

Fig. 38.3. Branchiopods A—*Artemia*; B—*Triops*; C—*Cyzicus*.

Subclass 2. Diplostraca

1. Body is enclosed within a laterally compressed bivalve carapace.

Subclass Diplostraca is divided into two orders:

Order 1. Conchostraca (*Clam shrimp*)

1. Entire body is completely enclosed within the carapace and animal looks strikingly like a little clam.
2. Ten to 32 trunk segments are present.
3. Second antennae are well developed, biramous and setose.
4. Compound eyes are sessile.

Examples. *Cyzicus* (Fig. 38.3C); *Lynceus*.

Order 2. Cladocera (*Water fleas*)

1. The bivalve carapace encloses the trunk but not the head and often terminates posteriorly in dorsal spine.
2. A space called **brood chamber** lies between the dorsal body surface and carapace.
3. Trunk has five or six pairs of appendages.
4. The tip end of the trunk, commonly called the **post-abdomen**, is turned ventrally and forward and bears special claws and spines for cleaning the carapace.
5. Head bears single median compound eye.

6. Antennae are large and used in swimming.

7. Most species are freshwater; some are marine (e.g., *Evadne*, *Podon*).

Examples. *Daphnia* (Fig. 38.4), *Leptodora*.

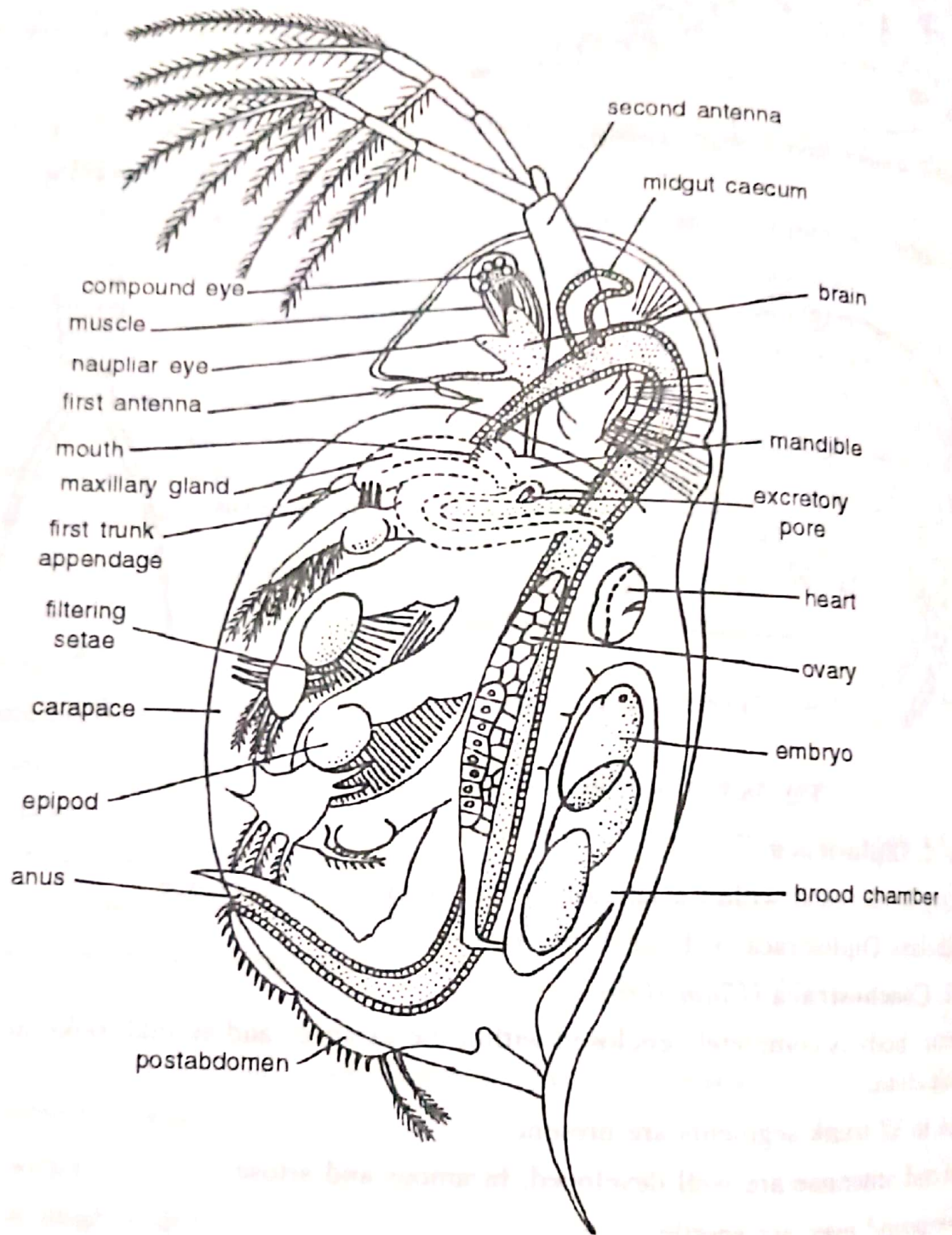


Fig. 38.4. *Daphnia pulex*. Female.

Subclass 3. Sarcostraca

1. Carapace is absent.

This subclass includes **single** order.

Order Anostraca (*Fairy shrimp*)

1. Carapace is absent.

2. Thorax contains 11 to 18 segments, each having a pair of appendages (**phyllopodia**).

3. Abdominal segments are limbless. Anal somite is with a pair of caudal rami.

4. Have stalked compound eyes.

Examples. *Branchinecta*, *Artemia* (brine shrimp, Fig. 38.3A, an inhabitant of salt lakes and ponds).

Class 3. Ostracoda

1. Include about 5,650 species of mussel or seed shrimps.

2. They are marine and freshwater minute crustaceans. Some are free living (swimmers); others live on bottom.

3. Body is highly reduced and enclosed within hinged, bivalved carapace, which is commonly impregnated with calcium carbonate.

4. Head is large and trunk is short. All external trunk segmentation have disappeared.

5. Antennules and antennae are well developed.

6. There are only two pairs of legs in trunk. Maxillae are leg-like and are modified for swimming, feeding, clasping, etc.

Class Ostracoda is divided into two subclasses.

Subclass 1. Myodocopa

1. All are marine.

2. Shell valves contain **antennal notch**.

3. Second antennae is adapted for swimming.

4. Two pairs of trunk appendages.

Subclass Myodocopa is divided into two orders.

Order 1. Myodocopida

The long worm-like second pair of trunk appendages are adapted for cleaning the interior of valves.

Example. *Cypridina*, *Gigantocypris*, *Skogsbergia*.

Order 2. Halocyprida

1. All are marine.

2. First pair of trunk appendages are present or absent.

3. Second pair of appendages are absent or short and leg-like.

Example. Planktonic species.

Subclass 2. Podocopa

1. Carapace valves are without an antennal notch.

2. One or two pairs of trunk appendages are present.

Subclass Podocopa is divided into two orders.

Order 1. Podocopida

1. First pair of trunk appendages are leg-like.

2. This large order includes marine as well as freshwater species.

Examples. *Cypris*, *Pontocypris*, *Candona* (See Box 38.1), *Cypridopsis*, *Mesocypris*, *Darwinula*, *Cythere*.

Box 38.1
Zenker's organ

Candona suburbana is a very common freshwater podocopid ostracod. This nonswimming bottom dweller feeds on algae and decomposing vegetation. Zenker's organ, which is a part of the male reproductive system, ejects sperm to the penis.

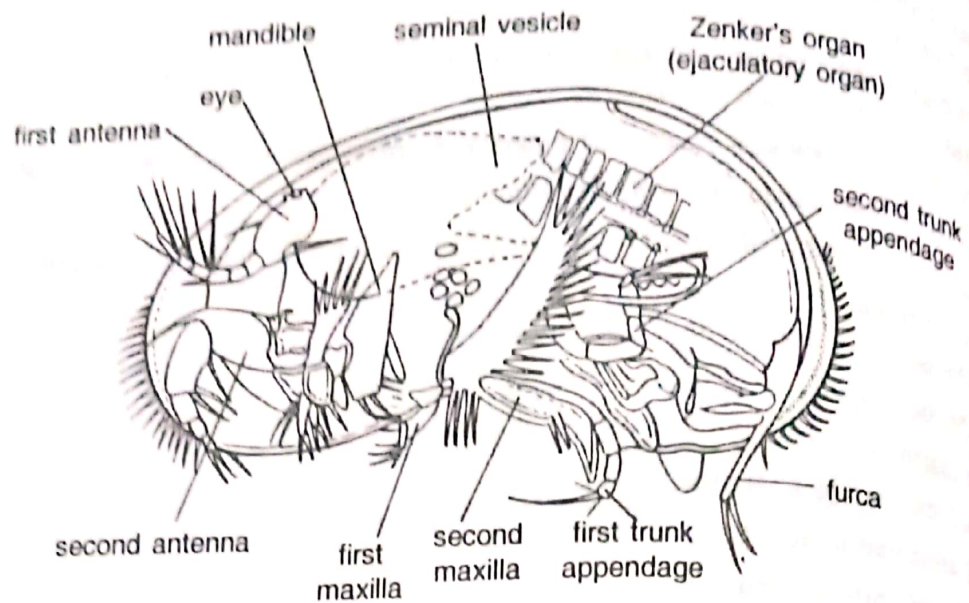


Fig. 38.5. *Candona suburbana*.

Order 2. Platycopida

1. Marine, benthic animals.
2. First pair of trunk appendages are not leg-like.

Class 4. Copepoda (Copepods)

1. It includes about 8405 species of small crustaceans.
2. Both marine and freshwater forms. Free living and parasitic.
3. Body is cylindrical and tapering and divided into head, thorax and abdomen.
4. Thorax bears five pairs of biramous appendages and abdomen is without appendages. Tail is with two caudal forks.
5. First pair of antennae are longer than the second pair and held outstretched.
6. Compound eyes are absent; naupliar eye is present.

Class Copepoda is divided into **seven** orders.

Order 1. Calanoida

1. Free living, planktonic forms.
2. First pair of antennae is very long having setae and 22 or more articles.

Examples. *Calanus*, *Calocalanus*, *Metridia*, *Acarita*.

Order 2. Misophrioida

1. Pelagic animals living on or above the bottom surface.
2. First pair of antennae are shorter, containing 11 to 16 articles.

Example. *Misophria*.

Order 3. Harpacticoida

1. Free living marine and freshwater forms. Bottom dwellers.
2. First pair of antennae are short having 10 articles.

Example. *Harpacticus*, *Canthocamptus*

Order 4. Monstrilloida

1. Marine; larval stages are parasitic in polychaetes and gastropods.
2. Adults are nonfeeding, planktonic and lack second antennae and mouth parts.

Example. *Monstrilla*, *Xenocoeloma*.

Order 5. Siphonostomatoida

1. Freshwater and marine forms.
2. Adults are parasitic on fish and invertebrates.

Example. *Nemesis*, *Clevella*, *Caligus*, *Penella*.

Order 6. Cyclopoida

1. Marine, freshwater, planktonic and benthic forms.
2. Some forms are commensals and parasites.
3. First pair of antennae are short containing 10 to 16 articles.
4. Second antennae are uniramous (unbranched).

Example. *Cyclops*, *Sapphirina*, *Oncaea*.

Order 7. Poecilostomatoida

1. Marine.
2. Adults are parasites on invertebrates and fish.

Example. *Ergasilus*, *Chondracanthus*.

Class 5. Mystacocarida or Mystacarida (*Moustache shrimp*)

1. It includes 9 species of marine forms adapted for living between the intertidal sand grains.
2. Body is long and cylindrical and divided into head, thorax and abdomen.
3. Thorax contains less than six segments. Mandibular palp is present.
4. Naupliar eye is absent.
5. Both pairs of antennae are long and prominent.
6. Maxillipedes are present. Mouth appendages contain setae for collecting detritus.
7. Caudal rami work as pincers.
8. Sexes are separate. Larva is **nauplius**.

This class includes **single** order.

Order Mystacocaridida

Example. *Derocheilocaris* (Fig. 38.6A)

Class 6. Branchiura (*Gill tails*)

1. This class includes about 150 species of marine and freshwater forms.
2. They are ectoparasitic on the skin and gill cavities of fishes.
3. Head and thorax are covered by a shield-like carapace.
4. Abdomen is small, bilobed and unsegmented.
5. Both pairs of antennae are reduced and modified for attachment. First pair of antennae have a large claw for attachment to the host.
6. Compound eyes are present.
7. In some (e.g., *Argulus*, Fig. 38.6B), first pair of maxillae contain two large suckers for attachment. Other appendages are vestigial.

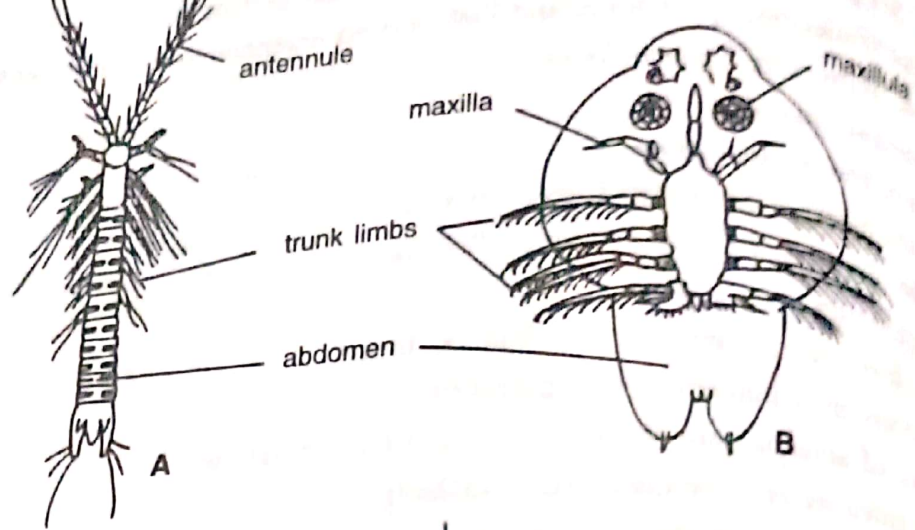


Fig. 38.6. A—*Derocheilocaris* (mystacocarid); B—*Argulus* (branchiuran).

Class 7. Remipedia

1. It includes only 2 species of crustaceans which are inhabitants of marine caves. They were discovered by Yager (1981).
2. Body is very long, segmented and worm-like.
3. Each body segment bears a pair of biramous appendages.

Example. *Lasionectes*.

Class 8. Tantulocarida

1. It includes only 4 species.
2. Small marine crustaceans ectoparasitic on deepwater crustaceans.
3. Body is similar to copepods but lacking trunk segments.

Example. *Copepode-like animals*.

Class 9. Cirripedia (*Curl foot barnacles*)

1. This class includes about 900 species of barnacles.
2. They are either free living or parasitic. All are marine.
3. Body is enclosed within a saccular bivalved **carapace** or mantle of lime. Carapace is divided into plates.
4. Both pairs of antennae are reduced or absent. **Mandibles** are blade-like.
5. Body is divided into head and trunk. External segmentation is very indistinct. Abdomen is absent.
6. Thorax bears six pairs of similar biramous appendages called **cirri**.
7. Most of them are **hermaphrodites**. Penis is long and tubular. Young ones hatch as **nauplius larva** that moults to produce **cypris larva**.

Class Cirripedia is divided into **four** orders:

Order 1. Ascothoracica or Ascothoracida (*Naked barnacles*)

1. They are parasitic on echinoderms and corals.
2. Bivalve or saccular carapace; without calcareous plates on the mantle.
3. First antennae are prehensile. **Mandibular palp** is present.
4. Abdomen is present.

5. Female gonopore on first thoracic segment.

Examples. *Dendrogaster, Ascothorax.*

Order 2. Acrothoracica (Naked boring barnacles)

1. They live attached to some calcareous substratum, especially shells of molluscs and corals.
2. They bore into substratum.
3. They lack calcareous plates on the mantle. A chitinous attachment disc is present.
4. Three to five pairs of cirri are present.

Examples. *Trypetesa, Kochlorine, Berndita.*

Order 3. Thoracica (Goose barnacles and Acorn barnacles)

1. They are free living and commensal forms; with or without stalk (peduncle).
2. Carapace or mantle is covered with calcareous plates.
3. Animal lies in the carapace upside down, i.e., stands on its head.
4. Six pairs of well-developed cirri are present.
5. They are monoecious.

Examples. *Lepas, Scalpellum, Verruca, Balanus, Coronula, Xenobalanus.*

Order 4. Rhizocephala

1. Parasitic on decapod crustaceans and tunicates.
2. Mantle, appendages and alimentary canal are absent.
3. Body is reduced to ramifying stolon and gonad sac.
4. Stalk or peduncle forms root-like absorptive processes.

Examples. *Sacculina, Peltogasterella, Lernaediscus.*

Class 10. Malacostraca

1. It includes about 22,651 species which are marine or freshwater.

2. Body is divided into head, thorax and abdomen.
3. Trunk is typically composed of 14 segments and a telson. Its first 8 segments form the thorax and last 6 form the abdomen.
4. Thorax may or may not be covered with carapace.
5. All body segments bear appendages.
6. **Female gonopores** are always located on the 6th thoracic segment and the **male gonopores** are on the 8th thoracic segment.

Class Malacostraca is divided into **three** subclasses:

Subclass 1. Phyllocarida

Order Leptostraca or Nebaliacea

1. It includes about 20 species of most primitive living malacostracans (appeared in Cambrian period).
2. Small sized marine animals living in bottom mud.
3. They are suspension feeders.
4. They have **eight** segments in the abdomen.
5. Thorax is enclosed in a bivalve carapace and is provided with foliaceous appendages.

Examples. *Nebalia, Paranebolia.*

Subclass 2. Hoplocarida

Order Stomatopoda (Mantis shrimp or armed shrimps)

1. It includes about 300 species which are marine and specialized predators of fish, crabs, molluscs and molluscs.
2. Body is dorso-ventrally flattened. Carapace is small and shield-like but does not cover last two thoracic segments.
3. Abdomen is large, broad and segmented.
4. First antennae (*i.e.*, **antennules**) with three flagella.
5. Second pair of thoracic appendages are large and chelate; it is developed for **raptorial feeding**.
6. Thoracic limb protopod (= protopodite) is composed of two segments. Endopod (= endopodite) comprise of four segments.
7. Compound eyes are stalked.
8. Pleopods are well developed; they contain gills.
9. Telson and uropods are large.

Examples. *Squilla*, *Lysiosquilla*, *Gonodactylus*.

Subclass 3. Eumalacostraca

1. Antennae are without three flagella.
2. Endopodite is composed of five segments.
3. Gills when present, they are restricted to thoracic limbs.

Class Eumalacostraca is divided into **four** superorders:

Superorder 1. Syncarida

1. Carapace is absent.
2. Eight thoracic segments are free or the first fused with head.
3. Thoracic appendages are biramous and similar. Chelate or subchelate legs are absent.
4. Freshwater (ground water)—inhabitants or cave-dwelling.

It includes **two** orders.

Order 1. Anaspidacea

1. It includes 10 species which are suspension feeders.
2. First thoracic somite is fused with head.
3. First thoracic legs are modified as maxillipedes and have distinct gnathobases.

Example. *Anaspides*.

Order 2. Bathynellacea

1. It includes about 25 species of minute malacostracans.
2. First thoracic segment is not fused with the head.

Example. *Brasilibathynella*.

Superorder 2. Pancarida

Order Thermosbaenacea

1. They are inhabitants of hot springs and ground water.
2. Small sized and blind animals having a reduced carapace which is fused with the first thoracic segment.
3. They carry eggs in dorsal brood pouch.

Example. Hot spring inhabitants.

Superorder 3. Eucarida

1. It includes large sized malacostracans.
2. Carapace is highly developed and fused with all the thoracic segments.