

S. S. College, Jehanabad

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Topic: Classification of fishes

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Q. 2

M. Sc. Zoology 4th sem.

17

Fish - 13th paper

Q. 2. Classification of Fishes.

→

Fishes are true first successful class of the phylum chordata. Due to their success they are found in large number of genus & species not only in present but were also found in the past. About 40,000 living species are present in the entire world. All of them are built on a fundamental plan and possesses the following characters:

(i) Fishes are cold blooded, poikilothermal vertebrate.

(ii) The movement & the equilibrium of the body maintained by the the paired & unpaired fins.

(iii) The body is covered with the dermal scales.

(iv) The organ of respiration is the gill.

(v) The notochord is partially replaced by the development of vertebrae.

(vi) A single circuit venous heart is present.

(vii) Skull and visceral arches are well developed.

- (viii) Internal ear with three semicircular canal.
- (ix) The lateral line sense organs are well developed.
- (x) The dorsal and ventral roots of the spinal nerves are united.
- (xi) Most of the nerves are united.
- (xii) The kidney is mesonephric;

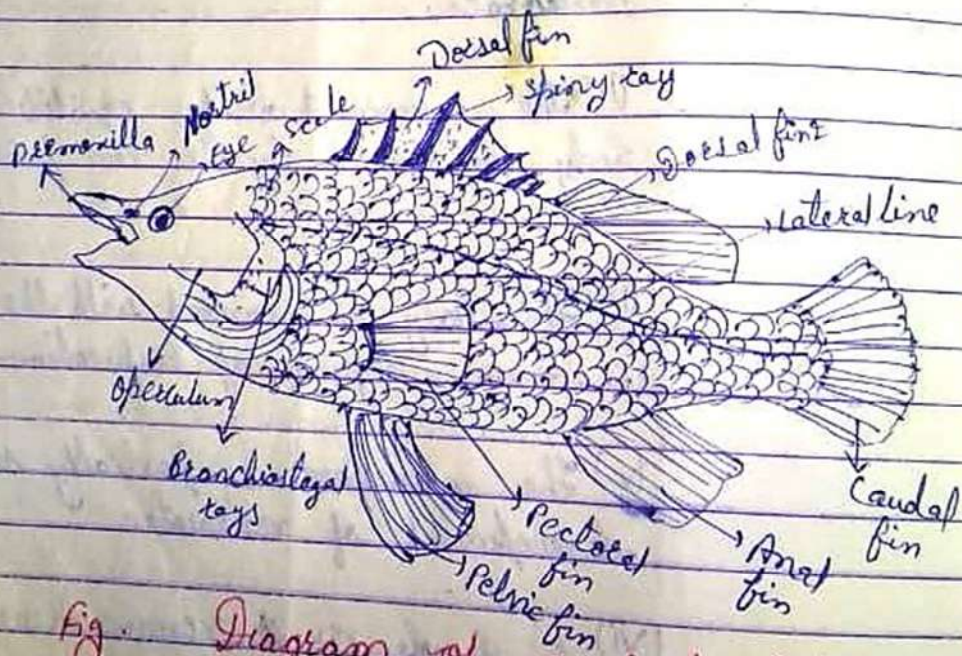


Fig. Diagram of a scaly fish

classification → The classification of fishes is very difficult task in the science of ichthyology. Due to complete lack of fossils record of transitional form, the vision of fishes is unsatisfactory.

J. Muller (1874) for the first time classified the lower chordates.

Regan (1906-1929) gave the elaborate classification of fishes in several of his papers.

Recent authors Goodrich (1930), Berg (1940), Grass (1958), Romer (1959) have given a detail classification of fishes.

The Berg classification (1940) is super class ϕ summarised as below :-

Series :- Pisces

These are aquatic crinathostomes having gills as the respiratory organs and fins for locomotion. These are divided into seven classes :-

1. Pterychthys (extinct)
2. Coecostei (extinct)
3. Acanthodii
4. Elasmobranchii
5. Holoccephali
6. Dipnoi ϕ
7. Teleostomi

→ (1) Pterichthys (extinct) →

(i) Head and the anterior part of the body is covered with bony carapace.

(ii) An operculum is present.

(iii) Pectoral fins are paddle-like with a bony covering.

(iv) Tail is heterocercal.

(v) One or two fins are present & nostrils are two.

(vi) Eyes are placed close together on the dorsal surface & there is a pineal opening between them.

Ex: Pterichthys.

→ (2) Cocosteus (extinct) →

(i) Head and the anterior part of the body is covered with a bony carapace consisting of large plates.

(ii) Notochord persistent.

(iii) External gill aperture present between the head & body carapace.

(iv) Neural and haemal arches are ossified.

(v) A dorsal fin is present.

Ex: Cocosteus.

→ (3) Acanthodii →

(i) Endoskeleton consisting of true bones.

(ii) A gill slit is present between the mandibular arch and the hyoid arch.

- (iii) four or five branchial arches are present.
 - (iv) Body covered with small ganoid scales.
 - (v) Air operculum is present.
 - (vi) Caudal fin is heterocercal.
- Ex - *Channina*.

→ (4.) Elasmobranchii →

- (i) Endoskeleton is cartilaginous.
 - (ii) Placoid scales present on the body.
 - (iii) No operculum.
 - (iv) Five to seven gill apertures are present on each side.
 - (v) Skull is hyostylic or amphistylic.
 - (vi) There is no air bladder.
- Ex - *Squalodon*, *Pristis*, *Dasyatis*.

→ (5.) Holocephali →

- (i) Endoskeleton is cartilaginous.
 - (ii) Skull is holostylic, palatoquadrate fused with the cranium.
 - (iii) An operculum is present.
 - (iv) Teeth are in the form of grinding plates.
 - (v) There is no cloaca.
- Ex → *Chimaera*.

→ (6.) Dipnoi →

- (i) These are lung fishes, air bladder serving for aerial respiration.

- (ii) operculum is present & there is only one external branchial aperture.
- (iii) Body covered with cycloid scales.
- (iv) Skull is autostylic.
- (v) Notochord is persistent.
- (vi) Internal nostrils are present.
- (vii) A cloaca is present.

Ex: Protopterus, Lepidosiren, Neoceratodus.

→ (7) Teleostomi →

- (i) Skull is hyostylic.
- (ii) An operculum is present & there is only one external branchial aperture.
- (iii) Air bladder usually present.
- (iv) No cloaca.

Teleostomi are divided into two subclasses:-

- [A] Crossopterygii and
- [B] Actinopterygii

(A) Crossopterygii →

- (i) Paired fins with a scale covered lobe and supported by an endoskeleton consisting of a jointed median axis with radials on each side.
- (ii) Internal nostrils are present.
- (iii) Scales cosmoid or cycloid.

Ex: Latimeria.

Crossopterygii further divided into two super orders:-
(a) osteolepids & (b) coelocanthii.

(a) Osteolepids →

- (i) caudal fin heterocercal.
- (ii) scale covered with coriaceous layer.
- (iii) ~~Sub~~ Sub opercular ectopterygoid well developed.
- (iv) occurred from lower Devonian period to upper Carboniferous period.

Super order osteolepids further divided into three order :-

(i) Osteolepiformes →

- (a) Scales are rhomboid type.
 - (b) Paired fins with short rounded lobe.
- Ex: Osteolepis

(ii) Holoptychiformes →

- (a) Scales are cycloid type.
 - (b) Paired fins with acute long lobed lobe.
 - (c) vertebrae centra absent.
- Ex: Gelyptolepis, Holoptychius.

(iii) Rhizodontiformes →

- (a) Scales are cycloid type.
- (b) vertebrae Paired fin with short rounded lobe.

Ex: Rhizodus, Steepodus

(b) Coelacanthii →

- (i) caudal fin diphyccercal having three bones.
- (ii) Sub order is absent.

Super order Coclocanthi has only one order -

- (i) Coclocanthus →
 - (a) Scales cycloid
 - (b) occurred from Devonian to recent.
- Ex → Labeomera (living)

(B) Actinopterygii →

- (i) Paired fins without muscular lobe and radials are not arranged biserially.
- (ii) No internal nostrils.
- (iii) Scales are ganoid type.

This subclass includes all the bony fishes. Actinopterygii have ~~one~~ one super order is found in Actinopterygii -

Polypteriformes → Scales are rhombic, ganoid type with tentacles. It is divided into a series of orders. It includes 59 orders.

- | | |
|--------------------------------|--------------------------------|
| (1) <u>Acipenseriformes</u> | (11) <u>Clupeiformes</u> |
| (2) <u>Amiiformes</u> | (12) <u>Cypriniformes</u> |
| (3) <u>Aspidochynchiformes</u> | (13) <u>Cyprinodontiformes</u> |
| (4) <u>Anguilliformes</u> | (14) <u>Characiformes</u> |
| (5) <u>Braconiformes</u> | (15) <u>Dasypteriformes</u> |
| (6) <u>Bathylacanthiformes</u> | (16) <u>Dactylopteriformes</u> |
| (7) <u>Beryciformes</u> | (17) <u>Echeocetiformes</u> |
| (8) <u>Batrachoides</u> | (18) <u>Crocodiformes</u> |
| (9) <u>Belontiiformes</u> | (19) <u>Ceratacei</u> |

- | | |
|---------------------------|------------------------|
| (20) Crastereostei formes | (41) Pycnodonti formes |
| (21) Gymnaronisei " | (42) Phaciodontei " |
| (22) Crabieisei " | (43) Phaciodontei " |
| (23) Criganteri " | (44) Poegneri " |
| (24) Halosauri " | (45) Phamerathyraki " |
| (25) Kosteii " | (46) Petropsi " |
| (26) Kamprii " | (47) Pachycorpi " |
| (27) Lophii " | (48) Redfieldi " |
| (28) Lepida " | (49) Rhallostei " |
| (29) Moemyxi " | (50) Saurichthyi " |
| (30) Mugili " | (51) Symbianchi " |
| (31) Mustacomboli " | (52) Scapeli " |
| (32) Mucurui " | (53) Stephanobeyei " |
| (33) Notodontii " | (54) Succapharyngii " |
| (34) Ospil " | (55) Syngnathi " |
| (35) Sphinocephali " | (56) Tazzati " |
| (36) Palaeonisa " | (57) Thinni " |
| (37) Plebidi " | (58) Tetradonti " |
| (38) Pegasi " | (59) Zei " |
| (39) Perci " | |
| (40) Pleuronecto " | |

Note: Red ticked orders are important orders.
 These orders can be described as follows: →

The 59 orders are very vast therefore the important orders can be studied in details: →

(1) Acipenseriformes →

- (i) Body elongated & covered with 5 rows of bony scales.
- (ii) Snout elongated.
- (iii) caudal fin heterocercal.
- (iv) Endocranium cartilaginous.

Ex → Acipenser

(2) Amia →

- (i) Body elongated
- (ii) vertebrae nonopisthocercous.
- (iii) Pectoral radials are attached with the scapular coracoid.

Ex = Amia

(3) Anguilliformes →

- (i) Body Eel like
- (ii) Skin is naked (without scales).
- (iii) Air bladder present.
- (iv) Dorsal & anal fins are long.

Ex = Anguilla & muraena

(4) Belontiiformes →

- (i) Body covered with cycloid scales.
- (ii) They are capable to jump in the air and glide over the surface of water by enlarged pectoral fins.

Ex = Exocoelus (flying fish).

(5) Beryci forms \rightarrow

(i) Marine.

(ii) Dorsal fins are well developed.

Ex: Cephaloxyberys.(6) Batrachoidi forms \rightarrow

(i) Body is scaleless.

(ii) Three pairs of gill.

(iii) Has large head with eyes.

Ex: Batrachus.(7) Clupei forms \rightarrow

(i) Scale cycloids.

(ii) Caudal fin Homocercal

(iii) Abdomen peeled & sp separated

(iv) Dorsal and anal fin without spine.

Ex: Notopterus, Salma & Clupea.(8) Cyprini forms \rightarrow

(i) Presence of weberian apparatus.

(ii) Air bladder connected with the Alimentary canal by a duct.

(iii) Dorsal, Anal & Pectoral fin have a spine² each.Cyprini forms further divide into two divisions:(a) Cyprini \rightarrow

(i) Body covered with scale or naked.

(ii) IIIrd & IVth vertebrae are not fused with each other.

Ex: Labeo, Catla.

(8) Silurii \rightarrow

(i) Body naked.

(ii) IInd, IIIrd, IVth & some times Vth vertebrae fused.

Ex: Wallago, Clarias.

(9) Cyprinodonti formes \rightarrow

(i) Small size fish.

(ii) Lateral line absent.

(iii) Herbivorous in habit.

Ex: Gambusia affinis.

(10) Dactylopteri formes \rightarrow

(i) Body Angular.

(ii) Head blunt with strong spines of feel.

Ex: Dactyloptera orientalis.

(11) Echeini formes \rightarrow

(i) first dorsal fin is modified to form an adhesive sucker for attachment.

(ii) scales cycloid & no air bladder.

(iii) No spines in second dorsal & Anal fins.

Ex: Echeinis (Sucker fish)

(12) Codi formes \rightarrow

(i) Body with long anal fins.

Ex: Bregmaceros macellandi.

(13) Crasterostei formes \rightarrow (i) small body & dorsal fin with V or VIIth spine. Ex: Crasterosteus aculeatus.(14) Lepidostei formes \rightarrow

(i) Skin with rhombic ganoid scales.

(i) Air bladder cellular.

(ii) Nasal opening at the end of snout.

Ex: Lepidosteus.

(15) Lampridi forms →

(i) fin without true spines.

(ii) upper jaw is protrusible.

Ex: Velifer.

(16) Staphii forms →

(i) First ray of the spines of dorsal fin is placoid on the head.

(ii) Ethmoid sphenoid, basic sphenoid & episthatic bone absent.

Ex: Lophius.

(17) Moemyi forms →

(i) Have an electric organ which are fused in an apical plate.

Ex: Moemyx.

(18) Mugilia forms →

(i) Fresh & Marine (Both)

(ii) Body elongated & dorsal fin fused.

(iii) Head covered with scales, scales cycloid/ctenoid.

Ex: Rhinmugil, Silamugil.

(19) Mustacomboli forms →

(i) Fresh water fish (Eel shaped)

(ii) Dorsal, caudal & Anal fin confluent.

(iv) Anal fin with 3 spines & some free spines present before dorsal.
Ex: - Mastacemolus armatus.

(20) Notocanthii formes \rightarrow

- (i) Body eel like.
- (ii) Swim bladder present.
- (iii) Caudal fin skeleton reduced.

Ex \rightarrow Notocanthus.

(21) Aphiocephali formes \rightarrow

- (i) Fins without spines.
- (ii) Accessory respiratory organ present.

Ex \rightarrow Channa species.

(22) Pleuronecti formes \rightarrow (Pleuronecte formes) \rightarrow

- (i) Fins without spines.
- (ii) Body adapted for bottom living.
- (iii) Skull asymmetrical.

Ex: - Pleuronectus.

(23) Percii formes \rightarrow (Perci formes) \rightarrow

- (i) Fins with spines.
- (ii) Two dorsal fin present.
- (iii) Weberian apparatus present.

Ex: - climbing perch

(24) Pegasi formes \rightarrow

- (i) Body with bony plates.
- (ii) Gill opening reduced a narrow lateral opening.
- (iii) Air bladder absent.

Ex: - Peagabus.

(25) *Scopeliiformes* :-

- (i) Adipose fin present.
- (ii) Dorsal and anal fin without spines.
- (iii) Laminous organ present.

Ex: *Matipoda*.

(26) *Syngnathiiformes* :-

- (i) Body composed with bony rings.
- (ii) Snout tubiform.

Ex: *Hippocampus*.

(27) *Symbotanchiiformes* :-

- (i) Body eel like.
- (ii) Dorsal, caudal & anal fins are continuous.
- (iii) Gill slits single.

Ex: *Amphiprion*, *Lucania*.

(28) *Tetraodontiiformes* :-

- (i) Scales are modified into spines.

Ex: *Psettodes*, *Tetraodon*.

(29) *Zeiiformes* :-

- (i) Pelvic fin with one spine.
- (ii) Anal fin with 1-4 spine.
- (iii) Body thin & deep.

Ex: *Zenitia*.

L.S. Berg's classification of fishes

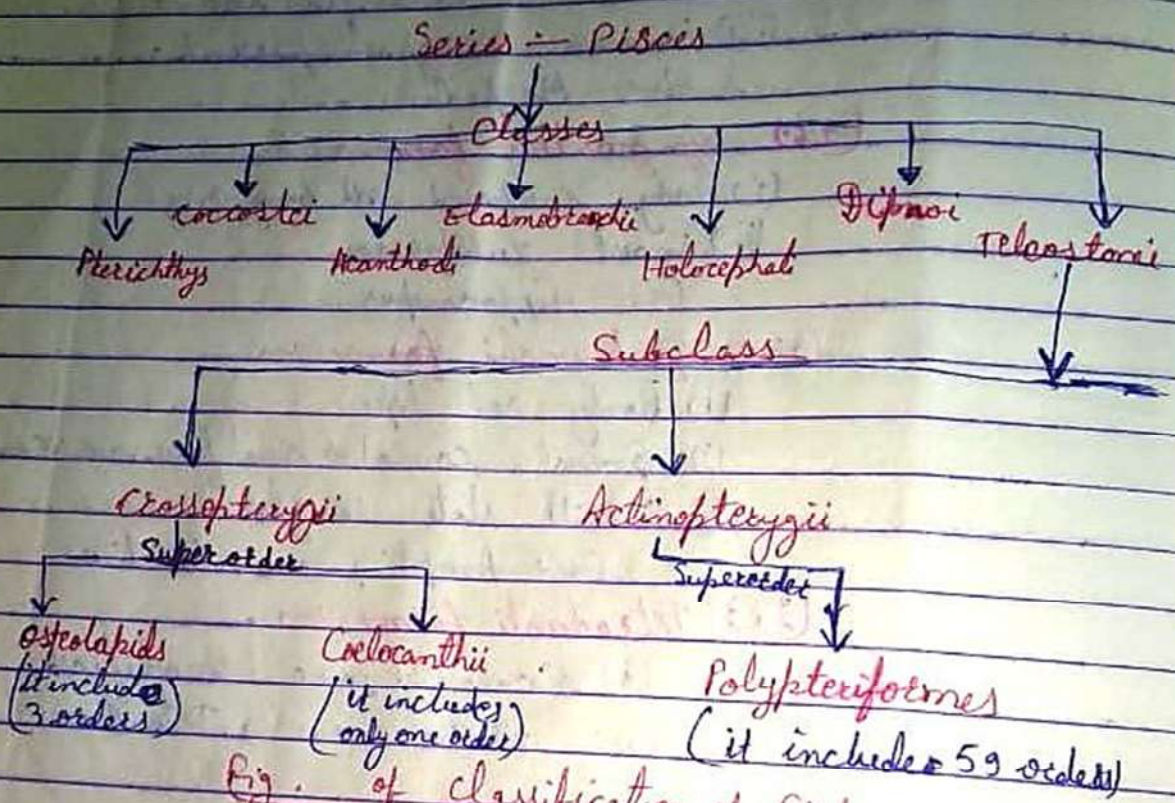


Fig. of classification of fish.