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ORIGINAL ARTICLE



Kasagia sudhakari, a new species of deep-sea spider crab (Crustacea: Brachyura: Majidae) from the southeastern Arabian Sea

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ABSTRACT

Kasagia sudhakari, a new species of spider crab, is described from two male specimens from southeastern Arabian Sea. This species differs from its only congener *Kasagia arbastoi* Richer de Forges & Ng, 2007, from the Philippines in the shape and form of the carapace, shape of the pseudorostral spines, arrangement of the orbital plates (supraorbital eave separated from the postorbital spine), size of the lateral branchial tubercles, as well as structures of the interantennular spine, hepatic lobe, cheliped, ambulatory merus and male first gonopod.

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Introduction

The majid genus *Kasagia* Richer de Forges & Ng, 2007 was hitherto known to contain only one species, *Kasagia arbastoi* Richer de Forges & Ng, 2007, described from three male specimens from steep reef slopes off the Balicasag Island in the Philippines (Richer de Forges & Ng 2007; Figure 1).

Recent dredging surveys along the continental shelf and slopes off the southwest coast of India by the Fisheries Oceanographic Research Vessel *Sagar Sampada* (FORVSS) obtained two male specimens of *Kasagia*, the first record of the genus from the Indian Ocean (Figure 1). The specimens are morphologically distinct from *K. arbastoi*, differing in the proportions and form of the carapace, armature of the lateral branchial margins as well as the structures of the supraorbital eave, pseudorostral spines, hepatic tooth, interantennular spine, cheliped, ambulatory merus and male first gonopod.

Material and methods

The sampling site is located on the continental shelf south of Cape Comorin, India (Figure 1). The seafloor at the site was hard-bottom substrate. Samples were taken with a Naturalist's dredge as a part of an extensive dredging survey along the entire southeastern Arabian Sea on-board the FORVSS cruise number 340.

A single dredging operation carried out on 30 May 2015 at station 34027 (7.44°N, 77.60°E; 109 m depth) yielded the two specimens used in this study. The samples were stored in transparent plastic vials with screw caps and preserved using 70% ethanol. Subsequently, these were deposited in the Referral Centre collection of the Centre for Marine Living Resources and Ecology, Kochi, Kerala, India.

Recently, the first author identified this material as a distinct species belonging to the rare majid genus *Kasagia*. The above observation was substantiated by the third author during his visit to the CMLRE, and subsequent comparison with the type species, *K. arbastoi*.

The specimens were cleaned with a light toothbrush to remove debris, examined and photographed with a Nikon stereozoom microscope (SMZ-25) equipped with a DS-Fi3 microscope camera and NIS-Elements imaging software. Line art illustrations were based on the stereozoom photographs and drawn in Adobe® Photoshop CS5. Measurements of the carapace and the appendages were made with a vernier calliper and those of the gonopods were made with the imaging software.

The terminology used follows Richer de Forges & Ng (2007). The measurements included (in millimetres) are for the maximum carapace length and width, respectively. The following abbreviations are used: CL = carapace length [including spines]; CMLRE = Centre for

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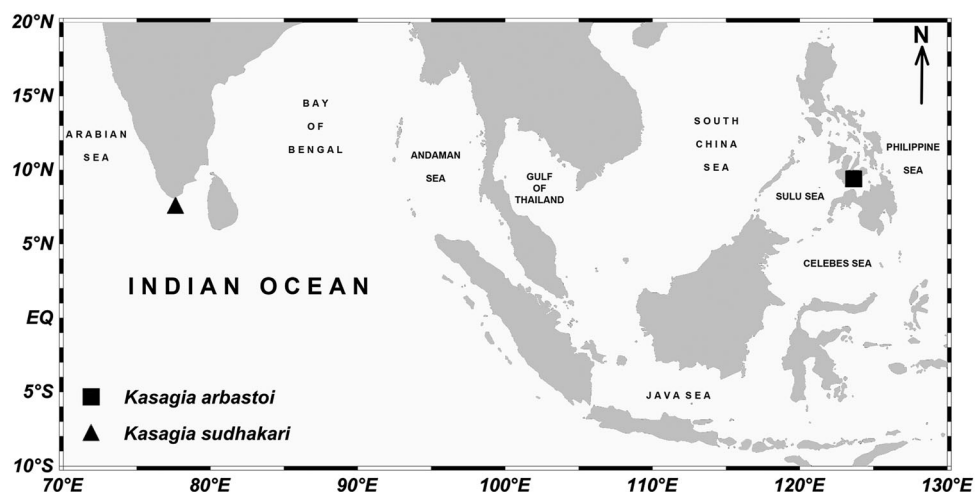


Figure 1. Geographical distribution of the genus *Kasagia* Richer de Forges & Ng, 2007.

Marine Living Resources and Ecology; CW = carapace width [including spines]; G1 = male first gonopod; G2 = male second gonopod; IO/SS/BRC = Indian Ocean/Sagar Sampada/Brachyura; P2–P5 = pereopods 2–5 (first to fourth ambulatory legs), respectively. The material examined is deposited in the Referral Centre collection of the Centre for Marine Living Resources and Ecology (IO/SS/BRC), Kochi, Kerala, India; and the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum of the National University of Singapore. The type specimens are preserved in 70% ethanol.

Comparative material examined

Kasagia arbastoi Richer de Forges & Ng, 2007: paratype (ZRC 2013.0176, 12.6 mm, male, Balicasag Island, Panglao, Bohol, Philippines, 200–300 m, coll. fishermen, tangle nets, June 2002).

Taxonomy

Family Majidae Samouelle, 1819

Genus *Kasagia* Richer de Forges & Ng, 2007

Kasagia Richer de Forges & Ng, 2007: 59. Type species: *Kasagia arbastoi* Richer de Forges & Ng, 2007.

***Kasagia sudhakari* sp. nov.**

(Figures 2–4)

Material examined

Holotype. IO/SS/BRC/00068, 10.8 mm CL, 7.3 mm CW, male, Arabian Sea, off Cape Comorin, India, 7.44°N, 77.60°E, 109 m, Naturalist's dredge, coll. FORVSS station 34027 (K.U. Abdul Jaleel), 30 May 2015.

Paratype. IO/SS/BRC/00069, 10.8 mm CL, 7.4 mm CW, male, same collection data as holotype.

Diagnosis

Carapace with posterior part distinctly wider, branchial region distinctly swollen; supraorbital eave not overlapping postorbital spine; hepatic tooth slightly conical, its anterior margin gently concave, posterior margin convex; lateral branchial margins with longer, prominent tubercles and spines; interantennular spine triangular. Cheliped length slightly more than two times postrostral CL, propodus dorsal margin with 5 blunt spinules. Ventral margin of ambulatory merus lined with many sharp granules. G1 slender, distal tip slender, margin folded with disto-lateral opening appearing in sternal view.

Description (based on holotype male)

Carapace ovoid (CL/CW = 1.48); regions defined, with convexities and shallow grooves, covered by rounded, squamiform granules, those on branchial regions higher with slightly boletate tips (Figure 2A and B). Pseudorostral spines relatively short (0.15 times CL), directed slightly downwards, gently diverging, oval in cross-section, surface granular, margins with small granules (Figure 2B). Eyes relatively short, not exceeding length of postorbital spine, with short peduncle, totally retracted inside commencing orbits (Figure 2C). Orbits comprised of concave supraorbital eave (separated from the base of pseudorostral spine by fissure), setose flattened postorbital spine (separated from supraorbital eave by very narrow hiatus, not overlapping), suborbital tooth and lateral extension

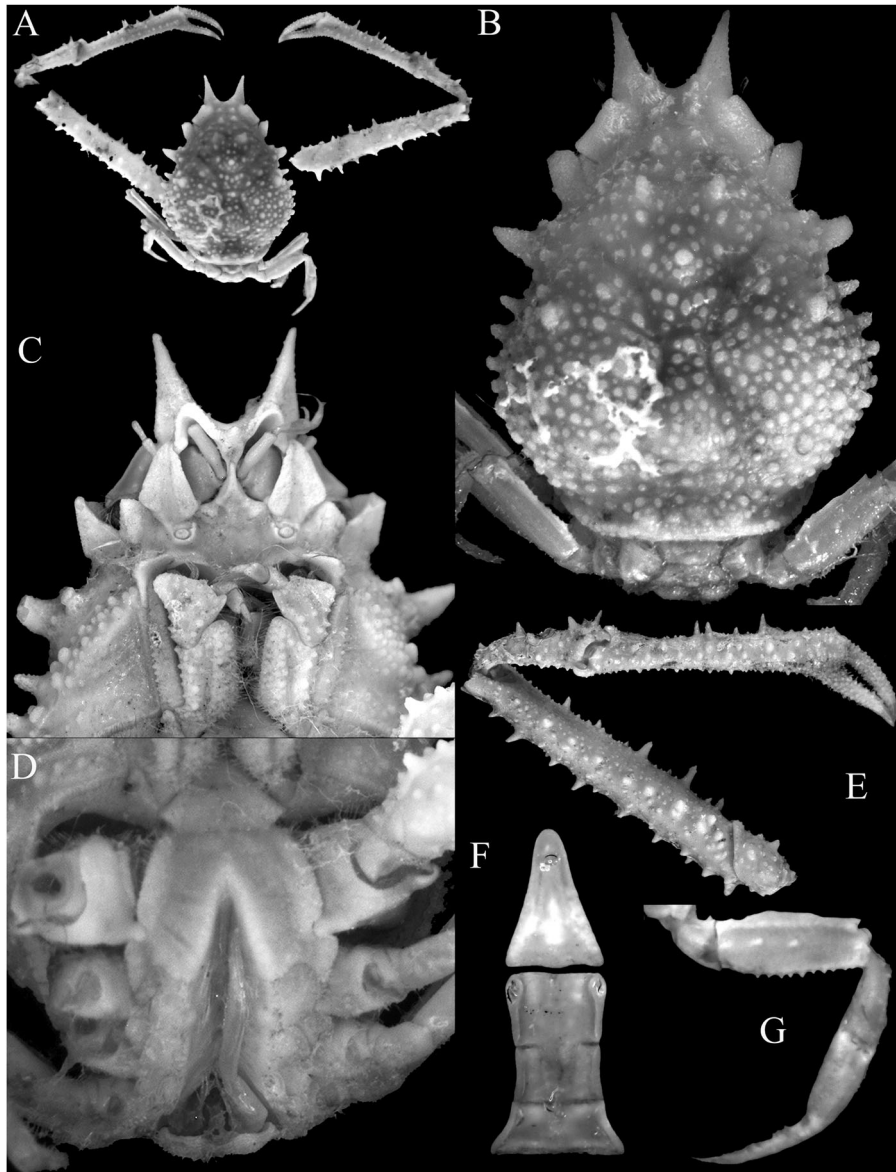


Figure 2. *Kasagia sudhakari*, new species, holotype male (10.8 × 7.3 mm) (IO/SS/BRC/00068), Arabian Sea. (A) Overall dorsal view; (B) dorsal view of carapace; (C) epistome, antennules, antennae, buccal cavity and third maxillipeds; (D) anterior thoracic sternum and sternopleonal cavity; (E) right cheliped (ventral view); (F) pleonal somites 4–6 and telson; (G) right P5 (ventral margins of merus, carpus and propodus denuded).

of fused basal antennal article (Figure 2B and C). Hepatic margin with large granular, dorsoventrally flattened triangular tooth, anterior margin gently concave, posterior margin convex, separated from postorbital spine by wide gap (Figure 2B and C). Gastric and branchial regions slightly inflated. Gastric region with well-spaced granules and 3 pairs of blunt spinules, posterior-most pair largest, behind level of postorbital spine which is largest (Figure 2A and B), posterior gastric region with blunt median spinule. Branchial region distinctly swollen, with well-spaced smaller granules anteriorly, granules more closely spaced on posterior part; lateral margins with longer

granular tubercles, progressively smaller posteriorly (Figure 2B). Cardiac region slightly elevated, covered with moderately-sized granules (Figure 2B). Subhepatic and pterygostomial regions granular (Figure 2C). Antennular fossae ovoid, crested rim granular, marked with blunt interantennular spine; antennules folding longitudinally (Figure 2C). Basal antennal article triangular, with longitudinal groove, base extending laterally to form floor of orbit; first antennal article equidistant between basal antennal article and epistome; flagellum short (Figure 2C). Epistome broad, posterior margin elevated, divided into four plates (Figure 2C). Buccal cavern sub-quadrangular,

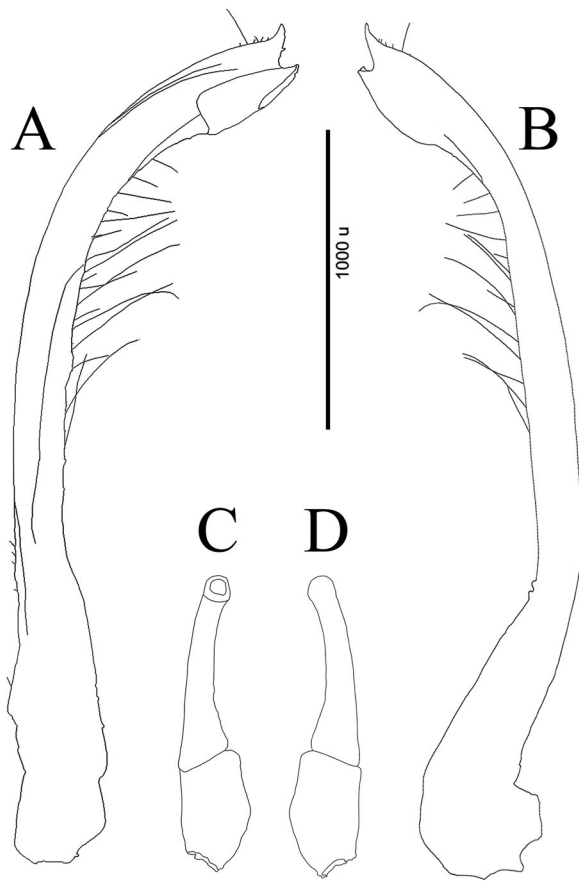


Figure 3. *Kasagia sudhakari*, new species, holotype male (10.8 × 7.3 mm) (IO/SS/BRC/00068), Arabian Sea. (A) G1 sternal view; (B) G1 pleonal view; (C) G2 sternal view; (D) G2 pleonal view.

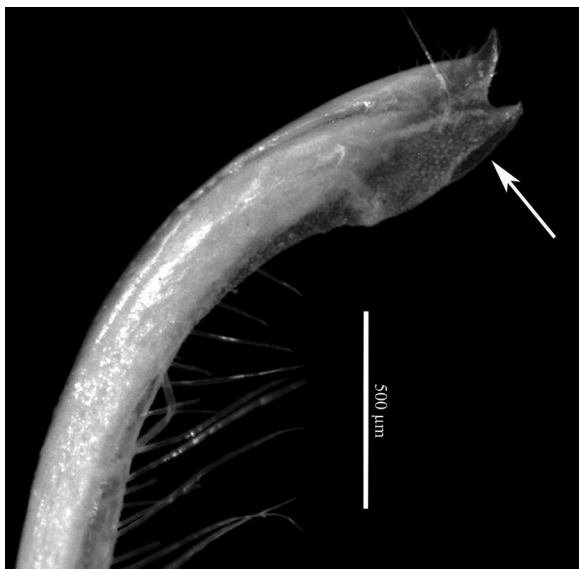


Figure 4. *Kasagia sudhakari*, new species, holotype male (10.8 × 7.3 mm) (IO/SS/BRC/00068), Arabian Sea. Distal part of G1, sternal view.

wider anteriorly, anterolateral angle distinctly elevated (Figure 2C). Third maxilliped covered by large squamiform granules, densely setose; ischium sub-rectangular, setose, with deep submedian longitudinal sulcus; merus triangular, 0.80 times as long as ischium, anteroexternal angle prominently auriculiform (Figure 2C).

Chelipeds long, about 2.14 times postrostral CL (Figure 2A and E); basis-ischium margins with strong tubercles; merus cylindrical, stout, granulated, longer than other articles, with a row each of blunt spines on anterior, dorsal and posterior margins; carpus short, granulated, narrow proximally, enlarged distally, with blunt spines on dorsal and posterior margins; propodus long, dorsal margin with 5 blunt spines, inner margin with one row of large interspaced granules; dactylus short (0.36 times propodus length), curved, sharp, finely tuberculated on internal margin; fingers densely granular, slightly bent from horizontal, tips of sharp fingers crossing when closed, occlusal surfaces with small teeth (Figure 2E).

Ambulatory legs (P2–P5) shorter than chelipeds, P3 missing, P2, P4 and P5 about 0.98, 0.83 and 0.76 times postrostral CL, respectively; merus triangular in cross-section, dorsal margin of merus almost glabrous, uneven, distinctly carinate, with distinct sharp subdistal dorsal tooth, ventral margin distinctly setose, armature of ventral margin (inner row + outer row + outer surface) as follows: P2 = 5 + 9 + 0, P3 = 5 + 12 + 0, P4 = 4 + 8 + 0, P5 = 1 + 10 + 2; dorsal margin of carpus with three tubercles, setose; P3–P5 propodi and dactyli setose, unarmed (Figure 2A and G).

Thoracic sternum longitudinally elongate, transversely narrow; sternites 1 and 2 fused to form triangular plate, separated from sternite 3 by shallow suture; sternites 3 and 4 fused, separated by shallow median depression, no clear suture, median surface smooth; sternopleonal cavity narrow, reaching almost to upper edge of coxae of chelipeds; margins of sternites 4–7 granular (Figure 2D).

Male pleon elongate (0.55 times postrostral CL), with 6 free somites and telson, surface covered with short setae; somite 1 narrow distally; telson relatively long, subequal to combined lengths of somites 5 and 6, tip pointed, lateral margin distinctly concave for distal two-thirds length, convex proximally (Figure 2F).

G1 simple, slender, distal portion curving dorso-mesially in pleonal view, apical portion dilated, appearing distinctly bifid, distal tip slender, margin folded (appears in sternal view), with lateral opening (Figures 3A, B and 4). G2 bisegmented, distal segment tubular, curved gently, wider proximally, distal aperture rounded (Figure 3C and D).

Variation

In the paratype male (CL/CW = 1.47) which is slightly larger than the holotype, the ridges and spines on the carapace and the meral crests on the pereopods are relatively more eroded; and the number of granules on the legs is different as follows: P2 carpus with 2 rows of 5 granules on dorsal margin, P2 propodus with 4 granules on dorsal margin, P3 with 8 granules on outer ventral margin. The two specimens are otherwise similar in all other characters.

Distribution

Arabian Sea, off Cape Comorin, India (7.44°N, 77.60°E).

Etymology

The specific epithet *sudhakari* honours the distinguished marine scientist and current CMLRE Director, Dr. M. Sudhakar.

Remarks

Kasagia sudhakari, new species, differs from *K. arbastoi* in the following characters: the carapace is proportionately broader, with the posterior part distinctly wider (Figure 2A and B) (versus carapace transversely narrower and more slender in *K. arbastoi*; Figure 5A and B); the branchial region is distinctly swollen (versus slightly convex in *K. arbastoi*; Figure 5A and B); the supraorbital eave does not overlap the postorbital spine at all (Figure 2B) (versus proximal part of supraorbital eave covers part of the distal portion of the postorbital spine in *K. arbastoi*; Figure 5B and E); the rostral spines are more divergent (versus only slightly in *K. arbastoi*; Figure 5B); the hepatic tooth is slightly conical in shape with the anterior margin gently concave and the posterior margin convex (Figure 2A and B) (versus the hepatic tooth is more dorsoventrally flattened with both margins gently convex in *K. arbastoi*; Figure 5B and E); the tubercles and spines on the lateral branchial margins are proportionately longer and more prominent (Figure 2B) (versus with only short lateral branchial tubercles in *K. arbastoi*; Figure 5B); the interantennular spine is more triangular (Figure 2C) (versus interantennular spine more compressed and relatively wider in *K. arbastoi*; Figure 5C); the chelipeds are proportionately shorter (2.14 times postrostral CL), with the propodus dorsal margin possessing 5 blunt spinules (Figure 2A and E) (versus chelipeds proportionally longer (over 3 times CL), the propodus dorsal margin with 10 blunt spinules in

K. arbastoi; Figure 5A and G); the ventral margin of the ambulatory merus is lined with many sharp granules (Figure 2G) (versus margin has only a few low granules in *K. arbastoi*; Figure 5H); and the more slender G1 with the tip slender and the margin folded with the disto-lateral opening appearing in sternal view (Figures 3A, B and 4) (versus G1 relatively thicker, and the tip wider in *K. arbastoi*; cf. Richer de Forges & Ng, 2007: Figure 5B and C).

Discussion

Kasagia is morphologically most similar to *Eurynome* Leach, 1814, *Choniognathus* Rathbun, 1932 and *Seiitaoides* Griffin & Tranter, 1986 (Richer de Forges & Ng 2007). *Eurynome* was characterized by small-sized pyriform carapace, covered dorsally with boletate tubercles or plate-like granules, long slender chelipeds with fingers strongly bent, and ambulatory legs with crests or tubercles on dorsal margins (see Griffin 1964; Griffin and Tranter 1986); and Richer de Forges & Ng (2007) separated *Kasagia* by a combination of carapace, cheliped, male thoracic sternal and G1 characters.

Kasagia is a rare majid genus hitherto known only from the Philippines (Richer de Forges & Ng 2007). The present discovery is a substantial extension of the range of the genus and the first record from the Indian Ocean (Figure 1). The type locality of *K. sudhakari*, new species, was obtained from a region off Kanyakumari which is a wide continental shelf (Alcock 1902), extending approximately 65 nautical miles up to the southernmost tip of the shelf, from depths of around 100 m in substrates which are hard and rocky. In comparison, *K. arbastoi* is a relatively deeper water inhabitant (200–300 m) of the steep slopes of Balicasag Island in the Central Philippines (Richer de Forges & Ng 2007). Both species share one ecological attribute – they occur in hard bottom ecosystems, which are typically hard to survey using conventional sampling methods (Ng et al. 2009; Mendoza et al. 2010). This may account for their apparent rarity. The genus is almost certainly more widely distributed in the Indo-West Pacific once the proper surveys are done.

A perusal through the list of the *RIMS Investigator* stations published by Huys et al. (2014) (see also Biological collections of the R.I.M.S. ... c1914) revealed that out of the six stations surveyed by this ship in the continental shelf and slope region south of Cape Comorin, only one station (number 257) was located in the upper part of the continental slope (262 m depth), whereas five other stations (numbers 128, 268, 335, 336 and 388) were located at depths between 1000 m and 1700 m depth contours. This

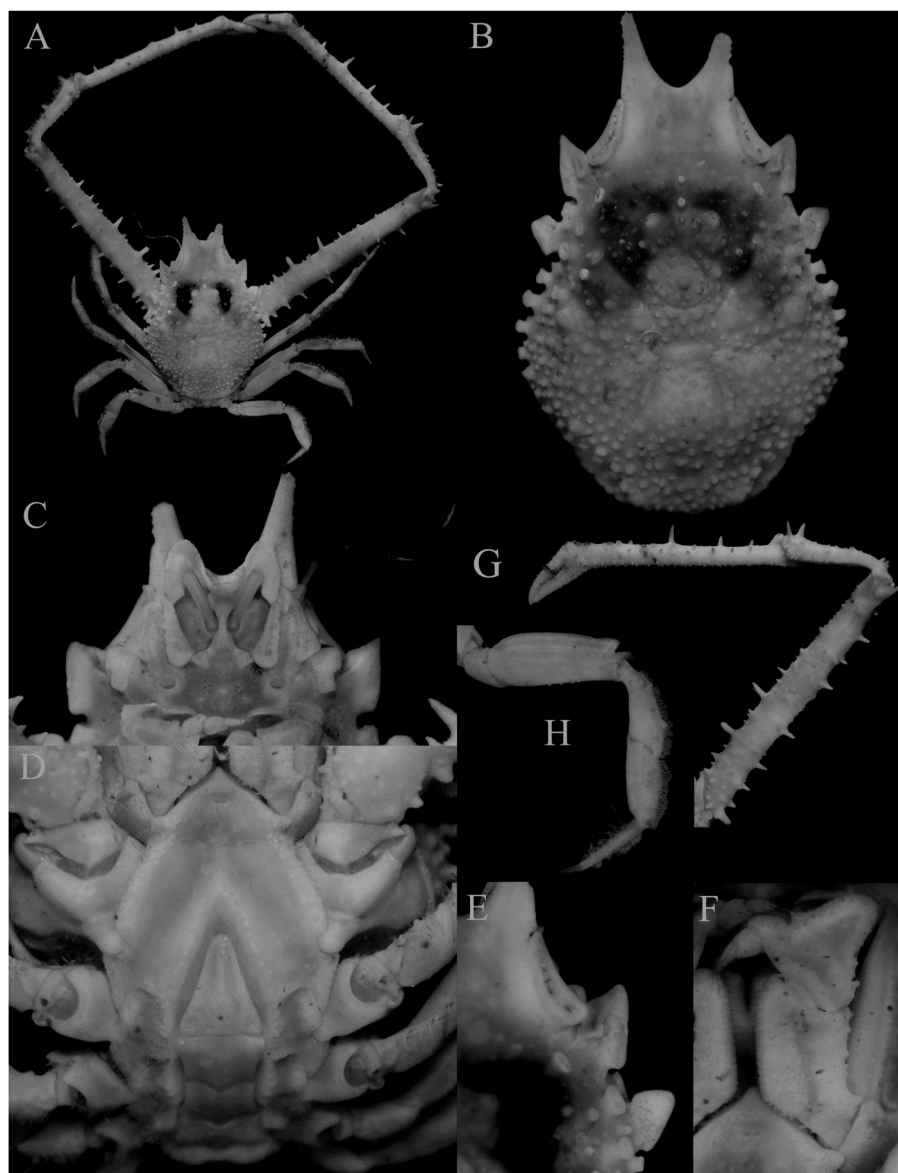


Figure 5. *Kasagia arbastoi* Richer de Forges & Ng, 2007, paratype male (12.6 × 9.2 mm) (ZRC 2013.0176), Philippines. (A) Overall dorsal view; (B) dorsal view of carapace; (C) epistome, antennules and antennae; (D) anterior thoracic sternum and pleon; (E) right supraorbital and preorbital margins, intercalated and hepatic teeth; (F) left third maxilliped; (G) right cheliped (dorsal view); (H) right P5 (ventral margins of merus, carpus and propodus denuded).

indicates that there is dearth of published literature pertaining to the brachyuran crabs from the shallower part of the shelf region, and dedicated faunistic surveys in the future, especially on hard bottoms, would almost certainly discover rare and new species.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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References

- Alcock A. 1902. A Naturalist in Indian Seas, or, four years with the Royal Indian Marine Survey Ship 'Investigator'. London: John Murray. 328 pages. doi:10.5962/bhl.title.97237.
- Biological collections of the R.I.M.S. 'Investigator.' List of stations. 1884–1913. 1914. Calcutta: Trustees of the Indian Museum, Baptist Mission Press. ii + 35 pages.
- Griffin DJG, Tranter HA. 1986. The Decapoda Brachyura of the Siboga expedition. Part VIII: Majidae. Siboga Expéditie. 39 (C4):1–335. 22 plates. Available from <https://decapoda.nhm.org/pdfs/11026/11026-002.pdf>.
- Griffin DJG. 1964. A review of the genus *Eurynome* Leach (Decapoda, Majidae) and a new species from New Zealand. Crustaceana. 6:195–206. doi:10.1163/156854064X00597.
- Huys R, Low MEY, de Grave S, Ng PKL, Clark PF. 2014. On two reports associated with James Wood-Mason and Alfred William Alcock published by the Indian Museum and the Indian Marine Survey between 1890 and 1891: implications for malacostracan nomenclature. Zootaxa. 3757(1):1–78. doi:10.11646/zootaxa.3757.1.1.
- Mendoza JCE, Naruse T, Tan S-H, Chan T-Y, Richer De Forges B, Ng PKL. 2010. Case studies on decapod crustaceans from the Philippines reveal deep, steep underwater slopes as prime habitats for 'rare' species. Biological Conservation. 19:575–586. doi:10.1007/s10531-009-9744-x.
- Ng PKL, Mendoza JCE, Manuel-Santos M. 2009. Tangle net fishing, an indigenous method used in Balicasag Island, central Philippines. Raffles Bulletin of Zoology (Suppl. 20):39–46. Available from <https://lkc.nhm.nus.edu.sg/app/uploads/2017/06/s20rbz039-046.pdf>.
- Richer De Forges B, Ng PKL. 2007. On a new genus and new species of deep-water spider crab from the Philippines (Crustacea, Decapoda, Brachyura, Majidae). Zootaxa. 1644:59–68. doi:10.11646/zootaxa.1644.1.3.