INVERTEBRATES, VERTEBRATES AND BIODIVERSITY

M.Sc. ZOOLOGY
SEMESTER – I
PRACTICAL MANUAL

PAPER – V: INVERTEBRATES ,VERTEBRATES AND BIODIVERSITY

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INVERTEBRATES, VERTEBRATES AND BIODIVERSITY

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FOREWORD

Since its establishment in 1976, Acharya Nagarjuna University has been forging ahead in the path of progress and dynamism, offering a variety of courses and research contributions. I am extremely happy that by gaining 'A+' grade from the NAAC in the year 2024, Acharya Nagarjuna University is offering educational opportunities at the UG, PG levels apart from research degrees to students from over 221 affiliated colleges spread over the two districts of Guntur and Prakasam.

The University has also started the Centre for Distance Education in 2003-04 with the aim of taking higher education to the door step of all the sectors of the society. The centre will be a great help to those who cannot join in colleges, those who cannot afford the exorbitant fees as regular students, and even to housewives desirous of pursuing higher studies. Acharya Nagarjuna University has started offering B.Sc., B.A., B.B.A., and B.Com courses at the Degree level and M.A., M.Com., M.Sc., M.B.A., and L.L.M., courses at the PG level from the academic year 2003-2004 onwards.

To facilitate easier understanding by students studying through the distance mode, these self-instruction materials have been prepared by eminent and experienced teachers. The lessons have been drafted with great care and expertise in the stipulated time by these teachers. Constructive ideas and scholarly suggestions are welcome from students and teachers involved respectively. Such ideas will be incorporated for the greater efficacy of this distance mode of education. For clarification of doubts and feedback, weekly classes and contact classes will be arranged at the UG and PG levels respectively.

It is my aim that students getting higher education through the Centre for Distance Education should improve their qualification, have better employment opportunities and in turn be part of country's progress. It is my fond desire that in the years to come, the Centre for Distance Education will go from strength to strength in the form of new courses and by catering to larger number of people. My congratulations to all the Directors, Academic Coordinators, Editors and Lesson-writers of the Centre who have helped in these endeavors.

Prof. K. Gangadhara Rao
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INVERTEBRATE AND VERTEBRATE PRACTICAL SYLLABUS

INVERTEBRATES

1. Nervous system of squilla/ sepia
2. Digestive system of sepia
3. Nervous system of prawn
4. Digestive system of prawn
5. Appendages of prawn
6. Sting of honey bee
7. Gnathochilarium of millipede
8. Museum Specimens and slides relevant to the type study in theory

VERTEBRATES

9. Museum specimens and slides relevant to the type study in theory.

BIODIVERSITY

10. Endangered species of Indian sub-continent (invertebrates and vertebrates)

INVERTEBRATES SPECIMENS

PHYLUM- PORIFERA

1. Sycon
2. Euplectella
3. Chondrilla
4. Cliona
5. Euspongia
6. Hircinia

PHYLUM- COLELENTERATA

7. Hydra
8. Physalia
9. Porpita
10. Velella
11. Aurelia
12. Gorgonia
13. Pennatula
14. Astrea
15. Fungia

PHYLUM- PLATYHELMINTHES

16. Planaria
17. Bipalium
18. Fasciola hepatica
19. Taenia solium
20. Ascaris lumbricoides

PHYLUM- ANNELIDA

21. Nereis
22. Heteroneries
23. Aphrodite
24. Chaetopterus
25. Arenicola
26. Amphitrite
27. Pheretima
28. Lumbricus
29. Tubifex
30. Acanthobdella
31. Hirudinaria granulosa

PHYLUM- ARTHROPODA

32. Squilla
33. Palaemon malcolmsonii
34. Astacus
35. Carcinus
36. Scolopendra
37. Julus
38. Peripatus
39. Aranea
40. Limulus
41. Periplaneta
42. Melanopus or poecillocerus
43. Dragon fly

PHYLUM- MOLLUSCA

44. Chaetoderma
45. Chiton
46. Dentalium
47. Pila
48. Murex
49. Aplysia
50. Doris
51. Aeolis
52. Limnaea
53. Unio
54. Loligo
55. Sepia
56. Octopus
57. Nautilus

PHYLUM- ECHINODERMATA

58. Antedon
59. Asterias
60. Ophiolepis
61. Echinus
62. Echinarachinus
63. Clypeaster
64. Cucumaria
65. Holothuria

INVERTEBRATES ,VERTEBRATES AND BIODIVERSITY

INVERTEBRATE AND VERTEBRATE PRACTICAL SYLLABUS

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INVERTEBRATES SPECIMENS

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4. Cliona
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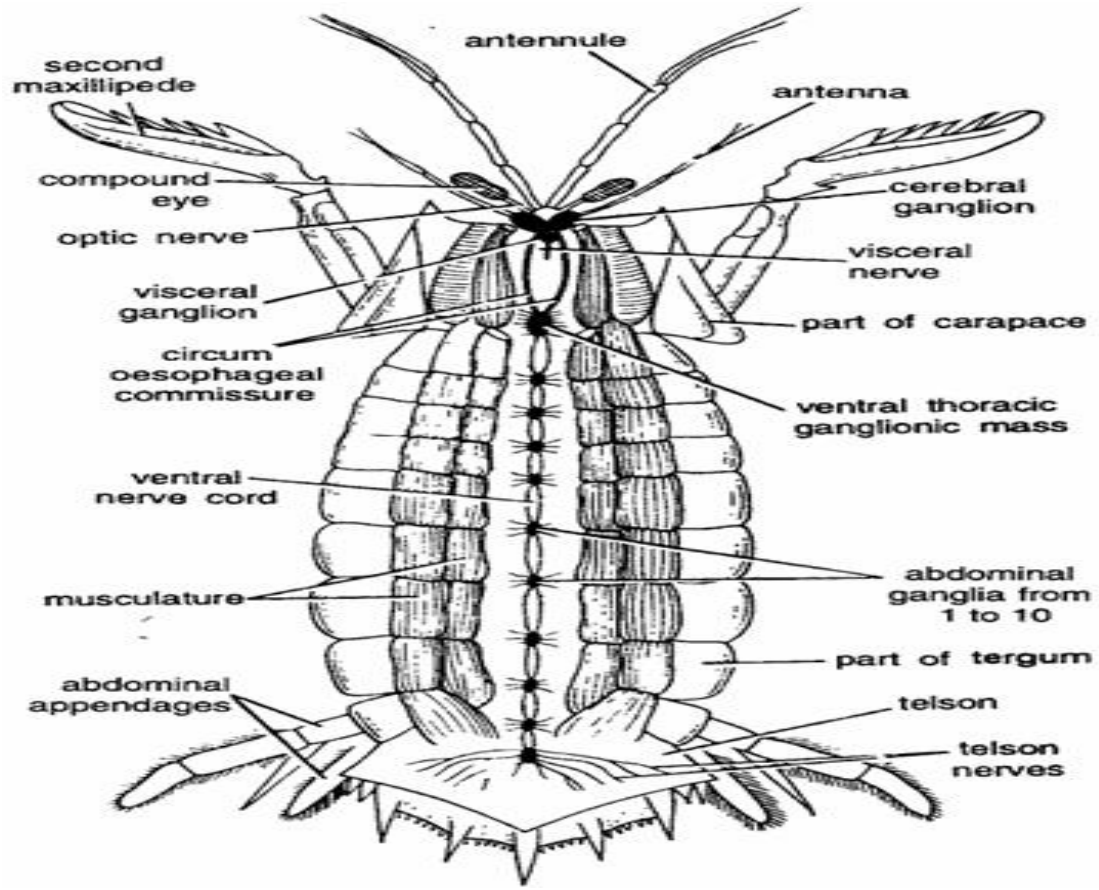
64. Cucumaria
65. Holothuria

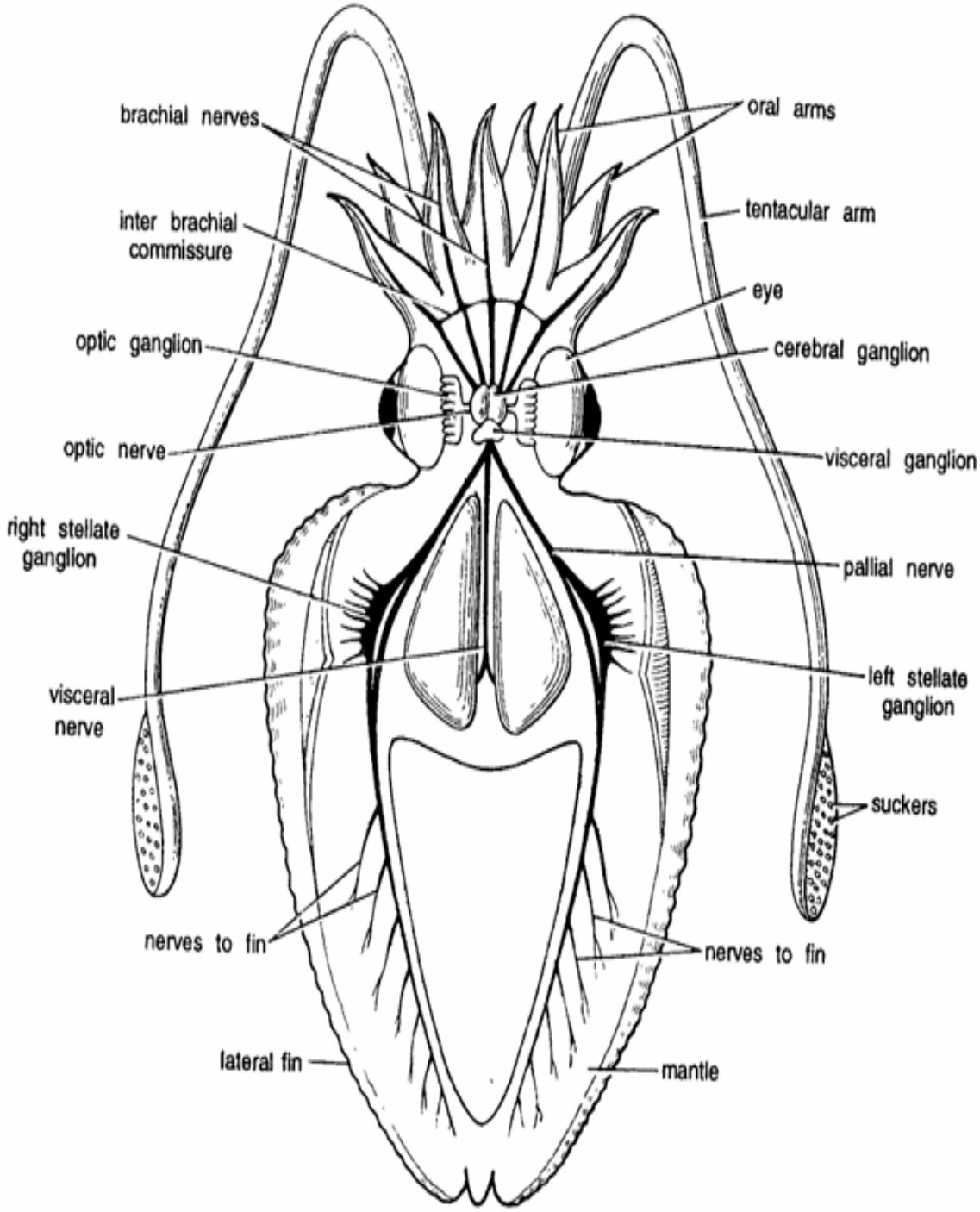
PRACTICAL MATERIAL INVERTEBRATES AND VERTEBRATES
INVERTEBRATES

NERVOUS SYSTEM OF SQUILLA



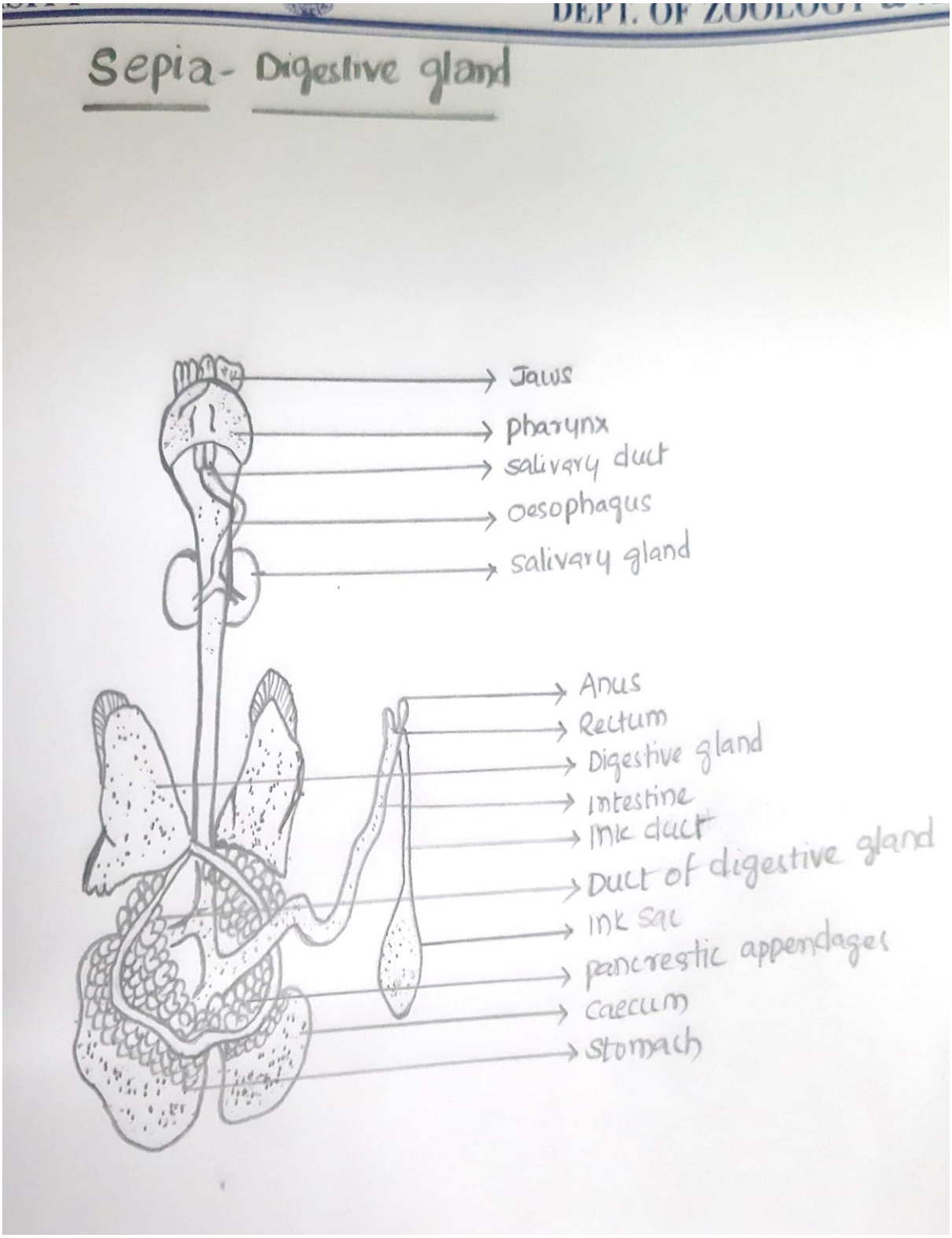
Nervous system squilla

NERVOUS SYSTEM OF SEPIA

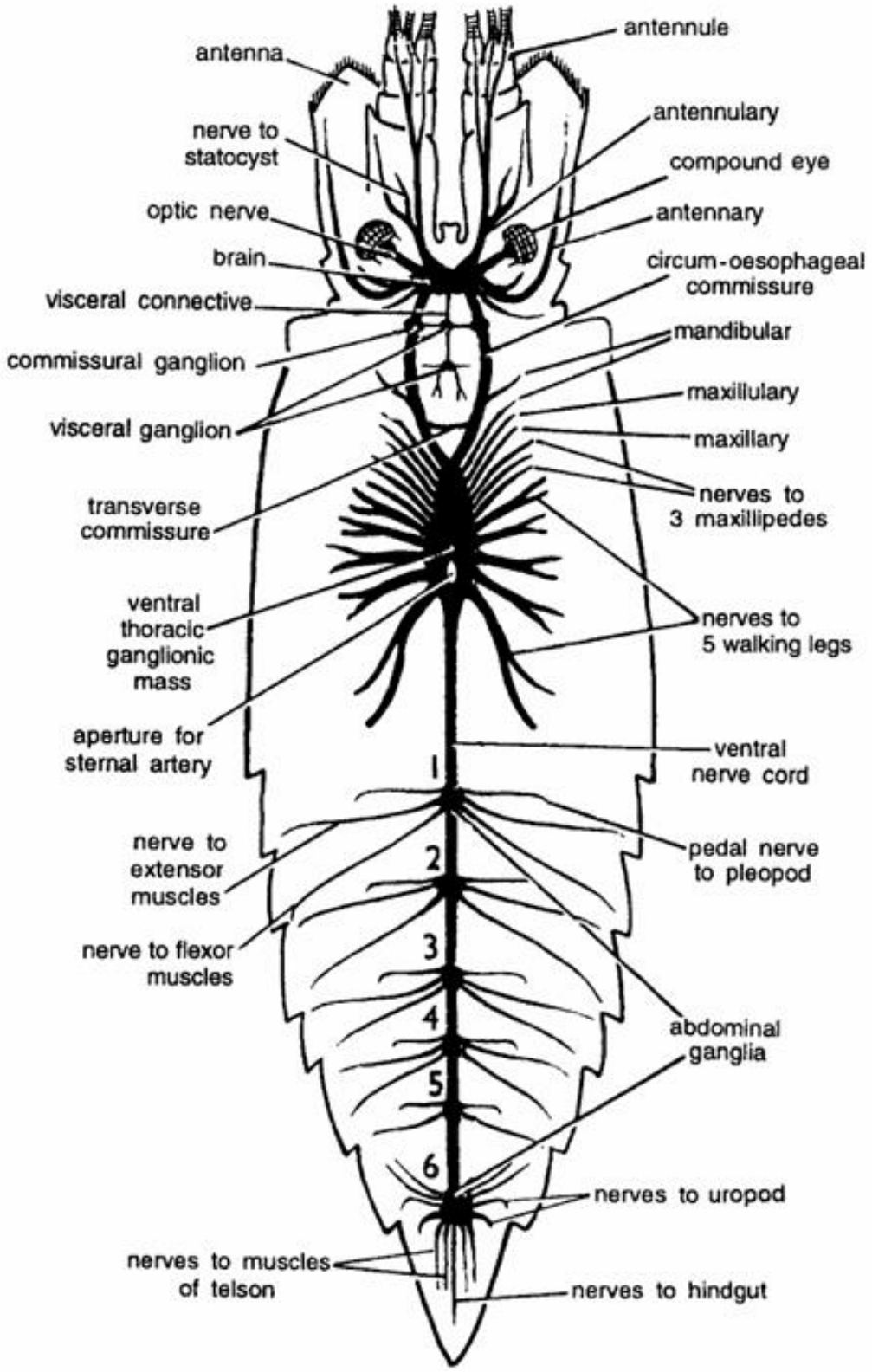


Nervous system of sepia

DIGESTIVE SYSTEM OF SEPIA



NERVOUS SYSTEM OF PRAWN



Nervous system of prawn

DIGESTIVE SYSTEM OF PRAWN

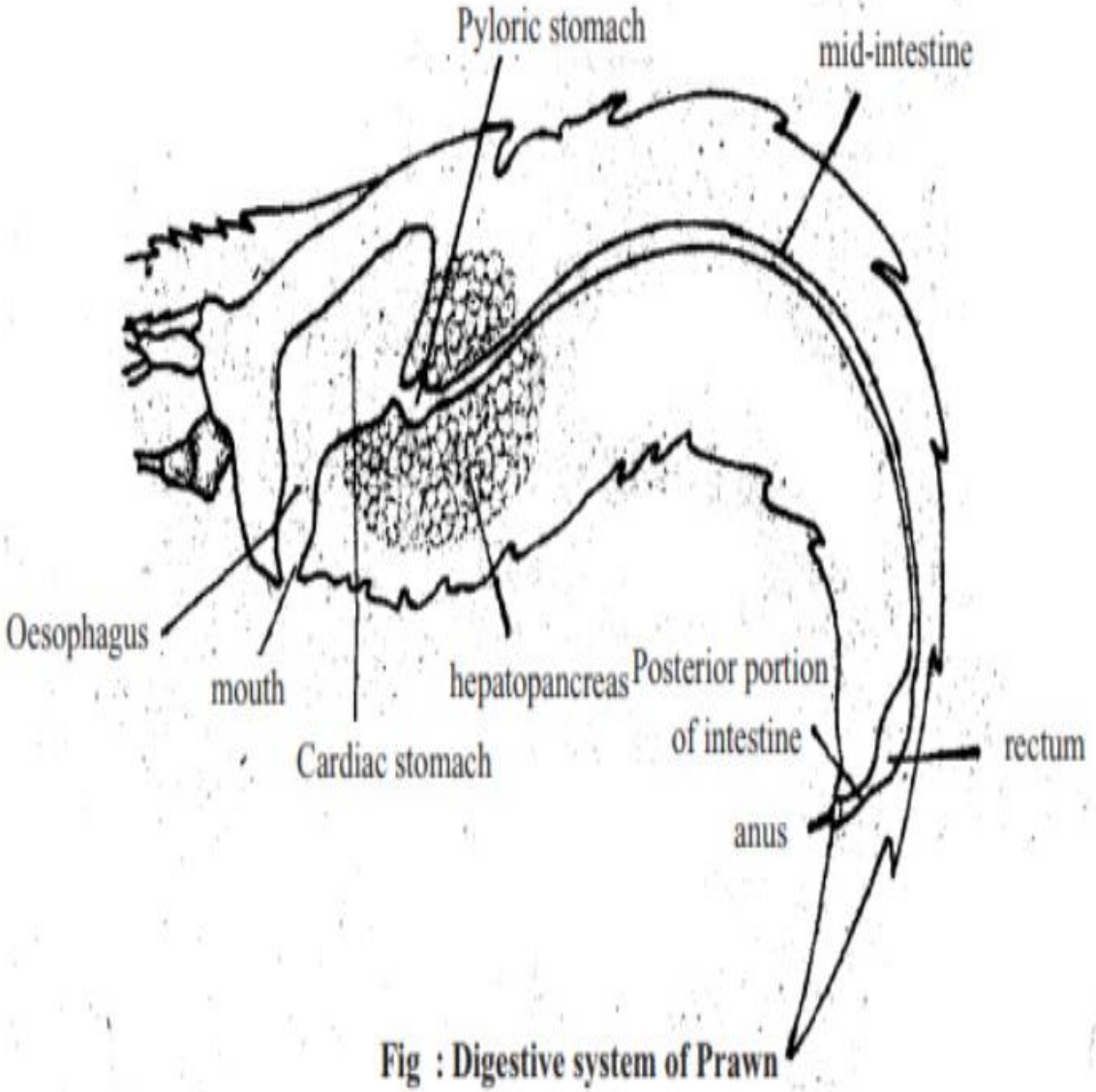
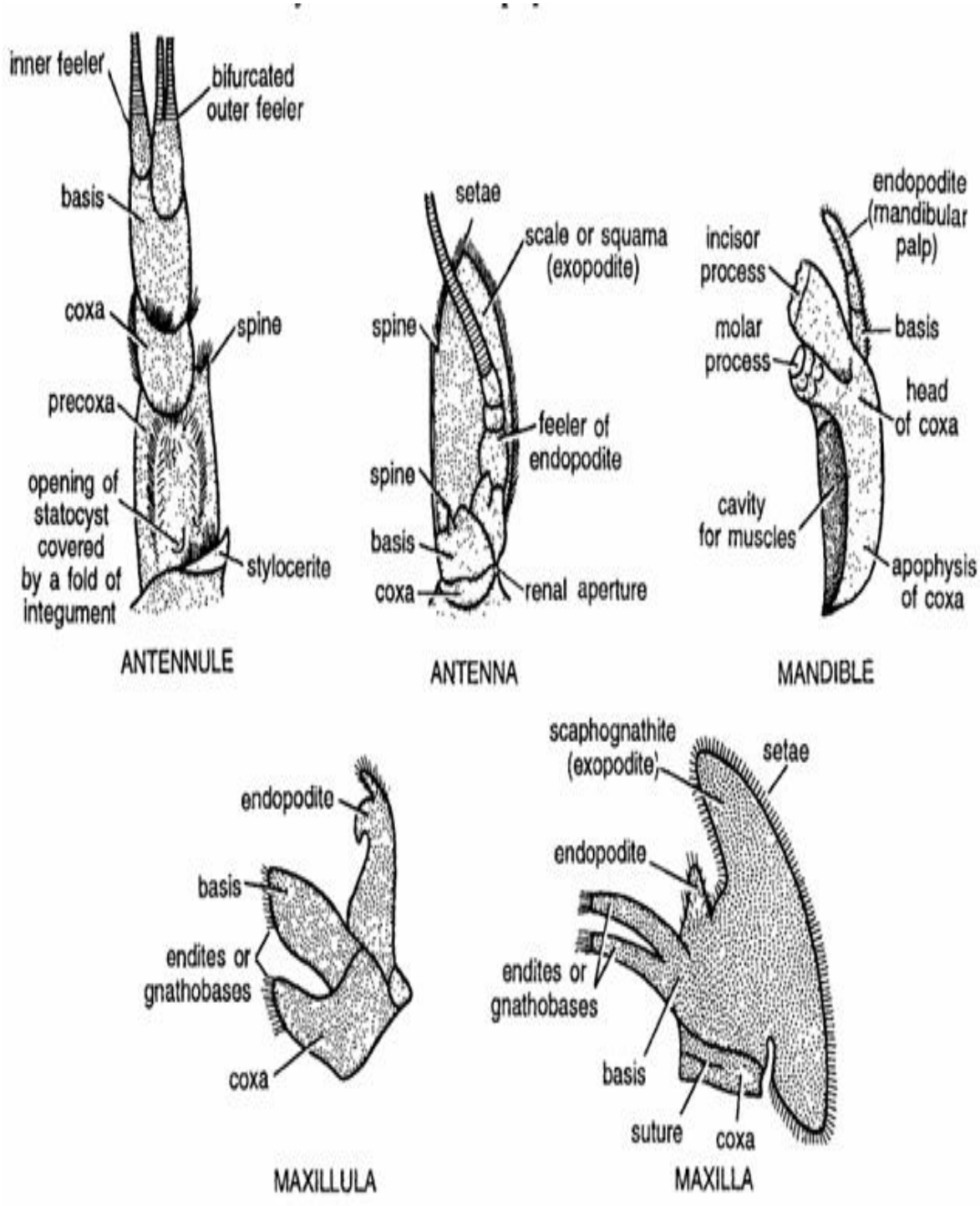


Fig : Digestive system of Prawn

Digestive system of prawn

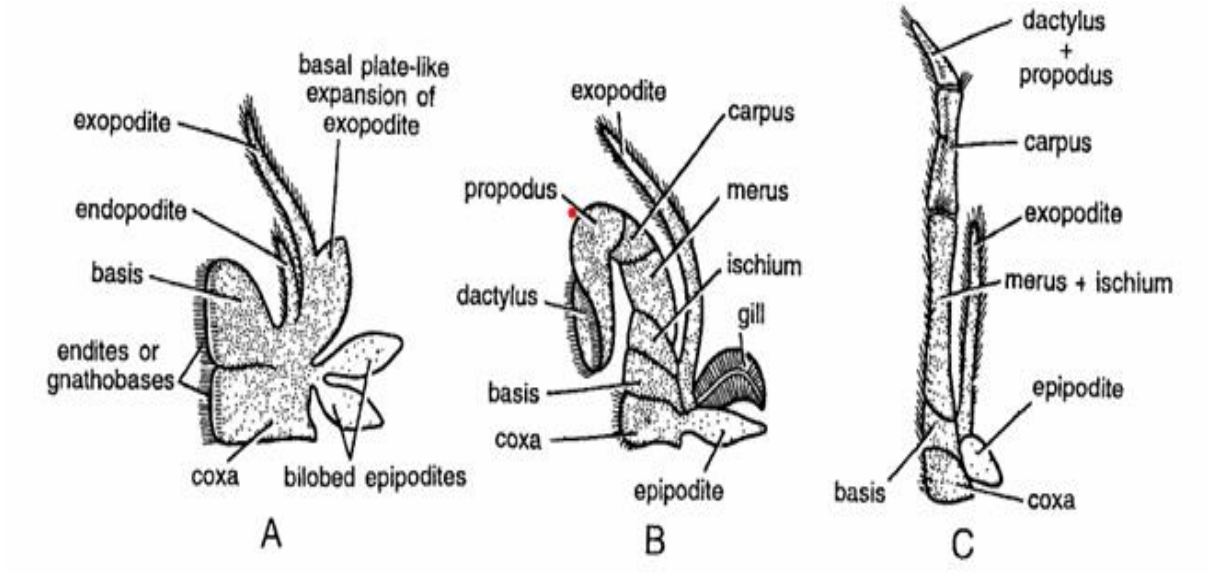
APPENDAGES OF PRAWN

1. CEPHALIC APPENDAGES

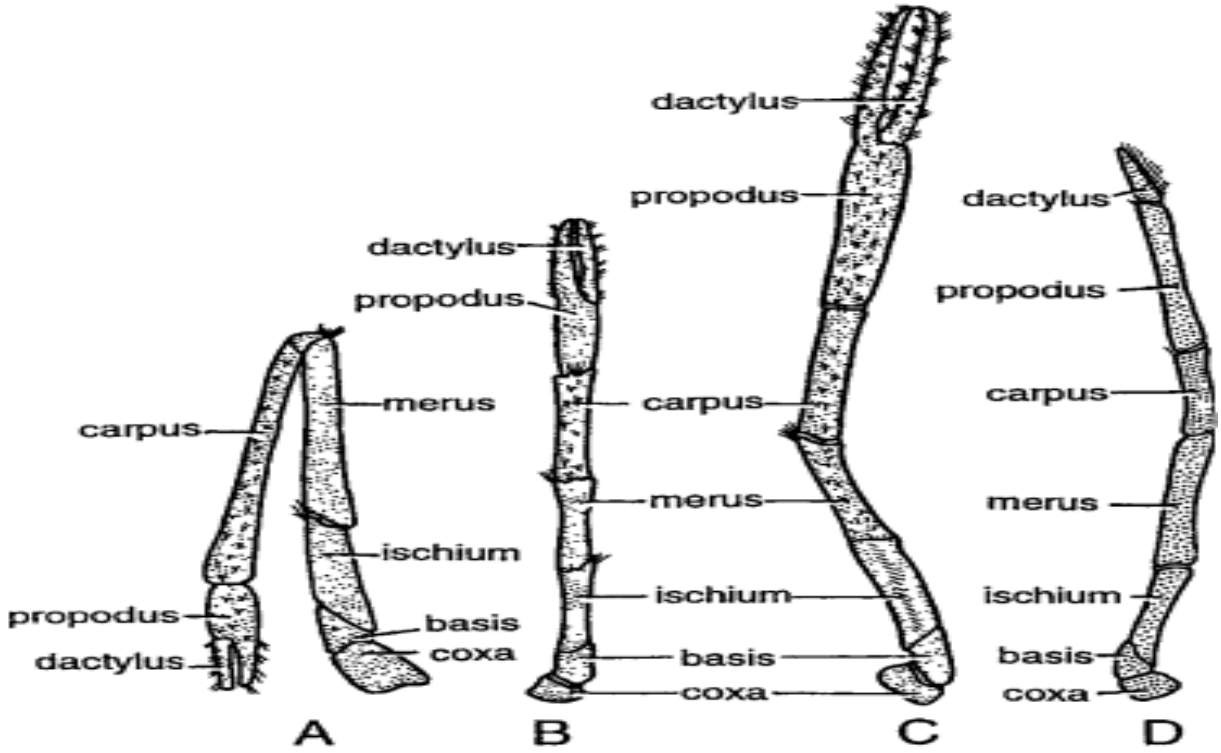


Palaemon: Prawn Cephalic Appendages

2. THORACIC APPENDAGES OF PRAWN



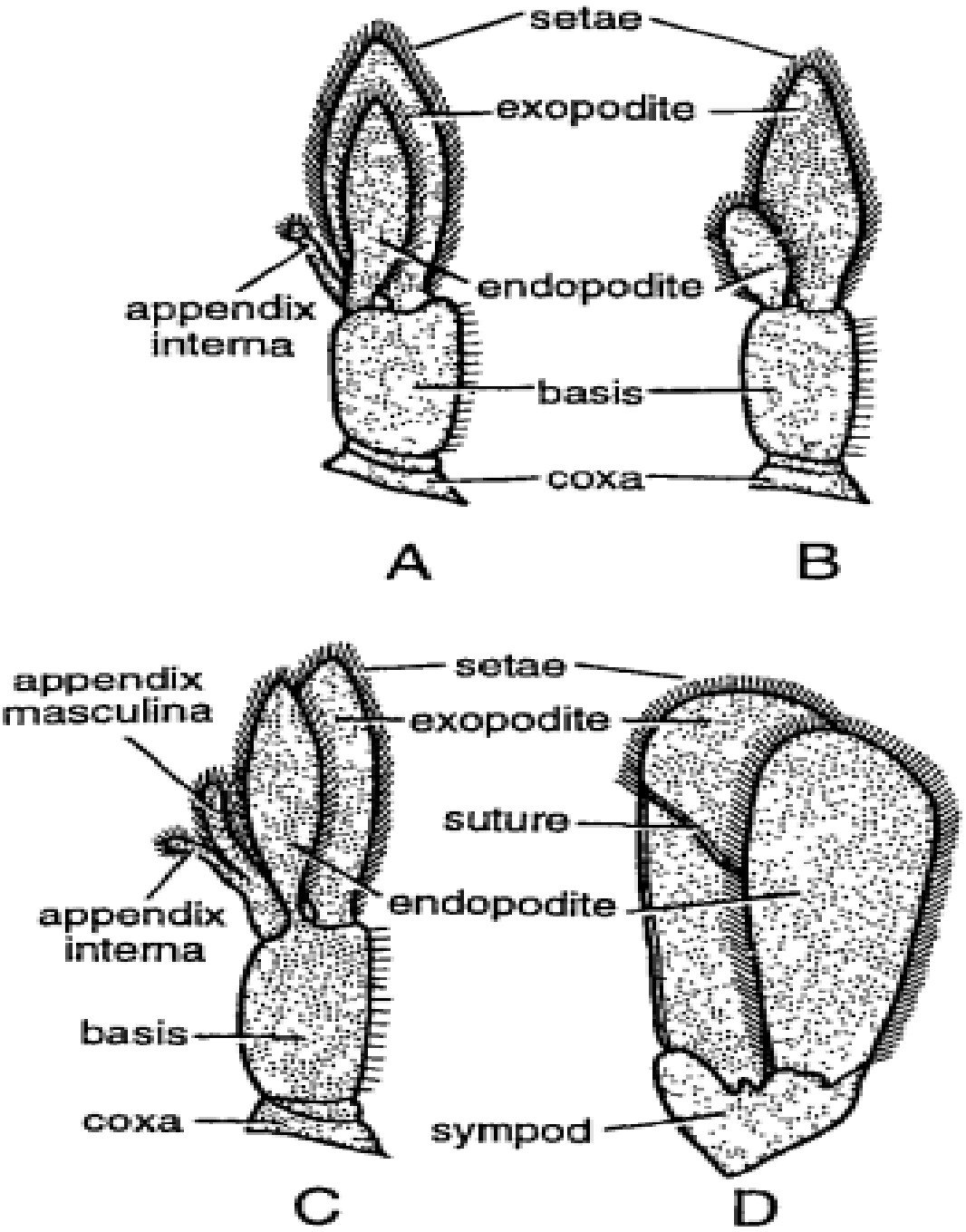
Palaemon: Prawn maxillipedes



Palaemon : Prawn. Walking legs. **A.** Typical (4th) non chelate legs, **B.** 1st chelate leg, **C.** 2nd chelate leg of female, **D.** 2nd chelate leg of male.

Palaemon: prawn walking legs

3. ABDOMINAL APPENDAGES OF PRAWN



Palaemon : Prawn. Abdominal appendages (pleopods), **A.** Typical, **B.** First, **C.** 2nd of male, **D.** Uropod.

Palaemon: prawn abdominal appendages

4. STING OF HONEY BEE:

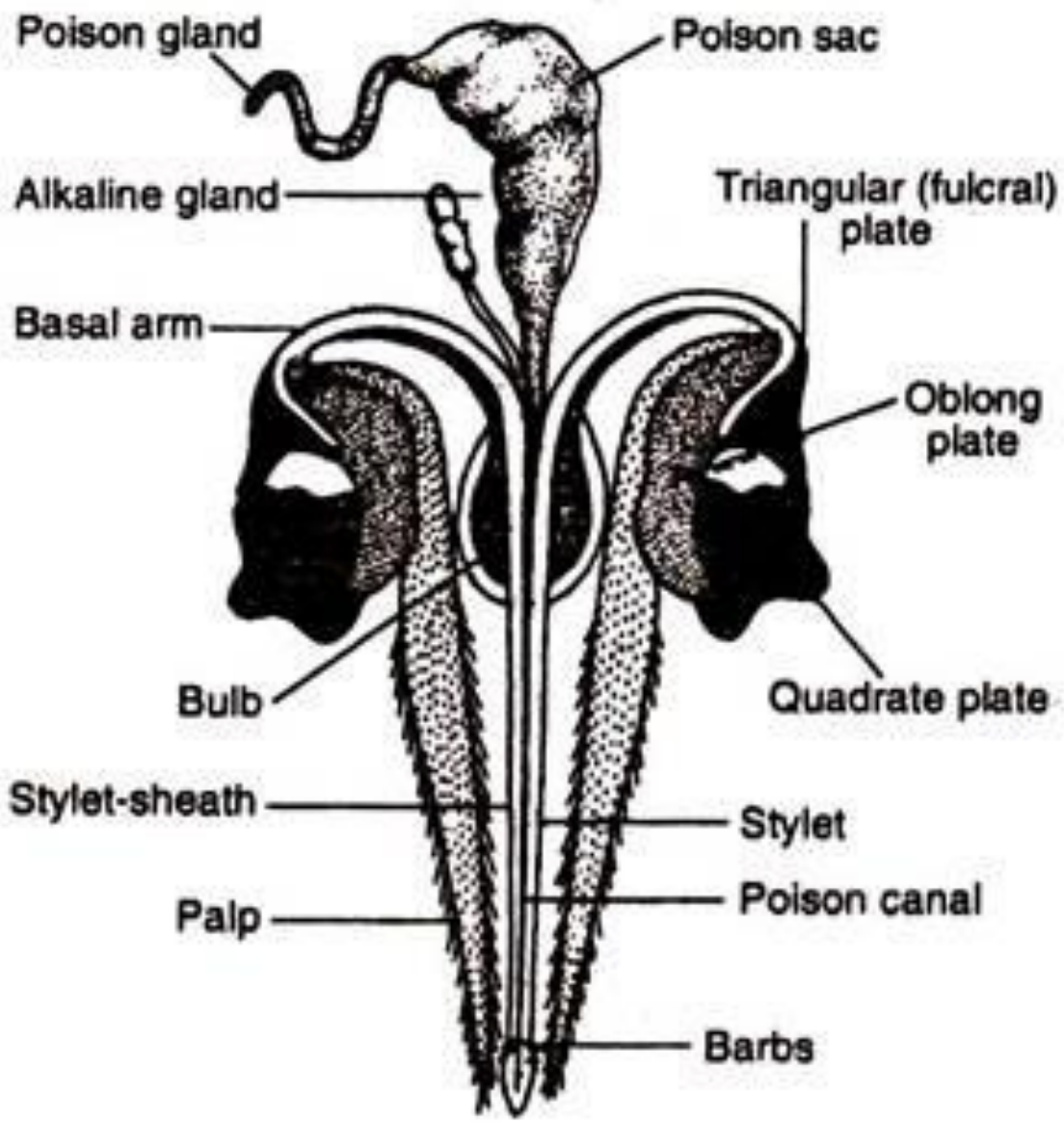
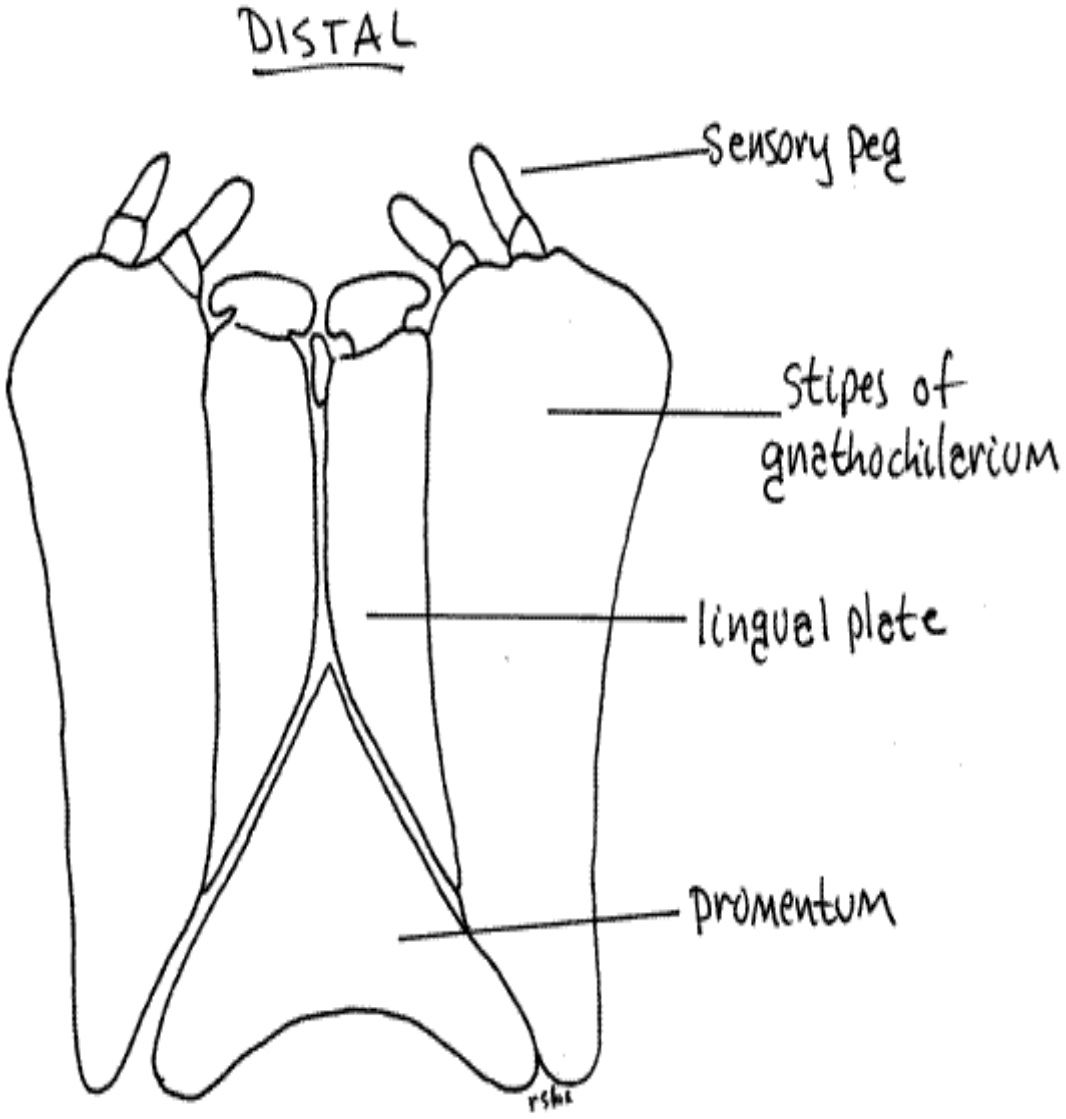


Fig. 18.78: Sting of a honey bee (worker).

5. GNATHOCHILARIUM OF MILLIPEDES



MUSEUM SPECIMENS AND SLIDES RELEVANT TO THE THEORY
PHYLUM: PORIFERA

1. SYCON

Classification:

Phylum	:-	Porifera
Class	:-	Calcarea
Order	:-	Heterocoe
Genus	:-	Sycon

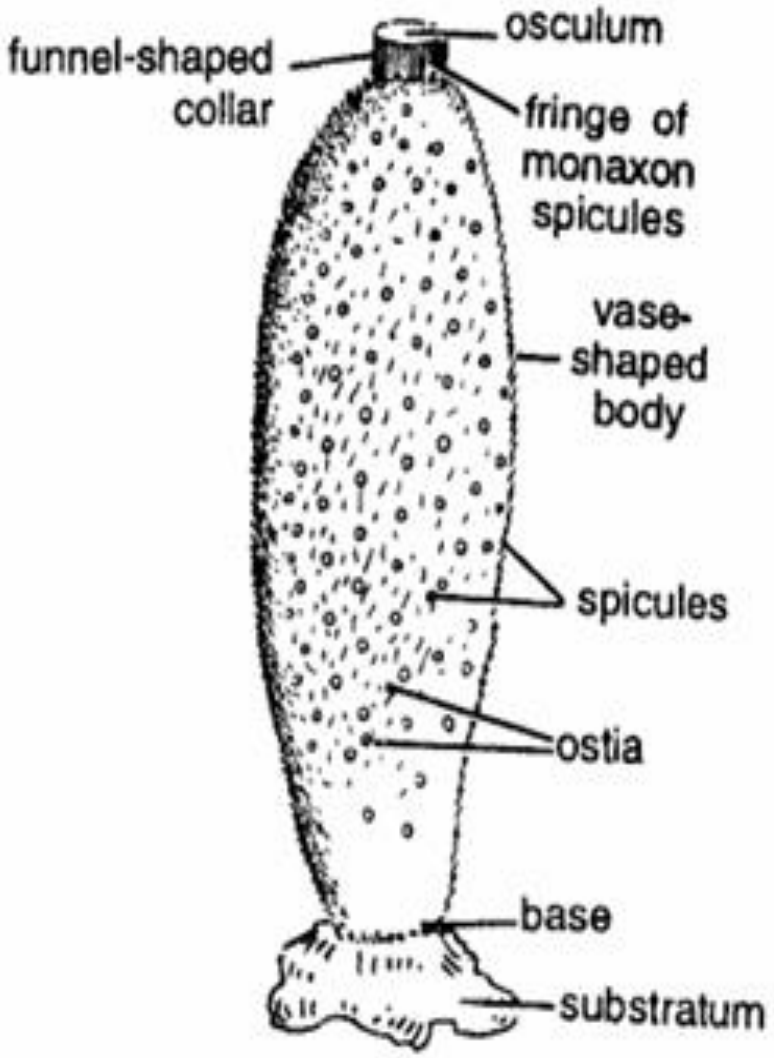


Fig. 3. *Sycon.*

IDENTIFICATION OF SYCON

Habit and Habitat: Sycon or Scypha is a small, solitary or colonial marine sponge found in shallow to approximately 60 fathoms deep in well oxygenated water.

Distribution: Common in Europe. Distributed from Rhode Island to Greenland.

Comments

1. Complex vase-shaped body, measuring 20 to 25 mm in length and 5 to 6 mm in diameter.
2. Each cylinder bulges in the middle and opens to the exterior by osculum. Body surface is covered by a ostia bearing membrane.
3. At the distal free end there is a large osculum, encircled by a fringe of large giant monaxon spicules forming funnel-shaped collar or oscular fringe.
4. Proximal and or base attached to substratum.
5. Body wall is thick through which monaxon, triaxon and tetraxon spicules project.
6. Body wall is composed of outer dermal epithelium, middle mesenchyma and inner flattened epithelium lining spongocoel which opens through the osculum.
7. Canal system is syconoid. Choanocytes are restricted to radial canals. Course of water current is ostia -prosopyles - radial - canals - apopyles - spongocoel - osculum - exterior. Nutrition, respiration and execration by canal system.
8. Hermaphroditic.
9. Reproduction by sexual or asexual methods. Asexual reproduction by budding and regeneration, while sexual by ova and sperms. Larva is amphiblastula.

Identification: Since the animal has radial tubes, oscular fringe, ostia and all above features, hence it is Sycon.

2. EUPLECTELLA

Classification:

Phylum :- Porifera
Class :- HexactineIlida
Order :- Hexasterophora
Genus :- Euplectella

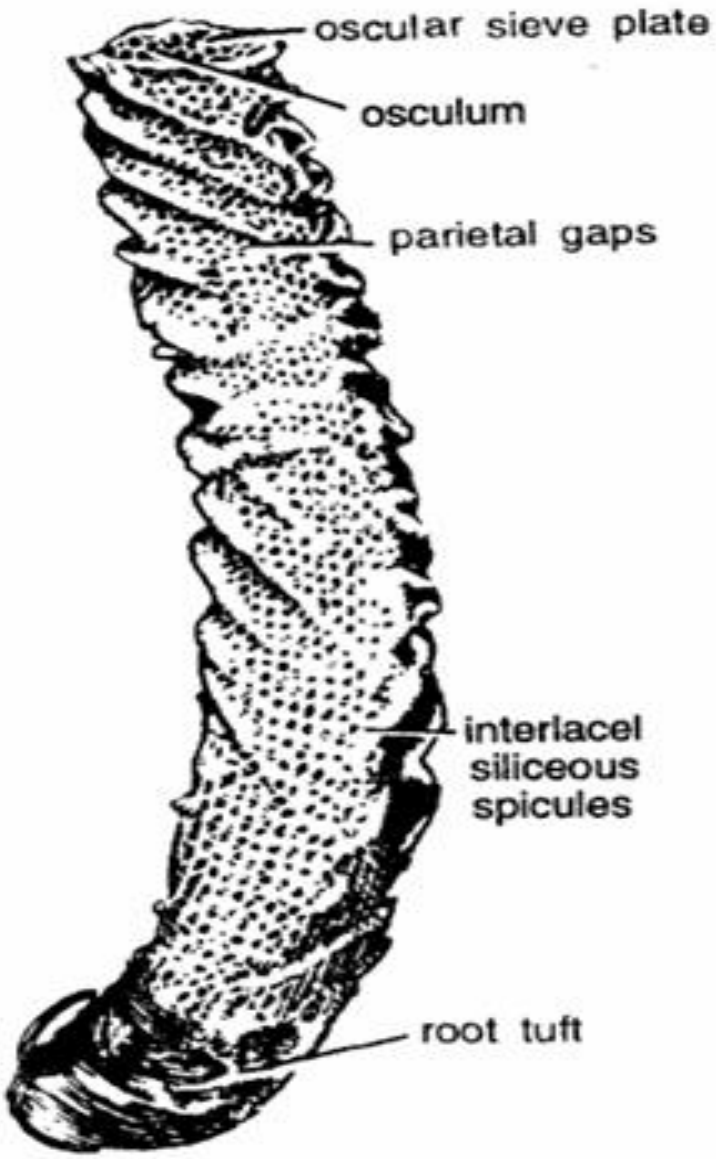


Fig. 6. *Euplectella.*

IDENTIFICATION OF EUPLECTELLA

Habit and habitat: Euplectella is solitary animal found abundantly in deep waters at the depths of 500 to 5,000 meters in slow running water, adapted for low water current.

Distribution: It is distributed near Philippines and West Indies.

Comments:

(1) Commonly called as Venus's flower basket due to its beautiful elegant glossy shape like knitted elongated basket.
(2) Animal measures 15 to 30 cm in length and 2 to 5 cm in diameter.
(3) Body is long, rigidly curved and cylindrical.
(4) Body is composed of four and six-rayed siliceous spicules interlaced and fused at their tips forming three dimensional network with parietal gaps.
(5) Spicules are joined together forming a network.
(6) Lower end contains usually a mass of long siliceous spicules in form of root tuft which fasten the animal with mud.
(7) Cloacal cavity is closed in above with a sieve plate.
(8) Osculum contains sieve called as oscular sieve plate.
(9) Canal system is of simple Sycon type.
(10) Euplectella displays an interesting commensal relation with certain species of shrimps. A young female and male shrimp enter into spongocoel and after growth become unable to come out. Their entire life is passed in sponge prison. They feed on plankton in water current.

Special features: Euplectella has great social and mythological value. The skeleton of this sponge, having imprisoned shrimps inside, is presented as wedding gift to newly married couples in Japan, signifying close association.

Identification: Since the specimen has knitted basket-shaped body, ostia, oscular sieve plate and all above features, hence it is Euplectella.

3. CHONDRILLA

Classification:

Phylum :- Porifera
Class :- Demospongia
Order :- Tetractinellida
Genus :- M.Chondrilla

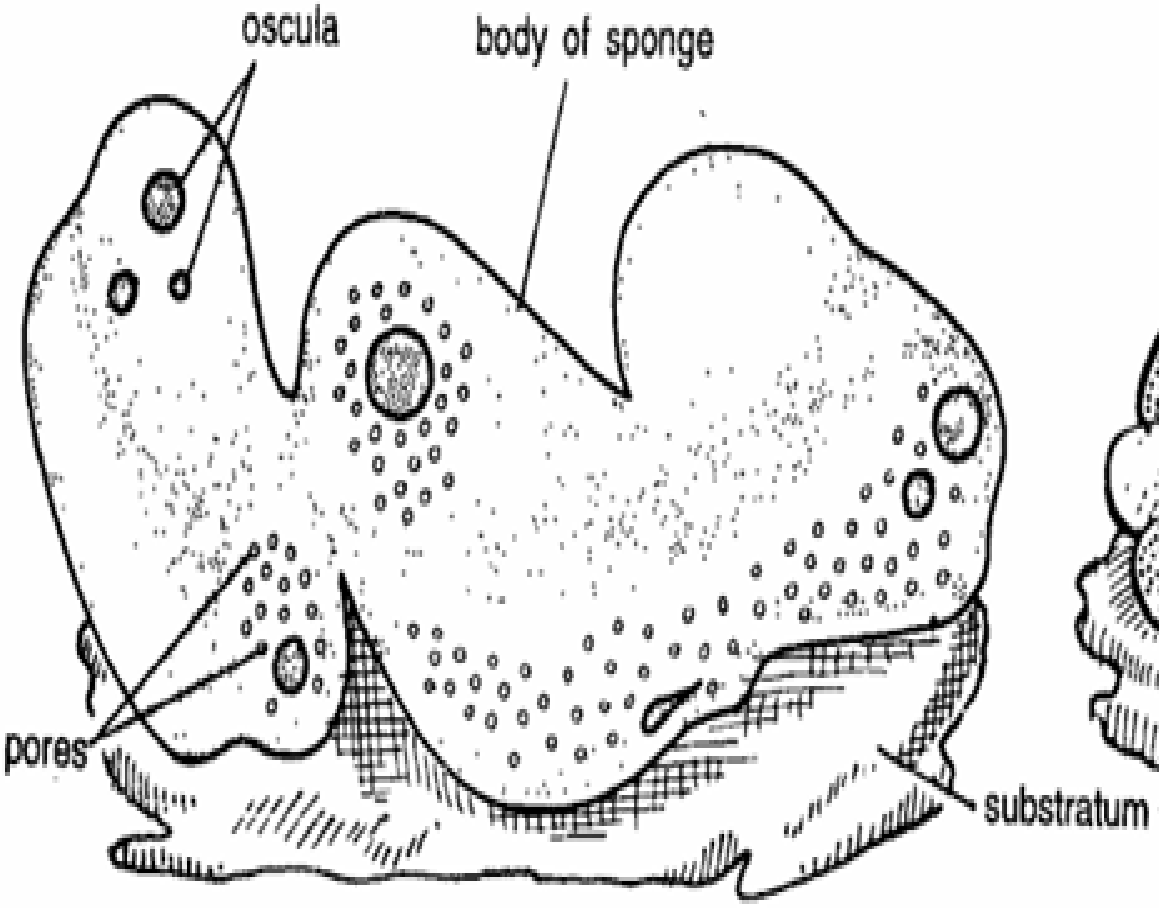


Fig. 10. *Chondrilla.*

IDENTIFICATION OF CHONDRILLA

Habit and habitat: Chondrilla is a marine tetractinellid demosponge.

Distribution: Found in British waters and U.S.A.

COMMENTS

1. Entire sponge body looks like a rounded mass attached to substratum.
2. Free surface contains few oscula, while rest of the body is perforated by several pores.
3. Body surface is smooth, but mesogloea is thick and stony due to spherasters.
4. Canal system is of leuconoid type.
5. Spheraster in thick cortex.
6. Spherasters found in the cortex between the cones are well developed while other spicules are absent.

Identification: Since the specimen contains pores, oscula and spherasters in thick cortex and all above features hence it is Chondrilla.

4. CLIONA

Classification:

Phylum :- Porifera
Class :- Demospongia
Order :- Monaxonida
Genus :- Cliona

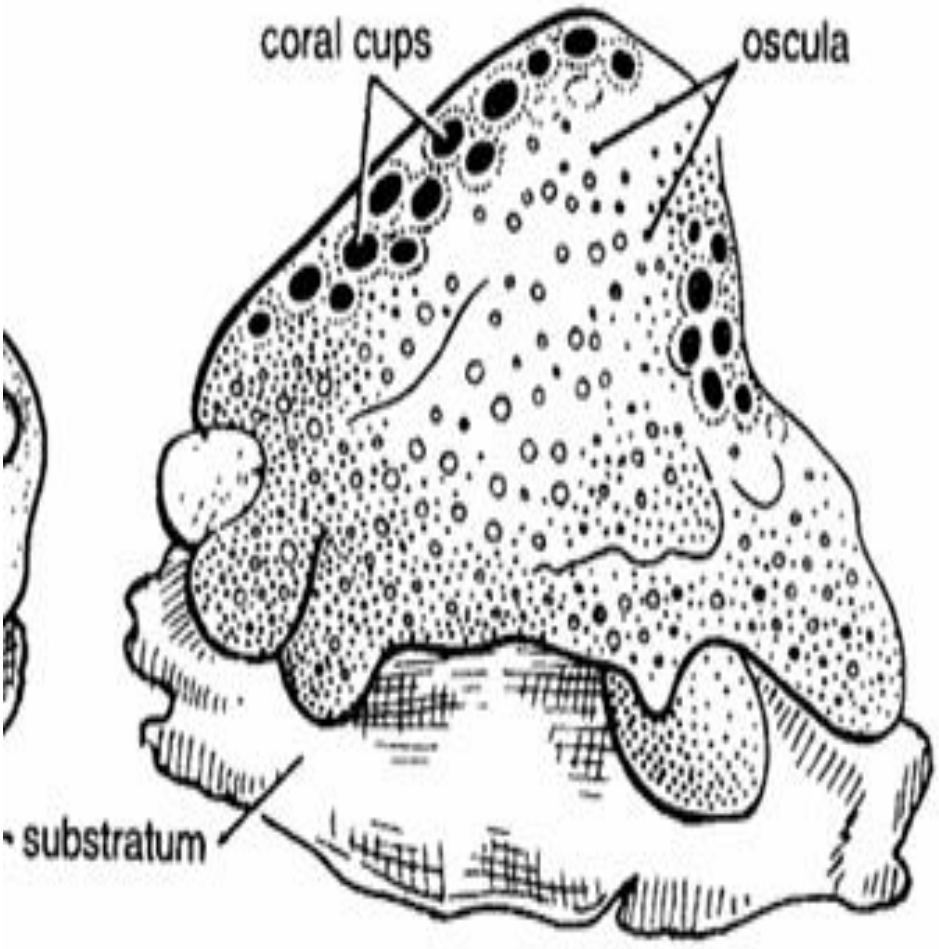


Fig. 11. *Cliona.*

Identification of cliona

Habit and habitat : Cliona forms low encrustation on rocks, coral skeletons, mollusc shells and other calcareous objects.

Distribution : Cosmopolitan, very common in South Carolina.

COMMENTS

1. Commonly called as boring sponge.
2. It is a light yellow coloured sponge.
3. Sponge forms a mass up to approximately 20 cm in diameter.
4. Proximal end or base is attached to substratum.
5. Clam shell, specially Venus, is completely riddled by it.
6. It enters the interior of above animals and lives permanently there, forming extensive burrows and tunnels.
7. Each tunnel has a raised opening, called osculum.
8. The surface shows various elevations each containing an osculum and large number of coral cups.
9. Reproduction sexual and early stages-free-living. The larva grows into a compact mass, 17 to 70 cm in diameter made up of spongin fibres and monaxial siliceous spicules.
10. Various oscula are seen over the surface.

Special features: The sponge beings its existence by boring in the dead or living shells of various molluscs. It honeycombs the shell and after destroying it grows over it. Cliona celata has sulphurous odour.

Identification: Since the specimen has raised oscula, pores and coral cups and all above features hence it is Cliona.

PHYLUM COELENTERATA

1. HYDRA

Classification

Phylum :- Coelenterata
Class :- Hydrozoa
Order :- Hydroidea
Sub-order :- Athecata
Genus :- Hydra

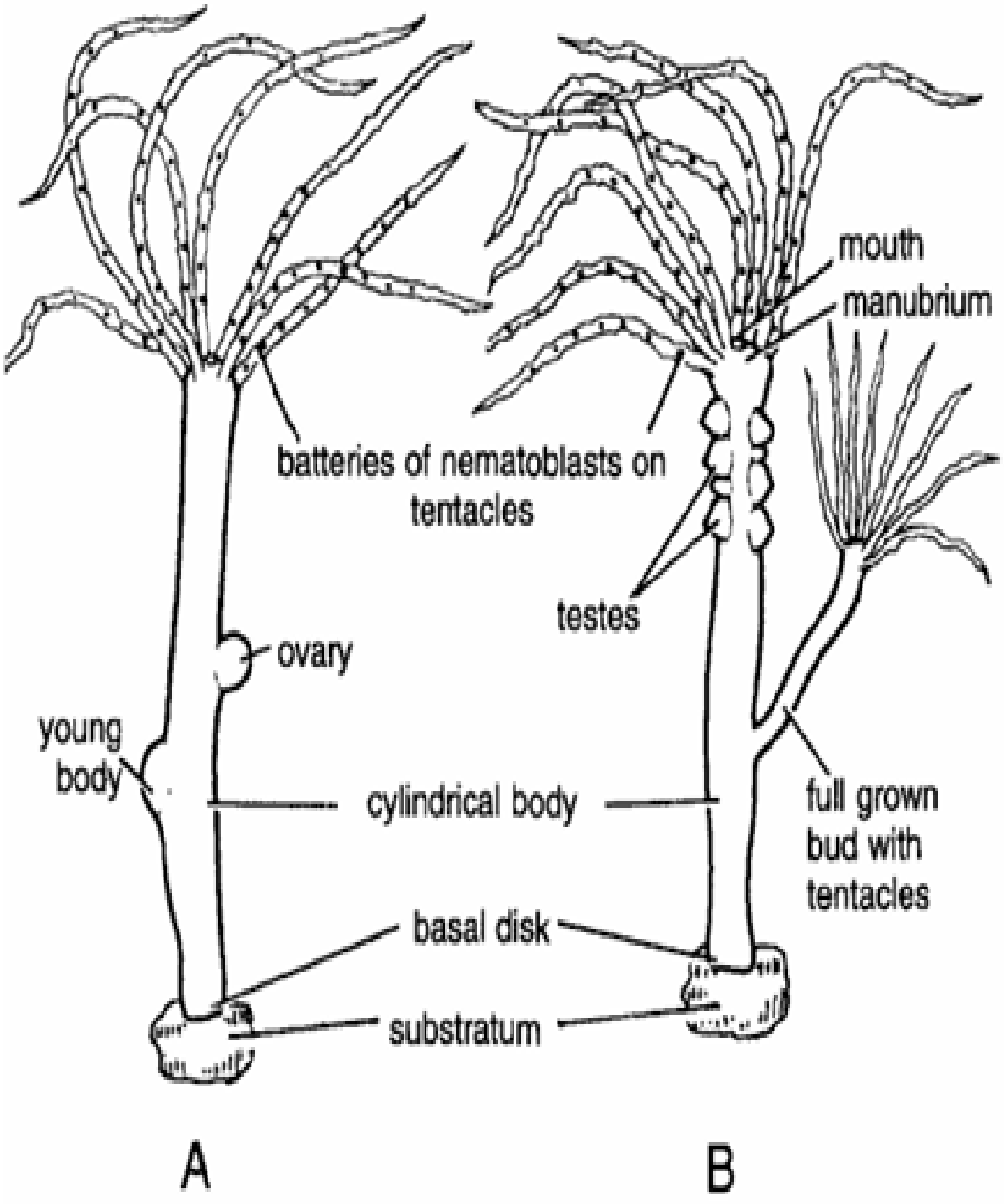


Fig. 22. *Hydra.* **A.** Female. **B.** Male.

Identification of hydra

Habit and habitat: Hydra IS a solitary and sedentary fresh-water fonn, found attached to stones, rocks and weeds.

Distribution : Cosmopolitan, but most common in India, Canada and U.S.A.

Comments

1. Cylindrical body is tube-like measuring approximately 1.3· cm in length.
2. Anterior end contains mouth or hypostome, which is crowned with 6 to 10 filiform nematocyst bearing tentacles.
3. Proximal end of the body contains pedal or basal disc or foot meant for attachment to the substratum.
4. Body is diploblastic, consisting of outer ectoderm, inner intervening endoderm and mesogloea. Body wall encloses a gastrovascular cavity extending into the tentacles.
5. In female Hydra ovary and buds are found on sides in mid position.
6. In male Hydra 3 or 4 pairs of testes, are found anteriorly and a full grown bud with tentacles on side.
7. Testes develop near the oral end and ovaries near the base.
8. It reproduces sexually by fusion of sperms and ova.
9. During asexual reproduction, lateral buds develop on the sides of the body which later on detach and develop into new Hydra.

Special features: Hydra viridis contains symbiotic green algae Zoochlorellae. Hydra is famous for division of labour for the first time in animal kingdom and moreover it has great experimental value as most of the regeneration and grafting experiments are conducted on it.

Identification: Since the animal contains 6-10 filliform tentacles anteriorly and gonads and buds on side and all above characters and hence it is Hydra. Male Hydra has 3 to 4 pairs of testes near oral end. Other species of Hydra are : I. H. utahensis, Hermaphroditic form; II. H. littoralis (i) Male, (ii) Female; III. Pelmetohydra oligactis (brown Hydra).

2. PHYSALIA

Classification:

Phylum :- Coelenterata
Class :- Hydrozoa
Order :- Siphonophora
Sub-order :- Physophorida
Family :- Physalidae
Genus :- Physalia

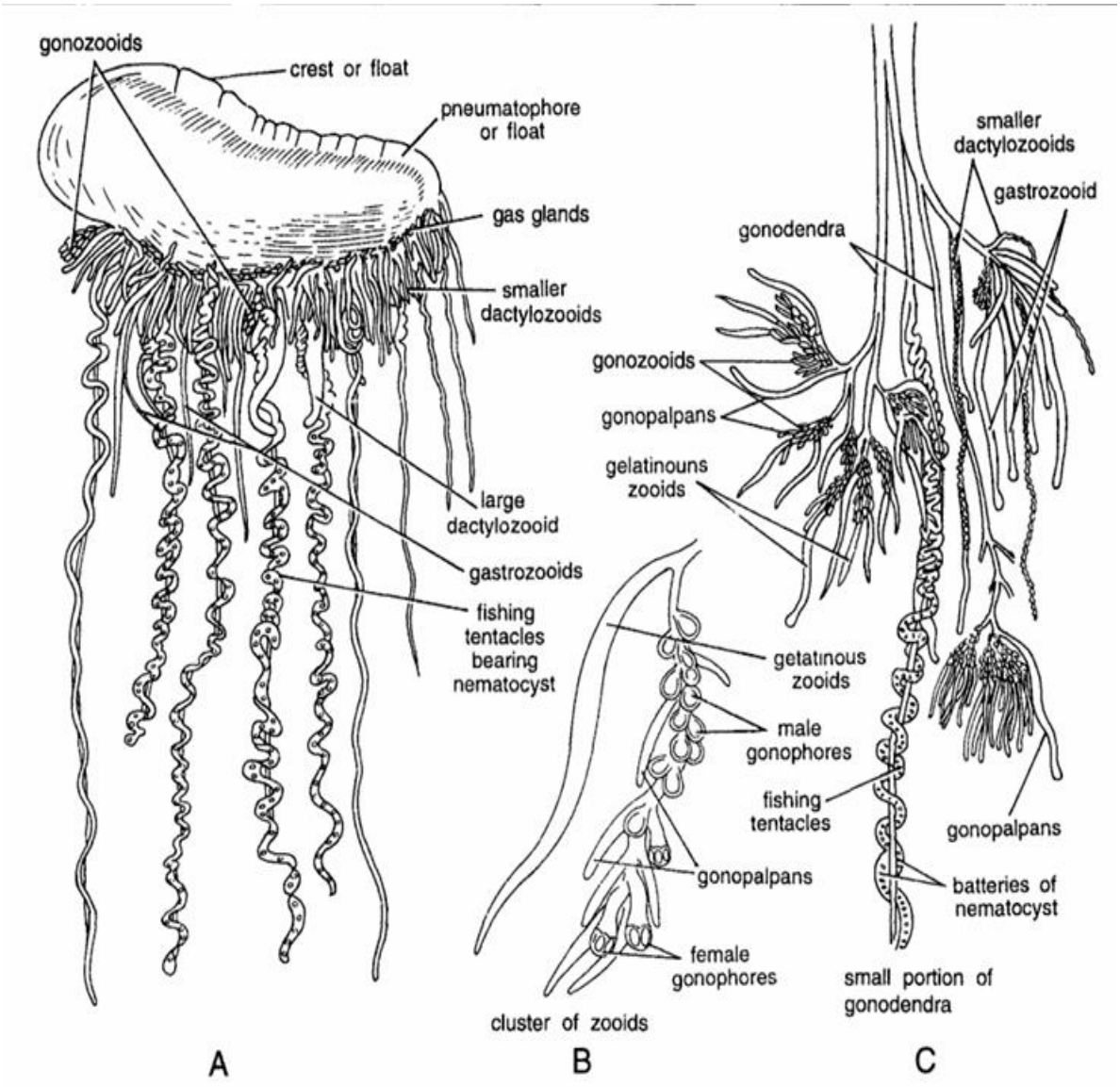


Fig. 30. *Physalia.* **A.** Entire colony, **B.** Portion of cluster of zooids, **C.** Small portion of gonodendra.

Identification of physila

Habit and babitat: Physalia is a marine. colonial, floating, pelagic coelenterate.

Distribution: Found in the warm sea in the gulf stream from Florida to Vineyard, U.S.A.

Comments

1. Commonly called as Portuguese man-of-war. It is so named because of its sudden appearance and disappearance like Portuguese ships during war.
2. Most beautiful siphonophore having irredescent peacock, blue or orange colour.
3. Size 10 to 30 em long but tentacles measure several metres.
4. Animal is composed of upper large crested pneumatophore or float and lower various zooids.
5. Pneumatophore contains gas glands which secrete air composed off 7.5% to 13.5% oxygen, 1·5% argon and 85% to 91% nitrogen.
6. Gas fills the float to swim or float and when animal has to sink, gas is forced out through the pneumatophore.
7. Ventrally the float contains budding coenosarc from which dactylozooids, gastrozooids, gonGzooids and gonodendra hang down.
8. A portion of cluster of zooids reveal large fishing tentacles with batteries of pneumatoeyst, gastrozooids without tentacles, large daetylozooids, small daetylozooid3, gonodendra and large gelatinous zooids of unknown function.
9. A part of gonodendra shows upper small male gonophores, lower large rounded female gonophores with eggs. Along with gonophores are several cylindrical gonopulpons.

Identification : Since the specimen has floats hanging gastrozooids, tentacles, gonozooids and all above characters, hence it is Physalia.

3. PORPITA

Classification

Phylum :- Coelenterata
Class :- Hydrozoa
Order :- Siphonophora
Sub-order :- Physophorida
Family :- Chondrophorae
Genus :- Porpita

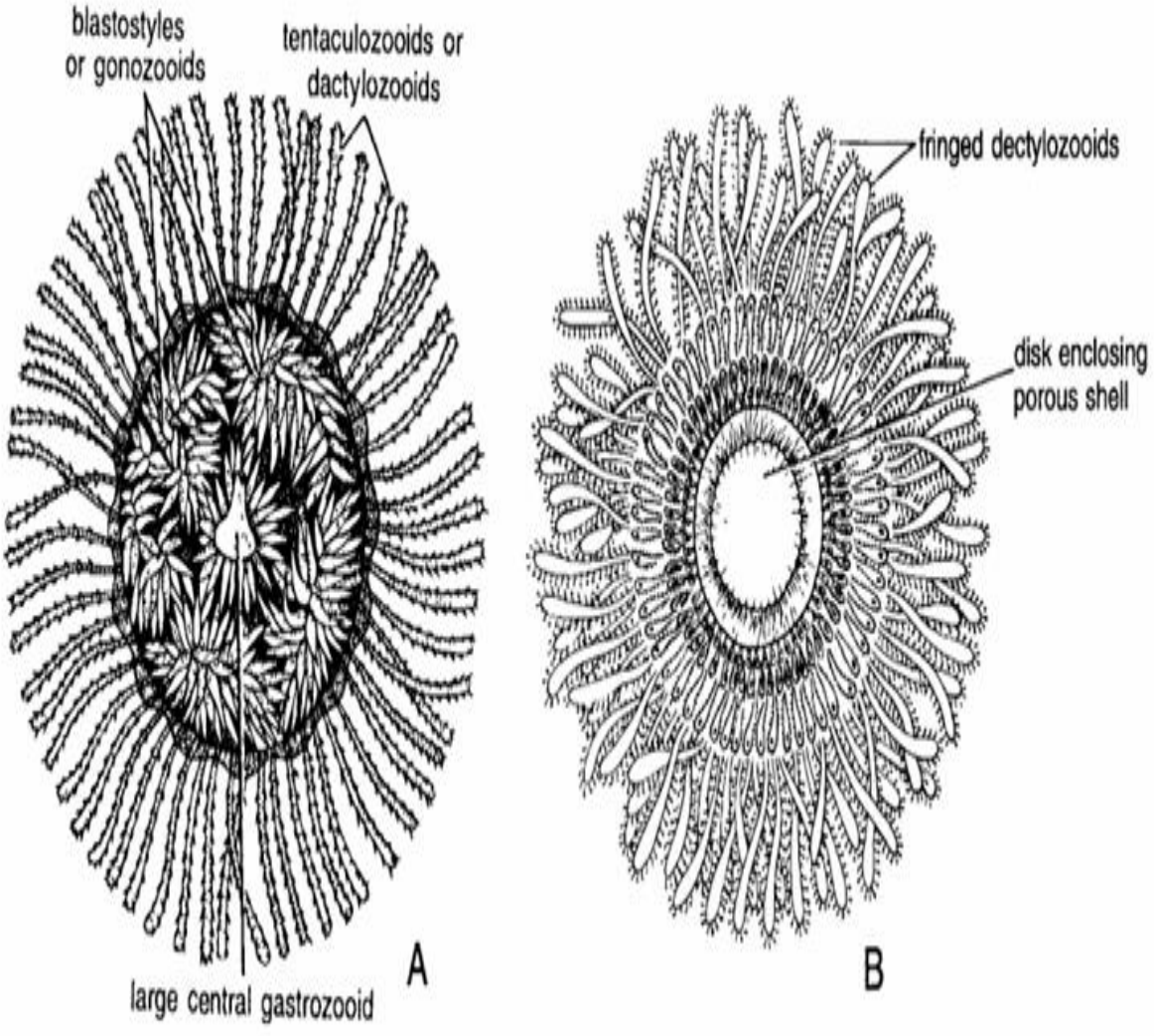


Fig 31. *Porpita.* **A.** Oral ventral side, **B.** Dorsal side.

Identification of porpita

Habit and habitat: Porpita is marine and colonial, found in warm seas.

Distribution: It is found along the South Atlantic coast and occasionally near U.K. coast.

Comments

1. It superficially resembles a medusa. It is most modified siphonophore. The stem is shortened to a flat coenosarc which along with float forms a rounded disk having several concentric air chambers.
2. Body is discoidal, enclosing a chambered, chitinous and porous shell, having air corresponding with pneumatophore of Physalia.
3. A large gastrozooid, having central mouth is encircled by several blastostyles.
4. Margin of disk contains numerous dactylozooids or tentacles armed with nematocysts.
5. Nectocalyces or swimming bells are absent.
6. Each air chamber opens to outside by a pair of pores.
7. Space between the gastric cavity of the gastrozooid and the pneumatophore is occupied by a large cellular mass traversed by canals, the so-called liver, supposed to have an excretory function.
8. The reproductive zooids are liberated as free medusae.

Identification: Since the animal has central disc surrounded by tentacles and all above feature, hence it is Porpita.

4. VELELLA

Classification

Phylum :- Coelenterata
Class :- Hydrozoa
Order :- Siphonophora
Sub-order :- Physophorida
Family :- Chondrophorae
Genus :-Velella (Little sail)

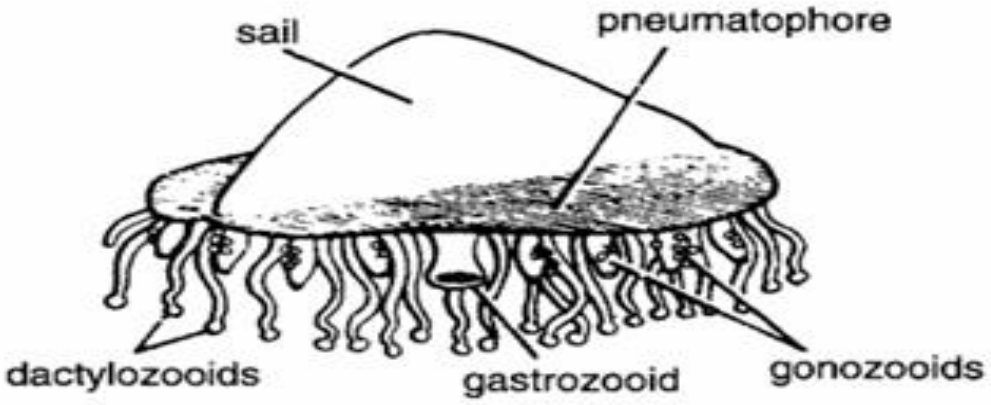


Fig 32. *Velella.*

Identification of velella

Habit and habitat: Velella is polymorphic marine colonial form.

Distribution : Commonly found in warm sea; Pacific coast from Puget Sound to Mexico, South Atlantic coast; occasionally off New England.

Comments

1. Velella is referred as sail by wind animal.
2. It is most beautiful open-sea form.
3. Deep blue colony consists of a rhomboidal disk pneumatophore or float containing air chambers without marginal identations.
4. Float differs from Porpita having a clear transparent vertical ridge or crest passing obliquely across the float and called as sail. Both float and sail are filled with gases.
5. On ventral surface hangs a single large gastrozooid and edge of disk is beset with numerous dactylozooids or tentaculozooids. Gonozooids are found around gastrozooid.
6. Gonozooids produce free medusae.
7. Velella is one of the most beautiful open-sea forms.

Identification : Since the specimen contains sail, short dactylozooid, gastrozooid, gonozooid and all above characters, hence it is Velella.

5. AURELIA

Classification:

Phylum :- Coelenterata
Class :- Scyphozoa
Order :- Semaeostomeae
Family :- U1mariidae
Genus :- Aurelia (Jelly-fish)

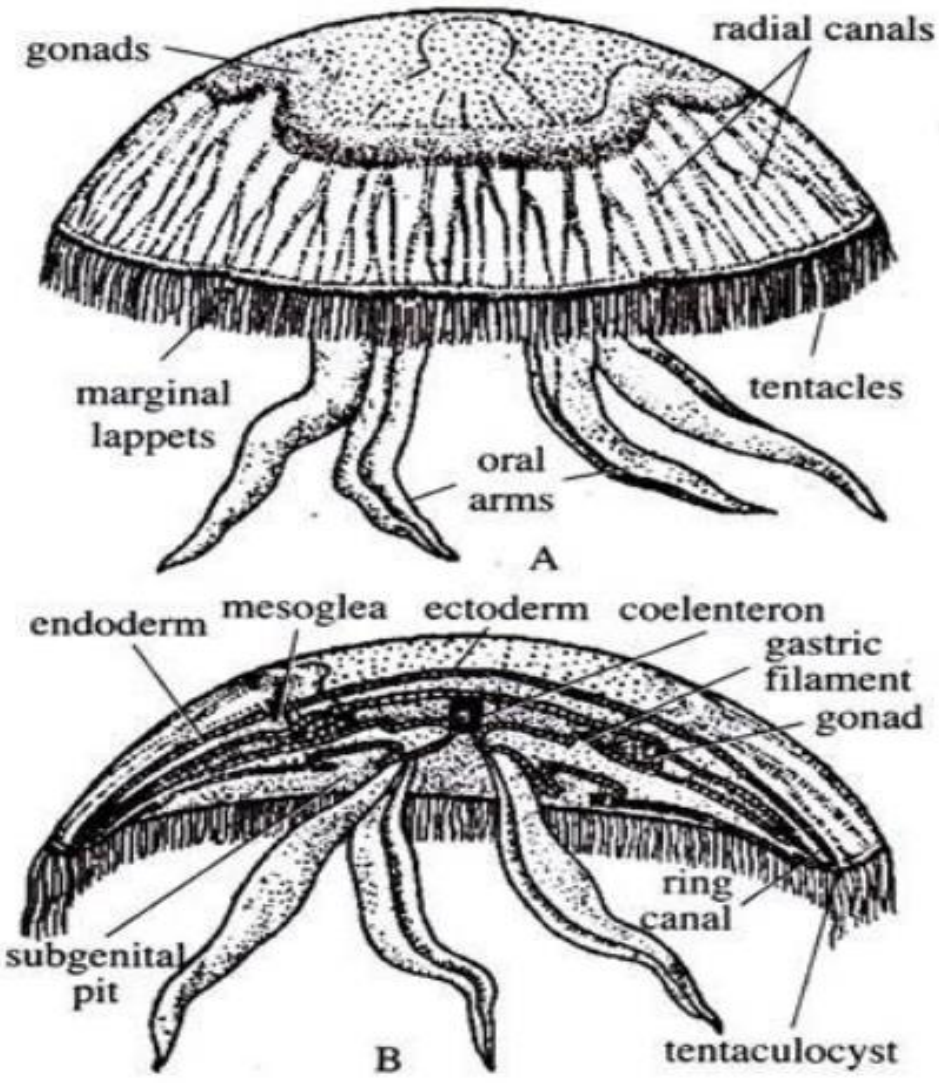


Fig. 1.38 : Figures showing A. Lateral view, B. Sectional view of *Aurelia*.

Identification of aurelia

Habit and habitat: Aurelia is a solitary marine and medusoid jelly-fish often living in brackish water. It inhabits coastal water of all oceans in all zones and in abundant number, mostly living in warm and temperate latitudes.

Distribution : Very common along the entire Atlantic coast and Pacific coast and only form reported in temperate regions.

Comments

1. Commonly called as Jelly-fish measuring approximately 30 cm in diameter.
2. Body is gelatinous, transparent, bluish, white, reddish or pinkish.
3. Saucer-shaped body is distinguished into convex ex-umbrellar and concave sub-umbrellar surfaces.
4. Various other structures seen are gastric filaments, sub-genital pits and velarium.
5. Sub-umbrellar margin contains marginal tentacles having stinging cells and 8 marginal lappets having sense organs or tentaculocysts in 8 lobes.
6. Mouth 4-comered. Each comer is drawn out into an oral arm along perradii.
7. Inter-radial, adradial and per-radial gastrovascular canals open in circular canal. Velarium present.
8. Jelly fish feeds on molluscs, crustaceans, protozoans, nematodes, rotifers, diatoms, polychaetes and copepods.
9. It swims by rhythmic contractions of umbrellar surfaces.
10. Male and female separate individuals. Life-cycle shows alteration of generation.
11. It responds to mussel juice, proteins, peptones, amino acids but not to sugars, starches or glycogen.

Identification : Since the specimen has jelly like texture, marginal tentacles, oral arms and all above characters, hence it is Aurelia.

6. GORGONIA

Classification:

Phylum :- Coelenterata
Class :- Anthozoa
Sub-class :- Octocorallia
Order :- Gorgonacea
Sub-order :- Scleraxonia
Family :- Gorgonida
Genus :- Gorgonia (Sea fan)

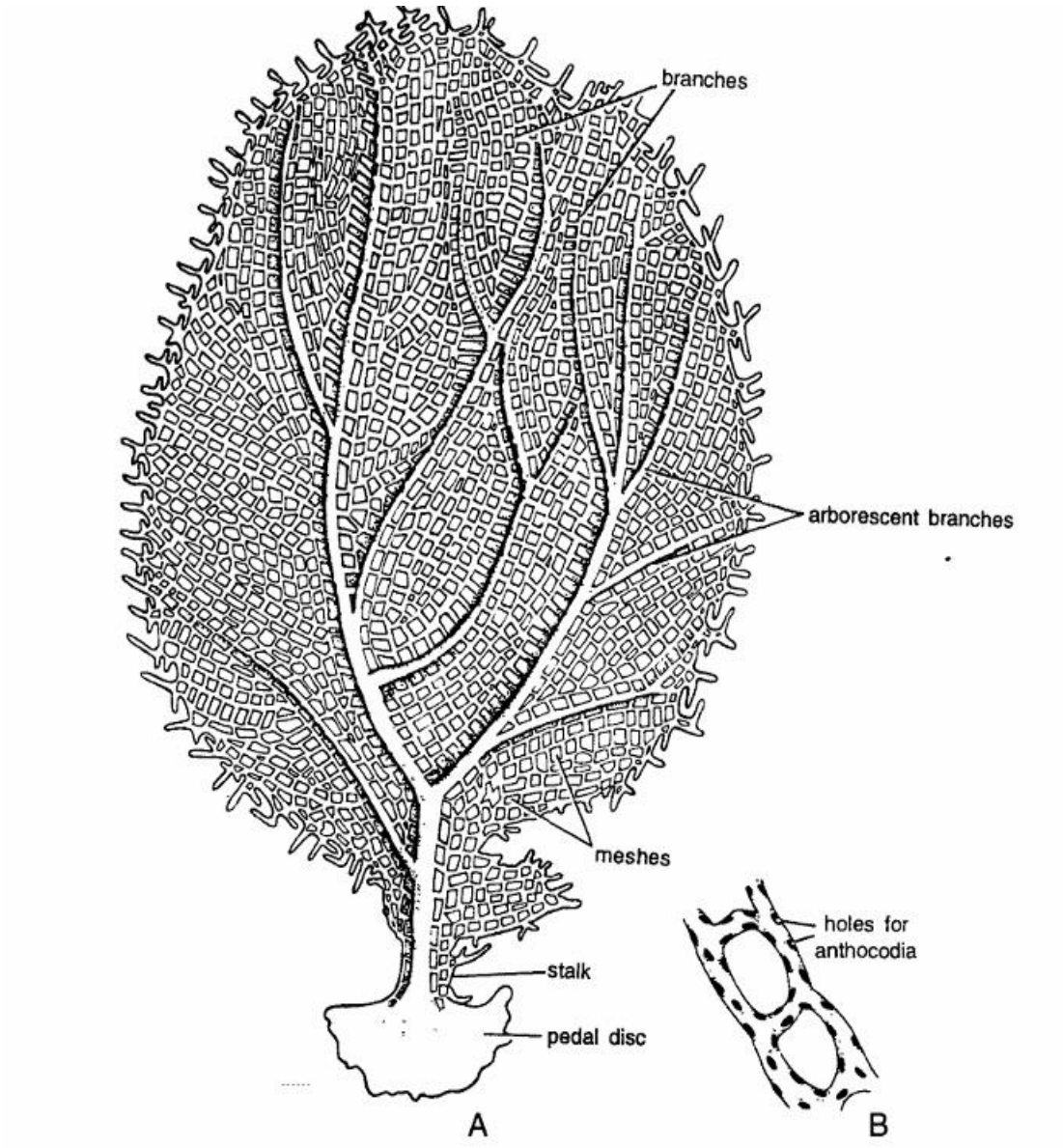


Fig. 46. *Gorgonia.* **A.** Complete specimen, **B.** A portion magnified.

Identification of gorgonia

Habit &nd habitat : Gorgonia is a colonial form inhabiting all seas from tide mark to over 4000 meters. Most of them are littoral. Some prefer warmer seas. Shallow water forms have fan-like structure. Deep sea fonns branch in all directions. It fonns one of the chief attractions of the submarine gardens of shallow tropical and subtropical waters.

Distribution: Found in South Atlantic and West Indies, Indo-Pacific ocean, Malay Archipelago, Bennuda and Bahamas.

Comments

1. Commonly called as Sea fan, whose graceful fonn and soft colouration constitute one of the chief attractions of 'submarine' gardens.
2. It fonns erect, yellowish or reddish arborescent branches in one plane connected by cross connections in a feathery manner and contour of the body becomes fan-like.
3. Branches are united by numerous cross-branches, fonning a network with meshes 2 to 5 mm wide, calcareous in nature.
4. Base of the colony is expanded to fonn a hold fast organ called as pedal disk.
5. Polyps or anthocodia emerge from branches and contain 8 pinnate tentacles, mouth, gastrovascular cavity, 8 gastric filaments and mesenteries.
6. Polyps occur in rows and on two sides only of the stem and its branches. In magnified portions holes for polyps are seen.
7. Skeleton consists of hornlike material called Gorgonin embedded in mesogloea. An axial rod extended throughout the colony and its branches. Axial rod consists of medulla and cortex. Gorgonin is proteinaceous consisting of tyrosine amino-acid.
8. Sexes are separate.

Special features : Gorgonia is very familiar museum specimen due to its fan-shaped body. The dried skeleton is often displayed as ornament. Sea fan has power of regeneration. It can form new anthocodia when branches are broken off. The heavy harm caused to gorgonian bed by storm is repaired.

Identification : Since the specimen contains fan shaped body and all above characters and hence it is Gorgonia.

7. PENNATULA

Classification

Phylum :- Coelenterata
Class :- Anthozoa
Sub-class :-Octocorallia
Order :- Pennatulacea
Family :- Pennatulidae
Genus :- Pennatula (Sea pen)

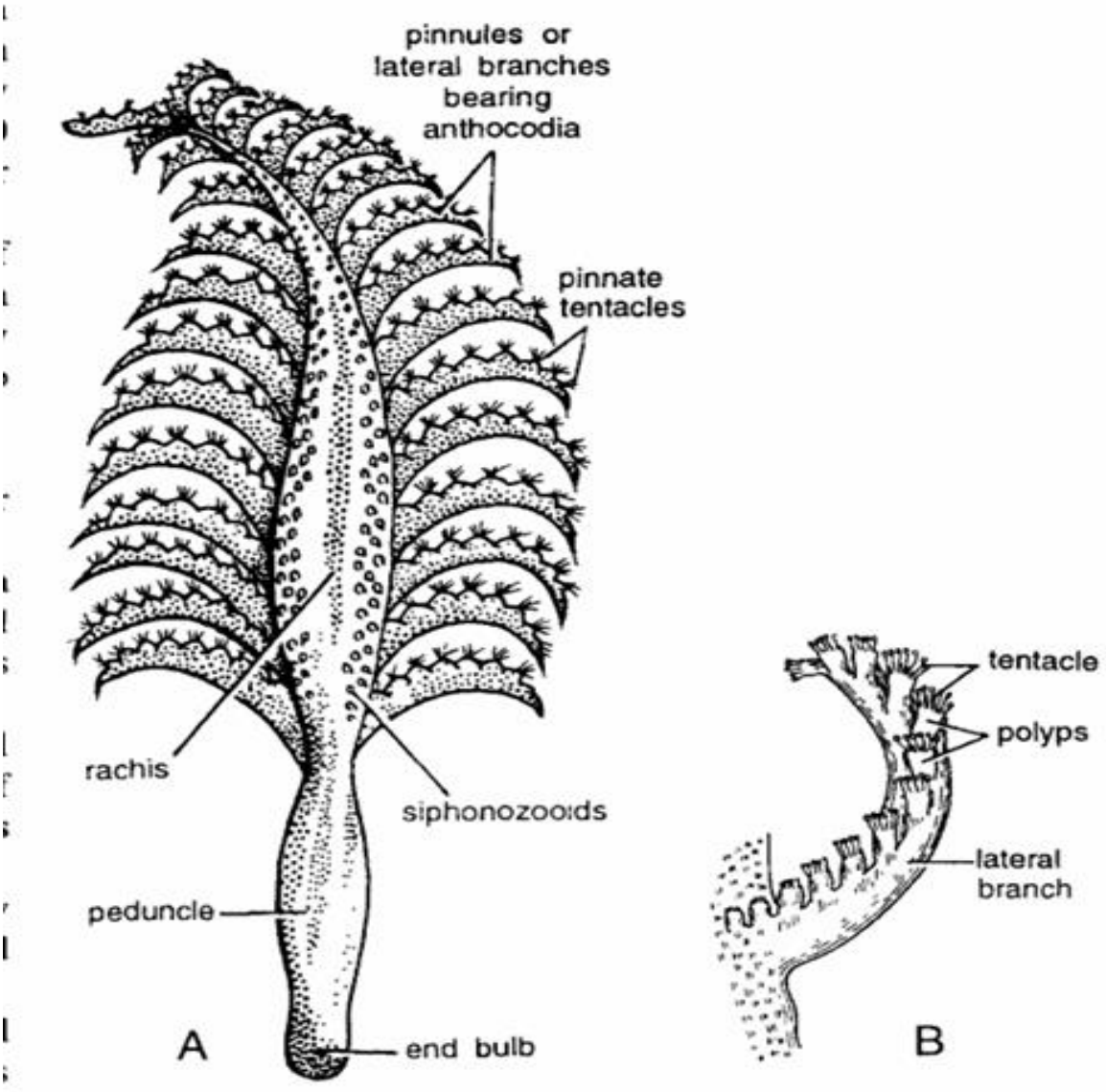


Fig. 48. *Pennatula.* **A.** Entire. **B.** Single pinnule.

Identification of pennatula

Habit and habitat: Pennatula is a sedentary and colonial actinozoan found in deep sea waters in sandy and muddy bottoms, 20 to 600 fathoms deep. It prefers warmer water.

Distribution: It is found in the gulf of St. Lawrence to Carolina common in Europe and especially found in newfoundland to nomitueket.

COMMENTS

1. Commonly called as sea pen or sea feather.
2. Animal is fleshy consisting of a very elongated primary axial polyp which gives numerous secondary bilateral polyps.
3. Body is divided into a proximal stalk or peduncle devoid of anthocodia and distal rachis having secondary polyps.
4. Central axis or rachis posteriorly forms a peduncle with an end bulb.
5. Anteriorly rachis bears lateral fleshy branches or pinnules containing a series of 8 to 12 gastrozooids or polyps. Each polyp has 8 pinnate tentacles.
6. Each leaf has a single row or anthocodia of which the outermost one is the oldest and nearest the dorsal side and others are budded successively towards ventral side of the stem. The first polyp budded becomes the end polyp.
7. Skeleton comprises of a long horny unbranched axis supporting rachis only. Rachis is deep red. Peduncle is rose coloured. Base is whitish.
8. Gastrozooids are feeding zooids, while siphonozooids draw water current. The siphonozooids have siphonoglyphs, which maintain water current in the canal system of the colony.
9. Sexes are separate (dimorphic) and gametes develop in gastrozooids.

Identification : Since the specimen contains rachis with lateral branches bearing polyps and all above characters and hence it is Pennatula.

8. Astraea

Classification:

Phylum :- Coelenterata
Class :- Anthozoa
Sub·c1ass :- Hexacorallia
Order :- Madreporaria
Genus :- Astraea

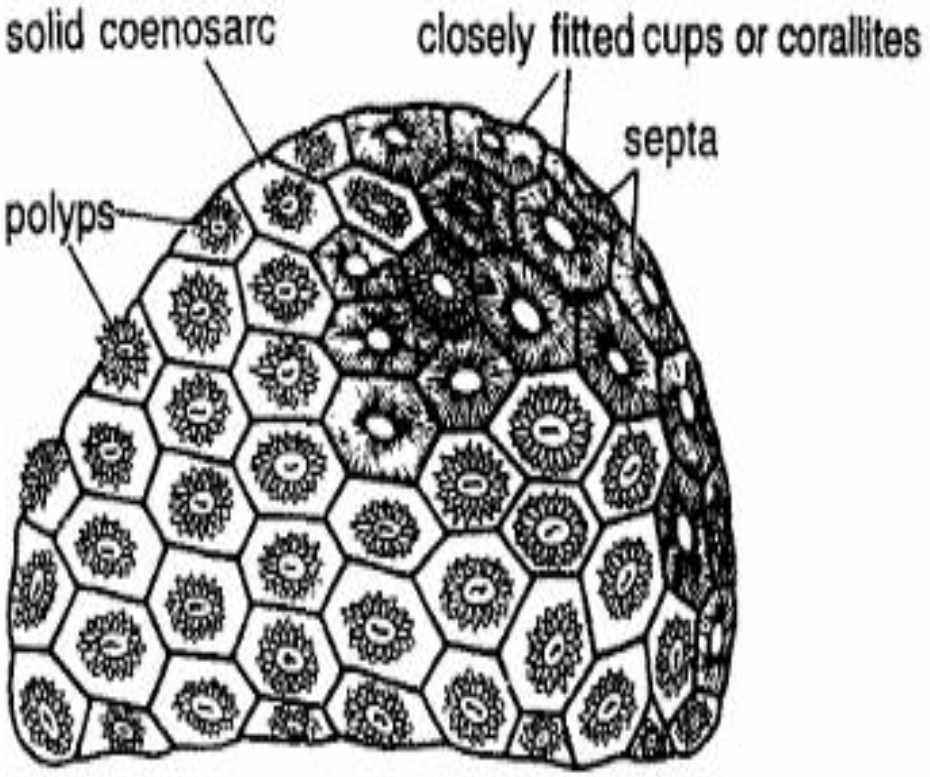


Fig. 62. *Astraea.*

Identification of Astraea

Habit and habitat : Astraea is a marine colonial, hexacorallian coelenterate coral.

Distribution: Found in U.S.A.; Florida and California.

Comments

1. Commonly called as stony coral.
2. Contains ectodermal, calcareous or calcium carbonate skeleton, called as corallium.
3. Colony is compact and massive produced by buds, growing more or less parallel with each other.
4. Skeleton is very hard like stone.
5. Surface of the body contains closely-placed cups or corallites containing polyps.
6. Zooids are separated by a solid coenosarc.
7. Coenenchyma is produced by calcification of coenosarc which also gives rise to corallites. Corallites lie in close contact with each other.
8. Astraea is a poreless coral reproducing by gemmation, fissiparous division and budding.

Identification : Since the specimen contains hardened calcification and closely fitted caps for polyps and all above characters and hence it is Astraea.

9. FUNGIA

Classification :

Phylum :- Coelenterata
Class :- Anthozoa
Sub·c1ass:- Hexacorallia
Order :- Madreporaria
Genus :- Fungia

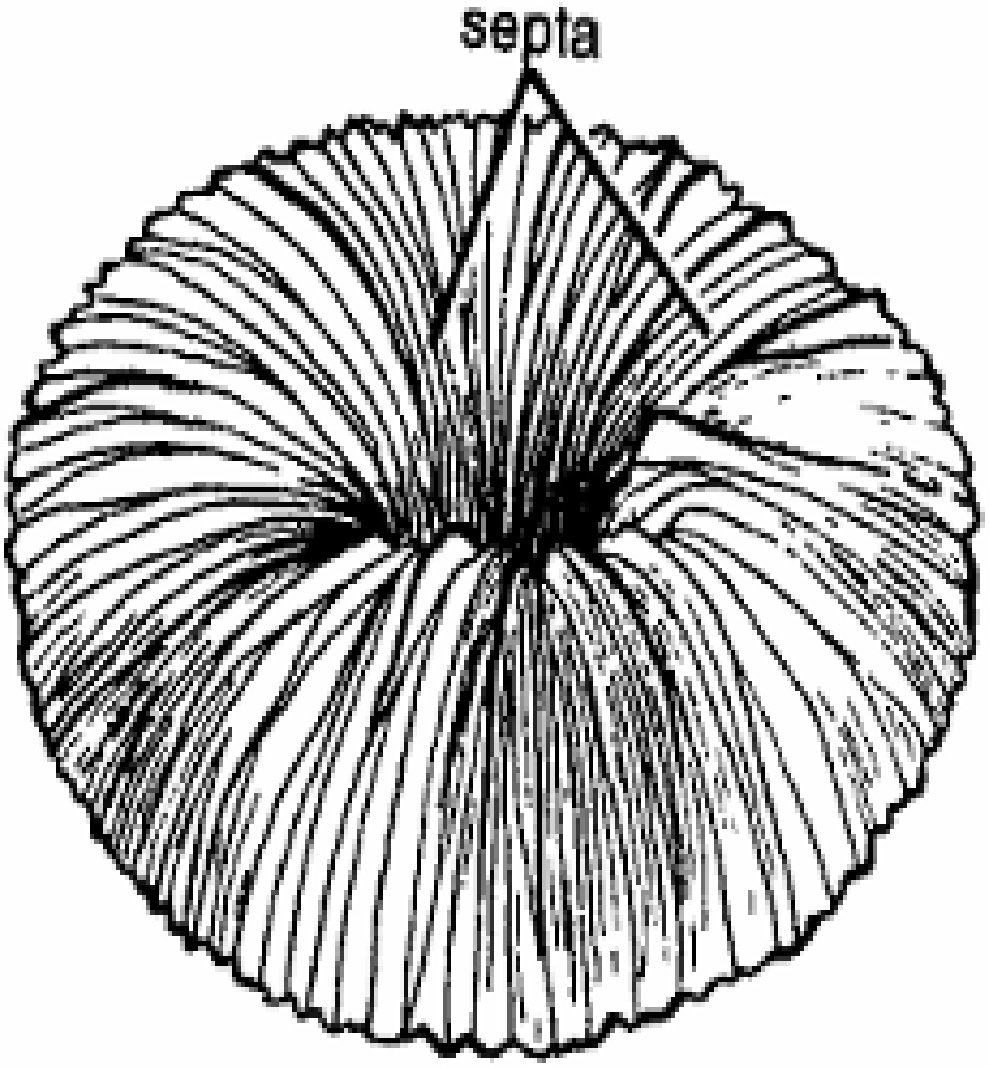


Fig. 66. *Fungia.*

Identification of fungia

Habit and habitat : Fungia is a solitary and marine coral.

Distribution : It is found in warm seas, generally in the Gulf of California.

Comments

1. commonly known as Mushroom coral.
2. It is found in sizes from 5 mm to 25 cm in diameter.
3. It is discoidal, mushroom-shaped. with upper convex and lower concave surfaces having thecae.
4. Discoidal corallite contains numerous septa connected together by a calcareous rod, known as synapticula.
5. Adult animal contains a single large polyp with numerous tentacles.
6. Animal lies loose on the bottom of sea or fastened below by a stalk.
7. Siphonoglyphs are absent.
8. Life history includes cup-shaped planula which metamorphoses into Fungia. adult. Fungia continues to give off ordinary buds throughout life.
9. It has long fossil history. It originated in tertiary period and is living successfully.

Identification : Since the specimen is mushroom shaped, has whitish septa and all above characters, hence it is Fungia.

PHYLUM: PLATYHELMINTHES

10. DUGESIA PLANARIA

Classification :

Phylum :- Platyhelminthes
Class :- TurbeUaria
Order :- Tricladida
Family :- Planariidae
Genus :- Dugesia

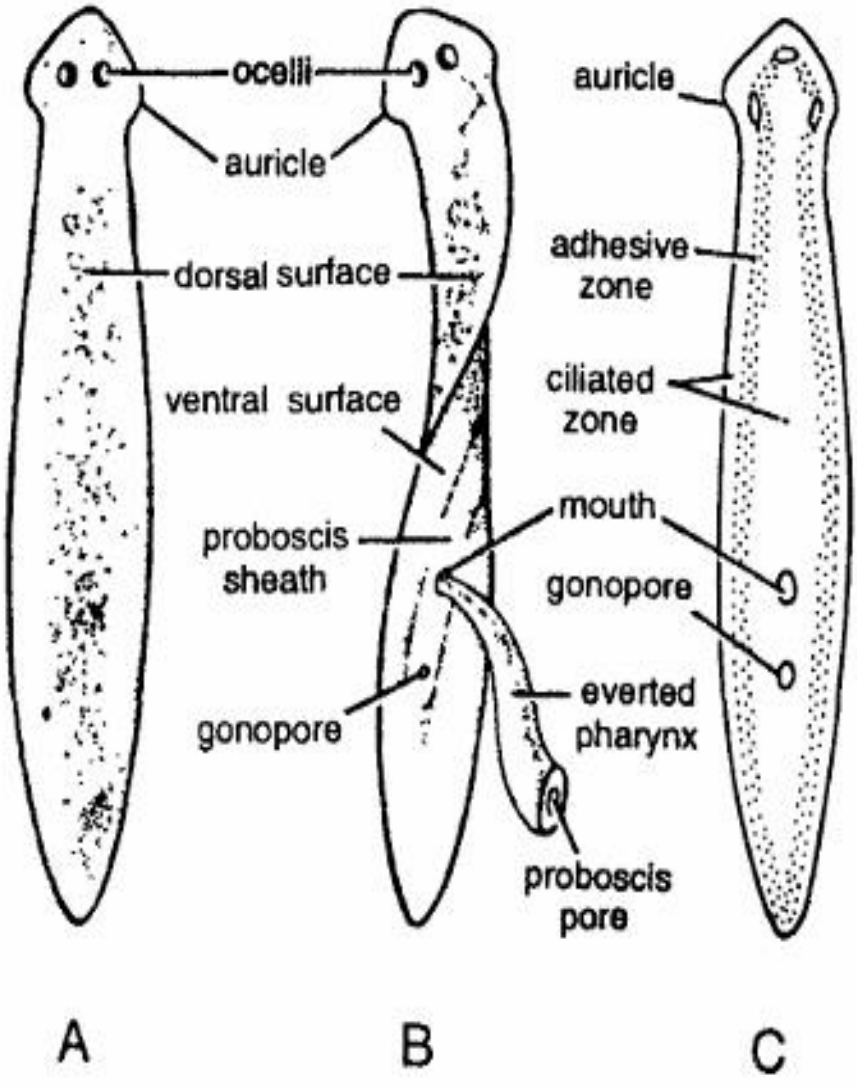


Fig. 72. *Dugesia.* **A.** Dorsal view. **B.** Dorsoventral view. **C.** Ventral view.

Identification of planaria

Habit and habitat : Dugesia is a fresh water, triclad found in streams, springs, ponds, lakes and caves, gliding over stones and debris by the side of the pond or on the bottom.

Distribution: Cosmopolitan, commonly found in temperate zones, U.S.A., India and U.K.

Comments

1. Commonly known as Planaria.
2. Dark brown elongated cylindrical animal measuring approximately 15 mm in length.
3. Body differentiated into dorsal and ventral surfaces. Ventral surface contains adhesive and ciliated zones.
4. Anterior region is called as head.
5. Head is triangular containing 2 ear like auricles on side and 2 semicircular ocelli.
6. Body tapers posteriorly as a pointed end.
7. Digestive system, consists of mouth, proboscis, oesophagus and intestine.
8. Intestine is peculiar having three branches, one extending upwards and two backwards and hence the name Tricladida
9. Mouth encircled by proboscis pore. Proboscis is highly muscular and lies in a proboscis sheath and is everted through the proboscis pore.
10. Gonopore lies behind proboscis pore. It reproduces sexually and asexually.

Identification : Since the specimen contains auricles, eyes and all above characters and hence it is Dugesia.

11. BIPALIUM

Classification:

Phylum :- Platyhelminthes
Class :- TurbeUaria
Order :- Tricladida
Family :- Bipaliidae
Genus :-Bipalium

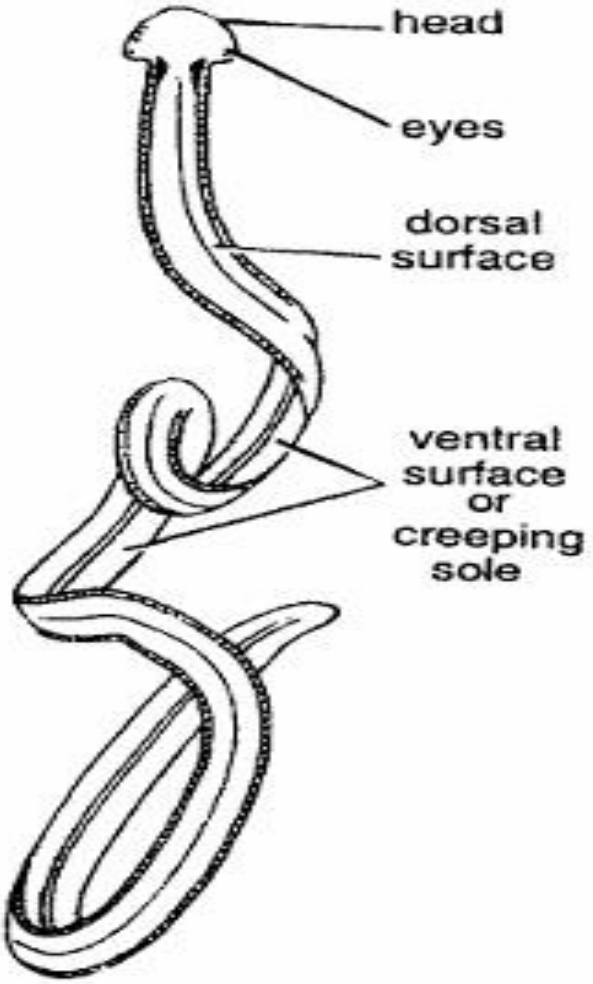


Fig. 73. *Bipalium.*

Identification of Bipalium

Habit and habitat : Bipalium is a large terrestrial triclad inhabiting the humid soil on the floor of the tropical jungles.

Distribution : It has cosmopolitan distribution chiefly found in green houses and outdoor regions in Florida, Louisiana and California. It is also found in temperate and tropical countries.

Comments

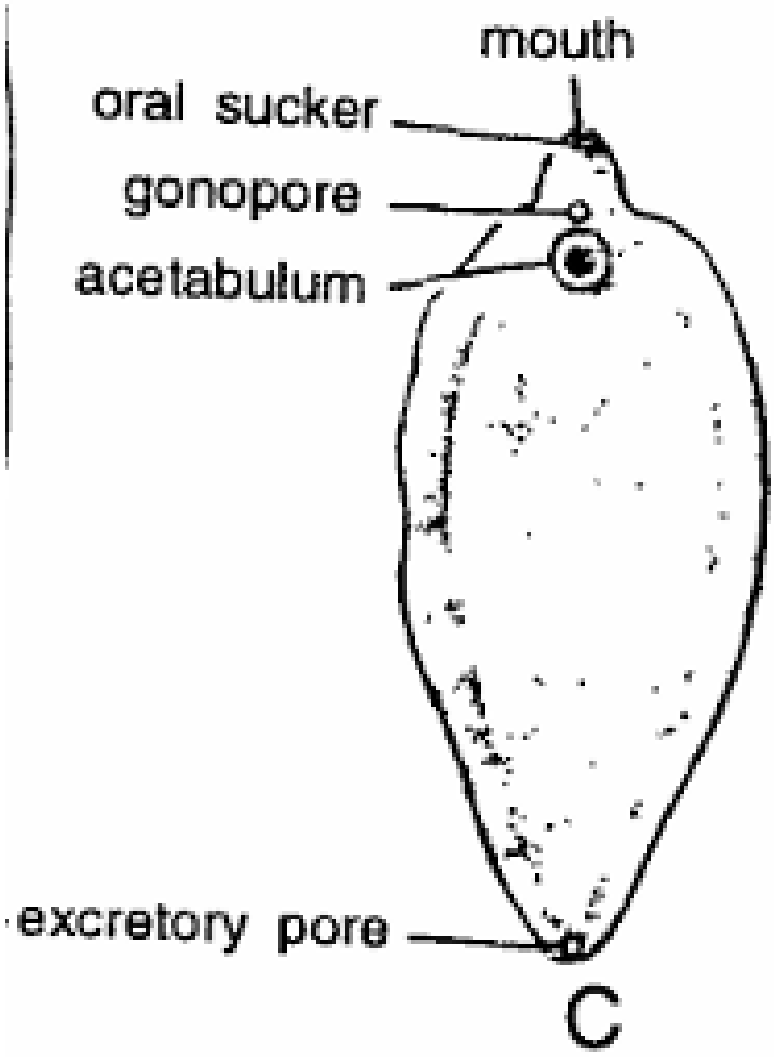
1. It is one of the largest land planarians measuring 20 to 50 cm in length. It was discovered in the green houses of the knew gardens in U.K. by Moseley (1878).
2. Animal consists of an expanded lunate head and cylindrical long body.
3. Numerous eyes are pres~nt on the margin of the head and sides of the body.
4. Purple, black, yellow, olive and grey coloured stripes are very distinct near the neck.
5. Body remains twisted.
6. This Planaria has stripes over the dorsal surface also and a creeping sole on the ventral surface.
7. Reproduction generally asexual. It never becomes sexual in temperate climate and it propagates by fragmentation.
8. Bipalium adventium breeds sexually.
9. If subjected to desiccation, it recovers water loss, provided the loss does not exceed, 45% of its weight.

Identification : Since the specimen contains a semi-circular head and all above features, hence it is Bipalium.

12. FASCIOLA HEPATICA

Classification:

Phylum :- Platyhelminthes
Class :- Trematoda
Order :- Digenea
Family :- Fasciolidae
Genus :- Fasciola
Species :- hepatica



Fasciola hepatica

Identification of fasciola hepatica

Habit and habitat : Fasciola hepatica is found in the bile ducts of liver and biliary passages of sheep, ox, horse, dog, elephant, man, monkey, deer and kangaroo. In sites they are seen protruding through bile ducts and liver substance.

Distribution : It has cosmopolitan distribution throughout sheep-raising areas. In U.S.A. and India it is endemic. Human Fascioliasis has been reported from Venezuela, Syria, China. Cuba, Argentina, U.S.S.R., Hungary, Rumania and France.

Comments

1. Commonly known as sheep liver fluke.
2. It is a polyxenous and pathogenic parasite.
3. Body is leaf-like, dorsoventrally flattened measuring 18 to 51 mm in length and 4 to 15 mm in breadth. Fasciola gigantica is larger than F. hepatica.
4. Anterior end is produced into a conical projection called cephalic cone.
5. There is a small ventrally-placed mouth at the anterior extremity, surrounded by oral sucker.
6. In both F. gigantica and F. hepatica, a little behind the mouth and oral sucker is an adhesive acetabulum or ventral sucker. Between oral sucker and ventral sucker is gonopore. Excretory pore is found at posterior extremity. Life-cycle involves two hosts. Sheep as definitive host and Limnea as intermediate host.
7. Life-cycle stages include zygote, Miracidium larva, Sporocyst larva, Redia larva, Cercaria larva and encysted Metacercaria. Metacercaria after ingestion by sheep changes into adult parasite inside the host.

Special features : The liver fluke causes anaemia, eosinophilia, diarrhoea, dysentery, ulcers, pain, bottle-jaw disease and liver rot in sheep. The yield of wool, leather and meat is greatly reduced in infested sheeps causing great loss to animal products industry. It also causes metabolic disturbances in the host.

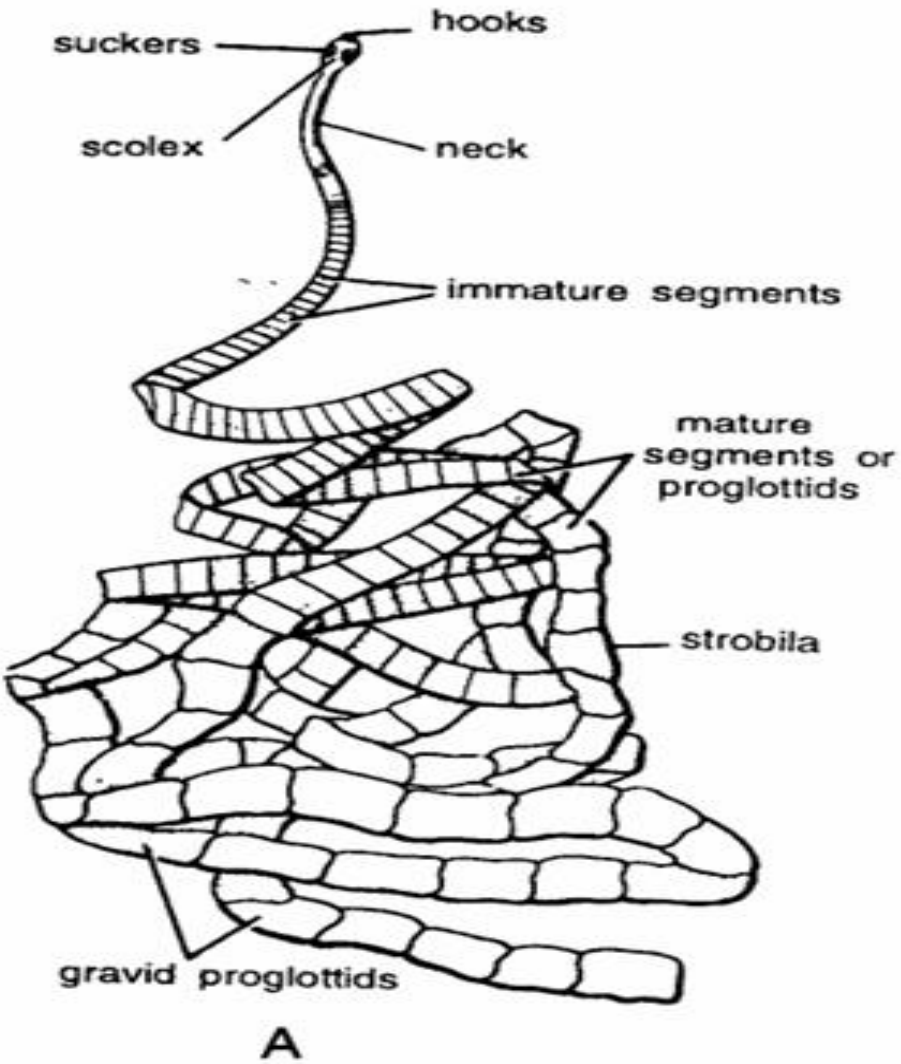
Preventive measures : The snails in the pond should be collected and destroyed if they are contaminated. The water vegetation near the pond regularly examined for encysted metacercariae. Sheep and goat should not be allowed to graze on such contaminated vegetation and thus infection of liver fluke can be avoided by them.

Identification : Since the specimen contains cephalic cone, acetabulum and all above characters and hence it is F. hepatica.

13. TAENIA SOLIUM PORK TAPEWORM

Classification:

Phylum :- Platyhelminthes
Class :- Cestoda
Sub-class :- Eucestoda
Order :- Cyclophyllidea
Family :- Taeniidae
Genus :- Taenia
Species :- solium



A

Identification of taenia solium

Habit and habitat : Taenia solium is found in the intestine of man. The scolex lies buried in the intestinal mucosa.

Distribution : The tapeworm is found endemic in the pork consuming areas. Its infection is abundant in India, China, Czechoslovakia, Y ogoslavia and Germany.

Comments

1. Commonly called as Pork tapeworm.
2. Body divided into scolex, neck, immature, mature and gravid segments.
3. Scolex serves as hold-fast organ. It contains 4 suckers and a rounded rostellum. Suckers contain radial muscles.
4. Rostellum at its base contains double row of 28 to 32 hooks.
5. Neck region is area of proliferation.
6. Mature segment contains well developed hermaphrodite genital organs. Gravid segments contain branched uterus filled with onchospherEs.
7. Life-cycle includes two hosts (i) man as definitive host and (ii) pig as intermediate host. Longitudinal and transverse excretory canals are seen in all segments.
8. In villages man deficates in the open field. Pig eats contaminated human faeces containing onchospheres and becomes infected.
9. Onchospheres or hexacanth larvae develop into Cysticerous larvae or bladder worm called as Cysticercus cellulose, which encyst in thigh, chest, shoulder muscles of the pig. Such muscle is called as Measly pork.
10. When man eats inadequately cooked hot dog or measly pork, it becomes infected and Taenia solium develops into adult in the intestine.

Special features: It causes various diseases in man like anaemia, secondary anaemia, eosinophilia, diarrhoea, haemorrhage, abdominal pain, nausea and insomnia, etc. Upto 13% eosinophilia is caused by it. It also causes metabolic disturbances in the host.

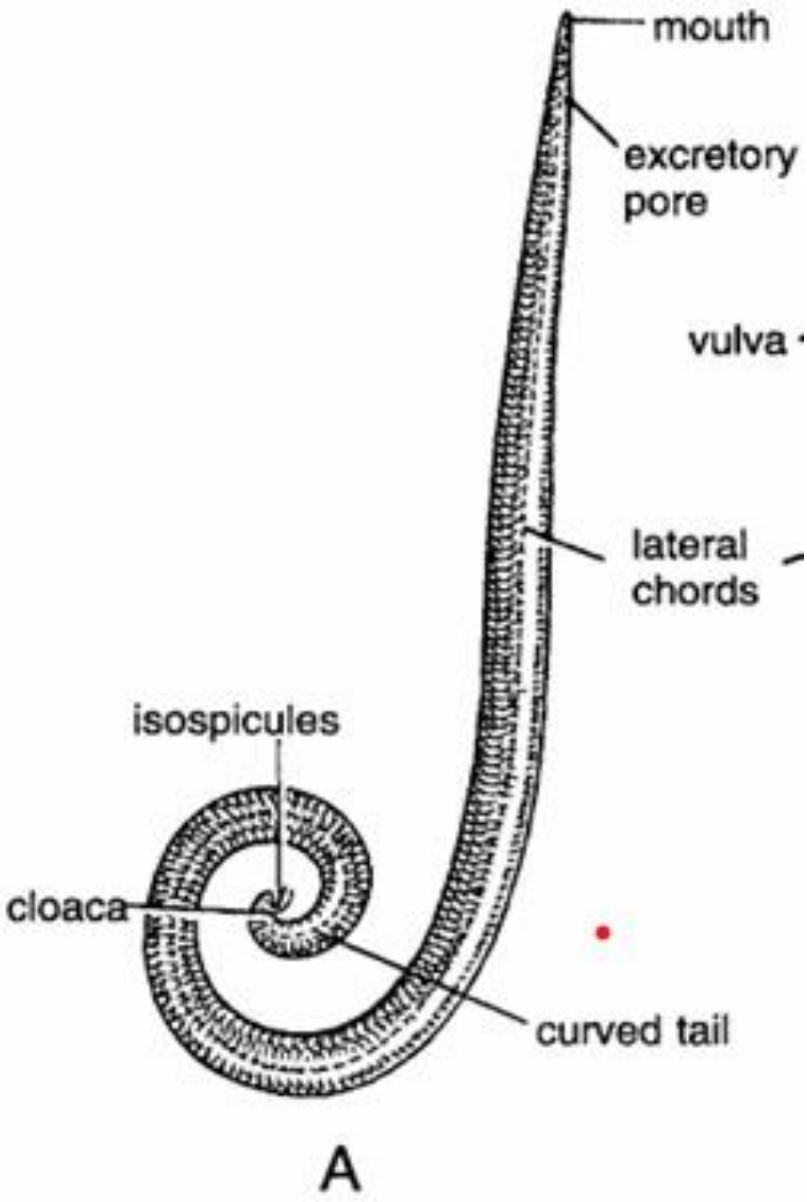
Preventive measures: The hot dogs are very common in affluent. Eating of measly pork should be avoided. The pig flesh should be examined for bladder cysts and contaminated flesh should not be allowed for marketing. Inadequately cooked pork should not be allowed and thus infection of Taeniasis can be prevented. ' .

Identification: Since the specimen contains scolex, neck and squarish segments and all above features and hence it is Taenia solium.

14. ASCARIS LUMBRICOIDES

Classification:

Phylum :- Aschelminthes
Class :-Nematoda
Order :-Ascaroidea
Genus :- Ascaris
Species :- lumbricoides



A

Identification of ascaris lumbricoides

Habit and habitat : Ascaris lumbricoides is found in the intestine of man and the pig. Both forms are morphologically identical having two different physiological strains. The infective eggs from man's Ascaris will not develop into the pig and similarly infective eggs obtained from the pig Ascaris will not develop into the man. However, the two specimens are called as Ascaris lumbricoides variety A. human is (found in man) and A. lumbricoides (suum found in pig).

Distribution : It is one of the most common nematodes found in all parts of the world especially in India, China, Philippines, Korea and Pacific Islands.

Comments

1. Commonly known as Round worm. It causes ascariasis in man especially in children. Infection occurs by eating raw and uncooked vegetables.
2. Shows sexual dimorphism with separate male and female individuals. Males measure 15 to 30 cm in length and female 20 to 35 cm.
3. Tail end of male is ventrally curved containing cloacal aperture, through which two equal isospicules project.
4. Tail end of female is bluntly pointed. Female genital opening or vulva found in anterior one third region.
5. Anterior ends exhibit same structures in both male and female.
6. Mouth is situated at the anterior extremity which is guarded by one dorsal and two sub-ventral lips.
7. Amphids are found in the sub-ventral lips.
8. Body is elongated and cylindrical.
9. Two lateral, one mid-dorsal and one mid-ventral longitudinal chords extent from anterior to posterior end. Excretory pore lies at a distance of about 2 rom from anterior end.
10. No intermediate host in life history.

Special features : Pathogenic nematode parasite causing haemorrhage, haemoptysis, appendicitis, peritonitis, tumour, ulcer, diarrhoea, eosinophilia and death. Its infection can be avoided by not eating raw and uncooked vegetables especially grown on human night soil fertilizer. Ascaris infection also causes disturbances in the nucleic acid, sugar, protein and fat metabolism of the host. Sometimes intestinal human is blocked by several parasites.

Prevention : A void eating raw unwashed and inadequately cooked vegetables and food. Contaminated water should not be taken.

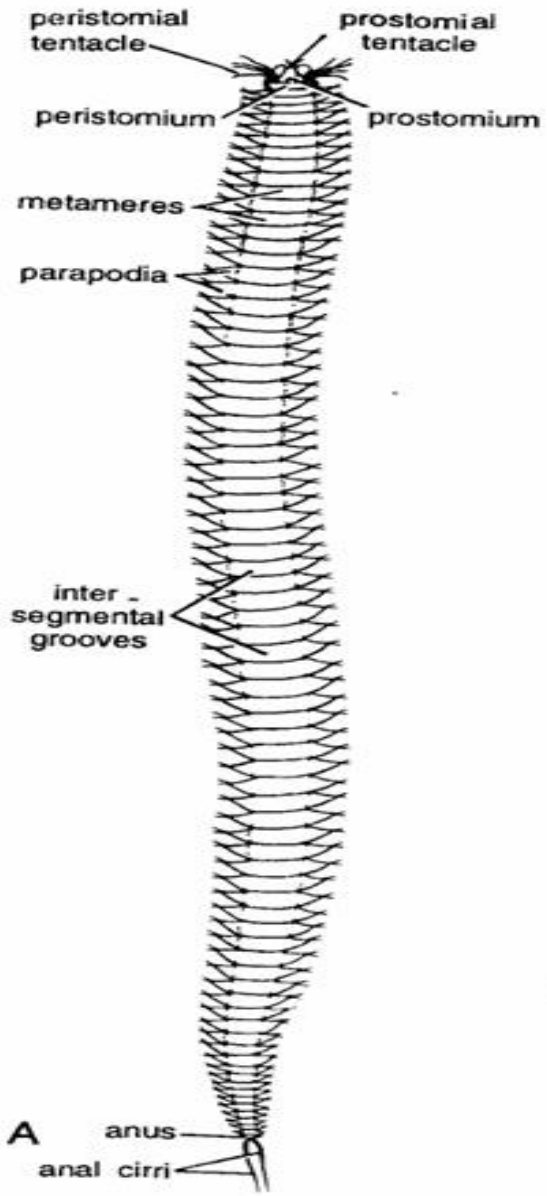
Identification : Since the animal has unsegmented cylindrical body, curved tail in male, pointed tail in female and hence it is A. lumbricoides.

PHYLUM ANNELIDA

15. NEREIS

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Errantia
Genus :- Nereis



Identification of nereis

Habit and habitat : Nereis is a marine crawling type, living in temporary burrows in sand, 200 meters deep. They are free-living, predaceous, nocturnal, carnivorous, often found buried in the intertidal sad.

Distribution : It has cosmopolitan distribution found along the North Atlantic coast, Pacific coast, U.S.A. and Europe.

Comments

1. Commonly called as Rag worm or Clam worm and is the simplest annelid.
2. Examination of preserved specimen shows cylindrical and elongated body form which is divided into similar metameres or segments about 200 in number.
3. First few segments fuse to form head which is composed of (i) prostomium or preoral lobe, which carries prostomial tentacles, palps and ocelli; and (ii) peristomium (2 segments fused), which carries antero-laterally 4 pairs of peristomial tentacles.
4. Mouth is found on the anterior surface of the peristomium.
5. Body segments, except head and anal segment, contain each pair of locomotory parapodia.
6. Segments are also called as metameres and between two segments in intersegmental groove.
7. Parapodia also serve as respiratory and circulatory organs. Each parapodium is composed of dorsal notopodium and ventral neuropodium. Parapodium also possesses aciculum for support and needle like setae for crawling.
8. Anal segment contains a pair or anal cirri.
9. Nereis is dioecious, although male and female worms can hardly be recognized.

Identification : Since the animal has prostomium, peristomium, parapodium and all above features and hence it is Nereis.

16. HETERONEREIS

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Errantia
Genus :- Jleteronereis

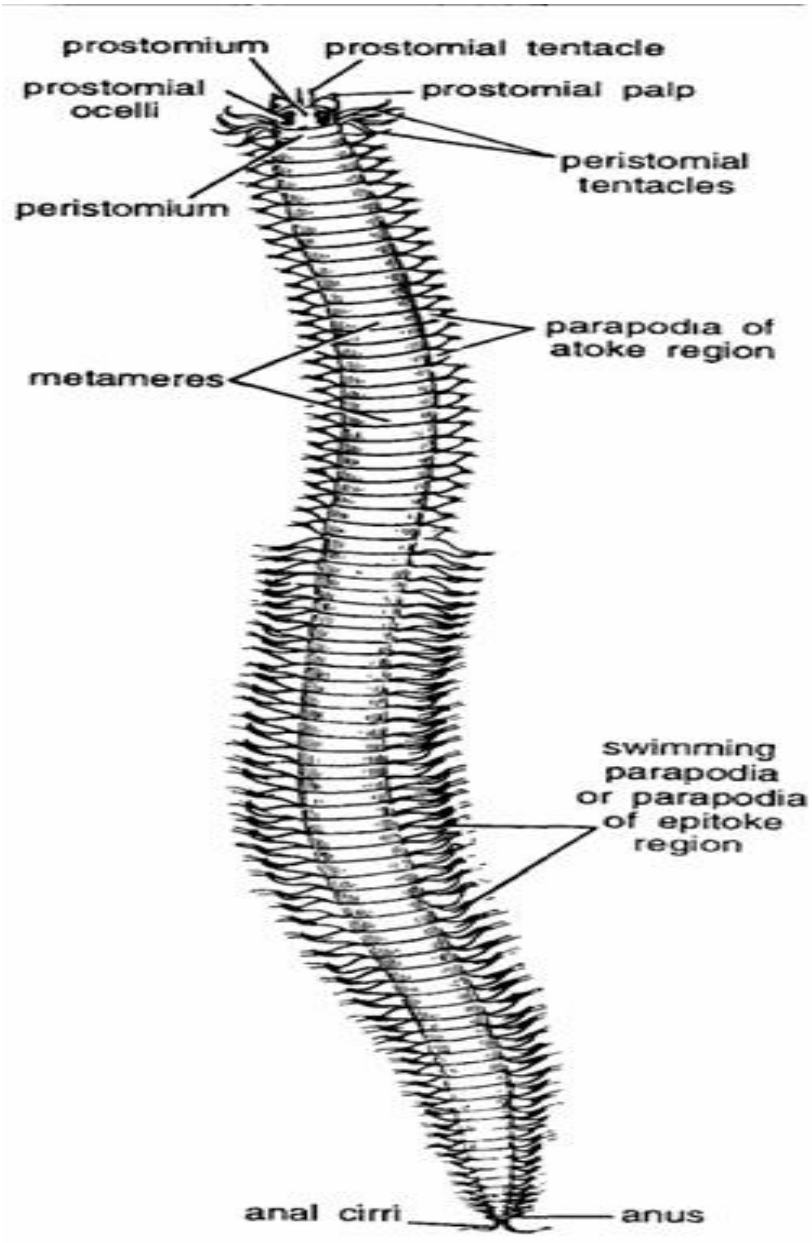


Fig. 80. *Heteronereis.* Entire.

Identification of Heteroneries

Habit and habitat: Heteronereis is a free-swimming worm found in sea.

Distribution : It has cosmopolitan distribution found along the North Atlantic coast, Pacific coast, U.S.A. and Europe.

Comments

1. Malmsgren identified that Heteronereis is the sexual phase of Nereis in which marked modifications occur in the posterior segments of the body which contain gonads.
2. During breeding season, clam worm leaves its tube and becomes free-swimming.
3. Body is differentiated into asexual anterior atoke and a posterior sexual epitoke which contains gametes.
4. Epitoke or posterior part becomes morphoiogically modified as the parapodia for become swimming.
5. Parapodia of Heteronereis contain additional foliaceous lobes and setae become oar-like. The notopodium and neuropodium become large leaf-like and act as fins and gills.
6. Peristomial cirri become large. Special sensory papillae develop on anal segment.
7. Prostomium contains prostomial tentacle, prostomial ocelli and prostomial palp. Peristomium contains peristomial tentacles.
8. Muscles and alimentary canal are reduced or become degenerated due to large development of gonads.
9. There is no marked sexual dimorphism in both sexes but the females tend to become orange or reddish.

Special features : Heteronereis has swarming habit. They swim to the surface of the sea water to shed the sperm or ova. Swarming occurs in the night and in some species they perform nuptial dance. Heteronereis dies after spawning. The development includes trochophore larva which metamorphoses into the adult.

Identification : Since the animal has epitoke, atoke and all above features and hence, it is Heteronereis.

17. APHRODITE

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Errantia
Genus :- Aphrodite

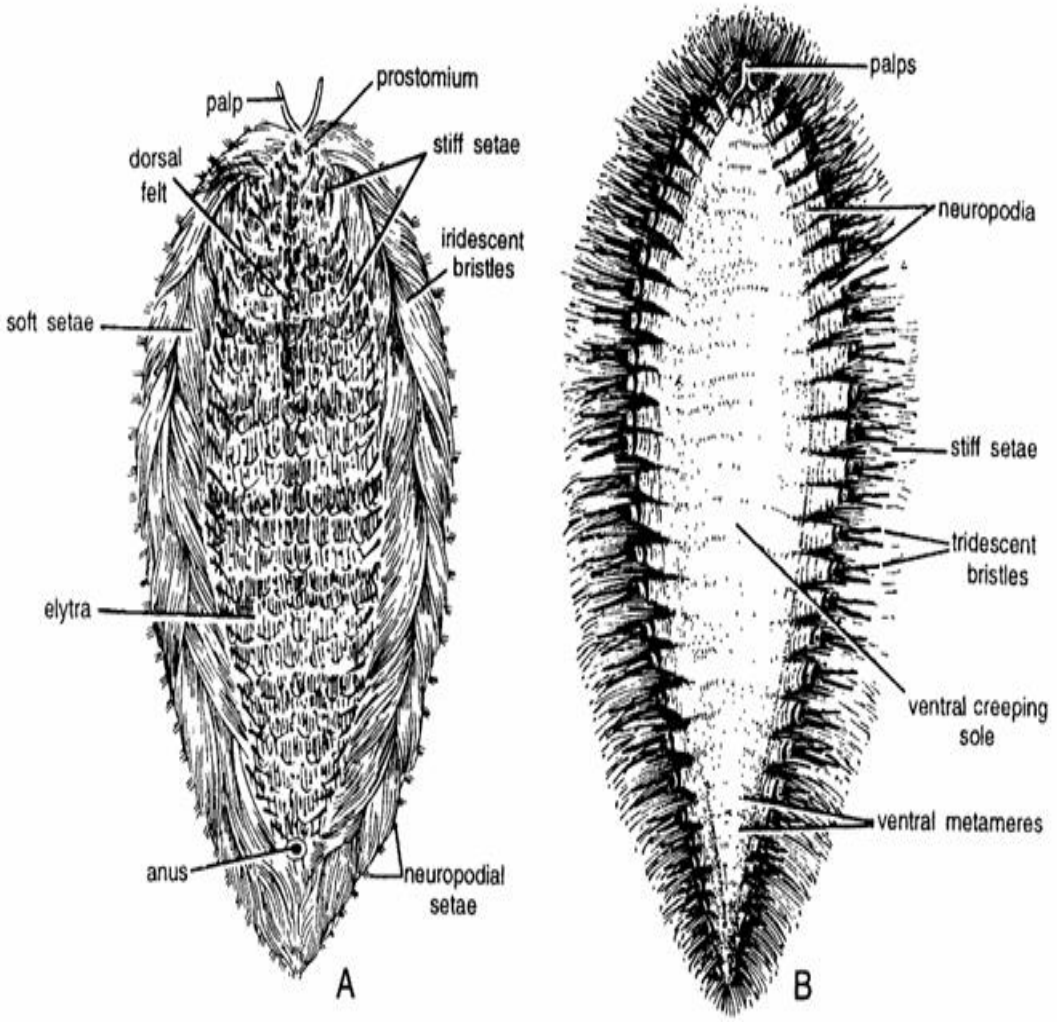


Fig. 85. *Aphrodite.* **A.** dorsal view, **B.** Ventral view.

Identification of Aphrodite

Habit and habitat: Aphrodite is marine worm inhabiting the deep water muddy bottoms. **Distribution:** It is found in U.S.A.

Comments

1. Commonly called as sea mouse measuring approximately 12 cm in length and made up of 30 to 35 segments.
2. Body is covered dorsally by felt-like or blanket-like setae arising from the notopodium.
3. Shape of the animal is oval, and dorsoventrally flattened. The dorsal surface is convex and is covered with setae of different kinds.
4. Anterior end contains a small head or prostomium, bearing a small median tentacle and 2 lateral palps. Anus is dorsally situated at the more pointed posterior extremity.
5. Parapodial structures are greatly modified. Notopodia contain 3 kinds of setae-(i) stiff setae, (ii) soft setae, and (iii) iridescent setae.
6. Neuropodial setae are also brown and stiff. The soft notopodial setae are modified to form a felt-like covering over the back of the animal, while dorsal cirri become plate-like and are called as elytra, 15 pairs in number. The elytra obtain dissolved oxygen from the sea water circulating around them.
7. Ventral surface is flat, segmented and forming a creeping sole. Each ventral segment or metamere contains stiff setae.
8. Pumping action of the dorsal body wall causes the sea water to be filtered through the dorsal felt into the space below.

Special features : Animal rolls itself with erect stiff setae like porcupine to protect itself from enemies when disturbed. During movement of the animal, colour changes from gold to peacock.

Identification : Since the specimen contains distinct stiff setae, iridescent setae and all above characters hence it is Aphrodite.

18. CHAETOPTERUS

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Tubicola
Genus :- Chaetopterus.

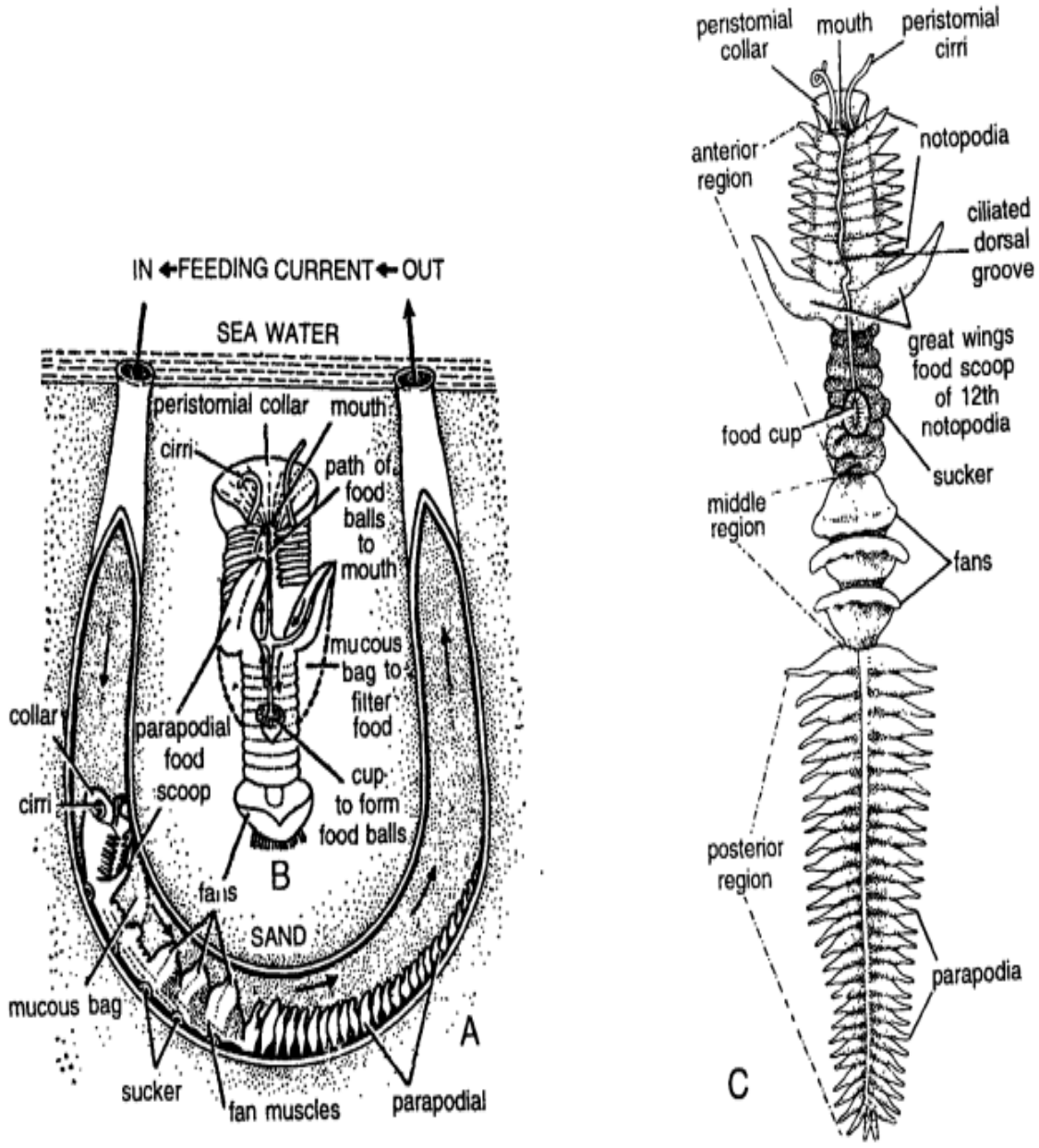


Fig. 87. *Chaetopterus.* **A.** Worm inside burrow, **B.** Anterior end showing feeding mechanism, **C.** Worm outside burrow.

Habit and habitat : Chaetopterus is a tubicolous, marine and bioluminescent annelid which lives permanently in a U-tube, made of sand and mucus with incurrent and excurrent openings. The tube is parchment like. Mode of feeding is ciliary.

Distribution : It is commonly found in Europe, U.S.A., North Carolina to Cape Cod.

Comments

1. Commonly called as paddel worm having greatly modified segments.
2. Tube is opaque, measuring approximately 50 cm long and about 1 cm in diameter.
3. Body is white, delicate, 30 cm long and divided into anterior, middle and posterior regions. The tentacles and palps are absent except a pair of backwardly directed peristomial cirri.
4. Parapodia are variously modified as for water pumping fans, sucking discs or food ball organs.
5. Anterior region comprises of 15 to 20 segments, having a funnel-shaped mouth surrounded by a collar-like peristomium and a pair of peristomial cirri in the first segment. Rest of the segments have reduced notopodium. Tenth segment bears great aliform wings like notopodia which collect food.
6. Middle region has fused segments. The notopodia of segments 14 to 16 are fused in mid line to form three fans. Notopodia are fused to form suckers.
7. Posterior region is longer with a pair of parapodia in each segment, about 11 to 30 in number.

Special features : The worm is strongly luminescent producing bluish-green light without heat. The light is produced by the action of luciferins and luciferase. Other special feature of the worm is its power of regeneration. The whole body can be regenerated from a single segment.

Identification : Since the specimen has greatly modified segments and all above features, hence it is Chaetopterus.

19. ARENICOLA

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Sedentaria
Genus Arenicola :-(The Lung worm)

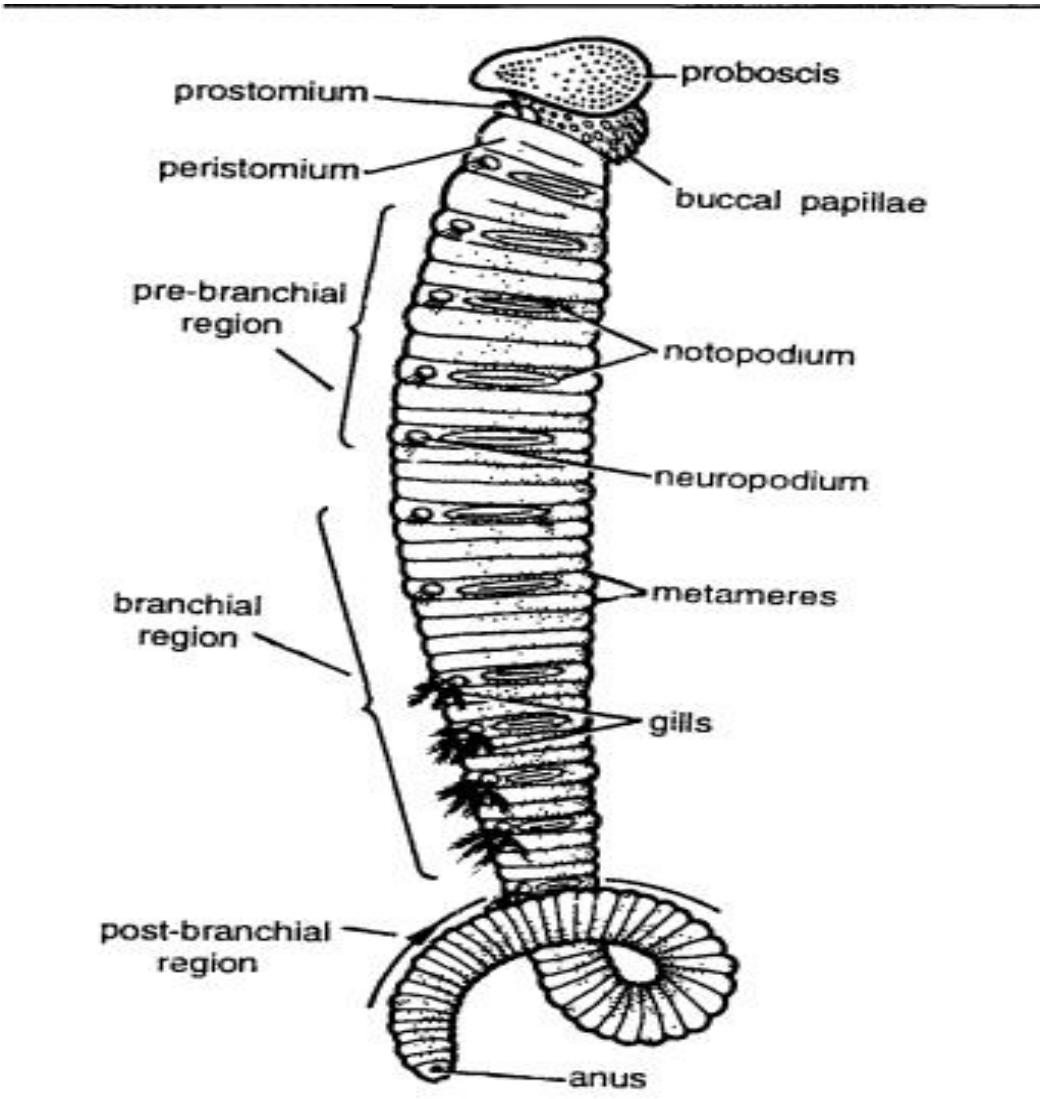


Fig. 90. *Arenicola.*

Identification of Arenicola

Habit and habitat : Arenicola is also tubiculous and burrowing polychaete, occurring just below the tide line in sea, where the water is less saline. Animals lives in a J-shaped burrow made of sand and mucus.

Distribution : It is distributed in Europe and U.S.A. (Florida to Cape Cod).

Comments

1. Body is stout, elongated, cylindrical and approximately 15 cm long, brownish or greenish in colour and divided into metameres.
2. Head without appendages and with an unarmed proboscis.
3. Animal is differentiated into an anterior pre-branchial, a middle branchial and a posterior post-branchial region.
4. Anterior region consists of a small trilobed prostomium with no eyes or tentacles, an achaetus peristomium and 6 segments bearing rudimentary parapodia.
5. Parapodia contains reduced notopodium and neuropodium.
6. Mouth lies ventral to the prostomium. The buccal region and pharynx protrude as proboscis which is covered by chitinized buccal papillae.
7. Middle region has 13 segments, each bearing in addition to neuropodia, a pair of extensively branched gills. Nephridia six pairs.
8. Posterior region has variable number of segments and devoid of parapodia or gills. Anus opens through last segment.
9. Arenicola is generally used as bait for fishing.

Identification : Since the specimen has pre-branchial, branchial and post-branchial regions and all above features, hence it is Arenicola.

20. AMPHITRITE

Classification:

Phylum :- Annelida
Class :- Polychaeta
Order :- Sedentaria
Genus :- Amphitrite

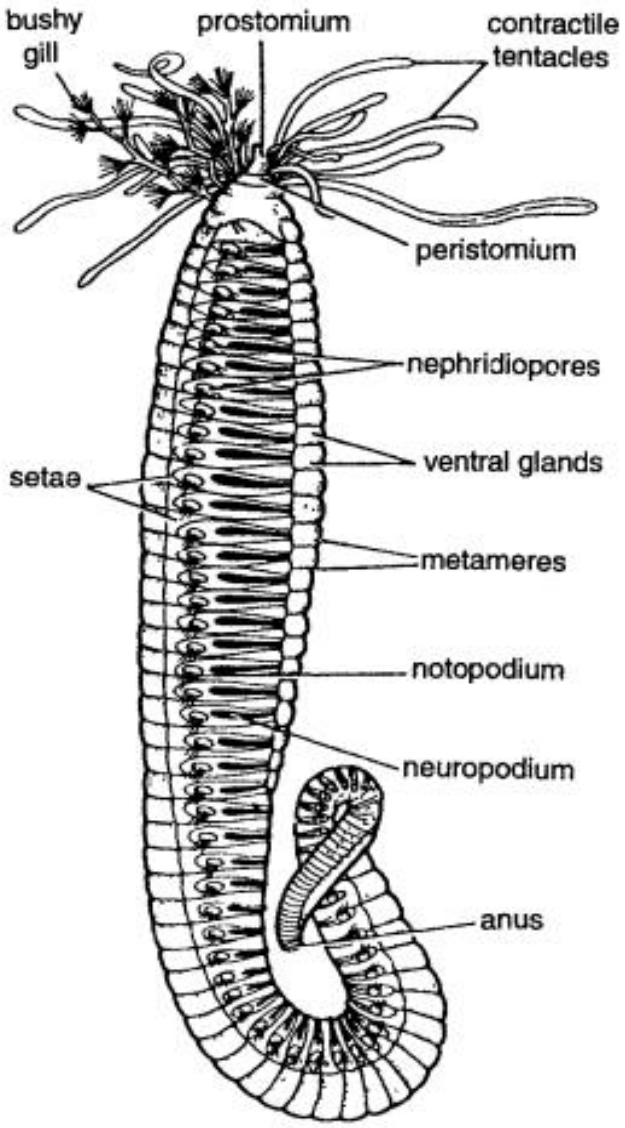


Fig. 91. *Amphitrite.*

Identification of Amphitrite

Habit and habitat : Amphitrite is a marine, sedentary polychaete, very common along the eastern coast of the United States. The animal dwells near the low tide level in tubes lined with mucus and buried in sand or mud.

Distribution : It is found in Europe and U.S.A. (North Carolina to Cape Cod).

Comments

1. Animal is long cylindrical, and pinkish in colour measuring 20 to 30 cm in length
2. Body is divided into metameres and regionated into somewhat thickened anterior region (head), middle region (trunk) and posterior narrow region.
3. Prostomium forms the upper lip and peristomium lower lip of the mouth. No eyes and palps in prostomium. Peristomium is also without appendages. Prostomium forms proboscis.
4. Just behind the head is a transverse ridge crowned with several, long hollow, yellowish and contractile tentacles having coelomic extension. They are feeding organs and have poor vascularization having a ciliated groove on one side.
5. Branchial region consists of many segments bearing notopodia with setae and neuropodia with uncini. The first three segments of the middle region contain three pairs of bushy gills placed dorso-laterally.
6. Gills contract rhythmically. Ventrally few thoracic segments have shield glands or ventral glands for mucus secretion.
7. Abdomen is long and each segment contains notopodia and neuropodia (uncini).
8. Caudal segments lack notopodia and anu:; is found terminally in the last segment as elongated aperture.

Special features : Generally Lepidometria a symbiont lives in the same tube with Amphitrite.

Identification : Since the specimen contains anterior feathery tentacles and all above characters and hence it is Amphitrite.

21. PHERETIMA : EARTHWORM

Classification:

Phylum :- Annelida
Class :- Oligochaeta
Order :- Neo-oligochaeta
Genus :- Pheretima

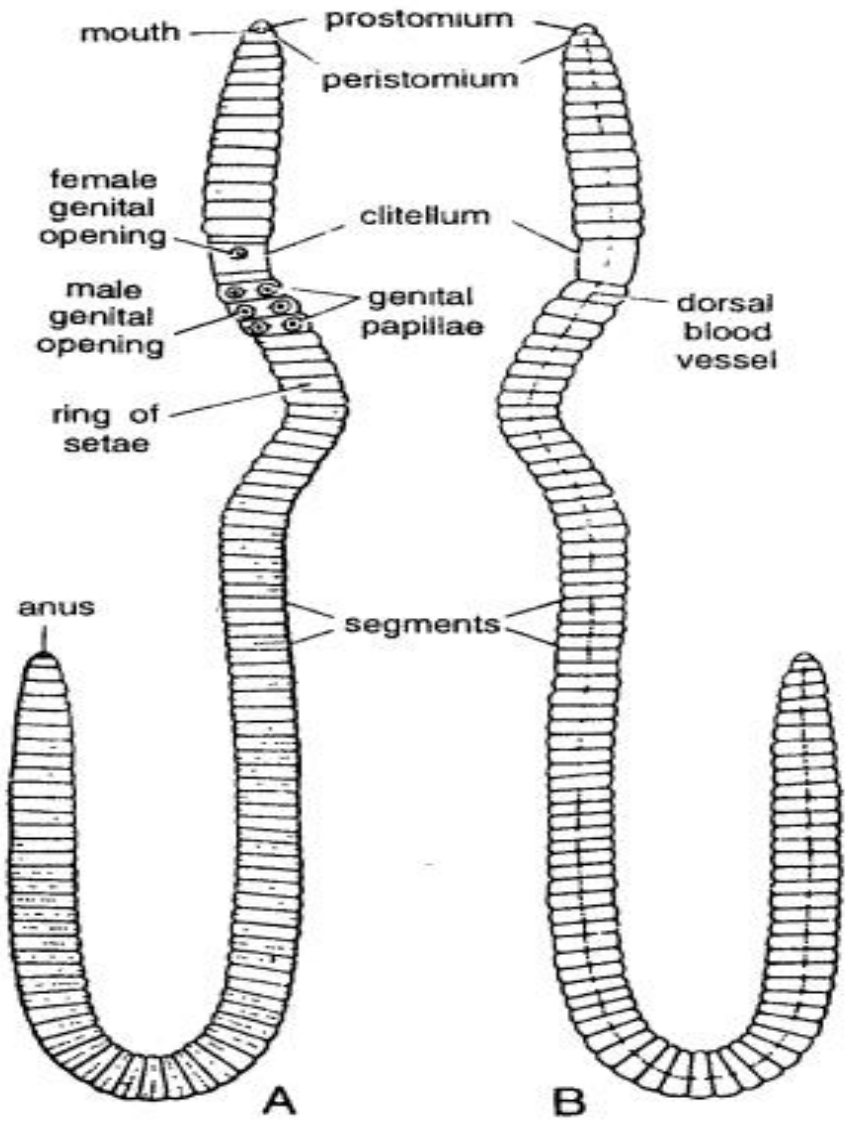


Fig. 96. ***Pheretima.*** **A.** Ventral view, **B.** Dorsal view.

Identification of Pheretima

Habit and habitat : Pheretima is found in the soil but absent in sandy and humus deficient soil. They are found in mountains, clayey and acidic soils. They live usually in the upper layers of slightly damp soils, lawns, gardens and up to the depth of 30 to 45 cm in burrows for protection against enemies and under unfavourable condition. According to Darwin one acre of land may contain 63,000 earthworms. It is nocturnal. The earthworm is hermaphroditic (monoecious).

Distribution : Cosmopolitan

Comments

1. Commonly called as Earthworm.
2. Body consists of 100 to 120 ring like segments depicting true metamerism and measuring approximately 150 mm.
3. Both external and internal segmentations are distinct. The worm is glistening deep brown or clay-coloured.
4. Anterior end is somewhat narrowly pointed, while posterior end is bluntly pointed.
5. Except the first and last segment, each segment contains a row of setae in the ventral body wall.
6. Dorsal surface is dark brown in colour and it is easily recognized by dark median line of dorsal blood vessel.
7. First segment is called as prostomium which contains ventral mouth. The last segments is called as anal segment containing anus.
8. A portion of the body is thickened and is called as clitellum around 14 to 16 segments.
9. Spermathecal pores are found in the inter-segmental grooves of 5/6, 6/7, 7/8 and 8/9 segments. The female-genital pore on the 14th segment and male-genital pores on the 18th segment. Two pairs of genital papillae lie on the ventral surface in the 17th and 19th segments.
10. Cross-fertilization, but copulation has not been studied in P. posthuma. Development takes place in cocoons.

Special features : Ea.rthwonn is economically very important as (i) It is used as fishing bait, (ii) It has medicinal, educational and experimental value, (iii) The earthworms are beneficial to agriculture. They are important agent in the conditioning of soil and pennit water to enter easily du.ring rain. The constant mixing of soild and organic debris contributes to development of good humus. Earthwonns are very good fertilizers and are cultured.

Identification: Since the specimen contains clitellum in 14 to 16 mm segments and all above features, hence, it is **Pheretima.**

22. LUMBRICUS

Classification:

Phylum :- Annelida
Class :- Oligochaeta
Order :- Neo-oligochaeta
Genus :- Lumbricus

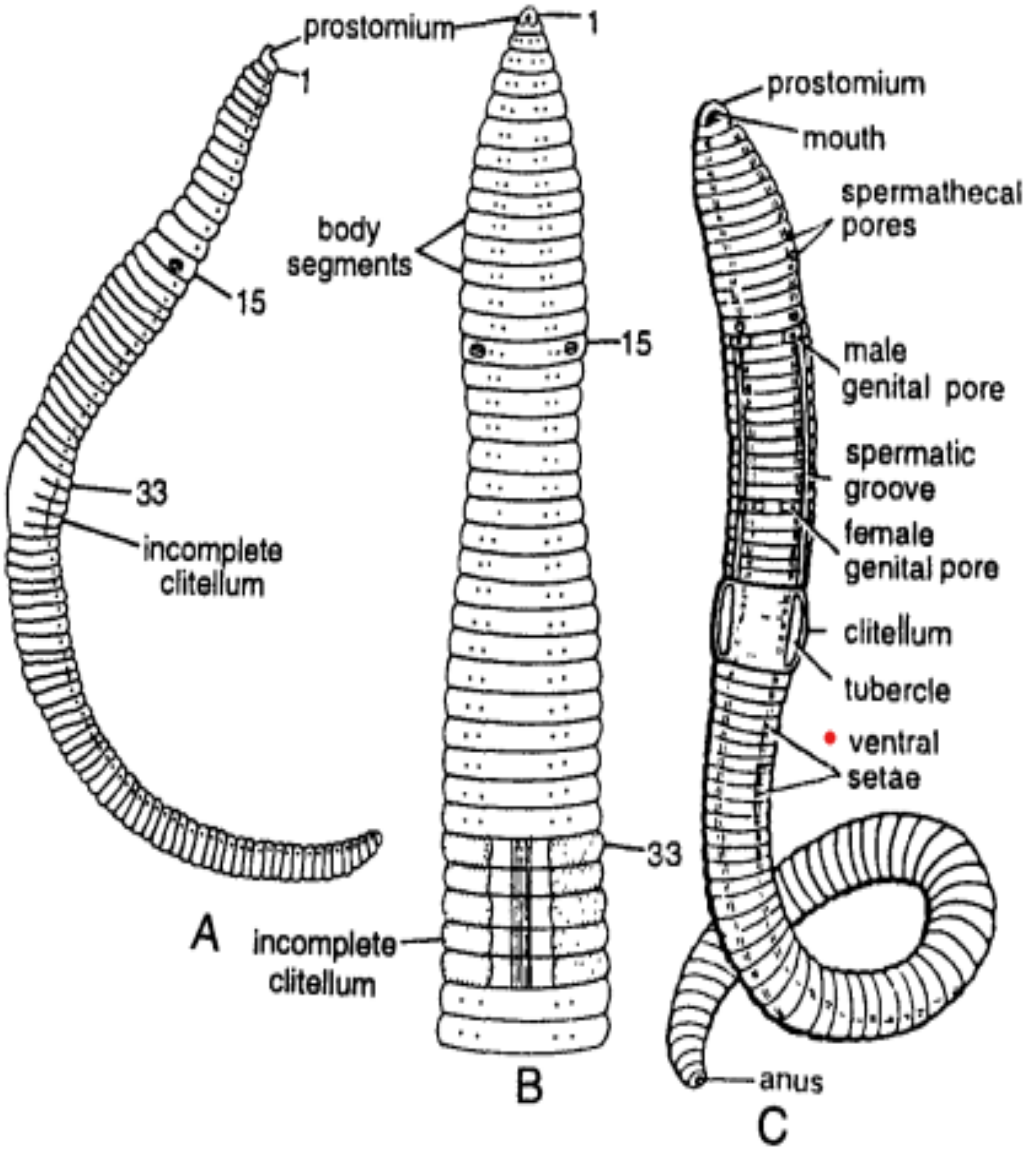


Fig. 97. *Lumbricus.* **A.** Entire worm, **B.** Incomplete clitellum, **C.** Block dots-state pore.

Identification of lumbricus

Habit and habitat : Lumbricus is found abundantly in moist soil.

Distribution : It is common earthwonn of Europe and U.S.A.

Comments

1. Commonly called as Earthworm.
2. Earthwonn is a common and favourite classroom animal in European countries.
3. It remains wholly in burrow during daytime because of light and humidity.
4. Cylindrical body measures 15 to 30 cm in length and consisting of about tOO metameric segments.
5. Each segment, except the first and the last bears S-shaped setae on ventral surface as black dots.
6. Lobular prostomium divides peristomium into two parts.
7. A pennanent clitellum develops in segments 33 to 37 only on dorsal and lateral sides, remains incompletp. ventrally. Clitellum contains tuberacle. Tail is flattened.
8. Dorsal and ventral surfaces well differentiated.
9. Hermaphroditic (monoecious), female-genital pores lie ventrally on 15th segment while male-- genital openings on 14th segment. Genital papillae are absent. Reproduction is sexual.
10. Dorsal pores are found in the midline of the inter-segmental grooves from the 10th segment onwards.
11. Coelomic fluid is exuded from these pores on the surface of the worm, when the worm is subjected to some irritation.

Special features : The peritoneum surrounding the intestine is modified to form a glandular layer called the chlorogogen cells. These extract wastes from the blood and later become detached and float in coelom. Ultimately much of their substances is engulfed by amoeboid cells and carried to the skin where it is deposited as pigment.

Identification : Since the specimen contains incomplete clitellum in 33 to 37 mm segments and all above features, hence it is Lumbricus.

23. TUBIFEX

Classification:

Phylum :- Annelida.
Class :- Oligochaeta
Order :- Archioligochaeta
Genus :- Tubifex

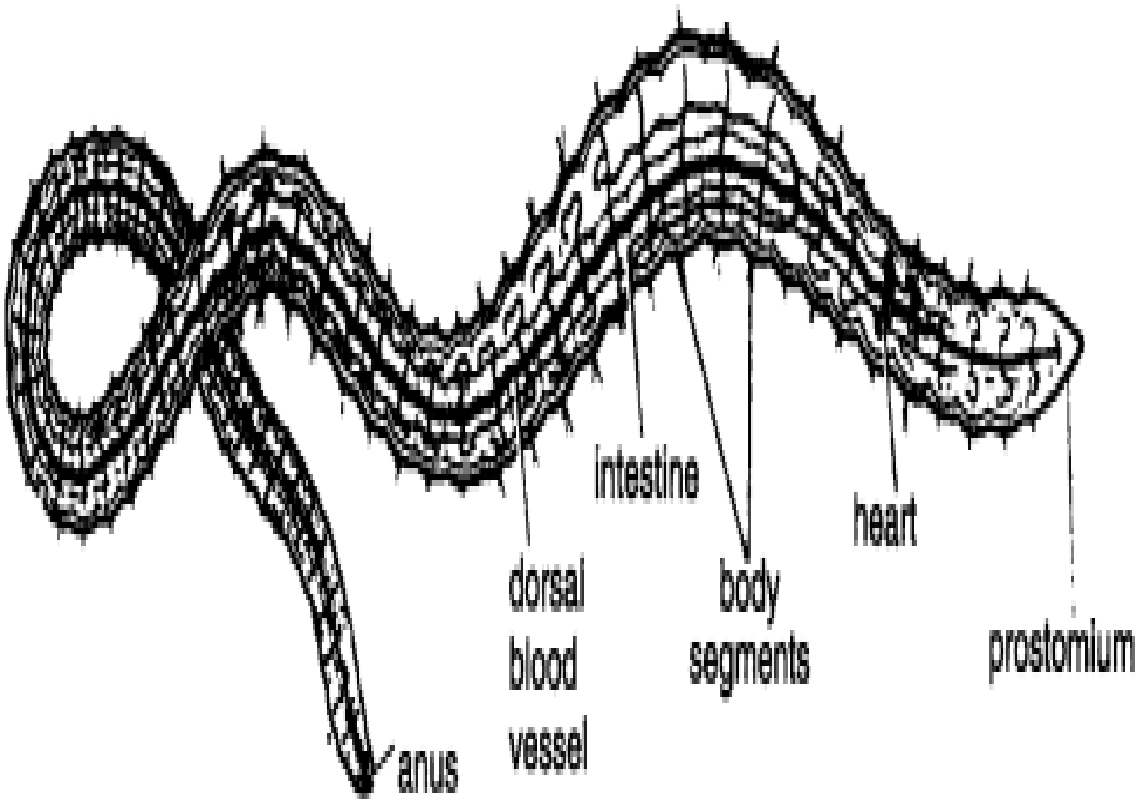


Fig. 98. *Tubifex*. Ventral surface.

Identification of tubifex

Habit and habitat : Tubifex is a tubicolous fresh-water archioligochaete, found abundantly on the bottom of deep lakes. The animal lives in tubes, made up of mud and minerals glued together by mucus.

Distribution: It is found in U.S.A. (Long Island Sound to Maine).

Comments

1. Body is cylindrical, red coloured, metamerically segmented measuring 4 cm in length.
2. First and second segments are prostomium and peristomium respectively.
3. Each segment contains 4 bundles of setae on dorsal and ventral sides.
4. Setae forked and hair-like in the dorsal bundles and only forked ones in ventral bundles.
5. Clitellum is found in 11th and 12th segments.
6. Contractile heart is found in 8th segment. Female-genital pores in the 11th segment and male-genital pore in the 12th segment.
7. Hermaphroditic. It reproduces sexually only.

Special features : Tubifex is encouraged to grow in filter beds of sewage disposal plants in order to keep the filter open. They have probably purifactory functions.

Identification : Since the animal contains 4-bundles of setae in each segment and all above features hence it is Tubifex.

1. ACANTHOBDELLA

Classification:

Phylum :- Annelida
Class :- Hirudinea
Order :- Acanthobdellida
Genus :- Acanthobdella

24. ACANTHOBDELLA

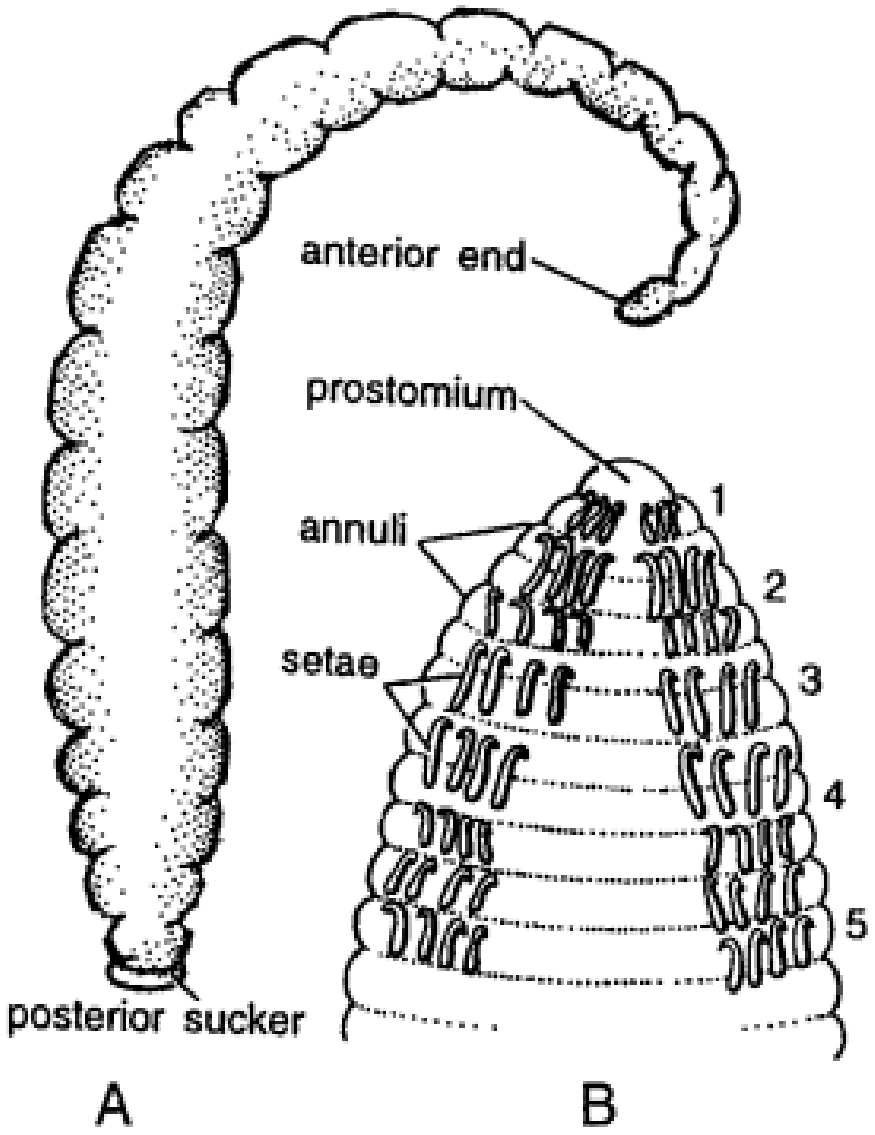


Fig. 99. *Acanthobdella.* **A.** Entire leech, **B.** Anterior end in ventral view.

Identification of Acanthobdella

Habit and habitat : The order Acanthobdella includes a single genus Acanthobdella found as an ectoparasite on the caudal and anal fins of the salmon fish Salmo salvelinus (Fig. 99).

Distribution: Commonly present in West Siberia and N.E. Europe.

Comments

1. Body consists of about 20 metameric segments only.
2. Anterior sucker is absent. Posterior sucker is well developed and consists of four segments.
3. Each ventro-Iateral sides of first five segments contain 4 pairs of setae embedded in setigerous sacs provided with retractor muscles.
4. Body cavity (perivisceral) is incompletely divided by 20 transverse septa.
5. Visceral peritoneum consists of flat globules, containing cells corresponding to chloragogen cells.
6. Nephridia with both external and internal openings.
7. Blood vascular system made of a dorsal and a ventral vessel and nervous system consists of 20 ventral ganglia of which the first and the last are composite.

Special features : The external morphology strongly suggests that Acanthabdella is leech but Michaelson regarded it as oligochaeta due to setae and incomplete septa. However Acanthobdella represents good connecting link between earthworms and leeches.

Identification : Besides absence of anterior sucker, animal shows all above features, hence it is Acanthobdella.

25. HIRUDINARIA GRANULOSA

Classification:

Phylum :- Annelida
Class :- Hirudinea
Order :-Rbynchobdellida or Gnathobdellida
Genus :- Hirudinaria
Species :- granulosa

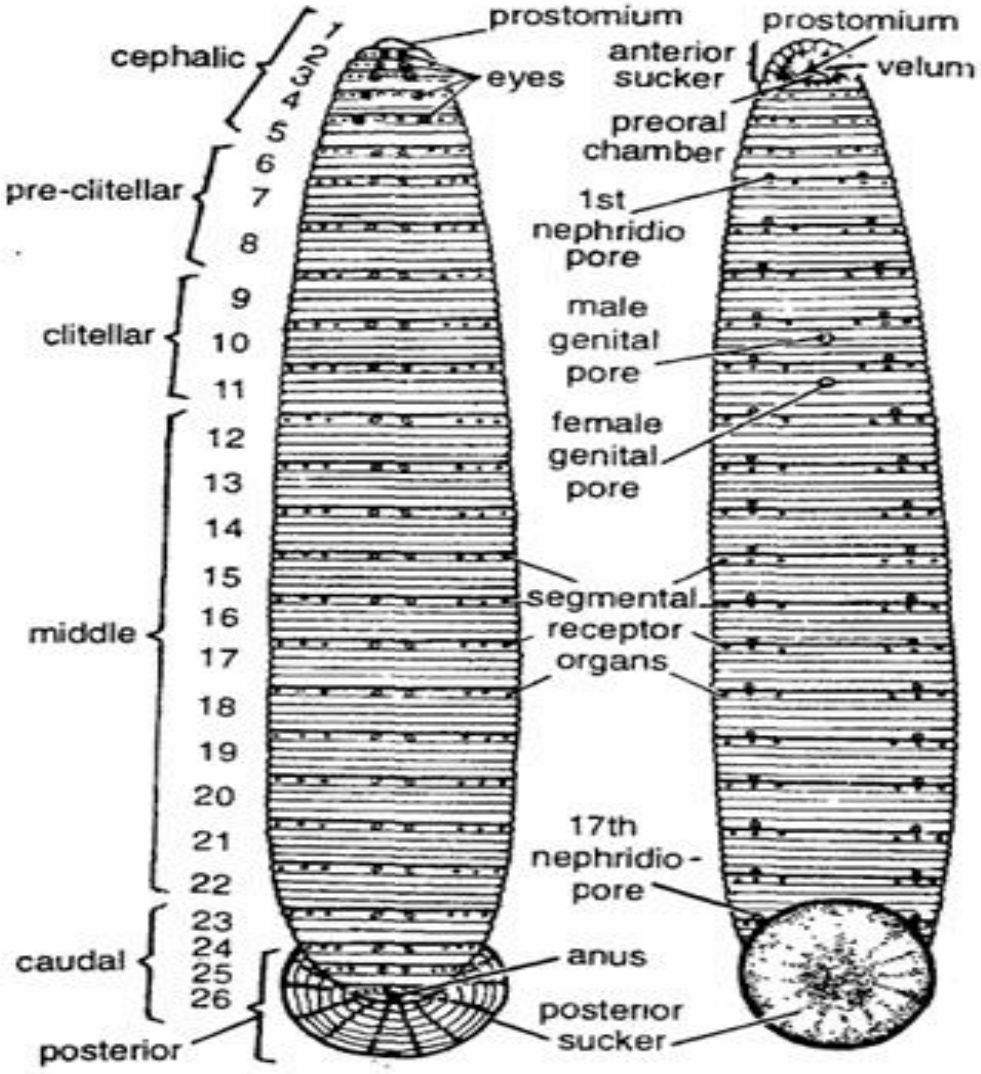


Fig. 104. ***Hirudinaria granulosa.*** **A.** Dorsal view, **B.** Ventral view.

Identification of Hirudinaria granulosa

Habit and habitat: Hirudinaria is found in fresh water ponds, lakes and swamps. It is a blood sucking or sanguivorous ectoparasite feeding and sucking the blood of frog, fishes and men.

Distribution: It has cosmopolitan distribution and specially found in India and Myanmar.

Comments

1. Commonly called as Indian cattle leech.
2. Body is soft, vermiform, elongated dorsoventrally flattened, measuring 30 to 35 cm in length.
3. Skin is kept moist and slimy due to abundant mucus secretion.
4. Anterior and posterior suckers are well developed.
5. Dorsal surface is olive green, ventral surface orange-yellow or red. Both surfaces have black stripes.
6. Body is divided into cephalic, preclitellar, clitellar, middle, caudal and posterior sucker regions with 33 segments. Each segment is superficially divided into 5 annuli.
7. Anterior sucker is oval and contains ventral tri-radiate mouth. It is formed by the fusion of prostomium and few anterior segments. The posterior sucker is highly muscular and acts as powerful locomotory and adhesive organ.
8. Eyes 5 pairs dorsally. Segmental receptor organs are 4 pairs (dorsal) and 3 pairs (ventral). Anus is on 26th segment, nephridiopores on 6 to 22 segments ventrally, male-genital pore on mid-ventral, inter-segmental groove of 2nd and 3rd annuli of 10th segment and female-genital pore on 11th segment.
9. Hermaphroditic. Genital organs are like Hirudo. Reproduction sexual. Development takes place on cocoons.

Special features: Cattles are often submerged in tanks and lakes. Several leeches attach to their body for blood sucking. It is said that a fully fed leech can live several months without blood-feed.

Identification : Since the leech contains 33 segments and all above features, hence it is Hirudinaria granulosa.

PHYLUM :- ARTHROPODA

26. SQUILLA

Classification:

Phylum :- Arthropoda
Class :- Crustacea
Sub-class :- Malacostraca
Order :- Stomatopoda
Genus :- Squilla

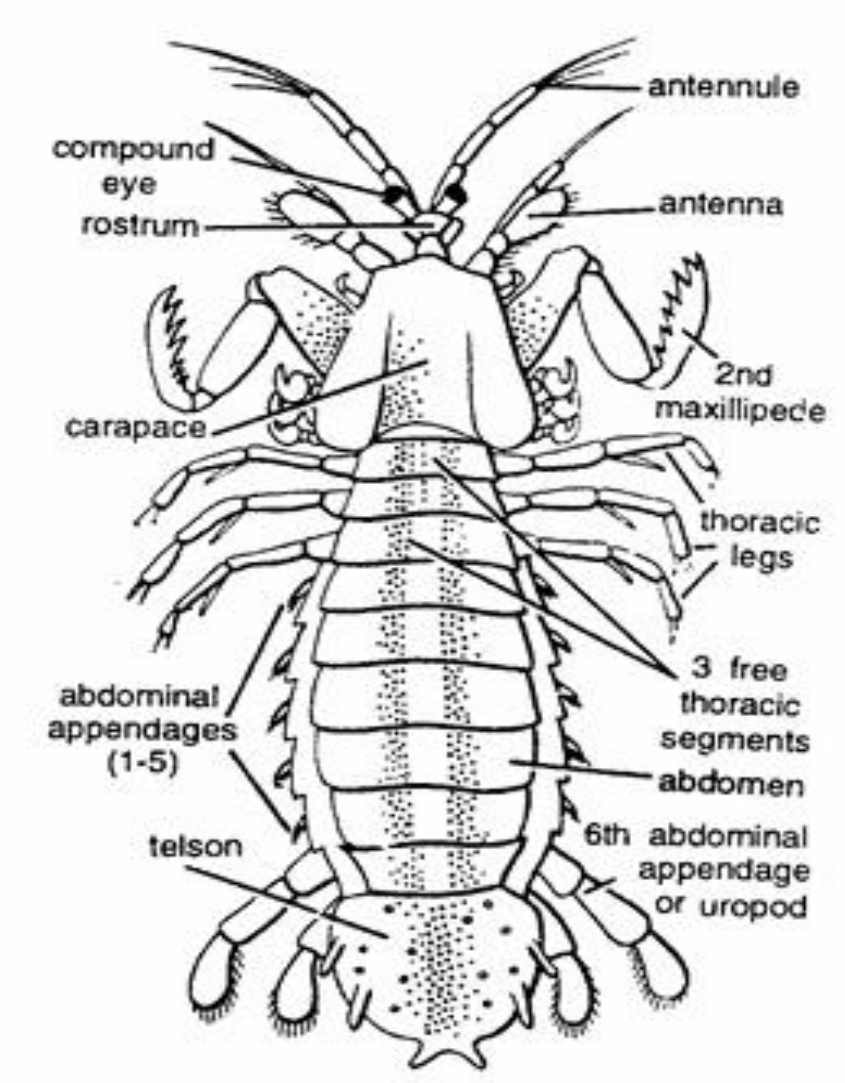


Fig. 148. *Squilla.*

Identification of squilla

Habit and habitat : Squilla is a large, marine crustacean, found in burrows in the sand or mud at the bottom of the sea. It is an active predatory form catching prey with powerful maxillipedes.

Distribution : It is found in India, Gulf of Mexico and Southern coast of Florida.

Comments

1. Body is whitish, semi-transparent and is differentiated in cephalothorax, thorax and abdomen measuring 25 em in length.
2. Carapace is small, flat uncalcified and fused with only three thoracic segments leaving at least four uncovered. Rostrum covers anterior region. There are two free segments in the head bearing pedunculate eyes and antennules respectively.
3. Head appendages are bilobed eyes, antennules and antennae.
4. First five pairs of uniramous thoracic appendages serve as maxillipedes, the second being the largest, sub-chelate and raptorial. The dactylus is armed with teeth on the inner margin. There are no oostegites.
5. Last three thoracic segments bear walking legs.
6. Ahdomen composed of 6 segments, is broader and elongated than eephalothorax. The first five abdominal segments with longitudinal ridges (carinae).
7. Abdomen has large and biramous pleopods. The first five pleopods have branchiae or gills attached to exopodites while the sixth pair of abdominal limbs form a tail fan with the telson.
8. Heart is greatly elongated extending through the thoracic and abdominal regions.
9. Larvae are pelagic and in their general form resemble the zoaea larva of crab.

Identification : Since the specimen contains whitish semi-transparent body and all above features, hence it is Squilla.

27. PALAEMON MALCOLMSONII

Classification :

Phylum ;- Arthropoda
Class :- Crustacea
Sub-class :- Malacostraca
Order :- Decapoda
Sub-order :- Macrura
Genus :- Palaemon
Species :- malcolmsonii

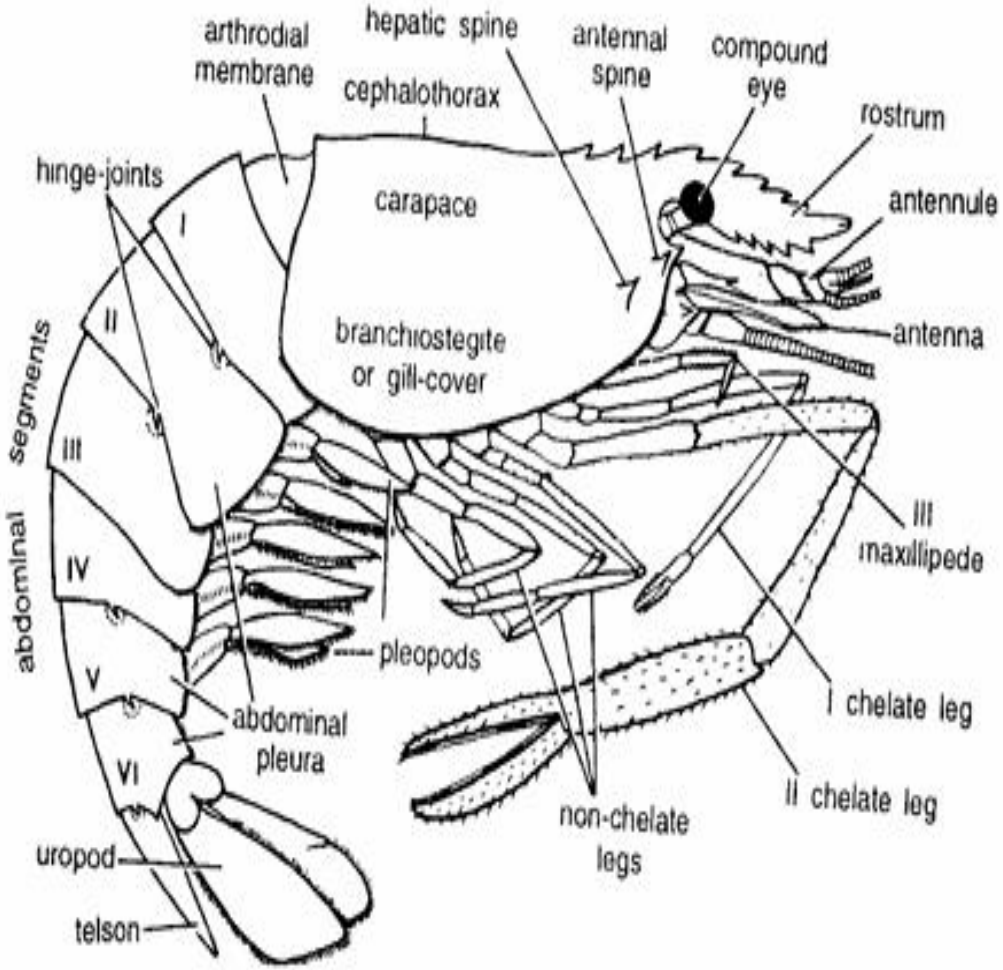


Fig. 150. *Palaemon malcolmsonii* : Prawn.

Identification of Palaemon malcolmsonii

Habit and habitat : Palaemon is found in fresh-water streams, rivers, ponds and lakes. The animal is nocturnal, hiding at the bottom during the day and coming to the surface at night in search of food.

Distribution : Commonly found in India.

Comments:

1. Commonly called as prawn.
2. Body is elongated, spindle-shaped, bilaterally symmetrical and deep orange coloured when preserved and measuring about 25 cm in length.
3. Divisions of the body are cephalothorax, abdomen and telson.
4. Cephalothorax is made up of 5 head and 8 thoracic segments. Carapace is anteriorly produced into sawtoothed rostrum. There are two prominent eyes on the head.
5. Abdomen is made up of 6 segments. It is dorsally rounded, laterally compressed and nonnally bent under the cephalothorax so that the animal looks like comma.
6. There are 19 pairs of appendages, one pair in each segment. The cephalic appendages comprise of antennules, antennae, mandibles, maxillulae and maxillae. A large platelike antennal used as a rudder in swimming.
7. Thoracic appendages are I maxillipedes, II maxillipedes, III maxillipedes and 5 pairs of jointed walking legs.
8. First abdomen somite is not reduced. Rest five abdominal segments contain paired biramous swimming pleopods. Vlth abdominal segment contains paired uropods and a telson. Development includes nauplius larva.

Special features : Prawns have edible importance and they have great educational importance. They are most familiar animals for dissection to understand invertebrate anatomy.

Identification : Since the specimen is larger than Penaeus, contains spatulate uropods and all above characters, hence it is Palaemon malcolmsollii.

28. ASTACUS FLUVIATILIS

Classification:

Phylum :- Arthropoda
Class :- Crustacea
Sub-class :- Malacostraca
Order :- Decapoda
Sub-order :- Macrura
Genus :- .Astacus
Species :- fluviatilis

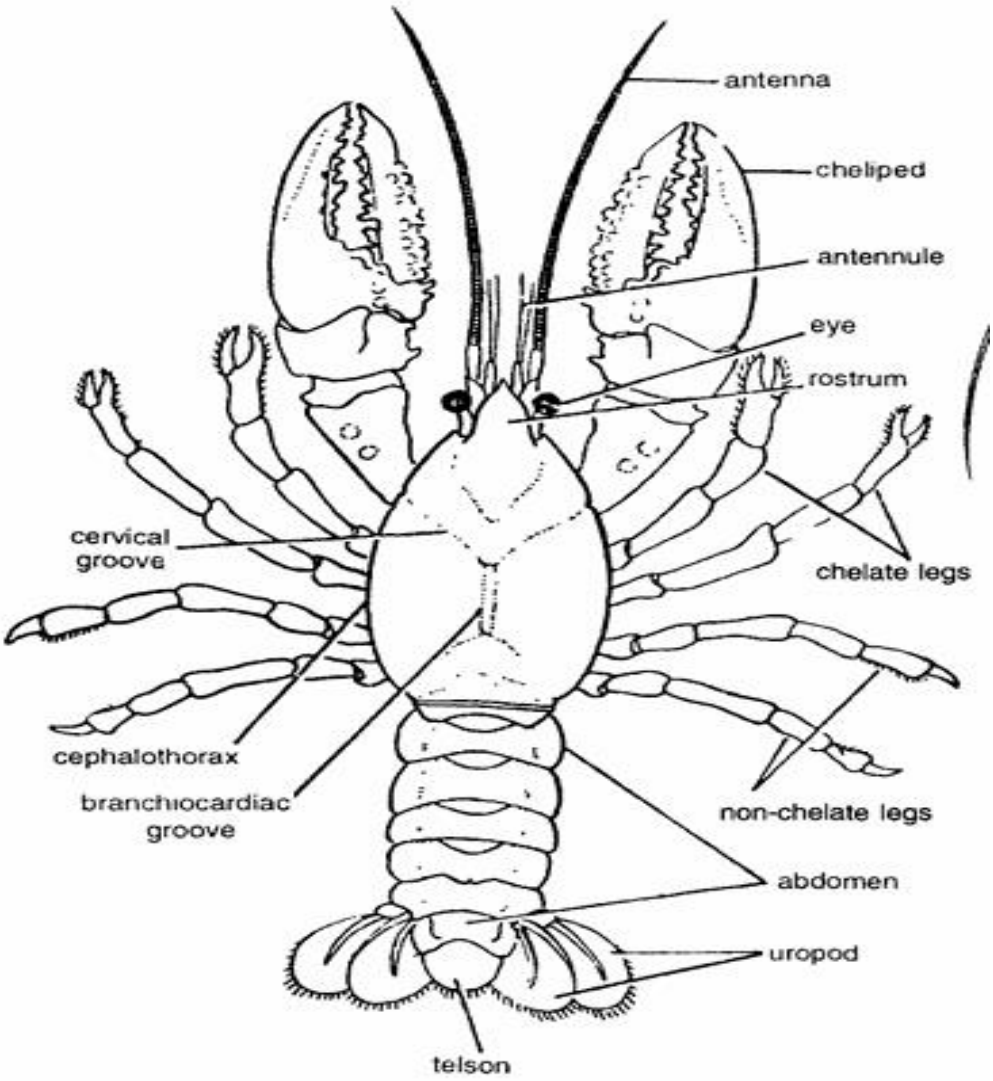


Fig. 151. *Astacus fluviatilis.*

Identification of Astacus fluviatilis

Habit and habitat : Astacus is common in streams, rivers and lakes. It is omnivorous feeding on any alive or dead matter. Its acts as scavenger.

Distribution: It is found on the Pacific slope, Europe, Asia, England, U.S.A., Australia and New Zealand.

Comments

1. Commonly called as cray-fish.
2. Body is essentially sub-cylindrical in shape, small, about 9 cm in length and divided into anterior cephalothorax, middle flexible abdomen and posterior telson.
3. Cephalothorax comprises of head and thorax and is covered by carapace, which is produced into short and unserrated rostrum and on sides covers the gills. Cervical groove demarcates head and thorax.
4. Eyes are stalked, antennules short and antennae elongated.
5. Appendages are 19 pairs-5 cephalic, 8 thoracic and 6 abdominal.
6. Abdomen contains 6 pairs of swimming appendages or pleopods and a telson.
7. Abdominal segments are movable upon one another in a vertical plane. The abdomen is long and extended and ending in tail fans.
8. Walking legs are chelate. One pair of legs are called as chelipeds. These are much enlarged appendages, terminating in huge claws or chelate.
9. Telson fonns a tail-fan together with uropods.

Special features : Female carries hundreds of small, rounded eggs on the ventral side of her abdomen. Eggs hatch into young cray-fishes, which are exact replicas of the mother and cling to her for some time.

Economic value : It is relished as food.

Identification : Since the specimen contains, cephalothorax, cheliped, fan-like uropod and all above features hence it is Astacus.

29. CARCINUS

Classification:

Phylum :- Arthropoda
Class :- Crustacea
Sub-class :- Malacostraca
Order :- Decapoda
Sub-order:- Brachyura
Genus :- Carcinus
(The common crab)

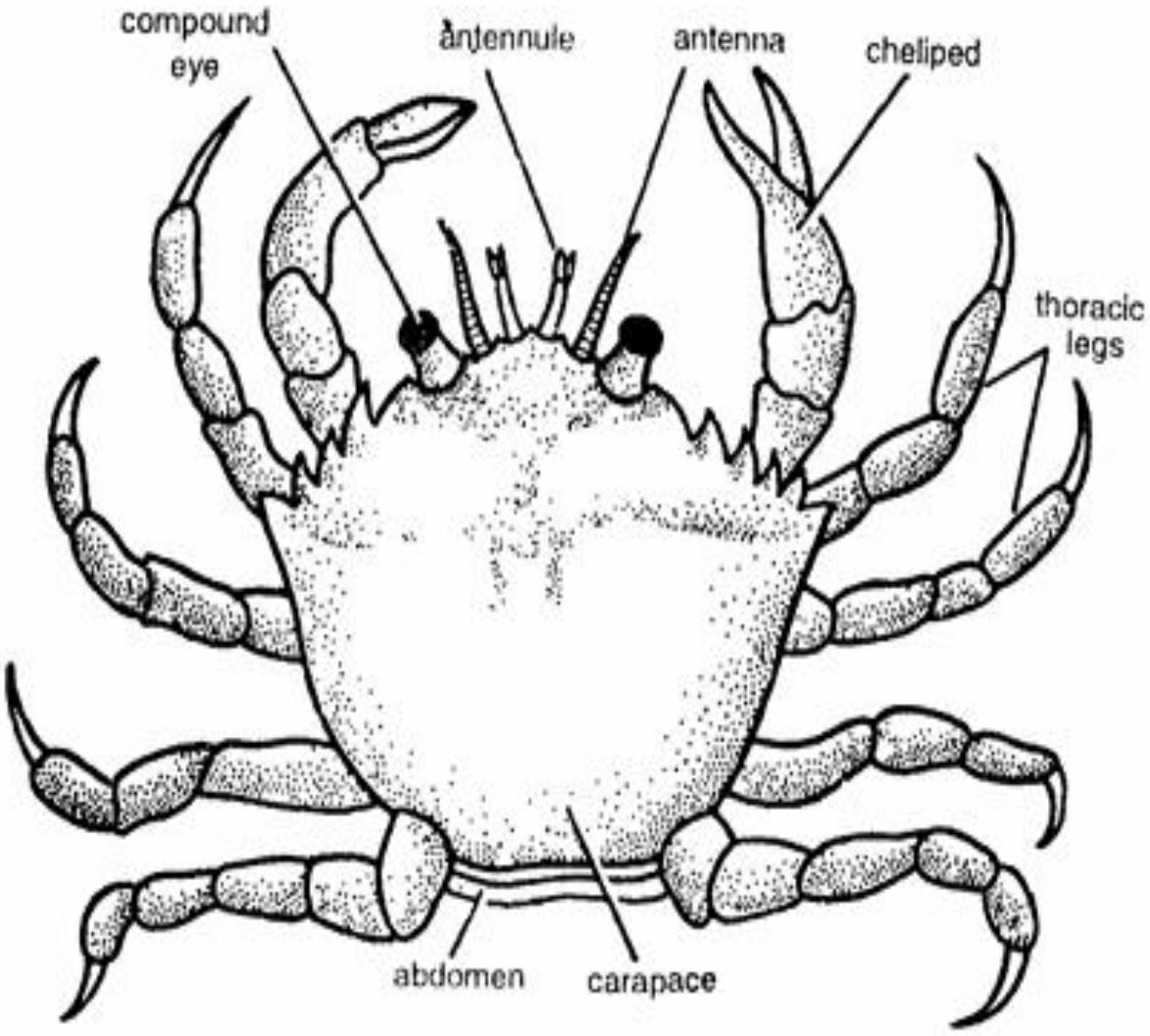


Fig. 155. *Carcinus.* The common crab.

Identification of carcinus

Habit and habitat : Carcinus is found buried among rocks or mud in shallow water. The crabs are highly specialized crustacean. Breeding season is spring.

Distribution : It has cosmopolitan distribution and specially found in Europe, U.S.A. and India.

Comments

1. Commonly called as Rock crab or True crab.
2. Body generally dorsoventrally compressed and consist of a large and broad cephalothorax and a stumpy abdomen. Cephalothorax is broader than long. The carapace is fused with epistome at the sides and nearly always in the middle. Rostrum absent.
3. Small antennules, antennae and eye spots are contained in the sockets of the carapace.
4. Third maxillipedes are broad flat, valve like covering the other mouth parts on ventral surfaces.
5. Five pairs of thoracic legs are well developed.
6. Abdomen is reduced and fixed under cephalothorax. It is permanently bent under the cephalothorax fitting into a groove in the thoracic sterna, thus remaining invisible in the dorsal view of the animal.
7. Abdomen is narrower in male but somewhat broader in female. The abdominal pleura greatly reduced or absent and the abdomen without tailfans.
8. Pleopods are greatly reduced. The male has only 2 pairs of pleopods to act as copulatory organ while the female has 4 pairs for th.e attachment of the eggs. Uropods are absent.
9. Young hatches in the zoaea stage and passes through a megalopa stage before reaching maturity.

Identification : Since the specimen contains stumpy abdomen and all above characters, hence it is Carcinus.

30. SCOLOPENDRA : CENTIPEDE

Classification:

Phylum :- Arthropoda
Class :- Chilopoda
Order :- Scolopendromorpha
Genus :-Scolopendra
(Centipede)

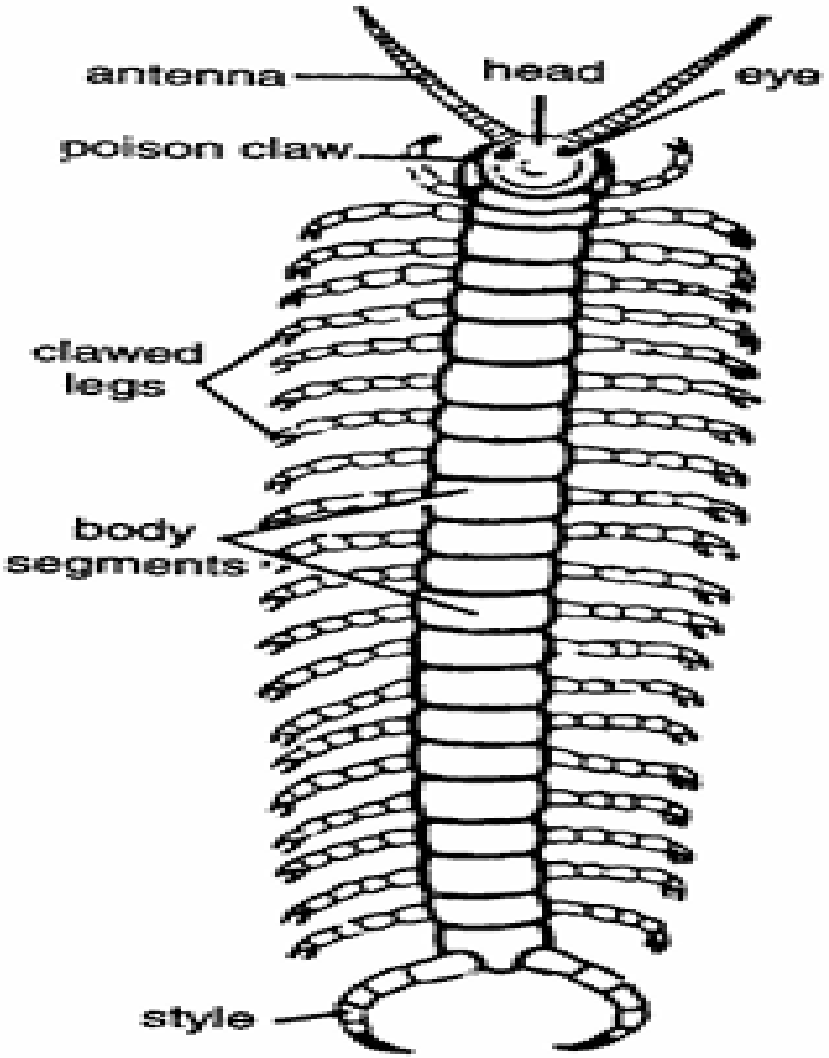


Fig. 156. *Scolopendra* : Centipede.

Identification of Centipede

Habit and habitat : Scolopendra is tropical animal, found in swampy places under bark, stones, decaying wood, etc. It requires absolute moisture. In less than 100% humidity, it loses water through spiracles and dies. It is carnivorous, usually hides by day below stones, plant leaves etc. and runs swiftly by night to prey on insects and earthworms.

Distribution : It is found in India, America (Austin and Texas).

Comments :

1. Commonly called as centipede.
2. Body is elongated, dark greenish-brown in colour, dorsoventrally flattened and is divided into a distinct head and a long, segmented trunk or body.
3. Head segments are closely fused. Head appendages are long antennae, ocelli and reduced maxillae and mandible visible on ventral side.
4. Mouth is guarded by labrum, mandibles and first maxillae.
5. Body segments have 21 pairs of walking legs. The first pair of legs are curved, clawed and forwardly directed to form maxillipedes or poison claws, while the rest of walking legs have 7 joints. All walking legs are similar.
6. Each leg is composed of coxa, trochanter, femur, tibia and 3 tarsi ending in a single claw.
7. Paired, oval spiracles or stigmata lie on the pleural areas, above the leg bases on segments 4,6,9,11,13,15,17,19 and 21.
8. Last segment bears ventral anus, genital atrium and a pair of anal style.
9. There is a single pair of tracheal tufts opening to the exterior on the head.
10. Scolopendra is harmful to mankind.

Identification : Since the specimen has a pair of short clawed legs in each segment and all above features, hence it is Scolopendra.

31. JULUS MILLIPEDE

Classification:

Phylum :- Arthropoda
Class :- Diplopoda
Genus ;-lulus
(The wire worm)

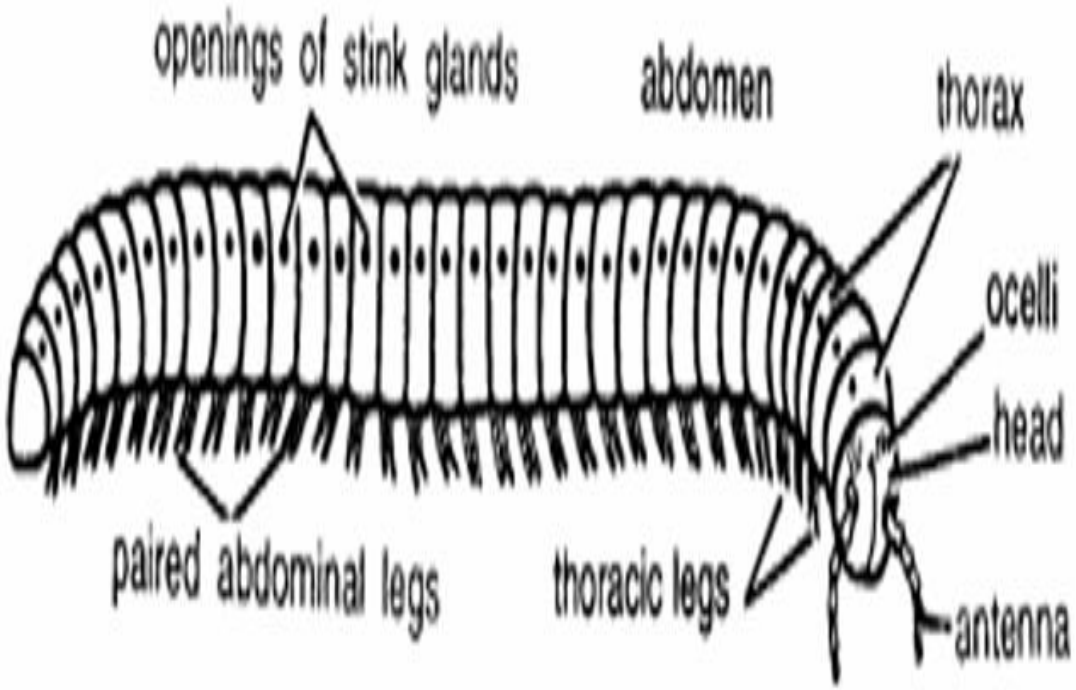


Fig. 157. *Julus* : Millipede.

Identification of millipede

Habit and habitat : lulus is also tropical, found in dark and damp places in meadows and gardens under stones and bark of dead trees. The anifi?al is rolled up under stones. It is herbivorous. It also burrows into the soil to feed on the roots of the living plants to which it causes great damage.

Distribution : It has cosmopolitan distribution found in India, U.S.A. and Europe.

Comments

1. Commonly called as wire worm.
2. Body of the animal is differentiated into head, thorax and abdomen.
3. Head is covered by cephalic shields bent downwards. Head appendages are 7 jointed delicate antennae, groups of ocelli, mandibles, obscured by gnathochilarium. Antennae on the sides of the head.
4. Thorax has four segments and each of the last three segments is provided with one pair of walking legs.
5. Abdominal segments are double, each having one tergum, two small sterna, two pairs of walking legs and two pairs of obscure spiracles.
6. Sides of most terga have dark openings of odoriferous glands, secreting noxious substance.
7. Animal moves very slow in spite of its so many legs. The colour may be yellowish brown or reddish-chestnut.
8. There is no tracheal system.

Identification : Since the specimen contains two pairs of short legs and all above features hence it IS lulus. Myroglutus is another millipede.

Instructions : Differentiate between lulus and Scolopendra.

32. PALAMNAEUS SCORPION

Classification:

Phylum ;- Arthropoda
Class ;- Arachnida
Order :- Scorpionida
Genus :- Palamnaeus (Scorpion)

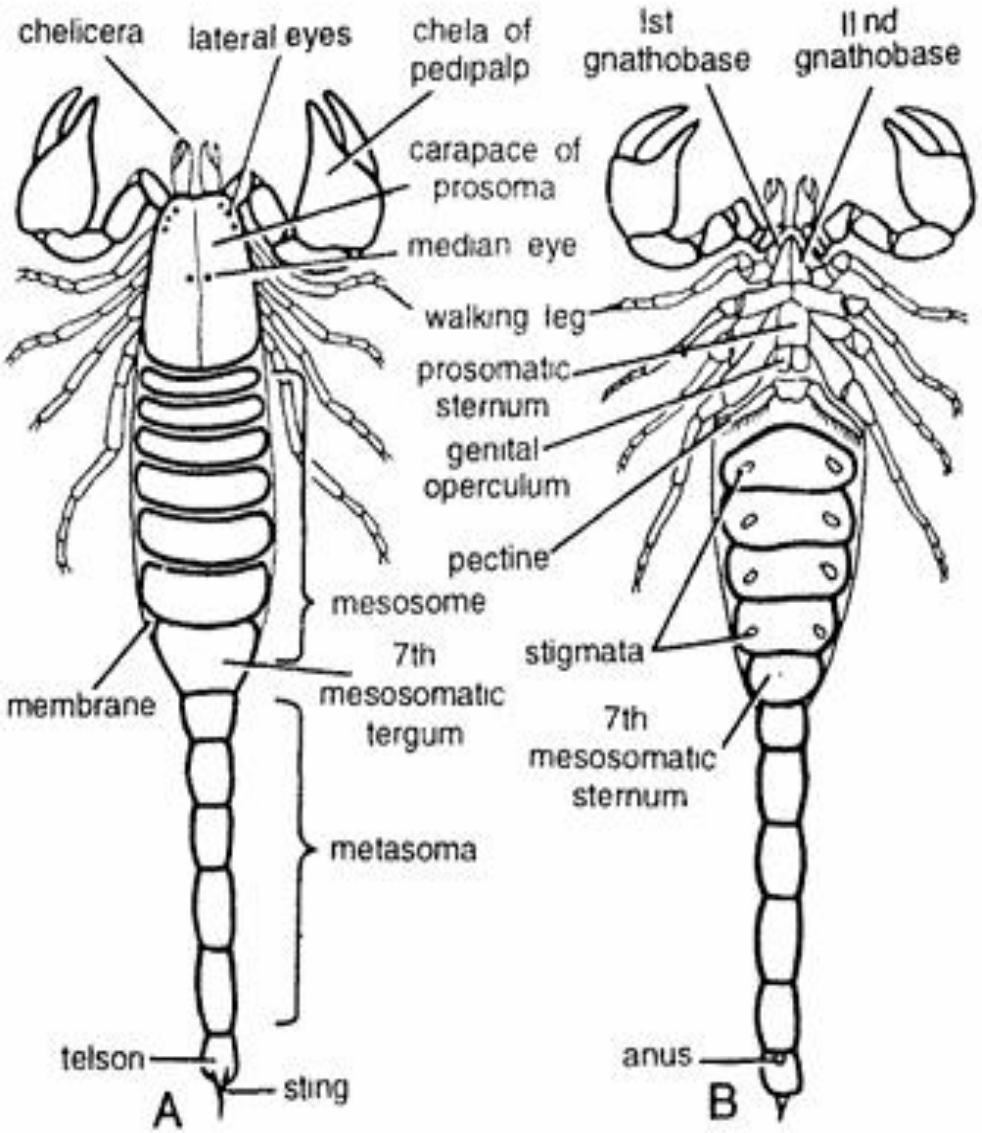


Fig. 159. *Palamnaeus* : Scorpion. **A.** Dorsal view, **B.** Ventral view.

Identification of Palamnaeus (Scorpion)

Habit and habitat : Palamnaeus is a nocturnal arthropod, found in sand, crevices and under stones and in bark of dead trees. It feeds on insects and spiders which they often kill with the sting.

Distribution : It has cosmopolitan distribution and specially found in India, Europe and U.S.A.

Comments

1. Commonly called as scorpion.
2. Body is elongated, segmented and differentiated into anterior prosoma and posterior opisthosoma.
3. Opisthosoma is sub-divided into a broad anterior mesosoma and a narrow posterior metasoma.
4. Prosoma is covered dorsally by a carapace and its appendages are a pair of small chelate chelicerae, a pair of large chelate pedipalps, 4 pairs of walking legs and several ocelli.
5. Body is encased in chitinous covering. The dorsal side covering is called as tergum, side one pleuron and ventral one sternum.
6. Mesosoma is composed of 7 broad segments and metasoma of 5 narrow segments.
7. Last metasomatic segment is telson containing a sting. Ventrally the sternum of first mesosomatic segment contains a pair of genital openings. The second meso somatic sternum bears a pair of sensory pectines, while third, fourth, fifth and sixth mesosomatic segments contain 4 pairs of bilateral stigmata, which are the openings of the respiratory booklungs. Metasoma is limbless.
8. Just beneath chelicerae there are I and II gnathobases.
9. Sexes are separate but without sexual dimorphism. Viviparous.

Special features : Scorpions are harmful to mankind; its sting causes extreme pain. fever and in some cases collapse. The sting has a poison duct from the sting gland present in telson. Other common forms are Buthus and Centrurus.

Identification : Since specimen has prosoma, mesosoma, metasoma and all above features, hence it is Scorpion.

33. ARANEA : SPIDER

Classification :

Phylum :- Arthropoda
Class :- Arachnida
Order :- Araneida
Genus :- Aranea

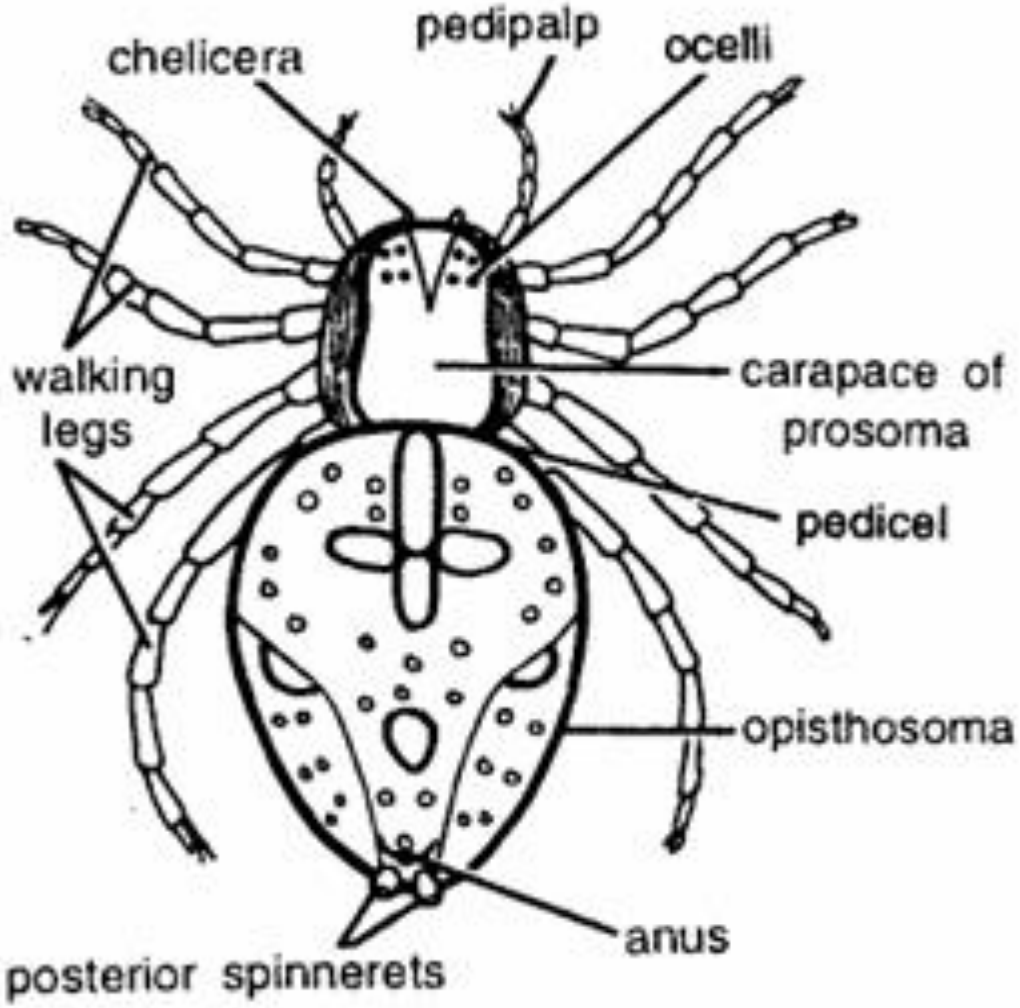


Fig. 160. *Aranea* : Spider.

Identification of Aranea

Habit and habitat : Aranea is commonly found in houses and gardens having cosmopolitan distribution. It is carnivorous, feeding on small insects by hunting or in ensnaring.

Distribution : It is found in India, Africa, New Zealand, Myanmar, Bangladesh and U.S.A.

Comments

1. Commonly called as spider.
2. Integument is never entirely smooth and glabrous but is more or less densely covered with hairs of many varieties, there being simple, plumose, or in the shape of bristles, scales, clubs or spines.
3. Body is differentiated into an anterior prosoma and a posterior opisthosoma which is superficially limbless. They are often brightly coloured. Prosoma and opisthosoma are joined narrow pedicel.
4. Prosoma is covered having 8 ocelli and appendages. by a delicate by carapace.
5. Head appendages are sub-chelate small chelicerae containing poison glands and six jointed pedipalps.
6. Segments 4 to 7 bear walking legs.
7. Opisthosoma is segmented, soft, rounded and without telson.
8. Last part of opisthosoma contains anus and 4 pairs of spinnerets spinning organs, which produce silken threads for the construction of spider web.
9. Respiratory organs are book-lungs.
10. Excretory organs are malpighian tubules and coxal glands. Sexes are separate with distinct sexual dimorphism.

Special features : The spiders construct webs of various types, reticular webs, sheet webs, funnel webs and geometric orb webs. Some spiders are vagabonds and make silk tents only for their protection while moulting or for wintering. Trap door spiders protect the mouth of their burrows with a hinged door.

Identification : Since the specimen has spinnerets spiniling organs and all above features, hence it is spider.

34. LIMULUS

Classification:

Phylum :- Arthropoda
Class :- Arachnida
Order :- Xiphosura
Genus :- limulus

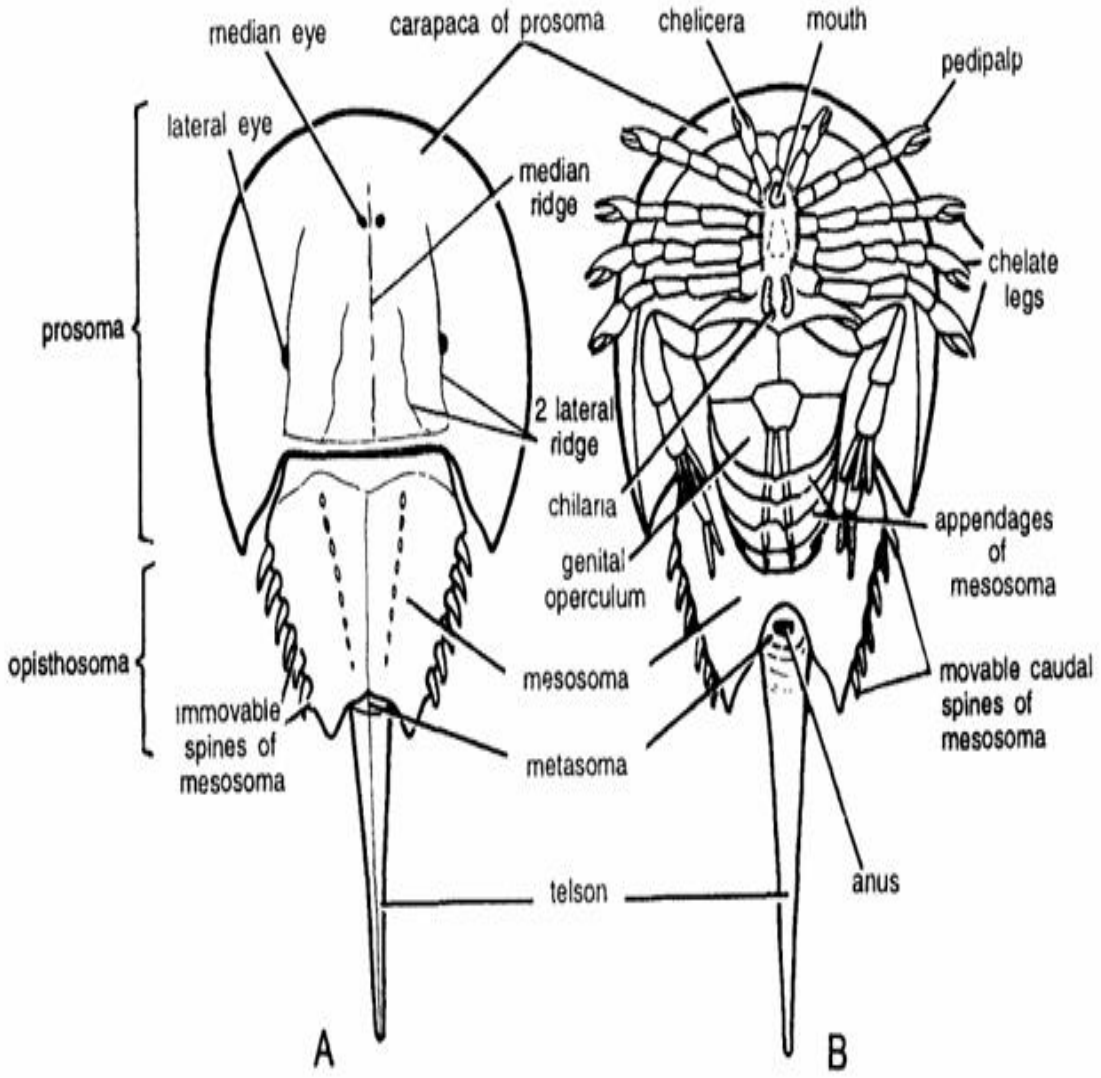


Fig. 161. *Limulus* : King crab. **A.** Dorsal view, **B.** Ventral view.

Identification of limulus

Habit and habitat : Limulus is marine found in muddy bottom, 2 to 6 fathoms deep, partly buried and crawling in sand for food. The king crab lives in shallow water along the shore, where it burrows in the sand and mud and eats worms and small animals. It comes to sandy beaches in the early summer to breed.

Distribution: It inhabits eastern coast of Asia and its island and eastern cost of North American from Nova Scotia to Florida. It has restricted and discontinuous distribution.

Comments

1. Commonly called as King crab.
2. Body is differentiated into a broad horseshoe-shaped prosoma and a small nearly triangular opisthosoma. Body regions are cephalothorax, abdomen and a long spike like telson or tail.
3. Prosoma is convex above with sloping sides. It contains one median and two lateral longitudinal ridges.
4. Prosoma is covered by a large semicircular carapace and joined to opisthosoma by a broad hinge. The prosomatic appendages are ftrst pair of chelate chelicerae, while 2 to 7 segments bear a pair of chelate walking legs each.
5. Carapace also bears one pair of median and two large composite sub-dorsal or lateral eyes.
6. Opisthosoma comprises of six segments, the mesosoma, a vestigial metasoma and a long spine like telson. Mesosoma contains 6 pairs of immovable spines.
7. Chelicerae are 3-jointed small and chelate.
8. Legs are biramous and the last pair are not paddle-shaped.
9. First pair of mesosomatic appendages form the genital operculum. Opisthosoma has book gills. The post anal caudal spine is hinged and freely movable.
10. Young are planktonic larvae (Trilobite stage).

Special features : Limulus has majestic look and hence it is called as king crab. Limulus has been reported from Paleozoic period when it was abundant and only five species of it, known since Triassic period, are living today, so it has long fossil history. The king crabs although of large size, have little economic importance. Sometimes they are fed to chicken and pigs.

Identification : Since the specimen contains semicircular carapace and all above features, hence it is King crab.

35. PERIPLANETA : COCKROACH

Classification:

Phylum :-Arthropoda
Class :- Insecta
Sub-class :- Pterygota
Division ;- Exopterygota
Order :- Orthoptera
Genus :- Periplaneta
Species :- americana

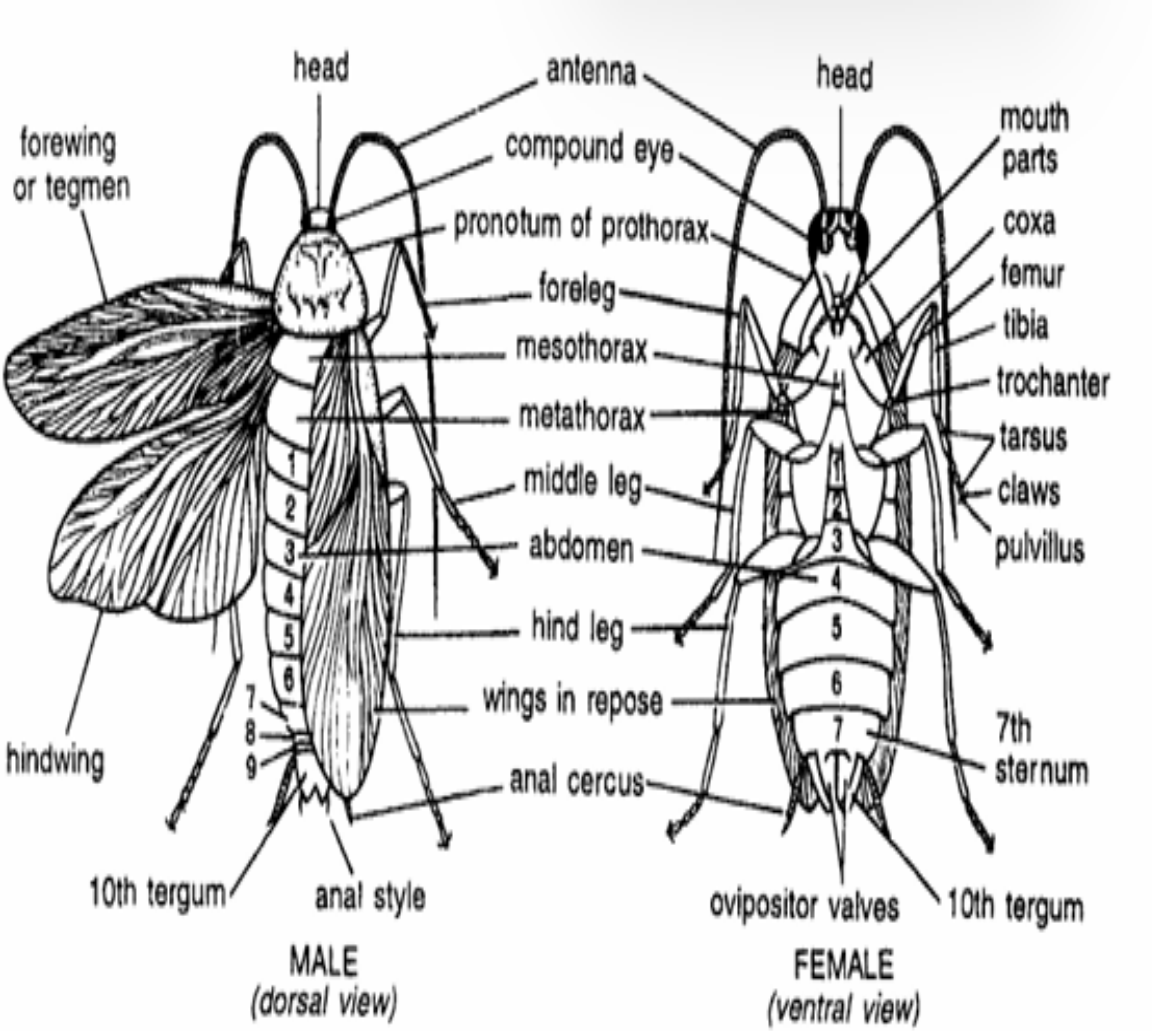


Fig. 164. *Periplaneta* : Cockroach.

Identification of Periplaneta

Habit and habitat : Periplaneta is a nocturnal creature, avoiding the daylight and found in warm and damp places like kitchens, bakeries, hotels, restaurants, godowns, stores, channels and ships, etc.

Distribution: It is found in India, Asia and U:S.A. It has original home in Mexico but has travelled with man to all parts of the world. They flourish chiefly in tropical damp forests but occur throughout the world.

Comments

1. Commonly called as cockroach.
2. Body reddish brown in colour measuring 2.5 cm in length.
3. Body elongated bilaterally symmetrical dorsoventrally flattened.
4. Body strongly differentiated into dorsal and ventral surface and divided into head, thorax and abdomen.
5. Dorsal surface has following structures :
    i. Head is slightly movable containing of a pair of long sensory antennae and pair of compound.
    ii. Thorax divisible into prothorax mesothorax and metathorax. Thorax contains 3 pairs of walking legs, a pair of anterior forewing, a pair of posterior hind wings. At rest wings remain folded and completely cover thorax and abdomen.
    iii. Abdomen contains 10 segments.
6. Ventral surface shows following structures:
    (i) Tentacles and eyes prominent in head.
    (ii) Head contains chewing type of clearly visible mouth parts. mouth parts coxa femur tibia trochanter tarsus
    (iii) Three pairs of legs in thorax, foreleg, middle leg and hind leg. Each contains coxa, trochantex, femur, tibia, tarsus, claws and pulvillus.
7. Male and female cockroaches are distinguished by the appendages in 10th abdominal segment.
8. Male cockroach has a pair of segmented anal cerci on sides and a pairs of unsegmented anal styles in 10th abdominal segment.
9. Female cockroach has anal cerci and ovipositor valves.

Economic status : These are the most important insect pests of human habitations destroying food and other things leaving behind a disagreable odour. They are regarded on general nuisance and sign of unclean conditions. Cockroaches are not devoid of goodness because they are extensively used for dissections to study invertebrate anatomy. They are also extensively used for physiological, biochemical, and toxicological researches in insects.

Identification : The cockroaches are so characteristic that there is no difficulty in indentifying them.

36. MELANOPUS: GRASSHOPPER

Classification:

Phylum :- Arthropoda
Class :- Insecta
Sub-class :- Pterygota
Division :- Exopterygota
Order :- Orthoptera
Genus ;- Melanopus

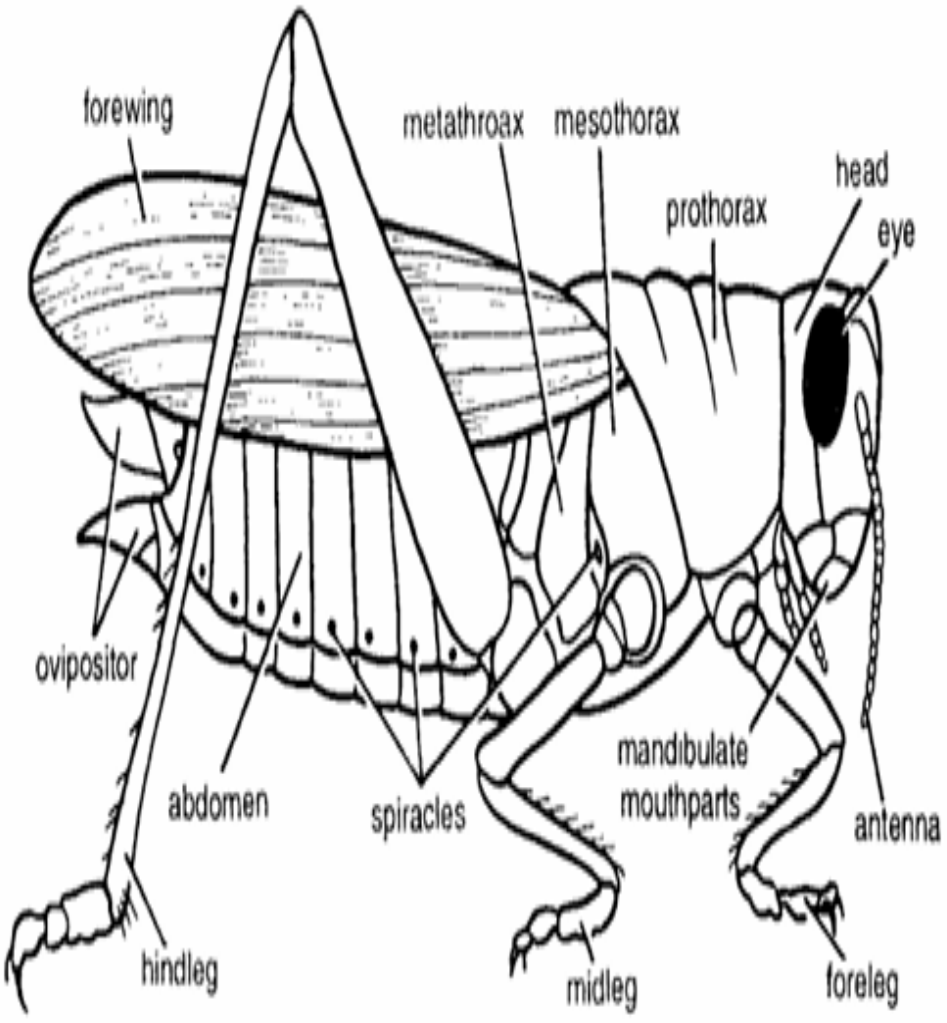


Fig. 167. *Melanopus* or *Poecillocerus* : Grasshopper.

Identification of grasshopper

Habit and habitat : Melanopus is commonly found in green fields and trees and hence green coloured.

Comments

1. Commonly known as grasshopper.
2. Body is differentiated into head, thorax and abdomen.
3. Head contains chewing mouth parts with large compound eyes and elongated backwardly directed antennules. Pronotum although large is not noticeably elongated.
4. Thorax is divided into proihorax, mesothorax and metathorax having foreleg, middle leg and hind leg respectively.
5. Hind legs are modified for jumping and leaping and are called as Saltatoral legs.
6. Thorax contains 2 pairs of wings. Forewings are opaque called as tegmen while hind wings are membraneous.
7. Female has a long ovipositor. Eggs are laid in groups.
8. Auditory organs are tympanum having stridulating organs.
9. Abdomen contains 11 segments, each having a pair of spiracular opening in ventrolateral position.
10. Nymphs are wingless.

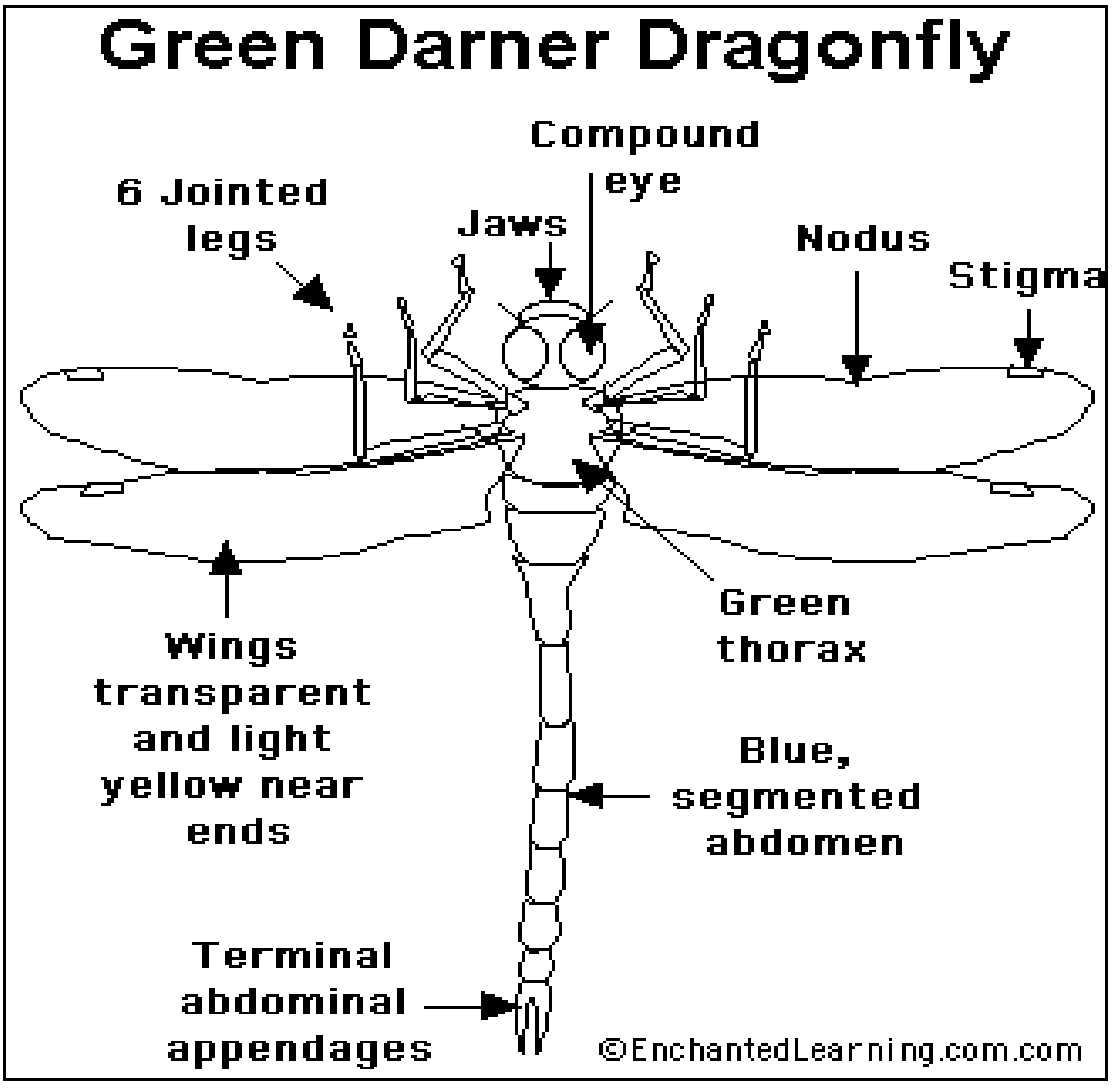
Economic status : Harmful insect destroying agricultural crops.

Identification : Since the insect contains jumping legs and all above features hence it is Melanopus.

37. DRAGON FLY

Classification:

Phylum :- Arthropoda
Class :- lnsecta
Sub-class :- Pterygota
Division :- Exopterygota
Order :-Odonata
Genus :- Dragon fly



Identification of Dragon fly

Habit and habitat : Dragon flies are abundantly found during rainy season resting on twigs, leaves or grass stalks.

Distribution : It has cosmopolitan distribution especially found in India, Myanmar, Srilanka, Malaysia, Asia, Europe and U.S.A.

Comments

1. Dragon fly is an elegant insect, famous for its beauty and brilliancy of its pigmentary and structural colours.
2. Body is divided into head, thorax and abdomen.
3. Head is exceptionally mobile and is attached to an exceedingly slender neck.
4. Head possesses large compound eyes, filiform antennae and biting and masticatory mouth parts.
5. Thorax indistinctly divided into reduced prothorax and fused mesothorax and metathorax. Thoracic legs 3 pairs, namely foreleg, mid leg and hind leg.
6. Wings are large, membranous and almost of equal size, frequently narrowing at the base and with venation only slightly reduced. A pterostigma is present and also enlargement of the veins known as 'arculus' and the 'nodus'. When at rest the wings may be held either vertically (damsel flies) or horizontally (dragon flies) wings have intercalated veins.
7. Abdomen contains 10 elongated segments with vestiges of 11th and 12th segments. 12th segment contains a pair of caudal furca or copulatory organs.
8. Oviposition endophytic or exophytic.
9. Metamorphosis is incomplete.
10. Nymphs are aquatic and respire by means of rectal or caudal gills. Labium in the nymphs is modified to form a prehensile grasping organ, the mask.

Special features: The adult members especially the larger ones are great favourites, with the out-of-door enthusiasts. Each dragon fly has a regular beat up and down in search of flying insect. When insect is sighted the dragon fly wheels from its course to capture the prey. When the insect is captured the dragon fly wheels back to its regular beat.

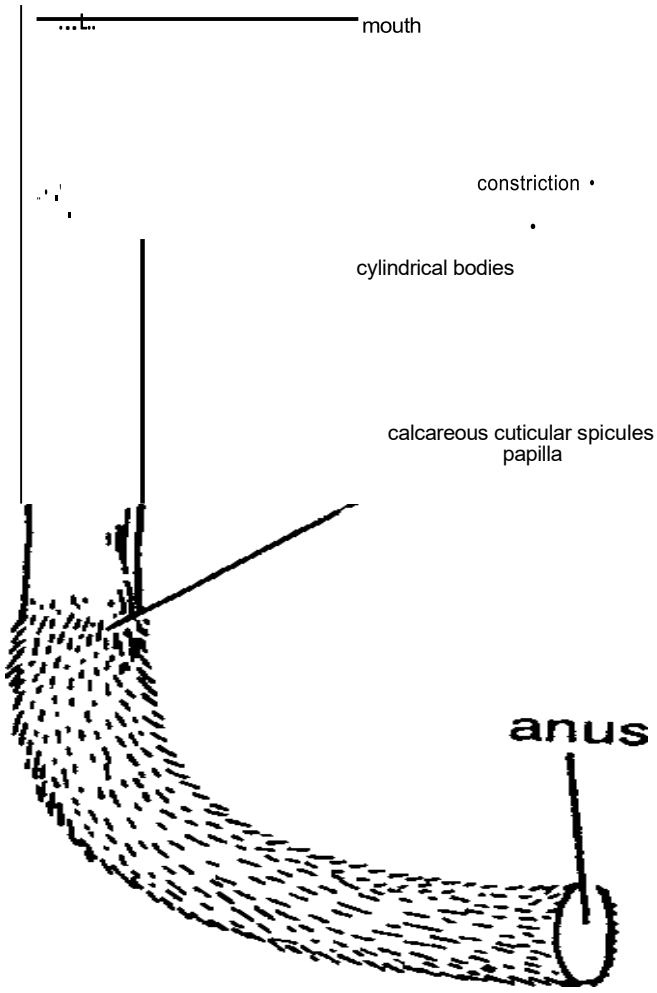
Identification : Since the specimen contains whitish membranous wings and all above features, hence it is Dragon fly.

PHYLUM :- MOLLUSCA

38. CHAETODERMA

Classification:

Phylum :- Mollusca
Class :- Amphineura
Phylum :- Monusca
Order :- Aplacophora
Genus :- Chaetoderma



Identification of chaetoderma

Habit and habitat : Chaetodenna is marine inhabiting modem to abyssal depths, generally found in non-littoral zone. The mollusc is carnivorous, aberrant and specialized.

Distribution: Found in U.S.A. and Europe.

Comments

1. Body of the animal is elongated, vermiform and almost cylindrical.
2. Mantle well developed and completely covering the body.
3. Shell is absent but cuticle contains numerous calcareous spicules.
4. Animal has anterior mouth a constriction, calcareous cuticular spicules or epidermal papillae and anus.
5. Heart with single auricle.
6. Nervous system is well developed with brain and ganglia.
7. Gills are reduced to a pair found in the cloacal cavity.
8. Nephridial ducts act as coelomoducts.

Identification: Since the animal has cylindrical body, cuticular spicules and all above features, hence it is Chaetoderma.

39. CHITON

Classification

Phylum :- Mollusca
Class :- Amphineura
Order :- Polyplacophora
Genus :- Chiton (Sea mouse)

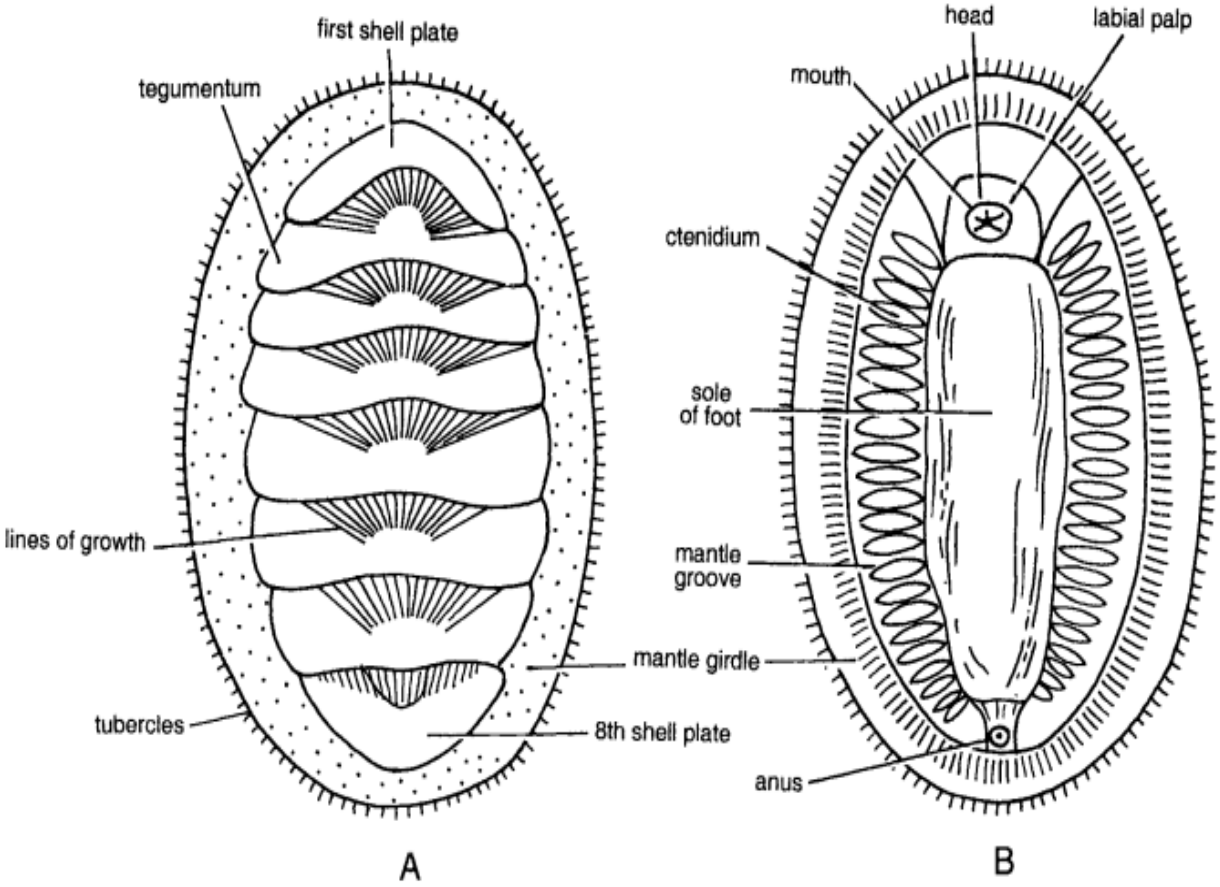


Fig. 110. *Chiton.* **A.** Dorsal view, **B.** Ventral view.

Habit and habitat : Chiton is a marine and sluggish slow moving animal, attached to rocks, empty shells, corals and under stones between tidemarks. It is mostly noctumal and remains concealed under rocks during day-time. It rolls its body when disturbed. It is a vegetable feeder and its food consists of algae and diatoms.

Distribution: Chitons are found in all parts of the world in shallow waters, few species live in deep sea.

Comments

1. Commonly called as sea mouse, measuring about 1 to 5 cms.
2. Body is elliptical, bilaterally symmetrical and dorsoventrally flattened and is differentiated into a small, indistinct head, a large flat foot and a dorsal mantle forming a roof-like covering.
3. Head contains ventral mouth and labial palps. Below head is sole of foot ventrally. Eyes and tentacles are absent. Mouth and anus are opposite ends.
4. Dorsal side of mantle contains a linear series of 8-calcareous overlapping plates marked with lines of growth. Sides of mantle form mantle girdle.
5. Several pairs of bipectinate ctenidia are found in a complete rows on either side of the body and lie in a mantle groove between foot and ventral side.
6. Plates are surrounded and kept in place by a muscular integumental fold called girdle.
7. Entire periphery of the mantle girdle contain small calcified tubercle or spicule.
8. Exposed part of the plate is called as tegumentum and overlapping part is called as articulum.

Economic importance : Sometimes Chiton is eaten by man. The foot is called as sea beal.

Identification: Specimen contains 8 calcareous plates dorsally and all above features hence it is Chiton.

40. DENTALIUM

Classification:

Phylum :- Mollusca
Class :- Scaphopoda
Genus :- Dentalium
(Tusk shell)

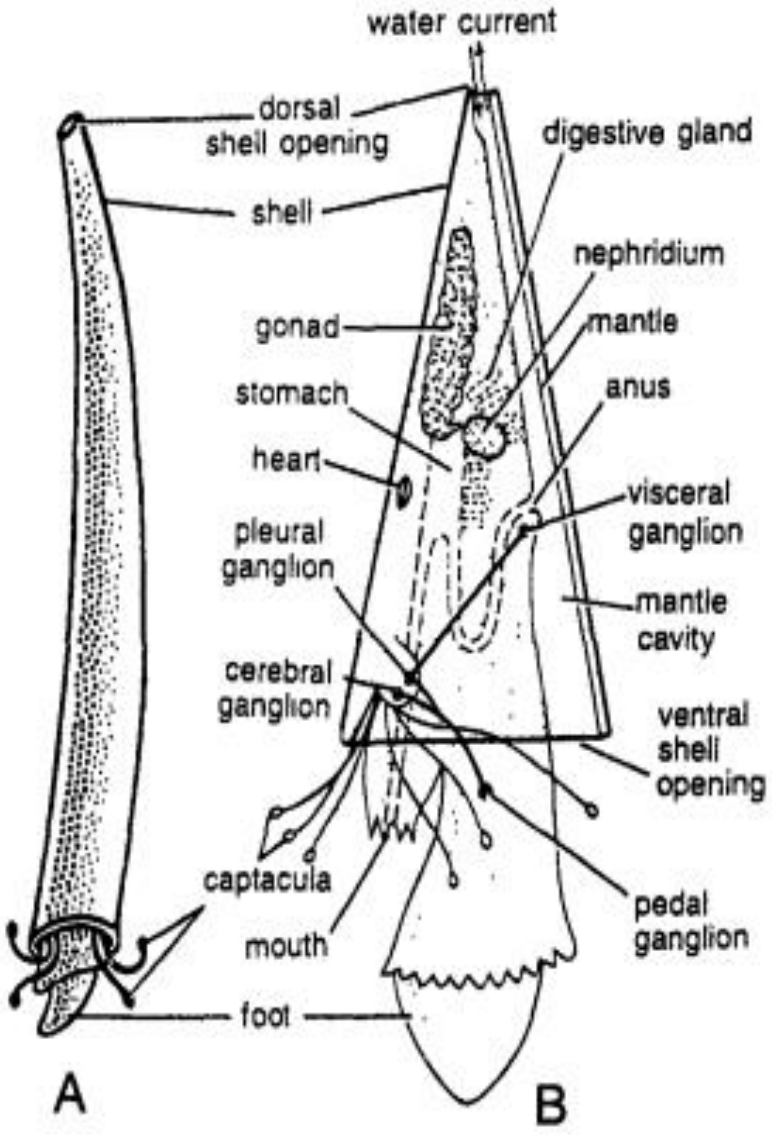


Fig. 111. *Dentalium.* **A.** Shelf, **B.** Animal buried in sand.

Identification of dentalium

Habit and habitat : Dentalium is marine, living in clean sand in various depths from shallow water to 2,600 fathoms deep.

Distribution : They are commonly found in Europe, Pacific coast, New England coast (except polar seas).

Comments

1. Body called as Elephant's tusk shell.
2. Body of the animal lies in a tubular, bilaterally symmetrical, cylindrical and arched shell secreted by mantle, the concave side representing the upper or dorsal side of the body.
3. Body of the animal has a vestigial head, which protrudes as proboscis from shell, without eyes.
4. Mouth is surrounded by leaf like tentacles called as captacules having sucker like tips which are sensory, prehensile and can regenerate.
5. No ctenidia are present, the tentacles being possibly homologous to them.
6. Conical foot also protrudes from shell from anterior end and burrows in sand.
7. After removing the shell, internal structures, such Dentalium. A. Shelf, B. Animal buried as muscles, liver and kidneys are seen. Radula is in sand. well developed. Anus behind the base of the foot. Respiration by transverse folds in the lining of the mantle because gills are absent.
8. Circulatory system is poorly developed. Nervous system is simple, consisting of usual cerebral, pleural and pedal ganglia. Eyes are absent. Circulatory system is very simple and there is no distinct heart.
9. Sexes separate.

Economic importance : The tusk shell was economically very important for Red Indian tribes of America. They used Dentalium indianorum as Sanampum of money (as currency).

Identification : Since the body is enclosed in a tusk shell and it has all above features hence it is Dentalium.

41. PILA GLOBOSA : APPLE SNAIL

Classification :

Phylum :- Mollusca
Class :- Gastropoda
Sub·class :- Prosobranchiata
Order :- Pectinibranchiatal
Sub·order :- Taenioglossa
Genus :- Pila
Species :- glohoso

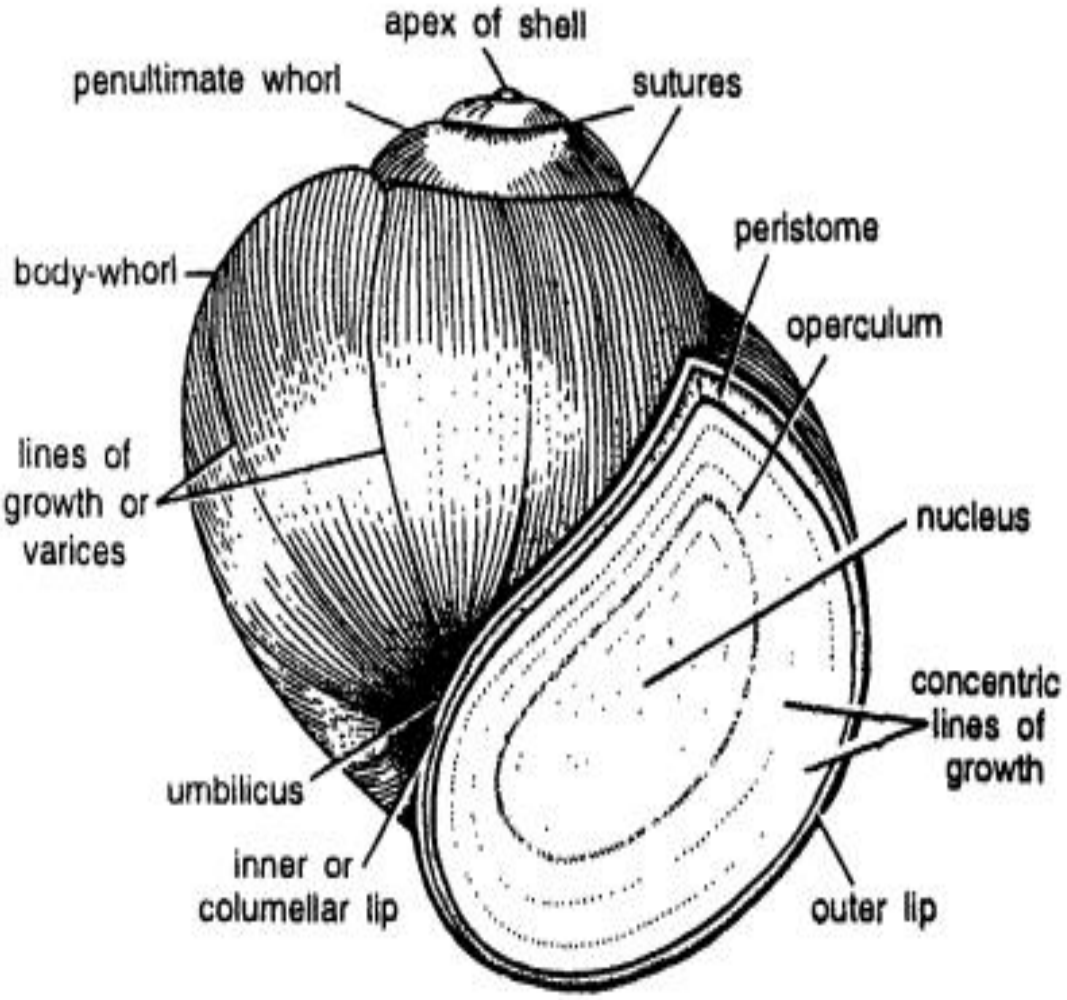


Fig. 116. *Pila.* Entire animal.

Identification of pila globosa:

Habit and habitat: Pila globosa is one of the largest fresh-water gastropod abundantly found in ponds, tanks, rice-fields and in water having succulent vegetation. They are amphibious. In winter they hibernate in the mud by the side of the pond and during prolonged drought they remain dormant.

Distribution: It is most common in India, U.S.A. and Europe.

Comments

1. Commonly called as fresh-water apple snail.
2. Body is covered by a thick yellow-coloured or brown globular univalve shell, comprising of body whorl, penultimate whorl and apex. Each division is separated by sutures.
3. Surface of the shell is marked by lines of growth.
4. Shell is spirally coiled round the axis, called the columella, and opens to the exterior by mouth of aperture.
5. Type of coiling is right handed and is called as dextral.
6. After removing the shell the soft part contains head, foot and visceral mass.
7. Mouth of the shell is wide and covered by operculum, which is attached to the hinder part of the foot and shows many concentric rings of growth around nucleus, umblicus and columellar lip are closely placed.
8. Head lies on the upper side and contains 1 pair of eyes. Foot is highly muscular and acts as creeping organ. Visceral mass spirally coiled and contains internal organs. It is covered by mantle or pallium. When the foot is protruded during living condition, the head, nuchal lobes, eyes, tentacles, etc. are distinctly seen. These structures are seen after removing the shell.
9. Sexes are separate but without sexual dimorphism.

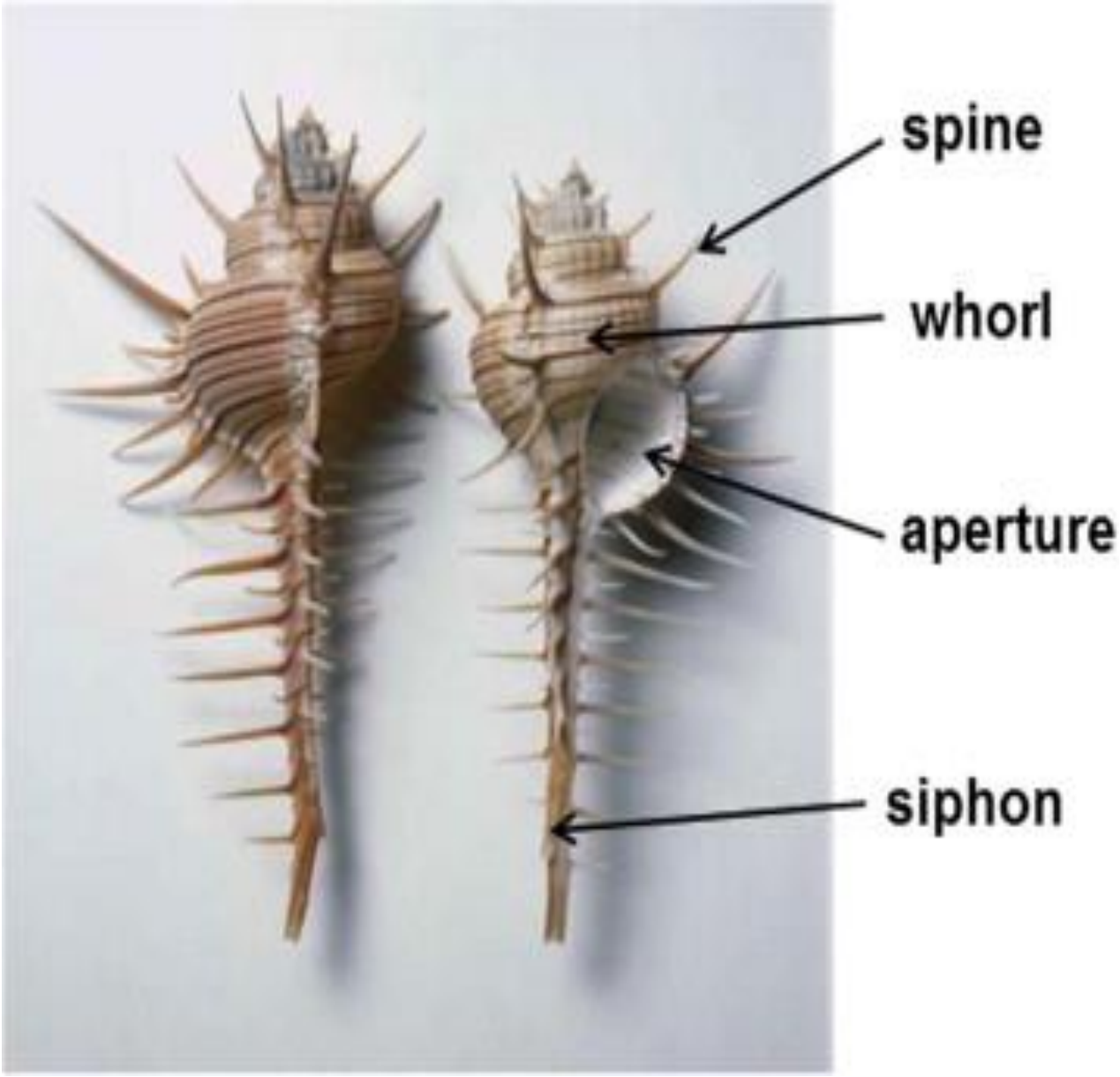
Special features : Pila is the slowest moving animal but it has great medicinal, experimental and study value.

Identification : Since the specimen contains largest body whorl and all above features hence it is Pila.

42. MUREX ANGULIFER

Classification:

Phylum :- Mollusca
Class :- Gastropoda
Sub·class :- Prosobranchlata
Order :- Pectlnlbranchlata
Sub·order ;- Rachlglossa
Genus :- Murex
Species :- angulifer



Identification of murex

Habit and habitat: Murex is an active, carnivorous and marine gastropod, feeding on living and dead animals in the sea.

Distribution: It is found on the Syrian coast, Greece, Italy, India, West Indies and U.S.A. (California). Found both in tropical and temperate seas.

Comments

1. Shell is spirally coiled, dextral with a long and prominent spine bearing 3 or more rows of prominent protuberances or spines forming ribs.
2. Aperture round, ending below in a long canal.
3. Peristome is produced into a long, spout-like prolongation known as the shell siphon which leads into the mantle cavity.
4. Head is prolonged anteriorly into a long proboscis, which can be retracted within a proboscis sheath.
5. Foot is large and tough, having flat creeping sole.
6. Shell is spirally twisted with an operculum.
7. Sexes are separate. The male has projecting muscular penis. The visceral hump is spirally coiled.
8. Eyes are placed at the base of the tentacles. Salivary glands and liver contain proteolytic enzymes.
9. Heart has one auricle and kidney is also one.
10. Nervous system is highly concentrated.

Economic importance: Some species of Murex are destructive to oyster industry. It has also ornamental importance and is also used for producing worshipping sound (Shankh). In ancient times the well known Tyrian or imperial purple dye was obtained from M. trunculus and M. bramdoris. The dye consisted of a yellowish secretion from a large mucous gland in the mantle.

Identification: Since the specimen has spirally coiled shell rib and all above feature hence it is Murex.

43. APLYSIA

Classification:

Phylum :- Mollusca
Class :- Gastropoda
Sub-class:- Eutbyneura
Order :- Opisthobranchia
Sub-order :-Tectibranchia
Genus :-Aplysia
(The sea hare)

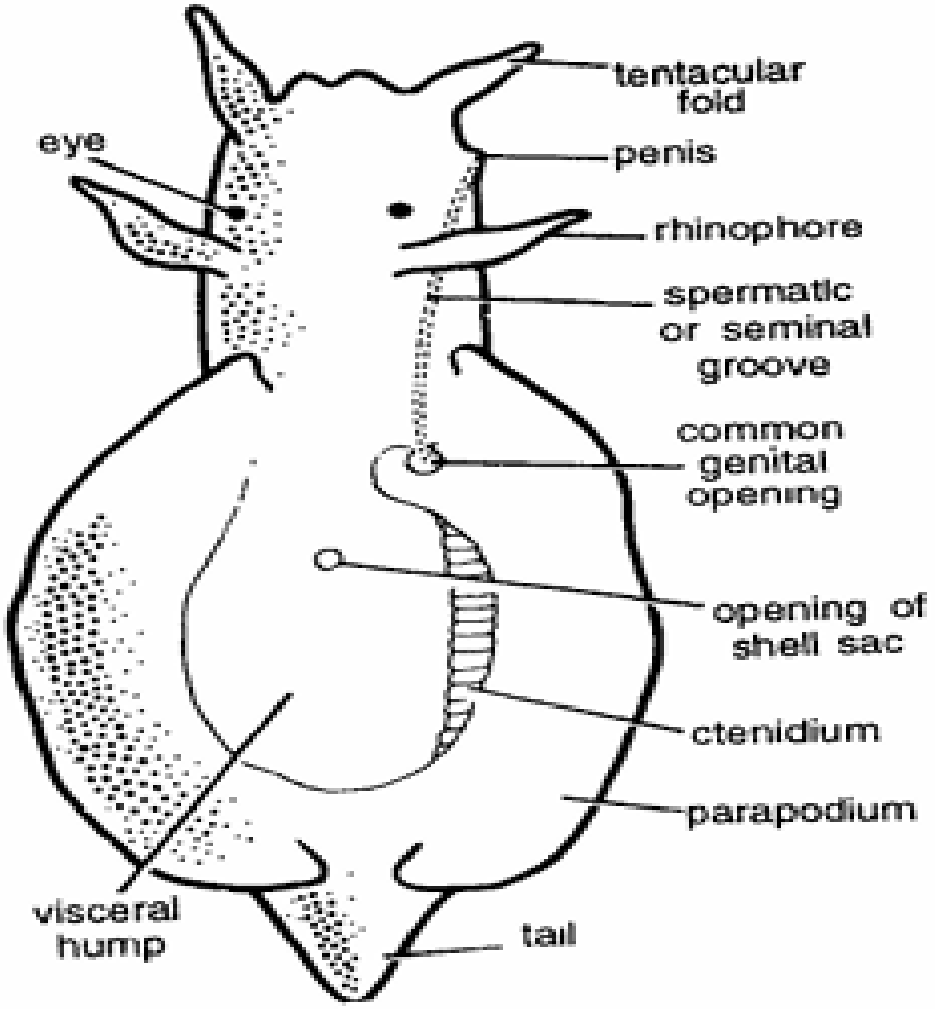


Fig. 118. *Aplysia.*

Identification of Aplysia

Habit and habitat : Aplysia is a marine gastropod found crawling among seaweeds. It has remarkable power of colour changes like the colour of the sunoundings. It inhabits upto a depth of 40 fathoms in uncontaminated water.

Distribution : It is found in India, Asia, West Indies and on the Florida coast.

Comments

1. Commonly called as sea hare.
2. Body of the animal is soft, slimy, fleshy and whitish or greenish in colour. Anterior end bears head and neck.
3. Animal is slug-like, with the anterior angles of the head extended into two large tentacular folds.
4. Besides anterior tentacular fords, there are pair of eyes and behind eyes another tentacular fold like structure called as rhinophores.
5. Mantle cavity is open on the right side with backwardly pointing ctenidium through a longitudinal slit. Anus is posteriorly located. Opening of shell sac and seminal groove is also seen.
6. Foot is muscular, and elongated pointed posteriorly.
7. On the lateral side, there is a pair of large fleshy outgrowths called as parapodia, which project upwards and inwards to enclose visceral hump and are used as fins for swimming.
8. Shell is internal and rudimentary. Opening of shell sac and spermatic seminal groove also seen. Animal is bisexual with a single gonoduct and a common genital opening.

Special features : Aplysia when disturbed secretes a purple fluid from the opening shell sac found in the mantle wall and it makes itself invisible to the enemy.

Identification : Since the animal has rhinophores and all above features, hence it is Aplysia.

44. DORIS

Classification:

Phylum :- Mollusca
Class :- Gastropoda
Suh-c1ass :- Euthyneura
Order :- Opisthobranchiata
Sub-order :- Nudibranchia
Genus :- Doris (Sea lemon)

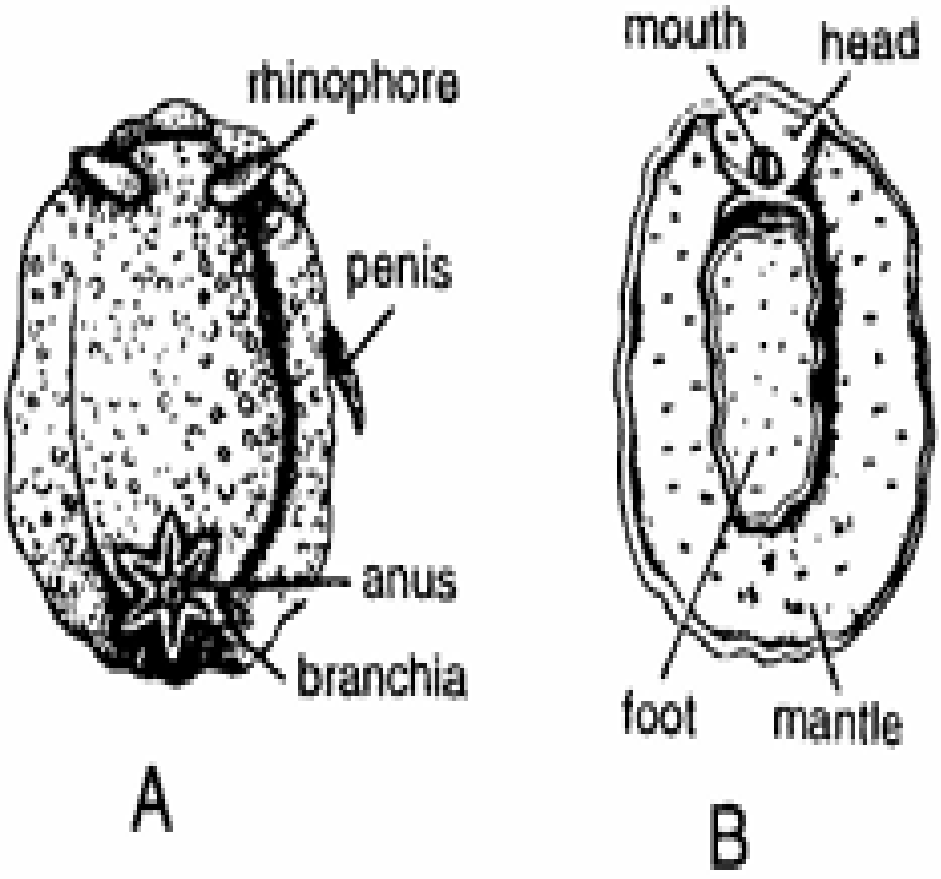


Fig. 119. *Doris*. A. Dorsal view, B. Ventral view.

Identification of Doris

Habit and habitat : Doris is a sluggish marine and curious gastropod found under stones at low tide mark and between weeds. It feeds on incrusting organisms like sponges.

Distribution : Cosmopolitan but specially found in the waters of New England.

Comments

1. Commonly known as sea lemon.
2. Body consists of more or less ovoid mass with a convex warm dorsal side.
3. Colour is purplish brown.
4. Head bears a pair of short retractile tentacles or rhinophores beset with calcareous spicules.
5. Mantle is usually pigmented and contains calcareous spicules or dorsal tubercles.
6. The anus lies mid-posteriorly and is surrounded by a circlet of feathered retractile secondary branchiae.
7. Ventral surface has mouth, head, tentacle and mantles. Anus is surrounded by branchia or gills.
8. Foot has a large creeping sole. Dorsal surface has protruding penis.
9. Digestive gland unbranched compact mass and nervous system of euthyneurous type.
10. Sexes are united and the gonopore is asymmetrically placed on the right side of the body.

Identification : Since the animal contains secondary retractile tentacles and all above features hence it is Doris.

45. AEOLIS

Classification :

Phylum :- Mollusca
Class :- Gastropoda
Suh-c1ass :- Euthyneura
Order :- Opisthobranchiata
Sub-order :- Nudibranchia
Genus :- Aeolis

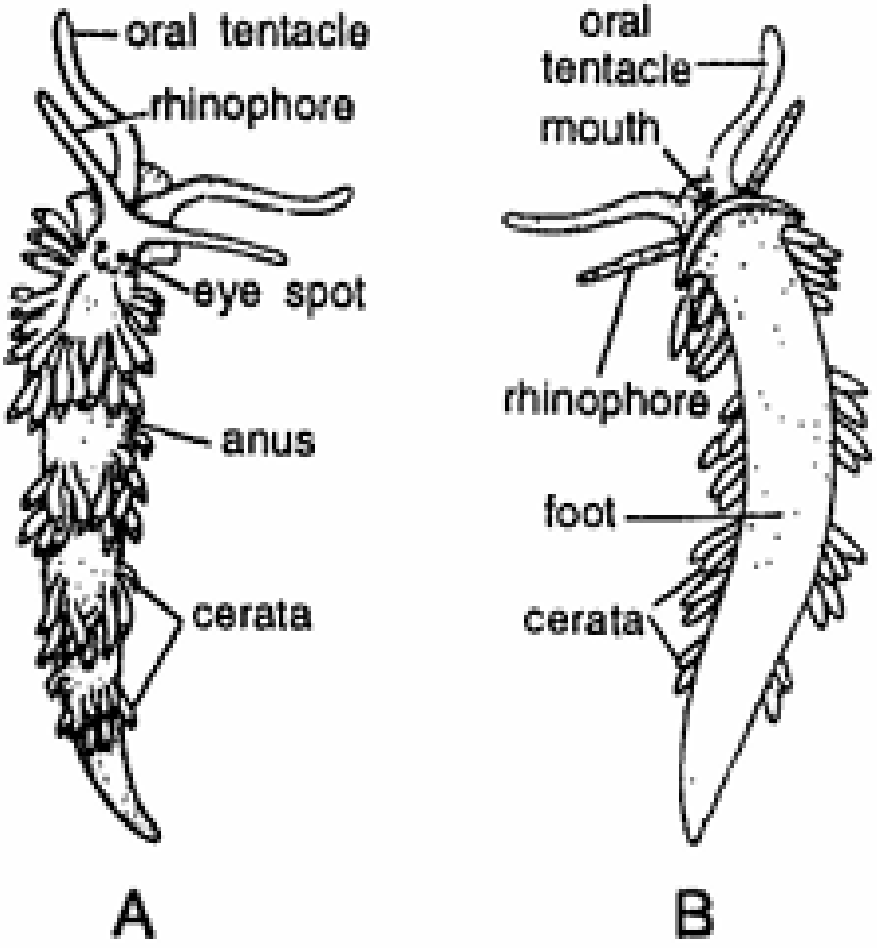


Fig. 120. *Aeolis*. A. Dorsal view, B. Ventral view.

Identification of Aeolis

Habit and habitat : Aeolis is a slug-like, marine gastropod, living among seaweeds and under stones between tide lines.

Distribution : It is found in Europe, U.S.A. and Rhodes Island or Arctic Ocean.

Comments

1. Commonly called as sea slug measuring 5 cm.
2. Body is elongated, shell-less, broad, elongated, depressed, tapering behind, gray or orange coloured with brown or white spots.
3. Head comprises of 2 pairs of cylindrical non-retractile oral tentacles and a pair of sessile eye spot.
4. The anterior pair of tentacles is called as cephalic tentacles, while posterior pair is designated as rhinophores.
5. Anus is seen in mid dorsal position.
6. True ctenidia are replaced by several secondary cylindrical branchiae or cerata, which are distributed over dorsal surface in 15 to 20 slanting rows.
7. Dorsal surface has eyespots, anus and the ventral surface contains foot.
8. Hermaphroditic protandrous form.

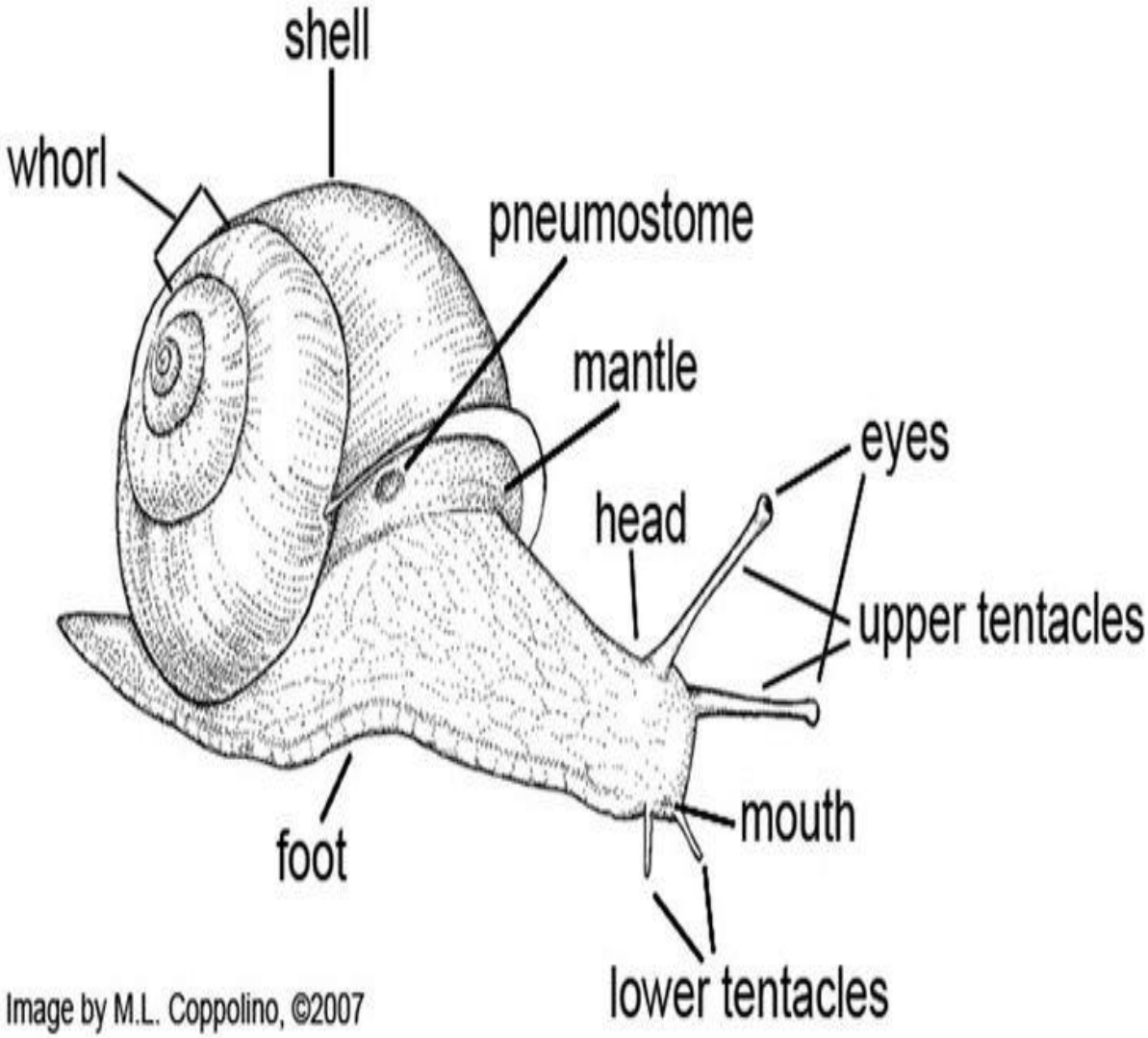
Special features : It feeds on sea anemones, whose nematocysts are stored in the cerata and discharged on irritation. This is a unique example of an animal using in defence of the offensive organs of another.

Identification : Since the specimen contains cerata and all above features, hence it is Aeolis.

46. LIMNAEA

Classification:

Phylum :- Mollusca
Class :- Gastropoda
Sub·class :- Euthyneura
Order :- Pulmonata
Sub·order :-Basommatophora
Genus :- Limnaea



Identification of limnaea

Habit and habitat: Limnaea is a typical fresh· water snail, found in ponds, lakes, etc.

Distribution : It is found in the northern states form Atlantic to Pacific, Europe, New England to Kansas, California, and the entire Pacific coast.

Comments

1. Commonly called as pond snail.
2. Shell is thin, horny and fragile with a sharply elongated spire.
3. Body whorl is the largest, while the penultimate whorl and apex are smaller.
4. Body whorl opens by a wide aperture which is covered by operculum.
5. Eyes are placed at the base of the single pair of flattened tentacles. The tentacles cannot be invaginated.
6. Foot is rounded behind. Species of Limnaea are quite resistant to freezing. They can survive for several weeks in ice.

Special features: Limnaea truncatula serves as intermediate host for the larval stages of the liver fluke. Sporocyst and redia stages of Fasciola hepatica are found in L. truncatula. The pond snail and miracidium larva of F. hepatica exhibit strong host specificity.

Identification : Since the animal contains elongated spire and all above features, hence it is Limnaea.

47. UNIO

Classification:

Phylum :- Mollusca.
Class :- Pelecypoda
Order :- Eulamellibranchiata
Genus :- Unio (The Fresh water Mussel or Clam)

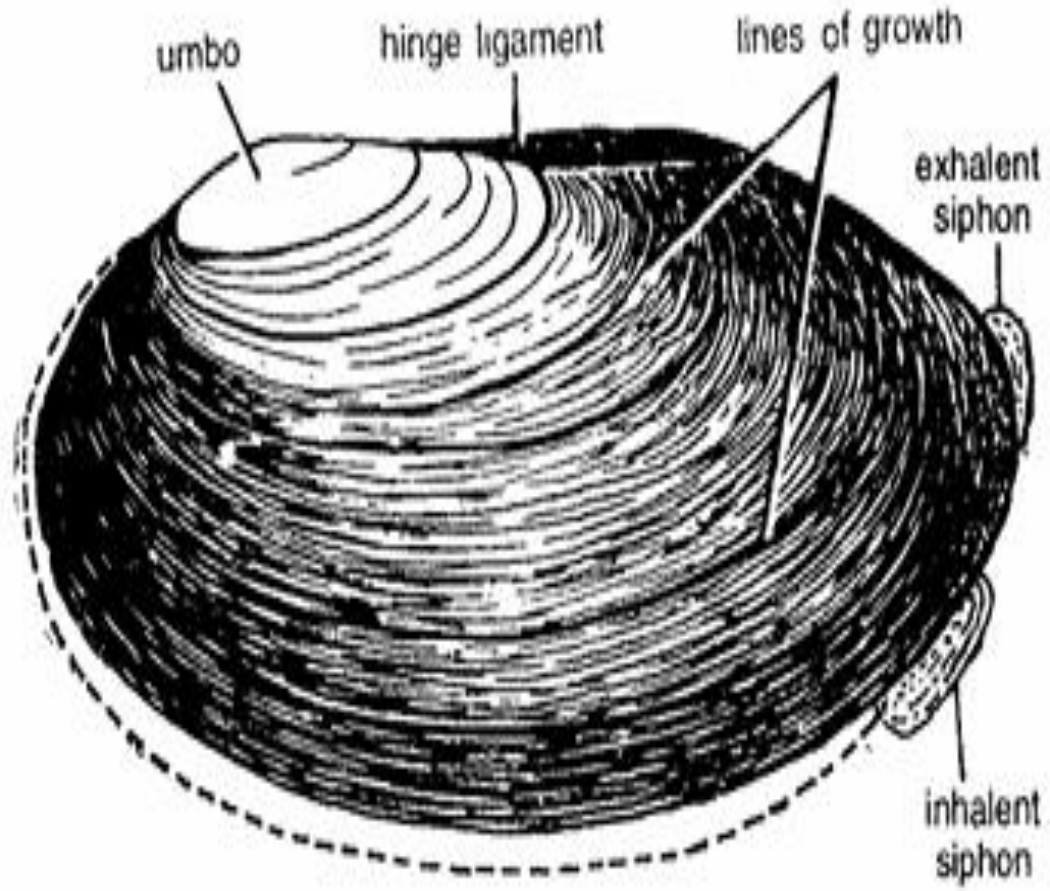


Fig. 126. *Unio.*

Identification of unio

Habit and habitat : Unio is the most familiar and very favourite pelecypod, found in ponds, lakes, rivers and streams. The animal is usually buried in the mud.

Distribution : It is commonly found in India, Europe, Atlantic slope and U.S.A.

Comments

1. Commonly called as fresh water mussel or clam.
2. Body is dark brown, unsegmented, bilaterally symmetrical and flattened from side to side measuring 5 to 10 cm in length.
3. Animal is completely enclosed in equal bivalve shells. The periostracum is generally smooth and without rays.
4. Two valves are united together along the dorsal side in a straight hinge-line by hinge-ligament. Anteriorly, in front of the hinge, there is a whitish, knob-like swelling on each valve, called as umbo. Outer surface of each shell contains various lines of growth. Hinge is without teeth.
5. Posteriorly, on lateral margins there are two openings; smaller one is exhalent siphon, while the larger one is inhalent siphon.
6. Mantle consists of two lobes, corresponding to two valves of the shell. Ctenidia are W-shaped and eulamellibranch.
7. Foot is large, muscular and wedge-shaped and is used for burrowing.
8. Adductor muscles are of same size, i.e. isomyarian.
9. Sexes are separate but the male and female shells are alike. Development includes glochidium larva.

Economic importance : The shells are used in making buttons and animals are largely dissected for understanding nervous system and invertebrate anatomy.

Identification : Since the specimen contains Umbo, hinge and all above characters, hence it is Unio.

48. LOLIGO

Classification:

Phylum :- Mollusca
Class :- Cephalopoda
Sub·c1ass:- Dibranchia
Order ;- Decapoda
Genus :- Loligo

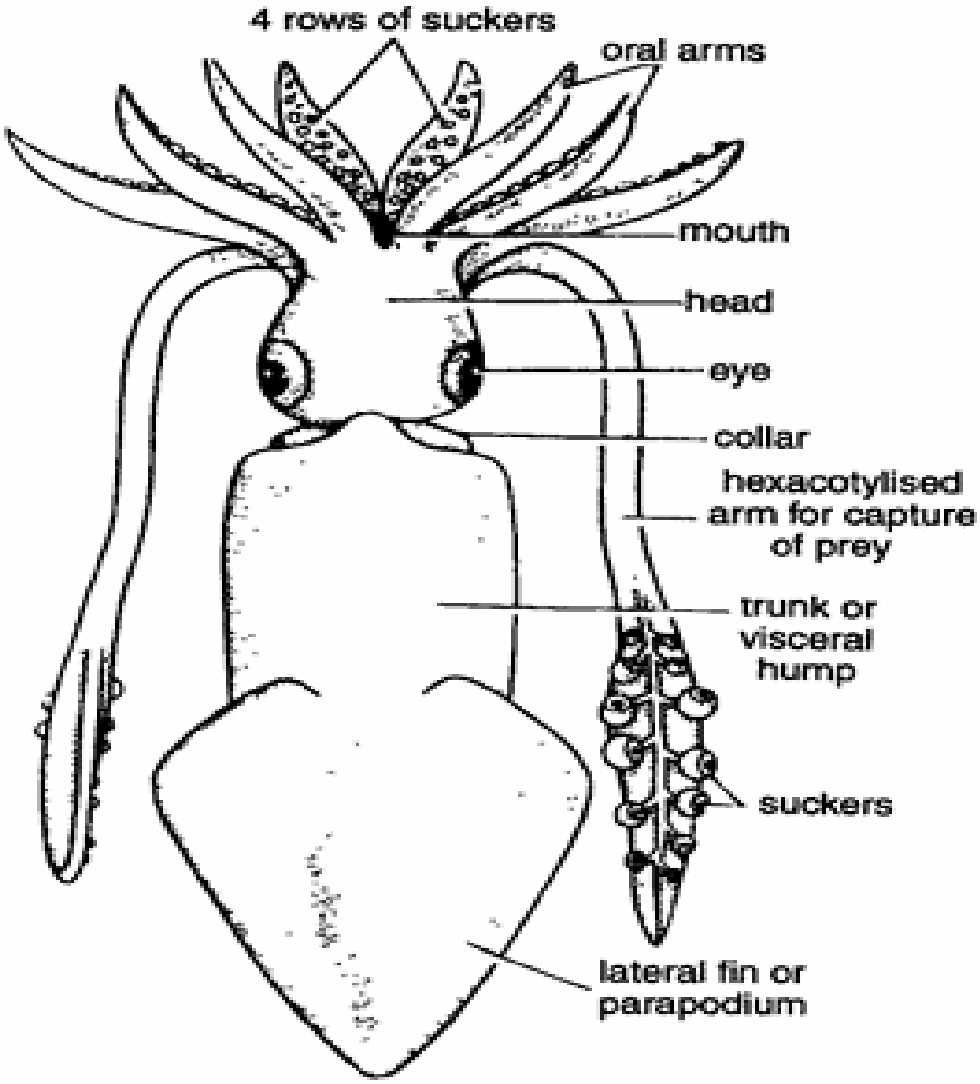


Fig. 135. *Loligo.*

Identification of loligo

Habit and habitat : £Oligo is found in warm seas and in coastal shallow or deep waters. Animal metachromatic i.e. colour changing habit. Commonly called as squid having dark greyish and reddish spots.

Distribution : It has cosmopolitan distribution found along the entire Pacific and Atlantic coast, China, India and U.S.A.

Comments

1. Commonly called as squid.
2. Body is fleshy, dorsoventrally flattened and differentiated into 3 regions (i) anterior head containing 10 oral arms and a pair of eyes with olfactory crest, (ii) middle trunk or visceral hump, and (iii) Posterior region with lateral fins or parapodia. Parapodium is contention of mantle. Head and trunk region are separated by collar.
3. Each one of 8 oral arms contain four rows of pedicellate suckers ventrally.
4. Remaining 2 oral arms on each side contains six pairs of pedicellate suckers. These arms are used for capturing prey and are calted as hectocotylised arms.
5. In males one such arm is also modified as copulatory organ. Oral arm are modifications of the foot.
6. After dissecting the animal, 2 ctenidia, 2 kidneys and 2 auricles are seen.
7. Shell, internal horny and non-chambered and is used in maintenance of natural buoyancy.
8. Ventral siphon is formed by the modification of foot.
9. Sexes separate.
10. Eggs are deposited in long cylindrical jelly masses attached together at one end.

Economic importance: The animal eject ink called as loligo ink in its defence. £Oligo has food value. It is eaten by Chinese and Italians.

Identification : Since the specimen contains all above features and the lateral fin is restricted to posterior part, hence it is Loligo.

49. SEPIA

Classification:

Phylum :- Mollusca
Class :- Cephalopoda
Sub·c1ass:- Dibranchia
Order :- Decapoda
Genus :- Sepia

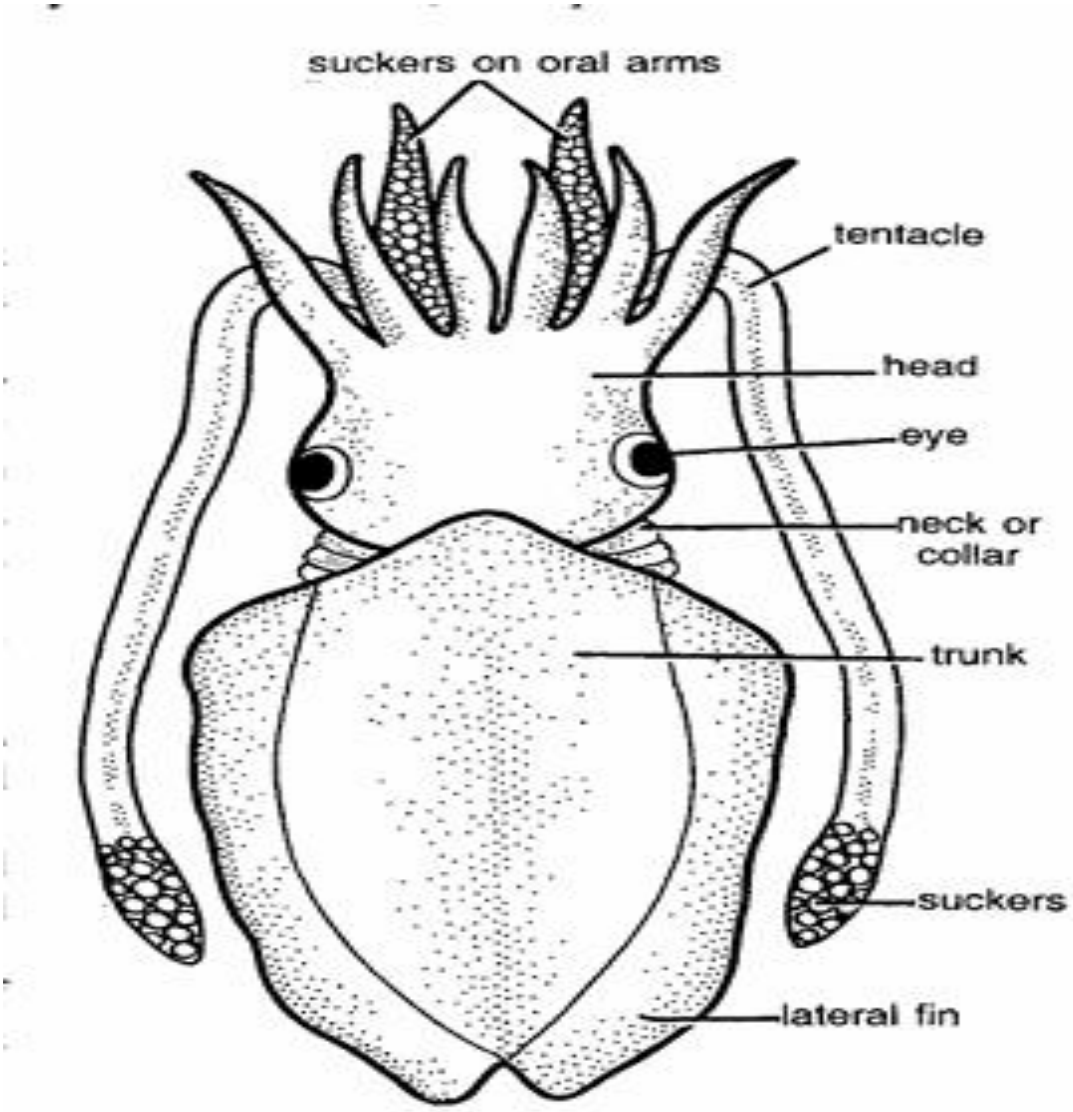


Fig. 136. *Sepia.*

Identification of sepia

Habit and habitat : Sepia is also a marine cephalopod, found along with Lo/igo in coastal waters in coral reefs. It is a good swimmer. It usually swims at night and rest flat at the bottom during daytime. It can also burrow by using fins as shovels. It is carnivorous, living on small fishes, crustaceans and other animals. Shallow to mid water forms.

Distribution : It has cosmopolitan distribution but specially found in India, Europe and Mediterranean region.

Comments

1. Commonly called as cuttle-fish.
2. Body is fleshy and differentiated into anterior head, middle collar and posterior trunk or visceral hump.
3. Colour is brownish with white spots stripes with violet fins. Chromatophores are present in the deeper layers of integument hence it gives a pigmented appearance.
4. Head contains 10 oral arms. 8 oral arms are smaller and have several rows of pedicellate suckers ventrally encircling around mouth. 2 arms on each side are elongated, each having several pedicellate suckers at its tip and are called as hectocotylised arms for capture of prey.
5. At the base of head is a pair of eyes without olfactory crest.
6. Sepia is luminescent and dibranchiate. It is also a myopsidan mollusc, having imperforated cornea and single oviduct.
7. Internal chambered calcareous shell is well developed and is flat. Shell is used in the maintenance of neutral buoyancy.
8. Chromatophores are present in the deeper layers of the integument and hence it gives a pigmented appearance. Sexes are separate.

Special features : Animal ejects ink by its ink gland in sea water when irritated. Ink is secreted from a pear-shaped ink sac lying over postero-ventral surface. Ink is called as Sepia ink which acts as defense mechanism for enemies.

Economic importance : It is used for food in the Mediterranean countries and the sepia ink has medicinal value.

Identification : Since the specimen contains lateral fin all around the visceral hump and all above features, hence it is Sepia.

50. OCTOPUS

Classification:

Phylum :- Mollusca
Class :- Cephalopoda
Sub-class :- Dibrauchia
Order :- Octopoda
Genus :- Octopus (The devil fish)

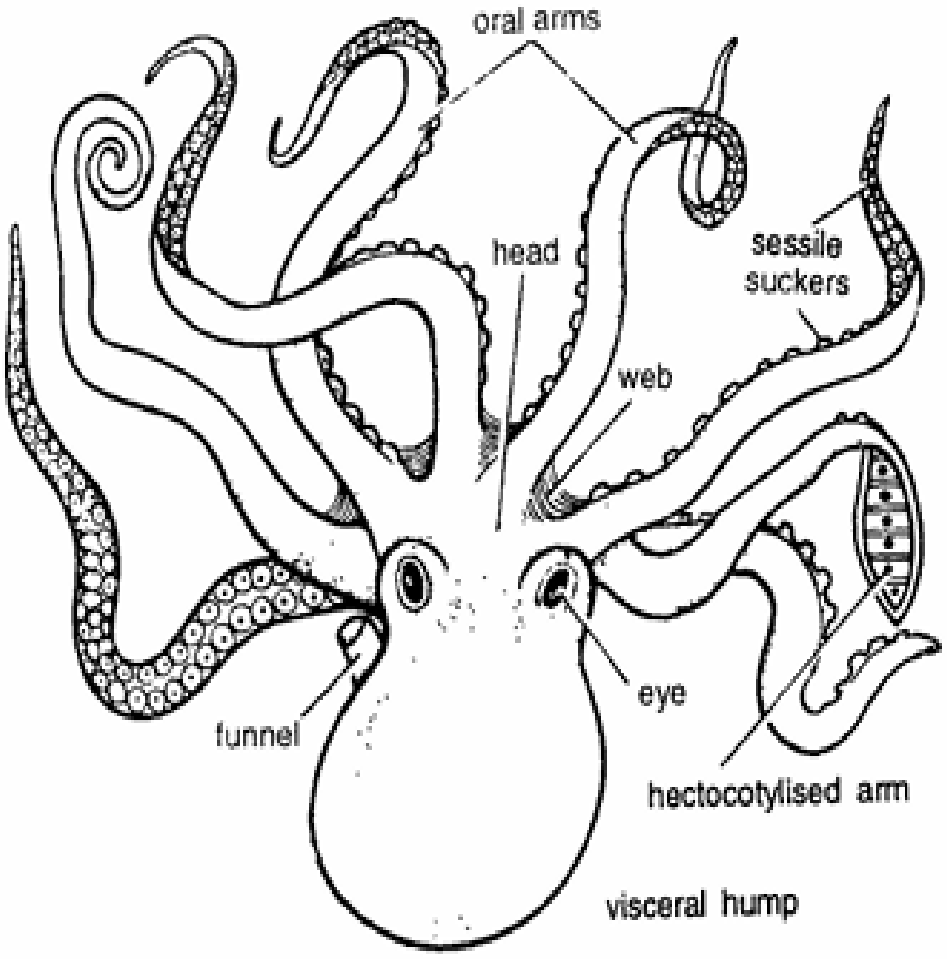


Fig. 137. *Octopus.*

Identification of Octopus

Habit and habitat : Octopus is a marine, nocturnal deep sea form found at the bottom of the sea. It feeds on crabs, fishes and other molluscs. It has colour changing habit.

Distribution : It has cosmopolitan distribution and is specially found in Europe, India, Atlantic and Pacific coasts, Alaska to lower California and Cape Cod.

Comments

1. Commonly called as devil fish.
2. Roundish or globose body is differentiated into a visceral hump and head.
3. Head contains eyes, siphon and 8 elongated arms, having 2 rows of sessile cupped, suctorial pockets or suckers on inner side. One of the arms in male is modified as spoon-shaped intromittent organ or hectocotylized arm. The arms are elongated webbed and similar.
4. Animal can crawl by its arm and can also swim backwards by ejecting jet of water from the funnel.
5. Shell and nidamental glands absent.
6. Visceral mass and the mantle cavity are enclosed by mantle.
7. Nervous system is well developed.
8. Octopus is dibranchiate, having 2 gills, 2 auricles and 2 kidneys.
9. Colour slaty but varying through all shades from nearly white to nearly black.

Special features : Giant Octopus can hold a man in its arms. It ejects inky fluid in water to protect itself. The inky fluid forms a sort of smoke-screen. The ink not only helps to conceal the Octopus but also paralyses the sense of smell in the moray eel, a common predatory enemy. It is largely used for studying behavioural sciences. Octopus is very intelligent and its name devil fish seems justified as displayed by its uncanny cleverness in stocking prey and devilish and cruel capacity in tearing the victim into small pieces once captured.

Identification : Since the specimen has rounded body and all above features, hence it is Octopus.

51. NAUTILUS

Classification:

Phylum :- Mollusca
Class :- Cephalopoda
Sub-class :- Tetrabranchiata
Genus :- Nautilus (The pearly Nautilus)

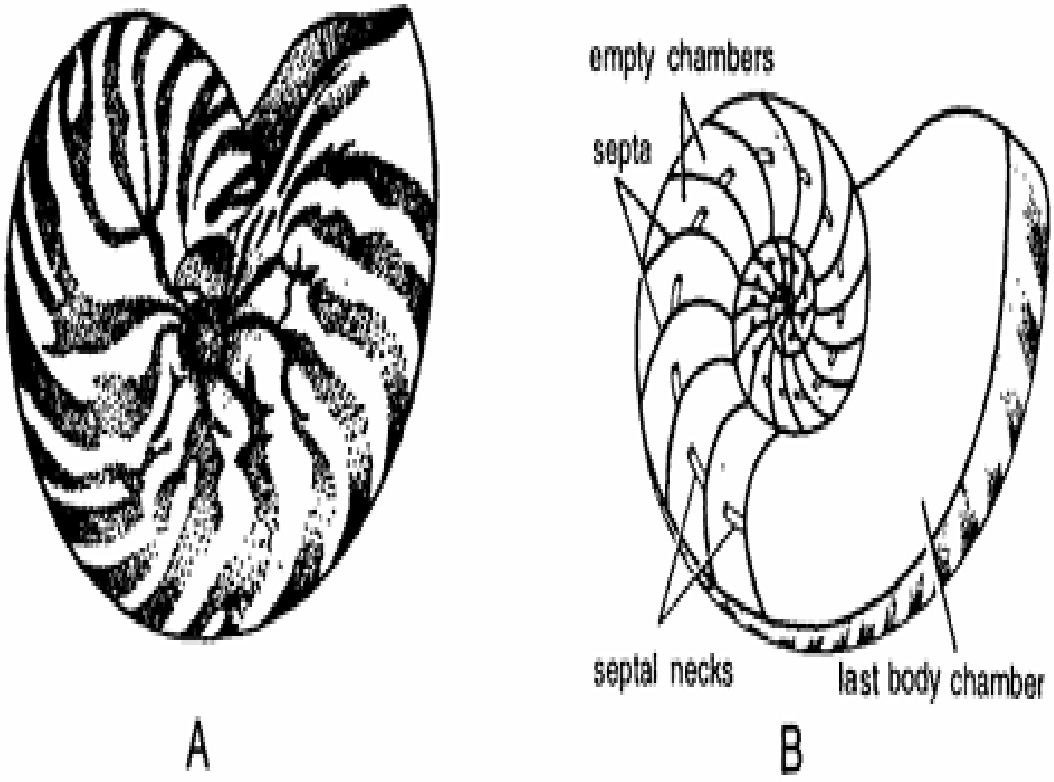


Fig. 138. *Nautilus*. A. Shell, B. Shell in section.

Identification of Nautilus

Habit and habitat: Nautilus is a gregarious, nocturnal deep-sea form crawling over the bottom in troops at night time in search of animal food comprising crabs and shellfish.

Distribution : Commonly found in Indian and Pacific oceans.

Comments

1. Commonly known as pearly Nautilus.
2. Body of the animal lies in the flat and spirally coiled shell in one plane and internally divided into various chambers by septa having septal necks.
3. Shell measures approximately 25 cm.
4. Shell is differentiated into body chamber containing head, tentacles and several coiled chambers with extension of visceral mass called siphundes.
5. Periostracum dark brown or black, porcellaneous layer with undulating transverse bands of white and yellowish brown alternately and inner layer pearly.
6. Body proper is lodged in the largest chamber and the other chambers remain either empty of filled up with gas which helps in floatations.
7. Internal septa are perforated. It is tetrabranchiate having 4 ctenidia, 4 kidneys and 4 auricles. Ink gland is absent.
8. Sexes are separate. About 60 to 90 prehensile tentacles are radially arranged around the mouth. Siphonal funnel is formed of two separate folds.
9. Eyes are open vesicles without cornea or lens. Ink gland and chromatophores absent.

Special features : Nautilus is the only cephalopod having external shell. It has about 2,000 fossil species which date back to the Cambrian and reaching their maximum in the Silurian and Devonian ages. The body is used for food and the shell is extensively employed for ornamental and useful purposes. Oliver Wendell Holmes in his famous poem, "Chambered Nautilus", calls it as "The ship of pearl".

Identification : Since the specimen contains spirally coiled shell and all above features, hence it is Nautilus.

PHYLUM ECHINODERMATA

52. ANTEDON

Classification:

Phylum :- Echinodermata
Sub-phylum :- Pelmatozoa
Class :- Crinoidea
Order :- Articulata
Genus :- Antedon
(The feather star)

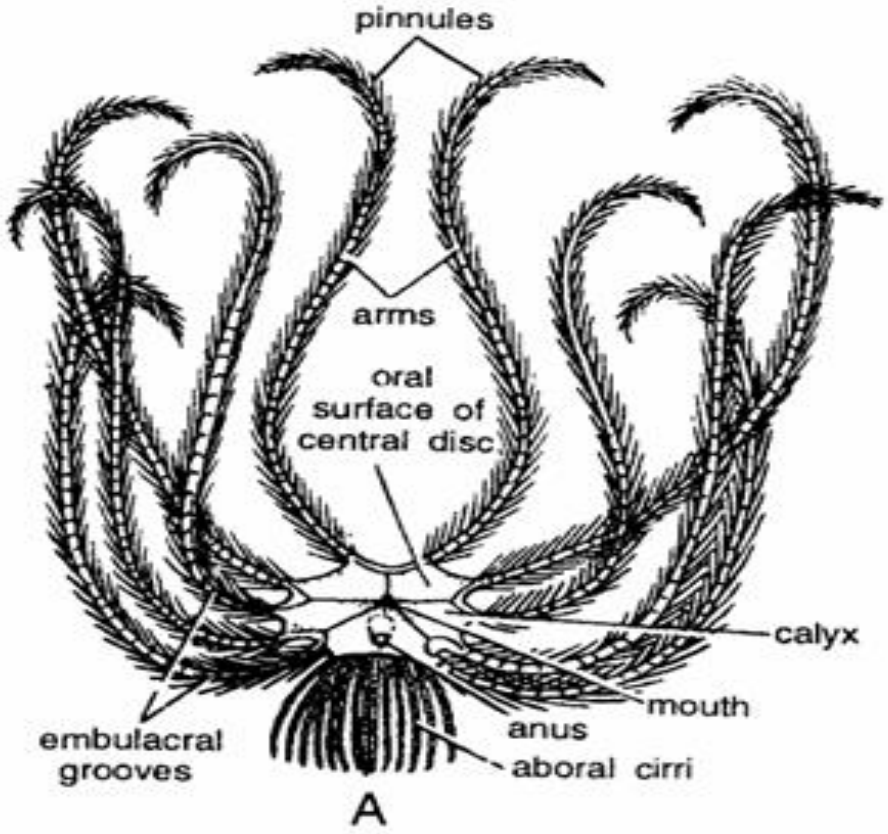


Fig. 188. *Antedon* : Feather star.

Identification of Antedon

Habit and habitat : Antedon is marine and occurs about 2 fathoms deep and remains attached to rocks by cirri from central disc. They are gregarious forms and feed on microscopic living organisms.

Distribution : It has world-wide distribution found in all seas and at all depths down to 5,800 meters. It is especially found along Atlantic coast in 25 to 500 fathoms from Chesa peake Bay to the banks of Newfoundland. The members are known form lower Cambrian to Recent.

Comments

1. Commonly called on sea-lily or feather-star.
2. On the aboral side calyx bears a knob-like structure called as centrodorsal plate or stalk.
3. The calyx is differentiated into an upper convex oral surface, having mouth and anus and the lower flat aboral surface, into which anus and cirri are inserted.
4. On the aboral side calyx bears a knob-like structure, called as stung of the stalk.
5. The oral surface is covered by a leathery skin in which numerous calcareous plates are embedded. It is directed upwards.
6. Mouth is central and directed upwards which leads into 5 food open grooves or ambulacral grooves, which divide into 10 as they reach near the edge and lead into the anus. The mouth is surrounded by sensory tube feet or podia which are without suckers. The ambulacral grooves give branches into each pinnule and throughout their course contain finger-like, non-prehensile tube feet or podia. Water vascular system is well developed. There is no madreporite.
7. There are 10 arms having extensions of viscera and each bears numerous pinnules containing gonads.
8. The cirri are emerging from aboral surface and are composed of skeletal ossicles.
9. Sea-lily attaches to substratum by cirri. Anus on aboral surface.
10. It is one of the living representatives of the class Crinoidea. Sexes are separate. Development includes cystidian and pentacrinoid larva.

Identification : Since the specimen contains aboral cirri and all above feature, hence it is Antedon.

53. ASTERIAS : SEA STAR OR STARFISH

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Asteroidea
Order :- Forcipulata
Genus :- .Asterias

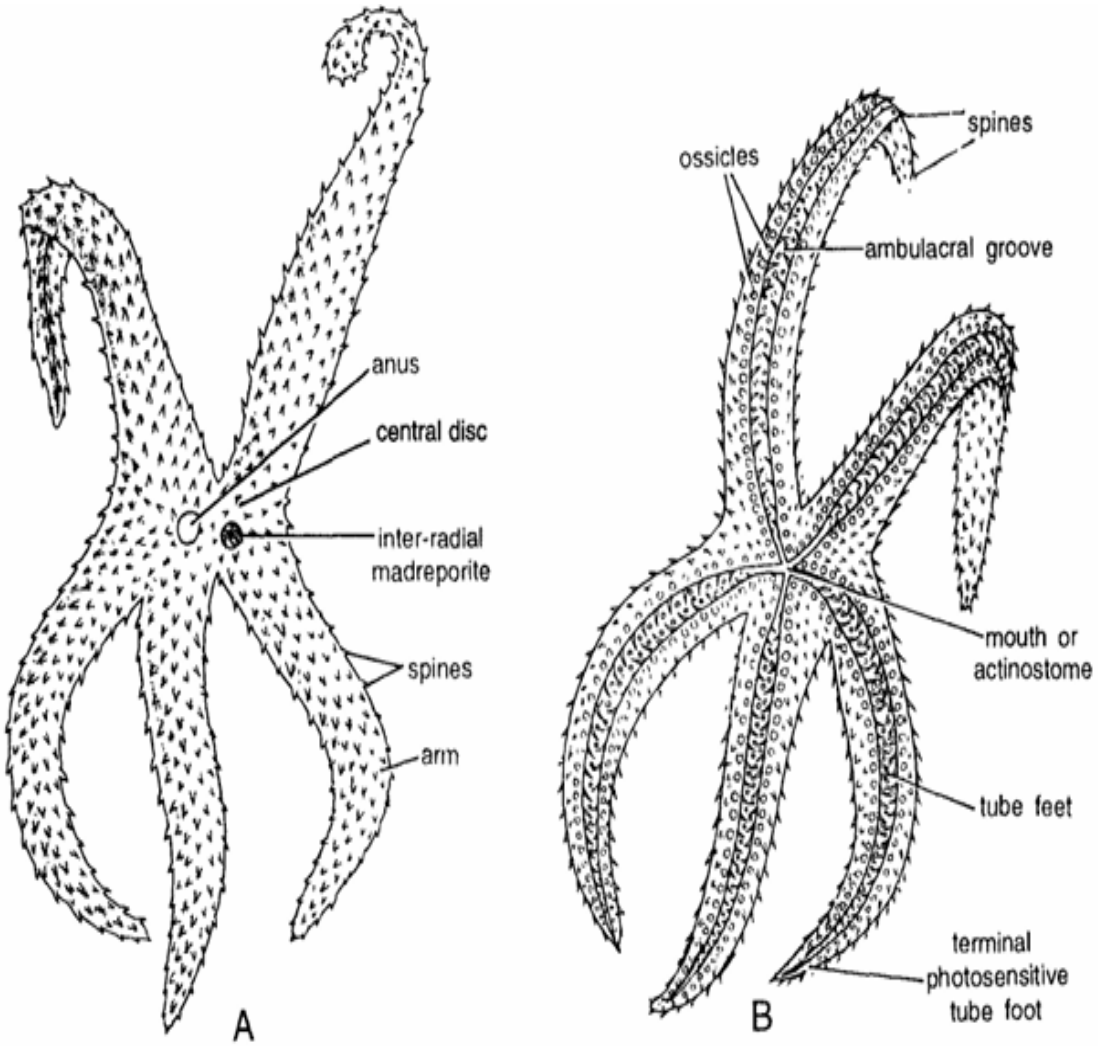


Fig. 189. *Asterias* : Starfish **A.** Aboral view, **B.** Oral view.

Identification of Asterias

Habit and habitat : Asterias is a marine form, found below 200 fathoms on most of the eastern seashore.

Distribution : It is distributed in shallow water in North temperate seas and especially abundant and reaching large size on the North Atlantic coast. It is specially found in India and U. S. A.

Comments

1. Commonly called as starfish or sea star. Members are radially symmetrical, free living and star shaped and hence called as starfishes or sea stars.
2. Body is radially symmetrical, star-shaped and pentagonal.
3. Body or central disc of the animal is distinguished into downwardly directed oral (mouth) and upwardly directed aboral surfaces.
4. Central disc is continued into 5 arms.
5. Aboral surface is pink and contains conical spines allover and asymmetrical sub-pentagonal madreporite plate in inter-radial position. The finger-like semi-transparent branchiae and pedicellariae are also present on aboral surface.
6. Terminal tube feet are photosensitive.
7. Oral surface contains central actinostome or mouth, from which five ambulacral grooves extend, one in each arm. The open ambulacral groove accommodates a large number of podia or tube feet. Water vascular system is well developed. Tube feet usually terminate in suckers.
8. Skeleton consists partly of a mesh work of ossicles and partly of a series of closely set, discrete plates.
9. Pedicellariae are usually present and may be of more than one kind.
10. Sexes are separate. Fertilization is external. The larva is typically a bipinnaria developing into a brachiolaria before metamorphosis into adult.

Identification : Since the specimen contains conical spines and all above features, hence it is Astrias.

54. OPHIOLEPIS

Classification:

Phylum :- Echinodennata
Sub-phylum :- Eleutherozoa
Class :- Ophiuroidea
Order :- Zygophiurae
Genus :- Ophiolepis

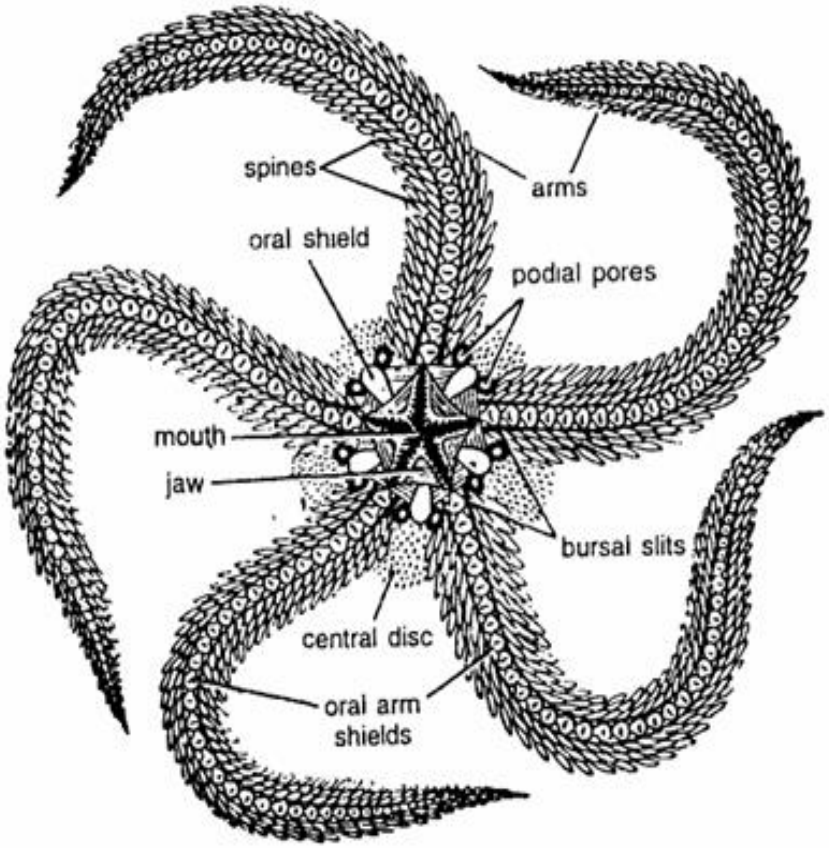


Fig. 196. *Ophiolepis.*

Identification of Ophiolepis

Habit and habitat : They are abundant in littoral zone hidden often in the sand and other objects. Some live in sponges.

Distribution : Distributed from tropical to polar regions and they have been collected from depths of 6,000 m.

Comments

1. Commonly called as Brittle stars.
2. Oral and aboral surfaces well differentiated.
3. Central disc and arms quite distinct. Arms contain podia.
4. Mesodermal endoskeleton consits of c1acareous ossic1es.
5. Central disc of aboral surface is composed of radial shield, lateral arms shield, aboral shield, central plate and primary concentric plates.
6. Central disc has primitive concentric arrangement of plates.
7. Branchial, dermal papillae and pedicellarea are absent.
8. Identification : Since specimen has primitive concentric arrangement of plates in central disc and all above features, hence, it is Ophiolepis.

55. ECHINUS

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Echinoidea
Sub-class :-Regularia or Endocyclia
Order :- Diadematoidea
Genus:- Echinus (Sea urchin)

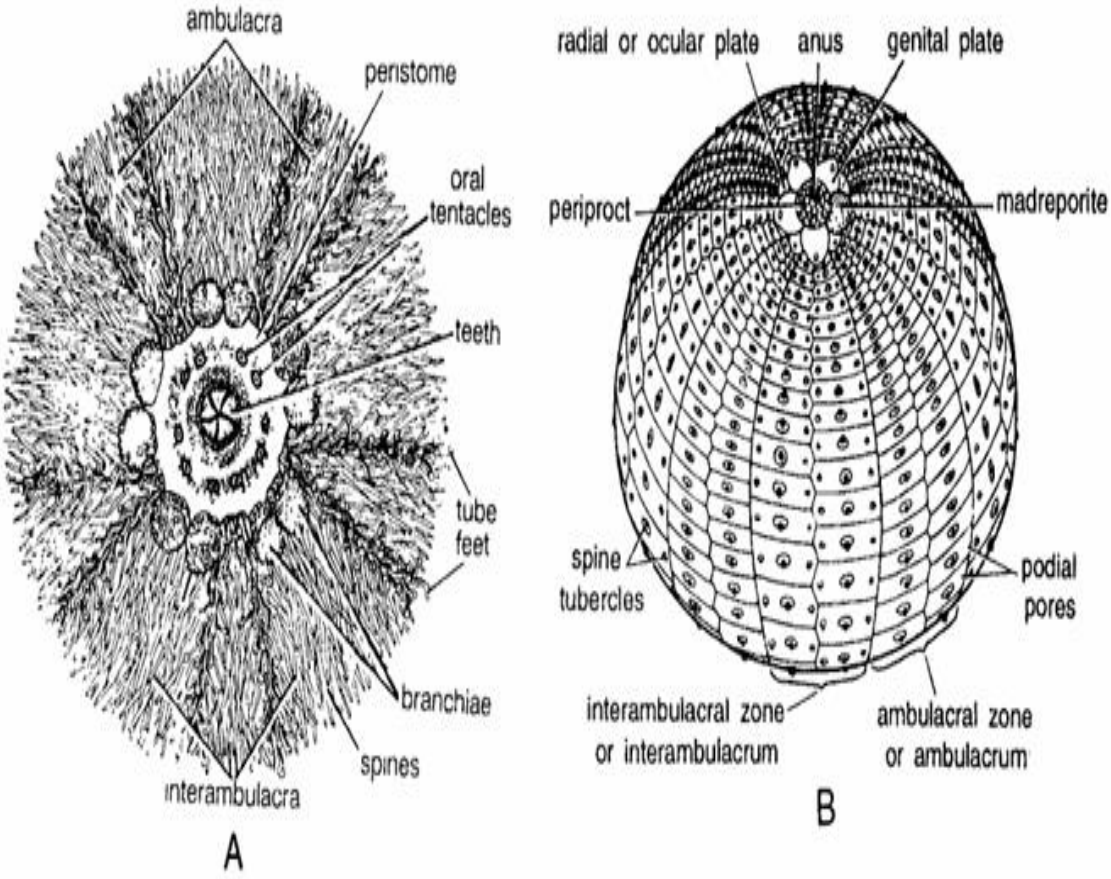


Fig. 198. *Echinus.* A. Oral view, B. Skeleton in aboral view.

Identification of Echinus

Habit and habitat : Echinus is a benthic animal occurring from inter-tidal zone to a depth of 5000 meters.

Distribution : It is widely distributed in the Atlantic, the Mediterranean and Pacific waters.

Comments

1. Commonly called as sea urchin.
2. Body is spherical and brownish and is differentiated into flat, oral and domed aboral surfaces along vertical oral aboral axis.
3. Body is enclosed in a rigid globular test or corona which is composed of calcareous plates which regularly interlock to form test.
4. Entire surface, except peristome and periproct, is covered by movable articulated spines to the test.
5. Pedicellariae and sphaeridia, offensive and defensive organs are found between movable articulated spines. The oral surface contains mouth, from where jaw apparatus or Aristotle's lantern or masticatory apparatus protrudes internally. The mouth is surrounded by a lip or peristome. The inside of peristome contains calcareous ossicles and buccal tube and on outer edge of peristome are ten branching gills.
6. Test is distinguished into ambulacral and inter-ambulacral zones. Water vascular system is well developed. Ambulacral groove closed.
7. Test bears numerous spines and rows of tube feet in ambulacral areas.
8. Dried test contains ocular plates, anus, genital plate, madreporite plate and double row of podia.
9. Madreporite and gonophore are present near anus and aboral in position.
10. Tube feet end in suckers and form five double meridional rows.

Special features : The mouth on lower surface is surrounded by a lip or peristome. In side of peristome contains calcareous ossicles and buccal tube and on outer edge of peristome are ten branching gills. The most interesting part is Aristotle's lantern. It is a masticatory apparatus which protrudes internally. Sea urchin's eggs have been extensively used for experimental work in embryology.

Identification : Since the specimen contains rounded test and all above features, hence it is Echinus.

56. ECHINARACHINUS

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Echinodea
Sub-class :- Irregularia
Order :- Clypeastroida
Genus :-Echinarachinus
(The sand dollar)

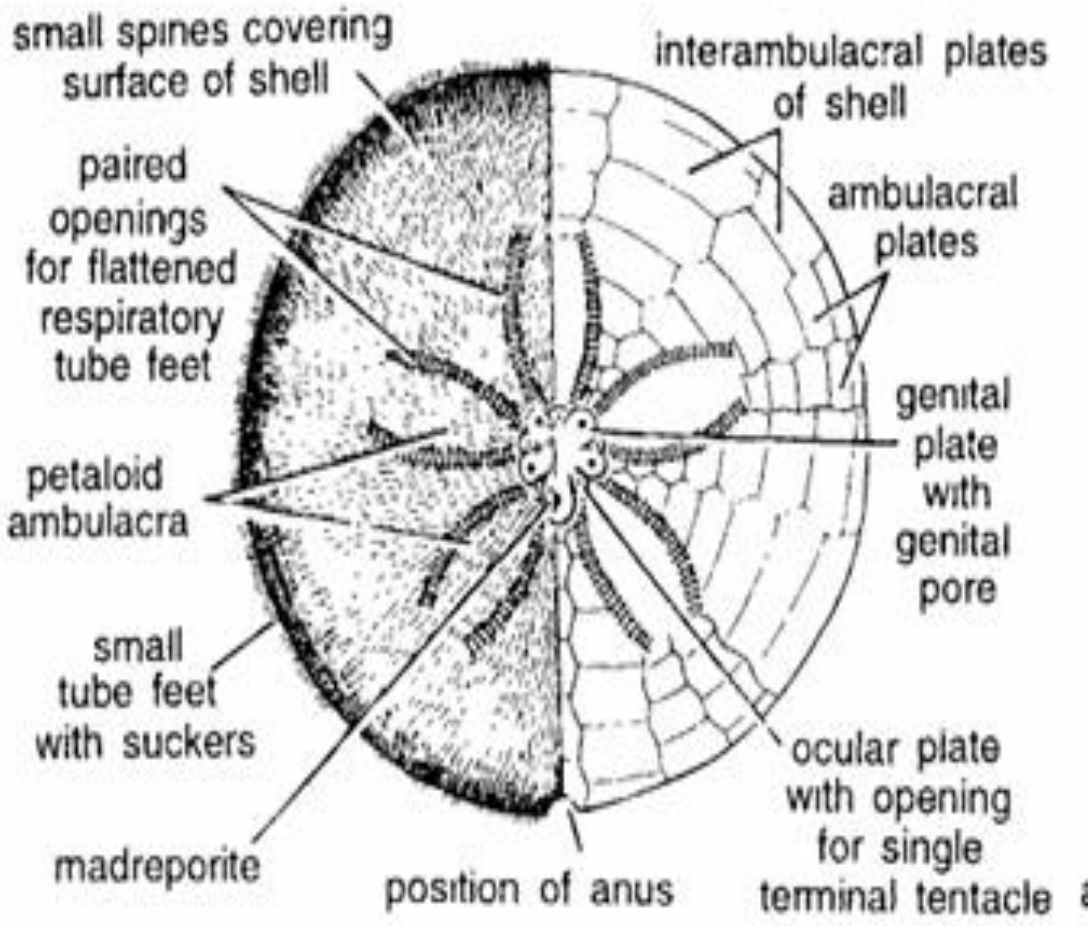


Fig. 200. *Echinarachinus* in aboral view.

Identification of Echinarachinus

Habit and habitat : Echinarachinus is commonly found about 800 fathoms deep, lying on sand or partly buried.

Distribution: It is found along West coast on North America, Pacific coast and U.S.A.

Comments

1. Commonly called as sand dollar.
2. Body is circular, disk-like and dorsoventrally flattened and differentiated into oral and aboral surface.
3. Oral surface is composed of inter-locking ambulacral and interambulacral ossicles beset with tiny spines.
4. Five petaloid ambulacra representing opening for tube feet in double row in the form of a petal. One present on aboral surface.
5. Petaloid also contain paired openings for flattened respiratory tube feet.
6. Entire test has small spines. Madreporite plate, ocular plate and genital plate with genital opening are found on aboral surface.
7. Anus is aboral.
8. Development includes echinopluteus larva.
9. Identification: Since the specimen contains five petaloid and all above features hence it is Echinarachinus.

57. CLYPEASTER

Classification :

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Echinodea
Sub-class :- Irregularia
Order :- Clypeastroida
Genns :- Clypeaster

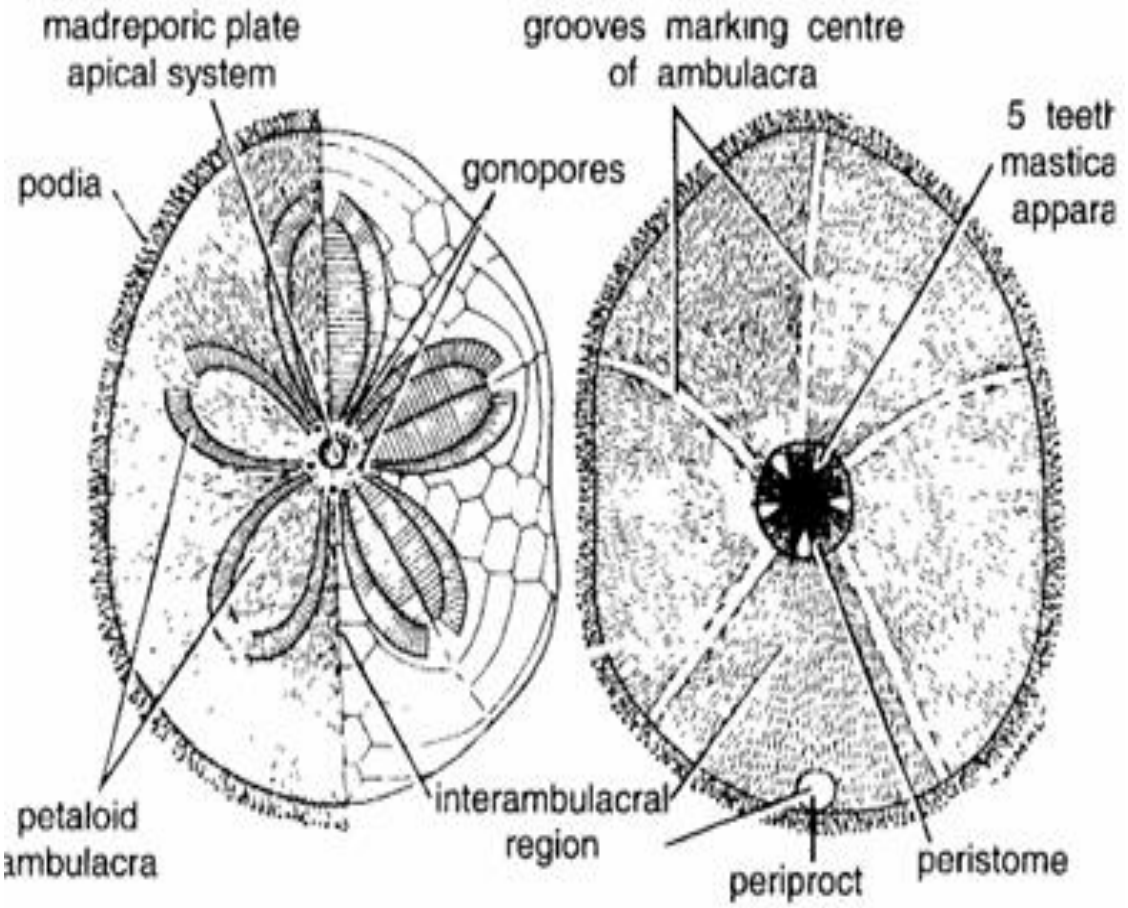


Fig. 201. *Clypeaster.* **A.** Aboral view, **B.** Oral view.

Identification of clypeaster:

Habit and habitat : Clypeaster is found creeping on the bottom or partly buried in sand. It shovels sand by its tube feet.

Distribution : It is found in tropical, sub-tropical region, Red Sea and North Carolina to Brazil.

Comments

1. Commonly called as cake urchin.
2. Body is flattened and is exhibiting bilateral symmetry. Test is more or less round in outline and is covered with thick and short spines.
3. Body differentiated into oral and aboral surfaces.
4. Shell more or less five sided, each petaloid area being wide and well marked and each pair of ambulacral.
5. Aboral surface is slightly convex. Aboral ends of 5 ambulacral areas are bordered, each by two rows of flattened, respiratory tube feet, which are arranged in such a way that they appear like petals of flowers and are hence called as petaloids.
6. Madreporite is placed at the centre of the aboral side, from which radiate five petaloid ambulacral areas which are clearly seen. Between two petaloid is interambulacral area.
7. Oral surface is flat and covered by a dense velvety coat or short spines and pedicellariae. Mouth lies in centre and communicates with 5 simple groove along the centre of the ambulacral areas. Anus or periproct oral. Around mouth is 5 teeth of masticatory apparatus. Ambulacral groove is clearly seen.
8. At the beginning of each ambulacral area near the peristome there exist two sphaeridia which are immovable and devoid of nerve ring.
9. Genital plates are fused with the central pentagonal plate. Radial ocular plates are distinct.
10. Development includes echinopluteus larva.

Identification : Since the specimen contains five distinct petaloid and all above features, hence it is Clypeaster.

58. ECHINOCARDIUM

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Echinoidea
Sub-class :- Irregularia
Order :- Spatangolda
Genus :-Echinocardium
(The heart urchin)

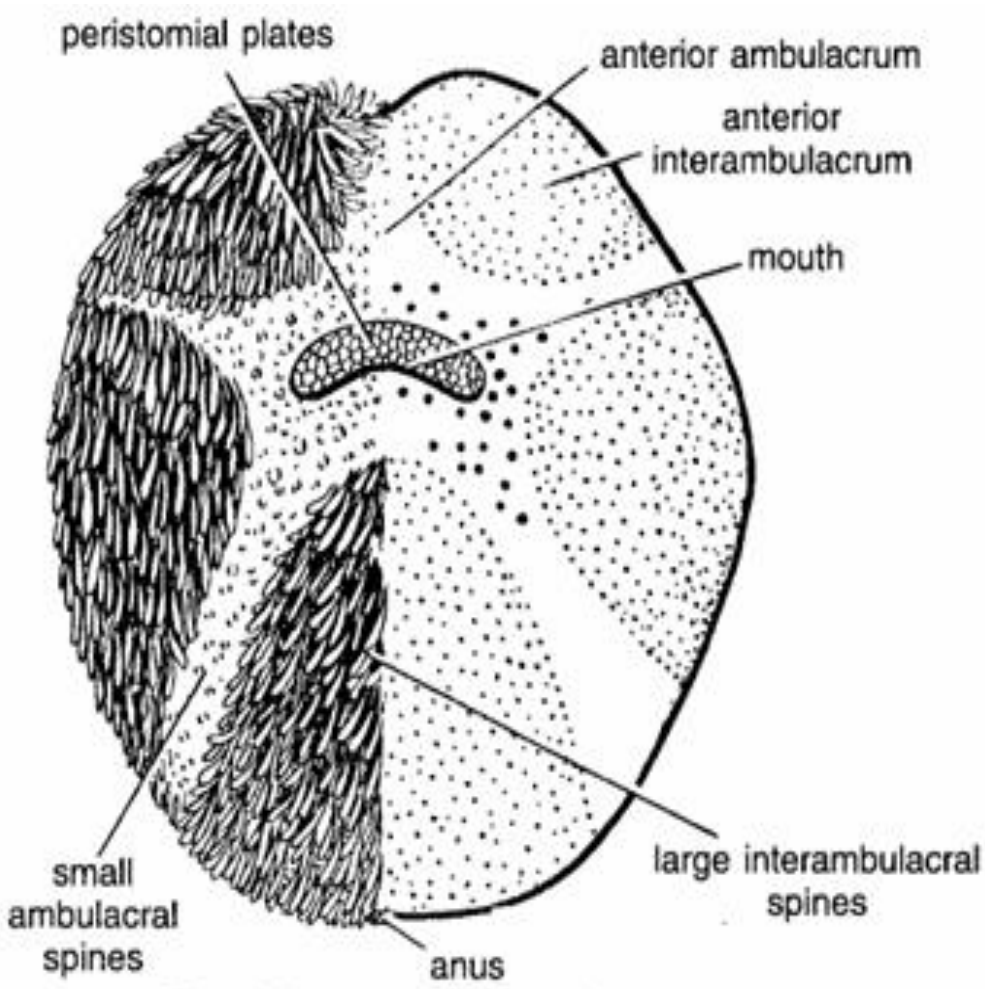


Fig. 202. *Echinocardium.* Oral view.

Identification of Echinocardium

Habit and habitat : Echinocardium burrows in sand 10 to 15 cm deep and moves by spines. It lives in a small chamber, which opens to surface by a chimney, through which animal feeds by protruding tube feet.

Distribution : It has world-wide distribution.

Comments

1. It shows extreme modification of echinoderm pattern as it becomes heart-shaped and is popularly known as heart urchin.
2. Test is large in size with four well-developed petaloids and aboral surface and anterior anJ posterior sides.
3. On oral surface long tubercles interambulacral spines are present.
4. Apical central plate contains gonopores. or long
5. Peristome or mouth becomes transversely extended.
6. Aristotle's lantern is absent.
7. Ambulacral areas bear short tube feet and short spines called ambulacral spines.
8. Inter-ambulacral areas bear long spines.
9. Development includes echinopluteus larva.

Identification : Since the specimen contains 4-well developed petaloid and all above features, hence, it is Echinocardium.

59. CUCUMARIA

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
Class :- Holothuroidea
Order :- Dendrochirota
Genus :- Cucumaria (The sea cucumber)

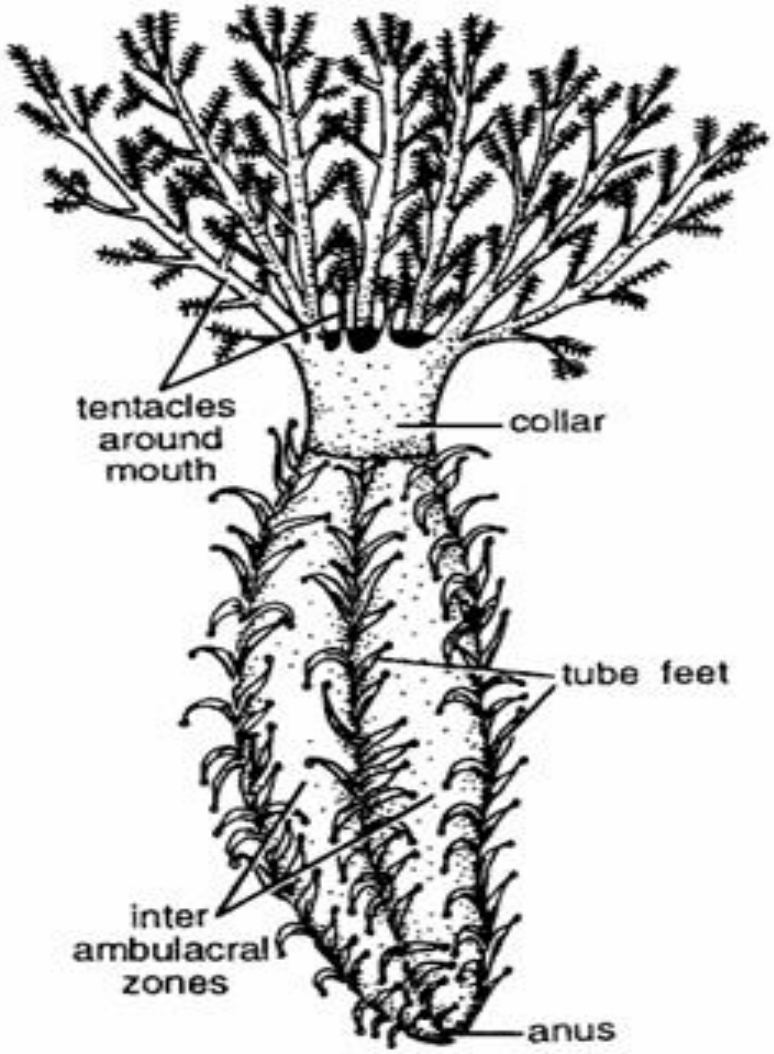


Fig. 203. *Cucumaria.*

Identification of Cucumaria

Habit and habitat: Cucumaria is iJ1habits approximately 200 fathoms deep wholly or partially buried in the mud. It feeds on detritus and plankton.

Distribution : It has cosmopolitan distribution and specially found in Europe, U.S.A. and India.

Comments

1. Commonly called as sea cucumber.
2. Body is elongated horizontally along the oral aboral axis. Colour of the body may be whitish, reddish or brown.
3. Oral end contains a whorl of 10 dendritic bushy, pinnately branched tentacles surrounding the terminal month. Tentacles are modified tube feet.
4. Anterior region is called as collar which contains mouth at anterior extremity.
5. Rest of the body differentiated into 5 ambulacral and 5 inter ambulacral zones. Ambulacral grooves are covered and run longitudinally.
6. Tube feet, when present, usually possess suckers and are either arranged in rows or are irregularly scattered.
7. Body wall which is dermo-muscular contains very small separate ossicles.
8. There is a single genital aperture, middorsally situated between the bases of two adjacent inter-ambulacral tentacles near mouth.
9. Animal rests on the so-called ventral surface, which is flattened and paralleled with oral aboral axis of the body, and is pentaradiate. It has 3 ambulacral areas trivium and forms s;)le. Dorsal surface with 2 ambulacral areas is called as bivium. Anus is aboral wit..lt paired respiratory trees.
10. Larva are Auricularia Doliolaria.

Identification : Since the specimen contains whorl of pinnately branched tentacles and all above features, hence it is Cucumaria.

60. HOLOTHURIA

Classification:

Phylum :- Echinodermata
Sub-phylum :- Eleutherozoa
class :- Holothuroidea
Order :- Aspidochirota
Genus :- Holothuria (Sea cucumber)

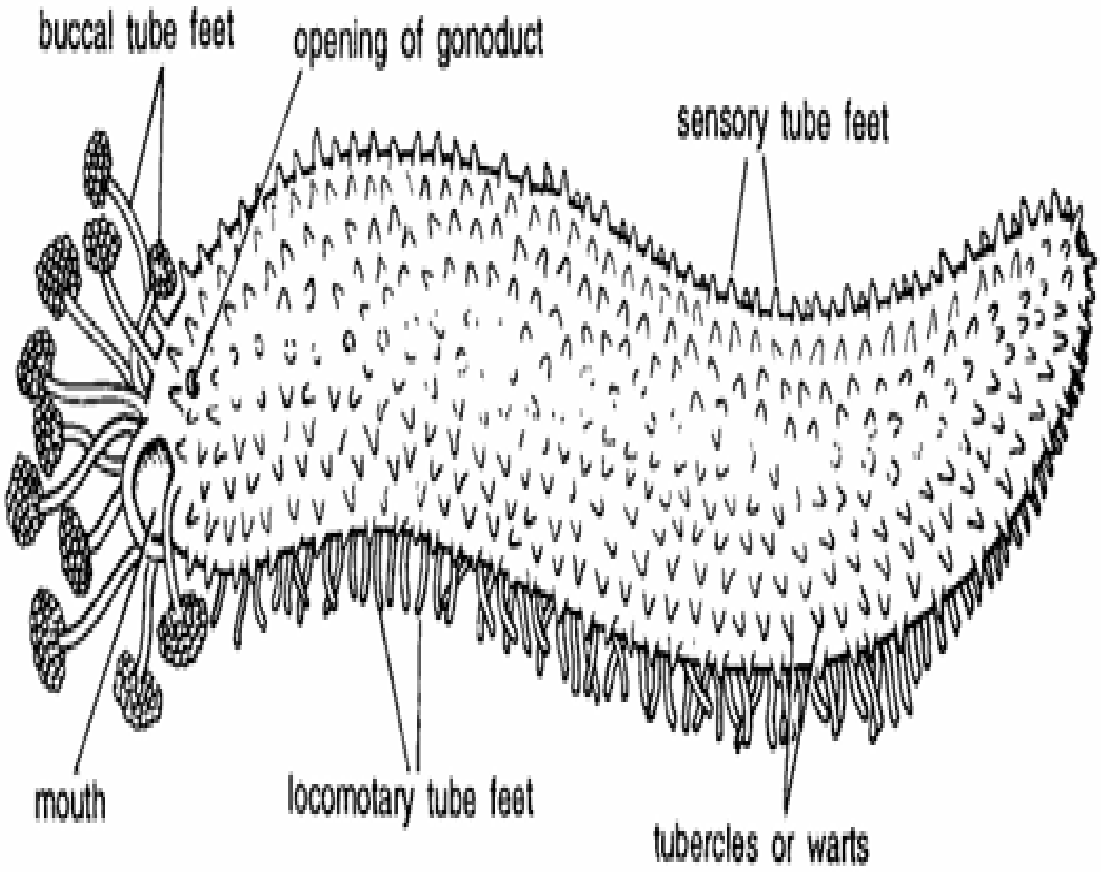


Fig. 204. *Holothuria.*

Identification of Holothuria

Habit and habitat : Holothuria is found near seacoasts and is measuring about 30 cm. The animal feeds on microorganisms and moves very slow on the sea bottom by the muscular contractions of the body wall and with the help of its tube feet.

Distribution : It is found in India, Florida and West Indies.

Comments

1. Commonly called as sea cucumber.
2. Body is elongated along the oral and aboral axis horizontally.
3. Oral end has large mouth surrounded by tactile buccal tentacles for collecting food.
4. Madreporite is internal polian vesicles 1 to many. Water vascular system well developed.
5. Tube feet contains suckers and are present in rows. Body divided into ambulacral and interambulacral areas.
6. Dermo-muscular body wall is embedded with small calcarious ossicles.
7. Pedicellariae or spines absent.
8. Respiratory tree and cuviers tubes are present internally.
9. Ambulacral grooves are covered and run longitudinally.
10. Sexes are separate. Development includes Auricularia larva which develops into Doliolaria before metamorphosis into adult.

Identification : Since the specimen contains small buccal tentacles and all above features, hence it is Holothuria.

VERTEBRATES SPECIMENS

PHYLUM- HEMICHODRATA

1. Balanoglossus

PHYLUM- UROCHORDATA

2. Herdmania
3. Pyrosoma

PHYLUM- CEPHALOCHORDATE

Class- cyclostomata

4. Petromyzon
5. Myxine

PHYLUM- PISCES

6. Torpedo
7. Notopterus
8. Labeo rohita
9. Clarius: mangur
10. Anabas
11. Catla catla
12. Protopterus

PHYLUM- AMPHIBIA

13. Ichthyophis
14. Necturus
15. Triturus cristatus
16. Bufo
17. Rhacophorus

PHYLUM- REPTILIA

18. Testudo
19. Chelone
20. Trionyx
21. Iguana
22. Darco
23. Typhlops
24. Python
25. Natrix
26. Dendrophis
27. Hydrophis

PHYLUM-AVES

28. Pavo cristatus
29. Columba livia
30. Pstillacula euparia

PHYLUM-MAMMALIA

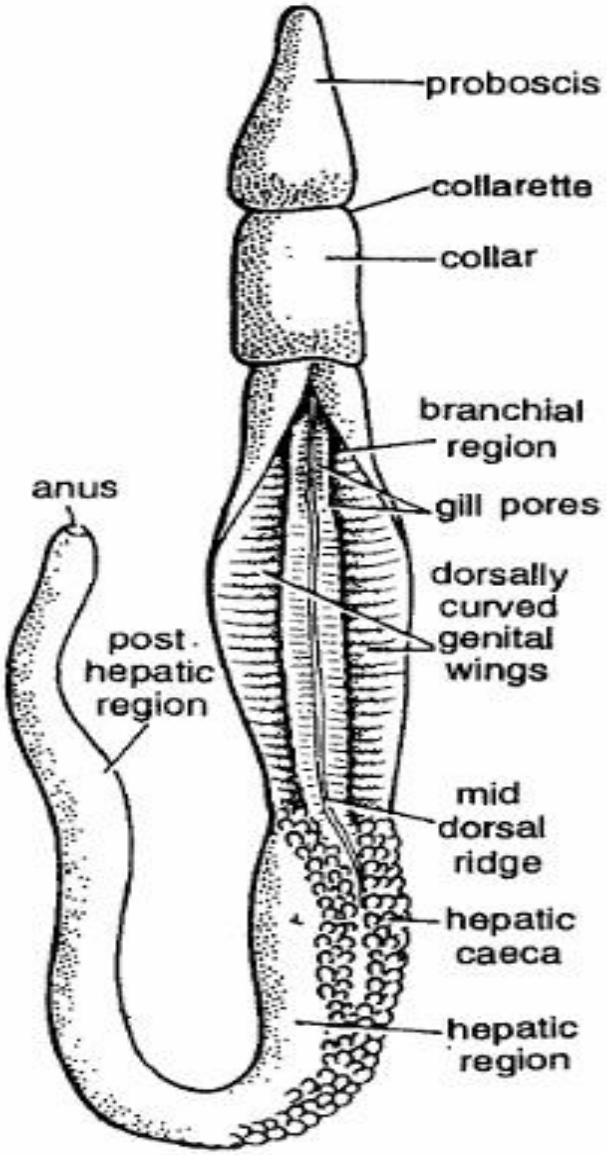
31. Funambulus
32. Rattus rattus

SUBPHYLUM I. HEMICHORDATA

1. BALANOGLOSSUS

Classification:

Phylum :- Hemichordata
Class :-Enteropneusta
Genus :-Balanoglossus



Identification of Balanoglossus

Geographical distribution : World-wide or cosmopolitan.

Habit and habitat : It is a marine animal, adapted for burrowing life in the sandy bottom. The animal lives inside the V-tubes (tubicolous). Most of them live in shallow water but a few go deeper upto approximately 15,000 feet. They burrow slowly by soft proboscis.

Comments

1. Balanoglossus is commonly called as 'Acorn worm.' It lives in a U-shaped burrow and at one opening of burrow fecal castings may be seen. V-tube burrow at other end has opening for anterior end and also another additional opening.
2. It measures 10 cm to 2.5 meters, depending on the species.
3. It is bilaterally symmetrical, triploblastic deuterostome with worm-shaped body divisible into three regions-anterior proboscis or prosoma, middle collar or mesosoma and posterior trunk or metasoma. Proboscis is conical, collar is funnel like, while trunk is cylindrical.
4. Proboscis contains heart vesicle, central sinus and buccal diverticulum. It has thick muscular body wall and its cavity or coelom opens to the exterior by the proboscis pore. Collar contains the mouth and collar coelom which opens by a pair of collar pores on dorsal surface.
5. Trunk region contains most of the internal organs, such as pharynx, gonads or hepatic region. Pharynx and gonads constitute branchiogenital region. Posteriormost part is abdomen.
6. Branchio-genital region is composed off : (i) genital wing having gonad (ii) branchial region containing paired gills and (iii) hepatic region having hepatic caecae.
7. Alimentation is complete and circulatory system usually contains contractile sac of heart.
8. Sexual dimorphism. Fertilization external and development includes tornaria larva. It possesses power of regeneration.

Sub phylum :- urocordata

2. HERDMANIA

Classification:

Phylum :- Chordata
Subphylum :- Urochordata
Class :- Ascidiacea
Order :- Enterogona
Genus :- Herdmania

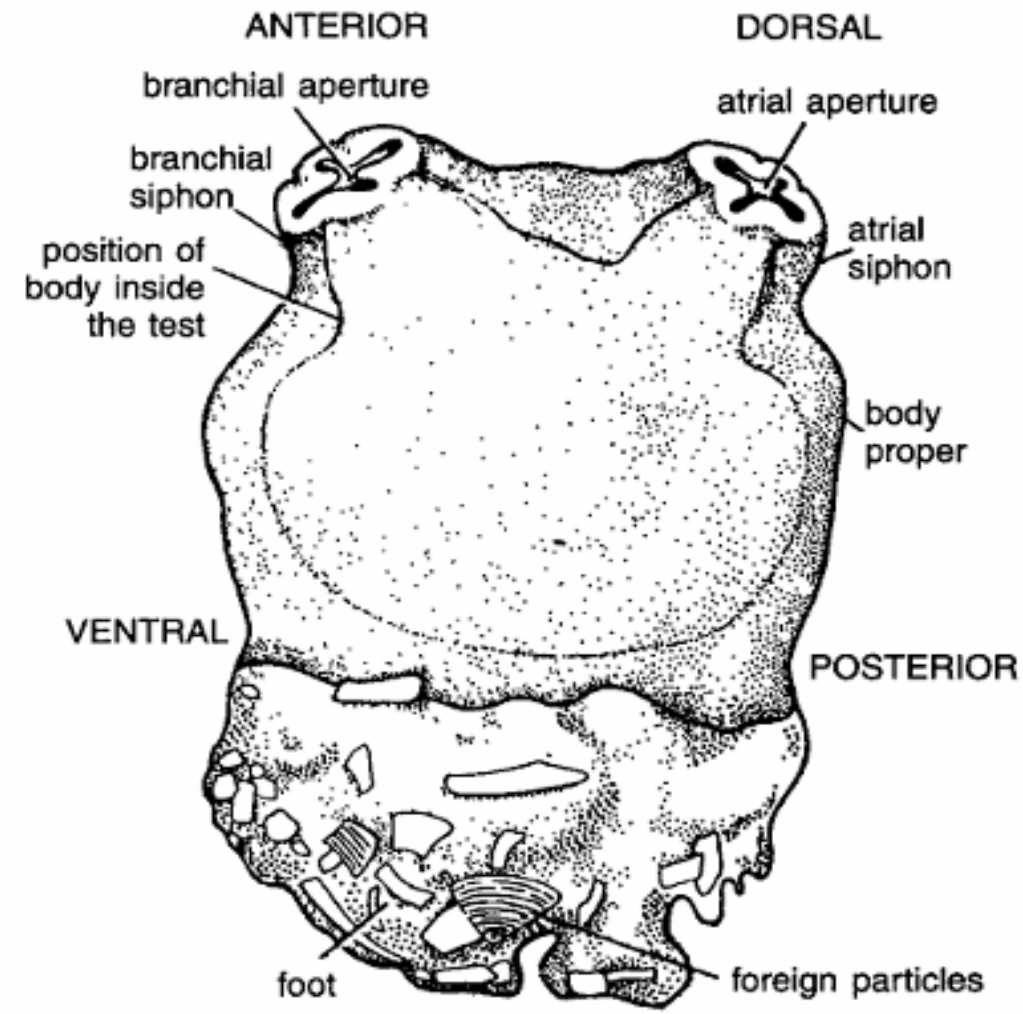


Fig. 7. *Herdmania.*

Identification of Herdmania

Geographical distribution : Different species of Herdmania (=Rhabdocynthia) are widely distributed in the Pacific, Atlantic and Caribbean seas, besides Indian Ocean.

Habit and Habitat: Solitary, sedentary and sometimes living as commensal in association with gastropod shells, specially over Xaneus pyruns (Shankh) and Xaneus angulatus (Conch).

Comments

1. It is commonly called as Monoacidian or Sea squirt. Das S.M. (1936) wrote a memoir on this animal. It is more or less like a purse or large oval potato, measuring 6.5 to n.8 cm in length and 5.2 to 6.9 cm in breadth.
2. Body dark brown, reddish brown or yellowish brown in colour and regionated into soft body proper and foot. Foot large, dirty, rough, leathery and with a number of foreign objects. It forms one-third of the body.
3. Body enclosed in a thick, tough and supporting transparent test or tunic in the form of a thick translucent protective investment meant for respiration and reception of stimuli.
4. It is composed of polysaccharide, called as tunicin, and protein. Without cutting the animal open at the free end, body is drawn to form 1.0 cm long branchial or incurrent siphon and 1.5 cm long atrial or excurrent siphon. The incurrent opening of mouth is somewhat laterally placed, while the excurrent opening is directed upwards.
5. Branchial and atrial apertures are found on branchial and atrial siphons respectively. Body proper lies within test.
6. Herdmania is hermaphroditic and protogynous.
7. Fertilization external. Development includes a fully formed larva, called ascidian tadpole larva.
8. It contains all the chordate characters i.e., notochord and nerve chord, etc.
9. Metamorphosis is retrogressive in which notochord, nerve cord, tail and tail fins are degenerated. By the time adult is formed, all chordate characters disappear.

Special features: Herdmania in adult form is devoid of any chordate characters which are exhibited only by its tadpole larva. Animal has also a peculiar symmetry; branchial aperture marks the anterior end and opposite end is the posterior end. The atrial aperture indicates dorsal side and the area diagonally opposed to it represents ventral side. Such abnormal symmetry is brought about by metamorphosing larva into sedentary adult.

Identification : Since the animal contains soft transluscent body and atrial and branchial apertures, at the same level and all above features, hence it is Herdmania.

3. PYROSOMA

Classification:

Phylum :- Chordata
Group :- Acraniata
Subphylum :- Urochordata
Class :- Thaliacea
Order :- Pyrosomida
Genus :- Pyrosoma

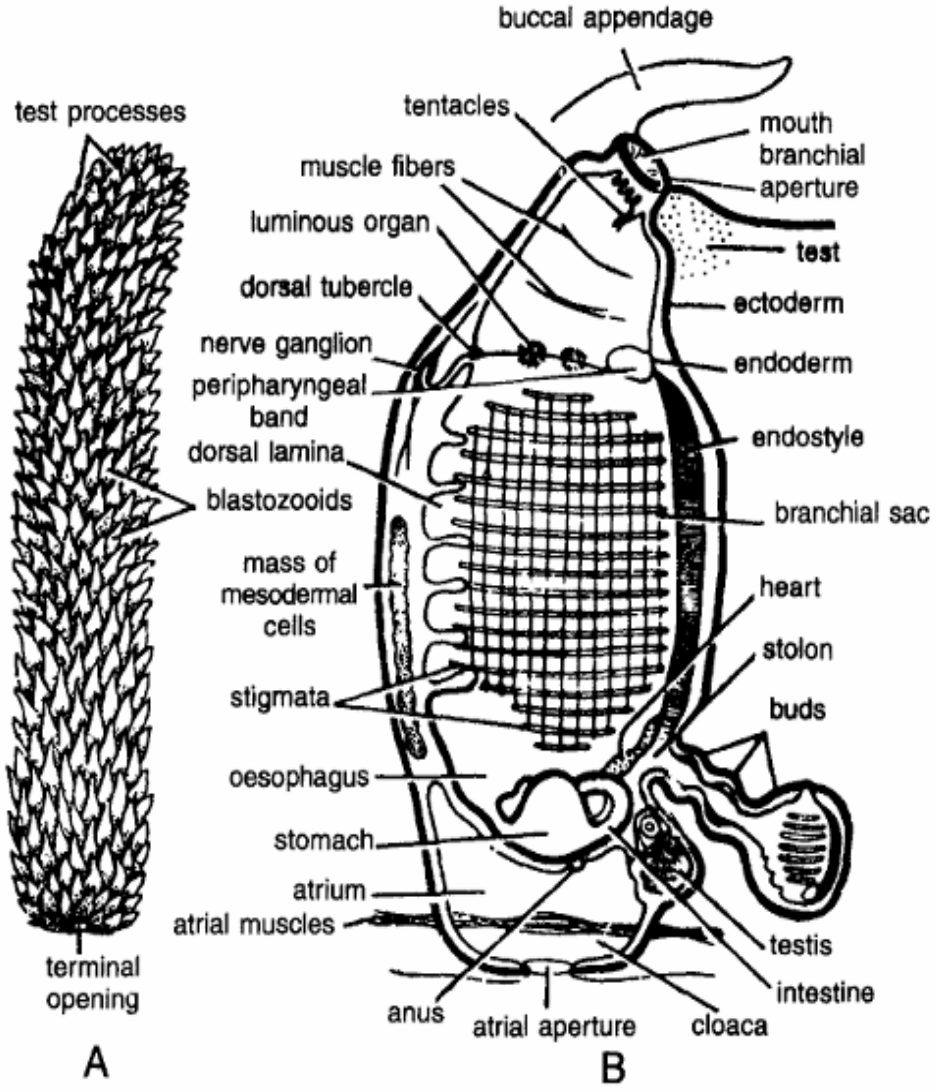


Fig. 8. *Pyrosoma.* **A.** Colony, **B.** Single zooid.

Identification of pyrosoma

Geographical distribution : Pyrosoma is distributed in tropical and sub-tropical regions.

Habit and habitat : Pyrosoma is pelagic, marine, colonial and bioluminescent urochordate, found at a depth of 500 meters. A few forms are abyssal.

Comments

1. It is a thimble-shaped hypopleustonic colony, 25 cm to 1 metre in length and consists of several individuals, called blastozooids, embedded in a common test having test processes and terminal opening.
2. Colony floats horizontally and is like a balloon cylinder. Zooids are arranged in the wall of the cylinder.
3. Branchial and atrial apertures are at opposite ends.
4. Branchial openings or mouths of individuals or zooids open to the outside, while atria open into a common cloaca with a tenninal outlet, from which a continuous jet emerges.
5. Colony moves by a jet propulsion. Rhythmic contractions of muscular bands in the body wall cause ejection of water through pharynx and atrium with sufficient force to propel the organism.
6. Each zooid consists of a large branchial sac with endostyle and dorsal lamina, neural complex, heart and atrium. Branchial sac contains 50 gill-slits divided by internal longitudinal bars.
7. Endostyle communicates with peripharyngeal band, retropharyngeal band and dorsal lamina. Intestine makes a loop around stomach and ends into atrium.
8. Heart is ventral. Lobed testis is found behind ovary. Close to the mouth of each zooid arises a tongue-like process of the test, called as buccal appendage.
9. Other structures seen are testes, anus, stomach, oesophagus intestine, atrial muscles, stigmata, mass of mesodermal cells, dorsal tubericle, muscle fibers, luminous organs and tentacles. Hermaphroditic.
10. Reproduction sexual and asexual. A single fertilized egg develops within blastozooid and gives rise to asexual oozooid. It gives stolon that forms 4 ascidiozooids or tetrazooid which degenerates and gives rise to cyathozooid. It is enclosed in a test and by repeated budding forms a colony.
11. Asexually colony multiplies the number of zooids by direct stolon budding, producing blastozooids.

Special features : The most outstanding characteristic of the creature is the shining of powerful light without heat, a phenomenon called as bioluminescence. Animal produces light on stimulation and when all colonies produce light, the entire area is illuminated as much as one can read the book. Light is produced by bioluminescent cells, which contain curved inclusions. According to some, these bioluminescent cells contain luminescent symbiotic bacteria. However, in any case, light is emitted by the chemical interaction between two compounds, luciferin and luciferase, in the presence of moisture.

Identification: Since the animal contains opposite branchial and atrial siphons with thimble-shaped colony and above features, hence it is Pyrosoma.

SUPERPHYLUM :- CYCLOSTOMATA

4. PETROMYZON

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :-Agnatha
Class :- Cyclostomata
Order :- Petromyzontia
Genus :-Petromyzn
Species :-marinus

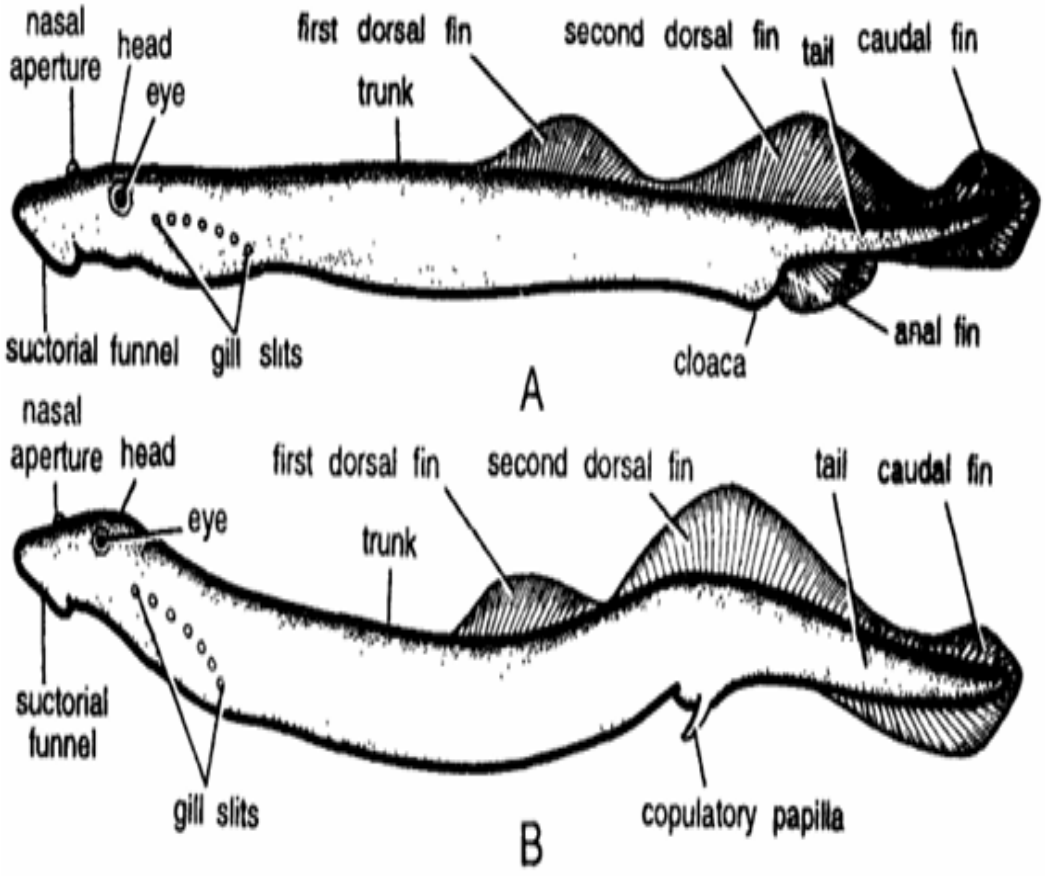


Fig. 13. *Petromyzon.* **A.** Female, **B.** Male.

Identification of Petromyzon

Geographical distribution : Petromyzon marinus is found in world-wide sea waters, coastal regions, streams and lakes of North America, Europe, West Africa, Australia, Chile, Japan, New Zealand, Tasmania.

Habit and habitat : Petromyzon is found both in salt and fresh-water. They lead an eetoparasitic life on other fishes, attaching to the body of host by buccal funnel and secreting an anticoagulant for continuous flow of blood. They are also anadromous i.e., ascending river for spawnina. Carniv8F8UI and predators.

Comments : Commonly called as lamprey.

1. Body is eel-like, measuring about 90 cm, and differentiated into head, trunk and tail.
2. First dorsal fin, second dorsal fin and caudal fin confluent.
3. Skin is without scales, slimy, green, brown and with strong metallic lusture. Head contains mouth but no jaws.
4. Mouth is surrounded by a large, ventral, suctorial funnel with numerous horny teeth.
5. The 'tongue' is toothed and piston-like.
6. Dorsal nasal sac and mouth are unconnected.
7. Paired eyes are present behind nasal-aperture. Gill-slits are 7 pairs and branchial basket is well developed.
8. Sexes are separate.
9. Female with large anal fin. Male with urinogenital or copulatory papilla. The development includes ammocoete larva which is very important phylogenetic ally as it is regarded a connecting link between Amphioxus and cyclostomes.

Economic importance : (i) Lampreys have very little food value, (ii) They injure and destroy fishes by sucking blood and causing secondary infection, (iii) Larval lampreys are used as bait for sport fishing and commercial fishing.

Special features : Lampreys are the lowest jawless vertebrates and their nearest allies are the ancient ostracoderms of Silurian and Devonian periods. There are no fossil representatives of this group to indicate their course of evolution.

Identification : Since the animal has 7 pairs of gill pores and is without jaws and has above features, hence it is Petromyzon.

5. MYXINE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrate
Division :- Agnatha
Class Cyclostomata
Order :Myxinoidea
Genus : Myxine

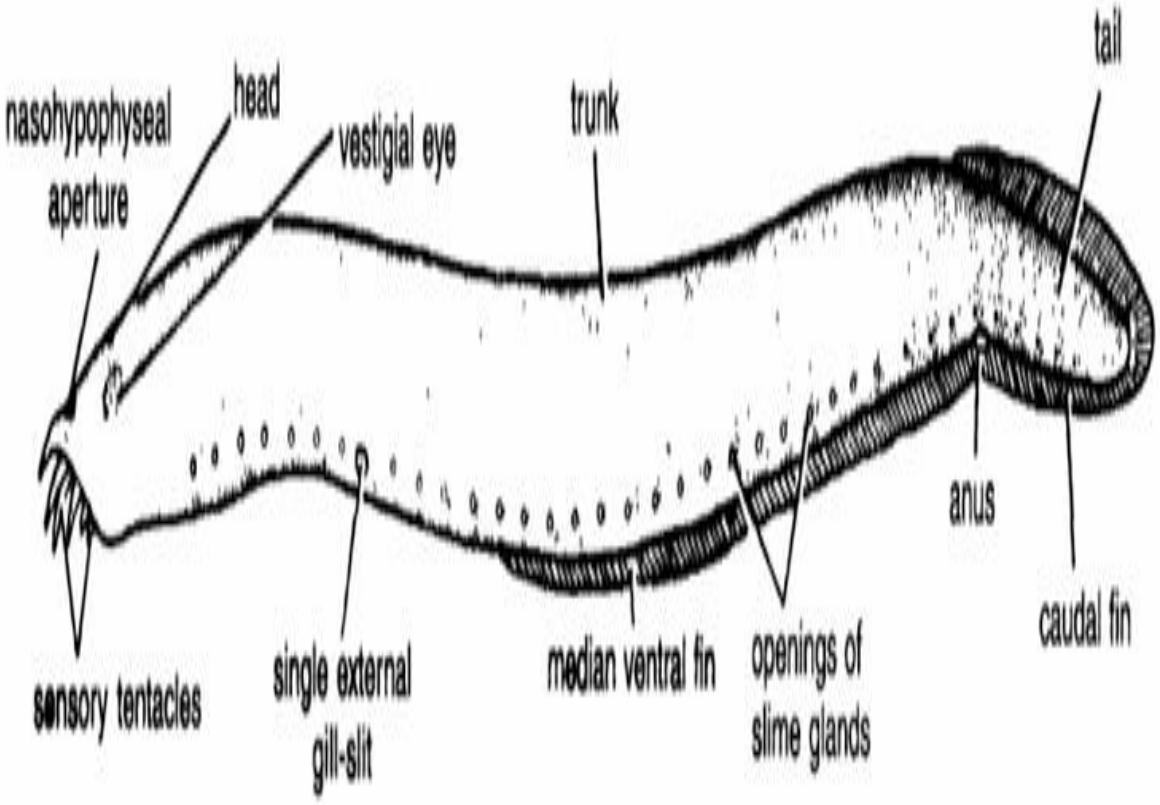


Fig. 14. *Myxine.*

Identification of myxine

Geographical distribution : Myxine is distributed along seacoasts of the Atlantic and Pacific oceans in North European, North Atlantic, American and Japanese sea waters.

Habit and habitat : Hagfishes or Myxine sometimes descend to a depth of 300 fathoms. They are purely marine, nocturnal and lie buried in the muddy bottom. They are parasitic or quasiparasitic and generally found attached to the body of fishes, especially around gill area. They bore their way into host body to eat viscera and muscles.

Comments

1. Commonly called as hagfish or borer.
2. Body is soft, without scales, worm-like, measuring about 60 cm in length and differentiated into head, trunk and tail.
3. Anterior extremity contains four tentacles supported by skeletal rods.
4. Mouth is terminal and surrounded by lips. Buccal funnel, and jaws are absent. There is a single nostril present close to the mouth. On ventrolateral sides mucous pores and distinct.
5. Dorsal fin indistinct caudal tin and ventral fin confluents.
6. Eyes vestigial, due to dark and bottom dwelling habit, photoreceptor organ is reduced.
7. Secrete enormous mucus through mucous pores. 10 to 14 pairs of gills open into a branchial chamber, which opens to the exterior by a single branchial opening.
8. Hermaphroditic and protandrous.
9. Eggs are enclosed in horny shell, bearing hooks by which they attach themselves to the weeds.

Economic importance : Hagfishes damage fish caught in nets. Sometimes hagfishes enter into the body of other fishes and eat entire soft parts leaving only a bag of skin and the bones.

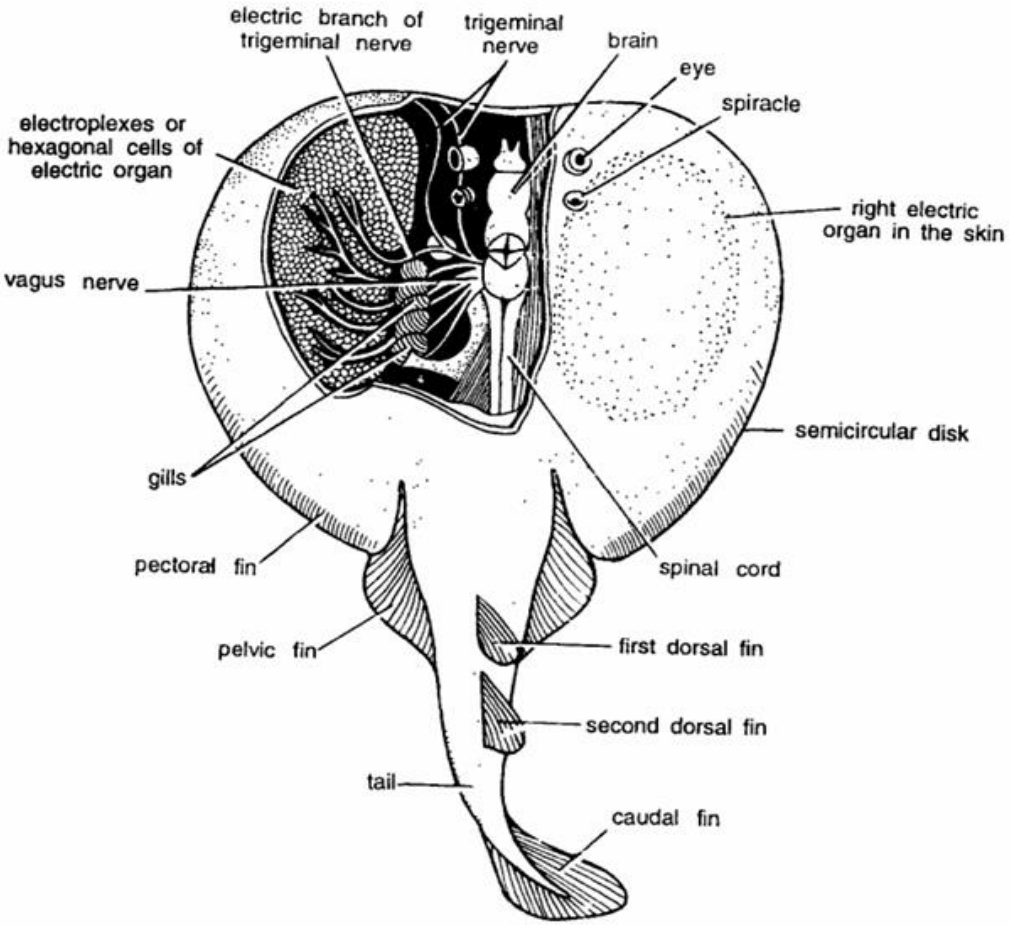
Special features: In hagfishes same individual produces sperms and then eggs later on. Development is direct. The hagfishes are injurious to fish industry. They are important from evolutionary point of view. The evolution of jawed vertebrates from agnathans could be hypothesized as the latter needed only jaws. Although no direct link is available to understand evolution of gnathostomes, but some armoured agnathan might have served as ancestor to the jawed vertebrates.

Identitication : Since the animal has 4 tentacles, single gill aperture and no buccal funnel and above features, hence it is Myxine.

6. TORPEDO : ELECTRIC RAY

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :Vertebrata
Division :- Gnathostomata
Superclass :-Pisces
Class :-Chondrichthyes
(=Elasmobranchi)
Sub-class :-Selachi
Order :- Hypotremata
(= Batoidea)
Family :-Torpidinidae
Genus :-Torpedo
(Electric ray)



Identification of torpedo

Geographical distribution : Torpedo has been reported from the Mediterranean, Atlantic and Indian Oceans, Red Sea, Pacific Ocean, East Indies, Tasmania, China, Japan, South Africa, North and South America as well as Australia. Upper Jurassic to Recent.

Habit and habitat : Torpedo or Astrape is a marine fish, found on flat, sandy or muddy bottom at a depth of 40 to 50 fathoms. It is carnivorous.

Comments

1. Commonly known as Electric ray because of the presence of a pair of electric organs, one on either side of the body between head and the pectoral fins.
2. Body is regionated into anterior semicircular disk supported by endoskeleton and posterior tail.
3. Fish measures 60 to 90 cm a,cross the widest part of the disk and the whole body has brown background which is ornamented with beautiful irregularly shaped, magenta-coloured spirals and spots.
4. Semicircular region is supported by branched prenasal rostrum and laterally by branched pre-orbital cartilages.
5. Branches radiate towards periphery. Disk is bordered by pectoral fins.
6. Skin is smooth, non-tuberculate and without scales.
7. Eyes and spiracles are closely placed above electric organs dorsally.
8. Mouth is transverse and ventrally situated. Tail is thick and short with two dorsal fins, a caudal fin and two lateral folds of skin.
9. Pelvic fins are just beneath the lower margin of the pectoral fin. Gill-slits on the ventral side.
10. Viviparous and produces live youngs.

Special features

(i) Torpedo contains a pair of large electric organs between margins of pectoral fins and head. These organs are considered as modifications of the adductor mandibulate and constrictor muscles and supplied by vagus and trigeminal nerves from vagus and trigeminal nerves from electric lobe of the medulla,

(ii) Each electric organ is composed of hexagonal cells called as electroplexes which are filled with jelly-like fluid and arranged vertically like prisms between upper and lower surfaces. Upper surface corresponds to anode and lower surface with the cathode. Thus, electric current of 50 to 60 volts passes from upper positive to lower negative surface. After fish has discharged electricity, some rest is required for further discharge. These are offensive and defensive organs and fishermen get electric shocks from captured electric rays.

Identification: Since this fish has 2 bulging electric organs and above features, hence it is Torped

7. NOTOPTERUS : CHITALA

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Pisces
Class :- Osteichthyes
Sub-class :- Actinopterygii
Superorder :-Teleostei
Order :- Ostariophysi
Family :- Notopteridae
Genus :- Notopterus

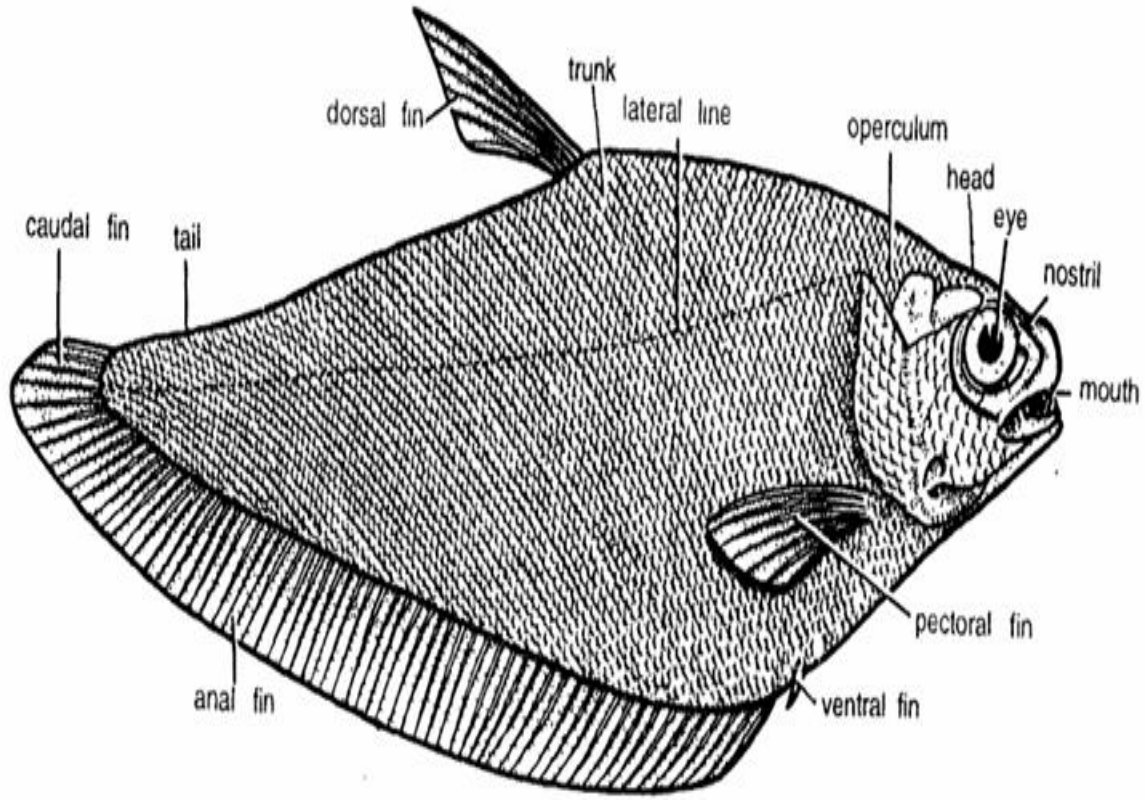


Fig. 35. *Notopterus.*

Identification of Notopterus

Geographical distribution: Notopterus is widely distributed in India, Myanmar, Malaya and West Africa, N. chitala is exclusively found in the fresh-waters of India. Eocene to Recent.

Habit and habitat : Notopterus commonly inhabits marshy meadows, lakes, fresh-water of brackish water. It is a bottom feeder, carnivorous, predacious and feeding on small organisms, insects and crustaceans.

Comments

1. Commonly known as cat-fish or Chitala. Body divided into head, trunk and tail.
2. Body is very strongly compressed with a short pre-caudal region and measuring about 1.5 meters in length.
3. Colour is silvery dark or greenish or glossy yellow on the back.
4. Head contains large and oblique mouth, whitish eyes and nostrils.
5. Dorsal fin is short and ventral fin very much reduced or absent. Very much elongated anal fin confluent with reduced caudal fin. Number of combined rays of anal and caudal fin varies from 85 to 100.
6. Paired pectorals and ventral fins closely placed.
7. Air bladder is very large and divided into several compartments. Teeth are homodont.
8. Gill covers are scaly. Lateral line scales 120 to 180, ventral scutes 25 to 45.

Economic importance : The flesh of the fish is very rich in nutrition and well flavoured.

Identification : Since this fish has confluent anal and caudal fins, strongly compressed body and above features, hence it is Notopterus.

8. LABEO ROHITA : ROHU

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Pisces
Class :- Osteichthyes
Sub-class :- Actinopterygii
Superorder :-Teleostei
Order :- Ostariophysi
Family :- Cyprinidae
Genus :- Labeo
Species :- rohita

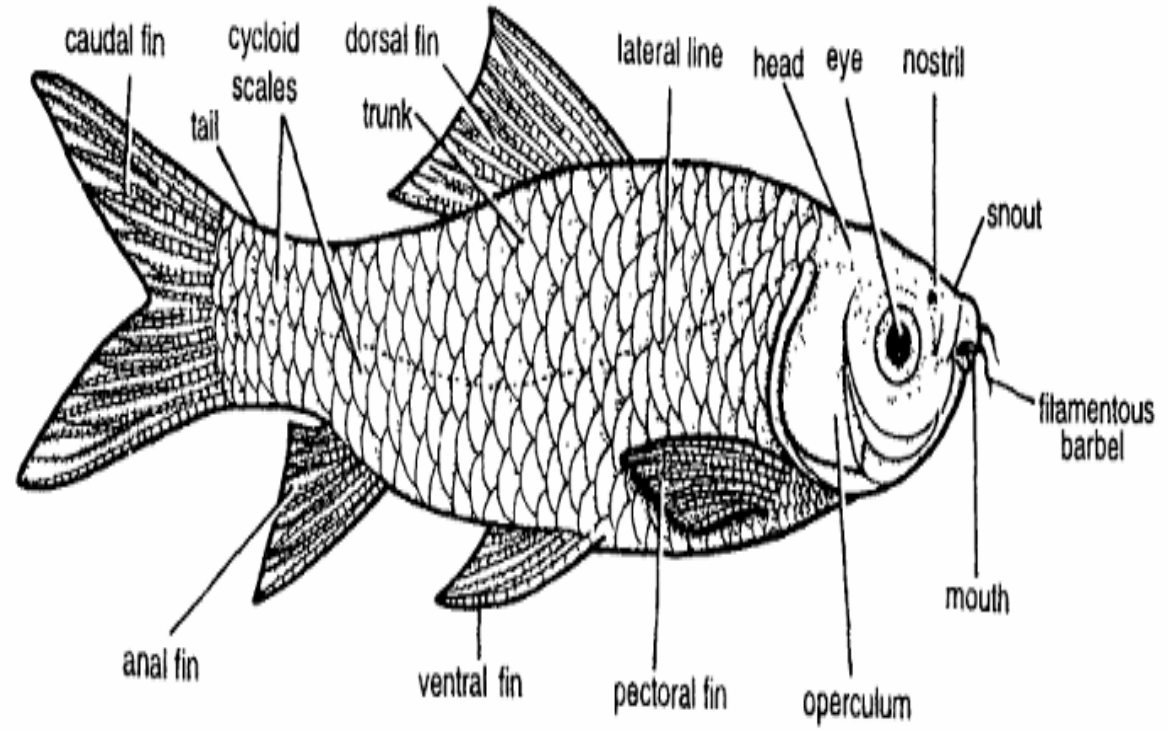


Fig. 36. *Labeo rohita.*

Identification of Labeo rohita

Geographical distribution : Labeo rohita is widely distributed in tropical and temperate regions specially found in India (Punjab, Assam) and Myanmar Eocene to Recent.

Habit and habitat : Labeo rohita is abundantly found in ponds and rivers. Carps are vegetarian and bottom feeders. They can occasionally feed on animal diet. Because of its feeding habit, it is cultivated with two other carps, Catla catla and Cirrhina mrigala. Rohu breeds only in the rivers and bund type of tanks but not in confined waters.

Comments

1. Commonly known as carp and Rohu in Hindi.
2. Body compressed, fusiform, about 1 metre in length and weighing about 4 kg. Colour of the body is bluish or brownish on back and silvery white below.
3. Body covered with large overlapping cycloid scales. Scales are of taxonomic importance. Body is regionated into head, trunk and tail.
4. Head is depressed and is produced into a short, obtuse and blunt snout. It bears a subterminal fringe-lipped mouth bounded by fleshy upper and lower lips. It also contains paired nostrils and paired eyes.
5. A pair of filamentous barbels arises from upper lip. Small tubercles cover the snout, which is oblong, depressed, swollen and projecting beyond the jaws.
6. Large operculum hangs on either side enclosing gills and branchial chamber. Lateral line is distinct.
7. Scales overlying the lateral line are perforated by tubes of the lateral line system. Scales are of taxonomic value. Scales are flat, bony with rounded edges and are called as cycloid scales.
8. These overlap and form a complete covering. Dorsal, anal, caudal, paired pectoral and anal fin with soft fin rays present. Caudal fin forked into equal lobes.
9. Weberian apparatus present between bladder and inner ear. Kidneys are mesonephric.

Economic importance: Labeo has great food value, fonning common man's food. The flesh is very delicious.

Special features: Mouth does not contain teeth. Teeth are found in pharynx only.

Identification : Since this fish has overlapping scales and above features, hence it is Labeo rohita.

9. CLARIUS : MANGUR

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Pisces
Class :- Osteichthyes
Sub-class :- Actinopterygii
Superorder :-Teleostei
Order :- Ostariophysi
Family :- Claridae
Genus :- Clarius

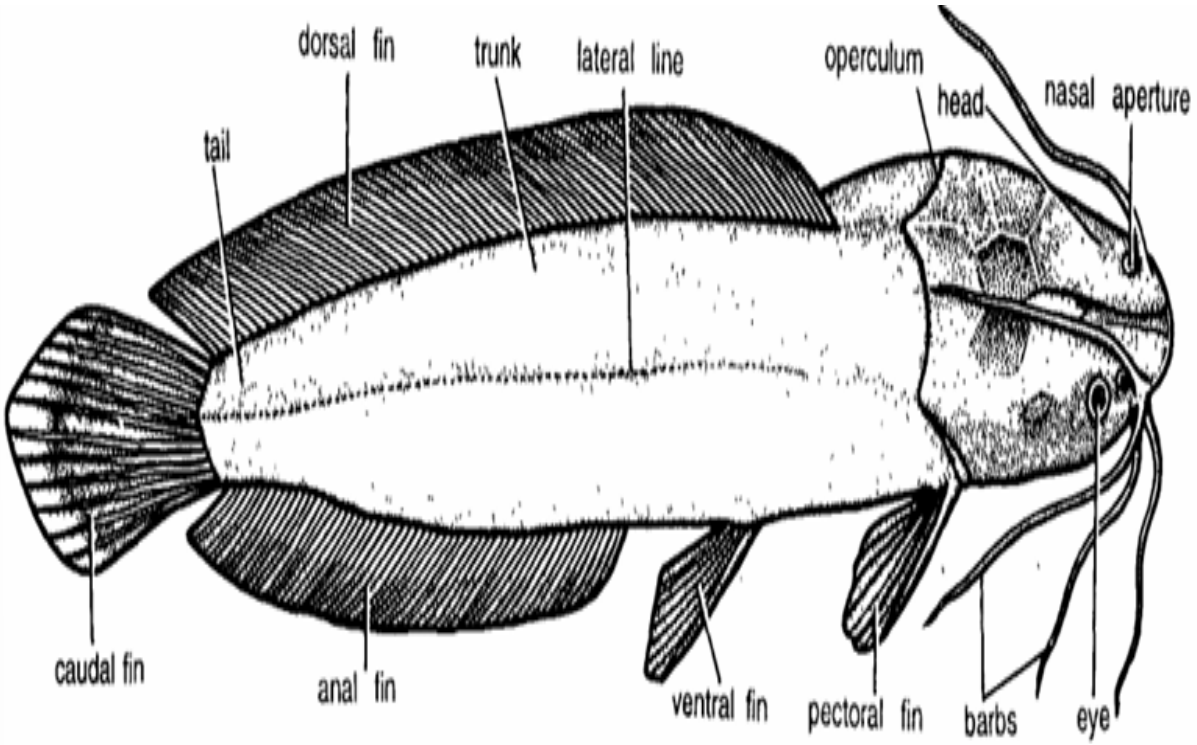


Fig. 37. *Clarius* (Magur).

Identification of clarius

Geographical distribution : Clarius is distributed in India, Myanmar, Sri Lanka and Malaya Archipelago. Eocene to Recent.

Habit and habitat : Clarius batrachus is found in fresh and brackish waters. It takes a wide variety of food including clams, insect larvae and crustaceans living in dirty ponds and muddy water. They act as scavangers.

Comments

1. Commonly called as cat-fish or magur. Body is divided into head, trunk and tail.
2. It is characterized by its spikeless dorsal fin, which extends all along the body from operculum to caudal fin.
3. Anal fin ,also extends from caudal fin to middle of the body.
4. Pectoral and ventral fins closely placed. Head is flat with four pairs of non-contractile and sensory barbels. Head bones are superficially exposed.
5. Head contains reduced eyes and nostrils.
6. Body is covered by scaleless and naked skin.
7. Dendritic accessory branchial apparatus supplements gill respiration and hence fish can live for a very long period outside water.
8. Air bladder is physostomous. Spiracles absent.
9. Lateral line distinct. Parietals, symplectics and sub-operculum absent. Tail is laterally compressed, diphycercal and having rounded caudal fin.
10. Weberian ossicles connecting internal ear and air bladder present.

Economic importance : Magurs are much valued for food.

Special features : Magur supplements gill respiration with accessory organs of respiration. It can remain away out of water for long time. It can also travel a distance of 112 km on its paired fins and is called as walking fish. On land respiration by accessory respiratory organs.

Identification : Since this fish has peculiar dorsal fin, barbles and above features, hence it is Clarius.

10. ANABAS : CLIMBING PERCH

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Pisces
Class :- Osteichthyes
Sub-class :- Actinopterygii
Superorder :-Teleostei
Order :-Percomorphi
Family :- Anabantidae
Genus :- Anabas
(Climbing perch)

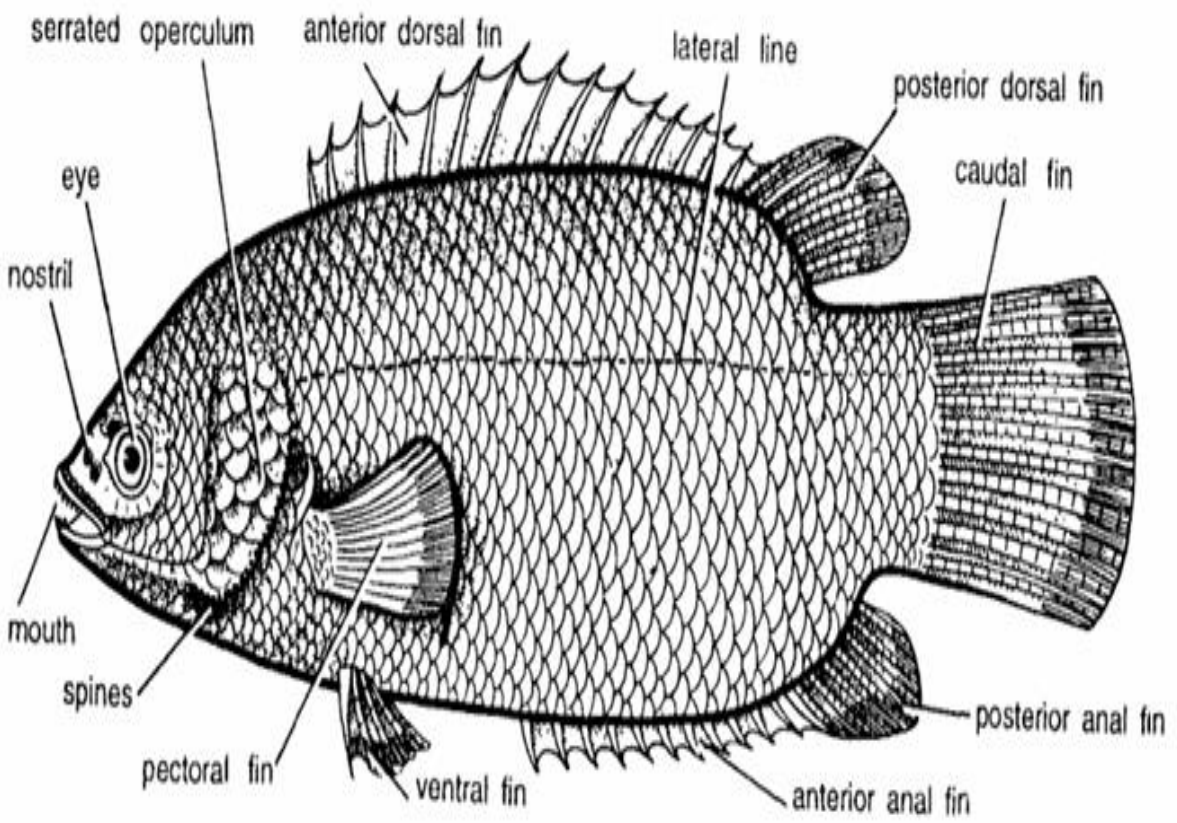


Fig. 44. *Anabas.*

Identification of Anabas

Geographical distribution: Anabas is distributed in Myanmar, India, Africa, Philippines, Sri Lanka and Malayasia Archipelago. Upper Cretaceous to Recent.

Habit and habitat : Anabas is a common South Indian fresh-water fish. It can live out of water for a long period. It i& predator on shrimps, ostracods, gastropod shells and young fishes. Male exhibits parental care.

Comments

1. Commonly known as climbing perch. Fish measuring about 30 cm is olive green in colour.
2. Body of the fish covered by cycloid scales and divided into head, trunk and tail.
3. Head is conical containing large eyes, nostrils and mouth. Jaws, prevomer and parasphenoid with fixed conical teeth.
4. In front of eyes is a pre-orbital bone containing spines. Small spines also occur along the edge of operculum.
5. Dorsal fin consists anterior dorsal fin and posterior dorsal fin. Similary anal fin divided into anterior anal fin and posterior anal fin.
6. Caudal fin is fan shaped. Ventral are anteriorly situated almost below pectorals.
7. Accessory respiratory super-branchial organ is well developed, having thin and folded bony laminae covered with mucous membrane.
8. Air bladder physoclistous.
9. Tail is perfectly symmetrical.

Special features : Anabas is able to walk on land by spines in search of earthworms. The crows and kites attack them and take tlIeir bodies over trees, and thus the fish is called as climbing perch, .as the fish might have climbed trees. But the fish cannot climb the tree. Anabas is so much dependent on atmospheric oxygen that it is asphyxiated if kept in water with no access to air. Fish can live out of water for a long period.

Identification : Since this fish has dorsal and anal fins rays and above features, hence it is Anabas.

11. PROTOPTERUS : AFRICAN LUNG FISH

Classification:

Phylum :-Chordata
Group :- Craniata
Sub-phylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Pisces
Class :- Osteichthyes
Sub-class :- Choanichthyes
Superorder :-Dipnoi
(Dipneusti)
Order :- Lepidosireniformes
Genus :- Protopterus
(African lung fish)

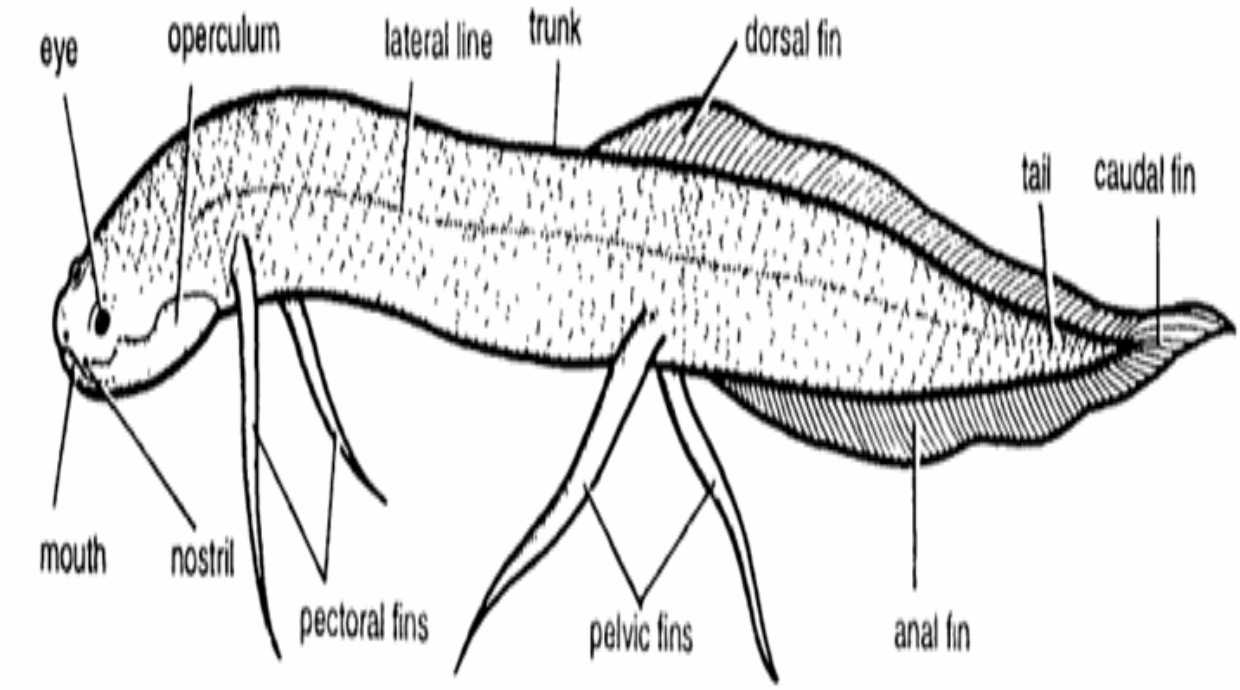


Fig. 54. *Protopterus.*

Identification of protopterus

Geographical distribution : Protopterus has wide distribution. It is found in the swamps of great African continent, the Nile, Congo basin, Lake Tanganyika. Devonian to Recent.

Habit and habitat : The fishes are adapted for burrowing life. They live in burrows made in muddy water. In dry season, during aestivation, they retire to vertical burrows (nests) in mud lined with mucus. It comes to surface to engulf the air.

Comments

1. Body is elongated, cylindrical, eel like and IS completely enclosed by small cycloid scales.
2. Body divided into head, trunk and tail.
3. Commonly called as African lung fish.
4. Head contains small eyes, nostrils and mouth. Dorsal, caudal and anal fins continuous.
5. Pectorals and pelvic fins are reduced to slender appendages and without fin rays.
6. There are six branchial arches and five clefts. Larval gills are retained as vestigial organs throughout life. There are two lungs (air bladders) extending throughout body cavity.
7. Lateral line well developed. Kidneys not so elongated.
8. Larva contains four pairs of apparent external gills. In some species vestiges of these may be found in the adult just above the opening of the operculum.

Special features : Protopterus is an air-breather fish. Protopterus annectens and 2 other species of Central Mrica retire to burrow themselves in mud, where mucus dries up to form 'cocoon' with lid and a tuhe which is connected with the mouth of the fish for breathing. It spawns after return of water. These lung fishes show combination of primitive and specialized characters. Presence of spiral valve in the intestine, cloaca, conus and unconstricted notochord are primitive characters. While lack of ossification in the cartilaginous cranium, absence of premaxillae and maxillae and presence of dental plates on jaws are specialized characters. Presence of internal nostrils, lung respiration and autostylic suspensorium show similarity with Amphibians.

Identification : Since this fish has slender modified appendages and above features, hence it is Protopterus.

CLASS: AMPHIBIA

12. ICHTHYOPHIS

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :-Tetrapoda
Class :- Amphibia
Order :- Gymnophiona or Apoda
Genus : Ichthyophis

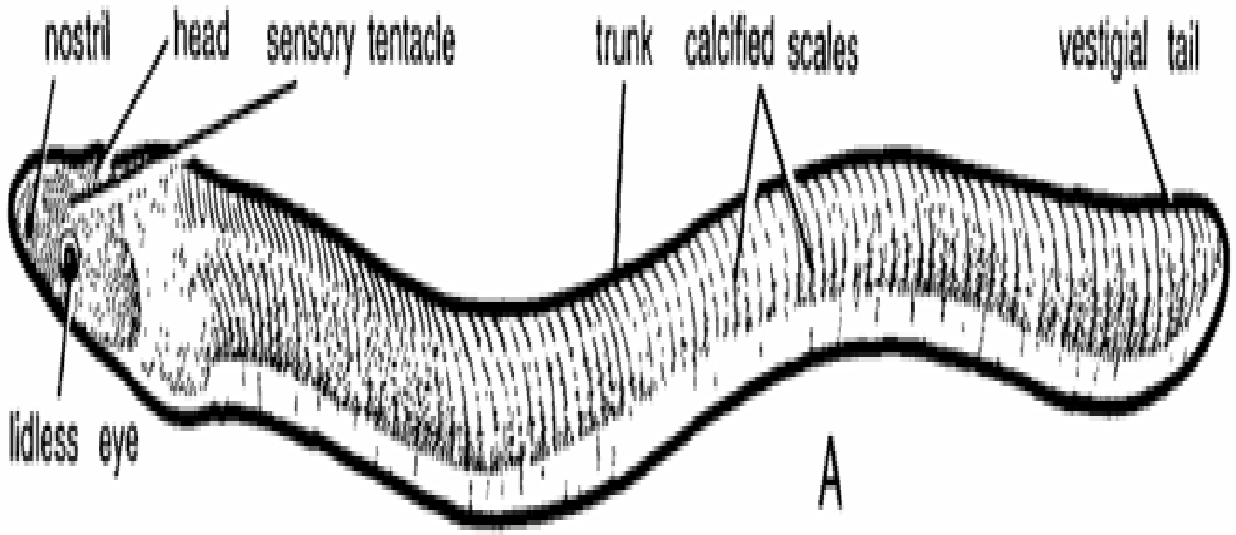


Fig. 57. A. *Ichthyophis*; B. Coiled female containing egg.

Identification of Icthyophis

Geographical distribution : Ichthyophis is distributed in tropical regions and found in Sri Lanka, Philippines, Borneo, Java, Scychelles, Mexico to Argentina and India (Mysore) and is the only representative of Gymnophiona living today in tropical countries.

Habit and habitat : Ichthyophis lives in burrows and leads a fussorial life in moist ground. The animal is blind and adapted for burrowing life. It feeds on invertebrates.

Comments

1. Commonly called as caecilian. Animal is wonn-like and slender, measuring about 30 cm in length.
2. Body divided into head, trunk and tail.
3. Body is covered with a smooth, slimy and transversely ringed skin consisting of small calcified scales arranged in transverse rows. Squirt glands in skin discharge an irritating fluid.
4. Head contains eyes, nostrils and a pair of sensory tentacles. Tympanic membrane, tympanic cavity and columella absent. Eyes small, functionless and covered by skin. Though reduced but contain all the parts.
5. A small protrusible tentacle is present between eye and nostril. Skull compact, roofed with bone.
6. Limbs and limb girdles absent. Vertebrae amphicoelous. Laryngotracheal chamber is prolonged into a distinct trachea. Right lung elongated, while left lung is reduced.
7. Anus is sub-terminal.
8. Males are provided with eversible copulatory organ, which shows advanced characters.
9. Fertilization internal. Male's cloaca is everted like copulatory organ.
10. Eggs are laid in moist burrows. Mother coils around eggs till they hatch into tadpoles.

Special features : Ichthyophis resembles Amphibia in having a 3 chambered heart, conus arteriosus, urinogenital organs and brain like Amphibia. But it differs from living Amphibia in having scales in dermis and meroblastic eggs. The animal also shows parental care, as the females take care of the eggs by keeping them in the coils of the body, till they hatch. It shows combination of primitive and advanced characters. The fonner characters include dennal scales in the skin and number of dennal bones in the skull. Loss of limbs, short post-anal part and copulatory organs are specialized characters.

Identification : Since the animal is limbless, contains calcified scales and vestigeal tail and above features, hence it is Ichthyophis.

13. NECTURUS : MUD PUPPY

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrate
Division :- Gnatbostomata
Superclass. :-Tetrapoda
Class :- Amphibia
Order :-Urodela or Caudata
Suborder :- Proteida
Family :- Proteidae
Genus :- Necturus

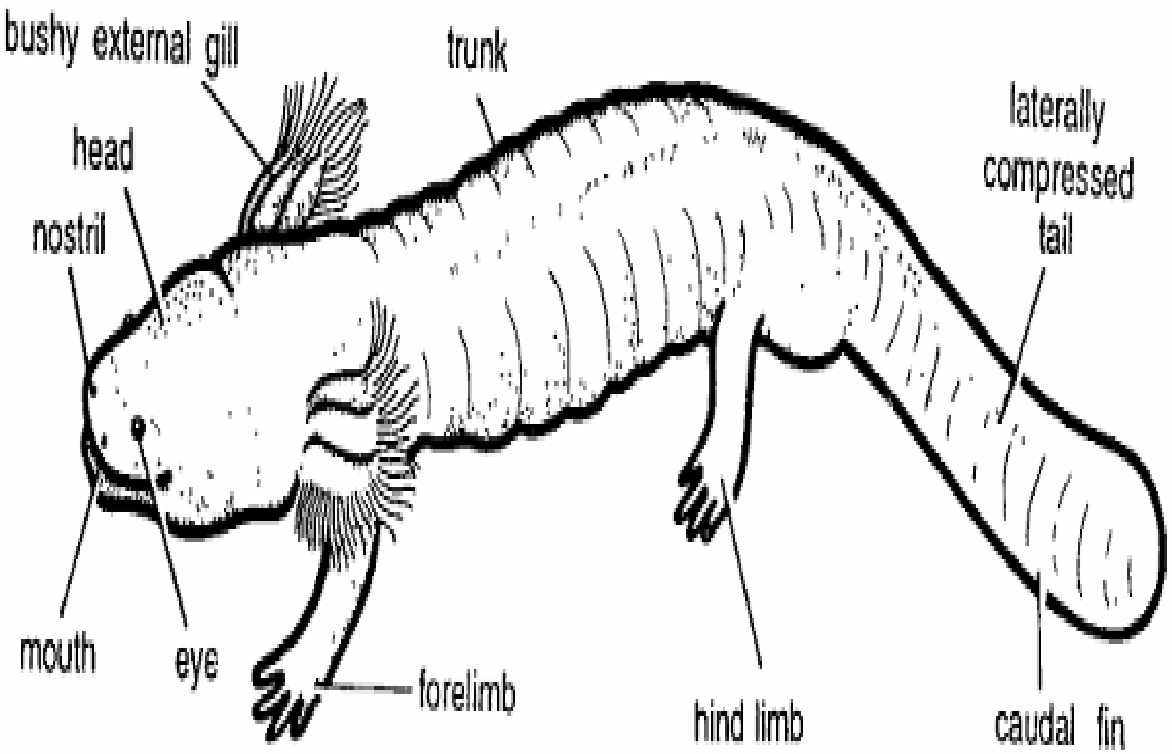


Fig. 59. *Necturus.*

Identification of Necturus

Geographical distribution :Necturus is found in North America and chiefly in Arkansas and Hudson rivers. Cretaceous to Recent. river, Carolina.

Habit and habitat : Necturus is an aquatic salamander of rivers and lakes of U.S.A. It is a crawling animal on the bottom. It eats small fishes and invertebrates.

Comments

1. Commonly called as Mud puppy or Water dog. laterally compressed tail caudal fin Rusty body of animal with blackish spots divided into head, trunk and tail, measuring about 30 to 40 cm in length.
2. Head is depressed and contains small eyes without eyelids, mouth and nostril.
3. Forelimbs and hind limbs are short and weak and provided with four digits only. First digit is lost, limbs are adapted for crawling only on the bottom of the rivers and lakes.
4. Tail laterally compressed and provided with tail fin. It is the main organ of progression.
5. Tympanum and organs of Jacobson absent; lungs present. Behind the head on each side there are three bushy, red-coloured, distinct external gills and two gill-slits.
6. Breathing is by only external gills. Mud puppy mates in autumn when females take up spermatophores deposited by males; lay eggs in Mayor June. 18 to 180 eggs in nests attached individually by jelly stalks to undersides of stones. Nests are guarded by females.
7. Eggs hatch in 38 to 63 days into a larva, which matures in 6 years to full size.

Special features : Adult is supposed to be a permanently neotenic larva with three pairs of external gills, two pairs of gill slits, lateral line, cartilaginous skull, with larval circulatory system and without Jacobson's organ. Experimentally, metamorphosis in Necturus could not be induced. It is a very interesting and favourite animal.

Identification : Since the above animal contains 3 pairs of external gills, laterally compressed tail and above features, hence it is Necturus.

14. TRITURUS CRISTATUS : CRESTED NEWT

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrate
Division :- Gnatbostomata
Superclass. :-Tetrapoda
Class :- Amphibia
Order :- Urodela or Caudata
Genus :- Triturus
Species : - cristatus

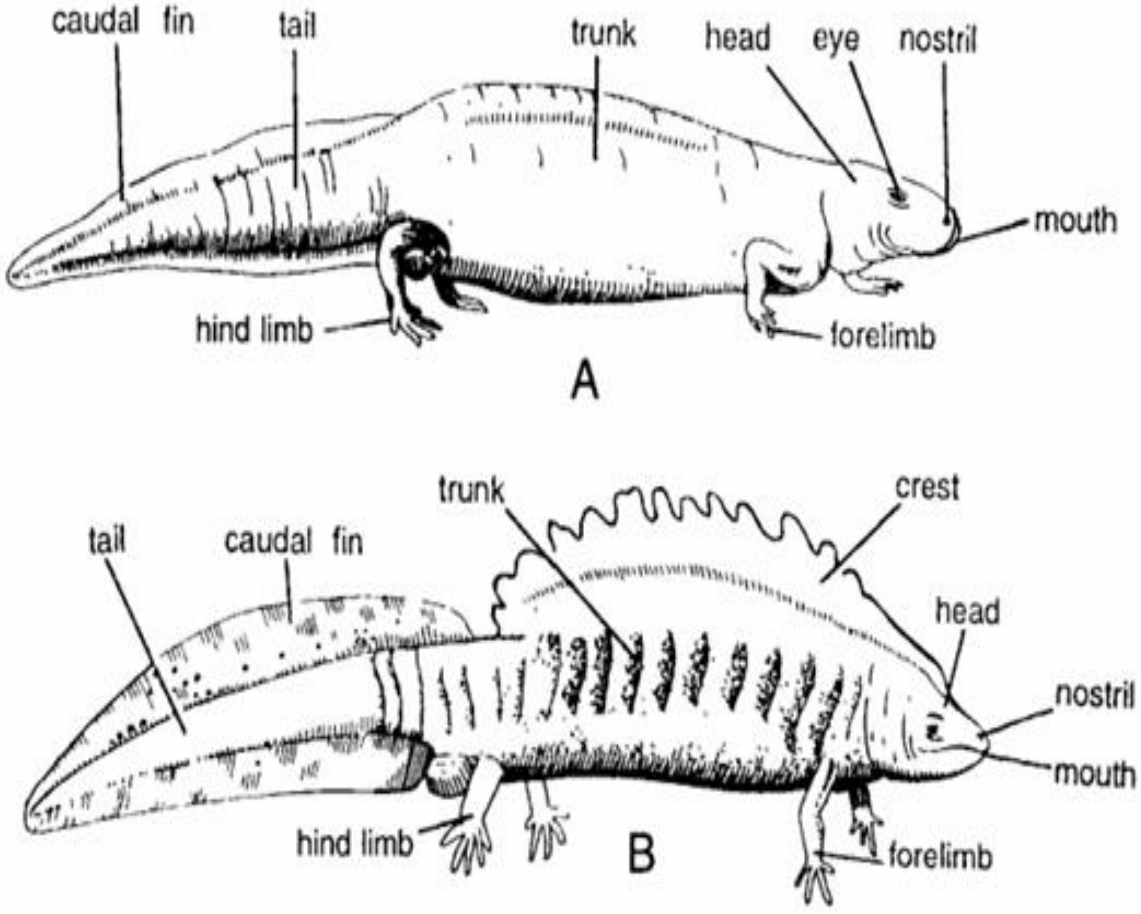


Fig. 65. *Triturus cristatus*, **A.** Female, **B.** Male.

Identification of Triturus

Geographical distribution : Triturus is distributed in U.S.A. from California to Southern Alaska and Europe. Eocene to Recent.

Habit and habitat : Triturus is terrestrial.

Comments

1. Commonly called as European Crested Newt.
2. Body is elongated and cylindrical and divided into head, trunk and tail. Skin is soft and slimy without scales.
3. Head is conical and compressed containing wide mouth and small nostrils.
4. Eyes are small with upper arid lower eyelids. Tympanum and eardrum absent.
5. Tail is elongated, thick and provided with dorsal and ventral fins without fin rays.
6. Forelimbs and hind limbs are well developed. The former bear four, and the latter five fingers. Girdles and sternum primitive.
7. Vertebrae opisthocoelus. Gills are absent; respiration by skin and lungs.
8. mouth nostril mouth Alimentary canal, excretory duct and gonadial ducts open into the cloaca. It exhibits marked sexual dimorphism.
9. Male develops crest on the back and becomes brilliantly coloured in breeding season.
10. Larval stage is provided with three pairs of gills which are lost in the adult.

Identification : Since this urodele has thick tail and crest in male and above features, hence it is Triturus.

15. BUFO : COMMON TOAD

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Amphibia
Order :- Anura or Salientia
Sub-order :- Procoela
Genus :- Bufo

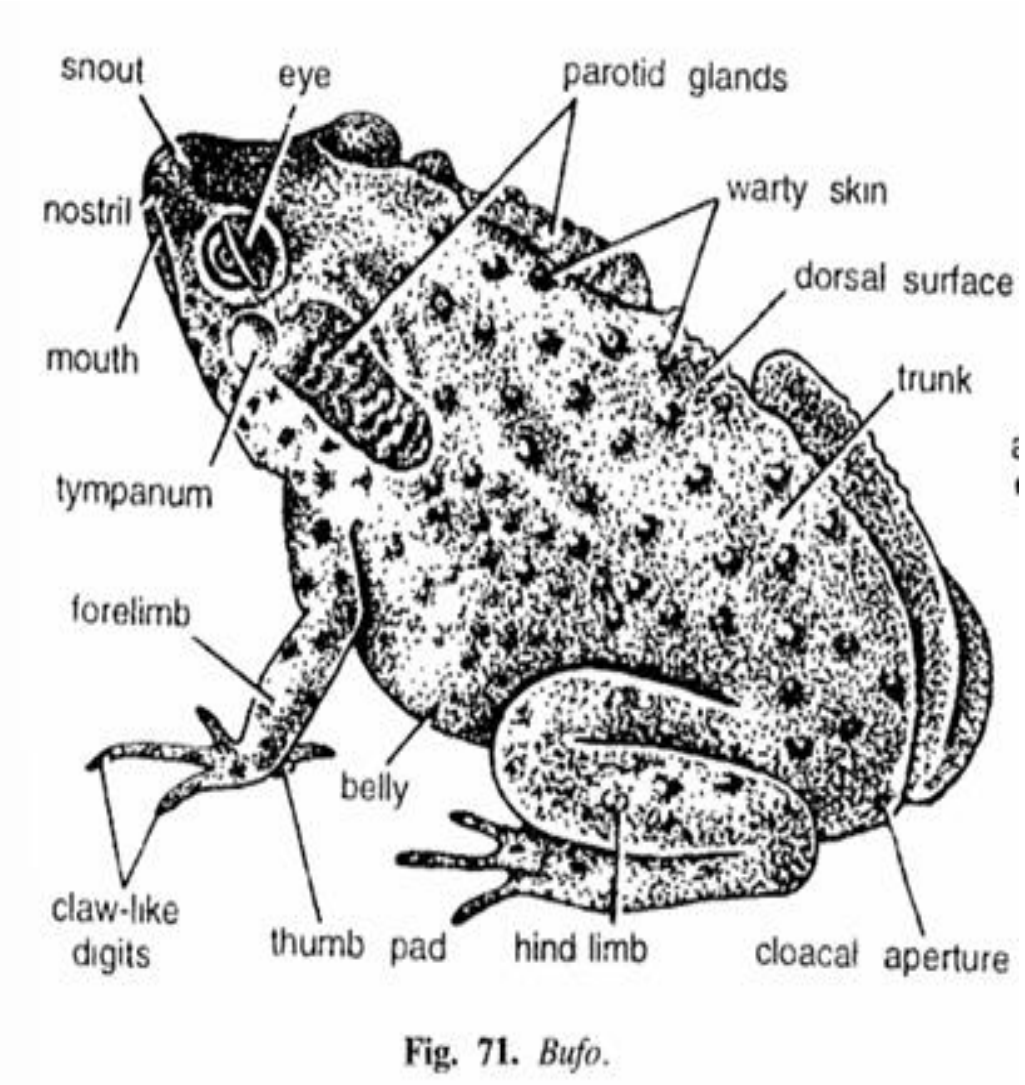


Fig. 71. *Bufo.*

Identification of Bufo

Geographical distribution : Bufo has world-wide distribution. They are abundantly found in India, United States and Pacific State of Alaska. Miocene.

Habit and habitat: Bufo is terrestrial, nocturnal, hiding under logs and stones or in burrows in day. It enters water only to breed and spawn.

Comments

1. Commonly called as true toad. It differs from frog in having rough, dry and warty skin with more poison glands than mucous glands.
2. The skin is more or less of protective nature than respiratory. Body divided into head and trunk.
3. Head contains mouth large eyes, nostrils and tympanum. Behind eyes there is a pair of large parotid poisol1 glands.
4. Hind limbs contain 4 claw like digits and thumb pads or adhesive pads.
5. Forelimbs and Hind limbs are short. Toes provided with horny tips and poorly developed webs. Maxilliary teeth, sternum absent and ventral parts of pectoral girdle overlap (arciferous). Sacral vertebra has dilated transverse processes.
6. Vertebrae procoelus. Urostyle with double condyle. Liver is bilobed. Glands of swammerdams absent.
7. Eggs are pigmented and laid in gelatinous string. Young toads mature in many years.

Special features : The parotid glands of the toad secrete two toxic substances, bufotalus and bufogus. These toxins cause nausea, respiratory and muscular disturbances and also effect heart functioning, if swallowed by man. Bufo melanostictus is found upto 3000 meters in the Himalayas.

Identification : Since this Anura contains parotid glands and above features, hence it is Bufo.

16. RHACOPHORUS : FLYING FROG

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :-Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Amphibia
Order :- Anura or Salientia
Suborder :- Diplasiocoela
Genus :- Rhacophorus

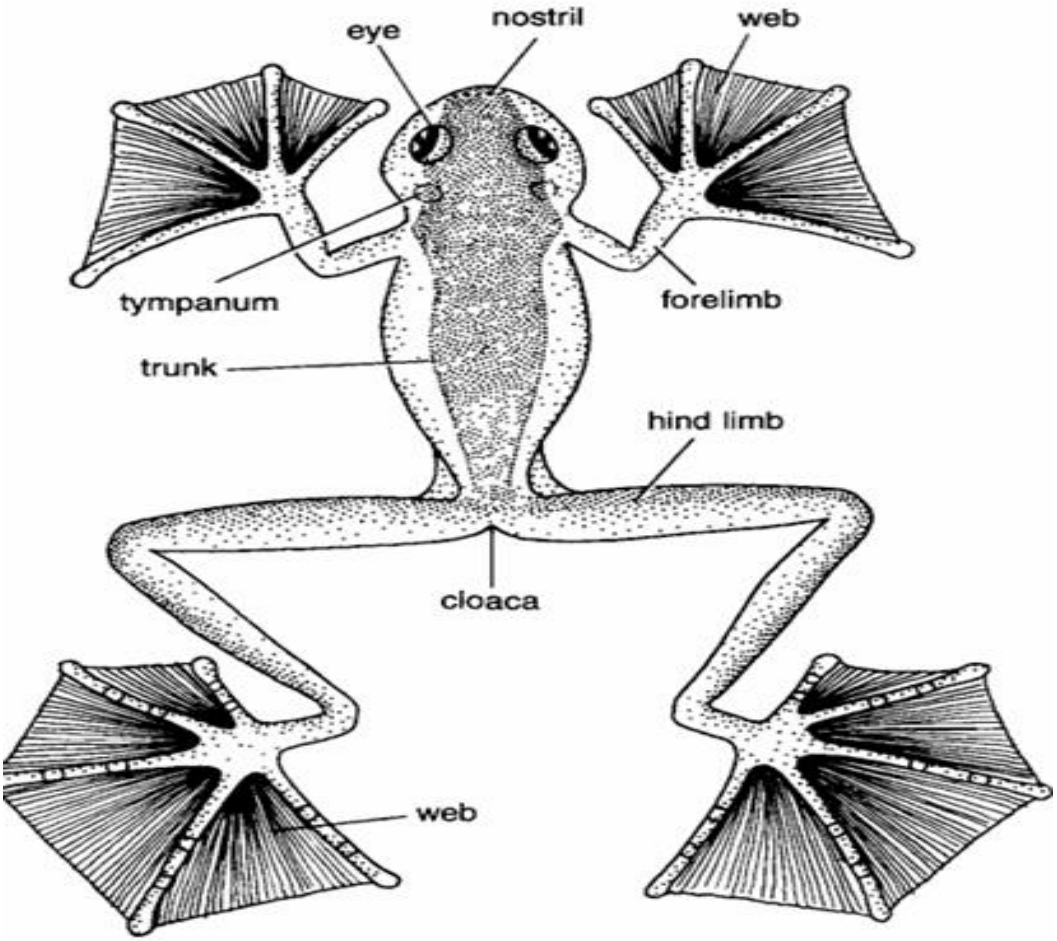


Fig. 73. *Rhacophorus.*

Identification of Rhacophorus

Geographical distribution: The tree frogs or flying frogs are found in Africa, South Eastern Asia, Japan and Madagascar. Miocene.

Habit and habitat : Rhacophorus is a tree-living frog. It remains calm and quiet under stones or on trees and comes out during twilight. It has power of rapid colour changing.

Comments

1. Commonly known as flying frog or tree frog.
2. Body slender, divided into head and trunk. Belly narrows posteriorly. Females larger than males.
3. Head broad and somewhat conical containing eye lids. Eyelids well developed. Tympanum behind eyes.
4. Limbs elongated and contain well developed webs in digits which also bear adhesive cushions at tips. Digits of hind limbs also contain intercalary cartilages.
5. The flying frogs climb on trees and walls and occasionally glide and while alighting on ground, the webs are spread like parachute.
6. Eggs laid usually in gelatinous foam over shallow water of pools and rice fields.

Special features : Rbacophorus shows extreme degree of adaptive radiation in frogs as it has acquired the power of flying or parachuting while alighting from trees. It shows parental care. Rhacophorus schlegeli has evolved a novel technique to care for its eggs. The copulating males and females burrow deep into the ground on the bank of the standing pond. Eggs are laid in froth and parents retire through a tunnel they dig behind which slopes down to open in pond. The froth settles down and turns into a fluid shortly before larvae hatch and slip into the pond.

Identification : Since this Anura contains well developed webs and above features, hence it is Rhacophorus.

CLASS: REPTILIA

17. TESTUDO : GIANT TURTLE

Classification:

Phylum :- Chordata
Group :-Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :-Reptilia
Subclass :- Anapsida
Order :- Chelonia
Suborder :- Thecophora
Family :- Testudinidae
Genus :-Testudo

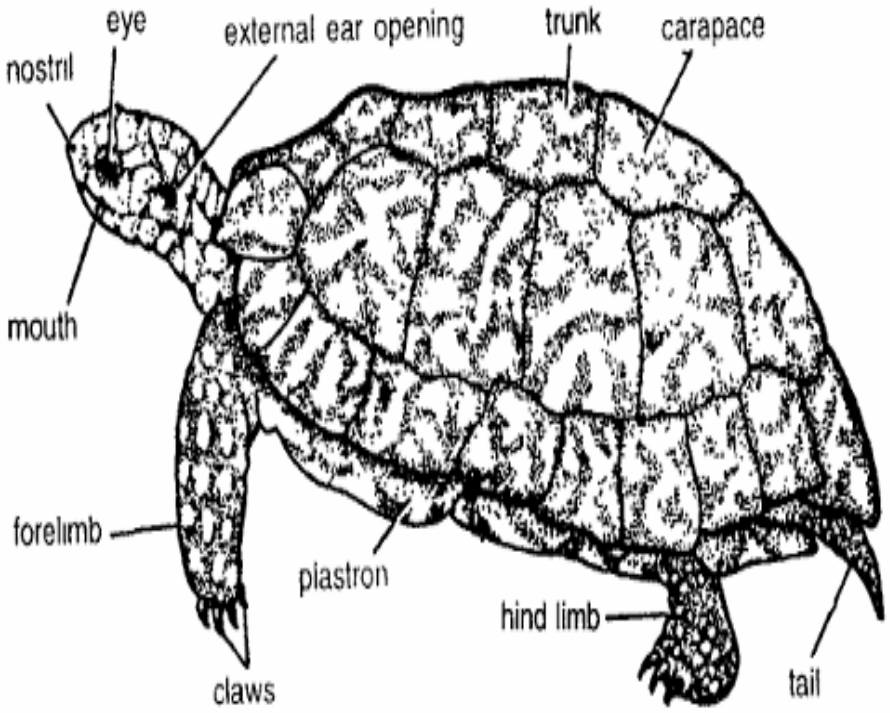


Fig. 74. *Testudo.*

Identification of Testudo

Geographical distribution : Testudo is widely distributed in Galapagos Islands, Africa, Europe, India and Sri Lanka. Jurassic to Recent.

Habit and habitat : Testudo is found in fresh-water or salt water or on land. It feeds on small worms and insects. It also hibernates during winter season.

Comments

1. Commonly known as Giant turtle. Body divided into head, neck, trunk and tail.
2. Body is encased in an oval shell consisting of closely sutured plate-like bones in definite manner. Over the shell is a layer of leathery skin or cornified scutes also in definite pattern.
3. Dorsal convex portion or carapace and the flatter ventral portion or plastron are joined on sides by skin.
4. Head, mounted on retractile neck, tail, and limbs protrude between two parts of the shell and in most species can be withdrawn completely within the margins of the shell.
5. Head contains mouth, nostril and eyes. Behind eye is external ear opening.
6. Jaws lack teeth but bear stout cornified sheaths to crush their food. Quadrate immovable.
7. Thoracic vertebrae and ribs consolidated with bony carapace. Feet are stumpy.
8. Toes end in horny claws that are useful in crawling and digging. They are uricotelic.
9. Male has an erectile penis on the ventral wall of the cloaca.
10. Oviparous.

Special features : The feet are adapted for walking on land. The limbs are massively built with sprawling gait. The clawed digits contain only two phalanges. Eggs are laid in holes (nests) in ground, dug and covered by females. Toes not webbed.

Identification : Since this tortoise contains polygonal scales and above features, hence it is Testudo.

18. CHELONE : GREEN TURTLE

Classification:

Phylum :- Chordata
Group :-Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :-Reptilia
Subclass :- Anapsida
Order :- Chelonia
Family :- Chelonidae
Genus :- Chelone

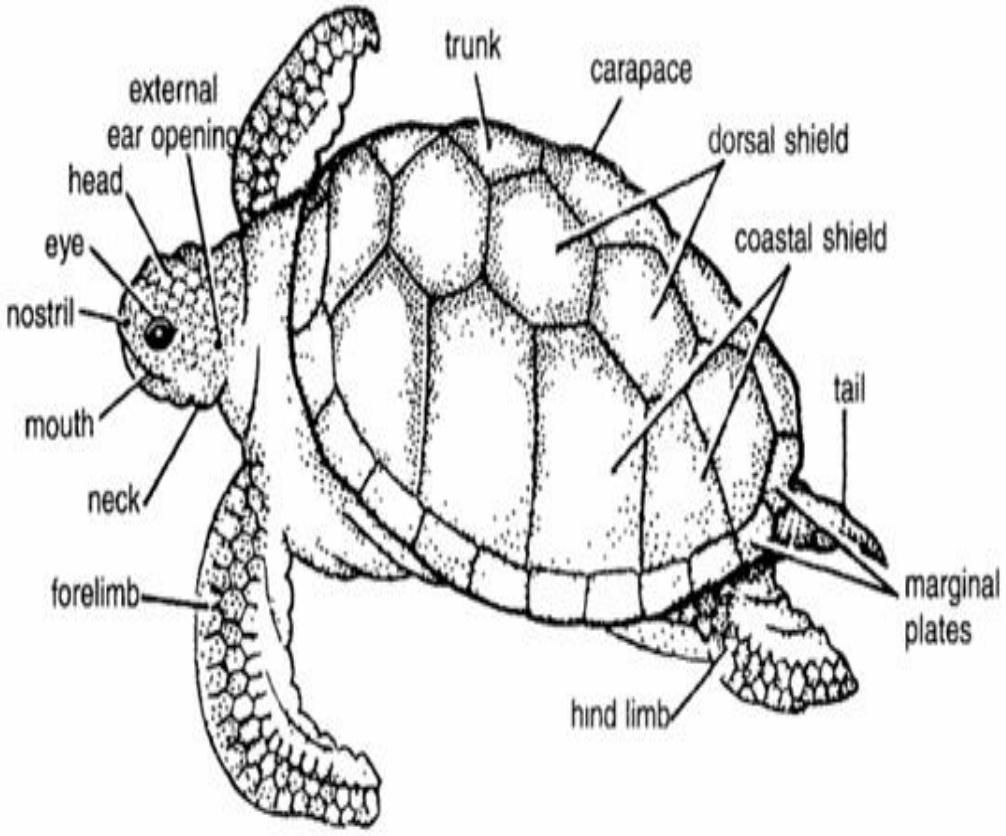


Fig. 77. *Chelone.*

Identification of chelone

Geographical distribution : Chelone is distributed in tropical and sub-tropical regions and chiefly found in the Indian, Pacific and Atlantic Oceans and coasts of the United States. Upper Cretaceous to Recent.

Habit and habitat : Chelone mydas is a marine reptile. They come ashore only to lay eggs.

Comments

1. Commonly called as green turtle. It measures about 110 cms.
2. Body divided into head, neck. trunk and tail. Body case is rigid. Carapace flat, heart-shaped and covered with smooth bony shields. Plastron is joined to carapace by ligament.
3. Dorsal shields are juxtaposed fitting closely into each other. Costal shields 4 pairs.
4. Head is covered by single pair of prefrontal shields. Jaws contain denticulate edges.
5. Head is partially retractile into shell. Head contains mouth, nostril, eye.
6. Eyes well developed, provided with eyelids and nictitating membrane.
7. Limbs adapted for swimming and flipper like.
8. The forelimbs form wing-like paddles. Only first digit is clawed while hind limbs clawed and webbed.

Special featnres : The sea turtles are economically important, because their armour is utilized for various purposes and their flesh is edible. being very delicious. Chelone weighs about 90 kg and is much valued for food.

Identification : Since this turtle has flipper-like limbs and above features, hence it is Chelone.

19. TRIONYX : SOFT RIVER TERRAPIN

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Subclass :- Anapsida
Order :- Chelonia
Family :- Trionychoidae
Genus :- Trionyx

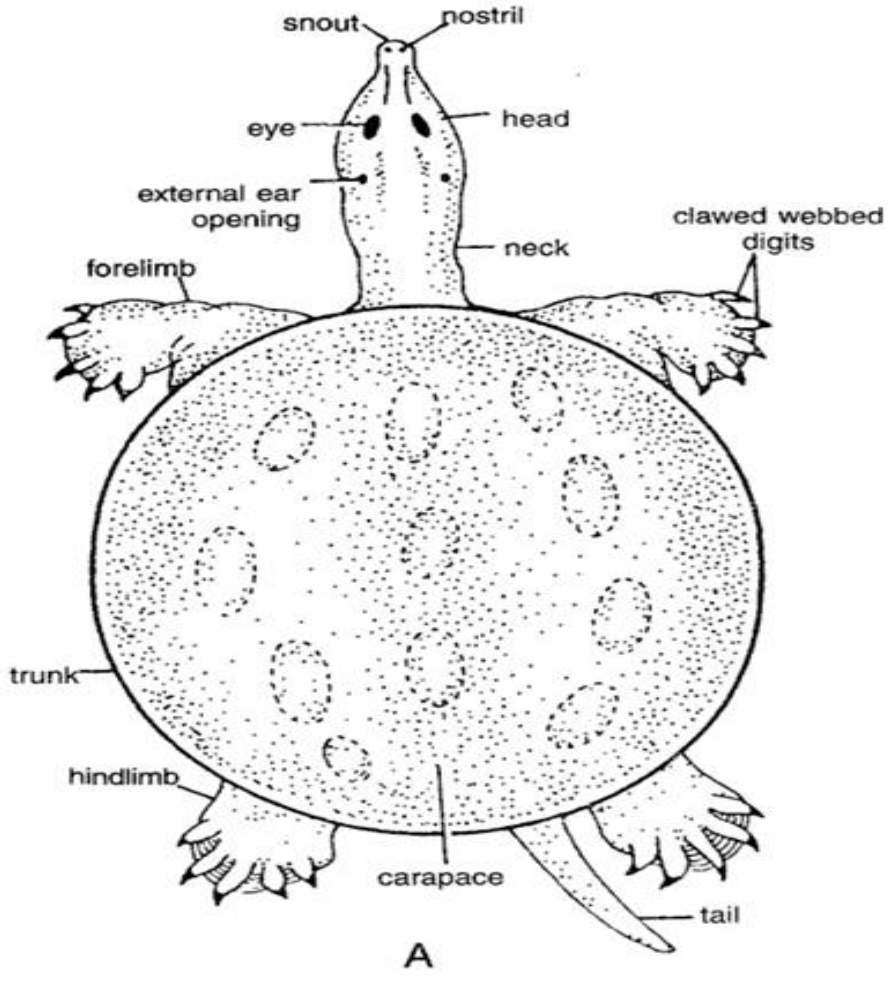


Fig. 78. *Trionyx* : **A.** Dorsal view. **B.** Ventral

Identification of Trionyx

Geographical distribution : Trionyx is widely distributed in India, North America, Africa, Asia and Malayasia Archipelago. Cretaceous to Recent.

Habit and habitat : Trionyx gangeticum is a common fresh-water and pond terrapin.

Comments

1. Commonly called as torto or soft river terrapin. body is flat, oval and encased in bony shell. Skin is smooth and leathery.
2. Body divided into head, neck, trunk and tail.
3. Head is pointed with greenish or blackish longitudinal streaks. Lips are fleshy.
4. Head contains, eyes, mouth and nostrils. Behind eyes are external ear opening. Dorsal surface is olive above and yellowish below.
5. Carapace is fused with vertebral column and ribs. Carapace consists of 9 median vertebral plates corresponding to trunk vertebrae and fused with the flattened neural spines of corresponding vertebrae. To these a median nuchal and 2 precaudals are added.
6. Lateral parts of carapace are composed of 8 costal plates.
7. Marginal plates are added to costal and precaudals. Plastron best seen in inner surface consists of a pair of epiplastron, a median entoplastron and paired hyo, hypo and xiphiplastron.
8. Only neck and tail vertebrae are movable. Feet are broadly webbed and only three inner digits are clawed.

Special features : Oviparous. Eggs are laid outside water. Because of rigid shell the breathing movements are produced by protrusion of the head, movements of girdles, limbs and pumping action of hyoid.

Identification : Since this terrapin contains clawed digits, webbed feet and longitudinal streaks over head and above features, hence it is Trionyx.

20. IGUANA

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :-Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub-order:- Sauria or Lacertilia
Family :- Gecknoidae
Genus :- Iguana

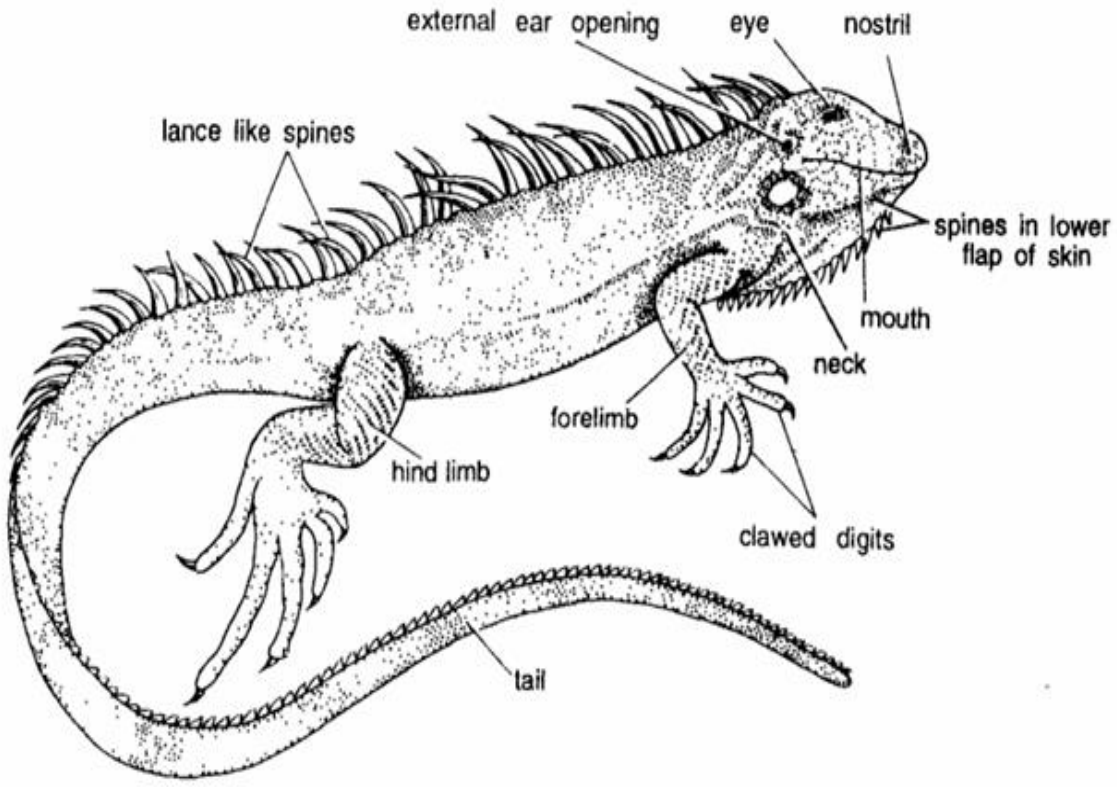


Fig. 83. *Iguana.*

Identification of Iguana

Geographical distribution: Iguana is found in tropical countries. It is distributed in Mexico, West Indies, Southern and Central America.

Habit and habitat : Iguana is adapted for active running and climbing. It feeds on leaves, fruits, some insects and small vertebrates. It lives on trees.

Comments

1. Lizard measures about 2 metres having head short neck, compressed trunk and elongated tail.
2. General colour of upper part is a mixture of green and black and underpart pale greenish or whitish.
3. Back contains lance-like spines along mid-dorsal line extending upto tail.
4. Mid-line spines are also present along lower jaw flap of skin. eye nostril "I spines in lower flap of skin Head contains wide mouth, small eyes, nostrils and opening of external ear.
5. Teeth are acrodont like and fixed to the sides of the jaw. Eyelids complete. Tongue is fleshy and non-protractile.
6. Forelimbs and hind limbs are normal. Digits are clawed.
7. Both sexes have femoral pores. I
8. n tropics Iguana is used as food by man.

Identification : Since this lizard contains median row of spines on back and tail, besides above characters, hence it is Iguana.

21. CROTAPHYTUS : COLLARED LIZARD

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :-Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Genus :-Crotaphytus

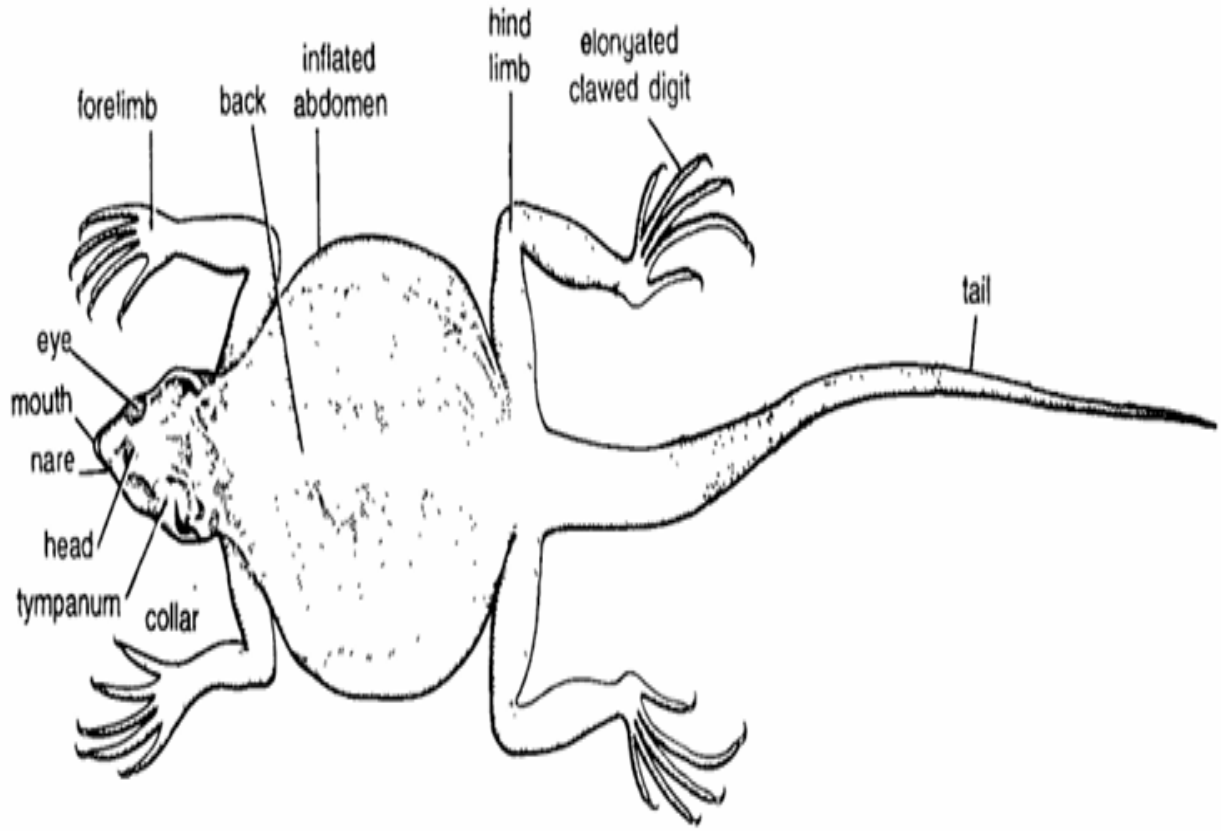


Fig. 84. *Crotaphytus.*

Identification of Crotaphytus

Geographical distribution : Crotaphytus is widely distributed in West Indies, Mexico, Southern and Central America.

Habit and habitat : Crotaphytus is a land lizard adapted for fast running and can jump like frog. It is nocturnal, carnivorous, oviparous and capable of changing colours.

Comments

1. Commonly called as collared or inflated lizard.
2. Body divided into head, neck, trunk and tail.
3. Head small containing mouth, eyes, nares and tympanum. Eyes have movable eyelids.
4. Tongue is small. Teeth pleurodont.
5. Neck is small and in male possesses a double black collar and female has a slaty grey narrow collar.
6. Forelimbs and hind limbs are stout, clawed and elongated.
7. Vertebrae procoelous Tail is elongated and narrowly pointed.

Special features : The lizard shows brilliant pigmentation specially during breeding season. The abdomen is inflated. The male is bright green coloured and the body surface is adorned with yellow spots. Females are grey coloured. The tail breaks in danger i.e., it shows autotomy.

Identification : Since the animal contains collar, inflated abdomen and above features, hence it is Crotaphytus.

22. DRACO : FLYING LIZARD

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub-order:- Sauria or Lacertilia
Family :- Agamidae
Genus :- Draco

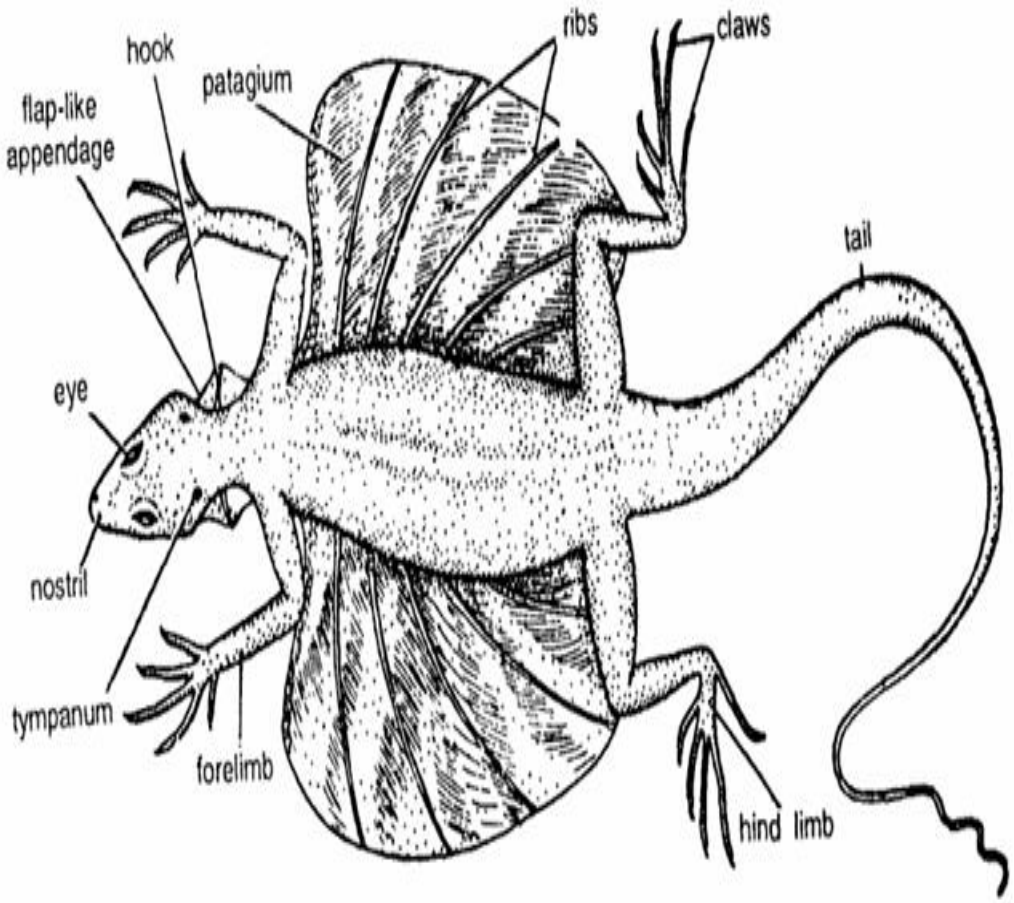


Fig. 85. *Draco.*

Identification of Draco

Habit and habitat : Draco is arboreal, living on trees. It feeds on small insects.

Comments

1. Commonly known as Dying dragon or flying lizard.
2. Body is dorsoventrally compressed, measuring 15 to 22 cm in length and divided into head, neck, trunk and tail.
3. Head is more or less triangular and contains eyes, tympanum behind eyes and nostril. Eyes are small with eyelids. Teeth heterodont and attached to the edges of the jaws.
4. Tongue is thick and short. Some animals have thoracic sac or dorsal spine.
5. Neck contains three hooks forming flap like appendages. Below the neck there are sac-like structures known as gular pouches, which are larger in males than females and they help in copulation.
6. Forelimbs and hind limbs normal.
7. On both sides of the body wing or patagium formed by extension of skin is present. Patagium is supported by lateral ribs.
8. Tail long, slender and whip-like.

Special features : Draco shows extreme adaptation for flying life and thus avoids its enemies on the ground. Most significant structures are membranous wings or patagia, which to volplane from a height. Flying lizard is adapted for climbing and gliding from higher to lower branches. Draco is brilliantly and beautifully coloured like flowers of trees in which it lives and thus it shows camouflage (mimicry).

Identification: Since this lizard contains patagium and above features, hence it is Draco.

23. TYPHLOPS : BLIND SNAKE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub·order:- Ophidia
Family :- Typhlopidae
Genus :- Typhlops
(Blind snake)

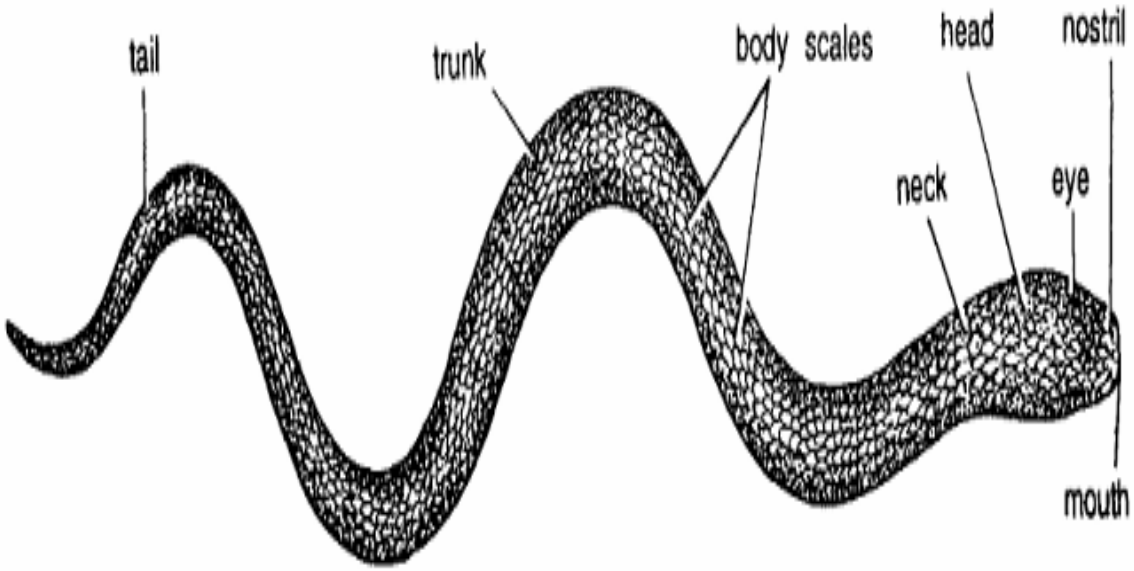


Fig. 93. *Typhlops.*

Identification of typhlops

Geographical distribution : Typhlops is widely distributed in Europe, Asia, Africa, America, Australia, .lndia, tropics and subtropics of both hemispheres.

Habit and habitat : It is a burrowing snake feeding on small insects, earthworms and soft larval insects.

Comments

1. Commonly known as blind snake.
2. Body divided into head, neck, trunk and tail. Body is elongated, cylindrical, measuring about 175 to 180 mm and covered by thin overlapping cycloid scales in multiple rows over whole body.
3. Animal looks like earthwoml and is of dark chocolate colour.
4. There is no distinct head and also there is no differentiation between dorsal and ventral scales which are in multiple rows over whole body. Head contains mouth nostril and eye.
5. Lower jaw without teeth, maxilla toothed and transversely placed, ectopterygoid and squamosal absent and pterygoid separate from quadrate.
6. Rostral, nasal, ocular and pre-ocular shields are larger.
7. Eyes are indistinct and covered with scales. They are immobile and without eyelids.
8. Limbs, feet, ear openings, sternum, urinary bladder absent. Mandibles join anteriorly by ligament. Tongue slender, bifid, protrusible. Left lung reduced.

Identification : Since this snake contains indistinct head and eyes and above features, hence it is Typhlops.

24. PYTHON : AJGAR

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub·order :- Ophidia
Family :- Boidae
Genus :- Python

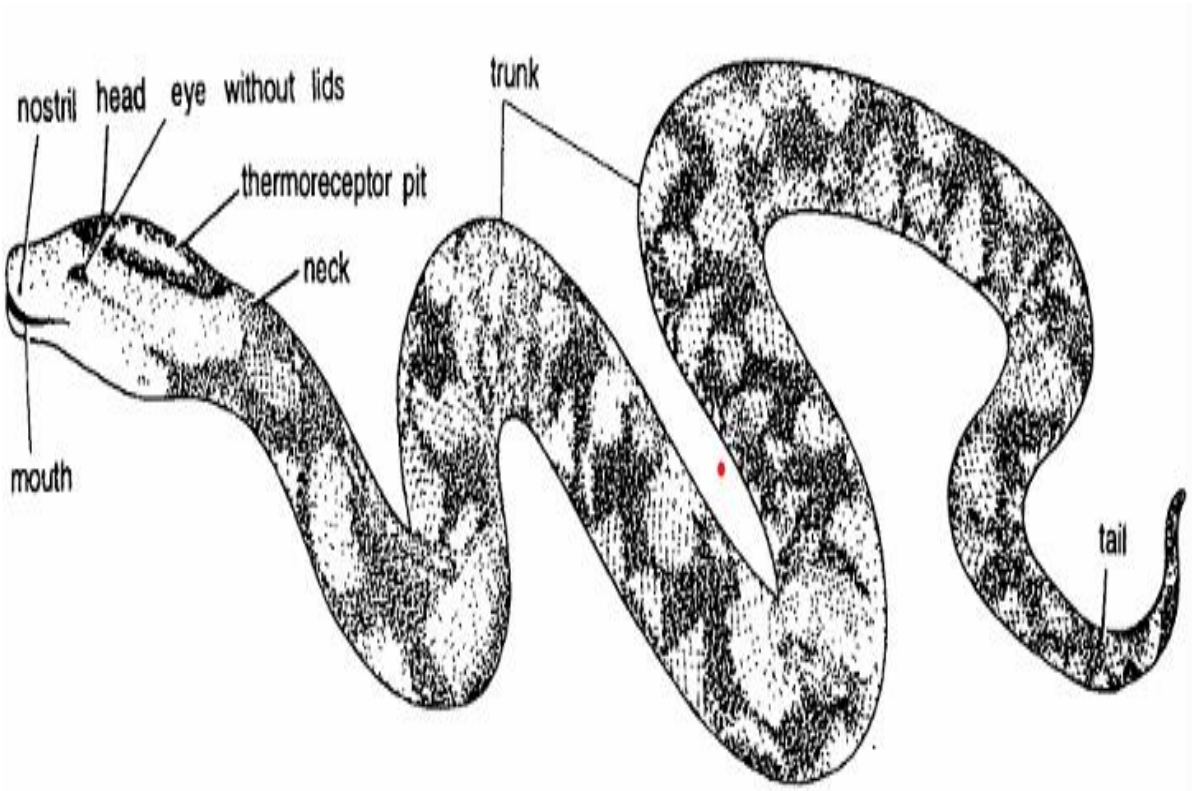


Fig. 94. *Python.*

Identification of python

Geographical distribution : Python has world-wide distribution except New Zealand.

Habit and habitat: They are found mostly on ground, in trees of tropical jungle, in dry, rocky or sandy places. They kill birds, goats, sheep, deer, cows, dogs, horses and even tigers. They can also swim in water. Oviparous.

Comments

1. Commonly known as Ajgar, is a favourite snake in a serpentarium.
2. Animal is huge, massive, voluminous, measuring about 10 metres in length, and weighing nearly 110 kilograms.
3. Body is covered with small scales in 60-75 rows. Body divided into head, neck, trunk and tail. Head contains mouth, nostril and eyes.
4. Dorsal side has brown pigmentation with dark grey rhomboid edged spots while ventral side is greyish with yellow brown spots.
5. Head is distinct from the neck and covered with symmetrical shields or small scales. Eyes are free and functional with vertical pupil.
6. Mandibles, pterygoids, palatines, maxillae and premaxillae contain teeth. Maxilla, palatine and pterygoid movable.
7. Rostral scale of head contains a deep thermo-receptive pit. Lancet-shaped brown mark present over head. Parietal, loreal and temporal regions are covered with irregular plates. Supra-Iabials are 11-13, 1st two contain pit and 7th touching eye, infralabials 16-18.

Special features: Python is very lethargic but during feeding and on seeing prey, it becomes very active and coils around the prey. It kills the prey by pressing within the coils of its massive muscular body and gradually it shoves the prey. Indian Python is P. molurus. It is one of the largest living serpent.

Identification : Since this snake has huge and massive looking body and above features, hence it is Python.

25. NATRIX : WATER SNAKE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub·order :- Ophidia
Family :- Colubridae
Genus :- Natrix

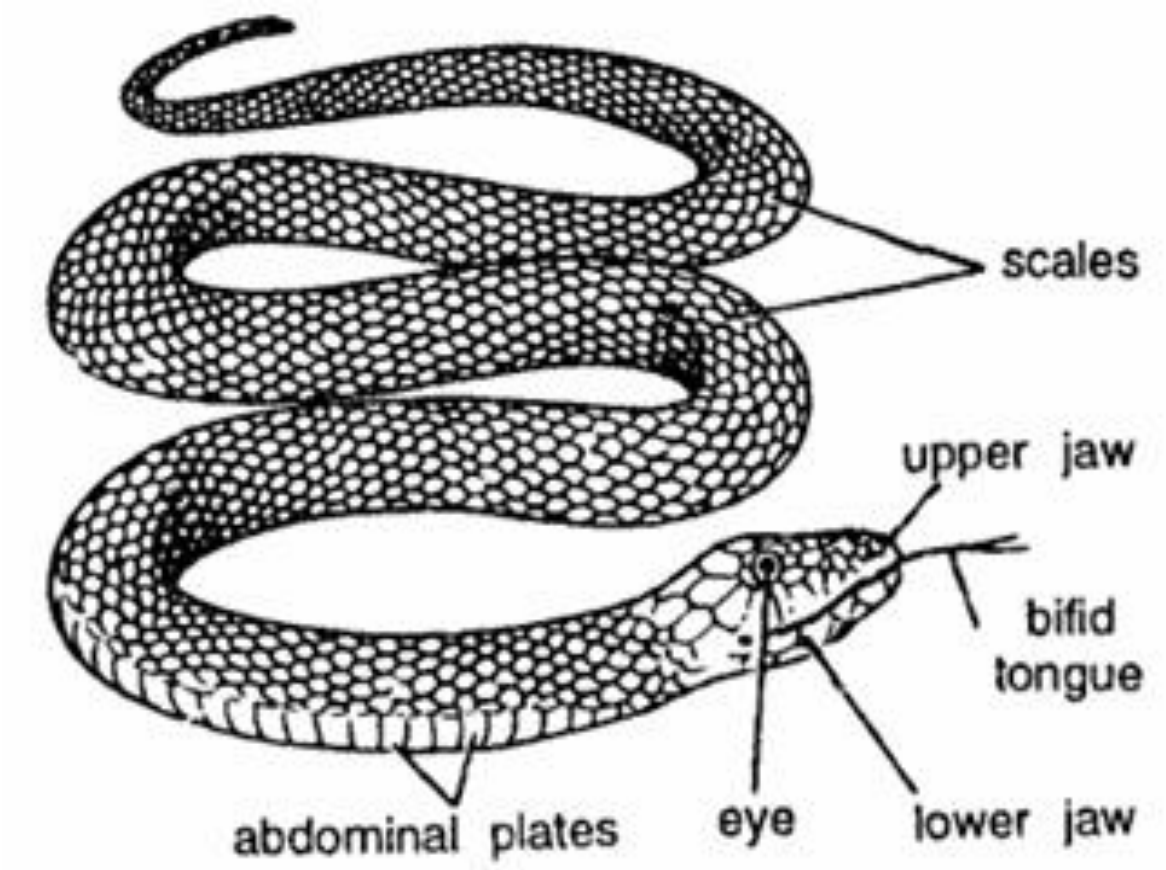


Fig. 97. *Natrix.*

Identification of Natrix

Geographical distribution : Natrix is widely distributed in U.S.A., Mexico, North Africa and India.

Habit and habitat : It is found in fresh-water, hidden under water vegetation or grasses. It is diurnal, oviparous and feeds on fishes and frogs.

Comments

1. Commonly called as water snake. It is non-poisonous. Natrix piscator is the common Indian water snake.
2. Body is covered with epidermal scales and chess-board like black spots. Body divided into head, neck, trunk and tail.
3. Head is distinct and comprises bulging eyes, slit-like mouth and bifid tongue. Head scales are large, called as shields. Belly scales plate-like, while side scales smaller. Bifid tongue protrude between upper and lower jaw.
4. Both jaws contain teeth but without fangs. Maxillaries horizontal forming most part of upper jaw.
5. Facial bones movable. Squamosal loosely attached to skull. Tympanum absent.

Identification : Since this snake contains chess-board like black spots and above features, hence it is Natrix.

26. DENDROPHIS : TREE SNAKE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub·order :- Ophidia
Family :- Colubridae
Genus :- Dendrophis

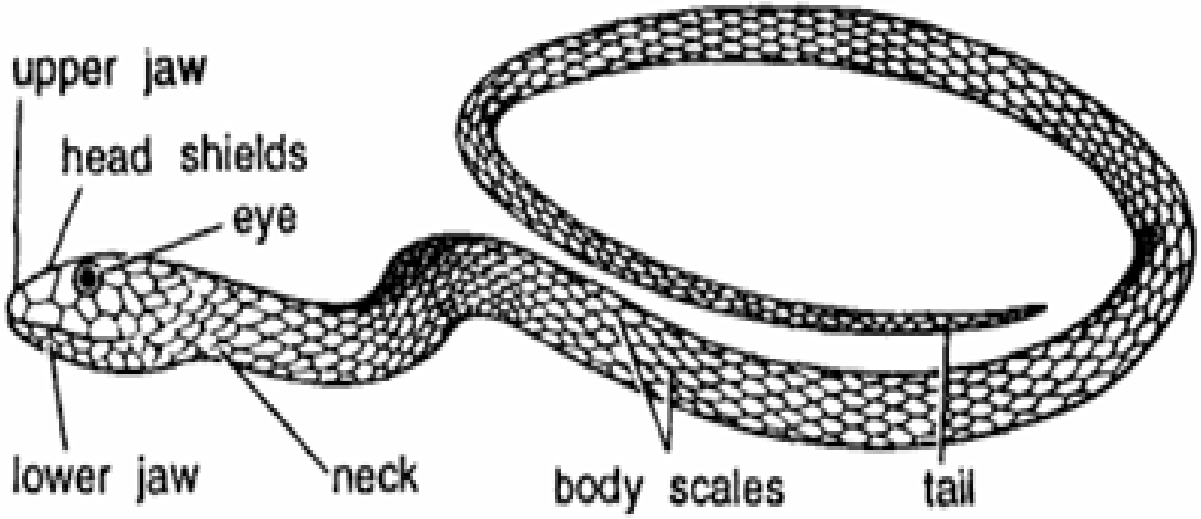


Fig. 98. *Dendrophis.*

Identification of Dendrophis

Geographical distribution : Dendrophis is found in Asia, South America and Australia.

Habit and habitat : It is adapted for arboreal life. It lives on trees and feeds on frogs. Diurnal and oviparous.

Comments

1. Dendrophis, a harmless and non-poisonous snake.
2. Commonly called as tree snake.
3. Snake is elongated and cylindrical with pointed tail measuring about 2 metres in length and having yellow stripes. Body divided into head, neck, trunk and tail. Head contains mouth and eyes.
4. Head is large and covered by large plate-like keeled shields forming 13 or 15 rows.
5. Scales of vertebral row enlarged. Belly scales plate-like while side scales are small.
6. Ventrals have a pair of suture-like lateral keel and notch on sides which helps in climbing.
7. Fangs absent but teeth present.
8. Eyes covered with transparent and fused membrane. Tympanic membrane absent.

Identification : Since this snake contains keel and notch on sides and above features, hence it is Dendrophis.

27. HYDROPHIS : SEA SNAKE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Squamata
Sub·order:- Ophidia
Family :- Hydrophidae
Genus :- Hydrophis

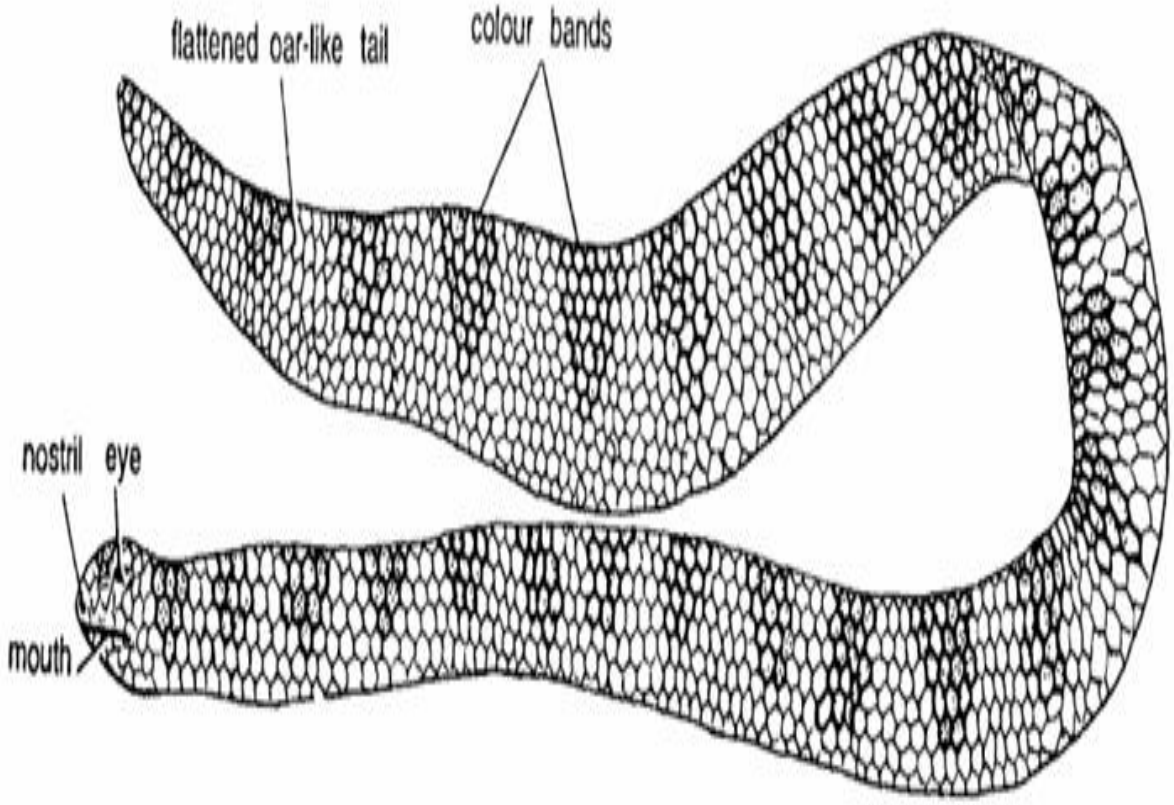


Fig. 99. *Hydrophis.*

Identification of Hydrophis

Geographical distribution : Hydrophis is found in India, along the Pacific coast from southern Mexico to northern South America, in the Bay of Bengal and Malaysia Archipelago.

Habit and habitat: It inhabits water, feeding on fishes.

Comments

1. Commonly called as sea snake. Body divided into head, neck, trunk and tail.
2. Body is elongated, laterally compressed, about 2 metres in length, and covered with small scales.
3. General pigmentation is dark olive green above with yellowish cross bars and whitish area below.
4. Head is indistinct and covered by large shields. Head contains nostril, mouth and eye.
5. Ventral scales are small. Loreal shield is absent. One pre-ocular, 2 post-oculars and 7-8 supra-labials present. 3rd and 4th supra-labials touch the eyes.
6. Maxillary teeth 14-18 behind the poison fangs.
7. Eyes small with rounded pupil.
8. Sea snakes are oviparous and they come out of water for egg laying.

Special features : Hydrophis is deadly poisonous or venomous snake and very dangerous to mankind. Its venum is neurotoxic. The tail is compressed and adapted for swimming. Tail in oar like.

Identification : Since the animal has compressed tail and above features, hence it is Hydrophis.

28. CROCODYLUS : MUGGER

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Crocodilia
Family :- Crocodylidae
Genus :- Crocodylus (Magarmach)

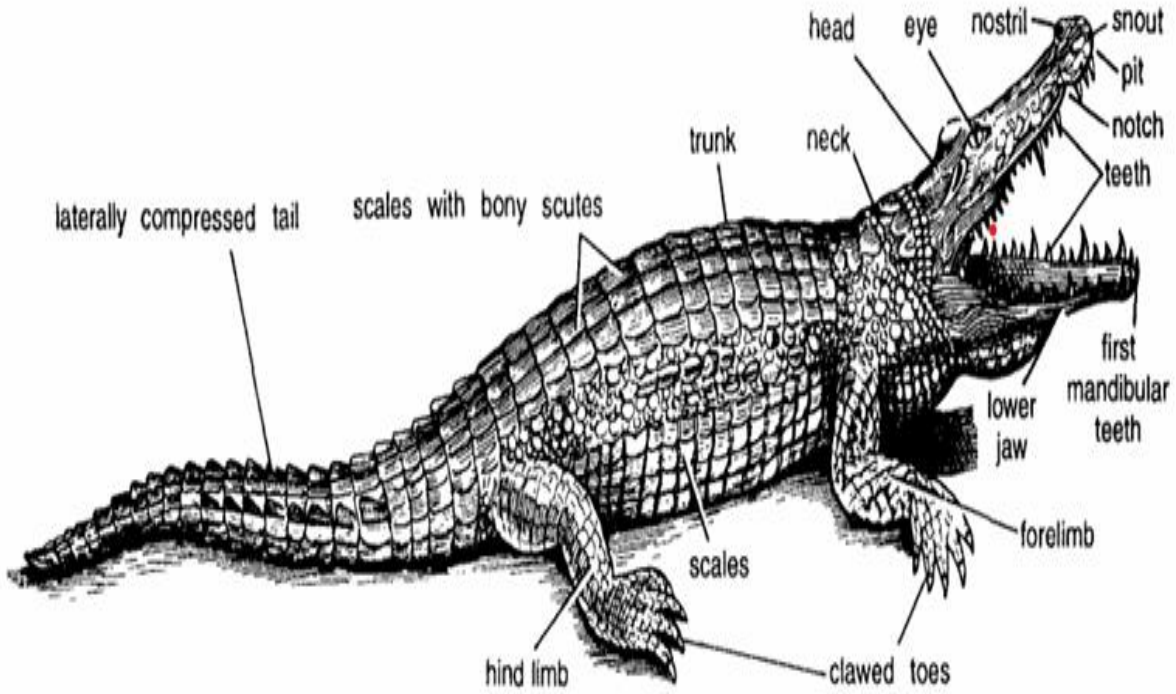


Fig. 105. *Crocodylus.*

Identification of Crocodylus

Geographical distribution : Crocodylus is found in Southern Asia, Africa, Australia, Central America and India. Triassic to Recent.

Habit and habitat : It is found in rivers and lakes. The animal makes 10 to 13 metres long tunnel below the level of water. The opening of the tunnel is used as entrance and the other side is used to deposit the eggs.

Comments

1. Commonly known as Mugger.
2. Body is stout, elongated, 4 to 6 metres in length and divided into head, neck, trunk and tail.
3. Surface covered by leathery armour of osteoscutes bony scutes arranged in transverse rows.
4. Upper part of the body is dark olive brown with black spots or bends.
5. Head long and triangular and narrows towards snout which is not differentiated from the rest of the skull. Jaws long, powerful, rimmed with numerous bluntly conical and unequal teeth, dental formula 16-19/14-15. The first tooth fits into a pit and fifth mandibular tooth into a notch on the outer side of upper jaw.
6. Ear opening small and protected by a small flap of skin.
7. Tongue not protrusible.
8. Tail long, heavy and laterally compressed.
9. Forelimbs and hind limbs short and pentadactyle, with 5 fingers and 4 toes, ending in claws and with webs.
10. Heart 4-chambered with separate ventricles. Bladder absent.

Special features : Crocodile is dangerous to mankind. It can eat the man.

Identification : Since this reptile has long and pointed snout with concial teeth and above features, hence 1 it is Crocodylus.

29. ALLIGATOR

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Reptilia
Sub-class :- Diapsida
Order :- Crocodilia
Family :- Crocodylidae
Genus_ :- Alligator

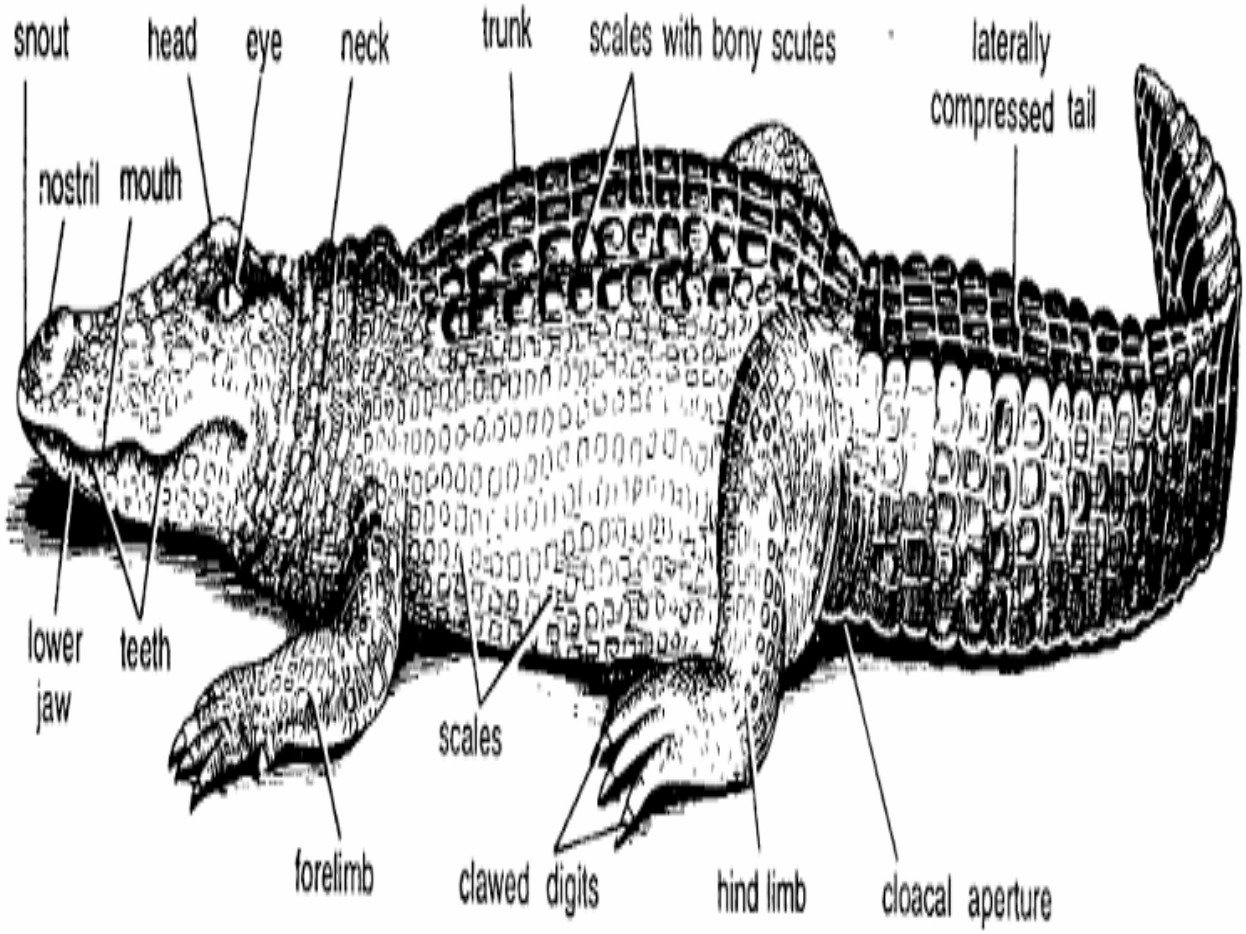


Fig. 106. *Alligator.*

Identification of Alligator

Geographical distribution: Alligator is found in China and North America.

Habit and habitat : Inhabits shallow water and on slight disturbance buries in sand.

Comments

1. Alligator resembles superficially with Crocodylus.
2. Body measures 3 to 4 metres in length. The upper part steel-grey and sides olive green.
3. Body divisible into head, neck, trunk and tail. Body is covered with thick leathery skin containing scutes. The dorsal bony scutes do not articulate with each other. The ventral scutes are with or without very little ossification. Mandibular symphysis is short extending only to the level of 4th and 5th tooth. In water eyes and nostrils are exposed.
4. Head is broad and snout bluntly rounded. Jaws long, powerful, rimmed with numerous, bluntly conical teeth which are unequal. Teeth 17-20/17-22 on each side. The first and fourth mandibular teeth fit into the pits of upper jaw. Tongue not protrusible. Head contains mouth, nostril and eyes.
5. Small ear opening is protected by a flap of skin and nasal bones divide nasal aperture.
6. Forelimbs and hind limbs short, pentadactyl and ending in toes with webs inbetween.
7. Tail long, heavy compressed.
8. Heart 4-chambered with separate ventricles. Bladder absent.
9. Eggs are laid in nests.

Identification : Since this reptile has peculiar scales and above features hence it is Alligator.

CLASS AVES (BIRDS)

30. PAVO CRISTATUS : PEACOCK

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Aves
Superorder :- Neognathae
Order :- Gallifonnes
Genus :- Pavo
Species :- cristatus

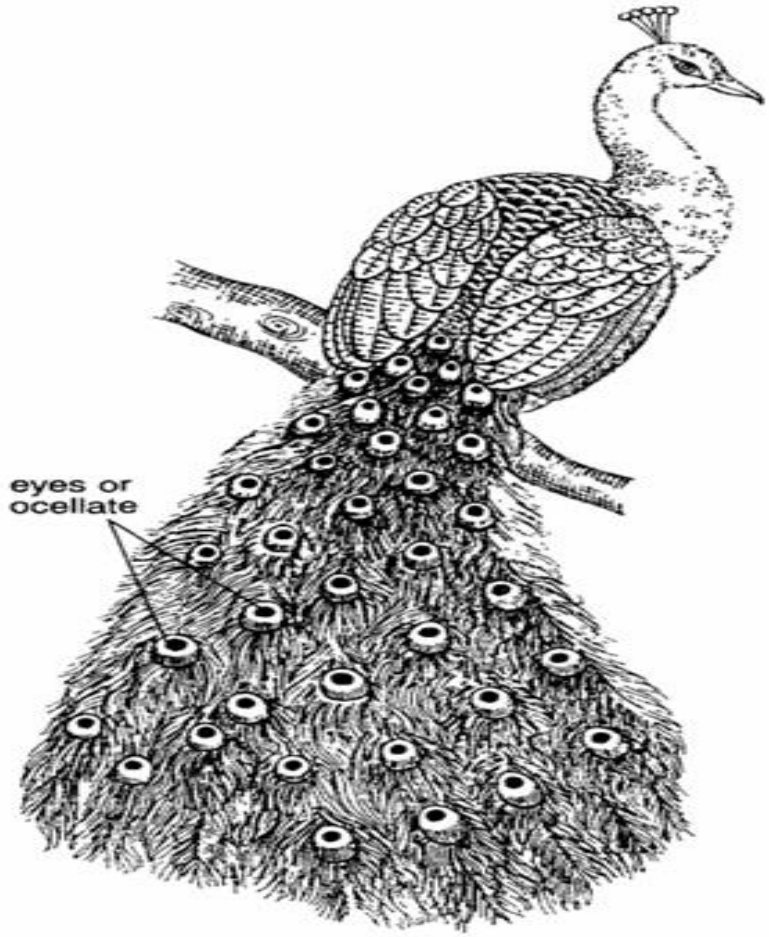


Fig. 119. *Pavo cristatus.*

Identification of pavo cristatus

Geographical distribution : Found in various localities of India. Eocene to Recent.

Habit and habitat : It inhabits dense scrub, jungle and forest, well provided with rivers and streams. They are shy birds. They feed on grains and vegetable shoots and often do severe harm to newly sown seeds. They also eat small reptiles and insects. It makes nests on ground.

Comments

1. Commonly called as pea-fowl or peacock. In Hindi it is called as Mor or Mayur.
2. It displays a well-marked sexual dimorphism.
3. Body divided into head, neck, back: breast and abdomen.
4. Head contains beak and eyes.
5. Male bird is beautifully pigmented with fans-shaped crest; brilliant metallic blue head, neck and breast; with long trailing bronze green upper tail coverts ending in shining blue green purple bronze 'eyes' or ocellate.
6. Tail measures 1.5 meters in length.
7. Female is duller having lower neck metallic green instead of blue as in male, and lacks the ornamented tail.
8. Feet adapted for scratching and running. Hind legs contain spur.

Special features : The dance of the peacock with its gorgeous tail coverts spread like a fan is very famous. It dances especially on a cloudy and rainy day. It also produces ugly shrieking sound may-awe in morning, evening, moonlight and on cloudy days. It is the national bird of India.

Identification : Since this bird has characteristic feathers with eyes and above features, hence it is Pavo cristatus.

31. COLUMBA LIVIA : PIGEON

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :-Tetrapoda
Class :- Aves
Superorder :- Neognathae
Order :- Columbiformes
Genus :- Columba
Species :-livia

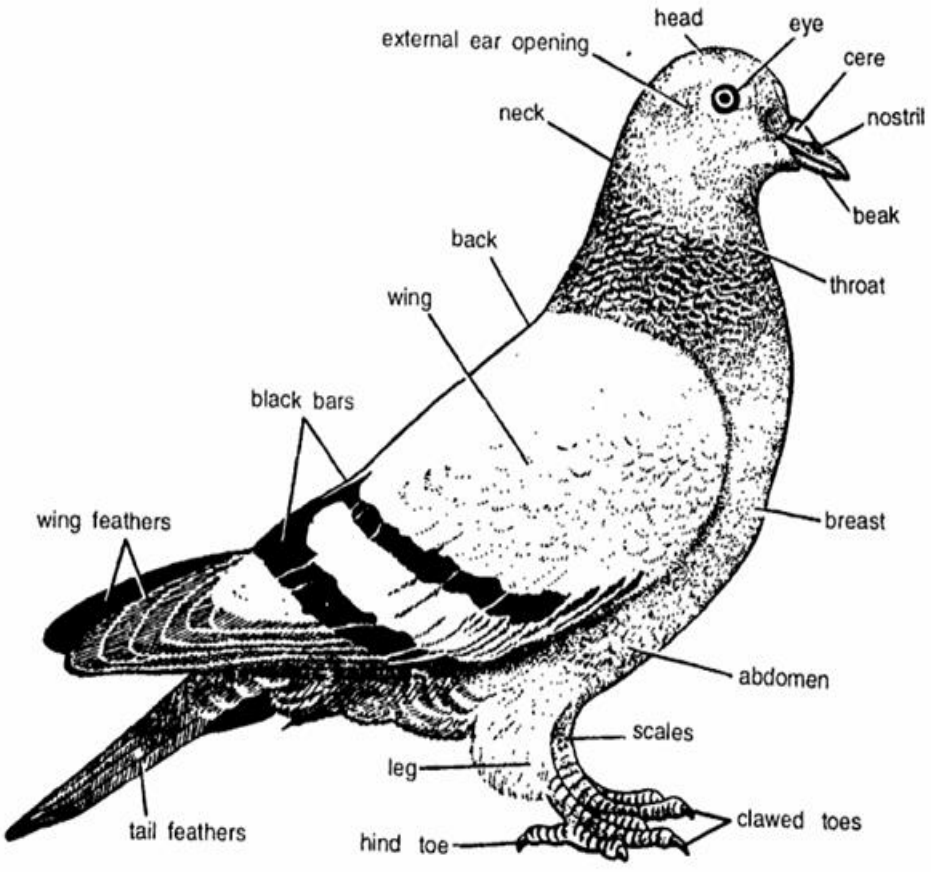


Fig. 120. *Columba livia.*

Identification of columba livia

Geographical distribution : Columba is commonly found in India, forested zone of the Pacific coast and United States. Eocene to Recent.

Habit and habitat : Columba livia is the most common and familiar bird around man, nesting in buildings, old houses, warehouses, sheds and railway stations. **Their flight is swift and strong. Breeding continues throughout the year.**

Comments

1. Commonly called as blue-rock pigeon and Kabutar in Hindi.
2. Body is divisible into head, neck, back and breast and abdomen.
3. Plumage is grey with glistening metallic green and purple on breast and neck.
4. Head contains large eyes and slit-like nostrils. It is produced into a short and slender bill or beak. Upper and lower beaks are covered by the horny sheath, called rhamphotheca. At the base of the upper beaks there is a patch of skin called cere.
5. Beak adapted for seed-eating.
6. Eyes are large, rounded, with a well-developed nictitating membrane and a rounded pupil.
7. Forelimbs are modified into wings which contain besides skeleton flight feathers called as remiges. Feet are covered with epidermal scutes formed by the fusion of several reptilian epidermal scales.
8. Hind limbs are modified for bipedal locomotion. Tarsus usually shorter than toes. Wing feathers, tail feathers present. Other structures seen are neck, breast, abdomen and black bars on wings.
9. Eggs white and unmarked.

Special features : Pigeons are the most common domesticated birds, which were in olden times used as messengers. They are also eaten by man. Their call notes are very familiar to man as gootr-goon, gootr-goon. Pigeons serve as an excellent example for artificial selection of Darwins theory of evolution as various varieties have been produced by man. Crop large, producing 'pigeon milk' to feed small young.

Identification : Since this bird has slaty grey plumage and above features, hence it is Columba livia.

32. PSITTACULA EUPARIA : PARROT

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Aves
Superorder :- Neognathae
Order :- Psittacifonnes
Genus :- Psittacula
Species :- euparia

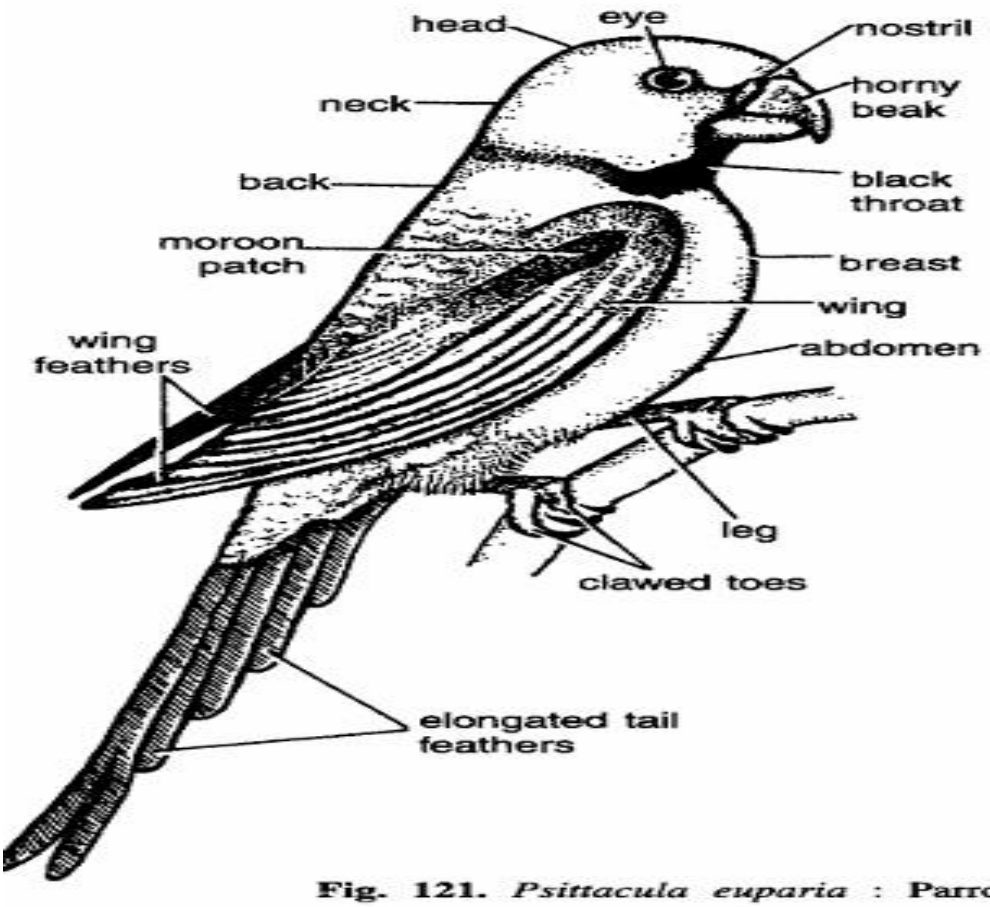


Fig. 121. *Psittacula euparia* : Parrot.

Identification of Psittacula euparia

Geographical distribution : Psittacula euparia is found in India, Pakistan, Myanmar, Sri Lanka and the United States. Eocene to Recent.

Habit and habitat : It is found on tall trees in flocks in city as well as in villages. It is also commonly found in the fruit trees, ripe crops and in jungles. Gregarious with loud voices. Feeds on fruits and crops.

Comments

1. Commonly called as Indian parakeet or parrot. Its Hindi name is Hiraman tota.
2. It has brilliant blue-green plumage with massive, deeply-hooked red bill and a distinct maroon patch on each shoulder. P. krameri has no shoulder patches, while P. cyanocephala has a bluish-red head and maroon shoulder patches.
3. Body is divisible into head, neck, back, breast and abdomen. Head contains eye, nostril and horny beaks.
4. Beak stout, narrow, sharp edged and hooked at the tip and adapted for fruit eating.
5. Upper mandible movable on frontal bone of skull. It is so articulated that its lowering automatically raises the upper beak, which is curved at the tip.
6. Feet adapted for grasping, holding and climbing. Foot zygodactylous in which I and IV digits are directed backwards and II and ill forward to provide a firm grip on the branch of the tree.
7. Tail feathers elongated. Maroon patches on wing feathers.
8. Flight is graceful and voice powerful.
9. Female is green all over, but the male has a rose pink and black neck collar ring.
10. Nesting season December to April.

Special features : Parrot is a popular domesticated cage bird, found almost in every home and it copies and speaks some words like man. It is a serious agricultural pest to the cultivators and food growers. It causes enormous harm to standing crops and ripening orchard fruits. It eats maize, pulse, groundnuts and sometimes does considerable damage in newly sown fields. Its voice is sharp, well familiar and screaming kee-ak, kee-ak, kee-ak, kee-ak.

Identification : Since this bird has green plumage and all above features, hence it is Psittacula.

CLASS MAMMALIA

33. FUNAMBULUS SQUIRREL

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Mammalia
Sub-class :- Theria
Infraclass :- Eutheria
Order :- Rodentia
Genus :- Funambulu

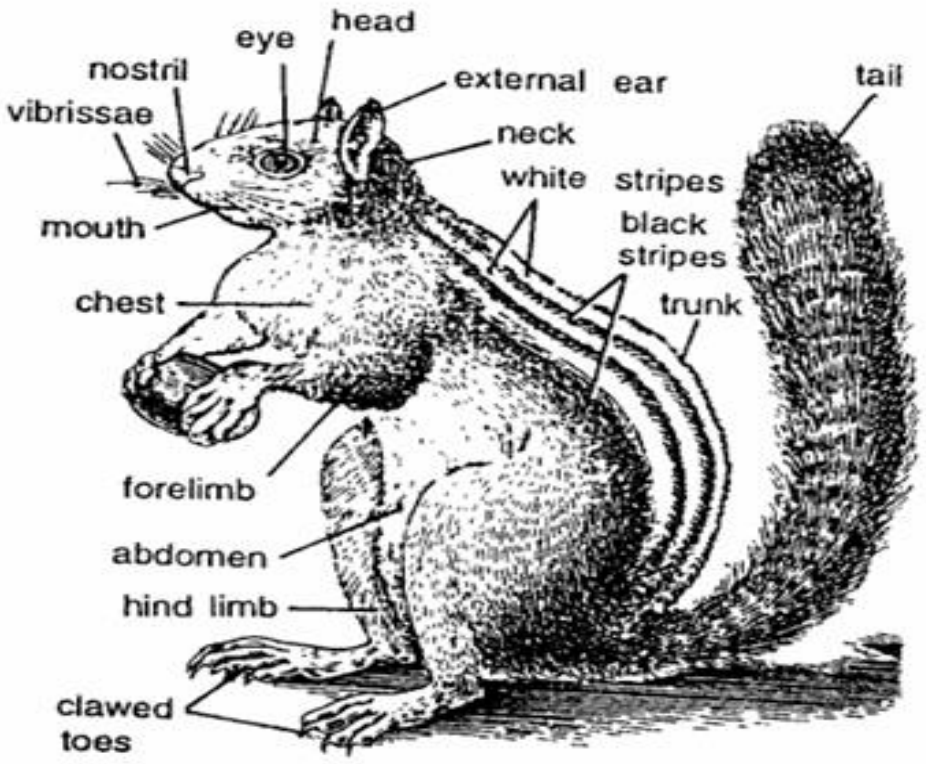


Fig. 148. *Funambulus* : Squirrel.

Identification of Funambulus

Geographical distribution : Funambulus has world-wide distribution. It is found on all continents and islands. Eocene to Recent.

Habit and habitat : It lives on trees, ground and is fast runner. It feeds on fruits and seeds. It builds nest of twigs and leaves. It is diurnal.

Comments

1. Commonly called as squirrel and in Hindi Gilahari.
2. Body contains three white and grey stripes on dorsal side, absent on neck.
3. Body divisible into head, neck, trunk or back, chest, abdomen and tail. Ventral side and limbs covered by small grey hairs.
4. Head contains snout with moustaches nostrils, large eyes and well developed pinnae.
5. Forelimbs and hind limbs well developed with clawed toes.
6. Tail elongated and bushy. Incisors exposed chisel-like, rootless, grow continuously, gap between incisors and cheek teeth, canine absent and upper and lower cheek teeth about equal size.
7. Palate narrow. Elbow joint rotates. Squirrel is also used for experimental ,mrposes. It is largely used in cancerous studies. Squirrel destroys fruit crops.

Identification : Since this mammal has bushy tail, stripes and above features, hence it is Squirrel (Funambulus).

34. LEPUS : HARE

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Mammalia
Sub-class :- Theria
Infraclass :- Eutheria
Order :- Insectivora
Genus :- Lepus

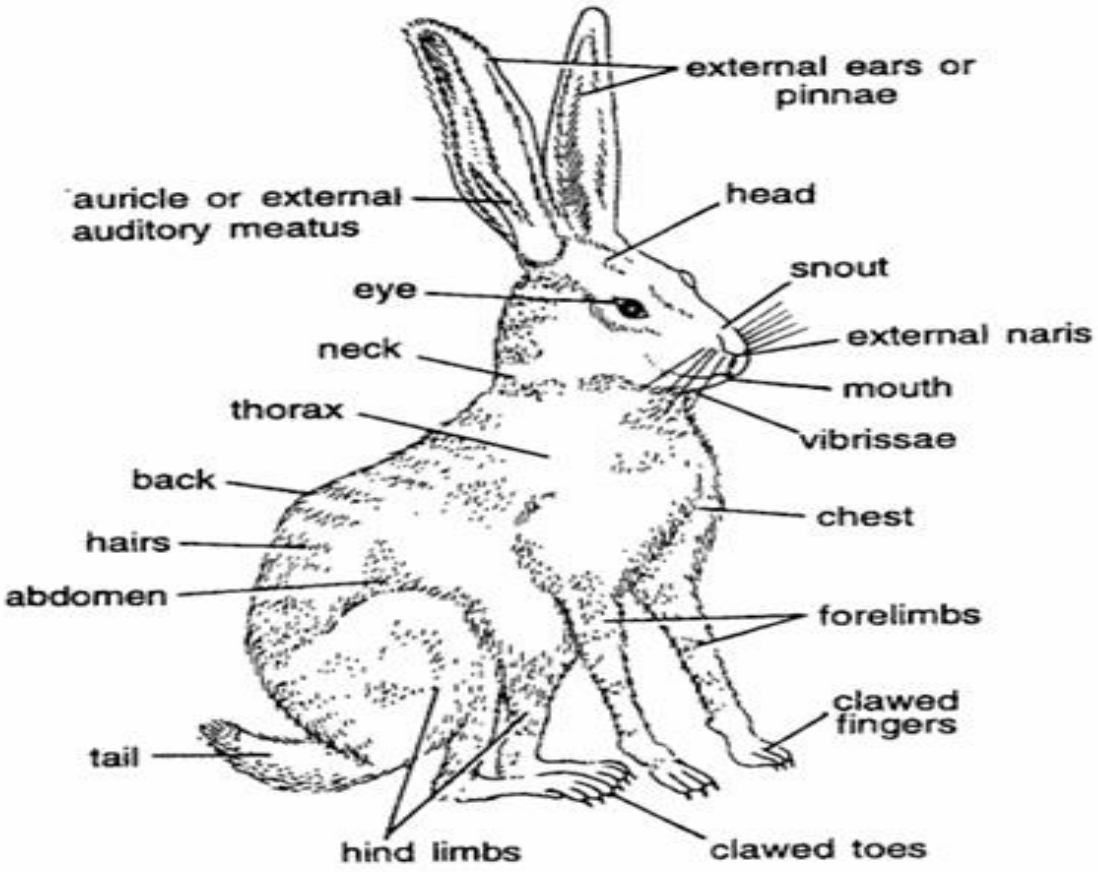


Fig. 147. *Lepus* : Hare.

Identification of lepus

Geographical distribution: Cosmopoliton. North Indian hare is Lepus ruficaudatus and South Indian hare is L. nigricollis.

Habit and habitat: Inhabiting fields, grasslands and woodlands. Gregarious, crepuscular (coming out of burrows for feeding in twilight, coprophagous (eating again their soft stool for maximum nourishment). Polyg~ous, nocturnal, solitary, nomadic and living in temporary shelters.

Comments

1. Commonly called as Hare.
2. Larger than rabbits. 50 to 70 cm long from mouth to anus. Body colour brown dorsally while ventral side is white.
3. Body divisible into head, neck, trunk or back, chest and abdomen.
4. Head contains eyes, tactile whiskers, nares, and longer erect external ears, snout, external nares and mouth.
5. Ears contain external auditory meatus.
6. Forelimbs and hind limbs more or less equal. Tail short and bushy. Runs at a speed of 60 kIn per hour. Wild hare can not be domesticated.

Identification : Since the animal has long erect pinnae and above features, hence it is Hare.

35. RATTUS RATTUS BLACK RAT

Classification:

Phylum :- Chordata
Group :- Craniata
Subphylum :- Vertebrata
Division :- Gnathostomata
Superclass :- Tetrapoda
Class :- Mammalia
Sub-class :- Theria
Infraclass :- Eutheria
Order :- Rodentia
Genus :- Rattus
Species :- rattus

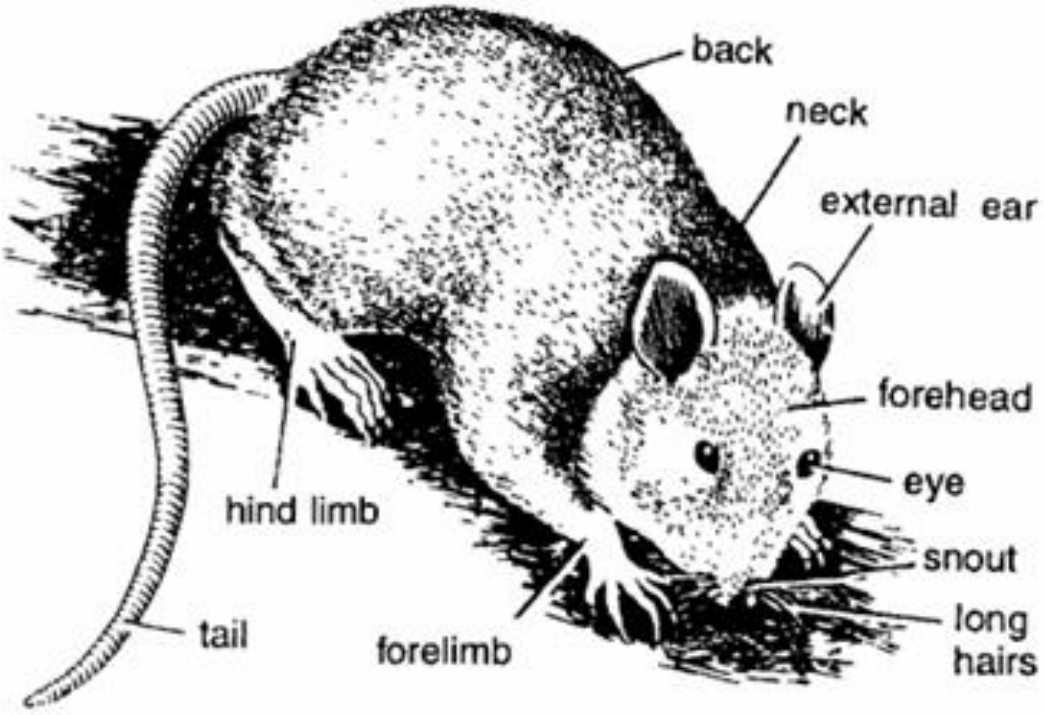


Fig. 149. *Rattus rattus.*

Identification of Rattus rattus

Geographical distribution : Rattus rattus is found in all parts of the world. It prefers warmer and drier conditions. Eocene to Recent.

Habit and habitat : It is a common rat inhabiting hokf and burrows in houses and in cultivated fields. It feeds on stored grains.

Comments

1. Commonly called as black rat.
2. Body divisible into head, neck, trunk and tail.
3. Head contains ears, eyes, nostrils, and snout with long moustache or vibrissae.
4. Body and limbs covered with hairs. Pinnae well developed. Eyes sharp. Rattus rattus.
5. Tail is elongated and scaly.
6. Incisor teeth chisel-like, open-rooted, used for gnawing. Canines absent. (8) ear long hairs Viviparous.

Special features : Rat destroys the crop and stored grains. It also spreads typhus fever and plague. It acts as carrier of these diseases. Rat has great experimental value. It is largely used in various biophysical and biochemical studies. It also acts as intermediate host for various helminthic diseases.

Identification : Since the animal has long vibrissae and above features, hence it is Rattus rattus.

BIODIVERSITY

33. Antipole cervicapra
34. Ardeotis nigriceps
35. Cursorius bitorquatus
36. Lophophorus impejanus
37. Grus antigone
38. Panthera leo
39. Platanista gangetica
40. Hylobates hoolock
41. Presbytis johnii
42. Equus hemionus
43. Macaca Silenus
44. Lepidochelys olivacea
45. Manis crassicaudata
46. Nilgiritragus hylocrius
47. Panthera unica

BIODIVERSITY
Antipole cervicapra

Identification character

1. It is commonly called as Black buck, also known as the Indian antelope.
2. It is native to India and Nepal.
3. It inhabits at grassy plains and lightly forested areas with perennial water sources.
4. The black buck is a moderately sized antelope.
5. Females and juveniles are yellowish-fawn to tan.
6. The male shows a two-toned colouration, while the upper parts and outside of the legs are dark brown to black.
7. During the 20th century, black buck numbers declined sharply due to excessive hunting, deforestation and habitat degradation.
8. The blackbuck is severely affected by natural calamities such as floods and drought, from which it can take as long as five years to recover.

Ardeotis nigriceps

Identification characters

1. *Ardeotis nigriceps* is commonly called the Great Indian bustard.
2. It is a large bird with a horizontal body and long bare legs.
3. The crown of the head is black and crested and is puffed up by displaying males. In females, it is smaller than in males.
4. It is distributed in semi-arid grasslands of central India.
5. It is listed as critically endangered in the IUCN Red List of threatened species lack of protection and hunting.
6. The body is brownish with a black patch spotted with white.
7. It is the heaviest bird among flying birds.
8. It is protected under the Wildlife Protection Act 1972 of India.

Cursorius bitorquatus

Identification Characters

1. It is commonly known as Double-banded.
2. It can be found locally in India in the Eastern Ghats of Andhra Pradesh.
3. It was first collected by Thomas C. Jordan.
4. It was then considered to be extinct for more than 80 years, until it was rediscovered in 1986 at the Cuddapah District, Andhra Pradesh.
5. They have long legs, short wings and long pointed bills which curve downwards.
6. They inhabit deserts and similar arid regions.
7. It is threatened by the exploitation of scrub forest, livestock grazing disturbance and quarrying.
8. There have been no confirmed sightings since 2009.

Lophophorus impejanus

Identification Characters

1. It is commonly known as the Himalayan Monal, also known as the Impeyan Monal and the Impeyan pheasant.
2. It is native to the Himalayan forests and shrublands at elevations of 2100 – 4500m.
3. It is the national bird of Nepal, where it is known as Monal.
4. It is relatively large sized pheasant; the bird is about 70cm long.
5. The adult male has multicoloured plumage, while female as in other pheasants, is more subdued in colour.
6. They native range extends from Afghanistan and Pakistan through the Himalayas in India, Nepal Southern Tibet and Bhutan.
7. In some areas, the species is threatened due to poaching and other anthropogenic factors.

Grus antigone

Identification Characters

1. It is commonly known as Sarus crane.
2. It is large non-migratory crane found in parts of Indian sub-continent, South East and Australia.
3. These are tallest flying birds, standing at a height of upto 1.8m.
4. It has overall grey colour and the contrasting red head and upper neck.
5. It is classified as vulnerable on the IUCN Red list.
6. Threats include habitat destruction and hunting, collecting, environmental pollution.
7. They forage on Marshes and Shallow wet lands for roots, tubers, insects, crustaceans and small vertebrate prey.

Panthera leo

Identification Characters

1. The *Panthera leo* is commonly known as “Lion” is a large cat of the genus Panthera native to Africa and India.
2. It has a muscular, deep-chested body, short rounded head, round ears, and a hairy tuft at the end of its tail.
3. It is sexually dimorphic, adult male lions are longer than females and have a prominent.
4. The lion habitats are grasslands, savannas and shrublands.
5. It is usually more diurnal than other Wild cats, but when persecuted, it adapts to being active at nights at twilight.
6. The lion is listed as vulnerable on the IUCN Red list.
7. African lions live in scattered populations across Sub-Saharan Africa.

Platanista gangetica

Identification Characters

1. It is commonly known as Ganges River dolphin.
2. The Ganges River dolphin has been recognized by the government of India as its National Aquatic Animal.
3. Ganges river dolphin usually are tan, chocolate brown or light blue.
4. They have an elongated, slender snout with sharp and very pointed teeth similar to most river dolphins.
5. The Ganges River dolphin has a rectangular, ridge like dorsal fin and females tend to be larger than males.
6. It lives in the Ganges and related rivers of South Asia, namely in the countries of India, Nepal and Bangladesh.
7. The Ganges River dolphin has been listed as endangered under the IUCN Red List since 1996.

Hylobates hoolock

Identification Characters

1. Hylobates are native to Eastern Bangladesh, North East India, Myanmar and South West China.
2. They search a size of 60 to 90cm and weight 6 to 9 kg.
3. The sexes are about the same size, but they differ considerably in coloration.
4. Males are black coloured with remarkable White brows, while females have a grey brown fur which is darker at the chest and neck.
5. They are diurnal and arbored, brachiating through the trees, with their long arms.
6. Their diet consists mainly of fruits, insects, and leaves.
7. Their life expectancy in the wild is about 25 years.

Presbytis johnii

Identification Characters

1. These are also known as “Surlis”.
2. These are in the group called “Old World Monkeys”.
3. They live in Thai- Malay Peninsula, on Sumatra, Borneo, Java and smaller nearby Islands.
4. Besides Surli, these are also known as “Langur” or “Leaf Monkey”.
5. These are diurnal forest dwellers; they spend nearly their entire live in the trees.
6. These are threatened species by hunting.
7. These are rated as vulnerable or worse by IUCN.

Equus hemionus

Identification Characters

1. It is commonly known as “Onager” also known as “Hemione” or Asiatic wild ass.
2. The anagers favoured habitats consists of desert plains, semi deserts, oasis and grasslands, savannahs, Mountain ranges.
3. They are reddish-brown or yellowish brown in colour and have broad dorsal stripe on the middle of the back.
4. The greatest threat facing the Onager is poaching for meat and in some areas for use in traditional medicine.
5. Asiatic wild ass is larger than the African wild ass.
6. Onagers are the most horse like wild asses.
7. They are short legged compared to horses and their colouring varies depending on season.
8. Male Onagers are usually larger than females.

Macaca Silenus

Identification Characters

1. It is commonly known as “Lion tail macaque”, also known as “Wandero”.
2. It is an old world Monkey, endemic to the Western ghats of South India.
3. They are covered in black fur and have a striking grey or silver mane that surrounds their face.
4. The face itself is hairless and black.
5. Its tail is long, thin and naked with a lion like black tail tuft at the tip.
6. The largest threat for them is fragmentation of habitat.
7. It occurs by large amount of timber harvesting and exotic plantation.
8. Second largest threat is from humans hunting and trapping them for meat.

Lepidochelys olivacea

Identification Characters

1. It is commonly known as “Olive ridely sea turtle”.
2. It is also known to be Pacific ridely sea turtle.
3. It is found in warm and tropical waters primarily in the Pacific and Indian oceans, but also in warm waters of Atlantic Ocean.
4. It is heart shaped and rounded.
5. Olive ridely is predominantly carnivorous, especially in immature stage of its life cycle.
6. They are vulnerable species according to the IUCN.
7. These are endangered because of their few remaining nesting sites in the world.

Manis crassicaudata

Identification Characters

1. It is commonly known as Indian pangolin and scaly anteater.
2. It is native to Indian subcontinent.
3. It has large, overlapping scales varies on its body which acts as armour.
4. The colour of the scales varies depending on the colour of the earth in surroundings.
5. Indian pangolins are principally threatened by hunting for local use and consumption and poaching.
6. Distributed in South Asia, including Pakistan, India, Nepal, Bangladesh and Srilanka.
7. Solitary and nocturnal, Indian pangolins excavate deep burrows for shelter.
8. It is medium sized mammal, typically reaching a weight of 8-16kg and a maximum length of 148cm.

Nilgiritragus hylocrius

Identification Characters

1. It is commonly known as Nilgiri tahr.
2. It is a stocky goat with short, coarse fur and a bristly mane.
3. Males are larger than females and of darker colour when mature.
4. Adult males develop a light grey area on their backs, thus are called “Saddle backs”.
5. It is endemic to Nilgiri hills and the Southern portion of the Western and Eastern Ghats in the states of Tamil Nadu and Kerala in Southern India.
6. It is the only species in the genus Nilgiritragus.
7. Both sexes have curved horns, reaching upto 40cm for males and 30cm for females.

Pantherea unica

Identification characters

1. It is commonly known as Snow leopard.
2. This species is native to the mountain ranges of central and South Asia.
3. It inhabits alpine and subalpine zones.
4. It is threatened by poaching and habitat destruction.
5. They have thick white-grey coat spotted with large black rosettes blends in perfectly with Asias steep and rocky, high mountains.
6. Their incredible natural camouflage, rendering them almost invisible in their surroundings.
7. They are often referred to as the “Ghost of the Mountains”.
8. It is listed as vulnerable on the IUCN Red list.

Prof. K. Sunita