**Diagnostic characters:**

Broad, single median, 7 laterals. 1st lateral is small, 2nd tall and broad, 4, 5, and 7 are short. VMP margin serrated/scalloped.

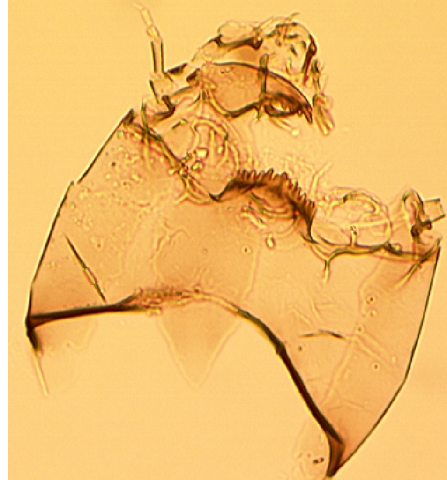
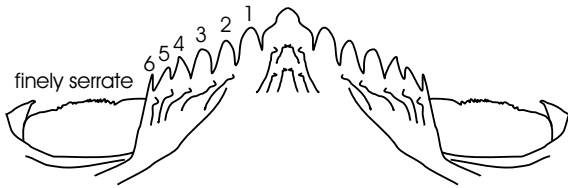
We suspect this is an early instar of a Chironomini type, probably *Polypedilum*. Note: the relative sizes of the outer laterals are consistent with *Polypedilum*. Banding pattern down the laterals is also consistent with *Polypedilum*. The median of our specimen may be worn down and may originally have consisted of 2 teeth.

Ecology:

Subfossil: Insufficient data.

Taxonomic references: Referred to as "Unknown 'Unip'" by Dieffenbacher-Krall et al. 2007.

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 319, 407 - single specimen in each.

**Diagnostic characters:**

Notched median, 6 laterals, 1st and 2nd laterals are clearly distinct, not joined together. Teeth of mentum and mandibles generally pointed, not worn. VMP tends to be narrow from top to bottom, upper edge finely serrate through at least the middle 1/3 section. Heads generally very small, mandibles often folded over mentum.

These are believed to be early instar Chironomini. In our sites, they occurred in sites also containing *Chironomus*. However, we cannot be certain they are not early instars of other Chironomini genera.

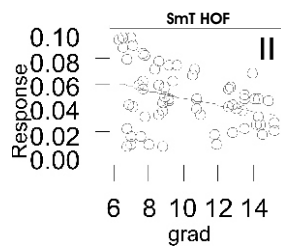
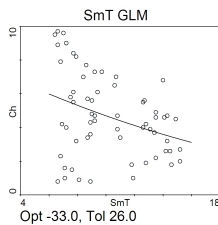
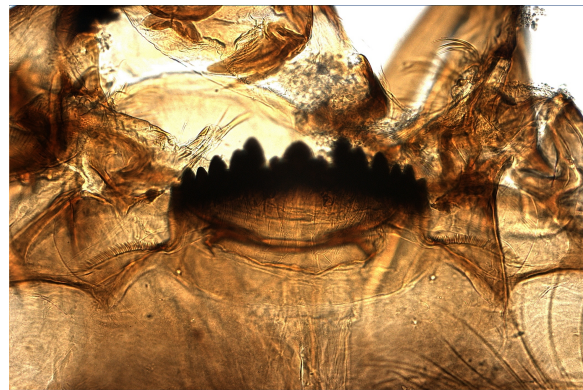
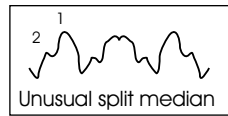
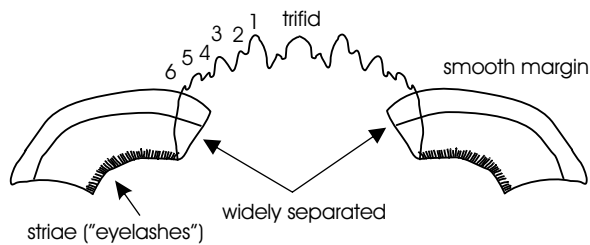
Ecology:

Subfossil: Insufficient data.

Taxonomic references:

Indistinguishable from early instar *Endochironomus* of Pinder (1995) p. 101. Similar in appearance to East African Chironomini larvula type 1 *sensu* Eggermont and Verschuren (2004b), which is believed to be 1st instar *Chironomus*. Referred to as Chironomini sp. a by Schakau (1993).

Lakes containing taxon: Ubiquitous, 51 Dieffenbacher-Krall et al. (2007) sites. Also 11 of 15 recounted Woodward and Shulmeister (2006) sites. Found in nearly all sites studied by Schakau (1993).



Diagnostic characters:

One of the most easily recognizable types. Trifold median, 6 laterals, 1st and 2nd laterals fused (mitten). 4th lateral usually narrower than 5th and often same height or shorter. Large VMP with smooth, broad margin, striated, prominent striation marks at base ("eyelashes"). Teeth often quite dark. Post occipital margin often thick and dark.

Martin and Forsyth (2007) differentiate 2 vmp types, one having < 60 striae (type A) and the other having > 60 striae (type B), 3 mentum types depending on relative height of laterals 4 & 5, 4 median types, and 3 mandible types. None of our specimens had more than 60 striae although Woodward (unpub.) found a very dark specimen of this type in Sugarbowl Tarn. In our experience, these characteristics are rarely all present on a single subfossil specimen making the ability to differentiate between Martin and Forsyth's types difficult or impossible.

One unusual specimen with a split median was found in fossil material (Kettlehole Bog 310). The same mutation was observed in a Pennington Pond, Maine (Dieffenbacher-Krall, unpub.) early Holocene specimen.

Similar taxa: *Cladopelma* and *Kiefferulus* have fine striations at base of VMP ("eyelashes"), and are the only other NZ types to have these. *Kiefferulus* is quite similar to *Chironomus* but VMP margin is serrated.

Ecology:

Subfossil: Ubiquitous, but is often the most abundant type in cold sites (Dieffenbacher-Krall et al. 2007). Woodward and Shulmeister (2006) noted that *Chironomus* is often the dominant taxa in high altitude (>1300 m a.s.l.) lakes, but may be present in high abundance below tree-line as well, and tends to dominant assemblages in hypertrophic lakes.

Organism: Found in fresh-brackish-polluted water habitats (Stark and Winterbourn 2000).

Throughout NZ. 4 named species (*C. antipodensis*, *C. analis*, *C. subantarcticus*, *C. zealandicus*) known in New Zealand, with at least 5 others suspected, all found in freshwater, but one unnamed species may also occur in saline or brackish water (Boothroyd and Forsyth 2007).

C. zealandicus is very common, especially in eutrophic waters. Its presence has also been recorded in water-filled leaf axils. Its larvae are indistinct from those of *C. analis*. (Stark and Winterbourn 2006). *C. zealandicus* is adaptable to temperatures as high as 34 °C and pH as low as 1.8 in geothermal waters (Forsyth 1983).

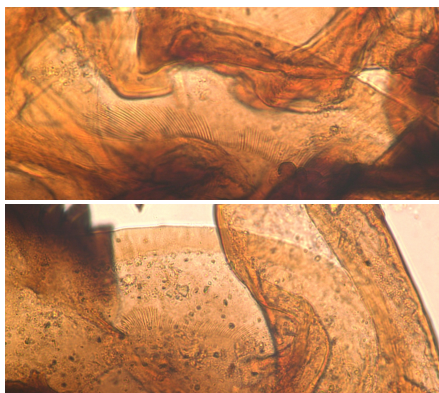
Forsyth (1971): *C. zealandicus* larvae build open-ended, straight tubes of fine organic and inorganic material. The 1st instar molts within the tube, then vacates it and builds a new tube. 2nd, 3rd, and 4th instars generally remain in the same tube, enlarging it as needed. 4th instar larvae may leave tubes for several hours at a time returning to any vacant tube, taking over a tube, or building a new one. The tube is not much longer than the larva. A salivary net at the front of the tube traps food particles. The net is then eaten and a new net built. Tubes may be built on the surface of the substrate, generally horizontal, or in the substrate. The front end of the tube is typically built up several mm above the substrate surface.

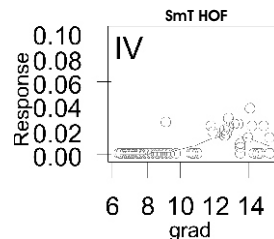
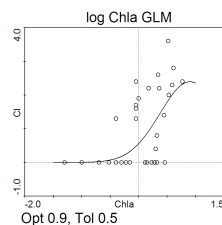
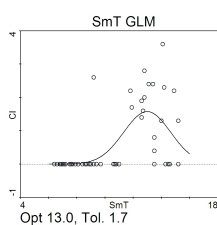
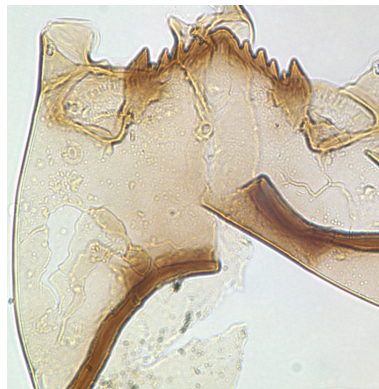
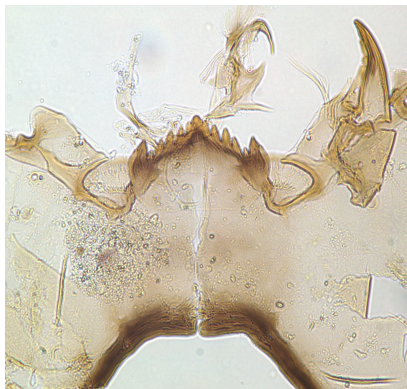
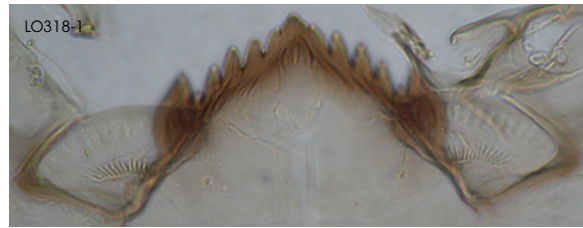
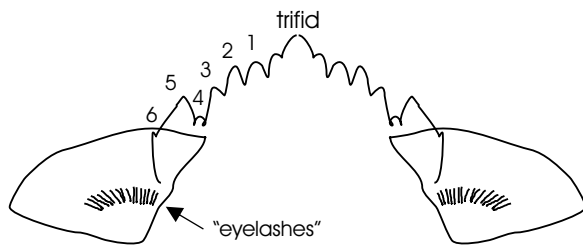
Boubee (1983) noted that *C. zealandicus* (may contain multiple species) larvae are usually found buried in rich muck, with tube openings sometimes projecting well above the sediment surface. When oxygen levels are low, larvae bodies may project up to 2/3 out of the tubes. They feed directly on the material surrounding them. Although Graham (1976) indicated that they graze at the sediment surface, and Forsyth (1971) described them as filter feeders, Boubee (1983) observed neither of these feeding methods. Open ended tubes are necessary for irrigation current. The larvae leaves a tube if it becomes plugged. Larvae feed on detritus, algae, diatoms, oligochaetes, crustaceans, insect remains, sponge spicules, and sand.

Taxonomic references: See Martin & Forsyth (2007)

Lakes containing taxon: Ubiquitous. 75 of Dieffenbacher-Krall et al. (2007) sites, all 15 of Woodward and Shulmeister (2006) recounted sites.

Specimen having > 60 striae





Diagnostic characters:

Trifid median, 6 laterals, 4th laterals quite small, 5th huge and prominent, 6th may appear as notch on 5th. VMPs widely separated, with strong striations at base ("eyelashes").

Similar types: *Chironomus* and *Kiefferulus* have fine striations at base of VMP ("eyelashes"), and are the only other NZ types to have these. But no other Chironomini types have such large 5th laterals as *Cladopelma*.

Northern hemisphere *Cladopelma* have 2 median teeth, usually with a central notch (Brooks et al. 2007). The teeth appressed to the median, considered to be part of a trifid median in NZ *Cladopelma*, are counted as the 1st laterals. Thus, Northern hemisphere *Cladopelma* are considered to have 7 laterals, with the 6th being the largest. *Microchironomus* is similar to NZ *Cladopelma*, having a single median, but the *Microchironomus* mentum is flat, not arched, whereas both Northern Hemisphere and NZ *Cladopelma* have arched medians.

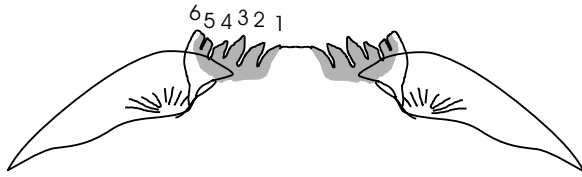
Ecology:

Subfossil: Occur in most abundance in productive sites with SmT from 12-15 °C (Dieffenbacher-Krall et al. 2007). Woodward and Shulmeister (2006) noted *Cladopelma* to be characteristic of mean February temperatures >13°C.

Organism: One species known in NZ, *C. curticalva*, found in freshwater (Boothroyd and Forsyth 2007); larvae common in lakes (Stark and Winterbourn 2000).

Boubee (1983): Larvae form short cases of detritus and algae on the sediment surface or plant stems, especially Characeae. They are generally inactive unless disturbed, but when disturbed they move about energetically. Feed on detritus and diatoms, *Pinnularia* in particular, which larvae may actively seek.

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 201, 207, 210, 214, 301-304, 309-311, 318-321, 323, 401, 404, 405, 423, 424. Woodward and Shulmeister (2006) recounted sites Emma, Sylvan, Howden.



Diagnostic characters:

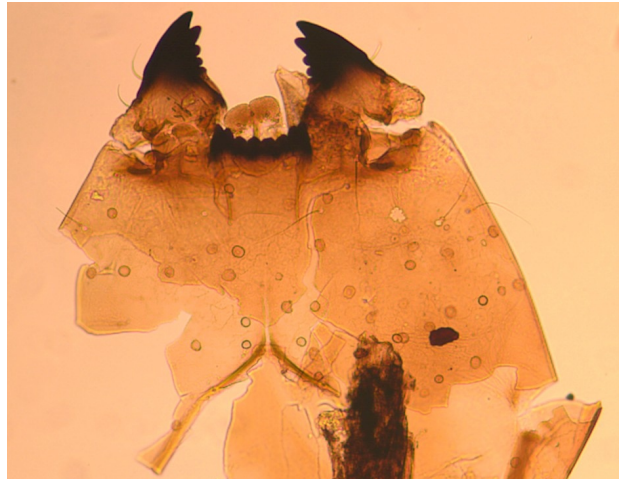
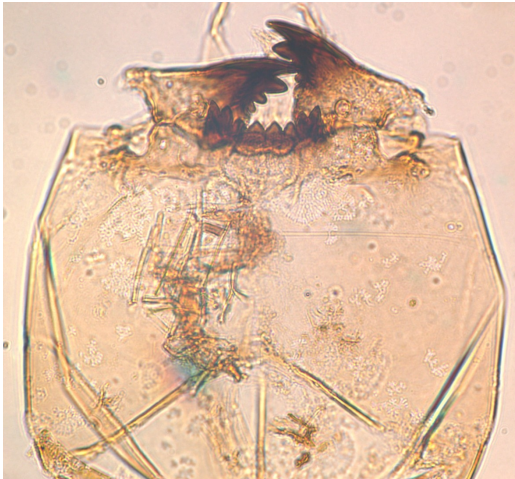
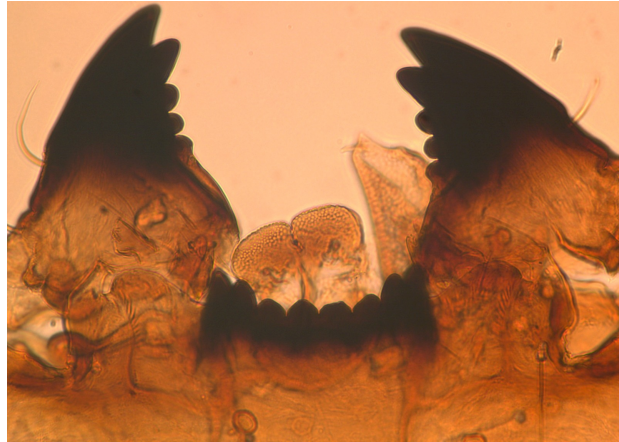
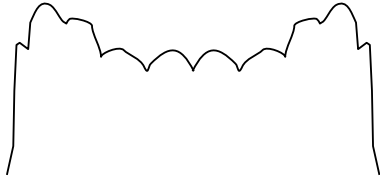
Mentum concave. Broad, pale, untoothed central region, 6-7 laterals. VMPs wider than mentum, blunt inner edge tapering to a point at outer edge.

Ecology:

Subfossil: No data.

Organism: Larvae known from Waitomo Stream and Lake Taupo, NI (Stark and Winterbourne 2000), King Country, and Central Volcanic Plateau, NI (Boothroyd unpub.). One unnamed freshwater species known in New Zealand (Boothroyd and Forsyth 2007).

Lakes containing taxon: Single specimen found in Galway Tarn late-glacial sediment (0111-T2 54-55; Vandergoes and Dieffenbacher-Krall, unpub.).

**Diagnostic characters:**

Concave mentum, 8-10 teeth total. No VMP. Mandible teeth heavily sclerotized, dark dorsal tooth, big apical tooth, and 2 inner teeth.

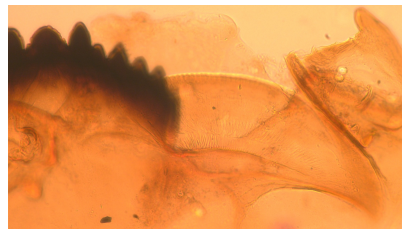
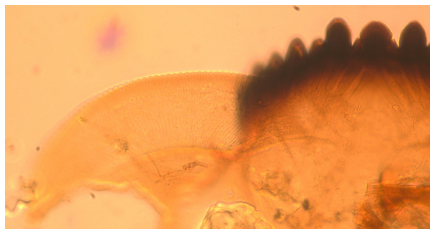
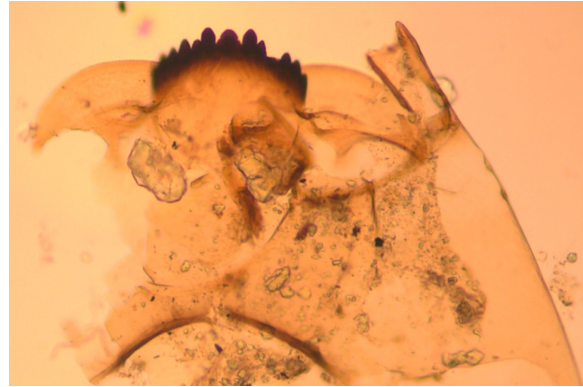
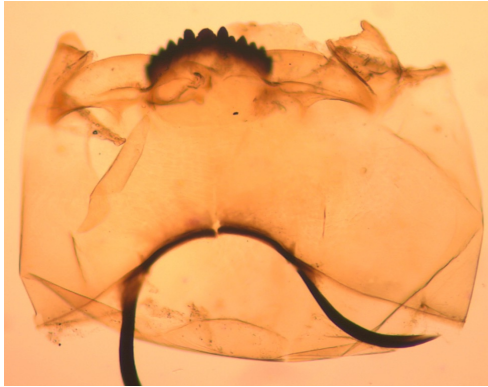
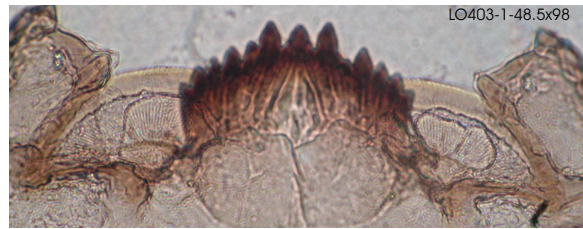
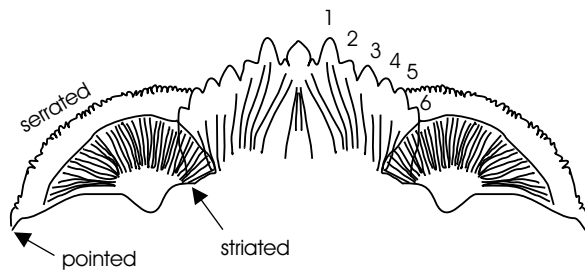
Similar in appearance to Northern Hemisphere *Stenochironomus*, which has 10 total teeth (4 medians and 3 laterals per side) (Brooks et al. 2007), Malaysian *Stenochironomus*, which also has 10 teeth (Cranston 2004), and East African *Stenochironomus* type Tanganyika *sensu* Eggermont and Verschuren (2004b).

Ecology:

Subfossil: Insufficient data.

Organism: One species, *H. pallidus*, known for New Zealand, freshwater, forested locations, wood feeder (Boothroyd and Forsyth 2007). *H. pallidus* larvae tunnel in superficial layers of soft, fungal-stained wood, dwelling generally within 2-4 mm of the wood surface, feeding on wood (Anderson 1982).

Lakes containing taxon: Not found in any Dieffenbacher-Krall et al. (2007) sites. Single specimen found in Harris (recounted Woodward and Shulmeister 2006). Found in core samples from Lake Monowai by Schakau (1993).



Diagnostic characters:

Median diamond shaped, notched or trifold. 6 laterals, 1st quite tall, 2nd tending to be shorter than 3rd. VMPs with serrated margins, pointed at outer end, striated.

Similar taxa: *Chironomus* and *Cladopelma* have fine striations at base of VMP ("eyelashes"), and are the only other NZ types to have these. *Chironomus* VMP has smooth edge and median is more prominently trifold.

Ecology:

Subfossil: Insufficient data. Occur in only 2 of our sites.

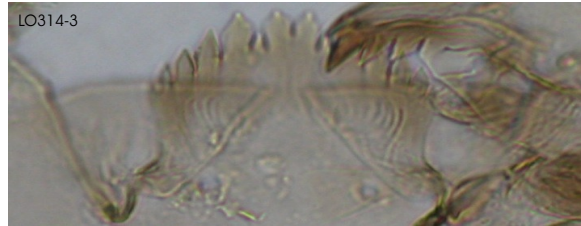
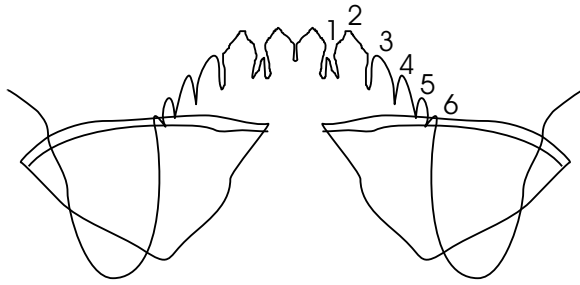
Organism: One species in New Zealand, *K. opalensis*, (Boothroyd and Forsyth 2007) occurs on wood and among roots of *Juncus* in ponds and lakes (Stark and Winterbourn 2000). Found throughout NZ (Boothroyd, unpub.).

Forsyth (1975): Larvae of *K. opalensis* in Opal Lake were found in cracks and crevices in submerged branches of fallen manuka scrub (*Leptospermum scoparium*) lying in water < 1m deep near the edge of the lake. No larvae were found in the Opal Lake mud. Larvae were collected from mud in a stock pond in Northland among the roots of *Juncus* in water about 0.1 m deep.

Found by Forsyth (1983) in geothermal waters with pH as low as 4.3 and temperature up to 25°C.

Taxonomic references: Forsyth 1975

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 403, 406.



Diagnostic characters:

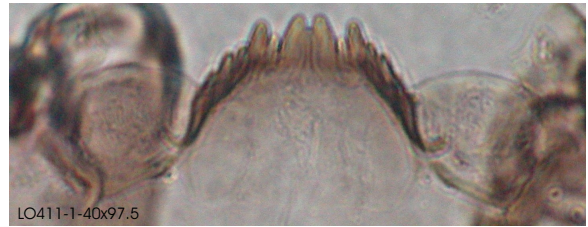
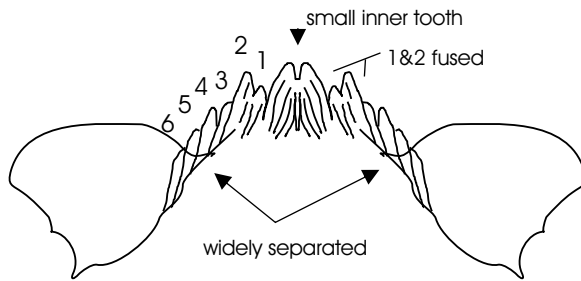
Tall double median, 6 laterals. 1st lateral is tiny, 2 nearly as tall as medians, 2-6 graduate downward in size. VMP long, strongly triangular, not widely separated.

Similar taxa: *Polypedilum* is quite similar but has 7 laterals, 3rd lateral is much taller than 4th, laterals 4-6 nearly uniform in size, VMP is more rounded than that of *Lauterborniella*.

Ecology:

Subfossil: Insufficient data.

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 208, 320, 321.



Diagnostic characters:

Median trident but may appear as bifid because middle tooth is very tiny and depressed. 6 laterals, 1st and 2nd fused with 1st being narrower and lower than 2nd (mitten). VMP separated by $\frac{1}{2}$ width of mentum, narrow and strongly curved.

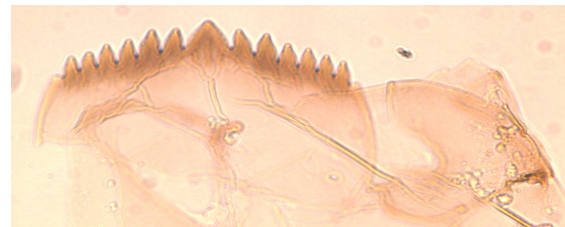
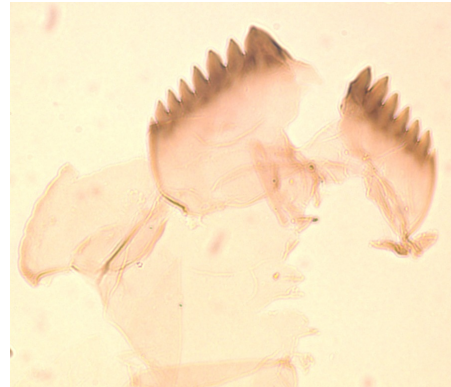
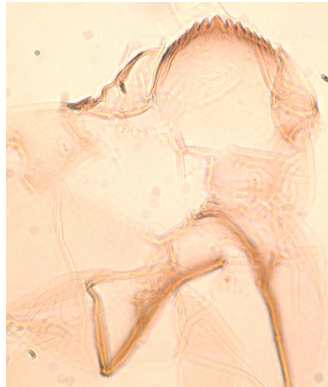
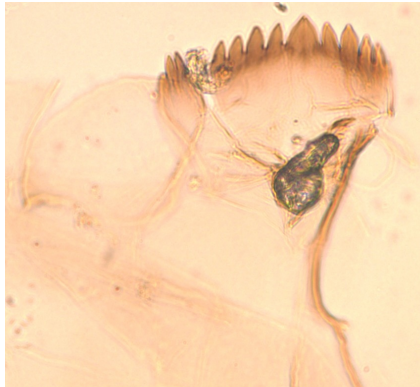
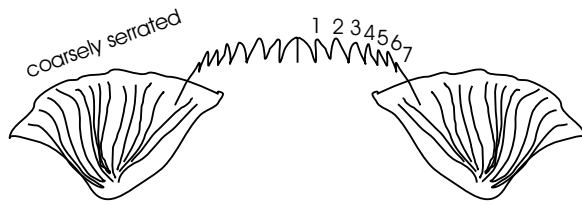
Similar taxa: *Paucispinigera* has 7 laterals, and two tiny median teeth between taller 1st laterals. Our *Microtendipes* may simply be poorly preserved *Paucispinigera* with the middle teeth too insignificant to be visible.

Ecology:

Subfossil: Insufficient data.

Organism: A single larva collected from Blue Lake, Tongariro appears to be *Microtendipes* (Winterbourne et al. 2000). Genus not definitive for New Zealand (Boothroyd and Forsyth 2007).

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 320, 410.



Diagnostic characters:

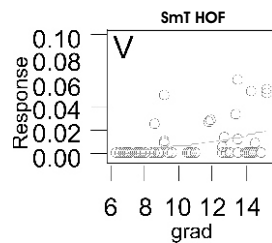
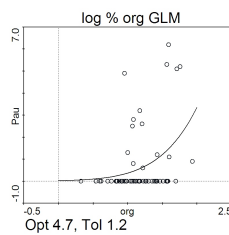
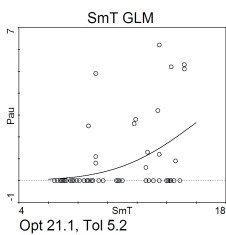
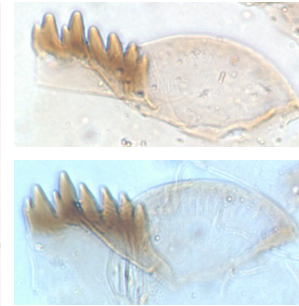
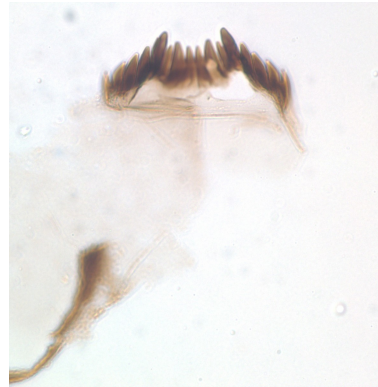
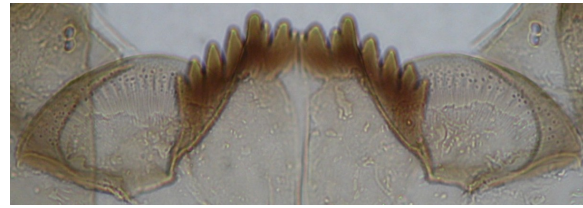
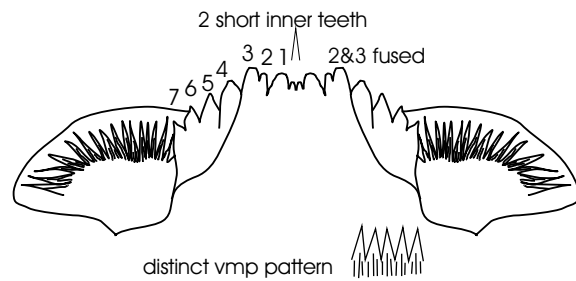
Single median often appears notched, 7 laterals, with lateral 7 sometimes tiny. VMPs have coarsely serrated edge and recurved striations. Striations may appear “eyelash”-like but are fewer than on *Chironomus* or *Cladopelma*.

Ecology:

Subfossil: Insufficient data. Just a few individuals found.

Organism: One species, *P. cylindricus*, freshwater (Boothroyd and Forsyth 2007). Larvae are uncommon, occurring in lakes throughout NZ (Stark and Winterbourn 2006, Boothroyd unpub.).

Lakes containing taxon: Dieffenbacher-Krall et al. (2007) sites 205, 207, 212, 406, 501. Woodward and Shulmeister (2006) recounted sites Sylvan and Howden.



Diagnostic characters:

Tiny double medians, 7 laterals. 3rd laterals tallest, 2nds small and fused to 3rds. Laterals 3-7 graduate downward in size. Striated VMPs. In half heads, which are common, tiny median and lateral 1, and fused laterals 2 and 3 have the appearance of 2 mittens.

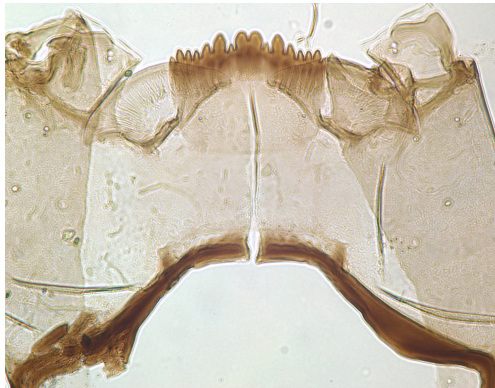
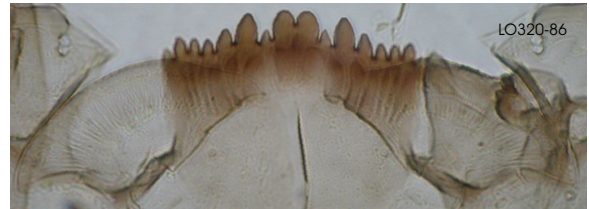
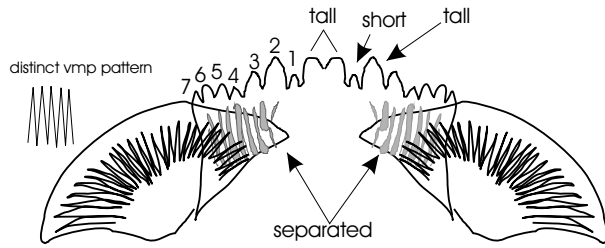
Similar taxa: *Microtendipes* has 6 laterals, and only one or no tiny teeth between tall medians. Partial *Paucispinigera* heads may appear like *Polypedilum*, especially if the medians are not visible. But *Polypedilum* laterals 4-6 do not graduate downward in size.

Ecology:

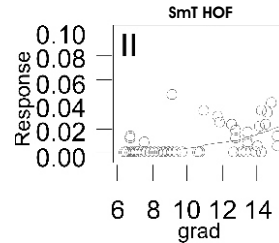
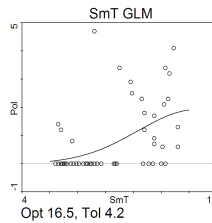
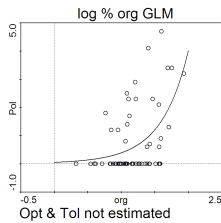
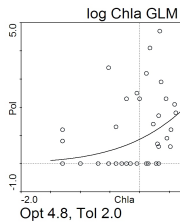
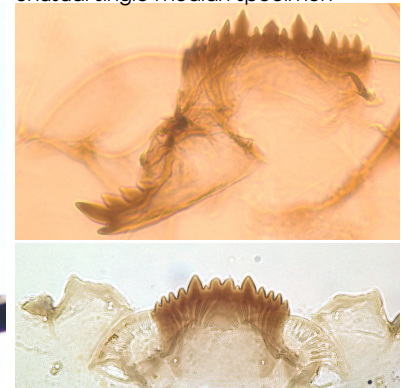
Subfossil: Found in greatest abundance in sites with relatively high sediment organic content.

Organism: Two species known for New Zealand, the endemic *P. approximata*, from forested, freshwater locations (Boothroyd and Forsyth 2007), and an undescribed species with a minute middle and 2nd lateral (Winterborne et al. 2000). *P. approximata* inhabits beech forest streams and some lakes, especially those with beech-derived substrates (Winterbourne et al. 2000). Throughout NZ, often in association with beech forest or peat derived streams, and some lakes. May be associated with springs and seepages (Boothroyd unpub.).

Lakes containing taxon: Found in 20 Dieffenbacher-Krall et al. (2007) sites, and Woodward and Shulmeister (2006) recounted sites Little Sylvester, Sylvan, Harris, Gertrude Saddle/Black, Howden.



Unusual single median specimen



Diagnostic characters:

Double median, 7 laterals. 1st laterals tiny, 2nd nearly as tall as medians, laterals 4-6 uniform in size with 6 sometimes being taller than 4 and 5. Mentum is broadly banded. VMPs separated, strongly striated. Head color generally pale. Thick post occipital margin.

Similar taxa: Partial *Paucispinigera* heads may appear like *Polypedilum*, but *Paucispinigera* laterals 4-6 graduate downward in size.

Ecology:

Subfossil: Occur in greatest abundance in sites with high sediment organic content, in the warmer half of our range (Dieffenbacher-Krall et al. 2007). Woodward and Shulmeister (2006) describe as characteristic of warm temperatures (mean February temperature >13°C), tolerant of a wide range of Chla and common in eutrophic lakes, but distribution is more closely related to temperature.

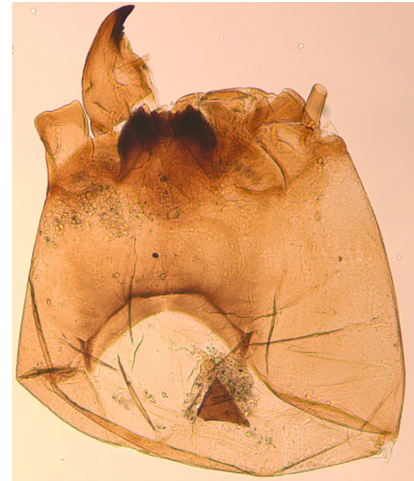
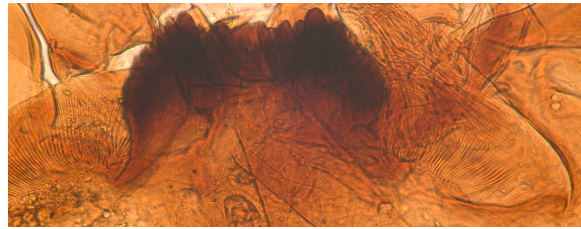
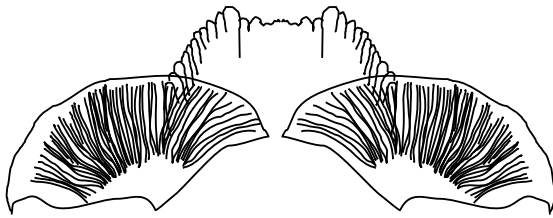
Organism: Ten species and possibly one additional unnamed species known from New Zealand, all freshwater (Boothroyd and Forsyth 2007).

Winterbourne et al. (2000): Larvae occur in wide range of freshwater habitats. *P. pavidum* is common in littoral of eutrophic lakes and some oxidation ponds. *P. opimum* and *P. harrisi* inhabit small streams and seepages. *P. luteum* probably occurs in running waters. *P. canum* has been collected from small, beech forest streams.

P. cumberi larvae are found in shallow, stagnant or slow moving waters (Forsyth 1971).

Boubee (1983) noted *P. spp.* were found mainly on inorganic shores of nutrient enriched lakes. Larvae form short tubes of sand and detritus, protruding a short distance above the substrate surface. The larvae observed by Boubee (1983) sometimes protruded from the tube and fed on a silk net laid at the entrance or on the tube walls. Larvae also ate materials accumulating on tube wall, or net built within the tube, and sometimes the entire tube. Feed on planktonic algae, diatoms, inorganic particles, and detritus.

Lakes containing taxon: 32 sites of Dieffenbacher-Krall et al. (2007). Woodward and Shulmeister (2006) recounted sites Howden, Sylvan, Alta, Emma, Little Sylvester, Iron, Sedgemere.

**Diagnostic characters:**

5-8 median teeth in a nearly straight line, 8 (11?) pairs of laterals, 1st laterals small, laterals 2-8 (11?) in descending size. Teeth of smaller larvae variable in number and disposition. VMP slightly wider than mentum, separated medially.

Ecology:

Subfossil: No data.

Organism: One species known in New Zealand, *X. canterburyensis* (Boothroyd and Forsyth 2007). Possible second species found in the Waikato River (Boothroyd unpub.).

Forsyth (1979): *X. canterburyensis* larvae and pupae are obligate, inquiline commensals of the freshwater mussel *Hyridella menziesi*, an inhabitant of the littoral zone of some NZ lakes. Larvae live between the mantle and valve of a mussel until they reach late 3rd or early 4th instar. Older larvae and pupae dwell beside the inhalant siphon at the valve margin. One generation per year. Larvae depend on spring growth of the host for pupation and emergence.

Forsyth and McCallum (1978) observations from Lake Taupo: 1st and 2nd instar enter the mussel valve in midsummer, migrate by early winter as 3rd instar larvae to the posterior end of the valve, and lodge near the margin beside the inhalant siphon. Spring growth of the mussel leaves the 4th instar outside the valve cavity in the inhalant siphon groove, where there is only room for a single larva. No larvae were found in open water, in sediment, or on macrophytes, and no more than 1 live larva was found per mussel valve. All valves had an average of 25 dead 1st and 2nd instar larvae buried in the nacreous layer of the shell. Larva guts contained mainly cells from the mantle epithelium, mucus, and fine detritus. 4th instar gut contained mainly epiphytic diatoms. Larvae within the mussel were lethargic, which Forsyth and McCallum (1978) speculated would make them less likely to cause irritation to the mussel, therefore less subject to burial in the nacre of the shell.

Taxonomic references: See Forsyth (1979) for instar changes and mentum variations.

Lakes containing taxon: Camp (Woodward and Shulmeister 2006), but not in any Dieffenbacher-Krall et al. (2007) sites.