

# A new subfamily, two new genera and three new species of Acleridae (Hemiptera: Coccoidea) from southern Africa, with a phylogenetic analysis of relationships

CHRIS J. HODGSON\* and IAN M. MILLAR†

\*Department of Biodiversity and Systematic Biology, The National Museum of Wales, Cardiff, Wales, U.K. and

†Biosystematics Division, ARC-Plant Protection Research Institute, Pretoria, South Africa

**Abstract.** A new acclerid genus, *Lecanacclerda* Hodgson & Millar, closely related to *Aclerda* but with fully developed legs and antennae, is introduced for a new new species, *L. macropoda* Hodgson & Millar, for which the male and female are described. In addition, genus *Rhodesacclerda* McConnell is revised and all known stages of existing species, *R. combreticola* McConnell and *R. halli* McConnell, are redescribed. The crawler, second-instar female, pupa and the adult male and female of a new species, *R. insleyae* Hodgson & Millar, from South Africa are also described. Another new genus, *Kwazulacclerda* Hodgson & Millar, close to *Rhodesacclerda*, is introduced and the crawler, second-instar female, second-instar male, pupa and adult male and female of the new species *K. loranthi* Hodgson & Millar from Kwazulu-Natal are described. A phylogenetic analysis based on adult macropterous male characters was undertaken to look at the relationships of these species with other Coccoidea. It is concluded that *Lecanacclerda* is closely related to *Aclerda*, *Kwazulacclerda* is closely related to *Rhodesacclerda*, *Kwazulacclerda* and *Rhodesacclerda* belong to Acleridae, and Acleridae should be split into two subfamilies, Rhodesacclerinae Hodgson & Millar (to include *Rhodesacclerda* and *Kwazulacclerda*) and Aclerinae Cockerell (to include *Aclerda*, *Lecanacclerda* and *Nipponacclerda*). These two subfamilies are diagnosed and a key is given for the separation of the genera now included in Acleridae. The relationships of Acleridae and Coccidae are discussed.

## Introduction

Genus *Aclerda* was introduced by Signoret (1874) for a group of scale insect species which mainly inhabit grasses and exhibit rather specialized morphological characters. At the time, Signoret considered that *Aclerda* was closely related to his coccid genus *Lecanopsis*, but this was considered unlikely by Green (1909) and, indeed, the genus was put in its own family, Acleridae, by Teague (1925). Since then, the family has been critically reviewed by McConnell (1954), who introduced two additional genera, *Nipponacclerda* with a single species from Japan, clearly closely related to *Aclerda*, and *Rhodesacclerda* with two species from what is

now Zimbabwe. The latter is a rather aberrant genus and its placement within Acleridae was considered questionable. When McConnell reviewed the family, *Aclerda* included some thirty-four species, but a few more species have since been described and the family currently comprises fifty-one species. *Aclerda* appears to be widespread and has been recorded from all the main geographical regions of the world. Most of the species have been described from the Nearctic, Palaearctic and Oriental Regions (Veilleux *et al.*, 2001).

Although adult female *Aclerda* (the flat grass scales) are often considered to be taxonomically close to the soft scales or coccids (see cladograms in Miller & Hodgson, 1997), there are a few characters that consistently separate these families. The most important on adult female acclerids are: the crenulated margin on posterior abdominal segments; the presence of only a single anal plate, although this may be very deeply divided (as in all African species); the presence of a ventral groove lying below the anal complex; and the

Correspondence: Dr C. J. Hodgson, Department of Biodiversity and Systematic Biology, The National Museum of Wales, Cathay's Park, Cardiff, CF1 3NP, Wales, U.K. E-mail: hodgsoncj@cardiff.ac.uk

presence of inner apodemes (called anal tube apodemes) on either side of the ventral groove (although these apodemes are probably homologous with the 'supporting bars' on either side of the anal cleft of Coccidae). In addition, adult female Aclerididae have an extreme reduction of the legs and antennae (often absent altogether or at most reduced to minute structures), the multilocular (pregenital) disc-pores are absent from the abdomen and the tubular ducts are restricted to the submargin (although they are somewhat more widespread in a few species). We describe below the adult male and female of a new genus and species from South Africa, which we believe belongs to Aclerididae (as it has the first four characters mentioned above) but in which the adult female has well developed legs and antennae and pregenital disc-pores across all the abdominal segments.

The male of the new species looks superficially similar to the male of *Rhodesaclerda*, as illustrated by McConnell (1954), and therefore the male of *R. combreticola* McConnell was also studied. More material of *Rhodesaclerda* was found in the South African National Collection, including males of two other species. On the basis of this material, it was decided to revise *Rhodesaclerda* and describe the two new species from South Africa, one of which is here placed in a new genus close to *Rhodesaclerda*, and to consider the placement of *Rhodesaclerda* within Aclerididae.

Some terminology previously used to describe aclerdid structures of the adult female (e.g. McConnell, 1954) has been changed in the following descriptions. On the dorsum, the dorsal invaginated setae of McConnell are here considered to be invaginated conical pores (as on the anal cone of *Rhodesaclerda* species); the dorsal microtubular ducts of McConnell are here referred to as dorsal microductules on *Lecanaclerda* as they appear to be similar in structure to the dorsal microductules of Coccidae, each of which also has a long, fine, inner ductule (these pores are absent on *Rhodesaclerda* and *Kwazulaclerda*, described as new below); the macro-tubular ducts of McConnell are here referred to as dorsal tubular ducts on *Lecanaclerda* (absent from species of *Rhodesaclerda* and *Kwazulaclerda*). In species of *Rhodesaclerda* and *Kwazulaclerda*, the 'macro-tubular ducts' of McConnell are not considered here to be homologous with the macro-tubular ducts of *Aclerda* species and are referred to as sclerotized bilocular pores. These are also present on the venter. On the venter, the ventral microtubular ducts of McConnell are here considered to be similar to the ventral microducts of Coccidae, as each has a short outer ductule and a similar broad inner ductule with a skirtlike flange at the distal end, whereas the ventral macro-tubular ducts are here referred to as ventral tubular ducts. In addition, the caudal sclerotized area of McConnell is referred to here as the sclerotized anal cone.

Because no species currently known within Aclerididae has more than highly reduced legs and antennae, and because there has been some doubt about the relationships of *Rhodesaclerda*, a phylogenetic analysis was undertaken

to consider whether the new species with well developed legs and antennae (*Lecanaclerda macropoda* Hodgson & Millar, described below) is an aclerdid, whether *Rhodesaclerda* and the new genus related to it (*Kwazulaclerda*) should continue to be included within Aclerididae, and to look at the relationships of aclerdids and soft scales, as these families have been considered to be closely related.

Female scale insects are wingless and are considered to be neotenic. This has released them from the constraints of normal insect structure, so that female scales have been able to diversify enormously in structure and are currently considered to belong to about eighteen extant families, all of which are strikingly dissimilar. This great diversity of structure makes it extremely difficult to choose female characters for a phylogenetic study, as the homology of the structures are uncertain and many have been lost (such as the antennae and legs in Aclerididae). On the other hand, most male scale insects are fully winged and are rather similar in appearance. There is therefore less doubt about the homologies of the structures of alate males. For this reason, the phylogenetic analysis undertaken in this study was restricted to morphological structures of alate males.

In addition to the species described or redescribed in this paper, the following exemplar taxa were also included in the phylogenetic analysis in an effort to include the most likely relatives to these new coccoids. Aclerididae: *Aclerda arundinariae* McConnell, *A. tillandsiae* Howell, *Aclerda* sp. A from Wasta, South Dakota, and *Aclerda* sp. B from Hildago, Mexico. Asterolecaniidae: *Asterolecanium proteae* Giliomee & Munting. Cerococcidae: *Cerococcus artemisiae* (Cockerell) and *Cerococcus indicus* (Maskell). Coccidae: *Coccus hesperidum* (L.) (Coccinae), *Eulecanium tiliae* (L.) (Eulecaniinae), *Filippia follicularis* (Targioni Tozzetti) (Filippiinae) and *Inglisia theobromae* Newstead (Cardiococcinae). Eriococcidae: *Eriococcus buxi* (Fonscolombe), *E. orariensis* Hoy and *Eriochiton hoheriae* Hodgson. Lecanodiaspididae: *Lecanodiaspis elytopappi* (Munting & Giliomee). Pseudococcidae: *Pseudococcus viburni* (Signoret). Kerriidae: *Tachardina aurantiaca* (Cockerell) and *Tachardiella* sp. from Tampico, Mexico. *Pseudococcus viburni* was treated as outgroup. A total of twenty-two taxa (Appendix 1) and seventy-six characters (Appendix 2) were used in the analysis. All multistate characters were treated as unordered. Analyses were performed in PAUP\* 4.0.0 (Swofford, 2000), using the heuristic search protocol with 1000 random-addition sequence replicates. A simple decay analysis was used by running a general heuristic search and keeping the cladograms with up to seven steps more than the shortest cladogram to obtain the Bremer support values. Bootstrap values were also determined from the above analyses.

Specimens of new species are deposited in the South African National Insect Collection, Pretoria (SANC); Smithsonian Institution, Washington, DC, U.S.A. (USNM); The Natural History Museum, London (BMNH), and the National Museum of Wales, Cardiff (NMW).

***Lecanaclerda* Hodgson & Millar, gen.n.**

*Type species. Lecanaclerda macropoda* Hodgson & Millar.

**General.** The only known species was found on the roots and leaf bases of a graminaceous plant.

**Adult female** (Fig. 1). Body elongate-oval, roundly pointed at anterior end and widest across abdomen; margin crenulated posteriorly. **Dorsum:** Derm membranous but sclerotized at posterior end of abdomen with several longitudinal ridges and bearing long setae on each side of anal cleft. Dorsal setae (A) finely spinose, distributed in segmental rows medially, otherwise fairly frequent throughout dorsum. Dorsal pores of at least 3 types present: dorsal sclerotized pores (B) large, with a heavily sclerotized margin, abundant posteriorly on abdomen, becoming less frequent anteriorly; much smaller pores (C), structurally similar to dorsal sclerotized pores, fairly abundant throughout rest of dorsum; and dorsal microductules (E) with a long inner ductule (dorsal microtubular ducts of McConnell, 1954), extremely infrequent, perhaps most abundant marginally on abdomen. Dorsal tubular ducts (dorsal macrotubular ducts of McConnell, 1954) (F) fairly abundant throughout dorsum but arranged in segmental rows medially. Anal plate (G) deeply divided almost to base of plate, with rounded outer margins and each half of plate rather pointed posteriorly; each plate with long finely spinose setae on each side, set on posterior half. Anal ring (ar) with numerous setae. Anal plate apparently supported by 2 inner heavily sclerotized anal tube apodemes (ap), each extending anteriorly for a distance approximately equal to length of anal plate and anal cleft combined; an inner slightly sclerotized ventral groove (vg) appears to lie between apodemes. Anogenital fold with long setae along its anterior margin and on each lateral margin. Eyespot oval, rather large; situated about halfway between margin and point dorsad to scape. **Margin:** Marginal setae (J) slightly longer and more abundant than on dorsum but neither arranged in a strongly defined row nor clearly differentiated from other body setae. Posterior margin of abdomen slightly sclerotized and with a few crenulations (cm) in sclerotized area. **Venter:** Derm membranous; dermal spinules present medially on thorax and abdomen. Ventral setae (Q) frequent throughout venter. Spiracular disc-pores (L) each generally with 5 loculi, present in groups laterad to each spiracle and in a dense group associated with each peritreme. Pregenital disc-pores (K) each larger than spiracular disc-pores and rather deep; mainly present across segments V–VII but with a few more anteriorly. Other ventral pores: medium-sized, heavily sclerotized pores (N), each quite similar to dorsal sclerotized pore but smaller, present throughout most of venter but least frequent medially and posteriorly; and ventral microducts (ventral microtubular ducts of McConnell, 1954) (M) each quite large, frequent throughout venter, but perhaps most abundant submarginally. Ventral tubular ducts (ventral macrotubular ducts of McConnell, 1954) (P) similar to those on the dorsum, frequent throughout. Antenna (S)

8-segmented, segments rather broad; most antennal setae rather spinose, with fleshy setae on segments VII and VIII. Clypeolabral shield significantly extended anteriorly and covered in a sclerotized membrane; apparently lacking setae; labium 1-segmented, with rather spinose setae. Spiracles (T) subequal in size. Legs (U) rather large, well developed, with a tibio-tarsal articulation and articulatory sclerosis; tarsus lacking a campaniform pore. Tarsal digitules thicker than claw digitules, of even thickness throughout but shorter than claw; claw digitules fine with small expanded apices, shorter than claw; claw very robust, with a suggestion of a denticle.

**Adult male** (Fig. 2). Small; antennae each more than half total length of body; body with very few mainly hairlike setae (hs); fleshy setae (fs) on limbs generally easy to differentiate from hairlike setae. Body with fairly frequent small convex pores (D; dp), each about size of hs socket. Wings a little shorter than total body length and rather narrow. **Head:** Median crest (mc) represented by slightly sclerotized ridge with a few striations; with fs and hs dorsal head setae (dhs). Dorsal mid-cranial ridge absent; ventral mid-cranial ridge (vmcr) represented by a short medial ridge with a pair of short lateral arms at anterior end (lmcr), arms not reaching antennae; with fleshy ventral mid-cranial ridge setae (vmcrs) between ventral mid-cranial ridge and each scape. Genae (g) without polygonal reticulations; genal setae (gs) possibly represented by 1 pair of hs medially. Simple eyes in 2 subequal pairs; ventral pair positioned far forward, almost in line with dorsal eyes. Ocelli (o) distinct. Ocular sclerite (ocs) sclerotized and polygonally reticulated (B, C) and extending across epicranium anterior to dorsal eyes. Preocular ridge absent. Postocular ridge (pocr) well developed and extending up side of head posterior to ocelli toward scape but not extending onto dorsal surface. Dorsal ocular setae absent. Ventral head setae (vhs) fleshy, present in a group just posterior to each scape on each ocular sclerite. Between ventral eyes and extending posteriorly appears to be an elongate lightly sclerotized platelike structure which broadens posteriorly. Tentorial bridge apparently absent, but with 2 strong sclerotized inner arms here considered to be tentorial arms (ta). Cranial apophysis (ca; A) rather small, with a bifurcated (or possibly trifurcated) apex, lying approximately between ventral eyes. **Antenna:** 10-segmented, filiform, rather robust, with numerous transverse ridges; scape (scp) with 1 hs on ventral surface and 1 or 2 fs near anterior margin; pedicel (pdc) with a few polygonal reticulations and hs, fs + 1 sensilla placodeum; segments III–X quite broad with short fs and no hs; segment III slightly club-shaped; bristles on VIII and IX not apparently differentiated; segment X (E) with fs, 3 capitate setae (caps) + 3 large bristles and 0–2 smaller bristles (ab) (although bristles poorly differentiated); with 2 sensilla basiconica (sb), one on apex and one positioned more proximally near bristle. **Prothorax:** Pronotal ridge (prnr) strong and fused dorsally; without lateral pronotal sclerite; without lateral pronotal setae. Prosternum (stn<sub>1</sub>) lightly sclerotized, with a weak transverse ridge, without a median ridge and without prosternal setae.

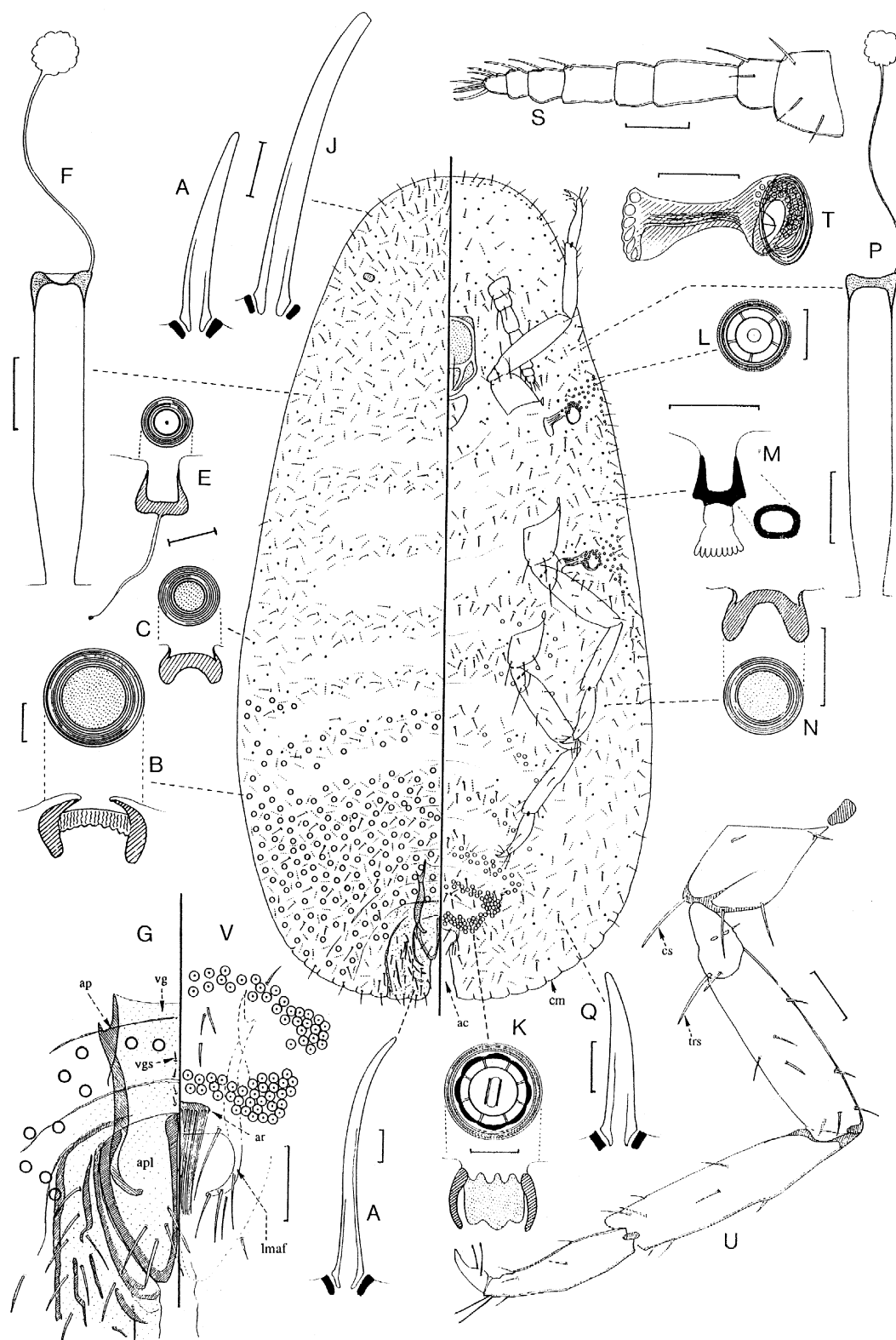


Fig. 1. *Lecanaclerda macropoda* Hodgson & Millar, adult female. For explanation of letters and abbreviations, see text.



Proepisternum + cervical sclerite (pepcv) well developed; propleural ridge (plr<sub>1</sub>) quite large; propleural apophysis (pla<sub>1</sub>) well developed. *Mesothorax*: Prescutum (prsc) rather small, wider than long; sclerotized; probably rather convex in life; prescutal ridge (pscr) and prescutal sclerite (pscs) well developed. Scutum (sct) with median membranous area rather small, about twice as wide as long; with hs scutal setae (scts); lateral sclerites sclerotized but not reticulated; prealare ridge (pra) well developed. Scutellum (scl) rather rectangular, sclerotized but not tubular and without a foramen; scutellar setae absent. Mesopostnotum (pn<sub>2</sub>) well developed; opening of postnotal apophysis (pna) large and very elongate but lacking an inner apophysis; prealare (pra) and triangular plates (tp) well developed. Mesepisternum (eps<sub>2</sub>) sclerotized, without ridges or reticulations. Most lateral structures not recognizable. Basisternum (stn<sub>2</sub>) quite large; median ridge (mdr) represented by slight sclerotizations; basisternum bounded by a weak marginal ridge (mr) and strong precoxal ridges (pcr<sub>2</sub>); without basisternal setae; lateropleurite (lpl) very large, with a hint of a weak anterior extension from marginal ridge; furca (f) fairly narrow at base, furcal arms rather thin, with arms nearly parallel, extending anteriorly to well past point where marginal ridge (mr) and precoxal ridges (pcr<sub>2</sub>) join. Postalare (pa) not reticulated at anterior end; postalare setae absent. Mesothoracic spiracles (sp<sub>2</sub>) normal in size. Postmesospiracular setae absent. Tegula (teg) well developed, with tegular setae (tegs). Three wing sclerites present, apparently similar to those on Coccidae. *Metathorax*: With a pair of hs metatergal seta (mts). Prepleural ridge (plr<sub>3</sub>) well developed. Episternum (eps<sub>3</sub>) lightly sclerotized, with fs and hs postmetaspiracular setae. Metepimeron (epm<sub>3</sub>) well developed, without setae. Antemetaspiracular setae absent. Metathoracic spiracle (sp<sub>3</sub>) placed more posteriorly than on Coccidae, normal in size. Dorsospiracular setae absent. Metasternum (stn<sub>3</sub>) lightly sclerotized. Anterior metasternal setae absent; with both fs and hs posterior metasternal setae (pmss). All structures associated with hamulohalteres absent. Metapostnotum (pn<sub>3</sub>) probably not sclerotized. *Wing*: Hyaline, with radial (rad) and medial (med) veins; narrow. Without alar lobe or alar setae. Hamulohalteres absent. *Legs*: With few setae, all hs or spurlike. Coxae (cx) each with hs + 2 long apical setae. Trochanter (tr) all rather swollen distally, each with a ring of 6 oval campaniform sensillae and a long seta ventrally. Tibia (ti) with mostly spurlike setae, particularly on distal third of leg; with one large apical tibial spur (tibs) (missing on only metathoracic leg but present on other legs). Tarsi (ta) with mostly spurlike setae; tarsal spurs (tabs) poorly differentiated; tarsal campaniform pore absent; tarsal digitules (tdt) about as long as claw. Claws (G; c) thin, shorter than width of tarsi, slightly curved, with a small but distinct denticle (cd); claw digitules (cdt) a little longer than claw. *Abdominal segments I–VIII*: Sternites (as) and tergites (at) all with sclerites; pleurites on segments III–VII showing slight sclerotization, particularly on more posterior segments. Caudal extension of segment VII absent. With only hs + dp present dorsally, ventrally and pleurally. Segment

VIII (E): tergite (at) sclerotized, particularly on caudal extension (ce) which appears to be heavily sclerotized; without ante-anal setae medially; sternite (as) sclerotized, without setae, not forming anterior part of penial sheath; caudal extension (ce) small, well sclerotized, with pleural setae. Glandular pouch absent. *Genital segment*: Penial sheath (E; ps) quite long, parallel-sided, sclerotized, swollen at base. Basal rod (bra) long and just about reaching basal membranous area (bma) anteriorly; without an extension posteriorly down aedeagus. Aedeagus (aed) short, about 0.2 length of basal rod, approximately parallel-sided, not nearly reaching apex of penial sheath; apparently covered by a broader sclerotized flap of about equal length. Penial sheath with small setae (pss) along each margin and a cluster of small sensilla (psp) present near apex.

*Comments*. Currently, this genus only includes the type species, *L. macropoda* Hodgson & Millar. In general appearance, *Lecanaclerda* looks very like *Aclerda* and *Nipponaclerda* but differs from both in that the adult female has fully developed legs and antennae and pregenital disc-pores ventrally on the abdomen.

*Etymology*. The name *Lecanaclerda* is formed from part of the word *Lecanium* (implying some similarity to Coccidae) and *Aclerda*, the genus to which it is most closely related.

### ***Lecanaclerda macropoda* Hodgson & Millar, sp.n.**

*Adult female* (Fig. 1). Described from 10 adult females in fair condition. *Unmounted material*: Only known specimens, stored in alcohol, showed no evidence of wax coverings; described as being on the 'roots' in 2 samples and from 'leaf bases' in a third. *Mounted material*: Body length 2.2–5.0 mm, width 1.1–3.1 mm. *Dorsum*: Dorsal setae (A) 15–24 µm long; with 12–17 longer setae on each side of anal cleft. Dorsal pores: dorsal sclerotized pores (B) mainly 13–16 µm wide, abundant posteriorly on abdomen, becoming less frequent anteriorly but a few often present laterally on segment III; much smaller pores (C), structurally similar to (1) but about half as wide (5–7 µm), fairly abundant throughout rest of dorsum; dorsal microductules (E) consisting of a slightly smaller, invaginated pore, with heavily sclerotized sides and base, and a long filamentous inner ductule with a small terminal gland; extremely infrequent, perhaps most abundant marginally on abdomen. Dorsal tubular ducts (F) each with a long wide outer ductule (c. 20 µm long, 4 µm wide), a thin inner ductule, c. 20 µm long, and a large terminal gland. Anal plates (G) each with 3 or 4 long, rather spinose setae on each side, each about 53 µm long, set on posterior half; length of anal plate 89–127 µm, width of both plates 120–138 µm. Anal ring (ar) with perhaps as many as 40 anal ring setae about 100 µm long. Ventral groove (vg) appears to have 4–6 small setae (vgs) in a line along its length. Anogenital fold (V) with possibly 1 or 2 long setae along its anterior margin and 2–4 long setae on each lateral margin. Eyespots 30–34 µm wide. *Margin*: Marginal setae (J) 28–53 µm long, although up to 80 + µm along anal cleft (ac) margin. *Venter*: Spiracular disc-pores

(L) each with 5–10 loculi, present in groups of 19–35 laterad to each spiracle and in a dense group of perhaps 30 disc-pores associated with each peritreme. Pregenital disc-pores (K) each with 8–13 loculi in outer ring and an elongate oval central loculus, abundant across segments VII–V; less frequent across other abdominal segments but sometimes present medially on metathorax and laterad to metacoxa; also with 1 present just anterior to one antenna on one specimen. Other ventral pores medium-sized, heavily sclerotized pores (N) similar to those on dorsum but smaller, 6–8 µm wide, present throughout most of venter but least frequent medially and posteriorly; and ventral microducts (M), c. 4 µm wide, with an oval to squarish pore opening, an outer duct of variable length (generally short, 1 or 2 µm, but occasionally 7+ µm long) and with a broad inner ductule with a tessellated inner end; frequent throughout venter but perhaps most abundant submarginally. Ventral tubular ducts (P) similar to those on dorsum, frequent throughout. Ventral setae (Q) each 9–23 µm long, mostly with a blunt apex but shortest setae with pointed tips. Antenna (S) generally 8-segmented but some segments distorted; length 235–358 µm; number of setae per segment (numbers in brackets unusual): scape 2 or 3; pedicel 2 (or 3) (+a campaniform sensilla); III 0; IV 0 (or 1); V 1 or 2; VI 1 (possibly fleshy); VII 1 (possibly fleshy); VIII 7 or 8 (some probably fleshy). Clypeolabral shield extended anteriorly, length (without labium) 220–305 µm; apparently lacking setae; labium about 86–109 µm wide, with 2 (or maybe 3) pairs of short rather spinose setae. Anterior spiracles (T) with peritreme 48–60 µm, posterior peritreme 60–72 µm. *Legs*: Lengths of metathoracic leg (U) (µm): coxa 210–288; trochanter + femur 265–418; tibia 182–276; tarsus 124–173; frequency of setae on legs shown in Table 1. Claws about 50 µm long, without a distinct denticle.

*Comments.* The dorsal sclerotized pores have their surface covered in microorifices. This is almost certainly also true of the dorsal sclerotized pores on adult female *Aclerda* species, when these are present. These pores are similar to some of the dorsal pores found on Coccidae, particularly the dorsal macropores found on most New Zealand soft scales (see Hodgson & Henderson, 2000).

Six species of *Aclerda* are currently known from Africa, all of them infesting grasses, namely *A. balachowskyi* McConnell from Guinea and 'French West Africa' (McConnell, 1955), *A. constricta* Ben-Dov from South Africa (Ben-Dov, 1977), *A. namibensis* Ben-Dov from

Southwest Africa (now Namibia) (Ben-Dov, 1977), *A. panici* Hall from Egypt (Hall, 1926), *A. pasquieri* Balachowsky from Algeria and Morocco (Balachowsky, 1939) and *A. (?) digitata* Cockerell from South Africa (Cockerell, 1902). Very little is known about *A. digitata* (see McConnell, 1954) but the lack of any mention of legs or antennae strongly suggests that it is not conspecific with *L. macropoda*. The other five species have the anal plate deeply cleft, suggesting that this may be a characteristic of aclderids from Africa. This character is also present on *L. macropoda*.

The adult female of *L. macropoda* is particularly interesting as it appears to fall between the families Aclerididae and Coccidae. It shares the following characters with Aclerididae (characters unknown in Coccidae): posterior margin of the abdomen sclerotized with a crenulated margin; single anal plate (although split almost its entire length); presence of elongate anal tube apodemes (internal apodemes are present in Coccidae but they are usually bladelike and much less distinct; *Psilococcus* is a possible exception in Coccidae); presence of an inner ventral groove lying between the anal tube apodemes; and an anterior extension of the clypeolabral shield (rare in Coccidae). On the other hand, it shares with Coccidae (characters otherwise unknown in Aclerididae) the presence of: well developed legs and antennae; pregenital multilocular disc-pores on the abdomen; and tubular ducts more or less throughout both the dorsum and the venter (rare medially on aclderids).

McConnell's figures of adult female *Aclerda* species (McConnell, 1943, 1954, 1955) show two distinct folds on the venter extending anteriorly from the anal area, with the vulva at the anterior end. These folds could not be seen on *L. macropoda*.

*Adult male* (Fig. 2; for other abbreviations see Figs 9, 15, 21). The following description uses Giliomee's (1967a) terminology for males of Coccidae. The description is based on one specimen in good condition but with one metathoracic leg missing. *Unmounted material*: Not seen. *Mounted material*: Total length 1.35 mm; quite robust; fleshy setae (fs) very scarce except on antennae; with a few small convex pores on dorsum. *Head*: Approximately diamond-shaped in dorsal view; width across genae 190 µm. Median crest (mc) with (on each side) about 1 fs near apex + 3 hs dorsal head setae + 1 dorsal pore (dp). Ventral mid-cranial ridge (vmcr) represented by a short (23 µm) medial ridge extending posteriorly between scapes but not reaching ocular sclerite (ocs); vmcr with a narrow slightly reticulated border and a broader area of slight sclerotization, which extends posteriorly to ocular sclerite; with 5 fs ventral mid-cranial ridge setae (vmcrs) just medio-laterally to each scape. Genal setae (gs) possibly represented by 1 pair hs medially. Simple eyes in 2 subequal pairs (dse; vse) (23–25 µm wide), slightly oval. Ocelli (o) placed laterally, each about 15 µm wide. Ocular sclerite (ocs) with polygonal reticulations (C) highly variable in shape and with 1 or 2 small, sinuous, inner ridges. Postocular ridge (pocr) widening slightly near ocelli. Dorsal ocular setae

**Table 1.** Range in frequency of setae on legs of *L. macropoda* ( $n = 10$ ).

	Prothoracic	Mesothoracic	Metathoracic
Coxa	3–5	4 or 5	5–7
Trochanter	3 or 4	3	3
Femur	11–13	10	10 or 11
Tibia	6	8	6
Tarsus	4	4	4

(docs) represented by 1 dp near dorsal eye. Ventral head setae (vhs): 2 fs in a group just posterior to scape. Cranial apophysis (A; c) + tentorial arms (ta) long, 83 µm from base of postocular ridge. *Antenna*: 775–825 µm long (ratio of total body length to antennal length 1:0.6). Scape (scp) 41–44 µm long, 53–55 µm wide. Pedicel (pdc) 44–48 µm long, 38 µm wide; with 3–5 fs + 2–4 hs (few setae on dorsal surface) + 1 sensilla placodeum. Segments III–X about 24–28 µm wide; fs each about 19–24 µm long; lengths of segments (µm): III 124; IV 99–103; V 101–108; VI 103; VII 86; VIII 73–75 and IX 59–63; setae rather few, approximate number per segment: III 8 fs + 0 hs (sensilla basiconica not detected); IV 12–15 fs + 0 hs; V 15 fs + 0 hs; VI 14 fs + 0 hs; VII 15 fs + 0 hs; VIII 15–19 fs + 0 hs; IX 12 fs + 0 hs. Segment X (E) as for generic diagnosis but 63–73 µm long, with 10 fs. *Prothorax*: With a line of 6 dp on each side posterolateral to pronotal ridge. Sternum (stn<sub>1</sub>) with a faint transverse ridge; median ridge absent; prosternum sclerotized, without prosternal setae but with 3 dp just laterad to sternite. Propleural ridge (plr<sub>1</sub>) with 2 dp near each ridge. Other setae, pores and sclerites absent. *Mesothorax*: Prescutum (prsc) 120 µm wide, 74 µm long. Scutum (sct) with median membranous area 79 µm wide, 33 µm long; scutal setae (scts) 2 hs on each side. Scutellum (scl) 107 µm wide, 54 µm long. Mesopostnotum (pn<sub>2</sub>) longish, extending posteriorly almost to a point level with anterior end of metacoxae. Basisternum (stn<sub>2</sub>) about 190 µm wide, 120 µm long. Mesothoracic spiracles (sp<sub>2</sub>) with peritreme 25–28 µm wide. Tegula (teg) with about 5 hs tegular setae (tegs) + 1 dp on each side. *Metathorax*: Episternum (eps<sub>3</sub>) with 3–5 fs + 4 hs postmetaspiracular setae (eps<sub>3</sub>s) + 2 dp on each side. Antemetaspiracular setae absent but perhaps with 4 dp on each side. Metathoracic spiracles (sp<sub>3</sub>) each with peritreme 31 µm wide. Dorsospiracular setae absent but with 1 dp in this position. Anterior metasternal setae absent but with 4 dp in this position; posterior metasternal setae (pmss): 1 or 2 fs + 1 hs on each side near coxae + 3 dp medially. *Wing*: Very narrow, about 1200 µm long, 500 µm wide (ratio of length to width 1:0.33; ratio of total body length to wing length 1:0.89). *Legs*: Prothoracic leg marginally longer than other legs. Coxa (cx) I 103; II and III 91 µm long; setae of coxa III about 10 hs + 2 long apical setae about 39–45 µm long. Trochanter (tr) + femur (fm) I 215; II 198–200; III 190 µm long; trochanter III with about 4 hs; long trochanter seta short: 14–18 µm, not flagellate; femur III with about 20 hs. Tibia (ti) I 227–236; II 219–228; III 211 µm long; tibia III with a total of about 27 setae, mostly spurlike, particularly on distal third of leg; apical spurs (tibs) (II) 15–16 µm long. Tarsi (ta) I, II and III each 99 µm long (ratio of length of tibia III to length of tarsus III 1:0.47); tarsus III with 17 setae, mostly spurlike; tarsal spurs (tabs) 19–21 µm. Claw (G; c) length (III) 25 µm. *Abdominal segments I–VIII*: Dorsal abdominal setae (ads) (number on each side): segments I–III with 1 or 2 hs + 1–3 dp; IV–VI with 1 hs + 2 dp; VII 1 or 2 hs + 1 or 2 dp. Dorsopleural setae (dps) (on each side): III 1 or 2 hs + 1 or 2 dp; IV–VI with 2 or 3 hs + 2–4 dp; ventropleural setae (vps) II 0 or 1 hs; III–VI with 1 hs; VII (dps + vps): 4 or 5 hs + 2 dp. Ventral abdominal setae (avs): II–VI with 2 or

3 hs + 0–2 dp; VII 1 hs + 0 or 1 dp. Segment VIII (E): caudal extension (ce) small, rounded, well sclerotized, with 2 or 3 fs + 1 hs pleural setae. *Genital segment*: Penial sheath (E; ps) 210 µm long, 64 µm wide at swollen base (ratio of total body length to penial sheath length 1:0.16). Basal rod (bra) 108 µm long. Aedeagus (aed) 23 µm long (ratio of aedeagus length to basal rod length 1:4.7). Penial sheath with 12 or 13 small setae (pss) along each margin.

*Comments*. The only reasonably detailed descriptions of male aclerdids are those of *Aclerda tillandsiae* Howell (Howell, 1976) and *A. arundinariae* McConnell (Nada *et al.*, 1976). To do a reasonable phylogenetic study, material of these two species and two other species of aclerdid were examined (see Appendix 1). From this study, it appears that the males of *Lecanaclerda macropoda* are very similar to the males of *Aclerda* species (but differ from males of Coccidae) in the general structure of the head and thorax, i.e. in having two pairs of simple eyes, the ventral pair lying rather far anteriorly almost under the dorsal pair; median crest reduced and not reticulated; ventral head setae restricted to just anterior to ventral eyes; presence of a short ventral midcranial ridge, with short lateral arms; genae without reticulations; an unusually long cranial apophysis + tentorial arms; a small prescutum and a small membranous area on scutum; four hs setae on the membranous area of scutum; furca with rather parallel, narrow arms; position of metathoracic spiracle posterior to rather than dorsad to each metacoxa; legs without fleshy setae, and with very narrow wings.

The male of *L. macropoda* differs from the males of *Aclerda* species in (character states on *Aclerda* species in brackets): having a claw with a denticle (denticle absent); no long pleural setae on abdominal segment VIII (long pleural setae present); a distinctly sclerotized caudal extension to abdominal segment VIII (caudal extensions on segment VIII absent); a much broader and more parallel-sided penial sheath (rather pointed); a long basal rod, much longer than aedeagus (basal rod equal to or shorter than aedeagus); sternites of abdominal segment VIII not forming an integral part of the penial sheath (sternite VIII strongly sclerotized, with penial sheath appearing to articulate with it); and aedeagus almost as wide as long (several times longer than wide). Many of these characters of *L. macropoda* are similar to those of males of *Rhodesaclerda* species discussed below.

*Etymology*. The name *macropoda* refers to the fully developed legs of this species, thus *macro-* from the Greek *makros*, meaning long, and *poda* from the Greek *podos*, a foot.

*Material examined*. *Holotype*, ♀, SOUTH AFRICA: Western Cape, Sir Lowry's Pass, on roots and leaf bases of *Plagiochloa* (= *Tribolium*) *uniolae* (Gramineae), 23 November 1977 (J.H. Giliomee) (SANC, accession No. HC 5345). *Paratypes*, as for holotype, 11 slides, 10 with a single ad ♀ (2 specimens old and split into dorsum and venter) + 1 ad ♂. Depositories: single paratype ad ♀ deposited in USNM, BMNH and NMW; remaining specimens in SANC.



**Rhodesaclerda McConnell**

*Rhodesaclerda* McConnell, 1954: 110.

*Rhodesaclerda* McConnell: Borchsenius, 1960: 248, 250–257; Morrison & Morrison, 1966: 175.

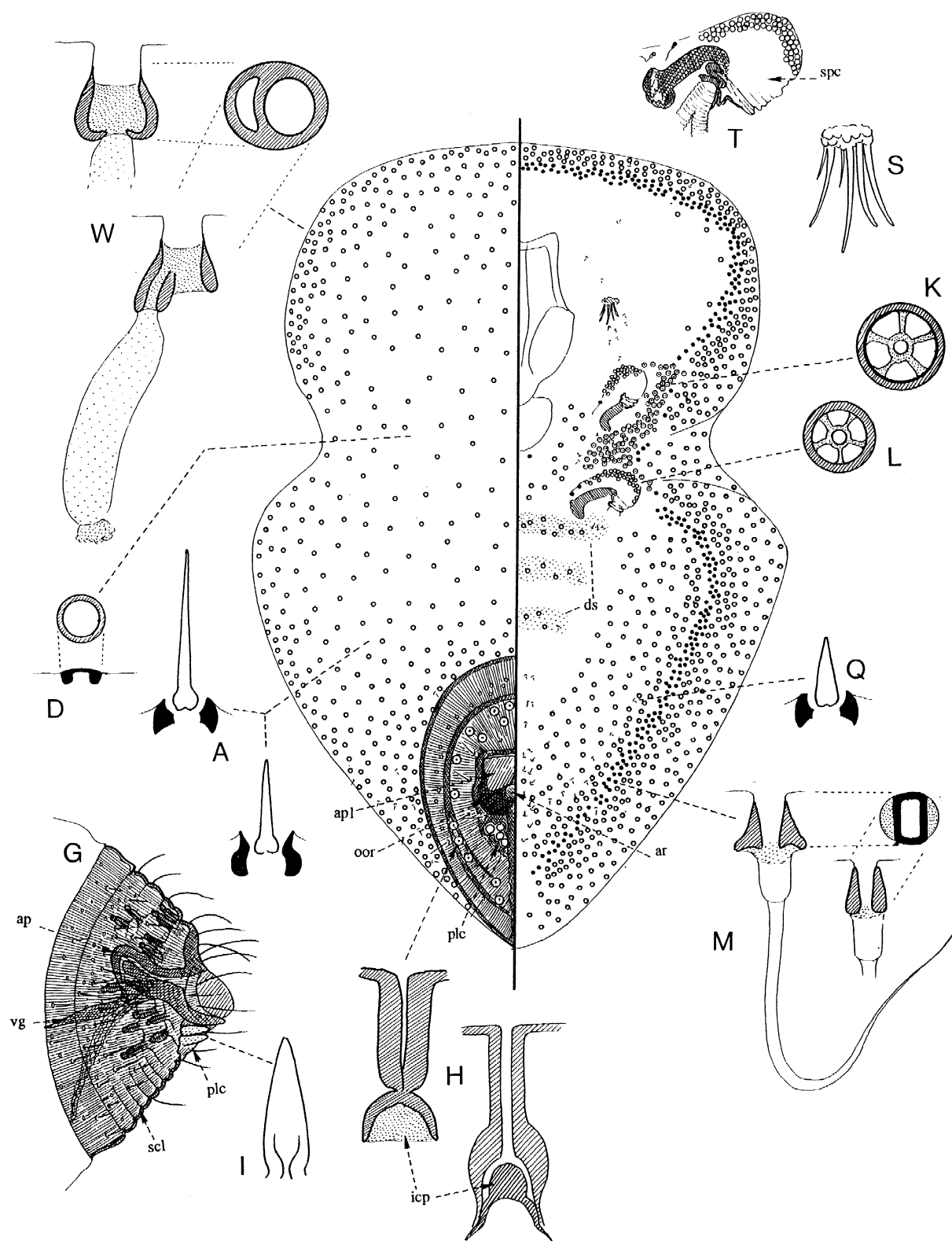
*Type species.* *Rhodesaclerda combreticola* McConnell, by original designation.

*Adult female* (Figs 3, 10, 12). *Test:* Of thick, yellow wax, exposed on surface of stems of host plants. *Mounted specimen:* Derm membranous apart from a large heavily sclerotized anal cone (G) on posterodorsal surface of abdomen, through which the anal complex opens, and which probably points posteriorly at an oblique angle in life. Margin strongly waisted in thoracic region. *Dorsum:* Dorsal setae (A) short, with deep basal sockets. Dorsal pores of 2 types, both present throughout: large heavily sclerotized slightly oval bilocular pores (W) with a large, round loculus and a narrow C-shaped loculus, latter loculus with a stout inner ductule, usually with a bushy inner end; and small simple pores (D). All other pores and tubular ducts absent. Anal cone (G) heavily sclerotized, with a central orifice (oor); anal cone with long flagellate setae and composed of sclerotized rings or bands (scl), bands with large invaginated conical pores (H, icp), each sunk into a cavity with strongly sclerotized walls; anal cone without a long anal tube; anal ring (ar) with long or short setae; anal cone with a pair of pocketlike pouches (plc) ventral to central orifice, each pouch with a group of elongate, conical pores. Anal cone with a pair of large anal tube apodemes (ap) whose anterior ends diverge quite strongly, and a single more ventral and membranous structure that could be a ventral groove (vg). *Margin:* Marginal setae perhaps represented by a very sparse line of small setae, often slightly longer than those elsewhere; stigmatic setae absent. Eyespots absent. *Venter:* Derm membranous, with small dermal spinules present medially on metathorax and anterior 3 or 4 abdominal segments. Pregenital disc-pores absent. Spiracular disc-pores (L) present in a group within a cavity, here referred to as spiracular cavity (T, spc), just anterior to each peritreme, each pore heavily sclerotized. Also with a group of multilocular disc-pores (K) present laterally between each anterior and posterior spiracle and often extending anteriorly laterad to each anterior spiracle; never forming a brachial plate extending onto dorsum. Ventral pores of 2 types present: heavily sclerotized bilocular pores (W) similar to those on dorsum, most common submarginally; small oval ventral microducts (M) with an inner lateral flange and an inner ductule which may divide into 2 or 3 thinner ductules; present as a marginal or submarginal band but infrequent or absent laterad to each group of multilocular disc-pores; also present on each side of labium and associated with entrance to spiracular cavity. Other ventral pores and tubular ducts absent. Ventral setae (Q) sparse, but with a group near or within each spiracular cavity. Antenna (S) reduced to a sclerotized base with several

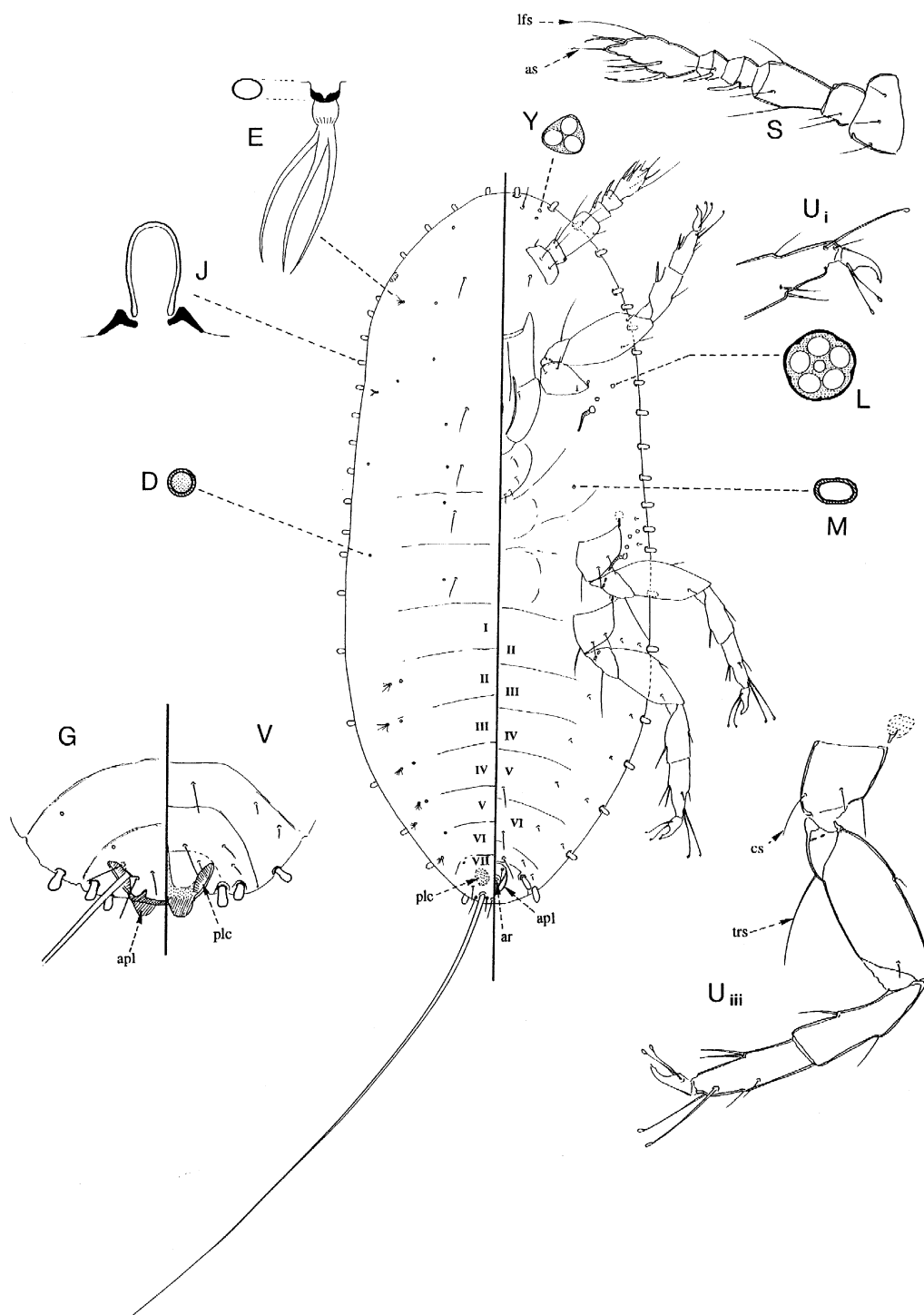
fleshy setae. Clypeolabral shield proportionately large; labium sometimes twisted to one side, number of setae on labium uncertain (see *Comments* under first-instar nymph of *R. combreticola*). Spiracles (T) situated within a cavity that opens medially through a groove or tube, cavity with a group of spiracular disc-pores, small setae and a few ventral microducts near entrance. Legs all reduced to a small area of sclerotization plus a few setae.

*First-instar nymph (sex not determined)* (Figs 4, 11). *Dorsum:* Membranous, lacking sclerotization in stigmatic areas. Dorsal setae represented by 2 pairs of long setae medially on head and 1 pair medially on pro-, meso- and metathoraces. Dorsal pores of 2 types present: small simple pores (D), mainly in a submarginal band, and in a line medially associated with setae on head and thorax; and rather similar-sized pores (E), perhaps with an oval opening, each with a group of 3 or 4 thin inner ductules, also mainly in a submarginal row. Posteriorly, with a pair of short sclerotized anal plates (G; apl) or ridges present on either side of anal opening dorsally; also with a pair of oval sclerotized areas (plc) (precursors of pocketlike pouches?) present posterolaterally, without setae. Anal lobes each with a very long seta, almost as long as body, plus 1 shorter seta on each side and a pair of setae medially just anterior to anal opening. Anal ring (ar) without setae or pores. *Margin:* Without stigmatic clefts; marginal setae (J) of 1 type, each seta blunt and stout, without a notch on lateral margins but with well developed basal sockets; setae in stigmatic position similar to marginal setae; with 1 seta in each stigmatic area plus 9 marginal setae on each side of abdomen, 4 between lateral stigmatic areas, 4 between anterior stigmatic area and eyespot and 8 between eyespots anteriorly. *Venter:* Head with 1 or 2 pairs of loculate pores (Y) anteriorly; with a single pair of ventral microducts (M) between pro- and mesocoxae; with spiracular disc-pores (L) present between spiracles and margin; with a pair of long setae medially on abdominal segments V, VI and VII; with a submarginal and a submedial seta on each side of each abdominal segment; seta posterior to each scape present or absent; with a pair of longish setae situated near anterior margin on head; with a small seta on either side of each posterior band of spiracular disc-pores, but without submarginal setae on each side between stigmatic areas. Antenna (S) quite short, 6-segmented; scape with 3 or 4 setae; pedicel with 2 setae + a campaniform pore; segment III with 3 setae; segments IV and V with a fleshy seta, segment V also with a flagellate seta; segment VI with 3 fleshy setae + 6 hairlike setae. Labium with 4 pairs of setae. Legs (U) well developed: coxae with 5 setae; trochanters with 1 long seta (trs) and one short seta; femora with 3 setae; tibiae with 2 setae; tarsi with 4 setae; tarsal digitules staggered but basically similar (except on prothoracic legs (U1), which have 1 digitule short and setose); tarsal campaniform pore absent; claw quite long, with a distinct denticle; claw digitules alike, longer than claw.

*Second-instar female* (Figs 5, 13). Rather similar to third-instar female but smaller and without bilocular pores ventrally and with hardly any multilocular disc-pores.



**Fig. 3.** *Rhodesa clerdia combreticola* McConnell, adult female. For explanation of letters and abbreviations, see text.



**Fig. 4.** *Rhodsaclerda combreticola* McConnell, first-instar nymph. For explanation of letters and abbreviations, see text.

*Second-instar male* (Fig. 6). Only known for *R. combreticola*. Similar to second-instar female, but with a much smaller anal cone, many fewer bilocular pores dorsally and fewer microducts and multilocular disc-pores ventrally.

*Third-instar female* (Fig. 7). Only known for *R. combreticola*. Very similar to adult female but with a small anal cone and fewer bilocular pores ventrally. It also lacks internal anal tube apodemes but may have a ventral

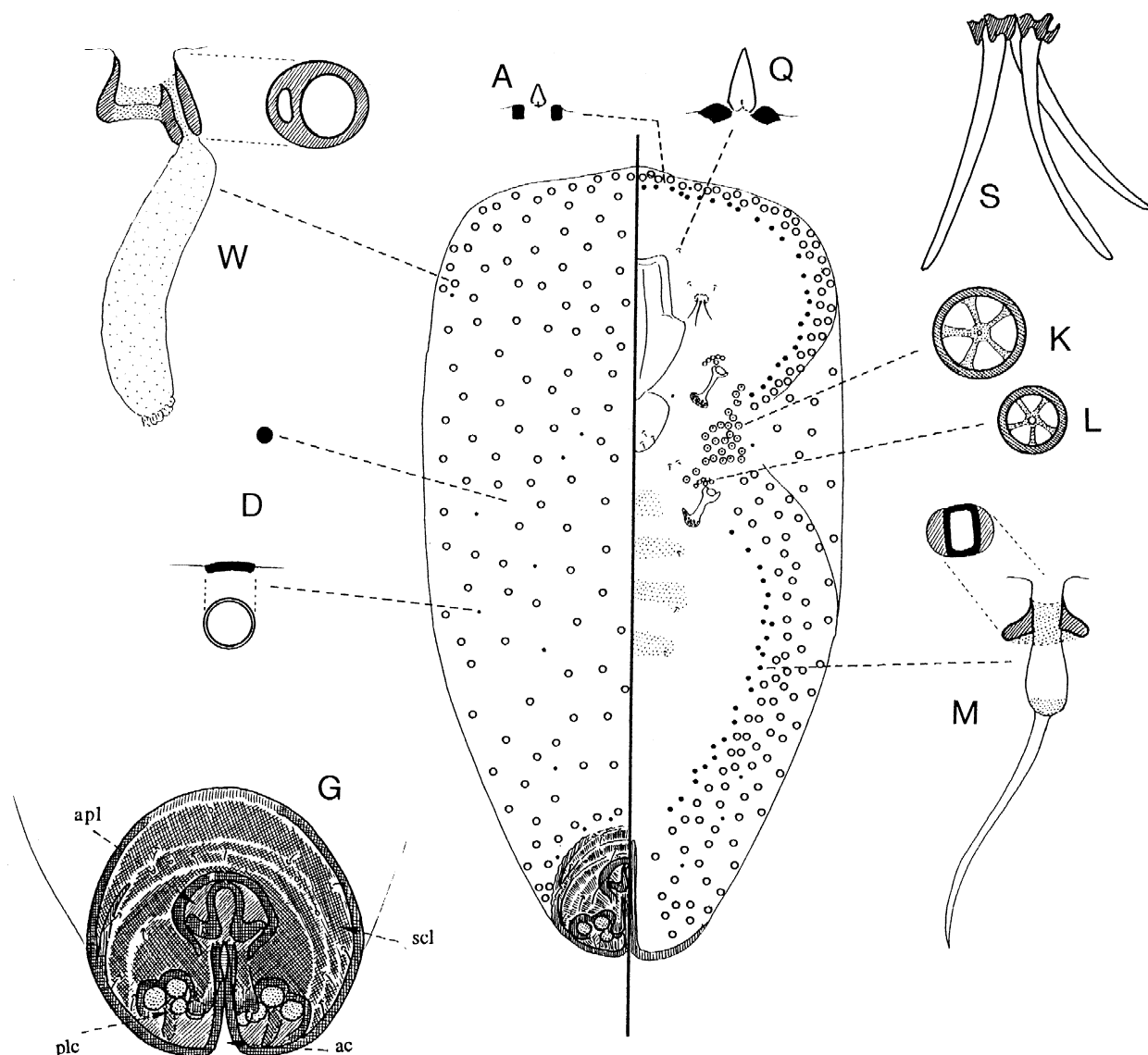


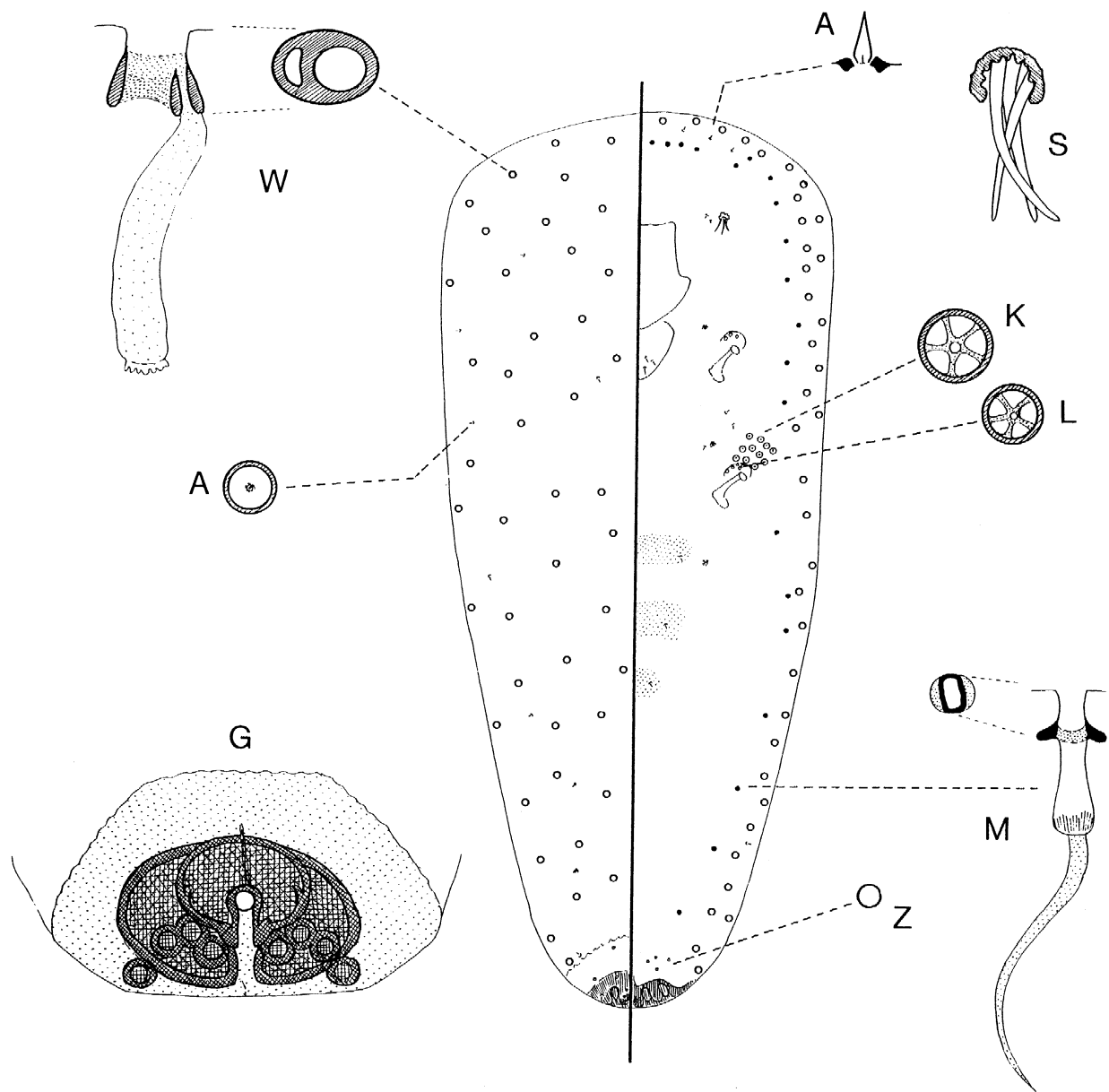
Fig. 5. *Rhodesia combreticola* McConnell, second-instar female nymph. For explanation of letters and abbreviations, see text.

groove (but see discussion under description of third-instar nymph of *R. combreticola*).

*Prepupa*. Unknown.

*Pupa* (Figs 8, 14). Segmentation obscure except on abdomen; derm membranous apart from posteriorly on dorsum of abdomen; with small dermal spinules ventrally; all ducts and pores (except spiracular disc-pores) absent and setae few. *Head*: Antenna moderately long, pointing posteriorly; basal segments slightly to moderately sclerotized. Dorsum and venter of head usually with a few minute setae (dhs). *Thorax*: Unsclerotized, with 3 pairs of moderately well developed legs, leg segmentation clear; coxae and trochanters somewhat sclerotized; prothoracic leg C-shaped, directed anteriorly and curving round in front of anterior margin of head; metathoracic leg extending posteriorly to about abdominal segment V; coxae with 2 minute pores; tarsal

campaniform pores absent; each leg with a small triangular finger on apex, probably an incipient claw. Wing-buds (wb) present. Anterior spiracles ( $sp_2$ ) situated just posterior and laterad to each procoxa and posterior spiracles ( $sp_3$ ) situated posterior and laterad to each mesocoxa; spiracular disc-pores (spdp) present or absent. *Abdomen*: Membranous, apart from segments V, VI and VII, which are distinctly sclerotized on dorsum. Small setae present on dorsum (ads) and venter (avs) of all segments, latter in line with setae on meso- and metathoraces; dorsopleural (dps) and ventropleural setae (vps) variable. Segment VII with a pair of lateral sclerotized lobes ( $ce_{VII}$ ), each lobe subequal to or slightly shorter than penial sheath (ps) but not extending around posterior to penial sheath; each with a group of fs + hs dorsopleural setae (dps). Segment VIII with a pair of small well developed sclerotized lobes ( $ce_{VIII}$ ) on dorsal

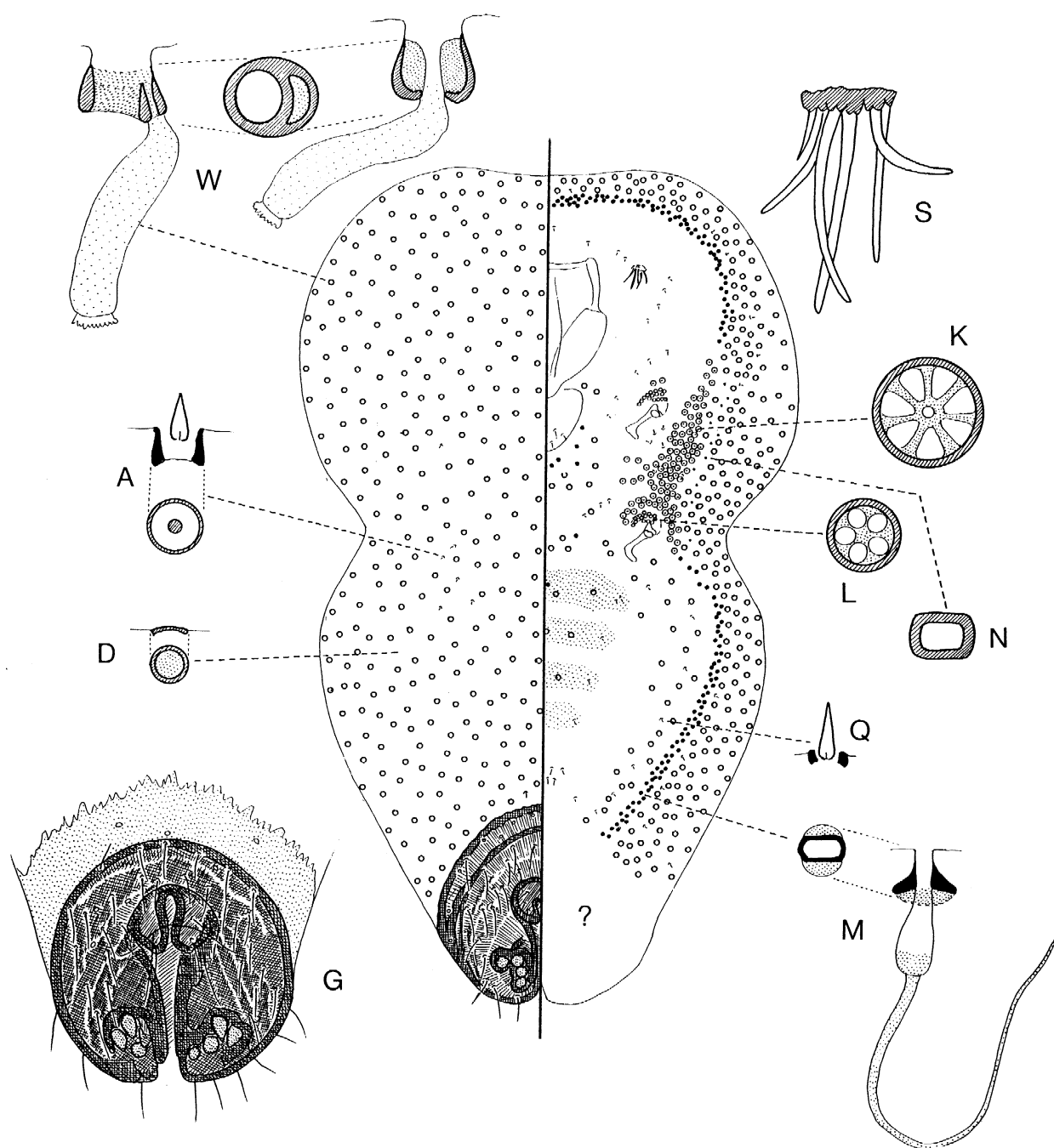


**Fig. 6.** *Rhodesaclerda combreticola* McConnell, second-instar male nymph. For explanation of letters, see text.

surface on either side of base of penial sheath, each about half length of lobes of segment VII and apparently without setae. Tergite of segment VIII without ante-anal setae. Penial sheath (ps) sclerotized, shorter than broad, maybe a little longer than lobes of abdominal segment VII.

**Adult male** (Figs 9, 15). Rather small, <1.3 mm long; thorax very narrow (*R. combreticola*) or broad (*R. insleyae*), abdomen proportionately rather broad; body fairly hirsute ventrally, with fleshy setae (fs) fairly frequent on metathorax and abdomen, these generally easily differentiated from hairlike setae (hs); dorsum with a few small convex pores (dp). **Head:** Median crest (mc) rather large, with weak reticulations, some hs dorsal head setae (dhs) and dp present.

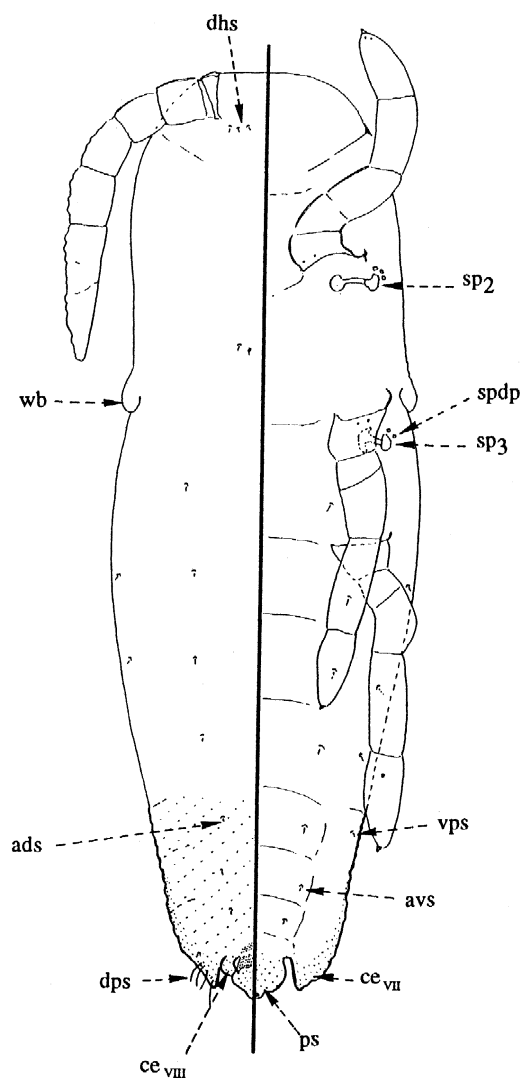
Mid-cranial ridge absent dorsally; ventral mid-cranial ridge (vmcr) variable, but with hs ventral mid-cranial ridge setae (vmcrs). Gena (g) not reticulated and lacking genal setae. Simple eyes in 2 almost round pairs; dorsal eyes (dse) each situated near base of antenna, ventral eyes (vse) placed towards posterior margin of head near mouth. Ocelli (o) very large and oval, situated just posterolateral to dorsal eyes. Ocular sclerite (ocs) polygonally reticulated (C) throughout. Preocular ridge (procr) short ventrally but fusing with sclerotization around dorsal eyes dorsally. Postocular ridge (pocr) strongly developed and extending anterodorsally past posterior margin of each ocellus but with an extension around each ocellus, and with a short



**Fig. 7.** *Rhodesaclerda combreticola* McConnell, third-instar female nymph. For explanation of letters, see text.

arm extending medially; sclerotization around each ocellus fusing with that around each dorsal eye (interocular ridge?). Dorsal ocular setae absent. Ventral head setae (vhs) present. Tentorial bridge poorly developed. Cranial apophysis (A; ca) bifurcated or possibly rounded apically, long, extending anteriorly past ventral eyes. *Antenna*: 7- or 8-segmented and filiform, subequal to half total body length. Most antennal segments with hs as well as fs. Apical segment (F) not constricted apically, with 3 capitate setae (caps),

some fs and probably 2 sensilla basiconica (sb); antennal bristles (ab) not always clearly differentiated. *Prothorax*: Pronotal ridge (prnr) strong and probably fused dorsally; without lateral pronotal sclerites (prn) or lateral pronotal setae (lpns). Post-tergites absent. Sternum ( $stn_1$ ) with a distinct transverse ridge, a strong median ridge and with a broad triangular unsclerotized area with slight radial ridging, and with or without prosternal setae. Anteprosternal and antemesospiracular setae absent.



**Fig. 8.** *Rhodesaclerda combreticola* McConnell, pupa. For explanation of abbreviations, see text.

**Mesothorax:** Prescutum (prsc) large and sclerotized, with well developed prescutal ridges (pscr) and prescutal suture (pscs). Scutum (sct) with median membranous area roughly quadrangular, with a pair of hs scutal setae (sets); lateral margins of scutum not reticulated, without setae; prealar ridge (prar) present but only pronounced posteriorly. Scutellum (scl) rectangular, possibly tubular, with a large foramen. Prealar (pra) and triangular plate (tp) well developed. Basisternum (stn<sub>2</sub>) with a weak median ridge (mdr) but bounded by strong marginal (mr) and precoxal ridges (pcr<sub>2</sub>); lateropleurite (lpl) large, with a distinct thin extension from marginal ridge anteriorly; furca (f) normally developed, furcal arms diverging slightly. Postalare without postalare setae. Mesopostnotum (pn<sub>2</sub>) well developed, median membranous area without sclerotization; postnotal apophysis (pna) represented by a lateral slit, without an internal apophysis. Mesothoracic spiracle (sp<sub>2</sub>) without asso-

ciated disc-pores. Postmesospiracular setae absent. Tegula possibly absent, but tegular setae (tegs) present. **Metathorax:** With 1 pair of metatergal setae (mts). Metapostnotum (pn<sub>3</sub>) probably not sclerotized. Metepisternum sclerotized or unsclerotized, with a fs and hs postmetaspiracular setae (eps<sub>3s</sub>). Metapleural ridge (plr<sub>3</sub>) well developed posteriorly; absent anteriorly, without suspensorial sclerite. Metepimeron (epm<sub>3</sub>) present. Antemetaspiracular setae (am<sub>3s</sub>) present or absent. Metathoracic spiracle (sp<sub>3</sub>) without associated disc-pores. Dorsospiracular setae (dss) present. Metasternum (stn<sub>3</sub>) sclerotized, with both anterior (amss) and posterior metasternal setae (pmss). Metapostnotum (pn<sub>3</sub>) probably not sclerotized. **Wing:** Hyaline, probably rather long and narrow, without alar lobe or alar setae. Hamulohalteres absent. **Legs:** With rather few setae; with a distinct sclerosis associated with tibio-tarsal articulation; tarsal spurs absent or poorly differentiated; tarsal campaniform pore absent. Claw (G; c) with a denticle (cd). **Abdominal segments I–VIII:** Tergites (at) at most only lightly sclerotized; sternites (as) all lightly sclerotized; pleurites mildly sclerotized on VI and VII. Caudal extension (ce) of segment VII rounded and lightly sclerotized. Dorsal setae (ads) all hs plus some dp. Dorsopleural setae (dps) mainly in a large group of fs on segments VI and VII; ventropleural setae (vps) few except on segments V–VII. Ventral abdominal setae (avs) fairly abundant, both fs and hs. Segment VIII (E): tergite (at) possibly lightly sclerotized; sternite (as) sclerotized and forming anterior part of penial sheath; caudal extension of VIII pronounced and lobelike. Glandular pouch absent; long setae in glandular pouch position absent. **Genital segment:** Penial sheath (ps) apparently articulating with sternite of segment VIII; sheath elongate and more or less parallel-sided, with a blunt apex; length about one-fifth total body length. Basal membranous area (bma) present between anterior end of basal rod and sternite VIII. Basal rod (bra) long, extending down most of aedeagus, anteriorly just reaching basal membranous area (bma). Aedeagus (aed) long and parallel-sided, extending to near tip of penial sheath, but not as broad as tip of sheath. Penial sheath with fine longitudinal ridges dorsally, small setae (pss) on each side and small sensilla (psp) posteriorly on apex.

**Comments.** *Rhodesaclerda* is very similar to *Kwazulaclerda*, described as new below, and to which it is clearly closely related, but differs as follows (characters for *Kwazulaclerda* in brackets). **Adult female:** Sclerotized brachial plates absent (present); long tubelike anal opening absent (present) and a pair of pocketlike pouches with conical pores on apex of anal cone present (absent). **Second-instar female:** Multilocular disc-pores not extending laterally onto dorsum (extending onto dorsum); conical pores restricted to within pocketlike pouches (present elsewhere on anal cone as invaginated pores) and anal platelike structures present over anal opening (apparently absent). **Crawler:** Conelike sclerotization around anal area absent (present). **Pupa:** Lobes of abdominal segment VII not extending around posterior to penial sheath (curve posteriorly around penial sheath). **Adult male:** Genal setae absent (present);

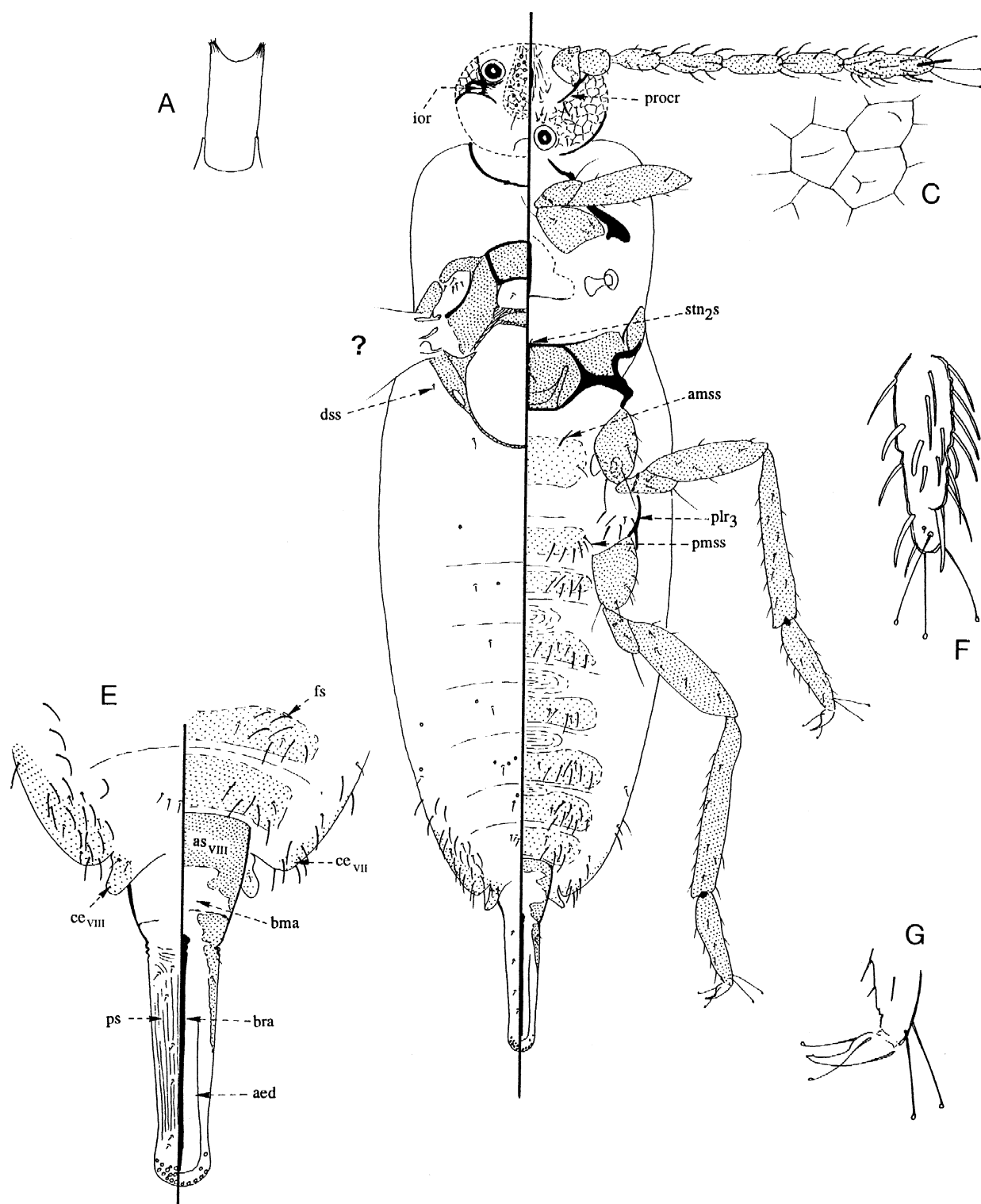


Fig. 9. *Rhodesaclerda combreticola* McConnell, adult male. For explanation of letters and abbreviations, see text.

postmesopiracular setae absent (present); membranous area on scutum approximately quadrangular (approximately triangular); without reticulations on scutum laterad to

scutellum (reticulations present); arms of furca short, not nearly reaching marginal ridge anteriorly (arms of furca unusually long, extending anteriorly past marginal ridge);



metepimeron present (absent); penial sheath with longitudinal ridges dorsally (absent); and aedeagus narrower than width of apex of penial sheath (broader because penial sheath more pointed).

One of the major features of these two genera is the anal cone on the adult female. It is here considered that the anal cone is formed from a sclerotization of the dorsum anterior to the anal plates plus the two short anal lobes on either side of the anal opening; little, if any, of the venter appears to become sclerotized. The anal lobes become fused ventrally in the later instars (often with a heavily sclerotized ridge at the point of contact). When an anal cone is squashed on a slide, the cone splits along this ventral line so that the cone can then lie flat.

*Rhodesaclerda* currently includes three species: *R. combreticola* McConnell, *R. halli* McConnell and *R. insleyae* Hodgson & Millar, described as new below. Other material is at hand which does not appear to belong to these species: a third-instar nymph close to *R. halli* (Botswana, Mogo-bane, on *Combretum apiculatum*, 1.xi. 1971, M.S. Irving, SANC: HC4454) and a crawler also similar to *R. halli* (off *Viscum capense*, Citrusdal, SANC: HC4753), suggesting that several more species remain to be described in this genus.

#### Key to adult females of *Rhodesaclerda*

1. Invaginated conical pores (other than those in pocketlike pouch) embedded in sclerotized derm of anal cone, each lying within a narrow cavity but with pore apex close to surface, with a granulate surface.....2
- Invaginated conical pores (other than those in pocketlike pouch) embedded in sclerotized derm of anal cone, each lying at base of a narrow cavity or duct whose walls may be heavily sclerotized, pore apex more than length of conical pore below surface of anal cone.....*combreticola*
2. Body small, less than 2 mm long; opening on apex of anal cone strongly oval; with 150–200 ventral microducts with long inner ductules in submarginal band around head between anterior spiracles; anal ring setae not extending through outer orifice of anal cone.....*insleyae*
- Body large, about 4 mm long; opening on apex of anal cone round; with about 300 ventral microducts with long inner ductules in submarginal band around head between anterior spiracles; anal ring setae long, extending through outer orifice of anal cone.....*halli*

#### *Rhodesaclerda combreticola* McConnell

*Rhodesaclerda combreticola* McConnell, 1954: 113.

**Adult female** (Fig. 3). Described from 2 complete specimens in fair to good condition, 4 in poor condition and 2 anal cones mounted separately. **Unmounted material:** 'Inclosed in a thick, yellow, waxy test, exposed on the surface of the stems of the host. . . . Test free from the body of the insect, composed of five distinct curved plates, four

marginal and one on the central dorsal surface, the posterior plate with an opening to which the caudal area of the insect is closely applied' (McConnell, 1954). **Mounted material:** Total length about 730 µm; body broadest across abdomen but with a moderately wide head and with a narrow waist in thoracic region; breadth across abdomen perhaps 570 µm. **Dorsum:** Dorsal setae (A) short but longer than width of basal socket; basal socket well developed, about 3 µm wide, quite frequent; perhaps most abundant submarginally and posteriorly, where setae longest. Dorsal pores as for generic diagnosis: bilocular pores (W) 5–6 µm wide; inner ductule about 13 µm long with a small bushy glandular end, abundant throughout but most frequent near margin; simple pores (D) frequent throughout. Anal cone (G) about 54 µm long (from anterior margin to anal plates), 380 µm wide, apparently without a narrow less sclerotized border anteriorly and laterally; cone with a pair of plate- or lobe-like structures posteriorly lying over anal cleft but perhaps lying within a cavity beneath outer anal orifice (here referred to as anal plates (apl), see discussion below after second-instar nymph); width of anal plates combined 58 µm; cone composed of a series of about 5–8 sclerotized concentric rings (scl) around anal orifice (oor), each ring with some long setae (each seta about 66–73 µm long), total number of setae on anal cone about 30–40; also with about 20–25 large pores (H), each with a heavily sclerotized ductule, sometimes constricted near distal end, and each with a sclerotized conical pore (icp) at distal end; outermost 2 sclerotized rings each with several small pores and some shorter setae; ventrally with a pocketlike pouch (plc) near apex of each anal lobe, each with 4 conical pores. Anal cone with a fairly short, heavily sclerotized inner flattened tube internally, from base of which possibly 2 anal tube apodemes (ap) and a less sclerotized structure (possibly the ventral groove?, vg) extend anteriorly. Anal ring (ar) 22 µm wide; anal setae, if present, very short. **Margin:** As for generic diagnosis. **Venter:** Spiracular disc-pores (L) each probably with mainly 5 loculi and about 4 µm wide; each spiracular cavity (T, spc) with about 25–40 disc-pores. Multilocular disc-pores (K) with 5–8 loculi, 5–6 µm wide, present in an elongate group anterior to posterior spiracle and extending laterad to anterior spiracle, with a few extending round anterior to it; each group with about 80–100 pores. Other ventral pores as for generic diagnosis: bilocular pores (W) scarce on head, mainly present laterad to labium, and also medially on thoracic and first 3 abdominal segments and in a broad, sparse submarginal band around abdomen; ventral microducts (M) with each pore opening into a bulbous proximal duct with a single long thin ductule (each about 8–24 µm long). Clypeolabral shield 186 µm long; labial setae not visible. Width of each spiracular peritreme about 33–40 µm; muscle plates each about 53–56 µm long. Legs apparently absent but perhaps represented by groups of setae.

**Comments.** The adult female and third-instar nymphs of *R. combreticola* are extremely similar and, indeed, the frequency or measurements or both of most structures of the adult female fall close to or within the ranges for the same

structures on the third-instar females. However, only adult females appear to have the internal sclerotized apodemelike anal structures, hence these stages can be separated. Apart from these internal sclerotizations, the main difference between the adult female and the third-instar female is the much larger anal cone on the former, which has a number of pores with strongly sclerotized walls to the invaginated conelike pores. For further discussion, see under third-instar nymph below.

*First-instar nymph* (Fig. 4). Described from 3 specimens, 2 slightly damaged posteriorly. *Unmounted material*: Not seen. *Mounted material*: Oval, perhaps slightly more pointed posteriorly. Total length 465–515 µm, width 195–220 µm. *Dorsum*: Dorsal setae as in generic diagnosis; anterior pair on head 13–17 µm long. Dorsal pores: small simple pore (D), mainly present in a submarginal band, with 1 pore per segment, 3 pairs mediolaterally on head but also with 3 pairs on thorax, each associated with a dorsal seta; pores with inner ductules (E), when visible, apparently with 1 pair present submarginally on head, 1 pair submarginally just mesad of anterior stigmatic area and up to 6 pairs submarginally on thorax. Anal area (G) with 2 small sclerotized areas (anal plates?, apl) divided by anal cleft; pocketlike structures (plc) each 12 µm long, about 8 µm wide; long anal lobe setae each about 310 µm long; shorter outer seta about 21 µm long; inner seta 13 µm long. Anal opening (ar) small. *Margin*: Marginal setae (J) as in generic diagnosis; each seta 6–9 µm long but seta laterad to anal opening slightly longer (13–18 µm long). Eyespot on margin, 10–12 µm wide. *Venter*: Spiracular disc-pores (L): each anterior disc-pore band with 2 disc-pores and each posterior band with 3 disc-pores, those near spiracle each with 3 loculi, those near margin each with 5 loculi. Other ventral pores as in generic diagnosis. Ventral setae: with a pair of small setae present just anterior to anal sclerotization; pre-anal setae on segment VII each 23–25 µm long; each seta just posterior to scapes 13 µm long. Antenna (S) 91–113 µm long; long lateral hairlike setae (lfs) on apical segment, 38 µm long; apical setae (as) 13–19 µm long. Clypeolabral shield 107–110 µm long; labium not twisted. Spiracles with peritremes about 5–6 µm wide; muscle plate perhaps bent medially. Legs (U) well developed, lengths (metathoracic): coxa 46–50 µm (length of longest coxal seta (cs) 21 µm); trochanter + femur 83 µm (length of long trochanter seta (trs) 58 µm); tibia 43–49 µm long; tarsus 41–44 µm; claw 18–20 µm long.

*Comments*. The crawler of *R. combreticola* is very similar to that of *R. halli* described below. The former appears to differ in having (character states on *R. halli* in brackets): two disc-pores in each anterior spiracular disc-pore band (only one disc-pore); dorsal pores with inner ductules present submarginally on most abdominal segments (absent submarginally from most abdominal segments); a seta present posterior to scape (setae absent just posterior to scape); and possibly in the structure of the anal lobes.

Four pairs of setae are clearly visible on the labium of this and other first-instar nymphs described herein. However, a careful examination of the other stages suggests that stages

older than the first instar may have only three pairs. We are not aware of different numbers of labial setae on the first and later instars in other scale insects.

*Second-instar female* (Fig. 5). Described from 2 specimens in excellent condition. *Unmounted material*: Not seen. *Mounted material*: Anterior end of body bluntly rounded, thorax appearing parallel-sided, narrowing to anal cone posteriorly but ventral margins of thorax with a deep waist; length 655 µm; breadth across head 412 µm. *Dorsum*: Dorsal setae (A) shorter than width of basal socket, width of socket 3–4 µm; very sparse. Dorsal pores possibly of 3 types: bilocular pores (W) each about 4–5 µm wide; stout, with inner ductule 6–7 µm long; frequent throughout but most abundant near margin; simple pores (D) infrequent, probably throughout; possibly a minute dark pore, distribution uncertain. Anal cone (G) as in diagnosis for adult female but with fewer sclerotized rings (scl); length of anal cone 121 µm, width 125 µm; with a pair of anal platelike structures (apl) that cover anal opening; combined width of anal plate 38 µm; anal plates surrounded by a series of 3 or 4 sclerotized concentric rings, but without a narrow less sclerotized area peripherally; sclerotized concentric ring nearest anal plates with about 9 shortish setae plus 4 small pores; outermost ring with 2 setae plus 1 pore; each anal lobe with a pocketlike pouch (plc) posteroventrally, each pouch with 4 conical pores. Anal cone without inner apodemes but ventral groove possibly present. Structure of anal ring unclear but 12 µm wide. *Margin*: As for adult female. *Venter*: Spiracular disc-pores (L) with 5 or 6 loculi, present in a group of 3–5 in anterior spiracular cavities and 6–8 in posterior spiracular cavities. Multilocular disc-pores (K) with 4–8 loculi, present in a loose group of 21–30 on each side between spiracles. Other ventral pores: bilocular pores (W) absent; ventral microducts (M) each about 2–3 µm wide, opening into a bulbous proximal duct with a single long thin ductule; with about 42 present around head between anterior spiracles and with 1 or 2 on either side of labium. Ventral setae very few, sparsely distributed medially on head; with 2 or 3 just anterior to each posterior spiracle and 1 mediolaterally on each of anterior 3 abdominal segments. Antenna (S) with basal segment about 10 µm wide, with 3 long fleshy setae 17–23 µm in length. Clypeolabral shield 132 µm long; labium with only 3 pairs of setae visible. Width of spiracular peritremes 12–14 µm; muscle-plate apodemes 33–42 µm long. Legs absent.

*Comments*. The pair of platelike structures present on *R. combreticola* (but possibly absent on the other *Rhodesa-clerda* species discussed here) are particularly obvious on the second-instar nymphs. They appear to be a single structure deeply divided down the middle and therefore very similar to the single anal plate found on other African *Aclerda* species.

The pouchlike cavities lie at the posterior end of each anal lobe, between which there is a distinct anal cleft. At this stage the anal lobes do not appear to have fused ventrally.

*Second-instar male* (Fig. 6). Described from 2 specimens in fair to good condition and a very poor specimen. *Unmounted material*: Not seen. *Mounted material*: Anterior

end of body bluntly rounded, thorax apparently parallel-sided, narrowing to anal cone posteriorly; margin apparently without a waist in thoracic region; length 819 µm; breadth across head 355 µm. *Dorsum*: Dorsal setae (A) shorter than width of basal sockets, width of sockets 3–4 µm. Dorsal pores: possibly only bilocular pores (W) present, each about 4–5 µm wide, with inner ductule 6–8 µm long, sparse throughout, most frequent near margin. Anal cone (G) rather small, about 66 µm long, 103 µm wide, with a deeply divided anal platelike structure overlying anal opening, width of anal plate 42 µm; each anal lobe with a pocketlike pouch ventrally, each with 3 conical pores and sometimes with another conical pore lateroventrally. Anal tube apodemes absent but ventral groove possibly present. Anal ring 12 µm wide. *Margin*: As for adult female. *Venter*: Spiracular disc-pores (L) with mainly 5 loculi, present in a group of 3–7 in anterior spiracular cavities and 5 or 6 in posterior spiracular cavities. Multilocular disc-pores (K) larger, present in a loose group of 11–13 just anterior to posterior spiracles, each with 4–12 loculi and some with less sclerotized margins. Other ventral pores: bilocular pores absent; ventral microducts (M) about 2.5 µm wide, opening into a short broad proximal duct with a single long ductule, with about 12–20 around head between anterior spiracles; and minute simple pores (Z) present in a small group just anterior to anal cone. Ventral setae (Q) sparse medially on head; with 2 or 3 just anterior to each posterior spiracle and 1 pair mediolaterally on each of anterior 3 abdominal segments. Antenna (S) with basal segment about 8 µm wide, with about 3 long fleshy setae 13–17 µm in length. Clypeolabral shield 124 µm long; labium not twisted to one side and with 3 pairs of setae visible. Width of spiracular peritremes 8 µm; muscle-plate apodemes 28–32 µm long. Legs represented by small groups of minute setae and basal sockets.

*Third-instar female* (Fig. 7). Described from 4 specimens in fair to good condition and 2 in poor condition. *Unmounted material*: Not seen. *Mounted material*: Total length about 800–874 µm; body probably broadest across head, abdomen almost as wide but with a narrow waist in thoracic region; breadth across head perhaps 425–508 µm. *Dorsum*: Dorsal setae (A) very short, basal sockets well developed, about 3 µm wide; quite frequent, perhaps most abundant medially. Dorsal pores as for adult female: bilocular pores (W) 5–6 µm wide, with inner ductule about 12 µm long with a small bushy glandular end; abundant throughout but most frequent near margin; and simple pores (D) frequent throughout. Anal cone (G) about 138–202 µm long, 150–172 µm wide, usually with a narrow, less sclerotized border anteriorly and laterally, total width 184–276 µm wide; cone composed of a series of about 5 or 6 sclerotized, concentric rings around anal plates, each ring with some long setae (about 23–28 µm long), total number of setae on anal cone about 30–40; outermost sclerotized ring with several small pores; cone with a deeply divided anal platelike structure medially at anterior end of anal cleft; width of plate 48–51 µm, each side of plate with 2 or 3 longish setae; ventrally, anal lobes each with a pocketlike pouch containing 4 or 5 conical pores. Inner anal

complex without anal tube apodemes. Anal ring 15 µm wide; anal ring setae, if present, very short. *Margin*: As for adult female. *Venter*: Spiracular disc-pores (L) about 4 µm wide, mainly with 5 loculi; spiracular cavities with at least 14–22 disc-pores. Multilocular disc-pores (K) about 5 µm wide, with 5–8 loculi; present in an elongate group of 60–90 mainly laterad to spiracles but also with a few just anterior to each spiracle. Other ventral pores as on adult female: bilocular pores (W), very sparse, only present near labium on head, with a few medially on thoracic and first 3 abdominal segments but also with a sparse submarginal band around abdomen; ventral microducts (M) each with an inner duct with a single, unusually long ductule (about 20–26 µm); with about 90–130 microducts present around margin of head between anterior spiracles and with a few on either side of labium; with an occasional pore on metathorax and first abdominal segment and 0–2 mesad to each spiracle. Antenna (S) with basal segment about 9–16 µm wide with 5 or 6 long fleshy setae. Clypeolabral shield 165 µm long; labium sometimes twisted to one side; only 3 pairs of setae visible on labium. Width of spiracular peritremes about 23 µm; muscle plates about 41–55 µm long. Legs apparently absent.

*Comments*. This stage is very similar to the adult female but it can be separated primarily by the absence of internal, sclerotized, apodemelike anal structures, which are only found in the adult female. However, it also differs in having a much smaller anal cone, which lacks the numerous deep pores, each with invaginated conical pore at its base. These third-instar nymphs were the only third instars in all the material of *Rhodesaclerda* seen by the authors. As indicated in 'Comments' under the adult female, the differences between the adult female and third-instar nymphs appear to be mainly in the size of the anal cone. It seems possible that the anal cone could continue developing while the adult female is maturing and reproducing. In other words, the extent of the sclerotization might increase with age, and the invaginated conical pores and anal tube apodemes might become more sclerotized and obvious, in which case these third instars would represent young adult females. There is no way of knowing, although there are no intermediates in the available material.

*Pupa* (Fig. 8). Described from 2 specimens in fair condition and with a few features confirmed on another 4 very poor uncleared specimens. *Unmounted material*: Not seen. *Mounted material*: Length 912 µm, width across wing-buds 300 µm; elongate, rounded at head end, rather bluntly pointed posteriorly. *Head*: Very short, posterolateral margin marked by a small diagonal sclerotized ridge ventrally. Antenna 327–381 µm long; apparently with 5 distinct segments plus a longer terminal segment on which segmentation obscure (ratio of body length to antennal length 1:0.33). Setae: with 1–3 pairs of minute setae present medially on dorsal surface (dhs) between antennae; ventral setae apparently absent. *Thorax*: Length of metathoracic legs 327–389 µm. Wing-buds (wb) much smaller than on other pupae known to authors, weakly sclerotized: length 41–50 µm; width about 18 µm. Spiracles with peritremes

about 17 µm wide; anterior spiracles (sp<sub>2</sub>) with 2–5 spiracular disc-pores (spdp), posterior spiracles (sp<sub>3</sub>) with 2 or 3 disc-pores; number of loculi in each pore uncertain. Dorsal setae in 2 pairs medially on prothorax, 1 pair mediolaterally on meso- and metathoraces; metathorax also perhaps with a single seta laterally; ventral setae represented by a single seta near mesocoxae. *Abdomen*: Segments V–VIII distinctly more sclerotized, particularly laterally, with a more obviously undulating margin; sometimes slightly narrower than more anterior segments. Setae as in generic diagnosis: apparently with 1 hs dorsopleural seta (dps) on segment II only and ventropleural setae (vps) present on at least segments II–V. Lobes (ce) on segment VII with a line of 4 fs + 1 hs dorsopleural setae (dps). Penial sheath (ps) 40–47 µm long, 50–57 µm wide (ratio of length to breadth about 1:0.8); apparently without either minute setae or pores on dorsal surface; genital opening possibly present near apex on ventral surface; with 2 areas of sclerotization on dorsum just anterior to penial sheath.

*Comments*. This pupa is unusually small and narrow, with unusually small wing-buds. The only other known pupa of a *Rhodesaclerda* species is that of *R. insleyae* described below and the latter is much more normal and has properly developed wing-buds. Both species share the following characters: antenna apparently seven- or eight-segmented; dorsum or lateral margins or both of posterior four segments of abdomen sclerotized and significantly different from more anterior segments; spiracular disc-pores present associated with at least the posterior spiracles; rather small head; minute setae on dorsum forming a line at least from metathorax to abdominal segment VII; presence of fleshy setae on lobes of abdominal segment VII; lobe of abdominal segment VIII well developed and sclerotized, and the penial sheath short and broad. The first two characters are unusual and unknown in other pupae.

*Adult male* (Fig. 9; for other abbreviations see Figs 2, 15, 21). Described from 2 specimens: (1) (USDA) most of thorax and abdomen in good condition but wings missing, head misshapen, antennae possibly malformed and basisternum not flat; (2) (BMNH) head and thorax rather misshapen, wings missing, antennae good. *Unmounted material*: Not seen. *Mounted material*: Body length 1.05–1.12 mm; thorax unusually narrow, abdomen proportionately rather broad. Fleshy setae (fs) scarce except on antennae and abdomen; with a few small convex dorsal pores (dp). *Head*: Misshapen, perhaps approximately round. Median crest (mc) with a total of 3 pairs of hs dorsal head setae and 19 dp. Mid-cranial ridge: ventral ridge (vmcr) short, without lateral arms; area between antennae and vmcr slightly ridged but not apparently reticulated; with 1–4 pairs of hs ventral median-crest setae (vmcrs). Genae (g) as for generic diagnosis. Simple eyes (dse, vse) 25–29 µm wide; ocelli (o) greatest width 20 µm. Ocular sclerite (ocs) with 1 or 2 small inner ridges in each reticulation (C). Preocular ridge (procr) and postocular ridge (pocr) as for generic diagnosis. Ventral head setae (vhs): with 0 or 1 fs + 3–5 hs on each side and none between or posterior to ventral eyes. Cranial apophysis (A; ca) possibly 35–58 µm long, with a shallow distal

bifurcation. *Antenna*: Mostly 7-segmented (but see under discussion below) and filiform; length 400–415 µm (ratio of total body length to antennal length 1:0.37). Scape (scp) 33–35 µm long, 41–44 µm wide, with 1 hs on ventral surface and 1 or 2 hs on dorsal surface. Pedicel (pdc) 33–40 µm long, 30 µm wide, without polygonal reticulations; with 1 or 2 hs only. Segments III–VI 18–25 µm wide; fs subequal to width of antennal segments, each about 17–22 µm long; length (µm) of III 59–73; IV 64–73; V 56–66; VI 64–75; number of setae per segment on III 1–4 fs + 4–6 hs; IV 6–13 fs + 0 or 1 hs; V 8–13 fs + 0 or 1 hs; VI 9–12 fs + 0 hs. Segment VII (F) 94–108 µm long but 1 antenna showing strong signs of a partial segmental constriction; not constricted apically but apical half with 2 or 3 capitate setae (caps), 3 large + 2 or 3 small antennal bristles (ab) plus 1 or 2 bristles on basal half of segment, 9–19 fs, and with 2 sensilla basiconica (sb), one situated near apex and another basally. *Prothorax*: Pronotal ridge (prnr) probably lacking a lateral pronotal sclerite (prn) and lateral pronotal setae (lpns). Small dorsal pores absent. Sternum (stn<sub>1</sub>) with transverse ridge weak but distinct; median ridge rather stronger, with a broad, unsclerotized triangular area, with slight ridging but no reticulations or prosternal setae. *Mesothorax*: Prescutum (prsc) about twice as wide as long (38 µm long, 83–85 µm wide). Scutum (sct) with median membranous area almost as wide as long (65–67 µm wide; 34–41 µm long); with 1 or 2 pairs of hs scutal setae (scts). Scutellum (scl) 66 µm wide, 20–22 µm long. Prealare (pra) usually parallel-sided. Basisternum (stn<sub>2</sub>) on available specimens apparently on edge (but illustrated as expected rather than as seen), about 109–119 µm wide, length uncertain but possibly about 65 µm; with a complete median ridge (mdr), rather weak anteriorly, becoming stronger posteriorly; with a single basisternal seta (stn<sub>2</sub>s) on median ridge; furca (f) well developed and extending anteriorly to a point midway between anterior margin and where marginal ridge (mr) and precoxal ridge (pcr<sub>2</sub>) join. Mesopostnotum (pn<sub>2</sub>) unusually short, extending posteriorly only to a point level with mesocoxae. Mesothoracic spiracle (sp<sub>2</sub>) peritremes 16–18 µm wide. Tegula (teg) probably absent but with 2–6 tegular setae (tegs) on each side. *Metathorax*: Episternum (eps<sub>3</sub>) unsclerotized but with 3–6 fs + 1–3 hs postmetaspiracular setae (eps<sub>3</sub>s). Metepimeron (epm<sub>3</sub>) sclerotized but without setae. Antemetaspiracular setae absent. Metathoracic spiracle (sp<sub>3</sub>) peritremes 18–20 µm wide. Dorsospiracular setae (dss): 0 or 1 hs. Metasternum (stn<sub>3</sub>) with 0–2 fs + 0 or 1 hs anterior metasternal setae (amss) and 3–9 fs + 1–3 hs posterior metasternal setae (pmss). *Wing*: Hyaline but only represented by a small basal portion (however, clearly alate as axillary wing sclerites present). Hamulohalteres absent. *Leg*: Subequal in length. Coxae (cx) I 78–86; II 77–86; III 85–95 µm long; setae of coxa III 0 or 1 fs + 5–8 hs; long apical seta on each coxa about 33–44 µm long. Trochanter (tr) + femur (fm) I 172–178; II 167–178; III 178–186 µm long; trochanter III with about 2–4 fs + 2–4 hs; long trochanter seta up to 39–53 µm; femur III with 0 or 1 fs + 7–12 hs. Tibia (ti) I 171–178; II 178–194; III 186–198 µm long; tibia III with about 28–30 setae, few fs, mainly hs, a few setae becoming spurlike on

distal third of leg; without an apical spur. Tarsus (ta) I 91–111; II 103–116; III 107–120  $\mu\text{m}$  long (ratio of length of tibia III to length of tarsus III 1:0.65); tarsus III with 15–18 setae; tarsal spurs absent; tarsal digitules (tdt) shorter than length of claw. Claws (c) quite long, thin, much longer than width of tarsi, slightly curved, with a denticle; length of III 30  $\mu\text{m}$ ; claw digitules (cdt) subequal in length to claw. *Abdominal segments I–VIII*: Dorsal setae (ads) on segment I absent + 1 dp; II and III each with 2–4 hs + 0–2 dp; IV 1 hs + 2 dp; V 2 hs + 4 or 5 dp; VI 2 hs + 1 dp; VII 5 hs only. Dorsopleural setae (dps) on segments II and III absent; IV 0 setae + 0 or 1 dp; V 1 hs + 0 or 1 dp; VI 4–7 fs + 0 or 1 hs; ventropleural setae (vps) on segments II–IV absent; V 1 fs + 1 hs; VI 2 fs + 1 hs; VII (dps + vps) 22 fs + 4–6 hs + 0 or 1 dp on each side. Ventral setae (avs) on segment II 2–11 fs + 1 or 2 hs; III 4–8 fs + 3 hs; IV 5 or 6 fs + 3 hs; V 8 or 9 fs + 4–6 hs; VI 10–15 fs + 3 or 4 hs; VII 9 fs + 3 or 4 hs. Segment VIII (E) without ventral abdominal setae; caudal extension (ce) of VIII slightly elongate, lobelike, with 2 or 3 hs pleural setae. *Genital segment*: Penial sheath (ps) quite long, parallel-sided, sclerotized; length (plus sternite VIII) 198–200  $\mu\text{m}$ ; width 66–76  $\mu\text{m}$  at anterior end of sternite VIII (ratio of total body length to penial sheath + sternite length 1:0.19). Basal rod (bra) total length 125–133  $\mu\text{m}$ ; anteriorly not quite reaching basal membranous area (bma). Aedeagus (aed) not very clear on either specimen, possibly about 80  $\mu\text{m}$  long, parallel-sided, quite broad but not as broad as penial sheath; apex close to tip of penial sheath, rather broad and blunt. Penial sheath with about 10 small setae (pss) along each margin and with a cluster of small sensilla (psp) present near apex.

*Comments*. The male of *R. combreticola* is very similar to that of *R. insleyae* described below. For a comparison with the male of the latter species, see under that species. Although the antenna appears to be seven-segmented, the apical segment is unusually long and has one or two moderate to slight constrictions along its length, which could represent the normal three apical segments fused together.

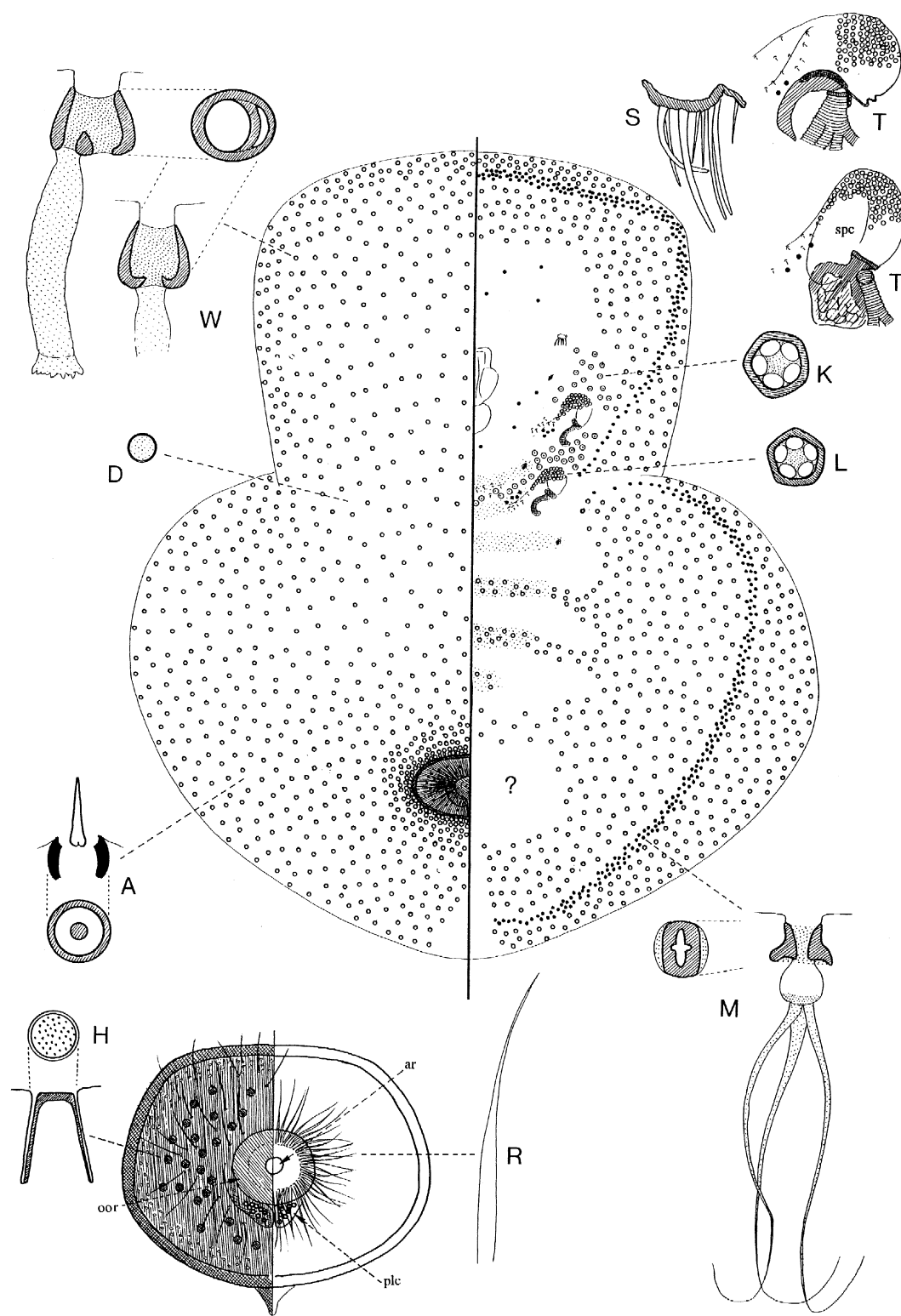
*Material examined*. *Holotype*, ♀, ZIMBABWE (as Southern Rhodesia): Inyazura, on *Combretum* sp. (Combretaceae), 14.v. 1929 (*W.J. Hall* #564) (BMNH): labelled TYPE. *Paratypes*, as for holotype (USDA; BMNH): 20 slides with 6 ad ♀ + 2 ad ♀ anal cones, 6 3rd ♀, 2 2nd ♀, 3 2nd ♂, 2 ad ♀, 2 pupae and 5 1st (1 moulting to 2nd ♀); Odzi, *Combretum* sp., 5.x. 1932 (*W.J. Hall* #771) (BMNH): 3 slides with 7 ad ♀.

### ***Rhodesaclerda halli* McConnell**

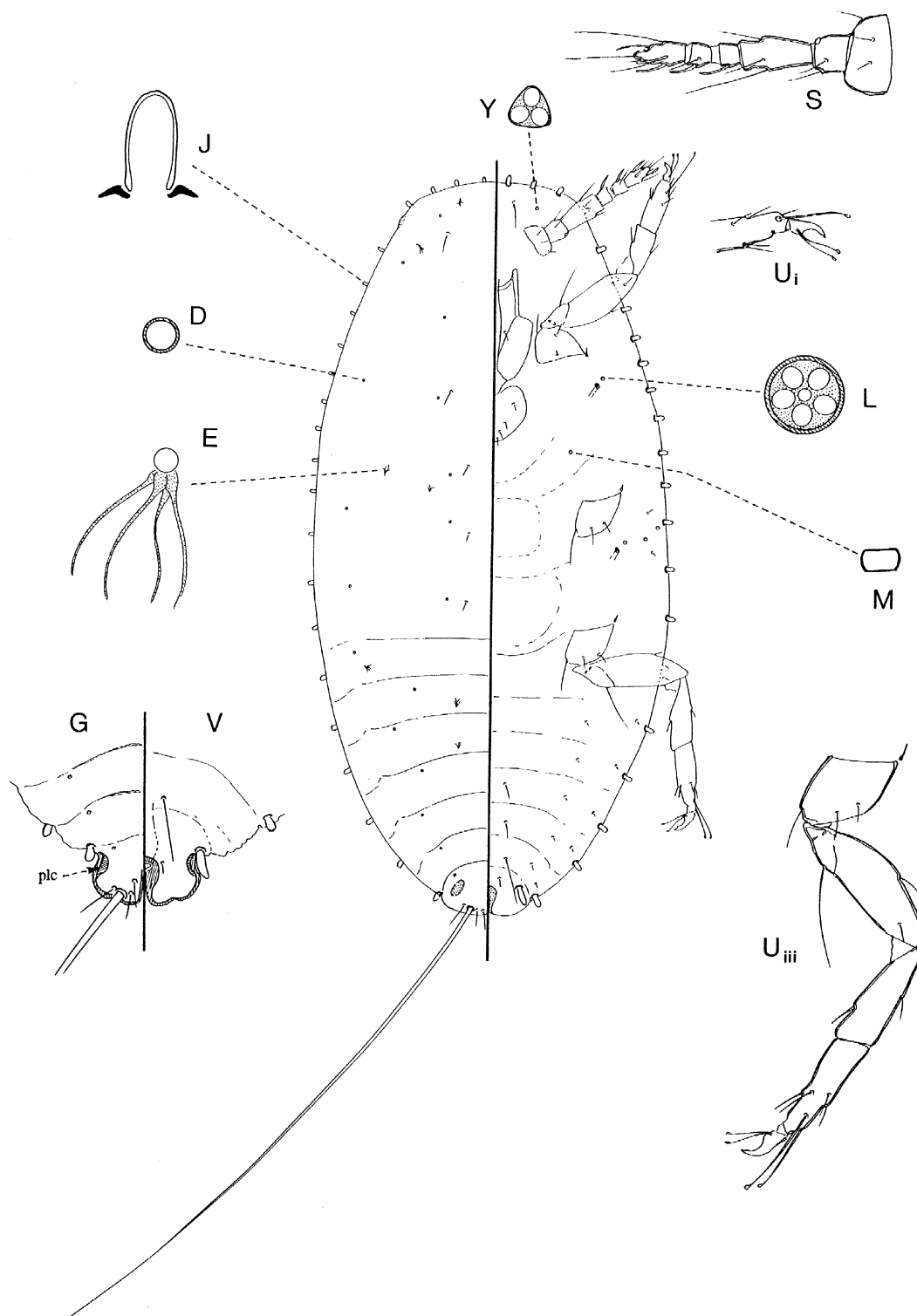
*Rhodesaclerda halli* McConnell, 1954: 115.

*Adult female* (Fig. 10; for other abbreviations, see Fig. 3). Described from 2 specimens, both in good condition. *Unmounted material*: 'Inclosed in a thick, straw-coloured, waxy test exposed on the surface of the stems of the host, the insect free from the test, which is composed of five indistinct plates, two lateral, one anterior, one posterior

and one dorsal, the test slightly longer than wide, with an opening in the posterior plate to which the posterior end of the insects is closely applied' (McConnell, 1954). *Mounted material*: Body large, strongly divided by a deep waist between spiracles; head about half width of abdomen; length about 3.6–3.9 mm; breadth across abdomen perhaps 3.1–3.4 mm. Sclerotized anal cone appearing to lie medially on abdominal dorsum. *Dorsum*: Dorsal setae (A) perhaps a little longer than on other species, 5–6  $\mu\text{m}$  long; frequent throughout. Dorsal pores of 2 types as in generic diagnosis: bilocular pores (W) oval, 6–8  $\times$  5–7  $\mu\text{m}$  in size, inner ductule about 14–17  $\mu\text{m}$  long; common throughout but particularly dense around anal cone; simple pores (D) very infrequent and small, distribution uncertain. Anal cone oval on mounted material; about 330–365  $\mu\text{m}$  long, 445–470  $\mu\text{m}$  wide; sclerotized, concentric rings not apparent but with 2 ventral halves fused along mid-ventral line and with a more heavily sclerotized band around outer margin; with a large round orifice (oor) centrally, about 83  $\mu\text{m}$  wide, leading to inner anal ring complex (ar); apparently without anal plate-like structures; surface of anal cone with numerous long setae, most frequent anteriorly, with a total of about 40 invaginated conical pores (H) more or less evenly distributed throughout; pocketlike pouches (plc) with 5–7 (possibly even 9) conical pores. Anal ring (ar) structure unclear, but with an eversible anal tube and numerous (probably 20 at least, 30 according to McConnell, 1954) long, probably flattened, setae (R) that protrude through outer orifice. Anal tube apodemes and ventral groove not detected but present and short according to McConnell (1954). *Margin*: As for generic diagnosis. *Venter*: Spiracular disc-pores (L) usually with 5 loculi, in a group of about 50 in anterior spiracular cavities and 70–90 in posterior cavities (T, spc). Opening to spiracular cavity visible mesad to each spiracle, openings with 8–11 small setae and 3–6 ventral microducts. Multilocular disc-pores (K) slightly larger than spiracular disc-pores and probably mainly 5 locular, with about 40–50 on each side divided into 2 groups, 1 group anterior to each spiracle, with that from anterior spiracle extending almost to antennae and that associated with posterior spiracle extending medially. Ventral pores as for generic diagnosis: bilocular pores (W) throughout venter except medially on head and thorax, and between anterior abdominal segments; ventral microducts (M) about 4  $\mu\text{m}$  wide, with an inner ductule, often divided into 2 or 3 narrow ductules; with about 300 in a broad submarginal band, 1–4 pores wide, around head between anterior spiracles; equally frequent along abdominal margins; with several microducts present medially on head anterior to mouthparts, laterad to labium and medially associated with opening to spiracular cavities. Ventral setae sparse throughout but perhaps most frequent medially on mesothorax and near entrance to spiracular cavities. Antenna (S) with basal segment about 25–30  $\mu\text{m}$  wide, with at least 8–10 fleshy setae of which 5 or 6 quite long (longest up to 35  $\mu\text{m}$ ), others much shorter (less than 12  $\mu\text{m}$ ). Clypeolabral shield 231–250  $\mu\text{m}$  long; labium not twisted to one side, with only 3 pairs of setae visible. Spiracles (T) with anterior peritreme 43–47  $\mu\text{m}$  wide,



**Fig. 10.** *Rhodesaclerda halli* McConnell, adult female. For explanation of letters and abbreviations, see text.



**Fig. 11.** *Rhodessaclerda halli* McConnell, first-instar nymph. For explanation of letters, see text.

posterior peritreme 56–58 µm wide. Legs represented by a small areas of sclerotization and a few setal sockets.

**Comments.** *Rhodesaclerda halli* differs from the other two species of *Rhodesaclerda* in being much larger, with the anal cone apparently placed more anteriorly on the abdomen. It also differs from the other two species (character states on other two species in brackets) in having: inner ductule of ventral microducts divided into more than one ductule (generally only one ductule); heavily sclerotized bilocular pore extremely abundant around anal cone, so that pores actually touch (although more frequent than elsewhere on dorsum, bilocular pores not nearly touching); and very long anal ring setae that protrude through outer orifice of anal cone (this is somewhat similar to *Kwazulaclerda loranhi*, described below, but are absent from the other two species). It shares with *R. insleyae* (described below) the cone-shaped invaginated setae with a granulate surfaces on the anal cone.

**Second- or third-instar female.** This was described and illustrated by McConnell (1954), but no material was seen during this study. It was described thus: 'Similar in many respects to the adult female, particularly as to the wax test, shape, size, spiracles, antennae, tubular ducts and pores. The only marked differences are the absence of vestigial legs and the form of the caudal sclerotized area. Caudal sclerotized area constitutes the posterior lobe of the body, with the apex acutely protruded, without any evidence of an anal cleft, except on the ventral surface, the anal complex composed of two folds invaginated from a V-shaped notch at the ventral apex, with the anal opening at the centre of the short cylindrical inner fold, this fold entirely without setae about its base, which are present on the adult. Anterior to the ventral apical V-shaped notch are two angular invaginated pockets with 7 or 8 short, stout, tuberculiform setae at the base of each pocket; the rims of these two pockets form the posterior portion of the V-shaped ventral groove, which is rather short.' In addition, McConnell's (1954) Fig. 41(K) shows that the bilocular pores on the dorsum are concentrated around the anal cone, that the anal cone appears to be fairly elongate with parallel sides, with a few short setae near the apex around the outer orifice and on the cone's ventral surface. The pocketlike pouches, lying in a deep V-shape, are particularly striking. There is a short inner (probably eversible) anal tube but no inner sclerotized structures (such as ventral grooves, anal tube apodemes, etc.) are shown.

**First-instar nymph** (Fig. 11; for other abbreviations see Fig. 4). Described from 5 recently hatched specimens, with most legs not fully expanded. **Unmounted material:** Not seen. **Mounted material:** Oval, perhaps slightly more pointed posteriorly. Body length 327–331 µm, width 155–165 µm. **Dorsum:** Dorsal setae and dorsal pores as in generic diagnosis; anterior setae on head 11–12 µm long. Dorsal pores: small simple pores (D) mainly in a submarginal band, with 1 pore per segment, plus mediolaterally 2 pairs on head and 3 pairs on thorax, each associated with a dorsal seta; small pores each with 4 inner ductules (E): apparently with 2 pairs submarginally on head, 1 or 2

pairs submarginally or submedially on thorax and up to 3 pairs on abdomen. Anal area (G) with 2 short lobes divided by an anal cleft; pocketlike structures (plc) 13–20 µm long, about 10 µm wide; anal lobe with long apical setae 290–383 µm long, outer and inner setae about 25 µm long. **Margin:** Marginal setae (J) as for generic diagnosis, 7–10 µm long; marginal setae laterad to pocketlike pouch slightly longer, 11–18 µm long. Eyespot on margin, 11–13 µm wide. **Venter:** Spiracular disc-pores (L): anterior disc-pore bands with 1 disc-pore and posterior bands with 3 disc-pores, those near spiracle with 3 loculi, those near margin with 5 loculi. Trilocular pore (Y) as in generic diagnosis. Ventral setae as for generic diagnosis: preanal setae on segment VII 25–33 µm long; setae posterior to scape absent. Antenna (S) 111–123 µm long, with long hair-like seta (lfs) on apical segment 45–47 µm long and apical seta (as) 25–35 µm long. Clypeolabral shield 86–100 µm long; labium not twisted, with 4 pairs of setae. Spiracles: very small, width of peritremes about 5 µm; apparently without a muscle plate. Legs (U) probably well developed on fully developed nymphs but here possibly not fully expanded; lengths of most fully developed (metathoracic) leg: coxa 46 µm (length of longest coxal seta (cs) 16–22 µm); trochanter + femur 81–85 µm (length of long seta (trs) 33 µm); tibia 49–53 µm long; tarsus 52–55 µm; claw 18–21 µm long.

**Comments.** The crawler of *R. halli* is very similar to that of *R. combreticola*, but appears to differ from the latter in (character states on *R. combreticola* in brackets) having only one disc-pore in the anterior spiracular disc-pore band (two), in lacking a seta posterior to scape (present) and in the distribution of the dorsal pores with inner ductules.

**Material examined.** *Holotype*, ♀, ZIMBABWE (as Southern Rhodesia): Mazoe, on *Combretum* sp. (Combretaceae), 14.ix. 1928 (*W.J. Hall*) (BMNH). *Paratypes*, as for holotype (BMNH): 4 slides with 1 ad ♀ and 5 1st-instar nymphs.

### *Rhodesaclerda insleyae* Hodgson & Millar, sp.n.

**Adult female** (Fig. 12; for other abbreviations see Fig. 3). Described from 7 adult females, all distorted to some extent, following description derived from a combination of all 7 specimens. **Unmounted material:** Not seen. **Mounted material:** Body narrow at anterior end (head + thorax), becoming about 2× as wide across abdomen; length about 1.25 mm; breadth across abdomen perhaps 850 µm. **Dorsum:** Dorsal setae (A) 3–5 µm long, present throughout but most common and longest near margin. Dorsal pores of 2 types as in generic diagnosis: bilocular pores (W) 6–8 × 5–7 µm, with inner ductule about 11–13 µm long with a large bushy glandular end; abundant throughout but most frequent near margin; simple pores (D) infrequent, distribution uncertain. Anal cone (G) about 463–483 µm long, 330–370 µm wide; with a series of about 9–10 sclerotized concentric rings (scl) and a longitudinal sclerotized ridge



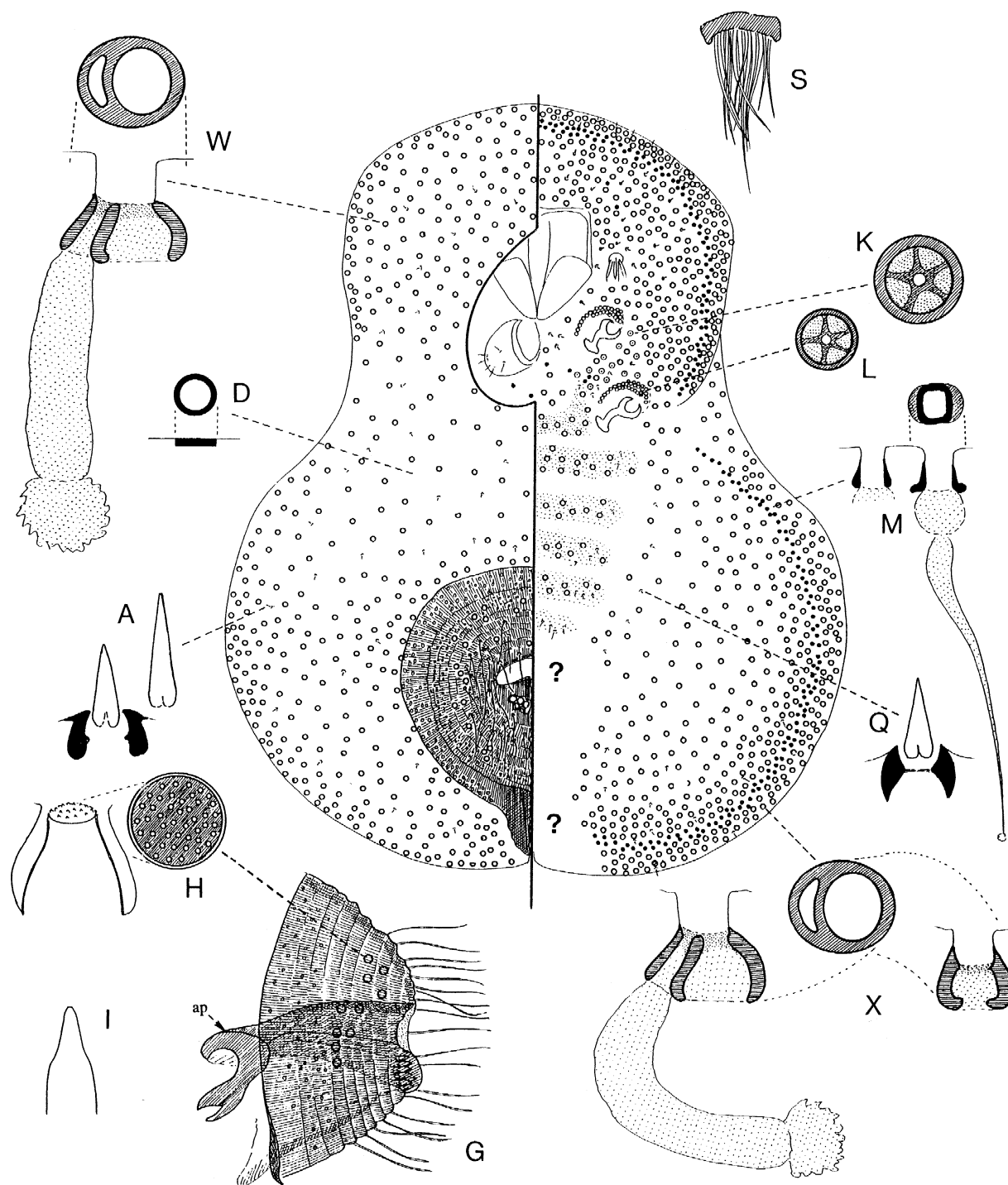


Fig. 12. *Rhodesaclerda insleyae* Hodgson & Millar, adult female. For explanation of letters and abbreviation, see text.

ventrally where anal lobes fuse; central (apical) area of cone heavily sclerotized, with a narrow inverted U-shaped opening (about  $83\text{ }\mu\text{m}$  wide) to inner anal complex; apparently without anal platelike structures; sclerotized ring immediately around U-shaped opening with long setae (each about  $83\text{ }\mu\text{m}$  long); next 3–5 concentric rings with more long setae

of similar length or shorter (down to about  $38\text{ }\mu\text{m}$  long); inner 6 or 7 concentric rings with a series of invaginated conical pores (H), each with a cribriformlike apex about  $8\text{--}9\text{ }\mu\text{m}$  wide; with 34 present on clearest specimen, situated mainly anterior and laterad to central opening; outermost 3 or 4 sclerotized rings with much smaller pores whose

structure could not be determined. Pocketlike pouches (plc) present, each with 4–6 (possibly up to 9) conical pores (I). Inner anal complex represented by a strongly sclerotized apodeme (ap) with a bifurcated inner end; exact structure could not be determined through dense sclerotization of anal cone, but ventral part appeared to represent inner ventral groove of other aclerdids. No structure representing an anal ring could be seen. *Margin*: As for generic diagnosis. *Venter*: Spiracular disc-pores (L) each about  $4\mu\text{m}$  wide, with normally 5 loculi; with a group of at least  $30+$  disc-pores in spiracular cavities (spc). Multilocular disc-pores (K) about  $6\mu\text{m}$  wide and perhaps with mainly 5-loculi; number uncertain but probably between 15 and 30 present between spiracles on each side; apparently absent between anterior spiracles and antennae. Ventral pores as for generic diag-

nosis: bilocular pores (X) common throughout venter; ventral microducts (M) about  $3.5\text{--}4.0\mu\text{m}$  wide, with a single long inner ductule ( $10\text{--}12\mu\text{m}$  long); present in a broad submarginal band mainly 1–3 pores wide, with  $150\text{--}200$  pores between anterior spiracles; also 1–3 pores mesad to spiracular cavities, posteriorly around labium and with about 4 anterior to mouthparts. Ventral setae (Q) medially each about  $4\mu\text{m}$  long but up to  $9\mu\text{m}$  long laterally and posteriorly. Antenna (S) with basal segment about  $20\mu\text{m}$  wide, with at least 10–12 long fleshy setae. Clypeolabral shield  $275\text{--}280\mu\text{m}$  long; labium twisted to one side, with only 3 pairs of setae visible. Opening to spiracular cavity distinct; width of anterior spiracular peritremes  $38\mu\text{m}$ , posterior peritremes  $45\mu\text{m}$ . Legs apparently absent, not even represented by a group of small setae.

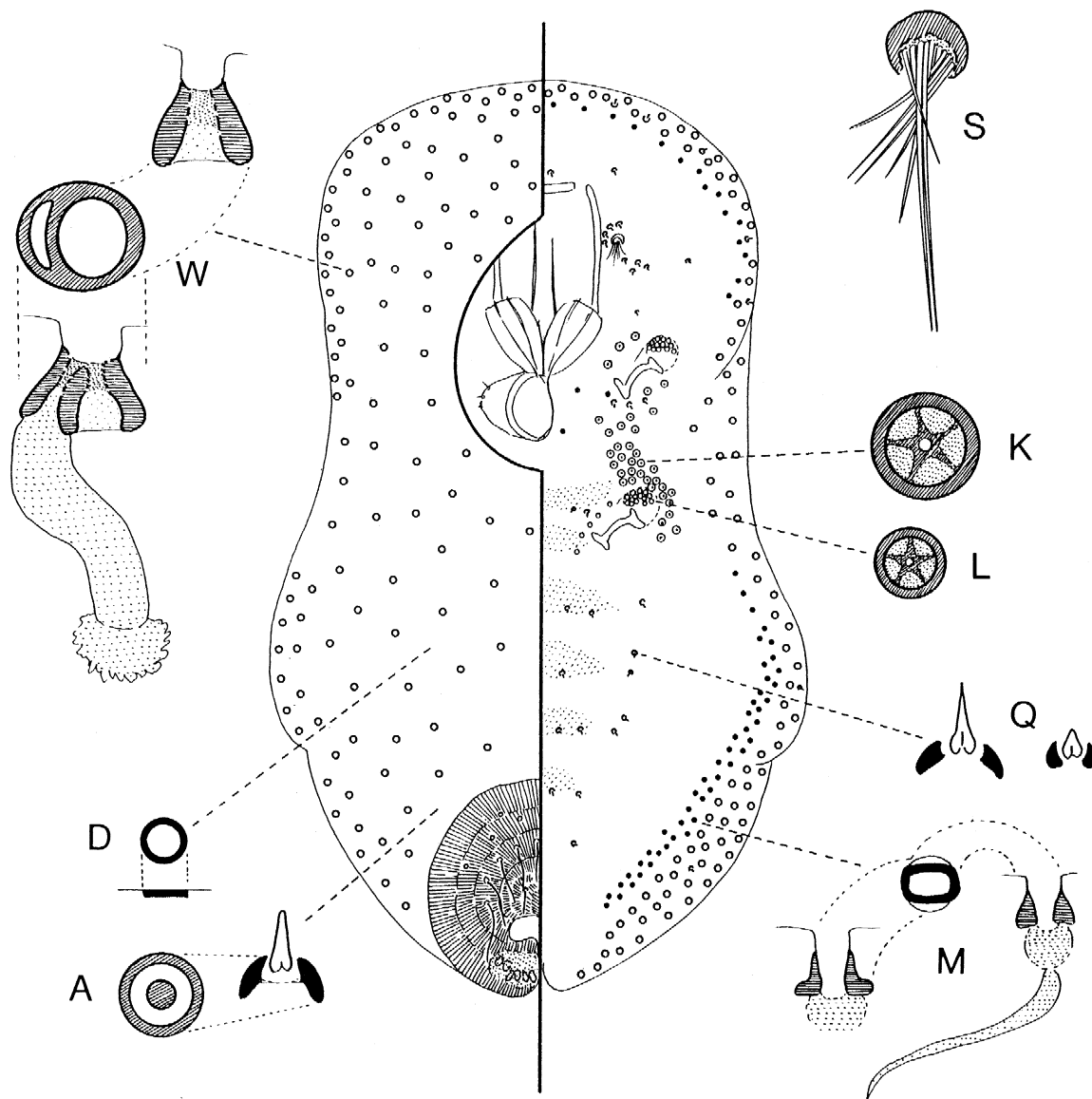


Fig. 13. *Rhodsaclerda insleyae* Hodgson & Millar, second-instar female. For explanation of letters, see text.

*Comments.* Adult females of *R. insleyae* are rather similar to those of *R. combreticola* McConnell. They differ in that the former species has (character state on *R. combreticola* in brackets): numerous sclerotized bilocular pores throughout the venter, including the head (very few near margin on head only); 10–12 setae on antenna (3 or 4); no anal plate-like structures, the exterior opening on the anal cone being a shallow inverted U (with anal platelike structures present, overlying a squarish outer orifice); and invaginated conical pores on anal cone with a flat, granulate surface (invaginated conical pores each deeply embedded within wall of cone within a narrow duct with heavily sclerotized walls). The presence, within the anal complex, of a ventral groove similar in structure to that seen in typical acclerid females, supports the view that *Rhodesaclerda* should continue to be included within Aclerididae.

*Second-instar female* (Fig. 13; for abbreviations see Fig. 5). Described from 1 specimen, quite well mounted but with the sclerotized anal cone broken into 4 parts. *Unmounted material:* Not seen. *Mounted material:* Anterior end of body blunt, parallel-sided, becoming slightly broader across abdomen; length about 700 µm; breadth across abdomen perhaps 445 µm. *Dorsum:* Dorsal setae (A) sparse, possibly restricted to near margin; about 2.5–3 µm long. Dorsal pores of 2 types: bilocular pores (W) about 5 µm wide; inner ductule with a large bushy glandular end, frequent throughout but most abundant near margin; simple pores (D) infrequent, distribution uncertain. Anal cone (G): length anterior to inverted U-shaped opening about 190 µm and entire cone about 160 µm wide; cone composed of a series of about 3 sclerotized, concentric rings (scl); apex of cone heavily sclerotized, with a shallow inverted U-shaped orifice to anal opening, with perhaps 2 long setae present immediately anterior to orifice; next innermost concentric ring with about 9 long setae; outermost 2 rings with a few small pores whose structure could not be determined; each pocketlike pouch (plc) containing about 6 conical pores. Anal platelike structures absent. Anal ring not visible. *Margin:* As for adult female. *Venter:* Spiracular disc-pores (L) each usually with 5 loculi, in a group of perhaps 16 or 17 within each spiracular cavity. Multilocular disc-pores (K) slightly larger than spiracular disc-pores, mainly 5-locular, located in a loose group of 30–40 mainly between anterior and posterior spiracles. Other ventral pores: bilocular pores (W) absent; ventral microducts (M) present in a submarginal band, pores about 3 µm wide; inner ductule usually undivided; with about 25–30 around head between anterior spiracles. Ventral setae (Q): abdominal segments with about 4–6 short setae medially; with 2 setae mesad to spiracle; with a group of about 6 setae around antenna; with a few other setae nearer margin. Antenna (S) with basal segment about 11 µm wide, with about 8–10 long setae. Clypeolabral shield 157 µm long; labium twisted to one side. Width of spiracular peritremes about 15 µm; muscle-plate apodemes 38–40 µm long. Legs apparently absent.

*Comments.* One slide has a nymph in the process of moulting to an adult female and so clearly represents the preadult stage. The nymph appears to be identical to that described

above (although it is not good enough to include in the above description). However, this stage also appears to be very similar to the second-instar nymph of *R. combreticola* described above, suggesting that a third instar may not be present in the latter species. McConnell's (1954) description and illustration of a preadult female of *R. combreticola* indicates that this species probably has large bilocular pores on the venter and many setae on the sclerotized cone, whereas the preadult of *R. insleyae* appears to have no large bilocular pores on the venter and few long setae on the sclerotized cone. The second-instar nymph of *R. insleyae* is rather similar to that of *R. combreticola* but differs in having (character state on *R. combreticola* in brackets) 8–10 setae on each antenna (3); long setae present on anal cone (absent); no anal platelike structures over anal opening (present), and six conical pores present in each pocketlike pouch (four pores in each pouch).

*Pupa* (Fig. 14; for abbreviations see Fig. 8). Described from one specimen in fair condition but development of adult male internally very advanced and prothoracic leg so folded as to be impossible to determine structure. *Unmounted material:* Not seen. *Mounted material:* Length 1.2 mm. Elongate, rounded at head end, rather bluntly pointed posteriorly. *Head:* Antenna 490 µm long; apparently with 7 or 8 distinct segments (ratio of total body length to antennal length 1:0.4). Setae few, perhaps with 1 pair of minute setae (dhs) medially on dorsal surface between antennae; ventral setae with 2 pairs anteriorly between antennal bases. *Thorax:* Length of each metathoracic leg 450 µm. Wing-bud (wb) 500 µm long, about 115 µm wide. Spiracles (sp<sub>2</sub>, sp<sub>3</sub>) with peritremes about 20 µm wide; anterior spiracles without spiracular disc-pores (spdp), posterior spiracles with 1 disc-pore; number of loculi in pores uncertain. Setae obscure, dorsum with 1 pair visible on metathorax, ventral setae possibly absent. *Abdomen:* Membranous except segments V–VIII distinctly sclerotized dorsally, segmentation absent; segmentation visible on venter. Setae as for generic diagnosis but dorsal abdominal setae (ads) on V and VI probably represented by small basal sockets; ventral abdominal setae (avs) with 1 small pair on segments III–VI; with 1 hairlike dorsopleural seta (dps) on segments II–IV, 2 on segment VI; ventropleural setae (vps) present on at least segment IV. Segment VII lobes (ce) much shorter than penial sheath, with a group of 5 fleshy dorsopleural setae (dps). Segment VIII as for generic diagnosis but with 3 pairs of pores or minute setae. Penial sheath (ps) 51 µm long, 83 µm wide (ratio of length to breadth 1:1.63); possibly with 3 minute pores or setae on dorsal surface.

*Comments.* This pupa appears to be a fairly normal coccoid pupa apart from the sclerotization dorsally on the posterior end of the abdomen and the seven- to eight-segmented antennae. Both of these characters are also present on the pupa of *R. combreticola*, but the latter species has very small wing-buds. For further comments on the characters of *Rhodesaclerda* pupae, see under *R. combreticola*. Other features (apart from the small wing-buds on *R. combreticola*) which appear to separate the pupae of

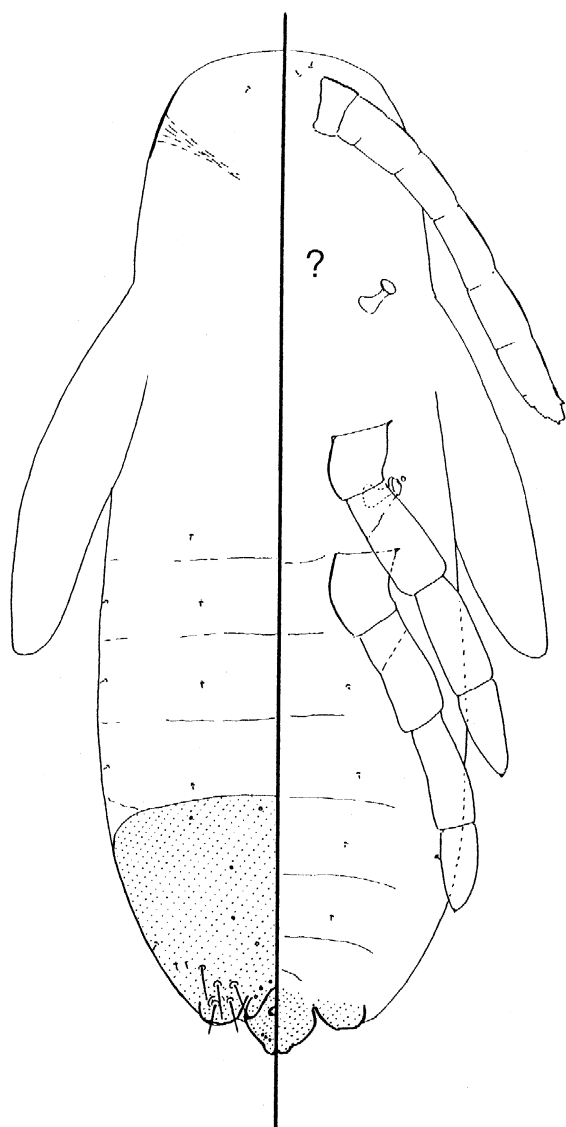
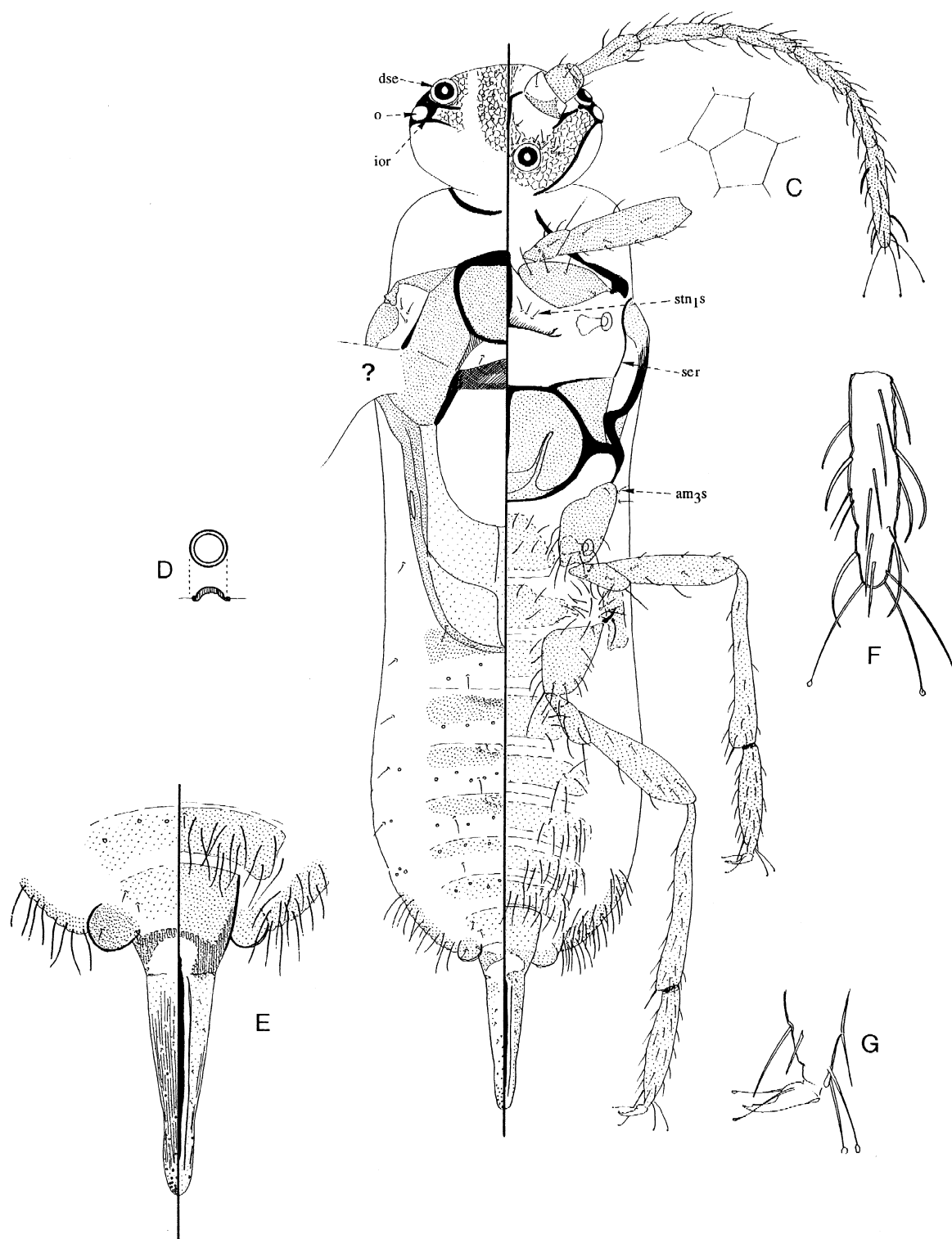


Fig. 14. *Rhodesaclerda insleyae* Hodgson & Millar, pupa.

these two species are the greater breadth of the abdomen (unusually narrow on *R. combreticola*) and the absence of spiracular disc-pores associated with the anterior spiracles (present on *R. combreticola*).

**Adult male** (Fig. 15; for abbreviations see Figs 2, 9, 21). Described from 2 specimens, both quite badly attacked by fungus: one with its wings extended straight forwards over head but otherwise quite good, second with even more fungus and wings extended straight back over abdomen, obscuring some features. **Mounted material:** Body length about 1.05–1.23 mm; antenna 8-segmented, about half body length; thorax not unusually small; with a few fleshy setae (fs) present ventrally on metathorax, with moderate numbers on abdomen; dorsum with a few small convex pores (dp). **Head:** Approximately oval in dorsal view. Median crest (mc) with 3 hairlike (hs) dorsal head setae

(dhs) and 10–13 small pores. Mid-cranial ridge with ventral ridge (vmcr) normally developed, extending posteriorly almost to ocular sclerite; with well developed lateral arms (lmcr); vmcr with a narrow band of striations anteriorly, these rapidly broadening posteriorly and fusing with ocular sclerite (ocs); with 0–2 pairs of hs ventral mid-cranial ridge setae (vmcrs). Genae (g) as for generic diagnosis. Simple eyes (dse, vse) 31–33 µm wide; ocelli (o) 21 µm wide, 28 µm long. Ocular sclerite (ocs) reticulations (C) without inner ridges. Preocular (procr) and postocular ridges (pocr) as for generic diagnosis. Ventral head setae (vhs) with about 8 or 9 h anterior to and just laterad to each ventral eye, but setae absent more laterally and posteriorly. Cranial apophysis (ca) possibly rounded. **Antenna:** 8-segmented, filiform; length 592–615 µm (ratio of total body length to antennal length 1 : 55). Scape (scp) 23–42 µm long, 48–57 µm wide, with 1 hs on ventral surface and 2 hs on dorsal surface. Pedicel (pdc) 40–47 µm long, 41–47 µm wide, possibly with a few striations; with 5 hs. Segments III–VII 18–20 µm wide; each fs about 26–31 µm long; length (µm) of III 79–83; IV 91–105; V 83–92; VI 81–86; VII 71–80; number of setae per segment III 5 or 6 fs + 3 hs (+ 2? sensilla basiconica); IV 15 fs + 2 hs; V 14–18 fs + 1 hs; VI 13–16 fs + 1 or 2 hs; VII 16–21 fs + 0 or 1 hs. Segment VIII (F) 102–125 µm long; not constricted apically; with 3 capitate setae (caps), 3 large antennal bristles (ab), one near proximal end of segment, plus 20–21 fs and 1 hs; sensilla basiconica not found. **Prothorax:** Pronotal ridge (prnr) strong and possibly not fused dorsally; possibly without a lateral pronotal sclerite (prn). Sternum (stn<sub>1</sub>) with transverse ridge fairly strong; median ridge very well developed (103–108 µm long), extending anteriorly between procoxae and about half length of segment; with a broad triangular basically unsclerotized area, but with some sclerotization along anterior margin of transverse ridge; with slight ridging but no reticulations; with 1–3 hs prosternal setae (stn<sub>1</sub>s) on each side. **Mesothorax:** Prescutum (prsc) almost as long as wide (107–112 µm long, 124 µm wide). Scutum (sct) with median membranous area possibly fairly narrow (107 µm wide, 30–66 µm long); with 1 pair of hs scutal setae (scts). Scutellum (scl) rectangular, 116 µm wide, 41 µm long. Prealare (pra) triangular. Basisternum (stn<sub>2</sub>) about 169–186 µm wide, 138–145 µm long; median ridge (mdr) strong anteriorly, fading posteriorly; without basisternal setae; furca (f) well developed, extending about two-thirds of distance to marginal ridge (mr). Mesopostnotum (pn<sub>2</sub>) long, extending posteriorly almost to a point level with metacoxae. Mesothoracic spiracles (sp<sub>2</sub>) with peritremes 22 µm wide. Tegula possibly absent but with 2 or 3 tegular setae (tegs) on each side. **Metathorax:** Without simple pores in area of metatergal setae. Ventral part of metapleural ridge (plr<sub>3</sub>) short. Episternum (eps<sub>3</sub>) with a broad platelike sclerotization, with many (at least 12) fs + 2 or 3 hs postmetaspiracular setae (eps<sub>3</sub>s) on each side. Metepimeron (epm<sub>3</sub>) also with a broad platelike sclerotization, without setae. Antemetaspiracular setae (am<sub>3</sub>s) with 1 or 2 hs on each side. Metathoracic spiracles (sp<sub>3</sub>) with peritremes 25 µm wide. Dorsospiracular setae (dss) 0 or 1 hs on each side. Metasternum (stn<sub>3</sub>) with about 5–13 fs anterior metasternal



**Fig. 15.** *Rhodesaclerda insleyae* Hodgson & Millar, adult male. For explanation of letters and abbreviations, see text.

setae (amss) and 1–5 fs posterior metasternal setae (pmss). *Wing*: Hyaline but folded so that details not visible. Hamulohalteres absent. *Legs*: Metathoracic leg marginally

longest. Coxae (cx) I 105–112; II 95–108; III 103–112  $\mu\text{m}$  long; setae of coxa III 6 fs + 5–8 hs; long apical seta on coxa about 58–73  $\mu\text{m}$  long. Trochanter (tr) + femur (fm) I 202–207;

II 202–207; III 219 µm long; trochanter III with about 1–3 fs + 2 hs; long trochanter seta up to 54–63 µm; femur III with 2–4 fs + 10–13 hs. Tibia (ti) I 190–199; II 215–228; III 223–240 µm long; tibia III with about 24–35 setae, few fs, mainly hs, a few setae becoming spurlike on distal third of leg; with a thin apical spur (tibs) 23–27 µm long. Tarsi (ta) I 120–136; II 128–133; III 140–153 µm long (ratio of length of tibia III to length of tarsus III 1:0.64); tarsus III with 30–33 setae; tarsal spurs (tabs) undifferentiated but about 28–32 µm long; tarsal digitules (tdt) shorter than claw. Claws (G, c) quite long and thin, much longer than width of tarsi, slightly curved, with a denticle (cd); length of III 31–33 µm; claw digitules (cdt) slightly longer than claw. *Abdominal segments I–VIII*: Dorsal abdominal setae (ads) across segment I possibly 2 hs + 0 dp; II 1 hs + 1 or 2 dp; III 0 or 1 hs + 3 or 4 dp; IV 1 fs + 11 dp; V 2 hs + 9 dp; VI 1 fs + 1 hs + 7 dp; VII 0 setae + 7 dp. Dorsopleural setae (dps) on segments II–V with 1 hs + 0 or 1 dp; ventropleural setae (vps) on segments II and III possibly absent; IV and V with 1 hs; VI plus VII (dps + vps) in an elongate group of numerous setae, mostly fs but with a few hs (plus possibly 2 dp) on each side. Ventral abdominal setae (avs) (on each side of sternite) on segment II 2 or 3 fs; III 5 or 6 fs; IV 2–5 fs + 0 or 1 hs; V 3–7 fs + 1 hs; VI (total) 10–16 fs + 1 hs; VII 17–22 fs + 1 hs. Caudal extension (ce) on VII rounded and sclerotized. Segment VIII (E) tergite (at) with 1 or 2 hs on each side; sternite (as) sclerotized and forming anterior part of penial sheath; without ventral abdominal setae; caudal extension (ce) of VIII rounded, sclerotized, with 1 or 2 hs pleural setae. *Genital segment*: Penial sheath (ps) quite long, only narrowing slightly posteriorly, sclerotized, length (plus sternite VIII) 231–246 µm; width 91–99 µm at base of sternite VIII (ratio of total body length to penial sheath + sternite VIII length 1:0.20). Basal rod (bra) length 147–151 µm. Aedeagus (aed) not very clear on either specimen, but clearest at posterior end, probably extending from near apex of penial sheath almost to anterior end of basal rod and then about 124–138 µm long; parallel-sided, quite broad but not as broad as penial sheath. Penial sheath with about 8 small setae (pss) along each margin and with a cluster of small sensillae (psp) present on posterior half.

*Comments*. The male of *R. insleyae* is clearly closely similar to that of *R. combreticola* but differs in a number of significant ways (character state on *R. combreticola* in brackets): ventral mid-cranial ridge well developed, with well developed lateral arms (poorly developed, without lateral arms); fleshy setae on antenna distinctly longer than antennal width (shorter); antenna distinctly eight-segmented (seven-segmented); ventral head setae frequent (few ventral head setae); thorax of normal width for male Coccoidea (unusually narrow); prosternum with prosternal setae (prosternal setae absent); median ridge on prosternum unusually long, extending anteriorly past procoxae (median ridge quite long but not extending past coxae); mesopostnotum normal, extending to level with metacoxae (mesopostnotum unusually short, not extending posteriorly to past mesocoxae); basisternal setae absent (present);

large platelike sclerotizations on the metepisternum and metepimeron present (absent); many postmetaspiracular setae present (few); legs with tibial spurs (absent); ventral abdominal setae and pleural setae on segments VI and VII common (few); caudal extension on abdominal segment VIII large and rounded (thinner and lobelike); penial sheath bluntly pointed (spatulate); sensillae on penial sheath widespread (restricted to apex); aedeagus apparently parallel-sided (slightly broader or spatulate posteriorly). Thus the adult males of these two species show a greater number of differences than the females.

*Significant characters shared by the adult males of both species*. Fusion of the preocular and postocular sclerites around each ocellus; shortened antennae (seven- or eight-segmented), each long-terminal segment possibly representing two or three fused segments; presence of simple pores on median crest; median membranous area of scutum present; median ridge on prosternum very well developed and long; postnotal apophysis represented by a narrow slit; scutellum possibly tubular with a foramen; tibio-tarsal articulation with a sclerotization; metasternum sclerotized; abdominal sternites all sclerotized; small convex pores present on all tergites and often also on pleurites; glandular pouches and long setae on segment VII absent; pleurites sclerotized on segments VI and VII; caudal extensions on abdominal segment VIII well developed; sternite of abdominal segment VIII an integral part of penial sheath; penial sheath elongate, with a blunt apex and with longitudinal ridges dorsally and laterally; basal rod very long, extending almost entire length of penial sheath; and aedeagus also possibly quite long and broad but narrower than penial sheath.

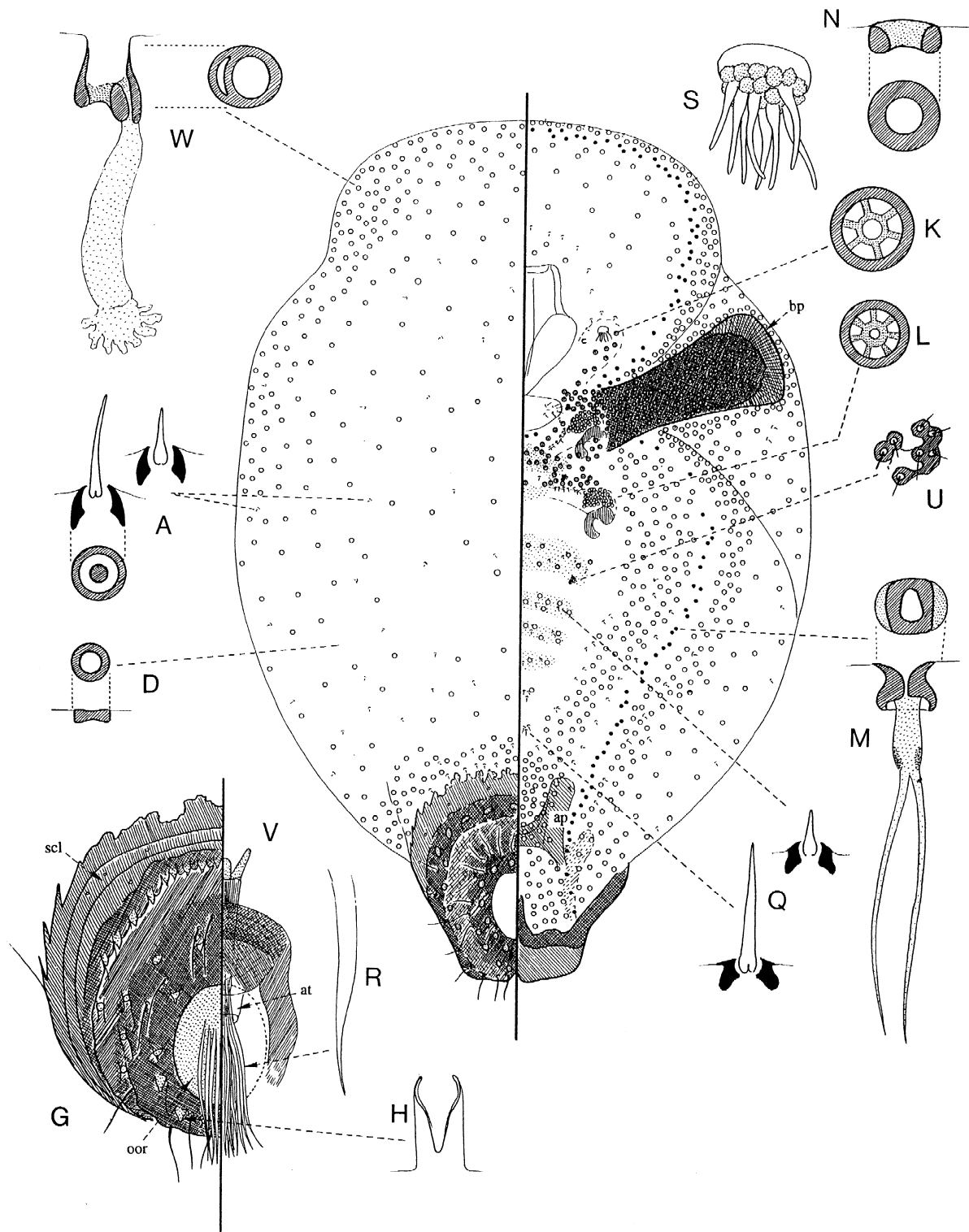
*Etymology*. This species is named after Patricia Insley, who collected both this new species and *Kwazulaclerda loranthe* described below. In addition, she has done much to improve the scale insect collection from southern Africa in the SANC while collecting parasitoids, particularly those of Coccoidea.

*Material examined*. *Holotype*, ♀, SOUTH AFRICA: Kwazulu-Natal, Oribi Gorge, on *Combretum kraussii* (Combretaceae), 16.i. 1972 (H.P. Insley) (SANC: HC4530). *Paratypes*, as for holotype: 13 slides with 6 ad ♀, 3 2nd ♀ (1 moulting to ad ♀), 1 pupa, 4 ad ♂. Depositions: single ad ♀ in USNM, BMNH and NMW, rest of material in SANC.

### ***Kwazulaclerda* Hodgson & Millar, gen.n.**

Type species: *Kwazulaclerda loranthe* Hodgson & Millar.

*Adult female* (Fig. 16). *Test*: Not seen. *Mounted material*: Derm membranous apart from a pair of heavily sclerotized, brachial plates (bp) on thorax extending laterally from venter onto dorsum and a large heavily sclerotized anal cone (G) on posterodorsal surface of abdomen, through which anal complex opens, and which probably points posteriorly at an oblique angle in life. Margin strongly waisted along ventral margin in thoracic region.



**Fig. 16.** *Kwazulaclerda loranhi* Hodgson & Millar, adult female. For explanation of letters and abbreviations, see text.

*Dorsum*: Dorsal setae (A) short, with deep basal sockets. Dorsal pores of 2 types, both present throughout: large bilocular pores (W) with one locus large and round,

other locus narrow and C-shaped, with a stout inner ductule with a bushy inner glandular end; and small simple pores (D). Other pores and tubular ducts absent. With a

large elongate heavily sclerotized brachial plate (bp) lying radially from near anterior spiracles well onto dorsum, enclosing numerous multilocular disc-pores (K). Anal cone (G) heavily sclerotized, with a large central orifice (oor) through which long anal-ring setae (R) protrude; apparently without anal platelike structures; anal cone composed of a series of sclerotized concentric rings (scl) dorsally and laterally; ventrally much shorter and clearly divided into halves (each half probably representing an anal lobe); sclerotized bands surrounding central orifice bearing both long flagellate setae and large invaginated conical pores (H), pores lying within narrow cavities; anal opening tubelike (at), with numerous flattened anal ring setae; anal cone without a pair of pocketlike pouches. A pair of large sclerotized anal tube apodemes (ap) present, extending and diverging anteriorly beneath anal opening; structure representing ventral groove not seen. *Margin*: Marginal and stigmatic setae absent, but margin perhaps demarcated by submarginal band of ventral microducts (M); with a deep waist in thoracic region between spiracles. Eyespots absent. *Venter*: Derm membranous, with small dermal spinules medially between spiracles and on anterior 4 abdominal segments. Pregenital disc-pores absent. Spiracular disc-pores (L) heavily sclerotized, usually with 5 loculi, present in a group just anterior to each peritreme in a deep spiracular cavity (spc). A group of strongly sclerotized multilocular disc-pores (K) present medially on thorax, between each pair of spiracles laterally and extending anteriorly to antenna; also present throughout both brachial plates (bp). Other ventral pores possibly of 3 types: bilocular pores (W) similar to those on dorsum; present throughout but most common submarginally; and round sclerotized pores (N) few, present near margin anterior to brachial plates (but may be ventral microducts); and ventral microducts (M) small oval pores with lateral flanges and an inner ductule which may divide into 2 or 3 thinner ductules; present in a submarginal band but possibly absent from between spiracles; also present ventrally near labium. Ventral tubular ducts absent. Ventral setae (Q) short, sparse, but with a group within spiracular cavities. Antenna (S) reduced to a sclerotized base with several fleshy setae. Clypeolabral shield proportionately large; labium often twisted to one side, with possibly only 3 pairs of setae. Spiracles with C-shaped muscle plates, lying within cavities that contain spiracular disc-pores, and which open medially through a groove or tube that is partially lined with small setae and a few ventral microducts. Legs (U) reduced to a small area of sclerotization, each with a few setae.

*First-instar nymph (sex not determined)* (Fig. 17). Derm membranous, lacking any sclerotization near stigmatic areas but with a heavily sclerotized area around anus. *Dorsum*: Dorsal setae present in 2 lines each of 6 setae mediolaterally on head and thorax. Dorsal pores of 2 types: small simple pores (D), mainly present in a submarginal band, and in line mediolaterally with setae on head and thorax; and rather similar-sized pores (E), perhaps with oval openings and with a group of 3 or 4 thin inner ductules; present in a submarginal row just mesad to simple pores. Anal area

complex (G) with a broad area of sclerotization extending around a central anus; with 2 apparently membranous areas (perhaps representing apex of anal lobes) on either side of anal opening, from each of which arise 3 setae, one very long (apical) seta and 2 much shorter; area immediately surrounding anal opening and membranous areas heavily sclerotized with strongly sclerotized ridges; with 4 stout, blunt setae, similar to marginal setae, associated with these ridges on outer anterolateral margin; and with a broad rather less sclerotized outer area surrounding this ring of setae. With a pair of sclerotized structures (V), possibly pouchlike, lying beneath posterior part of anal sclerotization. Anal ring not visible but probably lacking anal ring setae. *Margin*: Marginal setae (J) blunt, stout, with a notch on both margins; without stigmatic clefts but each stigmatic area with 1 marginal spine, identical to other marginal setae; with 7 setae on margins of abdomen, 4 between lateral stigmatic areas, 3 between each anterior stigmatic area and eyespot and 8 between eyespots anteriorly. Eyespot on margin. *Venter*: Head with 1 or 2 pairs of loculate pores (Y) anteriorly; probably with a single pair of ventral microducts between pro- and mesocoxae; with spiracular disc-pores (L) present between spiracles and margin; with long setae medially on abdominal segments V, VI and VII; with a submarginal and a submedial seta on each side of abdominal segments; single seta present posterior to scape; with a pair of longish setae near anterior margin on head; with a small seta on either side of each posterior band of spiracular disc-pores; without submarginal setae on each side between lateral stigmatic areas. Antenna (S) quite short, of 6 segments; scape with 3 or 4 setae; pedicel with 2 setae + a campaniform pore; segment III with 3 setae; IV and V each with a fleshy seta, V also with a flagellate seta; VI with 3 fleshy setae + 6 hairlike setae. Labium with 4 pairs of setae. Spiracles very small. Legs (U) well developed, number of setae per segment: coxae 5; trochanters 1 long and 1 short; femora 3; tibiae 2; tarsi 4; tarsal campaniform pores absent; tarsal digitules staggered but basically alike (except on prothoracic leg ( $U_1$ ), where one digitule short and setose); claws quite long, with a distinct denticle; claw digitules alike, longer than claws.

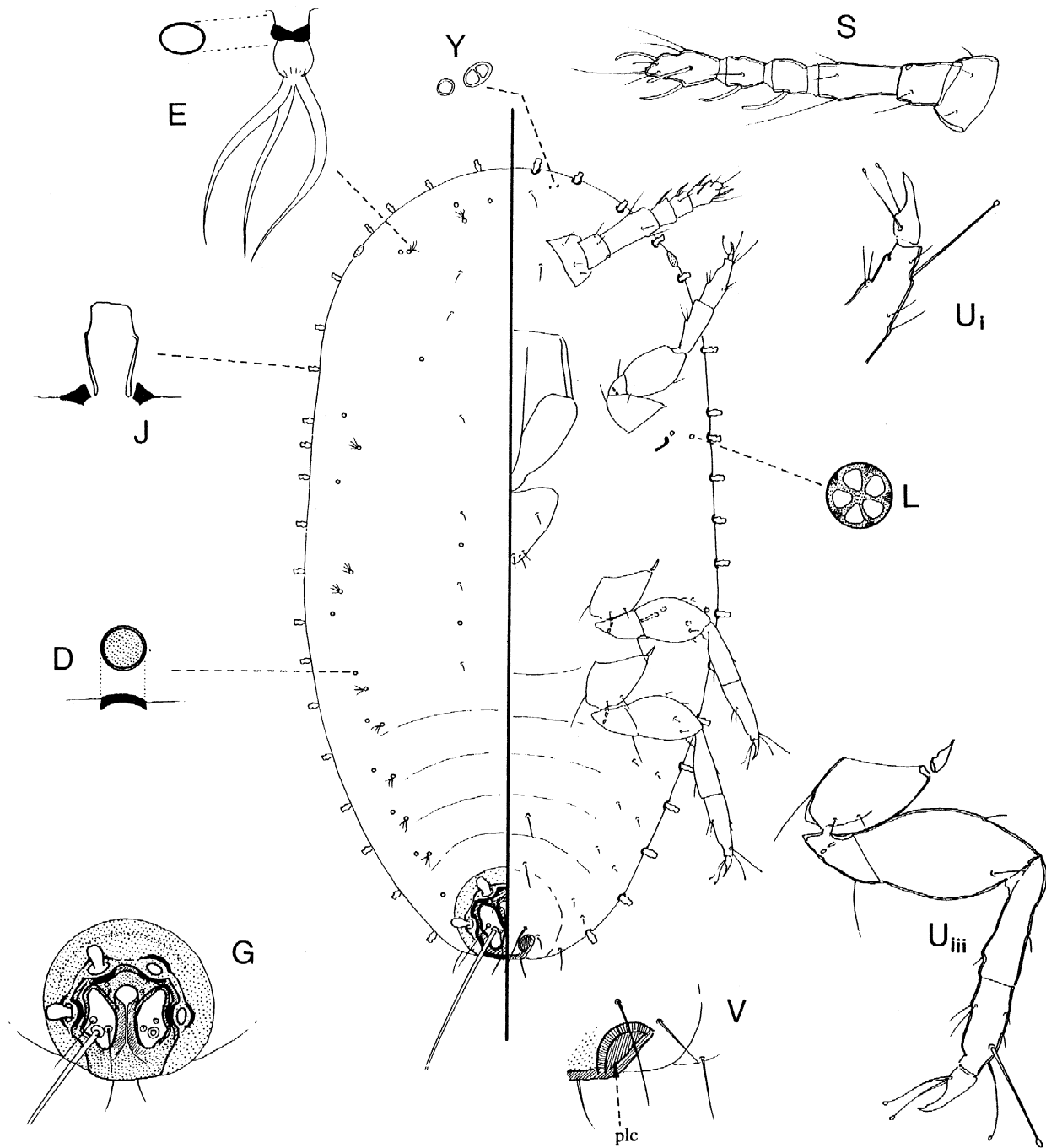
*Second-instar female* (Fig. 18). Rather similar to adult female but with a smaller anal cone with invaginated conical pores present around anal orifice; without both pocketlike pouches and brachial plates, but with a group of multilocular disc-pores between anterior and posterior spiracles, these extending laterally onto dorsum. Ventral bilocular pores very sparse.

*Second-instar male* (Fig. 19). Similar to second-instar female but with fewer bilocular pores on dorsum and venter; multilocular disc-pores between lateral spiracles not extending onto dorsum.

*Third-instar female*. Unknown.

*Pupa*. (Fig. 20). Segmentation obscure apart from abdomen ventrally; derm mainly membranous (except dorsally on abdomen), with small dermal spinules; all ducts and pores (except spiracular disc-pores) absent and setae few. *Head*: Antenna moderately long, pointing posteriorly;

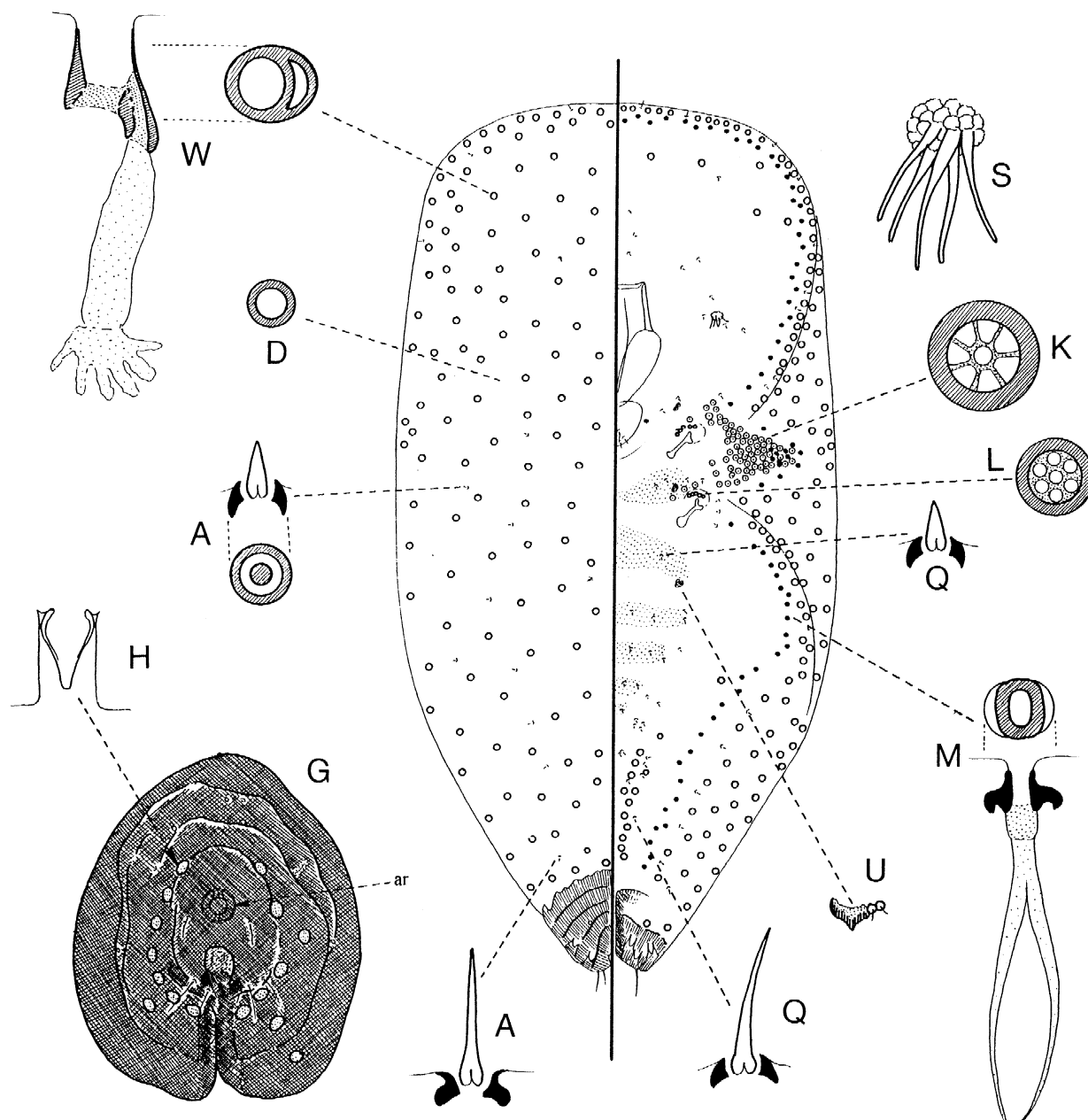




**Fig. 17.** *Kwazulaclerda loranhi* Hodgson & Millar, first-instar nymph. For explanation of letters, see text.

basal segments slightly to moderately sclerotized. *Thorax*: Unsclerotized, with a pair of well developed wing-buds (wb); 3 pairs of moderately well developed legs, leg segmentation clear; coxa and trochanter somewhat sclerotized; prothoracic legs C-shaped, directed anteriorly and curving round in front of anterior margin of head; metathoracic legs extending posteriorly to about abdominal segment V; tarsal campaniform pores absent; each leg with a small triangular

finger on apex, probably an incipient claw; anterior spiracles (sp<sub>2</sub>) just posterior and laterad to each procoxa, posterior spiracles (sp<sub>3</sub>) posterior and laterad to each meso-coxa; spiracular disc-pores (spdp) present. *Abdomen*: Membranous apart from a distinct sclerotization dorsally on abdominal segments V, VI and VII; dorsal (ads) small, probably present in pairs medially on all segments; ventral setae (avs) small, in a line with setae on meso- and



**Fig. 18.** *Kwazulaclerda loranhi* Hodgson & Millar, second-instar female nymph. For explanation of letters and abbreviation, see text.

metathoraces; dorsopleural and ventropleural setae (dps, vps) variable; segment VII with a pair of lateral sclerotized lobes (ce), subequal in length of penial sheath (ps) and with a group of fleshy and hairlike dorsopleural setae (dps); segment VIII with a pair of very distinct sclerotized lobes (ce) on either side of base of penial sheath on dorsal surface; apparently without setae; tergite of segment VIII without ante-anal setae; penial sheath (ps) sclerotized, subequal in length to lobes of abdominal segment VII and about as long as broad.

*Adult male* (Fig. 21). Small; thorax rather narrow, abdomen proportionately rather broad; body fairly hirsute

ventrally, with fleshy setae (fs) fairly frequent on metathorax and abdomen, these generally easily differentiated from hairlike setae (hs); dorsum with a few small convex pores (dp). *Head*: Median crest (mc) rather large, with weak reticulations, some dorsal head seta (dhs) and dp. Mid-cranial ridge absent dorsally, ventral ridge (vmcr) long with well developed lateral arms (lmcr). Gena (g) not reticulated but with genal setae. Simple eyes almost round, in 2 pairs; dorsal eyes (dse) situated near base of antennae, ventral eyes (vse) placed towards posterior margin of head near mouth. Ocelli (o) large, oval, placed just posterolaterally to dorsal eyes. Ocular sclerite (ocs) polygonally

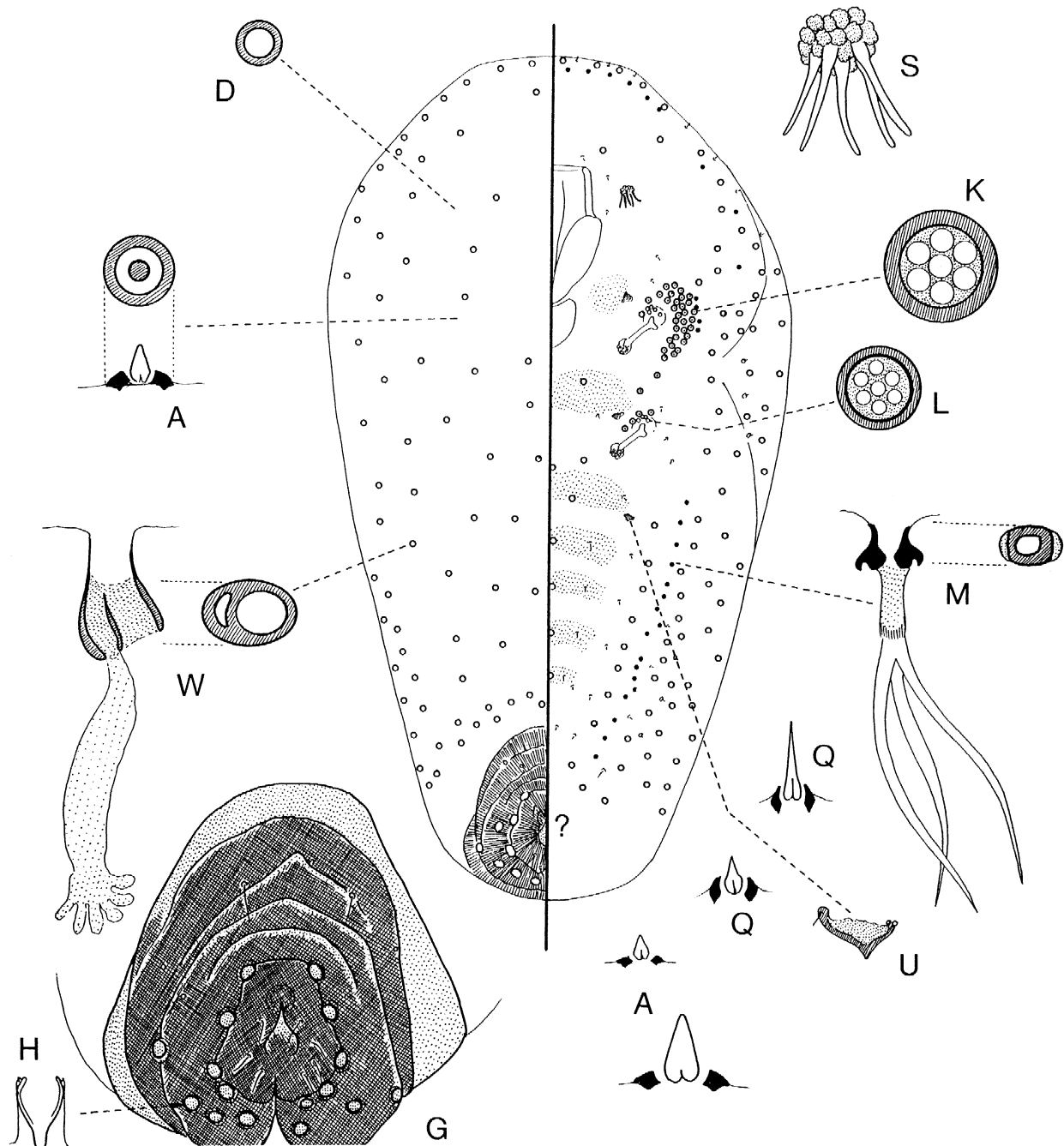
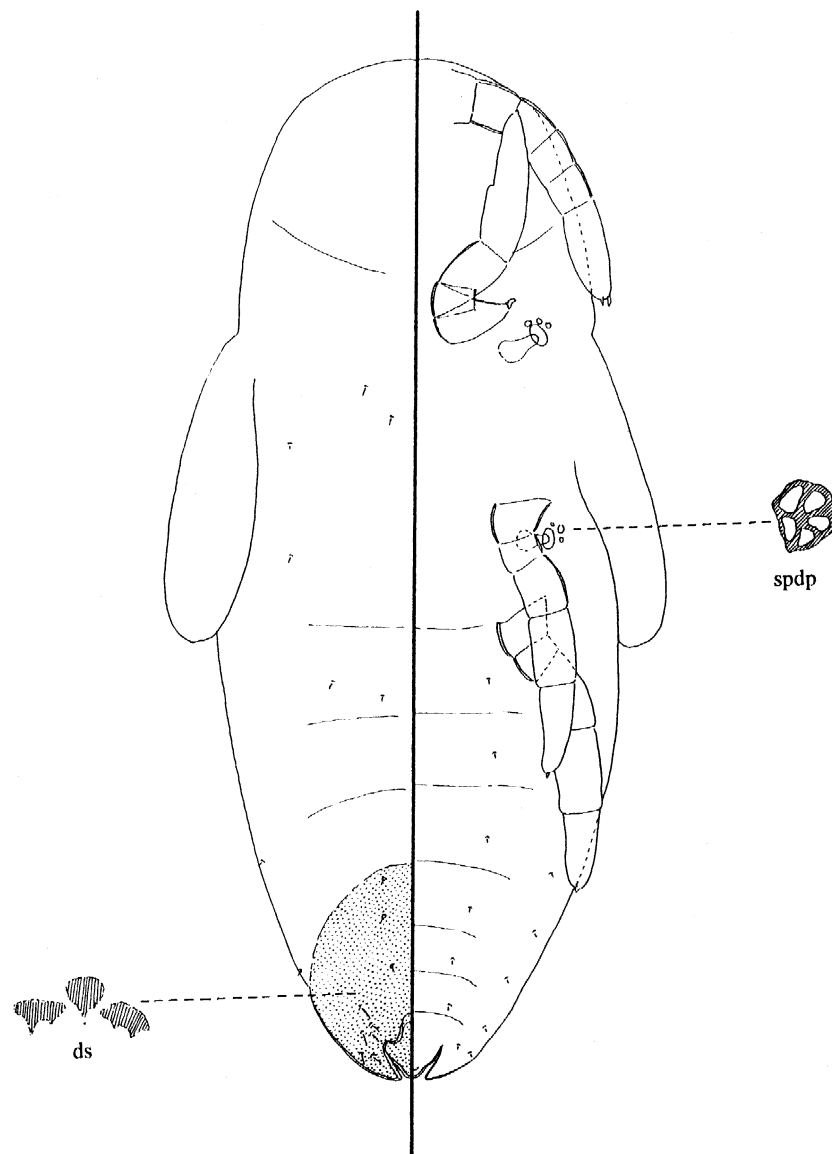


Fig. 19. *Kwazulaclerda loranthi* Hodgson & Millar, second-instar male nymph. For explanation of letters, see text.

reticulated (C) throughout. Preocular ridge (procr) short ventrally but fusing with sclerotization around dorsal eyes dorsally. Postocular ridge (pocr) strongly developed, extending anterodorsally past posterior margin of ocellus but with an extension around ocellus, and then medially almost to median crest; sclerotization around ocelli fusing with that around dorsal eyes (=interocular ridge (ior)?). Dorsal ocular setae absent. Ventral head setae (vhs) present. Tentorial bridge poorly developed. Cranial apophysis

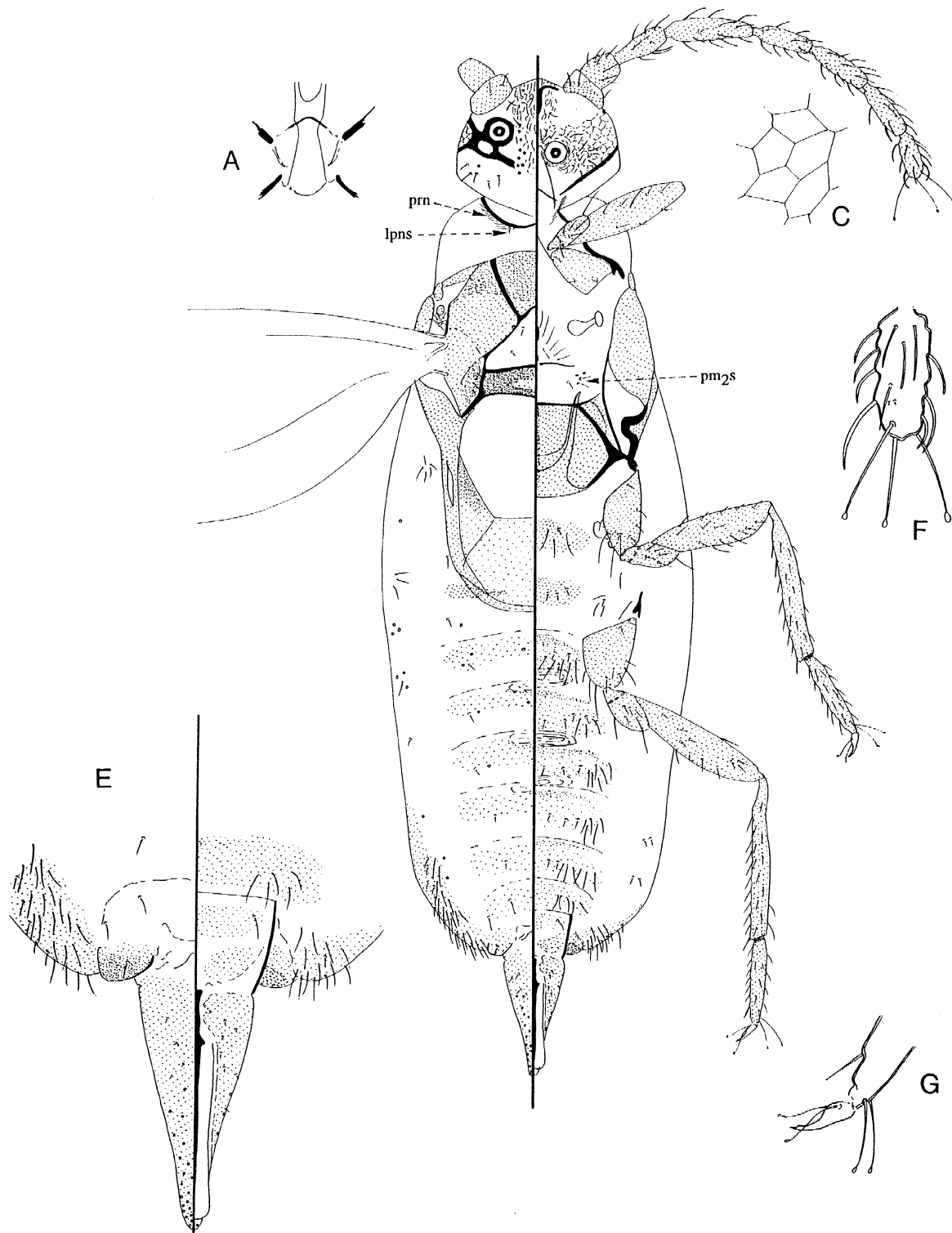
(A, ca) strong, apically bifurcated, extending anteriorly past ventral eyes, slightly constricted about halfway along length. *Antenna*: 8-segmented, filiform, slightly less than half total body length. Most segments with hs as well as fs. Segment VIII not constricted apically, with 3 capitate setae (caps), large and small antennal bristles (ab), some fs and 2 sensilla basiconica (sb). *Prothorax*: Pronotal ridge (prnr) strong, probably fused dorsally; with a broad lateral pronotal sclerite (prn); lateral pronotal setae (lpns) present



**Fig. 20.** *Kwazulaclerda loranthi* Hodgson & Millar, pupa. For explanation of abbreviations, see text.

or absent. Sternum ( $stn_1$ ) with a distinct transverse ridge, a weaker median ridge and a broad triangular unsclerotized area with slight radial ridging. Anteprosternal and antemesospiracular setae absent. *Mesothorax*: Prescutum ( $prsc$ ) large, sclerotized, with well developed prescutal ridges ( $pscr$ ) and prescutal suture ( $pscs$ ), latter possibly an inverted U-shape. Scutum ( $sct$ ) with a median membranous area apparently rather triangular in shape, with  $hs$  scutal setae ( $scts$ ); lateral margins of membranous area with a lightly sclerotized ridge; lateral margins of scutum sclerotized and possibly reticulated laterad to scutellum; prealare ridge ( $prar$ ) present but only pronounced posteriorly. Scutellum ( $scl$ ) rectangular, possibly tubular with a large foramen. Prealare ( $pra$ ) and triangular plate ( $tp$ ) well developed. Basisternum ( $stn_2$ ) large, with a weak median ridge ( $mdr$ ),

but bounded by strong marginal ( $mr$ ) and precoxal ridges ( $pcr_2$ ); lateropleurite ( $lpl$ ) possibly quite large, with a distinct thin extension from marginal ridge ( $mr$ ) anteriorly; furca ( $f$ ) with arms exceptionally long, extending anteriorly past marginal ridge; furcal arms diverging slightly. Postalare ( $pa$ ) with a few punctations anteriorly; without postalar setae. Mesopostnotum ( $pn_2$ ) well developed; postnotal apophysis ( $pna$ ) represented by a lateral slit; central membranous part of mesopostnotum without a sclerotized plate. Mesothoracic spiracle ( $sp_2$ ) without associated disc-pores. Postmesospiracular setae ( $pm_2s$ ) present. Tegula ( $teg$ ) and tegular setae ( $tegs$ ) present. *Metathorax*: Metatergal setae ( $mts$ ) present. Episternum ( $eps_3$ ) unsclerotized, with a few  $fs$  postmetaspiracular setae ( $eps_3s$ ). Metapleural ridge ( $plr_3$ ) well developed posteriorly; absent anteriorly and without



**Fig. 21.** *Kwazulaclerda loranthei* Hodgson & Millar, adult male. For explanation of letters and abbreviation, see text.

a suspensorial sclerite. Metepimeron ( $epm_3$ ) small. Antemetaspiracular setae absent. Metathoracic spiracle ( $sp_3$ ) without associated disc-pores. Dorsospiracular setae ( $dss$ )

present. Metasternum ( $stn_3$ ) sclerotized, with both anterior ( $amss$ ) and posterior metasternal setae ( $pmss$ ). Metapostnotum ( $pn_3$ ) probably not sclerotized. *Wing*: Hyaline, rather

long and narrow, without alar lobes or alar setae. Hamulohalteres absent. *Legs*: With rather few setae; tibio-tarsal articulation with a sclerosis; tarsal spurs (tabs) poorly differentiated; tarsal campaniform pore absent. *Abdominal segments I–VIII* with tergites (at) and sternites (as) all lightly sclerotized but with a heavier area of sclerotization along anterior margin of each sternite; pleurites VI and VII mildly sclerotized. Caudal extension (ce) of segment VII rounded, mildly sclerotized. Dorsal abdominal setae (ads) all hs. Dorsopleural setae (dps) mainly in a large group of fs on segments VI and VII; ventropleural setae (vps) very few except on segment VII. Ventral setae (avs) fairly abundant, both fs and hs. *Segment VIII*: tergite (at) probably lightly sclerotized; sternite (as) sclerotized, forming anterior part of penial sheath (ps); pleurite mildly sclerotized; caudal extension (ce) of VIII lobelike and distinct. Glandular pouch absent; long setae in glandular pouch position absent. *Genital segment*: Penial sheath (ps) articulating with sternite of segment VIII; sheath approximately triangular, narrowing into a fairly blunt apex. With a membranous area (bma) between anterior end of basal rod (bra) and sternite VIII. Basal rod (bra) long, extending down most of aedeagus, anteriorly just reaching basal membranous area (bma). Aedeagus (aed) rather long, parallel-sided or even broadening slightly at apex where clearly broader than penial sheath. Penial sheath without fine ridges but with some small setae (pss) on each side and some small sensilla (psp) posteriorly.

*Comments*. *Kwazulaclerda* is very similar to *Rhodesaclerda*, to which it is clearly closely related, but differs as follows (character state on *Rhodesaclerda* in brackets). *Adult female*: Presence of a pair of sclerotized brachial plates (absent); absence of pocketlike pouches (present). *Second-instar female*: Multilocular disc-pores extending laterally onto dorsum (restricted to venter); invaginated conical pores on anal cone throughout (restricted to pocketlike pouches); absence of pocketlike pouches (present). *Crawler*: A conelike sclerotization present around anal area (absent); marginal setae with a notch on each margin (notch absent). *Pupa*: Lobes of abdominal segment VII as long as and extending around penial sheath (lobes not extending around penial sheath). *Adult male*: Presence of genal setae (absent); apical antennal segment shorter than subapical segment (apical segment at least twice as long as subapical); postmesopiracular setae present (absent); tegula present (absent); membranous area on scutum triangular (rectangular); reticulations on scutum laterad to scutellum present (absent); furca with long arms (arms much shorter); metepimeron absent (present); penial sheath without longitudinal ridges (ridges present dorsally and laterally); apex of penial sheath narrower than apex of aedeagus (penial sheath broader than apex of aedeagus).

*Etymology*. The genus name is derived from *KwaZulu*, which refers to Kwazulu-Natal, the area of South Africa where the species below was collected, and *-aclerda* from genus *Aclerda* to which it appears to be related.

*Comment*. This genus currently contains only the type species, *K. loranthi* Hodgson & Millar described as new below.

### ***Kwazulaclerda loranthi* Hodgson & Millar, sp.n.**

*Adult female* (Fig. 16; for other abbreviations see Fig. 3). Described from 9 adult females, mostly in excellent condition. *Unmounted material*: Not seen. *Mounted material*: Head rounded; body apparently widest dorsolaterally on thorax, narrowing posteriorly to a heavily sclerotized anal cone but with a deep waist in thoracic area along ventral margin; brachial plates large; live material probably convex. Length about 1.07–1.5 mm; breadth across thorax perhaps 675–875 µm; without an obvious anal cleft and marginal stigmatic areas. *Dorsum*: Dorsal setae (A) mostly rather short and fine, fairly frequent throughout, largest near margin. Dorsal pores: bilocular pores (W) each 6–8 × 5–7 µm, inner ductule about 14–16 µm long; abundant throughout but most frequent near margin; and simple pores (D) fairly frequent throughout. Brachial plates (bp) 210–315 µm long, 80–140 µm wide, with numerous (100+) small pores which open into a larger multilocular disc-pore (K) beneath. Anal cone (G) about 265–330 µm long, 207–300 µm wide, but with a less sclerotized area basally, about 25 µm wider; anal cone with 2 or 3 concentric rings of pointed invaginated conical pores (H), each deeply embedded in derm, totalling perhaps 40 pores; also with a series of long setae (28–50 µm long), particularly concentrated around oval central orifice (oor); outermost areas of cone with a few small pores, structure unknown. Anus with a distinct anal tube (at), about 17–34 µm long, 35 µm wide, lying in a chamber within sclerotized anal cone, and from which about 20–25 long (220–265 µm), rather fleshy, probably flattened, anal-ring setae (R) protrude some distance out of chamber. Within anal cone, a bifurcated structure which might be an inner ventral groove (vg) or an apodeme (ap) or both extends anteriorly from anal area. *Margin*: As for generic diagnosis. *Venter*: Spiracular disc-pores (L) about 7–8 µm wide, usually with 5–8 loculi; in a tight group of at least 50 disc-pores lying within a spiracular cavity just anterior to peritremes. Multilocular disc-pores (K) about 9 µm wide, larger than spiracular disc-pores, each with 5–10 loculi; present in a group extending from base of brachial plate medially around anterior spiracles and joined posteriorly to labium, with a few extending to near antenna and also with a group near posterior spiracles; also present throughout brachial plates (bp). Other ventral pores: bilocular pores (W) present throughout much of venter, most common submarginally and least common medially, particularly on head; and ventral microducts (M) about 5–6 µm wide, with inner ductule 16–23 µm long; present in a submarginal band, with 63–76 pores around head between anterior spiracles; also with 2–4 just posterior to labium. Ventral setae (Q) with basal sockets perhaps subtly different from those of dorsal setae, but still broad; longest setae present posteriorly on abdomen; with groups of setae medially on abdominal segments (II perhaps 5–8; III 2–4; IV 4 or 5; V 7–9; VI 4–6); with about 5–10 setae along anterior margin of spiracular cavities; otherwise fairly frequent elsewhere on venter. Antenna (S) with basal segment about 20 µm wide, surface of segment with convex bumps and about 5–8 stout fleshy

setae 13–22 µm long. Clypeolabral shield 254–290 µm long. Spiracles with peritremes perhaps 23–27 µm wide. Legs (U) represented by groups of setae with strongly sclerotized basal sockets that coalesce (width of metathoracic group about 11–16 µm).

*Comments.* The adult female of this species is immediately separable from those of *Rhodesaclerda* species by the presence of the large brachial plates and absence of pocketlike pouches. However, it shares with *R. halli* the long anal-ring setae, which appear to be flattened and protrude through the outer anal cone orifice.

*First-instar nymph* (Fig. 17; for abbreviations see Fig. 4). Described from 2 specimens in good condition. *Unmounted material:* Not seen. *Mounted material:* Elongate-oval, perhaps slightly more pointed posteriorly. Body 445–460 µm long, 241–260 µm wide. *Dorsum:* Dorsal setae: with 3 pairs of setae mediolaterally on head and 3 pairs on thorax. Dorsal pores: small open pores (D) mainly present in a submarginal band, with 1 pore per segment, 1 pair mediolaterally on head and 2 pairs mediolaterally on thorax, in line with setae; and pores with several inner ductules (E) present in a submarginal band rather similar to (D) but a little farther from margin. Anal area (G): anal cone 53–58 µm long, 62 µm wide; longest anal lobe setae on membranous areas probably at least 200 µm long, but all broken on available specimens; innermost shorter pair of anal lobe setae 10–14 µm long; outermost pair 25–30 µm long; with a pair of minute setae and a pair of minute pores on anterolateral margin of anal opening. *Margin:* As for generic diagnosis, but marginal setae (J) 8–10 µm long. Eyespots 11–13 µm wide. *Venter:* Spiracular disc-pores (L) with mainly 3 loculi near spiracle and 5 loculi near margin, disc-pores lacking a central loculus; anterior disc-pore bands with 2 disc-pores and posterior bands with 3 or 4 disc-pores. Other ventral pores: with 2 pairs of very small (uni- and possibly bilocular) pores (Y) near margin anterior to scape; ventral microducts not detected but probably present mediolaterally between pro- and mesocoxae. Ventral setae as in diagnosis; long setae medially on abdominal segment VII 9–12 µm long; setae medially near scape 18–22 µm long. Antenna (S) 103–115 µm long; flagellate seta on segment VI (lfs) rather short, about 31–43 µm long; apical setae (as) 26–33 µm long. Clypeolabral shield 100 µm long. Spiracles with peritremes about 3–4 µm wide; length of muscle plates 29–38 µm. Legs (U) as in diagnosis, length of metathoracic coxa 39–47 µm (length of longest coxal seta (cs) 21–24 µm); trochanter + femur 68–73 µm (length of long trochanter seta (trs) 40–43 µm); tibia 38–40 µm; tarsus 31–35 µm; claw 17–21 µm.

*Comments.* The crawler of *K. loranthi* is similar to the first-instar nymphs of *Rhodesaclerda* species except that those of the former species have a sclerotized anal cone surrounding two apical membranous areas that probably represent the apex of the anal lobes, whereas there are only small areas of sclerotization present on *Rhodesaclerda*, possibly representing anal plates, and the marginal setae of *K. loranthi* have notches on both margins that are absent on known species of *Rhodesaclerda*.

*Second-instar female* (Fig. 18). Described from 9 specimens in excellent condition. *Unmounted material:* Not seen. *Mounted material:* Anterior end of body bluntly rounded, thorax apparently parallel-sided laterodorsally, narrowing to anal cone posteriorly, but ventral margin with a deep waist in thoracic region; body length 950–1300 µm; breadth at widest point across thorax 525–650 µm; with a heavily sclerotized anal cone on postero-dorsal surface of abdomen, through which anal complex opens. Legs and antennae very reduced. *Dorsum:* Derm membranous throughout, except for sclerotized anal cone. Dorsal setae (A) each very short, length 2–3 µm, about equal to width of basal socket but longer near margin and around anal cone (each up to 9 µm). Dorsal pores: bilocular pores (W) about 7 µm wide, inner ductule 11–12 µm long (but many pores with inner ductules apparently missing or absent); frequent throughout but most abundant near margin; and small simple pores (D) occasional, probably throughout. Anal cone (G) with a series of 3 or 4 sclerotized concentric rings (scl) and a narrow less sclerotized area laterally; innermost ring surrounding central anal orifice heavily sclerotized, with 2 or 3 pairs of long setae laterally and ventrally; next innermost concentric ring with 6–10 invaginated conical pores on each side, these deeply embedded in sclerotized derm; outermost rings with 0 or 1 invaginated conical pores and a few minute pores and flagellate setae; apparently without a posteroventral pocket-like pouch on either side of anal cleft; length of anal cone 180–210 µm, width of heavily sclerotized area 130–165 µm, width including less sclerotized margin up to 190 µm. Structure of inner anal complex unclear but without obvious sclerotized anal tube apodemes. Anal ring (ar) 17–20 µm wide with some small radial marks; no anal-ring setae seen. *Margin:* As in generic diagnosis for adult female. Eyespots not detected. *Venter:* Spiracular disc-pores (L) with 5–8 loculi, in a group of 5–10 lying within a spiracular cavity anterior to each peritreme. Multilocular disc-pores (K) larger than spiracular disc-pores, with 4–8 loculi, present in a triangular group of 57–74 laterad to and between spiracles and extending laterad onto dorsum. Ventral pores: bilocular pores (W) scarce, with a few mediolaterally on head and an elongate group anterior to anus; and ventral microducts (M) about 3–5 µm wide; inner ductule divided into 2 or 3 long thin ductules, about 18–21 µm long; with 17–48 microducts around head between anterior spiracles; also present dorsad to group of multilocular disc-pores, with 6–10 present within each group plus 1 or 2 on either side of labium. Ventral setae (Q) sparse medially on head; with a few near each 'leg' and present medially on most abdominal segments, with 0–2 pairs on segments II and III and 1 or 2 pairs on segments IV–VI. Antenna (S) with basal segment about 18–21 µm wide, with about 5 long fleshy setae (each 10–20 µm long) + 0 or 1 setose seta. Clypeolabral shield 161–175 µm long; labium occasionally twisted to one side, with 3 pairs of setae. Spiracles (S) with peritremes about 16–19 µm wide and muscle-plate apodemes 38–48 µm long. Legs (U) reduced to a small sclerotized areas of derm with a few setae.

*Comments.* The second-instar female nymphs of *K. loranthi* differ from those of *Rhodesaclerda* species as follows (character state on *Rhodesaclerda* species in brackets): invaginated conical pores present throughout sclerotized part of anal cone (absent); pair of pouchlike cavities absent posteriorly on anal cone (pouchlike cavities present); bilocular pores present ventrally (absent); group of multilocular disc-pores present between spiracles extending laterally onto the dorsum (restricted to near spiracles on venter).

*Second-instar male* (Fig. 19). Described from 7 specimens in excellent condition. *Unmounted material*: Not seen. *Mounted material*: Anterior end of body roundly pointed, thorax apparently parallel-sided, narrowing to anal cone posteriorly; however, thorax with a shallow waist ventrally; length 725–1225 µm; breadth at widest point of thorax 450–638 µm; with a moderate-sized heavily sclerotized anal cone on posterodorsal surface of abdomen. *Dorsum*: Dorsal setae (A) very short, 2–3 µm long, about equal to width of basal sockets; occasional throughout, most common near margin. Dorsal pores: bilocular pores (W) about 5–6 µm wide, with a stout inner ductule 11–14 µm long; frequent throughout but most abundant near margin; and simple pores (D) frequent throughout. Anal cone (G) with a series of 4–6 sclerotized concentric rings and a less sclerotized area laterally; length of anal cone 140–155 µm; width of heavily sclerotized area 136–166 µm, width of cone (including less sclerotized margin) up to 360 µm; innermost ring surrounding orifice to anal complex heavily sclerotized, with perhaps 4 pairs long setae situated laterally and ventrally; next innermost concentric ring with 5–9 invaginated conical pores (H) on each side, these deeply embedded in sclerotized derm; outermost rings each with 0 or 1 invaginated conical pores and a few minute pores and flagellate setae; pocket-like pouch absent from each side of anal cleft; with a moderate-sized central orifice posteriorly which opens into an inner chamber. Structure of inner anal complex unclear but without any obvious sclerotized ventral groove or apodemes. Anal ring 13–15 µm wide, with some small radial marks; no anal-ring setae seen. *Margin*: As for adult female diagnosis. Eyespots not detected. *Venter*: Spiracular disc-pores (L) with 4–7 loculi, present in a group of 4–6 within spiracular cavities. Multilocular disc-pores (K) larger than spiracular disc-pores, with 4–8 loculi; present in a group of 29–43 mainly laterad to anterior spiracle but with a few anterior to both anterior and posterior spiracles. Other ventral pores: bilocular pores (W) scarce, with a few medio-laterally on head, 1–4 medially on each thoracic and abdominal segment and with a submarginal line on each side of abdomen; and ventral microducts (M) about 3–5 µm wide, with a short inner ductule that splits into 2 or 3 long thin ductules, 18–25 µm long; with 11–20 microducts around anterior margin of head between anterior spiracles; with 4–6 laterad to main group of multilocular disc-pores but apparently without microducts near labium. Ventral setae (Q) sparse medially on head; with a few near each 'leg' and medially on most abdominal segments, with 1 pair on segments II–IV and 1 or 2 pairs on segments V and VI.

Antenna (S) with basal segment about 13–18 µm wide, with 5 or 6 long fleshy setae, each 13–18 µm long, plus 0 or 1 setose seta. Clypeolabral shield 267 µm long; labium occasionally twisted to one side, with 3 pairs of setae visible. Width of spiracular peritremes about 12 µm; length of muscle-plate apodemes 30–35 µm. Legs (U) reduced to a small sclerotized area of derm 9–23 µm wide, with 4–7 setae.

*Comments.* The second-instar male nymphs of *K. loranthi* differ from those of *R. combreticola* in (character state on latter in brackets): lacking anal platelike structures (present); invaginated conical pores present throughout sclerotized part of anal cone (absent); bilocular pores present ventrally (absent); multilocular disc-pores in a group on thorax extending around anterior spiracles (in a tight group anterior to posterior spiracles only).

*Pupa* (Fig. 20; for abbreviations see Fig. 8). Described from 3 specimens, one young specimen in good condition, one in fair condition but broken in half and a third old specimen with a poorly cleared male internally. *Unmounted material*: Not seen. *Mounted material*: Elongate, rounded at head end, rather bluntly pointed posteriorly. Length 1.0–1.33 mm, width across wing-buds 500–750 µm. *Head*: Very short, posterolateral margin marked by a small diagonal line on derm. Antenna 266–350 µm long; apparently with 5 distinct segments plus a longer terminal segment on which segmentation obscure (ratio of total body length to antennal length 1:0.36). Setae on head not found. *Thorax*: Length of metathoracic leg 318–419 µm. Wing-buds (wb) normally developed, 304–552 µm long, 74–146 µm wide. Spiracles (sp<sub>2</sub>, sp<sub>3</sub>) with peritremes about 18–20 µm wide, and 3 or 4 spiracular disc-pores (spdp) associated with each spiracle. Setae: with 2 pairs medially on dorsum of prothorax, 1 pair mediolaterally on meso- and metathoraces; no ventral setae detected. *Abdomen*: Segments V–VII distinctly sclerotized dorsally, sclerotized area almost round (length 225–290 µm, width 207–300 µm); sometimes with a slight indentation between segments IV and V marginally; dermal spinules (ds) on posterior sclerotized segments very clear. Setae as in generic diagnosis, but apparently with 1 pair of dorsopleural setae (dps) on segments III and IV and 1 pair of ventropleural seta (vps) on each side of all segments. Segment VII with an elongate group of 1–7 fs + 0 or 1 hs dps on each lobe (ce); each lobe curving around penial sheath posteriorly. Penial sheath (ps) 50–67 µm long, 60–68 µm wide (ratio of length to breadth about 1:1.1); apparently without either minute setae or pores on dorsal surface; genital opening possibly present near apex on ventral surface.

*Comments.* The pupa of *K. loranthi* is very similar to that of *Rhodesaclerda* species, and shares with them: antenna apparently six- to eight-segmented; dorsum of posterior four abdominal segments sclerotized and significantly different from more anterior segments; spiracular disc-pores present associated with at least the posterior spiracles; absence of ante-anal setae; minute setae on venter forming a line at least from metathorax to abdominal segment VII; presence of fleshy setae on lobes of abdominal segment VII; lobe of abdominal segment VIII well developed and sclerotized; penial sheath short and squat. The pupa of



*K. loranthi* differs from those of *Rhodesaclerda* species in that the lobes of abdominal segment VII on the former species are as long as the penial sheath and extend medially around it, whereas these lobes are shorter than the penial sheath on *Rhodesacerda* species.

There is a significant difference in size between the young and old pupae, particularly in the length of the wing-buds, which were about twice as long on the old specimen. All other measurements were also greater on the old specimen. It is obvious that quite a lot of growth can occur to the legs, antennae and wing-buds during this stage.

**Adult male** (Fig. 21; for abbreviations see Figs 2, 9, 15). Described from one specimen in excellent condition. **Mounted material:** Body length 1.38 mm; thorax proportionately slightly narrow; fleshy setae (fs) scarce except on antennae and ventrally on metathorax and abdomen; with a few small convex dorsal pores (dp). **Head:** Approximately round to 6-sided. Median crest (mc) with weak reticulations, most reticulations 'broken'; with 1 or 2 pairs of hair-like (hs) dorsal head setae (dhs) and 7 or 8 pairs of dorsal convex pores (dp). Mid-cranial ridge with ventral ridge (vmcr) extending posteriorly to ocular sclerite; area laterad to ventral mid-cranial ridge slightly ridged or weakly reticulated; with 0 or 1 hs ventral mid-cranial ridge setae (vmcrs) on each side. Gena (g) each with 5 hs genal setae + 1 dp. Dorsal (dse) and ventral simple eyes (vse) subequal in width, 33–38 µm wide. Ocelli (o) oval, greatest width 41–48 µm. Ocular sclerite (ocs, C) reticulations without inner ridges. Preocular (procr) and postocular ridges (pocr) as in generic diagnosis. Ventral head setae (vhs) with about 7 or 8 fs + 9 or 10 hs anterior to and on each side of ventral simple eyes but with no setae between or posterior to ventral eyes. Cranial apophysis (A; ca) 108 µm long. **Antenna:** 8-segmented, rather short; 625 µm long (ratio of total body length to antennal length 1:0.45). Scape (scp) 49–52 µm long, 53–55 µm wide, with 2 fs on ventral surface and 2 hs on dorsal surface. Pedicel (pdc) 48–50 µm long, 41–44 µm wide, without polygonal reticulations but with 4 or 5 fs + 5–7 hs. Segments III–VI 21–25 µm wide; fs a little longer than width of antennal segments, about 28–32 µm long; length (µm) of segment III 75; IV 116–125; V 91–95; VI 70–88 and VII 86–103; number of setae on segment III 10 or 11 fs + 3 or 4 hs; IV 20 fs + 3 hs; V 11–15 fs + 3 hs; VI 11–16 fs + 2–4 hs and VII 19–22 fs, 2 or 3 hs + 1 bristle. Segment VIII (F) short, 66–68 µm long; not constricted apically; with 3 capitate setae (caps), 3 large + 2 small antennal bristles (ab), 10 fs + 0 or 1 hs + 2 sensilla basiconica (sb), both near base of bristles. **Prothorax:** Lateral pronotal setae (lpns) with 0 or 1 hs on each side. Presence of post-tergites uncertain. Small convex pores absent. Sternum (stn<sub>1</sub>) with no prosternal setae. **Mesothorax:** Prescutum (prsc) length uncertain but perhaps about 95 µm long and 128 µm wide. Scutum (sct) with median membranous area approximately triangular in shape, length 66 µm, width 145 µm; with 3 hs scutal setae; membranous area with a small pore anteriorly on lateral sclerotized margins. Scutellum (scl) rectangular, 145 µm wide, 46 µm long; with 0 or 1 pair of scutellar setae (scls). Basisternum (stn<sub>2</sub>) about 219 µm wide, length 132 µm;

with a complete but very weak median ridge (mdr); without basisternal setae. Mesothoracic spiracles (sp<sub>2</sub>) with peritremes 19 µm wide. Postmesospiracular setae (pm<sub>2</sub>s): 1–3 hs + 2 dp on each side. Tegula (teg) well developed, with 6–10 tegular setae (tegs) on each side. **Metathorax:** With 1 hs metatergal seta (mts) but without dp. Episternum (eps<sub>3</sub>) unsclerotized but with 0 or 1 fs postmetaspiracular setae (eps<sub>3</sub>s) plus a group of 3 fs + 1 hs more medially. Metepimeron (epm<sub>3</sub>) small, without setae. Metathoracic spiracles (sp<sub>3</sub>) with peritremes 20 µm wide. Dorsospiracular setae (ds<sub>3</sub>s): 5 or 6 hs + 0 or 1 dp. Metasternum (stn<sub>3</sub>) with 4 fs + 4 hs anterior metasternal setae (amss) and 6 hs posterior metasternal setae (pmss). **Wing:** Narrow, length 1075 µm, width 325 µm (ratio of length to width 1:0.3; ratio of wing length to total body length 0.78:1); without alar lobes or alar setae. **Legs:** Metathoracic leg marginally longest. Coxae (cx) I 111–118; II 114; III 111–114 µm long; setae on coxa III 3 fs + 7 or 8 hs; long apical seta on each coxa about 35–47 µm long. Trochanter (tr) + femur (fm) I 207–210; II 223–226; III 240–243 µm long; trochanter III with 1–3 fs + 3–6 hs; long trochanter seta up to 38 µm; femur III with 1–5 fs + 13–19 hs. Tibia (ti) I 194–212; II 211–214; III 215–222 µm long; tibia III with about 37–41 setae, few fs, mainly hs, a few setae becoming spurlike on distal third of leg; apical spur (tibs) poorly differentiated, about 25 µm long. Tarsi (ta) I–III each 124–128 µm long (ratio of length of tibia III to length of tarsus III 1:0.58); tarsus III with 19–22 setae; tarsal spurs (tabs) about 23 µm long; tarsal digitules (tdt) not as long as claw. Claws (G, c) quite long and thin, much longer than width of tarsus, slightly curved, with a denticle (cd); length of III 35 µm; claw digitules slightly longer than claw. **Abdominal segments I–VIII:** number of dorsal setae (ads) (totals) on segment I absent; II 2 hs + 4 dp; III 2 hs + 6 dp; IV 2 hs + 3 dp; V 2 hs + 3 dp; VI 1 hs + 0 dp; VII 1 hs + 0 dp. Dorsopleural setae (dps) on segment II absent; III 2 or 3 dp; IV 1 hs + 2–4 dp; V 0 or 1 hs + 0–2 dp; ventropleural setae (vps) on segments II and III absent; IV 0 or 1 hs; V 1 or 2 hs; VI + VII (dps + vps) 30–40 fs + 12 or 13 hs + 0 or 1 dp on each side. Ventral setae (totals) (avs) on segment II 9 fs + 7 hs; III 5 fs + 9 hs; IV 10 fs + 8 hs; V 14 fs + 8 hs; VI: 11 fs + 4 hs; VII 10 fs + 0 hs. Segment VIII (E) tergite (at) with 2 hs dorsal setae (ads) on each side; sternite (as) with 1 fs ventral abdominal seta (avs) on one side only; caudal extension (ce) of VIII lobelike and distinct, with 1 hs pleural seta. **Genital segment:** Penial sheath (ps) 228–235 µm long (plus sternite VIII); 104 µm wide at base of sternite VIII (ratio of total body length to penial sheath + sternite VIII length 1:0.16). Basal rod (bra) 147 µm total length. Aedeagus (aed) probably about 116 µm long (but apex bent on itself). Penial sheath without fine ridges; with about 9–11 small setae (pss) on each side of anterior part of penial sheath and about 24 small sensilla (psp) on posterior half.

**Comments.** The adult male of *K. loranthi* differs from the males of *Rhodesaclerda* in having (character state on *Rhodesaclerda* in brackets): genal setae present (absent); a very short apical segment on each antenna (unusually long); slight reticulation on scutum laterad to scutellum (reticulations absent); a triangular-shaped membranous

area on scutum (rectangular); postmesospiracular setae present (absent); several dorsospiracular setae on each side (with only a single seta on each side); few postmetaspiracular setae (frequent); apex of penial sheath narrower than apex of aedeagus (broader than apex of aedeagus); no longitudinal ridges on dorsal surface of penial sheath (penial sheath with longitudinal ridges dorsally).

**Etymology.** This species is named after the plant genus *Loranthus* (Loranthaceae) on which it was collected.

**Material examined.** Holotype, ♀, SOUTH AFRICA: Kwazulu-Natal, Hluhluwe, on *Loranthus dregei* (Loranthaceae), August 1970 (H.P. Insley) (SANC). Paratypes, as for holotype: 31 slides with 8 ad ♀, 9 2nd ♀, 8 2nd ♂, 2 1st, 3 pupae, 2 ad ♂. Depositions: single ad ♀ in USNM, BMNH and NMW; two second-instar females and two second-instar males in USNM and BMNH, and one first instar-nymph in USNM; remaining material in SANC.

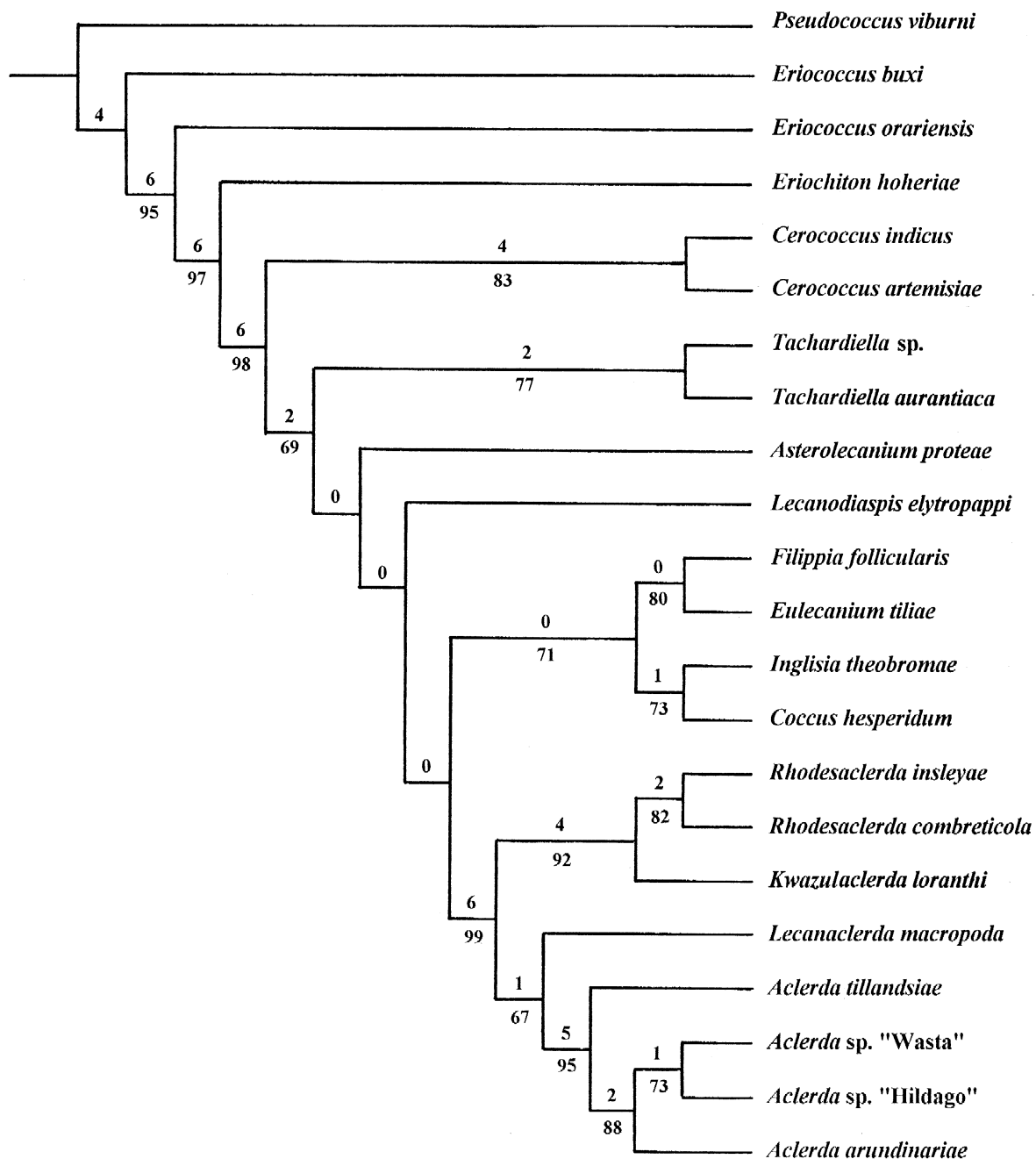
## Results of phylogenetic analysis and discussion

The phylogenetic analysis (based entirely on macropterous adult male characters) produced a single cladogram, length 287 steps, CI=42, RI=65 (Fig. 22). The cladogram has a single large terminal clade that consists of the two *Rhodesaclerda* species, *Kwazulaclerda loranhi*, *Lecanaclerda macropoda* and the four *Aclerda* species. This clade is supported by a bootstrap value of 99, a Bremer support value of 6 and by 16 character states (see Fig. 22), although only five are non-homoplasious: ch. 44(1), postnotal apophysis slitlike; ch. 57(1), pleurites present on one or more of abdominal segments II–VII; ch. 58(1), sternite VIII part of penial sheath, but not obviously so on *L. macropoda*; ch. 67(1), small convex pores present on abdominal tergites and pleurites, but apparently absent on *A. arundinariae*; and ch. 70(1), aedeagus broad at apex, but narrow on *R. insleyae* and *A. tillandsiae*. Nonetheless, the analysis strongly supports the view that *Rhodesaclerda* and *Kwazulaclerda* should be considered part of Acleridae, as was first suggested by McConnell (1954) for *Rhodesaclerda*.

In addition to the above male characters, there are a number of characters on the other growth stages that support this relationship: (1) as pointed out by McConnell (1954), the adult females share anal tube apodemes (median ventral sclerotized bars of McConnell, 1943), and apparently a telescoping anal tube, although this was not noted in this study (anal tube apodemes are also present associated with the anal plates of Coccidae, but the latter are much broader); (2) with the exception of *L. macropoda*, the adult female, second-instar male and female (+third-instar female?) nymphs all have the legs and antennae highly reduced or absent; (3) invaginated conelike pores (dorsal invaginated setae of McConnell, 1954), an important character of most *Aclerda* species, are present in the walls of the anal cone of adult female *Rhodesaclerda* and *K. loranhi*; (4) the spiracular disc-pores are more or less restricted to a cavity around the spiracular peritreme; (5) the ventral microducts may divide internally into several thin inner

ductules (rather more strongly developed in *Rhodesaclerda* and *Kwazulaclerda*); (6) the first-instar nymphs all have anal rings without anal ring setae; and (7) the presence of setae similar to marginal setae on the dorsum anterior to the anal area on first-instar nymphs (= anal lobe dorsal setae of McConnell on *Aclerda*). The presence of an anal platelike structure, divided longitudinally almost to its base, on *R. combreticola* also supports a relationship with Acleridae, where this character state is typical of the anal plates of all known African *Aclerda*.

However, the acclerid clade (Fig. 22) divides immediately at its basal node into two clades, one containing *Rhodesaclerda* species and *Kwazulaclerda loranhi* and the other with *Lecanaclerda macropoda* and the four *Aclerda* species. The *Rhodesaclerda* + *Kwazulaclerda* clade is supported a bootstrap value of 92, a Bremer support value of 4 and by 12 character states, whereas the latter is supported by a bootstrap value of 67, a Bremer support value of 1 and eight character states. The *Rhodesaclerda* + *Kwazulaclerda* clade has three non-homoplasious character states: ch. 11(1), ocelli large; ch. 15(1), antennae with seven or eight segments; and ch. 66(2), pleural setae abundant on posterior abdominal segments only. In addition, this clade is supported by ch. 3(2), convex pores present on median crest, but also present on *L. macropoda*; ch. 10(0), interocular ridge present, shared with *Pseudococcus viburni* and the two *Cerococcus* species, although the structure on the latter three species is quite different; ch. 16(0), presence of hairlike setae on antenna segments III+, a reversal; ch. 26(1), presence of a post-tergite, a reversal; ch. 42(0), few anterior metasternal setae, a reversal; ch. 55(1), tergites on abdominal segment VIII present, shared by several taxa arising from more basal nodes; ch. 61(1), caudal extension to abdominal segment VIII large and distinct, only shared by *Coccus hesperidum*; ch. 63(2), glandular pouch absent, but with a long seta on abdominal segment VIII in this position, also found on *Lecanodiaspis elytopappi* and *L. macropoda*; and ch. 64(1), with many fleshy setae on abdominal sternites, also present on *Inglisia theobromae*. Two other characters not included within the data matrix may also be important, namely: articulation of tibia and tarsus with an area of sclerotization, and the basal rod extending from the basal membranous area posteriorly almost to the apex of the aedeagus. In addition, the other growth stages of members of this clade have a number of unique characters with respect to other Coccoidea: (1) the sclerotized anal cone, which appears to be formed from a sclerotization of the dorsum just anterior to the anal complex plus the two anal lobes (rather similar to the 'caudal process' in the coccid genus *Ceroplastes*) (it seems possible that the concentric rings on this cone could be growth rings, although it is unlikely that they equate to moults and instars); (2) the structure of the sclerotized bilocular pores (and to a lesser extent the ventral microducts) is quite different to pores on any other coccoid known to the authors; (3) the retraction of the spiracles into a cavity, which opens medially beneath the thorax, would also appear to be unique; (4) on the pupae, the sclerotization of the dorsum on the posterior four abdominal segments is



**Fig. 22.** The single most parsimonious cladogram, *Pseudococcus viburni* as outgroup, with twenty-two other taxa and seventy-six characters from macropterous adult males only. Character states unordered. Length 287 steps, CI = 42, RI = 65. Numbers above lines refer to Bremer support values; those below lines refer to Bootstrap values above 50.

apparently unique, and (5) the seven- or eight-segmented antennae on the pupae are also highly unusual.

The *Lecanaclerda* + *Aclerda* clade has three non-homoplasious character states, namely: ch. 9(2), postocular ridge extending only a short distance past ocelli; ch. 12(3), cranial apophysis very long, extending almost to level with dorsal simple eyes; and ch. 13(2), apex of cranial apophysis with

3 + small divisions. In addition, this clade is supported by: ch. 5(1), short mid-cranial ridge, reversed on *A. tillandsiae* and also found on several taxa arising from more basal nodes; ch. 8(1), genal setae few, also present on *K. loranthi* and *Eriococcus orariensis*; ch. 23(0), prosternal setae few, a reversal; ch. 24(0), absence of a median ridge on prosternum, a reversal; and ch. 56(1), more than half tergites II–VII

sclerotized. The adult female and other growth stages also share a few unique features: (1) the sclerotized and crenulated posterior margin to the abdomen; (2) a single median anal plate; (3) a ventral groove beneath the anal opening; and (4) a strong reduction in the antennae and legs (except *L. macropoda*).

Thus, within Acleridae, there are two major clades that differ in a number of significant ways, even when considering just the male characters. A new subfamily is here introduced, Rhodesaclerinae, to include *Rhodesaclerda* and *Kwazulaclerda*, and Aclerinae Cockerell now includes *Aclerda*, *Lecanaclerda* and *Nipponaclerda* (which, although not considered in this paper, clearly belongs here). Rhodesaclerinae are known only from Combretaceae and the mistletoe families Loranthaceae and Viscaceae, whereas Aclerinae are mainly found on Gramineae, but with a few on other monocots: one species on Cyperaceae, two on Orchidaceae and one on Bromeliaceae. The new subfamily is formally defined after this discussion, along with a brief diagnosis and a key to aclerid genera.

Within Rhodesaclerinae, the adult male of *Kwazulaclerda* differs from those of the two species of *Rhodesaclerda* in twelve character states, most of which are shared with Aclerinae. However, in addition to the male characters used in this analysis, the female differs significantly from female *Rhodesaclerda* species, most particularly in having a large sclerotized plate (here referred to as a brachial plate due to its superficial similarity to those on Kerriidae), which extends from the spiracles onto the dorsum and contains a large number of multilocular pores, and also in lacking pouchlike cavities with conical pores posteriorly on the anal cone. In addition, the first-instar nymph has a sclerotized area around the tips of the anal lobes, which is also unique. Although *K. loranthi* shares many characters with species of *Rhodesaclerda*, it is considered that these differences are sufficient to justify the new genus.

Within Aclerinae, male *Lecanaclerda macropoda* differ from the males of the four *Aclerda* species included here in possessing some eight character states, which are shared either with Rhodesaclerinae or taxa arising from nodes near the base of the cladogram. As the female differs from all known *Aclerda* species in possessing well developed legs and antennae, it is thought that this new species should also be included in a new genus. Stages other than the adult male and female are not currently known for this species. However, the adult female shares some character states with the adult females of *Aclerda*, particularly: (1) the presence of tubular ducts on the dorsum and venter (absent on members of Rhodesaclerinae), and (2) the crenulated and sclerotized posterior margin of the abdomen (which forms part of the anal cone in Rhodesaclerinae). Adult females of *L. macropoda* and *Nipponaclerda biwakensis* (Kuwana) share the absence of invaginated conical pores, but they differ in a number of other features, most notably the presence of fully developed legs and antennae in the former species.

Another clade, containing the four coccid species, forms the sister group to the aclerid clade. This coccid clade shares five character states with the aclerid clade, namely:

ch. 19(1), absence of a postoccipital ridge, also absent on *Cerococcus artemisiae*; ch. 32(2), scutellum more or less tubular, also apparently shared with *Asterolecanium proteae*; ch. 34(1), median ridge of basisternum present, reversal on the two *Aclerda* species and also present on *Asterolecanium proteae*; ch. 41(1), postmetaspiracular setae few, reversal on the *Aclerda* species from Wasta, and also present on *Tachardia aurantiaca*, *Eriococcus buxi* and *Cerococcus indicus*; ch. 48(1), trochanter swollen and broader than base of femur, also present on *Asterolecanium proteae* and not developed on *Inglisia theobromae* and *Coccus hesperidum*. The Coccidae clade is diagnosed by six character states, four of which are non-homoplasious, namely: ch. 6(1), presence of lateral simple eyes, reversal on *C. hesperidum*; ch. 42(1), many anterior metasternal setae, but few on *F. follicularis* and *E. tiliae*; ch. 52(1), procoxal bristles present, absent on *Inglisia theobromae*; ch. 60(1), caudal extension on abdominal segment VII conspicuous, absent on *Inglisia theobromae*. The additional characters include: ch. 20(2), dorsal eyes significantly anterior to ventral eyes, also found on *Eriochiton hoheriae*, *Cerococcus indicus* and *Rhodesaclerda* species; and ch. 62(1), glandular pouch deep, also present on *Eriochiton hoheriae*, *Tachardia aurantiaca*, *Tachardiella* sp. and *Cerococcus indicus*. The characters chosen for the transformation series were those which were considered to be possibly shared by both Acleridae and Coccidae, but it is clear that none of the character states for the Coccidae + Acleridae clade are apomorphic for all four members of Coccidae, suggesting that Coccidae, although a sister group, may be more distantly related to Acleridae than had been suggested previously (see, for instance, Miller & Hodgson (1997), although Miller & Williams (1995) considered that Acleridae were more closely related to Micrococcidae than to Coccidae based on thirty-eight characters taken from the adult females, first-instar nymphs, adult males, life history and other data; Gullan & Cook (2001), using forty-three morphological characters of macropterous males, found that Lecanodiaspididae were closer to Coccidae than to Acleridae, whereas Foldi (1997), using fifty-four characters of the first-instars and adult males and females of twenty-five species, found that *Aclerda* was closest to *Tachardia*, but this clade formed a sister group to *Coccus*).

However, there are a few characters in the adult female and other 'sessile' stages of Acleridae and Coccidae that might be homologous. Most species in both taxa have anal plates lying over the anal opening, although Acleridae have only a single median plate whereas Coccidae have two (and anal plates appear to be absent on some Rhodesaclerinae). It is entirely possible, however, that these arose separately, as in Eriochitonini of Eriococcidae (Hodgson, 1995). In addition, the tarsal campaniform pore is present on most Coccoidea (Koteja, 1974) but has been lost in both Acleridae (first-instar nymphs and adult males) and Coccidae. The ventral microducts are also rather similar in that the pore opening lies at the end of a short outer ductule and there is a short inner ductule whose apex varies somewhat even within families. Clearly, more work needs to be done in this area.

**Aclerididae subfamily Aclerinae Cockerell:  
Balachowsky, 1942**

Type genus. *Aclerda* Signoret, 1874.

**Diagnosis.** Adult females: mainly occurring on Gramineae but also collected from other monocotyledonous plants; recorded from most geographical regions. Body generally elongate oval, 1.5–15.0 mm long. Dorsal derm becoming sclerotized at maturity, especially posteriorly on abdomen; dorsal setae, dorsal invaginated pores, dorsal tubular ducts and dorsal microductules generally present, occasionally absent; anal cleft short, with an anal plate at anterior end, anal plate sometimes deeply divided longitudinally, with a few pairs of long setae on dorsal surface; anal ring at outer end of telescoping tube, with long or short anal ring setae; anal area with 2 strongly sclerotized anal tube apodemes on either side of anal opening and extending anteriorly 1–2 × length of anal plate where they generally fuse; ventral tube present between anal tube apodemes. Marginal setae present, frequently tuberculiform, usually in an indefinite line 2 or more setae wide; stigmatic clefts absent; posterior margin of abdomen crenulated. Venter with ventral microducts and (generally) ventral tubular ducts; pregenital disc-pores absent (present on *Lecanaclerda*) but spiracular disc-pores always present, generally with a group within each spiracular peritreme; without long setae medially on pregenital abdominal segments. Antenna generally vestigial, rarely with up to 4 ringlike segments (fully developed in *Lecanaclerda*). Clypeolabral shield well developed; labium 1-segmented. Legs generally vestigial or absent (fully developed on *Lecanaclerda*). Spiracles large and prominent.

This subfamily contains three genera: *Aclerda* Signoret, with forty-seven species, *Nipponaclerda* McConnell with two species and *Lecanaclerda* Hodgson & Millar with one species.

**Aclerididae subfamily Rhodesaclerinae Hodgson & Millar, subfam.n.**

Type genus: *Rhodesaclerda* McConnell, 1954.

**Diagnosis.** Adult females: occurring on dicotyledonous plants, Combretaceae and mistletoe families Loranthaceae and Viscaceae; apparently restricted to southern Africa. Body basically oval but strongly waisted along ventral margin in thorax; body 1.5–4.0 mm long; derm membranous apart from a heavily sclerotized dorsal anal cone on posterior abdomen, each cone formed from sclerotization of anal lobes plus some dorsum anterior to anal area; anal cone with a central orifice opening into anal area with an anal ring with long or short anal ring setae; anal ring without (*Kwazulaclerda*) or with (*Rhodesaclerda*) a pair of pocketlike pouches, each with a few conical pores; anal cone composed of concentric rings of sclerotization, most rings with long setae and invaginated pores; anal platelike structures present or absent; anal ring on outer end of telescoping tube, with long or short anal ring setae; anal complex also with 2

strongly sclerotized anal tube apodemes on either side of anal opening and extending anteriorly where they fuse; a ventral tube probably present between anal tube apodemes. Dorsal derm with small setae, dorsal simple pores and larger bilocular pores, latter each bearing an inner ductule with a bushy glandular end; dorsal tubular ducts and dorsal microductules absent. Marginal setae absent. Anal cleft absent but margin strongly indented laterad to spiracles; stigmatic clefts absent; posterior margin of abdomen without crenulations. Venter membranous, with bilocular pores similar to those on dorsum and ventral microducts, each with an inner ductule which may divide into 2 or 3 long thinner ductules, mainly in a submarginal ring; ventral tubular ducts absent; larger multilocular disc-pores in a group on either side between spiracles, these abundant on *Kwazulaclerda* where they extend laterally onto dorsum, forming a heavily sclerotized brachial plate; without long setae medially on pregenital abdominal segments. Antenna vestigial, consisting of a basal segment with several fleshy setae. Clypeolabral shield well developed; labium 1-segmented. Legs generally vestigial or absent, each generally represented by a small group of setae and setal sockets. Spiracles lie within membranous cavities that open medially; spiracular peritremes without spiracular disc-pores but disc-pores present in a distinct group within each spiracular cavity; also with a few setae and ventral microducts along opening to spiracular cavity.

This subfamily contains two genera: *Rhodesaclerda* McConnell with three species and *Kwazulaclerda* Hodgson & Millar with one species.

**Key to genera in Aclerididae based on adult females**

1. Legs and antennae fully developed; pregenital disc-pores present across abdominal segments medially (Fig. 1) ..... *Lecanaclerda*
- Legs and antennae absent or very reduced; pregenital disc-pores absent ..... 2
- 2(1). Caudal region of abdomen with sclerotized cone; anal cleft absent; most abundant dorsal pore bilocular (Figs 3, 10, 16) ..... 3
- Caudal region of abdomen without sclerotized cone; anal cleft clearly present; most abundant dorsal pore not bilocular ..... 4
- 3(2). Thorax with a pair of sclerotized brachial plates extending laterally onto dorsum from near spiracles (Fig. 16) ..... *Kwazulaclerda*
- Thorax without a pair of sclerotized brachial plates extending laterally onto dorsum from near spiracles (Figs 3, 10) ..... *Rhodesaclerda*
- 4(2). Anal ring usually bearing about 10–20 anal ring setae, each longer than length of anal plate; marginal band of tuberculiform setae not complete, at least interrupted at anal cleft; dorsal conical pores (invaginated setae of McConnell, 1954) present ..... *Aclerda*
- Anal ring bearing 2 groups of 3–5 setae, each only about a third of length of anal plate; marginal band of tuberculiform setae complete, extending round dorsad

to anal plate; dorsal conical pores (invaginated setae of McConnell, 1954) absent.....*Nipponaclerda*

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## Appendix 1. Sources of data for the phylogenetic analysis.

1. *Aclerda arundinariae* McConnell. U.S.A.: Virginia, Princess Anne Co., W. Narrows Marina Seashore St. Park, on *Arundinaria* sp. 9.v. 1971, D.R. Miller & J.A. Davidson (USDA): 2 slides/4ad males in good condition.
2. *Aclerda* sp. Hildago. MEXICO: Michoacan, Hildago, 5mi. W. Ciudad, on grass, 7.iii. 1972, F.D. Packer (USDA, DRM #2214): 1 slide/2ad males in good to fair condition.
3. *Aclerda tillandsiae* Howell. U.S.A.: Georgia, Lowndes Co., Valdosta, ex *Tillandsia usneoides*, 4.xi. 1971, H.H. Tippins (Howell coll. no. JOH-22-72 a-e): 1 slide/1ad male unstained (reared out).
4. *Aclerda* sp. Wasta. U.S.A.: South Dakota, Pennington Co., Wasta, on Gramineae, D.R. Miller # 1841 (USDA): 1 slide/1ad male in good condition.
5. *Asterolecanium proteae* Giliomee & Munting. Giliomee & Munting, 1968; Giliomee, 1968.
6. *Cerococcus artemisiae* (Cockerell). U.S.A.: New Mexico, Embudo, on *Artemisia* sp., no date, Cockerell coll. (USDA, Cockerell coll.): 1 slide/1ad male in fair condition.
7. *Cerococcus indicus* (Maskell). INDIA: Anakapalli, ex *Hibiscus rosae-sinensis*, no date (USDA: E.E. Green coll, Let. December 9, 1929, 31-505): 1 slide/1ad male in poor condition.
8. *Coccus hesperidum* Linnaeus. Giliomee, 1967a: 92.
9. *Eriococcus buxi* (Fonscolombe). Afifi, 1968: 175.
10. *Eriococcus orariensis* Hoy. Afifi, 1968: 171.
11. *Eriochiton hoheriae* Hodgson. Hodgson & Henderson, 1996: 162.
12. *Eulecanium tiliae* (Linnaeus). Giliomee, 1967a: 37.
13. *Filippia follicularis* (Targioni Tozzetti). Giliomee, 1967a: 59.
14. *Inglisia theobromae* Newstead. Giliomee, 1967a: 88.
15. *Kwazulaclerda loranthei* Hodgson & Millar (this paper).
16. *Lecanaclerda macropoda* Hodgson & Millar (this paper).
17. *Lecanodiaspis elytropappi* (Munting & Giliomee). Munting & Giliomee, 1967; Giliomee, 1967b.
18. *Pseudococcus viburni* (Signoret) = *Pseudococcus obscurus* (Essig). Afifi, 1968: 131.
19. *Rhodesaclerda combreticola* McConnell (this paper).
20. *Rhodesaclerda insleyae* Hodgson & Millar (this paper).
21. *Tachardina aurantiaca* (Cockerell). THAILAND: Bangkok, ex *Ziziphus mauritiana* stems, 24.iv. 1973, K.L. Machler (USDA); 2 slides/2ad males in fair condition.
22. *Tachardiella* sp. MEXICO: Tampico, unknown host, 8.vii. 1891, D. Riley (USDA, Brownsville 27512/9506955): 1 slide/1ad male in fair condition.

## Appendix 2. Characters and character states.

### Head

1. *Body length*: (0) small (<1.41 µm); (1) intermediate; (2) large (>1.71 µm).
2. *Median crest fleshy setae*: (0) present; (1) absent.
3. *Median crest pores*: (0) multilocular; (1) absent; (2) convex.
4. *Mid-cranial ridge dorsally*: (0) well developed; (1) small; (2) absent.
5. *Mid-cranial ridge ventrally*: (0) well developed (almost or actually reaching ocular sclerite posteriorly); (1) small (not nearly reaching ocular sclerite posteriorly); (2) absent.
6. *Lateral eyes*: (0) absent; (1) present.
7. *Genae reticulations*: (0) absent; (1) present.
8. *Genae setae*: (0) >10; (1) <10; (2) absent.
9. *Postocular ridge, extension medially past ocelli*: (0) long (almost reaching median crest); (1) intermediate (barely reaching ocelli); (2) not reaching ocelli.
10. *Inter-ocular ridge*: (0) present; (1) absent.
11. *Ocelli*: (0) small; (1) large; (2) absent.
12. *Cranial apophysis*: (0) short (about as long as broad); (1) intermediate (not quite reaching posterior eyes); (2) long (extending anteriorly past posterior eyes but not reaching anterior eyes); (3) very long (extending to approximately level with dorsal eyes).
13. *Cranial apophysis apex*: (0) blunt; (1) bifurcate; (2) trifurcate.
14. *Scape setae number*: (0) more than 4; (1) usually 4; (2) usually 3; (3) other.
15. *Antennal segments*: (0) 9 or 10; (1) 8 or fewer.
16. *Antenna, hs on segments IV-IX*: (0) present; (1) absent.
17. *Preoral ridge*: (0) slender or vestigial; (1) well developed.
18. *Ventral head seta, between or posterior to ventral eyes*: (0) present; (1) absent.
19. *Postoccipital ridge*: (0) present; (1) absent.
20. *Dorsal eyes, position*: (0) level with ventral eyes; (1) just anterior to ventral eyes; (2) significantly anterior to ventral eyes.

### Thorax

21. *Pores*: (0) multilocular; (1) absent; (2) convex.
22. *Prosternum*: (0) sclerotized; (1) unsclerotized.
23. *Prosternal setae*: (0) <5 pairs; (1) >5 pairs; (2) absent.
24. *Prosternal median ridge*: (0) absent; (1) short or incomplete; (2) long.
25. *Prosternal transverse ridge*: (0) present; (1) absent.
26. *Post-tergite*: (0) present; (1) absent.
27. *Pronotal ridge*: (0) interrupted; (1) fused.
28. *Pronotal sclerite*: (0) well developed; (1) small; (2) absent.
29. *Membranous area of scutum*: (0) absent; (1) long and nearly square; (2) short and rectangular (width more than twice length).

30. *Scutum, reticulations on margins laterad to scutellum*: (0) absent; (1) present.
31. *Scutum, scutal setae*: (0) present laterally; (1) absent; (2) <5; (3) >5.
32. *Scutellum*: (0) scutellar ridge weak or absent; (1) scutellar ridge well developed; (2) scutellum more or less tubular.
33. *Scutellar setae*: (0) present; (1) absent.
34. *Basisternum, median ridge*: (0) absent; (1) incomplete or weak; (2) well developed.
35. *Basisternum, setae*: (0) >5; (1) <5; (2) absent.
36. *Basisternum, length of arms of furca*: (0) short; (1) intermediate; (2) long.
37. *Basisternum, degree of divergence of arms of furca*: (0) wide (almost at 45° to median line of insect); (1) intermediate; (2) parallel or almost parallel to each other.
38. *Postmesospiracular setae*: (0) present; (1) absent.
39. *Hamulohalteres*: (0) present; (1) absent.
40. *Dorsospiracular setae*: (0) absent; (1) present.
41. *Postmetaspiracular setae*: (0) absent; (1) <5; (2) >5.
42. *Anterior metasternal setae*: (0) few; (1) many; (2) absent.
43. *Lateropleurite*: (0) narrow (width less than half length); (1) intermediate; (2) broad (as wide as or wider than long).
44. *Postnotal apophysis opening*: (0) well developed and almost round; (1) slitlike.
45. *Metepimeron*: (0) well developed; (1) absent.
46. *Wings*: (0) broad, about  $\leq 2.3 \times$  width; (1) narrow, generally more than  $2.5 \times$  width.
47. *Legs*: (0) 30–40 setae per femur; (1) >40 per femur; (2) <30 per femur.
48. *Legs, trochanter width*: (0) narrow, about as wide as proximal end of femur; (1) wide, much broader than proximal end of femur.
49. *Legs, tibial spurs*: (0) 2 or more per leg; (1) 1 per leg; (2) absent.
50. *Legs, claw*: (0) not at angle to tarsus; (1) intermediate; (2) held almost at right angles.
51. *Legs, claw denticle*: (0) absent; (1) present.
52. *Legs, procoxal bristles*: (0) absent; (1) present.
53. *Mesopostnotal sclerotization*: (0) absent; (1) present.
54. *Spiracular disc-pores*: (0) absent; (1) present.

## Abdomen

55. *Tergites on segment VIII*: (0) present; (1) absent.
56. *Tergites on segments II–VII*: (0) almost entirely absent; (1) more than half sclerotized.
57. *Pleurites on segments II–VII*: (0) absent; (1) present on 1 or more.
58. *Sternites on segment VIII*: (0) sclerotized; (1) incorporated into penial sheath; (2) unsclerotized.
59. *Sternites on segments II–VII*: (0) unsclerotized; (1) more than half sclerotized.
60. *Caudal extension to VII*: (0) absent or inconspicuous; (1) conspicuous.
61. *Caudal extension to VIII*: (0) absent or inconspicuous; (1) conspicuous.
62. *Glandular pouch*: (0) shallow; (1) deep; (2) absent.
63. *Glandular pouch setae*: (0) normal glandular pouch setae present; (1) long setae present but without glandular pouches; (2) long setae in this position absent.
64. *Fleshy setae: ventral abdominal setae*: (0) few (<5 per segment); (1) many (>5 per segment); (2) absent.
65. *Hairlike setae, dorsal abdominal setae*: (0) 3 or fewer pairs per segment; (1) more than 3 pairs per segment; (2) absent.
66. *Pleural setae*: (0) about equally abundant on all abdominal segments; (1) few on posterior segments only; (2) abundant on posterior segments only.
67. *Abdominal pores*: (0) loculate, restricted to margins; (1) convex, not loculate, on tergites and laterally; (2) absent.
68. *Penial sheath length*: (0) short (>1.5 body length); (1) intermediate; (2) long (<0.2 body length).
69. *Aedeagus length*: (0) long (>0.5 length of penial sheath); (1) intermediate; (2) short (<0.25 length of penial sheath).
70. *Aedeagus width*: (0) narrow; (1) broad.
71. *Basal rod length*: (0) long (extending over half length of penial sheath); (1) intermediate; (2) short (<0.2 length of penial sheath).
72. *Anal ring*: (0) indistinct, without an obvious sclerotized ring; (1) with an obvious sclerotized ring.
73. *Setae on penial sheath, length on anterior half*: (0) intermediate; (1) long (>30 µm long); (2) short (barely visible, <3 µm long); (3) absent.
74. *Setae on penial sheath, length on posterior half*: (0) intermediate; (1) long (>30 µm long); (2) short (barely visible, <3 µm long); (3) absent.
75. *Basal membranous area*: (0) absent; (1) present.
76. *Penial sheath swollen proximally*: (0) absent; (1) present.



**Appendix 3.** Data matrix.

	12345	1 67890	11111 12345	11112 67890	22222 12345	22223 67890	33333 12345	33334 67890	44444 12345	44445 67890	55555 12345	55556 67890	66666 12345	66667 67890	77777 12345	7 6
<i>Aclerda arundinariae</i>	11121	01121	03220	11110	10001	01221	22012	12110	12211	12111	00110	11110	02120	02011	21331	0
<i>Aclerda</i> sp. <i>Hildago</i>	11121	01121	03220	11110	20001	01221	22100	12110	12211	12111	00110	11110	02120	01111	11321	0
<i>Aclerda tillandsiae</i>	11120	01121	03220	11111	11200	01221	22012	11110	1–210	12111	00–10	11110	02120	01010	21221	0
<i>Aclerda</i> sp. <i>Wasta</i>	01121	01121	03220	11110	20001	01221	22002	22110	02211	12111	00110	11110	02120	01011	21321	0
<i>Asterolecanium proteae</i>	01120	00201	21020	10101	11220	01120	12112	12110	02100	00121	00001	00010	02122	02200	20111	1
<i>Cerococcus artemisiae</i>	01012	01210	20010	00012	21200	11020	11102	10110	02100	02012	10001	00200	02220	02000	10100	0
<i>Cerococcus indicus</i>	01100	01200	20020	0–002	1–	11220	21102	10110	12200	–1012	10001	00200	01020	02000	20110	0
<i>Coccus hesperidum</i>	00120	01001	02120	10012	10120	00110	32122	00011	21100	01012	11000	00011	11020	02220	10221	0
<i>Eriococcus buxi</i>	01110	00001	00010	00001	10000	00000	01000	00000	10000	02000	00000	00000	00021	02010	21000	0
<i>Eriococcus orariensis</i>	11100	00101	00110	00100	10000	00000	01002	00100	00100	02000	00000	00000	00020	02110	21000	1
<i>Eriochiton hoheriae</i>	11010	00201	0–10	0–102	01200	10000	01002	10100	02101	02000	10000	00000	01020	02010	21110	1
<i>Eulecanium tiliae</i>	21110	11201	01120	10112	10210	00020	12122	10100	10100	00112	11000	10011	01020	02210	10221	0
<i>Filippia follicularis</i>	21120	11201	01120	10112	10010	00010	32122	00100	10100	00112	11000	00011	01020	02210	10221	0
<i>Inglisia theobromae</i>	10121	10011	00120	10112	10110	00020	32112	00011	21100	00012	10000	00010	01010	02200	10221	0
<i>Kwazulaclerda loranthi</i>	01220	00100	12111	00111	11210	111–1	22012	22011	10011	12111	10001	01110	12210	21101	00221	0
<i>Lecanaclerda macropoda</i>	01221	00121	03220	10111	20000	01220	22112	22110	12210	12112	10000	11010	12220	11121	00221	1
<i>L. elytropappi</i>	01120	00211	20130	10101	10210	00120	11102	10100	02100	00012	10001	00000	02220	02200	10220	0
<i>Pseudococcus viburni</i>	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00000	00001	00000	00000	0
<i>R. combreticola</i>	01221	00210	12121	00112	11220	11220	22111	11111	20210	–2122	00001	01110	12210	21101	00221	0
<i>Rhodesaclerda insleyae</i>	01220	00210	1–21	00112	10020	10220	22112	11110	20210	–2112	10001	01110	12210	21100	00221	0
<i>Tachardina aurantiaca</i>	11121	00201	01020	10101	11220	10021	11101	20110	12200	10002	10000	00010	01010	02200	20131	1
<i>Tachardiella</i> sp.	01110	01201	0–20	11111	1–	10220	1–002	20–10	02200	01002	10001	00010	01010	12200	20131	1