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Original Article

New records and geographic range extension of *Epilobocera capolongoi* Pretzmann, 2000 (Decapoda: Brachyura: Epiloboceridae) in Cuba, with notes on its natural history and conservation

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ABSTRACT

The natural history and conservation status of the West Indian endemic freshwater crabs of the genus *Epilobocera* are poorly known. Several species have restricted distributions and apparently specific ecological requirements, which make them particularly vulnerable to anthropogenic threats. *Epilobocera capolongoi* is known to occur exclusively in mountain streams and rivers above 300 m elevation in the Guamuhaya Massif, central Cuba. In addition to the publication with the original description, there is only one paper exclusively on this species, which reported it as being preyed upon by a heron and recorded it from some additional localities in the vicinity of Topes de Collantes, provinces of Cienfuegos and Sancti Spíritus. *Epilobocera capolongoi* is herein reported from Pico San Juan Ecological Reserve and Lomas de Banao Ecological Reserve, which expands its geographic range to about 60 km and its elevation to 1,000 m. The species was found living sympatric with the congeneric *Epilobocera cubensis poliorcetes* in Lomas de Banao Ecological Reserve, but apparently there exists some habitat segregation between them. Some phenotypic characters important to distinguish both species are described, some basic data on their natural history are provided, and an assessment of the conservation status of *E. capolongoi* following current IUCN criteria is made.

KEYWORDS

Freshwater crab, Greater Antilles, Malacostraca, Neotropical region, threatened species

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INTRODUCTION

The composition of the Greater Antillean endemic freshwater crab genus *Epilobocera* Stimpson, 1860 (Epiloboceridae) is somewhat confusing both from a taxonomic and a nomenclatural point of view (Rodríguez and Magalhães, 2005; Ng et al., 2008; Wehrtmann et al., 2016; Capolongo, 2018; Álvarez et al., 2020). Currently, it most likely comprises eight species distributed in Cuba and Isla de la Juventud (five species), Hispaniola (two species), and Puerto Rico and Saint Croix (one species) (Chace and Hobbs, 1969; Rodríguez and Williams, 1995; Pretzmann, 2000; Capolongo, 2003; 2005; 2014; 2018). The taxonomic status of a ninth species, *Epilobocera armata* Smith, 1870, is unclear (Capolongo and Pretzmann, 2002; Rodríguez and Magalhães, 2005; Capolongo, 2018). Also, many of the taxa described by Capolongo and Pretzmann (2002) and Capolongo (2003; 2005; 2017) might not be valid because of incorrect procedures according to the ICZN (1999) and require thorough revisions (Rodríguez and Magalhães, 2005; Álvarez et al., 2020).

Epilobocera capolongoi Pretzmann, 2000, inhabits exclusively the mountain streams and rivers of the Guamuhaya Massif, in central Cuba, at elevations between 390–650 m (Pretzmann, 2000; Capolongo, 2003; Rodríguez-Cabrera et al., 2018). This species exhibits a restricted geographic range, known only from five localities less than 10 km apart in the vicinity of Topes de Collantes, Cienfuegos and Sancti Spíritus provinces (Capolongo, 2003; 2006; 2018; Rodríguez-Cabrera et al., 2018). Together with *Epilobocera cubensis* Stimpson, 1860, *E. capolongoi* is among the largest freshwater crabs in Cuba, with a maximum carapace length (CL) and carapace width (CW) of 4.6 mm and 8.1 mm, respectively (Pretzmann, 2000; Capolongo, 2018). Based on an unpublished molecular phylogeny (sequences of 553 base pairs of the mitochondrial 16S rRNA gene), Capolongo (2014) stated that *E. capolongoi* is the most differentiated and basal species in Cuba, sharing a common ancestor with *E. sinuatifrons* (A. Milne-Edwards, 1866) from Puerto Rico and *E. haytensis* Rathbun, 1893, from Hispaniola.

The only available information on the natural history of *E. capolongoi*, other than it inhabits mountain streams and rivers, is that this crab can be preyed upon by a heron, *Nyctanassa violacea* (Linnaeus, 1758) (Aves: Ardeidae) (Rodríguez-Cabrera et al., 2018). Given the scarce information available on this species, it was evaluated as Data Deficient by the IUCN Red List since 2008 (Cumberlidge, 2008a; see also Cumberlidge et al., 2009). In the present paper, new records of *E. capolongoi* from two new protected areas, which extends its geographic and altitudinal ranges, as well as basic information on its habitat, behavior, and the associated decapod species assemblages is provided. Morphological structures and its coloration in life that might be important as diagnostic characters are described as well.

MATERIALS AND METHODS

The specimens were collected during both daytime and nighttime (using standard flashlights), either by turning rocks over, by digging crab holes along the riverbanks or by visual detection of active animals. Coordinates were taken in the field with a GPS (datum WGS 84). Vouchers were preserved in 75% ethanol and deposited in the Zoological Collection of the Instituto de Ecología y Sistemática (CZACC), Havana, Cuba. All measurements were taken to the nearest 0.1 mm with a caliper, except those of the male first gonopods (G1) that were photographed with a reference scale under a stereomicroscope. The crab species were identified using the morphological characters traditionally used and following the classifications of Pretzmann (2000), Capolongo and Pretzmann (2002), and Capolongo (2003; 2018). Terminology for the morphological structures of the G1 followed Rodríguez and Williams (1995). The sympatric species of shrimps were identified according to Juarrero de Varona and Gómez Hernández (1995).

The conservation status of *E. capolongoi* was evaluated following the criterion B (geographic range) of the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Subcommittee, 2019). The Area of Occupancy (AOO) and the Extent of Occurrence (EOO) were calculated with MapInfo Professional ver. 10.5. The EOO was estimated using the convex hull method and a standardized reference scale grid of 4 km^2 (2 × 2 km) cells for the AOO, as proposed by the IUCN Standards and Petitions Subcommittee (2019). For the purposes of this work and following the concept of "location" of the IUCN Standards and Petitions Subcommittee (2019, section 4.11), all records less than

2 km apart were considered as the same location (e.g., Topes de Collantes and immediate vicinity, and new records around La Sabina ranger station; Capolongo, 2003; 2018; Rodríguez-Cabrera et al., 2018).

RESULTS

Distribution

A total of 13 specimens of *E. capolongoi* (including one female carrying offspring) and 14 specimens of *E. cubensis* (specifically, *E. cubensis poliorcetes*, sensu Capolongo, 2003) (including two females carrying offspring) were collected and observed. The specimens were collected in four different localities within Lomas de Banao Ecological Reserve (Figs. 1, 2), associated with two different river basins, from 315 to 600 m elevation (App. 1) and in Pico San Juan Ecological Reserve (Figs. 1, 3), in mountain rainforest, at 1,000 m elevation. In most of the localities within Lomas de Banao Ecological Reserve both species were found living sympatrically.

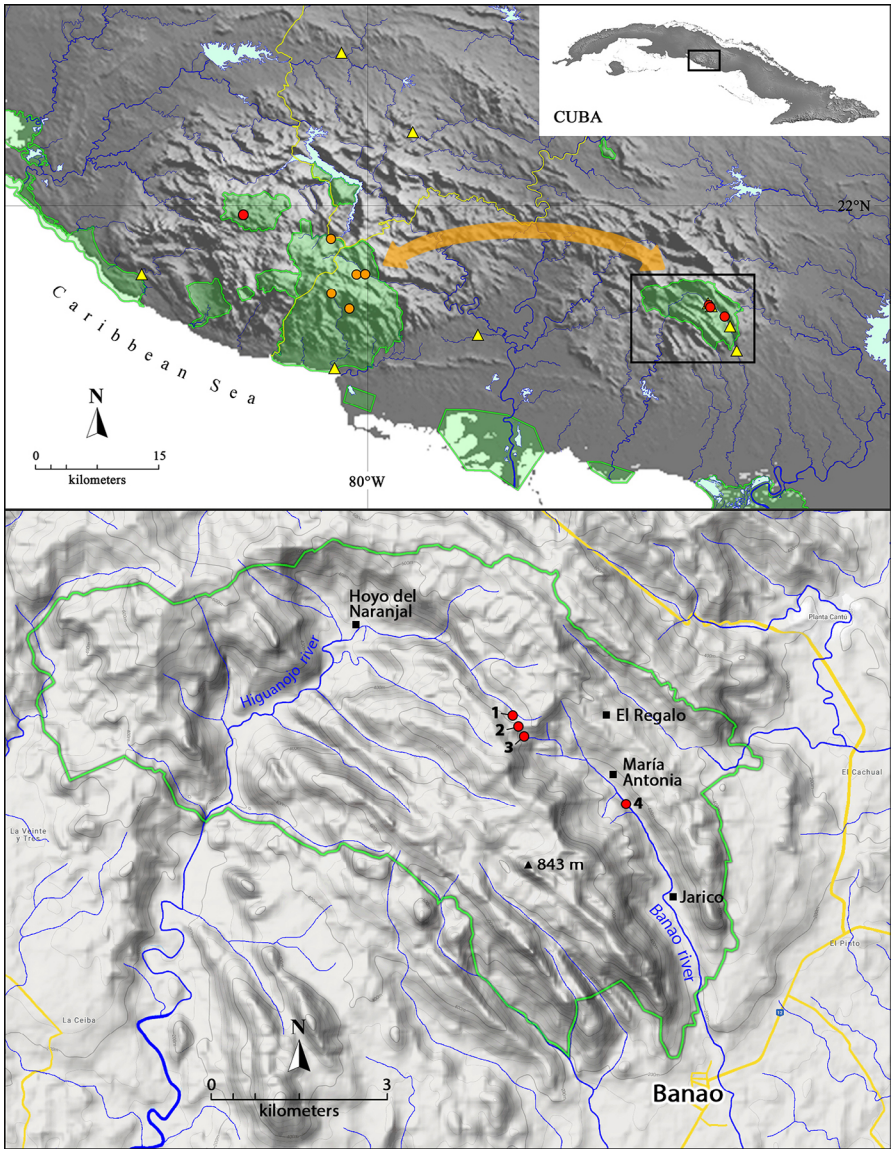

Figure 1. Distribution of *Epilobocera capolongoi* (circles) and *E. cubensis* (triangles) in central Cuba, depicting the previous records (orange circles) and new records (red circles) of *E. capolongoi*: 1) Tributary source of Higuanojo river, 2) La Sabina ranger station, 3) tributary source of Banao river, and 4) Banao river, near María Antonia ranger station; the westernmost new record (above) corresponds with Pico San Juan Ecological Reserve. Green shadings and contours depict protected areas. The two-headed orange arrow depicts the narrow strip of heights connecting the Trinidad Heights in the west and the Sancti Spíritus Heights in the east, assumed here as a putative communication pathway between the two presumably allopatric subpopulations of *E. capolongoi*.

Figure 2. Localities where *Epilobocera capolongoi* was collected in Lomas de Banao Ecological Reserve. Upper left, tributary source of Banao river; upper right, tributary source of Higuanojo river. Lower left, Banao river, near María Antonia ranger station. Lower right, view from La Sabina ranger station, after a heavy rain.

Figure 3. Habitat (above) and landscape (below) in Pico San Juan Ecological Reserve, Cienfuegos province, where a female *Epilobocera capolongoi* carrying offspring was observed in mountain rainforest at 1,000 m elevation.

Morphology

The most distinctive character of *E. capolongoi* is the very broad exopodite of the third maxilliped (more than twice the width of this structure in the remaining species of the genus), as well as the shape of the G1 (Figs. 4–6). *Epilobocera capolongoi* also differs from the sympatric species *E. cubensis* in overall coloration (see below and Tab. 1) and in some morphometric ratios (Fig. 7; App. 2) such as the proportions of the carapace (average width/length ratio: 1.7 in *E. capolongoi* vs. 1.6 in *E. cubensis*), in the proportional length of the walking legs (average 1.26 times as long as the carapace width in *E. capolongoi* vs. average 1.16 times as long as the carapace width in *E. cubensis*), in the cheliped carpus length/width ratio (1.7 in *E. capolongoi* vs. 1.5 in *E. cubensis*; not including the inner carpal spine, more developed in *E. cubensis*), and by having a slender cheliped merus (average length/width ratio: 2.6–2.7 in *E. capolongoi* vs. 2.2 in *E. cubensis*), with strong differences in ornamentation (Tab. 1; Fig. 8). The opening of the branchial efferent channel is also slightly different in both species (subquadrate in *E. capolongoi* vs. more rounded in *E. cubensis*; Fig. 9).

The G1 also differs strongly between *E. capolongoi* and *E. cubensis*. They differentiate in the shape and size of the mesial lobe (considerably more produced and laterally compressed in *E. capolongoi*), number of spines on the mesial angle of the cephalic margin (two in *E. capolongoi* vs. three in *E. cubensis*), and the size and distribution of the spines on the lateral, mesial, terminal, and caudal processes, among other differences (Fig. 6).

Coloration in life

Despite a brownish coloration predominating on both species, there are strong differences in several parts of the body (Figs. 4, 5, 8–10, 11, 12; Tab. 1). In general, *E. capolongoi* has a paler dorsal coloration and reddish pleurae on the chelipeds, whereas *E. cubensis* has an overall darker coloration with yellowish pleurae on the chelipeds and conspicuous "ringed" pereiopods and reddish eyes.

Natural history

Most specimens of *E. capolongoi* were active mainly at night (Fig. 10), but in shaded situations some specimens were observed active also during the day. This species seems to be opportunistic and takes shelter under rocks, logs, and other objects in the water, as well as in rock crevices. Some 20 holes were excavated along riverbanks, which contained crabs in Lomas de Banao Ecological Reserve and they were *E. cubensis*. The latter species clearly digs holes, mostly starting outside the water (sometimes up to half a meter above the water surface) with the final enlarged chamber always flooded with water. These holes sometimes have more than one entrance that communicates with the final chamber. *Epilobocera capolongoi* was never found in excavated holes.

In Pico San Juan Ecological Reserve, *E. capolongoi* lives associated with mountain rainforest about 1,000 m in elevation (Fig. 3), where permanent bodies of water are very scarce and represented by a couple of springs that never form streams or rivers, but only small, shallow pools. The specimen observed was wandering around on land, but close to one of these small pools. Nonetheless, rainfall is frequent in these mountains, thus humidity is very high, and the soil and leaf litter where the specimen was observed was wet. According to data from the meteorological radar station on Pico San Juan Ecological Reserve (J.D. León, pers. comm.), annual air temperatures average 27 °C in the warmest months (July–August) and 17 °C in the coolest months (January–February), sometimes dropping below 5 °C. The air relative humidity is above 85% all year round. Mean rainfall varies from 400 mm in the dry season (November–April) to 1,600 mm in the wet season (May–October), including maximum values above 3,000 mm.

In general, *E. capolongoi* seems to have more aquatic habits than *E. cubensis*. Nonetheless, both species do make incursions onto dry land, especially in wet weather or in very humid habitats. During the morning hours on 5 October 2013, an adult female *E. capolongoi* was observed carrying offspring (Fig. 11) in mountain rainforest at Pico San Juan Ecological Reserve, close to a spring that formed a small (about 1 m diameter), shallow pool. During the afternoon hours on 16 July 2019, an adult male *E. capolongoi* (CZACC 5.0047) was found walking around after heavy rain at La Sabina ranger station, about 150 m from and about 50 m higher than the nearest permanent bodies of water, the tributary sources of both Banao and Higuanojo rivers. This ranger station is located right on top of a watershed dividing the Banao and Higuanojo river basins, at 600 m elevation. At 22.25 h on 7 November 2018 and at 21.58 h on 11 July 2019, two females *E. cubensis* were observed carrying offspring (Fig. 12) in the same exact location on a mountain path about 700 m NW of Jarico ranger station (300 m elevation), respectively. Air temperature and relative humidity on those two nights varied from 25–26 °C and from 85–90%, respectively. This site is about 170 m from Banao river, the nearest permanent body of water, but this segment of path gets temporarily flooded after heavy rains, originating a muddy patch with tiny water pools and dense herbaceous vegetation.

During the afternoon of 13 October 2018, a juvenile *E. capolongoi* was observed devouring a caterpillar (unidentified species) in the tributary source of the Banao river. At that time caterpillars were abundant on the nearby vegetation and frequently dropped to the ground and into water. Whether the one observed being consumed by a crab was preyed on or scavenged after being drowned is difficult to elucidate.

Other decapods observed co-occurring with the two species of *Epilobocera* in Lomas de Banao Ecological Reserve were the shrimps *Atya lanipes* Holthuis, 1963 (Atyidae) (Higuanojo river basin), and *Macrobrachium carcinus* (Linnaeus, 1758) (Palaemonidae) (Higuanojo river basin, near Hoyo del Naranjal ranger station), and the crayfish *Procambarus cubensis* (Erichson, 1846) (Cambaridae) (Banao river basin). All the above species represent new records for this area as well. No other decapods were observed in Pico San Juan Ecological Reserve.

Conservation status

After summarizing the total of 10 records of *E. capolongoi* (from the literature and this paper) into seven locations assuming a grid size of 4 km^2, an AOO of 28 km^2 was obtained. The convex hull revealed an EOO of 306 km^2. According to the above values and considering also the condition Bb(iii), *E. capolongoi* fulfills the IUCN criteria in the category of Endangered

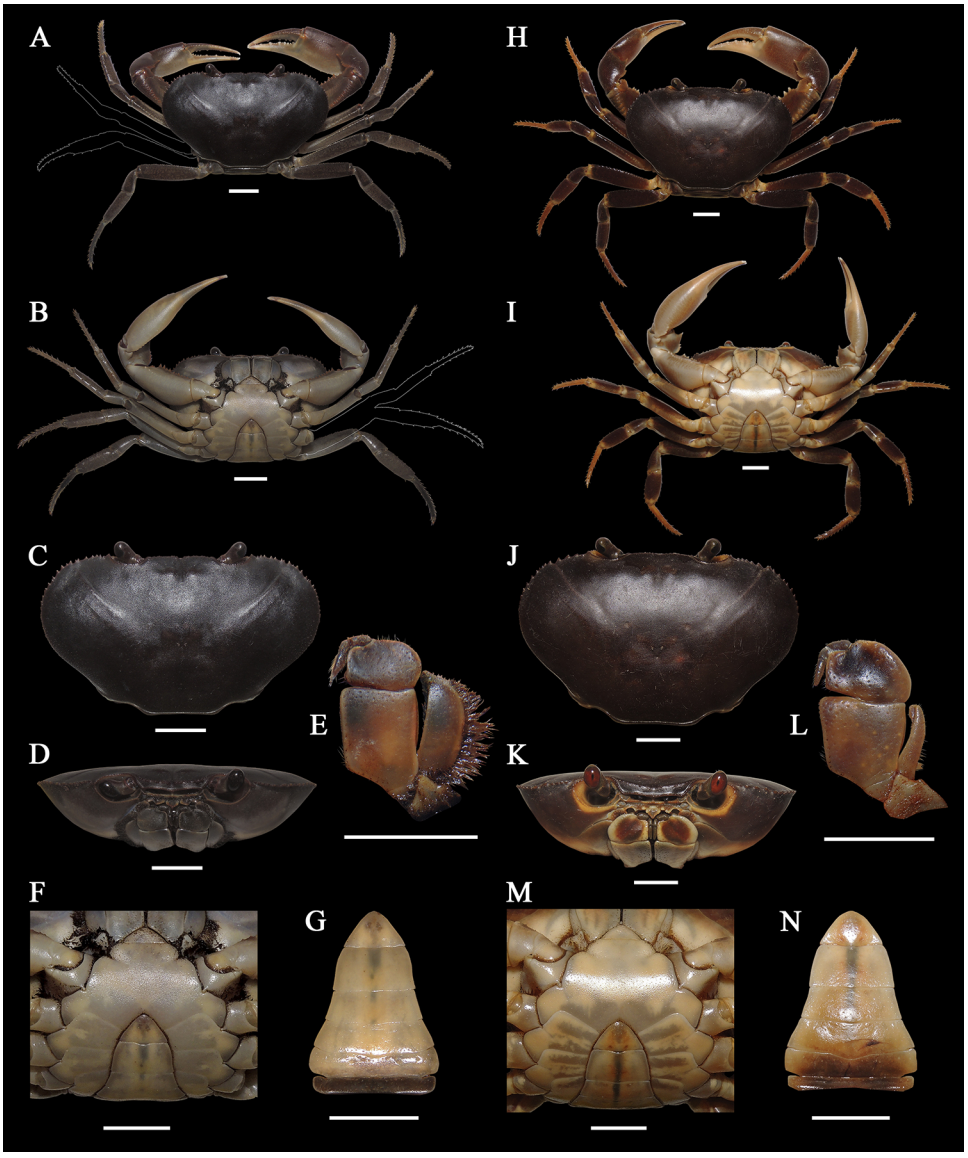

Figure 4. Adult male *Epilobocera capolongoi* (CZACC 5.0047) (**A**–**G**) and adult male *E. cubensis* (CZACC 5.0050) (**H**–**N**) from Lomas de Banao Ecological Reserve. **A**, **H**, Habitus, dorsal view; **B**, **I**, habitus, ventral view; **C**, **J**, carapace, dorsal view; **D**, **K**, carapace, frontal view; **E**, **L**, third maxilliped; **F**, **M**, sternal surface; **G**, **N**, pleon. All the images were taken soon after death (keeping the coloration in life), except **E** and **L** (after preservation). The white outline in **A** and **B** represent the missing second and third left walking legs. Scale bars = 10 mm.

(B1ab[iii]; B2ab[iii]). It must be added to the latter, however, that since it is mainly a riparian species, both the AOO and EOO may be overestimated.

DISCUSSION

Distribution

The new records of *E. capolongoi* expand its geographic range to about 60 km, 10 km westward and 42 km eastward of the nearest previous records at Charco Azul river (Guanayara Park) and Caburní stream (near Topes de Collantes), respectively (Pretzmann, 2000; Capolongo, 2003; Rodríguez-Cabrera et al., 2018). Its altitudinal range also increased 350 m from the previous record at 650 m, in the area of Topes de Collantes (Rodríguez-Cabrera et al., 2018). According to the available data, the species is subdivided into two putative allopatric subpopulations, one including Pico San Juan Ecological Reserve and Topes de Collantes Protected Landscape in the west and one in Lomas de Banao Ecological Reserve in

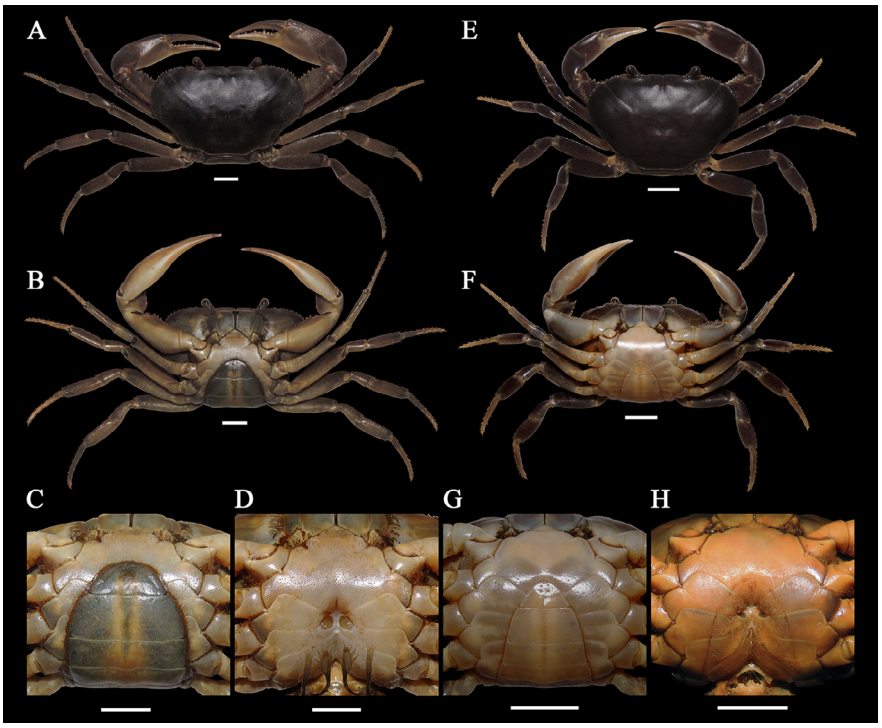

Figure 5. Adult female *Epilobocera capolongoi* (CZACC 5.0045) (**A**–**D**) and subadult female *E. cubensis* (CZACC 5.0059) (**E**–**H**) from Lomas de Banao Ecological Reserve. **A**, **E**, Habitus, dorsal view; **B**, **F**, habitus, ventral view; **C**, **D**, **G**, **H**, sternal surface, with detail of the vulvae (**D**, **H**). All the images were taken soon after death (keeping the coloration in life), except **H** (after preservation). Scale bars = 10 mm.

Figure 6. Right first gonopod of an adult male of *Epilobocera capolongoi* (CZACC 5.0047) (**A**–**G**) and *E. cubensis* (CZACC 5.0050) (**H**–**N**) from Lomas de Banao Ecological Reserve. **A**, **H**, whole structure, cephalic view; **B**, **I**, whole structure, caudo-mesial view; **C**, **J**, distal portion, cephalic view; **D**, **K**, distal portion, caudal view; **E**, **L**, distal portion, apical view; **F**, **M**, distal portion, mesial view; **G**, **N**, distal portion, lateral view. Abbreviations: Mesial lobe (ml), intermediate plate (ip), spines of mesial process (s), terminal process (tp), caudal process (cp), lateral process (lp), cephalic margin (cm), mesial angle of cephalic margin (ma). Scale bars = 1 mm.

Table 1. Comparison of ornamentation on the cheliped merus and coloration in life between *Epilobocera capolongoi* and *E. cubensis*. Abbreviations: TRTOM (irregular transverse rows of tubercles on the outer margin), TIUM (teeth on the inner upper margin), TILM (teeth on the inner lower margin).

Character	*E. capolongoi*	*E. cubensis*
Cheliped merus		
TRTOM	>20	<15
TIUM	13–18 (smaller, sharp-pointed)	9–14 (larger, conical)
TILM	2 or 3 well-developed teeth and sometimes with an oblique row composed of 1–3 teeth on the distalmost part and with 4–7 vestigial teeth along the middle region	13–17 well-developed teeth along the entire margin
Coloration		
Carapace	Uniformly brown or dark brown dorsally, fading to light grayish-brown or pale yellowish-brown on antero-lateral surfaces, whitish near branchial margin. Teeth on antero-lateral margin, on frontal fringe, and on upper-middle fringe of orbits, yellowish to reddish-brown	Uniformly dark brown on dorsal and antero-lateral surfaces, including ornamentation on fringes, and yellowish-brown around orbits and near branchial margin
Third maxilliped	Uniformly light grayish-brown or yellowish-brown	Ischium and exopodite light yellowish-brown, merus dark brown with paler margins
Eyes	Dark brown to black; eyestalk light grayish-brown or yellowish-brown, paler ventrally	Reddish-orange; eyestalk light brown, paler ventrally
Sternal area, abdominal segments, telson, and coxae	Pale grayish-brown to whitish	Beige with some gray markings
Pereiopods	Light yellowish-brown to grayish-brown, paler ventrally and toward the base, with teeth on margins of cheliped merus whitish to orange-brown; pereiopods 2–5 with paler spots	Dark brown (chelipeds paler ventrally), with dactylus and extreme portions of segments yellowish-brown, giving them a "ringed" appearance, with teeth on the margins of cheliped merus beige
Pleurae of chelipeds	Vermillion-red to purple-red	Yellowish-brown

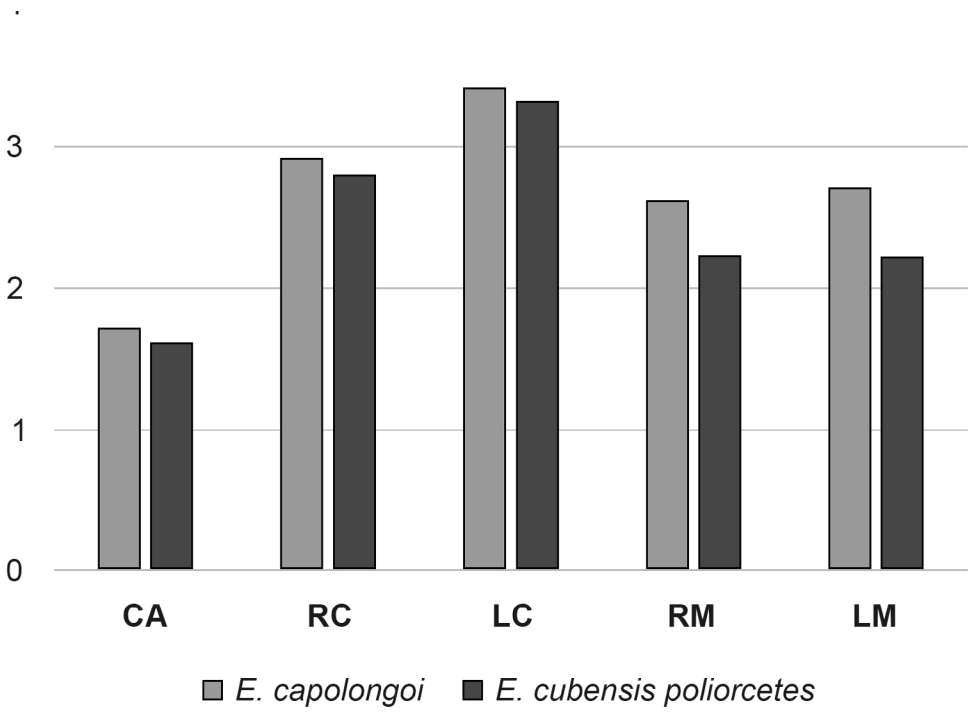

Figure 7. Variation of five morphometric ratios between *Epilobocera capolongoi* and *E. cubensis*: CA, carapace width/length; RC, right chela length/width; LC, left chela length/width; RM, right merus length/width; LM, left merus length/width (see App. 2).

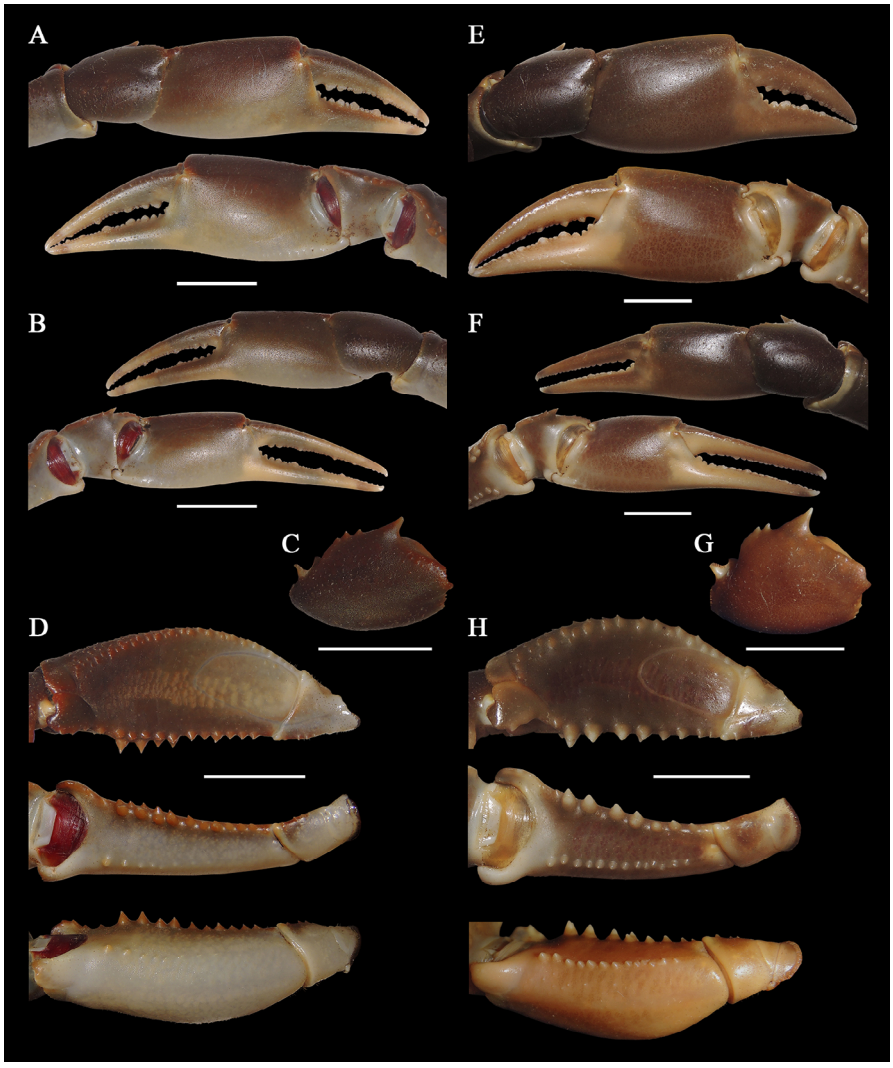

Figure 8. Chelipeds of an adult male *Epilobocera capolongoi* (CZACC 5.0047) (**A**–**D**) and of an adult male *E. cubensis* (CZACC 5.0050) (**E**–**H**) from Lomas de Banao Ecological Reserve. **A**, **E**, Right chela in outer (above) and inner (below) views; **B**, **F**, left chela in outer (above) and inner (below) views; **C**, **G**, right carpus in dorsal view; **D**, **H**, right merus in dorsal (above), inner (middle), and inner-lower (below) views. All the images were taken soon after death (keeping the coloration in life), except **G** and **H** below (after preservation). Scale bars = 10 mm.

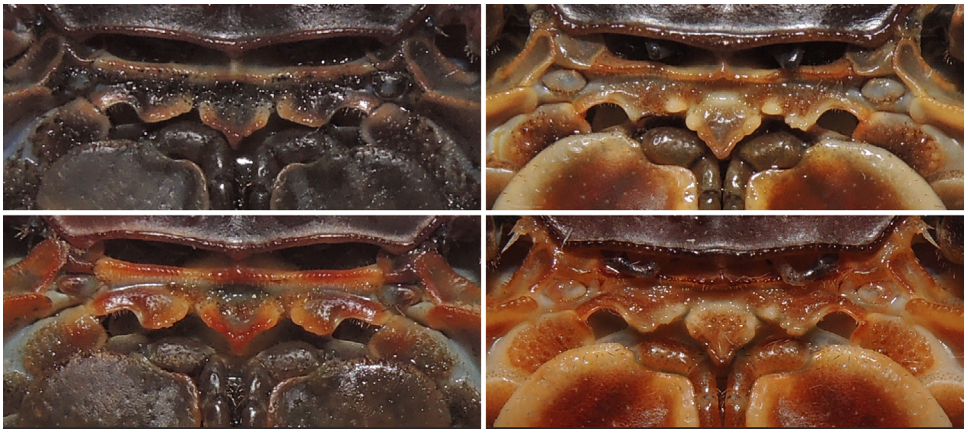

Figure 9. Detail of frontal region of *Epilobocera capolongoi* (upper left: CZACC 5.0047; lower left: CZACC 5.0045) and *E. cubensis* (upper right: CZACC 5.0050; lower right: CZACC 5.0051), showing variation in the shape of the epistome and the branchial efferent channel openings.

the east (Fig. 1). This putative allopatric distribution matches the topography of the region. The Guamuhaya Massif is formed by two main topographic units cut off by the Agabama river: the Trinidad Heights in the west (maximum elevation of 1,140 m at Pico San Juan) and the Sancti Spíritus Heights in the east (maximum elevation of 843 m at Loma de Banao) (Fig. 1; Mateo-Rodríguez and Acevedo-González, 1989; Comisión Nacional de Nombres Geográficos, 2000). These two topographic units make contact only through a narrow strip (approximately 5 km wide) of highland toward the northern region of this mountain range. The Agabama river here crosses from north to south, never exceeding 100 m elevation at any point, but heights usually above 200 m exist on both sides of the river, sometimes as far as a few hundred meters from each other. Given that *E. capolongoi* has been found exclusively in mountainous ecosystems above 300 m elevation and that the remaining areas surrounding this mountain range are disturbed lowlands, it seems reasonable to assume that the only possible zone of contact between these two putative allopatric subpopulations is the narrow strip of heights mentioned above (Fig. 1). Additional surveys will nonetheless be required in order to accept or reject the hypothesis of *E. capolongoi* occurring across this mountainous pathway, with a continuous distribution from the westernmost to the easternmost localities.

Epilobocera cubensis is known to have a distribution across the lowlands surrounding the Guamuhaya Massif, with its highest elevation (approximately 130 m) at Mabujina river, between El Quirro and Lagunita (Capolongo, 2003; 2018). The new records provided here from Lomas de Banao Ecological Reserve represent the highest elevations at which this species has been observed in central Cuba (maximum elevation at 550 m). This species was previously reported from Banao town, just 3.2 km south of Jarico ranger station (down the Banao river) (Fig. 1), but this is a lowland locality less than 100 m elevation (Capolongo, 2003). Nonetheless, *E. cubensis* is known to occur at elevations above 1,000 m in eastern Cuba (e.g., La Gran Piedra; https://www.inaturalist.org/observations/61538294; R. Teruel, pers. comm.).

Morphology and coloration in life

Despite the complex taxonomic and nomenclatural situation with the genus in Cuba, *E. capolongoi* is a highly differentiated species (probably the most morphologically divergent species in the genus) and it seems reasonable to assume that its taxonomic status is unlikely to be changed in future studies. The aim of the description provided here is only to confirm the species identity and to allow comparisons between the taxa reported.

In general, *E. capolongoi* looks slender and differently colored than *E. cubensis*, which can be easily distinguished by its more robust appearance and its dark brown coloration, "ringed" pereiopods and reddish-orange eyes (Figs. 4, 5, 10, 11, 12). Nonetheless, interspecific differences are much more evident when examined in detail. The fact that these two species keep their respective phenotypic entities despite being sympatric (no intermediate individuals have been found or reported thus far), including strong morphological differences in the G1, could be assumed as a direct evidence of reproductive isolation.

Natural history

The morphological and behavioral differences between *E. capolongoi* and *E. cubensis* allow them to coexist, possibly minimizing competition through habitat segregation and differential use of resources. While *E. cubensis* digs holes along the riverbanks, *E. capolongoi* seems to be a more opportunistic, wandering species that seeks shelter under rocks, logs, and other sunken objects, as well as in rock crevices. Capolongo (2006; 2018) had commented on the strong habitat segregation between *Epilobocera diazbeltrani* Capolongo, 2005 (inhabiting limestone holes filled with rainwater) and *E. cubensis* (originally treated as *Epilobocera cubensis cubensis* "Natio" *guisensis* by Capolongo and Pretzmann, 2002) (inhabiting rivers, also digging holes alongside the riverbanks; D. Capolongo, pers. comm.) in the locality of La Ceiba, Tercer Frente municipality, Santiago de Cuba Province, eastern Cuba; but in this case both species seem to be parapatric. *Epilobocera gertraudae* Pretzmann, 1965 (a specialized limestone and cave-

Figure 10. Adult female of *Epilobocera capolongoi* (CZACC 5.0045) found active at night in the tributary source of Higuanojo river on 10 November 2018. Photo by Aslam I. Castellón.

Figure 11. Adult female of *Epilobocera capolongoi* found carrying offspring in mountain rainforest on 5 October 2013, Pico San Juan Ecological Reserve, Cienfuegos province. Notice the very broad exopodite of the third maxilliped, which is a diagnostic character of this species. Photos by Ruben Marrero.

Figure 12. Female of *Epilobocera cubensis poliorcetes* found carrying offspring at night on 7 November 2018 on a mountain path about 700 m NW of Jarico ranger station, Lomas de Banao Ecological Reserve, Sancti Spíritus province. Photos by Aslam I. Castellón.

dweller species) and *Epilobocera gilmanii synoecia* Capolongo and Pretzmann, 2002 (a more generalist and widespread species) also co-occur in caves of Sierra de los *Órganos*, Pinar del Río province, western Cuba (Capolongo and Pretzmann, 2002; Capolongo, 2003; 2018), but showing a considerable segregation in habitat use (TMR-C, unpubl. data).

In the case of the juvenile-bearing females found walking around, inland incursions might favor offspring dispersal, as suggested by the young crabs easily abandoning their mothers even under minimal disturbance. In the case of the adult male found on land, it might have been just moving between bodies of water. In any case, these incursions onto dry land are evidence that these crabs are able to disperse across river basins, with the consequent implications for their biogeography (Ng and Rodriguez, 1995).

Conservation status

Given that *E. capolongoi* has been found exclusively in mountain springs, streams, and rivers with associated relatively well-preserved forests (Capolongo, 2003; 2018; Rodríguez-Cabrera et al., 2018), it is reasonable to expect a strong dependence of this species on forested areas. Also, the Guamuhaya Massif has a long history of forest depletion mainly because of forest fires and intensive felling for coffee plantations and stockbreeding (e.g., Domínguez González and Acosta Rodríguez, 2012; Mancina et al., 2017). Therefore, it is herein considered that the IUCN condition Bb(iii), which refers to continuous decline in the effective area extent and/or quality of habitat, was fully applicable to *E. capolongoi*.

Capolongo (2003) was the first author to call attention to the possibly critical conservation situation of *E. capolongoi* and other species of *Epilobocera* with restricted distributions in Cuba, which was later supported by Capolongo (2018) and Rodríguez-Cabrera et al. (2018). Cumberlidge et al. (2009) concluded that about one-sixth of all freshwater crab species in the world are seriously threatened and listed Cuba among the countries with the highest levels of endemism (100%) in its freshwater crab fauna (see also Wehrtmann et al., 2016). Five species of *Epilobocera* have been assessed by the IUCN Red List, including only two Cuban species: *E. capolongoi* (as Data Deficient) and *E. cubensis* (as Least Concern) (Cumberlidge, 2008a; 2008b; see also Cumberlidge et al., 2009; Wehrtmann et al., 2016). However, in his assessment, Cumberlidge (2008b) listed most Cuban taxa as synonyms of *E. cubensis* and treated *E. gilmanii* as a subspecies of the former, stating that such a "taxonomic arrangement has been suggested by Celio Magalhaes and is based on an ongoing study of this genus with Christoph Schubart and Capolongo". This arrangement was kept by Cumberlidge et al. (2009), although Álvarez et al. (2020) recognized most of the taxa described by Capolongo and Pretzmann (2002), including *E. armata*. Despite the confusion created by the works of D. Capolongo and/or G. Pretzmann (see Rodríguez and Magalhães, 2005; Álvarez et al., 2020), several of the taxa treated by Cumberlidge

(2008b) as synonyms of *E. cubensis* (e.g., *E. gilmanii*, *E. gertraudae*, and *E. diazbeltrani*) most probably represent valid species and need to be studied more thoroughly in order to establish their real taxonomic status. Because of their restricted distributions and specific habitat requirements, some of these taxa (e.g., *E. gertraudae* and *E. diazbeltrani*), could be facing a high risk of extinction as well as *E. capolongoi* (see Capolongo, 2003; 2018). The clarification of their taxonomic status is of paramount importance for their long-term conservation.

Hopefully, the information provided here will serve as a baseline to make a more accurate assessment of the conservation status of *E. capolongoi* on future assessments for the IUCN Red List. Fortunately, all records of *E. capolongoi* fall within protected areas, particularly Pico San Juan Ecological Reserve, Topes de Collantes Protected Landscape, and Lomas de Banao Ecological Reserve (see also Rodríguez-Cabrera et al., 2018). Nonetheless, additional studies are required to obtain more information about basic ecological requirements and demographic parameters such as population size, population structure, and distribution, which are important to provide this species with adequate management. Also, the reproductive biology and survival rate of this species is virtually unknown, which could make a difference regarding its long-term conservation.

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ADDITIONAL INFORMATION AND DECLARATIONS

Competing interests

The author declares no competing interest.

Data availability

All study data are included in the article and the appendices.

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APPENDIX 1

Specimens of *Epilobocera* examined and observed.

Epilobocera capolongoi

Cuba: Cienfuegos Province, Cumanayagua municipality, Pico San Juan Ecological Reserve, 500 m northeast of the meteorological radar station (21.99140 -80.14339; 1,000 m elevation), 5 October 2013, T.M. Rodríguez-Cabrera, R. Marrero and J.D. León, 1 ♀ carrying offspring (observed) (Fig. 11). Sancti Spíritus Province, Sancti Spíritus municipality: Lomas de Banao Ecological Reserve, tributary source of Banao river (21.88179 -79.59785; 530 m elevation), 13 October 2018, T.M. Rodríguez-Cabrera, 1 ♂ juvenile (CZACC 5.0048), 1 juvenile (observed); tributary source of Higuanojo river (21.88481 -79.59966; 550 m elevation), 13–14 October 2018, T.M. Rodríguez-Cabrera, 1 ♂ (CZACC 5.0040), 1 ♂ (CZACC 5.0041), 1 ♀ (CZACC 5.0042), 1 ♀ juv. (CZACC 5.0043), 1 ♀ juv. (CZACC 5.0044); idem locality, 10 November 2018, T.M. Rodríguez-Cabrera and A.I. Castellón, 1 ♀ (CZACC 5.0045), 1 juvenile (observed); idem locality, 15 March 2019, T.M. Rodríguez-Cabrera, 1 ♂ (CZACC 5.0046); Banao river, near María Antonia ranger station (21.871899, -79.581114; 315 m elevation), 12 June 2019, T.M. Rodríguez-Cabrera, 1 adult, unsexed (observed); La Sabina ranger station (21.88304 -79.59868; 600 m elevation), 16 July 2019, T.M. Rodríguez-Cabrera and A.I. Castellón, 1 ♂ (CZACC 5.0047).

Epilobocera cubensis

Cuba, Sancti Spíritus Province, Sancti Spíritus municipality: Lomas de Banao Ecological Reserve, tributary source of Banao river (21.88179 -79.59785; 530 m elevation), 14 October 2018, T.M. Rodríguez-Cabrera; 1 ♂ (CZACC 5.0049); tributary source of Higuanojo river (21.88481 -79.59966; 550 m elevation), 13–14 October 2018, T.M. Rodríguez-Cabrera, 3 ♂♂, 5 juveniles (♂ CZACC 5.0050, ♂ CZACC 5.0051, ♂ CZACC 5.0052, juv. CZACC 5.0053, juv. CZACC 5.0054, juv. CZACC 5.0055, juv. CZACC 5.0056, juv. CZACC 5.0057); Banao river, near Jarico ranger station (21.85616 -79.57445; 235 m elevation), 10 October 2018, T.M. Rodríguez-Cabrera, 1 ♂, 2 ♀♀ (♂ CZACC 5.0058, ♀ CZACC 5.0059, ♀ CZACC 5.0060); about 700 m NW of Jarico ranger station (21.86291 -79.57790; 300 m elevation), 7 November 2018, T.M. Rodríguez-Cabrera and A.I. Castellón, 1 ♀ carrying offspring (observed) (Fig. 12); idem locality, 11 July 2019, T.M. Rodríguez-Cabrera and A.I. Castellón, 1 ♀ carrying offspring (observed).

APPENDIX 2

Measurements of the specimens of *Epilobocera capolongoi* and *E. cubensis* from Lomas de Banao Ecological Reserve. Abbreviations: L = length, W = width, H = height, J = juvenile, R = ratio. The merus is that of the chelipeds. Hyphens indicate a missing appendage. Mean of ratios is expressed ± standard deviation (SD), accounting only for specimens with a carapace length above 20 mm.

Voucher	Sex	Carapace		Right chela		Left chela		Right merus		Left merus	
		W/L	R	L/H	R	L/H	R	L/W	R	L/W	R
E. capolongoi											
CZACC 5.0040	♂	45.0/26.0	1.7	–	–	28.7/8.0	3.6	–	–	20.1/7.5	2.7
CZACC 5.0041	♂	36.5/22.0	1.7	25.6/8.7	2.9	23.8/7.0	3.4	17.1/6.8	2.5	16.6/6.5	2.6
CZACC 5.0042	♀	51.2/29.4	1.7	36.7/11.6	3.2	32.9/10.1	3.3	24.0/8.5	2.8	21.9/8.0	2.7
CZACC 5.0043	J (♀)	36.7/21.8	1.7	25.5/8.3	3.1	24.0/7.0	3.4	16.9/6.6	2.6	16.6/6.4	2.6
CZACC 5.0044	J (♀)	31.9/19.2	1.7	19.5/5.5	3.6	21.0/6.3	3.3	12.6/4.8	2.6	14.5/5.6	2.6
CZACC 5.0045	♀	60.2/34.5	1.8	45.9/14.7	3.1	42.3/11.5	3.7	30.1/11.0	2.7	29.4/10.5	2.8
CZACC 5.0046	♂	54.3/32.0	1.7	42.1/16.0	2.6	31.6/10.9	2.9	27.3/10.6	2.6	26.0/9.4	2.8
CZACC 5.0047	♂	50.4/29.0	1.7	37.3/12.3	3.0	33.4/9.3	3.6	24.8/9.0	2.8	22.8/8.5	2.7
CZACC 5.0048	J (♂)	25.4/15.2	1.7	14.1/4.0	3.5	15.0/4.3	3.5	9.7/3.6	2.7	10.2/4.3	2.4
Mean	**1.7**		**2.9**		**3.4**		**2.6**		**2.7**		
SD	0.04		0.21		0.27		0.12		0.08		
E. cubensis											
CZACC 5.0049	♂	42.4/27.0	1.6	30.7/12.0	2.6	27.2/8.5	3.2	19.2/8.8	2.2	17.7/8.2	2.2
CZACC 5.0050	♂	56.1/34.8	1.6	42.7/16.7	2.6	36.4/11.8	3.1	26.6/11.6	2.3	24.6/11.0	2.2
CZACC 5.0051	♂	54.9/34.1	1.6	42.7/11.5	3.7	35.8/10.6	3.4	26.4/11.8	2.2	23.9/10.2	2.3
CZACC 5.0052	♂	46.2/29.1	1.6	35.2/12.9	2.7	30.0/9.0	3.3	22.2/9.8	2.3	20.3/8.7	2.3
CZACC 5.0053	J	25.7/16.6	1.6	17.3/6.4	2.7	15.5/5.6	2.8	10.6/5.1	2.1	9.9/4.8	2.1
CZACC 5.0054	J	24.4/15.8	1.5	16.3/5.5	3.0	15.0/4.2	3.6	10.2/4.8	2.1	9.7/4.5	2.2
CZACC 5.0055	J	17.8/11.6	1.5	12.4/4.2	3.0	11.1/3.2	3.5	7.5/3.4	2.2	7.0/3.3	2.1
CZACC 5.0056	J	17.3/11.3	1.5	11.7/4.1	2.9	10.2/3.0	3.4	7.3/3.4	2.2	7.7/3.2	2.4
CZACC 5.0057	J	15.8/10.4	1.5	10.2/3.4	3.0	9.8/2.7	3.6	6.5/3.2	2.0	6.5/2.8	2.3
CZACC 5.0058	♂	39.7/25.5	1.6	27.8/10.4	2.7	23.5/7.3	3.2	17.5/8.2	2.1	16.7/7.7	2.2
CZACC 5.0059	♀	44.9/28.4	1.6	30.4/11.4	2.7	27.2/8.3	3.3	18.8/8.5	2.2	18.0/8.4	2.1
CZACC 5.0060	♀	43.3/28.2	1.5	30.3/11.0	2.8	27.1/8.2	3.3	18.0/8.3	2.2	17.2/8.1	2.1
Mean	**1.6**		**2.8**		**3.3**		**2.2**		**2.2**		
SD	0.04		0.39		0.10		0.07		0.08		