only | <i>adonidum</i> (Linnaeus) |
| 2 | With a large oral rim duct dorsally, posterior to each frontal cerarius. Anal lobe cerarii placed near inner edge of an area of sclerotization | <i>latipes</i> Green |
| - | Without large oral rim duct dorsally posterior to each frontal cerarius. Anal lobe cerarii placed near the centre of surrounding sclerotized area | <i>fragilis</i> Brain |

Pseudococcus adonidum (Linnaeus)

Coccus adonidum Linnaeus, 1766 : 740.

Dactylopius longispinus Targioni, 1867 : 1-87.

Dactylopius longispinus Targioni, Newstead, 1903 : 168.

Pseudococcus longispinus (Targioni), Fernald, 1903 : 104.

Pseudococcus adonidum (Linnaeus), Ferris, 1950 : 174.

In Britain, a greenhouse species only and, apparently, not so common as hitherto supposed. ENGLAND. Cambridgeshire : Cambridge, fern, 17.x.1935 (H. C. James). Berkshire : Reading, *Phormium tenax*, 24.viii.1948 (M. I. Crichton). Surrey : Kew, Royal Botanic Gardens, *Stangeria* sp., 7.v.1896. SCOTLAND. Midlothian : Edinburgh, Royal Botanic Gardens, *Cycas* sp. (R. S. MacDougall).

Pseudococcus fragilis Brain

Pseudococcus fragilis Brain, 1912 : 186.

Pseudococcus gahani Green, 1915 : 180.

Pseudococcus gahani Green, Green, 1920 : 120.

Pseudococcus gahani Green, Green, 1921 : 151.

Pseudococcus gahani Green, Green, 1931 : 100.

Pseudococcus fragilis Brain, Essig, 1942 : 351.

Pseudococcus gahani Green, Ferris, 1950 : 180.

Pseudococcus fragilis Brain, De Lotto, 1958 : 96.

Numerous specimens have been examined from various localities in ENGLAND, SCOTLAND, WALES and CHANNEL ISLANDS, some from greenhouses and others living in the open, especially in the southern counties. There is an excellent description and illustration under the name *P. gahani* in the work by Ferris.

Pseudococcus latipes Green

Dactylopius citri (Risso), Newstead, 1903 : 164. (Misidentification.)

Pseudococcus longispinus var. *latipes* Green, 1917 : 264.

Pseudococcus maritimus (Ehrhorn), Green, 1920 : 121. (Misidentification.)

Pseudococcus maritimus (Ehrhorn), Green, 1921 : 151. (Misidentification.)

Pseudococcus maritimus (Ehrhorn), Green, 1928 : 31. (Misidentification.)

Pseudococcus maritimus (Ehrhorn), Green, 1931 : 99. (Misidentification.)

Pseudococcus malacearum Ferris, 1950 : 185 (syn. n.).

This species is probably the commonest of the greenhouse mealy-bugs in Britain. It was first described as a variety of *P. longispinus* and later Green regarded it as being identical with *P. maritimus* but it is quite distinct from both. A detailed description has been given by Ferris under the name *P. malacearum* and there seems to be little doubt that it is the same as *P. latipes*. The most striking feature is the anal lobe cerarius with two conical setae surrounded by a crowded mass of pores. This cerarius is situated at the inner edge of an oval sclerotized area which extends posteriorly to the base of the apical seta. Very often there is a small prolongation at the anterior edge of the sclerotized area.

Specimens are at hand on a wide variety of hosts from many greenhouses in ENGLAND, WALES, SCOTLAND and CHANNEL ISLANDS.

RHIZOECUS Künckel d'Herculis

Rhizoecus Künckel d'Herculis, 1878 : 163.

Rhizoecus Künckel d'Herculis, Hambleton, 1946 : 50.

Rhizoecus Künckel d'Herculis, Ferris, 1953 : 426.

Type of genus *Rhizoecus falcifer* Künckel d'Herculis.

All the hypogeic mealy-bugs in *Rhizoecus* and related genera have been studied in great detail by Hambleton. Differences in number of antennal segments, the lengths of the claw digitules and the presence or absence of eyes have led Hambleton to place some of the following species in the genera *Ripersiella* Tinsley and *Morrisonella* (= *Coccidella* Hambleton). In the present work all species are left in the genus *Rhizoecus* following the definition by Ferris (1953). Six species are known from Britain and may be identified from the key.

1	Circulus absent	2
-	Circulus present	3
2 (1)	Antennae 5-segmented, abdominal tergites each with 10-16 tritubular pores	
	<i>falcifer</i> Künckel d'Herculis	
-	Antennae 6-segmented, abdominal tergites each with 2 or 3 tritubular pores at most	
	<i>dianthi</i> Green	
3 (1)	Multilocular disc pores present on venter, bitubular pores present	<i>halophilus</i> (Hardy)
-	Multilocular disc pores absent on venter, tritubular pores present	4
4 (3)	With some tritubular pores on median and submedian areas of dorsum, labium	
	60-85 microns long	5
-	With a total of no more than 4 tritubular pores on dorsal margins only, labium	
	90-105 microns long	<i>elongatus</i> Green
5 (4)	Labium 60-70 microns long	<i>albidus</i> Goux
-	Labium 80-85 microns long	<i>cacticans</i> (Hambleton)

***Rhizoecus albidus* Goux**

(Text-fig. 14)

Ripersia halophila (Hardy), Green, 1917 : 262. (Misidentification.)

Rhizoecus (Pararhizoecus) albidus Goux, 1942 : 40.

HABIT AND DISTRIBUTION. In life these insects are white and so small as to resemble Collembola, for which they may be mistaken. They feed in the soil on the fine rootlets of grasses and often do extensive damage.

The species was first described from the roots of *Festuca* sp., at Bessenay, France. Material is at hand from the following localities in Britain: ENGLAND. Hertfordshire: Rothamsted, 1936. Shropshire: Newport, 24.ii.1939 (H. C. F. Newton). Staffordshire: 1947 (H. C. F. Newton); Newcastle, ix.1960. Surrey: Camberley (E. E. Green); Egham, xii.1959 (K. L. Boratynski). Herefordshire: Hereford, i.1932 (H. E. Durham).

RECOGNITION CHARACTERS. A small elongate-oval species measuring approximately 1.5 mm. long. Posterior end of body rounded. Anal lobes poorly developed, each with 1 long ventral seta and 2 long dorsal setae, appearing as a group of 3. Eyes small. Antennae 6-segmented, geniculate, length 165-170 microns. Legs well developed, trochanter + femur 120-130 microns, tibia + tarsus 130-135 microns; claw long and slender with claw digitules as long as or slightly longer than claw, with a very minute apical knob. Labium 60-70 microns long. Ostioles well developed, lower lip of each posterior pair without setae or trilobular pores; other lips each

with 2-4 setae and 4-7 trilocular pores. Circulus present within borders of segment IV, heavily sclerotized and cone shaped with distal circular plate containing about 7 circular areas. Anal ring rather large in comparison to size of body; anal ring setae about twice length of ring at its greatest diameter and about same length as apical setae.

Dorsal surface with numerous short pointed setae and forming distinct groups on thorax and head. Trilocular pores following the general distribution of the setae. Tritubular pores not numerous, there being rarely more than 3 on any segment of the abdomen or thorax and sometimes only a single one on mid-line; tending to be scattered on head. Some very minute tubular ducts present on abdominal segments, these very simple and heavily sclerotized; some segments entirely without ducts and others with at most 6.

Ventral surface with a more or less quadrate sclerotized area containing 4 marginal setae just anterior to clypeus. Body setae short and slender. Multilocular disc pores absent. Trilocular pores sparse. The setae and trilocular pores forming groups on thorax and head. Tritubular pores very few, there being a single marginal pore on some of posterior abdominal segments, occasionally one on thorax and one between antennal bases. Small tubular ducts, similar to those on dorsum, arranged 2-6 across some of posterior abdominal segments.

NOTES. Goux placed this species in the subgenus *Pararhizoecus* because it possesses a circulus similar to that of the type species *R. (Pararhizoecus) petiti* Goux. It is left in *Rhizoecus* following the definition of this genus by Ferris. Dr. Harold Morrison has kindly examined specimens of this species and has given valuable comments on its differences with *R. cacticans* and *R. elongatus*.

Rhizoecus cacticans (Hambleton)

Rhizoecus elongatus Green, Green, 1926 : 174 (in part as a misidentification).

Ripersiella cacticans Hambleton, 1946 : 64.

Rhizoecus cacticans (Hambleton), Ferris, 1953 : 432.

Specimens examined, all from greenhouses, include the following: ENGLAND. Hampshire: Bournemouth, *Phyllocactus* sp. (as a misidentification of *R. elongatus*). Isle of Wight: Sandown, roots of cactus, ii. 1949 (E. Elkan). Essex: Laindon, *Mammillaria* sp., roots, xii. 1928 (G. Fox-Wilson).

This species belongs to a group similar to *R. albidus* and *R. elongatus*. All are devoid of multilocular disc pores and possess small sclerotized tubular ducts. It comes closest to *R. albidus* but differs mainly in the length and shape of the labium (see key). Ferris has redescribed and illustrated this species.

Rhizoecus dianthi Green (Text-fig. 15)

Rhizoecus dianthi Green, 1926 : 175.

Morrisonella dianthi (Green), Hambleton, 1946 : 23.

Coccidella dianthi (Green), Hambleton, 1946a : 177.

HABIT AND DISTRIBUTION. Appearance in life not known. This species is known only from the roots of various plants in greenhouses. It was described from *Dianthus plumarius* and *D. barbatus*, ENGLAND, Surrey, Wisley, Royal Horticultural Society's Gardens, and from other plants in the London area. Collected since from Wisley on other occasions on various plants. Specimens have also been seen from Hampshire: Salisbury, *Pelargonium* sp. roots, viii. 1926 (G. Fox-Wilson). Somersetshire: Taunton, *Adiantum* sp., 7. iii. 1904.

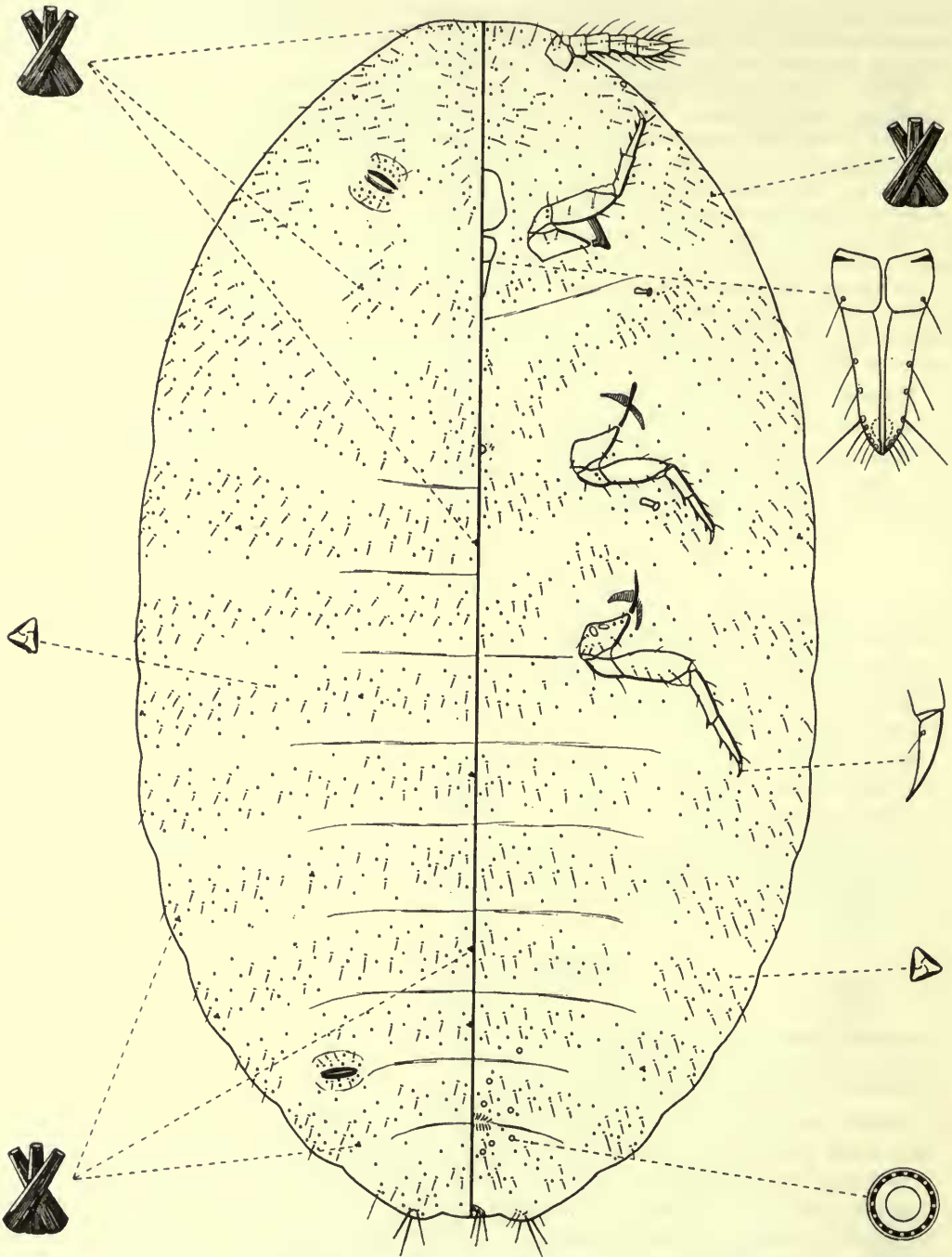


FIG. 15. *Rhizoecus dianthi* Green.

RECOGNITION CHARACTERS. Body broadly oval, length about 2 mm. Anal lobes poorly developed, each with a long ventral apical seta and 2 slightly shorter dorsal setae. Antennae 6-segmented about 170–175 microns long. Eyes present, very small. Legs normal for the genus, slender; posterior coxae with a few large oval areas; trochanter + femur 145–155 microns, tibia + tarsus 145–155 microns. Labium 85–95 microns long. Claw slender with very short pointed digitules. Ostioles with inner edges of lips sclerotized and with 2–4 setae and 5–8 trilocular pores on each lip. Circulus absent. Anal ring inclined to ventral surface when mounted on the slide.

Dorsal surface with numerous short slender setae. Trilocular pores evenly distributed. Tritubular pores sparse, there being from 2–4 on some abdominal segments and absent entirely on other segments; occasional pores present on thorax and head.

Ventral surface with short setae similar to those on dorsum. Multilocular disc pores few on posterior abdominal segments only. Segment VII with 1 or 2, VIII with 4–7, IX + X with 3–6, there being scarcely more than 12 altogether. Tubular ducts absent. Trilocular pores distributed fairly evenly. Tritubular pores not constant in position although there is often a single marginal pore present on one of posterior abdominal segments and a single pore on margins of pro- and metathorax.

NOTES. This species comes very close to *R. cyperalis* (Hambleton) described from El Salvador and both may be identical.

Rhizoecus elongatus Green

(Text-fig. 16)

Rhizoecus elongatus Green, 1925a : 174.

Rhizoecus mesembryanthemi Green, 1931 : 103 (syn. n.).

Morrisonella elongata (Green), Hambleton, 1946 : 25.

Morrisonella mesembryanthemi (Green), Hambleton, 1946 : 33.

Coccidella elongata (Green), Hambleton, 1946a : 177.

Coccidella mesembryanthemi (Green), Hambleton, 1946a : 177.

HABIT AND DISTRIBUTION. Appearance in life not known. A greenhouse species described from the roots of *Phyllocactus* sp., ENGLAND, Hampshire, Bournemouth. Recorded also from the roots of *Mesembryanthemum* sp., Surrey : Oxted (Type of *R. mesembryanthemi*). These are the only records from Britain but specimens are also at hand, collected by Dr. A. Reyne from Holland, Zeist Utrecht, on *Aloe variegata* roots.

RECOGNITION CHARACTERS. A small elongate species with parallel sides attaining a length of 2 mm., posterior end rounded, anal lobes with 1 long ventral seta and 2 slightly shorter dorsal setae. Antennae 6-segmented, about 240 microns long. Legs normal for the genus, claw slender and elongate with claw digitules either same length or slightly longer than claw, with minute apical knob; trochanter + femur 165–175 microns, tibia + tarsus 190 microns. Labium elongate, about 90–105 microns long. Eyes present, very small. Dorsal ostioles fairly well developed; lower lip of each posterior pair with about 4 trilocular pores and without setae; all other lips with 2–4 setae and about 4 trilocular pores. Cerarii absent. Circulus within borders of fourth abdominal segment, heavily sclerotized in the form of a truncated cone, wider than deep, the distal circular plate with numerous subcircular areas. Anal ring rather large for size of body, with 6 setae about twice length of diameter of ring and same length as apical setae.

Dorsal surface of body with numerous short slender setae and trilocular pores, both evenly distributed on abdomen and metathorax but anteriorly forming large groups so that there are some areas entirely clear. Minute tubular ducts present on thorax and abdomen; each in the form of a simple sclerotized internal tube; majority of segments with, at most, about 6–8

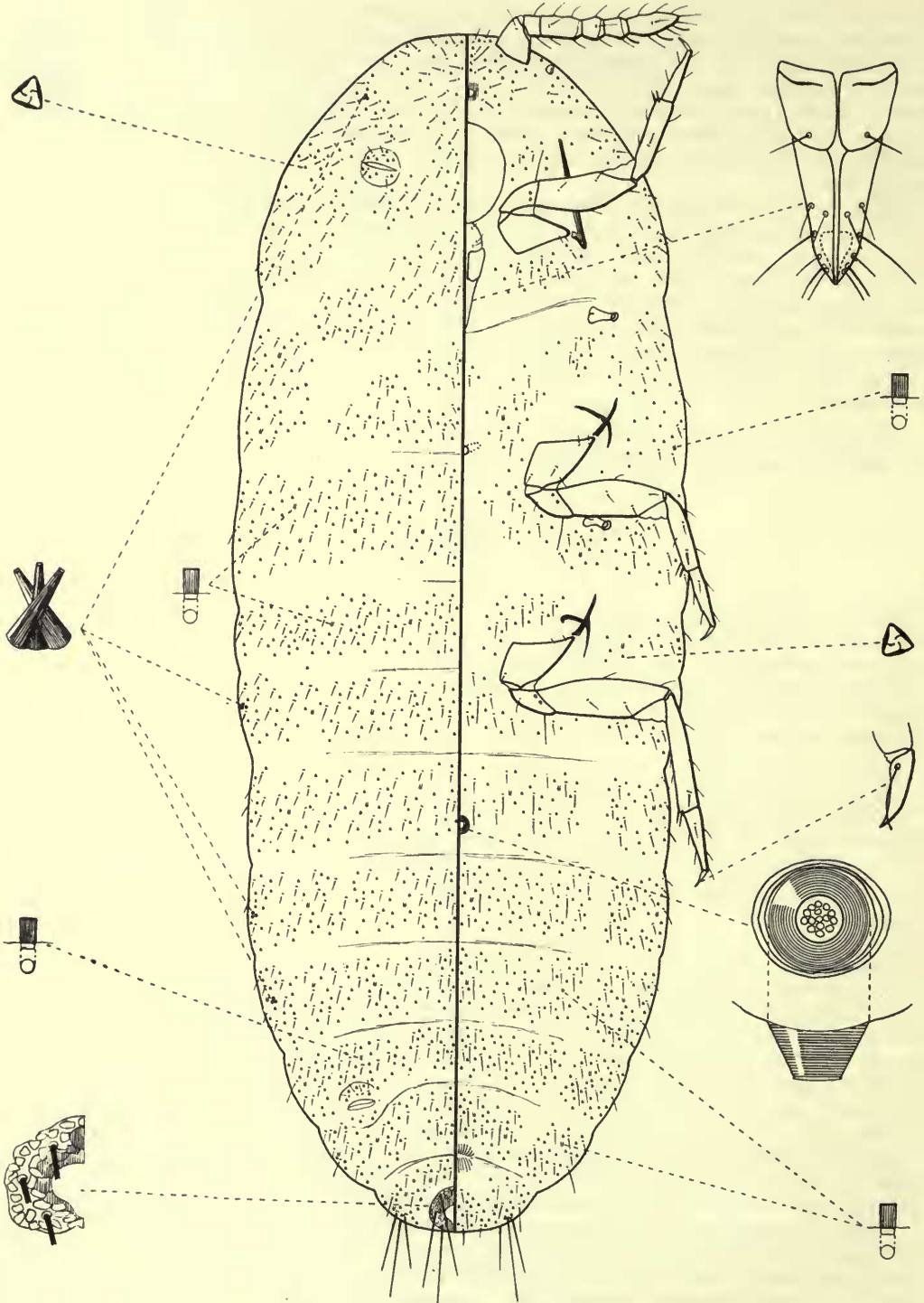


FIG. 16. *Rhizoecus elongatus* Green.

in a transverse row. Tritubular pores sometimes absent entirely or more often with 1 or 2 on margins of each side of body or on one side only, there being usually one on head and others on some abdominal segments.

Ventral surface with a small sclerotized plate anterior to clypeus. Short slender setae and trilocular pores numerous on abdomen but anteriorly they become sparse and form definite groups. Multilocular disc pores and tritubular pores absent. Minute tubular ducts, similar to those on dorsum, very sparse, there being 2-8 in transverse rows on abdominal segments and occasional ducts on thorax.

NOTES. This is a distinctive species with reduced numbers of tritubular pores. In his original description, Green stated that these pores were absent but in the specimens available this condition is very rare as there are usually one or two present on dorsum. Green's statement of the two different sized limbs in the type slide was due to the presence also of specimens of *R. cacticans*. He also stated, in his description of *R. mesembryanthemi*, that the body was completely devoid of setae. The original material has numerous setae and the specimens are identical with *R. elongatus*.

Rhizoecus falcifer Künckel d'Herculais

Rhizoecus falcifer Künckel d'Herculais, 1878 : 164.

Ripersia terrestris Newstead, 1895a : 213.

Ripersia terrestris Newstead, Newstead, 1903 : 190.

Rhizoecus decoratus Green, 1926 : 177.

Rhizoecus decoratus Green, Green, 1928 : 31.

Rhizoecus decoratus Green, Green, 1930 : 10.

Rhizoecus decoratus Green, Green, 1931 : 102.

Rhizoecus terrestris Newstead, Green, 1931 : 102.

Rhizoecus decoratus Green, Green, 1934 : 111.

Rhizoecus falcifer Künckel d'Herculais, Hambleton, 1946 : 53.

Rhizoecus falcifer Künckel d'Herculais, Ferris, 1953 : 444.

This species is now known from many parts of the world. In Britain it is found only in greenhouses on roots of numerous plants and is, apparently, quite common. Formerly known in Britain under the names *Rhizoecus terrestris* and *R. decoratus*, it was shown by Hambleton that these were the same as *R. falcifer*. For an illustration, see the work by Ferris. British specimens examined include the following : ENGLAND. London : palm roots, 1895 (C. O. Waterhouse) (*terrestris* type). Yorkshire : Hull, Eastington, roots of *Abutilon* sp., iv. 1925 (*decoratus* type). Lancashire : Fallowfield, *Carex* sp., roots, 19. viii. 1926 (J. H. Watson). Surrey : Wisley, Royal Horticultural Society's Gardens, *Dracaena* sp. roots, 6. iii. 1928 (G. Fox-Wilson), roots of various plants, 5. v. 1953 (D. J. Williams) ; Kew, Royal Botanic Gardens, 2. ii. 1932 (G. Fox-Wilson) ; Richmond, *Gardenia* roots, xii. 1950. Warwickshire : Studley, lily roots, 27. v. 1935 (J. F. Perkins). IRELAND. Dublin, *Adiantum* sp., roots, iii. 1901.

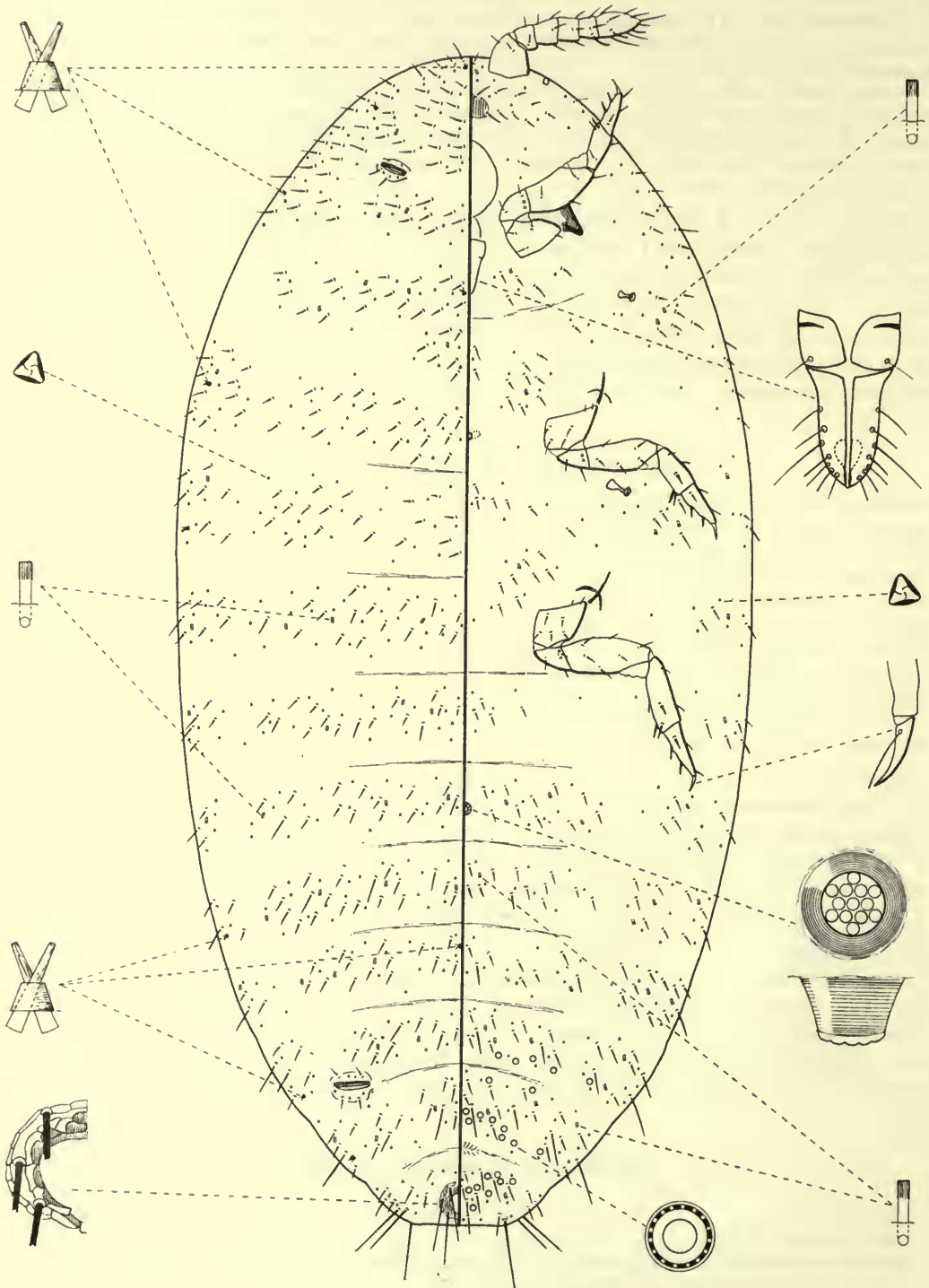
Rhizoecus halophilus (Hardy)

(Text-fig. 17)

Coccus halophilus Hardy, 1868 : 136, 137.

Dactylopius radicum Newstead, 1895b : 235 (in part, misidentification).

Ripersia halophila (Hardy), Newstead, 1903 : 192.

FIG. 17. *Rhizoecus halophilus* (Hardy).

Ripersia halophila (Hardy), Green, 1921 : 191.

Rhizoecus halophila (Hardy), Green, 1926 : 174.

HABIT AND DISTRIBUTION. The reference to this species has long since been forgotten and as it is in a journal which may not be readily available, the full original description is given below.

"6. *Coccus halophilus*, J. H. The Cocci offer few tangible specific characters. The present species apart from its peculiar habitudes cannot be readily discriminated by words. It is scarcely a quarter of a line long, oval, opaque white, without a hard scale, abundantly supplied with a white secretion. Found on the steep sea-banks near Fastcastle [SCOTLAND : Berwickshire] among the roots of *Ligusticum Scoticum*, and *Rhodiola rosea* ; and afterwards on the roots of *Statice Armeria* in the greywacke cliffs near Siccar Point. In both cases it follows the long fibrils minutely interwoven through the loose slaty *débris*."

Newstead has described the insect as pure white and with two appendages at the caudal extremity. It feeds only on the roots and is, apparently, not associated with ants. The known distribution is as follows :

ENGLAND. Norfolk : Blakeney Point, roots of *Armeria maritima*, vii. 1920 (E. E. Green). Isle of Man : Port Erin, roots of grass, 21. ix. 1918 (R. Newstead). SCOTLAND. Fifeshire : Isle of May, roots of grasses, ix. 1913 (W. Evans). Inverness-shire : (Outer Hebrides) St. Kilda, grass roots, vi. 1902 (R. Newstead). Ross and Cromarty : Swordale, roots of *Calluna* sp., 21. i. 1921 (D. J. Jackson). WALES. Anglesey : Puffin Island, on *Armeria maritima*. IRELAND. Donegal : among turf, viii. 1942 (J. Lister).

RECOGNITION CHARACTERS. Adult female ovate, about 1.5 mm. long. Posterior end with poorly developed anal lobes, each with 1 long ventral apical seta and 2 smaller dorsal setae. Antennae 6-segmented, total length approximately 155-170 microns. Legs normal, trochanter + femur 115-130 microns, tibia + tarsus 130-145 microns, claw with slender digitules about same length or longer than claw with very small knob at apex. Labium about 75 microns long. Eyes present. minute. Ostioles well developed, inner edges of lips sclerotized and each lip with about 2 setae and 2 or 3 trilocular pores ; occasionally without setae. Circulus present within borders of fourth abdominal segment, sclerotized and small, in form of truncate cone, wider than deep, distal surface with minute circular areas. Anal ring with 6 setae twice length of its diameter and about same length as apical setae.

Dorsal surface with slender setae of various lengths but mostly small. Trilocular pores not numerous. Tubular ducts small and slender without oral collar, in transverse rows of up to 8 on abdominal segments and becoming scattered on thorax and head. Bitubular pores present, very sparse, there being a marginal series of about 8 on each side of body and 2 or 3 on midline.

Ventral surface with short slender setae but tending to be longer on posterior abdominal segments, not numerous. Trilocular pores sparse. Bitubular pores absent. Tubular ducts, similar to those on dorsum, very few, situated in transverse rows on abdominal segments and becoming scattered on thorax and head. Multilocular disc pores on seventh and posterior segments only, there being scarcely more than 50 altogether but some specimens with as few as 30.

NOTES. The identification of this species is based on those made by Newstead and Green. It comes very close to *Rhizoecus (Pararhizoecus) petiti* described by Goux (1941a) another species with bitubular pores but in this case the multilocular disc pores are much more numerous and are situated on the fifth and posterior segments whereas in *R. halophilus* they are present on the seventh and posterior segments.

SACCHARICOCCUS Ferris

Saccharicoccus Ferris, 1950 : 216.

Type of genus *Dactylopius sacchari* Cockerell.

RECOGNITION CHARACTERS. Pseudococcidae with 7-segmented antennae. Two pairs of dorsal ostioles present. Circulus longer than wide, situated across the segmental line between fourth and fifth abdominal segments, medially constricted. Legs without a denticle on the claw. Minute irregular pores present on the surrounding derm near the attachment of the posterior coxae. Tubular ducts either few on ventral side of abdomen or numerous on both surfaces. Multilocular disc pores on dorsum and venter. Cerarii 1 pair, on anal lobes only.

NOTES. This genus was erected for the single species *Dactylopius sacchari*, having many characters similar to those of *Trionymus*. The description given by Ferris has been modified to cater for the species described below as new. One of the striking features of the new species is the large number of small irregular-shaped pores near the attachment of the posterior coxae. This character is shared also by *S. sacchari* but has, apparently, been overlooked. An examination of many correctly stained specimens of *S. sacchari* from various localities, shows that these pores are always present. The long stout marginal setae on the abdomen of *S. sacchari* are probably only of specific value and have been excluded from the generic definition as given by Ferris.

***Saccharicoccus penium* sp. n.**

(Text-fig. 18)

HABIT AND DISTRIBUTION. Description in life not known. Found at the base of grasses, ENGLAND, Hampshire, Yateley, 25.ix.1926 (E. E. Green).

RECOGNITION CHARACTERS. Adult female elongate, with more or less parallel sides, attaining a length of 3.5 mm. Anal lobes moderately developed. Antennae 7-segmented, small, about 240–250 microns long. Legs small and slender, trochanter + femur 150–170 microns, tibia + tarsus 165–175 microns. Labium about 70 microns long. Anterior and posterior ostioles poorly developed, each lip with 2–3 trilocular pores and lacking setae. Circulus large, longer than wide with sides constricted, hour-glass shaped. Cerarii represented by anal lobe pair only, each with 2 short conical setae set close together, surrounded by a group of about 7 or 8 trilocular pores and accompanied by a single auxiliary seta. Anal ring with 6 setae about twice as long as diameter of ring.

Dorsal surface with short pointed setae, not numerous. Trilocular pores with an even distribution. Multilocular disc pores forming definite transverse rows at posterior edges of segments V–VIII. Elsewhere on the body they tend to be scattered, although there is a noticeable concentration on the head margin and they are absent or nearly so in the median areas of the thorax. Tubular ducts of 2 types. A smaller type, slender, without any appreciable oral collar, in transverse rows in the middle of metathorax and abdominal segments. A larger type of duct, each with a large collar and a larger flange-shaped membranous ring arising from the inner edge of the collar, situated in transverse rows on segments VI–VIII and in a small group on anal lobes. Others present around head margins and an occasional one present elsewhere on the body.

Ventral surface with a pair of apical setae only slightly longer than anal ring setae. Body setae not numerous, all short and slender but tending to be longer than those on dorsum, especially in median areas. Minute simple pores of different shapes and sizes clustered near posterior coxae from which they extend laterally and posteriorly to segment III. Trilocular pores evenly distributed, sparse. Multilocular disc pores abundant in transverse rows at posterior edges of segments V–VIII. They are also numerous on segments IX + X, at anterior edges of segments

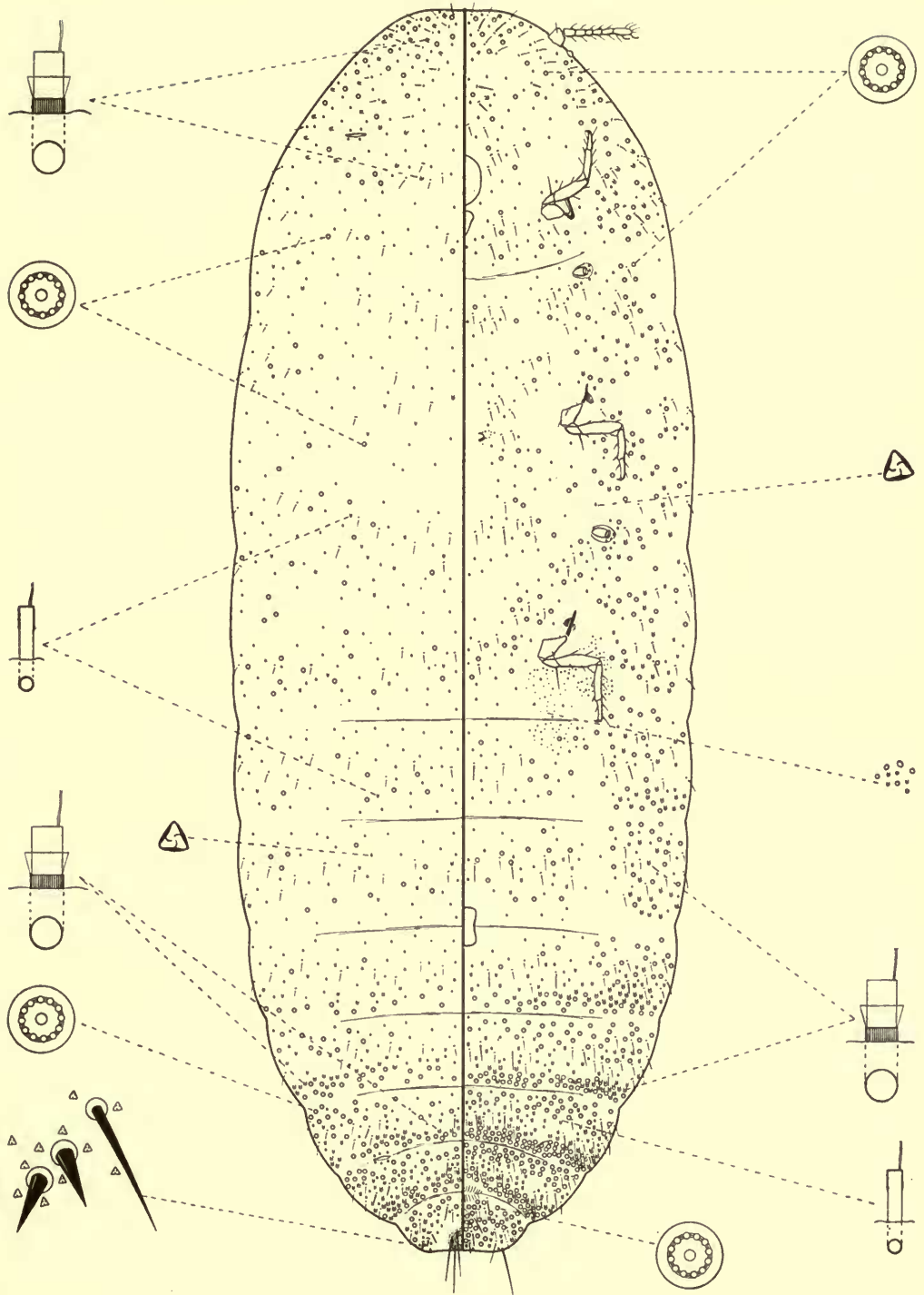


FIG. 18. *Saccharicoccus penium* sp. n.

VI-VIII and in a submarginal zone around body. Elsewhere they become scattered. Tubular ducts of same 2 sizes as on dorsum. A smaller type mainly in transverse groups in middle of segments V-VIII. A larger type numerous in marginal groups on abdominal segments, sometimes extending to median areas especially on posterior abdominal segments. Present also around the submargins of thorax and head in close association with the multilocular disc pores.

NOTES. This species differs from *S. sacchari* in possessing much more numerous multilocular disc pores and tubular ducts. The minute irregular pores tend to be concentrated lateral and posterior to the hind coxae whereas in *S. sacchari* they are mostly situated just anterior.

SPILOCOCCUS Ferris

Spilococcus Ferris, 1950 : 219.

Spilococcus Ferris, McKenzie, 1960 : 755.

Ferris erected this genus for species with oral rim ducts and with the cerarii lacking auxiliary setae. As stated in the discussion on *Atrococcus*, McKenzie has limited the genus to those species possessing from 6-17 pairs of cerarii and has erected the genus *Chorizococcus* for species with from 0-4 pairs of cerarii. Although *Atrococcus* is distinct in having species with a black body content and with the cerarii on abdomen only, the position is complicated with *Spilococcus cactearum* McKenzie, a species with an obvious relationship to other species of *Spilococcus* yet possessing a black body content. It is left in this genus for the time being pending further research.

Apart from *S. cactearum*, the other British species, *S. filicicola* (Newstead), is placed here as a temporary measure.

Spilococcus cactearum McKenzie

(Text-fig. 19)

Pseudococcus mamillariae Bouché, Green, 1930 : 9. (Misidentification.)

Spilococcus cactearum McKenzie, 1960 : 757.

HABIT AND DISTRIBUTION. According to McKenzie the adult female is covered with an even, light grey secretion. When boiled in caustic potash the body content turns black or blue-black. So far as is known, the species is confined to the Cactaceae. Specimens have been examined as follows: ENGLAND. Essex: Laindon, vi. 1928 (T. M. Endean). Middlesex: Pinner, v. 1947 (R. E. Elkan).

RECOGNITION CHARACTERS. Adult female broadly oval attaining a length of 2.5 mm. Anal lobes well developed. Antennae 8-segmented, 310-335 microns long. Legs normal, posterior coxae with a few translucent pores, posterior tibia with a small group of such pores; claw with a denticle; trochanter + femur 215-240 microns, tibia + tarsus 240-250 microns. Labium about 70 microns long. Anterior and posterior ostioles present, inner edges of lips sclerotized, each lip with 2 or 3 setae and about 6 trilocular pores. Circulus rather large, oval. Anal ring with a double band of pores and 6 setae about twice length of its diameter. Cerarii numbering 9-14 pairs, those on head and thorax variable in number but there are usually 7 pairs present on abdomen. Anal lobe cerarii each with a pair of slender conical setae set close together and accompanied by 5 or 6 trilocular pores and 3 or 4 auxiliary setae, the area at base of cerarian setae lightly sclerotized. Anterior cerarii each with setae more slender, sometimes wide apart but their presence can be detected by a group of 3 or 4 trilocular pores, without auxiliary setae.

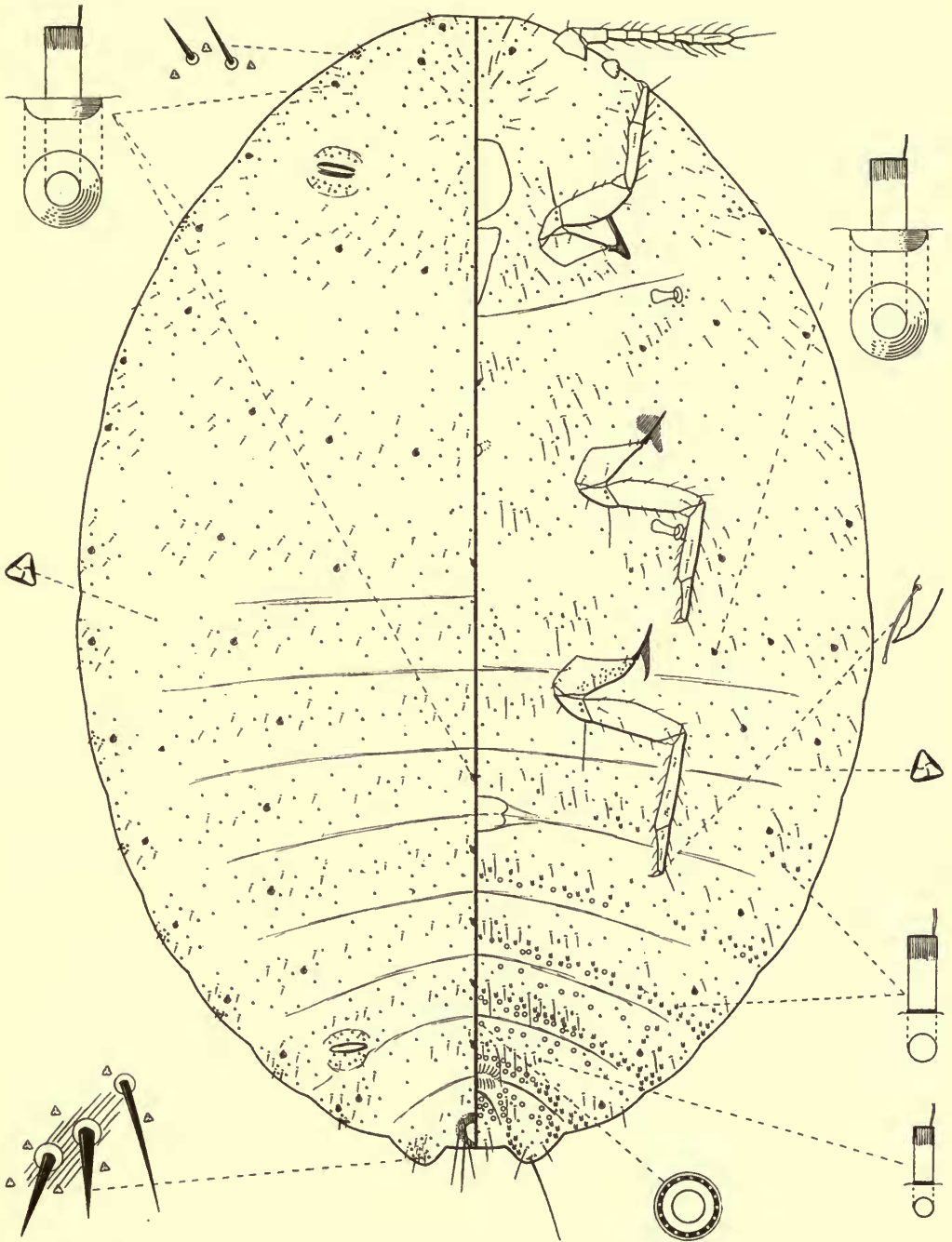


FIG. 19. *Spilococcus cactearum* McKenzie.

Dorsal surface of body with very small slender setae, not numerous. Trilocular pores evenly distributed. Tubular ducts with oral rim on segment VIII and all anterior segments, arranged in single transverse rows on abdomen, there being rarely more than 6 on each segment; on the thorax and head they become scattered.

Ventral surface with a pair of long apical setae longer than anal ring setae. Other setae slender but usually longer than those on dorsum especially on median areas, not numerous. Multilocular disc pores on abdomen only, confined to segments posterior to circulus. Arranged in transverse rows at posterior edges of segments and at anterior edges of segments VII and VIII. Tubular ducts with oral collar of two sizes. A small type, very few in transverse rows in middle of some of posterior abdominal segments and on anal lobes, an occasional duct sometimes present on thorax. A larger type in transverse rows on fourth and posterior segments immediately anterior to multilocular disc pores and usually continuous with noticeable marginal groups. One or two also present on thorax. Tubular ducts with oral rim arranged singly or in pairs on margins of segments IV–VIII but forward to metathorax they are more numerous, often with 2 or 3 on each segment. There is usually a pair between antennal bases and often 1 in median area of thorax. Trilocular pores not numerous but with an even distribution.

NOTES. This species has often been misidentified as *Pseudococcus mamillariae* based on the description of *Coccus mamillariae* Bouché. It has been shown by McKenzie, on the basis of a report by Lindinger (1934), that it cannot be the species described by Bouché and consequently McKenzie has described this black cactus-infesting species as new. British specimens have been checked against material from France collected by A. Balachowsky and from Italy collected by G. Paoli.

Spilococcus flicicola (Newstead) (comb. n.)

(Text-fig. 20)

Ripersia flicicola Newstead, 1898 : 96.

Ripersia flicicola Newstead, Newstead, 1903 : 184.

HABIT AND DISTRIBUTION. Newstead stated that in life this insect was pale ochreous yellow or red-pink; farinose, with broad irregular wax appendages on the margin of the abdominal segments. The insects also secrete slender iridescent filaments radiating from the sides of the body.

Known only from a greenhouse in the Royal Botanic Gardens, Kew, ENGLAND, on the fronds of *Trichomanes spicatum*, 27.ii.1897. It is possible that it will be found eventually in Central or South America.

RECOGNITION CHARACTERS. A broadly oval species, length of available specimens 1.5 mm., anal lobes well developed. Antennae 6-segmented, 240 microns long. Legs normal, stout, trochanter + femur 180 microns, tibia + tarsus 170 microns. Labium 105 microns long. Circulus absent. Ostioles well developed, inner edges of lips sclerotized, each lip with 0–2 setae and 4–6 trilocular pores. Anal ring with a double band of pores and 6 setae about twice length of ring at its greatest diameter. Cerarii numbering 10 pairs, there being 2 pairs on head and 8 pairs on abdomen. Anal lobe cerarii each with a pair of stout conical setae and a small group of about 7 or 8 trilocular pores accompanied by 6 auxiliary setae and a few other trilocular pores all on a large oval sclerotized plate the same area as anal ring. Anterior cerarii each with 3–7 trilocular pores and a pair of small conical setae except the frontal pair which have 3 conical setae, all without auxiliary setae.

Dorsal surface sparsely beset with short slender setae. Trilocular pores evenly distributed, not numerous. Tubular ducts present, of oral rim type, rather large. Each duct often with 1–3 trilocular pores and 1 or 2 setae immediately surrounding base of oral rim but not attached to it, although some ducts entirely without these. In the 2 specimens at hand there are 7 ducts

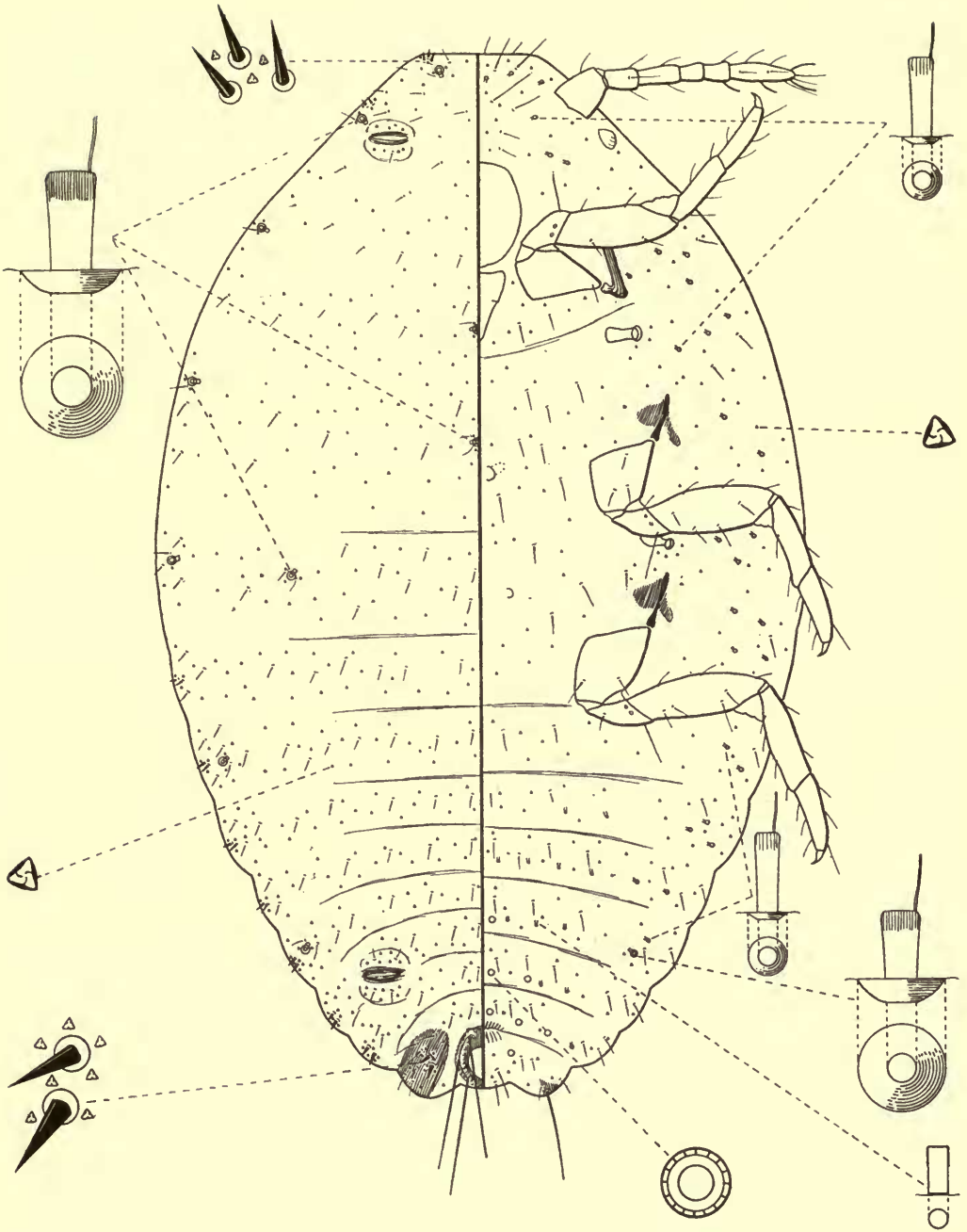


FIG. 20. *Spilococcus filicicola* (Newstead).

equispaced on either side of margin, 2 on mid-line of thorax and a pair in submedian areas of metathorax.

Ventral surface with small triangular sclerotized area on each anal lobe and an apical seta shorter than anal ring setae. Body setae few, short and slender but, for the most part, longer than dorsal setae. Trilocular pores evenly distributed but sparse. Multilocular disc pores in single transverse rows on median area of abdomen only. Tubular ducts with oral collar very few, in transverse rows on segments IV-VII. Tubular ducts with oral rim of 2 types. A single duct, slightly smaller than those on dorsum, but with rim of larger diameter than a multilocular disc pore, present on either side of segment VI. A smaller type of duct, each with a narrow rim of smaller diameter than a multilocular disc pore, present around the margins where they are more numerous on thorax.

NOTES. The placing of this species in *Spinococcus* is tentative as the dorsal sclerotization on the anal lobes and the very large oral rim ducts are not found on other species in the genus. Although some of the oral rim ducts have one or two setae and some trilocular pores around the base of the rim, this character is not constant.

SPINOCOCCUS Borchsenius

Spinococcus Kiritchenko, 1931 : 314 (*nom. nud.*).

Spinococcus Borchsenius, 1949 : 393.

Type of genus *Acanthococcus marrubii* Kiritchenko.

The main characters of this genus are the 17-18 pairs of cerarii with conical setae, these elevated slightly from the surrounding derm and with 2-10 trilocular pores immediately at the base. Dorsal setae similar in shape and size to cerarian setae, there being usually a row of dorsal cerarii on mid-line. Antennae 8-9-segmented. Claw with distinct denticle. Quinquelocular disc pores on ventral surface.

Spinococcus calluneti (Lindinger)

(Text-fig. 21)

Pseudococcus calluneti Lindinger, 1912 : 90.

Parapedronia calluneti (Lindinger), Balachowsky, 1954 [1953] : 230.

Spinococcus calluneti (Lindinger), Zahradník, 1959 : 537.

Spinococcus calluneti (Lindinger), Danzig, 1960 : 176.

HABIT AND DISTRIBUTION. Apparently confined to *Calluna* spp. and *Erica* spp. where it feeds mainly on the roots. Described originally from Germany and found on two occasions only in Britain as follows : ENGLAND. Cheshire : Chester, roots and flowers of *Erica cinerea*, *Calluna* sp., viii. 1922 (R. Newstead). Surrey : Oxshott, *Calluna vulgaris* roots, x. 1925 (K. Mansour).

RECOGNITION CHARACTERS. Adult female ovate about 1.5 mm. long. Anal lobes moderately developed, set well apart. Antennae 7-8-segmented, 245-320 microns long. Legs normal, claw with a distinct denticle. Trochanter + femur 170-180 microns, tibia + tarsus 190-200 microns. Labium 70-90 microns long. Circulus small and round within borders of segment IV. Ostioles present, inner edges of lips sclerotized, each lip usually with 3 trilocular pores and an occasional seta. Anal ring with a double band of pores and 6 setae about twice length of diameter of ring. Marginal cerarii numbering 18 pairs, the cerarian setae on small projections of the derm. Anal lobe cerarii each with 2 conical setae on a large sclerotized plate nearly same size as anal ring, containing about 10 trilocular pores and 1 or 2 minute setae. Anterior cerarii each with 2 smaller

conical setae set close together and with 2-4 trilocular pores immediately around the base, the base of each seta elevated from the surrounding derm.

Dorsal surface with setae of various sizes but of similar shape to cerarian setae. Dorsal cerarii each consisting of 2 conical setae situated on mid-line of body, these setae of same size as those of marginal cerarii. Similar sized setae in transverse rows, each with 1 or at most 2 trilocular pores on or near the basal projection; occasionally replaced by definite cerarii with 2 setae. Other dorsal setae very small. Multilocular disc pores present in transverse rows on thorax and abdomen and a few scattered on head. Tubular ducts with a similar distribution to multilocular disc pores, a single duct usually situated between 2 multilocular pores. Trilocular pores evenly distributed, not numerous.

Ventral surface with apical setae longer than anal ring setae. Other setae slender, of various lengths but usually longer in median areas. Multilocular disc pores in transverse rows on abdominal segments but forming groups towards margins. Marginal groups also present on thorax and 1 or 2 pores situated near each coxa. Quinquelocular disc pores present in median areas only on head and thorax and all prevulvar abdominal segments. Trilocular pores few, absent in median areas of anterior abdominal segments and thorax. Tubular ducts with oral collar of two sizes. A larger type, similar to dorsal ducts, around the margin, there being usually a single duct between two multilocular disc pores. A smaller type, about half the width, mainly concentrated in median areas of abdomen but some extending laterally among the larger type. An occasional smaller duct also present in median areas of thorax.

NOTES. The identity of this species is based on specimens from Erlangen, Germany, collected by H. Schmutterer.

TRIONYMUS Berg

Trionymus Berg, 1899 : 78.

Trionymus Berg, Ferris, 1950 : 251, 1953 : 482.

Trionymus Berg, McKenzie, 1960 : 764.

Type of genus *Westwoodia perrisii* Signoret.

This genus has been a source of confusion in recent years. It is very close to *Dysmicoccus* and it is doubtful if the latter will be accepted when further species are described. Ferris laid particular stress on the shape of the circulus which, in *Trionymus*, should be small and round or oval whereas in *Dysmicoccus* it should be large and divided by an intersegmental fold. McKenzie has disregarded the shape of the circulus and species with 6 or more cerarii are placed in *Dysmicoccus* and those with 5 or less are placed in *Trionymus*.

McKenzie's interpretation is accepted here although difficulties arise with *T. newsteadi*. This species possesses 4 or 5 pairs of cerarii and has close affinities with the genus *Dysmicoccus* with regard to body form and the shape of the circulus. Furthermore, its host is *Fagus* and, although there are exceptions, most species of *Trionymus* are found on grasses. As it has no obvious relationship to its present genus *Pseudococcus*, it is left in *Trionymus* for the time being.

This is by far the largest British genus and the 9 species may be separated by the following key :

1	Anal lobe cerarii borne on a distinct sclerotized plate as large as or larger than area of anal ring	2
-	Anal lobe cerarii not borne on a sclerotized plate	5
2 (1)	Circulus large, divided by an intersegmental fold	<i>tomlini</i> Green
-	Circulus small, round or oval, not divided by an intersegmental fold.	3

- 3 (2) Multilocular disc pores absent on dorsum except for total of no more than 4-6 on some of last abdominal segments *dactylis* Green
- Multilocular disc pores on dorsum in transverse rows 4
- 4 (3) With 26-45 trilocular pores on the sclerotized plate on anal lobes; tarsus about half length of tibia *perrisii* (Signoret)
- With 70-75 trilocular pores on the sclerotized plate on anal lobes; tarsus about one-third as long as tibia *phalaridis* Green
- 5 (1) With 4 or 5 pairs of cerarii; circulus large and quadrate-shaped *newsteadi* (Green)
- With 1 or 2 pairs of cerarii; circulus small and round 6
- 6 (5) Tubular ducts with the oral collar nearly half total length of duct *radicum* (Newstead)
- Tubular ducts with the oral collar very small 7
- 7 (6) Multilocular disc pores absent on dorsum *thulensis* Green
- Multilocular disc pores present on dorsum 8
- 8 (7) With a single pair of cerarii on anal lobes, cerarian conical setae slender *orestes* sp. n.
- With 2 pairs of cerarii, cerarian conical setae on anal lobes short and stout *diminutus* (Leonardi)

Trionymus dactylis Green

(Text-fig. 22)

Pseudococcus (Trionymus) dactylis Green, 1925 : 523.

Trionymus dactylis Green, Green, 1928 : 22.

HABIT AND DISTRIBUTION. Appearance in life not recorded. Known only from beneath the leaf sheaths of grasses. CHANNEL ISLANDS. Guernsey : St. Sampson, *Dactylis glomerata*, ix.1924 (E. E. Green) (Type); Petit Bot Bay, *Deschampsia caespitosa*, ix.1927 (F. Laing). ENGLAND. Somersetshire : Cheddar, *Dactylis glomerata*, viii.1926 (E. E. Green).

RECOGNITION CHARACTERS. Body elongate elliptical attaining a length of 5 mm. Anal lobes moderately developed. Antennae 8-segmented, length 380-425 microns. Legs normal, slender, posterior coxae with numerous translucent pores, trochanter + femur 315-340 microns, tibia + tarsus 335-370 microns. Labium 75-80 microns long. Anterior and posterior ostioles present, each lip with 4-6 trilocular pores and usually without setae although at times one may be present. Circulus very small, oval. Anal ring with a double band of pores and 6 setae twice length of diameter of ring. Cerarii numbering 3 or 4 pairs. Anal lobe cerarii each with 2 conical setae on a sclerotized plate, larger in area than anal ring, containing 12 long setae and about 40 trilocular pores. Penultimate cerarii each with 2 smaller cerarian setae accompanied by about 12 trilocular pores and 2 or 3 auxiliary setae and surrounded by a small sclerotized area. Cerarii on segment VII similar but without sclerotized area. Cerarii on segment VI, when present, with 1 or 2 small cerarian setae and 2 or 3 trilocular pores.

Dorsal surface with slender setae of various sizes. Multilocular disc pores either absent entirely or numbering only 3-4 at most on posterior abdominal segments. Trilocular pores numerous. Tubular ducts with oral collar of 2 sizes. A larger type, quite numerous on all segments, tending to form transverse rows on abdominal segments but becoming scattered on thorax and head. A smaller type present on abdomen, sparse, in transverse rows in middle of segments and occasionally on thorax.

Ventral surface of body with apical setae longer than anal ring setae. Other setae of various sizes and similar to dorsal setae. Multilocular disc pores on fifth and posterior segments only, except for an occasional pore anteriorly. Tubular ducts of same 2 sizes as those on dorsum. A larger type in transverse groups or rows on fifth and posterior segments and forming rather large groups laterally. Marginal or submarginal groups also present as far forward as head. Occasionally single ducts may be present in median areas of thorax. A smaller type of duct

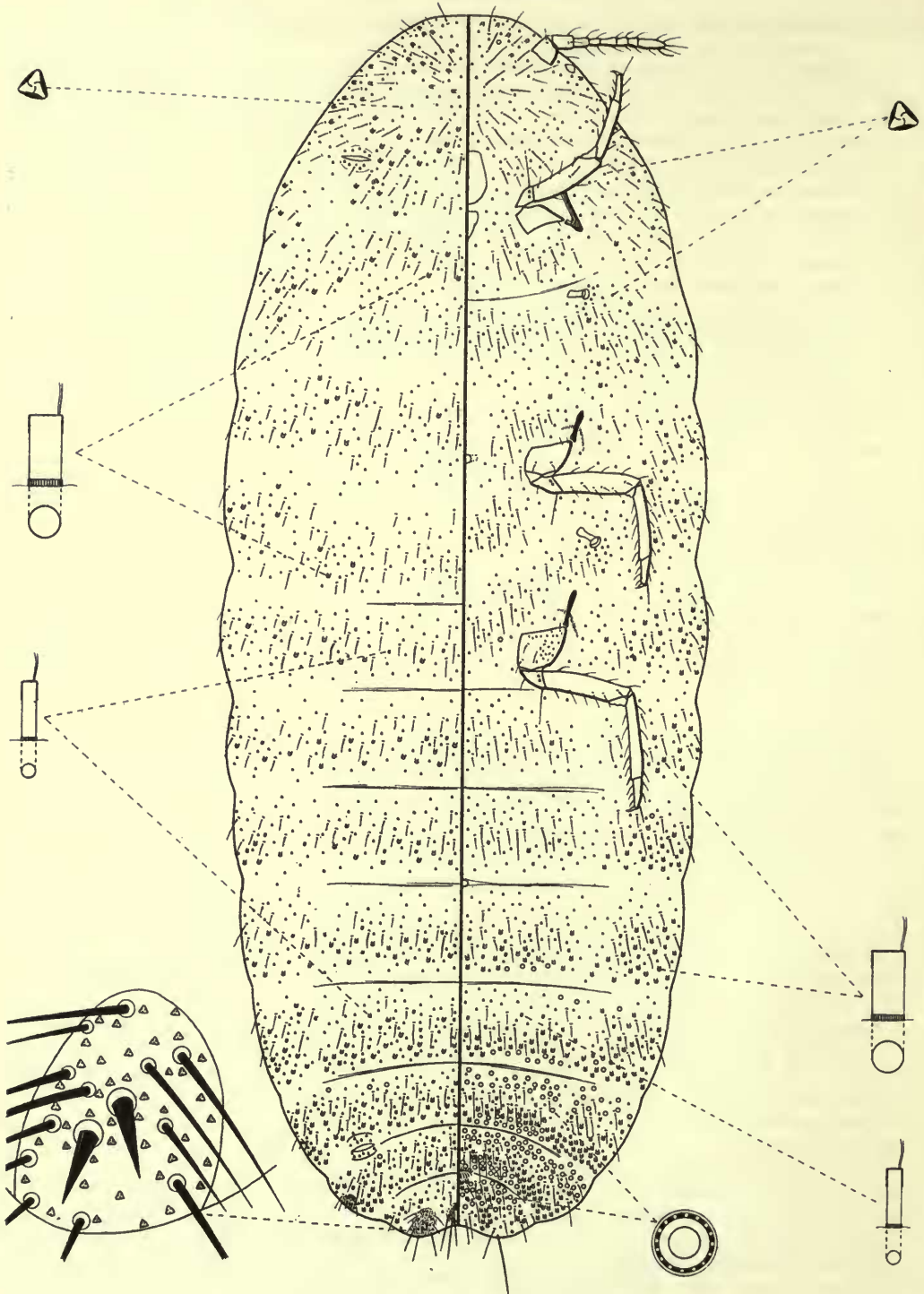


FIG. 22. *Trionymus dactylis* Green.

mainly present on abdomen across the middle of the segments, much fewer than larger type. Trilocular pores with an even distribution.

Trionymus diminutus (Leonardi)

Pseudococcus diminutus Leonardi, 1918 : 198.

Trionymus diminutus (Leonardi), Ferris, 1950 : 261.

Specimens are at hand from CHANNEL ISLANDS, Jersey (G. Fox-Wilson) on *Phormium tenax* to which plant it seems to be confined. It was described from Italy and is now known from New Zealand, U.S.A., Formosa and Russia. Ferris has redescribed and illustrated this species.

Trionymus newsteadi (Green)

(Text-fig. 23)

Pseudococcus newsteadi Green, 1917 : 265.

Trionymus newsteadi (Green), Zahradník, 1959 : 538.

HABIT AND DISTRIBUTION. Described as "Body pale purplish grey; limbs and antennae pale stramineous; venter thinly, dorsum rather thickly and evenly covered with white mealy secretion; terminal three or four segments of abdomen with short, stout, waxy tassels." It is known only from beech. ENGLAND. Surrey: Camberley, vii.1916, v.1917 (Type), 15.vi.1932 (E. E. Green). Buckinghamshire: Chartbridge (E. J. Joseph). Hertfordshire: Berkhamsted, 16.i.1913. Essex: Epping Forest, 25.v.1923 (C. L. Withycombe). Sussex: Midhurst, 18.v.1946 (W. J. Hall). Berkshire: Silwood Park, 31.v.1949 (K. L. Boratynski).

RECOGNITION CHARACTERS. Body broadly oval attaining a length of 3 mm., anal lobes moderately developed. Antennae 8-segmented, 340-410 microns long. Legs normal, posterior coxae and tibiae with a few translucent pores. Trochanter + femur 260-285 microns, tibia + tarsus 275-305 microns. Labium 105-120 microns long. Circulus large, posterior edge usually shorter than anterior edge. Posterior ostioles present only, each lip with 3 or 4 trilocular pores and apparently without setae. Anal ring with 2 rows of pores and 6 setae, these about twice length of diameter of ring. Cerarii numbering 4 or 5 pairs on abdomen. Anal lobe cerarii each with 2 slender conical setae and about 6 or 7 trilocular pores accompanied by 3 or 4 auxiliary setae, the area around the base of the setae sclerotized. Anterior cerarii on segments VI-VIII similar but cerarian setae smaller, auxiliary setae absent. Cerarii on fifth segment usually with setae similar to body setae and accompanied by about 3 trilocular pores.

Dorsal surface with slender setae. Tubular ducts numerous with deep collar occupying nearly one-third length of duct; a flange-shaped membranous ring also arising from the inner end of the collar. The ducts and dorsal setae are arranged in definite groups rather than in transverse rows leaving bare areas except for trilocular pores which are more evenly distributed, as in the accompanying diagram.

Ventral surface with apical setae longer than anal ring setae. Body setae slender but mainly longer than those on dorsum. Multilocular disc pores confined to abdomen except for occasional pores near the coxae. Fifth segment with about 10-18 pores and posterior segments with transverse rows at anterior and posterior edges of segments. Tubular ducts of 2 sizes, a larger type similar to those on dorsum, rather numerous in marginal groups on abdomen and less numerous in groups around the thorax and head. Present also in transverse rows on fourth and posterior segments. A smaller type of duct, similar in all respects to larger type, sparsely distributed in median areas of posterior abdominal segments and occasionally on abdominal margins. Trilocular pores not numerous.

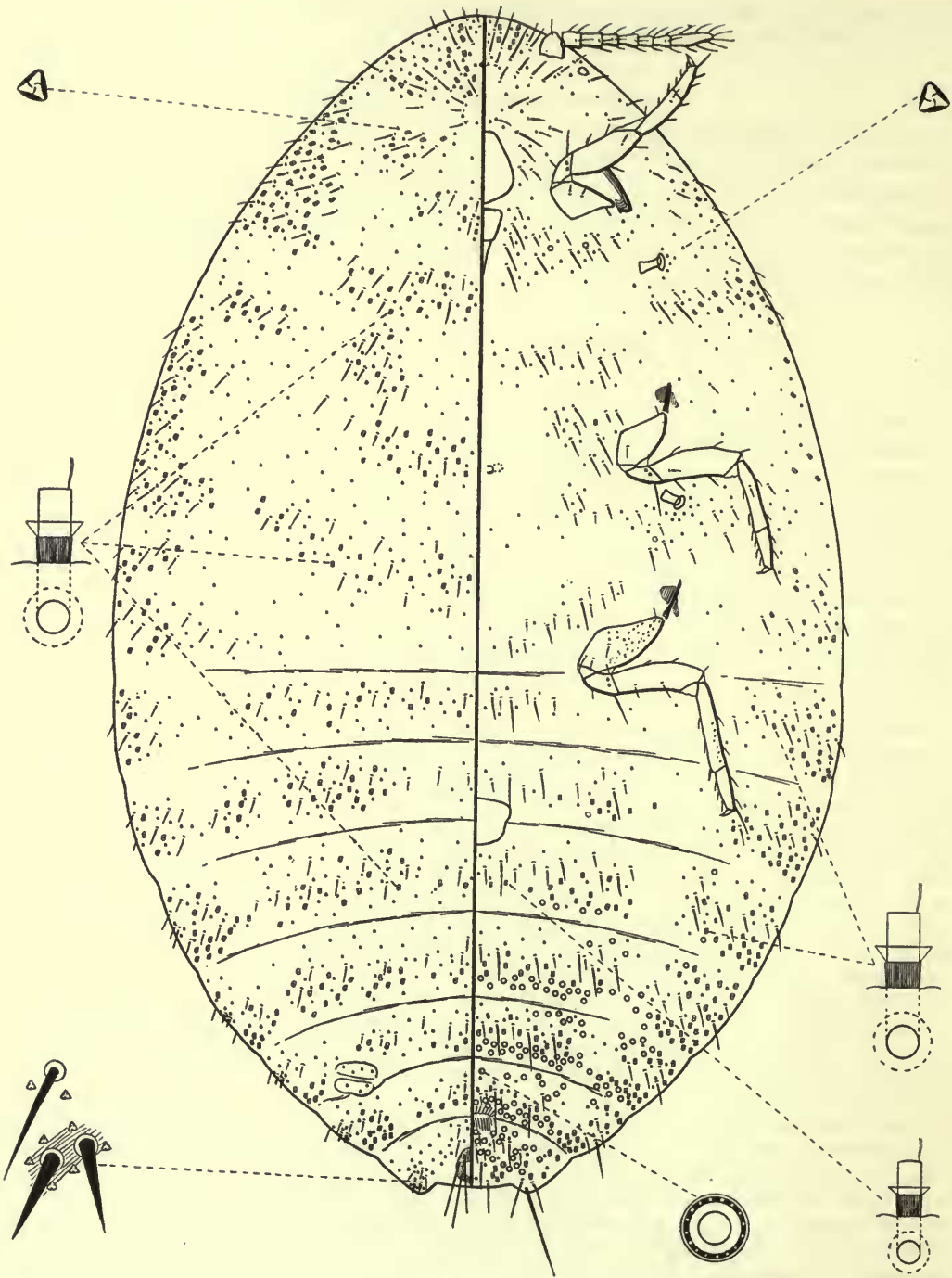


FIG. 23. *Trionymus newsteadi* (Green).

Trionymus orestes sp. n.

(Text-fig. 24)

Trionymus pulverarius (Newstead), Green, 1928 : 30. (Misidentification.)

HABIT AND DISTRIBUTION. External appearance not known: probably found on the leaf sheaths. ENGLAND. Surrey: Box Hill, *Brachypodium sylvaticum*, 26.ix.1921 (E. E. Green) (Holotype). Somersetshire: Cheddar, *Brachypodium sylvaticum*, viii.1926 (E. E. Green).

RECOGNITION CHARACTERS. An elongate species attaining a length of 3.5 mm. in available specimens. Anal lobes poorly developed. Antennae 7-segmented, 275–310 microns long. Legs rather small and slender, posterior coxae with a few translucent pores. Trochanter + femur 200–230 microns, tibia + tarsus 230–260 microns. Labium 75–80 microns long. Ostioles small, each lip with about 3 trilocular pores and without setae. Circulus present, small and oval. Anal ring with a double band of pores and 6 setae, about twice as long as diameter of ring. Cerarii on anal lobes only, each with 2 conical setae set close together and about 5 trilocular pores accompanied by a longer auxiliary seta.

Dorsal surface with slender setae of various sizes, not numerous. Multilocular disc pores arranged more or less at anterior and posterior edges of abdominal segments in single or double transverse rows becoming less numerous anteriorly. A few also present in no definite arrangement on thorax and head. Trilocular pores evenly distributed. Tubular ducts with oral collar of 2 types, a larger type in transverse rows on abdomen except on segments IX + X; present also on thorax and head where they have a random distribution. A smaller type, sparse, situated across the middle of abdominal segments except the last.

Ventral surface with apical setae longer than anal ring setae. Other ventral setae similar to those on dorsum but tending to be longer in median areas. Multilocular disc pores on posterior edges of segments V–VIII and on anterior edges of segments VI–VIII, present also on segments IX + X. Small marginal groups extending forward to head. Tubular ducts of two sizes as on dorsum. A larger type present mainly in marginal groups around body and a smaller type in transverse rows on abdomen and sometimes a few on thorax. Trilocular pores not numerous.

NOTES. This species is very close to *T. caricis* McConnell described from *Carex tribuloides*, Maryland, U.S.A., but differs in the greater number of dorsal multilocular disc pores which tend to form transverse rows on the abdominal segments. In *T. caricis* they are sparse and scattered.

Trionymus perrisii (Signoret)

(Text-fig. 25)

Westwoodia perrisii Signoret, 1875 : 337.*Dactylopius hibernicus* Newstead, 1895 : 167 (syn. n.).*Trionymus perrisii* (Signoret), Berg, 1899 : 78.*Dactylopius hibernicus* Newstead, Newstead, 1903 : 172 (in part).*Dactylopius pulverarius* (Newstead), Newstead 1903 : 174 (in part).*Pseudococcus pulverarius* (Newstead), Green, 1915 : 178. (Misidentification.)*Pseudococcus hibernicus* (Newstead), Green, 1920 : 120.*Trionymus pulverarius* (Newstead), Green, 1926 : 182. (Misidentification.)*Trionymus hibernicus* (Newstead), Green, 1926 : 183.*Trionymus pulverarius* (Newstead), Green, 1928 : 30. (Misidentification.)

HABIT AND DISTRIBUTION. Living at the base of the leaf sheath of grasses. Adult dull yellow to pale purplish, dusted with a fine white powder. Short tassels on last

two abdominal segments. This is, apparently, a common species in Britain and material has been examined from the following localities :

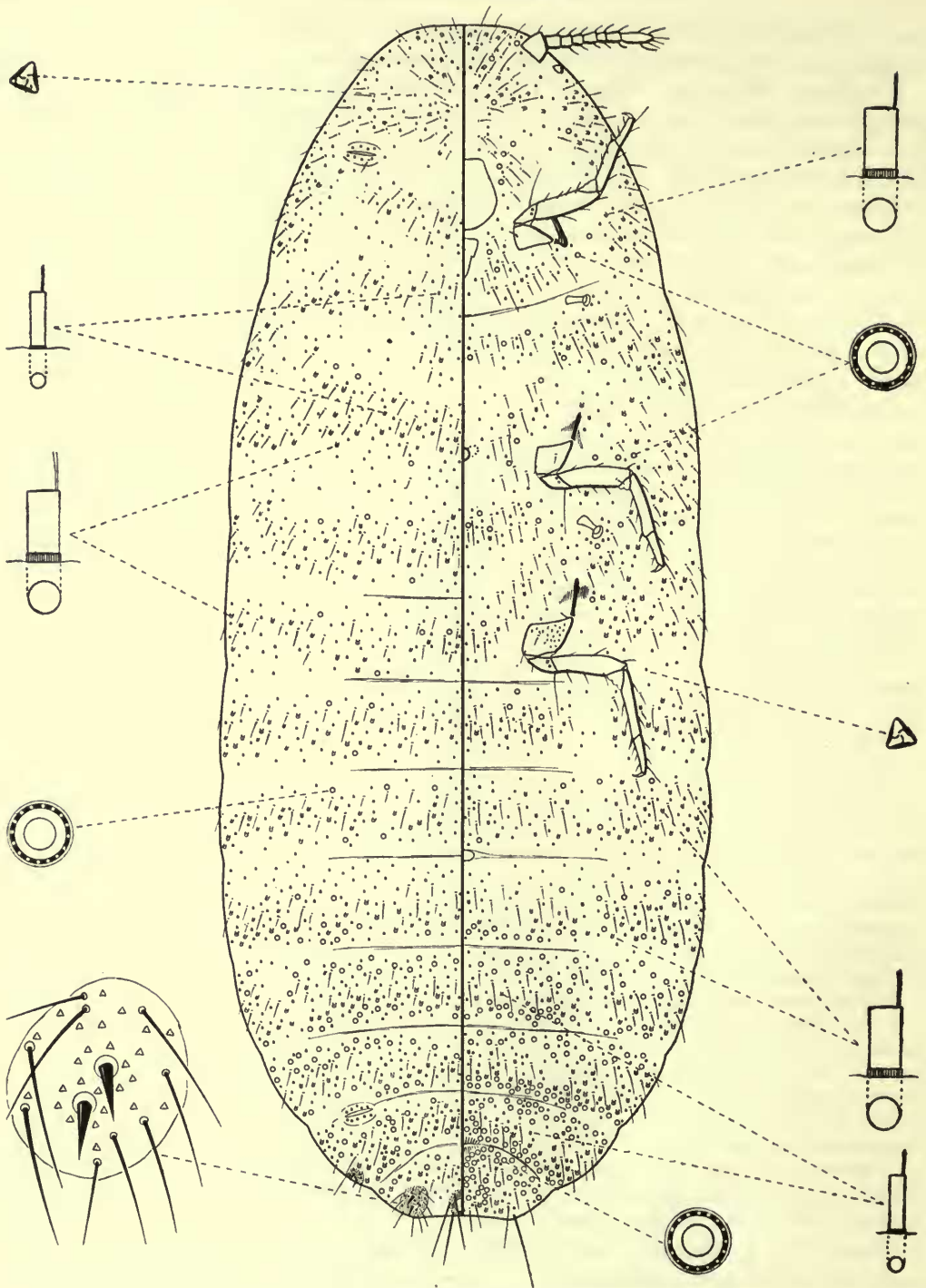
ENGLAND. Berkshire : Silwood Park, *Deschampsia caespitosa*, *Holcus* sp., 27.x. 1948, *Festuca rubra*, 22.ix.1948, 13.ix.1953 (K. L. Boratynski). Cheshire : Helsby Hill, *Agrostis* sp., 1.viii.1896 (R. Newstead). Cumberland : Whinlatter Pass, *Deschampsia caespitosa* 10.viii.1960 (D. J. Williams). Devonshire : Budleigh Salterton, 10.ix.1896 (E. E. Green). Durham : Waldridge Fell, 7.viii.1960 (D. J. Williams). Kent : Deal, ix.1899 (B. Tomlin). Norfolk : Ingoldisthorpe, viii.1892, (R. Newstead). Somersetshire : Cheddar, viii.1926 (E. E. Green). Surrey : Guildford, 21.vii.1922 (E. E. Green); Camberley, ix.1914, 19.ix.1928, 26.ix.1930 (E. E. Green). Yorkshire : Selby, ix.1918 (E. E. Green). Hawkesworth, 15.viii.1958, 6.viii.1960 (D. J. Williams). SCOTLAND. East Lothian : Gullane, Aberlady, North Berwick Law, viii.1925 (E. E. Green). IRELAND. Antrim : Ballintoy, 3.ix.1893 (L. E. Tomlin) (*hibernicus* type).

RECOGNITION CHARACTERS. Adult female elongate oval, up to 4.5 mm. in length. Anal lobes usually well developed. Antennae 8-segmented, 335-340 microns long. Legs normal, posterior coxae with translucent pores, trochanter + femur 215-260 microns, tibia + tarsus 250-285 microns. Labium about 95 microns long. Anterior and posterior ostioles moderately developed, each lip with 4-6 trilocular pores and rarely with setae. Circulus present, small and oval between fourth and fifth segments. Occasionally a second smaller circulus may be present on the next posterior segment and very rarely up to 4 circuli present in which case the extra ones are minute. Anal ring with 2 rows of pores and 6 setae twice as long as diameter of ring. Cerarii numbering 2 or 3 pairs. Anal lobe cerarii each with 2 conical setae on a sclerotized plate, slightly larger in area than anal ring. This plate also containing about 26-45 trilocular pores and 9 auxiliary setae. Cerarii on segment VIII each with a pair of smaller conical setae and on a small sclerotized plate with 8 trilocular pores and about 2 auxiliary setae. On segment VII cerarii often absent entirely but when present, with either 1 or 2 conical setae and 2 or 3 trilocular pores and not surrounded by a sclerotized area.

Dorsal surface with slender setae. Multilocular disc pores variable in number and distribution. On the abdomen they form transverse rows at the anterior and posterior edges of segments VI-VIII. On the anterior abdominal segments they become sparse and may be missing entirely on some of the edges. On the thorax they become scattered and sometimes they are present on the head. Trilocular pores rather numerous. Tubular ducts with oral collar of 2 sizes. A smaller-sized duct sparse, there being a few across the middle of most abdominal and thoracic segments. A larger type of duct, numerous, forming transverse bands on the abdominal segments. In some specimens they reach from the anterior to posterior edges of most segments but in other specimens they are concentrated in the middle of the segments or towards the posterior edges. On the thorax and head they are less numerous and become scattered.

Ventral surface with apical setae longer than anal ring setae. Ventral setae slender but tending to be longer than dorsal setae. Multilocular disc pores numerous in transverse rows at anterior and posterior edges of segments VI-VIII; present also on segments IX + X and on posterior edge of segment V. Elsewhere on the abdomen they are sparse and may be present or absent around the margins. On the thorax and head they are scattered on median areas and often extend around margins. Trilocular pores evenly distributed. Tubular ducts, of smaller type, present in middle of abdominal segments and in median areas of thorax; not numerous. A larger type in transverse rows and marginal groups on abdominal segments and extending around body in a marginal or submarginal zone.

NOTES. Dr. A. Reyne has very kindly sent specimens of *T. perrisii* from Holland and these agree with specimens of *T. hibernicus* described from Britain. Professor N. S. Borchsenius has also kindly examined some British specimens of *T. hibernicus*

FIG. 25. *Trionymus perrisii* (Signoret).

and it is his opinion that they are the same as *T. perrisii*. All of these specimens agree with the illustration of *T. perrisii* given by Marchal (1908).

Continental specimens usually have 3 distinct pairs of cerarii but on at least 1 specimen from Holland there are only 2 pairs. British specimens usually have 2 pairs of cerarii but the third pair is often represented by a single conical seta and 2 or 3 trilocular pores. Although a single circulus seems to be the more normal condition, some specimens in Britain have 2 and in rare cases up to 4.

Trionymus phalaridis Green

(Text-fig. 26)

Pseudococcus (*Trionymus*) *phalaridis* Green, 1925a : 37.

HABIT AND DISTRIBUTION. Described as "Colour reddish purple to dark slaty grey; closely dusted with white powdery secretion. Posterior extremity with four short waxy tassels." Living beneath the leaf sheath and stem. ENGLAND. Surrey: Frimley, 8.ix.1922 (E. E. Green) (Type); Camberley, 30.viii.1921, 30.ix.1921 (E. E. Green), all on *Phalaris arundinacea*. Gloucestershire: ix.1922 (K. G. Blair).

RECOGNITION CHARACTERS. Body elongate, sides subparallel, attaining a length of 6.5 mm. Anal lobes well developed. Antennae 8-segmented, 450-495 microns long. Legs rather long and slender, posterior coxae with a few translucent pores, trochanter + femur 380-395 microns, tibia about 3 times as long as tarsus, measuring together 405-445 microns. Labium 100 microns long. Ostioles present, usually with about 10-15 trilocular pores on each lip of posterior pair and about 4-6 on each lip of anterior pair; without setae. Circulus oval. Anal ring with a double band of pores and 6 setae over twice length of ring at its greatest diameter. Cerarii on last 2 segments only. Anal lobe cerarii each with 2 conical setae on a large sclerotized plate, larger in area than anal ring and accompanied by 70-75 trilocular pores and 12 or 13 slender auxiliary setae. Penultimate cerarii each with 2 smaller conical setae on a small round sclerotized plate containing about 15 trilocular pores and 5 auxiliary setae.

Dorsal surface of body with numerous slender setae of various sizes. Multilocular disc pores arranged in transverse rows at anterior edges of segments V-VIII and with only a few at posterior edges of these segments. On the anterior abdominal segments and thorax they are sparse and become scattered. Trilocular pores numerous and evenly distributed. Tubular ducts with oral collar of 2 sizes. A smaller type, few on abdomen, situated mainly across middle of segments. A larger type abundant, occupying most of the area of segments II-VIII except at anterior edges. On the thorax they become scattered but are well separated between the segments and on the head they lie in definite groups.

Ventral surface with a pair of apical setae longer than anal ring setae. Slightly shorter setae present around margins of abdomen. Other ventral setae of various sizes but all slender. Multilocular disc pores numerous on segments IX + X, in transverse rows at anterior and posterior edges of segments VI-VIII, and on posterior edges of segment V. A few also present on segment IV, around the margins to head and occasionally in median areas of thorax. Trilocular pores numerous. Tubular ducts of same 2 sizes as on dorsum. A smaller type sparse on abdomen and a larger type in transverse rows and marginal groups on the abdominal segments. Present also in groups around the margins to head and a few in median areas of thorax.

NOTES. This species comes close to *T. perrisii* but is usually much larger. The trilocular pores on the sclerotized plate on anal lobes are much more numerous and the tibia is about three times as long as the tarsus whereas in *T. perrisii* it is only twice as long.

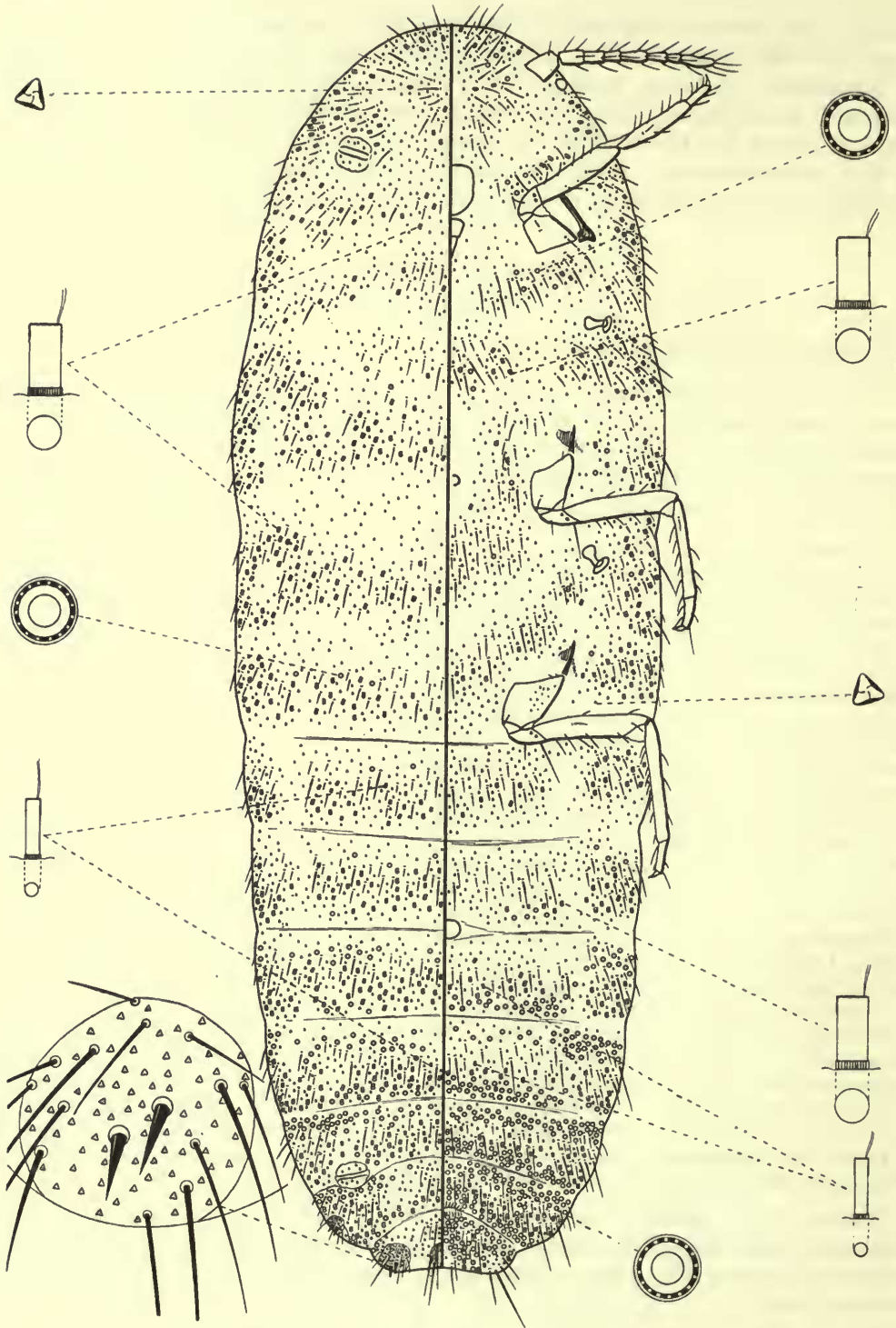


FIG. 26. *Trionymus phalaridis* Green.

Trionymus radicum (Newstead) (comb. n.)

(Text-fig. 27)

Dactylopius radicum Newstead, 1895b : 235.*Dactylopius hibernicus* Newstead, Newstead, 1903 : 172 (in part, misidentification).*Ripersia donisthorpei* Newstead, *In* Donisthorpe, 1907 : 5 (syn. n.).

HABIT AND DISTRIBUTION. Living at the base of grasses. Described originally as "pale reddish-pink . . . At period of gestation the ♀ completely envelops herself in a very loose cottony material, in which the pale flesh-coloured ova are laid." ENGLAND. Isle of Man : Port Erin, 21.ix.1918. Buckinghamshire : Waddesdon, 17.v.1953 (V. F. Eastop). Kent : Charing, in nest of *Ponera contracta* (H. Donisthorpe) (*donisthorpei* Type). WALES. Anglesey : Puffin Is., vi.1895 (*radicum* Type).

RECOGNITION CHARACTERS. Body elongate oval, about 3.5 mm. long. Anal lobes moderately developed. Antennae 7-segmented, 305–335 microns long. Legs normal, slender, hind coxae with a few translucent pores. Trochanter + femur 215–240 microns, tibia + tarsus 225–245 microns. Labium 70–75 microns long. Ostioles poorly developed with 4–7 trilocular pores on each lip and rarely with setae. Circulus very small, oval. Anal ring with a double band of pores and 6 setae longer than ring at its greatest diameter. Cerarii numbering 2 pairs only. Anal lobe cerarii each with a pair of conical setae and about 6 or 7 trilocular pores accompanied by a single auxiliary seta, the area between the cerarian setae sclerotized. Cerarii on segment VIII each with a pair of smaller conical setae and about 4 trilocular pores.

Dorsal surface of body with short slender setae, not numerous. Multilocular disc pores very few, scattered at random on thorax and abdomen. Trilocular pores evenly distributed. Tubular ducts arranged in transverse rows on thorax and abdomen and in groups on head, each duct with a large flange-shaped collar occupying nearly half total length of duct.

Ventral surface with apical setae longer than anal ring setae. Ventral setae all slender but mainly longer than dorsal setae. Multilocular disc pores numerous on segments IX + X and present in transverse rows at posterior edges and usually on anterior edges of segments V–VIII. Small numbers also on anterior abdominal segments and around the margins to head and one or two in median areas of thorax. Tubular ducts of 2 sizes ; a larger type, similar to dorsal ducts situated in groups around the margins and a few present in median areas of segments V–VIII. A smaller type of duct, similar to the larger type but with inner end rounded, present on abdomen mainly in the median areas.

NOTES. When Newstead collected this species he also found some smaller specimens which he thought were the larvae. They were, however, adult females of *Rhizoecus halophilus* and he mentioned this error in 1903. In this same work he sunk the name *Dactylopius radicum* as a synonym of *D. hibernicus*, stating that the "curiously shaped pores or glands" were caused by a parasite. The species is quite distinct and the tubular ducts, with the collar flange-shaped and nearly half the total length of the duct, serve to distinguish this species from all the other British species of *Trionymus*.

Trionymus thulensis Green

(Text-fig. 28)

Trionymus pulverarius (Newstead), Green, 1926 : 182. (Misidentification.)*Trionymus thulensis* Green, 1931a : 267.

HABIT AND DISTRIBUTION. Found beneath the leaf sheath and stem of grasses. Described originally from Iceland, Varmahlíð on *Festuca rubra*, 3.vi.1929 (C. H. Lindroth). British specimens are at hand from the following localities : ENGLAND.

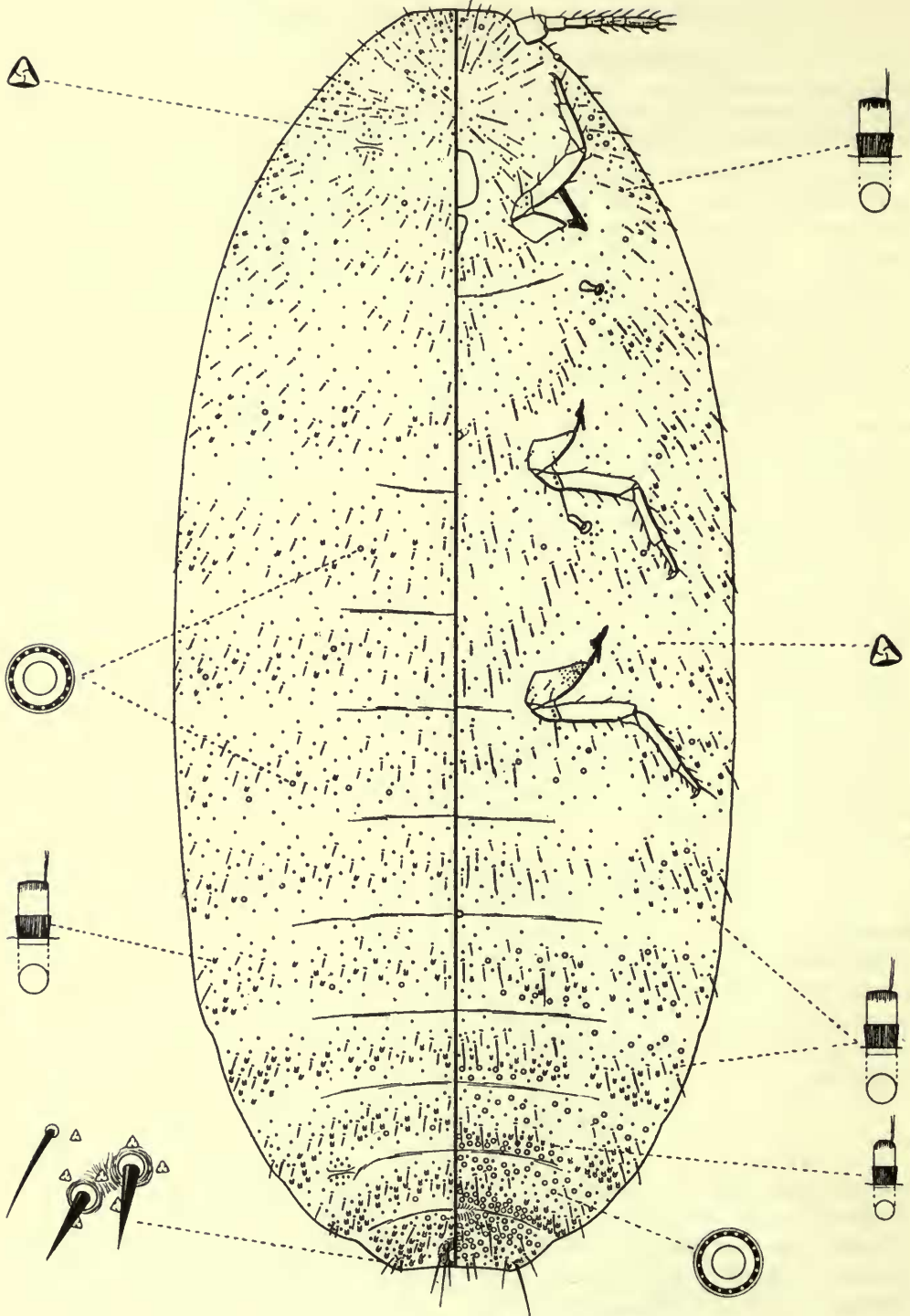


FIG. 27. *Trionymus radicum* (Newstead).

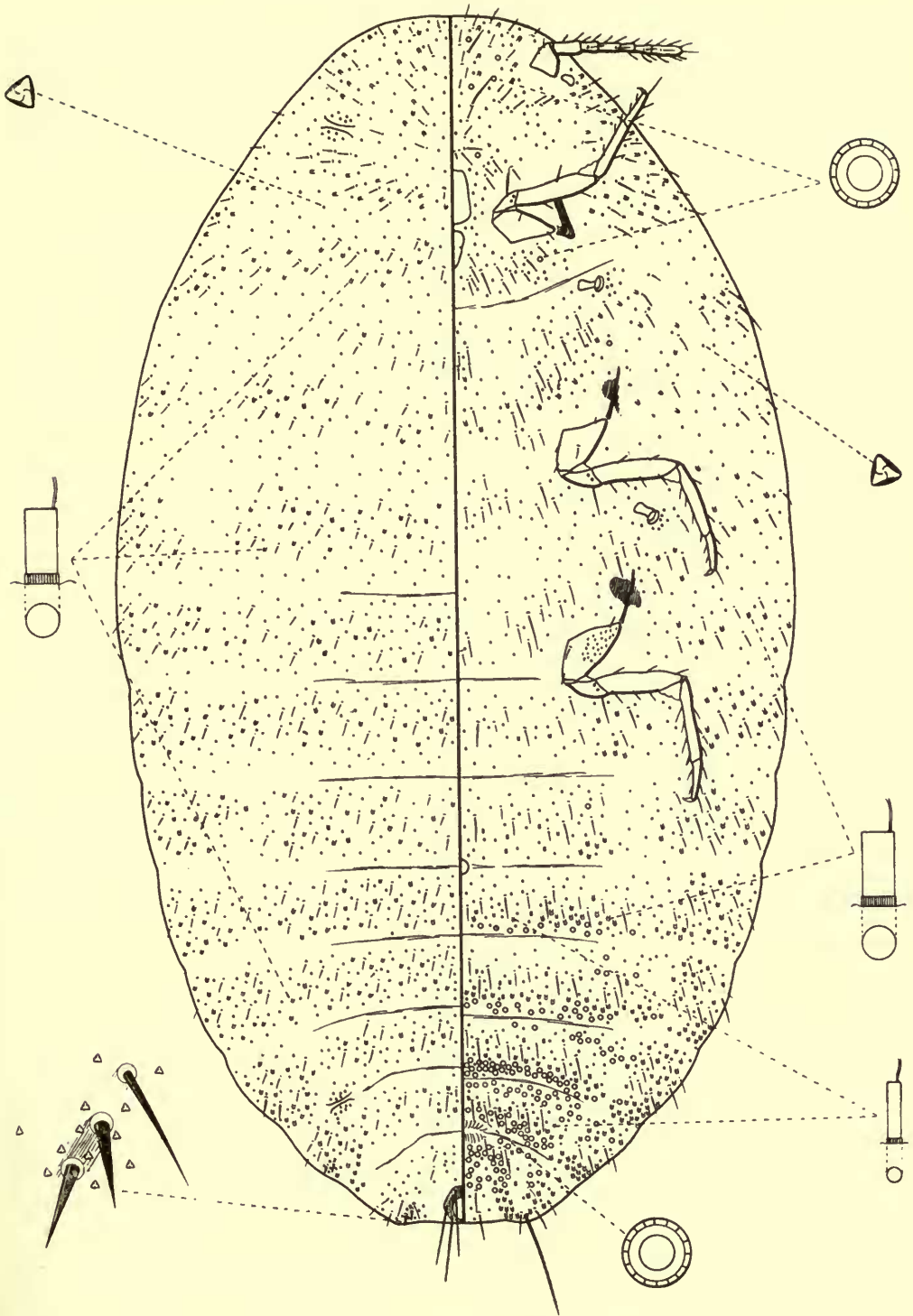


FIG. 28. *Trionymus thulensis* Green.

Berkshire : Silwood Park, *Holcus mollis*, 31.v.1951 (K. L. Boratynski). Durham : Low Fell, vi.1943 (R. S. Bagnall). Kent : Thurnham, *Trisetum flavescens*, 13.vii.1921 (E. E. Green). Isle of Wight : Seaview, 3.ix.1921 (E. E. Green). Norfolk : Snettisham, 18.vii.1895 (R. Newstead). Northumberland : Alnmouth, 2.iii.1935 (R. S. Bagnall). Surrey : Camberley, 5.ix.1923, vii.1929, 23.vii.1932 (E. E. Green). Yorkshire : Askham Bog, *Agrostis tenuis*, 22.vi.1956 (D. J. Williams). WALES. Brecknockshire : Llangammarch, vi.1926 (E. Earle).

RECOGNITION CHARACTERS. Body elongate elliptical to elongate oval, attaining a length of 4 mm. Antennae 7- or 8-segmented, length about 380 microns. Labium 80-95 microns long. Legs normal, posterior coxae with a few translucent pores; trochanter + femur 265-285 microns, tibia + tarsus 285-320 microns. Circulus small and round. Ostioles with about 6 trilocular pores on each lip and without setae. Anal ring with 6 setae twice as long as diameter of ring. Cerarii present on last 2 abdominal segments. Anal lobe cerarii each with a pair of conical setae, a small cluster of 7 or 8 trilocular pores, not on a sclerotized plate but small area between the setae sclerotized. Accompanied also by a single auxiliary seta immediately above cerarian setae. Cerarii on segment VIII with 2 smaller conical setae and about 6 or 7 trilocular pores and no auxiliary setae.

Dorsal surface of body with short slender setae. Multilocular disc pores absent. Trilocular pores not numerous, evenly distributed. Tubular ducts with oral collar of one size; absent on segments IX + X but present on all anterior abdominal segments and thorax in transverse bands and tending to become scattered on head. In some specimens they are quite sparse on thorax and head.

Ventral surface of body with a stout pair of apical setae longer than anal ring setae. Other ventral setae slender but mainly longer than on dorsum; not numerous. Multilocular disc pores present on segments IX + X and in transverse rows at posterior edges of segments V-VIII in median areas. Present also at anterior edges of segments VI-VIII and occasionally in median areas of anterior abdominal segments, thorax and head. Tubular ducts of 2 sizes, a larger type, similar to dorsal ducts, numerous in groups around margins to head and also in transverse rows on abdominal segments. Some also present in median areas of thorax. A smaller type of duct less numerous, situated in median areas of abdominal segments and sometimes among the lateral groups of the larger ducts.

NOTES. This species is, apparently rather common in Britain, and has been misidentified in the British literature as *T. pulverarius* (Newstead). The illustration has been prepared from specimens collected at Askham Bog, Yorkshire, which agree well with the type. Some other specimens studied show fewer multilocular disc pores and tubular ducts but these represent an extreme in variation.

Trionymus tomlini Green

(Text-fig. 29)

Pseudococcus (*Trionymus*) *californicus* Ehrhorn, Green, 1925 : 522. (Misidentification.)

Pseudococcus (*Trionymus*) *tomlini* Green, 1925 : 525.

HABIT AND DISTRIBUTION. External appearance not known. Found beneath the leaf sheaths of grasses. CHANNEL ISLANDS. Guernsey : Port Grat, *Psamma arenaria* (= *Ammophila arenaria*), ix.1925 (J. R. le B. Tomlin) (Type); Vazon Bay, *Agropyron repens*, ix.1924. ENGLAND. Isle of Man : Dalby in sandy shingle above high water mark ix.1922 (L. E. Tomlin).

RECOGNITION CHARACTERS. An elongate oval species measuring about 3.5 mm. long. Anal lobes moderately developed. Antennae 8-segmented, 425 microns long. Legs rather long,

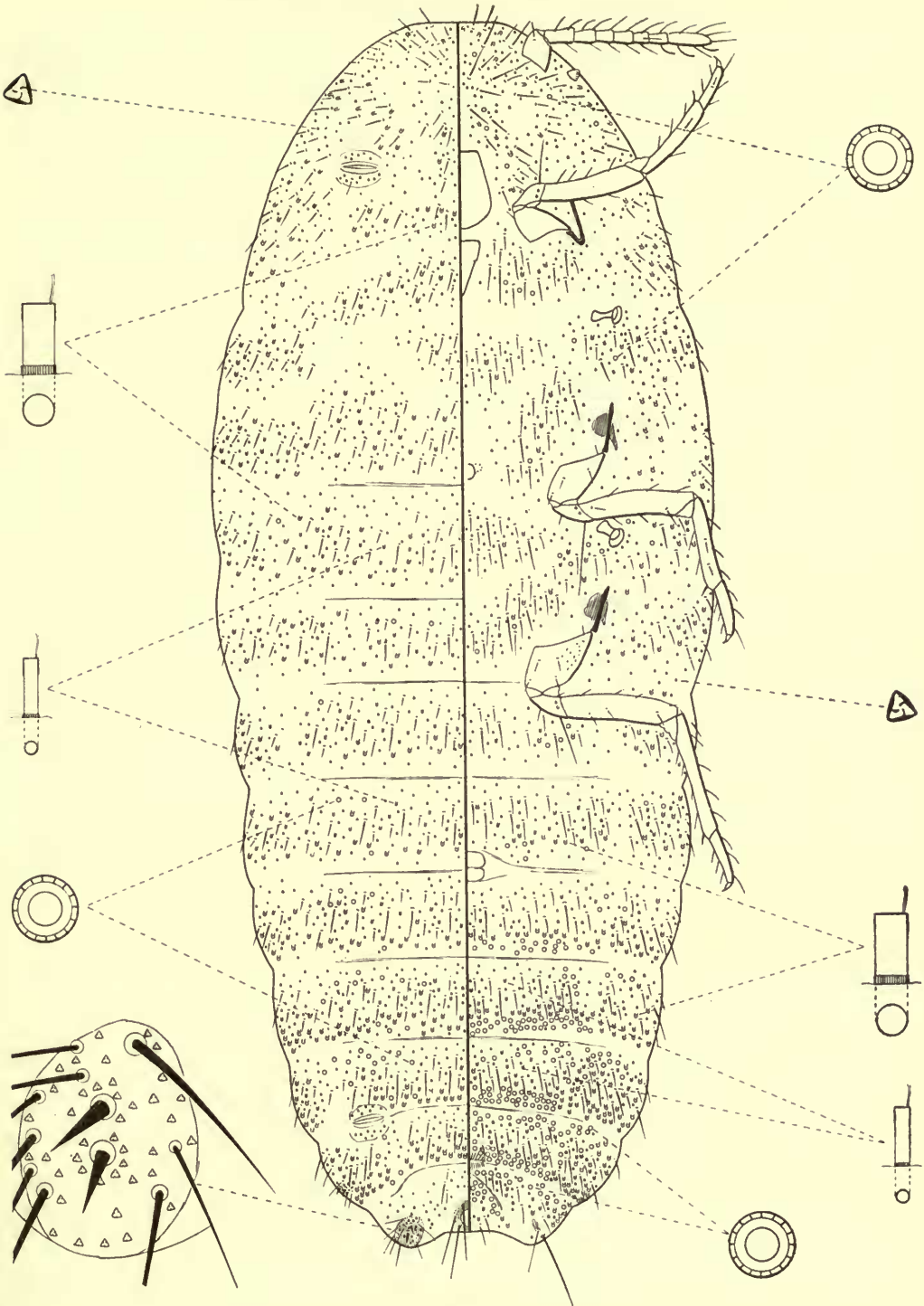


FIG. 29. *Trionymus tomlini* Green.

posterior coxae with a few translucent pores. Trochanter + femur 285–340 microns, tibia + tarsus 355–370 microns. Labium about 95 microns long. Anterior and posterior ostioles present, each lip with 6–8 trilocular pores, usually without setae but occasionally present. Circulus large and oval with a distinct intersegmental fold. Anal ring with 6 setae about twice length of its diameter. Cerarii numbering 2 pairs. Anal lobe cerarii each with 2 conical setae on an oval sclerotized plate nearly as large as anal ring and containing about 35–42 trilocular pores and 8 or 9 auxiliary setae. Penultimate cerarii not on a sclerotized area, each with 2 smaller conical setae, about 15 trilocular pores and 2 or 3 auxiliary setae.

Dorsal surface with slender setae of various sizes. Multilocular disc pores absent on segments IX + X and present at anterior and posterior edges of the other abdominal segments in no definite pattern; not numerous and becoming sparse on anterior abdominal segments; a few also present on thorax. Trilocular pores evenly distributed. Tubular ducts with oral collar of 2 sizes. A smaller type, not numerous, in middle of abdominal segments except IX + X and also present on thorax. A larger type of duct more numerous, arranged on segments II–VIII mainly in transverse rows on posterior edges and in marginal groups, but a few also present towards anterior edge of each segment. On the meta- and mesothorax they become scattered and on the prothorax and head form definite groups.

Ventral surface with apical setae longer than anal ring setae; each anal lobe also with a small sclerotized patch which is not attached to the apical seta. Body setae rather numerous, all slender, of various sizes but mainly long. Multilocular disc pores numerous on abdomen, present on segments IX + X and in transverse rows at posterior edges of segments IV–VIII. Situated also on anterior edges of segments VI–VIII and a few present on anterior abdominal segments and in median areas of thorax and head. Tubular ducts of same two types as on dorsum. A smaller type on abdomen, mainly across the middle of each segment. A larger type present in transverse rows at posterior edges of abdominal segments and in marginal groups which extend to head. Groups also present in median areas of thorax and head.

NOTES. In its general distribution of pores and ducts, this species comes very close to *T. perrisii* but differs in the form of the circulus which is quite large and divided by an intersegmental fold, whereas the circulus of *T. perrisii* is small and oval. It seems to have close affinities with *T. modocencis* (Ferris) and *T. haancheni* McKenzie, described from the U.S.A. which also have 2 pairs of cerarii and a large divided circulus. In this respect *T. tomlini* comes closest to *T. haancheni* but possesses more numerous multilocular disc pores on the dorsum, and on the venter they extend to the thorax and head whilst in *T. haancheni* they are present on the abdomen only.

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