

## Fresh-water Fauna of New Zealand, Contributions to a Knowledge of.

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(Translated from the German and communicated by E. W. Bennett.)

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### PART 1.—ON THE MICROFAUNA OF A POND IN A SPHAGNUM-BOG ON MOUNT ROLLESTON.

DURING the course of studies preliminary to writing a treatise on the "Tiergeographie des Süßwassers," I have found it essential to secure further information concerning certain regions which have a special significance in connection with the geographical distribution of animals. Of such regions, New Zealand stands in the front rank. Mr. E. W. Bennett, of Canterbury College, Christchurch, has been kind enough to forward material to me for investigation, for which I wish to express my heartiest thanks. As, however, I am also engaged at the present time on a study of Japanese and South American material, the examination of the collections from New Zealand is proceeding slowly; and for this reason, and also because there are many details which cannot be settled at once on account of the deficiencies in the literature, I propose to offer short reports from time to time as the work proceeds. The following paper, the first of the series, deals with the micro-fauna of a small tarn in a moss-bog which is situated on Mount Rolleston, near Arthurs Pass.

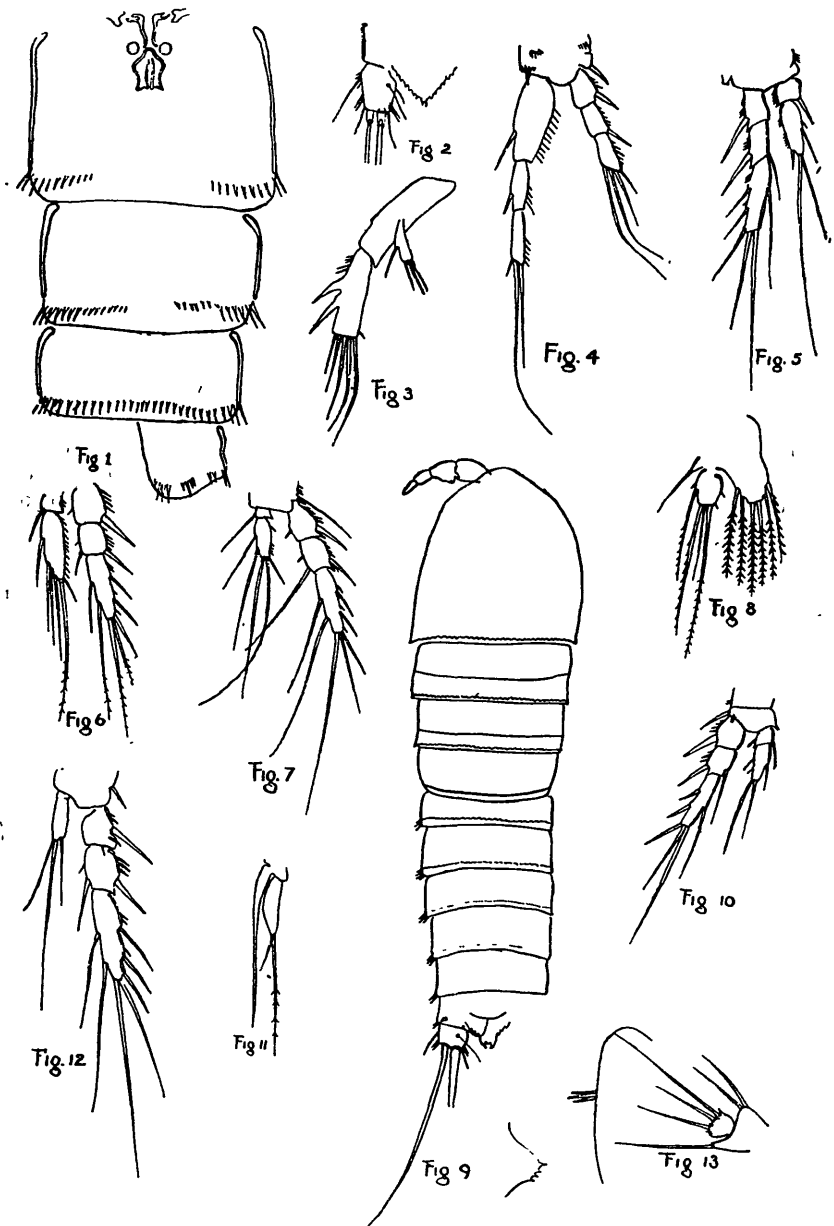
Entangled in a mass of *Sphagnum* and unicellular swamp-algae in a specimen-tube, were a number of fine shelled Rhizopoda, among which I recognized representatives of the genera *Nebela*, *Assulina*, and *Euglypha*. To make certain of these Rhizopods, I sent a small tube to the illustrious authority on the group, Herr E. Penard, of Genf, who was kind enough to look through the material. My sincerest thanks are here offered to Herr Penard for this service.

#### COPEPODA.\*

Of the contents of the tube, the Harpacticidae are without doubt the most interesting, partly because extremely little has hitherto been known of this group as represented in the Southern Hemisphere, and partly because this tube leads one to expect a preponderance of this section of the Copepoda similar to that which Delachaux has recently revealed in the case of the lakes of the Peruvian Andes—with which region, in fact, New Zealand and Australia have much in common; as for example the occurrence of the Boeckellidae.

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\*The five new species of Copepoda described in this section have already been named and briefly characterized in "Vorläufige Mitteilung über die Süßwasserfauna Neu-Seelands," *Zoolog. Anzeiger*, Bd. 75, Heft 7/10, pp. 223-225, 15th Feb., 1928.



FIGS. 1-13.—*Delachauxiella Bennettii* n. sp.

- |                                     |                                                         |
|-------------------------------------|---------------------------------------------------------|
| 1. ♀, abdomen, ventral;             | 8. ♀, fifth foot;                                       |
| 2. ♀, furca and anal plate, dorsal; | 9. ♂, dorsal view, and anal plate of a second specimen; |
| 3. ♀, 2nd antenna;                  | 10. ♂, second foot;                                     |
| 4. ♀, first foot;                   | 11. ♂, inner branch of third foot;                      |
| 5. ♀, second foot;                  | 12. ♂, fourth foot;                                     |
| 6. ♀, third foot;                   | 13. ♂, fifth and "sixth" foot.                          |
| 7. ♀, fourth foot;                  |                                                         |

No species of fresh-water Harpacticidae appear to have been hitherto recorded from New Zealand, and only two are known from Australia, viz., *Attheyella australica* Sars and *Moraria longiseta* Henry; but neither of these species shows any special relationships with the fauna of South America. The collection from Mount Rolleston contains representatives of two different types, viz., larger species of the *Canthocamptus* type, and smaller ones of the *Moraria-Parastenoqaris* type. These comparisons merely indicate their general aspects, and should not be interpreted as implying anything concerning their true systematic relationships. Those who have investigated the Harpacticidae know that the taxonomy of the group is at present in a most difficult condition, because no adequate basis has been discovered for a satisfactory delimitation of the genera. Although Graeter has shown the untenability of the method in other groups of Copepoda, the number of joints in the antennae or in the inner and outer branches of the swimming-feet is still commonly made use of in defining the genera, so that species are grouped into quite untenable genera such as *Attheyella*, *Mesochra*, etc. By a consistent extension of Graeter's point of view, Kiefer has just worked out a welcome reconstruction of the classification of the Cyclopidae. Among the Harpacticidae in which the relationships certainly appear to be more difficult to detect, Haberbosch has attempted a similar investigation, without however succeeding in reaching a tangible result. Hence in attempting to place the new species described below in existing genera, there are very considerable difficulties in the way.

In studying the Entomostraca of South America, the author has laid stress on those species of *Canthocamptus*, hitherto known only from that country, which are distinguished by a triangular or arrow-head-shaped anal plate; and for these he has founded the genus *Delachauxiella*. The opinions of specialists are divided on the question of the validity of this genus. In regarding the characteristics which were used for the definition of the genus as being of phylogenetic significance, the author was influenced by the fact that all of these species were known exclusively from South America. Certainly the objection can be raised that the genus *Moraria*, which can be separated from *Canthocamptus* only with difficulty, possesses triangular and frequently toothed anal plates, and that, moreover, in European representatives of the genus. On the other hand, the presence of two such species in New Zealand serves admirably for the geographical and morphological distinctness of the genus, and the genus *Delachauxiella* as defined by me may therefore be upheld, and two of the following new species placed in it.

#### 1. *Delachauxiella Bennetti* n. sp.

This species is by far the most abundant Harpacticid in the available material, and is represented by both sexes and by different stages of growth.

*Female*: A mature female, carrying six colourless eggs in an egg-sac, was 0.75 mm. in length without the furcal setae, and 1 mm. with them. These may be taken as the average dimensions; but a mature female scarcely 0.7 mm. in length was also found, and on

the other hand another reached the length of 1 mm. without the furcal setae.

The hinder edges of the thoracic segments are finely dentate. Of the abdominal segments, the last bears a continuous margin of spinelets on the ventral surface, while in the two preceding segments the row of spinelets is interrupted in the middle.

In the first pair of feet, both branches are three-jointed and without any striking peculiarities. In the second, third, and fourth pairs, the inner branches are only two-jointed. The armature is indicated in the accompanying figures. In the fifth pair, the inner part of the basal joint is broadly produced, and bears six almost equally long and sparsely-haired setae, while the second is oval and bears only four.

The anal plate is small and triangular, and armed at the edge with 5-7 somewhat distant teeth; at the end it usually runs out into a double tooth or two-pronged middle piece, but less frequently the point is produced into a single median tooth. (Fig. 2).

The furcae are slightly longer than broad, and bear two well-developed furcal setae, of which one is about half as long as the other.

The head has no distinct rostrum. The first antenna is 8-jointed. The sensory hair of the fourth joint extends considerably beyond the end of the antenna. The end-joint of the second antenna has five setae, regularly arranged according to length, and two strong lateral spines. The appearance of the female genital area is indicated in Fig. 1.

*Male*: The most obvious differences between the male and the female are the more slender proportions of the former, the fewer lateral teeth on the anal plate (usually only three), and the furcae, which are shorter and almost square in shape. The differences in the armature of the swimming-feet are shown in the accompanying figure. The inner branch of the third pair bears on the inner side of the second joint a spine which runs out into a smooth spine without a hook.

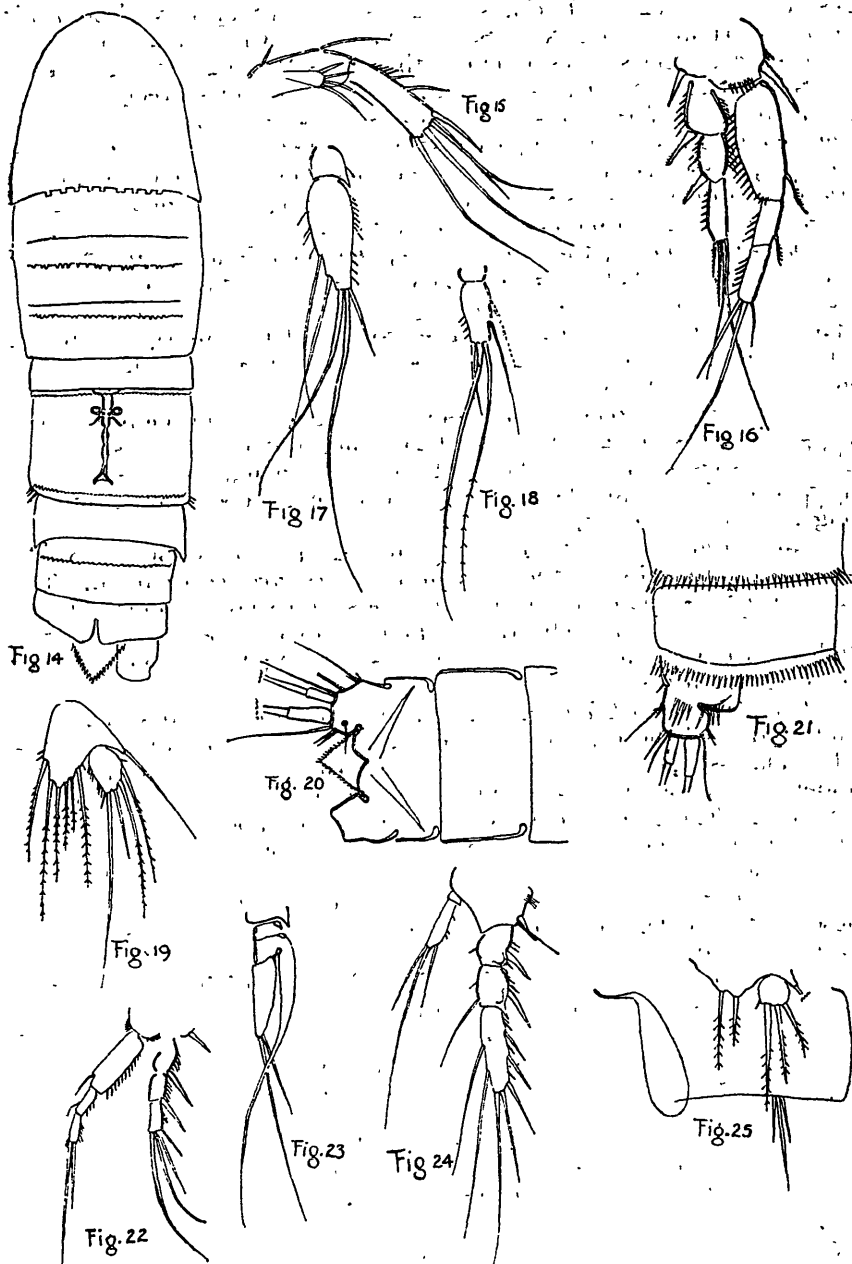
The rudimentary fifth feet bear only two setae on the inner part, and only three on the broadly-oval terminal joint.

A specimen of a female *Canthocamptus* was discovered, which differed from all the other Harpacticids in the tube in that it possessed a semi-circular untoothed anal plate, so that at first I thought that I had another new species. But a more detailed examination showed that this specimen agreed so thoroughly in all other details with *D. Bennettii* that it must certainly be included in the latter species. The abnormal form of the anal plate will probably have to be interpreted as a mutation of *D. Bennettii*.

## 2. *Delachauxiella* (= *Canthocamptus* auct.) *insignis*\* n.sp.

Another species which occurred much less commonly in the collection than *D. Bennettii* had likewise a triangular anal plate; the latter, however, was not provided with small marginal notches, but with long and slender teeth, so that the edge could almost be

\*On account of the distinctive square processes on the hinder edge of the first cephalothoracic segment.



FIGS. 14-25.—*Delachauxiella (Canthocamptus) insignis* n. sp.

- |                                     |                                    |
|-------------------------------------|------------------------------------|
| 14. ♀, dorsal;                      | 20. ♂, abdomen and anal plate;     |
| 15. ♀, second antenna;              | 21. ♂, abdomen, ventral;           |
| 16. ♀, first foot;                  | 22. ♂, first foot;                 |
| 17. ♀, inner branch of third foot;  | 23. ♂, inner branch of third foot; |
| 18. ♀, inner branch of fourth foot; | 24. ♂, fourth foot;                |
| 19. ♀, fifth foot;                  | 25. ♂, fifth and "sixth" foot.     |

described as fringed. Perhaps it agrees in this respect with *Moraria longiseta* Henry from New South Wales, of whose anal plate the discoverer of the species remarks that it is "fringed with hairs"; the figure agrees with this account. But one could scarcely describe the anal plate of the present species as haired; the armature of the edge could rather be compared with the teeth of a comb. It is, however, easily seen that our species has nothing to do with the *Moraria* in question—as shown at first glance by the shortness of the furcae, not to mention many other differences.

*Male*: Including the furcal setae, the body is about 0.8 mm. in length. The cephalothoracic segment bears at its hinder edge a series of remarkable and almost square prolongations. The hinder edges of the following segments are finely and irregularly produced. The last three abdominal segments bear a continuous row of spinelets on the ventral surface.

The furca is broader than long, bears two well-developed terminal setae, whose length is about 0.26 mm., and otherwise shows no characteristics of note. The anal plate is triangular in shape, as mentioned above, and bears along the edge on each side about 15 long and slender teeth.

Both branches of the first pair of legs are three-jointed, while the inner branches of the remaining pairs are two-jointed. The characteristic spine of the third pair ends in a smooth point without a hook. The fifth pair bears two almost equally long setae on the slightly-produced inner part of the basal joint; the second joint is rounded and bears three setae.

*Female*: About 0.7 mm. in length without the furcal setae. The hinder edge of the cephalothoracic segment shows the same remarkable square-shaped projections as in the case of the male, and the hinder edge of all the following segments are finely and irregularly produced. The hinder edge of the last three abdominal segments bears a long fringe of spinelets, which in the third last is interrupted in the middle.

The furcae and anal plate show no essential differences from those of the male. The sculpture of the genital area is shown in the accompanying figure.

The first pair of legs has both branches three-jointed, while the inner branches of the following pairs are only two-jointed. Differences are found between the right and left limbs in the number of setae on the terminal joints of the inner branches.

In the fifth pair, the inner part of the basal joint is strongly produced posteriorly, and bears six sparingly plumose setae. The terminal joint has four setae. Another difference between the right and left appendages occurs here, the prolonged part of the basal joint of the left pair having only five setae.

### 3. *Canthocamptus misogynus*\* n. sp.

Another species of a *Canthocamptid* was represented by only a single male; the length was about 0.8 mm. with the furcal setae, and about 0.6 mm. without them.

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\*Because found without the female.

The last abdominal segments bear an uninterrupted row of spinelets on the ventral side. The anal plate is flatly curved, and provided with numerous delicate teeth, so that it could almost be said to be ciliate. The furcae are almost square; the terminal setae are both well developed, the one being about twice as long as the other; the rest of the armature of the furcae is rather sparse, as indicated in the figure. The dorsal seta missing from the figure was evidently broken off during the preparation of the specimen.

The first pair of feet has the inner and outer branches both three-jointed. There is a notable plumose fringe on three lateral hairs of the last and second last joints of the inner branch, as shown in figure 27.

The second pair of feet has only a two-jointed inner branch; the distal outer corners of the joints of the outer branch are produced outwards into sharp points. These points are more strikingly developed in the corresponding joints of the third feet. The spine of the second joint of the inner branch of the third foot is as long as the exopodite and does not terminate in a hook.

The fourth pair is characterized by a very long exopodite, whose joints are well provided with setae and spinelets. The endopodite is two-jointed and very short, the first joint being very small.

The rudimentary fifth feet show on the slightly-produced inner part of the basal joint two setae of unequal length. The second joint is slightly broader than long, and bears at the distal edge five short spines and three setae.

#### 4. *Canthocamptus maoricus*\* n.sp.

A further Canthocamptid was represented by a single male specimen, of which unfortunately only a very incomplete account can be given; the description below, however, will sufficiently characterize the species to enable it to stand as valid.

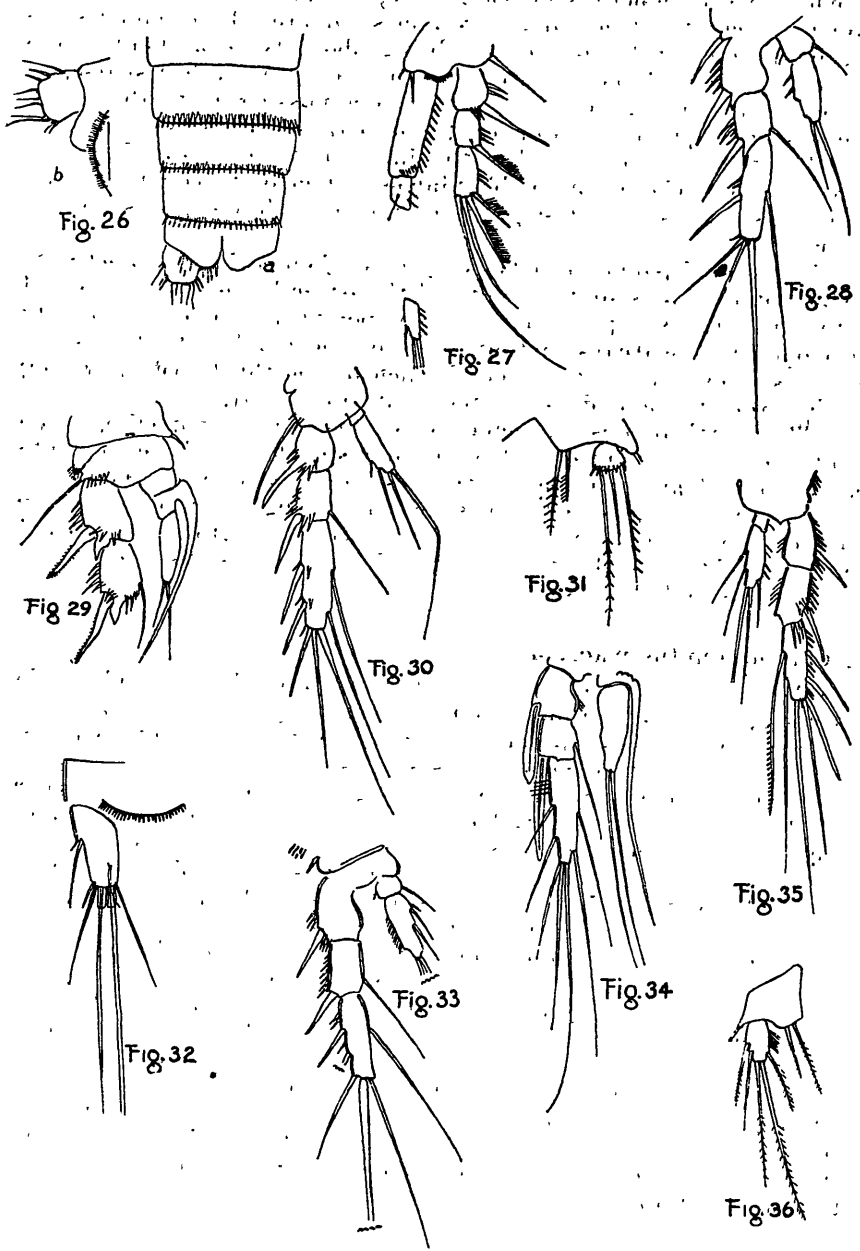
Length 1 mm. Second pair of legs with a two-jointed inner branch. Third pair remarkable on account of immense, broad, and blunt blades on the first and second joints of the outer branch. The spine of the inner branch runs out into a simple point without a hook. The fourth pair likewise has a two-jointed inner branch; the three joints of the outer branch bear remarkably blunt spines on the outer edges. The proximal seta of the inner edge of the last joint of the outer branch is characteristically toothed.

A slight asymmetry occurs in the fifth pair; on the one leg, the second joint bears five setae, and in the other the proximal seta of the outer edge is modified into a small spine. Such cases of asymmetry in other species have frequently been regarded as abnormalities, but the general tendency towards asymmetry in the Copepoda suggests that possibly the asymmetry may be a constant condition. As only the one specimen was forthcoming, however, it must remain undecided in the meantime which of these possibilities is correct.

The furcae are fully twice as long as broad. The anal plate is flatly curved and armed with 25 long spines.

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\*On account of its occurrence in New Zealand, the home of the Maori.



FIGS. 26-36.



Four specimens of a Harpactid differed from those described above, through their smallness and slender form; I refer them only provisionally to the one species. They were as follows:—

- (1) One immature specimen of doubtful sex;
- (2) A male;
- (3) Two females.

The two females differed from one another in certain respects, and there is at least a possibility that they may belong to two different species, in which case it would remain doubtful to which of the females the above-mentioned male would belong. As I find a difficulty in assigning these specimens to any of the existing genera, I intend to found a new genus for them; but in the meantime I postpone the definition of the latter until further details can be given in a later treatise.

### 5. *Antipodiella chappuisi* n. sp.

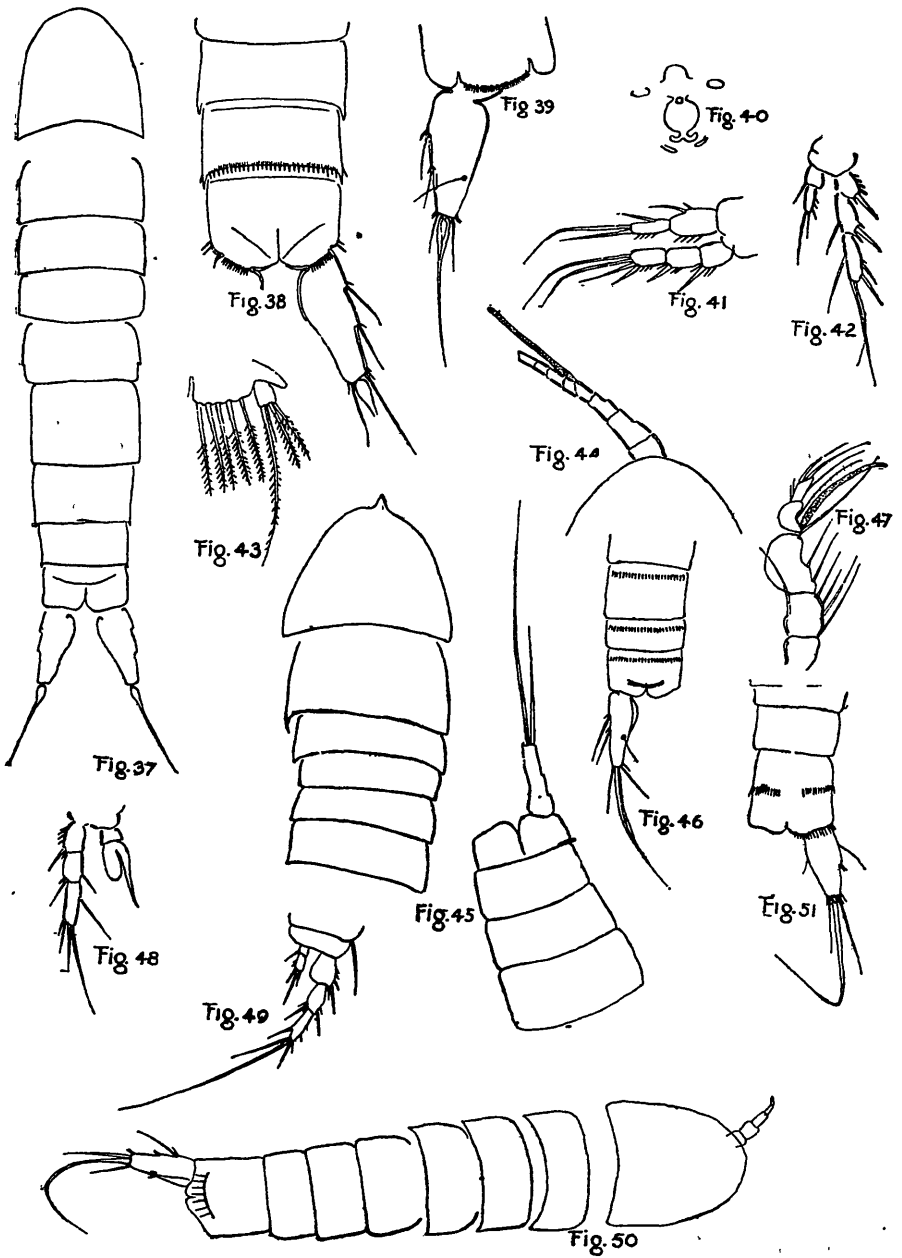
*Female*: Length 0.6 mm. including the terminal setae. Margins of the segments smooth. The surface-design of the genital segment is shown in the figure. Antenna 8-jointed; the sensory hair of the fourth joint extends beyond the end of the antenna for quite the length of the last two joints. The swimming-feet have a three-jointed outer and a two-jointed inner branch. The inner part of the basal joint of the fifth foot is scarcely produced, and bears five almost equally long and sparingly plumed setae. The second joint of this foot bears four setae—a long one at the inner corner, then a shorter and more slender one, then two subequal setae of moderate length. The furcate are  $2\frac{1}{2}$  times as long as broad; the outer edge bears two setae, each accompanied by a small spine, and at the end is a basally swollen and onion-shaped seta, which is scarcely longer than the furca, and is flanked on either side by a short and slender seta. In a second specimen, however, the long terminal seta was about twice as long and the basal part did not show the onion-shaped swelling. Since in addition the anal plate of the first specimen was furnished with a marginal fringe of hairs, and no such feature occurred on the second specimen, the edge of the plate being quite smooth, it may be that two closely related yet nevertheless distinct

FIGS. 26-31.—*Canthocamptus misogynus* n. sp.

26. ♂, ventral view of abdomen and furca; and anal plate.
27. ♂, first foot; last joint of the inner branch broken off, but the fragment figured was found with the rest of the preparation and agrees well.
28. ♂, second foot; some spines have probably been broken off from the second joint of the inner branch.
29. ♂, third foot; last joint of the outer branch broken off.
30. ♂, fourth foot;
31. ♂, fifth foot.

FIGS. 32-36.—*Canthocamptus mauricus* n. sp.

32. ♂, furca and anal plate;
33. ♂, second foot;
34. ♂, third foot;
35. ♂, fourth foot.
36. ♂, fifth foot.



FIGS. 37-51.

species are represented here; but it may simply be that the former species has a wide range of variation.

*Male*: The only male specimen found measured 0.5 mm. in length inclusive of the furcal setae. The hinder edges of the segments were simple on the dorsal side, while the last three abdominal segments each bore on the ventral side a continuous fringe of spinelets. The first antenna had a very long and stout sensory hair on the fourth joint. The accessory branch of the second antenna was noticeably small.

The inner branch of the third pair of feet bore a short and broad blade, which ended in a smooth point. The terminal joint bore no setae, and showed no sign that the latter might have been broken off. The outer branch of the fourth pair was three-jointed and the inner branch two-jointed. Of the fifth pair I did not succeed in obtaining more than an incomplete and doubtful figure, which I offer with due reservation. It would appear that the inner part of the base is not prolonged, and that it bears only one seta, the terminal joint having three. The possibility of error, however, is not excluded in this interpretation. At all events, the so-called sixth pair of feet was represented in this male only by a single spine.

The above-described male, which, though it reached a length of almost 0.5 mm., was evidently not yet mature, is figured in order to show particularly the remarkable armature of the flatly-curved anal plate, which bore seven long needle-shaped teeth.

The provisional generic name should serve as a reminder of the occurrence of this species in the Southern Hemisphere; the specific name is bestowed in honour of Dr. P. A. Chappuis, the chief authority on the Harpacticidae.

#### RHIZOPODA.

Unfortunately the samples forwarded to Herr Penard included only some of the forms which came under my notice. Nevertheless Dr. Penard's report forms a substantial contribution towards the elucidation of the fresh-water fauna.

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#### FIGS. 37-51.—*Antipodiella chappuisiella* n. sp.

37. ♀, dorsal view;
38. ♀, abdomen and furca, ventral view;
39. ♀, ditto, dorsal view;
40. ♀, sculpture of the genital area;
41. ♀, first foot;
42. ♀, third foot;
43. ♀, fifth foot.
44. ♀, first antenna (from a second specimen);
45. ♂, outline;
46. ♂, abdomen and furca, dorsal, with the spinelets of the ventral surface showing through;
47. ♂, modified antenna;
48. ♂, third foot;
49. ♂, fourth foot;
50. An immature specimen (?);
51. Abdomen and furca of the latter specimen.

Of a *Nebela*, which was by far the most abundant and remarkable form—as also in the samples which I investigated—Dr. Penard writes\* :—

“ It is similar to *Nebela vas Certes*, but differs therefrom in that the shell possesses a broad, hollow, and characteristic keel, which is always present and might well be regarded as a sufficient character to distinguish a new-species. I have not been able to identify it with any known species.”

Unfortunately only empty cases of this fine Rhizopod were found. Before the natural colours and the characteristics of the protoplast could be determined, it would be necessary to obtain living specimens of the animal—which indeed could easily be accomplished by a zoologist living in New Zealand. On account of Herr Penard's long-continued experience and acquaintance with the Rhizopod group, the short statement of such an authority is amply sufficient for the announcement of this *Nebela* as a new species, and I propose to name it *Nebela Penardi* n. sp.

Less abundant and also less remarkable is another species which is undoubtedly identical with *Nebela Certesi* Penard, which was described by Certes as a variety of *Nebela collaris*. It may be regarded as a Pacific species, and has already been recorded from New Zealand (Penard, “ Rhizopodes d'eau douce,” in *Brit. Antarctic Exped.*, 1907-1909).

Herr Penard has also detected two other small species of *Nebela* which could not be precisely determined; a *Euglypha* which is quite identical with *Euglypha ciliata*; and a *Diffugia* which unquestionably belong to *Diffugia acuminata*.

#### ROTATORIA.

The collection contained an abundance of *Anuraea cochlearis*, which is noteworthy, as *Anuraea serrulata* is likewise regularly found in European bog-mosses.

Numerous specimens occurred of *Dissotrocha aculeata* Ehb., in a form, however, characterized by having only two wing-like laterally situated spines. For the determination of this species I am indebted to Dr. David Bryce. Since all of the specimens in the available material were provided with only two such wing-like spines, it is evidently not a case of individual variation, but of a thoroughly established strain.

Some Rotifer loricae were also fairly common, which agree so completely with those of *Callidina angusticollis* Murray that there can be no doubt as to their identity with that species. Herr Penard drew my attention also to the presence of the loricae of a second Rotifer which perhaps belongs to *Habrotrocha perforata*; I found it also in the material which I examined, often clinging to *Sphagnum* leaves.

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\*Translation.

Isolated specimens were also found of *Monostyla crenata* Haring; this species has already been recorded from Australia and New Zealand by Murray.

One specimen of *Cephalodella mucronata* Myers was also discovered. Murray, who first described the species from eastern North America, has already noted that though he recorded it as new it had already been found; but the identification had been incorrect, as Murray had described it from New Zealand under the name of *Monommata appendiculata*.

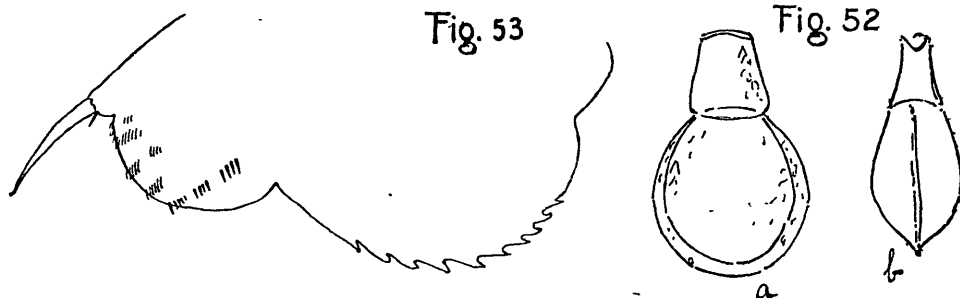


FIG. 52.—*Nebela Penardi* n. sp.  
a, side view; b, end view.

FIG. 53.—*Streblocerus serricaudatus* var. *Novae-Zelandiae* n. var.  
postabdomen.

#### CLADOCERA.

A number of specimens of a small form belonging to the Cladoceran genus *Alona* were present in the tube, but I have deferred the determination of these, partly because of the extraordinarily trifling value of these *Cladocera* from the point of view of animal geography, and partly because of the present unreliable state of the classification of this group of *Cladocera*, where almost every species has dozens of badly described synonyms, the arrangement and reduction of which has only just been taken in hand by some of the more recent authors.

The species *Streblocerus serricaudatus* was abundantly represented in both sexes. This species is thus now recorded for the first time from the southern hemisphere, whence only the second species of the genus, *S. pygmaeus*, a Brazilian form, has hitherto been known. The New Zealand form differs from the typical *S. serricaudatus* of North Europe, North Asia, and North America, in the following points:—

1. The post-abdomen is more richly provided with lateral rows of spinelets, and the proximal serrated segment is more prominent.
2. The vales of the shell are finely granulated, not polygonally sculptured.

The New Zealand form may therefore be distinguished from the typical species as *Streblocerus serricaudatus* var. *Novae-Zelandiae*. The most southern locality of the species has hitherto been Stingelin's record from mountain lakes of Columbia. (Fig. 53).

If the above account is reviewed with the purpose of making a comparison with the fauna of a European *Sphagnum* bog a considerable degree of ecological similarity is evident. But whereas the European *Sphagnum* contains usually only one Canthocamptid and rarely about one *Parastenocaris*, yet a considerable number of these forms are represented in the New Zealand material—a phenomenon which we do not regard as an exception but which we have to recognize as a peculiarity of the southern hemisphere.

Hydracarina and Ostracoda are quite absent from the material discussed in this paper. Nematodes were only very sparingly represented and must remain unidentified, as must also be the case with some Oribatidae and insect-larvae of which a small Tanysarsid was noticed but not further identified.

Rotifers were more plentiful, but included very few Bdelloida and none at all of the species typical of the European peat-moors, such as *Anuraea serrulata*, *Microdon clavus*, *Ploesoma*, or *Elosa*. In spite of this, the *Sphagnum* waters of Mount Rolleston remind us forcibly, through their Rhizopod fauna and the presence of *Streblocerus*, of the analogous faunistic areas of Europe.

At all events, the results obtained from this single tube justify the wish that collections might be procured from other localities in the mountain ranges of New Zealand in order that the picture of the New Zealand fauna might be completed.