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A NEW CAVERNICOLOUS FRESHWATER CRAB FROM NEW GUINEA (CRUSTACEA DECAPODA)

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With 1 text-figure and 1 plate

Through the kindness of Mr. Philip Chapman of Culford, Bury St. Edmunds, Suffolk, it was made possible for me to examine a male and a female of a species of cavernicolous crab from the Western Highlands of Papua New Guinea, collected there by Mr. N. Plumley. The species proved to be new to science and its description is given below.

A recent revision of the New Guinea freshwater crabs (Bott, 1974) listed 13 certain and 3 dubious species from the island. These 13 species belong to 3 genera (*Rouxana* Bott, 1969: 5 species; *Geelvinkia* Bott, 1974: 3 species; and *Holthuisana* Bott, 1969: 5 species). The first two genera and the nominate subgenus of the third are confined to New Guinea. All three genera belong to the family Sundathelphusidae Bott, 1969. The new species is placed here in the genus (and subgenus) *Holthuisana*; it proves to be closest to *H. subconvexa* (Roux).

None of the known species of New Guinea freshwater crabs has ever been reported from caves and none shows any adaptation to subterranean life. The find of the present troglobitic species therefore is of special interest, and I am most grateful to Mr. Chapman for this material.

The drawing of pl. 1 is made by Mr. W. C. G. Gertenaar, staff artist of the Rijksmuseum van Natuurlijke Historie.

Holthuisana alba new species (text-fig. 1; pl. 1)

Askembutem Cave, Wok Askembu near Tabubil, West Sepik District, Papua New Guinea; in pools on a ledge at the bottom of the second vertical pitch; 14-15 October 1978; leg. N. Plumley, no. 76. — 1 ♂ holotype, 1 ♀ paratype.

Description of holotype male. — The carapace is high and distinctly convex in a longitudinal direction: the anterior part is curved down. Transversely

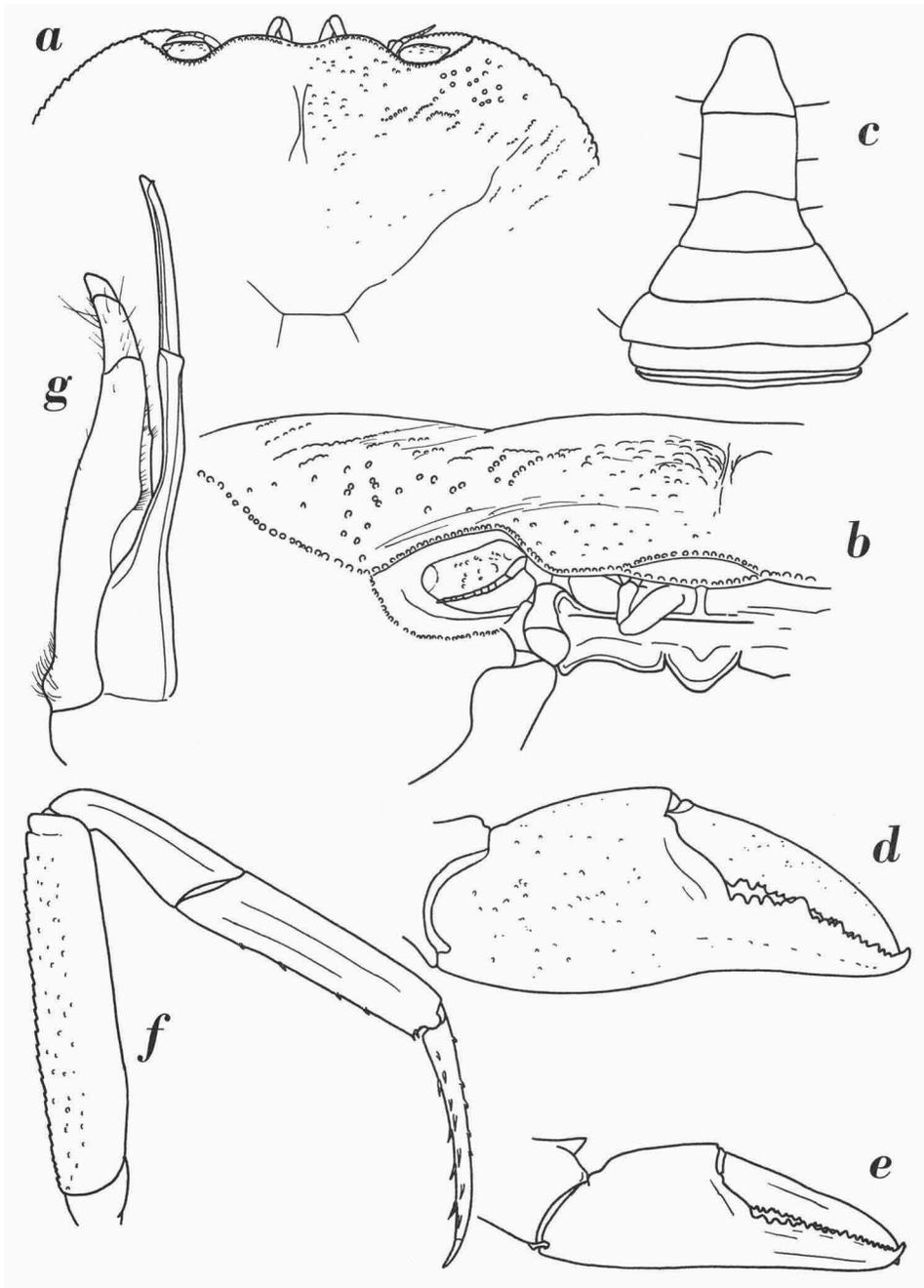


Fig. 1. *Holthuisana alba* new species, a, ♂, anterior part of carapace in dorsal view; b, ♂, front in anterior view; c, ♂, abdomen; d, ♂, larger chela; e, ♀, larger chela; f, ♀, fourth pereiopod; g, ♂, first and second gonopods. a, c-f, $\times 3$; b, $\times 6$; g, $\times 12$.

the carapace is only slightly convex. Its greatest width lies slightly before the end of the anterior third of the carapace. The anterior margin of the front is deeply emarginate in the middle, when viewed from above. It lies behind the arc formed by the anterolateral margins of the carapace. There is a distinct frontal triangle, which is directed down and somewhat backward, being visible only in oblique ventral view. The upper margin of the frontal triangle is distinct and sharp, it merges with the true anterior margin of the carapace. The triangle is slightly more than twice as wide as high. Its upper margin occupies less than half the width of the anterior margin of the front. The width of the front is $1/4$ of that of the carapace and half of the fronto-orbital width. The anterolateral angles of the front are broadly rounded and not forward produced; the lateral margins of the front merge gradually into the orbital margins, both are granular like the anterior frontal margin. The outer orbital angle is blunt; here the upper and lower orbital margins and the anterolateral margin of the carapace meet in one point. The orbit is directed slightly down laterally and is ovate in shape, being distinctly larger than the eyes. The anterolateral margin of the carapace is distinct and sharply carinate, it is minutely serrate; behind the widest part of the carapace the carina becomes entirely indistinct and disappears. It bears no epibranchial tooth, and even the epibranchial incision is hardly noticeable or absent. From the posterior part of the anterolateral margin curved rows of small granules curve inward onto the dorsal surface of the carapace. The posterolateral margin is broadly rounded and bears several of such transverse curved rows of granules. The posterior margin is about half as wide as the widest part of the carapace.

There is a faint indication of a postorbital ridge and of epigastric lobes. The carapace is slightly elevated at the level of the postorbital ridges and is somewhat roughened there by short grooves and granules, the latter sometimes being placed in short rows. A short but deep groove separates the epigastric lobes. Before the postorbital carinae the carapace shows a number of distinct but widely spaced granules. The H-shaped central groove of the carapace is distinct. A rather faint and interrupted cervical groove extends from this H-shaped groove anterolaterally, but it becomes obsolescent before reaching the anterolateral margin. The central part of the carapace behind the postorbital ridges has the surface smooth or slightly shagreened; laterally it is roughened by the transverse rows of granules.

The eyes are cone-shaped and much smaller than the orbit, which thereby is far from filled by them. No pigment is present at all. The cornea is strongly reduced and only barely visible at the tip of the cone-shaped eye as a small spot of a different structure from the rest of the eye. The exposed

surface of the eyestalk is remarkable by the presence of granules, pits and short hairs.

The antennulae fold transversely and the two fossae are separated by a thin sharply edged wall, which extends from the tip of the frontal triangle to the middle of the anterior margin of the epistome. The epistome is deeply sunken in the middle, showing a deep and rather wide transverse groove, which anteriorly is bordered by the ridge-like elevated anterior margin, which is straight and transverse. The posterior margin of the epistome consists of three parts: a median triangular ridge-like elevation pointing backward, and two lateral transverse ridges; the three parts are separated by deep incisions. The lateral ends of the epistome show some elevations and pits. The antennal peduncle forms the inner margin of the orbit, and the flagellum enters the orbit. The suborbital region is smooth, and, apart from a few scattered granules shows no ornamentation.

The distal segment of the mandibular palp is deeply bifurcate and of the *Gecarcinuoid* type.

The third maxillipeds fill the entire oral field, except for the efferent openings which are semicircular. The outer angle of the merus is rectangularly rounded. The merus is $\frac{3}{4}$ as long as wide and is about half as long as the ischium; it shows no groove. The ischium has a longitudinal groove slightly to the inside of its median line. The peduncle of the exopod is exposed, but the multi-articulated flagellum is hidden.

The chelipeds of the male are unequal; the right is the larger. Its fingers are somewhat longer than the palm and end in a sharp tip which is horn-coloured; the tips are crossing. The cutting edges of the fingers are slightly gaping proximally and carry distinct, but not very large teeth over their entire length. The teeth of the dactylus and those of the distal part of the cutting edge of the fixed finger are roughly alternatingly smaller and larger. The proximal five teeth of the fixed finger all are as large as, or slightly larger than, the largest of the other teeth. Both fingers are finely granular and show indistinct longitudinal grooves. The palm is slightly longer than high and somewhat swollen; it carries neither carinae nor spines, but shows some scattered very small tubercles which sometimes form indistinct transverse rows; there is no tubercle or swelling near the base of the fingers. The carpus is short and conical with a large triangular tooth on the inner surface; behind this large tooth there is a smaller two-topped tooth. The merus bears some granules and has the upper margin and the outer lower margin indistinctly serrate; no spines are present on any of the margins. The left first pereopod is more slender and smaller than the right. The fingers are distinctly longer than the palm, they are slender and close over

their entire length. The cutting edges are toothed over their full length, larger and smaller teeth are irregularly alternating. The palm is longer than high. The other segments are similar to those of the larger cheliped, but slenderer. The length of the chela is greater than the width of the carapace.

The walking legs are slender, but not excessively so. The second pereopod is about as long as the first. The dactylus is slender and shows four longitudinal ridges which carry spines; the spines of the upper ridges are distinctly shorter than those of the lower ridges. The propodus is as long as or slightly shorter than the dactylus, it bears a faint longitudinal ridge on either surface. The lower margin of the propodus bears two longitudinal rows of about 5 spines. The carpus measures about $\frac{3}{4}$ of the length of the propodus. The merus is about twice as long as the carpus and about 4 times as long as wide; the upper margin is irregularly serrate and does show a concavity just before the anterior end, but it bears no subdistal tooth. The second leg is the shortest walking leg, the fifth being slightly longer. The third and fourth legs are practically of equal length, and are distinctly longer than the other legs. The proportions of the various segments of the walking legs are practically the same, as is also the spination. The dactylus of the fifth leg, however, has the spines longer, especially those of the distal part of the upper margin, which are as long as the ventral spines. The spines on the propodus of legs 3 to 5 are smaller than those of the second leg. The merus of the third pereopod is slightly shorter than the carapace (about $\frac{7}{8}$).

The thoracic sternum of the male is smooth with scattered pits; a short transverse groove is present just before the tip of the appressed abdomen.

The male abdomen is somewhat T-shaped. The first segment is very short and wide, with a median transverse carina. The second segment is about twice as long as the first and slightly wider, it touches the coxae of the fifth pereopods. It, and the following segments, do not show any carina at all. The third segment at its base is somewhat wider than the second and narrows anteriorly, being trapezoid in shape; the posterior margin is about 1.3 times as wide as the anterior. The segment is slightly longer than the second and about 6 times as wide (at the base) as long. The fourth segment is about as long as the third and also narrows anteriorly, its basal width being about 1.3 times the distal width. The fifth segment is somewhat longer than the fourth and narrows slightly less strongly anteriorly; its lateral margins are very slightly concave. The sixth segment is the longest of the abdominal segments, being about 1.5 times as long as the fifth; it hardly at all narrows distally and its lateral margins are straight and practically parallel. The telson is as long as the sixth segment; it is triangular with a broadly rounded top, being slightly shorter than wide.

The first male gonopod is robust, straight, with the top curved somewhat outward. The distal two segments are firmly fused and the border between them is indistinct. The distal segment occupies less than $1/4$ of the total length of the gonopod; it ends in a corneous tubiform broad and truncate tip. The gonopod shows a deep groove on the inner surface for the reception of the second gonopod. The second gonopod is longer than the first, it is slender and straight. It ends in a thin, narrowly oval lobe which reaches beyond the opening of the duct. The distal segment is more than half as long as the preceding, and more slender. The proximal segment widens at the base.

Female. — The female resembles the male in about all respects. The chelipeds, although unequal, are relatively smaller and more slender than those of the male. The larger cheliped of the female (also the right in this specimen) resembles the smaller cheliped of the male. The carpus of this larger cheliped has the tooth behind the large inner tooth of the carpus quite sharp and distinct, followed by two low teeth. In the smaller female cheliped there are three rather small teeth behind the larger tooth of the carpus.

The female abdomen is very wide and reaches practically to the coxae of the second to fifth pereopods. The segments become gradually longer distally; the first to the fifth become gradually wider, the abdomen being widest at the line separating the 4th and 5th segments. The sixth segment and the telson together form almost a semicircle. The female openings on the sternite of the third pereopod are large and almost circular.

Size. — The carapace of the male is 21 mm long and 26 mm wide; in the female these measurements are 22 mm and 27 mm respectively.

Types. — The male is the holotype, the female the paratype. They form part of the collection of the Rijksmuseum van Natuurlijke Historie, Leiden under nos. Crust. D.32301 (holotype), and 32302 (paratype).

Colour. — The colour of the preserved specimens is uniformly yellowish white, without any trace of pigment. In life the animals are whitish transparent.

Remarks. — The shape of the distal segment of the mandibular palp shows clearly that the present species belongs in Bott's (1970: 22) Parathelphusoidea which more correctly should be named Gecarcinucoidea (see Holthuis, 1979: 25). The presence of a distinct frontal triangle makes that it should be assigned either to the Parathelphusidae or the Sundathelphusidae as defined by Bott (1970: 62, 95). The shape of the frontal triangle of the present species agrees better with the description of that organ in the Parathelphusidae as given by Bott (1970: 95) than with the one of Sunda-

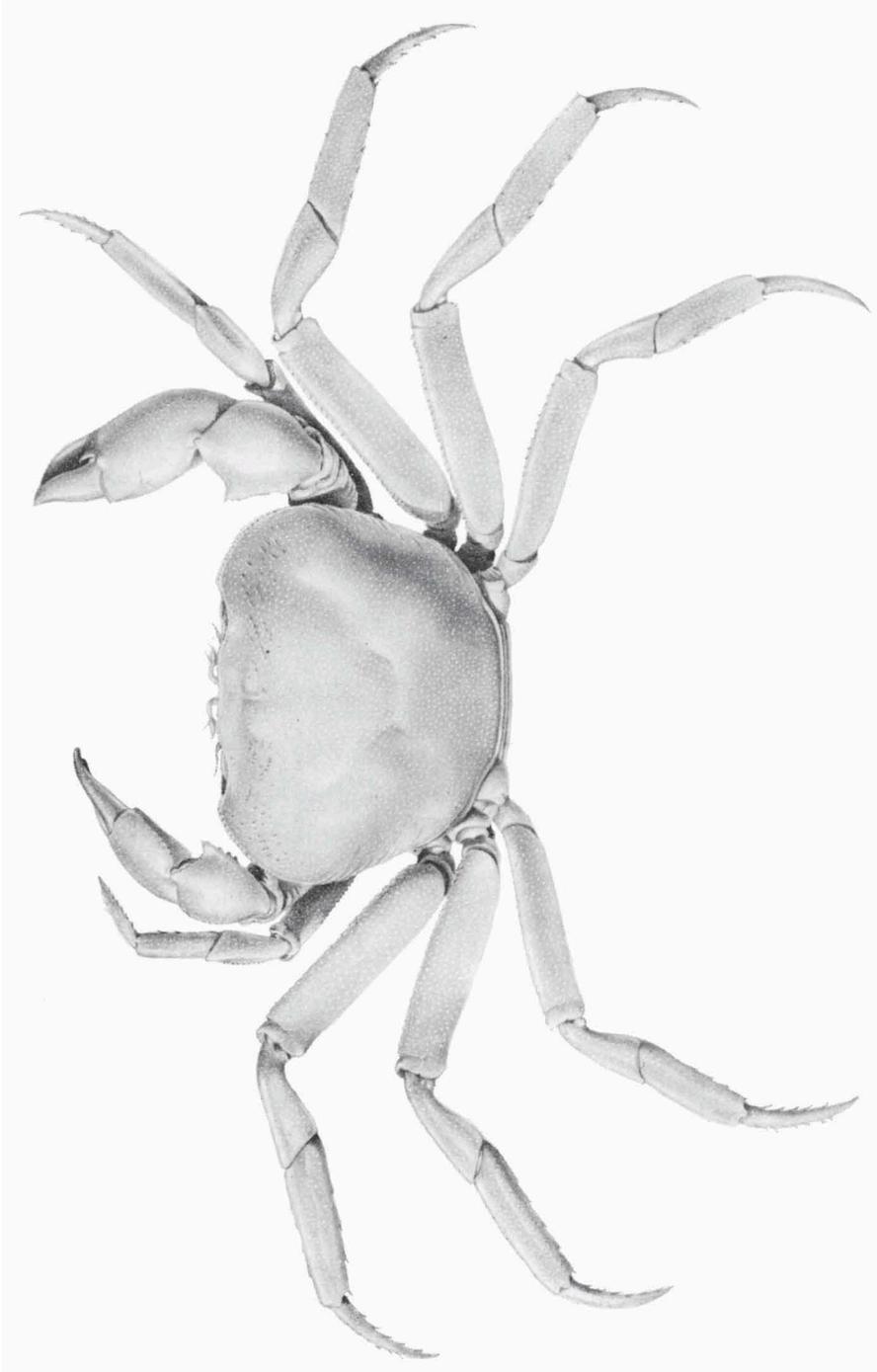
thelphusidae (Bott, 1970: 62), while also the first gonopod shows much resemblance to that of some Parathelphusids. However, the absence of an epibranchial tooth and of anterolateral teeth, and a comparison with specimens of the genus *Holthuisana* shows that the New Guinea cave crab should be placed among the Sundathelphusidae and in the latter genus. *Holthuisana* is one of the three genera of New Guinea freshwater crabs, all three belong to the family Sundathelphusidae. Bott (1974) revised these genera (*Rouxana* Bott, 1969, *Geelvinkia* Bott, 1974, and *Holthuisana* Bott, 1969) in his monographic treatment of the New Guinea freshwater crabs. The facts that in the new species the first male gonopod is curved outward, evenly narrowed distally and does not have the last segment distinctly separated from the preceding, while the frontal triangle has a distinct upper margin, show that it is a species of *Holthuisana* as defined by Bott; it differs in these characters from the other two genera. Among the species of *Holthuisana*, *H. alba* resembles closest *H. subconvexa* (Roux, 1927), but it differs by having the upper surface of the carapace roughened by tubercles and ridges, by the narrower frontal triangle, which is only about half as wide as the front, the more slender legs, the lack of a subdistal tooth on the upper margin of the merus of the walking legs, the unconstricted distal part of the male abdomen and the more robust first male gonopod. In its white colour and the reduced eyes *H. alba* differs from all species of Gecarcinucoidea known at present.

As just mentioned *Holthuisana alba* is the first white cavernicolous species of Gecarcinucoidea to become known, it is furthermore the second species of white and blind cave crab to be found in the Indo-West Pacific region, outside that region only four more troglobitic crabs are known. The five species of freshwater crabs that by the loss of sight, by the white colour and slender legs prove to have become fully adapted to life in subterranean waters are four species of Pseudothelphusoidea (*Trichodactylus mensabak* Cottarelli & Argano, 1977, and *Typhlopseudothelphusa mocinoi* Rioja, 1953, both from Mexico, and *T. juberthiei* Delamare Deboutteville, 1976, and *T. mitchelli* Delamare Deboutteville, 1976, both from Guatemala), and one species of Potamoidea (*Cerberusa caeca* Holthuis, 1979, from northern Sarawak, Borneo). The present species thus brings the total number of true troglobitic species among the freshwater crabs up to 6.

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Holthuisana alba new species, holotype ♂ in dorsal view. W. C. G. Gertenaar del.