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A New Species of *Caligus* (Copepoda) on a Species of  
*Tripterygion* from New Zealand

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**Abstract**

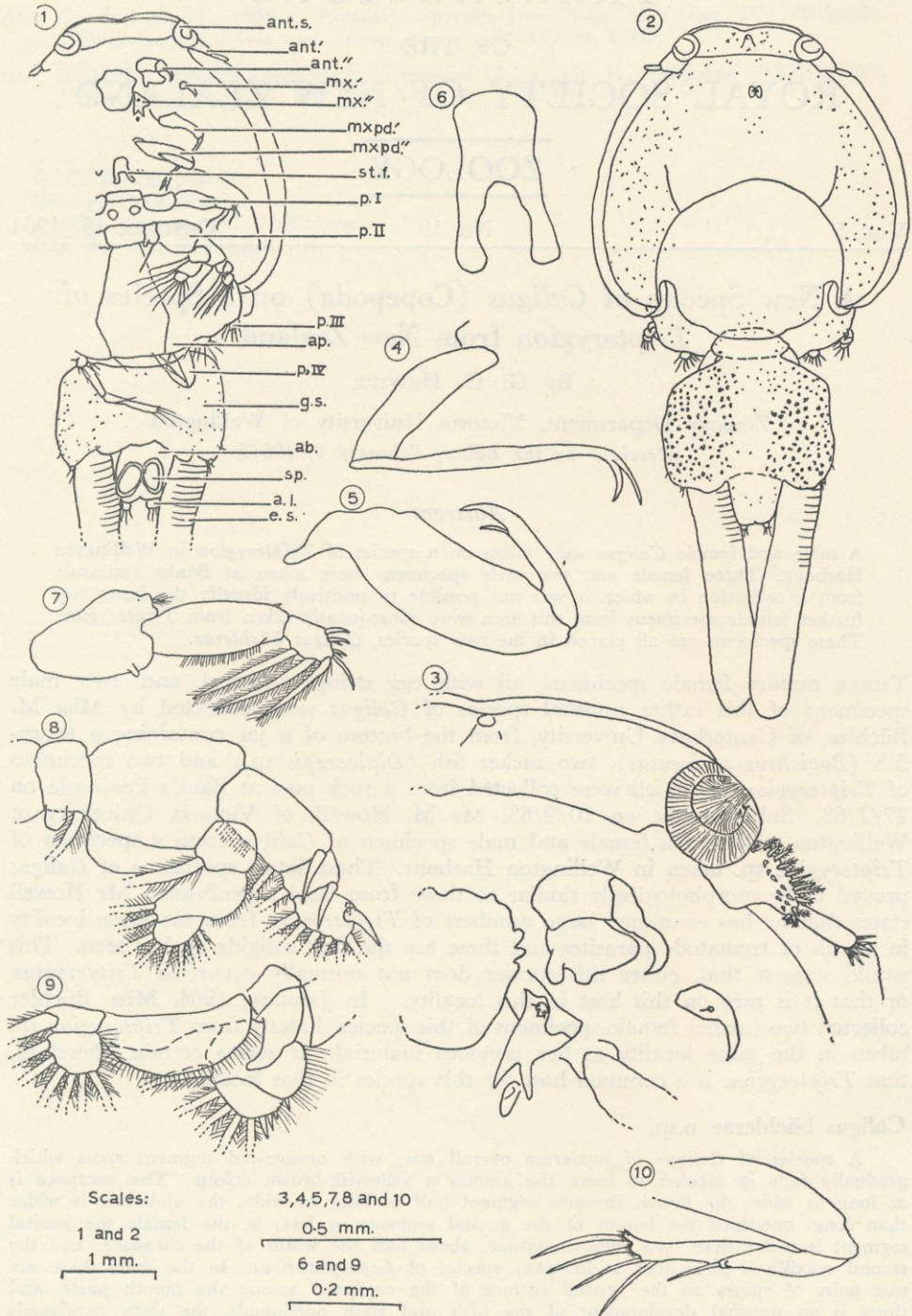
A male and female *Caligus* were taken on a species of *Tripterygion* in Wellington Harbour. Three female and two male specimens were taken at Banks Peninsula from a collection in which it was not possible to positively identify the host; two further female specimens from this area were subsequently taken from *Tripterygion*. These specimens are all placed in the new species, *Caligus büchlerae*.

THREE mature female specimens, all with egg strings attached, and two male specimens of this rather unusual species of *Caligus* were collected by Miss M. Büchler, of Canterbury University, from the bottom of a jar containing a thornfish (*Bovichtus variegatus*), two sucker fish (*Diplocrepis* sp.) and two specimens of *Tripterygion* sp. which were collected from a rock pool at Bank's Peninsula on 27/7/63. Subsequently, on 10/9/63, Mr M. Howell, of Victoria University of Wellington, collected a female and male specimen of *Caligus* from a specimen of *Tripterygion* sp. taken in Wellington Harbour. These latter specimens of *Caligus* proved to be morphologically similar to those from Bank's Peninsula. Mr Howell states that he has examined large numbers of *Tripterygion* from the same locality in search of trematode parasites and these are the first caligids he has seen. This would suggest that, either this species does not normally occur on *Tripterygion* or that it is rare on this host in this locality. In January, 1964, Miss Büchler collected two further female specimens of this species directly from *Tripterygion* sp. taken in the same locality as her previous material. It seems certain, therefore, that *Tripterygion* is a common host for this species in that locality.

***Caligus büchlerae* n.sp.**

A species of *Caligus* of moderate overall size, with orange-red pigment spots which gradually fade in alcohol to leave the animal a yellowish-brown colour. The carapace is as long as wide, the fourth thoracic segment half as long as wide, the abdomen is wider than long, one-third the length of the genital segment or less; in the female the genital segment is wider than long, subrectangular, about half the width of the carapace, and the second maxilla is bifurcated as in many species of *Lepeophtheirus*. In the male there are two pairs of spines on the ventral surface of the carapace among the mouth parts, and there is an unusual development of the fifth and sixth pereopods, the sixth pereopods reaching to the end of the anal laminae.





TEXT-FIG. 1.—*Caligus büchlerae* n.sp. ♀.—1—Ventral view. 2—Dorsal view. 3—Mouth parts and antennae. 4—First maxilliped. 5—Second maxilliped. 6—Sternal furca. 7—First pereiopod. 8—Second pereiopod. 9—Third pereiopod. 10—Fourth pereiopod.



*Female:*

Of moderate size, 4.77mm–5.40mm in total body length in the Bank's Peninsula specimens, 3.15mm for the Wellington specimen. (The Wellington specimen is generally two-thirds the size of the former specimens and only the measurements for the Bank's Peninsula specimens will be given below.) Orange-red pigment spots are found over most of the dorsal body surface, these spots being largest on the genital segment. The genital segment also has small pigment spots on its ventral surface. There are orange-red bands of pigment on the dorsal side of the egg cases between the individual eggs.

*Carapace* subcircular, as long as wide (2.97mm–3.20mm x 2.96mm–3.36mm), three-fifths the total body length. Frontal area three-fifths width of carapace, one-quarter as long as wide, posterior margin sublinear; anterior suckers (lunules) well developed (0.28mm–0.33mm in diameter), one-quarter width of frontal plate in diameter. Transverse dorsal rib half width of carapace, its mid-point median in carapace, forming an entire curve with the posterior longitudinal branches which are two-sevenths length of carapace; anterior longitudinal branches one-seventh length of carapace, only slightly curved, diverging anteriorly; posterior sinuses small, one-fourteenth length of carapace, two-thirds as wide as long; lateral areas rather pointed posteriorly; median posterior area at level of sinuses half width of carapace, posterior margin an entire curve and extending beyond lateral lobes for a distance equal to length of sinuses. Flange on free margin of lateral areas of moderate width (0.14mm–0.17mm), narrowing posteriorly to terminate at the sinus which bears a small separate flange on its lateral margin; flange on frontal area narrow. Eyes small and situated well forward, one-fifth of distance from anterior margin of carapace.

*Fourth, freely articulated, thoracic segment* one-quarter as wide as carapace, half as long as wide (0.33mm–0.38mm x 0.71mm–0.80mm), lateral margins rounded. Fourth pereopods borne on rather ventral lateral projections. Junction with genital segment indistinct.

*Genital segment* subrectangular, half width of carapace, four-fifths as long as wide (1.31mm–1.45mm x 1.63mm–1.83mm), angles rounded, posterolateral lobes poorly developed. Junction with abdomen indistinct.

*Abdomen* one-segmented, less than half length of genital segment, slightly wider than long (0.59mm–0.61mm x 0.71mm–0.80mm), lateral margins linear, posterior angles slightly rounded. Large spermathecae, about two-thirds length of abdomen, are borne on its ventral surface.

*Anal laminae* very small, one-fifth length of abdomen (0.11mm–0.12mm in length), subrectangular, as wide as long, placed on posterior margin of abdomen near lateral angles. Each lamina bears three long plumose setae posteriorly and a shorter plumose seta on the lateral margin near the posterior angle, as well as a row of cilia along the medial margin.

*Egg strings* short (2.6mm–3.3mm in length) and containing 32 to 41 eggs per string.

*First antenna* two-jointed, rather short, one-third as long as frontal area is wide, second joint two-thirds as long as first. First joint two-thirds as wide as long, narrowing to one-third this width distally, distal margin rounded. Second joint one-quarter as wide as long, distal margin rounded. First joint bears about eight plumose setae and two non-plumose setae on the anterior margin and four plumose setae on the distal margin as well as about 10 non-plumose setae medial to these margins; second joint bears six short and six long hairs distally and another long hair on inner margin one-quarter of distance from inner distal angle.

*Second antenna* two-jointed, subequal in length to first, first joint two-thirds length of second, set on an irregular base which is as wide as first joint is long and bears a broad spatulate spine two-fifths as long as base is broad. First joint of antenna two-thirds as wide as long, subrectangular, slightly curved; second joint two-fifths as wide at base as long, narrowing to a sharp point distally, distal one-third curving posteriorly.

*First maxilla* one-jointed, half length of second antenna, distal two-thirds curved to a depth equal to one-sixth length of maxilla, ending in a sharp point and bearing a small sensory hair on a raised boss.

*Second maxilla* one-jointed, subequal in length to first, distal two-fifths bifurcated as in many species of *Lepeophtheirus*, branches subequal in length and pointed distally; three very small hairs are borne on a single raised boss near the base; the bifurcated portion of the maxilla extends beyond the mouth tube posteriorly. There is a spine-like process, one-third the length of the maxilla borne on ventral surface of carapace between the distal branches of maxilla.



*Mouth-tube* one-eighth length of carapace, situated immediately ventral to the eyes, four-fifths as wide as long, narrowing to half this width distally, distal margin slightly curved.

*First maxilliped* one-third as long as carapace is wide in this region, two-jointed, first joint half as long as second; first joint one-quarter as wide as long, second joint one-fourteenth as wide as long, terminating in two subequal spines which comprise one-sixth the length of the joint.

*Second maxilliped* two-jointed, subchelate, as long as first maxilliped, second joint four-sevenths as long as first; first joint one-third as wide as long, rounded distally; second joint one-quarter as wide at base as long, narrowing to a sharp tip distally, distal two-sevenths, only, curved, curve shallow; slender spine, one-sixth as long as joint, borne on second joint at base of curved portion.

*Sternal furca* on midline of carapace just anterior to centre, two-thirds as long as mouth tube, distal half branched, branches separated by a curved margin proximally, slightly divergent, branches widening distally, distal margins rounded.

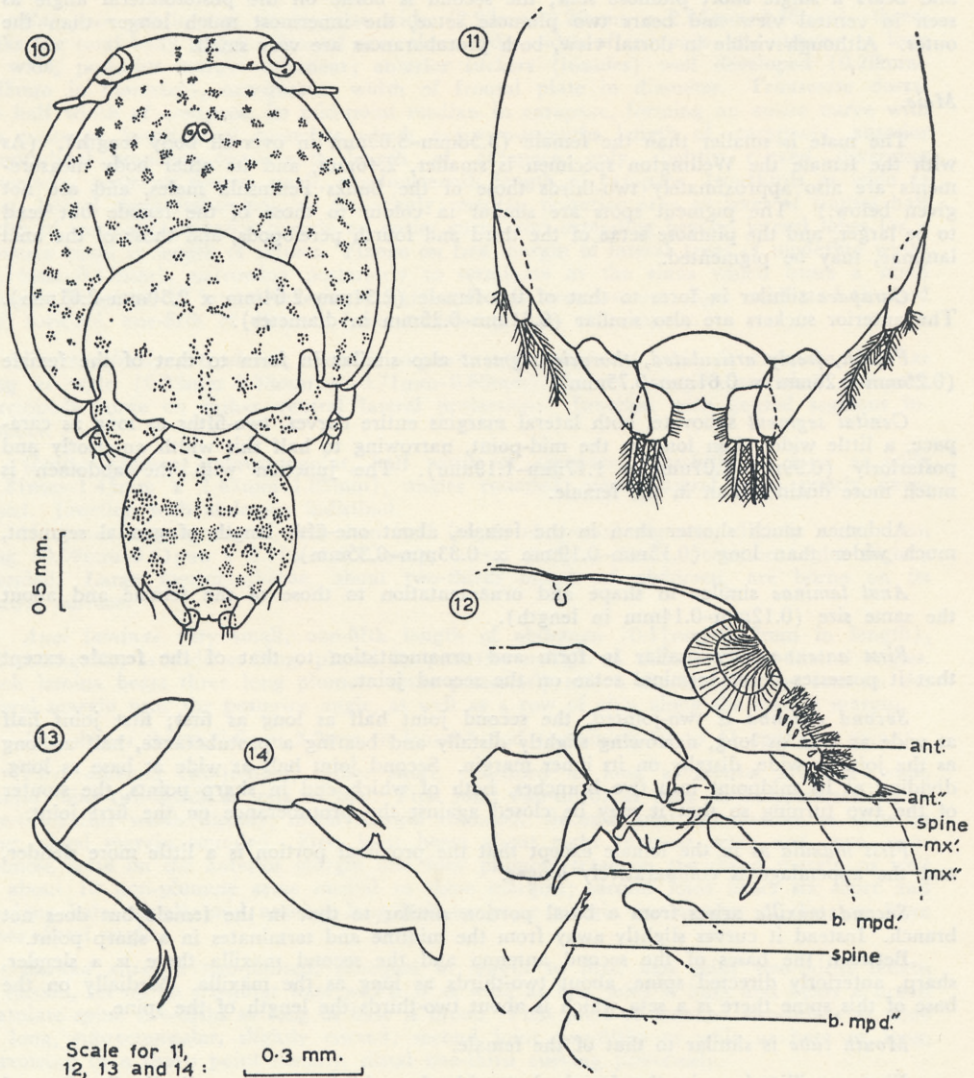
*First pereopod* three-jointed, as long as second joint of first maxilliped, basipod four-fifths as long as second joint, third joint half this length. Basipod two-thirds as wide as long, bearing a short plumose seta near the outer distal angle and a small process, probably representing endopod, on inner margin near distal angle; second joint two-fifths as wide as long medially, narrowing to half this width proximally and distally, bearing a row of cilia along the medial two-thirds of the inner margin, and a small spine on the outer margin near the distal angle; third joint subrectangular, two-thirds as wide as long, bearing three long plumose setae on inner margin, a shorter non-plumose seta on inner distal angle and three spines, the outermost half length of joint, the other two progressively shorter; two innermost with auxiliary spines, that on the median spine being half length of spine and attached to midpoint of spine, that on innermost being subequal in length to spine and attached near its base.

*Second pereopods* biramose, each ramus three-jointed, basipod two-jointed. *Basipod* two-thirds length of first pereopod, first joint one-third length of second, two-thirds as long as wide, sub-rectangular, bearing a long plumose seta on inner margin near distal angle and a ventral flange on posterior half of inner margin; second joint three-quarters as wide as long distally, narrowing to three-quarters this width proximally, outer distal angle rounded, bearing a broad flange on inner margin. *Exopod* subequal in length to basipod, second joint one-quarter as long as first, third joint half as long as first, first and second joints each with a long plumose seta on inner margin near distal angle, a row of long cilia over proximal half of inner margin and a long spine, half as long as first joint on outer distal angle; both joints subrectangular, the first joint half as wide as long, angles rounded, second joint half as long as wide; third joint subrectangular, four-fifths as wide as long, bearing six plumose setae on inner and distal margins, a long non-plumose seta on outer distal angle and a very small spine on dorsal surface near outer distal angle. *Endopod* two-thirds as long as basipod, first joint half length of endopod, second joint three-quarters this length and third joint subequal in length to first; first joint subrectangular, two-thirds as long as wide, outer margin three times length of inner and curved, bearing cilia over distal half, inner margin bearing a long plumose seta; second joint two-thirds as wide as long medially, narrowing proximally, outer distal angle emarginated for two-fifths length and half width of joint for attachment of third joint, outer margin curved and bearing cilia, free distal margin with two long plumose setae; third joint semicircular, proximal margin straight, curved margin bearing six long plumose setae.

*Third pereopod* attached to apron as in other species of the genus. Endopod and exopod well separated, the area between them bearing a semicircular flange with a ciliated free margin; endopod two-fifths length of exopod; basal spine of *exopod* two-thirds length of podite distal one-third only curved, curve slight, tip blunt; second joint two-fifths length of podite, two-thirds as long as wide, narrowing proximally and distally, inner and outer margins curved, inner margin with a long plumose seta near distal angle, outer margin bearing a row of long cilia and a short spine on the outer distal angle; third joint sub-semicircular, half as long as wide, proximal margin sublinear, outer part of margin with long cilia and three spines, the most proximal two-thirds as long as joint, the other two progressively smaller, distal and inner parts of margin bearing four long plumose setae. *Endopod* two-jointed, first joint two-thirds length of second, twice as wide as long, sub-rectangular, angles slightly rounded, bearing a long plumose seta on inner margin; second joint subrectangular, as wide as long at base, narrowing to three-quarters this width distally, angles rounded, bearing a row of long cilia over outer margin and six long plumose setae on inner and distal margins.



*Fourth pereopod* four-sevenths length of carapace, three-jointed, first joint half length of pereopod, distal two subequal in length; first joint one-third as wide as long, narrowing proximally and distally, outer margin curved, distal margin rounded; second joint two-ninths as wide as long, subpyriform owing to outer margin being four times length of inner, bearing a slender spine, two-fifths length of joint, on outer distal angle with a very small semicircular flange near its base; third joint one-fifth as wide as long proximally and distally, narrowing to two-thirds this width medially, inner margin twice length of outer,



TEXT-FIG. 2.—*Caligus buchlerae* n.sp. ♂. 10—Dorsal view. 11—Dorsal view, genital segment. 12—Mouth parts and antennae. 13—First maxilliped. 14—Second maxilliped.

Abbreviations.—a.l. = anal laminae; ab. = abdomen; ant' = first antenna; ant'' = second antenna; ant. s. = anterior sucker (= lunule); ap. = apron of third pereopods; b. mpd.' = base of first maxilliped; b. mpd.'' = base of second maxilliped; e.s. = egg strings; g.s. = genital segment; mx.' = first maxillae; mx.'' = second maxillae; mpd.' = first maxilliped; mpd.'' = second maxilliped; p. I-IV = first to fourth pereopods; sp. = spermathecae; st. f. = sternal furca.



bearing three spines on distal margin, innermost two-thirds length of joint, other two progressively a little shorter, innermost and medial spines each with small flanges near their bases, the flanges having cirri on their margins, outermost spine with a very small flange, its outer margin without ornamentation; a fourth spine, subequal in length to the outermost of the other three is borne subterminally on the outer margin.

*Fifth and sixth pereiopods* are represented by two protuberances on the genital segment; the first is situated on lateral margin one-quarter of distance from posterior angle and bears a single short plumose seta; the second is borne on the posterolateral angle as seen in ventral view and bears two plumose setae, the innermost much longer than the outer. Although visible in dorsal view, both protuberances are very small.

#### Male.

The male is smaller than the female (3.58mm–3.85mm in over-all body length). (As with the female the Wellington specimen is smaller, 2.46mm, and its other body measurements are also approximately two-thirds those of the Banks Peninsula males, and are not given below.) The pigment spots are similar in colour to those of the female but tend to be larger, and the plumose setae of the third and fourth pereiopods, and those of the anal laminae, may be pigmented.

*Carapace* similar in form to that of the female (2.34mm–2.64mm x 2.30mm–2.61mm). The anterior suckers are also similar (0.21mm–0.25mm in diameter).

*Fourth, freely articulated, thoracic segment* also similar in form to that of the female (0.25mm–0.26mm x 0.61mm–0.75mm).

*Genital segment* subovate, both lateral margins entire curves, two-fifths as long as carapace, a little wider than long at the mid-point, narrowing to half this width anteriorly and posteriorly (0.99mm–1.07mm x 1.17mm–1.19mm). The junction with the abdomen is much more distinct than in the female.

Abdomen much shorter than in the female, about one-fifth length of genital segment, much wider than long (0.15mm–0.19mm x 0.33mm–0.35mm).

*Anal laminae* similar in shape and ornamentation to those of the female and about the same size (0.12mm–0.14mm in length).

*First antenna* very similar in form and ornamentation to that of the female except that it possesses fewer terminal setae on the second joint.

*Second antenna* is two-jointed, the second joint half as long as first; first joint half as wide at base as long, narrowing slightly distally and bearing a protuberance, half as long as the joint is wide, distally on its inner margin. Second joint half as wide at base as long, dividing at its midpoint into two branches, both of which end in sharp points, the stouter of the two turning so that it may be closed against the protuberance on the first joint.

*First maxilla* as in the female except that the proximal portion is a little more slender, and the appendage is comparatively longer.

*Second maxilla* arises from a basal portion similar to that in the female but does not branch. Instead it curves slightly away from the midline and terminates in a sharp point.

Between the bases of the second antenna and the second maxilla there is a slender, sharp, anteriorly directed spine, about two-thirds as long as the maxilla. Medially on the base of this spine there is a seta which is about two-thirds the length of the spine.

*Mouth tube* is similar to that of the female.

*First maxilliped* as in the female but with the addition of a small distally directed spine, one-sixth the length of the second joint on which it is situated on the inner margin, one-third of the distance from the inner distal angle.

*Second maxilliped* as in the female except that the inner margin of the first joint bears medially a protuberance, half as long as the joint is wide, against which the second joint can close.

There is a large, sharp, anterolaterally directed spine arising from the ventral surface of the carapace between the bases of the maxillipeds and the mouth tube. It is as long as the mouth tube, and bears two small spines on its outer margin near the tip.



*First, second, third and fourth pereopods and sternal furca* all as in female.

*Fifth pereopod* situated on the lateral margin of the genital segment, one-fifth of the distance from the posterolateral angle; it is one-fifth the length of the genital segment, subrectangular, one-quarter as wide as long, and bears two long, plumose setae distally and a further short plumose seta just proximal to the outer distal angle.

*Sixth pereopod* situated on the posterior margin of the genital segment beside the posterolateral angle; subovate, one-quarter length of genital segment, half as wide as long and bearing two small spines distally. The length of this structure is such that it extends to the distal end of the anal laminae even when it is directed postero-medially, as it normally seems to be.

#### DISCUSSION

Superficially this new species closely resembles *C. orientalis* Gussev, 1951, *C. brevis* Shiino, 1954, *C. calotomi* Shiino, 1954, *C. latigenitalis* Shiino, 1954, *C. punctatus* Shiino, 1955, *C. communis* Shen, 1957, and *C. aduncus* Shen, 1959, as it possesses, as do all these species from the seas about China and Japan, a large carapace, subrectangular genital segment and small one-segmented abdomen. However, it can be separated from these, and all other species of *Caligus* so far described, by the bifurcated nature of the second maxillae. The only other species of this genus in which an appendage of similar appearance occurs is *C. alatus* Heegaard, 1943, and Heegaard states that in this case the appearance is caused by a spine at its base and is not a true bifurcation.

Although the simple spinelike state of the second maxilla is normally included as one of the generic characters of *Caligus* the author does not suggest that the present material belongs to a new genus. The other characters usually associated with the genus *Caligus*—e.g., the anterior suckers and the form of the pereopods are all clearly shown by the present specimens. Therefore it seems proper to regard the present species of *Caligus* as illustrating part of a range of variation in the form of the 2nd maxilla, similar to the variation in the form of the 2nd maxilla which occurs in the closely related genus *Lepeophtheirus*.

The male of this species *C. büchlerae* is readily distinguished since, although it lacks the bifurcate maxilla of the female, it possesses unusual spines beside the mouth parts and unusually well developed fifth and sixth pereopods, which make it very easy to identify.

The Wellington specimens are two-thirds the size of those taken at Banks Peninsula. Perhaps this reflects a physiological difference in the host, or that the species has reached the northern-most limit of its range and that it is a measure of the difference between the two localities in some ecological factor.

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