

To Dr. Chace:
Many thanks for your kindness
to this study Junji Okuno

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Rhynchocinetes rathbunae, a New Shrimp from the Hawaiian Islands (Crustacea: Decapoda: Rhynchocinetidae)¹

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ABSTRACT: A new species of caridean shrimp of the family Rhynchocinetidae, *Rhynchocinetes rathbunae* Okuno, is described and illustrated based on six males, an ovigerous female, a second female, and a juvenile from the Hawaiian Islands. It is closely related to *R. brucei* Okuno from the tropical western Pacific and *R. rugulosus* Stimpson from southern Australian waters, but is readily distinguishable from the two latter species by absence of a podobranch on the second maxilliped, the longer rostrum, forms of the stylocerite and endopod of male first pleopod, meral dentition of the ambulatory pereopods, and the color in life.

IN THE ORIGINAL DESCRIPTION of *Rhynchocinetes brucei* Okuno, 1994, it was suggested that another Hawaiian rhynchocinetid shrimp in the collections of the B. P. Bishop Museum, Honolulu, Hawai'i, might be an undescribed species. Through the courtesy of L. G. Eldredge, I examined the specimens in question during a short visit to the museum. In addition, John Hoover, an underwater photographer in Honolulu, kindly sent me some specimens of the shrimp captured at Waimea Bay and Hanauma Bay, O'ahu. This shrimp resembles *R. brucei* and *R. rugulosus* Stimpson, 1860, but differs in morphology and the life color, and I describe it here as new to science. Abbreviations are as follows: CL: postorbital carapace length; BPBM: Bernice P. Bishop Museum, Honolulu, Hawai'i; CBM: Natural History Museum and Institute, Chiba, Japan; NSMT: National Science Museum, Tokyo, Japan; NTM: Northern Territory Museum, Darwin; USNM: National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Rhynchocinetes rathbunae Okuno, n. sp.
Figures 1–3, Tables 1, 2

Rhynchocinetes rugulosus: Rathbun, 1906, 911, fig. 64; Edmondson, 1952, 70 (in part), fig. 2 (not Stimpson, 1860).

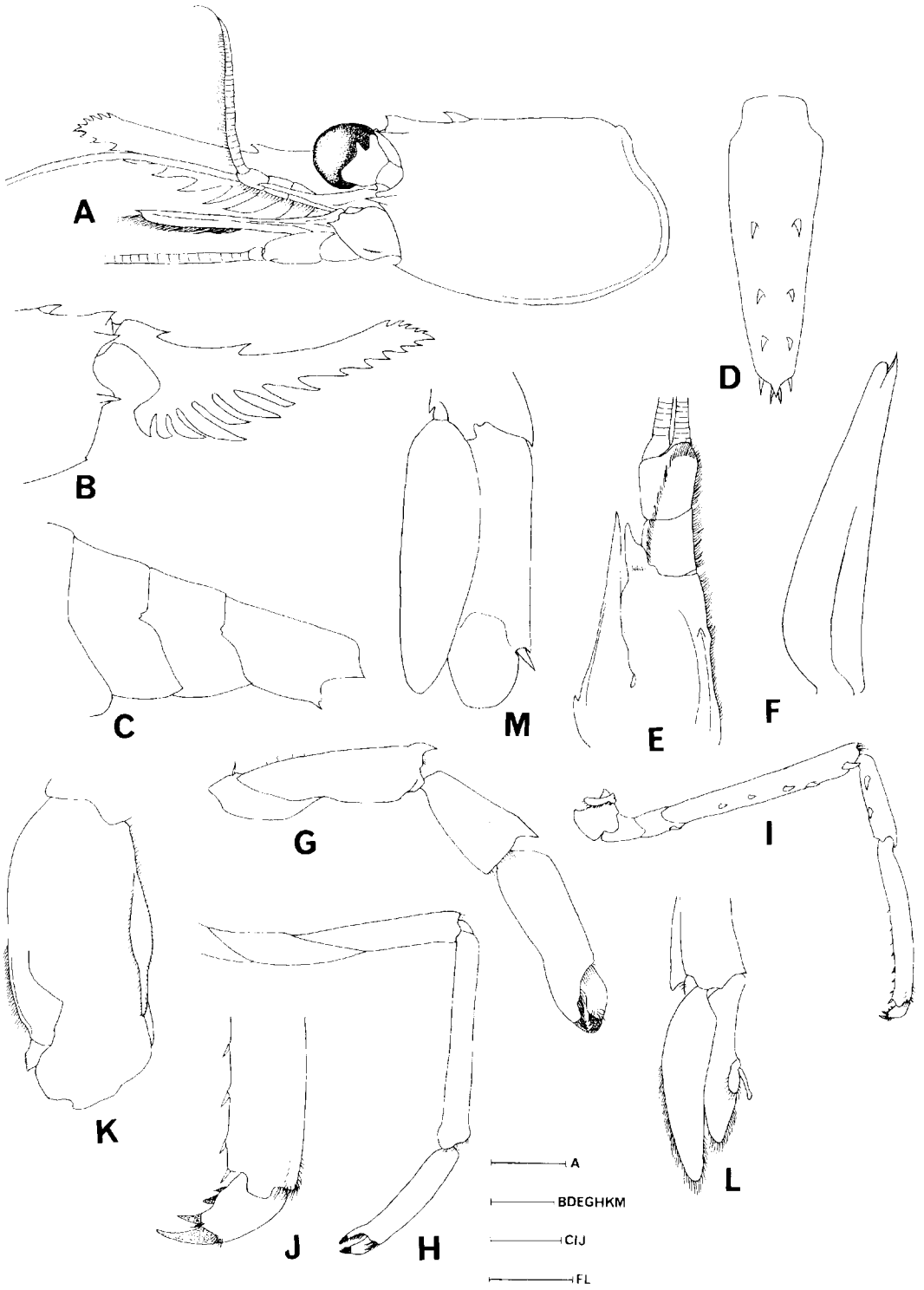
? *Rhynchocinetes rugulosus*: Edmondson, 1925, 6; Hiatt, 1948, 79 (not Stimpson, 1860).

TYPE MATERIAL: Holotype: Male (BPBM S11275, 7.0 mm CL), Hawaiian Islands, O'ahu, Waimea Bay, 21° 38.0' N, 158° 04.0' W, 29 November 1994, coll. J. Hoover and J. Earle. Paratypes: 1 male (BPBM S11276, 11.6 mm CL) and 1 ovigerous female (BPBM S11277, 8.0 mm CL), Hawaiian Islands, O'ahu, Kahe Pt., 21° 20.0' N, 158° 11.0' W, 4 February 1977; 3 males (NSMT Cr 2420, 11.3, 6.9, and 6.3 mm CL), same data as holotype; 1 female (CBM ZC 1964, 4.7 mm CL), Hawaiian Islands, O'ahu, Hanauma Bay, 21° 16.3' N, 157° 42.0' W, 25 June 1995, coll. J. Hoover; a juvenile (USNM 31008, 2.4 mm CL), French Frigate Shoals, 17–17½ fathoms (31–32 m) depth, coll. Steamer Albatross. **OTHER MATERIAL EXAMINED:** male (NSMT Cr 11104, 8.6 mm CL), Hawaiian Islands, exact collection site unknown, coll. aquarium traders.

DESCRIPTION: Body subcylindrical, typical form of *Rhynchocinetes*. Carapace (Figure 1A) covered with fine transverse striae, armed with two acute spines on median carina, anterior spine just behind rostral articulation, posterior spine feebly articulated with car-

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apace; supraorbital spine acute, directed anteriorly; antennal spine pointed, supported by feeble carina, directed anteriorly, extending beyond tip of supraorbital spine; pterygostomial angle with a small acute spine. Rostrum (Figure 1*B*) articulated with carapace, 1.3–1.6 times as long as carapace; dorsal margin armed with two teeth proximally, five to six small teeth subterminally; ventral margin armed with 12–13 teeth.

Abdominal somites (Figure 1*C*) covered with fine striae; first three somites with pleurae marginally rounded; sixth somite 0.5–0.7 times as long as carapace, 1.8–2.0 times as long as its distal depth, with an acute posteroventral spine; an acute anal spine between bases of uropods. Telson (Figure 1*D*) 0.6–0.8 times as long as carapace, 1.2 times as long as sixth abdominal somite, armed dorsally with three pairs of spines, the first pair at proximal two-fifths and the third pair at distal fifth; midpoint of posterior margin prominent, with three pairs of spinules, median pair longest.

Eye well developed, with large, globular cornea; stalk much more slender than cornea.

Antennular peduncle (Figure 1*E*) reaching about to midlength of scaphocerite; stylocerite long, reaching proximal third of distal segment; proximal segment with distolateral spine falling slightly short of distal margin of median segment, ventrally with an acute tooth at inner margin.

Scaphocerite (Figure 1*F*) 0.8–1.0 times as long as carapace, 3.6–4.3 times as long as maximum width, outer margin slightly concave distally; distolateral spine acute, exceeding end of lamella; basicerite with an acute ventrodistal spine and with rounded lobe just above spine.

Mandible (Figure 2*A*) with three-segmented palp, distal segment rounded, with dense setae marginally; incisor process stout, distal margin truncate, with blunt teeth; molar process subcylindrical, obliquely truncate

distally, with sparse long setae. Maxillula (Figure 2*B*) with slender palp with denticulate long seta distally; upper lacinia broad, with two rows of stout distal spines; lower lacinia slightly larger than the upper, with numerous spiniform distal setae. Maxilla (Figure 2*C*) with slender palp; coxal endite marginally oblique; distal endite bilobed, upper lobe distally rounded, slightly broader than the lower, lower lobe with indistinctly bilobed distal margin; scaphognathite well developed, anterior lobe with slightly rounded distal end, posterior lobe slender, elongate, directed posteriorly, inner margin with convex lobe proximally. First maxilliped (Figure 2*D*) with elongate, two-segmented palp with rounded distal end; proximal endite smaller than the distal, slightly rounded marginally; distal endite with distal margin concave; exopod well developed, caridean lobe large, flagellum slender; epipod bilobed, with feebly pointed distal margin. Second maxilliped (Figure 2*E*) without podobranch; epipod pointed distally, with the undivided, slightly triangular remains of a podobranch on upper margin proximally; dactylar segment with truncate distal margin; propodal segment broad, distomedial margin expanded; carpal segment with slightly convex distal end of outer margin. Third maxilliped (Figure 2*F*) slightly overreaching tip of scaphocerite; ultimate segment 0.5–0.7 times as long as carapace, 1.7–1.9 times as long as penultimate segment, with six dark corneous spines distally; penultimate segment 0.3–0.4 times as long as carapace; antepenultimate segment with a row of sparse setae laterally, with an acute distolateral spine; exopod well developed, falling slightly short of distal margin of antepenultimate segment.

Branchial formula as shown in Table 1.

First pereopod (Figure 1*G*) chelate, moderately robust, falling slightly short of midlength of scaphocerite; chela 0.4–0.5 times as long as carapace, 1.6–2.0 times as long as

◀ FIGURE 1. *Rhynchocinetes rathbunae*, n. sp., holotype male (BPBM S11275): *A*, carapace and cephalic appendages; *B*, anterior part of carapace with rostrum; *C*, fourth to sixth abdominal somites; *D*, telson; *E*, antennular peduncle, ventral view; *F*, scaphocerite (setae omitted); *G*, first pereopod; *H*, second pereopod; *I*, third pereopod; *J*, dactylus of third pereopod; *K*, endopod of first pleopod; *L*, second pleopod; *M*, uropod (setae omitted). Scales: *A*, 2.5 mm; *B*, *C*, *F*, *I*, 2.0 mm; *D*, *E*, *G*, *H*, *L*, *M*, 1.0 mm; *J*, *K*, 0.5 mm.

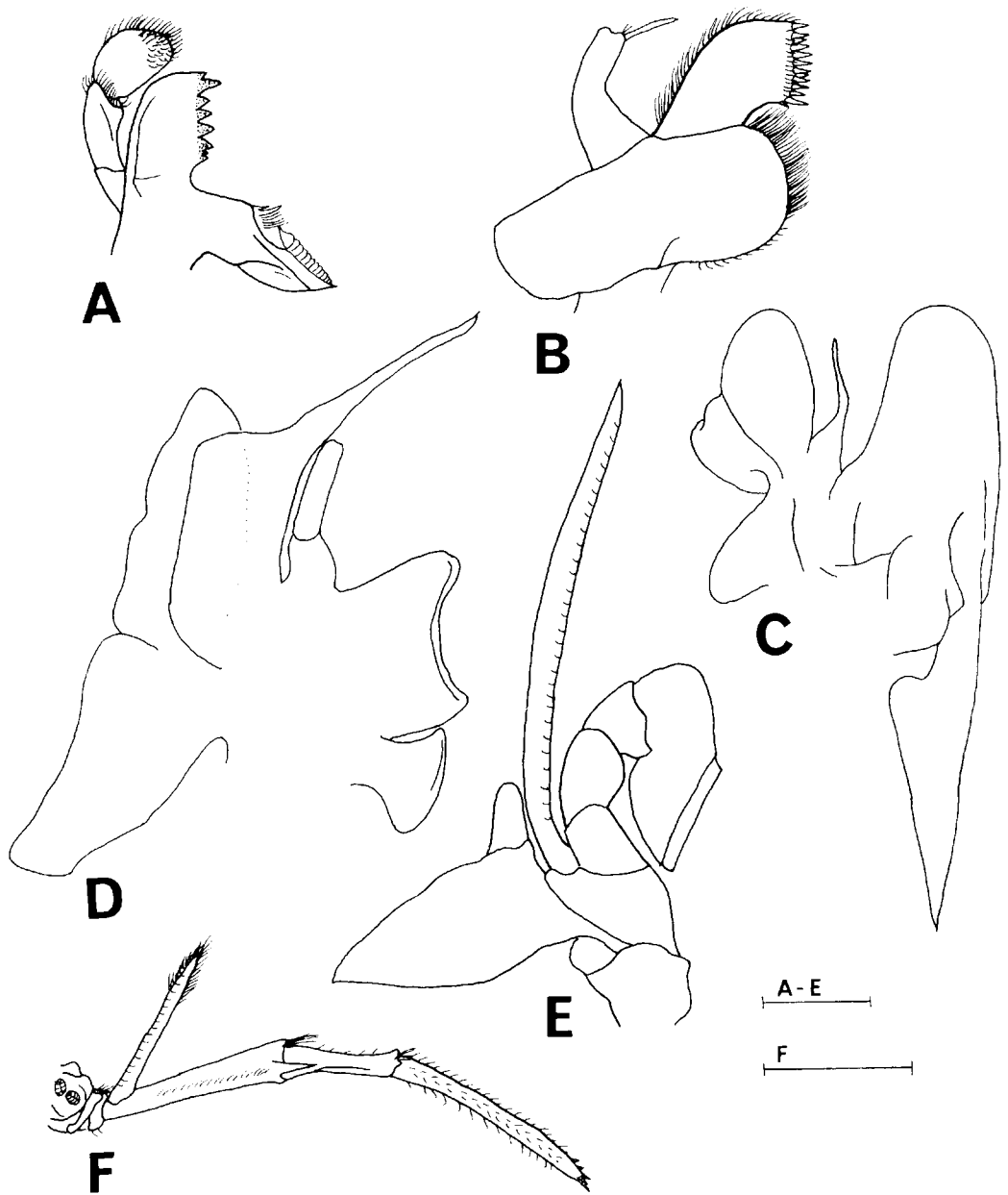


FIGURE 2. *Rhynchocinetes rathbunae*, n. sp., paratype male (BPBM S11276): A, mandible; B, maxillula; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Setae omitted on C, D, E. Scales: A-E, 1.0 mm; F, 5.0 mm.

TABLE 1
BRANCHIAL FORMULA OF
Rhynchocinetes rathbunae, N. SP.

	MAXILLIPEDS			PEREIOPODS				
	1	2	3	1	2	3	4	5
Pleurobranch	—	—	—	1	1	1	1	1
Arthrobranch	—	—	2	1	1	1	—	—
Podobranch	—	—	—	—	—	—	—	—
Epipod	1	1	1	1	1	1	1	—
Exopod	1	1	1	—	—	—	—	—

carpus, tips of both fingers with dark claws; carpus 0.2–0.3 times as long as carapace, with dorsal margin distally pointed; merus 1.6–1.8 times as long as carpus, with an acutely pointed spine at distal end of dorsal margin.

Second pereopod (Figure 1H) chelate, more slender than first pereopod, slightly overreaching midlength of scaphocerite; chela 0.3–0.4 times as long as carapace; carpus 0.4–0.5 times as long as carapace, 1.2–1.4 times as long as chela.

Third pereopod (Figure 1I) overreaching scaphocerite by propodal apex; ischium with an acute spine; merus 0.7–0.9 times as long as carapace, 2.2–2.5 times as long as carpus, with four to six almost equidistant acute spines; carpus 0.3–0.4 times as long as carapace, with two acute spines on outer surface; propodus 0.6–0.8 times as long as carapace, 1.9–2.0 times as long as carpus, with short equidistant spinules on flexor margin; dactylus (Figure 1J) with three accessory spines on flexor margin, decreasing in size proximally.

Fourth pereopod reaching distal third of scaphocerite, dentition resembling that of third pereopod; merus 0.7–0.9 times as long as carapace, 2.1–2.2 times as long as carpus; carpus 0.3–0.4 times as long as carapace; propodus 0.6–0.8 times as long as carapace, 1.7–2.0 times as long as carpus.

Fifth pereopod reaching proximal third of scaphocerite, dentitions of ischium and dactylus resembling those of third and fourth pereopods; merus 0.6–0.7 times as long as carapace, 1.7–2.0 times as long as carpus,

with four to five (rarely three) equidistant acute spines; dentition and proportion of carpus resembling those of fourth pereopod; propodus 0.5–0.7 times as long as carapace, 1.6–1.9 times as long as carpus.

Endopod of male first pleopod (Figure 1K) with distal end slightly pointed; developed appendix interna attaches midlength of inner margin, with numerous granules distally; small lobe at distal third of outer margin.

Endopod of male second pleopod (Figure 1L) with appendices masculina and interna attached at distal two-fifths of outer margin; appendix masculina broad, rounded, fringed with dense setae; appendix interna considerably more slender than appendix masculina, with numerous granules distally.

Uropodal endopod and exopod (Figure 1M) overreaching tip of telson; exopod with an articulated spine and a nonarticulated spine at distal fourth of outer margin, the former much longer than the latter.

COLORATION: Ground color of body generally transparent pink, carapace and first to fifth abdominal somites with labyrinth red lines, interspaced with white dots and lines. Rostral tip white. Third abdominal somite dorsally with a distinct, rounded (rarely oblong) median spot, sixth somite with longitudinal red lines extending to posterior margin of third somite. First and second pereopods mottled with red and white. Ambulatory pereopods with meri with red bands and carpi and propodi with red lines at the margin.

DISTRIBUTION: Known only from the Hawaiian Islands. It is usually found in the littoral zone (J. Hoover, pers. comm.).

ETYMOLOGY: This species is named in honor of Mary J. Rathbun (1860–1943), who originally suggested (1906) that a Hawaiian *Rhynchocinetes* was an undescribed species.

REMARKS: The juvenile paratype was recorded as *Rhynchocinetes rugulosus* by Rathbun (1906). Its rostrum is armed dorsally with four teeth distally and ventrally with 10 teeth decreasing in size distally. Rathbun's illustration is incorrect because the proximal

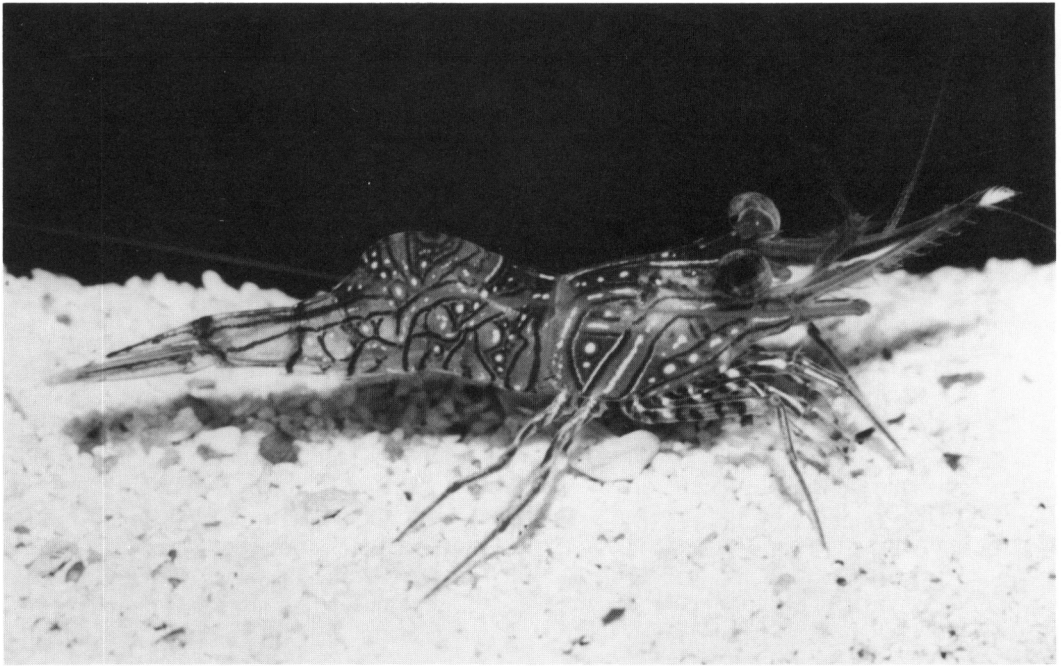


FIGURE 3. *Rhynchocinetes rathbunae*, n. sp., non type male (NSMT Cr 11104): Specimen alive in aquarium.

four teeth are distinctly smaller than the other teeth. The remarkable difference between the juvenile and the other specimens is the length of the stylocerite, which reaches the distal margin of the proximal antennular segment but not as far as the tip of the distolateral spine of the segment. The unusual length of the structure may represent intraspecific variation during development.

One of the male paratypes (BPBM S11276, 11.6 mm CL) has the telson armed dorsally with four and two dorsal spines on the left and right sides, respectively, and its posterior margin is armed with three pairs of spinules and an extra spinule on the left side. The form of the telson in this specimen is probably abnormal; the other specimens are considered to represent the typical form of the genus.

The third maxilliped and the first pereopod of the large male (11.3 mm CL) are distinctly different from those features in the females. The third maxilliped overreaches the scaphocerite by one-half of the ultimate

segment, which is distinctly longer (1.1 times the length of the carapace and 3.3 times the length of the penultimate segment) than those of the other specimens. The first pereopod reaches the distal fifth of the scaphocerite, and its chela is 0.6 times as long as the carapace and 2.3 times as long as the carpus.

DISCUSSION: The genus *Rhynchocinetes* s.l. is divided into two subgenera, *Rhynchocinetes* H. Milne Edwards, 1837, and *Cinetorhynchus* Holthuis, 1995 (Holthuis 1995). The former consists of 10 described species and the latter of 5 species (Okuno 1993, 1994a,b). The new species belongs to the subgenus *Rhynchocinetes*, having distinct rostral articulation, a supraorbital spine, two spines on the median carina of the carapace, and no posterolateral tergal spines on the fourth and fifth abdominal somites. It closely resembles *R. brucei* Okuno, 1994, and *R. rugulosus* Stimpson, 1860 [= *R. serratus* (H. Milne Edwards, 1837) ?] in the number of arthrobranches and the presence of a lobe on the

TABLE 2
COMPARISON OF CHARACTERS OF *Rhynchocinetes rathbunae*, N. SP. AND TWO RELATED SPECIES

	<i>R. rathbunae</i>	<i>R. brucei</i>	<i>R. rugulosus</i>
Rostrum/Carapace Stylocerite	1.3–1.6 Overreaching distal margin of 2nd antennular peduncle*	1.1–1.3 Not reaching distal margin of 2nd antennular peduncle	1.1–1.2 Overreaching distal margin of 2nd antennular peduncle
Podobranch on 2nd maxilliped	Absent	Present	Present
Meral spines			
3rd pereopod	4–6 (usually 5)	3	3–4
4th pereopod	5 (rarely 4)	3 (rarely 4)	3
5th pereopod	4–5 (rarely 3)	2–4 (usually 3)	3
Lobe on male 1st pleopodal endopod	Indistinct; at distal third of outer margin	Indistinct; at distal third of outer margin	Distinct; at midlength of outer margin
Median spot on 3rd abdominal somite	Present	Present	Absent

* Not present on the juvenile paratype.

outer margin of the male first pleopod. Specimens of *R. rathbunae* were compared with the type series of *R. brucei* and two males (NTM Cr 000343, 5.8 and 5.2 mm CL) and an ovigerous female (NTM Cr 003616, 12.0 mm CL) of *R. rugulosus*. The differences among the three species are summarized in Table 2. The most conspicuous diagnostic character of *R. rathbunae* is the absence of the podobranch on the epipod of the second maxilliped; in the other two species, a small podobranch occurs on the maxilliped.

Rhynchocinetes rathbunae seems to be endemic to the Hawaiian Islands, and its distributional range does not appear to overlap with those of the other 10 species belonging to the subgenus *Rhynchocinetes*. The distributions of the temperate and subtropical *Rhynchocinetes* species suggest that the range of each species is limited locally as follows: *R. australis* Hale, 1941, *R. kuiteri* Tiefenbacher, 1983, and *R. rugulosus* in southern Australian waters (Hale 1941, Tiefenbacher 1983, Okuno 1994a); *R. balssi* Gordon, 1936, in the southeastern Pacific from Juan Fernández to Lord Howe Islands (Gordon 1936, Holthuis 1972, Bruce 1985); *R. conspicio-cellus* Okuno & Takeda, 1992, and *R. uritai* Kubo, 1942, in central to southern Japanese waters (Kubo 1942, Okuno and Takeda 1992a); *R. typus* H. Milne Edwards, 1837,

along the coasts of Peru and Chile (Holthuis 1980). Of the two tropical species, *R. durbanensis* Gordon, 1936, is widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Ryukyu Islands, and *R. brucei* is known from the tropical western Pacific but they have not been recorded from the oceanic islands of the central Pacific (Okuno and Takeda 1992b, Okuno 1993, 1994a). The remaining species, *R. ikatere* Yaldwyn, 1971, is known only from deep waters off New Zealand at depths of 80–120 fathoms (146–220 m) (Yaldwyn 1971).

Previous authors have recorded a rhynchocinetid species identified as *R. rugulosus* from several localities in the Hawaiian Islands: French Frigate Shoals (Rathbun 1906), Laysan Island (Edmondson 1925), and off O'ahu (Hiatt 1948, Edmondson 1952). I could only re-examine the specimens recorded by Rathbun (1906) and Edmondson (1925). The specimen collected from Laysan Island (BPBM 1270, 3.7 mm CL) is dried and damaged, and the other specimens from the Hawaiian Islands have been lost. Although their taxonomic status was not determined morphologically, the distributional patterns discussed above suggest that the Hawaiian specimens previously recorded may be identical with *R. rathbunae*, except for the specimen illustrated by Edmondson (1952, fig. 2), which without

doubt can be referred to *R. rathbunae* because of the five meral spines on the fourth pereopod.

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