Art. XXIV.—New Zealand Diptera: No. 1.


[Read before the Philosophical Institute of Canterbury, 5th June, 1895.]

Plates V.—VII.

When one considers the great geographical isolation of New Zealand, and the discoveries that have been made of remarkable types among the higher classes of animal life as represented here, it seems peculiar that such little attention has been paid to the collection and classification of the lower classes of animal life. Although one cannot hope to parallel the discoveries of the moa and Sphenodon among the lower and more humble representatives of the animal kingdom, yet it is only to be expected that some of the lower animals will show great and remarkable variation from those types that have been collected and described in Europe and America. Entomology seems to have suffered from neglect even more than the other branches of zoology; for, though we have—thanks to the labours of Captain Broun and Mr. Fereday—fairly complete descriptions and classifications of the Coleoptera and Lepidoptera, none but spasmodic attempts have been made to collect and describe any other of the large orders of insects. The Diptera especially have been neglected, probably owing to the inconspicuous nature, and the usually out-of-the-way habitats, of most of the species belonging to this order. In 1881 Captain Hutton collected all the descriptions that had been written of the insects captured in New Zealand during the voyages of the "Astrolabe" and other ships and expeditions in these waters. To these descriptions he added a few of his own, and published the whole collection as a catalogue of the Diptera of New Zealand, together with similar catalogues of the Orthoptera and Hymenoptera. Since that time a few dipterous insects have been described by different authors in the "Transactions of the New Zealand Institute," but the total number now described does not amount to more than a hundred and twenty-five species, of which only twenty belong to the Nemocera. In 1892 Mr. Hudson, of Wellington, published a "Manual of New Zealand Entomology," in which figures and observations on the life-history of several species were given. Amongst these were some new species; but no descriptions were given of them. Two years ago I commenced to make a collection of our native species of flies, intending at the time to send them to England to
have them named. On mentioning this to Captain Hutton he pointed out the disadvantages of having them named in Europe, and advised me to work them up myself. This task I have found even more difficult than I anticipated, and my comparative inexperience in the distinguishing and description of specific characters is the only apology for the inaccuracies and blunders that I must necessarily make in the following classification and description of those Diptera that I have been able to obtain. I intend to publish from time to time papers on the various families of Diptera. These I hope to supplement every year by species that have been discovered during the preceding year; so that, ultimately, these papers may perhaps attain to the completeness of monographs on the different families of Diptera.

The classification I have adopted is that used by Mr. F. A. A. Skuse in his papers on the Australian Diptera. These papers have in every case been the model to which I have endeavoured to attain, and I must here express my keen appreciation of the work he has done in collating and systematizing the writings and classifications of other dipterologists in Europe and elsewhere. He has certainly very greatly lightened the task of all subsequent workers at the Diptera in the Australasian Colonies. He has kindly assisted me in all cases where there seemed to me a doubtful issue, and has offered to afford me every assistance in his power. Many pages of these papers, more especially those that deal with the descriptions and classifications of the families and genera, have been taken almost directly from his papers, and he has generously acquiesced in this wholesale cribbing.

As far as possible, every genus will have a type-species illustrated by a diagram, giving a general idea of the appearance of the insect, and displaying those characteristics that are made use of in the classification of the particular group to which the insect belongs. In general these diagrams have been drawn from dried specimens, and do not, therefore, give with any exactitude the form of the abdomen and other soft parts that are liable to shrinkage during the progress of drying. For specific characters the diagrams, though drawn with considerable care, cannot always be trusted. It would, perhaps, have been better to have omitted drawing the body of the insect, and to have given diagrams illustrating the neuration of the wings alone, as done by Mr. Skuse; but my work has already shown how useful such diagrams may be if made use of with proper caution.

I very deeply regret that I am at present unacquainted with the life-history of any but a very few of the species that I shall describe. I shall be able, however, to give diagrams illustrating the life-history of what are, I hope, fairly typical
species of each of the families. These diagrams have in every case been drawn from living specimens. All the material that I at present possess has been collected by myself, chiefly in the neighbourhood of Lincoln College; but during the summer vacation many specimens have been collected in various widely-separated parts of the colony. I have not thought it advisable to arrange keys for reference until so many specimens have been collected that they may be considered to form a fair percentage of the total number of species in the colony.

In regard to collecting specimens, I have, like Mr. Skuse, found that glass tubes are the most suitable apparatus. Some bruised laurel-leaves should be placed in the bottom of the tube, and over these a layer of blotting-paper. This will absorb the moisture given off by the laurel-leaves, and therefore protect the insects from the injury that always results to them from contact with fluid. Most of the smaller and many of the larger species can be collected by placing the tubes over them with care whilst they are settled on some object. They will usually not rise until the tube completely covers them, and after a little fluttering about they will die. Specimens captured in this way should be fixed as soon as possible with gum on thin white cardboard. Gum of tragacanth, with a trace of corrosive sublimate, is the most suitable substance, as it does not cause any glaze on the surface of the cardboard. Only a very small spot of gum is necessary, and the legs and wings should be spread out as much as possible, but not at the risk of mutilating the specimen. The larger and more active insects can be easily caught with a gauze or muslin net of the ordinary make, but the net should not have a ring of too large diameter, otherwise it will be found exceedingly cumbersome in bush districts, where most of the Diptera Nemocera are found. I have collected large numbers of specimens from windows looking out on to shady and moist gardens. If the top is left slightly open it will be found that many insects enter and flutter about on the glass-panes, where they are very easily captured. I shall be very happy to supply glass tubes and other requisites to any one who will be good enough to catch a few of these insects for me.

The only literature I have been able to obtain on the Diptera are Walker's "Insecta Diptera Britannica," Theobald's "Account of British Flies," Hutton's "Catalogue of New Zealand Diptera," some of Osten-Sacken and Loew's "Monographs of the Diptera of North America," and Mr. Skuse's admirable "Monographs of the Australian Diptera." These last so ably summarise the work of the best-known American and European authors on the Diptera that I shall in every case adopt the classification employed in them, and thus render the New Zealand Diptera very easily comparable.
with the Australian Diptera. Although I shall always regret not being able to obtain more works of reference, the papers that Mr. Skuse has written contain so much reliable information on the classification and arrangement of the genera that I feel I shall avoid most of the errors that would have been unavoidable without some firm basis and summary of other methods of classification.

The following table will show the classification adopted by Mr. Skuse, which is the one that I shall adhere to in my papers on the New Zealand Diptera:—

Order DIPTERA.

Section I. ORTHORHAPHA.

Division I. NEMATOCERA.

Subdivision 1. Oligoneura.

Families.—Cecidomyiidae, Sciaridae, Mycetophilidae, Simulidae, Bibionidae.

Subdivision 2. Polyneura.

Families.—Blepharoceridae, Culicidae, Chironomidae, Orenephilidae, Psychodidae, Tipulidae, Dixidae, Rhyphidae.

Division II. BRACHYCERA.

Subdivision 1. Cyclocera.

Families.—Xylophagidae, Coenamyidae, Stratiomyidae, Acanthemeridae, Tabanidae.

Subdivision 2. Orthocera.

Families.—Leptidae, Asilidae, Midasidae, Nemestrinidae, Bombylidae, Therevidae, Scenopinidae, Cyrtidae, Empididae, Dolichopodidae, Lonchopteridae.

Section II. CYCLORHAPHA.

Division I. PROBOSCIDEA.


Division II. EPROBOSCIDEA.

Families.—Hippoboscidae, Nycteribidae.
Order DIPTERA.

Wings two, mesothoracic, membranous, with radiate veins; posterior wings wanting, represented by a pair of small clavate filaments called halteres; mouth suctorial; metamorphosis perfect; larva apodal; pupa inactive.

Section I. ORTHORRHAPHA.
The pupa-case opening longitudinally.

Division I. NEMATOCERA.

The flies belonging to this division are characterized by the possession of long thread-like antennae, consisting of several joints, in many instances oramented with whorls of long, delicate hairs, especially in the males. Nearly all are to be recognised without much difficulty by their long and slender body and limbs, small rounded head, and elevated thorax. As typical examples may be mentioned the mosquitoes (Culicidae), daddy-long-legs (Tipulidae), and midges (Chironomidae). They are usually to be met with in all damp and shady situations, though they display considerable variety in habitat, appearance, and characters, as will be shown when the families are considered in detail. As these conditions in regard to habitat are thoroughly satisfied in many parts of New Zealand, it is only to be expected that we should possess an abundance of species and genera. The proper collection of the species would probably occupy many years, and the following papers will deal with what is probably quite a small percentage of the total number of species in the colony:—

Family 1. Cecidomyidae (Gall Midge).—Small, delicate species. Antennae generally long and necklace-like. Often no ocelli. Legs very long and slender; coxae short; tibiae slender, without spurs. Wings well haired, with very few veins. The larvae are generally parasites on plants, but in a few cases live on dead vegetable matter beneath the bark of decaying trees. The irritation produced by the larvae is frequently the cause of galls and other monstrous growths on plants. The perfect insects are found abundantly in shady places in forests, and are also frequent on window-panes facing shady or overgrown gardens.

Family 2. Sciaridae (Shade Midge).—Generally small. Antennae moderately long, curved, with cylindrical bead-like joints. Ocelli, three. Legs moderately long, slender; tibiae with or without spurs. Wings often dark, usually without hairs, their neuration approaching that of the last family. The larvae and pupae are found in decaying vegetable matter, especially in rotten potatoes. Perfect insect very abundant during the whole summer, especially in damp, shady localities.
Much more active than the insects of the last family. The larvae of some species have got the name of "army-worm" in Europe, from their habit of travelling together in large numbers. Represented by a large number of species in New Zealand.

Family 3. Mycetophilidae (Fungus Gnats).—Size, small to moderate; usually rather robust. Ocelli, three or two. Antennae short. Proboscis short. Legs rather long; coxae elongated; tibiae spurred. Wings often shaded, and sometimes pubescent; without discoidal cell, but neurotomes more elaborate than in the two preceding families. The majority of the larvae live upon fungi or decaying vegetable matter. Some form a web of slimy material, and are occasionally phosphorescent. Perfect insect very active, and often capable of leaping. Found abundantly in damp and shady situations. Represented by several genera and numerous species in New Zealand.

Family 4. Simulidae (Sandflies).—Size small. Body black, thick, and short. Antennae cylindrical, short. Ocelli, none. All parts of the body fully developed. Legs short; hind tibiae and first joint of the tarsus broad; tibiae without spurs. Wings broad, abundantly but rather obscurely veined. The larvae live in clear water, becoming fixed to plants when about to transform into pupae. Perfect insect capable of inflicting severe wound. Found abundantly in all regions where there is clear or running water. The family contains only one genus, which is well represented in New Zealand.


Family 6. Blepharoceridae. — Small. Antennae long and slender. Eyes alike in both sexes. Ocelli, three. Legs long; coxae short; posterior tibiae generally with strong spurs. Wings broad and long, in neurotomes approaching the Mycetophilidae. Skuse says very little is known of these species. I have not yet captured any specimens.

Family 7. Culicidae (Mosquitoes).—Very slender; moderately sized. Antennae moderately long. Mouth-parts of female containing all the organs found in the Diptera. Ocelli, none. Thorax stout. Legs long and slender. Wings slender, usually with scales; veins more than six in number. The larvae are abundant in all stagnant water, in which they move with a peculiar jerking motion. The perfect insects are abundant in low-lying bush districts. The males feed on vegetable matter, especially honey. The females are capable
of inflicting a severe bite. Represented by a moderate number of species in New Zealand.

Family 8. Chironomidae (Midges).—Small. Antennæ slender, beautifully adorned with hairs in the male. Proboscis fleshy and short. Ocelli, none. Abdomen and legs long and slender. Wings slender, veins as in Culicidae, but no scales, though hairs are often present. Larvae and pupæ generally aquatic, but some feed on dung and decaying vegetable matter. Perfect insect common in the neighbourhood of water. Some specimens capable of biting.


Family 10. Psychodidae (Moth Midges).—Very small flies. Antennæ long, whorled with hairs. Ocelli, none. Body clothed with coarse hair. Legs rather long; tibiae without spurs. Wings broad and hairy, with many longitudinal veins. Larvae living in fungi and rotten wood. Perfect insect frequently found on walls and windows. Represented by a few species in New Zealand, one at least of which is very common.

Family 11. Tipulidae (Daddy-long-legs).—The largest flies in this division, and in linear dimensions, if not in bulk, the largest flies of the order. Antennæ long and thread-like, often furnished with long hairs, or pectinated. Almost all without ocelli. Proboscis fleshy, rather prominent, and sometimes long. Thorax with a V-shaped transverse suture. Legs extremely long and fragile; tibiae often spurred at the tip. Wings long, with a very complete neuration; discoidal cell present in most cases; basal cells very long. Larvae and pupæ found in the ground, in rotten wood, in water, or in the leaves and stems of plants. Species extremely abundant in New Zealand; being found in numbers in all damp and shady situations.

Family 12. Dixidae.—Medium-sized gnats. Antennæ long. Ocelli wanting. Proboscis rather prominent. Body slender. Legs long and slender. Wings somewhat large, occasionally spotted; six longitudinal veins; discoidal cell wanting. Larvae aquatic. I have only found three specimens in New Zealand, all of which were taken on windows. According to Skuse they are common in Australia.

Family 13. Rhynchidae.—Moderate-sized flies. Antennæ moderately long. Ocelli, three. Legs rather long and slender. Wings rather long and broad, with a discoidal cell. This family contains a single genus. The larvæ feed on vegetable matter, cow-dung, &c. Perfect insects found in outhouses and
sheds, in damp, dark places in bush, also in caves, and in similar localities.

KEY TO THE FAMILIES OF NEMOCERA.

A. Thorax without any transverse suture.
   a. Tibiae not spurred.
      * Wings haired.
      Longitudinal veins few. Cecidomyiidae, 1.
      Longitudinal veins numerous. Psychodidae, 10.
      ** Wings naked.
      § No ocelli.
      1. Legs hairy; antennae with not more than 12 joints.
         Costal vein continued round the margin of the wing. Culicidae, 7.
         Costal vein terminating near the apex of the wing. Chironomidae, 8.
      2. Legs rather short; antennae short.
         Costal vein continued round the posterior border. Ornthophthalmidae, 9.
      3. Legs short; antennae with not less than 12 joints: Simuliidae, 4.
      §§ Ocelli present.
      No discoidal cell. Bibionidae, 5.
      A discoidal cell. Rhyphididae, 13.

b. Tibiae spurred.
   § No ocelli.
   §§ Ocelli present.
   All tibiae spurred. Dixidae, 12.
   All tibiae spurred. Blepharoceridae, 6.
   With or without spurs. Sciaridae, 2.


TERMINOLOGY.

As regards the technical terms employed, I feel I cannot do better than transcribe the following pages from Skuse’s paper. The terms described are those made use of by Osten-Sacken and Loew in their monographs of the Diptera of North America.

1. The Head.

The back of the head opposite the thorax is the occiput, and is prominently perceptible in both Diptera and Hymenoptera carrying their heads free. That portion of it lying over the attachment of the head is the nape (cervix). The front forehead or brow (frons) is that part of the head stretching from the antennae as far as the occiput, and is limited laterally by the compound eyes. The crown (vertex) is that part of the head on which there are usually the simple eyes (ocelli), generally three in number. The limit between the occiput and front is styled the vertical margin (margo verticalis). Most of those Diptera undergoing their metamorphosis within
the lower skin possess, immediately above the antennæ, an arcurated impression-line, which seems to separate from the front a small, usually crescent-shaped piece termed the frontal crescent (*lunula frontalis*). When the eyes meet on the front so as to divide it into two triangles the superior one is called the vertical triangle (*triangulum verticale*), the inferior the frontal triangle (*triangulum frontale*). The anterior portion of the head, reaching from the antennæ to the border of the mouth or oral margin (*peristomium*), is the face (*facies*). The antennæ are separated into two series of joints, the first consisting of the two basal joints, called the joints of the *scapus*, and the following those of the *flagellum*. Beneath the antennæ there are sometimes found longitudinal grooves (*fovea antennalis*) for their reception. The sides of the head from the eyes downwards are called the cheeks (*genæ*). A somewhat swollen ring sometimes surrounds or partly encompasses the swollen eyes, and is termed the orbit (*orbita*), the successive parts of which are the anterior (*orbita anterior suæ facialis*), inferior (*inferior s. genalis*), posterior (*posterior s. occipitalis*), superior (*superior s. verticalis*), and frontal (*frontalis*) orbits. Where no such ring is visible a distinct colour or some peculiar structure marking the nearest surroundings of the eyes is described on the orbit. The parts of the mouth (*os*) employed for sucking are called the sucker or proboscis; when attached to a long and generally cylindrical projection of the head it is called a snout (*rostrum*), and must be distinguished from a true proboscis. They may project from a wide aperture occupying a great part of the under-surface of the head, called the mouth-hole (*cavitæ oris*). The common fleshy root of the oral parts is connected by a membrane with the border of the mouth. This membrane has a shield sometimes almost carneous; it is then termed the clypeus, or shield (*clypeus prolabrum*). It is either entirely connected by the anterior border of the mouth, and is then movable, or it projects over it as a ridge, and it is then generally immovable. Generally the largest of the mouth-parts is the fleshy underlip (*labium* or *hypostoma*), made up of the stem (*stepes*) and the knob (*capitulum labii*), formed of two suctorial flaps (*labella*). Close by are to be seen the *palpi*, which are important to notice, being frequently very characteristic. The tongue (*lingua*), upper jaws (*mandibulae*), lower jaws (*maxillae*), and upper lip (*labrum*) are not only inconspicuous, but generally difficult to recognise, and are rarely of value in distinguishing species. According to Meinert, the pharynx is separate from the first metamere, on which the labium and labrum are situated; on the second metamere the maxillæ and their palpi are placed; while on the third are situated the mandibles.
2. The Thorax.

The mesothorax is very largely developed in this Order, being so much larger than the prothorax and metathorax that it forms the greater part of this division of the insect's body. On account of this it is designated the thorax, different names being given to characteristic parts of the prothorax and metathorax. The former frequently forms a neck-like prolongation that bears the head, and is then called the neck (collum). In some cases the four corners of the mesothorax, or the shoulders (humeri), are covered by a lobe of the prothorax (lobus prothoracis humeralis), distinctly separated from the mesothorax. If this lobe be so soldered to the mesothorax that it is impossible to detect a distinct line between them, except in their general colour or hair, it is styled the shoulder callosity (callus humeralis). When the prothorax applies closely to the anterior border of the mesothorax it has then the name of collar (collare). An important character in its presence or absence is a transverse furrow (sutura transversalis) frequently found crossing the middle of the upper side of the mesothorax, and terminating on each side just before the base of the wing. On each side of the breast, beneath the shoulder, there is a spiracle (stigma prothoracis). The plate on the side of the breast is called the pleura. The scutcheon (scutellum) is separated from the back of the mesothorax by a furrow, and is situated between the wings. A part of the metathorax is to be found beneath the scutellum; it is called the metanotum. It generally descends obliquely, is often convex, and has on each side a more or less inflated space, called the lateral callosity of the metanotum. The poisers, or halteres, have their origin beneath this callosity, and in front of each of them we find the spiracle of the metathorax. The membranous covers sometimes found above this spiracle have the name of covering-scales (squamae or tegulae).

3. The Abdomen.

The upper side is generally so called, the name of belly (venter) being given to the lower side. The terminal joint is furnished in the male with appendages destined to take hold of the female in copula, and if they take hold in the form of pincers and these are not bent under the body they are called forceps; in the female, with the organ for laying eggs (ovipositor), which may be either called the bearer (tenebra) or the style (stylus), according to its shape.

4. The Wings.

These organs need more close and special study than any others in the distinction of species. The diagram (Plate VII., 15
fig. 4) illustrating the veins and cells of the dipterous wing is wholly ideal, and combines all the characters that are found in the different families of the Order. The parts to which the numbers refer are named in the explanation of the plate. Some observations as to the relative value of the different veins and cells in describing characters of genera and species are given in Skuse's paper on the Australian Cecidomyiidae (vol. ii., Trans. Lin. Soc. N.S.W.).

Family CECIDOMYIDÆ.

1. Ovum.

Longer than broad, ends rounded, orange-red, yellow, or whitish. The eggs are laid on the surface of leaves, in the flowers of grasses, or beneath the bark of trees. The larva usually escapes in a few days. In some species there is a single annual generation, but in others eggs are laid at two or more distinct times of the year. I have never been fortunate enough to observe the eggs on any plants, but some of my specimens deposited eggs after capture.

2. Larva.

The larva is rather a slender maggot, generally white in colour, but often orange or red. The body consists of fourteen segments, most of which are provided with stigmata. Head is small and retractile, provided with soft and rudimentary mouth-organs. A slender, corneous organ usually projects from the first thoracic segment. This is called the anchor process, or breast-bone. The function of this organ is not yet certainly determined. Baron Osten-Sacken remarks that its homology is unknown, and suggests that it is used for locomotion. He points out that it may represent the mentum, and is therefore homologous with the boring mentum of the larvae of some Tipulidae. Miss Ormerod suggests that the organ is used to injure plant-tissues, in order that the nutritive juices may be obtained more readily and in greater abundance. The terminal segment of the body is frequently provided with stiff hairs, that aid apparently in locomotion.

Some of the species undergo their metamorphosis from larva to pupa in cocoons; others bury themselves in the ground; while others have no special covering, and undergo the change in the same place in which they have completed their larval growth.

Many years ago parthenogenesis was described in cecidomyid larva. It appears to be of much the same nature as that so well known in the various species of Aphid flies. The ovaries of the larva develope fully, and produce six or more buds. These also grow and again produce buds, from
which a new generation develops. Sometimes as many as five generations can be distinguished beneath the transparent skin of a larva.

3. Pupa.

In the pupa nearly all the organs of the imago can be distinguished—eyes, antennæ, wings, legs, all being easily discernible. The insects appear to remain a very short time in the pupa stage.

4. Perfect Insect.

Skuse states that, so far as his observations go, the insect lives but a short time in the perfect state. With that conclusion the observations I have made on our New Zealand species lead me to concur unfreservedly. The insects are particularly abundant in early spring, especially in the mornings and evenings. They can be found in numbers in all dark and shady places, many of them entering open windows that face shrubberies and being easily caught on the glass panes. Some species, however, can be found throughout the summer, but the number of species commonly found in summer is very much less than the numbers to be found in the spring. Their flight is usually feeble, and is never in a direct line, the insect darting hither and thither all the time it is on the wing. They do not seem to fly any distance, but the wind is probably a very important factor in their distribution. Mr. Skuse describes the extraordinary habits these insects have in New South Wales of hanging in cobwebs and vibrating in such a manner as to become more inconspicuous. Owing probably to hasty observation, I have never found them in such situations. I deeply regret that I have hitherto been unable to spare the time to investigate the life-history of any of the native species of Oecdomyidae. The larvae, as is well known, are usually parasites on the foliage of flowering-plants. As a result of the irritation produced by the larvae on the tissues of the plant, monstrous growths, or galls, are produced.

As regards the geographical distribution of these flies, it may be said that species occur in every region of the globe where the Diptera have been investigated. In Australia Mr. Skuse has described ninety-five species, which he says represent in all probability but a very small proportion of the total number of species present in that country. Up to the present time no species have been described from New Zealand, but the present paper contains descriptions of twenty-three species. As these have all been collected within twelve months, the total number of species in the colony would probably be considerably over a hundred. These insects offer many difficulties to the collector, for, in the first place, their size is so minute that it is frequently a matter of no small
difficulty to see them with the naked eye. On account of
their fragile nature they are extremely hard to set, and if left
in a glass tube where there is any trace of moisture they
quickly become dismembered, and their wings are injured. It
is advisable to carry the materials for setting the insects
whilst collecting, as one can then be sure of setting good
specimens still uninjured. If in my excursions last summer I
had been provident enough to carry the materials for setting
with me I should probably have double the present number
of species to describe. During the forthcoming spring and
summer, however, I hope to profit largely by my experience of
last year.

Structure of Imago.

The head is small, broader than long; round when viewed
from the front. Eyes generally lunate or reniform, more or
less contiguous on the front. Ocelli wanting in the sub-
family Cecidomyina, but extant in the Lestremina. Pro-
bscis short, thick, fleshy, directed towards the pectus. Palpi
prominent, four-jointed, the first joint short, the last usually
the longest. Antennæ long, moniliform or cylindrical, generally
verticillate-pilose, seldom without verticils, ten- to thirty-six-
jointed, of which the basal joints are more or less cupuliform;
flagellar joints sometimes pedicelled in the male and sessile
in the female, sometimes of the same structure in both sexes.
The thorax rounded, in some species gibbose, sometimes ex-
tending over the head in the form of a hood; without a
transverse suture. Halteres never completely bare, often
considerably haired or scaled; the pedicel long and slender,
the club large. Legs generally very long and slender; coxae
short, femora not thickened, tibiae without spurs, tarsi five-
jointed, the metatarsal joint much shortened in the first sub-
family; claws weakly developed, with apparently only one
cushion. Wings incumbent, proportionately long and broad,
rounded at the apex, cuneiformly narrowed at the base; as a
rule hyaline, though sometimes pellucid, with a pale bluish or
brownish tint; generally beautifully iridescent; sometimes
marmorated; more or less covered with irregularly-arranged
hairs; occasionally scaly; all the anterior margin scalous;
deeply ciliated at the apex and posterior margin. The
number of longitudinal veins amounts to at least two, or at-
most five—never less than four in the second sub-family, or
more than four in the first sub-family. In both sub-families
the last two longitudinal veins coalesce for more than half
their length, forming beyond a more or less distinct part.
The additional longitudinal vein of the Lestremina is inserted
between the second and third veins of the first sub-family; and
is furcate in all genera but Campylomyza. A longitudinal
wing-fold generally has its position just in front of the third longitudinal vein, and often partially encloses the latter, or, less frequently, obscures it entirely from view. No species has more than one transverse or cross vein, which lies between the first and second longitudinal vein; but it is frequently most indistinct, or sometimes altogether wanting. Abdomen elongate, composed of nine segments; in the male cylindrical, provided with large holding-forceps; in the female acuminate, with a protruding or non-protruding ovipositor, rarely without two small lamellæ. The whole body with a covering of fine, delicate hairs, or less frequently scales or scaly hairs, the latter occurring more often on the under-surface of the abdomen and legs.

The prevailing body-colours seem to be shades of yellow and red, darkening into brown proportionately as the integument becomes more horny. The expanse of the largest species exceeds four lines, while that of the smallest is less than a line. Regarding the relative numbers of the two sexes, the females seem to be far more abundant than the males.

**Classification.**

Skuse gives an excellent summary of the systems of classification of this family that have been adopted by previous authors, and for information on these I must refer to his paper. The following is the classification he adopts, and the one that will be adopted in this paper:—

**Sub-family I. Cecidomyina.**

Wings with not more than four longitudinal veins, the two last frequently combining in the beginning of their course, forming a more or less distinct fork. No ocelli. First tarsal joint much shortened.

Genus 1. *Heteropeza.*

Antennæ moniliform or sessile, 2 + 8 or 9 jointed. Legs short; third joint of tarsus very long. Wings with two longitudinal veins.

Genus 2. *Miastor.*

Antennæ 2 + 11 jointed, verticillate in the male. Legs slender in male, but more robust in female. Wings almost bare, with three longitudinal veins.

Genus 3. *Cecidomyia.*

Antennæ long generally, verticillate, 2 + 9 to 2 + 36 jointed. Wings with three or four longitudinal veins.

Section I. Wings with three longitudinal veins, the third either forming a fork or becoming more or less obsolete towards the tip.
Transactions.—Zoology.

Sub-section A. Cross-vein, if present, placed between the root and tip of the first longitudinal vein.

Sub-genus 1. Gonioclema (Skuse).
Antennae of female 2+11 jointed, verticillate, pilose. Second longitudinal reaching margin at the apex of the wing; cross-vein distinct; third longitudinal not branched.

Sub-genus 2. Cecidomyia (Loew).
Second longitudinal vein reaches the margin of the wing a little before its tip. Generally the same number of joints in male and female, the joints being pedicelled or sessile.

Sub-genus 3. Diplosis (Loew).
Second longitudinal vein reaches the margin of the wing at or beyond its tip. Antennae of male 2+24 jointed; joints pedicelled; single joints alternating with double ones, or all joints simple. Antennae of female 2+12 jointed; joints cylindrical, pedicelled.

Sub-genus 4. Asphondylia (Loew).
Second longitudinal vein reaches the margin of the wing a little beyond its tip. Antennae of both sexes with the same number of joints; the latter cylindrical, sessile, with a short pubescence and without verticils.

Sub-genus 5. Hormomyia (Loew).
Second longitudinal vein reaches the margin of the wing either at or beyond the tip. Thorax more or less gibbose, frequently extending over the head in the form of a hood. Joints of male antennae pedicelled, those of female pedicelled or sessile.

Sub-genus 6. Necrophlebia (Skuse).
Second longitudinal vein reaching margin of wing beyond its tip; third longitudinal vein without anterior branch. Antennae in female 2+12 jointed; joints pedicelled, with two verticils.

Sub-genus 7. Chastomera (Skuse).
First longitudinal vein very wide of costa; second longitudinal reaching margin beyond apex of wing; no trace of anterior branch of fourth longitudinal. Antennae in female pedicelled, verticillate.
Second longitudinal vein forms a curve before the cross-vein, and joins the margin a little beyond the tip of the wing; cross-vein rather long, oblique.

Sub-section B. Cross-vein very oblique, originating at the root of the first longitudinal vein.

Second longitudinal vein hardly undulating before the cross-vein. Joints of antennæ sessile, or almost sessile, in both sexes.

Second longitudinal vein sinuous before the cross-vein. Joints of antennæ pedicelled in both sexes; number variable.

Section II. Wings with four longitudinal veins.

Cross-vein sometimes like that in Section A, then the second longitudinal is not sinuated; sometimes as in Section B, second longitudinal is then sinuated.

Antennæ filiform, 2+11 jointed; joints cylindrical, without verticils. Second longitudinal vein reaching the margin considerably before the apex.

Antennæ 2+14 to 2+32 jointed; joints sessile, with short verticils. Three longitudinal veins, the first and second so near the costa as to be hardly discernible.

Sub-genus *Clinorhyncha* (Loew). Mouth prolonged into rostrum.

Sub-family II. *Lestrochina*.
Wings with at least four longitudinal veins and at most five, sometimes with a rudimentary vein behind the fifth; the additional vein is situated between the second and third of the last sub-family. Ocelli nearly always present. First tarsal joint not shortened.

Genus 1. *Campylomyza* (Meig).
Fourth longitudinal vein forked. Antennæ 11–20 jointed; joints pedicelled in both sexes in some species—in some male pedicelled, female sessile, in others both sessile.

The upper branch of the fork forms a curve almost in the shape of an S.
Genus 3. Catocha (Hol.).

The upper branch of the fork forms a single smooth curve. Male antennæ 16-jointed, verticillate, joints pedicelled; female antennæ 10-jointed, pilose.

Genus 4. Lestremia.

Second longitudinal vein joining the margin much before the apex of the wing; third longitudinal with a very long fork.

Genus 5. Cecidogona.

Antennæ 2 + 9 jointed; joints verticillate, with very short pedicels. Second longitudinal reaching margin close to apex; branches of third longitudinal very long, almost parallel to one another.

The number of genera and sub-genera at present represented by specimens in my collection is comparatively small, but I have no doubt that many vacant spaces will before long be filled up. The entire classification of species at present known is given above, so that little difficulty will be experienced in classifying species that may be discovered subsequently. In the descriptions given below I have only mentioned those various divisions that are represented by species in my collection. I have not yet discovered any species of Cecidomyia. Campyliomyza, on the other hand, is represented by several species.

Sub-family I. CECIDOMYINA.

Wings with not more than four longitudinal veins, the two last frequently combining in the middle of their course, forming a more or less distinct fork. No ocelli. First tarsal joint much shortened.


Eyes separated in both sexes by a broad forehead. Antennæ 2 + 11 jointed; the basal joints cupuliform; the flagellar joints in the male ovate, with short pedicels and long verticillate hairs; in the female moniliform, subsessile, with short verticils. Prothorax arched. Legs slender in the male, shorter in the female; the tarsal joints of unequal length. Wings almost bare, appearing granulate under a high power. Three longitudinal veins; cross-vein sometimes present.

Miastor agricolae. Plate V., fig. 1.

Antennæ, 0·026; expanse of wing, 0·033 × 0·013; length of body, 0·030 in. Antennæ nearly black, nearly as long as the body; oval, becoming nearly globose towards the tip; last joint elliptical; verticils moderately long. Thorax nearly black,
with a few long black hairs, becoming fuscous towards the abdomen. Scutellum pink. Halteres whitish, thinly clothed with black hairs; club moderate. Abdomen dull-red, moderately haired. Legs dusky-yellow; first, third, and fifth joints about equal length, slightly longer than the fourth, second nearly twice as long as the first; clothed with moderate black hairs. Wings hyaline, with a few scattered black hairs on the surface. First longitudinal vein one-third the length of the wing, dark-brown; second longitudinal apparently arises some distance below first longitudinal, at about one-third of its length; third longitudinal close to margin, very indistinct before joining with it.

I am rather doubtful as to whether this species is classified correctly. I hope to obtain other specimens during the ensuing summer, and make another more detailed examination.

**Miastor difficilis**, n. sp.

Antennae, 0.027; expanse of wing, 0.045×0.016; body, 0.027×0.005. Antennae light-grey, as long as the body; joints near the base elongate, elliptical, about twice the length of the pedicels, becoming nearly globose towards the tip; verticils about twice the length of the joints, spreading. Thorax dark-brown, a few long hairs, without any apparent arrangement, arising from it. Scutellum brown in the centre, bordered with grey. Halteres white, with long pedicels; club large, elongate, pyriform in shape. Abdomen with first two segments nearly black, remainder orange-red, sparingly clothed with dark hairs. Legs pale-yellow, with numerous short black hairs; first joint of tarsus very short, others indistinguishable from one another. Wings hyaline, slightly hairy. First longitudinal vein indistinct, close to costa, about one-third the length of the wing; second longitudinal vein arising from about a third of length of first longitudinal, some distance below it; third longitudinal close to margin, bends sharply downwards before ending in the margin.

I have only a single specimen of this insect: I am not quite satisfied as to its position. (Lincoln, January.)


Antennae long, moniliform or cylindrical, generally verticillate, rarely without verticils, from 2+9 to 2+36 jointed. Wings with three or four longitudinal veins, generally a longitudinal fold between the second and third longitudinal veins.

**Section I.**

Wings with three longitudinal veins, the third either forming a fork or becoming more or less obsolete towards the tip.
Cross-vein, if present, placed between the root and tip of the first longitudinal vein.

Sub-genus 2. Cecidomyia, Loew.—Antennae 2 + 9 to 2 + 22 jointed; generally the same number of joints in the male and female; joints pedicelled or sessile alike in both sexes, or pedicelled in the male and sessile in the female.

Cecidomyia destructor, Say. (Plate V., fig. 2.)—Length, 3mm. Eyes brownish-black. Front of head black, and clothed with long black hairs. Palpi yellowish, of four joints, partly covered by minute black scales, entirely covering the terminal joint. Antennæ yellowish-brown to almost black, composed of seventeen joints, with short black verticillate hairs; the first two joints very thick, first cup-shaped, second globular, third smooth, cylindrical, and elongated, gradually becoming smaller and ending in a long tapering point longer than any of the preceding. Proboscis minute, and rose-coloured. Thorax black, with grey tints in certain lights; white hairs on the sides, and also scattered on the ventral region. Scutellum black, hairy. Halteres yellowish-pink, with occasional black scales. A light-red line running from the neck to the base of the wing, along the side of the thorax. Abdomen pinkish, consisting of eight segments; the first segment is nearly black, the remaining segments are marked by a large square black spot on each side—these nearly unite on the seventh and eighth segments; the last two segments have a curious V-shaped marking, with two small lines, one on each side of it, and placed on a somewhat darker area than the general colour of the segments. Oviduct pale-reddish, yellow-brownish at the tip, composed of three joints; the last is pointed, and without lamellæ. Legs pink to light-red, clothed with black hairs. Second longitudinal nearly straight, then bends down and reaches margin before apex.

This insect has occurred in the colony within recent years. It is undoubtedly introduced. I have seen no specimens.

Sub-genus 3. Diplosis.—Second longitudinal vein reaching the margin of the wing either at or beyond the apex. Antennæ of the male 2 + 24 jointed; joints pedicelled; simple joints alternating with the double ones, or all the joints quite simple—in the latter case the joints only have one hair-whorl; joints sometimes with the hair-whorls equally long on the upper and under sides; often decorated with long stiff hairs on the upper side. Antennæ of the female 2 + 12 jointed; joints subsessile, or having very
short pedicels, cylindrical. Wings either unspotted or variegated.

A. Second Longitudinal Vein reaching the Margin of the Wing at or before the Apex.

1. Flagellar joints of the antennæ alternately singly and doubly jointed.
   a. Wings unspotted.

_Diplosis dubia_, n. sp. (Plate V., fig. 3.) Female. Antennæ, 0·033; expanse of wing, 0·060 × 0·024; body, 0·036 × 0·010. Antennæ dark-brown, the two basal joints of the flagellum being longer than the others; all the joints cylindrical, the pedicels being half the length of the joints; verticils small. Front part of thorax black, becoming ferruginous-brown posteriorly. Scutellum ferruginous. Halteres white; pedicels long, with rather small pyriform clubs, clothed, like the pedicels, with scattered black hairs. Abdomen ferruginous-brown, with a few hairs giving silvery reflections. Legs long, clothed with black hairs giving silvery reflections; femora longer than the tibiae; first joint of tarsus very short, second joint four or five times the length of the first, third about one-third the length of the second, fourth and fifth slightly shorter than the third. Wings with yellowish tinge, very small hairs. Veins yellowish; first longitudinal one-third length of the wing, close to costa; second longitudinal joining margin just before the apex; transverse vein joins first longitudinal at two-thirds of its length from the base.

I have only one specimen, taken at Lincoln, October.

_Diplosis difficilis_, n. sp. Male. Length of antennæ, 0·064; expanse of wings, 0·055 × 0·019; body, 0·031 × 0·005. Antennæ brownish, with moderately-long black verticils; double joints about the same length as their pedicels, but single joints considerably shorter; last joint ending in an appendage about as long as its pedicel. Head black, smooth. Thorax yellowish-brown, darker anteriorly; a patch of black curved hairs on each shoulder, but otherwise surface of thorax smooth. Scutellum light yellowish-brown, smooth. Halteres with long pedicels ending in a comparatively small club; dirty-white in colour, clothed sparingly with black hairs. Abdomen yellowish-brown; posterior part of the segments darker, clothed with black hairs, giving silver reflections. Legs about three times the length of the body; slender, light-yellow, but appearing nearly black from the large number of black hairs situated on them; tibiae slightly swollen at the tip. Wings hyaline, with slight yellowish tinge. Veins brownish; first longitudinal ending a little before half the distance along the costa; second longitudinal reaching the
margin of the wing at the apex; branch of third longitudinal very indistinct. Surface of wings clothed with long black hairs; fringe long.

I have only one specimen, of a male insect. (Lincoln, February.)

_Diplosis melana_, n. sp.—Antennæ, 0·035; expanse of wing, 0·077 × 0·029; body, 0·033 × 0·020. Antennæ dark-brown; joints of flagellum cylindrical, more than twice the length of their pedicels, ornamented with a few short verticillate hairs; terminal joints slightly shorter than the others, and conical in shape. Head black, with short hairs rising from its posterior border. Thorax black, and hairless except for a few tufts arising from the shoulders. Scutellum dark-grey. Abdomen black, ferruginous on the flanks; a few hairs on the sides of the segments with silvery reflections. Halteres with short pedicels clothed all over with black and grey hairs; club pyriform, small. Legs moderately long, dark-brown, covered rather thinly with black hairs; femora rather stout; tarsi lighter in colour than the proximal joints. Wings with a grey tinge, a few short hairs scattered over their surface. Veins yellowish-brown except the second longitudinal, which is black; first longitudinal joining the costa about half-way from the base of the wing, the transverse vein, which is almost colourless, joining it at about two-thirds of its length; second longitudinal reaching the margin at the apex of the wing; apex of forks of third longitudinal below end of second longitudinal.

I have only one female specimen. (Lincoln, November.)

_Diplosis minuta_, n. sp. Female. Antennæ, 0·026; expanse of wings, 0·050 × 0·018; body, 0·030 × 0·011. Antennæ black; joints of flagellum with short pedicels, about one-third the length of the joints; cylindrical, ornamented with short black verticils. Anterior portion of thorax black, becoming red towards the extremity; a few white scattered hairs on its surface. Scutellum red. Halteres with slender pedicels; club small, pyriform, covered like the pedicels with scattered black hairs. Abdomen with the anterior segments dark-brown, but becoming red towards the posterior end; a few scattered hairs with silvery reflections situated on its surface. Legs rather short, dull-yellow in colour, covered with hairs black in colour but giving silvery reflections; tibiae slightly shorter than the femora; first and fifth joints of the tarsus about the same length, second joint about twice the length of the third, which is longer than the fourth. Wings hyaline, with yellow reflections. Costa and second longitudinal dark-brown in colour, the others light-grey; first longitudinal ending at about one-third along the costa; second longitudinal ending at the apex; branch of third longitudinal forms
very acute angle with the trunk. Wings covered with slight pubescence.
Separated from D. dubia by shorter legs and smaller size; from D. difficilis by character of hairs on wings. (Lincoln, November.)

B. Second Longitudinal Vein reaching the Margin of the Wing beyond the Apex.

Diplosis fragilis, n. sp. (Plate VII., fig. 3.) Male. Antennæ, 0·049; wings, 0·066 × 0·027; body, 0·033 × 0·006. Antennæ with the joints longer than their pedicels, double joints nearly the same length as their pedicels; sub-globose; double joints cylindrical, with transverse suture, smoky-grey in colour; verticils not numerous, moderately long, black. Thorax ferruginous, dark in front but becoming lighter posteriorly. Scutellum semicircular, opaque, white. Halteres with long slender white pedicels; club pyriform, with small conspicuous thick black hairs. Abdomen with first segment ferruginous, the two succeeding segments much darker; the usual scattered hairs are present arranged on the posterior borders of the segments. Legs long and slender, light-yellow; femur and tibia about equal in length; first joint of the tarsus very short, second slightly shorter than the tibia; other joints much shorter, the fifth being the shortest. Wings perfectly hyaline, a few short black hairs being scattered over the surface. First longitudinal about one-third the length of the wing, marginal cross-veins situated half-way along it; second longitudinal at first straight, but afterwards strongly arcuated, ending a little beyond the apex; apex of feet of third longitudinal situated exactly below the end of the first longitudinal.

I have several specimens, collected at Lincoln during November and December.

Diplosis hirta, n. sp. Female. Antennæ, 0·033; wings, 0·071 × 0·027; body, 0·038 × 0·011. Antennæ dark-brown; joints of scapus fuscous; flagellar joints about twice the length of their pedicels; with one circle of long black verticils attached to the base; joints cylindrical, but constricted in the middle; terminal joint with distinct projection from its end. Thorax dark-brown, with two tufts of long black hairs arising on each lateral margin. Scutellum opaque, white. Halteres with long pedicels bearing a club thickly covered with black hairs. Abdomen dark-brown, with its segments much more hairy than in the other species. Legs dark-brown or black, covered with short black hairs—these are longer on the femora than elsewhere; joints of the legs as in D. fragilis. Wings smoky, their surface very densely covered with a brown pubescence; long, stiff, black hairs project from the costa, and there is a deep fringe extending right round the
posterior border of the wing. First longitudinal less than one-half the length of the wing; second longitudinal arcurated at the tip, ends slightly beyond the apex; anterior branch of third longitudinal very indistinct; transverse vein situated less than half-way along the first longitudinal.

I have two specimens, taken at Lincoln during November.

*Diplosis scoparia*, n. sp. Female. Antennae, 0·036; wings, 0·088 × 0·038; body, 0·059 × 0·012. Antennae dark-brown; joints about twice the length of their pedicels, cylindrical in shape, but slightly constricted in the middle; verticils short and scattered; terminal joint of the antennae bears a pointed projection at its end. Palpi pink. Thorax dark-brown, with two narrow pink stripes, widely separated at the anterior end, but converging considerably towards the scutellum; a few hairs on the lateral margins and on the pink stripes. Scutellum pink, with a row of hairs on its semicircular posterior margin. Halteres with long slender red pedicels, bearing a pyriform club clothed rather thickly with black hairs. Abdomen bright-pink, the posterior margins of the segments, as usual, bearing a few long hairs. Legs dark-brown; femora and tibiae about equal in length; joints of the tarsus as in *D. fragilis*. Wings smoky, rather thickly covered with a brown pubescence. First longitudinal rather less than half the length of the wing; second longitudinal at first straight, but afterwards strongly arcurated, ending considerably beyond the apex; fork of third longitudinal slightly beyond the end of first longitudinal; cross-vein situated less than half-way along first longitudinal.

I have two female specimens of this insect, which were taken at Lincoln in November.

*Diplosis wanganuiensis*, n. sp. (Plate VII., fig. 2.) Female. Antennae, 0·049; wings, 0·096 × 0·035; body, 0·071 × 0·014. Antenne dark-brown; joints of the scapus dull-yellow, nearly orbicular; basal joints of the flagellum more than double the length of those near the apex; basal joints much more, and apical joints slightly more, than double the length of their pedicels; terminal joint with a small projection; verticils small and scattered. Palpi the same colour as the joints of the scapus, as long as the antennae up to the first joint of the scapus. Thorax ferruginous, with two converging light lines; perfectly glabrous. Scutellum ferruginous, without hairs. Halteres with long slender white pedicels, the clubs being darker owing to the presence of black hairs. Abdomen pink, with long slender ovipositor; very few hairs on the segments. Legs light-brown, long and slender, very slightly hairy. Wings pellucid, glabrous, or slightly hairy. Costa and second longitudinal light-red; first longitudinal a little more than
one-third the length of the wing; second longitudinal strongly arcuoted, joining the margin some distance beyond the apex; third longitudinal very slightly bent upwards at the fork.

I obtained two specimens of this insect in a swamp at Wanganui.

_Diplosis flava_, n. sp. Male. Antennae, 0·092; wings, 0·115 × 0·097; body, 0·059 × 0·013. Joints of the scapus sub-globose, bright-yellow; flagellum cinereous; double joints rather shorter than their pedicels, single joint about a quarter the length of their pedicels; length of double joints near the base about three times their breadth, near the apex the length is about double the breadth; terminal joint longer than the three or four double joints immediately preceding it, becoming at its apex a colourless projection closely resembling a broken-off piece of pedicel. Palpi long and slender, light-yellow. Thorax yellow, perfectly glabrous, rather darker on the lateral margins. Halteres with very long and slender pedicels, bearing a small pyriform yellow club. Scutellum white, perfectly glabrous. Abdomen pink, with several bristly yellow hairs on the margins of the segments. Legs long and slender, yellow, but rather thickly clothed with small black hairs. Wings almost glabrous, hyaline. Veins colourless, except the basal portion of the costa, which is yellow; first longitudinal less than half the length of the wing; second longitudinal strongly arcuoted, joining the margin some distance beyond the apex of the wing; transverse vein half-way along the first longitudinal; fork of third longitudinal beyond the end of the first longitudinal.

I obtained a single specimen of this insect in a swamp at Wanganui.

_Subsection B._

Cross-vein very oblique, originating at the root of the first longitudinal vein.

Sub-genus _Epidosis._—Second longitudinal vein sinuous before the cross-vein. Joints of the antennae pedicelled in both sexes, their number variable.

_Epidosis magna_, n. sp. (Plate V., fig. 4.) Male. Length of antennae, 0·138; expanse of wings, 0·153 × 0·055; length of body, 0·068. Antennae 2+2 jointed, longer than body, pale-brown; long pedicels; joints about half the length of the pedicels, sub-globose; verticils long, arranged in two whorls on the joints; scapus joints near base of the flagellum almost cylindrical; joints longest in centre, decreasing in size towards apex. Palpi moderately long. Basal three joints of the flagellum covered with scattered black hairs. Thorax deep-brown, with two tufts of long black hairs, one tuft at each side; collar glistening-white; centre of thorax marked by a cuneiform stripe.
of fuscous brown, down the middle of which there is a narrow black line; sides of the fuscous-brown stripe marked by a single row of long black hairs. Scutellum glistening-white, with long black hairs on posterior portion. Halteres long, densely haired; club moderate. Abdomen light yellowish-red, densely covered with long grey or black hairs. Legs long and slender, everywhere covered with short black hairs, which are more numerous on the fore femora and less numerous on the tarsal joints than elsewhere. Wings pellucid, densely pubescent; violet, red, and blue reflections. Costal veins testaceous, but becoming red towards the apex of the wing; cross-veins pale, nearly straight, diverging from first longitudinal about four times the length of cross-vein from end of first longitudinal; second longitudinal thin, with a deep bow before cross-veins, reaches wing-margin beyond the apex; both branches of the third longitudinal indistinct.

Female. Size of body, 0·121; ovipositor, 0·044; antennæ, 0·146; wings, 0·158. Joints of antennæ, 2 + 25; pedicels short; joints cylindrical near base, but becoming orbicular at the apex; last joint two and a half times length of previous joint, subconical. Thorax darker than in the male, cuneiform stripe separated into two narrow linear fuscous-brown stripes approaching one another, and becoming lost opposite the base of the wings. Abdomen darker than in male, but otherwise similar. Ovipositor long, needle-shaped, same colour as abdomen. Venticils not so long as in male.

_Epidosis agricola_, n. sp. Female. Antennæ, 0·052; body, 0·090 × 0·011; wings, 0·119 × 0·011. Antennæ longer than the head and thorax, 2 + 11 joints; joints nearly cylindrical, with short pedicels; pedicels of lower joints shortest, those of central joints largest; joints gradually decreasing in size from below upwards; venticils few and scattered. Palpi bright-red, with a few scattered black hairs. Collare testaceous. Thorax a uniform pink colour, with two shallow and narrow grooves extending from the collare, where they are widely separated, to the base of the wings, where they are close together; a few scattered black hairs on the grooves and sides of the thorax. Scutellum rather brighter in colour than the thorax, with a few hairs on the posterior border. Halteres long, with white glabrous pedicels; club white and glabrous. Abdomen of a lighter pink than the thorax, with a few scattered hairs on the segments. Legs long and slender, covered rather thickly with short black hairs. Wings pellucid, thinly covered with black hairs. Second longitudinal vein bent in a short arcuation before junction with cross-vein, afterwards strongly bowed, and terminating beyond the apex of the wing; both
branches of third longitudinal vein indistinct; costal and second longitudinal veins red; transverse vein short, joining first longitudinal three times its own length from end of first longitudinal.

Lincoln, November.

_Epidosis ordinaria_, n. sp. Male. Antennæ, 0·046; body, 0·049 × 0·008; wings, 0·109 × 0·036. Antennæ 2 + 11 joints; joints of scapus nearly white; lowest joints of flagellum nearly cylindrical, shortly pedicelled; pedicels of middle joints longer, and joints shorter and oval; terminal joints small and oval; verticils few but long. Palpi moderately long, testaceous. Thorax dark-brown, becoming lighter posteriorly, with a few scattered black hairs. Scutellum opaque, white, with one or two black hairs, sometimes bordered with red. Halteres fuscous, pedicel densely covered with short black hairs; club moderate, covered with short black hairs. Abdomen pink, with scattered grey hairs. Legs long and slender, clothed with black hairs. Wings pellucid, densely covered with brown hairs, which are especially long in the fringe on the inner margin. Veins testaceous to red; second longitudinal slightly arcuated before junction with transverse veins, afterwards broadly arcuated, and ending slightly beyond apex of the wing; transverse vein short, about a quarter length of first longitudinal from rising-point of transverse to costa.

Most noticeable points: Colour of the scutellum and halteres, and veins of the wing. Common, October to March. Lincoln.

_Epidosis aurea_, n. sp. (Plate VI., fig. 3.) Antennæ broken; wings, 0·110 × 0·048; body, 0·051 × 0·024. Antennæ unfortunately broken in my single specimen; joints of scapus red in colour, with a few black hairs; flagellar joints all oval, with pedicels about half as long as themselves; joints cinereous in colour, with few but long verticils of a black colour. Palpi testaceous. There are eight flagellar joints remaining on one antenna, all of which are similar in size and shape. Anterior portion sides and posterior portion of the thorax orange-yellow in colour, a central dark-brown mark extending from the collare to a little anterior to the point of insertion of the wings, its length being about three times its breadth; on each side one black mark about the same size as the central brown mark, but situated more posteriorly; between the central and lateral marks orange-yellow stripes with a few golden hairs. Scutellum golden-yellow, with a few golden hairs. Halteres light-orange; pedicels long, and, like the club, clothed sparingly with black hairs. Abdomen dark-red, with a few grey hairs scattered over the segments. Legs long and slender, fuscous,
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covered with short grey and black hairs. Wings covered all over with short black hairs. Veins brown, distinct; second longitudinal vein nearly straight before junction with cross-vein, afterwards arcuated; transverse cross-vein about one-sixth length of first longitudinal from point of origin of transverse vein to junction with costa.

I have at present only a single specimen of this distinct species, which was captured at the foot of Mount Torlesse early in March.

Section II.

Wings with four longitudinal veins.

Sub-family II. LESTREMINA.

Wings with at least four longitudinal veins, or at most five; sometimes a rudimentary vein behind the fifth. The additional vein is placed between the two veins corresponding to the second and third of the first sub-family, and is generally furcate. Ocelli nearly always present. First tarsal joint not shortened.

I. Ocelli extant.

A. Wings with four longitudinal veins; the third not furcate; the fourth furcate, representing the fourth and fifth longitudinal veins of other genera coalescent for the first half of their course.

Genus I. CAMPYLOMYZA, Meigen. (Plate VII., fig. 1.)

Antennæ 2+6 to 2+23 jointed, moniliform, verticillate; joints ovate, lentiform, or cylindrical, with long pedicles in the male and sessile in the female, or sessile in both sexes. Wings large, considerably rounded at the apex; in some cases the base of the wing is cuneiform, in other cases the posterior angle is prominently rounded; hairs often scaly; long cross-vein.

A. Wings cuneiformly narrowed at the base.

Campylomyza tenuis, n. sp. Body, 0.038 × 0.013; antennæ, 0.027; wings, 0.049 × 0.025.

Antennæ grey, 2 + 9 joints; basal joints of flagellum rather large, globose, not quite so long as their pedicles; gradually decreasing in size towards the apex; ornamented with long verticils directed forward and just reaching a little beyond the base of the succeeding joint. Thorax short and broad, black or dark-brown, but paler on the lateral margins; a few long black hairs arise from its surface. Scutellum large, semicircular, grey. Halteres white, with very elongated pyriform clubs, on which some black hairs are situated. Abdomen pale, testaceous, with black hairs scattered over its
surface. Genital appendages elongated. Legs slightly paler than the abdomen; femur rather stout, shorter than tibia; very few hairs on any of the joints. Wings slightly smoky. First longitudinal rather distant from the costa, about half as long as the wing; second longitudinal ends slightly beyond the apex of the wing; basal portion more than five times the length of the transverse vein; third longitudinal very pale, issuing from the basal portion of second longitudinal at a little beyond half its length, disappearing before the margin; fourth longitudinal with a long anterior branch, nearly straight, posterior branch distinct, and strongly arcuated. Surface of wing covered with black hairs.

Lincoln, November.

_Campylomyza lincolniiensis_. Male. Antennæ, 0·048; wings, 0·044 × 0·025; body, 0·027 × 0·006.

Antennæ brown; joints of scapus slightly compressed; joints of flagellum thirteen in number, large, globose, decreasing in size from below upwards; pedicels nearly twice as long as the joints; verticils black, long, pointing forwards, just reaching the base of the succeeding joint; terminal joint much smaller than the rest, oval, rather longer than its pedicle, its verticils slender. Thorax about as broad as long, black, but ornamented with a few golden-yellow hairs. Scutellum semicircular, black. Halteres with slender pedicles and a circular white club. Abdomen black, slightly haired. Legs light-brown, rather short and robust, not hairy. Femora rather longer than the tibiae. Wings pellucid. First longitudinal joins the costa at about half its length, part beyond the transverse vein about twice its length; second longitudinal bent at junction of third longitudinal and of transverse vein, afterwards strongly arcuated, joining margin beyond the apex; basal part about five times the length of transverse vein; third longitudinal arising at about two-thirds of its length; third longitudinal very faint, disappearing before reaching the margin; fourth longitudinal faint, anterior branch nearly straight. Surface of wings covered sparingly with black hairs.

Lincoln, November. Only two specimens.

_Campylomyza- minuta_, n. sp. Female. Antennæ, 0·011; wings, 0·035 × 0·014; body, 0·028 × 0·005.

Antennæ dark-brown, 2 + 7 jointed; joints of flagellum with very short pedicels, broader than long, ornamented rather sparingly with long radiating verticils; terminal joint oval, rather longer than the others, and ornamented in the same manner. Thorax dark-brown, with lateral margins much lighter. Halteres with slender white pedicels and a small white club. Abdomen smoky-brown, darker at the posterior
border of the segments. Legs short, the same colour as the abdomen, rather hairy. Wings hyaline. First longitudinal about half as long as the wing, part beyond the transverse vein about as long as the transverse vein; second longitudinal vein distinct, only slightly bent, joining the margin distinctly before the apex of the wing; third longitudinal very indistinct, disappearing long before the margin is reached; fourth longitudinal indistinct, anterior branch long and nearly straight. Surface of the wings covered with a few scattered black hairs.

I have only one specimen, taken at Lincoln in February.

*Campylomyza nitida*, n. sp. Female. Antennae, 0.028; wings, 0.038 × 0.018; body, 0.033 × 0.008.

Antennae dark-brown; joints of flagellum thirteen in number, oval, about twice the length of their pedicels, ornamented with a few straight radiating verticils; terminal joint smaller than the others, without any projection. Thorax black and shining, without any hairs. Scutellum light-brown, oval. Halteres with a moderate pedicel and a small white club. Abdomen cinereous, narrowing considerably posteriorly, surface with a few scattered hairs. Legs light-brown; femora and tibiae robust, with a few scattered black hairs; first joint of tarsus double the length of the second; the others are always slightly shorter than the preceding joint, except the last, which is longer than the fourth. Wings slightly smoky. First longitudinal less than half the length of the costa; transverse vein long, but slightly shorter than that part of the first longitudinal beyond the point of junction; second longitudinal very distinct, distant from first longitudinal, joining margin at the apex; third longitudinal very indistinct, disappearing long before the margin; fourth longitudinal fairly distinct, but both branches disappear before they reach the margin. Surface of the wing with scattered black hairs.

Lincoln, February.

*Campylomyza hirta*, n. sp. Wings, 0.044 × 0.019; body, 0.038 × 0.006.

Antennae apparently 2 + 11 joints; joints of flagellum dark-brown, almost sessile, ornamented with a few short verticils; terminal joint equal to the others in size. Thorax dark-brown, almost smooth. Scutellum dark-brown. Halteres with a large club, almost black from the clothing of short hairs. Abdomen nearly cylindrical, but bulging out at the segments; dark-brown, but lighter than the thorax and scutellum. Legs short, dull light-yellow, ornamented with rather long black hairs; all the joints are rather stout. Wings hyaline, surface covered with long black hairs. First
longitudinal vein about half the length of the costa, part beyond junction with transverse vein slightly longer than transverse vein; basal portion of the second longitudinal about four times as long as the transverse vein, only slightly arcuated, joining the margin before the apex of the wing; third longitudinal very indistinct, proceeding from the second longitudinal about two-thirds of the length of second longitudinal; fourth longitudinal very indistinct, anterior branch rather long and only slightly bent.

I have only one specimen, and its antennæ are so contorted as to render it almost impossible to count the joints or measure their length. Lincoln, February.

*Campylomyza squamata*, n. sp. Female. Antennæ, 0·037; wings, 0·057 × 0·025; body, 0·042 × 0·011.

Antennæ light-brown, 2 + 10 jointed; joints of scapus lentiform, not hairy; joints of flagellum nearly globose, about half as long as their pedicels, last two joints much smaller than the rest, and with much shorter pedicels; terminal joint oval; all flagellar joints ornamented with long verticils directed forward and reaching to about the middle of the succeeding joint. Thorax black; almost destitute of hairs. Scutellum dark-brown. Halteres with short pedicels and small club. Abdomen black, covered with black hairs; genitalia orange. Legs light dull-yellow, the posterior pair being much longer than the two anterior pairs; femora and tibiae robust, covered with short black scaly hairs, very loosely attached. Wings pellucid. Veins light-brown, rather inconspicuous owing to the thick covering of scaly black hairs spread over the surface of the membrane; first longitudinal slightly more than half the length of the wing; transverse vein situated rather more than its own length from the end of the first longitudinal; second longitudinal ending at the apex; third longitudinal arising about two-thirds of the length of the basal portion of second longitudinal, disappears long before reaching the margin; anterior branch of fourth longitudinal distinct, arcuated, reaching the margin; posterior branch only slightly bent, does not reach the margin.

I have only one specimen, taken at Lincoln in September.

**b. Wings rounded at the base.**

*Campylomyza magna*, n. sp. Female. Antennæ, 0·017; wings, 0·088 × 0·039; body, 0·083 × 0·016.

Antennæ dark-brown, 2 + 10 jointed, nearly cylindrical; joints of scapus only slightly hairy; flagellar joints sessile, covered with a short pubescence; terminal joint the smallest. Palpi short and stout, brown. Thorax black, a central wedge-shaped portion shining, but the rest dull. Halteres with a
short brown pedicel, but a large cinereous club. Abdomen cylindrical, terminating in a short ovipositor. Abdomen clothed with short black hairs. Legs short and rather robust, dark-brown; first joint of the tarsus about half as long as the tibia and about double the length of the second joint; very few hairs on any of the joints. Wings smoky. Second longitudinal and costa dark-brown, the others lighter; distinct indication of auxiliary vein, but it does not join the costa; first longitudinal rather more than half the length of the wing, bending down at the junction of the transverse vein, which is only one-fifth of the length of remaining portion of first longitudinal; basal portion of second longitudinal about one-third of the length of vein, only slightly bent, joins margin before the apex of the wing; third longitudinal very indistinct, arising from second longitudinal at a little beyond a third of length of basal portion, cannot be followed more than a third of the distance to the margin; fourth longitudinal distinct, anterior branch only slightly bent, posterior branch almost at right angles, disappears before reaching the posterior margin of the wing. Posterior angle of the wing pronounced. Surface covered with a minute brown pubescence.

I have only one specimen of this large distinct species, taken at Lincoln in December, 1893.

_Campylomysa robusta_, n. sp. Male. Antennæ, 0·024; wings, 0·070 × 0·031; body, 0·055 × 0·011.

Antennæ black, 2 + 11 jointed; flagellar joints almost globose; pedicels about a quarter the length of the joints; all the joints are covered with hairs, but there are no-verticils; subterminal joint oval, and longer than the others, which are slightly compressed longitudinally; terminal joint much smaller than the others, apparently without a pedicel. Thorax black, clothed sparingly with light-coloured hairs. Scutellum black. Halteres with short thick brown pedicels, ending in rather a large oval cinereous club. Abdomen very dark brown, covered with scattered black hairs. Legs light-brown; femora about the same length as the tibiae, thick, clothed sparingly with light-coloured hairs. Wings with a distinct anal angle, rather smoky, covered with black hairs. First longitudinal less than half the length of the wing, part beyond point of origin of transverse vein about four times the length of transverse vein; second longitudinal slightly bent; ending a very little before apex of the wing, very distinct; third longitudinal very indistinct, arising a little beyond middle point of basal portion of second longitudinal; both branches of fourth longitudinal distinct, but the posterior branch does not reach the margin.

Lincoln, February.
Campylomyza ordinaria, n. sp. (Plate V., fig. 5.) Male and female. Antenna, 0·012; wings, 0·063 × 0·029; body, 0·052 × 0·007.

Antenna light-brown, 2 + 10 joints; first joint of scapus large, globose, second much smaller; lowest joint of flagellum lighter than the rest, oval, others subglobose, with pedicels about half their length; ornamented with numerous verticils about twice as long as the diameter of the joints; terminal joint oval, much smaller than the rest. Thorax dark-brown, with a few hairs. Scutellum semicircular, brown. Halteres with a short pedicel bearing an elongated pyriform club, light-brown in colour, and pubescent. Abdomen dark-brown, ornamented with numerous brown hairs. Legs more elongated than usual; femora and tibiae robust; very light brown or pale-yellow, thinly clothed with rather long light-coloured hairs. Wings rather smoky, clothed with rather a thick covering of light-brown hairs. Slight rudiment of auxiliary vein; first longitudinal less than half the length of the wing, part beyond point of origin of transverse vein about twice the length of the transverse vein; second longitudinal slightly curved, ending at the apex of the wing. Third longitudinal indistinct, disappearing a little distance from the margin; fourth longitudinal indistinct, anterior branch nearly straight, reaching the margin, posterior branch nearly at right angles to it, and disappearing close to the margin.

Two specimens, one male and one female. Lincoln, February.

Genus Lestremia, Macquart.

Antennæ moniliform, verticillate, in the male 2 + 14, in the female 2 + 9 to 2 + 10 jointed; the joints in the male almost ovate, pedicelled; in the female more cylindrical, with short pedicels. Wings large, moderately broad, with prominent posterior angle. First longitudinal vein very short; second longitudinal short, running rather close to costa, joining the border much before the apex of the wing; third longitudinal vein with a very long fork; cross-vein small beyond the middle of the first longitudinal vein.

Skuse records no species from Australia, but says the genus is represented by a few American and European species. There seems to be some doubt as to whether ocelli are present in the European species. As shown in Plate VI., fig. 4, three ocelli are always present in the New Zealand species.

Lestremia nova-zealandica, n. sp. (Plate VI., fig. 1.) Female. Antennæ, 0·033 (largest), 0·014 (smallest); wing, 0·126 × 0·050 (largest), 0·071 × 0·028 (smallest); body, 0·122 × 0·022 (largest), 0·060 × 0·014 (smallest).
Antennæ dark-brown; joints cylindrical, with very short pedicels; terminal about half as long again as the penultimate joint; a circlet of short verticils arises from the basal portion of each joint. Lower portion of frons black. Three ocelli, situated in a triangle just above point of insertion of the antennæ. Compound eyes far apart, emarginate, the antennæ being situated in the bend in the outline. The antennæ are nearly surrounded by a single row of facets, bead-like in appearance. Palpi light-yellow. Thorax dark-brown, hood-shaped; two stripes of lighter colour inclined to one another like the sides of a wedge, the point directed posteriorly; on these stripes long hairs are situated. Scutellum dark-brown, with a row of hairs along posterior margin. Halteres with short pedicels ending in elongate pyriform clubs; light-brown in colour, with scattered black hairs. Abdomen dark-brown, anterior portion of third and succeeding segments light-brown. Surface of all the segments with slender light-coloured hairs. Legs not much longer than the abdomen; light-brown femora, rather shorter than tibiae; latter light-pink at the tip; first joint of tarsus more than double the length of the second, others all shorter than the one preceding them. Wings pellucid, covered with scattered short black hairs. Costal and second longitudinal pink; rudiment of auxiliary vein present; first longitudinal more than one-third the length of the wing, cross-vein near its tip very oblique; second longitudinal ending long before the tip of the wing; third longitudinal branching out of second just before junction with cross-vein, fork long, both branches wavy, anterior branch ends at the tip of the wing; fourth longitudinal commencing nearer base of wing than third longitudinal, nearly straight, almost disappears before reaching the margin; fifth longitudinal distinct, strongly arcurated; sixth longitudinal short, lying close alongside fifth longitudinal. Posterior angle of the wing very distinct.

Lincoln. Fairly common, especially in very early spring, but is found all the year round.

Male. Antennæ, 0·055 (largest), 0·035 (smallest); wing, 0·077 × 0·030 (largest), 0·060 × 0·024 (smallest); body, 0·052 × 0·011 (largest), 0·046 × 0·011 (smallest). (Plate VI., fig. 2.)

Antennæ light-brown, 2 + 14 joints; joints cylindrical, with pedicels twice their length; all the joints appear double; ornamented with rather long verticils arising from the constriction in the middle of the joint; terminal joint oval, larger than those immediately preceding.

At first I thought that there were three distinct species, which, on examination, proved to differ only in size. This,
however, is very marked, though not constant enough to constitute distinct species. In all other particulars but size all my specimens are exactly identical; the antennæ, veins of the wings, and other organs show no variation. I have not been able to examine the palpi in any but a very few specimens, but, so far as I have been able to ascertain, the structure is constant.

All measurements given above are in inches.

EXPLANATION OF PLATES.

PLATE V.

Fig. 1. Miastor agricola, female.
Fig. 2. Cecidomyia destructor, male. The only object of this diagram is to illustrate the difference between this genus and Diplosis.
Fig. 3. Diplosis dubia, female.
Fig. 4. Epidosis magna, male.
Fig. 5. Campylomyza ordinaria, female.

These figures were all drawn from dried specimens. Their chief object is to illustrate the difference between the various genera to which they belong. They should not be relied on for specific characters.

PLATE VI.

Fig. 1. Lestremia nova-seelandica, female.
Fig. 2. male.
Fig. 3. Side view of Epidosis aurea (antennæ broken).
Fig. 4. Head of Lestremia nova-seelandica: o, occiput; e, compound eye; f, frons; g, ocelli; a, antennæ; p, palpi.

PLATE VII.

Fig. 1. Portion of antenna of Campylomyza.
Fig. 2. Portion of antenna of male of Diplosis wanganuiensis.
Fig. 3. Male of Diplosis fragilis.
Fig. 4. Diagram of ideal dipterous wing.

Cells.

A. First costal cell.
B. Second costal cell.
C. Third costal cell.
D. Marginal cell.
E. Submarginal cell.
F. First posterior cell.
G. Second posterior cell.
H. Third posterior cell.
I. Discal cell.
K. First or large basal cell.
L. Second basal cell, or anterior of the small basal cells.
M. Third basal cell, or posterior of the small basal cells.
N. Anal or axillary corner of the wing.
O. Alar appendage (alula).

Veins.

c. Transverse shoulder-vein.
d. Auxillary vein.
e. First longitudinal vein.
d. Second longitudinal vein.
e. Third longitudinal vein.
f. Fourth longitudinal vein.
g. Fifth longitudinal vein.
h. Sixth longitudinal vein.
i. Small or middle transverse vein.
j. Hinder transverse vein.
k. Rudiment of a fourth trunk.
l. Axillary incision.
m. Anterior branch of third longitudinal.
n. Anterior intercalary vein.
o. Posterior intercalary vein.

ART. XXV.—New Zealand Diptera: No. 2.—Mycetophilidae.


[Read before the Philosophical Institute of Canterbury, 5th June, 1895.]

Plates VIII.—XIII.

In common with the other families of smaller flies, the Mycetophilidae have suffered sadly from neglect at the hands of New Zealand entomologists. The only species hitherto recorded as existing in this colony were described by Captain Hutton in the "Catalogue of the New Zealand Diptera." He there gives descriptions of two species, one of which he places in the genus Mycetophila, and the other in the genus Platyura. The specimens from which Captain Hutton drew his descriptions are fortunately still extant in the museum of Lincoln Agricultural College, so I have been able to examine them; but I am unable to agree with Captain Hutton as to the place he assigns them in the classification of the Mycetophilidae. For reasons that will be given later on, I have deemed it necessary to establish new genera for both these flies, as they possess characters that certainly will not allow them to be placed in any previously-described genera. So far as my observations on the New Zealand representatives of this family have gone, I have been struck with the great diversity of type and structure that is exhibited by our species, for out of seven sub-sections into which the family is divided six are