

# **Morphometric characters**

## Morphometric characters

### Morphometrics

The morphometric characters are measurable features. These characters have been helpful for separating closely related genera and species and even population within species and are used in ichthyotaxonomical studies.

Measuring the linear dimension of whole or parts of finfish is probably the most widely used technique in finfish taxonomy. The commonly used length measurements in finfishes are (i) total length, (ii) standard length and (iii) fork length. Of these, the most frequently chosen one is total length, because it is quick and easy to measure. Further, total length has been related to many factors such as weight, age, fecundity, maturity, etc. These parameters should be easily assessed in relation to total length.

Though total length is the easiest to measure, in larger species with a deeply forked caudal fin, such as in scombrids, carangids, *etc.*, fork length is preferred. Though standard length is used by ichthyotaxonomists, in large specimens standard length is not used because of the difficulty in ascertaining the posterior margin of the hypural plate.

## Methods of Measuring

Measurements are made with special measuring boards. Length measurements are usually made with the fish lying on its right side snout to the left, on a measuring board consisting essentially of a wooden or metal base carrying a centre scale and having a headpiece (nose block) against which the snout is to be pressed (Holden and Rait, 1974). The mouth of the fish should be closed, the fish body and tail are straightened along the mid-line and the readings are to be recorded from the scale. The measurements should be recorded to the nearest 0.5 mm with a fine draftsman dividers using a fresh fish in a near to relaxed condition as far as possible. Rays and other dorso-ventrally flattened fishes may be measured by lying straight on their ventral surface. Disc width rather than overall length is sometimes used as linear dimension of rays. Large fishes could be measured with calipers or from point to point along the body surface with a tape.

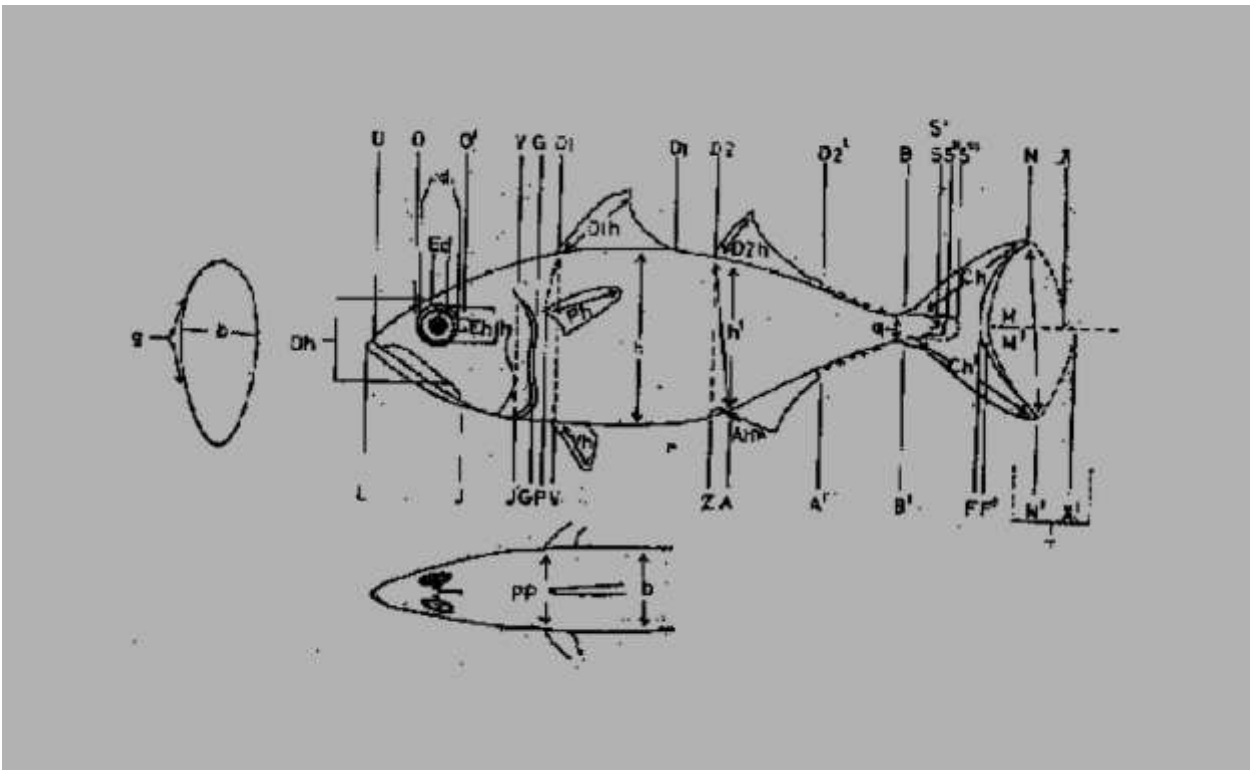
If a fish is to be measured in centimeter units, a board with 1 m long is sufficient. For a larger specimen, an extension piece of 30 cm long can be clipped or hinged to the board. For fish measured in half-centimeter units, a board of 50 cm long is usually sufficient. The scale must correspond to the measurements being recorded. It is also not possible to measure fish to the nearest centimeter below on a board 'marked 2 cm intervals'. Too many divisions in a scale will, either lead to mistake or waste time in recording characters to the nearest division.

## Definitions of Linear Measurements

Overall length measurements are made between perpendiculars along the median longitudinal axis from the snout (U, the position of the maxillary symphysis). Measurements from L are taken with the mouth closed. The other measurements to be taken are:

1. Standard Length: Taken from U to the tip of the hypural bone (urostyle). This varies from species to species.
2. Fork Length: Measured from U or L to the cartilaginous tip of shortest or median caudal ray.
3. Total Length: Measured from U or L to the longest caudal fin ray, upper or lower, or an average of both of them.

Longitudinal measurements other than overall length are also made between perpendiculars using measuring board with, for example, a sliding cursor. When these are made radially from point U, calipers are recommended. Point to point measurements are sometimes made on big fishes such as tunas by tape. These would be indicated by the word 'surface' as these are not generally recommended. All measurements from LX to LM and also their 'upper' equivalents are grouped under the general name 'total length' LT. LM has been called 'bilobular length' and 'total auxiliary length'. The word 'Extreme' is used in LX.



**Fig No:** Morphology and measurements of teleost

## Definitions of Position

U Maxillary symphysis

L Mandibular symphysis

OO Anterior edge of orbit

O Posterior edge of orbit

J Posterior edge of mandible (buccal commissure)

Y Gill-cover notch

G' Posterior bony edge of operculum

G Posterior membranous edge of gill cover

P Anterior point of insertion of the first pectoral fin ray

D1 Insertion of anterior dorsal (intersection of anterior margin of first dorsal spine, fin held erect with the contour of the back)

D1' Position of last ray of anterior dorsal

D2 Insertion of first ray of posterior dorsal

D2' Position of last ray of posterior dorsal

Z Anterior edge of cloaca

A Insertion of first anal fin ray

A' Position of last anal fin ray

B Insertion of dorsal lobe of caudal fin

S Posterior tip of urostyle (forward protuberance of hypural blade)

S' Posterior edge of fleshy peduncle or of pigmented zone

S'' Point of upper caudal keel

S''' Posterior limit of silvering (either last scale of the lateral line or the posterior zone  
limit of the scale covered by the peduncle)

F Cartilaginous tip of shortest (median) caudal ray

F' Membranous edge of caudal fin at fork

N Distal tip of the longest caudal fin ray with lobe normally extended

N' Distal tip of the longest ventral fin ray with lobe normally extended

M Point where line NN' intersects median longitudinal axis

M' Mid point of line MN'

X Distal tip of longest dorsal caudal fin ray, with lobe brought to the median longitudinal axis

X' Distal tip of the longest ventral fin ray, with the lobe brought to the median longitudinal axis



## Overall Length Measurements

LT and UT Total length (any extreme or normal length)

LX Dorsal extreme length

LX' Ventral extreme length

LX'' Greater extreme length (LX or LX', whichever is greater)

LN Dorsal normal length

LN' Ventral normal length

LN'' Greater normal length LN or LN', whichever is greater

LM Median normal length

LM' Mean normal length

LP Mid caudal length

LP' Fork length

LS Standard length to urostyle

LS' Standard length to peduncle

LS'' Standard length to keel

LS''' Standard length to silvering

LB (Dorsal) Body length

### **Other Longitudinal Measurements**

UJ Maxillary sheath length

LJ' Mandibular length

UO Snout length

UY Upper head length

LG Opercular head length

LG' Greatest head length

OO' Orbital diameter

ID Longitudinal iris diameter

Ed Longitudinal pupil diameter

O'Y Postorbital dorsal distance

UDI Preanterior dorsal distance

UP Prepectoral distance

UV Preventral distance

UD2 Preposterior dorsal distance

D1D1' Anterior dorsal fin base length

D2D2' Posterior dorsal fin base length

UA Preanal distance

AA' Anal fin base length

## **Vertical Measurements (Perpendicular Unless Otherwise Stated)**

Oh Orbital depth (from orbital crest to lower edge of maxillary, passing over middle of pupil)

Ih Perpendicular Iris Diameter.

Eh Perpendicular pupil diameter

YJ' Head length

DIP Back depth (oblique)

DIV Anterior dorsal depth (or dorsoventral depth)

h Greatest depth

D2Z Posterior dorsal depth

D2A Dorsoanal depth (slightly oblique)

h' Perpendicular anal depth

q (Least) peduncle depth

## **Lateral Measurements**

PP Pectoral breadth

b Greatest breadth

OO Interorbital distance (at level of pupil centre)

## **Other Measurements**

D1h Anterior dorsal height (distance from insertion to tip of longest spine)

D2h Posterior dorsal height (distance from insertion to tip of longest spine)

Ph Pectoral fin length

Vh Ventral fin length

Ah Anal fin height

Ch Dorsal caudal fin length

Ch' Ventral caudal fin length

Ch'' Greater caudal fin length

Ig Greatest iris diameter

Eg Greatest pupil diameter

g Greatest girth

VV Length of interventral flap

NN' Spread caudal distance

All measurements should be taken in percent of standard length or fork length in mm. For computation, a factor should be found out by dividing 100 with standard length. Then this factor has to be multiplied with each morphometric character for a single specimen to get percentage of standard length in millimeters (mm). The same procedure has to be made for all the specimens of a species that are studied. From this range, mean, standard deviation and standard error and confidence interval ranges can be computed for each morphometric characters in a species. To obtain full information, range of overlapping, overlapping ratio, range of extreme ratio and percentage of overlapping ratio of all body proportions should be calculated in all combinations (morphometric characters) for closely related species or species coming under same genus.

## **Morphology and Morphometric Characters of Shark**

The measurement of most of the morphometric characters are similar to bonyfish. As sharks do not have spines or rays in fins, measurements of fins should be from the origin of the fin to the respective fin lobe. The characters should be selected for sharks from the one given for bonyfishes in accordance to its morphology. Length of claspers and measurements of upper and lower lobes of caudal fin should be taken in addition to the characters listed for bonyfishes.

Fig Added (FAO Figure-Morphology and Morphometric)

## **Morphology and morphometric measurements of rays**

For rays, the following measurements should be recorded:

1. Preorbital length – Distance between snout to orbit
2. Postorbital length of disc – Distance between posterior part of orbit to anus
3. Body depth – Maximum distance across the body
4. Tail length – Distance between anus to the tip of posterior part of tail. The other characters are similar to that of sharks and bony fishes.

## Comparison of Sexes

The morphometric characters are to be taken separately for males and females. To find out any difference for a character, least square method has to be employed by taking standard length as 'X' and different morphometric characters as 'Y'. Analyses of co-variance (F-test) should be employed to find out any significance. If there is any significance, the sexes should be treated separately.