

2.—DESCRIPTION OF A NEW SPECIES OF PHREATOICUS (ISOPODA)
FROM SOUTH AFRICA.

(Plates XXIII. and XXIV.)

The tribe *Phreatoicidea*, Stebbing, was instituted to receive some peculiar Isopods resembling most nearly the *Asellota*, but differing from them in certain respects and possessing also an external likeness to the Amphipoda. It contains a single family, comprising, besides the typical genus with eight species, three other genera each with only one species.

The following is a list of all the hitherto known species.

TRIBE **PHREATOICIDEA**, Stebbing, 1893.

FAMILY PHREATOICIDAE, Chilton, 1891.

1. GEN. PHREATOICUS, Chilton, 1882.

1. *P. typicus*, Chilton, 1882. A blind species, from wells near Canterbury, New Zealand.
2. *P. australis*, Chilton, 1891. With eyes, from Mt. Kosciusko, 5,700 ft., Victoria, Australia.

Thompson, 1892, reported this species from Mt. Wellington, Tasmania, but subsequently (1894) referred his original specimen to the young of his species *P. tasmaniae*. Since then Smith, 1909, has recorded *P. australis* from several localities in Tasmania, from sea-level to the top of Mt. Wellington, 4,000 ft. According to the arrangement of spines on the uropods he distinguishes three varieties, to which, however, he does not give separate names.

3. *P. assimilis*, Chilton, 1894. Blind, from wells near Canterbury, New Zealand.
4. *P. tasmaniae*, Thomson, 1894. With eyes, from the Great Lake, 3,000 ft., Tasmania.

5. *P. shephardi*, Sayce, 1900a. Blind, from a surface spring at 2,000 ft., near Melbourne, Australia.
6. *P. kirkii*, Chilton, 1906. Blind, from fresh-water lagoon, New Zealand.
- 6a. *P. k.* var. *dunedinensis*, Chilton, 1906. Blind, from streams near Dunedin, New Zealand.
7. *P. spinosus*, G. Smith, 1909. With eyes, from the Great Lake, 3,000 ft., Tasmania.

This species is very similar to *P. tasmaniae*, especially as regards the telson and uropods. *P. tasmaniae* was described from a dried specimen, and Smith apparently has not seen this paper, since he quotes Thomson's record of *P. australis* from Mt. Wellington and makes no reference to Thomson's own correction in 1894. According to Thomson the young of *P. tasmaniae* differs from older specimens ($\frac{1}{2}$ inch) as regards the spines on the body, so that it is possible that *P. spinosus* (Smith gives its length as 15–25 mm.) is only a larger form of *P. tasmaniae*, though the 5th pleon segments differ.

8. *P. brevicaudatus*, G. Smith, 1909. With eyes, from the Great Lake, 3,000 ft., Tasmania.

2. GEN. PHREATOICOPSIS, Spencer and Hall, 1897.

1. *P. terricola*, Sp. and Hall, 1897. With eyes, burrowing in the banks of the Upper Gellibrand River, Victoria, Australia.

3. GEN. PHREATOICOIDES, Sayce, 1900.

1. *P. gracilis*, Sayce, 1900. Blind, from surface runnels, Gippsland, Victoria, Australia.

4. GEN. HYPsimETOPUS, Sayce, 1902.

1. *H. intrusor*, Sayce, 1902. Blind, in the burrows of the land-crayfish *Engaeus*, Tasmania.

From the above it will be seen that the family is distributed thus : New Zealand 3 species (1 genus) ; Australia 4 species (3 genera) ; and Tasmania 5 species (2 genera). Only one species is common to any two regions, namely, *P. australis* from Australia and Tasmania. The distribution of the family is thus a very narrow one. Sayce, 1902, remarks that it would be interesting to know

if any representatives were found in South America. The discovery of a species on Table Mountain, South Africa, is therefore of great interest, as being one more fact in support of the existence of an ancient land-mass connecting the Southern continents (Gondwanaland).

PHREATOICUS CAPENSIS, n. sp.

(Plates XXIII. and XXIV.)

Specific diagnosis. Body rather stout, surface with short scattered hairs, eyes well developed, head not as long as first and second peraeon segments together, first and second peraeon segments subequal in length, penultimate joint of first antenna as long as the preceding three joints together, second antenna four-sevenths of the total length, right mandible with secondary cutting-edge, sixth joint of first peraeopod (gnathopod) with the palm not well defined, fifth pleon segment as long as third and fourth together, with the posterior margin notched, pleopods 3-5 with epipodites, telson deeply concave above the terminal projection, lower margin straight, uropods not extending beyond end of telson.

Colour: Slaty-grey with lighter crescentic mottlings on sides of the peraeon and pleon; they are large on the anterior segments, but become smaller posteriorly.

Length: Up to 14 mm.

Habitat: Four specimens from near the reservoir on the top of Table Mountain (C. J. French, March 4, 1913). On May 1, 1913, Mr. S. H. Haughton and myself found numerous specimens under the moss growing on the stones in the bed of a swiftly running stream, near the reservoir at an altitude of about 3,000 ft. Several of them were pairing; the males are slightly larger than the females.

Prof. E. Goddard tells me he found the species some years ago on Table Mountain, but did not describe it. I have to express my thanks to him for permitting me to do this, and also for giving me Tasmanian specimens of *P. australis* for comparison.

The following detailed description is taken from the three largest specimens (11-14 mm.), 2 ♂♂ and 1 ♀; these specimens are in the South African Museum (No. A2257).

The *Body* is rather stout, the pleon long in proportion to the rest of the body. Using Sayce's method and reckoning the cephalon and peraeon as 100, then the pleon measures 70-75. The greatest depth of the pleon is equal to the breadth of the peraeon segments and a little more than twice their depth. The surface of the head

and anterior peraeon segments with irregular shallow depressions, which become obsolete on the posterior peraeon segments and pleon. Hairs on the peraeon and pleon short and scattered, most abundant on the 6th pleon segment.

The *Head* in profile is subtriangular, convex in front. Longer than the 1st peraeon segment but shorter than the 1st and 2nd segments together. Eyes well developed. Below the eyes is a small notch from which a groove runs backwards parallel with the inferior margin and defining the cheek. Frontal and inferior margins emarginate. Near the posterior margin is a groove running out to the rounded intero-posterior angle of the head.

The *Peraeon*. First segment rather closely attached to the head, a little longer in the centre than at the sides. Inferior angles rounded, not produced, inferior margin convex. Segments 2, 3, 4 nearly as long as and a little deeper than the first; inferior margins emarginate, infero-anterior angles rather pointed. Segments 5, 6, 7 a little deeper than the preceding ones; 5 and 6 a little shorter than 4, 7 half the length of 1. Inferior margins, especially of 5 and 6, excavate.

Epimera of segments 1-4 bilobed, the lobes rounded with a few hairs on each. Epimeron 1 nearly as long as its segment, epimera 2, 3, 4 distinctly shorter than their respective segments. Epimera 5, 6, 7 subtriangular, anterior angles rounded, posterior angles pointed, with a few hairs.

The *Pleon*. Its length (with telson) is twice its depth. Pleura well developed, concealing the pleopods in their natural position. Pleuron 1 nearly as deep as its segment, pleura 2, 3, 4 equal to or slightly longer than their respective segments, pleuron 5 nearly twice as long as its segment. Inferior margins rounded, beset with numerous hairs. Segment 1 not quite as long as peraeon segment 7, segments 2, 3, 4 gradually increasing in length; the fifth as long as the third and fourth together, posterior margin deeply notched where pleuron joins the segment; the sixth segment and telson together as long as the fourth and fifth together, infero-anterior angle rounded with 3 strong setae and a few hairs. No groove or ridge defining the junction of telson with the 6th pleon segment.

The *Telson* in profile is strongly convex above with a deep concavity above the terminal projection. This is bluntly tridentate with two strong spines and a few hairs; one strong spine in a slight notch on either side of the terminal projection and another strong spine further back and some little way within the inferior

margin. Inferior margin straight, both from below and from the side, fringed with hairs.

The *First Antenna* reaches to the middle of the 5th joint of peduncle of second antenna. Its peduncle consists of 3 joints: the first stout, the second subequal but narrower, the third a little longer and more slender than the second. Apices of each joint with setae. The flagellum equals in length the peduncle and consists of 5 joints, of which the first three are subequal in length and little more than half the length of the last joint of the peduncle; the fourth is as long as the three preceding ones together; the fifth minute. All the apices with fine hairs.

The *Second Antenna* reaches to the end of the peraeon and is four-sevenths of the total length. Peduncle of 5 joints; first two short and stout, next two longer and more slender and subequal in length; the fifth half as long again as fourth. The flagellum is $2\frac{1}{2}$ times as long as the peduncle and consists of about 30 joints; the first is composed of 2 or 3 incompletely fused joints, the remaining joints become longer and more slender towards the end. Apices of all with fine setae, but without calceoli.

The *Upper Lip* is evenly rounded, with terminal and lateral patches of hairs. The epistome is notched in the centre of the anterior margin.

The *Mandibles*. The left mandible is of the normal form, main cutting-edge with 4 obliquely set teeth, inner cutting-edge (lacinia mobilis) with 3 teeth; both edges strongly chitinized. The right mandible is unusual in having also two cutting-edges; the outer with 4 teeth, the inner with 3, but the inner edge is less strongly chitinized than that in the left mandible, being quite pale in colour. First joint of the palp the shortest, third a little longer, second half as long again as first. Anterior margin of third joint with a thick fringe of stout and simple (not plumose) setae.

The *Lower Lip*. Lobes oblong, apically rounded, the outer margin oblique distally, straight towards the base. Outer margin distally with a dense fringe of long hairs, inner margin with shorter hairs.

The *First Maxilla* has the outer lobe gently curved, margins parallel, apex with 12-13 teeth, some of the inner ones being dentate. Inner lobe shorter and a little narrower, apex with 4 strongly plumose setae, and 2 which arise from the bases of the first and third plumose setae and are plumose only at the tips.

The *Second Maxilla* has the outer articulated lobe half as broad again as the inner; outer margins of both convex, extremities

obliquely truncated, the outer with 19, the inner with 15 long setae denticulated on their inner edges. Inner fixed lobe rounded at apex, with a number of fine setae, the innermost ones being plumose. Inner margin slightly concave with a thick row of simple setae.

The *Maxillipeds*. Epipodite almost rectangular, very slightly longer than broad, the angles rounded, reaching to end of the second joint of exopodite. The basos a little more than twice as long as broad; ischios very short; meros produced externally for three-quarters the length of the carpus; carpus rather sunk in meros with external margin straight and internal margin convex; propodos ovate longer than broad; dactylos narrow lanceolate, as long as propodos. Endopodite arises from the basos and reaches to the middle of the carpus, bearing externally long plumose setae and internally 2 coupling spines.

The *First Peraeopod (Gnathopod)*. In the first as in all the legs the coxos is fused with the epimeron. The basos is twice as long as broad; ischios two-thirds length of basos and narrower; meros sub-triangular broader than long, anteriorly produced into a pointed process; carpus as long as broad, broader than third; propodos obovate, proximally twice as broad as distally, anterior margin evenly rounded, palm not well defined, slightly concave, beset with numerous setae and about 7 spines. These spines are tubercular in shape at the distal end, but towards the base of the palm gradually approximate to the ordinary form of setae, and eventually are indistinguishable from the setae fringing the base of the hand. The dactylos is strongly curved at the base, but distally nearly straight; a minute secondary unguis at base of the terminal one, and behind that some very minute denticulations.

The gnathopod of the female differs hardly at all from that of the male; the hand is equally developed and of the same form. The spines on the palm, however, are bicuspid and more slender.

The *Second and Third Peraeopods*. The basos is twice as long as broad; ischios two-thirds length of basos and also twice as long as broad; meros as long as ischios, subtriangular, anterior margin expanded distally; carpus a little shorter than meros; propodos as long as ischios; both the carpus and propodos have strong spines on the posterior margins; dactylos a little more than half the length of the propodos, with secondary unguis and an apical tuft of setae.

The *Fourth Peraeopod* is a little shorter than the preceding ones. The basos $2\frac{1}{2}$ times as long as broad; ischios two-thirds length of basos; meros a little shorter and expanded distally; carpus as long as meros, rather swollen, anterior margin with 3 apical setae and one further back, posterior margin with 6 very stout and long spines and a few finer setae; propodos a little longer than and at right angles to carpus, distal end prolonged externally beyond the articulation with the dactylos, anterior margin with an apical tuft and a few setae behind, posterior margin with 3 stout spines on a slightly convex palm and a few fine setae; dactylos shorter than and at right angles to propodos, curved, with secondary unguis, an outer apical tuft of setae and a few very fine ones on inner margin. The female differs from the male in the following points: the carpus is less swollen; the propodos more slender, the length being 3 times the breadth instead of twice; the dactylos less curved; the convex palm is hardly developed and the spines on both carpus and propodos are more slender.

The *Brood-pouches* in the female are developed on the 2nd, 3rd and 4th peraeon segments.

The *Fifth, Sixth and Seventh Peraeopods*. The fifth is slightly longer than the preceding ones and the sixth and seventh are longer than the fifth. They agree with each other except in the width of the basos; this in the 5th and 6th legs is one-half the length, in the 7th two-thirds. The ischios joint is three times as long as broad; the meros a little more than two-thirds the length of the ischios, with a distal prolongation on posterior margin; carpus joint nearly as long as ischios, its length nearly 4 times its breadth; propodos as long as carpus but more slender; dactylos half as long as propodos, with secondary unguis, apical tuft of setae and a few fine ones on the inner margin.

The setae of all the legs, but especially those of the last three pairs, are covered with numerous short-stalked Infusoria.

The *Male appendages* on the seventh peraeon segment are curved towards one another, not swollen at the base, with blunt apices and a few hairs, chiefly on the inner margin.

The *First Pleopod*. Protopodite rectangular; exopodite and endopodite lanceolate, the former rather narrower and more pointed than the latter, both with a few plumose setae on outer margins and apices.

The *Second Pleopod*. Protopodite subtriangular with 2 setae on its inner distal apex. First joint of exopodite produced proximally into a rounded lobe; both margins gently convex, the inner with

fine simple setae, the outer with plumose setae; apex oblique, scarcely hollowed to receive the second joint, which is more than twice as long as broad, with long plumose setae. Endopodite as long as first joint of exopodite, outer margin strongly curved, with a few setae becoming plumose distally, inner margin straight, apex rounded. These parts are similar in both sexes. The penial filament of the male extends to the end of the endopodite, with which it is fused for about one-half its length. The fused portion bears very minute hairs, the free portion on outer margin (*i.e.*, away from endopodite) small setae at regular distances apart, and becoming longer towards the apex, which is slightly bent over. In another specimen the penial filament is a little shorter than the endopodite with which only the basal third is fused.

The *Third Pleopod*. Protopodite triangular with internal apical tuft of setae. First joint of exopodite shorter and stouter than that of the second pleopod; length about $1\frac{1}{2}$ times its breadth, apex oblique and slightly hollowed to receive the second joint, which is $1\frac{1}{2}$ times as long as broad, obovate. Endopodite reaching to the middle of the second joint of exopodite, external margin very convex, inner straight. Epipodite subtriangular, external margin strongly rounded, inner slightly convex. Setae on the epipodite, inner and proximal portion of outer margin of 1st joint of exopodite simple, those on distal portion of the first joint and on the 2nd joint of exopodite and apex of endopodite plumose.

The *Fourth Pleopod* is very similar to the third, but apex of the 1st joint of exopodite is less oblique and more hollowed out for the 2nd joint, which is proportionately broader. Epipodite more semicircular in shape.

The *Fifth Pleopod*. First joint of exopodite larger than in any of the preceding pleopods, proximally rather bulging; breadth of the 2nd joint two-thirds its length. Endopodite does not reach the middle of the 2nd joint, and the inner margin is convex. Epipodite semicircular.

The *Uropods* reach to the end of the telson, but not beyond. Peduncle stout, twice as long as broad, grooved on its upper surface. Both of the upper margins with 3 spines and a few smaller setae, inferior margin with 4 spines increasing in length distally and shorter ones at the apex. Inner ramus a little longer than the peduncle, straight, upper margin with 3 spines in the middle and one near the apex, as well as a few small setae, lower margin with a small spine near the apex and 2-3 fine setae. Outer ramus not quite as long as peduncle, upper margin with 2 spines and a few

setae, lower margin with a small spine near the apex and 2-3 fine setae.

Affinities. As regards the shape of the telson this species bears most resemblance to *P. brevicaudatus*, except that the lower margin of the telson in the latter is convex and not straight as in the former. *P. capensis* is further distinguished by the notched 5th pleon segment and the longer second antennae, with a flagellum of 30 joints; that of *P. brevicaudatus* having only 19. A comparison with the mouth-parts and pleopods of *P. brevicaudatus* or *P. spinosus* is unfortunately impossible owing to the brevity of Smith's descriptions.

In the proportional length of pleon plus telson to cephalon plus peraeon *P. capensis* is near to *P. tasmaniae*, $\frac{7.0}{100} - \frac{7.5}{100}$ in both species; this proportion is a good deal higher than in any other species and is only exceeded in *P. spinosus*, where it is $\frac{9.0}{100}$. From *P. spinosus* *P. capensis* differs in having a notched 5th pleon segment, and from *P. tasmaniae* by the absence of a well-defined palm on gnathopod and in the shape of the ischios and meros of the maxillipeds; they agree, however, in having simple setae on the inner margin of the fixed lobe of the second maxillae.

The only other species which *P. capensis* somewhat resembles in the shape of the telson is *P. australis*; they agree also as regards the 1st and 2nd maxillae, the maxillipeds and the palm of the gnathopod. The differences are these: in *P. australis* the upper lip has no lateral as well as terminal patches of hairs, the epistome has an entire distal margin, the lower lip is slightly different in shape, the spine-row on the left mandible is far more conspicuous, the basos of the peraeopods is more expanded and the uropod has 2 very stout spines at the apex of the lower margin.

The most distinctive feature of *P. capensis* is the secondary cutting-edge in the right mandible. Hitherto the only member of the family in which this has been found is *Phreatoicopsis terricola*. In *Phreatoicus typicus*, *australis* and *assimilis* it is described as absent in the right mandible; in Tasmanian specimens of *australis* I have myself failed to find it. In the descriptions of the other species of *Phreatoicus* the right mandible has not been specially mentioned, so that it is possible that some or all of these species may be found to possess a secondary cutting-edge in the right as well as the left mandible.

P. capensis has no other characters in common with *Phreatoicopsis*, but agrees perfectly with *Phreatoicus*. It would, however, be interesting to know whether the penial filament on the 2nd

pleopod in *Phreatoicopsis* is free or fused in part with the endopodite. It is free in both *Phreatoicoides* and *Hypsimetopus*, but fused in *Phreatoicus*.

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