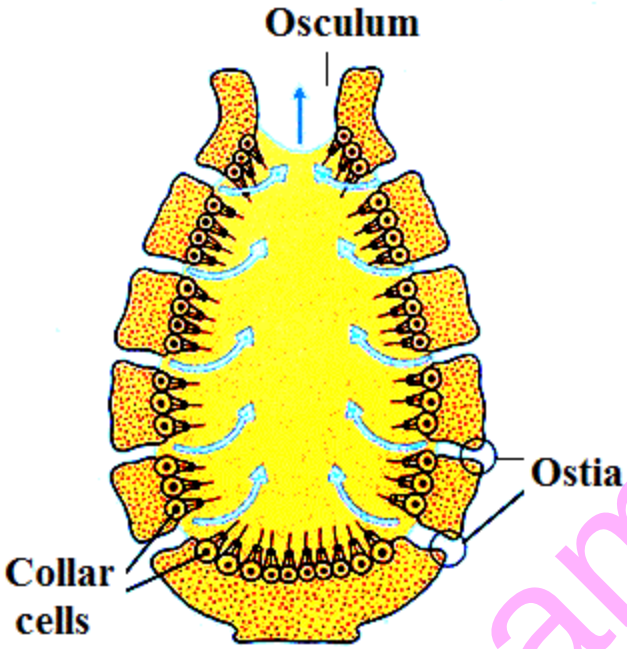
Phylum Porifera



(i) The word “Porifera” means pore bearers (Gr., *porus* = pore; *ferre* = to bear); their body wall has numerous minute pores, called ostia, through which a continuous current of outside water is drawn into the body.

(ii) Phylum porifera has the following salient features:

(1) All the sponges are Aquatic, Sedentary, Asymmetrical or Radially,

(2) They are diploblastic.

(3) The body is perforated by numerous minute pores called ostia.

(4) The ostia open into a large cavity called spongocoel.

(5) The spongocoel opens to the outside by a large opening called osculum.

(6) The sponges possess an endoskeleton in the form of calcareous spicules.

(7) Excretion and respiration occur by diffusion.

(8) They have greater power of regeneration.

(9) Reproduction takes place by asexual or sexual methods.

(10) Development is indirect or direct. The common larval are parenchymula, amphiblastula, etc.

(a) **Class 1. Calcarea**

(1) Skeleton is formed of Calcareous spicules.

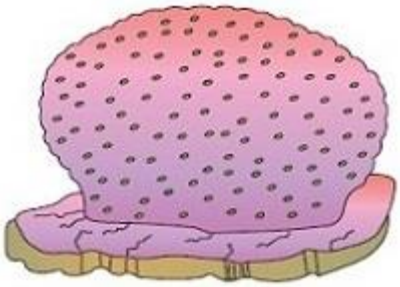
(2) Radially symmetrical.

(3) Choanocyte cells are large and conspicuous. Examples: Clathrina, Leucosolenia, Sycon, etc.

(4) Euplectela is the sponge which is given as a Gift in Japan.

(5) Leucosolenia is a smallest sponge.

(6) Ectorderm is formed by pinachocyte and endoderm is formed by choanocyte.



Euspongia

(b) **Class 2. Hexactinellida**

(1) Skeleton is formed of six rayed triaxon, silicious spicules.

(2) Canal system is branched or unbranched.

(3) Radially symmetrical.

(4) These are also known as glass sponges.

(5) Examples: Pheronema, Hyalonema, etc.,

(6) Hylonema is a Glass rope sponge.

(c) **Class 3. Demospongia**

(1) Skeleton either absent or present.

(2) The silicious spicules when present are never six rayed

(3) The canal system is complicated Rhagon type

(4) These sponges are of great economic importance

(5) Examples: Cliona, Spongilla, Chalina, Euspongia, Hippospongia, Oscarella, etc.

(6) Spongilla is a fresh water sponge.

Phylum Cnidaria (or Coelenterata)

(i) 'Tissue grade' eumetazoans with a radial symmetry.

(ii) The term "Coelenterata" signifies the presence of a single internal cavity called coelenteron, or gastrovascular cavity, combining functions of both digestive and body

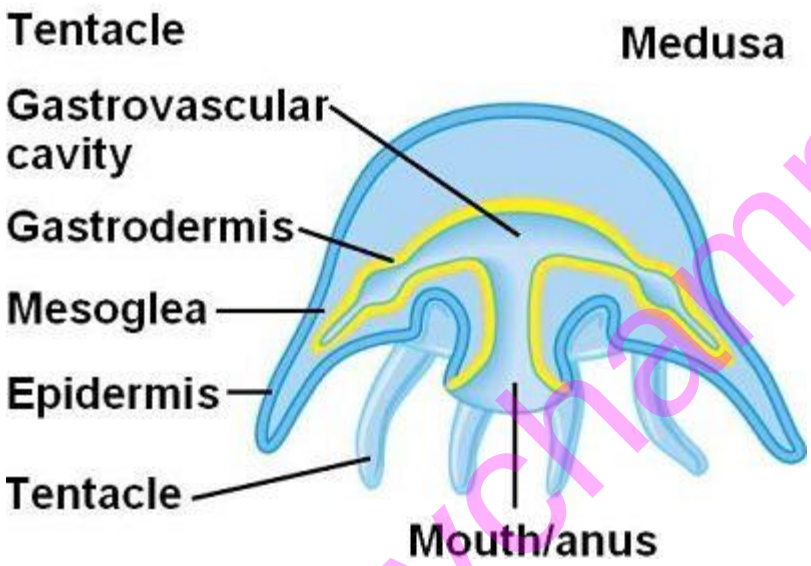
cavities. The term “Cnidaria” indicates the presence of stinging cells (Gr., *knide* = nittle or stinging cells).

(iii) Phylum coelenterata has the following salient features –

(1) Coelenterates are multicellular organisms

(2) They have tissue-grade of organization

(3) The body is radially symmetrical. Radial symmetry is the symmetry of a wheel



(4) All the members of this phylum are aquatic

(5) They are solitary or colonial

(6) polyps and medusa occur in the life cycle.

(7) The body wall is diploblastic.

(8) Nematocysts or stinging cells are present.

(9) Coelom is absent; hence coelenterates are acoelomate animals

(10) A gastrovascular cavity or coelenteron is present.

(11) Mouth is present; but anus is absent

(12) Digestion is extracellular as well as intracellular

(13) Respiratory, excretory and circulatory system are absent

(14) Nervous system is diffuse-type, formed or nerve-nets.

(15) Reproduction is by asexual and sexual methods

(16) Development is indirect as there are one or two larval forms

(17) Life history has alternation of generations or metagenesis.

(iv) **Classification of coelenterata:** Phylum coelenterata is divided into three classes.

(a) **Class 1 - Hydrozoa**

(1) Hydrozoa is solitary and fresh water or mostly colonial and marine.

(2) They exhibit tetramerous or polymerous radial symmetry

(3) Body wall consists of an outer ectoderm and an inner endoderm separated by a mesogloea.

(4) Gastrovascular cavity without stomodaeum, septa or nematocysts bearing gastric filament

(5) Skeleton or horny structure is horny perisarc in some forms.

(6) They exhibit polymorphism.

(7) Many hydrozoa exhibit alternation of generation

(8) Reproductive products of sex cells are usually ectodermal in origin and discharged externally.

(9) Cleavage is holoblastic, embryo ciliated planula.

(10) Examples : Hydra, Tubularia, Bougainvillea, Hydractinia, Eudendrium, Pennaria, Obelia, Sertularia, Plumularia

(11) Physalia is commonly known as Portuguese man of war. Aurelia is commonly known as Jellyfish.

(b) **Class 2 - Scyphozoa**

(1) Scyphhozoa includes large jellyfishes or true medusae.

(2) They are exclusively marine.

(3) Medusae are large, bell or umbrella-shaped and without true velum.

(4) Marginal sense organs are tentaculocysts

(5) Polypoid generation is absent or represented by small polyp.

(6) Gastrovascular system is without stomodaeum, with gastric filaments.

(7) Mesogloea is usually cellular

(8) Gonads are endodermal and the sex cells are discharged into the stomach.

(9) Examples: Lucernaria, Haliclytus

(c) **Class 3 - Anthozoa**

(1) These are solitary or colonial exclusively marine forms

(2) They are exclusively polypoid. Medusoid stage is altogether absent

(3) Body is cylindrical with hexamerous, octomerous or polymerous biradial or radiobilateral symmetry

(4) The stomodaeum is often provided with one or more ciliated grooves, the siphonoglyphs.

(5) Gastrovascular cavity is divided into compartments by complete or incomplete septa or mesenteries.

(6) Mesenteries bear nematocysts at their free edges

(7) Mesogloea contains fibrous connective tissue and amoeboid cells.

Subclass 1 - Alcyonaria (Octocorallia)

(1) These are colonial marine forms

(2) Polyps are long or short cylinders

(3) Polyps always bear eight pinnate, hollow tentacles

(4) Eight complete mesenteries are present.

(5) Single ventral siphonoglyph is present

(6) Endoskeleton is the product of mesogloeal cells

(7) Polyps are dimorphic in some forms.

(8) Examples: Tubipora, Calvularia, Alcyonium, Xenia, Heliopora, Gorgonia, Corallium, etc.,

(9) Tubipora is commonly known as organ pipe coral.

Subclass 2 - Zoantharia (Hexacorallia)

(1) These are solitary or colonial marine forms

(2) Tentacles simple, rarely branched, hollow cone shaped

(3) Mesenteries are numerous arranged in the multiple of five or six

(4) Two siphonoglyphs are commonly present

(5) Endoskeleton when present is calcareous, derived from ectoderm

(6) Polyps are usually monomorphic.

(7) Examples: Actinia, Metridium, Adamsia, Edwardsia, Astraea, Fungia, Zoanthus, Antipathes

(8) Metridium & Adamsia is commonly known as sea anemone.

Phylum Ctenophora

(i) Ctenophora is a small phylum. These animals exhibit the characters of Coelenterata and platyhelminthes.

(ii) Phylum Ctenophora shows the following salient features

(1) All the ctenophores are marine.

(2) They are solitary and pelagic.

(3) They are transparent.

(4) They have tissue-grade of organization.

(5) They have biradial symmetry.

(6) They are acoelomate animals.

(7) They are non-segmented.

(8) Their body-wall is diploblastic.

(9) The mesogloea contains cells.

(10) Nematocysts are absent.

(11) Special adhesive cells called colloblasts are present in all ctenophores.

(12) The gastrovascular system is well developed.

(13) Two anal openings are present.

(14) Skeletal system is absent.

(15) Excretion and respiration are carried out by diffusion.

(16) The nervous system is in the form of nerve net.

(17) An aboral sense organ in present in the form of statocyst.

(18) Cilia are used for locomation.

(19) They are hermaphrodites.

(20) Development is indirect. It includes a cydippid larva.

(iii) **Classification of Ctenophora**

(a) **Class 1 - Tentaculata**

(1) The body is simple, rounded or oval or ribbon-like.

(2) Two long aboral tentacles are present.

(3) Mouth is narrow and pharynx is small.

Order 1 - Cydippida

(1) Body is oval or rounded

(2) Two long branched tentacles are present and they can be retracted into sheaths

(3) Branches of gastro–vascular system are terminating blindly

(4) Examples: Hormiphora, Pleurobrachila, etc.,

Order 2 - Lobata

(1) Body is laterally compressed

(2) Two large oral lobes or lappets and four pointed processes or auricles are present

(3) Tentacles are many, non–retractile without sheaths.

(4) Stomodaeal and meridional vessels unite with one another

(5) Examples: Deiopea, Bolinopsis, etc.,

Order 3 - Cestida

(1) Body is laterally compressed and ribbon-like

(2) Two main tentacles and may lateral tentacles are present

(3) Four rows of rudimentary comb plates are present

(4) Meridonal and stomodaeal vessels anastomose

(5) Examples: Cestum, Velamen, etc.,

Order 4 - Platyctenea

(1) Body is worm-like and compressed in oral-aboral axis

(2) Tentacles with sheaths are present

(3) Comb rows or swimming plates are present only in larva

(4) Meridional canals are absent, but there is a system of branching peripheral system

(b) **Class 2 - Nuda**

(1) Body is large thimble-shaped or conical

(2) Tentacles are absent

(3) Mouth is wide and pharynx is large

(4) The meridional vessels are produced into a complex system of anastomosing branches

(5) Example: Beroe

Phylum Platyhelmithes

(i) “Platyhelminthes” means flatworms (Gr., *platys* = flat; *helmins* = worms); their body is dorsoventrally flattened.

(ii) **Salient features:**

(1) They are dorsoventrally flattened like a leaf

(2) They show organ grade of organization

(3) They are acoelomate animals

(4) They are triploblastic animals.

(5) They are bilaterally symmetrical animals.

(6) Some members have segmented body.

(7) Many of the parenchyma cells give rise to muscle fibres.

(8) The digestive system is completely absent from Cestoda and Acoela.

(9) The respiratory organs are absent. In parasites respiration is anaerobic

(10) There is no circulatory system

(11) The excretory system is formed of protonephridia (flame cells)

(12) The nervous system is well developed.

(13) They are hermaphrodites, *i.e.,* both male and female reproductive organs are present in the same animal

(14) Fertilization is internal in them.

(15) They are free-living or parasitic.

(iii) **Classification of Platyhelminthes**

(a) **Class 1 - Turbellaria**

(1) Most of the turbellarians are free living but some of them are ecotocommensal or parasitic

(2) The body epidermis is either cellular or syncytial

(3) Segmentation is absent

(4) Digestive system is present except in a few

(5) Suckers are absent

(6) Life cycle is simple

(7) Example: Dugesia, Notoplana, Bipalium

(b) **Class (2) – Trematoda**

(1) Ecto or endoparasites of vertebrates; commonly called flukes.

(2) Body mostly oval, unsegmented.

(3) Body wall without cilia, but covered by a thick, resistant, syncytial tegument.

(4) Suckers, and often hooks and spines, present for attachment to host tissues.

(5) Sense organs usually absent in adults.

(6) Digestive system well developed with terminal mouth, but no anus.

(7) Mostly hermaphrodite. Life cycle is simple or complicated.

(8) Examples: Polystomum, Fasciola, Schistosoma (blood fluke of man and other mammals).

(c) **Class (3) – Cestoda**

(1) All are endoparasites. Mostly found in alimentary canal of vertebrates; commonly called tapeworms.

(2) Body long and slender, tape-like, usually divided into small segments

(3) Body wall non-ciliated, with a thick tegument.

(4) Anterior end with suckers and other attachment organs.

(5) No mouth; digestive system absent.

(6) Sense organs absent.

(7) Each proglottid contains one or two complete sets of hermaphrodite (bisexual) reproductive organs.

(8) Life-cycle usually complicated with alternation of hosts. Embryo hooked.

(9) **Examples** – *Taenia, Echinococcus, Hymenolepis.*

Phylum Nematoda (or Nemanthelminthes)

(i) The term "Nematoda" literally
means **"threadworms"** or **"roundworms"** (Gr., *nema* = thread + *eidos* = form).

(ii) **Salient features**

(1) Many endoparasites of various animals and plants.

(2) Mostly minute or small; some large (1 mm to 25 cm); some upto several metres long.

(3) Slender, cylindrical, elongated body usually tapering towards both ends, and non-segmented.

(4) Body wall formed of a thick, tough and shiny cuticle.

(5) The false body cavity, or pseudocoel is spacious, with a fluid but no free cells

(6) Straight alimentary tract with terminal mouth and anus

(7) Circulatory system and respiratory organs absent.

(8) They are usually unisexual with sexual dimorphism.

(iii) Classification of Nematoda: On basis of the presence of absence of some specialized sense organs and caudal glands, and characteristics of excretory system, nematodes are classified into two classes:

(a) **Class (1) – Phasmidia or Secernentea:**

(1) Mostly parasitic.

(2) Possess a pair of unicellular, pouch-like sense organs, called plasmids.

(3) Another pair of reduced, pore–like sense organs, called amphids, present near anterior end.

(4) Excretory system with paired lateral canals.

(5) Caudal glands absent.

(6) **Examples** – Ascaris, Enterobius, Ancylostoma, Wuchereria, etc.

(b) **Class (2) – Aphasmidia or Adenophorea:**

(1) Mostly small, free-living.

(2) No phasmids.

(3) Amphids spiral, cord like or disc like, seldom pore like.

(4) No lateral excretory canals.

(5) Caudal glands present.

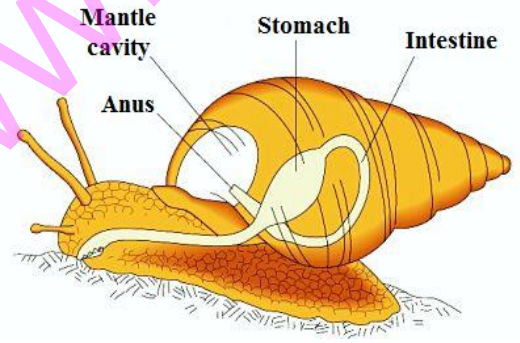
(6) **Examples** – Tichinella, Capillaria etc.

Phylum Mollusca

(i) Basically bilateral and protostomial eucoelomate eumetazoans whose soft body (L., *mollis* or *molluscum* = soft)

is non-segmented and enclosed within a skin–fold (mantle) which usually secretes a calcareous shell.

(ii) Salient Features:



(1) Molluscs are multicellular organisms

(2) They have a bilateral symmetry, but snails are asymmetrical

(3) They are triploblastic animals.

(4) They are coelomate animals.

(5) They have organ system grade of organization.

(6) The body is soft and non-segmented.

(7) The soft body is covered by a fleshy fold of the body wall. It is called mantle.

(8) The molluscs are provided with one or two calcareous shells.

(9) Respiration is carried out by the gills or pulmonary chambers.

(10) The digestive system is well developed.

(11) The circulatory system is of an open type.

(12) The excretory organ is the kidney.

(13) The nervous system is well developed.

(14) The sensory organs are eyes, statocysts and osphradia.

(15) Sexes are separate in them, or they are hermaphrodites.

(16) The development in their case in either direct or indirect

(iii) Classification of Mollusca

(a) **Class 1 - Aplacophora or Solenogasters**

(1) The body is worm–like, bilaterally symmetrical and cylindrical.

(2) The head, mantle, foot, shell and nephridia are absent.

(3) The body is covered with spicule–bearing cuticle.

(4) The digestive tract is straight with radula.

(5) A mid dorsal longitudinal keel or crest is often present.

(6) **Example:** Neomenia, Chaetoderma, etc.

(b) **Class 2 - Monoplacophora**

(1) The body is bilaterally symmetrical and segmented.

(2) The shell is formed of a single valve.

(3) The head is without eyes and tentacles.

(4) The gills are external and serially arranged.

(5) The nephridia are five pairs.

(6) **Example:** Neopilina galatheae

(c) **Class 3 - Polyplacophora**

(1) These molluscs are bilaterally symmetrical, and dorsoventrally flattened.

(2) The shell is composed of a longitudinal series of 8 plates.

(3) The foot is flat and ventral.

(4) The radula is well developed.

(5) **Example:** Chiton, Cryptochiton, etc.

(d) **Class 4 - Gastropoda**

(1) It seems that these animals are moving on their stomach. Hence, the name is gastropoda.

(2) Gastropods are marine, fresh water or terrestrial animals. A few are parasitic.

(3) The body is non-segmented and asymmetrical.

(4) The shell is univalve and spirally coiled.

(5) The head is distinct. It bears tentacles, eyes and a mouth.

(6) The foot is ventral and muscular.

(7) The buccal cavity is provided with a radula.

(8) The circulatory system is open.

(9) The sexes are mostly separate, while some forms are hermaphrodite.

(10) The development includes veliger and trochophore larvae.

(11) **Examples:** Haliotis, Cypraea (Cowrie) Pila (apple snail)

(e) **Class 5 - Scaphopoda**

(1) The foot is boat–shaped.

(2) The eyes, the tentacles and ctenidia are absent.

(3) Marine, bilaterally symmetrical molluscs.

(4) **Examples:** Dentalium, Siphonodentalium and Pulsellum

(f) **Class 6 - Pelecypoda**

(1) Pelecypoda are aquatic in habit.

(2) The body is bilaterally symmetrical and laterally compressed.

(3) The shell is formed of two distinctive shell plates.

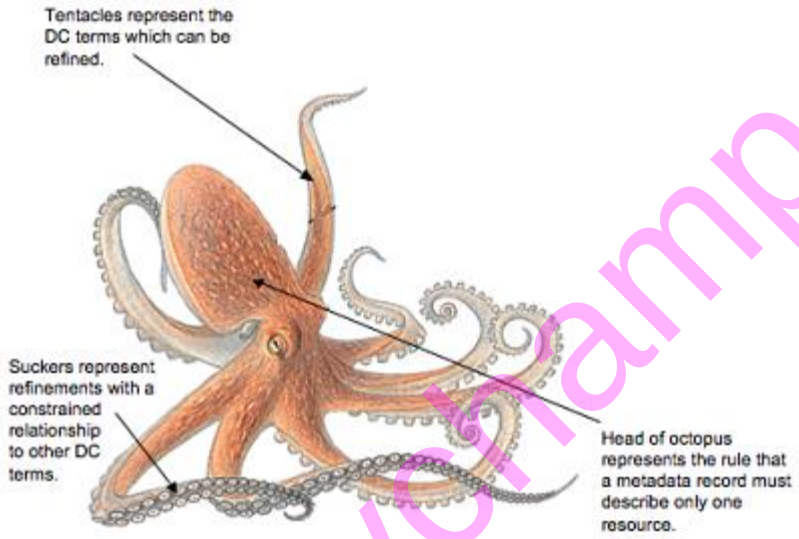
(4) The head is not distinct.

(5) The alimentary canal shows a crystalline style.

(6) The gills, excretory organs and the other structures are paired.

(7) The sexes are separate or united.

(8) The development is indirect having a glochidium larva.



(g) **Class 7 - Cephalopoda**

(1) The body is bilaterally symmetrical.

(2) The foot is modified into arms and funnel.

(3) The shell may be either absent or rudimentary

(4) The odonotophore with a radula is present.

(5) The ink–gland is present.

(6) The sexes are separate.

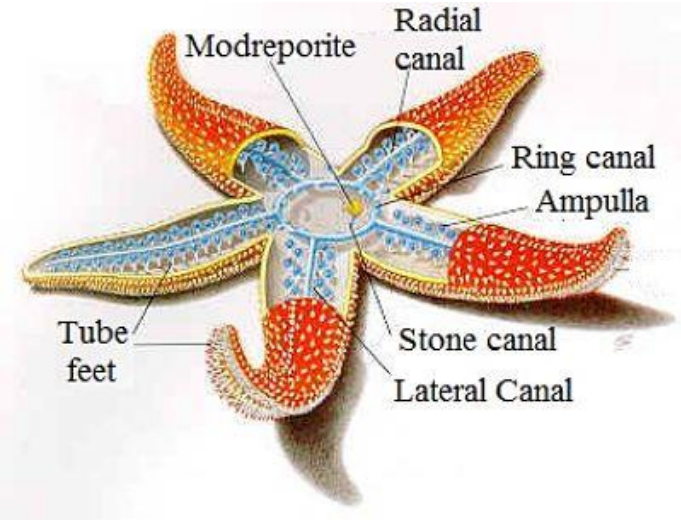
(7) The development is direct hence no metamorphosis and larval stage.

(8) **Example:** Nautilus, Loligo Sepia, Octopus

Phylum Echinodermata

(i) The term “Echinodermata” means spiny skin (Gr., *echinos* = spiny + *dermatos* = skin).

(ii) **Salient features:**



(1) Echinoderms are exclusively marine beings.

(2) They are triplobalstic and coelomate animals.

(3) They have radially symmetrical body.

(4) They have organ system grade of organization.

(5) They have well developed

(6) They have a water–vascular system with tube–feet for locomotion, feeding and respiration.

(7) Circulatory system is of the open–type.

(8) The sensory organs are poorly developed.

(9) The excretory organs are absent.

(10) They have pedicellariae.

(11) Development is indirect.

(12) The larval forms are bilaterally symmetrical.

(iii) **Classification of Echinodermata**

(a) **Subphylum I - Eleutherozoa : Free-living echinoderms**

Class 1 - Asteroidea

(1) Starfishes or sea stars.

(2) Arms 5 or more and not sharply marked off from the central disc.

(3) Tube feet in orally placed ambulacral grooves; with suckers.

(4) Anus and madreporite aboral.

(5) Pedicellariae present.

(6) Free-living, slow-creeping, predaceous and scavengerous.

Class 2 - Ophiuroidea

(1) Brittle-stars and allies.

(2) Body star-like with arms sharply marked off from the central disc.

(3) Pedicellariae absent.

(4) Stomach sac-like; no anus.

(5) Ambulacral grooves absent or covered by ossicles; tube feet without suckers.

(6) Madreporite oral.

Class 3 - Echinoidea

(1) Body not divided into arms; globular (sea urchins), or flattened disc-like (sea-cakes).

(2) Mouth at lower pole, covered by 5 strong and sharp teeth, forming a biting and chewing apparatus

called “Aristotle's Lantern”.

(3) Tube-feet slender with suckers.

(4) Skin ossicles fused to form a rigid globular, disc like, or heart-shaped shell or test with movable spines.

(5) 3–jawed pedicellariae present in skin.

(6) Gut long, slender and coiled.

(7) Larval forms pluteus and Echinopluteus.

(8) Examples – Sea urchins and sand dollars etc.

Class 4 - Holothuroidea

(1) Body massive, long and cylindrical like a cucumber

(2) Mouth at anterior and anus at posterior ends.

(3) Mouth surrounded by many hollow retractile tentacles.

(4) Tube feet usually present; sucker-like.

(5) Skin leathery, but relatively soft, without spines or pedicellariae; may have an endoskeleton

of minute calcareous ossicles.

(6) Respiration and excretion by two long and highly branched tubes (= respiratory tree) extending

into coelom from cloaca.

(7) Larval form Auricularia.

(8) Examples – Holothuria, Cucumaria etc.

(b) Subphylum II - Pelmatozoa: Stalked, sedentary echinoderms.

Class 5 - Crinoidea

(1) Body flattened and pentamerous.

(2) Disc enclosed in a hard, cup–shaped calyx formed of calcareous plates.

(3) Mouth in middle and anus excentral upon a cone, both upon oral surface.

(4) Tube feet sucker–like; restricted to central disc; can help in food–collection.

(5) Some forms (sea–lilies) permanently sessile and attached to sea–bottom by a long

stalk; others (feather stars) free-swimming.

(6) Spines and pedicellariae absent in skin.

(7) Examples – Sea lilies and Feather stars (Antedon)