Art. XXIII.—*The* Neuroptera *of New Zealand.*

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A list of our *Neuroptera* was published by Mr. R. McLachlan, F.R.S., in the "Annals and Magazine of Natural History" for July, 1873,* and but little has been added since. This list, however, contains no descriptions, and consequently is not of much use to those New Zealand naturalists who are unable to command a good library.

At the present time the most important work for entomologists in New Zealand is to observe the habits of our insects, and ascertain their life-histories, for many species are rapidly disappearing. But observing without putting the observations on record is of no use to any one but the observer, and in order to place on record observations on the habits of an insect it is necessary to know its scientific name. If the name of the insect is unknown the observations are useless; and if a wrong name be given to the insect the observations are worse than useless, for they propagate error and entail confusion until the error is rectified. It has been with the idea of helping field-naturalists in New Zealand to name their insects correctly that I prepared the descriptive catalogues of the *Diptera*, *Hymenoptera*, and *Orthoptera*, which were published by the Colonial Museum and Geological Survey in 1881; and the year before last I presented to this Institute a Synopsis of the New Zealand *Hemiptera*.† It is with the same object in view that I now offer a catalogue of the *Neuroptera*, compiled almost entirely from Mr. McLachlan's publications. I had hoped that Mr. McLachlan himself would have drawn up this catalogue, but I have been unable to persuade him to do so. Nevertheless, he has helped me by several criticisms, and, as he has glanced over the paper, I feel confident that no New Zealand species has been omitted. Nevertheless, I alone am responsible for any errors it may contain.

The *Neuroptera* have been variously classified by different entomologists, some of whom break them up into several orders, while a few unite the *Pseudo-neuroptera* and *Odonata* with the *Orthoptera*. The classification, however, is of no

* Reprinted in the Trans. N.Z. Inst., vol. vi., Appendix, p. xc.

† See Trans. N.Z. Inst., vol. xxx., art. xxi.

importance to my present object, and I have thought it best to follow Mr. McLachlan's list already alluded to, of which, indeed, this paper may be considered an enlarged second edition.

Group PSEUDO-NEUROPTERA.

The development is direct—that is, there is no quiescent pupal stage. The larvæ somewhat resemble the adult, but are without wings, which are developed externally.

ARTIFICIAL KEY TO THE FAMILIES.

Hind wings folded longitudinally, broader than fore wings	*Perlidæ.*
Hind wings not folded.	
Hind wings as large as the fore wings	*Termitidæ.*
Hind wings smaller than the fore wings.	
Abdomen with caudal appendages	*Ephemeridæ.*
Abdomen without caudal appendages	*Psocidæ.*

Family TERMITIDÆ.

The white-ants have the head horizontal and the antennæ short. The wings are long, narrow, and straight; the anterior and posterior are equal in shape and size; they are finely net-veined. The abdomen is ovate, and composed of ten distinct segments. The larvæ resemble the adults.

ARTIFICIAL KEY TO THE GENERA.

Antennæ 16- to 20-jointed	*Calotermes.*
Antennæ 12- to 14-jointed	*Stolotermes.*

Genus CALOTERMES, Hagen (1853).

Head rather small, triangular or rounded; eyes large, ocelli small; antennæ as long as the head, 16- to 20-jointed. Prothorax as wide, or nearly as wide, as the head, transverse, truncate or arcuate in front, with the sides and apical edge forming a semicircle. Tarsi with plantula. Wings with the subcostal nervure narrow, widening out towards the tip, and connected with the costal by five or six nervules crossing the costal area.

Soldiers short and stout, with a large cylindrical head, flattened in front and rugged or truncated before the jaws.

Distribution.—Warm climates, in both hemispheres.

Calotermes brouni.

Calotermes brouni, Froggart, Pro. Linn. Soc. of N.S.W., 2nd series, vol. xxi., p. 531, pl. 36, figs. 1, 1*a* (1897). *C. improbus*, Brauer, Reise der "Novara," Neuroptera, p. 45, not of Hagen.

General colour dark reddish-brown, with the wings fuscous and the nervures chocolate-brown. Length to tip of wings, 11 mm.; to end of the body, 6 mm.

Soldier with the head ochreous, more ferruginous towards the jaws; antennæ bright-yellow, with the apices of the joints pale. The rest dull-white. Length, 6 mm.

Worker with the head pale-yellow, the rest dull-white. Length, 4 mm.

Locality.—Auckland (*Broun*).

Calotermes insularis.

Termes insularis, Walker, Cat. Neuroptera Brit. Mus., part iii., p. 521 (1853); White, Zool. "Erebus" and "Terror," Insects, pl. 7, fig. 11 (1874). *Calotermes insularis*, Hagen, Cat. Termitina in Brit. Mus., p. 6 (1858); Froggart, Pro. Linn. Soc. of N.S.W., 2nd series, vol. xxi., p. 524, pl. xxxv., fig. 4 (1897).

General colour bright ferruginous; wings hyaline, nervures light brownish-yellow. Length to tip of wing, 23 mm.; to end of the body, 5 mm.; expanse of wings, 38–43 mm. The wings are much longer than in the last species.

Localities.—New Zealand (British Museum) and Victoria.

The type specimens were collected in New Zealand by Dr. Sinclair, but it does not appear to have been taken again by Captain Broun. Mr. Froggart has determined one specimen from the Melbourne Museum with it on account of the very long wings. Walker, in his description of the types, says that the wings are nearly twice the length of the body; and he gives the dimensions as length of the body 3½ lines (8 mm.), expanse of the wings 19 lines (41 mm.).

Genus Stolotermes, Hagen (1858).

Head large, circular; eyes oval, small, with coarse facets; ocelli present; antennæ 12- to 14-jointed. Prothorax heart-shaped. Tarsi without plantula; the first joint as long as those following. Neuration of the wings as in *Calotermes*.

Distribution.—Tasmania and New Zealand.

Stolotermes ruficeps.

Stolotermes ruficeps, Brauer, Reise der "Novara," Neuroptera, p. 46 (1868); Hudson, Man. N.Z. Entomology, p. 107, pl. 16, figs. 1–1*c* (1892); Froggart, Pro. Linn. Soc. of N.S.W., 2nd series, vol. xxi., p. 538, pl. 36, figs. 2, 2*a*.

General colour dark reddish-brown, the under-surface much lighter; bases of the joints of the antennæ fuscous. Length to the tip of the wings, 12 mm.; to the end of the body, 7 mm.

Soldier.—Head bright-yellow, ferruginous towards the apex; jaws black; upper surface of the thorax brownish-yellow, the rest dull-white. Length, 7–11 mm.

Localities.—Auckland and Wellington.

Family PSOCIDÆ.

Small insects with oval bodies and very small prothorax, which is partially concealed by the wings. Wings unequal in size, the fore pair larger, with few or rudimentary nervures. The larvæ live on tree-trunks, palings, &c., and are much like the adult. They are very active. Both sexes are said to possess the power of spinning a web. The common book-lice belong to this family, which has been much neglected by New Zealand entomologists.

Genus MYOPSOCUS, Hagen (1866).

Tarsi 3-jointed. Discoidal cell closed. Four posterior marginal cells.

Myopsocus novæ-zealandiæ.

Myopsocus novæ-zealandiæ, Kolbe, Entomologische Nachrichten, ix., p. 145 (1883); McLachlan, Ent. Mo. Mag., ser. 2, vol. 5, p. 270 (1894). *Psocus zealandicus*, Hudson, Man. N.Z. Entomology, p. 107, pl. 16, fig. 2 (1892).

Fuscous, the vertex with a clear spot in the middle. Wings grey, thickly sprinkled with brown, the spots at the extreme margin and in the disk confluent; cells of the fore wings with an irregular semilunar spot at the exterior margins; pterostigmata reddish-brown, trigonal, the interior margin broadly concave; nervures variegated with black and white; the first discoidal cell irregular, the anterior nervure one and a half times the length of the posterior; the fork elongated. Legs brown; femora blackish, the knees reddish; tibiæ black at their apices; first joint of the tarsus pale-red, the two last joints black. Length with wings, 5–6½ mm.

Locality.—Wellington.

The types of this species were sent by me to Mr. R. McLachlan in 1873.

Family PERLIDÆ.

The stone-flies have the antennæ setaceous, with numerous joints; the mandibles are generally rudimentary, but labial palpi are present. The prothorax is large. The abdomen is long, flattened, and with parallel sides; and there are generally two caudal setæ. The wings are unequal, the posterior ones broader, triangular in shape, and longitudinally folded when at rest, in which case they extend beyond the abdomen. The legs are widely separated, and the tarsi are 3-jointed. The larvæ resemble the adult, except in being wingless. They are found in streams, under stones. The nymph (or pupa) is active, with prominent wing-pads.

Genus STENOPERLA, McLachlan (1866).

The two first joints of the maxillary palpi are short, equal, broad; the others smooth; the third and fourth are each twice the length of the second; the fifth is shorter than the fourth. Antennæ short and slender. Wings when at rest surrounding the body; the anterior much narrower than the posterior, elongated; the transverse nervules are numerous and evenly distributed; the posterior wings three times as broad as the anterior, plicated, the transverse nervules distributed pretty evenly over the whole surface.

Distribution.—New Zealand.

Stenoperla prasina.

Chloroperla prasina, Newman, Zoologist, vol. 3, p. 852 (1845). *Hermes prasinus*, Walker, Cat. Neuroptera Brit. Mus., p. 206 (1852). *Stenoperla prasina*, McLachlan, Trans. Ent. Soc., ser. 3, vol. 5, p. 354 (1866); Hudson, Man. Entomology of N.Z., p. 106, pl. 16, fig. 3.

Green, depressed; head hardly broader than the thorax. Prothorax subtransverse, the front margin nearly straight, rounded posteriorly. Caudal setæ 13-jointed. Wings pale-green. Length, 18–20 mm.; expanse of wings, 50–58 mm.

Locality.—Throughout New Zealand.

Stenoperla (?) cyrene.

Chloroperla cyrene, Newman, Zoologist, vol. 3, p. 853 (1845). *Perla (?) cyrene*, Walker, Cat. Neuroptera Brit. Mus., p. 168 (1852); McLachlan, Trans. N.Z. Inst., vol. vi., App., p. xcii.

Black. Head scarcely depressed; antennæ with 40 joints, strong, submoniliform, scarcely shorter than the body, the joints subovate. Prothorax subtransverse, acutely angled, nearly quadrate, not much broader than the head. Caudal setæ very short, incurved, 14-jointed. Tibiæ banded with yellow. Wings blackish, semi-opaque, densely reticulated. Expanse of wings, 25 mm.

Locality.—New Zealand.

This species is not a *Chloroperla* nor a true *Perla*, nor is it a *Stenoperla*. Probably it belongs to a new genus, but well-preserved specimens are wanting for description. It is easily distinguished by its yellow tibiæ.

Genus LEPTOPERLA, Newman (1839).

Exterior portion of the fore wing with six strong parallel nervures, of which the fourth is forked at the extremity and the fifth unites with the fourth before its furcation; these

longitudinal nervures are intersected by several delicate transverse nervules. Antennæ and caudal setæ elongated. Legs elongated.

Distribution.—Tasmania and New Zealand.

Leptoperla opposita.

Perla opposita, Walker, Cat. Neuroptera Brit. Mus., p. 171 (1852). *Leptoperla opposita*, McLachlan, Trans. N.Z. Inst., vol. vi., App., p. xcii. (1874).

Black, shining, partly ferruginous. Head testaceous in front, hardly broader than the thorax; antennæ very minutely pubescent. Prothorax minutely punctured, rugulose on the disk, not broader in front, with a rim on each side and along the fore border, sides straight, angles rather sharp; scutellum with a yellow spot in front. Wings very slightly grey, darker about the transverse nervules; nervures black. Length of the body, 10 mm.; expanse of the wings, 28 mm.

Localities.—Tasmania and New Zealand.

Mr. McLachlan is of opinion that our insect is specifically distinct from that of Tasmania.

Family EPHEMERIDÆ.

The may-flies are distinguished by their unequal wings, their short antennæ, and by their long caudal setæ. The eggs are deposited in water. The larvæ are shaped like the imago, but have long jaws and false gills on each side of the abdomen. The active pupa, or nymph, crawls to the surface of the water and casts off the pupa-skin, and appears to be fully developed, although it is still covered with another very delicate pellicle, and in this stage is called the subimago. It then flies with difficulty to the shore and casts the thin pellicle. The caudal setæ grow sometimes to twice their former length, and it flies away as the imago.

The anterior margin of the wing is called the "costal" nervure, and immediately below it is the "subcostal"; and below that is the "radius": none of these are branched. Next comes a nervure which branches very near the base of the wing into an upper, called the "sector," and a lower, called the "prebrachial"; further on the sector sends out a second lower branch, the "cubitus," which thus lies between the sector and the prebrachial. Starting again from the base, three longitudinal nervures branch off together, the upper of which is called the "pobrachial," the middle the "anal," and the lower the "axillary" nervure.

ARTIFICIAL KEY TO THE GENERA.

The anal nervure meets the pobrachial at the root of the fore-wing .. .. *Ephemera.*
The anal nervure remains separate from the pobrachial.
Fifth joint of the hind tarsi very small or absent .. *Atalophlebia.*
Hind tarsi distinctly 5-jointed.
Hind tarsus shorter than the tibia.
One claw blunt in each tarsus .. .. *Coloburiscus.*
Both claws sharp in each tarsus .. .. *Chirotonetes.*
Hind tarsus longer than the tibia .. .. *Oniscigaster.*

Genus EPHEMERA, Linnæus (1746).

Imago.—Pronotum somewhat transverse. Legs all functional, the hind pair the shortest, its tarsi 4-jointed; fore tibiæ longer than the femur, shorter than the tarsus in the male, equal to it in the female. Wing neuration complete and plentiful. Hind wings well developed, without a longitudinal fold. Caudal setæ very long in the male, moderate in the female, the median about as long as the others.

Subimago.—Quiescent for about twenty-four to thirty-six hours, standing with erect connivent wings upon its hinder legs, the fore legs prorect, off the ground, and the setæ placed close together.

Nymph.—Fossorial, with tracheal branchiæ upon the sides of the segments. Legs short and strong, pilose, the tibiæ distally dilated and oblique, each hind tibia produced into a spine. Head with two conical projections in front.

Distribution.—North Temperate and Indian regions.

Ephemera hudsoni.

Ephemera hudsoni, McLachlan, Ent. Mo. Mag., 1894, p. 270; Hudson, Man. N.Z. Entomology, pl. 16, fig. 4.

Imago (male).—Body castaneous, the segmental divisions narrowly darker, paler beneath. Legs pale-yellowish, the anterior femora with a short blackish line internally, their tips and those of the tibiæ and tarsal joints darker. Anterior wings vitreous, iridescent, the costal margin dark reddish-brown. Posterior wings vitreous, without markings. Caudal setæ (?). Length of body (?); of anterior wings, 19½ mm.; expanse of wings, 41 mm.

Subimago (male).—Body greyish-brown, with the segmental divisions narrowly darker. Legs pale-yellowish, with the articulations blackish. Outer caudal setæ long, the middle rudimentary. Anterior wings subopaque, pale-greyish, with two oblique, transverse, smoky bands. Posterior wings with a smoky, median, oblique band. Length of the body, 20 mm.; expanse of the wings, 41 mm.

Subimago (female).—Rather larger and more robust than

the male; the middle caudal seta well developed, but shorter than the outer two.

Locality.—Wellington.

Genus ATALOPHLEBIA, Eaton (1881).

Imago.—Pronotum of the female with a longitudinal median ridge. Hind tibiæ generally longer than the femora, and longer than the tarsus. Middle caudal seta generally developed. Hind wings with costal and subcostal nervures much arched, the radius nearly straight; transverse nervules abundant in the fore wing; those in the marginal area, before the bulla, well defined.

Subimago.—Quiescent during many hours, standing upon all its feet, with the wings erect, and with the lateral caudal setæ spreading.

Nymph.—Unknown.

Distribution.—Australasia, Japan, Ceylon, South Africa, South America.

Atalophlebia dentata.

Leptophlebia dentata, Eaton, Trans. Ent. Soc. London, 1871, p. 80, pl. 4, fig. 18. *Atalophlebia dentata*, Eaton, Trans. Linn. Soc., 2nd series, Zool., vol. iii., p. 88 (1884).

Imago.—Brown, the segments narrowly bordered with black at their tips. Setæ hairy. Wings vitreous, the marginal and submarginal areas of the fore wing dark-yellow; the cross-nervules in the marginal area before the pterostigmatic space and those in the submarginal area bordered with brown, making a cloud on the bulla. Legs brownish-yellow, the femora more or less dark at the knee, the fore tibia black at the tip. Length of body, 8 mm.; of wing, ♂ 11 mm., ♀ 7–13 mm.

Subimago.—Wings light-grey, the cross-nervules faintly bordered with darker. Neuration black.

Locality.—New Zealand.

Atalophlebia costalis.

Baëtis costalis, Burmeister, Handb. der. Ent. Bd. ii., Abth. ii., p. 800 (1839). *Potamanthus costalis*, Walker, Cat. Neuroptera Brit. Mus., p. 546 (1853). *Atalophlebia costalis*, Eaton, Trans. Linn. Soc., Zool., vol. iii., p. 89.

Subimago.—Black, thorax with a whitish line in front of the wings; abdomen and legs banded with red. Length, 15 mm.

Locality.—Australia. Mentioned by McLachlan as probably occurring in New Zealand also.

Atalophlebia nodularis.

Leptophlebia nodularis, Eaton, Trans. Ent. Soc. London, 1871, p. 81, pl. 4, fig. 20. *Atalophlebia nodularis*, Eaton, Trans. Linn. Soc., Zool., vol. iii., p. 89, pl. x., fig. 16*e*.

Imago.—Reddish-black, with translucent spaces on segments 2 to 5 of the abdomen, one on each side of a dark median longitudinal line. Caudal setæ annulated. Wings vitreous, with the marginal and submarginal areas reddish-brown. Legs reddish, the fore and hind femora with a black band in the middle. Length, 9 mm.; of the wing, 10–12 mm.; of the setæ, 16 mm.

Subimago.—Wings light-grey, with dark neuration, with an ill-defined irregular dark cloud enclosing a light space.

Locality.—Christchurch.

Atalophlebia scita.

Baëtis scita, Walker, Cat. Neuroptera in Brit. Mus., p. 570 (1853). *Leptophlebia scita*, Eaton, Trans. Ent. Soc. London, 1871, p. 81, pl. 4, fig. 21. *Atalophlebia scita*, Eaton, Trans. Linn. Soc., Zool., vol. iii., p. 90, pl. x., fig. 16*f*.

Imago.—Dark-brown, the segments of the abdomen broadly tipped with black, the third to the sixth with a pair of translucent yellowish spots. Setæ annulated. Wings vitreous; the fore wings with a brown spot at the base of the costa, and with less distinct ones in the marginal area at the bulla, and in the pterostigmatic space. In the marginal area there are, in the male, 7–8 cross-nervules before the bulla and 11–13 beyond it; in the female there are 9 before and 18 beyond the bulla. Length of body, ♂ 6 mm., ♀ 9 mm.; of the wings, ♂ 7–8 mm., ♀ 11 mm.

Subimago.—Wings dark-grey, with black neuration, the nervules of the fore wings edged with darker; their scarcity behind the subcostal in the middle of the front of the disk gives rise to the appearance of a pale spot, whilst the mutual approximation of three or four about the bulla, and again in the midst of the pterostigmatic space, produces frequently two dark spots.

Locality.—New Zealand.

Genus Coloburiscus, Eaton (1887).

Imago.—Legs all functional; hind tibia longer than the femur or the tarsus; tarsi 5-jointed, the fifth joint rather indistinct; first joint of the hind tarsus shorter than the second; ungues in all the tarsi dissimilar. Posterior wings well developed, oblong-oval, with the dilatation of the marginal

area acute in front and with relatively scanty neuration in the narrow axillar region. Median caudal seta rudimentary.

Distribution.—Australia and North America.

Coloburiscus humeralis.

Palingenia humeralis, Walker, Cat. Neuroptera in Brit. Mus., p. 552 (1853); and *Baëtis remota*, Walker, *l.c.*, p. 564 (1853). *Coloburus humeralis*, Eaton, Trans. Ent. Soc. London, 1871, p. 132, pl. 3, fig. 1, and pl. 6, fig. 6; and Trans. Linn. Soc., Zool., vol. iii., p. 202, pl. 18, fig. 32*a*.

Imago.—Brown. Wings vitreous, tinged at the base and in the pterostigmatic region with light-brown; cross-nervules of the fore wing edged with brown between the cubitus and pobrachial nervures in the first one-third of their length, and between the costa and the sector in the first half. Fore legs dark-brown, the hind legs yellowish-brown. Length of the body, 11 mm.; of the wing, ♂ 13 mm., ♀ 14–16 mm.; of the setæ, ♂ 15–20 and 2 mm., ♀ 15 and 1 mm.

Subimago.—Wings very light-grey, with darker narrow borders to the nervules in the greater part of the disk. Length of the setæ, 14 and 1 mm.

Locality.—Canterbury and Otago.

Genus CHIROTONETES, Eaton (1881).

Imago.—Legs all functional; hind tibia shorter than the femur but longer than the tarsus; ungues similar, narrow and hooked. Costal dilatation of the hind wing obtuse, axillar region largely developed and with abundant neuration, of which a large portion is composed of numerous long branchlets of the hindermost axillar nervure. Median caudal seta rudimentary or aborted.

Distribution.—Europe, North America, and Sumatra.

Chirotonetes (?) ornatus.

Chirotonetes (?) ornatus, Eaton, Trans. Linn. Soc., 2nd series, Zoology, vol. iii., pp. 270 and 321, pl. 19, fig. 33*c* (1888).

Imago.—Thorax dark-brown in the male, yellowish-brown in the female. Abdomen reddish-brown, with a dark triangular spot behind on each side of every intermediate segment, before the apex of which is an ochreous space. Wings vitreous; the fore wings faintly yellowish in the first portions of the marginal and submarginal areas, and tinged with brownish-black in the pterostigmatic region, where the nervules are dark-bordered. Fore legs brown, the hind legs yellowish, with dark bands on the middle and tip of each femora, the tips of the tibiæ, and the joints of the tarsi. Length, 14–15 mm.; wings, 12–16 mm.; setæ, 16 and 1 mm.

Subimago.—Wings pale-grey; fore wings with a small yellowish spot at the roots of the subcostal nervure; nervules bordered with dark-brown, their borders confluent here and there into spots, producing an irregular chequered appearance. Length of setæ, ♂ 13 mm., ♀ 11 mm.

Locality.—Christchurch.

Easily distinguished from *C. humeralis* by the dark-bordered nervules forming here and there irregular blots, by the smaller extent of yellow at the base of the wings, and by the banded femora.

Genus ONISCIGASTER, McLachlan (1873).

Imago.—Legs all functional; hind tibiæ shorter than the femur, but longer than the tarsus; ungues dissimilar in each tarsus. Hind wings well developed, obtusely subovate, the dilatation of the marginal area obtuse in front; axillar region well developed, largely occupied by numerous long anastomosing nervules from the inner margin. Median caudal seta shorter than the outer pair. Abdomen very robust; the sixth to ninth segments winged on each side.

Distribution.—New Zealand.

Easily recognised by the terminal segments of the abdomen being produced on each side into horny wings with sharp points directed backwards.

Oniscigaster wakefieldi.

Oniscigaster wakefieldi, McLachlan, Ent. Mo. Mag., vol. 10, p. 108 (1873); Journ. Linn. Soc., vol. 12, p. 139, pl. 5, figs. 1–5; Eaton, Trans. Linn. Soc., 2nd series, Zool., vol. iii., p. 224, pl. 21, fig. 36; Sharp, in Cambridge Natural History, vol. v., Insects, p. 442, fig. 284.

Imago.—Dark-brown, rather lighter in the male. Wings vitreous, faintly tinged with light-brown; nervules dark-edged. Legs light-brown, banded with darker. Length, 16–21 mm.; wing, ♂ 16 mm., ♀ 19–21 mm.; setæ, 17 and 5 mm. Expanse of the wings, ♂ 35 mm., ♀ 40 mm.

Subimago.—Body greyish. Wings subopaque, smoky grey; nervules of the anterior portion of the fore wing broadly edged with dark-brown. Length of the setæ, 13 and 7 mm.

Locality.—Canterbury and Nelson.

In 1874 this insect was common in the neighbourhood of Christchurch. I have lived there during the last nineteen years without seeing a single specimen. Whether they have been killed off by the trout or by the sparrows I cannot say.

Group ODONATA.

The dragon-flies are well known to all, and are easily recognised. The neuration of the wing is very complicated, too much so to allow of intelligible description without a diagram, and I must refer the student to Packard's "Guide to the Study of Insects," or to a paper by Mr. W. F. Kirby in the twelfth volume of the "Transactions of the Zoological Society of London," which can be seen in any museum library. It will be sufficient here to point out that on the anterior margin, about midway between the pterostigma and the base, there is a short, thick, transverse nervule called the "nodus," which stops the subcostal nervure. The nervules between the nodus and the base of the wing are called "ante-nodals" or "ante-cubitals," while those between the nodus and the pterostigma are called "post-nodals" or "post-cubitals." All the nervures which cross the wing obliquely are called "sectors." That which starts from the nodus is the "nodal sector," the one next behind it is the "subnodal sector." Below the subcostal nervure comes the "median nervure," and then the "submedian." The first cross-nervule uniting the median with the submedian is the "arculus," which sends off two sectors. The upper one of these branches, and that branch next to the median nervure is called the "principal sector," while the posterior branch forms the "median sector." The "triangle" is an easily recognised area which lies just below the submedian nervure and a little outside the arculus.

The larva of the dragon-flies is aquatic and carnivorous, and very unlike the imago. The pupa is active, and resembles the larva, except for its rudimentary wings. Both larva and pupa are sometimes called the nymph stage. In this stage the lower lip is attached to an elongated "mentum," or mask, which is articulated to the posterior lower portion of the head; and to this mask is articulated the large and flat labium, which differs in shape in the different tribes or families. In the *Libellulina* the labium is entire, while the large lateral palpi are serrated on their inner edges. In the *Æschnina* it is notched, and has narrow palpi with very strong spines. In the *Agrionina* it is deeply cleft, and the palpi are slender, with articulated spines. The nymphs of this tribe can also be distinguished by having three elongated gills at the end of the abdomen.

ARTIFICIAL KEY TO THE NEW ZEALAND GENERA

Wings broad and rounded near their bases.
  Apices of the triangles of the fore wings directed backwards; sectors of the arculus united at their bases.
    Sectors of the arculus petiolate .. .. *Sympetrum.*
    Sectors of the arculus not petiolate .. .. *Somatochlora.*

Apices of the triangles of the fore wings directed outwards; sectors of the arculus separated at their bases.	
Eyes contiguous	*Æschna.*
Eyes separated	*Uropetala.*
Wings attenuated near their bases.	
The subnodal and median sectors starting close together from the principal sector, nearer the arculus than the nodus	*Lestes.*
The subnodal sector starting from the principal sector at the nodus, the median sector a little way behind it	*Xanthagrion.*

Tribe LIBELLULINA.

Eyes large and contiguous, without any tubercle behind. The first ante-nodal nervule of the fore wings is not always continuous across the lower costal space; the hind wings are rounded at the anal angle in both sexes; the triangles of the fore and hind wing differ in shape; sectors of the arculus united at the base.

Genus SYMPETRUM, Newman (1855).

Frontal tubercle slightly truncate; posterior lobe of the prothorax elevated. Pterostigma generally short or moderate; sectors of the arculus petiolate; one cross-nervule in the lower basal or median space. Fore wings with 7 or 8 (rarely 9 or 10) ante-nodal and 6 or 7 post-nodal nervules, the last ante-nodal very rarely and the first two or three post-nodals never continuous across the lower costal space; triangle rather broad, free, on a level with that of the hind wing, three or four rows of post-triangular cells; nodal sector undulated beyond the middle. Hind wings with 5 ante-nodal and 6 to 8 post-nodal nervules, the first three post-nodals not continuous across the lower costal space; triangle free.

Distribution.—Cosmopolitan.

Sympetrum bipunctatum.

Libellula (Diplax) bipunctata, Brauer, Reise der "Novara," Neuroptera, p. 26 (1868).

Head with the lips reddish, the front rather golden, with a narrow black line to the base of the antennæ; vertex yellow, the occipital triangle reddish. Thorax reddish, the sides yellowish, with black spots. Basal segment of the abdomen with a black spot on each side, the second or third with a black spot in the middle. Wings hyaline, the posterior pair yellowish at the base; costa yellow at the base; pterostigma margined with black.

Male with the legs black, the coxæ reddish, femora and tibiæ yellow on the outside. Pterostigma reddish; 9 or 10 ante-nodals.

Female with the legs yellowish, the femora black on the outside and the tibiæ on the inside; tarsi black. Pterostigma yellow; 8 or 9 ante-nodals.

Length of the body, 28 mm.; of the fore wings, 23 mm.; of the hind wings, 18 mm.

Locality.—New Caledonia.

Variety *novæ-zealandiæ*, McLachlan, Ent. Mo. Mag., 1894, p. 271.

Differs from the type chiefly in the greater extension of yellow at the base of the wings and its deeper tint. In the anterior wings of the female this colour extends to the second ante-nodal, to the arculus, and to near the end of the lower basal cell; and in the posterior wings it forms a triangular basal space reaching the triangle and continued in an oblique manner to the anal margin, some distance below the end of the membranule.

Male not known.

Locality.—Auckland and Wellington.

Tribe CORDULIINA.

Resembles *Libellulina*, but the eyes have a slight horny tubercle behind, the triangles of the wings are generally wider, the sectors of the arculus are often completely separated, the last ante-nodal nervule is always continuous, there is only a small number of post-nodal nervules, the nodal sector is never undulated beyond the middle, and the males usually have the anal angle of the wings angulated.

Genus SOMATOCHLORA, Selys (1878).

Tubercles behind the eyes slight. Pterostigma rather short. Fore wings with 7 or 8 ante-nodal and 6 to 8 post-nodal nervules; hind wings with 5 (or rarely 6) ante-nodals and 8 to 10 post-nodals. Sectors of the arculus united at their bases, but not petiolate. Basal and hypotrigonal areas undivided; lower basal (or median) area with one cross-nervule in both wings. Internal triangle of the fore wings with three cells; triangle of the hind wings followed by two cells. Superior anal appendages of the male long, subcylindrical, rather thicker in the middle; the inferior pair short, subtriangular. Those of the female long, subcylindrical, slightly curved upwards, and pointed at the apex.

Distribution.—North America and other places.

ARTIFICIAL KEY TO THE SPECIES.

Triangle of the hind wing not divided.
- Fore wing with seven ante-nodal nervules .. .. *S. smithii.*
- Fore wing with eight ante-nodal nervules .. .. *S. grayi.*

Triangle of the hind wing divided.
- Fore wing with eight ante-nodal nervules .. .. *S. braueri.*

Somatochlora smithii.

Cordulia smithii, White, Zool. "Erebus" and "Terror," Insects, pl. vi., fig. 2 (no description); Hudson, Man. N.Z. Entomology, p. 104, pl. 15, fig. 2 (1892). *C. novæ-zealandiæ*, Brauer, Reise der "Novara," Neuroptera, p. 78, tab. ii., fig. 3–3*b* (1868).

Head browny-green in front, the sides yellow. Thorax metallic bronzy-green. Wings hyaline in the male, in the female with a broad spot of pale brownish-yellow behind the pterostigma; hind wings yellowish at the base; pterostigma brown in the male, reddish in the female; triangle of fore wing divided by a nervule, that of the hind wing free; 7 ante-nodals in the fore wing and 5 in the hind wing. Legs black, the fore femora almost entirely red, the intermediate red on the inside. Abdomen dull-red, posteriorly moniliform in the male, depressed-cylindrical in the female; a median longitudinal band of blackish bronzy-green interrupted at the posterior margins of the segments by a yellow transverse line. Superior anal appendages in the male black, long, acute at the apex, and bent upwards, in the middle converging and subdilated, angled exteriorly. Inferior appendages simple, half the length, triangular, yellow. Anal appendages of the female cylindrical, incurved, acute. Length, 50 mm.; of fore wing, 35 mm.; of hind wing, 34 mm.

Locality.—Throughout New Zealand and the Chatham Islands.

Common.

Somatochlora grayi.

Epitheca grayi, de Selys, Synopsis Cordulines, p. 49 (1871).

Male.—Head with the lips yellowish, the face pale-brown, the upper part of the front metallic green. Thorax brown, with metallic-green reflections. Wings slightly tinged, the extreme base ochraceous, especially in the hind wings, where the colours expand along the membranule; neuration black, including the costa; pterostigma small, reddish; triangle traversed by a nervule in the fore wing, free in the hind wing; three post-trigonal cellules followed by two rows; the anal margin excavated, but almost filled in by the membranule, which is brownish-grey, paler at the base; 8 ante-nodals in the fore wing. Legs black, the anterior femora and an external band on the intermediate yellowish. Abdomen inflated at the base, a little constricted at the third segment, then broadening and flattening to the eighth, afterwards attenuated; oreillettes prominent. It is blackish above, excepting the first and second segments, which are yellowish, and the third to the tenth have on each side a broad yellow spot occupying their basal half. Superior anal appendages

blackish, almost double the length of the tenth segment, villose, cylindrical and straight in their first three-quarters, the apex expanding and forming a sort of club curved suddenly outwards almost at a right angle to the inner edge, the outer edge simply inclined, the extremity blunt, almost truncate. Seen in profile the upper side has a small point directed in front. Inferior appendages shorter, yellowish, subtriangular, slightly curved upwards, with a blunt point. Length of the abdomen, 39 mm.; of the hind wing, 33 mm.

Female unknown.

Locality.—New Zealand.

Somatochlora braueri.

Epitheca braueri, de Selys, Synopsis Cordulines, p. 50 (1871).

Male.—Head brown, rhinarium yellow, upper side of the front greenish, base of the eyes yellowish-brown. Thorax brown, the upper portions and sides bronzy-green. Wings tinged, slightly ochraceous at the extreme base; the posterior with the anal margin excavated, membranule large, blackish, paler at the base; pterostigma small, reddish-brown; triangles divided in all the wings; 8 ante-nodal nervules in the fore wings and 6 in the hind; 7 or 8 post-nodals. Legs brown, the tarsi blackish. Abdomen slender, brown, with bronzy reflections, with a sinuated dorsal blackish bronzy band, not well defined, prolonged over all the segments, the articulations blackish; oreillettes scarcely evident. Superior anal appendages subcylindrical, dark-brown, double the length of the tenth segment, without any tooth, slightly bent inwardly and curved outwardly in the second half, where there is a slight dilatation outwardly, the apex blunt. Inferior appendage one-quarter shorter, regularly attenuated, the extremity slender, truncated, slightly elevated. Length of the abdomen, 40 mm.; of the hind wings, 36 mm.

Female differs from the male in having a broad spot of yellowish-white below the pterostigma; 7 or 8 ante-nodals in the fore wing and 5 or 6 in the hind, 6 or 7 post-nodals in the fore wing and 8 or 9 in the hind (the right and left wings often different). Legs black, the proximal halves of the femora brown below. Anal appendages as in *S. smithii*. Length, 50 mm.; of abdomen, 36 mm.; of fore wing, 37 mm.; of hind wing, 36 mm.

Locality.—Canterbury.

Tribe ÆSCHNINA.

Eyes large and contiguous. Apices of the triangles of all the wings directed outwards; the quadrangle with transverse nervules.

Genus ÆSCHNA, Fabricius.

Eyes sinuated behind. The inferior appendage generally entire, sometimes quadrifid. Anal margin of the hind wings of the male generally projecting, with the posterior margin sinuated.

Distribution.—Widely spread in both hemispheres.

Æschna brevistyla.

Æschna brevistyla, Rambur, Hist. Névroptères, p. 205 (1842).

Face yellowish, with the margin of the upper lip and an I-shaped mark on the vertex black. Thorax reddish-brown, with two very oblique yellow lines on each side. Wings hyaline, or slightly tinged with reddish, the costal nervure reddish or yellow; pterostigma reddish-brown, narrow, longer in the female. Legs black, the femora reddish at their bases. Abdomen inflated at the base, then constricted; reddish-brown, with numerous yellow spots. Superior anal appendages in the male narrow, those of the female very short. Length, 65 mm.; of the abdomen, 46 mm.; of the fore wings, 42 mm.; of the hind wings, 42 mm.

Locality.—Eastern Australia and New Zealand.

Tribe GOMPHINA.

Eyes large, separated; apices of the triangles of the wings directed outwards; the quadrangle without nervules; wings unequal, the hinder pair broader.

Genus UROPETALA, Selys (1857).

The lower lip notched in the centre; occiput without any horns; eyes elongated; bristle of the antennæ articulated. Sides of the thorax without any salient points. Pterostigma long; all the triangles of the wings divided, the basiliar space not divided. Discoidal triangle of the fore wings with the superior side as long as or longer than the interior side, and divided into three cellules. Superior anal appendages of the male flattened, narrowed at the base; inferior appendages rather shorter, not sloped.

Distribution.—New Zealand.

Uropetala carovei.

Petalura carovei, White, Zool. "Erebus" and "Terror," Insects, pl. 6, fig. 1. *Uropetala carovei*, Selys, Mon. Gomphines, p. 370, pl. 19, fig. 2 (1857).

Front of the head and occiput pale-yellow, the vertex black. Thorax black, with two large yellow spots on the pronotum and two smaller ones on the mesonotum; an oblique yellow band on each side, meeting on the back between the two pairs

of wings. Abdomen dark-brown, the base of each segment with a pair of yellow spots. Legs long, the femora brownish, the tibiæ black. Wings hyaline; the pterostigma brown, surmounting 8 to 10 cellules. Discoidal triangle of the fore wing with the superior and interior sides forming a right angle; divided into three cellules by three nervules leaving the middle of each side and meeting in the middle. The internal triangle divided in the same way. Discoidal triangle of hind wing crossed by one or two nervules. Length, ♂ 86 mm., ♀ 87–92 mm.; of abdomen, ♂ 63 mm., ♀ 62–65 mm.; of fore wing, ♂ 51 mm., ♀ 59–60 mm.; of hind wing, ♂ 48 mm., ♀ 54–56 mm.

Locality.—New Zealand; especially the North Island.

A variation occurs in the division of the discoidal triangle of the fore wing, which is often simply crossed by two nervules, one from the superior the other from the interior side. The division of the internal triangle does not vary.

Tribe AGRIONINA.

Eyes small and distant; wings equal, attenuated at their bases.

Genus LESTES, Leach (1817).

Wings horizontal in repose. Nodal sector arising three to five cells behind the nodus; the subnodal not angulated or hardly undulated; the ultra-nodal sector interposed and the short sector angular under the nodus; two supplementary sectors interposed between the subnodal and the median sectors. Pterostigma three or four times as long as broad, surmounting 2 to 4 cellules. Two ante-nodals in all the wings. Quadrilateral with the internal side a third or a fourth of the interior. Anal appendages of the female cylindrical, subulate, shorter than the last segment.

Distribution.—Cosmopolitan.

Second Section.

External inferior angle of the quadrilateral much pointed. Colour blackish-bronze, mixed with blue or clear red. Inferior appendages of the male short.

Distribution.—Asia, Australasia, Oceania.

Lestes colensonis.

Agrion colensonis, White, Zool. "Erebus" and "Terror," Insects, pl. 6, fig. 3. *Lestes colensonis*, Selys, Synopsis Agrionines, p. 44 (1862); Hudson, Man. Ent. of N.Z., p. 104, figs. 3, 3*a* (1892).

Pterostigma black in the male, brown in the female, subtending three or four cells, not dilated, slightly oblique at the

end. Fore wing with 11–14 post-nodal nervures. Labrum olivaceous, edged with black; upper parts of the head bronzy-black. Prothorax black, with a dorsal touch of blue on each of the three lobes; front of the thorax bronzy-black, with a blue ante-humeral band, becoming post-humeral and almost forked in its upper part; the black band which borders it is sinuated on the outside, and prolonged above, under the wings, to the middle suture of the sides; the rest of the sides olivaceous, passing into yellowish below, where the breast is marked behind, on each side, with an elongated black spot. Abdomen slender, bronzy-blue; the 3rd to the 7th segment with a bluish basal ring, passing into yellowish, which is the colour of the lower surface. Legs yellowish-brown on the outside, black on the inside in the male. Superior appendages of the male like pincers, toothed outside, and having a tubercle at the base inside, which is the commencement of a dilatation terminated towards the middle by a very sharp tooth; the end inclined downwards, and curved slightly outwards. Inferior appendages not half the length of the superior, brown, thick, approximated, slightly attenuated.

In the female the blue of the thorax is replaced by yellow, and that of the abdomen by dull-bronze. The anal appendages are separated, subcylindrical, yellowish, shorter than the last segment; the valves slightly toothed at the tips. Legs brown inside.

Locality.—Throughout New Zealand.

Very common

Genus XANTHAGRION, de Selys (1876).

Head, thorax, and abdomen medium. The post-ocular rays clear, united by an occipital line. Lower sector of the triangle arising from the basal nervule of the post-costal; pterostigma lozenge-shaped, short on all the wings; post-nodal nervules 11 to 15. No spine on the vulva of the female.

Distribution.—Australia and New Zealand.

The New Zealand species differ from those of Australia in having the basal post-costal nervule placed between the first and second ante-nodals instead of below the first.

ARTIFICIAL KEY TO THE SPECIES.

Pterostigma surmounting one cellule.	
Yellow spots behind the eyes and on the prothorax	*X. zealandicum.*
No yellow spots behind the eyes or on the prothorax	*X. antipodum.*
Pterostigma surmounting two cellules	*X. sobrinum.*

Xanthagrion zealandicum.

Telebasis zealandica, McLachlan, Ann. Mag. Nat. His., ser. 4, vol. 12, p. 35 (1873); Trans. N.Z. Inst., vol. vi., App.,

p. xciii.; Hudson, Man. Entomology of N.Z., p. 105, pl. 15, fig. 4 (1892). *Xanthagrion zealandicum*, de Selys, Synopsis Agrionines, p. 232 (1876).

The male has the abdomen bright-red, with black rings at the sutures. Head and thorax above black, with long brownish hairs; a large red spot behind each eye, the two connected by a transverse red line. Prothorax black, its borders and three discal spots red; the posterior lobe rounded and but little projecting. Thorax with two bright-red lines; the sides reddish, with two black lines. Legs bright-red, with black spines. Superior anal appendages short, subtriangular, with an obscure tubercle inside. Inferior appendages hooked, as long as the 10th segment. Pterostigma surmounting one cellule. Length, 30–32 mm.; of abdomen, 21–24 mm.; of hind wing, 16–20 mm.; expanse, 34–38 mm.

The female has the red replaced by yellow on the head and thorax; the abdomen bronzy-black above, pale-yellowish beneath. Length, 33 mm.; of abdomen, 26 mm.; of hind wing, 20 mm.; expanse, 40 mm.

There are 13–14 post-nodal nervules and three cells between the quadrilateral and the nodus.

Locality.—Throughout New Zealand.

Common.

Xanthagrion antipodum.

Xanthagrion antipodum, de Selys, Synopsis Agrionines, p. 239 (1876).

Differs from *X. zealandicum* in having no spots behind the eyes, but a yellow occipital line only, and no yellow spots on the prothorax; the first abdominal segment has no yellow spot; the femora have a black ray on the outside. There are only 11 post-nodal nervules. The pterostigma is rather shorter than the opposite cell. Length of the abdomen, 24 mm.; of the hind wing, 17 mm.

Locality.—New Zealand.

Described from a single female specimen.

Xanthagrion sobrinum.

Telebasis sobrina, McLachlan, Ann. Nat. Hist., ser. 4, vol. 12, p. 36 (1873). *Xanthagrion sobrinum*, de Selys, Synopsis Agrionines, p. 234 (1876).

Very like *X. zealandicum*, but larger; the basal spot on the first segment of the abdomen is divided; the superior anal appendages are much exserted, scarcely half the length of the inferior, subtriangular, the lower edge concave. Four cellules between the quadrilateral and the nodus in all the wings; pterostigma surmounting fully two cellules; anterior

wings with 15 post-nodal nervules. Length, 39 mm.; of abdomen, 31 mm.; of hind wing, 22 mm.; expanse, 56 mm.

Locality.—New Zealand and Chatham Islands.

In Chatham Island specimens the basal black spot on the first abdominal segment is not divided, and there are 15 to 18 post-nodal nervules.

Group PLANIPENNIA.

The *Planipennia*, or *Neuroptera vera*, are distinguished by the larva being carnivorous, and very unlike the imago; while the pupa is quiescent and the wings are developed internally. The antennæ are long, the mouth is mandibulate, the wings are naked, and the hind wings are never folded. The tarsi are 5-jointed.

ARTIFICIAL KEY TO THE FAMILIES.

Nervures of the wing not very numerous	*Scialidæ.*
Nervures of the wing very numerous.	
Antennæ setaceous or moniliform	*Hemerobiidæ.*
Antennæ short, clavate..	*Myrmeleontidæ.*

Family SCIALIDÆ.

Large insects, with the body short and thick, the prothorax large and square. Antennæ long and setaceous. Ocelli conspicuous. Wings moderate, reticulated, the hinder pair rather smaller and with the anal space small, not plicated. The larvæ are aquatic. When full fed they leave the water, and make cells in the bank, in which the inactive pupæ undergo their transformation. They are generally known as alder-flies.

Genus CHAULIODES, Latreille (1805).

Prothorax as large as the head. Three ocelli close together. Antennæ pectinated or serrated. Neuration moderate, the nervules slender. Joints of the tarsi cylindrical. Caudal appendages of the male conical and simple.

Distribution.—Asia, Africa, America, Australia.

Chauliodes diversus.

Hermes diversus, Walker, Cat. Neuroptera in Brit. Mus., p. 205 (1852). *H. dubitatus*, Walker, *l.c.*, p. 204. *Chauliodes diversus*, McLachlan, Ann. Mag. Nat. Hist., ser. 4, vol. 4, pp. 37 and 39; Hudson, Man. Ent. of N.Z., p. 102, pl. 14, figs. 1–1*b*.

Ferruginous. Head much broader than the thorax, striped, testaceous in front, contracted hindward; antennæ piceous; prothorax with a slight longitudinal furrow, its length a little exceeding its breadth; abdomen piceous; wings long and

narrow; fore wings dingy-white, with numerous pale-brown dots, which are mostly on the pale testaceous veins; marginal region of the fore wings with twelve transverse veins (*Walker*). Length of the body, 28 mm.; expanse of the wings, 76 mm.

Locality.—New Zealand.

Family MYRMELEONTIDÆ.

The ant-lions have their wings much reticulated, the apical space with regular oblong cellules. The antennæ are generally clavate, and the legs are all similar. The larva is terrestrial, living in sand, where it makes conical hollows, at the bottom of which it lives.

Genus MYRMELEON, Linne (1748).

Antennæ short, clavate or subclavate. Abdomen long and slender.

Distribution.—Widely spread in warm latitudes.

Myrmeleon acutus.

Myrmeleon acutus, Walker, Cat. Neuroptera Brit. Mus., p. 377 (1853). *M. novæ-zealandiæ*, Colenso, Trans. N.Z. Inst., vol. 17, p. 156 (1885).

Black, slender, slightly tinged with grey; head yellow towards the mouth, with a yellow spot on each side of the face and a yellow streak by the base of each antenna; palpi tawny; antennæ wanting. Abdomen much shorter than the wings; legs black, femora beneath towards the base, and hind tibiæ yellow. Wings slightly grey, long, very narrow, slightly pointed; pterostigma pale-yellow; veins black with yellow bands; subcostal areolets simple, their veins forked at intervals from one-third of the length of the wing to the pterostigma, where there is a dark-brown spot; rows of dark-brown spots along the radius and its sector, and along the cubitus and its fork; small brown spots on the forks of the marginal veins and on the gradate veinlets towards the tip of the wing and along the hind border; a larger brown spot at the tip of the fork of the cubitus and another by the last of the quadrate areolets between the first sector of the radius and the cubitus; hind wings a little shorter and narrower than the fore wings, with a few brown dots towards the tip and along the hind border. Length of the body, 30 mm.; expanse of the wings, 71 mm. (*Walker*.)

Locality.—North Island of New Zealand.

This, or another species, is also found near Nelson, and occasionally as far south as Christchurch.

Family HEMEROBIIDÆ.

The lace-winged flies have the head vertical, with long setaceous antennæ inserted between the eyes, and indistinct ocelli. The wings are large, equal, densely reticulated, and without any anal area. The larvæ are terrestrial, the pupa enclosed in a cocoon.

ARTIFICIAL KEY TO THE GENERA.

Fore wings much dilated at the base	*Drepanepteryx.*
Fore wings narrowed at the base.	
No recurrent nervule	*Micromus.*
A recurrent nervule	*Stenosmylus.*

Genus STENOSMYLUS, McLachlan (1867).

Prothorax elongated, subcylindrical. Wings long and narrow, rounded or acute at the apex, subfalcate with the apical margin excised in the New Zealand species. Subcostal nervules numerous, those in the disk very numerous.

Distribution.—Australia and New Zealand.

Stenosmylus incisus.

Osmylus (?) incisus, McLachlan, Journ. of Entomology, vol. 2, p. 112, pl. 6, fig. 1 (1863). *Stenosmylus incisus*, McLachlan, Ent. Mo. Mag., vol. 6, p. 195: Hudson, Man. Ent. of N.Z., p. 101, pl. 14, fig. 2; Trans. N.Z. Inst., xxvi., p. 105.

Lurid, pubescent; antennæ yellow, slightly hairy; eyes lurid; abdomen fuscous; legs yellow, femora and tibiæ with a black spot at the knees, and another in the middle; apical joints of the tarsi black. Anterior wings narrow at the base, apical margin excised, subhyaline, sometimes tinged with brownish, clouded and irrorated with greyish fuscous; three large irregular-shaped blotches on the inner margin, and a somewhat lunate one in the apex, fuscous; costa spotted with fuscous; subcostal nervure and one in the middle of the wing yellow, all the others fuscous, dotted with white. Posterior wings marked in a similar manner, but less distinctly, and the apical margins very slightly excised. Length of the body, 17 mm.; expanse of the wings, 55 mm.

Locality.—Auckland and Otago.

Stenosmylus citrinus.

Stenosmylus citrinus, McLachlan, Ann. Mag. Nat. Hist., ser. 4, vol. 12, p. 38 (1873); Trans. N.Z. Inst., vol. 6, App., p. xcvi.: Hudson, Trans. N.Z. Inst., vol. xxv., p. 105.

Citron-yellow, obscured on the face; above blackish. Thorax black on each side. Anterior and intermediate tibiæ and posterior femora dark at each end and in the middle.

Anterior wings sprinkled with black spots; discal subapical spot, and some other small ones near the apical margin, whitish, margined with black. Posterior wings paler, with subobsolete black spots on the costal margins only; no white spots. Abdomen blackish. Length of the body, 16 mm.; expanse of wings, 32 mm.

Locality.—New Zealand.

Variable in colour. A specimen from Waitara has hardly any yellow, but is pale-grey, and has more dark points in the anterior wing. The white spots not margined with black. (*R. McL.*)

Stenosmylus latiusculus.

Stenosmylus latiusculus, McLachlan, Ent. Mo. Mag., ser. 2, vol. 5, p. 241 (1894).

Head above and pronotum yellowish; ocelli large but not prominent, approximate; antennæ pale-brown, the two basal joints and the base of the third joint yellow. Meso- and meta-nota yellowish, clouded with fuscescent. Anterior legs pale-yellow, the tips of the tibiæ and tarsal joints brownish, plantula brownish; posterior legs mostly fuscescent. Abdomen (♀) fuscous above, dull-yellowish beneath; apex obtuse, provided beneath with an ovipositor (?), which appears to consist of two closely applied 2-jointed pieces, the second joint directed backward from the first; the posterior margin of the 7th ventral segment produced in its middle into a quadrate valve, from within which a cylindrical process, broad at its base, is directed between the basal joints of the above-described apparatus. Wings long-oval, subacute at the apex, with a very slight subapical excision, ground-colour pale-grey; anterior wings with the neuration blackish and whitish irregularly alternate, giving a faint irregular tesselated appearance; pterostigmatic region long but ill-defined, whitish-testaceous; posterior wings almost without markings. Length of body, 13 mm.; of anterior wing, 26 mm.; its greatest breadth, 9 mm.; expanse of wings, 54 mm.

Locality—Otira Gorge.

Variety.—The head above and the pronotum more dusky, and the black margins of the latter rather broader. Posterior legs wholly yellowish. The anterior wings rather more strongly marked. Smaller. Expanse of wings, ♀ 45 mm.

Locality.—Greymouth (?).

Genus DREPANEPTERYX, Leach (1835).

Antennæ rather shorter than the body, moniliform, the basal joint very robust; maxillary palpi long and slender, labial palpi very short; ocelli wanting. Thorax broad. Wings broad; anterior pair much dilated and rounded at the

base, very numerous dichotomous nervures united by two longitudinal series on the costal area, and three somewhat irregularly placed oblique series on the disk, exclusive of the pair common to all the family; the apical margin excised, and with a recurved apex; the base of the inner margin with a mucronated process. Posterior wings shorter, with fewer nervures, somewhat lanceolate-acute, the hinder margin waved. Abdomen compressed. Legs long and slender.

Distribution.—Europe, Asia, &c.

Drepanepteryx instabilis.

Drepanepteryx instabilis, McLachlan, Journ. of Entomology, vol. 2, p. 115, pl. 6, fig. 4 (1863).

Reddish-fuscous; antennæ pale greyish-ochreous, annulated with brown; prothorax black at the sides; legs very pale greyish-ochreous. Anterior wings deeply excised below the apex, greyish subhyaline, clouded and irrorated with greyish-brown, forming transverse streaks on the costal margin; six sectors radii, ten gradate veinlets in the inner series, fourteen in the outer, the latter deeply margined with blackish; longitudinal veins dotted with greyish-brown. Posterior wings whitish-hyaline, interruptedly margined with grey; some of the veins blackish. Length of the body, 7½ mm.; expanse of the wings, 19 mm.

Locality.—Otago.

A variety has both series of gradate veinlets in the anterior wings margined with blackish; between them, on the costa, is a large subhyaline space without markings, and a somewhat conspicuous black spot near the base.

Drepanepteryx humilis.

Drepanepteryx humilis, McLachlan, Journ. of Entomology, vol. 2, p. 116, pl. 6, fig. 5 (1863).

Ochreous, slightly pilose; antennæ pale-ochreous; eyes lurid. Pro- and meso-thorax somewhat fuscous at the sides. Legs pale-ochreous, tarsi fuscescent. Anterior wings slightly excised at the apical margin, subhyaline, clouded with greyish-ochreous, and with a few scattered black dots, most numerous along the costal margin; apical and inner margins narrowly fuscous, spotted with white; longitudinal veins with fuscous points; nine veinlets in the inner gradate series, some of which are fuscous, thirteen in the outer. Posterior wings hyaline, pterostigma ochreous. Length of the body, 6 mm.; expanse of the wings, 15 mm.

Locality.—Auckland and Otago. Found also in Queensland.

In the New Zealand examples the posterior wings have a fuscous dash at the anal angle, but they do not sufficiently

differ from the Australian to warrant their separation specifically.

Genus MICROMUS, Rambur (1866).

The base of the costal area of the fore wing narrowed and without a recurrent nervure. Subcostal area with one basal cell.

Distribution.—Tasmania and New Zealand.

Micromus tasmaniæ.

Hemerobius tasmaniæ, Walker, Trans. Ent. Soc. of London, ser. 2, vol. 5, p. 186.

Dull-red; head tawny, with a band, a stripe, and a point on each side, hindward dull-red. Thorax with some tawny marks. Legs whitish. Wings narrow, almost vitreous; the veins whitish; fore wings pubescent; veins rather few, with brown points. Length of the body, 4–5 mm.; expanse of the wings, 10–12½ mm.

Locality.—Tasmania and New Zealand.

The type is from Tasmania.

Group TRICHOPTERA.

In the caddis-flies the wings are generally hairy, with longitudinal branching nervures, and but few transverse nervules; the posterior pair are generally larger than the anterior, and folded longitudinally when at rest. The antennæ are setaceous, and the mandibles obsolete. The maxillary palpi vary much, but are always 5-jointed in the female. The legs are long and slender, and the tibiæ are often furnished with spines in addition to the movable spurs which are found at the apex and sometimes near the middle of each tibia. These spurs usually differ in colour and appearance from the spines, and are important characters in classification. The formula 2 . 4 . 4. means that the fore tibia has a pair of apical spurs, while the middle and hind tibiæ have median pairs in addition to the apical pairs.

The neuration of the anterior wings is also very important in classification, and the following remarks—taken from Mr. McLachlan—may help the student. The anterior margin is called the "costa." Parallel to the costa is a nervure called the "subcosta." At the base of the wing the subcosta emits the "radius," which runs parallel to it. Near its base the radius emits the "sector," which divides into two branches, each of which again divides. The space between the two principal branches of the sector is closed by a transverse nervule, and is called the "discoidal cell." Turning now again to the base of the wing we find another longitudinal nervure below the radius. This is the "superior cubitus,"

which almost immediately divides into two branches, which again divide. At the first furcation of the upper branch there is generally a semi-transparent whitish spot without any hairs, called the "thyridium." The "inferior cubitus" is always fine, and does not branch. At the point of its termination on the inner margin of the wing there is another transparent whitish spot, called the "arculus." The apical forks of the sector and superior cubitus divide the extremity of the wing into a number of apical cells, which are numbered from before backwards.

The larvæ are aquatic, and live in cases formed of small pieces of sticks or leaves or grains of sand, &c., fastened together by a silky secretion from a spinning-gland, which opens on the second pair of maxillæ. In a few the case is formed of the secretion only. These cases are either fixed or free. The larva inhabiting them is herbivorous, and very unlike the imago. The pupa resembles the perfect insect, becoming active before it changes into the imago. These active pupæ are often called "nymphs."

ARTIFICIAL KEY TO THE NEW ZEALAND GENERA.

1. Length of the fore wing more than four times its greatest width.

Hind wing elongate, acute at the apex.
- Fore wing linear .. .. *Setodes.*
- Fore wing lanceolate .. .. *Oxyethira.*

Hind wing triangular, blunt at the apex.
- Tibial spurs 2 . 2 . 4 .. .. *Pseudonema.*
- Tibial spurs 2 . 2 . 2 .. .. *Notanatolica.*

2. Length of the fore wing between three and four times its greatest breadth.

Hind wing triangular .. .. *Leptocerus.*
Hind wing oblong.
- Length of hind wing more than three times its greatest breadth .. .. *Hydrobiosis.*
- Length of hind wing between two and three times its greatest breadth.
  - Antennæ strong; tibial spurs 3 . 4 . 4 .. .. *Polycentropus.*
  - Antennæ slender.
    - Tibial spurs 2 . 4 . 4; a transverse vein connecting the radius with the sector .. *Psilochorema.*
    - Tibial spurs 2 . 2 . 4; no transverse vein connecting the radius with the sector .. *Philaniscus.*

3. Length of the fore wing less than three times its greatest breadth.

Tibial spurs 2 . 4 . 4
- Last joint of the maxillary palpi like the others.
  - Upper edge of the discoidal cell straight .. *Œconesus.*
  - Upper edge of the discoidal cell excised .. *Pseudœconesus.*
- Last joint of the maxillary palpi composed of many jointlets .. .. *Hydropsyche.*

Tibial spurs 2 . 2 . 2
- Tibial spurs hairy .. .. *Olinga.*
- Tibial spurs not hairy .. .. *Pycnocentria.*

Family SERICOSTOMATIDÆ.

Maxillary palpi of the male 2- or 3-jointed, ordinarily very pubescent or pilose, and always formed in quite a different manner from those of the female; varying greatly according to the genus. Larva with non-fasciculate respiratory filaments; the case free.

Genus ŒCONESUS, McLachlan (1862).

Male.—Head quadrate; antennæ about the length of the wings, basal joint short and rather thick, not so long as the head. Maxillary palpi oval-elongate, much swollen, curved up in front of the head, their apices when viewed from above appearing as two rounded tubercles between the antennæ, moderately hairy. Labial palpi with the basal joints short, the second and third of equal length, long. Anterior tibiæ with two short spurs; intermediate and posterior, each with four long unequal spurs. Anterior wings rather short and broad, very slightly hairy, the costa much arched, apical margin almost straight; the costa from the base to the pterostigma is narrowly folded inwards; discoidal cell long and narrow; the superior cubitus does not fork before the anastomosis, and from this cause there are only eight apical cells; the anastomosis is complete and very oblique from the third apical cell; the lower part is not connected with the inner margin by a transverse nervule, and the last apical cell is continued from the apex to near the base of the wing, the apical portion being very broad; near the base of the third apical cell in all four wings is a small round hyaline spot. Posterior wings broad, folded, the discoidal cell short and triangular.

Female.—The maxillary palpi are 5-jointed, the basal joint very short, the second slightly longer, the third to the fifth still longer and nearly equal. The neuration of the anterior wings is regular, and in the posterior wings there are two additional apical forks.

Distribution.—New Zealand.

Œconesus maori.

Œconesus maori, McLachlan, Trans. Ent. Soc. London, 1862, p. 3; Jour. Linn. Soc., vol. 10, pl. 2, fig. 1.

Male.—Antennæ pale-ochreous; eyes blackish, slightly reticulated with brassy; head, thorax, and abdomen reddish-brown; legs reddish-ochreous; anterior wings rusty-brown, thickly irrorated with whitish spots, which are larger towards the base; on the inner margin are three elongated whitish spots, alternating with others of the dark ground-colour.

Posterior wings subhyaline, tinged with brownish. Length of the body, 8 mm.; expanse of wings, 21 mm.

Female.—Larger, the expanse of the wings being 30 mm.

Locality.—Wellington.

This insect, at first sight, has a somewhat deceptive resemblance to *Hydropsyche fimbriata.*

Genus PSEUDŒCONESUS, McLachlan (1894).

Male.—Antennæ, palpi, and legs practically the same as in *Œconesus.* Anterior wings without any costal fold, and no defined groove; the radius is confluent with the first apical sector (in both sexes and in both pairs as in *Œconesus*); upper edge of the discoidal cell excised (straight in *Œconesus*); apical forks Nos. 1, 2, and 3 present, the others irregular; the sixth apical cell very much dilated at its base in a nearly circular manner. Posterior wings with the apical forks Nos. 1, 2, 3, and 5 present, the neuration apparently regular.

Female.—The joints of the labial palpi shorter and broader, the terminal joint almost spoon-shaped. In both pairs of wings the apical forks Nos. 1, 2, 3, and 5 are present, and the neuration appears to be normal and regular.

Distribution.—New Zealand.

Pseudœconesus mimus.

Pseudœconesus mimus, McLachlan, Ent. Mo. Mag., 1894, p. 239.

Female.—Much like the same sex in *Œ. maori*, but slightly smaller; the pale irrorations are larger and less regular; near the base of the third apical cell is a rather large, rounded, pale spot, on each side of which is a somewhat conspicuous brown spot. On the antepenultimate ventral segment is a very strong triangular tooth. The end of the abdomen in dried specimens is very similar to that of *Œ. maori.*

Locality.—Wellington.

Pseudœconesus stramineus.

Pseudœconesus stramineus, McLachlan, Ent. Mo. Mag., 1894, p. 240.

Male.—Stramineous or pale-testaceous. Anterior wings pale-greyish, stramineous, closely irrorated with small whitish spots, apical margin narrowly interruptedly fuscescent, inner margin with four or five long fuscous lines alternating with long pale spaces. Posterior wings whitish-stramineous, the apical portion yellowish, fringes concolorous. Penultimate and antepenultimate ventral segments of the abdomen each with an acute tooth; superior appendages lateral, quadrate,

furnished with long hairs. Intermediate appendages (or penis-cover?), viewed from above, consolidated into a broad elongate plate, canaliculate above, deeply notched at the apex, furnished with very long hairs. Inferior appendages 2-branched, the branches distant, stout and cylindrical, curved so as to leave a semicircular space between them. Length of body, 7 mm.; expanse of wings, 28 mm.

Locality.—Wellington.

Female.—Like the male, but the body darker, and the anterior wings yellower. A sharp, broad, triangular tooth on the antepenultimate ventral segment. Margin of the last dorsal segment nearly straight and slightly excised in its middle. Tubular piece forming two small, broad, triangular, obtuse lobes, if viewed laterally, but open above and beneath. Length of body, 10 mm.; expanse of wings, 33 mm.

Locality.—Mount Arthur, Nelson; 2,800 ft.–4,500 ft. above the sea.

Genus OLINGA, McLachlan (1894).

Instead of *Olinx* (1870), which is preoccupied.

Antennæ slightly shorter than the wings, stout, the basal joint very long and thick, fringed beneath with long and strong hairs; vertex small, with very long hairs at the sides, turned upwards; maxillary palpi apparently 2-jointed, curved over the face, short and subcylindrical; labial palpi long. Prothorax hidden, meso- and meta-thorax scarcely hairy, shining; the former long, narrowed posteriorly, with a broad concave space in the middle above; the metathorax is much narrower, also with a concave median space, in the centre of the posterior portion of which is a triangular meta-scutellum. Legs moderately long and slender, pubescent, the tibiæ with stronger and spine-like hairs, spurs 2 . 2 . 4, furnished with spine-like adpressed hairs similar to those on the tibia, the two pairs on the posterior tibiæ very long and near together; tarsi long. Anterior wings narrow at the base, the apex widely dilated, the apical margin oblique; neuration indistinct, subcosta straight, the radius parallel, the two branches of the sector ending in long forks, which are connected by a transverse nervule, the whole membrane thickly coated with scales above. Posterior wings shorter, obtusely rounded at the apex, broad, the dorsal margin with a long fringe near the base, the membrane with procumbent hairs. Abdomen short and slender; a forked lobe proceeds from the middle of the last segment above; the penultimate segment is furnished beneath with a broad and obtuse lobe, extending beyond the apex in the male.

Distribution.—New Zealand.

Olinga feredayi.

Olinx feredayi, McLachlan, Journ. Linn. Soc., vol. 10, p. 198, pl. 2, fig. 2 (1870).

Pale-ochreous, the antennæ annulated with fuscous and with a fringe of strong black hairs below the basal joint. Wings smoky, the scales greyish-yellow, neuration darker. Abdomen blackish-fuscous, the appendages yellow. Length of the body, 5 mm.; expanse of the wings, 20 mm.

Locality.—Christchurch.

Genus Pycnocentria, McLachlan (1866).

Head transversely subquadrate, with an elongated tubercle on each side. Antennæ slender, about the length of the wings; basal joint thick, hairy, longer than the head. Maxillary palpi in the male 2-jointed, the basal joint very small and concealed, the second long and thick, curved up and furnished with long and strong hairs; those of the female 5-jointed, the basal joint short, the second long and stout, third equal to the second but thinner, the fourth and fifth shorter, equal. Anterior wings with dense pubescence, dilated before the apex; in the male there is a longitudinal fold furnished with coarse hairs extending nearly the whole length, and obliterating the discoidal cell; in the female this fold is absent. Posterior wings shorter and about as broad, obtuse at the apex; in the male with a longitudinal fold. Legs moderately long and slightly hairy; spurs 2. 2. 4, those of the anterior and intermediate tibiæ moderately long and unequal, both pairs of the posterior tibiæ nearly equal and close together.

Distribution.—New Zealand.

Pycnocentria funerea.

Pycnocentria funerea, McLachlan, Trans. Ent. Soc. London, 1866, p. 252.

Antennæ blackish-fuscous; head and thorax dark-chestnut, clothed with blackish hairs. Wings dark-fuscous, the folds in the male conspicuously darker; a small whitish spot at the anal angles of the anterior pair. Anterior legs greyish-ochreous, the intermediate and posterior femora and tibiæ fuscous, the tarsi ochreous. Abdomen blackish-fuscous, the divisions of the segments paler; in the male the upper margin of the last segment is produced in the middle into a long flattened lobe dilated at the base, then attenuated and obtuse at the apex, from under it project the curved points of the intermediate appendages; inferior appendages consisting of two branches, the upper obtuse and shorter than the lower; ventral surface

of the antepenultimate segment of the female with a short obtuse lobe. Length of the body, 4 mm.; expanse of the wings, 13 mm.

Locality.—Auckland.

Pycnocentria evecta.

Pycnocentria evecta, McLachlan, Journ. Linn. Soc., vol. 10, p. 199, pl. 2, fig. 3 (1870).

Head with blackish and golden hairs. Prothorax with golden hairs; meso- and meta-thorax nearly hairless, blackish-fuscous. Wings greyish, the anterior with short golden hairs. Legs yellow, the tibiæ and tarsi with blackish hairs. Abdomen reddish-brown, the appendages yellow. In the male the antepenultimate ventral segment bears a broad flattened obtuse lobe, and from the last dorsal segment protrudes a small elongately triangular subobtuse yellow lobe. Length of the body, 4 mm.; expanse of the wings, 16–17 mm.

Locality.—Christchurch.

Pycnocentria aureola.

Pycnocentria aureola, McLachlan, Journ. Linn. Soc., vol. 10, p. 200, pl. 2, fig. 4 (1870).

Like *P. evecta*, but the male has no abdominal lobes. Length of the body, 4–5 mm.; expanse of the wings, 12–19 mm.

Locality.—Auckland and Christchurch.

Genus HELICOPSYCHE, Hagen (1866).

Spurs 2 . 2 . 4, long, but the exterior spur on the anterior tibia is minute, and that on the other pairs is slightly shorter than the internal; the subapical pair on the posterior tibiæ near the apical.

This genus was founded originally to include the remarkable heliciform larvæ-cases made of grains of sand, which have only lately been hatched out in North America and Europe. In New Zealand these cases are very numerous in running streams, but the larvæ have not yet been reared. Three forms—probably indicating three different species—exist, but it is doubtful if they belong to *Helicopsyche*, as no adult insect of that genus has as yet been described from New Zealand. It is more probable that they belong to *Pycnocentria*.

Family LEPTOCERIDÆ.

Maxillary palpi 5-jointed in the male as well as in the female, strongly hairy, ordinarily ascending, and with the

last joint usually long but simple, although often flexible. Wings very pubescent, and for the most part narrow. Antennæ, as a rule, very long and slender. The larva has the respiratory filaments short, and ordinarily few in number, placed in tufts on the sides of the abdomen; the case tubular and free.

Genus PSEUDONEMA, McLachlan (1862).

Tetracentron, Brauer (1865).

Antennæ much longer than the wings, joints cylindrical, the basal joint long and thick. Maxillary palpi hairy; the basal joint short; second and third long, equal; fourth scarcely as long as the third, and less robust; fifth joint as long as the third and fourth together, flexible. Labial palpi with the terminal joint long and thin. Head subtriangular, the eyes prominent. Abdomen robust. Spurs of the tibiæ 2.2.4. Anterior wings rather thickly clothed with short hairs, long, narrow, slightly dilated at the apex, which is elongated; discoidal cell broad; first apical cell much longer than the others, the second short, scarcely reaching half-way to the anastomosis, the fifth narrow and very acute, barely reaching the anastomosis. Posterior wings folded.

Distribution.—New Zealand.

The small, brown, slightly curved larva-case, formed entirely from secreted material, which is so common under stones in running streams, probably belongs to this genus, but the larva has not yet been reared.

Pseudonema obsoleta.

Pseudonema obsoleta, McLachlan, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 305 (1862). *Tetracentron sarothropus*, Brauer, Verh. zool.-bot. Ges., in Wien, 1865, p. 418; Reise der "Novara," Neuroptera, p. 12, tab. i., fig. 5.

Dark-grey; basal joints of the antennæ rufous, with pale-grey hairs, the other joints reddish-black, with black and white rings. Head red, palpi piceous, with dark-grey hairs. Thorax obscure-red, with ill-defined dark stripes above. Legs dull-red, anterior femora with the upper parts black, anterior tibiæ blackish, with a yellow ring in the middle and at the apex; tarsi with very short blackish hairs; middle tibiæ dull-red, ringed with black and white hairs, first joint of the tarsi dull-red, with white hairs, the others with short black hairs. Abdomen dark-grey ringed with brown, the apex red, with pale-grey hairs. Superior anal appendages conical, yellow. Anterior wings dark-grey, densely hairy, sprinkled and banded with black and white spots. Posterior wings dark-grey, vitreous, the neuration pale-brown, the fringe alternately

black and white. Length of the body 10 mm.; expanse of the wings, 36 mm.

Locality. —Auckland and Christchurch. .

Pseudonema amabilis.

Tetracentron amabile, McLachlan, Journ. Linn. Soc., vol. 10., p. 20, pl. 2, fig. 5 (1870).

Brown, with grey hairs; antennæ brown, with narrow white rings. Anterior wings elongate, narrow, obliquely truncated near the apex, pale-grey, sprinkled and clouded with brown. Posterior wings broader, subhyaline, with greyish-yellow pubescence. Legs pale-grey, tarsi and anterior tibiæ brownish. Abdomen brown, the superior appendages in the male triangular, fimbriated; the inferior appendages thick, directed upwards. Length of the body, 10 mm.; expanse of the wings, 26–28 mm.

Locality.—Christchurch.

Genus NOTANATOLICA, McLachlan (1866).

Antennæ very fine, nearly thrice the length of the wing, longer in the male than in the female, maxillary palpi very hairy, the first and fourth joints moderately long, nearly equal; the second, third, and fifth equal, each about thrice the length of the fourth. Anterior wings long and narrow, slightly hairy, costal and dorsal margins nearly parallel, discoidal cell closed; upper branch of the superior cubitus forked in the male, twice forked in the female.* Posterior wings broad, subtriangular, shorter than the anterior. Legs long; spurs 2 . 2 . 2, each tibia being provided with two small and equal apical spurs. Abdomen robust, depressed in the female. Anal appendages well developed in the male, the inferior pair biarticulate; in the female the apex of the abdomen is obtuse, with two rounded superior valves.

Distribution.—Australasia and the Malay Archipelago.

Notanatolica cognata.

Leptocerus cognatus, McLachlan, Trans. Ent. Soc. London, ser. 3, vol. 1, p. 6 (1862). *Notanatolica cognata*, McLachlan, *l.c.*, vol. 5, p. 258 (1866); Journ. Linn. Soc., vol. 10, pl. 2, fig. 6.

Antennæ dark-brown, with white tips to the joints; basal joint testaceous; palpi black, clothed with long grey hairs. Head and thorax testaceous. Abdomen brown. Legs pale greyish-ochreous. Anterior wings grey, sparingly clothed with heavy pubescence. Posterior wings hyaline, with cop-

* For the neuration of *Notanatolica*, see Trans. Ent. Soc. London, ser. 3, vol. 5, pl. 19, fig. 3.

pery iridescence. Length of the body, 10 mm.; expanse of the wings, 30 mm.

Locality.—Auckland.

Notanatolica cephalotus.

Leptocerus cephalotus, Walker, Cat. Neuroptera Brit. Mus., p. 73 (1852). *Notanatolica cephalotus*, McLachlan, Journ. Linn. Soc., vol. x., p. 213.

Ferruginous, testaceous beneath. Head broader than the thorax; palpi slightly hairy; antennæ testaceous, more than four times the length of the body, with a black ring on each joint. Thorax with three brownish stripes. Legs testaceous. Wings subhyaline, the veins testaceous. Length of the body, 8 mm.; expanse of wings, 30 mm. (*Walker.*)

Locality.—Auckland.

Mr. Walker remarks that the wings of the specimen are much rubbed, and Mr. McLachlan calls it a doubtful species.

Genus Leptocerus, Leach (1815).

Antennæ very long and slender. Maxillary palpi very long and strongly hairy. Labial palpi very small. Legs long and slender, the anterior pair much shorter than the others. Spurs 2.2.2, those on the anterior tibiæ very short, the others long. Neuration of the anterior wings differing in the sexes. In the male the upper branch of the superior cubitus is once forked at the apex, while in the female it is twice forked. Apical cells Nos. 1 and 4 not reaching the anastomosis. Posterior wings usually much broader than the anterior; apical forks Nos. 1 and 5 present.

Distribution.—Northern Hemisphere, in cold and temperate regions.

Leptocerus (?) alienus.

Leptocerus (?) alienus, McLachlan, Journ. Linn. Soc., vol. 10, p. 202 (1870).

Brown, with long dark-grey hairs; antennæ white, with black rings. Anterior wings elongate, narrow, slightly dilated at the apex, rounded, dark-grey, the longitudinal nervures with brown dots. Posterior wings sooty; in the female the superior cubitus is twice forked at the end. Length of the body, 8 mm.; expanse of the wings, 23 mm.

Locality.—Christchurch.

It is uncertain to what genus this insect should be referred. So far as the general characters and the neuration of the anterior wings are concerned, it presents no apparent generic difference from the European species of *Leptocerus*, but the neuration of the posterior wings is somewhat aberrant. (*McLachlan.*)

Genus SETODES, Rambur (1842).

Antennæ and maxillary palpi varying. Legs long and slender, the anterior pair much shorter than the others; spurs of the tibiæ 0.2.2. Neuration of the wings similar in both sexes. Anterior wings very long and narrow, lanceolate, not dilated, almost always acute, clothed with dense pubescence and with long fringes. Posterior wings still narrower than the anterior, always acute, often subfalcate at the tips. Abdomen slender.

Distribution.—Europe.

Setodes unicolor.

Setodes unicolor, McLachlan, Journ. Linn. Soc., vol. 10, p. 203, pl. 2, fig. 7 (1870).

Greyish-brown; antennæ greyish-ochreous. Anterior wings greyish-yellow, with some brown dots. Posterior wings pale-grey, subhyaline, iridescent. Legs greyish-ochreous. Abdomen greyish-ochreous, the last segment in the male with a pale fringe of hairs; superior appendages small, broad; the inferior pair approximated, elongato-triangular. Length of the body, 5 mm.; expanse of wings, 20–23 mm.

Locality.—Christchurch.

Genus PHILANISCUS, Walker (1852).

Maxillary palpi with the fifth joint long and filiform. Antennæ nearly filiform, rather stout, almost as long as the wings. Fore tibiæ with two very short spurs at the apex; middle tibiæ with a pair of long spurs at the apex; hind tibiæ with two pairs of long spurs, one at three-fourths of the length, the other at the apex.

Distribution.—New Zealand and New South Wales.

The larvæ are marine, and live among seaweed, in rock-pools, between tide-marks. (See Journ. Linn. Soc., vol. 16, p. 417 (1882); and Ent. Mo. Mag., vol. 18, p. 278; vol. 19, p. 46; vol. 24, p. 154: also N.Z. Journ. of Science, vol. 1, p. 307.)

The position of this genus is doubtful.

Philaniscus plebejus.

Philaniscus plebejus, Walker, Cat. Neuroptera Brit. Mus., p. 116 (1852). *Anomalostoma alloneura*, Brauer, Reise der "Novara," Neuroptera, p. 16, pl. 1., fig. 6 (1865).

Dull-red, the sides of the thorax greyish. Antennæ thick, pale-tawny, ringed with grey, the apices dark-grey; clypeus with golden hairs; head with four narrow lines of red hairs. Legs dull-red. Anterior wings grey, subhyaline, tessellated with pale-chestnut, with a thin, yellow, woolly coating. Pos-

terior wings hyaline, the veins reddish, the dorsal margin near the base with black hairs. Inferior appendages in the male large, curved upwards, the apices bent downwards; in the female they are acute. (*Brauer.*)

Locality.—Auckland and Christchurch.

Family HYDROPSYCHIDÆ.

Maxillary palpi 5-jointed in both sexes, long, more or less deflexed, the last joint whip-shaped, and composed of numerous minute jointlets, slightly pubescent. Wings pubescent. Antennæ variable. Larvæ without any prominent hump on the first abdominal segment, external respiratory filaments present or absent, when present usually fasciculate. Cases fixed to stones. Sometimes several larvæ live in company under a common covering. The pupa not enveloped in a special cocoon.

Genus HYDROPSYCHE, Pictet (1834).

Antennæ very slender, the basal joint short and bulbose, the others after the second elongate, each slightly thickened within. Maxillary palpi with the second joint long, the third and fourth shorter, almost triangular, the fifth as long as the others united. Anterior wings narrow and elongate, obliquely truncated at the apex; anal lobe scarcely indicated; discoidal cell closed. Posterior wings much shorter, broader, folded, obtuse, usually with a long closed median cell.

Distribution.—Cosmopolitan.

Hydropsyche fimbriata.

Hydropsyche fimbriata, McLachlan, Trans. Ent. Soc. London, 1862, p. 9.

Antennæ pale-ochreous, annulated with dark-brown; eyes varied with brown and black. Head and thorax reddish-brown. Abdomen blackish above. Legs ochreous. Anterior wings tawny-ochreous, much darker towards the apex, with numerous small pale spots; several of these are larger towards the base; on the inner margin elongate pale spots alternate with the dark ground-colour; fringe of the apical margin conspicuously yellowish-white. Posterior wings clothed with clay-coloured hairs. Inferior anal appendages in the male with very long terminal joints, which are pointed and curved upwards, approximating at the tips. Penis pale, with a callosity before the apex beneath; apex dark-red, tumid. Length of the body, 8 mm.; expanse of the wings, 22 mm.

Locality.—Auckland.

This insect has a deceptive resemblance to *Œconesus maori*.

Hydropsyche colonica.

Hydropsyche colonica, McLachlan, Journ. Linn. Soc., vol. 11, p. 131, pl. 4, fig. 16 (1873).

Blackish, head and prothorax covered with hoary hairs; antennæ brown, with pale rings. Legs yellow. Abdomen blackish, with a broad whitish line along each side. Anterior wings long and narrow, greyish-yellow, thickly reticulated with dark-grey and with several short blackish streaks on the inner margin. Posterior wings smoky, the veins darker. In the male the last abdominal segment bears in its middle a nearly vertical short lobe, which is notched. Appendages testaceous or yellowish, the last joint of the inferior pair short, subobtuse, stout. Penis cylindrical, directed upwards, the apex thickened, bifid, bearing beneath two broad claw-shaped acute hooks. Length of the body, ♂ 7 mm., ♀ 8 mm.; expanse of wings, ♂ 22 mm., ♀ 28 mm.

Locality.—Christchurch.

Genus POLYCENTROPUS, Curtis (1835).

Antennæ strong, the joints short, the first bulbose. Maxillary palpi with the first and second joints very short, stout, almost transverse; the third and fourth cylindrical; the fifth as long as the others united, stout at the base. Anterior wings elongate-oval, densely pubescent, with short fringes. Posterior wings shorter, much broader, with obtuse apices; apical fringes short, those on the anal border longer; anal lobe well developed; discoidal cell open, and the two first costulæ generally connected near their middle by a small nervule.

Distribution.—Europe, America, Ceylon.

Polycentropus puerilis.

Polycentropus puerilis, McLachlan, Journ. Linn. Soc., vol. 10, p. 204, pl. 2, fig 8 (1870).

Fuscous, clothed with blackish and golden hairs intermingled. Antennæ yellow, with narrow brown rings. Anterior wings rather broad, the apices broadly elliptical; brown, thinly sprinkled with brownish-yellow dots. Posterior wings smoky-grey; apical forks 2 and 5 present, the first two costulæ not connected by a nervule. Legs dirty testaceous. Abdomen brown. In the male there is a narrow, elongate, testaceous lobe from the apical margin of the last dorsal segment, curved downwards; intermediate appendages needle-shaped; the superior broad and spoon-shaped; the inferior elongated. Length of the body, 5 mm.; expanse of the wings, 15 mm.

Locality.—Auckland and Christchurch.

Genus Hydrobiosis, McLachlan (1870).

Antennæ slender, the basal joint shorter than the head, and stout. Maxillary palpi long and pubescent, the two basal joints short and stouter than the others, fifth not so long as the third and fourth together. Anterior wings elongate, the costal and dorsal margins nearly parallel; the apex longly elliptical, clothed with woolly pubescence and longer hairs on the veins; fringes short; neuration not very distinct. Posterior wings shorter and broader, folded, rounded at the apex; fringes long on the dorsal margin; pubescence slight; no closed discoidal cell; a transverse vein unites the upper branch of the sector with the radius; a second unites the lower branch of the sector with the superior cubitus, and a third is placed below this, much nearer the base of the wing. Spurs 2 . 4 . 4; those on the anterior tibiæ small, on the others long and straight.

Distribution.—New Zealand.

Hydrobiosis frater.

Hydrobiosis frater, McLachlan, Journ. Linn. Soc., vol. 10, p. 207, pl. 2, figs. 9*a*, 9*b* (1870).

Brown; antennæ brown with narrow yellowish rings; vertex blackish, with dark-grey hairs; ocelli large, yellowish. Anterior wings with long woolly black and grey hairs; pterostigma elongate, brown; a space on the middle of the dorsal margin pale-grey, tufts of longer black hairs along the dorsal margin of the male only. Posterior wings subhyaline, the fringes blackish. Legs dull-red; anterior and intermediate tibiæ with a narrow median pale ring. Abdomen brown, yellowish beneath; the male with three ventral teeth. Length of the body, ♂ 5 mm., ♀ 7 mm.; expanse of the wings, ♂ 18 mm., ♀ 23 mm.

Locality.—Christchurch.

Hydrobiosis umbripennis.

Hydrobiosis umbripennis, McLachlan, Journ. Linn. Soc., vol. 10, p. 208, pl. 2, figs. 9*c*, 9*d* (1870).

Brown; antennæ yellow, with indistinct brown rings; ocelli large and conspicuous, yellow. Anterior wings brown, with blackish and whitish hairs; pterostigma darker, elongate; neuration pale yellowish-testaceous, apical fringe with yellowish dots and tufts of black hairs along the cubitus near the base. Legs pale-testaceous; the anterior tibiæ and tarsi rather brownish externally, with paler rings. Abdomen brown above, yellowish beneath; the male with but

one ventral tooth, which is long, on the apical margin of the penultimate segment. Length of the body, ♂ 8 mm., ♀ 11 mm.; expanse of the wings, ♂ 32 mm., ♀ 27 mm.

Locality.—Christchurch.

Genus PSILOCHOREMA, McLachlan (1866).

Antennæ very slender, slightly longer than the wings. Head transverse, produced in front between the antennæ, rugose, the hinder portion forming a raised collar. Ocelli very distinct. Maxillary palpi slender, slightly hairy, the two basal joints short and broad, the third longer and slender, the fourth shorter than the third, the fifth longer than the third. Mesothorax ovate, with a raised tuft of hairs in the middle in the male. Legs moderately long, alike in both sexes; spurs 2.4.4. Anterior wings narrow, the margins nearly parallel, hairy clothing short and dense; the apex somewhat dilated; on the cubital veins in the male are tufts of raised hairs; discoidal cell closed, with a smaller cell below it; apical cells long and narrow; apical forks present in all five veins. Posterior wings rather shorter and broader; pubescence scanty; apical forks present in all five veins. Abdomen moderately robust.

Distribution.—New Zealand.

In this genus the wings are nearly flat when in repose.

Psilochorema mimicum.

Psilochorema mimicum, McLachlan, Trans. Ent. Soc. London, ser. 3, vol. 5, p. 274 (1866).

Antennæ fuscous, annulated with yellow, the apical portion wholly fuscous. Head and mesothorax dark-chestnut. Anterior wings smoky, with pale-golden and whitish markings; a whitish indented fascia a little below the apex; several raised tufts of blackish hairs along the dorsal margin towards the base. Posterior wings greyish-hyaline. Legs greyish-ochreous, the tips of the tarsal joints annulated with pale-yellowish. Abdomen blackish-fuscous, the appendages testaceous. In the male the superior appendages are very small, slender at the base and clavate, hairy; inferior appendages very large and broad, concave and furnished with numerous minute blackish teeth internally, the outer margin broadly emarginate. Between the inferior appendages, on the superior portion, arises a long flattened and obtuse piece, probably the upper penis-cover. Length of the body, 6½ mm.; expanse of wings, 16 mm.

Locality.—Auckland and Christchurch.

Psilochorema confusum.

Psilochorema confusum, McLachlan, Journ. Linn. Soc., vol. 10, p. 210, pl. 2, fig. 10 (1870).

Brown; antennæ yellow, indistinctly ringed with brown; basal joint with golden hairs. Anterior wings pale-brown, with pale-yellow woolly clothing mixed with black; an indistinct whitish wavy band before the apex and some pale markings on the disk. Neuration very irregular in the male. Posterior wings grey, subhyaline, iridescent, fringes grey. Legs pale-yellow; anterior and intermediate tibiæ and tarsi rather brownish externally. Abdomen brown, the apical margin of each ventral segment broadly dingy-yellowish. Inferior appendages in the male elongated and slender, bent in the middle almost at right angles. In the female the penultimate ventral segment bears a tuft of hairs in the middle. Length of the body, 4 mm.; expanse of the wings, 15 mm.

Locality.—Auckland.

Family HYDROPTILIDÆ.

Very minute, strongly pubescent and hairy, the wings with numerous erect hairs. Palpi very hairy, simple in structure, alike in both sexes. Antennæ short and stout. The larvæ are without any external respiratory filaments, and make cases usually movable (fixed in a Brazilian species), formed of silk, to the exterior of which are sometimes attached minute grains of sand. The cases have a slit at each end, and the larvæ present their heads at either indiscriminately.

Genus Oxyethira, Eaton (1873).

Antennæ stout, the joints somewhat cup-shaped, slightly longer than broad, the basal joint much longer than the others. Maxillary palpi slender, the third to fifth joints long. Ocelli present. Spurs 0.3.4. Anterior wings extremely long and slender, the apices narrowly acuminate, clothing very dense, costal fringes long; neuration simple, the sector ends in a long simple fork, as also does the upper branch of the superior cubitus; few, if any, transverse nervules. Posterior wings exceedingly long and narrow, the apex longly acuminate as in the anterior, very acute; the costal margin strongly elbowed near the base; sector simple, superior cubitus apparently with a small fork at the apex, a distinct median transverse nervule.

Distribution.—Europe.

Oxyethira albiceps.

Hydroptila albiceps, McLachlan, Trans. Ent. Soc. London, 1862, p. 4. *Oxyethira albiceps*, Eaton, Trans. Ent. Soc. London, 1873, p. 145 (?): Hudson, Trans. N.Z. Inst. vol. 18, p. 213; Man. N.Z. Entomology, p. 99, pl. 14, fig. 3.

Male.—Antennæ grey, faintly annulated with darker; head clothed with dense greyish-white pubescence. Thorax fuscous. Abdomen brown above, silvery beneath. Legs pale-grey. Anterior wings dark greyish-fuscous, irrorated with pale-grey, the extreme apex conspicuously whitish. Posterior wings pale-grey, the cilia concolorous. Length of the body, 2 mm.; expanse of wings, 5 mm.

Locality.—New Zealand (*Dale*); Wellington (*Hudson*).

ART. XXIV.—*The Life-history of the Tuatara* (Sphenodon punctatum).

By ARTHUR DENDY, D.Sc., Professor of Biology in the Canterbury College, University of New Zealand.

[*Read before the Philosophical Institute of Canterbury, 22nd February, 1899.*]

THE results of my researches on the development of the Tuatara having been sent to England for publication,* it has been thought desirable to print a short account of the life-history of this remarkable animal in the "Transactions of the New Zealand Institute," in the hope that it may prove of interest to the members.

In 1896 I succeeded in making arrangements with Mr. P. Henaghan, then principal keeper on Stephens Island, in Cook Strait, for obtaining a supply of eggs, and, thanks to the untiring zeal displayed by my correspondent in the interests of science, these arrangements proved eminently successful. Mr. Henaghan also furnished me with very valuable information

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* "Summary of the Principal Results obtained in a Study of the Tuatara (*Sphenodon punctatum*)."—("Proceedings of the Royal Society of London," vol. 63, 1898.)

"Outlines of the Development of the Tuatara (*Sphenodon (Hatteria) punctatum*)."—("Quarterly Journal of Microscopical Science": In the Press.)

"On the Development of the Parietal Eye and Adjacent Organs in *Sphenodon (Hatteria)*."—("Quarterly Journal of Microscopical Science": In the Press.)