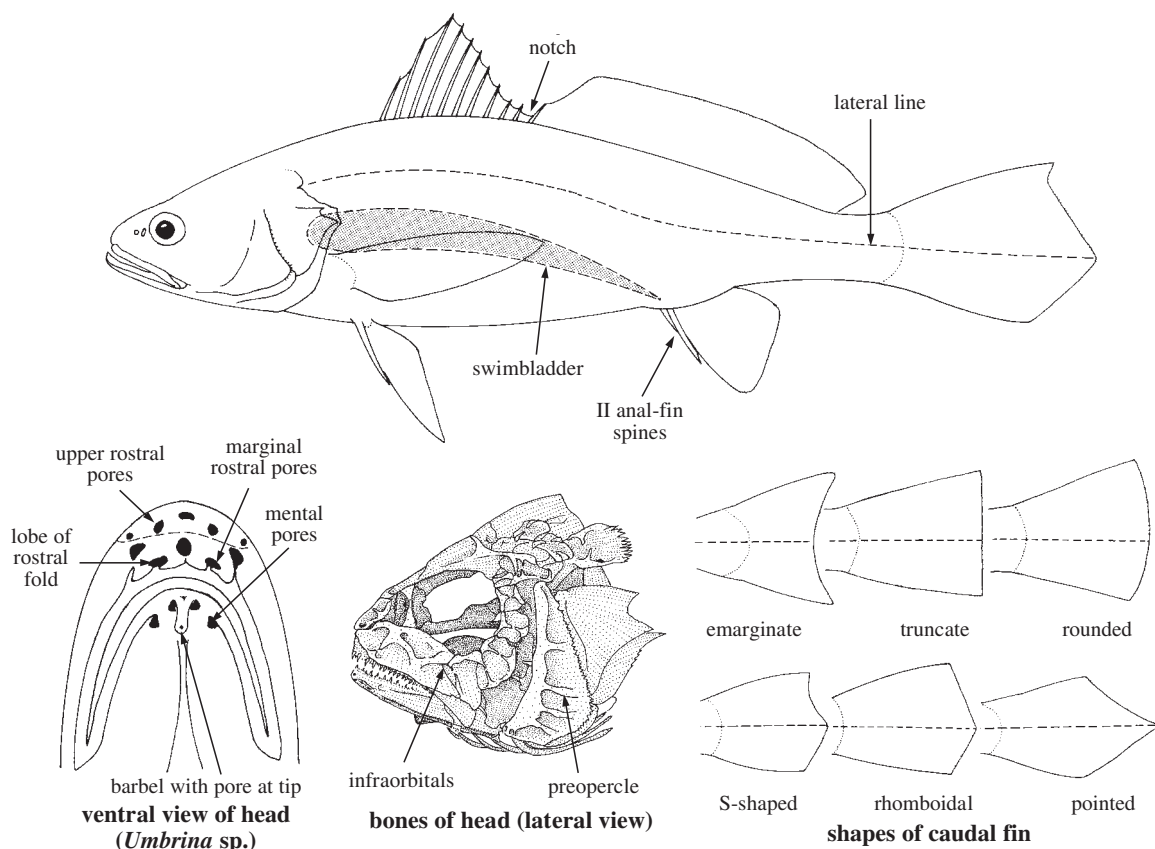


SCIAENIDAE**Croakers (drums)**

by K. Sasaki

Diagnostic characters: Moderately elongate, moderately compressed, small to large (to 200 cm standard length) perciform fishes. Head and body (occasionally also fins) completely scaly, except tip of snout. Sensory pores often conspicuous on tip of snout (upper rostral pores), on lower edge of snout (marginal rostral pores), and on chin (mental pores), usually 3 or 5 upper rostral pores, 5 marginal rostral pores, and 3 pairs of mental pores; these pores usually distinct in bottom feeders with inferior to subterminal mouth, whereas indistinct in midwater feeders with terminal to oblique mouth. A barbel sometimes present on chin. Position and size of mouth variable from strongly inferior to oblique, larger in species with oblique mouth, smaller in species with inferior mouth. Teeth differentiated into large and small in both jaws or in upper jaw only; **enlarged teeth always form outer series in upper jaw, inner series in lower jaw**; well-developed canines (more than twice as large as other teeth) may be present at front of one or both jaws; **vomer and palatine without teeth**. Dorsal fin continuous, with deep notch between anterior (spinous) and posterior (soft) portions; anterior portion with VIII to X slender spines (usually X), and posterior portion with I spine and 21 to 44 soft rays; **base of posterior portion elongate, much longer than anal-fin base**; **anal fin with II spines and 6 to 12 (usually 7) soft rays**; caudal fin emarginate to pointed, never deeply forked, usually pointed in juveniles, rhomboidal in adults; pelvic fins with I spine and 5 soft rays, the first soft ray occasionally with a short filament. Scales cycloid (smooth) or ctenoid (rough); **lateral-line scales extending to hind margin of caudal fin**. Dorsal side of head (skull) cavernous with a series of bridge-like bony struts; **infraorbitals and preopercle with variously developed ridges which fold over canals of cephalic lateral-line system**. Branchiostegal rays 7, of which 6 on ceratohyal and 1 on epihyal. **Swimbladder well developed with thick wall; carrot-shaped, or hammer-shaped, with horn-like, tube-like, or arborescent appendages**. Appendages may spread behind transverse septum or entering head beyond the septum. Drumming muscles (sound-producing muscles on body wall) usually developed in males, less so or absent in females. Sagitta (large earstone) thick, housed in well-inflated auditory bulla (ear capsule), with a tadpole-shaped impression (or sulcus) on its inner surface. **Colour:** highly variable from silvery to dark brown or black, either uniform or some species with spots and dark bands; juveniles of many species have bands and/or spots on body.



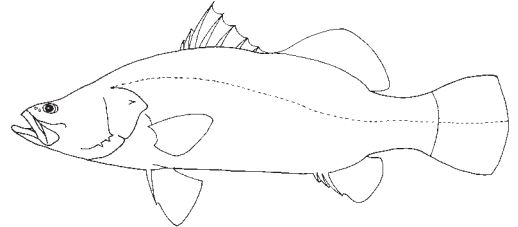
Habitat, biology, and fisheries: Primarily inhabit coastal waters on continental shelves, but also occur in estuaries and rivers, especially in breeding seasons and when juvenile and young. Never found in oceanic island groups distantly separated from a continental shelf (such as Mariana Islands and Solomon Islands in the area). A large majority of them are found over muddy or sandy bottoms. Some occur in large shoals and are the object of sizable fisheries. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of around 36 800 to 50 900 t of Sciaenidae from the Western Central Pacific. Actual yearly catch is probably still higher, since available statistics do not cover small-scale fisheries. Most croakers feed on small crustaceans, fishes, and benthic organisms. They are usually taken in bottom trawls and bottom set gill nets.

Similar families occurring in the area

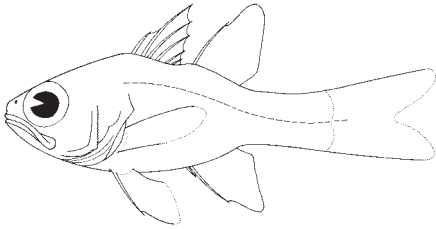
Other perch-like fishes either with lateral line not extending to hind margin of caudal fin, or anal fin with III spines.

Centropomidae: also with lateral line extending to hind margin of caudal fin, but anal fin with III spines.

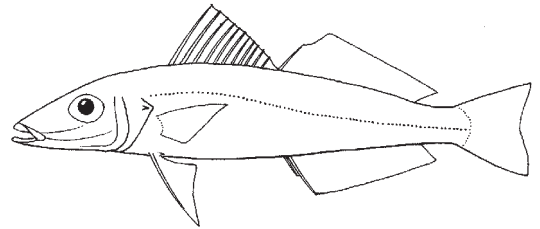
Apogonidae and Sillaginidae: also with II anal-fin spines, but lateral line terminated at the base of caudal fin (except extending onto caudal fin in some apogonids).



Centropomidae



Apogonidae

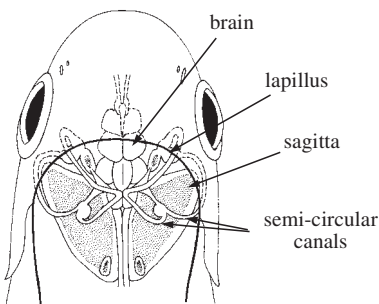


Sillaginidae

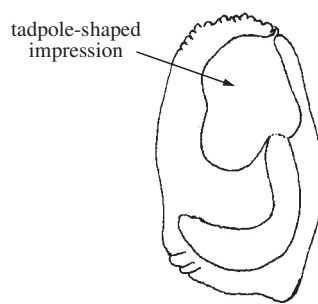
Identification note

Correct identification of genera of this family is not possible without examination of the swimbladder and the otoliths. General external features are highly variable even within a single genus, making it difficult to utilize them as key characters for identification of genera. Users are strongly advised to examine swimbladders and otoliths for reliable identification. The methods are described below:

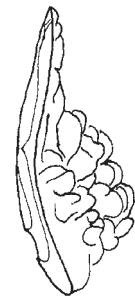
1. The **swimbladder** is located between the viscera and the vertebral column, separated from the head by a transverse membrane or septum. The body of the swimbladder is readily exposed after gutting the fish. It becomes necessary to remove organs anteriorly, in order to check the condition of anterior appendages.
2. **Otoliths** (earstones) are located in the ear capsules (auditory bulla) on each side of head; 1 pair (sagitta, see figures below) is large, while the other 2 pairs are rudimentary (except in *Johnius*). To examine the otoliths, it is necessary to remove them from the ear capsules by the following method: while keeping the gill cover open wide, cut the lateral wall of the ear capsule and then extract otolith; the lateral wall of ear capsule can be easily exposed by removing several muscle bundles connecting skull and dorsal gill arches.



dorsal view of head



inner view



lateral view

sagitta of *Argyrosomus regius*

Key to the genera of Sciaenidae occurring in the area

- 1a. Swimbladder with horn-like or tube-like appendages; their origins restricted to either anterior or posterior portion of bladder (Fig. 1) → 2
- 1b. Swimbladder with a number of branched appendages along its entire lateral side (Fig. 2) → 6

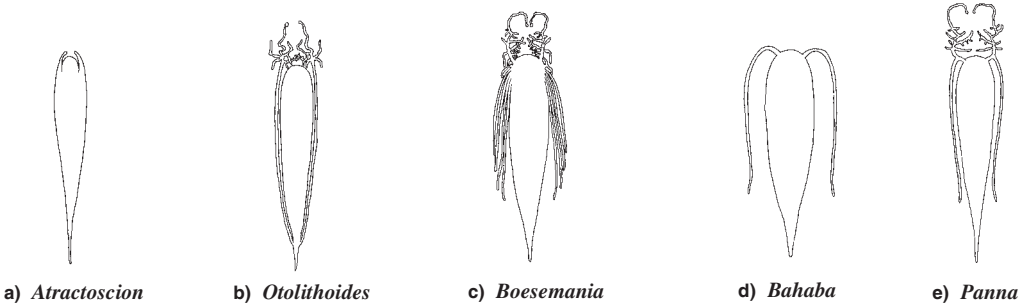


Fig. 1 swimbladders

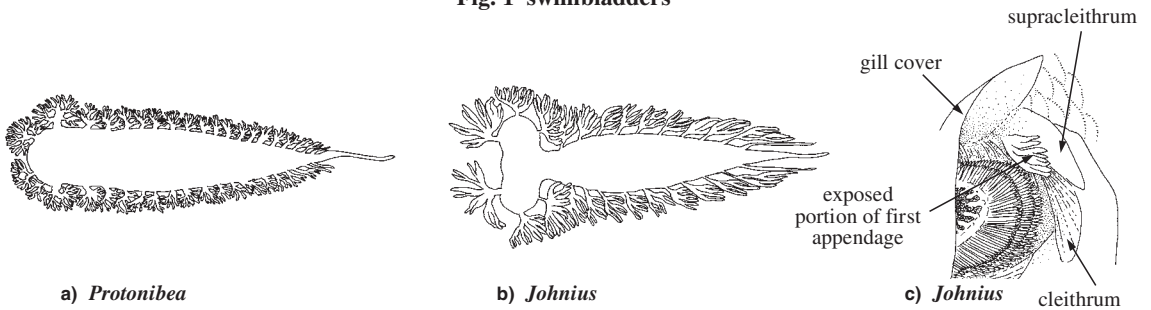


Fig. 2 swimbladders

- 2a. Swimbladder with a pair of horn-like appendages at anterior portion of bladder (Fig. 1a) *Atractoscion*
- 2b. Swimbladder with 1 to several pairs of tube-like appendages lying parallel to bladder (Fig. 1b-e) → 3
- 3a. Swimbladder appendages attached to posterior portion of bladder (Fig. 1b) *Otolithoides*
- 3b. Swimbladder appendages attached to anterior portion of bladder (Fig. 1c-e) → 4
- 4a. Swimbladder with several pairs of tube-like appendages directed posteriorly (Fig. 1c) . . . *Boesemania*
- 4b. Swimbladder with 1 pair of tube-like appendages directed posteriorly (Fig. 1d-e) → 5
- 5a. Swimbladder appendages simple, not divided, directed posteriorly (Fig. 1d) *Bahaba*
- 5b. Swimbladder appendages dividing into a forward directed branch and a posteriorly directed branch (Fig. 1e) *Panna*

- 6a. Swimbladder carrot-shaped (Fig. 2a); first appendage does not extend to lateral face of pectoral arch; sulcus head of sagitta not very oblique, shape of sulcus tail variable but not deepened as a hollow cone (Fig. 3a-c) → 7

- 6b. Swimbladder hammer-shaped (Fig. 2b); a lateral branch of first appendage extends to lateral face of pectoral arch at junction of cleithrum and supra-cleithrum (visible under gill cover) (Fig. 2c); sulcus head of sagitta very oblique, sulcus tail deepened as a hollow cone (Fig. 3d) → 19

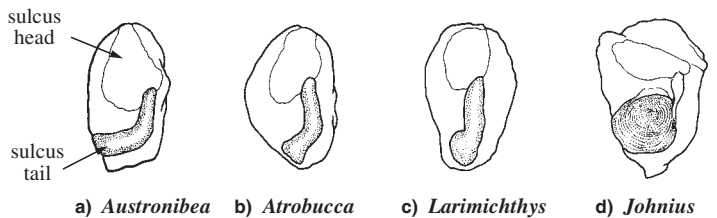


Fig. 3 sagittae

- 7a. Anterior pair of swimbladder appendages branching behind posterior surface of transverse septum and not entering head (Fig. 4a) → 8
- 7b. Anterior pair of swimbladder appendages entering into head beyond transverse septum and branching between skull and upper gill arches (Fig. 4b) → 14
- 8a. Outer upper teeth enlarged and spaced, but without outstanding canines (i.e. less than 1/2 length of other teeth) → 9
- 8b. One or 2 pairs of outstanding canine teeth in upper jaw or both jaws (i.e. more than 1/2 length of other teeth) (Fig. 5) → 12

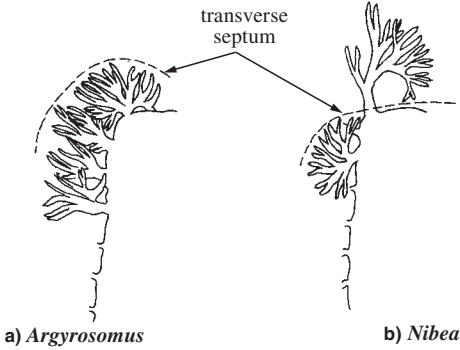


Fig. 4 anterior portion of swimbladder

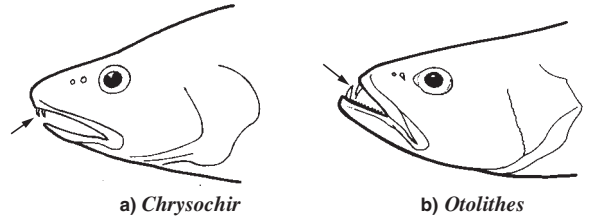


Fig. 5

- 9a. First pair of mental pores close together behind tip of jaw and united by a groove (Fig. 6a); lower fins dark *Protonibeia*
- 9b. First pair of mental pores on front of chin, 1 on each side of tip of jaw, not united by a groove (Fig. 6b); lower fins not dark → 10
- 10a. Tail of tadpole-shaped impression of sagitta J-shaped (Fig. 7a) *Argyrosomus*
- 10b. Tail of tadpole-shaped impression of sagitta only slightly curved (Fig. 7b) → 11

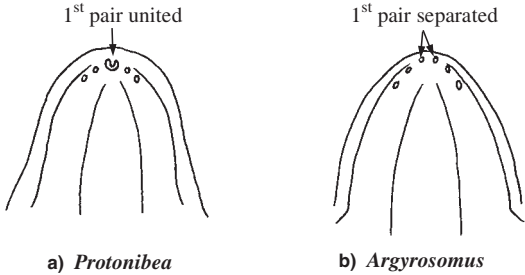


Fig. 6 ventral view of lower jaw (mental pores)

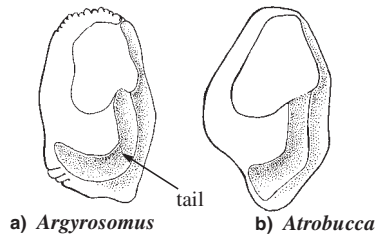


Fig. 7 sagitta (inner surface)

- 11a. Swimbladder appendages without well-developed dorsal limbs (Fig. 8a). *Pennahia*
- 11b. Swimbladder appendages with well-developed dorsal limbs (Fig. 8b) *Atroubucca*

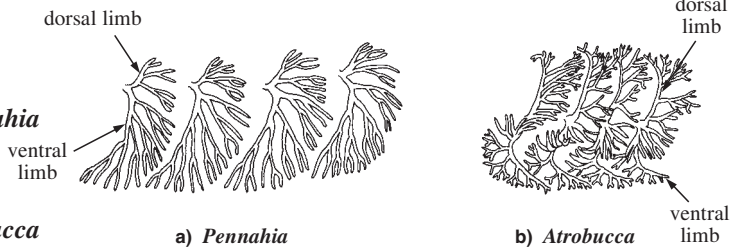


Fig. 8 swimbladder appendages

- 12a. Snout pointed; mouth inferior; large, outstanding canines in upper jaw only (Fig. 5a) *Chrysochir*
- 12b. Mouth terminal or lower jaw projecting; large, outstanding canines on 1 or both jaws (Fig. 5b). → 13

- 13a. Swimbladder appendages without well-developed dorsal limbs wrapped around main bladder (Fig. 9a); tail of tadpole-shaped impression of sagitta only slightly curved (Fig. 10a) *Otolithes*
- 13b. Some or all swimbladder appendages with well-developed dorsal limb branching on top of swimbladder (Fig. 9b); tail of tadpole-shaped impression of sagitta J-shaped (Fig. 10b) *Pterotolithus*

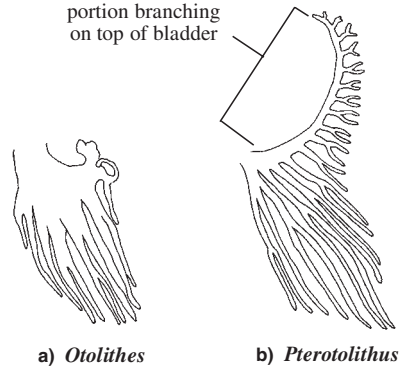


Fig. 9 swimbladder appendages

- 14a. Lower jaw with a single mental barbel (Fig. 11). *Dendrophysa*
- 14b. No mental barbel → 15

- 15a. Scales on top of head, anterior part of back and belly extremely rough (with enlarged, erect spinules) (Fig. 12) *Aspericorvina*
- 15b. No specialized scales → 16

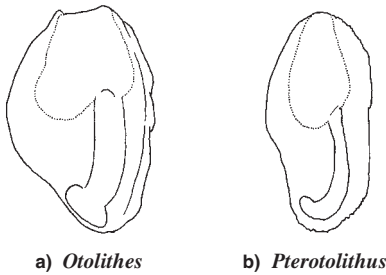


Fig. 10 sagitta (inner surface)

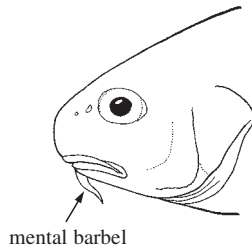


Fig. 11 *Dendrophysa*

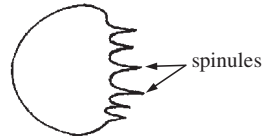


Fig. 12 scale from top of head (*Aspericorvina*)

- 16a. Swimbladder appendages with well-developed dorsal and ventral limbs (Fig. 13a); scales on anterior half of body cycloid (smooth) → 17
- 16b. Swimbladder appendages fan-like without well-developed dorsal limbs (Fig. 13b); scales on body ctenoid (rough to touch) → 18

- 17a. Dorsal-fin rays 28 to 29 *Sonorolux*
- 17b. Dorsal-fin rays 33 to 36 *Larimichthys*

- 18a. Second anal-fin spine length 23 to 41% of head length *Austronibea*
- 18b. Second anal-fin spine length 38 to 64% of head length (except for *N. semifasciata*, 34 to 44% of head length). *Nibea*

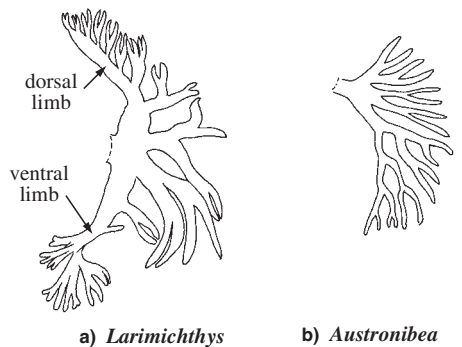


Fig. 13 swimbladder appendages

- 19a. Lower jaw teeth uniform in size or inner row of lower jaw teeth molariform (Fig. 14a) *Johnius (Johnius)*
- 19b. Inner row of lower jaw teeth enlarged, conical (Fig. 14b) *Johnius (Johnieops)*

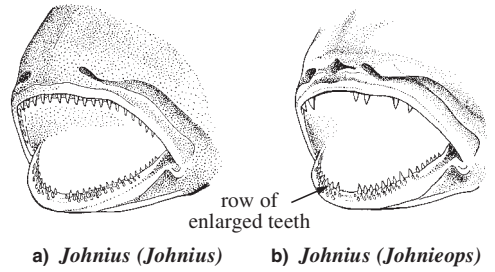


Fig. 14 dentition

Keys to the species of Sciaenidae

Remarks on key characters: a) a gill raker at the angle of the gill arch and denticulate flat plates are excluded from the lower gill raker count; b) interorbital width is the least bony width measured above centres of eyes.

Key to the species of *Argyrosomus* occurring in the area

- 1a. Caudal fin rhomboidal *Argyrosomus amoyensis*
- 1b. Caudal fin S-shaped or nearly truncate *Argyrosomus japonicus*

Key to the species of *Atrobucca* occurring in the area

- 1a. Dorsal-fin rays 23 or 24. *Atrobucca adusta*
- 1b. Dorsal-fin rays 27 to 33. → 2
- 2a. Membrane of gill cover with a distinct black blotch *Atrobucca kyushini*
- 2b. Membrane of gill cover without a distinct black blotch. → 3
- 3a. Pectoral fins short, 20 to 24% of standard length; body brown or copper coloured above, pale orange or white below when fresh *Atrobucca brevis*
- 3b. Pectoral fins long, 26 to 31% of standard length; body silvery, whitish below when fresh *Atrobucca nibe*

Key to the species of *Johnius (Johnius)* occurring in the area

- 1a. Chin with a barbel → 2
- 1b. Chin without a barbel → 3
- 2a. Dorsal-fin rays 23 to 26; scales on body cycloid; caudal fin S-shaped or truncate *Johnius amblycephalus*
- 2b. Dorsal-fin rays 29 to 34; scales on body ctenoid; caudal fin rhomboidal *Johnius macropterus*
- 3a. Anterior portion of dorsal fin with VIII or IX (usually IX) spines; anal-fin rays 6 or 7 (usually 6); scale rows above lateral line to origin of dorsal fin 10 to 15, scale rows below lateral line to origin of anal fin 17 to 21; scales on body cycloid. *Johnius trachycephalus*
- 3b. Anterior portion of dorsal fin with IX to XI (usually X) spines; anal-fin rays 7; scale rows above lateral line to origin of dorsal fin 5 to 11, scale rows below lateral line to origin of anal fin 7 to 17; scales on body cycloid or ctenoid. → 4
- 4a. Scales on upper part of body cycloid; caudal fin truncate; a yellow or white streak present along lateral line *Johnius carutta*
- 4b. Scales on upper part of body ctenoid; caudal fin rhomboidal or pointed (at least in specimens smaller than 15 cm standard length); a yellow or white streak absent along lateral line → 5

- 5a.** Scales on head all cycloid; ctenii on body scales poorly developed; body smooth to touch
 *Johnius laevis*
- 5b.** Scales on head (at least on interorbital space) ctenoid; ctenii on body scales well
 developed; body rough to touch → **6**
- 6a.** Lower jaw with inner short row of molariform teeth posteriorly *Johnius macrorhynchus*
- 6b.** Lower jaw teeth all conical, uniform in size → **7**
- 7a.** Scale rows above lateral line to origin of dorsal fin 5 or 6; scale rows below lateral line to
 origin of anal fin 7 to 11. → **8**
- 7b.** Scale rows above lateral line to origin of dorsal fin 6 to 11; scale rows below lateral line
 to origin of anal fin 10 to 17. → **11**
- 8a.** Dorsal-fin rays 31 to 33 *Johnius hypostoma*
- 8b.** Dorsal-fin rays 24 to 30. → **9**
- 9a.** First gill arch with 6 to 8 gill rakers on lower limb. *Johnius trewavasae*
- 9b.** First gill arch with 9 to 12 gill rakers on lower limb → **10**
- 10a.** Second anal-fin spine length 41 to 58% of head length *Johnius carouna*
- 10b.** Second anal-fin spine length 25 to 34% of head length *Johnius heterolepis*
- 11a.** Dorsal-fin rays 31 to 33; scale rows above lateral line to origin of dorsal fin 5 or 6; scale
 rows below lateral line to origin of anal fin 9 or 10; eye diameter 19 to 23% of head length
 *Johnius hypostoma*
- 11b.** Dorsal-fin rays 25 to 31; scale rows above lateral line to origin of dorsal fin 6 to 11; scale
 rows below lateral line to origin of anal fin 10 to 17; eye size variable. → **12**
- 12a.** Body dark pigmented; lower fins black *Johnius belangerii*
- 12b.** Body not dark pigmented; lower fins pale. → **13**
- 13a.** First gill arch with 7 to 10 gill rakers on lower limb → **14**
- 13b.** First gill arch with 9 to 12 gill rakers on lower limb → **16**
- 14a.** Snout well projecting in front of upper jaw; body depth 20 to 26% of standard length . . . *Johnius weberi*
- 14b.** Snout slightly projecting in front of upper jaw; body depth 25 to 30% of standard length. → **15**
- 15a.** Interorbital width 26 to 31% of head length; second anal-fin spine length 32 to 37% of
 head length (around 7 to 11 cm in standard length), 26 to 32% (around 11 to 16 cm)
 *Johnius latifrons*
- 15b.** Interorbital width 21 to 28% of standard length; second anal-fin spine length 38 to 51%
 of head length (around 6 to 11 cm in standard length), 29 to 42% (around 11 to 20 cm)
 *Johnius australis*
- 16a.** Snout bluntly rounded; eye diameter 21 to 28% of head length; vertebrae 25 *Johnius carouna*
- 16b.** Snout well pointed; eye diameter 13 to 24% of head length; vertebrae 26 *Johnius coitor*

Key to the species of *Johnius* (*Johnieops*) occurring in the area

- 1a.** Mental pores in 1 pair only *Johnius novaeguineae*
- 1b.** Mental pores in 3 pairs. → **2**

- 2a. First pair of mental pores separated by symphysis *Johnius plagiostoma*
 2b. First pair of mental pores by a crescent-shaped groove → 3
- 3a. Snout pointed; second anal-fin spine length 24 to 42% of head length *Johnius borneensis*
 3b. Snout bluntly rounded; second anal-fin spine length 45 to 54% of head length . . . *Johnius pacificus*

Key to the species of *Nibea* occurring in the area

- 1a. Lower jaw teeth uniform in size → 2
 1b. Inner row teeth on lower jaw enlarged → 3
- 2a. Lateral-line scales 57 to 60 *Nibea squamosa*
 2b. Lateral-line scales 48 to 50 *Nibea microgenys*
- 3a. Snout pointed, projecting in front of upper jaw; second anal-fin spine length 34 to 44% of head length *Nibea semifasciata*
 3b. Snout blunt, not projecting in front of upper jaw; second anal-fin spine length 39 to 59% of head length → 4
- 4a. Scale rows above lateral line to origin of dorsal fin 8 to 13, scale rows below lateral line to origin of anal fin 12 to 17, total scale rows 21 to 29 *Nibea soldado*
 4b. Scale rows above lateral line to origin of dorsal fin 14 to 17, scale rows below lateral line to origin of anal fin 17 to 23, total scale rows 31 to 39 *Nibea leptolepis*

Key to the species of *Panna* occurring in the area

- 1a. Dorsal-fin rays 33 to 36 *Panna microdon*
 1b. Dorsal-fin rays 42 to 44 *Panna perarmatus*


Key to the species of *Pennahia* occurring in the area






- 1a. Dorsal-fin rays 26 to 29 *Pennahia macrocephalus*
 1b. Dorsal-fin rays 22 to 25 → 2
- 2a. Mental pores in 3 pairs; caudal fin rhomboidal; a large black blotch on spinous dorsal fin *Pennahia pawak*
 2b. Mental pores in 2 pairs; caudal fin truncate; no large black blotch on spinous dorsal fin *Pennahia anea*

Key to the species of *Pterotolithus* occurring in the area

- 1a. Dorsal-fin rays 24 to 27 *Pterotolithus lateoides*
 1b. Dorsal-fin rays 30 to 34 *Pterotolithus maculatus*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Argyrosomus amoyensis* (Bleeker, 1863)
 *Argyrosomus japaonicus* Temminck and Schlegel, 1843
 *Aspericorvina jubata* (Bleeker, 1855)
 *Atractoscion aequidens* (Cuvier, 1830)
 *Atrubucca adusta* Sasaki and Kailola, 1988

- *Atrobuca brevis* Sasaki and Kailola, 1988
- *Atrobuca kyushini* Sasaki and Kailola, 1988
- *Atrobuca nibe* (Jordan and Thompson, 1911)
- *Austronibea oedogenys* Trewavas, 1977
- *Bahaba polykladiskos* (Bleeker, 1852)
- *Boesemania microlepis* (Bleeker, 1858)
- *Chrysochir aureus* (Richardson, 1846)
- *Dendrophysa russelli* (Cuvier, 1830)
- *Johnius (Johnius) amblycephalus* (Bleeker, 1855)
- *Johnius (Johnius) australis* (Günther, 1880)
- *Johnius (Johnius) belangerii* (Cuvier, 1830)
- *Johnius (Johnius) cantori* (Bleeker, 1874)^{1/}
- *Johnius (Johnius) carouna* (Cuvier, 1830)
- *Johnius (Johnius) carutta* Bloch, 1793
- *Johnius (Johnius) coitor* (Hamilton, 1822)
- *Johnius (Johnius) heterolepis* Bleeker, 1873
- *Johnius (Johnius) hypostoma* (Bleeker, 1853)
- *Johnius (Johnius) laevis* Sasaki and Kailola, 1991
- *Johnius (Johnius) latifrons* Sasaki, 1992
- *Johnius (Johnius) macropterus* (Bleeker, 1853)
- *Johnius (Johnius) macrorhynchus* (Mohan, 1976)
- *Johnius (Johnius) trachycephalus* (Bleeker, 1850)
- *Johnius (Johnius) trewavasae* Sasaki, 1992
- *Johnius (Johnius) weberi* Hardenberg, 1936
- *Johnius (Johnieops) borneensis* (Bleeker, 1850)
- *Johnius (Johnieops) novaeguineae* (Nichols, 1950)
- *Johnius (Johnieops) pacificus* Hardenberg, 1941
- *Johnius (Johnieops) plagiostoma* (Bleeker, 1850)
- *Larimichthys pamoides* (Munro, 1964)
- *Nibea leptolepis* (Ogilby, 1918)
- *Nibea microgenys* Sasaki, 1992
- *Nibea semifasciata* Chu, Lo, and Wu, 1963
- *Nibea soldado* (Lacepède, 1802)
- *Nibea squamosa* Sasaki, 1992
- *Otolithes ruber* (Bloch and Schneider, 1801)
- *Otolithoides biauritus* (Cantor, 1850)
- *Panna microdon* (Bleeker, 1849)
- *Panna perarmatus* (Chabanaud, 1926)
- *Pennahia anea* (Bloch, 1793)
- *Pennahia macrocephalus* (Tang, 1937)
- *Pennahia pawak* (Lin, 1940)
- *Protonibea diacantha* (Lacepède, 1802)
- *Pterolithus lateoides* (Bleeker, 1850)
- *Pterolithus maculatus* (Cuvier, 1830)
- *Sonorolux fluminis* Trewavas, 1977

Reference

Trewavas, E. 1977. The sciaenid fishes (croakers or drums) of the Indo-West-Pacific. *Trans. Zool. Soc. Lond.*, 33:253-541.

^{1/} Known only from a single, half-skin specimen from Malaysia.