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ON RED COLOURED SHRIMPS (DECAPODA, CARIDEA) FROM TROPICAL LAND-LOCKED SALTWATER POOLS

by

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In a number of widely separated places in the tropics, both in the Atlantic and in the Indo-West Pacific, bright red coloured caridean shrimps have been reported from a most peculiar habitat. This habitat is formed by salt water pools which are seemingly shut off from the sea and are often situated at a considerable distance from the shore; these pools, however, must have an underground connection with the sea as their water level falls and rises with the tides. In several instances the pools are in total darkness (in caves) or in semi-darkness.

Apart from this habitat and their red colour, the six species of shrimps so far observed in these pools have very little in common: they belong to 5 different genera and represent 3 different families. All of them seem to be restricted to this type of habitat. It is the object of this paper to bring together all the available information on these species so as to draw the attention to this curious phenomenon.

In the paragraphs "Material examined" the following abbreviations have been used to indicate the institutions where the material is deposited: I.R.S.M. = Institut de Recherches Scientifiques de Madagascar, Tananarive; R.M.N.H. = Rijksmuseum van Natuurlijke Historie, Leiden; U.S.N.M. = United States National Museum, Washington, D.C.

ATYIDAE

Halocaridina new genus

Definition. — Atyid prawns of small size. Rostrum unarmed. Carapace without supra-orbital, antennal or pterygostomian spines. Telson with two

pairs of dorsal spines. Eyes reduced, but with pigment. Carpus of both first and second cheliped deeply excavated anteriorly. Palm of chelipeds distinct. Exopods absent from all pereiopods. Pleurobranchs on pereiopods 1 to 4, no other branchiae present. First pleopod of male ending in a narrow appendix interna. Outer margin of uropodal exopod ending in a tooth, which at its inner side bears 1 or 2 movable spines; no other spines along the diaeresis.

In the reduced number of branchiae the present new genus resembles the group of *Limnocaridina, Limnocaridella, Atyella* and *Caridella*. From *Limnocaridina* and *Limnocaridella* it differs in the depressed shape of the rostrum, in the shape of the eyes, in that of the chelipeds and in the branchial formula. Also in *Atyella* and *Caridella* the rostrum is laterally compressed and the eyes well developed. In the former of these two genera the chelipeds have no palmar portion.

The type and only species known is *Halocaridina rubra* new species.

Halocaridina rubra new species (fig. 1)

Caridina brevirostris, Rathbun, 1906, p. 919, fig. 67; Edmondson, 1929, p. 4, fig. 1a, b; Edmondson, 1935, p. 16; Banner & Banner, 1960, p. 302 (not *Caridina brevirostris* Stimpson, 1860).

Material examined.

Puaka Bay, island of Hawaii, 5 miles south; 13 July 1902; "Albatross" Hawaiian Exploration. — about 20 specimens in poor condition (U.S.N.M. no. 31012).

Pohoiki, Lower Puna, island of Hawaii; 15 August 1924; Walter M. Giffard. — many specimens in poor condition (U.S.N.M. no. 58439).

Pool in the base of Lohena Rock, between the deserted villages of Wai-o-ahu-kini and Kaili-kii, W. of Ka Lae or South Point, Kau district, island of Hawaii; 5 December 1962; leg. W. H. Meinecke, don. A. H. Banner. — 21 specimens (R.M.N.H. no. Crust. D. 17994).

Description. — The rostrum is short and pointed, reaching about to the end of the basal segment of the antennular peduncle (sometimes falling somewhat short of it, sometimes slightly overreaching it). It is dorsoventrally depressed, being broadly triangular in dorsal view, very narrow in lateral view. It bears no teeth or spines at all. The lower orbital angle is blunt and bears no antennal spine. The pterygostomian angle is broadly rounded. The carapace bears no spines.

The abdomen is smooth. The pleura of the fourth and fifth somites have the posterior angle angularly rounded. The sixth somite is somewhat less than twice as long as the fifth, and slightly shorter than the telson. Both the posterolateral angle of the sixth somite and the process over the base of

the telson have the top bluntly rounded. The dorsal surface of the telson bears two pairs of spinules in its distal half; the posterior pair being about halfway the anterior pair and the posterior margin of the telson. This posterior margin is rounded and bears at each lateral end a spinule which is of about the same size as the dorsal spinules of the telson. Between these lateral spinules the posterior margin shows 7 long and strong spinules, the outer of which are longest, being about four times as long as the lateral spinule. The inner spinules are slightly shorter; the median may be very short or even absent.

The eyes are short and reach about to the middle of the basal segment of the antennular peduncle. They are broader than long, quadrangular, with a truncate anterior margin. The cornea is very small and is placed in the outer anterior corner of the eyestalk. Though small, it is distinctly pigmented.

The stylocerite is well developed and sharply pointed, it reaches the end of the basal segment of the antennular peduncle. Its outer margin shows a little notch just below the cornea. The second segment of the peduncle is much shorter than the first and slightly longer than the third.

The scaphocerite reaches beyond the antennular peduncle for a distance about equal to the length of the third peduncular segment. The outer margin of the scaphocerite is practically straight, or slightly concave and ends in a small tooth, which is distinctly overreached by the lamella. The antennal peduncle fails to reach the middle of the scaphocerite. A sharp spine is present on the antennal peduncle near the base of the scaphocerite.

The mandible is of the usual shape. The incisor process ends in several teeth; between it and the molar process the cutting edge bears a tuft of spinules. The molar process of one of the mandibles has the surface long and curved, fitting into the concave part of the molar process of the other mandible. The maxillula is of the normal shape, the lower endite is ovate, the upper bears several short spinules; the palp is well developed and ends in a narrow top. The maxilla too is normal: the lower endite is short and simple, the upper is deeply cleft; the palp is short and broad, with a narrow finger-like process at the outer distal end. The scaphognathite is well developed.

The first maxilliped has the exopod with a distinct caridean lobe; no epipod was seen. The palp is well developed. The two endites of the endopod are distinctly separated. The last two segments of the second maxilliped are totally fused. The exopod is long; the epipod is well developed. The third maxilliped overreaches the scaphocerite with part of the last segment. This segment ends in a double claw. The posterior margin bears some spines in the distal, numerous short spinules in the proximal part. It is distinctly longer

Fig. 1. *Halocaridina rubra* new species. a-c, holotype; d-p, paratypes. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, telson in dorsal view; d, e, mandibles; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, first pereiopod; l, second pereiopod; m, third pereiopod; n, fifth pereiopod; o, endopod of first pleopod of male; p, endopod of second pleopod of male. a-c, f-n, × 30; d, e, o, p, × 60.

than the penultimate segment. An exopod and an epipod are present. The branchial formula runs as follows:

	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	—	—	1	1	1	1	—
arthrobranchs	—	—	—	—	—	—	—	—
podobranchs	—	—	—	—	—	—	—	—
epipods	—	1	1	1	1	1	—	—
exopods	1	1	1	—	—	—	—	—

The first pereiopods reach about to the end of the antennal peduncle. The chelae are very short and heavy, being somewhat swollen. The fingers are about as long as or somewhat shorter than the palm and are stubby, at their tips there is the usual brush of hairs. The lower margin of the chela is slightly constricted near the base of the fixed finger. The carpus is about as long as the palm and very deeply excavated anteriorly. The merus is shorter than the palm and longer than the ischium. An epipod but no exopod is present. The second pereiopod is longer and reaches about to the end of the scaphocerite. Its chela is very similar to that of the first leg, but the carpus is distinctly longer, being far longer than the palm, though shorter than the entire chela; it too is deeply excavated anteriorly. The merus is shorter than either carpus or ischium. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus ends in a sharp point and bears about 5 teeth on the posterior margin. The propodus is between 3.5 and 4 times as long as the dactylus. It bears some spinules on the posterior margin. The carpus has about ¾ of the length of the propodus and bears no spines. The merus is about as long as the propodus and shows one to three strong movable spines near the posterior margin slightly before its middle. The ischium is short but bears a single strong movable spine. The fourth leg reaches about to the end of the scaphocerite and resembles the third. The fifth leg reaches about as far forwards as the fourth. Its dactylus bears about 25 comb-like arranged spinules on its posterior margin. The propodus is between 2.5 and 3 times as long as the dactylus, its posterior margin bears some spinules. The carpus is about half as long as the propodus. The merus is about ¾ as long as the propodus; it bears no spines. The ischium is half as long as the merus and has no spines either.

The endopod of the first pleopod of the male is ovate and ends in a very long and slender appendix which at its top bears a few retinacula. The second male pleopod has a well developed appendix masculina, which bears spines on the distal and inner margins; the appendix interna is very narrow and reaches far beyond the appendix masculina, it bears one retinaculum.

The protopod of the uropods ends in two sharp teeth, which are placed over the bases of the exo- and the endopod. The outer margin ends in a fixed tooth, which bears a slender spine (sometimes two) on its inner side. No other spines are placed on the diaeresis.

Size. — The specimens are about 7 to 14 mm in total length. Rathbun (1906) gave the length as 13.4 mm, Edmondson (1929) as up to about 15 mm. No ovigerous females have been reported.

Colour. — The Puaka Bay specimens are accompanied by a label stating their colour to be "vermillion", the Pohoiki specimens were said to be "scarlet vermillion". Also Edmondson (1929) gave the colour in life as vermilion.

Habitat. — The Puaka Bay specimens were "taken in small fresh or slightly brackish water pools in lava flow, near sea. The shrimps were found in some numbers on the rocks on the bottom of these pools". The Pohoiki specimens were found in "brackish water near sea level". The Lohena specimens were taken with *Metabetaeus lohena* Banner & Banner, 1960, at the type locality of the latter species (see p. 271). The animals seem to occur in rather great numbers in the pools in which they are found. Edmondson (1929) reported the species from "shallow pools on the elevated coral plain near the sea"; the same author later (Edmondson, 1935, p. 16) stated that the species inhabits "caverns in the coral plains near the seashore and has been found in old wells close to the sea."

Biology. — Banner & Banner (1960, p. 302) remarked that the species "is an herbivore evidently feeding upon the algae growing on the rocks of the pools and upon vegetable detritus falling into the pool. When undisturbed it settles in large numbers on rock surfaces, occasionally walking or swimming from rock to rock". As shown by the same authors the Alpheid *Metabetaeus lohena* Banner & Banner preys upon the atyid. Edmondson (1935, p. 16) stated that "both sea water and fresh water are fatal to the species, which requires an intermediate degree of salinity".

Distribution. — The species seems to be restricted to the Hawaiian Islands, and has been found there on the islands Hawaii and Oahu. Rathbun (1906) described the present specimens from Puaka Bay, Hawaii, while Banner & Banner (1960) reported on material from Lohena Rock, Hawaii, and stated that the species is "abundant in pools of subterranean origin about the Hawaiian Islands", without giving precise localities. Also Edmondson (1929, p. 4), though a little more specific ("specimens have been collected more recently from widely separated localities on Oahu and it is probable that the species inhabits all the larger islands of the Hawaiian group"), also is rather vague in his statement.

Remarks. — The species was first reported upon by Rathbun (1906), who dealt with the above mentioned Puaka Bay material. She identified the specimens with *Caridina brevirostris* Stimpson, a species described by Stimpson (1860, p. 29) from the "Loo Choo" (= Ryukyu) Islands. As shown by Kubo (1941, p. 304, figs. 1, 2) Stimpson's species is a true *Caridina* belonging to that section of the genus which Kubo has given independent generic status under the name *Neocaridina*. Edmondson (1929, p. 4, figs. 1a, b) mentioned the present species and figured the chelipeds. Banner & Banner (1906, p. 302) finally mentioned the occurrence of the species at the type locality of their new Alpheid *Metabetaeus lohena*. I take great pleasure in extending my best thanks to Dr. and Mrs. Banner for their extreme kindness to provide me with some very well preserved material of the present species from the pool near Lohena Rock. To Dr. Fenner A. Chace, Jr., of the Smithsonian Institution I am most grateful for his permission to study the Puaka Bay and Pohoiki specimens and thus to make certain the identity of Rathbun's (1906) material.

Antecaridina Edmondson, 1954

The genus contains but one species:

Antecaridina lauensis (Edmondson, 1935)

Mesocaris lauensis Edmondson, 1935, p. 13, fig. 4; Edmondson, 1935a, p. 4; Woltereck, 1937, p. 327; Holthuis, 1955, p. 25.
Antecaridina Edmondson, 1954, p. 368.
Antecaridina lauensis Holthuis, 1955, p. 25, fig. 8 d-f; Holthuis, 1956, p. 51; Delamare Debouteville, 1960, p. 645; Holthuis, in press.

Material examined.

Europa Island, W. of Madagascar; saline pool; June 1951; R. Paulian. — 12 specimens (I.R.S.M., and R.M.N.H. no. Crust. D. 18603).

Devil's Crack, Entedebir Island, Dahlak Archipelago, near Massawa, southern Red Sea; 15 March 1962; Israel South Red Sea Expedition, no. 1336. — 490 specimens (R.M.N.H. no. Crust. D. 18604).

An extensive description of this species, based on the above Europa Island specimens, is given by Holthuis (in press).

Size. — The specimens are 10 to 15 mm long. No ovigerous females are present in either of the above lots; none have been reported in the literature. Edmondson (1935) gave the size as 15.5 mm.

Colour. — The specimens from Entedebir were transparent when alive, with red chromatophores distributed over the entire body. These chromatophores are densest on the carapace and the tail fan. In expanded condition

they give the animal a bright red colour; when the chromatophores are contracted, the shrimps look almost colourless or yellowish; the yellowish colour being caused by the intestines of that colour. The distal part of the legs have no chromatophores, so that the chelae are colourless as well as the dactylus of the third pereiopod; in the fourth pereiopod the dactylus and part of the propodus, and in the fifth pereiopod the dactylus, propodus, and carpus are colourless. Edmondson (1935) stated the species to be "bright red in living state".

Habitat. — Edmondson's types came from two localities, the first, Numba cave is "65 feet high, the lowest 10 feet being filled with brackish water. The pool is 30 by 50 feet, its surface lying at sea level. The temperature of the water at the surface is 23.1 degrees Centigrade."; the second locality is an open salt lake "of considerable size and while somewhat remote from the sea is connected with it by subterranean channels" (Edmondson, 1935, p. 16). Dr. Paulian (in litt.) gave the following account of the pool on Europa Island where the shrimps were found: "Europa island is a small, low coral island ... Close to the meteorological station built on the island, there is a small depression in the coral, some 6 or 7 m long and about half as wide, very shallow, which is filled, partly by rain water drained from the neighbourhood, partly by sea water seeping through the coral rock (though the pool is at least 500 m from the sea shore). At least, the water was very strongly brackish when I collected the Atyids, and the level of the pool varies with the tide, rising and falling with it, though with some delay. There are a number of such pools on the island and the one in which the *Antecaridina* were collected was shaded by a few Casuarinas, which give only limited shade. Temperature was not as high as might be expected though the depth of the pood did not exceed 50 cm. No algae were visible. Some isopods were recovered with the Atyids ..." The so-called "Devil's Crack" on Entedebir Island, where the Israel Expedition found the species is a deep and narrow crack in the coral lime stone of the island at 80-150 m from the nearest seashore. The bottom of the crack contained a row of three pairs of shallow salty pools; the pools of each pair being surface-connected. The water level in the pools rose and fell with the tides. Because of the depth of the crack (about 5 meters) hardly any direct sunlight penetrated into the pools, two of which are even completely roofed over. The bottom of the pools showed a more or less extensive algal cover. The shrimps were numerous and sat on the rocky bottom of the pool, being clearly visible. An extensive account of Devil's Crack will be given by Steinitz (in press).

Distribution. — The species has a wide distribution in the Indo-West Pacific region, the three areas where it sofar has been found lying widely

apart. Apart from the two localities mentioned under "Material examined" the species has also been reported from Numbu Cave, Namuka Island, Lau Archipelago, Fiji Group (type locality) (Edmondson, 1935, 1935a), and from Wangava Island, Southern Lau Archipelago (Edmondson, 1935, 1935a).

ALPHEIDAE

Metabetaeus Borradaile, 1899

The present genus contains two species, both of which belong to the category of shrimps treated in this paper. No other species of the genus have sofar been reported.

Metabetaeus minutus (Whitelegge, 1897)

Betaeus minutus Whitelegge, 1897, p. 147, pl. 7 fig. 4 a, b; Anonymus, 1899, p. 518; Holthuis, 1955, p. 88.

Metabetaeus minutus Borradaile, 1899, p. 1014; Coutière, 1899, p. 375; Holthuis, 1955, p. 89, fig. 60 a; Banner, 1957, p. 193; Banner & Banner, 1960, p. 299, 301, fig. 2; Gressitt, 1961, p. 73.

Material examined.

Fakaofo Atoll, Tokelau Archipelago, 300 miles N. of Samoa, Pacific Ocean; brackish pond; 26 September 1958; M. Laird. — 4 specimens (R.M.N.H. no. Crust. D. 14352).

The present specimens agree quite well with the published accounts of the species.

Size. — The examined specimens are 9 to 12 mm long. Whitelegge's (1897) largest specimen measured 14 mm, that of Banner (1957) 17 mm. No ovigerous females have so far been reported.

Colour. — Whitelegge (1897, p. 148) described the colour as follows: "when alive the specimens were of a reddish-sand colour, in spirit the posterior two-thirds of the carapace is scarlet, the abdominal segments are also tinted on the upper surface with the same colour". Banner & Banner (1960, p. 301) stated the colour of this species to be similar to that of *M. lohena*, which they described as "a brilliant to a pale salmon red". Coutière (1899, p. 377), Banner (1957, p. 194) and Banner & Banner (1960, p. 301) described the presence of a distinct dark brown or black spot on the mandible, which is also present in my spirit specimens.

Habitat. — Whitelegge's (1897) specimens came from "under stones and in sponges in the mangrove swamp". Those reported upon by Banner (1957) came from a brackish pond, while Banner & Banner (1960, p. 302) reported the species from a pool "in a mangrove swamp; the base of this swamp was

an old reef flat, cut off from both the ocean and the lagoon by boulder and sand ramparts, and through the coral platform flowed definitely brackish water, rising and lowering not only with the tide but also with rapid periodicity of the waves on the ocean reef. The water flowed in and out through a series of ragged holes, and it was in these holes that the shrimp hid, emerging to the surrounding pools when unmolested", the same authors reported the species from a bomb crater in the center of Jabor Island, "the crater was almost dry at low tide and the shrimp were withdrawn into the holes of the coral at the base; but at high tide, when it was almost waist deep with brackish water, the shrimp emerged in great numbers". Gressitt's (1961) specimens, which were at least partly the same as those of Banner & Banner (1960) were found "in mangrove pond". The specimens collected at Fakaofo Atoll by Dr. Laird were found in a brackish pond with pH 8.0 and temperature 27° C.

Biology. — Banner & Banner (1960) considered the animals not carnivorous, they were never seen attacking other shrimp; when settling on human skin they gave the sensation of rasping rather than pinching the skin.

Distribution. — The species seems to have a fairly restricted distribution in the central Pacific. So far it is known from the following localities: Malel Island, Arno Atoll, Marshall Archipelago (Banner, 1957), Medyado (= Mejatto) and Jabor Islands, Jaluit Atoll, Marshall Archipelago (Banner & Banner, 1960; Gressitt, 1961), Imroj Island, Jaluit Atoll (Gressitt, 1961), Funafuti Atoll, Ellice Archipelago (Whitelegge, 1897; Borradaile, 1899; Anonymus, 1899; Coutière, 1899), Fakaofo, Tokelau Archipelago (present paper).

Metabetaeus lohena Banner & Banner, 1960

Metabetaeus lohena Banner & Banner, 1960, p. 299, fig. 1; Banner & Banner, 1962, p. 239.

A second species of *Metabetaeus* was very recently described. I have not seen material of it.

Size. — The type specimen, an ovigerous female, measured 16.6 mm.

Colour. — Banner & Banner (1960, p. 301) stated the colour in life to be "a brilliant to a pale salmon red, with the black mandibular spot conspicuous".

Habitat. — Banner & Banner (1960, p. 299) described the habitat as "a pool in the base of . . . a rock perhaps a hundred or more feet in diameter surrounded by the boulders of an a'a lava flow; in its base are several fissures, one of which is a cave about 30 ft. long, 10 or 12 ft. wide at the mouth and 15-20 ft. high; the pool of brackish water is 4-6 ft. deep in the

bottom of the cave" and on pp. 301-302 stated: "while surface layers of the water in the undisturbed pond were almost fresh, the under layers were definitely brackish, and the level of the water in the pool changed with the tides".

Biology. — Banner & Banner (1960, p. 302) indicated that the species "usually hides in the rubble at the bottom of the pool, or in cracks in its side, and makes sudden forays to capture the atyid [*Halocaridina rubra*] in its long rapacious chelae. It carries the struggling atyid in its chelae towards its mouth and disappears again into a hiding place, presumably to eat its prey".

Distribution. — So far the species is only known from the type locality, a pool in a cave near Lohena Rock immediately west of South Point, Hawaii Island, Hawaiian Archipelago.

Remarks. — The type material of this species was destroyed during a fire in the Hawaiian Marine Laboratory, Coconut Island, Oahu (Banner & Banner, 1962).

HIPPOLYTIDAE

Ligur Sarato, 1885

The genus *Ligur* contains at present two species. The type species is *Ligur ensiferus* (Risso) a deep-sea form inhabiting the Mediterranean. The other species is dealt with here.

Ligur uveae (Borradaile, 1899)

Parhippolyte uveae Borradaile, 1899a, p. 414, pl. 38 fig. 11; Holthuis, 1955, p. 99.
Ligur uveae Kemp, 1914, p. 123; Borradaile, 1917, p. 401; Gordon, 1936, p. 102, fig. 1; Holthuis, 1947, pp. 7, 32.
Long-whiskered Prawn Marden, 1958, p. 555, 2 figs.

Material examined.

Halmahera, northern Moluccas, Indonesia; 1862; H. A. Bernstein. — 6 specimens (R.M.N.H. no. Crust. D. 3764).

The specimens agree well with the descriptions of the species given in the literature.

Size. — The above Halmahera specimens are 45 to 51 mm long. The size of the species reported in the literature varies between 86 and 110 mm. Ovigerous females were reported by Borradaile (1899a) and Gordon (1936).

Colour. — "Being in nature of a rose-red colour" (Gordon, 1936, p. 107). Beautiful colour pictures of the species have been published by Marden (1958); these show the animals to be orange red, lighter in the anterior part of the abdominal somites, and with an irregular lighter spot in the centre

of the carapace; the legs also show lighter and darker parts; the flagella are reddish in their basal parts, white over the rest of their lengths.

Habitat. — "It is found [in Fiji] in land-locked pools of salt water shut off from the sea by coral rocks, through which, however, there is sufficiently rapid seepage to render the water level in the pools influenced by the rise and fall of tides" (Gordon, 1936, p. 107). Marden (1958, p. 555) gave a picture of the saltwater pool at Vatulele, Fiji.

Distribution. — The species inhabits a relatively wide area in the Indo-West Pacific region. It is known from the following localities: Aldabra, western Indian Ocean (Borradaile, 1917; Gordon, 1936), western Indian Ocean (Gordon, 1936), Halmahera, Moluccas (Holthuis, 1947), Uvea, Loyalty Islands (Borradaile, 1899a; Gordon, 1936), Vatulele Island, Fiji Archipelago (Gordon, 1936; Marden, 1958), Vanua Vatu and Vanau Levu Islands, Fiji Archipelago (Gordon, 1936).

Remarks. — Both Gordon (1936) and Marden (1958) remark that the prawn is considered sacred at Vatulele Island and that its catching is taboo there.

Barbouria Rathbun, 1912

This genus, which is monotypic, is closely related to *Ligur* Sarato, in fact the only important difference between *Barbouria* and *Ligur* is that in the former genus the arthrobranchs, which are present at the bases of the first four pereiopods in *Ligur*, are entirely absent.

Barbouria cubensis (Von Martens, 1872) (fig. 2)

Hippolyte Cubensis Von Martens, 1872, p. 136, pl. 5 fig. 14.
?*Hippolysmata cubensis* Kingsley, 1878, p. 89.
Hippolysmata cubensis Kingsley, 1878a, p. 56.
Barbouria poeyi Rathbun, 1912, p. 455, pls. 2-5; Sánchez Roig, 1916, p. 184; Kemp, 1924, p. 45; Wolf, 1934, p. 102; De Lattin, 1939, p. 31; Chace, 1943, pp. 30, 33; Barbour, 1945, p. 194; Rioja, 1953, p. 294; Jaume, 1954, p. 1500; Holthuis, 1955, p. 99; Holthuis, 1955a, p. 209; Hemming, 1957, p. 133.
Barbouria poegi Spandl, 1926, p. 89.
Barbouria poey Spandl, 1926, p. 140.
Barbouria Poeyi Chappuis, 1927, pp. 88, 90; Jeannel, 1943, p. 267.
Barbouria cubensis Holthuis, 1947, pp. 7, 33; Chace, 1954, p. 323; Holthuis, 1955, p. 99, fig. 67; Holthuis, 1956, p. 63; Nicholas, 1962, p. 173.

Material examined.

Cave near the seashore, between Morro Castle and Cojimar, Havana Province, Cuba; 10 March 1912; leg. T. Barbour; syntype of *Barbouria poeyi* Rathbun; don. U.S.N.M. — 1 specimen (R.M.N.H. no. Crust. D. 4771).

0.5 miles E. of Cojimar River, near Cojimar, Havana Province, Cuba; 1954; M. L. Jaume; don. U.S.N.M. — 6 specimens (R.M.N.H. no. Crust. D. 15330).

Description. — The present species shows so much resemblance to the species of the genus *Ligur* and especially to *Ligur uveae*, that I at first thought Rathbun's species to belong to that genus. The absence of arthrobranchs at the bases of the first four pereiopods, however, at once shows

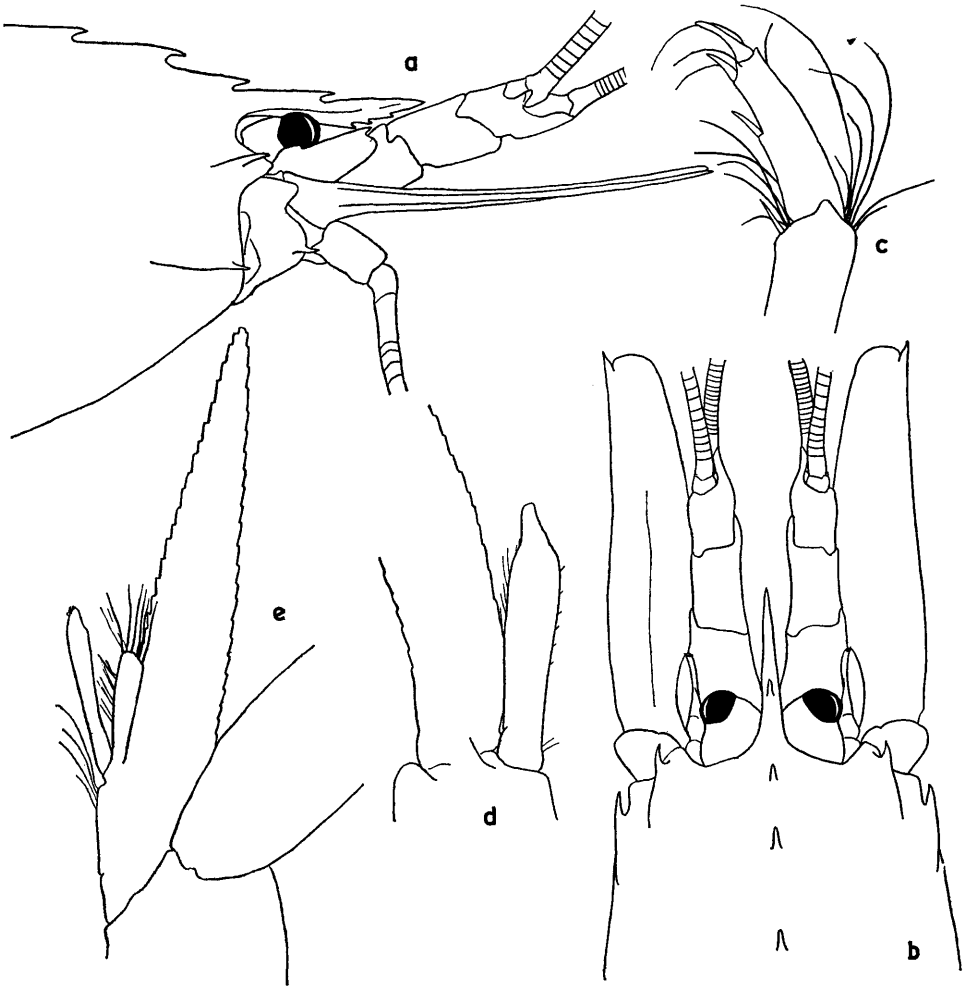

Fig. 2. *Barbouria cubensis* (Von Martens), syntype of *Barbouria poeyi* Rathbun. a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, dactylus of third pereiopod; d, endopod of first pleopod of male; e, endopod of second pleopod of male. a, b, × 7; c, × 50; d, e, × 20.

that this species and *Ligur uveae* are generically different. Like in *Ligur uveae* the antennal spine does not reach the anterior margin of the carapace, which just before this spine is produced to a rounded lobe, also the branchiostegal spine is separated from the anterior border of the carapace, its apex, however, just reaches that border. Furthermore both antennal and branchiostegal spines continue posteriorly in a horizontal carina. The carapace is smooth. The rostrum is short and fails to reach the end of the second segment of the antennular peduncle, dorsally it bears 4 teeth, the first three of which are placed behind the orbit. The first is placed at $^2/_3$ of the length of the carapace from the posterior margin of the carapace, the four teeth are regularly spaced, the fourth lies just midway between the posterior margin of the orbit and the tip of the rostrum. The lower margin of the rostrum bears three much smaller teeth, which are placed in the anterior half of the rostrum.

The abdomen is smooth, the pleura of the first four somites are rounded laterally; the pleura of the fifth somite end in a rather narrow point. The sixth somite is fully 1.5 times as long as the fifth. The pleura are very small and end in a sharp spine, the posterolateral angle of the somite ends in a pointed tooth. The telson is elongate, it is $^4/_3$ as long as the sixth abdominal somite. The dorsal surface of the telson bears two pairs of spines, the anterior of which is situated just anteriorly of the middle of the telson, the posterior pair lies midway between the anterior pair and the posterior margin of the telson. This posterior margin ends in a blunt apex and bears three pairs of spines. The outer spines are very short, the intermediate pair is strongest, and is about four times as long as the outer, while the inner pair is somewhat less than half as long as the intermediate.

The eyes have the cornea distinctly pigmented, but it is much narrower and shorter than the stalk. No ocellus is visible.

The antennular peduncle has the basal segment longest; the stylocerite is large, its inner margin is elevated to a sharp and high crest, this crest ends in a small but very distinct spine and bears a notch in the basal part. The second segment of the peduncle is shorter than the first, while the third is shorter than the second. There are two simple flagella.

The scaphocerite is very elongate and reaches with about $^1/_3$ of its length beyond the antennular peduncle.

For the oral parts I refer to Rathbun's (1912) description. The third maxilliped reaches with about $^1/_3$ of its length beyond the scaphocerite. The last segment measures $^3/_2$ of the length of the penultimate. The antepenultimate is about twice as long as the ultimate. The branchial formula of the present species is as follows:

branchiae	maxillipeds			pereiopods				
	1	2	3	1	2	3	4	5
pleurobranchs	—	—	1	1	1	1	1	1
arthrobranchs	—	—	—	—	—	—	—	—
podobranchs	—	1	—	—	—	—	—	—
epipods	1	1	1	1	1	1	1	—
exopods	1	1	1	—	—	—	—	—

The first pereiopod is short and thick-set, it fails to reach the end of the scaphocerite. The fingers are somewhat longer than the palm. The upper margin of the dactylus and the lower margin of the fixed finger are convex, the cutting edge is straight, entire, some dark brown small spines are present at the finger tips. The palm is broad and somewhat swollen. The carpus is slightly longer than the chela, the merus is about as long as the carpus. The second legs are slender, they reach with a small part of the carpus beyond the scaphocerite. The chela is very small, it has the fingers as long as the palm. The carpus is about six times as long as the chela and consists of 21 segments. The merus and the ischium combined have the same length as the carpus and chela combined. The merus and the ischium are subequal in length. The posterior margin of the ischium is provided with stiff curved hairs. The last three pereiopods are very slender and of about similar shape. The third leg reaches with the larger part of the carpus beyond the scaphocerite. The dactylus ends in a double claw, while a spine is present in the middle of the posterior margin. The propodus is 6 to 7 times as long as the dactylus and bears at its posterior margin some 5 spinules. The carpus is 1.3 to 1.5 times as long as the propodus, it is unarmed. The merus is much stronger than either propodus or carpus, and is 1.5 times as long as the latter segment, it bears about 7 strong spines at the posterior margin. The ischium is about $^1/_3$ of the length of the merus. In the fourth leg the propodus is about 10 times as long as the dactylus. The carpus measures $^4/_5$ of the length of the propodus, being thus, in contradistinction to the carpus of the third leg, shorter than the propodus. The merus is 1.5 times as long as the carpus. The ischium measures $^1/_3$ of the length of the merus. The fifth pereiopod reaches with the entire carpus beyond the scaphocerite. The propodus is 15 times as long as the dactylus; in the distal part of the posterior margin there are numerous closely packed spinules. The carpus is slightly more than half as long as the propodus. The merus is 1.3 times as long as the carpus, it bears only one posterior spine, which is placed in the distal portion. The ischium is half as long as the merus.

The endopod of the first pleopod of the male ends in a narrow top, which bears no hooks. In the second pleopod of the male the appendix masculina is

distinctly shorter than the appendix interna. The other pleopods are normal in shape. The uropods are slightly longer than the telson, they are elongate in shape. The outer margin of the exopod is straight, it ends in a small blunt tooth, which at its inner side bears a long movable spine.

Size. — The present specimens measure 36-40 mm. Von Martens (1872) gave the length as 44 mm, Rathbun (1912) as 42 mm. No ovigerous females have so far been reported.

Colour. — "In life they were a beautiful, translucent, crimson color, while the long antennae and the first pair of chelate appendages were pure white, contrasting strongly with the color of the body of the animal and the other legs" (Rathbun, 1912, p. 457). "Curious little red shrimps" which "had pure white tips to their walking appendages, making them appear as if they had stepped in white ink" (Barbour, 1945, p. 193). Jaume (1954, p. 1500) gave the species the vernacular name "camarón-rojo".

Habitat. — "A very deep cavern, almost full of clear, slightly brackish water, which we were told, fluctuated slightly with each tide" (Rathbun, 1912, p. 457); "a long wide-open area of bare rock. In this there was an open basin of clear water. We had evidently found a place where the roof of a small cave had fallen in and as a result it was possible to see far down into the water, which was crystal clear... Everywhere curious little red shrimps were to be seen" (Barbour, 1945, p. 193). "Una pequeña "casimba" cuya extensión no es mayor de cinco metros, la cual está situada a unos 80 o 100 metros del mar, dentro de la manigua y como a medio kilómetro aproximadamente al Este del Rio Cojímar" (Jaume, 1954, p. 1500).

Distribution. — The species is only known from Cuba. The type locality is "Cuba", but Von Martens's material in all probability came from the same place as that dealt with by Rathbun (1912), viz., a cave named "Cueva de los Camarones", near the seashore between Morro Castle and Cojimar, some km W. of Rio Cojimar, near Habana. This locality is now lost as the cave has been dynamited in order to make it to a swimming pool (Chace, 1943, p. 33; Barbour, 1945, pp. 194, 195; Jaume, 1954). Jaume (1954, p. 1500), however, discovered the species at a second locality, namely a small hole at about 80 or 100 m from the sea at about half a km E. of Rio Cojimar, Cojimar, province of Habana. This new locality, however, is also threatened, this time by a new projected airport.

Remarks. — The present species was first described by Von Martens (1872) as *Hippolyte cubensis,* it later was placed by Kingsley in the genus *Hippolysmata.* In 1912 Rathbun described a new genus and species *Barbouria poeyi* from Cuba. When comparing Von Martens's description and figure with that of Rathbun, the identity of the two species is obvious. Per-

haps the specimens of both authors were even collected at the same locality: Von Martens in his preface, namely, stated that part of his material was collected by Felipe Poey, and the material described by Rathbun was collected by Thomas Barbour, whose attention to the exact locality was drawn by manuscript notes of Poey's. Rathbun (1912) gave a description of the present species, with many photographs of the various parts of the body.

When comparing the characters of the present genus with those of the other Hippolytid genera it becomes evident that it differs from all except from *Ligur*, with which genus it agrees in almost every detail. So for instance the mandible does not possess an incisor-process, but is provided with a distinct palp. In most genera the palp is missing, when the incisor process is absent, only *Ligur, Nauticaris* and one species of *Alope* (*A. orientalis* (De Man)) have the palp and lack the incisor-process. *Barbouria* differs from *Alope* by the absence of supraorbital spines and by the multiarticulate carpus of the second pereiopod, from *Nauticaris* it differs by the absence of a movable tooth at the base of the uropods. In other characters like the shape of the mandibular palp, with the long last joint, the long and slender legs, the multiarticulate carpus of the second pereiopods and the arrangement of the antennal and branchiostegal spines on the carapace, there is the closest resemblance between *Ligur* and *Barbouria*.

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