

## A NEW SPECIES OF ALPHEID SHRIMP, *ALPHEUS BANNERORUM* FROM NORTHERN AUSTRALIA

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### ABSTRACT

A new species of free living alpheid shrimp, *Alpheus bannerorum*, from the Northern Territory, Australia, is described and illustrated. Most closely related to *A. parvirostris* Dana, it is most easily distinguished by its ocellate colour pattern. The species is common in intertidal pools.

**KEYWORDS:** Taxonomy, Crustacea, Alpheidae, *Alpheus*, new species, colour pattern, zoogeography.

### INTRODUCTION

Despite the extensive studies of the Australian alpheid shrimp fauna by D.M. Banner and A.H. Banner (1973, 1975, 1981), this subject has clearly not been exhausted. Considerable numbers of alpheid shrimp specimens from northern Australian waters, including a number of species new to the Australian fauna, were in their hands at the time of Professor Banner's recent death but his wife Dora decided not to continue with their study when their partnership was broken. One paper, describing two new Australian species, was subsequently completed (Banner and Banner 1986) and the rest of the specimens under study were returned to the Northern Territory Museum. One of these species is now described as new in the following report and is dedicated to the memory of Dora and Hank Banner in recognition of their major contribution to Australian alpheid shrimp studies. Professor Banner died on 17 August 1985, and Dora Banner on 15 December 1986.

### SYSTEMATICS

#### *Alpheus bannerorum* sp. nov. (Figs 1-6, Plate 1)

**Type material.** HOLOTYPE - ♀ (ovig.), Dudley Point, Darwin, Northern Territory, Stn. AJB-30, 6 November 1986, NTM Cr.004429A. ALLOTYPE - ♂, same data as holotype, NTM Cr.004429B. PARATYPES - NTM Cr. 004429 C-E. Paratypes are also deposited in the National Museum of Natural History, Washington, catalogue number USNM 234208; the Bishop Museum, Hon-

olulu, catalogue number 1987. 283 S-10805 and the Rijksmuseum van Natuurlijke Historie, Leiden, catalogue number 37181.

**Additional material.** Stn. AJB-19, Dudley Point, Darwin, NT., 12°25.1'S 130°49.0'E, intertidal, silty reef pools, LWS, 8 January 1985, coll. AJ Bruce, 7 (2 ovig. ♀), NTM. Cr.002512, 1 ovig. ♀, NTM. Cr.002513, 1 ♂, 1 ovig. ♀, NTM. Cr.002514, 1 ovig. ♀, NTM. Cr.004427; Stn. AJB-22, Channel Island, Darwin Harbour, N.T., 12°33.0'S 130°52.4'E, intertidal, sandy reef flat pool, 7 February 1985, coll. AJ Bruce, 8 (3 ovig. ♀), NTM. Cr.002682; Stn. AJB-24, Dudley Point, 8 March 1985, 1 ovig. ♀, NTM. Cr.004554; Stn. AJB-29, Dudley Point, 8 October 1985, 2 ♂, NTM. Cr.003704.

**Description.** A small sized, slenderly built alpheid shrimp of the "*edwardsii*" group.

Carapace moderately compressed, smooth and glabrous; rostrum acute, straight, slightly depressed, about 2.0 times longer than width across base, slightly exceeding proximal segment of antennular peduncle, with 1-2 lateral setae, lateral margins blended with slightly expanded anterior margin of orbital grooves, forming flattened convex prominence, orbital grooves shallow, short, rostral carina absent; orbital hoods rounded, without supraorbital teeth; pterygostomial angle broadly rounded; cardiac notch distinct.

Abdominal segments slightly compressed, smooth and glabrous; sixth segment about 1.4 times length of fifth, about 1.4 times longer than deep, posteroventral angle produced, acute, posterolateral angle produced, posteriorly angularly truncate; pleura of first

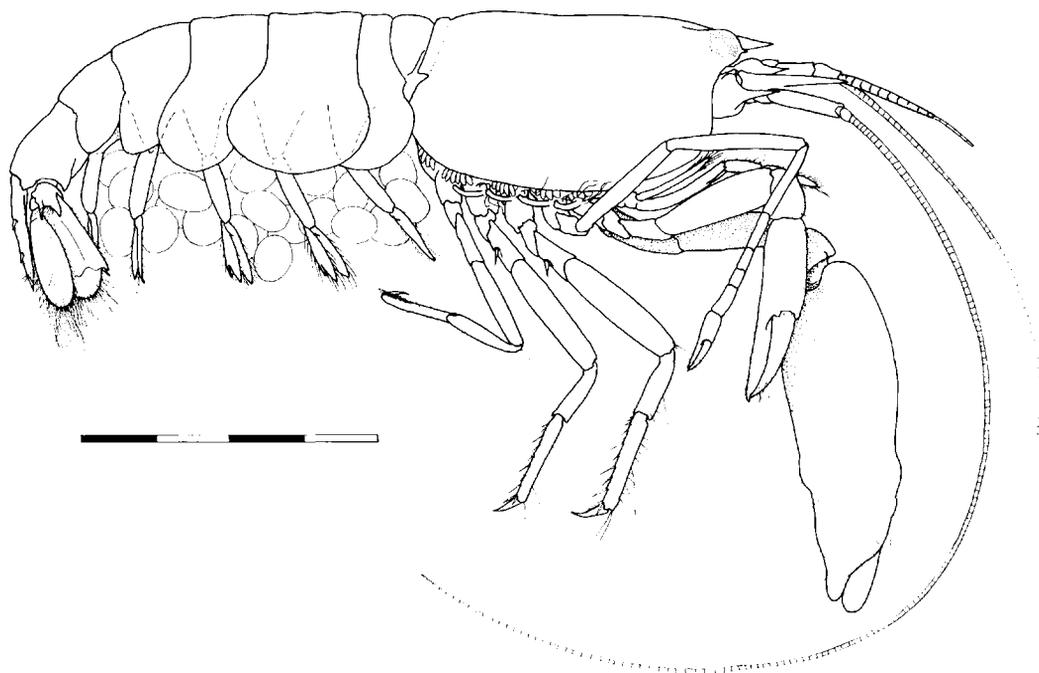


Fig. 1. *Alpheus bannerorum* holotype ♀ (ovig.), Dudley Point, Darwin. Scale divisions in millimetres.

three segments broadly rounded, larger in females than males, fourth and fifth slightly produced posteriorly, bluntly angular in females, angular or feebly acute in males; telson about 1.25 times length of sixth abdominal segment, broad, about 1.75 times longer than anterior width, posterior width 0.5 of anterior width, sides straight, posteriorly convergent, with two pairs of medium sized, subequal dorsal spines at 0.43 and 0.72 of telson length, posterior pair closer to midline than anterior, posterior margin convex, with median spinule in dissected specimen, with 12 long segmented plumose marginal setae and two pairs of lateral spines, small outer spine with larger inner spine, about 0.13 of telson length, and 1.3 times dorsal spine length, dorsal surface of telson with numerous short simple setae laterally and long erect setae posteriorly.

Antennular peduncle with proximal segment about 2.6 times longer than distal width, with acute distoventral tooth medially, distodorsal margin unarmed, with several long simple setae; statocyst well developed with granular statolith; stylocerite acute, distinctly exceeding distal margin of segment; intermediate segment subcylindrical, about 1.75 times longer than broad,

about 0.6 of proximal segment length, with several long setae distodorsally; distal segment subcylindrical, about 1.6 times longer than wide, 0.8 of intermediate segment length; upper flagellum feebly biramous, robust, with 8-9 proximal segments fused, short ramus with single segment, longer ramus filiform, eight segments, eight groups of aesthetascs; lower flagellum about 1.5 of postorbital carapace length, slender, with several long lateral setae proximally.

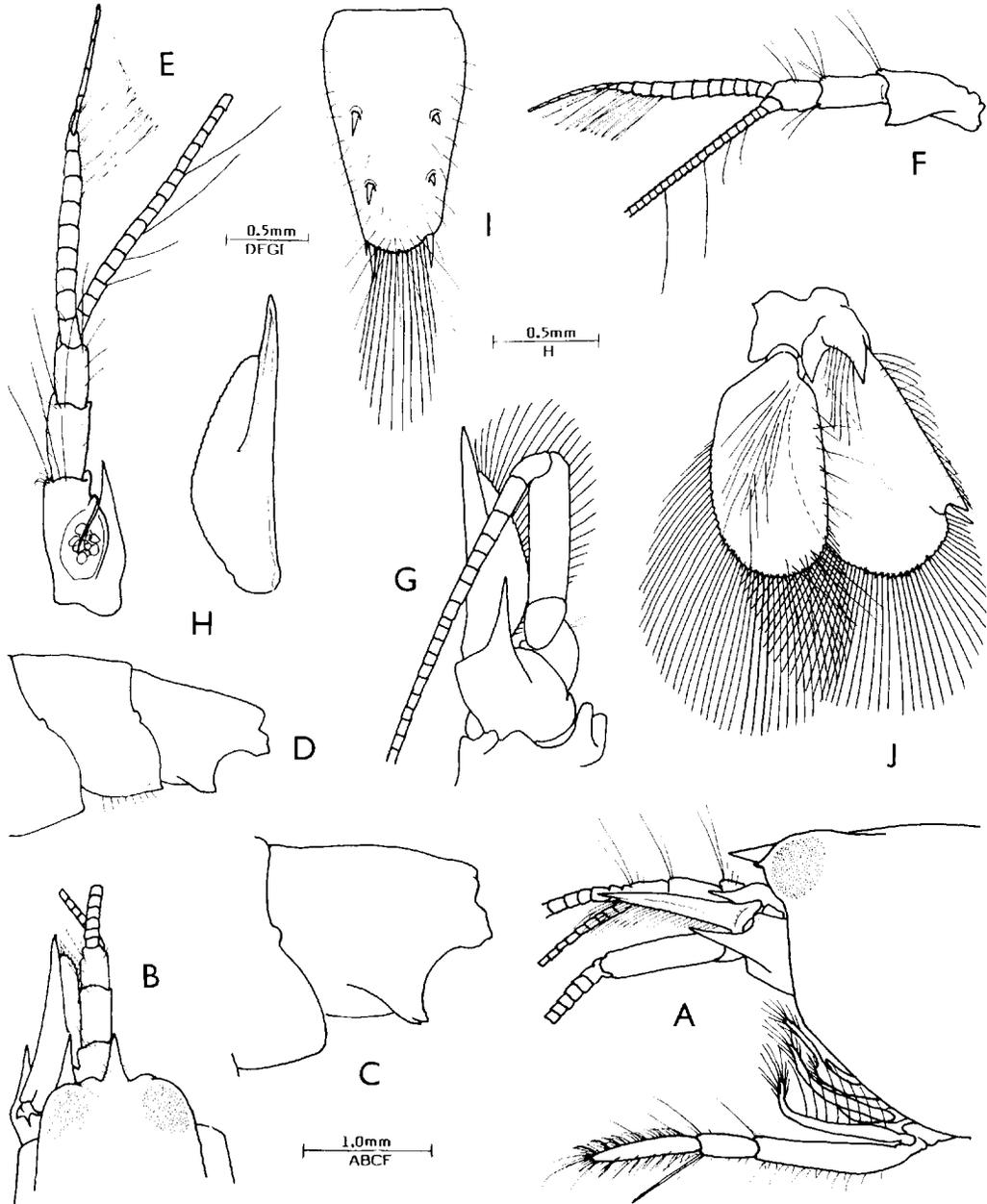
Antenna with robust basicerite with long slender lateral tooth generally exceeding proximal segment of antennular peduncle or reaching to middle of intermediate segment; carpocerite robust, about 3.5 times longer than wide, reaching to about distal end of scaphocerite lamella, flagellum well developed, robust, about 3.5 times postorbital carapace length.

Eyes with well pigmented cornea, completely covered by orbital hood, without anteromedial processes.

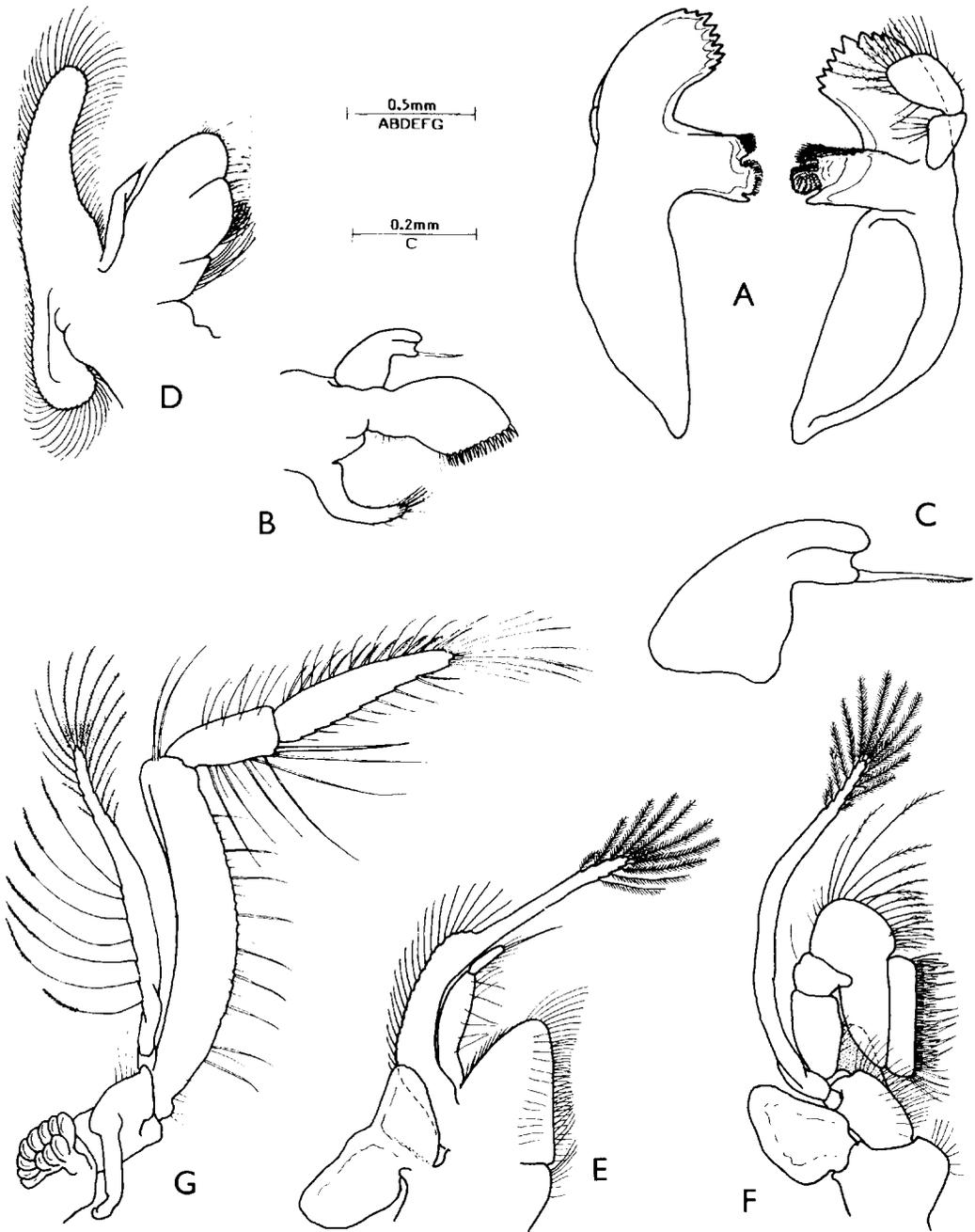
Mandible (right) with robust corpus; incisor process stout, broad, distally angular with five acute teeth medially and three blunt teeth laterally; molar process subcylindrical, distally truncate, with feeble teeth ringed with short setae; palp well developed, proxi-

mal segment subcylindrical, expanded distally, with setose distomedial angle, distal segment flattened, ovate, about 1.8 times longer than broad, 1.25 times length of proximal segment, with feebly plumose setae distomedially, simple setae distolaterally.

Maxillula with short, stout, feebly bilobed palp, lower lobe with distally denticulate spine; upper lacinia broad, lateral margin convex, distal margin oblique, straight, with about 25 short, stout, simple spines; lower lacinia slender, curved, with several



**Fig. 2.** *Alpheus bannerorum* paratypes (A-B, D-J, ♀ (ovig.), C, ♂): A, anterior carapace and appendages, lateral; B anterior carapace and left antennal peduncles, dorsal; C, posterior fifth and sixth abdominal segment; D, posterior fourth, fifth and sixth abdominal segments; E, antennule, dorsal; F, same, medial; G, antenna, ventral; H, scaphocerite, dorsal; I, telson; J, uropod.



**Fig. 3.** *Alpheus bannerorum* paratype ♀ (ovig.): **A**, mandible, right, dorsal and ventral aspects; **B**, maxillula; **C**, same, palp; **D**, maxilla; **E**, first maxilliped; **F**, second maxilliped; **G**, third maxilliped.

spiniform setae distally. Maxilla with slender, distally acute palp with single short terminal spinule; basal endite broad, deeply bilobed, densely setose medially; coxal endite simple, small, with numerous long setae medially; scaphognathite slender,

about 4.3 times longer than broad, posterior lobe short, rounded, anterior lobe 2.5 times longer than proximal width, medial margin concave. First maxilliped with elongate flattened two-segmented palp, proximal segment about 4.5 times longer than wide,

sparsely setose medially, distal segment about 0.38 of proximal segment length, with long distal setae and several short medial setae; basal endite broad, angular, sparsely setose laterally, densely setose medially, basal endite with several distomedial setae only; exopod well developed, caridean lobe narrow, flagellum with numerous plumose setae distally; epipod large, triangular. Second maxilliped with dactylar segment of endopod narrow, about 5.0 times longer than broad, with dense palisade of short unarmed blunt peg-like spines ventrally, with longer serrulate spines dorsally; propod expanded distally with numerous finely plumose setae

on anteromedial margin; carpus and ischiomerus normal; basis distodorsally expanded, medially excavate; exopod with slender flagellum with numerous plumose setae; coxa medially convex, sparsely setose, with oval epipod without podobranch laterally. Third maxilliped with endopod extending to middle of carpoerite; ischiomerus incompletely fused to basis, distally flattened, about 3.25 times longer than broad, subuniform, with distinct setose distolateral angle, ventromedial border setose, dorsal lateral margin sparsely setose; penultimate segment about 2.0 times longer than distal width, feebly tapered proximally, with sev-

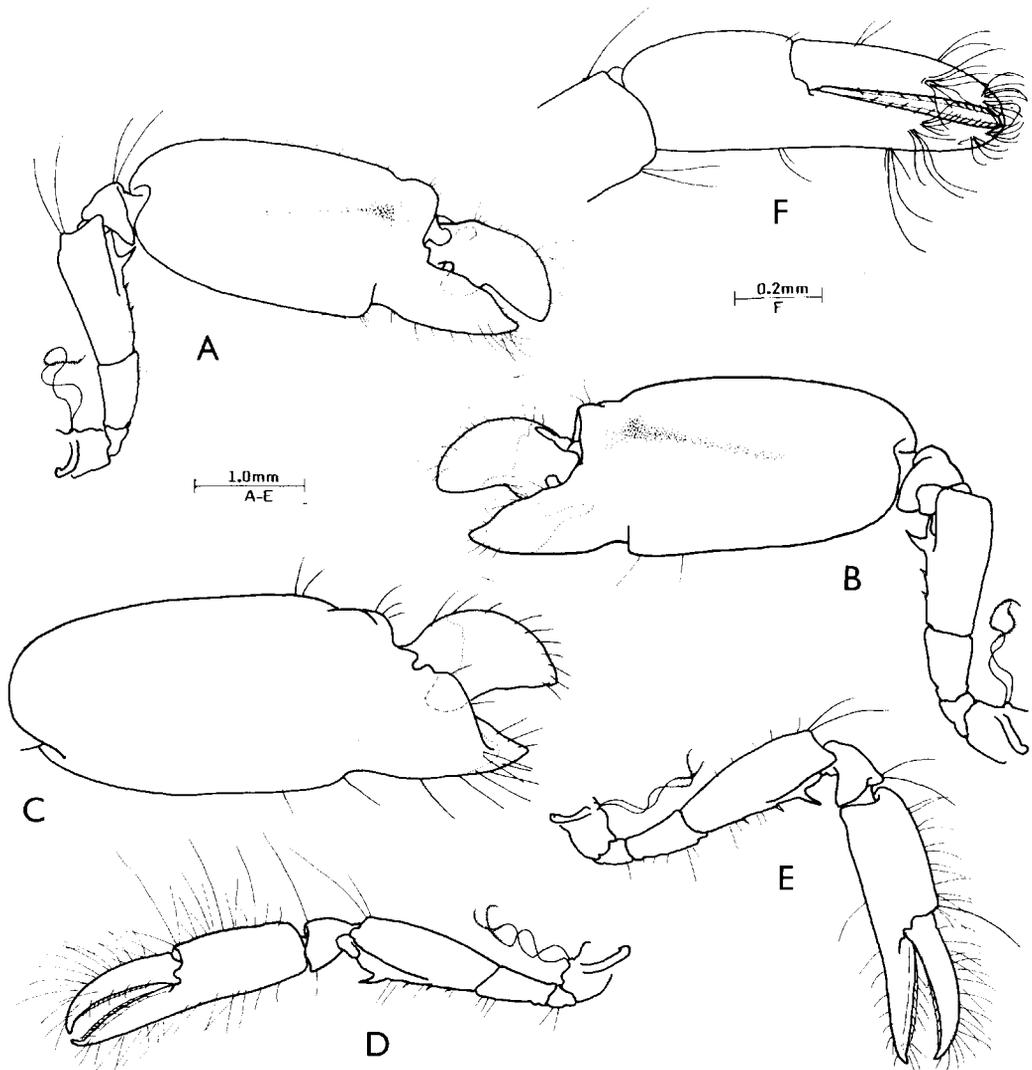
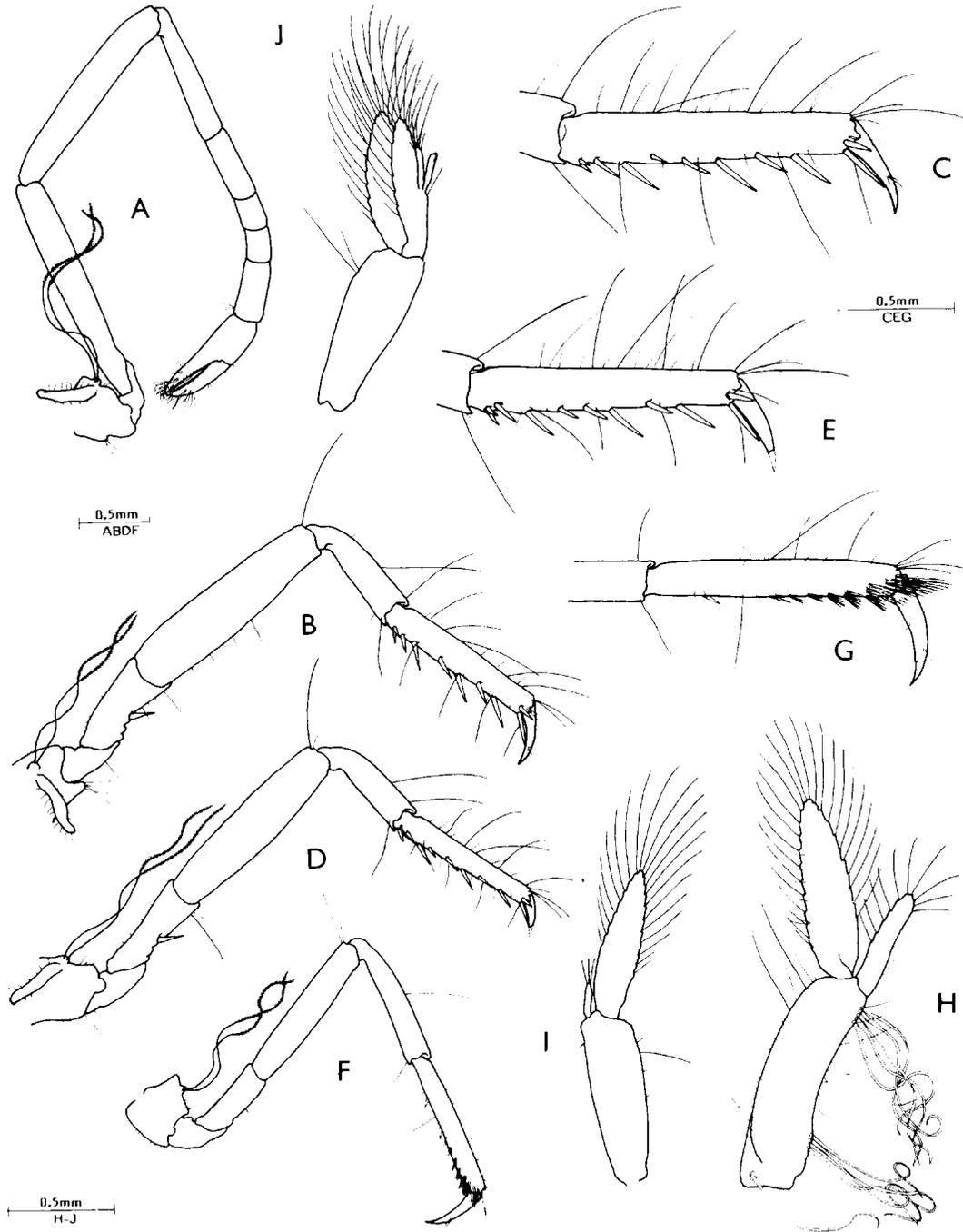


Fig. 4. *Alpheus bannerorum* paratypes (A, D, ♂, B-C, E-F, ♀): A, major first pereiopod, lateral; B, same; C, major chela, medial; D, minor chela; E, same; F, second pereiopod chela.

eral long finely serrulate spiniform ventrolateral setae and one very long finely serrulate distal ventrolateral spine, obliquely truncate at tip, with subterminal pore, equal to seg-

ment length; terminal segment about 1.7 times penultimate segment length, feebly tapered distally, about 4.5 times longer than proximal width, with 11 transverse rows of



**Fig. 5.** *Alpheus bannerorum* paratype (A-H, ♀ (ovig.), I-J, ♂): A, second pereiopod; B, third pereiopod; C, same, propod and dactyl; D, fourth pereiopod; E, same, propod and dactyl; F, fifth pereiopod; G, same, propod and dactyl; H, first pleopod; I, first pleopod; J, second pleopod.

short coarsely serrulate spines medially and numerous long slender finely serrulate setae distally, subequal to segment length, without distal spines, dorsolaterally sparsely setose; basis with medial margin straight, sparsely setose, with well developed exopod laterally, flagellum with numerous plumose setae on distal fifth, eight very long setae, mainly non-setulose, with fine serrulations distally; coxa not medially produced, with large oval plate laterally, distolateral angle acutely produced, lateral border with short setae, with simple epipod and small arthrobranch.

First pereopod with major chela similar in male and female, relatively smaller in latter, with palm smooth, slightly compressed, with numerous long setae dorsally, about 2.0 times longer than central depth; transverse groove on superior margin feebly developed; transverse groove on inferior margin more marked laterally, with proximal shoulder low, rounded; dactylus robust, compressed, about 0.4-0.45 of palm length, with plunger well developed, posterior rim setose; carpus short and stout, deeply excavate distally, about 0.2 of palm length, unarmed; merus robust, about 0.4-0.45 of palm length, about 2.1 times longer than distal width, concave ventrally, with large, very acute preterminal tooth on inner ventral margin, with two small spines proximally; ischium about half of merus length, 1.3 times longer than distal width, tapered and compressed proximally, unarmed; basis small, short, ventral length about 0.3 of meral length, unarmed, without exopod; coxa robust, with epipod laterally and bisetose setobranch dorsally.

Minor chela similar in male and female, palm with numerous long setae, about 2.0 times longer than wide, subcylindrical, smooth, dactyl subequal to palm length in male, slightly shorter in female, slender, tapering, about 4.0 times longer than proximal depth, with numerous long simple setae, lacking balaeniceps setae in both sexes, cutting edges entire, sharp, unarmed, tip hooked, fixed finger similar; merus as in major chela, more slender, about 1.15 times palm length, 2.6 times longer than wide; ischium about 0.4 of merus length in female, 0.5 in male.

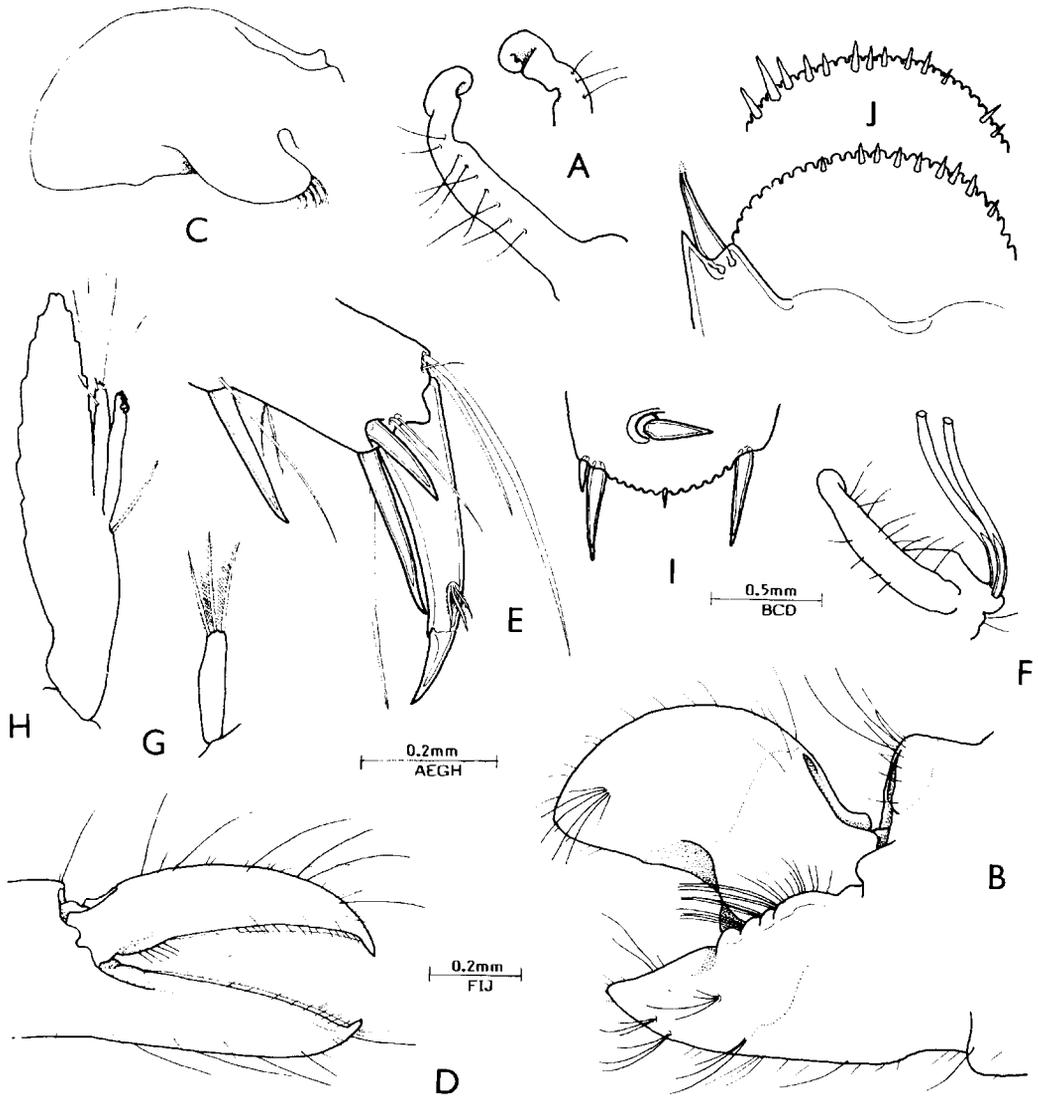
Second pereopod slender, exceeding carapocerite by whole of carpus and chela. Chela with palm subcylindrical, slightly compressed, about 1.6 times longer than deep,

sparsely setose, dactyl slender, compressed, about 4.4 times longer than proximal depth, with small hooked tip, cutting edge straight, entire, fixed finger similar, both with numerous groups of short setae; carpus five segmented, slender, about 3.0 times chela length, segments in ratio 1.8:1:1:2:4, proximal segment longest; merus about 6.3 times longer than central width, equal to length of first two carpal segments; ischium about 1.1 times meral length, subcylindrical, about 7.0 times longer than wide, widest at about 0.6 of length, unarmed; basis short, ventral margin about 0.28 of ischial length; coxa with lateral epipod and dorsal setobranch.

Third pereopod moderately slender, exceeding carapocerite by distal third of propod; dactyl compressed, about 4.3 times longer than proximal depth, 0.38 of propod length, unguis distinctly demarcated, about 0.3 of corpus length, corpus simple, without accessory teeth, with distal dorsolateral group of three short serrulate setae; propod with numerous long simple setae, about 6.0 times longer than wide, subuniform, slightly tapering distally, about 5.8 times longer than proximal width, with long distoventral spine and shorter distolateral spine and nine rather irregular ventral spines, some long, some short, basically in single row; carpus about 0.6 of propod length, about 3.5 times longer than broad, unarmed; 4.0 times longer than wide, distoventral angle unarmed, sparsely setose; ischium about 0.4 of merus length, with acute ventrolateral spine at 0.5 of length; basis with ventral margin about 0.28 of meral length; coxa with lateral and dorsal setobranch.

Fourth pereopod similar, less robust, dactyl about 0.36 of propod length, propod about 0.9 of third propod length, 0.15 times longer than wide, merus about 0.22 times longer than wide, 0.9 of third merus length, ischium with ventrolateral spine, coxa with epipod and setobranch. Fifth pereopod slender; dactyl about 0.4 of propod length; propod about 7.0 times longer than wide, with seven transverse rows of serrulate setae along distal half of ventrolateral margin, with 2-3 ventromedial spines; merus distoventrally unarmed; ischium unarmed; coxa with dorsal setobranch, epipod absent.

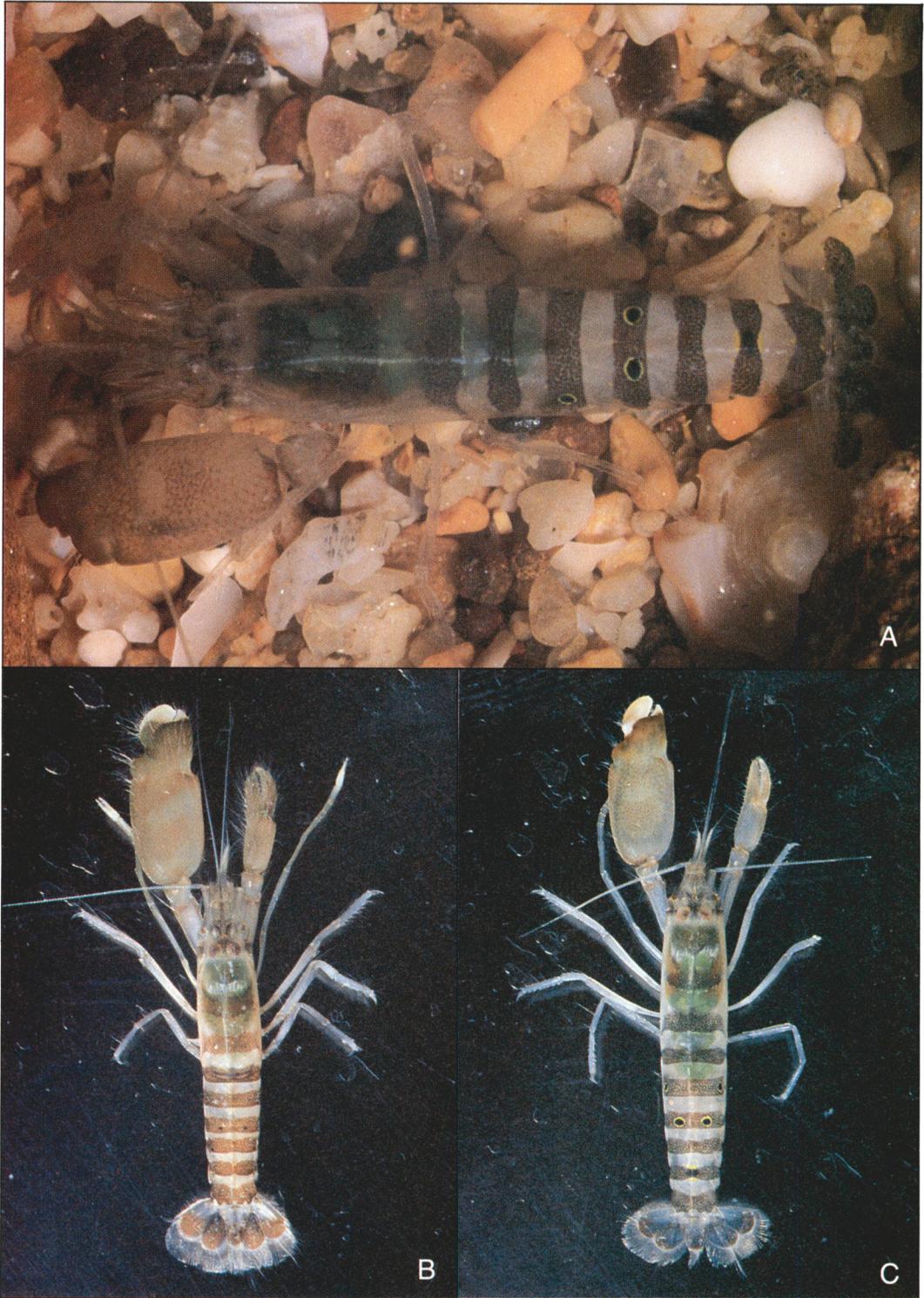
Pleopods normally developed. In female, basipodite of first pleopod about 3.75 times longer than wide, with distomedial and prox-



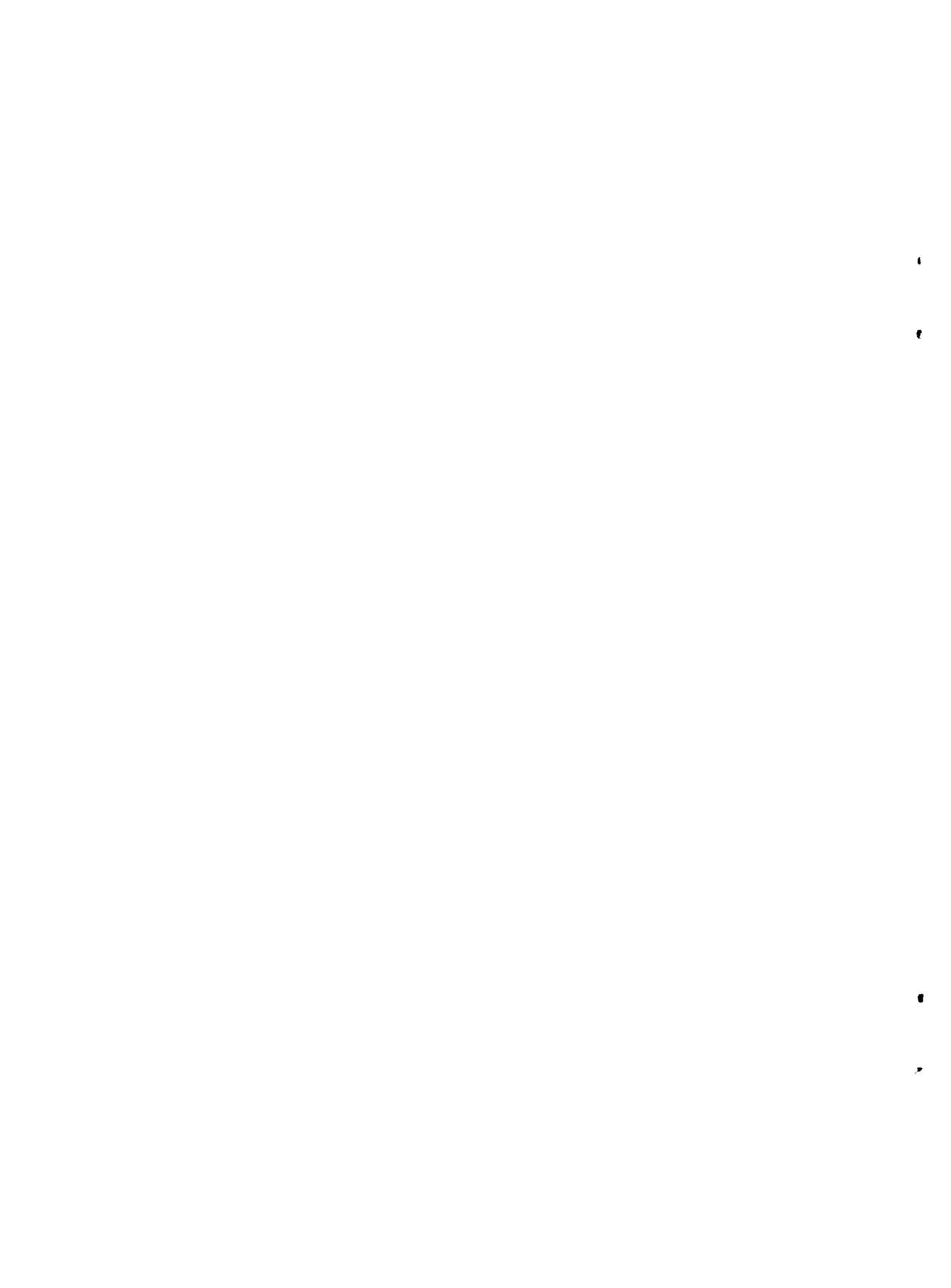
**Fig. 6.** *Alpheus bannerorum* paratypes (A-F, I, J, ♀. G, H, ♂): A, epipod of third maxilliped, lateral and distal end, medial; B, fingers of major chela, medial; C, dactyl of major chela; D, fingers of minor chela, medial; E, third pereopod, dactyl and distal propod; F, same, epipod and setobranch; G, endopod of first pleopod; H, endopod of second pleopod; I, telson, posterior margin; inset of dorsal spine; J, uropod, posterior margins of exopod (lower) and endopod (upper).

imomedial groups of ovigerous setae, with single proximal lateral ovigerous seta; endopod half length of basipodite, 4.0 times longer than broad, with longer plumose setae distally and laterally and shorter simple setae medially. In male, basipodite of first pleopod 3.0 times longer than broad, sparsely setose; endopod small, about 0.2 of basipodite length, 4.0 times longer than wide, slightly expanded centrally, with three distal

plumose setae, subequal to endopod length. Second pleopod with endopod well developed, about 5.0 times longer than broad, appendices at about 0.5 of medial margin length; appendix masculina slender, subcylindrical about 6.5 times longer than wide, 0.43 of endopod length, slightly exceeding appendix interna, with five long simple distal spines, subequal to appendix length; appendix interna slender, subequal



**Plate 1.** *Alpheus* spp. from, Dudley Point, Darwin, Australia: **A, C**, *A. bannerorum* paratype; **B**, *A. parvirostris*.



to appendix masculina length, with few distal cincinnuli.

Uropod with protopodite with two large acute dorsal teeth and numerous long simple setae; endopod broad, about 1.7 times longer than broad, lateral margin straight, with dense row of submarginal ventral setae, large acute tooth distally, with large mobile spine medially, distal margin broadly rounded with 8-10 submarginal dorsal spinules, diacresis well marked; endopod slightly shorter than exopod, 2.0 times longer than broad, distally rounded with 13-15 submarginal spinules, dorsal surface with numerous long erect setae.

Ova numerous and small.

**Measurements.** Holotype ♀, total length, (approx.) 11.5 mm; carapace length 4.4 mm; major chela 4.7 mm; minor chela 2.6 mm. Allotype ♂, total length (approx.) 9.0 mm; carapace length 3.45 mm; major chela 3.75 mm; minor chela 2.25 mm; Length of ova 0.8 mm.

**Colouration.** Body generally translucent, antennal peduncles and frontal region brownish, hepatopancreas dark brown, ovary bright green, posterior carapace and posterior half of each abdominal tergite with transverse dark red-brown bar, second with small dorsolateral eye spot, third with larger submedian eyespot, with black centre surrounded by thin yellow ring, fifth with transverse band constricted and darkened centrally with yellow patch anteriorly and posteriorly, caudal fan red brown except for anterior telson and anterolateral areas of uropod rami; chelae pale brown, dark brown on fixed finger of major chela, dactyl pale horn distally, proximally white, ambulatory pereiopods pale pinkish.

**Systematic Position.** *A. bannerorum* is most closely related to the common, well known and widely distributed species, *A. parvirostris* Dana, 1852, and is of very similar size and general morphology, but may be readily distinguished by the lack of an acute distoventral tooth on the merus of the third pereiopod. *A. bannerorum* may be readily confused with *A. parvirostris* on account of the conspicuously long distoventral process of the basicerite that occurs in both species but not in any other Indo-West Pacific species of *Alpheus*. Also shared, is the conspicuous transversely barred colour pattern of the abdominal segments but on closer

examination, *A. bannerorum* may be readily distinguished from *A. parvirostris* by the two pairs of well developed ocellate spots on the second and third segments, which provides an easy method of separation in the field. Other characteristic morphological features shared with *A. parvirostris* are the flattened extensions of the anterior margin of the carapace between the rostrum and the orbital hoods and the deep, narrow and oblique groove proximal to the dactylus of the large chela noted by Banner and Banner (1966).

Banner and Banner (1966) note that an acute tooth is present on the palm above the dactylar articulations in the male minor chela. This has not been noted in *A. bannerorum*. Similarly, in *A. bannerorum*, the ventral border of the minor chela lacks an inferior shoulder, noted as present but not heavy, in *A. parvirostris* by Banner and Banner (1981).

**Remarks.** Banner and Banner (1981) noted that some Australian specimens that they referred to *A. parvirostris* varied in the teeth on the meri of the third and fourth pereiopods. As they were working mainly on preserved material and lacking colour patterns, it is possible that these specimens should also be referred to *A. bannerorum*. Two specimens of *A. bannerorum* from Darwin, in which the colour pattern was known but had been lost in preservation, were examined by the Banners and subsequently referred to *A. parvirostris*. It is most probable that this new species is of widespread occurrence in Australia and beyond, as the colour pattern has been noted in specimens from Heron Island on the Great Barrier Reef and also in material from the South China Sea (pers. obs.). The two species appear to commonly occur together in shallow intertidal pools. At Dudley Point, *A. bannerorum* is more numerous. On Heron Island, *A. parvirostris* was the most abundant reef flat shrimp, up to 86 individuals in a square metre. *A. bannerorum* did not occur in the area sampled, but was found on small numbers elsewhere on the reef flat, in similar situations. Banner and Banners (1981) noted that specimens from the Houtman Abrolhos Islands, Western Australia, lacked distoventral teeth on the meri of the ambulatory pereiopod, so these specimens may also belong to *A. bannerorum*.

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Accepted 10 July 1987