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Revision of the deep-water spider crab genus, *Scyramathia* A. Milne-Edwards, 1880, with the description of a new species from the Mediterranean and notes on *Rochinia* A. Milne-Edwards, 1875, and *Anamathia* Smith, 1885 (Crustacea, Decapoda, Brachyura, Epialtidae)

Bee Yan Lee[1,3], Bertrand Richer De Forges[2], Peter K. L. Ng[3]

1 *Tropical Marine Science Institute, National University of Singapore, 18 Kent Ridge Road, Singapore 119227, Republic of Singapore*
2 *c/o Muséum National d'Histoire Naturelle, Institut de Systématique, Évolution, Biodiversité, ISYEB – UMR 7205 – CNRS, MNHN, UPMC, EPHE, Département Systématique et Evolution, 57 rue Cuvier, CP26, F-75005, Paris, France*
3 *Lee Kong Chian Natural History Museum, National University of Singapore, 2 Conservatory Drive, Singapore 117377, Republic of Singapore*

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Corresponding author: Bee Yan Lee (beeyan06@gmail.com; beeyan_lee@nus.edu.sg)

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Abstract

The taxonomy of the deep-water spider crabs of the genus *Scyramathia* A. Milne-Edwards, 1880, is revised and four extant species are recognised from the Atlantic and western Indian Ocean: *S. carpenteri* (Norman, in Thomson 1873) (type species), *S. umbonata* (Stimpson, 1871), *S. hertwigi* Doflein, in Chun 1900, and *S. tenuipes* **sp. nov.** *Scyramathia tenuipes* **sp. nov.** from the Mediterreanean is easily distinguished from its congeners by its slender and elongate ambulatory legs. All species are diagnosed and figured. The taxonomy of two allied genera from the Atlantic and Mediterranean, *Rochinia* A. Milne-Edwards, 1875, and *Anamathia* Smith, 1885, are also treated and their type species redescribed and figured.

Key Words

deep-sea, Epialtidae, new species, revision, spider crabs, taxonomy

Introduction

The deep-water epialtid spider crab genus, *Scyramathia* A. Milne-Edwards, 1880, was recently reinstated by Tavares and Santana (2018) who recognised two extant valid species, *S. carpenteri* (Norman, in Thomson 1873), and *S. umbonata* (Stimpson, 1871), as well as one fossil taxon, *S. boschii* (Casadío, Feldmann, Parras & Schweitzer, 2005). *Scyramathia* had previously been in the synonymy of *Rochinia* A. Milne-Edwards, 1875, for many years (see Griffin and Tranter 1986, Ng et al. 2008). When A. Milne-Edwards (1880a) described *Scyramathia*, he did not provide the distinguishing morphological characters despite placing two species in it and this has caused problems in defining it. Although Tavares and Santana (2018) recognised *Scyramathia*, they focused more on the differences between it and *Rochinia* s. str.

With a good series of *Scyramathia* specimens from various parts of Europe and Africa, including types, the genus is herein revised and diagnosed. Four species are

here recognised, including a new species from the Mediterranean. These species are diagnosed and figured. To provide context and necessary comparisons, the genera *Rochinia* A. Milne-Edwards, 1875, and *Anamathia* Smith, 1885, are also diagnosed, and their type species figured.

Material and methods

The material examined are deposited in the Muséum national d'Histoire naturelle (MNHN), Paris, France; The Natural History Museum (NHM), London, United Kingdom; U.S. National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C., U.S.A; Naturalis Biodiversity Centre (ex. Rijksmuseum van Natuurlijke Historie, RMNH), Leiden, Netherlands; The Australian Museum (AM), Sydney, Australia; Museum of Comparative Zoology (MCZ), Harvard University, U.S.A.; Biological Reference Collection, Institute of Marine Sciences (ICMD), Barcelona, Spain; National Museum of Science and Technology (NSMT), Tokyo, Japan; Senckenberg Museum Frankfurt (SMF), Frankfurt, Germany; Museum für Naturkunde (ZMB), Berlin, Germany; South African Museum (Iziko Museums of South Africa) (SAM), Cape Town, South Africa; National Oceanography Centre, Southampton, U.K.; and Zoological Reference Collection (ZRC), Lee Kong Chian Natural History Museum, National University of Singapore, Singapore.

Measurements provided, in millimetres, are of the carapace length (excluding pseudorostral spine) and carapace width (to the base of the lateral spine). The maximum length and width of the merus of the ambulatory legs are measured following Maenosono and Naruse (2016). The abbreviations used are as follow: G1 and G2 = male first and second gonopods, respectively; P2 and P5 = second and fifth ambulatory legs, respectively; and stn = station.

With regard to the taxa named by Sir Charles Wyville Thomson, his family name has been cited as "Thomson" (see examples: Conan et al. 1981; MacPherson 1983; De Mol et al. 2002; Pawson and Pawson 2013), "Wyville Thomson" (see examples: D'Udekem d'Acoz 1999; Ng and Richer de Forges 2007; Ng et al. 2008) or "Wyville-Thomson" (see examples: Alvarado et al. 2008; O'Hara et al. 2018; Gan and Li 2019). His family name is Thomson and his given name is Charles Wyville. "Wyville" came from his maternal grandfather, Dr Wyville Smith, who had been a hospital inspector. He clearly preferred using Wyville to Charles as his first name, and tended to sign his name "C. Wyville Thomson", even when writing to his son. Thomson was knighted and was addressed frequently as Sir Wyville. In the United Kingdom, when a person is knighted, the title "Sir" is conferred and usually used together with the given name and not the family name; and that was why in the narrative for the Challenger Expedition reports, John Murray referred to him as "Sir Wyville". The author's name is here written as "Thomson".

Systematic account

Superfamily Majoidea Samouelle, 1819
Family Epialtidae MacLeay, 1838

Genus *Rochinia* A. Milne-Edwards, 1875

Rochinia A. Milne-Edwards 1875 [in 1873–1880]: 86 (footnote); Stebbing 1910: 289 (list); Rathbun 1925: 204, 210; Garth 1958: 282, 283; Serène and Lohavanijaya 1973: 54; Ingle 1980: 140; Williams 1984: 315 (key), 322; Griffin and Tranter 1986: 174; Tavares 1991: 161, 162; Richer de Forges 1995: 45; De Melo 1996: 251 (key); D'Udekem d'Acoz 1999: 194; Davie 2002: 329; Ng and Richer de Forges 2007: 61–63; Ng et al. 2008: 105; Richer de Forges and Poore 2008: 64; Richer de Forges and Ng 2009: 2; Ng and Richer de Forges 2013: 362, 363; Richer de Forges and Ng 2013: 468; Pettan 2013: 10.

Rachinia [sic]: Alcock 1895: 165 (list); A. Milne-Edwards and Bouvier 1900: 132 (list); Stebbing 1910: 289 (list).

Type species. *Rochinia gracilipes* A. Milne-Edwards, 1875, by monotypy; gender feminine. Monotypic.

Remarks. The study by Tavares and Santana (2018: 222) suggests that *Rochinia* sensu stricto "should be restricted to its type species, *R. gracilipes* A. Milne-Edwards, 1875 with perhaps a few additional closely related species". To this effect, Tavares and Santana (2018: 223) left the rest of the other species, mainly from the Indo-West Pacific region, in *Rochinia* sensu lato. Ng and Richer de Forges (2013) had discussed the problems with *Rochinia* at length and suggested that more genera may need to be recognised. The recent work on the epialtid spider crabs from Papua New Guinea by Lee et al. (2019) described two species from *Rochinia* sensu lato and transferred four *Rochinia* sensu lato species to *Crocydocinus* Lee, Richer de Forges & Ng, 2019. Lee et al. (2019) noted that a revision for *Rochinia* is in preparation (see also Lee et al. 2017). In this study, one species, *S. hertwigi* Doflein, in Chun 1900, is transferred out of *Rochinia* sensu lato and back to *Scyramathia* A. Milne-Edwards, 1880.

Rochinia gracilipes A. Milne-Edwards, 1875

Figs 1A–C, 2A–F

Rochinia gracilipes A. Milne-Edwards 1875 [in 1873–1880]: 86 (footnote) (type locality: Cape Corrientes, Argentina); Griffin and Tranter 1986: 174 (list); Rathbun 1925: 210 (key), 218, pl. 229 figs 1–4; Monod 1956: 32 (list), 516–517 (in part); Garth 1958: 282 (list), 283 (list); Manning and Holthuis 1981: 253 (list), 254, 255; Tavares 1991: 160, 161 (list), 164, figs 3A, 5B; De Melo 1996: 266 (key), 268, unnumbered in-text fig.; Tavares and De Melo 2004: 130; Ng and Richer de Forges 2007: 61, 63 (list); Ng et al. 2008: 105 (list); Ng and Richer de Forges 2013: 362, fig. 5A; Pettan 2013: 2 (list), 3 (list), 5 (list), 6 (list), 10 (list), 11 (list), 12, 14, 16, 20, 26, 41, 47, 86 (key), figs 10a, b, 16d, 23a, b; Griffiths et al. 2014: 185, map 8; Pettan and Tavares 2014: 306 (list); Ceccon and De Angeli 2018:

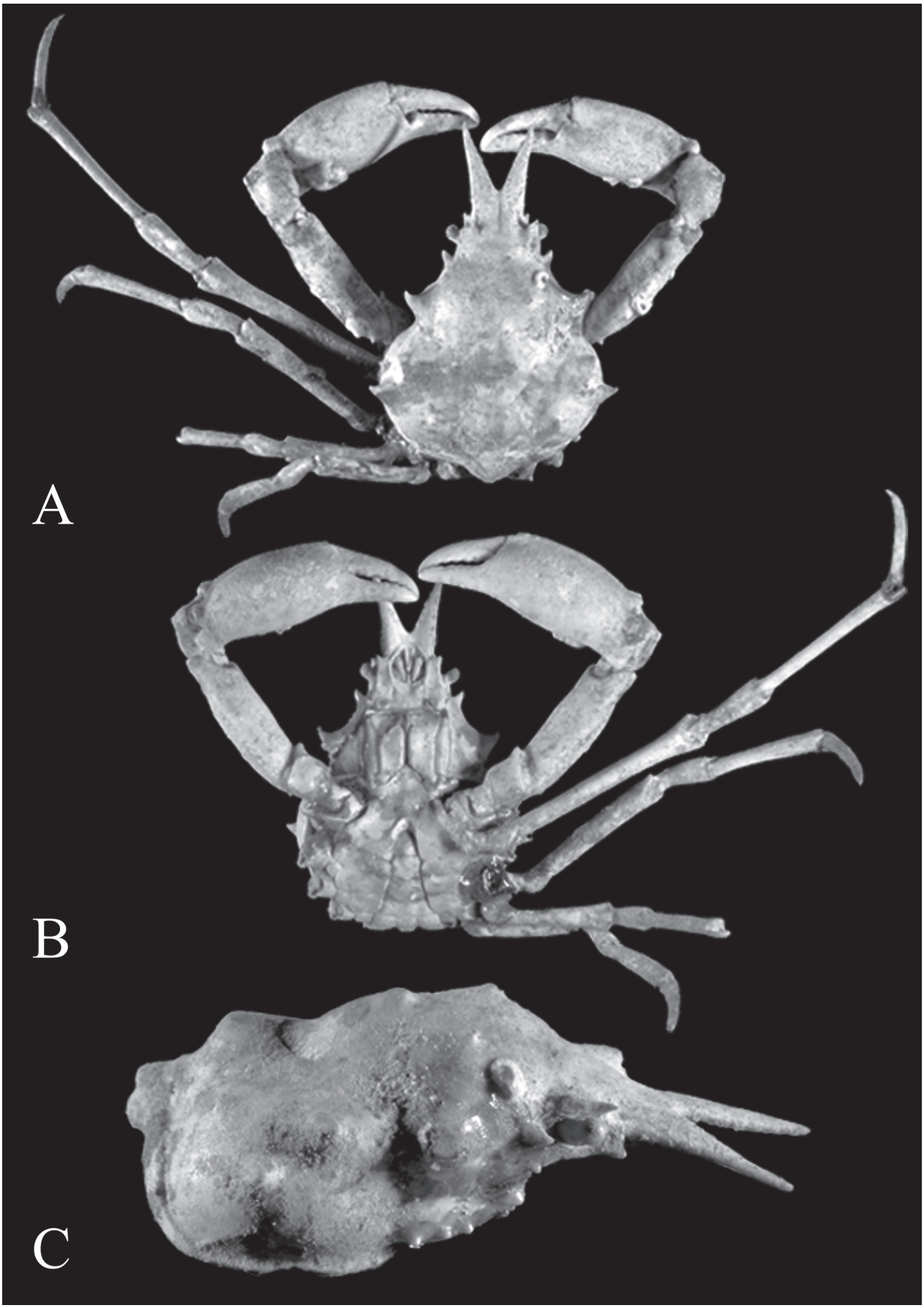

Figure 1. *Rochinia gracilipes* A. Milne-Edwards, 1875, paralectotype male [dry] (20.0 × 15.0 mm) (MNHN-IU-2000-4460 [= MNHN-B4460]), Cap. Corrientes. **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

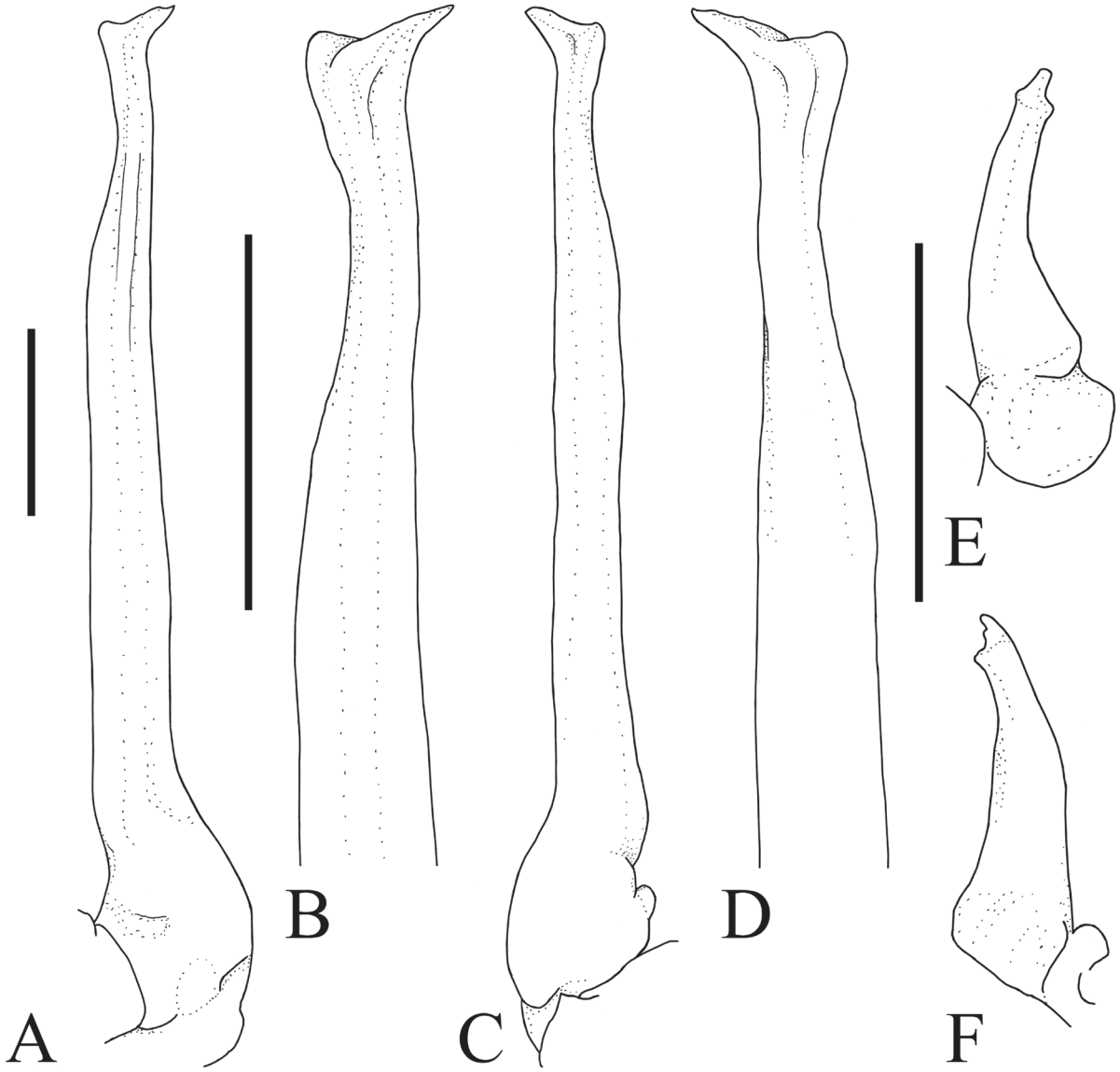

Figure 2. A–D. *Rochinia gracilipes* A. Milne-Edwards, 1875, paralectotype male (20.0 × 15.0 mm) (MNHN-IU-2000-4460 [= MNHN=B4460]), Cap. Corrientes, left G1; **A.** ventral view; **B.** ventral view of distal portion; **C.** dorsal view; **D.** dorsal view of distal portion; **E–F.** *R. gracilipes* A. Milne-Edwards, 1875, male (15.2 × 10.6 mm) (USNM 1150573), Argentina, left G2; **E.** ventral view of G2; **F.** dorsal view of G2. Scale bars: 1 mm.

151 (list); Tavares and Santana 2018: 201, 204, 223 (list), figs 2, 9D, 10A, B, 11A, 12A, 13I–J; Spivak et al. 2019: 95, fig. 51.

Rachinia [sic] *gracilipes*: A. Milne-Edwards 1875 [in 1873–1880]: pl. 18 fig. 1–1d; Lagerberg 1905: 22–24.

Materials examined. ***Paralectotypes:*** 1 ♂ [dry] (20.0 × 15.0 mm, 1 ♀ (10.4 × 8.5 mm) (MNHN-IU-2000-4460 [= MNHN-B4460]), Cap. Corrientes, coll. A Milne-Edwards. ***Other material:*** 3 ovigerous ♀♀ (15.1 × 11.1 mm, 14.9 × 10.8 mm, 14.5 × 10.1 mm), 3 ♀♀ (15.2 × 11.1 mm, 14.1 × 9.7 mm, 12.5 × 9.2 mm) (ZRC 2019.1634), Mar del Plata Habour, Argentina, 38°02'S, 57°31'30"W, coll. N Farias, 9 October 2014; 1 ovigerous ♀ (16.0 × 11.5 mm) (USNM 1277591), Mar del Plata, Buenos Aires Province, Argentina, South Atlantic Ocean, coll. M Doella-Jurado, 7 August 1911; 2 ♂ (15.2 × 10.6 mm, 11.9 × 9.8 mm) (USNM 1150573), Mar del Plata, Buenos Aires, Argentina, South Atlantic Ocean, coll. Franceschi and Lelois, February 1924; 1 ♂ (17.2 × 12.4 mm) (USNM 1150574), Mar del Plata, Buenos Aires, Argentina, South Atlantic Ocean, coll. M Doella-Jurado, 1914; 1 ♂ (10.5 × 7.1 mm), 1 ovigerous ♀ (14.0 × 10.1 mm) (USNM 55118), 40°22'S, 60°35'W, 55 m, coll. Hassler Expedition, 1951.

Remarks. No type specimen was designated when this species was described by A. Milne-Edwards (1875: 86 [footnote]) although various specimens from "la collection du Muséum" (i.e., the Muséum national d'Histoire naturelle (MNHN), Paris) as well as specimens from Hassler expedition were mentioned. There is also a fig-

ure of a male specimen provided in the same paper, but the name was incorrectly spelled as "*Rachinia gracilipes*" in the caption (see A. Milne-Edwards 1875: pl. 18 fig. 1). The male specimen that is found in the MNHN (MNHN-IU-2000-4460 [= MNHN-B4460]) matches the figure provided by A. Milne-Edwards (1875: pl. 18 fig. 1–1d). The same male specimen was used by Tavares (1991: figs 3A, 5B) and was considered a syntype by the author. This was, however, not listed by Tavares and Santana (2018) in their study to redefine *Rochinia*, when they designated another specimen as the lectotype for this species. It was mentioned by Tavares and Santana (2018) that the type material needs clarification and that the male specimen that was illustrated by A. Milne-Edwards (1875: pl. 18, fig. 1–1d) and deposited in the MNHN was clearly not the holotype as had been identified by Rathbun (1925). Rathbun's (1925) recognition of the "holotype" is incorrect as no type was selected in the original description by A. Milne-Edwards (1875) and all the material must be considered syntypes. Tavares and Santana (2018) designated one male specimen (MCZ 1950) as the lectotype for this species and five other female specimens as the paralectotypes, all collected from the Hassler expedition. Based on the original description by A. Milne-Edwards (1875: 86) and the figure (A. Milne-Edwards 1875: pl. 18 fig. 1–1d), the specimens from MNHN are also part of the type series. The G1 and G2 of the paralectotype male (MNHN-IU-2000-4460 [= MNHN-B4460]) is illustrated here (Fig. 2A–F). The type locality of this species is Cape Corrientes (= Cabo Corrientes), Argentina, and specimens are found in relatively shallow waters (about 55 m depth) (see also Tavares & Santana, 2018: 221).

Rochinia gracilipes was recorded from the coast of Africa near Gabon by Monod (1956). The male specimen figured (Monod 1956: figs 706–708) was compared with the MNHN type specimen and it does resemble the present concept of *R. gracilipes*. Monod (1956: 517), however, was not certain of the origin of the specimen and noted that its presence in African waters needs to be confirmed. Monod (1956)'s dubious African record is not included in the synonymy for this species for the time being.

Distribution. Currently only known from its type locality, Cape Corrientes (= Cabo Corrientes), Mar del Plata, Argentina (A. Milne-Edwards 1875), southeastern Brazilian coast (Spivak et al. 2019), South Shetland Islands (Griffiths et al. 2014); Antarctic Peninsula (De Melo, 1996; Tavares and Melo 2004).

Genus *Scyramathia* A. Milne-Edwards, 1880

Scyramathia A. Milne-Edwards 1880a: 356; A. Milne-Edwards 1880b: 277; Sars 1885: 5, 6; Smith 1886: 625[21]; A. Milne-Edwards and Bouvier 1894: 12, 13; Alcock 1895: 201; A. Milne-Edwards and Bouvier 1900: 131; Rathbun 1901: 61; Stebbing 1902: 5; Doflein 1904: 80, 81; Stebbing 1905: 25; Stebbing 1910: 289; A. Milne-Edwards and Bouvier 1923: 379; Barnard 1950: 48 (key), 49; Tavares 1991: 161, 162; Tavares and Santana 2018: 204, 208.

? *Scyramathia*: Alcock 1895: 165 (list).

Type species. *Amathia carpenteri* Norman, in Thomson 1873, subsequent designation by Rathbun 1925; gender feminine.

Diagnosis. Carapace pyriform, with strong raised plate-like structures in large adult specimens (Figs 3, 4A, 5A, 7A, C, 9A–I, 10A, 11A, 12, 13A); weak plates on smaller specimens (see Tavares et al. 2015: Fig. 1A–C). Pseudorostral spines long, slender, diverging at approximately 45° angle or less. Supraorbital eave truncated with sharp preorbital angle; strong postorbital lobe fused with hepatic spine, round anterior margin (Figs 3, 4A, 5A, 7A, C, 9A–I, 10A, 11A, 12, 13A). Mesogastric and cardiac regions with plates; long lateral branchial spine pointing outwards, more plate-like in large specimens (usually exceeding 20 mm carapace width) (Figs 3, 4A, 5A, 7A, 9A–I, 10A, 11A, 12, 13A). Antennal flagellum short, about half pseudorostral spine length. Basal antennal article longer than broad, with straight to gently convex outer margin. Distal angle of buccal frame blunt, slightly raised. Pterygostomial region with large, flattened granules on outer margin (Figs 4B, 5B, 6C, 7B, D, 10B, 11B, E, 13B). Chelipeds slender with slight carinate margins; propodus slender, longer than fingers; carpus with carinate margins; merus triangular in cross-section with carinate margins. Ambulatory legs long with cylindrical articles, rounded margins; merus with blunt distal angle; P2 longest (Figs 3, 4A, 5A, 10A, 11A, 12, 13A). Male thoracic sternum transversely broad, deeply groove; sternites 3, 4 relatively wide with slightly constricted lateral margin. Male pleon rectangular, telson triangular; surface of somites smooth (Figs 4B, 5B, 6D, F, 10B, 11B, E, 13B). G1 straight, distal part elongated, with sharp angle at tip (Figs 8C–F, 15A–H); G2 with wide distal tip forming C-shape lateral margin (Fig. 8G, H).

Remarks. When establishing *Scyramathia* A. Milne-Edwards, 1880, A. Milne-Edwards (1880a: 356) transferred *Scyra umbonata* Stimpson, 1871, and *Amathia carpenteri* Norman, in Thomson 1873, to it, commenting that both species do not belong to the genus they were described in: "Je ferai remarquer que l'*Amathia Carpenteri* n'appartient pas au genre *Amathia* et que la prétendue *Scyra umbonata* n'est certainement pas une *Scyra*" [I will point out that *Amathia carpenteri* does not belong to the *Amathia* genus and that alleged *Scyra umbonata* is certainly not *Scyra*]. He did not elaborate on the reasons why the two genera were different, nor did he compare it to *Rochinia* A. Milne-Edwards, 1875, which he described only seven years earlier. There were no distinguishing or diagnostic morphological characters provided for *Scyramathia* A. Milne-Edwards, 1880. No type species for the genus was proposed, Rathbun (1925) subsequently selected *Amathia carpenteri* Norman, in Thomson 1873, as the type species for *Scyramathia*.

Scyramathia carpenteri (Norman, in Thomson 1873) was described in *Amathia* Roux, 1828, but this genus name is preoccupied by *Amathia* Lamouroux, 1812 (Bryozoa), and as such, a new name *Anamathia*, was proposed by Smith (1885). Alcock (1895: 201) re-described *Scyramathia* as he understood it and remarked that it is distinct from *Anamathia*, with more affinities to *Hyastenus* White, 1847, and *Pugettia* Dana, 1851. Alcock (1895), however, had based his understanding of *Scyramathia* on the Indo-West Pacific species. In selecting *S. carpenteri* (Norman, in Thomson 1873) as the type species of *Scyramathia*, Rathbun (1925) also synonymised it under *Rochinia*, but without any explanation. Although Garth (1958: 283) listed *Scyramathia* A. Milne-Edwards, 1880, and *Anamathia* Smith, 1885, in the synonymy of *Rochinia*, he commented that the genus is not monophyletic due to the varying forms of the G1. *Scyramathia* has nevertheless remained under the synonymy of *Rochinia* since. Serène and Lohavanijaya (1973: 55) discussed the history of *Rochinia*, and noted that some authors (e.g. Barnard 1950) still considered *Scyramathia* a valid genus.

The species in *Scyramathia* s. str. have characteristic carapace plates that become more pronounced and lamelliform with age (see Tavares et al. 2016; Tavares and Santana 2018). Our studies confirm the findings of Tavares and Santana (2018). Tavares and Santana (2018) noted that *Scyramathia* includes the following species: *S. carpenteri* Norman, in Thompson, 1873, *S. umbonata* Stimpson, 1871, and a fossil species, *S. boschii* (Casadío, Feldmann, Parras & Schweitzer, 2005) (see Casadío et al. 2005). Tavares and Santana (2018), however, retained one species, *Scyramathia hertwigi* Doflein, in Chun 1900, from Africa in *Rochinia* sensu lato. It is clearly a *Scyramathia* species (present study).

Scyramathia s. str. is herein re-defined. With the transfer of *S. hertwigi*, as well as the description of a new species, *S. tenuipes* sp. nov., from the Mediterranean Sea, there are now four extant species and one fossil species in this genus.

Key to the extant species of *Scyramathia* A. Milne-Edwards, 1880 (based on adult male specimens)

1 Pseudorostral spines long, slightly longer than or equal to half carapace length; basal antennal article with straight to gently convex outer margin 2
– Pseudorostral spines short, shorter than half carapace length; basal antennal article with convex outer margin 3
2 With weak or relatively distinct plates on carapace; lateral branchial spine sharp, pointing laterally, slightly upwards; pterygostomial region with plate-like granules on outer margins; P2 merus length 11.8–14.0 times width; P5 merus length 5.5–7.3 times width ..... *Scyramathia carpenteri* (Norman, in Thomson 1873)
– With weak plates on carapace; lateral branchial spines sharp, pointing outwards; pterygostomial region with distinct granules on outer margins; P2 merus length 19.5–20.5 times width; P5 merus length 8.0–9.6 times width..... ..... *Scyramathia tenuipes* sp. nov.
3 With distinct, slightly raised plates on carapace; fused L-shaped postorbital and hepatic plates directed upwards; lateral branchial plate slightly curved, pointed upwards in large males ..... *Scyramathia hertwigi* Doflein, in Chun 1900
– With distinct, raised leaf-like plates on carapace; fused L-shaped postorbital and hepatic plates curved upwards; lateral branchial plate curved upwards in large males.....*Scyramathia umbonata* (Stimpson, 1871)

Scyramathia carpenteri **(Norman, in Thomson 1873)**

Figs 3, 4A–C, 5A–C, 6A–F, 7A–D, 8A–H, 9A–I, 14A, B

Amathia carpenteri Norman, in Thomson 1873: 175 (fig.), 176, fig. 35 (type locality: "sandy chalk of the Holtenia ground" [= between North Scotland and the Faeroe Islands]).

Scyramathia Carpenteri: A. Milne-Edwards 1880a: 356 [new combination]; A. Milne-Edwards 1880b: 277; Filhol 1885: 123, 154, fig. 38; Sars 1885: 6–11, 274, pl. 1 figs 1–7; Perrier 1886: 208, fig. 217; Smith 1886: 625[21], 626[22]; Bourne 1890: 308; A. Milne-Edwards and Bouvier 1894: 13, 14 (in part); A. Milne-Edwards and Bouvier 1899: 43 (in part); Doflein 1904: 81 (list); A. Milne-Edwards and Bouvier 1900: 133–138, pl. 20 fig. 1–10; Hansen 1908: 12; Bouvier 1922: 81 (in part); Grieg 1927: 44–45.

Anamathia Carpenteri: Smith 1886: 626[22]; Pocock 1889: 425, 426; Bourne 1890: 314, 315.

Anamathia carpenteri: Faxon 1895: 10.

Rochinia carpenteri: Rathbun 1925: 204 (list) [new combination]; Miranda y Rivera 1933: 41; Sivertsen and Holthuis 1956: 49; Allen 1967: 35 (list), 64 (key), 97 (fig.); Sankarankutty 1968: 51, figs 5D–F; Christiansen 1969: 20, 122–124, 123 (map), fig. 50; Ingle 1979: 47–53, 59, figs 1–7; Ingle 1980: 15 (list), 19 (table), 20 (table), 140, fig. 108, pl. 33 fig. b; Manning and Holthuis 1981: 254; Shelton and Dooley 1982: 109; Clark 1986: 190, 191 (map); Griffin and Tranter 1986: 180 (list); Rice 1990: 10, fig. 7; Tavares 1991: 161 (list), 172; d'Udekem d'Acoz 1999: 194 (in part); Casadío et al. 2005: 158 (list); Ng and Richer de Forges 2007: 63 (list); Ng et al. 2008: 105 (list); Ng and Richer de Forges 2013: 362, fig. 5B.

Rochinia Carpenteri: Bouvier 1940: 344, 345 (in part).

Scyramathia carpenteri: Tavares and Santana 2018: 204 (in part).

Material examined. ***Lectotype:*** ♂ (21.6 × 15.9 mm) (NHM 1907.8.28.3), stn 47, 'Holtenia ground', 59°34'N, 7°18'W, 958 m, coll. H.M.S. "Porcupine", 1869. Paralectotypes: 1 ♀ (13.0 × 8.4 mm) (NHM 1911.11.8.377), same locality and collection data as lectotype; 1 damaged juvenile ♀ (5.4 × 3.0 mm) (NHM 1910.2.4.213), stn 48, 'Holtenia ground' 59°32'N, 6°59'W, coll. H.M.S. "Porcupine", 1869. ***Other material:*** Scotland/North Sea • 1 ♂

FIG. 35.—*Amathia carpenteri*, NORMAN. Once and a half the natural size. (No. 47.)

Figure 3. Illustration of *Scyramathia carpenteri* (Norman, in Thomson 1873), "sandy chalk of Holtenia ground", overall dorsal view. (After Norman, in Thomson 1873: fig. 35).

(35.0 × 27.1 mm) (NHM 1981.108), stn 18, Sula Sgeir, 59°33.7'N, 06°49'W to 59°29.5'N, 06°43.3'W, 915–880 m, coll. A Wheeler, 16 July 1973; 2 ♂♂ (41.3 × 34.0 mm, 38.8 × 31.6 mm) (NHM 1983.449), 56°23'N, 09°18.2'W, 1010–1030 m, coll. W Wales, 20 October 1977; 7 ♂♂ (37.1 × 30.5 mm, 35.0 × 27.6 mm, 30.5 × 23.0 mm, 28.2 × 22.7 mm, 24.6 × 17.2 mm), 3 ♀♀ (37.1 × 30.6 mm, 33.5 × 27.5 mm, 22.4 × 17.2 mm), 1 ovigerous ♀ (35.8 × 29.0 mm) (NHM 1978.99), Atlantic Ocean, 56°33'N, 09°13'W to 56°30'N, 09°14'W, 750 m, coll. RW Ingle, 23 October 1977. PORCUPINE SEABIGHT • 3 ♂♂ (25.0 × 18.9 mm, 15.5 × 11.1 mm, 9.0 × 6.2 mm), 1 ♀ (34.8 × 28.2 mm), 1 ♀ (with bopyrid; 15.6 × 11.6 mm) (National Oceanography Centre), stn 50601, 51°19.2'N, 11°41.1'W – 51°21.1'N, 11°42.9'W, 927–770 m, coll. H.M.S. "Discovery" Collection, 1 July 1979; 1 ♂ (23.9 × 18.4 mm), 3 ♀♀ (17.1 × 13.8 mm, 13.6 × 10.6 mm, 12.5 × 9.4 mm) (National Oceanography Centre), stn 9752 #1, 51°16.3'N, 11°42.5'W – 51°18.6'N, 11°42.8'W, 1010–1045 m, coll. H.M.S. "Discovery" Collection, 7 April 1978.

Diagnosis. Carapace pyriform, strong diverging pseudorostral spines. Postorbital and hepatic spine fused, forming distinct L-shape plate on larger specimens. Carapace with 1 oblong mesogastric plate, 1 oblong cardiac plate, 2 metabranchial plates, 2 horseshoe-shaped epibranchial plates (Figs 3, 4A, 5A, 7A, C, 9A–I). Lateral branchial spine plate-like on specimens with strong carapace plates, present as strong spine on specimens with weak carapace plates (Figs 3, 4A, 5A, 7A, C, 9A–I). Male thoracic sternum deeply concave with distinct grooves (Figs 4B, 5B, 6D). G1 straight, with flattened, sharp tip; straight top margin (Fig. 8C–F).

Description. Carapace covered by a thick tomentum of setae; with several plates and spines. Pseudorostral spines

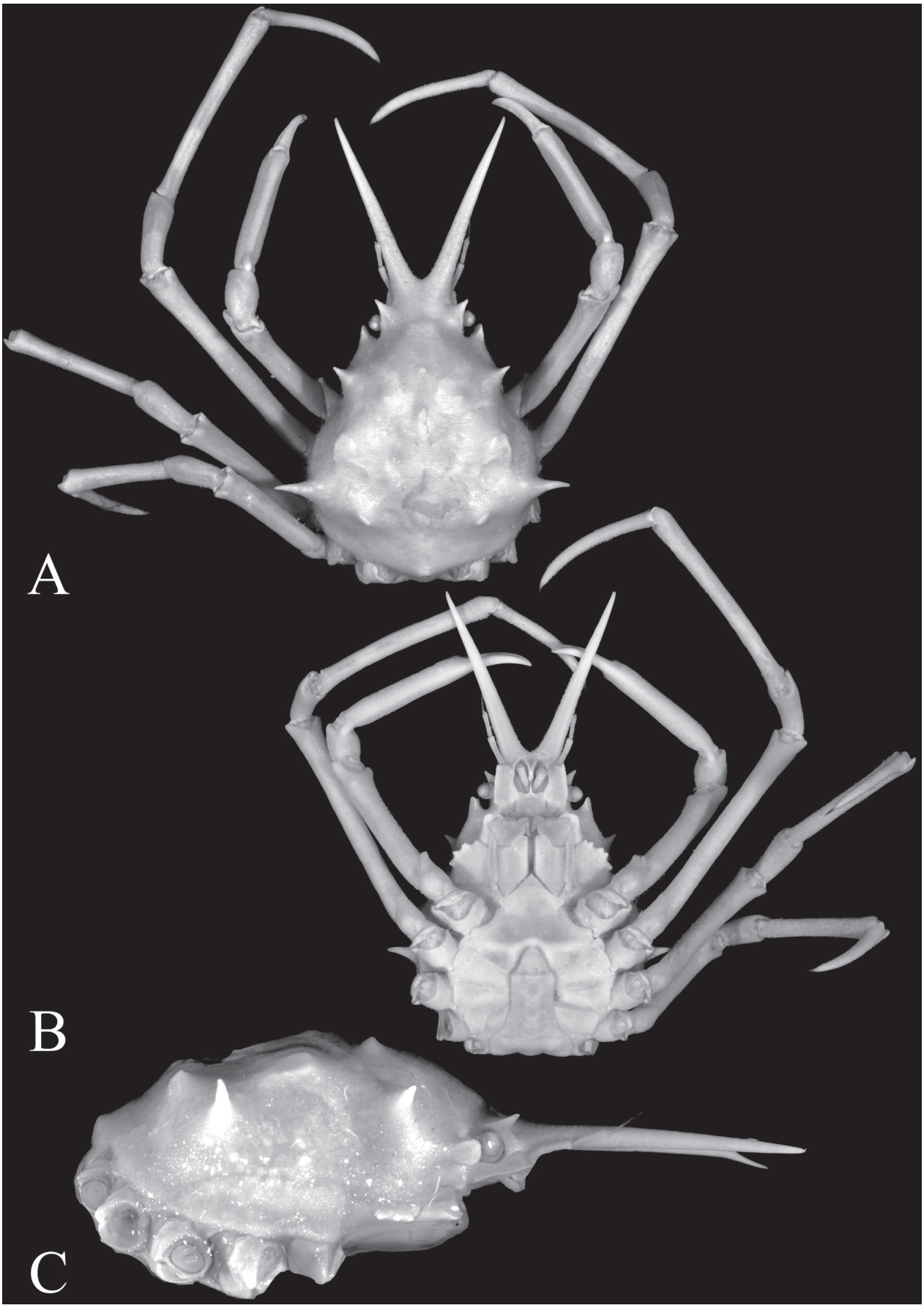

Figure 4. *Scyramathia carpenteri* (Norman, in Thomson 1873), lectotype male (21.6 × 15.9 mm) (NHM 1907.8.28.3), "Holtenia ground" (= between north Scotland and the Faeroe Islands). **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

sharp, straight, diverging, slightly deflected. Supraorbital eave with sharp preorbital spine; sharp angle preorbital spine on juvenile specimens. Hepatic spine pointing upwards, fused with postorbital plate; proportionally longer on juvenile specimens (Figs 4C, 5C, 6A, B, 8A, B). Carapace with plate-like structures: 1 oblong mesogastric plate; 1 oblong cardiac plate; 2 metabranchial plates; 2 horseshoe-shaped epibranchial plates (Figs 3, 4A, 5A, 7A, C, 9A–I). One long sharp branchial spine pointing laterally; proportionately longer in juveniles and specimens with weak carapace. One large intestinal granule on posterior border of carapace (Figs 3, 4A, 5A, 7A, C, 9A–I).

Antennal flagellum shorter than pseudorostral spines, about half or nearly equal in length. Basal antennal article fused to carapace; longer than broad; straight to gently convex outer margin; blunt distal angle of article. Pterygostomial region with several granules on outer margin (Figs 4B, 5B, 6C, 7B, D). Buccal frame square, covered by third maxiliped; strong, blunt distal angle of buccal frame (Figs 4B, 5B, 6C, 7B, D).

Chelipeds long, slender; propodus longer than dactylus; dactylus curved, serrulated along entire length (Fig. 6E); carpus short with granules on margin, dorsal margin carinated; merus with 1 tooth on distal upper border. Ambulatory legs slender; merus with sharp angle on distal end; male P2 merus length between 0.6–1.3 times carapace length, female P2 merus length between 0.8–1.0 times carapace length for female, male P2 merus length 8.2–14.0 times width, female P2 merus length 10.5–13.4 times width; male P5 merus length 0.4–0.6 times carapace length, female P5 merus length 0.3–0.5 times carapace length, male P5 merus length 4.2–7.3 times width, female P5 merus length 4.6–5.8 times width (Figs 3, 4A, 5A, 14A, B).

Male thoracic sternum with sternites 1–4 deep concave; sternites 1, 2 wider than long; sternites 3, 4 widest at base, lateral margin slightly constricted; sternites strongly defined (Figs 4B, 5B, 6D, F,). Male pleon with triangular telson and 6 somites, all free; widest on second and third somites. Adult female with round pleon, with all somites distinct. G1 straight, with flattened, sharp distal tip; straight top margin; slightly constricted at distal region (Fig. 8C–F).

Remarks. The identity of *Amathia carpenteri* Norman, in Thomson 1873 s. str., is critical to the status of *Scyramathia* as it is the type species of the genus. Although Tavares and Santana (2018) clarified the identity of the genus and had material of the species, they did not examine the types for this species. The species was named by Thomson in 1873 in his famous book about the exploration of the deep Atlantic by the H.M.S. Porcupine, "The Depths of the Seas" (p. 175: fig. 35; reproduced here as Fig. 3), under the name "*Amathia Carpenteri*" to honour his colleague Dr. W.B. Carpenter. There was no clear indication of number of specimens examined, with the author only commenting that "Another handsome new species, *Amathia carpenteri*, Norman (fig. 35), was common in the sandy chalkmud of the Holtenia ground." (Thomson 1873: 176). The figure shows that the cardiac region of the carapace appeared to be damaged (Thomson 1873: fig. 35; reproduced here as Fig. 3). In the NHM are three specimens that are labelled as syntypes of *A. carpenteri*, all obtained by the H.M.S. Porcupine. None of these specimens, however, match the measurements of the type figure, which was "once and a half the natural size" (Thomson 1873: fig. 35; reproduced here as Fig. 3). Of these, one male specimen (NHM 1907.8.28.3) agrees relatively well with the figure by Thomson (1873: fig. 35; Fig. 3), and the specimen label mentions that it was figured in Thomson (1873). This specimen, with catalogue number, NHM 1907.8.28.3, was noted by Christiansen (1969: 122) to be the lectotype for this species, and in an unpublished note, was also selected by Isabella Gordon (also unpublished data) to be the lectotype. The same specimen was also mentioned by Rice (1990: 10), noting that it is similar to the figure by Norman, in Thomson (1873: fig. 35). The type locality of this species was stated to be on "sandy chalk of the Holtenia ground". Holtenia Ground is an area between North Scotland and the Faeroe Islands that covers an area of approximately 500 km^2, with a depth of 820 to 1000 m (Carpenter et al. 1870; Reiswig and Champagne 1995). Specimen NHM1907.8.28.3 is here formally designated as the lectotype of *Amathia carpenteri* Norman, in Thomson 1873, to stabilise the taxonomy of the species and the genus.

The three type specimens differ markedly from each other in many ways although they are all from Holtenia Ground. The lectotype male (21.6 × 15.9 mm, NHM 1907.8.28.3) selected here differs markedly from the other two paralectotypes in having a smoother carapace, without the distinct raised plate-like structures on the carapace and the branchial regions are also proportionately more inflated (Figs 4A, 7A). The next largest type is a subadult female (13.0 × 8.4 mm, NHM 1911.11.8.377), and its carapace more closely resembles typical *S. carpenteri*, with the plates more developed. It is almost certainly the same specimen figured by Norman, in Thomson (1873: fig. 35; Fig. 3), with the shape and structures of the spines and plates agreeing very well, althought the left pseudorostral spine of the specimen is now broken (Fig. 7C). The third type specimen is a small and poorly preserved juvenile female (5.4 × 3.0 mm, NHM 1910.2.4.213) in which the dorsal surface of the carapace as well as the third maxillipeds are covered with setae but without any obvious plates. The surfaces of the third maxillipeds of the other two type specimens are finely granulated or smooth (Figs 4B, 7B, D).

Scyramathia carpenteri exhibits strong variation on the plate-like structures on the carapace of various sized specimens showed variation. D'Udekem d'Acoz (1999) observed that "L'ornementation de la carapace de *R. carpenteri* est extrêmement variable" but did not mention if it is due to the size of the specimens. Similar sized specimens showed either weak or strong plate-like structures (Fig. 9A–I). These differences are also seen in the type

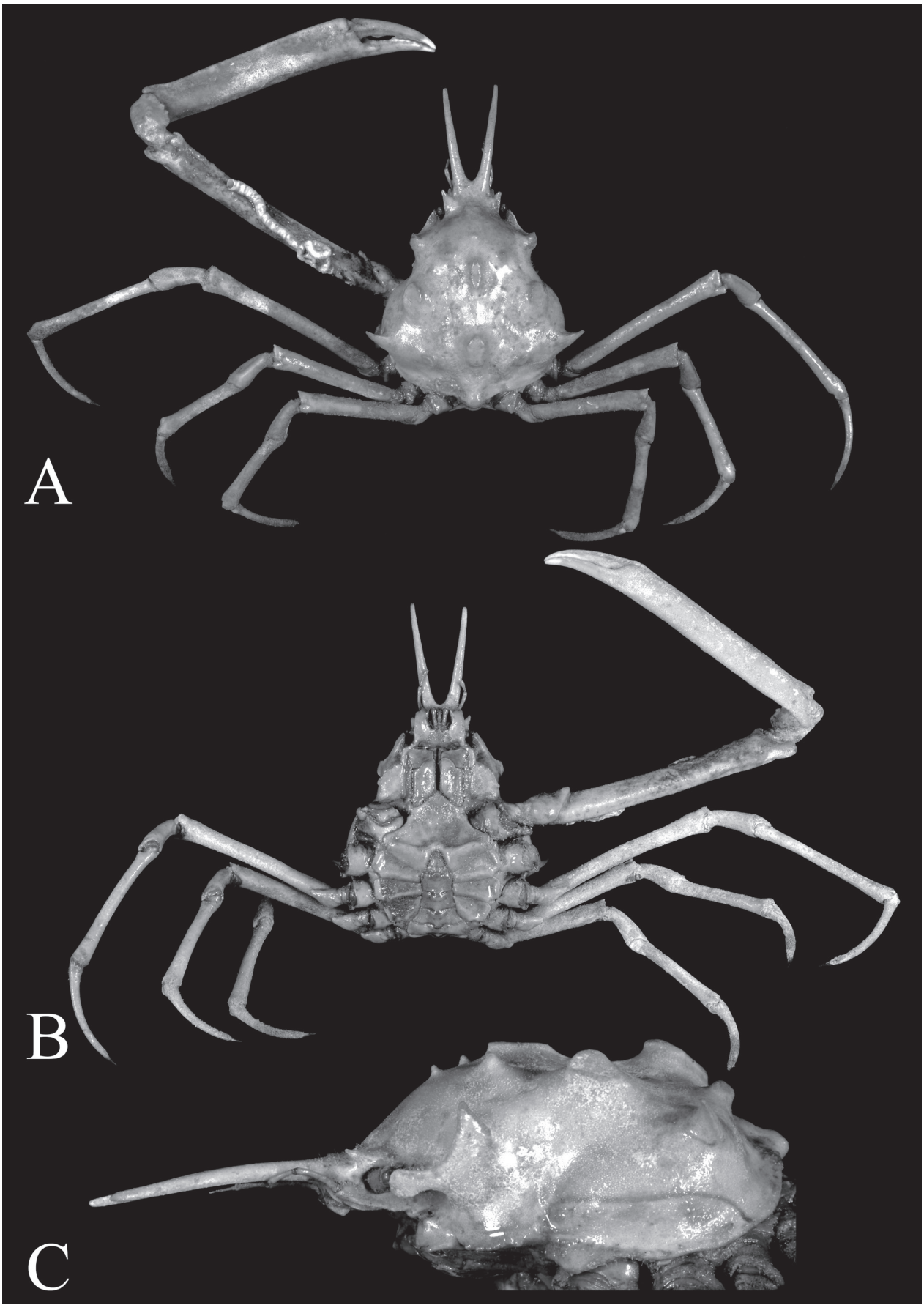

Figure 5. *Scyramathia carpenteri* (Norman, in Thomson 1873), male (41.3 × 34.0 mm) (NHM 1983.449), North Sea. **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

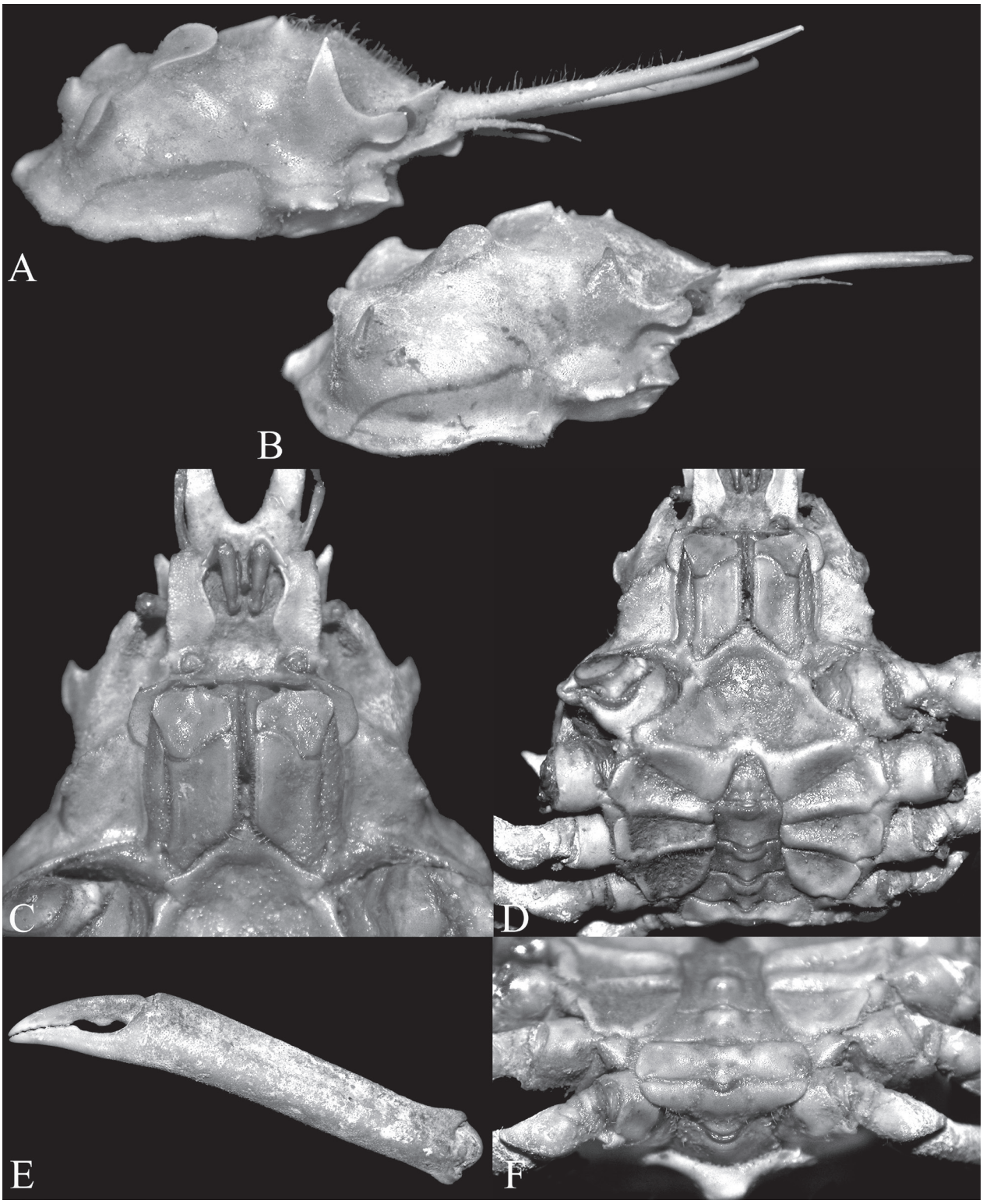

Figure 6. A. *Scyramathia carpenteri* (Norman, in Thomson 1873), male (35.0 × 27.1 mm) (NHM 1981.108), North Sea; **B–F.** *S. carpenteri* (Norman, in Thomson 1873), male (41.3 × 34.0 mm) (NHM 1983.449), North Sea. **A, B.** lateral view of carapace; **C.** ventral frontal surface of carapace; **D.** male thoracic sternum view; **E.** dorsal surface of male left chela; **F.** posterior ventral view of male pleon.

specimens where the larger sized male lectotype specimen has weak plate-like structures on the carapace whereas the same structures on the smaller sized female paralectotype specimens are relatively stronger. The variation of the plate-like structures on the carapace are therefore, not always size dependent. Other morphological characters that show variation on *S. carpenteri* includes the divergence of the pseudorostral spines, from relatively diver-

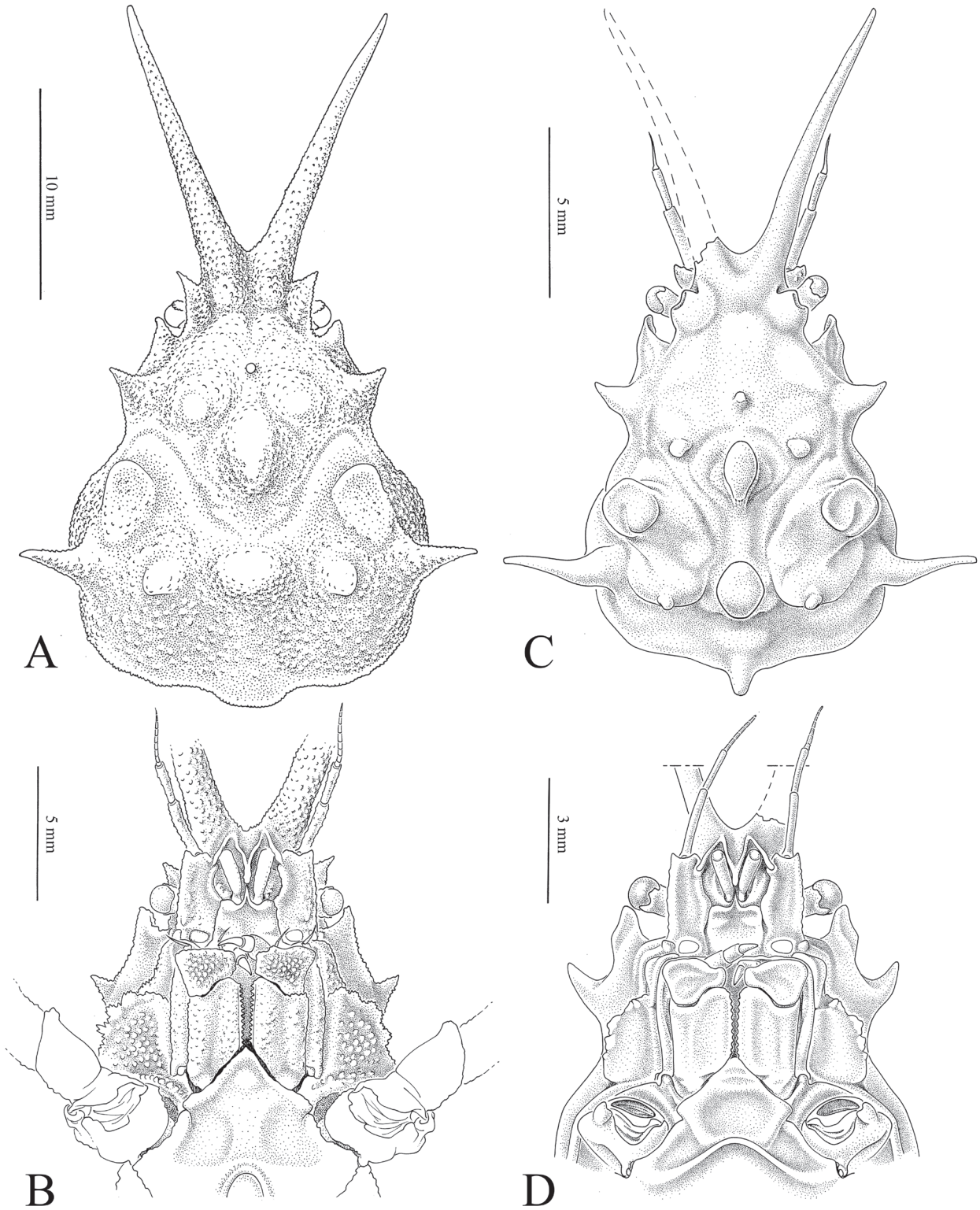

Figure 7. Illustration of *Scyramathia carpenteri* (Norman, in Thomson 1873). **A, B.** lectotype male (21.6 × 15.9 mm) (NHM 1907.8.28.3), "Holtenia ground" (= between north Scotland and the Faeroe Islands); **C, D.** paralectotype female (13.0 × 8.4 mm) (NHM 1911.11.8.377), same locality as lectotype. **A, C.** dorsal view of carapace; **B, D.** ventral frontal surface of carapace.

gent as seen on the lectotype (Fig. 4A) to subparallel as seen on the male specimen, with catalogue number, NHM 1983.449 (Fig. 5A); the hepatic region having a hepatic spine or plate (Figs 4A, 5A, 7A, C, 9A–I); and the lateral branchial spine on the carapace, from relatively straight, slightly curved or plate-like (Figs 4A, 5A, 7A, C, 9A–I).

Superficially, *S. carpenteri* resembles *S. umbonata* (Stimpson, 1871) from the western Atlantic, which also

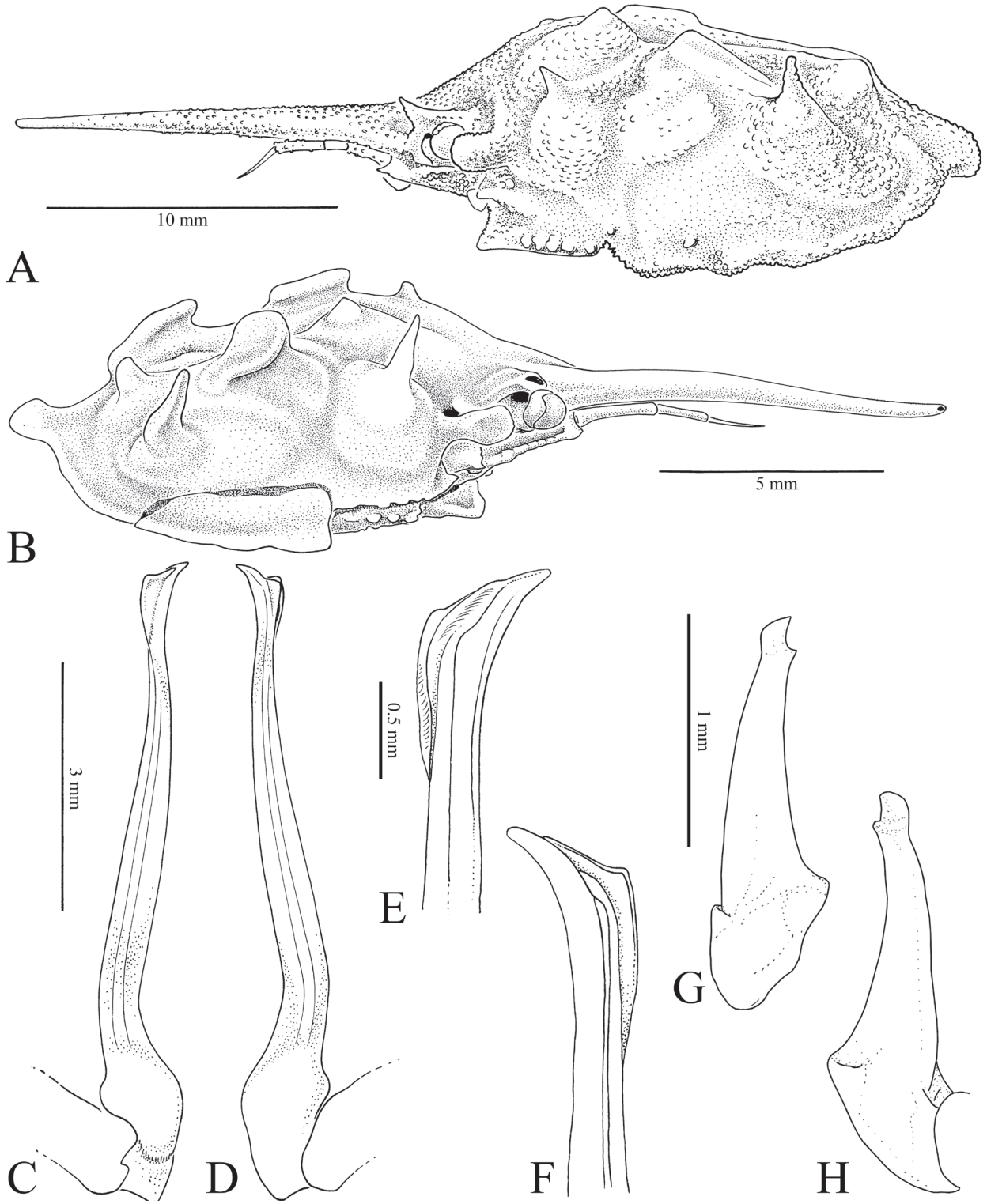

Figure 8. Illustration of *Scyramathia carpenteri* (Norman, in Thomson 1873). **A, C–H.** lectotype male (21.6 × 15.9 mm) (NHM 1907.8.28.3), "Holtenia ground" (= between north Scotland and the Faeroe Islands); **B.** paralectotype female (13.0 × 8.4 mm) (NHM 1911.11.8.377), same locality as lectotype. **A, B.** lateral view of carapace; **C.** ventral view of G1; **D.** ventral view of distal portion of G1; **E.** dorsal view of G1; **F.** dorsal view of distal portion of G1; **G.** ventral view of G1; **H.** dorsal view of G2. Scale bars: 1 mm.

appears to grow to a much larger size (57 mm maximum carapace length; see Tavares et al. 2015). There are, however, consistent differences, with *S. carpenteri*, which has relatively longer pseudorostral spines, and the outer margin of the basal antennal article is always straight or only slightly convex. The pseudorostral spines of *S. umbonata* are always proportionately shorter, even when similar sized specimens are compared, and the outer margin of

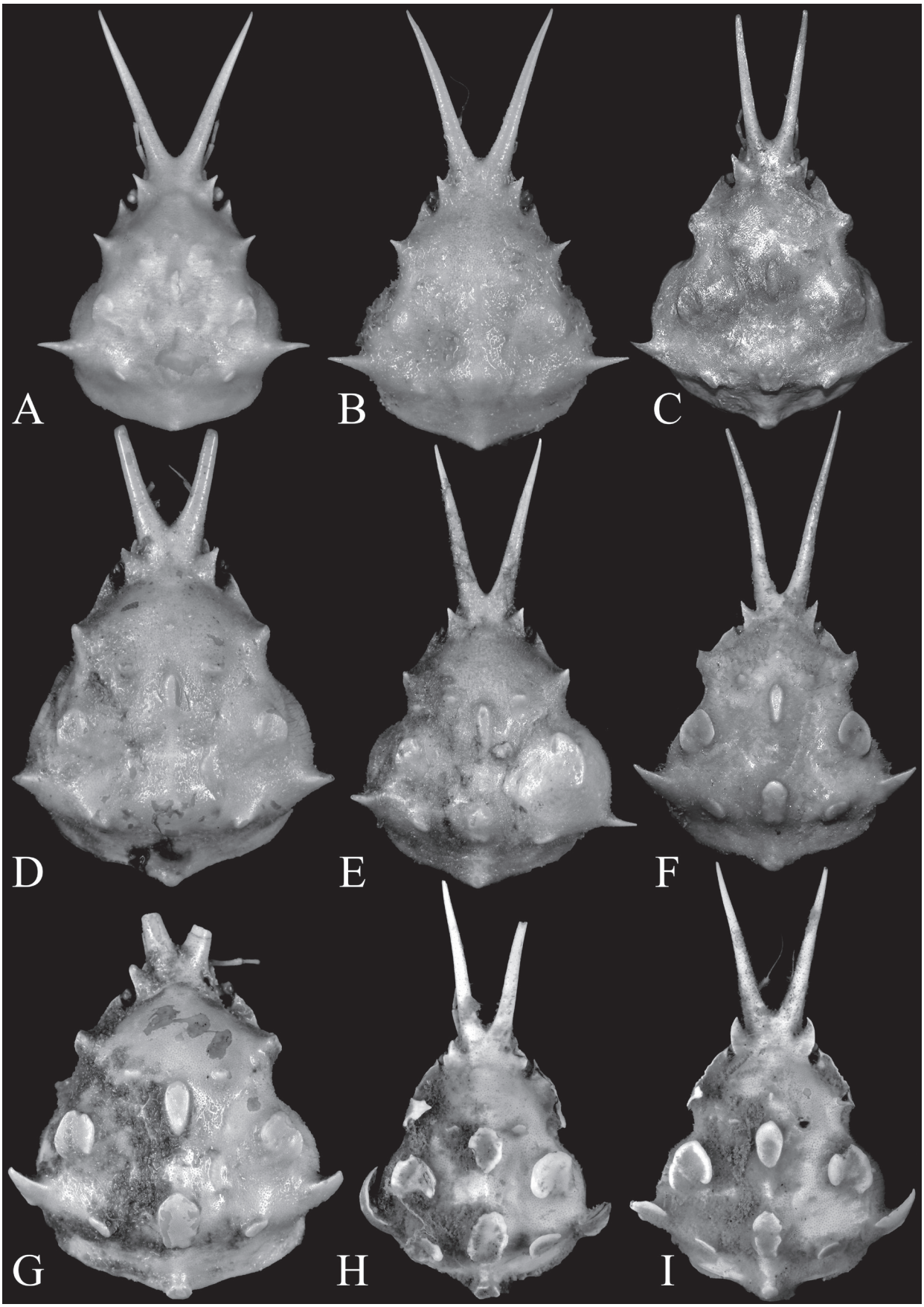

Figure 9. Variation of plate-like structures on carapace on *Scyramathia carpenteri* (Norman, in Thomson 1873). **A.** lectotype male (21.6 × 15.9 mm) (NHM 1907.8.28.3), "Holtenia ground"; **B, G.** female (22.4 × 17.2 mm, 35.8 × 29.0 mm, respectively) (NHM 1978.99), North Sea; **C.** male (41.3 × 34.0 mm) (NHM 1983.449), North Sea; **D, E, H, I.** male (28.2 × 22.7 mm, 37.1 × 30.5 mm, 24.6 × 17.2 mm, 33.0 × 25.7 mm, respectively) (NHM 1978.99), North Sea; **F.** male (35.0 × 27.1 mm) (NHM 1981.108), North Sea.

the basal antennal article is always distinctly convex (cf. Tavares et al. 2015: figs 1, 2, 4, 5). These differences are reliable for specimens of similar sizes. As such both species are here recognised as separate taxa.

It is interesting to note that some studies (A. Milne-Edwards and Bouvier 1899, 1900; Bouvier 1922, 1940) mentioned that *S. carpenteri* does not occur in the Mediterranean, which is the region where the species, *S. tenuipes* sp. nov., is now found (see remarks for *S. tenuipes* sp. nov.). Alphonse Milne-Edwards and Bouvier (1899, 1900) and Bouvier (1940) had material they referred to "*S. carpenteri*" from the Azores, and up north of São Jorge, and the Sahara beach. Based on their figures (see A. Milne-Edwards and Bouvier 1899: pl. 1 fig. 4; A. Milne-Edwards and Bouvier 1900: pl. 20 Figs 1, 6; Bouvier 1940: pl. 14 fig. 1), however, the specimens they figured are more similar to *S. tenuipes* sp. nov., with the ambulatory legs long and slender, and these records are hence referred there for now. The plates on the carapace as figured (see A. Milne-Edwards and Bouvier 1899: pl. 1 fig. 4; A. Milne-Edwards and Bouvier 1900: pl. 20 Figs 1, 6; Bouvier 1940: pl. 14 fig. 1) appear relatively stronger than what has been observed in *S. tenuipes* sp. nov., but as discussed earlier, this character is known to vary in *S. carpenteri* s. str. in any case.

Distribution. *Scyramathia carpenteri* is known from the type locality, "sandy chalk of the Holtenia ground" [= between North Scotland and the Faeroe Islands] (Carpenter et al. 1870; Norman, in Thomson 1873; Reiswig and Champagne 1995), South Iceland (Hansen 1908), Southwest Faeroe Islands, South of Norway, West of British Isles (Clark 1986).

Scyramathia hertwigi Doflein, in Chun 1900

Figs 10A–C, 14C, D, 15A–D

Scyramathia Hertwigi: Doflein, in Chun 1900: 172 (fig.); Doflein, in Chun 1902–1903: 172 (fig.).

Scyramathia Hertwigi Doflein, 1904: 81–84, pl. 27 fig. 3, pl. 28 fig. 1 (type locality: off Cape Point and on Agulhas Bank).

Scyramathia hertwigi: Stebbing 1902: 7, pl. 6; Stebbing 1905: 25; Stebbing 1910: 289; Barnard 1950: 50, 51, fig. 11b, c; Low et al. 2017: 116, fig. 2A, tables 2, 3.

Rochinia carpenteri: Monod 1956: 32 (list), 515. [not *Amathia carpenteri* Norman, in Thomson 1873].

Rochinia hertwigi: Serène and Lohavanijaya 1973: 56 (key); MacPherson 1983: 32–35, figs 19, 20a–c; Griffin and Tranter 1986: 175 (key), 180; Casadío et al. 2005: 159 (list); Ng and Richer de Forges 2007: 62 (list); Ng et al. 2008: 105 (list); Tavares and Santana 2018: 223 (list); Griffiths et al. 2018: 199.

Materials examined. ***Lectotype:*** ♂ (33.7 × 27.0 mm) (ZMB 13699), Atlantic, South Atlantic Ocean, Agulhasstrom [= Agulhas current], coll. Deutsche Tiefsee Expedition, 2 November 1898. ***Paralectotypes:*** 3 ♂♂ (24.7 × 19.0 mm, 23.6 × 17.7 mm, 18.7 × 13.7 mm), 2 ♀♀ (28.3 × 22.6 mm, 26.4 × 20.2 mm) (ZMB 13700), stn 103, Agulhasstrom [= Agulhas current], 500 m, coll. Deutsche Tiefsee Expedition, 2 November 1898; 8 ♂♂ (2 largest: 22.8 × 17.9 mm, 21.6 × 16.5 mm; 2 smallest: 16.2 × 12.3 mm, 16.0 × 11.9 mm), 2 ovigerous ♀♀ (25.9 × 20.5 mm, 24.3 × 19.2 mm), 8 ♀♀ (2 largest: 25.1 × 19.4 mm, 22.6 × 17.3 mm; 2 smallest: 20.1 × 15.2 mm, 14.3 × 10.3 mm) (SMF 23085), stn 103, Atlantic, South Atlantic, Agulhasstrom [= Agulhas current], 35°10'S, 23°2'E, 500 m, coll. FS 'Valdivia", 2 November 1898. ***Other material:*** South Africa • 1 ♂ (29.2 × 22.9 mm) (SAM-A39580), west grounds, I + J trawls, coll. UCT Ecological Survey, 22 November 1946; 2 ♂♂ (33.2 × 27.7 mm, 31.9 × 27.1 mm) (SAM-A47887), west coast, 333 m, coll. 17 January 2007; 1 ♂ (19.0 × 14.2 mm), 1 ovigerous ♀ (34.4 × 27.1 mm) (SAM-A12149), West of Slangkop, Cape Peninsula, 457 m, coll. P Henry, 16 February 1965; 1 ♂ (47.0 × 38.0 mm) (SAM-A40027), stn A10121-082-035-4197, 34°36.6'S, 25°15.1'E, 480 m, coll. R.S. Africana South Coast Hare Biomass Survey, 31 May 1990; 1 ♂ (23.7 × 18.5 mm), 1 ovigerous ♀ (36.0 × 28.5 mm), 1 ♀ (24.5 × 18.4 mm) (SAM-A47872), stn NAN401 T027, 34°20.2'S, 18°12.7'E, 290 m, coll. L Atkinson, Nansen West Coast Survey, 15 January 2007; 1 ♂ (40.7 × 31.1 mm) (AM P34653), off Cape Town, 34°21'S, 17°57'E, coll. 18 December 1929; 3 ♂♂ (34.6 × 27.3 mm, 29.3 × 23.1 mm, 22.0 × 17.0 mm) (NHM 1924.7.19.1–3), stn 103, Cape, no other data. SOUTH ATLANTIC • 1 ♀ (21.5 × 18.9 mm) (ZMB 26204), stn 153/1968, 28°22'S, 14°24'E, 470–460 m, coll. E Haeckel, 9 May 1968.

Diagnosis. Carapace pyriform, covered with short setae. Pseudorostral spine short, diverging. Supraorbital eave with sharp preorbital spine; postorbital lobe fused to hepatic plate on large size specimens. Carapace with plates: 1 hepatic plate pointing upwards, 1 short mesogastric spine above 1 oblong mesogastric plate, 1 large protogastric granule, 1 oblong cardiac plate, 1 large epibranchial plate, 1 mesobranchial plate, 1 posterior blunt spine, 1 lateral branchial plate curved upwards (Fig. 10A). Plates less distinct on juvenile specimens. Antennal flagellum equal to or slightly longer than pseudorostral spines. Basal antennal article with convex outer margin, with blunt distal angle of article. Buccal frame covered by third maxilliped, distal angle of buccal frame raised, distinct. Pterygostomial region plate-like with 3 or 4 granules on outer margin (Fig. 10B). Chelipeds slender, propodus longer than fingers, slightly carinate; carpus with granules on carina margin; merus triangular in cross-section, granulated on edge. Ambulatory legs slender; merus cylindrical; male P2 merus length 0.8–1.2 times carapace length, female P2 merus length 0.4–0.8 times carapace length, male P2 merus length 10.9–14.9 times width, female P2 merus length about 8.5 times width; male P5 merus length 0.4–0.6 times carapace length, female P5 merus length 0.4–0.5 times carapace length, male P5 merus length 4–6.8 times width, female P5 merus length 4.6–5.8 times width (Figs 10A, 14C, D). Male thoracic sternum wide, concave on sternites 1–4; regions well defined; sternites 3, 4 widest, lateral margins slightly

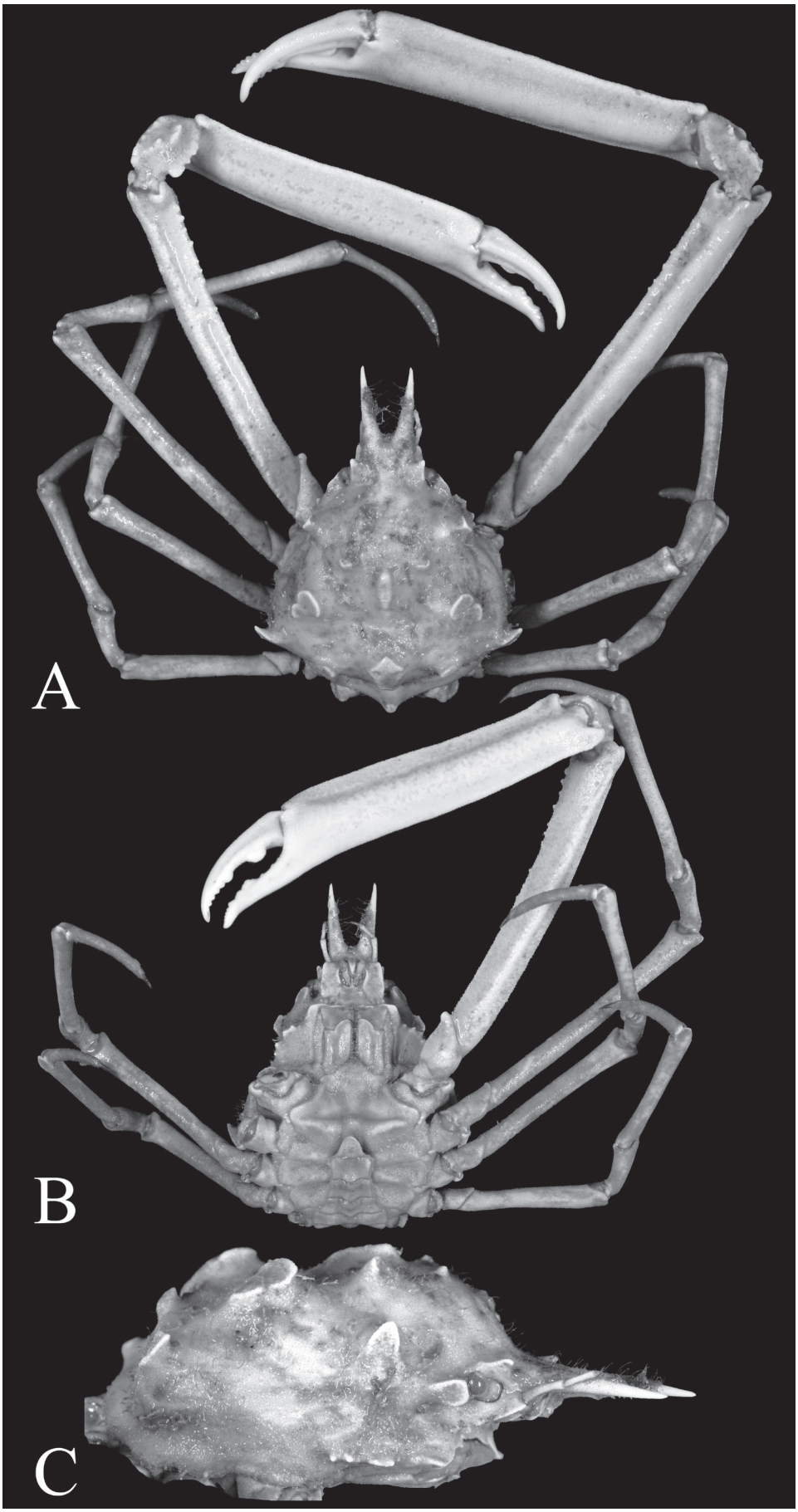

Figure 10. *Scyramathia hertwigi* Doflein, in Chun 1900, lectotype male (33.7 × 27.0 mm) (ZMB 13699), South Atlantic Ocean. **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

constricted medially. Male pleon with triangular telson; surface of somites smooth (Fig. 10B). G1 straight with flattened sharp tip (Fig. 15A–D).

Remarks. The author and year of publication for *Scyramathia hertwigi* has traditionally been cited as Doflein (1904). Doflein (1904: 81), however, cited a figure of this species in Chun (1900). Hence, the authorship and date of publication for *S. hertwigi* should be "Doflein in Chun 1900" (see Low et al. 2017). The figure by Doflein that is in Chun (1900) was stated to be drawn to scale (Low et al. 2017). Doflein (1904), when describing the species, did not specify the number of specimens examined, but mentioned that many male and female specimens were examined. The specimen that was figured by Doflein, in Chun (1900), is currently deposited in ZMB. The measurement of the male specimen deposited in the Museum für Naturkunde, Berlin (ZMB) is very similar to that drawn by Doflein, in Chun (1900) and we are confident they are the same specimen. The location where this specimen was collected matches that listed in Doflein (1904). Since no type was designated in Chun (1900) or Doflein (1904), this male specimen (ZMB 13699) is herein designated as the lectotype of *S. hertwigi*.

The Atlas by Doflein (1904: pl. 27 figs 1–7) has figures that show a series of sizes of the carapace with plates, in particular the horse-shoe shaped epibranchial plate. In this species, the pseudorostral spines are always proportionately shorter than those in *S. carpenteri*. The differences between *S. carpenteri* and *S. hertwigi* were discussed by MacPherson (1983: 35), and we agree with his interpretation. There are also slight variations amongst the specimens from South Atlantic (SMF 23085), which tend to have less distinct plates on the carapace, and slightly shorter and stouter ambulatory legs while a large specimen (AM P34653) from South Africa has distinct plates on carapace, and somewhat longer and slender ambulatory legs. These differences, however, are not substantial and should not be a reason to treat them as different.

The specimens of "*Scyramathia carpenteri*" from off Cape Bajador, West Africa (= off Boujdour, Western Sahara) reported by Tavares and Santana (2018: 204) may not be that species. This location overlaps with the distribution range of *S. tenuipes* **sp. nov.**, and it is possible their specimens belong to this species instead. Their material will need to be re-examined.

Distribution. *Scyramathia hertwigi* is known from its type locality, off Cape Point and on Agulhas Bank, South Africa, as well as parts of the south Atlantic along the African coast. It is the only species that enters the south-western-most edge of the Indian Ocean.

Scyramathia umbonata (Stimpson, 1871)

Figs 11A–C, 14E

Scyra umbonata Stimpson 1871: 115 (type locality: off Sand Key, Florida).

Scyra umbonata: A. Milne-Edwards 1875 [in 1873–1880]: 87–88; A. Milne-Edwards 1880 [in 1873–1880]: pl. 31A fig. 5–5b; A. Milne Edwards 1880c: 2; Sars, 1885: 6 (list), 7 (list), 274 (list); Smith 1886: 626[22 on separate]

Scyramathia umbonata: A. Milne-Edwards 1880a: 356; A. Milne-Edwards 1880b: 277; A. Milne-Edwards and Bouvier 1923: 381; Tavares and Santana 2018: 204 (list), Figs 1, 12C, 13A, B.

Anamathia umbonata: Rathbun 1894: 61–62, pl. 1 Figs 1–3; Faxon 1895: 10.

Rochinia umbonata: Rathbun 1925: 210 (key), 222, 223, text-fig. 85, pl. 72, pl. 73 fig. 1; Bullis and Thompson 1965: 12 (list); Williams et al. 1968: 61, fig. 16; Takeda 1983: 135; Williams 1984: 322 (key), 323–325, figs 258, 260c; Abele and Kim 1986: 42, 172 (key); Griffin and Tranter 1986: 175 (list); Soto 1991: 628 (table), 632 (list), 633 (list), 634, 636 (list); Tavares 1991: 161 (list), 164; Poupin 1994: 43, 44, pl. 4 fig. g; Nizinski 2003: 128; McLaughlin et al. 2005: 253 (list); Wicksten and Packard 2005: 1762 (list); Casadío et al. 2005: 159 (list), 160; Ng and Richer de Forges 2007: 63 (list); Ng et al. 2008: 106 (list); Felder et al. 2009: 1078 (list); Pettan 2013: 72–80, 87 (key), figs 14a, b, 17h, 18b, 19b, 20b, 28a–d, 29a–c; Pettan and Tavares 2014: 306 (list), fig. 1; Tavares et al. 2016: 1065–1069, figs 1–6.

Rochinia confusa Tavares 1991: 161 (list), 162–165, fig. 1A–C, 5A, pl. 1 A–D (type locality: off Rio de Janeiro, 23°46'S, 42°09'W, Brazil); De Melo 1996: 266 (key), 267, unnumbered in-text fig.; Casadío et al. 2005: 158 (list); Ng and Richer de Forges 2007: 63 (list); Ng et al. 2008: 105 (list); Pettan 2013: 21–26, 87 (key), figs 7a, b, 16a, 18a, 19a, 20a; Pettan and Tavares 2014: 305 (list), fig. 1.

(For the remaining Neotropics literature, see Tavares et al. 2016).

Material examined. Paratype of *Rochinia confusa* Tavares, 1991: 1 ♂ (8.0 × 5.2 mm) (MNHN-IU-2014-19836 [= MNHN-B24570]), stn 54, Brazil, 19°36'S, 38°53'W, coll. TAAF/MD55, 2 June 1987. ***Other material:*** 1 ♀ (36.7 × 27.9 mm) (NSMT-Cr7178), off Suriname, 7°47'N, 54°08'W, 60 m, coll. 1980.

Diagnosis. Carapace pyriform, covered with short setae. Pseudorostral spine short, diverging. Supraorbital eave fused to carapace with sharp preorbital spine; postorbital lobe and hepatic spine fused, forming a L-shape plate-like structure, pointing upwards; plate-like structure not formed on juvenile specimens. Carapace with raised plates: 1 hepatic plate curved, pointing upwards, 1 short mesogastric granule above 1 oblong mesogastric plate, 1 oblong cardiac plate, 1 large epibranchial plate, 1 mesobranchial plate, 1 posterior blunt spine, 1 lateral branchial plate curved upwards (Fig. 11A). Plates less distinct on juvenile specimens. Antennal flagellum equal to or slightly longer than pseudorostral spines. Basal antennal article with convex outer margin, with blunt distal angle of article. Buccal frame covered by third maxilliped, distal angle of buccal frame raised, distinct. Pterygostomial region plate-like with 3 or 4 granules on outer margin (Fig. 11B). Chelipeds slender, propodus longer than fingers, slightly carinate. Ambulatory legs slender; merus cylindrical; male P2 merus length approximately 0.7 times carapace length, female P2 merus length 0.6–1.0 times carapace length, male P2 merus length approximately 9.0 times width, female P2 merus length 9.5–12.3 times width; male P5 merus length approximately 04 times carapace length, female P5 merus length 04–0.6 times carapace length, male P5 merus length approximate-

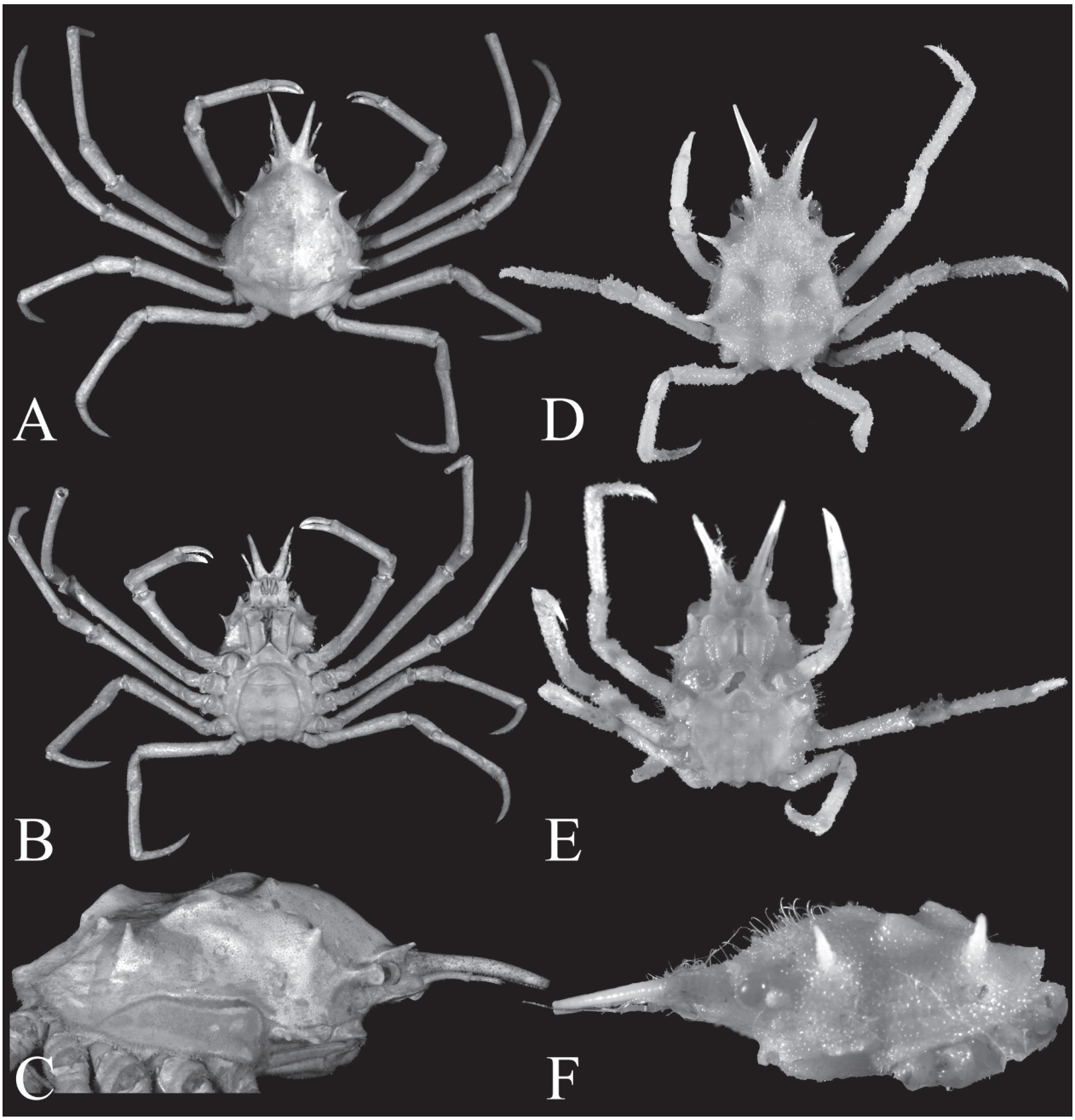

Figure 11. A–C. *Scyramathia umbonata* (Stimpson, 1871), female (36.7 × 27.9 mm) (NSMT-Cr7178), off Suriname; **D–F.** *Rochinia confusa* Tavares, 1991, paratype male (8.0 × 5.2 mm) (MNHN-IU-2014-19836 [= MNHN-B24570]), Brazil. **A, C.** overall dorsal view; **B, E.** overall ventral view; **C, F.** lateral view of carapace.

ly 4.4 times width, female P5 merus length 4.1–6.9 times width (cf. Rathbun 1925: pl. 72, 73 fig. 1; Figs 11A, 14E). Male thoracic sternum wide, concave on sternites 1–4; regions well defined; sternites 3, 4 widest, lateral margins slightly constricted. Male pleon, telson triangular; surface of somites smooth (Fig. 11E). G1 straight with flattened sharp tip (cf. Tavares and Santana 2018: fig. 13A, B).

Remarks. *Scyramathia umbonata* was originally described as a species of *Scyra* by Stimpson (1871) from off Sand Keys in Florida. Stimpson (1871) provided measurements for one male specimen but did not indicate if he had more material. It was transferred to *Scyramathia* by A. Milne-Edwards (1880a), and Rathbun (1894) subsequently referred it to *Anamathia*. Rathbun (1925) later transferred the species to *Rochinia* when she synonymised the genera. The type material for the *S. umbonata* is probably no longer extant (Tavares et al. 2016).

Tavares et al. (2016) discussed the taxonomy of *S. umbonata* at length (see also Tavares and Santana 2018) and synonymised *Rochinia confusa* Tavares, 1991, under *S. umbonata*, stating that *R. umbonata* undergoes drastic

changes in morphology as it grows, with more distinct plates being present on larger sized specimens. This is the same pattern as seen in *S. carpenteri* and *S. hertwigi*. Tavares and Santana (2018) later transferred it back to *Scyramathia*. There is no need to redescribe or figure this species as the detailed study and figures of this species by Tavares et al. (2016) and Tavares and Santana (2018) are quite sufficient. For these reasons, a neotype is also not needed for this species for the time being.

Distribution. *Scyramathia umbonata* is recorded from the North Carolina to Gulf of Mexico (United States of America), Nicaragua, Caribbean Island, and Brazil (Tavares et al. 2016).

Scyramathia tenuipes sp. nov.

http://zoobank.org/2686B3A1-9ECC-44CE-95BD-665E8555F228

Figs 12, 13A–C, 14F–J, 15E–H

Scyramathia Carpenteri: A. Milne-Edwards and Bouvier 1894: 13, 14 (in part); A. Milne-Edwards and Bouvier 1899: 43 (in part), pl. 1 fig. 4; Bouvier 1922: 81 (in part). [not *Amathia carpenteri* Norman, in Thomson 1873].

Rochinia Carpenteri: Bouvier 1940: 344, 345 (in part), fig. 209, pl. 14 figs 1–3. [not *Amathia carpenteri* Norman, in Thomson 1873].

Rochinia (*Amathia*) *carpenteri*: Dieuzeide 1955: 53–55, fig. 9.

Rochinia (*Scyramathia*) *carpenteri*: Dieuzeide and Roland 1958: 21 (list), 62 (list). [not *Amathia carpenteri* Norman, in Thomson 1873].

Rochinia carpenteri: Dieuzeide 1960: 76 (list); Fransen 1991: 6, (list), 7 (list), 181 (list); García Raso 1996: 741 (in part); D'Udekem d'Acoz 1999: 194 (in part); Abelló et al. 2002: 187 (table), 189 (list), 191 (table), 193 (table), 195 (table); Araújo et al. 2014: 38, fig. 1F. [not *Amathia carpenteri* Norman, in Thomson 1873].

Material examined. ***Holotype:*** ♂ (33.9 × 26.3 mm) (ICMD288), Mediterranean Sea, coll. 1994. ***Paratypes:*** 1 ovigerous ♀ (31.2 × 24.6 mm) (ICMD000708), Málaga, Mediterranean Sea, 36°31'19"N, 03°59'18"W, 650 m, coll. 1 May 2016; 1 ♀ (27.7 × 20.5 mm) (ICMD000712), Castell de Ferro, Mediterranean Sea, 36°39'19"N, 03°16'47"W, 638 m, coll. 5 May 2016; 1 ovigerous ♀ (32.2 × 25.8 mm) (ZRC 2019.1635, ex. ICMD000696), Adra, Mediterranean Sea, 36°33'51"N, 03°03'52"W, 572 m, coll 29 April 2016; 1 ♂ (32.0 × 25.4 mm) (ZRC 2019.1636, ex. ICMD000713), Málaga, Mediterranean Sea, 36°18'44"N, 04°20'25"W, 770 m, coll. 24 April 2016; 1 ♂ (29.6 × 22.9 mm) (ICMD000700), Alborán Island, Mediterranean Sea, 35°33'51"N, 03°03'52"W, 819 m, coll. 6 May 2016; 1 ♂ (29.7 × 22.0 mm) (ICMD000707), Málaga, Mediterranean Sea, 35°31'7"N, 03°59'18"W, 650 m, coll. 1 May 2016; 1 ovigerous ♀ (30.6 × 23.7 mm) (ICMB000711), Castell de Ferro, Mediterranean Sea, 36°39'19"N, 03°16'47"W, 638 m, coll. 5 May 2016; 1 ♂ (14.9 × 10.5 mm) (ZRC 2019.1637, ex. ICMD000706), Málaga, Mediterranean Sea, 36°31'19"N, 03°59'18"W, 650 m, coll. 1 May 2016; 1 ♀ (16.3 × 12.5 mm) (ZRC 2019.1638, ex. ICMB000705), Málaga, Mediterranean Sea, 36°31'19"N, 03°59'18"W, 650 m, coll. 1 May 2016.

Diagnosis. Carapace pyriform. Pseudorostral spines straight, almost half of carapace length. Supraorbital eave fused with carapace, with blunt preorbital spine; postorbital lobe fused with hepatic spine. Carapace with plates: 1 hepatic spine, 1 small granule above 1 oblong mesogastric plate, 1 protogastric granule, 1 epibranchial plate, 1 oblong cardiac plate, 1 metabranchial granule, 1 lateral branchial spine, 1 blunt posterior spine (Figs 12, 13A). Antennal flagellum shorter than pseudorostral spines, about half of pseudorostral length. Basal antennal article longer than broad, straight outer margin with blunt roundish distal angle of article (Fig. 13B). Buccal frame with distal angle of buccal frame slightly raised with round edge. Pterygostomial region with 3 or 4 granules on outer margins (Fig. 13B). Chelipeds slender, propodus longer than fingers, slightly carinate margin; carpus with granules; merus smooth, triangular in cross-section. Ambulatory legs slender; merus with distal angle blunt; male P2 merus length 1.0–1.4 times carapace length, female P2 merus length 1.0–1.3 times carapace length, male P2 merus length 17.3–20.5 times width, female P2 merus length 14.8–21.5 times width; male P5 merus length 0.4–0.7 times carapace length, female P5 merus length 0.5–0.6 times carapace length, male P5 merus length 7.1–9.5 times width, female P5 merus length 7.9–8.8 times width (Figs 12, 13A, 14F–J). Male thoracic sternum flat, slightly concave; sternites 3, 4 widest. Male pleon with triangular telson and all 6 somites free; somites 2, 3 widest; surface of somites smooth (Fig. 13B). G1 straight, distal part relatively shorter, sharp tip (Fig. 15E–H).

Etymology. The term "*tenuis*", which means thin in Latin, is used for the slender ambulatory legs. The name is used as a noun in apposition.

Remarks. *Scyramathia tenuipes* sp. nov. is superficially similar to *S. carpenteri*, but there are several important differences between the two species. Firstly, all the adult specimens of *S. tenuipes* sp. nov. examined have relatively less distinct plates on the carapace (Figs 12, 13A) (versus adult *S. carpenteri* usually have more prominent plates on the carapace; Figs 3, 4A, 5A, 7A, C, 9A–I). More significantly, it also has distinctly longer and more slender ambulatory legs, with the P2 meri length of all the male specimens longer or subequal in length (1.0–1.4 times) to the carapace length, and the P5 meri length 7.1–9.5 times longer than the width (Figs 12, 13A, 14F–J) (versus *S. carpenteri* has relatively shorter and less slender ambulatory legs, with the P2 meri of all male specimens typically subequal in length (0.7–1.1 times) to the carapace length, and the P5 meri length 4.2–7.3 times the width; Figs 3, 4A, 5A, 14A, B). This character is consistent in all the adult male and female specimens examined. The pterygostomial region of adult *S. tenuipes* sp. nov. has relatively more distinct granules (Fig. 13B) compared

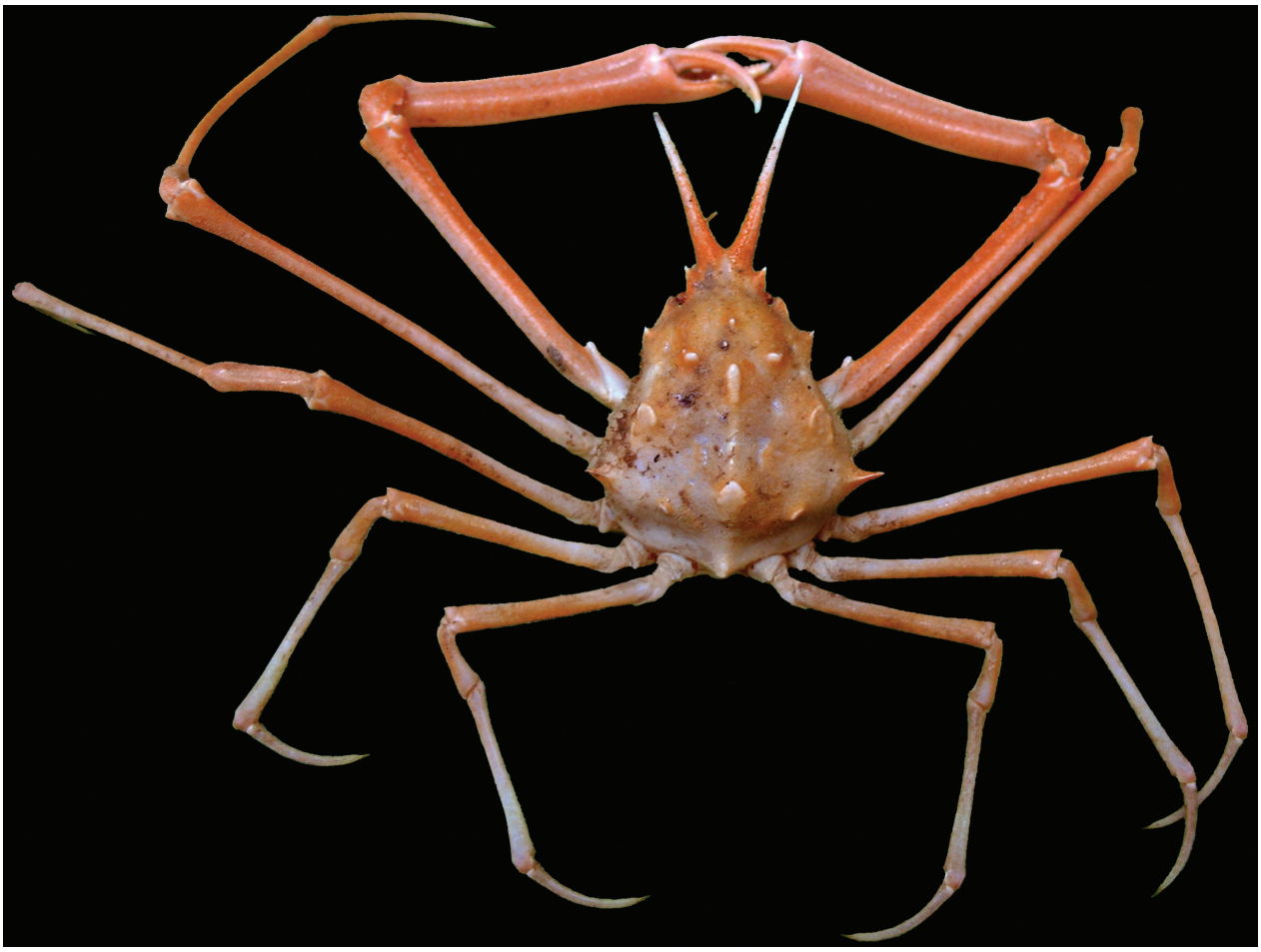

Figure 12. Colour in life of *Scyramathia tenuipes* sp. nov., holotype male (33.9 × 26.3 mm) (ICMD288), Mediterranean Sea (Credits: MacPherson E & Abelló P).

to the more plate-like granules on that of adult *S. carpenteri* (Figs 4B, 5B, 6C, 7B, D); and the distal part of the G1 of *S. tenuipes* sp. nov. is always relatively shorter (Fig. 15E–H) compared to the longer ones of *S. carpenteri* (Fig. 8C–F).

An unpublished genetic study by the first author comparing *S. tenuipes* sp. nov. with *S. carpenteri*, *S. hertwigi*, *S. umbonata* and other *Rochinia* species shows small but consistent differences that indicate we are dealing with a recent but separate species. A total of five genes, three mitochondrial genes: COI, 12S, 16S, and two nuclear genes: 18S and H3, were used for the molecular analysis in this unpublished work. The cytochrome oxidase I (COI) dendrogram for *S. tenuipes* sp. nov. and *S. carpenteri* shows a consistent 0.3% difference between them whereas the differences between the other *Scyramathia* and *Rochinia* species ranged from 1.3–10.9 %. Significantly, the phylogenetic tree from the Maximum Likelihood analysis shows an 87% support for *S. tenuipes* sp. nov. and *S. carpenteri* as separate clades.

The type locality of *S. tenuipes* sp. nov. is an interesting area in the Mediterranean. The Alboran Sea is at the western narrow part of Mediterranean that ends at the Strait of Gibraltar. The complex circulation of the waters through this very narrow strait of approximately 14 km, is known to play a key role in regulating the gene flow for a number of benthic species (Palero et al. 2011). The peculiar hydrographic features of the Strait of Gibraltar were established since the end of the Messinian (upper Miocene) about 5.4 million years ago, after a period of very low sea level of 500,000 years where the strait was dry, and the Mediterrannean Sea was completely closed. Between Spain and Morocco, the very narrow strait has several choke points not deeper than 350 m that seriously affects the water currents. The surface Atlantic waters are entering at speeds varying from 1 to 2 knots, whereas the outflow of the Mediterranean waters nearer the sea bottom flows at a speed of 1.1 to 0.9 knots (Millot 2005). The physical characteristics of these two opposite currents are also very different: the Atlantic surface water has a salinity of 36 g/l while the Mediterranean waters are denser at 38 g/l of salt. As a result of such conditions, the Alboran Sea has more influx from the Altantic Ocean than the rest of the Mediterranean basin (Pascual et al. 2016). These peculiar oceanographical conditions could explain why *S. tenuipes* sp. nov. is most common in the Alboran Sea and not in the rest of Mediterranean or even in the main Atlantic waters adjacent. In the Mediterranean, *S. tenuipes* sp. nov. is known only from the western part of Mediterranean along the coast of Spain (Marco-Herero et al. 2015; Palero pers. comm.). The un-

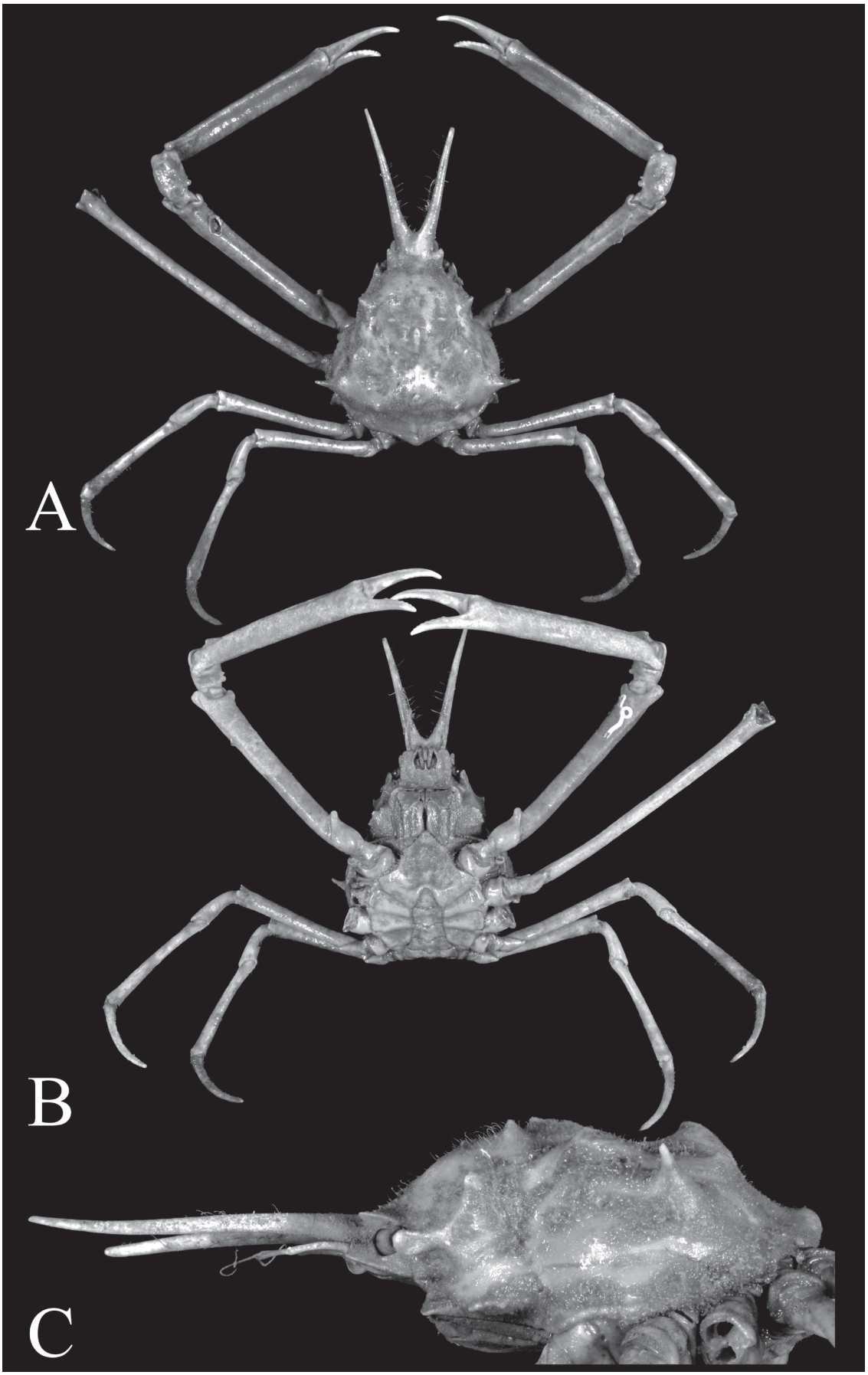

Figure 13. *Scyramathia tenuipes* sp. nov., holotype male (33.9 × 26.3 mm) (ICMD288), Mediterranean Sea. **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

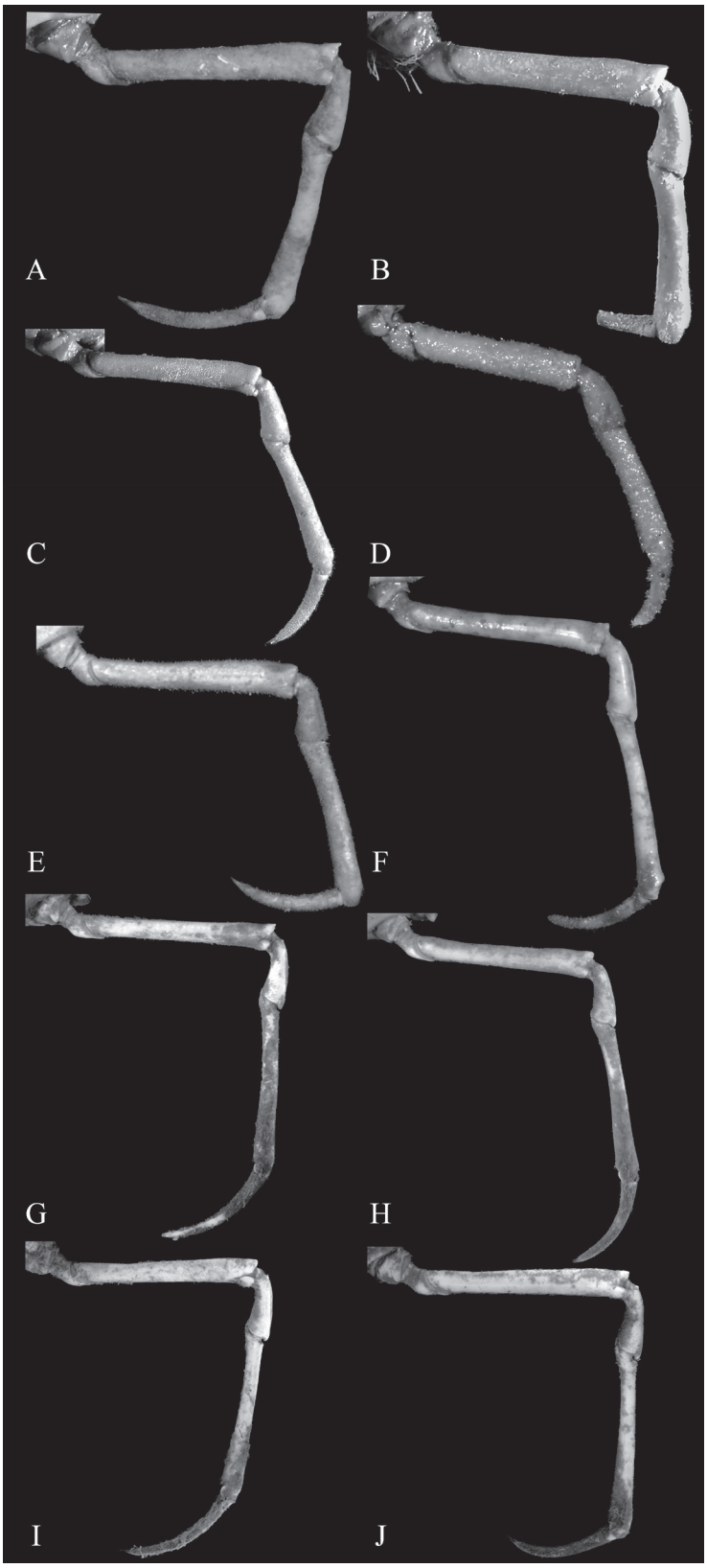

Figure 14. Dorsal view of P5. **A, B.** *Scyramathia carpenteri* (Norman, in Thomson 1873); **A.** male (41.3 × 34.0 mm) (NHM 1983.449), North Sea; **B.** ovigerous female (35.8 × 29.0 mm) (NHM 1978.99), Atlantic Ocean; **C, D.** *S. hertwigi* Doflein, in Chun 1900; **C.** male (34.6 × 27.3 mm) (NHM 1924.7.19.1–3), South Africa; **D.** female (24.5 × 18.4 mm) (SAM-A47872), South Africa; **E,** *S. umbonata* (Stimpson, 1871), female (36.7 × 27.9 mm) (NSMT-Cr7178), off Suriname; **F–J.** *S. tenuipes* sp. nov.; **F.** holotype male (33.9 × 26.3 mm) (ICMD288), Mediterranean Sea; **G.** paratype male (29.7 × 22.0 mm) (ICMD000707), Mediterranean Sea; **H.** paratype male (32.0 × 25.4 mm) (ZRC 2019.1636), Mediterranean Sea,; **I.** paratype ovigerous female (31.2 × 24.6 mm) (ICMD000708), Mediterranean Sea,; **J.** paratype ovigerous female (32.2 × 25.8 mm) (ZRC 2019.1635), Mediterranean Sea.

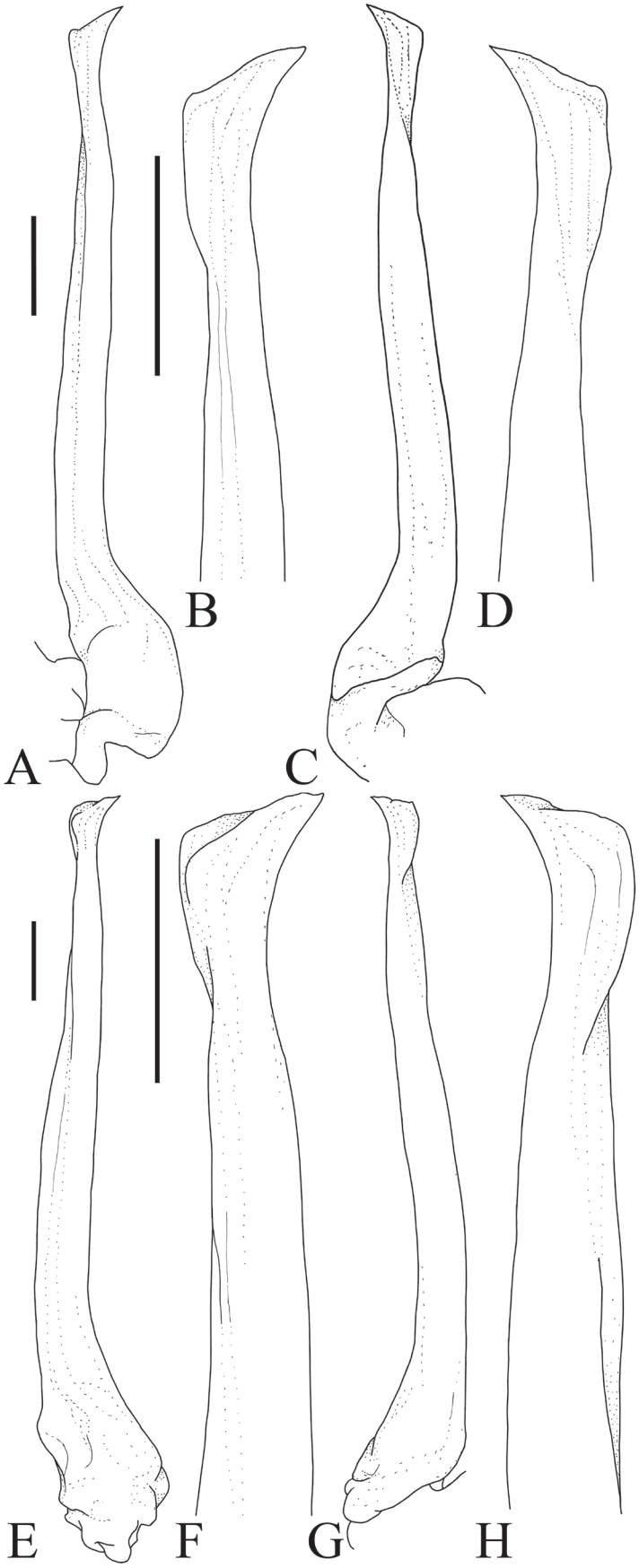

Figure 15. A–D. *Scyramathia hertwigi* Doflein, in Chun 1900, paralectotype male (24.7 × 19.0 mm) (ZMB 13700), Agulhasstrom [= Agulhas current], left G1; **E–H.** *Scyramathia tenuipes* sp. nov., holotype male (33.9 × 26.3 mm) (ICMD288), Mediterranean Sea, left G1. **A, E.** ventral view; **B, F.** ventral view of distal portion; **C, G.** dorsal view; **D, H.** dorsal view of distal portion. Scale bars: 1 mm.

usual oceanographic features in the Alboran Sea are what the species prefers. A study by Tortonese (1964) on the Mediterranean fish fauna have shown that the fish fauna differs in the different regions in the Mediterranean, for example the scorpionfish, *Trachyscorpia cristulata echinata* (Köhler, 1896) (Sebastidae), is found only in the western part of Mediterranean, which is also observed by submersible during the Cyanalboran cruise (Zibrowius pers. comm.). It has also been discussed by d'Udekem d'Acoz (1999) that there are crustacean species that showed variations in morphological differences between the Atlantic and Mediterranean populations with unknown, continuous or absence of intermediate populations in between (see d'Udekem d'Acoz 1999: table 1). These morphological differences due to the geographical distribution are linked to the different physical characteristics of the Atlantic and Mediterranean waters (d'Udekem d'Acoz 1999). However, it is likely that these species might be separate ones, as in this case, which requires more study.

There are various records of *S. tenuipes* sp. nov. as "*S. carpenteri*", and while A. Milne-Edwards and Bouvier (1899, 1900) and Bouvier (1922, 1940) state that *S. carpenteri* was not known from the Mediterranean, d'Udekem d'Acoz (1999) noted that a Mediterranean specimen was figured by Dieuzeide (1955). The figure of the Mediterranean specimen by Dieuzeide (1955: fig. 9), shows an animal with long and slender ambulatory legs, weak plates on carapace, and relatively straight and slightly divergent pseudorostral spines, diagnostic characters of *S. tenuipes* sp. nov. (Figs 12, 13A). Subsequently, Dieuzeide (1960) commented that the species was commonly found among the bamboo coral, *Isidella elongata* (Esper, 1788) (Isididae: Alcyonacea) in the Mediterranean. Some of the specimens of *S. tenuipes* sp. nov. that were examined in this study were found with unidentified deep-sea anemones attached on their carapace.

Distribution. *Scyramathia tenuipes* sp. nov. is known from its type locality, the western Mediterranean Sea, with possible records from Algeria (Dieuzeide 1955), Azores, north of Sao Jorge in Portugal, and Sahara beach (A. Milne-Edwards and Bouvier 1894, 1899, 1900; Bouvier 1940), Morocco (A. Milne-Edwards and Bouvier 1900; Sivertsen and Holthuis 1956; Fransen 1991), and Mauritania (A. Milne-Edwards and Bouvier 1900).

Genus *Anamathia* Smith, 1885

Amathia Roux 1828: 8, 11, 12, pl. 3; H. Milne Edwards 1834a: 285, 286.

Pisa (*Amathia*) De Haan 1839: 78 (key), 84.

Anamathia Smith 1885: 493 (replacement name for *Amathia* Roux, 1828); Miers 1886: 25 (in part); Alcock 1895: 165 (list); Faxon 1895: 8; Bouvier 1940: 345; Ng et al. 2008: 102 (list); Tavares and Santana 2018: 202, 208.

Type species. *Amathia rissoana* Roux, 1828, by monotypy, gender feminine.

Diagnosis. Carapace pyriform with spines. Pseudorostral spines relatively long, straight, stout, cylindrical, slight diverging at approximately 20° angle or less. Supraorbital eave with blunt preorbital angle; weak postorbital lobe small, round anterior margin. Carapace with strong spines; 3 spines medially: metagastric, cardiac, intestinal; strong lateral branchial spines pointed outwards and downwards (Figs 16A, 17A). Antennal flagellum shorter than pseudorostral spines (Fig. 17B). Basal antennal article longer than broad, distal angle blunt, relatively straight outer margin. Distal angle of buccal frame elongated, forming strong blunt angle. Pterygostomial region with granules on outer margin (Fig. 17B). Chelipeds slender, articles with rounded margins; propodus slender, longer than fingers; carpus with spines on outer margin; merus with spine on distal angle, rounded margins. Ambulatory legs slender, articles with rounded margins; merus with blunt distal angle; P2 longest (Figs 16A, 17A). Male thoracic sternum concave anteriorly, constricted between sternites 1, 2 and 3, 4; sternites 3, 4 with lateral margin slightly constricted. Male pleon triangular, telson triangular, margin round; with raised granules on somites 2–5 (Fig. 17B). G1 straight with flattened sharp tip (Fig. 18A–D); G2 with distal tip round (Fig. 18E, F).

Remarks. The genus was first described as *Amathia* by Roux (1828). The name was changed to *Anamathia* by Smith (1885), as the earlier name was preoccupied for a bryozoan (Lamouroux 1812). This genus was synonymised by Rathbun (1925) under *Rochinia* A. Milne-Edwards, 1875, with no detailed explanation. Ng et al. (2008) listed the genus as valid as well but again with no explanation. Tavares and Santana (2018) discussed the matter and considered this genus as valid, listing the morphological differences from *Rochinia* and *Scyramathia*. *Anamathia hystrix* (Stimpson, 1871) was also transferred to this genus by Tavares and Santana (2018) without explanation. Although the external features of this species resemble *A. rissoana*, *R. hystrix* has a strong preorbital spine and a pronounced mesogastric spine in the middle of the carapace; and on the basis of this as well as unpublished genetic data, we are of the opinion that it should not be placed in this genus. As such, *R. hystrix* together with the rest of the Atlantic and East Pacific *Rochinia sensu lato* species will be dealt with separately by Lee et al. (in prep).

Anamathia rissoana (Roux, 1828)

Figs 16A–C, 17A–C, 18A–F

Amathia rissoana Roux, 1828: 2 unnumbered paes, pl. 3 (type locality: Mediterranean).

Amathia Rissoana: H. Milne Edwards 1834a: 286; H. Milne Edwards 1840: pl. 34 bis fig. 2; Heller 1863: 29, 30, pl. 1 figs 4, 5.

Anamathia rissoana: Smith 1885: 493 (list); A. Milne-Edwards and Bouvier 1899: 43, 44, pl. 1 fig. 5; A. Milne-Edwards and Bouvier 1900: 138, pl. 20 fig. 11; Pesta 1918: 348, fig. 112; Bouvier 1922:

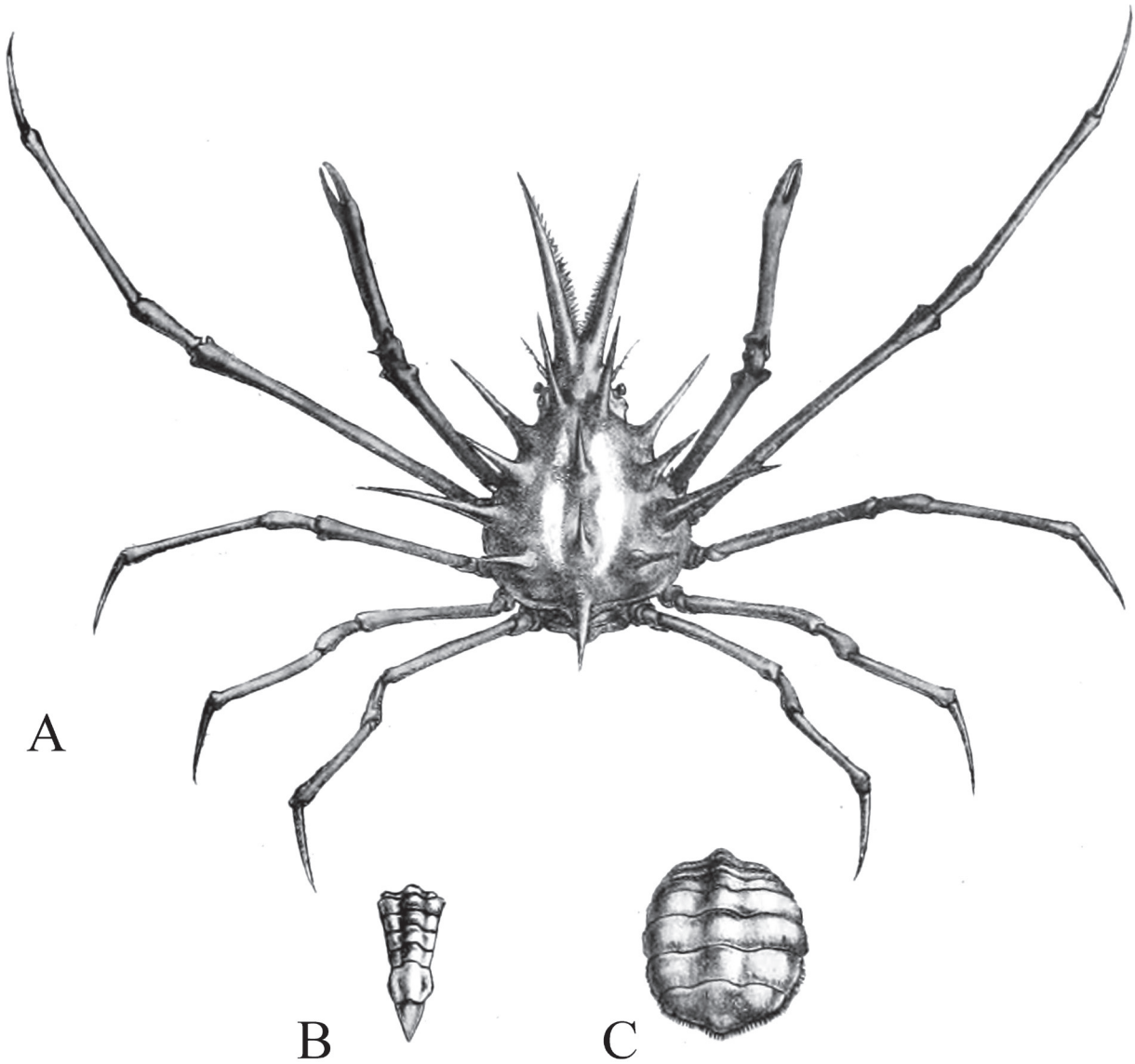

Figure 16. Illustration of *Anamathia rissoana* (Roux, 1828), Mediterranean. **A.** overall dorsal view; **B.** male pleon; **C.** female pleon. (After Roux 1828: pl. 3).

80; Rathbun 1925: 204 (list); Bouvier 1940: 345–347, fig. 210, pl. 14 fig. 4; Kramp 1947: 3, fig. 1; Dieuzeide 1950: 52; Dieuzeide 1955: 20 (list), 57, fig. 10; Holthuis 1962: 242 (list); Vervoort 1966: 383, fig. 6; Zariquiey Álvarez 1968: 465, figs 7c, 153b, 154g, h; Holthuis 1977: 74; Manning and Holthuis 1981: 253 (list), 254; Relini et al. 1986: 145 (table); Guerao and Abelló 1996: 245–250, Figs 1–3; Mura et al. 2005: 110–115, figs 1–8; Ng et al. 2008: 102 (list); Maynou and Cartes 2012: table 1; Araújo et al. 2014: 38 (list); Bo et al. 2015: 14, fig. 4P; Mastrototaro et al. 2016: 244–246, fig. 2A–H; Mastrototaro et al. 2017: 214, 216 (list), 217, 222, figs 5j, k, 6j–n, table 3; Taviani et al. 2017: 65, fig. 6B, table 3; Ceccon and De Angeli 2018: 151, fig. 2.1; Tavares and Santana 2018: 208 (list), figs 3, 12B, 13C, D.

Rochinia rissoana: Garth 1958: 283, 289; Clark 1986: 192, 193 (map); d'Udekem d'Acoz 1999: 194; González-Gordillo et al. 2001: 280 (list); Mura and Corda 2011: 679 (table).

Rochinia (*Anamathia*) *rissoana*: Cartes et al. 2013: 62.

Material examined. North Atlantic Ocean • 1 ♂ (22.9 × 16.1 mm), 1 ♀ (23.5 × 16.5 mm) (SMF 4420), stn 9C-189, 30°5.1'N, 28°38.4'W, 340–305 m, coll. Meteor Expedition, 26 July 1967; 4 ♂♂ (26.2 × 17.5 mm, 24.0 × 15.2 mm, 19.9 × 12.8 mm, 13.1 × 8.2 mm), 4 ovigerous ♀♀ (27.5 × 17.2 mm, 25.1 × 16.2 mm, 23.1 × 14.6 mm, 21.0 × 13.4 mm, 19.8 × 12.5 mm), (SMF 4410), stn 9c-130, 36°41.1'N, 14°14.8'W, 216–225 m, coll. Meteor Expedition, 3 July 1967; 1 ♂ (16.5 × 11.2 mm), 1 ♀ (24.0 × 15.4 mm), 2 juveniles (SMF 5542), stn 19–131, 30°8'N, 28°38.5'W, 269 m, coll. Meteor Expedition, 17 February 1970.

Description. Carapace pyriform, covered with layer of setae, smooth when denuded (Figs 16A, 17A). Supraorbital eave fused with carapace with blunt preorbital angle; postorbital lobe cup-like, small (Fig. 17B).

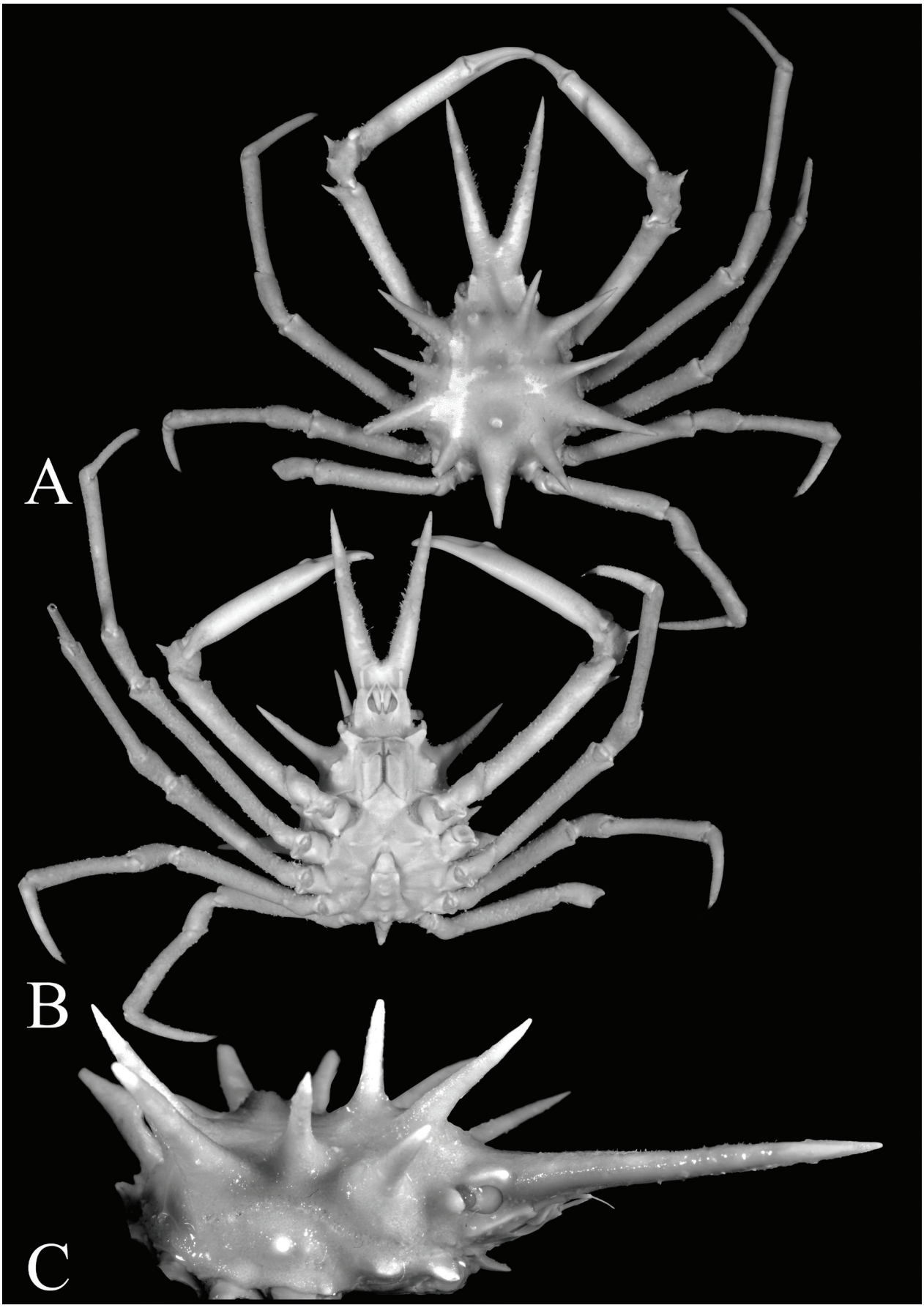

Figure 17. *Anamathia rissoana* (Roux, 1828), male (22.9 × 16.1 mm) (SMF 4420), North Atlantic Ocean. **A.** overall dorsal view; **B.** overall ventral view; **C.** lateral view of carapace.

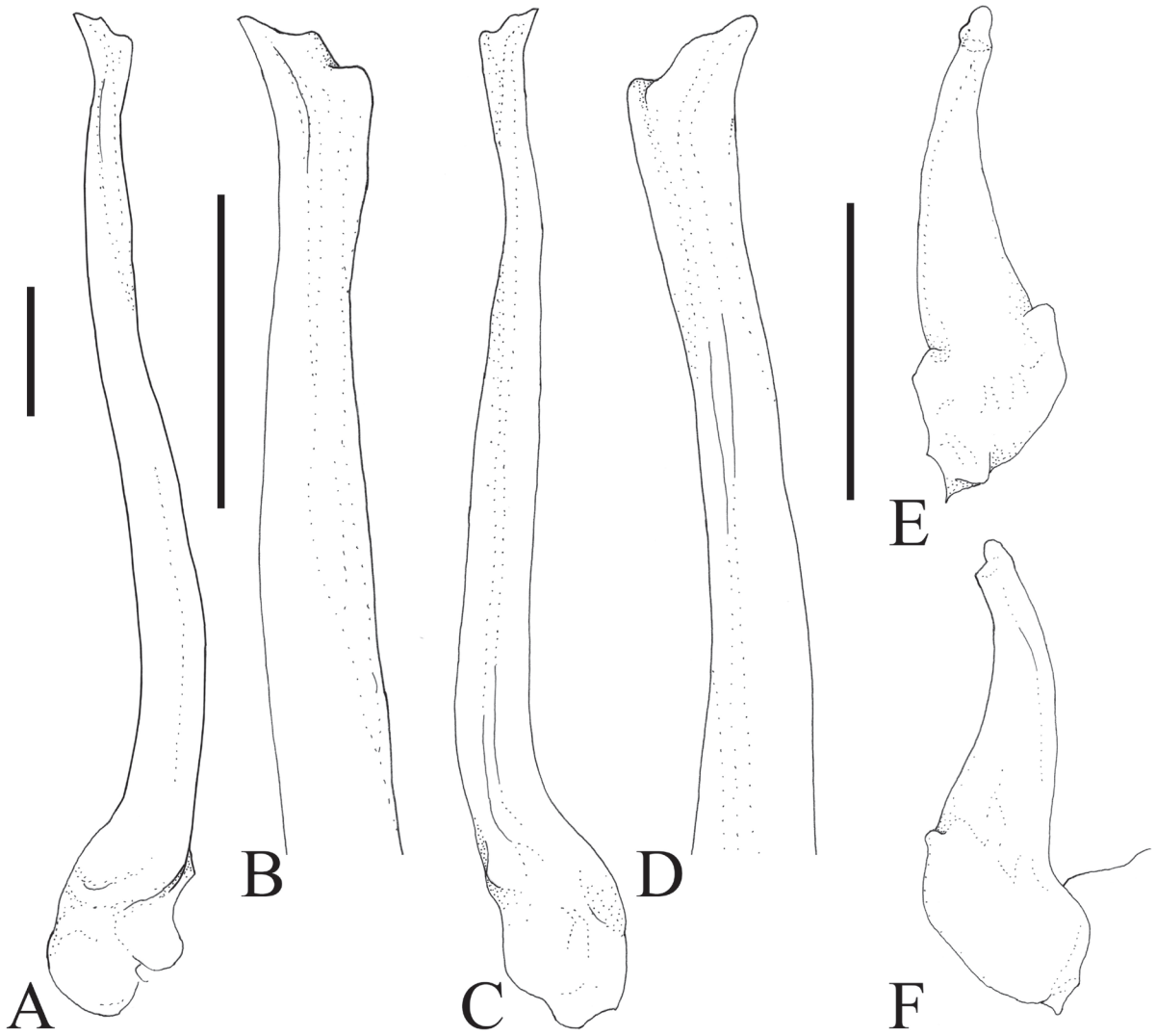

Figure 18. *Anamathia rissoana* (Roux, 1828), male (26.2 × 17.5 mm) (SMF 4410), North Atlantic Ocean, left G1 and G2. **A.** ventral view; **B.** ventral view of distal portion; **C.** dorsal view; **D.** dorsal view of distal portion; **E.** ventral view of G2; **F.** dorsal view of G2. Scale bars: 1 mm.

Carapace with 13 spines: 1 hepatic spine, 1 protogastric spine, 1 metagastric spine, 1 lateral epibranchial spine, 1 lateral branchial spine, 1 cardiac spine, 1 metabranchial spine, 1 strong intestinal spine near posterior of carapace (Figs 16A, 17A).

Antennal flagellum shorter than pseudorostral spines. Basal antennal article longer than broad, narrow; straight outer margin with blunt distal angle. Presence of granule at base of article. Buccal frame covered by third maxilliped, distal angle of buccal frame distinct, highly protruded, forming blunt angle. Pterygostomial region with 2 or 3 granules on outer margin; second granule biggest (Fig. 17B).

Chelipeds slender, palm longer than dactylus; carpus with 2 spines on distal edge; merus with sharp spine on distal angle. Ambulatory legs slender; distal angle of merus blunt; P2 longest (Figs 16A, 17A).

Male thoracic sternum slightly concave, constricted between sternites 1, 2 and 3, 4; sternites 3, 4 widest (Fig. 17B). Male pleon with semi circular telson and 6 somites; somites 2, 3 widest; large granule on middle of second to fifth somites (Fig. 16B, 17B). Adult female with round pleon, with all somites free (Fig. 16C). G1 straight, with flattened, sharp tip (Fig. 18A–D).

Remarks. Roux (1828) described *Amathia rissoana* from the Mediterranean, and it was noted by Roux (1828) that the rare crab is found 20 metres deep amongst "les algues et les focus". Roux (1828) did not indicate the number of specimens that was examined, but he had at least one male and one female which were figured (Roux 1828: pl. 3; reproduced here as Fig. 16A–C). These specimens are therefore syntypes; but the whereabouts of Roux's specimens are not known. His figures, however, are relatively detailed and leave no doubt regarding the species identity.

The morphology of this species is distinct from species of *Rochinia* in having distinct carapace spines (Figs 16A,

17A) (versus smooth carapace in *Rochinia*; Fig. 1A), and buccal frame with highly protruded blunt angle (Fig. 17B) (versus lack of protruded angle on buccal frame in *Rochinia*; Fig. 1B).

There are studies that report the prezoea and first zoea stage morphology for *A. rissoana* (Guerao and Abelló 1996), as well as the size of the species at sexual maturity (Mura et al. 2005). This species has been noted to be associated with bamboo coral, *Isidella elongata* (Esper, 1788) (see Maynou and Cartes 2012; Cartes et al. 2013; Mastrototaro et al. 2017), and black coral, *L. glaberrima* (see Bo et al. 2015), and typically with the hydroid epibiont, *Rosalinda incrustans* (Kramp, 1947), on its carapace (Kramp 1947; Vervoort 1966; Mastrototaro et al. 2016). This species was also recently observed to have *R. incrustans* on its pseudorostral spines and climbing on colonies of *I. elongata* to catch small prey (Mastrototaro et al. 2017: 217, figs 5j, k, 6j–n).

A new fossil species, *Lessiniamathia bolcense* Ceccon & De Angeli, 2018, was recently described (see Ceccon and De Angeli 2018).

Distribution. Madère (= Madeira), Açores (= Azores), Méditerranée (= Mediterranean) (Bouvier 1922), NE Atlantic, SE Atlantic (Azores, Madeira), Mediterranean Spain, Baleares Islands, Italy, and Adriatic (Clark 1986).

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