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A new cave species of *Cryphiops* (Crustacea: Decapoda: Palaemonidae) from Southern Mexico

FABIOLA BALDARI[1], LUIS M. MEJÍA-ORTÍZ[2,4] & MARILÚ LÓPEZ-MEJÍA[3]

[1]*Dipartimento di Biologia, Università di Roma "Tor Vergata". Vía della Ricerca Scientifica I-00133 Roma Italy.*
E-mail: fabiola.baldari@uniroma2.it
[2]*Laboratorio de Bioespeleología y Carcinología, 3) Laboratorio de Biología Evolutiva y Genética de Poblaciones. Universidad de Quintana Roo -Cozumel (UQROO-Cozumel). División de Desarrollo Sustentable, Dpto. Ciencias y Humanidades.*
Avenida Andrés Quintana Roo s/n, C. P. 77640, Cozumel, Quintana Roo, México.
E-mail: luismejia@uqroo.mx & marlopez@uqroo.mx
[4]*Corresponding author. E-mail: luismejia@uqroo.mx*

Abstract

The second cave species of the genus *Cryphiops* from Chiapas, Mexico is described. *Cryphiops sbordonii* **sp. nov.** is similar to *Cryphiops luscus* in exhibiting reduced eyes, and an enlargement of ambulatory appendages. It differs from this species in ornamentation of the rostrum, proportions of the articles of the first and the second pereiopods, and proportion between the length of the appendix masculina and the length of the appendix interna, as well as the disposition and the number of the setae on the appendix masculina. *Cryphiops sbordonii* new species occurs in the Cueva Chamburro, a cave located in the Margaritas Region of Chiapas, southern Mexico.

Key words: *Cryphiops*, Stygobitic Shrimps, Mexico

Introduction

In Mexico there are several caves in Chiapas State (Sbordoni *et al.* 1977, 1986, 1987; Sbordoni & Lucarelli 1989-'90; Reddell 1981) where several decapod species are part of the obligate fauna (Holthuis 1973; Hobbs *et al.* 1977; Reddell 1981; Villalobos 2005; Mejía-Ortíz *et al.* 2008). Three species of the genus *Cryphiops* Dana, 1852 currently inhabit these cave systems and epigean rivers that belong to the subgenus *Bythinops* Villalobos, Nates & Cantu, 1989: *Cryphiops luscus* (Holthuis 1973) and *Cryphiops perspicax* (Holthuis 1977) have been reported only from caves; and *Cryphiops villalobosi* Villalobos, Nates & Cantu, 1989 has been collected from epigean rivers and streams.

In this paper, a new stygobitic species is described. It occurs in the Cueva Chamburro in the Margaritas Region (fig. 1). The relationships of the new species with other subterranean and epigean species from Chiapas are discussed.

The type specimens are deposited in the National Crustacean Collection (CNCR) of the Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City. The description is based on holotype and allotype material.

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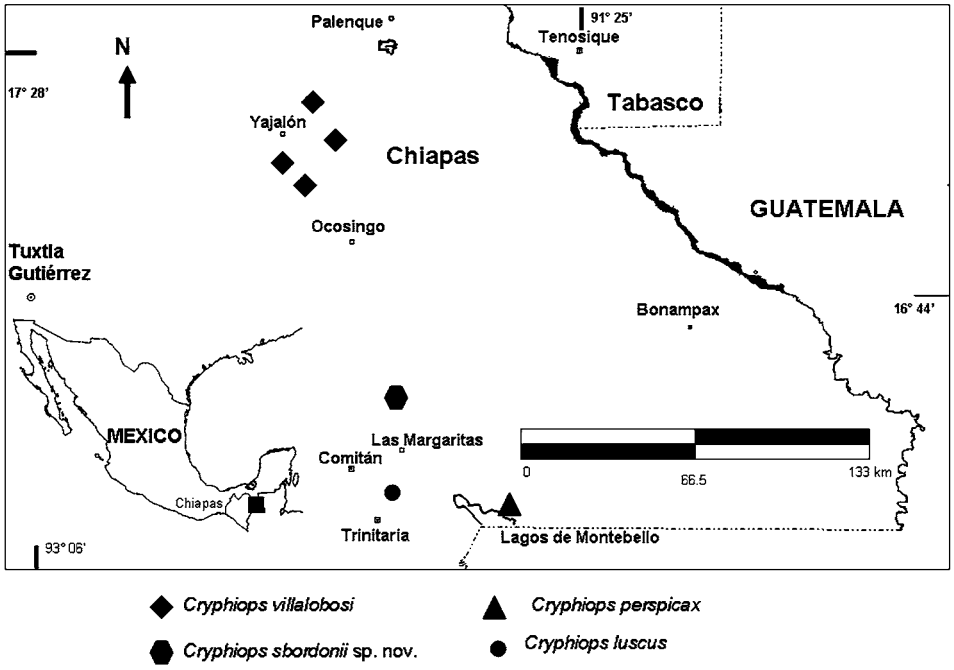

FIGURE 1. Distribution of the species of *Cryphiops* in Chiapas State Mexico. *C. luscus*: Cueva del Arco, San Rafael del Arco, La Trinitaria. *C. perspicax*: Cenote la Cueca, Tziscao, La Trinitaria. *C. sbordonii*, **sp. nov.**: Cueva Chamburro, Las Margaritas. *C. villalobosi* streams between Ocosingo-Yajalon, Chiapas.

Systematics

***Cryphiops sbordonii* sp.nov.**
figs. 2–4

Holotype. Male (Fig. 2A), (CL) = 25 mm, 01 March 2001; V. Sbordoni leg.; Cueva Chamburro, Las Margaritas, Chiapas, Mexico (16° 25' 57" N 91° 56' 40" W); CNCR 25106

Allotype. Female (Fig. 2B), CL= 22.5 mm, 01 March 2001; V. Sbordoni leg., same locality as holotype; CNCR 25107

Paratypes. 1 female, CL= 12.3 mm; 01 March 2001; V. Sbordoni, coll.; CNCR 25108.

Description. Medium sized prawn, maximum total length 54.5 mm. Rostrum short, straight, tip not reaching the distal border of scaphocerite but almost reaching the third article of antennular peduncle; dorsal margin bearing 8 teeth, lack teeth in postorbital position and on ventral margin (fig 2a). Live *Cryphiops sbordonii* **sp. nov.** is white, without pigment in the body.

Carapace smooth, maximum length 25 mm, with only antennal spine; branchiostegal groove shallow.

Abdomen smooth, pleura of first three somites broadly rounded (fig. 2a & b). Posteroventral margin of fourth and fifth pleura rounded, all pleura bearing setae on ventral border. Sixth somite 1.5 times as long as fifth.

Eyes reduced, cornea with a small apical black point, this point bearing facets (fig. 2c).

Antennules (Fig. 3H) with short stylocerite on the proximal third of first peduncular segment. First antennular segment with acute distolateral spine and concave depression to fit eye. Second antennular segment semi-cylindrical, with sinuous distal margin and lateral row of long setae.

Antennae (Fig. 3F) with basicerite bearing short spine on internal margin. Scaphocerite 2.4 times as long as wide, distolateral spine short, widely separated from distal margin of main blade.

Mandibles (Fig. 4A) with 3-segmented palp, first and second segments shorter than third segment; incisor process with 6 conical teeth, molar process with 7 wide, rounded teeth on mesial border.

Maxillules (Fig.4B) with bilobed palp, distal lobe slender, with one setae on tip, proximal lobe blunt with two thick and short setae; anterior lacinia with six long setae on mesial margin, distal margin with a row of fine setae; posterior lacinia joint with anterior lacinia, straight, distal half covered with setae.

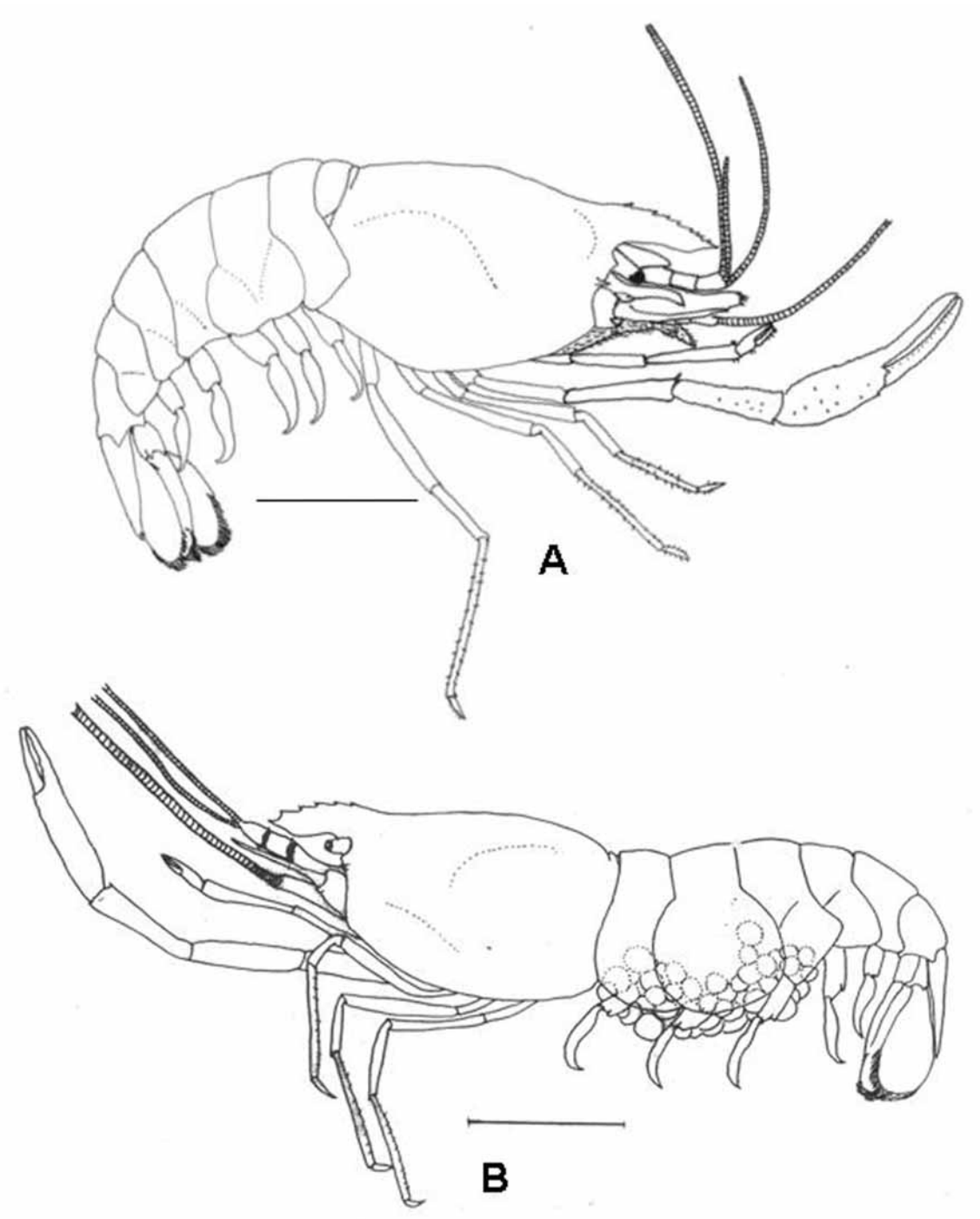

FIGURE 2. *Cryphiops sbordonii* **sp. nov.** A, lateral view from male holotype CNCR 25106. B, lateral view of female allotype with eggs, CNCR 25107. Scale bars: 10 mm.

Maxillae (Fig. 4C) with scaphognathite bordered with plumose setae, anterior lobe narrower and longer than posterior one; palp without setae, tapering distally, strongly curved inwards; endite bilobed, divided by incision along distal third, both lobes with tuft of setae on the tip.

First maxilliped (Fig. 4D) with bilobed endite, bearing three seate along margin, and tuft of setae on surface of distal lobe. Exopod slender, 4.4 times as long as palp, distal third bearing long setae; palp simple,

with two thick setae, shorter than endite; caridean lobe large, fused to base of exopod, bearing long, plumose setae all along margin.

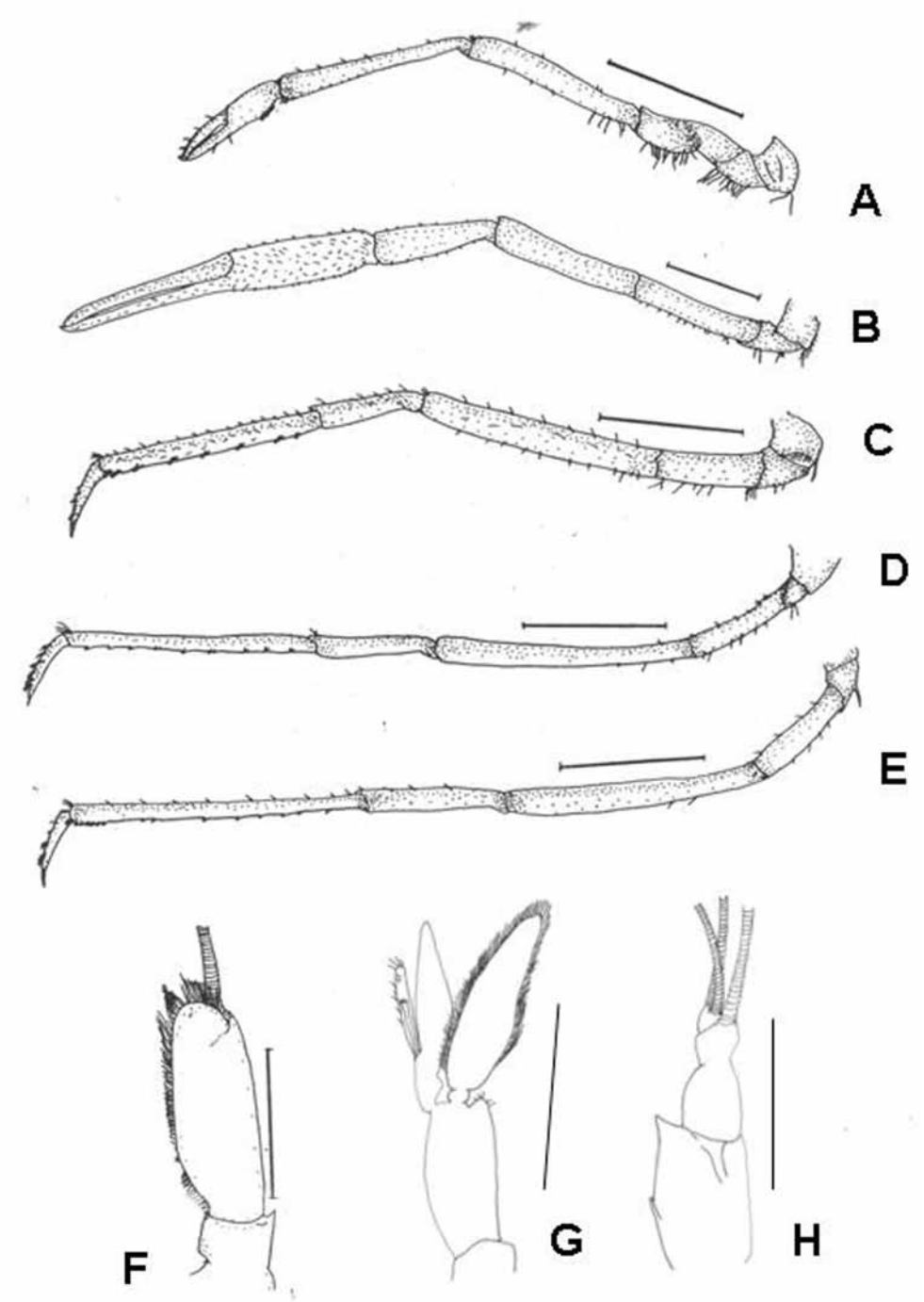

FIGURE 3. *Cryphiops sbordonii* **sp. nov.**, male holotype CNCR 25106. A–E, first through fifth pereiopods, respectively; F, distal portion of antennal peduncle; G, appendix masculina on second pleopod; H, distal portion of antennular peduncle. Scale bars: A–E, 5 mm; F–H, 5 mm.

Second maxilliped (Fig. 4E) subpediform, podobranch present, well developed; endopodite 4-segmented, distal 2 segments oriented mesially, gnathal border with marginal setae and spines and submarginal setae; exopod slender, almost 1.5 time as long as endopod, tip bearing long, plumose setae (fig. 4E).

Third maxilliped (Fig. 4F) pediform, slender, reaching beyond basal portion of antennal flagellum; arthrobranch present, well developed; coxa with rounded lateral projection. Endopod 3-segmented, with abundant setae along ventral margin; first segment 1.5 times as long as second segment; second segment as

long as third, distal margin ending in nail. Exopod slender, flat, almost the same length as the first segment of endopodite, bearing long setae distally.

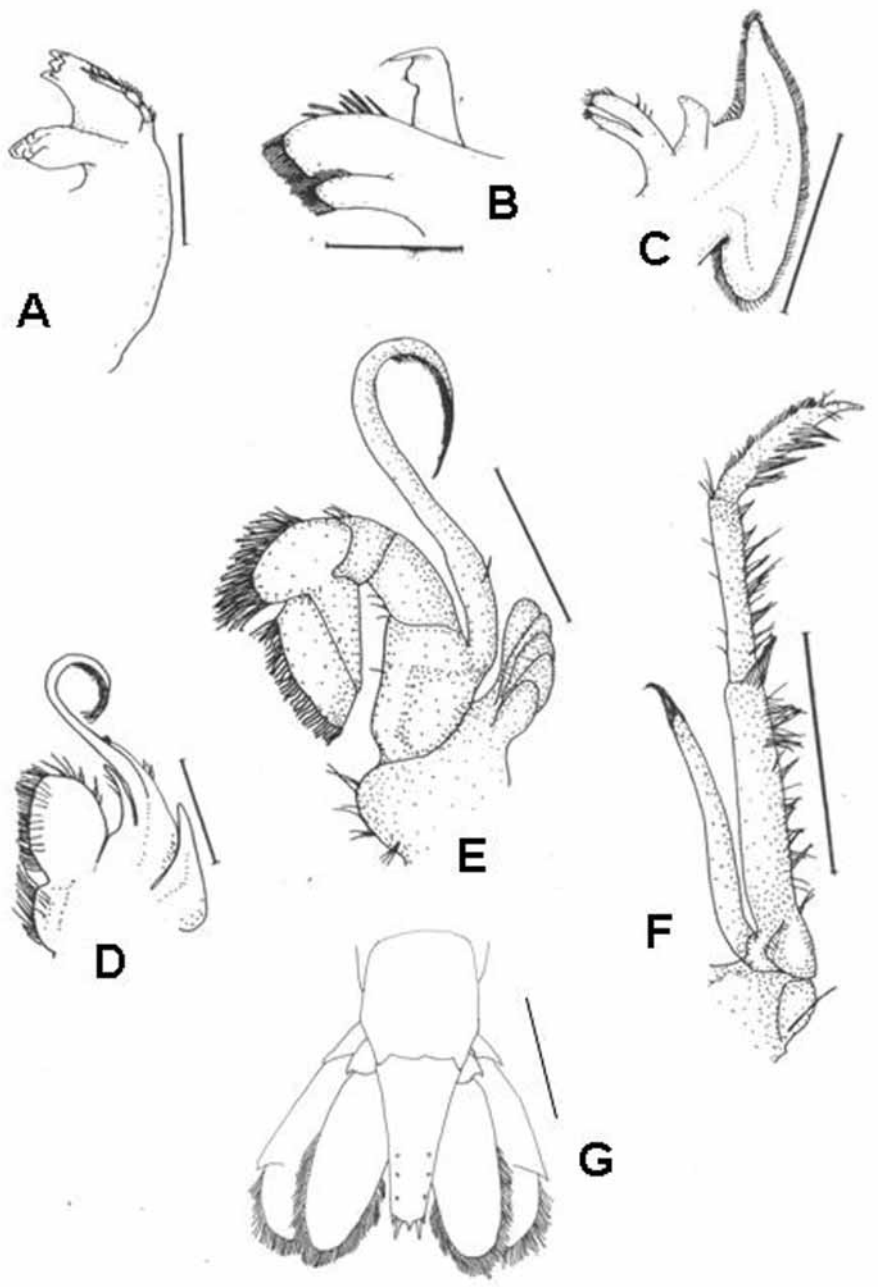

FIGURE 4. *Cryphiops sbordonii* **sp. nov.**, male holotype CNCR 25106. A, right mandible; B, right maxillule; C, right maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped; G, telson and uropods. Scale bars: A–E, 2 mm; F–G, 5 mm.

First pereiopods (Fig. 3A) slender, smooth, with few tufts of setae on both fingers. Palm surpassing distal margin of scaphocerite; palm slightly compressed, as long as dactylus; carpus 1.75 times palm length, 1.12 times merus length.

Second pereiopods (Fig. 3B) subequal in size, without spines. Palm semi- cylindrical, 3.3 times as long as wide, with dispersed tufts of setae, 0.8 times dactylus length; carpus 1.19 times palm length, 0.8 times as long as merus; ischium 0.9 times merus length. Fingers not gaping, elongate, cutting margins covered with tufts of setae, fixed finger and dactylus without teeth.

Propodus and dactylus of third pereiopod (Fig. 3C) with several short setae. One row of 7 spines on ventral margin. Propodus 3 times length of dactylus, 2.05 times carpus length.

Fourth pereiopods (Fig. 3D), sparsely pilose; propodus 3.4 times dactylus length, 1.87 times as long as carpus; with one row of 9 movable spines on ventral margin of propodus, one pair of setae on propodus–dactylus articulation.

Fifth pereiopods (Fig. 3E) the longest. Propodus and carpus pilose; one longitudinal row of 12 movable spines, distal 4 close together, 1 spine on propodus–dactylus articulation; propodus 4 times dactylus length, 2.1 times carpus length.

Appendix masculina (Fig. 3G) 2 times length of appendix interna, inner margin with 10 pairs of spines.

Telson (Fig. 4G) 1.4 times longer than sixth somite, shorter than uropodal rami; bearing two pairs of dorsal spines, first pair in distal fifth, second pair in middle section with a single spine in the middle on left side; posterior margin broadly triangular bearing two pairs of lateral spines, inner pair 5 times longer than external one, with plumose setae between inner spines, center ending in acute tip.

Etymology. This stygobitic shrimp is named in honor of its discoverer, Professor Valerio Sbordoni, who has greatly contributed to the knowledge of the cave fauna of Chiapas.

Habitat. This species lives in the Cueva Chamburro, a cave system situated northeast of Las Margaritas, Chiapas, Mexico. The cave was explored and surveyed in March 2001, during one of the several expeditions led by Prof. V. Sbordoni. Description and topography of this cave have been reported by Pedicone –Cioffi (2004). The whole cave system is about 600 m long, and 90 m deep. From the entrance, located in the bottom of a wide doline, a steep descending passage 60 m deep leads to two galleries.

The main gallery develops for around 400 m south-eastwards, housing series of rock pools and, in most of its development, a stream ending in a siphon. As reported by Prof. V. Sbordoni, shrimps have been collected along the stream, swimming in rather deep waters.

TABLE 1. Comparison among the *Cryphiops* (*Bithynops*) species from Chiapas.

	C. luscus	*C. perxpicax*	*C. villalobosi*	*C. sbordonii* **nov. sp.**
Rostrum	5–8/1, not reaching distal margin of scaphocerite.	5–7(1)/1, reaching or overpassing beyond distal margin of scaphocerite.	6–9(1)/1–2, reaching distal margin of scaphocerite.	8(0)/0, not reaching distal margin of scaphocerite.
Scaphocerite	2.5 times as long as wide	2.9 times as long as wide	2.8 times as long as wide	2.4 times as long as wide
Telson	1.3 times length of 6th abdominal somite	1.2 times length of 6th abdominal somite	1.5 times length of 6th abdominal somite	1.4 times length of 6th abdominal somite
Eyes	Reduced, with black point.	Pigmented	Pigmented	Globular cornea with facets over black point
First pereiopods	Reaching chela of 2nd pereiopods. Carpus 1.5 times length of chelae	Reaching first third of carpus length of 2nd pereiopods. Carpus 1.5 times length of chelae.	Reaching the first third of carpus length of 2nd pereiopods. Carpus 1.3 times length of chelae.	Almost reaching the distal margin of carpus of 2nd pereiopod. Carpus 1.75 times length of chelae.
Second pair of pereiopods	Robust covered with sharp spinules; ischium 0.7 as long as merus, 0.76 as long as carpus and 0.31 as long as chelae. Fingers as long as palm length	Robust with scattered setae; ischium 0.73 as long as merus, 0.7 as long as carpus, and 0.4 as long as chela.	Cylindrical with small sharp spinules; ischium 0.53 as long as merus, 0.58 as long as carpus and 0.35 as long as chelae.	Semi–cylindrical covered with disperse tufts of setae; ischium 0.88 as long as merus, as long as carpus and 0.40 as long as chelae. Fingers 1.28 long as palm length.
Appendix masculina	Approximately 1.85 times length of appendix interna, with 12 pairs of spines.	Almost 1.8 times as long as appendix interna, with 11 pairs of spines	Approximately 2.05 times as long as appendix interna, with 15 pair of spines.	Approximately 2 times as long as appendix interna with 10 pair of spines.

Discussion

Of the four species of *Cryphiops* inhabiting the waters of Chiapas, only two show morphological adaptations to cave life: *Cryphiops luscus* and *Cryphiops sbordonii* **sp. nov.** *Cryphiops perspicax* although known only from Cenote la Cueva, is not a stygobitic species, rather it is a stygophile species (Reddell 1981). *Cryphiops villalobosi* is an epigean species, living in superficial rivers in the same area. All species are close geographically, and occur in a small geographical area (Fig. 1). It is possible that there are still unexplored caves or rivers in Chiapas or Guatemala where this genus lives. However, is seems clear that the extension of this genus does not not beyond the natural barrier defined by the Sierra Madre de Chiapas.

These two morphologically cave adapted species have elongated pereiopods, lacking of pigmentation on body and have small black point on each eye. However, the enlargement of the pereiopods and the shape of the eyes together with the antennae length in the *C. sbordonii* sp. nov. shows that this species is more adapted to cave life.

The morphological differences between the new species and the other cave species are: the ornamentation of the rostrum, the proportions of the articles of the first and the second pereiopods, the proportion between the length of the appendix masculina and the length of the appendix interna, as well as the disposition and the number of the setae on the appendix masculina (Table 1). Obviously the lack of any stygobiont characters makes the epigean species inmmediately distinguishable.

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Literature cited

Hobbs, H.H. Jr., Hobbs, H.H. III & Daniel, M.A. (1977) A review of the troglobitic decapod crustaceans of the Americas. *Smithsonian Contribution to Zoology*, 244, 183 pp.

Holthuis, L.B. (1973) *Bythinops luscus*, A new genus and species of cavernicolous shrimps from Mexico (Crustacea, Decapoda, Palaemonidae). In: Subterranean fauna of Mexico. Part II. *Quaderni Accademia Nazionale dei Lincei*, 171, 135–142.

Holthuis, L.B. (1977) Cave shrimps (Crustacea, Decapoda, Natantia) from Mexico. In: Subterranean fauna of Mexico. Part III, *Quaderni Accademia Nazionale dei Lincei*, 171, 173–195.

Mejia-Ortiz, L.M., Baldari, F. & Lopez-Mejia, M. (2008) *Macrobrachium sbordonii* (Decapoda: Palaemonidae) a new stygobitic species of freshwater prawn from Chiapas Mexico. *Zootaxa*, 1814, 49–57.

Pedicone-Cioffi, A. (2004) Descrizione delle grotte esplorate dal 1998 al 2001. *Notiziario del Circolo Speleologico Romano, nuova serie*, 16–19, 55–82.

Reddell, J.R.(1981) A review of the cavernicole fauna of Mexico, Guatemala and Belize. *Bulletin of the Texas Memorial Museum*, 27, 1–327.

Sbordoni, V., Argano, R., Vomero, V. & ZULLINI, V. (1977) Ricerche sulla fauna cavernicola del Chiapas (Messico) e delle regioni limitrofe: grotte esplorate nel 1973 e nel 1975. Criteri per una classificazione biospeleologica delle grotte. In: Subterranean fauna of Mexico, part III. *Quaderni Accademia Nazionale dei Lincei*, 71, 5–74.

Sbordoni, V., Argano, R. & Vomero, V. (1986) Relazione biologica sulle spedizioni “Malpaso” 1981–82 e 1984. *Notiziario del Circolo Speleologico Romano, nuova serie*, 1, 73–88.

Sbordoni, V., Carchini, G. & Lucarelli, M. (1987) Primi risultati delle ricerche biospeleologiche svolte nel 1986 e 1987 in Chiapas (Messico). *Notiziario del Circolo Speleologico Romano, nuova serie*, 2, 135–150.

Sbordoni, V. & Lucarelli, M. (1989–'90) Raccolte biospeleologiche in Chiapas (1988–1991). *Notiziario del Circolo Speleologico Romano, nuova serie*, 4–5, 55–64.

Villalobos, J.L., Nates, J.C. & Cantu, A. (1989) Revisión de los géneros *Cryphiops* Dana, 1852 y *Bithynops* Holthuis 1973 de la familia Palaemonidae (Crustacea, Decapoda), y descripción de una especie nueva para el estado de Chiapas, México. Anales del Instituto de Biología, Universidad Nacional Autónoma de México Ser. Zoología, 60(2), 159–184.

Villalobos, J.L. (2005) Sistemática de los cangrejos de agua dulce de México, Tribu Pseudothelphusini Ortmann, 1897 (Crustacea: Decapoda: Brachyura: Pseudothelphusidae). Análisis filogenético biogeográfico y descripción de especies nuevas. Tesis Doctoral. Instituto de Biología, UNAM, 394 pp.