

## A new species of caridean shrimp of the family Styrodactylidae from the eastern Pacific Ocean

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*Abstract.*—Four specimens of shrimp of the family Styrodactylidae were collected at two stations off Baja California, Mexico, and California, U.S.A. These are the first specimens of the family reported from the eastern Pacific. The shrimp are described as a new species, *Bathystyrodactylus echinus*. The species can be recognized by the following features: rostrum straight, much longer than the carapace, bearing at least 23–27 dorsal and 18–25 ventral spines; eye small and without pigment, stylocerite slender and not reaching middle of first segment of antennular peduncle, carapace without prominent posterior dorsal hump, body set with minute spinules, posterior pereopods considerably longer than anterior two pair, slender and lacking fringe of setae.

Shrimp of the family Styrodactylidae are recognized by their peculiar first and second pereopods, which end in elongate but nearly equal fingers with setae on the cutting edges. These pereopods and the maxillipeds are densely setose. Species of the family are widely distributed from tropical to temperate regions (e.g., Cleva 1990a), although most of the species described to date have come from the tropical Indo-Pacific (Chace 1983; Cleva 1990b, 1994, 1997; Okuno and Tachikawa 2000). Chace (1983) and Cleva (1994) reviewed the members of the family, described new species, and provided keys. Hanamura and Takeda (1996) described an additional genus, *Bathystyrodactylus*, for a new species (*B. inflatus*) from off Taiwan (and for the former *Styrodactylus bathyalis* from the Coral Sea), bringing to 5 the number of recognized genera in the family (*Styrodactylus*, *Neostyrodactylus*, *Parastyrodactylus*, *Styrodactyloides*, and *Bathystyrodactylus*). There have been no previous reports of the family in the eastern Pacific Ocean.

While sorting specimens in the Benthic

Invertebrate Collection of Scripps Institution of Oceanography, we found four specimens of shrimp of this family from three stations taken off California, U.S.A., and Baja California, Mexico. The specimens include both males and females. We compared these specimens with specimens of *Styrodactylus rectirostris* in the collections of Texas A&M University (catalog number 2-7212, Oregon station 5916) and with published descriptions of other species in the family. The specimens represent an unknown species of *Bathystyrodactylus*, described herein.

### Systematic Account

*Bathystyrodactylus echinus*, new species  
Figs. 1–5

*Holotype:* Male, carapace length (CL) 32.7. Basin off Magdalena Bay, Baja California, Mexico (24°35'N, 113°25'W), 3563–3621 m, 6-foot Sigsbee trawl, 24 June 1965, ship *Horizon* sta. MV65-I-38, Carl Hubbs, collector; Scripps Institution of

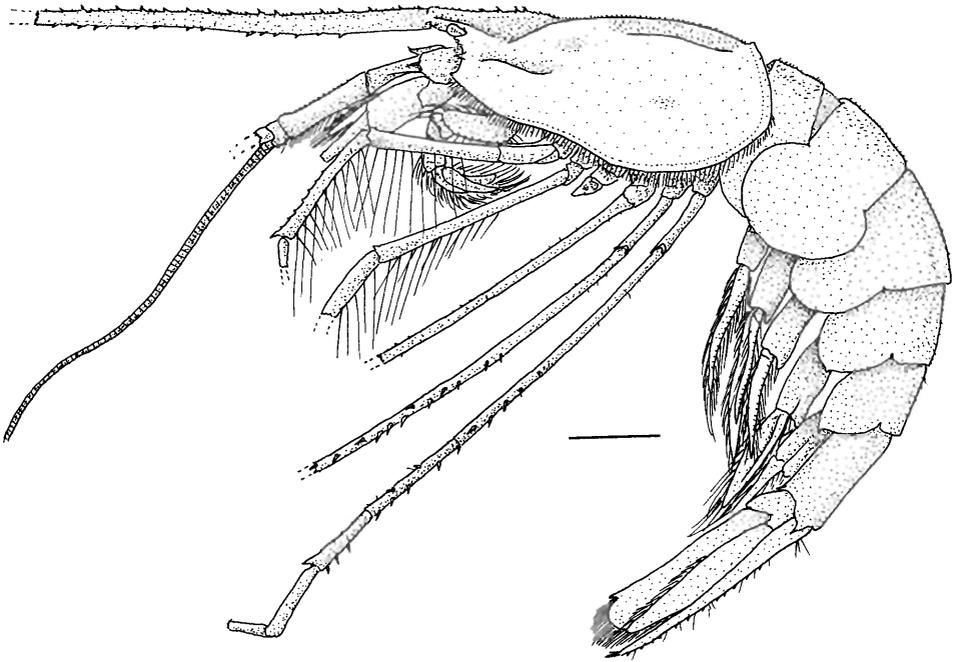


Fig. 1. *Bathystylodactylus echinus*, new species, male holotype, Scripps Institution of Oceanography C3188. Scale bar = 10.0 mm.

Oceanography (SIO) catalog number C3188.

*Paratypes:* Male, CL 41.4, same station as holotype, LACM CR 1965-349.1 (Natural History Museum of Los Angeles County). Female, CL 29.7. Basin off Magdalena Bay, Baja California, Mexico (24°23'N, 113°17'W), 3427–3621 m, 45-foot otter trawl, 25 June 1965, ship *Horizon* 2 sta., MV65-I-39, C. Hubbs, SIO cat. no. 3203. Female CL 27.6 Patton Escarpment (32°25'N, 120°40'W), 3689–3630 m, 40-foot otter trawl, 7 Feb. 1981, ship *New Horizon* sta. 133, collector S. Luke, SIO cat. no. C10324.

*Description:* Rostrum (Figs. 1, 2B, C) nearly straight, nearly 2× length of carapace but broken in all specimens, with 23–27 movable dorsal and 18–25 ventral spines; series of 7–9 minute spinules on carapace just posterior to rostrum proper, long setae along distal ventrolateral surface. Carapace (Fig. 2A) with hepatic depression well delineated. Antennal and branchiostegal spines short but obvious, antennal spine

located ventral to suborbital angle. Lateral surface of carapace inflated over branchial region, suprbranchial carina curved. Area posterior to eye and antennal origin slightly depressed. Anterior regions of carapace set with small, simple, movable spinules, posterior regions punctate or with few spinules.

Abdomen (Fig. 1) with small spinules on dorsal and lateral surfaces, somites one and two rounded dorsally, somite three weakly carinate dorsally; somite four rounded to weakly carinate, with or without shallow depression interrupting dorsal carina; pleura of somites rounded, those of somites four and five (Fig. 5B) each with sharp posteroventral spine; one specimen with minute spine on pleuron of somite three. Telson (Fig. 5C, E) 8× longer than wide, tapering to apex, with 11–13 pairs of dorsolateral spines located on weak ridges and numerous small spinules; two mesial spines flanking apex on either side. (Apex of telson preserved in only one specimen; observed asymmetry may be due to injury.)

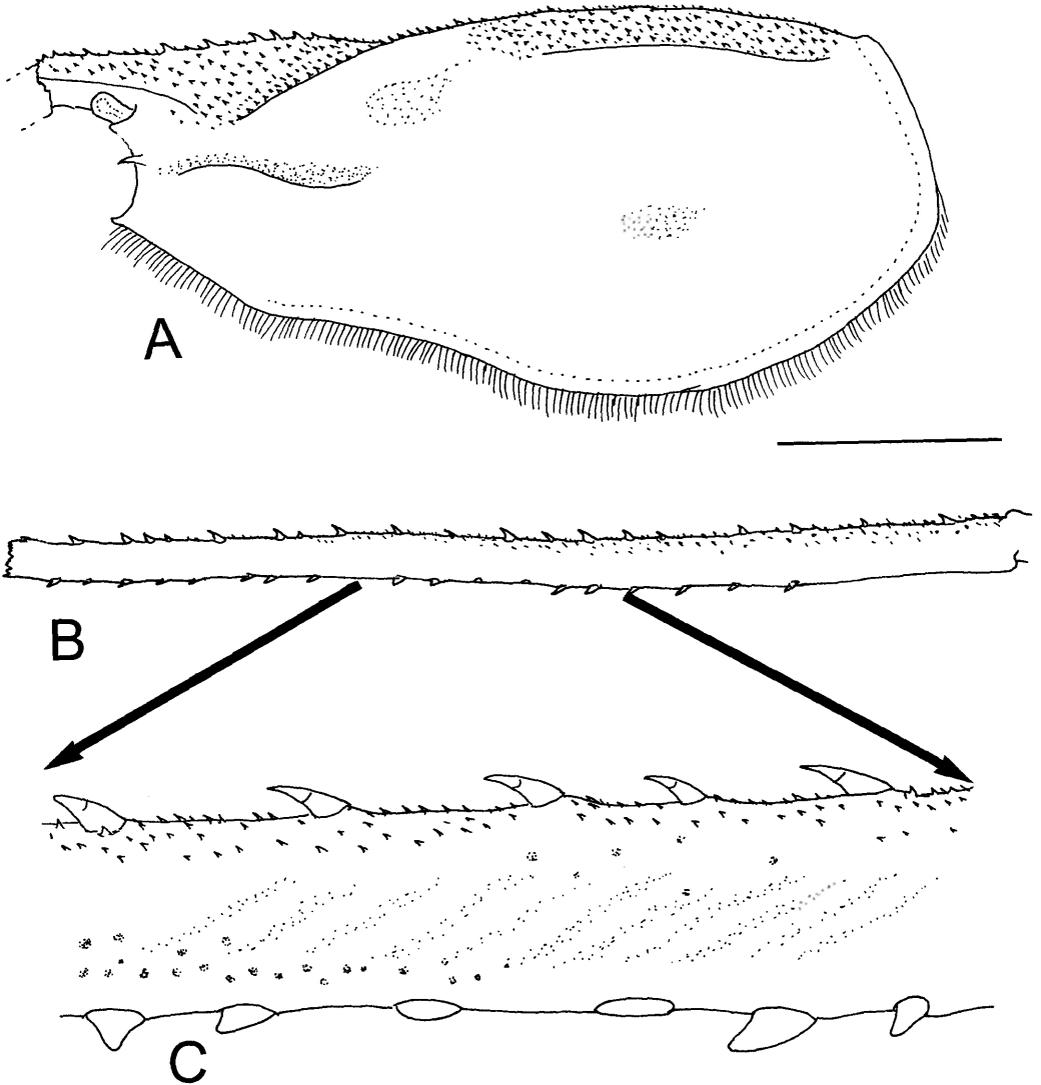


Fig. 2. *Bathystylodactylus echinus*, new species, male holotype, carapace and rostrum. A, carapace and eye, lateral view. B, rostrum (attached at area of dashed lines in A and illustrated at same scale as A). C, higher magnification of region of rostrum shown in B and denoted by arrows. Scale bar = 10.0 mm A, B; 2.5 mm C.

Eyes (Figs. 1, 2A, 5A) reduced, cornea without trace of pigment.

Antennular peduncle (Fig. 5A) elongate. Stylocerite slender, not reaching middle of first segment. First and second segments subequal in length, third segment very short. Antennal scale (scaphocerite) more than 4× long as broad, outer margin slightly concave, with microscopic spinules, not reaching end of second segment of anten-

nular peduncle, blade exceeding distolateral spine. Carpocerite covered by minute spinules, reaching second segment of antennular peduncle. Basicerite bearing strong lateral spine.

Mandible (Fig. 3A) with molar process bearing teeth in the following configuration: 2 small, one large, 4 small and large blunt process; stout, 2-jointed palp present. First maxilla (Fig. 3B) with distal endite broad

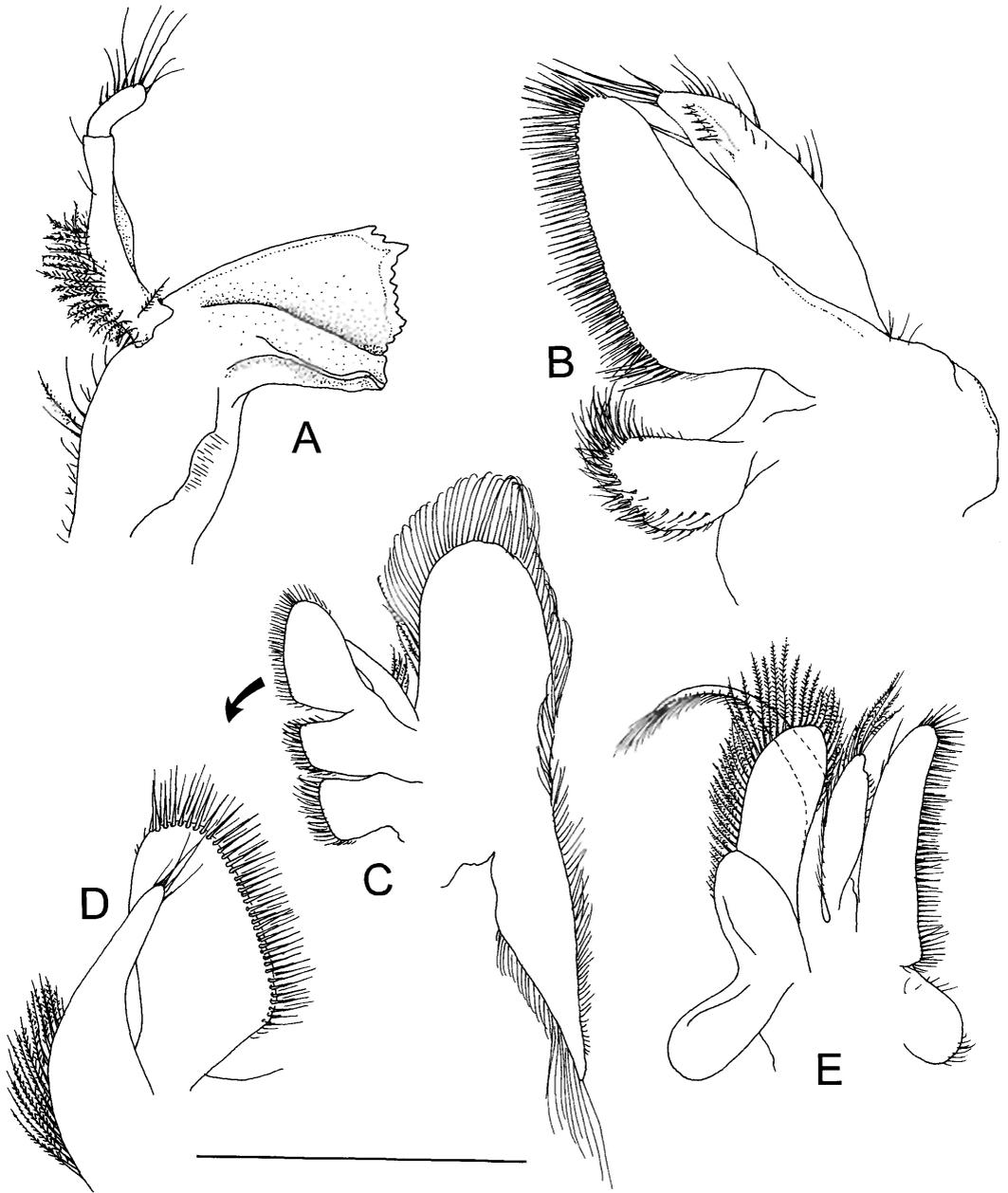


Fig. 3. *Bathystylocdactylus echinus*, new species, male paratype (LACM CR 1965-349.1). A, mandible; B, first maxilla; C, second maxilla; D, inner surface of second maxilla slightly enlarged and showing palp; E, first maxilliped. Scale bar = 5.0 mm A, B, D; 10.0 mm C, E.

and with stiff mesial setae; proximal endite curved inward and ending in brush of setae; palp ending in long setae and having tufts of setae on lateral surface. Second maxilla (Fig. 3C, D) with distal endite larger than

2 more proximal endites; long palp ending in 5 setae, scaphognathite with anterior half rounded, posterior half slender and curved mesially, bearing long setae. First maxilliped (Fig. 3E) with long distal and short

proximal endites; palp reaching 3/4 length of distal endite and ending in tuft of setae; exopod with lash, well developed caridean lobe and deeply bilobed epipod.

Second maxilliped (Fig. 4A) much larger than inner mouthparts, with exopod having lash and reaching end of basal segments; podobranch and epipod present; basal segments fringed with stiff curved setae; antepenultimate segment short, with long simple setae on flexor margin at articulation with basal segments; penultimate segment with fringe of long setae on flexor margin; two terminal segments; that on flexor side longer than one on extensor side, both fringed with long setae. Third maxilliped (Fig. 4B) setose, with arthrobranch but without exopod, exceeding antennular peduncle by about length of distal segment. Ultimate segment longest, with dense setae on flexor side. Penultimate segment with long, pinnately branched setae. Antepenultimate segment with both long and short setae.

Pereopods all lacking exopods or epipods. First pereopod (Fig. 4B, C) with entire flexor surface fringed with long setae, merus longer than carpus, propodus about equal in length to carpus, ending in elongate chela (Fig. 4C); fingers simple, with long setae and shorter spine-like setae along cutting edges. Second pereopod similar to first. Third to fifth pereopods (Fig. 1) elongate, with few scattered setae; merus of third pereopod with 8–10 spines on flexor and lateral surfaces; merus of fourth pereopod with 15, merus of fifth pereopod 14; carpus shorter than merus; propodus broken and dactylus missing in all specimens.

All pleopods densely setose. First pleopod shorter than second to fifth pleopods. Male second pleopod (Fig. 4D, E) with appendix interna and appendix masculina, appendix masculina reaching nearly 1/2 length of appendix interna, with apex notched and bearing small hooks.

Lateral branch of uropod with spinules, margin nearly straight, two small teeth by

suture (Fig. 5D). Uropods shorter than telson.

*Etymology.*—The specific name is derived from the Greek word for spiny.

*Remarks.*—The new species can be assigned to the genus *Bathystylodactylus* according to the features given by Hanamura and Takeda (1996). The new species bears a well-developed and two-jointed mandibular palp. Both sexes bear well-developed arthrobranchs on the four anterior pereopodal somites. There is no supraorbital spine. The stylocerite falls far short of the mesiodistal margin of the basal segment. There are no fringes of setae on pereopods 3–5, as there are in *Stylodactylus rectirostris* and other species of *Stylodactylus*. Hanamura and Takeda (1996) mentioned that the third to fifth abdominal somites were “weakly carinate” dorsally. In our specimens, only somite three is consistently weakly carinate. The posterior three pereopods definitely are longer than the anterior two in the new species, but due to breakage, their relative lengths to each other cannot be determined.

Two species of *Bathystylodactylus* have been described previously: *B. bathyalis* (Cleva, 1994), from the Coral Sea (as *Stylodactylus bathyalis*); and *B. inflatus* Hanamura and Takeda (1996), from off Taiwan (Hanamura and Takeda 1996). *Bathystylodactylus echinus* can be distinguished from the former by its curved rostrum and characteristic sharp spine on the ventral margin of abdominal pleuron three. Like *Bathystylodactylus inflatus*, *B. echinus* has a straight rostrum with numerous dorsal and ventral spines. The pleura of the fourth and fifth abdominal somites each bear a posteroverventral spine. However, in *B. inflatus* the carapace has a marked wide elevation near the posterodorsal margin. This is not present in *B. echinus*. The shape of the supra-branchial carina is more sinuous in *B. inflatus* than in *B. echinus*. In *B. inflatus*, there are 11 spinules on the carapace posterior to the rostrum; in *B. echinus*, there are 8–9. In *B. inflatus*, there are 9–10 dorsal rostral

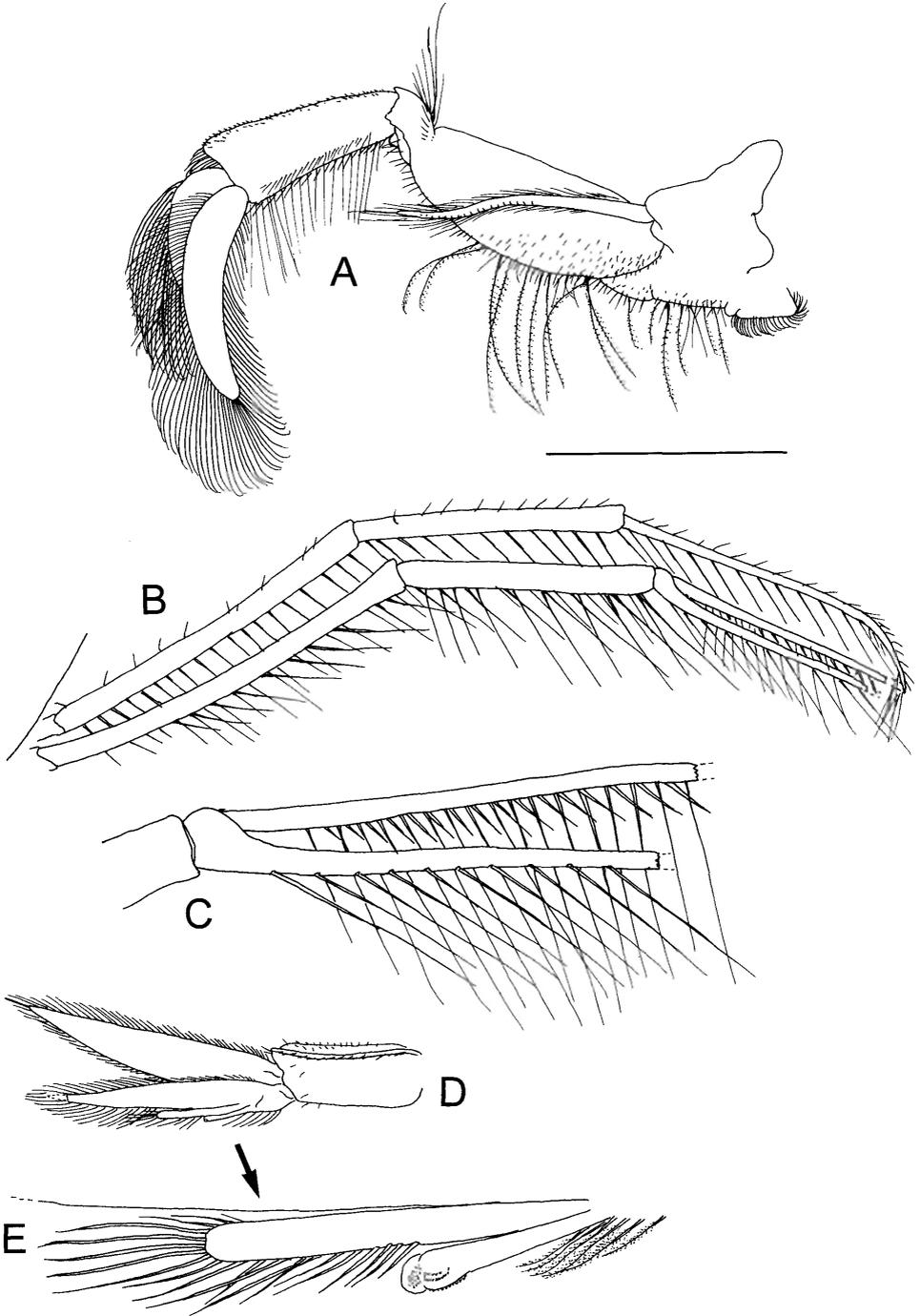


Fig. 4. *Bathylstylodactylus echinus*, new species, male paratype (LACM CR 1965-349.1) (A) and holotype (SIO C3188) (B-E). A, second maxilliped (paratype). B, right third maxilliped (upper appendage) and first pereopod (holotype). C, higher magnification of chela of first pereopod (tips of fingers broken). D, second pleopod (holotype). E, higher magnification of appendix interna and appendix masculina (arrow from D). Scale bar = 10.0 mm A, E, E; 7.5 mm B, C.

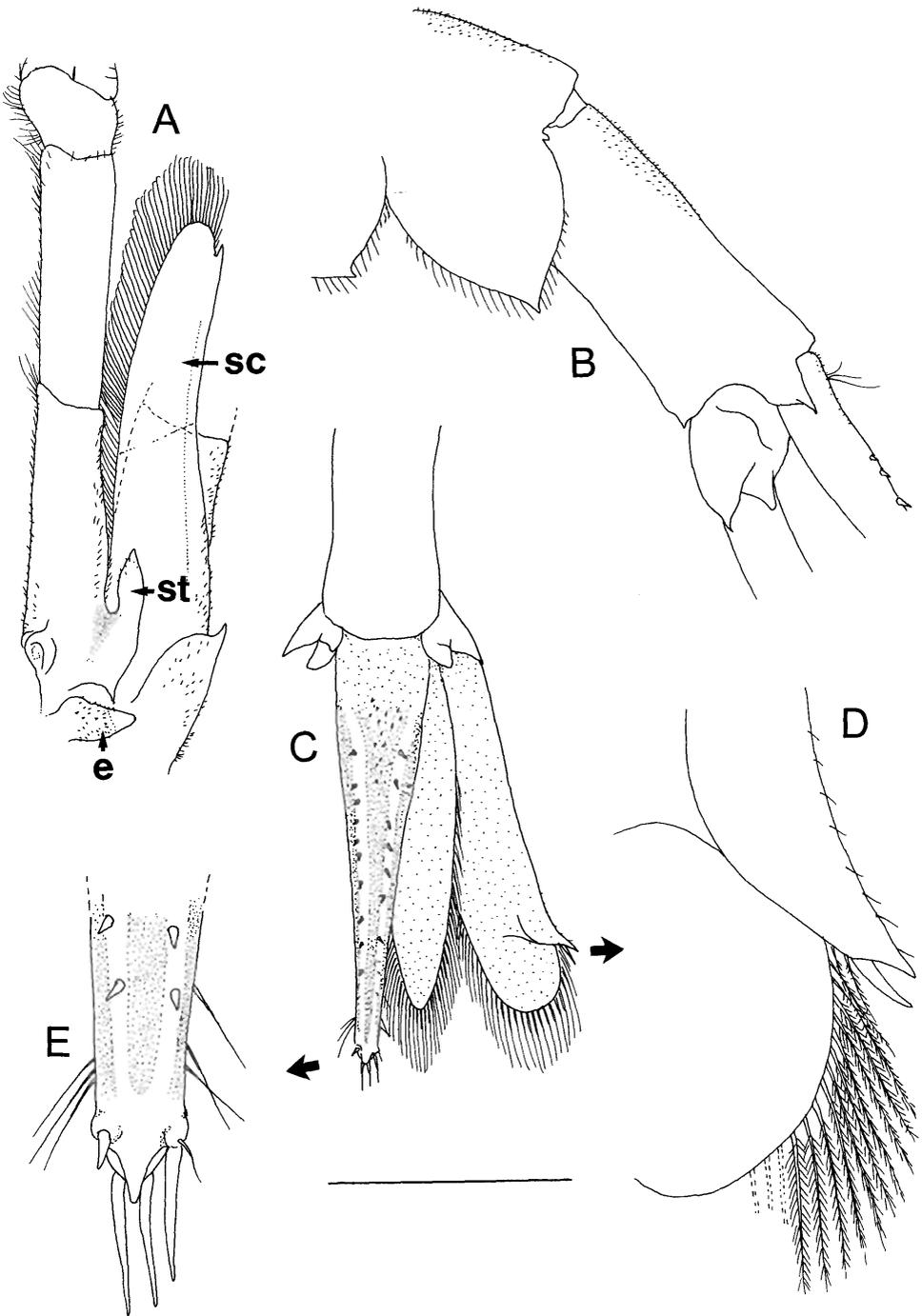


Fig. 5. *Bathystylodactylus echinus*, new species, male paratype (A) and holotype (B-E). An, antennule, antenna, and eye (e), right side, dorsal view, male paratype (LACM CR 1965-349.1). sc = scaphocerite; st = stylocerite. B, lateral view of abdominal somite 6 plus portions of the telson, uropods, and pleurae of somites 4 and 5, holotype. C, telson and right uropods, dorsal view, holotype. D, higher magnification of distolateral area of outer uropod (arrow from C). E, higher magnification of tip of telson (arrow from C). Scale bar = 10.0 mm A, B; 7.5 mm C; 3.75 mm D, E.

spines located proximally to the origin of the first ventral rostral spine; in *B. echinus*, there are no more than 4. The integument of *B. inflatus* was described as "thin" and the body consequently "soft." In *B. echinus*, the integument appears to us to be typical of a benthic caridean, and not membranous (as seen in midwater species of the Oplophoridae, for example).

Cleva (1994) and Hanamura and Takeda (1966) described the body of *Bathystylodactylus* species as "pubescent." Their illustrations show a very light coating of pile. In *B. echinus*, the spinules on the body are characteristic and easily seen, especially on the dorsal aspect of the carapace. These spinules conform in shape and structure to tactile or vibrational sensory structures seen in other crustaceans (Cohen and Dijkgraaf 1961).

*Bathystylodactylus echinus* is the largest and deepest species known in its family. It was collected with the flatback lobster *Willemoesia inornata* Faxon at stations MV65-I-38 and MV65-I-39, and with the galatheid crab *Munidopsis antonii* (A. Milne-Edwards) at station MV65-I-39.

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#### Literature Cited

- Chace, F. A. Jr. 1983. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, part 1. Family Stylo-dactylidae.—Smithsonian Contributions to Zoology 381: 1–21.
- Cleva, R. 1990a. Sur les Stylo-dactylidae (Crustacea, Decapoda, Caridea) de l'Atlantique.—Bulletin Muséum National d'Histoire Naturelle 4, sér. 12, sect. A, 1: 165–176.
- . 1990b. Crustacea Decapoda: les genres et les espèces indo-ouest pacifiques de Stylo-dactylidae. Pp. 71–136 in A. Crosnier, Résultats des Campagnes MUSORSTOM, vol. 6.—Mémoires du Muséum National d'Histoire Naturelle (A), 145.
- . 1994. Some Australian Stylo-dactylidae (Crustacea: Decapoda) with descriptions of two new species.—The Beagle, Records of the Museum and Art Galleries of the Northern Territory 11: 53–64.
- . 1997. Crustacea Decapoda: Stylo-dactylidae récoltés en Indonésie, aux îles Wallis et Futuna et au Vanuatu (Campagnes KARUBAR, MUSORSTOM 7 et 8). Données complémentaires sur les Stylo-dactylidae de Nouvelle-Calédonie. Pp. 385–407 in A. Crosnier & P. Bouchet, eds., Résultats des Campagnes MUSORSTOM, 16. Mémoires du Muséum National d'Histoire Naturelle, Paris 172.
- Cohen, M. J., & S. Dijkgraaf. 1961. Chapter 2. Mechanoreception. Pp. 65–108 in T. H. Waterman, ed., The physiology of Crustacea, vol. II. Academic Press, New York, 681 pp.
- Hanamura, Y., & M. Takeda. 1966. Establishment of a new genus *Bathystylodactylus* (Crustacea: Decapoda: Stylo-dactylidae), with description of a new species from northwestern Pacific.—Zoological Science 13:929–934.
- Okuno, J., & H. Tachikawa. 2000. A new species of the genus *Neostylodactylus* Hayashi & Miyake, 1968 (Crustacea, Decapoda: Stylo-dactylidae) from southern Japan.—Proceedings of the Biological Society of Washington 113:39–47.