GDC MEMORIAL COLLEGE

BAHAL (BHIWANI)-127028

Lab Manual

Zoology (B.Sc.1st & 2nd Semester)

Department of Zoology

INDEX

EXPERIMENT – 1

AIM:- To study the different specimen of phylum porifera.

SYCON OR SCYPHA

Classification:-

- Phylum - Poriferra
- Class - Calcarea
- Order - Heterocoela
- Genus - Sycon (Scypha)

Habitat:-

It is a small marine sponge commonly found in shallow water attached to rocks just below the low tide mark.

Habits:-

1. Found in colony.
2. Locomotion is absent.
3. Feeds upon planktons and organic matter.
4. Both asexual and sexual reproduction found.

Points of Identfication:-

1. Branching colonial sponge consisting of several hollow cylindrical branches.
2. Has numerous small sized pores called dermal ostia on body surface and a single large sized osculum at its tip.
3. Terminal osculum is guarded by an oscular fringe of monaxon spicules.

Economic Importance:-

It is a type study animal. Its anatomy and physiology have been thoroughly studied.

GRANTIA

Classification:-

- Phylum - Poriferra
- Class - Calcarea
- Order - Heterocoela
- Genus - *Grantia*

Habitat:-

Like sycon it is also a marine sponge commonly found in shallow waters attached to rocks.

Habits:-

1. Found in colony.
2. Locomotion is absent.
3. Omnivorous in nature.
4. Both asexual and sexual mean of reproduction.

Morphology:-:-

1. It has a vase like body.
2. Bears numerous dermal ostia on the surface and a single terminal osculum.
3. Osculum is guarded by an oscular fringe formed by spicules.
4. Body gives bristly appearance due to the presence of spicules.

EUPLECTELLA

Classification:-

- Phylum - Poriferra
- Class - Hexactinellida
- Order - Hexasterophora
- Genus - *Euplectella*

Habitat:-

It is a marine sponge found attached to substratum in deep seas (upto a depths of 500-5000 m). It is found in abundance in phillipines and West Indies.

Habits:-

1. Found singly.
2. Attached to substratum.
3. Omnivorous in nature.
4. Both asexual and sexual mode of reproduction.
5. Development is indirect including larva known as stereogastrula.

Morphology:-:-

1. Body is curved, cylindrical and rigid.
2. Osculum is covered by a sieve plate, the oscular sieve.
3. Presence of a tuft of siliceous spiceous spicules at the posterior end.
4. Pressence of syconoid type of canal system.
5. True ostia absent, body is perforated by parietal gaps.

Economic Importance:-

Dried skeleton of Euplectella is a costly wedding gift in Japan as it is thought to be a symbol of union till death.

HYALONEMA

Classification:-

- Phylum - Poriferra
- Class - Hexactinellida
- Order - Amphidiscophora
- Genus - *Hyalonema*

Habitat:-

It is a marine sponge found attached to substratum by root spicules in deep waters of sea. It is mostly found in the coastal regions of New England and America.

Habits:-

1. Locomotion is absent.
2. Omnivorous in nature.
3. Reproduce by both asexual and sexual reproduction.

Point of Morphology:-

1. The body of the sponge is ball shaped borne on a long twisted 'rope like root' of siliceous spicules.
2. Long siliceous spicules pass through the middle of the body as columella and often project as a gastral cone.
3. Upper surface having the gastral cone bears opening of the excurrent canals.

Economic Importance:-

Because of its siliceous spicules it looks very beautiful so used for the ornamental purpo

SPONGILLA

Classification:-

- Phylum - Poriferra
- Class - Demospongiae

- Order - Haplosclerina
- Genus - *Spongilla*

Habitat:-

It is a fresh water sponge. It is commonly found in warmer regions of India.

Habits:-

1. Omnivorous in nature.
2. Both asexual and sexual way of reproduction.
3. Development is indirect including a free swimming larva.

Point of Morphology:-

1. Colonial and highly branched.
2. Body surface has numerous small dermal ostia and oscula.
3. Yellow brown in colour but may be green due to the presence of symbiotic algae.

Economic Importance:-

It shows symbiosis with green algae (Zoochlorellae).

EUSPONGIA

Classification:-

- Phylum - Poriferra
- Class - Demospongiae
- Order - Dictyoceratida
- Genus - *Euspongia*

Habitat:-

It is a marine sponge found attached on rocky floor in warms, shallow waters upto a depth of 180 meters

Habits:-

1. Found in colony.
2. Omnivorous in nature.
3. Both asexual and sexual way of reproduction.
4. Sexual dimorphism is absent.

Point of Morphology:-

1. Body surface has numerous small dermal ostia and a few large sized oscula.
2. Skeleton is formed of sponging fibres.
3. Body surface is raised into small projections called the conuli.

EXPERIMENT – 2

AIM:- To study the different specimen of phylum coelenterate.

PORPITA

Classification:-

- Phylum - Coelenterata
- Class - Hydrozoa
- Order - Siphonophora
- Genus - *Porpita*

Habitat:-

It is a free living, colonial marine coelenterate found on the surface of warm seas.

Habits:-

1. Found in the form of a polymorphic colony.
2. Carnivorous in a nature.
3. Both asexual and sexual mode of reproduction.
4. Development is indirect including a free swimming larva named planula.

Morphology:-:-

1. It has a circular, sail-less, disc like pneumataphore.
2. Presence of a flat disc like coenosare on the oral side.
3. Coenosare bears a single large central gastrozooid.

Economic Importance:-

It is studied as a museum specimen.

VALELLA

Classification:-

- Phylum - Coelenterata
- Class - Hydrozoa
- Order - Chondrophora
- Genus - *Valella*

Habitat:-

It is free living, colonial, marine coelenterate found on the surface of warm seas.

Habits:-

1. Found in a polymorphic colonly.
2. Air filled pneumapophore are present.
3. Carnivorous in nature.
4. Both asexual and sexual reproduction.

Morphology:-:-

1. Presence of a pneumatophore with a sail or aboral side.
2. Presence of a flat disc like coenosare on the oral side.
3. Coenosare bears a single large central g astrozooid surrounded by numerous gonzooids which are in turn surrounded by marginal dactylozooids or tentaculozooids.

Economic Importance:-

It is studied as a museum specimen.

PHYSALIA

Classification:-

- Phylum - Coelenterata
- Class - Hydrozoa
- Order - Siphonophora
- Genus - *Physalia*

Habitat:-

It is a marine polymorphic hydrozoan found floating on water surface of tropical and subtropical seas.

Habits:-

1. Found in a polymorphic colony.
2. Carnivorous in nature.
3. Sexual reproduction.
4. Development is direct.

Morphology:-:-

1. Presence of an oval-shaped pneumatophore with a sail on the aboral side. Pneumatophore is filled with gas having the compostition as 90% nitrogen and 1.5% argon along with other gases.
2. The pneumatophore is hydrostatic is function.
3. A cormidium has gastrozooids, dactylozooids and branched blastostyles called gondendra. Gonodendra bears both male and female gonophores.

Economic Importance:-

Physalia troubles bathers. The poison secreted by its nematocysts is neurotoxin which affects the nervous system. The poison is nearly as virulent as the venum of Cobra and highly dangerous to man.

AURELIA

Classification:-

- Phylum - Coelenterata
- Class - Scyphozoa
- Order - Semaeostomeae (Discomedusae)
- Genus - *Aurelia*

Habitat:-

It is a marine coelenterate inhibiting the coastal waters almost all over the tropical and temperate seas.

Habits:-

1. Locomotion by swimming.
2. Carnivorous in nature.
3. Both asexual and sexual reproduction.
4. Development is indirect including a planula larva, scyphispome larva and a ephyra larva.

Morphology:-:-

1. It has a gelatinous, transparent, sucer-shaped body.
2. The subumbrellar margin of the umbrella beset with tentacles and broken into 8 notches.
3. Presence of a squarish mouth on a short manubrium, placed in the centre of subumbrellar surface.
4. Presence of four oral arms.

Economic Importance:-

It is used as a good museum specimen.

RHIZOSTOMA

Classification:-

- Phylum - Coelenterata
- Class - Scyphozoa
- Order - Rhizostomeae

- Genus - *Rhizostoma*

Habitat:-

It is marine and is found in the coastal waters of the tropical and temperate seas.

Habits:-

1. Active swimmer due to presence of coronal muscles.
2. Carnivorous in nature.
3. Unisexual and includes a free swimming planula larva.

Morphology:-:-

1. Has a bowl-shaped umbrella.
2. Presence of additional mouth-bearing processes, the scapulets on the outer surface of arms near the umbrella.
3. Presence of eight arms.

Economic importance:-

It is a museum specimen.

METRIDIUM

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa or Actinozoa
- Order - Actinaria
- Genus - *Metridium*

Habitat:-

It is marine inhibiting shallow coastal waters of Atlantic, pacific and Indian Oceans. It is found attached to substratum like rocks etc.

Habits:-

1. Locomotion is absent but slow creeping is present.
2. Omnivorous in nature.
3. Both asexual and sexual reproduction.

Morphology:-:-

1. Has short cylindrical body differentiated into oral disc, column and pedal disc.
2. Oral disc is flat with a slit-like mouth surrounded by numerous short and hollow tentacles.
3. Column is differentiated into upper scapus by a fold called collar.
4. Basal disc is broad and meant for attachement.

Economic Importance:-

When fully expanded they look like beautiful flowers.

MILLEPORA

Classification:-

- Phylum - Coelenterata
- Class - Hydrozoa
- Order - Hydrocorallina
- Genus - *Millepora*

Habitat:-

It is marine and inhibits tropical seas from shallow waters to a depth of 20 metres.

Habits:-

1. Locomotion is absent.
2. Carnivorous in nature.
3. Both asexual and sexual reproduction.

Morphology:-:-

1. Surface of coenosteum bear pores, hence the name millepora. Pores are of two types – larger gastropores and smaller dactylopores.
2. Coenosteum is ramified by a network of coenosarcal tubes.

Economic Importance:-

It participates in the formation of coral reefs.

ALCYONIUM

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Alcyonacea
- Genus - *Alcyonium*

Habitat:-

It is a marine and inhibits warn shore waters. It is especially found attached to stones in Indo-pacific ocean.

Habits:-

1. Found in colony.
2. Carnivorous in nature.
3. Both asexual and sexual reproduction.

Morphology:-:-

1. Alcyonium colony consists of a stout trunk branched into thick blunt lobes.
2. Trunk bears pores for the protrusion of polyps.
3. A polyp has two regions, basal part embedded in the trunk and the apical part or anthocodium that protrudes out through a pore.
4. All the polyps are interconnected with each other inside the trunk by a network of gastrodermal tubes called solenia.

Economic Importance:-

It is a museum specimen.

TUBIPORA

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Stolonifera
- Genus - *Tubipora*

Habitat:-

It is a marine and found on coral reefs in tropical seas.

Habits:-

1. Locomotion is absent.
2. Found in colony.
3. Carnivorous in nature.
4. Both asexual and sexual reproduction.

Morphology:-:-

1. The skeleton of the colony consists of erect tubes united at intervals by horizontal platforms.
2. Colony broadens distally.

Economic Importance:-

It is a museum specimen.

ZOANTHUS

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Zoanthidea
- Genus - *Zoanthus*

Habitat:-

It is marine anthozoan commonly found in warm, shallow waters.

Habits:-

1. Found attach to the body of other animals.
2. It is a cilliary feeder.
3. Both asexual and sexual reproduction.

Point of Morphology:-

1. Presence of narrow horizontal stolen at the base of polyp.
2. Polyps are small and lock pedal disc and skeleton.
3. Each polyp bears an oval mouth and a ring of tentacles.

Economic Importance:-

It is a museum specimen.

MADREPORA

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Madreporaria
- Genus - *Madrepora*

Habitat:-

It is marine and found in shallow tropical waters of Australian seas, West Indies and Florida.

Habits:-

1. Sedentary in nature.
2. Found in colony.
3. Carnivorous in nature.
4. Both asexual and sexual reproduction.

Morphology:-:-

1. Colony tree like with numerous terminal and lateral polyps which are enclosed in cylindrical cups or corallites separated by perforated coenosteum.
2. Corallite is made up of calcium carbonate secreted by polyps.
3. Branched coenosteum called corallum looks like stag horn.

Economic Importance:-

It is one of the most important reef-forming corals.

FUNGIA

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Madreporaria
- Genus - *Fungia*

Habitat:-

It is marine and generally found in tropical sea.

Habits:-

1. Found singly.
2. Carnivorous in nature.
3. Both asexual and sexual reproduction.

Morphology:-:-

1. Calcareous skeleton is called corallite.
2. Corallite is discoidal, mushroom shaped with numerous septa interconnected by synapticulae.

Economic Importance:-

It is used as ornamental coral.

ASTRAEA

Classification:-

- Phylum - Coelenterata
- Class - Anthozoa
- Order - Madreporaria
- Genus - *Astraea*

Habitat:-

It is marine and found attached to rocks in tropical seas.

Habits:-

1. Found in colony.
2. Carnivorous in nature.
3. Both asexual and sexual reproduction.

Morphology:-:-

1. Each polyp secretes a colcerous skeleton called the corallite, for its protection. Each corallite is cupshaped.
2. Corallite of all the polyps fuse so that the colony presents the appearance of a stone, the corallum.

Economic Importance:-

It is an ornamental coral. It is a reef building coral.

EXPERIMENT – 3

AIM:- To study the different specimen of phylum platyhelminthes.

DUGESIA

Classification:-

- Phylum - Platyhelminthes
- Class - Turbellaria
- Order - Tricladida
- Genus - *Dugesia*

Habitat:-

Dugesia or planaria is a fresh water triclad that is found under logs, debris, rocks etc. in cool, clear and running water of streams and springs world-wide.

Habits:-

1. It may be free living or found in groups.
2. It shows cannibalism.
3. Both asexual and sexual reproduction.
4. Development is direct.

Morphology:-:-

1. Body is leaf like with triangular head and body tapers posteriorly and varies brown to black in colour.
2. Head has on either side a conical projection, the auricles and bears a pair of eyes on the dorsal surface.
3. Mouth lies on the ventral surface behind the middle of the body.
4. Gonopore (gential pore) lies on ventral side just behind the mouth.

FASCIOLA

Classification:-

- Phylum - Platyhelminthes
- Class - Turbellaria
- Order - Fasciola
- Genus - *hepatica*

Habitat:-

Fasciola hepatica is commonly known as liver fluke or sheep liver fluke.

Habits:-

1. Feeds upon the blood or bile juice.
2. Respiration is anaerobic.
3. Development is indirect including miracidium, sporocyst, redia, cercaria and metacercaria larval stages.

Morphology:-:-

1. Has a dorsoventrally flattened leaf shaped, unsegmented body.
2. Anterior end of the body in distinguished into a triangular oral cone called head lobe.
3. Presence of an oral sucker at the anterior end, encircling the mouth.
4. Presence of a highly muscular ventral sucker or acetabulum on the ventral side, a little posterior to the headlobe.
5. Presence of excretory pore at the extreme posterior end of the body.
6. Presence of genital pore medially between oral and ventral suckers.

Economic Importance:-

It disturbs working of liver. Heavy infection in sheep causes a disease fascioliasis or liver-rot.

TAENIA

Classification:-

- Phylum - Platyhelminthes
- Class - Cestoda
- Order - Cyclophyllidea (Taenioidea)
- Genus - *Taenia*

Habitat:-

Taenia solium is commonly called as pork-tape worm.

Habits:-

1. Saprozoic in nature.
2. Anaerobic respiration is present.
3. Development is indirect including hexacanth and cysticerus larva.

Morphology:-:-

1. Body is long, dorsoventrally flattened, narrow ribbon like more than 2 to 3 meters long.
2. Body is differentiated into scolex, neek and strobila.
3. Strobila is formed of three types of proglottibs : immature, mature and gravid proglottids.

Economic Importance:-

Adult worm causes taeniasis. Its bladder worm or cysticercus larva causes cysticercosis in humans.

ECHINOCOCCUS

Classification:-

- Phylum - Platyhelminthes
- Class - Cestoda
- Order - Cyclophyllidea (Taenioidea)
- Genus - *Echinococcus*

Habitat:-

It is commonly called dog or hydatid tapeworm. It inhibits the intestine of dogs almost all over the world.

Habits:-

1. Saprozoic in nature.
2. Anaerobic respiration is present.
3. Development is indirect including hexacanth and cysticerus larva.

Morphology:-:-

1. Body differentiated into scolex, neek and strobila.
2. Scolex has 4 suckers and a protrusible rostellum with two rows of hooks.
3. Strobila consists of one immature, one or two mature and one very large gravid proglottid.

Economic Importance:-

It causes hydatid disease in dogs which causes enlargement of liver. Sometimes man also becomes its incidental intermediate host.

EXPERIMENT – 4

AIM:- To study the different specimen of phylum aschelminths.

ASCARIS

Classification:-

- Phylum - Aschelminthes
- Class - Nematoda
- Order - Ascaroidea
- Genus - *Ascaris*

Habitat:-

Ascaris lumbricoides is common endoparasite found in small intestine of humans.

Habits:-

1. Holozoic nutrition is present.
2. Respiration is facultative anaerodic.
3. Sexual reproduction is present.
4. Development is direct.

Morphology:-:-

1. Body is elongated, cylindrical, tapering at both ends.
2. Body surface is marked by four longitudinal lines, one mid-dorsal, one mid-ventral and two lateral lines.
3. Mouth is provided with three lips.
4. Sexual dimorphism well marked.

Economic Importance:-

Heavy infestation causes a disease called ascariasis, blockage of intestine etc.

MELOIDOGYNE

Classification:-

- Phylum - Aschelminthes
- Class - Nematoda
- Order - Tylemchida
- Genus - *Meloidgyne*

Habitat:-

It is a phytoparasitic nematode and is found as a parasite in the galls of roots of large number of plants.

Habits:-

1. Saprozoic in nature.
2. Unisexual and show sexual dimorphism.
3. Female develop parthenogenetically and male develop from the fertilize eggs.

Morphology:-:-

1. Body is elongated, cylindrical and tapering at both ends.
2. Sexual dimorphism is well marked. Male is long and cylindrical and have cloacal aperture, copulatory bursa and one pair of penial spicules. Female is gourd-shaped and has a beak like spear at the anterior end and have a pharyngeal bulb.

Economic Importance:-

It is a harmful phytoparasite.

TRICHINELLA

Classification:-

- Phylum - Aschelminthes
- Class - Nematoda
- Order - Phasmidia (Secernentea)
- Genus - *Trichinella*

Habitat:-

Trichinella spiralis is a cosmopolitan human parasite. It first lives in human intestine, but later encysts in the muscles. It also occure in many other mammalos like pigs, dogs etc.

Habits:-

1. Holozoic nutrition.
2. Anaerobic respiration.
3. Unisexual and sexual dimorphism is present.

Morphology:-:-

1. Mouth without lips.
2. Male is smaller and has a terminal cloacal aperture and a pair of conical processes at the hind end.
3. Female is larger having its vulva opening near the middle of the pharynx. Posterior end of female is straight.

Economic Importance:-

Its hardened cysts cause muscular pain and this disorder is called trichinosis.

ANCYLOSTOMA

Classification:-

- Phylum - Aschelminthes
- Class - Nematoda
- Order - Strongyloidea
- Genus - *Ancylostoma*

Habitat:-

Ancylostoma duodenale is an intestinal parasite of humans. It inhibits small intestine of man and lies firmly anchored by drawing a bit of the intestinal lining into its mouth.

Habits:-

1. Holozoic nutrition.
2. Anaerobic respiration.
3. Unisexual and sexual dimorphism is present.
4. Development is indirect including a rhabditiform and strongyliform larva.

Morphology:-:-

1. Male is smaller than the female and have its hind end expanded to form copulatory bursa for holding the female during copulation.
2. Female is larger than the male and have a small caudal spine at its hind.

Economic Importance:-

Heavy infection of the worm cause ancylostomiasis which is charaterised by gastro-intestinal disturbances, anemia etc.

EXPERIMENT – 5

AIM:- To study the different specimen of phylum annelida.

PHERETIMA

Classification:-

- Phylum - Aschelminthes
- Class - Oligochaeta
- Order - Opisthophora
- Genus - *Pheretima*

Habitat:-

Earthworm live in the moist soil, rich in humus (decaying organic material).

Habits:-

1. Nocturnal, fossorial in nature.
2. Locomotion by muscular contractions of body.
3. Omnivours in nature.
4. Bisexual, show cross fertilization.

Morphology:-s:-

1. Body is long, narrow, cylindrical, metmerically segmented and brown in colour.
2. Presence of clitellum (an are without outward segmentation) seen in segments 14, 15 and 16.
3. Body divided into preclitellar (1-13 segments) clitellar (14-16 segments) and post clitellar (17 onward segments upto last) regions.
4. Presence of female genital aperture on the ventral surface of clitellum in the 14^{th} segment.

Economic Importance:-

They are of great economic importance. They are mainly useful, but have a few harmful activities also.

Useful Activiteis:-

1. They are beneficial in agriculture. A land rich with worms is rich in nutrition, because of their ability to feed on dead decaying organic matter and passing out useful organic matter in their excreta.
2. They make burrows, which makes the soil porous. The porous soil permits more penetration of air and moisture.
3. They are used as baits to catch fishes.

Harmful Activities:-

1. They spoil golf grounds by making burrows in them.
2. They promote soil erosion by making pores in slopes.

HETERONEREIS

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Phylldocida
- Genus - *Heteroneries*

Habitat:-

Nereis is commonly called clam worm is a marine cosmopolitan worm.

Habits:-

1. Nocturnal activity.
2. Locomotion is by oar like parapodia.
3. Unisexual but no sexual dimorphism.
4. Development includes a free swimming trochophore larva.

Morphology:-:-

1. Body is differentiated into anterior asexual region atoke and posterior sexual region epitoke.
2. Parapodia of segments of epotoke have oar-like setae and foliaceous outgrowths.

Economic Importance:-

It is used as a museum specimen. It is a nice example of epitoky.

POLYNOE

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Phyllodocida
- Genus - *Polynoe*

Habitat:-

It is a marine polychaete and is found under stones, logs etc. near tide marks.

Habits:-

1. Carnivorous in nature.
2. Unisexual but no sexual dimorphism.
3. Development includes trochophore larva.

Morphology:-

1. Small, flat, oval body covered dorsally by large scales, the elytra.
2. Small head with protrusible pharynx (proboscis), 2 pairs of eyes, 3 tentacles and 2 pairs of cirri.

Economic Importance:-

It shows bio-luminescence and this phenomenon is used for self defence.

APHRODITE

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Phyllodocida
- Genus - *Aphrodite*

Habitat:-

Aphrodite is a marine polychaete commonly fund in deep muddy areas (below low-water mark). It is found in U.S. A.

Habits:-

1. Carnivorous in nature.
2. Locomotion is with the help of elytra.
3. Unisexual but no sexual dimorphism.
4. Development includes trochophore larva.

Morphology:-:-

1. Oval body with convex dorsal and flat ventral surface.
2. Dorsal side is covered by long, thin, thread like iridescent bristles, which gives a feeling of hair (hence the common name).
3. Flat ventral surface has segments used for creeping.
4. Parapodial setae are of 3 types : stiff setae (like spines), soft setae (thread like) and iridescent setae (bristle like).

Economic Importance:-

It is a museum specimen. Alive, it is a beautiful animal which changes colour from gold to peacock blue.

EUNICE

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Eunicidae
- Genus - *Eunice*

Habitat:-

It is a marine polychaete found living in burrows in coral reefs.

Habits:-

1. Fossorial in nature.
2. Carnivorous feeding.
3. Fertilization is external and development includes trochophore larva.

Morphology:-:-

1. Head bears a pair of cirri, 5 tentacles and a palp.
2. Body differentiated into anterior atoke (non-sexual region) and posterior epitoke (sexual region)

Economic Importance:-

Epitokes are used as food. They are eaten alive or roasted and are considered a delicacy.

CHAETOPTERUS

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Canalipalpata
- Genus - *Chaetopterus*

Habitat:-

Chaetopterus is a marine polychaete that permanently lives in parchment like U-shaped tubes, open at both ends embedded in mud encrusted with sand and debris in the intertidal zone. It is distributed worldwide end commonly found in Europe.

Habits:-

1. Fossorial in nature.
2. Carnivorous feeding.
3. Fertilization is external and development includes trochophore larva.

Morphology:-

1. Body divided into 3 distinct regions – anterior, middle and posterior.
2. Anterior region includes head, mouth, funnel, collar and a ciliated food groove. Parapodia of this region modify to give rise to great wings, food cup and food scoop.
3. Middle region has specially modified parapodia called fans used for food collection, creating water current and for locomotion.
4. Posterior region longest, where metameric segmentation is most evidently seen. Each segment bears biramous parapodia.

Economic Importance:-

It is a museum specimen.

ARENICOLA

Classification:-

- Phylum - Annelida
- Class - Polychaeta
- Order - Capitellida
- Genus - *Arenicola*

Habitat:-

It is a marine tubicolous polychaete found in U-shaped burrow. One opening of the burrow is funnel like and the other has faecal castings about it.

Habits:-

1. Fossorial in nature.
2. Omnivorous feeding.
3. Fertilization is external and development includes trochophore larva.

Morphology:-

1. Body divisible into 4 regions : Head, pre-branchial, branchial and post branchial.
2. Head region consists of prostomium and peristomium.
3. Prebranchial region consists of seven segments. Each segment of this region, except the first, bears pair of parapodia.
4. Branchial region consists of eleven segments. Each segment bears gills and parapodia.
5. Post branchial region consists of variable number of segments. All segment are without gills and parapodia.

Economic Importance:-

It is used as a museum specimen.

TUBIFEX

Classification:-

- Phylum - Annelida
- Class - Oligochaete

- Order - Tubificida (Archioligochaeta)
- Genus - *Tubifex*

Habitat:-

Tubifex is a fresh-water tubicolour oligochaete. It inhibits the bottom of deep lakes, streams etc.

Habits:-

1. Omnivorous in nature.
2. Locomotion is waving type.
3. Bisexual, but shows cross fertilization.

Morphology:-

1. Cylindrical metamerically segmented body that tapers posteriorly.
2. Body is bright red in colour.
3. Presence of clitellum in segments 11^{th} and 12^{th}.
4. Male genital pore lies in 11^{th} segment.
5. Female genital pore lies in 12^{th} segment.
6. Each body segment bears dorsal and ventral bundles of setae.

Economic Importance:-

It has putrefaction ability. It is grown for putrefaction in filter beds of sewage disposal plants.

PONTOBDELLA

Classification:-

- Phylum - Annelida
- Class - Hirudinea
- Order - Rhynchobdellida
- Genus - *Pontobdella*

Habitat:-

It is common name if Fish leech. It is an ectoparasit on sharks, rays and skates and feed on their blood.

Habits:-

1. Feed on the blood of the host.
2. Hermaphrodite, but cross fertilization due to the protandrus nature.
3. Development is direct.

Morphology:-

1. Long, cylindrical greenish coloured body.
2. Body surface is leathery with numerous tubercles.
3. Preence of anterior and posterior suckers. Anterior sucker is saucer-shaped and posterior sucker is cup shaped.

Economic Importance:-

1. Studied as an example of ectoparasite of fishes.
2. Shows parental care.

EXPERIMENT – 6

AIM:- To study the different specimen of phylum arthropoda.

PERIPATUS

Classification:-

- Phylum - Arthropoda
- Class - Onychophora
- Genus - *Peripatus*

Habitat:-

Peripatus is terrestrial worm like arthropoda that is found under stones, logs and leaf litter in damp tropical forests. It is abundantly found in South Africa and Australia.

Habits:-

1. Locomotion is walking type.
2. Carnivorous feeding.
3. Unisexual.
4. Development is direct.

Morphology:-

1. Body is soft, velvety nearly cylindrical that look like a caterpillar.
2. Head continuous with the body and bears a pair each of antennae, eyes, jaws and oral papillae.
3. Presence of many pairs of unjointed, stumpy (parapodia like) legs each ending into a pair of horny claws.

Economic Importance:-

It acts as a connecting link between arthropoda and annelid.

PALAEOMON

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Decapoda
- Genus - *Palaemon*

Habitat:-

Palaeomon inhibits fresh water ponds, ditches, lakes, streams and rivers in Central and South India.

Habits:-

1. Nocturnal activity.
2. Omnivorous feeding.
3. Locomotion is walking type.
4. Unisexual reproduction.

Morphology:-

1. Palaemon has a spindle shaped body which is bilaterally symmetrical and pale-yellow in colour.
2. Body is divisible into cephalothorax and abdomen.
3. Presence of an exoskeleton of hard cuticle.
4. Cephalothorax bears 5 pairs of legs, 3 paris of maxillipedes and 5 pairs of cephalic appendages.
5. Abdomen bears 5 pairs of oar like pleopods and one pair of uropods.

Economic Importances:-

1. It is used as a food.
2. It is used as a good laboratory animal.

PALINURUS

Classification:-

- Phylum - Arthropoda

- Class - Crustacea
- Order - Decapoda
- Genus - *Palinurus*

Habitat:-

Palinurus is a marine decapods of Asia and Europe.

Habits:-

1. It is nocturnal.
2. Carnivorous Feeding.
3. Respire through gills.
4. It is unisexual and show sexual dimorphism.
5. Female is oviparous and development is indirect.

Morphology:-

1. Body armed with spines and divisible into cephalothorax and abdomen.
2. Rostrum is reduced to a small spine.
3. Antennae are long and fused proximally.
4. All legs nonchelate and plepods are broad fan like.

Economic Importance:-

Palinurus is used as food in many countries.

CANCER

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Decapoda
- Genus - *Cancer*

Habitat:-

It is a marine and found buried in rocks and mud on the coasts. (Some species of cancer also inhibit shallow fresh water).

Habits:-

1. Carnivorous feeding.
2. Walk with the help of thoracic legs.
3. Unisexual reproduction, female is oviparous.
4. Development is indirect including zoaea and megalopa larva.

Morphology:-

1. Body divisible into cephalothorax and abdomen.
2. Cephalothorax is covered by broad, flat, disc like carapace and bears a pair of stalked compound eyes, small sized antennules, antennae and 5 pairs of thoracic legs.
3. First pair of legs are very large and chelate.

Economic Importance:-

It is used as food.

EUPAGURUS

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Decapoda
- Genus - *Eupagureu*

Habitat:-

Eupagurus is a marine decapode crustacean. It lies in the empty gastropod (molluscan) shells. It is conmopolitan in its distribution.

Habits:-

1. It is carnivorous in diet.
2. Food is captured by its thoratic chelate legs.
3. It is unisecual. Female is oviparous and carry eggs on a plateform formed by its pleoponds. Development is direct.

Morphology:-

1. Body divisible into cephalothorax and abdomen.
2. Cephalothorax is broad, flattened with hard shell, bear short antennules, long antennae and stalked eyes.
3. First three pairs of legs are chelate and last two small and non chelate. Right leg is larger than the left.
4. Last pair of appendages e.g. uropods are hook like.

SACCULINA

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Rhizocephalan
- Genus - *Sacculina*

Habitat:-

Sacculina is a parasite of crabs. It is cosmopolitan.

Habits:-

1. Parasitic in nature.
2. Bisexual, cross fertilization is present.
3. Development is indirect including nauplius larva.
4. Shows retrogressive metamorphosis.

Morphology:-

1. Body is highly degenerate.
2. Body gives root like appearance on the host's body.

Economic Importance:-

Presence of the parasite interferes with the metabolism of the host. It causes many changes in the sex characters of the host, including parasitic castration. The male host acquires female characters while female ovaries become degenerated.

BALANUS

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Thoracica
- Genus - *Balanus*

Habitat:-

It is marine and is found in abundance in all the seas attached to rocks, ships, molluscan shells, whales etc.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Bisexual, shows cross fertilization.
4. Development is indirect including a nauplius larva.

Morphology:-

1. Body is enclosed by six calcareous shell plates – one dorsal keel or carina, one anterior rostrum and two pairs of lateral plates.
2. The opening of the shell is provided with a four fold cover consisting of two scuta and two paired plates, the terga.
3. Six pairs of thoracic legs protrude out through the openings of the shell for capturing food particles.

Economic Importance:-

It is used as a museum specimen. It is also eten in certain parts of the world.

LEPAS

Classification:-

- Phylum - Arthropoda
- Class - Crustacea
- Order - Thoracica
- Genus - *Lepas*

Habitat:-

It is a marine crustacean found attached to floating objects like ships, logs, turtles etc. It is cosmopolitan in its distribution.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Bisexual, shows cross fertilization.
4. Development is indirect including a nauplius larva.

Morphology:-

1. Body divisible into a proximal cylindrical, wrinkled stalk or peduncle and distan compressed somewhat triangular capitulum.
2. Capitulum is enclosed in a bivalve carapace or mantle strengthened by a bivalve shell.
3. Bivalved shell is formed of 5-calcareous plates – a pair of anteriolateral scuta, a pair of posteroleral terga and a median carina.

Economic Importance:-

It is used as a museum specimen. It is also eaten in certain parts of the world.

LEPISMA

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Thysanura
- Genus - *Lepisma*

Habitat:-

It is a terrestrial, wingless insect, commonly found in damp places

Habits:-

1. Nocturnal activity.
2. It runs very fast.
3. Unisexual reproduction, sexual dimorphism is present.
4. Female is oviparous.

Morphology:-

1. It is silvery white in colour and has a fish like body, hence its common name is silver fish.
2. Body divisible into head, thorax and abdomen.
3. Head bears a pair of long antennae and a pair of eyes.
4. The thorax is 3-segmented and bears a pair of jointed legs on each segment (wings absent).
5. The abdomen is 11 segmented and bears a pair of anal cerci and a long thread like telson.

Economic Importance:-

It is a harmful insect that damages our books and clothes.

PERIPLANETA

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Dictyoptera
- Genus - *Periplaneta*

Habitat:-

Periplaneta is a terrestrial, cosmopolitan insect found in places, where there is warmth and food e.g. kitchens, hotels, warehouses, railway wagons, underground drains etc.

Habits:-

1. Nocturnal activity.
2. Omnivorous feeding.
3. Unisexual, shows sexual dimorphism.
4. Females are oviparous.

Morphology:-

1. Dark brown coloured elongated, ovoid, dorsoventrally flattened, bilaterally symmetrical body.
2. Entire body is covered by hard chitinous plates called sclerites. Sclerites form exoskeleton.
3. Body divided into head, thorax and abdomen.
4. Head bears a pair of black coloured kidney shaped compound eyes, a pair of long antennae and mouth parts.

Economic Importance:-

The are harmful insects and destroy our food, clothes, papers etc. They also spread foul smell.

SCHISTOCERCA

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Orthoptera
- Genus - *Schistocerca*

Habitat:-

These are found in desert areas in the tropical regions of the world (Africa, Arabia, Iran, Pakistan and North-West India).

Habits:-

1. Diurnal activity.
2. These are fast flying animals.
3. Herbivorous in nature.
4. Unisexual reproduction.

Morphology:-

1. Body is robust with head broadly joined with the thorax. Head bears a pair of compound eyes, a pair of short antennae and mouth parts.
2. Forewings are leathery to form tegmina and have black spots. Hind wings are large and memberanous.
3. The hind legs are long and stout and are meant for jumping.
4. Male has anal styles.

Economic Importance:-

Locusts are agricultural pests of great importance and are the worst destroyer of standing crops and orchards.

POECILOCERUS

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Orthoptera
- Genus - *Poecilocerus*

Habitat:-

Poecilocerus pictus is commonly found on Ak-plants (Calotropis) during summer.

Habits:-

1. Diurnal activity.
2. These are fast flying animals.
3. Herbivorous in nature.
4. Unisexual reproduction.

Morphology:-

1. Body divisible into head, thorax and abdomen.
2. Body is covered by a hard cuticular exoskeleton made up of chitinous sclerites.
3. Head is hypognathus and bears antennae, compound eyes and mouth parts.

Economic Importance:-

They are harmful insects and damage our crops.

CICADA

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Homoptera
- Genus - *Cicada*

Habitat:-

Cicadas live on trees (arboreal) and are found in forests of India, Europe and America.

Habits:-

1. Diurnal activity.
2. Mouth parts are sucking type.
3. Unisexual, shows sexual dimorphism.
4. Females are oviparous.

Morphology:-

1. Body is robust and divisible into head, thorax and abdomen.
2. Head bears a pair of compound eyes, three ocelli very short antennae and mouth parts. Each antenna bears at terminal bristle the arista.
3. Presence of two pairs of membraneous wings that extend much beyond the abdomen.
4. Females has a chisel like ovipositor.

Economic Importance:-

They are harmful because they damage fruit trees.

FORFICULA

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Dermaptera
- Genus - *Forficula*

Habitat:-

Forficula is an insect commonly found is houses and gardens.

Habits:-

1. Nocturnal activity.
2. May be carnivorous, omnivorous or saprozoic.
3. Unisexual, shows sexual dimorphism.
4. Female is oviparous.

Morphology:-

1. Body is elongated, flat and dark brown.
2. Head is prognathus and bears a pair of compound eyes and a pair of long antennae.
3. Forewings are short, leathery and veinless.
4. Presence of a pair of unjointed and cerci which are modified into stout forcaps or pincers for defence and offence. Pincers are longer in the male than in the female.

Economic Importance:-

Omnivorous species of Forficula are harmful and destroy our flowering plants.

SYMPETRUM

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Odonata
- Genus - *Sympetrum*

Habitat:-

It is commonly found flying in the air over the ponds and streams with aquatic vegetation. It is cosmopolitan in distribution.

Habits:-

1. Carnivorous feeding.
2. Diurnal activity.
3. These fly very fast.
4. Unisexual reproduction, development is indirect including a larval stage named as naiad.

Morphology:-

1. Body divisible into a large head, robust thorax and long abdomen.
2. Head bears a pair of prominent compound eyes and a pair of inconspicuous antennae.
3. Both pairs of wings are membranous and each has a coloured spot called pterostigma. Hind wing is produced backwards in the form of a lobe like structure, a characteristic feature of dragon files.
4. Male copulating organ located on the second and third sternite.

Economic Importance:-

Dragon flies are useful insects as they eat mosquitoes and their.

MICROTERME

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Isoptera
- Genus - *Microtermes*

Habitat:-

Termites occur throughout the tropics and warm temperate countries. They either burrow in wood or make subterranean nest called termitarium.

Habits:-

1. Found in colony.
2. Shows polymorphism including queen, king, workers, soldiers, nasutes.
3. Unisexual reproduction.
4. Development is direct.

Morphology:-

1. Soft, flat body divisible into head, thorax and abdomen.
2. King and queen are large dark brown and have a pair of compound eyes, two pairs of membranous wings, a pair of moniliform (beaded) antennae, In queen wings are shed after swarming.
3. Other castes are small, wingless, blind, whitish and sterile. Soldiers have a large head with huge mandibles.

Economic Importance:-

Termites are harmful. They damage living plants, household furniture, books, railway sleepers, buildings etc. They are useful in that are eaten by certain people and dispose off dead wood in forests.

DYSDERCUS

Classification:-

- Phylum - Arthropoda

- Class - Insecta
- Order - Hemiptera
- Genus - *Dysdercus*

Habitat:-

It is serious pest of cotton plants. It is commonly found on cotton plants and lady's finger plants.

Habits:-

1. It has piercing and sucking type of mouth parts.
2. Destructive in nature.
3. Unisexual reproduction, female is oviparous.
4. Common name is red cotton bug.

Morphology:-

1. Elongated, oval, bright red body with distinct white bands.
2. Long antennae
3. Forewings are thick and horny in the anterior half and membranous and black in the posterior half. They cross each other at rest, forming a diamond like black area on the back. They are called hemelytra. Each hemelytron has a black spot near its middle.

Economic Importance:-

It is a serious pest of cotton. Body adults and nymphs suck the sap from cotton balls. This causes shriveling of balls and destroy the germinating power of the seeds. It also injects into the cotton balls a microorganism that causes red stains on cotton fibres, so it is also called cotton stainer.

BOMBYX

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Lepidoptera
- Genus - *Bombyx*

Habitat:-

Bombyx mori is an arboreal insect found on mulberry trees. It is a native of china but is now a days reared and grown for getting silk in many countries.

Habits:-

1. Adults do not feed.
2. Male die after copulation and the females die after egg laying.
3. Egg hatches into a larval stage known as caterpillar.

Morphology:-

1. Stout, creamy white, hairy body divisible into head, thorax and abdomen.
2. There is no proper constriction between thorax and abdomen.
3. Antennae are feathery and tapering.
4. Presence of faint lines across the forewings.

Economic Importance:-

It is useful insect. Its cetarpillar produce true silk of commerce.

APIS

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Hymenoptera
- Genus - *Apis*

Habitat:-

Apis is an insect that is found all over the world.

Habits:-

1. These shows polymorphic colony.
2. Diurnal activity.
3. Three caste are found : queen, drones and workers.
4. Female lay two types of eggs : fertilize and unfertilized eggs.
5. Unfertilized eggs develops into drones.
6. Fertilize eggs develop into queen for workers.

Point of Morphology:-

A. Workers:

1. Head is triangular and bears a pair of compound eyes, three ocelli, a pair of short jointed antennae and chewing and lapping type of mouth parts.
2. All the three pairs of legs are densely covered with hairs which aid in gathering pollen. Fore legs have eye brush on their distal part for removing pollen from the surface of compound eyes. Distal posterior end of tibia has velum and antennae comb to clean the antennae. Posterior face of metatarsal segment bears a pollen brush.
3. Mesolegs have on their inner distal end of tibia a long spine like pollen spur.
4. Metathoracic legs have pollen basket on the outer surface of the tibia. Inner surface of metatarsus have pollen combs.

B. **Queen bee:** Has elongated body with tapering abdomen and short legs and wings.
C. **Drones:**
    1. Have stouter and broader built body.
    2. Have large eyes and small pointed mandibles.

Economic Importance:-

They are useful insects. They pollinate flowrs and act as the best pollinating agents. They give us honey and bee wax.

POLISTES

Classification:-

- Phylum - Arthropoda
- Class - Insecta
- Order - Hymenoptera
- Genus - *Polistes*

Habitat:-

They are common insects during summer month in North India.

Habits:-

1. Diurnal activity.
2. Polymorphic colony having three caste : queen, workers and drones.
3. Omnivorous feeding.
4. Unisexual reproduction.
5. Common name is yellow wasp.

Morphology:-

1. Slender, golden body with a transversely wide head.
2. Head bears bent antennae and chewing type of mouth parts.
3. Thorax bears 2 pairs of this wings and three pairs of legs.
4. A narrow pedicel joins the thorax with abdomen.
5. Abdomen is spindle shaped and bears a sting in females.

Economic Importance:-

They stings which is highly painful.

THYROGLUTSU

Classification:-

- Phylum - Arthropoda
- Class - Diplopoda (Pauropoda)
- Order - Julliformia
- Genus - *Thyroglutus*

Habitat:-

They live in soil and humus and are commonly found in damp, shady places under stones, logs etc. They are cosmopolitan, found in India.

Habits:-

1. It shows slow walking.
2. Herbivorous feeding.
3. Unisexual, female is oviparous and development is direct.

Morphology:-

1. Body consists of many segments and divisible into head, thorax and abdomen.
2. Head bears short seven jointed antennae, a pair of maxillae and a pair of mandibles forming a gnathochilarium.
3. Thorax formed of 4 segments, first without appendages, others with a pair of legs each.
4. Abdomen formed of many segments, each with two pairs of legs.

Economic Importance:-

They are harmful as they eat roots of plants. They have evolutionary significance. They show a mixture of annelid and insect features.

SCOLOPENDRA

Classification:-

- Phylum - Arthropoda
- Class - Chiloponda
- Order - Scolopendromorpha
- Genus - *Scolopendra*

Habitat:-

They are found under surfaces of stones, soil and humus, and barks and logs. They are found in both tropical and temperate regions of the world.

Habits:-

1. Nocturnal activity.
2. It shows fast running.
3. Unisexual, oviparous, development is direct.
4. Common name is Centipede.

Morphology:-

1. Body is elongated, dorsoventrally flattened and divided into head and trunk.
2. Head is distinct and bears a pair of antennae, a pair of mandibles and two pairs of maxillae.
3. Trunk segements are numerous and each segment bears a pair of legs. First pair of legs are modified into poison claws.
4. Genital aperture is situated at the hind end of the body.

Economic Importance:-

It is harmful insect. Its sting is highly painful but not fatal.

PALAMNAEUS

Classification:-

- Phylum - Arthropoda
- Class - Arachnida
- Order - Scorpionida
- Genus - *Palamnaeus*

Habitat:-

It is a terrestrial, solitary arachnid found hidden in holes and crevices and under stones, bricks, logs etc. They inhibit tropical and subtropical countries, except Newzealand and Oceanic islands.

Habits:-

1. Nocturnal activity.
2. Carnivorous feeding.
3. Unisexual reproduction.
4. Female is viviparous.

Morphology:-

1. Elongated body divisible into cephalothorax (Prosoma) and abdomen (Opisthosoma).
2. Cephalothorax (prosoma) is unsegmented bears a pair of small chelicerae, a pair of large pedipalpi with pincers.
3. Abdomen comprises 12 segments and shows two regions : anterior preabdomen (mesosoma) and posterior postabdomen (metasoma).
4. Pre-abdomen formed of seven broad, flat segments.

Economic Importance:-

Scorpions are harmful animals. They sting is very painful but not dangerous to man.

ARANEA

Classification:-

- Phylum - Arthropoda
- Class - Arachnida
- Order - Araneida (Araneae)
- Genus - *Aranea*

Habitat:-

It is a terrestrical, solitary arachnid commonly found in jungles, deserta, caves, houses and gardens.

Habits:-

1. Nocturnal activity.
2. Carnivorous feeding.
3. Sucking type of mouth parts.
4. Unisexual, shows sexual dimorphism.

Morphology:-

1. Oval unsegmented body divisible into anterior small, flat cephalothorax (Prosoma) and posterior large abdomen (Opisthosoma).
2. Cephalothorax bears four pair of simple eyes, one pair of chelicerae, one pair of pedipalpi and four pairs of legs for walking.
3. Abdomen has 4-5 pairs of spinnerets that spin silk thread for making web.

Economic Importance:-

Spiders are useful as they eat insects some of which are harmful to us.

LIMULUS

Classification:-

- Phylum - Arthropoda
- Class - Merostomata
- Order - Xiphosurida
- Genus - *Limulus*

Habitat:-

Limulus is marine inhibiting shallow waters mostly buried in sand. They are found in coastal waters of India, Pacific and Atlantic oceans.

Habits:-

1. Nocturnal activity.
2. Carnivorous feeding.
3. Sucking type of mouth parts.
4. Unisexual, shows sexual dimorphism.
5. Development includes a trilobite larva.

Morphology:-

1. Body is divisible into cephalothorax (Prosoma) and abdomen (Opisthesoma).
2. Prosoma is covered dorsally by a horse-shoe shaped carapace and has one pair of chelicerae and five pairs of non-chelate legs.
3. Opisothosoma is differentiated into mesosoma and vestigial metasoma. Metasoma has a long caudal spine (telson).

Economic Importance:-

It is a good example of living fossil.

EXPERIMENT – 7

AIM:- To study the different specimen of phylum mollusca.

MYTILUS

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Fillibranchiata
- Genus - *Mytilus*

Habitat:-

Mytilus is a marine bivalve mollusk and is found in shallow coastal waters between the tide marks. It is cosmopolitan in its distribution.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development includes glochidium larva.

Morphology:-

1. The foot is long and secretes byssal.
2. The inhalant siphon is very wide. Both siphons present at the posterior end.
3. The mantle edge is uneven.

Economic Importance:-

It is used as food in European countries and is also eaten by poor people in our country.

OSTREA

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Pseudolamellibranchiata
- Genus - *Ostrea*

Habitat:-

It is a marine mollusk found in shallow warm waters in all seas except the colder ones.

Habits:-

1. Locomotion is absent.
2. Carnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development includes glochidium velliger larva.

Morphology:-

1. Two shell valves are unequal with whitish, coarse, rugged surface and are highly irregular.
2. The small, thin flat right valve forms a lid over the large, thick, deeply concave left value which is permanently attached to rocks.
3. The foot and byssus are absent.

Economic Importance:-

It is edible and used as food. It is cultivated in Oyster beds near the sea shore. Oysters and clams produce pearls.

CARDIUM

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Eulamellibranchiata
- Genus - *Cardium*

Habitat:-

Cardium inhibits shallow water in the sea.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development includes glochidium larva.

Morphology:-

1. Shell is bivalve, valves are moderately flat, subcircular and ribbed.
2. Siphons are fairly large and bear sensory tentacles.
3. Foot is long and wedge-shaped.

Economic Importance:-

It is used as a museum specimen. It is used as food.

PHOLAS

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Eulamellibranchiata
- Genus - *Pholas*

Habitat:-

Phola is a marine and lives in burrows mode in hard clay or soft rocks.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development includes trochophore larva.

Morphology:-

1. Shell is elongated and has additional calcareous plates between the two valves.
2. Shells valves are serrated on the anterior side.
3. The siphons are long and fused.

Economic Importance:-

It is harmful because it makes burrows in rocks. It is used as a museum specimen.

SOLEN

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Eulamellibranchiata
- Genus - *Solen*

Habitat:-

Solen is a marine bivalve mollusk found buried in sand in the sea.

Habits:-

1. Locomotion is swimming type.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development includes glochidium larva.

Morphology:-

1. Shell is long, narrow, thin and equivalved and looks like a handle of the razor, hence the common name.
2. The foot is large, cylindrical end highly muscular.
3. Siphons are short and united in the basal halves.

Economic Importance:-

It is eaten as food in certain parts of the world.

PECTEN

Classification:-

- Phylum - Mollusca
- Class - Pelecypoda (Bivalvia)
- Order - Pseudolamellibranchiata
- Genus - *Pecten*

Habitat:-

Pecten is marine and inhibits shallow coastal waters all over the world.

Habits:-

1. Locomotion is absent.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Bisexual reproduction But shows cross fertilization.
5. Development includes glochidium larva.

Morphology:-

1. Body is covered by bivalve shell.
2. The valves of the shell are unequal and somewhat triangular, have radiating ribs and wavy margins and are produced dorsally into anterior and posterior wings or auriculae.
3. Foot is highly reduced.

Economic Importance:-

It is used as food in some countries.

PATELLA

Classification:-

- Phylum - Mollusca
- Class - Gastropoda
- Order - Aspidobranchiata (Archaeogastropoda)
- Genus - *Patella*

Habitat:-

Patella is marine gastropod and is found attached on the rocks in the sea between tide marks. It is cosmopolitan in its distribution.

Habits:-

1. Locomotion is creeping type.
2. herbivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development direct.

Morphology:-

1. Small, oval body covered by a cone like shell.
2. Shell I without operculum.
3. Head bears a pair of stout sensory tentacles, eyes and mouth.
4. Foot is large and has a broad, flat, creeping sole.
5. Foot is surrounded by a thick, horse-shoe shaped muscle band, the pallial muscle, used for attachement.

Economic Importance:-

It is eaten as food by poor people in many countries.

HALIOTIS

Classification:-

- Phylum - Mollusca
- Class - Gastropoda
- Order - Aspidobranchiata (Archaeogastropoda)
- Genus - *Heliotis*

Habitat:-

Heliotis is a marine gastropod and occurs at and below low tide level in tropical and temperate seas all over the world.

Habits:-

1. Locomotion is very fast.
2. Omnivorous feeding.
3. Respiration with the help of gills.
4. Unisexual reproduction But no sexual dimorphism.
5. Development is direct.

Morphology:-

1. Shell lacks operculum, ear shaped and bears holes or foramina for the outgoing water current and sensory tentacles.
2. Foot is large and bears dorsally a fold of skin, the epiodium that gives off numerous sensory epipodial tentacles.
3. Head bears two pairs of tentacles and a paor of ommatophores with terminal eyes.

Economic Importance:-

1. It shells are used for making jewellery, buttons and buckles and for decoration.
2. It is used as food in China, Japan and America.
3. It produces low quality pearls.

APLYSIA

Classification:-

- Phylum - Mollusca
- Class - Gastropoda
- Order - Aplysiacea (Anaspidea)
- Genus - *Aplysia*

Habitat:-

Anlysia is a marine gastropod found among sea weeds in all the seas. It is cosmopolitan in its distribution.

Habits:-

1. Locomotion is creeping and swimming type.
2. Herbivorous feeding.
3. Respiration with the help of gills.
4. Bisexual but shows cross fertilization.
5. Development is direct.

Morphology:-

1. Presence of fleshy body with internal, reduced shell.
2. Body differentiated into a prominent head, an extensile neck, a humped viscera mass and a long narrow grooved foot.
3. Head bears two pairs of tentacles. Posterior tentacles are long and are called rhinophores. They stand out like the ears of a hare, hence sea hare.
4. Presence of lateral extension of the foot as parapodia.

Economic Importance:-

It is used as a museum specimen.

LIMAX

Classification:-

- Phylum - Mollusca
- Class - Gastropoda
- Order - Pulmonat
- Genus - *Limax*

Habitat:-

Limax is a terrestrial gastropod. It is common in rainy seasons in damp shady places, such as gardens and forests. It is cosmopolitan in its distribution.

Habits:-

1. Nocturnal activity.
2. Herbivorous feeding.
3. Bisexual but shows cross fertilization.
4. Development is direct.

Point of Morphology:-

1. Body is elongated, dark grey in colour and tapers poteriorly. Body is differentiated into head, foot and visceral hump.
2. Head bears two pairs of tentacles. Anterior tentacles are short and posterior tentacles are long and bear eyes at their tip.
3. Mouth ventral in position and bounded by a pair of lateral lips.
4. Mantle forms a small, shield-like area on the dorsal side of the anterior part of the body.
5. Visceral hump has a pulmonary aperture for aerial respiration.

Economic Importance:-

They act as plant pests and damage seedlings, tender shoots and leaves. They are taken as food in some countries.

DORIS

Classification:-

- Phylum - Mollusca
- Class - Gastropoda
- Order - Nudibranchiata
- Genus - *Doris*

Habitat:-

Doris is a marine gastropoda and is found under stones in almost all the seas. It is cosmopolitan in its distribution.

Habits:-

1. Nocturnal activity.
2. Carnivorous feeding.
3. Bisexual but shows cross fertilization.
4. Development is direct.

Morphology:-

1. Body is oval and depressed convex above and flat below.
2. Head is indistinct, but anterior end bears a pair of olfactory tentacles or rhinophores.
3. Mantle covers the entire body and bears papillae or tubercles on the dorsal side.
4. Sole like foot on the ventral side.
5. Anus is surrounded by a ring of secondary branchial or gills for respiration.

Economic Importance:-

It is used as a museum specimen.

LOLIGO

Classification:-

- Phylum - Mollusca

- Class - Cephalopoda
- Order - Decapoda
- Genus - *Loligo*

Habitat:-

Loligo is a marine decapode found in coastal shallow or deep waters of warm seas. It is cosmopolitan in its distribution.

Habits:-

1. Gregarious feeder.
2. Locomotion is swimming type.
3. Defence is by camoflauge.
4. Unisexual, sexual dimorphism is present.

Morphology:-

1. Body divisible into head, neck and trunk.
2. Head bears 8 sucker-bearing arms, 2 long tentacles, a pair of eyes and mouth. Actually head is very small. It is muscular foot that give rise to 8 arms round the mouth.
3. Trunk is long, narrow and cylindrical.
4. Fins are short, broad, terminal and united posteriorly.

Economic Importance:-

It is eaten as food by Chinese and Italians.

SEPIA

Classification:-

- Phylum - Mollusca
- Class - Cephalopoda
- Order - Decapoda
- Genus - *Sepia*

Habitat:-

Sepia is a marine decapode inhibiting shallow coastal waters in the warm seas. It is cosmopolitan in its distribution.

Habits:-

1. Gregarious feeder.
2. Locomotion is swimming type.
3. Defence is by discharging ink behind it.
4. Unisexual, sexual dimorphism is present.

Morphology:-

1. Body is brownish in colour and have as globular head and shield like trunk.
2. Head bears 8 sucker bearing oral arms and 2 sucker-bearing tentacles, a pair of large laterally placed eyes and mouth. Actually the head is very small, it the muscular foot that give rise to 8 long arms round the mouth.
3. The trunk bears lateral muscular folds, the fins or parapodia.
4. Presence of a funnel or siphon on the ventral side.

Economic Importance:-

1. It is used as food.
2. It gives sepia-ink used by artists and also have medicinal value.
3. Its shell (internal) is used as a source of calcium for pet birds.

OCTOPUS

Classification:-

- Phylum - Mollusca
- Class - Cephalopoda
- Order - Octapoda
- Genus - *Octopus*

Habitat:-

Octopus is a marine cephalopod. They are widely distributed, found in Europe, India, Atlantic and Pacific coasts.

Habits:-

1. Carnivorous feeder.
2. Locomotion is swimming type.
3. Defence is by camoflauge.
4. Unisexual, sexual dimorphism is present.

Morphology:-

1. Body contains visceral mass but it looks like a head, though head is present but it is small.
2. The muscular foot modifies and give rise to 8 long arms.
3. Each arm has double row of suckers.
4. Typical molluscan shell is absent, it is actually reduced and found embedded in the body wall, therefore, not visible.
5. Fins are absent.
6. Bears eyes and a funnel (siphon).

Economic Importance:-

1. In many countries its meat is considered a delicacy.
2. Some species of octopus are harmful as they voraciously eat fishes and can hold even a man in its arms.

CHITON

Classification:-

- Phylum - Mollusca

- Class - Amphineura
- Order - Chitonida
- Genus - *Chiton*

Habitat:-

It is marine and found attached to the rocks, empty shells etc. Mostly littoral or sub-littoral, occurring in shallow tidal areas. In India they are most commonly seen on the sea-side rocks in Mumbai and Rameshwaram.

Habits:-

1. Gregarious feeder.
2. Locomotion is crawling type.
3. Defence is by camoflauge.
4. Unisexual, sexual dimorphism is present.

Morphology:-

1. Body is covered dorsally by a shell consisting of a row of 8 calcareous plates.
2. Head lacks tentacles and eyes.
3. Foot is sole like on the ventral side.
4. Presence of a pallial groove with many pairs of bipectinate gills on ech side of the body.

Economic Importance:-

1. Chitons are eaten by Red Indians in USA therefore, sometimes also called a “Sea beef”.
2. They are a good source of carotenes, xanthophylls and vitamin A.

DENTALIUM

Classification:-

- Phylum - Mollusca
- Class - Scaphopoda
- Genus - *Dentalium*

Habitat:-

Dentalium is a marine, fossorial mollusca found in the shallow and deep waters. It is widely distributed except for the cold polar waters.

Habits:-

1. Omnivorous feeder.
2. Unisexual but no sexual dimorphism.
3. Female is oviparous.
4. Development includes velliger larva.

Morphology:-

1. Shell is tubular and curved and open at both the ends.
2. From the broader end of the shell projects out foot, mouth and small tentacles called captacula. Captacula help in food collection.

Economic Importance:-

It is used as a decorative piece. Red Indians of USA use the empty shells to make ornaments.

EXPERIMENT – 8

AIM:- To study the different specimen of phylum echinodermata.

ATERIAS

Classification:-

- Phylum - Echinodermata
- Class - Asteroidea
- Order - Asteroida
- Genus - *Asterias*

Habitat:-

Asterias is a marine, bottom dwelling (benthonic) echinoderm found living in the deep sea preferring rocky areas where locomotion and concealment are easier. It is found sea water around India and USA.

Habits:-

1. Locomotion is creeping type.
2. Carnivorous feeding.
3. Unisexual but without sexual dimorphism.
4. Development includes bipinnaria larva.

Morphology:-

1. Body is star-shaped and is formed of a central disc and five radiating arms. Body is flat with distinct oral and aboral surfaces.
2. Central disc has mouth on oral side and madreporite and anus on the aboral side.
3. From the mouth leading into the arms are five ambulaeral grooves one in each arm. Ambulacral groove contains two double rows of podia or tube feet.
4. Aboral surface bears numerous short, stout spines.

Economic Importance:-

1. They are harmful as they cause a considerable damage to clams and oyster.
2. They are useful also. Dried and powdered starfishes are used as fertilizer. Their eggs are edible. They also act as scavengers to clean the sea floor.

ECHINUS

Classification:-

- Phylum - Echinodermata
- Class - Echinoidea
- Order - Echinoida
- Genus - *Echinus*

Habitat:-

Echinus is a marine, benthonic, occur between the intertidal zone upto a depth of 5000 meters. They are widely distributed in the Atlantic, Pacific and Mediterranean ocean.

Habits:-

1. Locomotion is creeping type.
2. Omnivorous feeding.
3. Unisexual but without sexual dimorphism.
4. Development includes echinopluteus larva.

Morphology:-

1. Body is globular and is somewhat flattened, covered by a rigid, globular shell called test or corona.
2. Mouth is present on the oral side and is surrounded by an area called the peristome.
3. Anus is present on the aboral side and is surrounded by an area called periproct.
4. Presence of branchial surrounding the peristome.
5. Presence of movable spines.

Economic Importance:-

1. They are useful as they act as scavengers.
2. Their eggs are used in embryological studies.

CUCUMARIA

Classification:-

- Phylum - Echinodermata
- Class - Holothuroidea
- Order - Dendrochirota
- Genus - *Cucumaria*

Habitat:-

Cucumaria is a marine echinoderm found in the shallow tropical and sub-tropical waters of Indo-Pacific sea. It is found in India, West Indies and Florida.

Habits:-

1. Locomotion with the help of muscular undulation of body.
2. Omnivorous feeding.
3. Unisexual but without sexual dimorphism.
4. Development includes Auricularia larva.

Morphology:-

1. Body is elongated through oral-aboral axis and look like a cucumber.
2. Arms and spines absent.
3. Mouth and anus are at the two opposite ends of the body. Mouth is anteriorly placed and is surrounded by oral tentacles.
4. Body bears numerous podia or tubefeet.
5. Body surface has alternating ambulacral and interambulacral zones.

Economic Importance:-

1. It is used as museum specimen.
2. It is used as food in some countries.

OPHIOTHRIX

Classification:-

- Phylum - Echinodermata
- Class - Ophiuroidea
- Order - Ophiurae
- Genus - *Ophiothrix*

Habitat:-

It is marine, benthonic echinoderms that is found in shallow to deep waters. It is cosmopolition in its distrubtion.

Habits:-

1. Nocturnal activity.
2. Locomotion is creeping type.
3. Carnivorous feeding.
4. It has the power of regeneration.
5. Unisexual reproduction, development includes pluteus larva.

Morphology:-

1. Body is five rayed star-shaped formed of central disc and five arms.
2. Arms are clearly demarcated from the central disc.
3. Mouth is present on the oral surface and has five angles.
4. In ech radius, these are two bursal slits.

Economic Importance:-

It is used as a museum specimen.

ANTEDON

Classification:-

- Phylum - Echinodermata
- Class - Crinoidea
- Order - Articulata
- Genus - *Antedon*

Habitat:-

Antedon is a marine, sedentary echinoderm found attached to rocks in the sea at moderate depths. It is cosmopolitan in distribution, found in all seas. It is commonly found along Atlantic coast.

Habits:-

1. Omnivorous feeding, food is capture with the help of pinnules.
2. Locomotion is absent.
3. Have the power of regeneration.
4. Unisexual, development includes pentacrinoid larva.

Morphology:-

1. Body is made up of central convex disc and five arms.
2. Each arm is divided into two branches at the base.
3. Arms bear spine like structures called pinnules.
4. Aboral side of the central disc bears cirri.
5. Both mouth and anus situated on the oral side.

Economic Importance:-

It is a living fossil.

ASTROPHYTON

Classification:-

- Phylum - Echinodermata
- Class - Ophiurodea
- Order - Eurylae
- Genus - *Astrophyton*

Habitat:-

Astrophyton is a marine echinoderm. It occurs in North Atlantic upto a depth of 1500 meters.

Habits:-

1. Carnivorous feeding, food is capture with the help of pinnules.
2. Have the power of regeneration.
3. Unisexual, development includes pluteus larva.

Morphology:-

1. Body star-shaped formed of a central disc and five arms.
2. Arms are greatly branched and bear spines on their oral side.
3. Near the end of arms, the spines are modified into hooks.

Economic Importance:-

It is used as a museum specimen.

EXPERIMENT – 9

AIM:- To study the given specimen of phylum hemichordata.

BALANOGLOSSUS

Classification:-

- Phylum - Hemichordata
- Class - Enteropneusta
- Genus - *Balanoglossus*

Habitat:-

Balanoglossus is marine, fossorial, tubicolous worm like animal which lives in a U-shaped burrow at the bottom of sand in intertidal zone. It is cosmopolitan in distribution.

Habits:-

1. Lives in burrows.
2. Omnivorous feeding.
3. Unisexual, sexual dimorphism is present.
4. Development includes tornaria larva.

Morphology:-

1. Body is divided into shrot conical proboscis, collar and long trunk.
2. Proboscis is cylindrical, tapering and muscular. Near its base there is present a proboscis pore.
3. Trunk is long and divided into three parts: (a) anterior branchiogenital part; (b) hepatic region and (c) the posterior end.
4. Presence of anus at the end of trunk.

Economic Importance:- It acts as a connecting link between chordates and non-chordates. Thus, have an evolutionary significance.

EXPERIMENT – 10

AIM:- To study the permanent stained slides of protozoans.

AMOEBA (W.M.)

Identification Points:-

1. Irregular-shaped (asymmetrieal) body due to the presence of many pseudopodia (lobopodia).
2. Body covered by plasmalemma.
3. Cytoplasm differentiated into ectoplasm and endoplasm.
4. Presence of a single stained nucleus, a large single contractile vacuole and large number of food vacuoles in the endoplasm.

EUGLENA (W.M.)

Identification Points:-

1. Oval spindle shaped body with blunt anterior and pointed posterior end.
2. Body is externally covered with pellicle.
3. Anterior end of the body has a flask-shaped cytopharynx which leads into a large reservoir.
4. Presence of a single whip-like flagellum that arises from the base of the reservoir.
5. Presence of a single whip-like flagellum that arises from the base of the reservoir.
6. Presence of nucleus, radially arranged chloroplasts and paramylum bodies in the endoplasm.

TRYPANOSOMA (W.M.)

Identification Points:-

1. Body is elongated and tapering at both ends.
2. Anterior end more tapering while posterior end is somewhat bluntly rounded.
3. A single flagellum present at the anterior end.
4. Flagellum is attached to the outer surface of undulating membrane.
5. Presence of a rounded nucleus somewhat in the middle of the body.

NYCTOTHERUS (W.M.)

Identification Points:-

1. Body is bean-shaped and covered with short cilia.
2. Presence of lateral peristome and posterior cytopyge.
3. Cytoplasm differentiated into ectoplasm and endoplasm.
4. Endoplasm contains food vacuoles, contractile vacuole and two nuclei.
5. Macronucleus is large and oval in shape and micronucleus is small and rounded in shape.

RADIOLARIAN OOZE (W.M.)

Identification Points:-

1. Many radiolarians have a hard, transparent, symmetrical skeleton.
2. Skeleton imparts different shapes to these organisms.
3. The opening of the skeleton is extended in the form of fine, stiff ray-like pseudopodia (filopodia).

PARAMECIUM (W.M.)

Identification Points:-

1. Slipper-like body with blunt anterior and pointed posterior end.
2. One side of the organism has a depression, which leads into a oral groove.
3. Cytoplasm clearly divisible into ectoplasm and endoplasm.
4. Presence of a large kidney-shaped macronucleus and a dot like micronucleus and many food vacuoles in the cytoplasm.

PARAMECIUM IN BINARY FISSION (W.M.)

Identification Points:-

1. Presence of a transverse constriction around the body between the daughter nuclei.
2. Anterior daughter is called proter and posterior daughter is called opisthe.

PARAMECIUM IN CONJUGATION (W.B.)

Identification Points:-

1. The two Paramecia in paired conditions known as conjugants are seen.
2. An endoplasmic bridge between two conjugating Paramecia is visible.
3. Each conjugant has a smaller male pronucleus and a larger female pronucleus.

EXPERIMENT – 11

AIM:- Identification of permanent slides of phylum porifera.

SYCON (T.S.)

Identification Points:-

1. Body wall consists of an outer dermal epithelium of flattened pinacocytes and inner gastrodermis of choanocytes.
2. Presence of mesenchyme between two cellular body layers.
3. Thick body wall consists of incurrent canals and radial canals arranged alternately.

SYCON (L.S.)

Identification Points:-

1. Body wall consists of an outer dermal epithelium of pinacocytes and inner gastrodermis of choanocytes.
2. Outer dermal epithelial layer is perforated by many dermal ostia.
3. Presence of mesenchyme between two cellular body layers.
4. Thick body wall consists of incurrent canals and radial canals arranged alternately.

LEUCOSOLENIA (L.S.)

Identification Points:-

1. Body wall is thin and unfolded.
2. Mesenchyme is feebly developed.
3. Ostia open directly into the spongocoel.
4. Ostia open directly into the spongocoel.
5. Spongocoel is large and lined all over by flagellated (choanocytes) cells and opens out by a single terminal osculum.
6. Presence of Asconoid type of canal system.

GEMMULE (W.M.)

Identification Points:-

1. Gemmule is a rounded body with a central mass of archoaeocytes enclosed in a double layered cyst wall.
2. Archeocytes are surrounded by amphidisc spicules.
3. Presence of monoaxon spicules.
4. Presence of micropyle in fully grown gemmule.

SPICULES OF A SPONGE (W.M.)

Identification Points:-

1. Monoaxon spicules are linear shaped in a single axis.
2. Some spicules with similar ends and some with dissimilar ends.

EXPERIMENT – 12

AIM:- To study the permanent stained slides of phylum coelenterata.

HYDRA WITH BUDS (W.M.)

Identification Points:-

1. Body is long, tube-like and have oral and aboral ends.
2. Oral end bears a conical manubrium with circular mouth at the tip.
3. Mouth is surrounded by a ring of tentacles.
4. Presence of external outgrowth called buds.

OBELIA COLONY (W.M.)

Identification Points:-

1. Obelia colony is highly branched and consists of two types of branching filaments : horizontal and vertical.
2. Horizontal branches collectively called hydrorhiza hydrocauli.
3. Hydrocaulus branches in a scorpioidcymose (zig-zag) manner.
4. Apex of each hydrocaulus ends in a bud.

MEDUSA OF OBELIA (W.M.)

Identification Points:-

1. Medusa is saucer-shaped or umbrella-shaped having upper convex ex-umbrella and lower concave sub-umbrella.
2. From the centre of sub-umbrella hangs a vertical tube called manubrium. Manubrium has at its lower end a four-sided aperture, the mouth.
3. Slender filaments, called the tentacles, hang down from the edge of the umbrella.
4. Presence of four per-radial gonads and eight ad-radial sense organs called statocysts.

EPHYRA LARVA OF AURELIA (W.M.)

Identification Points:-

1. Body is saucer-shaped with 8 bifid arms.
2. Four arm are per-radial and other four are inter-radial in position.
3. Each arm ends into two lappets with a sensory notch.
4. Presence of a four-sided mouth at the centre of sub-umbrellar surface.

EXPERIMENT – 13

AIM:- To study the permanent slides of phylum platyhelminthes and aschelminthes.

T.S. FASCIOLA – PASSING THROUGH TESTES

Identification Points:-

1. Body wall lacks epidermis and is formed of thick spiny tegument (non-cellular cuticle), muscle-layers and mesenchyme cells.
2. Presence of many section of intestinal caecae and sections of testes.
3. Sections of testes have different stages of spermatogenesis.
4. Presence of vitelline glands on the lateral sides.
5. Parenchyma fills the spaces between different body parts.

T.S. FASCIOLA – PASSING THROUGH UTERUS AND OVARY

Identification Points:-

1. Body wall lacks epidermis and is formed of thick spiny tegument, muscle-layers and mesenchyme cells.
2. Presence of section of ovary, intestinal caecae and uterus.
3. Sections of the ovary have different stages of oogenesis.
4. Presence of vitelline glands on the lateral sides.
5. Parenchyma fills the spaces between different body parts.

MICRACIDIUM LARVA OF FASCIOLA (W.M.)

Identification Points:-

1. Micracidium is an oval, microscopic, flattened larva which appears conical in shape.
2. Anterior end of the larva is projected into a conical lobe called apical papilla.
3. Body is uniformly covered with epidermal plates. There are 21 plates arranged in 5-rows.
4. Presence of two eye spots.

SPOROCYST LARVA OF FASCIOLA (W.M.)

Identification Points:-

1. Sporocyst is an elongated sac-like larva covered with cuticle.
2. Body wall is formed of outer tegument, musculature and mesenchyme.
3. Body sac contains germ cells, flame cells and redia larvae.
4. Presence of two excretory pores.

REDIA LARVA OF FASCIOLA (W.M.)

Identification Points:-

1. Body of redia larva is elongated, cylindrical and sac-like.
2. Body wall is formed of tegument, epithelial layer and mesenchyme.
3. Presence of mouth at the anterior end. Mouth leads into pharynx and a sac-like intestine.
4. Presence of a muscular ring like swelling called the collar.

CERCARIA LARVA OF FASCIOLA (W.M.)

Identification Points:-

1. Larva has a flat, oval body with a long tadpole like tail.
2. Presence of mouth at the anterior end and is surrounded by an anterior or oral sucker.
3. Presence of a large ventral sucker or acetabulum situated in the middle of the body on ventral side.
4. Body space is filled with parenchyma and contains a few cystogenous glands, numerous flame cells and reproductive rudiments.

SCOLEX OF TAENIA SOLIUM (W.M.)

Identification Points:-

1. Scolex is about 1 mm in diameter with four cup-like adhesive suckers.
2. Presence of 22-32 curved, chitinous hooks in two circles.
3. Hooks are arranged in a ring around the base of a retractile cone, the rostellum.

MATURE PROGLOTTID OF TAENIA SOLIUM (W.M.)

Identification Points:-

1. Mature proglottids are almost squarish in form and have fully developed sex organs, nervous and excretory systems.
2. Both the lateral sides of proglottids contain lateral longitudinal nerve cords and lateral excretory canals.
3. Male reproductive system is formed of testes, vasa efferentia, vasa deferentia and cirrus (penis).
4. Female reproductive system consists of a bilobed ovary connected by isthmus, oviduct, ootype, vitellaria and Mehlis gland, vagina and uterus.

FEMALE ASCARIS (T.S.)

Identification Points:-

1. Body consists of outer cuticle, syncitial opidermis and longitudinal muscles.
2. Muscle layer is formed of spindle shaped longitudinal muscles only. Each muscle is drawn into long muscle tail.
3. Epidermis is thickened into ridges in four regions which project into the body cavity as four longitudinal chords of which two are lateral ones, one dorsal and one ventral.
4. Two lateral excretory canals are visible within the two lateral cords.

EXPERIMENT – 14

AIM:- To identify the permanent slides of phylum annelida.

PHERETIMA THROUGH PHARYNEGEAL REGION T.S.

Identification Points:-

1. Body wall formed of four layers : cuticle, epidermis, musculature and coelomic epithelium (parietal peritoneum).
2. Presence of true coelom lined by parietal and visceral peritoneal layers.
3. Presence of section of pharynx in the centre.
4. Presence of pharyngeal bulb on the roof of pharynx.

PHERETIMA THROUGH TYPHLOSOLAR REGION T.S.

Identification Points:-

1. Body wall formed of four layers : cuticle, single layered epidermis, musculature (outer circular and inner longitudinal muscles) and coelomic epithelium (parietal peritoneum).
2. Presence of true coelom lined by parietal and visceral peritoneal layers.
3. Body cavity or coelum is having a central section of intestine. Intestine is having a middorsal projection the typhlosole.
4. Presence of sections of supra intestinal excretory ducts and doral blood vessel above the section of intestine in the coelom.

SEPTAL NEPHRIDIUM OF EARTHWORM (W.M.)

Identification Points:-

1. Septal nephridium is formed of a ciliated funnel (nephrostome), neck, body of nephridium and terminal duct.
2. Nephrostome funnel is a rounded structure through which the nephridium opens into the coelom.
3. Body of the nephridium is formed of a short straight lobe and a long spirally twisted loop.
4. Spirally twisted loop is differentiated into proximal and distal limbs.

SETAE OF EARTHWORM (W.M.)

Identification Points:-

1. Each seta is somewhat f-shaped.
2. Each seta is formed of three parts-base, body and neck.
3. Each seta is having a slight swelling, the nodulus, near the middle.

EXPERIMENT – 15

AIM:- To identify the different slides of phylum arthropoda.

MOUTH PARTS OF COCKROACH (PERIPLANETA) (W.M.)

Identification Points:-

1. Mouth parts are of biting and chwing type.
2. Mouth parts include labrum, hypopharynx, two mandibles, two maxillae and a labium.
3. Mandibles broad and plate-like with inner margins serrated adapted for biting and chewing of food.
4. Maxilla consists of basal protopodite formed of carbo and stipes, outer expedite forms maxillary palp and inner part endopodite formed of glacina and galea.

HEAD AND MOUTH PARTS OF APIS (HONEY BEE) (W.M.)

Identification Points:-

1. Head of a worker bee bar a pair of oval compound eyes, three simple ocelli and a pair of many jointed antennae.
2. Mouth parts of chewing and lapping type adapted for collecting nectar, pollens and moulding wax.
3. Mandibles are smooth and spoon-shaped.
4. Maxillae lack laciniae, have vestigial palp and bear long blade-like galae.

CIMEX- W.M.

Identification Points:-

1. Body is small, falt, reddish brown and subcircular.
2. Body is divided into three parts : head, thorax and abdomen.
3. Head is small and bears a pair of small compound eyes, a pair of long antennae and piercing and sucking type of mouth parts.
4. Thorax bears a pair of mesothoracic wing pads. Hind wings are absent. It also bears three pairs of jointed legs.
5. Abdomen is without appendages.

HEAD AND MOUTH PARTS OF HOUSEFLY (MUSCA) (W.M.)

Identification Points:-

1. Head is large and bears a pair of compound eyes, three ocelli and a pair of short antennae.
2. Mouth parts are of sponging or lapping type used for absorbing fluid food. Mouth parts are formed of proboscis, maxillary palps, labrum-epipharynx and hypopharynx.
3. Mandibiles are absent.
4. Maxillae are represented only by single jointed maxillary palps.

STATOCYST OF PRAWN T.S.

Identification Points:-

1. Statocyst is a subspherical circular sac about 1-1.5 mm wide.
2. Presence of an oval ring of delicate receptor setae round a minute heap of sand grains.
3. Each receptor seta is formed of two parts : a swollen base and a slender.

EXPERIMENT – 16

AIM:- To study the permanent slides of phylum mollusca.

GLOCHIDIUM LARVA OF ANODONTA (W.M.)

Identification Points:-

1. Glochidium larva has a bivalve shell. Two valves are interconnected by a single abductor muscle.
2. Each valve ends distally into a hook.
3. Presence of mantle. Mantle has brush-like sensory bristles.
4. Presence of long adhesive byssus thread.

RADULA OF PILA (W.M.)

Identification Points:-

1. Radulla is a flat ribbon-like structure found inside the buccal cavity of pila.
2. It is quite hard and brownish in colour.
3. It bears several transverse rows of minute horny teeth.
4. It bears two wing-like outgrowths called flaps at its anterior end.

OSPHRADIUM OF PILA (W.M.)

Identification Points:-

1. Osphradium is an oval bipectinate organ.
2. It is formed of a slightly raised central axis bearing on either side a row of about 14 fleshy conical leaflets.
3. The leaflets are attached to the mantle by their broad bases.

EXPERIMENT – 17

AIM:- To study the different slides of phylum echinodermata.

ARM OF STARFISH T.S.

Identification Points:-

1. Body well is formed of cuticle, single layered epidermis, dermis, muscular coat and coelomic epithelium.
2. Presence of dermal ossicles and haemal spaces in the dermis.
3. Presence of spines, pedicellarial and branchial on the outer surface (aboral side).
4. Presence of tube feet, radial nerve, perihaemal canals, ambulacral groove on the oral side.
5. Presence of pyloric caecae and gonads in the perivisceral coelom.

PEDICELLARIAE OF STARFISH (W.M.)

Identification Points:-

1. They are microscopic pincer-like bodies.
2. Each is formed of a flexible stalk bearing three calcareous plates : a basilar plate and two jaws.
3. Each jaw is bears serrations on its inner side.

EXPERIMENT – 18

AIM:- To study the permanent stained slides of phylum hemichordate.

BALANOGLOSSUS THROUGH BRANCHIOGENITAL REGION T.S.

Identification Points:-

1. Body wall is formed of a single layer of tall, narrow columnar cells and musculature.
2. Presence of gill pores.
3. Presence of many gonads.
4. Presence of genital wings.

EXPERIMENT – 19

AIM:- To prepare a temporary squash preparation of onion root tips.

Requirements:-

1. Fixed onion root tips.
2. Acetic alcohol.
3. Acetocarmine stan.
4. n/10 HCl or 2N hydrochloric acid.
5. Spirit lamp.
6. Watch glass.
7. Clean glass slides.
8. Coverslips.
9. 70% alcohol.
10. Filter paper.
11. Nail polish and a compound microscope.
12. Conical flask.
13. Beakers etc.

Procedure:-

1. For the growth of onion root tips place the onion bulbs with their root side down in contact with water in a beaker or conical flask.
2. After 3 to 4 days when the roots grow upto a length of 2 to 3cm remove the onion bulbs and cut the root tips and transfer them to a solution of acetic alcohol (acetic acid 1 Part and ethyl alcohol 3 parts v/v.
3. Acetic alcohol acts as a fixative to fix the roots.
4. Keep root tips in this fixative for 12-24 hrs.
5. After fixation transfer these root tips in 70% alcohol until they are used for squash preparation.
6. Transfer the root tips from fixative or 70% absolute alcohol into a watch glass and wash them with water.
7. Drain off water with the help of a pipette and add a few drops of n/10 HCl. Wait for 10 minutes at room temperature or heat for a minute over a spirit lamp flame.
8. After hydrolysis drain off the HCl and wash the root tips in water.

9. After hydrolysis drain off the HCl and wash the root tips in water.
10. Remove the water and cut the root tips to retain only the meristematic region and remove the debris from the slide/watch glass.
11. Take one onion root tip on the clean slide and add a drop of 1% acetocarmine on the root tip and carefully place a cover slip over it.
12. Gently heat it on a spirit lamp and then coatl, repeat this process 4-5 times.
13. Place the slide between the filter paper and gently press the cover slip down. Using the flat bottom of a pencil slowly tap on the filter paper (you can tap with your finger also) to obtain a uniform spread of the material.
14. Seal the edges of the cover slip by applying nail polish.
15. Observe the slide under the compound microscope.

EXPERIMENT – 20

AIM:- To prepare a temporary squash preparation of grasshopper testis.

Requirement:-

1. Grasshopper testis.
2. Acetocarmine stain.
3. Spirit lamp.
4. Watch glass.
5. Plain glass slides.
6. Coverslips.
7. Filter paper.
8. Droper.
9. Compound microscope.

Procedure:-

1. Collect grasshopper and select male out of them.
2. Chloroform male grasshoppers.
3. Remove wings of chloroformed grasshoppers and give a cut in tergites of 4 to 6the abdominal segments with the help of a scissors.
4. Take the testes and put then in 0.7% NaCL solution (normal saline). Remove fat bodies from the testes.
5. Place the testes into 1% sodium citrate solution for 10 minutes.
6. Put the testes in fixative (Carnoy's solution, formed of Glacial Acetic acid and absolute alcohol (1 : 3 v/v) for 24hrs.
7. Preserve the fixed testes into 70% alcohol.
8. Take few follicles of fixed grasshopper testes in a watch glass and add few drops of acetocarmine stain. Keep them in stain for 10-15 minutes.
9. Now take 2 or 3 follicles from stained testes material on a clean dry glass slide. And cover them with cover slip. Slightly warm the slide on the flame of spirit lamp to soften the follicles.
10. Place the slide between the folds of a filter paper and gently press the cover slip down. Gently tap on the filter paper with the help of the flat bottom of a pencil or your finger to obtain a uniform spread of the material.

11.Seal the edges of the cover slip by applying nail polish.
12.Observe the slide under the compound microscope.

EXPERIMENT – 21

AIM:- To study the different mitotic stages through permanent stained slides.

Different stages of mitosis are as follows:-

1. **Prophase:-**
    i. Appearance of chromosomes due to dehydration and unwinding of chromatin reticulum.
    ii. Chromosomes become shorter and thicker.
    iii. Each chromosome. Begins to appear as two chromatids with a single centromere.
    iv. Nuclear membrane and nucleolus slowly disappears.
2. **Metaphase:-**
    i. Chromosomes tend to arrange themselves in the middle of the cell called the equatorial plate.
    ii. When observed carefully, the sister chromatids of the chromosomes can be seen.
3. **Anaphase:-**
    i. Centromere splits and a single chromosome with two chromatids becomes two independent chromosomes.
    ii. Daughter chromosomes moves towards the opposite poles.
4. **Telophase:-**
    i. Chromosomes reach the poles and undergo coiling and form chromatin reticulum.
    ii. The nuclear membrane and nucleolus reappears.
    iii. Two daughter nuclei are formed at the poles.
5. **Cytokinesis:-**
    i. Cell plate formation.

EXPERIMENT – 22

AIM:- To study the different meiotic stages through permanent stained slides.

A. Meiosis – 1 :

1. **Prophase -1 :-** Prophase-1 is of the longest duration and is divided into 5-substages:
   a) **Leptotene:-**
      i. Chromosomes in the form of long thread like structures with beaded appearance visible.
      ii. Nucleus, nucleolus and nuclear membrance present.
2. **Zygotene :-**
      i. Zygotene pairing also called synapsis (pairing between two homologous chromosomes) is visible.
      ii. Chromosomes form bivalents.
      iii. Chromosomes becomes more shorter and thicker.
      iv. Nucleolus and nuclear membrane start disappearing.
3. **Pachytene :-**
      i. Each homologous chromosome pair consists of two closely opposed sister chromatids, this each pair containing four replicas known as tetrads.
      ii. Two non-sister chromatids twist around each other. This process is called crossing over.
4. **Diplotene:-**
      i. Separation of non-sister chromatids and tiht pairing is relaxed. This process is known as desynapsis.
      ii. The separation of homologous chromosomes is however not completed. They remain attached at one or more points where crossing over has occurred. These points of attachement are called chiasmata.
      iii. Nuclear membrane and nucleolus almost disappears.
5. **Diakinesis:-**
      i. Chromosomes becomes more thick.
      ii. Each bivalent is clearly seen to contain four separate chromatids, with each pair of sister chromatids attached at their centromere, whereas non-sister chromatids that crossed over are linked by chiasmata.
      iii. Nuclear membrane and nucleolus completely disappears.

B. Metaphase-1 :

1. Bivalent chromosomes arrange themselves in a plane of the equator forming equatorial plate.
2. Centromeres of each chromosome are directed towards the opposite poles.