

**AN ILLUSTRATED KEY TO THE MALACOSTRACA
(CRUSTACEA) OF THE NORTHERN ARABIAN SEA
PART-V: ISOPODA**

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ABSTRACT: The northern Arabian Sea Isopod fauna is keyed out, excluding the gulfs fauna. Some terrestrial species are also included. Previous accounts and recent collections from Pakistan mainly at Karachi have turned up 7 suborders, 18 families, 76 genera and 121 species. There 5 are new records from Pakistan. For each species, there is an illustration and information of its reporter from the area and on its host, if parasitic. The source of illustration is also given.

KEY WORDS: Marine; Isopoda; key; Arabian Sea north of 10°N; terrestrial (coastal area).

INTRODUCTION

This is the first comprehensive key to the marine isopods from the northern Arabian Sea upto 10°N including the parasitic and interstitial forms. One suborder Oniscidea is included for the sake that its one or two species are littoral even in sea water, otherwise they live in semi arid or arid area. There are in all 7 suborders, 18 families, 76 genera and 121 species. The genera and species which could not be inserted in the couplets or triplets of the key are given as 'Not treated' and appropriately placed. Important changes in taxonomy of species are referred.

The study is based on the collection of the Marine Reference Collection and Resource Centre (MRC), University of Karachi, supplemented with the records from the existing literature for the given area. Special mention may be made to the works of Chopra; Barnard; Pillai; Javed; Bruce; Kensley and Schotte. The new records in the present key from Pakistan given by Kazmi are preceded by an asterik, dealt in detail elsewhere.

The isopods are characterized having a body divided into a cephalon, a pereon and a pleon. The latter always ending in a telson (Fig. 1). The main character which separates Isopoda from other Malacostraca is the presence of gills on their pleopods, some of the other characteristics which distinguish isopods from other peracarids are (1) seven pairs of uniramous legs or pereopod, all more or less alike (hence isopod) except Gnathids which have only 5 pairs of walking legs (2) appendages never chelate (3) six pairs of biramous pleonal appendages and (4) biphasic moulting (Brusca *et al*, 2001).

Among the parasitic forms, both on fish and crustaceans the adult female is often so distorted (Fig. 2) that only during post-embryonic development their isopod connections are revealed.

The isopods have their importance as scavengers. As wood borers they enormously damage harbour installations and mangrove, weakening the prop roots; and as fish

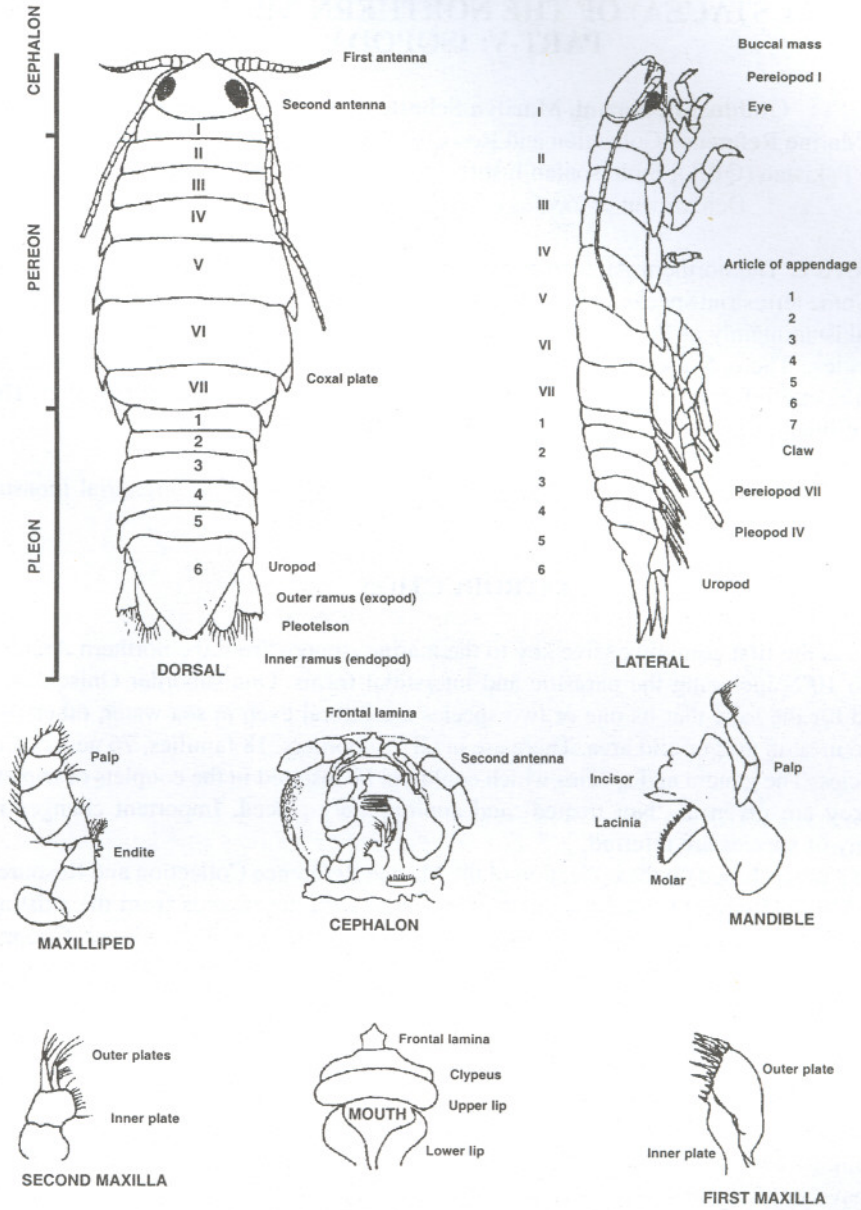


Fig. 1. Diagrams of generalized isopod.

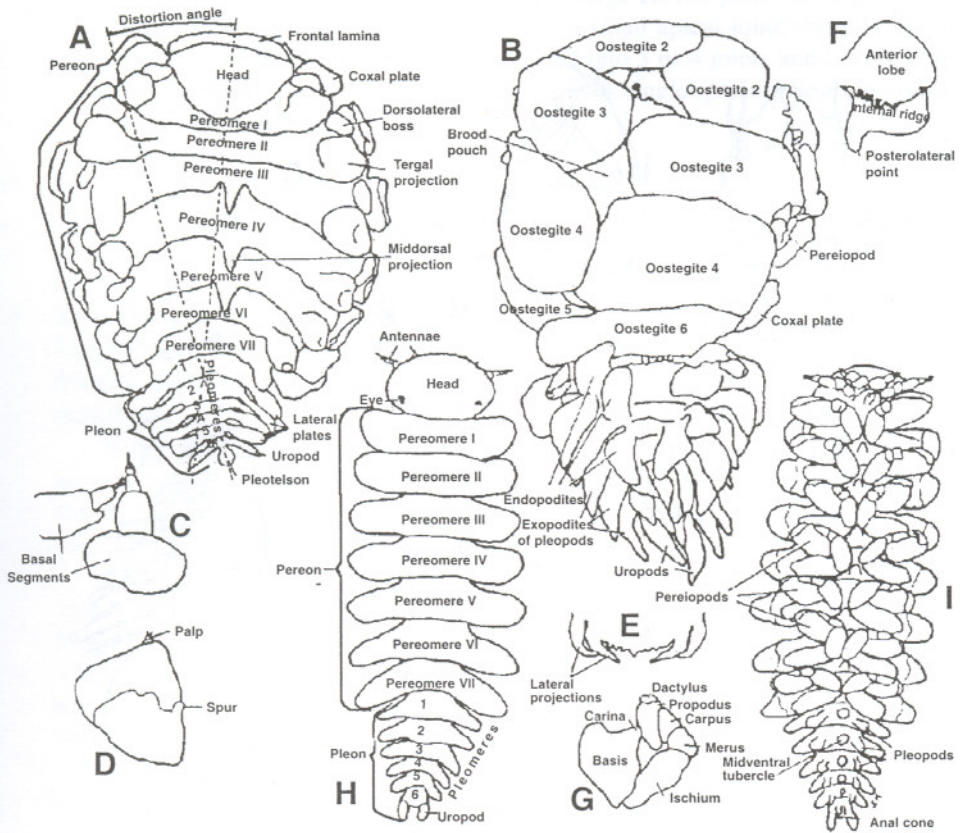


Fig. 2. Bopyrid illustrating morphological characters. A-G, female; H-I, male. A, dorsal view; B, ventral view; C, antennae; D, maxilliped; E, posteroventral border of head; F, oostegite 1. internal view; G, pereopod; H, dorsal view; I, ventral view. (after Markham, 1985)

parasites increasing fish mortality rate in wild and farmed fisheries.

KEY

1. With only 5 pairs of pereopods (thoracomere 2 entirely fused to cephalon, with its appendages functioning as a second pair of maxillipeds; thoracomere 8 reduced, without legs); adult males with mandibles grossly enlarged, forcepslike, projecting in front of head; adult females without mandibles. Suborder Gnathiidea Hansen, 1916.

A single family: Gnathidae Harger, 1814.

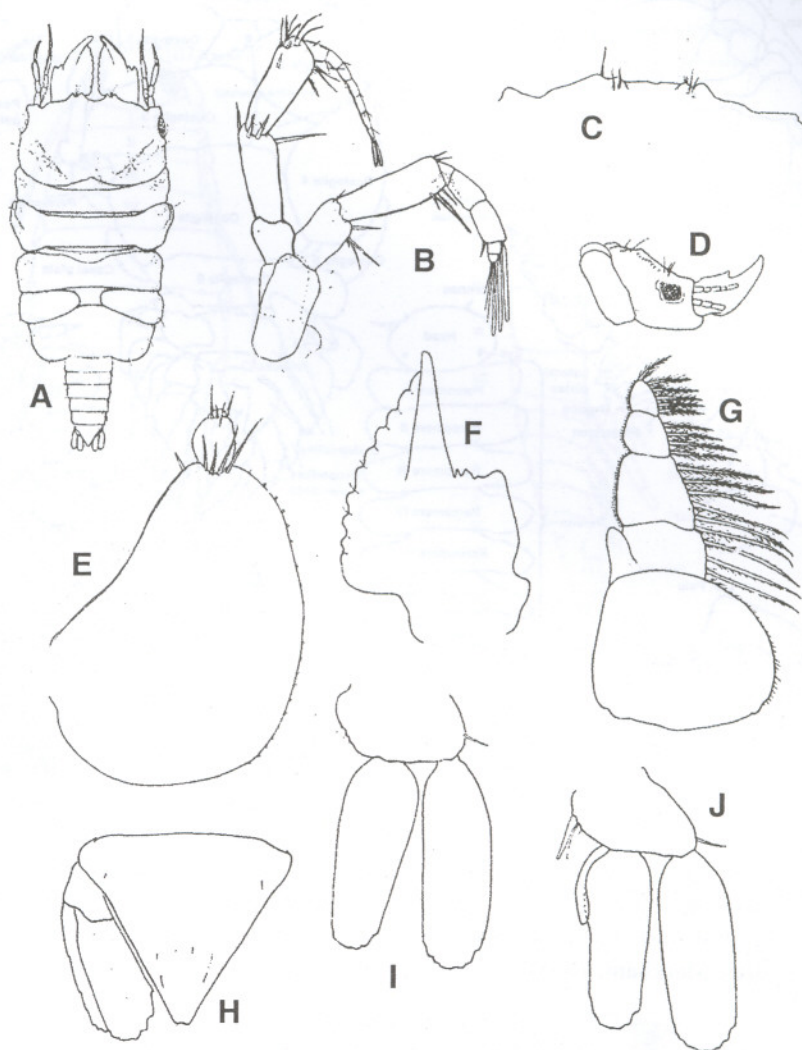


Fig. 3. *Gnathia arabica* Schotte, 1995 . A, male, dorsal habitus; B, antenna and antennule; C, frontal margin of cephalon; D, lateral view of cephalon; E, pylopod (pereopod 1); F, mandible; G, maxilliped; H, telson and uropod; I, pleopod 1; J, pleopod 2 (after Schotte, 1995).

Gnathopoda in male forming a pair of very large curved plates arching over the lower face of the cephalon and termination in a small apical joint; those in female much smaller and more pediform, being divided into 3 or 4 joints and having at the base a thin lamella A single species: *Gnathia arabica* Schotte, 1995.

Reference: Schotte, 1995.

- With 7 pairs of pereopods (thoracomere 2 not fused to cephalon, with 1 pair of maxillipeds and 7 pairs of pereopods); males without projecting, forcepslike mandibles; females with mandibles. 2
- 2. Adults obligate parasites on other crustaceans; bilateral symmetry reduced or lost in females; male a small bilaterally symmetrical symbiont living on the body of the female; antennae vestigial; antennules reduced to 3 or fewer articles; without maxillules. Suborder Epicaridea Latreille, 1831.
 - Sexes separate. Females show some segmentation. Antennae vestigial or become specialized. Mandibles and maxillipeds present, usually two maxillae rudimentary or absent. Oostegites usually large (except in Dajidae). A single infraorder: Bopyrina.
 - Adult female show segmentation and appendages. Trunk more or less asymmetrical and seven pereopods present on one side. Oostegites always present. Males minute. A single family: Bopyridae Rafinesque, 1815. 3
 - Not obligate parasites on other crustaceans; bilateral symmetry retained in both sexes; male not living as symbiont; antennae not vestigial; antennules variable; usually with maxillules. 11
- 3. Brood pouch not extending far beyond sides of pereon, at least partly formed by five pairs of loosely overlapping, stiff oostegites of nearly equal size; pleopods, when present, not pedunculate; infesting hosts branchially. 5
 - Brood pouch large, flaccid sac extending slightly to far beyond at least one side of pereon, tightly enclosed by flexible oostegites, usually fewer than five pairs and of unequal sizes; pleopods and lateral plates, when present, pedunculate; infesting hosts abdominally.
 - Body often nearly symmetrical; brood pouch formed by oostegites on both sides of body and extending equally to both sides of pereon; infesting paguroids dorsoabdominally Subfamily Athelginae Codreanu and Codreanu, 1956. 4
- 4. Head pentagonal in female; pleon with 5 distinct pleomeres. Male with head oval, pleon fused, subtriangular, slightly wider, no indication of any pleonal appendages Genus *Parathelges* Bonnier, 1900.
 - A single species: *Parathelges neotenuicaudis* (Shyamasundari *et al.*, 1993).
 - Host: *Pagurus kulkarnii* Sankolli.
 - Reference: Markham and Kazmi, 1998.

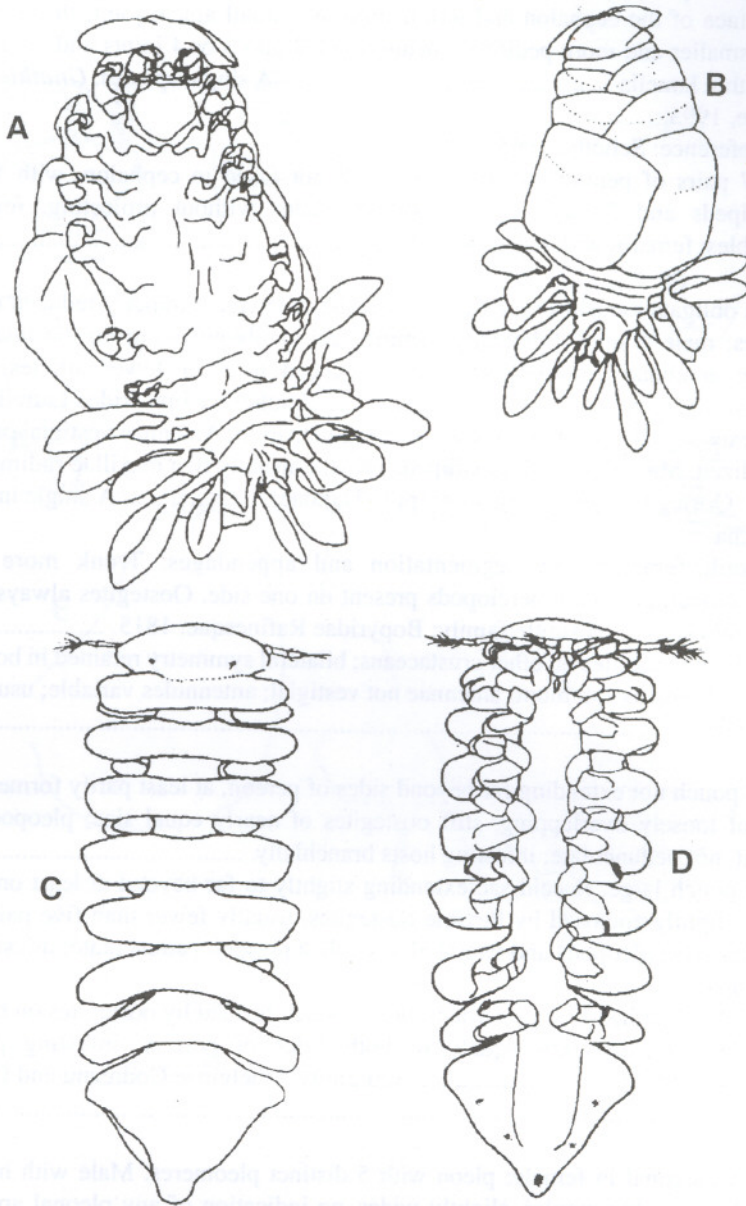


Fig. 4. *Parathelges neotenuicaudis* (Shyamasundari *et al.*, 1993). A, female, dorsal view; B, ventral view; C, male, dorsal view; D, ventral view. (after Markham and Kazmi, 1998).

- Male with pleon fused without lateral indication of pleomere 1; all five pairs of pleopods well developed but no uropods Genus *Allathelges* Kazmi and Markham, 1999.

A single species: *Allathelges pakistanensis* Kazmi and Markham, 1999.

Host: *Paguristes perspicax* (Nobili).

Reference: Kazmi and Markham, 1999.

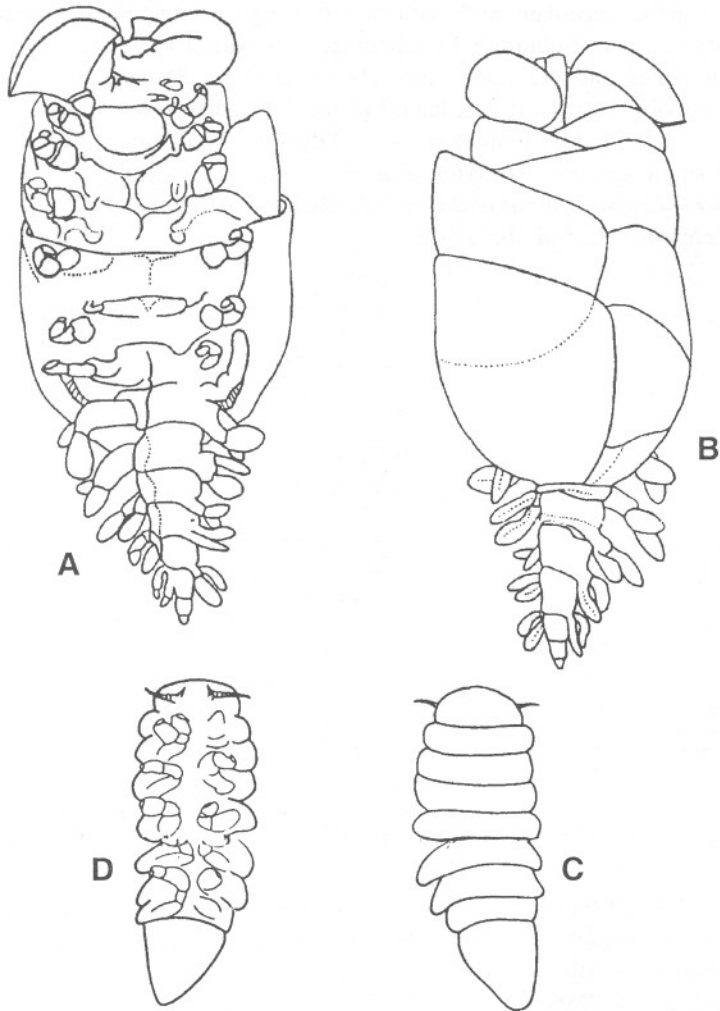


Fig. 5. *Allathelges pakistanensis* Kazmi and Markham, 1999. A, female, dorsal view; B, ventral view; C, male, dorsal view; D, ventral view. (after Kazmi and Markham, 1999).

5. Brood pouch completely enclosed by oostegites; usually infesting brachyurans, anomurans or penoid shrimps. 6
- Brood pouch usually completely open, most or all of ventral surface of pereon exposed (if brood pouch nearly closed, pleon almost fused or sharply twisted); infesting carideans and stenopoids. 7
6. Lateral plates sometimes absent, at most ovate, none directed forward; pleopodal rami ovate to lanceolate, both with smooth margins; infesting anomurans or, rarely, carideans. Subfamily Pseudioninae Codreanu, 1967. 8
- Lateral plates and pleopodal rami always present, elongate, with tuberculate to digitate margins; at least first lateral plates directed forward; infesting brachyurans Subfamily Ioninae H. Milne Edwards, 1840, emend. R. Codreanu, 1967.
- A single species: **Dactylokepon* sp.
 Host: *Leucosia biannulata* Tyndale-Biscoe and George.
 Reference: Kazmi, this study.



Fig. 6. *Dactylokepon* sp. male, dorsal view. (after Kazmi, unpublished)

- Lateral plates of female well developed, pleural lamellae on 6th abdominal segment. No pleopods in male, infesting penaeids Subfamily Orbioninae R. Codreanu, 1967.
- Not treated: *Parapenaemon japonica* (Thielemann, 1910).
 Host: *Penaeus* spp.
 References: Qazi, 1959 as *Epipenaemon qadrii*; Tirmizi and Kazmi, 1994.
 Not treated: *Parapenaeolla lamellata* Bourdon, 1979.
 Host: *Metapenaeus monoceros* (Fabricius)
 Reference: Bourdon, 1979.

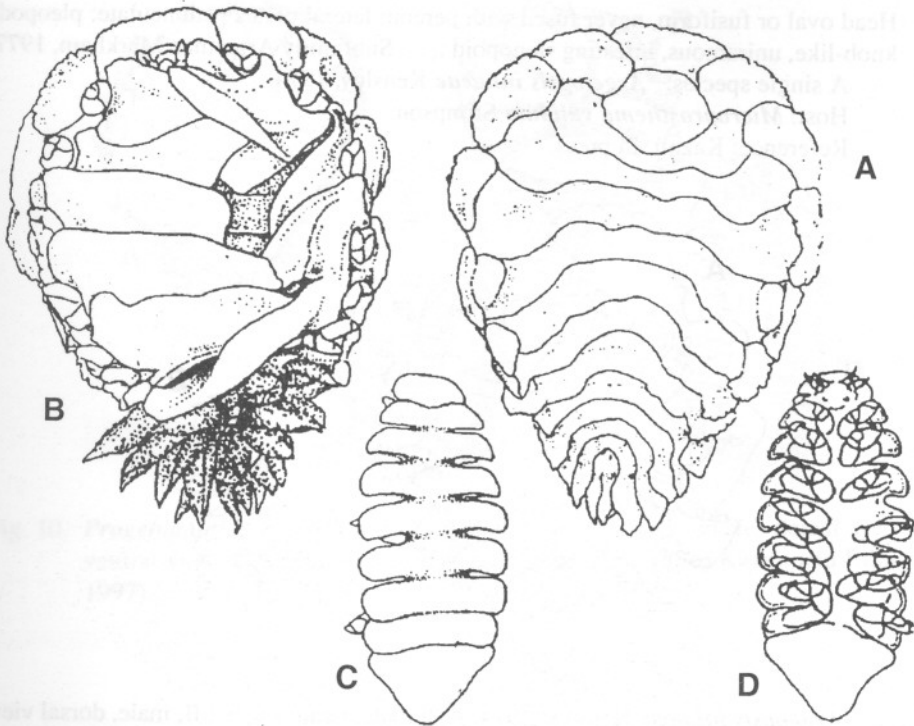


Fig. 7. *Parapenaemon japonica* (Theilemann, 1910). A, female, dorsal view; B, ventral view; C, male, dorsal view; D, ventral view (after Kazmi and Tirmizi, 1994).

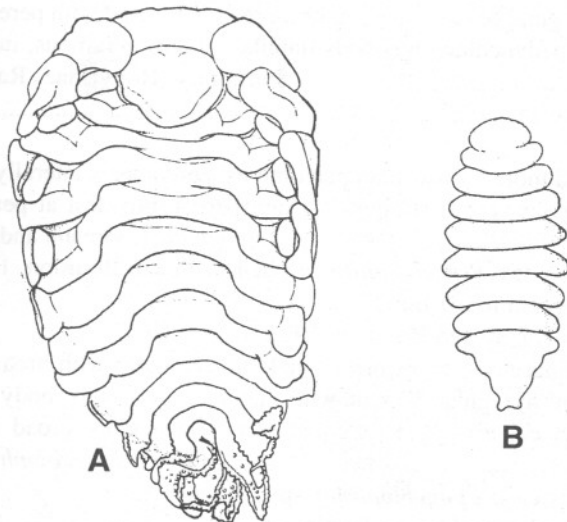


Fig. 8. *Parapenaeonella lamellata* Bourdon, 1979. A, female, dorsal view; B, male, dorsal view. (after Bourdon, 1979).

- 7. Head oval or fusiform, never fused with pereon; lateral plates pedunculate; pleopods knob-like, uniramous, infesting stenopoid Subfamily Argeiinae Markham, 1977.
 A single species: **Argeiopsis inhacae* Kensley, 1974.
 Host: *Microprosthema validum* Stimpson.
 Reference: Kazmi, in press.

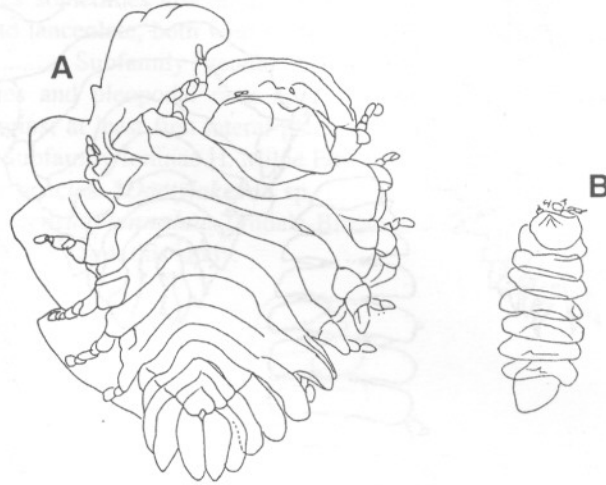


Fig. 9. *Argeiopsis inhacae* Kensley, 1974. A, female, ventral view; B, male, dorsal view (after Kazmi, in press).

- Head subrectangular or subtriangular or more or less fused with pereon; lateral plates, if present, not pedunculate; pleopods flaplike, usually biramous, infesting carideans Subfamily Bopyrinae Rafinesque, 1815, emend. R. Codreanu, 1967. 9
- 8. Male with head more narrow than pereomeres, pereomeres laterally distinct. Female head subtriangular almost straight in front, pereon broadest at pereomere 4 Genus *Progebiophilus* Codreanu and Cordeanu, 1963.
 A single species: *Progebiophilus assisi* Kazmi and Bourdon, 1997.
 Host: *Upogebia assisi* Barnard
 Reference: Kazmi and Bourdon, 1997.
- Male with distinct body segments, cephalon rectangular with broad truncated front, telson small and triangular. Female with flattened, oval body, body segments clearly marked, telson consists of two equal lobes, oostegites broad and subquadrate Genus *Upogebiophilus* Nobili, 1906.
 A single species: *Upogebiophilus* sp.
 Host: *Upogebia quddusiae* Tirmizi and Ghani.
 Reference: Ghani, 1995.

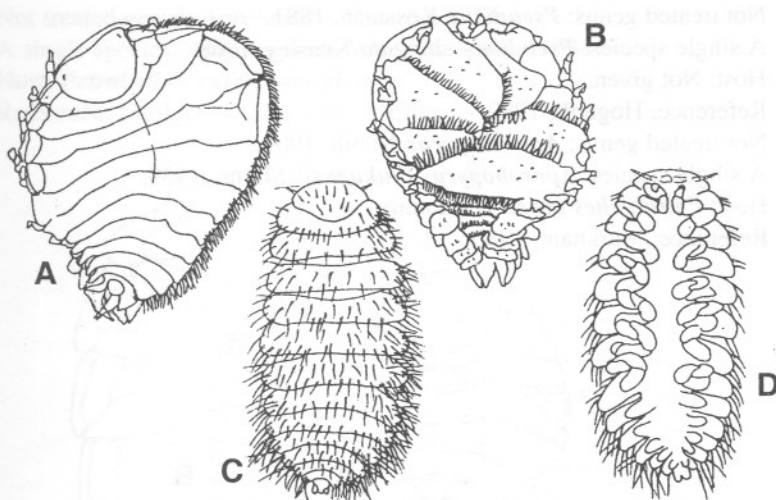


Fig. 10. *Progebiophilus assisi* Kazmi and Bourdon, 1997. A, female, dorsal view; B, ventral view; C, male, dorsal view; D, ventral view. (after Kazmi and Bourdon, 1997).

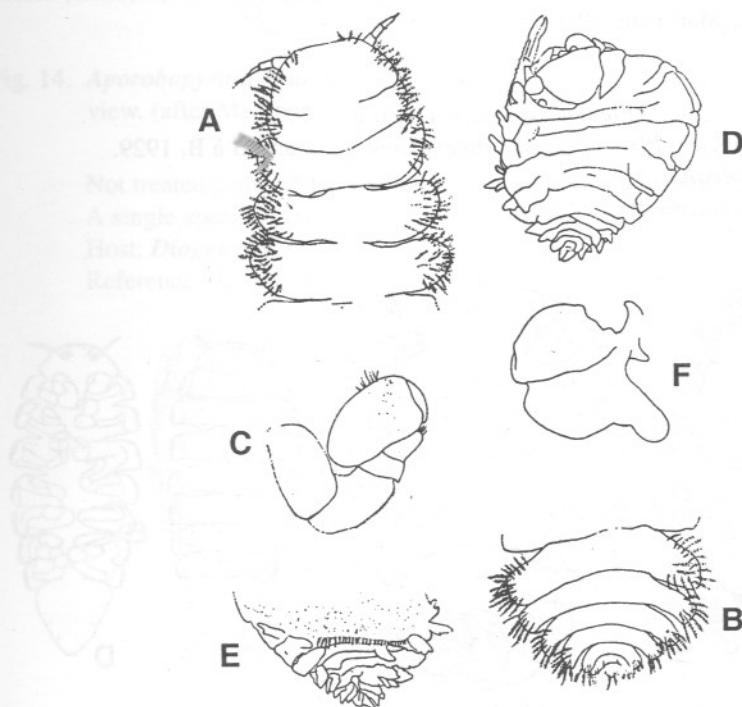


Fig. 11. *Upogebiophilus* sp. A, male, anterior part; B, same, posterior part; C, pereiopod I; D, female; E, same, abdomen and pleopods; F, oostegite I. (after Ghani, 1995).

Not treated genus: *Pseudione* Kossman, 1881.

A single species: *Pseudione elongata* Kensley, 1968.

Host: Not given.

Reference: Hogarth, 1989.

Not treated genus: *Aporobopyrus* Nobili, 1906.

A single species: *Aporobopyrus ryukuensis* Shiino, 1939.

Host: *Petrolisthes boscii* (Andouin)

Reference: Markham, 1980.

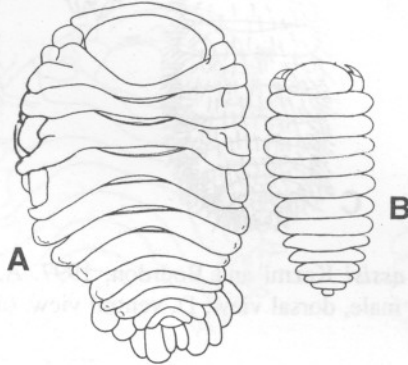


Fig. 12. *Aporobopyrus ryukuensis* Shiino, 1931. A, female, dorsal view; B, male, dorsal view. (after Markham, 1980).

Not treated genus: **Pleurocryptosa* N and B à B, 1929.

A single species: *Pleurocryptosa megacephalon* N and B à B, 1929.

Host: *Petrolisthes* sp.

Reference: Kazmi, this study.

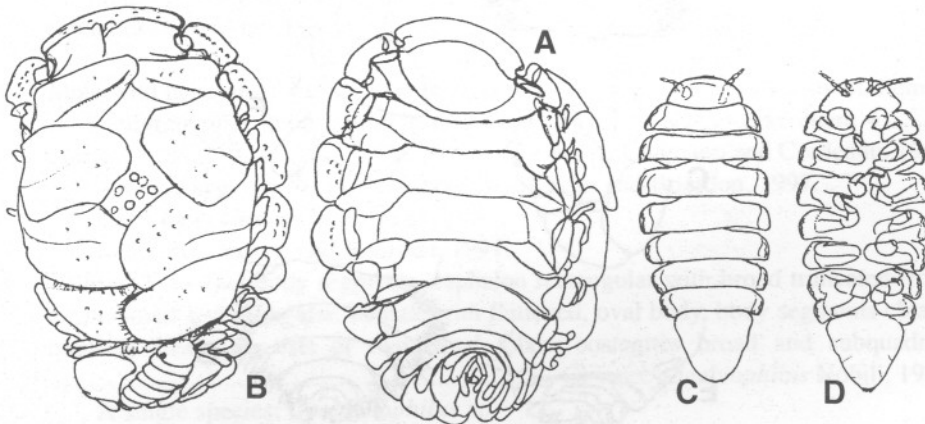


Fig. 13. *Pleurocryptosa megacephalon* N and B à B, 1929. A, female, dorsal view; B, female, ventral view; C, male, dorsal view; D, male, ventral view. (after Kazmi, unpublished).

Not treated genus: *Aprobopyrina* Shiino, 1934.
 A single species: *Aprobopyrina lamellata* Shiino, 1934.
 Host: *Petrolisthes rufescence* Heller.
 Reference: Markham, 1980; Ghani, 1996.

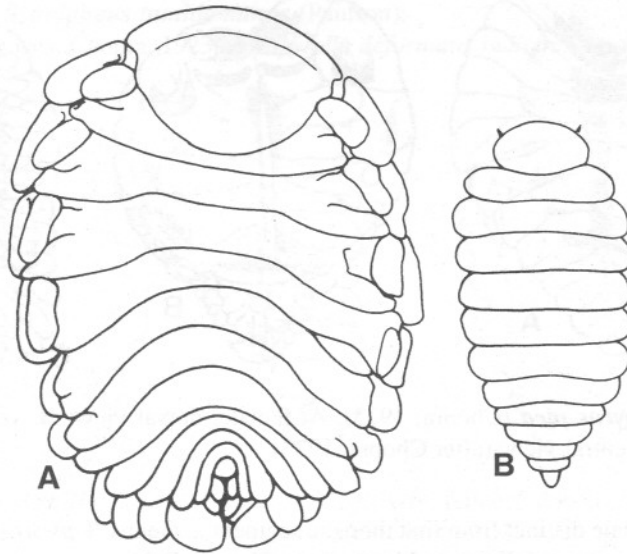


Fig. 14. *Aprobopyrina lamellata* Shiino, 1934. A, female, dorsal view; B, male, dorsal view. (after Markham, 1980).

Not treated genus: **Asymmetrione* Codreanu, Codreanu and Pike, 1965.
 A single species: *Asymmetrione* sp.
 Host: *Diogenes* spp.
 Reference: Kazmi, this study.

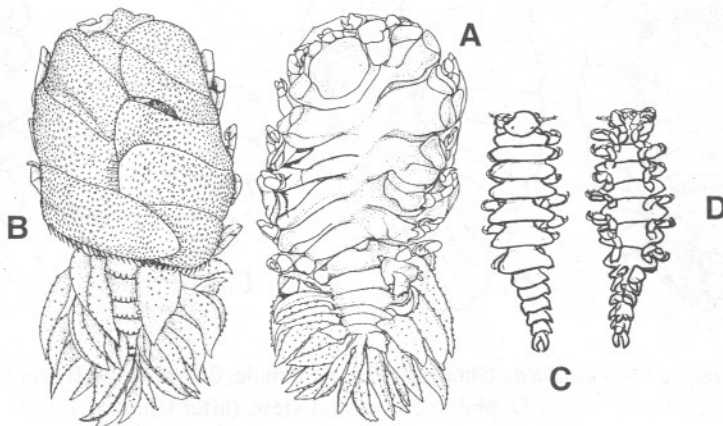


Fig. 15. *Asymmetrione* sp. A, female, dorsal view; B, female, ventral view; C, male, dorsal view; D, male, ventral view. (after Kazmi, unpublished).

Not treated genus: *Probopyrus* Giard and Bonnier, 1888.

A single species: *Probopyrus pica* (Chopra, 1923)

Host: *Leander potamiscus* Kemp (= *Leptocarpus potamiscus*)

Reference: Chopra, 1923 and Qazi, 1959 as *Palaegyge pica*

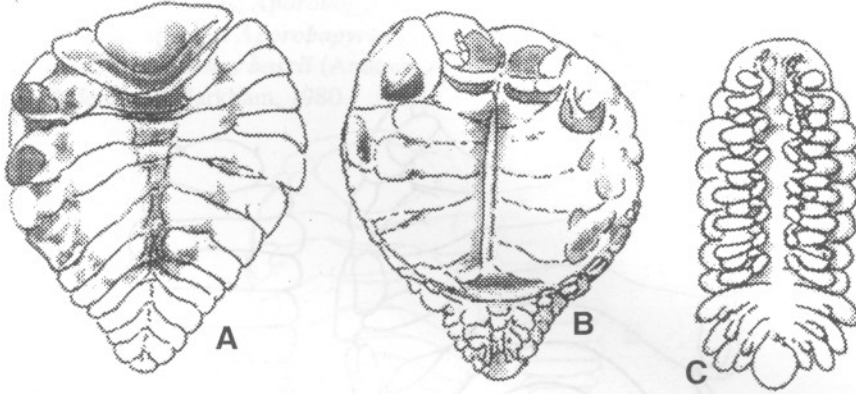


Fig. 16. *Probopyrus pica* (Chopra, 1923). A, female, dorsal view; B, ventral view; C, male, ventral view. (after Chopra, 1923).

9. Head in female distinct from first thoracic segment....Genus *Bopyrus* Latreille, 1802.

A single species: *Bopyrus bimaculatus* Chopra, 1923.

Host: *Palaemon serrifer* (Stimpson).

Reference: Chopra, 1930 as *Bopyrus squillarum bimaculatus*.

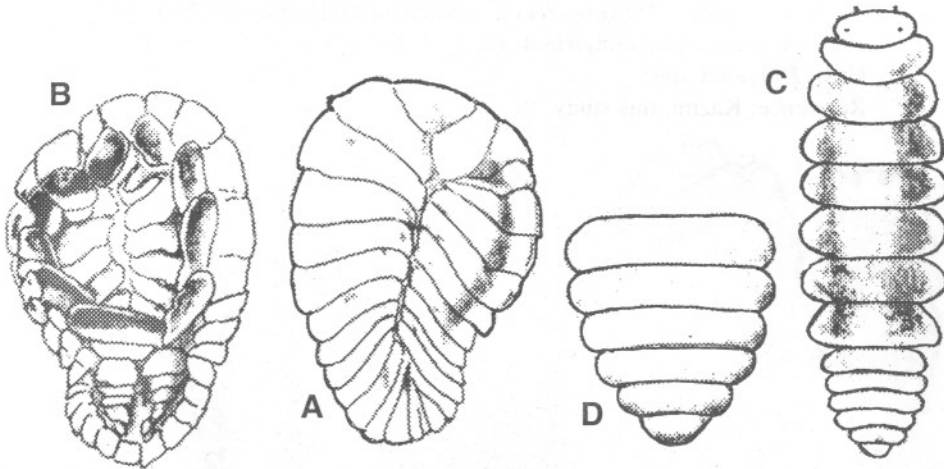


Fig. 17. *Bopyrus bimaculatus* Chopra, 1923. A, female, dorsal view; B, ventral view; C, male, dorsal view; D, abdomen, ventral view. (after Chopra, 1923).

- Head in female fused with first thoracic segment. Six very distinct pleomeres separated by rather deep lateral incision. Five pairs of overlapping biramous pleopods Genus *Parabopyrella* Markham, 1985. 10
10. All pairs of pleopods biramous *Parabopyrella indica* (Chopra, 1923).
 Host: *Synalpheus tumidomanus* (Paulson).
 References: Chopra, 1923 as *Bopyrella deformans indica*; Kazmi, this study.

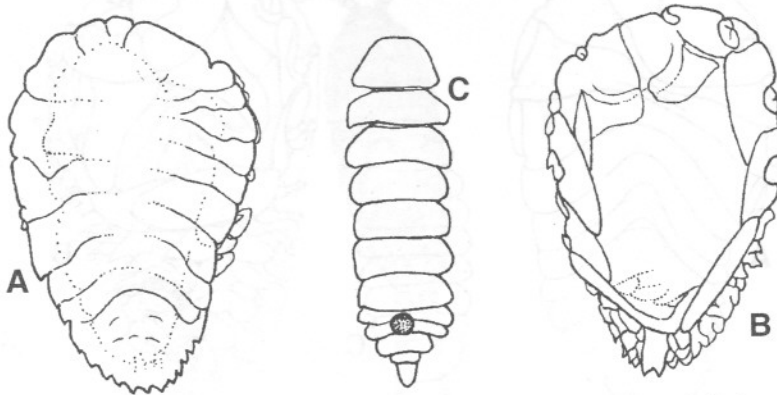


Fig. 18. *Parabopyrella indica* (Chopra, 1923). A-B, female, dorsal and ventral view respectively; C, male, dorsal view. (after Chopra, 1923).

- Pleopods poorly developed, somites separate *Parabopyrella nierstraszi* (Chopra, 1930).
 Host: Alpheid and hippolytid shrimps.
 References: Qazi, 1959 as *Bopyrella mortenseni*; Kazmi, this study.

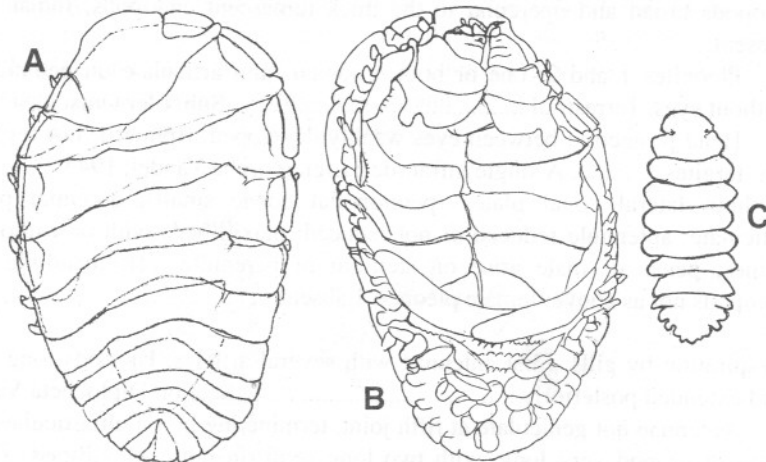


Fig. 19. *Parabopyrella nierstraszi* (Chopra, 1930). A, female, dorsal view; B, ventral view; C, male, dorsal view. (after Kazmi, unpublished).

- Pleopods biramous, tuberculate, 5 pairs. Abdominal somites fused centrally and on short side. *Parabopyrella saronae* (Bourdon and Bruce, 1979).
 Host: *Saron marmoratus* (Olivier).
 Reference: Ghani and Tirmizi, 1993 as *Bopyrella saronae* Bourdon and Bruce.

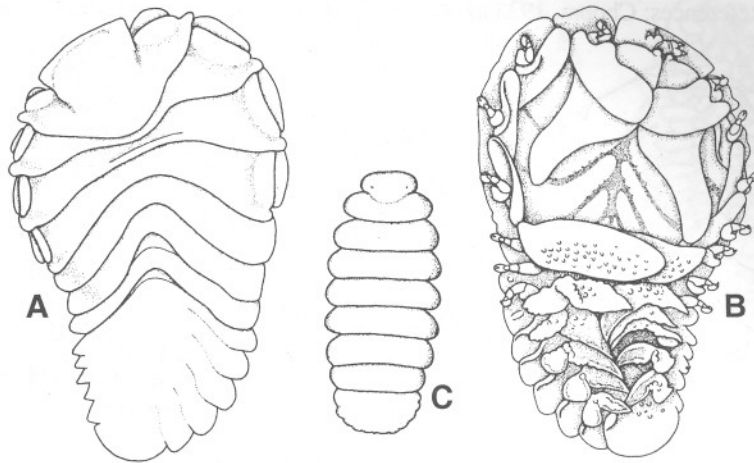


Fig. 20. *Parabopyrella saronae* (Bourdon and Bruce, 1979) A, female, dorsal view; B, ventral view; C, male, dorsal view. (after Bourdon and Bruce, 1979).

11. With lateral coxal plates; antennal peduncle 5-articulate; antennule reduced to 5 or fewer articles; maxillipeds without coupling spines; penes of male arise from articulation between pereonite VII and pleonite 1; mandible without palp; pleopodal exopods broad and opercular to the thick tumescent endopods; female pleopod 1 present.
 Pleonites 1 and 2; one or both uropodal rami articulate on peduncle; with or without eyes. Terrestrial Suborder Oniscidea Dana, 1852.
 Head projection between eyes weakly developed. Epimerii not separated from the tergites. A single infraorder: Ligiamorpha Vandel, 1943. 12
- Without lateral coxal plates (pereopodal coxae small); antennal peduncle 6-articulate; antennule reduced or not reduced; maxillipeds with or without coupling spines; penes of male arise on sternum of pereonite VII; mandible with palp; pleopods not as above; female pleopod 1 absent..... 14
12. Respiration by gills. First antennae with several articles. Uropods long, cylindrical and extended posteriorly Section Diplocheta Vandel, 1957.
 Antennae not geniculate at fifth joint, terminating in a multiarticulate flagellum. Base of uropod very long, with two long setiform rami. Maxillipeds four-jointed, elongate A single family: Ligiidae Brandt, 1883.

A single species: **Ligia exotica* Roux, 1828

Reference: Joshi and Bal, 1959; Kazmi, present study.



Fig. 21. *Ligia exotica* Roux, 1828. Adult male, dorsal view. (after Kazmi, unpublished).

- Water transport system present. Uropods branches cylindrical but short Section Crinocheta Legrand, 1946. 13

13. With a highly convex body, able to roll up into a ball. Dorsal surface of body with no distinguishably visible scales. First flagellum of antennae as long as or longer than second Family Porcellionidae Verhoeff, 1918.

A single species: *Hemilepistus klugii* Brandt, 1833

Reference: Barnard, 1935; Schotte, 1993.

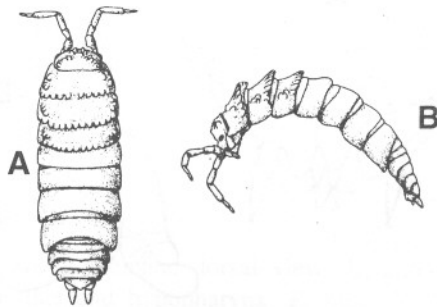


Fig. 22. *Hemilepistus klugii* Brandt, 1833. A, male, dorsal view; B, lateral view. (after Schotte, 1993)

- With flat broad body and short strong pereopods. Pseudotracheae in all pleopodal exopods Family Eubelidae Budd-Lund, 1904.
 Not treated genus: *Periscyphis* (Gerstaecker, 1873).
 A single species: *Periscyphis vittatus* Omer-Cooper, 1926.
 Reference: Kazmi and Yousuf, 2000.

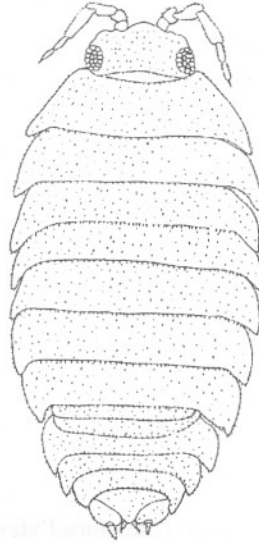


Fig. 23. *Periscyphis vittatus* Omer-Cooper, 1926. Male, dorsal view. (after Kazmi and Yousuf, 2000)

- Not treated genus: *Xeroniscus* Ferrara and Taiti, 1990.
 A single species: *Xeroniscus* sp.
 Reference: Ferrara and Taiti, 1990.

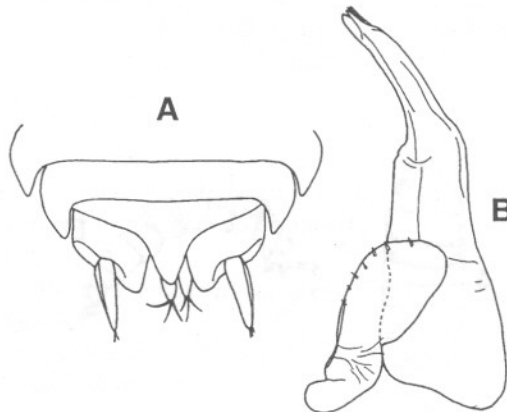


Fig. 24. *Xeroniscus* sp. A, male, pleonites 4, 5 telson and uropods; B, pleopod I. (after Ferrara and Taiti, 1990)

14. Anus and articulating base of uropods positioned terminally (or subterminally) on pleotelson; uropods styliform. 15
 - Anus and articulating base of uropods positioned laterally, at base of pleotelson; uropods flattened. 19
15. Minute, usually less than 3 mm long; long and slender, length about 6 times width; antennal peduncle without a scale; antennule reduced, peduncle indistinguishable from flagellum; maxilliped without coupling spines on endite; female pleopod 2 biramous; male pleopod 2 endopod not geniculate; interstitial. Suborder Microcerberidea Lang, 1961.

A sole family: Microcerberidae Karaman, 1933.

A single species: *Coxicerberus* sp.

Reference: Kazmi and Naushaba, 2000.

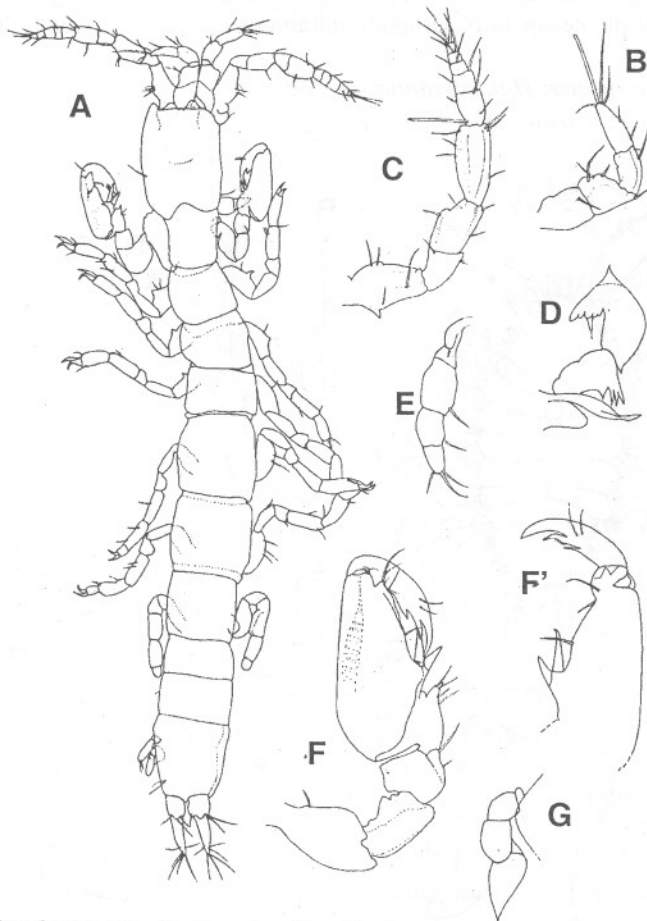


Fig. 25. *Coxicerberus* sp. A, female, dorsal view; B, antenna 1; C, antenna 2; D, mandible, maxillae and hypopharynx; E, maxilliped; F, F', pereiopod 1; G, pleopod 1. (after Kazmi, 2001)

- Rarely minute, usually greater than 4 mm long; body not elongate (length less than 6 times width); antennal peduncle usually with a scale; antennule rarely reduced, peduncle and flagellum distinct; maxilliped almost always with coupling spines on endite; female pleopod 2 uniramous; male pleopod 2 endopod large and geniculate; rarely interstitial. Suborder Asellota Latreille, 1803. 16
- 16. Eyes on lateral, peduncle-like projections; dactylia of pereopods 2-7 with two claws. 18
- Eyes if present dorsolateral on head, not pedunculate; dactylia of pereopods 2-7 with two or three claws.
 Pleotelson broad, shield like; uropods short but clearly visible in dorsal view
 Family Santiidae Kussakin, 1988. 17
- 17. Frontal margin of head with large, broadly rounded lobe with fringe of spines. Pleon consisting of pleotelson only. Uropods uniramous. Genus *Halacarsantia* Wolff, 1989.
 A single species: *Halacarsantia* sp.
 Reference: Kazmi, 2001.

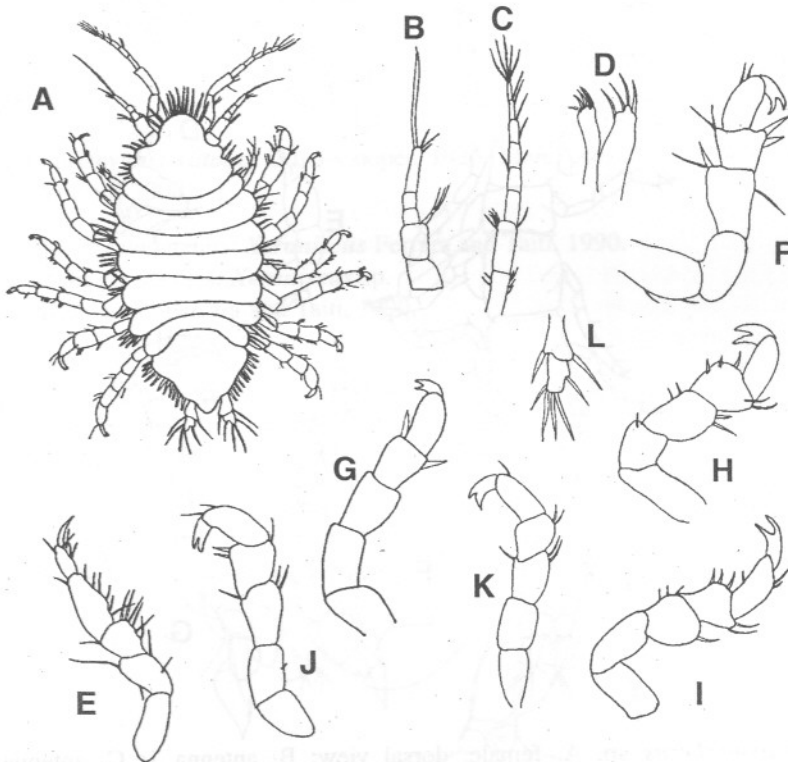


Fig. 26. *Halacarsantia* sp. A, entire, dorsal view; B, antenna 1; C, antenna 2; D, maxilla 1; E-K, pereopods 1-7; L, uropod. (after Kazmi, 2001)

- Frontal margin of head straight. One short pleonite in front of pleotelson. Uropods biramous..... Genus *Santia* Siversten and Holthuis, 1980.

A single species: *Santia spicata* Kensley and Schotte, 2002.

Reference: Kensley and Schotte, 2002.

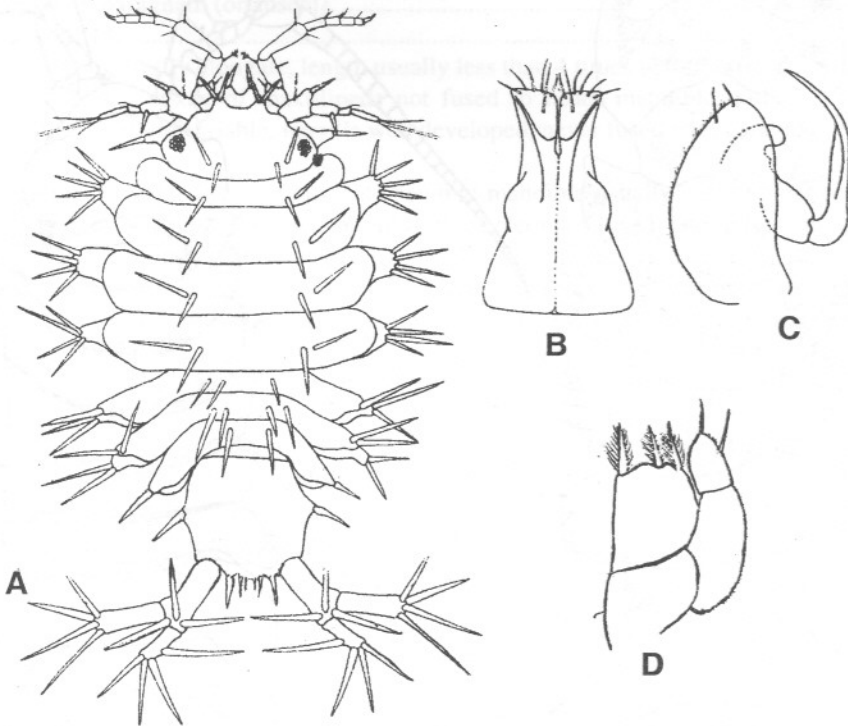


Fig. 27. *Santia spicata* Kensley and Schotte, 2002. A, male, dorsal view; B, pleopod 1; C, pleopod 2; D, pleopod 3. (after Kensley and Schotte, 2002)

- 18. Both pairs of antennae small, flagella lacking or rudimentary; antennal articles of peduncle dilated; uropods short, inserted in subterminal excavations of pleotelson, not extending much beyond its posterior margin, if at all. Family Joeropsidae Nordenstam, 1933.

A single species: *Joeropsis karachiensis* Kazmi and Yousuf, 2001.

Reference: Kazmi and Yousuf, 2001.

- Antennae, long with multi articulate flagella; antennal articles of peduncle not dilated; uropods well developed. Family Janiridae Sars, 1899.

Not treated genus: **Carpias* (Miller, 1941).

Carpias algicola (Miller, 1941)=*Carpias longimanus* (Pillai, 1954).

Reference: Pillai, 1954.

**Carpias* sp.

Reference: Kazmi, this study.

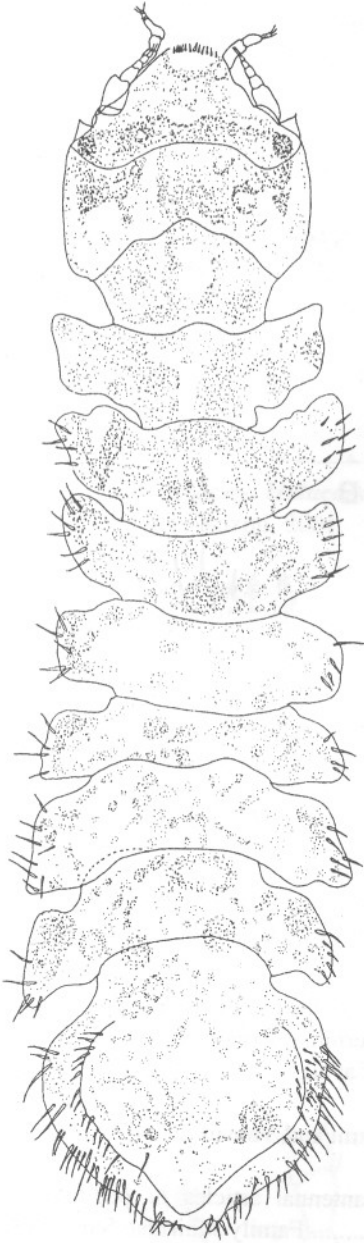


Fig. 28. *Joeropsis karachiensis* Kazmi and Yousuf, 2001. Male, dorsal view. (after Kazmi and Yousuf, 2002)

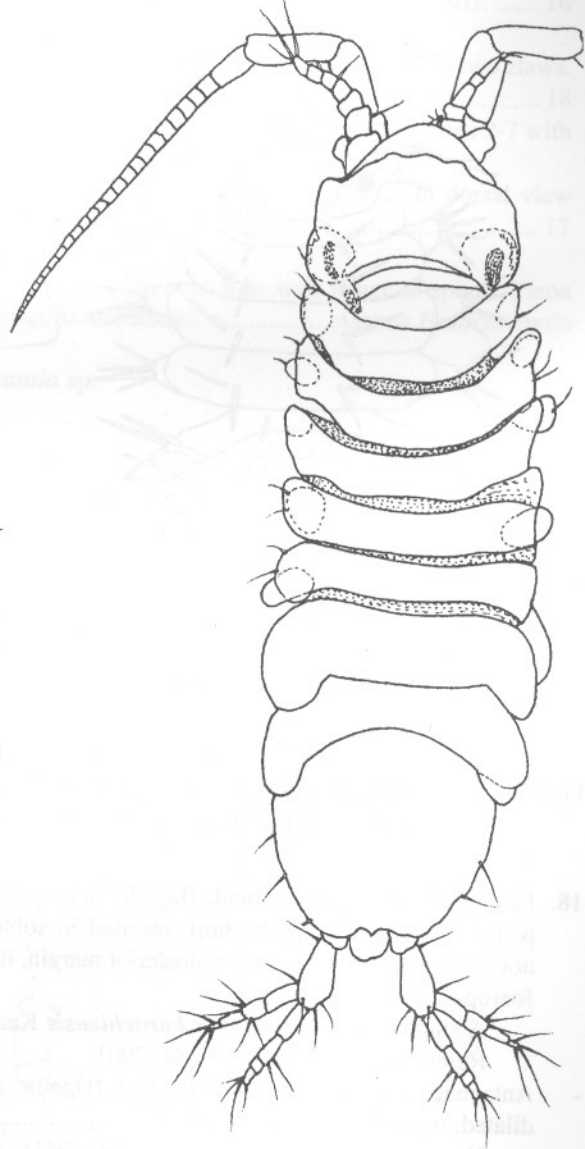


Fig. 29. *Carpias* sp. Female, dorsal view. (after Kazmi, unpublished)

19. Body elongate, length usually more than 6 times width; uropodal exopod curving dorsally over pleotelson; coxae of maxillipeds fused to head (i.e. not freely articulating); mandible with unique lamina dentata (in lieu of spine row and lacinia mobilis; lamina dentata, spine row and lacinia mobilis lacking in Paranthuridae); maxillule an elongate stylet with apical hooks or serrate margin; maxilla vestigial and fused with paragnath (or absent). Suborder Anthuridea Leach, 1814. 20
- Body not markedly elongate, length usually less than 4 times width; uropodal exopod not as above; coxae of maxillipeds not fused to head; mandible without lamina dentata; maxillule variable; maxilla well developed, never fused with paragnath. ... 27
20. Mouthparts adapted for cutting and chewing; mandible usually with molar process, lamina dentata and toothed incisor; all or most pleonites fused, one or two statocysts Family Anthuridae Leach, 1814. 21
- Mouthparts stylet-like, adapted for piercing and sucking, forming a conelike structure; mandible usually with smooth incisor, no molar process or lamina dentata; pleonites 1-6 usually with distinct sutures, zero or one telsonic statocyst Family Paranthuridae Menzies and Glynn, 1968. 26
21. Maxilliped of 6 segments Genus *Haliophasma* Haswell, 1881.
A single species: *Haliophasma poorei* Kensley 1980.
Reference: Kensley, 1980
- Maxilliped of fewer than 6 segments 22

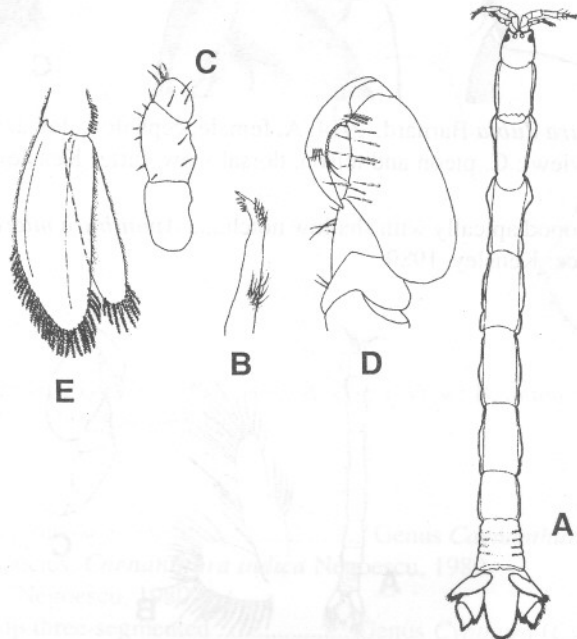


Fig. 30. *Haliophasma poorei* Kensley, 1980. A, male, dorsal view; B, maxilla; C, maxilliped; D, pereiopod 1; E, pleopod 1. (after Kensley, 1980)

22. Maxilliped of 5 segments. Pereiopod 4-7 with triangular carpus Genus *Apanthura* Stebbing, 1900. 23
 - Maxilliped of fewer than 5 segments 24
23. Uropodal exopod strongly notched *Apanthura dubia* Barnard, 1914 [= *Apanthura sandalensis* non Stebbing = *Amakusanthuria dubia* (Barnard, 1914)]. Reference to change: Kensley and Schotte, 2000.
 Reference: Kensley, 1980.

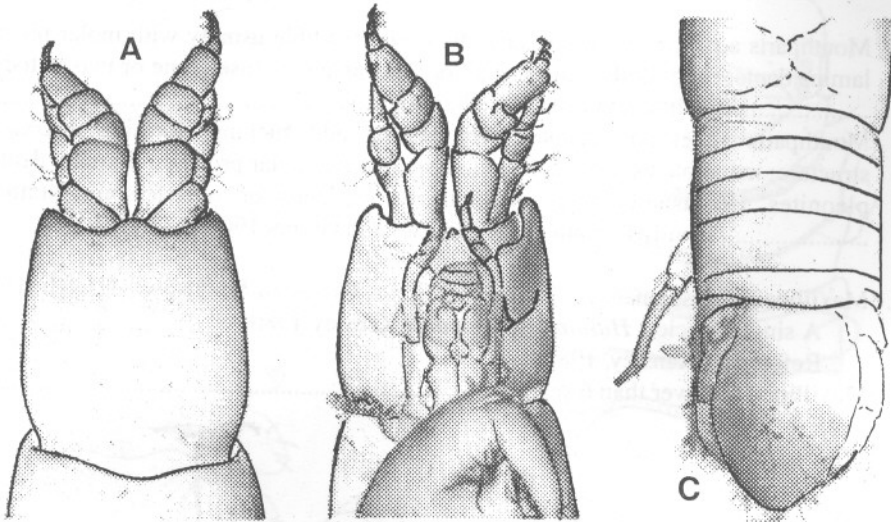


Fig. 31. *Apanthura dubia* Barnard, 1914. A, female, cephalon, dorsal view; B, cephalon, ventral view; C, pleon and telson, dorsal view. (after Kensley, 1982)

- Uropodal exopod apically with shallow notch..... *Apanthura microps* Kensley, 1980.
 Reference: Kensley, 1980.

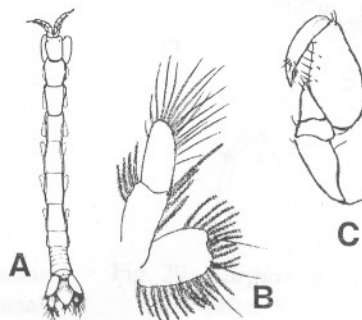


Fig. 32. *Apanthura microps* Kensley, 1980. A, female, dorsal view; B, uropod; C, pereiopod I (after Kensley, 1980)

24. Pereiopods 4-7 with triangular carpus 25
 - Pereiopods 4-6 with more or less rectangular carpus. Pereiopod 7 absent
 Genus *Exallanthura* Kensley, 1980.

A single species: *Exallanthura sexpes* Kensley, 1980.
 Reference: Kensley, 1980.

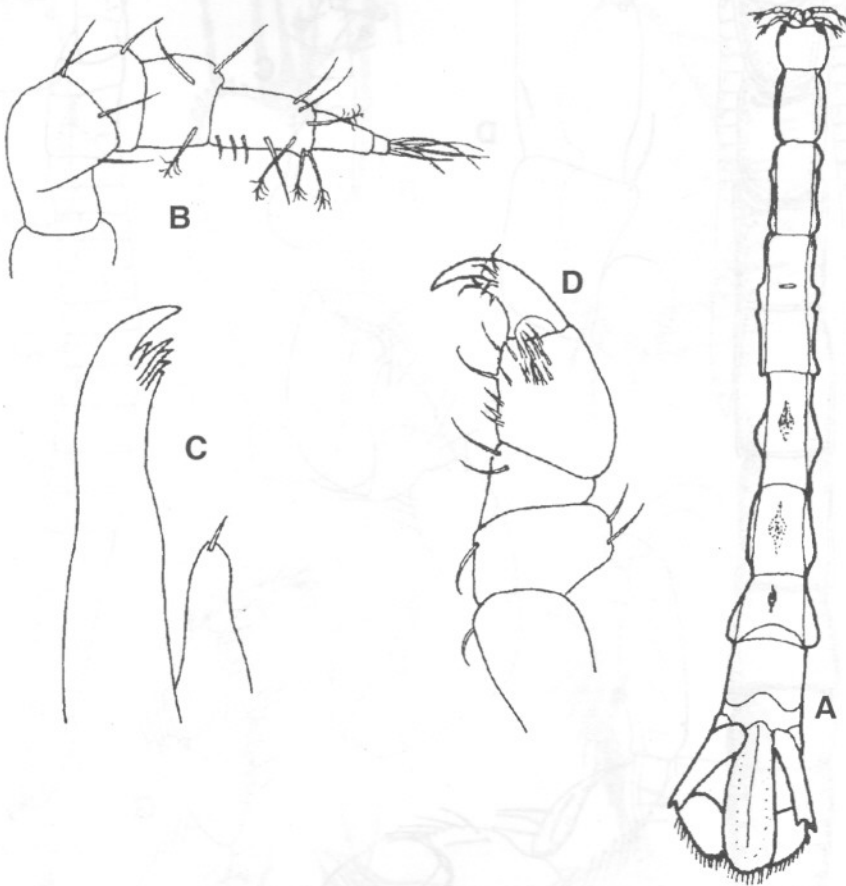


Fig. 33. *Exallanthura sexpes* Kensley, 1980. A, dorsal view; B, antenna; C, maxilla; D, pereopod I. (after Kensley, 1980).

25. Mandibular palp one-segmented Genus *Caenanthura* Kensley, 1978.
 A single species: *Caenanthura indica* Negoescu, 1980.
 Reference: Negoescu, 1980.
 - Mandibular palp three-segmented Genus *Cyathura* (*Cyathura*) Norman
 and Stebbing 1886.

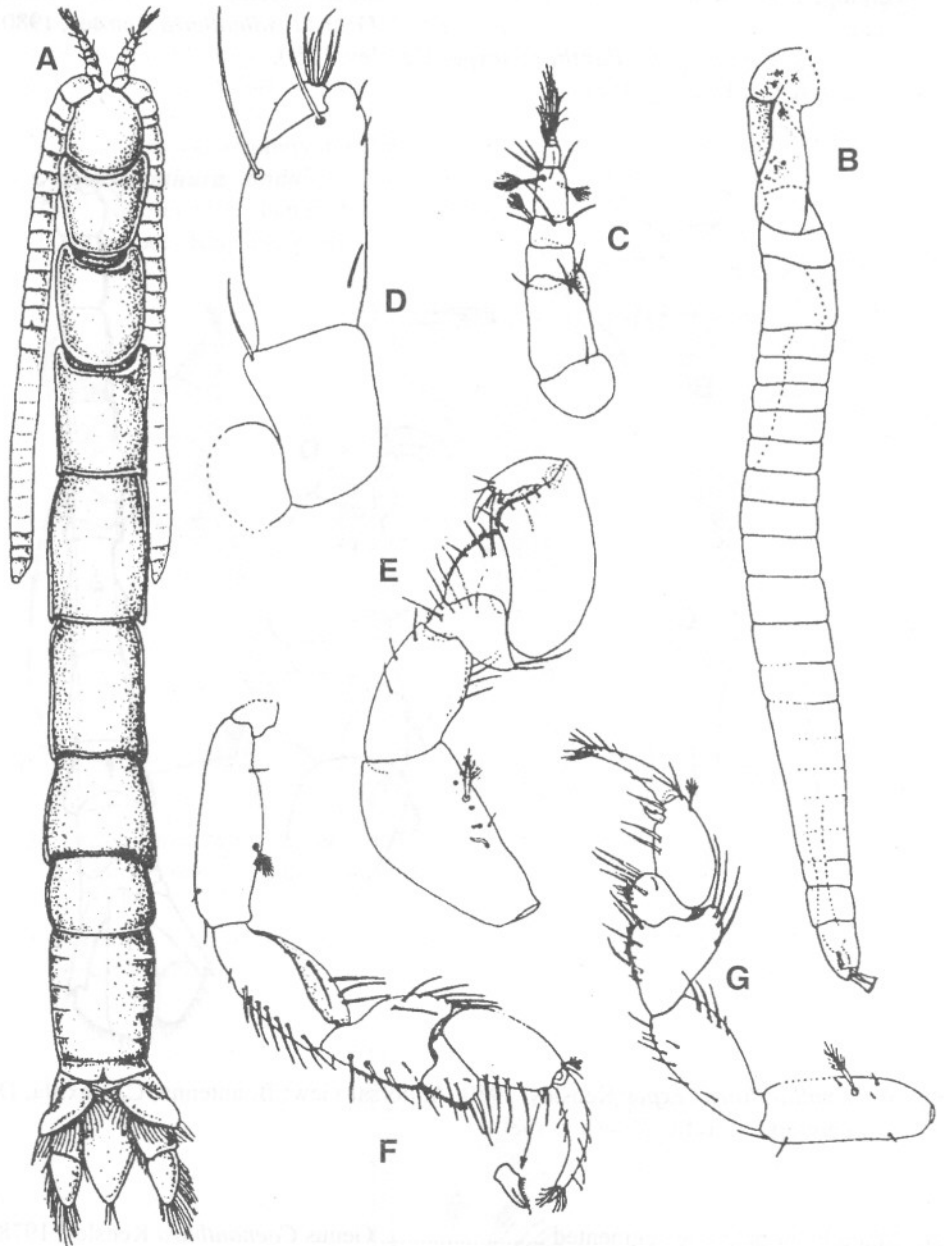


Fig. 34. *Caenanthura indica* Negoescu, 1980. A, male, dorsal view; B, antennule; C, antenna; D, maxilliped; E, pereiopod I; F, pereiopod II; G, pereiopod III. (after Negoescu, 1980)

A single species: *Cyathura (Cyathura) francispori* Negoescu, 1981.
Reference: Wagele, 1984.

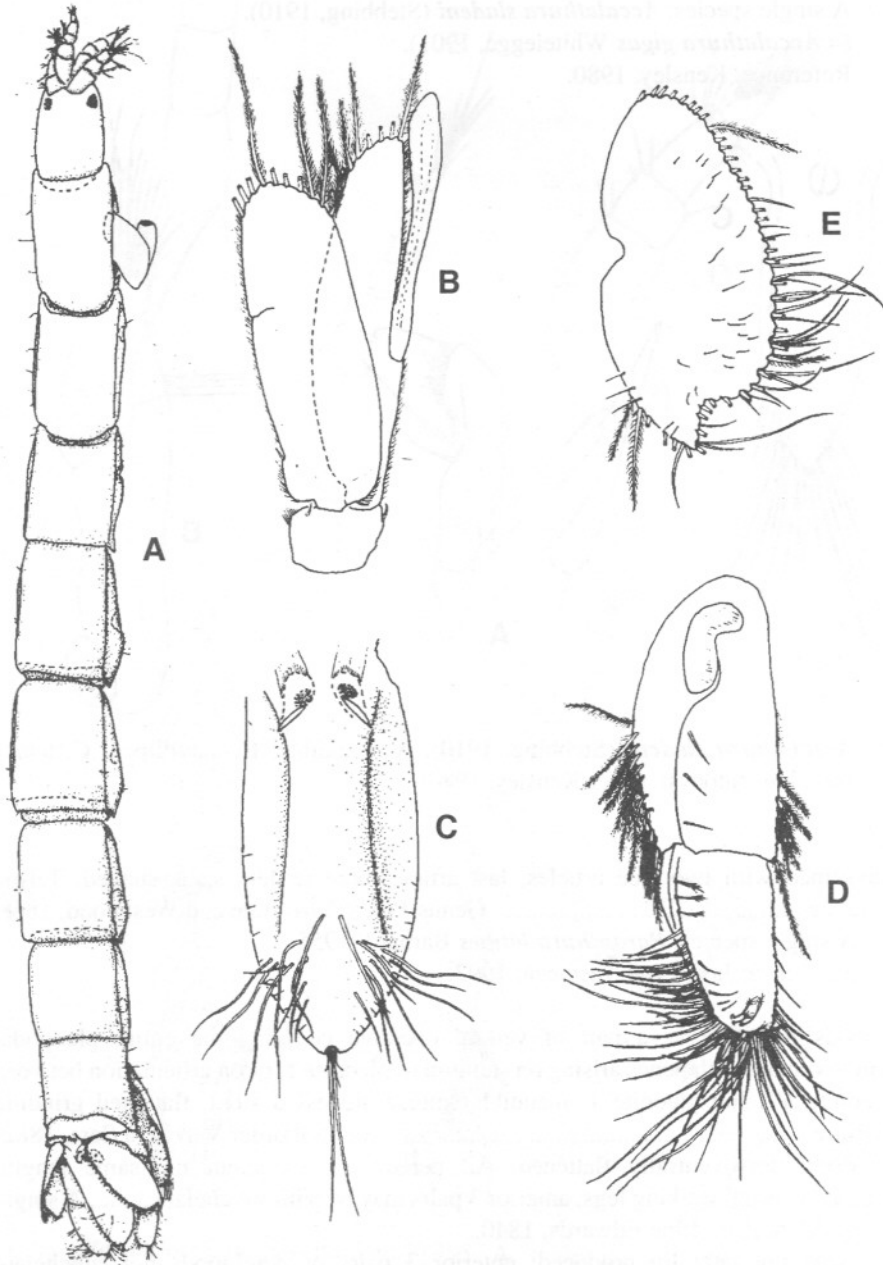


Fig. 35. *Cyathura francispori* Negoescu, 1981. A, male, dorsal view; B, second pleopod; C, telson; D, endopod of uropod; E, exopod of uropod. (after Wagele, 1984)

26. Maxilliped of three free articles. (basal article fused with cephalon, some authors do not count them as free). Statocyst single, not paired. Flagellum of antenna multiarticulate. Pleopod 1 operculiform, not indurated. Uropodal endopod distinctly narrower than peduncle Genus *Accalathura* Barnard, 1925.
 A single species: *Accalathura sladeni* (Stebbing, 1910).
 (= *Accalathura gigas* Whitelegge, 1901).
 Reference: Kensley, 1980.

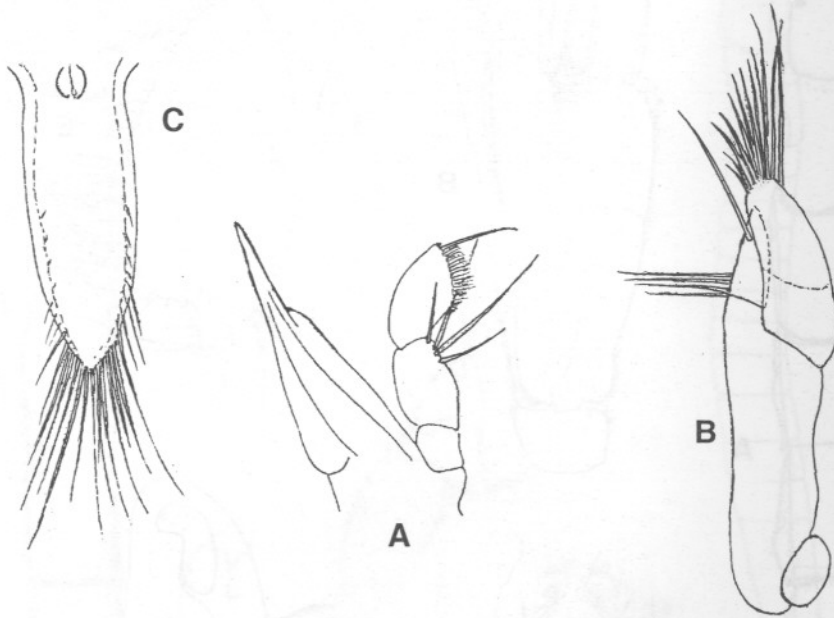


Fig. 36. *Accalathura sladeni* (Stebbing, 1910). A, mandible; B, maxilliped; C, telson showing statocyst. (after Kensley, 1980)

- Maxilliped with two free articles, last article more or less spear-shaped. Telson spatulate Genus *Paranthura* Bate and Westwood, 1868.
 A single species: *Paranthura latipes* Barnard, 1955.
 Reference: Javed and Yasmeen, 1992.
27. Uropods modified as a pair of ventral opercula covering the entire pleopodal chamber; male with penes arising on sternum of pleonite 1, or on articulation between pereonite VII and pleonite 1; mandibular molar process a stout, flattened grinding structure. Suborder Valvifera Sars, 1882.
 Body dorsoventrally flattened. All pereomeres of about the same length. Pereiopods usual walking legs; anterior 3 pairs may be with subchelae A single family: Idoteidae Milne Edwards, 1840.
 Head not laterally produced; anterior 3 pairs of pereiopods not subchelate uropods uniramous (except in *Cleantis*). A single subfamily: Idoteinae Dana, 1852. 28

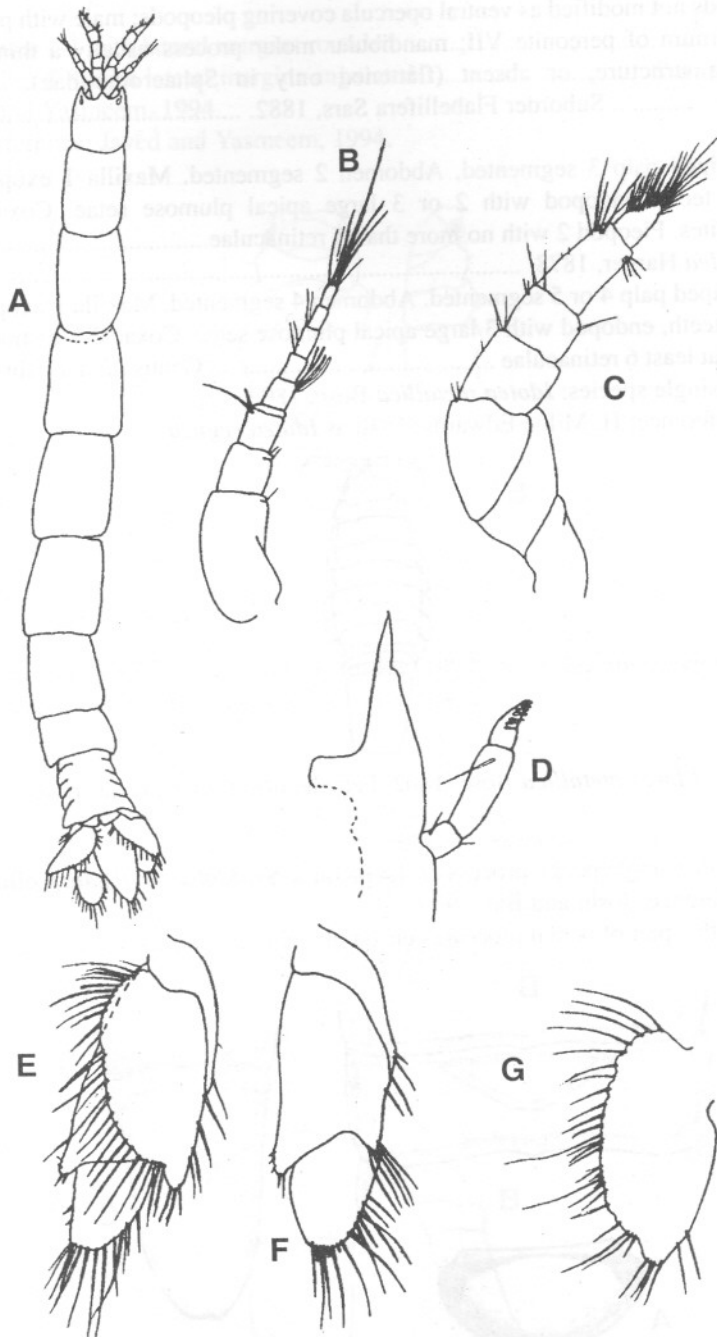


Fig. 37. *Paranthura latipes* Barnard, 1955. A, male, dorsal view; B, antennule; C, antenna; D, mandible; E, uropod; F, uropod exopod; G, uropod endopod (after Javed and Yasmeen, 1992)

- Uropods not modified as ventral opercula covering pleopods; male with penes arising on sternum of pereonite VII; mandibular molar process usually a thin, bladelike, cutting structure, or absent (flattened only in Sphaeromatidae). Suborder Flabellifera Sars, 1882. 32
- 28. Maxilliped palp 3 segmented, Abdomen 2 segmented. Maxilla 1 exopod with 11 apical teeth, endopod with 2 or 3 large apical plumose setae. Coxae fused to pereonites. Pleopod 2 with no more than 5 retinaculae..... Genus *Synidotea* Harger, 1878. 29
- Maxilliped palp 4 or 5 segmented. Abdomen 4 segmented. Maxilla 1 exopod with 12 apical teeth, endopod with 3 large apical plumose setae. Coxae 2-7 distinct. Pleopod 2 with at least 6 retinaculae Genus *Idotea* Fabricius, 1798.
 A single species: *Idotea metallica* Bosc, 1802.
 Reference: H. Milne Edwards, 1840 as *Idotea regusa*.

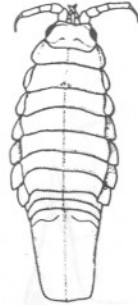


Fig. 38. *Idotea metallica* Bosc, 1802. Female, dorsal view. (after Kwon, 1986)

- 29. Male with a single penial process on 1st pleon.... *Synidotea variegata* Collinge, 1917.
 Reference: Joshi and Bal, 1959.
- Male with a pair of penial processes on 1st pleonite. 30

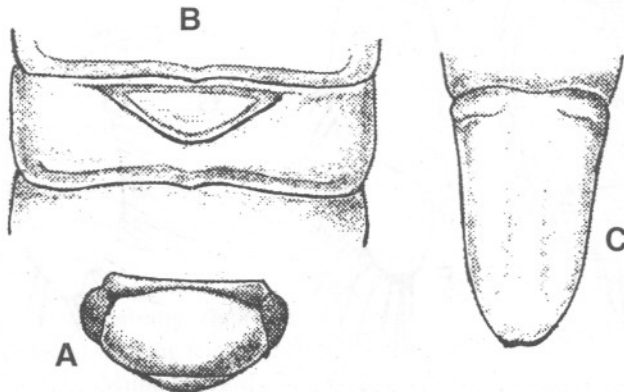


Fig. 39. *Synidotea variegata* Collinge, 1917. A, cephalon, dorsal view; B, fourth pleonic somite; C, pleotelson, dorsal view; D, penial process (after Collinge, 1917)

30. Pereonites 1-4 with lateral margins rounded 31
 - Pereonites 1-4 with lateral margins angulated *Synidotea indica*
 Javed and Yasmeen, 1994.
 Reference: Javed and Yasmeen, 1994.

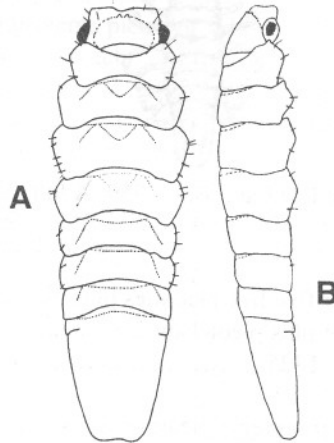


Fig. 40. *Synidotea indica* Javed and Yasmeen, 1994; A, male, dorsal view; B, same, lateral view. (after Javed and Yasmeen, 1994)

31. Outer lobe of maxilla I with 9 spines; base of uropod without keels
 *Synidotea fecunda* Javed and Yasmeen, 1994.
 Reference: Javed and Yasmeen, 1994.

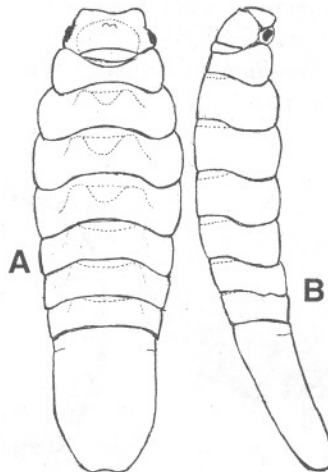


Fig. 41. *Synidotea fecunda* Javed and Yasmeen, 1994. A, adult male, dorsal view; B, same, lateral view. (after Javed and Yasmeen, 1994)

- Outer lobe of maxilla 1 with 7-8 spines; base of uropod keeled
 *Synidotea worliensis* Joshi and Bal, 1959.

Reference: Joshi and Bal, 1959.



Fig. 42. *Synidotea worliensis* Joshi and Bal, 1959. Adult male, dorsal view. (after Joshi and Bal, 1959).

- 32. Pleon composed of four or five free pleonites plus pleotelson 46
- Pleon of one free segment plus pleotelson Family
 Sphaeromatidae Latreille, 1825 33
- 33. Pleopods 4 and 5 lacking transverse pleats or folds Subfamily
 Cassidininae Iverson, 1982.

Body deeply vaulted, not depressed. Cephalosome not set posteriorly into first pereonite. Coxal plates of pereonites 2-7 separated from tergites by suture. All coxal plates directed ventrally, not expanded. Pleonal tergite with two minute, posteriorly placed incisions. Pleotelson with rounded apex lacking groove, notch or projection. Both uropodal rami unreduced and separate. Pereiopods all ambulatory, increasing in size posteriorly, Penes separate to base. Mouthparts of ovigerous female unmetamorphosed. Marsupial lamellae absent, brood carried in pouch formed by two opposing ventral pockets Not treated
 Genus: *Tholozodium* Eleftheriou *et al*, 1980.

A single species: *Tholozodium ocellatum* Eleftheriou *et al*, 1980.

Reference: Eleftheriou *et al*, 1980.

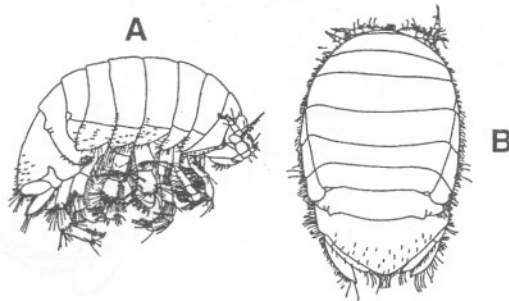


Fig. 43. *Tholozodium ocellatum* Eleftheriou *et al*, 1980. A, male, lateral view; B, dorsal view. (after Eleftheriou *et al*, 1980)

Not treated Genus: *Cassidina* H. Milne-Edwards, 1840.

A single species: *Cassidina extenda* Joshi and Bal, 1992.

Reference: Joshi and Bal, 1992.

- Pleopods 4 and 5 with transverse pleats or folds on both rami; pleotelson apex usually with terminal notch or foramen Subfamily Dynameninae Bowman, 1981 34
 - Pleopods 4 and 5 with transverse pleats or folds on endopods only; pleotelson apex usually entire, lacking a notch or foramen.....Subfamily Sphaeromatinae H. Milne- Edwards, 1840..... 42
34. Antenna 1 peduncle article 1 distal angles not produced as plate but bearing acute distal processes; exopod of uropod acute Genus *Cerceis* H. Milne-Edwards, 1840.
- A single species: *Cerceis biforamina* Javed and Yousuf, 1996.
- Reference: Javed and Yousuf, 1996.

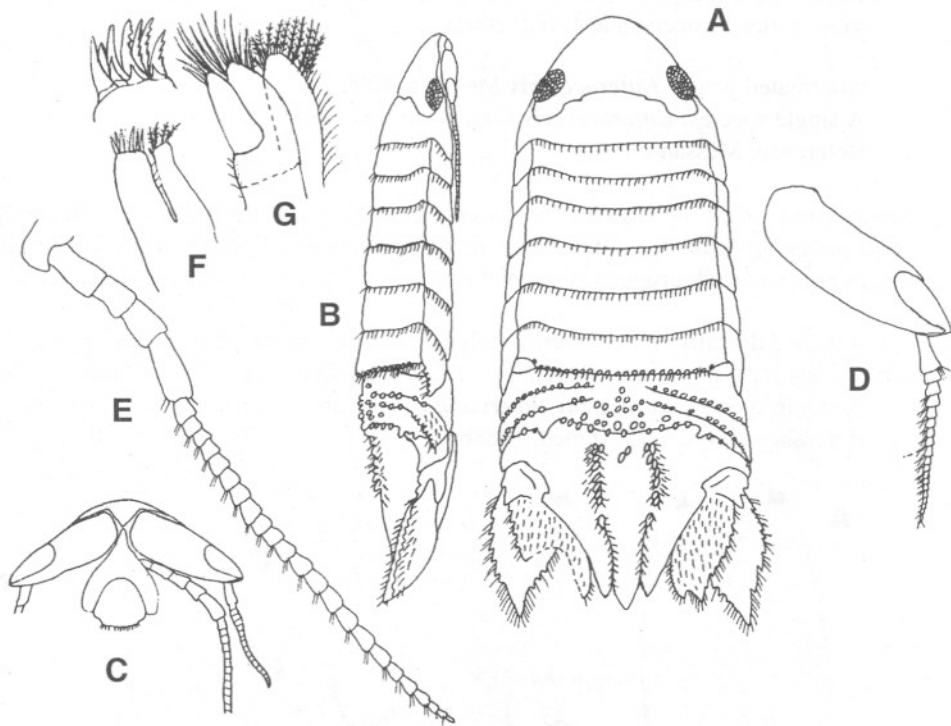


Fig. 44. *Cerceis biforamina* Javed, and Yousuf, 1996. A, male, dorsal view; B, lateral view; C, epistome, labrum and peduncles of antennae; D, antenna I; E, antenna 2; F, maxilla I; G, maxilla 2. (after Javed and Yousuf, 1996).

Not treated genus: *Paracerceis* Hansen, 1905.
 A single species: *Paracerceis sculpta* (Holmes, 1904)
 Reference: Yasmeen and Javed, 2001.

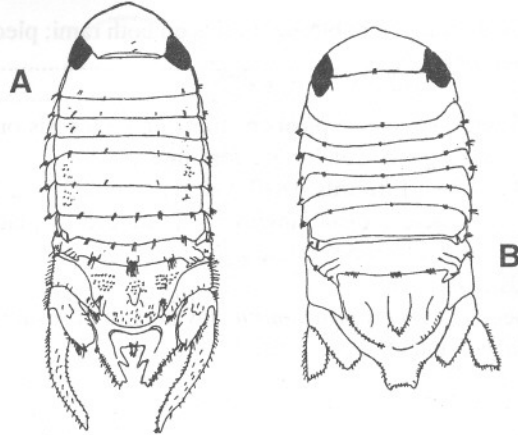


Fig. 45. *Paracerceis sculpta* (Holmes, 1904). A, male, dorsal view; B, female, dorsal view. (after Yasmeen and Javed, 2001).

Not treated genus: *Enterocerceis* Messana, 1990.
 A single species: *Enterocerceis somala* Messana, 1990.
 Reference: Messana, 1990.

- Anterior margin of cephalosome not extended forward, not dorsoventrally flattened; coxal plates not forming continuous lateral margin; antenna 1 peduncle article 1 distal angles not produced; uropod exopod not acute 35
- 35. Coxal plate 7 dorsally curved, narrow, tubular structure; pereopods accessory unguis bifid; penes separate at base, short Genus *Paraimene* Javed and Ahmed, 1988.
 A single species: *Paraimene tuberculata* Javed and Ahmed, 1988.
 Reference: Javed and Ahmed, 1988b.

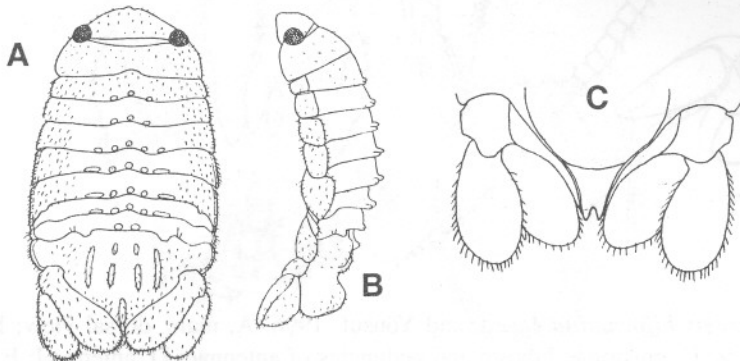


Fig. 46. *Paraimene tuberculata* Javed and Ahmed, 1988. A, dorsal view; B, lateral view; C, pleotelson. (after Javed and Ahmed, 1988b).

- Coxal plate 7 normal; pereopods accessory unguis simple; penes fused at base, long 36
- 36. Pleotelson apex entire; pleopod 1 endopod very narrow, peduncle produced medially Genus *Sphaeromopsis* Holdich and Jones, 1973 37
- Pleotelson apex with subapical foramen; pleopod I endopod not very narrow, peduncle not produced medially 40
- 37. Pleotelson domed dorsally, pleopod 1 endopod not pointed distally, medial margin not strongly convex 38
- Pleotelson not domed dorsally; pleopod 1 endopod pointed distally, medial margin strongly convex *Sphaeromopsis minutus* Javed and Yousuf, 1995.
Reference: Javed and Yousuf, 1995a.

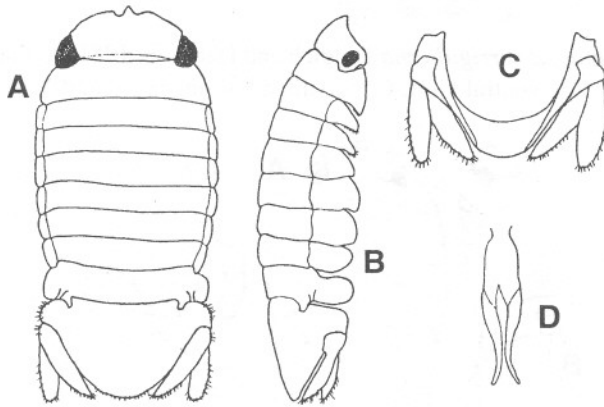


Fig. 47. *Sphaeromopsis minutus* Javed and Yousuf, 1995. A, male, dorsal view; B, same, lateral view; C, ventral view of pleotelson; D, penes. (after Javed and Yousuf, 1995a)

- 38. Epistome visible in dorsal view 39
- Epistome not visible in dorsal view, antero-lateral angles of pereonite 1 not extending anteriorly; penes rami thickened midway along lateral margins, tapering abruptly to acute apices; pleopod 1 endopod broad, subrectangular
..... *Sphaeromopsis serriguberna* Holdich and Harrison, 1981.
Reference: Javed and Yousuf, 1995a.
- 39. Penes rami broad proximally, tapering gradually to truncate apices; pleopod I exopod narrow, not subrectangular *Sphaeromopsis petita* Javed and Yousuf, 1997.
Reference: Javed and Yousuf, 1997.
- Penes tapering gradually from mid-point to narrowly and rounded
..... *Sphaeromopsis amathitis* Holdich and Jones, 1973.
Reference: Messana, 1990.

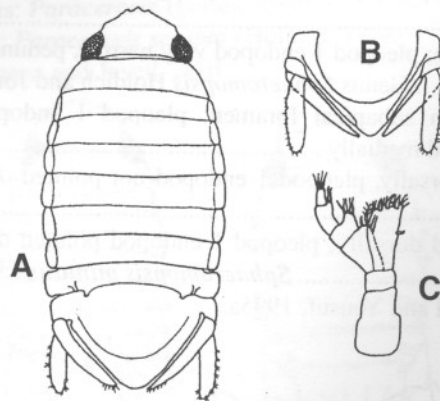


Fig. 48. *Sphaeromopsis serriguberna* Holdich and Harrison, 1981. A, male, dorsal view; B, pleotelson, ventral view. C, maxilliped. (after Javed and Yousuf, 1995a)

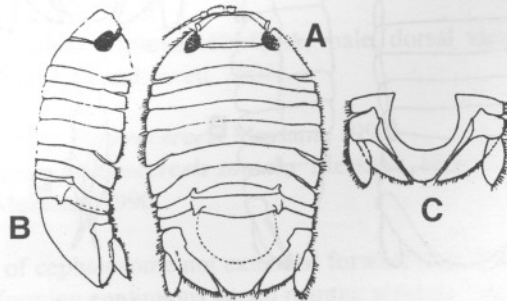


Fig. 49. *Sphaeromopsis petita* Javed and Yousuf, 1997. A, male, dorsal view; B, lateral view; C, ventral view, pleotelson. (after Javed and Yousuf, 1997).

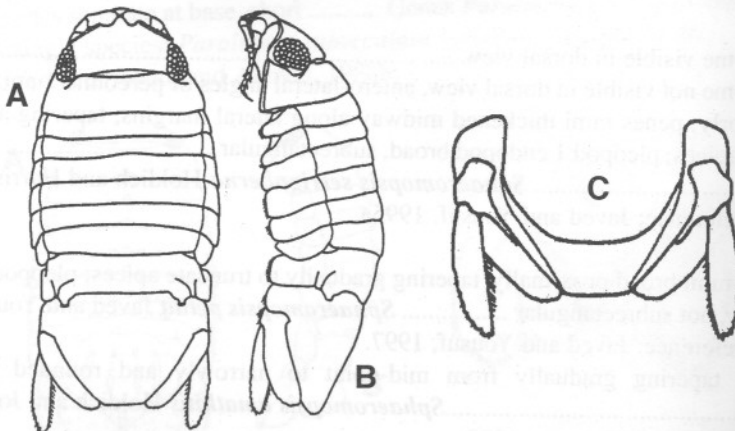


Fig. 50. *Sphaeromopsis amathitis* Holdich and Jones, 1973. A, male, dorsal view; B, lateral view; C, ventral view of pleotelson. (after Holdich and Jones, 1973)

40. Pleonal suture Y-shape with one line reaching to posterior margin of pleon at each lateral side; ventral margin of pleotelson without turned ridges not meeting in posterior mid-line Genus *Paradella* Harrison and Holdich, 1982.
 A single species: *Paradella diana*e (Menzies, 1962).
 Reference: Javed and Ahmed, 1987.

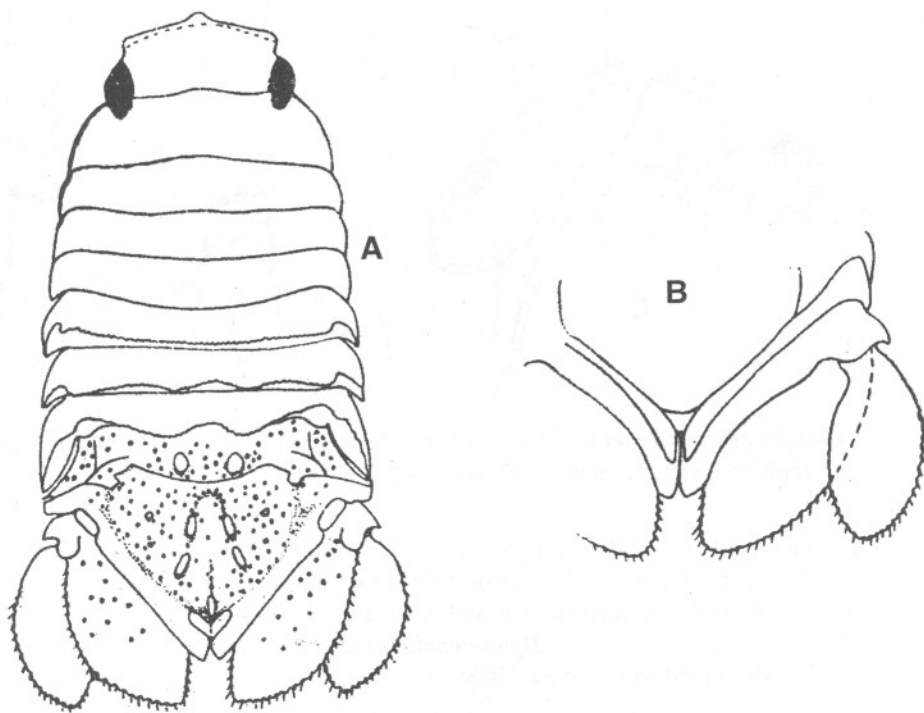


Fig. 51. *Paradella diana*e (Menzies, 1962). A, male, dorsal view; B, ventral view of pleotelson. (after Javed and Ahmed, 1987)

- Pleon with two suture lines reaching posterior margin at each lateral side; ventral margin of pleotelson either with out curved ridges, meeting posterior mid-line Genus *Dynamenella* Hansen, 1905. 41
- Pleon with two long suture lines at either side, one reaching the posterior lateral angle, and the other the posterior margin of the pleonal tergite; pleotelson with three prominent, longitudinal ridges Genus *Pseudocerceis* Harrison and Holdich, 1982.
 A single species: *Pseudocerceis seleneides* Messina, 1988.
 Reference: Messina, 1988.

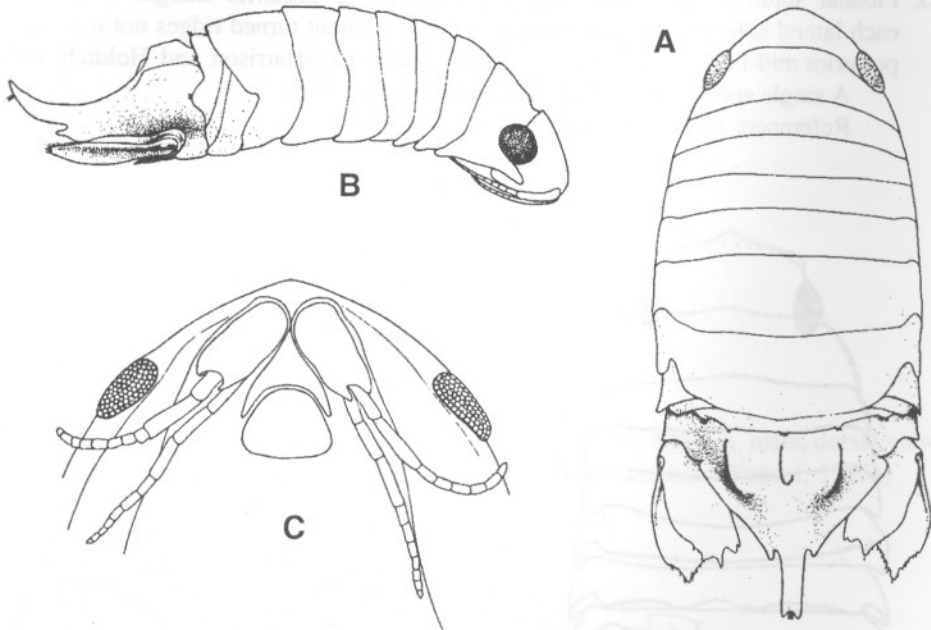


Fig. 52. *Pseudocerceis seleneides* Messana, 1988. A, male, dorsal view; B, lateral view; C, cephalon, ventral view. (after Messana, 1988)

41. Body surface pubescent. Pereonite 5-7 with granulated transverse lines. Pleon with a pair of submedian tubercles. Pleotelson with a median pair of longitudinal rows of tubercles. Subapical foramen circular and opened posteriorly

..... *Dynamenella bullejiensis* Javed and Ahmed, 1988.

Reference: Javed and Ahmed, 1988a.

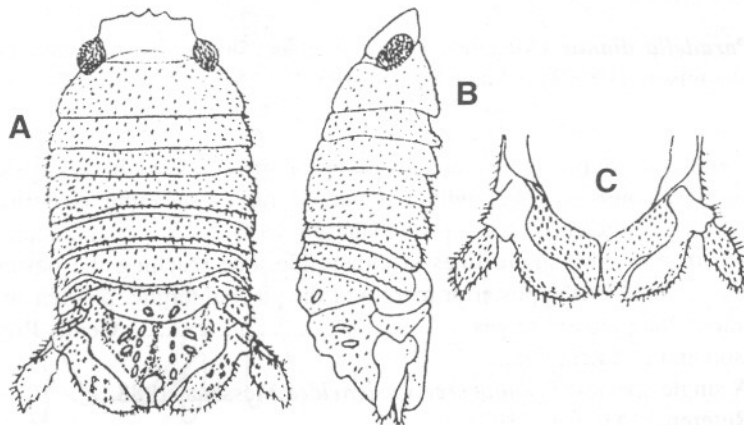


Fig. 53. *Dynamenella bullejiensis* Javed and Ahmed, 1988. A, male, dorsal view; B, lateral view; C, pleotelson, ventral view. (after Javed and Ahmed, 1988a)

- Surface of pleon and pleotelson granulated *Dynamenella granulata*
 Javed and Ahmed, 1988.
 Reference: Javed and Ahmed, 1988a.

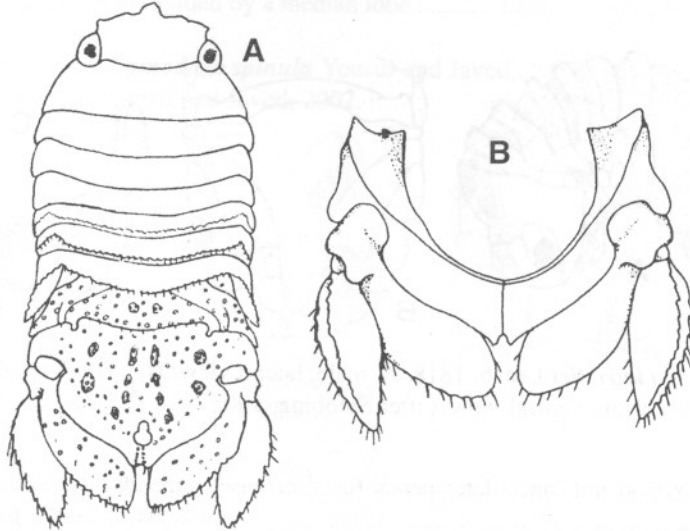


Fig. 54. *Dynamenella granulata* Javed and Ahmed, 1988. A, male, dorsal view; B, ventral view of pleotelson. (after Javed and Ahmed, 1988a)

Not treated: *Dynamenella scaptocephala* Messana, 1990.
 Reference: Messana, 1990.

- 42. Uropod uniramous Genus *Paracilicæa* Stebbing, 1910.
 A single species: *Paracilicæa keijii* Javed, 1990.
 Reference: Javed, 1990.

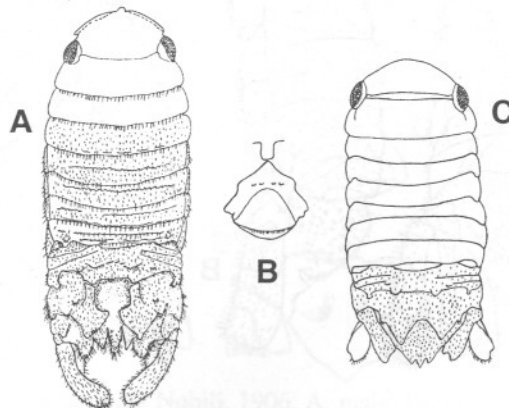


Fig. 55. *Paracilicæa keijii* Javed, 1990. A, male, dorsal view; B, epistome; C, female, dorsal view. (after Javed, 1990)

- Uropod biramous 43
- Uropod endopod reduced, exopod large Genus *Cilicaea* Leach, 1818.
A single species: *Cilicaea latreillei* Leach, 1818.
Reference: Stebbing, 1905.

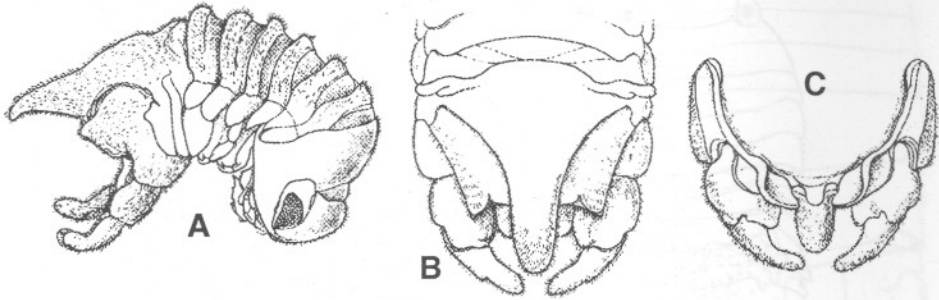


Fig. 56. *Cilicaea latreillei* Leach, 1818. A, male, lateral view; B, pleotelson, dorsal view; C, pleotelson, ventral view. (after Stebbing, 1905)

- 43. Uropod exopod not lanceolate; penes fused at base, appendix masculina recurved Genus *Clianella* Boone, 1923.
A single species: *Clianella amblysina* (Pillai, 1954).
Reference: Javed and Yousuf, 1995b.

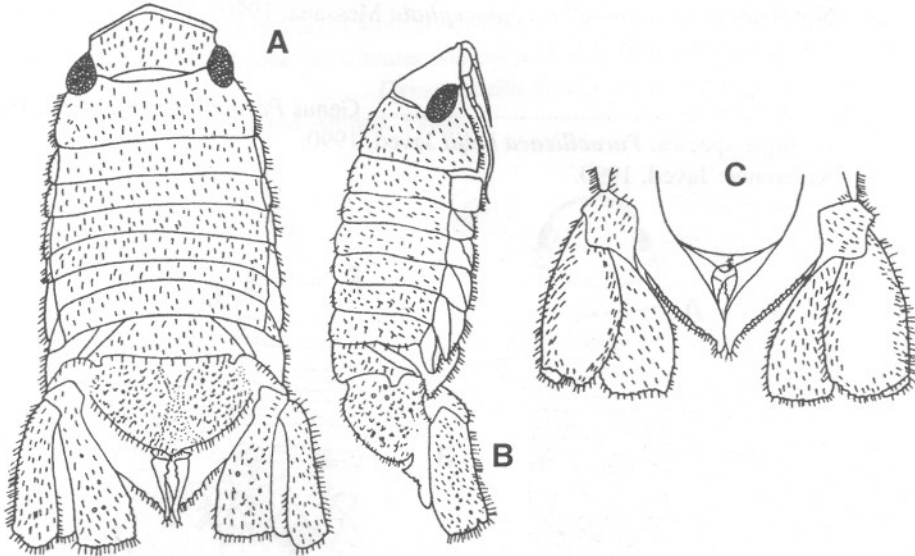


Fig. 57. *Clianella amblysina*, (Pillai, 1954). A, male, dorsal view; B, same, lateral view; C, pleotelson, ventral view. (after Javed and Yousuf, 1995b)

- Uropod exopod lanceolate; penes not fused at base, appendix masculina not recurved 44
- 44. Apex of pleotelson rounded Genus *Sphaeroma* Latreille, 1802 45
- Apex of pleotelson divided by a median lobe Genus *Cymodoce* Leach, 1814.

Not treated: *Cymodoce spinula* Yousuf and Javed, 2002.
 Reference: Yousuf and Javed, 2002.

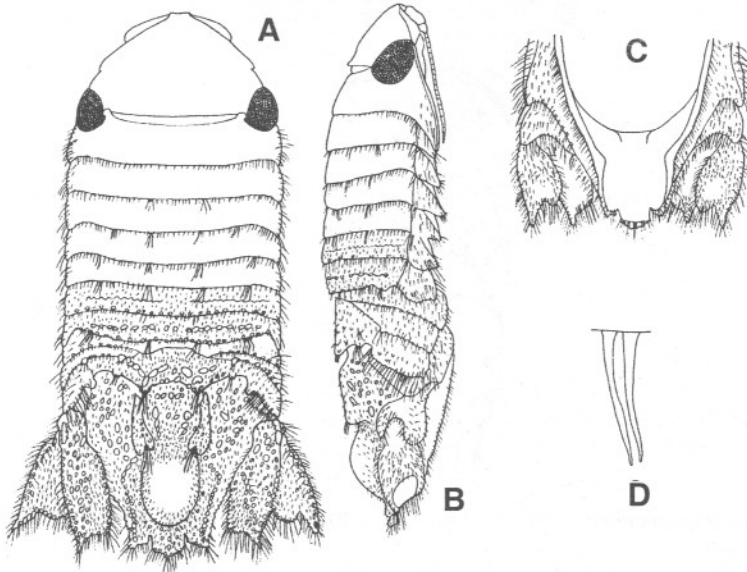


Fig. 58. *Cymodoce spinula* Yousuf and Javed, 2002. A, male, dorsal view; B, lateral view; C, ventral view of pleotelson; D, penes. (after Yousuf and Javed, 2002)

Not treated: *Cymodoce richardsoniae* Nobili, 1906.
 Reference: Hogarth, 1989.

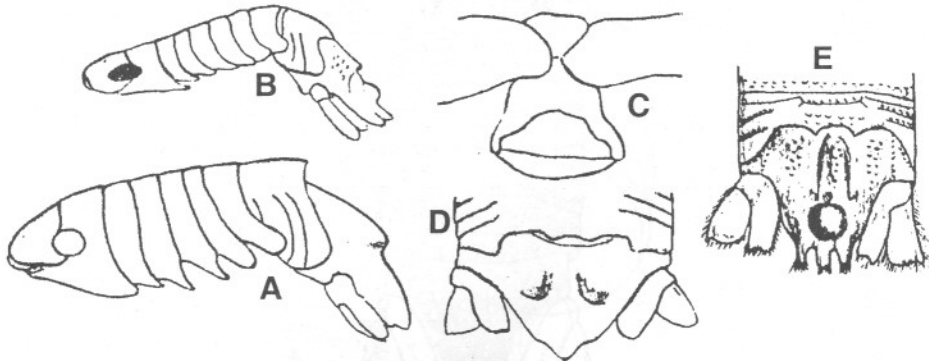


Fig. 59. *Cymodoce richardsoniae* Nobili, 1906. A, male, lateral view; B, female, lateral view; C, epistome; D, pleotelson female, dorsal view; E, same, male, dorsal view. (after Nobili, 1906)

Not treated Genus: *Oxinasphaera* Bruce, 1997

A single species: *Oxinasphaera penteumbonta* Benvenuti *et al.*, 2000.

Reference: Benvenuti *et al.*, 2000.

45. Dorsum of pleotelson with 4 stout tubercles in a transverse row near the anterior margin *Sphaeroma terebrans* Bate, 1866.
Reference: Barkati and Tirmizi, 1990.

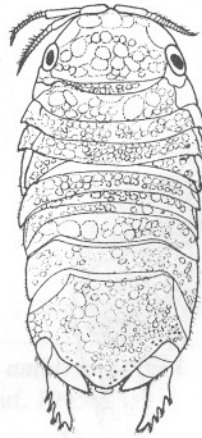


Fig. 60. *Sphaeroma terebrans* Bate, 1866. Male, dorsal view. (after Barkati and Tirmizi, 1991)

- Dorsum of pleotelson with 2 longitudinal rows of stout tubercles near midline
..... *Sphaeroma walkeri* Stebbing, 1905.
Reference: Joshi and Bal, 1959; Ghani and Ali, 2001.

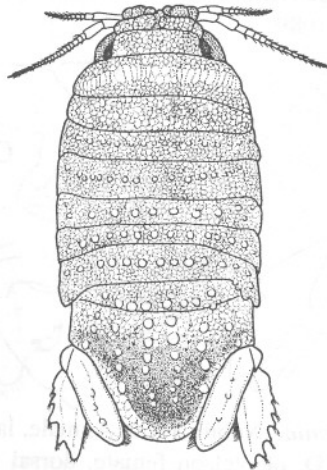


Fig. 61. *Sphaeroma walkeri* Stebbing, 1905. Male, dorsal view. (after Kazmi, unpublished)

Not treated: *Sphaeroma annandalei* Stebbing, 1911.

Reference: Joshi and Bal, 1959.

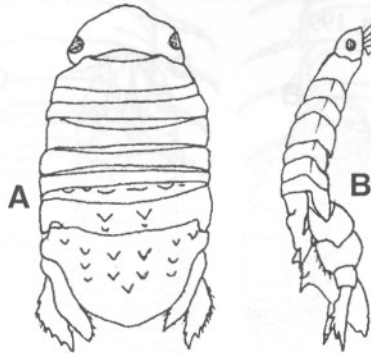


Fig. 62. *Sphaeroma annandalei* Stebbing, 1911. A, male, dorsal view; B, lateral view. (after Stebbing, 1911)

Not treated: *Sphaeroma globicauda* Dana, 1853.

Reference: Stebbing, 1904.

46. Both uropodal rami flattened 47

- Uropod with one or both rami hook-like Family Limnoriidae White, 1850.

Body oblong, buccal mass very prominent below. Mandibles very strong. Maxillipeds slender. Anterior pereopods somewhat shorter than the posterior; dactyli in all pairs provided with secondary claw. Pleopods with lamellar rami, (except the last). Uropods with outer ramus short, unguiform, inner linear wood-boring A single genus: *Limnoria* Leach, 1814.

Not treated: *Limnoria bombayensis* Pillai, 1961.

Reference: Palekar and Bal, 1957.

Not treated: *Limnoria bituberculata* Pillai, 1957.

Reference: Pillai, 1957.

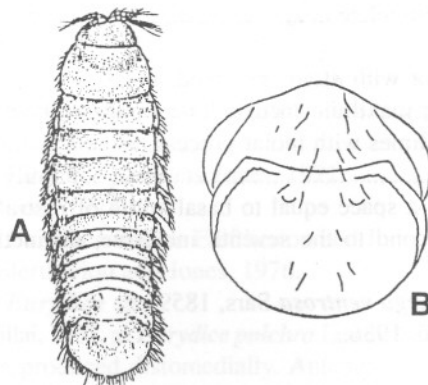


Fig. 63. *Limnoria bituberculata* Pillai, 1957. A, male, dorsal view; B, pleotelson. (after Pillai, 1961)

Not treated: *Limnoria platycauda* Menzies, 1957.

Reference: Karande *et al.*, 1993.

Not treated: *Limnoria indica* Becker and Kampf, 1958.

Reference: Cookson, 1991.

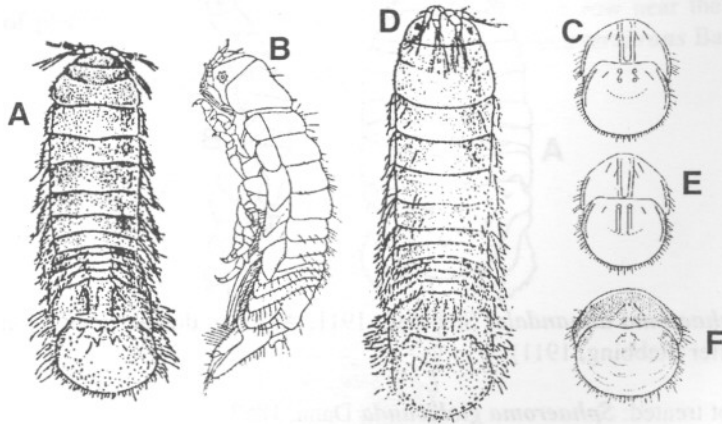


Fig. 64. *Limnoria indica* Becker and Kampf, 1958. A, male, dorsal view; B, same, lateral view; C, pleonite 5 and pleotelson, dorsal view; D, female, dorsal view; E, pleonite 5 and pleotelson, dorsal view (after Cookson, 1991). F, *Limnoria platycauda* Menzies, 1957, pleotelson of male (after Menzies and Glynn, 1968).

Not treated: *Limnoria tripunctata* Menzies, 1951.

Reference: Cookson, 1991.

- 47. Pereiopods 4-7 prehensile (dactyli longer than propodi and markedly curved); antenna reduced, without clear distinction between peduncle and flagellum; maxillipedal palp 2-articulate Family Cymothoidae Leach, 1818 64
- Pereiopods 4-7 ambulatory (dactyli shorter than propodi and not markedly curved); antenna not as above, with clear distinction between peduncle and flagellum; maxillipedal palp 2-5 articulate 48

- 48. Maxilliped and maxilla with stout, recurved apical spines; maxillule lateral lobe forms a slender stylet; maxillule medial lobe small, without stout circumplumose spines; mandible sometimes with molar process, usually without lacinia mobilis Family Aegidae Leach, 1815.

Eyes separated by a space equal to basal width of rostral point; epimera of all segments, from the second to the seventh inclusive, distinctly separated from the segments.

A single species: *Aega ventrosa* Sars, 1859.

Reference: Barnard, 1936.

- Maxilliped and maxilla without stout, recurved apical spines; maxillule lateral lobe does not form a slender stylet; maxillule medial lobe with or without stout

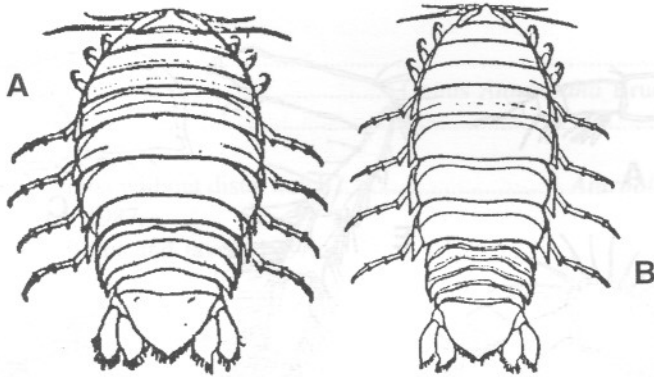


Fig. 65. *Aega ventrosa* Sars, 1859. A, male, dorsal view; B, female, dorsal view. (after Schioedte and Meinert, 1879 in Richardson, 1905).

- circumplumose spines; mandible with or without lacinia mobilis and molar process 49
49. Mandible with well-developed lacinia mobilis and large, spinose, bladelike molar process; maxilliped with endite; maxillule lateral lobe with 11-14 apical spines; maxillule medial lobe large, with 3-4 stout, circumplumose spines; maxilla biramous Family Cirolanidae Dana, 185250
- Mandible with lacinia mobilis absent, or represented by small feeble spine row; maxilliped without endite; maxillule medial lobe small, without 3-4 stout circumplumose spines; maxilla uniramous Family Corallanidae Hansen, 189059
50. Pleonite 5 with free lateral margins. Clypeus with downwardly projecting blade Subfamily Eurydicinae Racovitza, 1912.....51
- Pleonite 5 with lateral margin hidden by those of pleonite 4. Clypeus flat Subfamily Cirolaninae Harger, 1880.....52
51. Uropod peduncle not produced. Antennule peduncle article 1 longer than article 2 or 3; antennule article 2 arising at right angle to article 1; maxilliped endite barely reaching or extending barely beyond first palp article; maxilliped endite without coupling setae; lateral margins of pleonite 5 not encompassed by pleonite 4 Genus *Eurydice* Leach, 1815.
- Not treated: *Eurydice peraticis* Jones, 1971.
 Reference: Jones, 1971.
- Not treated: *Eurydice indicis* Eleftheriou and Jones, 1976.
 Reference: Eleftheriou and Jones, 1976.
- Not treated: *Eurydice* sp.
 Reference: Pillai, 1967, as *Eurydice pulchra* Leach. Reference to change: Jones, 1974.
- Uropod peduncle produced distomedially. Antennule peduncle with 4 or 5 articles; maxilliped endite with single coupling hook; pleonite 5 with free lateral margins, not

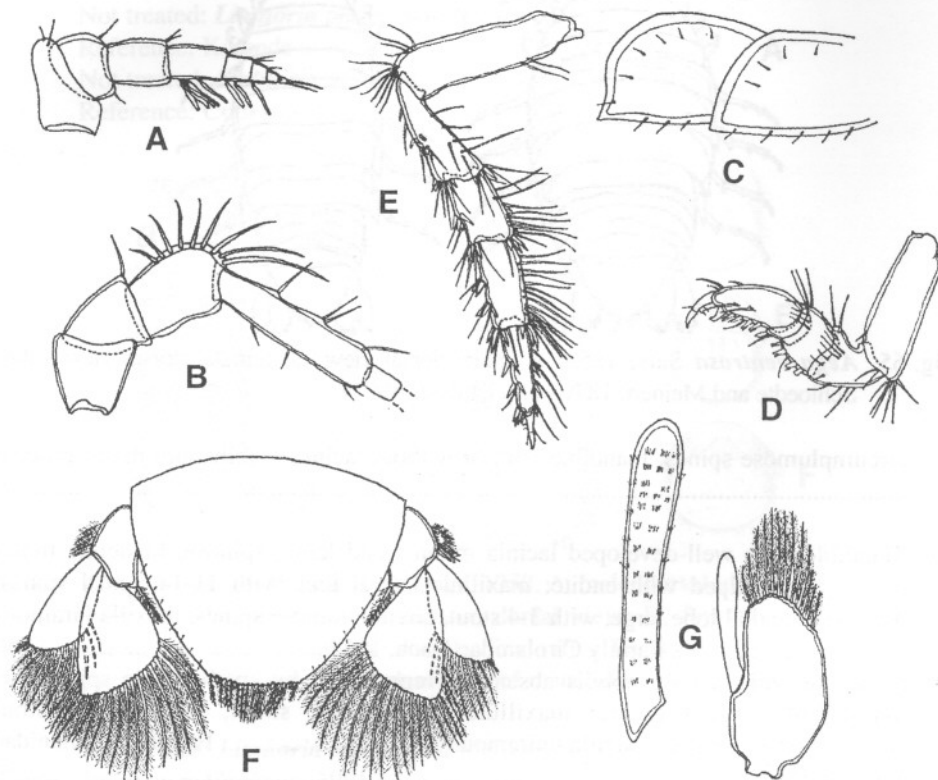


Fig. 66 . *Eurydice peraticis* Jones, 1971. A, male, antennule; B, peduncle of antenna; C, epimera 6-7; D, pereopod I; E, pereopod 7; F, telson and uropod; G, appendix masculina. (after Jones, 1974).

overlapped by pleonite 7 Genus *Excirolana* (Richardson, 1912)

A single species: *Excirolana orientalis* (Dana, 1853)

Reference: Joshi and Bal, 1959, as *Cirolana bombayensis*

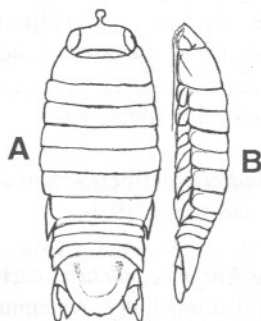


Fig. 67. *Excirolana orientalis* (Dana, 1853). A, male, dorsal view; B, same, lateral view. (after Yasmeen, this issue)

52. Clypeus flat..... 54
 - Clypeus projecting ventrally.....Genus *Atarbolana* Bruce and Javed, 1987 53
53. Appendix masculina without distal notch *Atarbolana exoconta* Bruce and Javed, 1987.
 Reference: Bruce and Javed, 1987.

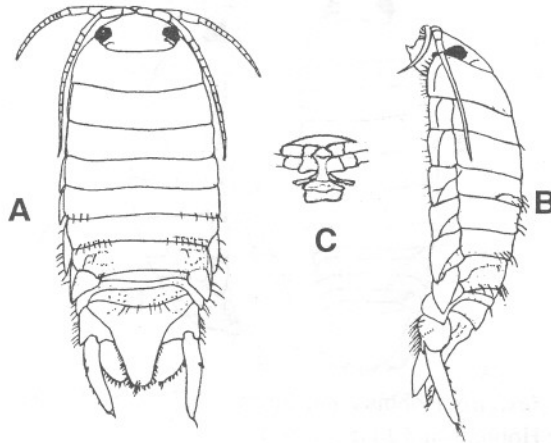


Fig. 68. *Atarbolana exoconta* Bruce and Javed, 1987. A, male; B, same, lateral view; C, clypeal region. (after Bruce and Javed, 1987)

- Appendix masculina with distal notch..... *Atarbolana setosa* Javed and Yasmeen, 1989
 Reference: Javed and Yasmeen, 1989

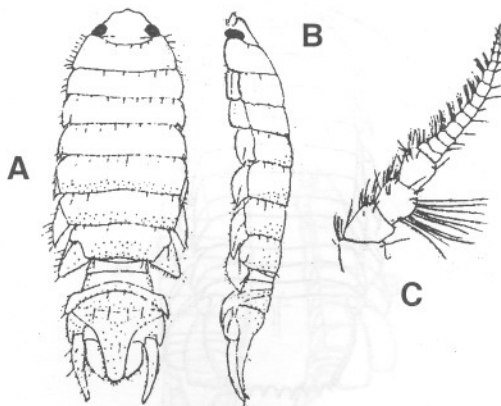


Fig. 69. *Atarbolana setosa* Javed and Yasmeen, 1989. A, male, dorsal view; B, same, lateral view; C, antenna. (after Javed and Yasmeen, 1989)

54. Pereiopods 5-7 natatory (with setose flattened articles).....Genus *Natatolana*
Bruce, 1981

Not treated: *Natatolana hirtipes* (Milne-Edwards, 1840)

Reference: Barnard, 1936 as *Cirolana hirtipes* Milne - Edwards, 1840.

Not treated: *Natatolana insignis* Hobbins and Jones, 1993.

Reference: Barnard, 1936 as *Cirolana albicaudata* Stebbing, 1900.

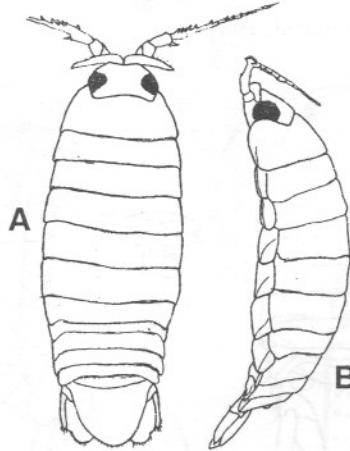


Fig. 70. *Natatolana insignis* Hobbins and Jones, 1993. A, male, dorsal view; B, lateral view. (after Hobbins and Jones, 1993)

- Pereiopods 5-7 ambulatory55

55. Pleopods with accessory respiratory branchiae Genus *Bathynomus*
A. Milne-Edwards, 1879.

A single species: *Bathynomus giganteus* A. Milne-Edwards, 1879

Reference: Wood-Mason and Alcock, 1891.

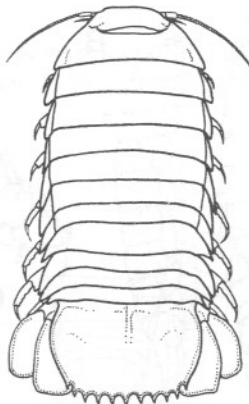


Fig. 71. *Bathynomus giganteus* Milne-Edwards, 1879. Male, dorsal view. (after Alcock and Anderson, 1894).

- Pleopods without accessory respiratory branchiae 56
- 56. Pleopods 3 and 4 endopods without marginal setae.....Genus *Anopsilana*
Delamare-Deboutteville, 1956.
 A single species: *Anopsilana pustulosa* (Hale, 1925)
 Reference: Bruce, 1986b.
- Pleopods 3 and 4 endopods with marginal setae.....57
- 57. Mandible with broad, tridentate incisor; antennule peduncle article 3 always longer
 than 1 or 2; clypeus short, broad, flat, and sessile, not projecting ventrally
 Genus *Cirolana* Leach, 1818 58
- Mandible with narrow incisor Genus *Neocirolana* Hale, 1925.
 A single species: *Neocirolana arabica* Javed and Yasmeen, 1990.
 Reference: Javed and Yasmeen, 1990.

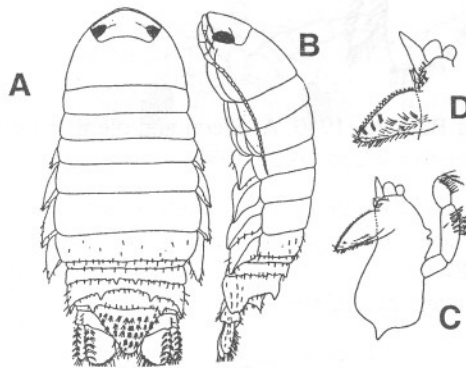


Fig. 72. *Neocirolana arabica*. Javed and Yasmeen, 1990. A, male, dorsal view; B, lateral view; C, mandible; D, mandible, incisor and molar processes. (after Javed and Yasmeen, 1990)

- 58. Lateral margin of uropod exopod convex with 5 minute spines and several setae on
 proximal half of telson. Pleotelson with submedian pair of spines and lateral
 margins fringed with plumose setae, apex with 8 spines *Cirolana brucei*
 Javed and Yasmeen, 1995.
 Reference: Javed and Yasmeen, 1995.

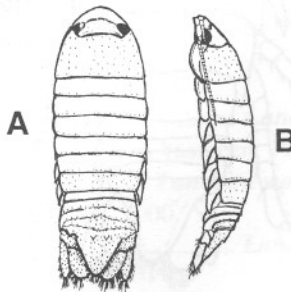


Fig. 73. *Cirolana brucei* Javed and Yasmeen, 1995. A, male, dorsal view; B, same lateral view. (after Javed and Yasmeen, 1995)

- Lateral margin of uropod exopod sinuous, entirely setose. Abundant setae on pleotelson dorsal surface *Cirolana bovina* Barnard, 1940.
Reference: Hogarth, 1989.

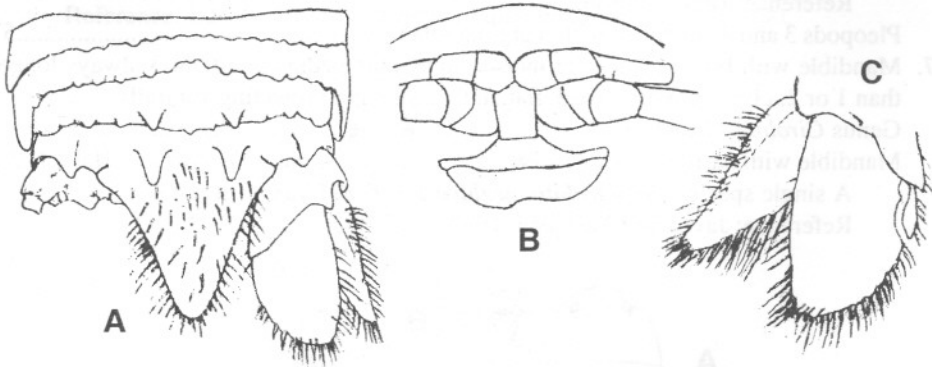


Fig. 74. *Cirolana bovina* Barnard, 1940. A, Pleon and pleotelson; B, clypeal region; C, left uropod. (after Bruce and Javed, 1987)

- Lateral margin of uropod exopod convex with 4 minute spines, scarcely setose. Pleotelson dorsal surface without setae *Cirolana manorae* Bruce and Javed, 1987
Reference: Bruce and Javed, 1987

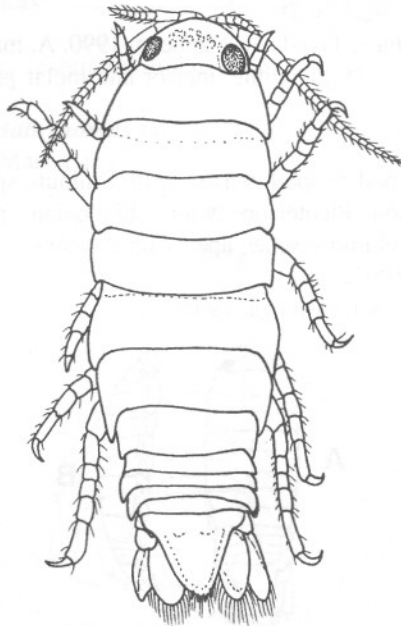


Fig. 75. *Cirolana manorae* Bruce and Javed, 1987. Dorsal view. (after Bruce and Javed, 1987).

Not treated: *Cirolana carina* Jones, 1976

Reference: Hogarth, 1989

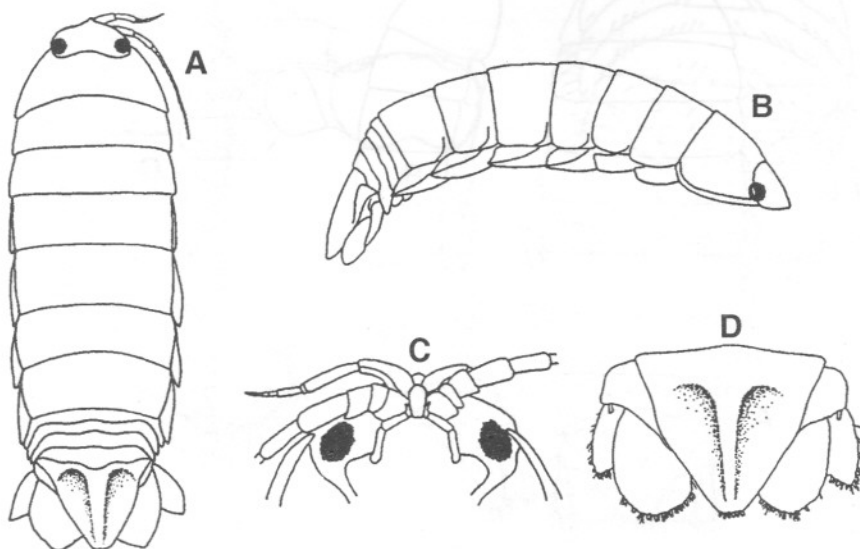


Fig. 76. *Cirolana carina* Jones, 1976. A, male, dorsal view; B, lateral view; C, ventral view of head; D, telson and uropods. (after Jones, 1976)

Not treated: *Cirolana sulcatacauda* Stebbing, 1904

Reference: Monod, 1971

Not treated Genus: *Dolicholana* Bruce, 1986.

A single species: *Dolicholana elongata* (Milne-Edwards, 1840).

Reference: Barnard, 1936, as *Cirolana elongata*.

59. Maxillule lateral lobe a single large, falcate spine; maxilla 3- or 4 articulate, apical article sublinear, elongate; mandible with slender trunk and row of small spines behind incisor; mandible incisor not elongate Genus *Lanocira* Hansen, 1890 60
- Maxillule lateral lobe not a single large falcate spine; maxilla a short, rounded lobe; mandible not as above 61
60. Cephalon with distinct rostrum *Lanocira gardineri* Stebbing, 1904.
References: Pillai, 1960; Javed and Yasmeen, 1997.
- Cephalon with upturned rostrum *Lanocira wowine* Yasmeen and Javed, 2000.
Reference: Yasmeen and Javed, 2000.
- Cephalon in male without rostrum *Lanocira zelandica* Stebbing, 1905.
Reference: Pillai, 1954.

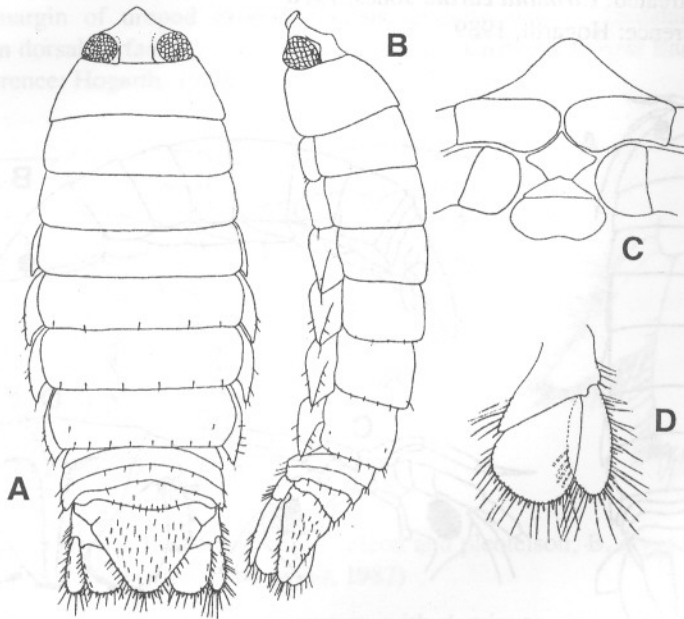


Fig. 77. *Lanocira gardineri* Stebbing, 1904. A, male, dorsal view; B, lateral view; C, clypeal region; D, uropod. (after Javed and Yasmeen, 1992)

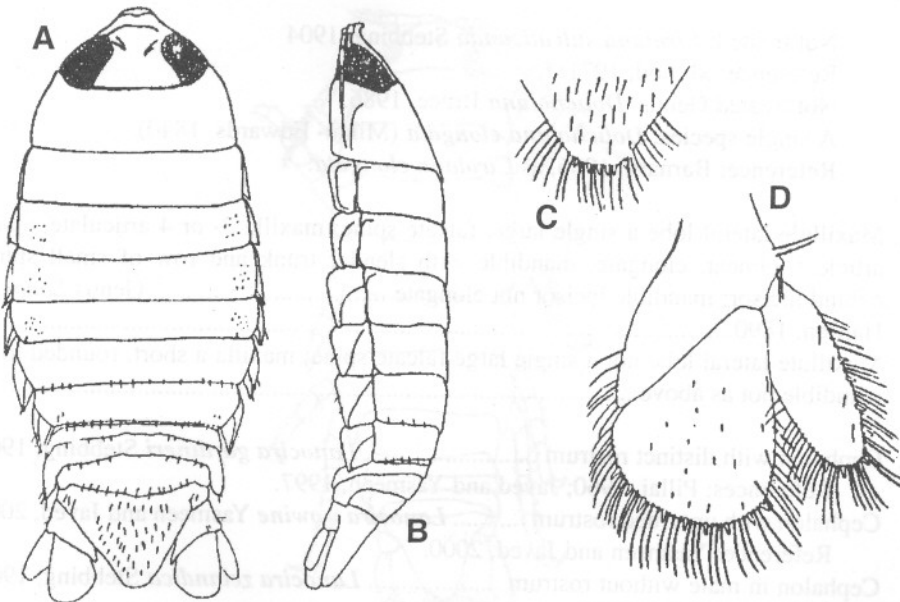


Fig. 78. *Lanocira wowine* Yasmeen and Javed, 2000. A, dorsal view; B, lateral view; C, distal region of pleotelson; D, uropod. (after Yasmeen and Javed, 2000)

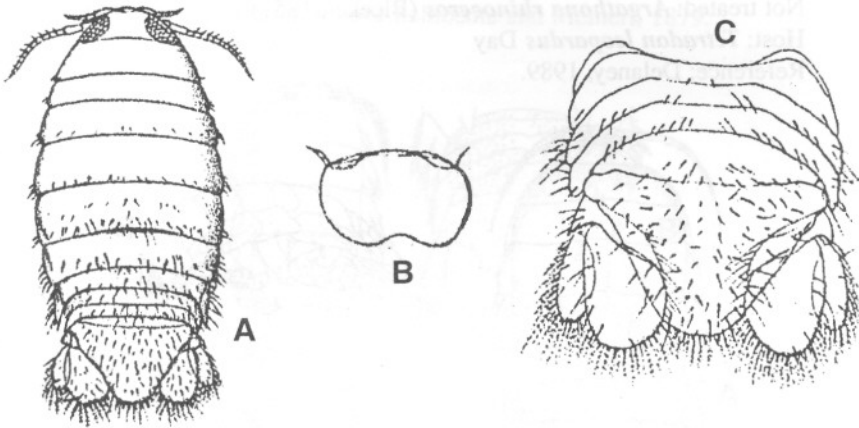


Fig. 79. *Lanocira zeylandica* Stebbing, 1905. A, male, dorsal view; B, cephalon; C, pleotelson and uropods. (after Stebbing, 1905)

61. Maxillule lateral lobe with 1 large falcate spine and 1-4 small hook-like accessory spines; mandible trunk and apex wide, incisor well developed but not elongate or falcate; maxilliped palp 4- or 5 articulate Genus *Argathona* Stebbing, 1905.
 Not treated: *Argathona muraeneae* Bal and Joshi, 1959 (= genus *inquirenda*)
 Hosts: *Muraena tessellata* (Day) and *Argyrops spinifer* (Forsk.)
 References: Bal and Joshi, 1959; Ghani and Shireen, 1995.

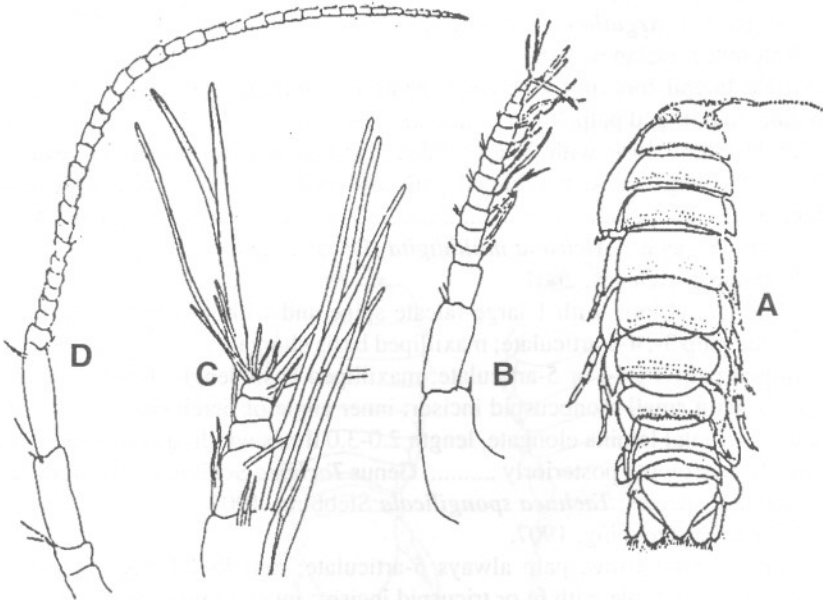


Fig. 80. *Argathona muraeneae* Bal and Joshi, 1959. A, female, dorsal view; B, antennule; C, apical setae of antennule; D, antenna. (after Ghani and Shireen, 1995)

Not treated: *Argathona rhinoceros* (Bleeker, 1857)

Host: *Tetrodon leopardus* Day

Reference: Delaney, 1989.

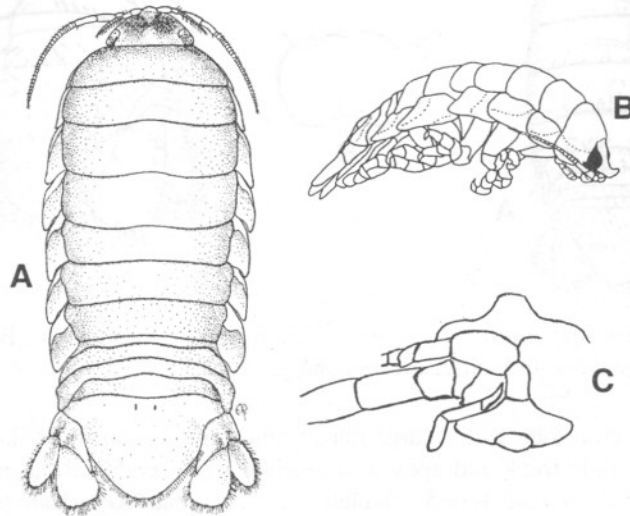


Fig. 81. *Argathona rhinoceros* (Bleeker, 1857). A, male, dorsal view; B, same, female, lateral view; C, clypeal region. (after Delaney, 1989)

Not treated: *Argathona normani* Stebbing, 1905.

Reference: Delaney, 1989.

- Maxillule lateral lobe not as above; mandible trunk and apex narrow, incisor not elongate; maxilliped palp 3-4 or 5- articulate 62
- 62. Maxillule lateral lobe with 2 large falcate spines and 0-3 small accessory spines between the large ones; maxilliped palp always 5 articulate; maxilliped basis not elongate Genus *Alcirona* Hansen, 1896.

A single species: *Alcirona multidigita* (Dana, 1853).

Reference: Kensley, 2001.

- Maxillule lateral lobe with 1 large falcate spine and without small accessory spines; maxilliped palp 3-, 4-5 articulate; maxilliped basis elongate 63
- 63. Maxilliped palp 3-, 4-, or 5-articulate; maxilliped basis length 1.5-2.0 times width; mandible with small monocuspid incisor; inner angle of pereopod I carpus strongly produced; frontal lamina elongate, length 2.0-3.0 times width, quadrangular, rounded anteriorly, narrowing posteriorly Genus *Tachaea* Schitoedt and Meinert, 1879.

A single species: *Tachaea spongicola* Stebbing, 1907.

Reference: Stebbing, 1907.

- Maxilliped very narrow, palp always 5-articulate; maxilliped basis length 2.0-4.0 times width; mandible with bi or tricuspid incisor; inner angle of pereopod I carpus not produced; frontal lamina not elongate, shape various, occasionally reduced or absent Genus *Corallana* Dana, 1853.

Not treated: *Corallana nodosa* Schioedte and Meinert, 1879.
Reference: Pillai, 1967.

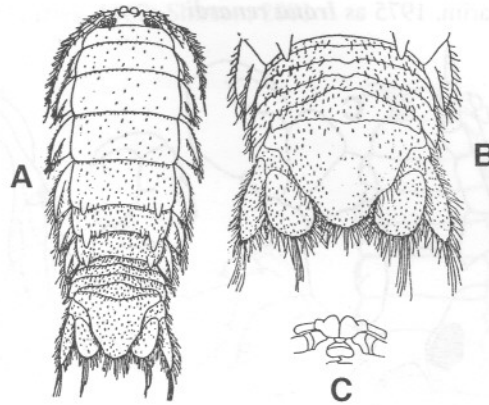


Fig. 82. *Corallana nodosa* Schioedte and Meinert, 1879. A, male, dorsal view; B, pleon and telson (after Pillai, 1961); C, clypeal region. (after Bruce, 1982)

Not treated: *Corallana sculpta* (Milne Edwards, 1840).
Reference: Bruce, 1982.

- 64. Brood pouch without posterior pocket; pleopod rami all lamellar.....65
- Brood pouch with posterior pocket, at least endopod of pleopod 5 with prominent lobes.....67

- 65. Antennule larger than antenna; maxilliped palp article 3 robust, without setae; pereopods with relatively long robust dactyli...Genus *Mothocya* Costa in Hope, 1851
Not treated: *Mothocya karobran* Bruce, 1986.
Host: *Strongylura leirua* (Bleeker)
Reference: Bruce, 1986a.

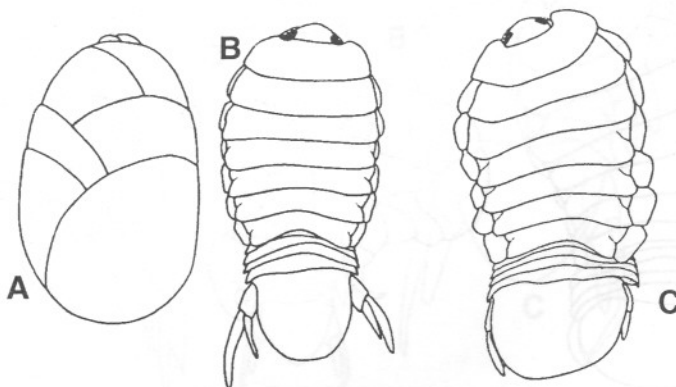


Fig. 83. *Mothocya karobran* Bruce, 1986. A, brood pouch; B, male; C, female. (after Bruce, 1986)

Not treated: *Mothocya renardi* (Bleeker, 1857).

Host: Mackerel.

Reference: Karim, 1975 as *Irona renardi*.

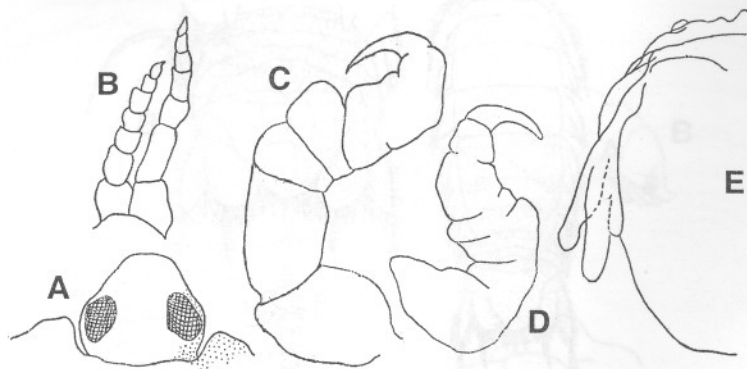


Fig. 84. *Mothocya renardi* (Bleeker, 1857). A, cephalon; B, antennae; C, pereopod I; D, pereopod VII; E, telson. (after Karim, 1975)

Not treated: *Mothocya melanosticta* (Schioedte and Meinert, 1884).

Host: Not given.

Reference: Karim, 1975 as *Irona melanosticta*.

- Antennule shorter than antenna; maxilliped palp article 3 slender, with setae; pereopods with relatively short dactyli.....Genus *Elthusa* Schioedte and Meinert, 1881.....66

- 66. Cephalon with acute rostral point; posterior coxae small, not conspicuous.....*Elthusa propinqua* (Richardson, 1905)

Reference: Barnard, 1936 as *Livoneca propinqua*

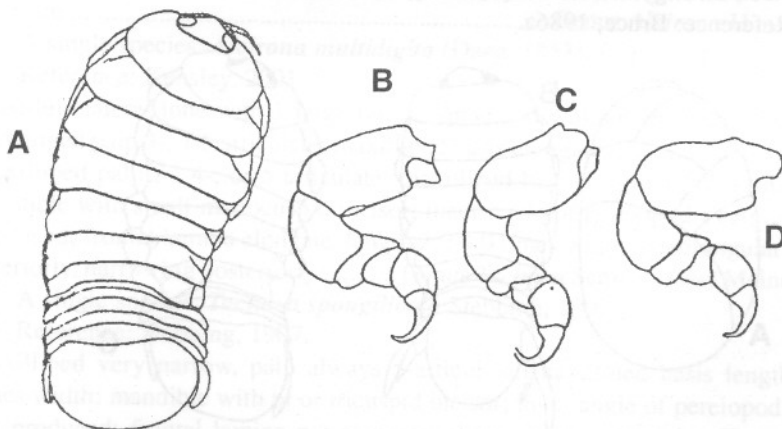


Fig. 85. *Elthusa propinqua* (Richardson, 1904). A, dorsal view; B, pereopod V; C, pereopod VI; D, pereopod VII. (after Richardson, 1905)

- Cephalon anteriorly rounded or truncate; posterior coxae prominent in dorsal view.....*Elthusa raynaudii* Milne Edwards, 1840.
Reference: Menzies, 1962; Shireen, 2001.

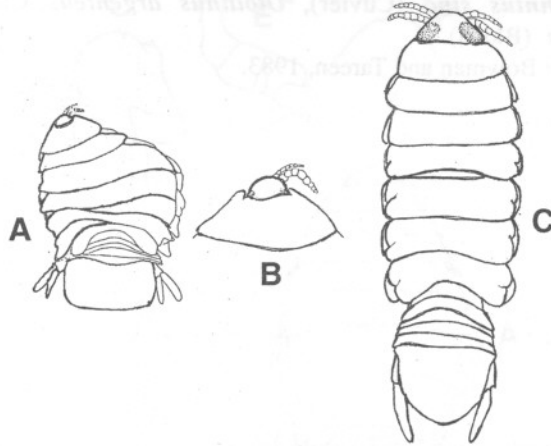


Fig. 86. *Elthusa raynaudii* H. Milne-Edwards, 1840. A, female, dorsal view; B, pereonite I and head; C, male, dorsal view. (after Shireen, 2001)

- 67. Pleonites 1 and 2 with ventrolateral processes; uropods extending beyond posterior of pleotelson..... Genus *Nerocila* Leach, 1818.....68
- Pleonites 1 and 2 without ventrolateral processes; uropods not extending beyond posterior of pleotelson Genus *Norileca* Bruce, 199071
- 68. Uropodal exopod and endopod elongate *Nerocila phaiopleura* Bleeker, 1857
Host: *Chiracetrus nudus* (Swainson)
Reference: Shireen, 2001

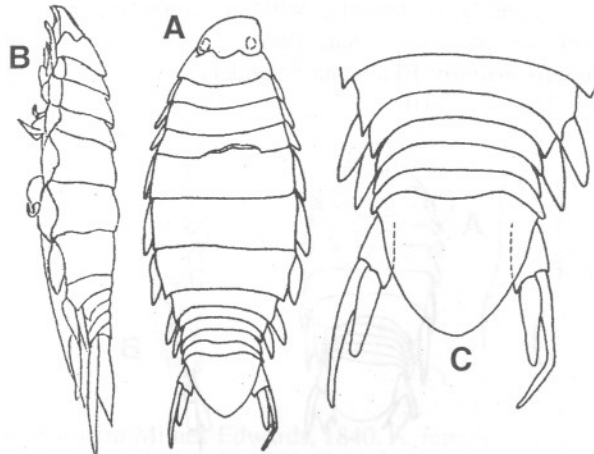


Fig. 87. *Nerocila phaiopleura* Bleeker, 1857. A, female, dorsal view; B, same, lateral view (after Shireen, 2001); C, pleon and pleotelson. (A, C after Bowman and Tareen, 1983)

- Uropodal exopod curved, endopod broad with serration.....69
- 69. 1st proximal segments of antennule swollen, close together. Head narrowed anteriorly *Nerocila kistra* Bowman and Tareen, 1983.
 Host: *Johnius sina* (Cuvier), *Otolithus argenteus* Cuvier, *Pomadasys maculatus* (Bloch).
 Reference: Bowman and Tareen, 1983.

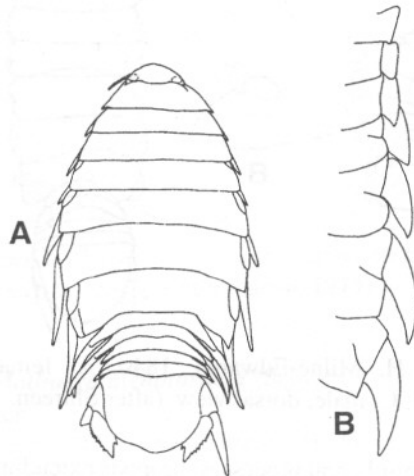


Fig. 88. *Nerocila kistra* Bowman and Tareen, 1983. A, female, dorsal view; B, pereon, lateral part. (after Bowman and Tareen, 1983)

- 1st proximal segments of antenna not swollen, well separated. Head broad anteriorly..... 70
- 70. Telson evenly rounded posteriorly, without caudomedial lobe
Nerocila sigani Bowman and Tareen, 1983
 Host: *Siganus oramin* (Bloch and Scheider).
 Reference: Kensley, 2001.

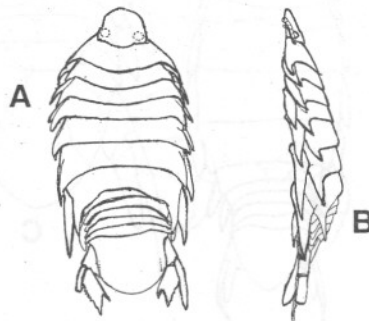


Fig. 89. *Nerocila sigani* Bowman and Tareen, 1983. A, female, dorsal view; B, same, lateral view. (after Bowman and Tareen, 1983)

Telson with distinct caudomedial lobe.....*Nerocila serra* Schioedte and Meinert, 1881
 Host: *Mugil dussumeiri maculatus* (Bloch).
 Reference: Karim, 1975.

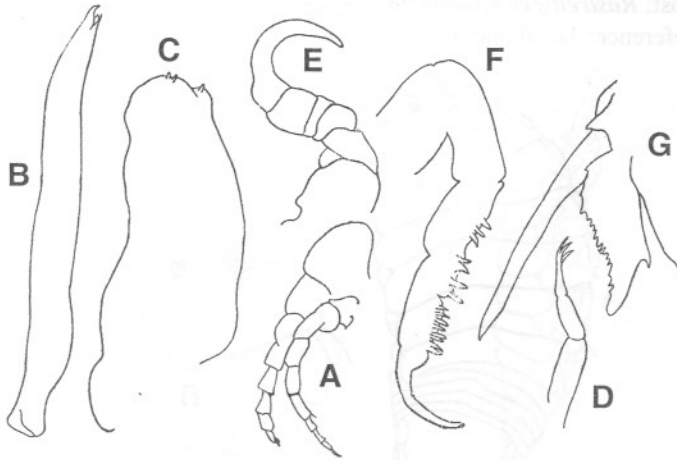


Fig. 90. *Nerocila serra* Schioedte and Meinert, 1881. A, antennae; B, maxilla I; C, maxilla II; D, palp of mandible; E, pereopod I; F, pereopod VII; G, telson. (after Karim, 1975)

Not treated: *Nerocila depressa* Milne-Edwards, 1840 = *Nerocila pigmentata* Bal and Joshi, 1959.
 Host: Mugil.
 References: Karim, 1975; Shireen, 2001.

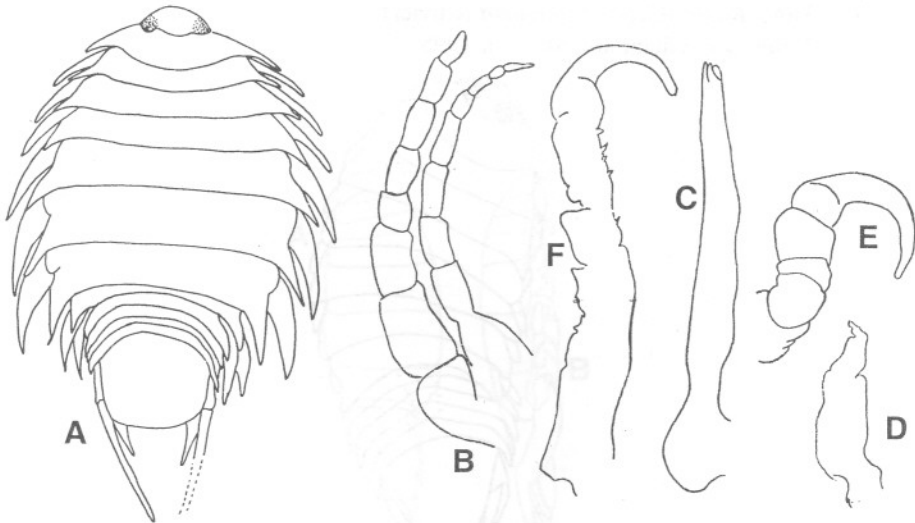


Fig. 91. *Nerocila depressa* Milnes-Edwards, 1840. A, female, dorsal view (after Shireen, 2001); B, antennae; C, maxilla I; D, maxilliped; E, pereopod I; F, pereopod VII; (after Karim, 1975)

71. Body weakly vaulted about 2.0 times as long as wide, widest at pereonite 4, twisted to right side, cephalon moderately immersed in pereonite 1 *Norileca borealis* Javed and Yasmeen, 1999.

Host: *Rastrelliger kanagurta* (Cuvier).

Reference: Javed and Yasmeen, 1999.

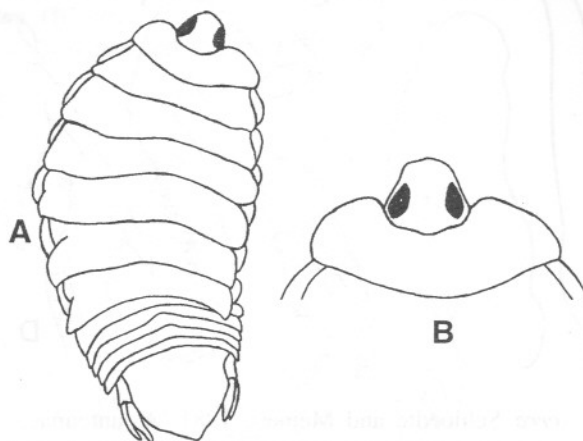


Fig. 92. *Norileca borealis* Javed and Yasmeen, 1999. A, female, dorsal view; B, cephalon. (after Javed and Yasmeen, 1999)

- Body twisted to one side, pleonite 5 about as wide as pleonite 1; maxilliped palp article 2 about 3 times as long as article 3 *Norileca indica* (Milne Edwards, 1840).

Host: *Rastrelliger kanagurta* (Cuvier).

Reference: Ghani and Shireen, 1995.

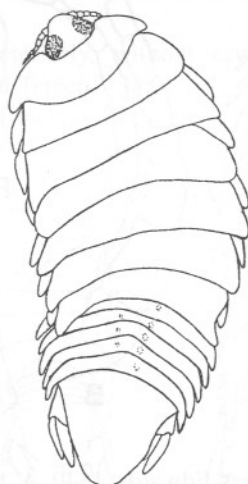


Fig. 93. *Norileca indica* (Milne Edwards, 1840). Male, dorsal view. (after Ghani and Shireen, 1995)

- Body weakly twisted to one side, pleonite 5 narrower than pleonite 1; maxilliped palp article 2 about as long as article 3 *Norileca triangulata* (Richardson, 1910).
Hosts: *Rastrelliger kanagurta* (Cuvier)
Reference: Ghani and Ali, 1998

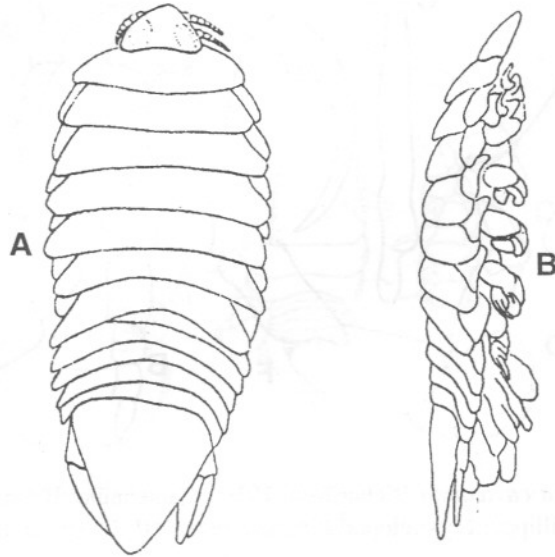


Fig. 94. *Norileca triangulata* (Richardson, 1910). A, female, dorsal view; B, same, lateral view. (after Ghani and Ali, 1998)

Not treated Genus: *Anilocra* Leach, 1818.

Anilocra dimidiata Bleeker, 1857

Host: Not given.

Reference: Pillai, 1954; Shireen, 2001.

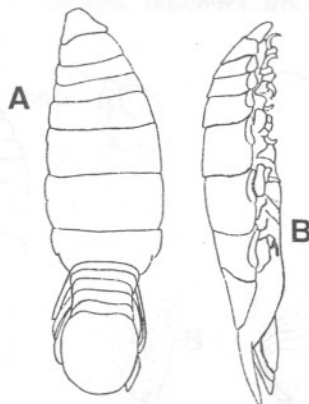


Fig. 95. *Anilocra dimidiata* Bleeker, 1857. A, female, dorsal view; B, same, lateral view. (after Shireen, 2001)

Not treated: *Anilocra cavicauda* Richardson, 1910.

Host: *Nematolosa nasus* (Bloch).

Reference: Karim, 1975.

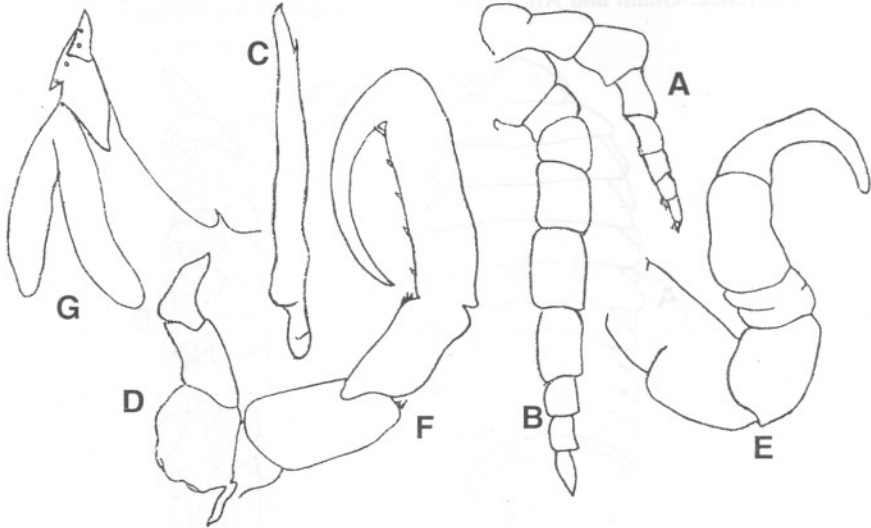


Fig. 96. *Anilocra cavicauda* Richardson, 1910. A, antennule; B, antenna; C, Ist maxilla; D, maxilliped; E, pereopod I; F, pereopod VII; G, telson. (after Karim, 1975)

Not treated Genus: *Cinusa* Schioedte and Meinert, 1884.

A single species: *Cinusa tetradontis* Schioedte and Meinert, 1884.

Reference: Schioedte and Meinert, 1884.

Not treated Genus: *Catoessa* Schioedte and Meinert, 1884.

A single species: *Catoessa ambassae* Bruce, 1990.

Hosts: *Chorinemus* spp. and *Carangoides malabaricus* (Bloch)

Reference: Ghani and Ali, 1998

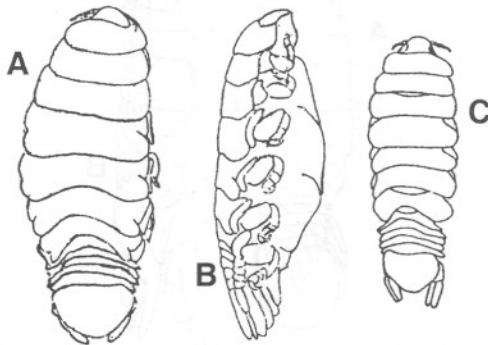


Fig. 97. *Catoessa ambassae* Bruce, 1990. A, female, dorsal view; B, same, lateral view; C, male, dorsal view. (after Ghani and Ali, 1998)

Not treated Genus: *Cymothoa* Fabricius, 1787.

Cymothoa eremita (Brunnich, 1783).

Host: *Parastromateus niger* (Bloch).

Reference: Bal and Joshi, 1959; Shireen, 2000.

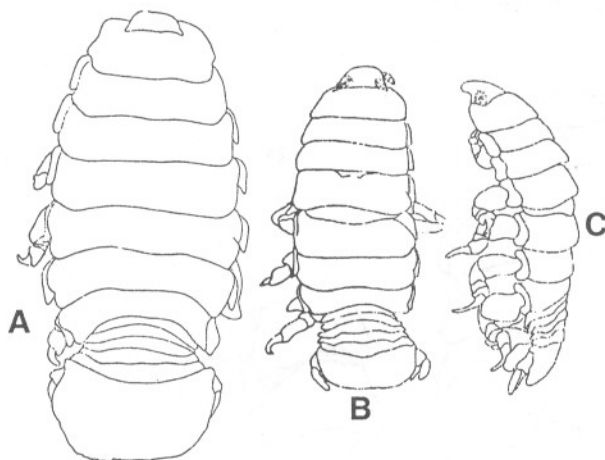


Fig. 98. *Cymothoa eremita* (Brunnich, 1783). A, female, dorsal view; B, male, dorsal view; C, same, lateral view. (after Shireen, 2000)

Not treated: *Cymothoa cinerea* Bal and Joshi, 1959

Reference: Bal and Joshi, 1959

Not treated: *Cymothoa paradoxa* Haller, 1880

Reference: Haller, 1880

Not treated Genus: *Joryma* Bowman and Tareen, 1983

Head not reaching margin pereonite 1. Pleonite 1 lateral expansion bilateral, distinctly bilobed. Telson triangular *Joryma sawayah* Bowman and Tareen, 1983.

Host: *Sardinella* spp.

Reference: Ghani and Shireen, 2000.

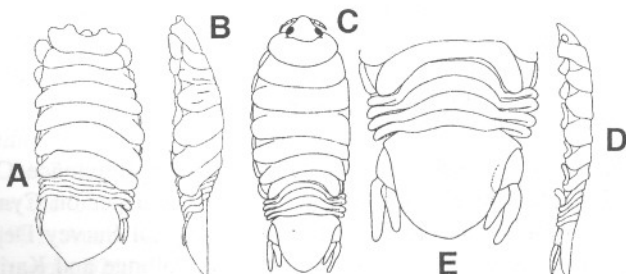


Fig. 99. *Joryma sawayah* Bowman and Tareen, 1983. A, female, dorsal view; B, lateral view; C, male, dorsal view; D, same, lateral view; E, pleotelson. (after Bowman and Tareen, 1983)

Head exceeding pereonite 1 expansion. Pleonite 1 lateral expansion unilateral, not bilobed. Telson broadly rounded *Joryma engraulidis* Barnard, 1936.

Host: *Sardinella* spp.

Reference: Shireen, 2000.

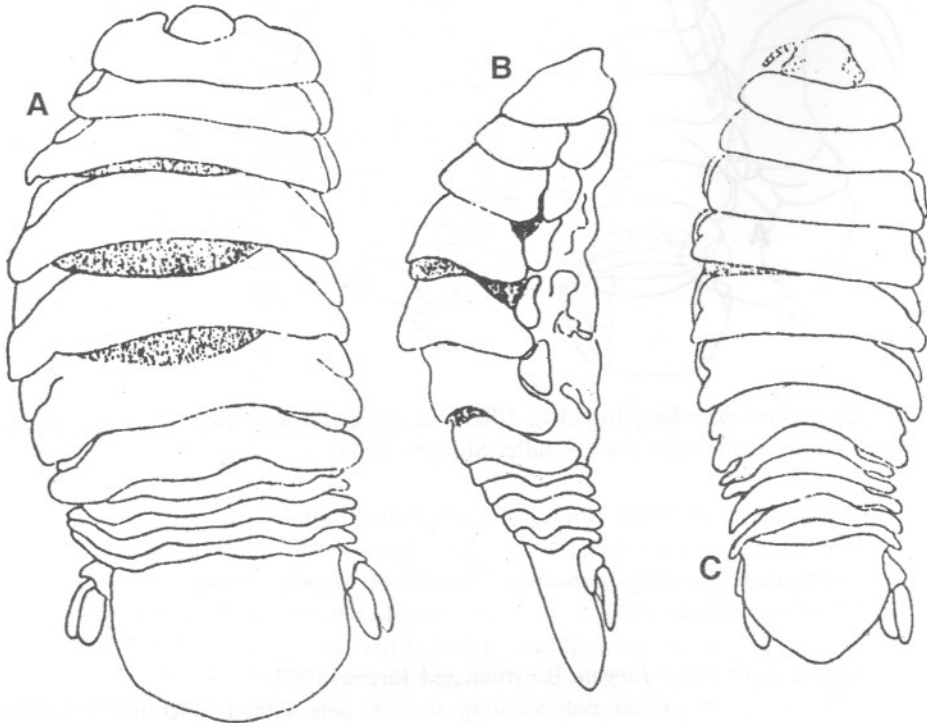


Fig. 100. *Joryma engraulidis* Barnard, 1936. A, female, dorsal view; B, same, lateral view; C, male, dorsal view. (after Shireen, 2000)

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