

Rochinia confusa, a junior synonym of *R. umbonata* (Crustacea: Brachyura: Epialtidae) as revealed by ontogenetic changes

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The carapace and chelipeds ornamentation of the deep-water spider crab Rochinia umbonata (Stimpson, 1871), from the Western Atlantic undergo very dramatic ontogenetic changes. Since the also deep-water spider crab Rochinia confusa Tavares, 1991 is differentiated from R. umbonata mostly on the basis of these characters, R. confusa is regarded herein as an ontogenetic stage and, therefore, a junior subjective synonym of R. umbonata.

Keywords: Ontogeny, synonym, spider crabs, Majoidea, deep-water, Brazil

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INTRODUCTION

The proliferation of benthic surveys in Brazilian deep-waters in recent years has yielded a wealth of decapod crustacean material, whose study is gradually helping to improve our understanding of the taxonomic composition of the south-western Atlantic benthic fauna, and particularly its relationship with areas further north in the Caribbean Sea and Gulf of Mexico.

The Brazilian deep-water spider crab *Rochinia confusa* Tavares, 1991 (Majoidea: Epialtidae) has long been regarded as the southern counterpart of *Rochinia umbonata* (Stimpson, 1871), a species for many years only known from the east coast of the USA, Gulf of Mexico and Caribbean Sea, and recently reported from Brazil (Amapá, Pará, Pernambuco, Bahia, Espírito Santo, Rio de Janeiro) (Coelho *et al.*, 2008 and references therein). However, we have since studied a large series of specimens of *Rochinia umbonata* of different ontogenetic stages and we can now show that *R. confusa* is just an ontogenetic stage and, therefore, a junior subjective synonym of *R. umbonata*. The substantial morphological changes of the carapace and chelipeds over ontogeny are herein described and illustrated, and the synonymy between *R. confusa* and *R. umbonata* discussed.

The material used for this study is housed in the crustacean collections of the Museu de Oceanografia 'Dr Petrônio Alves Coelho' (MOUFPE), Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ), Muséum national d'Histoire naturelle, Paris (MNHN), Museu de Zoologia da Universidade de São Paulo (MZUSP), and National Museum of Natural History, Smithsonian Institution, Washington DC (USNM).

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Standard measurements (in mm) are cl, carapace length (rostrum not included) and cw, carapace maximum width.

SYSTEMATICS

Infraorder BRACHYURA Linnaeus, 1758

Superfamily MAJOIDEA Samouelle, 1819

Family EPIALTIDAE MacLeay, 1838

Genus *Rochinia* A. Milne-Edwards, 1875

Rochinia umbonata (Stimpson, 1871)

(Figures 1–6)

Scyra umbonata Stimpson, 1871, p. 115.

Scyra umbonata — A. Milne-Edwards, 1875, p. 87; 1879: pl. 31, Figures 5, 5a, 5b; 1880a, p. 2; Sars, 1885, p. 6, 7 e 274; Smith, 1886, p. 625.

Scyramathia umbonata — Milne-Edwards, 1880b, p. 356; Milne-Edwards & Bouvier, 1923, p. 381.

Amathia modesta Stimpson, 1871, p. 124.

Amathia modesta — A. Milne-Edwards 1878, p. 135; Miers, 1886, p. 26.

Anamathia modesta — Smith, 1885, p. 493; Faxon, 1895, p. 10.

Anamathia umbonata — Rathbun, 1894, p. 61, pl. 1, Figures 1–3; Faxon, 1895, p. 10.

Rochinia umbonata — Rathbun, 1925, p. 222, text-figure 85, pl. 72, pl. 73, figure 1; Chace, 1940, p. 63; Bullis & Thompson, 1965, p. 12; Williams *et al.*, 1968, p. 61, Figure 16; Pequegnat, 1970, p. 183; Powers, 1977, p. 67; Takeda, 1983, p. 135, 1 fig; Williams, 1984, p. 323, figure 258, 260c; Abele & Kim, 1986, p. 42; Griffin & Tranter, 1986, p. 175; Soto, 1991, p. 628, table 2; Paulmier, 1993, p. 26, pl. 30, Figure 1; Poupin, 1994, p. 43, pl. 4g; Silva *et al.*, 1999, p. 171; 2001, p. 97; 2002, p. 102; Viana *et al.*, 2002, p. 17; 2003, p. 17; Nizinski, 2003, p. 128; Lalana *et al.*, 2004,

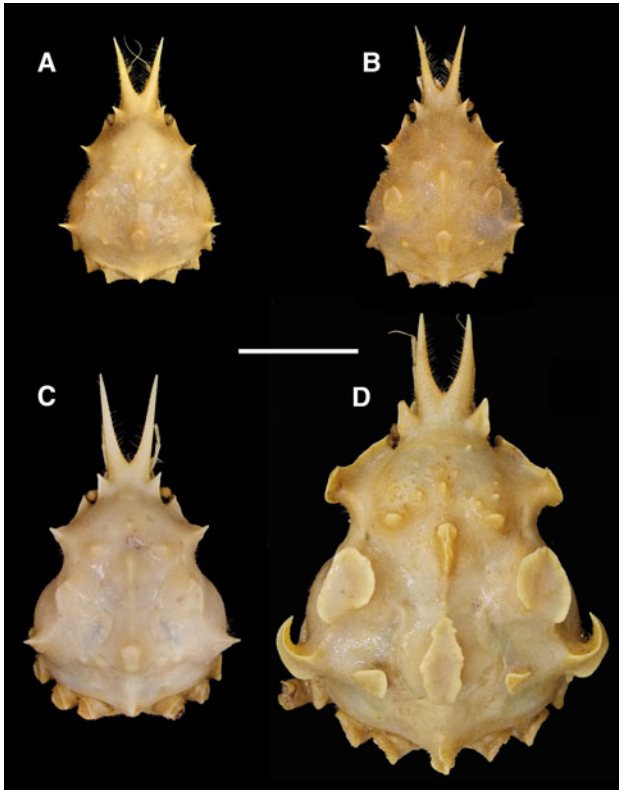


Fig. 1. Dorsal view of cephalothorax of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A) male cl 30 mm, cw 23 mm (MZUSP 15725); (B) male cl 32 mm, cw 23 mm (MZUSP 17424); (C) male cl 42 mm, cw 31 mm (USNM 1000819); (D) male cl 57 mm, cw 43 mm (MZUSP 16228). Scale bar: 20 mm.

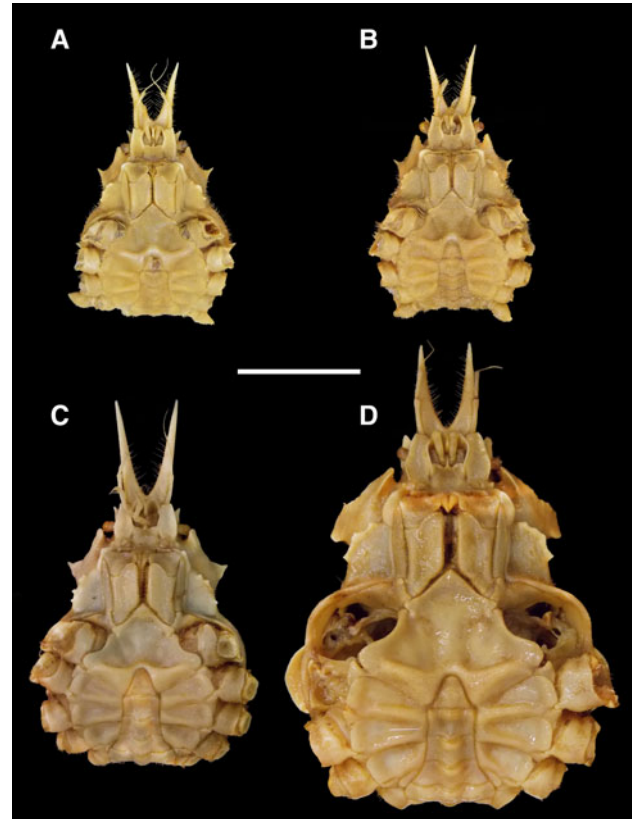


Fig. 2. Ventral view of cephalothorax of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A) male cl 30 mm, cw 23 mm (MZUSP 15725); (B) male cl 32 mm, cw 23 mm (MZUSP 17424); (C) male cl 42 mm, cw 31 mm (USNM 1000819); (D) male cl 57 mm, cw 43 mm (MZUSP 16228). Scale bar: 20 mm.

p. 8; McLaughlin *et al.*, 2005, p. 253, 315; Casadío *et al.*, 2005, p. 159; Wicksten & Packard, 2005, p. 1762; Ng & De Forges, 2007, p. 63; Serejo *et al.*, 2007, p. 141; Coelho *et al.*, 2008, p. 17; Ng *et al.*, 2008, p. 106; Felder *et al.*, 2009, p. 1078.

Rochinia confusa Tavares, 1991, p. 162.

Rochinia confusa — Melo, 1996, p. 266; 1998, p. 468; Viana *et al.*, 2002, p. 12; 2003, p. 15; Casadío *et al.*, 2005, p. 158; Ng & De Forges, 2007, p. 63; Coelho *et al.*, 2008, p. 17; Ng *et al.*, 2008, p. 105.

TYPE MATERIAL. Not extant, presumably lost in the Great Chicago fire of 1871.

TYPE LOCALITY. Off Sand Key, Florida, 261 m.

COMPARATIVE MATERIAL EXAMINED

Gulf of Mexico: United States of America, Alabama, RV 'Oregon II', station 11580, 29°11'N 87°55'W, 10 March 1971, W. Santana det., 640 m depth, 1 ovigerous female (USNM 1191773). Louisiana, south-west of Mississippi River delta, RV 'Oregon', station 4702, 27°83'N 90°55'W, 22 February 1964, 732 m depth, 1 adult male (USNM1184631). Louisiana, Grand Island, RV 'Citation', station WC-6, 27°42'44"N 91°32'55"W, 10 June 1985, 543–783 m depth, 1 male cl 42 mm, cw 31 mm; 1 male cl 11.1 mm, cw 7.5 mm; 1 female cl 49.5 mm, cw 37 mm; 1 female cl 22.4 mm, cw 15.6 mm; 1 female cl 17.4 mm, cw 11.3 mm (USNM 1000819). Caribbean Sea: Guadeloupe, Basse Terre, fishing traps, D. Lamy col., M. Tavares det., 500–600 m depth, 1 male cl 28 mm, cw 21 mm (MZUSP 24569). Nicaragua, RV 'Oregon', station 1926, 15°55'N 82°10'W, 549 m, 3

September 1957: 2 adult females (USNM uncatalogued). Brazil: Amapá, REVIZEE Norte, Prospecção III, Lance 2, 03°43'N 48°53'W, 15 November 1996, 186 m depth, 1 male (MOUFPE 15448). Recife, REVIZEE Nordeste, Cruzeiro V, station 117, 08°13.2'S 34°33.3'W, 19 November 1999, 575 m depth, 1 ovigerous female (MOUFPE 15449). REVIZEE, Cruzeiro V/00, station 14: 1 male (MOUFPE 15469). Espírito Santo, REVIZEE Pesca, station D-0503, 19°39.943'S 38°30.435'W, 29 June 1999, 808 m depth, 1 male, 6 females (MNRJ 13694). Espírito Santo, RV 'Marion Dufresne', TAAF MD/Brazil 1987, station 54 CB93, 19°36'S 38°53'W, 02 June 1987, 707–733 m depth, male paratype of *Rochinia confusa*, cl 12 mm, cw 8 mm (MNHN-B 24570). Rio de Janeiro, RV 'Marion Dufresne', TAAF MD/Brazil 1987, station 64 CB 105, 23°46'S 42°09'W, 2 June 1987, 592–610 m depth, female holotype of *Rochinia confusa*, cl 32 mm, cw 23 mm (MNRJ 1581). Rio de Janeiro, PADCT, station 6623, 24°13'30"S 43°10'60"W, fish trap [no depth]: 1 male, cl 30 mm, cw 23 mm (MZUSP 15275). 1 male cl 32 mm, cw 23 mm; 1 female cl 36 mm, cw 27 mm (MZUSP 17424). Brazil, [no exact locality or depth], RV 'Kinpo Maru', station 123, trawling, E. Severino-Rodrigues leg.: 1 male cl 57 mm, cw 43 mm; 1 male cl 49 mm, cw 39 mm; 1 female cl 48 mm, cw 38 mm (MZUSP 16228).

DISTRIBUTION

United States (from North Carolina to Gulf of Mexico), Nicaragua, West Indies and Brazil (Amapá, Pará,

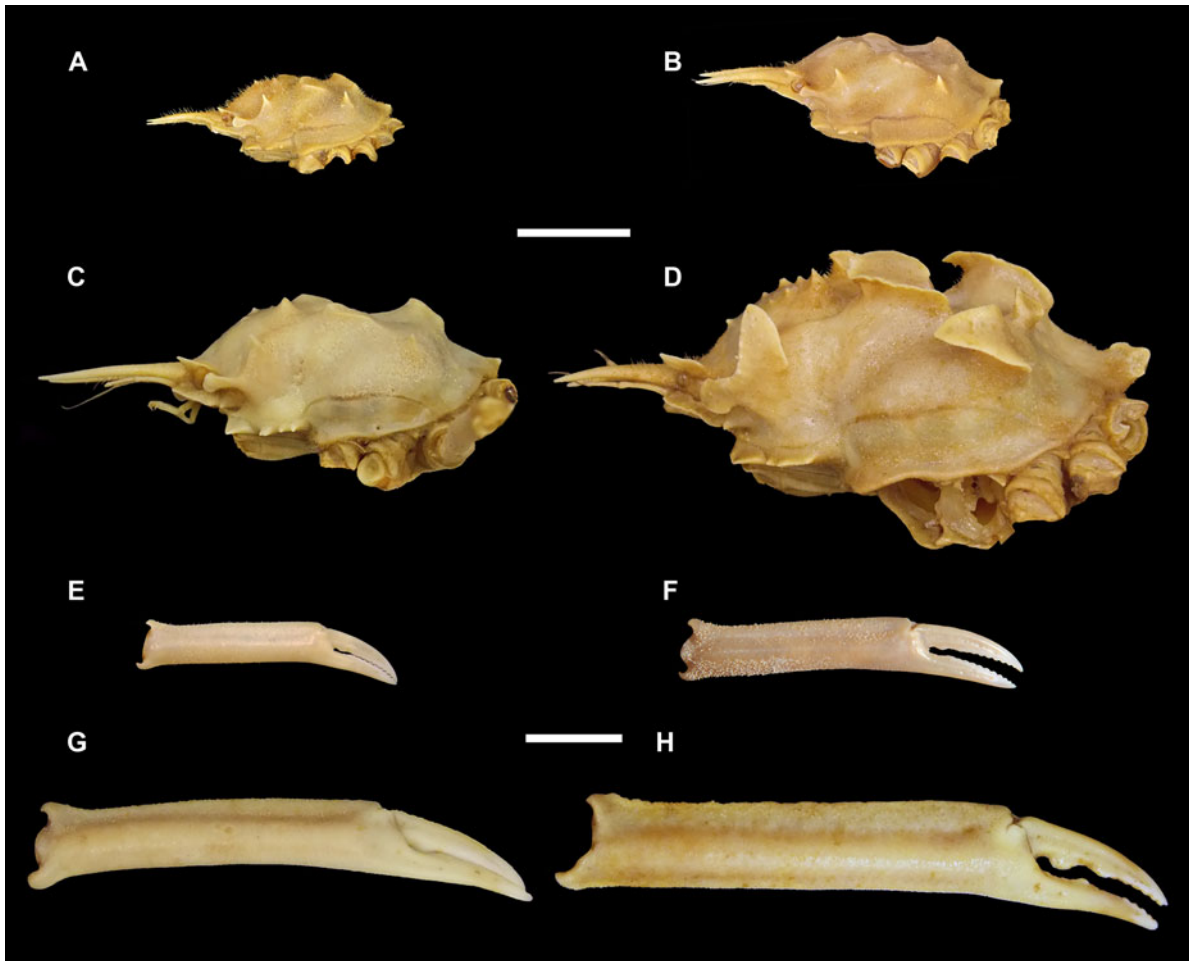


Fig. 3. Lateral view of cephalothorax and right cheliped of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A, E) male cl 30 mm, cw 23 mm (MZUSP 15725); (B, F) male cl 32 mm, cw 23 mm (MZUSP 17424); (C, G) male cl 42 mm, cw 31 mm (USNM 1000819); (D, H) male cl 57 mm, cw 43 mm (MZUSP 16228). Scale bars: A–D, 20 mm; E–H, 10 mm.

Pernambuco, Bahia, Espírito Santo and Rio de Janeiro), between 161 and 900 m. *Rochinia umbonata* has been mistakenly recorded from São Paulo (as *R. confusa*) by Coelho *et al.* (2008).

REMARKS

Changes over ontogeny in *R. umbonata* have only been occasionally recorded in the literature. Rathbun (1894, p. 62), referring to four specimens of *R. umbonata* from off Georgia (USA), considered the morphological differences between an ovigerous female and smaller specimens sufficient to make the ovigerous female a distinct species, were it not for a specimen intermediate in form between the ovigerous female and the younger specimens. Williams (1984, p. 324) remarked that *R. umbonata* is 'Extremely variable in ornamentation. The slender legs become extremely so in large individuals.'

In *Rochinia umbonata*, the morphology of the carapace indeed undergoes very strong modifications over ontogeny regardless of sex (Figures 1–6). In fully developed specimens (e.g. cl 48 mm, cw 38 mm or larger) the rostral spines are slightly shorter and less divergent (Figures 1, 2, 4 & 5); the carapace supraorbital, preorbital, hepatic, mesogastric, proto-, meso- and metabranchial, cardiac, and intestinal tubercles become very large, flat-topped, leaf-like plates

whose circumferences are broader than the stem (Figures 1D, 3D, 4D & 6D); the lateral and mesial margins of the antennal articles 2 + 3 are distinctly expanded into lobes (Figures 2C, D, 3C, D, 5C, D & 6C, D); the pterygostomial teeth are coalescent at the base, rather indistinct distally forming a prominent pterygostomial ridge; and the carapace regions are distinctly more swollen. In contrast, in developing specimens (e.g. cl 12 mm, cw 8 mm or smaller), the carapace supraorbital, hepatic, metabranchial and intestinal protuberances show as strong, sharp spines (Figures 1A, B, 3A, B, 4A, B & 6A, B), whereas the mesogastric, proto-, mesobranchial and cardiac are flattened small nodosities (Figures 1A, B, 3A, B, 4A, B & 6A, B), the antennal articles 2 + 3 are only slightly expanded mesially and laterally (Figures 2A, B, 3A, B, 5A, B & 6A, B), the pterygostomial teeth are much less coalescent at the base, rather distinct distally, forming a lower pterygostomial ridge; and the carapace regions are distinctly less swollen. In contrast to fully developed specimens in which the circumference of the scutellate preorbital protuberance is much broader than the stem, in developing specimens the preorbital protuberance is already scutellate but its circumference is not, or only slightly, broader than the stem. In both fully developed and developing specimens the preorbital and hepatic scutellate plates are fused to each other, but only in fully developed specimens is the preorbital scutellate plate

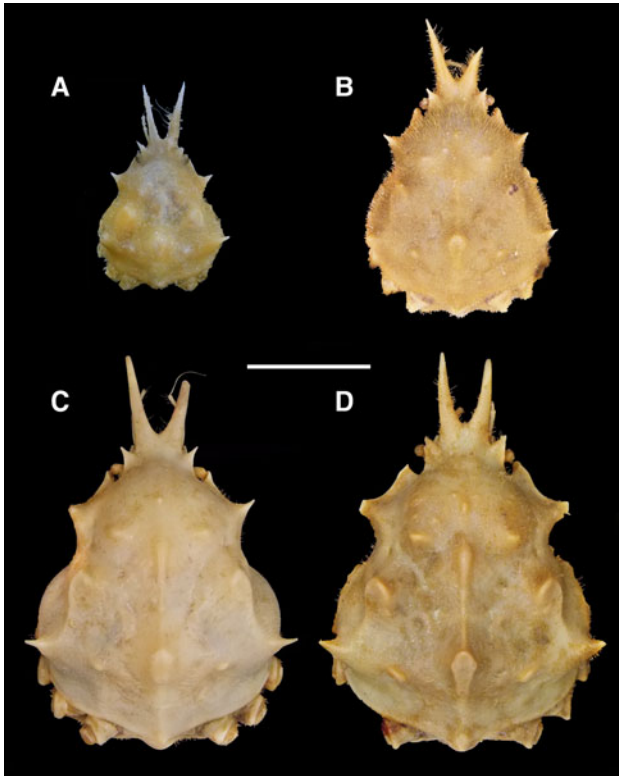


Fig. 4. Dorsal view of cephalothorax of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A) female holotype of *Rochinia umbonata*; (B) female cl 32 mm, cw 23 mm (MNRJ 1581); (C) female cl 36 mm, cw 27 mm (MZUSP 17424); (D) female cl 49.5 mm, cw 37 mm (USNM 1000819); (E) female cl 48 mm, cw 38 mm (MZUSP 16228). Scale bar: 20 mm.

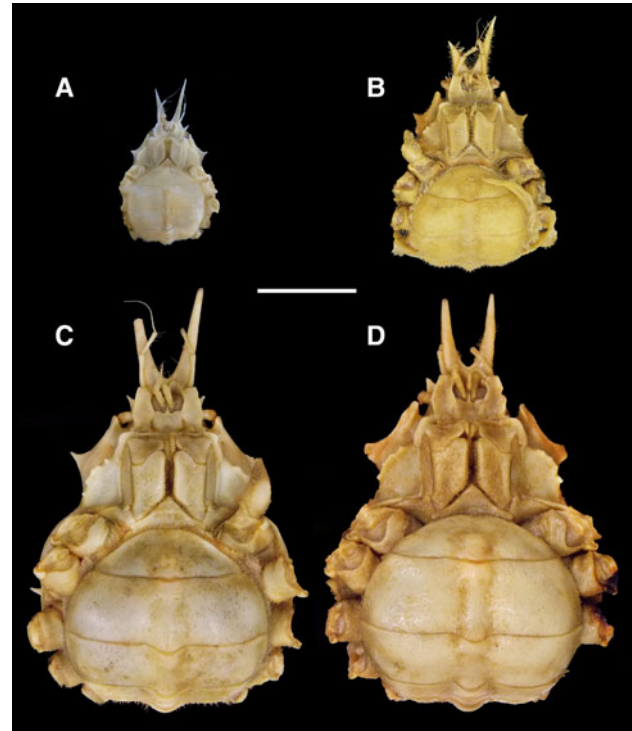


Fig. 5. Ventral view of cephalothorax of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A) female holotype of *Rochinia umbonata*; (B) female cl 32 mm, cw 23 mm (MNRJ 1581); (C) female cl 36 mm, cw 27 mm (MZUSP 17424); (D) female cl 49.5 mm, cw 37 mm (USNM 1000819); (E) female cl 48 mm, cw 38 mm (MZUSP 16228). Scale bar: 20 mm.

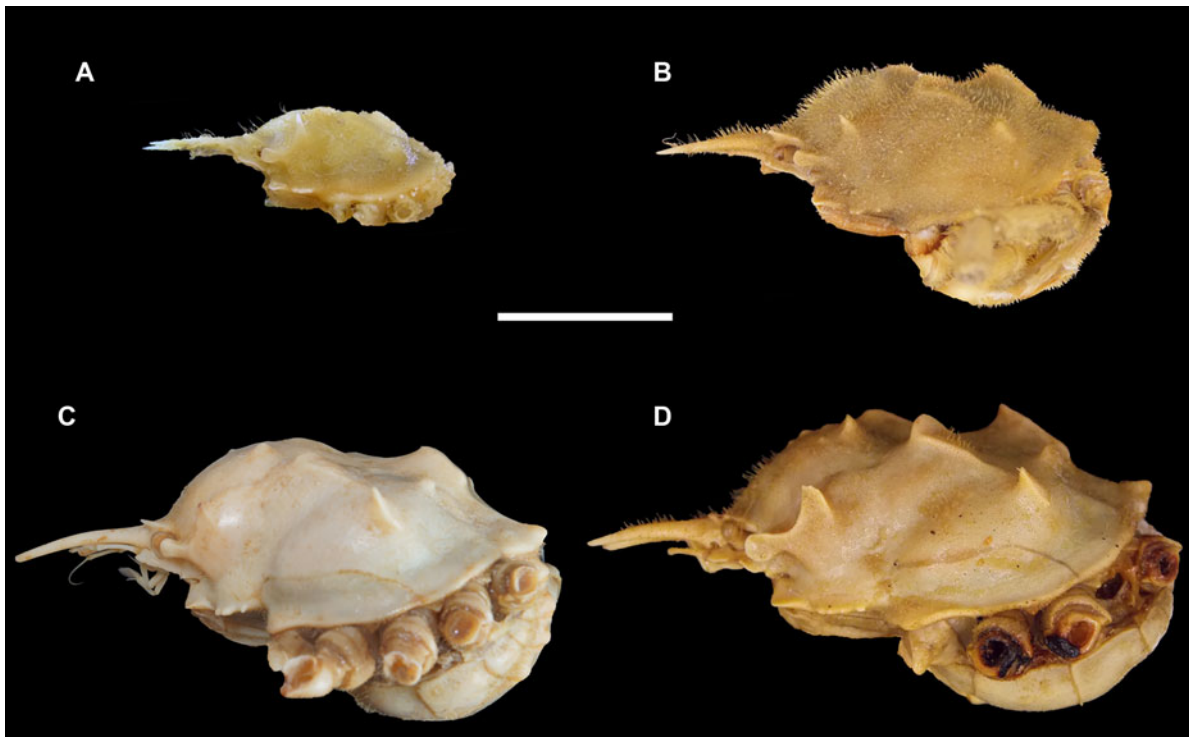


Fig. 6. Lateral view of cephalothorax of *Rochinia umbonata* (Stimpson, 1871), cheliped and pereopods electronically removed. (A) female holotype of *Rochinia umbonata*; (B) female cl 32 mm, cw 23 mm (MNRJ 1581); (C) female cl 36 mm, cw 27 mm (MZUSP 17424); (D) female cl 49.5 mm, cw 37 mm (USNM 1000819); (E) female cl 48 mm, cw 38 mm (MZUSP 16228). Scale bar: 20 mm.

and the hepatic boletate ornamentation fused together to form a very large leaf-like plate whose circumference is much broader than the stem. In developing specimens, the scutellate preorbital plate is fused to a hepatic sharp spine (Figures 3 & 6).

Whereas the male abdomen does not change during ontogeny (Figure 2), that of mature females becomes dome-like, almost circular in outline, extremely broad, completely covering the thoracic sternum (Figures 5 & 6); the vulvae have much larger openings. In immature females the abdomen is flattened, remarkably longer than large, leaving the thoracic sternum exposed laterally; the vulvae are narrow and slit-like.

The chelipeds also undergo morphological modifications over ontogeny; being more evident in males (Figures 3A–H). In fully developed specimens (e.g. cl 49 mm, cw 39 mm or larger), the cutting edges of the cheliped fingers are provided with teeth distinctly dissimilar in size and shape (Figure 3H). The dactylus has two strong, submolariform teeth fitting each into a low hiatus on the cutting margin of the fixed finger, one very strong, subproximal tooth, and one much smaller tooth at the midlength of the dactylus. The submolariform teeth of the dactylus are probably the result of coalescent serrated teeth. The fixed finger has one low, rounded, massive tooth at its midlength that fits into a low hiatus on the cutting margin of the movable finger. The cutting edges of the dactylus and the fixed finger are provided with serrated teeth at their distal third. The cheliped is longer than the first pereopod and the dorsal surface of the cheliped merus is strongly laterally compressed, forming a distinct edge along its entire length. However, in developing specimens the cheliped fingers have small, serrated, similar in size juxtaposed teeth along the cutting margins; the dactylus is provided with a low subproximal tooth fitting into a low hiatus of fixed finger (the fixed finger lacks the submolariform tooth); the movable and fixed fingers slightly gap subproximally when closed (Figures 3E–G). The cheliped is shorter than the first pereopod and the cheliped merus dorsal surface is only very slightly laterally compressed.

The female holotype (cl 32 mm, cw 23 mm) (Figures 4A, 5A & 6A) and the male paratype (cl 12 mm, cw 8 mm) of *Rochinia confusa* show all the morphological characteristics of an ontogenetic stage (cf. supra) of *R. umbonata* and, therefore, they are herein regarded as conspecific with *R. umbonata*. Indeed, Tavares (1991, p. 164) had already remarked the resemblance between *R. confusa* and *R. umbonata*: 'Par les traits généraux de la carapace, *Rochinia confusa* sp. nov. se rapproche de *R. umbonata* (Stimpson, 1871), de la mer des Caraïbes, mais elle diverge fortement de cette dernière par P2 et P3 beacoup plus longs que les chélopèdes. Chez *Rochinia confusa* sp. nov., l'épine hépatique de la carapace est aussi nettement plus développée que chez *R. umbonata*. As more specimens from Brazilian deep-waters have become available, it is now clear that the strong morphological differences between *R. confusa* and fully developed specimens of *R. umbonata* can be attributed to ontogeny. True to its name, *R. confusa* should therefore be considered as a junior subjective synonym of *R. umbonata* and the geographic records of *R. confusa* to Brazil subsequent to those in the original description (Espírito Santo and Rio de Janeiro by Tavares, 1991), should all now be referred to *R. umbonata* Stimpson, 1871 (from Amapá, Maranhão, Pernambuco and Bahia by Silva *et al.*, 2001; Viana *et al.*, 2002; Serejo *et al.*,

2007). None of these authors, however, have suggested the synonymy between *R. confusa* and *R. umbonata*.

Feres *et al.* (2008) attributed to *Rochinia confusa* one ovigerous female obtained from the intertidal of Panaquatira beach, Maranhão (02°28'13"S 44°03'19"W) of which a low-quality photograph was provided. In their work, the authors never mentioned if their specimen was found alive or stranded dead along the beach. Judging from their photograph it is highly improbable that that female is identical with *R. confusa* (= *R. umbonata*). In any case, there are no intertidal species of *Rochinia* known so far.

ACKNOWLEDGEMENTS

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