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Sezione: MISSIONI ED ESPLORAZIONI - I

SUBTERRANEAN FAUNA OF MEXICO

PART III

FURTHER RESULTS OF THE ITALIAN ZOOLOGICAL MISSIONS TO MEXICO,
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LIPKE B. HOLTHUIS (*)

CAVE SHRIMPS (CRUSTACEA DECAPODA, NATANTIA)
FROM MEXICO

RIASSUNTO. — L'Autore studia in questo lavoro i Decapodi Palemonidi ed Atyidi raccolti in Chiapas, Tabasco e Yucatán dai componenti della III spedizione biospeleologica italiana in Messico, ed in Tabasco, Yucatán e Quintana Roo dal Dr. HORST WILKENS dell'Università di Amburgo.

Vengono fatte considerazioni su *Typhlatya pearsei* CREASER, su *Bithynops luscus* HOLTHUIS e su *Creaseria morleyi* (CREASER). Viene ridescritta *Typhlatya mitchelli* HOBBS and HOBBS e sono poi descritte due nuove specie di Palemonidi: la prima *Bithynops perspicax* n. sp., raccolta in un cenote in Chiapas, è estremamente affine a *B. luscus* HOLTHUIS, e se ne distingue per lo sviluppo normale degli occhi; la seconda, *Macrobrachium acherontium* n. sp., raccolto nelle Grutas de Coconà ed in una cavità limitrofa, non presenta forti adattamenti morfologici alla vita in grotta.

Viene infine citato un esemplare immaturo di *Macrobrachium*, sul cui status tassonomico è difficile pronunciarsi senza conoscere gli adulti.

The present paper deals with two collections of subterranean shrimps of the families Palaemonidae and Atyidae, both made in Mexico. The first of these collections was brought together during the third Biospeological Expedition to Mexico of the Accademia Nazionale dei Lincei, organized by prof. P. PASQUINI and conducted by prof. R. ARGANO, V. SBORDONI and A. ZULLINI who, during 1973, explored several caves in the Mexican states of Chiapas, Tabasco and Yucatán. The second collection was made by Dr. HORST WILKENS of the Zoological Institute of the University of Hamburg, Germany, who in 1970 and 1975 studied the cave fauna in the states of Tabasco and Yucatán, and in the Territory of Quintana Roo.

Each collection contained 4 species; two species were represented in both collections so that the total number of species dealt with here amounts to 6. Of these two are new, and two were quite recently described.

REDDELL (1971 : 25, 26) in his enumeration of the Mexican cave fauna listed only 4 shrimps: 3 troglobionts and one troglonexene. In the following years new species were described in rapid succession and at present 11 troglobiont and one troglonexene species of shrimp are known from Mexico, in Yucatán alone there are four known troglobiont shrimp species. The 12 species

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known at present from Mexican caves belong to three families: Atyidae (3 troglobionts), Palaemonidae (7 troglobionts, 1 trogloxene), and Alpheidae (1 troglobiont). Only the first two families are represented in the present collections. The only known Mexican cave alpheid is *Alpheopsis stygicola* Hobbs, described by HOBBS (1973 a : 73, figs. 1, 2) from Oaxaca and so far only known from the types.

In a recent paper HOBBS and HOBBS (1976) gave a review of the 4 species of cave shrimps of Yucatán, with complete synonymy and distribution records. One of the species that HOBBS and HOBBS described as new, *Typhlatya mitchelli*, is also represented in the collection made by Dr. WILKENS. Before I was acquainted with HOBBS and HOBBS' paper a description and figures of Dr. WILKENS specimens were made; these are published here, as any additional information on this evidently rare species seemed to be worth while.

The abbreviation cl. is used here to indicate the carapace length of the specimens.

I want to express my deep gratitude to Drs. V. SBORDONI of Rome and H. WILKENS of Hamburg for entrusting me with the study of the shrimp collections made by them, and for the detailed data on the habitats, biology and colour of the animals collected.

A word of special thanks is due to Dr. HORTON H. HOBBS, JR., Smithsonian Institution, Washington, D.C. In the first place Dr. HOBBS allowed me to consult the manuscript of the 1976 paper by HOBBS and HOBBS before it was published and so prevented me from unnecessarily coining a junior synonym for *Typhlatya mitchelli*. Secondly, Dr. HOBBS most generously placed at my disposal all his material of *Macrobrachium acherontium*, a species which he himself had recognized as new, and allowed me to use these specimens for my description.

Atyidae

The family Atyidae is represented in Mexico by three troglobiont species, all three belonging to the genus *Typhlatya* and all three so far known only from Yucatán Peninsula. Two of these species are represented in the collections studied here, the third *Typhlatya campecheae* HOBBS and HOBBS, 1976, was recently described and is only known from the type locality in Campeche State.

***Typhlatya pearsei* CREASER, 1936 (fig. 1 k)**

For a complete synonymy I refer to HOBBS and HOBBS (1976: 10, figs. 5, 6).

Material examined:

Cueva Santa Elena, Telchac Puerto, Yucatán, near the north coast of Yucatán Peninsula; March 1975: H. WILKENS; 3 specimens.

Cueva de Hochtún, Hochtún, about 45 km E of Merida, Yucatán; March 1975; H. WILKENS; 3 specimens.

Cueva Coop, a cave 3 km west of the highway between Playa del Carmen and Felipe Carillo Puerto, near the village of Pamul, 120 km from Felipe Carillo Puerto, Territorio de Quintana Roo; March 1975; H. WILKENS; 1 specimen.

The specimens agree quite well with the published descriptions of the species. CREASER (1936: 129, fig. 38) showed the scaphocerite as an oval plate without tooth, but as pointed out by CHACE and MANNING (1972: 17), such a tooth is present in the types; also other slight errors in CREASER'S description were corrected by CHACE and MANNING. The tooth of the scaphocerite (fig. 1 k) is very distinct in the present material. The fifth pereopod of my specimens shows the exopod reduced as in the types (CREASER, 1936; CHACE and MANNING, 1972).

Typhlatya pearsei seems to be restricted to Yucatán Peninsula. HOBBS and HOBBS (1976) enumerated all the localities where it has been found. The present material, all of which was collected by Dr. WILKENS, originates from two localities that had previously been mentioned for the species, and one which is new. The latter, Cueva Coop near Pamul, Territorio de Quintana Roo, even is the first from outside the state of Yucatán, though still within Yucatán Peninsula.

Dr. WILKENS observed that the animals when alive are of a light, whitish, colour, being somewhat opaque, not transparent. They swim freely around and are easy to catch. They are found in total darkness, and never are met with in localities that are typical for *T. mitchelli*.

***Typhlatya mitchelli* HOBBS and HOBBS, 1976**

***Typhlatya mitchelli* HOBBS and HOBBS, 1976: 2, figs. 1, 2.**

Material examined:

Cenote Zaci near the highway from Tizimin to Colonia Yucatán and El Cuyo at 36 km from Tizimin, Yucatán; March 1975; H. WILKENS; 3 specimens.

Cenote Xkeken at Dzib Nut near Valladolid at the highway from Valladolid to Merida, Yucatán; March 1975; H. WILKENS; 1 specimen.

Description. — The rostrum is short and sharply pointed. It is directed forward or obliquely upward and fails to reach the end of the eyes. The tip of the rostrum is sharp and slender. No teeth are present on either upper or lower margin. The lower angle of the orbit is broadly rounded. The carapace bears no spines at all.

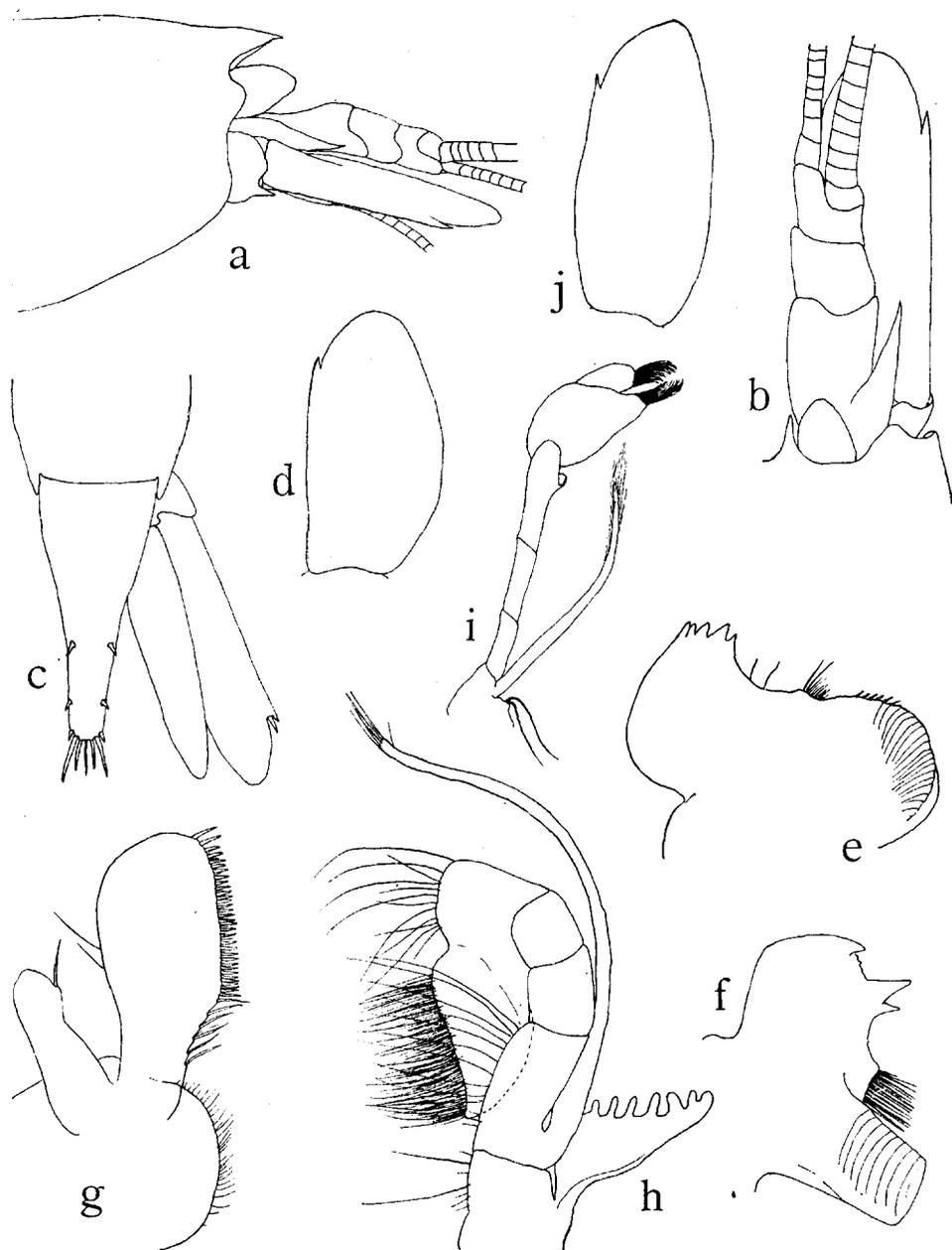


Fig. 1. — a-i, *Typhlatya mitchelli* HOBBS and HOBBS. a, anterior part of the body, in lateral view; b, rostrum, eye, antennula and antenna, in dorsal view; c, telson and right uropod, in dorsal view; d, scaphocerite; e, f, mandibles; g, maxillula; h, second maxilliped; i, first pereopod. j, *Typhlatya pearsei* CREASER, scaphocerite. a-d, i, j, $\times 25$; e-h, $\times 68$.

The pleura of the first five abdominal somites are broadly rounded. The sixth somite is about 2.5 times as long as the fifth; its pleuron is angular and the posterolateral lobiform process is without distal spine. The telson is somewhat shorter than the sixth somite; its dorsal surface bears two pairs of small spinules on the posterior third. The posterior margin of the telson is rounded and rather wide, it carries seven or eight spines: the outer pair is the shortest, being $1/3$ of the length of the next pair, which is strongest of all; the third pair is slightly shorter and narrower than the second; the median spine, or median pair of spines, is narrowest of all and about as long as the spines of the third pair.

The eyes are bullet-shaped and without visual elements or visual pigment. They reach slightly beyond the middle of the basal segment of the antennular peduncle.

The stylocerite is long and pointed, it reaches almost to the end of the basal segment of the antennular peduncle. No spine is present at the outer anterolateral angle of the basal segment. The second and third peduncular segments are of about the same length, the third is wider; the two segments together are longer than the first. The outer of the two antennular flagella has the basal segments widened, it is about 2.5 times as long as the inner flagellum and shorter than the entire body.

The scaphocerite reaches distinctly beyond the antennular peduncle. It is about 2.5 times as long as wide. The outer margin is rather straight or slightly sinuous, and ends in a distinct tooth, which is far outreached by the lamella. A sharp tooth is present in the basal part of the antennal peduncle near the outside of and slightly below the base of the scaphocerite. The end of the antennal peduncle reaches about to the middle of the second segment of the antennular peduncle. The antennal flagellum is very long, being at least twice as long as the total length of the body.

The mandible has the incisor process provided with a number (3 to 5) of small but very distinct teeth; the molar process bears a number of ridges, between the two processes the margin of the mandible bears a tuft of hairs. The maxillula has the palp simple with a distinct subdistal bristle; the upper lacinia is high, the lower short and almost circular. The maxilla has the upper endite divided into two lobes by a distinct notch; the palp is well developed and so is the scaphognathite. The first maxilliped has the lower endite much shorter than the upper, but more medially produced; the palp is broad; the exopod has the distal part reduced and not flagelliform, the caridean lobe is rather distinct; the epipod is small and oval. The second maxilliped has the exopod long and slender, flagelliform; an epipod is present bearing short gill-like filaments. The third maxilliped reaches to or slightly beyond the end of the scaphocerite. The last segment ends in a sharp point and has the posterior margin provided with about 10 spinules in the distal half, the proximal half bears numerous setae; the penultimate segment is about $3/4$ as long as the distal and is slightly longer than the antepenultimate; a well developed exopod, an epipod and an arthrobranch are present.

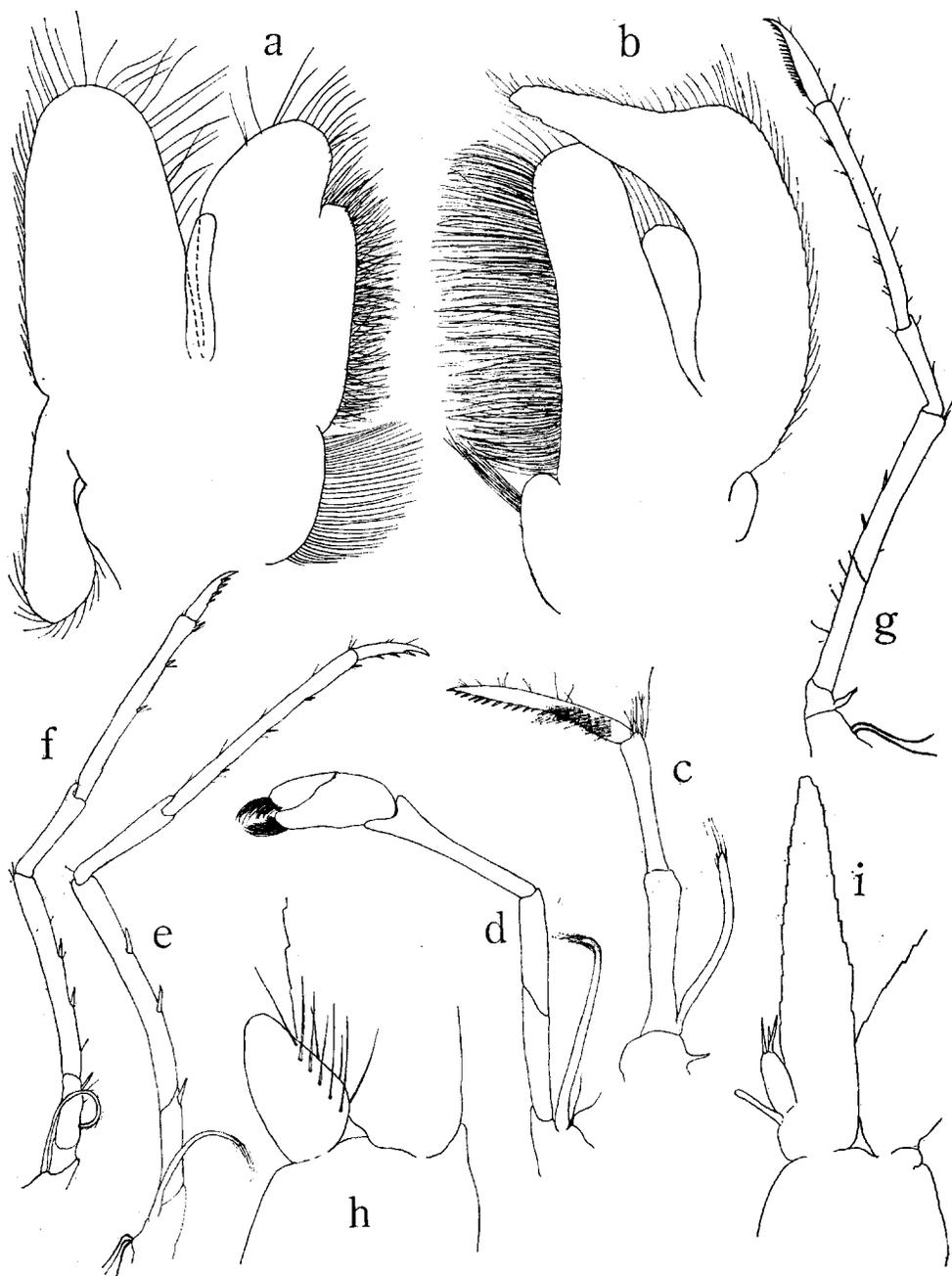


Fig. 2. - *Typhlatya mitchelli* HOBBS and HOBBS. a, maxilla; b, first maxilliped; c, third maxilliped; d, second pereiopod; e, third pereiopod; f, fourth pereiopod; g, fifth pereiopod; h, endopod of first pleopod of male; i, endopod of second pleopod of male. a, b, h, $\times 68$; c-g, $\times 25$; i, $\times 37$.

The branchial formula is as follows:

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

r = rudimental, *m* = mastigobranch.

The first pereiopod is short and reaches to the end of the antennular peduncle. The fingers are blunt and swollen and slightly shorter than the likewise swollen palm. The carpus is excavated anteriorly for the reception of the posterior part of the chela; it is slightly shorter, but much more slender than the chela and longer than the merus. The exopod is well developed and reaches as far as the carpus; an epipod and a mastigobranch are present. The second pereiopod reaches with the chela beyond the antennular peduncle; it is longer and more slender than the first pereiopod. The fingers are as long as the palm, and likewise short and blunt. The carpus is somewhat less than 1.5 times as long as the chela and excavate anteriorly. The merus is 0.6 times as long as the carpus and about as long as the ischium. The exopod is well developed as in the first leg, it reaches to the distal part of the merus; also the epipod and mastigobranch are present. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is slender and bears three movable spinules on the posterior margin. The propodus is about three times as long as the dactylus and has the posterior margin provided with about 4 small spinules. The carpus is half as long as the propodus. The merus is somewhat shorter, but wider, than the propodus and bears two strong spines on the posterior margin; a similar spine is present in the distal part of the ischium. The exopod is smaller than in the previous leg, but still well developed; it reaches slightly beyond the end of the ischium; an epipod and a mastigobranch are present. The fourth leg reaches to or slightly beyond the scaphocerite; it is distinctly shorter than the third leg, but otherwise very similar. The fifth leg reaches as far forwards as the fourth. The dactylus is slightly less than half as long as the propodus and bears a row of about 20 comb-like arranged spines on the posterior margin. The propodus does not show any spinules at all and is about twice as long as the carpus. The merus is about 2/3 as long as the propodus; it has two spines on the posterior margin. No

spines were observed on the ischium. The exopod of the fifth leg is reduced to a mere rudiment; there is no epipod, just a mastigobranch.

The first pleopod of the male has the endopod oval with some hairs in the outer half. In the second male pleopod the appendix masculina is short and oval, but still longer than the appendix interna; it ends in three rather strong bristles. The uropods are long and slender. The outer margin of the exopod ends in a tooth, which at its inner side shows a single movable spine.

Size. — The total length of the specimens varies between 8 and 11 mm, the carapace length between 2.5 and 3.5 mm.

Colour. — The specimens from both localities were noted to be pigmented in life. The collector remarked about the specimens from Cueva Zaci that they are similar to *Typhlatya pearsei*, but "weisen im Gegensatz zu diesen aber noch Melaninpigmente auf". The same was remarked about the specimen from Cueva Xkeken. In the preserved material dark pigment is still visible. These dark chromatophore-like specks are especially distinct at the rostrum and in a broad band along the lateral margin of the carapace; on the rest of the carapace there are some irregular areas of colour. A narrow band is visible along the free margin of the abdominal pleura, and a wider or narrower median area along the posterior margins of the abdominal terga. The telson shows the colour in the median area and in the distal part; in the uropods the colour is in the proximal part. The antennular peduncle is entirely dark or shows a dark basal segment and dark streaks in the distal two segments. The scaphocerite is dark except for a light area in the middle. The legs are dark in their basal part and often also near the distal articulations. The pleopods show some dark colour basally and near the articulation of the proto-podite and the blades. It is most peculiar that this colour has not dissolved in alcohol after the animals having been preserved for about a year. Were it not that the collector observed the colour in the living material, and that it only is found in the present species and not in *T. pearsei* collected at about the same time, I would have suspected this colour to be artificial, caused by reagents used during preservation. The eyes lack the true black pigment of the visual elements and only show this more or less diffuse brownish colour. HOBBS and HOBBS (1976) noted their preserved specimens to be "translucent to white".

Habitats. — The Cenote Zaci is a cavity with subterranean water, where daylight penetrates only very faintly. There is so little light that no green plants do exist in this cenote. The water is stagnant, clear, and 0.3 to 1 m deep; it probably is connected with a larger and deeper subterranean water system. The fishes in this cenote belong to *Rhamdia guatemalensis* GÜNTHER; also a species of mysid was observed, belonging to the genus *Anthromysis*.

The Cenote Xkeken contains a large stagnant pool, which very likely is in contact with an extensive subterranean system. Light enters through a hole in the roof, but there is so little light that also here no green vegetation

can exist. The water, like in the previous cenote, is very clear. Also here the fish *Rhamdia guatemalensis* and a species of *Anthromysis* were observed.

Biology. — The species is usually found among root systems that hang down from the roof of the cenote and that in the water form dense, strongly branched masses. The animals were observed singly or in pairs remaining quietly among the finely branched rootlets where they evidently found their food. They were not observed swimming, this in contrast to *T. pearsei* which was usually seen swimming freely around.

The finely branched root systems of trees or other plants exposed in the water are among the favourite habitats of small atyids all over the world, whether subterranean or epigeal.

Remarks. — The species is rather close to *Typhlatya pearsei* from which it can be distinguished immediately by the short rostrum, the more elongate scaphocerite, and possibly also by the colour.

Palaemonidae

The majority of the species of cave shrimps reported from Mexico belongs to this family: seven true troglobionts and one troglaxene. They are assigned to 5 genera, 3 of which (*Bithynops*, *Creaseria* and *Macrobrachium*) are represented in the collections studied. The two other genera have one Mexican species each, both are troglobionts: *Neopalaemon nahuatlus* HOBBS (1973 : 26, figs. 1, 2) from Oaxaca, known only from the original record, and *Troglocubanus perezfarfanteae* VILLALOBOS (1971 : 1, figs. 1-24) from San Luis Potosi. The latter species, before the original description was published, had already been reported upon under the name *Troglocubanus* sp. by REDDELL (1967; 1971 : 23).

Bithynops HOLTHUIS, 1973

This genus was erected for a cavernicolous species with reduced eyes, *Bithynops luscus*, and the degenerate condition of the eyes was at that time considered to be a character of generic importance. The discovery by the Italian expedition of a second species of this genus, described here as new, proves that in *Bithynops* there are species with reduced eyes as well as those in which the eyes are almost normally developed. Therefore the definition of the genus has to be emended in this respect.

So far the two species dealt with here are the only known representatives of the genus.

Bithynops luscus HOLTHUIS, 1973

Bithynops luscus HOLTHUIS, 1973 : 136, figs. 1, 2; SBORDONI, ARGANO and ZULLINI, 1973 : 24.

Material examined:

Cueva dell'Arco, Lagunas de Montebello, La Trinitaria, Chiapas; altitude 1470 m; 19 August 1973; R. ARGANO; 3 specimens (2 ovigerous).

The rostrum in the present ovigerous females reaches about to the base of the third segment of the antennular peduncle. The fingers of the second legs are somewhat longer than the palm and the tubercles on this leg are fewer and farther apart than in the males.

The specimens agree well with the original description.

Size. — The carapace length of the ovigerous females is 20 and 22 mm; the third specimen, a non-ovigerous female, has cl. 22 mm.

Distribution. — The species is only known from the above cave, the type locality.

Bithynops perspicax new species

Material examined:

Cenote la Cueva, Lagunas de Montebello, La Trinitaria, Chiapas; altitude 1480 m; 18 August 1973; R. ARGANO, V. SBORDONI and V. VOMERO; 54 specimens (1 ovigerous female).

Description. — The rostrum reaches to or almost to the end of the antennular peduncle. It is high and bears 5 to 7 dorsal teeth, all of which are usually placed on the rostrum proper, rarely the first is placed over or even slightly behind the posterior margin of the orbit. The upper rostral margin is convex and the teeth are rather evenly distributed over it. The ventral margin bears 1 or 2, rarely 3 teeth, which are placed in the extreme distal part. The tip of the rostrum is simple. The midrib of the rostrum lies in the lower half of the rostrum and merges with the orbital margin. The lower orbital angle is rounded. The antennal spine is distinct and placed on the anterior margin of the carapace just below the lower orbital angle. The branchiostegal line is present some distance below the antennal spine, it is short and extends from the anterior margin of the carapace in the direction of an elongate, almost groove-like hepatic depression. There is no trace of a hepatic or branchiostegal spine. The carapace shows a depression some distance behind the orbit. There is also a faint branchiocardiac groove in the posterior half of the carapace.

The pleura of the first three abdominal somites are broadly rounded, those of the fourth and fifth somites end in a blunt posterolateral angle. The sixth somite is rather high and slightly less than 1.5 times as long as the fifth. Both the pleuron and the posterolateral process of the sixth somite end in a distinct sharp tooth. The telson is about 1.5 times as long as the sixth somite. It bears two pairs of dorsal spines which are placed in the posterior half of the telson; the anterior pair being placed slightly before the posterior third of the

telson; the posterior pair lies about halfway between it and the posterior margin of the telson, or is placed somewhat closer to the anterior pair. A small median tuft of hairs is placed in the basal part of the telson. The posterior margin of the telson bears two pairs of spines: the outer of these are very short and fail to reach as far as the tip of the telson. The inner pair of spines are long and robust, about three times as long as the outer and distinctly

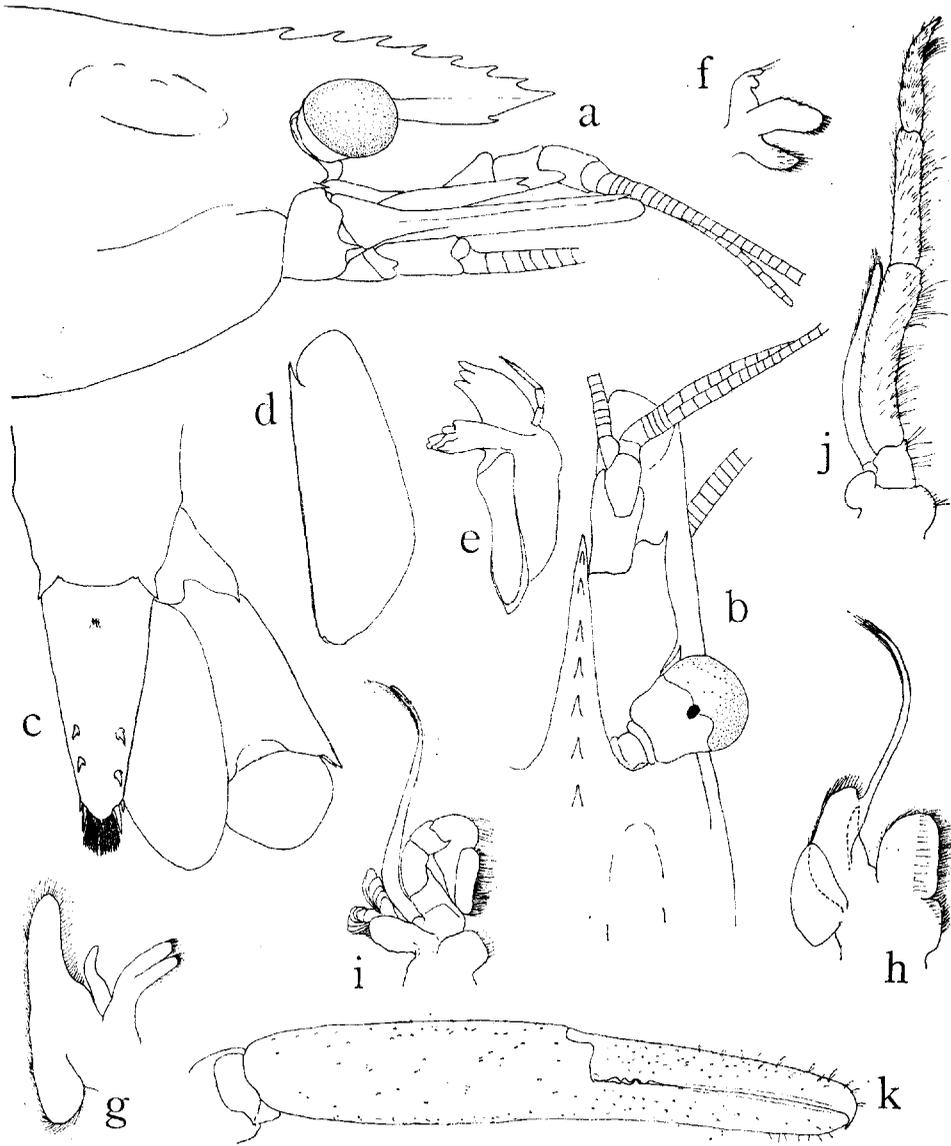


Fig. 3. — *Bithynops perspicax* new species. a, anterior part of body, in lateral view; b, anterior part of body (right half), in dorsal view; c, telson and right uropod, in dorsal view; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped; k, chela of second pereopod. a-k, $\times 6$.

overreach the apex of the telson. Between the inner spines there is a fringe of long plumose hairs, which are distinctly longer than the spines. The posterior margin of the telson is strongly convex in the median part and ends in a sharp triangular apex.

The eyes are well developed. The cornea is rounded and as wide as the greatest width of the peduncle. A distinct ocellus is present. The eyes reach slightly beyond the middle of the basal segment of the antennular peduncle.

The stylocerite is short, acute and triangular, it reaches about $\frac{1}{3}$ of the length of the basal segment of the antennula. The outer anterior margin of that segment is rounded with a strong anterolateral spine, which overreaches the margin. The second segment of the antennular peduncle measures about half the length of the first and is much longer and wider than the third segment. The two rami of the upper flagellum are fused for about 3 to 5 segments. The free part of the shorter ramus is more than five times as long as the fused part and consists of about 9 to 18 segments.

The scaphocerite reaches distinctly beyond the antennular peduncle. It is $\frac{3}{8}$ as wide as long. The lamella narrows only slightly anteriorly, the anterior margin being rounded, slightly produced at the inner angle. The outer margin of the scaphocerite is practically straight, the final tooth is directed forward or slightly inward and distinctly fails to overreach the lamella. The antennal peduncle does not reach as far as the first segment of the antennular peduncle. The basal part of the peduncle bears an external spine and a dorsal lobe at the base of the scaphocerite.

The mandible has a three-segmented palp; the incisor process ends in three teeth, the molar process shows irregular broad teeth. The maxillula has the lower endite slender, slightly narrower than the upper; the palp is bilobed. The maxilla has the endite deeply cleft, the palp is well developed and the scaphognathite large. The first maxilliped has the two endites distinctly separated by a deep incision; the palp is well developed; the exopod has a long flagellum and a well developed caridean lobe; the epipod is oval. The second maxilliped has a distinct epipod and a large podobranch; the exopod has the flagellum about as long as the one of the first maxilliped. The third maxilliped reaches beyond the end of the basal segment of the antennular peduncle, but fails to reach the end of the second; it bears a well developed exopod, an epipod and a pleurobranch. The ultimate segment ends in a sharp point and is slightly shorter than the penultimate; the antepenultimate segment is about 1.5 times as long as the distal segment.

Pleurobranches are present on all pereopods and the third maxilliped. No epipods or exopods are present on the pereopods. The first pereopod reaches with the chela or a small part of the carpus beyond the scaphocerite. The fingers are as long as the palm. The chela is somewhat more than half as long as the carpus. The merus is about 1.5 times as long as the chela. The second leg is robust, it reaches with the chela beyond the scaphocerite. The chela and the distal part of the carpus bear scattered spinules. The fingers are slightly shorter than the palm. They close over their full length and have

the tips crossing. The cutting edge of the dactylus bears three very small but distinct teeth in the extreme proximal part, the cutting edge of the fixed finger has only one such tooth, which fits between the anterior two of the dactylus. The carpus is about as long as the palm and somewhat longer than the merus. The third leg reaches slightly beyond the scaphocerite. The dactylus is simple. The propodus is three times as long as the dactylus and bears

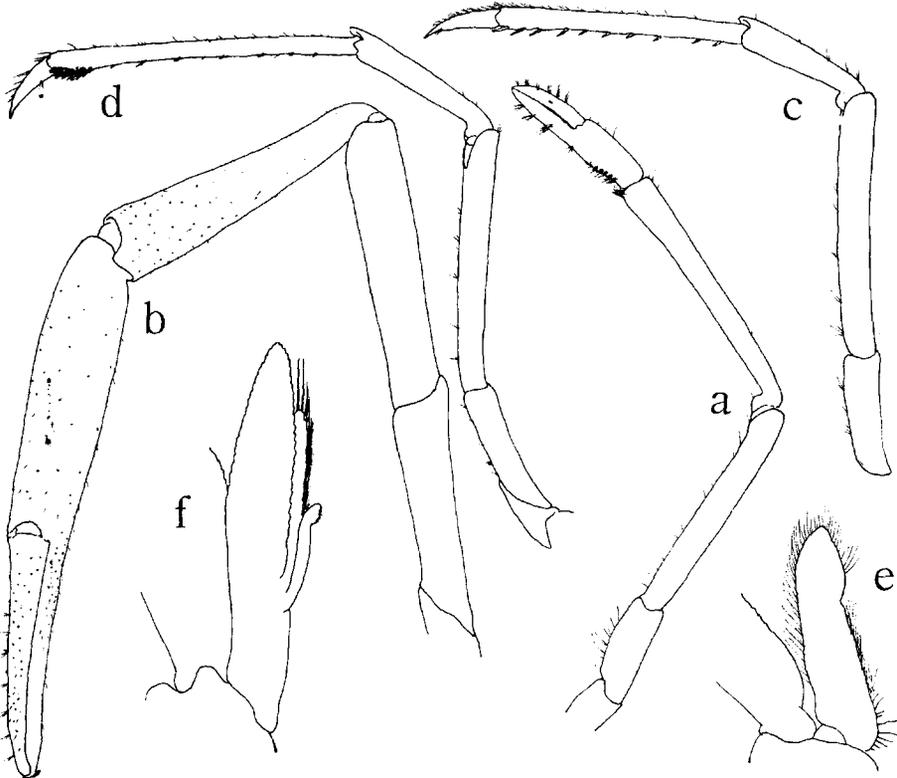


Fig. 4. - *Bithynops perspicax* new species. a, first pereopod; b, second pereopod; c, third pereopod; d, fifth pereopod; e, endopod of first pleopod of male; f, endopod of second pleopod of male. a-d, $\times 6$; e, f, $\times 12.5$.

a row of about 10 spinules on the posterior margin. The carpus has somewhat more than half the length of the propodus and is about half as long as the merus. The fourth leg resembles the third very strongly, it reaches slightly less far forward. The fifth leg reaches almost to or slightly beyond the end of the scaphocerite. The dactylus is rather short, being about $1/4$ of the length of the propodus. The propodus bears several small spinules on the posterior margin and has transverse rows of setae in the distal part of that margin. The carpus is slightly more than half as long as the propodus and about $2/3$ as long as the merus.

The endopod of the first pleopod of the male is oval with the inner margin somewhat concave; it bears no appendices. The endopod of the second pleopod

of the male has a very long appendix masculina, which is almost twice as long as the appendix interna, and has the distal and inner margin with rather stiff bristles. The uropods are wide, and reach beyond the telson. The protopodite shows a sharp outer tooth and a blunt upper lobe. The outer margin of the exopod is straight and ends in a sharp tooth, which has a movable spine situated on its inner side. A distinct diaeresis is present. The endopod is broadly oval.

Size. — The holotype is a male specimen with a carapace length of 20 mm. The carapace length of the paratypes varies between 9 and 21 mm. The only ovigerous female has cl. 18 mm. The eggs are large and rather few, their diameter is 1.9 to 2.5 mm.

Remarks. — The present species is very close to *Bithynops luscus*, the only other species of the genus known so far. The two species may immediately be distinguished by the development of the eyes. In *B. luscus* the eye is degenerate, the cornea is much narrower and shorter than the eyestalk; in *B. perspicax* the cornea is normal and as wide as the greatest width of the ophthalmic peduncle. The resemblance of the two forms is so great in most other respects, that I would have hesitated to assign them to different species, were it not that in the extensive material of both examined by me no intermediate forms were found.

Habitat. — The Cenote la Cueva is partly filled with stagnant water, in which a rich population of the present species was found. The specimens were seen in full daylight near the shore. According to the guide of the expedition, who lived near the cave, there is another shrimp population much deeper inside the cave; these deeper water forms were said to be completely white in colour, but could not be collected or even observed by the expedition. It is possible that these deeper specimens actually belong to *B. luscus*.

Biology. — The species was seen actively swimming and crawling about in shallow water near the shore of the cenote.

***Creaseria morleyi* (CREASER, 1936)**

For a complete synonymy of this species see: HOBBS and HOBBS, 1976: 16, figs. 7, 8.

Material examined:

Cueva de Hoctún, Hoctún, about 45 km E of Merida, Yucatán; spring 1970; H. WILKENS; 2 specimens.

Cueva Balaam Canché, Chichen-Itza, about 120 km E of Merida, Yucatán; 28 August 1973; R. ARGANO; 4 specimens.

Cueva del Pochote near Muna, about 60 km S of Merida, Yucatán; March 1975; H. WILKENS; 1 female.

Cueva Coop, a cave 3 km west of the highway between Playa del Carmen and Felipe Carillo Puerto, near the village of Pamul at 120 km from Felipe Carillo Puerto, Territorio de Quintana Roo; March 1975; H. WILKENS; 1 specimen.

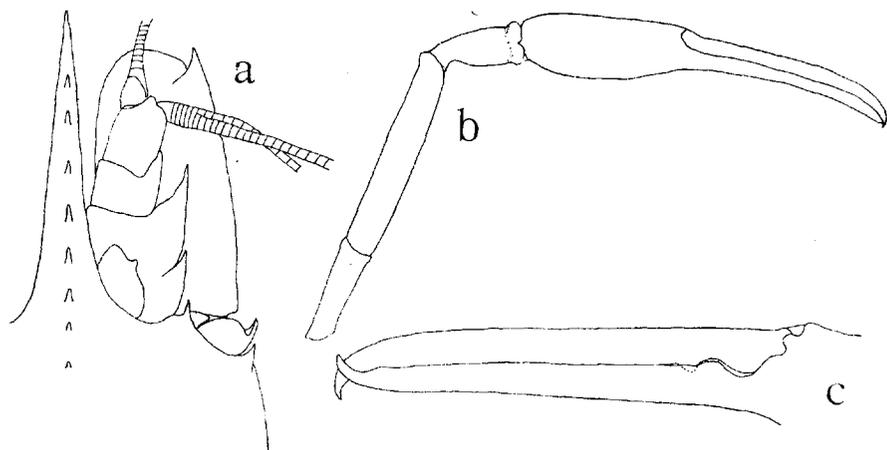


Fig. 5. — *Creaseria morleyi* (CREASER). a, anterior part of body (right half), in dorsal view; b, second pereopod; c, fingers of second pereopod. a, c, $\times 6$; b, $\times 2.5$.

The largest specimen (from Balaam Canché cave) is much larger than the type, its total length is about 70 mm, its carapace length 31 mm. The smallest specimen is the one from Cueva Coop, which has a carapace length of only 11 mm.

The specimens agree well with the descriptions given in the literature. The eye, however, is not always perfectly bullet-shaped as described, but often shows a distinct tubercle on the outer surface somewhat behind the apex.

In the larger specimens the crenulated tooth of the fixed finger of the second leg, as described by CREASER (1938) and HOLTHUIS (1952: 154) is distinct, the cutting edge of the dactylus bears a triangular tooth distally of the tooth of the fixed finger.

Distribution. — So far the species was only known from the state of Yucatán; it is now reported for the first time from outside that state. The territory of Quintana Roo, however, also is situated on the Yucatán Peninsula. The previously published records of this species have been enumerated by HOBBS and HOBBS (1976: 16).

Biology. — Dr. WILKENS observed that the species lives in total darkness, it crawls over the bottom and also swims. The animals are very aggressive, if two or more specimens are placed together in a smallish container they will attack and mutilate each other.

Macrobrachium BATE, 1868

Three species of *Macrobrachium* have been reported from Mexican caves. BREDER (1942 : 11) mentioned *M. carcinus* (L.) (as *M. jamaicensis*) from La Cueva Chica, San Luis Potosi; the species is widely distributed in epigeal waters of the Atlantic drainage of Mexico and BREDER's specimens cannot be considered true cave forms, even though they were said to be lighter in colour than the normal epigeal form. OSORIO TAFALL (1943 : 49) who later visited the cave again did not succeed in obtaining the species.

The two other *Macrobrachium* species from Mexican caves are true troglobionts. One is described here as new, the other is *M. villalobosi* HOBBS (1973 a : 77, fig. 3), from Oaxaca, which is only known from the type material.

Macrobrachium acherontium new species

Material examined:

Grutas del Coconá, 3 km NE of Teapa, Tabasco; altitude 60 m above sea level; in the dark part of the cave; spring 1970; H. WILKENS; 1 specimen. — 29 December 1971; DAVID MCKENZIE; 4 specimens. — 26 August 1972; R. W. MITCHELL and W. H. RUSSELL; 5 specimens. — 26 August 1973; V. SBORDONI and V. VOMERO; 24 specimens. — March 1975; H. WILKENS; 4 specimens. — 15 June 1975; J. REDDELL, A. GRUBBS and S. WILEY; 15 specimens.

Resumidero del Coconá, 3 km N.E. of Teapa, Tabasco; 14 June 1975; J. REDDELL and A. GRUBBS; 5 specimens.

The specimens collected by Messrs. MCKENZIE, MITCHELL, RUSSELL, REDDELL, GRUBBS and WILEY form part of the collection of the National Museum of Natural History, Washington, D.C., those collected by Dr. WILKENS are now in the Rijksmuseum van Natuurlijke Historie, Leiden, while those collected by Drs. SBORDONI and VOMERO are partly in the collection of the Zoological Institute of the University of Rome and partly in the Leiden Museum.

Description. — The rostrum is high and straight, in the females it is relatively shorter and higher than in the males. It reaches almost to the end of the scaphocerite, sometimes it barely overreaches the end of the antennular peduncle. The upper margin is somewhat convex and bears 8 (rarely 7) to 11 teeth, two or three of which are placed behind the orbit, in the anterior 1/5 to 1/6 of the carapace (rostrum excluded). The dorsal teeth are all very similar and rather evenly spaced. The ventral margin is very convex and usually bears a single tooth in the distal part, sometimes this tooth is altogether absent and rarely there are two teeth. The midrib divides the rostrum in two halves of about equal height, and merges with the orbital margin. The lower orbital angle is lobiform and rounded. The antennal spine stands just below the lower

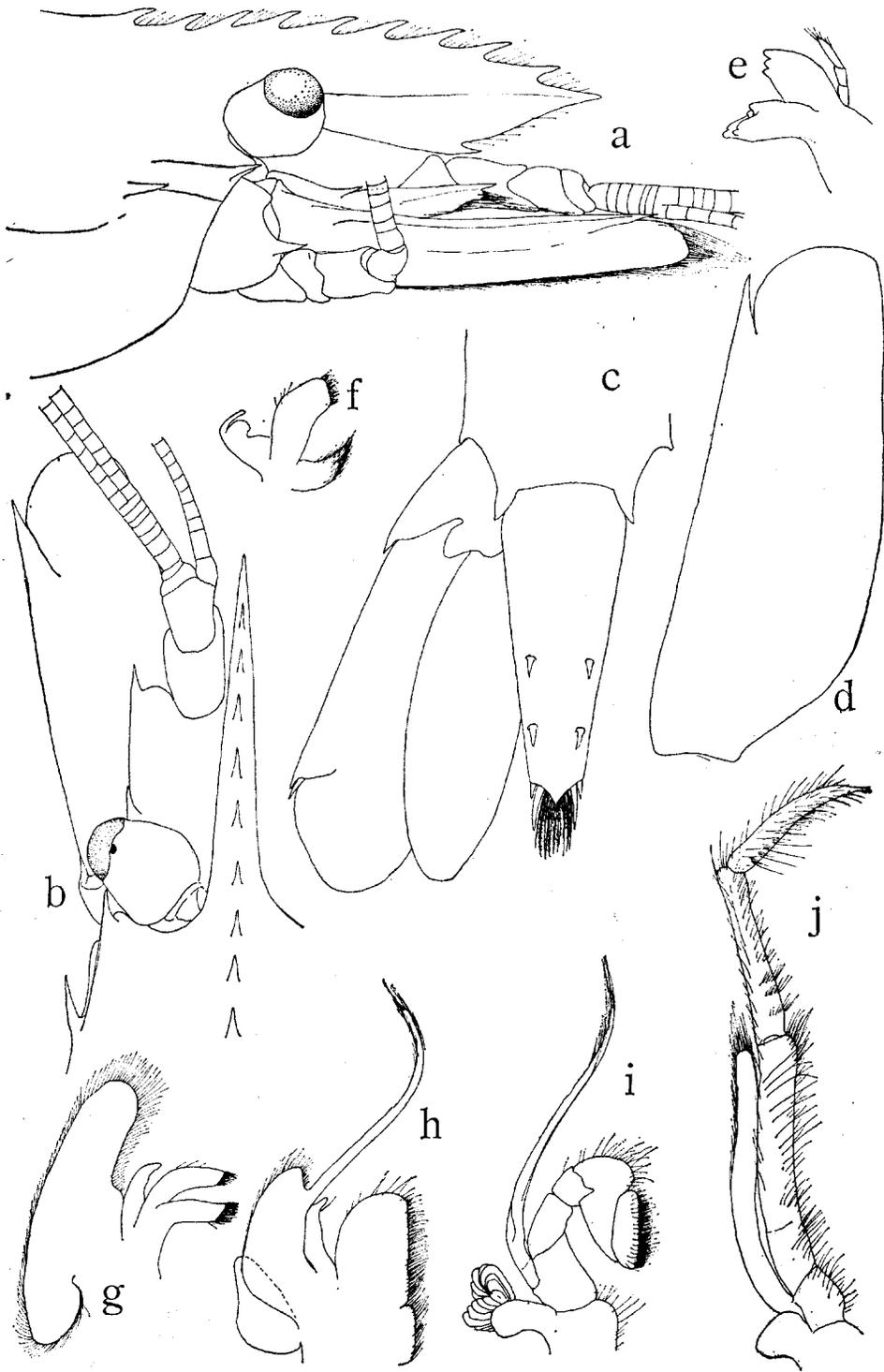


Fig. 6. - *Macrobrachium acherontium* new species. a, anterior part of body, in lateral view; b, anterior part of body (left half), in dorsal view; c, telson and left uropod, in dorsal view; d, scaphocerite; e, mandible; f, maxillula; g, maxilla; h, first maxilliped; i, second maxilliped; j, third maxilliped. a - j, $\times 12$.

orbital angle at a short distance behind the anterior margin of the carapace. The hepatic spine is as strong as the antennal and stands behind and below it; it is connected with the anterior margin of the carapace by the branchiostegal line. A blunt ridge extends from the antennal spine back to just above the hepatic spine. A hepatic groove is distinct and extends from below the hepatic spine backward. A faint branchiocardiac groove is visible in the posterior part of the carapace.

The abdomen is smooth. The pleura of the first four somites are broadly rounded, that of the fifth somite is more angularly rounded posteriorly. The sixth somite is about $5/3$ as long as the fifth, its pleura are pointed, as is also the posterolateral process; the latter shows a rectangular lobe below the sharp tooth. The telson is 1.2 times as long as the sixth abdominal somite. It bears two dorsal pairs of spines; the anterior pair is placed in the middle of the telson, the posterior is somewhat closer to the anterior pair than to the posterior margin of the telson. This posterior margin ends in a sharp triangular median point and bears two pairs of spines. The spines of the outer pair are short, being about $1/3$ of the length of those of the inner pair. Between the inner spines there are several (about 10) strong feathered setae.

The eyes have the cornea much reduced, being much shorter and narrower than the eyestalk; it is globular, however, and shows a distinct ocellus. The eye reaches about to the middle of the basal segment of the antennula.

The stylocerite is slender and sharply pointed. It reaches to about the middle of the basal segment of the antennular peduncle. The anterolateral angle of the basal segment ends in a sharp tooth, which reaches beyond the middle of the second segment. The anterior margin of the basal segment mediad of the anterolateral spine is convex and is far overreached by the spine. The second and third segments of the peduncle are about of the same length, and much shorter than the first. The outer flagellum has the two rami fused for a short distance, about 7 segments long; the free part of the shorter ramus is much more than 7 times as long as the fused part.

The scaphocerite reaches beyond the antennular peduncle and about as far as the tip of the rostrum. It is about three times as long as wide. The outer margin is straight and ends in a sharp tooth, which is far overreached by the lamella, which has the anterior margin broadly rounded, with the inner part sometimes somewhat produced. A lateral spine and a dorsal lobe are present on the antennal peduncle at the base of the scaphocerite. The end of the antennal peduncle does not reach so far as the basal segment of the antennular peduncle.

The mandible bears a three-segmented palp; the incisor process ends in three short blunt teeth; the molar process shows the usual broad teeth. The maxillula has the palp deeply bilobed; the upper endite is blunt, the lower rather slender. The maxilla has the endite deeply cleft; the palp and scaphognathite are distinct. The first maxilliped has the two endites separated by a deep incision; the palp is well developed; the exopod has a long flagellum and its caridean lobe is large; the epipod is bluntly triangular. The second

maxilliped has the exopod also with a long flagellum; an epipod and a large podobranch are present. The third maxilliped reaches to the middle or almost to the end of the second segment of the antennular peduncle. The last segment ends in a sharp tip, it is about as long as the penultimate segment,

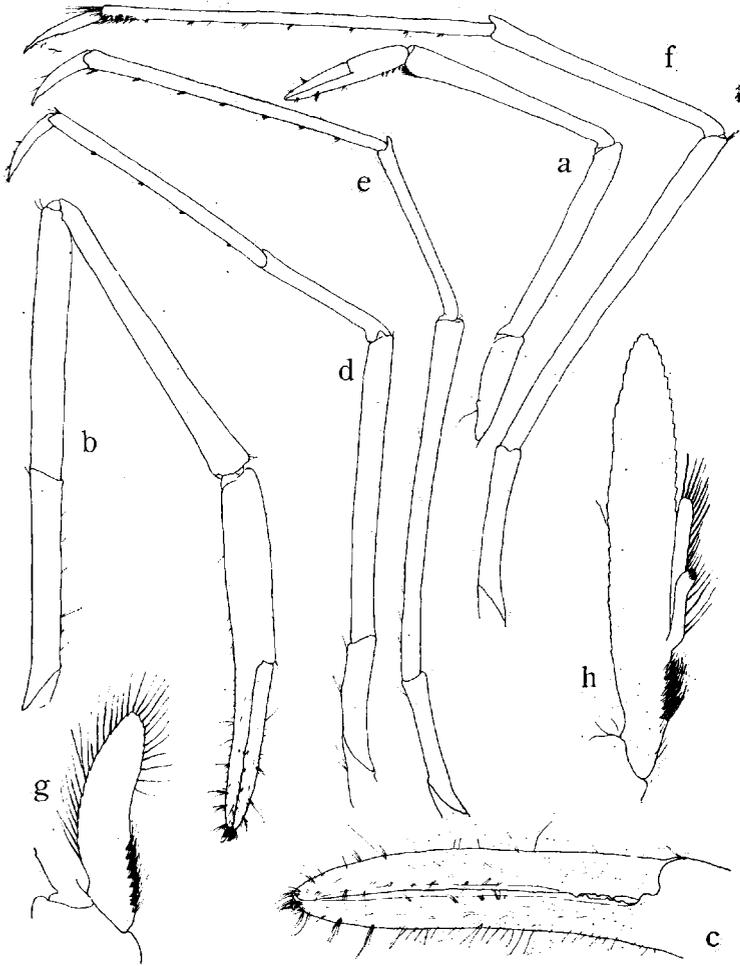


Fig. 7. - *Macrobrachium acherontium* new species. a, first pereiopod; b, second pereiopod; c, fingers of second pereiopod; d, third pereiopod; e, fourth pereiopod; f, fifth pereiopod; g, endopod of first pleopod of male; h, endopod of second pleopod of male. a-f, $\times 15$; g, h, $\times 30$.

and has about $2/3$ of the length of the antepenultimate. The exopod is large, an epipod, an arthrobranch and a pleurobranch are present.

All pereiopods are provided with a pleurobranch, but no other gills, epi- or exopods. The first leg reaches with the fingers or less beyond the scaphocerite. The fingers are slightly longer than the palm. The carpus is somewhat less than twice as long as the chela and of about the same length as the merus. The second pereiopod reaches with the chela and part of the carpus

beyond the scaphocerite. It is smooth and slender and no spinules are present. The chela is long and narrow, the fingers are about as long as the palm and slightly narrower. The cutting edges bear a few very small teeth in the extreme proximal part. The carpus is somewhat shorter than the chela, but much longer than the palm, it also is conspicuously longer than the merus. The ischium is slightly shorter than the merus. The third leg reaches with the dactylus and part of the propodus or with only part of the dactylus beyond the scaphocerite. The dactylus is 0.3 to 0.36 times as long as the propodus. The latter is slender and bears a few (about 4) spinules on the posterior margin. The carpus is 1.5 times to twice as long as the dactylus. The merus is distinctly longer and wider than the propodus. The fourth leg reaches slightly farther forward than the third, it surpasses the scaphocerite with half or somewhat less than half the propodus; it is longer and consequently more slender than the third leg. The dactylus is about as long as that of the third leg. The propodus is longer than that of the third leg and 4 to 5 times as long as the dactylus; its posterior margin bears a few more spinules. The carpus is slightly less than $\frac{2}{3}$ as long as the propodus and longer than that of the third leg. The merus is distinctly longer than the propodus and than the merus of the third leg. The fifth leg is the longest of the three walking legs and reaches with half or somewhat less than half the length of the propodus beyond the scaphocerite. The dactylus is only slightly longer than those of the third and fourth legs; it measures $\frac{1}{5}$ to $\frac{1}{4}$ of the length of the propodus. The latter has several very small spinules on the posterior margin, and in the distal part of that margin some transverse rows of setae. The propodus is almost 1.5 times as long as that of the third leg. The carpus measures about $\frac{2}{3}$ of the length of the propodus; the merus is slightly shorter than the propodus.

The first pleopod of the male has the endopod ovate with the inner margin concave, it bears no appendices. The endopod of the second pleopod of the male has the appendix masculina about twice as long as the appendix interna, and provided with bristles. The protopod of the uropods has dorsally a sharply acute lobe externally and a blunt lobe medially. The outer margin of the exopod is straight, and ends in an acute tooth. This tooth bears at its inner side a movable spine, which projects beyond the tip of the tooth. The endopod is ovate.

The very young specimens (cl. 3.5 to 6 mm) resemble the adults in the general shape, in that of the rostrum and the eyes, which show distinctly the reduced cornea. The legs, however, are shorter and less slender, reaching less far forward. The dactyli of the walking legs are relatively longer and the carpus relatively shorter than in the adults.

Macrobrachium acherontium is very close to another Mexican species of cavernicolous shrimp, *M. villalobosi* HOBBS, which was found in the Cueva del Nacimiento del Rio San Antonio, 10 km S S W of Acatlán in Oaxaca. The two species differ in the following points: (1) In *Macrobrachium acherontium* the rostrum is shorter, higher, with the teeth longer than in *M. villalobosi*; in the latter species only one or two (rarely three) of the dorsal rostral

teeth are placed behind the orbit. (2) In *M. acherontium* the antennal spine is not placed on the anterior margin of the carapace, but somewhat behind it, and is continued posteriorly as a blunt carina. In *M. villalobosi* the spine is smaller, situated on the anterior margin of the carapace, and is not the end of a carina. Also the hepatic spine in *M. villalobosi* is distinctly smaller than in the new species. (3) The eyes in *M. villalobosi* are entirely without cornea or pigment, while in *M. acherontium* a distinct, be it very reduced, dark pigmented cornea is present. (4) The first leg in the new species has the fingers relatively longer and the carpus shorter than in *M. villalobosi*. The second leg has the chela much longer in relation to the carpus than in *M. villalobosi*. The last three legs are remarkably similar in the two species.

Size. — The carapace length of the examined specimens ranged from 3.5 to 16 mm.

Colour. — Dr. SBORDONI described the colour of the living shrimps as "transparent brownish". Dr. WILKENS, who examined specimens in their natural habitat and also kept material alive in an aquarium in Hamburg, was also struck by the smokey colour of the animals, which he described as "rauchscharz", with pale, but not quite transparent unpigmented parts. When fixed in Bouin the dark blackish brown colour first turned red and afterwards disappeared entirely. The preserved specimens have the usual pale cream colour of most preserved shrimps. It is most interesting that, in contrast to most cave shrimps, which are either entirely transparent, white or red, the present species shows a blackish brown coloration.

Habitats. — The Gruta del Coconá lies at an altitude of about 60 m. It has been described by SBORDONI, ARGANO and ZULLINI (1973, pp. 14, 15). In the spring the water is stagnant, this being the dry season; in August the water level was higher and the water was flowing slowly. The shrimps were found in the part of the cave that was completely dark. The Italian expedition of 1971 noted a rich fauna in the main stream, among which troglotic planarians and amphipods were conspicuous; in 1973 they noted a poor population of poeciliid fishes. Dr. WILKENS observed the Characid fish *Astyanax mexicanus* (PHILIPPI) there.

Biology. — Dr. WILKENS remarked that the animals usually rest quietly on the bottom or walk about; they are rarely observed actively swimming, usually only when forced to do so. They are easily captured and quite common at the type locality.

Macrobrachium sp.

Material examined:

El Azufre, a resurgent 1 km E of Teapa, Tabasco; altitude 40 m; 27 August 1973; V. SBORDONI; 1 specimen.

A single unfullgrown specimen (cl. 13 mm) of *Macrobrachium* was obtained from a resurgent near Teapa, in the same general area as the type locality of *Macrobrachium acherontium*.

The specimen does resemble *M. acherontium* in many respects. The rostrum has 9 dorsal teeth, two of which are on the carapace proper; the ventral margin bears two teeth, the anterior of which is abnormal and very poorly developed. The shape and position of the antennal and hepatic spines are like in *M. acherontium*. However, the eyes in this specimen are normally developed and have a large cornea, which is distinctly wider than the eyestalk and fully pigmented. Also the legs, though resembling those of *M. acherontium*, are distinctly different in that they are far less slender.

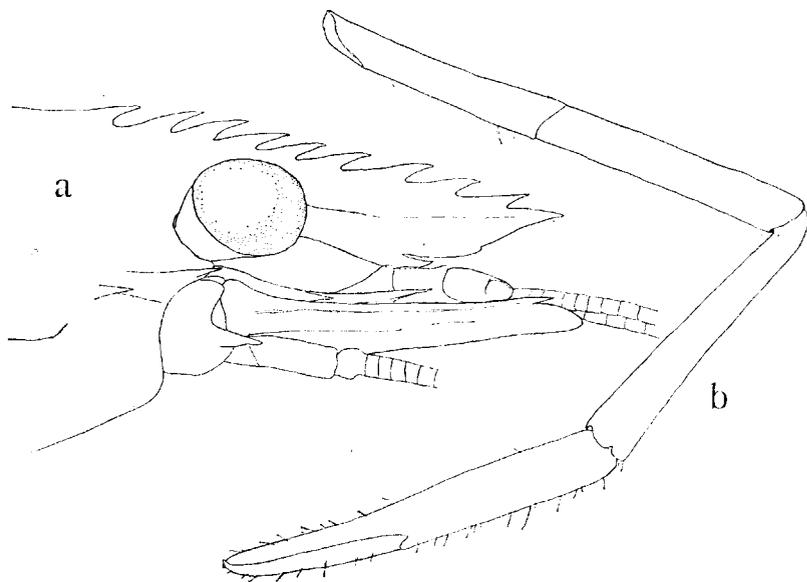


Fig. 8. — *Macrobrachium* sp. a, anterior part of body, in lateral view; b, second pereiopod. a, b, $\times 15$.

The fact that only a single, probably immature specimen is available makes it impossible to conclude whether it is a new species or just an epigeic form of *M. acherontium*. It is to be hoped that more material can be collected of this interesting form.

SUMMARY. — Shrimps of the families Palaemonidae and Athyidae collected in subterranean waters of Mexico are dealt with in this paper. Comments and new records are given for *Typhlatya pearsei* Creaser, *T. mitchelli* Hobbs and Hobbs and *Bithynops luscus* Holthuis. Two new Palaemonid species are described: *Bithynops perspicax*, an eyed form closely related to *B. luscus*, from a cenote in the state of Chiapas, and *Macrobrachium acherontium*, a poorly cave adapted species, from the Cueva de Coconà in the state of Tabasco.

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