1. INTRODUCTION

This catalogue is intended primarily as an aid in fisheries and fisheries-related studies. Emphasis is therefore placed on including details useful for identification, and available fisheries and biological information on the 20 species of caesionids. The taxonomic accounts are based on a recent revision by Carpenter (1985, 1987) which contain more details regarding the systematics of the Caesionidae than the present catalogue.

Fisheries information regarding caesionids is scarce in the literature. One reason for this lack of data is that fusiliers are of relatively minor importance in industrial fisheries, although they make up a significant part of artisanal multispecies catches in some countries. Caesionids are generally considered good eating but their market size is rather small (typically 17 to 40 cm in total length). They are common in markets throughout their range, but usually in small quantities. Fusiliers dwell primarily over coral reefs, where most commercial fishing gears do not operate. Therefore, caesionids are most commonly harvested by artisanal fisheries, and hence, catch statistics are not well documented. Where caesionids are fished in large commercial quantities, catch data are difficult to gather because they are part of a complex multispecies stock. In both artisanal and commercial fisheries, several caesionid species are usually caught together with a variety of unrelated species. In catch data, species of fusiliers are rarely reported separately, but rather, lumped together under a family heading.

In many areas, fusiliers are indirectly related to commercial fisheries, as tuna baitfish. In these fisheries, several species of caesionids are used, together with many unrelated species. No explicit data are available on quantity or proportion of fusiliers utilized as baitfish. Where caesionids are used as baitfish however, they are generally considered as one of the more important groups.

A factor contributing to the lack of specific fisheries information regarding fusiliers is the difficulty which existed in the identification of species in this family. One can compare the conflicting names assigned to species in recent works (i.e. Masuda et al., 1975; Schroeder, 1980; Shen, 1984; and Gloerfelt-Tarp & Kailola, 1984) to appreciate the confusion that exists. It is timely therefore, to report on the taxonomic status and fisheries-related information on caesionids, to aid in studies on tropical multispecies fisheries.

This catalogue is intended to be as self-contained as possible. A glossary of technical terms and illustrations are included to help minimize the necessity to refer to related literature. In order to avoid cluttering of the text, literature citations are confined to the "Bibliography," except in cases where it is necessary to refer to a specific work.

Acknowledgments

I offer special thanks to J.E. Randall who has helped me in many ways during the revision of the Caesionidae. I thank again everyone mentioned in my dissertation and revision paper who contributed to work on fusiliers during my graduate studies.

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1.1 Plan of the Systematic Catalogue

A family description is given, followed by a key to all genera and species. The species accounts are arranged alphabetically by genera and species. Characteristics of subfamilies and subgenera are summarized under "General Remarks on Fusiliers." Each genus is introduced with its type reference, synonyms, and diagnostic features. Multispecies genera also have comments on general biology, habitat, distribution, and interest to fisheries. The information pertaining to each species is arranged by paragraphs, in the order listed below:

(1) Scientific name: The reference for the original description and the type locality are given.

(2) Synonyms: All invalid names and combinations that have been applied are referenced.

(3) FAO Names: FAO-accepted English names and tentative French and Spanish names are given for each species. The FAO English name is considered the standard to be used for fishery purposes. This should avoid confusion which can be caused due to the existence of multiple names for the same species or to the use of the same name for several species. The FAO name is not intended to supplant the use of local names but rather, to serve as a worldwide reference.

(4) Diagnostic Features: Distinctive characters of the species, as an aid for identification, accompanied by useful diagrams. These diagnoses should be consulted, together with the frequency distribution tables of fin ray and scale counts, to confirm species identified by using the illustrated key.

(5) Geographical Distribution: The general geographic range is given in the text and illustrated on a map. The map shading includes known areas of occurrence and intermediate areas between locality records where a species is expected to be found.

(6) Habitat and Biology: Information on habitat, behaviour, food habits and reproduction.

(7) Size: The approximate maximum total length

(8) Interest to Fisheries: General information on the extent, type of fisheries, and utilization. Detailed fisheries data is unavailable for all species and therefore, only a qualitative assessment is possible.

(9) Local Names: These are given where published names are available. Often, a single local name is applied to several species.

(10) Literature: Recent references which contain illustrations that could be useful for identification. It is stated if an incorrect name is given in the reference.

(11) Remarks: Useful information which is not appropriately covered in the previous paragraphs. Frequently used incorrect scientific names are mentioned here.

1.2 General Remarks on Fusiliers

The caesionids are marine perciforms found only in the tropical Indo-Pacific. The English vernacular name for members of this family, "fusiliers", apparently derives from a military name. The term fusilier refers to certain formations of eighteenth and nineteenth-century infantry which were often characterized by flamboyant uniforms. Caesionids are colourful fishes; many have bright yellow stripes and patches. They are also synchronous schooling fishes. Hence, these fish are usually observed in formation, wearing colourful "uniforms".

Phylogenetic relationships and classification: The Caesionidae are related to the lutjanid or snapper fishes (see FAO Species Catalogue, Vol. 6). Johnson (1980) showed that the nearest relatives (sister group) to caesionids are the snappers belonging to the subfamily Lutjaninae. He used characters relating primarily to jaw musculature to prove this relationship. The fusiliers are recognized as a separate family within the snapper superfamily Lutjanoidea, because they possess unique morphological features characteristic of their feeding mode. The caesionids are specialized for plankti-

vorous feeding, while their nearest relatives, the lutjanine snappers, are typically benthic carnivores. The fusiliers possess a jaw morphology and body shape very distinct from typical snappers. The most striking of these specializations is the fact that the ascending premaxillary process is a completely separate ossification (Fig. 5). This process is confluent with the premaxilla in related perciforms. Fusiliers have a highly protrusible upper jaw which is an adaptation for picking zooplankton from the water column. The modification of the ascending premaxillary process is related to jaw protrusibility.

Within the Caesionidae, there are recognizable trends in jaw structure and body shape related to a presumable refinement of their adaptation to planktivory. One of these trends relates to jaw protrusion. Members of the more primitive genus Caesio have a single process on the premaxilla (named the postmaxillary process) projecting posteriorly, which is lateral to the median ascending premaxillary process. In the remaining, more derived genera of caesionids, there are 2 postmaxillary processes (Fig. 5). The additional process presumably allows greater control, and perhaps extent, of jaw protrusion.

Another trend within the caesionids relating to planktivory is the reduction of dentition. The closest relatives to caesionids, the lutjanine snappers, are primarily benthic carnivores with strong teeth suitable for grasping prey. These snappers commonly have enlarged canines in their jaws, and teeth on their vomer and palatines. Fusiliers feed primarily on zooplankton, and there is no need for a well developed dentition to seize and hold prey. They have small, weak teeth, and some species lack teeth on the vomer, palatines and premaxillaries. The most ancestral living caesionid species, *Caesio cuning,* has larger, more numerous teeth than other fusiliers. In addition, *C. cuning* is the only caesionid with a tooth plate on the third epibranchial. The snappers also possess this pharyngial tooth plate. The most derived caesionids, *Gymnocaesio gymnoptera* and *Dipterygonotus balteatus,* have very small teeth and lack teeth completely on their palatines and premaxillaries.

The trend in body shape of caesionids reflects an increased adaptation to a semi-pelagic, planktivorous existence. The more ancestral species are high-bodied, like their snapper relatives. The more derived ones are more slender, fusiform and elongate, similar to many pelagic fishes. The most derived caesionid species, *Dipterygonotus balteatus,* has a very slender and elongate body, compared with most other members of this family, and it has developed a mostly nearshore pelagic existence. Unlike all other caesionids, *D. balteatus* inhabits coral reefs only in the juvenile stage. As adults, members of this species are captured together with other nearshore pelagics such as sardines and anchovies.

Carpenter (1985) examined the relationships within the Caesionidae. There are 20 species, which can be subdivided into 2 subfamilies, 4 genera, and 6 subgenera (Fig. 1). The taxonomic categories above the species level were determined using a numerical technique which maximizes the information content and predictive value of the classification, within the framework of hypothesized cladistic relationships.

This classification does not follow the strict phylogenetic classification rules suggested by some authors (e.g. Wiley, 1981) although the phylogenetic hypothesis can be retrieved from an annotated classification (Carpenter, 1987). A phylogenetic style classification was rejected because it was found to contain a significantly lower information content and predictive value than the classification presented here. In addition, a phylogenetic classification would have been very different from the one commonly used, with potential confusion to fisheries scientists and other biologists. The phylogenetic hypothesis of the Caesionidae is given in Fig. 2.

The systematic accounts in this catalogue are organized alphabetically by the genus and species levels of classification ignoring subfamilies and subgenera. The genus is the most useful supraspecific taxon in caesionids for fishery and general taxonomic purposes. In comparative biology, systematics, and other studies however, it is often desirable to have a detailed understanding of relationships within a group. These relationships are largely based on osteological and meristic characters which may also be useful to the fishery biologist if he needed to identify mutilated specimens at least to subgenus level or to confirm species identification that remained inconclusive after use of the keys based on external morphological characters.

Tables I and II summarize those osteological and meristic characters most useful in delineating the supraspecific taxa of caesionids.

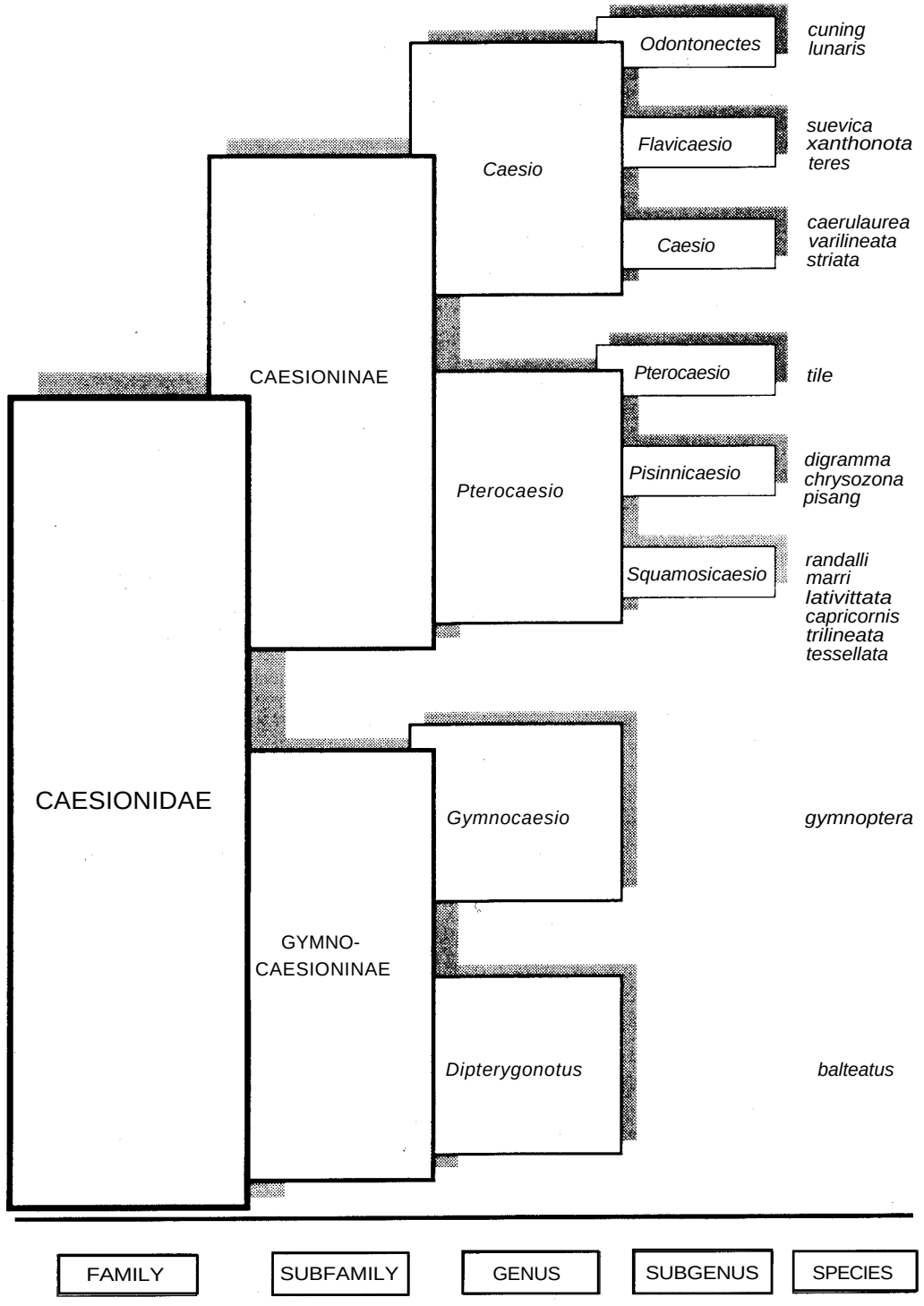


Fig. 1 Structure of the Linnean Classification of Caesionidae

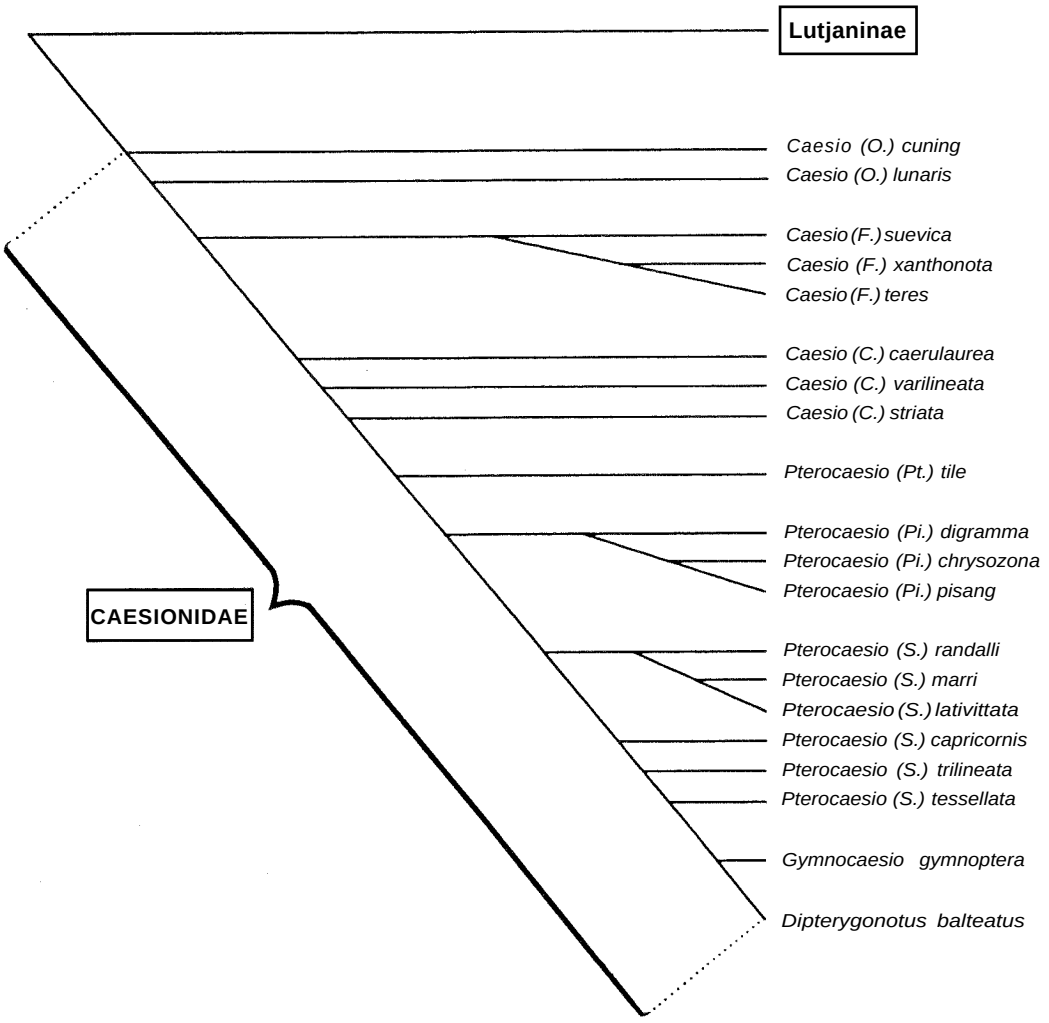


Fig. 2 Phylogenetic Hypothesis of the Caesionidae

TABLE I

Characters useful in Distinguishing Subfamilies and Genera within the Caesionidae

	Scales on median fins	Teeth on pre-maxilla	Number of pro-current caudal rays	Number of post-maxillary processes	Shape of posterior end of maxilla
Caesioninae *Caesio*	+	+	9-10	1	Blunt
Pterocaesio	+	+	9-10	2	Tapered
Gymnocaesioninae *Gymnocaesio*	-	-	7-8	2	Tapered
Dipterygonotus	-	-	7-8	2	Tapered

TABLE II

Characters useful in Distinguishing Subgenera within the Caesionidae

	Openings pars jugularis	Process type on basi-occipital	Typical epipleural ribs	Occipital-frontal crest	Process first neural arch	Process first epi-pleural	Process second epi-pelural	Teeth on palatines
Caesio								
Odontonectes	3	A	10-13	+ + +	-	-	-	+
Flavicaesio	3-4	B	13-14	+	-	-	-	+
Caesio	2	C	14	+ -	-	-	-	+
Pterocaesio								
Pterocaesio	2	C	14	-	-	-	-	+
Pisinnicaesio	5	D	14	-	+ + +	+	+ -	+
Squamosicaesio	5	E	14	-	+	-	-	-
Gymnocaesio	5	E	14	-	+	-	-	-
Dipterygonotus	5	F	14	-	(+)	-	-	-

Abbreviations used: **A** = no distinct process; **B** = small, indistinct process; **C** = distinct process, separated from condyle by prominent concavity on ventral surface of basioccipital; **D** = relatively large process directly adjacent to condyle; **E** = short, distinct process separated from condyle by a narrow concavity; **F** = horn-like process, separated from condyle by a narrow concavity; **+** = present; **+ + +** = very well developed; **(+)** = present in a different form than **+** ; **-** = absent; **+ -** = variable, either present or absent

For an explanation of the characters presented in these tables, refer to the "Illustrated Glossary of Technical Terms and Measurements" in this catalogue.

The family Caesionidae (see Fig. 1) is divided into 2 subfamilies. The subfamily Caesioninae contains the genera *Caesio* and *Pterocaesio.* The Caesioninae are characterized by having scales on the median fins, teeth present on the premaxilla, a number of procurrent caudal rays typically 9 or 10 and, right and left ascending premaxillary processes easily separable from one another into 2 distinct pieces. The subfamily Gymnocaesioninae is comprised of the genera *Gymnocaesio* and *Dipterygonotus.* This subfamily is characterized by the absence of scales on the median fins, an edentate premaxilla, a number of procurrent caudal rays typically 7 or 8 and right and left ascending premaxillary processes not easily separable from one another into 2 pieces.

The genus *Caesio* is partitioned into the subgenera *Odontonectes, Flavicaesio,* and *Caesio. Odontonectes* includes the species *C.(O.) cuning* and *C.(O.) lunaris.* This subgenus is characterized by having typically 2 or 3 lateral openings in the pars jugularis, there is no distinct process on the basioccipital for attachment of Baudelot's ligament, usually 10 to 13 epipleural ribs, usually 11 soft anal rays, and a very well developed supraoccipital-frontal crest. *Flavicaesio* consists of the species *C.(F.) suevica, C.(F.) xanthonota,* and *C.(F.) teres*. This subgenus is distinguished in having 3 or 4 openings in the lateral wall of the pars jugularis, a small process on each ventrolateral surface of the basioccipital for attachment of Baudelot's ligament, 10 to 13 epipleural ribs, usually 12 soft anal rays and, a moderately well developed supraoccipital-frontal crest. The subgenus *Caesio* is comprised of the species *C.(C.) caerulaurea, C.(C.) varilineata* and *C.(C.) striata.* Members of this subgenus have 2 openings in the lateral wall of the pars jugularis, a distinct process on the basioccipital for attachment of Baudelot's ligament, typically 14 epipleural ribs, usually 12 soft anal rays and, a moderately well developed or not well developed supraoccipital-frontal crest.

The genus *Pterocaesio* contains 3 subgenera; *Pterocaesio, Pisinnicaesio,* and *Squamosicaesio.* The subgenus *Pterocaesio* contains a single species, *P.(P.) tile.* This subgenus is differentiated from other *Pterocaesio* by having 2 openings in the lateral wall of the pars jugularis, a small prezygopophysis on the first neural arch, no flattened projections on the first or second epipleurals, and teeth on the palatines. The *Pisinnicaesio* consists of *P.(P.) digramma, P.(P.) chrysozona,* and *P.(P.) pisang.* This subgenus is distinguished by having typically 5 openings in the lateral wall of the pars jugularis, a pronounced prezygopophysis on the first neural arch, a flattened projection on the first epipleural rib, with or without a flattened projection on the second epipleural rib, and teeth on the palatines. *Squamosicaesio* includes 6 species; *P.(S.) randalli, P.(S.) marri, P.(S.) lativittata, P.(S.) capricornis, P.(S.) trilineata,* and *P.(S.) tessellata.* The squamosicaesionids have 5 openings in the lateral wall of the pars jugularis, a slightly pronounced prezygopophysis on the first neural arch, no flattened projections on the first or second epipleurals, and no teeth on the palatines.

Habitat and Biology: As mentioned previously, fusiliers are planktivorous, schooling fishes. Their schooling behavior presumably relates to predation pressure; caesionids are actively preyed upon by reef residents and visitors such as groupers, snappers, jacks and tunas. During normal daytime activity, fusiliers swim actively in midwater around or near reefs in synchronous formation. When they encounter favorable feeding conditions (presumably when predation pressure is minimal, when the currents are suitable and patches of zooplankton are sufficiently dense), fusiliers break formation and assume a feeding aggregation. In these aggregations, they swim slowly and asynchronously, making quick, short lunges forward while picking zooplankton from the water column. Fusiliers can sometimes be observed swimming around "cleaner stations" on the reef, where some members of the aggregation slow down and interact with cleaner wrasses. During initial recruitment to a reef, juvenile caesionids generally remain in a restricted area close to the substrate. When threatened, they dart around, rather than in, coral heads and rocks in order to escape. At night, fusiliers are quiescent and remain close to the reef, often in crevices and under coral heads. During this time their body colour frequently assumes a blotched, reddish tinge.

Fusiliers often school in mixed species aggregations. It is not uncommon to see a school composed of 3 or 4 species. Species with similar markings, especially caudal markings, tend to be found most often in the same school. This strategy presumably allows greater numbers to join a single school, while individual members are not conspicuous. A highly noticeable constituent of a school would be more easily singled out by a predator. Therefore, fusiliers with a dark blotch at the tip of each caudal lobe, such as most species of *Pterocaesio* and the species of *Gymnocaesio,* often school together. The species with a black streak inside the caudal lobes, such as *Caesio caerulaurea, C. varilineata, C. striata,* and *Pterocaesio tile* may be found in the same school. *Caesio cuning, C. xanthonota,* and *C. teres*, all with yellow caudal fins, sometimes aggregate with one another. Juveniles of C. *lunaris* often have a yellow caudal fin and they can be seen schooling together with juvenile *C. cuning* close to the reef. As adults, C. *lunaris* typically loose this yellow caudal colouration and they no longer are seen schooling with C. *cuning.*

Fusiliers are primarily reef inhabitants, although they often range over soft bottoms while swimming from reef to reef. This is evidenced in that they are sometimes caught by trawlers, far from reefs. One species, *Dipterygonotus balteatus,* is found on reefs only as juveniles. As adults, they are typically caught together with sardines, anchovies, and other nearshore pelagic species.

The reproductive biology of caesionids has been examined in only a few species. They appear to be typified by early sexual maturity, and high fecundity. They have a prolonged spawning season, but recruitment peaks once or twice a year. Like their closest relatives, the snappers, fusiliers have separate sexes (dioecious), with no significant difference in sex ratio. Caesionids are gonochoristic (sex remains constant after maturity). Spawning behaviour has been reported for *Caesio teres* (Bell and Colin, 1985) and *Pterocaesio digramma* (Thresher, 1984). These caesionids spawn in large groups around the full moon. They migrate to select areas on the reef at dusk and initiate spawning during slack water. In *C. teres*, spawning is preceded by periodic mass vertical ascents and descents to within about 1 m of the surface. During spawning they stay near the surface and subgroups within the mass swirl rapidly in circles and release gametes. They subsequently descend and then rise again to the surface for further spawning bursts. This is repeated several times over the course of 10- 15 minutes. *P. digramma* mass-spawns about 1 m off the bottom by drawing together in a tight group, releasing their gametes, and rushing apart.

Fisheries: Fusiliers are caught by many fishing methods. As mentioned, they are midwater, schooling fishes, and therefore most likely to be caught by nets. They are harvested over reefs by drive-in nets and gill nets, and over soft bottom by trawl nets. Fusiliers shelter on the reef at night and are commonly captured by fish traps designed to exploit this behaviour. They feed on zooplankton which makes them unlikely candidates for hook-and-line fisheries. In certain areas however, fusiliers are routinely taken by hook-and-line. Caesionids are caught by explosives in some areas. This method is however, illegal, and obviously of questionable application environmentally, especially in fragile coral reef habitats.

The development of reef fisheries in a particular area will largely determine the fishing methods to be used and the importance of caesionids to total fisheries production. In Sri Lanka for example, some reef fisheries are composed of numerous, small, wind-driven canoes using hook-and-line. These fishermen use small hooks and special techniques to catch fusiliers. Several species are common in markets in Sri Lanka where they command a medium-range price. In the Gulf of Thailand, trawls are the primary fishing gear and reef fisheries are not well developed. Here, *Caesio cuning* and

C. *caerulaurea* are a minor part of the catch in the trawl fisheries. In south-western Thailand however, fusiliers are caught principally with gillnetsand fish traps.

Fusiliers are usually taken in multispecies catches; they are easily confused with other colourful fishes, particularly some species of Lutjanidae, a family from which they were separated only recently. Landing statistics available at FAO are still reported under Lutjanidae, and only a single genus (Caesio) is given separately (see Table III).

TABLE III

Reported Catch in Metric Tons of Caesio Species by Fishing Area, Country and Year

Country	Area	1983	1984	1985	1986
Indonesia	57	974	804	524	830
Area total	57	974	804	524	830
Indonesia	71	9 598	10 235	12 695	13 340
Malaysia	71	922	432	446	620
Philippines	71	17 595	19 817	16 278	15 063
Singapore	71	2 098	1 830	1 308	1 150
Area total	71	30 213	32 314	30 727	30 263
Species total	57 and 71	31 187	33 118	31 251	31093

As a result of the paucity of landing statistics for individual species or even genera, and of the widespread confusion of fusiliers with species of other families, these figures probably represent only a fraction of the actual catch of caesionids taken in the Indo-Pacific area.

In the Philippines, fusiliers are landed and consumed on a larger scale than in any other place in the world, both on a per capita basis and in terms of total fisheries production (Table III). They are a common catch component in subsistence and artisanal fisheries and a major focus in specific commercial reef fisheries. Estimates of the relative importance of fusiliers in small-scale fisheries production in the Philippines are generally unreliable because these statistics are difficult to collect. Alcala and Luchavez (1981) however, monitored an artisanal reef fishery in the central Philippines, which averaged overall yields of 8 to over 14 t/km/yr They found that caesionids are the third-most important group landed out of 13 groups recorded in this fishery. They comprised about 15% of the total catch per year for a total of 0.48 metric tons in a reef area of 1.56 km^2.

The Philippine large-scale muro-ami is the only commercial fishery in the world which focuses on caesionids as a major catch component. This gear relies on up to several hundred swimmers who use a vertical scare-line to drive reef fish into a movable net (Fig. 3). The Philippine commercial muro-ami captures about 17,000 t/yr of caesionids. They are the most important group by weight, and make up approximately 80% of the catch.

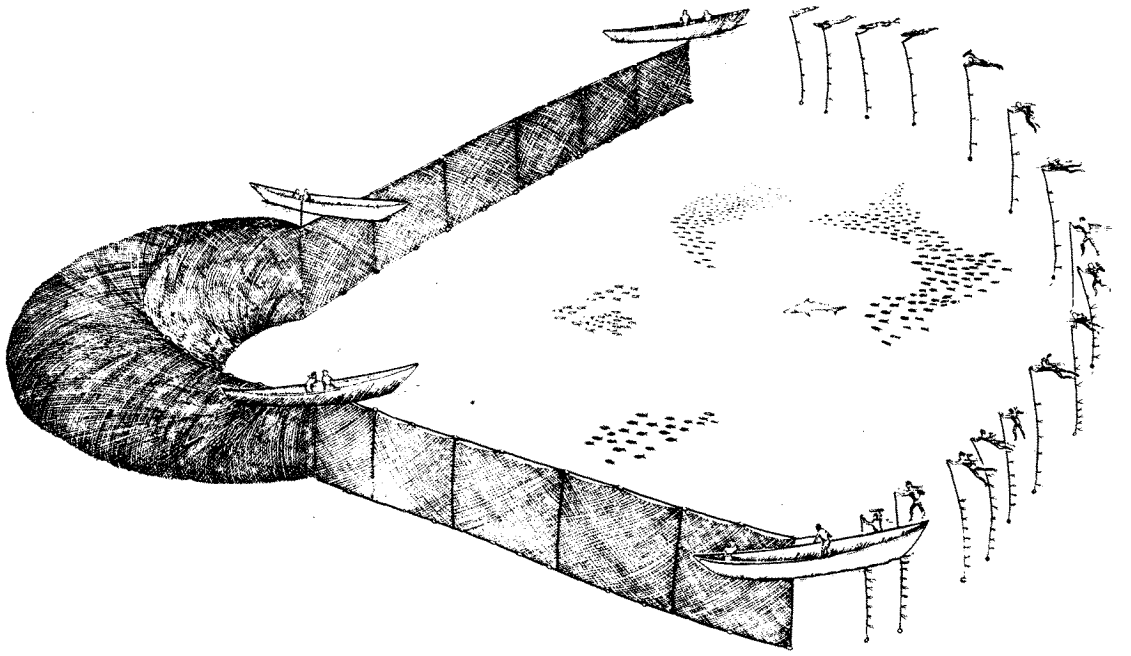


Fig. 3 Muro-ami operation

Caesionids are important baitfishes in many areas where reefs are in proximity to tuna fisheries. This is most notable in oceanic small island systems such as the Laccadive Islands and Maldives in the Indian Ocean and, the Caroline Islands, Marshall Islands, and Fiji in the Pacific. In these areas, the success of the tuna fishery depends on the availability of caesionids and a few other groups of bait fishes. Caesionids are commonly caught by lift nets over the reef flats. These nets are baited by throwing finely minced fish over the net, and lifted when reef fishes gather to feed over it. Some baitfish fusiliers are also captured at night with lights and dip nets. Caesionids survive nicely in bait wells. Juvenile *Caesio*, small *Pterocaesio, Gymnocaesio,* and *Dipterygonotus* are all common as baitfishes.

Where catch statistics are recorded, fusiliers, as well as other reef fishes, appear to be of minor importance in terms of a country's total fisheries production. In the Philippines, where they are fished most heavily, they comprise only about 1% of the recorded total commercial and municipal catch. However, almost 100 groups of fishes and invertebrates contribute to this total production. Fisheries production in the tropics typically depends on diverse resources. In coastal communities that rely on small-scale coral reef fisheries, fusiliers are often an important fisheries component. In these communities, caesionid catches contribute substantially in nutritional and socio-economic terms.

1.3 Illustrated Glossary of Technical Terms and Measurements

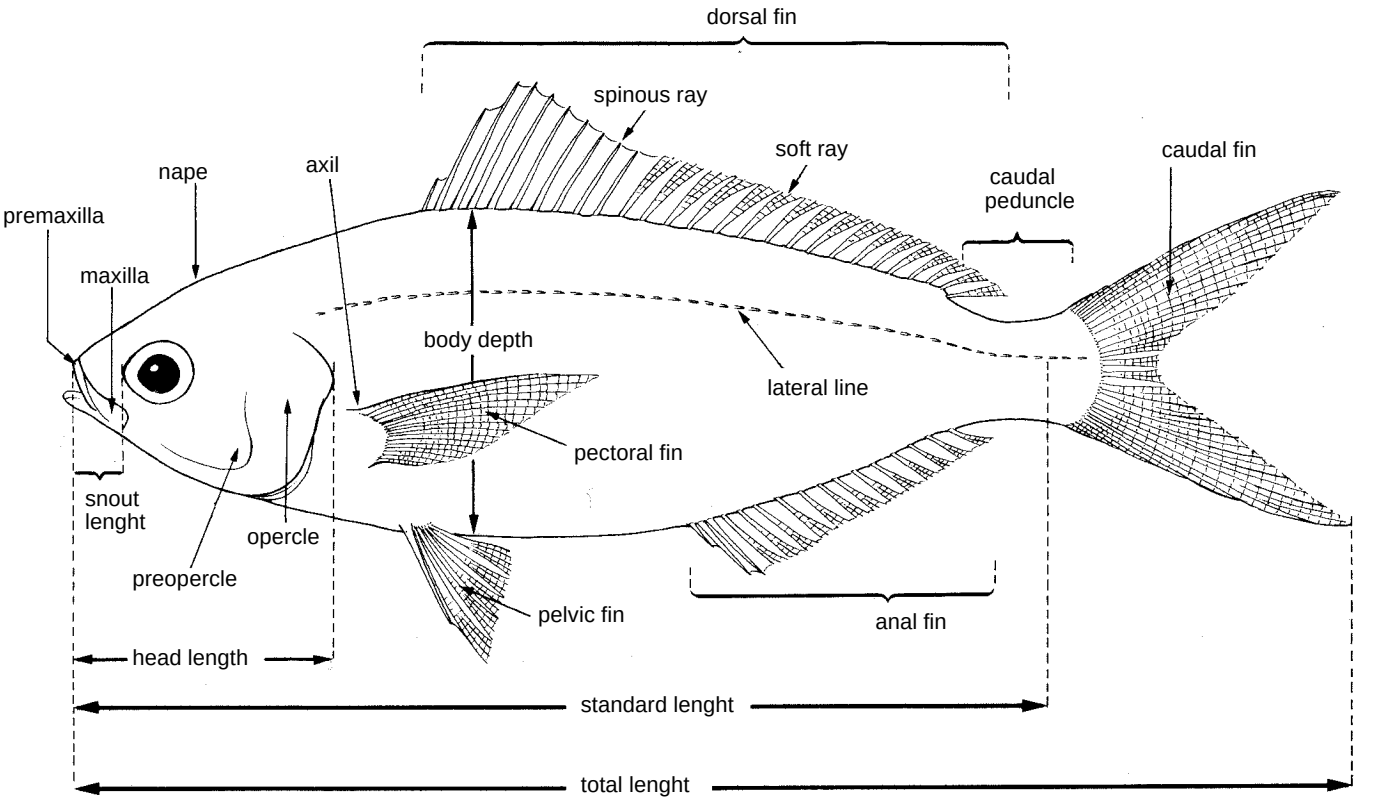
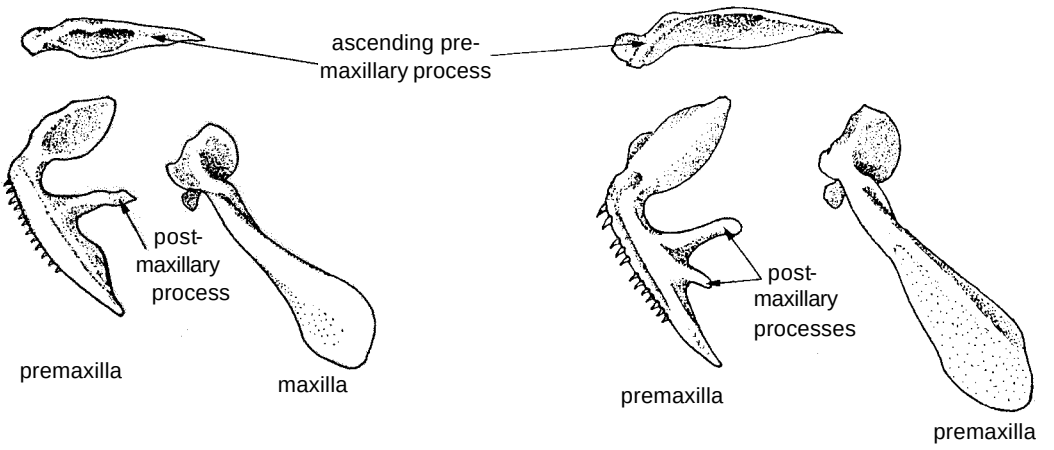


Fig.4 External morphology and measurements

Anterior - Relating to the front portion.

Ascending premaxillary process - A process on each premaxilla at the midline (symphysis) where the two premaxillae meet, extending posteriorly. In caesionids, this is a separate bone from the premaxilla (Fig. 5).



(a) Caesio ***(b) Pterocaesio, Dipterygonotus***

Fig. 5 Exploded view of upper left side of jaw

Axil - The angular region between the pectoral fin and the body (Fig. 4).

Basioccipital - The true floor of the braincase (Fig. 6)

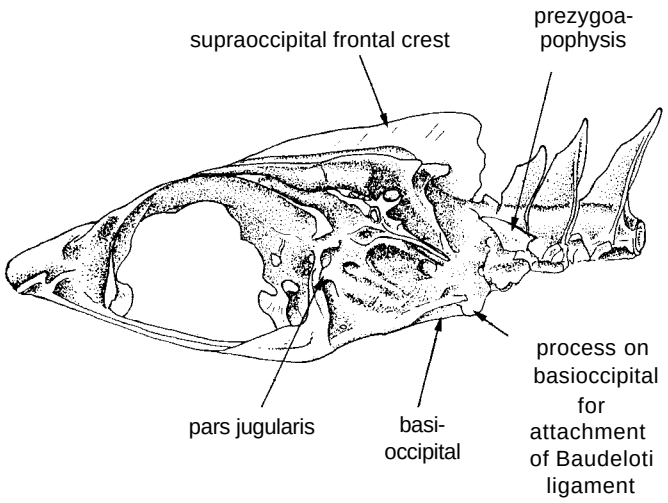


Fig.6 Skull and anterior vertebrae (Pterocaesio pisang) (lateral view)

Baudelot's ligament - The ligament connecting the basioccipital with the dorsal tip of the cleithrum (a bone in the pectoral girdle).

Canine - Elongate, conical tooth.

Caudal peduncle - The narrow end of the body between the posterior end of the dorsal fin and the base of the caudal fin (Fig. 4).

Cheek scales - Scales on the preopercle. This meristic character is counted as the maximum number of rows on the preopercle, between the eye and the ventral margin of the preopercle (Fig. 7).

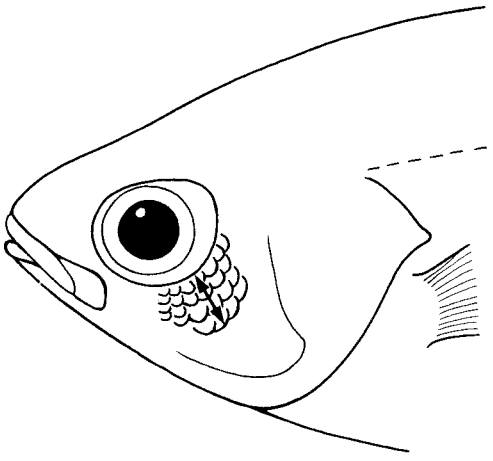


Fig. 7 Cheek scales

Ctenoid scales - Scales with small spiny projections on the posterior end (Fig. 8b).

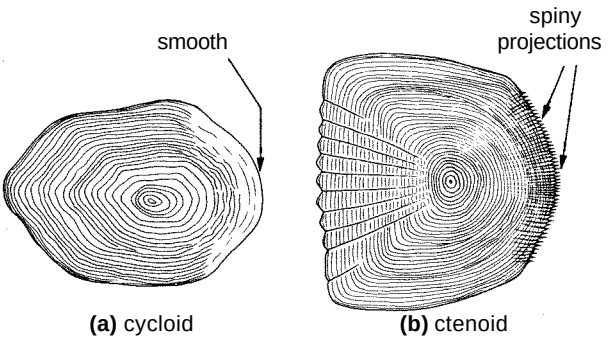


Fig. 8 Scales

Compressed - Flattened from side to side; refers to relative body width.

Condyle - A process on bone for the purpose of articulation, e.g. the condyle on the basioccipital articulates with the first vertebra.

Confluent - Joined together.

Conical - Cone-shaped; refers to teeth.

Cycloid scales - Scales without spiny projections at the posterior end (8a).

Dentary - The tooth-bearing bone of the lower jaw.

Distal - Away from the centre of the body, outward from the point of attachment; the opposite of proximal.

Edentate - Without teeth.

Epibranchial - The second upper element in the branchial arch (Fig. 9).

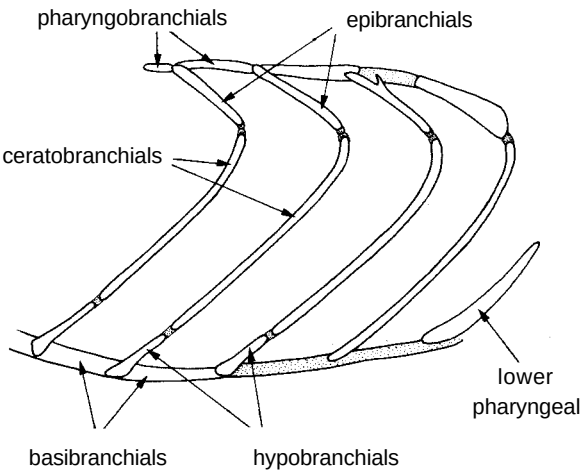


Fig. 9 Bones of branchial arches (schematic)

Epipleural ribs - Bones which attach on the outside upper surface of ribs and project into the muscle of the flanks (Fig. 10).

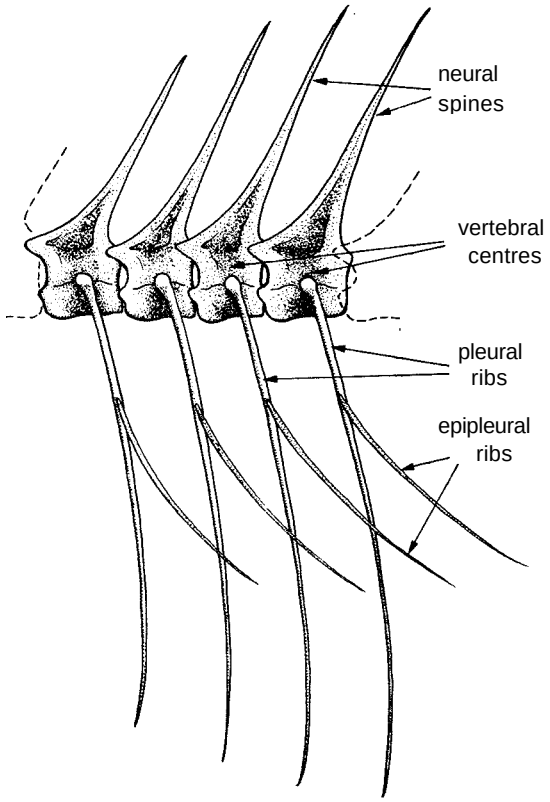


Fig. 10 Thoracic vertebral column with ribs (schematic)

Interorbital space - The region of the head above and between the eyes.

Lateral line - A series of pored or tubed scales forming a raised line along the side of the body (Fig. 11). The lateral-line scales are counted from the most anterior pored scale to the base of the caudal fin which is detected by the crease resulting from folding the fin forward.

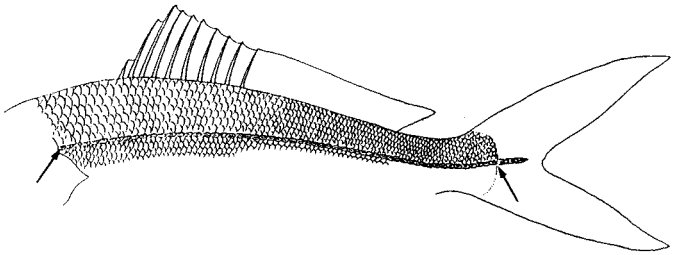


Fig. 11 Lateral line

Maxilla - The bone of the upper jaw lying above the premaxilla (Fig. 5)

Meristic - Divided into parts or discrete units; pertaining to number of parts as in scales or fin rays. Meristic characters include scale counts and fin ray counts.

Nape - The dorsal region of the head where the skull joins the body (Fig. 4).

Opercle margin - The posterior edge of the bone covering the gill region (Fig. 4).

Palatine - Paired bones on the sides of the roof of the mouth on either side of the vomer (Fig. 12).

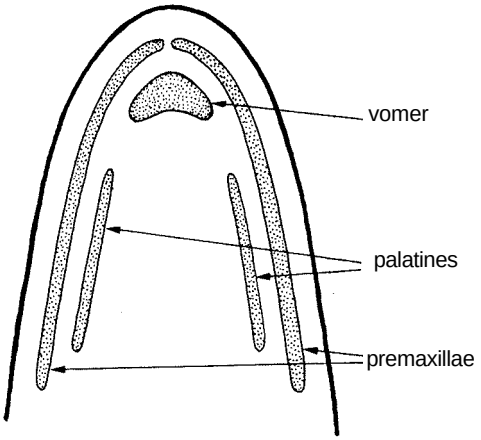


Fig. 12 Vomer and palatine bones on roof of mouth (schematic)

Pars jugularis - A chamber outside and lateral to the braincase which serves as a conduit for nerves and blood vessels connecting the brain. In caesionids, there is one opening to the pars jugularis which faces forward into the eye socket and, from 1 to 4 openings on the lateral side (Fig. 6).

Peduncular scales - Scales found on the caudal peduncle. Upper and lower peduncular scales are circumference scale row counts (rows counted on both right and left sides and including the midline scale row) with the lateral-line row inclucled in the lower peduncular count; these scale rows are counted in the mid-portion of the caudal peduncle (Fig. 13)

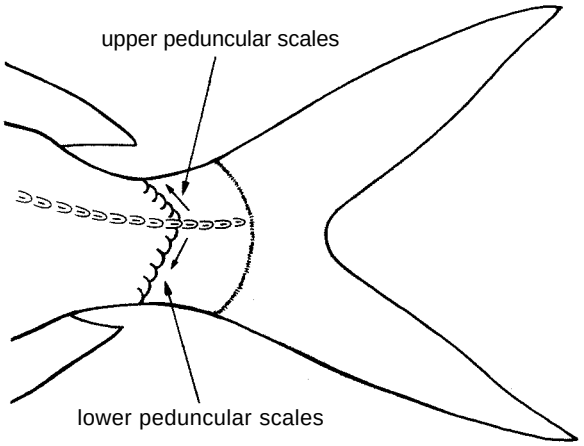


Fig. 13 Scale counts on caudal peduncle

Postmaxillary process - A process located on the side of the premaxilla which points roughly towards the posterior portion of the fish (also called lateral premaxillary process) (Fig. 5).

Posterior - The rear or hind portion.

Predorsal configuration - Refers to the position of the predorsal bones and first dorsal pterygiophores (bones supporting the fin rays) in relation to the neural spines (spines projecting upwards from the vertebrae). The formula for this configuration contain 0's which represent a predorsal bone, slants which represent a neural spine, and numbers which indicate the number of rays supported by pterygiophores (Fig. 14).

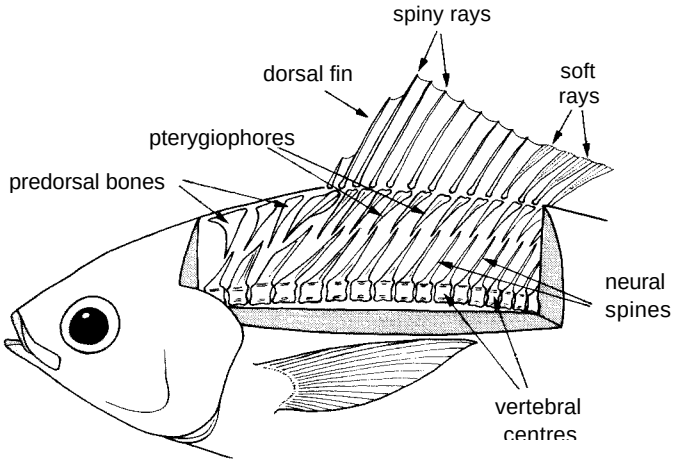


Fig. 14 Schematic representation of predosal bones and dorsal fin supports (i.e.0/0/0 + 2/1 +1)

Predorsal scales - The scales on the midline in front of the dorsal fin origin. These scales are counted as the scale rows which intersect the midline from the anterior point of the dorsal fin to the anterior point of the supratemporal band of scales (Fig. 15).

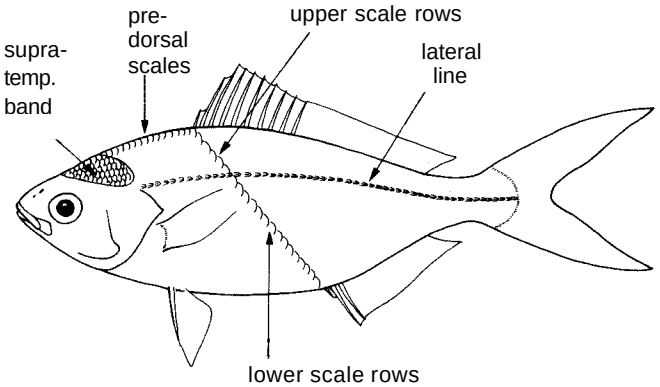


Fig. 15 Predorsal scales and counts of scale rows above and below lateral line

Premaxilla - The anterior bone of the upper jaw (Fig. 5).

Preopercle - Bone on the cheek in front of the opercle and forming the front part of the gill cover (Fig. 4).

Prezygopophysis - The anterior projecting process on the upper portion of the arch of the vertebra (Fig. 6).

Procurrent caudal rays - Short caudal rays on the upper and lower margin of the caudal fin which do not project to the hind margin of the fin (Fig. 16).

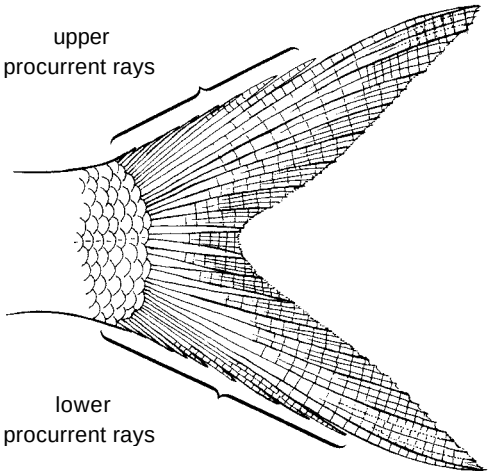


Fig. 16 Caudal fin (*Caesio*)

Proximal - Toward the centre of the body; the opposite of distal.

Pterygiophore - The bone which supports the base of each fin ray (Fig. 14).

Ray - A fin support element; soft rays are segmented and flexible; spinous rays are stiff, unsegmented, and support the anterior portion of the anal and dorsal fins in caesionids.

Scales above and below lateral line - A transverse series of scale rows; below lateral-line scales are counted from the origin of the anal fin, not including the median ventral scale row, along a forward diagonal to the lateral line; above lateral-line scales are counted from the origin of the dorsal fin, not including the median dorsal scale row, on a diagonal backward to the lateral line; the lateral line row is not included in these counts (Fig. 15).

Supraoccipital-frontal crest - On the dorsal surface and centre of the skull, a ridge of bone running longitudinally over the frontal and supraoccipital bones (Fig. 6).

Supratemporal band of scales - A distinct band of scales, roughly "U"-shaped, on the upper head (Figs. 15,17).

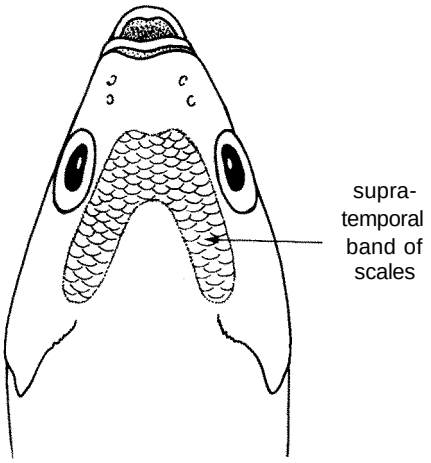


Fig. 17 Dorsal view of head

Vomer - A bone forming the middle front part of the roof of the mouth, sometimes bearing teeth (Fig. 12).

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