



A new genus of palaemonid shrimp (Crustacea: Decapoda: Palaemonidae) to accommodate *Leander belindae* Kemp, 1925, with a redescription of the species*

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Abstract

A redescription of the little known shrimp *Leander belindae* Kemp, 1925 based on syntypal material as well as some previously unreported museum specimens is provided. In view of its aberrant morphology, a new genus, *Rhopalaemon* gen. nov., is erected. The new genus is most similar to *Palaemon* Weber, 1795, but can be easily distinguished from that genus, and all other palaemonine genera, by the following combination of characters: propodus of the ambulatory pereopods distally expanded; branchiostegal tooth and groove present; basal crest on rostrum absent; appendix interna on the first pleopod of males absent; and mandibular palp present.

Key words: Crustacea, Decapoda, Palaemonidae, *Rhopalaemon*, new genus

Introduction

Leander belindae Kemp, 1925 was described on the basis of 75 specimens taken from rock pools at Kilakarai in the Gulf of Mannar and a further specimen taken from Cape Comorin. Additional collections of this species have been reported only twice since its description (Kurien 1954, eleven specimens from Kanyakumari, Tamil Nadu; Ravindranath 1979, nine specimens from Visakhapatnam, Andhra Pradesh) and, to the authors' knowledge, the species has only been mentioned in the literature (mostly as *Palaemon belindae*) six times following its description (Holthuis 1950; Kurien 1954; Dutt & Ravindranath 1974; Ravindranath 1979; Pereira 1997; Jayachandran 2001). Holthuis (1950) transferred the species to the genus *Palaemon* Weber, 1795 and most subsequent authors have accepted this generic placement. With the exception of Jayachandran's (2001) verbatim reproduction of Kemp's description, and short diagnoses provided by Kurien (1954) and Ravindranath (1979), the aforementioned references just cite the species name without providing further details and no further descriptive information is available for the species. Syntypes belonging to *L. belindae* present in the collections of the Natural History Museum (London) and the Rijksmuseum van Natuurlijke Historie, Leiden (= Nationaal Natuurhistorisch Museum, Naturalis) as well as some previously unreported specimens held in the Museum National d'Histoire Naturelle, Paris provide the opportunity to redescribe the species. A re-examination of these specimens has revealed that the species cannot be satisfactorily be included in either *Leander* Desmarest, 1849 or *Palaemon* as they are presently defined, nor any of the other Palaemoninae genera, and therefore a new genus is erected here to accommodate the species.

The following abbreviations are used in the text: pocl (post-orbital carapace length), ov. (ovigerous), RMNH (Rijksmuseum van Natuurlijke Historie = Nationaal Natuurhistorisch Museum, Naturalis, Leiden), NHM (Natural History Museum, London), MNHN (Museum National d'Histoire Naturelle, Paris).

Systematics

Palaemonidae Rafinesque, 1815

Palaemoninae Rafinesque, 1815

Rhopalaemon gen. nov.

Type species. *Leander belindae* Kemp, 1925.

Diagnosis. Body subcylindrical, slightly compressed laterally. Rostrum laterally compressed, shorter than carapace, stout, without basal crest, with strong lateral ridge, with dorsal and ventral unarticulated teeth, single row of plumose setae present between the teeth. Carapace glabrous with antennal and branchiostegal teeth, branchiostegal groove arising dorsally to branchiostegal tooth. Branchiostegal tooth sub-marginal. Eyes pigmented, banded, with ocellus. Fourth thoracic sternite with well developed median process; eighth thoracic sternite of males with well developed process, that of females with small blunt tubercle. Well developed pre-anal tooth present. Mandible with palp, third maxilliped lacking subdistal spine on antepenultimate segment, other mouthparts as for *Palaemon*. Pereiopod 2 stout, being only slightly longer than ambulatory pereiopods. Pereiopods 3–5 with propodus distally expanded bearing 3–5 strong spines distally; distal most spines paired; dactyli simple, strongly curved. Grooming brush on pereiopod 5 reduced to a single poorly defined row hidden amongst the stout spines. Pleopod 1 of male without marginal appendix, with inner medial spines. Pleopods 2–5 with appendix interna in both sexes, pleopod 2 of male also with appendix masculina. Upper flagellum of antennula biramous, with rami fused for one quarter of their length. Antennular peduncle comprised of three articles, with well developed stylocerite, ventromedial tooth and anterodistal tooth present; statocyst present. Béc ocellaire well developed with strong median process. Fifth abdominal pleuron rounded posteroventrally. Telson with 2 pairs of dorsal spines situated dorsomedially; acute posteromedian process, 2 pairs of spines on posterior margin, outer pair much shorter than inner pair; 1 pair of very stout plumose setae, longer than inner pair of spines. Mobile medial spine of exopod of uropod slightly exceeding fixed tooth.

Gill formula as follows: 5 pleurobranchs (P1–5), 2 arthrobranchs (1 reduced, both Mxp3), 1 podobranch (Mxp2), 3 epipods (Mxp1–3), 3 exopods (Mxp1–3).

Derivation of name. The name is a combination of the Latin *rhopalon* meaning club like and the generic name *Palaemon* in reference to the club-like shape of the propodi of the ambulatory pereiopods; gender masculine.

Remarks. The subfamily Palaemoninae currently contains 18 genera, with a further two described elsewhere in this issue (Wowor & Ng this issue). Many of the generic diagnoses within this subfamily depend heavily on the presence and absence of a “hepatic” versus “branchiostegal” tooth. However, as pointed out by Walker & Poore (2003) these two teeth are in fact homologous structures, with the “hepatic” tooth merely being a branchiostegal tooth which has migrated further up the carapace during ontogeny. Notwithstanding this, the actual position of the tooth can continue to be used in differentiating genera.

The branchiostegal position of the tooth in the new genus, clearly differentiates it from *Brachycarpus* Bate, *Macrobrachium* Bate, *Neopalaemon* Hobbs and *Pseudopalaemon* Sollaud (in which the tooth is in a hepatic position), as well as from *Troglocubanus* Holthuis, *Troglomexicanus* Villalobos, Alvarez & Iliffe, *Troglindicus* Sankolli & Shenoy, *Leptocarpus* Holthuis and *Cryphiops* Dana (all these genera lack a branchiostegal tooth). *Rhopalaemon* gen. nov. can be differentiated from both *Exopalaemon* and *Nematopalaemon*, as it lacks the dorsal, rostral crest, characteristic of both these genera. The presence of a distinct branchiostegal groove further separates the new genus from *Leandrites* Holthuis, *Creaseria* Holthuis, *Urocaridella* Borradaile and *Leander* Desmarest, in which such a groove is lacking.

Rhopalaemon gen. nov., appears closely related to a rather heterogeneous assemblage comprised of *Coutierella* Sollaud, *Palaemonetes* Heller and *Palaemon* Weber. The relationships between these genera (and their constituent species) are poorly understood at present. *Coutierella* differs considerably from the other genera in the structure of its mouthparts. The laciniae of the maxillula are broad, the lower one being twisted,

whilst the basal endite of the maxilla bears a fringe of very long setae; these and other differences clearly indicate an adaptation to a specific food source (see Bruce 1989). In contrast, the mouthparts are rather conservative in *Palaemon*, *Palaemonetes* as well as *Rhopalaemon* gen. nov. Although *Palaemonetes*, as currently defined, lacks a mandibular palp (vs. present in *Rhopalaemon* gen. nov.), the validity of this character has been questioned (Fujino & Miyake 1968; Chace 1972).

Rhopalaemon gen. nov. primarily differs from both *Palaemon* and *Palaemonetes* in the conspicuous development of the distal part of the propodi of the ambulatory pereopods, these being ventrally expanded (vs. not-developed); furnished with a concentrated row of stout spines (vs. dispersed along the medial margin); as well as the very reduced grooming brush on the fifth pereopod (vs. comprised of at least two, distinct rows of serrulate setae). The development of the distal part of the propodi is reminiscent of those encountered in the unrelated genera *Rapipontonia* Marin (Pontoniinae), *Chlorocurtis* Kemp (Pandalidae), as well as in some species of *Thor* Kingsley and *Hippolyte* Leach. Although the precise function of this structure remains unclear, Marin (2007) suggested a grasping function to hold onto hydroids for *Rapipontonia*. A similar function could perhaps be inferred in *Rhopalaemon* gen. nov., although many species of *Palaemon* also live in hydrodynamically active environments, and lack such a grasping structure.

***Rhopalaemon belindae* (Kemp, 1925) new combination**

Leander belindae Kemp 1925: 308–311, Figs. 12, 13a–e. — Kurien 1954: 71.

Palaemon (Palaemon) belindae. — Holthuis 1950: 7. — Ravindranath 1979: 189–191, Figs. 1a–c. — Pereira 1997: 50.

Palaemon belindae. — Dutt & Ravindranath 1973: 124. — Jayachandran 2001: 209, Figs. 56a–e.

Material examined. Syntypes: (i) 1 male, pocl 5.9 mm; 1 ov. female, pocl 8.5 mm; Kilakarai, Ramnad District, Gulf of Mannar, S. India; 18.II.1913; leg. S.W. Kemp; RMNH.D.7691. (ii) 4 ov. female, pocl 7.9–9.1 mm; 1 female, pocl 6.6 mm; rockpools, Kilakarai, Gulf of Mannar, S. India; coll. Zoological Survey of India; NHM 1924.1.25.17–21. **Non-type material:** (i) 3 ov. females, pocl 7.6–9.7 mm; 3 females pocl 3.3–6.4 mm; 2 males, pocl 4.0–4.9 mm; 1 individual, pocl 2.2 mm; amongst rocky blocks, Waltair Beach, Andhra Pradesh, India; 07.III.1980; leg. P. Noël; MNHN 8141. (ii) 6 ov. females, pocl 7.4–9.9 mm; 1 female, pocl 6.9 mm; 2 males, pocl 5.3–5.5 mm; amongst rocky blocks, Waltair Beach, Andhra Pradesh, India; 05.III.1980; leg. P. Noël; MNHN 8137.

Description. Carapace glabrous (Figs. 1A, B). Rostrum (Figs. 1C, D) slightly descendant with strong lateral ridge; much shorter than carapace, reaching to base of distolateral tooth of scaphocerite; armed with 7–8 strong dorsal teeth and 2 ventral teeth; dorsal teeth without weakly constricted bases, posterior 2–3 teeth situated behind orbit, proximal-most situated at about one third carapace length; spacing between teeth roughly equal; tip of rostrum either simple pointed or bifid; double row of setae present in ventral unarmed portion, strong, single row of setae present between teeth both dorsally and ventrally. Antennal and branchiostegal teeth (Fig. 1D) present, subequal in size, sub-marginal. Anterior margin of carapace distinctly concave in region of branchiostegal tooth. Branchiostegal groove originating dorsal to branchiostegal tooth, trending downwards, finishing at about one third carapace length, slightly lower than at its origin. Sub-orbital lobe produced, angular (Fig. 1D); pterygostomial angle rounded. Béc ocellaire (Fig. 1D) globular with slightly concave anterior margin, pronounced, slightly hooked median process, directed upwards at about a 45° angle, dorsal surface with strong concavity.

Eye (Figs. 1E, F) well developed, with pigmented cornea; two concentric bands of pigment present on cornea, lower band usually faint; cornea slightly wider than stalk, approximately equal in length; ocellus present on dorsomedial side.

Antennular peduncle (Fig. 1G) extending almost to distal margin of scaphocerite; basal segment 1.7 times as long as wide, slightly convex outer margin, stylocerite acute; distolateral tooth far exceeding laminar portion, extending to almost level with distal margin of penultimate segment; ventro-medial tooth present; statocyst with statolith; ultimate segment 1.6 times as long as penultimate, combined length slightly less than 0.7 times that of basal segment.

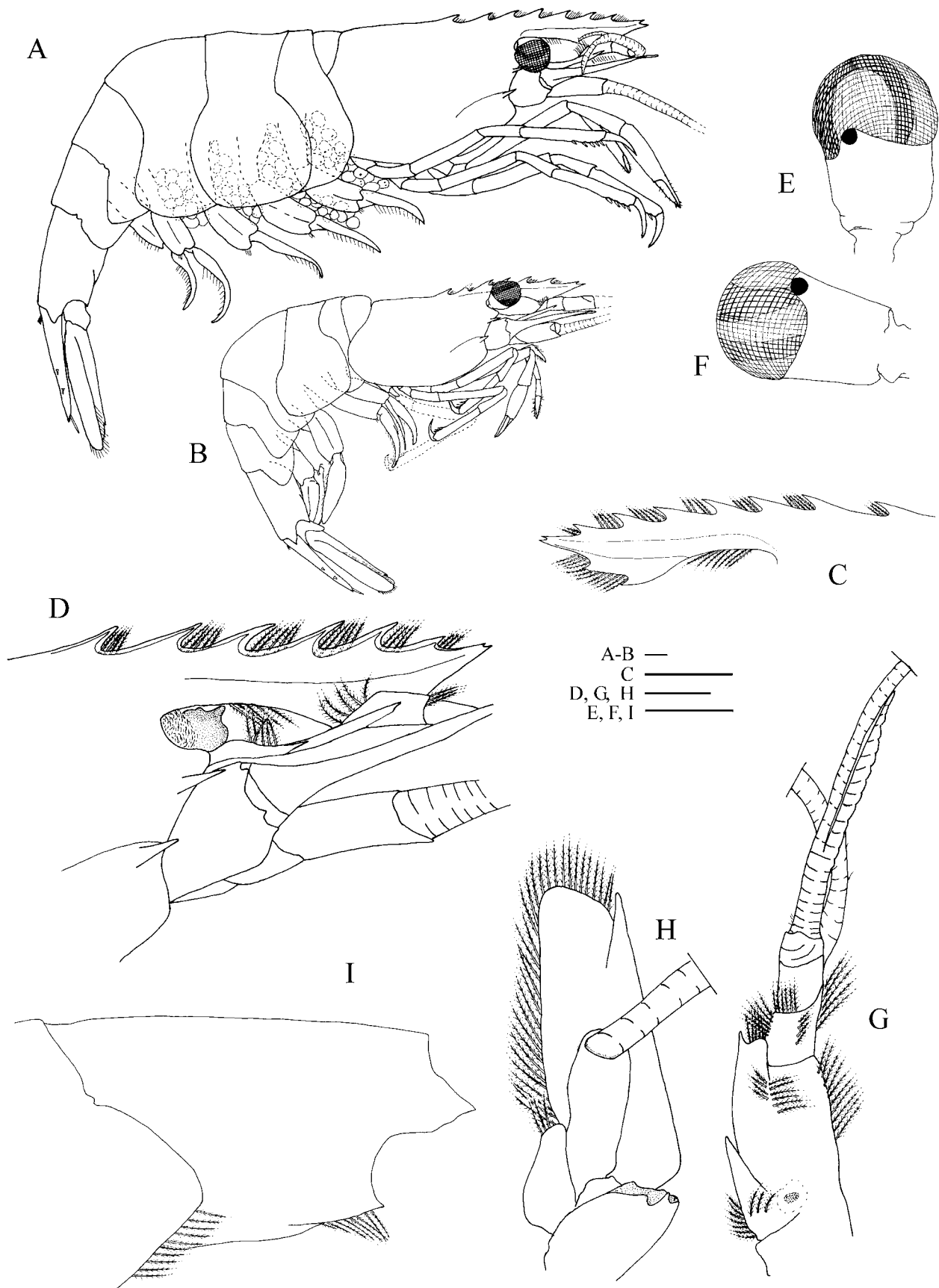


FIGURE 1. *Rhopalaemon belindae* comb. nov.: A, Habitus, lateral view, female syntype; B, same, male syntype; C, rostrum, left lateral view; D, carapace anterior portion, right lateral view; E, left eye, dorsal view; F, same, lateral view; G, left antennular peduncle, dorsal view; H, left scaphocerite, ventral view; I, posterior portion of abdomen, left lateral. A–B (RMNH D 7691 male, pochl. 5.9 mm, female, pochl. 8.5 mm); C–I (ov. female, pochl. 8.1 mm, MNHN 8137). All scale bars equal 1.0 mm.

Dorsal flagellum of antennula fused for one quarter of length (approximately 8 segments fused, 28 free); free portion strongly serrate on ventral margin, with several aesthetascs on each segment.

Scaphocerite (Fig. 1H) broad, laminar, 2.6 times as long as broad; outer margin straight, terminating in a tooth, falling short of distal margin of lamina; basal segment of antenna with reduced lateral tooth. Flagellum of antenna slightly longer than length of body.

Abdominal pleura furnished with plumose setae on ventral margin (Fig. 1I); fifth pleuron posterodistal angle evenly rounded; sixth segment approximately 1.4 times length of fifth; posterolateral margin angular, without notch disto-ventrally; median lobe acute, with rounded ventral submedian process.

Thoracic sternal armature sexually dimorphic. Fourth thoracic sternite of females (Fig. 4H) armed with sharp median tooth with strong, incomplete posterior ridge; fifth thoracic sternite with incomplete ridge; sixth and seventh with low rounded median bosses only; eighth sternite with small blunt median tubercle; in ovigerous and post-ovigerous females eighth sternite with flattened setose plate. Fourth thoracic sternite of males (Fig. 4I) as in females; fifth to seventh thoracic sternites with low, rounded median bosses; eighth sternite with well developed, sharp median conical tooth.

Abdominal sternal armature sexually dimorphic. First to third abdominal sternites of females with small blunt median tubercle; fourth sternite unarmed; fifth with longitudinal ridge. In males, first to third abdominal sternites bearing narrow, parallel sided, blunt tipped tooth; fourth abdominal sternite unarmed; fifth abdominal sternite as in females. Pre-anal plate (Fig. 4A) armed with well developed tooth in both sexes.

Mandible (Fig. 2B) with three segmented palp; basal segment twice length of second segment, terminal segment 1.2 times length of basal segment; outer margin of palp fringed with simple and pappose setae, approximately 5 simple apical setae, disto-medial margin of second segment with single, long, simple seta. Incisor process of mandible with 3 teeth on right mandible, middle one smallest, and 4 teeth on left mandible, middle 2 smaller than outer teeth; molar process with 4 teeth of varying sizes. Paragnaths (Fig. 2A) covering about half mandibles; alae formed by broad, transverse broadly oval, distal lobes, ventromedial lobes triangular. Corpus short, narrowly separated medially; base with two carinae. Epistome (Fig. 2A) triangular with rounded anterior angle and strong anteromedian carina. Labrum (Fig. 2A) narrow, rectangular. Maxillula (Fig. 2C) with lower lacinia sub-rectangular, smaller and narrower than upper lacinia, with stout setae distally; upper lacinia with several distal spines and stout setae; with single simple seta on upper margin; palp with bifid tip; upper process naked, lower process broad with setiform process on ventral tubercle. Maxilla (Fig. 2D) with upper lacinia deeply cleft, ending in several stout, plumose setae, several simple setae on upper margin; palp well developed, broad with few plumose setae on outer margin; scaphognathite large, fringed with plumose setae. First maxilliped (Fig. 2E) with endites separated by distinct notch; palp slender, slightly twisted, with single subterminal simple seta and terminal plumose seta; exopod well developed, slender, furnished with plumose setae distally; caridean lobe well developed, broad, fringed with plumose setae; epipod large, bilobed, lobes sub-rectangular. Second maxilliped (Fig. 2F) with broad rectangular ultimate segment; penultimate segment broadly triangular, with convex, semicircular upper margin; exopod much longer than endopod; epipod and well developed podobranch present. Third maxilliped (Fig. 2G) pediform; ultimate segment 0.75 times length of penultimate; ischiomerus broadening distally, with strongly curved dorsal margin; exopod 0.7 times length of ischiomerus; epipodal plate broadly ovate; two arthrobranchs present, one rudimentary and obscured by larger.

Well developed pleurobranchs present on all thoracic legs. First pereopod (Fig. 3A) overreaching scaphocerite by length of fingers; basis approximately 0.6 times length of ischium; ischium disto-ventrally expanded; merus 1.3 times length of ischium; carpus 1.9 times as long as merus and slightly expanded distally; chela (Fig. 3B) 0.8 times length of carpus, fingers equal to palm, with tufts of setae; carpal-propodal brush present. Second pereopod (Fig. 3C) extending beyond scaphocerite by half length of palm of chela; ischium 3.5 times length of basis; merus 1.3 times length of ischium; carpus 0.75 times length of merus, strongly expanded distally; chela (Fig. 3D) about 1.7 times length of carpus; fingers approximately 0.4 times length of chela, 0.7 times length of palm, cutting edges covered with stout setae, proximally without dentition. Ambulatory pereopods robust, broadly similar in length. Third pereopod (Fig. 3E) overreaching scaphocerite by length of dactylus; ischium 2.1 times length of basis; merus twice length of ischium; carpus 0.5 times

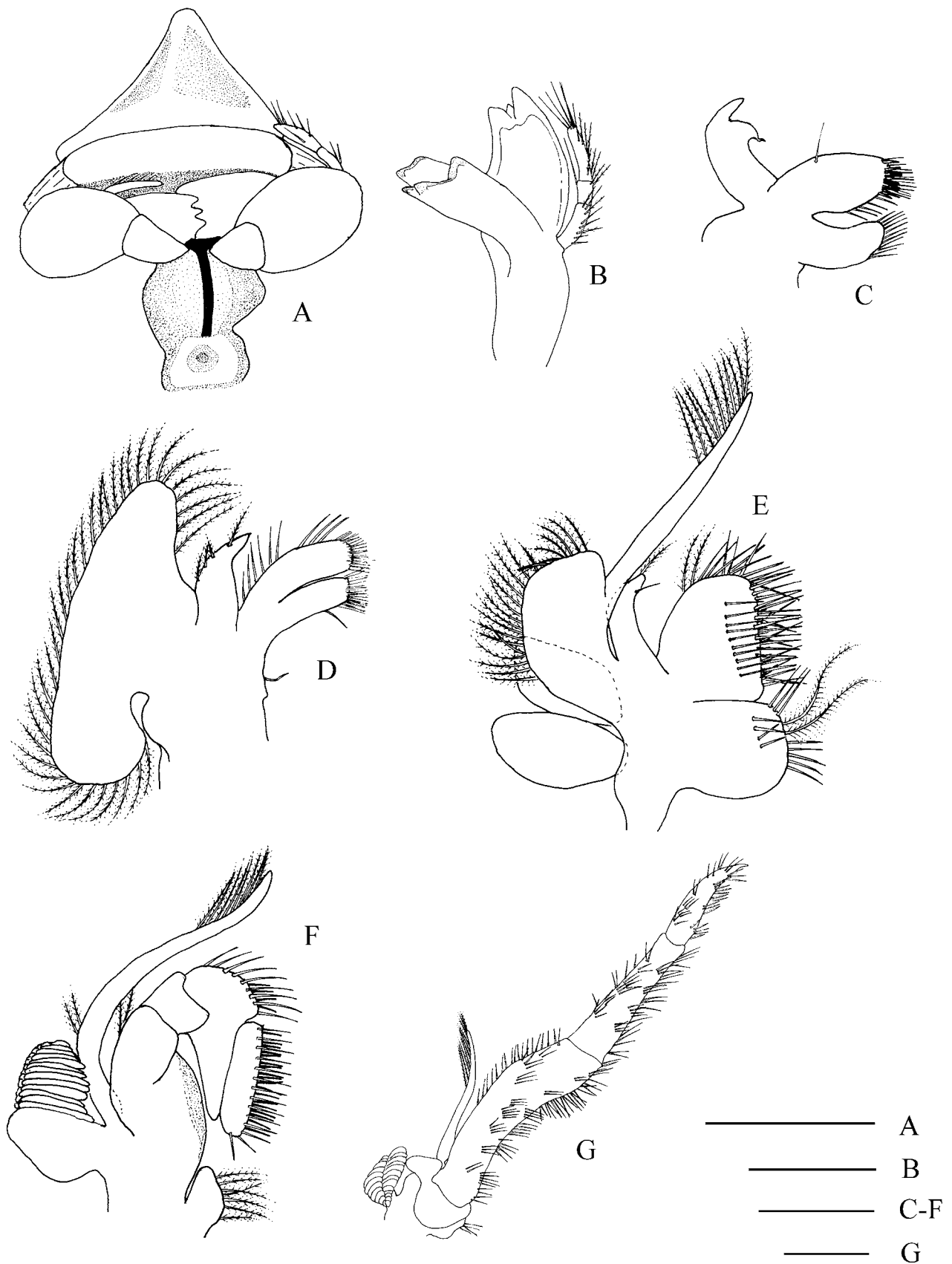


FIGURE 2. *Rhopalaemon belindae* comb. nov., MNHN 8137: A, paragnaths and epistome, ventral view; B, left mandible, mesial view; C, maxillula, ventral view; D, maxilla, ventral view; E, first maxilliped, ventral view; F, second maxilliped, ventral view; G, third maxilliped, mesial view. A (ov. female, pochl. 8.1 mm); B–G (ov. female, pochl. 9.7 mm). All scale bars equal 1.0 mm.

length of merus, equal in length to ischium; propodus 2.0 times length of carpus, equal in length to merus, distally dilated, 1.3 times wider distally than proximally, ventral margin of dilated portion armed with 4 single spines and a distal pair, a further spine occasionally present further along margin; dactylus, stout, simple, strongly curved, about 0.3 times length of propodus. Fourth pereiopod (Fig. 3F) reaching end of scaphocerite; ischium 2.3 times length of basis; merus 2.4 times length of ischium; carpus 0.5 times length of merus, slightly longer than ischium; propodus slightly longer than ischium, distally dilated, 1.3 times

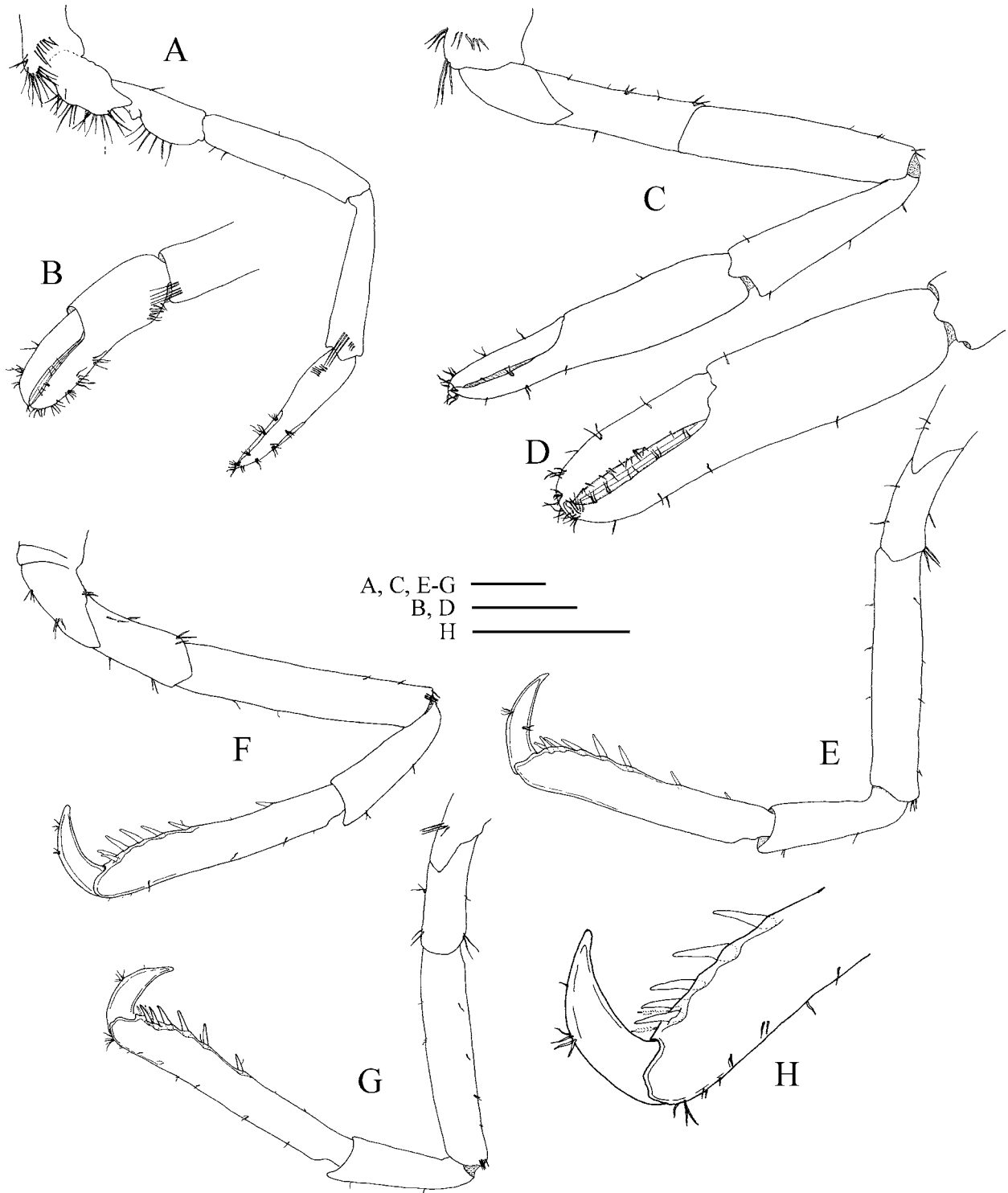


FIGURE 3. *Rhopalaemon belindae* comb. nov., ovigerous female, pocl. 8.1 mm MNHN 8137: A, first pereiopod, mesial view, chela rotated; B, same, chela; C, second pereiopod, mesial view, chela slightly rotated; D, same, chela; E, third pereiopod, mesial view; F, fourth pereiopod, mesial view; G, fifth pereiopod, mesial view; H, same, distal part. All scale bars equal 1.0 mm.

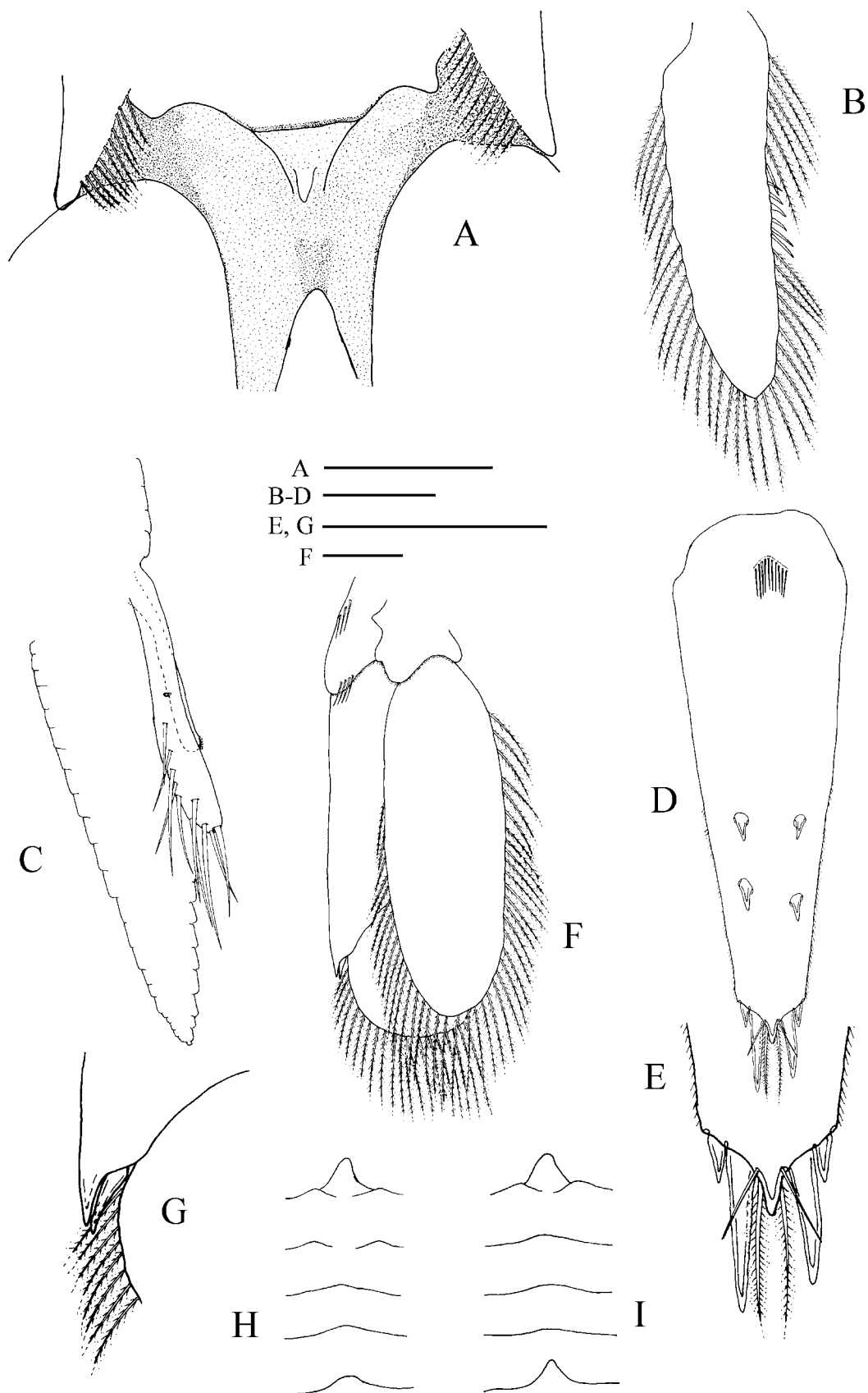


FIGURE 4. *Rhopalaemon belindae* comb. nov., MNHN 8137: A, pre-anal plate, ventral view; B, endopod of first pleopod of male, anterior view; C, appendix interna and appendix masculina, anterior view; D, telson, dorsal view; E, same, distal; F, uropods, dorsal view; G, same, close up of lateral tooth and spine; H, thoracic sternal armature, female; I, same, male. A, D–F (ov. female, pochl. 8.1 mm); H (female, pochl. 6.9 mm); B–C, I (male, pochl. 5.5 mm). All scale bars equal 1.0 mm, H–I not to scale.

wider distally than proximally, ventral margin of dilated portion armed with 4 single spines and a distal pair, a further spine occasionally present further along margin; dactylus stout, simple, strongly curved, about 0.3 times length of propodus. Fifth pereopod (Fig. 3G) falling short of distolateral tooth of scaphocerite by length of dactylus; ischium 2.0 times length of basis; merus 2.4 times length of ischium; carpus 0.5 times length of merus; propodus 2.1 times length of carpus, distally dilated, 1.3 times wider distally than proximally, ventral margin of dilated portion armed with 4–5 single spines and a distal pair, a further spine occasionally present further along margin, grooming brush (Fig. 3H) comprises 1 poorly developed row of serrulate setae hidden between ultimate and penultimate spines; dactylus stout, simple, strongly curved, about 0.35 times length of propodus.

First pleopod sexually dimorphic in proportions, lacking appendix interna in both sexes; in males endopod 0.5–0.6 times length of exopod, both exo- and endopods fringed with plumose setae but medial portion of inner margin of endopod devoid of plumose setae, with 7 spines (Fig. 4B); in females, endopod approximately 0.4 times length of exopod. Second to fifth pleopods broadly similar with endopod being slightly shorter than exopod, bearing appendix interna. Second pleopod of males with appendix masculina; about 1.4 times length of appendix interna (Fig. 4C), furnished with 8 lateral and 3 apical simple setae.

Telson (Fig. 4D) 1.1 times length of sixth pleonite; length:width ratio 3:1 proximally narrowing to 7.8:1 distally; dorsal surface with 2 pairs of spines and 1 pair of simple setae subdistally on median process; proximal dorsal tuft of about 10 simple setae present; proximal pair of spines situated at about 0.55 of telson length, distal pair at about 0.7–0.75 length; marginal setae present in distal half only; posterior margin (Fig. 4E) prolonged into acute process, with 1 pair of submedian plumose setae and 2 pairs of spines, inner pair about 3 times longer than outer pair; median process exceeding outer pair of spines.

Uropods (Fig. 4F) broadly ovate, overreaching telson by 0.3 times length of endopod; exopod slightly longer than endopod, weak diarthrosis present; mobile lateral spine of exopod overreaching fixed tooth by length of tip (Fig. 4G).

Eggs 0.7×0.6 mm.

Colour pattern. According to Kemp (1925: 311): “Translucent, thinly speckled with yellow and dark green chromatophores and with a certain amount of scattered white pigmentation in the middle of the carapace. On the dorsal side of the abdomen at the hinder end of the second and third somites there was a lenticular patch of pale dull pink and the distal two thirds of the tail-fan were heavily spotted with dark green or yellow brown. All the legs were banded with blue and each also bore a light red patch at the distal end of the merus, carpus and propodus or palm. The eggs were dark grey or olive. Young specimens were always paler than adults.” Additionally, Kemp (1925: 309) noted: “there are two concentric rings of dark pigment on the cornea, but the lower one is usually faint”, whilst Ravindranath (1979: 190) remarked: “antennular flagellae bear dark (greenish-maroon) and pale (pink) alternating bands”.

Distribution and habitat. Currently known from two locations in the southern Indian state of Tamil Nadu (Keelakarai, Kanyakumari), as well as Andhra Pradesh State (Visakhapatnam), from littoral pools.

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