

**A STYGOBIONT CRAB, *CHACEUS CAECUS* N.SP., AND ITS RELATED
STYGOPHILE SPECIES, *CHACEUS MOTILONI* RODRIGUEZ, 1980,
(CRUSTACEA, DECAPODA, PSEUDOTHELPHUSIDAE) FROM A CAVE
IN THE CORDILLERA DE PERIJA, VENEZUELA**

by

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I - INTRODUCTION

Since the description by RIOJA (1953) of the first stygobiont crab, our knowledge of the troglitic Brachyura has steadily increased. By HOLTHUIS (1986) last count there were 12 species in the Superfamily Potamoidea that could qualify as stygobionts, i.e., found only in subterranean waters and excluded from epigean biotopes. This number could be considered as conservative, because the distinction between stygobionts, stygophiles and stygoxenes is not an easy task and transitional situations are commonly found.

The species of freshwater crabs associated with caves are relatively numerous in Middle America, with 16 species of Pseudothelphusidae (GUINOT, 1988 ; RODRIGUEZ and HOBBS, 1989 a ; RODRIGUEZ and HOBBS, 1989 b) and 3 of Trichodactylidae (RODRIGUEZ, in press) reported to occur in the subterranean waters of Southern Mexico, Guatemala and Belize. But of this number, only the Pseudothelphusid genus *Typhlopseudothelphusa* and the trichodactylid *Rodriguezia mensabak* have reached the advanced stage in which the faceted cornea of the eyes disappear. On the other hand, only one stygobiont freshwater crab has been described from South America (RODRIGUEZ, 1985), *Neostrengeria sketi*, with reduced eyes but presence of pigmented cornea.

Recently the Venezuelan Society of Speleology collected a blind pseudothelphusid crab during expeditions carried out in 1987 and 1989 to a karstic area of the Cordillera de Perija, a mountainous chain that trends North for 300 km, from its origin in the northern Andes to the Caribbean coast, along the Venezuela-Colombia border. Together with the stygobiont species, a second epigeous one, already known from this cordillera (RODRIGUEZ, 1966), was collected inside the cave. Since the two species are closely related taxonomically, in the present contribution we describe both with some detail to allow for a critical appraisal of the troglitic adaptations in these crabs.

We are indebted to Carlos GALAN, Juan NOLLA and Igor ALMEIDA, members of the Venezuelan Speleological Society who carried out a careful survey of the caves, and to Hector SUAREZ who took part in the second expedition and helped with processing of the material. The specimens are deposited in the Reference Collection of the Instituto Venezolano de Investigaciones Cientificas (IVIC), Caracas.

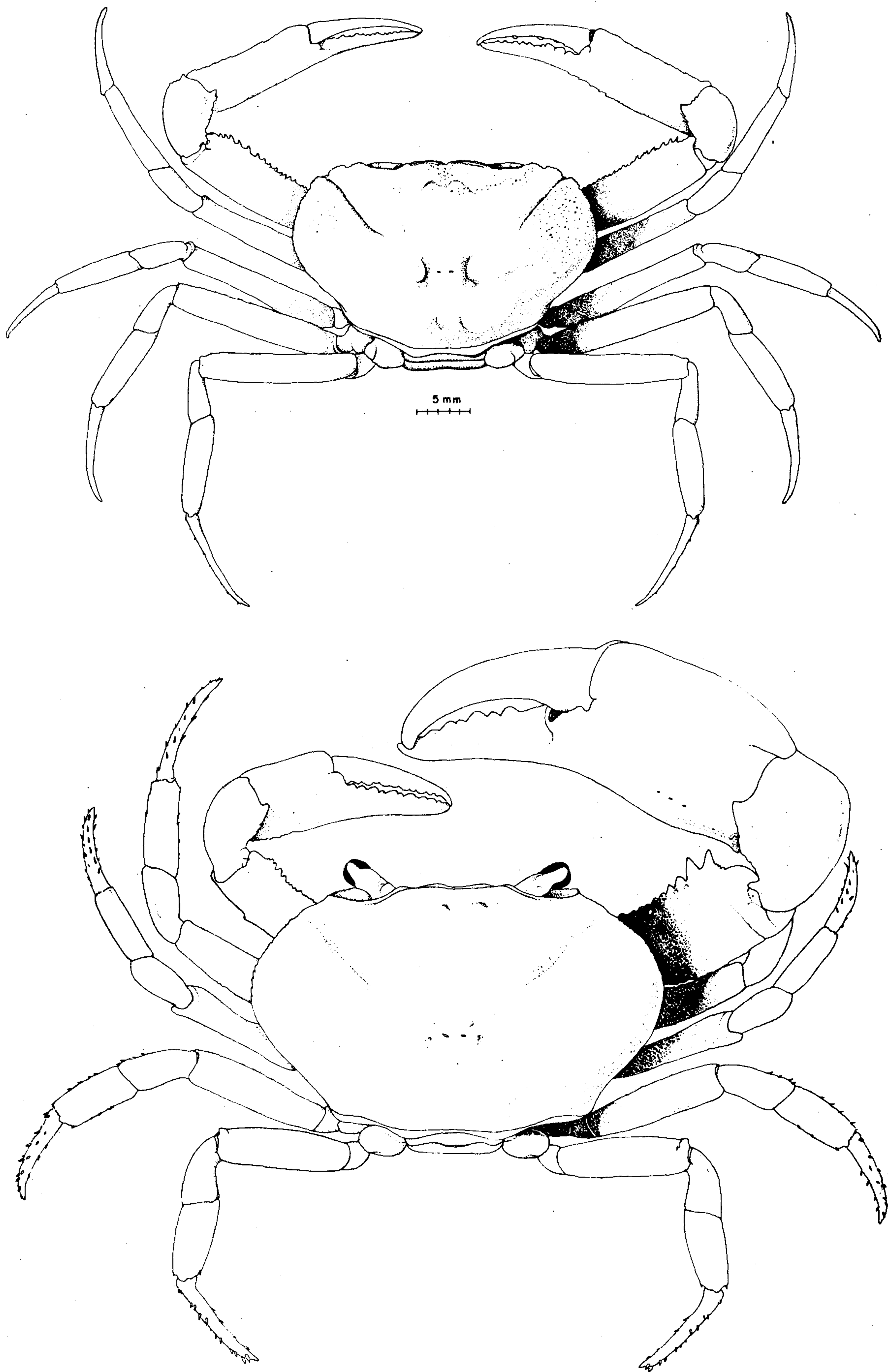


Fig. 1 - Upper : *Chaceus caecus*, n.sp., holotype ; lower, *Chaceus motiloni*, male cl. 23.6 mm from Cueva Punto Fijo.

II - DESCRIPTIONS

Chaceus caecus, new species

Fig. 1, upper ; fig. 2, A-H ; fig. 3, A-F.

Material - Cueva Punto Fijo, Rio Guasare, Estado Zulia, Venezuela ; 20 January 1989 ; C. BOSQUE and H. SUAREZ ; 1 male holotype, cl. 17.5, cb. 27.5 mm, 1 male paratype, cl. 16.0, cb. 25.1 mm (IVIC). Same locality ; 15 April 1987 ; Carlos GALAN ; 2 females paratypes, cl. 18.9 and 18.2 mm, cb. 29.6 and 28.9 mm (IVIC).

Description. Carapace narrower than in other species of the genus ($cb/cl = 0.57$). The cervical groove is slightly sinuous, thin and deep distally, wide and shallow proximally ; it reaches the margin of carapace where it forms a large emargination. The anterolateral margin has 2-3 papillae behind the outer orbital angle, followed by a notch and a rounded lobe with 5-7 denticles ; behind the cervical notch the margin is provided with denticles interspaced with small papillae arranged in an irregular row. The frontal lobes are rounded, small, continued laterally by a ridge. The median groove is replaced by a shallow and wide depression. The surface of the carapace between the postfrontal lobes, the lateral ridges and the front is depressed, flat, covered with flattened papillae. The upper border of the front is strongly bilobed in dorsal view, with a deep notch in the middle ; the margin of each lobe is somewhat oblique, and consequently the lobes are more advanced near the mid-line. In frontal view the upper margin is slightly inclined towards the mid-line ; the upper and lower margins of the front and orbits are bordered with papillae similar to those of the external orbital angle, giving to the anterior part of the carapace a granular appearance. The lower margin is more advanced than the upper. The surface of the front between the upper and lower margin is narrow. The surface of the carapace is covered by small papillae, not visible to the naked eye, more conspicuous towards the sides. The ocular peduncles are conical, tapering to a globular apex, with no traces of pigment or facets ; there is a large empty space inside each orbit.

The chelipeds are long and slender. The palm in frontal view is narrower than in other species of the genus. The fingers are long and slender, 0.45 the total length of the chela ; when closed the fingers have a moderate gape between them ; their tip cross ; in dorsal view they are strongly arched inwards ; the fingers have 4 larger teeth proximally and smaller teeth of variable size on its distal half. The ischium of chelipeds are very long, approximately 0.6 the breadth of carapace, its supero-interior margin has an irregular row of small spines that diminish in size proximally, and another irregular row of papillae over the infero-internal margin. The carpus is also elongated and has 1 larger spine and 2-3 minute spines on the inner margin. The fingers have small dark points ; the upper surface of the hand and carpus and the external border of the merus are covered by small squamiform papillae which become squamiform tubercles on the proximal half of the merus. The walking legs are long and slender, the largest being those of the third pair (total length approximately 1.5 breadth of carapace) ; in this pair the merus is 4.2 times longer than wide. The dactyli are very long and slender ; there are 5 rows of minute spines, with 7-8 spines in each row ; in the 5th pereopod these spines increase in size distally, and the last spines of the upper and lateral rows are considerable stronger. There are minute spines on the upper margin of the carpus, and in the lower and upper margins of the propodus, and small tubercles and squamiform papillae on the upper margin of the merus. The exognath of the third maxilliped is 0.8 the length of the ischium. The orifices of the efferent branchial channels are partly closed by a spine of the yugal angle and by the production of the lateral lobe of the epistome. The branchial chamber possess the perforated area or pseudolung characteristic of the Pseudothelphusidae.

The first male gonopod is stocky ; its distal end is curved and directed mesial, and thus the gonopore open in a perpendicular plane to the main axis of the appendage. The caudal lobe is rounded, foliose, thickened on the lateral border ; it does not reach the apex of the gonopod. The gonopore is bordered by a strong finger-like projection and a proximal triangular spine ; there is a rounded elongated papillae at the base of the finger-like projection. The spines surrounding the gonopore are very few and minute. There is a row of long plumose setae over the lateral side of the gonopod and shorter setae on the caudal basal surface. The second gonopod has the tip excavated and bordered with spinules.

Color. Carapace and pereopods uniformly light cream, with some dark internal blotches visible through the carapace cuticle, particularly in the proto- and mesogastric area where a large bluish patch is present.

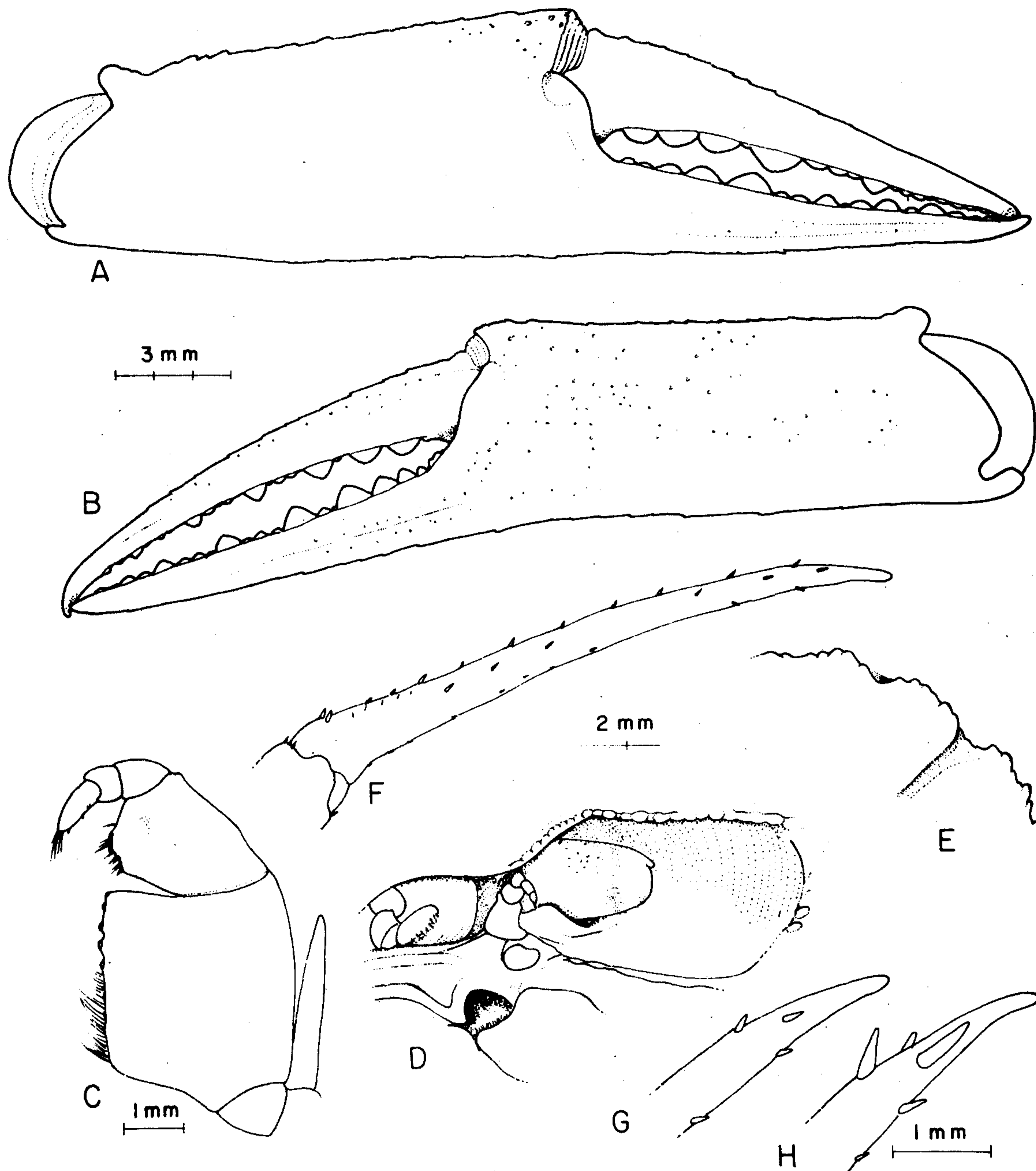


Fig. 2 - *Chaceus caecus*, n.sp., male holotype : A, largest cheliped ; B, smaller cheliped ; C, 3rd maxilliped ; D, orbital area ; E, antero-lateral angle of carapace ; F, dactylus of 3rd pereopod ; G, claw of 3rd pereopod ; H, claw of 5th pereopod.

Etymology. The specific name *caecus* is from the Latin for blind in reference to the reduced condition of the eyes.

Chaceus motiloni RODRIGUEZ, 1980.

Fig. 1, lower ; fig. 3 G

Pseudothelphusa sp. RODRIGUEZ, 1966, p. 132, fig. 10, pl. 7, fig. 3,4 ; PRETZMANN, 1972, p. 57.

Chaceus motiloni RODRIGUEZ, 1980 a, p. 890 ; RODRIGUEZ, 1980 b, p. 329, fig. 73 ; RODRIGUEZ, 1982, p. 38, fig. 14.

Material. Cueva Punto Fijo, Rio Guasare, Estado Zulia, Venezuela ; 20 January 1989 ; C. BOSQUE and H. SUAREZ ; 3 males, cl. 23.6, 23.1 and 21.5 mm, cb. 38.2, 36.9 and 34.7 mm, respectively (IVIC). Cano El Indio, Rio Guasare, Estado Zulia, Venezuela ; 20 January 1989 ; C. BOSQUE and H. SUAREZ ; 1 immature male, cl. 12.8 mm, cb. 19.6 mm (IVIC).

The original description of the species (RODRIGUEZ, 1980 a) was based on 2 small males in which the carapace curves strongly downwards anteriorly, hiding the upper and lower borders of the front in dorsal view. This character is due undoubtedly to the poor preservation of the specimens and it should be deleted from the key to the species of *Chaceus* given by RODRIGUEZ (1980 a). The present material comprises 3 fully mature males and shows several differences with the type material. For this reason a corrected description of the species is given below.

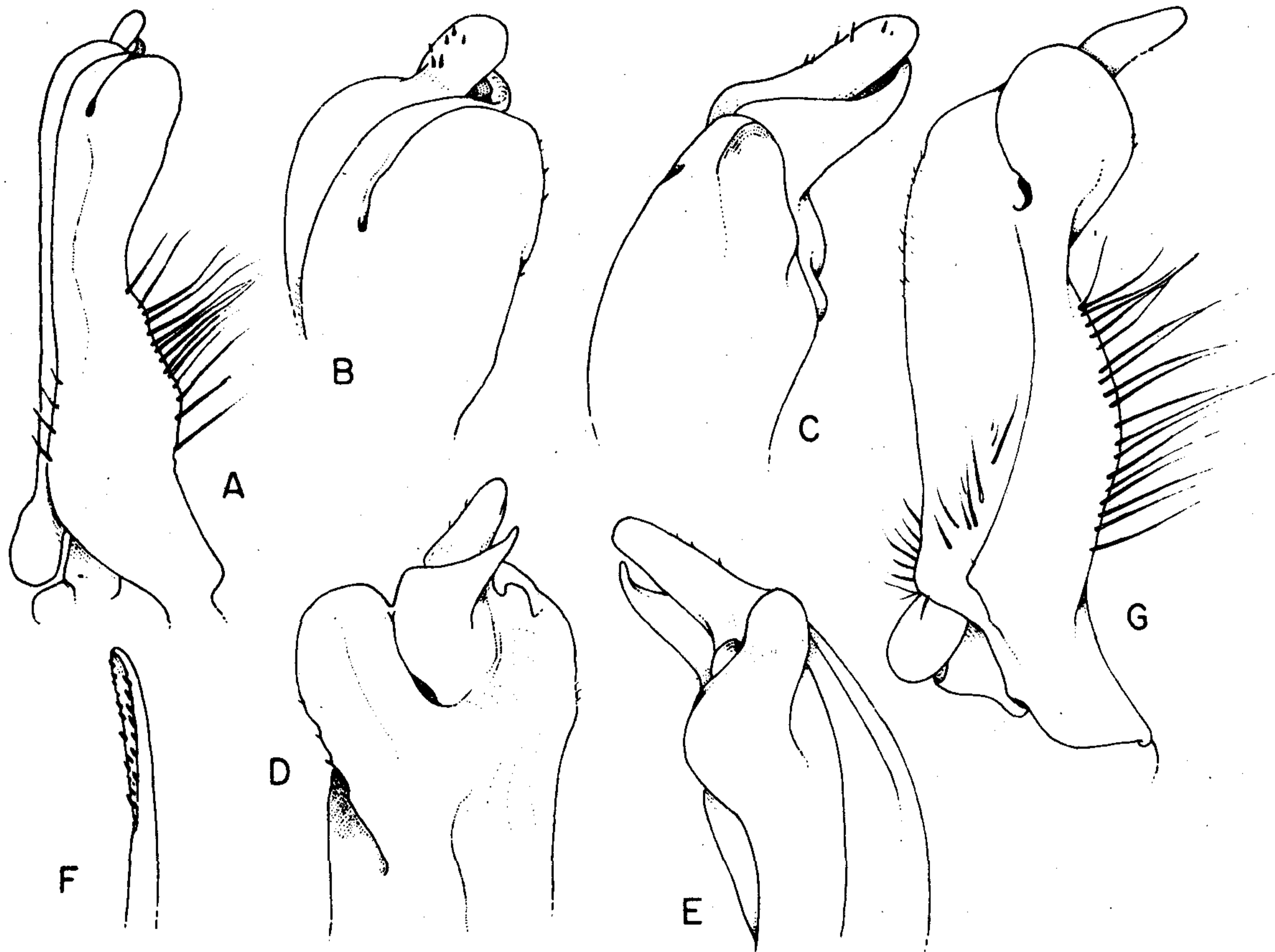


Fig. 3 - A-F, *Chaceus caecus*, n.sp., male holotype : A, first gonopod, total view, caudal ; B, first gonopod, detail of apex, caudal ; C, same, lateral ; D, same, cephalic ; E, mesial ; F, second gonopod, detail of apex. G, *Chaceus motiloni* RODRIGUEZ, male from Cueva Punto Fijo, cl. 23.6 mm, first gonopod, total view, caudal.

The cervical groove is slightly sinuous, deep and wide, it ends far from the lateral margin. The anterolateral margin has a depression behind the orbit followed sometimes by a rounded papillated lobe ; the rest of the margin is covered by indistinct papillae or denticles. The postfrontal lobes are small, oval shaped and low, marked on its anterior margin by a scar. The median groove is absent, but the surface of the carapace in this area is depressed. The surface of the carapace in front of the postfrontal lobes is strongly inclined anteriorly. The upper border of the front is ill defined, convex or slightly bilobed in dorsal view, concave in frontal view. The lower margin is strongly sinuous in frontal view. The surface of the front between the upper and lower borders is very narrow. The surface of the carapace is smooth, covered by small papillae not visible to the naked eye.

The chelipeds are strongly unequal in the full grown males, the largest been extraordinarily developed ; when fully extended it is 1.7 the breadth of carapace ; the palm is inflated ; the fingers gape strongly. The walking legs are moderately short and stout, the largest being those of the 2nd pair (total length approximately 1.2 the breadth of carapace) ; the merus in this pair is 3.7 times longer than wide. The exopod of the third maxilliped is 0.58-0.61 the length of the lateral margin of the ischium of exognath. The orifice of the efferent branchial channel is almost closed by a spine at the jugal angle and by the production of the lateral lobe of the epistome.

The first male gonopod of the specimens of *C. motiloni* from Cueva Punto Fijo exactly corresponds with the holotype, but in the immature male from Cano El Indio the apical processes of this appendage are not fully developed.

Color. Variable, but more commonly the upper part of the carapace and walking legs are brown

reddish or chocolate ; the chelipeds are uniformly light brown, or with the fingers whitish and the palm vinaceous.

III - TAXONOMICAL RELATIONSHIPS AND EVALUATION OF THE CAVERNICOLOUS CHARACTERS

A cladistic analysis performed by RODRIGUEZ and CAMPOS (1989) have shown that the four species of *Chaceus* previously known form a well-defined monophyletic group within the tribe Strengerianini. The most conspicuous diagnostic characters of the genus are found in the apex of the first gonopod which consists of a long digitiform process with a long triangular spine at its base and a lobe of variable shape on its lateral side. Within the genus, *Chaceus motiloni*, *C. caecus* and *C. pearsei* resembles each other in the shape of the digitiform process and basal triangular spine, but differs in the shape of the lateral lobe. This last process has a larger degree of resemblance between *C. motiloni* and *C. caecus* than between any of these two species and *C. pearsei*. Consequently, *C. motiloni* should be considered as the most probably sister species of *C. caecus*.

Several characters clearly distinguish the present stygobiont species from the epigeous members of the genus. The depigmentation, shape of the pereopods and reduction of the eyes, as observed in *C. caecus*, are characters attributable to the stygobiont condition of this species (RODRIGUEZ, 1985 ; HOLTHUIS, 1986 ; GUINOT, 1988). Within the Pseudothelphusidae, the reduction of the eyes is more pronounced in the species of *Typhlopseudothelphusa* where only a reduced ocular peduncle subsists. Also the pereopods are more elongated and slender in this genus and the dentition of the chelipeds possess a characteristic serrated appearance. The pseudothelphusid pseudolung wich is absent in *Typhlopseudothelphusa*, still persists in *Chaceus caecus*, although in a somewhat reduced form.

	cl	cb/cl	e/i
<i>C. caecus</i>	17.5	1.57	0.81
<i>C. davidi</i>	16.5	1.76	0.70
<i>C. motiloni</i> (holotype)	12.5	1.66	0.58
<i>C. motiloni</i> (Guasare)	23.6	1.62	0.68
<i>C. nasutus</i>	12.5	1.63	0.74
<i>C. pearsei</i>	30.0	1.71	0.70

Tab. 1 - Morphometric relationships in the species of *Chaceus*. (cl, maximum recorded carapace length ; cb/cl, ratio between carapace breadth and carapace length ; e/i, ratio of the exognath to the ischium in the third maxilliped).

Other differential characters of *Chaceus caecus* also present in *Typhlopseudothelphusa* are (1) the extension of the cervical groove to the margin of carapace where it ends in a shallow notch ; (2) the irregular papillation of the antero-lateral margin ; (3) the ornamentation of the front and orbits with papillae, manifest in *T. mocinoi* and *T. acanthochela* in the form of minute beads (RIOJA, 1953, fig. 2 ; HOBBS, 1986, fig; 2 i) ; (4) the advancement of the two median lobes of the front, very incipient in *C. caecus*, but strongly developed in the species of *Typhlopseudothelphusa*, particularly in *T. mocinoi* and *T. acanthochela* (RIOJA, 1953, fig. 1 ; HOBBS, 1986, fig. 2 a). The appearance of these characters in species which are very distant phylogenetically suggests that these might be convergent characters explainable for the common cavernicolous habitat.

IV - BIOSPEOLOGICAL REMARKS

The two species of crabs discussed in the present contribution were collected in the Cueva Punto Fijo, code ZU.21. of the nomenclature in use by the Venezuelan Society of Speleology. According to a survey carried out by members of this Society on April 15, 1987 (BCRA degree : 4D) (Sociedad venezolana de espeleologia, 1989), this cavity is located at 72° 28' 06" W, 10° 57' 10" N, the elevation of the entrance above sea level is 590 m, and it has a total length of 254 m, with a drop of 10 m. The entrance is located at the bottom of an elongated doline and forms a seasonal sink for a small endorreic valley of approximately 40 hectares. There is a second cave (ZU.22.) of 32 m of total length located 400 m to the north. This karstic area is located in Cretaceous limestones of the Apon formation, an extensive stratigraphic unit of the Northern Cordillera de Perija, dated as of Aptian age (Lexico Estratigrafico de Venezuela, 1970).

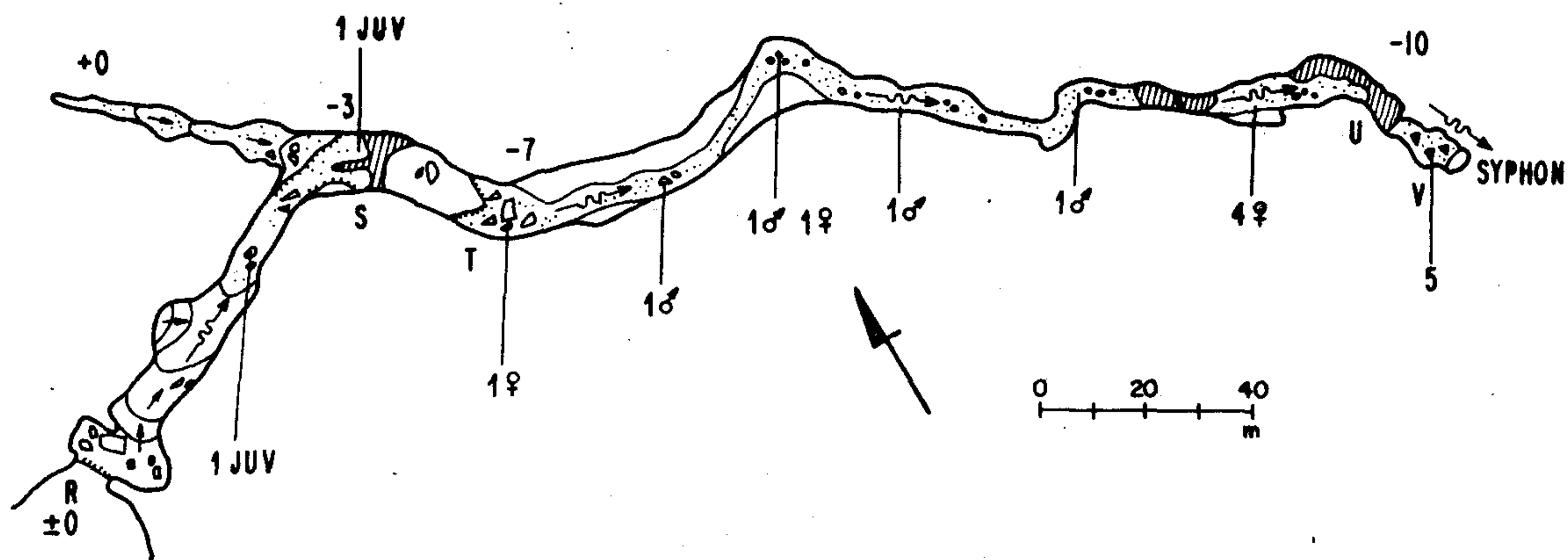


Fig. 4 - Punto Fijo cave ZU.21, Venezuela, with records of *Chaceus caecus*. Base map reproduced from Sociedad Venezolana de Espeleología (1989), with permission.

The cave (fig. 4) consists of a descending gallery which obliquely intersects another of similar cross-section (width 3-7 m, height 1.5-3 m). The access gallery has a trickle of water along the floor which at the junction point "S" drains into a deep pool. From this point flows a small stream (discharge 10 liter/s) to a terminal siphon ("V"), where the access is obstructed by rocks. In the course of the stream there are several shallow pools and deposits of mud and gravel. Flood marks up to 1.5 m high indicate a considerable total discharge during the rainy season. The recorded temperature of the water was 21° C.

Chaceus motiloni was found only in the area of the cave where light prevails during day time, that is from 0 to 5 meters inside the cave ; 3 males, 4 females, and the exuvia of a male of this species were recorded during a period of observation of 45 minutes by two collectors ; the animals were found under pebbles out of the water and just in the water line. These crabs form a periodically isolated deme since there are no superficial courses of water at least 1 km around the cave during the dry season.

A total of 19 specimens of *Chaceus caecus* were recorded in total darkness, in the bottom of the pools and in the course of the stream, in the places indicated in fig. 4. However, it should not be discarded that other specimens could inhabit the inaccessible portion of subterranean water beyond the terminal syphon.

In addition to the crabs, the hypogeous fauna observed consists of an undescribed species of a Trichomycteridae catfish, blind, unpigmented, of approximately 20 cm maximum length which is relatively common in the cave ; a small population of approximately 30 individuals of the frugivorous bat *Carollia* sp. ; one species of a carabid beetle, a blind unpigmented species of cricket, and a species of Opilionid.

The input of organic matter from outside is evident since there are seeds and seedlings in several parts of the cave and particulated vegetable matter is present in the water. Fungi were observed, but no guano deposits exist, and thus the small arthropods usually associated with it are absent. Interconnection of the subterranean waters in the area must be assumed since the same species of the trichomycterid catfish (but not the rest of the fauna) is present in the smaller cave to the North and in a spring which surfaces for 50 m near the main cave.

SUMMARY

Chaceus caecus, new species, is described from a cave in the Cordillera de Perija, Venezuela. Its nearest relative, the epigeic species *C. motiloni* RODRIGUEZ, 1980, widely distributed in this cordillera also inhabits this cave as a stygophile. The morphological differentiation between the stygophile and stygobiont species includes depigmentation, slenderness of the pereiopods, ocular reduction and changes in the anterior and latero-anterior margins of carapace. The population number of the stygobiont species is very low in the accessible part of the karstic area.

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