

## A NEW SPECIES OF HINGE-BEAK SHRIMP FROM THE WESTERN PACIFIC (CRUSTACEA, DECAPODA, RHYNCHOCINETIDAE).

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### ABSTRACT

A new rhynchocinetid shrimp, *Rhynchocinetes brucei*, sp. nov. is described and illustrated. It is most closely related to *R. rugulosus* Stimpson from Australia, but can be distinguished from the latter species by having a shorter stylocerite, an indistinct lobe on the outer margin of the second pleopod in the male and by its live color. The new species occurs in the Philippines, Hong Kong and on the Great Barrier Reef.

KEYWORDS: Crustacea, Decapoda, Rhynchocinetidae, *Rhynchocinetes*, new species, West Pacific.

### INTRODUCTION

The shrimps of the genus *Rhynchocinetes* H. Milne Edwards, 1837, form a very distinct group of caridean shrimps on account of the presence of a movable rostrum which is articulated with the carapace and the presence of numerous transverse striae over the whole body surface. During recent taxonomic studies on hinge-beak shrimps, it has been noted that the color pattern is one of the most important diagnostic characters for identification of these shrimps (Nomura and Hayashi 1992; Okuno and Takeda 1992a, b).

One of these shrimps, *Rhynchocinetes rugulosus* Stimpson, 1860, is a well known species, being distinguished from its congeners by the presence of an arthrobranch on the third pereopod and a single lobe at the outer margin of the endopod of the first pleopod in the male (Gordon 1936; Hale 1941). In life, the dorsal surface of the third abdominal segment is ornamented with a beautiful red and white meshwork (Healy and Yaldwyn 1970; Coleman 1987). In the specimens from Hong Kong identified by Bruce (1986) as *R. rugulosus*, however, there is a large median spot on the dorsal surface of the same segment.

Through the kindness of Dr A.J. Bruce of the Northern Territory Museum, I have been able to examine many specimens of several species of

rhynchocinetid shrimps which are deposited in the collection of the Northern Territory Museum, Darwin. Among these materials are some specimens of *R. rugulosus* and related species from some widely separated localities, viz. Hong Kong, Heron and Lizard Islands on the Great Barrier Reef. As the result of direct comparison, it became clear that the specimens from Hong Kong and the Great Barrier Reef differ from *R. rugulosus* from Sydney and its vicinity, not only in life-coloration but also in some morphological characters. The former specimens are described below as a new species under the name of *Rhynchocinetes brucei* sp. nov.

The measurements follow those of Okuno and Takeda (1992a). The abbreviations are as follows: NTM - the Northern Territory Museum, Darwin, Australia; NSMT - the National Science Museum, Tokyo, Japan; cl - carapace length.

### SYSTEMATICS

#### *Rhynchocinetes brucei* sp. nov. (Figs 1-3, 4a-b, Plate 1)

*Rhynchocinetes rugulosus* Bruce, 1986: 612.

**Type Material.** HOLOTYPE - male (10.0 mm cl), Long Ke Wan, Hong Kong, 8 m depth, 27 April 1980, coll. diver, NTM Cr.003618.

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PARATYPES - 1 male (9.3 mm cl), Lizard Island, Queensland, coll. H.K. Larson, NTM Cr.000678; 1 male, 1 ovig. female (5.7 and 7.5 mm cl), Heron Island, Queensland, 12 m depth, 6 February 1986, coll. A.J. Bruce, NTM Cr.003617; 2 males (11.5 and 14.5 mm cl), Long Ke Wan, Hong Kong, 8 m depth, 27 April 1980, coll. diver, NTM Cr.003618 (B, C); 1 male (12.3 mm cl), Stn. T/13, Mirs Bay, Hong Kong (22° 31.5' N, 114° 19.9' E), 18 m depth, 5 April 1986, coll. P. Shin, NTM Cr.003806; 1 ovig. female (10.3 mm cl), Peng Chau, Mirs Bay, Hong Kong, 15 April 1986, NTM Cr.003951; 1 male (10.8 mm cl), Gau Tau, Mirs Bay, Hong Kong, 16-20 m depth, 18 April 1986, coll. divers, NTM Cr.004002.

**Additional Material.** Four specimens - 1 juv. (2.9 mm cl), Lizard Island, Queensland, 19 September 1981, coll. H.K. Larson, NTM Cr.000168; 1 male (6.3 mm cl), Lizard Island, Queensland, coll. H.K. Larson, NTM Cr.009606; 1 male (15.4 mm cl), Stn. PH. HK-4, Kai Kun Tan, Hong Kong, 4-6 m depth, 5 April 1986, coll. P. Hutchings, NTM Cr.003812; 1 male (6.4 mm cl), Philippines, coll. aquarium trader, NSMT-Cr 1529.

**Description.** Body subcylindrical, rather robust, without lateral ridge. Carapace with many fine transverse striae; depth 0.5 - 0.6 times length of carapace; anterior width 0.6 - 0.7 times length of carapace. Two acute teeth on dorsal carina behind rostral articulation; orbital spine strong, on level of upper orbital margin; antennal spine longer than orbital spine, strongly pointed,

exceeding anterior margin of carapace; pterygostomial angle bluntly pointed, directed anteriorly.

Rostrum distinctly articulated with carapace, laterally compressed and curved obliquely upward along its distal half; length 1.1 - 1.3 times length of carapace; upper margin with two acute large spines on proximal half, second tooth at 0.5 of rostral length, tip of rostral upper margin with four to six teeth smaller than proximal teeth; lower margin with 12 - 15 acute teeth, decreasing in size distally.

Abdomen marked with fine striae similar to those of carapace; third segment weakly humped posterodorsally, length 0.5 - 0.8 times as long as carapace; pleurae of first three segments rounded; fifth segment with acute posterolateral angle, directed backward; sixth segment 0.4 - 0.5 times longer than carapace, with sharply pointed spine directed backward obliquely just in front of base of uropod. Telson about 0.6 times longer than carapace, with three pairs of posterior spines present, lateral spines very small, shorter than dorsal spines, intermediate spines long and robust. Submedian spines slender, slightly longer than lateral spines.

Antennular peduncle reaching to median part of rostrum; distal margin of proximal segment with sharply pointed lateral spine, reaching to distal margin of next segment; stylocerite well developed, strongly acute distally, usually shorter than distal spine of proximal segment, rarely reaching to apex of distal spine; statocyst longi-

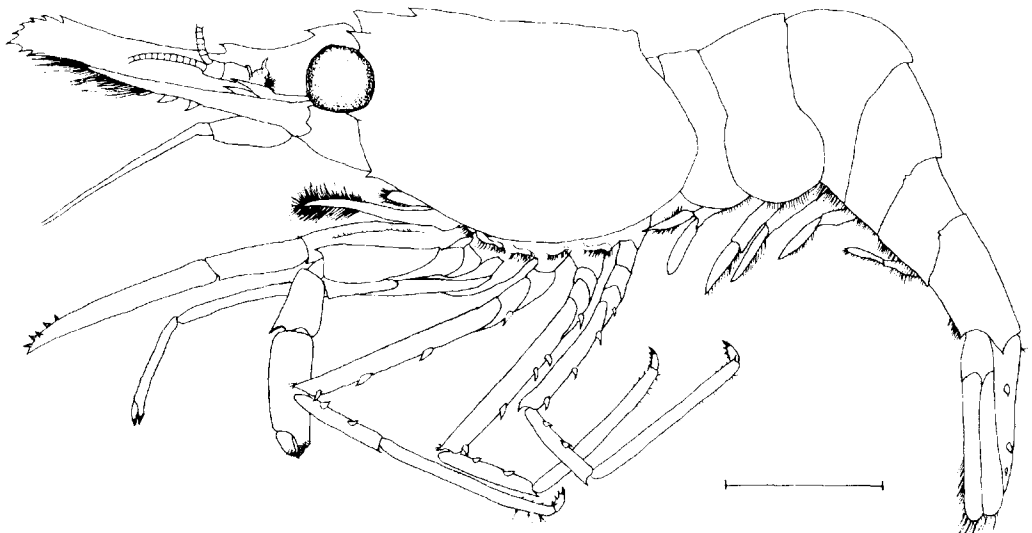


Fig. 1. *Rhynchocinetes brucei* sp. nov., holotype male, Long Ke Wan, Hong Kong (NTM Cr.003618). Scale represents 5 mm.

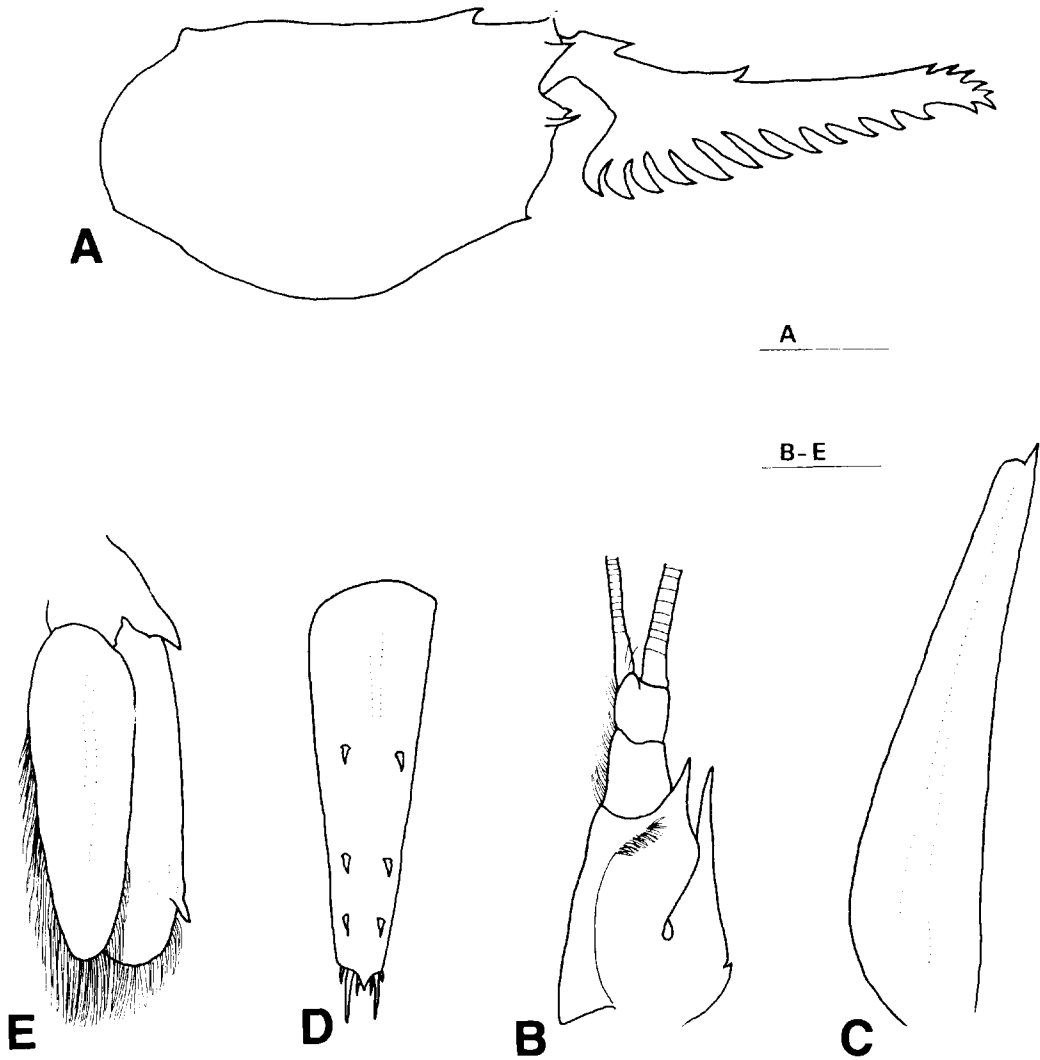


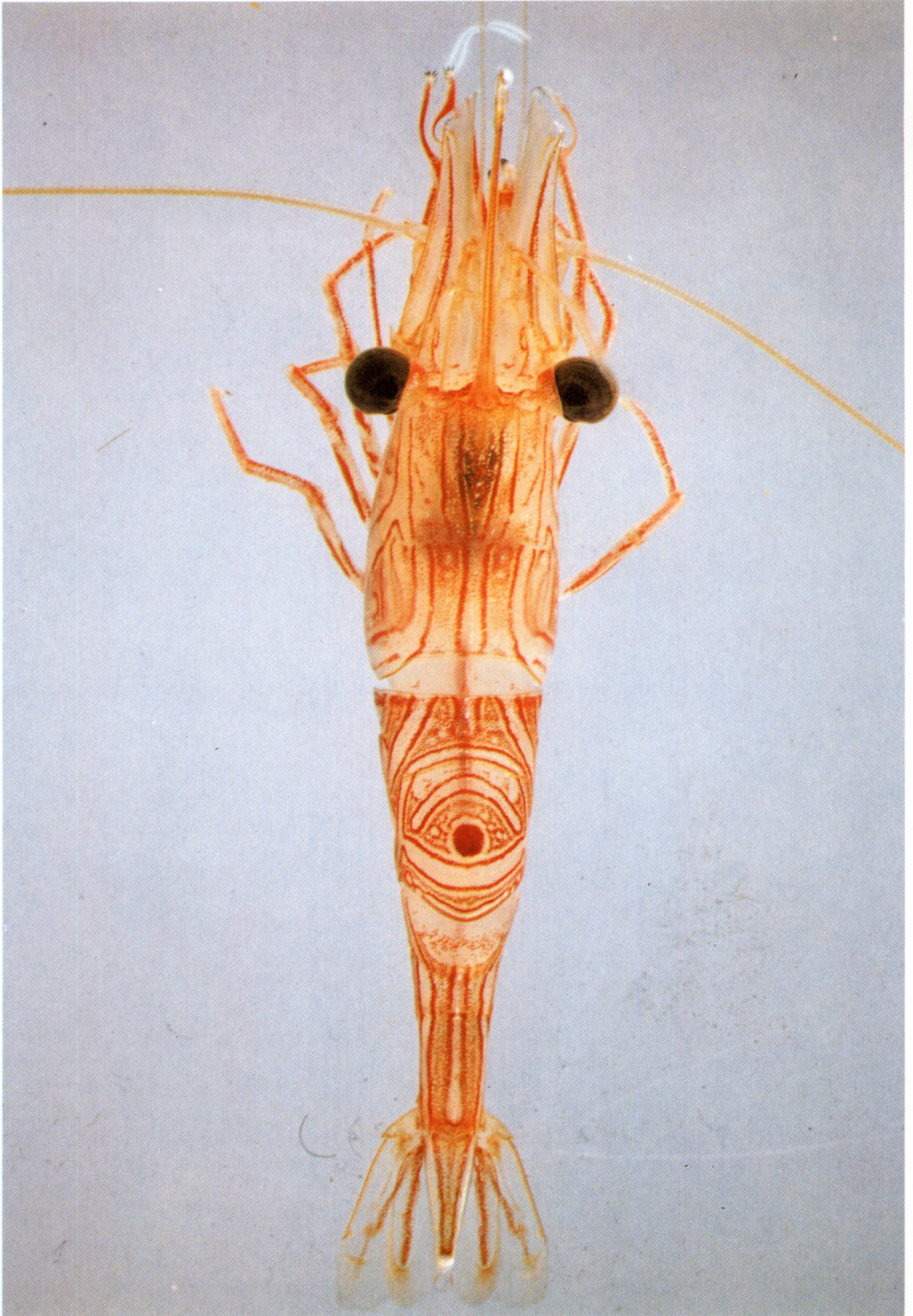
Fig. 2. *Rhynchocinetes brucei* sp. nov., paratype male (11.5 mm cl, NTM Cr.003618B). A, carapace and rostrum; B, antennular peduncle; C, antennal scale; D, telson; E, uropod. Scales: A = 5 mm, B-E = 2 mm.

tudinally oblong; intermediate and distal segments short, together are equal to two thirds of length of proximal segment, length of distal segment almost equal to that of intermediate segment.

Antennal scale well developed, not reaching to rostral apex, 0.8 - 0.9 times as long as carapace; broad proximally, narrower distally, maximum width 0.2 times longer than its length; distolateral spine strongly acute, extending beyond tip of lamella; basicerite with acutely pointed anteriorly directed lateral tooth.

Mouthparts generally similar to those of congeners. Mandible robust, with three-segmented

palp; distal segment of palp with dense setae at outer margin, larger and stouter than penultimate segment; molar process stout, with five slits at distal end; incisor process stout, with 11 sharp distal teeth. Maxillula with sharply pointed palp; proximal endite broader than distal endite with dense setae at inner margins. Maxilla with simple palp, proximal third broad, distal two-thirds slender; distal endite bilobed, distal lobe rounder and broader than proximal, with dense setae at outer margin of endite; proximal endite strongly convex, with dense setae at inner margin, which are longer than those of distal endite;



**Plate 1.** *Rhynchocinetes brucei* sp. nov., non-type specimen, Philippines (6.4 mm cl, NSMT-Cr 1529), dorsal view.

scaphognathite large, anterior lobe broad and rounded, posterior lobe posteriorly elongated, sub-triangular, with dense long setae at distal end.

All maxillipeds with both epipod and exopod. First maxilliped with rather slender endopod, with dense setae at inner margin; proximal endite broad and rounded, inner margin densely fringed with setae; exopod well developed, with long setae distally; epipod bilobed. Second maxilliped of normal form; dactylus slender, with dense setae, propodus with distomedial angle convex, with dense long setae at outer margin; carpus with acute distolateral tooth; ischiomerus as long as basis, with sparse setae at distal end of outer margin; exopod well developed, with numerous setae distally; inner margin of coxa straight; epipod with small podobranch. In female and young male, third maxilliped slender, usually extending slightly beyond rostral apex, rarely failing to reach rostral apex; distal segment 2.3 - 2.7 times as long as penultimate segment, tip armed with five to eight dark horny spines; ischiomerus with sparse setae; in large male, third maxilliped more robust than those of female and young male, surface glabrous, extending well beyond rostral apex by proximal two-thirds of penultimate segment; distal segment very long, about 1.1 times longer than carapace, about 4.6 times longer than penultimate segment, single dark horny spine situated at apex; with two small arthrobranches and acute spine directed forward at distal margin of ischiomerus.

The branchial formula is shown in Table 1.

First pereopod robust, more or less compressed, usually reaching to median part of rostrum; distal end of upper margin of merus and carpus each with strong acute tooth; chela 0.4 - 0.7 times as long as carapace, 1.5 - 2.2 times as long as carpus; in large male, more robust than in female and young male, chela 0.9 - 1.1 times longer than carapace, 2.9 - 3.2 times

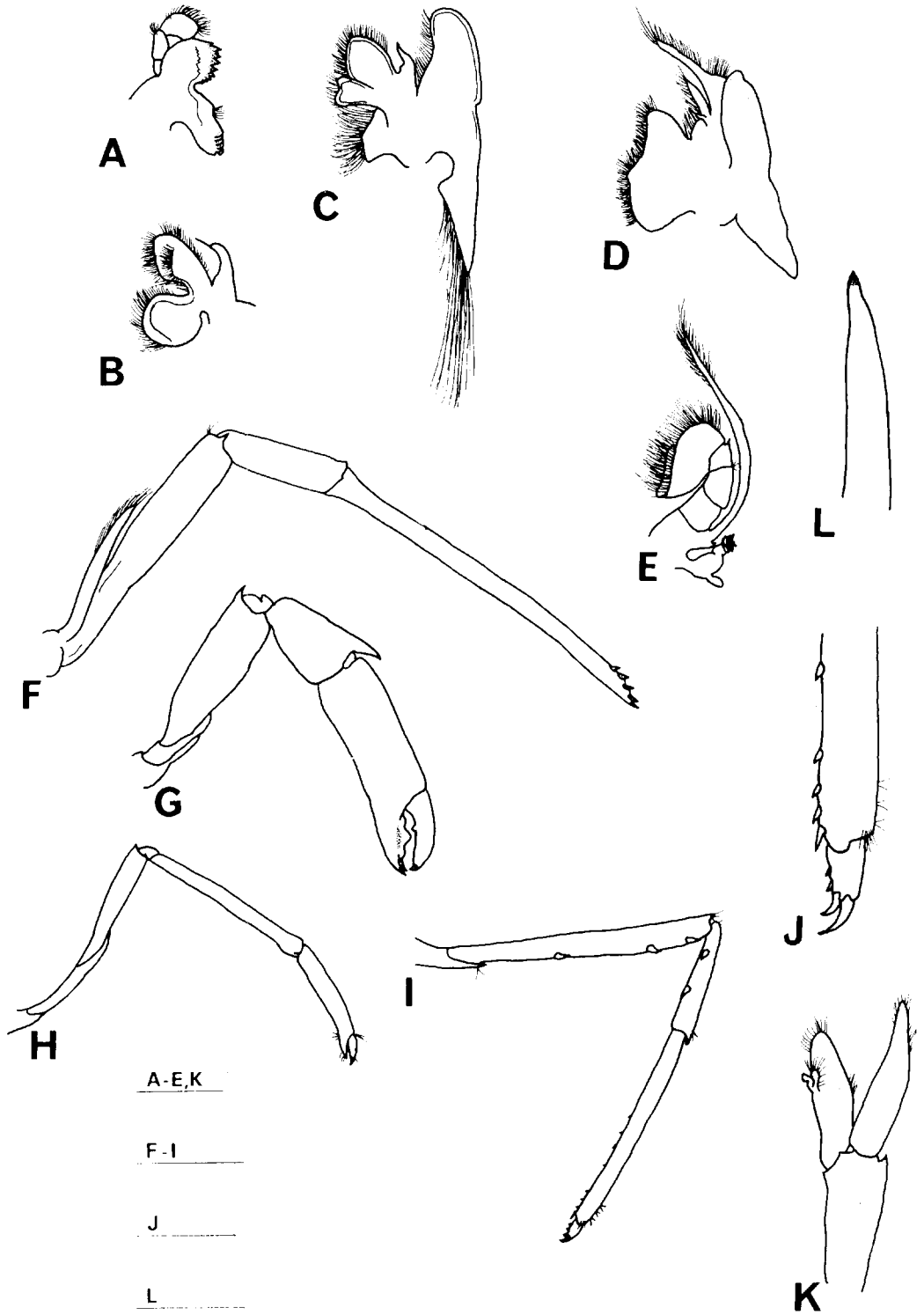
longer than carpus, broad distally, strongly curved movable finger opposing fixed finger; with well developed arthrobranch.

Second pereopod more slender than first pereopod; surface of palm entire, base of movable and fixed fingers sparsely fringed with setae, length of chela 0.3 - 0.4 times as long as carapace, 0.6 - 0.7 times as long as carpus; carpus 0.5 - 0.6 times as long as carapace; in female and young male, reaching to proximal two-thirds of rostrum, longer than first pereopod; in large male, extending to rostral apex, shorter than first pereopod; articular membrane with arthrobranch, smaller than that of first pereopod.

Last three pereopods moderately slender, similar to each other; ischium of each pereopod armed with single blunt spine at lower margin, or unarmed; carpus of each pereopod with two rather acute spines at outer surface, 0.3 - 0.4 times as long as carapace; dactylus of each pereopod with strong acute horny claw at its apex, three small acute spines posterior to terminal claw. Third pereopod usually reaching to rostral apex, but in large male, extending beyond rostral apex by proximal two-thirds of propodus; articular membrane with arthrobranch smaller than those of first and second pereopods; merus with three small equidistant spines on lower part of outer surface, 0.7 - 0.9 times longer than carapace, 2.0 - 2.4 times longer than carpus, 1.1 - 1.3 times longer than propodus; propodus armed with five to eight equidistant spinules at distal part of lower margin, most posterior spinules stronger than others, sparse setae at distal part of upper margin, 0.6 - 0.7 times as long as carapace; dactylus 5.3 - 8.0 % of merus. Fourth pereopod usually reaching to proximal two thirds of rostrum; merus with three spines (rarely four) similar to those of third pereopod, 0.7 - 0.8 times as long as carapace, 1.9 - 2.3 times as long as carpus, 1.1 - 1.3 times as long as propodus; propodus armed with spinules and setae like those of third pereopod, 0.5 - 0.7 times longer as carapace; dactylus 5.7 - 8.6% of merus. Fifth pereopod reaching to middle of rostral length; merus with two to four (usually three) small equidistant spines at lower part of outer surface, shorter than those of third and fourth pereopods, 0.6 - 0.7 times longer than carapace, 1.7 - 2.0 times longer than carpus, 0.9 - 1.1 times longer than propodus; propodus similar to those of two anterior pereopods, 0.6 - 0.7 times longer than carapace; dactylus 5.9 - 10.0 % of merus.

**Table 1.** Branchial formula of *Rhynchocinetes brucei* sp. nov.

	Maxillipeds			Pereopods				
	I	II	III	I	II	III	IV	V
Pleurobranchs				1	1	1	1	1
Arthrobranchs			2	1	1	1		
Podobranchs		1						
Epipods	1	1	1	1	1	1	1	1
Exopods	1	1	1					



**Fig. 3.** *Rhynchocinetes brucei* sp. nov., paratype male (A-K, 11.5 mm cl, NTM Cr.003618B; L, 14.5 mm cl, NTM Cr.003618C). **A**, mandible; **B**, maxillula; **C**, maxilla; **D**, first maxilliped; **E**, second maxilliped; **F**, third maxilliped; **G**, first pereopod; **H**, second pereopod; **I**, third pereopod; **J**, dactylus of third pereopod; **K**, male second pleopod; **L**, tip of third maxilliped of large male. Scales: A-E, K-L = 2 mm, F-I = 5 mm, J = 1 mm.

Endopod of male first pleopod distinctly broader than exopod of same pleopod, outer margin with dense setae at proximal half, with very small lobe at proximal two thirds of length; appendix interna situated at proximal four fifths of inner margin, apex with dense very small setae; distal part of endopod as broad as proximal part, weakly pointed distally.

Endopod of male second pleopod with appendices masculina and interna; appendix masculina with sparse setae at outer margin and more dense setae at its apex, as long as appendix interna.

Exopod of uropod rounded distally, with articulated acute spine and non-articulated small tooth at distal third of outer margin; distal end of endopod slightly rounded, fringed with dense setae on outer margin.

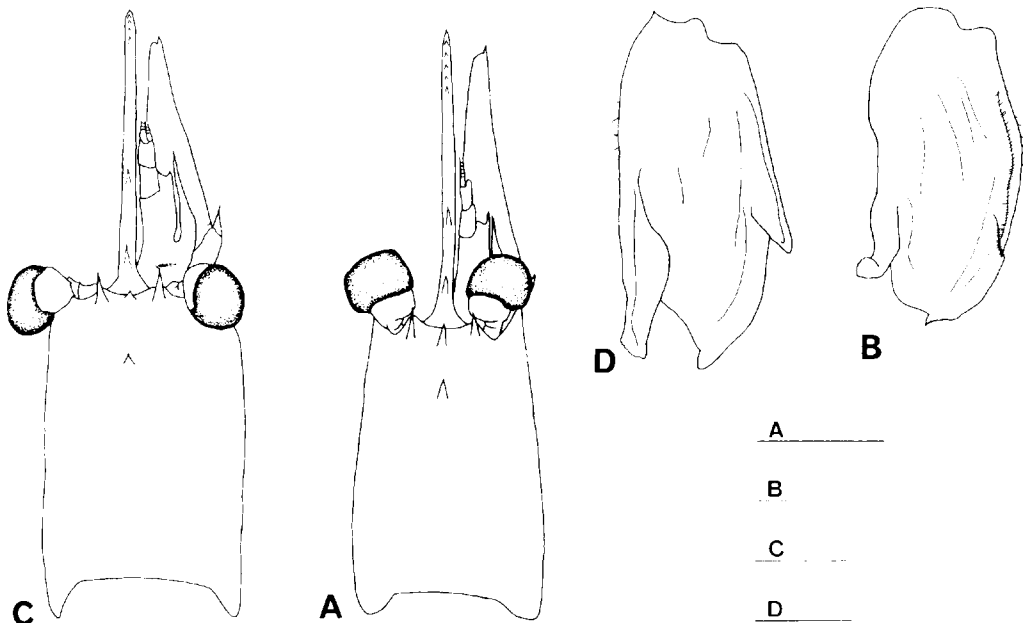
**Coloration.** Ground color of whole body rather hyaline, pale pinkish, with pattern of complicated red bands covering whole body; small white spots between red bands at lateral and dorsal surfaces of carapace. Third abdominal segment with large dark reddish median spot on dorsal surface. Rostrum with longitudinal red bands on lateral surface, rostral apex white. All segments of pereopods mottled with red and white, except for blackish terminal claws. Tail fan semi-translucent, with reddish band along each outer margin.

**Etymology.** *Rhynchocinetes brucei* is named in honour of Dr. A.J. Bruce who kindly sent me on loan several specimens of rhynchocinetid shrimps deposited in the Northern Territory Museum.

**Systematic Position.** *Rhynchocinetes brucei* resembles *R. rugulosus* in the presence of a single lobe on the outer margin of the endopod of the first pleopod in the male and the number of gills in the branchial formula. The present new species is, however, distinguished from *R. rugulosus* by the following differences.

1) In *R. brucei*, the stylocerite is usually shorter than the distolateral spine of the proximal segment of the antennular peduncle and fails to reach the distal margin of the next segment. In *R. rugulosus*, the stylocerite extends beyond the distolateral spine of the proximal segment and reaches to the middle part of the distal segment, except in very small specimens that are less than 3.3 mm cl. The antennular peduncle of *R. rugulosus* has been figured by McCulloch (1909).

2) The endopod of the first pleopod in the male of *R. brucei* is equally broad from the proximal to the distal part with a bluntly pointed distal end, and an indistinct small lobe is situated on the outer margin, whereas the width of the same endopod of *R. rugulosus* is



**Fig. 4.** Comparison of *Rhynchocinetes brucei* sp. nov. (A, paratype ovig. female, 10.3 mm cl, NTM Cr.003951; B, paratype male, 11.5 mm cl, NTM Cr.003618B) and *R. rugulosus* Stimpson, 1860 (C, ovig. female, 12.0 mm cl, NTM Cr.003616; D, male, 5.8 mm cl, NTM Cr.000343.) A, C, dorsal view of anterior part; B, D, endopod of male first pleopod. Scales: A, C=5 mm, B=1 mm, D=0.5 mm.



narrower distally and the outer margin has a distinct large lobe. It was possible to establish that the differences are not due to sexual dimorphism in the process of male growth, through the results of my examination of small (5.7 mm cl) to large (15.4 mm cl) series of *R. brucei* and by comparison with the detailed description of the endopod of *R. rugulosus* given by Hale (1941).

3) In life, *R. brucei* has a large dark median spot on the dorsal surface of the third abdominal segment, while *R. rugulosus* lacks such a median spot on the same segment, which is ornamented only with a red and white meshwork (Healy and Yaldwyn 1970; Coleman 1987).

There is an obvious similarity in color, having a large dark median spot on the third abdominal segment between *R. conspicuocellus* Okuno and Takeda, 1992a, and the present new species. The former differs, however, from the latter by lacking an arthrobranch on the third pereopod and lacking a lobe on the outer margin of the endopod of the first pleopod in the male.

#### DISCUSSION

The shrimps of the genus *Rhynchocinetes* are divided in two distinct species groups (Kemp 1925; Gordon 1936). One (*R. typus* species-group) is characterized by having a strong acute supraorbital spine and two teeth on the median carina of the carapace behind the distinct rostral articulation, the other (*R. rigens* species-group) by the absence of a supraorbital spine and having three teeth on the median carina behind the indistinct rostral articulation. The present new species is referred to the *R. typus* species-group.

*Rhynchocinetes brucei* is known from the Philippines, Hong Kong and the Great Barrier Reef in the tropical West Pacific. The range of this species may be, however, extended by further revisional studies of rhynchocinetid shrimps, as it is conceivable that some earlier scientists may have recorded the species under other names (e.g. *R. typus* or *R. rugulosus*).

According to Stimpson (1860), the type locality of *R. rugulosus* is "In portu Jacksoniensi Australiae", so the name of *R. rugulosus* is valid for the species occurring around Sydney and its neighbouring waters, the distinguishing characters of which are compared above with those of the present new species.

There are some records of hinge-beak shrimp from Hawaiian waters under the name of *R. rugulosus* (Rathbun 1906; Edmondson 1925; Edmondson 1952; Hiatt 1948). However, the Hawaiian specimens disagree with *R. rugulosus* and *R. brucei* in morphology and in the live color, based on my observation of a single rhynchocinetid specimen from Hawaii. I hope that additional Hawaiian specimens will be compared directly with specimens of *R. rugulosus* and *R. brucei*, to establish with certainty the systematic position of the Hawaiian species.

The species of the Australian *R. typus* species-group may be identified from the following key.

The Australian *Rhynchocinetes typus* species-group.

- 1 a. Third pereopod with arthrobranch ..... 2
- b. Third pereopod without arthrobranch ..... 4
- 2 a. Equidistant three teeth on proximal to median parts of rostral upper margin; outer margin of endopod of male first pleopod without lobe; third abdominal segment strongly humped posterodorsally .....  
    ..... *R. durbanensis* Gordon
- b. Two teeth on proximal to median parts of rostral upper margin; outer margin of endopod of male first pleopod with distinct lobe; third abdominal segment weakly humped posterodorsally ..... 3
- 3 a. Stylocerite reaches beyond tip of distolateral spine of antennular proximal segment; dorsal surface of third abdominal segment ornamented only with a red and white meshwork ..... *R. rugulosus* Stimpson
- b. Stylocerite less than or equal to tip of distolateral spine of antennular proximal segment; dorsal surface of third abdominal segment with distinct dark median spot .  
    ..... *R. brucei* sp. nov.
- 4 a. Second pereopod with arthrobranch .... 5
- b. Second pereopod without arthrobranch .  
    ..... *R. balssi* Gordon
- 5 a. Stylocerite reaches beyond tip of distolateral spine of antennular proximal segment; outer margin of endopod of male first pleopod without lobe ..... *R. australis* Hale
- b. Stylocerite does not extend to tip of distolateral spine of antennular proximal segment; outer margin of endopod of male first pleopod with distinct lobe .....  
    ..... *R. kuiteri* Tiefenbacher