field; the individual records are given under each species. I also desire to thank Mr. W. C. Davies, Curator of the Cawthron Institute, for the photograph from which Plate 19 has been prepared.

Family RHYACOPHILIDAE.

Up to the present only two genera of this family have been found in New Zealand—viz., *Hydrobiosis* McL. and *Psilochorema* McL. The former of these is also recorded from Queensland, but the latter is peculiar to New Zealand.* Five new genera are here proposed to be added for the reception of seven new species. The family is a difficult one to study, and in order to facilitate such study I give herewith figures of the wing-venation and a dichotomic key to the seven New Zealand genera:—

KEY TO THE NEW ZEALAND GENERA OF THE FAMILY RHYACOPHILIDAE.

1. Forewing with the branches of M normally developed 2
   Forewing with M_2 and M_3 fused basally for some distance, so that an apparent apical fork is formed distally between them .. .. Genus NEUROCHOREMA n. g., ♂♂.
2. Forewing with the radial cell present, closed distally by a cross-vein; not symmetrically pointed at apex 3
   Forewing with the radial cell absent, and the apex symmetrically pointed Genus TIPHOBIOSIS n. g.
3. Radial cell of forewing not followed distad by a second small closed cell .. 4
   Radial cell of forewing with a second small closed cell attached to it distad, enclosing the wing-spot 7
4. Forewing with both Af_1 and Af_2 sessile on the radial cell 5
   Forewing with either Af_1 or Af_2 or both stalked from the radial cell .. 6
5. Cu_2 in forewing ends at about level of beginning of pterostigma, well beyond 1A; 2A long; fork of Cu_1 not dichotomic, attached basally to Cu_2 by a cross-vein .. .. .. Genus HYDROCHOREMA n. g.
   Cu_2 in forewing ends by a strong curve at same point as 1A, half-way along the wing; 2A very short; fork of Cu_1 dichotomic, very long, not connected with Cu_2 .. .. Genus HYDROBIOSELLA n. g.
6. Forewing with Af_1 sessile on the radial cell, Af_2 stalked Genus HYDROBIOSIS McL.
   Forewing with Af_1 stalked, Af_2 sessile on the radial cell .. .. Genus NEUROCHOREMA n. g., ♀♀.
7. The small cell distad from the radial cell in forewing is closed distally by fusion of R_4 and R_5; veins of the distal part of the forewing neither close together nor parallel .. .. Genus SYNCHOREMA n. g.
   The small cell distad from radial cell in forewing is closed distally by a cross-vein; veins of the distal part of the forewing close together and parallel .. .. Genus PSILOCHOREMA McL.

Genus HYDROBIOSIS McL. (Text-fig. 1.)

McLachlan, *Journ. Linn. Soc. London*, 1871, x, p. 206.

This genus can at once be recognized by the large pterostigma, with R_1 and sometimes even R_2 running through it; the presence of a closed radial cell in the forewing only, with Af_1 sessile upon it but Af_2 well stalked; the absence of the median cell in both wings; the long Af_2 in the hind-wing, with short stalk, and the very long 2A in the forewing. Text-fig. 1 shows these characters clearly.

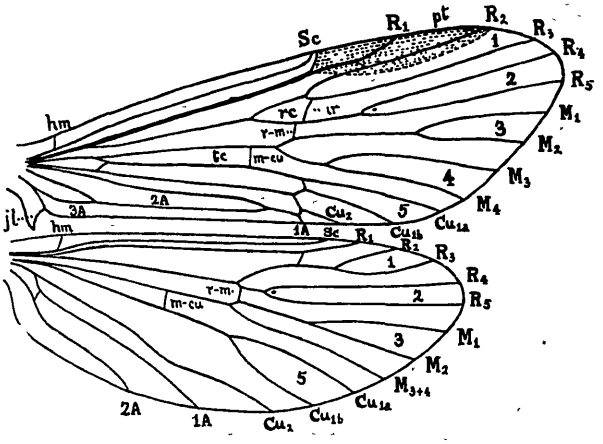
A peculiar character of the genus, not previously noticed, is that the labial palpi appear to be four-segmented, owing to the mentum being very

* *Ps. (?) aculeatum* Blanchard is a Chilian insect doubtfully referred to this genus.

strongly bifid. The same character is to be found in *Tiphobiosis* n. g., and is possibly present in other related genera also.

Genotype.—*Hydrobiosis frater* McL. (New Zealand.)

Four species of this genus are known—viz., *H. frater* McL., *H. umbripennis* McL., *H. ingenua* Hare, and *H. stigma* Ulmer; the first three of these occur in New Zealand only, the fourth in Queensland. The description of *H. ingenua* given by Hare mentions neither the venation nor the form of the male appendages, so that the species is quite unrecognizable



TEXT-FIG. 1.—*Hydrobiosis umbripennis* McL., ♂. Wing-venation.
(For lettering see p. 314.)

except by examination of the type. I have seen specimens in Mr. G. V. Hudson's collection determined by Mr. Hare as *Hydrobiosis occulta* Hare (a species which he described at the same time as *H. ingenua*), and they undoubtedly belong to the genus *Hydropsyche;* so I omit the species *occulta* Hare from the list of known species of *Hydrobiosis*, and remove it to *Hydropsyche.* Whether *H. ingenua* Hare really belongs to *Hydrobiosis* or not I am unable to say.

Genus PSILOCHOREMA McL. (Text-fig. 2.)

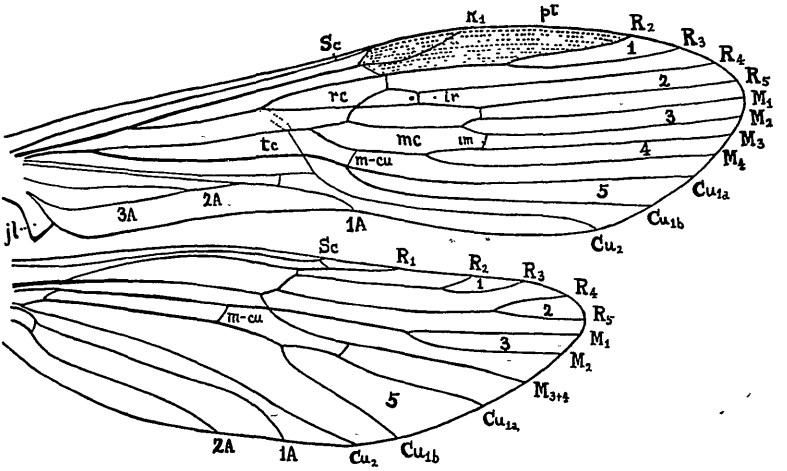
McLachlan, *Trans. Entom. Soc. London*, 1866, ser. 3, v, p. 273.

A very remarkable genus, recognizable at once by the closely parallel arrangement of the veins in the distal part of the forewing; by the peculiar shape of the forewing, which has the costal and posterior margins parallel for the basal half, but the apical half of the wing is dilated by the outward curving of the posterior margin from the end of 1A to the apex; by the very elongated pterostigma of the forewing, and by the presence of an extra small closed cell placed distally from the radial cell in the forewing, between R_4 and R_5, and closed distally by a short cross-vein. These characters are clearly shown in text-fig. 2.

It should be noted that McLachlan, in his diagnosis of this genus, states that five apical forks are present in both the forewing and the hindwing. This is an error, Af_4 being absent in the hindwing, as is all known Trichoptera.

Genotype.—Psilochorema mimicum McL.

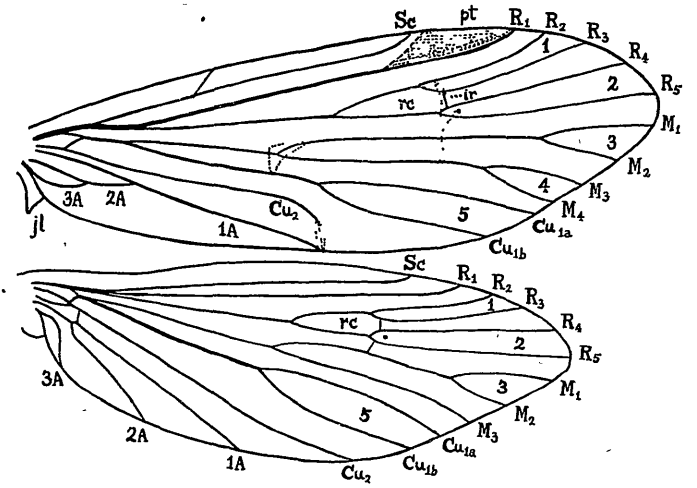
Only two species are known, *Ps. mimicum* McL. and *Ps. confusum* McL., both confined to New Zealand.



TEXT-FIG. 2.—*Psilochorema confusum* McL., ♀. Wing-venation. (For lettering see p. 314.) A small hyaline area is enclosed by the dotted lines in forewing.

Genus HYDROBIOSELLA n. g. (Text-fig. 3.)

Allied to *Hydrobiosis* McL., but easily distinguished from it by the following characters: A closed radial cell present in both wings, with Af_1 and Af_2 sessile upon it. In the forewing, the humeral veinlet is replaced



TEXT-FIG. 3.—*Hydrobiosella stenocerca* n. g. and sp., ♂. Wing-venation. (For lettering see p. 314.) The dotted lines in forewing indicate the positions of small hyaline areas.

by an oblique veinlet situated nearly half-way along Sc. Median cell absent in both wings; Af_3 and Af_4 in forewing, and Af_3 in hindwing, all short forks with very long stalks. The cubital fork, Af_5, long and strongly

formed in both wings, and of normal dichotomic shape in forewing and not connected with Cu_2 by a cross-vein. Anal veins in forewing looped up into the typical short double Y-vein found in so many Trichoptera, 2A not being lengthened as in *Hydrobiosis*. Pterostigma short in both wings. Tibial spurs 2, 4, 4, as also in all the New Zealand genera of this family.

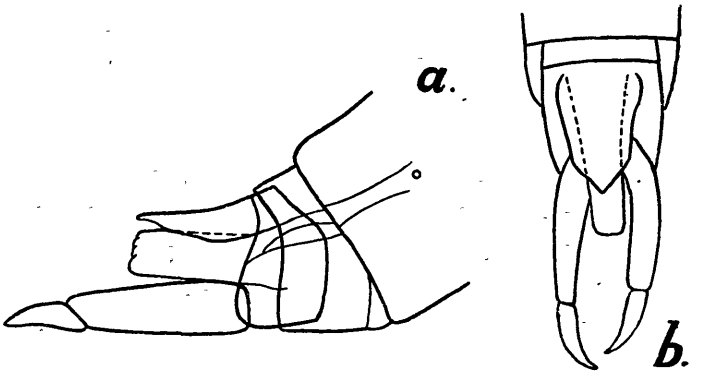
Genotype.—Hydrobiosella stenocerca n. sp. (New Zealand.)

Hydrobiosella stenocerca n. sp. (Plate 19, figs. 1, 2, and text-figs. 3, 4.)

Total length, 4–5·5 mm.; forewing, 7–9 mm.; expanse, 15–19 mm.

Head.—Eyes greyish-black. Vertex with a strong tuft of yellowish hairs extending between bases of antennae. Antennae somewhat shorter than forewing, yellowish-brown, strongly annulated with dark brown; the basal segment with a tuft of dark hairs above it. Maxillary palpi brownish, with the bases of segment 3–4 yellowish-brown. Labial palpi long and very slender, dull-brownish.

Thorax fuscous, marked with brown; pronotum with stiff, dark hairs, and sometimes also with some yellowish hairs like those on the vertex. Legs testaceous, the tarsi slightly darkened basally.



TEXT-FIG. 4.—*Hydrobiosella stenocerca* n. g. and sp., ♂. Appendages (× 40). *a*, lateral view; *b*, dorsal view. Note the long, narrow, two-segmented gonapophyses. (10 per cent. KOH preparation.)

Wings.—Forewing irregularly mottled with medium fuscous and yellowish-brown, showing several more or less conspicuous blotches of the darker colour, notably one across Cu_1 somewhat before middle of wing, and a larger oblique and somewhat curved one arising about middle of posterior margin and running upwards and outwards over base of cubital fork on to M_{3+4}. Costal and apical margins always more or less spotted with alternate fuscous and yellowish-brown patches, and pterostigma irregularly marked with both these colours. All the markings very variable; some specimens, usually those of larger size, being very boldly and beautifully marked, while others, usually of smaller size, have the markings more or less obliterated, and appear much less variegated in colour. Hindwing semi-hyaline, pale fuscous, slightly darker distally than basally, somewhat iridescent along main veins, and sometimes with slight mottling like that of forewing around apical margin.

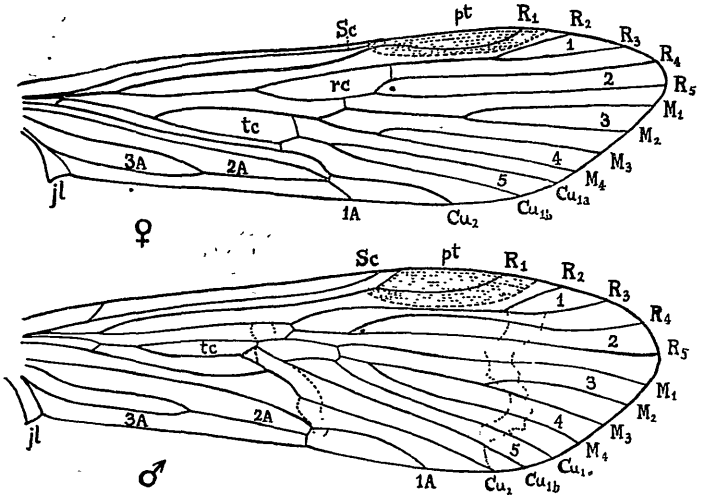
Abdomen dark fuscous, including appendages of male, of which a preparation in 10 per cent. KOH solution is shown in text-fig. 4; they are remarkable for their elongate, narrow form. In the dried insect the two gonapophyses often appear closely contiguous, almost as if fused together in the middle line. In the female the last segments of the abdomen are drawn out into a slender ovipositor about 2 mm. long, carrying at its extremity two minute ear-like appendages.

Types.—Holotype male (expanse 17·5 mm.) from Gouland Downs (7th February, 1922, R. J. T.); allotype female (expanse 15·5 mm.) from Nelson (29th December, 1920, A. Philpott); and series of males from Nelson, Dun Mountain, Mount Arthur, and Gouland Downs: all in Cawthron Institute collection. The holotype male is selected for the boldness of its markings, and is shown in Plate 19, fig. 1.

Habitat.—Fast-running streams throughout the Nelson district as far as Collingwood and Gouland Downs; also around Wellington, though apparently not so common; and occasionally in Canterbury. This species is readily attracted to light, and is a very rapid runner, dashing about wildly when captured.

Genus Neurochorema n. g. (Text-figs. 5, 6.)

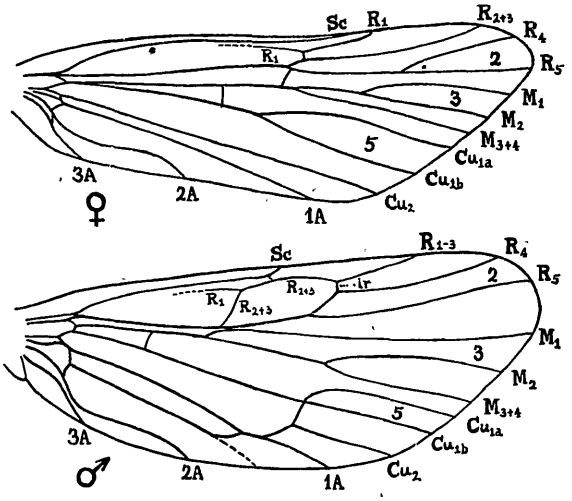
A very distinct genus, differing from all the other New Zealand representatives of the family by the great dissimilarity in the venation of the wings in the two sexes, and also by the absence of the first apical fork, and



Text-fig. 5.—*Neurochorema decussatum* n. g. and sp. Venation of forewing of female (above) and male (below). (For lettering see p. 314.) Note the fusion of M_2 and M_3 basally in the male. In the male the dotted lines indicate enclosed hyaline areas.

the incompleteness of R_1 basally, in the hindwing. Wings considerably broader in male than in female; in the latter, Sc, at about half-way in both wings, approaches very close to the costal border, and runs in contact with it from there on to its termination. Pterostigma of forewing very

large, with R_1 running through it. In both sexes, forewing has all five apical forks present, but hindwing has only Af_2, Af_3, and Af_5. The correct naming of the veins in the male is only possible by comparison with those of the female, when it will at once be seen that, in the forewing, M_2 and M_3 have partially coalesced in the male, so as to produce an *apparent* fork between them distally, whereas the true apical forks, Af_3 and Af_4, lie one above and one below this apparent fork respectively. The branches of the cubitus and the end of 1A are also abnormally developed in the male, and 1A takes much the same position distally that Cu_2 does in the female, as can be seen from text-fig. 5. In the hindwing the male shows very high



TEXT-FIG. 6.—*Neurochorema decussatum* n. g. and sp. Venation of hindwing of female (above) and male (below). (For lettering see p. 314.) Note the closed cell in the radial area of the male, with the incomplete stem of R_1 attached to it above, also the basal fusion of M_2 with M_{3+4}, and the peculiar structure of the cubitus and 1A.

specializations, a wide closed cell being formed below the distal end of Sc; this cell is bounded by R_{2+3} basally, R_{1-3} above, R_{4+5} below, and by a cross-vein distally. M_2 has become fused basally with M_{3+4} in the same manner as with M_3 in forewing. Cu_2 has become bent and fused for a short distance with 1A, which is also bent, and there is a strong cross-vein connecting Cu_2 with the fork of Cu_1. Text-fig. 6 shows how much more highly specialized the hindwing of the male has become in comparison with that of the female. Tibial spurs, 2, 4, 4. Abdomen of female not produced into an elongated ovipositor.

Genotype.—Neurochorema decussatum n. sp. (New Zealand.)

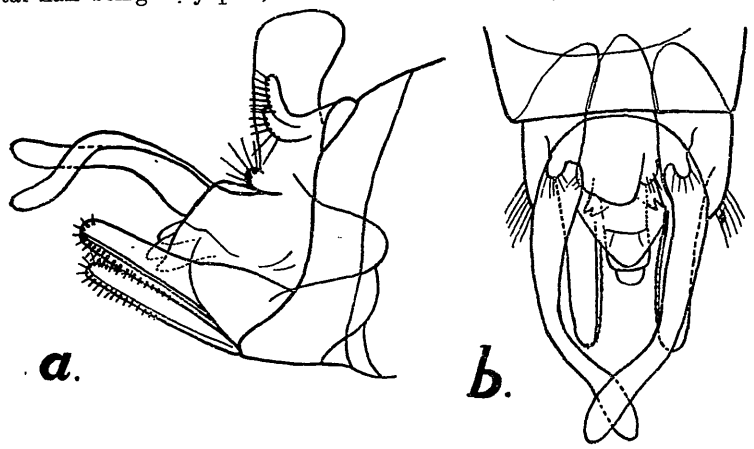
Neurochorema decussatum n. sp. (Plate 19, figs. 3, 4; text-figs. 5–7.)

Total length, ♂ 5 mm., ♀ 5·5 mm.; forewing, ♂ 8 mm., ♀ 8·5 mm.; expanse, ♂ 17 mm., ♀ 18 mm.

Head dark brown, with pale hairs; eyes brown; antennae brown, the basal segment swollen; palpi fuscous.

Thorax very dark brown, with pale hairs on prothorax. Legs pale testaceous.

Wings.—Forewing semitransparent yellowish-brown, with darker brown pterostigma; male with a clearly marked whitish band crossing wing obliquely from about middle of R_1 outwards and downwards to point of junction of 1A and 2A, and most strongly visible in cubital region, where veins are bent to run alongside it, and with a less clearly marked pale zigzag fascia descending from distal end of pterostigma across wing to end of Cu_2; these markings are present in female also, but much less conspicuously. In male, the costa carries a series of black hairs, especially noticeable towards pterostigma, but these are absent in female. In both sexes there is a strongly marked patch of dark hairs at junction of 3A with 2A. Numerous short upright hairs are present on wing, those in distal half being very pale, those on basal half being pale also in female,



TEXT-FIG. 7.—*Neurochorema decussatum* n. g. and sp., ♂. Appendages (× 50). *a*, lateral view; *b*, dorsal view. Note the crossed pre-anals. (10 per cent. KOH preparation.)

but pale mixed with dark hairs in male, especially along Cu and its branches, where there are numerous dark hairs. Hindwing hyaline, iridescent, with pale yellowish-brown hairs distally, and pale fringe of same colour.

Types.—Holotype male (Nelson, 5th October, 1920, A. Philpott), allotype female (20th October, 1920, A. Philpott), and series of five paratype males, taken October to November, 1920, by Mr. Philpott, at Nelson: all in Cawthron Institute collection.

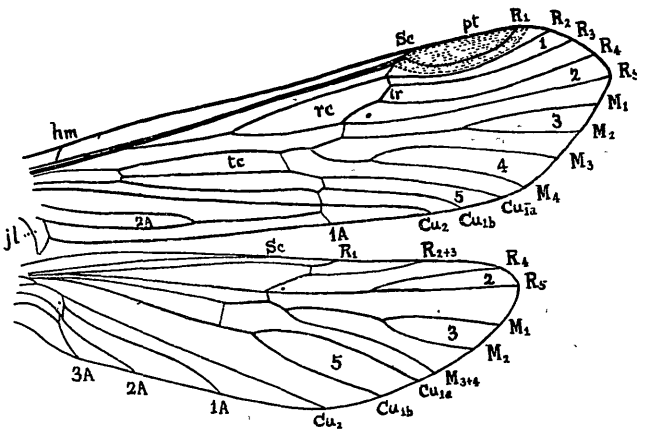
Habitat.—South Island of New Zealand, especially around Nelson. Other localities are Cass, Canterbury, and also around Invercargill. Probably widely distributed.

Abdomen blackish; appendages of male yellowish-brown, pre-anals crossed as shown in text-fig. 7; in the dried insect they sometimes appear evenly more strongly crossed.

Genus HYDROCHOREMA n. g. (Text-fig. 8.)

Allied to both *Hydrobiosis* and *Hydrobiosella*, but differing from both of them in the absence of Af_1 in the hindwing, R_{2+3} being a simple vein without a terminal fork. It resembles *Hydrobiosella* in having both Af_1 and Af_2 of forewing sessile upon the closed radial cell, whereas *Hydro-*

biosis has Af_1 sessile but Af_2 stalked. It also resemble *Hydrobiosis* in the form of the two median forks, Af_4 being a very long fork with short stalk, Af_3 a somwhat shorter fork with stalk about as long as the fork itself; in *Hydrobiosella* these two forks are both short terminal forks with very long stalks. The structure of the cubitus in the forewing is very similar to that in *Hydrobiosis*—*i.e.*, considerably more specialized than in *Hydrobiosella*, where the large fork of Cu_1 is free and of primitive dichotomic form. Anal area of forewing with both 2A and 3A well developed, the former joining 1A at the bend of Cu_2 just below point where Cu_1 forks, and the latter extending a little beyond half-way from base to this point. Pterostigma of forewing well developed, with R_1 running through it as a loop. Sc running alongside or fused with R_1 in forewing, separate from it in hindwing, but very short, ending up before half-way along costa. Hindwing with Af_2 apparently forked, but position of wing-spot, placed apparently in angle between R_{2+3} and R_{4+5} at their origins, would



TEXT-FIG. 8.—*Hydrochorema crassicaudatum* n. g. and sp., ♂. Wing-venation.
(For lettering see p. 314.)

appear to indicate that there has been a suppression of the extra cell to be described in next genus; in this case the genus *Hydrochorema* would show a more highly evolved state of the radial sector in hindwing than does *Synchorema*, though the same region remains more primitive in forewing. General shape of wings rather long and slender, the forewing gradually widening from base outwards to end of pterostigma, and then narrowing quickly to form a bluntly-pointed apex on R_5. Hindwing with apex at R_5, but practically in line with costa. Tibial spurs, 2, 4, 4. Male with long, forcipate gonapophyses.

Genotype.—*Hydrochorema crassicaudatum* n. sp. (New Zealand.)

Hydrochorema crassicaudatum n. sp. (Plate 19, fig. 5; text-figs. 8, 9 *b*, 10 *a*.)

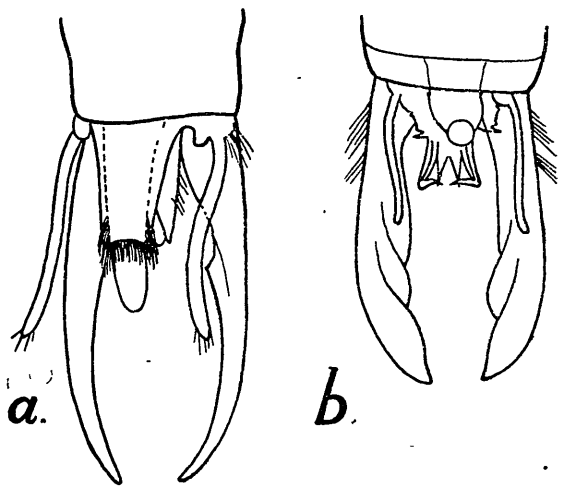
♂. Total length, 4 mm.; forewing, 6·7 mm; expanse, 14 mm.

Head brown, very hairy; eyes dark brown; antennae nearly as long as forewing, medium brown, with tuft of dark hairs below bases; colour of antennae darkening towards tip, and all segments very lightly annulated with darker brown; maxillary and labial palpi dull-brownish.

Thorax very dark brown. Legs—femora medium testaceous; fore and hind tibiae dark brown, middle tibiae somewhat paler, very hairy; spurs testaceous; tarsi rather dark brown annulated with paler brown.

Wings.—Forewing a medium fuscous, covered with numerous raised hairs, some dark, some yellowish-brown; a strong fringe of blackish hairs along termen, longest at tornus; pterostigma 1·2 mm. long, strongly marked, dark fuscous; termen with row of pale golden-brown spots just indicated along margin, and similar row parallel to it from end of pterostigma to behind tornus; veins brown. Hindwing subhyaline, with brownish veins; membrane slightly infuscated apically; fringe of delicate brownish hairs.

Abdomen blackish, tenth tergite and pre-anal appendages dark, gonapophyses and penis semitransparent yellowish-brown. Sternites 8 and 9, with conspicuously projecting mid-ventral spines. Text-figs. 9 *b*, 10 *a*, show a preparation of the appendages in 10 per cent. KOH solution, seen from



TEXT-FIG. 9.—Dorsal views of male genital appendages in the genus *Hydrochorema* n. g. *a*, in *H. tenuicaudatum* n. sp.; *b*, in *H. crassicaudatum* n. sp. The large forceps in each case is formed by the two gonapophyses. (× 40.) (10 per cent. KOH preparation.)

above and laterally. In the dried specimen the very long, thickened forceps formed by the gonapophyses is the distinguishing mark of this species, and has suggested the specific name.

♀. Unknown.

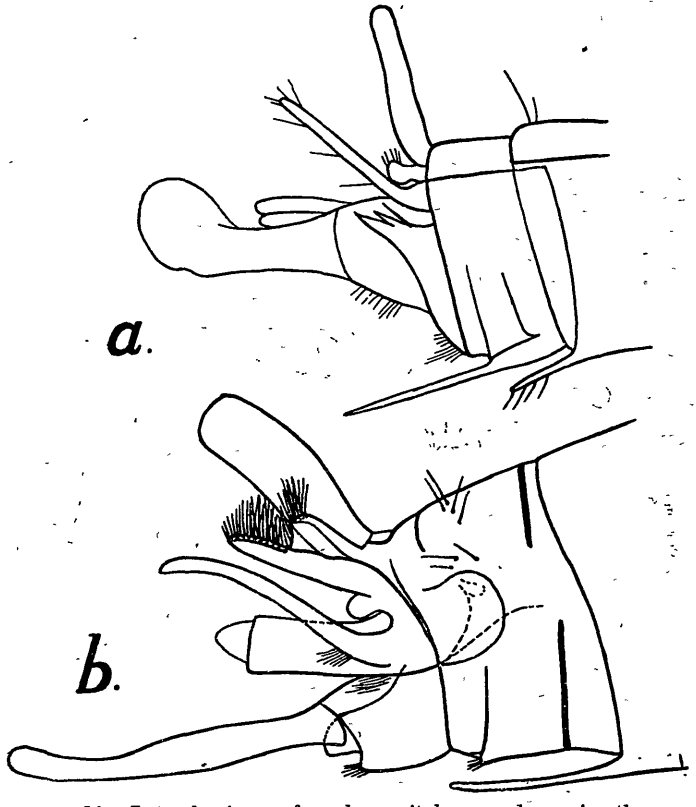
Types.—Holotype male, Nelson (15th December, 1921, A. Philpott); two other males, of larger size and more brownish coloration, expanding about 19–20 mm., one from Takaka (6th February, 1921, R. J. T.), and one from Rotorua, North Island (18th November, 1919, R. J. T.); this last specimen is rather rubbed and old, and has been used for the preparation of the appendages drawn in text-figs. 9 *b*, 10 *a*. All the above in Cawthron Institute collection.

Hydrochorema tenuicaudatum n. sp. (Plate 19, fig. 6; text-figs. 9 *a*, 10 *b*.)

♀. Total length, 6 mm.; forewing, 10·5 mm.; expanse, 22 mm.

Head, *thorax*, and *abdomen* blackish-brown; eyes dull-blackish; antennae about as long as forewing, brown, annulated with darker brown on every segment. Legs entirely pale testaceous.

Wings.—Forewing blackish-fuscous, with few very short upstanding yellowish-brown hairs; pterostigma not very distinct; termen with very distinct row of golden-brown spots and very short fringe of brownish hairs; a suggestion of parallel row of spots from end of stigma down to behind tornus, but due only to small groups of golden-brown hairs. Hindwing subhyaline, iridescent, with dark-brown veins and short fringe of brown hairs.



TEXT-FIG. 10.—Lateral views of male genital appendages in the genus *Hydrochorema* n. g. *a*, in *H. crassicaudatum* n. sp.; *b*, in *H. tenuicaudatum* n. sp. Note the upturned process of the tenth tergite above, the slender pre-anals, and the long gonapophyses. (10 per cent. KOH preparation.) (× 40.)

♂. Differs from female in being of somewhat smaller size and with somewhat narrower wings, the forewings very dark, almost black. Appendages as shown in text-figs. 9 *a*, 10 *b*; gonapophyses forming an elongated slender forceps, which is diagnostic of the species in the dried specimen. Only sternite 8 with a projecting spine.

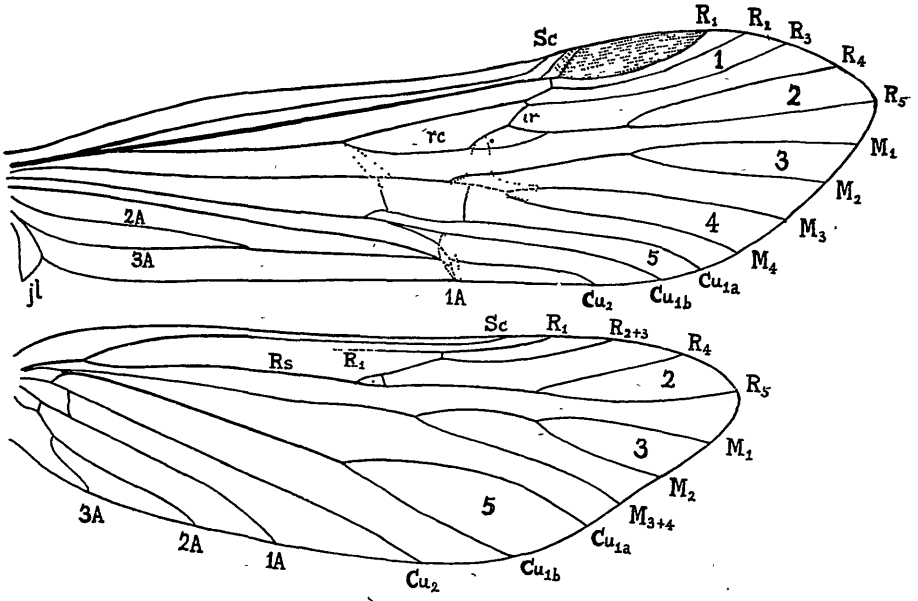
Types.—Holotype female and allotype male, Mount Arthur, 4,000 ft. (28th February, 1921), taken by Mr. A. Philpott; both in Cawthron Institute collection. Both specimens were in perfect condition, but the male has since been badly damaged by an accident, so the female has been made the holotype. The appendages of male have been cut off and treated with 10 per cent. KOH for preparation of text-figs. 9 *a*, 10 *b*.

Habitat.—Mount Arthur, Nelson Province, is the only locality for this insect, so far as known.

A female taken by myself on Ben Lomond, Queenstown (15th December, 1921), may possibly belong to this species, but is considerably smaller than the holotype, and with narrower wings.

Genus SYNCHOREMA n. g. (Text-fig. 11.)

Closely allied to *Hydrochorema* n. g., with which it agrees in the important characters of the general shape of wings, the absence of Af_1 in hindwing, and the general form of median and cubital apical forks, but differing



TEXT-FIG. 11.—*Synchorema zygoneura* n. g. and sp., ♂. Wing-venation. (For lettering see p. 314.) Note the formation of the extra small cell enclosing the wing-spot, owing to a partial fusion of R_4 and R_5. The dotted lines in forewing indicate the positions of small hyaline areas.

from it in the following important points: Hindwing with main stem of R_1 atrophied, but with Sc well developed, and running close to costa for three-fourths of its length. In both wings Af_2 appears to be stalked; but there is a small cell present, attached distally to radial cell in forewing, and occupying angle between R_{2+3} and R_{4+5} at their origins in hindwing, and inside this cell can be seen the wing-spot. This shows clearly that in both wings R_4 and R_5 have become secondarily fused together for a considerable distance, thus shortening the fork Af_2 and making it appear stalked, but leaving the wing-spot, which always occurs

in angle between R_4 and R_5, in secondary cell formed by this fusion. This formation is unique, so far as I know, in the order, but may profitably be compared with that found in forewing of *Psilochorema* (text-fig. 2), where a secondary cell has been formed by development of an extra cross-vein, so as to enclose within it the wing-spot as shown. In this latter case it will be noted that no fusion of R_4 with R_5 has taken place. Tibial spurs 2, 4, 4. Appendages of male very short.

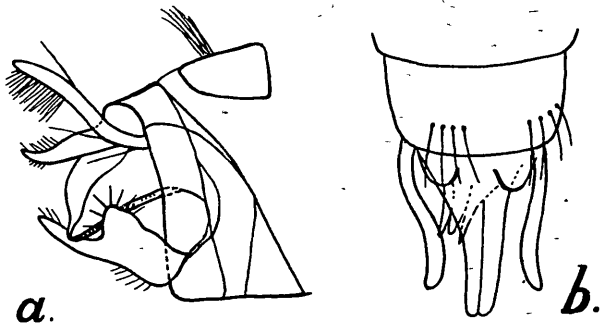
Genotype.—*Synchorema zygoneura* n. sp. (New Zealand.)

Synchorema zygoneura n. sp. (Plate 19, fig. 7; text-figs. 11, 12.)

♂. Total length, 4 mm.; forewing, 6·7 mm.; expanse, 14 mm.

Head, *thorax*, and *abdomen* brownish; eyes black; antennae and legs pale testaceous.

Wings.—Forewing semitransparent subfulvous, with numerous short upright golden-grown hairs; pterostigma darker, brownish; venation brownish; fringe of pale-brownish hairs of moderate length. Hindwing hyaline, iridescent, with a fringe of short dark-brown hairs very closely set above apex of wing, but with longer and paler hairs, less closely set, around termen and posterior margin; venation brown.



TEXT-FIG. 12.—*Synchorema zygoneura* n. g. and sp., ♂. Appendages (× 55). *a*, lateral view; *b*, dorsal view. (10 per cent. KOH preparation.)

Appendages very short, as shown in text-fig. 12; in the dried specimens they are sometimes scarcely to be discerned, except for the two slender and slightly clubbed pre-anal appendages.

Female closely resembling male, but larger (expanse, 16·5 mm.), and usually with forewings somewhat brighter in colour.

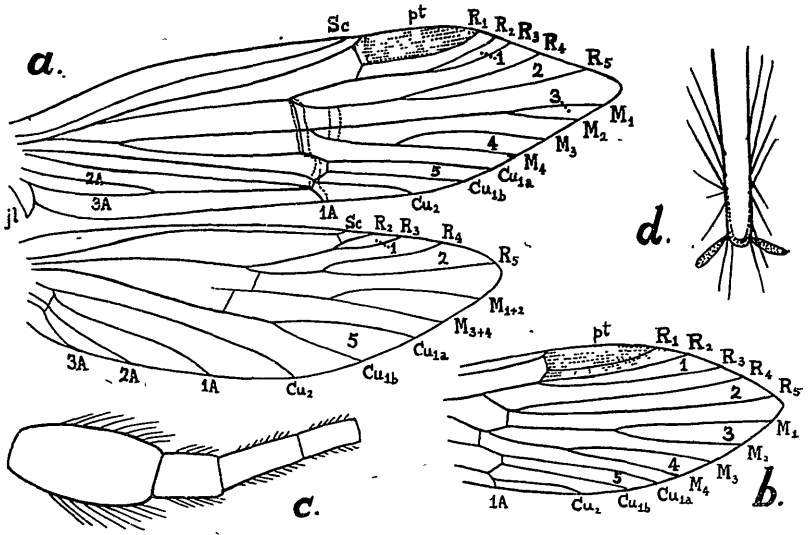
Types.—Holotype male, Mount Arthur, 4,500 ft. (23rd December, 1921, A. Philpott). Allotype female, Arthur's Pass, 2,800 ft. (19th January, 1920, R. J. T.). Also other males from Nelson (6th January, 1921, A. Philpott), Gouland Downs (7th February, 1922, R. J. T.), and females from Arthur's Pass (19th January, 1920, R. J. T.) and Queenstown (14th December, 1919, R. J. T.): all in Cawthron Institute collection. The Nelson specimen has been used for the 10 per cent. KOH preparation from which text-fig. 12 has been drawn. The Gouland Downs male and Queenstown female are slightly less subfulvous than the others, showing a distinct tinge of greyish.

Habitat.—South Island of New Zealand; rare.

This species closely resembles *Hydrochorema crassicaudatum* n. sp. in size and shape, but can be distinguished from it by its more fulvous forewings, its peculiar venation, and the very short anal appendages of the male.

Genus TIPHOBIOSIS n. g. (Text-fig. 13.)

Wings narrow, forewing with posterior margin parallel to costa, apex symmetrically pointed and lying between R_5 and M_1; hindwing also pointed, apex just below R_5. Forewing with all five apical forks present; hindwing with only 1, 2, and 5. Pterostigma strongly developed in forewing. No closed cells present in either wing, except only thyridial cell of forewing. Sc well developed in both wings, R_1 and basal part of M obsolescent in hindwing. Forewing with fork of Cu_1 of specialized form, very narrow; 2A meets 1A close to its end, and 3A meets 2A about half-way along its length. Tibial spurs 2, 4, 4, those of fore tibiae greatly



TEXT-FIG. 13.—Details of structure in the genus *Tiphobiosis* n. g. *a*, wing-venation of *Tiphobiosis montana* n. sp., ♂. *b*, distal half of forewing of *T. fulva* n. sp., ♀. *c*, first four segments of antenna of *T. montana* n. sp., ♂ (× 75). *d*, end of elongated ovipositor of female of *T. montana* n. sp., showing the two small, ear-like gonapophyses (× 75). In *a* the dotted lines in forewing indicate the position of the small hyaline areas. (For lettering of *a* and *b* see p. 314.)

reduced. Male with short gonapophyses but long pre-anal appendages and outgrowth of tenth tergite. Female with end segments of abdomen very long and narrow, forming an elongated ovipositor with the two minute ear-like gonapophyses at its extremity (text-fig. 13 *d*).

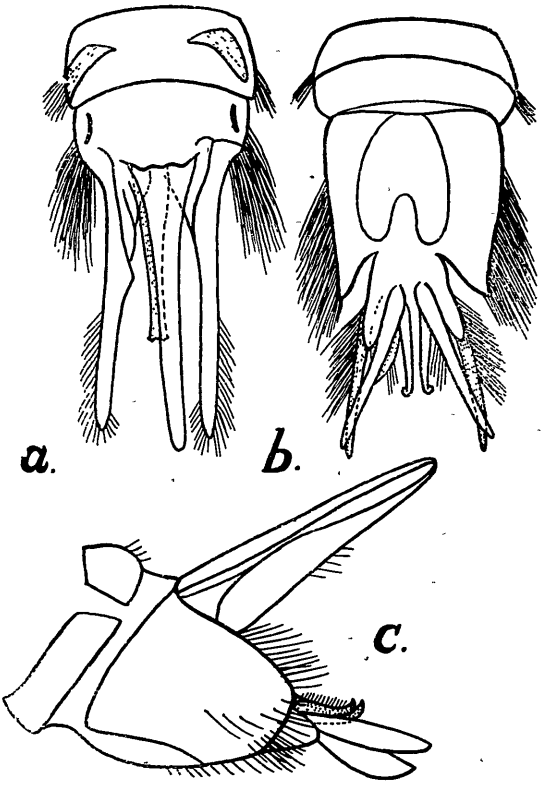
Genotype.—Tiphobiosis montana n. sp. (New Zealand.)

This peculiar genus is very distinct, but is probably related fairly closely to *Hydrochorema*, from which it differs in the shape of wings, absence of radial cell in forewing, presence of Af_1 and absence of Af_3 in hindwing, obsolescence of R_1 and basal portion of M in same wing, reduction of spurs in fore tibiae, remarkable form of male genitalia, and elongated ovipositor of female. It is represented by two very distinct species of subalpine caddis-flies, both confined, as far as is known, to the southern part of the South Island.

Tiphobiosis montana n. sp. (Plate 19, fig. 13 ; text-figs. 13, 14.)

♂. Total length, 3·5 mm. ; forewing, 5·2 mm. ; expanse, 11 mm.

Head, thorax, and *abdomen* dull-blackish ; eyes black ; vertex covered with pale-greyish hairs ; antennae nearly as long as forewing, dark brown, basal segment swollen, two and a half times as long as second segment (text-fig. 13 *c*), the third longer and narrower than second ; last segment of maxillary palpi a little longer than fourth. Legs—coxae and femora dark-brownish, tibiae and tarsi medium testaceous.



TEXT-FIG. 14.—*Tiphobiosis montana* n. g. and sp., ♂. Appendages (× 50). *a*, dorsal view ; *b*, ventral view ; and *c*, lateral view. Note the long process of the tenth tergite, and the lengthening of the ninth sternite. (10 per cent. KOH preparation.)

Wings.—Forewing pale testaceous, with numerous upstanding hairs of a pale-golden colour, giving the wing a slight tinge of yellowish ; costal and posterior margins a little darker than rest ; pterostigma 1 mm. long, darkened. From fork of Rs a cross-vein descends on to M exactly above thyridial cross-vein ; a pale subhyaline space encloses these cross-veins, and another similar space occurs a little distad from from it. Hindwing subhyaline, slightly infuscated, with two cross-veins corresponding with the two mentioned above for forewing, but not quite in line with one another. Ninth sternite greatly elongated. Appendages of very remarkable

form, as shown in text-fig. 14; the process of tenth tergite and pre-anal appendages long and slender, penis shorter, with bifid apex, gonapophysis short.

♀. Very similar to male, but differing from it in the slightly darker, more fuscous forewings, and in having the abdomen produced into a semitransparent brownish ovipositor, 1·5 mm. long, carrying a number of stiff bristles directed both forward and backwards; gonapophyses ear-like, minute, 0·07 mm. long.

Types.—Holotype male, Ben Lomond, Queenstown, 4,000 ft. (15th December, 1919, R. J. T.), also several paratype males taken at the same time; allotype female, Gouland Downs, 2,000 ft., Nelson Province (7th February, 1922, R. J. T.): all in Cawthron Institute collection.

Habitat.—Swampy areas in subalpine localities, South Island.

Tiphobiosis fulva n. sp. (Text-fig. 13 *b*.)

♀. Forewing, 8 mm.; expanse, 17 mm.

This species differs from the previous one in its much greater size, and also in having head clothed with rich brown hairs, forewings a deep fulvous, with few upstanding hairs of a dark colour, and venation very distinct by the much greater length of apical forks, and the non-alignment of cross-veins, as shown in text-fig. 13 *b*; also shape of apical portion of forewing is different, both margins being convex as they approach apex, whereas in *T. montana* n. sp. they are both straight. The unique type is somewhat damaged and the abdomen is missing; when captured, however, it was noted that the abdomen terminated in a very long, slender ovipositor, similar to that described for the previous species, but considerably longer.

Type.—Holotype female, unique, captured by Mr. G. V. Hudson, near a waterfall on the Humboldt Range, Wakatipu, 3,600 ft. (2nd March, 1903); in Cawthron Institute collection, presented by Mr. Hudson.

Family HYDROPTILIDAE.

Genus ZELANDOPTILA n. g. (Text-fig. 15.)

Wings long and narrow, with long fringes, fringe of hindwing basally somewhat longer than width of wing itself. Sc short in forewing, long and close to costa in hindwing. R_1 thickened in both wings, but terminating about half-way along hindwing by turning down to join R_{2+3}. A long, narrow triangular pterostigma strongly developed in forewing. Forewing with apical forks 2, 3, 4, and 5 present, hindwing with 2, 3, and 5; no closed cells in either wing, and no cross-veins except a faint indication of one below stigma in forewing and one between Cu_2 and 1A in hindwing. Anal area very narrow, much reduced in hindwing, where Cu_2 ends well before half-way, 1A at about one-fifth, 2A half-way along 1A, and 3A appears to be absent. Tibial spurs apparently 1, 2, 4. Female with end of abdomen extended into a long and very slender ovipositor.

Genotype.—*Zelandoptila moselyi* n. sp. (New Zealand.)

As far as I know, this remarkable genus has no near relatives in any part of the world, and must be considered as a very primitive Hydroptilid type. It would appear to have originated by reduction from an already reduced Rhyacophilid type allied to *Tiphobiosis*, thus strongly supporting the view now generally held that the Hydroptilidae as a whole are a reduced offshoot of the more primitive Rhyacophilidae.

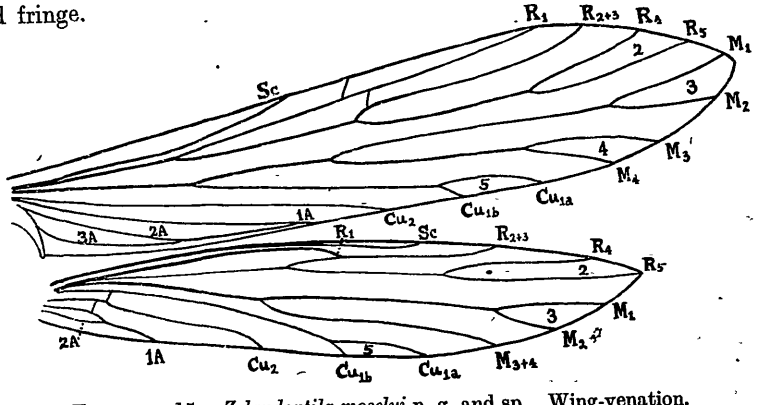
Zelandoptila moselyi n. sp. (Text-fig. 15.)

♀. Total length, 4·5 mm., inclusive of the very slender ovipositor, 1·5 mm. long; forewing, 4·8 mm.; expanse 10·5 mm.

Head dark brown, with pale hairs; eyes greyish-black; antennae about three-fourths as long as forewing, pale testaceous, strongly annulated with dark bands on each segment; palpi testaceous, darker basally.

Thorax dark brown. Legs—coxae reddish-brown, rest testaceous.

Wings.—Forewing a medium fuscous, with abundant soft horizontal hairs of dark colour, and also numerous upright pale-golden hairs. Base of pterostigma dark, but distal two-thirds pale, with pale hairs above it along costa. Fringe inclined to pale golden along termen, but dull-coloured elsewhere. Hindwing somewhat infuscated, with fuscous veins and fringe.



TEXT-FIG. 15.—*Zelandoptila moselyi* n. g. and sp. Wing-venation.
(For lettering see p. 314.)

Abdomen blackish-brown; ovipositor semitransparent testaceous, carrying a few stiff hairs, and with the two elongate oval gonapophyses at extreme end, exceedingly minute.

Type.—Holotype female, unique, Tokaanu, Lake Taupo, North Island (24th November, 1919, R. J. T.); in Cawthron Institute collection.

This species is dedicated to Mr. Martin H. Mosely, F.E.S., the well-known British authority on the Hydroptilidae.

Family HYDROPSYCHIDAE.

Genus HYDROPSYCHE Pictet.

Pictet, *Rech. Phrygan.*, 1834, p. 199.

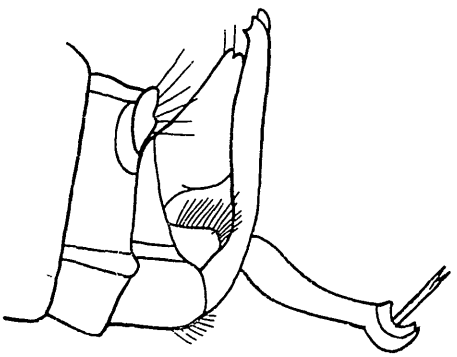
Four species of this genus are known from New Zealand—viz., *H. fimbriata* McL., *H. colonica* McL., *H. auricoma* Hare, and *H. occulta* (Hare), the last having been described by mistake as belonging to the genus *Hydrobiosis*. A fifth species is here added.

Hydropsyche philpotti n. sp. (Plate 19, fig. 8; text-fig. 16.)

♂. Total length, 5 mm., forewing, 8·3 mm.; expanse, 18 mm.

Head, thorax, and *abdomen* entirely dull-blackish; eyes black; antennae dull black, not quite as long as forewing. Appendages black with exception of the very prominent penis, which is semitransparent yellowish-brown. Legs dull-brownish.

Wings.—Forewing black in life, fading to deep fuscous in the dried specimen; scattered over wing, but especially on apical half, are numerous small rounded spots of a slightly paler colour, not at all prominently marked, and a more conspicuous pale-yellowish patch on posterior margin at end of Cu_2 and 1A. Cu_1 a stout vein, strongly marked in black. Hindwing dull fuscous, partially transparent, with darker venation.



TEXT-FIG. 16.—*Hydropsyche philpotti* n. sp., ♂. Appendages (× 45). Note the vertically upstanding gonapophyses and the remarkable penis. (10 per cent. KOH preparation.)

Text-fig. 16 shows the very characteristic genital appendages of this species, in which the gonapophyses are held vertically upright, while the remarkably shaped penis projects outwards horizontally, carrying a strong terminal lobe from which projects a slender bifid spine.

♀. Unknown.

Types.—Holotype male and three paratype males, Dun Mountain, Nelson, 3,000 ft. (8th January, 1922, A. Philpott); all in Cawthron Institute collection.

Evidently allied to *H. occulta* (Hare), but easily distinguished by its black coloration and the form of its appendages.

Family CALAMOCERATIDAE.

Up to the present no representative of this family has been recognized in New Zealand, though in Australia several species of the genus *Anisocentropus* are known, one of which extends as far south as Tasmania. I am now able to show that the very remarkable genus *Philorheithrus* Hare belongs to this family. This genus was proposed by Hare in 1910 for Hudson's species "? *agilis*," placed by that author in the family Sericostomatidae, between the genera *Pseudoeconesus* and *Olinga*. Even a cursory examination of so large an insect would show that the maxillary palpi of the male were five-segmented, a character which at once puts it out of the family Sericostomatidae. Hare, in the diagnosis of his new genus, correctly states the structure of the maxillary palpi; but he does not attempt to place the insect in any family, nor are his generic characters selected in such a way that it is possible to do so without a complete re-study of the insect itself.

The characters on which the genus *Philorheithrus* finds its place in the family Calamoceratidae are as follows: Maxillary palpi five-segmented

in both sexes (suborder Aequipalpia), the last segment not flexible or annulated, not longer than the preceding one. Ocelli absent. Median cell present in forewing. All five apical forks present in forewing. Antennae with first segment enlarged. Genital appendages of the male with strongly developed pre-anals.

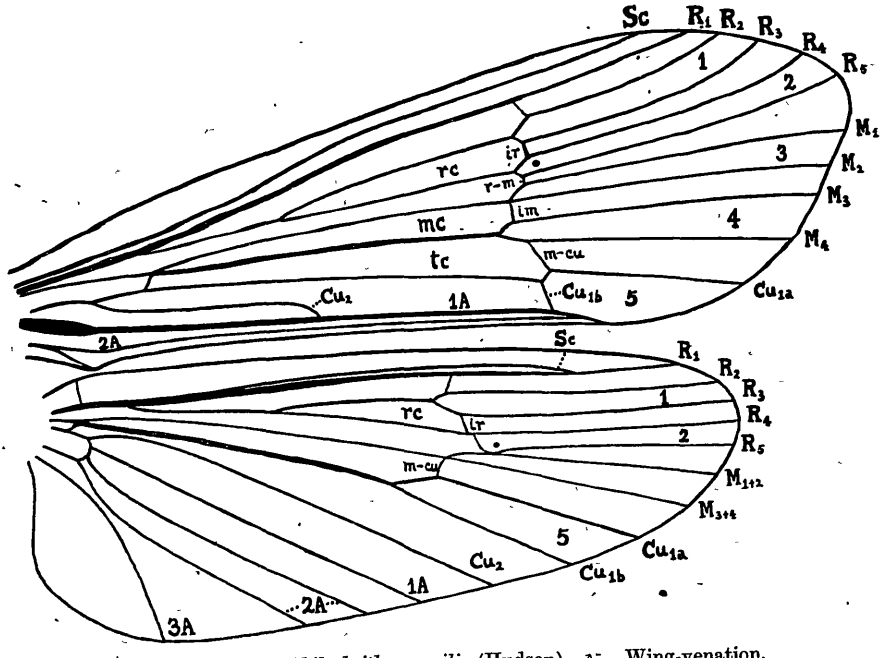
Genus PHILORHEITHRUS Hare, *nomen emendatum.* (Text-figs. 17, 18.)

Philorheithous Hare, *Trans. N.Z. Inst.*, vol. 42, p. 32, 1910.

Hare gives the derivation from ῥεῖθρον = a stream, from which it would appear that *Philorheithous* is a *lapsus calami*, or misprint for *Philorheithrus*.

The genus needs to be redefined as follows :—

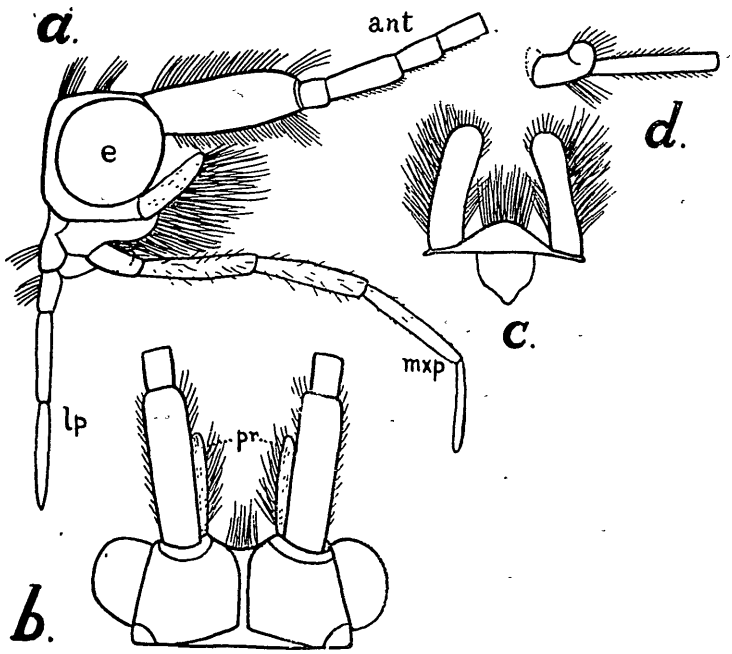
Head subrectangular, broader than long, very hairy; antennae with the first segment stout, cylindrical, as long as the next three taken together; total length of antenna about as long as that of forewing,



TEXT-FIG. 17.—*Philorheithrus agilis* (Hudson), ♂: Wing-venation. (For lettering see p. 314.)

sometimes longer, sometimes shorter. From beneath the antennae there projects, in the male only, a pair of very hairy processes, about half as long as the first antennal segment (text-fig. 18 *a–c*); they appear to be homologous with the "pilifers" of Lepidoptera. Maxillary palpi with the first segment short, swollen distally on the inner side into a small knob (text-fig. 18 *d*); the succeeding three segments elongated, cylindrical, each a very little longer than the one succeeding it; distal segment distinctly narrower than rest. Labial palpi with first segment little more than half as long as second; second and third about equal.

Wings variable in shape, the forewing especially so, being sometimes very narrow, with costal and posterior margins parallel, and little or no enlargement of breadth towards apex, sometimes broadening considerably towards apex, which may be either somewhat rounded, or rather sharply pointed, or right-angled, with termen cut off squarely and distal part of costa strongly arched above it. Hindwings also very variable in size, shape, and breadth. Venation characterized by the presence of closed radial, median, and thyridial cells in forewing, and closed radial cell in hindwing; at the level marked by ends of these cells in forewing there



TEXT-FIG. 18.—*Philorheithrus agilis* (Hudson), ♂. Details of structure of the head. *a*, lateral view of head, showing eye (*e*), antenna (*ant*), maxillary palpi (*mxp*), and labial palp (*lp*); the hairy processes are seen projecting upwards and outwards below the base of the antenna. *b*, view of head from above, with first two segments of antennae only, and the processes (*pr*) partially visible beneath them. *c*, the two hairy processes, or pilifers, dissected out to show their relationship with the small triangular labrum, situated between them. *d*, first two segments of maxillary palp, showing the swollen knob on segment 1 distally. (All figures × 22.)

is developed, by means of additional cross-veins, a complete *transverse cord* or anastomosis of the veins, such as is frequently met with in the family Limnephilidae. Anal area of forewing excessively narrowed, vein 1A very strongly formed, and greatly thickened at base. Hindwing with apical forks 1, 2, and 5; Sc more or less fused with R_1, anal area somewhat expanded.

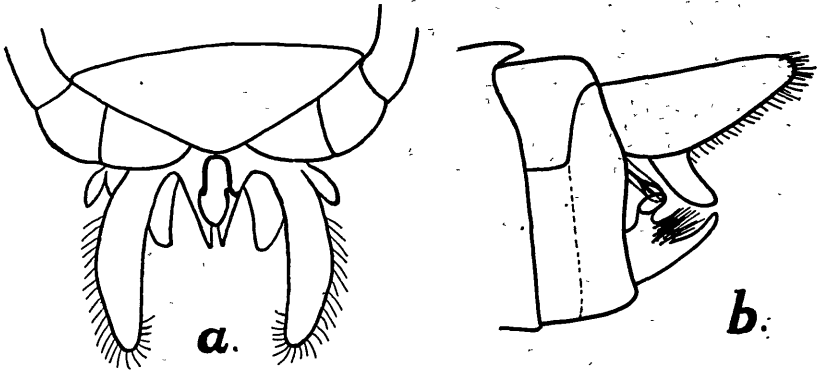
Tibial spurs 2, 4, 4. Male genital appendages with strong, forcipate pre-anal appendages and short gonapophyses. Female without elongation of terminal abdominal segment; gonapophyses well developed as stout lobes.

Genotype.—Philorheithrus agilis (Hudson). (New Zealand.)

Two species of this genus are known from New Zealand, one of which is here described for the first time. There are also to be found in eastern Australia and Tasmania closely similar insects, none of which have so far been described.

Philorheithrus agilis (Hudson). (Plate 19, fig. 9; text-figs. 17–19.)

In size this is one of the most variable insects known to me; female specimens in the Cawthron Institute collection vary from 21 mm. to 37 mm. in expanse, and the male is almost as variable. The shape of the wings and the distinctness of the colour-pattern are also very variable. Plate 19, fig. 9, is taken from a strongly-marked and rather broad-winged form. Text-fig. 18 shows the interesting structure of the head and mouth-parts; text-fig. 19 two views of the male genitalia after treatment with 10 per cent. KOH solution (in the dried specimen the pre-anal appendages appear somewhat more forcipate); and text-fig. 17 shows the venation of the male, that of the female being practially the same.



TEXT-FIG. 19.—*Philorheithrus agilis* (Hudson), ♂. Appendages (× 30). *a*, dorsal view; *b*, lateral view. Note the strongly developed pre-anals. (10 per cent. KOH preparation.)

Type in Mr. G. V. Hudson's collection (sex not stated; probably a male).

Habitat.—Provinces of Wellington, Nelson, and Canterbury; local, but abundant in places; found on fast-running mountain-streams.

Philorheithrus lacustris n. sp. (Plate 19, fig. 10.)

♂. Total length, 8 mm.; forewing, 14 mm.; expanse, 29 mm.

Morphologically very close to *Ph. agilis* (Huds.), from which it may at once be distinguished by pointed apex and evenly-rounded termen of forewing, much more elongated hindwing with narrowed apex, stronger arching of costa of forewing near base, absence of any definite colour-pattern on wing, forewings being a dull medium fuscous, darker towards apices, with a slightly paler mark on pterostigma, hindwings semitransparent greyish, tinged yellowish-pink along costal margin. Appendages rather similar those of *Ph. agilis*, pre-anals forming a stout forceps, but gonapophyses not projecting at all as in that species, and excessively short.

♀. Unknown.

Types.—Holotype and paratype males, Lake Wakatipu, at Kingston, (13th December, 1919, R. J. T.); both in Cawthron Institute collection.

Habitat.—Shores of Lake Wakatipu; very rare. The cases and larvae were found attached to rocks near the shore, showing that the larval habitat of this species differs greatly from that of its relative *Ph. agilis*. There is a species closely resembling this, but not yet described, which is very abundant around the shores of the three lakes of the Cradle Mountain massif, in north-west Tasmania.

Family LEPTOCERIDAE.

Genus Triplectides Kolenati.

Kolenati, *Gen. et Spec. Trichopterorum*, vol. 2, p. 247, 1859.

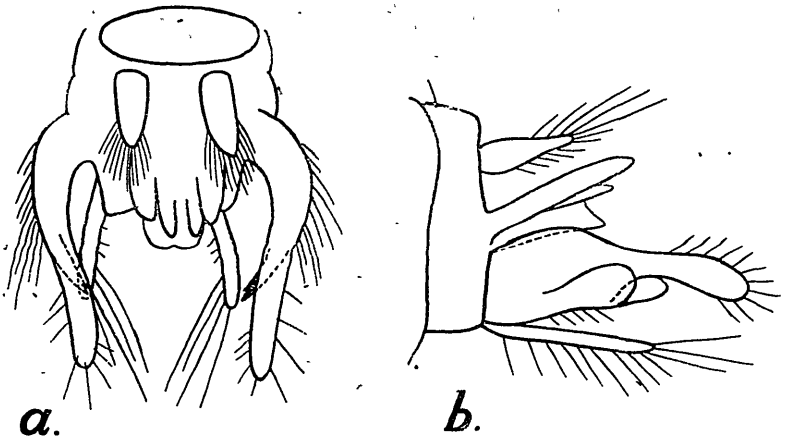
Genotype.—*T. gracilis* (Burm.), Brazil.

This genus is very closely allied to *Notanatolica* McLach., from which it differs only in having the tibial spurs 2, 2, 4, instead of 2, 2, 2, or 0, 2, 2.

Triplectides oreolimnetes* n. sp. (Plate 19, figs. 11, 12; text-fig. 20.)

♂. Total length, 6 mm.; forewing, 10 mm.; expanse, 21 mm.

Head fuscous, with pale-grey hairs; eyes medium greyish; antennae fuscous, 22 mm. long, very slender, but basal segment swollen and carrying pale-grey hairs; palpi fuscous.



Text-fig. 20.—*Triplectides oreolimnetes* n. sp., ♂. Appendages (× 50). *a*, dorsal view; *b*, lateral view. (10 per cent. KOH preparation.)

Thorax and *abdomen* fuscous shading to brownish. Legs—forelegs dark fuscous, with short, dark tibial spurs; middle and hind legs pale testaceous, including spurs. Genital appendages as shown in text-fig. 20, the pre-anals very short, the gonapophyses long, with a strong bifid claw-like process developed from middle of ventral surface; beneath gonapophyses there are developed two straight, cylindrical ventral processes about two-thirds their length.

* Greek ὄρος, a mountain; λίμνη, a lake.

Wings.—Forewing medium fuscous, somewhat transparent in places, and more or less strongly mottled with whitish or greyish. Pterostigma with whitish or greyish patch; R_1, Cu_1, and 1A strongly mottled with whitish. Distal third of wing mottled with patches of greyish-white hairs which tend to become arranged in three transverse rows across wing. Hindwing subhyaline, somewhat infuscated distally; venation fuscous.

Types.—Holotype male, allotype female, and series of seven paratype males, all from Gouland Downs, Nelson Province (7th February, 1922, R. J. T.), 2,000 ft. Also a single male, slightly larger, from Mount Arthur Tableland (20th February, 1921, A. Philpott), 4,500 ft. All the above in Cawthron Institute collection.

♀. Very similar to male, but with shorter antennae and wings; expanse only 18 mm.; abdomen stouter than in male; hindwings less transparent.

This species is fairly closely related to *T. obsoleta* McL., from which it is distinguished at once by its very much smaller size, duller coloration, and differently-shaped male genitalia. It appears to be confined to elevated localities in the South Island, where it is to be found sitting on the reeds or bushes fringing small mountain-tarns. The larva has the very characteristic habit of forming its case out of small particles of micaceous matter selected from the bottom of the tarns; the case itself is very narrow subcylindrical in shape, and can generally be detected only by the glint of the sun on the micaceous particles when the larva moves.

Family SERICOSTOMATIDAE.

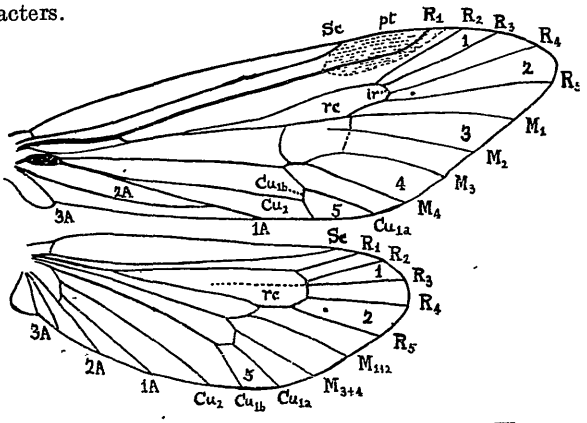
This family is in many respects the most highly evolved in the whole order, being marked by numerous specializations in the wing-venation, the form of the antennae, and more especially in the structure of the maxillary palpi of the male, these being reduced to four, three, or even only two segments, and specialized so as to be of quite different form from those of the female. The family is well represented in New Zealand, no less than ten species being known, belonging to seven genera. Six new species are here added, and one new genus is proposed for the reception of four of them.

Genus PYCNOCENTRODES n. g. (Text-fig. 21.)

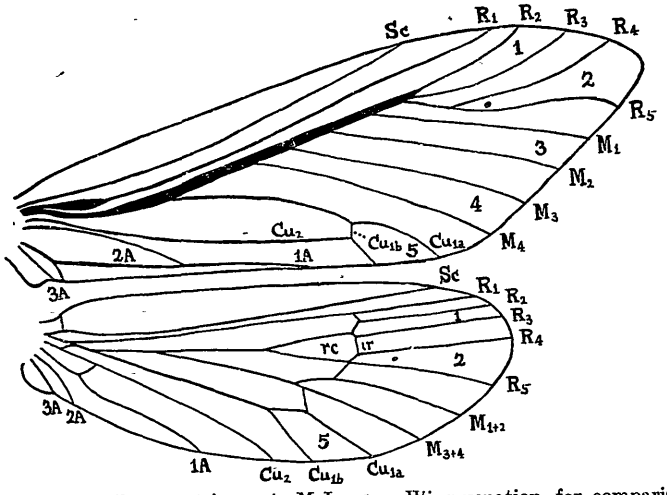
Allied to *Pycnocentria* McL., from which it differs by the absence of the longitudinal fold in forewings of male, and the consequent normal structure of the radial sector in both sexes. The radial cell is present, and is of a somewhat narrowed, elongate form, basal portion being particularly narrowed. In some cases the stem of R_{2+3} may be weakened or obsolescent, so that the radial cell is incomplete above (as in *P. olingoides* n. sp.), but venation is always very distinct from that of *Pycnocentria* (text-fig. 22), where all the branches of Rs, M, and Cu_1 come off direct from longitudinal fold. Stem of R_{2+3} in hindwing of male also weakened or obsolete, leaving radial cell open above. Apical forks of forewing all present, as in *Pycnocentria;* in hindwing, only 1, 2, and 5 present, as also in *Pycnocentria.* No longitudinal fold in hindwing of male. Tibial spurs 2, 2, 4. Maxillary palpi of male short and hairy, not projecting beyond end of first antennal segment.

Genotype.—Pycnocentrodes chiltoni n. sp. (New Zealand.)

The differences between the venations of males of *Pycnocentria* and the new genus can be seen at once by comparing text-figs. 21 and 22. The females resemble one another very closely both in venation and in other characters.



TEXT-FIG. 21.—*Pycnocentrodes chiltoni* n. g. and sp., ♂. Wing-venation. (For lettering see p. 314.)



TEXT-FIG. 22.—*Pycnocentria evecta* McL., ♂. Wing-venation, for comparison with text-fig. 21. Note the longitudinal groove in the forewing. (For lettering see p. 314.)

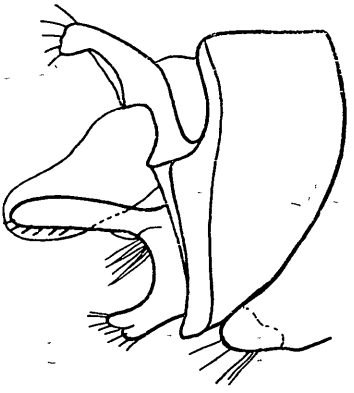
Four new species belonging to this genus may be distinguished by the following key :—

1. Smaller species, the males expanding about 12 mm. to 14 mm. .. 2
   Larger species, the males expanding about 19 mm. to 22 mm., and having a general superficial resemblance to *Olinga feredayi* McL. 3
2. Forewing a medium brownish-testaceous, with an area of pale golden-yellow hairs forming a faint fascia below pterostigma and descending as far as Cu_{1b} .. .. *P. chiltoni* n. sp.
   Forewing nearly black in life, dark fuscous in the dried insect, with bright golden patches near base and also in the wedge-shaped area between Cu_1, Cu_{1b}, and 1A .. .. .. *P. pulchella* n. sp.
3. Hairs of forewing uniformly fulvous; penis of male deeply bifid *P. olingoides* n. sp.
   Hairs of forewing almost entirely fuscous; penis of male not bifid .. .. *P. hamiltoni* n. sp.

Pycnocentrodes chiltoni n. sp. (Plate 19, fig. 14; text-figs. 21, 23.)

♂. Total length, 4·5–5 mm.; forewing, 7–8 mm.; expanse, 13·5–16 mm.

This insect shows a strong superficial resemblance to *Pycnocentria evecta* and *P. aureola* McL., its general form and coloration being much the same. It may be distinguished from them at once as follows: In both sexes the antennae are pale testaceous, strongly annulated with fuscous on all segments, and the pale-golden scaling of the forewing does not extend all over the wing, but is confined to the subcosta, the cubito-anal area, and a fascia extending across the wing from the pterostigma to Cu_{1b}; in fresh specimens there is an irregular area slightly darker than the rest of the wing, just basad from this fascia, and sometimes curving round it in the form of the letter C. The male can at once be distinguished further by the absence of the darkly shaded longitudinal band of the forewing which is characteristic of the genus *Pycnocentria*. The female expands 16–18 mm., and is thus considerably larger than the male, but not so large as the female of *Pycnocentria evecta*. It resembles the male fairly closely, but the wings are of a paler colour, with a larger area covered with pale-golden hairs.



TEXT-FIG. 23.—*Pycnocentrodes chiltoni* n. g. and sp., ♂. Appendages (× 55). Lateral view. Note the bilobed gonapophysis and the soft membranous penis with chitinous lateral processes. (10 per cent. KOH preparation.)

Text-fig. 23 shows a lateral view of the male appendages, after maceration in 10 per cent. KOH solution. The soft, everted penis, with lateral chitinous processes, is not visible in the dried insect. The gonapophyses are bilobed.

Types.—Holotype male and series of three paratype males, Cass, Canterbury (6th January, 1920, R. J. T.); allotype female, and series of three paratype females and one male, Nelson (allotype, 29th November, 1920, A. Philpott): all in Cawthron Institute collection.

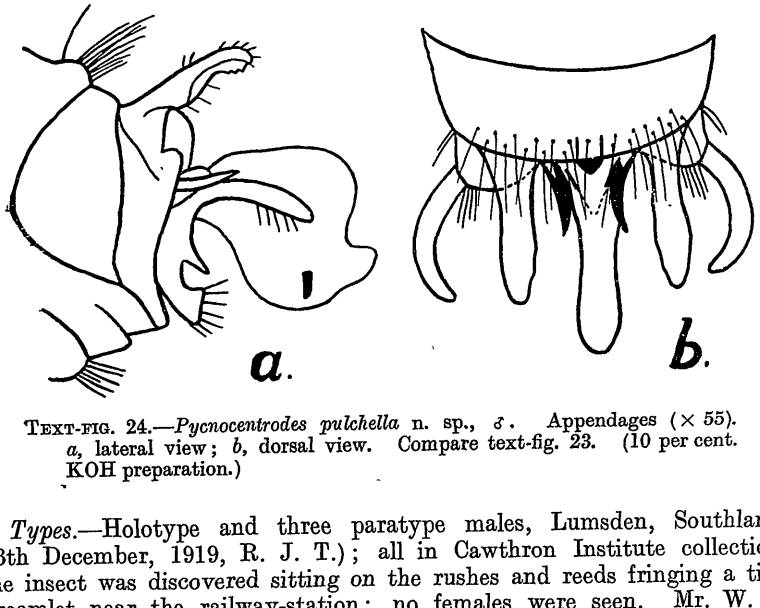
Habitat.—All parts of the South Island; not uncommon. I have specimens also from Dunedin; the females of the latter are of a pale testaceous colour, but this may be due to their having been taken late in the season. The resemblance of this insect to *P. evecta* has probably caused it to be overlooked, as has been the case with *P. aureola* also.

This insect is dedicated to my friend Dr. C. Chilton, Professor of Biology, Canterbury College, Christchurch, through whose kindness I was enabled to visit the Cass Biological Station, near which this insect was first discovered.

Pycnocentrodes pulchella n. sp. (Plate 19, fig. 15; text-fig. 24.)

♂. Total length, 3·5–4 mm.; forewing, 6–7 mm.; expanse, 13–15 mm.

Easily recognized by its dark-fuscous wings (almost black in life), forewing having a patch of bright golden hairs at base and another extending outwards so as to fill wedge-shaped area between Cu_1, Cu_{1b}, and 1A. The antennae have the large basal segment fuscous, the rest rich pale brown annulated with darker brown. The epicranium carries a number of long golden hairs. Thorax and abdomen black; appendages brownish, shaped as in text-fig. 24.



TEXT-FIG. 24.—*Pycnocentrodes pulchella* n. sp., ♂. Appendages (× 55). *a*, lateral view; *b*, dorsal view. Compare text-fig. 23. (10 per cent. KOH preparation.)

Types.—Holotype and three paratype males, Lumsden, Southland, 13th December, 1919, R. J. T.); all in Cawthron Institute collection. The insect was discovered sitting on the rushes and reeds fringing a tiny streamlet near the railway-station; no females were seen. Mr. W. G. Howes, of Dunedin, was present with me when they were taken. No other locality is yet known for this very beautiful little caddis-fly.

Pycnocentrodes olingoides n. sp. (Plate 19, fig. 16; text-fig. 25 *a*.)

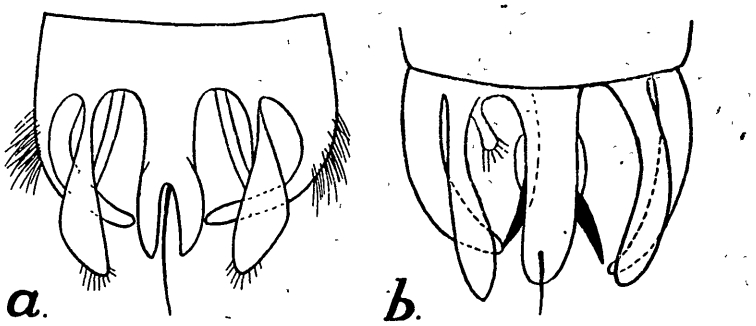
♂. Total length, 5 mm.; forewing, 10 mm.; expanse, 21·5 mm.

Head, thorax, and *abdomen* brown; the epicranium with rich golden hairs; antennae three-fourths as long as forewing, fulvous annulated with darker brown; mouth-parts entirely fulvous. Legs entirely fulvous.

Wings.—Forewing covered with short fulvous hairs; veins rich brown. Hindwing subhyaline, slightly infuscated, with rich brown venation, and pulvous hairs along Sc and R_1; fringe along costa to apex fulvous, along posterior border pale-greyish. Anal appendages of the dried insect as in text-fig. 25 *a*, pre-anals rather broadly foliate, with narrow bases; penis deeply bifid, and carrying a long projecting bristle nearly twice as long

as each lobe of the bifurcation; gonapophyses rather short, forcipate. Sternite 8 with a broad process extending from it.

♀. Closely resembling the male both in size and colour, but at once distinguished from it by the slender, five-segmented maxillary palpi and absence of the complicated genital appendages; forewings also are slightly narrower at base.



TEXT-FIG. 25.—Male genital appendages, dorsal view, of *a*, *Pycnocentrodes olingoides* n. sp.; *b*, *Pycnocentrodes hamiltoni* n. sp. Drawn from the dried insect. (× 45.)

Types:—Holotype male and allotype female, Gouland Downs, Nelson Province (7th February, 1922, R. T. J.); both in Cawthron Institute collection; also a paratype male from same locality.

Both sexes of this insect very closely resemble female of *Olinga feredayi* McL.; hence the specific name given. They are best distinguished from it by the more fuscous hindwings of the latter, and by the fact that in the genus *Olinga* many of the hairs of the forewings are flattened down into the form of narrow scales.

Pycnocentrodes hamiltoni n. sp. (Plate 19, fig. 17; text-fig. 25 *b*.)

Closely similar in size and shape to the preceding species, but the male can at once be distinguished by the colour of wings, which are semi-transparent brownish-fuscous, with numerous short brown hairs, and a long patch of golden hairs occupying the cubito-anal space of forewing. The wings also show some pinkish-brown iridescence. The antennae are pale yellowish-brown, with medium brown annulations; the abdomen is pale olive-green; legs yellowish-brown; appendages dark brown, shaped as shown in text-fig. 25 *b*; penis not bilobed, but with a short bristle projecting from near its end, and a pair of large sharp spines standing out on either side of it; the pre-anals less broadly foliaceous than in preceding species; gonapophyses forcipate, somewhat stouter than in preceding species. The eighth sternite carries a process. Female very closely similar to that of preceding species, but having termen of forewing slightly more arched, and radius more strongly curved within pterostigma; also abdomen shows a tinge of greenish. From female of *Olinga feredayi* it can at once be distinguished by the difference of venation: radius in *Olinga* runs straight through pterostigma, and curvature of branches of M and Cu is different.

Types.—Holotype male and allotype female, Pouto River, between Tokaanu and Lake Roto-Aira, North Island (27th November, 1919); both in Cawthron Institute collection.

This species is dedicated to my friend Mr. Harold Hamilton, Zoologist to the Dominion Museum, Wellington, who was present with me when the insects were taken.

Genus HELICOPSYCHE Hagen.

Hagen, *Entom. Monthly Magazine*, vol. 2, p. 252, 1866.

This very widespread genus is remarkable for the peculiar formation of the branches of the media in both wings. In the forewing, M_2 and M_3 are fused together for some distance basally, thus forming an apparent apical fork between them when they diverge distally, much in the same way as has been described above for males of the genus *Neurochorema*. In the hindwing, where M_4 is absent, this same fusion takes place between M_2 and M_{3+4} basally, and results in the apparent presence of three veins, M_{1+2}, M_3, and M_4, though these are actually M_1, M_2, and M_{3+4} respectively. This transference of vein M_2 on to a common stalk with M_{3+4} in this wing led Ulmer to state that Af_4 was present in the hindwing of this genus and of the allied Australian genus *Saetotricha*. As a matter of fact, Af_4 is never present in the hindwing of any Trichopteron, since M_4 never exists as a separate vein.

The larval characteristics of the genus are well known, the generic name having been given from the helicoid form of the case, which is composed of grains of sand, and is so beautifully modelled as to appear almost exactly like a small snail-shell. To accommodate itself to its peculiar home the larva has become greatly elongated.

Genotype.—Helicopsyche borealis Hagen. (North America.)

Only a single species has so far been recorded from New Zealand—viz., *H. zelandica* Hudson (Plate 19, fig. 18)—more fully described by Hare in 1910, Hudson's original description being very scanty. Two more species are here added, making three for the Dominion. They may be distinguished by the following key :—

1. Wings dark fuscous or blackish	*H. zelandica* Huds.
Wings very pale greyish	2
2. Smaller species, expanding 9–10 mm., the wings unicolorous whitish-grey, without any markings : process of tenth tergite of male narrower at apex than at base, the tip triangularly excavated	*H. albescens* n. sp.
Larger species, expanding 11–12 mm., the wings pale-greyish, with slight indications of some paler markings on forewing ; process of tenth tergite of male as broad at apex as at base, the tip strongly truncated	*H. howesi* n. sp.

Helicopsyche albescens n. sp. (Plate 19, fig. 19 ; text-fig. 26.)

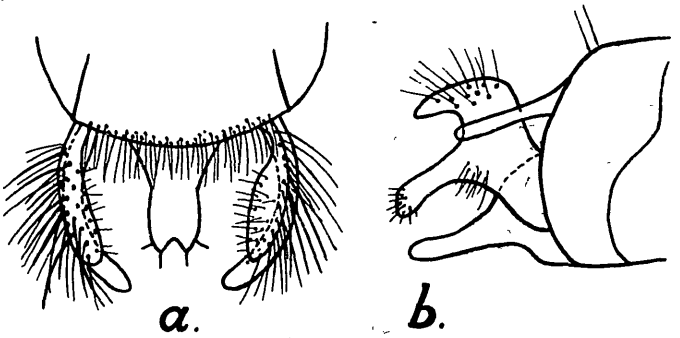
♂. Total length, 3 mm. ; forewing, 4·5 mm. ; expanse, 9·5 mm.

The whole of the *head*, *thorax*, and *abdomen* dull brownish-testaceous, except eyes, which are blackish, and antennae, which are testaceous ; legs pale greyish-testaceous.

Wings semitransparent whitish, with very pale greyish hairs and fringe ; venation pale-greyish. Appendages of very characteristic form, as may be seen from text-fig. 26 ; process of tenth tergite wider at base than at apex, and the latter triangularly incised and carries four short stiff bristles ; pre-anals short and slender ; gonapophyses very large, two-branched, and exceedingly hairy.

Types.—Holotype male, allotype female, and series of paratype males, Purau Creek, Lyttelton Harbour (3rd January, 1920, R. J. T.) ; all in Cawthron Institute collection.

Habitat. — South Island: Canterbury and Nelson Provinces. The species occurs commonly around Nelson, but I have taken only males so far.



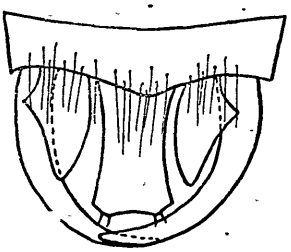
TEXT-FIG. 26.—*Helicopsyche albescens* n. sp., ♂. Appendages (× 84). *a*, dorsal, view; *b*, lateral view. Note the bilobed gonapophysis in *b*. (10 per cent. KOH preparation).

Helicopsyche howesi n. sp. (Plate 19, fig. 20; text-fig. 27.)

♂. Total length, 3·5 mm.; forewing, 5·5 mm.; expanse, 11·5 mm.

Head, thorax, and *abdomen* dull brownish-testaceous; antennae testaceous, with basal segment darker, fuscous; epicranium with long fuscous hairs. Legs very pale testaceous.

Wings pale-greyish, with slightly-indicated paler whitish patches on forewing at one-third from base, near costa, and at two-thirds from base, below pterostigma, also a little before pterostigma and distally between M and Cu_1. Hairs and fringe greyish, with slight tinge of brown. Appendages of dried insect as shown in text-fig. 27; the process of tenth tergite as broad at apex as at base, the tip strongly truncated; pre-anals short, subtriangular, angulated externally not far from bases; gonapophyses much larger, appearing strongly forcipated when viewed from above.



TEXT-FIG. 27.—*Helicopsyche howesi* n. sp., ♂. Appendages (× 84), dorsal view, for comparison with text-fig. 26. Drawn from the dried insect.

♀. Unknown.

Type.—Holotype male, unique, Dunedin (1st January, 1920); in Cawthron Institute collection. The larvae were plentiful in the streams, and their cases are larger and composed of coarser sand-grains than those of the other two species. Mr. W. G. Howes has, I believe, succeeded in rearing this species several times.

This species is dedicated to my friend Mr. W. G. Howes, whose guest I was at the time the insect was taken, and whose keen work on aquatic and other insects is well known to all entomologists in the Dominion.

Explanation of the Comstock-Needham Notation used in the Text-figures illustrating Wing-venation.

The numerals 1, 2, 3, 4, 5 indicate the five apical forks of the wing, usually designated in the text as Af_1, Af_2, Af_3, Af_4, and Af_5 respectively.

1A, 2A, 3A, the three anal veins; in the forewings of Trichoptera they become looped up to form a double Y-vein.

Cu, cubitus. Cu_1, first cubitus, branching into Cu_{1a} and Cu_{1b}, between which is enclosed the fifth apical fork, Af_5.

hm, humeral veinlet. *im*, inter-median cross-vein. *ir*, inter-radial cross-vein. *jl*, jugal lobe (in Rhyacophilidae).

M, media. In forewing it has four branches, M_1, M_2, M_3, M_4 respectively, of which the first two enclose the third apical fork, Af_3, while the third and fourth enclose the fourth apical fork, Af_4. In the hindwing it has only three branches, M_1, M_2, and M_{3+4} respectively, and hence Af_4 is never present in that wing.

m-cu, medio-cubital cross-vein. *mc*, median cell, closed distally by the cross-vein *im*. *pt*, pterostigma.

R, radius. R_1, its main stem. Rs, radial sector, with its four branches R_2, R_3, R_4, R_5 respectively; of these, R_2 and R_3 together enclose the first apical fork, Af_1, while R_4 and R_5 together enclose the second apical fork, Af_2; the wing-spot is found in the angle of this latter fork.

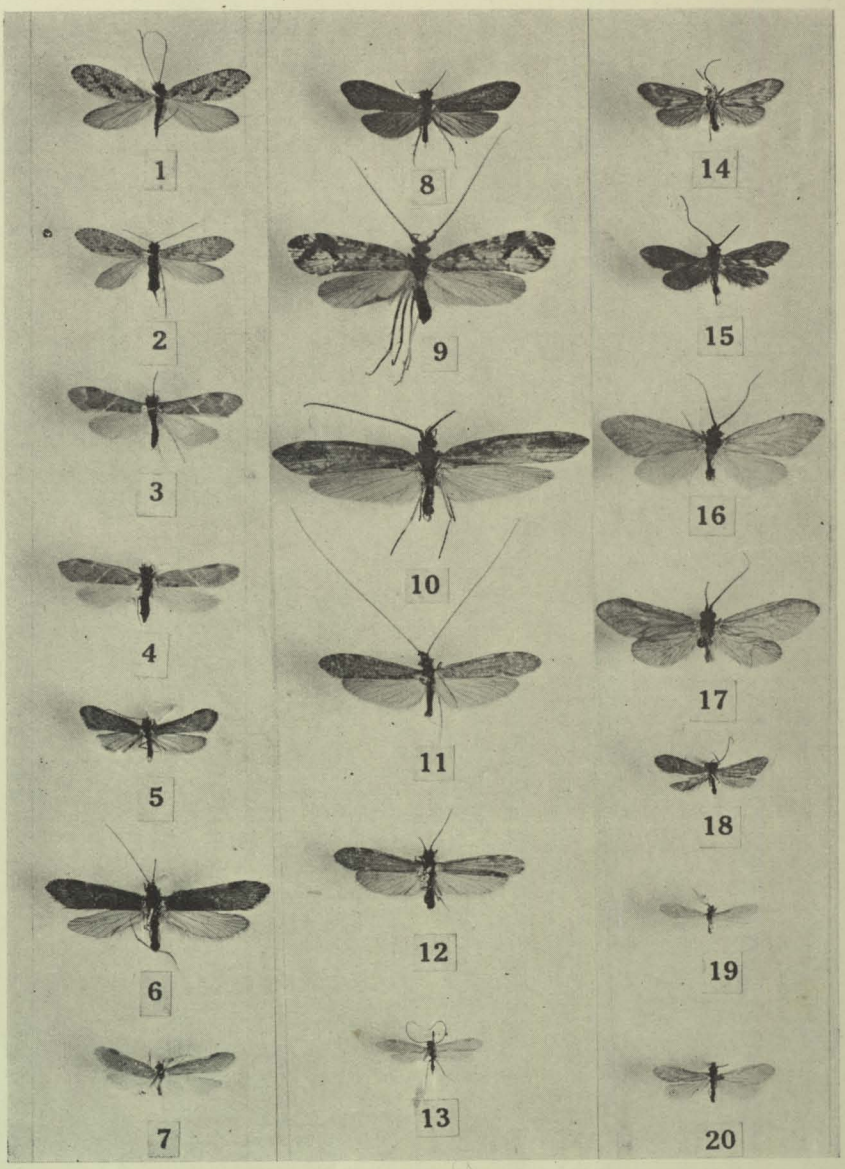
r-m, radio-median cross-vein. *rc*, radial cell, closed distally by the inter-radial cross-vein *ir*.

Sc, subcosta. *tc*, thyridial cell, closed distally by the medio-cubital cross-vein *m-cu*.

Explanation of Plate 19.

Fig. 1.—*Hydrobiosella stenocerca* n. g. and sp. Holotype male.
Fig. 2.—*Hydrobiosella stenocerca* n. g. and sp. Allotype female.
Fig. 3.—*Neurochorema decussatum* n. g. and sp. Holotype male.
Fig. 4.—*Neurochorema decussatum* n. g. and sp. Allotype female.
Fig. 5.—*Hydrochorema crassicaudatum* n. g. and sp. Holotype male.
Fig. 6.—*Hydrochorema tenuicaudatum* n. sp. Holotype female.
Fig. 7.—*Synchorema zygoneura* n. g. and sp. Holotype male.
Fig. 8.—*Hydropsyche philpotti* n. sp. Holotype male.
Fig. 9.—*Philorheithrus agilis* (Hudson). Rather broad-winged and well-marked male from Gouland Downs.
Fig. 10.—*Philorheithrus lacustris* n. sp. Holotype male.
Fig. 11.—*Triplectides oreolimnetes* n. sp. Holotype male.
Fig. 12.—*Triplectides oreolimnetes* n. sp. Allotype female.
Fig. 13.—*Tiphobiosis montana* n. g. et sp. Holotype male.
Fig. 14.—*Pycnocentrodes chiltoni* n. g. and sp. Holotype male.
Fig. 15.—*Pycnocentrodes pulchella* n. sp. Holotype male.
Fig. 16.—*Pycnocentrodes olingoides* n. sp. Holotype male.
Fig. 17.—*Pycnocentrodes hamiltoni* n. sp. Holotype male.
Fig. 18.—*Helicopsyche zelandica* Hudson. Specimen from Karori, Wellington (Nov. 30, 1919, R. J. T.).
Fig. 19.—*Helicopsyche albescens* n. sp. Specimen from Nelson (Jan. 1, 1921, A. Philpott).
Fig. 20.—*Helicopsyche howesi* n. sp. Holotype male.

All the figures in the plate are magnified 1·3 diameters.



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