

## Report on a Collection of Fresh-water Cyclopidae from New Zealand.

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THE more humble representatives of the fauna of the inland waters of New Zealand are as yet very imperfectly known. The various accounts yet published refer only to rather random samples; yet they are sufficient to show that (taking the Australian region as a whole) a highly distinctive character is given to the fauna of that region by a number of characteristic forms, such as, for example, those of the Copepoda. It is consequently a matter of considerable interest to systematists and no less to zoo-geographers to have some precise information concerning the fresh-water fauna of Australia and New Zealand and the various associated islands.

An extensive collection of New Zealand fresh-water animals from a variety of habitats has been sent to Professor V. Brehm by Mr E. W. Bennett, and, as shown in previous published reports, these collections have revealed quite a series of new and remarkable representatives of the lower Crustacea, particularly Copepoda of the sub-family Harpacticoida. Professor Brehm has entrusted the Cyclopids from these collections to me for investigation, and I wish to offer here my heartiest thanks for the opportunity of examining them.

The material received by me was contained in 34 tubes, whose contents were derived from the following localities:—

1. Waimate. Stagnant weedy pool.
2. Arno, S. of Waimate. Large flooded lagoon.
- 3, 4, 5. Timaru. Sluggish or stagnant pools, weedy.
6. Maronan Road, near Ashburton. Rapid turbid stream in flood.
7. Ashburton. Stagnant weedy pool on golf links.
8. Rakaia River bed, by railway bridge. Rapid stream, sandy bottom, without weeds.
9. Selwyn River bed. Very weedy pools, probably only rain-pools not flooded by the river.
12. Christchurch. Alga cultures in greenhouse, Canterbury College. Possibly originally from Arthur's Pass.
13. Selwyn Huts, mouth of Selwyn River.
16. Label lost. Canterbury.
17. Tai Tapu. Muddy ditch.
- 18, 20, 22. Governor's Bay, Lyttelton Harbour. Horse trough.
23. Brackish pool at Lake Ellesmere, connected with lake by a ditch.
24. Pool (? brackish) by Lake Forsaith, probably flooded by the lake in winter. The lake is brackish.

26. Arthur's Pass, summit, 2500 feet. Pool in alpine Sphagnum bog, water brown and curdy with flocculent decaying weed.
27. ? Arthur's Pass.
29. Sefton, North Canterbury. Shallow weedy stream, rather sluggish.
30. Sefton. Large deep pond, shaded by willows and covered with *Azolla* and *Lemna*.
31. Near Sefton. Rapid stream with few weeds.
32. Leithfield. Deep culvert, shaded by bridge; willows, and *Lemna*.
33. Greta Valley, North Canterbury. Very weedy pool, stagnant (? temporarily).
34. Gebbie's Valley, Banks Peninsula (Plains district). Shallow and muddy culvert.
35. Near Waipara River. Deep roadside pool.
36. Cheviot. Small muddy pool.
37. Cheviot. Sluggish stream, with *Lemna* and other weeds, and willows.
38. Near Hurunui River. Extremely turbid roadside pool.
39. Cheviot. Lake in the Park.
40. Cheviot. Lake in the Domain.
42. Nonoti, near Cheviot. Large weedy pond.
43. Lake Ellesmere. Brackish water.

In these 34 tubes, in spite of the variety of localities from which the material was taken, I could find only ten species of Cyclopidae, which were as follows.

1. *Cyclops bisetosus* Rehberg.
- " *bicuspidatus* Claus.
- " *monacanthus* Kiefer.
2. *Cyclops bicuspidatus* Claus.
- " *bisetosus* Rehberg.
3. *Cyclops bisetosus* Rehberg.
4. *Cyclops bicuspidatus* Claus.
5. *Cyclops bicuspidatus* Claus.
6. *Cyclops robustus* Sars.
7. *Cyclops robustus* Sars ? (badly preserved).
8. *Cyclops bicuspidatus* Claus.
9. *Eucyclops serrulatus* (Fischer) ?
- Cyclops robustus* Sars ? (badly preserved).
12. *Paracyclops finitimus* Kiefer.
13. *Eucyclops serrulatus* (Fischer) ?
- Cyclops robustus* Sars.
- " *monacanthus* Kiefer.
16. *Paracyclops finitimus* Kiefer.
17. *Eucyclops serrulatus* (Fischer).
- Cyclops robustus* Sars.
18. *Cyclops robustus* Sars.
20. *Eucyclops serrulatus* (Fischer).
22. *Cyclops robustus* Sars or *Cyclops vernalis* Fischer (badly preserved).

23. *Cyclops monacanthus* Kiefer.  
 24. *Cyclops bicuspidatus* Claus.  
 26. *Macrocyclus albidus* (Jurine), 1 juv.  
 27. *Eucyclops serrulatus* (Fischer).  
 29. *Eucyclops serrulatus* (Fischer).  
 30. *Cyclops bicuspidatus* Claus.  
 31. *Eucyclops serrulatus* (Fischer).  
 32. *Cyclops robustus* Sars.  
       " *bisetosus* Rehberg.  
 33. *Macrocyclus albidus* (Jurine).  
       *Eucyclops serrulatus* (Fischer).  
       *Cyclops varicans* Sars.  
 34. *Cyclops vernalis* Fischer.  
 35. *Cyclops bisetosus* Rehberg.  
 36. *Cyclops robustus* Sars.  
 37. *Eucyclops serrulatus* (Fischer).  
       *Paracyclops finitimus* Kiefer.  
       *Cyclops robustus* Sars.  
       " *bisetosus* Rehberg.  
 38. *Eucyclops serrulatus* (Fischer).  
       *Cyclops bicuspidatus* Claus.  
 39. *Eucyclops serrulatus* (Fischer).  
       *Cyclops robustus* Sars.  
 40. *Cyclops bicuspidatus* Claus.  
 42. *Cyclops bicuspidatus* Claus.  
 43. *Cyclops crassicaudoides* Kiefer.  
       " *monacanthus* Kiefer.  
       *Eucyclops serrulatus* (Fischer) ?

The systematic arrangement of these species is as follows:—

Genus **Macrocyclus** Claus.

*Macrocyclus albidus* (Jurine).

Genus **Eucyclops** Claus.

*Eucyclops serrulatus* (Fischer).

Genus **Paracyclops** Claus.

*Paracyclops finitimus* Kiefer.

Genus **Cyclops** O. F. Müller.

*Cyclops* (*Acanthocyclops*) *robustus* Sars.

" ( " ) *vernalis* Fischer.

" (*Diacyclops*) *bicuspidatus* Claus.

" ( " ) *bisetosus* Rehberg.

" ( " ) *crassicaudoides* Kiefer.

" (*Microcyclops*) *varicans* Sars.

" (*Metacyclops*) *monacanthus* Kiefer.

This list can be regarded as only a scanty one, and I am convinced that twice as many species of Cyclopids occur in the district in question. There are several reasons why they may well have escaped record here. First, anyone wishing to include Cyclopids in his collections of the fresh-water fauna must be familiar with the habits

of these animals, and the habits differ considerably in the species of the various groups. It is remarkable, for example, that in none of the tubes is there a single truly planktonic species, such as a member of the genus *Mesocyclops*; or that of the creeping rather than free-swimming forms, the *serrulatus* group of the genus *Eucyclops* is represented by only a single species, and the genus *Ectocyclops* is not represented at all. It is obvious, moreover, that not all of the species occurring in a given locality can be collected by a single visit to that locality, for the collecting should be spread over a considerable time, say a year at least, in order that those species may be collected which are absent or only very sparingly represented at some seasons. Finally, another important factor is the thoroughness or otherwise of the subsequent examination of the material, and, in the present case in particular, the picking out of the Cyclopids from the original bulk catch; for one whose aim is the study of animals of all descriptions may easily pass over a number of small or otherwise inconspicuous species which a specialist would most probably detect.

We may therefore conclude that since only ten authentic forms of free-living fresh-water Cyclopids are known from the whole Dominion of New Zealand, and since on a rough estimate this can be only about one-third of the total number of species which may confidently be expected to occur there, our knowledge of the New Zealand Cyclopids is still highly incomplete, and there is a wide field for investigation by local zoologists.

The further geographical distribution of the New Zealand Cyclopids, so far as they are known, is worthy of note. Seven species (*Macrocyclops albidus*, *Eucyclops serrulatus*, *Cyclops robustus*, *C. vernalis*, *C. bicuspidatus*, *C. bisetosus*, and *C. varicans*) are very widely distributed, and their occurrence in New Zealand calls for no further comment. The remaining three species, however, serve to give a distinctive character to the New Zealand Cyclopid fauna. One of them, *Paracyclops finitimus*, is at present known, apart from the New Zealand record, from North and South Africa. *Cyclops crassicaudoides* and *C. monacanthus* appear to be endemic to New Zealand, but they do not present any very remarkable features and are closely related to species with a wider distribution; viz., *C. crassicaudoides* is related to *C. bisetosus* (which itself occurs in New Zealand) and to *C. crassicaudis*, while *C. monacanthus* is related to *C. minutus* and *C. arnaudi*.

The only works, so far as I know, which have previously dealt with the New Zealand Cyclopids are from the pen of the Hon. G. M. Thomson, whose earlier paper, however, I have been unable to consult. I cannot express a personal opinion, therefore, on the species there described as new under the name of *Cyclops novaezealandiae*, but Schmeil has concluded, after studying certain specimens which were sent to him, that this species is not separable from "*Cyclops serrulatus*." But since the latter species has since been dismembered into a whole series of independent forms, we can hardly state in precise modern terms what Schmeil's opinion amounts to. Schmeil also united *Cyclops gigas* Thomson with *Cyclops bicuspidatus* Claus,

but although I have concurred with this view in my account of the Cyclopidae in the "Tierreich," I now find a difficulty in so doing, in that Thomson was able to distinguish his form from *Cyclops bisetosus*. According to Schmeil, *Cyclops chiltoni* is a synonym of *Cyclops fimbriatus*, but the form of the furca as figured by Thomson did not, in my opinion, permit an easy identification with that species, but placed it much nearer to *forma inominata*. But now that I have identified the material of *Paracyclops* before me as *P. finitimus*, the possibility remains that Thomson likewise had this form. I believe that *C. chiltoni*, therefore, cannot in any case be now regarded as a valid species. Finally, in my account in the "Tierreich," I have expressed the opinion that *Cyclops aequoreus*, on account of the shortness of the furca, is possibly identical with *Halicyclops propinquus* Sars.

If the above brief discussion of the first large collection of fresh-water Cyclopidae from New Zealand leads to a more detailed investigation by local zoologists and fresh-water biologists, the aim of this paper will have been thoroughly attained.

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