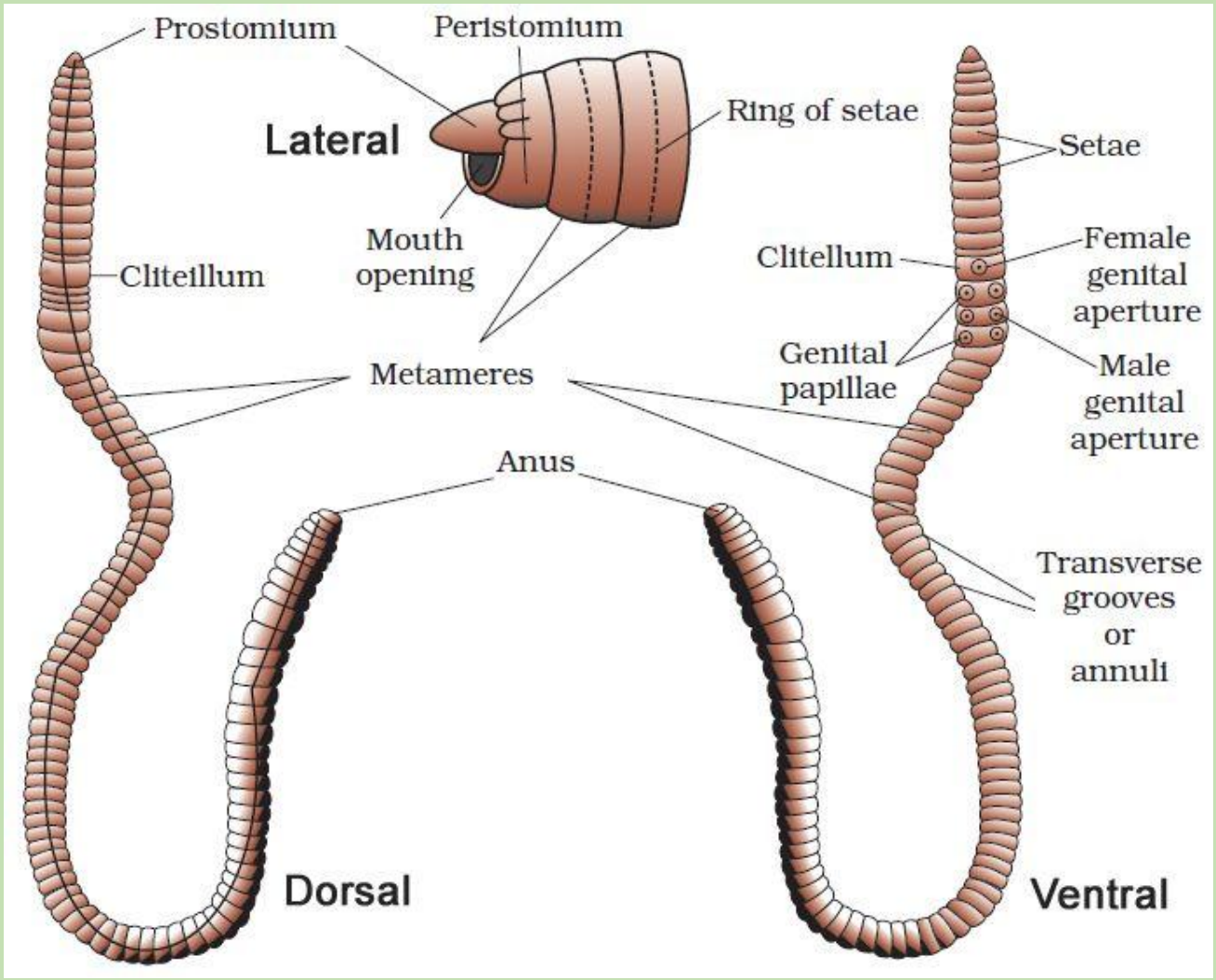
UNIT – 2

PHYLUM – ANNELIDA

The name Annelida has been derived either from Latin annelus (a ring), or French anneler (to arrange in rings) and the Greek eidos (form).

2.1 Salient Features of Phylum Annelida

- Most of the annelids are aquatic, fresh water as well as marine, some are terrestrial which live in burrows or in tubes.
- Body is elongated, vermiform and bilaterally symmetrical.
- Body is metamerically segmented.
- Externally, segments are shown by transverse grooves and internally by muscular partitions called septa.
- The segments or metameres or somites are many and arranged one after the other in a single linear series.
- The outer most covering of body is called cuticle secreted by underlying epidermal cells.

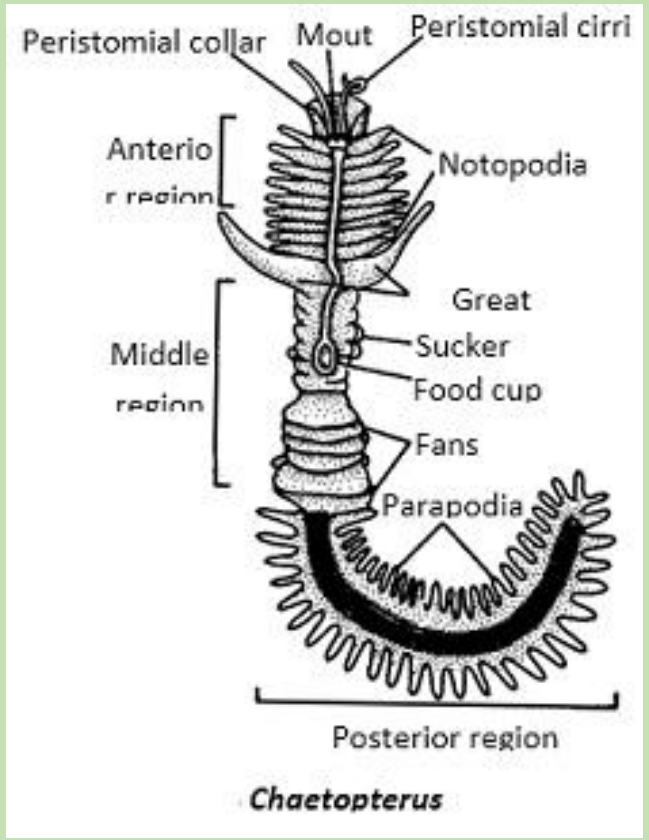

Prostomium
Peristomium
Lateral
Ring of setae
Setae
Mouth opening
Clitellum
Clitellum
Female genital aperture
Genital papillae
Metameres
Male genital aperture
Anus
Transverse grooves or annuli
Dorsal
Ventral

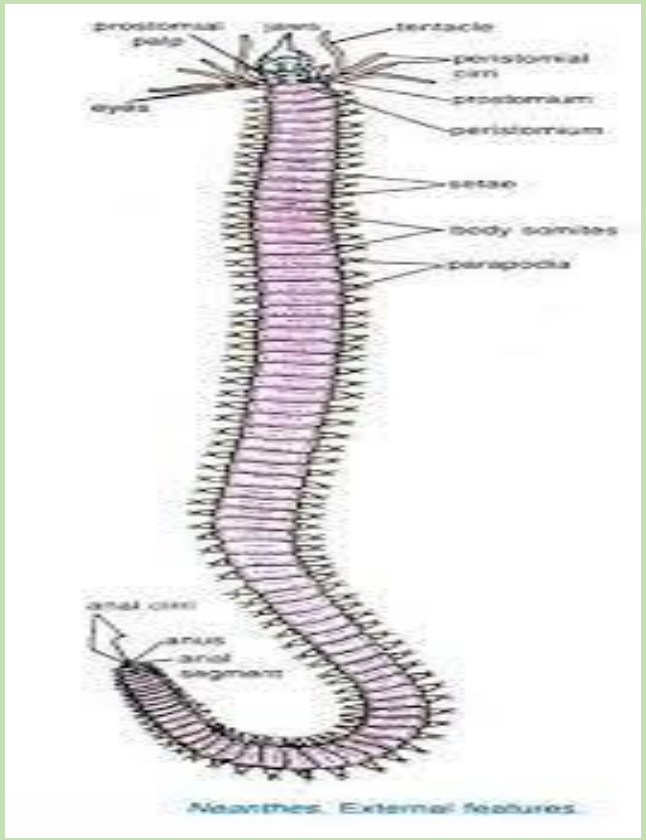
- The body wall is composed of circular and longitudinal muscles.
- Setae or chaetae are the locomotory organs.
- They are triploblastic animals.
- All annelids are true coelomate animals. The body cavity or coelomic cavity is lying between the two layers of mesoderm.
- Respiration is by general body surface or by special projections or gills of parapodia and head.
- Annelids shows well developed blood vascular system and it is of a closed type.
- Blood is red due to dissolved haemoglobin.
- Nephridia are the excretory organs which communicate the coelom with the exterior end.
- Nervous system consists of cerebral ganglion (Brain), circumpharyngeal connectives and double ventral nerve cord with segmental ganglia.
- Sexes may be separate (Polychaeta) or united (Hermaphrodite) e.g., Oligochaeta and Hirudinea
- In indirect development, there is characteristic larva called trochophore larva.

Class – Polychaeta

- Most of the animals are marine, few are fresh water and carnivorous.
- Body is elongated, cylindrical and segmented into similar somites.
- The annelids show distinct head with sense organs such as eyes, tentacles, cirri, palps and mouth.
- Each body segments bears paired, flattened lateral outgrowths of body wall, called parapodia. They are locomotory and respiratory in function.
- Many bristles or setae extend from parapodia in bundles; hence animals are called polychaeta.
- The clitellum or cingulum is absent.
- Cirri or branchiae may be present on body segments.
- Sexes are generally separate (Dioecious).
- Many shows asexual reproduction like serial or lateral budding.
- Fertilization is external.
- Development shows metamorphosis with a typical free swimming trochophore larva.

Examples: *Nereis*, *Aphrodite*, *Chaetopterus*, *Terebella*, *Amphitrite*.


Peristomial collar
Mout
Peristomial cirri
Anterio
r region
Notopodia
Great
Sucker
Middle
region
Food cup
Fans
Parapodia
Posterior region
Chaetopterus

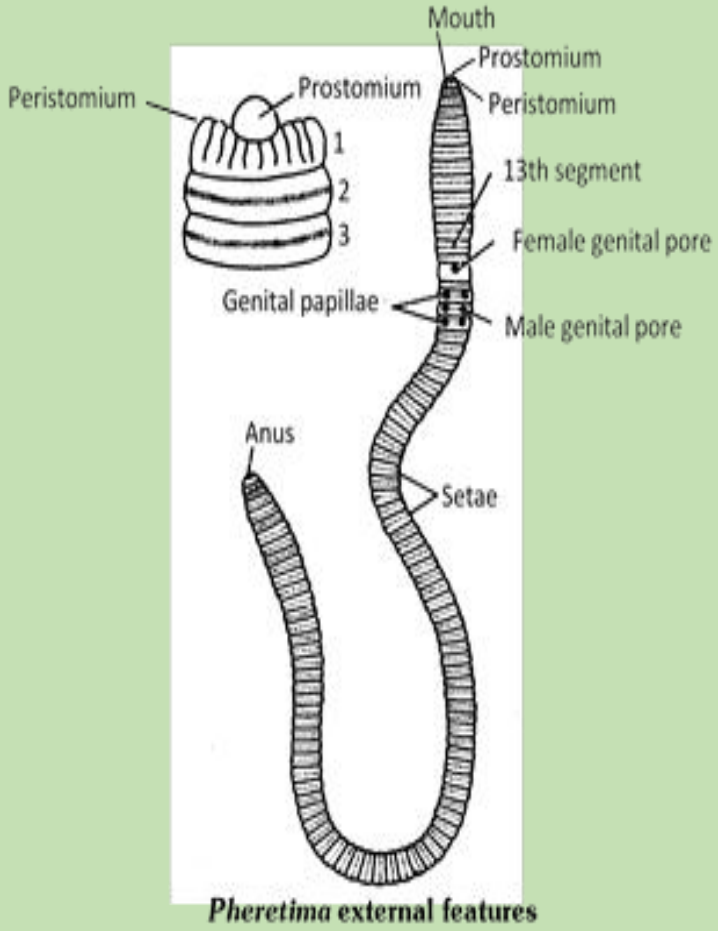

tentacle
peristomial
cirri
prostomium
peristomium
setae
body somites
parapodia
anus
anal
segment
Nearthes External features

Class – Aelosomata:

- These are small to minute worms with many chaetae.
- They live in the interstitial zone of both freshwater and brackish water environment.
- They are hermaphrodite animals.
- Each animal possessing one ovary and two testes.
- There are about 25 species.
- They are little known to science and their classification is disputed with some authors considering them to be part of the Oligochaeta.

Class – Oligochaeta:

- Most of the animals are terrestrial, some are fresh water and marine.
- No distinct head, prostomium is small without sense organs and appendages.
- Rod like setae are present in the body wall of each segment for locomotion.
- Clitellum or cingulum is usually present.
- Some animals bear external gills for respiration.
- Integument or skin also shows respiration.
- They are bisexual or monoecious or hermaphrodite.
- Development is direct. No metamorphosis and larval stage.
- Development occurs inside cocoon secreted by clitellum.
- Some animals show asexual reproduction by transverse fission.
- All possess a great power of regeneration.



Pheretima external features

Examples: *Pheretima, Tubifex, Lumbricus, Branchiobdella*

Class – Hirudinea:

- Some are terrestrial, some freshwater and a few marine.
- They are generally ectoparasitic and blood sucking.
- Body is dorso-ventrally flattened or cylindrical and segmented.
- Number of body segments are small but definite usually 33.
- Each segment again shows superficial divisions into 2 to 5 transverse rings or annuli.
- Anterior and posterior ends of body are provided with suckers called cephalic and anal suckers respectively.
- They are useful for locomotion and attachment.
- Head is not distinct and bears only eyes.
- Coelomic cavity is greatly obliterated and filled by botryoidal tissue.
- Body is very muscular and has great power of contraction and extension.
- Sexes are united. Nephridia are excretory organs.
- Fertilization is internal and development is direct and it occurs in cocoon secreted by clitellum.

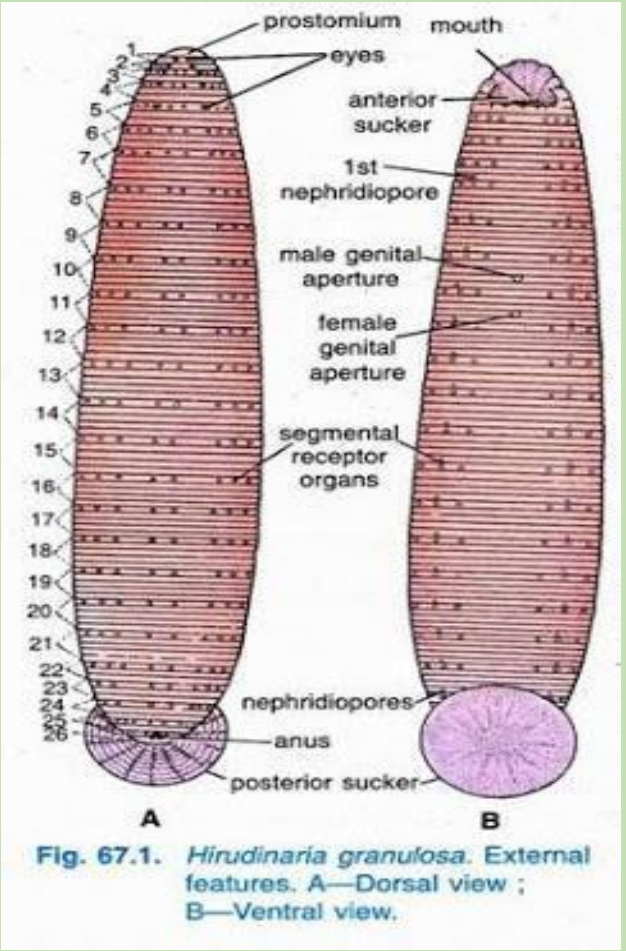


Fig. 67.1. *Hirudinaria granulosa*. External features. A—Dorsal view ; B—Ventral view.

Examples: *Hirudinaria (Leech), Acanthobdella, Placobdella, Hirudo*

Class – Brachiobdella:

- They are small, aquatic whitish animals.
- These animals are either commensals or parasites on crayfish.
- They are mostly found in the northern hemisphere.
- Different species attached to their hosts at different places on the body.

Example: *Branchiobdella parasitica* attaches to the underside of the abdomen while *B. astaci* attaches to its hosts gills.

Economic Importance of Annelida:

1. As a bait and food: These animals are the major portion of the diet of birds, like robins, chickens, ducks, frogs, centipedes and small mammals. Earthworms are commonly used as a bait for fishing all over the world. They are the best food of fish in aquaria. Earthworms are also used as a food in many parts of civilized world.
2. In Agriculture: Earthworms are known as the friends of farmers because they plough the soil and make the soil fertile by adding castings in it. The burrowing and swallowing earth below the surface increases fertility of soil. Due to burrows, air and moisture penetrates into porous soil and improve drainage and helps root growth. The castings of earthworms are a best quality manure for soil which increases the soil fertility. The vermicompost manure production is helpful as biomanure for soil.
3. Use in Medicine: In past earthworms were used as medicine. The medicines prepared from earthworms were used to cure stones in bladder, yellowness of jaundice, pyorrhoea, piles, gout, diarrhoea etc. Earthworms are also used in various fancy medicines in Japan, China and India.
4. Surgical Agents: In the past, Leeches were extensively used in surgery for blood letting under mistaken belief that removal of bad blood may cure the disease. Leeches suck the blood from their prey in painless manner. The use of Leeches in Ayurvedic medical practice in India is very ancient. Leeches were also used in treatment of piles, tonsilitis and baldness.

5. Use in Laboratories: Earthworms and Leeches are of convenient size and used in dissection. Therefore, they are employed for class purposes in the Zoological laboratories. They are also used in research purpose.

6. Harmful Worms: Earthworms sometimes become harmful. Exceptionally, the burrows made by earthworms may cause loss of water in irrigated lands. Their castings on slop land responsible for soil erosion. Some earthworms are an ectoparasites of frog and man. The earthworms are said to serve as an intermediate host in the transmission of some parasites such as tapeworm, gapeworm of chicken and the lung nematode of pigs.

7. As Predators: Leeches also act as predators because they destroy insect larvae, worms, molluscs and other leeches and invertebrates. They also attack on fish, frog, toads, turtles, crocodiles, snakes, birds and mammals.

8. Vermiculture: Vermiculture essentially means the scientific culturing or rearing of earthworms. Its farming all deal with the culture and application of earthworms for various purposes viz.- 1.

1. As in the production of vermicompost (rich bio-fertilizer)
2. Earthworm protein as animal feed for livestock
3. Some species for the treatments of industrial wastes
4. Earthworms play a significant role in the biotic components of soil processes, which include turning and mixing of soils.

Habit and Habitat:

Earthworm is the best known, soil-inhabiting animal, occurs in divers habitats and traced in forest, grassland, gardens, orchards, plant nursery and greenhouse. Organic material like manure, litter, composite, humus, effluents and kitchen drainage are highly attractive for some species, while others are hygrophilous and few live under snow and high mountains, hence identification of the various earthworm species on the basis of their micro-habitat is important to farmers. Ecological factors like Ph, moisture content, salinity and temperature play an important role in the habitat of earthworm.

Useful Species of Earthworms:

a) ***Eudrilus eugeniae:*** It is one of the widely used exotic species in vermiculture. This cosmopolitan Eudrilid is originally from Africa and popularly called as the African Night Crawler. This species occurs in orchard and natural farming with the temperature ranging from 19-220C and soil depth 15-22 cm.

b) ***Eisenia foetida:*** This is fast growing earthworm, with annual cocoon production almost 35 times as compared to that of Eudrilus eugeniae. The conversion ratio for this species is high and make it suitable for use in vermicomposting. The morphological features and other factors are more or less resemble with Eudrilus eugeniae.

c) ***Perionyx sansibaricus:*** It is one of the best known indigenous species for vermicomposting mostly occur in social forestry in the depth ranging from 3-8 cm, temperature 20-28 0C but varied Ph and at moisture content ranging from 20-40%. This species is purely used for the purpose of vermicomposting.

d) ***Pontoscolex corethrurus:*** It is an endogenic (deep soil dweller) shallow burrowing worm, around 2 cm in length. This is a geo-phytophagous species and usually not used for vermicomposting.

e) ***Eudichogaster species:*** It is one of Indian species of Michaelson. These found in monoculture vegetation and mixed farming at depth ranges from 0-30 cm and moisture content from 17-30%, temperature 19-240C.

f) ***Polypheretima elongata:*** It is one of the most widely distributed species of the Megascolecid group. These species are found in monoculture farming at 20 cm depth, 25% moisture content and at the temperature 210C.

Methods of Vermiculture:

Earthworms feed upon a variety of organic material and could be produced commercially for recycling biodegradable organic wastes, production of biofertilizers and animal protein for poultry and fish food. Vermiculture is feasible in suitable containers or specially designed boxes in small scale or shades in farm in large scale, since they are omnivorous, able to withstand environmental changes and resistant to many diseases. It is possible to culture worms both indoors and outdoors depending upon the local climatic conditions.

1. Culturing Techniques in Small Scale
2. Culturing Techniques at Farm and Production of Vermicompost

Vermicompost as Biofertilizer:

Vermiculture, the technology of producing rich biofertilizers and animal protein by using earthworms, has well established itself commercially in many developed countries. It has been estimated that one million worms can convert about 120 tones of organic wastes into biofertilizers in about one months' time. There are vast quantities of domestic garbage and industrial wastes. Thus, production of biofertilizers through vermicomposting or vermiculture has bright future in India. Vermicomposting is the process of converting organic waste into vermicompost through the action of epigeic earthworm species. The earthworm consumes the soil matter and convert it into humus within a short period of time and thereby increase the soil fertility within 24 hours.

Applications of Vermitechnology:

1. Use of epigeic earthworms in the production of vermicompost. This technology can be used for urban and rural waste recycling for conversion of organic wastes to manure.
2. Vermicompost as a manure in agriculture or as inoculum for improving and maintaining soil fertility.
3. Earthworm protein as animal feed for livestock.
4. Earthworm species for the treatment of industrial wastes.
5. Earthworms play a significant role in the biotic components of soil processes, which include turning and mixing of soils.
6. Earthworm species are used for treatment of different types of industrial effluents.