

## A new genus and two new species of cirolanid isopod Crustacea from the northern Indian Ocean

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A new genus of cirolanid isopod *Atarbolana*, and two new species, *Atarbolana exoconta* and *Cirolana manorae*, are described. *Atarbolana* is distinguished from related cirolanid genera by having a projecting clypeus, pleon with three free tergites, and cylindrical uropod exopod.

*Cirolana manorae* is most similar to *Cirolana bovina* Barnard, and new figures are given for that species.

KEYWORDS: Cirolanidae, Marine Isopoda, Northern Indian Ocean, Taxonomy.

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### Introduction

The isopod fauna of the Indian Ocean can only be considered to be moderately well known, with South Africa the most comprehensively studied region within this area. Cirolanids of the East African coast have also received some attention. The northern Indian Ocean, in particular, is little studied. Bruce (1986) lists the major taxonomic works on cirolanids for these areas, and lists all the known cirolanid species. In view of the lack of taxonomy for the northern Indian Ocean the discovery of new cirolanid taxa is unremarkable.

These two species are the first cirolanids to be reported from the coast of Pakistan. Both new species have been taken from the rocky inter-tidal coast of Manora Island, Karachi.

*Atarbolana* gen. nov. is a genus of some interest. It fits within the *Pseudaega*-group of genera listed by Botosaneanu *et al.* (1986). This group can be identified by several distinct character states: a blade-like projecting clypeus; ambulatory pereopods, pleopods 1 and 2 with elongate rami, pleopods 3–5 with naked endopods. *Eurydice* Leach and *Metacirolana* Nierstrasz have a blade-like projecting clypeus, but have very different antennule, antennal, pereopodal and pleopod morphologies.

Within the *Pseudaega*-group *Atarbolana* is unique in having the pleon reduced: all other genera possess five fully visible pleonites. *Atarbolana* is also the only genus which does not have a flat, broad pleotelson.

Type-material has been deposited in the collections of the Australian Museum (AM). Material identified as belonging to a species but not used in formulating the descriptions has been retained by W. J.

### Taxonomy

Family Cirolanidae Dana

*Atarbolana*, new genus

*Diagnosis.* Frontal lamina anteriorly dilated separating antennule bases. Clypeus

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with triangular blade projecting antero-ventrally. Pleon short, with three free terga; pleonite 5 laterally overlapped by pleonite 4. Antennule longer than antenna, peduncle four-articulate. Antennal peduncle four-articulate. Mandible with lacinia mobilis well-developed. Maxilliped endite with two coupling hooks. Pleopod 1 rami elongate, narrow; peduncle almost as wide as long. Pleopod 2 appendix masculina arising about mid-way along medial margin; endopods of pleopods 3–5 without marginal setae. Pleonite 4 lateral margins overlapping and extending beyond pleonite 5. Uropod exopod cylindrical.

*Additional characters.* Cephalon with small rostral process. Pereonite 1 slightly longer than pereonite 2. Eyes antero-lateral. Frontal lamina triangulate anteriorly, anterior margin freely projecting. Mandible incisor tridentate, teeth of left mandible less distinct than those of right; posterior tooth of each mandible elongate and pointed; lacinia mobilis with row of large submarginal spines; molar triangular with continuous marginal spines; palp three-articled, article 2 longest. Maxilliped endite with two coupling hooks. All pereopods ambulatory, all dactyli stout, with secondary unguis. Uropodal rami unequal, exopod with few setae and spines, endopod with rounded apex, and abundant marginal spines interspersed with setae; peduncle produced along inner margins of endopod.

*Type-species.* *Atarbolana exoconta* sp. nov., by monotypy.

*Remarks.* The morphology of the clypeus, and pleopods, places *Atarbolana* in the group of genera outlined by Bruce (1986) that includes, among others, *Exciorolana* Richardson, *Pseudolana* Bruce, *Eurylana* Jansen, *Pseudaega* Thomson. An antennal peduncle of four articles is unusual within the Cirolanidae, the only other genera having this character being *Eurydice* and *Exciorolana*, with some species of the latter having five. *Eurydice* is otherwise very different from *Atarbolana*. *Pseudolana* differs in having a linear frontal lamina, five visible pleonites and a wide pleotelson. *Exciorolana*, the only other similar genus, differs in having a prominent dilated rostrum which is fused to the frontal lamina, and also has five visible pleonites. *Atarbolana* can be separated from all other genera by the cylindrical uropod exopod.

*Etymology.* The name is derived from the Greek word *atarbes*, meaning fearless and unflinching.

***Atarbolana exoconta* sp. nov.**

(Figs 1, 2)

*Material.* Male, HOLOTYPE, 4.2 mm (AM P37199), female, PARATYPE, 3.7 mm, (AM P37200), Manora Island, Karachi, Pakistan, 24°47.6'N, 66°58.6'E, 31. viii. 1985, coll. Roshan.

*Type-locality.* Manora Island, Karachi, Pakistan, 24°47'40''N, 66°58'39''E.

*Description of male.* Body about 2.5 times longer than wide. Cephalon with apex of rostral process overlapped by frontal lamina, posterior margin of cephalon with groove on each side indicating presence of maxillipedal somite. Pereonite 1 longest with single ventro-lateral furrow, pereonites 1–4 with few scattered setae dorsally; postero-lateral margins of pereonites 5–7 with small denticles and setae. Coxae 2–3 rectangular, with entire curved carina; coxae 4–7 each with entire oblique carina; ventral margins of pereonite 1 and coxae setose; posterior margin of coxae 5–7 sinuate, produced beyond posterior margin of respective segment. Postero-lateral margins of pleonite 4 produced well over proximal part of uropodal peduncle, pleonites 4–5 with scattered small denticles. Pleotelson abruptly narrowed distally, apex rounded with

about 16 marginal spines and marginal setae; dorsal surface with two bimedial depressions and longitudinal ridge, posterior half flat.

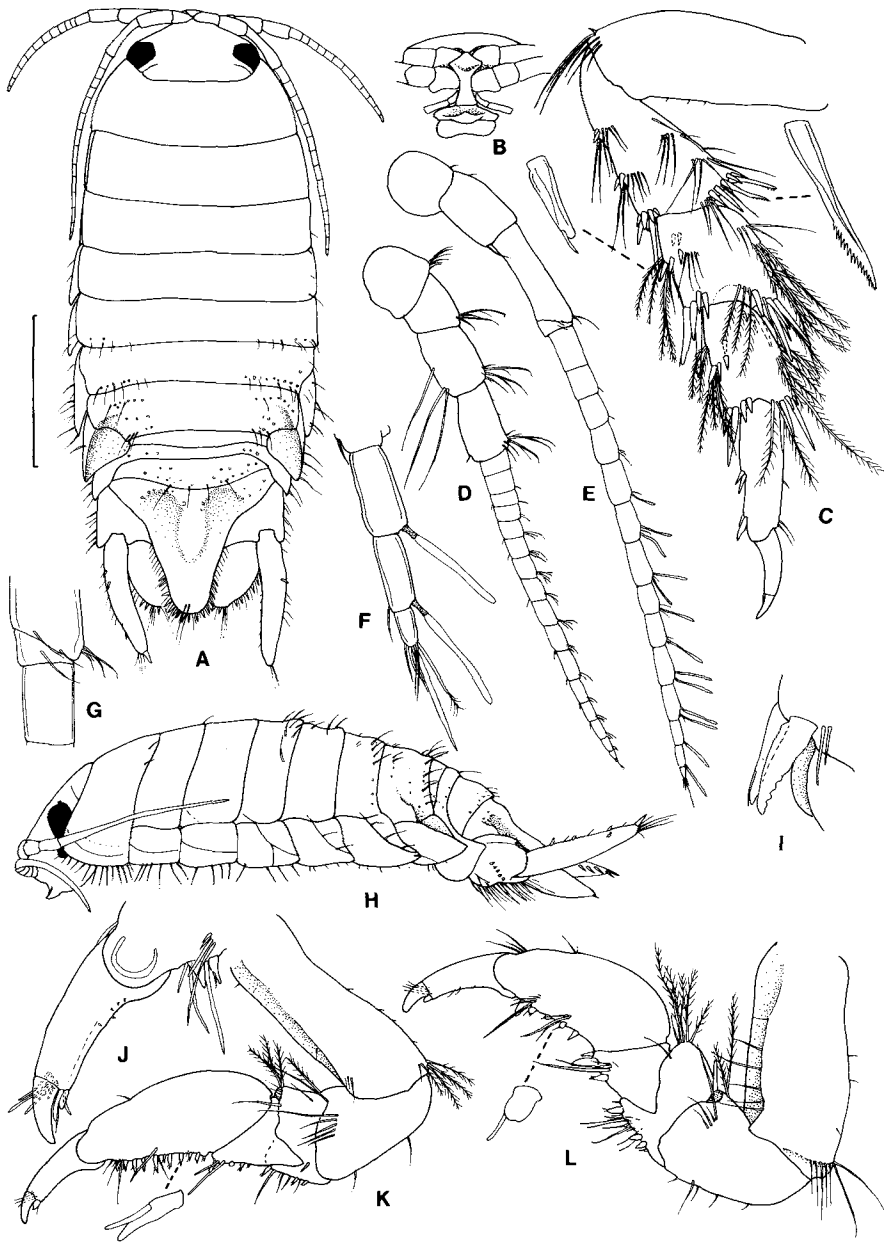


FIG. 1. *Atarbolana exoconta* sp. nov. D–G, PARATYPE, remainder HOLOTYPE. A, Dorsal view; B, clypeal region; C, pereopod 7; D, antenna; E, antennule; F, antennule flagellum, distal articles; G, antennule, peduncle articles 3 and 4; H, lateral view; I, pereopod 7, propodus postero-distal angle; J, pereopod 1 dactylus; K, pereopod 1; L, pereopod 2. Scale bar = 1.0 mm.

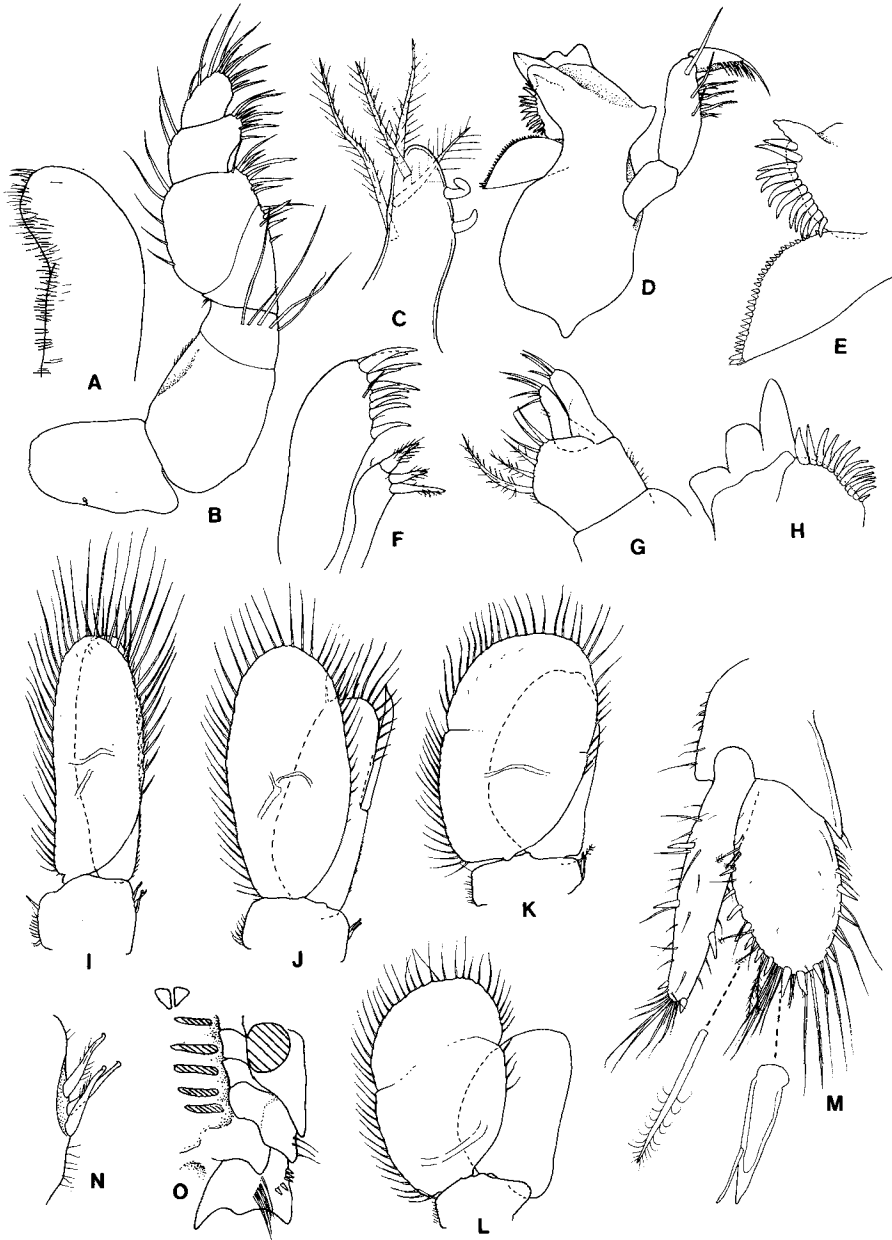


FIG. 2. *Atarbolana exoconta* sp. nov. I-L, N, O, HOLOTYPE, remainder PARATYPE. A, Paragnath; B, maxilliped; C, maxilliped endite; D, left mandible; E, lacinia mobilis and molar process, left mandible; F, maxillule; G, maxilla; H, right mandible incisor, and lacinia mobilis; I-L, pleopods 1, 2, 4, 5 respectively; M, uropod; N, pleopod 1, peduncle medial margin; O, left pleonites ventral view.

Antennule flagellum composed of 14 articles, extends beyond pereonite 3, articles 5–14 bearing aesthetascs. Antenna peduncle articles 1 and 2 short, articles 3 and 4 slightly longer and subequal in length; articles 1–4 each with a group of long setae at antero-distal angle; flagellum composed of 16 articles.

Frontal lamina pentagonal, with triangulate anterior and concave lateral margins. Mandible palp articles 2 and 3 with stout setae on lateral margin. Maxillule with three stout, moderately plumose spines on endopod, exopod with 10 curved spines and one slender spine. Maxilla medial lobe with three long plumose and three long simple setae, central lobe with five terminal setae, lateral lobe with three long terminal setae. Maxilliped palp article 3–5 with continuous fringe of setae on medial margin, lateral margins with several long setae; marginal setae on distal margins only of palp article 2; palp article 1 with five distally placed long setae; endite with two subterminal and two lateral stout plumose setae and two coupling hooks.

Pereopod 1 basis with four long plumose setae at postero-distal angle; ischium with two lateral marginal setae, five long subterminal setae, and two setae (one plumose) at antero-distal angle; merus with three long plumose setae at antero-distal angle, posterior margin with three spines and setae; carpus postero-distal margin armed with four spines and two setae; propodus posterior margin with 10 acute spines interspersed with setae; dactylus with distinct secondary unguis. Pereopods 2 and 3 similar to pereopod 1 but propodal spines fewer and more robust, other spines larger. Pereopods 4–7 similar to each other, increasing in length posteriorly. Pereopod 7 with ischium, merus and carpus flattened with numerous simple and long plumose setae, stout spines (some serrate) on anterior margins and distal angles, posterior margin of propodus with two groups of two spines.

Pleopod 1 rami narrow, elongate, exopod broader than endopod with long marginal setae; median margin of peduncle with three coupling spines, disto-lateral angle with a single spine. Pleopods 2–5 with peduncle becoming progressively shorter, rami rounder, and endopods shorter; pleopods 3 and 4 essentially similar.

Uropod exopod elongate, slender, extending well beyond apex of pleotelson, sparsely setose, lateral margin with three and medial margin with one spine; distal margin with a tuft of long setae and one spine; endopod margins convex, apex rounded, not extending beyond apex of pleotelson, medial margin with eight spines, lateral with seven spines, both margins with long and short setae (few plumose).

*Female.* Differs from description of male only in primary sexual characteristics, except that uropod endopod is longer than male and extends almost to level of pleotelson apex.

*Colour.* In alcohol, brown with chromatophores over dorsal surfaces.

*Size.* Males 4.2–4.5 mm, females 2.5–4.3 mm.

*Remarks.* This species is immediately distinguished from all other Cirolanidae by the short pleon in combination with cylindrical uropod exopod.

*Distribution.* At present known only from the Karachi coast of Pakistan.

*Etymology.* The epithet is derived from the Greek *exochos* (jutting out) and *kontus* (long pole), and alludes to the uropod exopod.

**Genus *Cirolana* Leach**  
***Cirolana manorae* new species**  
(Figs 3, 4)

*Material.* Male, 10.5 mm, HOLOTYPE, (AM P37145), Manora Island, Karachi, Pakistan, 24°47'40"N, 66°58'39"E, 21. vi. 1981. PARATYPES. Male, 10.0 mm,

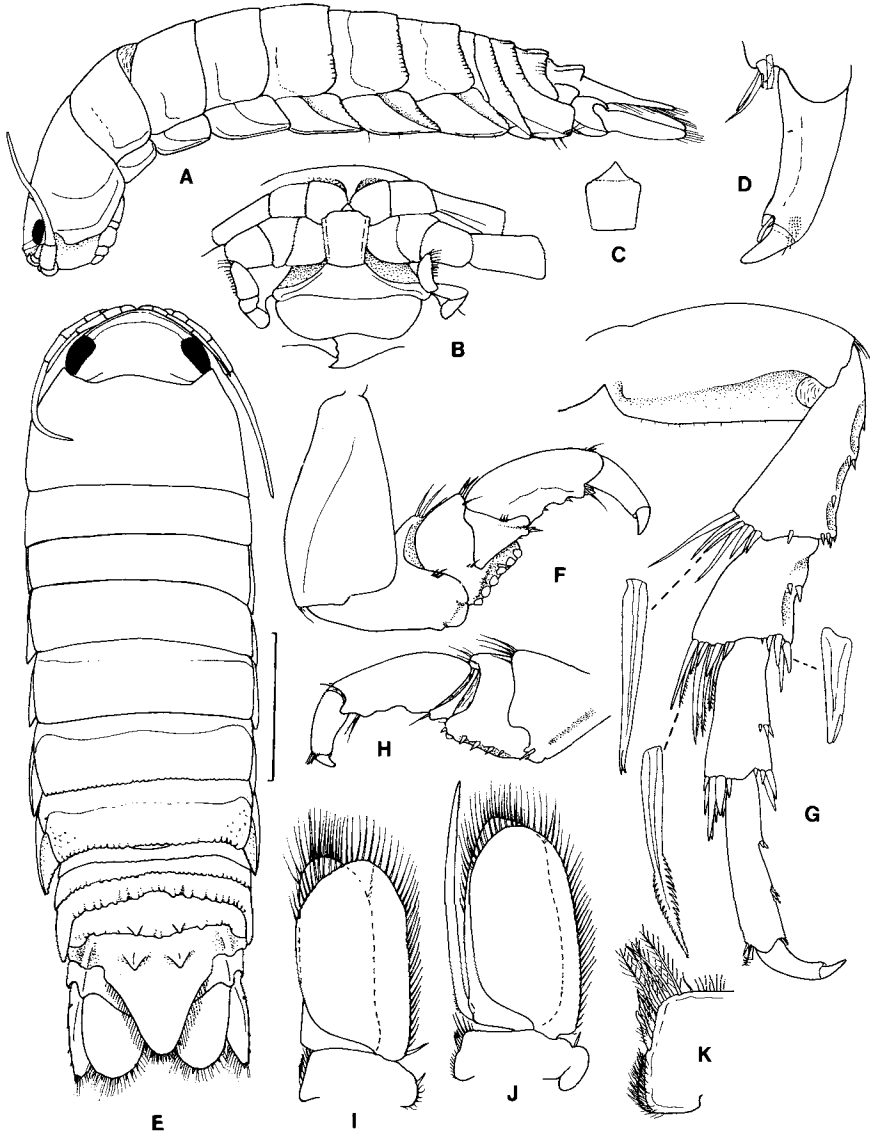


FIG. 3. *Cirolana manorae* sp. nov. C, PARATYPE (AM P37146), remainder HOLOTYPE. A, Lateral view; B, clypeal region; C, clypeus, PARATYPE; D, pereopod 1 dactylus; E, dorsal view; F, pereopod 1; G, pereopod 7; H, pereopod 1, medial view; I, pleopod 1; J, pleopod 2; K, pleopod 2, peduncle medial margin. Scale bar = 2.0 mm.

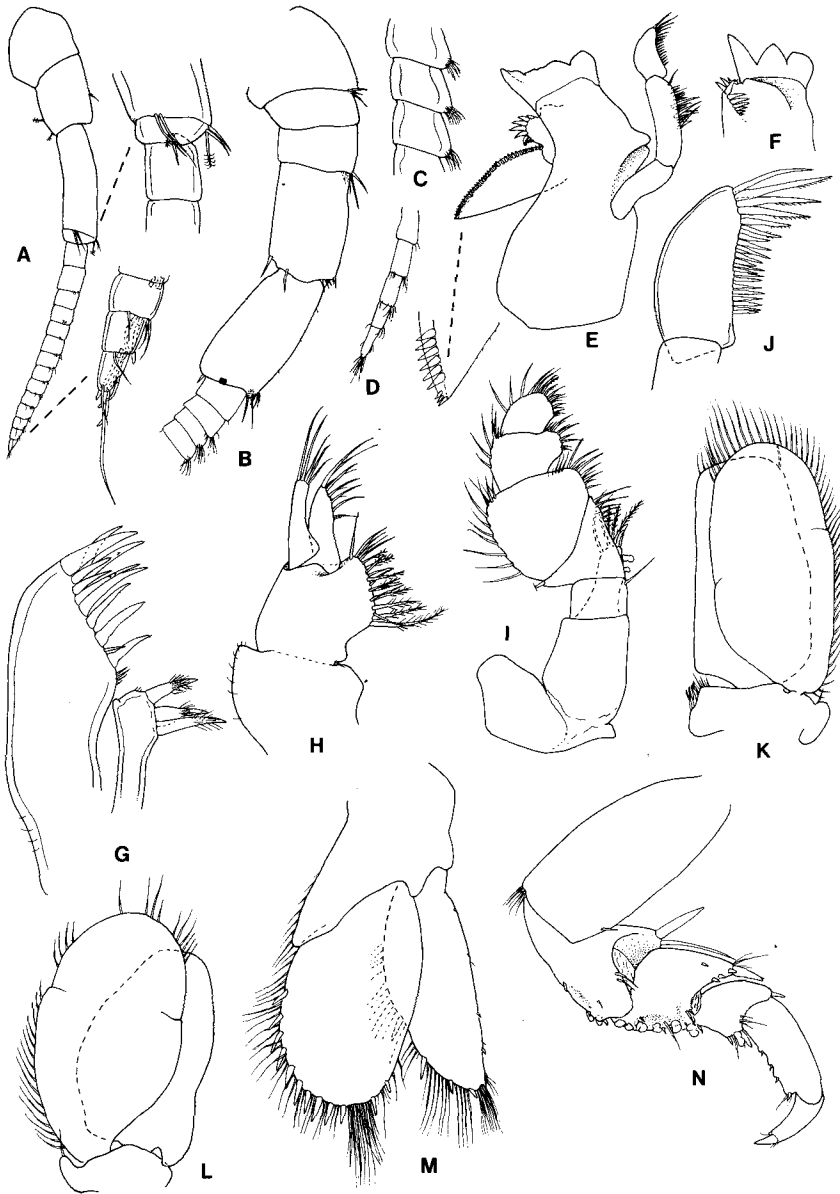


FIG. 4. *Cirolana manorae* sp. nov., paratype (AM P37146). A, Antennule and details; B, antenna; C, antennal flagellum, articles 10, 12; D, antennal flagellum, terminal articles; E, left mandible; F, right mandible apex, dorsal view; G, maxillule; H, maxilla; I, maxilliped; J, mandible palp article 3; K, pleopod 3; L, pleopod 5; M, uropod; N; pereopod 2.

as HOLOTYPE (AM P37146) Two males (7.9, 8.0 mm); three females (ovig. 7.5, non-ovig. 8.5, 9.0 mm), one manca, Bulleji, Karachi coast, Pakistan, 11. iii. 1983, inter-tidal (AM P37148). Female (ovig. 8.0 mm), Manora Island, Karachi, 6. vi. 1981 (AM P37148).

*Type-locality.* Manora Island, Karachi, Pakistan, 24°47'40''N, 66°58'39''E.

*Description of male.* Cephalon rostral process not visible in dorsal view, separating antennular bases; inter-ocular carina present on anterior margin, complete dorsal inter-ocular furrow running from dorso-median margin of each eye; posterior margin with groove on each side indicating presence of maxillipedal somite. Eyes with black ocelli. Pereonite 1 smooth dorsally, with two lateral furrows on each side. Pereonites 2–7 subequal in length, 5–7 each with transverse furrow, that of 6 complete. Posterior margins of pereonites 6–7 denticulate. Coxae 2–7 each with entire and oblique carina; posterior margins of coxae 4–7 concave, projecting beyond posterior margins of respective segments. Pleonite 1 largely concealed by pereonite 7, visible only dorso-medially. Posterior margins of pleonites 2 and 3 dentate, pleonites 4 and 5 with distinct nodules. Pleonite 4 with postero-lateral margins produced well beyond posterior margin of pleonite 5, posteriorly truncate. Dorsal surface of pleotelson with submedian pair of large acute tubercles, antero-lateral margin sinuate, postero-lateral margin feebly concave and fringed with plumose setae and about eight spines.

Antennule peduncle four articulate, articles 1 and 2 subequal, article 3 longest; flagellum composed of about 15 articles, extends beyond posterior margin of eye. Antennal peduncle stout, article 1 equal in length to combined lengths of articles 2 and 3, article 4 shorter than 5, flagellum extending to pereonite 2.

Frontal lamina pentagonal, lateral margins straight, diverging anteriorly, antero-lateral margins concave can appear truncate in certain perspectives. Mandibles' incisors asymmetrical, right mandible incisor with three distinct subequal cusps, that of left mandible with posterior and anterior cusps prominent, central broad and shallow; molar process well produced with continuous row of spines; lacinia mobilis with about eight spines; mandible palp article 3 broad, lateral margin of article 2 and 3 setose. Maxillule with about 10 stout spines and five short setae on gnathal surface of exopod; endopod with three robust plumose spines. Maxilla with broad medial lobe bearing continuous fringe of long plumose setae except at disto-medial angle where setae are simple; central lobe with seven long and four short setae, lateral lobe with five long terminal setae. Maxillipedal endite with six terminal setae and two coupling hooks.

Pereopod 1 basis stout with two setae at postero-distal angle; ischium with three setae at antero-distal angle; merus with about three setae at antero-distal angle, posterior margin with six tubercular blunt spines on lateral side and four acute submarginal and two distal spines on medial side; carpus triangular laterally, posterior margin with two spines at distal angle; propodus with three setae at antero-distal portion, posterior margin sinuate, with two acute spines on palm, third robust spine with few setae opposing dactylus. Pereopod 2 and 3 similar to 1, but less robust. Pereopod 2 with tuft of setae at postero-distal angle of basis; ischium with one stout and an acute large spine at antero-distal angle, posterior margin weakly sinuate with a small spine in middle and two blunt and an acute spine at postero-distal margin; merus with few setae, with one long and three small spines at antero-distal angle and three spines at anterior margin, posterior margin with six blunt spines; carpus with a spine at antero-distal angle, two stout and two acute spines at postero-distal angle, one spine at proximo-posterior margin; propodus with three spines on palm, fourth spine and two setae opposing the dactylus. Pereopods 4–7 similar but becoming longer posteriorly.



Pereopod 7 distal angles of ischium, merus and carpus each with a group of spines, those on anterior angles larger, and on ischium and merus bifurcate and serrate respectively. Postero-distal angle of basis with a tuft of setae; posterior margins of ischium, merus, carpus and propodus with further groups of one to three spines; propodus with spine opposing dactylus. Penes absent, vasa deferentia opening directly on the surface.

Pleopod 1 rami subequal in length, exopod with prominent spine at proximo-lateral angle. Medial margins of peduncle of pleopods 1–4 with four coupling spines. Pleopod 2 with endopod slightly longer than exopod, appendix masculina arising basally, extending well beyond endopod, narrowing smoothly to pointed apex, proximal portion and disto-lateral extremity with fine setules. Peduncle of pleopods 1–5 disto-lateral angles each with single spine. All pleopod setae plumose. Uropods extending clearly beyond apex of pleotelson, rami subequal in length. Exopod lateral margin slightly convex with four minute spines and three short setae; medial margin with long setae and four spines; apex indistinctly bifid with a tuft of setae. Endopod lateral margin convex without setae, disto-lateral margin with two spines; medial margin bearing fringe of long plumose setae and 10 spines; distal margins rounded, apex wide with dense mass of setae.

*Female.* Differ from description of male in primary sexual characteristics, often having more weakly developed sculpturing and being smaller in size than males.

*Colour.* Pale tan in alcohol.

*Size.* Males 10.0–12.0 mm, females 7.5–9.5 mm.

*Remarks.* This species is most similar to *Cirolana bovina* Barnard. The frontal lamina in both species is the same, and there is little difference in the morphology of the antennae, mouthparts, pereopods and pleopods. Within the cirolanids such similarity of appendages is normal within groups of closely related species (see Bruce, 1986). *Cirolana bovina* is a poorly known species, having been figured only by Barnard (1940). Pillai's (1967) record of that species is of uncertain identity: it is certainly not *C. bovina* sensu Barnard, and appears closer to *Cirolana manorae*. Pillai's (1967) fig 2.E shows the lateral margin of the uropod exopod with about nine large spines, contrasting with *C. manorae* which has only four minute spines. Jones (1976) recorded *C. bovina* from Kenya, his remarks indicating setae on the pleotelson dorsal surface suggest that his specimens are *C. bovina*.

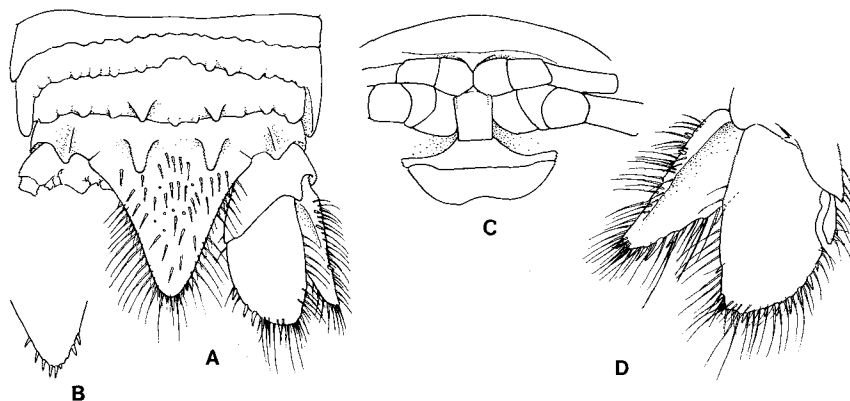


FIG. 5. *Cirolana bovina*, dissected female syntype. A, Pleon and pleotelson; B, pleotelson apex, ventral view; C, clypeal region; D, left uropod.

Comparison of the type-specimens of *Cirolana bovina* (Fig. 5) with those of *C. manorae* show several major differences. Most importantly, the shape of the pleotelson and uropods, and the setation and spination of the uropods are distinct. These differences and others are summarized in Table 1.

Table 1. Character differences between *Cirolana bovina* and *Cirolana manorae*.

<i>C. bovina</i>	<i>C. manorae</i> sp. nov.
Pereonite 6 without nodules	with nodules
Pleonite 4 with large nodules	small nodules
Pleonite 5 and pleotelson with large nodules	small nodules
Pleotelson dorsal surface with abundant stiff setae	without setae
Pleotelson lateral margins with double row of setae	with single row
Uropod exopod lateral margin sinuate, entirely setose	weakly convex, with three small spines, scarcely setose
Uropod endopod medial and lateral margins forming distinct angle, lateral margin 3/4 setose	evenly rounded, lateral margin without setae

Within the family Cirolanidae, pleotelson and uropod morphology is of major importance in species discrimination. Bruce (1986) gave considerable attention to uropod morphology and spine number in separating species within sibling complexes within the genus *Cirolana*, and also between species-groups. The differences between *Cirolana bovina* and *Cirolana manorae* are substantial and cannot be attributed to regional variation.

*Distribution.* Recorded here from Pakistan, N.L.B. has identified further specimens from the Goa coast of India.

*Etymology.* The specific epithet is taken from the type-locality.

### Acknowledgements

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