3. Gills are located near the base of thoracic appendages.
4. Compound eyes are stalked.

This superorder is divided into **two** orders.

Order 1. Euphausiacea (*Krills*)

1. It includes about 90 species of brightly shining krills.
2. All are marine; pelagic and shrimp-like, upto 3 cm long.
3. Sides of carapace do not enclose the gills tightly.
4. Thoracic appendages are biramous and anterior ones are not modified as maxillipeds.
5. Many contain light producing **photophores** and are biolumnescents.

Example. *Euphausia.*

Order 2. Decapoda (*Shrimps, crabs, lobsters* and *cray fishes*)

1. It includes about 10,000 species accounting for nearly 20 per cent of the known species of crustaceans.
2. They are marine, freshwater or terrestrial.
3. Their first three pairs of thoracic appendages are modified as **maxillipedes**. The remaining five pairs (*i.e.*, 10) of thoracic appendages are **uniramous walking legs** (hence the name decapoda).
4. The carapace encloses the gills in a branchial chamber.
5. **Statocyst** is present in the basal segment of first antennae (or antennule).

Examples. Shrimps—*Crangon* (sand shrimps), *Alpheus* (snapping shrimp), *Palaemon* or *Macrobrachium* (prawn), *Atya*; **crayfish**—*Procambarus*, *Astacus*, *Cambarus*; **lobsters**—*Nephrops*, *Homarus*; **marine burrowing shrimp**—*Thalassina*; **spiny lobsters**—*Panulirus*; **hermit crab**—*Eupagurus*, *Pagurus*; **coconut crab**—*Birgus*; **lobster**—*like Galathea*; **mole crabs**—*Hippa*, *Emerita*; *Brachyura*; **box crab**—*Calappa*, **Spider crab** *Maja*; **fiddler crab**—Uca; **mud crab**—*Xantho*; **rock crab**—*Cancer*; **blue crab**—*Callinectes*.

Superorder 4. Peracarida

1. This superorder carries 40 per cent of the known species of Crustacea.
2. They distinctly contain a **ventral brood chamber** or **marsupium** in the female. It is formed by large plate-like processes of certain thoracic coxae.
3. A carapace may be present or absent.
4. First thoracic somite is fused with the head.
5. There are eight pairs of thoracic appendages. First pair is usually a maxillipede and remaining seven are **legs**.
6. Development is direct.

Superorder Peracarida is divided into **five** orders:

Order 1. Mysidacea (*Opossum shrimps*)

1. Most are marine and some live in freshwater (*i.e*, in lakes and caves); pelagic and benthic; filter—feeder or scavengers.
2. They occur in large **swarms** forming an important food organism of economically important fish.
3. Ventral **marsupium** present *i.e.*, oostegites present from two to all of thoracic legs forming a marsupium due to which they are called **opposum shrimps**.
4. They have stalked compound eyes.
5. First and sometimes second pair of thoracic appendages are modified as maxillipedes.

Order 2. Cumacea

1. It includes 800 species which are marine, burrowing and filter feeding creatures. They live in burrows or mucous tubes in bottom mud or sand.
2. Swarming occurs in males.
3. Head and thorax are greatly enlarged. Carapace covers the first three to four thoracic segments forming a gill chamber.
4. Abdomen is very narrow; it is usually without pleopods in females and bear two to five pleopods in males.
5. Uropods are slender, filiform structures and used in cleaning the anterior segments.
6. Antennae are vestigial in the female but very long in males.
7. Series of filamentous gills are present on first pair of maxillipedes.

Example. *Diastylis.*

Order 3. Amphipoda (*Both foot*)

1. It includes about 5,500 species which are marine freshwater or terrestrial. They may be free living and ectoparasitic species.
2. Some are pelagic, most are benthic, a few are filter feeders.
3. Body is laterally compressed and without carapace.
4. Compound eyes are sessile lacking eyestalks.
5. There are one pair of maxillipedes and seven pairs of uniramous thoracic legs two gills.
6. The abdominal appendages include three pairs of pleopods and three pairs of uropods. T are adapted for jumping.

Example. *Caprella* (skeleton shrimp), *Hyalella*; *Paracyamus* (whale lice), *Phronima* (pa of jelly fish or tunicates); *Orchestoidea*, *Rhabdosoma*.

Order 4. Isopoda (*Equal foot*)

1. It includes about 10,000 species which are freshwater, marine or terrestrial. They are free living and parasitic.
2. They are not filter feeders. Mouth parts resemble with that of insects.
3. Body is dorso-ventrally flattened. Head is shield-shaped.
4. Carapace is absent; compound eyes are sessile.
5. There is one pair of maxillipedes and seven pairs of

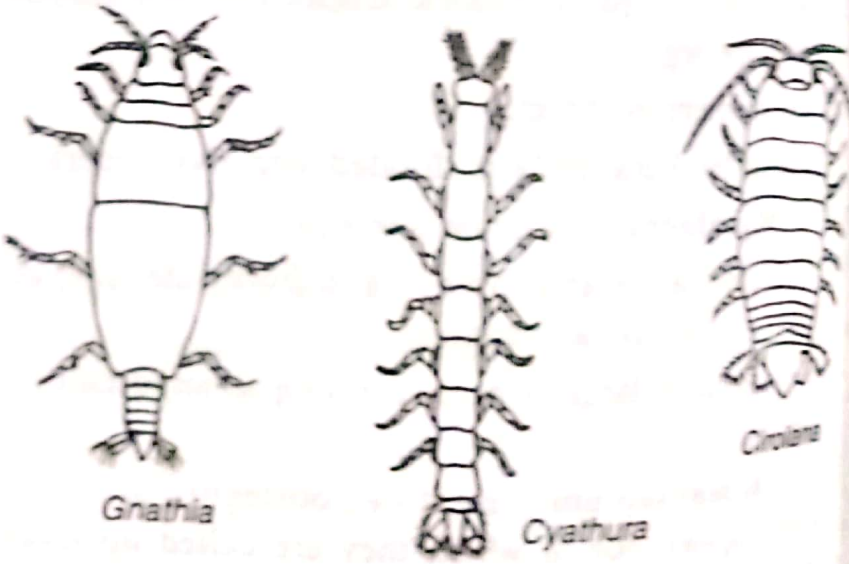

Fig. 38.7. Some isopods.

similar uniramous thoracic legs. These are adapted for crawling (they creep like insects). Some aquatic isopods can also swim.

6. Some abdominal pleopods function as gills.
7. Uropods are fan-shaped.
8. Some isopods can roll up, armadilo-like when disturbed. Land isopods, often called **pill bugs, sow bugs** or **wood lice** are frequently found under logs in wooded areas.

Example. *Gnathia, Cyathura, Limnoria, Cirolana, Astacilla, Asellus, Phreatoicus, Bopyrus, Ligia, Oniscus.*

Order 5. Tanaidacea

1. It includes about 550 species of small, benthic marine animals.
2. They burrow in mud or live in mucous tubes.
3. A small carapace covers anterior part of body; inner surface of carapace acts as gills.
4. Eyes are lobed, present on lateral immovable processes.
5. The first thoracic appendages are maxillipedes equipped with flattened epipodite.
6. Third thoracic appendages are adapted for burrowing.
7. Females have marsupium.
8. Each of them begin life as a female. After having served in this role, it molts to a male and serves in this capacity at least once.

Examples. *Leptochelia, Tanais.*

Subphylum 4. Uniramia

Subphylum Uniramia is divided into **five** classes:

Class 1. Chilopoda (*Centipedes*)

1. It includes about 2500 species of centipedes.
2. They live in moist places such as soil and humus and beneath stones, bark and log. They are nocturnal and carnivorous animals feeding upon soft insects such as cockroach, plant lice, silver fish and earthworm and slugs.
3. First pair of trunk appendages (maxillepedes) are modified into **poison claw** or **forcipules**.
4. Body is divided into head and trunk. Head is convex in scutigeromorph but flattened in other centipedes.
5. Trunk is somewhat flattened and elongated and contains 15 to 170 segments. Each segment bears one pair of legs. All the legs are similar. The last pair of legs are elongated and sensory (or defensive) in function.
6. Last segment is limbless, called **genital segment**, and it bears genital opening.
7. Centipedes run very rapidly.

Class Chilopoda is divided into **two** subclasses:

Subclass 1. Epimorpha

1. Development is **epimorphic**, *i.e.*, young contains all segments when they hatch.
2. The female broods its eggs by winding itself around the egg mass.
3. Adults contain 21 or more pairs of legs.

This subclass is divided into **two** orders:

Order 1. Geophilomorpha

1. Elongated, blind burrowing form with 31 to 180 pairs of legs.
2. Each trunk somite with dorsal tergite and intertergite and ventral sternite and intersternite.

3. Antennae with 14 segment.
4. Pair of spiracles are present in all but first and last somites.

Examples. *Geophilus, Strigamia, Mecistocephalus.*

Order 2. Scolopendromorpha

1. They contain 21 to 23 pairs of legs.
2. Tergal plates correspond to sternal plates and are equally large.
3. Antennae with 17 to 31 segments.
4. Eyes are absent or composed of four ocelli.
5. They contain 9 to 11 pair of spiracles.

Examples. *Scolopendra, Theatops.*

Subclass 2. Anamorpha

1. Development is **anamorphic**, *i.e.*, the youngs contain segments less than that of adult
2. No brooding occurs.
3. Adults have 15 pairs of legs.
4. A pair of **organ of Tomosvary** is present on the head at the base of antennae. It is u in **vibration detection** and **monitoring of humidity**.

This subclass is divided into **two** orders.

Order 1. Lithobiomorpha

1. Antennae contain 19 to 70 segments.
2. Trunk contains nine large and six small somites.
3. Large and small tergal plates alternate.
4. Spiracles are paired and lateral.
5. Eyes with many ocelli.
6. Development is anamorphic.

Examples. *Lithobius, Bothropolys.*

Order 2. Scutigeromorpha

1. Legs and antennae are very long.
2. Fifteen sternal plates, but with only eight tergal plates.
3. Eyes are large and compound.
4. Spiracles are unpaired and located mid-dorsally on tergal plates.
5. Development is anamorphic.

Example. *Scutigera.*

Class 2. Symphylla

1. It includes 160 species of myriapods which live in soil of green houses and attack plant ro and can be serious pest to vegetable and flower crops.
2. They are between 1 and 8 mm in length and superficially resemble lithobiomorph centiped
3. Somites of trunk are covered by 15 to 24 tergal plates.
4. Trunk contains 12 legs bearing segments.Trunk terminates in a tiny oval telson.
5. First maxilla with no palp. Second maxillae fuse to form a **labium.**
6. A single pair of spiracles opens on to the sides of the head, and the tracheae supply o the first three trunk segments.
7. **Gonopore** is present ventrally on fourth trunk segment.

8. The last (14th) segment bears a pair of spinnerets or cerci and a pair of long, sensory hairs (called **trichobothria**).
9. Eyes are absent.
10. Two organs of Tomosvary are present (Fig. 38.9).
11. Development is anamorphic.

Examples. *Scutigerella* (Fig. 38.8); *Hanseniella*.

Class 3. Diplopoda (*'Thousand legged'* or *millipedes*)

1. It includes about 10,000 species.
2. Millipedes avoid light and live beneath leaves, stones, bark and logs and in soil. They are herbivorous and run much more slowly.
3. Diplopod (double foot) refers to the most important character of millipedes. They contain two pairs of legs in nearly each abdominal segment. This occurs because two embryonic somites fuse to form an adult somite, called **diplosegment**.
4. Body is elongated and cylindrical.
5. Body is divided into **head** (first 5 segments), **thorax** (of 3 segments) and **abdomen** of 20 to 100 segments.
6. Last head segment is called **collum** and forms a large collar behind the head.
7. Thorax contains one pair of legs in each segment.
8. Each of the diplosomites is enclosed in a continuous skeletal ring, with no articular membranes between the **tergal, pleural** and **sternal plates**. Each segment is covered with single tergal plate dorsally and two sternal plates ventrally. Tergites are impregnated with calcium salts like the crustacean.

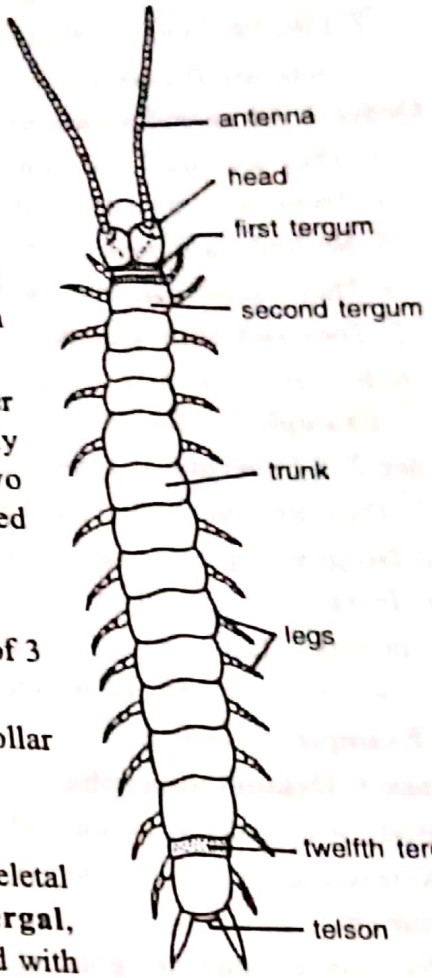

Fig. 38.8. *Scutigerella* (in dorsal view).

9. **Stink glands** or **repugnatorial glands** are present in many millipedes (e.g., *Julus*, *Apheloria*) secreting noxious substances which may be **aldehydes, quinones, phenols** and **hydrogen cyanide**.
10. Actual copulatory organs are modified trunk appendages, called **gonopods**.

Class Diplopoda is divided into following **three** subclasses:

Subclass 1. Pencillata (*Pselaphgnatha*)

1. Minute millipedes with broad and soft bodies. Integument bears tufts and rows of serrated scale-like, setae.
2. Eyes are present.
3. Gonopods and stink glands are absent.
4. Trunk bears 13 somites.

Example. *Polyxenus*.

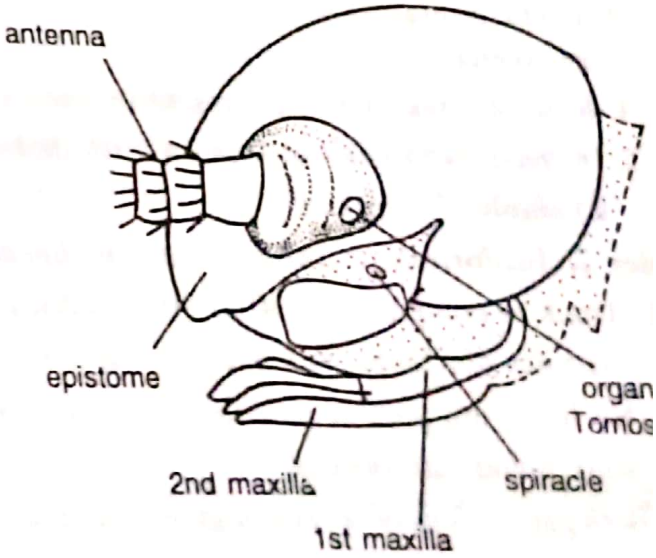

Fig. 38.9. Head of *Hanseniella*.

Subclass 2. Pentazonia

1. Tergal plates are arched.
2. Last two pairs of legs are modified for clasping.

Subclass Pentazonia is divided into **two** orders:

Order 1. Glomeridesmida or Limacomorpha

1. They are small and blind.
2. Trunk is composed of 20 to 22 arched somites.
3. No limbs are present on collum, gnathochilarium.
4. They cannot roll into ball.
5. They lack stink glands.
6. In males, last pair of legs are modified as **gonopods**.

Example. *Glomeridesmus.*

Order 2. Glomerida or Oniscomorpha

1. They are commonly called **pill millipedes.**
2. No limb is present on collum, gnathochilarium.
3. Trunk is composed of 12 to 13 somites which are flattened on the ventral surface.
4. In males, last pairs of legs are modified ; the last pair is used for sperm transfer.
5. Their body can be rolled into ball.

Example. *Glomeris.*

Subclass 3. Helminthomorpha

1. Body is cylindrical or somewhat flattened.
2. At least one pair of legs (gonopods) of the seventh segment in the male is modified for sp transfer.
3. This subclass includes greatest number of millipedes species.

This subclass is divided into **eleven** orders, out of which following **three** are m important.

Order 1. Polyzoniida or Colobognatha (*Suctorial millipedes*)

1. Largely tropical, suctorial and elongated millipedes.
2. No limbs are present of collum; gnathochilarium.
3. Body contains 30 or more diplosomites. Sternal plates are not fused with res exoskeleton.
4. Row of stink glands is present on each side of body.
5. In male, both pairs of legs on sixth diplosomite is modified as gonopod.

Example. *Polyzonium.*

Order 2. Juliformia or Julida (*Snake millipedes*)

1. Trunk is composed of 30 to 90 cylindrical segments.
2. Sternites are fused with exoskeleton (*i.e.*, pleurotergal arch).
3. No limbs are present on collum, gnathochilarium.
4. Stink glands are present.
5. Both pairs of legs of seventh segment (sixth when collum is excluded) are modified as gono in male.

Examples. *Julus, Nemasoma, Blaniulus, Thyroglutus.*