Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First Year)

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Paper Title: Diversity of Chordates and Genetics.

Unit: Pisces

Module Name: Classification of Pisces (Osteichthyes)

Module No: 8

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Notes

General characteristics of Osteichthyes

(Gr., osteon= bone; ichthys = fish)

Inhabit all types of water-fresh, brackish, or salt; warm or cold.

Body spindle-shaped and streamlined.

Fins both median and paired, supported by fin rays of cartilage or bone. Tail usually homocercal.

Skin with many mucous glands, usually embedded dermal scales of three types: ganoid, cycloid and ctenoid. Some fishes without scales. No placoid scales.

Endoskeleton chiefly of bone. Cartilage in sturgeons and some others. Notochord replaced by distinct vertebrae. Pelvic girdle usually small and simple or absent. Claspers absent.

Mouth terminal or subterminal. Jaws usually with teeth. Cloaca absent, anus present.

Respiration by gills. Four pairs of gills on bony gill-arches, covered by a common operculum on either side.

An air-bladder or swim-bladder often present with or without duct connected to pharynx. Lung-like in some (Dipnoi).

Ventral heart 2-chambered (1 auricle + 1 ventricle). Sinus venosus and conus arteriosus present. Aortic arches four pairs. Erythrocytes oval, nucleated. Temperature variable (poikilothermal).

Adult kidneys mesonephric. Excretion ureotelic.

Brain with very small olfactory lobes, small cerebrum and well-developed optic lobes and cerebellum. Cranial nerves ten pairs.

Lateral line system well developed. Internal ear with three semi-circular canals.

Sexes separate. Gonads paired.

Fertilisation usually external. Mostly oviparous rarely ovoviviparous. Egg minute to 12mm in size cleavage meroblastic.

Development direct, rarely with metamorphosis.

Classification of Osteichthyes

Class Osteichthyes includes a large assemblage of true bony fishes. There are well over 30,000- 40,000 living species, both fresh water and marine. The classification of class Osteichthyes described here has been largely followed after A.S. Romer (1966) which has also been followed by most authors, including Storer and Usinger.

Class Osteichthyes is divided into two sub-classes : Sarcopterygii and Actinopterygii

Subclass I. Sarcopterygii

(Gr., sarcos = fleshy; pterygium = fin)

Paired fins leg-like or lobed, with a fleshy, bony central axis covered by scales.

Popularly called fleshy or lobe finned, or air breathing fish.

Sarcopterygii has been divided into two orders : Crossopterygii and Dipnoi.

Order 1. Crossopterygii

(Gr., crossoi = a fringe; pteryx = fin)

Paired fins lobed covered with scales. Pectoral fins are supported by a jointed median axis bearing radials. Caudal fin three – lobed.

Spiracles present.

Air-bladder vestigial.

Example: Latimeria.

Order 2. Dipnoi

(Gr., di= double ; pnoe = breathing)

Cycloid scales covering the skin.

Single gill-slit on either side present and covered by operculum.

Paired fins lobed.

Air- bladder single or paired, lung-like.

Example : Protopterus.

Subclass II. Actinopterygii

(Gr., actis = ray ; pteryx = fin)

Includes all ray-finned fishes.

Paired fins thin, broad, without fleshy basal lobes and supported by dermal fin-rays.

Tail generally homocercal, in a few heterocercal or semi-herterocercal.

Scales either ganoid or reduced to thin horny structures or completely absent in some.

Actinopterygii is divided into three superorders: Chondrostei, Holostei and Teleostei.

Superorder A : Chondrostei

Primitive ray finned fishes or cartilaginous ganoids.

Tail fin heterocercal.

Scales usually ganoid.

Order 1. Polypteriformes

Typical rhomboid ganoid scales.

Dorsal fin of eight or more finlets.

Air-bladder bilobed opening into the intestine ventrally.

Example: Polypterus (Bichir).

Order 2. Acipenseriformes

Body covered with five rows of bony scutes.

Snout elongated, having barbels on the ventral surface.

Caudal fin heterocercal.

Example: Polydon (Paddle-fish).

Superorder B. Holostei

(Gr., holos = entire; osteon = bone).
Intermediate ray-finned fish, transitional between Chondrostei and Teleostei.
Ganoid or cycloid scales.
Tail fin heterocercal.
Mouth opening small.

Order 1. Amiiformes

Thin, overlapping cycloid scales.
Caudal fin abbreviate heterocercal.
Long dorsal fin.
Example: Amia (Bowfin).

Order 2 . Semionotiformes

Scales rhomboidal ganoid and in oblique rows.
Body elongated.
Nasal opening at end of much elongated snout.
Example: Lepisosteus (Gar- pike).

Superorder C. Teleostei

(Gr. teleos = complete; ostgon bone)
Scales cycloid, ctenoid or absent.
Mouth terminal, small.
Tail fin mostly heterocercal.
Endoskeleton more or less bony.

Order 1- Clupeiformes

Scales cycloid and well developed.

Caudal fin homocercal.

Air bladder communicate with the pharynx.

Examples: Salmo (Atlantic salmon), Sardinops (Pacific sardine).

Order 2 . Scopeliformes

Deep sea fishes having phosphorescent organs.

Dorsal and anal fins without spines. An adipose fin present.

Mouth wide and provided with numerous small teeth.

Example : Harpodon (Mumbai duck).

Order 3. Cypriniformes or Ostariophysi

Fins either without spines or dorsal, anal and pectoral have a spine each.

Ventral (pelvic) fins abdominal.

A peculiar Weberian apparatus, connecting the internal ear with the air-bladder, present.

Example : Labeo (Rohu).

Order 4. Anguiliformes

Body elongated eel-like or snake-like.

Dorsal and anal fins long and confluent behind pelvic fins, if present, abdominal.

Fins devoid of spines.

Example: Anguilla (Freshwater eel).

Order 5. Beloniformes (Synentognathi)

Body elongated covered with cycloid scales.

Pectoral fins large and high on body.

Some of them are capable of jumping into the air and glide with the help of enlarged pectoral fins.

Example : Belone or Xenentodon (Garfish).

Order 6. Syngnathiformes (Solenichthyes)

Body, covered with protective layer of scales or bony rings.

Snout tubular with suctorial mouth.

Males possess brood pouch for the development of the young.

Examples : Hippocampus (Sea horse), Syngnathus (Pipe fish).

Order 7. Ophiocephaliformes or Channiformes

Body covered with cycloid scales.

Head depressed, covered with plate-like- scales.

Accessory respiratory organs present.

Example : Ophiocephalus.

Order 8. Symbranchiformes

Body elongated eel-like or snake-like devoid of scales.

Dorsal, caudal and anal fins continuous. Pectoral fins absent.

Air-bladder absent.

Examples : Amphipnous, Symbranchus (Eels).

Order 9. Mastacembeliformes

Freshwater eel-like fishes.
Nostrils on tubular tentacles at the end of snout.
Buccal cavity enlarged for air breathing.
Examples : Mastacembelus, Macrognathus.

Order 10. Perciformes or (Percomorphi).

Two dorsal fins, ventral (pelvic) fins thoracic with not more than 6 rays.
Fins usually with spines.
Weberian apparatus absent.
Air bladder without duct.
Example : Anabas (Climbing perch).

Order 11. Scorpaeniformes

Enlarged heads and pectoral fins.
Projecting spines from gill-covering.
Example: Pterois (Scorpion fish).

Order 12. Pleuronectiformes
Bottom dwellers.
Body flat, lying on one side, adapted for bottom living.
Head asymmetrical.
Both eyes present on the upper or dorsal side and close to each other.

Examples : Synaptura, Pleuronectes.

Order 13. Echeneiformes (Discocephali)

Body covered with cycloid scales.

First dorsal fin modified into a flat oval adhesive disc on head for attachment.

It possesses 12-28 transverse ridges which are modified spines.

Example : Echeneis or Remora (Sucker fish).

Order 14. Tetradontiformes (Plectognathi)

Body usually globular.

Body scales modified into spines. Scutes or bony plates cover the body.

Strong jaws with a sharp beak.

Gill-slits small like a hole on either side of fish in front of pectorals.

Examples: Tetrodon (Globe fish), Ostracion (Coffer fish or Trunk fish).

Order 15. Lophiiformes (Pediculati)

First ray of spinous dorsal fin placed on the head is transformed into a fishing organ consisting of a rod (illicium) and a lure called esca.

Mouth large with long pointed teeth.

Body with minute scales or scaleless.

Luminescent organs present.

Example : Antennarius (Angular fishes).