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NEW SPECIES OF PARASITIC
COPEPODS
FROM SOUTHERN AFRICA

BY

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WITH 2 PLATES



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Introductory

THE specimens which form the subject of the present paper were all obtained by Mr H. Skoog, the Conservator of the Natural History Museum at Gothenburg, Sweden, during an expedition to Cape Colony, South Africa, and Portuguese West Africa, or Angola, in 1912.

Although the material is rather limited, being contained in four vials, the collection is of much interest and value because it comes from a region where the parasitic copepods have received but little attention. It will not be surprising, therefore, that the specimens in each vial prove to be a new species, and it is a matter of congratulation that two of these species are represented by both sexes.

The specimens are deposited in the Gothenburg Museum, where they will serve as types of the new species. They are all excellently preserved.

Argulus alexandrensis, New Species.

Pl. 1, figs. 1—5.

Host and record of specimens. Two specimens, both males, were taken from the outside surface of a *Zeus* species, apparently identical with the well-known *Z. jaber*, at Port Alexander, Portuguese West Africa, Sept. 26, 1912. One of these is a little smaller than the other, but both appear to be fully developed.

Specific characters of the male. Carapace somewhat obovate, its posterior lobes broadly rounded and not quite reaching the abdomen. Cephalic area large and broadly triangular; eyes large, far forward and widely separated. Respiratory tracts two in each

lateral area, separated by a short interval, the anterior one nearly circular, the posterior one oblong and somewhat curved. Abdomen oval, about twice as long as wide; the posterior sinus cut nearly to the center, narrow triangular in shape, with the tiny anal laminae basal; the posterior lobes long and rather sharply pointed.

The first antennae have a tiny claw on the anterior margin of the basal joint, a very stout and strongly curved claw on the lateral margin and a small spine on the posterior margin. The two terminal joints project beyond the tip of the lateral claw and are sparsely armed with setae. The second antennae are close behind the first pair and nearly twice as long. Each consists of four joints, the three terminal ones heavily armed with setae at their outer ends. The basal joint carries a spine on its posterior margin and there are two accessory spines, one behind the other, inside of the base of the joint on the ventral surface of the head. The sucking disks are each about one-fourth of the width of the carapace, and are placed so far forward that their anterior margins are on a level with the eyes. The ribs supporting the flexible margins of these disks are each made up of ten segments, all about the same length, but those at the base and tip narrower than the ones in the center.

The mouth tube is long and narrow and reaches to the base of the accessory spines between the maxillipeds. The latter are of medium size; the roughened plate on the basal joint is exceptionally wide and prominent. The three teeth on its posterior margin are asymmetrical; the inner one is long, narrow, pointed and somewhat curved, the middle one is short, narrow and squarely truncated at its tip, while the outer one is a flattened lamina, wider than long, and has the shape of a truncated pyramid.

The third joint has a wide roughened area along its anterior margin and across its distal end. The fourth joint is tipped with three curved claws, diminishing in size from in front backwards.

The testes occupy the entire base of the comparatively large abdomen and are fused across the midline. Of the secondary sexual characters the basal joints of the fourth legs are very small and practically destitute of lobes. The peg at the anterior distal corner of the terminal joint is in the form of a spherical knob, which projects nearly its entire length. The pocket on the posterior margin of the third legs occupies nearly the full width of the joint, but projects only a little; none of the other legs are modified.

Color (preserved material) a light orange-yellow, the eye black,

the outlines of the respiratory areas and testes slightly tinged with brown, and a few brown dots on the dorsal and ventral surfaces of the abdomen, above and below the testes.

Total length 5 mm. Abdomen 1.75 mm. long, 1 mm. wide (*alexandrensis*, Port Alexander where the specimens were found).

Remarks. This species resembles *A. alosae* GOULD and *A. arcassonensis* CUENOT, but differs specifically from them both. From *alosae* it differs in the shape of the carapace and abdomen. In the size and shape of the respiratory areas, in the shape of the roughened plate on the basal joint of the maxillipeds and of the spines along its posterior margin, in the design of the supporting ribs of the margins of the sucking disks, and in the width of the last thoracic segment and in its overlapping the abdomen.

From *arcassonensis* it differs markedly in color, showing no black pigment whatever, in the size and shape of the testes and of the secondary sexual characters on the fourth legs, in the length of the posterior sinus of the carapace, and in the design of the supporting ribs of the margins of the sucking disks. And both the host and the locality are entirely new.

It is unfortunate that no female specimens were found, but since the males of both *alosae* and *arcassonensis* are known the above comparison is perfectly valid.

Of the twelve African species thus far known ten have been obtained from fresh-water hosts and two from the ocean. The first of the latter to be discovered was *giganteus*, described by LUCAS in 1845 in his »Exploration scientifique de l'Algérie, Histoire Naturelle des Animaux Articulés, Première partie, Crustacés», p. 83; pl. 8, fig. 9. The second salt-water species was *melita* described by P. J. VAN BENEDEN in Bulletins de l'Académie royale de Belgique, 3e série, tome XXII, no. 11, p. 369; unnumbered plate. This was taken from a species of shark caught in the Bay of Dakar on the Atlantic coast of Senegal. The present is the third oceanic species and was obtained farther down on the Atlantic coast of Portuguese West Africa.

In locating the species it has been necessary to choose between the key published by the present author in 1903 in Proceedings U. S. National Museum, vol. 25, p. 701 and a substitute key, for African species only, proposed by CUNNINGTON in 1913 in Proceedings Zoological Society, London, p. 265. This was accompanied by criticisms of the original key which practically condemned it as use-

less. Some of his criticisms were excellent and are worthy of being incorporated in any key, but with all due respect the others seem trivial and without foundation.

For example, he stated »Again, while it is easy in extreme cases to point out forms in which the carapace lobes overlap, or do not reach the abdomen, it is virtually impossible to distinguish accurately those with the carapace lobes just reaching the abdomen.« In other words, with three groups in which to locate a specimen, while it is easy to tell whether or not it belongs in two of them, »it is virtually impossible to distinguish accurately« the third group. If this criticism were really valid, it does not seem to have occurred to Cunnington that it would apply with equal force to his substitute key. He made two divisions, the first with a carapace »about as long as broad« and the second with a carapace »distinctly longer than broad«. The logical third division, when discovered, will possess a carapace distinctly broader than long. But it does not seem any easier to distinguish a species whose carapace is about as long as broad than it does to recognize one whose carapace lobes just reach the abdomen.

Another criticism was as follows: »A key in which in so many cases male and female specimens of the same species are separated under merely arbitrary standards falls very short of what is to be desired«. The original key included twenty-seven species and the male and female were separated in four of them, 15 percent of the whole. In the key which Cunnington substituted there were eight species and the male and female were separated in two of them, 25 percent of the whole. Judged by his own standard, therefore, the original key was nearly twice as satisfactory as his substitute.

But leaving this out of account, all keys are purely arbitrary, and one that did not separate the two sexes, when there are marked differences between them, would scarcely be serviceable.

Accordingly the original key is still retained, and the present species falls in the third group, where it is most closely related to *alosa*.

In a manuscript revision of the original key, including the fifty species described up to the present writing, it is found necessary to separate the sexes in ten species, but even this is only twenty percent of the whole. In addition, the few species wherein there is any real difficulty of choice have been placed in two groups, so that whichever choice is made will identify the species.

Achtheinus parvidens, New Species.

Pl. 1, figs. 6—12.

Host and record of specimens. Three females, two with egg strings and one in a development stage, were taken from the outside surface of *Acaecythias vulgaris* captured at Table bay, Cape Colony, South Africa, June 14, 1912.

Specific characters of the female. General form an elongated ellipse, about three times as long as wide. Carapace trapezoidal, widest across the posterior margin, somewhat narrowed anteriorly, with strongly convex sides. There is a shallow sinus between the frontal plates at the center of the anterior margin, while the posterior margin has a wide central lobe and narrow, bluntly rounded lateral lobes. The lateral areas are narrow and the transverse grooves are obliterated. The dorsal plates covering the fused second and third thorax segments have a combined width equal to that of the carapace, but are considerably narrowed at their bases, where they are fused across the midline. The plates of the fourth segment are also fused at their bases, their combined width is a little more than that of the preceding pair, they are nearly circular in outline, and their inner margins overlap. The genital segment is the same width as the carapace but is one-half longer, with nearly straight sides and well rounded posterior corners. The posterior sinus is broad and oval at its base, but its sides quickly come together and overlap. The egg strings are narrow and a little more than twice the length of the body.

The abdomen is one-jointed and diamond-shaped, about twice as wide as long, with a slit-like posterior sinus. The anal laminae are broad, strongly flattened and do not reach the posterior margin of the genital segment. Each is tipped with two small spines.

At the base of the abdomen on the ventral surface of the genital segment, is a rudimentary sixth segment, with a well marked lobe on either side. At the sides of the abdomen, attached to the ventral surface of the genital segment, is a pair of rudimentary fifth legs, each composed of a long conical process tipped with a single spine.

The two joints of the first antennae are about the same width and length, and are sparsely armed with setae. The terminal claw of the second antennae is rather slender, is curved in the form of a sickle, and is armed with minute teeth on the inner margin near the tip. The pad on the basal joint of the maxillipeds is large and

elliptical and the terminal claw is short and nearly straight. Opposite the claw is a process projecting backwards and inwards, and actually a little longer than the claw itself. The first four pairs of legs are biramose, the rami of the first three pairs three-jointed and of the fourth pair one-jointed, all armed with short spines instead of setae.

Color (preserved material) a straw yellow, tinged with brown over the ovaries and oviducts.

Total length 8 mm. Carapace 2.50 mm. long, 2.90 mm. wide. Genital segment 4 mm. long, 2.90 mm. wide. Egg strings 17 mm. long. (*parvidens*, short-toothed, alluding to the second antennae.)

Remarks. This new species resembles *A. pinguis* more than any of the others thus far described. But it may be readily distinguished by the narrowed bases of the dorsal plates and their fusion across the midline, by the fact that the genital segment is much longer than wide, by the overlapping of the posterior lobes, by the smallness of the teeth on the terminal claws of the second antennae, by the size of the process opposite the terminal claw of the maxillipeds and by the details of the swimming legs, especially the second and third pairs.

A. pinguis was taken from the fin of a sawfish off the Cape of Good Hope, while the present species was deeply buried in the skin of a shark.

Parabrachiella australis, New Species.

Pl. 2, figs. 16—23.

Host and record of specimens. Twenty females and ten males were taken from the gills of the hake *Merluccius capensis*, called locally »stockfish» at Cape Barracouta, Cape Colony, South Africa, April 27, 1912.

Specific characters of female. Body elongate and slender, the cephalothorax distinctly separated from the body and bent backward at an angle of forty-five degrees with the body axis. Thorax considerably flattened dorsoventrally and carrying four posterior processes, the two dorsal ones larger and longer than the two ventral. Egg strings as long as the body and attached above the ventral pair of posterior processes and between the bases of the dorsal pair. Eggs arranged in about eight longitudinal rows, with 55 or 60 eggs in each row. No distinct abdomen or genital process.

The head is covered dorsally with a tiny triangular carapace, whose anterior margin is squarely truncated. Across this margin extend the second antennae, which are biramose, the dorsal ramus one-jointed with a few minute spines, the ventral ramus two-jointed and unarmed.

The first maxillae are tripartite, the dorsal finger much smaller than the other two, which are about the same size. The palp is minute and is tipped with two setae. The second maxillae are short and entirely separate; each is fashioned at its tip into a sort of hand, made up of five lobes or finger processes. The bulla is between the two hands and is attached to what may be termed their palms.

Color (preserved material) a uniform orange-yellow.

Total length, including the posterior processes, 12.50 mm. Body 10 mm. long, 2 mm. wide. Egg strings 12 mm. long, 0.75 mm. in diameter.

Specific characters of male. Axis of head nearly at right angles with that of the body, the two fused and without any external traces of segmentation. Body strongly convex dorsally, flattened ventrally and tapered posteriorly, where it terminates in two minute conical anal laminae, inclined forward and ventrally.

First antennae stout and three-jointed, the basal joint with a large seta on the inner margin, the second joint with a minute seta on the outer margin, and the third joint tipped with a conical process. Second antennae biramose, the dorsal ramus ending in a wide rounded knob, the ventral ramus tipped with a stout curved claw and bearing two smaller claws posterior to its base. Maxillae like those of the female, maxillipeds a little stouter and with a stronger terminal claw.

Color (preserved material) orange yellow.

Total length 3.95 mm. Greatest diameter 2 mm.

(*australis*, southern, as coming from Cape Colony, Africa.)

Remarks. The genus *Parabrachiella* was established by the present author in the Proceedings of the U. S. National Museum, vol. 47, 1915, p. 713, to include KRØJER's *Brachiella rostrata* and HELLER's *Brachiella insidiosa*.

The present species corresponds exactly with the generic characters there established, but may be distinguished from *insidiosa* by the fact that the head of the female is not enlarged and rounded, the second maxillae are much shorter and have no minute appendages at their bases, the ventral posterior processes are relatively

three times as long, and the terminal claw of the maxilliped is shorter and stouter, and shuts in between two tubercles on the basal joint. The male is twice the size of the *insidiosa* male, the first antennae are much stouter, the terminal claw on the exopod of the second antennae is not dentate, and the first maxillae have three rami instead of only two.

The present species may be distinguished from *rostrata* by the possession of two pairs of posterior processes instead of only a single pair.

Chondracanthus stramineus, New Species.

Pl. 1, fig. 13:2, figs. 14-15.

Host and record of specimens. A single female with an attached male was obtained from the gills of *Merluccius capensis* together with the preceding species.

Specific characters of female. General body-form short and thickset, but appearing long and slender by reason of the lateral and posterior processes which are pressed closely to the sides of the body and extend backward parallel with the body axis. The head is elliptical, considerably longer than wide, with a short spine on either side at the posterior margin.

The first thorax segment is narrowed into quite a distinct neck, and is separated from the second segment by a well-defined groove. The first three thorax segments are separated from one another and from the rest of the body by well-defined grooves on the ventral surface and by poorly-defined ones on the dorsal surface. The first and second legs are biramose, the rami in the form of conical processes, neither jointed nor armed.

Behind the second legs a pair of processes arise from the ventral surface close to the midline and extend backward nearly to the tips of the posterior processes. These latter arise at the posterior corners of the body and extend straight backward above the egg strings and between the lateral processes, and are three-fourths as long as the body.

Running along the midline of the ventral surface of the thorax and terminating in a large knob at the posterior end is a thickened ridge or keel. This sends out branches on either side to the bases of the two posterior pairs of processes.

The abdomen is minute and two-jointed and terminates in a pair of small anal laminae, which are conical and destitute of setae.

Color (preserved material) a uniform straw-yellow, the egg strings with a darker brownish tinge.

Total length, including the posterior processes, 10.50 mm. Greatest width at the third thorax segment, 2.90 mm. Egg strings 11.50 mm. long.

(*stramineus*, straw-colored).

Specific characters of male. First and second thorax segments fused with the head, the resulting cephalothorax being strongly arched dorsally and nearly flat ventrally. Third and fourth thorax segments free and about the same size. Genital segment somewhat acorn-shaped, without lobes or appendages. Abdomen a short knob, terminating in a pair of long conical and acuminate anal laminae. First maxillae with a large basal joint, a small cutting blade devoid of teeth, and a minute palp. Second maxillae long and slender and tipped with a stout claw. Maxillipeds with a short and stout basal joint and a slender and strongly curved terminal claw.

Two pairs of rudimentary swimming legs, each uniramous and one-jointed, armed with tiny spines.

Color (preserved material) a uniform straw-yellow.

Total length 1.25 mm. Cephalothorax 0.85 mm. long, 0.50 mm. in greatest diameter.

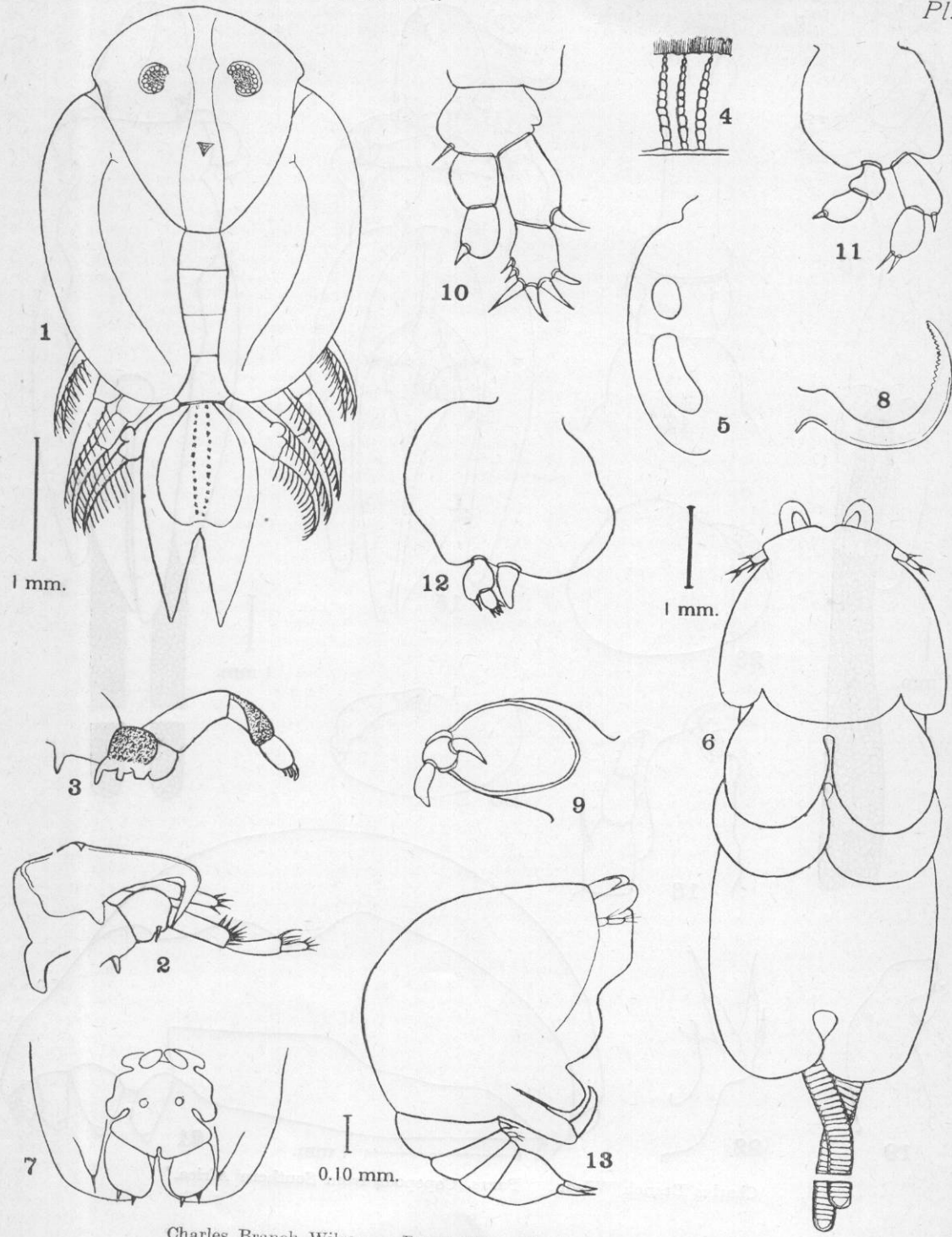
Remarks. Although there is but a single specimen of each sex and it does not seem wise to mutilate either of them in order to obtain the details of the mouth parts, the species is still clearly differentiated from all others by the general morphology of the body.

Its chief characters in the female are the small spines or horns on the sides of the head, the widely divergent rami of the second legs, the long and slender, undivided, lateral and posterior processes, and the peculiar keel on the midline of the ventral surface of the thorax, with the knob at its posterior end. In the male the curving of the body into a complete semicircle and the position and structure of the second antennae and the second maxillae are peculiar. This male is very similar to the male of *C. palpifer*, which was taken from a species of *Gadus* at Nanaimo, B. C.

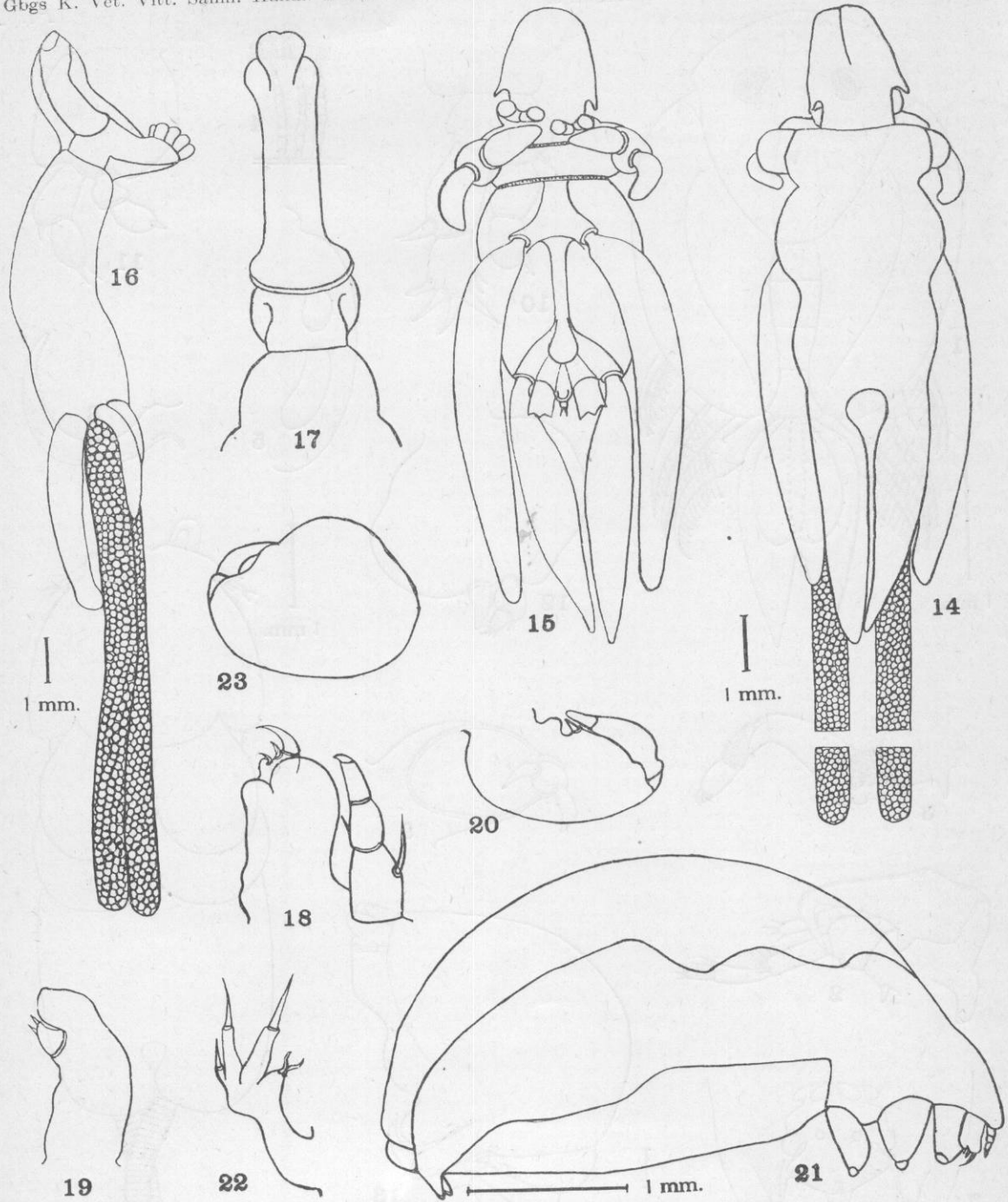
Explanation of the plates

Plate 1. Fig. 1. Dorsal view of male *Argulus alexandrensis*. Fig. 2. First and second antennae. Fig. 3. Maxilliped. Fig. 4. Three supporting ribs from the flexible margin of the sucking disks. Fig. 5. Respiratory areas. Fig. 6. Dorsal view of female *Achtheinus parvidens*. Fig. 7. Ventral view of posterior end of body, showing abdomen and partly differentiated sixth thorax segment. Fig. 8. Second antenna. Fig. 9. Maxilliped. Figs. 10—12. First, second and third swimming legs. Fig. 13. Side view of male *Chondracanthus stramineus*.

Plate 2. Fig. 14. Dorsal view of female *Chondracanthus stramineus*. Fig. 15. Ventral view of same. Fig. 16. Side view of female *Parabrachiella australis*. Fig. 17. Dorsal view of cephalothorax and anterior thorax. Fig. 18. First and second antennae of male. Fig. 19. Second antenna of female. Fig. 20. Maxilliped of female. Fig. 21. Side view of male. Fig. 22. First maxilla of same. Fig. 23. Maxilliped of same.



Charles Branch Wilson, Paras. Copepods from Southern Africa.



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