Definition

The Annelida in general are elongated, bilaterally symmetrical, metamerically segmented, triploblastic and coelomate worms with a thin cuticle, dermo-muscular body-wall with chitinous setae embedded in it, usually a closed blood-vascular system, segmentally arranged nephridia and a nervous system on the same plan as that of the earthworm. The paired appendages, when present, are not jointed.

General characters

(1) Mostly *aquatic*, marine as well as freshwater, and some terrestrial, *generally burrowing* or living in *tubes*.

(2) The body is vermiform, more or less elongated and bilaterally symmetrical. Quite a high degree of cephalization occurs.

(3) The body is metamerically segmented—externally by transverse grooves, and internally by transverse muscular partitions called *dissepiments* or *septa*—into a number of divisions, the *rings*, *somites*, *segments* or *metameres*, which are arranged one after the other in a single linear series.

(4) The outermost body-covering, or *cuticle*, is thin and not composed of *chitin*, thus differing from that of the Arthropoda. It is secreted by the underlying epidermal cells.

(5) The body-wall is *dermo-muscular*, i.e. composed greatly of muscles and, therefore, highly contractile. Muscles are continuous and circular as well as longitudinal, ordinarily segmentally arranged.

(6) The paired *appendages*, when present, are never jointed.

(7) The *locomotary organs* are segmentally repeated groups of chitinous bristles, called *setae* or *chaetae*, embedded in the skin. Annelids are the only animals to use setae for locomotion. They may be arranged either in two pairs on each side of each segment (*lumbricine arrangement*), or they may be more numerous and disposed in a ring (*perichaetine arrangement*).

(8) The body is *triploblastic, consisting of three layers, the epidermis*, the *epithelium* lining the gut, and the *mesoderm* represented by skeletal tissues, muscles, excretory and reproductive organs, and so forth. In this respect they resemble a frog rather than a *Hydra* which is a *diploblastic* animal.

(9) All annelids are coelomate.

(10) The *body cavity* is a true *perivisceral coelom* lying between the two layers of mesoderm. It is a spacious cavity except in leeches in which it is very small.

(11) The *alimentary canal* is generally a straight but complex tube leading from a ventral *mouth* at the anterior end, to a terminal *anus*, at the posterior end of the body. Digestion is entirely extracellular.

(12) The *respiration* is carried on either through general body surface or through special projections (gills) of parapodia and head.

(13) The *blood-vascular system* is generally well developed and of a closed type made of definite blood-vessels and with a regular flow of blood. They are the first animals to have a closed vascular system. The *blood* is coloured usually red due to *haemoglobin* dissolved in it.

(14) The *excretory system* consists of metamerically repeated, special, coiled, ectodermal tubes, the *nephridia*, which may communicate the coelom with the exterior.

(15) The *nervous system* consists of paired *cerebral* or *supra-pharyngeal ganglion* (*brain*), connected by a pair of *circumpharyngeal connectives*, around the pharynx, with a double *ventral nerve cord* bearing segmental ganglia and extending throughout the length of the body. Nerve cells are present throughout the length of the cord and not confined to ganglia alone.

(16) The *gonads* develop from the coelomic epithelium. The reproductive elements may pass out either through the

ectodermal nephridia or through a series of paired genital ducts the mesodermal *coelomoducts*.

(17) The *sexes* may be united when the *development* is direct (*Oligochaeta, Hirudinea*), or the sexes may be separate when the development is indirect. (*Polychaeta, Archiannelida*). Cleavage is spiral and the characteristic larval stage, when present, is a trochophore.

(18) Asexual reproduction occurs in some species.

Brief classification

The segmented worms or annelids are variously classified by different authors. There are more than 8,700 known species divided in four main classes, primarily on the basis of the presence or absence of setae, parapodia, metameres, and other morphological features.

Class 1. Polychaeta (Gk., *poly*, many ; *chaete* bristles)

(1) Practically all marine.

(2) Somites numerous, with well developed fleshy lateral outgrowths, the parapodia, bearing many setae that are variously modified.

(3) A distinct head usually present bearing eyes, tentacles, cirri and palps.

(4) Clitellum absent.

(5) Sexes usually separate (dioecious). Gonads develop within numerous ordinary segments but not permanent.

(6) Fertilization external. Larva typically a free-swimming trochophore.

(7) Make important food item for fish and much used for fish bait.

The class contains over 40 families and nearly 5,340 known species, conveniently grouped into two subclasses, although this division is not a natural one.

Sub-class 1. Errantia (L., *errans*, wandering)

(1) Segments numerous and similar.

(2) Head with a distinct prostomium bearing sensory appendages.

(3) Parapodia well developed with acicula.
(4) Pharynx usually protrusible and with jaws and teeth.
(5) Predatory and pelagic, crawling, burrowing and tube-dwelling worms.
Examples : *Neanthes, Nereis, Polynoe, Aphrodite, Eunice, Myzostoma.*

Sub-class 2. Sedentaria

(1) Body of 2 or more regions with dissimilar somites and parapodia.
(2) Prostomium small, without sensory appendages.
(3) Parapodia small, without acicula.
(4) Pharynx usually non-protrusible, without jaws or teeth.
(5) Typically live in burrows or tubes, feed on detritus or plankton.
Examples : *Chaetopterus, Arenicola, Spirorbis.*

Class 2. Oligochaeta (Gr., *oligos*, few ; *chaete*, setae)

(1) Mostly freshwater and terrestrial worms
(2) Without parapodia.
(3) Setae few per segment and arranged singly.
(4) No distinct head with sensory appendages.
(5) Clitellum present.
(6) Hermaphrodite with gonads confined to a few specialized segments. Testes anterior to ovaries.
(7) Fertilization external. No larval stages.
(8) Extremely important to agriculture and widely used as fish bait and as food for small animal pets.
The class contains nearly 3,100 known species grouped into four orders as follows :

Order 1. Plesiopora plesiotheca

(1) Male gonopores on the segment following the testes.
(2) Spermathecae present in the region of the genital segments.
Examples : *Aeolosoma, Nais, Tubifex.*

Order 2. Plesiophora prosotheca

(1) Male gonophores on the segment following the testes.

(2) Spermathecae considerably in front of the genital segments.
Examples : *Enchytraeus, Aspidodrilus.*

Order 3. Prosopora

(1) Male gonopores in same segment with the last pair of testes.
(2) Aquatic.
Examples : *Branchiobdella, Bdellodrillus.*

Order 4. Opisthopora

(1) Male gonopores at least one segment behind the last pair of tests.
(2) Aquatic or terrestrial.
Examples : *Pheretima, Lumbricus, Eisenia.*

Class 3. Hirudinea (L., *hirudo*,a leech)

(1) Freshwater, marine or terrestrial. Parasitic or predaceous.
(2) Body pigmented, usually depressed, made of fixed number (33) of small segments subdivided externally by secondary rings or annuli.
(3) Tentacles, parapodia and setae are absent.
(4) Usually two suckers present, a smaller anterior and a powerful posterior sucker.
(5) Coelem much reduced, largely filled with connective tissue and muscles.
(6) Hermaphrodite with numerous testes and one pair of ovaries.
(7) Fertilization internal. Eggs laid in cocoons. Development direct, without a larva.
(8) Economically important mainly as ectoparasite of man and his livestock.

The class contains more than 300 known species grouped in four orders, as follows :

Order 1. Acanthobdellida

(1) No anterior sucker, proboscis or jaws.
(2) Setae present in the five anterior segments.
(3) A compartmented coelem present.
Example : A single genus, *Acanthobdella.*

Order 2. Rhynchobdellida

(1) Jawless leeches with a protrusible proboscis.
(2) A separate blood system with colourless blood.
(3) Strictly aquatic.
Examples : *Glossiphonia, Pontobdella.*

Order 3. Gnathobdellida

(1) No proboscis ; 3 chitinous jaws present.
(2) Blood is red.
(3) Aquatic or terrestrial leeches.
Examples : *Hirudo, Hirudinaria.*

Order 4. Pharyngobdellida

(1) No proboscis, jaws or teeth.
(2) Freshwater or amphibious and predaceous leeches.
Examples : *Erpobdella, Dina.*

Class 4. Archiannelida (Gr., *archi*, first)

It is a heterogenous minor group including an assortment of about a dozen genera of largely unrelated small marine worms, without setae or parapodia. Segmentation is chiefly internal. They are unisexual or hermaphrodite and their larva is a trochophore. The name 'Archiannelida' was created in the belief that the members were primitive worms. The name is still retained for convenience only to include aberrant polychaetes of uncertain affinities. Some zoologists treat Archiannelida as a class of Annelida, while others make it an appendix to the class Polychaeta ; it has been treated as a class in this book.

Examples : *Polygordius, Dinophilus.*