Class 5. Insecta

Subclasses (2)

1. Apterygota

Orders (5)

1. *Protura*
   Example. *Eosentomon*
2. Apiera (Diplura)
   Example. *Campodea*
3. Collembola
   Example. Springtails (*Entomobrya*)
4. Microcoryphia
   Example. Jumping springtails (*Machilis*)
5. Thysanura
   Example. Silver fish (*Lepisma*)

2. Pterygota

Orders (more than 17)

1. **Ephimerida**
   Example. Mayflies (*Ephemera*)
2. **Odonata**
   Example. Dragonflies (*Macromia*)
3. **Orthoptera**
   Examples. Grasshopper (*Poeciloceros*), locust (*Schistocerca*), cockroach (*Periplaneta*)
4. **Isoptera**
   Example. Termites (*Termes*)
5. **Dermaptera**
   Example. Earwig (*Forficula*)
6. **Plectoptera**
   Example. Stoneflies (*Taeniopteryx*)
7. **Mallophaga**
   Example. *Cuclogaster*
8. **Anopleura**
   Example. Human louse (*Pediculus*)
9. **Thysanoptera**
   Example. Thrips (*Taeniothrips*)
10. **Hemiptera**
    Example. Bedbug (*Cimex*)
11. **Homoptera**
    Example. *Cicada*
12. **Neuroptera**
    Example. *Mantispid*
13. **Coeloptera**
    Examples. Beetles (Lady bird beetle, *Adalia*), weevils (rice weevil, *Calandra oryzae*), fireflies (*Lamprohorous*)
14. **Lepidoptera**
    Examples. Butterflies (*Papilio*, *Kalima*), moth (*Bombyx mori*)
15. **Diptera**
    Examples. Mosquitoes (*Anopheles*, *Culex*), fruitflies (*Drosophila*), housefly (*Musca*)
16. **Hymenoptera**
    Examples. Wasps (*Polistes*, *Vespa*), honeybee (*Apis*)
17. **Siphonoptera**
    Example. Rat flea (*Xenopsylla*)

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38.3. DETAILED CLASSIFICATION

Phylum Arthropoda is divided into **four** subphyla:

Subphylum 1. Trilobita (or Trilobitomorpha)

1. This subphylum is represented by fossil or extinct trilobites. They existed from Cambrian to Permian periods.
2. Body was divided into three lobes by two longitudinal furrows.
3. All body segments except the last contained **biramous appendages**.
4. Marine and benthozoic (bottom-dweller) arthropods.

Examples. *Triarthrus, Dalmanites.*

Subphylum 2. Chelicerata

1. Body is divided into **cephalothorax** or **prosoma** and **abdomen** or opisthosoma.
2. **Antennae** and **true jaws** are absent.
3. Cephalothoracic or prosomic appendages comprises of one pair of **chelicerae**, one pair of **pedipalps** and four pairs of **walking legs**.
4. Chelicerae form first pair of appendages. They are preoral and feeding appendages.
5. Second opisthosomal segment bear gonopores.
6. Excretion occurs by **coxal glands.**
7. Mostly terrestrial and predaceous.

Subphylum 3. Crustacea

1. Body is divisible into **cephalothorax** (fused head and thorax) and **abdomen.**
2. Cephalothorax is covered dorsally by **carapace.**
3. Head bears a pair of **compound eyes** and five pairs of biramous appendages: 1. two pair of antennae (*i.e.*, **antennules** and **antennae**); 2. **mandibles**; 3. two pairs of maxillae (*i.e.* **maxillules** and **maxillae**).
4. Each segment of thorax and abdomen contains a pair of branched or biramous appendages.
5. Their skeleton is hard and calcified.
6. They respire by means of gills.
7. Excretion is by green glands.
8. All are aquatic—mostly marine, some are freshwater (*e.g.*, *Daphnia*) and a few are adapted for moist land (crabs and wood lice).
9. Crustaceans are so abundant in oceans that they have been called "the insects of the sea".

Subphylum 4. Uniramia

1. Appendages are **uniramous** or unbranched.
2. The head is composed of five pairs of appendages—1. a single pair of **antennae**; 2. a pair of **labrum**; 3. a pair of **Mandibles** and 4. first and second pair of **maxillae**, with latter forming a **labium**.
3. **Trachea** are used for respiration.
4. **Malpighian tubules** are employed as excretory organs. Excretory waste is ammonia.
5. Nearly all are terrestrial

(**Note.** In old system of classification subphyla **Crustacea** and **Uniramia** were included in one subphylum **Mandibulata**. Four groups of uniramia, namely the **centipedes, millipedes, pauripods** and **symphyla**, form the common group **Myriapoda** including about 10,500 species).

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Subphylum 2. Chelicerata

Subphylum Chelicerata is divided into **three** classes:

Class 1. Merostomata

1. Cephalothorax is covered by large, continuous dorsal shield.
2. Five or six pairs of abdominal appendages are modified as **gills**.
3. There is a well-developed spine or **telson** at the posterior end of body.
4. They contain a pair of compound eyes and a pair of simple eyes.
5. All are aquatic.

Class 2. Arachnida

1. This class includes about 10,000 species.
2. Body consists of two regions (or tagmata): **cephalothorax** (or **prosoma**) and **abdomen** (or **opisthosoma**).
3. The cephalothorax bears a pair of **chelicerae**, one pair of **pedipalps** and four pairs of **walking legs**. They lack **antennae** and **true jaws**.
4. Pedipalps are leg-like appendages that serve a sensory function, as in spiders, or are used for seizing the prey, as in scorpions.
5. Abdomen is without appendages.
6. Air-breathing mostly terrestrial arthropods.

Class 3. Pycnogonida (or Pentopoda)

1. This class includes about 1,000 species of sea **spiders**.
2. Arthropods with very small bodies and disproportionally **long legs**.
3. Body is narrow and comprises of **head** (cephalon), **trunk** (throax) and a short conical **abdomen.**
4. Head bears four **eyes** on a cen-tral tubercle and a cylindrical **proboscis**.
5. Trunk is formed of 4 to 6 cylindrical segments.
6. Appendages include a pair of **chelicerae** (called **chelifo-res**), a pair of **palps**, a pair of **ovigerous legs** or **ovigers** and four to six pairs of **walking legs**.
7. Ovigers are peculiar and may be used in grooming and in males to carry the eggs.
8. There are no special organs for respiration and excretion.
9. Sexes are separate; the eggs are carried on the ovigers of males and give rise to larvae, called **protonymphon**, hav-ing three pairs of legs.
10. Most pycnogonids are marine, bottom dwellers and crawl about algae, hydroids and bryozoans. They are **carnivorous** and feed on hydroids, soft corals, anemones, bryozoans, small polychaetes and sponges.

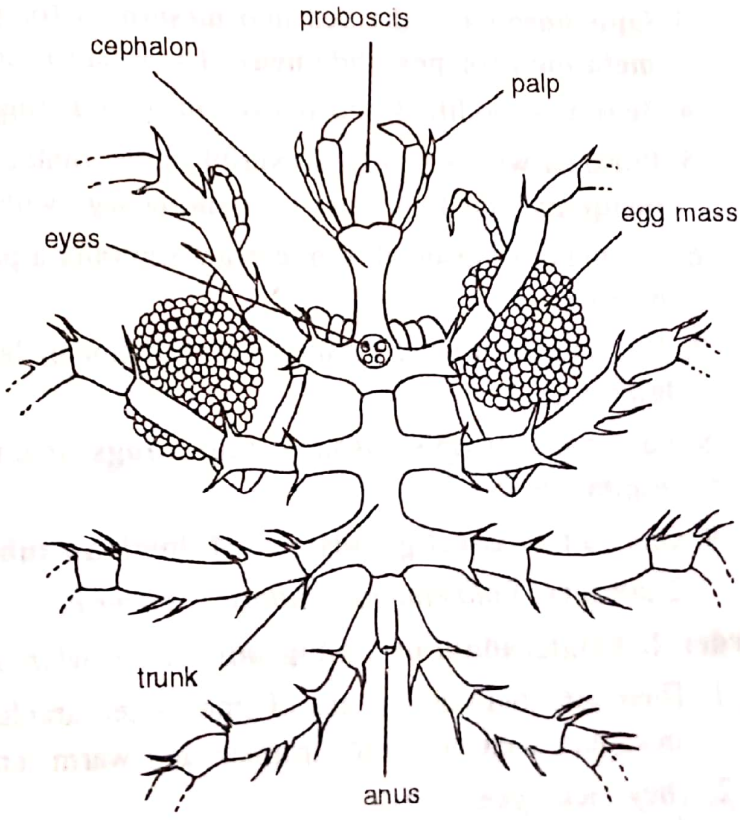

Fig. 38.1. *Nymphon rubrum*, a sea spider.

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Examples. *Nymphon* (Fig. 38.1); *Pycnogonum*, *Pallene*, *Decolopoda*.

Class 1. Merostomata. Class Merostomata is divided into following two subclasses:

Subclass I. Xiphosura

1. Hemicircular prosoma or the cephalothorax is covered with a large horse-shoe shaped carapace.
2. Segments of abdomen (or opisthosoma) are fused and covered with a single plate.
3. Caudal spine or **telson** is as long as the body.
4. Cephalothorax with a pair of **chelicerae,** five pairs of walking legs and a pair of chilaria.
5. Walking legs are four to six-segmented and significant for burrowing and capturing the prey.
6. First four pairs of walking legs have projections, called **gnathobases** on the inner side of the basal coxae. They are used to fragment the prey.

This subclass includes a **single** order.

Order Lemulida. Example. *Limulus* (king crab).

Subclass 2. Eurypterida

1. This subclass includes extinct giant arthropods that existed from the Cambrian and Permian period.
2. Cephalothorax is small and covered with a carapace.
3. Abdomen (opisthosoma) includes **mesosome** and **metasoma,** which lacks appendages.
4. Telson present.

Examples. *Eurypterus*, *Pterygotus*.

Class 2. Arachnida

Class Arachnida is divided into following **eleven** orders.

Order 1. Scorpionida or Scorpiones (*Scorpions*)

1. There are about 2000 species of scorpions found in tropical and sub-tropical areas.
2. **Prosoma** is covered with a single shield or carapace.
3. **Opisthosoma** is divided into **mesosoma** (or **preabdomen**) of seven broad somites and **metasoma** (or **postabdomen**) of five narrower somites.
4. **Telson** is modified into poison gland and sting.
5. Prosoma with a pair of powerful, three-jointed chelicerae; a pair of large, distinct chelate **pedipalps** and four pairs of **walking legs** with nine podites.
6. Second opisthosomal somite bears ventrally a pair of comb-like sensory appendages, called **pectines**.
7. The middle of head carapace bears a pair of large **median eyes** and 1 to 5 pairs of small **lateral eyes**.
8. Four pairs of opisthosomal **book lungs** or unbranched **tracheal tubes** are present for respiration.
9. One pair of **coxal glands** and **Malpighian tubules** perform excretion.

Examples. *Palamnaeus*, *Buthus*, *Centrurus*.

Order 2. Palpigradida or Palpigradi (*Micro-whip scorpions*)

1. There are about 60 species of small-sized arachnids which live in soil (in sand) and under rocks and seem to prefer tropical and warm temperate climates.
2. They lack **eyes**.
3. **Anus** is not terminal but followed by a many-segmented **post abdomen** or flagellum which is called **whip**.

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