

**A MANUAL FOR STANDARDISED LINEAR
MEASUREMENTS
OF
EXPLOITED FINFISH AND SHELLFISH**



CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

Indian Council of Agricultural Research

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PREFACE

Stock assessment of the exploited marine fishery resources, a major objective of the Central Marine Fisheries Research Institute, requires data on linear measurements of fish to study their age and growth. Data on the morphometric characters of the commercially important species are also of vital importance in identifying the unit stocks. In order to maintain uniformity in the collection of the data it is felt that a manual is required.

This manual includes diagrammatic sketches of body measurements, a glossary of technical terms related to morphometric measurements and other allied characters of finfishes and shellfishes. An index indicating the names of the species/group and the pages where they appear in the manual is also given for the benefit of the user. It is hoped that this manual would serve as a useful guide to all engaged in fishery research.

I express my deep appreciation to all the Scientific and Technical personnel of Fishery Resources Assessment Division, Demersal Fisheries Division, Pelagic Fisheries Division, Crustacean Fisheries Division and Molluscan Fisheries Division of the Institute who are responsible to bring out this manual.

P.V.Rao
Acting Director

INTRODUCTION

Marine fish landings in India have shown fluctuations over the years. These fluctuations may be due to anthropogenic effect or due to environmental factors such as currents and drifts. In order to understand these fluctuations and to rationally manage the various resources a proper understanding on the status of the exploited stocks, including the biology and behaviour of individual species is required. To achieve these, CMFRI has been conducting research on the stocks of commercially important species such as oil sardine, mackerel, tunas, seer fishes, cat fishes, croakers, pomfrets, penaeid prawns, crabs, lobsters, cephalopods, bivalves and gastropods.

While taking up such stock assessment studies based on the data collected by the Institute, it was felt that there is a need to standardise the method of taking linear measurements for different species for the sake of uniformity and at the same time maintaining rationality for such an approach. The method of taking measurement varies from species to species. Usually the maximum length from the tip of the snout to the longest ray of the caudal fin, either upper or lower, as the case may be, is considered as the total length of the species. For example, for the total length of mackerel upper caudal lobe is considered and for oil sardine the lower caudal lobe. However, in certain cases, for example threadfin bream in which the upper lobe is extended into a filament which is likely to be broken, the lower lobe is taken for measurement of the total length.

In this connection the scientists working in different species have been requested to send their suggestions. The present publication is an outcome of these suggestions. It includes the methodology for taking linear measurements of crustaceans, molluscs and fin fishes along with a glossary of technical terms used in the field identification and morphometrics.

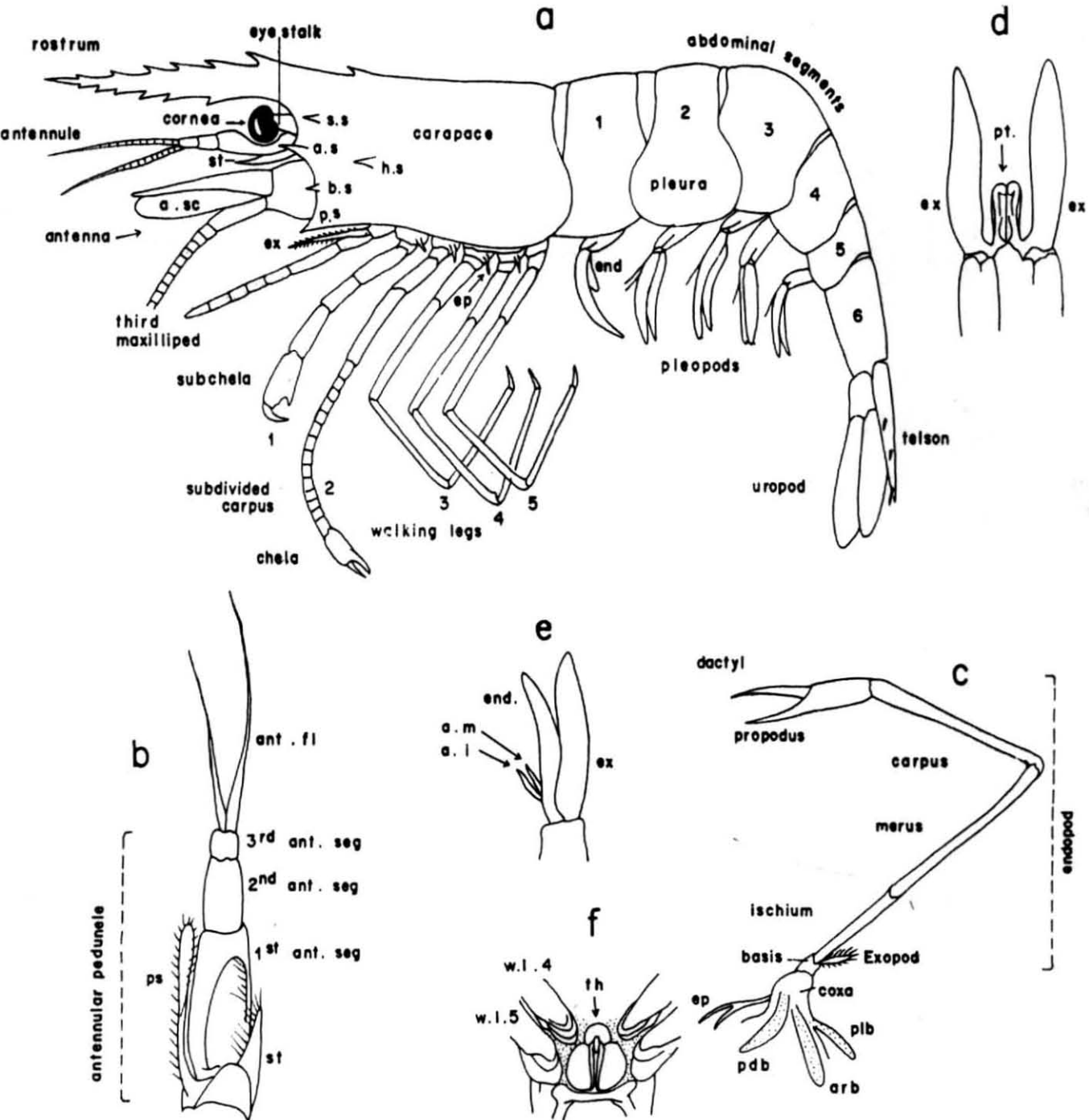
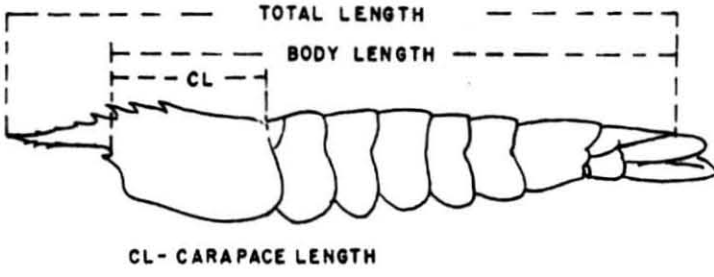
Legend

Prawn, external features. a, schematic diagram of lateral view entire; b, right antenna; c, a pereopod with branchiae; d, first pair of male pleopods showing petasma, e, second pleopod; f, ventral view of posterior region of cephalothorax showing thelycum.

a.i, appendix interna; a.m, appendix masculina; arb, arthrobranch; a.s, antennal spine; b.s, branchiostegal spine; end, endopod; ep, epipod; ex, exopod; h.s, hepatic spine; pdb, podobranch; plb, pleurobranch; ps, prosartema; p.s, pterygostomianⁿ spine; pt, petasma; s.s, supraorbital spine; st, stylocerite; th, thelycum; w.l, walking leg.

I CRUSTACEA

A PRAWN

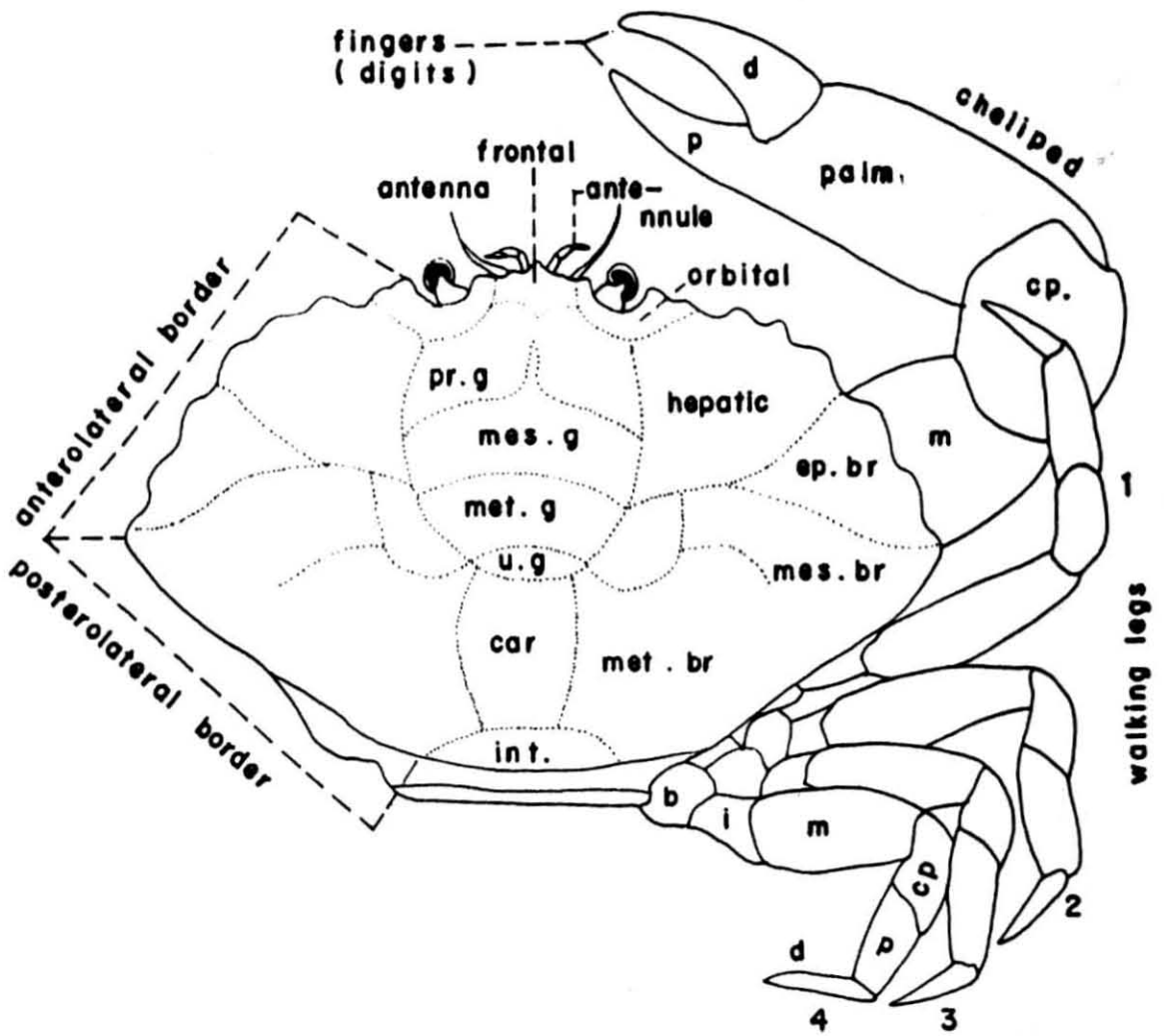
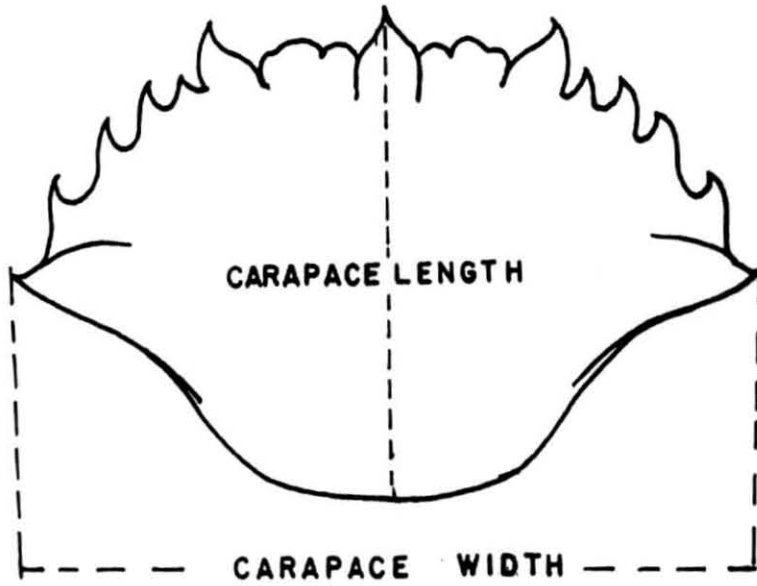


Legend

Crab dorsal view, external features

b, basis; car, cardiac; cp, carpus; d, dactylus;
ep.br, epibranchial; i, ischium; int, intestinal;
m, merus; mes.br, mesobranchial; mes.g, meso-
gastric; met.br, metabranchial; met.g, metagastric;
p, propodus; pr.g, protogastric.

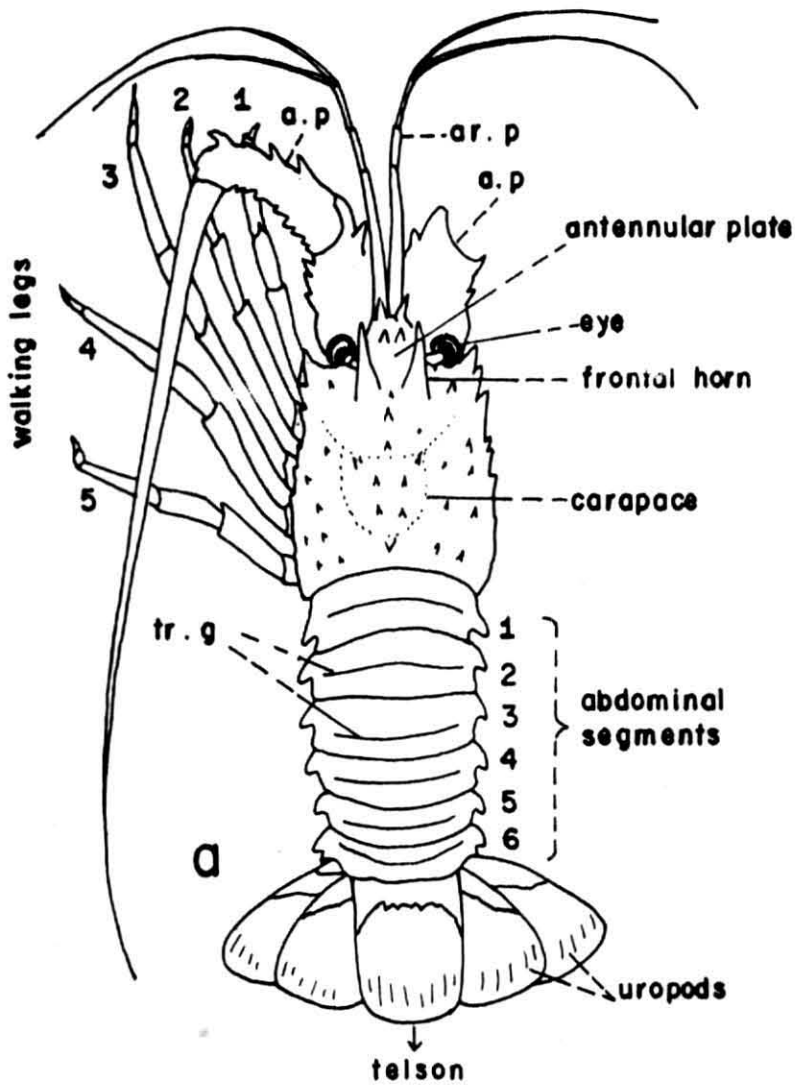
B. CRAB



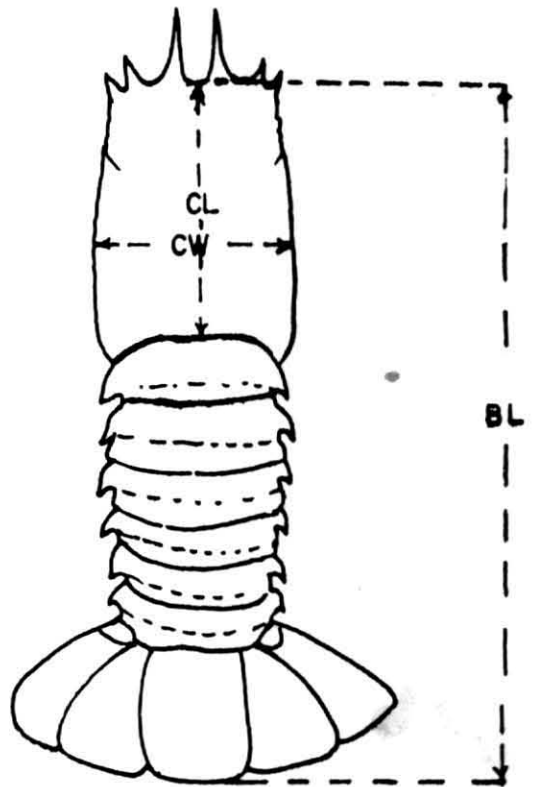
Legend

Lobster, external features. a, spiny lobster dorsal view; b, schematic dorsal view of right half of sand lobster carapace with antennule and antenna.

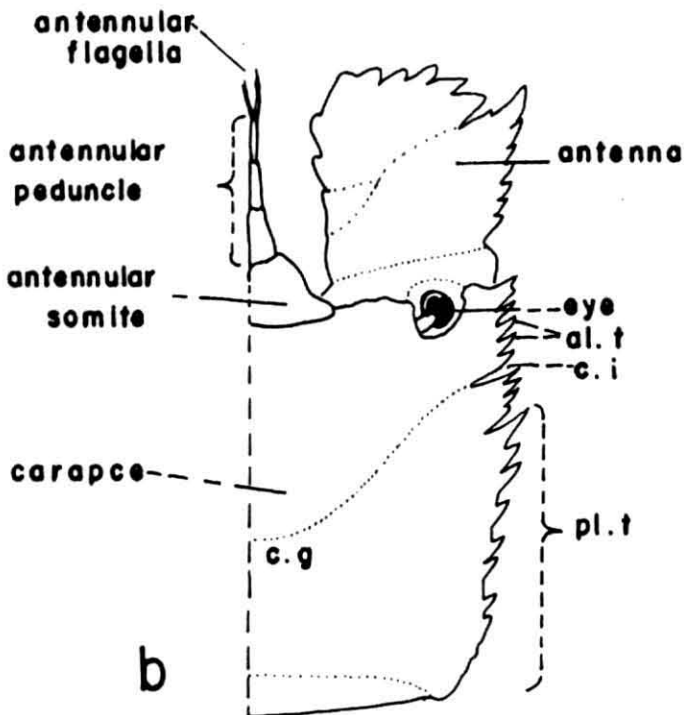
a.p, antennal peduncle; al.t, anterolateral teeth;
ar.p, antennular peduncle; c.g, cervical groove;
c.i, cervical incision; pl.t, posterolateral teeth;
tr.g, transverse grooves.



C. LOBSTER



CL - CARAPACE LENGTH
 CW - CARAPACE WIDTH
 BL - BODY LENGTH



PRAWNS, CRABS AND LOBSTERS : GLOSSARY OF TERMS

- Abdomen** : Posterior region of body consisting of six (prawns and lobsters) or less (crabs) well defined somites, carrying equal or less number of paired appendages.
- Acicle** : Antennal scale which is reduced to a spine.
- Afferent channels** : Openings through which water passes to the gills.
- Antenna** : Appendage of the third cephalon somite.
- Antennal angle** : An angular curve on the anterior margin of carapace just below the orbit.
- Antennal spine** : Spine on anterior edge of carapace immediately below orbit adjacent to base of antenna.
- Antennule (Antennula)** : Appendage of the second cephalon somite.
- Anterolateral teeth** : Teeth on anterolateral border of carapace between orbit and lateral spine in crabs and teeth on lateral margin of carapace in front of cervical incision in sand lobsters.
- Appendix interna** : Small separate branch on medial side of pleopodal endopodite tipped with hooks which interlock with opposite member in swimming.
- Appendix masculina** : Accessory male organ located medially on second pair of pleopods between endopodite and appendix interna.
- Arthrobranchiae** : Gills attached to articular membrane between the coxa of an appendage and the body wall.
- Basis (basipodite)** : Second article (from the body) of a leg or maxilliped. Sixth segment from distal end of the limb.
- Basicerite** : Spine on dorsal side of basis of antenna; sometimes more lateral than dorsal.
- Branchial chamber** : Space between thorax and lateral part of carapace above the bases of legs. Respiratory water current is pumped through the branchial chamber by the action of some of the mouth parts.

Branchiocardiac groove : Groove separating branchial and cardiac regions.

Branchiostegal spine : Spine on anterior edge of carapace, or near it, immediately below branchiostegal groove.

Branchiostegite : Part of carapace not coalesced ventrally with the thoracic somites, but overhanging on each side as a covering for gill chamber.

Branchium : Gill

Buccal cavity : Cavity on ventral surface of body in which the mouthparts are situated; it is bounded anteriorly by the epistome, laterally by the free edges of the carapace.

Carapace : Shield - like covering of the cephalothorax

Carina : Ridge or crest

Carpus (carpopodite) : Third article from the distal end of a leg.

Cephalon : Head. It is formed by the first six somites of the body, and is fused with the thoracic region of cephalothorax. The first cephalic somite carries the eyes, the second the antennulae, the third the antennae, the fourth the mandibles, the fifth the maxillule and the sixth the maxillae.

Cervical groove : Complex groove or series of grooves running across carapace.

Cephalothorax : Region of body formed by the anterior 14 somites including the first 6 somites of cephalon and the rest 8 thoracic somites.

Chela : Arrangement of the distal two articles of a crustacean limb by which the terminal element is opposed to the element which precedes it, so that the appendage is adapted for grasping.

Chelate : Carrying a chela or pincer

- Chelipeds** : Pair or pairs of thoracic legs immediately behind the maxillipeds. They bear chelae, or pincerclaws, and are often stouter, sometimes much stouter than the succeeding walking legs.
- Cornea** : The distal part of eye that carries the visual elements and is usually pigmented.
- Coxa (coxopodite)** : First or proximal article of a leg or maxilliped.
- Dactyl (dactylus or dactylopodite)** : Terminal or distal article of a leg or maxilliped. The dactyl is the movable finger of a cheliped.
- Efferent channels** : Channels through which water passes out from the gills.
- Endognath** : Inner or principal branch of a maxilliped.
- Endopodite** : Medial ramus of a biramous appendage.
- Endostome** : Part of the epistome which forms the palate in crabs and is usually separated from the epistome proper by a transverse ridge.
- Epigastric lobes** : Anterior lobes or subregions of the gastric region.
- Epimere** : A lateral part of the wall of body somites situated between the tergum and the insertion of appendages.
- Epipodite** : Outgrowth of the first seven thoracic coxae.
- Epistome** : The median area on the ventral surface of cephalothorax situated between the anterior margin of the oral field and the bases of antennae and antennulae.
- Exognath** : Outer or secondary branch of a maxilliped.
- Exopodite** : Lateral ramus of a biramous appendage.
- Fingers (digits)** : Narrow scissorlike blades of the claw end of a cheliped, with the movable finger being the dactyl, and the immovable finger the terminal part of the propodus.
- Front** : Frontal portion of carapace; that portion of the carapace of a crab which lies between the orbits.

Frontal teeth : True frontal teeth; those teeth originating on the front but exclusive of the inner orbital teeth.

Gastric region : Large median area, in the crab carapace, bounded behind by the cervical suture, laterally by the hepatic regions, and anteriorly by the fronto-orbital regions. It is divisible into the following subregions or lobes: epigastric, protogastric, mesogastric, metagastric, and urogastric.

Hand (chela) : Propodus and dactyl of the cheliped.

Hepatic region : A small (paired) subtriangular, anterolateral region, wedged between branchial and gastric regions, and either margin of carapace or margin of orbit in crabs.

Hepatic spine : Spine on hepatic region in prawns.

Ischium (ischiopodite) : Fifth article of a leg or maxilliped from the distal end. It is usually the first large article of the maxilliped.

Merus (meropodite) : Fourth article from the distal end of a leg or maxilliped. It is sometimes called the arm of a cheliped.

Mesogastric lobe : Lobe or subregion which is the median division of the gastric region, pentagonal in form, and with a long, narrow, anterior prolongation.

Metagastric lobe : Posterolateral lobe or subregion of the gastric region; often not defined.

Ocellus : Little eye, distinct from the main organ of vision.

Orbit : Cavity in the carapace containing the eye.

Orbital region : Narrow space bordering upper margin of orbit; not always distinguishable.

Palate : Roof of buccal cavity in crabs.

Palm : Proximal portion of propodus of chela.

Pereopod : Thoracic appendages behind the mouth parts, i.e. the appendages of somites 10 to 14.

- Petasma** : Endopodite of the first pleopods in male penaeid prawns. It takes the form of a complicated membranous plate bearing coupling hooks medially which interlock with the member of the opposite side. The petasma may terminate distally in various combinations of complex-shaped lobes. Additional complex processes may also be present.
- Pleopod** : Appendage of any of the first five abdominal somites.
- Pleurobranchia** : Gills attached to lateral wall of body dorsal to the articulation of an appendage.
- Podobranchia** : Gills attached to the coxa of an appendage.
- Postorbital groove** : Groove on carapace behind orbit and more or less parallel to margin or orbit.
- Propodus** : Second article from the distal end of a leg or maxilliped. In a cheliped, the propodus consists of a palmar portion and a narrower immovable finger.
- Prosartema (Dorsal eye brush)** : Long, thin, ciliated lobe arising dorsally from proximomedial border of first antennular segment and extending anteriorly; found in family Penaeidae.
- Protogastric lobe** : Lobes or subregions which are the anterolateral lobes of the gastric region.
- Protopodite** : Peduncle of an appendage; in unmodified form, it consists of one coxal and one basal article.
- Pterygostomian region** : Triangular space on ventral surface of carapace, on either side of buccal cavity in crabs. Region at anterolateral corner of carapace in prawns.
- Pterygostomian spine** : Spine at anterolateral (anteroventral) corner or border of carapace.
- Scaphocerite** : Antennal scale.
- Stylocerite** : Spine or rounded lobe on lateral aspect of basal article of antennules.

Subhepatic region : Area below the hepatic region and below the anterolateral border of the carapace.

Suborbital spine : Spine on lower rim of orbit.

Supraorbital spine : Spine above and behind orbit.

Telson : Terminal somite of the abdomen in prawns and lobsters, carrying no appendages.

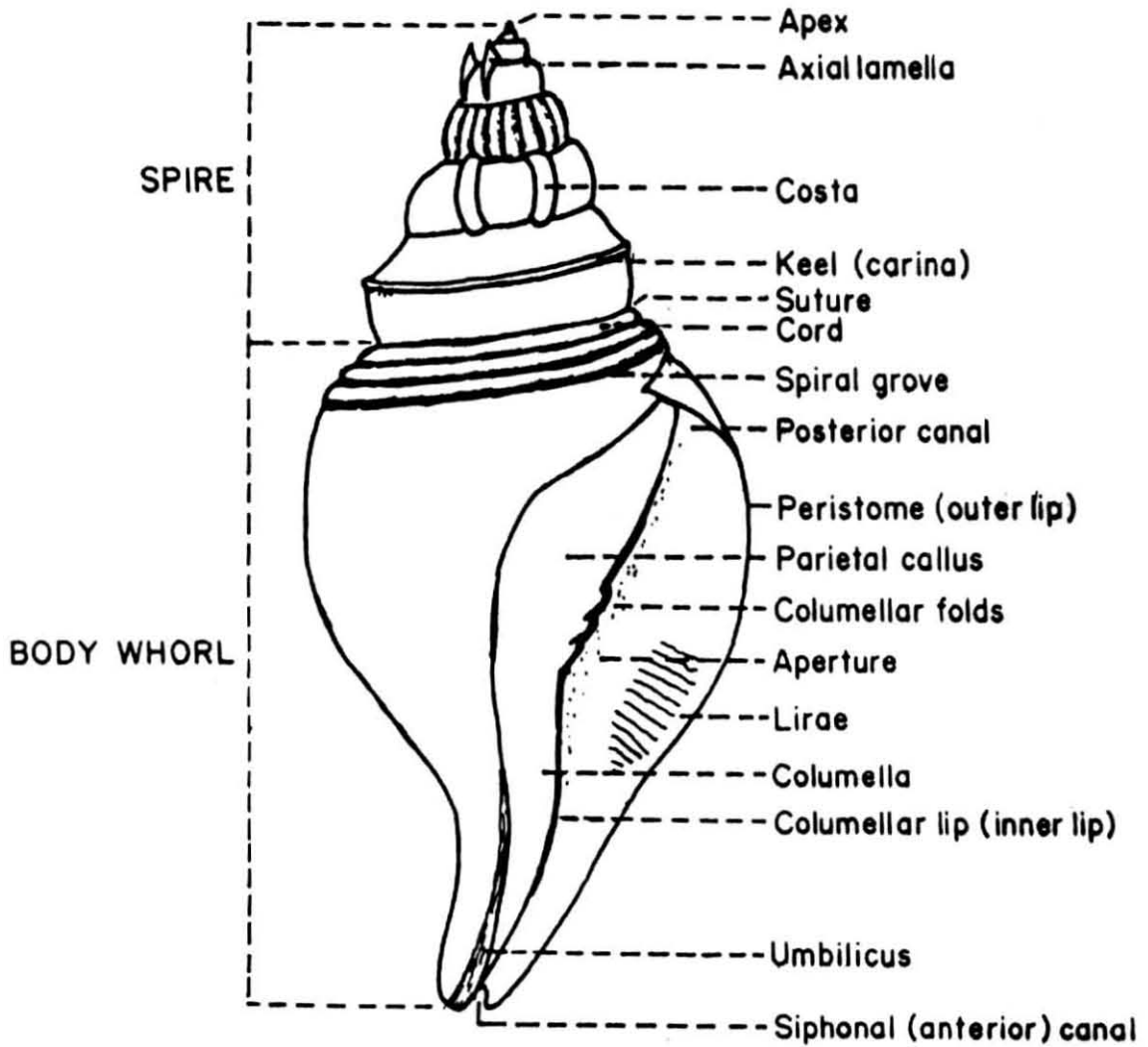
Tergite : Dorsal plate of a segment.

Thelycum : External seminal receptacle, variously developed, lying on sternum of the thorax and formed by outgrowths from the last two thoracic somites.

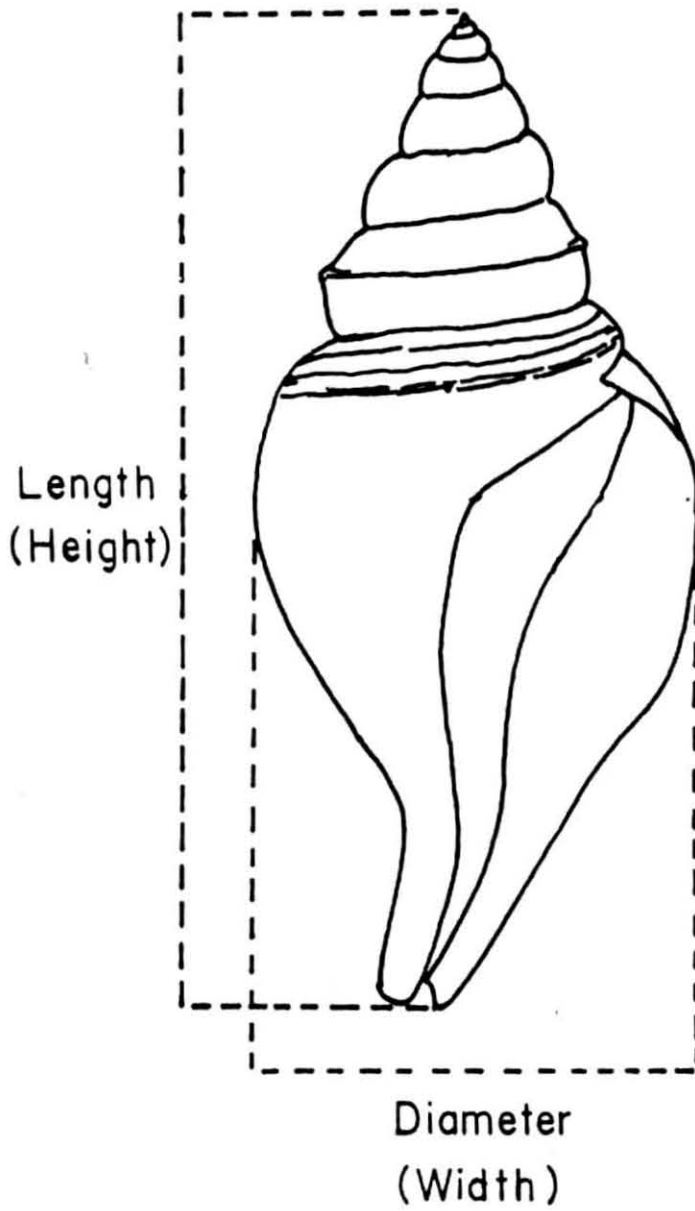
Uropod : Appendage of the sixth abdominal somite.

II. MOLLUSCA

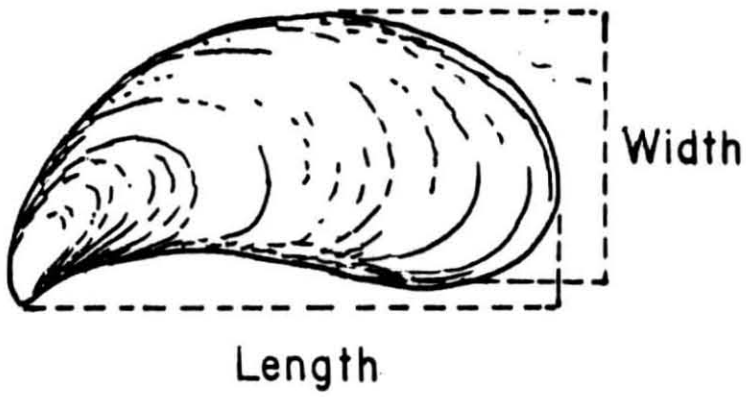
A. GASTROPODS



GASTROPODS

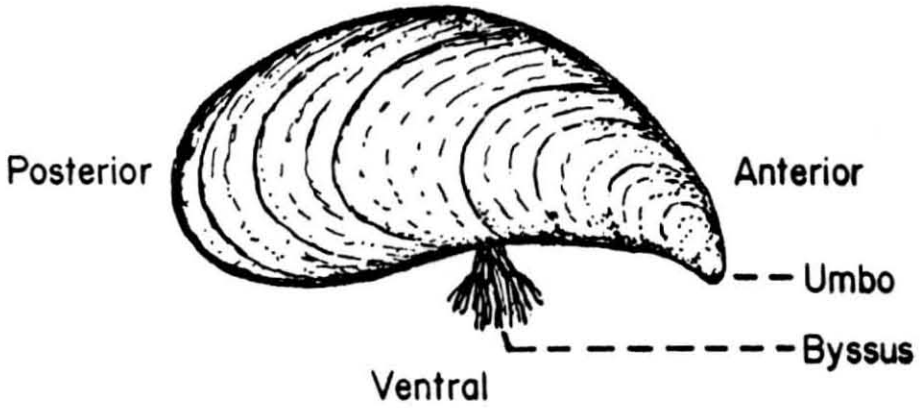


B. BIVALVES
MUSSEL

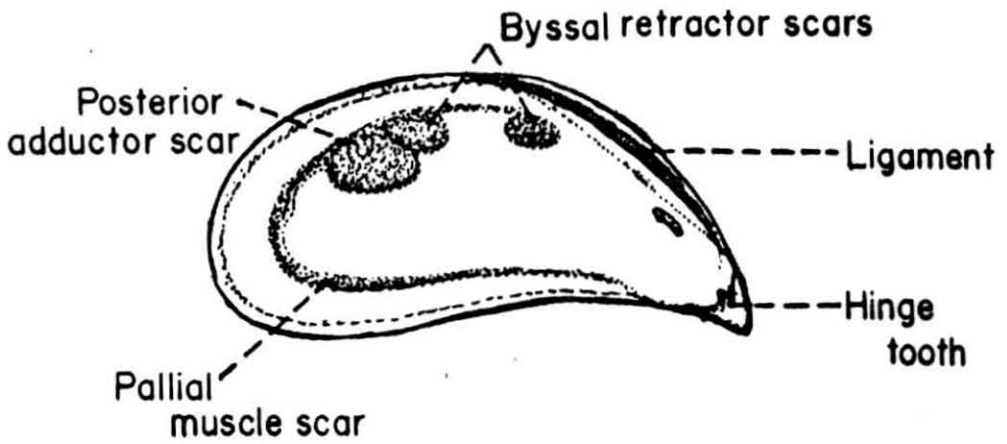


MUSSEL

Dorsal



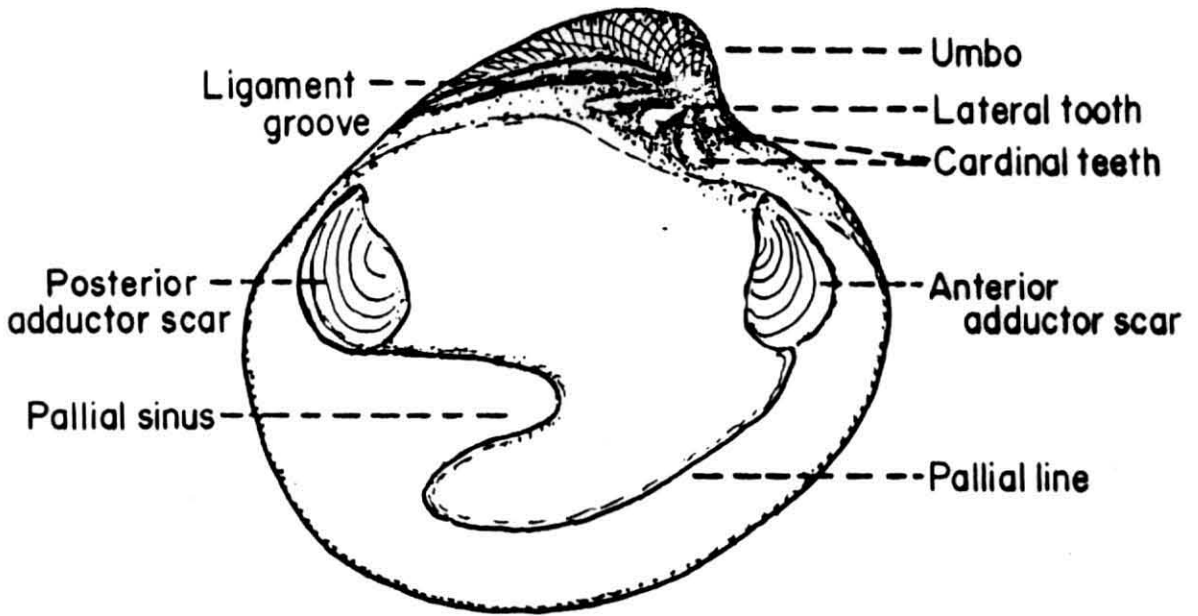
Right Valve: Lateral View (Outer)



Left Valve: Lateral View (Inner)

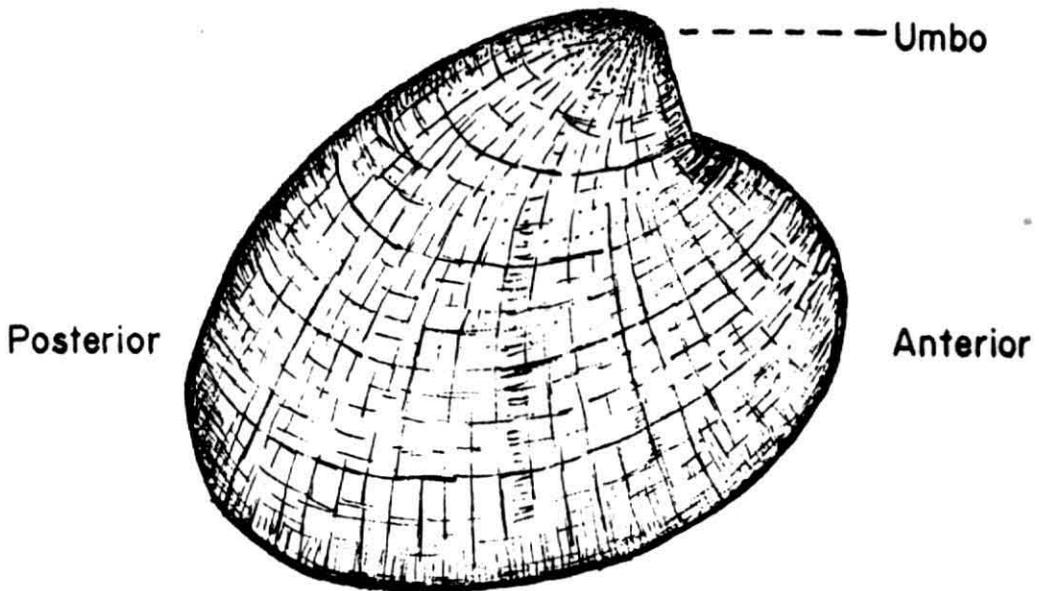
CLAM

Dorsal



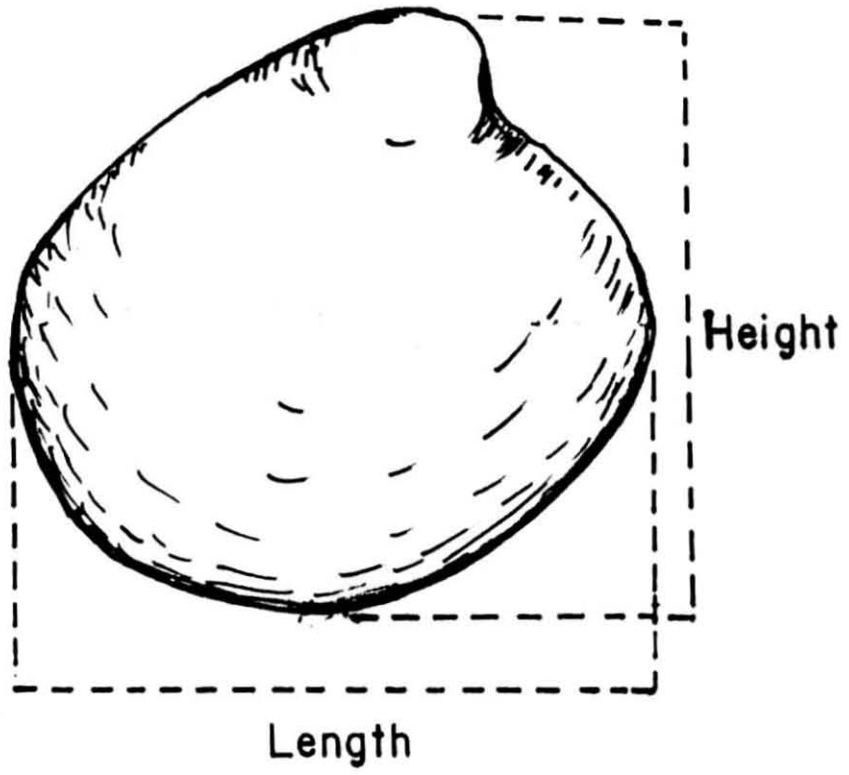
Ventral

Left Valve: Lateral View (Inner)

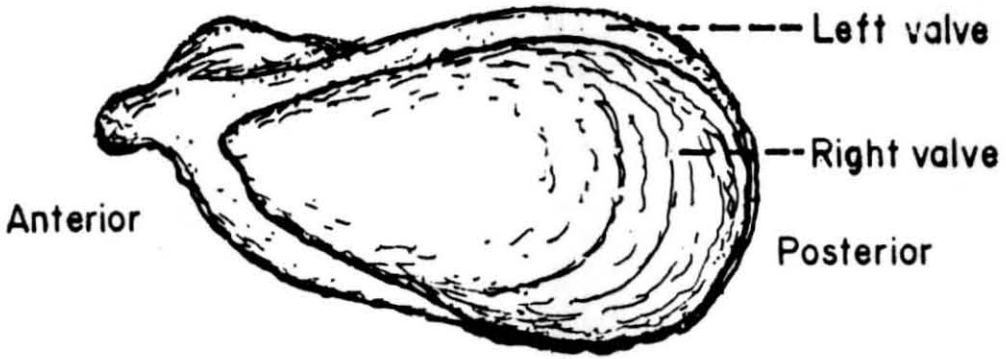


Right Valve: Lateral View (Outer)

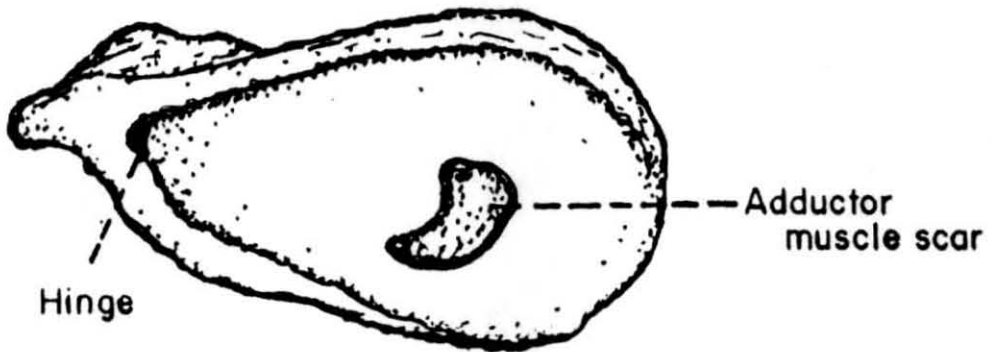
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EDIBLE OYSTER

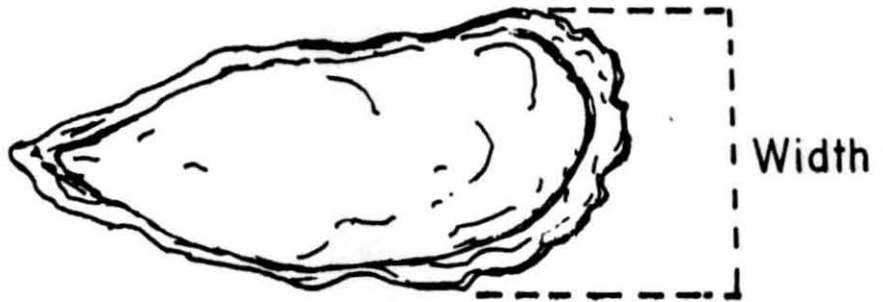
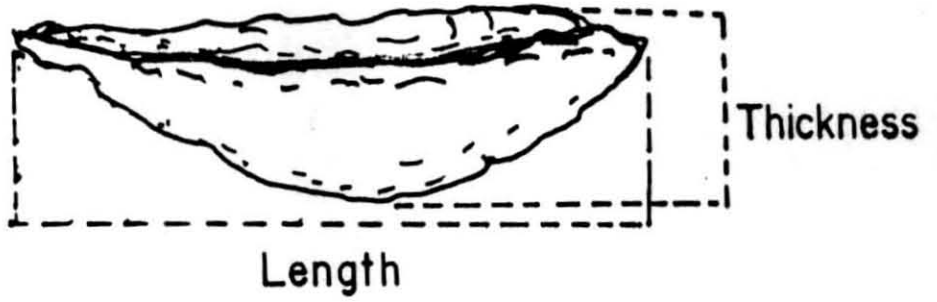


Shell: Outer View

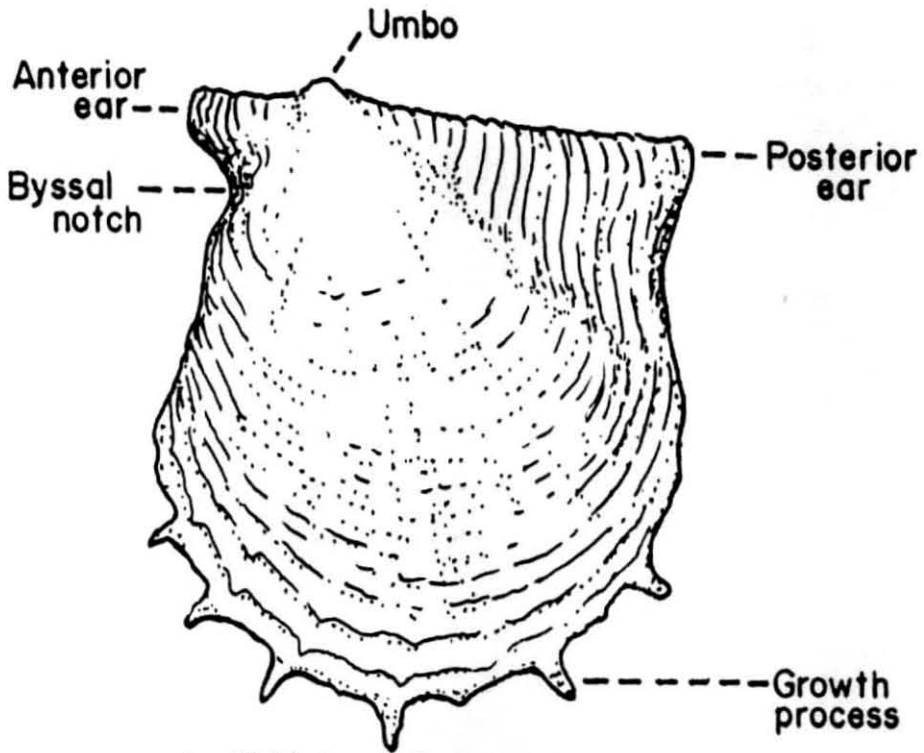


Left Valve: Inner View

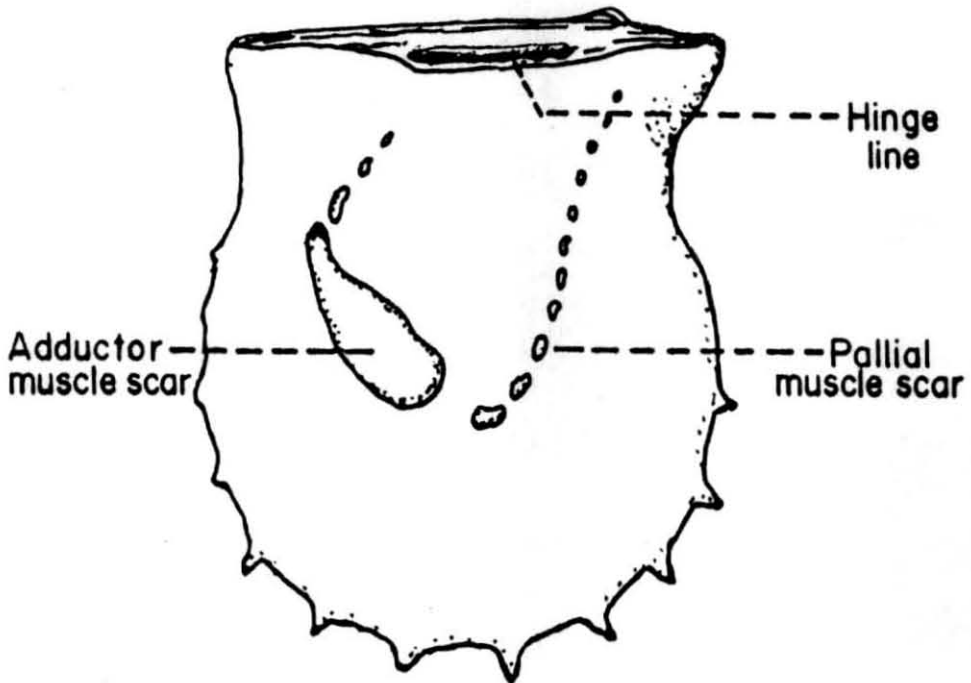
EDIBLE OYSTER



PEARL OYSTER

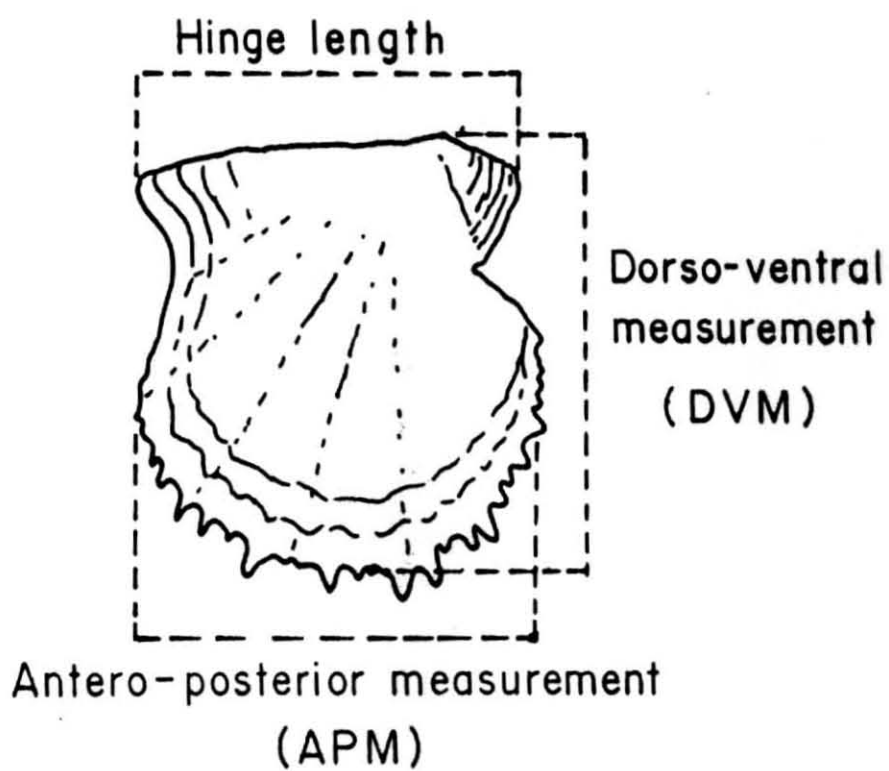


Left Valve: Outer View



Left Valve: Inner View

PEARL OYSTER

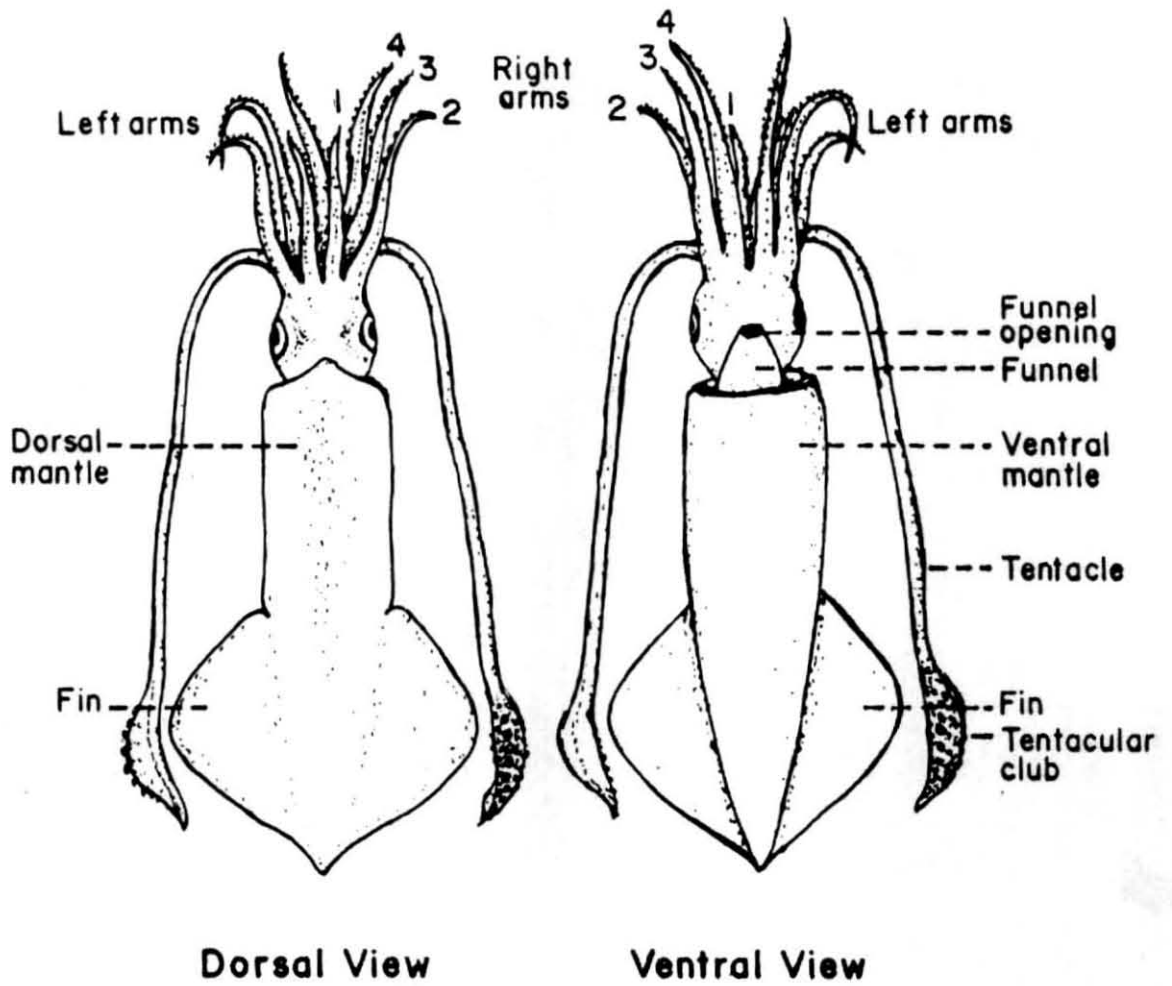


Thickness

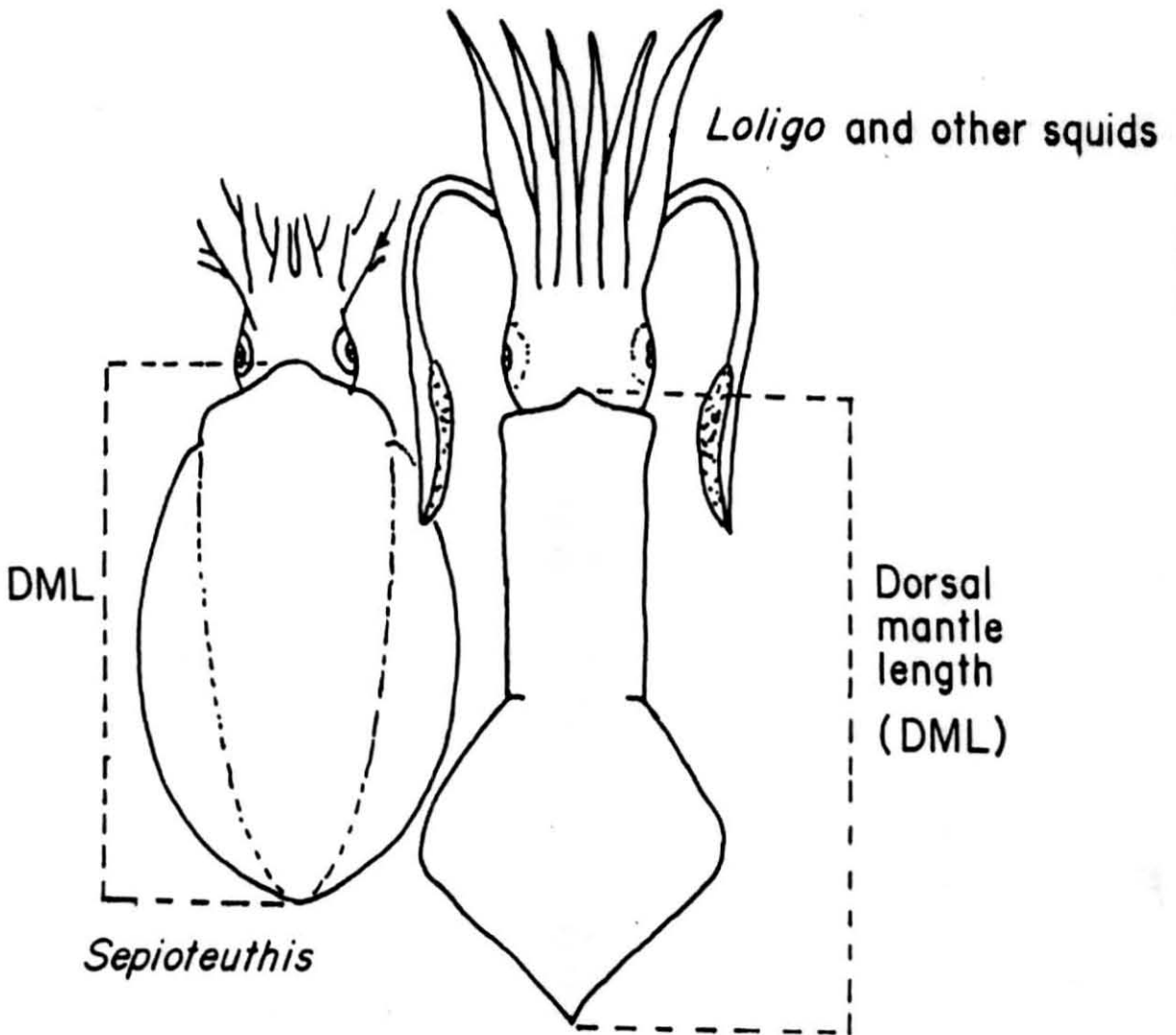


C. CEPHALOPODS

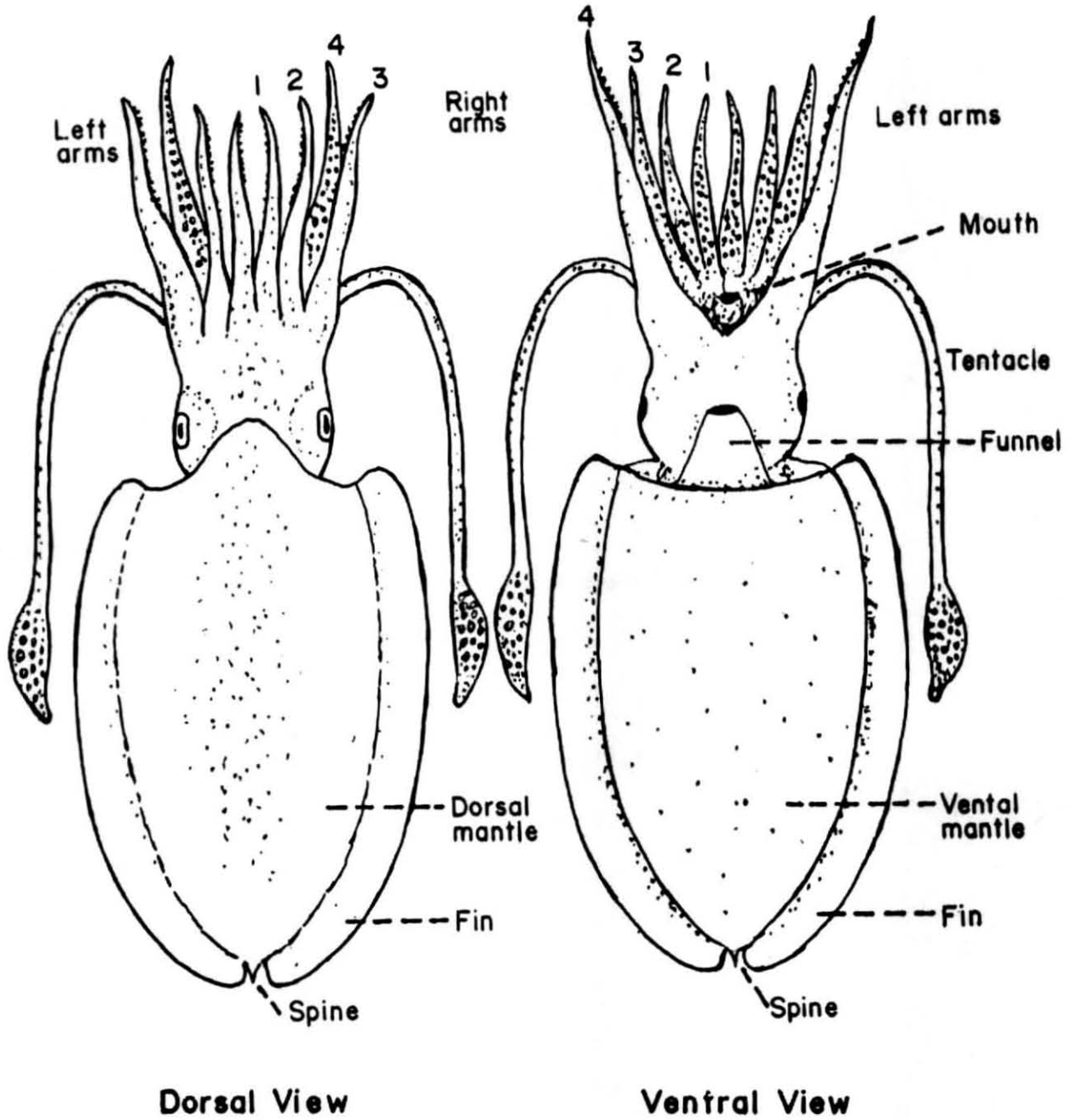
SQUID



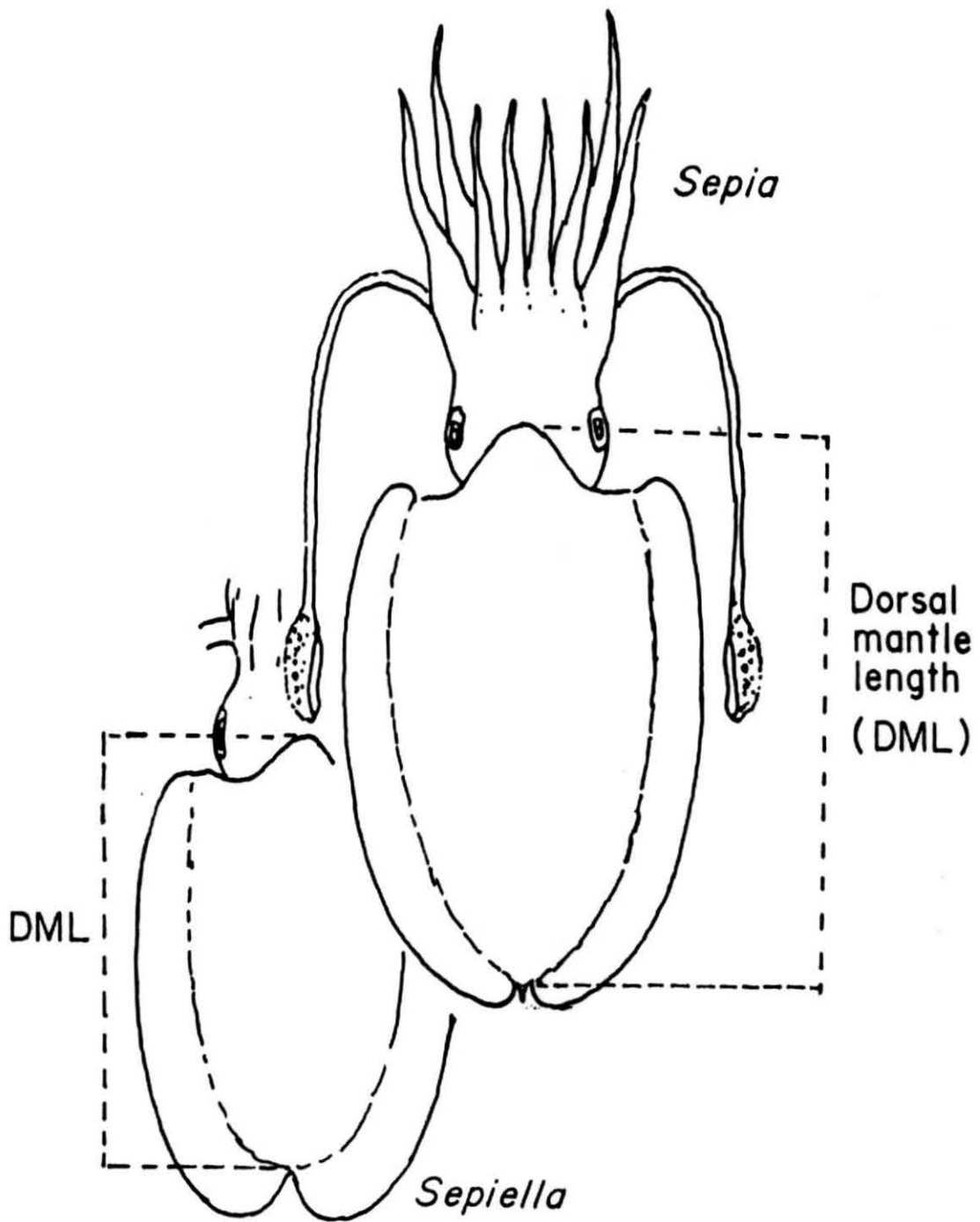
SQUID



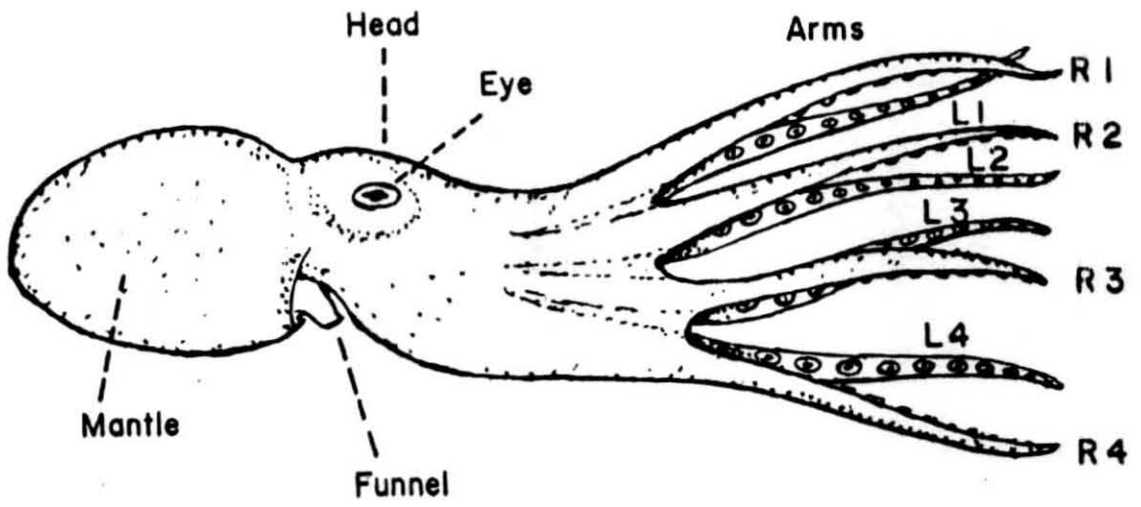
CUTTLEFISH



CUTTLEFISH

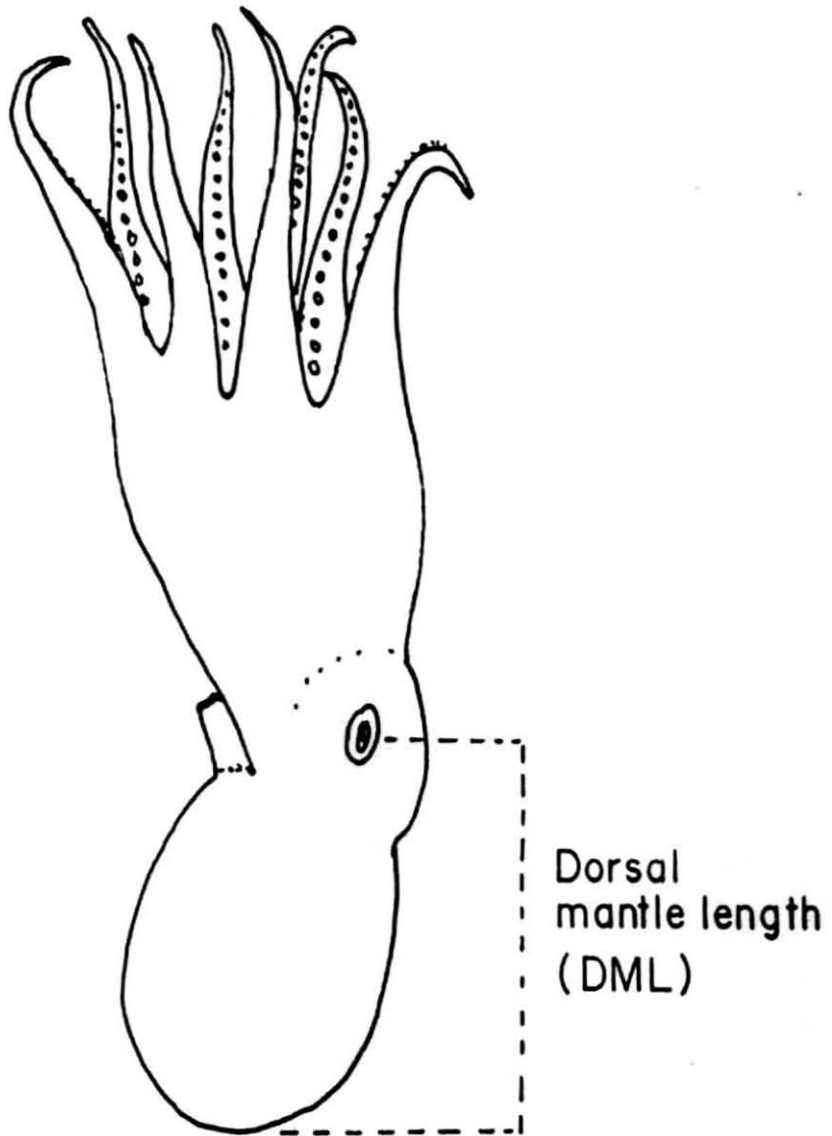


OCTOPUS

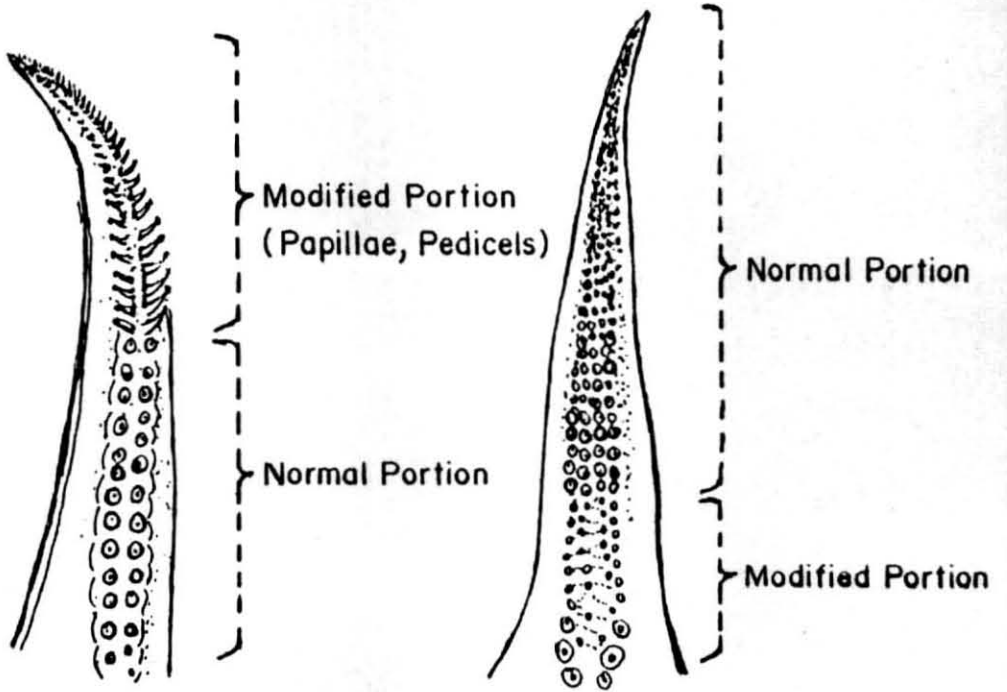


View From Right Side

OCTOPUS



HECTOCOTYLISED ARMS

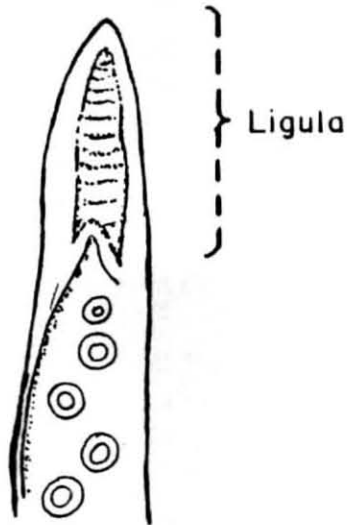


SQUID

Fourth Left Arm

CUTTLEFISH

Fourth Left Arm



OCTOPUS

Third Right Arm

GASTROPODS : GLOSSARY OF TERMS

- Anterior end** : The end of a shell where the aperture is situated, or the front end of the mollusc when in motion.
- Aperture** : The principal opening of the body whorl in a gastropod shell.
- Apex** : The tip of the spire in gastropod shell.
- Apophysis (Pl. apophyses)** : The projecting structure on the inner side of operculum in some gastropods.
- Axis** : Imaginary line through shell apex about which are coiled the whorls of most gastropod shells.
- Axial lamella (Pl. lamellae)** : A thin plate or scale, parallel with shell axis of univalve molluscs.
- Base** : The last-formed part of the gastropod shell opposite to the apex.
- Body whorl** : The last-formed, usually the largest, whorl (chamber) of a shell.
- Callus** : A shelly substance composing a thickened layer, usually around the aperture (eg: parietal callus).
- Columella** : The axial pillar around which whorls (chambers) of the gastropod shell coil, commonly visible at the inner lip of the aperture.
- Columellar lip (inner lip)** : The inner wall of aperture, opposite to the outer lip (peristome).
- Columellar fold (plait)** : Ridge winding round columella and projecting into the interior of shell.
- Cord** : Line of coarse, elevated ornament with rounded top.
- Costa** : Line of ornament similar to cord but of greater prominence.
- Denticle** : A projection resembling a tooth, situated around the margin of the gastropod aperture.
- Dorsal** : The uppermost side of certain gastropods (opposite to the aperture).

- Fasciole** : A spiral band formed by the successive growth lines on the anterior or posterior canal.
- Growth line** : Elevated and concentrically disposed lines or ridges indicating the former growth margins.
- Keel (carina)** : A prominent rib or ridge usually making a change of shape in the outline of the shell.
- Lamella** : A thin plate or scale; (eg: axial lamella).
- Labial** : Pertaining to the lip of the shell.
- Labial teeth** : Tooth-like processes around the aperture of some gastropods, notably cowries.
- Lira (Pl. lirae)** : Fine linear elevation of shelly material usually within outer lip of shells.
- Operculum** : The horny or calcareous structure formed by and attached to the foot covering the aperture of some gastropod shells.
- Palatal** : Pertaining to the outerlip of the aperture of gastropod shell.
- Parietal** : The inside wall of a coiled shell, within the aperture; (eg: parietal edge, parietal callus).
- Parietal shield** : A callus or glaze forming a thickening on the inner lip along the columellar border of the aperture of the shell.
- Periphery** : Outermost part of any whorl, farthest from the axis of coiling.
- Peristome (outerlip)** : The outer margin of the aperture of a shell extending from suture to base of columella.
- Periostracum** : Coating or skin of corneous material known as conchiolin covering the calcareous shell of many molluscs.
- Posterior end** : The end of shell opposite to the aperture, or the nearest rear end of the mollusc when it is in motion.
- Propodium** : The anterior part of a snail's foot.
- Spine** : Spiky or thorn-like protuberance on shell surface.

- Spiral groove** : Curved depression running around the shell surface.
- Spire** : The visible parts of all the whorls of the gastropod shell, except the last one or body whorl.
- Sulcus** : A fissure, slit or furrow; (eg: labial sulcus).
- Suture** : The spiral line marking the junction between the whorls of a shell.
- Siphonal canal** : Tubular or gutter-like extension of lower part of apertural margin often continuous with columella, also known as anterior canal, for enclosure of anterior siphon.
- Umbilicus** : The hole around which the inner surface of a gastropod shell is coiled; imaginary axis passes through centre of umbilicus.
- Varix** : Prominently raised ridges on the surface of the shell.
- Ventral** : The apertural side of a gastropod shell.
- Whorl** : One complete turn of a coiled, tubular, gastropod shell around its imaginary axis.

BIVALVES : GLOSSARY OF TERMS

- Adductor muscle** : One or two muscles in a bivalve used for connecting the valves and drawing them together. Anterior adductor muscle and posterior adductor muscle.
- Adductor muscle scar** : Impression or scar on inner side of shell valves where adductor muscle was attached.
- Anterior end** : The end of a shell nearest to the umbo when directed upwards.
- Apophysis** : A projecting peg-like or finger-like structure on inside of the shell below umbo to which certain muscles are attached.
- Beak** : The small tip of a shell, near the hinge.
- Byssal gape** : Opening between two shell valves through which byssus is extruded.
- Byssus** : The threads which are secreted by certain bivalves for attachment to solid objects.
- Cardinal teeth** : Those situated more or less in the central part of the hinge area.
- Cartilage pit** : A depression on the shell valve for the inner part of the ligament.
- Concentric (lines, grooves, ridges)** : Coinciding in direction with growth lines on bivalve shells.
- Crenulate** : Finely notched or corrugated, as on the ventral margin of some shell valves.
- Dorsal** : At or towards the hinge.
- Ear** : Small extension of dorsal region of bivalve shell, usually with a notch between it and main part of shell, as in Pectinidae.
- Escutcheon** : Depressed, elongate area behind umbones, encompassing ligament, if external, on one or both valves of a bivalve shell; usually differing from rest of shell in ornamentation and colour.

- Gape** : Space between edges of valves of a closed bivalve shell.
- Growth lines** : Elevated and concentrically disposed lines or ridges indicating former growth margins.
- Heterodont** : The hinge teeth of bivalves that are differentiated into cardinals and laterals.
- Hinge** : Thickened internal area in dorsal region of shells where ligament and interlocking teeth are situated.
- Hinge line** : Dorsal or upper side of hinge.
- Hinge plate** : Part of hinge bearing teeth and sockets.
- Hinge tooth (cardinal, lateral)** : Structure projecting from hinge plate which in conjunction with an opposing socket, is a strengthening device in bivalve shells.
- Lamella** : A thin plate or scale.
- Lateral teeth** : Teeth situated on either side of the cardinal teeth.
- Left valve** : Valve situated on observer's left when bivalve shell is placed with anterior end pointing away from him and the hinge uppermost.
- Ligament** : Elastic, corneous structure joining valves of bivalve shell dorsally and causing valves to open when adductor muscles are relaxed.
- Lumule** : Usually heart-shaped depression anterior to umbones of many bivalves.
- Mantle** : The fleshy membrane that encloses the body of molluscs and secretes the shell and periostracum.
- Pallial line** : The impression or scar on the inner surface of the bivalve shell marking the attachment of the mantle.
- Pallial sinus** : An indentation in the pallial line.
- Posterior** : The rear end of a shell away from the umbo when directed upwards.

Posterior ridge : Ridge originating near or on umbo and running diagonally towards posterior end of ventral margin of the shell.

Reticulate : Shell sculpture characterised by distinct lines crossing each other like a network.

Right valve : Valve situated on observer's right when bivalve shell is placed with anterior end pointing away from him and the hinge line uppermost.

Rib : Fairly broad and prominent elevation of shell surface, usually occurring as a continuous line.

Siphon : A tube like extension of the mantle by which water enters or leaves the mantle cavity.

Siphonal notch : A narrow sinus terminating the siphonal canal.

Siphonal fasciole : Spiral growth lines marking the former position of the siphonal notch.

Spine : Spiky or thorn-like protuberance on shell surface.

Sulcus : A fissure, slit or furrow.

Tubercle : Small rounded elevation on shell surface larger than pustule.

Umbo (pl. umbones) : The earliest formed or uppermost part of bivalves.

Ventral : Part opposite to hinge (opposite to dorsal side).

CEPHALOPODS : GLOSSARY OF TERMS

Arms : Cephalopods have circum-oral arms or appendages around the mouth arising from the head, and hence the name cephalopoda, meaning head-footed animals. In decapods (squids and cuttlefishes) there are ten appendages, of which eight are short sessile arms and two are long tentacles. In octopods (octopus) there are only eight arms (no tentacles). In nautiloides (nautilus) there are numerous short appendages. The arms of squid, cuttlefish and octopus are paired and designated as left or right arms. The dorsal arms are the first pair, the dorso-lateral are the second pair, the ventro-lateral are the third pair, and the ventral arms are the fourth pair; the tentacles of decapods also are paired. Each appendage is designated with reference to its position: first left arm, third right arm, right tentacle and so on.

Arm formula : The relative lengths of arms are expressed in 'arm formula' in the order of decreasing length. For example 2.3.4.1 denotes $2 > 3 > 4 > 1$.

Armature : Arrangement of either suckers or hooks or both on arms and tentacular clubs.

Beak : The hard, horny, part of the mouth having the upper and lower jaws or mandibles, more or less shaped like a parrot's beak.

Buccal lappets : Small, 6-8 triangular flaps of buccal membrane around the mouth, each lappet bearing one or more minute suckers.

Buccal membrane : Web-like membranous sheath surrounding the mouth in squids and cuttlefishes; absent in octopus.

Calamus (Calimus) : A small conical projection of the extreme tip of the spermatophoral groove in the hectocotylised arm of octopus.

Carpal clusters : A group of small suckers and fleshy knobs on the carpus of tentacular club.

Carpal knobs : Small, round, fleshy projections on the carpus of tentacular club.

Carpal suckers : Cup-like small suckers on the carpus of tentacular club.

Carpus (wrist) : Proximal portion of tentacular club provided with small suckers and sometimes with knobs.

Chromatophores : Contractile pigment sacs in the outer skin; they are under nervous control, and are responsible for colour and colour changes.

Corneal membrane : A thin transparent membrane covering the eyes of cuttlefishes and neretic (myopsid) squids.

Cuttlebone : The thick, chalky, calcified internal shell of cuttlefish.

Dactylus : The distal portion of tentacular club where small suckers are present.

Dentition : Presence of teeth on horny rings of tentacular and arm suckers of squids and cuttlefishes.

Faveola : Membranous folds or ridges of skin that form a pocket-like structure in the funnel groove of some oceanic (oegopsid) squids.

Fins : A pair of muscular flaps on the lateral sides of the mantle of squids and cuttlefishes (absent in octopus); and in locomotion.

Funnel (siphon) : A tube situated on the ventral side of the body, through which water from mantle cavity is pumped out like a jet which enables the backward darting movement of the animal.

Funnel groove : A pit-like depression in the postero-ventral part of the head in which lies the free portion of the funnel.

Funnel locking apparatus : A mechanism by which the basal portion of the funnel and the inner wall of the anterior portion of the mantle are kept in locked-up position. This is facilitated by the cartilaginous grooves or depressions on each side of the funnel into which corresponding projections on the inner wall of the mantle are fitted. By this the mantle opening is tightly closed, expelling the water in the mantle cavity like a jet.

Funnel organ : A glandular structure present on the inner wall of the funnel; usually 'W' or 'VV' shaped in octopus and 'A' shaped with an oval patch on either side in squids and cuttlefishes.

Gladius (pen) : Thin, feather-shaped and opaque chitinous internal shell embedded in the dorsal side of the mantle in squids.

Hectocotylus : Structural modification of a portion of one of the arms in male cephalopods for transfer of spermatophores into the female. Such an arm is called the hectocotylied arm. Suckers, pedicels and protective membranes are differently modified in different species.

Hooks : Sharp, curved, chitinous structures on the arms and tentacular clubs in some oceanic squids.

Ink-sac : A bag in which thick black-coloured ink is produced and stored to be used as a defensive or escape mechanism. It is located in the mantle cavity anteriorly in squids and posteriorly in cuttlefish, in some octopuses it is greatly reduced or absent.

Keel : The membranous extension on the aboral side of arms, tentacles and tentacular clubs; also known as swimming membrane.

Light organ : A specialised structure in some cephalopods, also known as photophore; produces bioluminescence either by chemical action or through symbiotic bacteria.

- Ligula** : The spoon-shaped tip of the hectocotylished arm in octopus.
- Mantle** : The muscular body wall of cephalopods surrounding the internal organs.
- Manus** : The mid-portion of the tentacular club between carpus and dactylus; also known as hand. Usually the suckers on manus are larger in size.
- Papillae** : Modified pedicels (without suckers) on the hectocotylished arm of the male squid.
- Pedicel** : Cone-shaped fleshy stalk of suckers on arm and tentacular club.
- Protective membrane** : Web-like membrane present along the sides of arm and tentacular club.
- Rachis** : The thickened mid-axis of the gladius.
- Radula** : The chitinous band in the buccal mass having several transverse rows of teeth used for grasping food.
- Spermatophoral groove** : A groove on the ventral margin of the hectocotylished arm of octopus. During mating, spermatophores are conducted through this groove to the ligula.
- Suckers** : Muscular, cup-like structures on the arms and tentacular clubs. Some have stalks as in squids and cuttlefishes. The suckers of octopus have no stalks.
- Sucker ring** : The horny rings with teeth-like projections, imbedded in the sucker openings in squids and cuttlefishes; suckers of octopus have no rings.
- Tentacle** : Two elongate slender appendages one on either side of the mouth, terminating in expanded clubs in squids and cuttlefishes. They are used for capturing prey. In squids the tentacles are contractile; in cuttlefishes they are contractile and can be retracted into pouches or pockets. Tentacles are absent in octopods.
- Tentacular club** : The flattened and expanded terminal portion of tentacle which bears suckers, hooks or both.

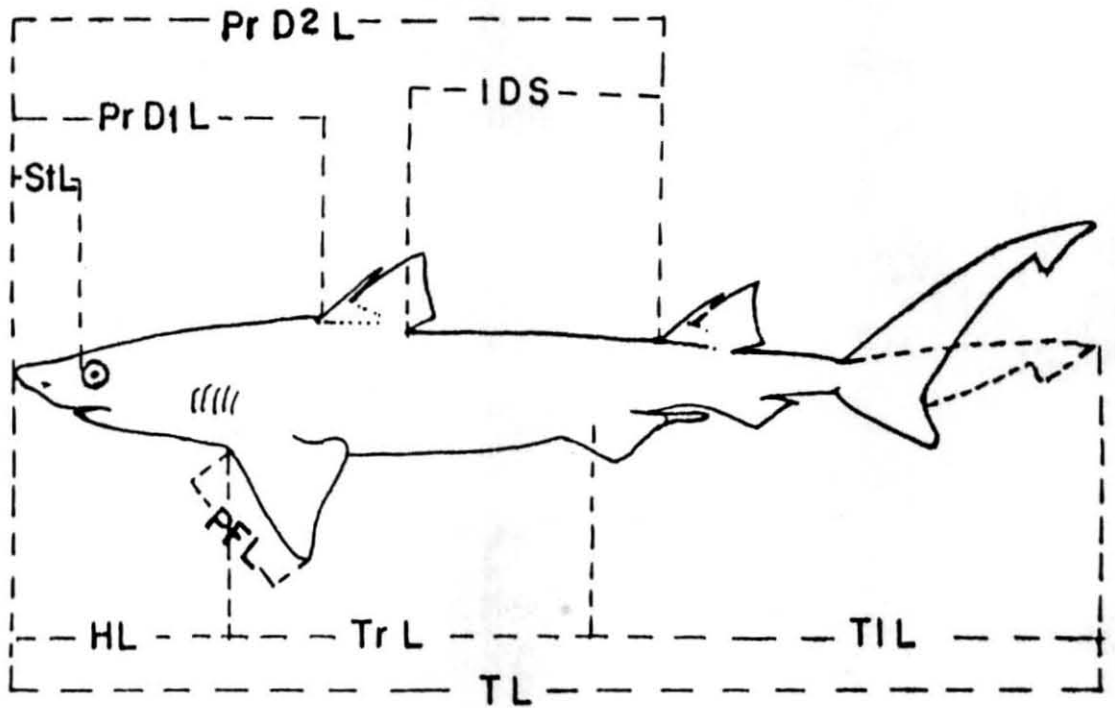
Legend

TL	Total Length
HL	Head Length
TrL	Trunk Length
TtL	Tail Length
StL	Snout Length
Pr.D1L	Pre Dorsal (1) length
Pr.D2L	Pre Dorsal (2) Length
IDS	Innter Dorsal Length
PFL	Pelvic Fin Length

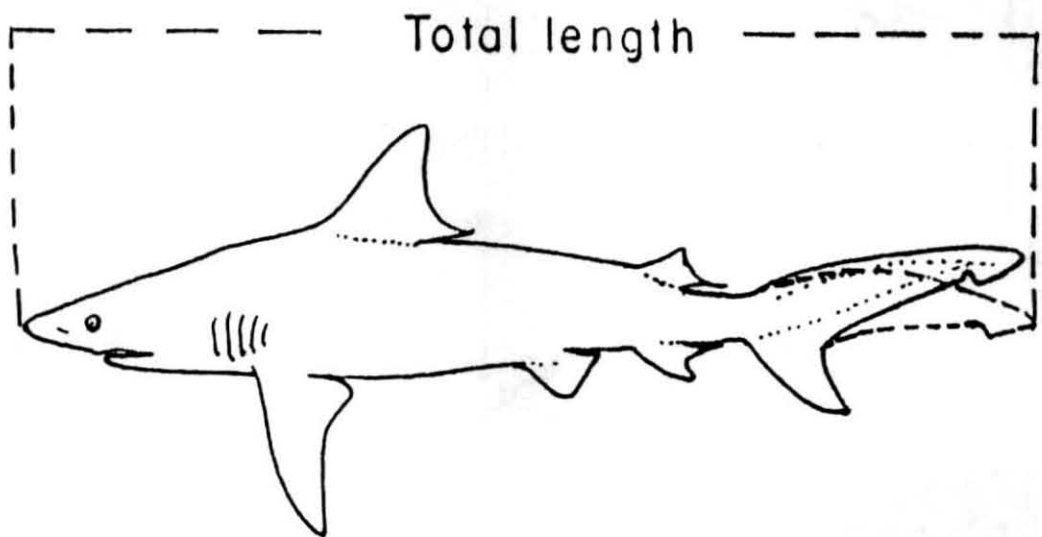
III FISHES

A. ELASMOBRANCHS

Morphometry

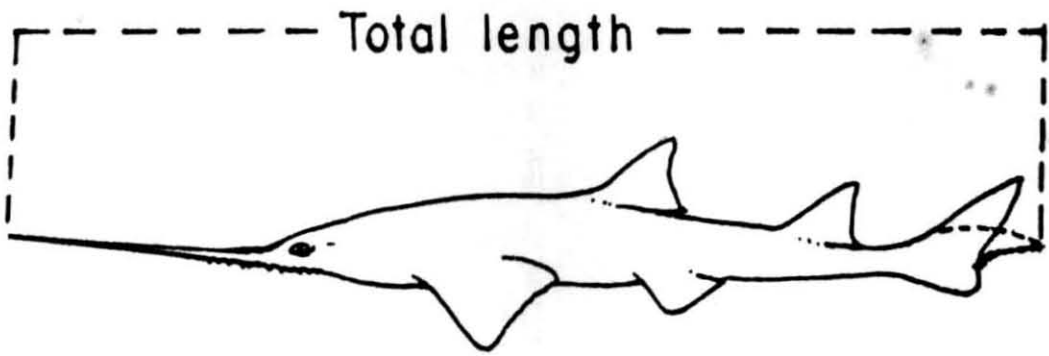


1. SHARK



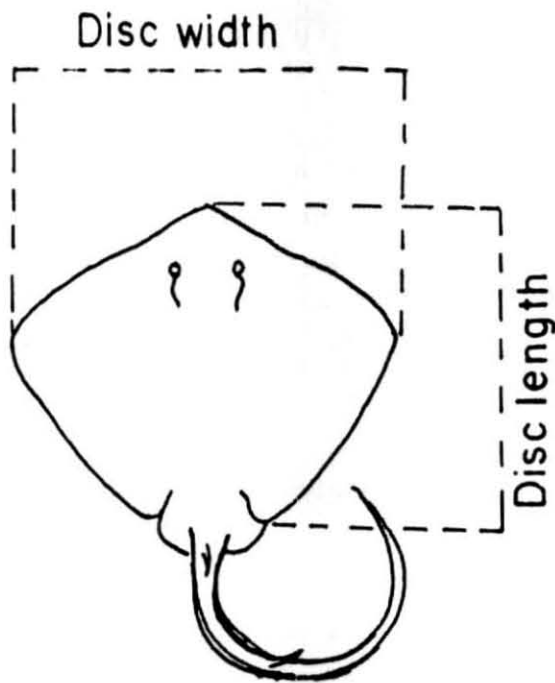
Carcharhinus limbatus

**2. SKATES
SAWFISH**



Pristis microdon

**3. RAY
STINGRAY**



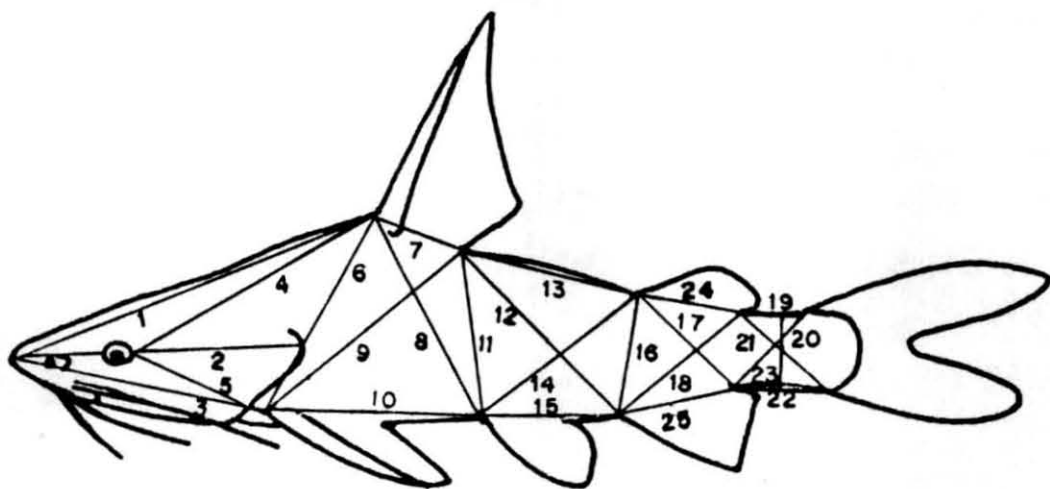
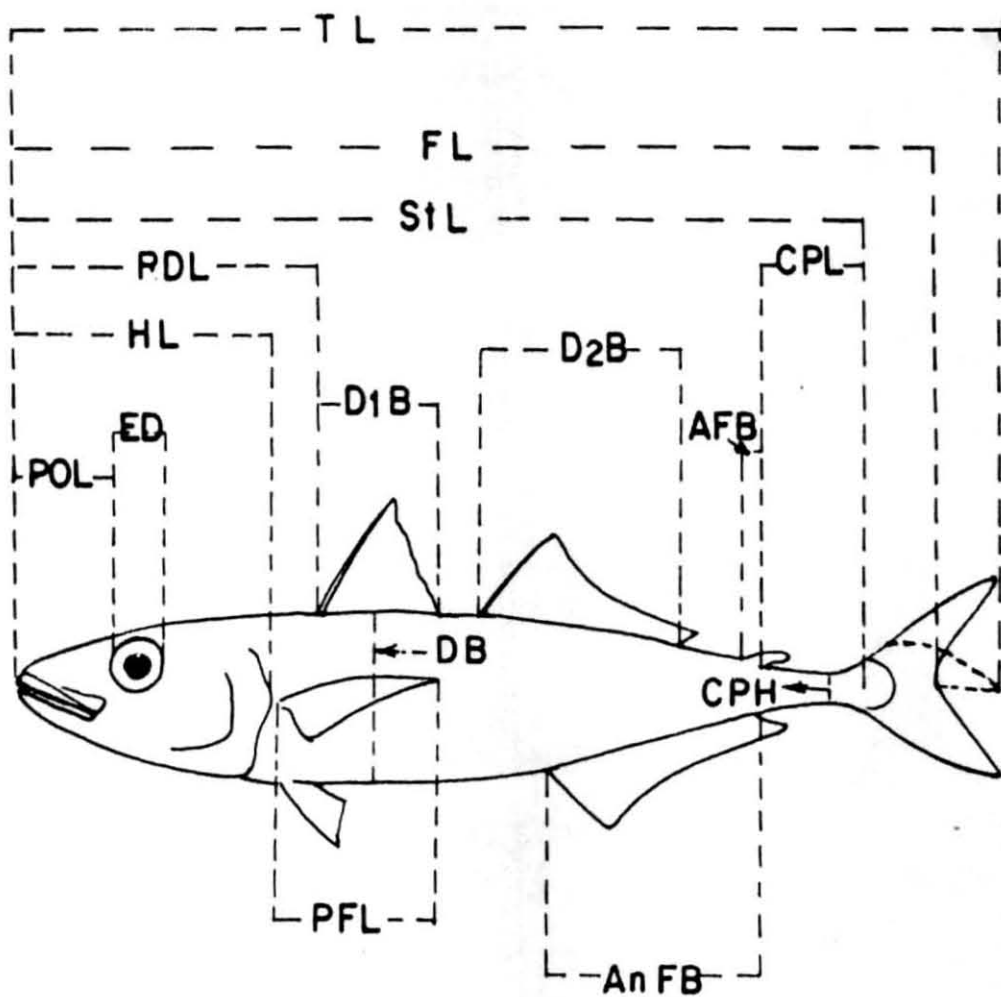
Dasyatis kuhlii

Legend

TL	Total Length
FL	Fork Length
StL	Standard Length
PDL	Pre Dorsal Length
HL	Head Length
POL	Pre Orbital Length
ED	Eye Diameter
D1B	First Dorsal Base
D2B	Second Dorsal Base
CPL	Caudal Peduncle Length
AFB	Adipose Fin Base
DB	Depth of Body
CPH	Caudal Peduncle Height
PFL	Pectoral Fin Length
AnFB	Anal Fin Base

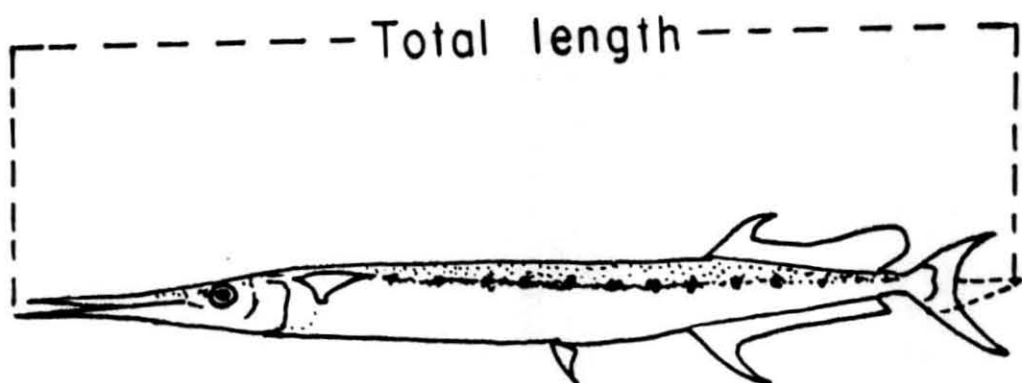
B. TELEOST

Morphometry



TRUSS NETWORK MORPHOMETRICS

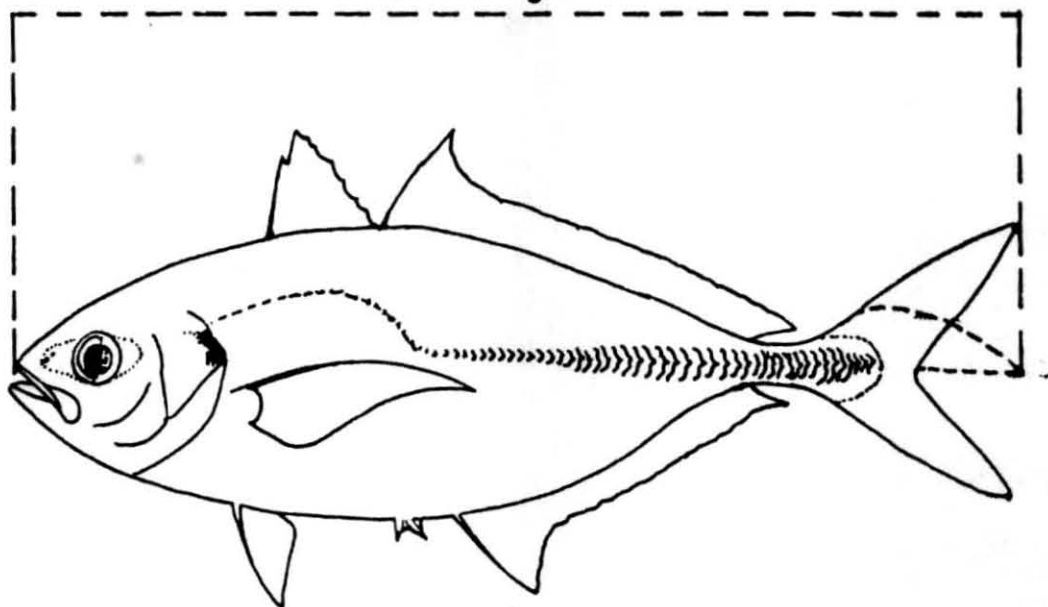
FULL BEAK (GAR FISH)



Ablennes hians

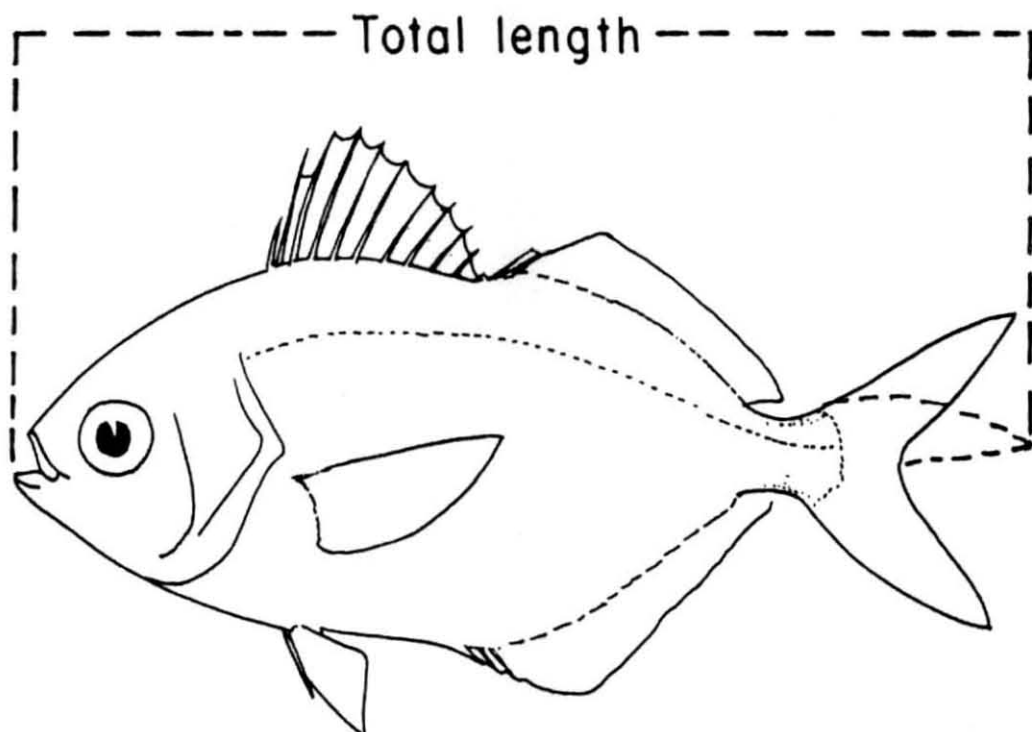
TREVALLY

Total length



Alepes djeddaba

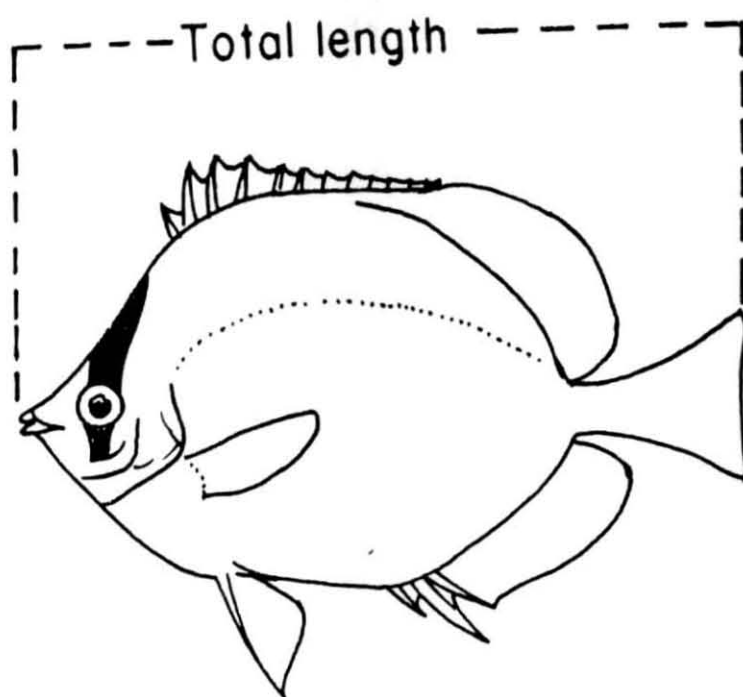
INDIAN DRIFT FISH



Ariomma indica

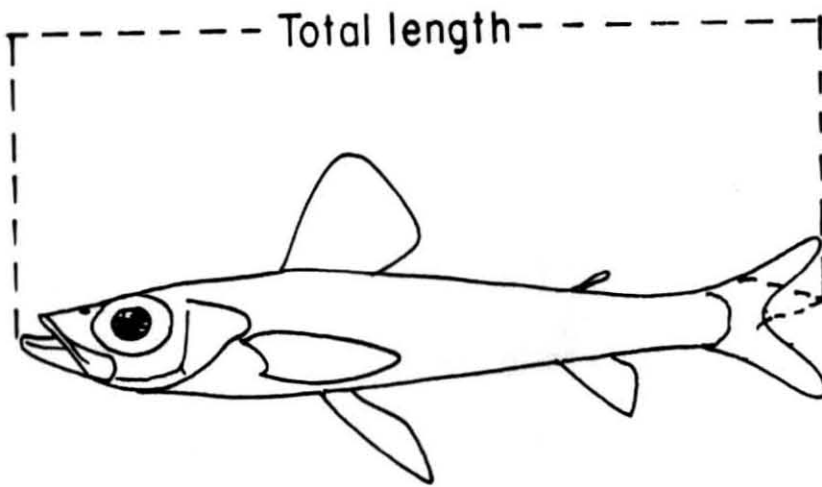
(Psenes indicus)

BUTTERFLY FISH CORAL FISH

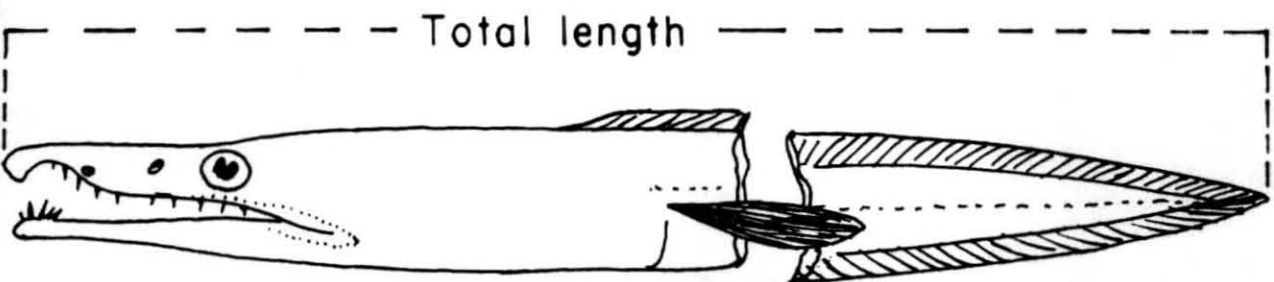
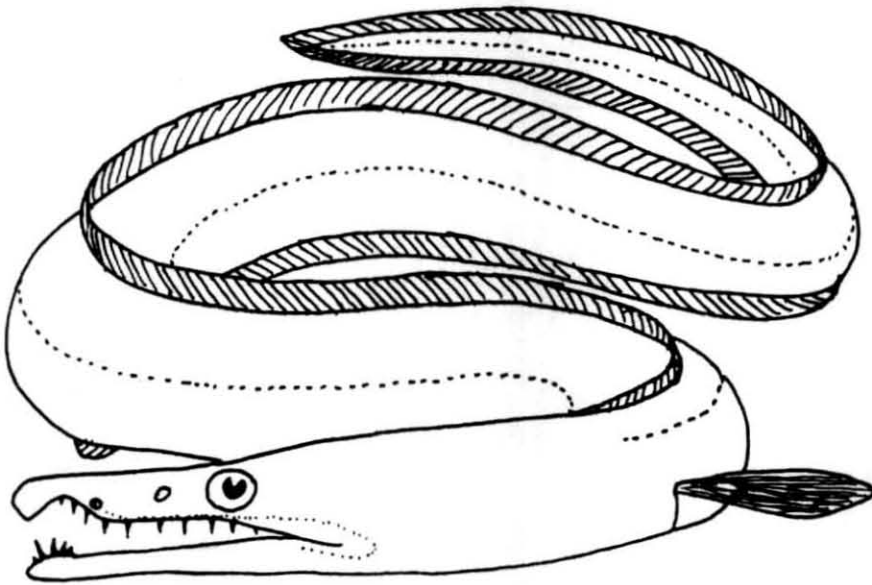


Chaetodon sp.

GREEN EYE

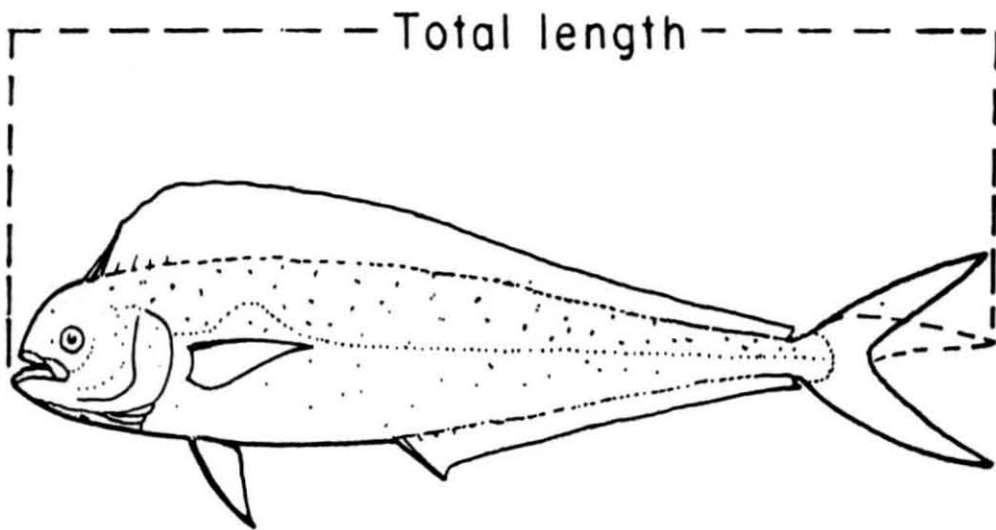


Chlorophthalmus agassizi
EEL



Congresox talabonoides

DOLPHIN FISH



Coryphaena hippurus

FLAT FISH

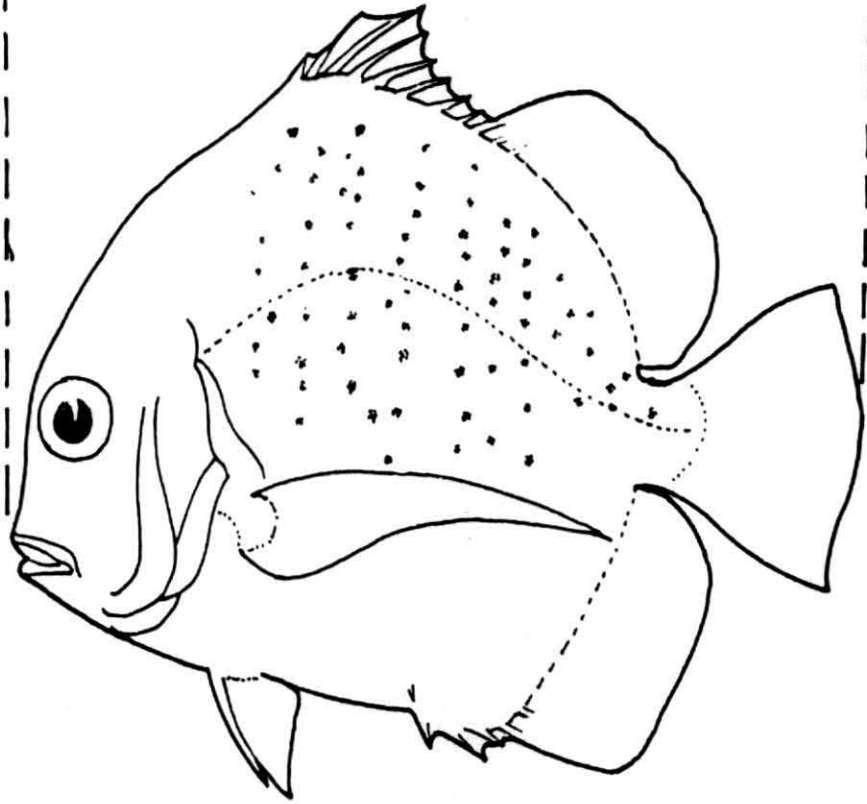
Total length



Cynoglossus macrolepidotus

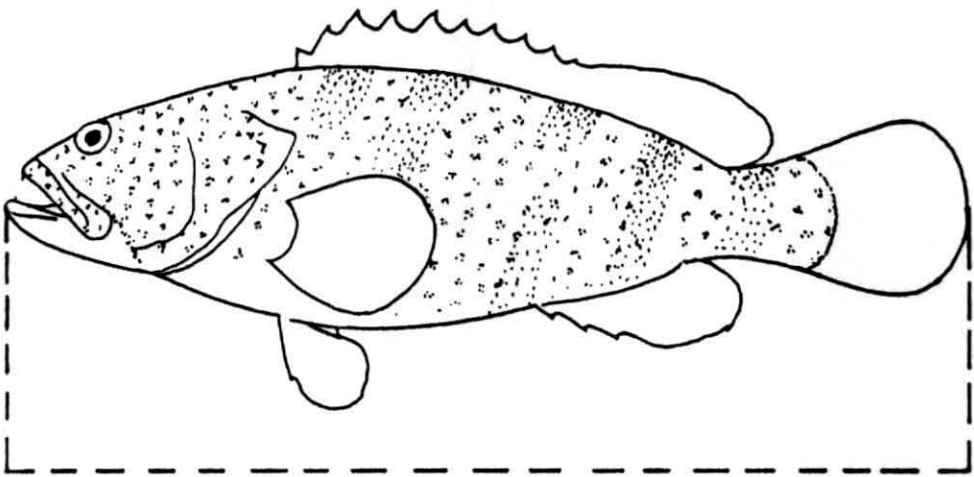
SICKLE FISH

— Total length —



Drepane punctata

GROUPER (REEF COD)

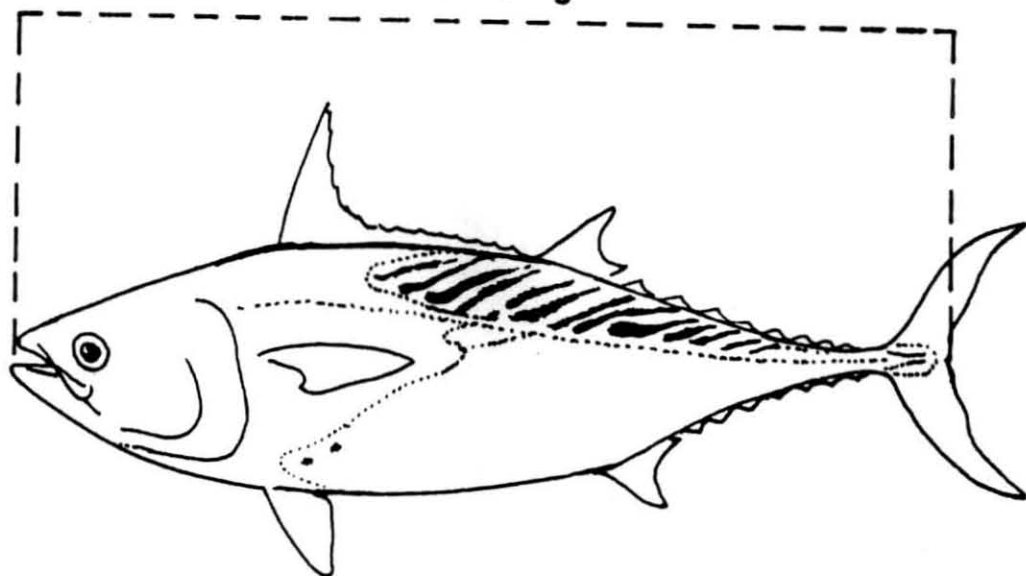


Total length

Epinephelus tauvina

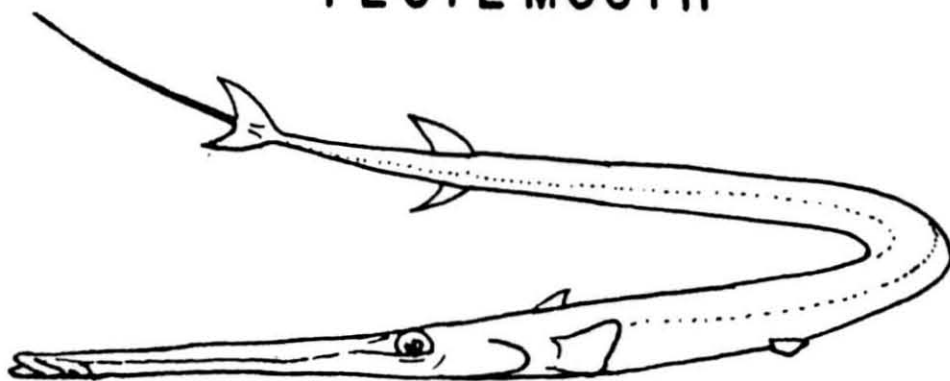
LITTLE TUNA

Fork length

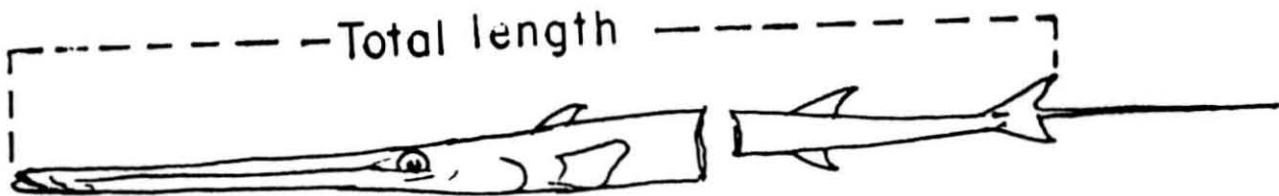


Euthynnus affinis

FLUTE MOUTH



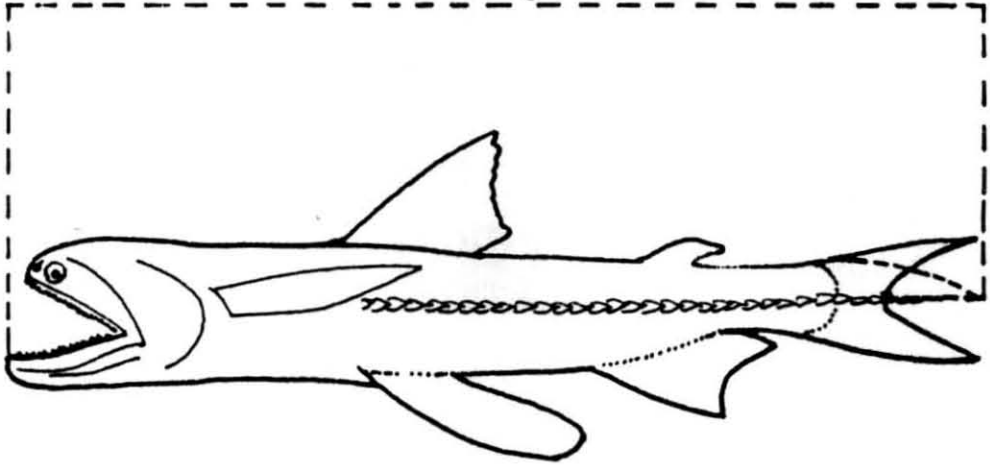
Total length



Fistularia petimba

BOMBAY DUCK

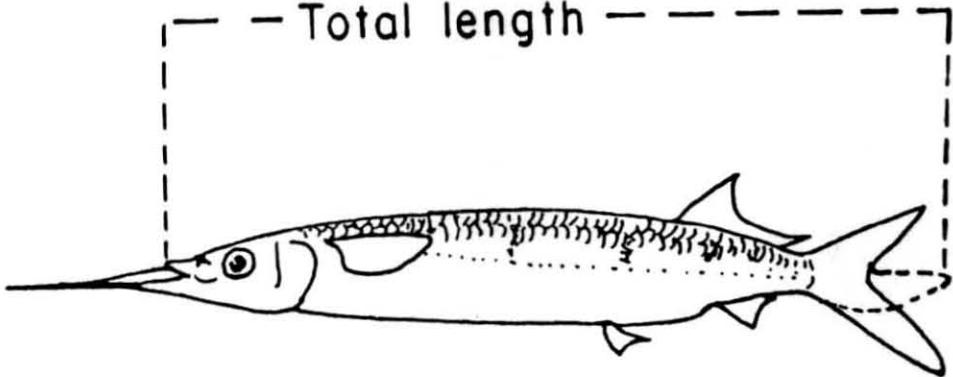
Total length



Harpodon nehereus

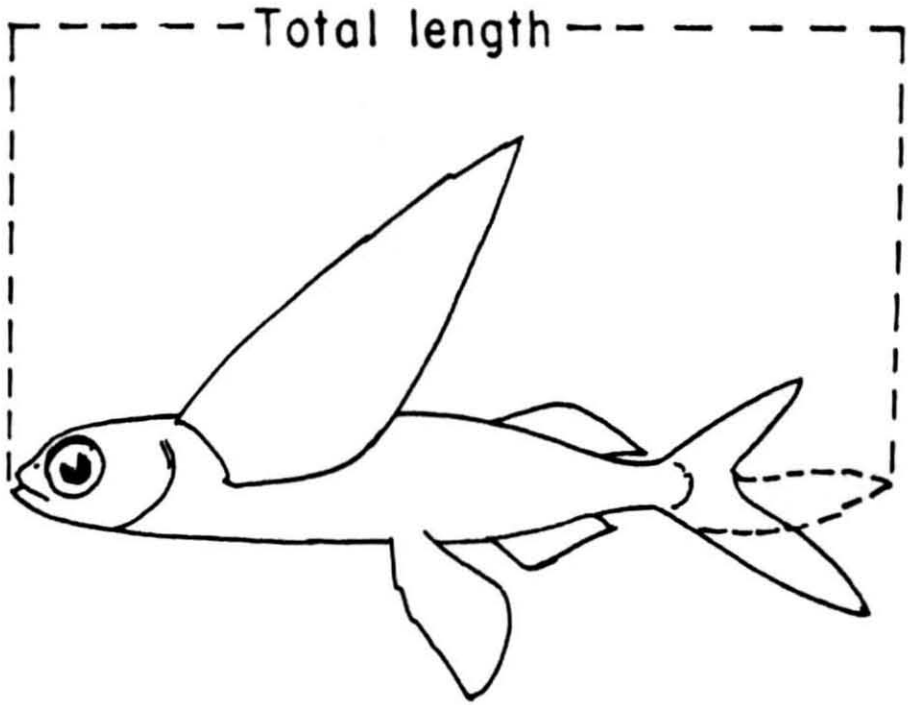
HALF BEAK

— Total length —



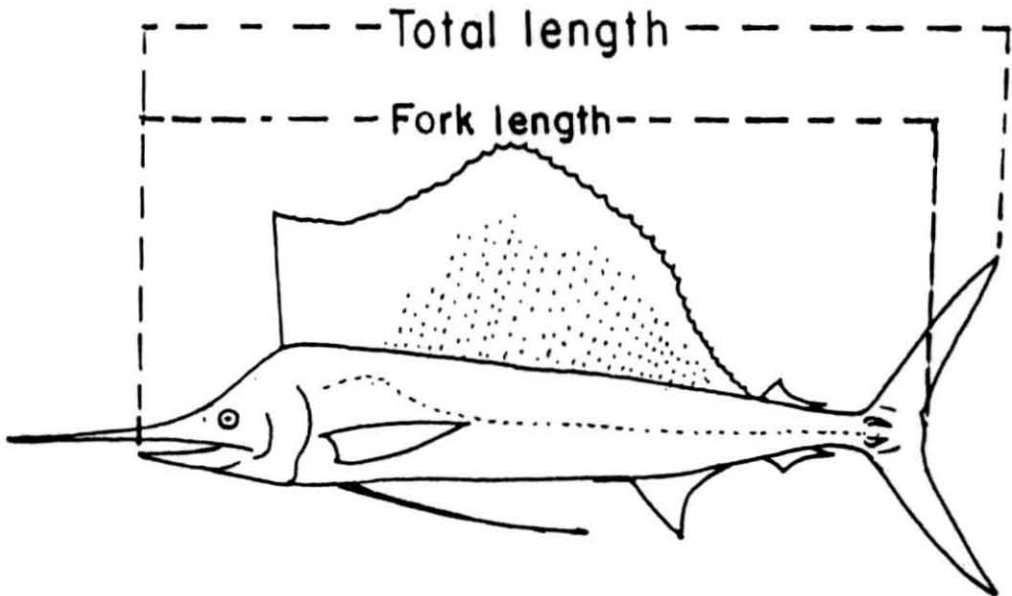
Hemirhamphus fur

FLYING FISH



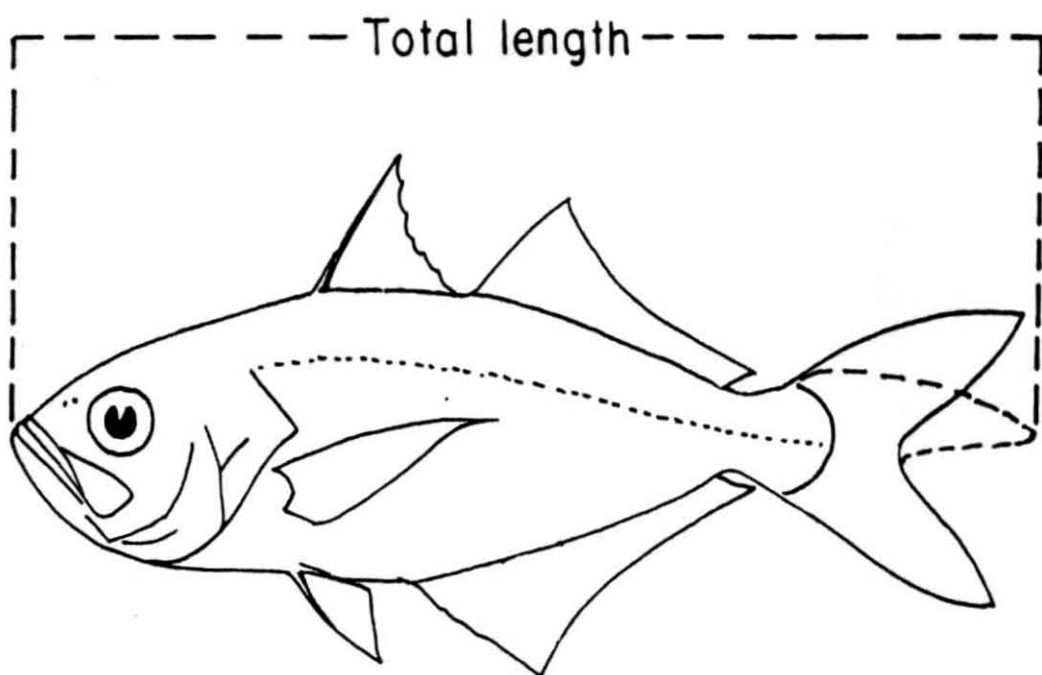
Hirundichthys coramandelensis

SAIL FISH



Istiophorus platypterus

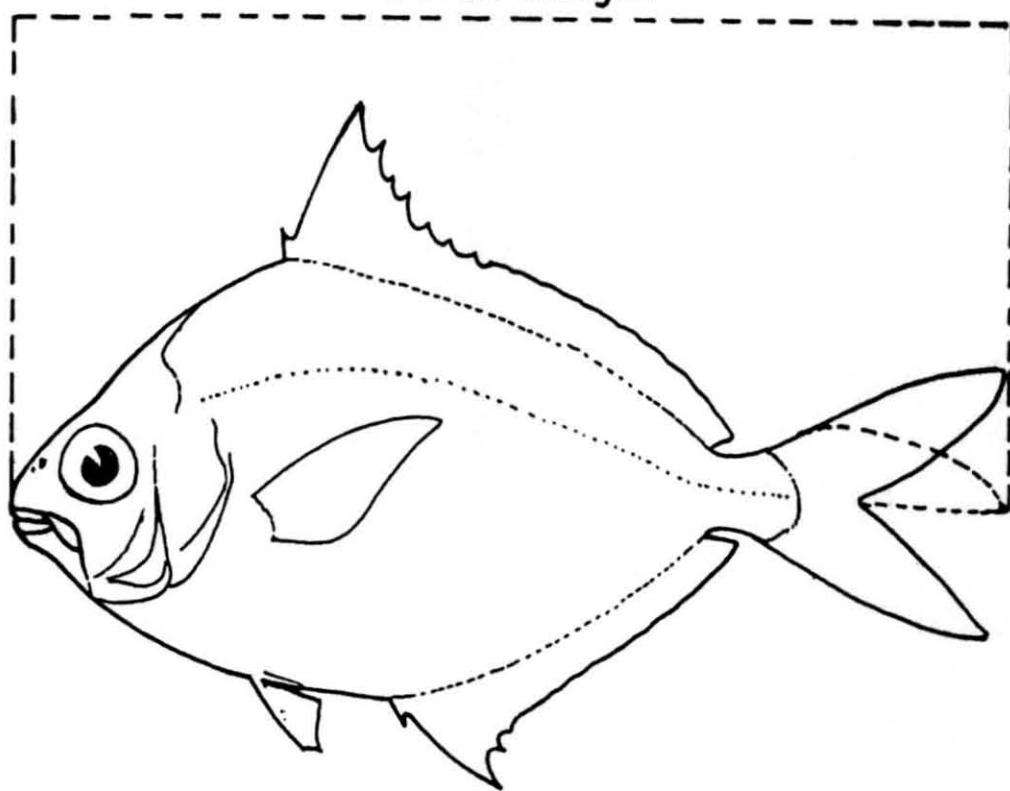
WHITE FISH / BIG JAWED JUMPER



Lactarius lactarius

SILVER BELLY (PONY FISH)

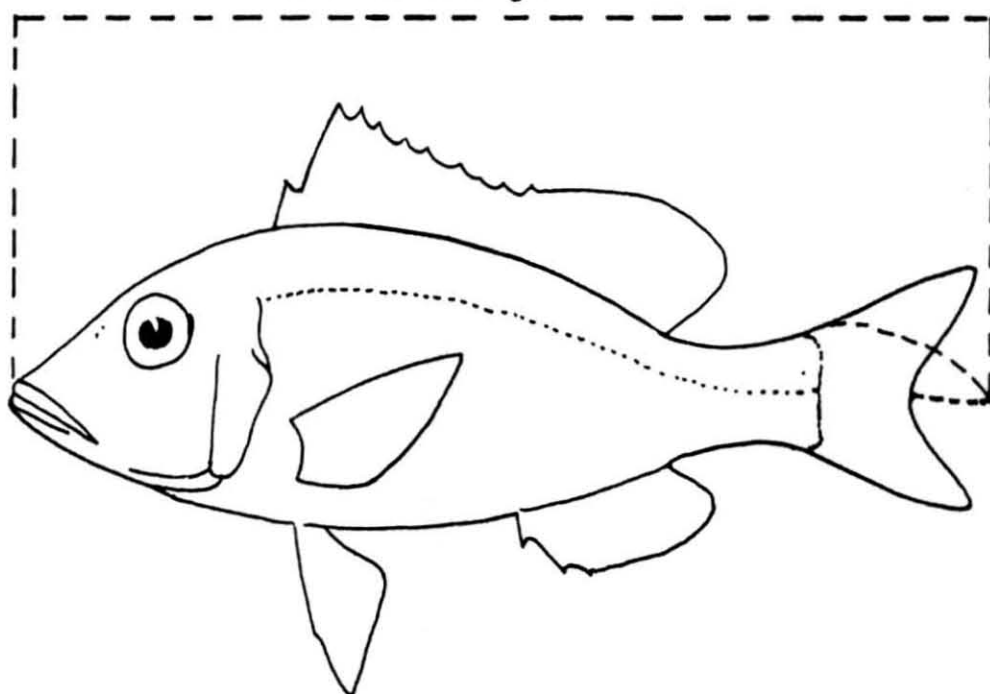
Total length



Leiognathus equulus

PIG FACE BREAM

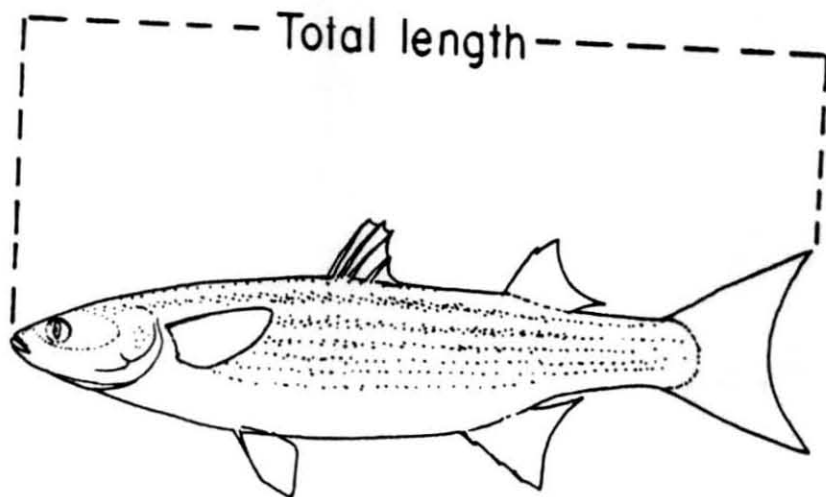
Total length



Lethrinus nebulosus

MULLET

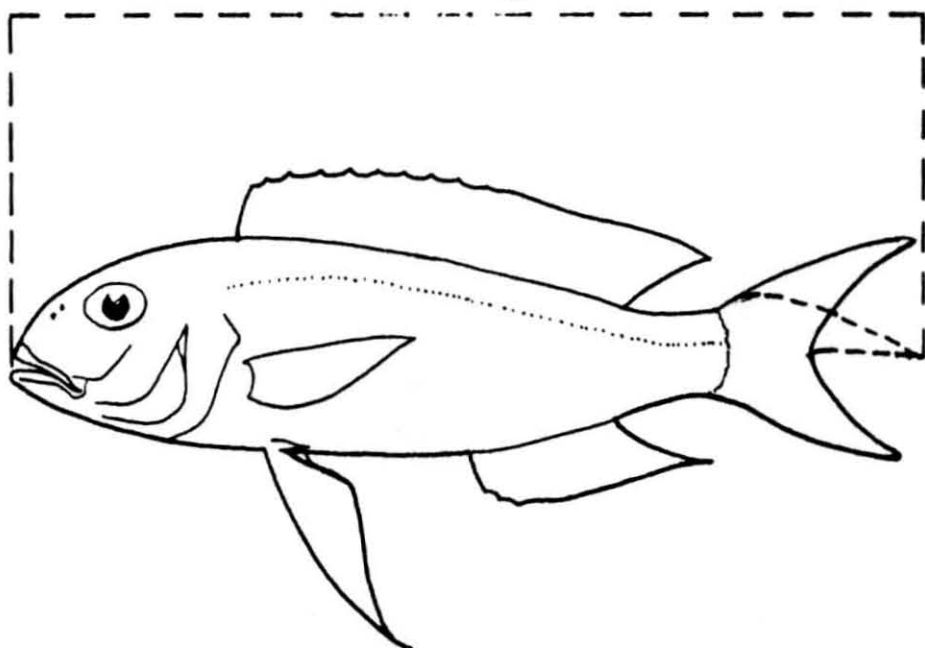
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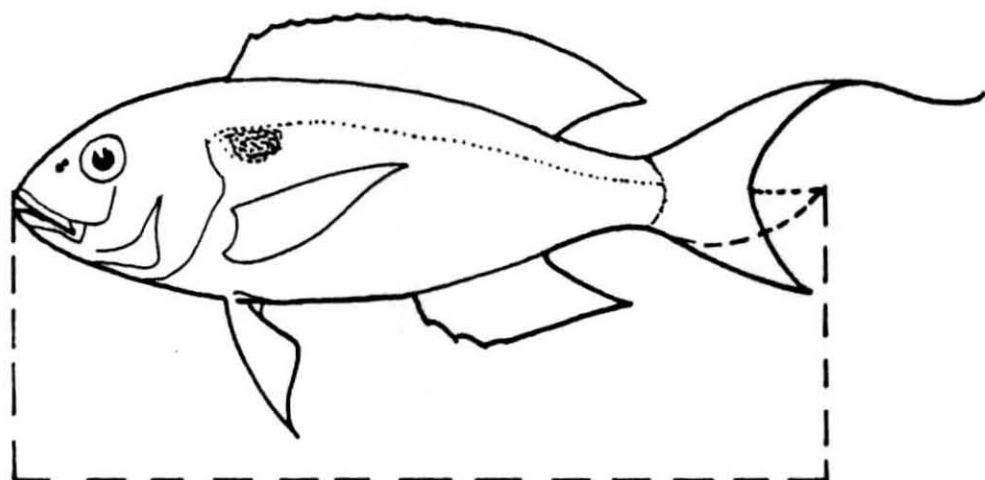
Mugil cephalus

THREADFIN BREAM

Total length



Nemipterus delagoae

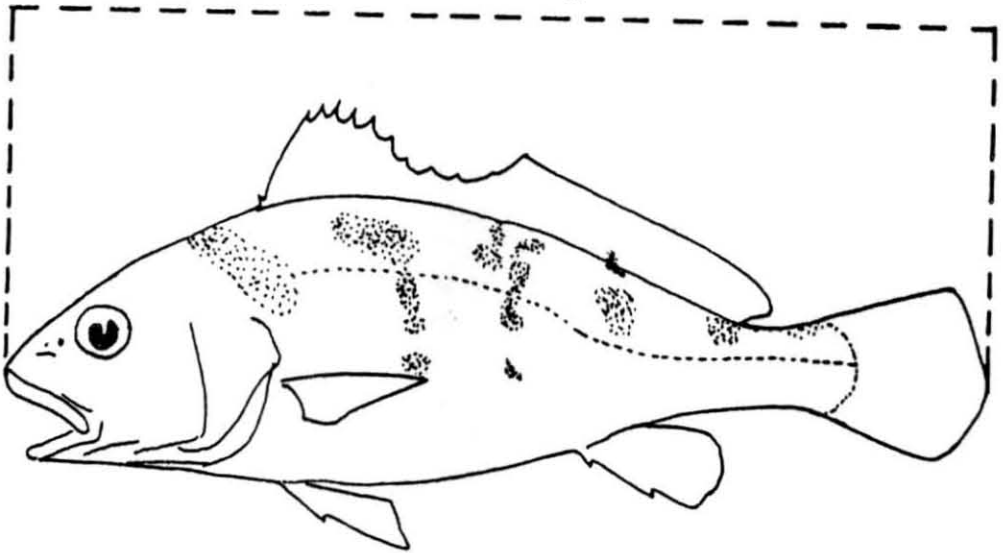


Total length

Nemipterus japonicus

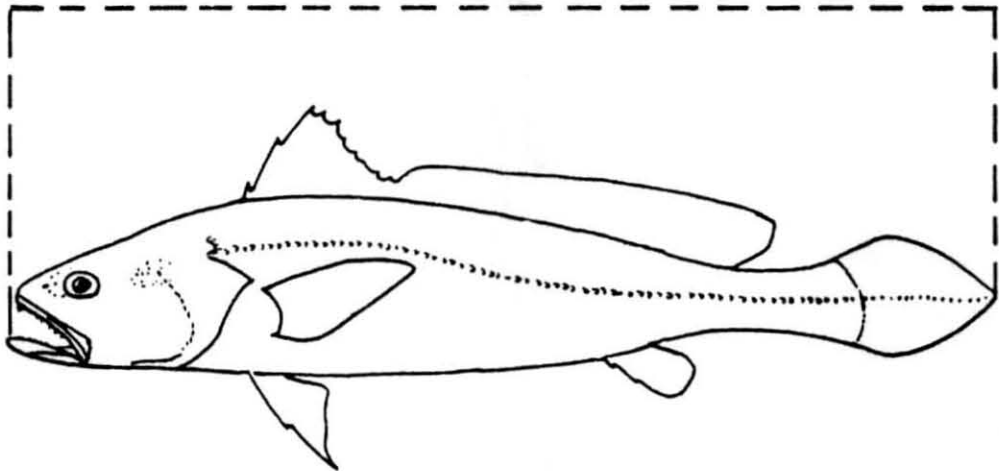
CROAKER

Total length



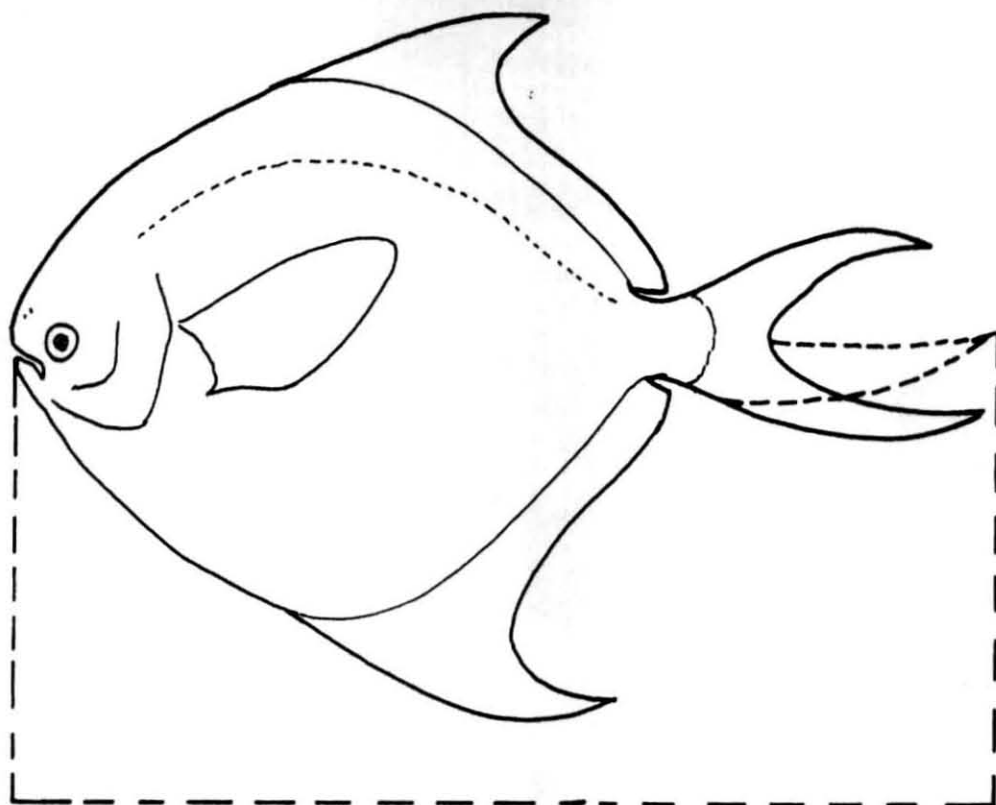
Nibea maculata
(*Johnius maculatus*)

Total length



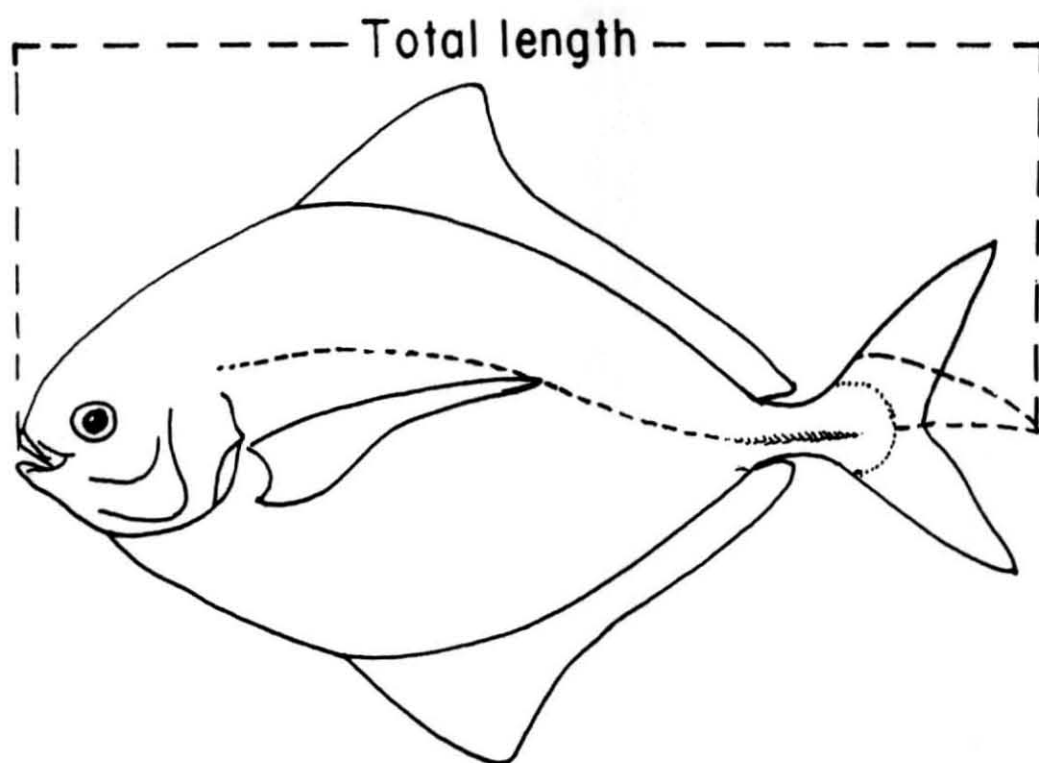
Panna microdon

SILVER POMFRET



Total length
Pampus argenteus

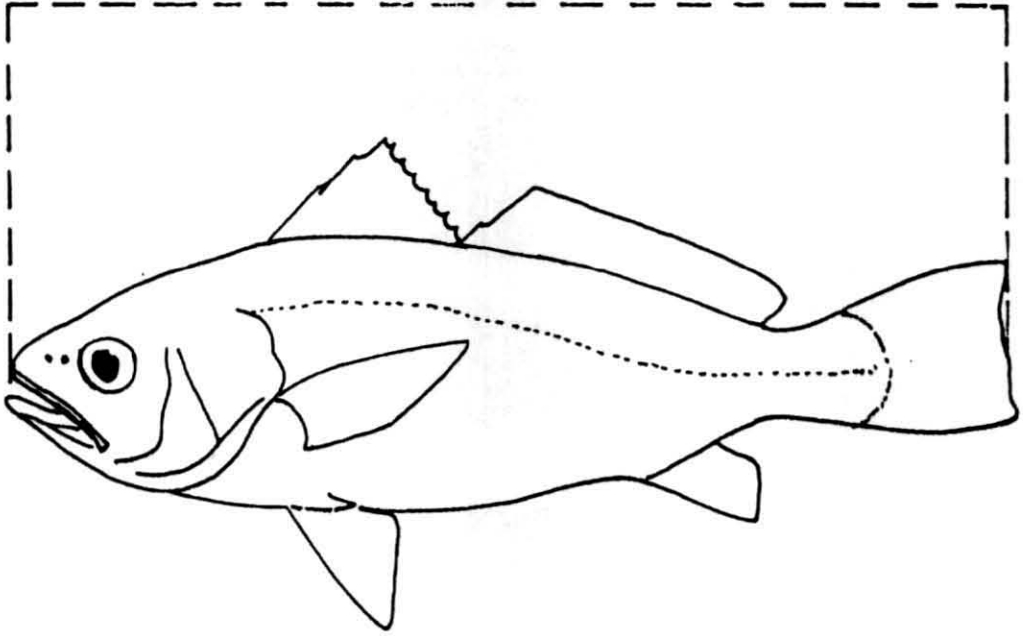
BLACK POMFRET



Parastromateus niger
(Formio niger)

CROAKER

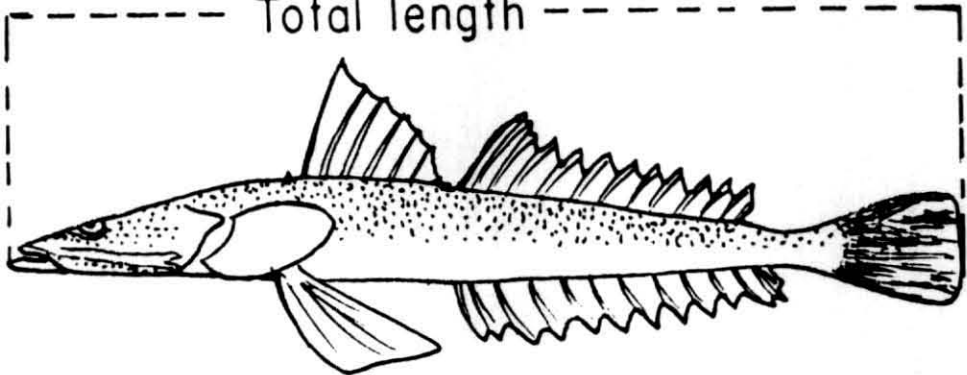
Total length



Pennahia macrophthalmus

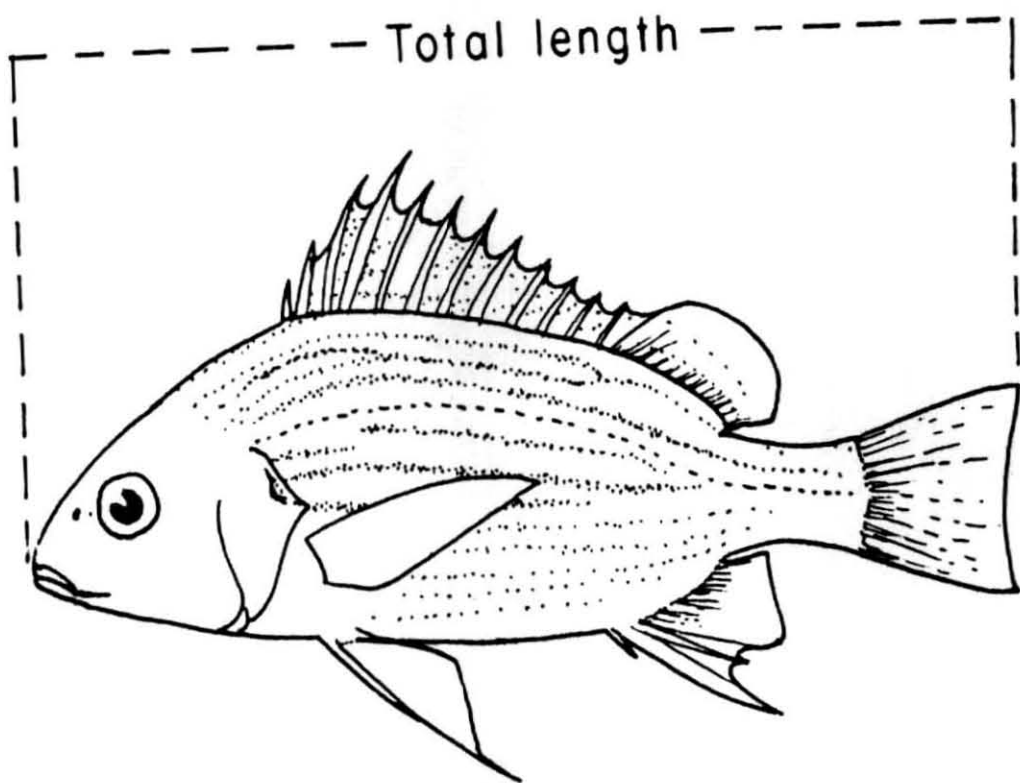
FLAT HEAD

Total length



Platyce phalus indicus

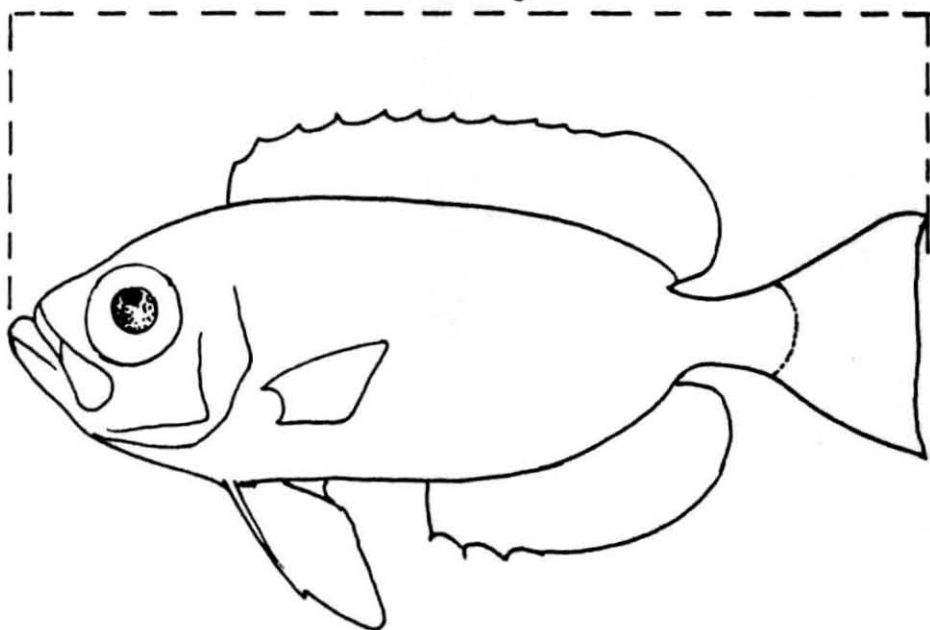
GRUNTERS



Pomadasys hasta

BULLS EYE

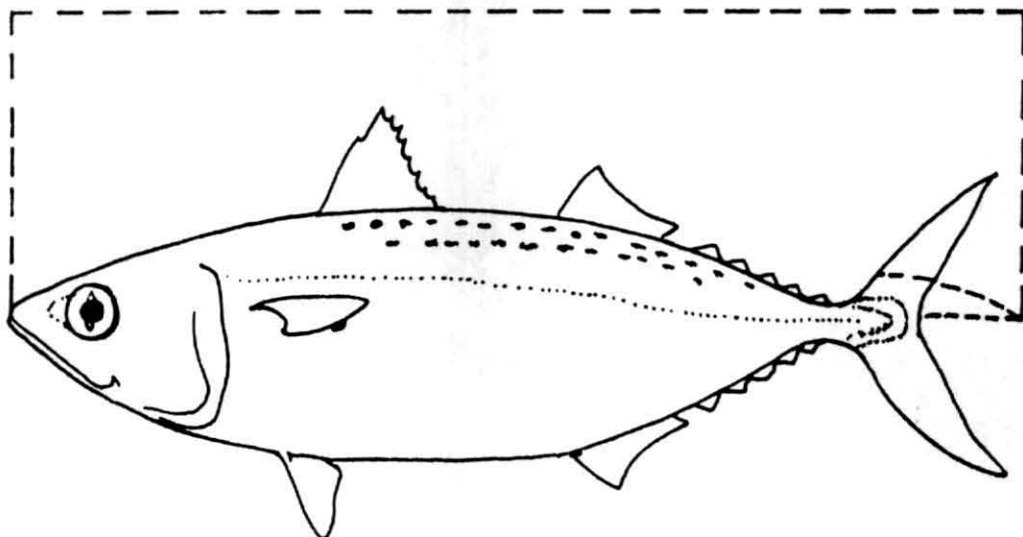
Total length



Priacanthus hamrur

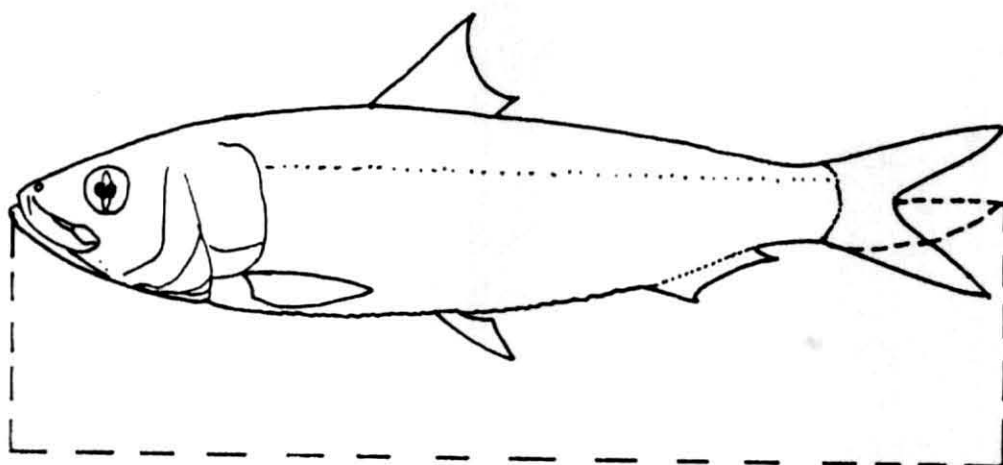
INDIAN MACKEREL

Total length



Rastrelliger kanagurta

OIL SARDINE

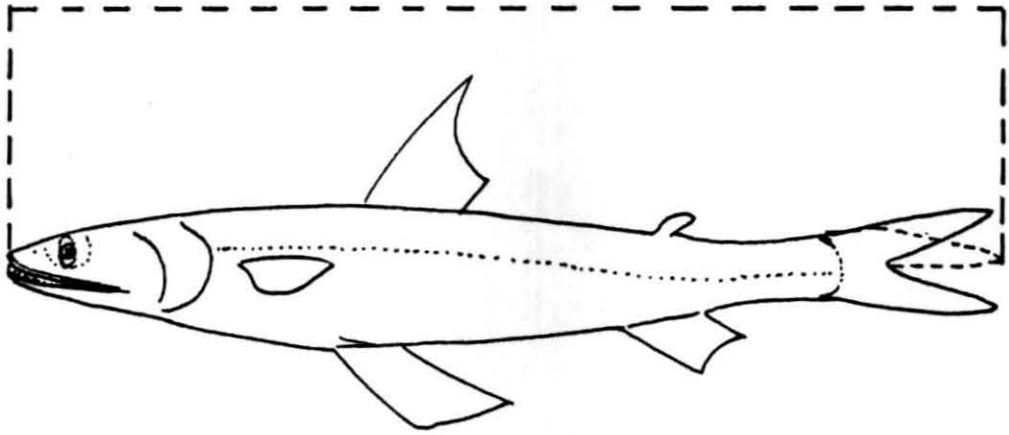


Total length

Sardinella longiceps

LIZARD FISH

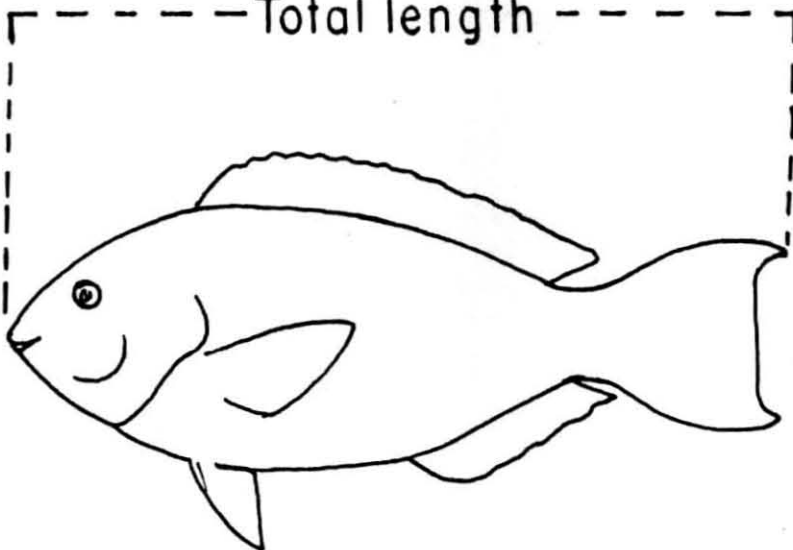
Total length



Saurida tumbil

PARROT FISH

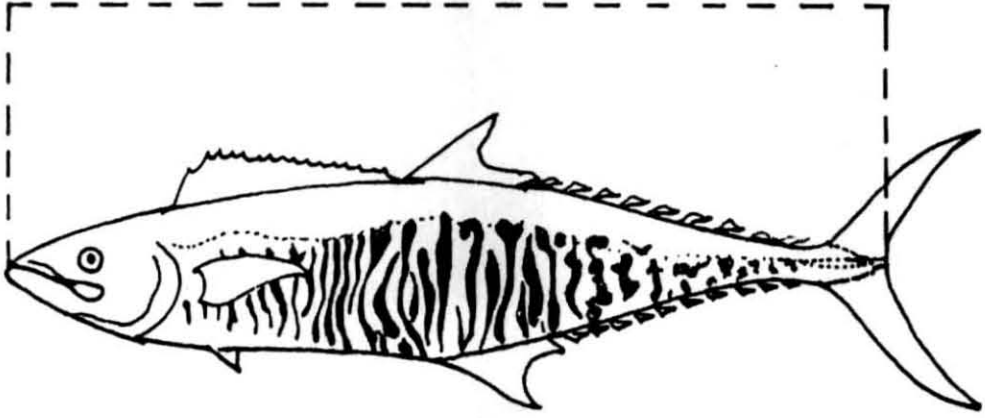
Total length



Scarus russelli

SEER FISH

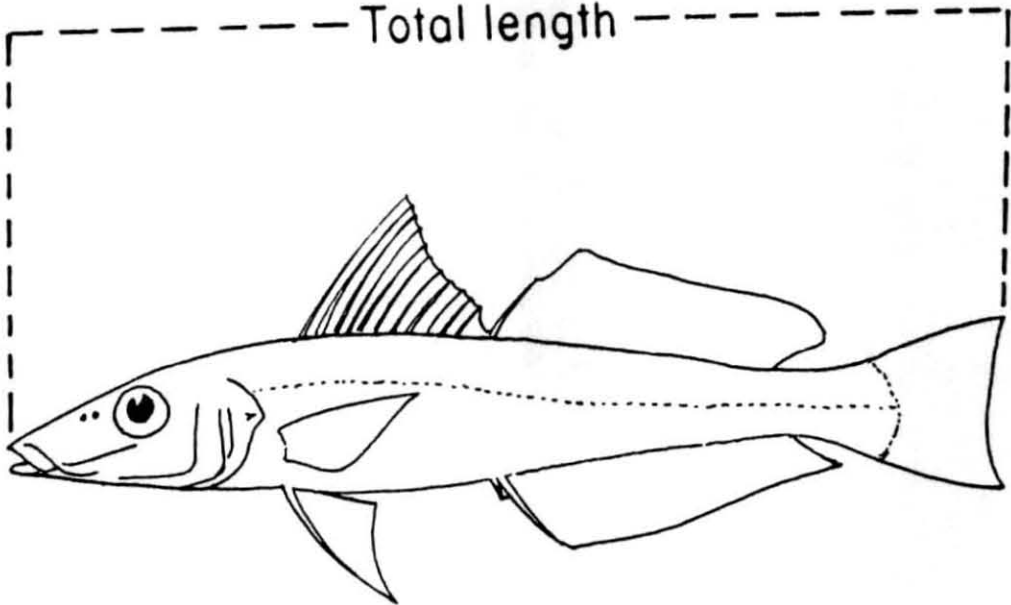
Fork length



Scomberomorus commerson

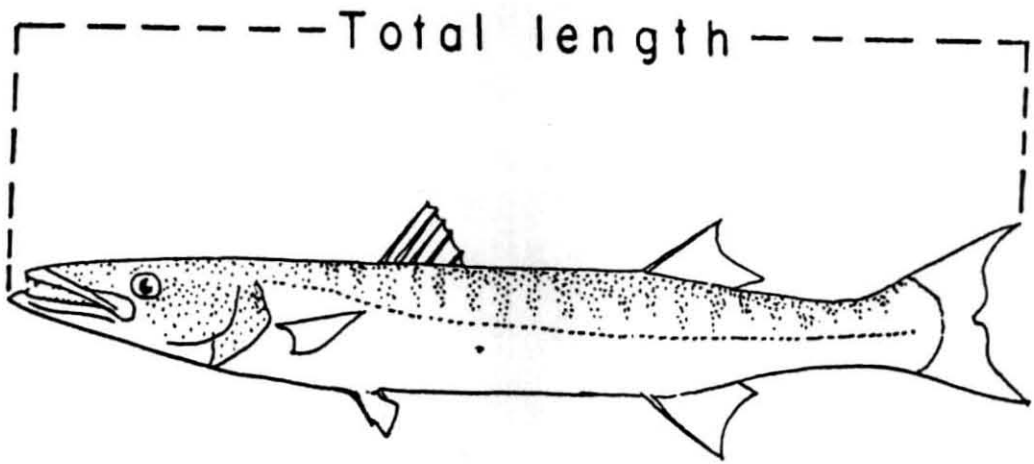
WHITING

Total length



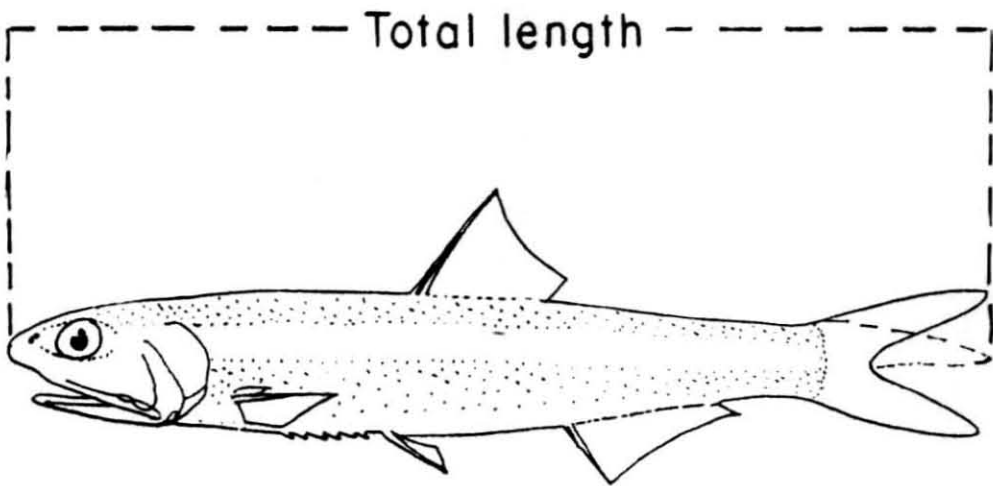
Sillago sihama

BARRACUDA



Sphyraena barracuda

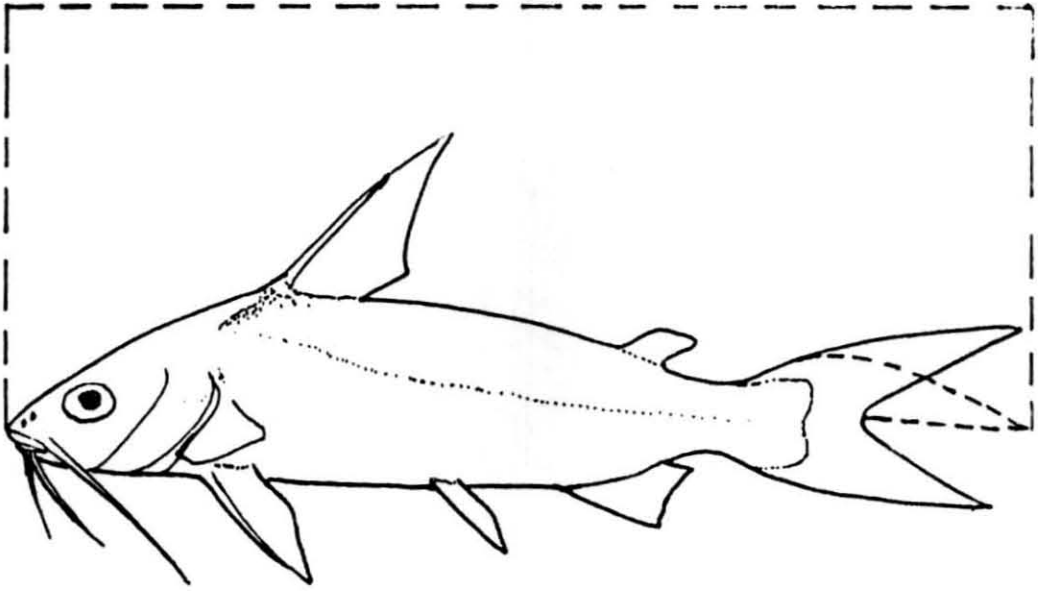
ANCHOVY



Stolephorus heterolobus

CATFISH

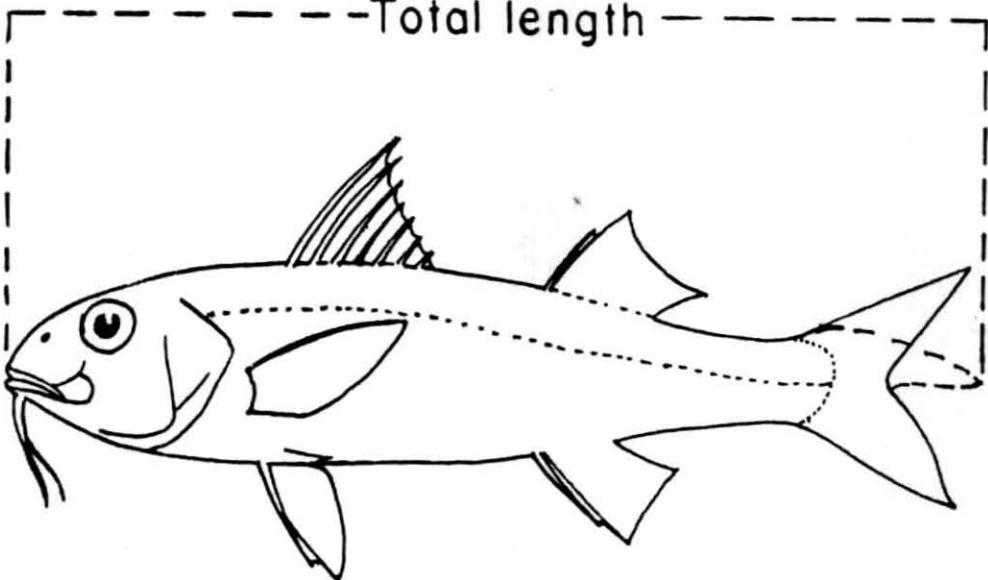
Total length



Tachysurus thalassinus

GOAT FISH

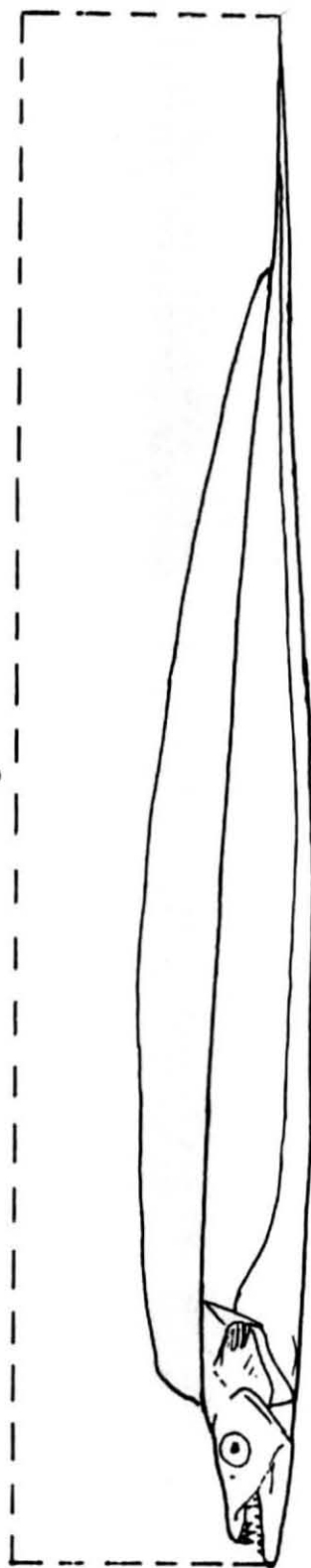
Total length



Upeneus vittatus

RIBBON FISH (HAIR TAILS)

Total length



Trichiurus lepturus

FINFISHES : GLOSSARY OF TERMS

Abdomen : Belly

Abdominal : Pertaining of the belly

Acute : Sharp - pointed

Adipose eyelids : Transparent membranes covering partly the surface of eye.

Adipose fin : Fin which is fleshy or fatty and present behind dorsal fin.

Adnate : One part adhering to the other.

Anal : Pertaining to vent; abbreviation for anal fin.

Anastomosing : Inter joining

Anterio-inferior : That which is situated below anterior end of head.

Anterio-transverse : That which is situated in the middle of anterior end of head.

Antrorse : Directed forward

Anus : External opening of the intestine often referred to as the vent.

Apical : At the tip or apex

Auxiliary scales : Small scales superimposed on or along hind edges of larger ones.

Asperites : Rough bony excrescences

Axil/Axial/Axilla : Angle between pectoral fin and body-pertaining to pectoral axilla or pelvic axilla.

Axillary : Pertaining to the axil or upper angle of pectoral fin.

Axillary process : An accessory, enlarged scale attached to the upper or anterior base of the pectoral or pelvic fins.

Air bladder : A membranous gas filled sac lying just beneath the backbone either open or closed.

- Ankylosed** : Grown firmly together
- Asymmetrical** : Lacking symmetry
- Back** : The dorsal side of a fish
- Barbel** : Elongate fleshy tentacular projection - usually around the mouth.
- Basal** : Pertaining to the base; at or near the base; used with reference to fins.
- Bicuspid** : Having 2 cusps or lobes
- Bifid** : Cleft into two
- Bifurcate** : Forked into 2 parts generally pertaining to caudal fin.
- Bilaterally symmetrical** : Capable of being halved in one and only one plane in such a way that the 2 halves are approximate images of each other.
- Bilobate** : Having 2 lobes
- Bony plates** : Hard plate like structures, which are modified from scales (see carapace) which encase body.
- Bony rings** : Hard ring - like structures, which are modified from scale, which encase body.
- Branched ray** : A soft ray which forks into 2 or more parts distally.
- Branchial** : Pertaining to the gills
- Branchiostegals** : Bony rays supporting the gill membrane.
- Buckler** : A bony shield often with a spinous projection on caudal peduncle.
- Buccal** : Pertaining to the mouth cavity.
- Canines** : Elongate conical teeth.
- Carapace** : Shell like structure on the back of a fish (Ostracion) encasing the body.
- Cardiform** : Coarse and sharp small teeth.
- Carinate** : Having a keel or ridge along the mid line.

- Cartilaginous** : Composed of cartilage.
- Caudal** : Pertaining to the tail; abbreviation of caudal fin.
- Caudal fin (Shapes)** : Pointed, Truncate, Emarginate, Forked, Lunate, Wedge shaped.
- Caudal peduncle** : The narrow terminal part of body between the end of dorsal fin and the base of caudal fin.
- Cephalic** : Pertaining to the head.
- Cephalic pit** : Pore like structures present on lateral side of gill cover.
- Chin** : Space in front of the lower jaw; the lower surface between the mandibles.
- Cilia** : Fine hair - like outgrowths.
- Ciliated** : Bordered with cilia; fringed with fine hair - like projections.
- Cirri** : Small simple projections; fringes.
- Clasper** : Extensions of the pelvic fins in male sharks.
- Cleft** : Split; divided; pertaining to fish mouth.
- Cloaca** : Genital opening combined with anus.
- Compressed** : Flattened laterally; Flattened from side to side. Refers to body.
- Confluent** : Flowing or merging together or into one; joined together.
- Conical teeth** : When blunt are called - obtuse; long and sharp called Acute - Fang like - caniniform.
- Continuous** : On contact or closely adjoining.
- Convex** : Arched or rounded outward, pertaining to dorsal and ventral profile of fishes.
- Corselet** : A band of specialised scales on midlateral part of body behind the pectoral fin.
- Cranial** : Pertaining to skull.

- Crenulate** : With the edge slightly scalloped.
- Ctenoid** : With spiny (comb like) hind margin - refers to scales.
- Cuirass** : Armour consisting of back - plate and breast - plate.
- Cultrate** : With a knife edge.
- Cuneate, cuniform** : Wedge - shaped.
- Cutaneous** : Pertaining to the cuticle or skin.
- Cusp** : A projection or a point on the crown of a teeth.
- Cycloid** : With smooth (even) hind margin - Refers to scale.
- Deciduous** : Which is shed easily or rubbed off.
- Dendritic** : Resembling a tree
- Dentate** : Denticulate, with Dentigerous; toothed like a projection.
- Dentition** : Pattern of arrangement and character of the teeth.
- Depressed** : Flattened dorso - ventrally as in skates and rays.
- Depth** : Vertical height of body.
- Dermal** : Pertaining to the skin.
- Dimorphic/Dimorphous** : With two distinct forms.
- Distal** : Remote from the point of origin or insertion.
- Dorsal** : Pertaining to the back, abbreviation for dorsal fin.
- Dorsal origin** : The apex of an angle which is formed by the dorsal ridge of the body and the anterior most or spine of the dorsal or first dorsal fin.
- Dorso - ventrally** : Pertaining to direction from top towards bottom.
- Edentulous** : Without teeth.
- Elongate** : Extended.
- Emarginate** : With the margin slightly hallowed; Notched but not definitely forked, shallow notch in the tail.
- Entire** : Not serrated; pertains to undivided dorsal ray; with a smooth margin. Refer to scales, operculum and fin.

- Epibranchial** : A bone forming upper part of the gill arch.
- Exserted** : Fin rays much projecting beyond the fin membrane.
- Eractile** : Capable of being raised or erected.
- Falcate, falciform** : Long, narrow, curved, scythe - shaped.
- Filamentous** : Thread - like, filiform.
- Fimbriate** : Fringed at the margin.
- Finlet** : Small fins in series behind the dorsal fin and ventral;
Division of fin into series of smaller units.
- Finrays** : Horny supports of fins; usually called soft rays and generally though not always, flexible and bilaterally paired and segmented; may also refer to spiny rays.
- Fontanella** : An opening for the discharge of secretions.
- Forked** : Connected basally but separated distally, furcate.
- Fossa** : A pit or depression.
- Free spine/detailed spine** : Spine not connected to another spine by membrane.
- Fusiform** : Spindle shaped.
- Furcate** : Forked.
- Gill arch** : The skeleton supporting gills.
- Gill - membrane** : Membranes covering gill - openings attached to the branchiostegals.
- Gill opening** : The opening between the opercle and side of the head of the higher fishes.
- Gill rakers** : A series of bony projection along the anterior edge of the gill - arches.
- Gular plate** : A plate covering the upper part of the throat.
- Gibbous** : Convex, protuberant
- Hipural** : The modified terminal bone of the vertebral column, supporting the rays of caudal fin.

- Heterocercal** : Caudal fin with longer upper lobe.
- Hexagonal** : Six - sided.
- Homocercal** : Caudal fin with equal upper and lower lobes.
- Humeral** : Pertaining to the shoulder region.
- Hump** : Round lump that slicks out; pertains to Notopterus.
- Hyaline** : Transparent, devoid of pigment.
- Hyoid** : A bone or series of bones at the base of the tongue and derived from the hyoid arch of the developing embryo.
- Illicium** : Modified isolated first ray of the dorsal fin in angler fish.
- Imbricate** : Having parts overlaying each other.
- Imperforate** : Not pierced.
- Incisors** : Flattened front cutting teeth, which is chissal shaped.
- Incisiform** : Shaped like an incisor.
- Inferior** : Lower in position.
- Infraorbital** : Small bones along lower side of eye; pertaining to the area below eye.
- Integument** : A covering or coating layer.
- Interdorsal** : Pertaining to the space between two dorsal fins.
- Intermaxilla** : Anterior bone in the upper jaw and situated between the maxillaries; premaxilla.
- Interopercle** : Membrane bone between preopercle and branchiostegale.
- Interorbital space** : The space above and between the eyes.
- Iridocyte** : An iris - like pigment cell.
- Iris** : The round, pigmented membrane surrounding the pupil of the eye.
- Isthmus** : The narrow fleshy projection of the chest below the gill openings.

- Jugular** : Pertaining to the throat.
- Keel** : A ridge extending longitudinally and laterally along the middle
(of the side)
- Labial** : Pertaining to the lips.
- Labial - fold** : A skin flap surrounding corners of the mouth.
- Labial furrow** : A groove connected to the lips.
- Lamellae** : Thin layers of tissue.
- Laminae** : Thin layers of bone, skin or other tissue.
- Lanceolate** : Lance - shaped, gradually tapering towards the extremity;
spear shaped.
- Lateral** : At or towards the side.
- Lateral line** : A series of muciferous tubes forming a slightly raised
line along the side of the body.
- Lateral line scales** : Scales grown above the lateral line.
- Lateral line pores** : Opening from the sensory lateral line canals
to the outside.
- Lingual** : Pertaining to the tongue
- Lobate** : Divided into lobes or having rounded divisions.
- Lobules** : Small lobes.
- Lunate** : Shaped like a crescent
- Luminiscent** : Pertaining to the production of light.
- Mandible** : The bone or bones forming the lower jaw.
- Mandibular** : Pertaining to lower jaw.
- Mandibular pores** : Small openings along a tube (usually hidden)
on the lower side of each jaw.
- Mandibular symphysis** : The tip of the lower jaw where the 2 mandible
unite, sometimes called the chin.
- Marmoration** : A pattern of marbled appearance.
- Maxilla** : The principal side bone of the upper jaw.

- Maxillary** : Pertaining to the upper jaw.
- Median, Mesial** : Pertaining to the middle.
- Median fins** : Combined terms of dorsal, caudal and ventral fins.
- Melanophore** : A cell containing melanin or black pigment.
- Mental barbel** : On chin.
- Molar** : A blunt and rounded grinding tooth.
- Molariform** : Having the form of rounded grinding teeth.
- Monomorphous** : Having essentially similar form or structure.
- Multiserial** : Arranged in many series.
- Mesial** : Pertaining to the middle.
- Mid - lateral** : Pertaining to the middle of the side.
- Mouth - oblique** : The mouth is modified so that the jaws when closed are not in horizontal position.
- Mouth - subterminal** : Mouth almost at the anterior tip of the head and opens anteriorly.
- Mouth - terminal** : The mouth is at the anterior end of the head.
- Mouth - ventral** : The mouth is located far beyond the tip of the head and opens ventrally.
- Musciferous** : Carrying mucus.
- Multicuspid** : Having many cusps.
- Multifid** : Having many clefts or division (branches or forks).
- Myotome** : The blocks of lateral trunk muscle.
- Nape** : Part of the neck, adjoining the skull.
- Narial/Nasal** : Pertaining to the nostrils.
- Nasoral** : Area between the nostrils and mouth.
- Notch** : V - shaped cut in an edge or surface.
- Nictitating membrane** : Inner eye lids; a transparent membrane which assists in keeping the eye clean.

- Non-protractile** : Incapable of being drawn out.
- Nostril** : Opening of nose out side.
- Nuchal** : Pertaining to the nape.
- Obselete** : Disappearing or scarsely evident.
- Obtuse** : With blunted or rounded end; blunt, not pointed.
- Occipital** : Pertaining to the hind part of the head dorsally.
- Occiput** : The hind part of head or skull.
- Ocellus** : An eye-like spot or marking often with marginal ring.
- Ocellated** : Having eye-like spots.
- Ocular** : Pertaining to the eye.
- Oculo-narial** : Between eyes and nostrils.
- Operculum** : Gill cover supported by the 4 bones; opercle, preopercle, inter-opercle and sub-opercle.
- Opercular** : Pertaining to the eye, especially bones surrounding the eye.
- Opercles** : Gill cover, the posterior bone in the protective cover over the gill region.
- Orbicular** : Rounded
- Orbit** : The eye socket.
- Orbital** : Pertaining to the eye, especially the bones surrounding the eye.
- Oronasal** : A groove running between the nostril and eye.
- Osseous** : Composed of or resembling bone; containing bone.
- Ossicle** : A plate or bone-like material.
- Ossified** : Become changed to bone or structures resembling bone.
- Ovate** : Of egg shaped.
- Paired fins** : Combined terms of the pectoral and pelvic fins.
- Palate** : Roof of the mouth.

- Palatines** : Membrane bones on each side of the palate; teeth on the palatine bones.
- Palmate** : Having the shape of the palm of the hand, with lobes arising from a common centre.
- Papilla** : A small fleshy projection.
- Papillate/papillose** : Covered with papillae.
- Parietal** : A paired bone forming part of the roof of the skull.
- Pectinate** : Shaped like a comb
- Pectoral** : Pertaining to the breast; abbreviation for pectoral fin.
- Pectoral-falcate** : Pectoral forms a curve like a sickle.
- Pectoral flap** : A scaly elongate flap on the axil of pectoral fin.
- Pedichel** : A more or less conical expansion above in front of pre-maxilla.
- Pedichel/pedicle** : A sharp surrounding stalk or stem.
- Peduncle** : The stalk or basal support of the tail.
- Pelvic** : Relating to the ventral fins or the bony girdle supporting them.
- Pelvic fins (Position) Thoracic** : Pelvic beneath the pectoral.
- Jugular** : Further forwards
- Abdominal** : Far back.
- Penultimate** : Last but one in the series.
- Peripheral** : Pertaining to external boundary or superficial parts.
- Photophore** : Light emitting organ or luminous spot.
- Pharyngeal teeth** : Teeth attached to the pharyngeal bone (the rear most gill arch)
- Plicate** : Pertaining to being folded like a fan.
- Plurial serial** : Consisting of several rows.
- Posterior** : Behind

- Postorbital/Postocular** : Region behind the eyes
- Precaudal** : Anterior to the tail region or caudal fin.
- Predorsal** : Before the dorsal
- Premaxilla** : One of the two bones on either side of the mid-line of the upper jaw, immediately in front of nasal bones some times overlapping the maxillary bones.
- Prenasal** : Before nasal
- Preopercle, preopercular** : Membrane bone between the cheek and opercular forming the front part of the gill cover.
- Preorbital** : Pertaining to the region before the eye; a membrane bone of the skull in front of and below the eye.
- Procumbent** : Leaning forwards; directed forward.
- Procurrent** : Projecting forwards
- Protractile** : Capable of being extended forwards or drawn out.
- Protrusible** : Capable of being thrust forwards or outwards.
- Proximal** : Part nearest to the body or base of attachment.
- Pseudobranchiae** : Small gills on the inner side of the gill cover or vestigial gills some times present on the inner surface of the gill cover.
- Pterotic** : A cranial bone in the region of the ear.
- Pterygoids** : Paired bones on the posterior part of the palate; teeth borne on these bones.
- Pungent** : Pricking and producing a sting.
- Pyriform** : Pear shaped
- Ramus** : One branch or half of the jaw
- Ray** : The term applies to all of the soft and hard rays of the fins, as well as to all spines; a jointed radial which, supports the membrane of the fin.
- Reticulated** : On the form of a network.

- Rectilinear** : Formed or bounded by straight lines.
- Recurved** : Curved upward and inward.
- Retrorse** : Turned backward.
- Ridge** : A raised narrow strip
- Rivulated** : Marked by narrow irregular streaks of colour.
- Rostral fin** : A small fin lobe in front of head below snout, an organ developed in eagle ray.
- Rostrum** : A projecting snout or beak.
- Rugose** : With a rough or wrinkled surface.
- Scale** : Thin flat horny plates covering the body of fish.
- Scaly sheath** : Narrow layers of scales extended from the body to the lower portion of the dorsal fin and the anal.
- Scapular** : Shoulder
- Scute** : An external horny or bony plate or a sharply ridged scale.
- Septum** : A partition.
- Serrate, serrated** : Bearing saw - like teeth or notched.
- Serration** : Bearing saw - like teeth.
- Setae** : Bristles or - hair - like projections
- Setiform** : In the form of bristles.
- Sinistral** : Turned in the left - hand direction.
- Snout** : Portion of head which projects in front of eyes above the mouth.
- Soft dorsal** : The portion of the dorsal fin which is composed of jointed or flexible rays.
- Soft ray** : Segmented or flexible support to the membrane of the fin.
- Spine** : A sharp projecting point; an unjoined radial supporting the anterior portion of the dorsal and anal fins; a sharp pointed process of bone.

- Spinons, spiniform, spinigerous** : Having the shape of the spine; bearing spines or sharp projections.
- Spinous dorsal** : Anterior portion of the dorsal fin supported by stiff unjointed spines.
- Spinule** : A small spine
- Spiracle** : A respiration opening behind the eye in sharks and rays.
- Squamations** : Scale arrangement
- Standard length** : Distance in a straight line from the anterior most part of the snout or upper lip to the caudal base.
- Stellate** : Star shaped
- Striated** : Marked by narrow lines or grooves usually parallel
- Striae** : Fine lines or ridges.
- Subcaudal** : Lower lobe of tail in sharks.
- Sub-operculum** : A membrane bone below the opercle forming part of the gill cover
- Suborbital** : Pertaining to beneath the eye; a membrane bone of the skull situated below the eye.
- Superior** : Above or on the upper surface
- Suprabranchial** : Situated above the gills.
- Supramaxilla** : A small supplementary bone lying along upper edges of the maxilla.
- Supraoccipital** : Situated on the top of the head; a large median bone forming part of the roof of the skull.
- Supraocular** : Pertaining to the region above the eye.
- Supraorbital** : Pertaining to the region above the eye.
- Sub-orbicular** : Not quite but nearly circular
- Supra-temporal** : Pertaining to the upper part of posterior - lateral region of head.
- Suture** : Line of junction of two parts immovably connected.

Symphyseal knob : A projection or swelling below and in front of the symphysis or point of junction of the two dentaries or lower jaw bones.

Symphysis : The point of junction of 2 halves of the jaws.

Symphysial : Pertaining to the symphysis.

Swimbladder : Same as air bladder

Tail : Part of the body posterior to the body cavity.

Tail fin : Caudal fin.

Temporal : Pertaining to the posterior - lateral part of head.

Terminal : Pertaining to the end or situated at the end.

Thoracic : Pertaining to the chest.

Tongue : Either free, adnate (fastened down to the floor of mouth).

Total length : The greatest distance in a straight line (not following body curves) from the anterior most projecting part of the head to the tip of the caudal fin.

Transverse : Cross wise or some what oblique.

Tricuspid : With three cusps or points.

Trilobate : With three lobes or divisions.

True spine-ray : An unpaired structure without segmentation, usually stiff and sharp apically.

Truncate : Terminating abruptly as if cut off square.

Trunk : Body excluding head and extremities.

Tubercle : A small excrescence.

Tuberculate : Resembling or having tubercles.

Tubiform : Tube - like

Tubule : Small hollow; cylindrical structure.

Truncate : Cut - off square.

Ultimate : Last in the series

Undulated : Waved

Uniserial : Pertaining to arrangement in a single row.

Unpaired fins : Vertical fins (dorsal and caudal)

Vent : The external opening of the alimentary canal; Anal.

Ventral : Pertaining to the abdominal or lower surface.

Ventrals : Abbreviation for the paired fins on the ventral side of pelvic fins.

Ventral flap : A scaly elongate flap on the axil of pelvic fin.

Ventrolateral : The area in which the side and ventral surface meet.

Venule : A small vein - like structure.

Venulose : Full of small veins and their branches.

Vermiculation/Vermiculating : A pattern of wavy worm-like lines.

Vertical fins : The unpaired fins along the median line of the body, the dorsal, caudal and anal fins.

Vestigeal : Pertaining to remnant; rudimentary

Villi : Minute finger - like processes.

Villiform : Having the form or appearance of velvet.

Villiform teeth : Small slender teeth forming velvety bands.

Vomer : A bone forming the front part of the roof of the mouth.

Vomerine : Pertaining to the vomer bone; especially teeth borne on this bone.

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