

Some little-known Benthic Insect Taxa from a Northern New Zealand River and its Tributaries

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Summary

Figures and notes on occurrence are given for 17 taxa from 12 families of rare or little-known insects collected from the Waitakere River and Cascade Stream, in the Waitakere Ranges, northern New Zealand. These include Odonata (Corduliidae), Hemiptera (Mesoveliidae), Coleoptera (Staphylinidae, Dytiscidae, Hydraenidae, Helodidae, Ptilodactylidae, Elmidae), Diptera (Tipulidae: Limoniini and Hexatomini, Ceratopogonidae, Sciomyzidae), and Trichoptera (Psychomyiidae: Ecnominae).

In addition, a list is presented of all species collected during the study.

INTRODUCTION

In the course of a study of benthic invertebrates in the Waitakere River and some of its tributaries (Towns 1976), several insect species were collected which presented particular identification difficulties. Some of these species were widespread, so their presence was considered worth recording, although in most cases it has not been possible to provide identity to specific level. Ecological studies of stream invertebrates often produce a number of indeterminate species, particularly in New Zealand, where many stream groups are poorly known. It is hoped that provision of figures and notes on the occurrence of some of the lesser known groups will make their identity apparent to subsequent collectors working in the same area, and will also generate interest in their distribution.

Most of the species recorded are not represented in standard texts on New Zealand aquatic invertebrates (e.g., Marples 1962; Pendergrast and Cowley 1966; Miller 1971), although many have been recorded by Wise (1973, at least to family level. In the absence of published keys to most of these groups in New Zealand (except for Odonata and Dytiscidae), several overseas identification keys were used, including Usinger (1956), Edmondson (1959), Borror and DeLong (1964), and CSIRO (1970).

The complete list of species collected from the study area is presented in Table 1. With 144 taxa (115 Insecta), the list is the largest compiled for a New Zealand stream system, and is comparable in size to those obtained in similar studies of temperate Northern Hemisphere streams. This is despite implications that the invertebrate fauna of New Zealand streams is species-poor (Percival MS cited in Stout 1973).

Two groups, with a number of indeterminate species, are not dealt with in the following account. These are Chironomidae and Ephemeroptera, both of which were well represented in the study area.

Representatives of all taxa are lodged with the New Zealand Arthropod Collection, Entomology Division, DSIR, Auckland. Adult and larval Hydraenidae, and *Antiporus strigosulus*, have been deposited in the National Museum, Wellington.

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Table 1. List of macroinvertebrate species collected in the Waitakere River and its tributaries between May 1973 and March 1976. Abbreviations: L, light-trapped adults; *, reared to adult; *(S), reared to subimago; R, runnel; C, Cascade Stream; W, Waitakere River and Upper Waitakere Stream; D, drift samples.

COELENTERATA*Chlorohydra* sp.**PLATYHELMINTHES****Tricladida**

Planariidae

Cura pinguis (Weiss, 1909) W*Neppia montana* (Nurse, 1950) W*Neppia* sp. W? *Rhabdocoela* indet. W**NEMERTEA**

Tetrastemmatidae

Prostoma ?graecense (Böhmig, 1898)

NEMATODA indet. W

ANNELIDA**Hirudinea**

Glossiphoniidae

Glossiphonia heteroclita (L., 1761) W**Oligochaeta**

Lumbricidae

Eiseniella tetraedra (Savigny, 1826) W

Lumbriculidae

Lumbriculus variegatus (Müller, 1774) W

Phreodrilidae

Phreodrilus sp. W

Tubificidae

Limnodrilus sp. W*Aulodrilus plurisetus* (Piguet, 1906) W

Naididae

Chaetogaster sp. W*Nais ?elinguis* Müller, 1773 W*Slavina appendiculata* d'Udekem, 1855*Pristina* sp. W**MOLLUSCA****Gastropoda**

Hydrobiidae

Potamopyrgus antipodarum (Gray, 1843)

Lymnaeidae

Lymnaea tomentosa tomentosa (Pfeiffer, 1855) W

Physidae

Gyraulus corinna (Gray, 1850) W

Latiidae

Latia neritoides Gray, 1850**Bivalvia**

Sphaeriidae

Sphaerium novaezealandiae Deshayes, 1854 W*Pisidium ?casertanum* (Poli, 1791) W**ARTHROPODA****Crustacea**

OSTRAGODA

Cypridae

Herpetocypris pascheri Brehm, 1929*Cypridopsis vidua* (O. F. Müller, 1776)

CLADOCERA

Chydoridae

Chydorus sp. W*Alona* sp. W

COPEPODA

Cyclopidae

Macrocyclops albidus (Jurine, 1820) W*Acanthocyclops robustus* (G. O. Sars, 1863) W

AMPHIPODA

Eusiridae

Paracalliope fluviatilis (Thomson, 1879) W*Paraleptamphopus subterraneus* (Chilton, 1881) R

DECAPODA

Parastacidae

Paranephrops planifrons White, 1842**Insecta**

EPHEMEROPTERA

Siphonuridae

Nesameletus flavitinctus (Tillyard, 1923) **Rallidens mcfarlanei* Penniket, 1966 W*Ameletopsis perscitus* (Eaton, 1899)*Coloburiscus humeralis* (Walker, 1853)*Oniscigaster wakefieldi* McLachlan, 1873 W

Siphlaenigmatidae

Siphlaenigma janae Penniket, 1962 C*

Leptophlebiidae

Zephlebia versicolor (Eaton, 1899) **Zephlebia dentata* (Eaton, 1871) **Zephlebia cruentata* (Hudson, 1904) **Zephlebia nodularis* (Eaton, 1871) **Zephlebia* sp. A **Zephlebia* sp. B **Zephlebia* sp. C *(S) **Deleatidium lillii* Eaton, 1899 **Deleatidium myzobranchia* Phillips, 1930 **Deleatidium cerinum* Phillips, 1930 **Deleatidium* sp. C **Deleatidium* sp. E **Atalophlebioides sepia* (Phillips, 1930) **Atalophlebioides cromwelli* (Phillips, 1930) *(S)

Table 1 (continued)

| | | | | |
|--|---|----|--|---|
| | <i>Atalophlebioides</i> sp. A | * | Culicidae | |
| | <i>Atalophlebioides</i> sp. B | * | Dixinae indet. | |
| | Gen. nov. sp. A | * | Chironomidae | |
| Ephemeridae | <i>Ichthybotus hudsoni</i> (McLachlan, 1894) | | Tanypodinae (2 indet. species) | |
| | | | <i>Ablabesmyia malus</i> (Hutton, 1902) | L |
| | | | <i>Psectrotanypus flavipes</i> (Freeman, 1959) | L |
| ODONATA | | | Diamesinae | |
| Coenagrionidae | <i>Xanthocnemis zealandica</i> (McLachlan, 1873) | W | <i>Maoridiamesa harrisi</i> Pagast, 1947 | * |
| | | | <i>Lobodiamesa campbelli</i> Pagast, 1947 | L |
| Corduliidae | <i>Procordulia grayi</i> (Selys, 1871) | WD | Orthocladiinae (at least 2 indet. species) | |
| PLECOPTERA | | | ? <i>Austrocladius</i> sp. (1 indet. species) | * |
| Eustheniidae | <i>Stenoperla prasina</i> (Newman, 1845) | | <i>Cricotopus zealandicus</i> Freeman, 1959 | * |
| Austroperlidae | <i>Austroperla cyrene</i> (Newman, 1845) | | <i>Syncricotopus pluriserialis</i> (Freeman, 1959) | * |
| Gripopterygidae | <i>Megaleptoperla ?grandis</i> (Hudson, 1913) | C | <i>Corynoneura</i> sp. (1 indet. species) | W |
| | <i>Acroperla trivacuata</i> (Tillyard, 1923) | * | Chironominae | |
| | <i>Zelandoperla maculata</i> (Hare, 1910) | | ? <i>Chironomus</i> sp. | L |
| | <i>Zelandobius ?confusus</i> (Hare, 1910) | | <i>Polypedilum opimus</i> (Hutton, 1902) | * |
| | <i>Zelandobius furcillatus</i> Tillyard, 1923 | * | <i>Tanytarsus funebris</i> (Freeman, 1959) | L |
| Notonemouridae | <i>Halticoperla viridans</i> McLellan & Winterbourn, 1968 | R | <i>Paratanytarsus agameta</i> (Forsyth, 1971) | * |
| HEMIPTERA | | | Ceratopogonidae (1 undescribed species) | |
| Veliidae | <i>Microvelia macgregori</i> (Kirkaldy, 1899) | | Simuliidae | |
| | | | <i>Austrosimulium australense</i> (Schiner, 1868) | |
| Mesoveliidae indet. | | WD | <i>Austrosimulium longicorne</i> Tonnoir, 1925 | W |
| MEGALOPTERA | | | Tabanidae indet. | |
| Corydalidae | <i>Archichauliodes diversus</i> (Walker, 1853) | | Stratiomyidae (2 indet. species) | |
| | | | Sciomyzidae indet. | |
| COLEOPTERA | | | Empididae indet. | |
| Staphylinidae indet. | | | Ephydriidae indet. | |
| Dytiscidae | <i>Antiporus strigosulus</i> (Broun, 1880) | | Muscidae indet. | |
| Hydraenidae | <i>Orchymontia</i> sp. (1 undescribed species) | | TRICHOPTERA | |
| | Genus II sp. A | | Hydropsychidae | |
| | Genus II sp. B | W | <i>Aoteapsyche rarururu</i> (McFarlane, 1973) | |
| | Genus III sp. (1 undescribed species) | | <i>Aoteapsyche colonica</i> (McLachlan, 1871) | |
| Hydrophilidae | <i>Enochrus tritus</i> (Broun, 1880) | WD | <i>Orthopsyche fimbriata</i> (McLachlan, 1862) | |
| Helodidae indet. (1 undescribed species) | | | Polycentropodidae | |
| Ptilodactylidae indet. (1 species) | | | <i>Polyplectropus puerilis</i> (McLachlan, 1868) | |
| Elmidae | <i>Hydora nitida</i> Broun, 1885 | | Psychomyidae | |
| | <i>Hydora</i> sp. (1 indet. species) | | <i>Ecnomina</i> sp. (1 indet. species) | C |
| DIPTERA | | | Philopotamidae | |
| Tipulidae | Limoniini indet. | * | <i>Dolophilodes mixta</i> Cowley, 1976 | |
| | Hexatomini indet. | | Rhyacophilidae | |
| | <i>Paralimnophora skusei</i> Hutton, 1900 | W | <i>Hydrobiosis parumbripennis</i> McFarlane, 1951 | |
| | | | <i>Hydrobiosis soror</i> Mosely, 1953 | L |
| Psychodidae | ? <i>Psychoda</i> sp. | | <i>Hydrobiosis clavigera</i> McFarlane, 1951 | |
| | | | <i>Psilochorema macroharpax</i> McFarlane, 1951 | L |
| | | | <i>Psilochorema nemorale</i> McFarlane, 1951 | |
| | | | <i>Neurochorema confusum</i> (McLachlan, 1868) | |

Table 1 (continued)

| | | | |
|--|----|---|---|
| <i>Neurochorema armstrongi</i> McFarlane, 1951 | | <i>Pycnocentroides aeris</i> Wise, 1958 | L |
| <i>Hydrochorema crassicaudatum</i> Tillyard, 1924 | | <i>Confluens hamiltoni</i> (Tillyard, 1924) | C |
| <i>Costachorema xanthoptera</i> McFarlane, 1939 | C | <i>Olinga feredayi</i> (McLachlan, 1868) | |
| <i>Costachorema psaroptera</i> McFarlane, 1939 | C | Oeconesidae | |
| <i>Tiphobiosis montana</i> Tillyard, 1924 | L | <i>Oeconesus maori</i> McLachlan, 1862 | W |
| Hydroptilidae | | Halicophidae | |
| <i>Oxyethira albiceps</i> (McLachlan, 1862) | | <i>Alloecentrella magnicornis</i> Wise, 1959 | C |
| <i>Paroxyethira hendersoni</i> Mosely, 1924 | W | <i>Zelolessica cheira</i> McFarlane, 1956 | C |
| <i>Paroxyethira kimminsi</i> Leader, 1972 | W | Helicopsychidae | |
| Sericostomatidae | | <i>Helicopsyche albescens</i> Tillyard, 1924 | |
| <i>Pycnocentria funerea</i> McLachlan, 1866 | CR | Leptoceridae | |
| <i>Pycnocentria evecta</i> McLachlan, 1868 | | <i>Triplectides obsoleta</i> (McLachlan, 1862) | |
| <i>Beraoptera roria</i> Mosely, 1953 | | <i>Hudsonema amabilis</i> (McLachlan, 1863) | |
| <i>Pycnocentroides modesta</i> Cowley, 1976 | L | LEPIDOPTERA | |
| | | Pyralidae | |
| | | <i>Nymphula nitens</i> (Butler, 1880) | W |
| | | Acarina (at least 5 species) | |

STUDY AREA AND METHODS

The Waitakere River is situated in the Waitakere Ranges west of Auckland (30° 50'S, 174° 30'E), and arises in mixed broadleaf-podocarp forest, with large mature and regenerating stands of kauri (*Agathis australis* Salisb.). This cover extends approximately to site k (Fig. 1). The stream then passes through mixed bracken (*Pteridium aquilinum* var. *esculentum* (Forst. f.) Kuhn) — tea tree (*Leptospermum scoparium* J. R. et G. Forst.) — gorse scrub (*Ulex europaeus* L.) grazed by stock, more open farmland at sites I and II, and finally swampland. The Waitakere River headwaters feed a reservoir above a 100 m falls upstream of site a.

Species recorded were obtained from approximately 340 benthic samples collected between April 1973 and February 1976. These include 24 dip-net kick samples (Mills 1971) taken during a survey of the Waitakere River (sites a-l including I and II; Fig. 1) and its main tributaries, the Cascade Stream, and the "Upper Waitakere Stream" (informal name used here for the Waitakere River above its junction with the Cascade Stream). Most of the other samples were obtained by 0.04m² Surber sampler at sites I, II, III, IV, l, s, q. Fourteen 24-h drift samples were also obtained at sites II, III, q, and r.

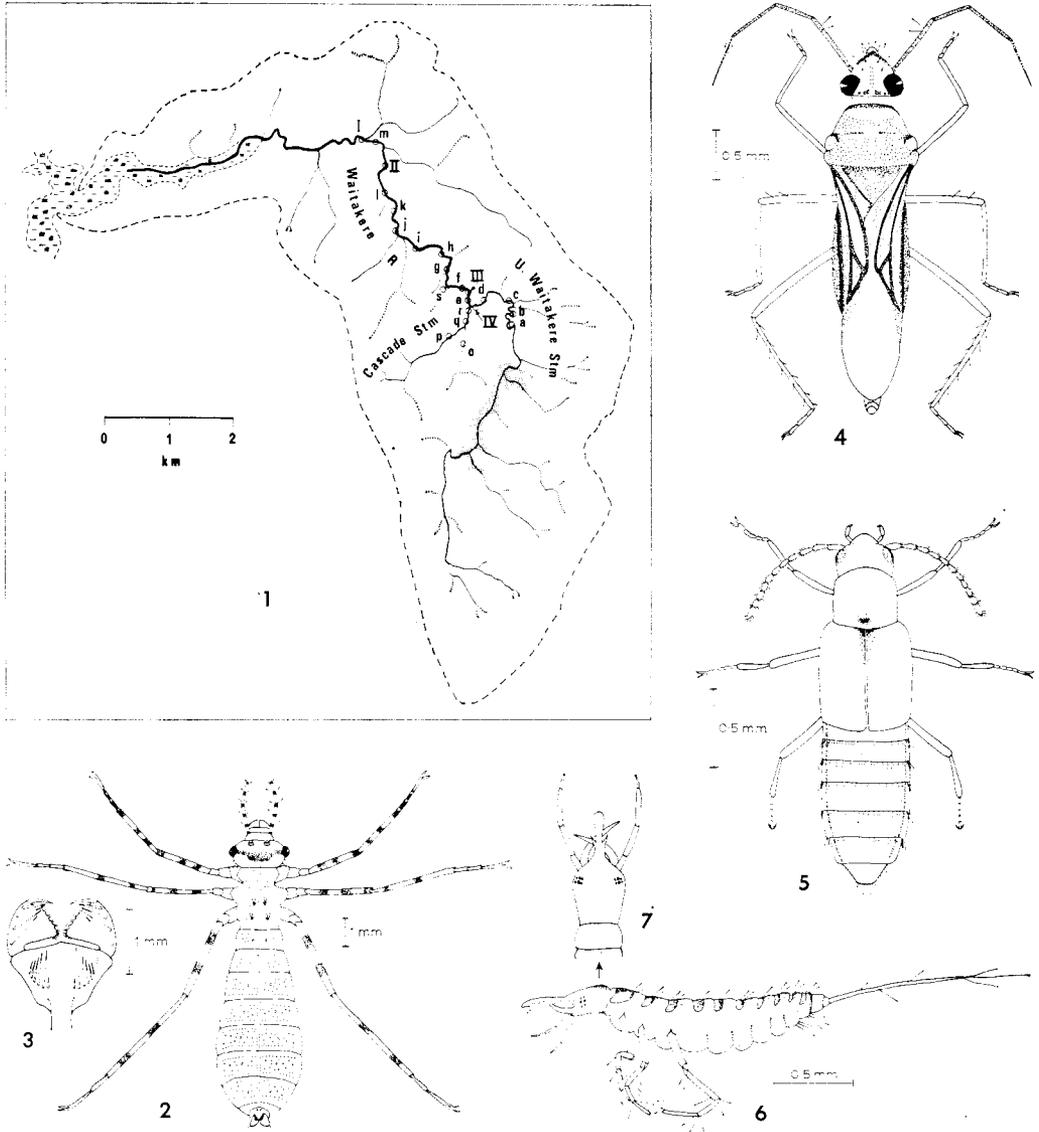
All sampling nets were made from 0.2 mm mesh plankton netting. Most samples, except for those from a shallow pool at site IV ($n = 36$) and some dip-net samples in the Cascade Stream, were obtained from riffle areas.

The various sites on Fig. 1 and Table 2 are sections of the stream divided on the basis of physiography and faunal composition (Towns in prep.) and are as follows: Runnel (s), Cascade Stream (Upper) (o, p), Cascade Stream (q), Cascade Stream (lower) (r), Upper Waitakere Stream (a-d), Waitakere River (i-k incl. III, IV), Waitakere River (lower l, I, II).

Order ODONATA
Family CORDULIIDAE

Procordulia grayi

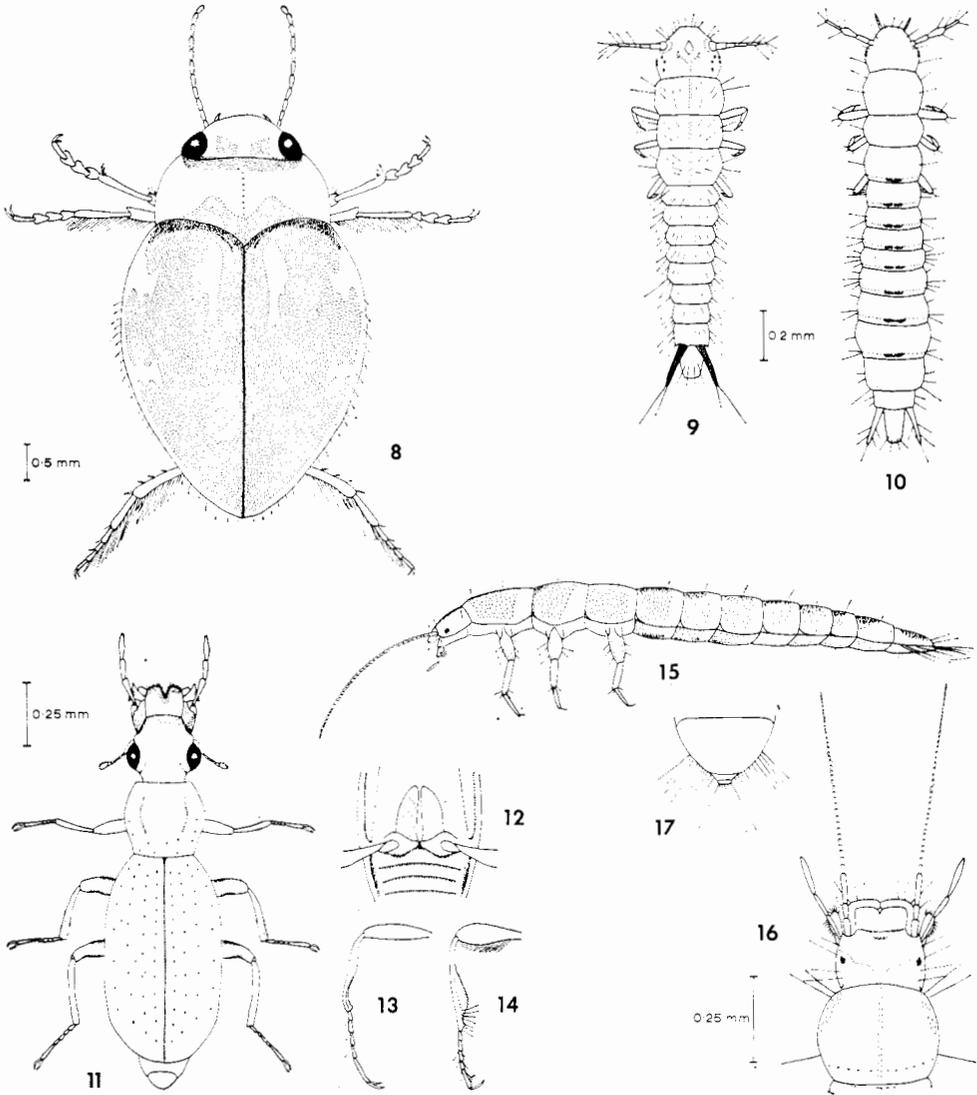
The dragonfly nymph most commonly figured in New Zealand texts is the large *Uropetala carovei*. *Procordulia grayi* is smaller (Fig. 2) and unlike *Uropetala* does not form burrows (Penniket 1966). A distinctive feature of the larvae of *P. grayi* is the arrangement of palpal setae (Fig. 3, see also Penniket 1966). According to Penniket the species is most common in lakes, so its appearance in drift samples from a riffle (site II) suggests that the single specimen obtained was washed out of a pool.



Figs 1-7 1 Study area, showing location of sample sites. 2, 3 *Procordulia grayi*: 2 larva; 3 parts of labium, including lateral lobes of labium and inner surface of mentum. 4 Mesoveliidae adult. 5 Staphylinidae adult. 6, 7 *Antiporus* sp. larva; 6 larva; 7 head and mouthparts, dorsal.

Order HEMIPTERA
Family MESOVELIIDAE

Pendergrast and Cowley (1966) record this family in New Zealand, but none of its members have yet been described. A single adult specimen (Fig. 4) was obtained from drift samples. Indeterminate Hemiptera, possibly immature mesoveliids, were also collected. Mesoveliids can be distinguished from the more common veliid, *Microvelia*, by the presence of apical, as opposed to subapical, claws.



Figs 8-17 8 *Antiporus strigosulus* adult. 9, 10 Hydraenidae larvae. 11-14 Hydraenidae adults: 11 *Orchymontia* sp.; 12 metasternum, ventral view; 13 genus III sp. hind leg; 14 genus II sp. hind legs. 15-17 Helodidae larvae: 15 larva; 16 head, dorsal view; 17 anal segment.

Order COLEOPTERA

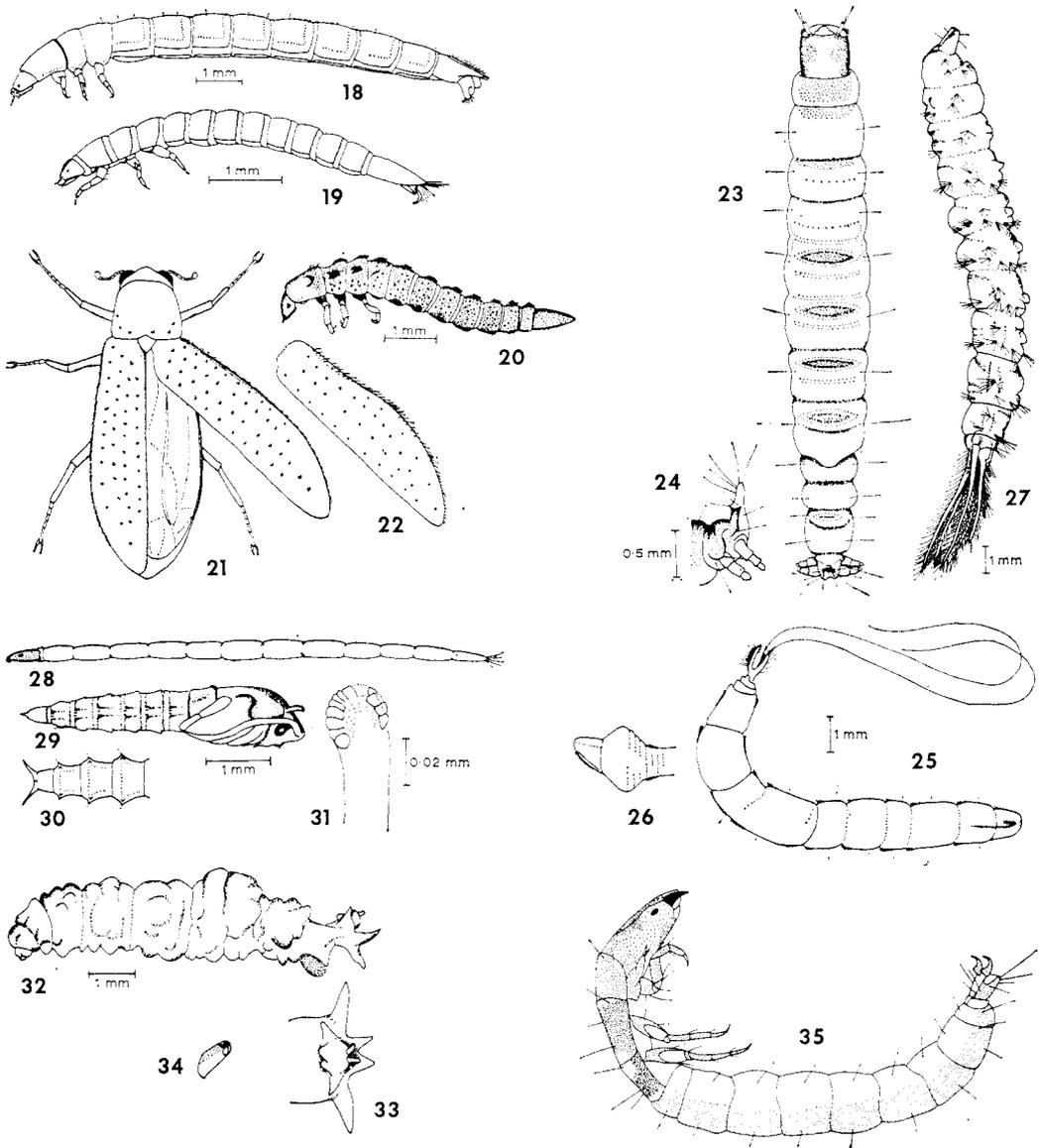
Family STAPHYLINIDAE

Aquatic staphylinids have not been recorded previously from New Zealand streams. Small black beetles (Fig. 5) were obtained in benthic samples from the lower Cascade Stream and Waitakere River. These appeared often enough in the samples to suggest they were water-associated, if not fully aquatic. Outside New Zealand, adult and larval staphylinids are often associated with fresh water (Usinger 1956).

Family DYTISCIDAE

Antiporus strigosulus

Two adult *A. strigosulus* (Broun (Fig. 8 and a larva (Figs 6, 7) possibly



Figs 18-35 18 Ptilodactylidae larva. 19-22 Elmidae: 19 *Hydora nitida* larva; 20 *Hydora* sp. larva; 21 *Hydora nitida* adult; 22 *Hydora* sp. elytra. 23-27 Tipulidae: 23-24 Limoniini; 23 larva; 24 terminal segments and gills; 25, 26 Hexatomini; 25 larva; 26 terminal segment with gills retracted (terminal bulge an artifact of preservation (P. M. Johns pers. comm.)); 27 *Paralimnophora skusei* larva. 28-31 Ceratopogonidae: 28 larva 29-31 pupa; 29 pupa; 30 abdomen, frontal view; 31 pupal respiratory horn. 32-34 Sciomyzidae larva: 32 larva; 33 terminal segment, dorsal view; 34 respiratory siphon. 35 *Ecnomina* sp. larva (after D. R. Cowley).

of this species were collected in the Waitakere River from drift (site II) and benthic (site IV) samples. An adult was also collected amongst red algae (*Bostrychia harveyi*) in the Cascade Stream.

A key to adult dytiscids is given by Ordish (1967) and some larvae are described by Wise (1961), although some of the names used by Wise are now outdated Ordish 1966).

Family HYDRAENIDAE

New Zealand apparently has a number of species in this little-known family, although only 2 have been named. One, *Orchymontia spinipennis*, is included in Wise's (1973) list, and the second, *O. maclellani*, has only recently been described (Zwick 1975).

Adults of 4 species were present in the study area, 2 of them widespread and common throughout the year (Table 2). Larvae of 2 species of this family were collected in drift samples (Figs 9, 10). None of the species is described and only one (*Orchymontia* sp.) has a generic name (Fig. 11). The family is at present under revision by R. G. Ordish (National Museum, Wellington).

Orchymontia sp. adults can be distinguished from the other 3 species (representing 2 genera; R. G. Ordish pers. comm. by their velvety metasternum (Fig. 12). Of the remaining 3 species, males of genus III sp. have curved hind tibia (Fig. 13), males of genus II sp.B have expanded hind tibia and a fringe of hair on the femur (Fig. 14), and males of genus II sp.A have straight hind tibia and lack femoral hair fringes.

Family HELODIDAE

Larval Helodidae, Hydraenidae, and possibly Ptilodactylidae have apparently been long confused with Elmidae in New Zealand (Wise 1973). A number of helodid species are known from New Zealand streams, but according to Wise (1973), none are described. The specimens found in the Waitakere River were small elongate, dorsoventrally compressed (Fig. 15), orange or brown in colour, with distinctive multisegmented antennae (Fig. 16), and a rounded anal segment (Fig. 17).

Family PTILODACTYLIDAE

Larvae of this family are widespread in the Waitakere River and its catchment, being most abundant in the minor tributaries. The group is not included in Wise's (1973) list for New Zealand, but a member of the family, *Byrrhocryptus urquharti*, is figured by Hudson (1934) and attributed to the family Dascillidae. Although it has been established that the Waitakere species is not *B. urquharti*, its specific identity remains unknown.

Ptilodactylids can be distinguished from the superficially similar elmids by the presence, in the former, of a flat, hair-fringed dorsal plate on the anal segment, and a pair of clawed anal appendages (Fig. 18).

Family ELMIDAE

Elmid larvae commonly form a major component of stream invertebrate communities, but they are often difficult to identify to species. Adult *Hydora nitida* are common in the Waitakere River during summer, and the larvae (Fig. 19) are probably of this species. A single larval specimen of a second species was found in the Lower Cascade Stream. It can be distinguished from *H. nitida* by the presence of middorsal and ventral crests, and nodules over the body surface (Fig. 20).

A second adult elmids, referred to here as *Hydora* sp.B, is also locally common in summer. Unlike *H. nitida*, *H. sp.B* has a particular tendency to launch into flight when disturbed. *Hydora nitida* adults have bronze-coloured, strongly punctate elytra, and the body surface covered by fine, reclined hairs (Fig. 21). *Hydora* sp.B has black, shiny, anteriorly impressed elytra, less punctate than those of *H. nitida*. The body surface is covered with coarse, upright hairs (Fig. 22).

Order DIPTERA

Family TIPULIDAE

Little is known of the freshwater tipulids of New Zealand, although their larvae are often among the more abundant stream macroinvertebrates. A note

Table 2. Distribution in the study area of taxa mentioned in the text.

| | Runnel | Cascade Stm. (Upper) | Cascade Stm. | Cascade Stm. (Lower) | Upper Waitakere Stm. | Waitakere R. | Waitakere R. (Lower) |
|-------------------------------------|--------|-------------------------|--------------|-------------------------|-------------------------|--------------|-------------------------|
| Corduliidae | | | | | | | |
| <i>Procordulia grayi</i> (Selys) | | | | | | | + |
| Mesoveliidae | | | | | | | + |
| Staphylinidae | | | | + | | + | |
| Dytiscidae | | | | | | | |
| <i>Antiporus strigosulus</i> adults | | | + | | + | | + |
| <i>Antiporus</i> sp. larvae | | | | | + | | |
| Hydraenidae adults | | | | | | | |
| <i>Orchymontia</i> sp. | | + | + | + | + | + | + |
| Gen II sp. A | | + | + | | + | + | + |
| Gen II sp. B | | | | | + | | |
| Gen III sp. | | + | + | + | | | |
| Unidentified larvae | | | | | | | |
| Type A | | | | | | + | + |
| Type B | | | | | | | + |
| Helodidae | | + | | + | + | + | |
| Ptilodactylidae | + | + | + | + | + | + | + |
| Elmidae | | | | | | | |
| <i>Hydora nitida</i> Broun adults | | | | + | + | + | + |
| <i>Hydora nitida</i> larvae | | + | + | + | + | + | + |
| <i>Hydora</i> sp. B adults | | | | + | | | |
| Unidentified larvae | | | | + | | | |
| Tipulidae | | | | | | | |
| Limoniini | | + | + | + | + | + | + |
| Hexatomini | + | + | + | + | + | + | + |
| <i>Paralimnophora skusei</i> Hutton | | | | | | + | + |
| Ceratopogonidae | | | | | | | |
| larvae | | + | + | + | + | + | + |
| pupae | | + | | | | | |
| Sciomyzidae | | | + | + | | | + |
| Psychomyiidae | | | | | | | |
| <i>Enomina</i> sp. | | | + | | | | |

by Johns (1972) is the most informative account of our aquatic taxa. The most common tipulids in the Waitakere River are members of the tribe Limoniini (Fig. 23), which have 2 pairs of 3-segmented gills (Fig. 24). Species of the tribe Hexatomini were locally common, particularly in some tributaries. Hexatomini have a distinctive golden coating over the body and feathery gills (Fig. 25), although in some specimens the gills were not obvious (Fig. 26). Included in this group is *Paralimnophora skusei* (Fig. 27), a large tipulid which was taken only twice.

Family CERATOPOGONIDAE

No aquatic ceratopogonid larvae from New Zealand are described, although they are often common. Larvae (Fig. 28) are widespread in the Waitakere River and its tributaries and a pupa was also collected (Figs 29, 30). The pupal respiratory horn of members of the family is often distinctive (Fig. 31) and may be used to distinguish species (Thomsen 1937).

Family SCIOMYZIDAE

Larvae of this family are often predators of aquatic snails (Usinger 1956; Colless and McAlpine 1970). They are not included in Wise's (1973) list of aquatic insects. Seven genera have been recorded from New Zealand (Harrison 1959), but only some *Neolimnia* species are predators of aquatic snails (J. K. Barnes pers. comm.).

Unidentified sciomyzid larvae were collected from the Cascade Stream (Fig. 32), and also by Howard-Smith (1975) in the Oratia Stream. The respiratory siphons of the Cascade Stream species have the three spiracular openings commonly found in the group (Figs 33, 34).

Order TRICHOPTERA

Family PSYCHOMIIDAE

A larva of *Ecnomina* was collected from the Cascade Stream. This is the first record of larvae of this subfamily Ecnominae from New Zealand, although adults of a single species, *E. zealandica*, have been known for some time (Wise 1958). The larvae are superficially similar to those of Rhyacophilidae but can be distinguished from them by the form of sclerotisation of the thoracic segments. Rhyacophilidae have only the prothoracic segment sclerotised (McFarlane 1951), whereas *Ecnomina* has all thoracic segments sclerotised. *Ecnomina* also lacks the chelate forelimbs found in Rhyacophilidae. A more detailed description of the species is given by Cowley (1975: Fig. 14).

DISTRIBUTION OF TAXA

The distribution of each taxon discussed above is given in Table 2. Some emiid species, ptilodactylids, some Hydraenidae adults, tipulids, and ceratopogonids were common in the samples. The remaining groups occurred infrequently, and in several cases fewer than 5 specimens were obtained.

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