

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

St Clair, R. M., 1994. Some larval Leptoceridae (Trichoptera) from south-eastern Australia. *Records of the Australian Museum* 46(2): 171–226. [28 July 1994].

doi:10.3853/j.0067-1975.46.1994.13

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at
www.australianmuseum.net.au/publications/
6 College Street, Sydney NSW 2010, Australia



Some Larval Leptoceridae (Trichoptera) from South-eastern Australia

R.M. ST CLAIR

Monash University,
Clayton, Vic. 3168, Australia

ABSTRACT. Leptoceridae larvae belonging to 23 species in twelve genera are described, most for the first time. They are: *Triplexa villa* Mosely, *Condocerus paludosus* Neboiss, *Notoperata maculata* (Mosely), *N. sparsa* (Kimmins), *Symphitoneuria opposita* (Walker), *Lectrides varians* Mosely, *Triplectidina nigricornis* Mosely, *Triplectides similis* Mosely, *T. proximus* Neboiss, *T. elongatus* Banks, *T. varius* Kimmins, *T. truncatus* Neboiss, *T. altenogus* Morse & Neboiss, *T. australicus* Banks, *T. ciuskus* Mosely, *T. australis* Navás, *T. volda* Mosely, *T. magnus* (Walker), *Westriplectes pedderensis* Neboiss, *Leptorussa darlingtoni* (Banks), *Leptocerus sounta* Mosely, *Triaenodes volda* Mosely, and *Oecetis laustra* Mosely. Keys are provided for identification of larvae to generic level and for separation of two species of *Notoperata* and eleven species of *Triplectides*. On the basis of adult, larval and pupal characters, *Triplectides hamatus* Morse & Neboiss is here placed as a junior synonym of *T. truncatus*. Most of the species described here belong to the Triplectidinae which is confined to Australasia, southern Asia, and Central and South America. Comparisons are made with known larvae from these regions. Larval habitats are described.

ST CLAIR, R.M., 1994. Some larval Leptoceridae (Trichoptera) from south-eastern Australia. Records of the Australian Museum 46(2): 171–226.

Despite the very widespread and common occurrence of leptocerids in Australia and the advanced state of taxonomic knowledge of the adults (Neboiss, 1983, 1986), very few larval descriptions are available. As a result, identification of larvae beyond family level is rarely possible. Overseas information is of limited value in identification of the larvae of Australian species as much of it refers only to one subfamily, the Leptocerinae. Indeed, available definitions of the family exclude larvae of many Australian species.

Larval descriptions from previous studies are available for only five species of Australian Leptoceridae:

Lectrides varians and *Leptorussa darlingtoni*, both described fully by Jackson (1985), *Notalina spira*, described as *Oecetis situlus* (Korboot, 1964a), *Triplectides volda* (Korboot, 1964b) and *Triaenodes bernaysae* (Korboot, 1964c). Korboot (1963) also provided notes on the larvae of *Triplectides volda*, *T. australis* and *Symphitoneuria exigua*.

Morse & Neboiss (1982) stated that the species identified by various authors as *Triplectides magnus* from Asia, New Zealand and other locations outside south-eastern Australia is probably some other species, possibly *T. australis*. This presumably applies also to the

incomplete larval descriptions of *T. magnus* by Tillyard (1925) and Ulmer (1906).

The phylogeny of the family Leptoceridae was first presented by Morse (1981), incorporating some studies by earlier workers, and has been refined since by Holzenthal (1986, 1988b) and Morse & Holzenthal (1987). These works place the genera into subfamilies and tribes but generally do not discuss the relationships within the tribes.

The Leptoceridae is divided into two subfamilies: Leptocerinae Leach and Triplectidinae Ulmer. The Triplectidinae is restricted to Australasia and the neotropics, but the Leptocerinae is cosmopolitan. Differences between larvae of the two subfamilies have been outlined by Ulmer (1955) and Cowley (1978), but fewer than ten species of Triplectidinae were included in these two studies.

There are six known Australian leptocerine genera (*Leptorussa*, *Russobex*, *Leptocerus*, *Triaenodes*, *Setodes* and *Oecetis*) and nine known Australian triplectidine genera (*Triplexa*, *Condocerus*, *Notalina*, *Notoperata*, *Lectrides*, *Symphitoneuria*, *Triplectidina*, *Triplectides* and *Westriplectes*).

The aim of this study is to describe larval Leptoceridae after association of reared larvae with adults. For practical reasons, collections were predominantly from Victoria although many of the species are not restricted to that state. The taxonomy of the family as detailed in Neboiss (1983) is followed and readers should consult this work for nomenclature and synonymy.

Materials and Methods

Methods used for collecting, rearing and describing are as described in St Clair (1991). The only difference is due to loss of sclerites from pupal cases of some species described here. For such species, the contents of the rearing container were sorted under a stereo microscope to ensure as many sclerites as possible were retrieved. The Material examined section of each description lists reared males (ie, male adult or pupa, pupal skin larval sclerites and case), reared females and larvae, numbers without a symbol. Only specimens collected by people other than myself have the collectors' names listed. Specimens are lodged in the Museum of Victoria, numbers starting PT- are registration numbers. Terminology follows that of Wiggins (1977, 1984).

Results

Twenty-three species are described here (and a further 8 in previous papers by St Clair, 1988, 1991) in the larval stage, most for the first time. Only one genus recorded from Australia was not found during this study. Larvae of this genus, *Setodes*, have been described from other countries (Wiggins, 1977; Wallace, 1981). Keys for identification of larvae to genera, and to species for

Notoperata and *Triplectides* are provided.

Although collections were mainly made in Victoria, published distribution records of adults (Neboiss, 1983) suggests the results have a wider applicability. Of the species considered, only four appear to be endemic to Victoria on available data; most species are found in other states and thus the keys provided are applicable to much of the south-eastern Australian region.

In Australia, Leptoceridae are common and widespread. The larvae of Leptoceridae can be found in a wide variety of aquatic habitats: streams (except for torrential stretches and sections lacking backwaters), swamps, lakes, temporary streams and ponds, saline lakes, saline creeks, estuaries and even the splash zone of waterfalls. Most larvae are associated with still or slow-flowing water, and are often in backwaters of an otherwise fast flowing stream. Few species occur in areas of high current speeds. The larvae are usually found on detritus, macrophytes or submerged riparian vegetation. In surveys of stream benthos, leptocerid numbers have frequently been underestimated owing to the tendency of the larvae of many species to be out of the main stream channel where sampling is usually conducted.

Larval Leptoceridae can be quite abundant; Metzeling *et al.* (1984) collected 2,334 *Notalina bifaria* larvae and 1,190 early instar *Notalina* larvae in ten 0.05 m² samples from one site on the La Trobe River, Victoria.

Several leptocerid species occur at a given site: seven species were collected from each of several sites during this study and 11 species have been recorded from a single site on the La Trobe River (Marchant *et al.*, 1984).

Identification of Larvae

Larval characteristics of Leptoceridae. Most larval Leptoceridae described here are easily recognised by the presence of obvious long antennae on the anterior margin of the head capsule. In some species of *Oecetis* and all species of *Triplectides* the antennae are much shorter. Even in these two genera, the antennae are still considerably longer than those of most other families. The only exception is larvae of *Triplexa villa* (Fig. 2) which have tiny antennae situated nearly halfway between the eye and the anterior margin of the head capsule, comparable in position and length to those found in many other families.

Long hind legs are also characteristic of the family (Fig. 1). The trochanter is two-segmented with the second segment elongate (much longer than in most other families). The trochanter is longer on the posterior surface and apparently joins with the second segment of the femur. As the trochanter is fairly translucent, the first segment of the femur is usually visible through it. The femur is also divided into two segments. The first segment of the femur is very small and appears to be present only on the anterior surface of the leg (see Fig. 1). In *Lectrides*, *Symphitoneuria*, *Triplectides* and *Westriplectes* the tibia is divided into two segments, usually of about equal length. All species in this study

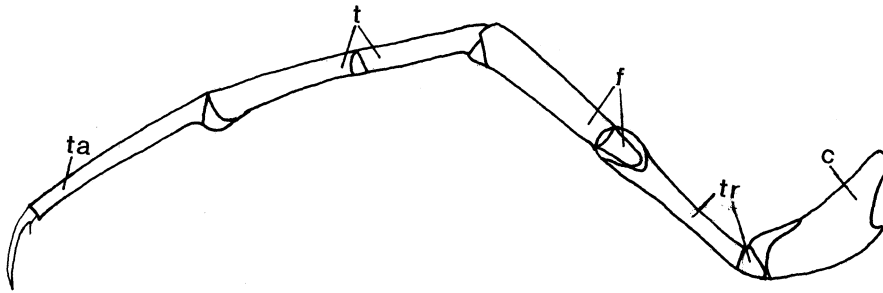


Fig. 1. Right hindleg of *Triplectides australis* larva, anterior view, c – coxa, tr – trochanter, f – femur, t – tibia, ta – tarsus.

displayed this basic leg configuration with only minor variability.

The following combination of characters define larval Leptoceridae; first abdominal segment with dorsal and lateral protuberances, anal claws with one or a few simple accessory hooks (not a comb-like structure), pronotum completely sclerotised, middle leg with tibia and tarsus not fused, without a median horn-shaped process on prosternum, metasternum with two, or (usually) more, setae on metasternum (J. Dean, personal communication).

Larvae of *Anisocentropus* (Calamoceratidae) are commonly confused with Leptoceridae. Larvae of *Anisocentropus* can be distinguished by the elongate forward directed processes on the pronotum (similar to that shown in fig.3.1 in Wiggins 1977) and the lack on setae on the metasternum.

All larvae examined in this study have a sclerite on the lateral humps of abdominal segment I and these sclerites are covered anteriorly with numerous very short pale setae. These setae are not shown in the figures.

Subfamily characteristics. Ulmer (1955) first compared larvae of the two subfamilies. However, his description of Triplectidinae was tentative as it was based on only two species. Cowley (1978) discussed the main characters distinguishing the two subfamilies in New Zealand, basing his findings on eight species. The following description of larvae for the two subfamilies is based on 26 Australian species of Triplectidinae and 15 Australian species of Leptocerinae. Information on non-Australian Leptocerinae is also used. The two subfamilies are found to be less distinct in the larvae than in the adults because the larval characters of two genera (*Leptorussa* and *Russobex*) are intermediate between those of the two subfamilies.

Leptocerinae

There is no single diagnostic character for larvae of this subfamily. The most distinctive character is the presence of additional cephalic lines of weakness at which the primary sclerites usually subdivide at ecdysis (eg, Fig. 21A,E). These additional lines of weakness are considered characteristic of the entire family by Hickin (1967), Lepneva (1966), Wallace (1981) and Wiggins

(1977). In Australia, where larvae of both subfamilies are present, it is obvious that the lines of weakness are confined to the Leptocerinae. However, they are not present in all Leptocerinae, as they are absent in the two primitive genera *Leptorussa* and *Russobex*. These lines of weakness are present only in the fifth instar and may be difficult to see on pale specimens.

Generally the metanotum is not sclerotised, although North American species of *Mystacides* and *Nectopsyche* have small sclerites at setal area 3 (Wiggins, 1977). *Leptorussa* larvae have small medial metanotal sclerites, smaller but otherwise comparable with those of larval Triplectidinae.

The foretrochantin is short and obtuse (eg, Fig. 23J) in all Australian leptocerine larvae except *Leptorussa* and *Russobex*, in the latter two genera it is comparable with that of Triplectidinae larvae. Prosternal sclerites (as distinct from the narrow lateral sclerites at the posterior margin of the mesosternum) are absent. The lateral line is reduced and pale or absent. The head is often short ventrally but is long in some species. Often the ventral apotome does not completely divide the genae. The frontoclypeal apotome may have a constriction in a variable but species-specific position along its length.

Larvae swim by rapidly beating the hind legs back and forth. This has been observed in *Leptocerus*, *Triaenodes* and those species of *Oecetis* which characteristically make light cases consisting mainly of vegetable matter.

Triplectidinae

There are no obvious diagnostic features of this subfamily. The following characters are useful in distinguishing triplectidine larvae, but are not characteristic because they are shared with one or both of the two primitive leptocerine genera. Additional cephalic lines of weakness are absent in all Triplectidinae, but also in the two most primitive leptocerine genera (*Leptorussa* and *Russobex*). The metanotum has at least two sclerites (sclerites only occur at setal area three when medial sclerites are present) in all species but also *Leptorussa*.

The foretrochantin is sinuous, long tapering (eg, Fig. 20B) in all Triplectidinae larvae but also in *Leptorussa* and *Russobex*.

One or two small sclerites are present centrally at the posterior margin of the prosternum although absent in *Notalina moselyi* Kimmins and *Triplexa villa* Mosely. The mesonotum has two sclerites near the midline at the posterior margin, more central than the sclerites of leptocerine larvae.

The lateral line is moderately long and thick (absent in *Triplexa* and short and fairly thin in *Notalina*), dark and distinct. Ventrally the head is moderately long, completely divided by the ventral apotome. The frontoclypeal apotome has a constriction at about half its length.

The larvae swim by rapidly flicking the head and thorax back and forth. Usually this is done with the larvae partly on their back. This has only been observed in larvae of *Notalina* and *Condocerus*.

Difficulties with Subfamily Placement of Larvae compared with Adults

It is apparent from the above subfamily descriptions that four characters can be used to separate the two subfamilies: i) presence or absence of additional cephalic lines of weakness; ii) presence or absence of metanotal sclerites; iii) shape of foretrochantin; iv) presence or absence of prosternal sclerites. However, two genera (*Leptorussa* and *Russobex*) would be placed into the Triplectidinae using larval characters, while adult characters place them in Leptocerinae. This large difference between life history stages presumably arose from different rates of evolution in the larvae and adults, something that has been noted previously within the Trichoptera (Ross, 1967).

Key to Genera for Mature Larvae of Australian Leptoceridae

1. Metanotum without sclerites (Leptocerinae except *Leptorussa*) 2
 - Metanotum with at least 2 sclerites (rarely very small or pale) (Triplectidinae and *Leptorussa*) 5
2. Claw of midleg modified to form a hook; coronal suture indistinct; case made entirely or almost entirely of secretion, translucent (Figs 21, 24Q) *Leptocerus*
 - Claw of midleg simple; coronal suture distinct; case with plant or sand additions, opaque 3
3. Hind tibia divided (rarely with the division faint); case of spirally arranged plant matter (Figs 22, 24R) *Triaenodes**
 - Hind tibia undivided; case other than of spirally arranged plant matter 4
4. Ventral apotome short, indistinct, not completely dividing genae; mandibles greater than twice as long as wide, flat and with few teeth (Fig. 3C); labrum with numerous setae (Fig. 23) *Oecetis*
 - Ventral apotome moderately long and narrow, distinct, completely dividing genae; mandibles less than twice as long as wide, teeth arranged around a central narrow concavity; labrum with few setae *Russobex*
5. Antennae (not including terminal hair-like segment) less than one-fifth the width of the anterior margin of frontoclypeal apotome (Figs 2, 9) 6
 - Antennae (not including terminal hair-like segment) longer than one-fifth the width of the anterior margin of the frontoclypeal apotome (Fig. 4) 7

- 6. Antennae situated behind base of mandible on anterior margin of head capsule; half or less of the metanotum covered by sclerites (Fig. 9) *Triplectides*
- Antennae nearly halfway between the anterior margin of the head capsule and the eye; much more than half of the metanotum covered by sclerites (Fig. 2) *Triplexa*
- 7. Metanotum with 2 sclerites; some gills divided into at least 2 filaments 8
- Metanotum with more than 2 sclerites; gills single filaments 9
- 8. Metanotal sclerites very small but dark, rarely folded under front margin of segment; ventral apotome almost square *Leptorussa*
- Metanotal sclerites larger but very pale; ventral apotome a narrow rectangle an undescribed species of *Notalina* from North Queensland
- 9. Hind legs with tibia undivided (Fig. 4) 10
- Hind legs with tibia divided (Fig. 1) 12
- 10. Anterior margin of pronotum scalloped; corner of pronotum extended and/or cut away laterally (Fig. 5) *Notoperata*
- Anterior margin of pronotum straight; corner smoothly rounded 11
- 11. Metanotum with at least 6 sclerites; metasternum with about 8 setae, usually each with a small basal sclerite (Fig. 4) *Condocerus*
- Metanotum with less than 6 sclerites; metasternum with numerous setae, none with a basal sclerite *Notalina*
- 12. Anterolateral corner of pronotum brought to a slight point or smoothly rounded (Fig. 8) *Triplectidina*
- Anterolateral corner of pronotum brought to an obvious elongate point (Fig. 7) 13
- 13. Metanotum with 2 medial sclerites and either 2 distinct lateral sclerites on each side or these overlapped so appear as 1 long sclerite *Lectrides*
- Metanotum with 2 short medial sclerites and 1 small lateral sclerite on each side (Fig. 7) 13
- 14. Metanotum with a pair of long setae posterior to the medial sclerites; ventral apotome rectangular; tergite IX with 6 long and 4 short setae; metasternal setae each with a small basal sclerite (Fig. 7) *Symphitoneuria*
- Metanotum without a pair of long setae posterior to the medial sclerites; ventral apotome tapering posteriorly; tergite IX with 4 long and 4 short setae; metasternal setae arising from 2 comparatively large sclerites (Fig. 20) *Westripectes*

* The larvae of *Setodes* in Wiggins (1977) and Wallace (1981) would key out as *Triaenodes* in this key, but without the characteristic case type. If the Australian species is similar to that figured by Wiggins and Wallace, it would differ from *Triaenodes* in having a sand grain case and large sclerotised plates, spines or other armament on the end of the abdomen.

Triplectidinae

Triplexa Mosely

Diagnosis. The following characters define *Triplexa*: antennae very short and situated between the eye and the anterior margin of the head capsule; metanotal sa1 and sa2 sclerites separate but abutting; metapleural sclerites (but not mesopleural sclerites) unusually large.

Remarks. The larvae and pupae of *Triplexa* are very unusual with several character states that are quite atypical of the Leptoceridae. They are, however, very similar to the larvae and pupae of *Atanatolica* and, to a lesser extent, *Grumichella*, two Neotropical Triplectidine genera reviewed by Holzenthal (1988b). The unusual character states of *Triplexa* and *Atanatolica* are as follows (in brackets the usual state of the character): very short antennae (long antennae); coronal suture broad posteriorly (very narrow posteriorly); mandible without teeth (with teeth) and with one long setal brush in the central concavity of each mandible (Fig. 2,2A) (2 short setal brushes in the central concavity of the left mandible only); sclerotisation around the ventral apotome very light (sclerotisation normal); ventral apotome appearing not to reach the posterior margin of the head capsule and a ventral suture present (ventral suture absent); secondary setation on the head and pronotum (no secondary setation); metanotal sclerites fused or almost so and covering most of the segment (sclerites separate and covering less than half of the segment); metapleural sclerites unusually large; legs rounded in cross section (flattened); hind tibiae curved outwards (straight); long tapered sand case with a posterior silk section with a dorsal opening (straight and with a posterior opening, without a posterior silk section).

Some characters of interest were not mentioned by Holzenthal (1988b). The position of the antennae in *T. villa* and as shown for both *Atanatolica* and *Grumichella* is unique in the family. Larvae of *T. villa* are unique at least within the Australian Leptoceridae in having an accessory hook on the inner margin of the anal claw, although double accessory hooks are found on a neotropical species (probably *Atanatolica* sp.) figured by Botosaneanu (1974). *T. villa* larvae are also unusual in having stout dark peg-like setae on the anterior margin of the pronotum, however, similar setae are shown for the species regarded as *A. botosaneanui* by Holzenthal (1988b) (Botosaneanu & Flint, 1982: fig. 56). The metasternum of *T. villa* is unusual within the Australian Leptoceridae in having posterior sclerites and the gills are dorsoventrally flattened instead of rounded. However, no mention is made of either character in descriptions of *Atanatolica* larvae.

The larvae of *Triplexa* and *Atanatolica* are strikingly similar. From descriptions by Holzenthal (1988b), the only distinguishing features are: metanotal sa1 and sa2 sclerites completely fused in *Atanatolica*, separate but abutting in *Triplexa*; meso- and metapleural sclerites unusually large in *Atanatolica*, only metapleural sclerites

unusually large in *Triplexa*.

Holzenthal (1986) moved *Triplexa* from the tribe Hudsonemini to the tribe Grumichellini. He stated that "discovery of the immatures of *Triplexa* possibly will test this phylogenetic hypothesis since known Grumichellini immatures are highly derived with several striking homologous". Discovery of the immatures shows *Triplexa* to be very similar to *Atanatolica*, sharing all the striking homologies of that genus, fully supporting the inclusion of *Triplexa* in the Grumichellini.

Holzenthal (1986) also discusses the biogeography of Leptoceridae. He proposes a tropical component of the trans-Antarctic biota due to the presence of *Atanatolica* and *Grumichella* in Brazilian South America. The extreme similarity of larval *Triplexa* to *Atanatolica* and the tropical distribution of *Triplexa* is support for this argument. The larvae of *Triplexa psocoptera* from New Caledonia could provide further information for this proposal.

The distinctive features of larvae of this genus and of *Atanatolica* may be influenced by habitat. All Australian larval *Triplexa* were collected from the splash zone of waterfalls. A detailed description of a similar habitat was given for *A. dominicana* by Flint (1968), who noted that larvae were never submerged, and also for larvae of a species probably belonging to *Atanatolica* in Venezuela (Botosaneanu, 1974). Thus morphological modification may have arisen by adaptation to this almost terrestrial habitat.

Reduction of the lateral line and absence of prosternal sclerites, both characters otherwise only found in larval Leptocerinae and some *Notalina*, may also be influenced by the unusual larval habitat of *Triplexa*.

Description. Antennae short, much less than one-fifth width of frontoclypeal apotome on front margin; antennae situated nearly halfway between front margin of head capsule and eye, eye further from front of head capsule than in other Leptoceridae; without additional lines of weakness on head; ventral apotome very short, genae divided by ventral ecdysial line for most of their length, area around ecdysial line very pale and appears lightly sclerotised; labrum with very numerous secondary setae; mandibles short and wide, with ridge instead of teeth, both with several long setae in central concavity; pronotum with front margin straight, pronotum anterolateral corner rounded; foretrochantin sinuous, long tapering; metanotum extended posteriorly, mostly covered by 6 sclerites; metasternum with 5-14 setae without basal sclerites, but sclerites on segment medioposteriorly; hind tibia undivided; gills if present with several filaments, very flat; lateral line absent; tergite IX with 4 long and 6 short setae or with 8 long and 4 short setae; anal prolegs without secondary setation.

Remarks. There are only two species in this genus, *T. villa* from eastern Australia and *T. psocoptera* from New Caledonia.

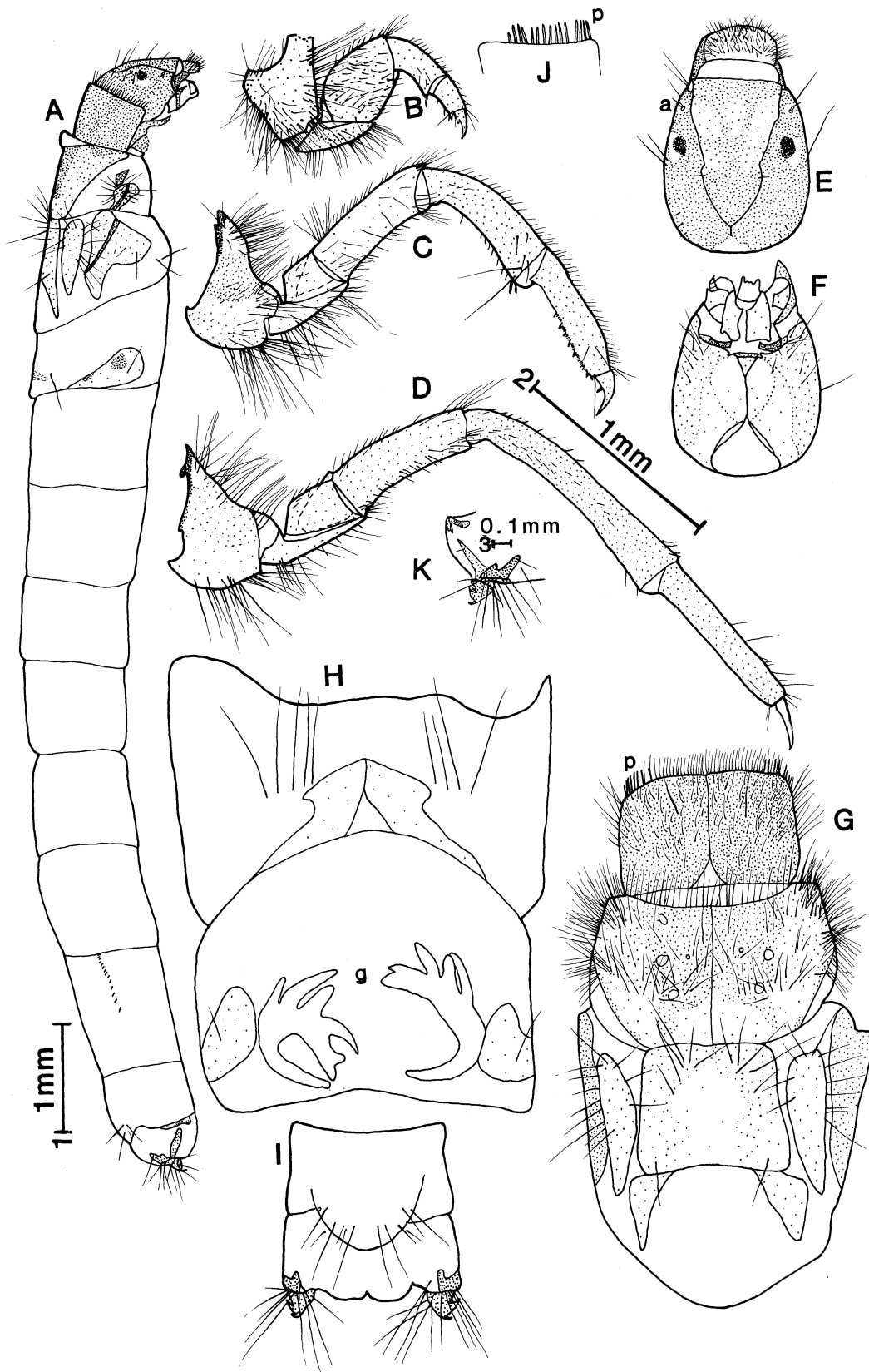


Fig. 2. *Triplexa villa* larva PT-957 (A-G, I-J) and PT-960 (H only). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – metasternum and segment 1 ventral view, I – segment IX dorsal view, J – right pronotal sclerite anterior margin, K – anal proleg. A – scale 1, B-J – scale 2. Secondary setation not shown on A or E. a – antenna, g – gills, p – peg-like setae.

Triplexa villa Mosely

Figs 2, 3A, 24A

Material examined. Three male and 3 female pupae, most with larval sclerites retained, and 85 larvae. NEW SOUTH WALES: Dorrigo National Park, Cedar Falls, 11 Dec. 1985, D. Bickel, 3 males pupae (incl. PT-958), 3 pupae (5 of the pupae retained the larval sclerites in the case), 3 (incl. PT-957); Dorrigo National Park at cascade in spray 16 Dec. 1984, A. Wells, 4. QUEENSLAND: Eungella National Park, tributary of Cattle Creek, M.J. Tyler, 26 Jan. 1984, 78 (incl. PT-960).

Description. *Head.* Width 0.42-0.63 mm. (n=31, 2 sites); oblong dorsally but wider posteriorly; brown with very pale area over region of coronal suture and pale brown patches on frontoclypeal apotome, ventrally very pale medially and brown laterally; frontoclypeal apotome long, very broad anteriorly, constriction slight; head covered with numerous setae in front two thirds (not figured); numerous setae on submental sclerites, palpifer and palps.

Thorax. Pronotum brown; anterior margin laterally with short black peg-like setae; prosternum without sclerites; foretrochantin very long and thin, upturned section at shallow angle to base; mesonotum extended laterally on front margin, mottled brown, paler laterally; metanotal sclerites arranged as in Figure 2, medial sclerites pale brown with pair of dark elongate spots anteriorly, some with very pale spots posteriorly, lateral sclerites pale brown, sometimes with pale spot each, medial posterior sclerites brown, sometimes curled so differing from Figure 2, metanotum often with small mesal sclerite on posterior margin; prosternum without sclerites; metasternal sclerites pale yellow; legs brown with paler areas on coxae, first segment of femur on mid- and hindleg black; leg segments rounded in cross-section; hind femora curved outwards; midleg with femur ventrally and whole of tibia and tarsus with a roughened appearance due to numerous, very short setae, hind leg similar on trochanter and femur ventrally and whole of tibia and tarsus.

Abdomen. Lateral hump sclerites very pale yellow with black patches, front half with numerous brown very

short projections instead of setae; gills present or absent, when present on segment 1 and possibly 2 and 3 dorsally, laterally and ventrally; gills strongly dorsoventrally flattened, divided into a variable number of filaments; tergite IX very pale, may be difficult to see, sometimes with pale brown spots; NSW specimens with either 8 long and 4 short setae or 4 long and 6 short setae; lateral sclerites and ventral sole plate dark brown; anal claw large with 1 comparatively large accessory hook on outer margin and 1 small accessory hook on inner margin of base of claw.

Body length. 6-10 mm.

Case. Tapering and curved tube made of small sand grains. Posteriorly with small tip made of secretion, curved upwards and with dorsal opening (Fig. 24A).

Early instar larvae. Larvae with head widths of 0.27-0.36 mm, n=6, were assumed to be in their fourth instar and those with head widths of 0.22 mm, n=2, were assumed to be in their third instar. These larvae were readily identified as most of the unusual characteristics of this species were present.

Habitat and distribution. All three collectors of larvae of this species noted on the label that the larvae were in the splash zone of a waterfall. These specimens were found further south and further north than the distribution of south-eastern Queensland given by Neboiss (1983).

Condocerus Neboiss

Diagnosis. The combination of 6 or 7 metanotal sclerites and hindleg with tibia undivided is sufficient to characterise this genus.

Description. Antennae (not including terminal hair-like segment) moderately long, close to one-quarter width of frontoclypeal apotome at front margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B but more slender; left mandible with 2 short setal brushes in central concavity; without secondary lines of weakness on head; ventral apotome long and tapering; pronotum front margin straight, pronotum anterolateral corner rounded; foretrochantin sinuous long tapering; metanotum with 6 or 7 sclerites; metasternum with 8-12 setae, usually each with small sclerite at base, roughly in transverse row; additional very short setae usually present, each with tiny basal sclerite; hind tibia undivided; gills single filaments; lateral line commences medially on segment III; tergite IX with 6 long and 4 short setae; anal prolegs with secondary setation.

Remarks. The two species in this genus are *C. paludosus*, described here, and *C. aptus*, which is confined to south-west Australia. Larvae from Western Australia, assumed to be those of *C. aptus*, agree with the generic description given here.

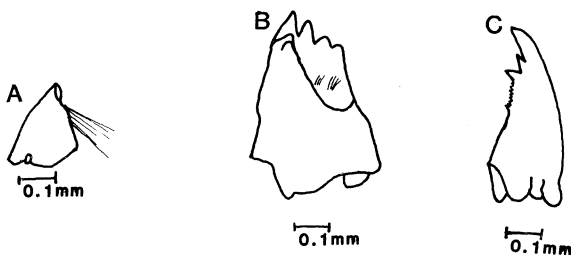


Fig. 3. Larval mandibles of A - *Triplexa villa* right mandible, B - *Triplectides ciuskus* left mandible, C - *Oecetis laustra* left mandible.

Condocerus paludosus Neboiss

Figs 4, 24B

Material examined. Eleven reared males, 4 reared females and 195 larvae. VICTORIA: Stony Creek at Turret Falls, 3 km south-west of Halls Gap, 4 Dec. 1983, 21; Dairy Creek, 6 km south of Halls Gap, 3 Nov. 1981, 1 male, 6; Mount Rosea Creek, 8 km west-south-west of Halls Gap, 2 Nov. 1981, 1; Wannon River, 25 km west-south-west of Halls Gap, 3 Nov. 1981, 1 male (PT-939); Ford River, 7 km south-east of Lavers Hill, 25 Oct. 1984, 4; Gellibrand River at Gellibrand, 25 Oct. 1984, 5; Coliban River at Trentham Falls, Trentham, 11 Nov. 1981, 1; Acheron River, 3.5 km east-south-east of Narbethong, 17 Nov. 1981, 26, 9 Feb. 1982, 1 male, 2 Dec. 1982, 2 males, 19 Jan. 1984, 1 female; tributary of the Howqua River, 18 km south-east of Merrijig, 31 Jan. 1982, 7; Acheron River at Taggerty, 19 Oct. 1984, 8; Big Pats Creek, 4 km east-south-east of Warburton, 6 Nov. 1983, 1; Toorong River at Falls, 6 km north-east of Noojee, 27 Nov. 1981, 11, 24 Jan. 1984, 1 male, 2 females; Mount Bogong, tributary of Middle Creek, 3 km east-south-east of Cope Hut, 1 Oct. 1982, 1 male, 4; Little Snowy Creek at Eskdale, 30 Nov. 1982, 6; Barkly River, 9 km north-west of Licola, 7 Nov. 1984, 2; Dinner Creek, 15 km north-north-east of Licola, 7 Nov. 1984, 2 males, 1 female, 8; Wellington River, 11 km north of Licola, 6 Nov. 1984, 7; Moroka River, 10 km east of Mount Wellington, 7 Nov. 1984, 23; Wonnangatta River at Waterford, 8 Nov. 1984, 1 male (incl. PT-987); Dargo River, 6 km north of Dargo, 8 Nov. 1984, 1 male, 38 (incl. PT-910); Murray River at Tom Groggin, 19 Nov. 1982, 2; Rodger River, 23 km south-west of Bonang, 1 Nov. 1983, 6; Bonang River on Bendoc-Orbost Road, 29 Jan. 1983, 3; West Errinundra River, 5 km north of Errinundra, 31 Dec. 1982, 44; east branch of the East Errinundra River, approximately 23 km south-east of Bonang, 24 Jan. 1983, 5.

Description. *Head.* Width 0.55-0.63 mm (n=36, 4 sites); oblong dorsally, slightly narrower anteriorly, brown with scarcely contrasting pale spots and few contrasting darker spots, some specimens with pale stripe on each side of frontoclypeal apotome in front of constriction, much paler laterally and ventrally with contrasting dark spots, some specimens with dark patch on posterior margin ventrally; frontoclypeal apotome widest on its anterior margin, rounded and tapering behind constriction; ventral apotome strongly tapering, narrow in distal half (some specimens more so than others); left mandible with 6 teeth; right mandible with 5 teeth.

Thorax. Pronotum pale brown, paler at front and sides; mesonotum pale brown with darker spots; metanotal sclerites brown, arranged as in Figure 4; foretrochantin short, with long upturned section; prosternal sclerites brown, with or without pale forward extension at medial edge; mesosternal sclerites comparatively small, pale brown with darker anterior margin; metasternum with 4-18 additional short setae, usually in clump at each side of segment anterior to main row of setae; legs pale yellow to pale brown, unbanded; hind legs with several long spines ventrally; thorax often with scattered short setae usually with tiny sclerite at base.

Abdomen. Lateral hump sclerites pale, often additional short setae scattered on segment I each with tiny sclerite at base; most specimens with 3 pairs of very short gills,

all dorsal, on segments 3-5 inclusive; tergite IX pale brown in some specimens to pale yellow with pale brown spots or patches in others; lateral sclerites very pale yellow anteriorly to pale brown posteriorly, darker in some specimens, some with pale brown spots anteriorly; ventral sole plates pale yellow, darker on some; anal claws comparatively small, with 2 nearly parallel accessory hooks on outer margin; many specimens with 6 anal gills extruded.

Body length. 6-12 mm.

Case. Made of small pieces of plant matter, often green, arranged to form tapering tube. Usually with additional long sections of detritus on sides and back looking as though they act like stabilisers. Tube usually about one and a half times larval length but case often longer due to long 'stabilisers' (Fig. 24B).

Early instar larvae. Larvae of *C. paludosus* can be identified also in fourth and third instar by row of 8 setae on metasternum, metanotal sclerites (although these may be pale) and presence of long spines on legs. Head widths of fourth instar larvae: 0.33-0.39 mm (n=7), third instar: 0.22-0.23 mm (n=2).

Habitat and distribution. Larvae were collected in streams ranging from alpine creeks to warm lowland rivers, and all with permanent flow. They were virtually always found on the water's surface with the case attached by silk to detritus in midstream or riparian vegetation. Larvae lie facing upstream with legs held out wide.

Collection of specimens from the Murray River and far East Gippsland suggest this species occurs in New South Wales, as well as Tasmania and Victoria, as recorded in Neboiss (1983).

Notalina Mosely

Larvae of seven species in this genus have been described (St Clair, 1991). The mandibles of these species are similar to that of Figure 3B, but more slender.

Notoperata Neboiss

Diagnosis. This genus can readily be identified with the following combination of characters; anal proleg without secondary setae, hind tibia undivided, and pronotum anterior margin with projections and an extension on the pronotum anterolateral corner.

Description. Antennae long, about one-third the width of frontoclypeal apotome at anterior margin; labrum without secondary setae or with transverse row of several setae anteriorly; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B; left mandible with 2 short setal brushes in central concavity; ventral apotome long and narrow; without secondary lines of weakness on head; pronotum anterior

margin scalloped, anterolateral corner extended; foretrochantin sinuous, long tapering; metanotum with 4 sclerites; metasternum with 9-31 setae, these without obvious basal sclerites or with very small, very pale sclerites; hind tibia undivided; gills single filaments; lateral line starts anteriorly on segment III; tergite IX with 6 long and 4 short setae; anal prolegs without secondary setation.

Remarks. This description applies to *N. maculata* and *N. sparsa* from south-eastern Australia and *N. tenax* from Western Australia, although comparatively few specimens of each were examined.

Larvae of the other two species in this genus (*N. diversa* and *N. syncope*), both from Western Australia, are unknown. The following key separates the two species from south-eastern Australia:

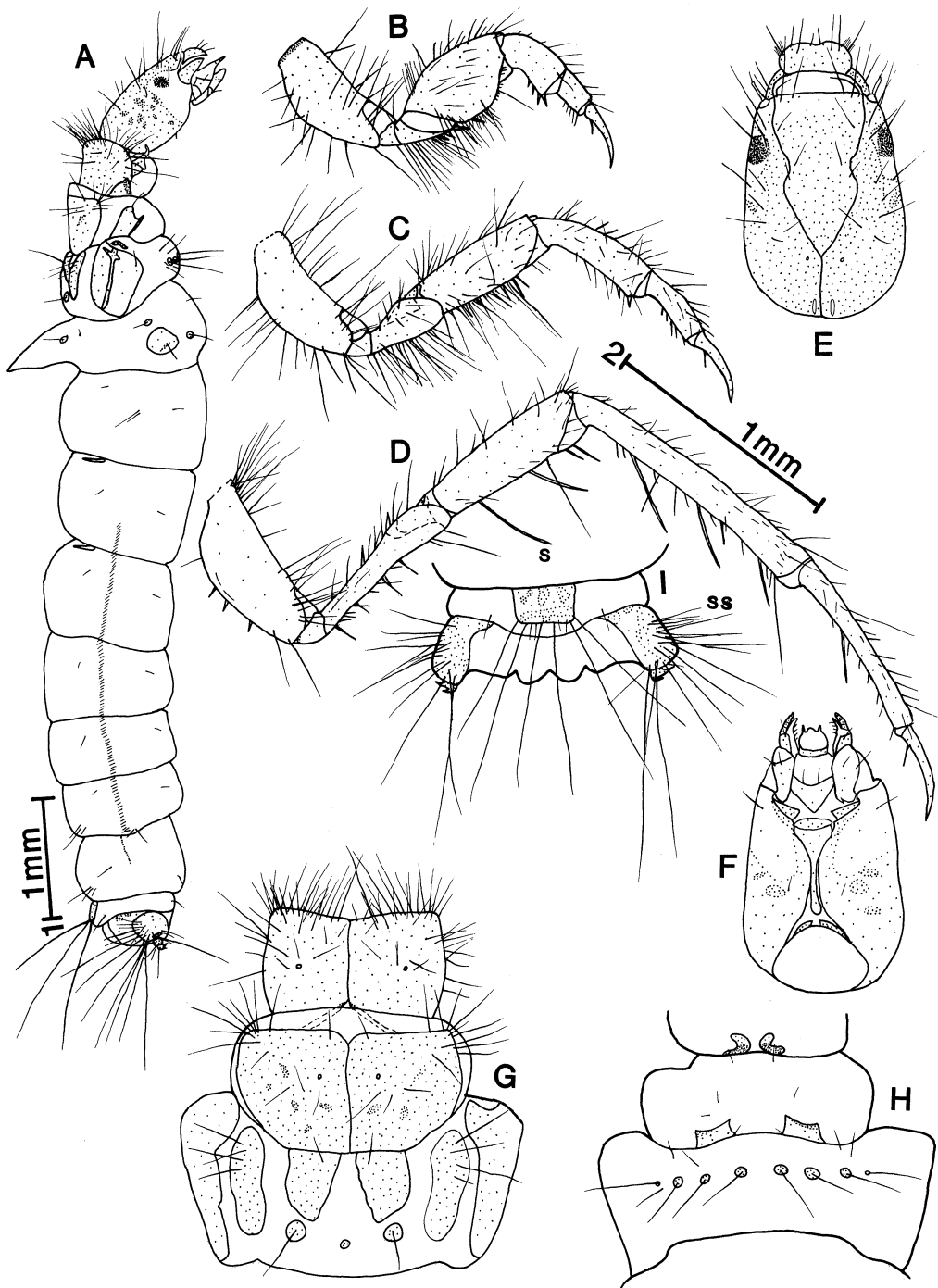


Fig. 4. *Condocerus paludosus* Neboiss larva (PT-910). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – thorax ventral view, I – segment IX dorsal view. A – scale 1, B-I – scale 2. s – long spines, ss – secondary setae on anal proleg.

1. Metanotal medial sclerites longer than wide; pronotum anterolateral corner scooped out laterally *N. sparsa*
- Metanotal medial sclerites about as long as wide; pronotum anterolateral corner elongate *N. maculata*

Notoperata maculata (Mosely)

Figs 5, 24C

Material examined. Ten reared males, 10 reared females and 11 larvae. VICTORIA: Mount Buffalo, sphagnum bog 300 m south-east of Tatra Inn, 5 Dec. 1982 and 27 Nov. 1982, 7 males, 8 females, 7 (incl. PT-954); 4 km north of Mount Wellington, small creek in snowgrass plain, 6 Nov. 1984, 3 males (incl. PT-955), 2 females, 4.

Diagnosis. The following combination of character states, in addition to those used in the key, distinguishes this species from the only other known species in this genus, *N. sparsa* (for which character states are shown in brackets): frontoclypeal apotome with only a slight constriction, almost triangular behind the constriction (rounded and tapering); metanotal medial sclerites shorter than lateral (as long or longer); metasternum with more than 20 setae (less than 20 roughly in 2 clumps, most setae with very small, very pale sclerite at base). The case is also distinctive, longer and with the detritus somewhat spirally arranged in *N. sparsa*. Habitat may also provide useful information for separation as *N. maculata* is only known from alpine sphagnum bogs and creeks and *N. sparsa* is only known from swampland in low areas of Wilson's Promontory.

Description. *Head.* Width 0.75-0.88 mm (n=11, 2 sites); oblong dorsally, slightly wider posteriorly; brown with few often poorly contrasting spots, long pale patch on both sides of frontoclypeal apotome posteriorly; frontoclypeal apotome, widest on anterior margin, with only slight constriction, almost triangular behind constriction; ventral apotome tapering to be narrow and rounded posteriorly and about one-third the anterior width; left mandible with 6 teeth; right mandible with 5 teeth.

Thorax. Pronotum brown, paler anteriorly, with poorly contrasting light brown spots, anterolateral corner elongate; mesonotum light brown with pale yellow spots, some spots with brown margin; metanotal sclerites arranged as in Figure 5, pale yellow, medial sclerites shorter than lateral sclerites, pair of short and long setae posterior to medial sclerites; foretrochantin with moderately long upturned tip; prosternal sclerites pale brown; mesosternal sclerites pale yellow; metanotal medial sclerites shorter than lateral sclerites; metasternum with 22-31 setae; legs mottled brown.

Abdomen. Lateral hump sclerites pale yellow; gills as in diagram in table 1, even on specimen reared for 8 months; tergite IX very pale yellow, difficult to see; lateral sclerite pale brown; ventral sole plate very pale

yellow; anal claw with 2 accessory hooks on outer margin.

Body length. 10-11 mm.

Case. Tubular, slightly wider anteriorly and often slightly longer dorsally so that small hood is formed. Made of detritus; medium sized rectangular pieces, small thin strips and small round pieces put together with no apparent pattern. Case about one and a half times the length of larva (Fig. 24C).

Remarks. Larvae of the two species from south-eastern Australia are similar, but the adults are strikingly so.

Habitat and distribution. Larvae of this species have only been collected from alpine areas, usually in sphagnum bogs, rarely in creeks. However, adults have been collected from much lower altitudes but searches for larvae at these sites were unsuccessful. This species has been recorded from North Queensland (Benson & Pearson, 1988), greatly extending the range of south-east Queensland, New South Wales, Victoria and Tasmania (Neboiss, 1983) and unlikely to be near sphagnum bogs.

Notoperata sparsa (Kimmins)

Figs 6, 24D

Material examined. VICTORIA: Wilson's Promontory, swamp on Five Mile Track 1 km east of Tidal River Road, 6 Nov. 1986, 3 males (PT-972), 5 females, 22 (incl. PT-962).

Diagnosis. See diagnosis section for *N. maculata*.

Description. *Head.* Head width 0.75-0.81 mm, n=8; oblong dorsally; very dark brown to almost black with strongly contrasting orange spots, lateral band of spots, ventrally with few spots posteriorly, antennae brown; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome tapering but still comparatively broad posteriorly, rarely narrow posteriorly; labrum with few setae; left mandible with 5 teeth; right mandible with 5 or 6 teeth.

Thorax. Pronotum anterior margin concave anteriorly, anterolateral corner scooped out laterally; dark brown with strongly contrasting orange spots posteriorly; mesonotum brown, yellow-brown posteriorly with contrasting yellow spots; metanotum with sclerites anteriorly as shown in Figure 6, medial sclerites as long or longer than lateral sclerites, medial pair pale brown with diffuse yellow spots, lateral pair pale yellow,

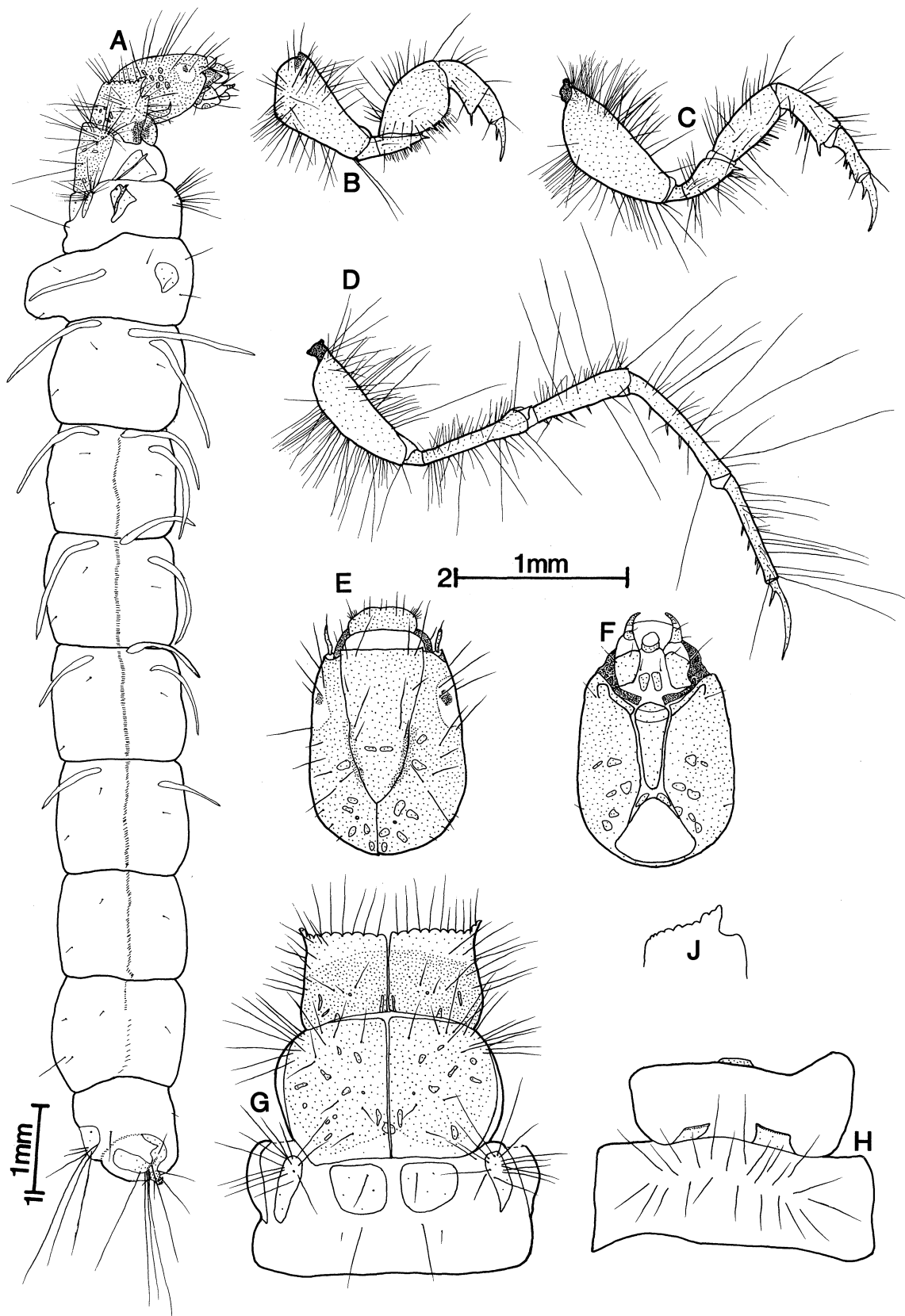


Fig. 5. *Notoperata maculata* larva (PT-954). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – thorax ventral view, I – segment IX dorsal view, J – right anterolateral pronotum corner. A – scale 1, B–J – scale 2.

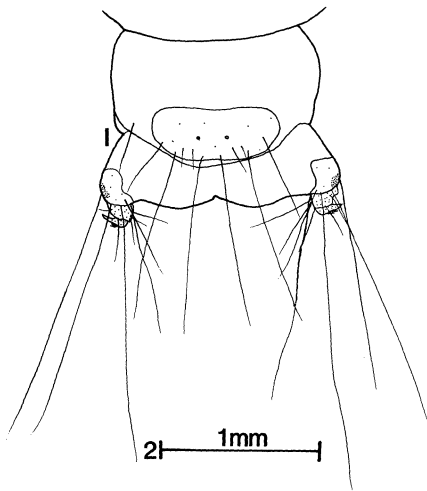


Fig. 5 cont'd.

posteriorly on segment 1 pair of short setae and 1 pair of long setae; foretrochantin with upturned section short and thin; prosternal sclerite pale brown; mesosternal sclerite pale brown, rarely with pale yellow spots, metasternum with 10-13 setae roughly in 2 clumps, most setae with a very small, very pale sclerite at base; foreleg and midleg with brown coxae, rest of leg light brown and orange; hindleg yellow with brown bands.

Abdomen. Lateral hump sclerites very pale and difficult to see; gills single filaments, arranged as in diagram in table 1, most with fewer than maximum number shown; lateral line moderately short and moderately dark; tergite IX very pale yellow anteriorly, orange posteriorly; ventral sole plate orange; anal claw moderately long with 2 nearly parallel accessory hooks on outer margin.

Body length. 12-13 mm.

Case. Made of spirally arranged rectangular and irregular pieces of brown detritus. Very long and thin, commonly about 5 times length of larva but only 2-3 mm diameter. Larvae do not swim with their case.

Early instar larvae. One fourth instar larva, head width 0.5 mm, fits above description apart from being paler and less sclerotised and ventral apotome narrower posteriorly.

Habitat and distribution. Larvae of this species are only known from one locality, a swamp on Wilson's Promontory, with humic water and extensive submerged and emergent macrophyte growth. This is the first record of this species outside Tasmania.

Lectrides Mosely

Diagnosis. The diagnostic characters are: antennae longer than half the width of the frontoclypeal apotome on anterior margin; hind tibiae divided; pronotum anterolateral corner extended and anterior margin

scalloped; metanotum with 6 sclerites, occasionally the 2 pairs of lateral sclerites fuse to form 1 long pair.

Remarks. The species of this genus known in the larval stage are very similar to those of *Symphitoneuria*, *Triplectidina* and *Westriplectes*. Larval *Lectrides* differ from larvae of the other three genera predominantly in possession of two pairs (or 1 long pair) of lateral metanotal sclerites and a pair of setae on the metanotum posterior to the medial sclerites.

Description. Antennae long, about half width of frontoclypeal apotome at anterior margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B but little more slender; left mandible with 2 short setal brushes in central concavity; ventral apotome moderately long, moderately broad anteriorly; without secondary lines of weakness on head; pronotum anterolateral corners with long projection, anterior margin scalloped; foretrochantin sinuous, long tapering; metanotum with 6 sclerites, a pair of setae present at setal area 3; metasternum with 8-14 setae, most or all with small sclerite at base; hind tibia divided; gills single filaments; lateral line starts anteriorly on segment III; ninth tergite with 6 long and 4 short setae; anal proleg without secondary setae; abdomen dorsoventrally flattened.

Remarks. There are two species in this genus: *L. varians*, described here, and *L. parilis* from Western Australia. Larvae from Western Australia, presumed to be those of *L. parilis*, were examined and included in the generic description.

Lectrides varians Mosely

Material examined. Twenty-four reared males, 29 reared females and 110 larvae. VICTORIA: Stony Creek at Turret Falls, 3 km south-west of Halls Gap, 4 Dec. 1983, 3 females, 3; Lerdergerg River, 4.8 km west-north-west of Blackwood, 27 June 1982, 2 males, 1 female, 29 July 1982, 1 male, 26 Feb. 1984, 4 males, 6 females, 15 Oct. 1985, 16; Shaws Lake, Blackwood, 15 Nov. 1985, 1 male, 1 female, 19; Jock Marshall Reserve, Monash University, Clayton, Melbourne, 14 Mar. 1985, 5; Acheron River at Taggerty, 30 Jan. 1982, 4 males; Acheron River at Acheron, 30 Jan. 1982, 1 female; Sheepwash Lagoon approximately 10 km north-east of Yea, 2 Oct. 1982, 1 female; Seven Creeks, 1 km south-east of Strathbogie, 1 Feb. 1982, 2 males; Big River, 10 km south-west of Jamieson, 30 Jan. 1982, 1 female; King River at Cheshunt, 2 Oct. 1982, 1 male; Ovens River at Porepunkah, 2 Oct. 1982, 1 female; Billabong approximately 3 km north of Eskdale, 30 Sept. 1982, 1 female; Mount Buffalo, Lake Catani, 5 Dec. 1982, 1 female, 4; Cobannah Creek, 4 km east-south-east of Cobannah, 15 Nov. 1983, 2; Pond beside Moroka River, 10 km east of Mount Wellington, 7 Nov. 1984, 1; Merrijig Creek, 7 km north-north-west of Bullumwaal, 16 Nov. 1983, 2 males; Prospect Creek, 5 km north-west of Mount Taylor, 15 Nov. 1983, 1 female; Rich River, 26 km north-north-east of Orbost, 14 Oct. 1982, 5 males, 5 females; Brodribb River, 24 km north-north-east of Orbost, 14 Oct. 1982, 1 female; Back Creek, 1 km north-

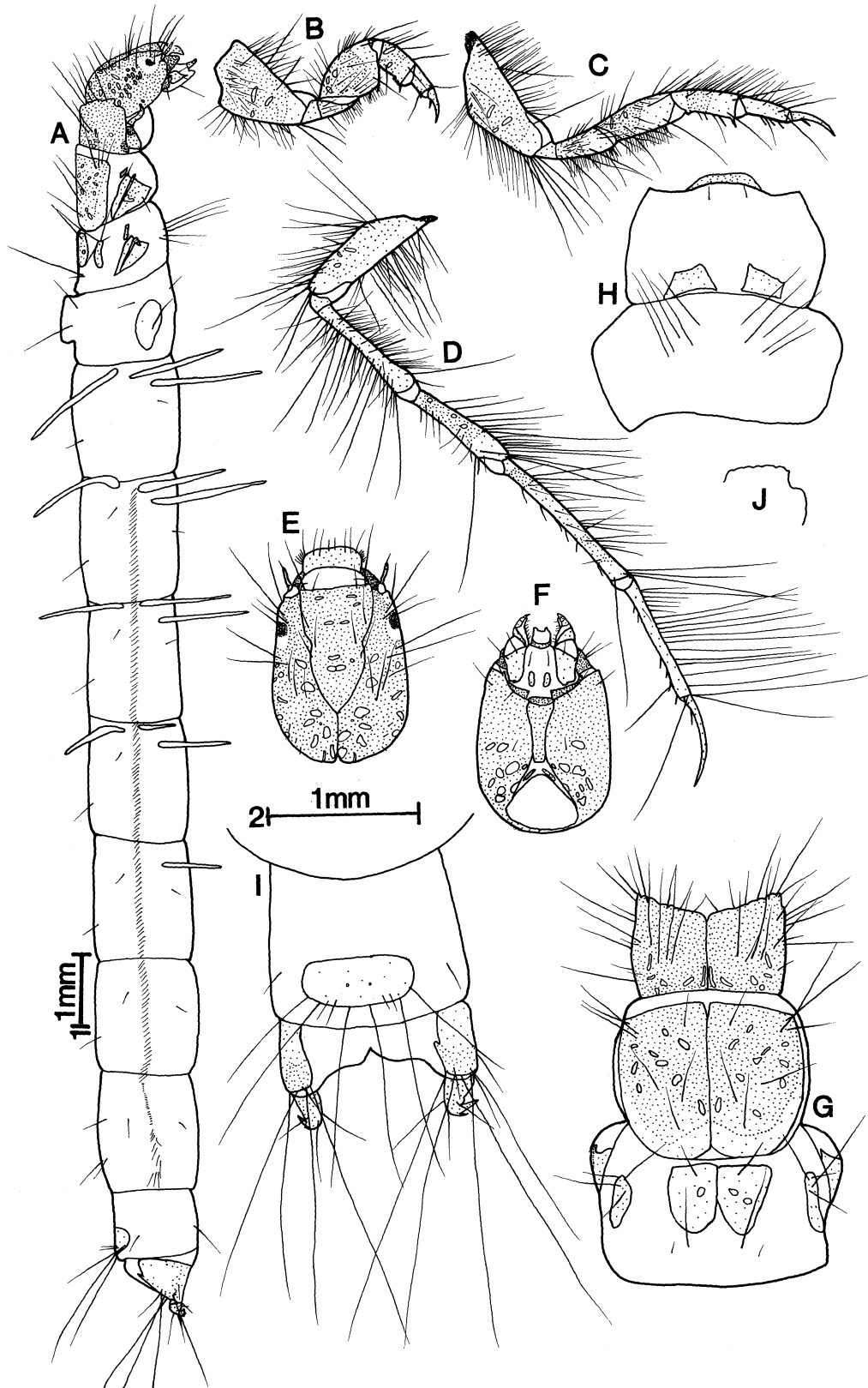


Fig. 6. *Notoperata sparsa* larva (PT-962). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

east of Noorinbee North, 13 Oct. 1982, 1 female; Rodger River, 23 km south-west of Bonang, 2 Nov. 1983, 1 male, 3 females, 11; Wangan River on Princes Highway, East Gippsland, 3 Jan. 1982, 2 males, 2 females, 11; east branch of East Errinundra River, approximately 23 km south-east of Bonang, 24 Jan. 1983, 7; Betka River, 6 km west-south-west of Mallacoota, 5 July 1983, 6.

Comments. The larva of this species was described and figured from South Australia by Jackson (1985). The following description includes only additional notes to her description and indicates the range of variation in Victorian specimens.

Description. *Head.* Width 0.61-0.81 mm (n=48, 6 sites); orange or golden brown or brown, with yellow spots, some specimens with pale area at back of head on each side dorsally; frontoclypeal apotome only slightly wider to much wider behind constriction than on anterior margin, usually irregular suture line behind constriction, rarely straight; left mandible with 5 or 6 teeth.

Thorax. Spots on pronotum with distinct or indistinct margins; metanotal lateral sclerites sometimes overlap giving appearance of 1 long sclerite on each side; metasternum with 6-10 setae, most commonly 8, each with small sclerite at base, rarely 2 sclerites join so that 2 setae arise from 1 sclerite.

Abdomen. Gills as in diagram in table 1; larvae from creeks with low water temperatures usually have close to number of gills shown and these are comparatively short; larvae from lakes or streams with warmer water temperatures have close to maximum number of gills shown and these are comparatively long; spicules large and obvious; anal claws with 2 accessory hooks on outer margin, 1 parallel to claw and 1 large one at an angle to it but their bases adjacent.

Case. Usually about one and one-half to 2 times body length.

Early instar larvae. The case is a very useful aid in identification of even tiny larvae, although it may be similar to case of early instar *Westriplectes* which is unknown for early instar larvae. Towns (1983) notes that *L. varians* hatchlings make distinctive case. Fourth instar larvae (head width 0.42-0.48 mm, n=12) are recognisable from above description. Third instar larvae (head width 0.31 mm n=1) have metanotal lateral sclerites very pale, frontoclypeal apotome straight behind constriction and pronotum anterolateral corner rounded but with deep indentation on lateral margin.

Remarks. Some very pale specimens with metasternal sclerites, metanotal sclerites (particularly lateral sclerites) and ninth tergite difficult to see, legs slightly banded or without pigment bands.

The cases of the two species in this genus are very similar but some larvae of *L. parilis*? have cases made of only two leaf pieces as is typical of *Anisocentropus* (Calamoceratidae). A photograph of the larva of *L. varians* was provided by Towns (1983).

Habitat and distribution. This species occurs in the widest variety of habitats of any species in this study.

It is found closely associated with detritus in backwaters of streams from cool foothills streams to warm lowland streams and including temporary streams. It also occurs in lakes from alpine areas to lowland. As the species is recorded as widely distributed from south-east Queensland, Victoria and Tasmania (Neboiss, 1983), its absence from New South Wales is probably an artefact of collection.

Symphitoneuria Ulmer

Diagnosis. The diagnosis is as for *Lectrides* with the exception of possessing a total of 4 metanotal sclerites with the lateral pair short. See remarks section for *Lectrides*.

Description. Antennae long, nearly half as long as anterior margin of frontoclypeal apotome; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity; left mandible with 2 short setal brushes in central concavity, similar to Figure 3B; ventral apotome moderately long and moderately broad; without secondary lines of weakness on head; pronotum anterolateral corner extended, scooped out laterally, anterior margin scalloped; foretrochantin sinuous, long tapering; metanotum with 4 small sclerites, lateral sclerites particularly small; metasternum with 18-50 setae, most with very small pale sclerite at base; hind tibia divided; gills single filaments (apart from figured specimen); lateral line starts anteriorly on segment III; tergite IX with 6 long and 4 short setae; anal prolegs without secondary setae.

Remarks. This description is based on only one of the five species in the genus. Larvae of the other two Australian species (*S. exigua* [McLachlan] and *S. wheeleri* Banks) and the two New Caledonian species are unknown.

Symphitoneuria opposita (Walker)

Figs 7, 24E-G

Material examined. Ten reared males, 18 reared females and 27 larvae. VICTORIA: Gnarkeet Creek, 10 km north-east of Lismore, 23 Oct. 1984, 3 females, 2; Balcombe Creek, near Balcombe Army Camp, Nepean Highway, Mornington, 14 Oct. 1984, 2 (incl. PT-949), 23 Dec. 1984, 2 males, 1 female; Balcombe Creek on Bungower Road, Mornington, 11 Jan. 1982, 2 females, 1; Yallock Creek, 2 km south-south-east of Koo-wee-rup 1980, 3 females; Wilsons Promontory, swamp on Five Mile Track 1 km east of Tidal River, Road. 6 Nov. 1986, 1; Ewings Morass, 11 km south-east of Nowa Nowa, 15 Oct. 1982, 1 male (incl. PT-912), 1; Ewings Morass, 15 km south-east of Nowa Nowa, 15 Oct. 1982, 6 males, 5 females, 14; Simpsons Creek, 11 km south-west of Orbost, 14 Oct. 1982, 2 males, 4 females, 6. SOUTH AUSTRALIA: Eight Mile Creek at mouth, 8 km east of Port MacDonnell, 21 May 1984, 1 male, 1.

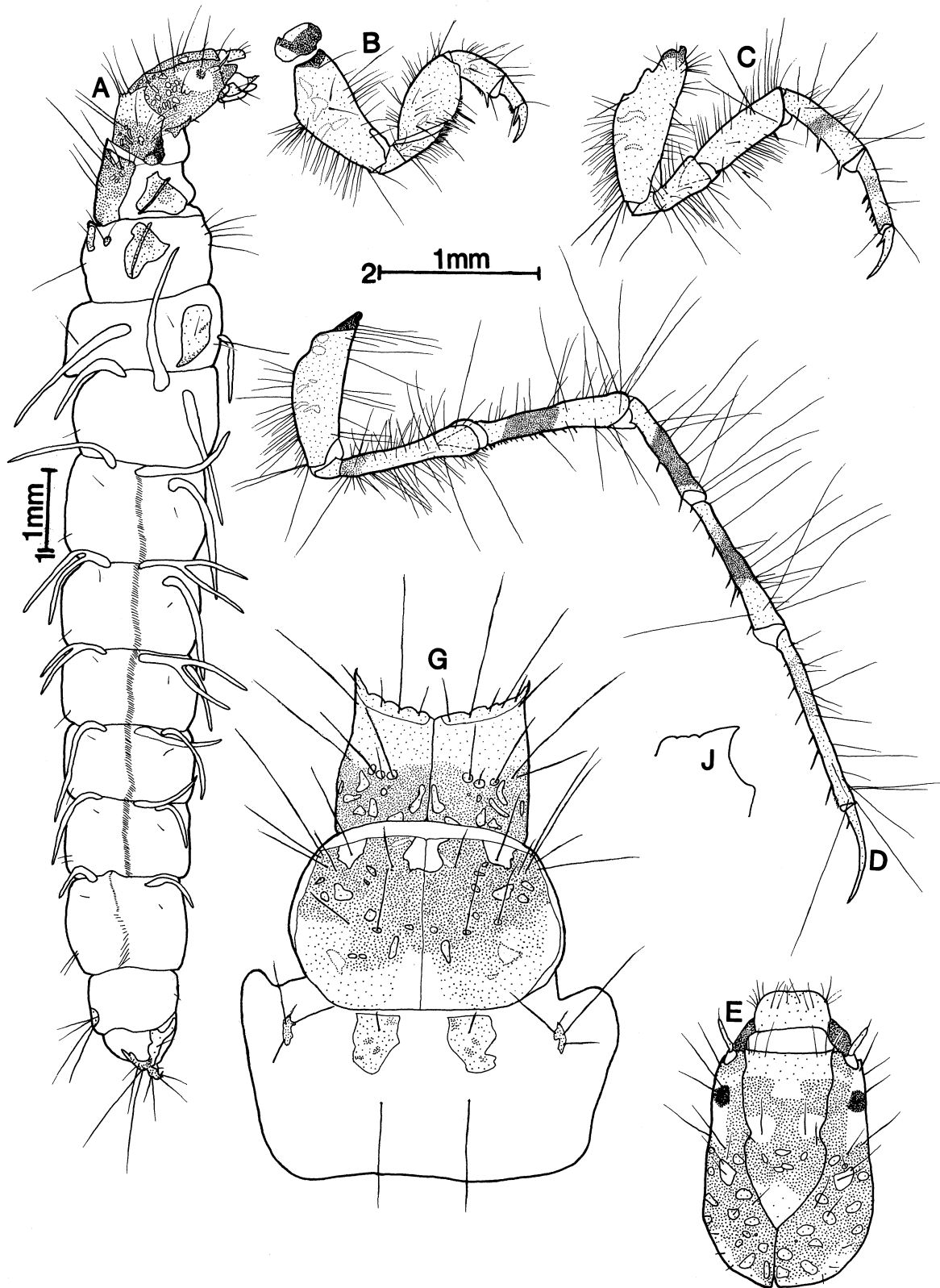


Fig. 7. *Symphitoneuria opposita* larva (PT-949). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

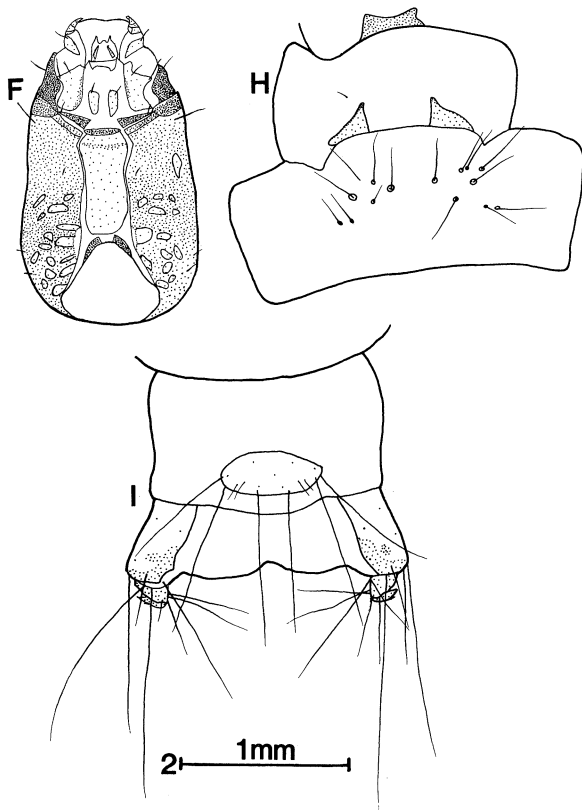


Fig. 7 cont'd.

Description. *Head.* Width 0.72-0.81 mm (n=22, 4 sites); oblong dorsally; brown or black with lightly or strongly contrasting yellow patches and spots, always 4 yellow areas on frontoclypeal apotome: 1 in posterior tip, 1 on each side at constriction and 1 on anterior margin medially; pale area at back of head may extend forward on each side dorsally or ventrally; paler ventrally, ventral apotome paler still; frontoclypeal apotome widest on anterior margin, sides usually straight behind constriction then tapering, but variable; ventral apotome scarcely tapering posteriorly; left mandible with 6 teeth; right mandible with 5 teeth.

Thorax. Pronotum dark brown or black, anterior third yellow or orange and strongly contrasting with rest of segment, some specimens with 2 pale patches anteriorly in midline corresponding with those on mesonotum; small spots yellow; mesonotum usually dark brown, paler posteriorly, spots yellow, usually strongly contrasting; metanotal sclerites arranged as in Figure 7, medial sclerites grey to brown with darker spots and sometimes with dark borders, rarely all very pale and difficult to see; foretrochantin long with thin sharply upturned point; prosternal sclerite brown; mesosternal sclerites pale brown, may join in middle; legs usually pale brown with pale yellow spots, some with brown bands on midlegs and hindlegs.

Abdomen. Lateral hump sclerites yellow with brown stem; gills as in diagram in table 1, only figured specimen had divided filaments; tergite IX very pale, often difficult to see; lateral sclerites and ventral sole plates pale yellow with pale brown or brown sides; anal

claw moderately small, with one, rarely 2, accessory hooks on outer margin.

Body length. 6-12 mm.

Case. Larvae of this species were found in several case types during this study but most may have been modified in the laboratory. The main types are: i) long thin pieces of twigs, bark and leaves in loose spiral arrangement, and in ti-tree (*Leptospermum*) swamps small ti-tree leaves are used extensively (Fig. 24G); ii) numerous small to very small sand grains with some grains protruding to give roughened surface, usually there is detritus section as well (Fig. 24E), sand and snail shells are also used in predominantly detritus cases; and iii) fewer larger pieces of detritus resulting in an untidy broad, less tubular case (Fig. 24F) similar but less regular than that of *Triplectidina nigricornis* or, when flattened, a less extreme form of the *Lectrides varians* case (Jackson, 1985). All three case types are long and tubular, and wider when detritus is used. Most have the dorsal surface longer than the ventral so that small hood is formed. The case is usually twice as long as larva, or longer.

Remarks. A brief description of the larva of *S. exigua* was given by Korboot (1963), but insufficient detail was given to enable species identification or comparison with the generic description given above.

Habitat and distribution. This species is usually found in small, sluggish, often turbid lowland streams and swamps. It is often associated with ti-tree swamps or ti-tree lined creeks. A few specimens were found in Gnarkeet Creek, Victoria, a slightly saline creek. The collection of specimens in South Australia near the Victorian border provides a small range extension outside that published of Victoria and Tasmania (Neboiss, 1983).

Triplectidina Mosely

Diagnosis. The generic diagnoses is as for *Symphitoneuria* with the exception that the pronotum has the anterolateral corner scarcely extended, if at all, and the anterior margin only slightly scalloped.

Description. Antennae long, about half width of frontoclypeal apotome at anterior margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B; left mandible with 2 short setal brushes in central concavity; ventral apotome moderately long and narrow; without secondary lines of weakness on head; pronotum with anterior margin only slightly scalloped if at all, anterolateral corner either rounded or with very small projection; foretrochantin sinuous, long tapering; metanotum with 4 comparatively small sclerites; metasternum with 12-59 setae, some with small pale basal sclerite; hind tibia divided; gills single filaments; lateral line starts anteriorly on segment III; tergite IX

with 6 long and 4 short setae; anal prolegs without secondary setae.

Remarks. There are two other species in this genus, both from New Zealand. Larvae of only one is known belonging to the recently described *T. mosely* (McFarlane & Ward, 1990). The larvae of this species fit the above generic description (Cowley, 1978, as *T. oreolimnetes*).

Triplectidina nigricornis Mosely

Figs 8, 24H

Material examined. Twenty reared males, 20 reared females and 144 larvae. VICTORIA: Billabong of Werribee River, 15 km north-west of Ballan, 15 Nov. 1985, 14; Lerderderg River, 4.8 km west-north-west Blackwood, 13 Sept. 1983, 1; Lerderderg River, 3.8 km north-north-west of Blackwood, 15 Nov. 1985, 4; Swamp at Bullarto, 12 Oct. 1983, 9 males (PT-948), 6 females, 24 (incl. PT-952); pond beside Acheron River, 3 km north-north-east of Narbethong, 16 Oct. 1981, 8 males, 8 females, 28, 15 Mar. 1983, 41; temporary tributary of the Acheron River, 12 km north of Warburton, 22 Oct. 1982, 25; pond beside Moroka River, 10 km east of Mount Wellington, 7 Nov. 1984, 3 males, 6 females, 7.

Description. *Head.* Width 0.70-0.88 mm (n=68, 5 sites); oblong dorsally; dark brown with weakly contrasting orange spots, sometimes pale area on frontoclypeal apotome at constriction on each side; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome tapering fairly strongly, posterior width less than half the anterior width; left mandible with 6 teeth, right mandible with 6 teeth.

Thorax. Pronotum brown with yellow spots posteriorly; mesonotum mottled orange and brown with pale to dark yellow spots; metanotal sclerites arranged as in Figure 8, pale brown with pale yellow spots; foretrochantin with upturned tip at sharp angle to base; prosternal sclerites dark brown; mesosternal sclerites light brown with brown anterior margin; legs without pigment bands; foreleg pale brown, midlegs orange, hindlegs yellow, all with coxae darker and with pale yellow spots.

Abdomen. Lateral hump sclerites pale yellow with a pale brown stem; gills as in diagram in table 1; tergite IX pale brown, often with very pale patch posteriorly at each end; lateral sclerite and ventral sole plate pale brown; anal claw moderately large, with 2, rarely 3, nearly parallel accessory hooks on outer margin.

Body length. 6-10 mm.

Case. Commonly made of comparatively heavy pieces of old detritus including leaves, bark, and stems all cut into rounded, square or rectangular pieces that are placed together to form slightly tapering tube (Fig. 24H), often with 3 or 4 pieces of detritus along top and bottom and many smaller pieces along sides. Rarely case made of spirally arranged wattle (*Acacia*) pinnules or hollowed twig. The case varies from only slightly longer than larva to about twice as long, most commonly around one and

one half times length of larva.

Early instar larvae. The character states described above are present in fourth and third instar larvae although more difficult to see. Head widths: fourth instar 0.45-0.60 mm (n=36, 4 sites), third instar 0.31-0.39 mm (n=34, 3 sites).

Habitat and distribution. Larvae are found associated with detritus in temporary swamps, pools filled by flooding streams and slow flowing areas of temporary streams. The known distribution of Tasmania, central and western provinces and Victoria, Gippsland (Neboiss, 1983) is here extended to include central and more of eastern Victoria.

Triplectides Kolenati

Diagnosis. This genus can readily be identified by the combination of short antennae and pronotum with projections on the anterior margin.

Description. Antennae (not including terminal hair-like segment) short, usually about one-eighth the width of the frontoclypeal apotome at anterior margin; labrum without secondary setae; mandibles short and broad, teeth grouped around central concavity, similar to Figure 3B, some more slender; left mandible with 2 short setal brushes in central concavity; ventral apotome long and narrow or moderately thick, tapering to variable degree; without secondary lines of weakness on head; pronotum anterolateral corner with at least small projections, anterior margin at least lightly scalloped; foretrochantin sinuous, long tapering; metanotum with 4 or 5 sclerites (some or all may be pale); metasternum with 3-100 setae, associated with none to 4 sclerites, and some small additional sclerites on some specimens; hind tibia divided (except in *T. varius*); gills single or multiple filaments; lateral line starting anteriorly on segment III; tergite IX with 6 long and 4 short setae; anal prolegs without secondary setae.

Remarks. Larvae of the Australian species fit the generic diagnosis of Holzenthal (1988a) based on the South American species, with one exception: some Australian species have a sclerite on the metanotum at sa2 and Holzenthal states there are none in this position.

This genus is the most widespread in the subfamily, found in Asia as far North as Japan, New Guinea, South Pacific Islands (including Vanuatu, New Caledonia and New Zealand) and South and Central America as well as Australia (Morse & Neboiss, 1982). The Australian species were revised by Morse & Neboiss, (1982) and, incorporating a new synonymy, the number of Australian species is 24. As a result of collecting and rearing during this study, larvae of 11 species are described here, ten for the first time.

Larval *Triplectides* are common and widespread. They occur in a variety of water bodies from sphagnum bogs at high altitudes to temporary swamps in lowland areas.

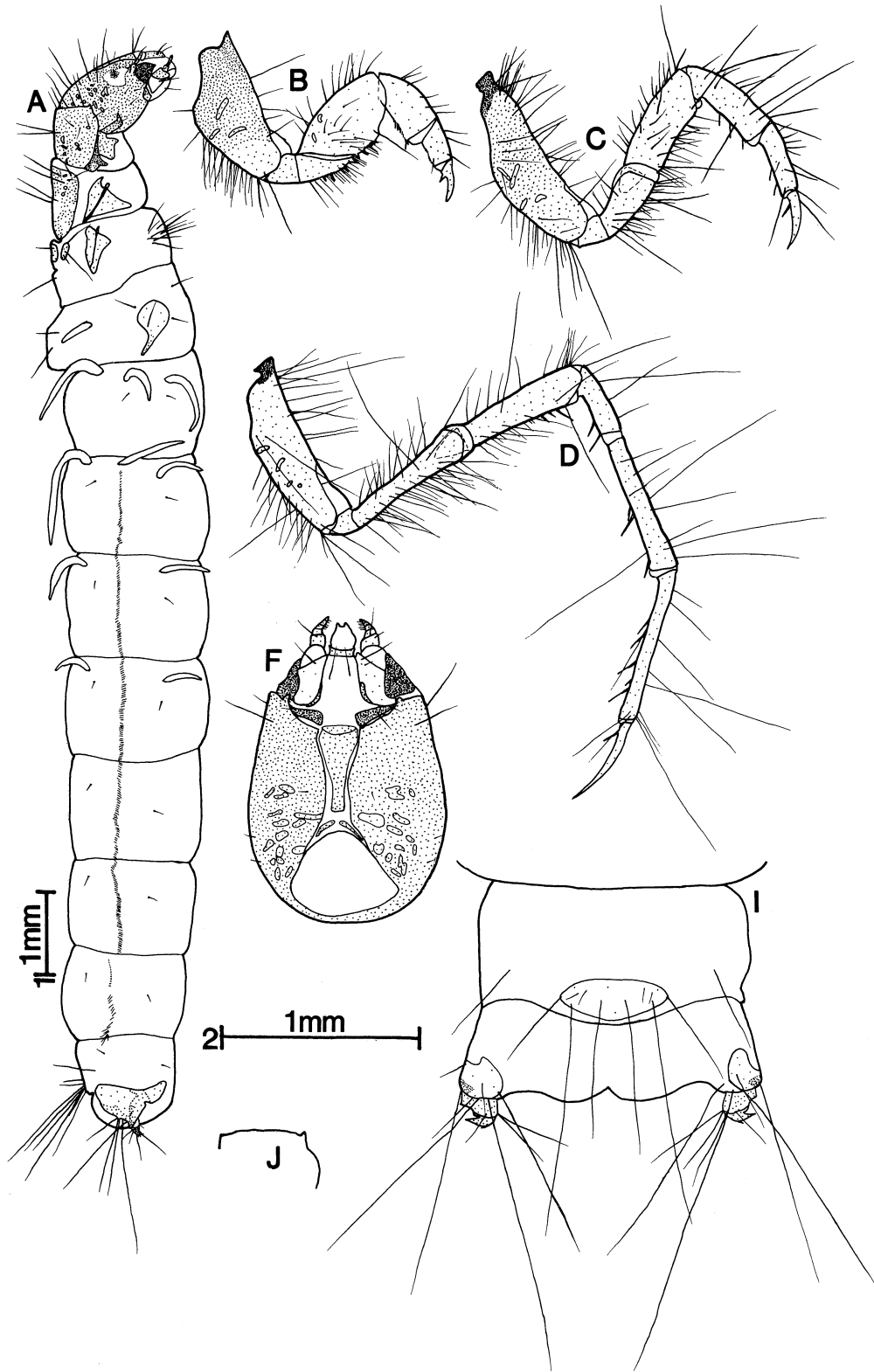


Fig. 8. *Triplectidina nigricornis* larva (PT-952). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – thorax ventral view, I – segment IX dorsal view, J – right anterolateral pronotum corner. A – scale 1, B-J – scale 2.

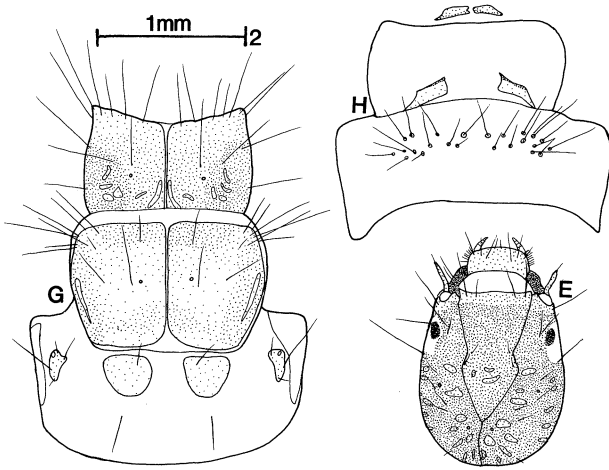


Fig. 8 cont'd.

Up to three species have been found at one site on many occasions. The larvae are amongst the largest in the family.

Larvae of this genus have a variety of case types. Although some species make a characteristic case, larvae of all *Triplectides* species will hollow out a stem or a twig. The hollowed stem or twig case is almost exclusively used by *Triplectides* larvae (only on rare occasions have larvae of *Triplectidina nigricornis* and *Lectrides varians* used such cases) and allows quick recognition of larvae belonging to this genus in the field.

Morse & Neboiss (1982) divided the Australian species into eight species groups. Larvae belonging to six of these groups were reared. Comparison of the groups is not attempted at this stage, with so few species in some groups known in the larval stage and larvae of some groups unknown. However, the early indications suggest the species groups are useful for the larval stages and so they are included below.

Key to Species of the Genus *Triplectides*

- 1. Most gills divided into 2-4 filaments (Fig. 9) *T. similis*
- Gills single filaments 2
- 2. Metanotum with 5 sclerites (may be very pale), frontoclypeal apotome widest on anterior margin of head (Fig. 10) 3
- Metanotum with 4 sclerites, frontoclypeal apotome as wide or wider behind its constriction (Figs 16,17) 7
- 3. Anterolateral corners of pronotum much extended (Fig. 11) 4
- Anterolateral corners of pronotum not extended but some may have projections on the anterior margins with larger projections on the anterolateral corners 5
- 4. Hind tibia divided (Fig. 11) *T. elongatus*
- Hind tibia undivided (Fig. 12) *T. varius*
- 5. Two comparatively large pale sclerites present on metasternum; mesonotum a very pale yellow and hard to see, in contrast to very dark pronotum (Fig. 10) *T. proximus*
- Four small sclerites on metasternum; mesonotum mottled brown, paler than pronotum but not strongly contrasting (Figs 13, 14) 6
- 6. Ventral apotome very narrow posteriorly; frontoclypeal apotome with a large pale patch on each side at constriction; legs without dark pigment bands; case rarely much wider than larva (Fig. 13) *T. truncatus*
- Ventral apotome little narrower posteriorly than anteriorly; frontoclypeal apotome without large pale patches at constriction; legs sometimes with dark pigment bands; case often many times wider than larva (Fig. 14) *T. altenogus*

7. Frontoclypeal apotome wider behind constriction than on anterior margin; usually irregular shape behind constriction (Fig. 15) *T. australicus* group*
- Frontoclypeal apotome as wide behind constriction as on anterior margin, or if wider then pronotum with only slight scalloping on anterior margin (Fig. 17) 8
8. Pronotum lightly scalloped on anterior margin; frontoclypeal apotome with at least 3 conspicuous yellow patches, 1 on each side at the constriction and 1 in the posterior tip (Fig. 17) *T. australis*
- Pronotum with long projections (similar to Fig. 16J) on anterior margin; frontoclypeal apotome usually without 3 conspicuous yellow patches 9
9. A conspicuous yellow patch on posterior tip of frontoclypeal apotome, other patches if present, less conspicuous; head not elongate; head and thorax brown to dark brown (Fig. 18) *T. volda*
- No conspicuous yellow patches on frontoclypeal apotome although some small spots present; head elongate; head and thorax orange (Fig. 19) *T. magnus*

*For separation of *T. australicus* and *T. ciuskus* see the descriptions of the two species.

T. similis group

Diagnosis. Gills divided into filaments; frontoclypeal apotome widest on anterior margin; pronotum with slight scalloping and slightly larger projections on anterolateral corner; 4 metanotal sclerites; metasternum with 18-31 setae.

Triplectides similis Mosely

Figs 9, 24I

Material examined. Fifteen reared small eyed males, 9 reared large eyed males listed below with (e) after the number of males, 40 females and 162 larvae. VICTORIA: McKenzie River at Falls, 3 km south-east of Zumsteins, 3 Nov. 1981, 1 male(e), 2 females; Mount Rosea Creek, 8 km west-south-west of Halls Gap, 3 Nov. 1981, 1 female, 3; Chapple Creek, 4 km west of Chapple Vale, 24 Oct. 1984, 2 females, 9; Gellibrand River, 5 km west of Chapple Vale, 24 Oct. 1984, 3 females, 7; Loves Creek, 7 km north of Gellibrand, 1 male, 1 male(e), 2 females; Ford River, 7 km south-east of Lavers Hill, 5 Dec. 1983, 1 male, 1 female; Barwon River, 7 km south of Winchelsea, 26 Jan. 1982, 1 female; Lake Daylesford at Daylesford, 11 Nov. 1981, 3 females; Coliban River at Trentham Falls, Trentham, 11 Nov. 1981, 1 female, 6; Yarrowee River, 4 km north-west of Inverleigh, 27 Jan. 1982, 1 male(e); Werribee River, 15 km north-north-west of Ballan, 25 Nov. 1982, 1 male(e), 1 female, 29 June 1982, 1 male(e); Lerderderg River, 4.8 km west-north-west of Blackwood, 15 Oct. 1984, 1 male (incl. PT-944); Balcombe Creek, beside Balcombe Army Camp, Nepean Highway, Mornington, 23 Dec. 1984, 1 female; Woori Yallock Creek, 6 km west of Yarra Junction, 16 Oct. 1981, 1 female; Acheron River, 5 km west-south-west of Marysville, 19 Oct. 1984, 1 male(e); Acheron

River, 3 km south of Taggerty, 19 Oct. 1984, 1 female; Acheron River at Taggerty, 18 Oct. 1984, 1 female, 20; Acheron River at Acheron, 30 Jan. 1982, 1 female; Big River, 10 km south-west of Jamieson, 30 Jan. 1982, 1 male(e), 1 female; La Trobe River at Hawthorn Creek, 12 km east of Neerim, 27 Oct. 1981, 1 male(e); Lower Tanjil River on Moe to Erica Road, 26 Oct. 1981, 1 male(e); Stony Creek at Cheshunt, 2 Oct. 1982, 1 males(e), 3 females; Dandongadale River, 3 km west of Dandongadale, 2 Oct. 1982, 2 females, 8; Ovens River at Porepunkah, 2 Oct. 1982, 1 male(e); Macalister River, 15 km south-south-east of Licola, 7 Nov. 1984, 3 females; Wonangatta River at Waterford, 14 Nov. 1983, 1 female, 8 Nov. 1984, 2 males, 2 females, 47 (incl PT-942); Tambo River, 17 km south-east of Omeo, 30 Sept. 1982, 4 males, 8; Rocky River, 17 km north-east of Orbost, 14 Oct. 1982, 4 males(e), 2 females, 50; Rich River, 26 km north-north-east of Orbost, 13 Oct. 1982, 14; Tonghi Creek on Princes Highway, 13 Oct. 1982, 1 male(e), 4 Jan. 1982, 1 female; Thurra River on Princes Highway, 3 Jan. 1982, 1 female; Bemm River on Princes Highway, East Gippsland, 14 Oct. 1982, 1 female; Wigan River on Princes Highway, 3 Jan. 1982, 1 female; Betka River, 11 km west-south-west of Mallacoota, 6 July 1983, 4. NEW SOUTH WALES: Little Henry River, 17 km south-east of Glen Innes, 20 May 1983, 1 female, 3; Back Creek, 16 km south-east of Glen Innes, 20 May 1983, 1 male.

Diagnosis. This species is readily recognised by the divided gills. The rounded head shape, pale head colour, shape of pronotum anterior margin and corner, and case type are also useful in recognition.

Description. *Head.* Width 1.00-1.22 mm (n=87, 14 sites); oblong but somewhat rounded dorsally; usually orange to orange-brown, rarely brown, with comparatively large contrasting yellow spots; yellow patch on each side of frontoclypeal apotome at constriction, sometimes extending to anterior margin; frontoclypeal apotome

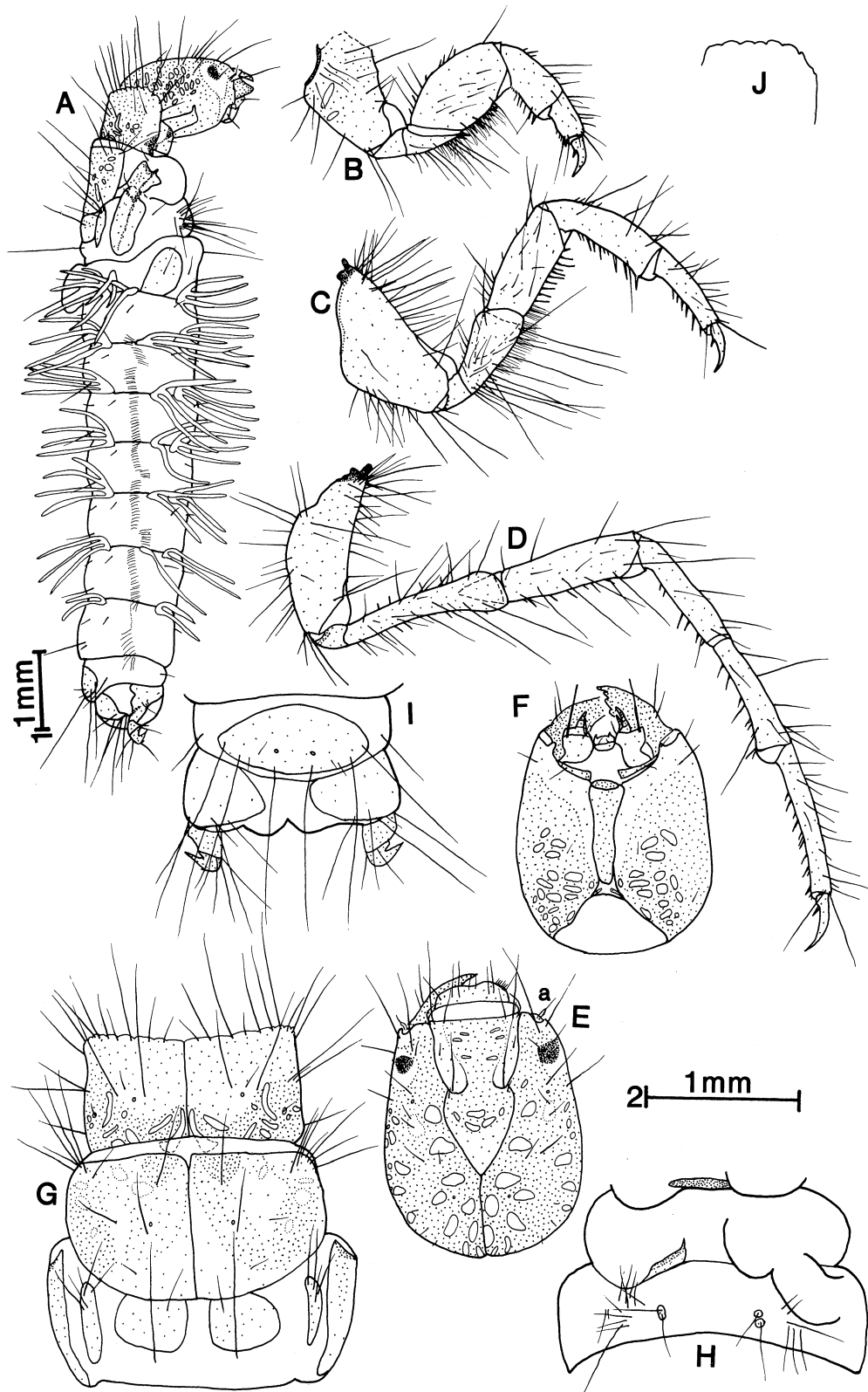


Fig. 9. *Triplectides similis* larva (PT-942). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – thorax ventral view, I – segment IX dorsal view, J – right anterolateral pronotum corner. A – scale 1, B–J – scale 2. a – antenna.

sometimes pale posteriorly; some with pale stripe posterodorsally on each side; pale patch around eye nearly straight on posterior margin; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome tapering posteriorly, rarely broad for most of length; left mandible with 7 teeth; right mandible with 5 teeth.

Thorax. Pronotum yellow-brown with contrasting yellow spots; anterior margin lightly scalloped with slightly larger projections on anterolateral corners, rarely almost straight margin with corners almost rounded; mesonotum mottled pale brown with lightly contrasting yellow, rarely very pale yellow, patches; usually with brown patch on anterior margin at midline; metanotum with 4 sclerites arranged as in Figure 9, medial sclerites pale yellow-brown, lateral sclerites paler yellow brown; with 18-31 metasternal setae, most associated with 2-4 small pale sclerites, those not associated with these sclerites sometimes with very small pale basal sclerite; foretrochantin with upturned section short; prosternal sclerite dark brown, comparatively broad; mesosternal sclerites pale yellow with orange anterior margins; legs as in Figure 9B-D with or without pigment bands; hind tibiae divided.

Abdomen. Lateral hump sclerite pale yellow, slightly darker anteriorly; number of gill filaments highly variable even at one site, at least some divided with up to 4 filaments, usually more anterodorsally, some of range shown in diagram in table 1; tergite IX pale orange, lateral sclerite and ventral sole plate pale orange; anal claw moderately large with one accessory hook on outer margin.

Body length. 6-14 mm, possibly some increase in size with warmer water.

Case. A hollowed twig or distinctive curved case made of numerous small pieces of detritus, mainly wood or stem (Fig. 24I). Distinctive case is used by all early instar larvae, hollowed twig not used until third instar or later. Case usually not much longer than larva, rarely up to twice as long. Nearly all cases cause larvae to float on the water's surface.

Early instar larvae. Fourth instar larvae are little different to fifth instar and so readily recognisable; head width 0.66-0.80 mm (n=23, 6 sites). Third instar larvae have several anterior gills divided into at least 2 filaments; head width 0.44-0.50 (n=14, 4 sites). Earlier instar larvae can often be identified from their distinctive case.

Remarks. Morse & Neboiss (1982) note that there are large and small eyed males in this species. No obvious larval differences appeared to occur that could be related to eye size of males. Males of both eye types were reared during this study and both types from the one locality on one occasion.

Habitat and distribution. This species is found in a wide range of flowing habitats, from cool alpine creeks to cool forested creeks to warm lowland rivers. Usually year round flow is required but rarely it is found in

streams that do not flow in summer. Three pupae collected from one stick in Lake Daylesford, Victoria may have washed in from an inflow creek. Most larvae collected were near the surface on macrophytes, wood and submerged riparian vegetation. Larvae hatched from eggs in the laboratory swam almost constantly whilst larvae of the other species hatched from eggs, *T. truncatus*, *T. ciuskus* and *T. proximus*, did not swim at all. The *T. similis* hatchlings may swim to riparian vegetation. Kept in still water in the laboratory, many larvae of this species crawled out of their containers, whilst those of *T. truncatus* and *T. ciuskus* did not. Neboiss (1983) gives the distribution as south-east Queensland, New South Wales, Victoria, South Australia, and Tasmania.

T. proximus group

Larvae of only one of the two species from this group are described here.

Diagnosis. Frontoclypeal apotome widest on anterior margin; pronotum with only small projections and these extending laterally; metanotum with 5 sclerites; 24-61 metasternal setae and 2 comparatively large pale sclerites.

Triplectides proximus Neboiss

Figs 10, 24J

Material examined. Eleven reared males, 16 reared females and 188 larvae. VICTORIA: Murrundindi River, 2 km west-south-west of Buxton, 11 Feb. 1984, 6; Big Pats Creek, 4 km east-south-east of Warburton, 6 Nov. 1983, 3 females, 19; Acheron River, 12 km north of Warburton, 8 Mar. 1981, 1 female, 16 Oct. 1982, 1; Acheron River, 3.5 km east-south-east of Narberthong, 17 July 1981, 2 males, 5 females, 16 Oct. 1981, 2 males, 2 females; Acheron River at Taggerty, 19 Oct. 1984, 18 (incl. PT-941); Toorongo River, 5 km north-east of Noojee, 24 July 1981, 2 males; Toorongo River, 6 km north-east of Noojee, 27 Nov. 1981, 12; Loch Creek on Loch Valley Road, first crossing north of Noojee, 24 July 1981, 1 female, 2; Western Tyers River, 18 km north-north-east of Erica, 28 Oct. 1981, 2 females, 10; Middle Tyers River, 3.5 km north-north-east of Erica, 27 Oct. 1981, 1 male; Eastern Tyers River, 3.5 km north-north-east of Erica, 27 Oct. 1981, 1 male, 2 females, 2; Howqua River, 18 km south-east of Merrijig, 31 Jan. 1982, 3; Delatite River, 2 km south of Merrijig, 8 Nov. 1981, C. Yule, 1 male; Macalister River, 5 km south of Mount Howitt, 18 Nov. 1985, 4; Two Mile Creek, 6 km north of Dargo, 8 Nov. 1984, 4; Tarra Falls approximately 12 km north-west of Yarram, 9 Dec. 1984, 2 males (incl. PT-892); Bundarra River, 16 km north-west of Omeo, 1 Oct. 1982, 1; Mitta Mitta River at Glen Valley, 30 Sept. 1982, 15; Snowy Creek, 8 km south-east of Mitta Mitta, 30 Oct. 1982, 11; Maroka River, 10 km east of Mount Wellington, 7 Nov. 1984, 1; Rodger River, 23 km south-west of Bonang, 1 Nov. 1983, 13; Ada River, 4 km south-south-west of Errinundra, 27 Jan. 1983, 21; West Errinundra River, 4 km north-north-west of Errinundra 30 Dec. 1983, 12; West Errinundra River, 5 km

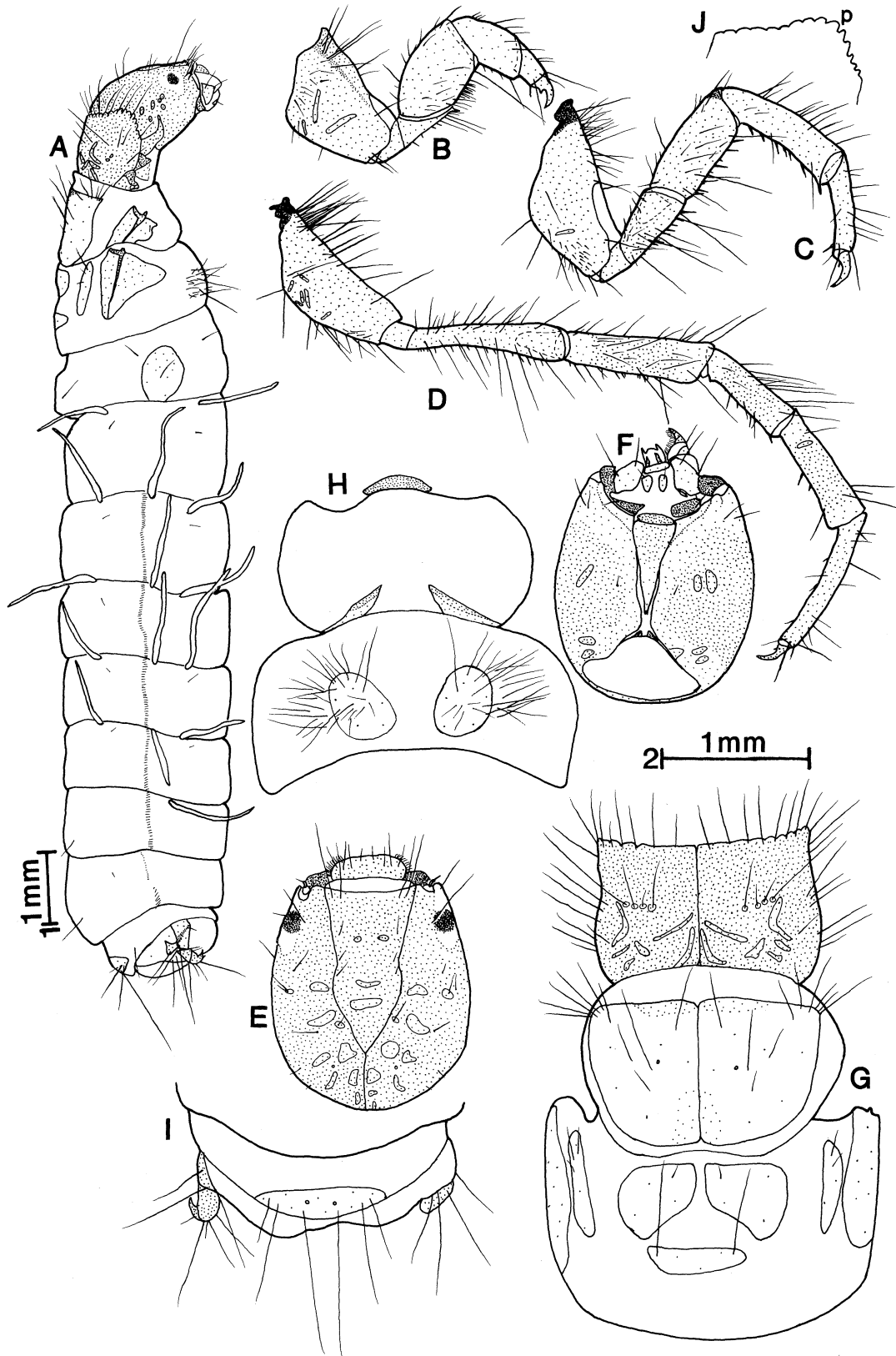


Fig. 10. *Triplectides proximus* larva (PT-941). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – thorax ventral view, I – segment IX dorsal view, J – right anterolateral pronotum corner. A – scale 1, B–J – scale 2. p – projection.

north-north-west of Errinundra, 31 Dec. 1983, 12; Errinundra River, at junction with Ada River, East Gippsland, 27 Jan. 1983, 15; East Branch of East Errinundra River, approximately 23 km south-east of Bonang, 26 Jan. 1983, 13.

Diagnosis. As well as the character states listed in the species group diagnosis, this species is recognised by the mesonotum being much paler than pronotum.

Description. *Head.* Width 0.85-1.32 mm (n=880, 5 sites); rounded dorsally; red-brown or very dark, almost black, with only lightly contrasting orange spots, only small spots on frontoclypeal apotome; pale patch around eye with curved posterior margin; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome tapering to point posteriorly; left mandible with 5 or 6 teeth; right mandible with 4 teeth.

Thorax. Pronotum red-brown to dark brown with only lightly contrasting orange spots, anterolateral corner with several small fairly regular projections extending onto lateral margin, anterior margin very lightly scalloped; mesonotum usually pale yellow, with small brown patch on anterior margin of each sclerite, very much paler than pronotum; metanotal sclerites pale yellow, can be difficult to see, 5 sclerites arranged as in Figure 10 (posterior medial sclerite may be difficult to see); foretrochantin stout basally with upturned section narrow; prosternal sclerite brown; mesosternal sclerites pale brown with darker anterior margin, metasternal setae very numerous, 24-61, less than half associated with 2 comparatively large pale medial sclerites; legs brown, some with lightly contrasting spots, without pigment bands although joints may be paler than rest; hind tibia divided.

Abdomen. Lateral hump sclerite yellow posteriorly, pale brown anteriorly; gills single filaments, arranged as in diagram in table 1, maximum number the most common; tergite IX pale brown or yellow, may be difficult to see; lateral sclerite and ventral sole plate very pale brown; anal claw with 3 accessory hooks on outer margin, each decreasing in size so that sometimes only one is clearly visible.

Body length. 5-16 mm.

Case. A hollowed twig or piece of charcoal (Fig. 24J). Small pieces of detritus occasionally added around entrance to stick and case may be extended posteriorly using small pieces of detritus. Case usually one and one-half to 2 times length of larva. Virtually all early instar larvae use sand cases made by other trichopteran larvae. Such 'borrowed' cases are generally recognisable as belonging to *Triplectides* larvae due to their habit of adding detritus to front of case. Most larvae change to hollowed stick case during their third or fourth instar.

Early instar larvae. Head shape and very much paler mesonotum make this species identifiable in third or earlier instars. Head width ranges at Acheron River were: fourth instar 0.63-0.85 mm, third instar 0.37-0.56 mm, second instar 0.25-0.31 mm, and first instar 0.16-0.18 mm.

Habitat and distribution. Larvae are found in backwaters and log jams in montane and foothills rivers and creeks, and are apparently confined to cool waters. Neboiss (1983), lists the distribution as New South Wales; Victoria, south-east coastal ranges; Tasmania, northern provinces. Collections for this study were made in most of eastern and central Victoria and no further west than Mount Macedon where a male pupa, lodged in the Museum of Victoria, was found.

T. elongatus group

Larvae of only two of the six species in this group are known, *T. elongatus* and *T. varius*.

Diagnosis. Frontoclypeal apotome widest on anterior margin; pronotum anterolateral corner much extended; 5 metanotal sclerites; metasternum with 26-100 setae; comparatively short hindlegs (tibia undivided in *T. varius*).

Triplectides elongatus Banks

Fig. 11

Material examined. 27 reared males, 32 reared females and 93 larvae. VICTORIA: Headwaters of McFarlane Creek, 4 km west of Mount Wellington, 6 Nov. 1984, 1 male, 5 females, 19 (incl. PT-945); Lake Mountain, swamp on creek at Snowy Hill Car Park, 18 Nov. 1983, 14 males (incl. PT-929), 12 females, 36; headwaters of Caledonia River, near Howitt Hut, Howitt Plains, 18 Nov. 1985, 4; Mount Baw Baw, sphagnum bog 400 m east of Baw Baw Alpine Village, 9 Dec. 1983, 4 males, 4 females, 7; Mount Buffalo, small creek 300 m south-east of Tatra Inn, 6 Dec. 1982, 1 male, 4 females, 5, 27 Nov. 1983, 6 males, 7 females, 8; Mount Buffalo, head of Bunyip River, I. Bayly & J. McAuley 28 Oct. 1978, 14; small tributary of Rocky Valley Dam 3 km north-north-east of Mount Cope, 1 Oct. 1982, 1 male.

Diagnosis. The character states listed for the *elongatus* group are distinctive of both known species. Apart from the undivided tibia of *T. varius*, the larvae of this species and *T. elongatus* are very similar. *T. elongatus* larvae generally have fewer metasternal setae, frontoclypeal apotome with the constriction more rounded, pronotum anterolateral corner more extended, extended laterally as well as anteriorly and anterior margin more lightly scalloped. However overlap occurs in all characters other than division of the tibia.

Third instar larvae are more difficult to distinguish from other species due to the rounded pronotum but the hind tibia is still divided, readily distinguishing it from *T. varius* the only species in the genus it has been found to co-exist with to date.

Description. *Head.* Width 1.08-1.23 mm (n=27, 3 sites); rounded dorsally; dark brown to black with lightly

contrasting orange spots, only small spots on frontoclypeal apotome; some larvae with head pale posteriorly; pale patch around eye with rounded posterior margin; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome

tapered but still comparatively broad posteriorly; left mandible with 6 teeth; right mandible with 6 teeth.

Thorax. Pronotum dark brown with lightly contrasting orange spots, anterolateral corner extended but without projections, anterior margin lightly scalloped; metanotum

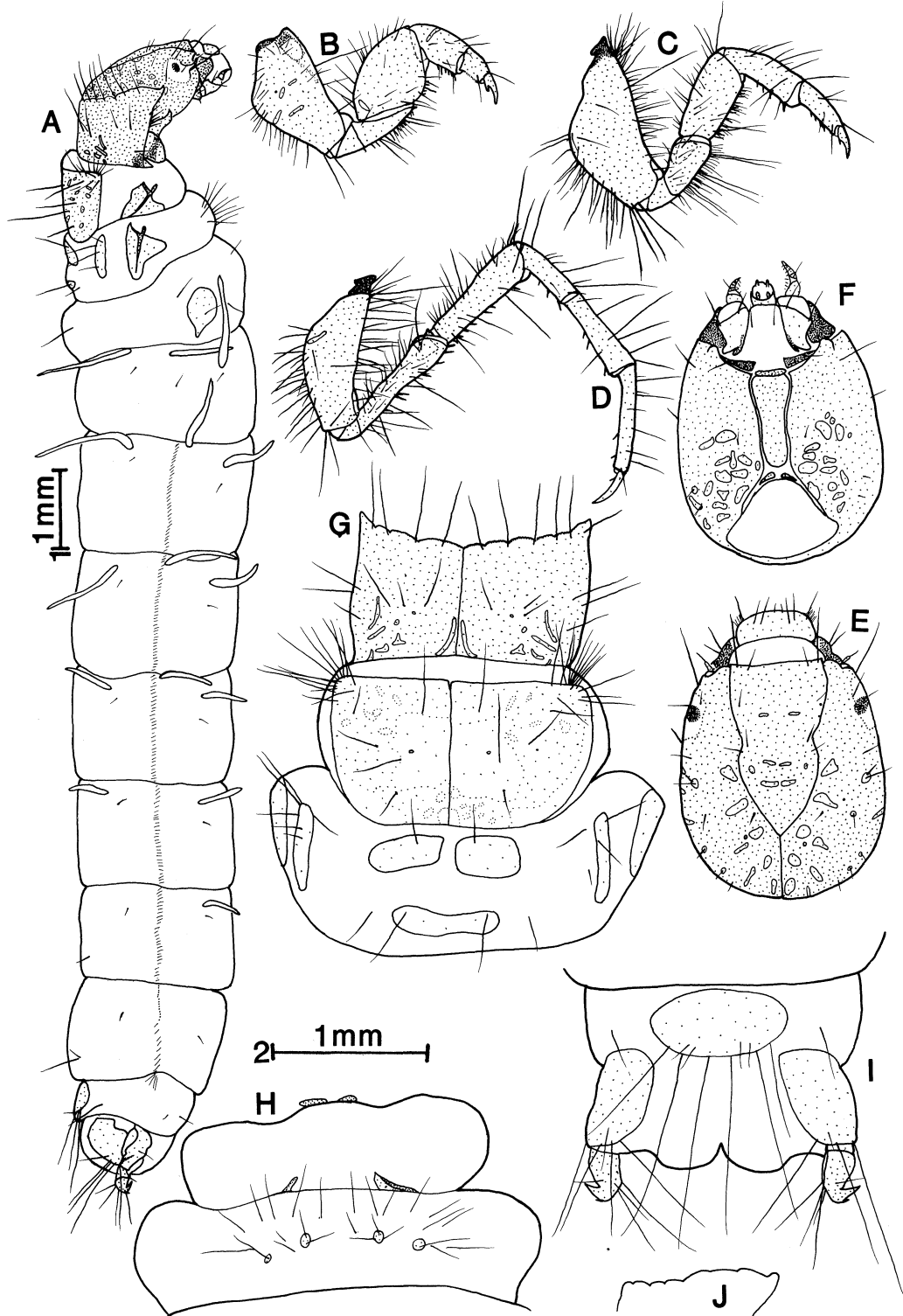


Fig. 11. *Triplectides elongatus* larva (PT-945). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

with sclerites as shown in Figure 11, anterior medial sclerites pale brown, lateral sclerites and posterior medial sclerite pale yellow; mesonotum yellow to pale brown, mottled and with lightly contrasting yellow spots; metanotum with 5 sclerites as in Figure 11 (posterior sclerite may be difficult to see); foretrochantin broad and stout basally, upturned section short and blunt; prosternum with 2 dark brown sclerites, these sometimes appearing as one; mesonotal sclerites pale brown with darker anterior margins; 26-50 metasternal setae, some associated with 4 small very pale sclerites that may be difficult to see, other setae may have small sclerite at base; legs orange-brown, without dark pigment bands; hind tibia divided.

Abdomen. Lateral hump sclerite yellow-orange, darker anteriorly; gills single filaments, arranged as in diagrams in table 1; tergite IX orange or pale brown; lateral sclerites and ventral sole plate orange; anal claw large, with one accessory hook on outer margin.

Body length. 9-13 mm.

Case. Construction appears variable at different localities probably due to availability of materials. Dorsal surface always longer than ventral so that short hood formed. Case usually tubular, tapering posteriorly and little longer than larva. Case types: (i) hollowed twig or rush stem, (ii) several narrow twigs or rush stems bundled together in a similar manner to Figure 24N, (iii) several rectangular pieces of detritus resulting in a case similar to that of *Triplectidina nigricornis* (Fig. 24H) or (iv) numerous very small pieces of detritus. Sand grains used with small pieces of detritus but mostly by early instar larvae. Many larvae add thin short stems to extend out like skirt. If hollowed twig used, little detritus may be added to anterior end and some to posterior end to lengthen case.

Early instar larvae. Fourth instar larvae, head width 0.58-0.75 mm (n=11, 2 sites), are recognisable from above characters. Third instar larvae, head width 0.38-0.41 mm (n=3), have pronotum anterolateral corner rounded and hind tibia divided.

Habitat and distribution. Larvae have been found only in sphagnum bogs and small alpine creeks above about 1500 m in altitude. Collection of larvae from very shallow water following heavy rain suggests they are able to survive drying of surface water, presumably in damp moss or buried in gravel.

The distribution listed in Neboiss (1983) of eastern New South Wales, north-east Victoria, and Tasmania does not mention altitude, possibly because adults are capable of long distance flight.

Triplectides varius Kimmins

Figs 12, 24K

Material examined. Twelve reared males, 12 reared females and 17 larvae. VICTORIA: Mount Baw Baw, small creek approximately 400 m east of Baw Baw Alpine

Village, 9 Dec. 1982, 11 males, 12 females, 15 (incl. PT-938); small creek in snowgrass plain 4 km north of Mount Wellington, 6 Jan. 1984, 1 male; Mount Buffalo, pool in swamp at head of Bunyip River, I. Bayly & J. McAuley, 28 Oct. 1978, 2. NEW SOUTH WALES: small tributary of Lake Albina approximately 20 m upstream of lake, 22 Feb. 1983, 6 males, 4 females, 15; Sphagnum bogs 3.5 km west-south-west of Guthega (approximately 1680 m altitude), 22 Feb. 1983, 8 males, 3 females, 6; small creek on Drift Hill approximately 5 km east-south-east of Thredbo, 20 Nov. 1982, 3 males (incl. PT-956), 8 females, 3; Geehi River on slopes of Mount Jagungal, L. Metzeling, 4 Dec. 1981, 1.

Diagnosis. This species is unique within the *Triplectides* in having the hind tibia undivided, otherwise it is very similar to *T. elongatus* (see Diagnosis section for *T. elongatus*).

Description. **Head.** Width 1.06-1.23 mm (n=29, 4 sites), rounded dorsally, dark brown to black, some specimens with very lightly contrasting orange spots, back of head paler on some, only small spots on frontoclypeal apotome, pale patch around eye with rounded posterior margin; frontoclypeal apotome widest on anterior margin, tapering behind constriction; ventral apotome tapered but still fairly broad posteriorly; left mandible with 6 teeth; right mandible with 6, rarely 5, teeth.

Thorax. Pronotum brown to dark brown, some specimens with lightly contrasting orange spots, anterior margin lightly scalloped, no projections on anterolateral corner but this very extended anteriorly; mesonotum brown to dark brown, usually little paler than pronotum; metanotum with 5 sclerites (posterior medial sclerite may be difficult to see) arranged as shown in Figure 12, pale brown, posterior medial sclerite very pale brown to pale brown; foretrochantin stout basally and with moderately short thick upturned section; prosternal sclerite dark brown; mesosternal sclerites light brown with darker anterior margin; 60-100 mesosternal setae, some associated with very pale sclerites, 1-3 per sclerite; legs fairly uniform brown, without pigment bands, hind tibia undivided.

Abdomen. Lateral hump sclerites pale orange; gills single filaments, arranged as in diagram in table 1; tergite IX pale brown; lateral sclerites and ventral sole plate light brown; anal claws moderately large, with 1 accessory hook on outer margin.

Body length. 8-13 mm.

Case. Tubular and slightly arched, longer dorsally so short hood formed. Made of small pieces of detritus and sand irregularly arranged (Fig. 24K), rarely with larger pieces of detritus. Rarely larvae use hollowed twigs. The case usually up to about one and one-half times length of larva.

Early instar larvae. Fourth instar larvae (head width 0.64-0.70, n=3) are easily identified using above description. Third instar larvae (head width 0.45 mm, n=1) have pronotum corner rounded and hind tibia undivided.

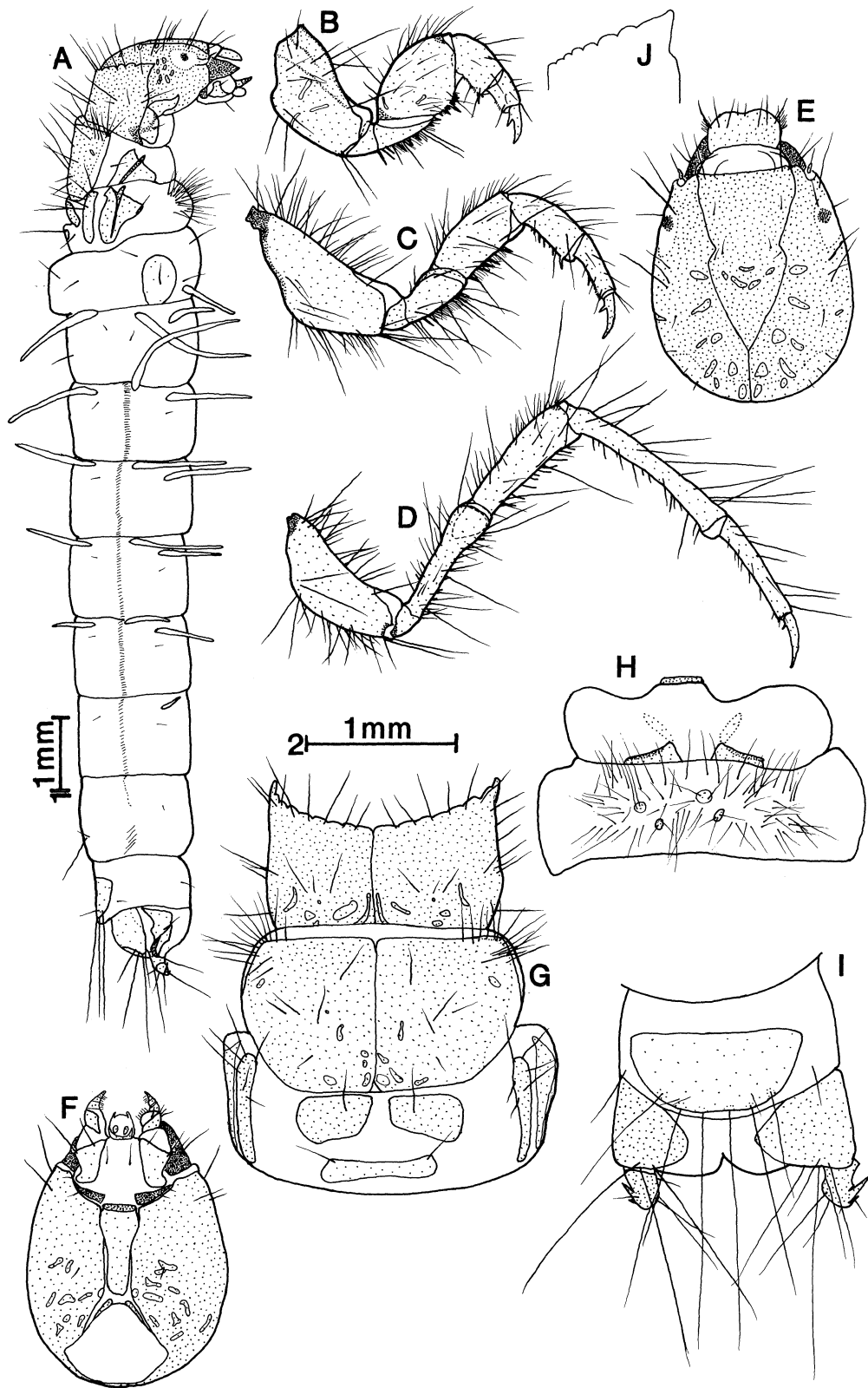


Fig. 12. *Triplectides varius* larva (PT-938). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

Habitat and distribution. Larvae have so far only been collected from the same habitat listed for *T. elongatus*, sometimes in the same creek or bog. Collections made in very shallow water after heavy rain on two occasions suggest larvae are able to survive drying of surface water, presumably in damp moss or buried in gravel.

The current published distribution (Neboiss, 1983) is New South Wales and eastern Victoria, in the south-east mountains.

T. truncatus group

Larvae of *T. truncatus* and *T. altenogus* are the only two of the seven species in this group that are known.

Diagnosis. Frontoclypeal apotome widest on anterior margin; pronotum with slight scalloping and small projections on the anterolateral corner; metanotum with 5 sclerites; metasternum with 8-33 setae.

Triplectides truncatus Neboiss

Figs 13, 24L

Triplectides truncatus Neboiss 1977: 129, figs 699-702.

Triplectides hamatus.—Morse & Neboiss 1982: 76, figs 50, 51, 80 (new synonym).

Material examined. Seventy-six reared males, 88 reared females and 124 larvae. VICTORIA: Stony Creek at Turrett Falls, 3 km south-west of Halls Gap, 4 Dec. 1983, 3 males, 8 females, 5; Dairy Creek, 6 km south of Halls Gap, 3 Nov. 1981, 1 female, 1; Asplin Creek at Gellibrand River, 4 km east of Gellibrand, 26 Jan. 1982, 2 males, 2 females, 2; West Barham River, 7 km north-west of Apollo Bay, 11 Mar. 1984, 1 female, 1; Grey River, 4 km west-north-west of Kennett River township, 5 Dec. 1983, 10 males, 13 females, 34; Erskine Falls near Lorne, 25 Oct. 1984, 11 males, 5 females, 13 (incl. PT-943), 27 Jan. 1982, 1 male, 3 females; Ford River, 7 km south-east of Lavers Hill, 25 Oct. 1984, 2; Yarrowee River, 4 km north west of Inverleigh 27 Jan. 1982, 1 male; Werrabee River, 15 km north-north-west of Ballan, 25 Nov. 1982, 1 male; Lerderderg River, 4.8 km west-north-west of Blackwood, 10 May 1982, A. Boulton, 1 male, 27 June 1982, Boulton, 2 males, 1 female, 23 Dec. 1982, 2 males, 4 females, 20 Jan. 1983, 1 male, 26 Feb. 1984, 2 males, 7 females, 18 Sept. 1984, 6 males, 9 females; Acheron River, 3.5 km east-south-east of Narbethong, 18 Nov. 1983, 1 female, 19 Dec. 1983, 1 male, 19 Jan. 1984, 1 male, 3 females, Acheron River, 12 km north of Warburton, 8 Mar. 1981, 1 male; tributary of the Howqua River, 18 km south-east of Merrijig, 31 Jan. 1982, 1 male, 5 females; Traralgon Creek, 4.5 km north of Calder Junction, 27 Oct. 1981, 1 male, 2 females; Western Tyers River, 18 km north-north-east of Erica, 27 Oct. 1981, 3 males (incl. PT-897), 5 females, 20; Tarra Falls approximately 12 km north-west of Yarram, 9 Dec. 1984, 8 males, 3 females, 11; Pond beside Moroka River, 10 km east of Mount Wellington, 8 Nov. 1984, 1; Dinner Creek, 15 km north-north-east of Licola, 7 Nov. 1984, 3 males, 8 females, 4; Two Mile Creek, 6 km

north of Dargo, 8 Nov. 1984, 4 males, 3 females, 2; Barkly River, 9 km north west of Licola, 18 Nov. 1985, 1 female; Eurobin Falls, Mount Buffalo National Park, 6 Dec. 1982, 11 males, 4 females, 16; Rodger River, 23 km south-west of Bonang, 2 Nov. 1983, 1 male; east branch of the East Errinundra River, approximately 23 km south-east of Bonang, 24 Jan. 1983, 12. TASMANIA: small pools on flood bank of Olga River, P.S.L., P.A. and R.S., 9 Feb. 1976, 3.

Diagnosis. Within the *T. truncatus* group, this species is recognisable by the frontoclypeal apotome with a yellow patch on each side at the constriction, ventral apotome very narrow in posterior half and legs without pigment bands. The case shape described above is only found in this species and can aid in identification, however, some larvae use a hollowed twig.

Description. *Head.* Width 0.69-0.97 mm (n=1,028, 7 sites); oblong dorsally; dark orange or brown with contrasting orange spots, some specimens with pale area on each side of head posteriorly; frontoclypeal apotome paler than surrounding area but with dark patch medially, and always with obvious yellow patch on each side at constriction, these often extending to anterior margin; pale patch around eye straight or rounded posteriorly; frontoclypeal apotome widest on anterior margin, straight sided or rounded and tapering behind constriction; ventral apotome strongly tapering so very narrow in posterior half; left mandible with 6 teeth; right mandible with 4 or 5 teeth.

Thorax. Pronotum brown with orange spots, anterior margin very lightly scalloped with few irregular small projections on anterolateral corner; mesonotum paler than pronotum, rarely very much so, mottled brown with orange and yellow spots; metanotum with 5 sclerites (posterior sclerite may be very pale and difficult to see), arranged as in Figure 13, medial anterior sclerites brown with yellow spots, lateral sclerites yellow and brown, posterior medial sclerite very pale yellow; foretrochantin with moderately long upturned section at fairly shallow angle to base; prosternal sclerite brown, mesosternal sclerites very pale, each with brown anterior margin, often with pale anterior extension on medial edge; 14-33 metasternal setae, mainly associated with 4 small pale sclerites, additional setae to those on sclerites may have small pale sclerite at base, up to 5 such sclerites; legs with coxae brown proximally, rest of leg segments orange, without pigment bands, fore femur with only slender dorsal spines, hind tibia divided.

Abdomen. Lateral hump sclerite yellow; gills with single filaments, arranged as in diagrams in table 1; tergite IX pale yellow, the 4 smaller setae may be difficult to see; lateral sclerite and ventral sole plate orange-yellow; anal claw moderately large with one, rarely 2, accessory hooks on outer margin.

Body length. 8-14 mm.

Case. Early instar larvae construct distinctive case made of pieces of twig and detritus placed together irregularly but fairly tidily so that case comparatively thin and compact, often somewhat triangular in cross-section.

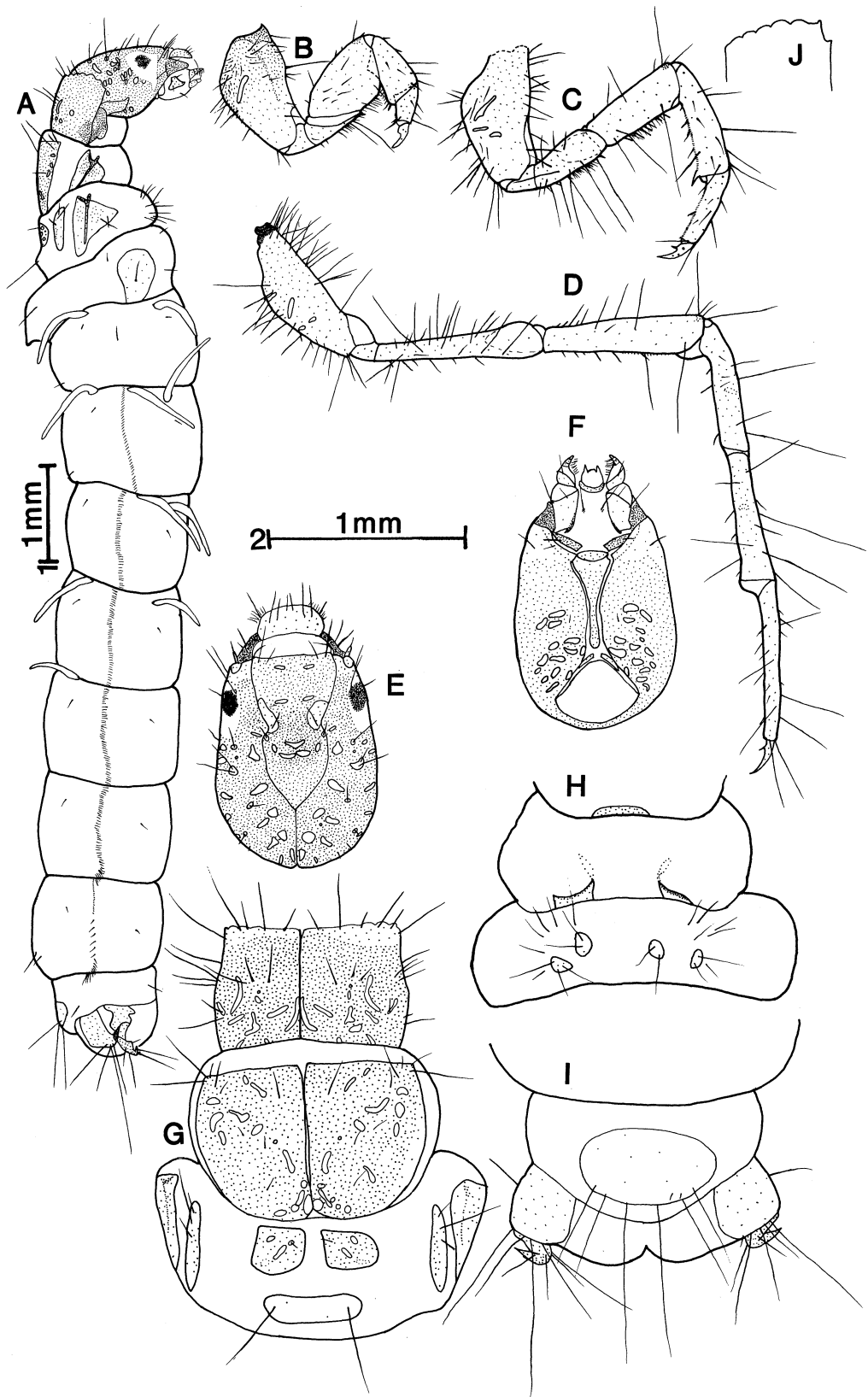


Fig. 13. *Triplectides truncatus* larva (PT-943). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

Late instar larvae have either case of this form or use hollowed twig. Generally case is one and one-half to 2 times length of the larvae (Fig. 24L).

Early instar larvae. Fourth instar larvae are recognisable from the above description, head width 0.42-0.65 mm. Third instar larvae have yellow patches present on frontoclypeal apotome at constriction, head width 0.29-0.41 mm. Second instar larval head width 0.20-0.28 mm.

Remarks. The adult males reared during this study were not all as described in Morse & Neboiss (1982), many had characteristics of *T. hamatus* Morse & Neboiss (1982) and others showed a wide range of variation between the two. Adults of these different forms were at times reared from larvae collected at a single locality. Although some variation occurred in the larvae, as indicated in the description above, it could not be related to different types of adults. *Triplectides truncatus* was originally described from Tasmania. Only three larvae were available from Tasmania and these fit the above description. For these reasons I consider *T. hamatus* to be a synonym of *T. truncatus*.

Habitat and distribution. Larvae were collected on detritus accumulations in backwaters in forested montane and foothill creeks. In eastern Victoria, the larvae appear confined to upper reaches of the creeks being replaced by *T. proximus* lower in the forested section. In western Victoria where *T. proximus* does not occur, *T. truncatus* occurs in lower, warmer reaches of creeks and even in intermittent creeks. The published distribution of *T. truncatus* is Tasmania, western province and Victoria widespread along south coast ranges (Neboiss, 1983). Larval collections and the recorded distribution of *T. hamatus* of eastern New South Wales coastal ranges pushes the distribution further north in Victoria and into New South Wales.

Triplectides attenogus Morse & Neboiss

Figs 14, 24M

Material examined. Six reared males, 7 reared females and 40 larvae. VICTORIA: Bellbird Creek at Bellbird, East Gippsland 13 Oct. 1982, 1 male; Thurra River on Princes Highway, East Gippsland, 13 Oct. 1982, 2; Tonghi Creek on Princes Highway, East Gippsland, 13 Oct. 1982, 1; Back Creek, 1 km north-east of Noorinbee North, 13 Oct. 1982, 3 males, 3 females, 2; Rich River, 26 km north-north-east of Orbost, 14 Oct. 1982, 1 male (PT-930), 4 females; Brodribb River, 24 km north-north-east of Orbost, 14 Oct. 1982, 1 male; Martins Creek, 29 km north-north-east of Orbost, 30 Jan. 1983, 1 (PT-935); Martins Creek, 27 km south-west of Bonang, 30 Jan. 1983, 23; Rodger River, 23 km south-west of Bonang, 1 Nov. 1983, 9; east branch of East Errinundra River, approximately 23 km south-east of Bonang, 24 Jan. 1983, 1; Dowell's Creek, east branch of Mallacoota Inlet, Neboiss, 23 Mar. 1974, 1.

Diagnosis. Within the *T. truncatus* group, this species

and be identified by frontoclypeal apotome with only small yellow patches, if any, at the constriction, ventral apotome tapering to about half its anterior width posteriorly, forelegs with short stout spines dorsally on femur and tibia, and legs sometimes with dark bands. The case type is useful for identification unless a hollowed twig is used. The distinctive case incorporates elements of those made by *T. truncatus* and *Lectrides varians*. This species is most similar to *T. truncatus*. Third instar larvae are more difficult to distinguish from *T. truncatus* but the spines present on the foreleg and case structure are useful in identification.

Description. *Head.* Width 0.94-1.06 mm (n=20, 4 sites); oblong dorsally; brown to very dark brown or black with lightly contrasting orange spots, spots small on frontoclypeal apotome, pale patch around eye with straight posterior margin; frontoclypeal apotome widest on anterior margin, rounded and tapering behind constriction; ventral apotome tapering fairly strongly so posterior width about half anterior width; left mandible with 6 teeth; right mandible with 5 teeth.

Thorax. Pronotum brown to very dark brown or black with small lightly contrasting orange spots, very lightly scalloped and lightly serrate on anterior margin, with few small irregular projections on anterolateral corner; mesonotum paler brown than pronotum, usually with some yellow spots; metanotum with 5 sclerites (posterior sclerite may be difficult to see), arranged as in Figure 14, medial anterior sclerites brown with lightly contrasting yellow or orange spots, other metanotal sclerites pale yellow or pale brown; foretrochantin stout basally with sharply upturned tip short; prosternal sclerite dark brown; mesosternal sclerites pale brown with darker anterior margin, sometimes with pale anterior extension at medial edge; 8-15 metasternal setae, most associated with 4 sclerites, additional setae may have small sclerite at base; forelegs stout, dark brown, with short stout spines on dorsal margin, particularly on femur; midlegs and hindlegs brown, legs may have pigment bands, hind tibia divided.

Abdomen. Lateral hump sclerite yellow, darker anteriorly; gills with single filaments, as in diagram in table 1; tergite IX pale brown; lateral sclerite and ventral sole plate very pale yellow or brown; anal claw with 1 accessory hook on outer margin.

Body length. 13-15 mm.

Case. Hollowed twigs or case characteristic of species consisting of large leaf pieces forming top and bottom surfaces with tube of small pieces of detritus between them (Fig. 24M). Case usually very much wider (5 times or more) and longer than larva.

Early instar larvae. Fourth instar larvae are recognisable from the above description, head width 0.66-0.73 mm (n=12, 4 sites). Third instar larvae, head width 0.42-0.44 mm (n=3), with spines on the legs.

Habitat and distribution. Found in backwaters in medium to large creeks in far East Gippsland, often in rainforest areas. It is interesting to note that the

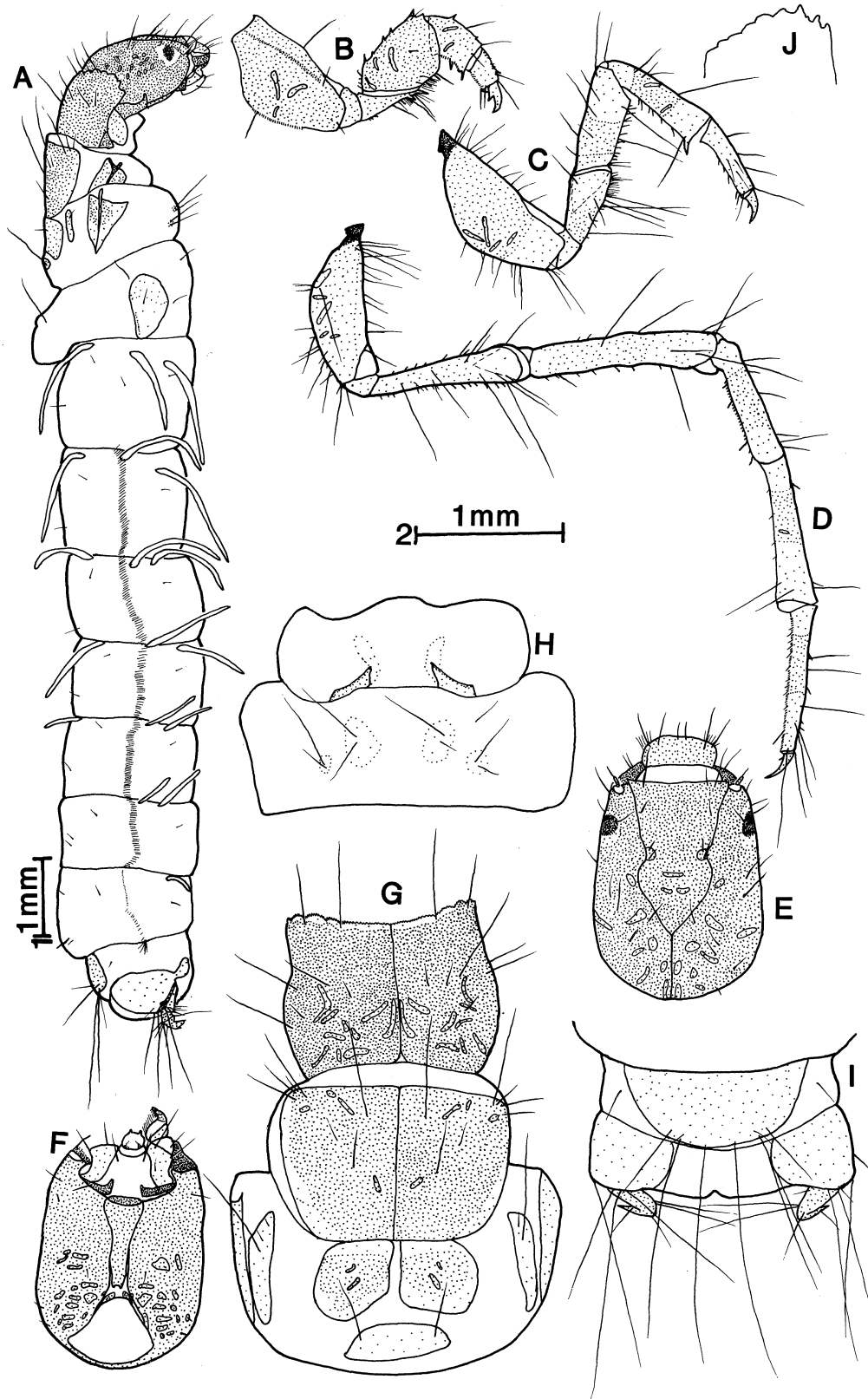


Fig. 14. *Triplectides altenogus* larva (PT-935). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

distribution reflects rainforest distribution in part: north-east and south-east coastal ranges of south-east Queensland, New South Wales, east Victoria (Neboiss, 1983). Larvae were also collected in lowland areas in Victoria.

T. australicus group

Diagnosis. Frontoclypeal apotome widest behind constriction; pronotum with large projections on anterior margin; metanotum with 4 sclerites; metasternum 9-34 setae.

Remarks. *Triplectides australicus* and *T. ciuskus* larvae, the only two known in this group, are very similar and are sympatric. Whilst the combination of a few characters allows identification of most specimens, overlap in all characters occurs. Despite this they do appear to be distinct species. In the reared material pupae were consistently distinguishable on one character. Reared adults were instantly recognisable using spur formulae but many characters on males and females did show some overlap. Again in the reared material, *T. ciuskus* larvae always matched with the *T. ciuskus* pupal character and *T. ciuskus* adult spur formula, showing that the species differences, while small, do hold. This generally held also for *T. australicus* with the exception that a few reared larvae were similar to *T. ciuskus*. Such larvae may be mistaken for *T. ciuskus* larvae but the proportion of larvae this applies to is small.

Triplectides australicus Banks

Fig. 15

Material examined. Nineteen reared males, 16 reared females and more than 84 larvae. VICTORIA: Floating Islands Lagoon 2.5 km west of Pirron Yallock, 24 Oct. 1984, 1 male, 1 female, 2; Pirron Yallock Creek at Pirron Yallock, 24 Oct. 1984, 1 male; Barwon River, 7 km south of Winchelsea, 26 Jan. 1982, 1 female; Mount Emu Creek at Skipton, 29 Apr. 1982, 1; Lake Daylesford at Daylesford, 11 Nov. 1981, 3 males, 12 Oct. 1983, 1 male, 3 females, 11 (incl. PT-936), 18 Sept. 1984, 5 males, 1 female, 2; Paddock Creek, 5 km west of Ballan, 10 June 1976, larvae, MV; Werribee River at Ballan, L. McMillan, 27 July 1976, larvae; Campaspe River, 5 km north-west of Woodend, 19 Nov. 1981, 3 males, 5 females, 20; 19 Oct. 1983, 2 females, 16; Broken River, 9 km north of Mansfield, 1 Feb. 1982, 5 males (incl. PT-904), 2 females, 26; Stony Creek at Cheshunt, 2 Oct. 1982, 1 female, 6; Wodonga DAW2, 18 Feb. 1970, larvae; Mitta Mitta River, Dartmouth Environmental Survey loc. AH, 30 Nov. 1973, larvae; North Melbourne, 26 Feb. 1918, M. Searle, larvae. SOUTH AUSTRALIA: Ewens Ponds approximately 13 km east-north-east of Port MacDonnell, 21 May 1984, 4 males, 2 females, 4.

Diagnosis. *Triplectides australicus* is sometimes indistinguishable from *T. ciuskus* larvae (see notes under

T. australicus group). *Triplectides australicus* larvae are usually distinguished by their orange colour and the presence of a straight line on the posterior margin of the pale patch around the eye. The following characters also usually apply: legs unbanded or with comparatively weak pigment bands; frontoclypeal apotome usually with 2 moderately large spots at the constriction, 1 on each side, rarely with a small spot in the posterior tip; knob-like extension on frontoclypeal apotome behind the constriction, if present, usually fairly small; long spots on the pronotum midline posteriorly usually indistinct in shape; spots on head may join into a large patch ventrally.

Description. *Head.* Width 0.84-1.13 mm (n=50, 4 sites); oblong dorsally, usually orange, some brown, with contrasting yellow spots often diffuse, frontoclypeal apotome usually with moderately large yellow patch at constriction on each side, sometimes with yellow patch in posterior tip; frontoclypeal apotome wider behind constriction than at anterior margin, shape behind constriction variable (sometimes different on 2 sides on 1 animal); with small knob at each side at widest point, straight sided then triangular, rounded or irregular; ventral apotome tapered to be about half anterior width posteriorly; pale patch around eye usually straight posteriorly but rarely with rounded posterior extension medially on one or both sides of head; larvae may be very large; left mandible with 4 teeth; right mandible with 6 teeth.

Thorax. Pronotum orange, rarely brown, often with diffuse yellow spots, pair of spots on midline posteriorly usually large and diffuse; pronotum with projections on anterior margin and anterolateral corners, projections truncate rectangular or more rounded, variable in size, shape and number, rarely 2 projections fuse into 1 broad one; mesonotum pale orange-brown, rarely pale brown, with diffuse yellow spots; metanotum with 4 sclerites arranged as in Figure 15, medial sclerites pale orange or brown with yellow spots, lateral sclerites sometimes paler; foretrochantin with moderately long to long, thin usually sharply upturned section; prosternal sclerite brown; mesosternal sclerites brown each with darker brown anterior margin, sometimes extended towards middle of segment on medial edge; 9-26 metasternal setae, mainly associated with 4 small pale brown sclerites, those not associated with sclerites may have very small sclerite at base; legs orange or orange-brown, with or without pigment bands, if present rarely strongly contrasting with rest of leg segment, hind tibia divided.

Abdomen. Lateral hump sclerite orange posteriorly, yellow anteriorly; gills single filaments, arranged as in diagram, almost all with maximum number shown; tergite IX very pale, often scarcely visible, often with variable number of pale to dark brown spots with irregular outlines in anterior third of sclerite; lateral sclerite and ventral sole plate pale, often with medial dark area with yellow spots; anal claw moderately large, with 2 or more accessory hooks on outer margin.

Body length. 9-18 mm, generally larger in lakes than

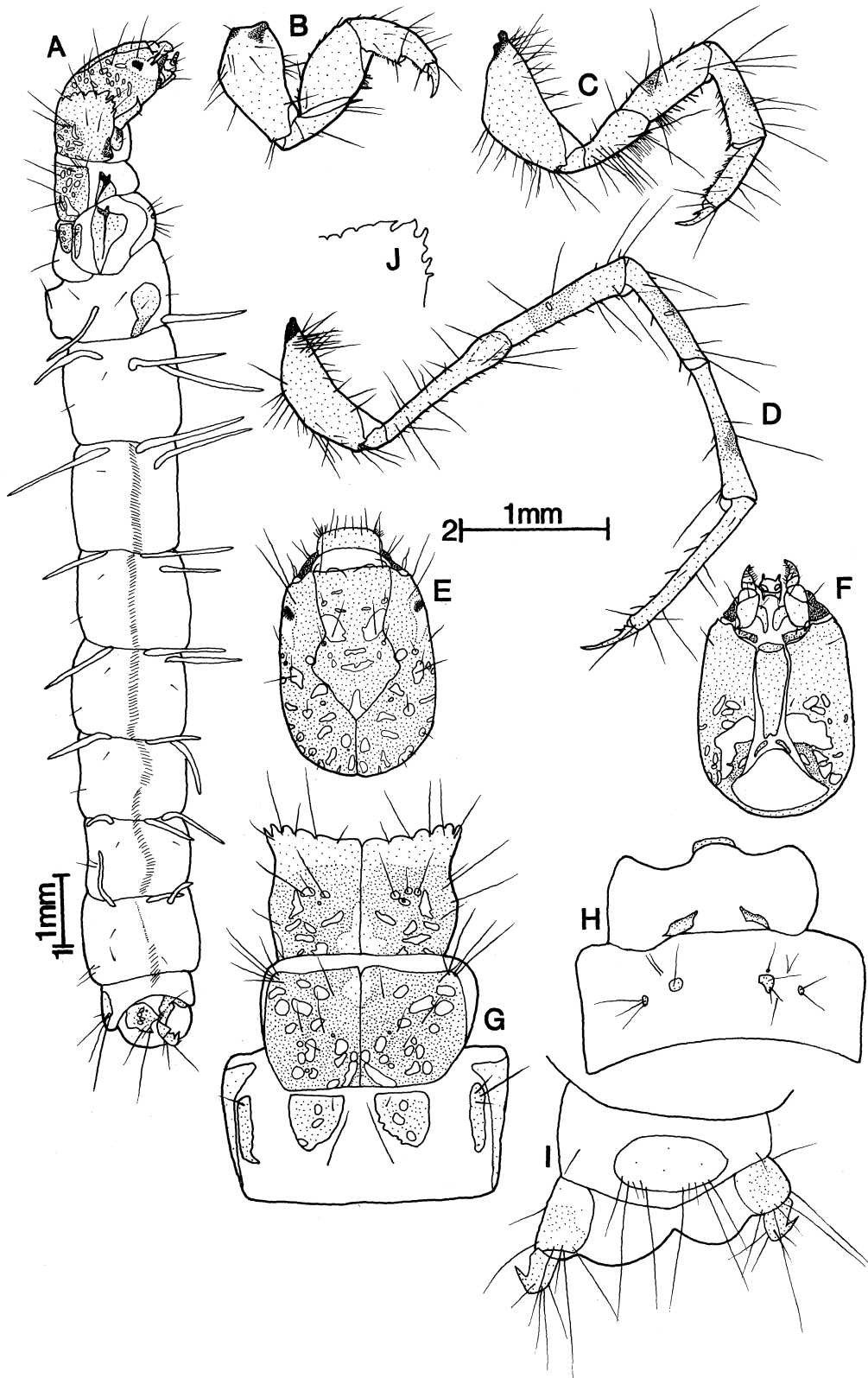


Fig. 15. *Triplectides australicus* larva (PT-936). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

in rivers.

Case. Case often hollowed twig or rush stem, less commonly several small stems bundled together or around main stem. Usually little or no detritus added to hollowed stick cases. Case commonly about twice length of larva, particularly in lentic habitats. The largest case found was 75 mm long by 4 mm diameter.

Early instar larvae. Fourth instar larvae, head width 0.53-0.69 mm (n=30, 3 sites), have the ventral apotome tapering to point and frontoclypeal apotome about same width behind constriction as at anterior margin and straight behind constriction.

Remarks. Larvae of this species may be confused with larvae of *T. magnus* and *T. volda*, particularly in early instars. Information on separation of larvae of these three species is provided in the remarks section under the descriptions of *T. magnus* and *T. volda*. The shape and colour of the frontoclypeal apotome in fourth instar larvae is much more similar to that of *T. australis*, with which it co-exists. Only relative size of projections on the pronotum allow the two species to be distinguished.

Habitat and description. Larvae have been found in large warm lowland permanent rivers which are often sluggish and permanent lakes, often associated with macrophytes.

The known range of the species is Queensland, New South Wales, Victoria and north-west Australia (Neboiss, 1983). The specimens from just inside the South Australian border extend the range slightly.

Triplectides ciuskus Mosely

Fig. 16

Material examined. Fifty-five reared males, 119 reared females and 283 larvae. VICTORIA: Dairy Creek, 6 km south of Halls Gap, 3 Nov. 1981, 1 male, 1 female; McKenzie River at McKenzie Falls 3 km south-east of Zumsteins, 3 Nov. 1981, 1 male, 1 female; Wannon River, 25 km south-south-west of Halls Gap, 3 Nov. 1981, 2 males, 1 female, 8; Woody Yalaok Creek, 4 km south-west of Cape Clear, 23 Oct. 1984, 7 females, 17; tributary of Hopkins River, 6 km south of Ararat, 3 Jan. 1981, 2 females; Asplin Creek at Gellibrand River, 4 km east of Gellibrand 26 Jan. 1982, 2 females, 6; West Barham River, approximately 8 km north-west of Apollo Bay, 11 Mar. 1984, 28; Grey River, 4 km west-north-west of Kennet River township, 5 Dec. 1983, 18; Erskine River at Erskine Falls near Lorne, 27 Jan. 1982, 1 male, 2 females; Barwon River, 7 km south of Winchelsea, 26 Jan. 1982, 1 male, 6; Mount Emu Creek at Skipton, 28 Apr. 1982, 1 male, 3 females, 9; Coliban River at Trentham falls, Trentham, 11 Nov. 1981, 1 female; Lake Daylesford at Daylesford, 12 Oct. 1983, 1 male, 15; 18 Sept. 1984, 32; Lerderderg River, 4.8 km west-north-west of Blackwood, 27 June 1982, 1 female, 23 Dec. 1982, 1 female, 20 Jan. 1983, 1 male, 18 Sept. 1984, 1 female; Main Creek, 18 km north-west of Flinders, 10 Jan. 1982, 2 males (incl. PT-885), 5 females; Woori Yallock Creek, 6 km west of Yarra Junction, 16 Oct. 1981, 1 female; Yarra River at Millgrove, 27 Nov. 1981, 4 males (incl. PT-887), 2 females; Acheron

River at Taggerty, 30 Jan. 1982, 3 males, 4 females, 29; Acheron River at Acheron, 30 Jan. 1982, 3 males, 6 females; Howqua River, 18 km south-east of Merrijig, 31 Jan. 1982, 1 female; Seven Creeks approximately 1 km south-east of Strathbogie, 1 Feb. 1982, 6 males, 6 females, 16; Tarago River on Labertouche Road, 1 km north of Princes Highway, 6 Nov. 1981, 5 males, 4 females, 18; Traralgon Creek on Traralgon Creek Road, 4.5 km north of Calder Junction, 27 Oct. 1981, 1 male; Stony Creek at Cheshunt, 2 Oct. 1982, 2 males, 3 females, 14; King River at Cheshunt, 2 Oct. 1982, 4 females; Dandongadale River, 3 km west of Dandongadale, 2 Oct. 1982, 2 females, Ovens River at Porepunkah, 2 Oct. 1982, 5 females, 30; Lake Catani, Mount Buffalo, 5 Dec. 1982, 1 male, 4 females; Mitta Mitta River at Glen Valley, 30 Sept. 1982, 1 female; Snowy Creek, 8 km south-east of Mitta Mitta, 30 Sept. 1982, 2 females; Bundarra River, 16 km north-west of Omeo, 1 Oct. 1982, 1 male, 4 females; Cobungra River, 15 km north-west of Omeo, 1 Oct. 1982, 2 males, 4 females; Tambo River, 17 km south-east of Omeo, 30 Sept. 1982, 4 females; Prospect Creek, 5 km north-west of Mount Taylor, 15 Nov. 1983, 1 female; Cobannah Creek, 4 km east-south-east of Cobannah, 15 Nov. 1983, 13; Billabong beside Wongungurra River, approximately 3 km north-north-west of junction with Wonangatta River, 18 Nov. 1984, 1 (PT-908); Simpsons Creek, 11 km south-west of Orbost, 14 Oct. 1982, 14, 30 Nov. 1982, 8 females; Brodribb River, 24 km north-north-east of Orbost, 14 Oct. 1982, 1 female; Rich River, 26 km north-north-east of Orbost, 14 Oct. 1982, 2 females; Bemm River on Princes Highway East Gippsland, 14 Oct. 1982, 2 males, 1 female; Cabbage Tree Creek on Princes Highway East Gippsland, 14 Oct. 1982, 10; Bellbird Creek on Princes Highway East Gippsland, 13 Oct. 1982, 1 female; Back Creek, 1 km north-east of Noorinbee North, 13 Oct. 1982, 2 males, 5 females; Rodger River, 23 km south-west of Bonang, 2 Nov. 1983, 1 male, 1 female; Tonghi Creek on Princes Highway East Gippsland, 4 Jan. 1982, 1 male, 2 females; Wingan River, on Princes Highway East Gippsland, 3 Jan. 1982, 8 males, 4 females; Genoa River, 1 km south-east of Wangarabell, 3 Jan. 1982, 3 males, 8 females. NEW SOUTH WALES: Murray River at Tom Groggin, 19 Nov. 1982, 17; Back Creek, 16 km south-east of Glen Innes, 20 May 1983, 1 male; Little Henry River, 17 km south-east of Glen Innes, 20 May 1983, 2 males, 4 females; Water Cress Creek on Coffs Harbour-Ebor Road, 24 May 1983, 1 male, 4 females. SOUTH AUSTRALIA: Eight Mile Creek at mouth approximately 10 km east of Port MacDonnell 21 May 1984, 1 male, 1 female, 7.

Diagnosis. *Triplectides ciuskus* is sometimes indistinguishable from *T. australicus* larvae, as discussed under *T. australicus* group. Most *T. ciuskus* larvae can readily be identified by the presence of the backward projection on the posterior margin of the pale patch around the eye (Fig. 16K) and the dark colour of the head and thorax. The following characteristics also usually hold: presence of strong banding on the legs; small or no spots on the frontoclypeal apotome at the constriction; absence of the spot in the posterior tip of the frontoclypeal apotome in fifth instar larvae; the presence of a large knob on each side of the frontoclypeal apotome at the widest point; the distinct boomerang-shaped spots in the midline of the pronotum posteriorly; spots on head ventrally distinct.

Larvae in the first 4 instars may have a yellow spot in the posterior tip of the frontoclypeal apotome, in a

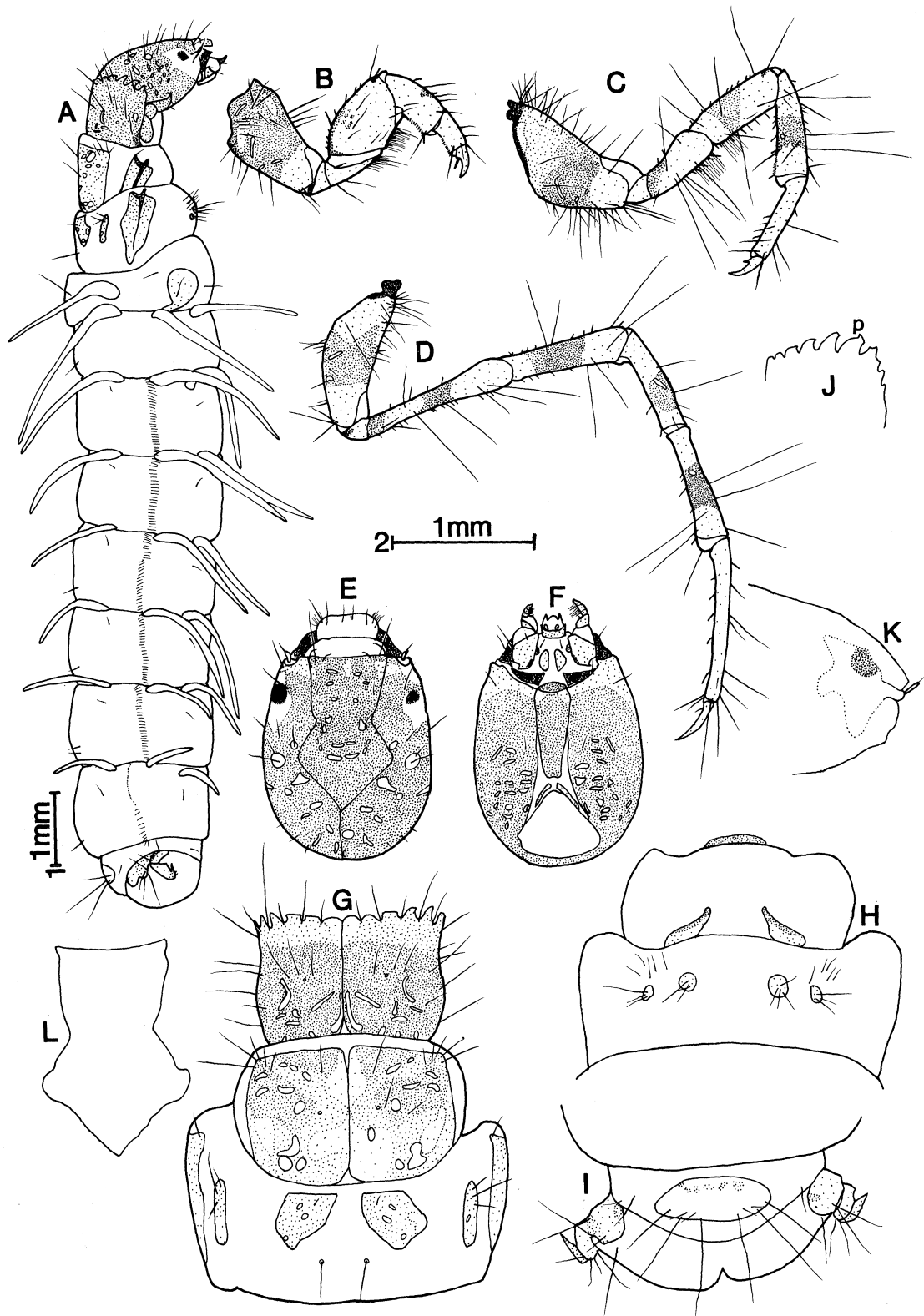


Fig. 16. *Triplectides ciuskus* larva (PT-908, A.-J.). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner, K - head lateral view, L - frontoclypeal apotome. A - scale 1, B-J - scale 2, K-L - not to scale. p - projection.

similar position to *T. volda*, causing confusion with larvae of that species.

Description. *Head.* Width 0.83-1.13 (n=231, 10 sites); oblong dorsally; usually brown or black but can be orange, with yellow or orange lightly or strongly contrasting spots, frontoclypeal apotome usually without (at most small) yellow patches at constriction, fifth instar larvae never with yellow spot in posterior tip, pale patch around the eye with conspicuous backward projection towards top of anterior margin posteriorly (Fig. 16K), this projection rarely small; frontoclypeal apotome widest behind constriction, usually irregular in shape at widest point, most commonly with rounded knob on each side at widest point (Fig. 16L); but several other shapes occur, often different on different sides of frontoclypeal apotome; ventral apotome tapering but still fairly broad posteriorly, about half anterior width; left mandible with 6 teeth, right mandible with 4 or 5 teeth.

Thorax. Pronotum usually brown but can be dark brown or orange, with yellow spots, pair of spots on midline posteriorly usually narrow, distinct, boomerang shaped, rarely broad and diffuse, with projections of anterior margin usually truncate rectangles but these vary in length, width and shape, rarely 2 projections fuse to form one broad one; metanotum with 4 sclerites as shown in Figure 16, medial sclerites pale brown with yellow spots, lateral sclerites pale brown; foretrochantin broad based usually with short upturned section; prosternal sclerite dark brown; mesosternal sclerites very pale with brown margin; 11-34 metasternal setae, most associated with 4 small sclerites, rarely 3 when 2 on one side fuse, setae not associated with these sclerites may have small sclerite at base; legs yellow to orange with brown to dark brown or black pigment bands, bands often with yellow spots, hind tibia divided.

Abdomen. Lateral hump sclerite pale brown posteriorly, yellow anteriorly; gills single filaments, arranged as in diagram in table 1; tergite IX very pale, often only seen due to pale brown spots towards anterior of tergite; lateral sclerite and ventral sole plate orange to brown; anal claw moderately large and with 2 or more accessory hooks on outer margin.

Body length. 8-15 mm.

Case. Commonly hollowed twig or stem, often with detritus added around opening. Sometimes bundled sticks used or untidy case made of pieces of detritus. Very rarely stones or snail shells used in case construction. Case usually not much longer than larva, rarely up to twice length of larva, very rarely longer. Larvae in first 3 instars usually use sand cases of other leptocerids or other caddises, these usually distinguished from those of original owner because *T. ciuskus* larvae add detritus anteriorly. Some early instar larvae make their own untidy cases of detritus.

Early instar larvae. Fourth instar larvae generally fit description above but ventral apotome tapers to point ventrally, head width 0.55-0.78 mm (n=158). Third instar larvae much more difficult to identify and have legs banded, typical shape of the pale patch around the

eye, some small projections on pronotum, frontoclypeal apotome widest behind constriction although shape much more similar to that of *T. australis* and ventral apotome shorter than head ventrally, head width 0.31-0.45 (n=190). Second instar larvae legs banded, otherwise no characteristic features, head width 0.21-0.28 mm (n=114).

Habitat and distribution. Larvae of this species are common in Victoria in a wide range of habitats. They occur in cool foothill streams but are more common in lower warmer sections of creeks and rivers, and can be found in still or sluggish waters and even intermittent streams. In forested streams they are usually found in log jams and detritus accumulations while in cleared reaches they are often associated with riparian vegetation. This species has previously been recorded from Northern Territory, Queensland, New South Wales, Victoria and Tasmania (Neboiss, 1983). This is the first record from South Australia.

T. australis group

Larvae of *T. australis*, *T. magnus* and *T. volda* are described here, larvae of the other two species in this group are unknown.

Diagnosis. Frontoclypeal apotome as wide behind constriction as at anterior margin; pronotum with large projections on anterior margin (in 2 of 3 species); metanotum with 4 sclerites; metasternum with 3-31 setae.

Triplectides australis Navás

Figs 17, 24N

Material examined. Twenty-five reared males, 35 reared females and 131 larvae. VICTORIA: swamp near Lake Mundi approximately 35 km west-north-west of Casterton, 28 Apr. 1982, 5 males, 7 females, 14; dam approximately 13 km west of Casterton, 28 Apr. 1982, 2 males, 1 female; dam at Toolondo, 27 Apr. 1982, 1 female; Clear Lake at Toolondo, 28 Apr. 1982, 1 male; Mount William Creek, 16 km south-east of Halls Gap, 2 Dec. 1983, 3 males, 5 females, 18 (incl. PT-937); McKenzie Creek, 6 km south of Horsham, 2 Nov. 1981, 2 females, 2; Bungalally Creek, 4 km south of Horsham, 27 Apr. 1982, 1 female; Hopkins River at Hexham, 4 Dec. 1983, 3; Mount Emu Creek, 10 km north-west of Gnotuk, 4 Dec. 1983, 1; Mount Emu Creek at Trawalla, 2 Dec. 1983, 2; swamp 8 km north-east of Princetown, 4 Dec. 1983, 2 males, 4 females, 4; swamp beside Gellibrand River, approximately 7 km south-east of Princetown, 5 Dec. 1983, 4 males, 3 females, 6; Lake Daylesford at Daylesford, 12 Oct. 1983, 1; Farm dam at Lyonville, 18 Nov. 1981, 1; Jock Marshall Reserve dam, Monash University, Clayton, Sept. 1981, 1 female, 23 Nov. 1983, 2 males (incl. PT-899), 6 females, 11 July 1984, 9, 12 Jan. 1985, 1 female; Balcombe Creek, Bungower Road, Mornington, 11 Jan. 1982, 2 males, 2 females; Balcombe Creek near Balcombe Army Camp, Nepean Highway

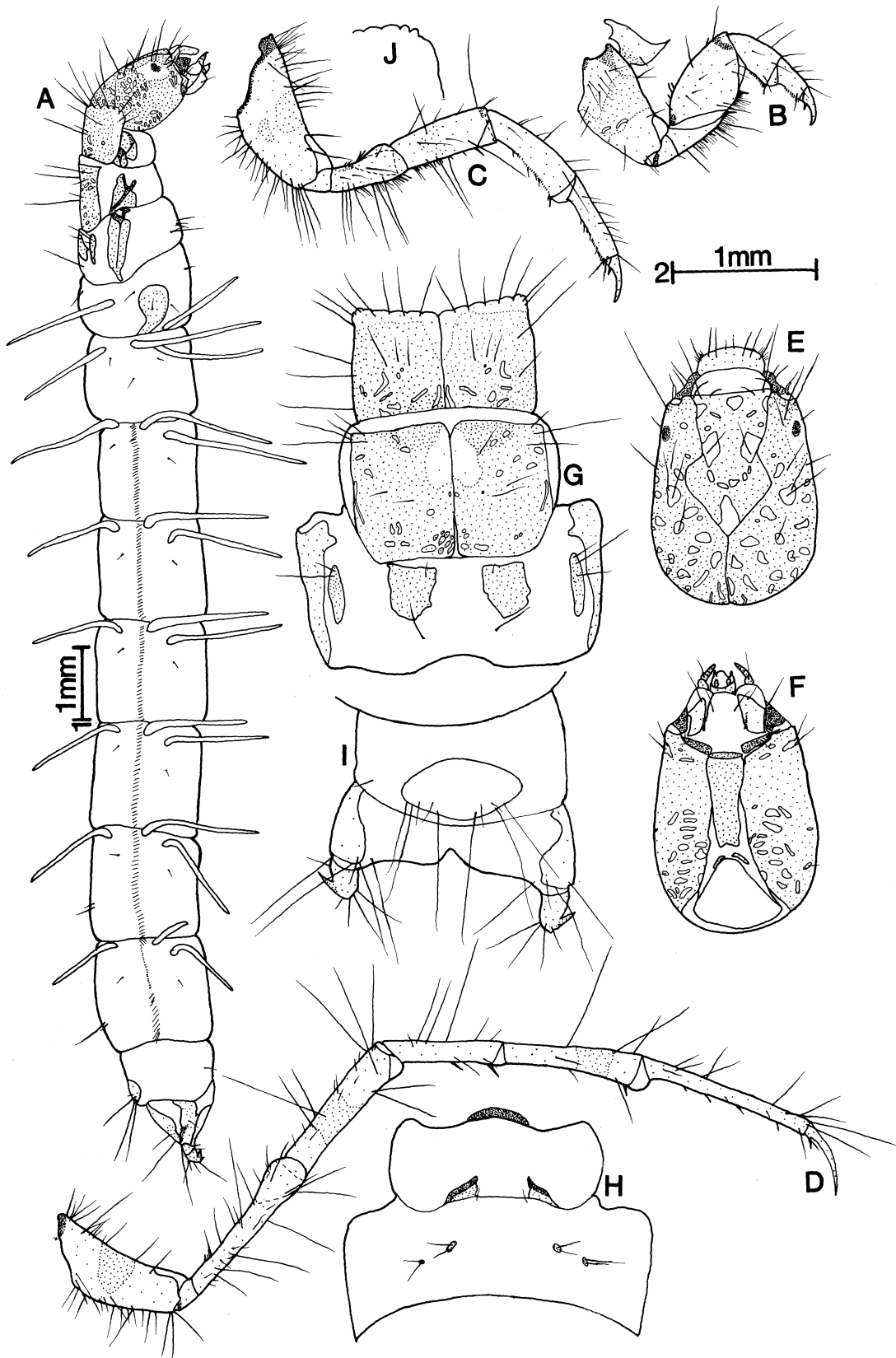


Fig. 17. *Triplectides australis* larva (PT-937). A - body lateral view, B - right foreleg and foretrochantin, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

Mornington, 14 Oct. 1984, 1; Sheepwash Lagoon approximately 10 km north-east of Yea, 1 Feb. 1982, 4, 2 Oct. 1982, 1 male, 6; a saline tributary of Sunday Creek, Lot 6 Dockery's Road, Tallarook, S. Schreiber, Nov. 1983, 2; Dam, Dookie Agricultural College, A. Sokol, 30 Nov. 1983, 12; billabong approximately 3 km north of Eskdale, 30 Sept. 1982, 2; Billabong (Ryan's II) 5 km east of Wodonga, 29 Sept. 1982, 7 females, 4; Lake Bunga (estuarine) 3 km north-east of Lakes Entrance, 15 Oct. 1982, 2 males, 1 female, 2; Simpson's Creek, 11 km south-west of Orbost, 14 Oct. 1982, 1, 3 Jan. 1983, 1; Wingan River on Princes Hwy, East Gippsland, 3 Jan. 1982, 1. NEW SOUTH WALES: Lake Wyangan near Griffith, 10 May 1982, 4. SOUTH AUSTRALIA: Stubb's Waterhole, Arkaroola Creek, Mount Painter Sanctuary, Flinders Ranges, 10 Sept. 1984, 1 male, 6; Farm dam 2 miles west of Quorn, D. Morton, 14 July 1974, 4. WESTERN AUSTRALIA: roadside ditch, Gidgegannup area, 12 Jan. 1986, A. Boulton, 16.

Comment. Morse & Neboiss (1982) note that the literature references to *Triplectides magnus*, often as *Notanatolica magna*, may refer to this species. The only larval description (based on specimens from Java and Sumatra) that enables specific identification (Ulmer, 1955) does not fit the present description. Korboot (1963) provided notes on larvae said to belong to this species but the details are insufficient for positive identification.

Diagnosis. Within the *T. australis* group, this species is readily recognised by the distinctive shape of frontoclypeal apotome; presence of a yellow patch on either side of the frontoclypeal apotome at the constriction and a third in the posterior tip; only light scalloping on the anterior margin of the pronotum. Gill number is surprisingly constant in this otherwise highly variable species.

Description. *Head.* Width 0.76-1.08 mm (n=400, 2 sites); oblong dorsally; brown with contrasting yellow spots, frontoclypeal apotome with at least 3 yellow patches, 1 on each side at constriction and 1 in posterior tip, may have up to 3 additional yellow patches on anterior margin, pale patch around eye may have posterior extension on posterior margin; frontoclypeal apotome as wide behind constriction (rarely wider) as on anterior margin, usually straight sided then tapering behind constriction, very rarely either irregular as in *T. ciuskus* or very rounded as in *T. magnus*, if so, usually different on 2 sides; ventral apotome tapering to be about half anterior width posteriorly; left mandible with 6 teeth; right mandible with 4 teeth.

Thorax. Pronotum brown with yellow spots, yellow patch anteriorly on midline that may extend across front, anterior margin only lightly scalloped and with at most small projections at anterolateral corners; mesonotum usually with yellow patch in midline at front, brown with yellow spots; metanotum with 4 sclerites arranged as in Figure 17, medial sclerites pale brown to brown, sometimes with yellow spots, lateral sclerites pale brown to brown; rarely with very small sclerites posteriorly on metanotum; foretrochantin broad basally with thin upturned section at moderately acute angle to base;

prosternal sclerite dark brown, broader than in most species; mesosternal sclerites brown with darker anterior margin; 3-16 metasternal setae, most associated with 2-4 small brown sclerites, setae not associated with main sclerites may have very small basal sclerite; legs usually with at least few pale pigment bands, rarely very strongly contrasting bands, hind tibia divided.

Abdomen. Lateral hump sclerite light brown; gills single filaments, as in diagram in table 1, almost all specimens with maximum number shown; tergite IX very pale yellow, often difficult to see; lateral sclerite and ventral sole plate very pale yellow; anal claw large, with one, sometimes 2, rarely no accessory hooks on outer margin.

Body length. 4-20 mm.

Case. Usually hollowed twig or stem, some larvae make case with either bundled stems (Fig. 24N), or large pieces of detritus apparently arranged without order so that a bulky case results. Ti-tree leaves sometimes used resulting in case very similar to that of *Symphitoneuria* (Fig. 24G) larvae using the same leaves. Whole stick or whole stem cases very rarely used by larvae in instars one to 3. Case usually 2 or more times length of larva. In dam at Monash University, Melbourne, larvae usually had cases that floated on water's surface and larvae were collected amongst floating detritus.

Early instar larvae. These have 3 yellow patches on frontoclypeal apotome but early instar larvae of other species in *T. australis* and *T. australicus* groups may have same pattern. Fourth instar, and to lesser extent third instar, larvae can be distinguished using absence of projections on pronotum. Head widths: fourth instar 0.51-0.70 mm (n=383), third instar 0.32-0.44 mm (n=227), second instar 0.21-0.31 mm (n=161) and first instar 0.14-0.15 mm (n=29).

Remarks. A small number of larvae examined from South Australia and New South Wales were within the range of variation seen in Victorian specimens. Sixteen larvae from Western Australia differed from Victorian specimens in the following ways: i) the three yellow patches on the frontoclypeal apotome smaller, ii) bands on the legs more conspicuous, and iii) detritus cases neater, but the larvae were otherwise within the range of variation seen in Victorian larvae.

Five larvae of *T. cephalotes*, a very closely related species from New Zealand, varied only slightly from the above description. Minor variations in colour pattern outside that seen in Australia and the presence of a gill on the first abdominal segment dorsally were the only differences seen.

Habitat and distribution. Larvae were found in slow flowing rivers and creeks, slightly saline creeks, estuaries, swamps, temporary swamps, farm dams, lakes and billabongs, usually in warm water. This species appears to have a rapid generation time and this together with its viviparity (Morse & Neboiss, 1982) may help it to colonise temporary habitats. The specimens examined were from a restricted area of the distribution: Australia

wide except Tasmania (Neboiss, 1983) and New Caledonia (Neboiss, 1986).

Triplectides volda Mosely

Figs 18, 24O

Material examined. 6 reared males, 8 reared females and more than 75 larvae. VICTORIA: Bungalally Creek, 4 km south of Horsham, 2 Nov. 1981, 1 male, 2 females, 27 Apr. 1982, 2 females, 5; Billabong (Ryans II) about 5 km east of Wodonga, 29 Sept. 1982, 1; Lagoon at Tallandoon, 29 Sept. 1982, 4 males (incl. PT-902), 2 females, 13; billabong about 3 km north of Eskdale, 30 Sept. 1982, 1 female; Barkly River, 9 km north-west of Licola, 18 Nov. 1985, 1; Macalister River, 15 km south-south-east of Licola, 6 Nov. 1984, 1; Macalister River, 3 km north-north-east of Licola, 6 Nov. 1984, 3; Macalister River, 11 km, north-north-east of Licola, 6 Nov. 1984, 2; Wongungurra River about 2 km north of junction with Wonangatta River, 7 Nov. 1984, 16 (incl. PT-934); Wonangatta River at Waterford, 6 Nov. 1984, 1 female, 8; Dargo River, 6 km north of Dargo, 8 Nov. 1984, 1 male, 1; Deddick River at Tingaringy track, L. MacMillan, 7 Jan. 1983, 12; Mitta Mitta River, 4 km north of Eskdale Loc. AP. Dartmouth Quantitative Survey, 4 Feb. 1974, larvae. NEW SOUTH WALES: Wamban Creek about 2 km up from Kia Ora bridge on Moruya River, P.S. Lake, 9 Dec. 1985, 12.

Diagnosis. Within the *T. australis* group, this species is recognised by: large projections on the anterior margin of the pronotum; yellow spot or stripe in the posterior tip of the frontoclypeal apotome; pale patch around eye usually with a straight posterior margin.

Description. *Head.* Width 0.64-0.84 mm (n=43, 10 sites); oblong dorsally; brown to dark brown with contrasting yellow spots; conspicuous yellow patch in posterior tip of frontoclypeal apotome, patches on either side of constriction of frontoclypeal apotome, if present, not conspicuous, pale patch around eye straight posteriorly, rarely with small posterior projection; frontoclypeal apotome as wide behind constriction as on anterior margin, rounded and tapering behind constriction; ventral apotome tapering slightly posteriorly; left mandible with 6 teeth; right mandible with 5 teeth.

Thorax. Pronotum brown with yellow anteriorly and yellow spots, anterior margin with large projections, largest on anterolateral corner, rarely with 2 projections fused together to form 1 broad one, projections vary in size and shape; mesonotum pale brown with lightly contrasting pale yellow spots and pale yellow area on midline anteriorly 4 sclerites arranged as in Figure 18; metanotal medial sclerites pale brown with pale yellow spots, lateral sclerites pale brown, sometimes with pale spot; foretrochantin stout basally with upturned section at relatively shallow angle to base; prosternal sclerite dark brown; mesosternal sclerites very pale brown with brown anterior margin; 11-31 metasternal setae, most associated with 4 small pale sclerites, those not associated with sclerites may have very small basal sclerite; legs

yellow with strongly contrasting brown bands.

Abdomen. Lateral hump sclerite light brown, paler anteriorly and posteriorly; gills single filaments, as in diagram in table 1; tergite IX very pale, may be difficult to see; lateral sclerite and ventral sole plate pale brown; anal claw moderately large, with 1 rarely 2, accessory hooks on outer margin.

Body length. 5-8 mm.

Case. Either rough detritus case, sometimes with sand added, or hollowed twig. Some larvae use either sand or secretion cases of other trichopteran larvae but usually add detritus to anterior end (Fig. 24O). Case usually about twice length of larvae although less if hollowed stick used.

Remarks. Some details of larval morphology and biological notes are given by Korboot (1963, 1964b). The description in the 1964 paper fits some of the description below but details are not available for head colour pattern.

Because of the small size of many of the fifth instar larvae of this species, confusion is likely with earlier instars of other species, particularly *T. ciuskus* and *T. australicus* both of which may have a spot in the posterior tip of the frontoclypeal apotome in early instars. This can be avoided by careful comparison with size of pronotal projections which are not as long in early instars and comparison with the ventral apotome. The ventral apotome tapers to a point in fourth instar *T. ciuskus* and *T. australicus* larvae and is not as long as the head ventrally in their third instars. *Triplectides ciuskus* can also be identified using the back projection of the margin of the pale patch around the eye although this may be small at times on *T. ciuskus* larvae and present occasionally on *T. volda* larvae. Early instar *T. volda* larvae could not be distinguished from other *Triplectides* larvae with certainty.

Habitat and distribution. Larvae were found, usually in warm water, in billabongs and sluggish to fast flowing creeks and rivers. The published distribution of this species is Queensland, New South Wales, Victoria, widespread, coastal. Larvae were collected from some sites that were well inland.

Triplectides magnus (Walker)

Fig.19

Material examined. Fourteen reared males, 7 reared females and more than 14 larvae. VICTORIA: Lake Gilleard, Warrnambool, Neboiss, 20 Jan. 1953, larvae; Floating Islands Lagoon approximately 15 km west of Colac, 24 Oct. 1984, 1 male, 2 females, 4 (incl. PT-940); Balcombe Creek beside Balcombe Army Camp, Nepean Hwy Mornington, 14 Oct. 1984, 3 males, 2 females, 1; Sheepwash Lagoon approximately 10 km north-east of Yea, 1 Feb. 1982, 2 males (incl. PT-919), 1 female, 1, 2 Oct. 1982, 1 male; Giffard A. Neboiss, 24 June 1953, larvae; Ewings Morass 15 km south-east of Nowa Nowa, 15 Oct. 1982, 1 male, 1; Simpsons Creek, 11 km south-west

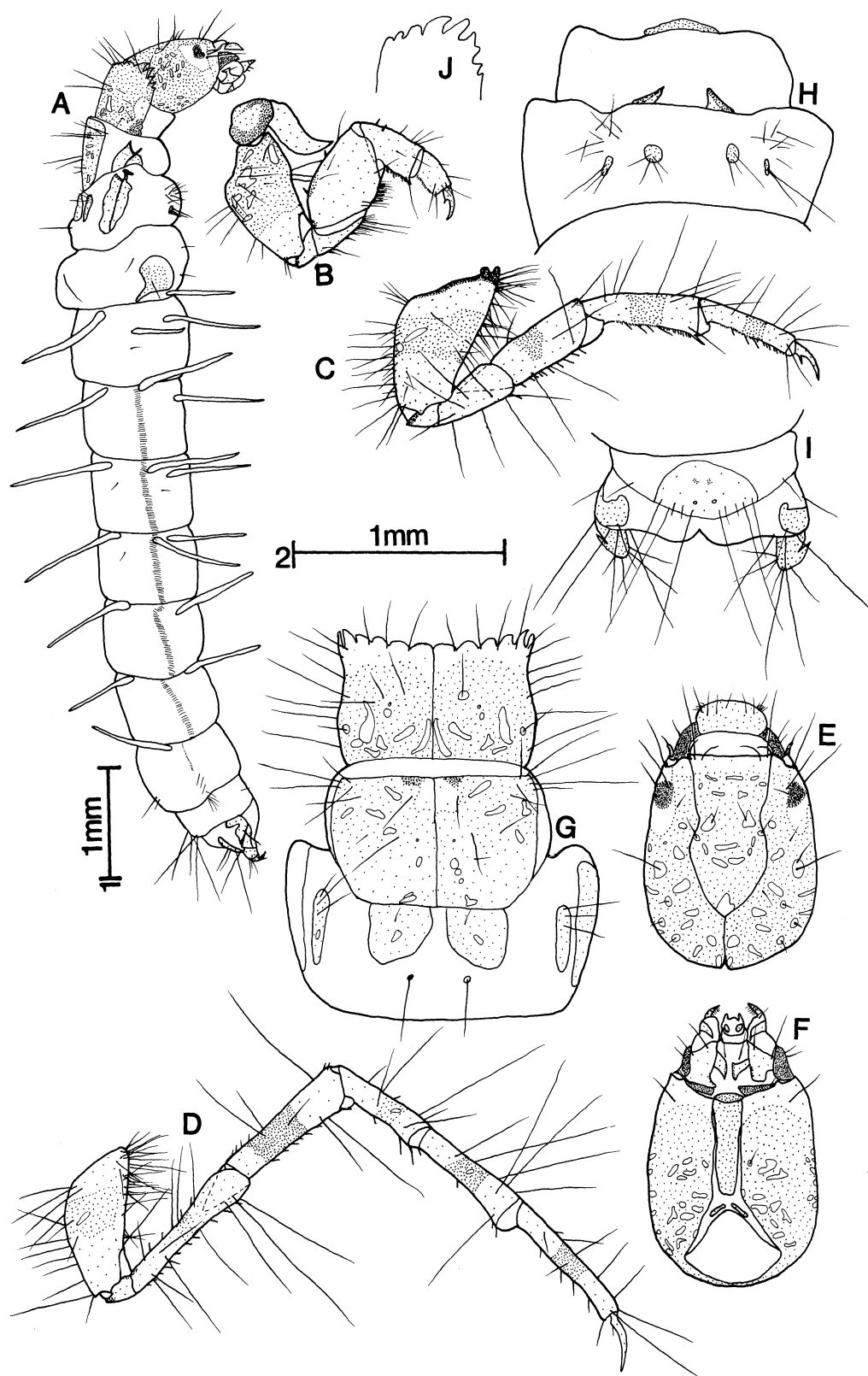


Fig. 18. *Triplectides voldi* larva (PT-934). A - body lateral view, B - right foreleg and foretrochantin, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

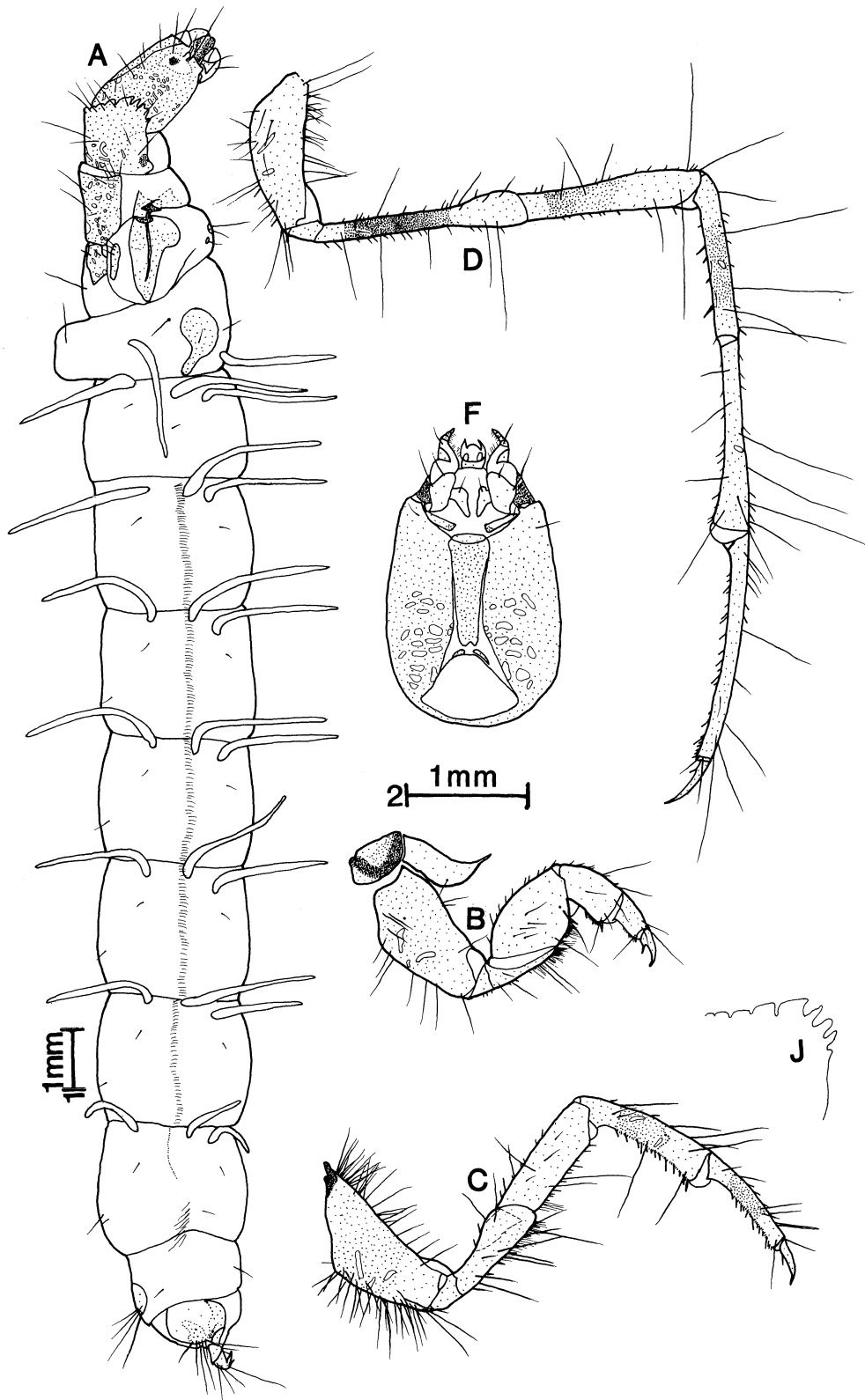


Fig. 19. *Triplectides magnus* larva (PT-940). A - body lateral view, B - right foreleg and foretrochantin, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

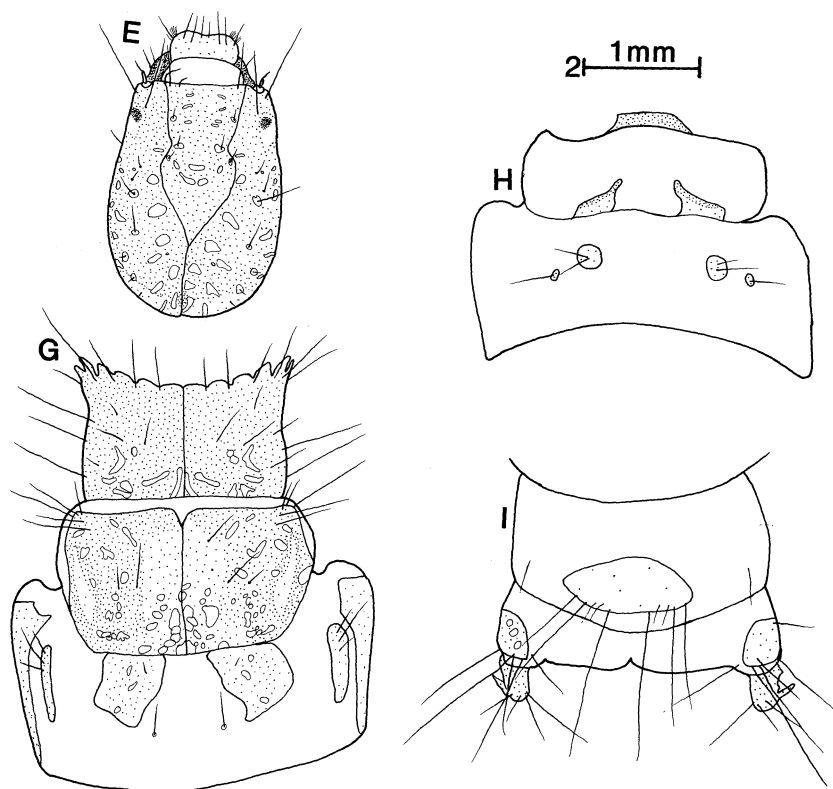


Fig. 19 cont'd.

of Orbest, 14 Oct. 1982, 6 males, 1 female, 7, 3 Jan. 1983, 12; Genoa River at Genoa, 13 Oct. 1982, 1 female; Lake Barracoota, A. Neboiss, 28 Jan. 1975, larvae.

Diagnosis. Within the *T. australis* group, this species can be recognised from the following: head orange, elongate, with only small spots in the frontoclypeal apotome. This species is most similar to *T. australicus* and is differentiated from it by head shape and frontoclypeal apotome colour and shape.

Description. *Head.* Width 0.95-1.20 mm. (n=13, 5 sites); oblong but comparatively elongate dorsally; orange, rarely brown, with contrasting yellow spots, all yellow spots on frontoclypeal apotome small, some specimens with pale areas at back of head, pale area around eye with posterior margin straight; frontoclypeal apotome as wide behind constriction as on anterior margin, rounded and tapering behind constriction, rarely straight sided as in *T. australis*; ventral apotome tapering till about half anterior width posteriorly; left mandible with 6 teeth, right mandible with 4 teeth.

Thorax. Pronotum orange or brown with contrasting yellow spots, anterior margin with large projections particularly at anterolateral corner; mesonotum mottled orange-brown with lightly contrasting yellow spots; metanotum with 4 sclerites arranged as in Figure 19, pale brown with yellow spots, median sclerites paler;

foretrochantin with moderately long to long, thin, upturned section at shallow angle to base; prosternal sclerite brown, mesosternal sclerites pale brown with brown anterior margin; 6-13 metasternal setae, usually associated with 4 small, pale sclerites; legs orange, usually with pigment bands, may be strongly banded, hind tibia divided.

Abdomen. Lateral hump sclerite light brown, paler anteriorly; gills single filaments, as in diagram in table 1; tergite IX very pale, difficult to see; lateral sclerite and ventral sole plate pale orange or orange, some with pale spots; anal claw large, with 2 or 3 accessory hooks on outer margin.

Body length. 11-17 mm.

Case. Hollowed stem or stick. Rarely detritus added around anterior opening. Case usually much longer than larva, up to 3 or more times larval length.

Early instar larvae. Fourth instar larvae (head width 0.63-0.73, n=12) are recognisable from the above description. Third instar larvae (0.41-0.44 mm, n=2) and earlier instar larvae may be difficult to distinguish from *T. australicus* larvae of the same instar.

Remarks. Larvae said to belong to this species have been described several times, mostly as *Notanatomica magna*. Most of these descriptions are inadequate for specific identification (Tillyard, 1925; Ulmer, 1908). The information provided by Ulmer in 1955 differs notably from all larvae described here and clearly the specimen

he describes belongs to a different species. Morse & Neboiss (1982) say the adult descriptions refer to another species, possibly *T. australis*. The larval description by Ulmer (1955) does not fit the larval description of *T. australis*.

Habitat and distribution. Larvae are found, usually associated with rushes or submerged macrophytes, in warm sluggish streams, billabongs and lakes. This species has been recorded in Victoria and Tasmania (Neboiss, 1983). Larvae were collected so far east that they probably extend at least into south-eastern New South Wales.

Westriplectes Neboiss

Diagnosis. The generic diagnosis is as for *Symphitoneuria* but with the exception that long setae posterior to the medial metanotal sclerites are absent.

Description. Antennae long, greater than half width of frontoclypeal apotome at anterior margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B, but more squat; left mandible with 2 short setal brushes in central concavity; ventral apotome tapering but still broad posteriorly, comparatively short and broad; without secondary lines of weakness on head; pronotum scalloped anteriorly, anterolateral corners with 3-pronged (rarely 2 or 4-pronged) extension; foretrochantin sinuous, long tapering; metanotum with 4 small anterior sclerites and 4 very short setae posteriorly, often very difficult to see; metasternum with 8-13 setae, all associated with 2 comparatively large, pale brown sclerites; hind tibia divided; gills single filaments; lateral line starts anteriorly on segment III; tergite IX with 4 long and 6 short (most specimens) or 4 long and 4 short setae; anal prolegs without secondary setae.

N.B. This diagnosis and description are based on larvae of one species (*Westriplectes pedderensis*) and from one site only.

Remarks. No information is available on the larvae of the other two species in this genus, one from Western Australia (*W. albanus*) and one from north Queensland (*W. angelae*). *Westriplectes pedderensis* and *W. angelae* were recently recorded from Wilsons Promontory, Victoria, A. Neboiss (personal communication).

Westriplectes pedderensis Neboiss

Figs 20, 24P

Material examined. VICTORIA: Wilsons Promontory, swamp on Five Mile Track, 1 km east of Tidal River Road,

6 Nov. 1986, 14 males (incl. PT-970), 6 females, 58 (incl. PT-961).

Description. *Head.* Width 0.63-0.86 mm (n=15); oblong dorsally; brown or dark brown, rarely mottled, with contrasting yellow spots, a yellow patch on each side of frontoclypeal apotome at constriction, laterally band of yellow spots, antennae brown or dark brown; frontoclypeal apotome widest on anterior margin, with constriction at about half its length, straight sided then strongly tapering, rarely rounded or irregular behind constriction; mandibles comparatively squat, left mandible with 6 teeth, right mandible with 5 teeth.

Thorax. Pronotum brown with contrasting yellow spots, mesonotum brown with yellow spots; metanotal sclerites arranged as in Figure 20, medial sclerites brown with yellow spots, lateral sclerites pale brown; foretrochantin with moderately long upturned section; prosternum usually with dark brown sclerite, pale in some specimens; mesosternal sclerites very pale brown or brown; metasternal sclerites rarely subdivide so 3 present on segment; foreleg yellow with some brown mottling on coxa; mid- and hindlegs yellow with light brown or brown banding, bands often most of length of segment.

Abdomen. Somewhat dorsoventrally flattened; lateral hump sclerites yellow-brown; short anterior pair of setae on segment I often each with a small sclerite at base, variable in size and colour; lateral line dark; gills as in diagram in table 1; spicules obvious, in a single line, additional spicules to one side of the line, as shown in Figure 20A, only present on specimen figured; tergite IX not apparent; lateral sclerites very pale orange, ventral sole plate orange; setae of anal claw comparatively short; anal claw short and with 1 short accessory hook on outer margin.

Body length. 11-14 mm.

Case. Made of 2 or more pieces of rush stem, usually one dorsally and one ventrally but may be more. Pieces chosen by the larvae are curved outwards so case, while similar to that of *L. varians*, is more rounded in cross section (Fig. 24P). Additional small pieces of detritus may be added anteriorly or posteriorly. Some cases have additional longer sections that cause case to be quite deep in cross-section. Dorsal surface is longer than ventral so that small hood is formed. Some cases cause larvae to float on surface amongst floating detritus.

Early instar larvae. Fourth instar larvae, head width 0.48-0.56 mm (n=14), are similar to above description but have ventral apotome narrower posteriorly, 2 long and 8 short setae on tergite IX, fewer gills and fewer metasternal setae.

Habitat and distribution. This species has only been collected from Lake Pedder in Tasmania and one swamp in Victoria. The water in this swamp was humic and there was extensive emergent and submerged macrophytic growth.

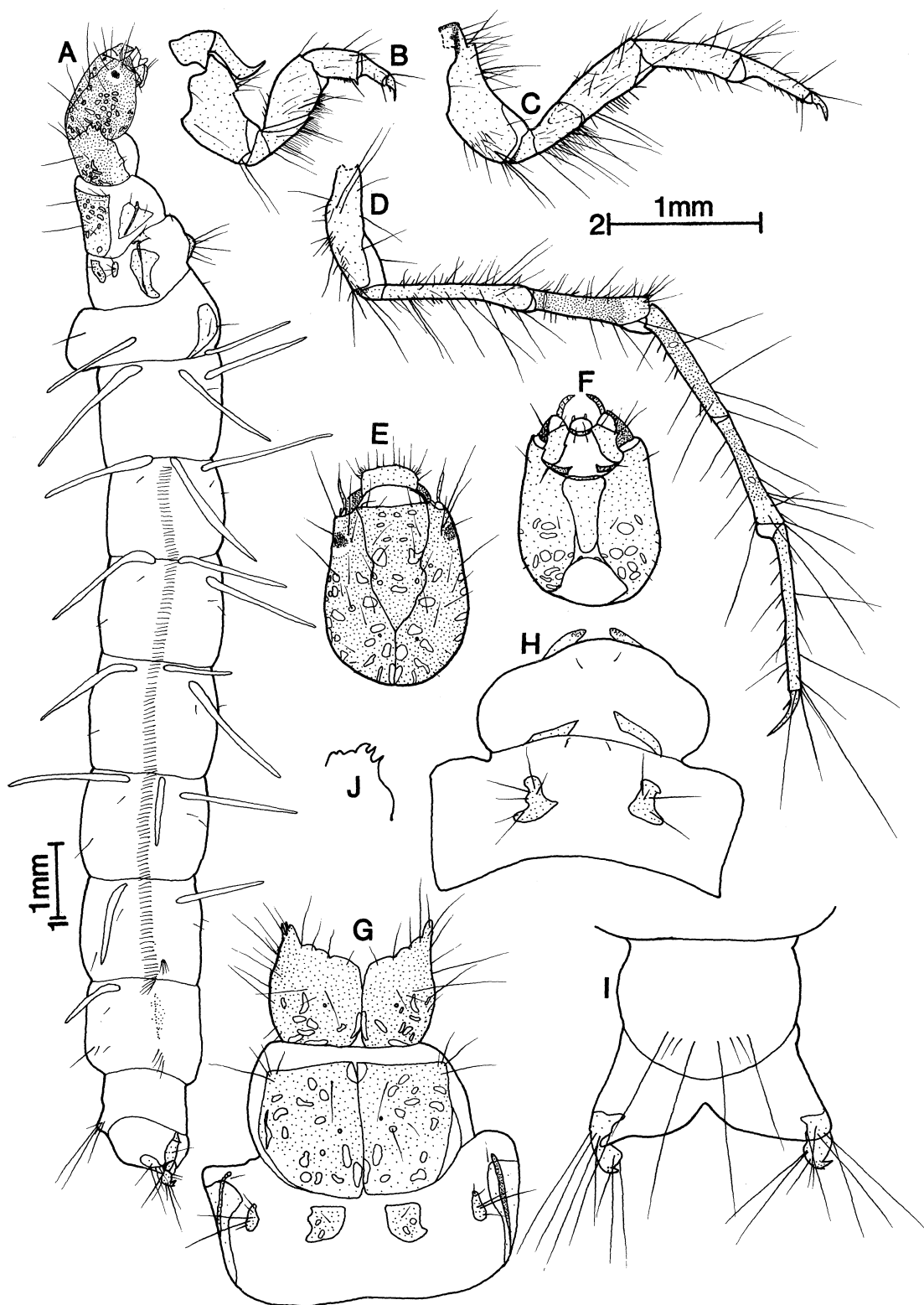


Fig. 20. *Westriplectes pedderensis* larva (PT-961). A - body lateral view, B - right foreleg and foretrochantin, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal, H - thorax ventral view, I - segment IX dorsal view, J - right anterolateral pronotum corner. A - scale 1, B-J - scale 2.

Leptocerinae

Leptorussa Mosely

Diagnosis. The combination of 2 small sclerites on the metanotum, ventral apotome short and broad, gills divided into filaments and anal proleg without secondary setae defines this genus.

Description. Antennae long, approximately one third width of frontoclypeal apotome at anterior margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity, similar to Figure 3B but little more slender; left mandible with 2 short setal brushes in central concavity; ventral apotome comparatively short and broad, almost square; without secondary lines of weakness on head; pronotum with anterior margin straight, anterolateral corners smoothly rounded; foretrochantin sinuous, long tapering; metanotum with 2 small irregularly rounded sclerites; metasternum with 4-10 setae without associated sclerites; hind tibia undivided; gills divided into several filaments; lateral line starts anteriorly on segment III; ninth tergite with 2 long and 4 short setae; anal prolegs without secondary setae.

Remarks. This genus is monotypic. The larvae of this genus do not fit the subfamily description, as the head does not have additional lines of weakness, prosternal sclerites are present, the foretrochantin is sinuous, long tapering and small sclerites are present medially on the metanotum.

Leptorussa darlingtoni (Banks)

Material examined. 31 reared males, 20 reared females and 294 larvae. VICTORIA: swamp near road at Bullarto, 12 Oct. 1983, 7 males, 1 female, 30; Lerderderg River, 4.8 km west-north-west of Blackwood, 23 Dec. 1982, 1 female, 16 Aug. 1983, 31; Kangaroo Creek, 2 km south-west of Glenlyon, 12 Oct. 1983, 4; Churchill National Park, abandoned aqueduct in north-east corner, 7 Oct. 1984, 17; pond beside Acheron River, 3 km north-north-east of Narbethong, 16 Oct. 1981, 1 male, 50; temporary pond 4.5 km south-east of Tanjil Bren, A. Sokol, June 1981, 2 males, 4 females, 25; temporary pond 2.7 km south of Tanjil Bren, A. Sokol, June 1981, 2 males; Warrigul Creek, 9 km south of Giffard, 16 Nov. 1983, 17 (all in second instar); Prospect Creek, 5 km north-west of Mount Taylor, 15 Nov. 1983, 1; Swamp approximately 4 km south-south-west of Kingswills Bridge on Wonnangatta River, 15 Nov. 1983, 3 males, 6 females, 11; Cobannah Creek, 4 km east-south-east of Cobannah, 15 Nov. 1983, 10 males, 4 females, 61; Billabong beside Wungungurra River, approximately 3 km north-north-west of junction with Wonnangatta River, 8 Nov. 1984, 6 males, 4 females, 46; Betka River, 6 km west-south-west of Mallacoota, 5 July 1983, 1.

Comments. The larvae of this species have been described and figured from South Australia by Jackson (1985). The following is additional notes to her description

and details of variation found in Victorian specimens. Photographs of the larva and an ovipositing female are provided by Towns (1983) and notes on the biology of the larvae are given by Towns (1985) and Jackson (1984).

Description. *Head.* Width 0.45-0.59 mm (n=1,019 larvae from one site); colour pattern variable, usually brown with yellow patches and darker brown spots but some individuals pale orange with darker spots and poorly contrasting pale yellow patches; frontoclypeal apotome usually with pale cross anteriorly often with 4 brown spots in the cross, pale patch on each side at constriction and stripe from posterior tip, some or all pale patches may join; pale stripe usually at back of head dorsally on each side, sometimes broad with brown spots and sometimes joined to pale area around eye; usually dark spots behind pale area around eye laterally.

Thorax. Pronotum and mesonotum variable in colour, usually brown, some specimens with darker spots and some with yellow patches of highly variable size. Foretrochantin with tip comparatively short so less sinuous than in most larvae with sinuous foretrochantin.

Abdomen. Green or yellow when alive; gills arranged as in diagram in table 1; lateral hump sclerites very pale yellow; lateral line setae very pale and short; tergite IX very pale yellow, usually difficult to see, with highly variable brown areas, these areas usually divided so that there appears to be 2 small brown sclerites; lateral sclerite and ventral sole plate very pale yellow with brown patches less variable than on tergite IX.

Case. Distinctive sand grain case that may have numerous small rounded projections added to sides and top. Often sudden change in colour of sand used suggests different coloured sand used to that from previous building episodes. Hatchlings make less regular sand tube.

Early instar larvae. Case type and presence of the small metanotal sclerites aid in identification of even very small larvae. Head widths: fourth instar 0.31-0.42 mm (n=607); third instar 0.22-0.28 mm (n=828); second instar 0.15-0.21 mm (n=908); first instar 0.11-0.14 mm (n=257), all from one site.

Habitat and distribution. Larvae are found in temporary swamps, flood filled pools beside rivers, temporary ponds and pools in temporary streams. They occur in subalpine to lowland water bodies. The recorded distribution is New South Wales, Victoria, Tasmania and South Australia (Neboiss, 1983).

Russobex St Clair

Comments. The larvae of the only known species in this genus was described in St Clair (1988). I placed the genus in the Leptocerinae between *Leptorussa* and *Athripsodini* in the phylogenetic scheme of Morse (1981). This is confirmed from larval characters. The larvae of *Russobex* share with the larvae of *Leptorussa* i) the lack

of additional lines of weakness on the head and ii) a sinuous, long tapering foretrochantin. *Russobex* differs in that it has lost the metanotal sclerites and in this respect is more closely related to the rest of the Leptocerinae than is *Leptorussa*.

Leptocerus Leach

Diagnosis. The hook on the modified claw of the midleg is distinctive of this genus.

Description (based on Australian species). Antennae long, almost as long as anterior margin of frontoclypeal apotome; labrum without secondary setae; mandibles short and wide, with semicircular ridge or ridge with few small teeth around a central concavity (worn?); left mandible with 2 short setal brushes in central concavity; ventral apotome not obvious, not completely dividing genae; head with additional lines of weakness; pronotum with anterior margin straight, anterolateral corner rounded; foretrochantin short and obtuse; metanotum without sclerites; metasternum with 2 setae, without sclerites; claws of midleg modified to form hook; hind tibia undivided; gills single filaments; lateral line absent; tergum IX with 2 long and 4 short setae; anal prolegs without secondary setae.

Remarks. This description is based on only one of the four Australian species. This genus is worldwide in distribution and several larval descriptions are available. The main characters in the generic description are comparable with overseas species of *Leptocerus* (Lepneva, 1966; Wallace, 1981; Wiggins, 1977). Metasternal setae and mesosternal sclerites were not figured or discussed in most of the overseas descriptions and so cannot be compared.

Leptocerus souta Mosely

Figs 21, 24Q

Material examined. VICTORIA: Campaspe River, 5 km north-west of Woodend, 19 Nov. 1981, 1 male, 2 females, 4 (incl. PT-914); Lake Purrumbete at Camperdown, A. Neboiss, 27 July 1953 and 28 Aug. 1953, numerous larvae. Recent attempts to collect more specimens from both localities were unsuccessful.

Description. *Head.* Width 0.44 mm (n=1); oblong dorsally; yellow with brown spots, white at back, ventrally yellow laterally, medially mostly white with brown and dark brown patches, rarely patches much paler; frontoclypeal apotome long, thin and fairly straight sided, almost reaching back of head.

Thorax. Pronotum yellow with pale brown patches and brown spots; mesonotum mottled yellow and pale brown with brown spots; foretrochantin truncate; mesosternum

with brown lateral sclerites; legs yellow with few pale brown spots; 2 setal fringes on femur, tibia and tarsus of hind leg at about 180° from each other.

Abdomen. Green when alive, colour shows through case; lateral hump sclerites very pale; dorsal hump with thin transverse line of sclerotisation medially; 3 pairs of gills on second segment as shown in Figure 21, some with only 2 pairs of gills, some with 2 or 3 pairs of gills on segments II and III; tergite IX very pale yellow; lateral sclerites and ventral sole plate brown; anal claw with 2 accessory hooks on outer margin, one smaller than other; numerous moderately long setae between prolegs ventrally.

Body length. About 4 mm.

Case. Made entirely of silk or has few scattered sand grains incorporated in silk, but remains translucent (Fig. 24Q), about twice as long as larva.

Habitat. This species is only known from a large freshwater lake and a deep pool in a very sluggish river, both with extensive macrophyte growths. This species has previously only been recorded from South Australia and Queensland (Neboiss, 1983).

Triaenodes McLachlan

Diagnosis. The case type is the most characteristic feature of larvae belonging to this genus, others include; ventral apotome rectangular, hind tibia divided, numerous short setae in 2 bands between prolegs ventrally.

Description (based on Australian species). Antennae long, almost as long as width of frontoclypeal apotome on anterior margin; labrum without secondary setae; mandibles short and wide, teeth grouped around central concavity similar to Figure 3B; left mandible with 2 short setal brushes in central concavity; ventral apotome rectangular, comparatively short; head with additional lines of weakness; pronotum anterior margin straight, anterolateral corner rounded; foretrochantin short and obtuse; metanotum without sclerites; metasternum with 6-16 setae, without sclerites; hind tibia divided; gills absent; lateral line absent; tergite IX with 2 long and 4 short setae or 6 long and 4 setae; anal prolegs without secondary setae; numerous short setae in 2 bands between prolegs ventrally.

Remarks. This genus is worldwide in distribution and descriptions of larvae of several species are available (eg, Wallace, 1981; Wiggins, 1977; Lepneva, 1966). In Australia adults of only four species are described but many new species are awaiting description (Neboiss, personal communication).

Comparatively few larvae of this genus were reared during this study. Of those reared, adults of only one species could be identified, which is described here. Larvae of four or more species reared but not yet described, also fitted the generic description above.

However, larvae of one species had the division of the hind tibia very pale and indistinct so that care is necessary when using the key to genus for at least one species of *Triaenodes*.

The larvae of *T. bernaysae* Korboot was described by Korboot (1964c) but insufficient information was given for specific identification; the adult of *T. bernaysae* is redescribed and difficulties with the type material discussed by Neboiss (1987).

Information is also available for larvae from other countries (Lepneva, 1966; Wallace, 1981; Wiggins, 1977). These larvae also fit the generic description above apart from number of metasternal setae and presence of gills. The Australian species appear to be the only ones

without gills. In North America presence or absence of gills on certain segments are the only larval characters used to separate *Ylodes* and *Triaenodes* (Manuel & Nimmo, 1984).

As well as the additional lines of weakness found on the heads of most larval Leptocerinae, larvae of *Triaenodes* have a line branching from behind the eye and extending to near the back of the head so that a small lateral apotome is formed (Fig. 22). This is difficult to see in pale specimens but was present in all Australian species examined. This is not mentioned for any of the species from the northern hemisphere but is figured by Lepneva (1966: fig.782). This lateral apotome rarely divides from the parietals completely at ecdysis.

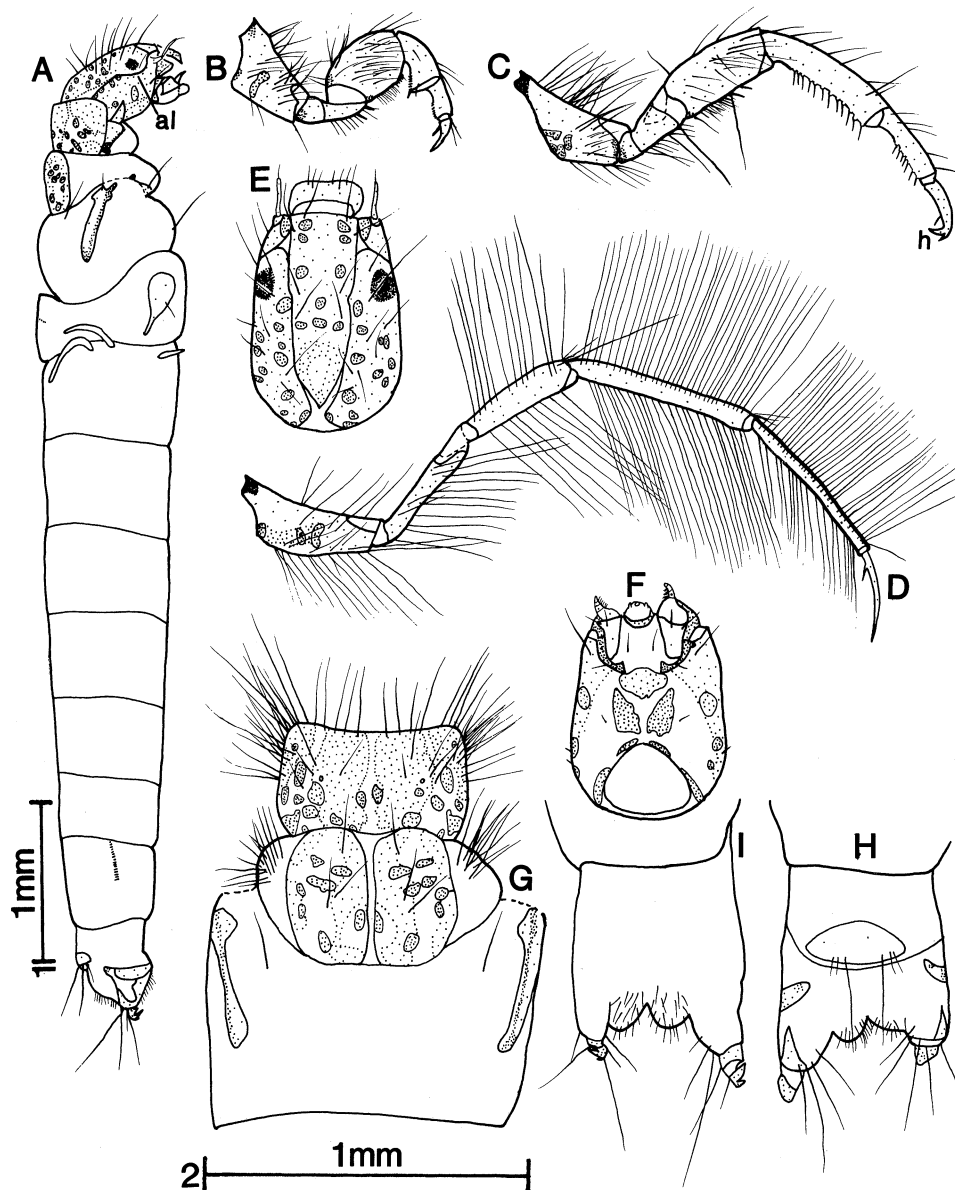


Fig. 21. *Leptocerus souta* larva (PT-914). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view. A - scale 1, B-I - scale 2. al - additional line of weakness, h - hook-like claw on midleg.

Larvae of this genus have a case made of spirally arranged short, thin, regular plant sections. In Australia, some species of *Notalina* make a similar case.

Trienodes voldi Mosely

Figs 22, 24R

Material examined. Thirteen reared males, 11 reared females and 30 larvae. VICTORIA: Ovens River at Porepunkah, 2 Oct. 1982, 7 males (incl. PT-932), 6 females, 13 (incl. PT-928); King River at Cheshunt, 2 Oct. 1982, 5 males, 3 females, 16; Macalister River, 15 km south-south-east of Licola, 6 Nov. 1984, 1 male, 2 females; north arm of Lake Glenmaggie, 6 Nov. 1984, 1.

Description. *Head.* Width 0.44-0.52 mm (n=15, 2 sites); oblong dorsally; short ventrally; dark brown with variable pale patch at back of frontoclypeal apotome and variable pale stripe on each side from back of head joining with pale area around eye dorsally; some dark spots laterally; frontoclypeal apotome long, thin with fairly straight sides and brought to point posteriorly; left mandible with 6 teeth and right mandible with 5 teeth.

Thorax. Pronotum mottled brown; mesonotum pale yellow with brown spots, spots variable in number and position; metanotum with 2 pairs of setae; foretrochantin truncate, slightly longer dorsally than ventrally; prosternum with 2 pairs of short setae anteriorly; mesosternum with pair of short setae anteriorly and dark brown lateral sclerite on posterior margin; metasternum with pair of short setae anteriorly and transverse row of 8, rarely 6 or 7, setae towards posterior margin; legs pale brown, 2 long setal fringes at approximately 180° from each other on hind femur, tibia and tarsus.

Abdomen. Lateral hump sclerite very pale yellow with pale brown stem; spicules pale; tergite IX roughly square, very pale brown (sometimes difficult to see); lateral sclerite and ventral sole plate very pale brown; claws with 2 or 3 very small accessory hooks on outer margin.

Body length. 3-7 mm.

Case. Made of short thin sections of fairly fresh brown plant matter spirally arranged (Fig. 24R). Varies from about length of larva to about twice as long as larva but is most commonly about one and one-half times as long.

Early instar larvae. Fourth instar larvae (head width 0.30-0.33 mm, n=3) have no spots on the head or thorax, no additional lines of weakness on head, 8 metasternal setae and ventral apotome triangular but completely dividing genae.

Habitat and distribution. Larvae were collected amongst vegetation in large rivers with submerged sedge, fine willow roots or macrophyte beds. This species has previously only been recorded from south-east Queensland (Neboiss, 1983).

Oecetis McLachlan

Diagnosis. The long maxillary palpi and single-blade mandibles distinguish all known species in this genus.

Description (based on Australian species only). Antennae moderately long to very long, about one-quarter to over half width of frontoclypeal apotome on anterior margin; labrum with secondary setae; mandibles long and thin, blade-like, with few teeth on cutting edge and without setae (Fig. 3C); ventral apotome triangular, short, not completely dividing genae; head with additional lines of weakness; pronotum with anterior margin straight, anterolateral corners rounded; foretrochantin short and broad; metanotum without sclerites; metasternum with 2 to numerous setae without sclerites at base; hind tibia undivided; gills single filaments; lateral line short and pale; tergite IX with 6 long and 4 short setae in some species, numerous setae in others; anal prolegs without secondary setae.

Remarks. *Oecetis* is another worldwide genus and larval descriptions from other countries are available (Wallace, 1981; Wiggins, 1977; Lepneva, 1966). In Australia 19 species have been described but the genus is in need of revision and several new species await description (Neboiss, personal communication).

Larvae belonging to this genus were commonly collected during this study but only a small proportion survived and emerged. This is probably due to lack of suitable food as larvae of *Oecetis* are generally predatory (Wiggins, 1984). Identification of many of the reared animals is tentative as they belong to undescribed species or are variants of described species. For this reason larvae of only one species, *O. laustra* Mosely, are described here. Larvae of the other eight or more species were variable in the following features.

Head. Colour pattern; frontoclypeal apotome straight sided and narrow, narrow with small lateral extensions or fairly broad; some species with secondary setae.

Thorax. Segments long and thin or short and broad; some species with secondary setae all over thorax; colour pattern; setae present or absent on mesosternum; setae few or numerous on metasternum; legs with variable number of setae, larvae with sand cases generally have fewer setae; length of tarsal claws; length of basal seta on tarsal claw; shape of foretrochantin.

Abdomen. Most species with gills as shown for *O. laustra* but may also have gills on first abdominal segment, some with very few gills; lateral sclerites striped or comparatively uniform colour; anal claws with 1-3 teeth on outer margin.

Case. The case is: i) square in cross section and made of green macrophyte sections, as shown for *O. laustra* (Fig. 24S), larvae swim with these cases; ii) a similar case made of detritus instead of green macrophytes; iii) a curved detritus case; iv) various sand grain cases.

The larva of *Oecetis australis* (Banks) described by Korboot (1964a) as *O. situlus* Korboot is clearly the larva of *Notalina spira* St Clair (see St Clair, 1991).

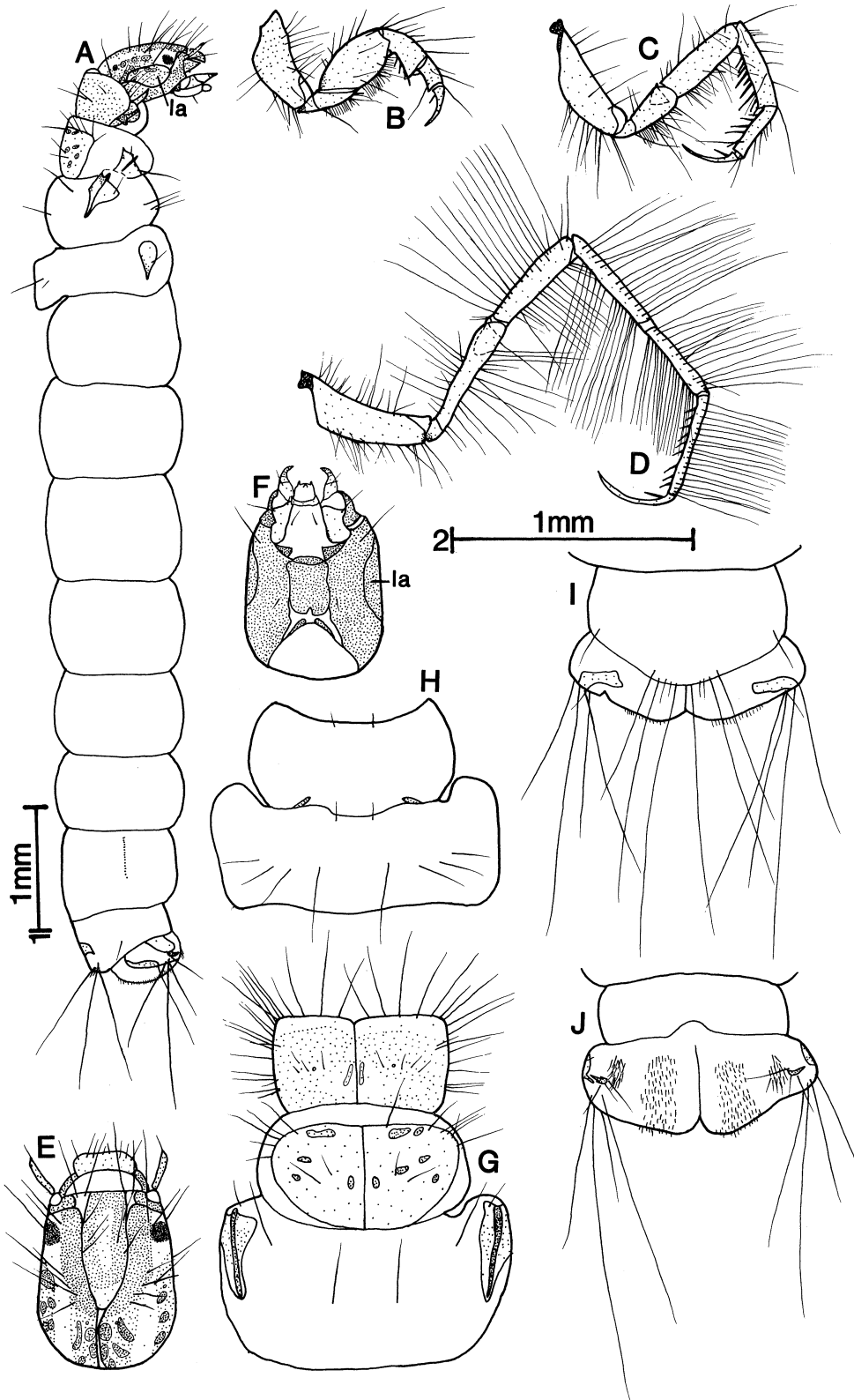


Fig. 22. *Triaenodes voldi* larva (PT-928). A - body lateral view, B - right foreleg, C - right midleg, D - right hindleg, E - head dorsal view, F - head ventral view, G - thorax dorsal view, H - thorax ventral view, I - segment IX dorsal view, J - segment IX ventral view. A - scale 1, B-J - scale 2. la - lateral apotome.

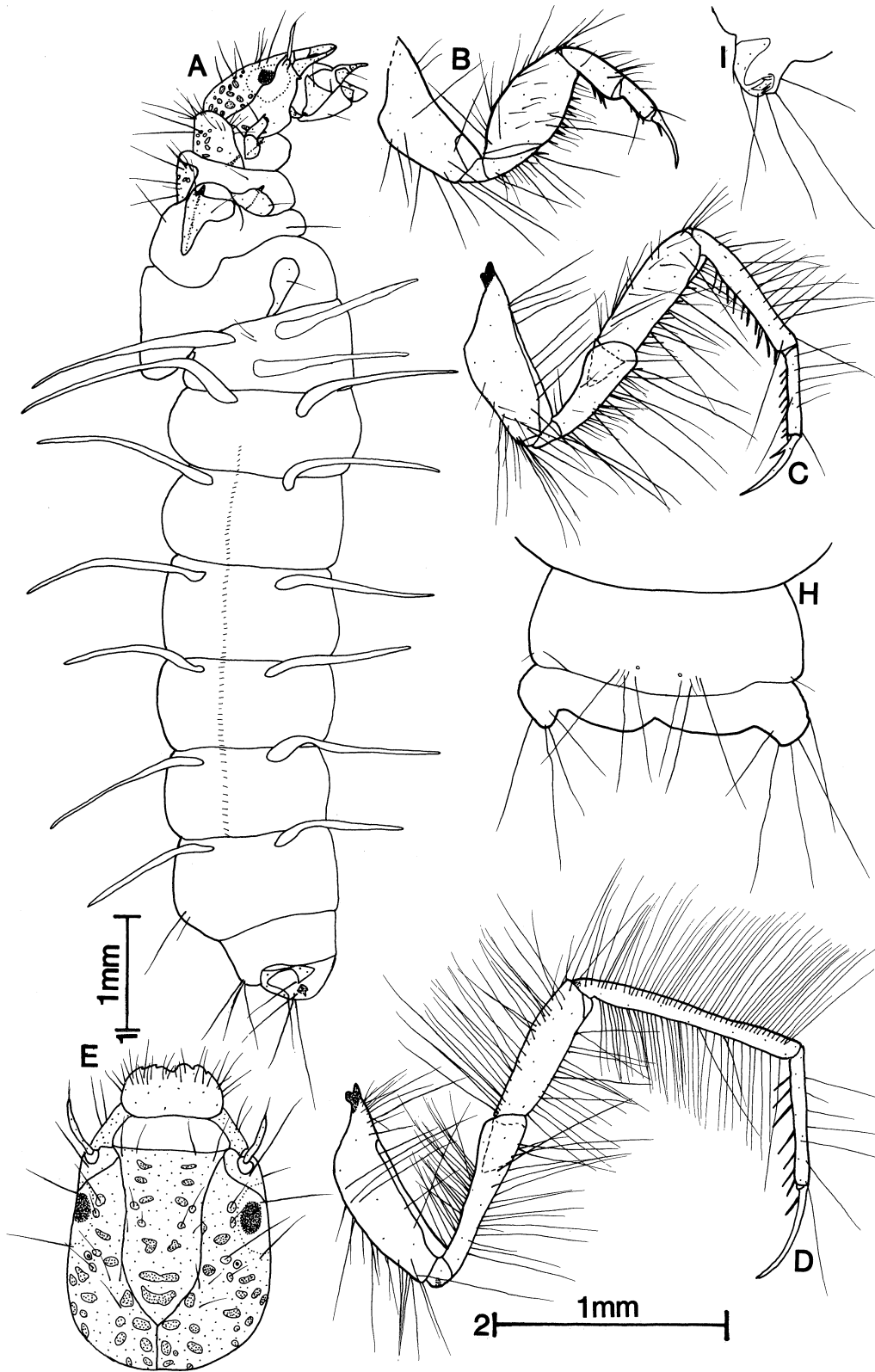


Fig. 23. *Oecetis laustra* larva (PT-917). A – body lateral view, B – right foreleg, C – right midleg, D – right hindleg, E – head dorsal view, F – head ventral view, G – thorax dorsal view, H – segment IX dorsal view, I – anal proleg. A – scale 1, B-I – scale 2.

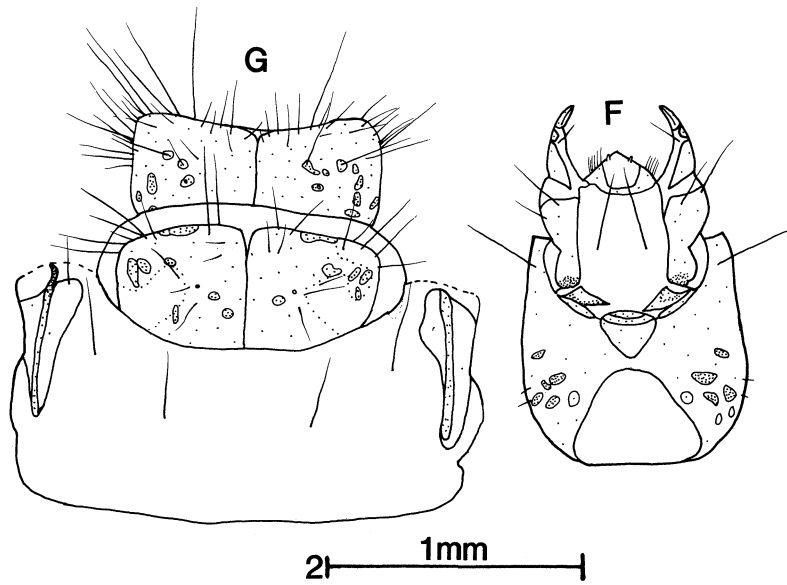


Fig. 23 cont'd.

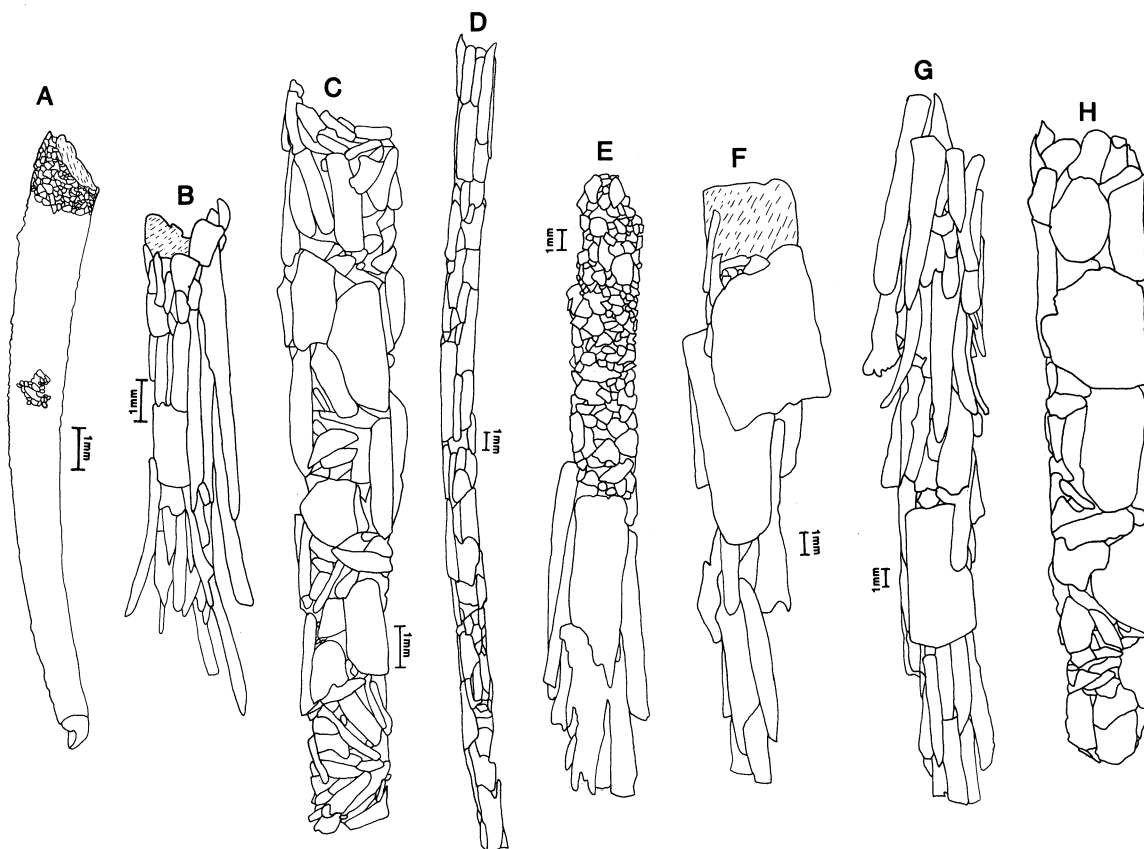


Fig. 24. Larval cases. A – *Triplexa villa*, B – *Condocerus paludosus* (PT-910), C – *Notoperata maculata* (PT-954), D – *N. sparsa*, E-G – *Symphitoneuria opposita*, H – *Triplectidina nigricornis* (PT-952).

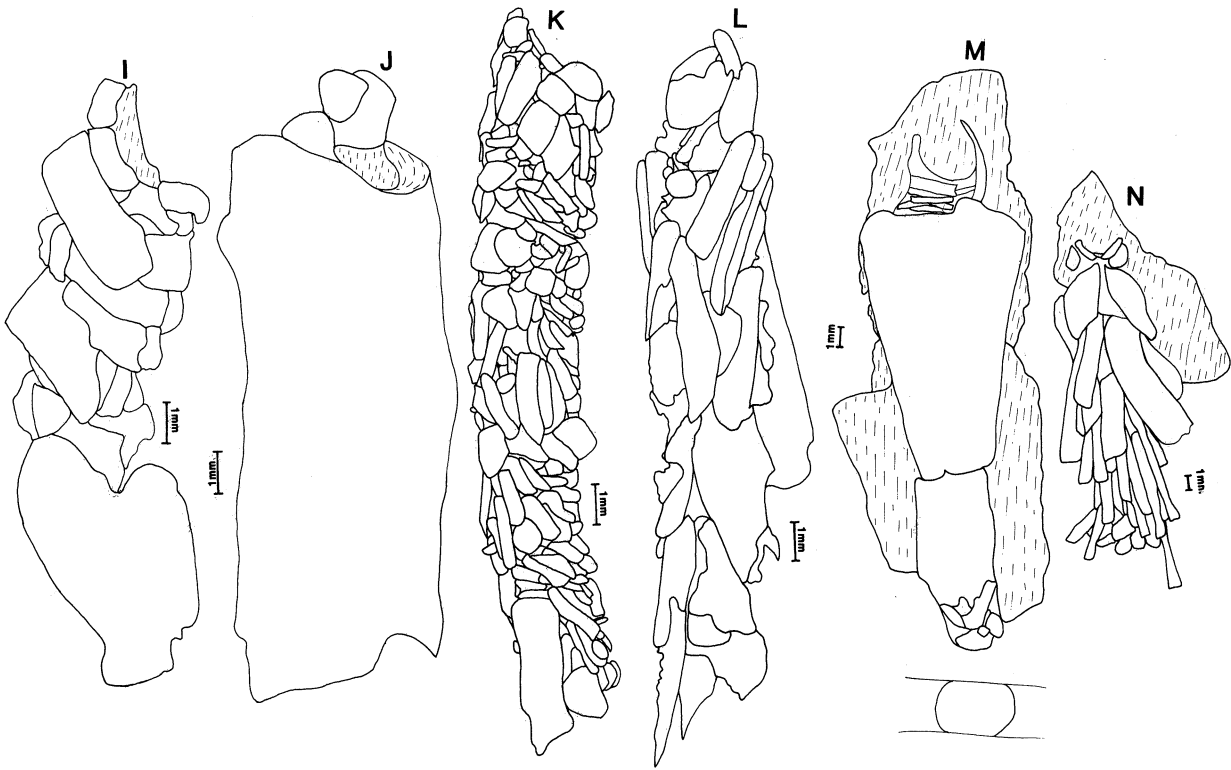


Fig. 24 cont'd. I - *Triplectides similis*, J - *T. proximus*, K - *T. varius*, L - *T. truncatus* (PT-943), M - *T. altenogus* (with diagrammatic cross section), N - *T. australis*.

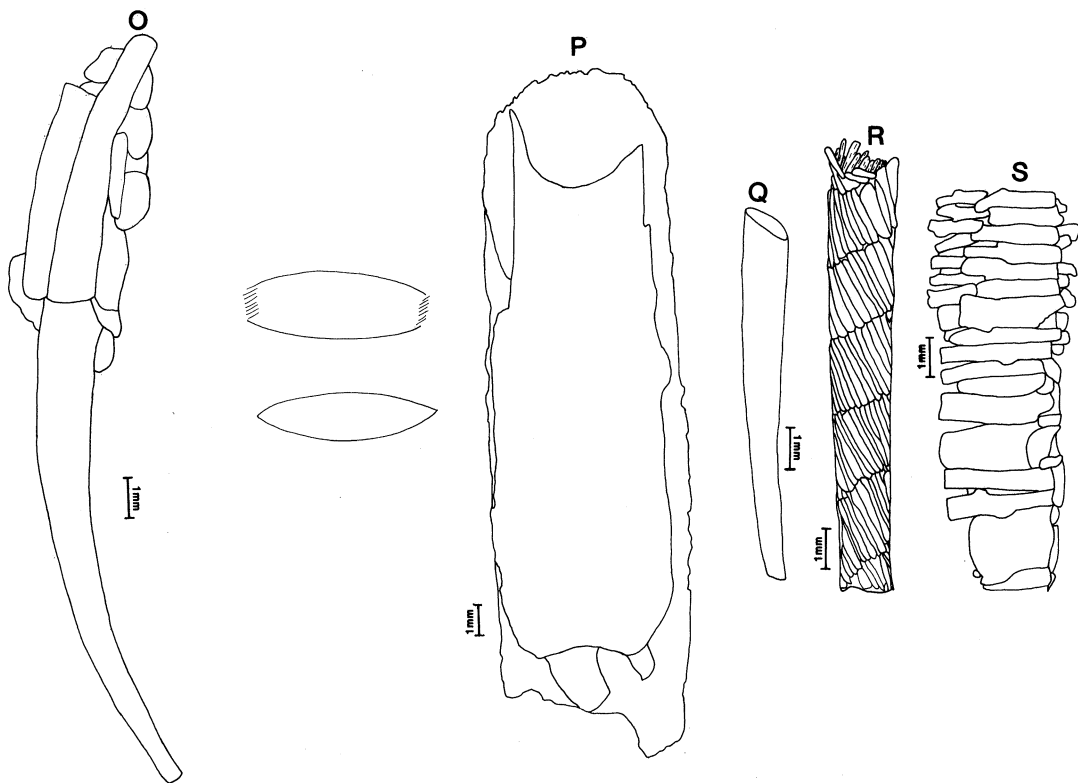


Fig. 24 cont'd. O - *Triplectides volda*, P - *Westriplectes pedderensis* (with diagrammatic cross sections of other cases), Q - *Leptocerus soute*, R - *Triaenodes volda* (PT-928), S - *Oecetis laustra* (PT-917).

Oecetis laustra Mosely

Figs 3C, 23, 24S

Material examined. Three reared males, 5 reared females and 14 larvae. VICTORIA: Bungalally Creek, 4 km south of Horsham, A. Sokol, 5 Feb. 1986, 1; Warrambine Creek, 5 km south-west of Inverleigh, 27 Jan. 1985, 1; Shaws Lake at Blackwood, 15 Nov. 1985, 1; Patterson Lakes Melbourne, K. Ough, 4 Aug. 1982, 1; swamp in Stratford Highway Park, 16 Nov. 1983, 2 males (incl. PT-947), 4 females (incl. PT-889), 6 (incl. PT-917); Lake Bunga, 3 km east-north-east of Lakes Entrance, 15 Oct. 1982, 1 male, 1 female, 2; Genoa River at Genoa, 13 Oct. 1982, 1.

Description. *Head.* Width 0.72-0.88 mm (n=8); approximately square dorsally; pale yellow with brown spots, back of head on each side with strip without spots; paler ventrally; frontoclypeal apotome posteriorly with 4 spots or some of these merged to form 2 bars or 1 bar and 2 spots; pale patch around eye faint; antennae long, over half length of frontoclypeal apotome at anterior margin; frontoclypeal apotome long, sides fairly straight.

Thorax. Pronotum pale yellow with brown spots; mesonotum very pale yellow, white at sides, with brown spots; metanotum with 2 pairs of setae; foretrochantin blunt with short finger-like projection dorsally; metasternum with 2 setae (1 larva with 1 on one side and 3 on other); legs very pale yellow; foreleg comparatively long and thin; hindleg with 2 long setal fringes 180 degrees apart on femur, tibia and tarsus.

Abdomen. Lateral hump sclerites very pale, gills long and thin arranged as in diagram in table 1; tergite IX not apparent; lateral sclerite and ventral sole plate pale yellow, small; anal claw small, with 3 accessory hooks on outer margin.

Body length. 4-7 mm.

Case. Made of thin green rectangular strips of macrophyte arranged in tapering 4 sided box (Fig. 24S). Posterior end blocked with silk membrane with small central hole or slit. Case usually not much longer than larvae. This case type used by other species of *Oecetis*.

Habitat and distribution. Larvae were found in lakes, swamps, estuaries and sluggish streams, usually associated with macrophytes. This species has previously not been recorded from Victoria but occurs in Western Australia, Queensland and Tasmania (Neboiss, 1983).

ACKNOWLEDGMENTS. This work is part of that submitted for the degree of Doctor of Philosophy at the Zoology Department, Monash University. I wish to thank my two supervisors, Drs Sam Lake and Arturs Neboiss for their advice, criticism and encouragement freely given during this study. John Morse, Dave Morton, Ken Walker, Mark Harvey and Alice Wells provided discussion on taxonomic methods and useful criticism of the manuscript. Sabine Schreiber, Owen and Nikolas Hammond, Leon Barmuta, Louisa MacMillan and Andrew Boulton all helped in the field, and many people provided specimens. Additional field collecting was made possible by

a post-graduate grant from the Australian Museum, Sydney. Two anonymous referees are thanked for useful criticism of the manuscript.

References

- Benson, L.J. & R.G. Pearson, 1988. Diversity and seasonality of adult Trichoptera captured in a light trap at Yuccubine creek, a tropical Australian rainforest stream. *Australian Journal of Ecology* 13: 337-344.
- Botosaneanu, L., 1974. Une remarquable larve de Trichoptere du Venezuela. *Entomologische Berichten* 34: 116-120.
- Botosaneanu, L. & O.S. Flint, jr, 1982. On some Trichoptera from Northern Venezuela and Ecuador (Insecta). *Beaufortia* 32: 13-26.
- Cowley, D., 1978. Studies on the larvae of New Zealand Trichoptera. *New Zealand Journal of Zoology* 5: 639-750.
- Flint, O.S., jr, 1968. Bredin-Archbold-Smithsonian biological survey of Dominica. 9: The Trichoptera (caddisflies) of the Lesser Antilles. *Proceedings of the United States National Museum* 125: 1-86.
- Hickin, N.E., 1967. *Caddis Larvae of the British Trichoptera*. 476 pp. Hutchinson. London.
- Holzenthal, R.W., 1986. Studies in neotropical Leptoceridae (Trichoptera), VI: Immature stages of *Hudsonema flaminii* (Navás) and the evolution of and historical biogeography of Hudsonemini (Triplectidinae). *Proceedings of the Entomological Society of Washington* 88: 268-279.
- Holzenthal, R.W., 1988a. Systematics of neotropical *Triplectides* (Trichoptera: Leptoceridae). *Annals of the Entomological Society of America* 81: 187-208.
- Holzenthal, R.W., 1988b. Studies of neotropical Leptoceridae (Trichoptera), VII: The genera *Atanatolica* Mosely and *Grumichella* Muller (Triplectidinae: Grumichellini). *Transactions of the Entomological Society of America* 114: 71-105.
- Jackson, J.E., 1984. Taxonomy, biology and case function of *Lectrides varians* Mosely and *Leptorussa darlingtoni* Banks larvae (Trichoptera: Leptoceridae). B.Sc. Honours Thesis, Zoology Department, University of Adelaide.
- Jackson, J.E., 1985. Larvae and pupae of *Lectrides varians* Mosely and *Leptorussa darlingtoni* (Banks) (Trichoptera: Leptoceridae). *Transactions of the Royal Society of South Australia* 109: 83-89.
- Korboot, K., 1963. Biological studies of some caddisflies (Trichoptera) from south east Queensland. *Papers of the Department of Entomology, University of Queensland* 1: 241-274.
- Korboot, K., 1964a. Four new species of caddisflies (Trichoptera) from eastern Australia. *Journal of the Entomological Society of Queensland* 3: 32-41.
- Korboot K., 1964b. Comparative studies of the external and internal anatomy of three species of Caddis flies (Trichoptera). *Papers of the Department of Entomology, University of Queensland* 2: 1-44.
- Korboot, K., 1964c. Eight new species of caddisflies (Trichoptera) from the Australian Region. *Papers of the Department of Entomology, University of Queensland* 2: 47-56.
- Lepneva S.G., 1966. Larvae and pupae of Integripalpia, Trichoptera. *Fauna of the U.S.S.R. Vol.2 no.2. Zoologicheskii Institut, Akademiya nauk S.S.S.R. new series* 95: 1-560. [English Translation, Israel Program of Scientific Translation (1970)].

- McFarlane, A.G. & J.B. Ward, 1990. *Triplectidina moselyi* n. sp., a previously misidentified New Zealand caddis-fly (Trichoptera: Leptoceridae). *New Zealand Entomologist* 13: 55–59.
- Manuel, K.L. & A.P. Nimmo, 1984. The caddisfly genus *Ylodes* in North America (Trichoptera: Leptoceridae). **In** J.C. Morse (ed.). Proceedings of the Fourth International Symposium on Trichoptera. Junk, 486 pp.
- Marchant, R., P. Mitchell & R. Norris, 1984. A distribution list for the aquatic invertebrates of the lowland region of the La Trobe River, Victoria. *Occasional Papers from the Museum of Victoria* 1: 63–79.
- Metzeling, L., A. Graesser, P. Suter & R. Marchant, 1984. The distribution of aquatic macroinvertebrates in the upper catchment of the La Trobe River, Victoria. *Occasional Papers from the Museum of Victoria* 1: 1–62.
- Morse, J.C., 1981. A phylogeny and classification of the family-group taxa of Leptoceridae (Trichoptera). **In** G.P. Moretti (ed.). Proceedings of the Third International Symposium on Trichoptera. Junk, The Hague, pp. 257–264.
- Morse, J.C. & R.W. Holzenthal, 1987. Higher classification of Triplectidinae (Trichoptera: Leptoceridae). **In** M. Bournaud & H. Tachet (eds). Proceedings of the Fifth International Symposium of Trichoptera. Junk, The Hague, pp. 139–144.
- Morse, J.C. & A. Neboiss, 1982. Triplectides of Australia (Insecta: Trichoptera: Leptoceridae). *Memoirs of the National Museum of Victoria* 43: 61–98.
- Neboiss A., 1977. A taxonomic and zoogeographic study of Tasmanian caddisflies (Insecta: Trichoptera). *Memoirs of the National Museum of Victoria* 38: 1–208.
- Neboiss, A., 1983. Checklist and bibliography of the Australian caddis-flies (Trichoptera). *Australian Society for Limnology, Special Publication No.5*, 132 pp.
- Neboiss, A., 1986. Atlas of Trichoptera of the SW Pacific-Australian Region. Junk, The Hague, 286 pp.
- Neboiss, A., 1987. Identity of Trichoptera species described by K. Korboot 1963–1964. *Memoirs of the National Museum of Victoria* 48: 131–140.
- Ross, H.H., 1967. The evolution and past dispersal of the Trichoptera. *Annual Review of Entomology* 12: 169–206.
- St Clair, R.M., 1988. The adult and immatures of *Russobex* gen. nov. a new monotypic genus from Victoria (Trichoptera: Leptoceridae). *Proceedings of the Royal Society of Victoria* 100: 47–52.
- St Clair, R.M., 1991. The genus *Notalina* (Trichoptera: Leptoceridae) in southeastern Australia with descriptions of the larvae and pupae. *Australian Journal of Invertebrate Taxonomy* 4: 895–934.
- Tillyard, R.J., 1925. Odonata, Neuroptera and Trichoptera from Groote Eylandt, Gulf of Carpentaria. *Records of the South Australian Museum* 3: 41–44.
- Towns, D.R., 1983. Terrestrial oviposition by two species of caddisfly in South Australia (Trichoptera: Leptoceridae.). *Journal of the Australian Entomological Society* 22: 113–118.
- Towns, D.R., 1985. Limnological characteristics of a South Australian Intermittent Stream, Brown Hill Creek. *Australian Journal of Marine and Freshwater Research* 36: 821–837.
- Ulmer, G., 1906. Neuer Beitrag zur kenntnis aussereuropaischer Trichopteren. *Stettiner Entomologische Zeitung* 66: 1–119.
- Ulmer, G., 1908. Trichopteridae und Ephemeridae. *Fauna Sudwest-Australiens* 2(3): 25–46.
- Ulmer, G., 1955. Kocherfliegen (Trichopteren) von den Sunda-Inseln. Tiel II Larven und Puppen der Integripalpia, unter Berücksichtigung verwandter Formen und deren Literatur aus anderen Faunengebieten. *Archive fur Hydrobiologia Supplement* 21: 408–608.
- Wallace, I.D., 1981. A key to the larvae of the family Leptoceridae (Trichoptera) in Great Britain and Ireland. *Freshwater Biology* 11: 273–297.
- Wiggins, G.B., 1977. Larvae of the North American Caddisfly Genera (Trichoptera). University of Toronto Press, Toronto, 401 pp.
- Wiggins, G.B., 1984. Trichoptera. **In** R.W. Merritt & K.W. Cummins. *An Introduction to the Aquatic Insects of North America*. 2nd edn. Kendall Hunt, Dubuque, Iowa, 722 pp.

APPENDIX

Table 1. Gill diagrams. Eight rectangles represent the first 8 abdominal segments, with the line bisecting the rectangles representing the lateral midline of the larva. The first segment is to the left. Numbers in the boxes refer to the number of gill filaments and the positions of the numbers represent the positions of the gills on the segment.

Notoperata maculata

| | | | | | | | |
|---|---|---|---|---|---|--|--|
| 1 | 1 | 1 | 1 | 1 | 1 | | |
| | 1 | 1 | 1 | 1 | | | |
| | 1 | 1 | 1 | 1 | 1 | | |

Lectrides varians

| | | | | | | | |
|-----|---|---|---|---|---|-----|-----|
| 0-1 | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |

Triplectidina nigricornis

| | | | | | | | |
|---|---|-----|-----|-----|-----|-----|--|
| 1 | 1 | 1 | 1 | 0-1 | 0-1 | 0-1 | |
| | 1 | 0-1 | 0-1 | | | | |
| | 1 | 1 | 1 | 0-1 | 0-1 | | |

Triplectides proximus

| | | | | | | | |
|--|---|---|---|---|-----|-----|--|
| | 1 | 1 | 1 | 1 | 1 | 1 | |
| | | 1 | 1 | 1 | 0-1 | | |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | |

T. elongatus range

| | | | | | | | |
|--|---|---|---|---|-----|-----|--|
| | 1 | 1 | 1 | 1 | 0-1 | 0-1 | |
| | 1 | 1 | 1 | 1 | 0-1 | | |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | |

T. truncatus range

| | | | | | | | |
|--|---|-----|-----|-----|-----|-----|--|
| | 1 | 1 | 0-1 | 1 | 1 | | |
| | | 0-1 | 1 | 0-1 | 0-1 | | |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | |

T. altenoquus

| | | | | | | | |
|--|---|---|---|---|---|-----|-----|
| | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

T. ciuskus

| | | | | | | | |
|-----|---|---|---|---|---|---|-----|
| 0-1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| 0-1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |

T. volda

| | | | | | | | |
|-----|---|---|---|---|---|-----|-----|
| 0-1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| | 1 | 1 | 1 | 1 | 1 | 0-1 | |
| 0-1 | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |

Westriplectes pedderensis range

| | | | | | | | |
|---|---|---|---|---|-----|-----|-----|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 0-1 | 0-1 | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |

Leptorussa darlingtoni

| | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|
| 3 | 3 | 3 | 2-3 | 2-3 | 2-3 | 1-3 | 0-2 |
| | 0-3 | 1-2 | 0-4 | 0-1 | 0-1 | | |
| 3 | 2-3 | 3 | 2-3 | 2 | 1-2 | 0-2 | |

N. sparsa

| | | | | | | | |
|--|---|---|---|---|-----|--|--|
| | 1 | 1 | 1 | 1 | 0-1 | | |
| | 1 | 1 | 1 | 1 | 0-1 | | |
| | 1 | 1 | 1 | 1 | 0-1 | | |

Symphitoneuria opposita

| | | | | | | | |
|---|-----|---|---|-----|-----|-----|-----|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| | 0-1 | 1 | 1 | 0-1 | 0-1 | 0-1 | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |

Triplectides similis

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 1-3 | 4 | 4 | 3-4 | 3-4 | 3-4 | 2-4 | 1-3 |
| | 1-3 | 2-3 | 1-3 | 1-2 | 0-3 | 0-2 | |
| 0-3 | 3-4 | 3-4 | 3-4 | 3-4 | 2-3 | 1-3 | 1-2 |

T. varius

| | | | | | | | |
|---|---|---|---|---|-----|-----|-----|
| | 1 | 1 | 1 | 1 | 1 | | |
| | 1 | 1 | 1 | 1 | 0-1 | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 0-1 | 0-1 |

T. elongatus most common

| | | | | | | | |
|--|---|---|---|---|---|---|--|
| | 1 | 1 | 1 | 1 | 1 | | |
| | 1 | 1 | 1 | 1 | | | |
| | 1 | 1 | 1 | 1 | 1 | 1 | |

T. truncatus most common

| | | | | | | | |
|--|---|---|---|---|---|--|--|
| | 1 | 1 | 1 | 1 | 1 | | |
| | | 1 | 1 | 1 | | | |
| | 1 | 1 | 1 | 1 | 1 | | |

T. australicus

| | | | | | | | |
|-----|---|---|---|---|---|---|---|
| 0-1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0-1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

T. australis

| | | | | | | | |
|---|---|---|---|---|---|---|-----|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

T. magnus

| | | | | | | | |
|---|---|---|---|---|---|---|-----|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 0-1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

W. pedderensis most common

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Oecetis laustra

| | | | | | | | |
|--|---|---|---|---|---|---|---|
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 |