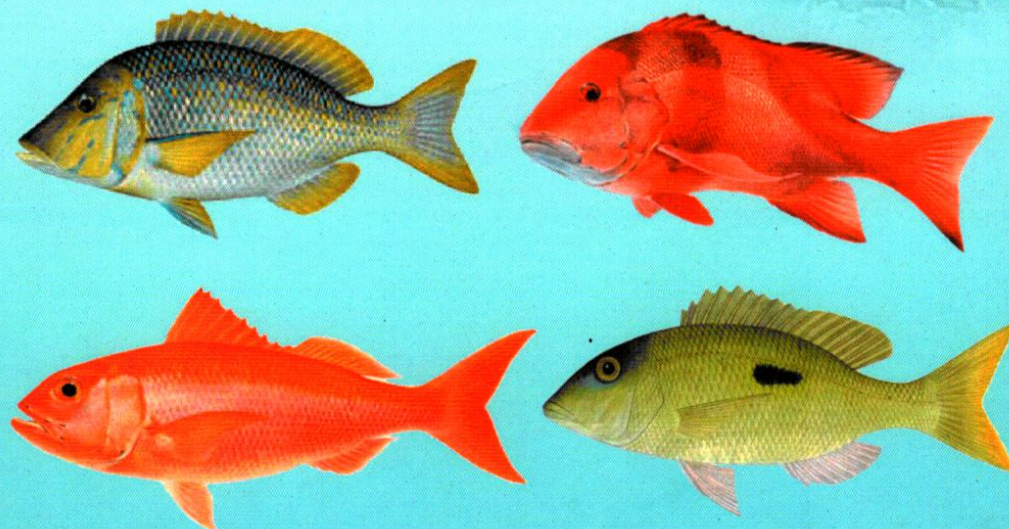


Snapper & Emperor
Of Spermonde Archipelago
INDONESIA



Andi Iqbal Burhanuddin
Yukio Iwatsuki



**SNAPPER & EMPEROR
OF SPERMONDE ARCHIPELAGO
INDONESIA**

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SNAPPER & EMPEROR OF SPERMONDE ARCHIPELAGO INDONESIA

Andi Iqbal Burhanuddin
Yukio Iwatsuki

Penerbit:



**Snapper & Emperor of Spermonde Archipelago
INDONESIA**

Penulis:

1. Andi Iqbal Burhanuddin
2. Yukio Iwatsuki

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PREFACE

Since the current Indonesian government announced the long-term vision to be the Global maritime fulcrum, scientists have become more enthusiastic in exploring the country's maritime potentials including biodiversity, ecology, biology of marine fishes. Despite the it is well-known to be the one of the most diverse marine, especially coral reef fishes in the world, there is very few books available to express this claim in Indonesia.

The book written by Andi Iqbal Burhanuddin (Hasanuddin University, Indonesia) and Yukio Iwatsuki (University of Miyazaki, Japan) for describing Indonesian reef fishes, especially for the Family of Lutjanidae and Lethrinidae is indeed will fill the information gap. This book also may enrich the need of information not only by scientists, but also by the government both at national and local levels. Although the reef fishes covered in this book only those found the Spermonde Archipelago (South Sulawesi, Indonesia), we believe that its application and implication is still relevant to national and even to global area of the world coral reefs.

Faculty of Marine Science and Fisheries, Hasanuddin University, Indonesia is very proud and pleased for the publication of this very important book. I hope that this book can be widely utilized to enrich our scientific endeavor and improve our reef fish strategic

management which will in turn contribute to the prosperity of our community and nation.

Makassar, 10th November 2017

Dean, Faculty of Marine Science and Fisheries, Unhas

Dr. Ir. St. Aisyah Farhum, MS.

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INTRODUCTION

Fish exhibit enormous diversity in their morphology, in the habitats, and in their biology. There are approximately 22,000 species inhabiting our planet, including *ca.* 13,500 marine origin. Fishes constitute almost half the total number of vertebrates, live in almost every conceivable type of aquatic habitat with range in size from tiny 12 mm adult Philippine goby to the giant 15 meter whale shark.

Indonesia is a part of the Coral Triangle in the Western Pacific Ocean. This region is believed to be hosting 2000 to 3500 fish species as well as the center of marine fish diversity. Yet there is hardly a good reference to guide field researchers working on fish taxonomy and fisheries. With the increasing significance of fish as a source of protein, many ocean areas are exploited up to a maximum and some of them are even overexploited. Exploited fish stocks call for meticulous observation, and conservation by using total allowable catches, by limiting mesh sizes, declaring fish sanctuaries, and other measures. A prerequisite for these, however, is the knowledge of the species composition of the fish stocks.

Spermonde Archipelago, known by the public as Sangkarang islands consist of ± 121 islands, scattered from Takalar in the south to Mamuju in Sulawesi. It is coral reefs platform located along the southwestward off-shore of Makassar City and occupied with

Makassarese, Buginese, and Mandarese who manage marine resources for less than a century. It has an estimated area of 60.000 hectares and composed of nearly 98 small reef islands which are mostly patch reefs supported by coral reef ecosystems. In the last 30 years the islanders began to connect with external markets which changed their fishing techniques. The change threatens significantly the availability of sustaining resources due to destructive fishing.

This book was written with the purpose of increasing knowledge in the development of fisheries biology in Indonesia. It covers only the members of family Lutjanidae and Lethrinidae in marine habitats around Spermonde Archipelago, South Sulawesi, Indonesia, and intended to be used for study, research, and education by not only ichthyologists and fisheries scientists but also by university students and local government administrators.

Collection Sites

Spermonde Archipelago, known by the public as Sangkarang islands consist of \pm 121 islands, scattered from Takalar in the south to Mamuju in Sulawesi. It is coral reefs platform located along the southwestward off-shore of Makassar City and occupied with Makassarese, Buginese, and Mandarese who manage marine resources for less than a century. It has an estimated area of 60.000 hectares and composed mostly patch reefs supported by coral reef ecosystems.

The Spermonde Archipelago comprises some 67 low-lying coral atoll islands distributed over a submarine limestone plateau, the Spermonde shelf. Within the province of Sulawesi Selatan (South Sulawesi), the islands belong to five different administrative regions: the municipality of Makassar and the regencies of Pangkajene Kepulauan, Takalar, Barru and Maros.

Specimens of lutjanid and lethrinus fishes used in this study were purchased in Rajawali Fish Landing Port and Paotere Fish Landing Port Makassar, South Sulawesi. The specimens purchased had been collected from Spermonde Archipelago area mostly by gill net and hand-line or small trawl between April 2000 to September 2015.



The Spermonde Archipelago and its position in the Indonesian Archipelago (inset); dashed lines represent submerged reefs and the 200 m isobath, the position of some of the islands and the province capital Makassar is indicated (after Stapel (1997)).



Fisheries activities at Paotere and Rajawali Fish Landing Port,
Makassar South Sulawesi

Methods of Measurements and Counts

Methods of measurements, counts and figure generally followed Nakabo, 2002, Carpenter, 2001 and Allen, 2000. For the fin formulae, the numbers of spinous and soft fin rays are described by Roman numerals (I, II, III,) and Arabic numerals (1, 2, 3,), respectively. The unbranched soft rays are sometimes expressed in small Roman numerals (i, ii, iii,). Spinous fin rays are generally called spines. In the case of the dorsal or anal (sometimes pectoral or pelvic) fins containing spines and soft rays, the numbers of spines and soft rays are separated by a comma. When the dorsal (or anal) fin consists of two or more fins (i.e. first dorsal fin, second dorsal fin,), each fin is separated by a hyphen. Gill rakers on the first gill arch on the right side of the body are used for counting. Numbers of gill rakers on the upper and lower limbs are separated by a "+" sign. When present, the one or more gill rakers between the limbs are included in the lower limb.

A (number of anal fin rays), D (number of dorsal fin rays), GR (number of gill rakers), LGR (number of gill rakers on lower limb). LL (number of lateral line scales): number of scales on lateral line from the scale behind the posttemporal to the caudal fin base. LLp (number of pored scales on lateral line): only the number of pored scales on lateral line is counted. LR (number of scales in longitudinal row): number of scales in longitudinal row from the end of the opercular membrane to the caudal fin base. P₁ (number of pectoral fin rays). P₂ (number of pelvic fin rays).

PDS (number of predorsal scales): number of scales on the dorsal midline from the origin of dorsal fin forward to occipital region.
SL (standard length): linear distance of from most anterior point of upper lip (or snout) with mouth closed to caudal fin base (posterior end of hypurals, roughly where fold formed by bending caudal fin).
TL (total length): greatest linear distance between most anteriorly projecting part of head with mouth closed and farthest tip of caudal fin when caudal rays squeezed together. VN (number of vertebrae): counts of vertebrae from behind the cranium to the urostyle.

Acknowledgments

We are grateful for the generous support received from the Ministry of Research Technology and Higher Education of Indonesia, Rector of Hasanuddin University, Dean Faculty of Marine Science and Fisheries Hasanuddin University and Head of Marine Science Department of Hasanuddin University. We express our thank to all members of Marine biology laboratory at the Faculty of Marine Science and Fisheries Hasanuddin University. Many individuals helped us in various ways with the preparation of this book edition, we are grateful to them all.

GLOSSARY

A	: symbol for anal fin
Adipose	: Fatty
Adipose fin	: small unrayed fin lobe usually behind dorsal fin in some species
Anal	: pertaining to the anus; abbreviation for anal fin
Anterior	: pertaining to front portion
Antrorse	: forward-pointing
Apical	: at the tip or apex
Arborescent	: branched like a tree
Auxiliary scales	: small scales superimposed on or along margins of larger one
Axil	: angle between paired fins and body
Axillary scale	: scale in pectoral or ventral fin axil
Barbel	: elongate fleshy tentacle on chin or front of upper jaw
Bicuspid	: having two cusps or points
Bifid	: split into two
Bifurcate	: forked
Branchiae	: gills
Branchial	: pertaining to gills
Branchiostegals	: bony rays supporting gill membranes behind lower jaw
Buckler	: bony shield
Canines	: elongate, conical teeth like those of dogs
Caniniform	: having form of canine teeth
Caninoid	: similar in form to canine teeth
Carapace	: horny or bony encasement of body
Cardifonn	: coarse, rounded, sharp teeth
Caudal	: pertaining to tail; abbreviation for caudal fin

Ciliate	: fringed with fine, hair-like projections
Cirri	: small simple barbels
Coalesced	: grown together
Compressed	: flattened laterally
Crenulate	: having edges slightly scalloped
Crescentic	: crescent-shaped
Ctenoid	: with a comb-like margin of small spines; scales with spiny hind edge
Cycloid	: with a smooth even border; scales without spines along their hind margins
D	: symbol for dorsal fin
Deciduous	: easily shed or rubbed off with reference to scales
Dentate, denticulate	: with tooth-like projections
Denticle	: small tooth-like structure
Depressed	: flattened from top to bottom
Dimorphism	: two different forms
Distal	: remote from the point of attachment
Dorsal	: pertaining to back; abbreviation for dorsal fin
Dorso-ventrally	: pertaining to direction from back towards belly
Edentulous	: without teeth
Emarginate	: with hind margin slightly hollowed
Entire	: with smooth margin
Excised	: with margin cut out or concave
Falcate, falciform	: long, narrow and curved; shaped like a scythe
Fimbriate	: fringed at the border
Forklength	: length measured from snouttip to deepestpointof caudal fin fork
Furcate	: Forked
Fusiform	: spindle-shaped
Gas bladder	: sac filled with gas, beneath backbone
Gill arch	: bony skeleton supporting gills

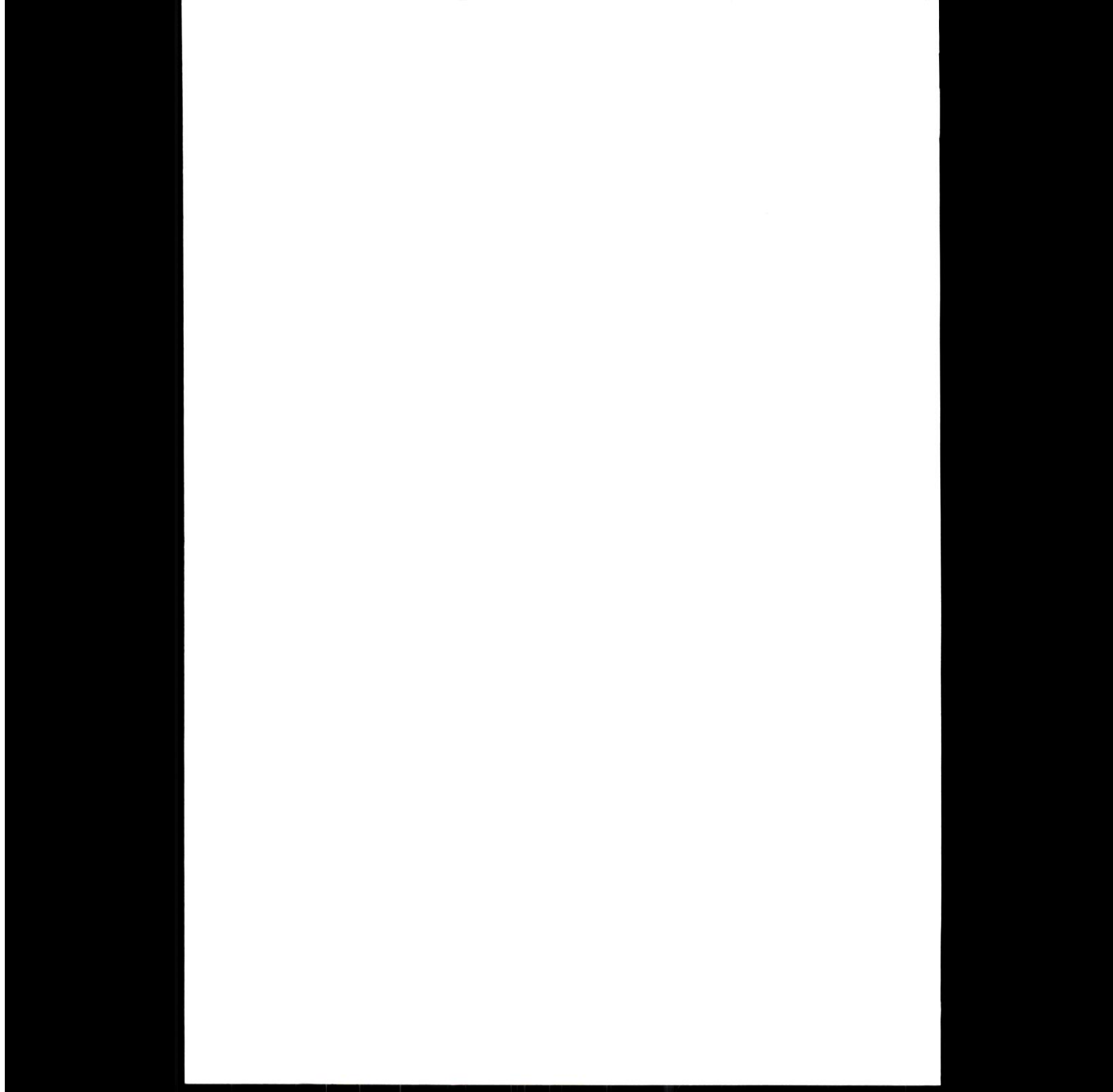
Gill openings	: opening behind head connecting gill chamber to exterior
Gill rakers	: series of bony projections along edge of gill arch
Gular plate	: bony plate covering upper part of throat region
Heteracanth	: having dorsal spines asymmetrical
Hyaline	: transparent, devoid of pigment
Incisiform	: shaped like an incisor tooth
Incisor	: laterally flattened tooth for cutting
Inframarginal	: pertaining to below the margin
Infraorbital	: pertaining to area below eye
Interdorsal	: pertaining to space between dorsal fins
Intermaxilla	: anterior bone in upper jaw, situated between maxillae; pre-maxilla
Interorbital	: pertaining to space on top of head between eyes
Isthmus	: narrow fleshy ventral forward-projection of body separating gill openings on each side
Lanceolate	: lance-shaped
Lateral	: pertaining to, at or towards the side
Lateral line	: series of tubes forming a raised line along side of body and having sensory function
Lobate	: divided into lobes
Lunate	: shaped like a crescent or moon
Mandible	: bone or bones forming lower jaw
Mandibular	: pertaining to lower jaw
Maxilla	: principal bone of upper jaw
Maxillary	: pertaining to upper jaw
Median	: lying or running in axial plane; intermediate; middle
Mid-lateral	: pertaining to middle of sides
Molar	: blunt tooth adapted for grinding
Molariform	: having the form of a molar tooth

Morphological	: pertaining to form and structures as distinct from function
Morphometric	: pertaining to length measurements of body structures
Multifid	: having many clefts or divisions
Nape	: part of neck adjoining skull
Nasal	: pertaining to nostrils
Nuchal	: pertaining to neck
Obsolete	: disappearing, indistinct
Obtuse	: having a blunt end, not pointed
Occipital	: pertaining to back part of head or occipital bones
Occiput	: back part of head or skull
Ocellated	: having eye-like spots
Ocellus	: eye-like spot with a marginal ring
Ocular	: pertaining to eyes
Opercular	: pertaining to bones of gill cover
Operculum	: principal posterior bone of gill cover
Orbicular	: round or shield-shaped
Orbit	: the border around the eye
Orbital	: pertaining to eye
Osseous	: composed of or resembling bone
Ossification	: process of forming bone or laying down calcified material to resemble bone
Ossified	: turning into bone or structure resembling bone
P	: symbol for pectoral fin
Palatines	: membrane bones on each side of roof of mouth
Paired fins	: pectoral and ventral fins
Palmate	: having shape of palm of hand, with lobes arising from a common center
Papilla	: small fleshy projection, usually from skin
Papillate, papillose	: covered with papillae
Pectoral	: pertaining to breast; abbreviation for pectoral fin

Peduncle	: stalk or basal support of tail
Peripheral	: pertaining to external boundary or superficial parts
Pharyngeal	: pertaining to pharynx; bones behind gills in gullet
Pharynx	: gullet or anterior part of alimentary canal following mouth cavity
Postero-dorsal	: pertaining to upper posterior area
Postero-ventral	: pertaining to lower posterior area
Postocular, postorbital	: pertaining to region behind eye
Preopercular	: pertaining to preoperculum
Preoperculum	: membrane bone between cheek and operculum, forming front part of gill cover
Preorbital	: pertaining to region before eye; a membrane bone of skull, situated in front of and below eye
Procumbent	: lying down and pointing forward
Protractile	: capable of being drawn out or extended forwards
Proximal	: part nearest body or base of attachment
Pseudobranch	: gill-like structure on inner surface of gill cover
Pterygoid	: paired bones on posterior part of roof of mouth
Pyloric caeca	: sac-like appendages at pylorus (posterior opening of stomach)
Ray	: flexible structure supporting membrane of fin
Reticulated	: divided by veins into a network
Retorse	: backward-pointing
Rhomboidal	: diamond-shaped
Rostral	: pertaining to snout
Rostrum	: projecting snout or beak
Rudimentary	: weakly developed

Rugae	: roughness or wrinkles
Rugose	: with a rough or wrinkled surface
Rugosity	: projection or wrinkle causing roughness
Scute	: external horny or bony plate or sharply ridged scale
Serra	: saw-like tooth or notch
Serrate, serrated	: bearing saw-like teeth
Setiform	: having form of bristles
Soft dorsal	: portion of dorsal fin which is supported by jointed or flexible rays
Spine	: sharp projecting point; stiff unjointed fin ray
Spinous	: composed of spines
Soft ray	: A segmented fin ray which is composed of two closely joined lateral elements. It is nearly always flexible and often branched
Spinous dorsal	: anterior portion of dorsal fin which is supported by stiff unjointed spines
Spinule	: small spine
Standard length	: length measured from snout tip to last vertebral bone which can be felt with fingertip
Stria	: narrow band, streak, line, groove or canal
Striated	: marked by narrow lines or grooves, usually parallel
Subcylindrical	: nearly cylindrical
Subocular	: pertaining to area beneath eye
Suboperculum	: membrane bone beneath operculum forming part of hind border of gill cover
Supramaxilla	: small supplemental bone lying along upper edge of maxilla
Supraoccipital	: situated on top of back of head; large median bone forming part of skull
Supraocular, supraorbital	: pertaining to area above eye

Suture	: line of junction of two parts immovably connected
Symphysial	: pertaining to symphysis
Symphysis	: line of junction between two bones, particularly point of junction of the two halves of either jaw
Thoracic	: pertaining to chest region
Total length	: length measured from snout tip to caudal fin tip
Transverse	: crosswise; lying across or between
Tricuspid	: having three cusps or points
Trilobate	: having three lobes or divisions
Truncate	: terminating abruptly or as if cut off square
Tubercle	: small excrescence, usually hard
Tuberculate	: resembling or having tubercles
Tubule	: small hollow, cylindrical structure
Uniserial	: pertaining to arrangement in a single row
Unpaired fins	: dorsal, caudal and anal fins
V	: symbol for ventral fin
Ventral	: pertaining to abdominal or lower surface; abbreviation for ventral fin
Vermiculation	: pattern of fine wavy worm-like lines or streaks of colour
Villiform	: having the form or appearance of velvet; especially small slender teeth forming velvety bands
Viviparous	: producing living young from within the body of the parent female
Vomer	: bone forming front part of roof of mouth in nasal region
Vomerine	: pertaining to vomer; especially teeth borne on this bone



FAMILY LUTJANIDAE

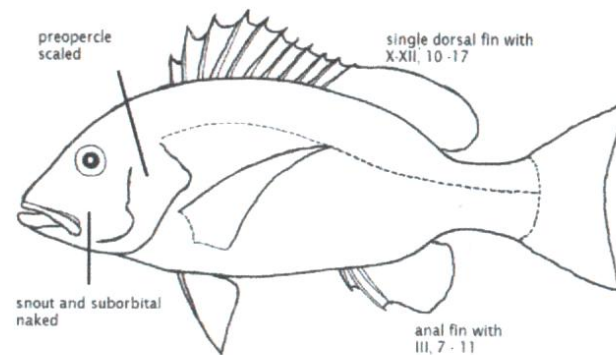
Snapper, jobfishes

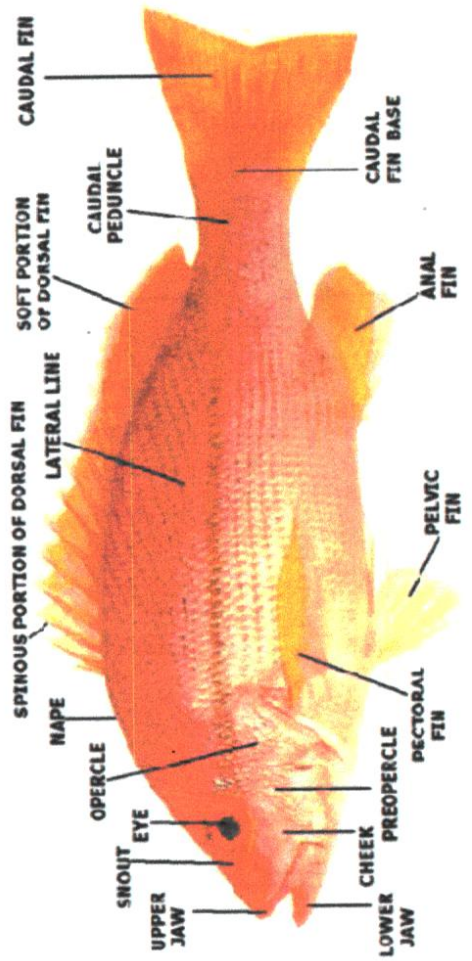
The members of the family Lutjanidae are generally known worldwide as snapper, relatively large family with 17 genera and 103 species. The group is distributed in all tropical seas, but the vast majority inhabit the Indo-Pacific region (Allen & Talbot 1985). The snapper are medium-sized, oblong fishes with triangular heads. All have shallow, notched tails, and a single continuous dorsal fin that is often higher in the front. Most species are active; nocturnal predators that primarily feed on fishes, but they also consume cephalopods. Other common foods include crabs, shrimps, crustaceans, gastropods, and planktonic organism. Plankton is especially important in the diets of *Paracasio* and *Macolor* (Allen & Erdmann, 2012). Most snappers inhabit shallow to medium depth, however, a few species live along ledges several hundred meter below the surface. Gonochoristic (sexes separate), reaching sexual maturity at about 40 to 50% of maximum length, with big females producing large numbers of eggs. Eggs and larvae identified as lutjanid are pelagic; the larvae avoid surface waters during the day, but display a more even vertical distribution at night.

Family Lutjanidae with the following combination of characters: Typical perch-like fishes, body moderately elongated to deep, oblong, moderately compressed, and covered with moderate or small ctenoid scales. Some rows of scales on preoperculum and on gill cover. Pelvic axillary process well developed. Upper jaw usually

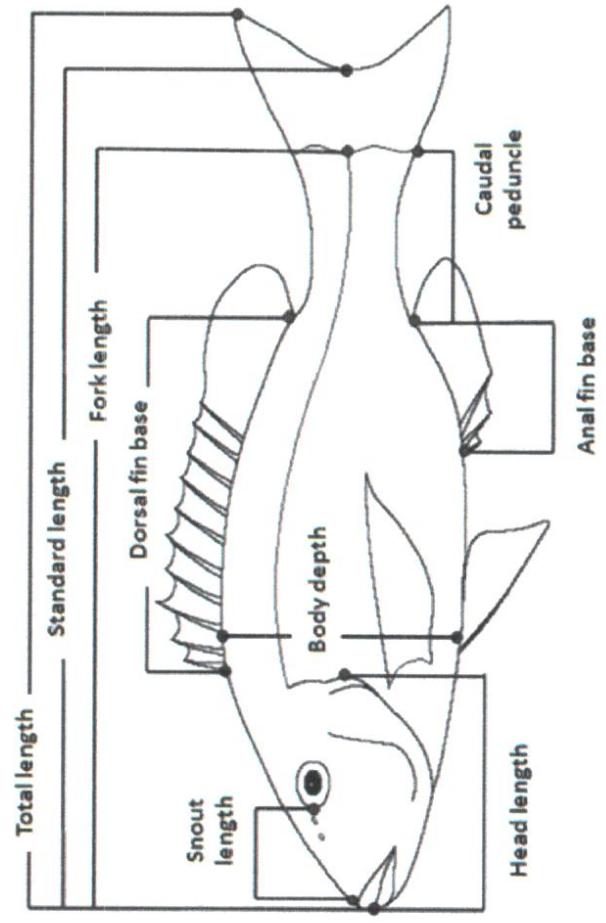
moderately protractile (fixed in *Aphareus*); maxilla slipping for most or all of its length under preorbital bone when mouth is closed. Two nostril on each side. Lateral line complete, straight or gently curved. Mouth terminal moderate to large, extending somewhat when opened. Preoperculum usually serrated, often finely. Enlarged canine teeth usually present on jaws, small teeth on platines and usually on vomer. Dorsal fin single, continuous or with a shallow notch, with X-XII (9-12 spines) 9-18 soft rays; anal fin with III (three spines), 7-11 soft rays; pelvic fin inserted just behind pectoral base, with I (1 spine), 5 rays; caudal fin truncate to deeply forked with 17 principal rays. Snout and suborbital area without scales; preopercle scaled; no spines on opercle.

Adult mostly bottom-associated fishes occurring in 1 – 550 m of warm seas throughout the world. Some species reach 100 to 120 cm, and many are excellent food-fishes, although in some area certain species are ciguatoxic. Color highly variable, mainly from yellow through red to blue, often with blotches, lines or other patterns.

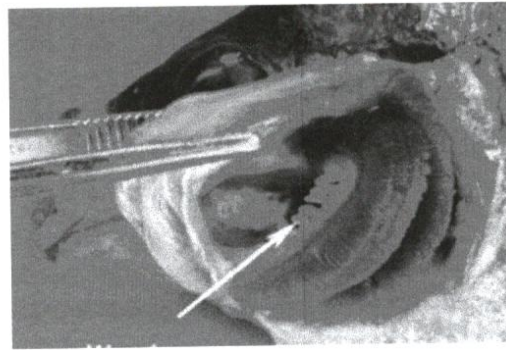




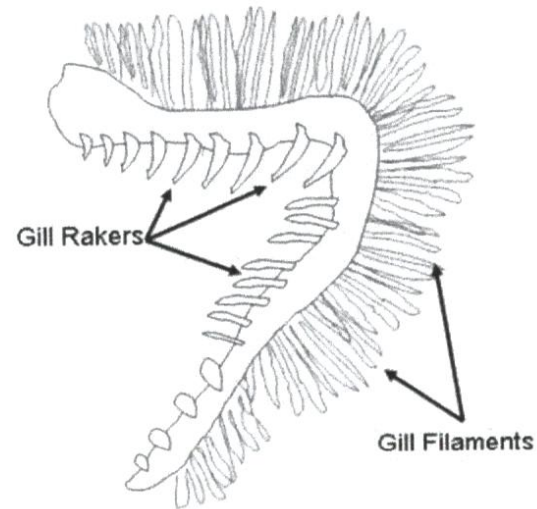
Body Parts of Lutjanid



Body measurement of Lutjanid

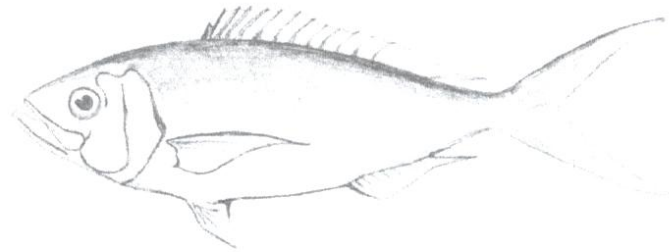


Gill arch of lutjanid



Aphareus furca (Lacepède, 1801)

(Figure 1)



Descriptions:

English: Blue smalltooth jobfish

Indonesian: Tariasan

Inhabits reefs and rocky bottoms to at least 100 m dept; Occurs solitary or in small form group. Caught mainly with handlines or vertical longlines. Distinguished by elongated body shape and deeply forked tail. Similar to *A. rutilans*, but has dark margin on edge of cheek and gill cover and body lacks yellow hue.

Dorsal rays X, 11; Anal rays III, 8; Pectoral rays 15-16. Body elongate, laterally compressed. Depth 3.0 to 3.2 times in standard length (SL); Head 3.0 to 3.2 times SL; Nostrils on each side of snout close together. Lower jaw protruding. Premaxillae not protrusible, fixed by a frenum. Maxilla extending to below middle of eye or slightly beyond. Cheek scaled. Preopercular scaleless. Preorbital with oblique parallel striae. Interorbital region flattened. Teeth in jaws extremely small (villiform bands); roof of mouth usually toothless. Maxilla without scales or longitudinal ridges. Gill openings extending far anterior to orbit. Dorsal fin continuous, not deeply incised near junction of spinous and

soft portions. Last soft ray of both dorsal and anal fins well produced, longer than next to last ray. Caudal fin strongly forked. Pectoral fins long somewhat shorter than head, reaching posteriorly to about vertical through anterior part of soft dorsal fin.

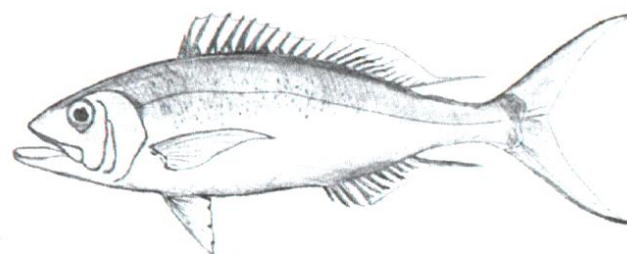
Colour: Variable: Adults dark-grey with yellowish fins and more or less distinct white spot near dorsal origin. Silvery purplish brown on back, shading to silvery blue grey on ventral half of body. Dark outline on rear edge and bar in gill cover or edge of preopercle and opercle. Scaleless part of head olive. Small juveniles have Caudal fin olive with yellow hind margin. Iris brownish.

Size: Maximum SL about 60 cm, commonly to 25 cm.

Distribution: Red Sea and East Africa to Hawaiian Island, and Australia. (FAO, 2001; Allen and Erdmann, 2012).

Aphareus rutilans Cuvier, 1830

(Figure 2)



Descriptions:

English: Rust smalltooth jobfish

Indonesian: Lupus, Kurisi

Inhabits reefs and rocky bottoms to at least 100 m dept; similar to *A. furca*, but lacks distinct black outline on edge of cheek and gill cover, also has stong yellow hue on body.

Dorsal rays X, 11; Anal rays III, 8; Pectoral rays 15-16. Body elongate, laterally compressed. Depth 3 to 3.4 times in standard length (SL); Nostrils on each side of snout close together. Lower jaw protruding. Premaxillae not protrusible, fixed by a frenum. Maxilla without scales; membrane of dorsal and anal fins without scales Maxilla. Maxilla extending to below middle of eye or slightly beyond. Teeth in jaws extremely small, minute in large adults; roof of mouth toothless. Interorbital region flattened. Gill openings extending far anterior to orbit. Dorsal fin continuous, not deeply incised near junction of spinous and soft portions. Pectoral fins somewhat shorter than head. Last dorsal and anal fins well developed. Last soft ray of both dorsal and anal fins well produced, longer than next to last ray. Caudal fin deeply forked. Tubed lateral-line scales 69 to 75.

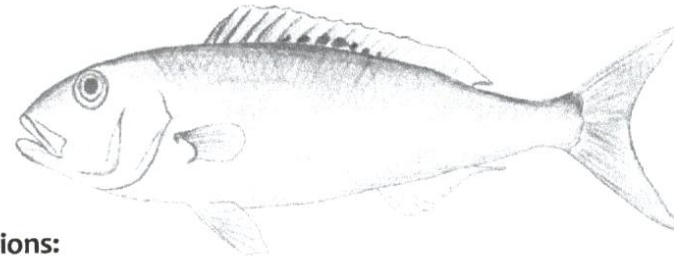
Colour: Body color varied from blue-grey, light brown above or mauve to overall reddish; margin of maxilla black; in some specimens, at least, inside of mouth, gill chamber, and gills shining silver; fins uniform pale brown or reddish, pelvic and anal fins sometimes whitish.

Size: Maximum standard length about 80 cm, commonly to 45 cm.

Distribution: Widespread in the Indo-Pacific from Hawaii to the East Africa, and Australia to Ryukyu Islands. (FAO, 2001; Allen and Erdmann, 2012).

Aprion virescens Valenciennes, 1830

(Figure 3)



Descriptions:

English: Green jobfish

Indonesian: Kakap merah; Tariasan

Inhabits reef reef and rocky bottoms to at least 100 m dept; distinguished by dark green to blue-grey colour an dark patches along base of dorsal fin.

Dorsal rays X, 11; Anal rays III, 8; Pectoral rays 15-17. Body elongate, robust and rounded. Snout below nostrils and each side of snout close together. Preopercle edge smoot, sometimes denticulated in juveniles. Pectoral fins shorter than pelvic fins, less than half head length. Very distinct horizontal groove on snout ventral to nostrils. Snout long. Mouth terminal; upper and lower jaw about equal, maxilla without scales or longitudinal ridges. Maxilla extending to vertical through about anterior margin of orbit or somewhat short of orbit. Teeth in both jaws in bands, with strong canines anteriorly; teeth on roof of mouth in chevron- or crescent-shaped patch on vomer and in elongate band on each palatine. Interorbital region flattened. Dorsal fin continuous, not deeply incised near junction of spinous and soft portions. Last soft ray of both dorsal and anal fins well produced, longer than next to last ray. Caudal fin forked. Pectoral fins short, less

than 1/2 length of head, about equal to length of snout. Tubed lateral-line scales 47 to 51.

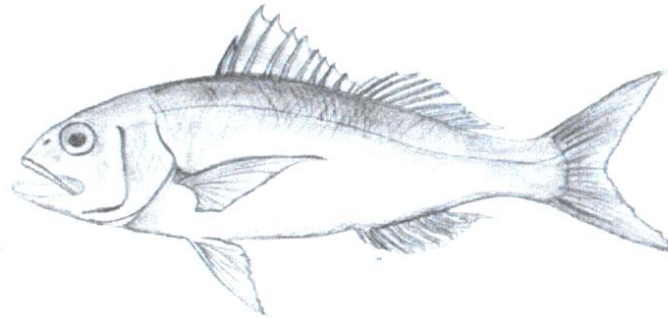
Colour: Body color dark green, bluish, or grey-blue, shading to white ventrally with black area often present at base of last five dorsal spines.

Size: Maximum about 80 cm, commonly to 50 cm.

Distribution: Widely distributed in the Indo-Pacific from Hawaii to East Africa and from Southern Japan southward to Australia. (FAO, 2001; Allen and Erdmann, 2012).

Etelis carbunculus Cuvier, 1828

(Figure 4)



Descriptions:

English: Ruby snapper

Indonesian: Kakap Merah; Tariasan

Inhabits reefs and rocky offshore reef bottoms to at least 100 m dept; distinguished by brighter red colouration and less forked tail.

Dorsal rays X, 11; Anal rays III, 8; Pectoral rays 15-17. Body relatively elongate, laterally compressed. Nostrils on each side of snout close together. Head considerably longer than deep. Gill cover with two

broad, flat spines, not produced, the upper obscure. Maxilla with scales, but without longitudinal ridges. Lower jaw protruding slightly. Premaxillae protrusible. Maxilla extending to below middle of eye. Both upper and lower jaws with conical teeth; 1 to several enlarged canines on each side of both jaws; vomer and palatines with teeth, those on vomer in a chevron-shaped patch. Interorbital region flattened. First gill arch with 5 to 8 gill rakers on upper limb, 11 to 14 on lower limb (total number, including rudiments, 17 to 22). Dorsal fin continuous, but spinous portion of fin deeply incised at its junction with soft portion. Last soft ray of both dorsal and anal fins produced, longer than next to last ray. Caudal fin forked, the lobes relatively short compared with other species of *Etelis*. Pectoral fins fairly long; in specimens more than about 19 cm standard length, length of pectoral fins about 80 to 90% of head length. Tubed lateral-line scales 48 to 50. No scale on interorbital and snout region. Upper jaw with several rows of scales.

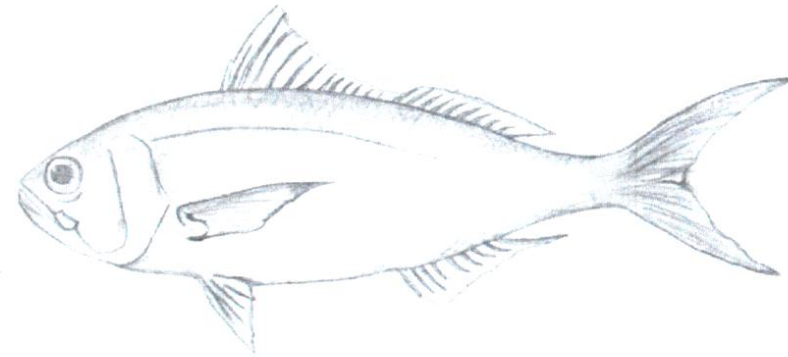
Colour: Body mainly pink to red, white on lower sides and belly silvery with rosy shades. Snout, jaws, eye and inside of mouth red. Fins all rosy, pectoral pale.

Size: Maximum standard length 80 cm or more, commonly to 50 cm.

Distribution: Widely distributed in the Indo-Pacific from Hawaii to East Africa and from Southern Japan southward to Australia. (FAO, 2001).

Etelis radiosus Anderson, 1981

(Figure 5)



Descriptions:

English: Scarlet snapper , Red snapper

Indonesian: Kakap merah, Kurisi

Inhabits rocky bottoms between 40 – 100 m depth; distinguished by pale (pinkish) colour and more forked tail.

Dorsal rays X, 11; Anal rays III, 8; Pectoral rays 15-17. Body relatively elongate, laterally compressed. Snout short, nostrils on each side of snout close together. Maxilla with scales, but without longitudinal ridges. Interorbital region flattened. Lower jaw protruding. Premaxillae protrusible. Maxilla extending to vertical near posterior margin of orbit. Pectoral fins fairly long, a little shorter than head. Small conical teeth in jaws with a few anterior ones in each jaw enlarged, sometimes into canine-like teeth; vomer and palatines with teeth, those on vomer in a rounded arch-shaped. Dorsal fin continuous, but spinous portion of fin deeply incised at its junction with soft portion. Last soft ray of both dorsal and anal fins produced, longer than next to last ray. Membranes of dorsal and anal fins without scales. Caudal fin lunate.

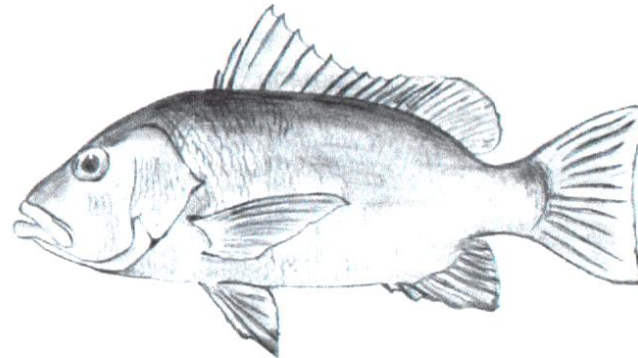
Colour: mainly red, lighter on lower sides and belly.

Size: Maximum SL about 80 cm, commonly to about 50 cm.

Distribution: Widely distributed in the Indo-Pacific from Samoa to Sri Lanka and from the ryukyu Islan Southward to australia (FAO, 2001).

***Lutjanus argentimaculatus* (Forsskål, 1775)**

(Figure 6)



Descriptions:

English: Mangrove red snapper

Indonesian: Kakap merah; Jambian, Bambang

Inhabits estuaries an inshore and offshore reefs to 100 m depth. Young and sub-adults found in mangrove estuaries.

Dorsal rays X, 13-14; Anal rays III, 8; Pectoral rays 16-17. Body stout and moderately deep, its depth 2.6 to 3.0 times in standard length. Preoperculum without notch, or at most with a slight notch. Vertical and horizontal margin of preoperculum finely serrated. Snout somewhat pointed; preorbital bone relatively broad, wider than eye diameter; preopercular notch poorly developed, interopercular notch indistinct or absent. Posterior profile of dorsal and anal fins rounded. Caudal fin emarginate to nearly truncate. Scale rows on back parallel

to lateral line. Longitudinal rows of scales above lateral line parallel to dorsal profile anteriorly, but appearing to rise obliquely under soft part of dorsal fin or under posterior part of spinous dorsal fin. Scale rows below lateral line horizontal.

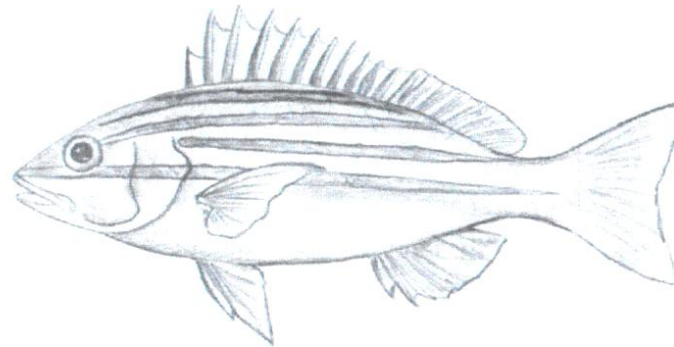
Colour: Body overall greenish brown to reddish dorsolaterally, whitish or silvery ventrolaterally ; belly silvery or whitish. Sometimes a silvery patch in the centre of each scale.

Size:Maximum total length about 120 cm, commonly 50 to 80 cm.

Distribution: Widespread in the Indo-west Pacific from Samoa and Australia. (FAO, 2001; Allen and Erdmann, 2012).

***Lutjanus bengalensis* (Bloch, 1790)**

(Figure 7)



Descriptions:

English: Bengal Seaperch, Bengal Snapper

Indonesian: Kakap kuning; Gorara

Inhabits coral reefs between 5 to 30 m depth. Distinguished by series of faint yellow stripes on the side of body.

Dorsal rays X, 13; Anal rays III, 8; Pectoral rays 16-17. Body moderately deep, its depth 2.4 to 2.7 times in standard length. Snout somewhat

pointed; preorbital bone relatively narrow; its width usually less than eye diameter; preopercular notch and knob well developed; vomerine tooth band lacking a medial posterior extension; tongue smooth, without teeth. Scale rows on back rising obliquely above lateral line. Caudal fin emarginate.

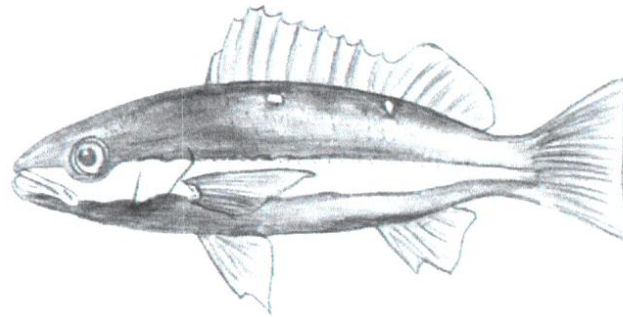
Colour: Yellow on upper half and white below with a series of 4 bright blue stripes, does not extend onto head, and no faint stripes on belly; back and sides yellowish; belly whitish; no black spot on back below middle of dorsal fin; fins yellow to whitish.

Size: Maximum total length about 35 cm, commonly to 20 cm.

Distribution: Distributed Indian Ocean species ranging from Red Sea and East Africa to Andaman Island and Indonesia. (FAO, 2001; Allen and Erdmann, 2012).

***Lutjanus biguttatus* (Valenciennes, 1830)**

(Figure 8)



Descriptions:

English: Two-spot banded Seaperch

Indonesian: Tanda-tanda pasir

Dorsal rays XI, 11; Anal rays III, 8; Pectoral rays 16-17. Body elongated, fusiform or very slender, its depth 3.4 to 3.7 times in standard length.

Snout profile low, sloping very gently; vomerine tooth patch triangular, with a medial posterior extension, or diamond-shaped; tongue smooth without teeth. Preopercular notch indistinct; Posterior profile of dorsal and anal fins somewhat pointed or angular. Caudal fin truncate. Pectoral fins with 15 or 16 rays. Scale rows on back rising obliquely above lateral line.

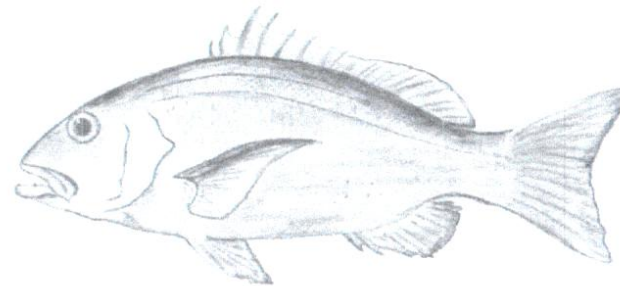
Colour: Grey on back, dark band from snout to caudal fin base; pair of broad red-brown stripes on each side of broad white stripe on middle of side or broad pearly white stripe from below eye to base of caudal fin. Two pearly lateral blotches above lateral line, one below spinous dorsal base and other below soft dorsal base.

Size: Maximum total length about 20 cm, commonly to 15 cm.

Distribution: Maldives, India, Sri Lanka to Solomon Island and Great Barrier Reef, Australia (FAO, 2001; Allen and Erdmann, 2012).

***Lutjanus bohar* (Forsskål, 1775)**

(Figure 9)



Descriptions:

English: Two-spot banded Seaperch

Indonesian: Kakap mailah

Dorsal rays X, 13-14; Anal rays III, 8; Pectoral rays 16-17. Body compressed moderately deep. Snout somewhat pointed, dorsal profile of head rounded; preorbital bone relatively broad; its width usually greater than eye diameter. Preopercle margin with a distinct

shallow notch and an interopercular knob. Caudal fin slightly emarginated. Vertical and horizontal borders of preoperculum finely denticulate. Posterior profile of dorsal and anal fins rounded. Scale rows on back rising obliquely above lateral line.

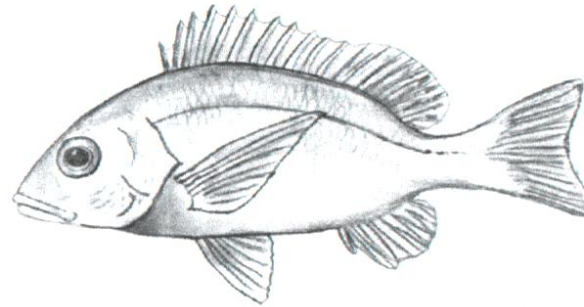
Colour: Back and upper sides dark brown or blackish; lower sides and belly reddish, with darker horizontal stripes; fins mainly dusky except pectoral fins pink with dorsal edge prominently black; Juveniles with pair of white spot on back or two distinct silvery white spots on body between lateral line and dorsal profile.

Size: Maximum total length about 75 cm, commonly to 50 cm.

Distribution: Widely distributed in the Indo-Pacific from Hawaii to East Africa and from Southern Japan southward to Australia. (FAO, 2001; Allen and Erdmann, 2012).

***Lutjanus bouton* (Lacepède, 1803)**

(Figure 10)



Descriptions:

English: Moluccan snapper

Indonesian: Kakap Maluku

Dorsal rays X, 12-13; Anal rays III, 8; Pectoral rays 16-17. Body moderately deep. Snout somewhat pointed; eye large; preorbital bone narrow, its width much less than eye diameter; preopercular notch well developed; vomerine tooth band lacking a medial posterior

extension; tongue smooth, without teeth. Caudal fin emarginate. Scale rows on back rising obliquely above lateral line.

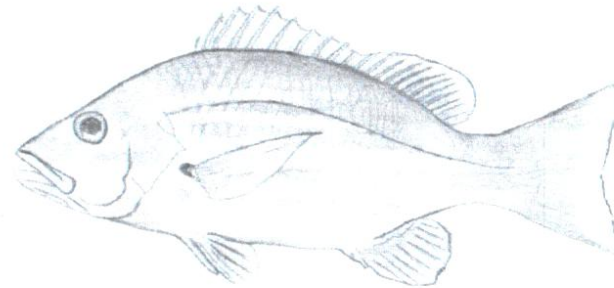
Colour: Body usually with 10-12 faint yellow stripe on sides. head and breast dusky reddish brown; back salmon pink to yellowish grey on back grading to yellow below, sometimes with black spot; dorsal and caudal fin light pink, caudal sometimes with yellow suffusion; anal and pelvic fins yellow; pectoral fins translucent yellow with small brown spot at base of uppermost rays.

Size: Maximum total length about 30 cm, commonly to 20 cm.

Distribution: Widely distributed in the Indo-Pacific from Samoa and from Southern Japan southward to Australia. (FAO, 2001; Allen and Erdmann, 2012).

Lutjanus carponotatus (Richardson, 1842)

(Figure 11)



Descriptions:

English: Spanish flag snapper

Indonesian: Kakap bendera

Inhabits coral reefs to at least 35 m depth. Distinguished by striped pattern.

Dorsal rays X, 14 - 16; Anal rays III, 9; Pectoral rays 14-16. Body moderately deep, its depth 2.5 to 2.8 times in standard length. Snout slightly pointed, dorsal profile of head steeply sloped; preopercular

notch and knob poorly developed; vomerine tooth band with a medial posterior extension; tongue with a patch of granular teeth. First gill arch with 15 to 18 gill rakers, of which 8 to 11 (including rudiments) on lower limb. Caudal fin emarginate. Scale rows on back rising obliquely above lateral line.

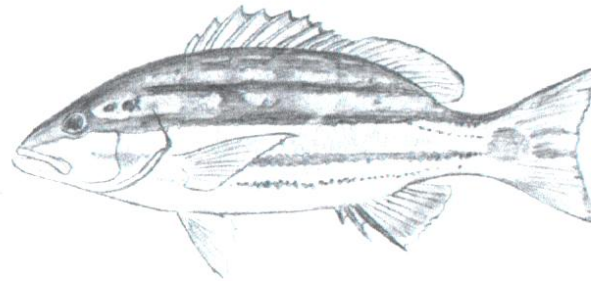
Colour: Blue-grey to whitish overall with with a series of 8 or 9 orange, yellow, or golden-brown stripes on sides; back and upper sides blue-grey or brownish; lower sides and belly white or yellowwhite; fins yellowish; pectoral fin with a distinct black spot at base of uppermost rays and in axil.

Size: Maximum total length about 50 cm, commonly to 30 cm.

Distribution: Indian to Papua Guinea and northern Australia, ranging northward to southern China; ranges through East Indian region. (FAO, 2001; Allen and Erdmann, 2012).

Lutjanus decussatus (Cuvier, 1828)

(Figure 12)



Descriptions:

English: Checkered snapper

Indonesian: Tanda-tanda Batu; Kakap Tembola

DX, 13-14, A III, 8 or 9; P₁ 16-17. Body moderately compressed, its depth 2.7 to 2.9 times in standard length. Dorsal profile of head moderately

sloped; Preoperculum serrated and with a shallow notch above angle. Vomerine tooth patch crescentic, without a medial posterior extension; tongue with a patch of granular teeth. Caudal fin emarginate. Scale rows on back rising obliquely above lateral line.

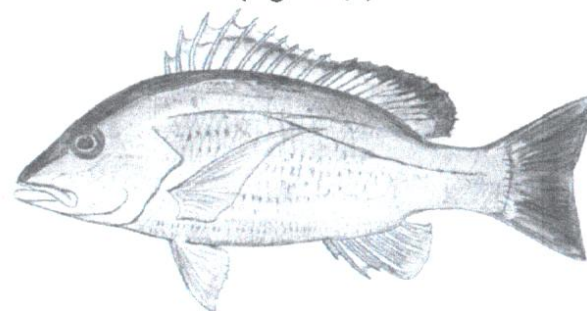
Colour: Very peculiar colour pattern. Five dusky reddish longitudinal bands, generally whitish with a “checker-board” pattern on upper half of sides, consisting of dark brown bars and stripes surrounding rectangular, whitish “windows”; lower half of sides with 2 dark brown stripes; a large black spot covering most of caudal-fin base.

Size: Maximum total length about 30 cm, commonly to 20 cm.

Distribution: India and Sri Lanka to West Papua, Indonesia and Western Australia, northwards to Ryukyu Islands; ranges throughout and East Indian region except Papua New Guinea and Solomon Island. (FAO, 2001; Allen and Erdmann, 2012).

Lutjanus fulvus (Schneider, 1801)

(Figure 13)



Descriptions:

English: Blacktail snapper, Flame-tailed Snapper, Yellow-margined seaperch

Indonesian: Kakap tambak

The Flame-tailed Snapper is a common inhabitant of lagoon reefs and semi-protected seaward reefs from depths of 1 to over 30 m, particularly

part of eye. Upper and lower jaws both with an outer row of conical teeth (a few anterior teeth in upper jaw enlarged into small canines) and an inner band of villiform teeth; vomer and palatines with teeth, vomerine tooth patch with backward prolongation in midline (patch sometimes diamond-shaped); teeth present on tongue. Maxilla without scales or longitudinal ridges. Interorbital region flattened. Dorsal fin continuous, not deeply incised near junction of spinous and soft portions. Last soft ray of both dorsal and anal fins well produced, longer than next to last ray. Caudal fin forked. Pectoral fins long: somewhat shorter than, about equal to, or somewhat longer than length of head.

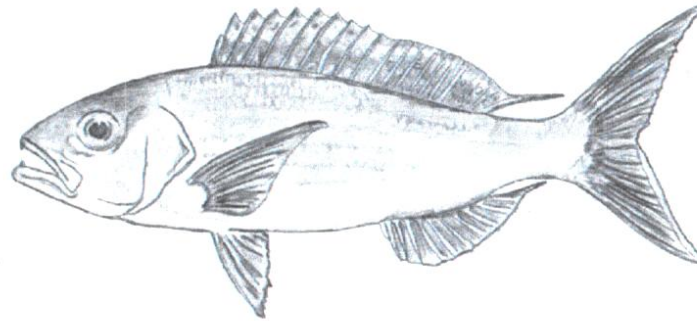
Colour: silvery with lavender hue; dark spots on top of head, more conspicuous in young; margin of dorsal fin orange; caudal fin purplish with inner margin of fork pale.

Size: Maximum standard length 50 cm or more, commonly to about 30 cm.

Distribution: Western Pacific from Samoa to Taiwan Province of China and Singapore and from the Ryukyu and Ogasawara islands southward to New Caledonia and northeastern Australia (FAO, 2010).

Pristipomoides typus Bleeker, 1852

(Figure 38)



Descriptions:

English: Sharptooth jobfish

Indonesian: Kurisi bali

Occurs over rocky bottoms at depths between about 40 and 100m. Feeds on benthic invertebrates and fishes. Caught mainly with handlines. DX, 11; A III, 8; P₁ 15 or 16. Body elongate, laterally compressed. Nostrils on each side of snout close together. Jaws about equal or lower jaw protruding slightly. Premaxillae protrusible. Maxilla extending to vertical through about middle of eye or slightly short of middle of eye. Upper and lower jaws both with an outer row of conical teeth, a few of the anteriormost teeth enlarged into canines, and an inner band of villiform teeth; vomer and palatines with teeth, those on vomer in chevron-shaped patch; no teeth on tongue. Maxilla without scales or longitudinal ridges. Interorbital region flattened. Dorsal fin continuous, not deeply incised near junction of spinous and soft portions. Last soft ray of both dorsal and anal fins extended into short filaments. Caudal fin forked. Pectoral fins long, a little shorter than length of head, slightly falcate.

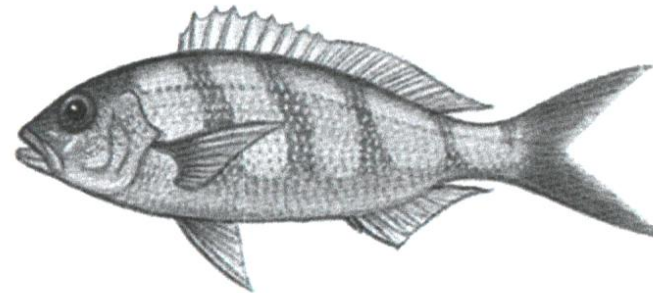
Colour: body and fins rosy; top of head with longitudinal brownish yellow vermiculations and spots of brownish yellow; dorsal fin with wavy yellow lines.

Size: Maximum standard length 50 cm or more, commonly to 35 cm.

Distribution: Western Pacific from New Guinea to Sumatra and northward to the Ryukyu Islands; also known from the Andaman Sea arm of the eastern Indian Ocean; reports from the western Indian Ocean and Western Samoa need verification (FAO, 2010, Rau and Rau, 1980).

***Pristipomoides zonatus* (Valenciennes, 1830)**

(Figure 39)



(an FAO Drawing)

Descriptions:

English: Obliquebanded snapper

Indonesian: Lalosi

Occurs over rocky bottoms at depths between about 70 and 350 m; most abundant between about 100 and 200 m. Caught mainly with handlines. DX, 11; A III, 8; P₁ 15 or 16. Body moderately deep

compressed. Upper jaw reaches beyond from of pupil, Jaws about equal or lower jaw protruding slightly. Preopercular margin finely serrated. Premaxillae protrusible. Maxilla extending to vertical through about middle of eye or slightly short of middle of eye. Upper and lower jaws both with an outer row of sharp conical teeth (a few of anteriormost teeth in upper jaw enlarged and caniniform) and an inner band of villiform teeth; vomer and palatines with teeth, those on vomer in chevron-shaped patch; no teeth on tongue. Maxilla without scales or longitudinal ridges. Interorbital region flattened to slightly convex. Dorsal fin continuous, not deeply incised near junction of spinous and soft portions. Last soft ray of both dorsal and anal fins well produced, longer than next to last ray. Caudal fin forked. Pectoral fins long, a little shorter than length of head.

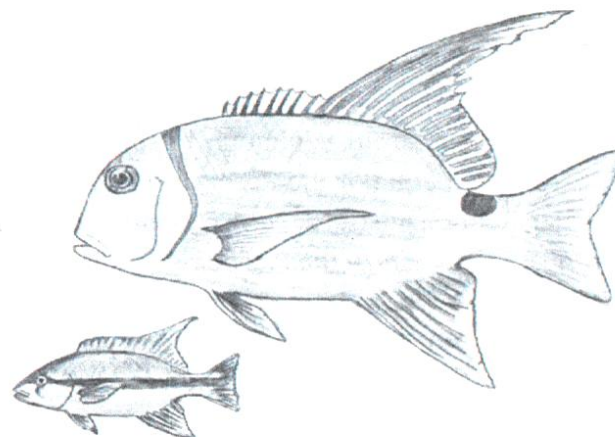
Colour: overall pink or reddish with alternating oblique red with five broad or yellow bars on side of body; dorsal and caudal fins yellow, other fins pink.

Size: Maximum standard length about 40 cm, commonly to 25 cm.

Distribution: Widespread in the tropical Indo-Pacific Ocean from East Africa to Hawaii and Tahiti, north to southern Japan, south to Australia and Lord Howe Island. It is mainly found in southern Taiwanese waters. (FAO, 2010; Rau and Rau, 1980).

Symphorichthys spilurus (Günther, 1874)

(Figure 40)



Descriptions:

English: Sailfin snapper, Threadfin sea-perch

Indonesian: Markisa

Found over sand bottoms in the vicinity of coral reefs at depths between about 5 and 60 m. Usually seen solitarily. Feeds on fishes and sand-dwelling crustaceans and molluscs. Caught mainly with handlines and bottom trawls. DX, 17-19; A III, 11; P₁ 16 or 17. Deep bodied with very steep snout profile, tall dorsal and anal with fins with one or more filament at apex of dorsal fin. Nostrils on each side of snout not very close together. Mouth terminal, jaws about equal. Premaxillae protrusible. Maxilla reaching vertical through about middle of eye. Upper jaw with a row of submolar teeth; lower jaw with about 3 rows of smaller submolars; upper and lower pharyngeal bones enlarged and bearing enlarged molariform teeth. Maxilla without scales or longitudinal ridges. Dorsal fin continuous, notched slightly near junction of spinous and soft portions. Pectoral fins somewhat longer than head. Soft dorsal and anal fins sheathed in scales basally.

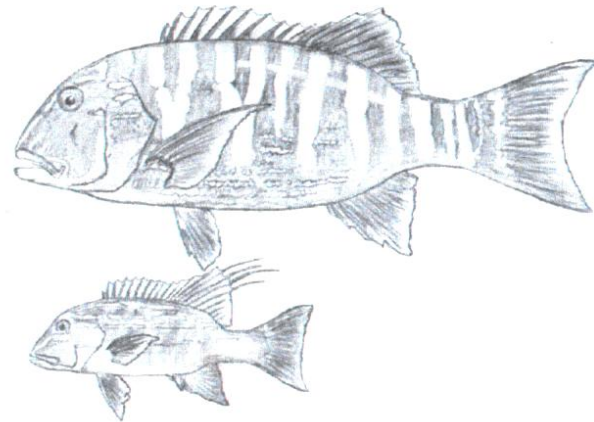
Colour: Overall yellowish, with a series of bright blue stripes on sides and head; a prominent black spot with a pale margin on dorsal surface of caudal peduncle; sometimes with an orange bar across interorbital region and an orange bar above pectoral-fin base; juveniles light brown above and whitish below with broad black stripe along midbody.

Size: Maximum SL about 50 cm, commonly to about 25 cm.

Distribution: Western margin of the Pacific including New Caledonia, the Great Barrier Reef of Australia, New Guinea, Sulawesi (Celebes), Admiralty Islands, Palau Islands, the Philippines, and the Ryukyu Islands; also known from Rowley Shoals in the eastern Indian Ocean off Broome, Western Australia (FAO, 2001; Allen and Erdmann, 2012).

Symphorus nematophorus (Bleeker, 1860)

(Fig. 41)



Descriptions:

English: Chinamanfish, Threadfin Sea-perch

Indonesian: Markisa

Inhabits coastal reefs from shallow water to depths of at least 50 m. Occurs solitarily. Caught mainly with handlines. DX, 15-16; A III, 8; P, 16 or 17. Body moderately compressed. Anterior profile relatively steep, but not nearly as steep as in *Symphorichthys*. Eye located well above mouth. Lacrimal (suborbital region) broad. Deep groove running obliquely downward from eye to anterior nostril or a little beyond. Nostrils on each side of snout not very close together. Mouth terminal, jaws almost equal. Premaxillae protrusible. Maxilla reaching vertical through about middle of eye. Teeth in jaws in narrow bands, with the outer teeth enlarged; canine teeth present at anterior end of upper jaw; vomer toothless; tongue with a patch of Dorsal fin continuous, notched slightly near junction of spinous and soft portions. Spinous part of dorsal fin distinctly lower than soft part. One or more anterior soft rays of dorsal fin produced into long filaments in juveniles. Last soft ray of dorsal and anal fins not produced. Caudal fin emarginate. Pectoral fins 70 to 90% head length.

Colour: Pale orange or brown with conspicuous blue stripes on head and body, sometimes with irregular dark and pale bars superimposed on side of body; young brown or yellowish on back and upper sides, yellowish below, and with bright blue stripes on side.

Size: Maximum standard length about 80 cm, commonly to 35 cm.

Distribution: Western margin of the Pacific including New Caledonia, the Great Barrier Reef of Australia, New Guinea, Sulawesi (Celebes), Admiralty Islands, Palau Islands, the Philippines, and the Ryukyu Islands; also known from Rowley Shoals in the eastern Indian Ocean off Broome, Western Australia (FAO, 2001; Allen and Erdmann, 2012).

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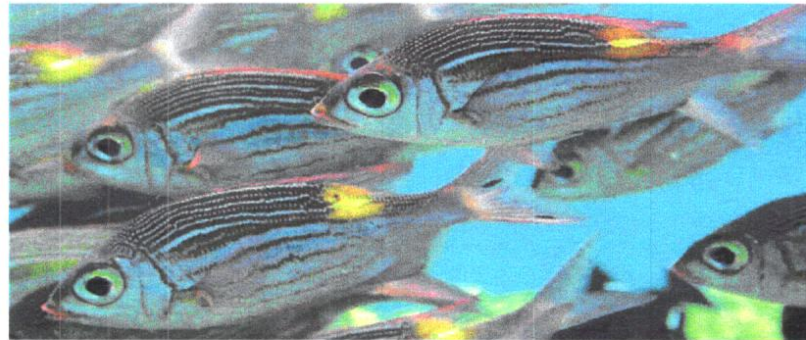
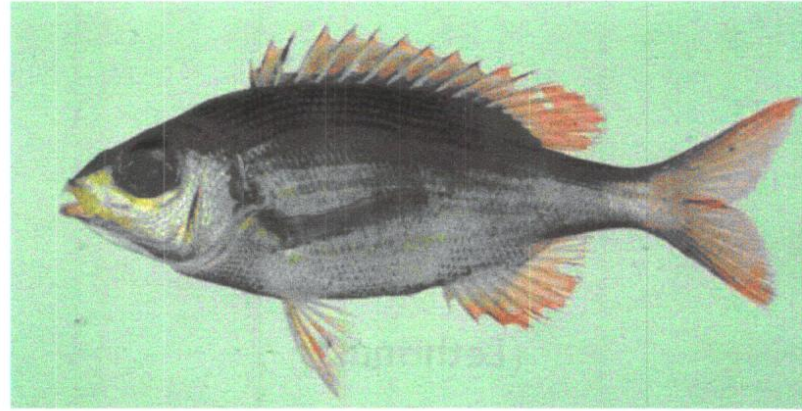
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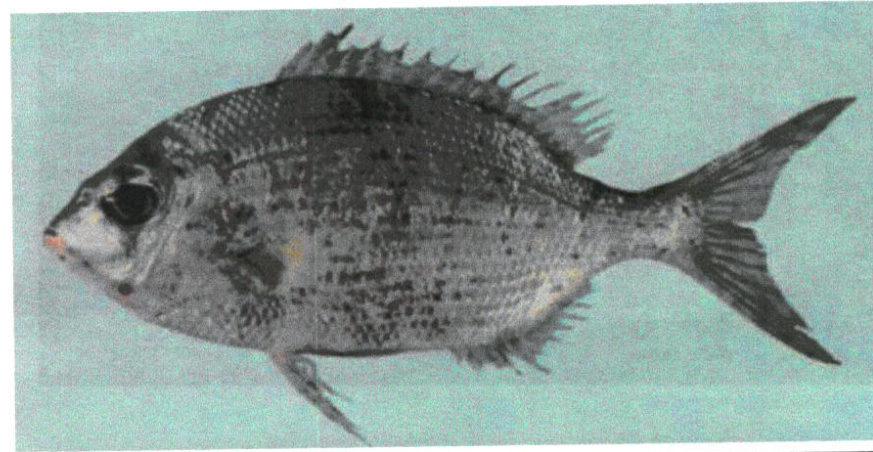
APPENDIX

(Lethrinus)

Gnathodentex aurolineatus (Lacepède, 1802)



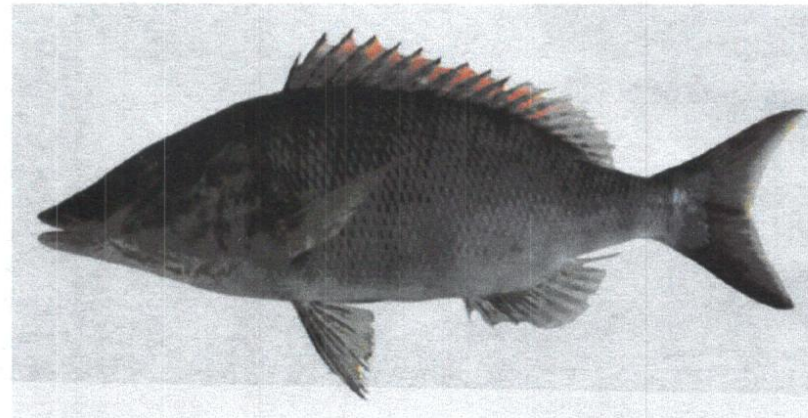
Gymnocranius elongatus Senta, 1973



Gymnocranius griseus (Temminck and Schlegel, 1843)



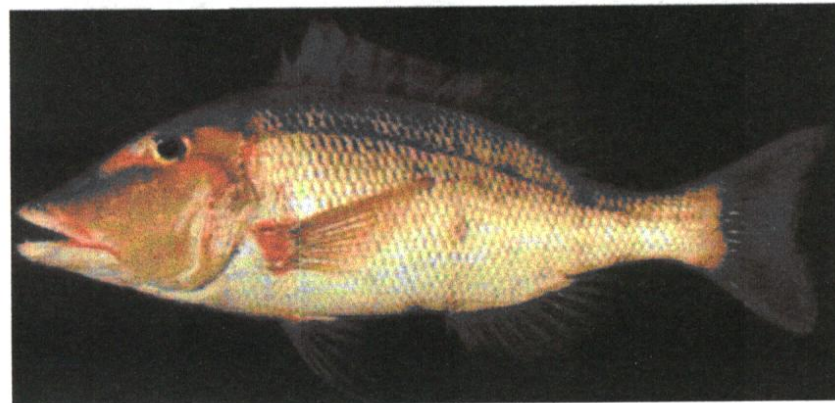
Lethrinus microdon (Valenciennes, 1830)



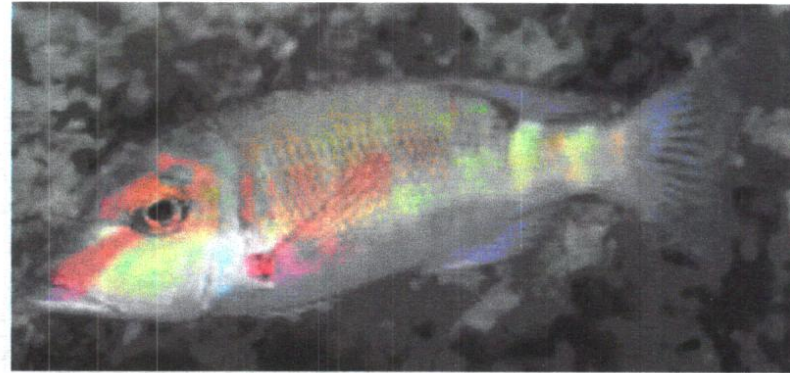
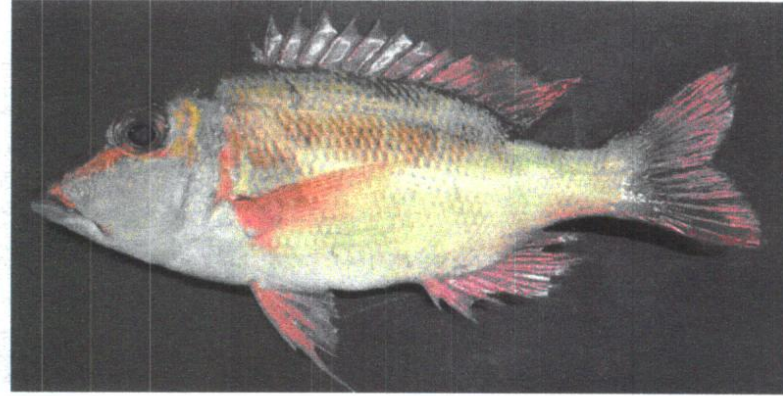
Lethrinus amboinensis Bleeker, 1854



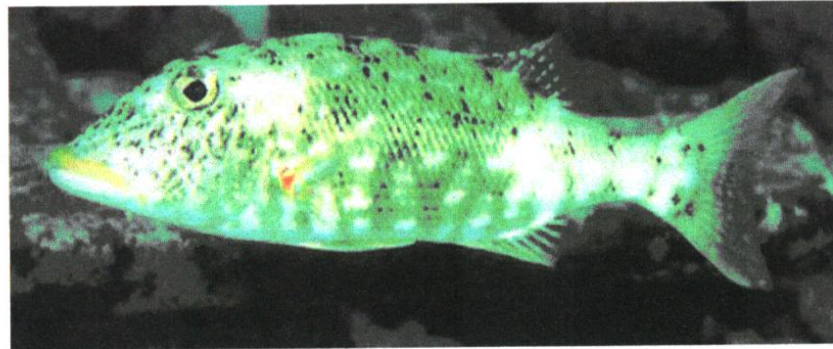
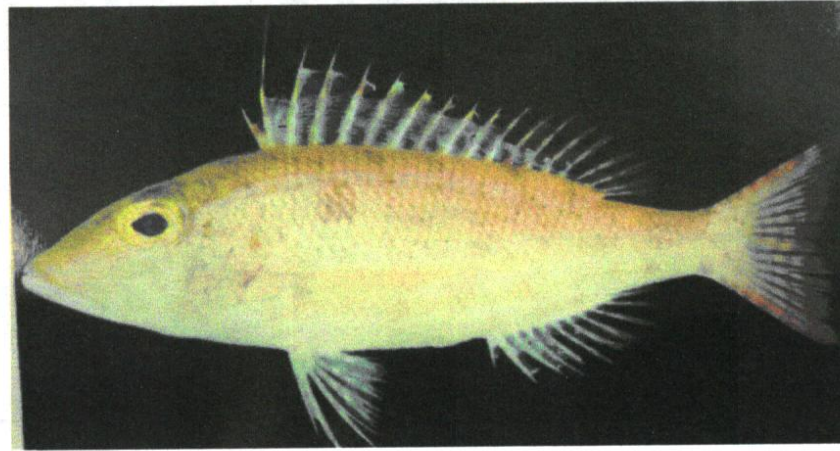
Lethrinus miniatus (Schneider, 1801)



Lethrinus erythropterus Valenciennes, 1830

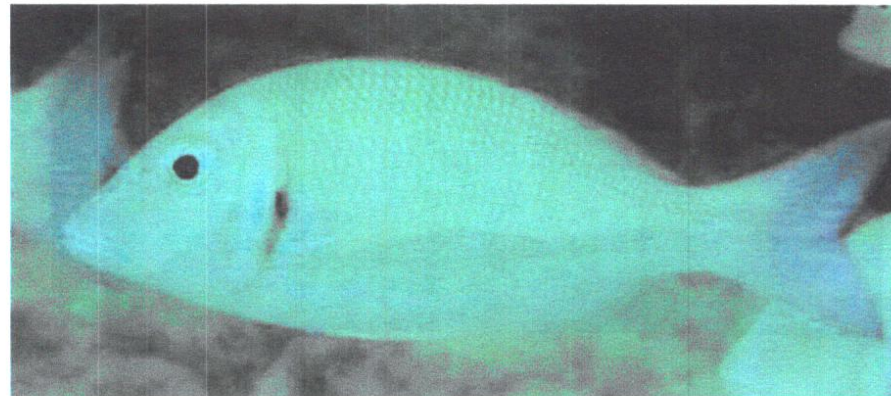
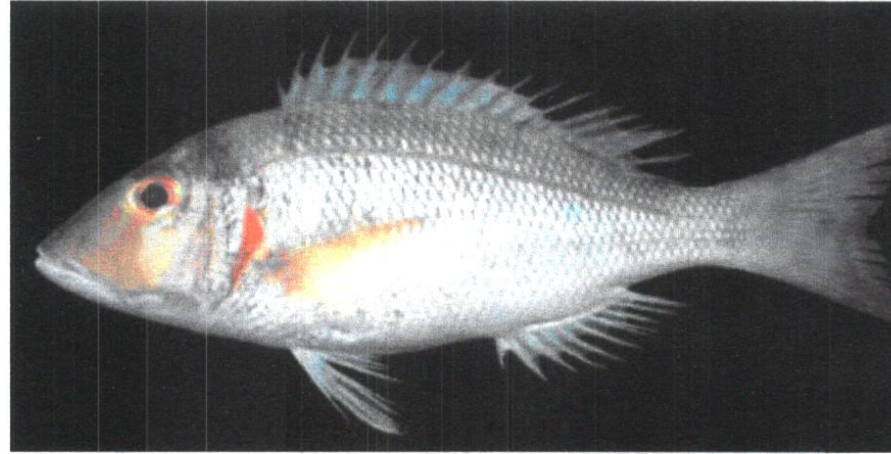


Lethrinus genivittatus Valenciennes, 1830

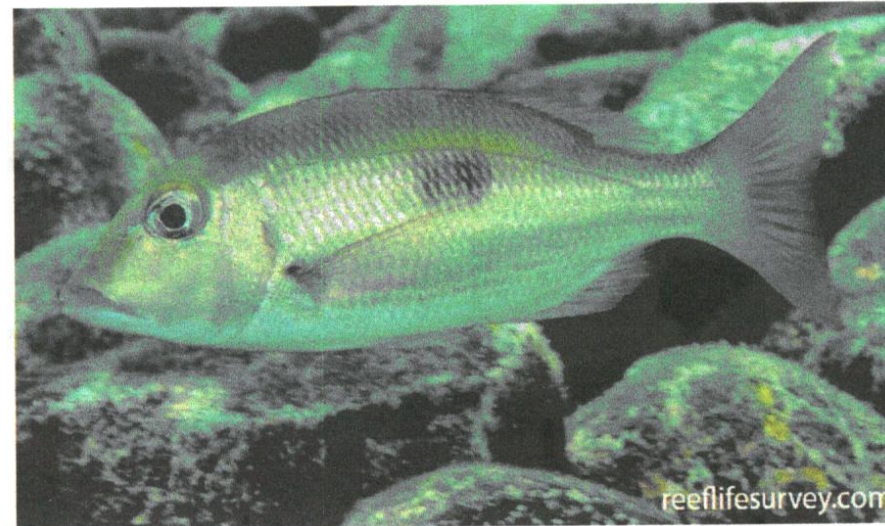
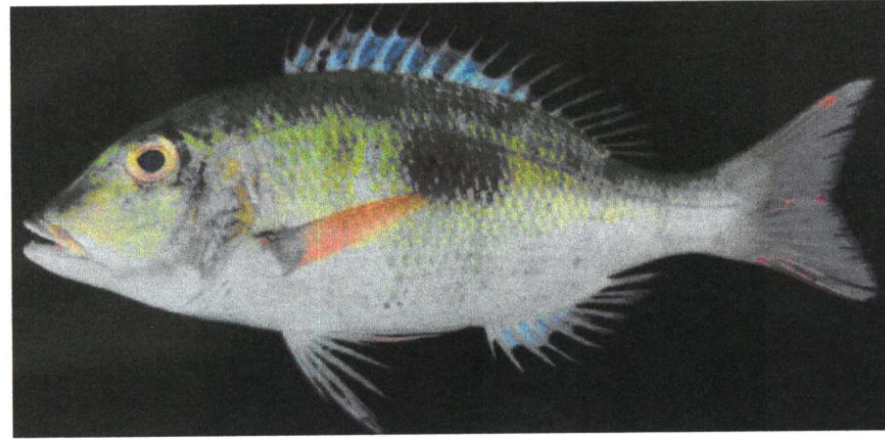


By: Randall, JE

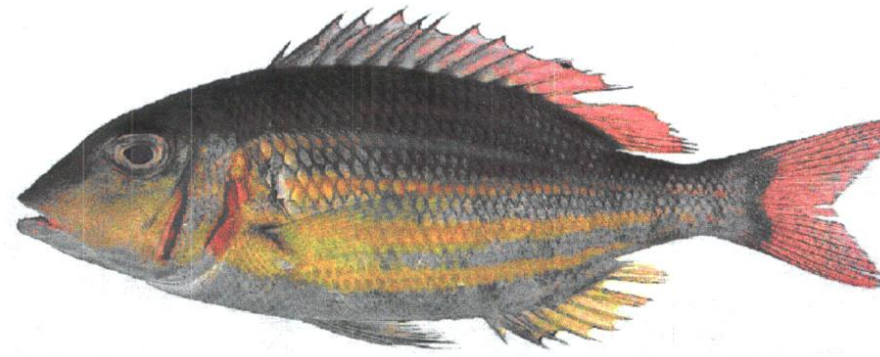
Lethrinus lentjan (Lacepède, 1802)



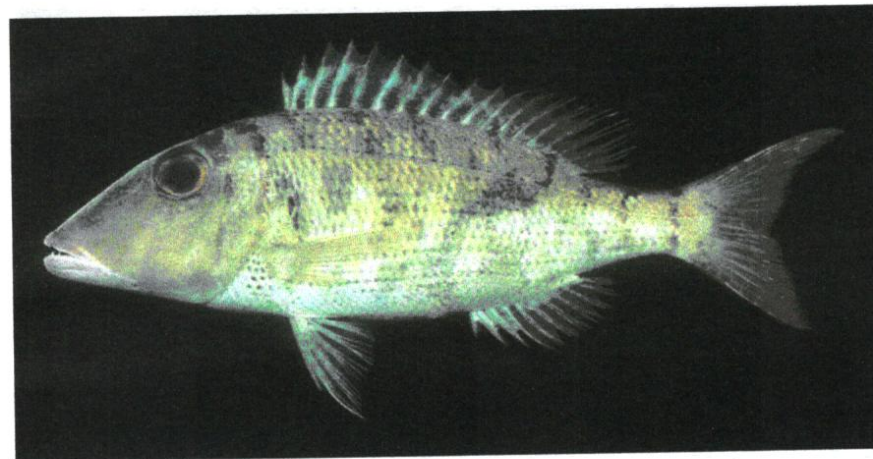
Lethrinus harak (Forsskål, 1775)



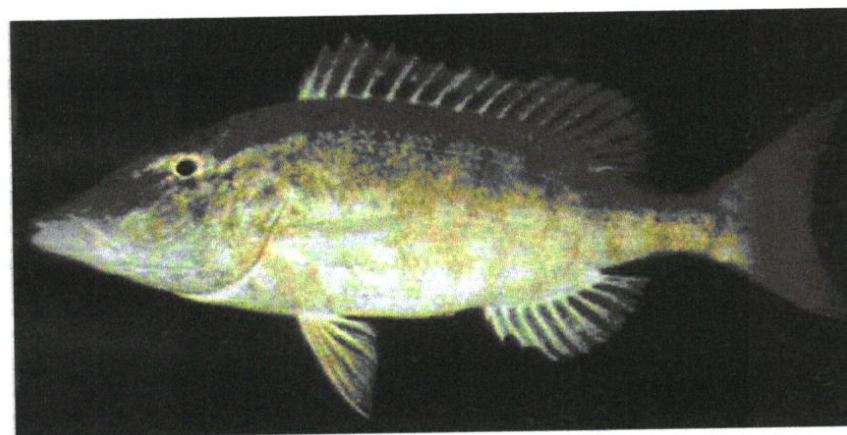
Lethrinus ornatus Valenciennes, 1830



Lethrinus semicinctus Valenciennes, 1830

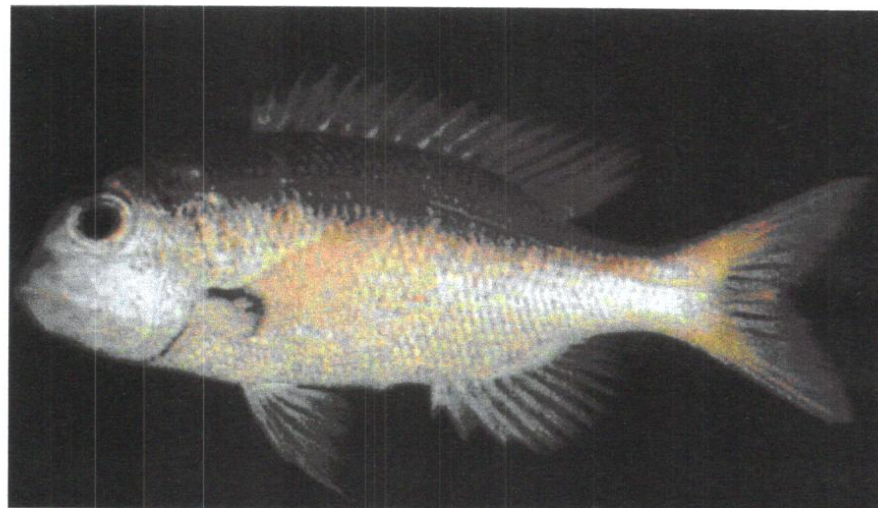


Lethrinus olivaceus Valenciennes, 1830



(By: Randall, JE, FAO 2011)

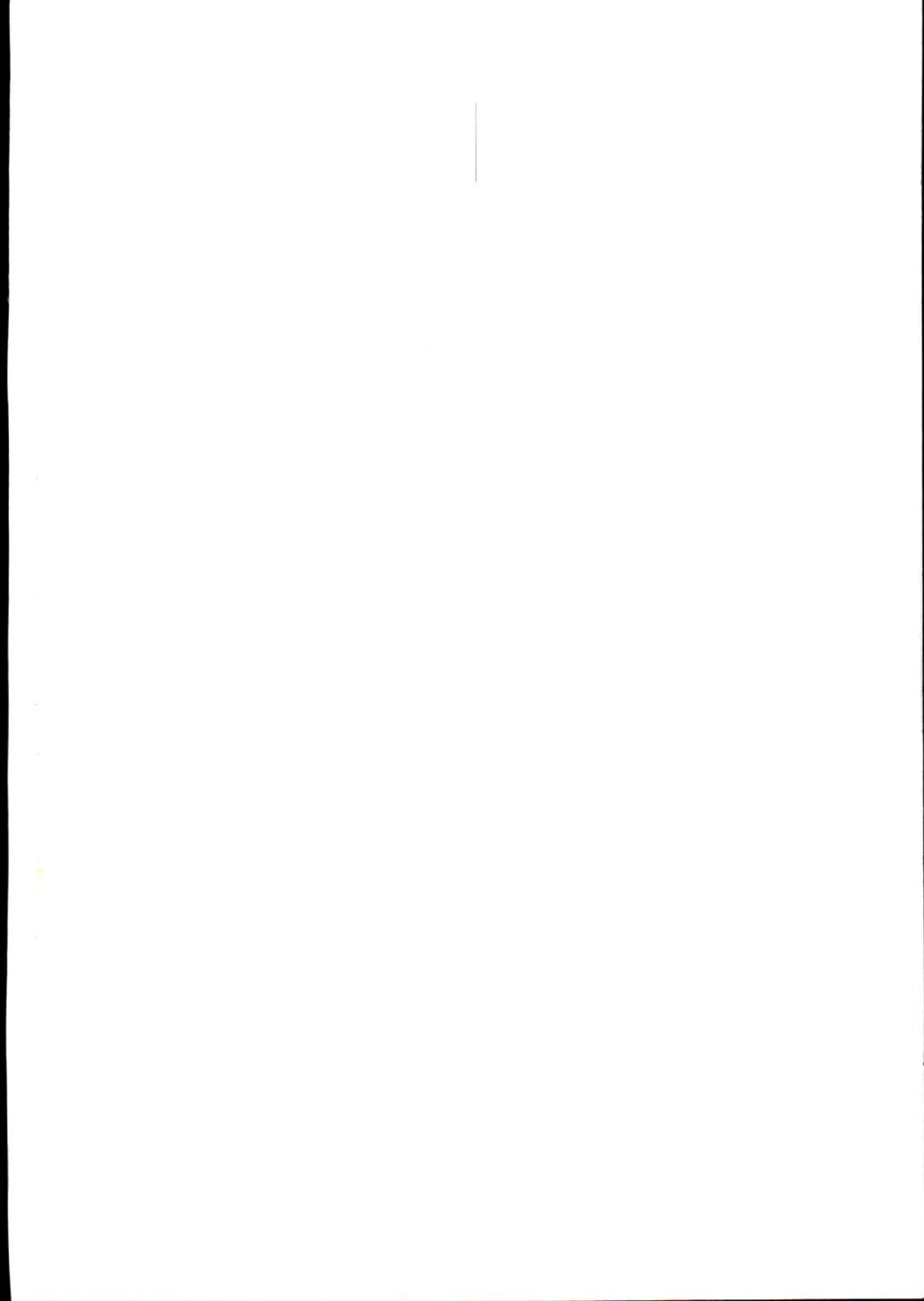
Monotaxis grandoculis (Forsskål, 1775)



(By: Randall, JE, FAO 2011)



(By: Fishbase, 2017)



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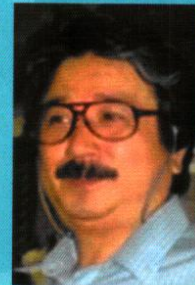


Andi Iqbal Burhanuddin

Professor of fish Taxonomy Faculty of
Marine Science and Fisheries, Hasanuddin
University, Makassar, Indonesia
Jl. Perintis Kemerdekaan Km. 10 , Makassar
Indonesia.

Yukio Iwatsuki

Professor of fish Taxonomy Department
Marine Biology and Environmental Science,
Faculty of Agriculture University of Miyazaki
Japan 1-1 Gakuen Kibanadai-nishi, Miyazaki,
889-2192, JAPAN.



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