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Identification guide to genera of aquatic larval Chironomidae (Diptera) of Australia and New Zealand

PETER S. CRANSTON
Evolution and Ecology, Research School of Biology, The Australian National University, Canberra, A.C.T. 2601, Australia
Cranston: urn: lsid:zoobank.org:author: C068AC61-DF1D-432A-9AB7-52B5D85C6C79
Orcid ID: 0000-0001-7535-980

Abstract

Identification keys are provided for the final (4th) instar larvae of genera of Chironomidae (Diptera), from aquatic habitats in Australia and New Zealand. Morphological features of taxonomic utility are discussed and illustrated by line drawings. Summaries of described species for each genus and their distribution is provided, with reference to means of further identification where available. In the subfamily Podonominae, 5 genera are keyed of which 3 are recorded from New Zealand; the 4 genera of Aphroteniinae are from Australia (absent from New Zealand); in Diamesinae 1 genus is Australian, 2 are from New Zealand; in the Tanypodinae 21 genera are found in Australia and 4 are from New Zealand; in Orthocladiinae 31 genera are reported from Australia, 14 from New Zealand; and in Chironominae 43 genera are keyed from Australia, 9 from New Zealand. Larvae of *Axarus* Roback, *Chernovskiia* Sæther and *Omisus* Townes (Chironomini) are recognised in Australia for the first time. The undescribed larva of *Paucispinigera* Freeman, endemic to New Zealand, is keyed and several other New Zealand taxa are included based on unpublished records. Genera reported from Australia and New Zealand as adults, but unknown as larvae, are listed.

Key words: Keys, larvae, new records

Introduction

The Chironomidae is a diverse and abundant family of Diptera (true flies). The immature stages are predominantly aquatic where the larvae may dominate the macro-invertebrate biota in biomass and taxon richness. Terrestrial, semi-terrestrial and marine larvae are included only if freshwater association is suspected.

Early studies in Australia and New Zealand emphasised the adults and before progress could be made on the ecologically significant immature stages an adult-based classificatory framework had to be established. The regional generic concepts of Freeman (1959, New Zealand; 1961, Australia) predominantly have stood the test of time, with subsequent studies expanding existing concepts. Newly described species plus informal taxon names (only some of which have been validated) have been added and recognised genera and species continue to grow. However, the requirements of formal descriptive taxonomy and the increased desirability of linkage to molecular studies, including barcoding (e.g. Krosch *et al*., 2015), can slow formal description. Typical expansion of the described biota through rearing and with molecular guidance in Australia is demonstrated by *Cricotopus* Wulp, expanded from 2 to 12 by 10 new species (Drayson *et al*. 2015) and *Riethia* Kieffer, expanded to 12 by 9 new species (Cranston 2019a).

Some richly illustrated keys exist for larval Chironomidae in Australia, at least to generic level. Notable are nationwide keys by Cranston (1996, 2000b), for south-west Western Australia by Leung *et al*. (2011; 2013) and Madden (2010) emphasised larval morphology visible without requiring dissection. Two non-traditional identification resources in Australia are from Cranston (2000b), and an interactive ("Lucid™") key and diagnostics at global scale, for genera including all those from Australia, incorporating a glossary, diagnoses, line drawings and numerous photographic illustrations (Cranston 2010). An updated catalogue for Australia (Bugledich *et al*. 1999) is available online (ABRS 2019). Although an interactive key exists for Chironomidae of Campbell Island (McMurtrie *et al*. 2014) no modern key is available for New Zealand and even the location of some described types and vouchers is uncertain.

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Comprehensive keys to the immature stages are limited, more so for larvae than pupae. Larval Chironomidae rarely can be identified reliably to species based on morphology alone although this is an aspiration in all biological studies, including in biological monitoring of environmental change. Taxonomy is dependent on the adult (usually male) stage, to which immature stages must be associated by rearing or by DNA barcoding. Stable taxonomy across the Holarctic region (Andersen *et al*. 2013) was possible only after decades-long studies by multiple researchers rearing chironomids to reconcile the taxonomy. Such intensive study has not taken place in Australia and New Zealand and unknown or undescribed taxa abound. In Australia some have been provided with codes (informal names) pending rearing and formal publication: these codes for presumed higher-level are included in this work.

Geographic gaps in survey may not be problematic as eco-biogeography of the Chironomidae includes a cool stenothermic "Gondwanan" fauna, which in Australia extends into subtropical and even northern Queensland (McKie *et al*. 2005) and may be represented also in south-western Western Australia and more controversially to New Zealand. A warm-adapted "Gondwanan" fauna believed to be restricted to the northern Australia (and Papua New Guinea) can occur in summer-warm waters in temperate New South Wales. Some low taxonomic level taxa (genera, species groups) are shared between Australia, South America and less often New Zealand (e.g. Krosch *et al*., 2011; Krosch & Cranston, 2013). In Australia, continent-wide survey shows less regional endemism at least at morphospecies level than expected. Current ecology may mask deeper historical biogeographic signals. The distributional data presented here covers most currently known Australian taxa but is less intensive for New Zealand. However, few taxa can be considered excluded by their 'apparent' absence from any given geographic area.

As with all diverse groups of insects, keys are provisional—some taxa will not be reliably identifiable beyond genera. These keys are based on 4th (final) instar larvae, and earlier instars will not key reliably. Recent new discoveries include from inadequately studied micro-habitats, such as immersed wood-associated chironomid fauna. Earlier guides (e.g. Cranston 1996; 2000b) encouraged review of material that doesn't key and thus updating is ongoing. No final and definitive version for such a widespread and diverse group of organisms can ever be claimed, and users of any key should bear this in mind. Extralimital keys such as for South East Asia (Cranston 2004) can be consulted. Some new New Zealand records are published here based on collections of the author and Matt Krosch, specimens held in Australian National Insect Collection, CSIRO, Canberra.

Preservation and mounting. Independent of collecting method, all life stages of Chironomidae are preserved best in 75–90 % ethanol or isopropanol, and stored cold and dark. Material intended for molecular studies should be preserved in high strength alcohols (90–96%). Formalin preservation is useless for slide-preparation, and, as with 'denatured' alcohol, DNA is degraded making it unavailable for molecular study. Although unmounted material can be identified (e.g. Madden, 2010) if the user is familiar with a modestly diverse regional fauna, at least some slide preparations are required. Larvae killed by immersion in high strength alcohols have contracted mouthparts and may be brittle: improved slides can be produced from larvae killed by placing them initially in more dilute alcohol or cooled in a freezer.

For slide preparation, the head capsule should be removed and macerated in a 10% solution of caustic potash (KOH) for 5 to 10 minutes (warm) or longer at room temperature. The body is also important but a shorter duration of clearing is needed to avoid producing a pale 'ghost'. Specimens are passed through glacial acetic acid (5 minutes) then into alcohol (ethanol or isopropanol) (15 minutes). If Canada Balsam is used, a stage of alcohol layered over either cedarwood or clove oil (15 minutes) is required. For Euparal, the alcohol / oil stage is omitted, and mounting is direct from acetic acid via 100% ethanol or isopropanol as water is immiscible with either Balsam or Euparal mountants. Advantages of isopropanol including its reduced hygroscopy (low water uptake), lower volatility, and legality of transporting and use for field work. Conservation for DNA extraction in isopropanol is preferred as it is never 'denatured'.

The larval head and body are best placed under separate cover slips, otherwise the mount may be too thick to permit high magnification examination of the uncompressed head capsule. By applying gentle pressure and carefully manipulating the cover slip whilst observing the results through a dissecting microscope, with the head orientated horizontally and ventral side uppermost. To view the dorsal sclerites in Chironominae the dorsal head may need to be separated by dissection, together with the labrum. In the Tanypodinae the complete head must be cleared such that ventral and dorsal setae (and sensory pits) and the internal ligula and components can be examined unobscured by head contents. A well laid-out labrum-epipharynx is needed to observe fine structural detail in Orthocladiinae and Chironominae (Cranston 2013).

Non-destructive extraction should be used for molecular voucher materials (Krosch & Cranston 2012). Subsequently a short soak in dilute KOH will clear remnant non-cuticular material, with standard slide mounting procedures providing permanent preservation for vouchering via subsequent curation.

Faced with large numbers of larvae for routine identification, the processing above may be unnecessarily complex and time consuming. Mounting media are available that eliminate the need for dehydration and serve as clearing agents; larvae may be mounted directly from weaker alcohol or water. The optical qualities of Hoyer's (Berlese) mountant is the best for appropriate clearing, allowing better detail including for photography, especially at highest magnifications. However, all valuable (archival) specimens should be remounted into permanent media. During drying shrinkage is common and fresh mountant should be added at the edge of the cover slips to top up, but avoid inducing air bubbles. Drying slides can be enhanced in an incubator or hot plate at 50° to 60°C. Heated mountant becomes more viscous and the position of the body parts can change due to pressure from the cover slip, so slides should be checked and the position of the body parts readjusted if necessary.

Terminology and Morphology (Cranston 1994, 2013).

Chironomidae are holometabolous insects with the immature larva undergoing metamorphosis via a pupal stage to a very different-looking adult fly. Chironomids have four discrete larval stages (instars) (rare Arctic, exceptions with 5 instars), with morphological change between instars; identifications are made largely on the final instar Larval Chironomidae have a well-developed, exposed, complete, and non-retractile head capsule, with the mandibles operating in an oblique to horizontal plane, and a narrow, elongate, segmented body that lacks jointed thoracic legs. Chironomid larvae may be distinguished from other dipteran larvae only by the following features in combination: Spiracles are absent, the apneustic condition, except for *Austrochlus* (Podonominae) that are metapneustic, with posterior spiracles only.

Parapods (prolegs) are paired, on the first thoracic and terminal abdominal segments, but variably fused and/or reduced, more so in semi-aquatic and terrestrial taxa.

The terminal abdominal segment bears paired dorsal procerci, each carrying apically a tuft of setae, lacking in few taxa.

Certain larval Orthocladiinae may resemble closely some larval Ceratopogonidae, but the uniquely modified pharynx of the latter, comprising two strongly sclerotised, diverging arms and a complex of food-sorting combs, contrasts with the weakly sclerotised, relatively unmodified pharynx of Chironomidae.

The chironomid larval body

The chironomid larval body, excepting the head capsule, is nearly always divided into three externally visible thoracic and nine abdominal segments (Fig. 1A), although pseudo-segmentation occurs in a few Chironomini (Fig. 16L). Late 4th instar larvae can be recognised by swollen anterior segments due to pupal and adult structures developing within. Thoracic swelling occurs in some earlier (non-terminal) instars in wood-mining taxa and in *Corynoneura* and *Thienemanniella.*

The only appendages of the thorax are the anterior parapods, which are paired, fleshy, unsegmented 'false legs' that bear claws and are placed ventrolaterally on the 1st thoracic segment. Similar posterior parapods are found ventrolaterally on the terminal abdominal segment. Parapods may be partially or completely fused; rarely parapods and claws are reduced or even absent, notably in some 'terrestrial' taxa (e.g. Fig. 12R). Pre-anal, on the dorsal side, the procerci are paired tubercles each bearing an apical tuft of setae (Fig. 1G). Lying posterior to, and between, the bases of the posterior parapods, surrounding the terminal anus, are one to three (usually two) pairs of anal tubules. Larvae of *Chironomus* and some relatives often have haemolymph-filled abdominal tubules, better termed tracheal gills. There may be one or two ventral pairs of these tubules on abdominal segment VIII, and often one pair arising lateral near the posterior margin of abdominal segment VII (Fig. 14I).

The chironomid larval head capsule

The chironomid larval head capsule comprises a fully sclerotised cranium that includes a dorsal plate and paired lateral genae. These areas are delineated by ecdysial lines of weakness along which the integument splits during moulting (ecdysis).

The dorsal head shows variation useful for identification, perhaps especially at species level, and notably in the subfamily Chironominae. Three areas: the frons, clypeus and labrum (from posterior to anterior) are separate components separated by more-or-less visible sutures, or fused to another and/or variously fragmented (Fig. 1D). Each area has associated cephalic setae: thus S_4 and S_5 are located on the frons, S_3 lies on the clypeus, and S_1 and S_2 on the labrum. A sclerite, strengthened cuticle, occupies either the complete area (as is usual for the frons) or only part (as often for the clypeus), and may be subdivided (as in the labrum, with central and lateral sclerites (Fig. 1D).

The genae form the ventral and lateral walls, which may extend to meet dorsally at the coronal suture in larvae in which the frons fails to contact the postoccipital margin (the posterior margin of the head capsule (Fig. 1E). The remaining cephalic setae, S_6 (suborbital), S_7 (supraorbital), S_8 (parietal), S_9, S_{10} (genal) and S_{11}, S_{12} (coronal), are all located as their names imply on the genae. The positions of these setae relative to the ventral (VP) and dorsal (DP) pores, and to the seta submenti (SSm) varies systematically in the Tanypodinae (Fig. 2B, C). The anterior frons in some Chironomini appears thinner in an area termed a 'fenestra' (window) (Fig. 1D, 14L).

Anterodorsally on the genae, the antennae (Figs. 1F, 2E) are multi-segmented, mostly distinctive and protruding, and retractile only in Tanypodinae (Fig. 2B, C). The non-retractile antenna may arise directly from the genae or be located on an elevated pedestal sometimes adorned with spines or combs (e.g. Fig. 13F, G). In subfamilies Podonominae and Aphroteniinae the antennae are positioned more posteriorly, near mid-dorsally. The basic antennal segment number is 5, with variation including reduction to 4 or 3, or increased through division to 6 or rarely apparently to 7 or 8 segments (e.g. Fig. 16E, F). The apical segment in Orthocladiinae, when 6-segmented, is very fine, perhaps no more than 1μ wide (Fig. 12E). In some taxa, portions of elongate segments may be hyaline and poorly sclerotised (Fig.17K) and the antenna can trail rather than protrude anteriorly. 'Terrestrial' larvae may have reduced segment number and length (e.g. Fig. 12O, P); fully aquatic larvae living within sandy substrata (psammophiles) may have weakly sclerotised antennae (Fig. 11B). Segment homology can be recognised by the consistent placement of a blade at the apex of the 1st segment, and by Lauterborn organs placed on the 2nd segment (Fig. 12C, F). These organs usually are paired and located opposite at the segment apex, but other arrangements occur, including alternate positions on segments 2 and 3 (Fig. 15I). The Lauterborn organs are compound, comprising a peg sensillum and paired, thin-walled, fan-like sensilla, which in Tanytarsini may be located apically on short to very long pedestals (Fig. 13I). Reduction of the Lauterborn organs to pegs or styles occurs, notably in 'semi-aquatic / terrestrial' taxa.

The labrum, recognised by locating labral setae S_1 and S_2 (Fig. 1D), is the anterior extension of the frons and clypeus (whether these be separate or fused as a frontoclypeus). At its most distinctive (Fig. 1E), the labrum comprises a median labral sclerite and 3 pairs of lateral sclerites, but some or all of these components may be fused or fragmentary. The ventral labrum is the epipharynx (or palatum), which bears setae, chaetae and scales involved in sensing the anterior environment and in feeding. Anterior to the labral sclerite are the labral sensilla basiconica, comprising S IVA, a larger bisensillum or trisensillum, and S IVB, a smaller peg (which may be missing). Anterior to these lie three distinctive pairs of sensilla chaetica. The usually simple and fine S III lie more medial, and slightly posterior, to the paired S II setae. The S II setae are usually simple, but may be broadened or even pectinate. The anterior-most labral setae, the paired S I, can be simple to bifid, plumose or pectinate. The anterolateral labral margin bears chaetae; anteromedially there may be a single or divided plate, the labral lamella(e), at the labral margin. The margin itself comprises sclerotised structures, including the torma, and delimits the palatum beneath.

The palatum and premandibles are ventral labral features (Fig. 1D). Paired, movable and toothed premandibles attach ventrally to the tormal bar, but are lacking in Aphroteniinae, Podonominae and Tanypodinae. The palatum comprises a median epipharynx, bounded by a U-shaped ungula and terminating in a basal sclerite. Three groups of scales or spines occur on the epipharynx: an anteromedian pecten epipharyngis, and lateral and basal chaetulae. The pecten epipharyngis is a plate that may be a fused, pectinate as in many Chironomini, consist of three more or less fused scales, or may be lacking completely (all Tanypodinae).

Prominent mouthparts include paired, articulated mandibles, operating obliquely between the labrum and the maxilla. Exceptionally, some wood-mining larvae have a narrowed labrum, and mandibles thus operate near vertically. The mandible (Fig. 1B) is toothed, typically with at least one dorsal tooth, a dominant apical tooth, and a variable number of inner teeth (two or three in most taxa). Some lack a dorsal tooth, and a distal sclerotisation or projection of the mandibular mola may be mistaken for an additional inner tooth. Here distal projections of the mola are not treated as teeth. Three mandibular setae or groups of setae can be identified: a comb-like pecten mandibularis on the dorsal subapical surface; a seta subdentalis arising proximal to the inner-most tooth, usually inserted on the ventral side; and a branched seta interna basally on the dorsal surface (Fig. 2G).

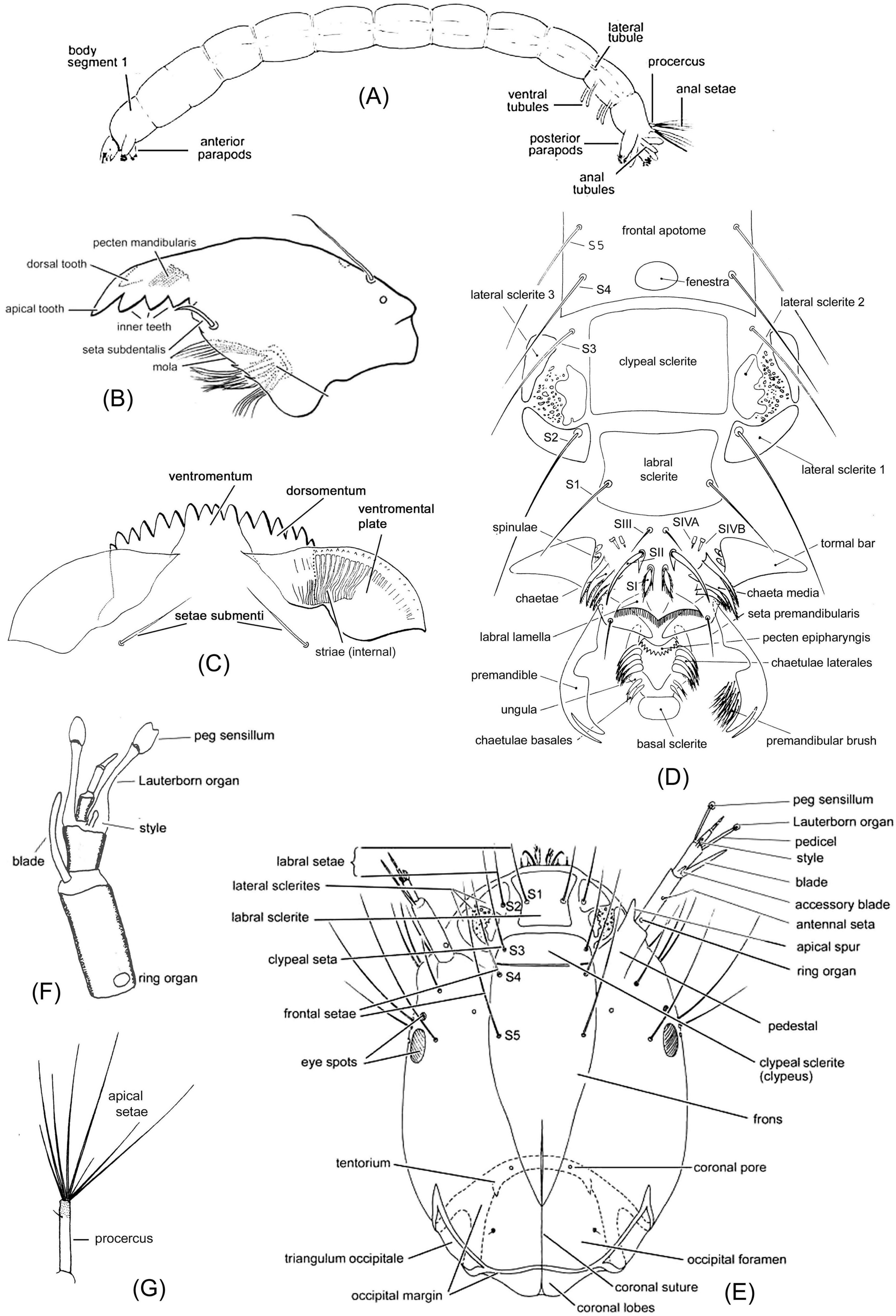

PLATE 1. Larval morphology. (A) Habitus, *Chironomus* sp., (B) Mandible stylised; (C) Mentum of Chironomini; (D) frontal apotome and larval sclerites of *Kiefferulus* sp.; (E) dorsal head of Chironomini, stylised; (F) antenna of *Neozavrelia optoputealis*; (G) Procercus, stylised.

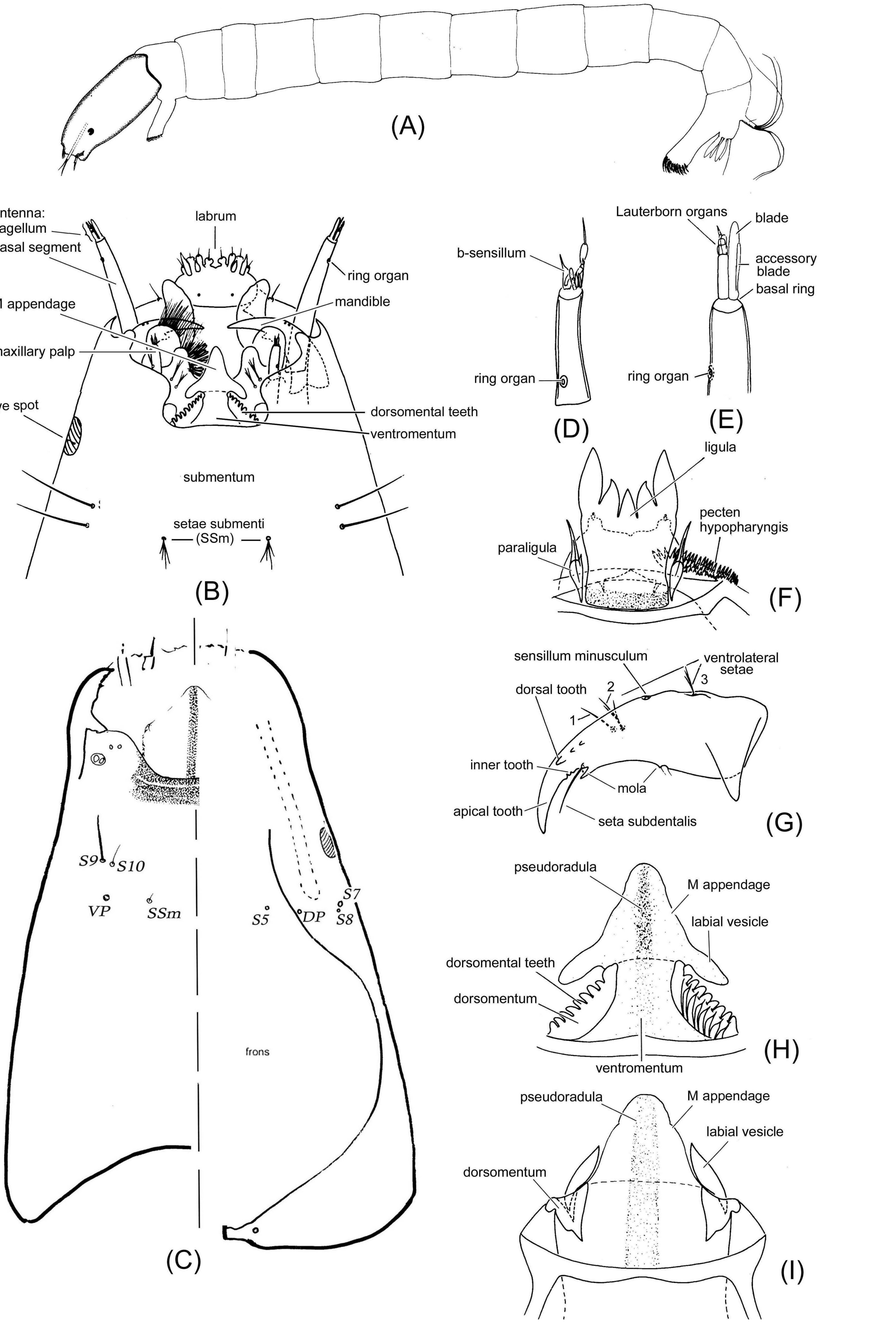

PLATE 2. Larval morphology, Tanypodinae, stylised. (A) Habitus; (B) Ventral head; (C) setae and sensory pits (L side ventral, R side dorsal); (D) Maxillary palp; (E) Antenna; (F) Ligula, paraligula and hypopharynx); (G) Mandible; (H) Mentum of non-Pentaneurini; (I) Mentum of Pentaneurini.

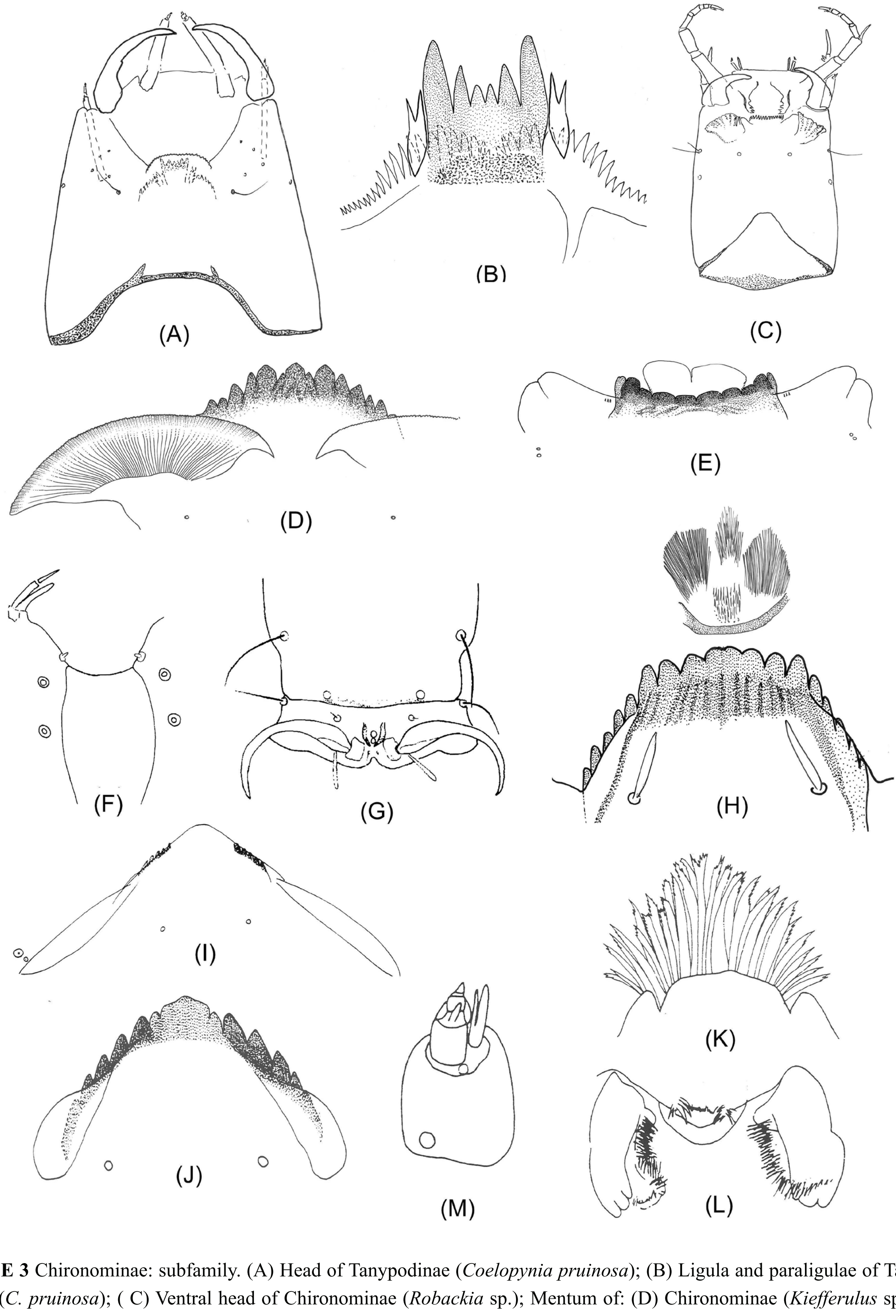

PLATE 3 Chironominae: subfamily. (A) Head of Tanypodinae (*Coelopynia pruinosa*); (B) Ligula and paraligulae of Tanypodinae (*C. pruinosa*); (C) Ventral head of Chironominae (*Robackia* sp.); Mentum of: (D) Chironominae (*Kiefferulus* sp.); (E) *Stenochironomus* sp.; (F) Aphroteniinae (*Aphroteniella filicornis*); (G) labium of Aphroteniinae (*A. filicornis*), (H) hypopharynx and midmentum of Diamesinae (*Paraheptagyia*); mentums of (I) Orthocladiinae (*Nanocladius* sp.), (J) Orthocladiinae (*Parakiefferiella* sp.); (K) prementum of Telmatogetoninae; (L) epipharynx and premandibles of Telmatogetoninae; (M) antenna of Telmatogetoninae (K-M,*Telmatogeton japonicus*).

The dominant ventral feature of the larval head in most subfamilies is the mentum (Fig. 1C), a transverse toothed plate comprising a median ventral wall (ventromentum) and a dorsal wall (dorsomentum) that extends more laterally and curves dorsally behind the ventromentum. Although the 'typical' toothed mentum appears single, especially in Orthocladiinae and Chironomini, the line of fusion between the dorsal and ventral components often can be recognised, delimiting the median ventromental component. In larval Tanypodinae the ventromentum is hyaline overlying a dorsomentum that is toothed only in 'non-Pentaneurini' (Fig. 2H). The anterior projection in Tanypodinae is a hyaline M appendage with a median strip, the pseudoradula (Fig. 2H, I), and posterolaterally with vesicles.

The ventromental plates are lateral to posterolateral contiguous extensions of the ventromentum. In Orthocladiinae the plates vary from scarcely indicated to very well developed (Fig, 3I, J). In the Chironominae (Fig. 1C), the dorsal (inner) surface of the ventromental plates is striate, often with attendant hooks and similar structures that give rise to fan-like plates internally with highly complex micro-architecture associated with the maxilla beneath. The obverse to the striae of the ventromental plate is the cardo of the maxilla. Structures of the mentum are essential to recognition of larval chironomid taxa at taxonomic levels from species to subfamily (e.g. Fig. 3, Fig. 4E-G).

Posterior to the mentum, the gula and submentum are terms used for essentially the same structure: the mentum grades into gula or submentum that extends posteriorly to the occipital margin and laterally is fused to the genae.

The maxilla lies dorsolateral to the mentum and comprises a base of variable breadth bearing a ventrolateral maxillary palp (Fig. 2D), dorsomedial galea and posteromedial lacinia. In some Chironomini the lacinia apicomedially bears characteristically long setae directed behind (dorsal to) the mentum.

The most obvious internal structure of the head is the premento-hypopharyngeal complex, which lies dorsal to the mentum, but may be obscured in ventral view of slide-mounted material by the mentum and/or apices of the mandibles. The complex is double lobed, consisting of a ventral prementum and dorsal hypopharynx, with a salivary gland outlet between the lobes. The hypopharynx is weak, usually being a scaly lobe or comb, but with clear rows of teeth in some Tanypodinae (Fig. 2F). The prementum is well-developed in Tanypodinae, where it forms a principal part of the feeding apparatus, consisting of a median, toothed plate, the ligula (which represents the fused 'glossae'), and paired, toothed paraligulae ('paraglossae') (Fig. 2F). The ligula acts as a fulcrum to assist the ingestion of food. In other subfamilies the prementum differs, including as anteriorly-protruding 'brushes' in Diamesinae and Telmatogetoninae (Fig. 3H, L), but are more usually weak.

The larval eyes typically are areas of dark pigment beneath the cuticle. In larvae of Tanypodinae (Fig. 2A), Podonominae (Fig. 4B), Aphroteniinae (Fig. 5B) and few Orthocladiinae, eye spots are single. Most larval Chironominae and Prodiamesinae have clearly separate double 'eye spots' as do most Orthocladiinae. This variation can be used to presort unmounted larvae.

Taxonomic names

Taxon names are given their authorship, but the date of publication can be obtained from Bugledich et al. (1999), updated in ABRS (2019). Included species in each genus are summarised, and specified only if less than 3 species are included.

Abbreviations. ACT—Australian Capital Territory; Aust—Australia; c—central; e—east; inc.—including; Is—Island, n—north; NSW—New South Wales; NT—Northern Territory, NZ—New Zealand; Qld—Queensland; R—River; s—South; SA—South Australia; sp. (spp.)—species singular (plural); Tas—Tasmania; Vic—Victoria; w. west; WA—Western Australia.

Subfamily key

1 Antenna retractile into head (Fig. 3A). Hypopharynx with distinctive toothed ligula (Fig. 3B). Mentum usually weakly sclerotised. . . . . **Tanypodinae**

1' Antenna non-retractile (Fig. 3C). Ligula never toothed as above. Mentum nearly always sclerotised toothed plate (e.g. Fig. 3D, E, J). 2

2(1') Mentum variably developed but always broad, and with usually striate, ventromental plates (Fig. 3D) [Exceptionally plates of *Stenochironomus* (Fig. 3E) and *Harrisius* lack striations, but some hooks present] . . . . **Chironominae**

2' Mentum with, at most, relatively small, ventromental plates, never striate (Fig. 3I, J) 3

3(2') Mentum untoothed (Fig. 3F). Sensory setae of anterior labrum elongate (Fig. 3G) . . . . **Aphroteniinae**

3’ Mentum nearly always toothed (Fig. 3H–J). Labral setae small 4

4(3’) Premandibles absent. Procercus usually elongate, much longer than wide . . . . **Podonominae**

4’ Premandibles present (Fig. 3L). Procerci generally squat, not elongate 5

5(4’) Central ligula and lateral paraligulae of prementum resembling 3 brushes (Fig. 3H). 3rd antennal segment may be annulate . . . . **Diamesinae**

5’ Prementum never developed as 3 brushes, although single median brush (M-appendage) may be present (Fig. 3K). No annulate antennal segments. 6

6(5’) Prementum with many-branched, brush-like M appendage, lying antero-ventral to mentum (Fig. 3K). Premandible short and broad with strong inner brush (Fig. 3L). Antenna short but distinctly 4-segmented (Fig. 3M) . . . . **Telmatogetoninae**
[*Telmatogeton* Schiner, freshwater/marine interface. 2 spp. in SA, 1 in NZ: Antipodes Is.]

6’ Prementum not brush-like. Premandibular brush absent or weak. If antenna 4-segmented and short (less than 1/2 mandible length), then apical segmentation indistinct (Fig. 10N, 11F) . . . . **Orthocladiinae**

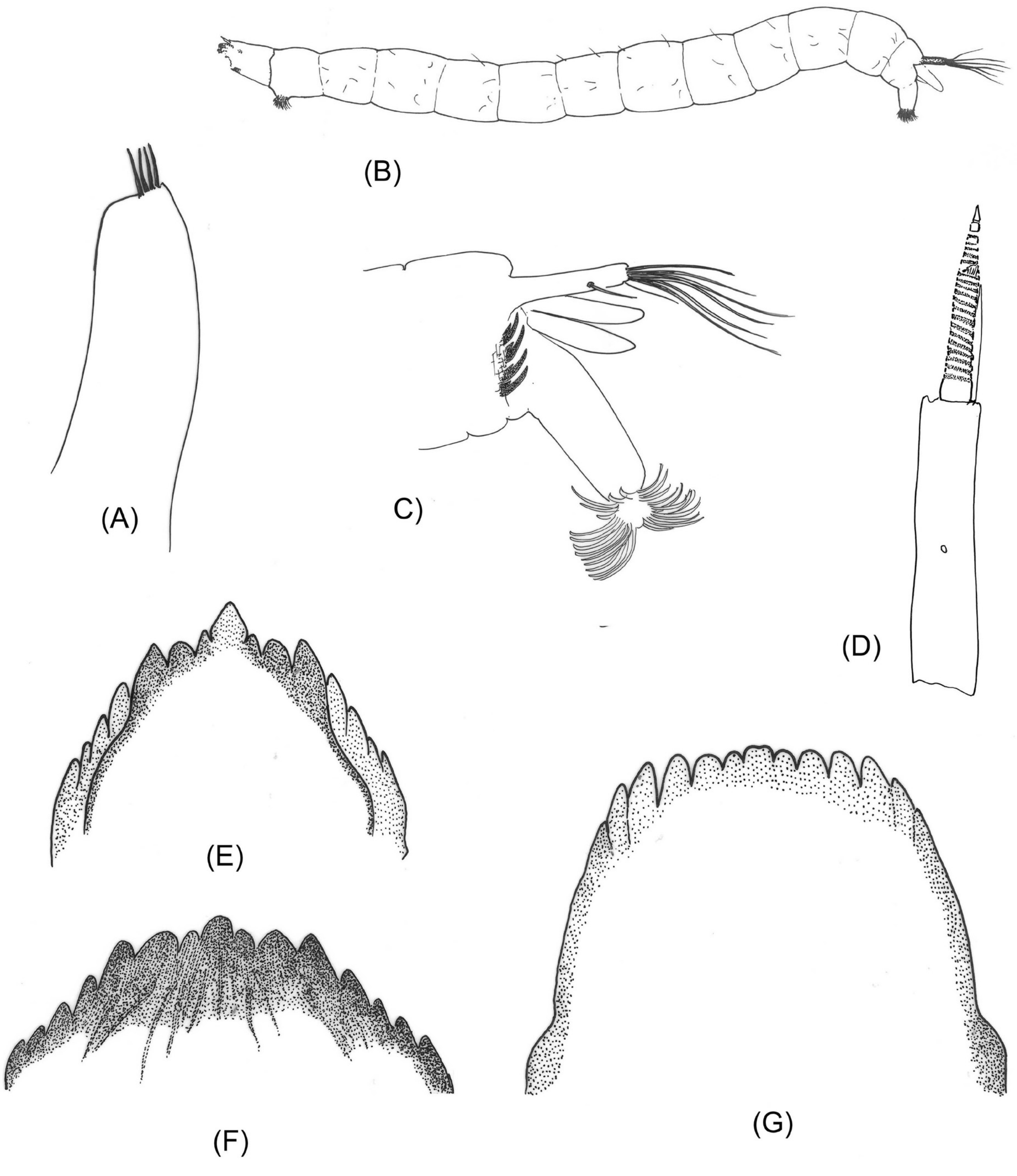

PLATE 4. Larval Podonominae. (A) Procercus of *Podonomopis evansi*; (B) Habitus *Podonomus* sp.; (C) Posterior abdomen, *Podochlus australiensis*; (D) Antenna, *Podonomopsis discoceros*; E-G, Mentums of (E) *P. australiensis*, (F) *Parochlus bassianus*, G. *Podonomus* sp.

Key to Podonominae larvae: genera

[see Brundin 1966; Cranston *et al*. 1987, 2002; *Rheochlus* Brundin unknown as larva.]

1 Procercus bulbous, procercal setae reduced to short apical crown (Fig. 4A). . . . . *Podonomopsis* Brundin
[2 named Aust spp., *P. discocerus* Brundin and *P. evansi* Brundin, from e. Aust, inc. Tas. (Brundin 1966). Molecular diversity is higher]

1' Procercus elongate with well-developed procercal setae (Fig. 4B, C). 2

2(1') Terminal abdominal segment with posterolateral pad of dorsally directed spines (Fig. 4C). Median mental tooth paler, triangular, protruding (Fig. 4E) . . . .*Podochlus* Brundin
[2 named Aust spp., *P. australiensis* and *P. tasmaniensis* (both Brundin 1966); 4 NZ, none subantarctic]

2' Terminal abdominal segment without spines. Mentum dark, median tooth rounded less protruding (Fig. 4F, G) 3

3(2') Procercus dark posteriorly, pale anteriorly, stout, less than 2× as long as wide, Spiracles present dorsolateral on abdominal segment VIII . . . . *Austrochlus* Cranston
[3 Aust spp., from arid WA and s. NT (Cranston *et al*. 2002)]

3' Procercus unicoloured, up to 5× as long as wide. Spiracles not visible. 4

4(3') Median mental tooth broader and higher than 1st and subsequent lateral teeth (Fig. 4F) . . . . *Parochlus* Brundin
[Diverse, speciose, distinction largely based on pupae. 4 named spp. from Aust inc. Tas; 14 from NZ, including 4 from subantarctic Is, Brundin 1966]

4' Median mental tooth subequal in breadth and height to 1st and subsequent lateral teeth (Fig. 4G) . . . . *Podonomus* Philippi
[2 s. Aust spp. inc. Tas.; 3 described from NZ (Brundin 1966), none from subantarctic Is.]

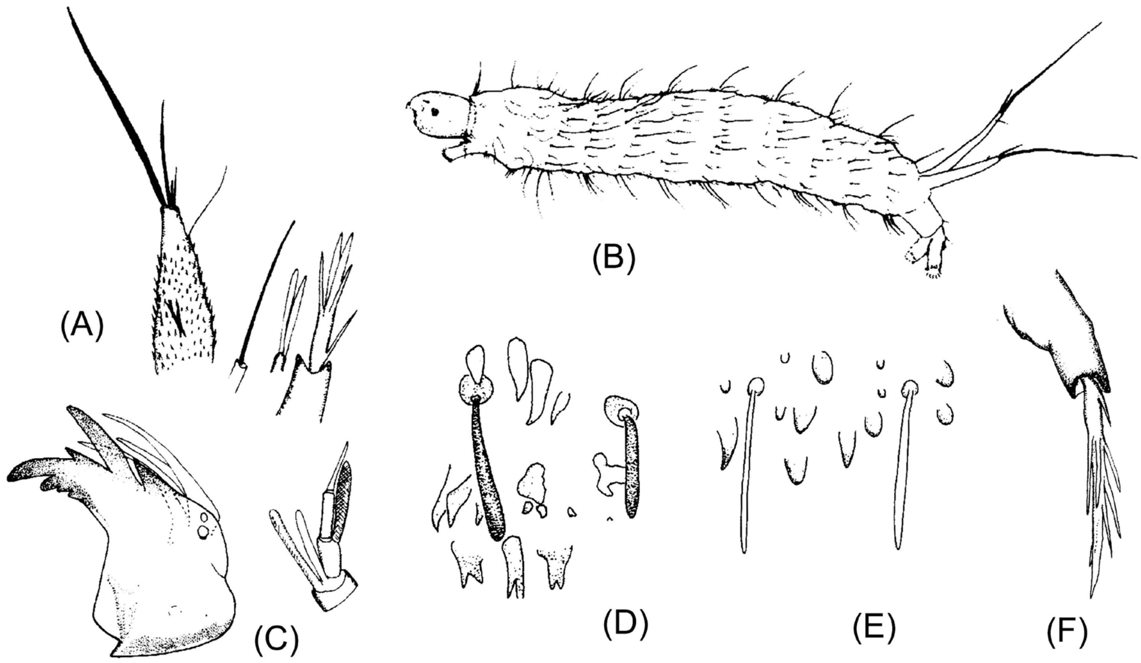

PLATE 5. Larval Aphroteniinae. (A) Procercus and body setae, *Aphrotenia australiensis*; (B) Habitus, *Aphroteniella filicornis*; (C) Mandible and antenna (to scale) *A. filicornis*; (D-F) Abdominal cuticle of (D) *A. filicornis*, (E) *A. tenuicornis*, (F) *A. australiensis*.

Aphroteniinae larvae: Genera, Species

[see Brundin 1966; Cranston & Edward 1992]

1 Body with plumose extensions to cuticle, some body setae feathered (Fig. 5A, F). Procercus spinose (Fig. 5A) . . . . *Aphrotenia* Brundin
[1 Aust sp., *A. australiensis* Cranston & Edward, NSW]

1' Body smooth, or with papillae and hooklets, none plumose (Fig. 5E); body setae all simple. Procercus smooth (Fig. 5B) . . . 2

2(1') Body smooth. Head notably large (>15% body length). Antenna as long as mandible . . . . *Paraphrotenia* Brundin
[*P. fascipennis* Brundin, Aust: NSW, Vic]

2' Body with papillae and hooklets (Fig. 5E). Head smaller (*c.* 10% body length). Antenna minute, much shorter than mandible (Fig. 5C) . . . .*Aphroteniella* Brundin ... 3
[2 Aust spp., Qld to Tas, SA, molecular evidence for more]

3(2') Body with larger papillae, some of which are developed as hooklets (Fig. 5D). Second longest apical seta of procercus shorter, <120µm . . . . *Aphroteniella filicornis* Brundin

3' Body with small papillae, without hooklets (Fig. 5E). Second longest apical seta of procercus long, >130µ . . . . *Aphroteniella tenuicornis* Brundin

Key to Diamesinae: genera

1 Mentum pale without distinct median teeth (Fig. 6A). Head pale without darkened posterior head. . . . . . .*Lobodiamesa* Pagast [*L. campbelli* Pagast from NZ]

1' Mentum dark, toothed (Fig. 6B). Head dark with black posterior 1/3 of head (Fig. 6C). 2

2(1') Australia . . . . *Paraheptagyia* Brundin [2 Aust spp., *P. tasmaniae* (Freeman) from Tas, *P. tonnoiri* (Freeman) from se Aust.]

2' New Zealand. . . . .*Maoridiamesa* Pagast [5 NZ spp., (Brundin 1966) including *M. insularis* Brundin from Campbell Is.]

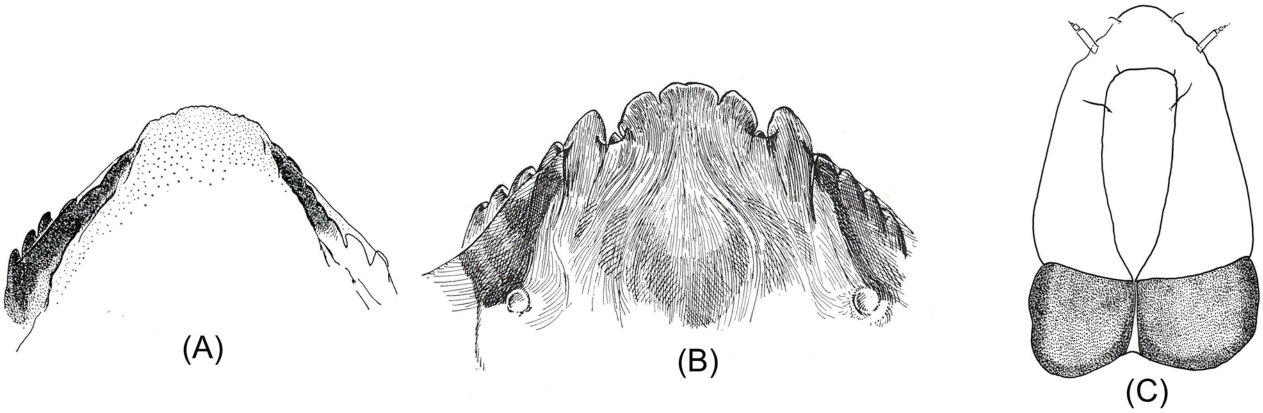

PLATE 6. Larval Diamesinae. Mentum of (A) *Lobodiamesa campbelli*, (B) *Paraheptagyia tonnoiri*; (C) Dorsal head *P. tonnoiri.*

Key to Tanypodinae: Genera

1. Body bearing longitudinal lateral setal fringe (Fig. 7A). Dorsomentum toothed (Fig. 7B) . . . . ('non-Pentaneurini') ... 2

1' Body lacks setal fringe. Dorsomentum untoothed (Fig. 7C) . . . . (tribe Pentaneurini) ... 11

2(1') Dorsomental teeth not aligned on plate (Fig. 7D). 3

2' Dorsomental teeth at plate margin (Fig. 7G) 4

3(2) Mandible strongly hooked, with large basal tooth (Fig. 7E). . . . . *Clinotanypus* Kieffer [2 Aust spp., *C. crux* Wiedemann from tropical n, 1 undescribed from R. Murray drainage]

3' Mandible gently curved, with low rounded inner tooth (Fig. 7F). . . . . *Coelotanypus* Kieffer [1 Aust sp, *C. wirthi* Freeman, only from Narrabeen, NSW, no immature stages recognised yet]

4(2') Dorsomentum a complete arc of subequally sized teeth with median appendage not demarcated (Fig. 7G) . . . . (tribe Coelopyniini) . . . *Coelopynia* Freeman [monotypic Aust, *C. pruinosa* Freeman, widespread]

4' Dorsomental teeth interrupted medially by pale median section (Fig. 7H) 5

5(4') Mandible squat, with very expanded base and short apical tooth (Fig. 7J). Ligula near parallel-sided, teeth equal-sized (Fig. 7I). Pecten hypopharyngis absent . . . . (tribe Tanypiini) ... *Tanypus* Meigen [1 sp. tropical Aust, sp. unverified]

5' Mandible longer and more slender. Ligula more flared, teeth uneven (Fig. 7L, M). Pecten hypopharyngis present. 6

6(5') Mandible with multiple spine-like teeth on mesal surface, without distinct basal tooth (Fig. 7K) . . . .(tribe Fittkauimyiini) ... *Fittkauimyia* Karunakaran [1 sp, Aust, likely *F. disparipes* Karunakaran, from n. (inc. W.A.) to Vic border]

6' Mandible without mesal spine-like teeth 7

7(6') Ligula with point of inner teeth distinctly curved outwards (Fig. 7L) 8

7' Ligula with middle teeth anteriorly directed or slightly curved inwards (Fig. 7M) 9

8(7) Paraligula bifid (Fig. 7L). Mandible with weak basal tooth (Fig. 7N). Dorsomental plates each with 4 large teeth . . . .*Apsectrotanypus* Fittkau [3 named sp, Aust, 5 NZ; most as *'Anatopynia'* and /or *Macropelopia*. Revision needed]

8' Paraligula with two or more inner spines (Fig. 7M). Mandible with large, blunt basal tooth. Dorsomental plates each with 5-8

large teeth (Fig. 7O) . . . . *Alotanypus* Roback
[*A. dalyupensis* Freeman, s.w. Aust, 2 NZ (under *Gressitius* Sublette & Wirth)]

9(7') Antennal blade extending well beyond apex of flagellum (Fig. 7P). Anterior parapods connected basally by fine hooklets . . . . *Djalmabatista* Fittkau
[1 undescribed sp., e. Aust]

9' Antennal blade not extending beyond flagellum (Fig. 7Q). Anterior parapods not connected by spinulose area 10

10(9') Ligula completely mid-brown, all teeth even-lengthed; paraligula an elongate spine with two medio-ventrally directed basal spines. . . . . *"Anatopynia" pennipes*
[Name used in Aust & NZ for larva/pupa of uncertain placement]

10' Ligula with black teeth, pale basally, median tooth shorter than laterals; paraligula multi-toothed (Fig. 7R). . . . . (tribe Procladiini) *Procladius* Skuse
[globally diverse and taxonomically confused; 3 Aust spp. allocated to subgenus *Procladius* s.s.; molecular evidence for many more taxa]

11(1') Basal segment of maxillary palp divided (Fig. 8A, B) 12

11' Base of maxillary palp undivided (Fig. 8C) 14

12(11) Basal palp segment divided into 2–5 sections, if only 2, then membranous part proximal to basal 1/3 (Fig. 8A). One or more claws of posterior parapod darker than remainder (Fig. 8D) . . . . *Ablabesmyia* Johannsen
[*A. hilli* Freeman and *A. notabilis* (Skuse) named from Aust, *A. mala* (Hutton) from NZ]

12' Membranous division of maxillary palp about 1/3 from base (Fig. 8B). All hind parapod claws usually all yellow 13

13(12') Submentum with seta S9 linearly aligned with SSm and S10, with VP more posterolateral (Fig. 8E). Dark posterior parapod claw in 1 sp. . . . . *Paramerina* Fittkau
[treated as a junior synonym of non-Aust *Zavrelimyia*; 3 named Aust spp, more based on genetics; 1 NZ sp, *Zavrelimyia harrisi* (Freeman)]

13' Submentum with S9 more or less aligned with VP and SSm, with S10 lying anterior to VP (Fig. 8F). All posterior parapod claws yellow . . . . Pentaneurini 'genus C'
[undescribed, 1 sp. from buttongrass swamps in Tas.]

14(11') Inner teeth of ligula apically curved outwards (Fig. 8G) 15

14' Inner teeth of mentum directed anteriorly or slightly inwards (Fig. 8H, I) 16

15(14) Second antennal segment annulate (Fig. 8J). S9, S10 approximated, distant from VP, SSm (Fig. 8K). . . . . *Australopelopia* Cranston
[monotypic: *A. prionoptera* Cranston, Aust: Qld to Tas and WA]

15' Second antennal segment non-annulate. VP associated with S9, S10 (Fig. 8L). . . . . *Thienemannimyia* gp.
[Several larvae and pupae of this group from Aust n. tropics; genus allocation uncertain]

16(14') Ligula with middle tooth larger than inner teeth (Fig. 9A). Submentum with setae (S9, S10 and SSm) and VP linearly arranged with SSm distantly posterior to anterior group (Fig. 9B), anal tubules as long as posterior prolegs . . . . . . *Nilotanypus* Kieffer
[1 sp, unnamed, widespread esp. n. Aust, not SA]

16' Ligula with middle tooth not protruding (Fig. 8I, 9F). Submental setae and VP variously arranged, never linear; SSm less distant from S9, S10, SSm (Fig. 9G–J). Anal tubules shorter than anal prolegs 17

17(16') Apex of 2nd antennal segment with Lauterborn organ elongate, subequal in length to 3rd segment, appearing like bifid apex (Fig. 9C). 2nd antennal segment dark. DP absent (Fig. 9D). . . . . *Monopelopia* Fittkau
[larvae from R. Murray billabong and lower lakes. Aust. NSW/Vic/SA; 1 unnamed sp. from tree rot holes, NZ, S. Is.]

17' Apex of 2nd antennal segment without well developed Lauterborn organ. 2nd antennal segment pale. DP present (Fig. 9E) 18

18(17') Ligula narrow with 4 teeth (Fig. 9F), rarely 5. SSm lying medial to VP, S10 (Fig. 9G) . . . . Pentaneurini 'genus E'
[undescribed genus, Aust: s.w. WA, NSW]

18' Ligula conventionally broad, with 5 teeth. SSm retracted posterior to S9, S10, VP (Fig. 9H, I, J) 19

19(18') S10 placed antero-lateral to slightly postero-lateral to VP (Fig. 9H) 20

19' S10 distinctly posterior median to VP (Fig. 9I) 22

20(19) Gula and submentum smooth, lacking creases (Fig. 9H) . . . . *Larsia* Fittkau
[1 sp, perhaps *L. albiceps* (Johannsen), in sandy lotic situations. all mainland states, very similar to 2 taxa below, but pupal thoracic horn distinguishes]

20' Gula and submentum creased (Fig. 9I, J) (view in phase or Nomarski optics) 21

21(20') Mola at base of seta subdentalis projecting strongly, triangular (Fig. 9K) . . . . Pentaneurini 'ST1'
[undescribed genus, s.e. Aust]

21' Mola at base of seta subdentalis gently rounded (Fig. 9L) . . . . .Pentaneurini 'genus D'
[undescribed genus from s.e. Aust. Possible congener with 'ST1', differs in pupal thoracic horn]

22(19') Gula and submentum with many short transverse "creases"; S9 medial to VP (Fig. 9I) . . . . *Yarrhpelopia* Cranston
(= Pentaneurini 'genus A'; 1 sp. *Y. norrisi* Cranston, s.e. Aust, Cranston 2017, tolerant of mine waste]

22' Gula and submentum with few longer transverse "creases"; S9 directly anterior to VP (Fig. 9J) . . . . . .Pentaneurini 'genus B'
[undescribed genus, Aust (N.T., s.e. Qld, NSW)]

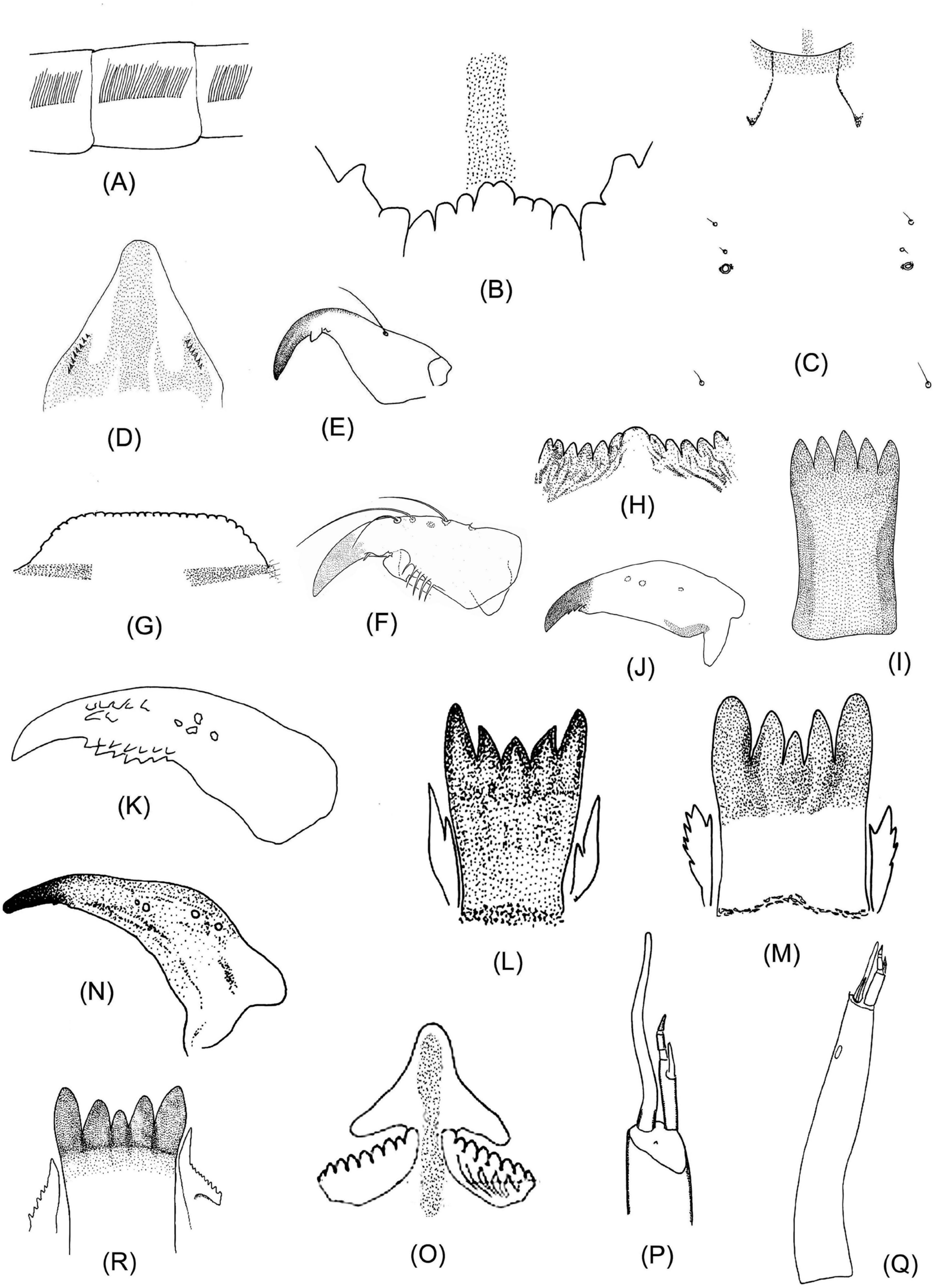

PLATE 7. Larval Tanypodinae, 'non-Pentaneurini'. (A) Mid-segments, *Procladius*; (B) mentum, *Fittkauimyia*; (C) Mentum and prementum, *Nilotanypus*; (D) Mentum, *Clinotanypus*; (E) mandible, *Clinotanypus*; (F) mandible, *Coelotanypus*; (G) mentum, *Coelopynia pruinosa*; (H) mentum, *Procladius*, (I) ligula, *Tanypus*; (J) mandible, *Tanypus*; (K) mandible, *Fittkauimyia*; (L) ligula, paraligulae, *Apsectrotanypus*; (M) ligula, paraligulae, *Djalmabatista*; (N) mandible, *Apsectrotanypus*; (O) mentum, *Alotanypus*; (P) Antennal apex, *Djalmabatista*; (Q) Antenna, *Procladius*. (R) Ligula, paraligulae, *Procladius*.

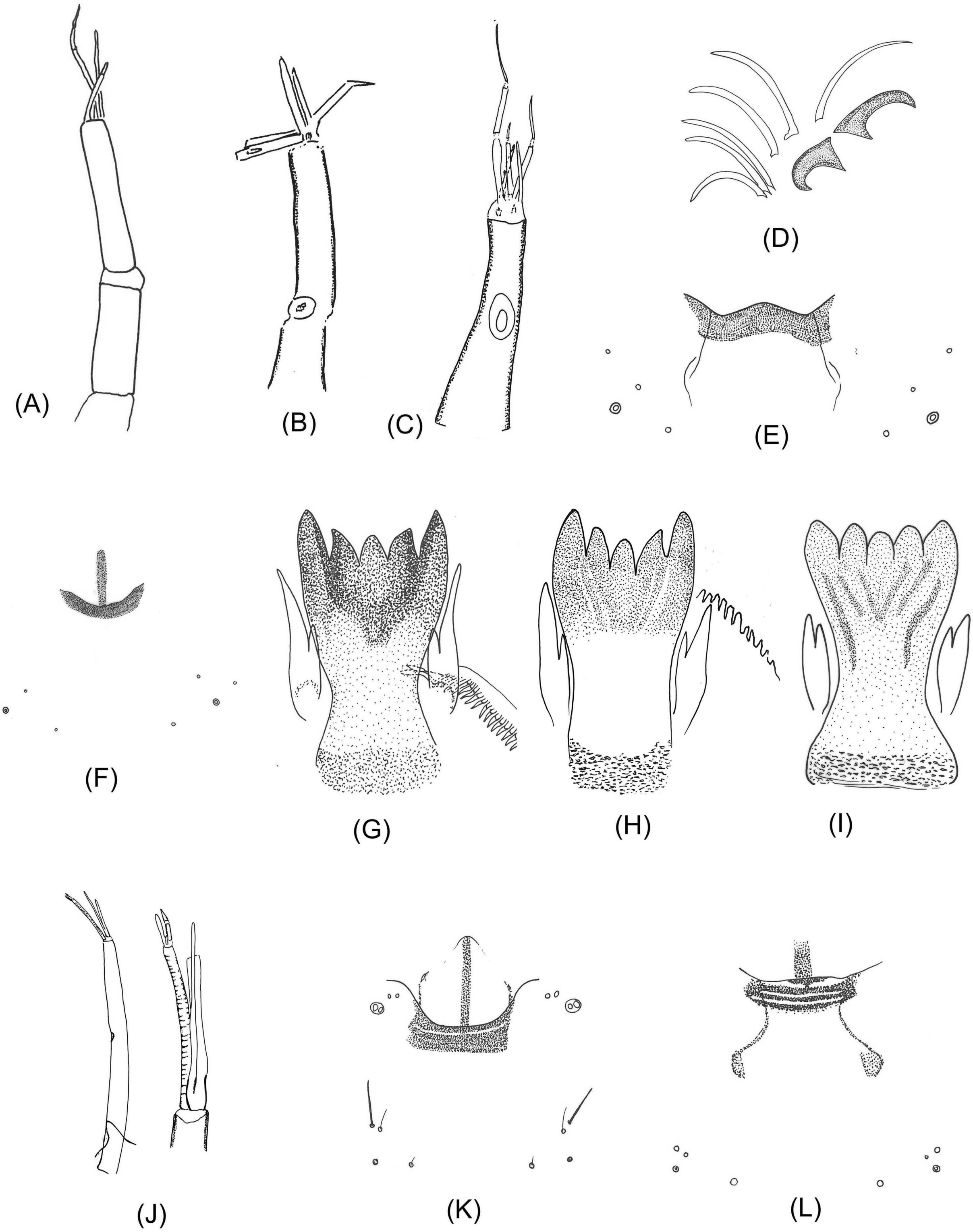

PLATE 8. Larval Tanypodinae 2, Pentaneurini. Antenna of: (A) *Ablabesmyia*, (B) *Paramerina*, (C) *Australopelopia prionoptera*; (D) Posterior parapod claws of *Ablabesmyia*; Mentum, submentum of: (E) *Paramerina*; (F) Pentaneurini genus C; Ligula of: (G) *Australopelopia*; (H) Thienemannimyia gp., (I), *Larsia*; (J) Antenna and detail of apex, *Australopelopia*; Mentum, submentum of: (K) *Australopelopia*, (L) *Thienemannimyia* gp.

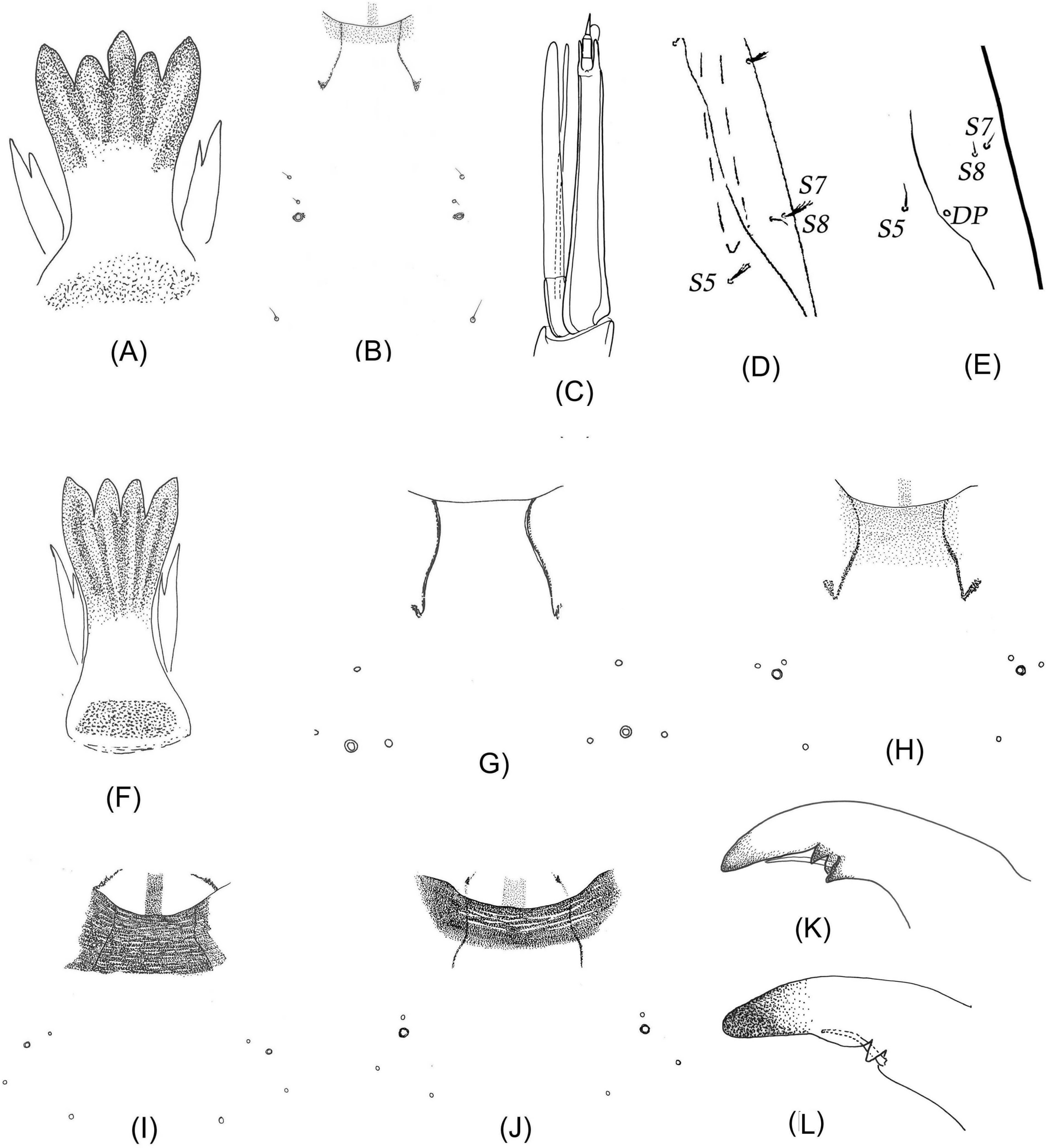

PLATE 9. Larval Tanypodinae 3, Pentaneurini. (A) Ligula, *Nilotanypus* sp., (B) Mentum, submentum, *Nilotanypus*; (C) Antennal apex, *Monopelopia*; Dorsal head, L side: (D) *Monopelopia*; (E) *Yarrhpelopia*; (F) Ligula of Pentaneurini 'genus E'; Mentum, submentum of (G), Pentaneurini 'genus E', (H) *Larsia*, (I) *Yarrhpelopia*, (J) Pentaneurini 'genus B'. Mandible of: (K) Pentaneurini 'ST1' (L) Pentaneurini 'genus D'.

Key to Orthocladiinae: Genera

1. Procercus apically bearing procercal setae (Fig. 10A); parapods distinct, with claws (Fig. 10A), may be fused at base 2

1' Procercus absent, parapods may be reduced, absent or fused (Fig. 10B), claws often absent 31

2(1) Ventromental plate well developed, extending beyond lateral margin of outermost tooth of mentum (Fig. 10C) 3

2' Ventromental plate weaker to indistinguishable, not extending beyond lateral margin of outermost mental tooth (Fig. 10D) (however, may extend posterolateral to darkened base of outermost tooth) 11

3(2) Setae associated with ventromental plate ('beard'), may be weak (Fig. 10D–H, K) 4
3' No setae associated with ventromental plate (Fig. 10C) 9
4(3') Setae of ventromentum dense, multiserial, extensive; ventromental structures complex (Fig. 10E) and difficult to interpret .... *Tonnoirocladius* Cranston
[*T. commensalis* (Tonnoir), commensal on larval Blephariceridae, NZ: S. Is. Cranston 2007]
4' Ventromental setae sparse; ventromental plates simple, conventional (Fig. 10G) 5
5(4') Median mental teeth paired (Fig. 10G) (appears single if worn) 6
5' Median mental tooth single (Fig. 10K) 7
6(5) Ventromental setae fine, sparse, short, originating in compact zone (Fig. 10G) . . . . . *Rheocricotopus* Thienemann & Harnisch
[1 undescribed sp. widespread in Aust.]
6' Ventromental setae stronger, longer, more numerous (Fig. 10H) . . . .*Naonella* Boothroyd
[2 spp. from NZ, *N. forsythi* Boothroyd, *N. kimihia* Boothroyd, Boothroyd 1994]
7(5') Antenna with 4 segments. Innermost mandibular tooth bulbous, much larger than next inner tooth (Fig. 10I) . . . . *Kaniwhaniwhanus* Boothroyd
[Monotypic, *K. chapmani* Boothroyd, from NZ: N. Is, Boothroyd 1999]
7' Antenna with 5 segments. Inner mandible teeth conventional, decreasing (Fig. 10J) 8
8(7') All mental teeth dark. SI seta palmate . . . . *Paulfreemania* Cranston & Krosch
[Monotypic, *P. pictipenne* (Freeman), NZ, S. Is; Cranston & Krosch 2011]
8' Median mental tooth paler than laterals (Fig. 10K). SI seta bifid (Fig. 10L) . . . . *Botryocladius* Cranston & Edward
[part: *B. freemani* Cranston & Edward, WA, NSW, ACT, differs from congeners (below) in the single median mental tooth, Cranston & Edward 1999]
9(3') Mandible with narrow apical tooth, small 1st inner, then two strong triangular innermost teeth (Fig. 10M). Antenna 4 segmented with apical 2 short (Fig. 10N). . . . . genus 'nr *Psectrocladius*'
[1 sp. allocated to *Psectrocladius*; better as gen..n. in *Brillia* group; s.e. Aust]
9' Mandible not as above. Antenna 5 or 6 segmented, apical antennal segment fine and elongate 10
10(9') Ventromental plate extending lateral but only indistinctly extended posteriorly beyond base of outermost mental tooth (Fig. 10C) . . . . *Parakiefferiella* Thienemann
[Pupal evidence for >5 spp. Aust, 2 NZ; widespread, none described]
10' Ventromental plate extending well posterolateral to base of outermost mental tooth (Fig. 10O) . . . .*Nanocladius* Kieffer
[Larvae suggest >3 spp., Aust inc. WA endemics; none described]
11(2') Antenna 1/2 head length or longer (Fig. 11A) 12
11' Antenna shorter than 1/2 head length 14
12(11) Apical antennal segment narrow, elongate; 2nd segment part hyaline (Fig. 11B). Posterior parapod without basiventral spine (Fig. 11D) . . . . *Stictocladius* (part)
[5 described spp. Aust; 2 NZ (N. & S. Is), Cranston & Sæther 2010]
12' Apical antennal segment short, never whip-like; each segment fully sclerotised (Fig. 11C) Posterior parapod with basi-ventral spine (Fig. 11E) 13
13(12') Antenna 4 segmented, longer than head (Fig. 11A) . . . . *Corynoneura* Winnertz
[3 described spp. from Aust., no larval associations]
13' Antenna 5 segmented, slightly longer than 1/2 length of head . . . . *Thienemanniella* Kieffer
[1 European sp, *T. trivittata* Goetghebuer, unlikely to be correct or to represent true diversity; 1 undescribed sp., NZ]
14(11') Ventromentum with distinct setae beneath (Fig. 10F) 15
14' Ventromentum without setae beneath. 16
15(14) Ventromental setae stout and relatively broad (Fig. 10F). Premandible with strong brush (Fig. 10L) . . . . *Botryocladius* Cranston & Edward
[(part, 8 of 9 Aust spp., widespread including WA, 7 from e.; Cranston & Edward 1999; *B. freemani* Cranston & Edward, Aust: WA. NSW, ACT, differs from congeners in single median mental tooth]
15' Ventromental setae short, fine and sparse (Fig. 10G) Premandible without brush . . . .*Rheocricotopus*
[as above (#6), keyed here for uncertainty about worn median mentum]
16(14') Mentum with 6 or 8 teeth in total; median pair large and separated by broadly V-shaped notch (Fig. 11G). Antennal blade extends beyond antennal apex (Fig. 11F) 17
16' Mentum with > 6 teeth, medially either single, or median pair never large and widely separated. Antennal blade rarely extends beyond antennal apex 18
17(16) Antenna 4 segmented, 3-4 very short; blade very long (Fig. 11F). Mentum with 6 teeth (Fig. 11G) . . . . *Austrobrillia* Freeman
[*A. longipes* Freeman from WA, s.e. Aust., n. NSW to Tas., Cranston 2000d]
17' Mentum with 8 teeth (Fig. 11H). Antenna 5 segmented with elongate fine 5th reaching apex of blade . . . . *Stictocladius* Edwards
[part, *S. sofour* Cranston & Saether, s.e. Aust]
18 (16') Premental and maxillary setae (Fig. 11I) and setae submenti (Fig. 11J) multi-branched . . . . . *Pirara* Boothroyd & Cranston
[*P. matakiri* Boothroyd & Cranston from NZ, N. Is.; *P. australiensis* Boothroyd & Cranston from s.e. Aust (not Tas.) Boothroyd & Cranston 2005]
18' Premental and maxillary setae simple 19
19 (18') Ventromental plates with complex sinuous sclerotisation (Fig. 11K, L) 20

19’ Ventromental plates simple, linear, or curved postero-laterally 21
20(19) Ventromental plate extending basal or baso-lateral to outer mental tooth, posterior to base of outermost tooth (Fig. 11K). 4th antennal segment much longer than 3rd. . . . . *Parametriocnemus* Goetghebuer
[*P. ornaticollis* (Kieffer), Aust especially n., uncommon]
20’ Sinuous ventromental plate aligned posterior to lateral mental teeth, well medial to outer teeth (Fig. 11L). 4th antennal segment subequal to 3rd . . . . ‘SO1’
[taxon code for larva/pupa from Aust, NSW, ACT]
21(19’) Mentum with medio-lateral paired lobes extending in horizontal plane (perhaps curiously developed ventromental plates) (Fig. 11M, N) 22
21’ Mentum otherwise, no such paired lobes (Fig. 11O) 23
22(21) Paired median mental teeth strongly protruding (Fig. 11M) . . . . ‘genus wood miner’
[distinctive larva, unreared, gut filled with wood fibres: s.e. Aust]
22’ Paired median mental teeth not protruding beyond line of slope of remaining mental teeth (Fig. 11N) . . . . ‘SO2’
[taxon code for larva/pupa from Aust, NSW, ACT]
23(21’) Ventromental plate with dark, heavily sclerotised base, appearing like postero-lateral ‘ledge’ to base of outermost mental tooth (Fig. 11O) 24
23’ Ventromental plate not as above, always more or less hyaline 26
24(23) Body setae as long as segment bearing. Clypeal area of frontoclypeal apotome sculpted (Fig. 11P) . . *Paralimnophyes* Brundin
[2 described spp. Aust; *P. albibasis* Freeman is reared; both co-occur in WA]
24’ Body setation much shorter, <1/2 length of segment bearing. Frontoclypeal apotome smooth 25
25(24’) Mandible with 3 inner teeth. Supra-anal seta elongate, about as long as anal setae . . . . *Limnophyes* Eaton
[In Aust and NZ based largely on pupae, identity uncertain as is reported parthenogenesis. A NZ sp. resides in tree rot holes]
25’ Mandible with 4 teeth (Fig. 11Q). Supra-anal seta no more than 1/3 length of anal setae . . . . *Compterosmittia* Sæther
[1 undescribed sp., phytotelm-dwelling (*Alocasia* axils) in Aust, NSW]
26 (23’) Mentum with 4 lateral teeth and broad median tooth, when unworn has central, heavier sclerotised nipple (Fig. 12A) . . . . genus ‘Australia’
[includes ‘genus nr *Cardiocladius’* (Cranston 1996), taxon codes for patchily distributed, hygropetric larva, Aust]
26’ Mentum not as above, lacks median nipple, usually with more lateral teeth (Fig. 12B) 27
27(26’) Antenna 4 segmented (Fig. 12C). Subapical procercal seta strong (Fig. 12D) . . . . *Eukiefferiella* Thienemann
[*E. insolida* (Skuse), widespread Aust inc. Lord Howe Is.; *E. brundini* Boothroyd & Cranston, NZ, N. & S. Is., Boothroyd & Cranston 1995,]
27’ Antenna 5–6 segmented (Fig. 12E). Subapical seta of procercus weak or displaced anterior to base of procercus 28
28(27’) Antenna 6 segmented with 6th fine and elongate (Fig. 12E) ..... *Anzacladius* Cranston [2 spp.. Aust, *A. numbat* Cranston, WA, *A. kangaroo* Cranston; *A. kiwi* Cranston from NZ, South Is., Cranston 2009]
28’ Antenna 5 segmented, apical segment never so developed (Fig. 12F) 29
29(28’) Antennal segments 2 and 3 subequal, with paired large Lauterborn organs placed on broad apex of segment 2 (Fig. 12F) ………………….................… . . . . *Echinocladius* Cranston
[monotypic, *E. martini* Cranston, widespread e. Aust., Cranston 2000c]
29’ Antennal segment 2 usually appreciably longer than 3, apex usually no broader than base, Lauterborn organs single, small or absent 30
30(29’) Premandibles and ungula strongly sclerotised, robust (Fig. 12G). Ventromental plates distinct angled at 45° (Fig. 12H). Body setae simple. Procercus short.. . . . . *Cardiocladius* Kieffer
[*C. australiensis* Freeman, widespread Aust. associated with simuliid larvae on which predatory]
30’ Premandible and ungula less robustly developed. Ventromental plates not so angled (Fig. 12I). Some body setae often plumose (Fig. 12J). Procercus normally developed . . . . *Cricotopus* van der Wulp
[includes syn *Paratrichocladius* (Cranston & Krosch, 2015); key to 11 Aust spp. Drayson *et al*. 2015; key for 6 NZ spp., Boothroyd 1990, 2002].
31(1’) Conical head small on swollen body. Median mentum a broad pale tooth, lateral teeth fine, needle-like (Fig. 12K). Single toothed mandible (Fig. 12L). Ectoparasitic on Ephemeroptera . . . . *Symbiocladius* Kieffer
[*S. (Acletius) aurifodinae* Hynes, sporadic Aust, NSW, Vic.]
31’ No such contrast between conical head and swollen body; mentum and mandible more conventionally formed. Free-living, not ectoparasitic 32
32(31’) Mentum with 5 pairs of lateral teeth, the outer 3 fused (Fig. 12M) . . . .?*Gymnometriocnemus* Goetghebuer
[several unreared larval types (Aust, inc. W.A.) may belong to this genus, 2 named spp. Aust.; *Pterosis* Sublette & Wirth 1980 from NZ, Campbell Is. may be this genus]
32’ Mentum formed otherwise, outer teeth distinct 33
33(32’) Anal tubules present (Fig. 12N). 34
33’ Anal tubules completely absent (Fig. 12R) 35
34(33) Median mental teeth paired. SI seta simple, strong, SII fine, simple . . . . *Allotrissocladius* Freeman
[*A. amphibius* Freeman, granite rockpools, Aust, WA.]
34’ Median mental tooth simple, often with protruding ‘nipple’. SI and SII setae bifid . . . . *Smittia* Holmgren*, Camptocladius* van der Wulp*, Pseudosmittia* Goetghebuer, perhaps *Allocladius* Kieffer.
[A suite of ‘terrestrial’ genera rarely in aquatic systems]

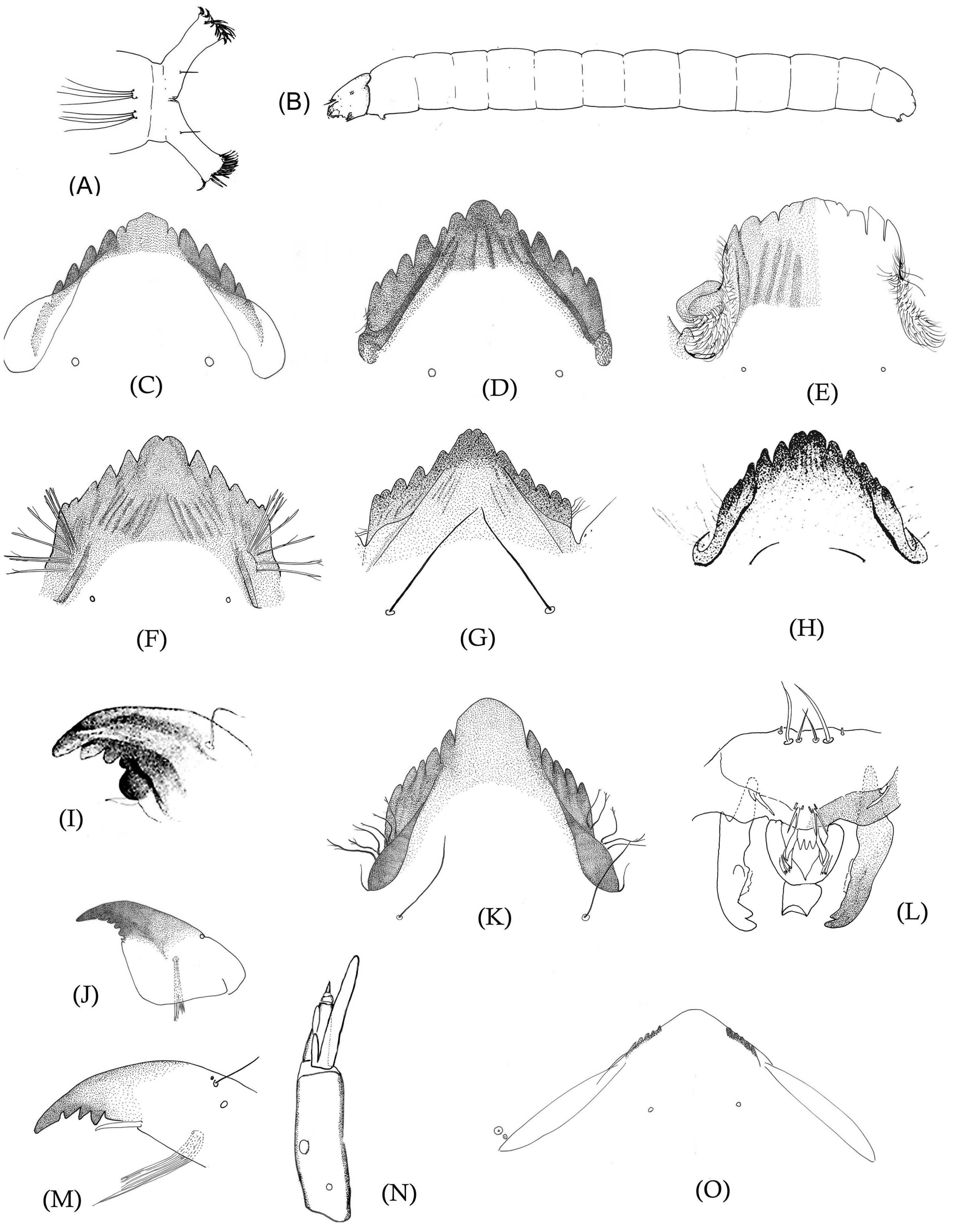

PLATE 10. Larval Orthocladiinae 1. (A) Posterior body, *Thienemanniella*; (B) Habitus, *Bryophaenocladius*; Mentum of: (C) *Parakiefferiella*, (D) *Cricotopus hillmani*, (E) *Tonnoirocladius commensalis*, (F) *Botryocladius grapeth*, (G). *Rheocricotopus* sp., (H) *Naonella forsythi*; Mandible of: (I) *Kaniwhaniwhanus chapmani*, (J) *Botryocladius freemani*; (K) Mentum, *B. freemani*; (L) Labrum, *B. freemani*; (M) Mandible, 'nr *Psectrocladius'*; (N) Antenna, 'nr *Psectrocladius'*; (O) Mentum, *Nanocladius* sp..

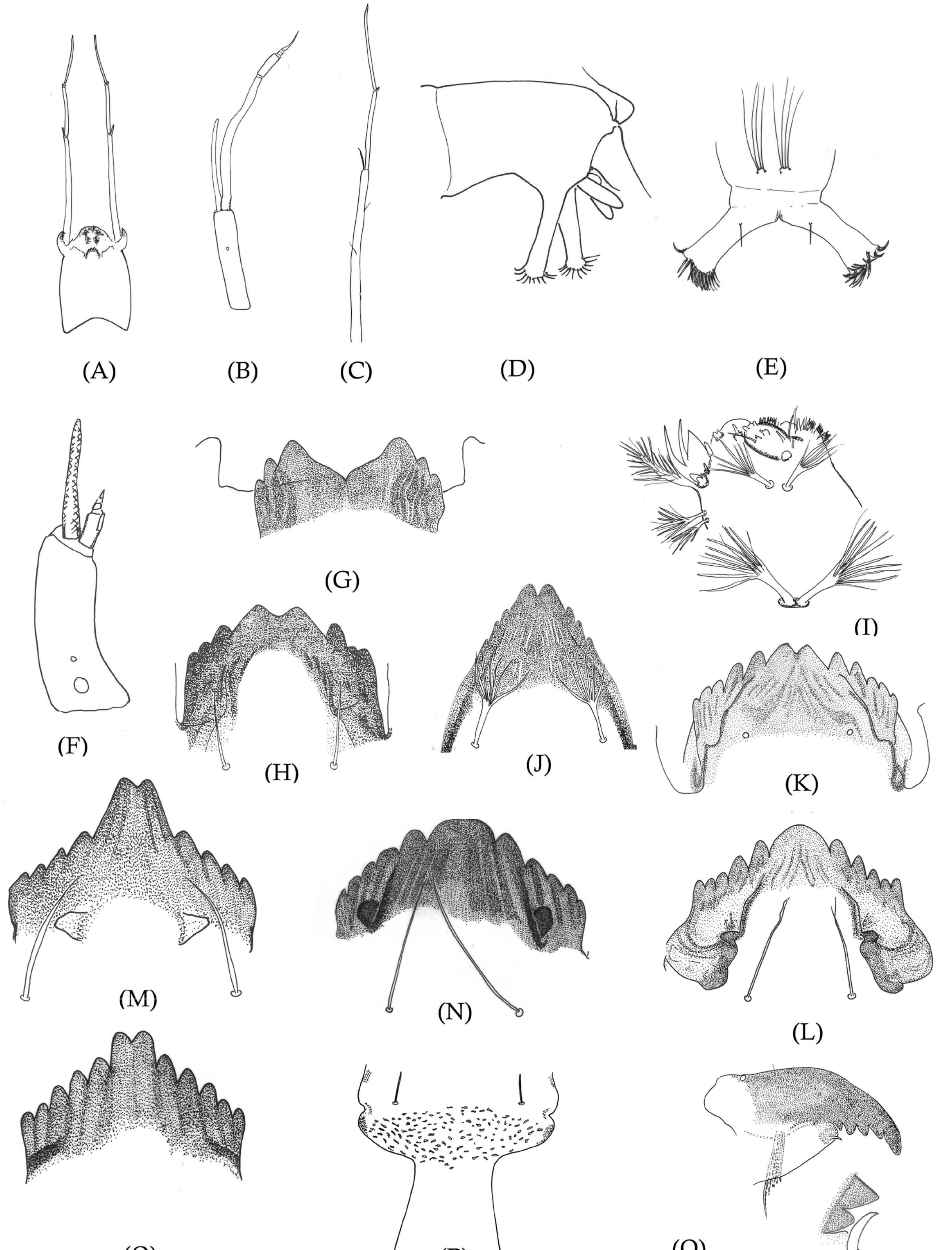

PLATE 11. Larval Orthocladiinae 2. (A) Ventral head, *Corynoneura* sp.; Antenna of; (B) *Stictocladius uniserialis* Freeman, (C) *Corynoneura* sp., (D) posterior abdomen, *S. uniserialis*; (E) Posterior abdomen, *Thienemanniella* sp., (F) Antenna, *Austrobrillia longipes*; Mentum of; (G) *A. longipes*, (H) *Stictocladius sofour*; (I) Maxilla, *Pirara australiensis*; Mentum of; (J) *P. australiensis*, (K) *Parametriocnemus ornaticollis* Kieffer, (L) genus 'SO1', (M) 'woodminer', (N) genus 'SO2', (O) *Paralimnophyes* sp.; (P) Clypeal area, *Paralimnophyes* sp., (Q) Mandible (inset inner teeth and mola), *Compterosmittia* sp.

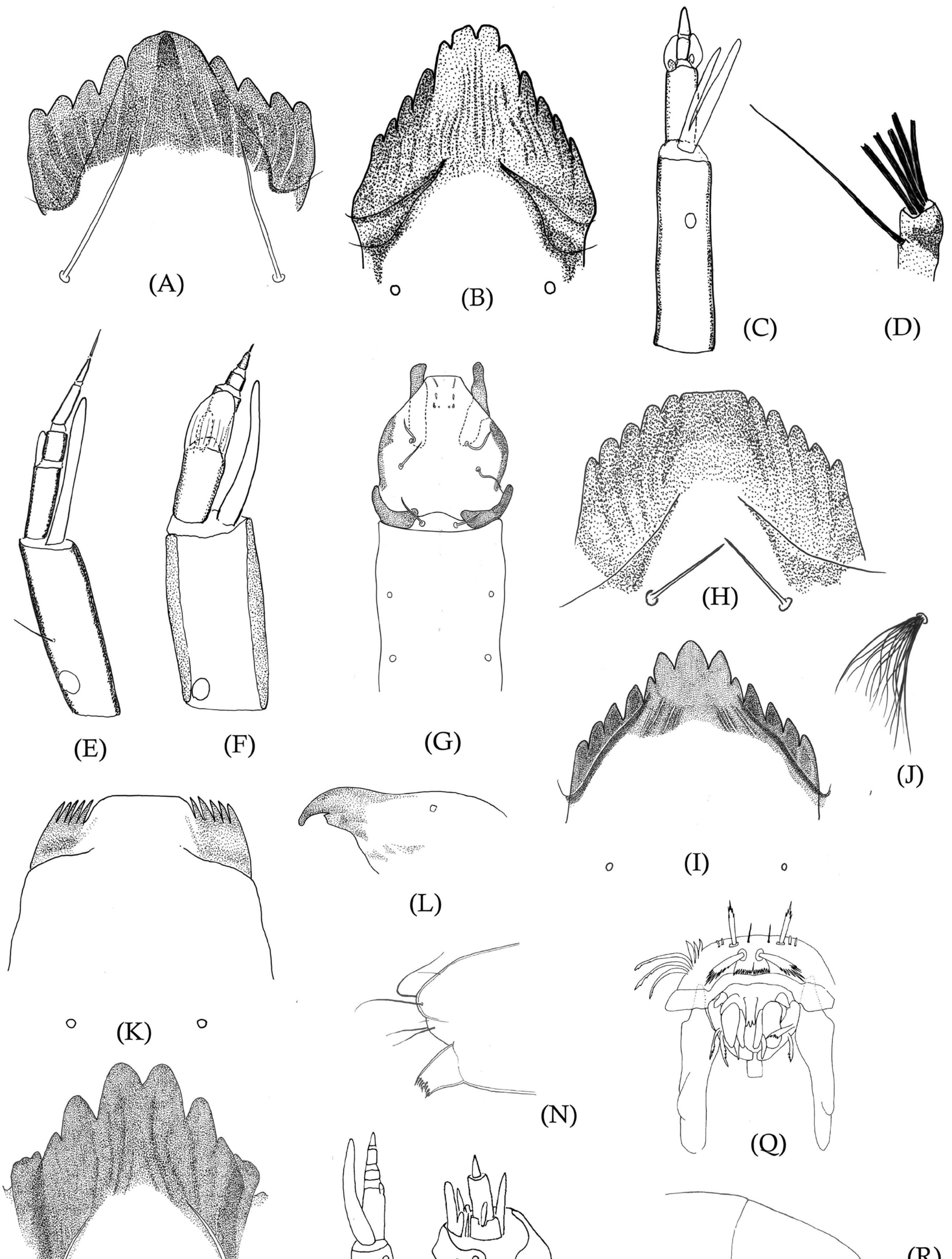

PLATE 12. Larval Orthocladiinae 3. Mentum of; (A) 'genus Australia, (B) *Eukiefferiella insolita*; (C) Antenna, *E. insolita*: (D) Procercus, *E. insolita*; Antenna of; (E) *Anzacladius numbat*; (F) *Echinocladius martini*; (G) Dorsal labrum, *Cardiocladius* sp.; Mentum of (H) *Cardiocladius* sp., (I) *Cricotopus acornis*; (J) Abdominal l_4 seta, *C. acornis*; (K) Mentum, *Symbiocladius aurifodinae*; (L) Mandible, S. *aurifodinae*; (M) Mentum, ? *Gymnometriocnemus* sp.; (N) Anal segments, *Clunio* sp.; Antenna of; (O) *Clunio* sp.; (P) *Semiocladius* sp.; (Q) Labrum, *Clunio* sp.; (R) Anal segments, *Camptocladius stercorarius*.

35(33') SI and SII setae broad and feathered (Fig. 12Q). Antenna short but with 5 distinct segments, 1st higher than wide (Fig. 12O) . . . . *Clunio* Haliday
[marine intertidal, freshwater coastal seepages, 2 spp.. Aust, 1 unnamed NZ]
35' SI bifid, other S setae simple. Antenna minute, with 4 segments, 1st wider than high (Fig. 12P) . . . . *Semiocladius* Sublette & Wirth
[marine shores and proximity, mesohaline estuaries. *S. crassipennis* (Skuse), e Aust including Lord Howe Is., Cranston & Dimitriadis, 2005; 3–4 described spp.. NZ (Sublette & Wirth, 1980)]

Key to Chironominae: Genera

1 Bases of S1 setae fused and SII on long pedestals (Fig. 13A). Antenna always with 5 segments with distinct Lauterborn organs, sometimes on pedestals. Ventromental plates approximated (Fig. 13E), rarely separated by greater than width of median tooth / teeth . . . . (tribe Tanytarsini) . . . 2
1' Bases of S1 rarely fused, SII rarely on pedestal (Fig. 13B). Antenna 5 – 8 segmented, Lauterborn organs usually opposite, can be alternate or indistinct. Ventromental plates usually well separated (Fig. 13D) 8
2(1) Ventromental plates separated by width of 3 median mental teeth (Fig. 13D) 3
2' Ventromental plates separated by no more than single median mental tooth (Fig. 13E) 4
3(2) Lauterborn organs alternate on segment 2; antennal pedestal with apical, non-palmate process (Fig. 13F) . . . . *Stempellinella* Brundin
[no described spp. Aust, NZ; 2 larval types from n and e Aust]
3' Lauterborn organs opposite, apical on segment 2; antennal pedestal medially with palmate process (Fig. 13G) . . . . *Stempellina* Thienemann
[2 described spp. Aust, 3 immature stage taxa, none associated with described adult]
4(2') Premandible with 3 or more teeth (Fig. 13A) 5
4' Premandible bifid (Fig. 13C).. 7
5(4) Lauterborn organs sessile (Fig. 13H). Seta subdentalis inserted dorsally. . . . . *Nandeva* Wiedenbrug, Reiss and Fittkau
[1 described sp. Aust, *N. fittkaui* Cranston 1999. Larva link to S. American adult Cranston 2019b]
5' Lauterborn organs with distinct small to large pedestals (Fig. 13I, J). Seta subdentalis inserted ventrally. 6
6(5') Antennal segment 2 wedge-shaped, subequal in length to 3rd segment; large Lauterborn organs arise from short pedicels (Fig. 13I) . . . . *Cladotanytarsus* Kieffer
[5 described spp. Aust, many poorly-differentiated types on immature stages, few confidently associated with adult]
6' Antennal segment 2 cylindrical, longer than 3rd segment; smaller Lauterborn organs arise from longer pedicels (Fig. 13J) . . . . *Tanytarsus* van der Wulp
[36 named spp., Aust, some associated with immature stages especially from n. Aust, Cranston 2000a; 5 named, 2 coded spp. NZ, few reared]
7(4') Lauterborn organs large, on broad pedestals, extending beyond antennal apex. 2nd antennal segment squat, scarcely longer than 3rd . . . . *Neozavrelia* Goetghebuer
[2 spp. from Aust, *N. optoputealis* Cranston, Blue Mts, NSW, *N. bowmani* Cranston: NT, Cranston 1998]
7' Lauterborn organs small, sessile or on short pedestal not extending to antennal apex 8
8(7') Pecten epipharyngis consisting of 3–5 lobes. Striae of ventromental plate narrow and homogeneous across plate . . . . *Paratanytarsus* Thienemann & Bause
[5 described spp. from Aust, many larvae known inc. paedogenetic *P. grimmii* (Schneider), also NZ, plus undescribed spp.]
8' Pecten epipharyngis a broad toothed comb. Striae of ventromental plate appearing as crenulate median transverse band across plate . . . . *Rheotanytarsus* Thienemann & Bause
[9 described Aust spp., many larvae known, Cranston 1997; undescribed sp. NZ]
9(1') Ventromental plates obscure, scarcely striate (Fig. 13K, L). Head dorso-ventrally flattened. Abdomen flaccid with enlarged, thickened thoracic segments. Immersed wood/leaf mining larvae. 10
9' Ventromental plates distinct, striate (Fig. 14F, J, K). Head not dorso-ventrally flattened. Body not flaccid, thoracic segments not thickened. Few spp. mine wood 11
10(9) 3rd antennal segment short, subequal to 5th; 3rd & 5th each 1/2 length of 4th segment (Fig. 13M) . . . . *Harrisius* Freeman
[*H. pallidus* Freeman, NZ; *H. montanus* Freeman, widespread Aust. Larva mines wood]
10' 3rd antennal segment slightly shorter than 4th, both longer than 5th (Fig. 13N) . . . . *Stenochironomus* Kieffer
[*S. (s.str.) watsoni* Freeman abundant, widespread Aust; leaf and soft-wood mining]
11(9') Mentum with deep median V-shaped cleft, with slight indications of serrations on antero-median margin (Fig. 14A). Apical mandibular tooth long, dorsal tooth curved (Fig. 14B) . . . . *Fissimentum* Cranston & Nolte
[2 larvae of undescribed spp., Aust, Qld, Vic, Cranston & Nolte 1996]
11' Mentum never cleft as above. Mandible different 12
12(11') S1 seta plumose, SII not blade-like, labral lamellae present, pecten epipharyngis a wide plate, rarely reduced to 3 sometimes serrate lobes (Fig. 14C) 13
12' S1 and SII setae simple, frequently blade-like, labral lamellae absent, pecten epipharyngis often single scale (Fig. 13B, 14D), rarely toothed . . . . *Harnischia* complex . . .34
13(12) Head bean-shaped in lateral profile (Fig. 14E). Teeth of mentum and mandible pale (Fig. 14F, G). Larvae very small . . . .

. . . . *Nilothauma* Kieffer
[2 Aust spp. described: *N. infissum* Adam & Saether, male only, NT; *N. adunatum* Adam & Saether, pharate male, NSW (Adam & Saether 1999); no larva associations to adult]

13' Profile of head not bean-shaped At least lateral mental teeth and apical mandibular teeth dark. 14

14(13') Antenna 5 segmented with Lauterborn organs either opposite on 2nd segment or absent 15

14' Antenna 6 segmented with Lauterborn organs alternate, either on apices of 2nd and 3rd segments or alternate on 2nd segment 23

15(14) Mandible with basal striations (Fig. 14H). With 2 pairs of ventral tubules and 1 pair of lateral tubules although often reduced (Fig.14I) . . . . *Chironomus* Meigen
[13 named Aust spp., 4 spp. NZ, larval differentiation tentative]

15' Mandible lacking basal striations (present exceptionally in *Xylochironomus* Cranston) 16

16(15') Ventromental plates narrow, *c*. 2 x as wide as deep (Fig. 14J). . . . . *Dicrotendipes* Kieffer
[15 described spp. Aust; larval keys Epler 1988, Cranston 1996, 2000a; seeming not NZ]

16' Ventromental plates broad, at least 3 x as wide as deep (Fig. 14K) 17

17(16') 'Fenestra' on anterior of frons (Fig. 14L). 18

17' No such structure present 19

18(17) Premandible with at least 5 teeth (Fig. 14L) . . . . *Kiefferulus* Goetghebuer
[7 described spp. Aust, some keyed Cranston 1996, 2000a, 1 NZ]

18' Premandible with 2 apical teeth (Fig. 14M). . . . . *Einfeldia* Kieffer
[*E. australiensis* (Freeman), Aust, Qld to SA, Cranston *et al*. 2016]

19(17') Apex of labrum with distinctive brush of setae (Fig. 14N) . . . . *Xenochironomus* Kieffer
[*X. canterburyensis* Feeman from NZ; 5 Aust spp. based on pupae, larvae similarly, see Cranston 1996]

19' Apex of labrum without such brush 20

20(19') Mentum with even number of teeth (paired median teeth) (Fig. 14O). Anterior frons broadened, hyaline anterior to frontal seta S_4 (Fig. 14P). Seta subdentalis inserted on ventral mola (opposite surface to seta interna) . . . . *Polypedilum* Kieffer
[15 named spp. in Aust, many more based on immature stages; 10 in NZ; subgenera (adult-based) likely invalidated by molecular data]

20' Mentum with odd number of teeth (single median tooth) (Fig. 15A, C, F) 21

21(20') Ventromental plates drawn out laterally, meeting medially (Fig. 15A). Premandible multi-toothed. Seta subdentalis feathered, inserted ventrally on mola (Fig. 15B). . . . . *Axarus* Roback
[1 unnamed sp, new to Aust, unreared larva n. Qld.]

21' Ventromental plates not tapered laterally, may or not meet medially. Premandible 2–3 toothed. Seta subdentalis, simple, elongate, inserted dorsally on mola (same surface as seta interna) (Fig. 15D). 22

22(21') Median mental tooth large, domed; ventromental plates in near contact medially, rounded laterally (Fig. 15C). Antenna arising from pedestal (Fig. 15E). . . . . *Riethia* Kieffer
[*R. zeylandica* Freeman is sole NZ sp.; 13 described Aust spp., continent-wide; 1 from New Caledonia (Cranston 2019a)]

22' Median mental tooth recessed, small; ventromental plates narrower, separated by width of 3 median mental teeth (Fig. 15F). No antennal pedestal . . . . *Megacentron* Freeman
[suspect larva of *M. erebeus* (Skuse), Aust, n. NSW]

23(14') Ventromental plates sub-triangular, in near contact medially (Fig. 15G). Antenna as long as head. . . . . *Zavreliella* Kieffer/*Lauterborniella* Thienemann & Bause
[*Z. marmorata* (van der Wulp) in Aust, 2+ more spp. on larva]

23' Ventromental plates more semilunar to fan-shaped, well separated. Antenna shorter than head. 24

24(23') Ventromental plates semilunar in outline (Fig. 15H). Mandible striate basally Fig. 15I) . . . . *Xylochironomus* Cranston
[*X. kakadu* Cranston, Aust, NT, n Qld, Cranston 2006]

24' Ventromental plates fan-shaped (Fig. 15N–S). Mandible without basal striations 25

25(24') Mentum, or at least median (ventromental) cluster of teeth, pale (Fig. 15N, O) 26

25' Mentum teeth evenly pigmented, not contrasting between middle and laterals. 28

26(25) Basal Lauterborn organ in mid-2nd segment (Fig. 15J). Mentum with 4 even-sized teeth (Fig. 15N) . . . *Paratendipes* Kieffer
[1 or more spp., undescribed from Aust, widespread, sandy benthos]

26' Basal Lauterborn organ apical on 2nd segment (Fig. 15K). Mentum with median teeth uneven in size (Fig. 15O, P) 27

27 (26') Mentum with 2 larger teeth in mid-ventromentum of 6 teeth (Fig. 15O) . . . . *Microtendipes* Kieffer
[*M. umbrosus* Freeman from Aust, Qld]

27' Mentum with 2 small teeth in mid-ventromentum of 8 teeth (Fig. 15P) . . . . *Paucispinigera* Freeman
[*P. approximata* Freeman from NZ, similar larva from Aust, Vic, Barmah Forest]

28(25'') Mentum evenly curved, all teeth subequal sized, with 1 or 3 median mental teeth (Fig. 15Q) . . . . *Stictochironomus* Kieffer
[2 Aust spp., *S. illawara* Freeman from NSW, *S. fluviaticus* (Skuse) common lotic in e. Aust.]

28' Mentum with teeth uneven in size, with even number of median teeth (Fig. 15R, S) (unless deeply recessed median pair are worn, appearing single) 29

29(28') Basal Lauterborn organ in mid-3rd antennal segment (Fig. 15L) . . . . *Skusella* Freeman
[*S. subvittata* Freeman, widespread Aust, esp. n. Aust., Cranston & Tang 2018]

29' Basal Lauterborn organ always apical on 2nd antennal segment (Fig. 15M) 30

30(29') Single mid-tooth of mentum minute, strongly recessed, dorsomentum not indicated as ventromental plates medially-orientated (Fig. 16A) . . . . *Omisus* Townes
[1 prospective larva, Aust.]
30' Median mental teeth paired, if small, not recessed. Dorsomentum an extension of median ventromental plate 31
31 (30') Dorsomentum a cluster of 6–8 teeth (Fig. 16B, C) 32
31' Dorsomentum a cluster of 2 or 4 delimited teeth (Fig. 16D) 33
32 (31') Paired median mental teeth low relative to adjacent (also small) teeth, all recessed relative to larger compound first ventromental teeth (Fig. 16B) . . . . *Paraborniella* Freeman
[*P. tonnoiri* Freeman, widespread Aust in ephemeral waters, not Tas or Vic]
32' Median mentum comprising 4 even-sized teeth, subequal to adjacent teeth (Fig. 16C) . . . . *Paraskusella* Cranston
[2–3 spp., n. and cent. Aust. Cranston 2018]
33 (31') 4th antennal segment with distinct curve (Fig. 15M). Ventromentum 4 subequal teeth (Fig. 16D) . . . . *Conochironomus* Freeman
[4 Aust spp., WA, NT to s. Qld; Cranston & Hare 1995]
33' 4th antennal segment straight. Ventromentum 2 high teeth flanked by 2 small teeth (Fig. 15S) . . . . *Imparipecten* Freeman
[*I. pictipes* Freeman, from s.e. Aust, NSW to Tas, Cranston & Hardwick 1996]
34(12') Antenna long (c. half head length), with 7–8 segments (Fig. 16E, F) 35
34' Antenna with 5 or indistinctly 6 segments, < half head (Figs. 16O, 17A). 36
35 (34'). Abdominal segments conventional. Antenna 7 segmented (Fig. 16E) (including hyaline 'bubble' at apex). Long thin posterior prolegs and procercal apical setae directed posteriorly (Fig. 16G). Mentum toothed, ventromental plates distinct (Fig. 16K). Head shape rectangular (Fig. 16I). . . . .*Robackia* Sæther
[1 undescribed Aust sp. in sandy lotic benthos, NT]
35' Abdominal segments 1–7 subdivided (Fig. 16L). Antenna 8-segmented (Fig. 16F). Posterior parapods ventrally directed (Fig. 16H). Head elongate, narrow anteriorly (Fig. 16J). Mentum untoothed, ventromental plates weak . . . . . . *Chernovskiia* Sæther
[1 undescribed Aust sp., in sandy lotic benthos, s.w. WA]
36(34') Mentum conspicuously concave with pale median tooth (Fig. 16M, N) 37
36' Mentum conventionally more or less convex (Fig. 17B –E) 38
37(36') Antenna 5-segmented; blade inserted on 2nd segment (Fig. 16O). . . . .*Cryptochironomus* Kieffer
[*C. griseidorsum* (Kieffer) only described sp. from Aust, 1 unnamed sp. NZ; pupal diversity higher]
37' Antenna 6-segmented; blade inserted subapically on 3rd segment (Fig. 17A) . . . *Demicryptochironomus* Lenz *(Irmakia* Reiss*)*
[at least 1 undescribed sp, Aust, ACT, NSW]
38(36') Outermost group of 3 mental teeth setoff from general slope (Fig. 17B, C) 39
38' Mentum teeth decreasing evenly in height from median to outermost (Fig. 17D, E) 40
39(38) Mentum with single median tooth; ventromental plate with crenulate anterior margin (Fig. 17B) . . . .*Microchironomus* Kieffer
[2–3 Aust spp., of which *M. tener* (Kieffer) is described]
39' Mentum with paired median teeth; ventromental plate with smooth anterior margin (Fig. 17C) . . . . *Cladopelma* Kieffer
[*C. curtivalva* (Kieffer) reported from Aust and NZ, but molecular diversity is high]
40 (38') Midmentum paler than outermost teeth (Fig. 17D, E). Mandible with strong, long apical tooth (Fig. 17F, G) 41
40' Midmentum dark as outer teeth (Fig. 17I). Mandible with short blunt apical tooth (Fig. 17L). 42
41(40) Mentum with 2 broad, flat median teeth (if worn, appears single) (Fig. 17D). Mandible with elongate apical tooth and weak inner teeth (Fig. 17F). Procerci conventional. . . . . *Harnischia* Kieffer
[*H. curtilamellata* (Malloch) described, likely 2 or more undescribed spp, widespread in sandy benthos, Aust, not Tas]
41’ Mentum with single domed median tooth (Fig. 17E). Mandible with distinct inner teeth (Fig. 17G). Procercal anal setae very long (Fig. 17H) . . . .*Anuncotendipes* Cranston
[*A. australotropicus* and *A. kakadu*, both Cranston, from Aust, NT, n. Qld, Cranston 1999]
42(40') Antenna with some hyaline sections, with indistinct segmentation, probably 6-segmented; style arising from mid-2nd segment (Fig. 17K). Pecten epipharyngis of 3 scales (Fig. 17J) . . . . *Paracladopelma* Harnisch
[only *P. angustum* (Freeman) allocated, tentatively; 6 Aust spp. on immature stages]
42' Antenna with 5 segments without hyaline sections; bifid style arising at apex of 1st segment (Fig. 17M). Pecten epipharyngis of multiple spines (Fig. 17N) . . . . *Parachironomus* Lenz
[*P. delinificus* (Skuse) from Aust, *P. cylindricus* (Freeman) from NZ, are only described regional spp.; 5 Aust spp. based on pupal stages]

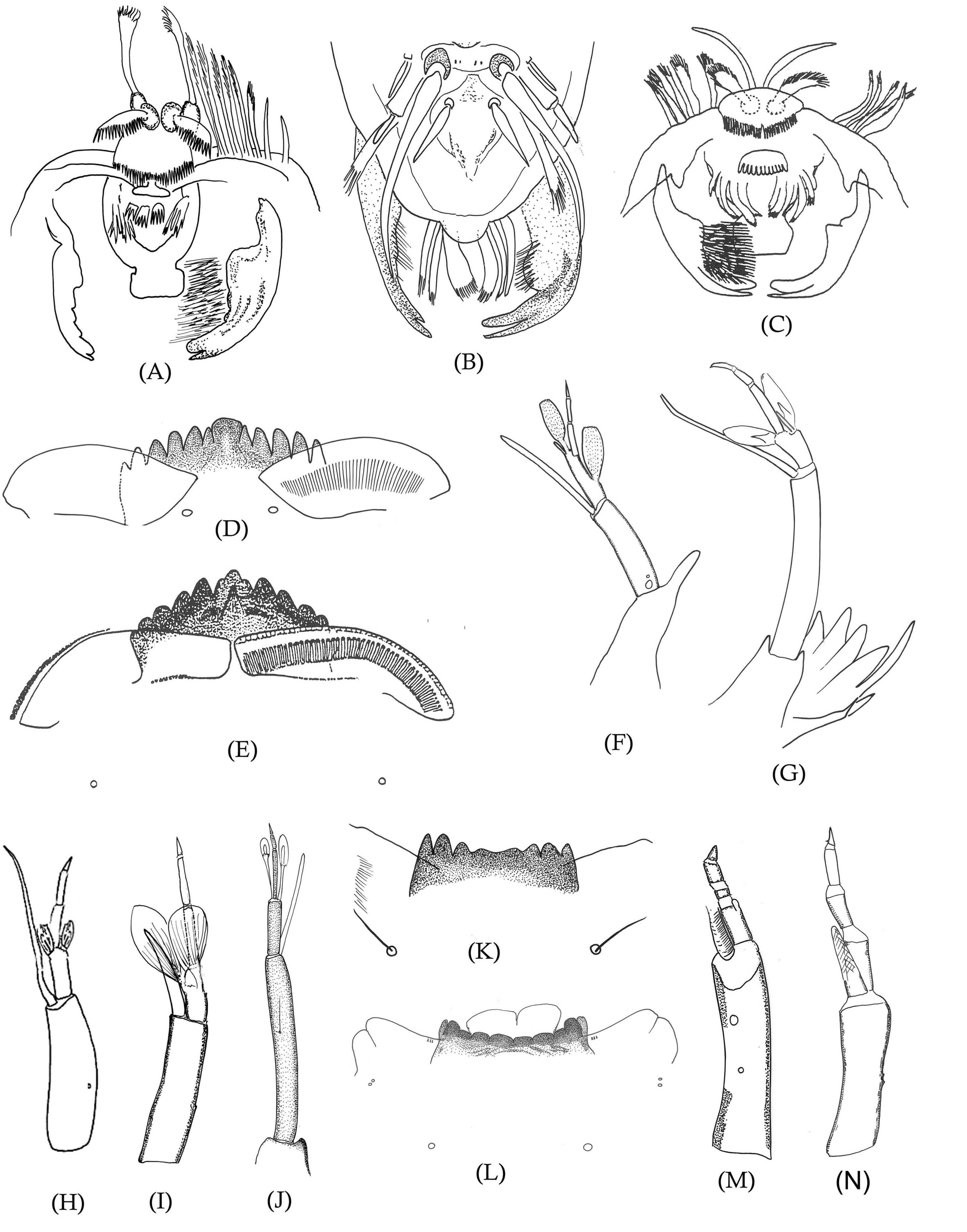

PLATE 13. Larval Chironominae 1. Labrum, epipharynx of: (A) *Cladotanytarsus* sp; (B) *Cladopelma curtivalva*; (C) *Rheotanytarsus johnsoni*; Mentum, ventromental plates of: (D) *Stempellina* sp., (E) *Rheotanytarsus christinae*; Antenna of: (F) *Stempellinella* sp., (G) *Stempellina* sp., (H) *Nandeva* sp., (I) *Cladotanytarsus* sp., (J) *Tanytarsus richardsi*, (K) *Harrisius montanus*, (L) *Stenochironomus watsoni*; Antenna of: (M) *H. montanus*, (N) *S. watsoni*.

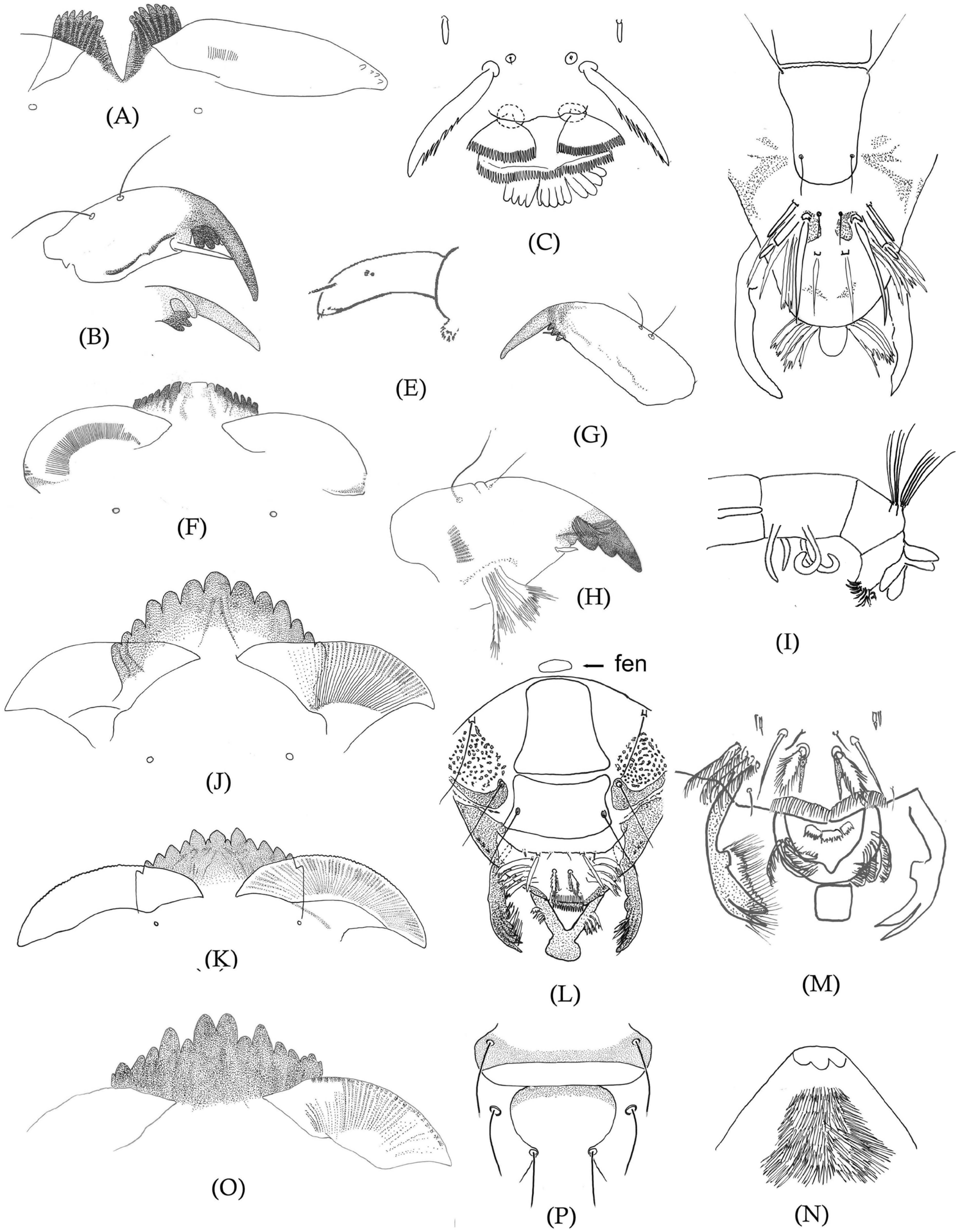

PLATE 14. Larval Chironominae 2. (A) Mentum, ventromental plates *Fissimentum* sp. (B) Mandible (inset dorsal apex), *Fissimentum* sp., (C) Labrum, epipharynx *Paraborniella tonnoiri*; (D) Dorsal head, Labrum, epipharynx *Microchironomus* 'K1'; (E) lateral head, *Nilothauma* sp.; (F) Mentum, *Nilothauma* sp.; Mandible of: (G) *Nilothauma* sp., (H) *Chironomus* sp.; (I) Posterior abdomen, *Chironomus* sp.; Mentum, ventromental plates, (J) *Dicrotendipes cumberlandensis*; (K) *Kiefferulus intertinctus*; (L) Dorsal head, labrum-epipharynx *K. intertinctus*; (M) Labrum-epipharynx, *Einfeldia australiensis*; (N) Anterior labrum, *Xenochironomus* sp.; (O) Mentum, ventromental plates, *Polypedilum australotropicus*; (P) Anterior dorsal sclerites, *P. australotropicus*. Abbreviation: fen—fenestra.

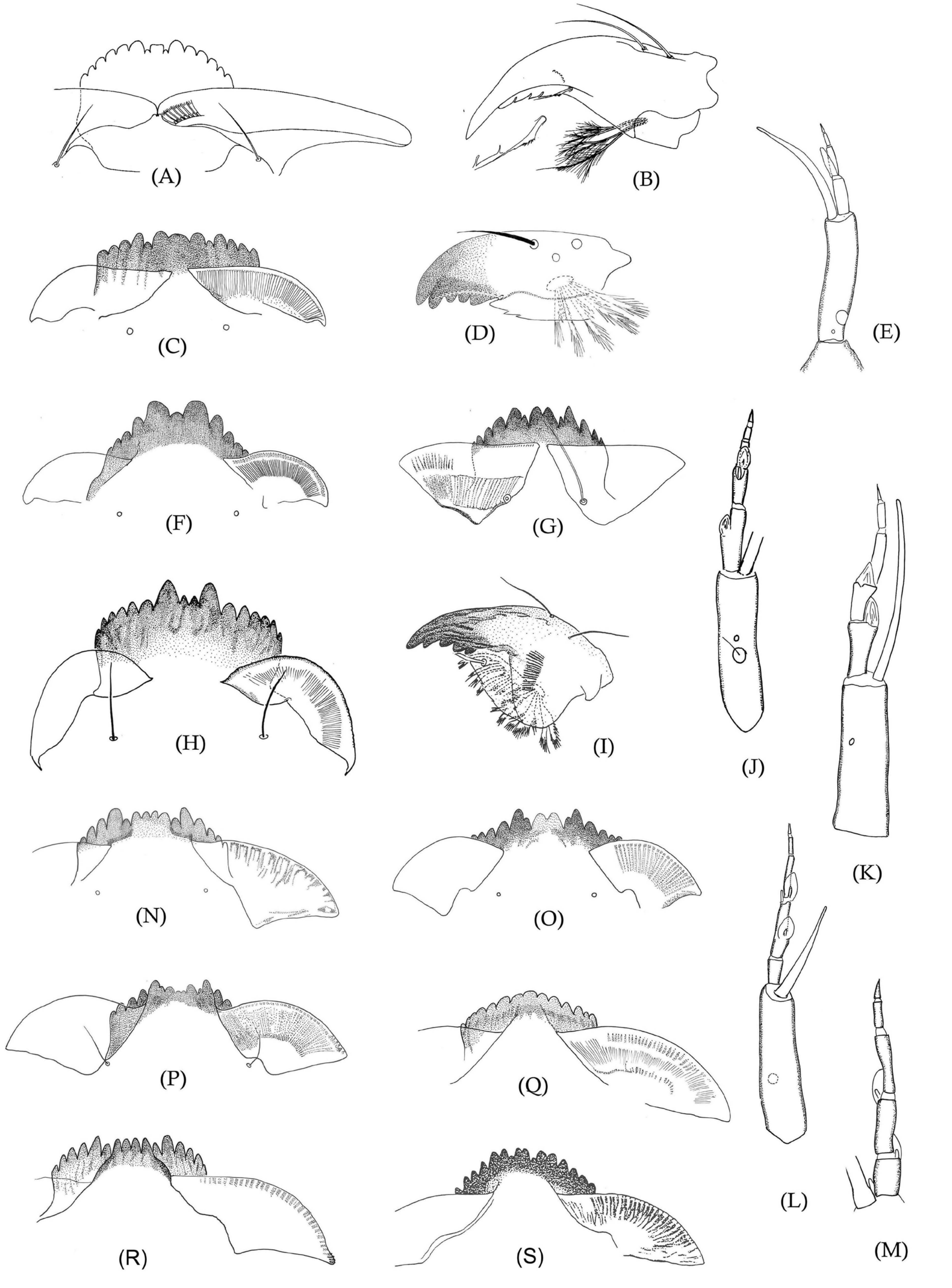

PLATE 15. Larval Chironominae 3. (A) Mentum, ventromental plates, *Axarus* sp. (B) Mandible, *Axarus* sp.; *Riethia zeylandica*, (C) Mentum, ventromental plates, (D) Mandible, (E) Antenna. Mentum and ventromental plates of: (F) putative *Megacentron* sp., (G) *Zavreliella marmorata*; (H) *Xylochironomus kakadu*; (I) Mandible, *X. kakadu.* Antenna of (J) *Paratendipes* sp., (K) *Paucispinigera approximata*, (L) *Skusella subvittata*, (M) *Conochironomus* sp.; Mentum and ventromental plates of: (N) *Paratendipes* sp., (O) *M. umbrosus*, (P) *P. approximata*, (Q) *Stictochironomus illawara*, (R) *S. subvittata*, (S) *Imparipecten pictipes*.

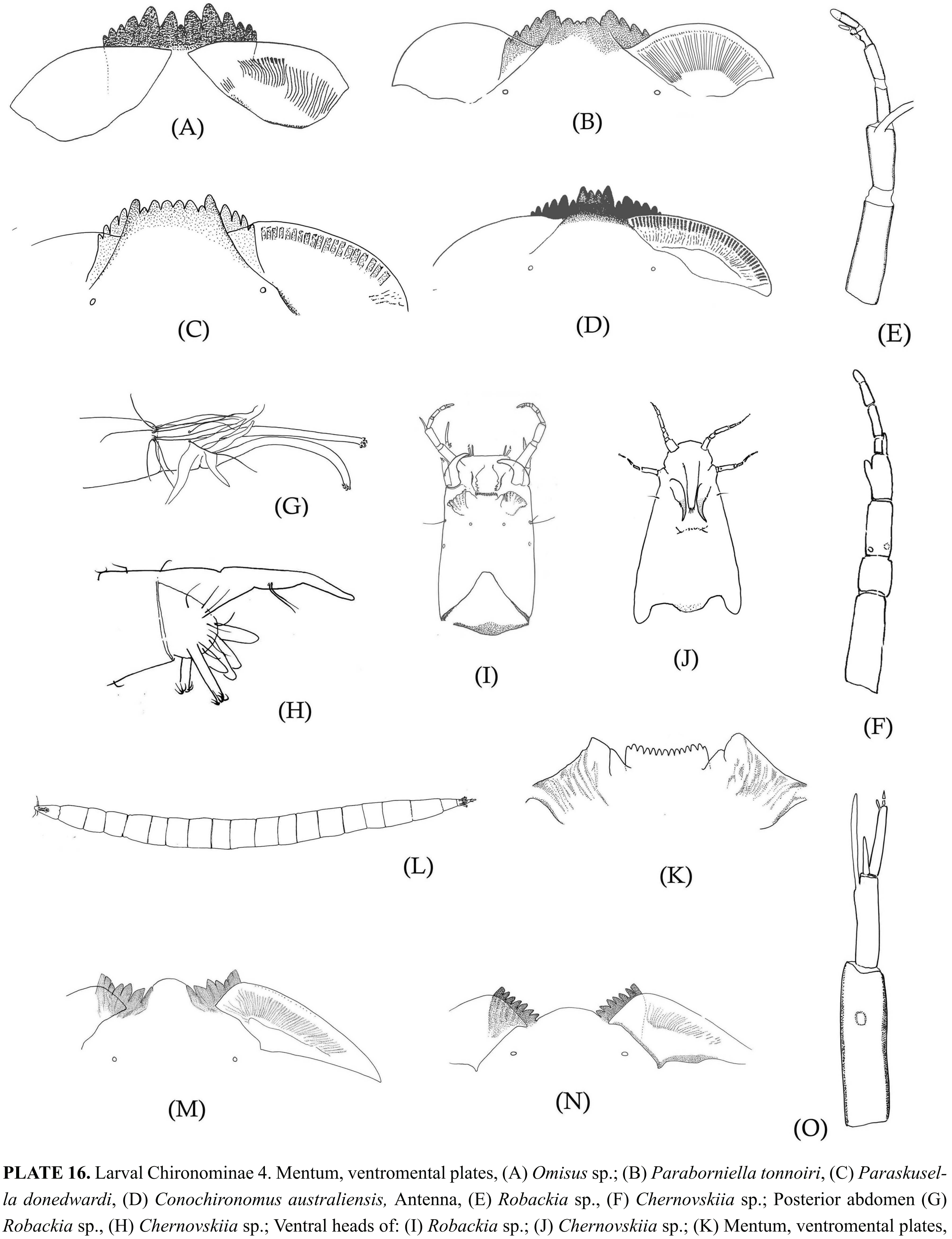

PLATE 16. Larval Chironominae 4. Mentum, ventromental plates, (A) *Omisus* sp.; (B) *Paraborniella tonnoiri*, (C) *Paraskusella donedwardi*, (D) *Conochironomus australiensis,* Antenna, (E) *Robackia* sp., (F) *Chernovskiia* sp.; Posterior abdomen (G) *Robackia* sp., (H) *Chernovskiia* sp.; Ventral heads of: (I) *Robackia* sp.; (J) *Chernovskiia* sp.; (K) Mentum, ventromental plates, *Robackia* sp.; (L) Whole body *Chernovskiia* sp.; Mentum ventromental plates, (M) *Cryptochironomus griseidorsum* (N) *Demicryptochironomus* (*Irmakia*) sp.; Antenna of: (O) *C. griseidorsum*.

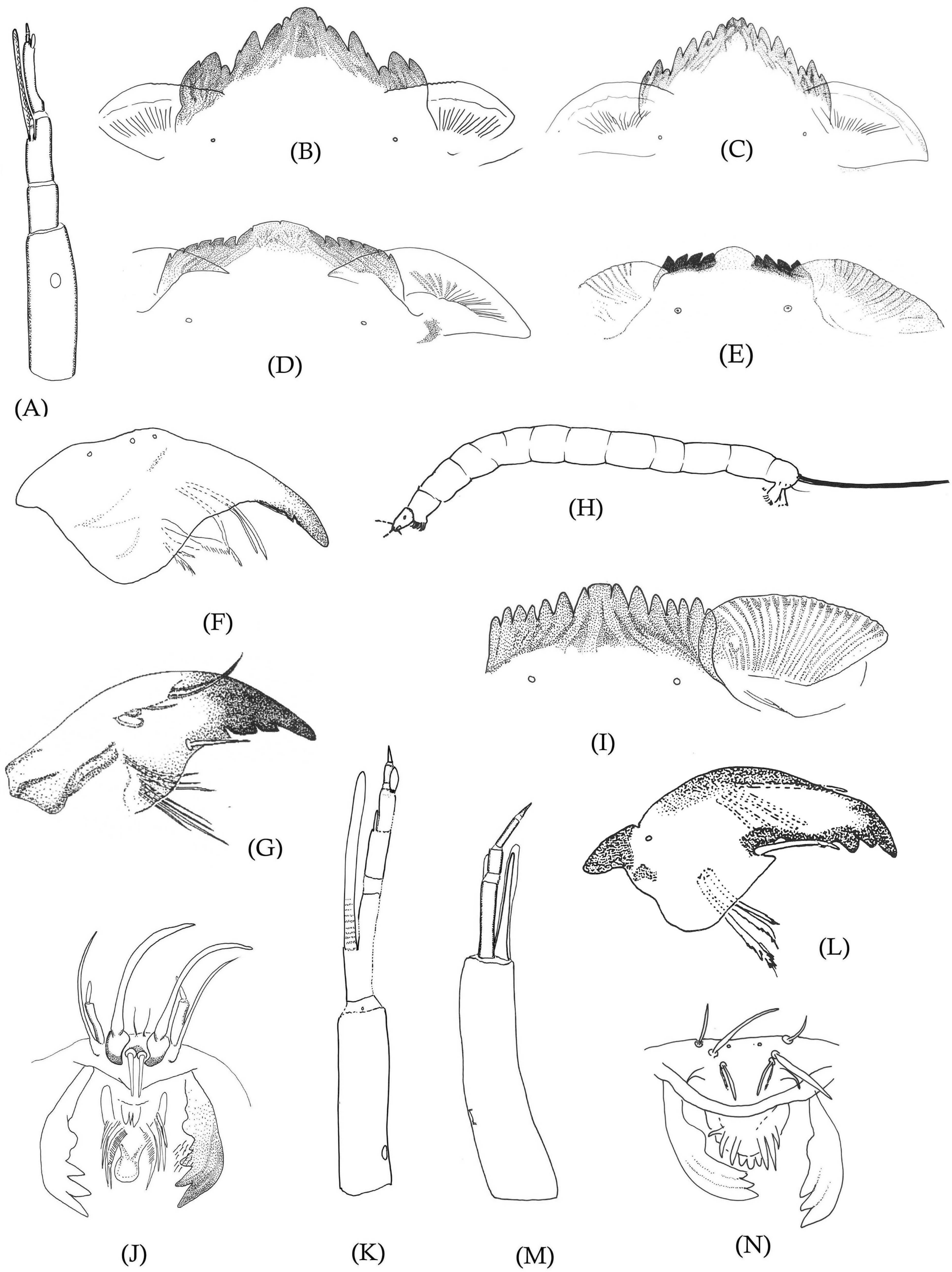

PLATE 17. Larval Chironominae 5. (A) Antenna, *Demicryptochironomus* (*Irmakia*) sp.; Mentum, ventromental plates of (B) *Microchironomus tener*, (C) *Cladopelma* ?*curtivalva*, (D) *Harnischia* sp., (E) *Anuncotendipes australotropicus*; Mandibles of (F) *Harnischia* sp., (G) *A. australotropicus*; (H) Habitus *A. australotropicus*; *Paracladopelma* 'K1', (I) Mentum, ventromental plates, (J) Epipharynx, (K) Antenna, (L) Mandible; *Parachironomus* sp. (M) Antenna; (N) Epipharynx.

The following genera reported from the region remain unknown in the larval stage. Australia: Chironominae: *Parvitergum* Freeman. Orthocladiinae: *Allometriocnemus* Freeman; *Austrocladius* Freeman; *Doloplastus* Skuse; *Kiefferophyes* Freeman; *Nasuticladius* Freeman; *Rhinocladius* Edwards and *Trondia* Ferrington & Saether. Podonominae: *Rheochlus* Brundin. New Zealand (including subantarctic islands): Chironominae: *Ophryophorus* Freeman. Orthocladiinae: *Gynnidocladius* Sublette & Wirth; *Hevelius* Sublette & Wirth; *Kuschelius* Sublette & Wirth; *Maryella* Sublette & Wirth; *Mecaorus* Sublette & Wirth; *Nakataia* Sublette & Wirth; *Nesiocladius* Sublette & Wirth and *Pterosis* Sublette & Wirth. The larvae of *Allocladius* Keffer is described from elsewhere (Ferrington & Sæther, 2011) but understanding of the differentiation is unclear. Adults allocated to *Metriocnemus* van der Wulp are uncertainly placed there, and although the larva is known elsewhere, it has not been verified from the region.

Acknowledgments

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