

# A Review of the Copepod Genus *Boeckella* in New Zealand

By V. H. JOLLY

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## Abstract

THE systematic position of the genus *Metaboeckella* is discussed. It is considered that the genus was established on insufficient and atypical specimens, and that it is synonymous with the genus *Boeckella*. The species *B. ambigua* is shown to be synonymous with the species *B. dilatata*, and the species *B. delicata* is considered to be a sub-species of *B. propinqua*. The genus *Boeckella* is therefore at present represented in New Zealand by four species, *B. triarticulata*, *B. hamata*, *B. propinqua*, and *B. dilatata*, and by one sub-species *B. propinqua* sub sp. *delicata*. All of these, except *B. triarticulata*, are endemic. Revised specific descriptions are given, and figures of the important specific characteristics.

## Order CALANOIDA

### Family CENTROPAGIDAE Sars 1902

#### Genus BOECKELLA de Guerne & Richard, 1889.

*Synonyms.* (For a full list see Marsh, 1924.)

1882. *Boeckia* Thomson, not Malm.

1905. *Metaboeckella* Ekman.

## HISTORICAL REVIEW

The above genus was originally established by G. M. Thomson, 1882, to include a new species which he named *Boeckia triarticulata*, but as the generic name *Boeckia* was preoccupied, it was re-named *Boeckella* by de Guerne and Richard, 1889. During the exploratory hey-day at the turn of the century further species were added to the genus from Australia, South America, and one from Mongolia. The confusion which arose through descriptions of synonymous species from such isolated regions was reduced by Ekman (1905) in a paper on the systematics, and synonymies of the genus *Boeckella*.

Marsh (1924) reviewed the genera *Boeckella* and *Pseudoboeckella* and provided a key to the then known species of fresh-water Centropagidae. This key is extended by Fairbridge (1945) to include the new species and varieties which had been created in the interim. Fairbridge placed the number of species as 32, and the varieties as 5. Two further species have been described from South America by Harding (1955).

PREVIOUS RECORDS WITHIN NEW ZEALAND. The following is a list of the species of the genus *Boeckella* recorded from New Zealand, all of which were described as new:—

*B. triarticulata* Thomson, 1882.

*B. dilatata* Sars, 1904.

*B. propinqua* Sars, 1904.

*B. hamata* Brehm, 1929.

*B. ambigua* Percival, 1937.

*B. delicata* Percival, 1937.

*B. triarticulata* var. *quarta* Brehm, 1939.

Ekman (1905) found the species *B. dilatata* sufficiently different to be regarded as a new genus, which he named *Metaboeckella*. The only further records of any of the above species within New Zealand have been those of Brady (1906) who recorded *B. triarticulata* and *B. propinqua*, and Henry (1924) who recorded *B. triarticulata*.

Genus *BOECKELLA* de Guerne & Richard, 1889.

## GENERIC CHARACTERS (after Sars, 1904).

Cephalothorax consist of 6 segments, the head segment being the largest. The 5 thoracic segments are each provided with a pair of biramous limbs. The last segment of the female is produced into extensive lappets on each side. Abdomen of female 3-articulate, that of the male 5-articulate. Caudal lamellae short, each with 5 plumose setae. Antennae and oral parts closely resemble those of the genus *Diaptomus*. Legs of female all natory, and sub-equal in structure, exopodites three segmented, endopodites of legs 1 to 4 also three-segmented, though segmentation of leg 1 may be indistinct, endopodite of leg 5 may be reduced. Exopodites of female fifth legs have second joint produced into a stout inner spine. Last pair of legs in male prehensile, very powerful, terminating in long movable claws, left and right endopodites of both rudimentary.

## DISCUSSION

Ekman (1905) established the genus *Metaboeckella* after examining the specimens from which Sars (1904) described the species *Boeckella dilatata* from Lake Wakatipu. His grounds for creating a new genus were two (1) the finding of but two articulations in the endopodites of the first and also fifth legs of the female, and (2) the lack of spines on the endopodite of the female fifth pair. It is felt that this genus was established on a few atypical specimens since Sars remarked (1904) in describing the species that he had only a limited number of specimens, most of which were young. The author has had the advantage of taking specimens from Lake Wakatipu at varying seasons of the year and from a number of different localities. It would appear that the Copepods in this lake and other similar large oligotrophic lakes are monocyclic, for at most seasons hauls contain little but immature animals. Females carrying fully-developed eggs appear in numbers only during the late spring and early summer. Many specimens have been dissected, and it has been found that the endopodites of the female fifth legs show a variation from 1-3 segments, bearing from 0-4 spines (Text-fig. 2, figs. 3, 3A, 3B). Regarding the segmentation of the endopodite of the first leg the articulations are indistinct, but in many the three segments can be discerned (Text-fig. 1, fig. 5). It is therefore felt that there is no justification for retaining the genus *Metaboeckella*.

***Boeckella triarticulata*** Thomson. Text-fig. 1, figs. 1 and 7; Text-fig. 2, fig. 4; Text-fig. 3, fig. 1.

1882. *Boeckia triarticulata* Thomson

1889. *Boeckella triarticulata* de Guerne & Richard

1894. *Boeckella triarticulata* Sars

1939. *Boeckella triarticulata* var. *quarta* Brehm

## SPECIFIC CHARACTERS (in part after Sars, 1894)

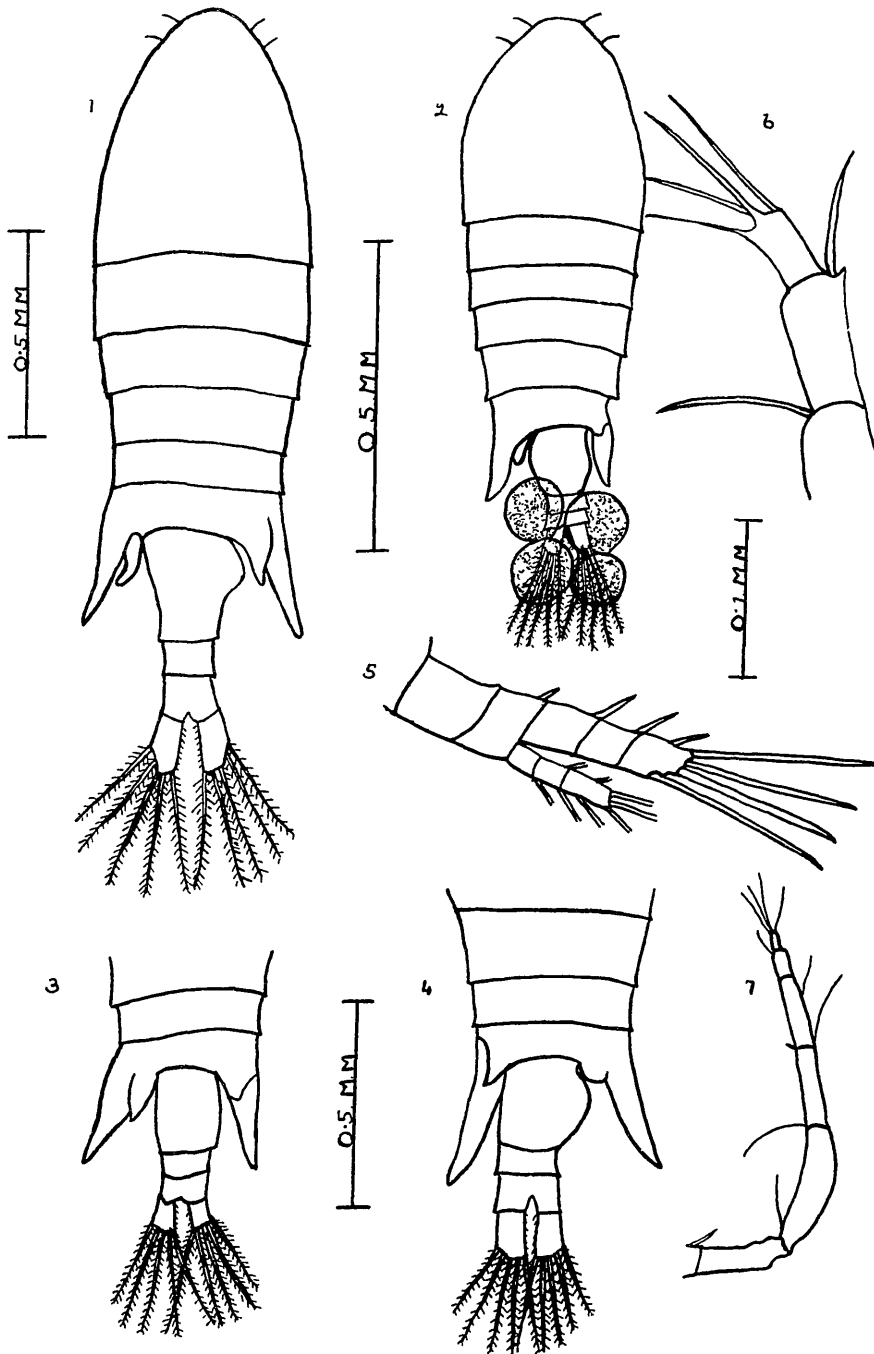
*Female*: Length 2.1-2.5 mm (Text-fig. 1, fig. 1).

Antennule extends to approximately the end of caudal furca. Body spindle-shaped, width greatest in region of first thoracic segment. Lappets consist of two lobes, the outer sharply tapered reach approximately the end of the genital segment, the inner lobes are asymmetrical, somewhat hamate and less than half the length of outer lobes. Genital segment asymmetrically bulged, exceeds the combined length of the following two segments. The caudal furca are short, expanded distally, and bear a median fringe of fine setae. Furcal setae very plumose. Fifth legs, exopodite spine number 1:2:7; endopodite 1:1:6; (characteristic of genus). The strong spine on inner margin of segment 2 serrate with approximately 7 teeth on each side. Last segment somewhat longer than segment 2 but much more narrow, with median terminal spine equal in length to whole segment; flanking spines sub-equal and less than half length of median spine. Spines bear fine setae. Endopodite is in length equal to first two segments of exopodite (Text-fig. 2, fig. 4). Egg number large, usually exceeds 32, eggs relatively small.

*Male*: Length, 2.0-2.1 mm.

Right antennule geniculate, 7 segments anterior to hinge very tumified, segments posterior to hinge number 5, but articulation may be indistinct. (Text-fig. 1, fig. 7.)

*Right Fifth Leg*: First segment somewhat triangular and produced into an outer spine, which does not exceed second segment in length, second segment of greater length than first segment also ends in a spine, third segment forms a strong sickle-shaped claw thickened proximally. Endopodite consists of one segment, somewhat expanded at base, sides more or



TEXT-FIG. 1—Fig. 1—*Boeckella triarticulata* (Christchurch pond). Fig. 2—*B. dilatata* (Lake Wakatipu). Fig. 3—*B. hamata* (Lake Lyndon). Fig. 4—*B. propinqua* (Pond, Canaan Track, Nelson). Fig. 5—First leg, male, *B. dilatata* (Lake Wakatipu). Fig. 6—Terminal segs. right antennule of male *B. propinqua*. Fig. 7—Terminal segs. right male antennule *B. triarticulata*

less parallel but terminate in a small point. In length the endopodite equals approximately the first two segments of the exopodite.

*Left Fifth Leg:* The basipodite is expanded into a serrated lamella. The exopodite is composed of three segments, the first two of which each bear a spine. The claw which is longer, more slender and less curved than that of the right leg is composed of segments 2 and 3, the articulation between the last two segments may be indistinct. The endopodite is one-segmented, slight, and about half the length of that on the right side (Text-fig. 3, fig. 1).

*Variations.* (1) *Colour:* Specimens showing red and blue patches, as well as colourless individuals have been taken. Miss Thomson (unpublished work) after a season's observation of this species in one pond reached the conclusion that colour was not characteristic of any one population, but variable within a population due to some unknown factor.

(2) *Antennule:* The length varies from population to population extending from the last abdominal segment to the end of the caudal furca, but never to end of caudal setae.

(3) *Thoracic Lappets:* The outer lobes may equal the genital segment or extend to almost the end of the last abdominal segment.

(4) *Right Fifth Leg of Male:* The length of the spine on first segment of exopodite may vary from half to nearly the whole length of the second segment. The claw is stouter in some populations.

(5) *Left Fifth Leg:* The form of the basipodite lamella may be triangular or pear-shaped. The serrations appear more marked on the pear-shaped form.

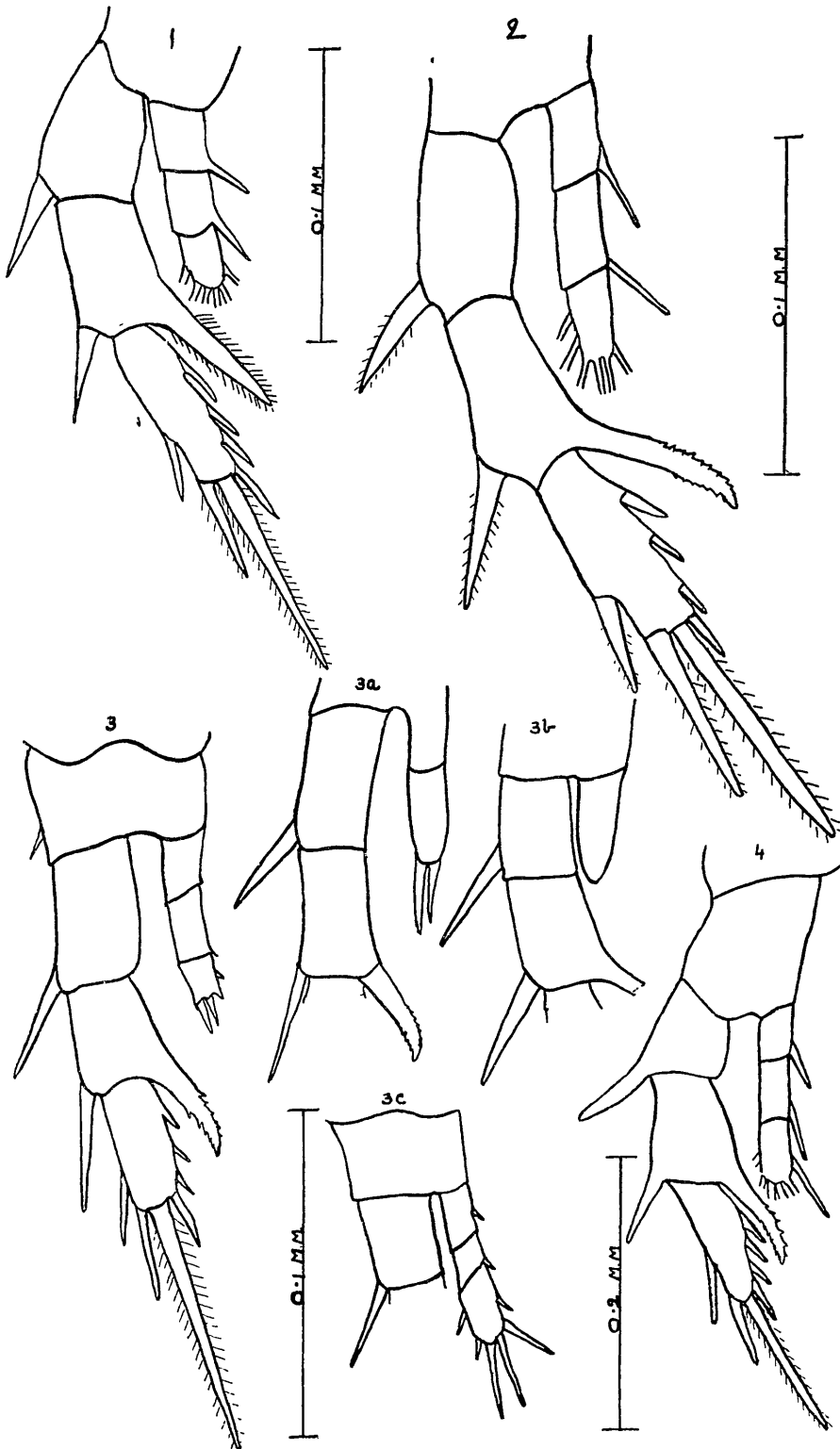
#### OCCURRENCE WITHIN NEW ZEALAND

This species is common in ponds both ephemeral and permanent in Canterbury and Otago. During the present survey it has not been collected in the North Island, but this is probably due to the fact that collecting there has been concentrated on lakes. Henry (1924) recorded it from the vicinity of Auckland. However, this may be a questionable record since in the areas where she mentioned its occurrence I have only taken the species *B. propinqua*.

#### DISCUSSION

Brady (1906) remarked that *B. triarticulata* and *B. propinqua* occurred together in samples submitted to him from the "lacustrine waters of New Zealand". He does not mention specifically any locality but is referring to plankton hauls taken during the Bathymetrical Survey made by Lucas & Hodgkins in 1902 of the following New Zealand lakes—Rotorua, Roto-iti, Taupo, Roto-Aira, Waikare, Whangape, Waikaremoana, Wakatipu, and Manapouri. He considered that *B. triarticulata* and *B. propinqua* were so alike that they might be considered as the same species but remarked that he thought *B. propinqua* might be a more fully-developed condition of *B. triarticulata*. Sars (1908) did not countenance this view and maintained that *B. propinqua*, which he himself had described, was specifically distinct. In plankton hauls collected from all the lakes sampled during the Cambridge Bathymetrical Survey I have not taken *B. triarticulata* for it is definitely a pond form. In none of these lakes do two different species of *Boeckella* occur together. It would appear that Brady has confused the species *B. dilatata* which Sars described (1904) from Lake Wakatipu, and which also occurs in Lake Manapouri, with *B. triarticulata*, which it resembles in some details but from which it differs very greatly in size and the form of the endopodites of the fifth legs. Brady must have been wrong in considering *B. propinqua* as the more fully-developed form of *B. triarticulata* since the size of the latter is 2.1 mm to 2.5 mm and that of the former is but 1.4 mm (measurements by Sars, which also agree with my own observations). In addition the mature forms are different. Compare Figs. 1 and 2, Text-fig. 1.

Brehm (1939) regarded specimens forwarded to him from Leithfield, Canterbury, New Zealand, as belonging to the group *B. triarticulata*, but exhibiting sufficient difference to be worthy of recognition as a variety which he designated *B. triarticulata* var. *quarta*. He also considered that the species *B. oblonga*, and *B. triarticulata* Sars (1908) from Australia should be regarded as varieties of *B. triarticulata* sensu stricto. Fairbridge (1945), in describing new species of *Boeckella* from Western Australia drew attention to their affinity to *B. triarticulata* but nevertheless, "for convenience," retained their specific identity.



TEXT-FIG 2—Fifth legs of females Fig. 1—*Boeckella propinqua* (Canaan Track Pond, Nelson) Fig. 2—*B. hamata* (Lake Lyndon). Fig 3—*B. dilatata* (Lake Wakatipu) Figs. 3a and 3b—Aberrant endopodites *B. dilatata* (Lake Wakatipu) Fig. 3c—Fully developed endopodite *B. dilatata* (Lake Howden) Fig 4—*B. triarticulata* (Christchurch Pond).

In considering the taxonomic status of New Zealand specimens falling within the *B. triarticulata* group it has been possible to make observations on at least 10 males and 10 females from 12 different localities including the type localities of *B. triarticulata* Thomson, and *B. triarticulata* var. *quarta* Brehm. As might be expected, from no two localities were the animals identical. Since the International Rules of Nomenclature no longer give taxonomic status to varieties it was necessary to consider these variations in the light of possible sub-specific differences.

The following is a translation of the criteria on which Brehm (1939) based his varietal differences:—

- (1) Length of antennule.
- (2) Length of thoracic wings.
- (3) Length of endopodite of male right fifth leg.
- (4) Length of seta on first segment of the right male fifth leg.
- (5) Basal thickening of claw on male right fifth leg.
- (6) Development of basal outgrowth on male right fifth leg.
- (7) Number of segments in endopodite on left male fifth leg.

Two of these variations are not valid for the observed New Zealand specimens—namely (5) and (7). Brehm remarked that Fig. 6, Pl. 8, Sars (1894), indicated that the right male claw is not thickened at the base. However, some thickening occurs in the Eyreton topotypes as it does in all New Zealand specimens of the species. Regarding (7), Brehm considered there was an indication of two segments in the left fifth male endopodite of the Leithfield specimens to which he gave the provisional designation var. *quarta*. This segmentation I have not found. As Brehm had but two male specimens he may have been mistaken.

It is felt that no New Zealand specimens of *B. triarticulata* show sufficient variation from the topotypes to be worthy of sub-specific rank nor is there sufficient correlation between such variability as occurs between populations, to make any grouping of isolated populations possible. Therefore, it is considered better to regard varietal differences as ecological aberrations and note them as has been done above. For this reason the var. *quarta* is declared as a synonym of *B. triarticulata*.

Specimens of the *B. triarticulata* group from Australia, on the other hand, show differences which may be considered as sub-specific, but these cannot be discussed without further Australian material for comparison.

**Boeckella hamata** Brehm, 1929. Text-fig 1, fig. 3; Text-fig. 2, fig. 2; Text-fig 3, fig. 3.

The above species was described by Brehm from specimens sent to him from Lake Lyndon, Canterbury, and it is easily distinguished by the characteristics which he has clearly set out (pp. 807–809, Figs. 1–4). The above diagnosis given by Brehm has been somewhat extended to allow for the slight variations found to exist in a number of populations.

#### SPECIFIC CHARACTERS (after Brehm in part).

*Female:* Length 1.25–1.55 mm.

Antennule reaches approximately end of furcal rami. Greatest body width anterior to first thoracic segment. Outer thoracic lobes tapered, extending beyond genital segment, inner lobes bell-shaped. Furca nearly as broad as long, setae plumose, (Text-fig. 1, fig. 3).

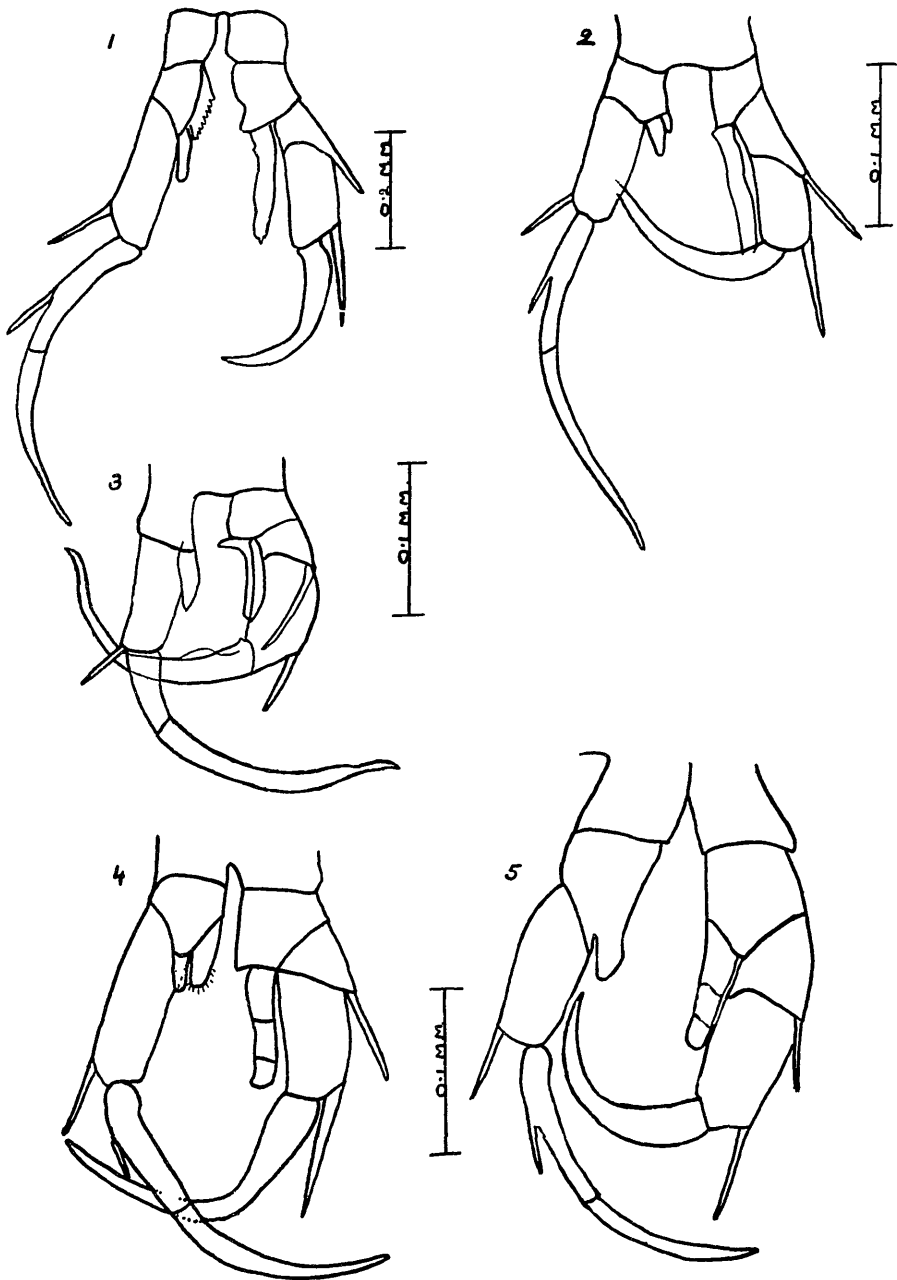
*Fifth Legs:* Exopodite spine formula 1:2:7. Inner process of segment 2 strongly serrated, serrations lobe-like. Terminal segment exceeds segment 2 in length. Median terminal spine longer than segment, outer flanking spine strong, more than half length of median spine. Inner spine characteristically short. Endopodite spine formula 1:1:5 or 6. Length equals approximately first 2 segments of exopodite (Text-fig. 2, fig. 2). Egg number usually small, and eggs larger than in preceding species.

*Male:* Length 0.95–1.2 mm

Modified antennule stout, segments distal to hinge number four.

*Fifth Legs:* Exopodites 3 segmented, endopodites 1 segment only.

*Right Leg:* Exopodite characteristic; spine on segment 1 extends nearly to end of segment 2, claw bears a basal chitinous knob, opposite which rises a chitinous lamella, claw tapers



TEXT-FIG 3—Fifth legs of males. Fig. 1—*Boeckella triarticulata* (Christchurch Pond) Fig. 2—*B. dilatata* (Lake Wakatipu). Fig. 3—*B. hamata* (Lake Lyndon). Fig. 4—*B. propinqua* sub sp. *delicata* (Lake Brunner). Fig. 5—*B. propinqua* (Canaan Track Pond, Nelson).

gradually to distal sixth where it is suddenly narrowed. Endopodite rounded with basal edge produced into hook-shaped process.

*Left Leg:* Claw of exopodite thickened at base, narrowed sharply over distal fifth. Endopodite stout, but short (Text-fig. 3, fig. 3).

*Variations.* (1) *Antennule:* In some populations the antennule extends beyond the furcal rami to almost the end of the furcal setae.

(2) *Endopodites Female Fifth Legs:* The terminal segment may carry 5 or 6 spines, in those with 6 the segment appears longer. This variation is from lake to lake not within one population.

**REMARKS.** Brehm in his text (p. 807) noted the thoracic lobes as being almost as long as the genital segment, whereas in Fig. 1, p. 807, he showed them as almost equal in length to the 3 abdominal segments. I did not find in any egg-bearing females the two-segmented condition noted by Brehm, p. 808. (These observations were made on Lake Lyndon type material from Canterbury Museum, which I have had the privilege of studying.)

**OCCURRENCE.** This species has not been recorded out of New Zealand. I have found it to occur in both the North and South Islands in the following lakes: Lyndon, Waiholo, Pearson, Wairarapa, Mahinerangi, and also in a lake near Flaxbourne, Tomahawk Lagoon, and ponds near Grassmere. It appears to be rather a lacustrine than a pond species and to favour the shallower and more turbid lakes.

**Boeckella propinqua** Sars. Text-fig. 1, figs 4 and 6; Text-fig. 2, fig. 1; Text-fig. 3, figs. 4 and 5.

1904. *Boeckella propinqua* Sars

1905. *Boeckella propinqua* Ekman.

1906. *Boeckella propinqua* Brady.

1906. *Boeckella triarticulata* Brady

1924. *Boeckella triarticulata* Henry

1937. *Boeckella delicata* Percival

Sars (1904) described the above species from specimens collected at D'Urville Island. It has not been possible so far to obtain specimens from D'Urville Island where there are three freshwater lagoons, from any of which the specimens may have been obtained. However, in a sample taken in a large pond near Caanan Track in the Takaka hills, Nelson, off which coast D'Urville Island lies there occurs a species of *Boeckella* which agrees with the description of Sars (1904, pp. 636-8, Pl. 35, figs. 10 a-h) for this species. The specimens from the Caanan Track pond are therefore considered as neotypes.

The confusion by Brady (1906) of specimens of *B. propinqua* and *B. triarticulata* has already been discussed under the latter species.

Percival (1937) described as a new species *B. delicata* from specimens taken in the plankton of Lake Brunner, Westland. Reference to the descriptions of both *B. propinqua* and *B. delicata* suggests a strong similarity between the two described species. Type material of *B. delicata* has been examined and the syntypes compared with the Caanan Track neotypes as well as with specimens from other localities in New Zealand which conform with the diagnosis of this species. There are so many characters common to the specimens from Lake Brunner, Caanan Track and also certain other localities that they must be considered as all belonging to the same species, namely *B. propinqua*. However, the minor differences in the form of the male fifth legs (see Text-fig. 3, figs. 4 and 5) differentiate the Lake Brunner specimens sufficiently to give them sub-specific rank and the species *B. delicata* is therefore referred to as *B. propinqua* sub sp. *delicata*.

#### SPECIFIC CHARACTERS (after Sars in part).

*Female:* Length 1.2-1.5 mm Greatest width in region of first thoracic segment.

*Antennule* reaches approximately end of furcal setae Thoracic lobes extend beyond genital segment, inner lobes asymmetrically bulged (Text-fig 1, fig. 4).

*Fifth Legs:* Exopodite spine on segment 2 broad at base, finely setose, not serrated as other New Zealand species; terminal segment longer and narrower than segment 2, bears



usual 7 spines, terminal spine exceeds length of segment, flanking spines sub-equal, outer somewhat longer. Endopodite about equal to segment 2 of exopodite, terminal segment bears usual 6 spines (Text-fig. 2, fig. 1).

*Egg number* not large; up to 8 observed.

*Male*: Length 1.0–1.3 mm.

*Right Antennule*: Segments below hinge number 4, last but one segment carries a slightly hooked process (Text-fig. 1, fig. 6).

*Right Fifth Leg*: Exopodite, first segment somewhat triangular in shape, spine approximately  $\frac{1}{2}$  length segment 2. Terminal claw broadened at base, tapered. Endopodite 3-segmented, does not reach end of segment 2 of exopodite.

*Left Fifth Leg*: Exopodite slighter than right exopodite, claw longer. Endopodite minute, basal lamella missing or very slight (Text-fig. 3, fig. 5).

*Variations*: Endopodites of left male fifth legs always small, but in the North Island populations somewhat more definite, as is also basal lamella, than in Caanan Track neotypes and Sars (Fig. 10 B, Pl. 35). Endopodite of right fifth male leg usually three-segmented, but specimens occur in which the third articulation is indistinct, length variable.

**OCCURRENCE.** This species has been taken in the plankton of Lakes Taupo, Roto Aira, and Waikare, and in the dam at Chelsea, Auckland, known as Duck Creek, in the North Island as well as in the above-mentioned pond in Takaka hills, Nelson in the South Island. The form occurring in Lake Waikare appears to show a similarity to the form in Lake Brunner assigned to the sub-species *delicata*, but until a greater knowledge of that population is acquired it is felt better to regard it provisionally as *B. propinqua*.

#### ***Boeckella propinqua* Sars sub-species *delicata* Percival. Text-fig. 3, fig. 4.**

##### **SUB-SPECIFIC CHARACTERS.**

*Size*: Female length 1.15 mm. Male 1.0 mm.

*Thoracic Lobes*: Relatively symmetrical.

*Female Fifth Legs*. As for species, the special characteristic of which is lack of serration on spine of segment 2 of exopodite, and the greater length of distal fourth inner spine.

*Male Fifth Legs*: Right fifth endopodite 2 or 3 segmented, first segment almost equals two terminal segments. Left fifth leg bears a definite fringed lamella, and a relatively longer endopodite than *B. propinqua*. As noted by Percival the claw of the left exopodite carries a rounded projection near the base (Text-fig. 3, fig. 4).

**OCCURRENCE.** Lake Brunner, Westland, South Island of New Zealand.

#### ***Boeckella dilatata* Sars Text-fig. 1, figs. 2 and 5; Text-fig. 2, fig. 3; Text-fig. 3, fig. 2.**

1904. *Boeckella dilatata* Sars

1905. *Metaboeckella dilatata* Ekman

1937. *Boeckella ambigua* Percival.

The generic status of this species has already been discussed.

##### **SPECIFIC CHARACTERS.**

*Female*: Length 1.2–1.4 mm

*Antennule*: Length variable, but does not extend beyond furca.

*Cephalo-thorax*: First segment large, approximately equals five subsequent segments. Greatest width anterior to thoracic segments. Outer thoracic lobes asymmetrical, extend to end of or beyond genital segment, inner lobes much shorter (Text-fig. 1, fig. 2).

*Abdomen*: First segment laterally bulged, exceeds combined length of remaining two segments. Furca short, nearly as broad as long, approximal margins fringed, furcal setae plumose.

*Fifth Legs*: Exopodite spine number as for genus. Inner spine segment 2 strongly built and serrated. The fourth inner spine of terminal segment more robust than others on same side, but shorter than outer terminal spine. Median terminal spine approximately twice as long as last segment, which is longer but more narrow than segment 2. Endopodite spine formula usually 1:1:6, but segments and spines may be reduced (Text-fig. 2, figs. 3, 3a, b and c).

*Eggs*: Relatively large, number usually four, but up to 16 observed.

*Males*: Length 0.8–0.9 mm.

*Antennule*: Segments distal to hinge four in number, terminal segment very small.

*Right Fifth Leg*: This limb bears a strong resemblance to the corresponding appendage of *B. triarticulata*, but is less robust. The spine on the first segment of the exopodite extends to the end of segment 2. The endopodite is one-segmented, and in length may exceed the first two segments of the exopodite.

*Left Fifth Leg:* The basipodite may form a reduced lamella without serrations. The last two segments of the exopodite form a narrow claw which is greater in length than that of the right side. The endopodite is short but stout, extending not more than half the length of segment 1 (Text-fig. 3, fig. 2).

#### DISCUSSION

When Sars (1904) described *B. dilatata* he remarked that his few specimens were mostly immature, which doubtless accounts for the fact that he did not note the basal lamella of the fifth left male leg, found only two segments in the endopodites of the female fifth legs, and appears to have considered the antennules as shorter than they normally occur. For these reasons Percival had justification in considering the specimens from Lake Tekapo as a new species which he named *B. ambigua*.

Examination of the descriptions and figures of the two species reveal the following differences:—

*SIZE.* Females: *B. dilatata*, 1.1 mm; *B. ambigua*, 1.4 mm. Males: *B. dilatata*, 0.8 mm; *B. ambigua*, 0.86 mm.

Such variation is not significant in different populations, and may be attributed to ecological conditions.

*BODY FORM.* It is not possible to compare these since Percival does not give a figure, but that of Sars shows a somewhat broader cephalo-thorax than normally occurs.

*Endopodites of Female Fifth Leg:* Sars showed the endopodites of *B. dilatata* as being two-segmented without spines, whilst Percival showed those of *B. ambigua* as being three-segmented, but with a reduction of spines. As remarked above in discussion of the status of the genus *Metaboeckella* specimens have been taken in Lake Wakatipu with endopodites varying from 1-3 segments and with from 0-4 spines. The variability of the endopodites therefore makes them an unreliable specific character. In addition specimens from several lakes agreeing in other characters with the diagnosis for *B. dilatata* have been taken that have the normal complement of segments and spines consistent for the genus.

*Right Endopodite of Male:* The figures of the two authors differ in that Sars showed the right male endopodite of *B. dilatata* as being more rounded and regular than does Percival for the analogous leg of *B. ambigua*. All observed specimens including the Lake Wakatipu form have an endopodite consistent with that illustrated by Percival variably slightly shorter or slightly longer than the second segment of the exopodite.

*Basal Lamella of Left Male Leg.* Although Sars does not figure this it is, though very minute, usually to be observed as shown by Percival in Pl. XXIII, fig. 3.

Since certain differences in the diagnosis of the two species *B. dilatata* and *B. ambigua* have been shown above to be geographical variations, and others attributable to immaturity, in my opinion the two species are synonymous, and since *B. dilatata* was the first described it takes precedence. This view is substantiated by the fact that Fairbridge (1945) has noted a variability in segmentation and spine formula in *B. opaqua* whose life history he has carefully studied, and Brehm (1939) questions the importance of segmentation as a specific character.

*REMARKS.* This species is very variable in form. In many ways it resembles *B. triarticulata* the type species of the genus, differing mainly in its much smaller size being but half the length, in the lack of a denticulated or serrated lamella, and in the frequent reduction of spines on the fifth female endopodites, which also in some populations lack the "triarтикуlate" segmentation. As Percival showed in his description of *B. ambigua*, which I believe to be a synonym of this species, there occurs in Lakes Tekapo and Alexandrina, an aberrant female form which, though female in most characteristics, has a right antennule modified as in the male of the species. The fifth legs in this peculiar form also show a reduction of armature. In the type material from Lake Tekapo, from which Percival described *B. ambigua*, none of these aberrant females were seen with a true egg sac, but one was observed with an attached spermatophore, and what may have been a very early stage of egg development. As remarked above, in Lake Wakatipu *B. dilatata* appears to be monocyclic, whilst in Lake Hayes, from which I have taken numerous seasonal samples, egg-bearing females have been taken at all seasons. In the polycyclic form

the fifth endopodites of the female are, when mature, three-segmented and carry one spine on each of the first two segments and six on the terminal segment.

**OCCURRENCE.** This species has been recorded only from the southern portion of the South Island of New Zealand. It has been taken in Lakes Tekapo, Alexandrina, Macgregor, Hawea, Wanaka, Wakatipu, Hayes, Moke, Rere, Howden, Manapouri, Te Anau, Green Lake, Diamond Lake, Hauroko and Monowai.

These lakes are all believed to be glacial in origin, and therefore date from the post-glacial Pleistocene.

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V H JOLLY,  
Department of Zoology,  
University of Otago.