INTRODUCTION TO FISH MANAGEMENT

FIS201

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INTRODUCTION

Fish are poikilothermic or cold blooded animals that live in the aquatic environment

Most fish, especially the recent species, have scales on their body and survive in the aquatic environment by the use of gills for respiration.

Another major characteristic of a typical fish is the presence of the operculum which covers the gills on the posterior.

ICHTHYOLOGY

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- Ichthyology is the scientific study of fish.
- Fish, because of the possession of notochord belong to the phylum Chordata

Fish are the most numerous vertebrates. About 20,000 species are known to science

FISH TAXONOMY

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Taxonomy is the scientific classification of organisms

WHY TAXONOMY?

To know/identify the different components in a fish population.

To study the population dynamics in a population. (Number of each species in a population.)

Important in fish culture – to know the species of fish that is most suitable for culture.

HOW TO IDENTIFY FISH

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NAMES

Confusion can be avoided only by using the Latin/scientific names which are the same worldwide, while vernacular names are often different in locations only fifty miles apart.

SPECIES

Any group of fish, or of any other animal for that matter, whose members are similar in structure and appearance and are capable of breeding among themselves belong to the same species.

GENUS

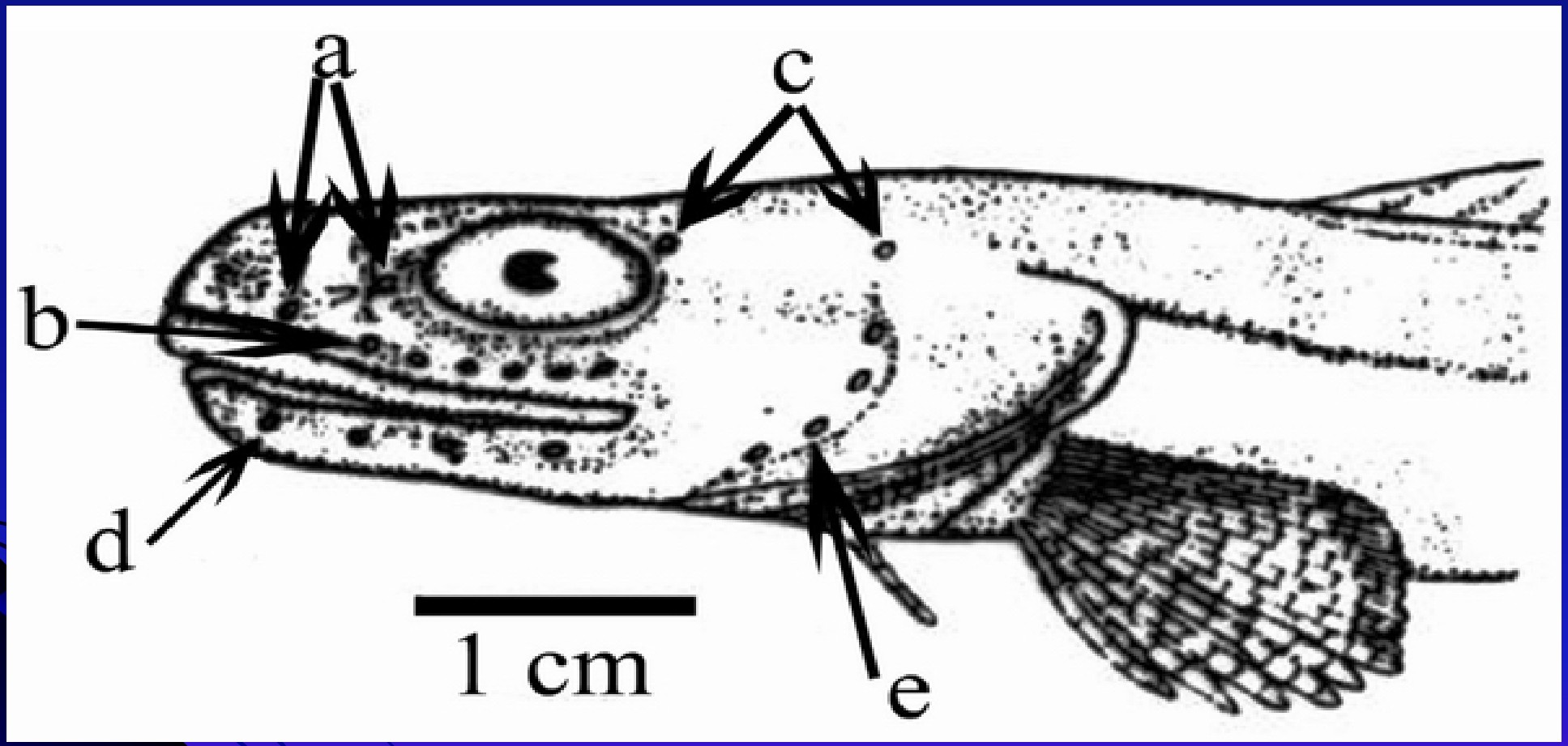
A genus encompasses a group of species, which are closely related to one another and are therefore usually similar in appearance.

Generic names begin with a **capital letter**, and both generic and specific names are *italicized*.

MERISTIC FEATURES

The most vital external characteristic for identifying fish is the fin ray counts, especially those of the dorsal and anal fins.

HEAD PORE PATTERN IN *OPHTHALMOLYCUS MACROPS*



a) Nasal, b) Suborbital, c) Postorbital, d) Mandibular, and e) Preopercular

Spines

The number of spines and or rays in the dorsal and anal fins is generally the most consistent character in a species; and is seldom the same in different species.

RAYS

Each fin is made up of a number of rays, which are usually bony and flexible, and may be either simple or branched

DORSAL FINS

Some West African species have two dorsal fins, the posterior of which is often soft, fleshy tissue and are thus termed an adipose fin. The size and shape of the adipose fin is sometimes given as a clue to the identity of a species.

CAUDAL FIN

The caudal fin (or tail fin) of most fish is lobed; i.e. it is forked and has the upper and lower lobes attenuated to points. It can also be rounded or truncate.

MOUTH

- The position of the mouth is sometimes given when describing a species.
- A mouth is said to be terminal when it is at the extreme tip of the snout.

It is a general rule that fish with mouths in an inferior position, like most catfish and carps feed on detritus, worms, algae and bottom dwelling organisms

Fish with terminal mouths, such as perch and tiger fish, are usually predators or plankton feeders.

Cyprinodonts and others with oblique mouths usually feed on insects or their larvae which they take from the surface of the water.

TEETH

The position and character of teeth are sometimes important in the classification of fish.

The terms used to describe positions of teeth are:

- Premaxillary- teeth in the front margin of the upper jaw,
- Maxillary- teeth on the sides of the upper jaw on a separate bone;
- Mandibular- teeth on the margin of the lower jaw;
- Vomerine- teeth on the front part of the roof of the buccal cavity,
- Palatine - when further back on the palate and
- Pharyngeal - when they are situated in the throat.

NOSTRIL

Most fish have two nostrils on each side of the head in front of the eyes. Cichlids are exceptions, with only one on each side.

GILLS

- The function of the gills is to extract oxygen from water, where it is usually abundant in a dissolved form, and to rid the blood of carbon dioxide.
- The large surface area of gill filaments and their thin membranous covering allows an interchange of gases to take place as the oxygenated water passes over them.

LATERAL LINE

- This is the visible part of the extraordinary sensory system of fishes,
- lateral line consists of a series of marks or pits, usually one on each scale, running along about the midline of each side of the body and also at times on the head.

SCALES

Scales are protective coat of flexible armour that cover the body of some bony fish which are embedded below the skin

- The different types of scales possessed by various fish are important for identification purposes.
- Polypterus alone among local fishes have ganoid scales.

- Scales are termed Ctenoid when the exposed edges are ciliated or toothed. The surface of fish with ctenoid scales, such as climbing perches, is always rough.
- Most fish have Cycloid scales; that is, with the exposed margin evenly rounded, giving the skin a smooth surface.

COLOUR

Identification on the basis of colour can be quite misleading as these often differ strikingly according to the habitat, sex, breeding activity or other factors. Many members of the cichlid family have the ability to change colour.

- Male *Hemichromis fasciatus*, for example, when in clear water during breeding activity, are canary yellow and have vivid black bands on the sides. At other times they are usually silvery on the sides and the bands are reduced to smaller black patches.

SEXUAL DIFFERENCES

The sex of a fish can very seldom be determined from its external characters, but the anal fins of males and females of some species do differ in shape.

FISH CLASSIFICATION

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- A system of classification provides the means for resolving the problem of the origin and evolution of life.
- Classification involves scientific philosophy that uses inductive procedures.

"FAMILY TREE" OF THE NILE TILAPIA"

- **Phylum** Chordata – **Animals with Notochord**
- **Subphylum** Vertebrate – **Animals with a backbone**
- **Class** Osteichthyes – **Bony fishes**
- **Order** Perciformes – **Perch-like fishes**
- **Family** Cichlidae – **Cichlid fishes**
- **Genus** *Oreochromis* – **Mountain cichlid group**
- **Species** *niloticus* – **Nile tilapia**

NAME AUTHORITY

Thus "*Clarotes macrocephalus* Daget 1954" indicates that this species was first described by Daget in his publication

REASONS

FOR

CLASSIFICATION

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To create order out of confusion by making accurate identification of every organism.

To serve as guide on relationship between organisms.

METHODS OF STUDYING TAXONOMY OF FISHES

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MORPHOMETRIC CHARACTERS

They are characters that represent the morphology. They are always measurable characters e.g. body depth, fork length, standard length, total length, front length etc.

In using these morphometric characters for identification, the ratio of these lengths are used which are peculiar to a certain species within a certain range. e.g.

$$\frac{BD}{TL} \quad 0.4 - 0.6$$

ELECTROPHORETIC METHOD

This involves the analysis of component proteins in the blood or tissue in identifying fish.

RACIAL STUDY

It involves separation into different racial stocks. This is only relevant to a particular species of fish. The third name of a fish reflects its race.

METHODS OF CLASSFICATION

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Generally, seven standard categories form the internationally accepted groups of classification for all living organisms.

THESE STANDARD CATEGORIES ARE:

- Kingdom
- Phylum (phyla)
- Class
- Order
- Family
- Genus (Genera)
- Species (species)

The complexity and diversity increase downward; from kingdom to specie. Therefore, we find fish names existing in the genera and species levels.

SUB-DIVISIONS

In a attempt to make the classification table more meaningful and to give room for major dissimilarities we have within the seven major divisions sub-divisions e.g. sub- phylum, super class, sub order etc.

RULES OF CLASSFICATION

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In genera, generic name must always begin with capital letter while the specific name must begin with small letter. E.g. *Lates niloticus* note "L" and "n"

The generic and specific names must always be underlined e.g. *Clarias gariepinus*, *Oreochromis niloticus* or italicized

The naming system comprising of specific and generic names is called *BINOMIAL SYSTEM OF CLASSIFICATION.*

CHARACTERTISTICS OF CHORDATES

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The presence of notochord which runs longitudinally, from the anterior to the posterior end of the body.

The possession of a nerve cord which is dorsally oriented except in the primitive fishes.

The possession of holes in the pharyngx (throat) called silts or clefts.

CHARACTERTISTICS OF VERTEBRATES

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- They possess some form of cranium.
- They possess some trace of vertebral

- The front end of the nervous system is differentiated into an elaborate brain, associated with special receptors like eyes, nose etc.
- The meter organisation of the body allows the performance of delicate movements to suit the situations that the receptors reveal.

- Presence of heart, at least 3 chambers, assisting in circulation of blood.
- The presence of haemoglobin in the red corpuscles as a medium for carrying oxygen in the blood.

The excretory system consists of meso-dermal funnel (kidney) which functions as osmo-regulator

CHARACTERISTICS OF ELASMOBRANCHII

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- They are cartilaginous.
- They possess 5-7 gill slits
- They have spiracles.

CHARACTERISTICS OF CHONDRICHTHYES

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- They possess constricted notochord
- They all have jaws
- The skeletons are cartilaginous

- They have paired and unpaired fins
- Nostrils are in pairs
- They have three semi-circular canals in the ear

- The cranium is not totally fussed to the arch (not joined by connective tissues).
- They possess placoid scales
- Mouths are inferior

CHARACTERISTICS OF OSTEICHTHYES

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- They have bony jaws, skull and skeleton
- Gills are usually 4 pairs in number
- They possess operculum
- The scales are bony either cycloid, ctenoid or ganoid

THE EXTERNAL FEATURES OF A SCALELESS FISH.

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1. Operculum
2. Cephalo-muchal shield
3 Dorsal spine
4. Dorsal filament
5. Dorsal fin
6. Adipose fin
7. Caudal peduncle
8. Caudal fin
9. Anal fin
10. Lateral line
11. Pelvic fin
12. Pectoral spine
13 pectoral fin
14 Humeral process
15 maxillary barbel
16 Outer mandibular barbel
17 Inner mandibular barbel

THE EXTERNAL FEATURES OF A SCALY FISH.

1. Dorsal fin
2. Adipose fi
3. Dorsal spine
4. Caudal peduncle
5. Anal fin
6. Lateral line
7. Pelvic fin
8. Pectorial fin
9. Operculum

FISH ANATOMY

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THE BASIC STRUCTURE OF A FISH

Like most animals, the fish has a body which includes the head, trunk and limbs. The body has generally an elongated shape.

The head, trunk and the tail follow each other without any separation, which enables the fish to wriggle easily in the water. Limbs are fins. The body is covered with the skin.

THE HEAD

In the front part of the head is the mouth, of which the shape and features differ according to the feeding habits of the fish.

MOUTH

Some fish have large mouths with sharp teeth for seizing prey, while others have small mouths on the under surface of the head, suitable for scrapping up algae from the bottom.

TEETH

The shape of the teeth of fish depicts the feeding habits of the fish. Predatory fish, such as the *Hydrocynus* are well supplied with sharp teeth.

Vegetation eating fish may have teeth, each one with many more or less rounded points, arranged in bands along the side of the jaws (*Tilapia rendalli*).

The teeth of some omnivorous fish (*Alestes*) are quite similar to the molars of man. In many fishes, there is, in addition, a bony plate bearing teeth in the back of the throat which are called pharyngeal teeth (*Tilapia*, Carp).

NOSTRIL

On the snout, above the mouth, are the nostrils. The nostrils are not used for breathing but only for smelling.

BARBEL

- Some fish have filaments along the side of their mouth which can be longer than the head itself e.g.(catfish) which are called barbels. Their number can vary between 2 and 8. They are sensory organs which help the fish to find its food.

OPERCULA

At the hind end of the head are two bony flaps called opercula or gills covers, which can be lifted; underneath are the gills.

GILLS

Every gill is made of a bony arch carrying long red filaments on one side called the gill filaments and short teeth like, or longer comb like projections on the other side called gill rakers.

The gill filaments are the breathing organs of the fish and are also used as a strainer to sieve out food particles from the water

THE TRUNK

The trunk is the part of the body in which are located a number of organs: the air bladder, the stomach, the intestine, the liver, the kidneys, the ovaries, the testicles. It starts from the head and includes the ventral cavity.

THE TAIL – CAUDAL FIN

It is located behind the anus and ends with the caudal fin. An anal fin and sometimes a part of the dorsal fin can be found on the tail.

THE FINS

When identifying fish, the fins are the first things, which should be examined. The number of fins, their types, sizes, location on the body and position in relation to each other, are most important.

The fins are similar to paddles made out of rays which would be joined together by a web. The rays can be either spiny or soft, ramified into a paint-brush and are then called soft rays.

TYPES OF CAUDAL FINS

The caudal fin or tail of most fish is lobed, which means that it is forked and has the upper and lower lobes attenuated to points. But in some fish, it is round, pointed or truncated.

ADIPOSE FIN

Some species of fish have two dorsal fins, the second of which is often an adipose fin, composed only of soft, fleshy tissue and usually without rays of any kind.

BODY FORMS

- Commonly, the fish body is torpedo-shaped (fusiform), and most often slightly to strongly ovoid in cross section. In free swimming species, the body approximates the theoretically perfect streamline form in which the greatest cross section is located close to 36 percent of the length back from the anterior tip

- globe shapes (globiform – e.g. puffers, tetraodontidae)
- serpentine (anguilliform – e.g. eels, *anguillidae*),
- threadlike in outline (filliform e.g. snipe eels, Nemichthyidae).

- Compressed: flattened but greatly elongated
- Trachipteriform: flattened from top to bottom
- Depressed – the skates, rajidae, and the batfishes

FISH ADAPTATION TO AQUATIC LIFE

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- **Shape** - streamlined, fusiform
  rounding edge of such shapes reduces resistance
- **tapering** - of posterior part
  minimizes drag
- **mucus cover** - further reduces drag, smoothens

- Laterally compressed body prevails in quiet water body of relatively dense cover.
- Depressed body prevails among bottom dwellers
- Dorso-ventrally flattened body characterized stream fishes.

FINS

Used by fishes to achieve all forms of locomotion, stabilization, balancing, change of direction and breaking in their aquatic environment

- Used as gliding organ in some flying fishes
- Used for terrestrial locomotion in some catfishes
- As organ for crawling: use of some modified fins e.g. paired fins like pectoral, pelvic fins

FISH DIVERSITY OF NIGERIA

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Nigeria has diversity of fin and shell fish fauna consisting of over 250 species in Inland waters

- There are about 101 species (22 families) in Kainji lake alone (Ita 1993)
- 86 in lake Chad (Hopson 1967),
- 25 species (10 families) in Tiga lake (Ita 1985)
- 21 species (10 families) in Bakolori (Ita 1993)

- 32 species (11 families) in Oyan lake (Ikenweiwe, 2005) and
- 199 species from 78 families in the brackish and marine waters (Tobor and Ajayi 1978).

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THANK YOU

FURTHER READINGS

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- Fish and Fisheries of Northern Nigeria
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