

A SYNOPSIS OF THE SPECIES OF BOECKELLA AND PSEUDOBOECKELLA WITH A KEY TO THE GENERA OF THE FRESH-WATER CENTROPAGIDAE.

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The fresh-water genera of Centropagidae are of a great deal of interest because of the rather restricted distribution of many of the species, and a thorough study of these animals from a morphological standpoint is likely to throw much light on their phylogeny and furnish valuable data for the theories of geographical distribution. For this study it is not only helpful but also necessary to have a synopsis giving the species characteristics in a fairly complete but brief form. Giesbrecht and Schmeil's Copepoda Gymnoplea, published in 1898, did this in an admirable manner; many publications have been issued since 1898, however, and new species and genera have been added. The author has had in mind the preparation of synopses of the fresh-water genera of copepods, and the present paper is a contribution to that end. This publication has resulted from a personal need of a synopsis of the genera *Boeckella* and *Pseudoboeckella*.

It is perhaps not necessary to go into a discussion of the morphological relations of *Boeckella* and *Pseudoboeckella*. This has been done at some length by Ekman, 1905, and the author accepts his conclusions. *Pseudoboeckella* Mrazek differs from *Boeckella* DeGuerne and Richard by the fact that the endopodite of the right fifth foot of the male is always 3 segmented with the distal segment armed with setae. It is possible that the differences between *Boeckella* and *Pseudoboeckella* should hardly be considered of generic value, but the distinction is a convenient one, and it seems wise to use the two generic names.

KEY TO THE GENERA OF THE CENTROPAGIDAE OF FRESH WATER.

	Endopodites of feet 1-5, 2 segmented.....	Calamoecia Brady.
	Endopodites of feet 1-4, 1 segmented.....	2
	Endopodites of feet 1, 1 segmented; 2-4, 2 segmented.....	3
1.	Endopodites of feet 1-4, 3 segmented.....	4
	Endopodites of feet 1-5, 3 segmented.....	6
	Endopodites of feet 1, 2 segmented; 2-4, 3 segmented, endopodites female fifth feet, 2 segmented.....	8

2. { Abdomen of male symmetrical, fifth feet of female without endopodites, exopodites of 3 segments, the distal terminating in a long spine .... **Heterocope** Sars.  
 Abdomen of male asymmetrical, fifth feet of female without endopodites, exopodites of 3 segments, the distal not terminating in a spine.... **Epischura** Forbes.
3. { Exopodites of feet 1-4, 3 segmented; in female fifth feet endopodites 2 segmented..... **Brunella** Smith.  
 Exopodites of feet 1, 1 segmented; 2-4, 2 segmented; female fifth feet without endopodites ..... **Eurytemora** Giesbrecht.
4. { First antennae 20-22 segmented..... **Pseudodiaptomus** Herrick.  
 First antennae 25 segmented..... 5  
 Female fifth feet without endopodites, male fifth feet with terminal hook on right foot only and the hook is turned outward instead of inward. **Poppella** Richard.
5. { Female fifth feet with endopodites, male fifth feet with terminal hooks on both exopodites ..... 9  
 Female fifth feet with endopodites, male fifth feet with terminal hook on right exopodite only, fourth feet with a long curved spine on inner distal angle on first basal segment ..... **Gladiferens** Henry.
6. { Exopodites of second antennae, 5 segmented, 2, 3, and 4 being short. **Parabroteas** Mrazek.  
**Limnocalanus** Daday, **Gigantella** Ekman, **Parabroteas** Ekman.  
 Exopodites of second antennae, 6 segmented, 2-5 being short. **Sinocalanus** Burckhardt.
7. { Exopodites of second antennae 7 segmented, 1, 3, 4, 5, and 6 being short..... 7  
 Furca short..... **Osphranticum** Forbes.  
 Furca long..... **Limnocalanus** Sars.
8. { In the male fifth feet both exopodites terminate in an elongated hook; in the female fifth feet the exopodites are distinctly 3 segmented. **Metaboeckella** Ekman.  
**Boeckella** (dilatata) Sars.  
 In the male fifth feet only the right exopodite terminates in an elongated hook, in the female fifth feet the third segments of the exopodites are either rudimentary or wanting..... **Diaptomus** Westwood.  
**Hemidiaptomus** Sars, **Paradiaptomus** Sars.
9. { Endopodites of right fifth foot of male rudimentary, 1-3 segmented, without setae..... **Boeckella** DeGuerne and Richard.  
 Endopodite of right fifth foot of male, 3 segmented, with setae. **Pseudoboeckella** Mrazek.

**Genus BOECKELLA** DeGuerne and Richard.

- Syn. { *Boeckia* THOMPSON, 1883.  
*Boeckella* (part) DEGUERNE and RICHARD, 1889.—SARS, 1894, 1896, 1901, 1903, 1904 (part).—(part) GIESBRECHT and SCHMEIL, 1898.—MRAZEK, 1901.—(part) DADAY, 1901.  
*Boeckellopsis* MRAZEK, 1901.  
*Pseudoboeckella* DADAY, 1902, 1905.—EKMAN, 1905.  
*Hemiboeckella*, SARS, 1911.

KEY TO SPECIES OF BOECKELLA.

1. { Terminal segments of exopodites of fifth feet of female armed with 2 spines. **minuta** Sars.  
 Terminal segments of fifth feet of female armed with 3 spines..... 2  
 Terminal segments of fifth feet of female armed with 6 spines..... 6  
 Terminal segments of exopodites of fifth feet of female armed with 7 spines or setae..... 7



- In the female the antennae reach the furca, the lobes of the last thoracic segment are short and turned out.....*symmetrica* Sars.
12. In the female the antennae extend to end of furca, the lobes of the last thoracic segment turn back and reach one half the length of the first abdominal segment.....*tenera*<sup>1</sup> Sars.
- In the female the antennae extend to the furca, the lobes of the last thoracic segment extend one-half the length of the first abdominal segment. .*longiseta* Smith.
13. In the female the antennae extend to the abdomen, or to the second abdominal segment, the lobes of the last thoracic segment extend to the second abdominal segment; in the male the hook of the exopodite of the right fifth feet is cleft at tip.....*pseudocheles* Searle.
- Lobes of last thoracic segment of female extend nearly to end of furca. *nyoraensis* Searle.
14. Lobes of last thoracic segment of female do not exceed second abdominal segment..... 15
- In the male there is a spine on the inner surface of the first basal segment of the right fifth foot, the endopodite of the left fifth foot is small and broad, its breadth being to its length as 5 to 6.....*saycei* Sars.
15. There is no spine on the first basal segment of the male right fifth foot, the endopodite of the left foot is small and narrow, its breadth being to its length as 3 to 5.....*propinqua* Sars.
- The right endopodite of the male fifth feet is short and rounded at tip. ....*rubra* Smith.
16. The right endopodite of the male fifth feet is elongated, pointed, and bears near base a short curved spine.....*robusta* Sars.

**BOECKELLA ASYMMETRICA** Searle.

1914. *Boeckella asymmetrica* SEARLE, p. 192, pl. 10, figs. 1-4.

*Female*.—The first antennae extend beyond the furcae. The sides of the last thoracic segment consist of two lobes each, which extend back to the second abdominal segment. The two sides are asymmetrical. The abdomen is asymmetrical, projecting to the right.

*Male*.—In the fifth feet the right endopodite is 1 segmented and extends one-third the length of the second segment of the exopodite; the left endopodite is lacking. Figure 1 shows the fifth feet of the male.

*Length*.—Male, 0.75 mm.; female, 1.45 mm.

Melbourne, Australia.

**BOECKELLA BERGI** Richard.

1897. *Boeckella bergi* RICHARD, pp. 322-325, fig. 2.

1898. *Boeckella bergi* GIESBRECHT and SCHMEIL, p. 61.

1901. *Boeckella bergi* SARS, pp. 6-10, pl. 1, figs. 1-15.

1901. *Boeckellopsis bergi* MRAZEK.

1902. *Pseudoboeckella bergi* DADAY, pp. 220-224, pl. 4, figs. 6-19.

1905b. *Boeckella bergi* EKMAN, p. 602.

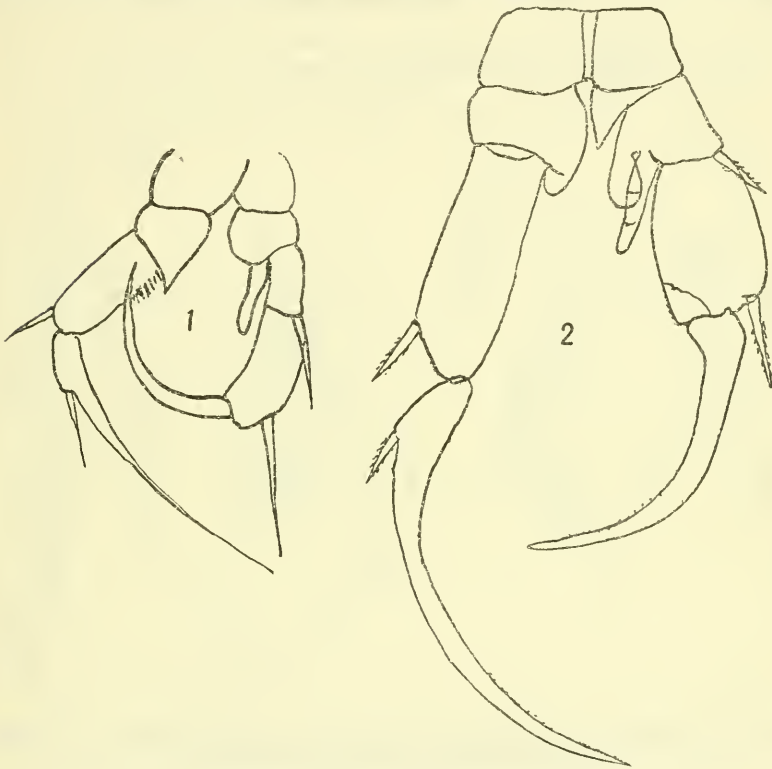
*Female*.—The first antennae extend to the furcae, or to their ends. The sides of the last thoracic segment, consisting of 2 lobes each, extend back to second or third abdominal segment. The first

<sup>1</sup> In the opinion of the author, there is no sufficient reason for separating *symmetrica* and *tenera*. The male fifth feet are about as near identical as two individuals can be.



abdominal segment is asymmetrical, projecting to the left. The exopodite of the second antenna consists of 7 segments, 1, 3, 4, and 5 being short. The terminal segments of the exopodites of the fifth feet are armed with 3 spines.

*Male*.—The sides of the last thoracic segment are not lobed and are asymmetrical. In the fifth feet the second basal segments have lamellae on the inner side; the right endopodite is 3 segmented and extends one-half the length of the second segment of the exopodite;



FIGS. 1-2.—1, *BOECKELLA ASYMMETRICA* SEARLE, FIFTH FEET OF MALE, AFTER SEARLE. 2, *B. BERG RICHARD*, FIFTH FEET OF MALE, AFTER SARS.

the left endopodite is of 1 segment and is minute. Figure 2 shows the fifth feet of the male.

*Length*.—Male, 1.45–1.8 mm.; female, 1.8–2 mm.

Argentina; Patagonia.

#### *BOECKELLA CORONARIA* Henry.

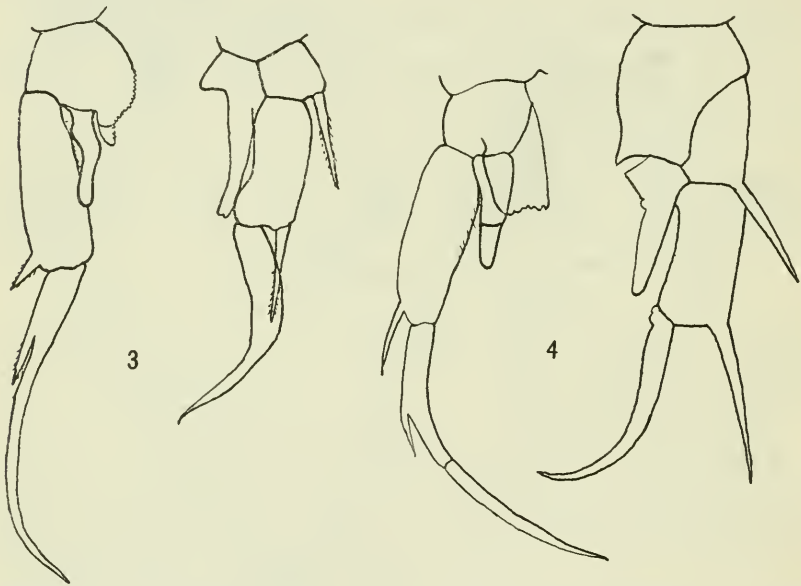
1922. *Boeckella coronaria* HENRY, pp. 557–558, pl. 55, figs. 1–7.

*Female*.—The first antennae extend to the middle of the furca. The sides of the last cephalothoracic segment flare out somewhat and project back beyond the middle of the first abdominal segment;

the inner lobes are acute. The terminal segments of the exopodites of the fifth feet bear 7 spines.

*Male*.—The right endopodite of the fifth feet is 1 segmented and extends to the end of the second segment of the exopodite; it has a blunt-pointed projection on its inner surface near the base; the distal end is blunt, with a slight indentation. The inner margin of the second basal segment of the left foot is denticulate; the left endopodite is 1 segmented, is of an irregular curved form, and extends two-thirds the length of the first segment of the exopodite. Figure 3 shows the fifth feet of the male.

*Length*.—Female, 1.5 mm.; male, 1.3 mm.  
New South Wales.



FIGS. 3-4.—3, *BOECKELLA CORONARIA* HENRY, FIFTH FEET OF MALE,  $\times 212$ , AFTER HENRY. 4, *B. FLUVIALIS* HENRY, FIFTH FEET OF MALE,  $\times 153$ , AFTER HENRY.

#### *BOECKELLA FLUVIALIS* Henry.

1922. *Boeckella fluvialis* HENRY, p. 557, pl. 56, figs. 1, 2, and 4-6.

*Female*.—The first antennae extend nearly to the end of the furcal setae. The sides of the last cephalothoracic segment extend backward, the projections being slender and acute, and reach the end of the first abdominal segment; the inner lobes are short and rounded with a short pointed projection in the middle. The terminal segments of the exopodites of the fifth feet bear 7 spines.

*Male*.—In the male fifth feet the right endopodite is 1 segmented and reaches the end of the second segment of the exopodite; it has a blunt-pointed projection on its inner surface near the base; the distal

end is round and tapering. On the second basal segment of the left foot is a rectangular lamella which is serrate on its distal margin. The left endopodite is 2 segmented and about two-thirds the length of the first segment of the exopodite; the inner margin of the first segment of the exopodite is sparsely ciliate. Figure 4 shows the fifth foot of the male.

*Length.*—Female, 1.8 mm.; male, 1.7 mm.

New South Wales.

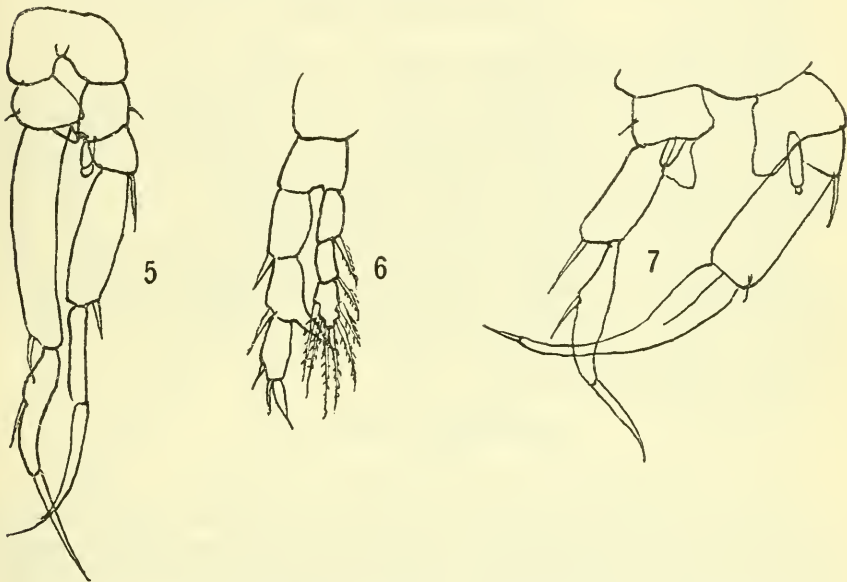
**BOECKELLA GRACILIPES** Daday.

1901. *Boeckella gracilipes* DADAY, pp. 348, 349.

1902. *Pseudoboeckella gracilipes* DADAY, pp. 224–227, pl. 5, figs. 1–7.

1905. *Boeckella gracilipes* EKMAN, p. 603.

1906. *Boeckella gracilipes* MARSH, p. 183, pl. 17, figs. 6 and 7.



FIGS. 5-7.—5, BOECKELLA GRACILIPES DADAY, FIFTH FEET OF MALE,  $\times 165$ . 6, B. GRACILIPES DADAY FIFTH FOOT OF FEMALE,  $\times 165$ . 7, B. GRACILIS DADAY, FIFTH FEET OF MALE, AFTER DADAY.

*Female.*—The first antennae extend to the end of the furca. The last thoracic segment projects only slightly, the sides not distinctly divided. The terminal segments of the exopodites of the fifth feet are armed with 3 spines.

*Male.*—In the fifth feet the right endopodite consists of 2 segments and equals in length the first segment of the exopodite. The left endopodite is of one segment and is minute. Figure 5 shows the fifth feet of the male, and Figure 6 the fifth feet of the female.

*Length according to Daday.*—Male, 0.8 mm.; female, 0.8 to 1.1 mm.

*Length according to Marsh.*—Male, 1.28 mm.; female, 1.485 mm.

Argentina; Lake Titicaca.

## BOECKELLA GRACILIS Daday.

1902. *Pseudoboeckella gracilis* DADAY, pp. 227-231, pl. 9, figs. 1 and 9-17.

1905b. *Boeckella gracilis* EKMAN, p. 602.

*Female*.—The first antennae extend to the second abdominal segment. The sides of the last thoracic segment are not lobed and project somewhat. The terminal segments of the exopodites of the fifth feet are armed with 3 spines.

*Male*.—Both endopodites of the fifth feet are 1 segmented and small; the second basal segments of both feet bear a cuticular projection on the inner distal angle. Figure 7 shows the fifth feet of the male.

*Length*.—Male, 1.4 to 1.6 mm.; female, 1.7 to 2.2 mm.

Argentina.

## BOECKELLA INSIGNIS Smith.

1909. *Boeckella insignis* SMITH, p. 85, pl. 17, figs. 4-12.

*Female*.—The first antennae extend to one-half the length of the furcal setae. The exopodites of the second antennae consist of 6 segments, 1, 3, 4, and 5 being short. The projections of the last thoracic segment are short. The terminal segments of the exopodites of the fifth feet are armed with 6 spines or setae.

*Male*.—In the fifth feet the right endopodite consists of one segment and equals in length one-half the second segment of the exopodite; the left endopodite is very short, 1 segmented, and ciliated. Figure 8 shows the fifth feet of the male.

*Length*.—Female, 2 mm.

Tasmania.

## BOECKELLA LONGISETA Smith.

1909. *Boeckella longiseta* SMITH, pp. 85-86, pl. 17, figs. 13-17.

*Female*.—The first antennae extend to the furcae. The sides of the last thoracic segment are lobed and extend to one-half the length of the first abdominal segment. The terminal segments of the exopodites of the fifth feet are armed with 7 spines or setae.

*Male*.—In the fifth feet the right endopodite is 2 segmented and extends to one-half the length of the second segment of the exopodite. The left endopodite is rudimentary or wanting; in figure not separated. Figure 9 shows the fifth feet of the male.

*Length*.—Female, 1.5 mm.

Tasmania.

## BOECKELLA MICHAELSENI Mrazek.

1901. *Boeckellina michaelсени* MRAZEK, pp. 11-12, figs. 10, 33, 36, 47, 48.

1901. *Boeckella pygmaca* DADAY, pp. 349-350.

1902. *Pseudoboeckella pygmaca* DADAY, pp. 231-233, pl. 5, figs. 8-12.

1905. *Pseudoboeckella anderssonorum* EKMAN, pp. 10-14, figs. 3-5.

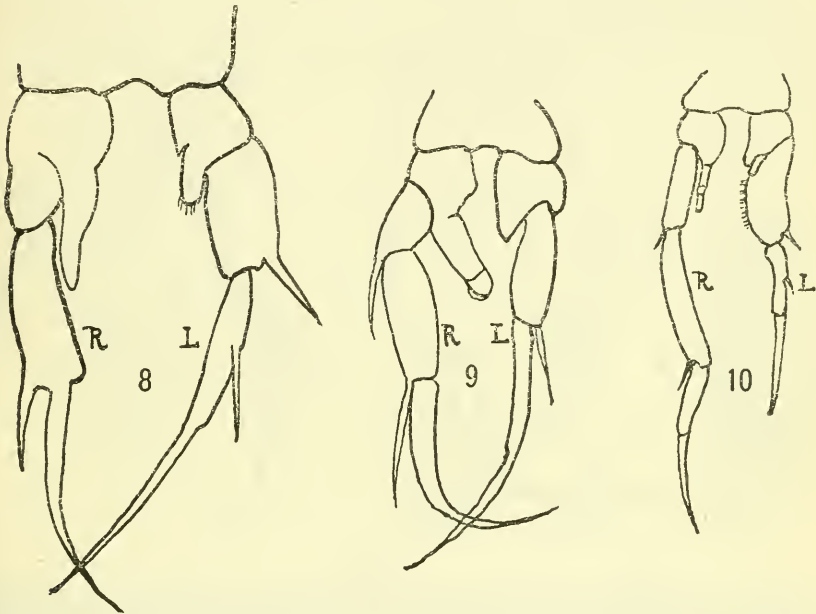
1905b. *Boeckella michaelсени* EKMAN, p. 603.

1914. *Boeckella michaelсени* SCOTT, pp. 1 and 2, pl. 1, figs. 4-6.



*Female*.—The first antennae extend to or beyond the furca. The sides of the last thoracic segment are not lobed and do not reach beyond one-half first abdominal segment. The terminal segments of the exopodites of the fifth feet are armed with 3 spines.

*Male*.—In the fifth feet the right endopodite is 3 segmented (2 segmented in *pygmaea* Daday and *michaelseni* Scott) and nearly or quite equals the first segment of the exopodite; the left endopodite is 1 segmented and rudimentary; the first segment of the left exopodite is convex and spinose on the inner side. Figure 10 shows the fifth feet of the male.



FIGS. 8-10.—8, *BOECKELLA INSIGNIS* SMITH, FIFTH FEET OF MALE, AFTER SMITH. 9, *B. LONGISETA* SMITH, FIFTH FEET OF MALE, AFTER SMITH. 10, *B. MICHAELSENI* MRAZEK, FIFTH FEET OF MALE,  $\times 120$ , AFTER MRAZEK.

*Length*.—Male, 1 mm.; female, 1.15 mm.

Tierra del Fuego; Argentina; Falkland Islands.

#### BOECKELLA MINUTA Sars.

1896. *Boeckella minuta* Sars, pp. 71-74, pl. 8, figs. 5-7.

1898. *Boeckella minuta* GIESBRECHT and SCHMEIL, p. 62.

1908. *Boeckella minuta* Sars, pp. 10-11, pl. 2, figs. 1-4.

1919. *Boeckella minuta* HENRY, p. 31.

1922. *Boeckella minuta* HENRY, p. 558.

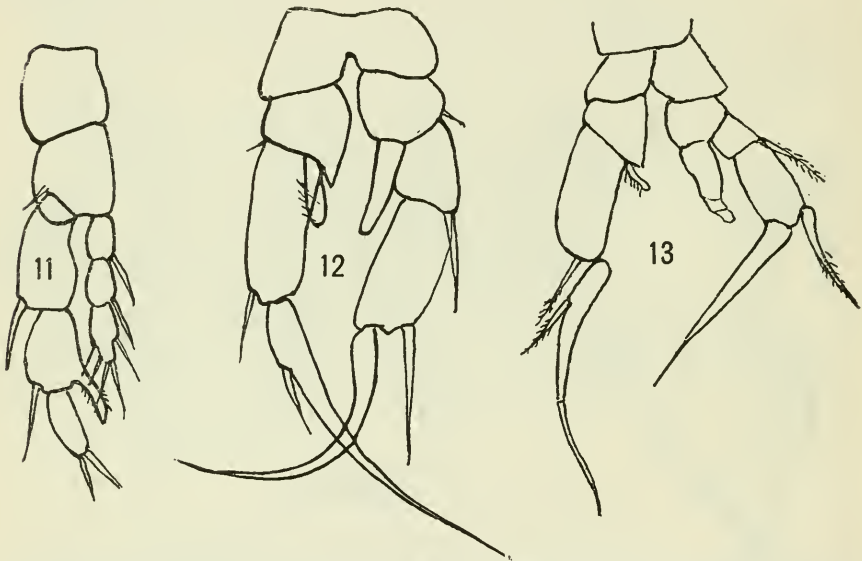
*Female*.—The first antennae extend to the furca. The sides of the last cephalothoracic segment are produced backward nearly the length of the first abdominal segment and have small inner lobes.

The abdomen is asymmetrical, the first segment projecting to the left. In the fifth feet the terminal segments of the exopodites are armed with 2 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented and does not reach the middle of the second segment of the exopodite; the second basal segment of the left foot is produced on the inner angle; the left endopodite is 1 segmented and less than one-half the length of the first segment of the exopodite. Figure 11 shows the fifth foot of the female, and Figure 12 the fifth feet of the male.

*Length*.—Male, 1.28 mm.; female, 1.3 mm.

Southern Australia.



FIGS. 11-13.—11, *BOECKELLA MINUTA* SARS, FIFTH FOOT OF FEMALE,  $\times 150$ , AFTER SARS. 12, *B. MINUTA* SARS, FIFTH FEET OF MALE,  $\times 150$ , AFTER SARS. 13, *B. NYORAENSIS* SEARLE, FIFTH FEET OF MALE, AFTER SEARLE

*BOECKELLA NYORAENSIS* Searle.

1912. *Boeckella nyoraensis* SEARLE, 197, pl. 4, figs. 1-4.

*Female*.—The first antennae extend beyond the furca. The sides of the last cephalothoracic segment project backward nearly to the end of the furca; the projections have inner lobes, the left triangular and acute, the right with parallel sides and rounded tip. The first abdominal segment is asymmetrical. In the fifth feet, the terminal segments of the exopodites bear 7 spines.

*Male*.—In the fifth feet the right endopodite is 3 segmented and nearly equals in length the first two segments of the exopodite. The left endopodite is minute, slender and 1 segmented. Figure 13 shows the fifth feet of the male.

*Length*.—2.6 mm.

Nyora, Victoria.

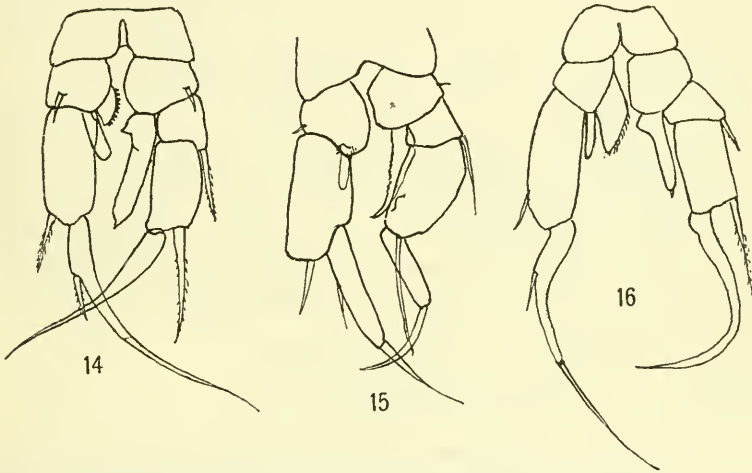
## BOECKELLA OBLONGA Sars.

1908. *Boeckella oblonga* Sars, pp. 6 and 7, pl. 1, figs. 5-8.

1922. *Boeckella oblonga* Henry, pp. 556-557.

*Female*.—The first antennae extend to the furca. The sides of the last cephalothoracic segment have prominent and acute inner lobes and project back about two-thirds the length of the first abdominal segment. The abdomen is asymmetrical, the right side being the more prominent. The terminal segments of the exopodites of the fifth feet are armed with 7 spines.

*Male*.—Both endopodites of the fifth feet are 1 segmented. The right endopodite extends to the end of the second segment of the exopodite and bears on the inner margin near the base a prominent tubercle. The second basal segment of the left foot has on the inner



FIGS. 14-16.—14, *BOECKELLA OBLONGA* Sars, FIFTH FEET OF MALE,  $\times 114$ , AFTER Sars. 15, *B. OCCIDENTALIS* Marsh, FIFTH FEET OF MALE,  $\times 110$ . 16, *B. ORIENTALIS* Sars, FIFTH FEET OF MALE, AFTER Sars.

surface a serrate lamella. The left endopodite is one-half the length of the first segment of the exopodite. Figure 14 shows the fifth feet of the male.

*Length*.—Female, 2 mm.

Southern Australia.

## BOECKELLA OCCIDENTALIS Marsh.

1906. *Boeckella occidentalis* Marsh, pp. 179-183, pl. 18, figs. 1, 3-6.

*Female*.—The first antennae extend to the end of the furca. The last segment of the cephalothorax projects backward and has inner lobes. The abdomen is symmetrical. The terminal segments of the exopodites of the fifth feet bear 3 spines. The exopodites of the second antennae consist of 7 segments, 1, 3, 4, 5, and 6 being short.

*Male*.—In the fifth feet the right endopodite is 1 segmented, pointed, and curved inward, and reaches the end of the second seg-

ment of the exopodite. The left endopodite is 1 segmented and less than one-half the first segment of the exopodite. The second segment of the right exopodite bears on the inner surface near the distal end a rather prominent tubercle. Figure 15 shows the fifth feet of the male.

*Length*.—Female, 1.505 mm.; male, 1.43 mm.

Lake Titicaca and Lake Poopo.

**BOECKELLA ORIENTALIS** Sars.

1903. *Boeckella orientalis* Sars, pp. 196–197, pl. 9, figs. 1–15.

1905b. *Boeckella orientalis* EKMAN, p. 602.

*Female*.—The first antennae reach the furca. The last cephalothoracic segment is produced backward on the sides beyond the first abdominal segment; it has inner lobes, the left one being acute and the right one rounded. The exopodites of the second antennae are 7 segmented, the second and seventh segments being long. The terminal segments of the exopodites of the fifth feet bear 7 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented, pointed, has a blunt-pointed projection on the inner side near the base, and nearly equals in length the first two segments of the exopodite. The left endopodite is 1 segmented, nearly equaling in length one-half the first segment of the exopodite. The second basal segment of the left foot bears on its inner side a serrate lamella which extends distad to the end of the endopodite. Figure 16 shows the fifth feet of the male.

*Length*.—Female, 1.7 mm.; male, 1.4 mm.

Mongolia.

**BOECKELLA POOPOENSIS** Marsh.

1906. *Boeckella poopoensis* MARSH, pp. 183–187, pl. 17, fig. 5; pl. 18, fig. 2.

*Female*.—The first antennae extend to the end of the furcal setae. The sides of the last cephalothoracic segment have inner lobes and project backward the length of the first abdominal segment. The exopodites of the second antennae consist of 5 segments. The terminal segments of the exopodites of the fifth feet are armed with 3 spines. The third segment of the endopodites of the fifth feet bear 5 setae.

*Male*.—In the fifth feet each of the second basal segments bears a blunt spine near the inner distal angle. The endopodites are 2 segmented; the right reaches one-half the length of the second segment of the exopodite and the left one-half the length of the first segment of the exopodite. Figure 17 shows the fifth feet of the male.

*Length*.—Male, 1.4 mm.; female, 1.53 mm.

Lake Poopo.



## BOECKELLA PROPINQUA Sars.

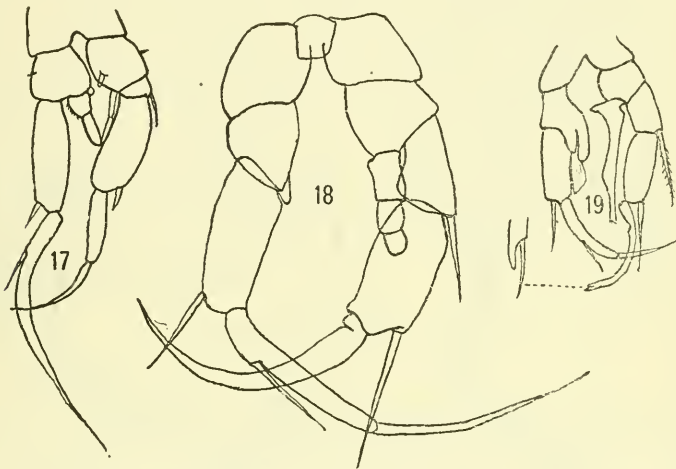
1904. *Boeckella propinqua* Sars, pp. 636-638, pl. 35, figs. 10a-h.

1905b. *Boeckella propinqua* EKMAN, p. 602.

1906. *Boeckella propinqua* BRADY, p. 696.

*Female*.—The first antennae extend beyond the furca. The exopodites of the second antennae are composed of 7 segments. The last cephalothoracic segment projects backward on the sides the length of the first abdominal segment; the projections have inner lobes which are rounded. The first abdominal segment is asymmetrical. In the fifth feet the terminal segments of the exopodites are armed with 7 spines.

*Male*.—In the fifth feet the right endopodite consists of 3 segments and extends to about one-third the length of the second



FIGS. 17-19.—17, *BOECKELLA POOSENSIS* MARSH, FIFTH FEET OF MALE,  $\times 44$ . 18, *B. PROPINQUA* Sars, FIFTH FEET OF MALE,  $\times 56$ , AFTER Sars. 19, *B. PSEUDOCHÉLES* SEARLE, FIFTH FEET OF MALE, AFTER SEARLE.

segment of the exopodite. The left endopodite is 1 segmented and very short. Figure 18 shows the fifth feet of the male

*Length*.—Female, 1.4 mm.

New Zealand.

## BOECKELLA PSEUDOCHÉLES Searle.

1912. *Boeckella pseudocheles* SEARLE, p. 198, pl. 5, figs. 1-9.

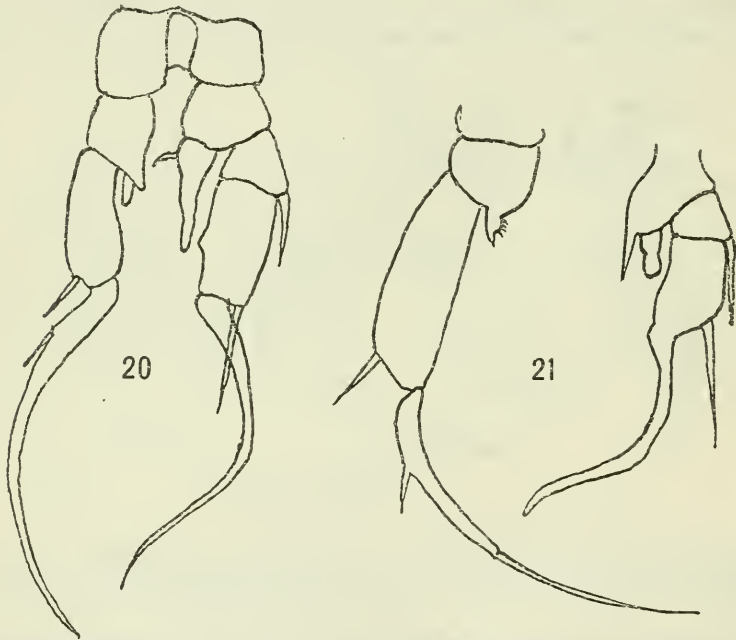
1912. *Boeckella pseudocheles* Sars, pp. 12-13, pl. 8, figs. 10-15.

1922. *Boeckella pseudocheles* HENRY, p. 559.

*Female*.—The first antennae are slightly longer than the cephalothorax. The sides of the last cephalothoracic segment flare outward and project backward to the second abdominal segment: they have inner lobes which are acute. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—In the right fifth foot the terminal hook of the exopodite is divided at the tip, making an imperfect chela. The endopodite is 2 segmented, angular; the proximal segment has a blunt internal projection near the base and the distal segment is notched at the end; the endopodite exceeds in length the first two segments of the exopodite.

The second segment of the left exopodite, as shown by Sars, has 2 spines instead of 1 as is customary in this genus. The second basal segment of the left fifth foot has a smooth lamella projecting from its inner surface. The endopodite is 1 segmented, short, and lamelli-form. Figure 19 shows the fifth feet according to Searle.



FIGS. 20-21.—20, *BOECKELLA ROBUSTA* SARS, FIFTH FEET OF MALE, AFTER SARS. 21, *B. RUBRA* SMITH FIFTH FEET OF MALE, AFTER SMITH.

*Length*.—Male, according to Searle, 2.5 mm.; female, according to Sars, 2.35 mm.

Southern Australia.

#### *BOECKELLA ROBUSTA* Sars.

- 1896. *Boeckella robusta* SARS, pp. 66-71, pl. 8, figs. 1-4.
- 1898. *Boeckella robusta* GIESBRECHT and SCHMEIL, p. 61.
- 1905b. *Boeckella robusta* EKMAN, p. 602.
- 1909. *Boeckella robusta* SMITH, p. 87.
- 1922. *Boeckella robusta* HENRY, p. 558.

*Female*.—The first antennae extend to the abdomen. The last cephalothoracic segment is produced backward somewhat beyond the first abdominal segment; the projections have small inner lobes

which are pointed. The first abdominal segment is slightly asymmetrical. In the fifth feet the terminal segments of the exopodites are armed with 7 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented, pointed, and extends nearly to the end of the second segment of the exopodite; it bears on the inner margin near the base a short curved spine. The left endopodite is 1 segmented and very short. Figure 20 shows the fifth feet of the male.

*Length*.—Female, 3.2 mm.

Southern Australia.

**BOECKELLA RUBRA** Smith.

1909. *Boeckella rubra* SMITH, p. 86, pl. 18, figs. 1-5.

*Female*.—The first antennae extend to the furca. The last cephalothoracic segment extends back three-fourths the length of the first abdominal segment; it has inner lobes which are rounded at the tip. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented and extends about one-half the length of the second segment of the exopodite. The left endopodite is very short, 1 segmented, and pointed. Figure 21 shows the fifth feet of the male.

*Length*.—Female, 0.7 mm.

Tasmania.

**BOECKELLA SAYCEI** Sars.

1908. *Boeckella saycei* SARS, pp. 8-9, pl. 1, figs. 9-13.

*Female*.—The first antennae reach nearly the end of the furca. The sides of the last cephalothoracic segment are divergent and produced backward to the third abdominal segment; they have inner lobes which are small with rounded tips. In the fifth feet the terminal segments of the exopodites are armed with 7 spines.

*Male*.—In the right fifth foot the second basal segment has a short broad spine on its inner margin; the endopodite is 3 segmented, exceeding in length the first segment of the exopodite. The left endopodite is short and lamelliform. Figure 22 shows the fifth feet of the male.

*Length*.—Female, 1.5 mm.

Southern Australia.

**BOECKELLA SEARLI** Sars.

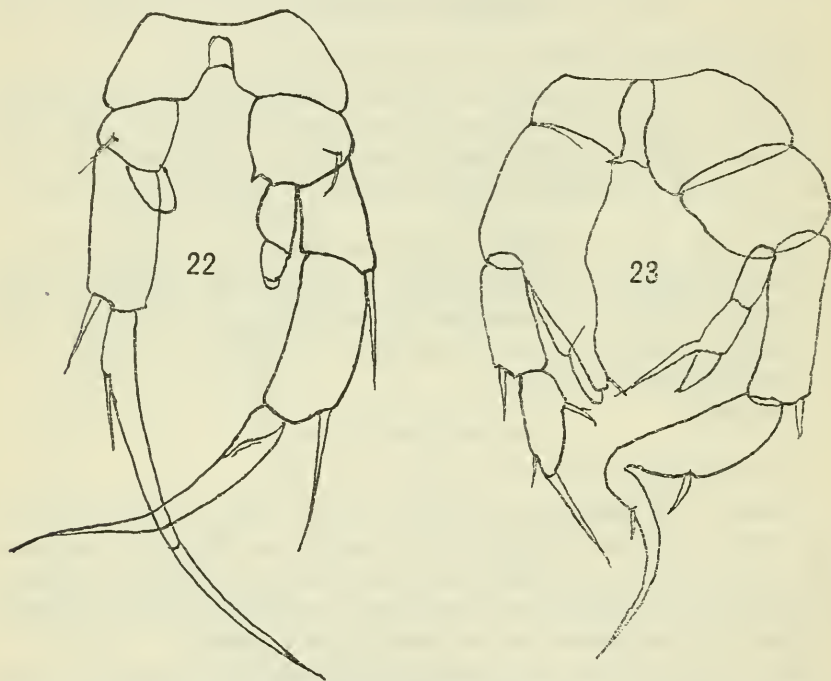
1912. *Hemiboeckella searli* SARS, pp. 13-18, pl. 9, figs. 1-14

1922. *Hemiboeckella searli* HENRY, pp. 560-561.

*Female*.—The first antennae extend to the abdomen. The sides of the last cephalothoracic segment have no inner lobes and project back very slightly. The first abdominal segment is slightly asymmetrical. The exopodites of the second antennae consist of 7 seg-

ments, 1, 2, 4, 5, and 6 being short. The terminal segments of the exopodites of the fifth feet are armed with 6 spines.

*Male*.—In the fifth feet the right endopodite is 3 segmented, the second segment having on its inner distal angle an acute cuticular projection extending twice the length of the third segment. The left endopodite is 2 segmented, the second segment bearing on its inner side a seta-like projection. The second basal segment of the left foot has on its inner distal angle a broad cuticular process reaching to the middle of the second segment of the exopodite; the second segment of the exopodite has a small external spine and a rather



FIGS. 22-23.—22, *BOECKELLA SAYCEI* SARS, FIFTH FEET OF MALE  $\times 170$ , AFTER SARS. 23, *B. SEARLI* SARS, FIFTH FEET OF MALE, AFTER SARS.

strong curved spine about midway of its inner border. Figure 23 shows the fifth feet of the male.

*Length*.—Male, 1 mm.; female, 1.6 mm.

Southern Australia.

Sars makes the new genus *Hemiboeckella* for this species, but I see no good reason for separating it from *Boeckella*.

**BOECKELLA SYMMETRICA** Sars.

1908. *Boeckella symmetrica* Sars, pp. 9-10, pl. 1, figs. 14-17.

*Female*.—The first antennae extend to the furca. The lateral extensions of the last cephalothoracic segment are very short and pro-

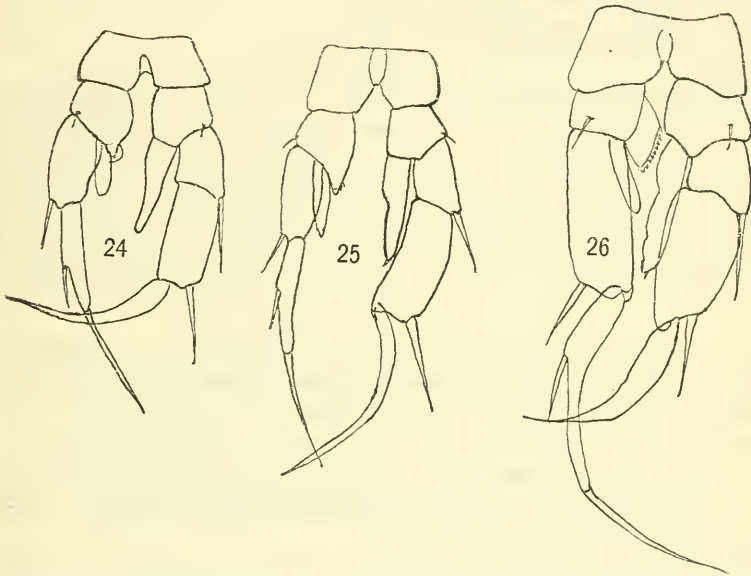


ject from the body at very nearly right angles; they have inner lobes which are acute. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented, conical in form, and extends three-fourths the length of the second segment of the exopodite. The second basal segment of the left foot has on the inner distal angle a small, smooth lamella. The left endopodite is 1 segmented, rounded at the end, and nearly equals in length the first segment of the exopodite. Figure 24 shows the fifth feet of the male.

*Length*.—Female, 1.6 mm.

Southern Australia.



FIGS. 24-26.—24, *BOECKELLA SYMMETRICA* SARS, FIFTH FEET OF MALE,  $\times 114$ , AFTER SARS. 25, *B. TENERA* SARS, FIFTH FEET OF MALE, AFTER SARS. 26, *B. TRIARTICULATA* THOMPSON, FIFTH FEET OF MALE,  $\times 87$ , AFTER SARS.

#### BOECKELLA TENERA Sars.

1912. *Boeckella tenera* SARS, pp. 10-12, pl. 8, figs. 6-9.

*Female*.—The first antennae extend to the end of the furca. The sides of the last cephalothoracic segment are produced backward nearly one-half the length of the first abdominal segment; the left side is much larger than the right; they have inner lobes which are small and spiniform. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—In the fifth feet the right endopodite is 1 segmented, pointed, and extends about one-half the length of the second segment of the exopodite. The second basal segment of the left foot has on

its inner distal angle a denticulate lamellar projection. The left endopodite is 1 segmented and equal in length to the first segment of the exopodite. Figure 25 shows the fifth feet of the male.

*Length.*—Female, 1.8 mm.

Southern Australia.

**BOECKELLA TRIARTICULATA** Thompson.

1883. *Boeckia triarticulata* THOMPSON, p. 95, pl. 6, figs. 1-9.

1889. *Boeckella triarticulata* DEGUERNE and RICHARD, p. 103, figs. 57-58.

1894. *Boeckella triarticulata* SARS, p. 49, pl. 7, figs. 1-8; pl. 8, figs. 1-9.

1896. *Boeckella triarticulata* SARS, p. 66.

1898. *Boeckella triarticulata* GIESBRECHT and SCHMEIL, p. 61.

1905b. *Boeckella triarticulata* EKMAN, p. 602.

1906. *Boeckella triarticulata* BRADY, p. 695.

1908. *Boeckella triarticulata* SARS, pp. 5-6, pl. 1, figs. 1-4.

1922. *Boeckella triarticulata* HENRY, p. 556.

*Female.*—The first antennae extend to the third abdominal segment. The exopodites of the second antennae are 7 segmented, segments 1, 3, 4, 5, and 6 being short. The sides of the last cephalothoracic segment are divergent and extend back to the second abdominal segment; they have inner lobes which are small, acute, and bent outward. The first abdominal segment is asymmetrical. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male.*—In the fifth feet the right endopodite is 1 segmented, rounded at the tip which is armed with a short spine, and nearly equals in length the first two segments of the exopodite. The second basal segment of the left foot bears on its inner margin a serrate lamella. The left endopodite is 1 segmented, rounded at tip, and one-half the length of the first segment of the exopodite. Figure 26 shows the fifth feet of the male.

*Length.*—According to Thompson, 2.54 mm.; according to Sars, 1894, male, 1.67 mm.; female, 2.1 mm.; according to Sars, 1908, female, 2.5 mm.

Australia; New Zealand.

**Genus PSEUDOBOECKELLA** Mrazek.

Syn. { *Diaptomus* (part) LÜBBOCK, 1855.  
       *Boeckella* (part) DEGUERNE and RICHARD, 1889.—POPPE and MRAZEK, 1895.—  
       (Part) GIESBRECHT and SCHMEIL, 1898.—DADAY 1901 (part), 1902 and 1905.—  
       EKMAN, 1905.  
       *Pseudoboeckella* MRAZEK, 1901.—EKMAN, 1905b.  
       *Paraboeckella* MRAZEK, 1901.

## KEY TO SPECIES OF PSEUDOBOECKELLA MRAZEK.

- { The terminal segments of the exopodites of the fifth feet of the female have 3 spines ..... 2  
 { The terminal segments of the exopodites of the fifth feet of the female have 5 spines. silvestri Daday.  
 1. { The terminal segments of the exopodites of the fifth feet of the female have 6 spines ..... valentini Scott.  
 { The terminal segments of the exopodites of the fifth feet of the female have 7 spines ..... 5  
 2. { The left endopodite of the male fifth feet consists of 1 segment. *braziliensis* Lubbock.  
 { The left endopodite of the male fifth feet consists of 2 segments ..... 3  
 3. { In the left fifth foot of the male the second segment of the exopodite has 2 spines on the external border ..... dubia Daday.  
 { In the left fifth foot of the male the second segment of the exopodite has 1 spine on the external border ..... 4  
 4. { The second segment of the left exopodite of the fifth feet of the male has a small spine on the internal side at the base of the hook ..... setosa Daday.  
 { The second segment of the left exopodite of the fifth feet of the male does not have a small spine on the inner side at the base of the hook ..... longicauda Daday.  
 5. { In the 3-segmented endopodite of the right male fifth foot the second and third segments are slender, the third segment is terminated with 2 spines; the left endopodite is 2 segmented ..... brevicaudata Mrazek.  
 { In the 3-segmented endopodite of the right male fifth foot the second and third segments are not especially slender and the third is armed with 4 stout spines; the left endopodite is 2 segmented ..... poppei Mrazek.

## PSEUDOBOECKELLA BRAZILIENSIS Lubbock.

1854. *Diaptomus braziliensis* LUBBOCK, pp. 236-240, pl. 15, figs. 3-8.

1889. *Boeckella braziliensis* DEGUERNE and RICHARD, pp. 100-102, figs. 54-56 (from Lubbock).

1901. *Pseudoboeckella braziliensis* MRAZEK, pp. 5-6, pl. 1, figs. 11 and 13; pl. 2, figs. 24 and 30.

1905b. *Pseudoboeckella braziliensis* EKMAN, p. 600.

Not *Pseudoboeckella braziliensis* POPPE and MRAZEK, nor DADAY.

*Female*.—The first antennae extend to the last cephalothoracic segment. The sides of the last cephalothoracic segment extend back nearly to the second abdominal segment; they do not have inner lobes and their inner margins are nearly straight. The terminal segments of the exopodites of the fifth feet have 3 spines.

*Male*.—In the fifth feet the hook in both exopodites bears a small spine on the inner side; in the right foot the spine is situated at about one-third the length of the hook and in the left at about one-half. In the right endopodite the three segments are approximately equal in length and the whole endopodite equals the first 2 segments of the exopodite. The left endopodite is short and composed of 1 segment. Figure 27 shows the fifth feet of the male.

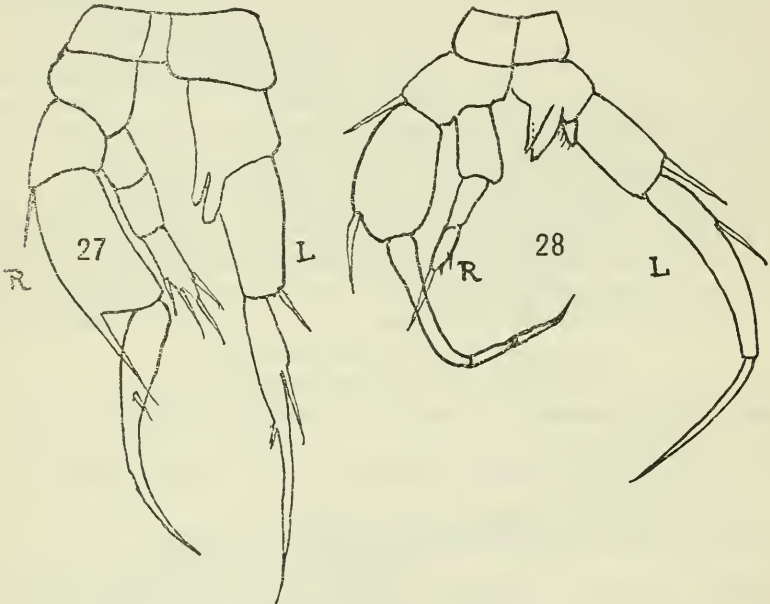
*Length*.—Male, 1.6 mm.; female, 2 mm.

Patagonia; Tierra del Fuego.

## PSEUDOBOECKELLA BREVICAUDATA Mrazek.

1901. *Paraboeckella brevicaudata* MRAZEK, pp. 8-11, figs. 7, 12, 21, 26, and 27.  
 1905a. *Boeckella vexillifera* EKMAN, pp. 16-20, figs. 7-12.  
 1905b. *Pseudoboeckella brevicaudata* EKMAN, pp. 600-601.  
 1905b. *Pseudoboeckella brevicaudata*, var. *vexillifera* EKMAN, p. 601.  
 1914. *Pseudoboeckella brevicaudata* SCOTT, T., pp. 4-5, pl. 1, figs. 1, 7, and 10.  
 1921. *Pseudoboeckella brevicaudata* RÜHE, pp. 56-61, fig. 20, *a-e*, fig. 21, *a-d*.

*Female*.—The first antennae extend to the third or fourth cephalothoracic segment. The sides of the last cephalothoracic segment are asymmetrical, the left side being the larger; there are no inner lobes, but the inner margins are sinuate; they extend backward according



FIGS. 27-28.—27, *PSEUDOBOECKELLA BRAZILIENSIS* LUBBOCK, FIFTH FEET OF MALE, AFTER MRAZEK. 28, *P. BREVICAUDATA* MRAZEK, FIFTH FEET OF MALE, AFTER MRAZEK.

to Ekman's figure one-half the length of the first abdominal segment, according to Rühle's figure beyond the first abdominal segment. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—In the fifth feet the second segment of the right exopodite is slender, somewhat curved, and bears on its distal end a curved hook whose general position is approximately at right angles with the second segment. The right endopodite is 3 segmented, the first segment being nearly as broad as long, and the second and third segments long and slender; the third segment bears at the tip 2 spines, one long and one short; these 2 spines are shown in the figures of Ekman and Scott, but only 1 in the figures of Mrazek and Rühle; Mrazek, Ekman, and Rühle show also on this third segment 2 small lateral spines. Scott shows no lateral spines; if we may assume



slight errors in some of the figures, it would seem probable that the armature of this segment, typically at least, consists of 2 terminal spines, one long and one short, and 2 lateral spines on the inner margin. The left exopodite is 2 segmented, the second segment bearing a lateral spine and a terminal scythe-shaped hook; the endopodite is short and 1 segmented. The second basal segment of the right foot also bears a hook-like projection on its anterior distal margin, which is nearly as large as the endopodite. Figure 28 shows the fifth feet of the male.

*Length.*—According to Ekman, male 2–2.55 mm., female 2.9–3 mm.; according to Scott, female 2 mm.; according to Rùhe, male 2–2.55 mm., female 2.1–3.1 mm.; and according to Mrazek, male 18 mm., female 21 mm. It seems probable that Mrazek's figures of size are a misprint and that they should be, male 1.8 mm., female 2.1 mm.

Patagonia; Tierra del Fuego; Falkland Islands; Kerguelen Island; New Amsterdam Island.

This has by some been considered identical with *Centropages brevicaudatus* Brady, 1875 and 1879, but Brady's description is so brief and incomplete that identification of his form is impossible.

**PSEUDOBOECKELLA DUBIA** Daday.

1901. *Boeckella dubia* DADAY, p. 345.

1902. *Boeckella dubia* DADAY, pp. 236–239, pl. 6, figs. 1 and 2.

1905b. *Boeckella dubia* EKMAN, p. 600.

*Female.*—The first antennae extend to the last cephalothoracic segment. The sides of the last cephalothoracic segment extend back to the end of the first abdominal segment and are acute and slightly lobed on the inner margin. The terminal segments of the exopodites are armed with 3 spines.

*Male.*—In the fifth feet the right endopodite is 3 segmented and longer than the first 2 segments of the exopodite. There is a cuticular extension of the inner distal angle of the second basal segment of the left foot, covering about one-half the first segment of the endopodite. The second segment of the left exopodite bears 2 spines. The left endopodite is 2 segmented, the distal segment bearing at its outer end a spine; with the spine the endopodite equals in length the first segment of the exopodite. Figure 29 shows the fifth feet of the male.

*Length.*—Male, 2.6 mm.; female, 2.5–3 mm.

Patagonia.

**PSEUDOBOECKELLA LONGICAUDA** Daday.

1901. *Boeckella longicauda* DADAY, pp. 346–347.

1902. *Boeckella longicauda* DADAY, pp. 243–247, pl. 6, figs. 10, 14, and 16.

1905b. *Pseudoboeckella longicauda* EKMAN, p. 600.

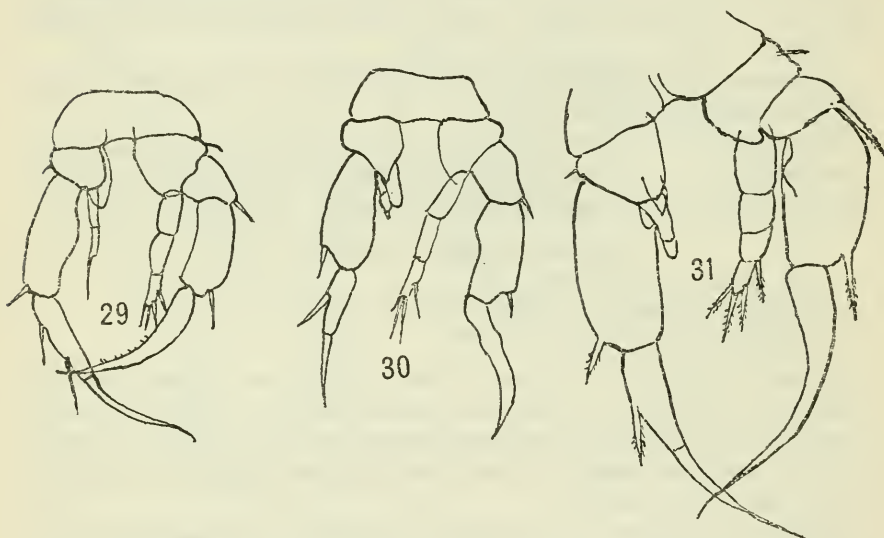
*Female.*—The first antennae extend to the last cephalothoracic segment. The sides of the last cephalothoracic segment extend

backward one-half the length of the first abdominal segment; the ends are turned slightly outward and are acute; the inner margin is sinuate. The terminal segments of the exopodites bear 3 spines.

*Male*.—The right endopodite of the fifth feet is slender, 3 segmented, and equal in length to the first 2 segments of the exopodite. The second basal segment of the left foot bears on its inner distal angle a cuticular projection which is as long as the endopodite. The left endopodite is 2 segmented, somewhat less than one-half the length of the first segment of the exopodite, and its terminal segment is tipped with a small blunt spine. Figure 30 shows the fifth feet of the male.

*Length*.—Male, 2.6–2.8 mm.; female, 3.6–3.8 mm.

Patagonia.



FIGS. 29-31.—29, *PSEUDOBOECKELLA DUBIA* DADAY, FIFTH FEET OF MALE, AFTER DADAY. 30, *P. LONGICAUDA* DADAY, FIFTH FEET OF MALE, AFTER DADAY. 31, *P. POPPEI* MRAZEK, FIFTH FEET OF MALE, AFTER POPPE AND MRAZEK.

#### *PSEUDOBOECKELLA POPPEI* Mrazek.

1895. *Boeckella braziliensis*, POPPE and MRAZEK, pp. 13-16, figs. 1-11.

1898. *Boeckella braziliensis* GIESBRECHT and SCHMEIL (part), p. 60.

1901. *Pseudoboeckella poppei* MRAZEK, p. 6.

1901. *Boeckella entzii* DADAY, pp. 345-346.

1902. *Boeckella entzii* DADAY, pp. 239-243, pl. 6, figs. 3-9.

1905b. *Pseudoboeckella poppei* EKMAN, p. 600.

1909. *Pseudoboeckella poppei* SARS, pp. 22-29, pl. 3, figs. 1-16.

*Female*.—The last segment of the cephalothorax projects back fully one-half the length of the first abdominal segment; the sides do not have inner lobes, but the inner margins are sinuate. The first abdominal segment is somewhat asymmetrical, projecting more to the left side. The terminal segments of the exopodites of the fifth feet have 7 spines.

*Male*.—The lobes of the last cephalothoracic segment are much smaller than in the female. In the fifth feet the right endopodite consists of 3 segments and the terminal segment is armed with 4 spines. The left endopodite is 2 segmented and is very small. Figure 31 shows the fifth feet of the male.

*Length*.—As given by Daday for *entzii*, male, 2.2–3 mm.; female, 2.6–3.5 mm. The other authors do not give the size.

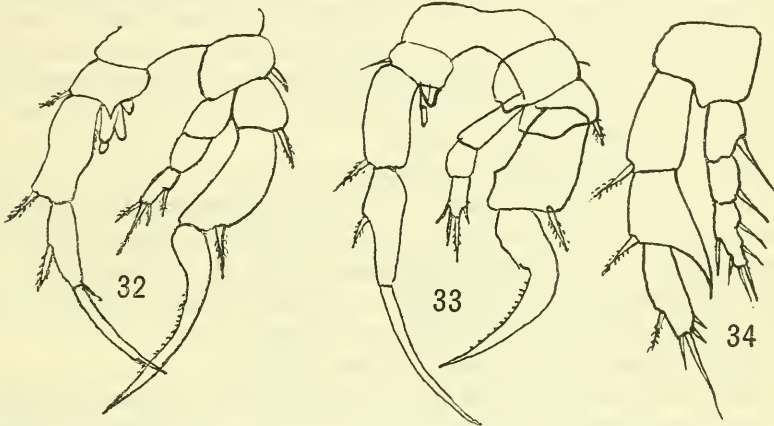
South Georgia; Patagonia.

PSEUDOBOECKELLA SETOSA Daday.

1901. *Boeckella setosa* DADAY, p. 347.

1902. *Boeckella braziliensis* DADAY, pp. 247–251, pl. 6, fig. 15; pl. 7, figs. 1–6.

*Female*.—The first antennae equal in length the cephalothorax. The sides of the last cephalothoracic segment are produced backward



FIGS. 32–34.—32, PSEUDOBOECKELLA SETOSA DADAY, FIFTH FEET OF MALE, AFTER DADAY. 33, P. SILVESTRI DADAY, FIFTH FEET OF MALE, AFTER DADAY. 34, P. SILVESTRI DADAY FIFTH FOOT OF FEMALE, AFTER DADAY.

nearly to the second abdominal segment; they do not have interior lobes, but are sinuate on the inner margins. The terminal segments of the exopodites of the fifth feet have 3 spines.

*Male*.—The endopodite of the right fifth foot equals in length the first 2 segments of the exopodite; the terminal segment is armed with 4 spines. The left endopodite of the fifth feet is 2 segmented and about one-half the length of the first segment of the exopodite. The second segment of the left exopodite has 1 spine on the external border and also a small spine on the internal side at the base of the hook. Figure 32 shows the fifth feet of the male.

*Length*.—Male, 1.6–2 mm.; female, 1.8–2.2 mm.

Patagonia.

Daday, 1902, makes *B. setosa* a synonym of *B. braziliensis* Daday and *D. braziliensis* Lubbock. It seems probable that *setosa* Daday

and *braziliensis* Daday are the same. *B. braziliensis* Daday, however, is not *D. braziliensis* Lubbock, for the endopodite of the left fifth foot of the male in Lubbock's species is 1 segmented, but in Daday's 2 segmented. Moreover Mrazek's figure shows a small spine on the inner side of the hook of the exopodite of the male fifth foot, and this does not appear in Daday's figure. It seems best, therefore, to use *setosa* as the name of the species.

PSEUDOBOECKELLA SILVESTRI Daday.

1901. *Boeckella silvestri* DADAY, p. 348.

1902. *Boeckella silvestri* DADAY, pp. 251-255, pl. 7, figs. 7-15.

1905a. *Boeckella entzii* EKMAN, pp. 15-16, pl. 1, fig. 6.

1905b. *Pseudoboeckella entzii* EKMAN, p. 600.

*Female*.—The first antennae reach the end of the first abdominal segment. The sides of the last cephalothoracic segment project backward, reaching beyond the first abdominal segment; the left side is larger than the right; the inner margins are sinuate, but there are no inner lobes. The first segment of the abdomen is asymmetrical, projecting to the left. The terminal segments of the exopodites of the fifth feet are armed with 5 spines.

*Male*.—In the fifth feet the hook of the right exopodite is sharply curved, is really sickle shaped. The right endopodite is 3 segmented, reaching to the end of the second segment of the exopodite; the terminal segment is armed with 4 spines. The left endopodite is very short and composed of 2 segments. Figure 33 shows the fifth feet of the male and Figure 34 a fifth foot of the female.

*Length*.—Male, 1.8-2.2 mm.; female, 2-2.5 mm.

This is the only described species in which the terminal segments of the exopodites of the female fifth feet have 5 spines. Ekman gives no description of *B. entzii* and has only one figure; that figure, however, is of the female fifth foot and shows the terminal segment of the exopodite with five spines. In lack of further description it would seem that it should be considered identical with Daday's *silvestri*.

Daday reported *silvestri* from Patagonia. Ekman reported his *entzii* from Louis Philippe Land, Southern Georgia, and the Falkland Islands. If the preceding identifications are correct, it must have a fairly wide distribution.

PSEUDOBOECKELLA VALLENTINI T. Scott.

1914. *Pseudoboeckella valentini* T. SCOTT, pp. 5-7, pl. 1, figs. 2, 8, and 11.

*Female*.—The first antennae reach the third segment of the abdomen. The sides of the last cephalothoracic segment are straight, that is flare outward very little, rounded at the tips, and have inner lobes. The hook of the second segment of the exopodites of the fifth feet is long, extending beyond the end of the third segment, and is



slightly recurved at the tip. The terminal segments of the exopodites have 6 spines.

*Male*.—In the fifth feet the second basal segment of the right foot in addition to the spine at the outer distal angle has a 2-pointed spine at the inner distal angle. The right endopodite is 1 segmented, exceeds the first segment of the exopodite in length, has 2 stout curved spines at the inner distal angle and upon the tip and extending along the inner side 5 shorter stout curved spines. There is also a straight acute spine near the proximal end on the inner margin. The left endopodite in Scott's figure does not seem to be separated from the second basal segment; it is 1 segmented or perhaps rudimentary. Figure 35 shows the fifth feet of the male.

*Length*.—Female, 1.6 mm.

Falkland Islands.

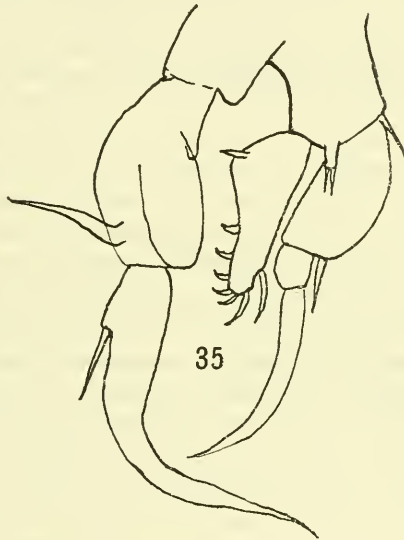


FIG. 35.—PSEUDOBOECKELLA VALLENTINI SCOTT, FIFTH FEET OF MALE, AFTER SCOTT.

#### DISTRIBUTION OF THE SPECIES OF BOECKELLA AND PSEUDOBOECKELLA.

The distribution of the fresh-water Centropagidae is a matter of a good deal of interest, as they are much more restricted in their habitats than some other forms of the Copepoda; for example, many of the species of the Cyclopidae are world-wide in their distribution while many of the species of the Centropagidae are found only over somewhat limited areas. The morphological differences, due to environment, make it possible in the case of the species of the Centropagidae to make some conjectures in regard to their phylogeny.

Both *Boeckella* and *Pseudoboeckella* are genera of the southern continents. Only one species, *B. orientalis*, is found north of the

equator, and, as stated later, the author is inclined to think that there must be some mistake about this species.

The genus *Boeckella* occurs in Australia, Tasmania, New Zealand, in South America from Tierra del Fuego to Lake Titicaca, and in the Falkland Islands. There are 8 species in Australia, 3 in Tasmania, 2 in New Zealand, 6 in South America, 1 in the Falklands, and 1 in Mongolia. One species, *B. triarticulata*, has been found in both Australia and New Zealand. With this exception, of Australia, New Zealand and Tasmania, each has its peculiar species. The South American species are all distinct from those of Australia, New Zealand, and Tasmania. One South American species, *B. michaelsoni*, has been found in the Falkland Islands. With this exception none of the South American species has been found away from the continent. *B. gracilipes* and *B. occidentalis* have been found in Lake Titicaca and *B. occidentalis* and *B. poopuensis* in Lake Poopo. The others were found in Patagonia and Argentina.

*B. orientalis* found in Mongolia bears a surprisingly close resemblance to *B. oblonga* found in Australia. The differences as shown in Sars's figures are that the lobes of the last cephalothoracic segment of the female are longer in *B. orientalis* and of a somewhat different form from those in *B. oblonga*, and in the left fifth foot of the male the serrate lamella of the second basal segment is longer. It may be a fair question whether the differences should be considered more than varietal. In that case we are faced with the fact that a genus which, with this single exception, is confined to the southern continents, and there has developed into somewhat localized species, has one species common to southern Australia and Mongolia. This would hardly seem possible, and one can not help conjecturing whether the locality labels of the collections might not have been misplaced.

Of the 8 species of *Pseudoboeckella* all but one are found in Patagonia; this one, *P. vallentini*, has been found only in the Falklands. Two species, *P. poppei* and *P. silvestri*, occur not only in Patagonia but in South Georgia, and *P. silvestri* has been found also in Louis Philippe Land and the Falkland Islands. *P. brevicaudata* has a rather surprising distribution, for besides occurring in Patagonia and Tierra del Fuego it has been collected in Kerguelen and New Amsterdam Island. It certainly is strange that this species should be found in the islands in the Indian Ocean but not on any of the islands near South America. Of course, in any discussion of the distribution of these forms, it should be remembered we are speaking only of the localities in which the species have been found, and that the islands bordering the Antarctic have been very imperfectly explored for their invertebrate fauna.

In regard to the manner in which these species were distributed, it should be said that while there is no impossibility, theoretically,

of birds carrying them in mud attached to their feet, there is little evidence that this actually occurs, while observed facts seem to indicate that the ordinary means of distribution of fresh-water copepods is by water transportation. It seems most probable, therefore, that the genera traveled from the Antarctic Continent, and the species have become differentiated in the various localities.

It may be noted that inasmuch as in the development of the Centropagidae there is a tendency to reduction of the endopodites of the fifth feet of the male, from a phylogenetic standpoint *Pseudo-boeckella* would be considered more primitive than *Boeckella*.

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