

The genus *Coralaxius* redefined, with the description of two new species (Crustacea: Decapoda: Axiidae)

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(Accepted 28 July 1993)

The genus *Coralaxius* is rediagnosed, and the type species *C. nodulosus* (Meinert, 1877), the holotype of which was found to be identical with *C. abelei* Kensley and Gore, 1982, is redescribed. The two new species of *Coralaxius* are described, viz. *C. galapagensis* from the Galapagos Islands, and *C. indopacificus* from Fiji and the Comoro Islands. On the basis of carapace, gill and appendage characters, it is concluded that *C. indopacificus* is more primitive than the other two species. The genus is thought to have had a tethyan distribution, with the eastern Pacific representative being cut off from the western Atlantic form with the raising of the Isthmus of Panama.

KEYWORDS: Crustacea: Decapoda: Axiidae, *Coralaxius*, taxonomy, Caribbean, Galapagos, Indo-West Pacific.

Introduction

The genus *Coralaxius* was established by Kensley and Gore (1982) for their new species, the cryptic coral reef-inhabiting *C. abelei*, the type localities being the Florida keys and the barrier reef of Belize, Central America. It has since been found that the species had been described by Meinert in 1877, but that an apparent confusion of the collecting locality had left the species unrecognized. With the examination of Meinert's type, and collection of related material from three widely separated locations, it was decided to rediagnose the genus and describe two new species.

Material and methods

The Caribbean material came from a variety of collectors, including the author. Material was found either by breaking open chunks of dead coral, or from rotenone sampling stations carried out during reef research programs. The Indo-Pacific material was deposited as unidentified material in the Smithsonian collections. All figures and micrographs are by the author. All material is housed in the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution (USNM). The carapace length (cl) is measured from the base of the rostrum to the posterior margin of the carapace.

Systematic account

Family AXIIDAE Huxley, 1879

Genus *Coralaxius* Kensley and Gore, 1982

Coralaxius Kensley and Gore, 1982: 1278; Sakai and de Saint Laurent, 1989: 2, 10.

Type species. By original designation, *Coralaxius abelei* Kensley and Gore, 1982: 1278 [= *Axius nodulosus* Meinert, 1877].

Type locality. Unknown for *A. nodulosus*, assumed to be West Indies.

Gender. Masculine.

Diagnosis. Gonochoristic. Carapace with supraocular spine present; post-cervical spines and carina lacking; rostrum at same level as anterior carapace; rostral margins unarmed or with 1 or 2 pairs of small spines; median carina entire or with 2 spines anterior to tubercle; submedian carina absent; lateral carinae dentate. Sternite of thoracic segment 6 forming pair of hollowed submedian lobes accommodating bases of pereopod 3; sternite of segment 7 similar in male and female, anteriorly narrowed into narrow contiguous lobes, broadening posteriorly into pair of slightly hollowed triangular lobes, accommodating base of pereopod 4 along anterolateral margin.

Eye well pigmented, stalk longer than eye; facets hexagonal. Antennal acicle reduced to small bifid or trifid scale. Epistome bearing strong median conical spine. Maxilla scaphognathite bearing spinulose flagellum. Exopod and epipod present on maxillipeds 1–3, exopod of maxilliped 3 with flagellum flexed at angle to protopod. Pereopods lacking exopods, with vestigial epipods on pereopods 1 and 2; neither propodi nor dactyli of 3–5 expanded; pereopod 1, chelae not sexually dimorphic, lateral (outer) surfaces of dactyli, propodi, and carpi tuberculate; chelae relatively large, approximately equal to carapace in length, differentiated into broad, robust (crushing?) chela and more slender (cutting?) chela, cutting edge of fixed finger of smaller chela bearing 2 strong elongate teeth. Pereopod 2 chelate. Dactyli of pereopods 3–5 simple, although that of 5 sometimes approaching biunguiculate condition. Branchial formula variable. Pleopodal rami elongate-slender; appendix interna present on 2–5; pleopod 1 ♂ present, of 2 articles, distal article expanded, bearing small patch of hooks; pleopod 2 ♂ with bilobed appendix masculina; pleopod 1 ♀ of single ramus. Uropod with lateral ramus having distal suture. Telson longer than wide, bearing submedian dorsal spines, with large posterolateral mobile spine.

Remarks. Examination of the animal supposedly collected from the North Sea off Nymindégab by Krøyer and described by Meinert (1877) as *Axius nodulosus* reveals that it is unquestionably a mature male of *Coralaxius abelei*. No differences could be detected between this animal and the abundant, more recent material from the Caribbean. Given that all three species of *Coralaxius* have been recorded from tropical coral reef habitats, the North Sea species would be remarkable, especially as it has never been collected again. I suggest that Meinert's specimen in the Zoological Museum, Copenhagen, came from the Caribbean, (perhaps from the then Danish West Indies), and that the collection data became confused at some point. Torben Wolff (in litt. 1991) states that the original label does not exist, and that the green label accompanying the specimen was written either by Schioedte or under his supervision somewhere between the publication of the description in 1877 and his death in 1885. The white label accompanying the specimen was rewritten by K. Stephensen.

Sakai and de Saint Laurent (1989) place the genus *Coralaxius* in the new subfamily of the Axiidae, the Coralaxiinae. Examination of the diagnosis of this subfamily becomes necessary, especially with the discovery of two further species of *Coralaxius*. Several characters mentioned in the diagnosis occur in other genera of the Axiidae: reduced, bi- or trispinose antennal acicle (reduced and bispinose in *C. indopacificus* as well as in species of *Eutrichocheles*); the subterminal unguis of the dactylus of pereopods 3–5 stands at the end of a series of spines increasing in size

distally, as in species of *Allaxius* or *Eiconaxius*); exopod of maxillipeds 2 and 3 consisting of a relatively elongate basal article and a strongly flexed distal flagellar portion (aside from the flexure, this is no different from several genera, e.g. *Parascytoleptus*). The feature of the epistome being covered laterally by the anterior branchiostegite is open to interpretation; in all three species of *Coralaxius*, the epistome (which bears a short median spine) is extremely narrow, there being very little space between the mandible and the antennal bases. There is thus very little for the branchiostegite to cover; consequently this character appears to have dubious value. The epistomal median spine itself, however, appears to be a unique feature of *Coralaxius*. Several other characters appear to be unique to *Coralaxius* among the genera of the Axiidae: lack of epipods (apart from the tiny bumps on pereopods 1 and 2) on pereopods 1–4; exopod of maxilliped 1 lacking flagellum; bilobed appendix masculina on pleopod 2 of the male. The first two may be related to the very small size of the adult animal, with some reduction in mouthparts, while the loss of epipods and associated podobranchs (as well as pleurobranchs in *C. galapagensis* and *C. nodulosus*) may reflect the relationship between surface area and volume, the smaller the animal the greater its relative surface area and therefore the less need for a high number of gills. The bilobed structure of the appendix masculina would seem to be the single feature which has no equivalent in the rest of the axiids and therefore the single apomorphy defining the subfamily.

The three species of *Coralaxius* seem to be highly adapted for crevice-life on coral reefs, with their small size, reduced gills, short rostrum, relatively large well-pigmented eyes, highly spinose chelipeds of pereopod 1, and (at least in *C. nodulosus*) strongly red- and white-banded antennal and antennular flagella. Indeed, *C. nodulosus* adults are probably the smallest representatives of the family Axiidae. It is thus difficult to give much weight to the assertion (Sakai and de Saint Laurent, 1989: 10) that *Coralaxius* 'is closely related' to the Upper Cretaceous fossil *Schlueteria* Fritsch and Kafka, 1887, from Czechoslovakia. There is some superficial similarity in the shape of the second pereopod, and in the spinose nature of the first pereopod chela (see reconstruction in Glaessner, 1969, fig. 283; Fritsch and Kafka, 1887, fig. 53, pls 6, 7; Blondel *et al.*, 1989, pl. 1, fig. 3), but given the multicarinate anterior carapace, the low, poorly defined rostrum, the bidentate abdominal pleura, the lack of a suture on the lateral uropodal ramus, and the lack of detail for many of the appendages in the fossil, there can be little support for this assertion.

Coralaxius galapagensis n. sp.
(Figs 1, 2)

Material examined

HOLOTYPE USNM 243578, ovig. ♀ cl 4.0 mm, Allan Hancock Pacific Expeditions, sta. 795–38, Sullivan Bay, James Is. [San Salvador], Galapagos, coll. 21 January 1938, surface at light.

Diagnosis. Carapace surface smooth; rostrum much shorter than eye, with one pair of lateral teeth; 4 teeth on lateral carina, first pair in supraorbital position; median carina well marked but unarmed. Abdominal pleura ventrally rounded. Telson length about 1.4 times greatest width, with 2 teeth and single strong mobile spine on lateral margin, 2 pairs of blunt teeth on dorsal surface.

Antennular peduncle reaching beyond eyes by length of distal article; basal article longer than 2 distal articles together, with 4 short spines on mesial margin, stylocerite

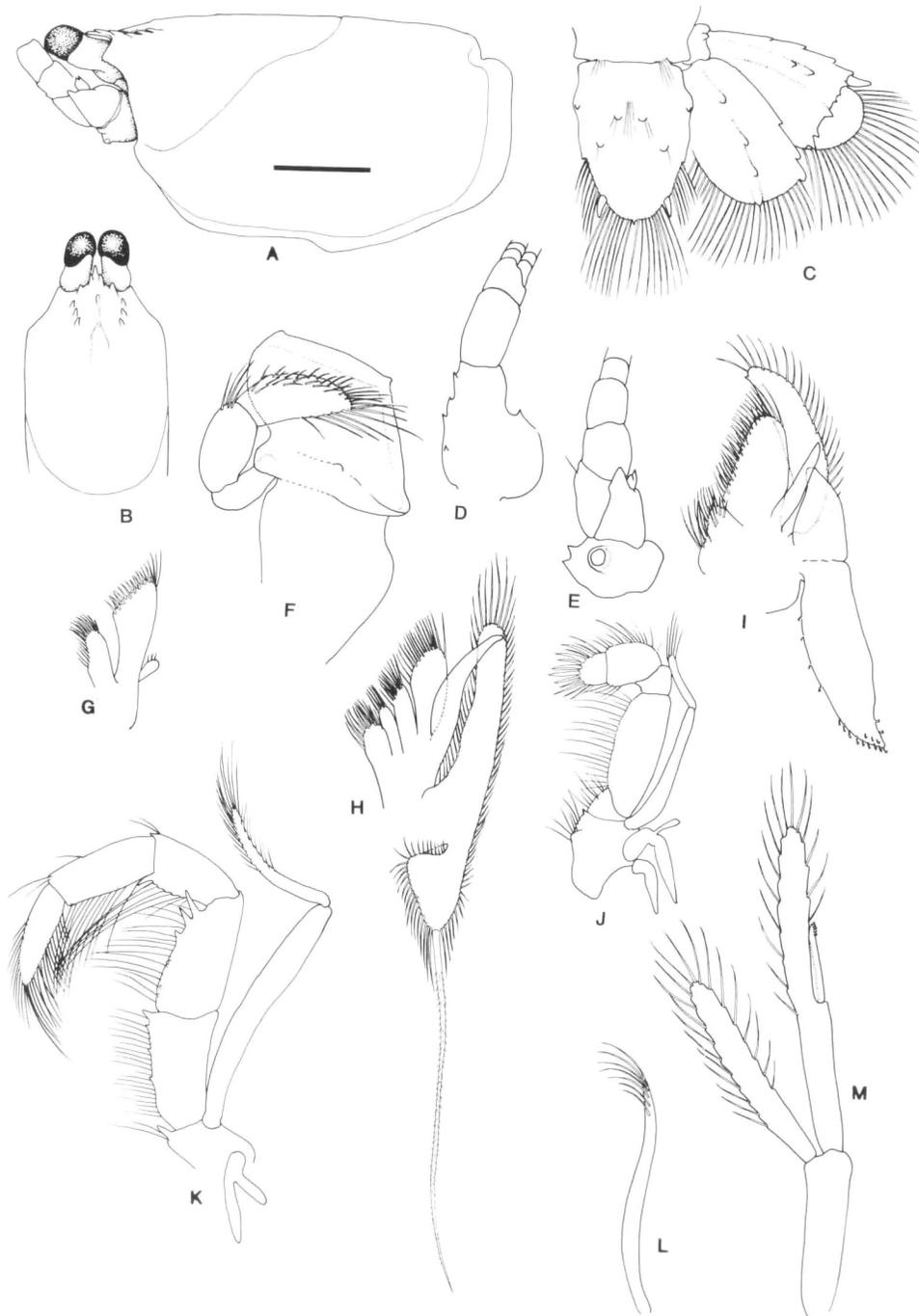


FIG. 1. *Coralaxius galapagensis* n. sp. (A) carapace in lateral view; (B) anterior carapace in dorsal view; (C) telson and right uropod; (D) antennular peduncle; (E) antennal peduncle; (F) mandible; (G) maxillula; (H) maxilla; (I) maxilliped 1; (J) maxilliped 2; (K) maxilliped 3; (L) female, pleopod 1; (M) female, pleopod 2.

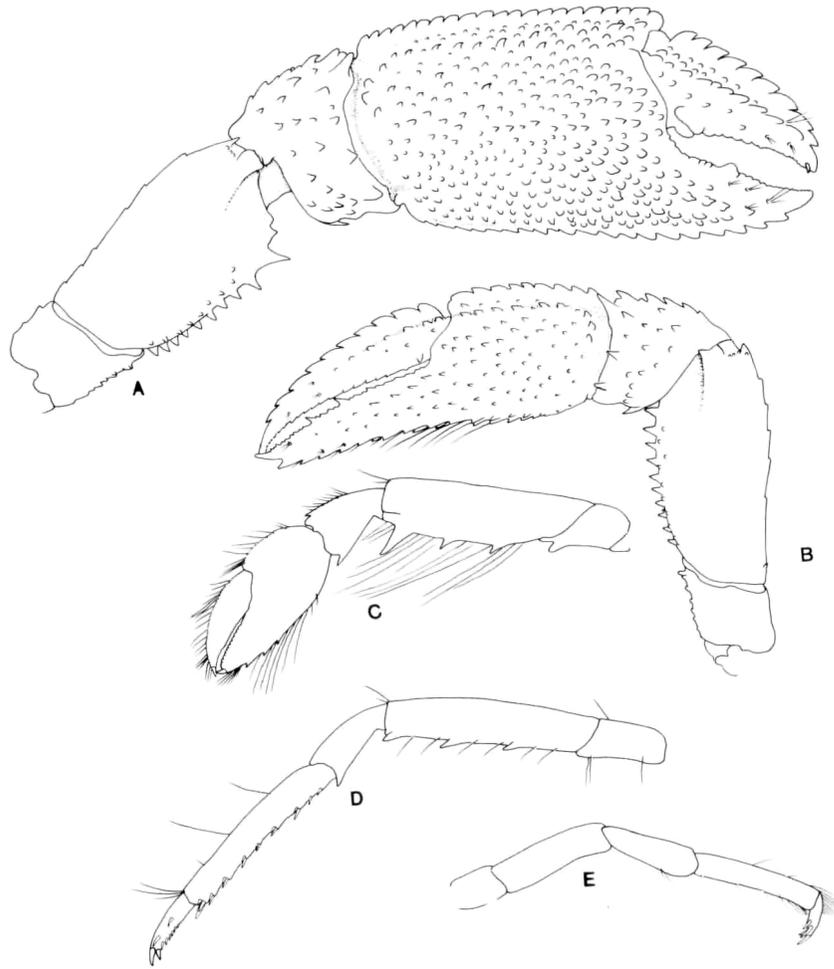


FIG. 2. *Coralaxius galapagensis* n. sp. (A) pereopod 1, larger cheliped; (B) pereopod 1, smaller cheliped; (C) pereopod 2; (D) pereopod 3; (E) pereopod 5.

inflated, with single small distal spine; article 2 slightly longer than article 3. Antennal peduncle subequal in length of antennular peduncle, of 5 articles, basal article with 2 short spines mesial to aperture of antennal gland; article 2 bearing broad distal bifid scale; article 3 set obliquely on 2; article 5 slightly shorter than 4; flagella about twice length of carapace. Mandibular palp of 3 articles, article 2 somewhat inflated, terminal article longer than 2, bearing band of short setae on lateral margin, more elongate setae on mesial margin; cutting edge obtusely triangular, molar barely developed, represented by rounded and hollowed proximal area. Maxillula with exopod reduced to small rounded lobe bearing 3 setae. Maxilla with basial and coxal endites bilobed, heavily setose on mesial margin; endopod slender, almost reaching apex of anterior lobe of scaphognathite; latter elongate, slender, posterior lobe broader, triangular, with elongate modified setal whip at apex.

Maxilliped 1 having well developed bilobed epipod, posterior lobe twice length of anterior, with several hooked setae on mesial and distal margin and surface; exopod

elongate, curved, bearing marginal plumose setae; endopod slender, reaching to midlength of exopod; basal and coxal endites strongly setose on mesial margins. Maxilliped 2, epipod bearing vestigial podobranch; arthrobranch of single filament present; exopod consisting of 2 slender articles, distalmost about half length of proximal, bearing few distal plumose setae. Maxilliped 3, ischium with few small teeth and single large distal tooth on posterior margin; merus with 3 large posterodistal teeth; carpus with single large posterodistal tooth. Pereopod 1, larger cheliped, ischium with posterior margin serrate; merus with posterior margin bearing about 10 large teeth plus several smaller denticles, anterior margin serrate with strong anterodistal tooth; surface of carpus bearing scattered acute tubercles, strong tooth anterodistally; propodus with upper margin of palm 1.5 times length of fingers, anterior and posterior margins strongly serrate, lateral surface fairly densely tuberculate, several tubercles acute, cutting edge of fixed finger with single moderately strong tubercle at mid-length; dactylus with anterior margin strongly serrate, lateral surface having row, plus several scattered tubercles, cutting margin with broad rounded tubercle at base. Pereopod 1, smaller cheliped, ischium with posterior margin denticulate; merus with 10 teeth on posterior margin, increasing in size distally; carpus with scattered acute tubercles on lateral surface plus strong anterodistal tooth; propodus with upper margin of palm about three-fifths length of fingers, strongly serrate, lateral surface with numerous scattered acute tubercles, posterior margin strongly serrate, cutting edge of fixed finger finely serrate, having 2 large teeth in distal half; dactylus with anterior margin strongly serrate, cutting edge finely and evenly serrate. Pereopod 2, merus bearing 3 strong teeth on posterior margin; carpus with single posterodistal tooth. Pereopod 3, merus with 3 strong teeth on posterior margin; carpus unarmed, about 0.4 length of propodus; latter with row of about 9 single or double short spines on posterior margin; dactylus about 0.4 length of propodus, with strong unguis and slightly smaller secondary claw, plus row of 6 smaller spines on posterior margin, 2 small spines on lateral margin. Pereopod 4 similar to 3, but lacking teeth on merus. Pereopod 5 much shorter than preceding leg, with ischium, merus and carpus unarmed; propodus bearing dense clump of setae distally; dactylus with strong unguis and slightly smaller secondary claw, plus two spines on lateral margin. Pleopod 1 of single elongate, slender article bearing distal plumose setae. Pleopod 2, endopod almost twice length of exopod, appendix interna sited just short of midlength. Uropod with lateral ramus having 4 teeth on outer margin, 6 teeth and strong mobile spine along transverse suture, 2 teeth on outer ridge of dorsal surface; mesial ramus with 3 teeth on lateral margin including rounded distal one, 4 teeth on dorsal ridge.

Gill formula for *Coralaxius galapagensis*.

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Epipod	1	1	1	v	v	—	—	—
Podobranch	—	v	v	—	—	—	—	—
Arthrobranch	—	v	2	2	2	2	2	—
Pleurobranch	—	—	—	—	—	—	—	—

v, Vestigial.

Etymology. The specific epithet refers to the type locality, the Galapagos Islands.

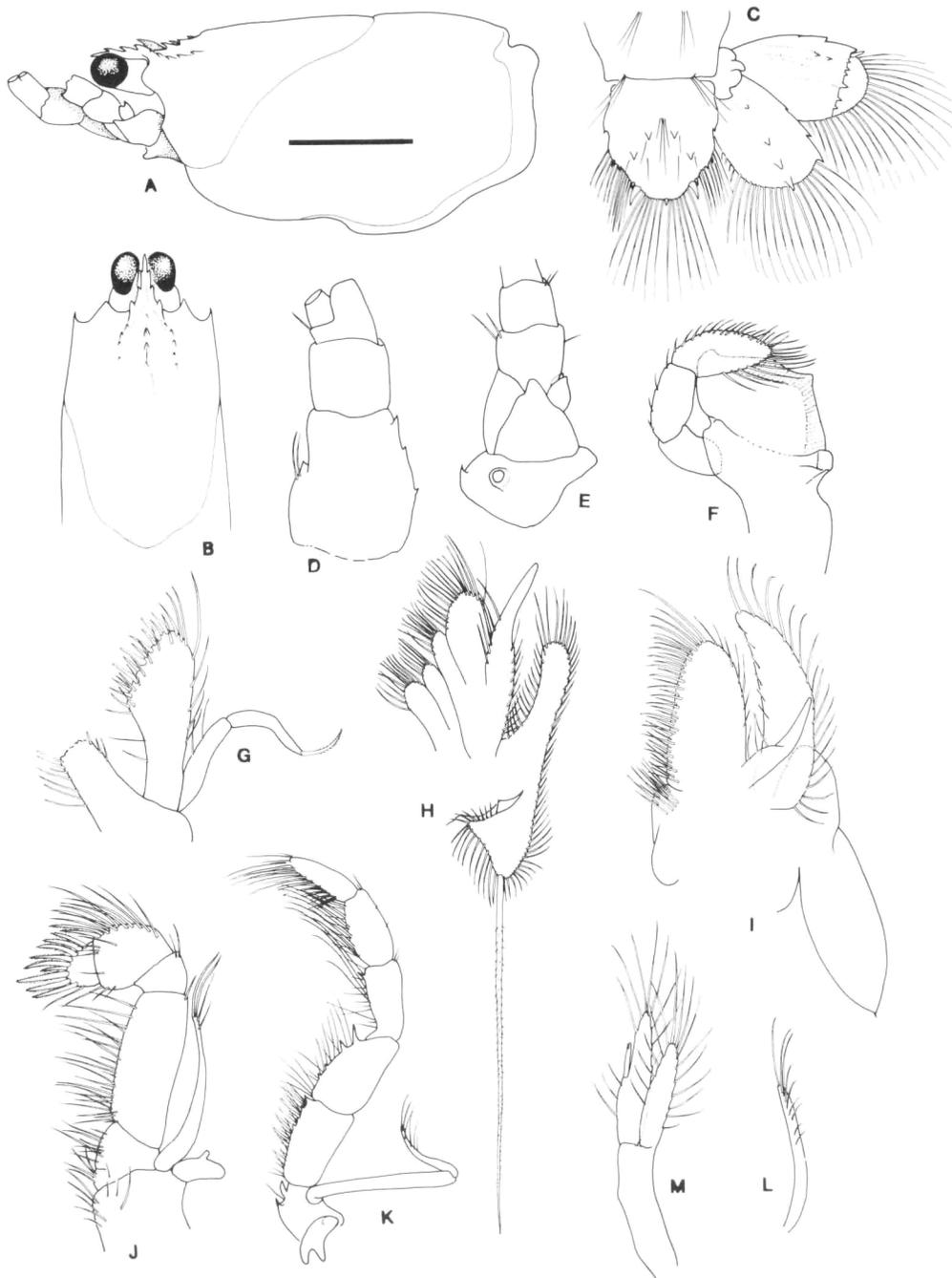


FIG. 3. *Coralaxius indopacificus* n. sp. (A) carapace in lateral view; (B) anterior carapace in dorsal view; (C) telson and right uropod; (D) antennular peduncle; (E) antennal peduncle; (F) mandible; (G) maxillula; (H) maxilla; (I) maxilliped 1; (J) maxilliped 2; (K) maxilliped 3; (L) female, pleopod 1; (M) female, pleopod 2.

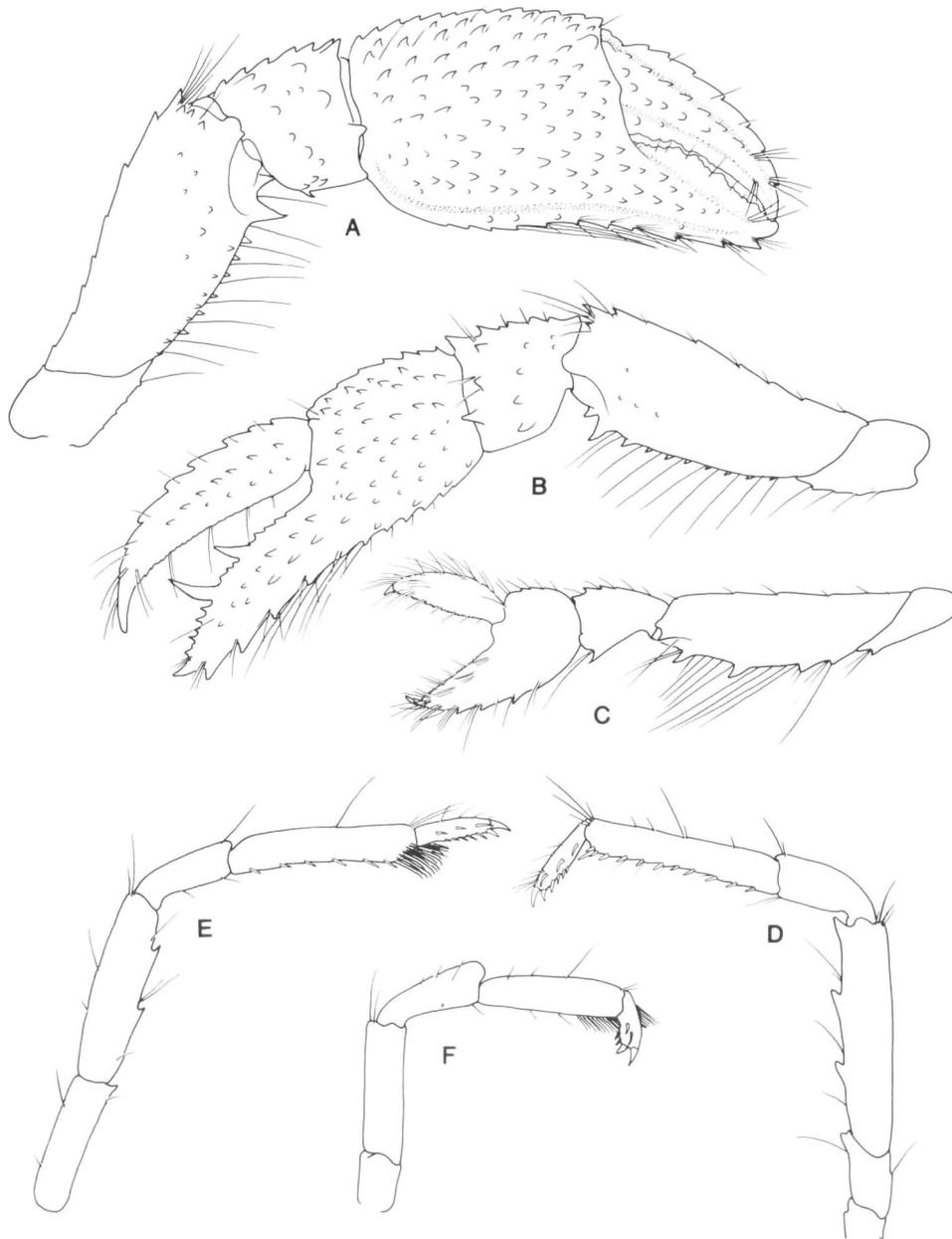


FIG. 4. *Coralaxius indopacificus* n. sp. (A) pereopod 1, larger cheliped; (B) pereopod 1, smaller cheliped; (C) pereopod 2; (D) pereopod 3; (E) pereopod 4; (F) pereopod 5.

Coralaxius indopacificus n. sp.
(Figs 3, 4)

Material examined

HOLOTYPE USNM 243414, ovig. ♀, cl 3.8 mm, Fiji Expedition sta. WE 83-31, Astrolabe Reef, Kandavu, Fiji, 5-8 m, coll. R. Winterbottom; PARATYPE USNM

243415, ovig. ♀, cl 3.0 mm, same locality; PARATYPE USNM 243416, ovig. ♀, cl. 3.1 mm, Fiji Expedition, sta. WE 83–35, north–west corner of Herald Pass, Kandavu, Fiji, 10–20 m, coll. R. Winterbottom; PARATYPE USNM 243574, ovig. ♀, cl 3.2 mm, sta. RW88–25, Comoro Is., Indian Ocean, 12°05′15″S, 44°29′20″E, 10–14 m, poison station, coll. R. Winterbottom, 20 November 1988.

Diagnosis. Rostrum reaching anterior margin of cornea of eyes, with 2 pairs of lateral teeth plus large supraorbital pair. Carapace surface smooth, with 2–3 teeth on median carina, 2–5 teeth on lateral carina. Abdominal pleura ventrally rounded. Telson with lateral margin with 2 teeth, 2 small and 1 strong articulating spines; 2 pairs teeth on dorsal surface.

Antennular peduncle reaching well beyond eyes, basal article equal in length to 2 distal articles, with 3 small spines on mesial margin, stylocerite somewhat inflated, with single small distal spine; article 2 slightly longer than 3. Antennal peduncle subequal in length to antennular peduncle, of 5 articles, basal article with single short spine mesial to aperture of antennal gland; article 2 bearing distal bifid scale; article 3 set obliquely on 2; article 5 slightly shorter than 4; flagella about 1.5 times carapace length, 4 pairs of aesthetascs on third to sixth distalmost articles. Mandibular palp of 3 articles, 2 basal articles subequal in length, terminal article somewhat longer, bearing short setae on lateral margin, more elongate setae on mesial margin; cutting edge obtusely triangular, with small truncate molar proximally. Maxillula with exopod well developed, of 2 slender articles, distal article bearing terminal fringed spine; basal endite bearing numerous simple setae. Maxilla with basal and coxal endites bilobed, heavily setose on mesial margins; anterior lobe of scaphognathite slender, posterior lobe broader and triangular, bearing modified setal whip at apex.

Maxilliped 1 having well developed epipod, posterior lobe lacking marginal hooks; exopod elongate, curved, bearing marginal plumose setae; endopod slender, reaching to about midlength of exopod; basal and coxal endites strongly setose along mesial margin. Maxilliped 2 having exopod not reaching distal end of merus, with few distal plumose setae; dactylus bearing cluster of stout fringed spines. Maxilliped 3, posterior margin of ischium with 4 small teeth; posterior margin of merus with 2 small proximal teeth, 2 large distal teeth. Pereopod 1, larger cheliped, ischium with posterior margin denticulate; merus with 1 strong distal and 6 small spines on posterior margin, dorsal margin serrate; carpus with 1 posterior spine, dorsal and external surface bearing acute tubercles; propodus with upper margin of palm 1.3 times length of fingers, outer surface and anterior and posterior margins bearing acute tubercles, cutting edge of fixed finger irregularly tuberculate; upper margin of dactylus serrate, outer surface bearing acute tubercles, cutting edge irregularly tuberculate. Pereopod 1, smaller cheliped with merus bearing 1 strong distal and 9 small teeth on posterior margin, upper margin serrate, with 2 or 3 distal teeth; outer surface of carpus bearing acute tubercles, upper margin serrate; outer surface of propodal palm bearing acute tubercles, palm 0.6 times fingers in length, posterior margin strongly serrate, cutting edge with 2 strong and several small teeth; upper margin of dactylus strongly serrate, cutting edge barely serrulate. Pereopod 2, merus with 4 teeth on posterior margin. Pereopod 3, ischium with short blunt tooth posterodistally; merus with 3 strong teeth on posterior margin; carpus unarmed; propodus with row of about 10 short spines on posterior margin; dactylus about half length of propodus, with strong unguis followed by row of 5 smaller spines on posterior margin, bearing 3 spines on lateral surface. Pereopod 4, ischium with single posterodistal tooth; merus with 2 teeth on posterior margin; carpus unarmed; propodus with 6 slender spines on posterior margin plus

dense cluster of posterodistal setae; dactylus about half length of propodus, with strong unguis followed by row of 6 spines on posterior margin, 3 spines on lateral surface. Pereopod 5, ischium, merus, and carpus unarmed; propodus bearing dense cluster of distal setae; dactylus about half length of propodus, with strong unguis and secondary claw, plus 2 small spines on posterior margin, 2 small spines on lateral surface.

Pleopod 1♀ uniramous, slender, elongate, bearing distal setae. Pleopod 2♀, endopod with appendix interna articulating at about midlength, exopod about 0.75 length of endopod. Uropod with lateral ramus having 3 teeth on outer margin including distal tooth, 6 teeth along suture margin; 3 teeth on lateral margin of mesial ramus, including distal tooth.

Gill formula for *Coralaxius indopacificus*.

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Epipod	1	1	1	v	v	—	—	—
Podobranch	—	v	r	—	—	—	—	—
Arthrobranch	—	—	2	2	2	2	2	—
Pleurobranch	—	—	—	—	1	1	1	—

v, Vestigial; r, reduced.

Remarks. Comparison of the Fijian and Comoran specimens revealed no morphological differences. The extraordinarily broad geographic range of this species (mid-Pacific to mid-Indian Ocean) is not without precedent: *Parascytoleptus tridens*, also a tiny coral-reef inhabiting axiid, is known from Hawaii and Guam in the Pacific Ocean, and from Aldabra Atoll in the Indian Ocean, while *Eutrichocheles bisquamosa*, a coral rubble inhabitant, is known from Palau, Saipan, and Aldabra Atoll. Careful collecting at intervening sites in both the Indian and Pacific oceans will probably reveal the more widespread distribution of *C. indopacificus*.

Etymology. The specific name refers to the broad geographic range of the species, i.e. occurring in both the Indian and Pacific oceans.

Coralaxius nodulosus (Meinert, 1877)
(Figs 5, 6)

Axius nodulosus Meinert, 1877: 212; Stephensen, 1910a: 276, figs 1–5; 1910b: 75, fig. 49; De Man, 1925a: 18; Balss, 1926: 26; Poulsen, 1940: 209, fig. 2.

?*Axiopsis nodulosus*. Borradaile, 1903: 539.

Coralaxius abelei Kensley and Gore, 1982: 1278, figs 1–6; Abele and Kim, 1986: 26, 289, 291 (fig.); Sakai and de Saint Laurent, 1989: 2, 11 [typ. err. page 101 'aberei']; Werding and Müller, 1989, 252.

Coralaxius nodulosus. Sakai and de Saint Laurent, 1989: 2, 11, 102.

Material examined

HOLOTYPE [*Axius nodulosus*], Zoological Museum, Copenhagen (ZMC), ♂ cl 2.2 mm, Nymindégab, North Sea; HOLOTYPE [*Coralaxius abelei*], USNM 173629, ♀ cl 4.2 mm, off Key Largo, Florida, 76 m; ALLOTYPE [*Coralaxius abelei*], USNM 170857, ♂ cl 2.1 mm, Carrie Bow Cay, Belize, 11 m; PARATYPES [*Coralaxius abelei*], USNM 171763, ♂ cl 2.6 mm, Carrie Bow Cay, Belize, 13 m; USNM 171766, ♂ cl 2.0 mm, Carrie Bow Cay, Belize, 26–30 m; USNM 170856, ♀ cl 2.9 mm, Carrie Bow Cay, Belize, 15 m; USNM 171765, ♂ cl 2.1 mm, 2♀ cl 2.7 mm, 3.3 mm, Carrie Bow Belize, 26 m; USNM 171764, ♀ cl 3.0 mm, Carrie Bow Cay, Belize, 26 m.



FIG. 5. *Coralaxius nodulosus*. (A) anterior carapace, eyes and antennal bases in dorsal view; (B) buccal area, with right third maxilliped removed; arrow indicates epistomal spine; (C) antennal scale; (D) apex of antennular flagellum showing aesthetascs; (E) thoracic sternite and female genital apertures on coxae of pereopod 3; (F) female thoracic sternite between coxae of pereopod 4; (G) abdomen of ovigerous female in ventral view; (H) male thoracic sternite between coxae of pereopod 4, and genital apertures on coxae of pereopod 5; (I) telson.

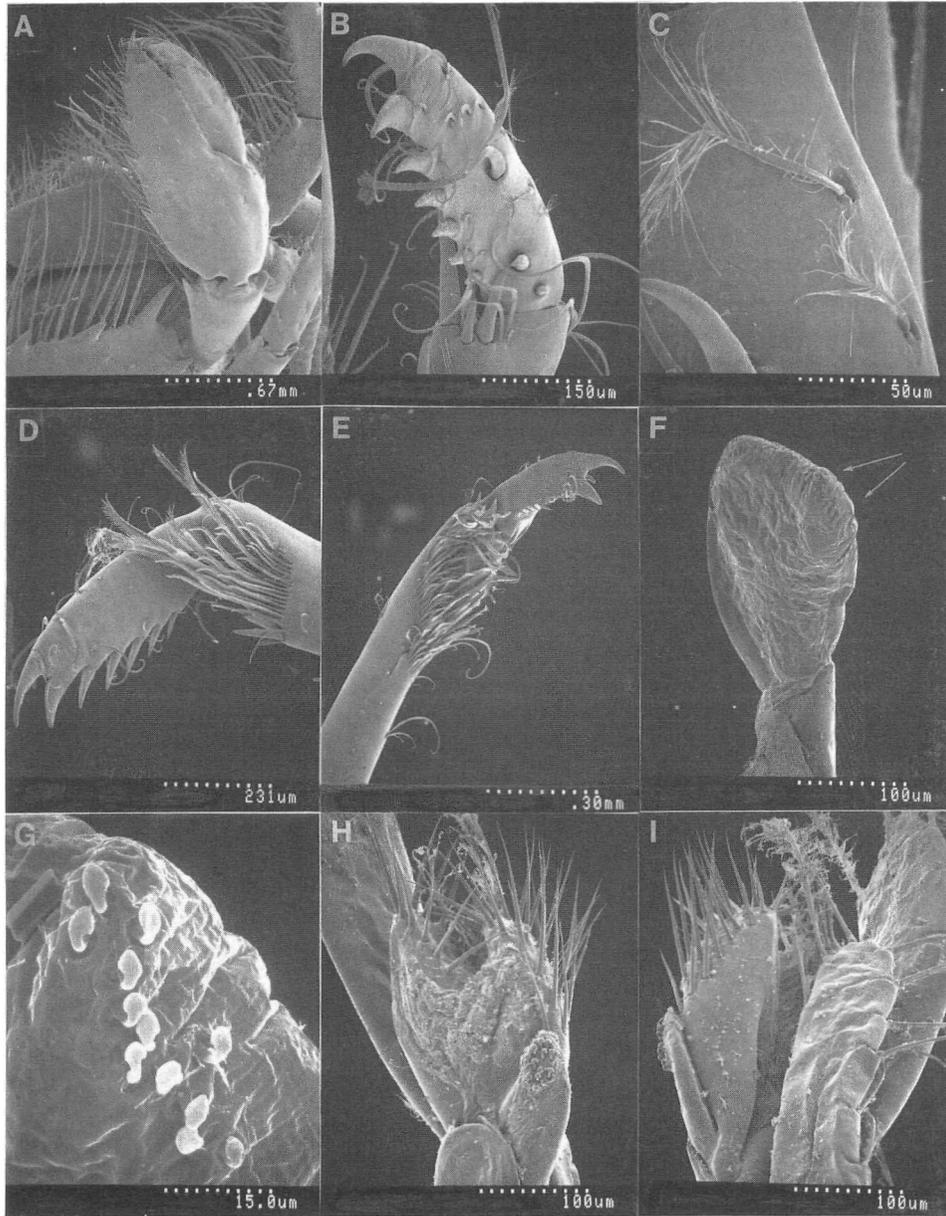


FIG. 6. *Coralaxius nodulosus*. (A) chela of pereopod 2; (B) dactylus of pereopod 3; (C) sensory setae on dactylus of pereopod 3; (D) distal propodus and dactylus of pereopod 4; (E) distal propodus and dactylus of pereopod 5; (F) male pleopod 1, arrows indicate extent of hooks; (G) male pleopod 1, hooks enlarged; (H) male pleopod 2, appendix interna and bilobed appendix masculina, anterior view; (I) male pleopod 2, appendix interna, appendix masculina, and exopod in posterior view.

Additional material. USNM 243431, 30♂, 11 ovig. ♀, 21♀, Carrie Bow Cay, Belize, 9–128 m; USNM 243432, 8♂, 1♀, Glovers Reef, Belize, 12 m; USNM 243433, 2♂, Curlew Cay, Belize, 21 m; USNM 243434, 11♂, 5 ovig. ♀, 8♀, Looe Key, Florida, 6 m; USNM 243435, 1♂, *Gerda* sta. 984, Strait of Florida, 24°05'N, 80°20'W, 155–230 m; National Natuurhistorische Museum, Leiden (NNML), 1 ovig. ♀, *Pillsbury* sta. P-1195, off Jamaica, 17°23.6'N, 76°02.2'W, 15–18 m; NNML, 2♂, 1♀, *Pillsbury* sta. P-1196, off Jamaica, 17°27.5'N, 75°57'W, 26 m; NNML, 1♂, *Pillsbury* sta. 1252, off Jamaica, 17°09'N, 78°57'W, 26 m; NNML, 1♂, *Pillsbury* sta. P-1317, off Costa Rica, 9°59'N, 82°55'W, 55–69 m; NNML, 1♂, *Pillsbury* sta. P-1202, off Jamaica, 17°51.1'N, 76°23.8'W, 18 m; NNML, 1♀, *Pillsbury* sta. P-1204, off Jamaica, 17°46.1'N, 76°46'W, 36–91 m.

Distribution. Belize, 11–128 m; Florida, 6–76 m; Strait of Florida, 155–230 m; Jamaica, 18–91 m; Costa Rica, 55–69 m; Colombia, 6–25 m.

Diagnosis. Carapace surface faintly rugose. Rostrum short, barely reaching level of cornea of eyes, acutely triangular, with single small lateral spine at base; lateral carina having 5 spines in arc on each side, anteriormost spine supraocular in position; median carina well marked from rostral base to tubercle, less well defined thereafter, becoming obsolete well before reaching cervical groove. Abdominal pleura ventrally broadly truncate. Telson dorsally with 2 pairs submedian spines, 3 pairs fixed lateral spines, elongate articulating posterolateral spine with smaller spine at its base, series of stout setae between third fixed spine and articulating posterolateral spine; posterior margin bearing elongate setae plus with median spine.

Antennular peduncle with basal article equal in length to 2 distal articles, 3 teeth on mesial margin, small distal tooth on somewhat inflated stylocerite; article 3 slightly shorter than article 2; flagella about 3 times carapace length. Antennal peduncle with basal article having small tooth mesial to aperture of antennal gland; article two with broad distally bifid or obscurely trifid scale; article 3 set obliquely on article 2; articles 4 and 5 subequal in length; flagellum about 3 times carapace length. Mandibular palp of 3 articles, distal article longest, with band of short setae on lateral margin, longer setae on mesial margin; incisor obtusely triangular, with short distal and median tooth, molar represented by short hollowed structure. Maxillula lacking exopod; basal endite bearing simple setae. Maxilla with basial and coxal endites bilobed, heavily setose on mesial margins, anterior lobe of scaphgnathite slender, posterior lobe broader, triangular, bearing modified setal whip at apex.

Maxilliped 1 having well developed bilobed epipod, posterior lobe at least twice length of anterior, bearing several short hooked setae on distal margin; exopod elongate, curved; endopod slender, digitiform, not reaching midlength of exopod; basial and coxal endites strongly setose along mesial margins. Maxilliped 2, epipod lacking any vestige of podobranch; exopod reaching distal margin of merus, with several distal plumose setae; dactylus bearing several stout fringed setae. Maxilliped 3, ischium and merus each bearing about 6 spines on posterior margin, increasing in length distally; carpus with single distal spine on posterior margin. Pereopod 1, larger cheliped with ischium bearing 5 low spines on posterior margin; merus with about 9 strong spines; carpus with anterior margin spinose, lateral surface tuberculate; propodal palm just less than twice length of fingers, broad, lateral surface tuberculate, tubercles becoming larger anteriorly, anterior margin bearing row of rounded tubercles, posterior margin serrate-spinose, mesial surface less tuberculate than lateral, fixed finger with several rounded teeth on cutting edge. Dactylus with anterior margin strongly tuberculate, lateral and mesial surface tuberculate, cutting

edge finely dentate. Smaller cheliped, ischium, merus and carpus as in larger cheliped; chela markedly less broad than larger chela, propodal palm about two-thirds length of fingers, mesial and lateral surfaces tuberculate, anterior margin tuberculate spinose, cutting edge of fixed finger finely denticulate along with 2 large acutely triangular teeth; dactylus with anterior margin spinose, cutting edge finely denticulate. Pereopod 2, ischium with single distal spine; merus with 3 well-spaced spines on posterior margin; carpus with single distal spine; chela broad, with anterior and posterior margins serrate. Pereopod 3, merus with 3 short stout teeth on posterior margin; carpus unarmed; propodus with row of about 8 short spines on posterior margin; dactylus about half length of propodus, with strong unguis and secondary claw, followed by row of 5 short spines. Pereopod 4 similar to 3, but merus lacking posterior teeth. Pereopod 5, ischium, merus, and carpus unarmed, propodus with dense cluster of distal setae; dactylus with strong unguis and secondary claw followed by 4 smaller spines, 3 spines on lateral surface. Pleopod 1♂ uniramous, of 2 articles, distal article ovate, distally expanded, bearing clump of hooked setae mesiodistally. Pleopod 1♀ uniramous, consisting of single slender article bearing distal plumose setae. Pleopod 2♂ with lanceolate exopod bearing marginal plumose setae; endopod bearing short appendix interna and broad strongly bilobed appendix masculina armed with marginal bands of stout setae, at about midlength of mesial margin. Pleopod 2♀ and pleopods 3–5 of both sexes, exopod slightly shorter than endopod; latter with short appendix interna articulating at midlength of mesial margin. Uropodal lateral ramus with 4 spines on lateral margin, 2 spines on dorsal ridge, 5 or 6 spines along suture, large mobile spine at angle of suture and lateral margin; mesial ramus with 5 spines on dorsal keel, distalmost being marginal, 3 spines on lateral margin.

Gill formula for *Coralaxius nodulosus*.

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Epipod	1	1	1	v	v	—	—	—
Podobranch	—	—	r	—	—	—	—	—
Arthrobranch	—	—	2	2	2	2	2	—
Pleurobranch	—	—	—	—	—	—	—	—

v, Vestigial; r, reduced.

Remarks. *Coralaxius nodulosus* was fairly well illustrated when described as *C. abelei* by Kensley and Gore (1982); instead of repeating these illustrations, supplemental SEM photographs are provided of details not originally given.

The two species described here differ in several characters from the western Atlantic type species; these differences are summarized in Table 1.

Several of these characters appear to be present in a more primitive state in the Indo-West Pacific species, and more advanced in *C. galapagensis* and *C. nodulosus*, the former perhaps being intermediate in some features. The shorter rostrum, the unarmed median carina of the carapace, the absence of pleurobranches, and the presence of epipodial hooks on maxilliped 1, as seen in *C. galapagensis* and *C. nodulosus* are more advanced states than seen in *C. indopacificus*. The exopod of

Table 1. Comparison of seven morphological characters in three species of *Coralaxius*.

	<i>C. galapagensis</i>	<i>C. indopacificus</i>	<i>C. nodulosus</i>
Rostrum	Short	Long	Short
Median carina	Unarmed	With teeth	Unarmed
Maxillule exopod	Reduced	Normal	Absent
Maxilliped 1 exopod hooks	Present	Absent	Present
Maxilliped 2 podobranch	Vestigial	Vestigial	Absent
Maxilliped 3 podobranch	Vestigial	Reduced	Reduced
Pleurobranchs	Absent	Present	Absent

maxilla 1, being normal in *C. indopacificus*, reduced in *C. galapagensis*, and absent in *C. nodulosus*, may indicate the direction of the radiation of the genus, i.e. from Indo-West Pacific via the Eastern Pacific, to the Western Atlantic across the isthmus of Panama. A more likely scenario, however, is that the evolution reflects a tethyan distribution from tropical Indo-West Pacific to Western Atlantic and Eastern Pacific before the raising of the Isthmus of Panama. With this latter event, the Galapagos population became isolated. That this type of distribution actually took place is further suggested by the freshwater species of the atyid genus *Typhlatya*, several of which occur in the Caribbean while one also occurs in the Galapagos.

Acknowledgements

I thank all the individuals who collected and deposited material of *Coralaxius* in the Smithsonian Institution, especially Dr R. Winterbottom of the Royal Ontario Museum, Canada, who collected all the Indo-West Pacific material. I am grateful to Dr Greg Rouse and Ms Marilyn Schotte of the Department of Invertebrate Zoology who assisted with SEM preparation. My thanks are due to Dr Torben Wolff of the Zoological Museum, Copenhagen, for loan of the holotype of *C. nodulosus*, and to Drs R. B. Manning and A. B. Williams who read an earlier draft of this paper.

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