

# Phylum Annelida

## (Characters, Classification and Types)

Phylum Annelida (L., *Annelus* = a ring) includes about 12,000 species of segmented coelomate worms. They range from a deep-sea species measuring less than 1 mm in length to giant tropical earthworms (of Australia) which measure upto 4 m in length. Most annelids are aquatic found in the sea as swimmers, crawlers, burrowers and tube dwellers or in freshwater where they usually burrow. Terrestrial annelids are mostly burrowers and some are parasites. Phylum Annelida comprises three main classes: the **Polychaeta** (marine), the **Oligochaeta** (terrestrial and freshwater) and the **Hirudinea** (terrestrial, marine and freshwater leeches).

Annelids are soft-bodied, elongated, cylindrical, bilaterally symmetrical, metamerically segmented coelomate worms having a thin covering of cuticle, a dermomuscular body wall and often chitinous setae.

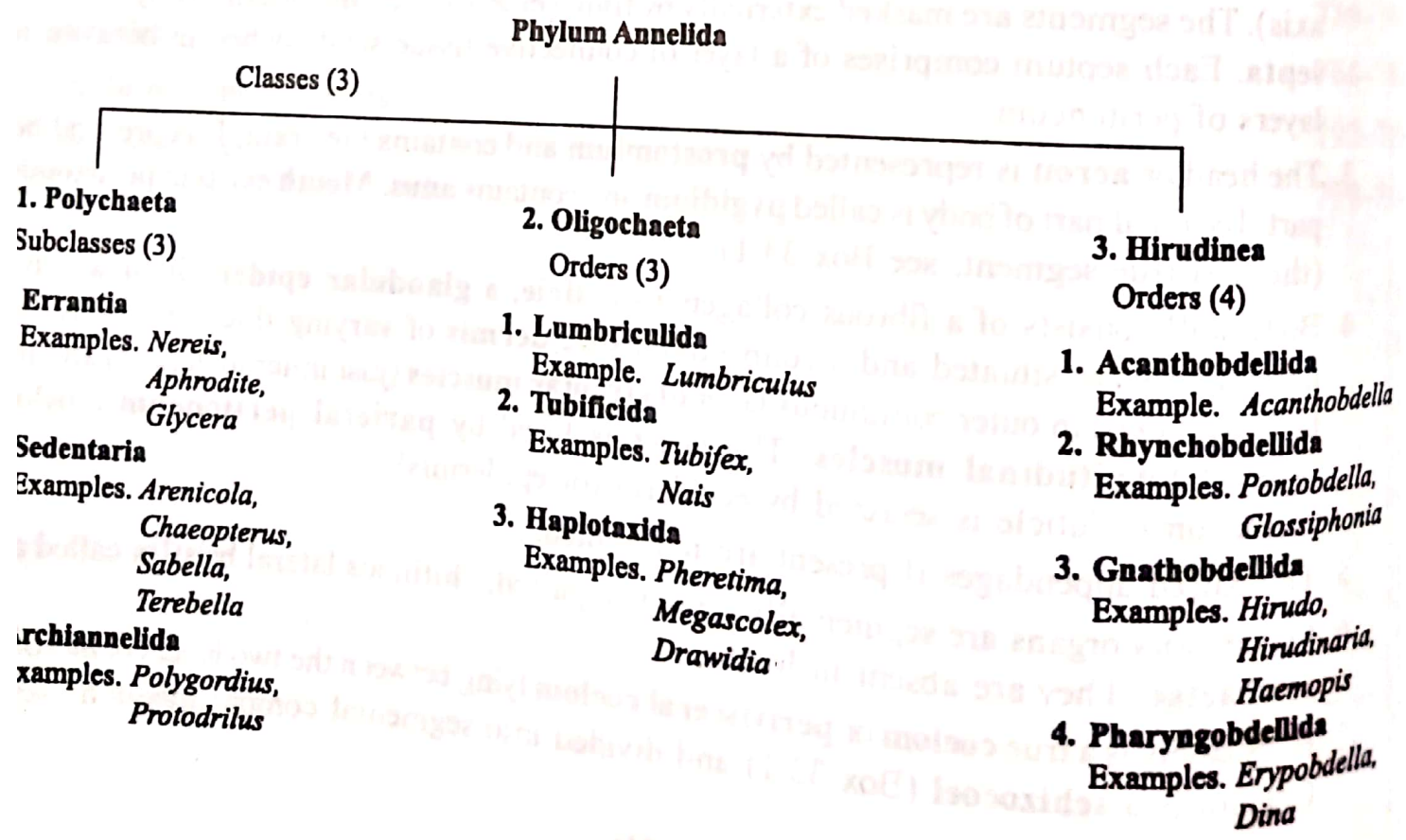
### 33.1 GENERAL CHARACTERS

1. Annelids are triploblastic and bilaterally symmetrical coelomates.
2. Body is soft, elongated, vermiform (worm-like) and metamerically segmented (*i.e.*, body divided into similar parts or segments which are arranged in a linear series along the antero-posterior axis). The segments are marked externally by transverse grooves and internally by transverse **septa**. Each septum comprises of a layer of connective tissue sandwiched in between two layers of peritoneum.
3. The head or **acron** is represented by **prostomium** and contains the brain. It is pre-oral body part. Terminal part of body is called **pygidium** and contains **anus**. Mouth exists in **peristomium** (the first true segment, see Box 33.1).
4. Body wall consists of a fibrous collagenous **cuticle**, a **glandular epidermis** in which the nerve fibres are situated and a connective tissue **dermis** of varying thickness. Muscles of body wall exist in outer continuous layer of **circular muscles** (just inner to dermis) and inner layer of **longitudinal muscles**. The latter is lined by **parietal peritoneum** (coelomic epithelium). Cuticle is secreted by ectoderm (or epidermis).
5. The paired appendages if present are not jointed.
6. Locomotory organs are segmentally arranged, paired, chitinous lateral bristles called **setae** or **chaetae**. They are absent in leeches.
7. Body cavity is a true **coelom** or **perivisceral coelom** lying between the two layers of mesoderm. Coelom is a **schizocoel** (Box 33.1) and divided into segmental compartments by septa.

2. Schizocoel. A coelom which appears as a...

8. **Alimentary canal** is a straight tube running from the anterior mouth to the posterior anus. Digestion is **extracellular**.
9. Respiration occurs through general body surface or gills.
10. Circulatory system or blood vascular system is well developed and **closed type**. Blood is usually red and contains **haemoglobin** (a respiratory pigment). Respiratory pigment is often dissolved in the plasma.
11. Excretory organs are segmental, ectodermal in origin, ciliated, paired and called **nephridia** (metanephridia and protonephridia).
12. The nervous system consists of an anterior, dorsal ganglionic mass or **brain**; a pair of anterior **connectives** surrounding the gut and a long double or single solid **ventral nerve cord** with ganglionic swellings and lateral nerves in each segment.  
A **giant fibre system** is used for rapid conduction and evokes fast startle contraction. *Aphrodite* and *Chaetopterus* have no giant fibre system but other annelids including *Lumbricus* have giant fibre system.
13. Gonads develop from coelomic epithelium.
14. Sexes may be united (monoecious or hermaphrodite) or separated (dioecious).
15. Development is **direct** (without any larval stage) in monoecious annelids and is **indirect** (with **trochophore larva**) in dioecious and aquatic annelids.
16. Cleavage is spiral and determinate.
17. Asexual reproduction occurs in some annelids. Power of regeneration of their lost parts occurs in many annelids.
18. Aquatic or terrestrial.

### 33.2 OUTLINE CLASSIFICATION



## 33.3 DETAILED CLASSIFICATION

Phylum Annelida is divided into three classes:

### Class 1. Polychaeta

1. Class Polychaeta (Gr., *poly* = many; *chaete* = bristles) includes more than 8000 species having great diversity (classified into 86 families; see Box 33.4 and 33.5).
2. Exclusively marine; mostly carnivorous (predaceous or scavengers), some are herbivorous or deposit feeders.
3. Polychaetes may be errant (free-moving) or sedentary.
4. Polychaetes have varied habitats: surface-dwelling (crawling), gallery-dwelling, burrowing and tubicolous.
5. The majority are less than 10 cm long; some are as small as 1 mm and others as large as 70 cm.
6. Colour of the body may be red, pink or green.
7. Body is elongated and segmented. Each segment carries a pair of lateral, fleshy, paddle-like appendages or feet called **parapodia**. Parapodia bear many large setae or chaetae (in bundles).
8. Head is well developed (*i.e.*, cephalization well marked). It contains eyes, tentacles, cirri and palps.
9. Clitellum absent.
10. Cirri or branchiae (gills) or both may be present for respiration. Some part of parapodia is also used as a gas exchange surface.
11. Internal transport occurs through blood-vascular system or coelomic fluid or both. Gas transport uses three types of iron-containing respiratory pigments: **haemoglobin** (red in colour and most common), **chlorocruorin** (green in colour and occurs in *Serpula*, etc.) and **haemerythrin** [a nonhaem (lacking porphyrin) red protein pigment of *Magelona*].
12. Main sensory organs include **eyes**, **nuchal organs** or ciliated pits (chemoreceptors) and **statocysts** (*e.g.*, *Arenicola*).
13. Sexes are separate. Gonads are localized but extending throughout whole body.
14. Fertilization external (see Box 33.2); free-swimming larval stage is trochophore larva. No cocoon is formed.
15. Power of **regeneration** is well developed. For example, *Chaetopterus* can be regenerated from a single segment but this power is restricted in anterior most 14 segment.
16. Asexual reproduction occurs by lateral **budding**.

#### Box 33.2 Epitoky and Swarming

Copulation is rare in polychaetes. Instead synchronous emission of sperm and eggs occurs. Epitoky and swarming bring a dispersed benthic population (*e.g.*, *Neries*) together for a brief pelagic existence, when gametes are shed and the likelihood of fertilization is increased. **Epitoky** is the formation of pelagic reproductive individuals or **epitokes** (*e.g.*, *Heteroneries* and Samoan palolo worm) that are adapted for leaving bottom burrows, tubes and other habitats. **Swarming** is a synchronous behaviour in which sexually mature individuals congregates in a relatively short time to increase the likelihood of fertilization.

### Class 2. Oligochaeta

1. Class Oligochaeta (Gr., *oligo* = few; *chaete* = bristles) includes about 3100 species. Oligochaetes approximate the polychaetes in size.

2. Mostly freshwater or terrestrial (*i.e.*, damp earth) forms.
3. Body segmented. Parapodia absent. Setae are usually arranged segmentally. Setae are short and embedded in the integument.
4. Head is indistinct and eyes and cephalic appendages such as tentacles and cirri are absent.
5. Clitellum is present. It secretes a cocoon for the eggs.
6. Most oligochaetes are scavengers and feed on dead organic matter, particularly vegetation. Digestive tract is straight and relatively simple containing mouth, pharynx, crop, gizzard, intestine and anus. Intestine has **typhlosole** (A dorsal longitudinal invagination of the intestine wall to increase the absorptive surface).
7. Intestine is surrounded by a layer of yellowish peritoneal cells, called **chlorogogen cells**. They have a role similar to liver of vertebrates (Box 33.3).

occur within a cocoon.

### **Class 3. Hirudinea**

1. Class Hirudinea (L., *hirudo* = a leech) includes about 500 species of leeches.
2. Most are freshwater; some are marine or terrestrial. Some are ectoparasites.
3. Body is elongated and dorso-ventrally flattened.
4. Body consists of definite number of segments which may be further divided externally into 2 to 4 annuli. Head is indistinct.
5. **Setae** (except one genus), **parapodia** and **cephalic appendages** are absent.
6. Body is provided with a small **suctorial anterior sucker** and a large **posterior sucker** used for adhesion or locomotion. Both suckers are situated ventrally.
7. Clitellum present.
8. Coelom is greatly reduced. It is represented by a specialized circulatory system, called **haemocoelomic system**. True blood vessels are also present.
9. Coelom is filled up with characteristic **botryoidal tissue**.
10. The septa are absent. Metamerism is shown by nephridia and nervous system (*i.e.*, by ganglia of the ventral nerve cord).

11. Hermaphrodite, fertilization is internal (cross fertilization due to copulation).

12. Development is direct (i.e., no larval stage); eggs are laid in cocoons.

13. Vertebrates form the principal hosts of ectoparasitic, or blood-sucking leeches. Digestion of blood, which is slow, depends on exopeptidases (enzymes) produced by the leech and a symbiotic bacterial flora.

## Class 1. Polychaeta

Class Polychaeta is divided into following three subclasses.

### Subclass 1. Errantia

1. Subclass Errantia (L., *errans* = wandering) includes free-swimming, crawling, burrowing and tube-dwelling worms.

2. Body segments are numerous and similar except at anterior and posterior ends.

3. Each body segment carries a pair of well-developed parapodia. Parapodia contain acicula (stiff basal setae) and setae.

4. Head is well-developed, being distinguished into prostomium carrying eyes, tentacles and palpi. Peristomium with mouth.

5. Pharynx is usually protrusible and armed with chitinous jaws and teeth to capture prey.

Examples. *Nereis*, *Aphrodite*, *Glycera*, *Polynoe*, *Syllis*.

### Box. 33.4 Families of Errantia

According to Fauchald (1977), Parker (1982) and Barnes *et al.*, (1992) subclass Errantia includes the following thirteen or more families:

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| Family 1.  | Aphroditidae. Example. <i>Aphrodite</i> .  |
| Family 2.  | Polynoidae. Example. <i>Polynoe</i> .  |
| Family 3.  | Sigalionidae. Example. <i>Sigalion</i> .   |
| Family 4.  | Polyodontidae. Example. <i>Polyodontes</i> .   |
| Family 5.  | Phyllodoceidae. Example. <i>Phyllodoce</i> .   |
| Family 6.  | Amphinomidae. Example. <i>Amphinome</i> .  |
| Family 7.  | Alciopidae. Example. <i>Alciopa</i> .  |
| Family 8.  | Tomopteridae. Example. <i>Tomopteris</i> .   |
| Family 9.  | Hesionidae. Example. <i>Podarke</i> .  |
| Family 10. | Syllide. Example. <i>Syllis</i> .  |
| Family 11. | Nereididae. Example. <i>Nereis</i> .   |
| Family 12. | Nephtyidae. Example. <i>Nephtys</i> .  |
| Family 13. | Glyceridae. Example. <i>Glycera</i> .  |
| Family 14. | Eunicea (Considered as superfamily). Examples. <i>Eunice</i> , <i>Palola</i> , <i>Arabella</i> . |
| Family 15. | Histriobdellidae. Example. <i>Histriobdella</i> .  |
| Family 16. | Ichthyotomidae. Example. <i>Ichthyotomus</i> .   |
| Family 17. | Myzostomidae. Example. <i>Myzostoma</i> .  |

### Subclass 2. Sedentaria

1. Sedentary, tubicolous worms living in calcareous or chitinous tubes secreted by epidermal glands.

2. Body is divisible into two or more regions.

3. Segments are not of same type; each segment with a pair of reduced parapodia lacking acicula. Parapodia often modified to perform specific functions.