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and species of cavernicolous shrimp from Mexico  
(Crustacea Decapoda, Palaemonidae)

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*BITHYNOPS LUSCUS*, A NEW GENUS AND SPECIES  
OF CAVERNICOLOUS SHRIMP FROM MEXICO  
(CRUSTACEA DECAPODA, PALAEMONIDAE)

RIASSUNTO. — L'Autore descrive *Bithynops luscus*, nuovo genere e nuova specie di Crostacei Decapodi Palaemonidi, raccolti dalla II spedizione zoologica lincea in Messico nella Grutas de l'Arco, presso La Trinitaria, nello stato del Chiapas. Il nuovo genere, per ora rappresentato soltanto da questa specie cavernicola, è affine ai generi *Macrobrachium* e *Cryphiops*.

From February to April 1971 the "Spedizione Zoologica Messico-1971" of the Istituto di Zoologia dell'Università degli Studi di Roma, inspired by prof. Pasquale Pasquini, and sponsored by the Accademia Nazionale dei Lincei of Roma, explored a number of caves in Mexico and Guatemala. In a cave in the Mexican State Chiapas a peculiar palaemonid shrimp was discovered. The species, which shows adaptations to subterranean life, proved to be new and to belong to an undescribed genus. The present note provides a description of this highly interesting form.

I wish to express my gratitude to dr. Valerio Sbordoni of the Istituto di Zoologia for entrusting me with the material of this species and for the information on its habitat and habits that he provided me with.

The abbreviation cl. is used for carapace length.

**Bithynops** new genus

DEFINITION: A genus of Palaemoninae with the rostrum well developed, toothed dorsally and ventrally. The carapace has antennal, but no supra-orbital, hepatic, branchiostegal, or pterygostomial spines. The telson has two pairs of dorsal and two pairs of posterior spines; the posterior margin between the inner spines bears numerous setae. The eyes have the cornea reduced, but present. The mandible bears a three-segmented palp. The second maxilliped is provided with a podobranch, the third with a pleurobranch. The second pereopods are very robust and are spinulate. The third to fifth pereopods have the dactylus simple.

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Appendices internac are present on the endopods of the second to fifth pleopods, there is no appendix on the first. The male has a slender appendix masculina on the second pleopod. The uropods are of the normal type.

TYPE SPECIES: *Bithynops luscus* new species.

The new genus is very closely related to *Macrobrachium* and *Cryphiops*, resembling these two genera in the stocky body form, the presence of a three-segmented mandibular palp, the heavy and spinulate second perciopods and the short and simple dactyli of the last three pereopods. *Bithynops* resembles *Cryphiops* and differs from *Macrobrachium* in the total absence of a hepatic spine. From *Cryphiops* it differs by the poorly developed eyes, by the second legs which are equal and show no sexual dimorphism and by the smooth last three perciopods, which, apart from the spinules along the posterior margin of the propodus, show no spinules at all.

#### ***Bithynops luscus* new species**

Grutas de l'Arco, near San Raphael de l'Arco, La Trinitaria (about 16° 10' N 92° 01' W), Chiapas State, Mexico, altitude 1470 m, Atlantic drainage, 21 February 1971, leg. R. Argano, 1 ovigerous female, cl. 19 mm. Same locality, 7 March 1971, leg. R. Argano, V. Sbordoni and A. Zullini, 32 specimens (including 8 ovigerous females, cl. 18–25 mm) cl. 7–25 mm.

#### DESCRIPTION.

The rostrum fails to reach the end of the antennular peduncle. It is rather high, with the midrib close to the lower margin. The upper margin bears 5 or 6 regularly distributed teeth; the posterior of these teeth stands over or slightly behind the posterior limit of the orbit. The lower rostral margin bears a single tooth and is provided with many long soft hairs; sometimes this tooth is absent. The lower angle of the orbit is bluntly rounded. The antennal spine is distinct and placed a short distance below the orbital angle. There is no trace of either hepatic or branchiostegal spine, not even in the juveniles. The anterolateral angle of the carapace is broadly rounded without a pterygostomial spine. The branchiostegal suture is very short and placed slightly below the antennal spine. The carapace shows in the lower anterior half a distinct longitudinal hepatic groove, which slopes slightly down posteriorly, and anteriorly is directed toward the antennal spine; it is very sharp and deep, but stops at a considerable distance behind the antennal spine. A less conspicuous branchiocardiac groove is present as well as a short longitudinal depression somewhat behind the orbit. The integument of the carapace and abdomen, apart from scattered shallow pits, is smooth.

The pleura of the first four abdominal somites are rounded, that of the fifth ends in a sharp angle. The sixth somite is longer than the fifth but 3/4

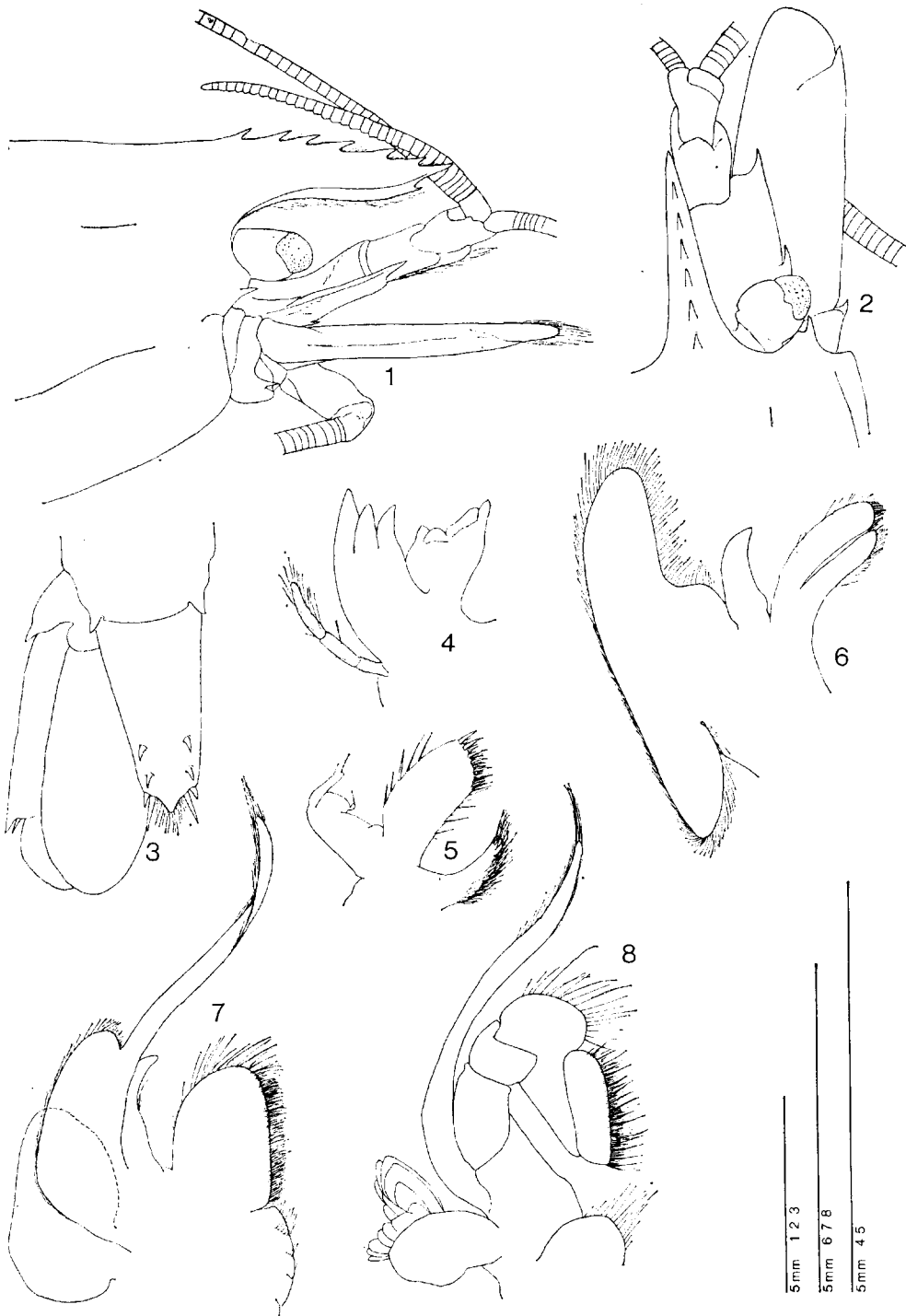


Fig. 1.

*Bythinops luscus* new species. 1) anterior part of body in lateral view; 2) anterior part of right side of body in dorsal view; 3) telson and left uropod in dorsal view; 4) mandible; 5) maxillula; 6) maxilla; 7) first maxilliped; 8) second maxilliped.

1-3, 9, 10, 13, 14  $\times$  12; 4, 5, 15, 16  $\times$  25; 6-8  $\times$  20; 11, 12  $\times$  6; 17  $\times$  50.

as long as the telson. Its pleuron is sharply pointed, its posterolateral angle is triangular with an acute tip.

The telson is much shorter than the uropods. It has two dorsal pairs of spines, both of which are placed in the distal third. The posterior pair lies much closer to the posterior margin of the telson than to the anterior pair. The posterior margin ends in a sharp median tooth and carries two pairs of spines, the outer are very short, the inner more than twice as long as the outer. Between the inner spines there are numerous feathered setae.

The eyes are reduced. The cornea is distinctly shorter and somewhat narrower than the stalk, and in the specimens examined, is rather weakly pigmented. The eyes reach somewhat beyond the middle of the basal segment of the antennular peduncle.

The stylocerite is short and sharp. The lower inner margin of the basal segment of the antennular peduncle shows a sharp, rather broad spine in about the middle of its length. The outer margin of this basal segment is produced forwards and ends in a sharp tooth, which reaches distinctly beyond the middle of the second segment. The second segment is about as long as, but distinctly wider than the third. The two branches of the upper antennular flagellum are fused for about 7 segments. The free part of the shorter branch is three to four times as long as the fused part; the inner margin of this free branch is serrated.

The scaphocerite reaches somewhat beyond the antennular peduncle. It is  $2\frac{1}{2}$  times as long as wide. The outer margin is slightly convex and ends in a strong tooth which fails by far to reach the end of the broadly rounded lamella. The antennal peduncle fails to reach the middle of the lamella. A strong spine is present on the antennal peduncle near the base of the scaphocerite.

The mandible has the incisor process ending in three large and strong teeth. The molar process shows some bluntly rounded teeth. A well developed three-segmented palp is present.

The maxillula has the lower endite slender and curved, it narrows gradually towards the top. The upper lacinia is broader and distally truncated. The palp is bilobed distally, the upper lobe is elongate and slender, the lower is triangular and ends in a small rounded knob which bears a short bristle.

The maxilla has the endite deeply cleft, showing two slender laciniae. The palp is short and blunt, the scaphognathite is well developed.

The maxillipeds are all provided with well developed exopods, those of the third maxilliped being smallest. The first maxilliped has the two endites separated by a deep incision, the lower endite reaches slightly beyond the upper. The palp is elongate and slender. The caridean lobe is well developed and rather broad. The epipod is oval and undivided.

The second maxilliped has the last segment attached to the penultimate with its longer margin. It is of the usual shape. An epipod and a well developed podobranch are present.

The third maxilliped reaches beyond the rostrum but fails to attain the end of the antennular peduncle. The ultimate and penultimate segments are of about equal length; the antepenultimate segment is distinctly longer than either. The exopod reaches almost to the distal end of the antepenultimate segment. An epipod and a pleurobranch are present.

The branchial formula is as follows:

	Maxillipeds			Pereiopods				
	1	2	3	1	2	3	4	5
<i>pleurobranchs</i> . . . . .	—	—	1	1	1	1	1	1
<i>arthrobranchs</i> . . . . .	—	—	—	—	—	—	—	—
<i>podobranchs</i> . . . . .	—	1	—	—	—	—	—	—
<i>epipods</i> . . . . .	1	1	1	—	—	—	—	—
<i>exopods</i> . . . . .	1	1	1	—	—	—	—	—

The first pereiopod reaches with its chela (sometimes slightly more, sometimes less) beyond the scaphocerite. The fingers are longer than the palm. The carpus is about 1.5 times as long as the chela and slightly longer than the merus.

The second pereiopods are equal in size and shape and are very robust. They reach with part of the carpus beyond the scaphocerite. The segments are covered with short and rather sharp spinules. The fingers are about as long as the palm. The cutting edges are entire, except for two very small teeth in the extreme proximal part. The fingertips are strongly curved and crossing. The palm is more or less cylindrical as is also the carpus. The latter is slightly shorter than the palm and widens somewhat distally. The merus is about as long as the carpus and longer than the ischium.

The third leg reaches with the dactylus and a small part of the propodus beyond the scaphocerite. The dactylus is simple and measures about 2/5 of the length of the propodus. The propodus has the posterior margin provided with a row of about 8 evenly spaced spinules. The carpus is about 2/3 as long as the propodus. The merus is distinctly longer and wider than the propodus. The fourth leg resembles the third and reaches about to the end of the scaphocerite.

The fifth leg reaches about as far forward as the fourth. It is very similar to the previous two legs but is more slender. The dactylus is less than 1/3 of the length of the propodus. The propodus, apart from about 9 or 10 spinules on the posterior margin, bears a fringe of hairs in the distal part of that margin, which lacks in the previous legs. The carpus is more than twice as long as the dactylus. The merus is almost 1.5 times as long as the carpus.

The abdominal sternites of the males and non-ovigerous females bear a median spine, which, in the first and second somite especially, is rather wide and strong, being smaller and sharper in the following somites. In ovigerous females these spines are reduced or absent.

The first pleopod of the male has the endopod ovate with the inner margin concave, it is about half as long as the exopod and bears no appendages. The second male pleopod has the endopod slightly shorter than the exopod;

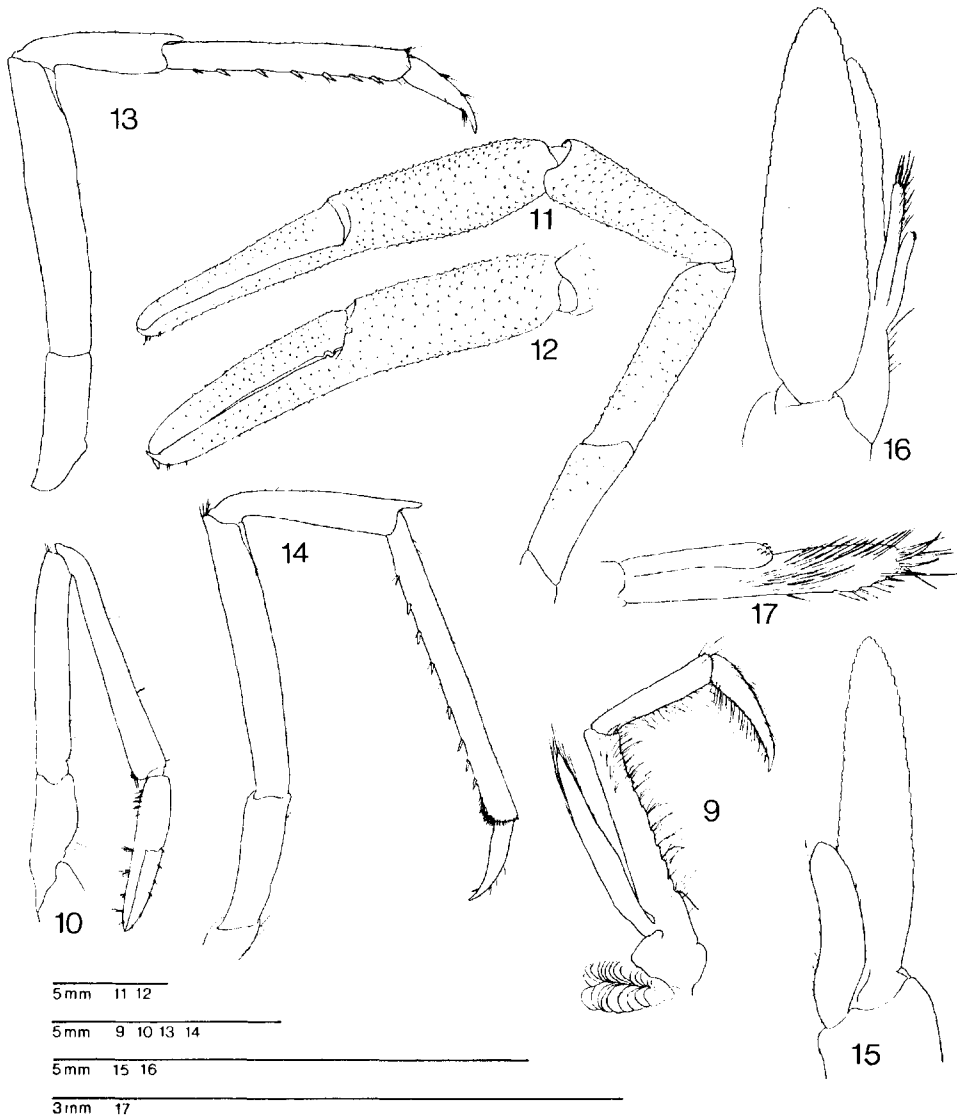


Fig. 2.

9) third maxilliped; 10) first pereopod; 11) second pereopod; 12) chela of second pereopod in lateral view; 13) third pereopod; 14) fifth pereopod; 15) first pleopod of male; 16) second pleopod of male; 17) appendices interna and masculina of second pleopod of male.

1-3, 9, 10, 13, 14  $\times 12$ ; 4, 5, 15, 16  $\times 25$ ; 6-8  $\times 20$ ; 11, 12,  $\times 6$ ; 17  $\times 50$ .



the appendix masculina is somewhat longer than the appendix interna, it is narrowly elongate and carries several long bristles distally.

The protopodite of the uropod ends in two dorsal lobes, the outer of which is pointed, the inner rounded. The outer margin of the exopod is straight, and ends in a large tooth which at its inner side shows a movable spinule. A diaeresis is present. The endopod is ovate and about as long as the exopod.

*Size.* The carapace length of the examined specimens varies between 7 and 25 mm. The largest male has the carapace length 23 mm, in ovigerous females this length varies between 18 and 25 mm. The eggs are rather few and large, their diameter is between 1.5 and 2.2 mm.

*Colour.* The shrimps, when alive, were observed by dr. Sbordoni to be transparent-whitish. As shown by a colour photograph, made in the cave, there is a slight reddish shine over the body, while the antennal flagella are also pale reddish or brownish. The cornea is deep black.

*Habitat.* All the shrimps were collected in a single cave, the Grutas de l'Arco, which is extensively described in the introduction to the present volume. (SBORDONI, ARGANO and ZULLINI, 1973). This cave is peculiar in that light enters through various little natural windows; in this way a considerable part of the cave receives some outside light. A small stream runs through the cave. Part of the course of this stream is epigeal. In the cave the stream is of various width and rapidity, its depth usually did not exceed 20 cm. In places it formed pools in which the water flowed very slowly, in other parts the water formed little rapids. Everywhere in the cave the water was quite clear.

The shrimps occurred throughout the aquatic habitat of the cave, except for a deep pool near the main entrance.

In the same habitat an epigeal crayfish was found, which also occurred in the outside part of the stream.

*Habits.* The shrimps were observed both walking on the bottom of the stream and swimming. Although they tried to avoid capture by swimming, they were rather easily caught. The individuals occurred in groups and were quite plentiful.

A small bivalve mollusk (as yet unidentified) proved to be very common in the cave and at some points the bottom of the stream was covered with their dead shells. The suggestion was made that the shrimp possibly fed on these Molluscs.

It is interesting to note that the eyes, although the cornea is reduced in size, seem to be fully functional. In this respect the species closely resembles *Macrobrachium cavernicola* (Kemp) from the Siju Cave in Assam (see KEMP, 1924: 42, pl. 3 figs. 1-4).

So far very few subterranean shrimps have been reported from Mexico: *Creaseria morleyi* (Creaser) (fam. Palaemonidae) and *Typhlatya pearsei* Creaser (fam. Atyidae) are both known from Yucatan only. Further there are two more Palaemonid shrimps reported from Mexican caves: *Macrobrachium*

*carcinus* (L.), an epigean species found in a cave in San Luis Potosi and an undescribed species of the genus *Troglocubanus* likewise found in San Luis Potosi (see REDDELL and MITCHELL, 1971: 143, REDDELL, 1971: 25, 26).

SUMMARY. — A new genus and species of Palaemonid shrimp, *Bithynops luscus*, is described from the Grutas de l'Arco, near La Trinitaria, Chiapas, Mexico. The new genus is closely related to *Macrobrachium* and *Cryphiops*.

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- SBORDONI V., R. ARGANO and A. ZULLINI (1973) — *Biological investigations on the caves of Chiapas (Mexico) and adjacent countries: Introduction*. In *Subterranean Fauna of Mexico, Part II*. « Quad. Accad. Naz. Lincei », 171, 5-45.

#### ADDENDUM

Since the submission of the manuscript of the present paper, Dr. HORTON H. HOBBS (1973, "Bull. Assoc. Mexican Cave Studies", 5, 25, figs. 1, 2) in a paper entitled "Three new troglobitic Decapod Crustaceans from Oaxaca, Mexico" published the description of a new Mexican cave Palaemonid. This shrimp was described as a new genus and species *Neopalaemon nahuatlus*, and was collected in Cueva del Guano, 10 km NE of Valle Nacional, in Oaxaca, Mexico. The genus *Neopalaemon* differs from *Bithynops* by the presence of a hepatic spine on the carapace, by the total absence of corneal elements and eye pigment, in having the mandibular palp two-segmented, and by the smooth second pereopods.