

NOV 9 1908

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*Prof. Alex. Agassiz,
with the author's compliments*

FRESH-WATER COPEPODA

FROM VICTORIA, SOUTHERN AUSTRALIA

BY

G. O. SARS

WITH 4 AUTOGRAPHIC PLATES

ARCHIV FOR MATEMATIK OG NATURVIDENSKAB. B. XXIX, NR. 7



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INTRODUCTION.

No fresh-water *Copepoda*, as far as I know, have hitherto been recorded from the southern part of Australia, and I think therefore that the present paper, which treats of the South Australian species of that ordre, may be of some interest, the more so as it contains descriptions and figures of several species apparently new to science. For the material upon which this paper is based, I am wholly indebted to Mr. O. A. Sayce, who with great generosity has placed in my hands some collections made in that region during the year 1901, as also a series of partly coloured drawings executed by himself from living specimens. The collections also contain a number of *Cladocera* and *Ostracoda*; but I have found it appropriate in the present paper to confine myself to the *Copepoda*, reserving the account of the other 2 orders for another paper to be published in the course of this or the next year.

The Copepoda here recorded belong to the 3 leading divisions, *Calanoida*, *Cyclopoida* and *Harpacticoida*, and the number of species is in all 11, 6 of which have turned out to be new to science. For the sake of comparison, I give on the accompanying plates carefully drawn figures of all the 11 species as yet stated to occur in Southern Australia, with some anatomical details of each.

CALANOIDA.

FAM. CENTROPAGIDÆ.

Gen. *Boeckella*, Guerne & Richard.

Syn.: *Boeckia*, Thomson.

Remarks.—This genus was originally established in the year 1883 by Prof. Geo. Thomson, to include a New Zealand species, *B. triarticulata*; but, as the name *Boeckia* proposed by that author had been previously appropriated by Dr. Malm for a genus of Amphipoda, Messrs. Guerne & Richard changed it in 1889 to *Boeckella*, referring to this genus also the *Diaptomus brasiliensis* of Lubbock. In recent times the number of species has been greatly augmented, and Dr. E. v. Daday found it appropriate to group the species into 2 nearly-allied genera, *Boeckella* and *Pseudoboeckella*. As the type of the first-named genus he regards *Diaptomus brasiliensis* Lubbock, as that of the other new genus *Boeckia triarticulata* Thomson. Such an arrangement cannot, however, in my opinion be admitted. In any case the type of the genus *Boeckella* ought to be the species originally described by Prof. Thomson, and, if the genus *Pseudoboeckella* should be accepted, this name must be transferred to the group for which Lubbock's species is the type.

The genus *Boeckella* Guerne & Richard is chiefly confined to the southern hemisphere, only a single species having hitherto been recorded from north of the equator, viz., *B. orientalis* G. O. Sars, which occurs in the eastern part of Mongolia. As to the distribution of the 2 genera or subgenera *Boeckella* and *Pseudoboeckella* Daday, the last-named genus (in the sense here adopted) seems to be wholly confined to South America and the neighbouring islands, whereas the true genus *Boeckella* is represented both in South America, Australia, New Zealand and Mongolia. The species of the present genus exhibit a very similar external appearance. On a closer examination, however, they may be easily distinguished by the shape of the lateral and sub-dorsal lappets of the last segment of the metasome in the female, by the form of the genital segment in the latter, and by the structure of the last

pair of legs, especially those of the male.¹ In some cases also the general form of the body and the relative length of the anterior antennæ may serve as distinguishing characters.

In the collections made by Mr. Sayce in Victoria no less than 5 different species of the present genus are represented, 3 of which have turned out to be new to science. I give below short diagnoses of all the 5 species, with remarks on their affinity, occurrence and distribution.

1. *Boeckella triarticulata* (Thomson).

(Pl. I, figs. 1—4).

Boeckia triarticulata, Thomson, "On New Zealand Copepoda"; Proceed. N. Zeal. Institut, Vol. XV, p. 95, Pl. VI, figs. 1—9.

Boeckella triarticulata, G. O. Sars, "Fresh-water Entomostraca of New Zealand", Chr. Vid. Selsk. Skrifter, 1894, p. 49, Pl. VII & VIII.

Specific Characters.—Body of female (fig. 1) moderately slender, with the anterior division oblong oval in form, scarcely at all contracted behind and only slightly so anteriorly, front evenly rounded. Lateral lappets of last segment of metasome rather large, lanceolate, divergent, extending beyond the genital segment, sub-dorsal lappets distinctly hamate at the tip. Urosome about half the length of the anterior division, genital segment rather much dilated at the base and conspicuously asymmetrical, bulging more abruptly on the right side than on the left, lower face (see fig. 2) slightly protuberant near the base. Anterior antennæ, when reflexed, extending scarcely beyond the 2nd caudal segment. Last pair of legs in female (fig. 3) with the terminal joint of the outer ramus well developed and armed with 7 spines, inner ramus extending beyond the middle joint of the outer. Last pair of legs in male (fig. 4) very powerfully devel-

¹ It may here be noted, that the outer ramus of the left leg is not, as indicated in my former description of the type species, unarticulate, but in reality biarticulate, like that of the right leg. The distal joint is, however, so narrow, that it has the appearance of forming only a part of the slender terminal claw, with which it is in fact quite immovably connected. Yet, on a closer examination, generally a distinct boundary is found to exist between the true claw and the joint (compare the figures here given of these legs in the different species).

oped, left leg provided inside the 2nd basal joint with a rather conspicuous triangular lamella, serrate at the edge, inner ramus comparatively small and cylindric in form, right leg with the spines of the outer ramus of about equal size, apical claw scarcely longer than the ramus itself, inner ramus uniarticulate, sub-cylindric in form, and not extending as far as the distal joint of the outer, tip obtusely rounded and armed with a small denticle.

Colour bluish, more or less tinged with reddish brown.

Length of adult female reaching to 2.50 mm.

Remarks.—This form, in my opinion, ought to be regarded as the type of the genus *Boeckella*, whether this genus be taken in the extent of Messrs. Guerne and Richard, or in the more restricted sense of Dr. Daday. It may be easily distinguished from the other known species by the strong lanceolate lateral lappets of the last segment of the metasome in the female, and more particularly by the conspicuously hamate form of the sub-dorsal lappets of that segment. The New Zealand form *B. propinqua* G. O. Sars, which Prof. Brady regards as merely a variety of the present species, is evidently specifically distinct, differing, as it does, very conspicuously both in the much greater length of the anterior antennæ and in the structure of the last pair of legs in the male.

Occurrence.—Several specimens of this form were found in a sample taken by Mr. Sayce from a swamp at St. Arnaud, northern area of Victoria.

Distribution.—New Zealand, near Dunedin (Thomson), neighbourhood of Sydney (coll. Whitelegge).

2. *Boeckella oblonga*, G. O. Sars, n. sp.

(Pl. I, figs. 5–8).

Specific Characters.—Body of female (fig. 5) much more slender than in the type species, with the anterior division narrow oblong in form and slightly contracted both behind and anteriorly. Lateral lappets of last segment of metasome much smaller than in *B. triarticulata* and slightly unequal, spiniform, not nearly extending as far as the genital segment, sub-dorsal lappets simple, not hamate at the tip. Urosome scarcely attaining

half the length of the anterior division, genital segment less dilated at the base than in the type species and somewhat asymmetrical, left side more evenly convex than right, though exhibiting in front of the middle a slight sinus, lower face (see fig. 6) somewhat protuberant near the base. Anterior antennæ, when reflexed, extending to the base of the caudal rami. Last pair of legs in female (fig. 7) almost exactly as in *B. triarticulata*; those of male (fig. 8) likewise rather similar, though, on a closer comparison, differing in some particulars: left leg with the serrate lamella inside the 2nd basal joint less prominent and distinctly hamate at the tip; right leg with the spine of the distal joint of outer ramus twice as large as that of the proximal joint, apical claw considerably exceeding the ramus itself in length; inner ramus of this leg extending as far as the distal joint of the outer, and exhibiting at the base inside a well-marked projecting lobule, tip drawn out into a fine point.

Length of adult female 2.00 mm.

Remarks.—This new species is closely allied to *B. triarticulata*, though easily distinguishable by the much more slender form of the body, as also by the rather different shape of the lateral and sub-dorsal lappets of the last segment of the metasome in the female. The form of the genital segment is also somewhat different, and the anterior antennæ relatively more elongated. Finally, it differs in some structural particulars of the last pair of legs in the male, as pointed out in the above diagnosis.

Occurrence.—Some specimens of this form were collected by Mr. Sayce from a pool at Bourk Road, and, as proved by one of the drawing sheets sent, they had been subjected by that author to a closer examination. He referred them provisionally, though with some doubt, to *B. triarticulata* Thomson. A few specimens of the same form were also found in the above-mentioned sample from St. Arnaud, and could easily be selected from those of the true *B. triarticulata* here occurring.

3. *Boeckella Saycei*, G. O. Sars, n. sp.

(Pl. I, figs. 9—13)

Specific Characters.—Body of female (fig. 9) rather stout, with the anterior division oval in form and obtusely rounded in front. Lateral lappets of last segment of metasome very largely developed, wing-like, divergent, extending far beyond the genital segment, sub-dorsal lappets small and closely adjoining the lateral ones, tip obtusely rounded. Urosome comparatively short, scarcely exceeding in length $\frac{1}{3}$ of the anterior division, genital segment very broad, almost quadrate in form, though somewhat asymmetrical, being conspicuously produced at the right posterior corner, lower face (see figs. 10 & 11) rather protuberant throughout. Anterior antennæ, when reflexed, extending almost to the end of the caudal rami. Last pair of legs in female (fig. 12) with the inner ramus comparatively small, not extending to the end of the middle joint of the outer, and having the number of setæ on the terminal joint reduced. Last pair of legs in male (fig. 13) moderately strong, left leg without any serrate lamella inside the 2nd basal joint, inner ramus very small, lamelliform; right leg with a small dentiform projection inside the 2 basal joint, outer ramus with both spines rather slender and subequal, apical claw about the length of the ramus itself, and somewhat flexuous, inner ramus scarcely longer than the proximal joint of the outer, and somewhat irregular in shape, being divided into 3 imperfectly defined articulations, the 1st of which is rather dilated.

Colour, according to the statement of Mr. Sayce, dull reddish yellow.

Length of adult female 1.50 mm.

Remarks.—This is a very distinct species, easily recognizable by the large wing-like lateral lappets of the last segment of the metasome in the female, and by the peculiar shape of the genital segment of the latter, both these characters being well indicated in some drawings made by Mr. Sayce in one of the sheets sent. This form was also considered by that naturalist to be “most probably” a new species, but no name was proposed. I have much pleasure in naming it in honour of that distinguished author, the generosity of whom has enabled me to work out the present account.

Occurrence.—The specimens of this pretty species contained in the collection were taken at Heidelberg, near Melbourne. According to notes on the drawing sheets, it also occurred in 2 other localities, viz., at Cheltenham and Sandringham. On the other hand, it was not found in the sample from St. Arnaud, which contained specimens of all the other species.

4. *Boeckella symmetrica* G. O. Sars, n. sp.

(Pl. I, figs. 14—17).

Specific Characters.—Body of female (fig. 14) comparatively short and stout, with the anterior division oval in form and regularly narrowed both behind and in front. Lateral lappets of last segment of metasome very small and pointing straight outwards, sub-dorsal lappets likewise small and simple, acute at the tip. Urosome nearly half as long as the anterior division, genital segment large and tumid, broadest at the base, and perfectly symmetrical, with a slight sinus on each side about in the middle; lower face (see fig. 15) greatly protuberant throughout. Anterior antennæ, when reflexed, extending to the base of the caudal rami. Last pair of legs in female (fig. 16) about as in *B. triarticulata*; those in male (fig. 17) moderately strong, left leg with a rounded quite smooth lobe at the end of the 2nd basal joint inside, inner ramus conical in form and extending almost as far as the outer; right leg with the distal spine of the outer ramus longer than the proximal one, apical claw about the length of the ramus itself; inner ramus of this leg, as usual, larger than that of the left leg, lanceolate, unarmed, extending somewhat beyond the middle of the distal joint of the outer.

Length of adult female 1.60 mm.

Remarks.—This also is a well defined species, being especially distinguished by the poor development of the lateral lappets of the last segment of the metasome in the female, and by the perfectly symmetrical genital segment. In the latter respect it differs from all the other known species, in which this segment always is more or less conspicuously asymmetrical in shape. The specific name here proposed refers to that character.

Occurrence.—Some few specimens of this form were taken by Mr. Sayce at East Kiew. It also occurred not unfrequently in the above-mentioned sample from St. Arnaud.

5. *Boeckella minuta*, G. O. Sars.

(Pl. II, figs. 1—4).

Boeckella minuta, G. O. Sars, "Fresh-water Entomostraca from the neighbourhood of Sydney", p. 71, Pl. 8, figs. 5—7.

Specific Characters.—Body of female (fig. 1) very slender, with the anterior division narrow oblong in form, and considerably contracted in front, less so behind. Lateral lappets of last segment of metasome of moderate size, narrow mucroniform in shape, and extending nearly as far as the genital segment, sub-dorsal lappets very small, triangular in form. Urosome not nearly attaining half the length of the anterior division, genital segment not much dilated, and conspicuously asymmetrical, left side forming a slight and quite even bulge, right side in its greater extent almost straight and only close to the base forming a small rounded prominence, lower face (see fig. 2) rather protuberant in front of the middle. Anterior antennæ very slender and elongated, extending, when reflexed, beyond the caudal rami. Last pair of legs in female (fig. 3) with the terminal joint of the outer ramus comparatively small and only armed with 2 unequal spines, both issuing from the tip, inner ramus scarcely extending as far as the middle joint of the outer. Last pair of legs in male (fig. 4) rather strong, left leg exhibiting at the end of the 2nd basal joint inside a narrow triangular, unarmed lamella, inner ramus not extending to the middle of the proximal joint of the outer; right leg with the distal spine of the outer ramus twice as long as the proximal one, apical claw much curved and longer than the ramus itself; inner ramus simple, cylindrical, not extending to the middle of the distal joint of the outer.

Length of adult female 1.30 mm.

Remarks.—This form was described by the present author in the year 1896 from specimens taken in the neighbourhood of Sydney. It is the smallest of the known species, and moreover easily recognized by the long and slender anterior antennæ, the shape of the lateral and sub-dorsal lappets of the last seg-

ment of the metasome in the female, and by the poor development of the terminal joint of the outer ramus of the last pair of legs in the same.

Occurrence.—Several specimens of this form, most of them still immature, were collected by Mr. Sayce at Heidelberg, near Melbourne. Some adult specimens were also found in the above-mentioned sample from St. Arnaud.

Distribution.—Neighbourhood of Sydney (coll. Whitelegge).

Gen. *Calamoecia*, Brady, 1906.

Generic Characters.—Body more or less slender, with the anterior division composed of the normal number of segments. Front without any tentacular filaments below. Last segment of metasome produced of the end laterally to more or less projecting lappets, sub-dorsal lappets wanting. Urosome in female composed of 3, in male of 5 segments, caudal rami lamelliform, truncated at the tip. Antennæ and oral parts built on the same type as in *Boeckella*. Natatory legs with the number of joints in the inner rami reduced. Last pair of legs in female on the whole built upon the same type as in *Boeckella*; those of male, however, rather different and very asymmetrical, the right leg being much the larger and terminating in a very strong claw, left leg without any apical claw, the outer ramus being quite short and club-shaped; inner rami of these legs rather unequal, that of left leg much the larger.

Remarks.—This genus has been recently established by Prof. Brady,¹ to include a New-Zealand species, *C. Lucasi*, found in some plankton-samples from the lakes Waikare and Rotoito. The description and figures given of this form do not seem to have been worked out with sufficient exactness, and most probably include some errors, which also may inhere the generic diagnosis given.² Considering this, I have been induced to refer a small Calanoid found in the collection of Mr. Sayce to this genus,

¹ On the Entomostracan Fauna of the New-Zealand Lakes. *Procced. Zool. Soc. London* 1906.

² The author himself admits that, owing to the difficulties connected with the examination of this form, he is by no means sure that his account is in all cases entirely correct.

in spite of the apparently great difference it shows from the New-Zealand species both in the general form of the body and in the structure of some of the appendages. In some essential points there is, however, an evident accordance between these two species, proving them to be in all probability congeneric. In any case, a renewed examination of the New-Zealand form would be desirable, to point out more precisely the real specific differences between it and the Australian form. As to the relation of the present genus to other Calanoid genera, Prof. Brady believes that it is most nearly allied to the genus *Limnocalanus* G. O. Sars. In my opinion, however, it comes much nearer to the genus *Boeckella*, yet also differing from that genus in some characters of apparently generic value, thus in the reduction of the number of joints in the inner rami of the natatory legs, and in the peculiar structure of the last pair of legs in the male.

6. *Calamoecia australica*, G. O. Sars, n. sp.

(Pl. II, figs 5—19).

Specific Characters.—Female. Body (fig. 5, 6) less slender than in the type species, with the anterior division oblong oval in form, being somewhat dilated in its anterior part and very slightly attenuated behind, front obtusely rounded. No distinct cervical sulcus present. Lateral lappets of last segment of metasome rather large, obtusely acuminate at the tip, and extending nearly as far as the genital segment, left lappet somewhat larger than right. Urosome comparatively short, not nearly attaining half the length of the anterior division, genital segment large and tumid, perfectly symmetrical, its lower face remarkably protuberant throughout (see fig. 6). Caudal rami (fig. 17) a little longer than the last segment, one of the setæ attached to a distinct ledge of the outer edge, the others to the transversely truncated tip. Anterior antennæ scarcely as long as the body and composed of the normal number (25) of articulations (fig. 7). Posterior antennæ (fig. 8) with the outer ramus about as long as the inner, and having some of the articulations imperfectly defined. Oral parts (figs. 9—12) scarcely differing in structure from those in *Boeckella*. Inner ramus of 1st pair of legs (fig. 13) uniarticulate, and extending scarcely beyond the middle joint of the

outer; that of the 3 succeeding pairs (figs. 14, 15) biarticulate. Last pair of legs (fig. 16) with the outer ramus about the length of the basal part, spines of outer edge very small, unguiform projection of middle joint, on the other hand, well developed and coarsely denticulate, terminal joint comparatively small and armed with 6 spines; inner ramus scarcely extending beyond the middle joint of the outer, uniarticulate, and carrying in all 8 comparatively short setæ.

Male (fig. 18), as usual, somewhat smaller than female, with the urosome much narrower and composed of 5 well-defined segments. Lateral lappets of last segment of metasome very unequal, the left one much reduced in size, the right almost as large as in the female. Right anterior antenna hinged in the usual manner. Last pair of legs (fig. 19) powerfully developed, outer ramus of right leg without any spines outside, but with a small dentiform projection inside the distal joint, apical claw very much elongated, being more than twice as long as the ramus itself, and strongly curved in the middle; outer ramus of left leg short, elbow-shaped, distal part lamellar and bent upon the proximal one at a right angle, being only armed with a small spine issuing from the lower face at about the middle; inner rami very unequal both in size and structure, though consisting each of only a single joint, that of right leg somewhat shorter than the corresponding outer ramus and of conical form, being tipped with a single slender spine, that of left leg fully twice as long, sublinear in form, though slightly widening at the extremity, which is armed with 5 slender spines, one of which is attached outside at some distance from the tip.

Length of adult female 1.10 mm., that of male 0.90 mm.

Remarks.—The above-described Calanoid, though in my opinion congeneric with the New-Zealand form recorded by Prof. Brady, is most assuredly specifically very distinct, differing, as it does, rather conspicuously both in the external appearance and in the structure of some of the appendages, for instance the last pair of legs in both sexes. It may be that, on a more exact examination of the New-Zealand form, these differences will turn out to be less strongly marked than at present appearing from a comparison of the drawings here given with those reproduced by Prof. Brady; but in any case there will remain differences

sufficient enough for distinguishing these 2 forms as well defined species.

Occurrence.—Only some few specimens of this interesting form were found in the collection. They were picked up from the above-mentioned sample taken at St. Arnaud, which on the whole proved to be very rich in different forms of Entomostraca.

CYCLOPOIDA.

FAM. CYCLOPIDÆ.

Gen. CYCLOPS, O. Fr. Müller.

Remarks.—This well-known genus seems to be represented in all parts of the world, and some of its species have a truly cosmopolitan distribution. This is the more perplexing, as none of the species, like the fresh-water Calanoida, produce resting ova which admit of being transported in a dry state for any longer extent, without losing their developing power. For this reason, I have also never succeeded in raising any species of this genus from dried mud, whereas species of fresh-water Calanoida may be easily obtained in this way. In what manner this extraordinary distribution of some of the species has taken place, it is very difficult to conjecture. One is almost compelled to believe, that it must have been effected in a very remote time, when the dispersion of land and water was quite different from that now existing.

Of the present genus 4 species were found in the collection from Southern Australia. Two of these have turned out to be identical with well-known European species, whereas the other 2 seem to be peculiar to the Australian continent.

7. *Cyclops albidus* (Jurine).

(Pl. III, figs. 1—4).

Remarks.—I have dissected one of the Australian specimens of this form, and carefully compared all the appendages with those of the common European species, without detecting any

difference whatever. The specimen here figured, an adult female, measured in length 1.50 mm. For comparison, I give besides some detail-figures (figs. 2—4) of the same specimen, to show its identity with the European species.

Occurrence.—Some specimens of this form, most of them still immature, were picked up from the sample taken at St. Arnaud. It also occurs in the neighbourhood of Sydney, several specimens having been found in samples from that region taken by Mr. Whitelegge and kindly sent to me for examination.

Distribution.—Europe, Asia, northern part of Africa, North and South America, Hawayi Island.

8. *Cyclops australis*, King.

(Pl. III, figs. 5—18).

Cyclops australis King, G. O. Sars, Fresh-water Entomostraca from the neighbourhood of Sydney, p. 74.

Syn.: *Cyclops sydneyensis*, Schmeil.

Remarks.—In the above-quoted paper I have given an exhaustive diagnosis of the present species, and I therefore think that I can dispense myself from re-describing it here. As, however, no figures have hitherto been published, I subjoin on the accompanying plate figures of both sexes made from South Australian specimens, together with detail-figures of all the appendages.

As to the specific name here used, Dr. Schmeil, appealing to § 2 of the „Rules for the scientific naming of animals” has found it necessary to reject the name proposed by King, giving the species a new name, viz., *C. sydneyensis* Schmeil. It is true, that King has given no description or figures of his *Cyclops australis*, to render it recognizable; but yet there is all reason for believing, that it in fact has been precisely this species which King has had before him, because it is both the largest and the most common of all the Australian Cyclopes. In any case, it must be taken into consideration, that the species has been actually characterised under the above name (by the present author), and, according to the same „Rules” to which Dr. Schmeil appeals, the name of a species should be that under which it has been first clearly described or figured. If there should still be any scruple

in retaining the above specific name, it can simply be settled by changing the annexed name of the author (in this case from King to G. O. Sars).

It is somewhat difficult to decide, to which of the groups of Cyclops established by Dr. Schmeil the present species should properly be referred. According to the rudimentary condition of the last pair of legs (see figs. 16, 18), it could be placed within one of the 2 groups: *gracilis-diaphanus* or *varicans-bicolor* group. It differs, however, from either of these 2 groups in the structure of the natatory legs, only the 1st pair having biarticulate rami, whereas the 3 succeeding pairs have the rami distinctly 3-articulate (see figs. 13, 14, 15). In so far this species represents quite a particular group.

Adult females of this species attain a length of nearly 2 mm., whereas male specimens are scarcely more than half as large.

Occurrence.—This form was collected by Mr. Sayce near Hawthorn, and was figured in one of the drawing-sheets sent. Moreover several specimens were picked up from the sample taken at St. Arnaud.

Distribution.—Neighbourhood of Sydney (coll. Whitelegge).

9. *Cyclops Leuckarti*, Claus.

Var. *australiensis* G. O. Sars.

(Pl. III, figs. 19—24).

Remarks.—The form here figured agrees in the anatomical details (see figs. 20—23) very closely with the European species. It differs, however, in the somewhat less robust form of the body (see fig. 19.), and more particularly in the comparatively greater length of the caudal rami (see figs. 19, 24), which fully equals that of the last 2 caudal segments combined. These rami are also less divergent than in the European form, extending almost straight behind. It thus may more properly be considered as a particular variety of that cosmopolitan species.

Occurrence.—Some few specimens of this form were found in the sample from St. Arnaud. The same variety also occurs in the neighbourhood of Sydney, a rather great number of specimens having been picked up from samples taken by Mr. Whitelegge in that region and kindly sent to me for examination.

10. *Cyclops Arnaudi*, G. O. Sars, n. sp.

(Pl. IV, figs. 1—8).

Specific Characters.—Female. Body (fig. 1) somewhat robust, with the anterior division broadly oval in form, and having its greatest width behind the middle. Cephalic segment comparatively large, about twice as long as the 3 succeeding segments combined, and narrowly rounded in front. Epimeral parts of the latter segments somewhat exstant laterally. Last segment of metasome comparatively broad, its lateral parts rounded and rather projecting. Urosome considerably exceeding half the length of the anterior division, genital segment slightly dilated at the base and about the length of the 3 succeeding segments combined. Caudal rami (fig. 8) slender and elongated, nearly half as long as the urosome, linear in form and scarcely at all diverging, seta of outer edge rather remote from the apex, outermost apical seta about same length as the innermost, but rather stronger, spiniform, the 2 middle apical setæ distinctly jointed at the base, the inner one almost twice as long as the outer. Anterior antennæ (fig. 2) comparatively short and stout, scarcely exceeding half the length of the cephalic segment, and rather thick at the base, being composed of only 11 articulations. Posterior antennæ (fig. 3) likewise of a less slender form than in most other species (comp. Pl. III, fig. 7). All the natatory legs (figs. 4—6) with biarticulate rami; inner ramus of 4th pair (fig. 6) with only a single apical spine. Last pair of legs (see fig. 7) of rather a peculiar appearance, basal joint not defined from the segment, being only indicated by a seta attached to the lateral parts of the segment itself, terminal part well defined, forming a small oval lamella extended laterally, not, as usual, ventrally, and carrying a comparatively short apical spine and a slender curved sub-lateral seta.

Male unknown.

Length of adult female 0.95 mm.

Remarks.—This new species seems to be nearest allied to the 2 European species, *C. varicans* G. O. Sars and *C. bicolor* G. O. Sars, having, as these, the rami of all the natatory legs biarticulate. It is, however, distinguished from either of them by the more elongated caudal rami, and more particularly by the peculiar appearance of the free joint of the last pair of legs. In

no other true Cyclops this joint is extended laterally, as in the present species, and in this respect, as also in the lamellar form of the joint, it somewhat reminds of the marine genus *Halicyclops*, Norman.

Occurrence.—Only 2 female specimens of this distinct species have hitherto come under my notice. They were found in the above-mentioned sample taken at St. Arnaud, from which locality the species is named.

HARPACTICOIDA.

FAM. CANTHOCAMPTIDÆ.

Gen. *Attheyella*, Brady.

Remarks.—The type of this genus, established by Prof. Brady in the year 1880, is the *Canthocamptus crassus* G. O. Sars (= *Attheyella spinosa*, Brady), in which both rami of the 1st pair of legs are distinctly 3-articulate. Some authors only refer to this genus the species with biarticulate inner rami of the 1st pair of legs, whereas the above-named form together with *A. gracilis* G. O. Sars and some other exotic species are included in the genus *Canthocamptus*. This cannot, however, by any means be admitted. If the genus *Attheyella* be accepted, it certainly must include the species upon which it was originally founded. I think that the difference in the number of joints in the inner ramus of the 1st pair of legs is of insignificant value as a generic character. On the other hand is the poor development of the inner rami in all the succeeding pairs of natatory legs a character common to all the species of the present genus, by which it can easily be distinguished from *Canthocamptus*, in which at least the anterior pairs have well-developed, 3-articulate inner rami.

The genus is represented in different parts of the world: Europe, Asia, Africa, North America, Hawaii Island, and I now can add also a well-marked Australian species.

11. *Attheyella australica*, G. O. Sars, n. sp.

(Pl. IV, figs. 9–26).

Specific Characters.—Female. Body (fig. 9) comparatively robust, somewhat resembling that in the type species, though more attenuated behind. Cephalic segment rather large, fully as long as the 3 succeeding segments combined, rostral projection obsolete. Last segment of metasome small, though almost of same width as the preceding one. Urosome shorter than the anterior division, its segments coarsely spinulose at the end ventrally and laterally; last segment about the length of the preceding one, with the anal opercle not much prominent and quite smooth at the edge. Caudal rami (fig. 21) pyriform in shape, with the inner edge convex and densely hairy in its anterior part, outer edge with 2 distinct successive ledges, each carrying a slender seta accompanied by a few small spinules, tip attenuated and narrowly truncated, with the middle seta very strong and elongated, the other 2 comparatively small, the innermost one about half the length of the outermost, dorsal face of each ramus with a well-marked carina running along the anterior half, and provided at the end of this carina with a delicate, erect seta arising from a knoblike prominence. Anterior antennæ (fig. 10) more slender than in the type species, and gradually attenuated, being composed of the usual number of articulations (8); distal part about the length of the proximal one, with the last joint much the longest. Posterior antennæ (fig. 11) with the terminal joint about the length of the basal one and rather narrow, outer ramus uniaarticulate, with 4 setæ, 2 apical and 2 lateral. Oral parts (figs. 12–15) agreeing in structure with those in the other species of the genus. 1st pair of legs (fig. 16) with the rami very unequal, the inner one much the longer and distinctly 3-articulate, outer ramus extending scarcely beyond the middle joint of the inner. Natatory legs (figs. 17–19) comparatively more slender than in the type species, but of a very similar structure, except that the terminal joint of the inner ramus in the 2 anterior pairs has an additional seta inside. Last pair of legs (fig. 20) of moderate size, distal joint less produced than in the type species, inner apical seta much longer than any of the others, inner expansion of proximal joint comparatively short, triangular in form, and fringed

with 6, somewhat spiniform setæ, 2 of them, issuing from the outer edge, closely juxtaposed.

Male considerably smaller than female and exhibiting the usual sexual differences. 2nd pair of legs (fig. 22) conspicuously transformed, and resembling in structure those in the male of *A. crassa*. 4th pair of legs with the inner ramus (fig. 23) comparatively smaller than in female, and having the number of setæ much reduced, apical spine of outer ramus (fig. 24) exhibiting outside 4 remarkably strong denticles. Last pair of legs (fig. 25), as usual, much smaller than in female, with the inner expansion of proximal joint very slight and only provided with 2 unequal spines. Genital lobes (fig. 26) rather small, with 2 spines and a slender hair-like seta outside.

Length of adult female 0.67 mm.

Remarks.—This form is nearly allied to the European species, *A. crassa* G. O. Sars, but is evidently specifically distinct, exhibiting some well-marked differences in the anatomical details. It is also, as far as I can see, different from any of the other species recorded.

Occurrence.—Some few specimens of this form were picked up from the above-mentioned sample taken at St. Arnaud.

EXPLANATION OF THE PLATES.

PL. I.

BOECKELLA TRIARTICULATA, Thomson.

- Fig. 1. Adult ovigerous female, dorsal view; magnified 45 diameters.
 « 2. Urosome together with the last segment of metasome, viewed from left side; magnified 68 diameters.
 « 3. Leg of last pair, magnified 130 diameters.
 « 4. Last pair of legs of a male specimen, same amplification.

BOECKELLA OBLONGA, G. O. Sars, n. sp.

- Fig. 5. Adult female, dorsal view; magnified 62 diameters.
 « 6. Urosome together with the last segment of metasome, viewed from left side; magnified 80 diameters.
 « 7. Leg of last pair, magnified 170 diameters.
 « 8. Last pair of legs from a male specimen; same amplification.

BOECKELLA SAYCEI, G. O. Sars, n. sp.

- Fig. 9. Adult ovigerous female, dorsal view; magnified 68 diameters.
 « 10. Urosome together with the last segment of metasome, viewed from left side; magnified 75 diameters.
 « 11. The first 2 segments of urosome, ventral view; magnified 124 diameters.
 « 12. Leg of last pair, magnified 170 diameters.
 « 13. Last pair of legs from a male specimen; same amplification.

BOECKELLA SYMMETRICA, G. O. Sars, n. sp.

- Fig. 14. Adult female, dorsal view; magnified 68 diameters.
 « 15. Urosome together with the last segment of metasome, viewed from left side; magnified 75 diameters.
 « 16. Leg of last pair, magnified 170 diameters.
 « 17. Last pair of legs from a male specimen; same amplification.

Pl. II.

BOECKELLA MINUTA, G. O. Sars.

- Fig. 1. Adult ovigerous female, dorsal view; magnified 80 diameters.
 « 2. Urosome together with the last segment of metasome, viewed from left side; magnified 104 diameters.
 « 3. Leg of last pair, magnified 150 diameters.
 « 4. Last pair of legs from a male specimen, same amplification.

CALAMOECIA AUSTRALICA, G. O. Sars, n. sp.

- Fig. 5. Adult female, with a spermatophore attached to the genital segment, dorsal view; magnified 85 diameters.
 « 6. Same specimen, viewed from left side.
 « 7. Anterior antenna, magnified 130 diameters.
 « 8. Posterior antenna, magnified 260 diameters.
 « 9. Mandible with palp.
 « 10. Maxilla.
 « 11. Anterior maxilliped.
 « 12. Posterior maxilliped.
 « 13. Leg of 1st pair.
 « 14. Leg of 2nd pair.
 « 15. Leg of 4th pair.
 « 16. Leg of last pair.
 « 17. Extremity of urosome, with the caudal rami, dorsal view.
 « 18. Adult male, dorsal view; magnified 85 diameters.
 « 19. Last pair of leg of same, magnified 260 diameters.

Pl. III.

CYCLOPS ALBIDUS, Jurine.

- Fig. 1. Adult female, dorsal view, magnified 62 diameters.
 « 2. Extremity of anterior antennæ, showing the hyaline rim inside the terminal joint; magnified 245 diameters.
 « 3. Terminal joint of inner ramus of a leg of 4th pair; same amplification.
 « 4. Leg of last pair, magnified 300 diameters.

CYCLOPS AUSTRALIS, King.

- Fig. 5. Adult ovigerous female, dorsal view; magnified 62 diameters.
 « 6. Anterior antenna, magnified 130 diameters.
 « 7. Posterior antenna; same amplification.
 « 8. Anterior lip.
 « 9. Mandible.
 « 10. Maxilla

- Fig. 11. Anterior maxilliped.
 « 12. Posterior maxilliped.
 « 13. Leg of 1st pair.
 « 14. Leg of 2nd pair.
 « 15. Leg of 4th pair.
 « 16. Lateral part of last segment of metasome, with the rudimentary leg of last pair and the pertaining seta springing off from the segment itself.
 « 17. Adult male, dorsal view; magnified 62 diameters.
 « 18. Lateral parts of the last segment of metasome and the 1st of urosome of same, ventral view, exhibiting the corresponding leg of last pair and genital lobe; magnified 130 diameters.

CYCLOPS LEUCKARTI, Claus,var. *australiensis* G. O. Sars.

- Fig. 19. Adult ovigerous female, dorsal view; magnified 80 diameters.
 « 20. Anterior antenna, magnified 200 diameters.
 « 21. Leg of 1st pair, same amplification.
 « 22. Leg of 4th pair.
 « 23. Leg of last pair.
 « 24. Extremity of urosome, with the caudal rami, dorsal view.

Pl. IV.

CYCLOPS ARNAUDI, G. O. Sars, n. sp.

- Fig. 1. Adult female, dorsal view; magnified 104 diameters.
 « 2. Anterior antenna, magnified 240 diameters.
 « 3. Posterior antenna.
 « 4. Leg of 1st pair.
 « 5. Leg of 2nd pair.
 « 6. Leg of 4th pair.
 « 7. Lateral parts of the last 2 segments of metasome and 1st of urosome, exhibiting the corresponding leg of last pair.
 « 8. Extremity of urosome, with the caudal rami, dorsal view.

ATTHEYELLA AUSTRALICA, G. O. Sars, n. sp.

- Fig. 9. Adult female, dorsal view, magnified 130 diameters.
 « 10. Anterior antenna, magnified 340 diameters.
 « 11. Posterior antenna.
 « 12. Mandible with palp.
 « 13. Maxilla.
 « 14. Anterior maxilliped.
 « 15. Posterior maxilliped.

- Fig. 16. Leg of 1st pair.
 « 17. Leg of 2nd pair.
 « 18. Leg of 3rd pair.
 « 19. Leg of 4th pair.
 « 20. Leg of last pair.
 « 21. Extremity of urosome, with the caudal rami, dorsal view.
 « 22. Leg of 2nd pair from a male specimen.
 « 23. Inner ramus of a leg of 4th pair from the same specimen.
 « 24. Apical spine of outer ramus of same leg.
 « 25. Leg of last pair of male.
 « 26. Genital lobe of same.









