

## HAEMULIDAE

Grunts; Sweetlips - Popondok; Gerot-gerot; Gaji; Raja; Kaci

Moderate-sized fishes with oblong, well-compressed bodies and convex head profile. Lips thick, partly hidden by suborbital; bands of pointed teeth in jaws; preoperculum margin serrated; cheeks, operculum, most of head and suborbital scaled. Longitudinal groove and/or 2-6 pores on chin. Scales moderate to small, ctenoid. Single dorsal fin with 9-15 strong spines, 12-26 rays; 3 spines in anal fin, the second often very strong; scaly axillary process at ventral fin base; caudal fin truncate or emarginate. Colour variable at different ages. Many species "grunt" when caught.

Nineteen genera in the family, representatives of three obtained on the Survey.

REFERENCES: Johnson, Randall & Chenoweth, 2001; McKay, 2001a; Parenti, 2019; Randall & Johnson, 2000.

### KEY TO GENERA FOUND ON SURVEY

- A. Central longitudinal groove behind chin, 2 pores on chin behind lower lip (Fig 1) . . . . . Pomadasys  
 AA. No groove behind chin, 6 pores on chin (Fig 2) . . . . . B  
 B. 9-10 dorsal spines, 21-26 rays in dorsal fin; soft dorsal fin base longer than spinous base . . . . . Diagramma  
 BB. 11 or more dorsal fin spines; fewer than 22 rays in dorsal fin; soft dorsal fin-base subequal or shorter than spinous fin-base . . . . . Plectorhinchus

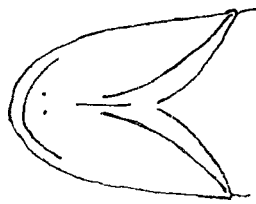


Fig 1

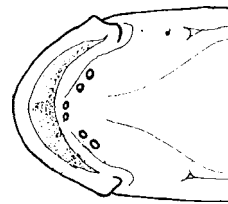


Fig 2

### **Diagramma pictum**

Body with orange spots on head, body and fins fading with age to plain grey-blue, sometimes with darker spots in large individuals; dark brown or black spots on soft dorsal and caudal fins. Head profile moderately steep; dorsal fin spines highest anteriorly, 2<sup>nd</sup> spine longest and twice or more the length of first spine.

D IX-X, 20-25. L. lat. 57- 74. Total GR (first arch) 19-23.

### **Plectorhinchus chaetodonoides**

Body of adults brown, tending yellow over back and head; dark brown spots densely cover the back, sides and all fins except the uniform dark brown pectoral fins; throat and lower half of body plain brown; brown margin to unpaired fins. Lips broad and fleshy. Soft dorsal fin height almost equal to its base; caudal fin emarginate.

D XI-XII, 18-20. L. lat. 52-59. Lower GR (first arch) 27-32.

### **Plectorhinchus flavomaculatus**

Upper head, back and sides of adults greyish green; orange yellow wavy horizontal lines on head become thinner and oblique on body, breaking into spots on back and over caudal peduncle; red mark on pectoral fin base and on edge operculum. Yellow-brown wavy lines and spots on dorsal fin, numerous dark brown spots on caudal.

D XII-XIII, 19-22. L. lat. 53-60. Lower GR (first arch) 16-19; total 26-34.

### **Diagramma punctatum**

Body green-grey with bright yellow or bronze spots and/or lines on head, extending onto back, breast and upper caudal peduncle; scales of adults with small bronze centres, forming rows; 4-6 rows of olive-orange spots along dorsal, many similar spots on caudal fin, caudal fin tips yellow. Dorsal fin spines highest anteriorly, 2<sup>nd</sup> spine longest and at least twice length of first and equal to 3<sup>rd</sup> spine.

D IX-X, 22-25. L. lat. 55-64. Total GR (first arch) 20-23 (voucher: 335 mm SL)

### **Plectorhinchus chrysotaenia**

Dark violet-blue body, paler ventrally; 7 or 8 golden orange horizontal bands, narrower than space between them, along head and body; fins plain bright yellow, spinous dorsal sometimes grey.

D XII-XIII, 18-21. L. lat. 53-58. Total GR (first arch) 28-33. (voucher: 210 mm SL)

### **Plectorhinchus chubbi**

Body of adults plain dark grey or dusky blue, with faint dark patches on back; black edge on operculum; fins dark blue or charcoal. Head profile bluntly convex; lips thicken with age; 3<sup>rd</sup> or 4<sup>th</sup> dorsal spine longest.

D XI-XII, 15-17. A III, 7-8. L. lat. 65 (average). Lower GR (first arch) 21-23. (voucher: 320 mm SL)

### **Plectorhinchus gibbosus**

Adults plain reddish brown to dull green or grey, bronze sheen on lower head and body; fins charcoal. Lips thick, swollen, yellow in larger fish. Dorsal fin deeply notched between spined and rayed portions, spines strong.

D XIII-XIV, 15-17. L. lat. 46-55. Lower GR (first arch) 17-19. (voucher: 334 mm SL)



*Plectorhinchus lineatus*



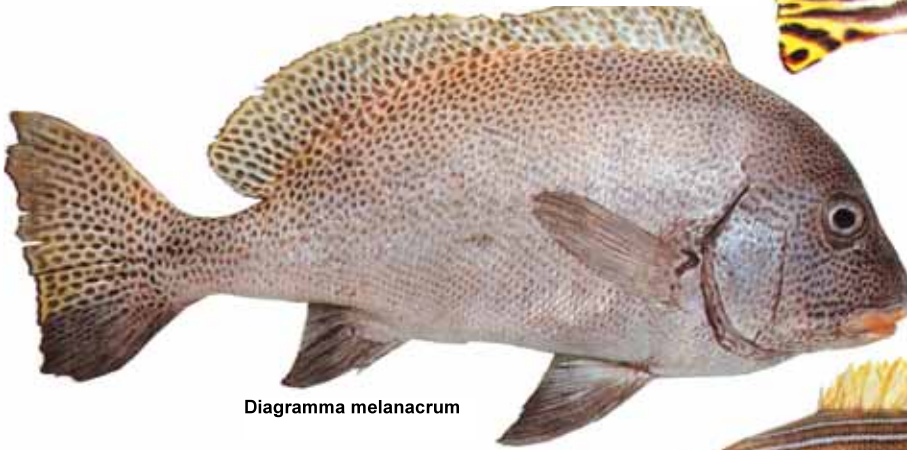
*Plectorhinchus lessonii*



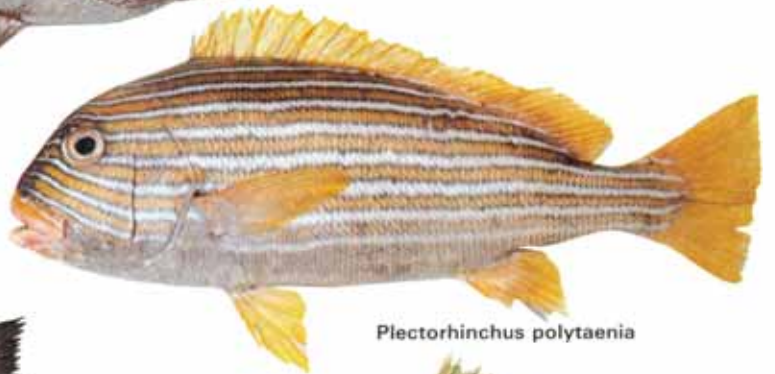
*Plectorhinchus albivittatus*



*Plectorhinchus vittatus*



*Diagramma melanacrum*



*Plectorhinchus polytaenia*



*Pomadasys argenteus*



*Pomadasys argyreus*



*Pomadasys furcatus*



*Pomadasys kaakan*

**Plectorhinchus lineatus**

Oblique dark brown or black bands over upper two-thirds of body and head, becoming close together and very oblique in adults, background colour pale blue or fawn; scarlet patches around mouth and on pectoral fin base. Paired fins yellow, remainder covered with large dark spots.

D XII-XIII, 18-20. L. lat. 54-58. Total GR (first arch) 26-30. (voucher: 275 mm SL)

**Plectorhinchus albovittatus**

Body of adults plain dark blue-brown or grey with scarlet or crimson line around mouth and along preopercular edge; outer anterior part of soft dorsal fin with large black patch, anal and paired fins dark grey; lobes of caudal fin black, especially lower lobe. Lips swollen in large fish; caudal fin distinctly emarginate.

D XII-XIII, 16-20. L. lat. 54-56. Lower GR (first arch) 26-31. (voucher: 125 mm SL)

**Diagramma melanacrum**

Lower 1.4-1.3 of caudal fin black. Body and fins grey-blue, bronze sheen on upper back below dorsal fin; black or brown spots densely cover head, body, dorsal and caudal fins, spots fading and becoming smaller on lower sides; ventral, anal, and opercular membrane black. Ventral fins reach to or beyond anus; 3<sup>rd</sup> or 4<sup>th</sup> dorsal fin spine longest, 1<sup>st</sup> dorsal fin spines 1.7-2.3 times in length of 2<sup>nd</sup> spine; caudal peduncle depth 2-2.2 in its length, caudal fin truncate.

D X-XI, 22-24. L. lat. 55-57. Lower GR (first arch) 22. (voucher: 407 mm SL)

**Pomadasys argenteus**

Many scattered black spots cover upper two-thirds of body, no spots on head; body otherwise silvery grey; bronze sheen to lower head and breast. Fins plain except dorsal, with 2-4 rows of dark spots, more prominent on membrane between spines. Dorsal fin deeply notched. Eye diameter much less than snout length.

D XII, 13-15. A 7-8. L. lat. 45-52. Total GR 17-20. (voucher: 225 mm SL)

**Pomadasys furcatus**

Six to 10 dark brown horizontal double lines along back and sides, becoming single posteriorly. Fins plain silvery violet, narrow black margin on spinous dorsal and dusky outer half of caudal and anal fins; pale median band along soft dorsal fin. Row of small scales behind each ray of dorsal and anal fins.

D XIII, 14-16. A III, 8-9. Tr above. L. lat. 52-54. 25-26 scales around caudal peduncle. (voucher: 135 mm SL)

**Plectorhinchus lessonii**

Five to 7 dark blue-brown bands along body, much broader than pale blue space between them, bands meeting at an angle on nape and front of head and running down snout; large distinct black blotch on pectoral fin base. Broad dark blotches and bands over unpaired yellow fins, close together and oblique on caudal fin.

D XII-XIII, 18-22. L. lat. 54-58. Total GR (first arch) 19-22. (voucher: 135 mm SL)

**Plectorhinchus vittatus**

Four to 6 black or dark brown horizontal bands along body, broader than white space between them and continuous around front of head to other side; opercular edge, pectoral base and ventral fin axil red. Fins bright yellow, dorsal and caudal with broad brown, longitudinal bands, caudal fin bands oblique on lobes.

D XII-XIV, 17-21. Lower GR (first arch) 21-22. (voucher: 180 mm SL)

**Plectorhinchus polytaenia**

Body pale orange-fawn with 7-9 brown-edged, pale blue horizontal bands, nearly as broad as space between them, over body and head; bands ascend slightly on head. Fins usually plain yellow, soft dorsal, pectoral and caudal striped in young.

D XII-XIII, 19-22. L. lat. 54-60. Total GR (first arch) 26-29. (voucher: 400 mm SL)

**Pomadasys argyreus**

Plain silvery green or grey body and all fins, back and head bronze; large dark brown blotch on upper operculum. Preoperculum margin serrated.

D XII, 13. A III, 7. L. lat. 44-50. Tr 6-8+ 9, 18-20 scales around caudal peduncle.

(voucher: 190 mm SL)

**Pomadasys kaakan**

Eight to 12 vertical bars of black checks over upper sides, spots arranged into blotches or grouped in pairs, bars faded in larger fish; 3-4 conspicuous rows of black spots along dorsal fin; ventral, anal and lower lobe of caudal fin dark yellow. Eye diameter less than snout length; second dorsal spine longest, dorsal fin deeply notched, last spine 1.5-2 times length of second-last (penultimate) spine.

D XII, 14. A III, 7. Tr 7-9+9. 20 scales around caudal peduncle.

(voucher: 200 mm SL)



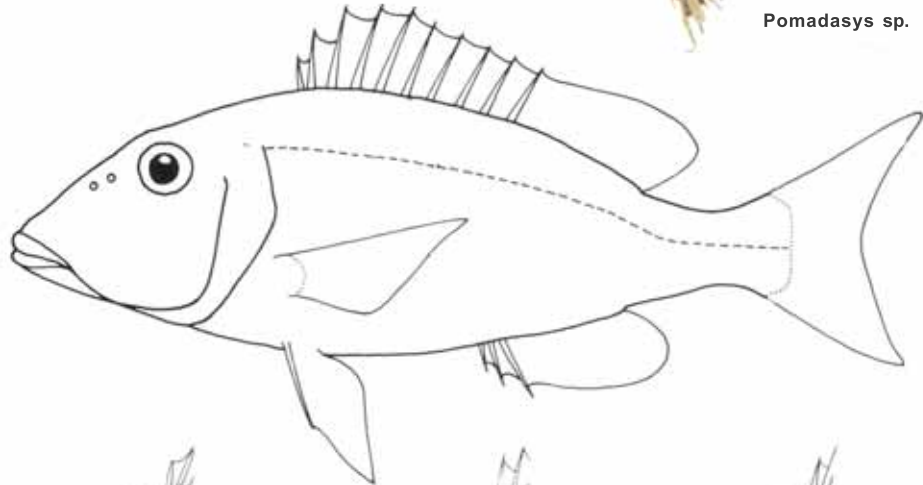


*Pomadasys maculatus*

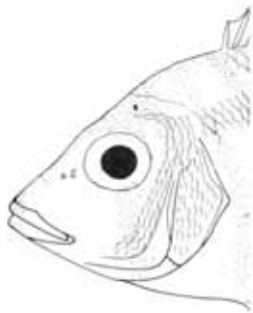


*Pomadasys sp.*

**LETHRINIDAE**



*Lethrinus*



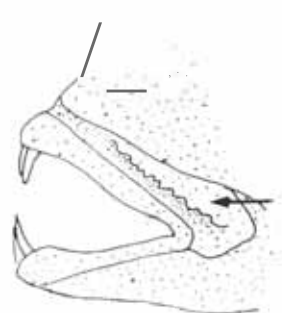
*Gymnocranius*



*Gnathodentex*



*Monotaxis*



*Wattsia*



*Gnathodentex aureolineatus*



*Gymnocranius elongatus*



*Gymnocranius griseus*



*Gymnocranius grandoculis*



**Pomadasys maculatus**

Silvery green, broad wedge-shaped black band across nape to just below lateral line; usually about four larger and smaller bands across back above lateral line, ending opposite end of dorsal fin. Fins yellow, large black blotch on dorsal fin anteriorly.

D XII, 13-15. A III, 7. L. lat. 49-55. 22-25 scales around caudal peduncle.

(voucher: 150 mm SL)

**Pomadasys sp**

Body silvery, green or violet over head and back; 5-6 vertical broad bars of black blotches over upper sides, dispersing into irregular rows with age; 2-3 rows of black spots on dorsal fin, sometimes faded; lower caudal fin lobe, anal and ventral fins grey or dull white. Eye about equal to snout length; dorsal fin not deeply notched, last two spines about equally long.

D XII, 13-14. A III, 7-8.

(voucher: 237 mm SL)

**LETHRINIDAE**

Emperors - Asuan; Lentjam; Ketamba

**Oblong, moderately compressed perch-like fishes with a large head. Lips often thick and fleshy; maxilla concealed, without supplementary bone, mostly slipping below preorbital bone. Gill rakers short and knob-like. A single continuous dorsal fin with 10 spines and 9-10 rays, at most a slight notch between the two parts; anal fin with 3 spines and 8-10 rays; pectoral fins moderately long and pointed with 13-15 rays; ventral fins with an axillary process. Caudal fin emarginate to forked. Scales finely ctenoid and moderate in size.**

The family comprises five genera, all of which were obtained on the Survey.

**SYNOPSIS OF GENERA FOUND ON SURVEY**

- Lethrinus** Head naked except for gill cover; 9 dorsal fin rays, 8 anal fin rays.
- Gymnocranius** Cheek with 4-5 rows of scales; maxilla surface smooth; 10 dorsal fin rays; 10 anal fin rays.
- Wattsia** Cheek with 5 rows of scales; maxilla with a strongly denticulated longitudinal ridge; 10 dorsal fin rays; 10 anal fin rays; caudal fin lobes rounded.
- Gnathodentex** Cheek with 6 rows of scales; maxilla with a strongly denticulated longitudinal ridge; each jaw with a narrow band of villiform teeth, an outer series of conical teeth, 4 canines at front of upper jaw and 6 at front of lower jaw; 10 dorsal fin rays; 9 anal fin rays; caudal fin lobes pointed.
- Monotaxis** Cheek with 5 rows of scales; maxilla with a strongly denticulated longitudinal ridge; canines and a broad patch of small teeth in jaws anteriorly, followed by a series of 6 or 7 round, flat molars on each side; 10 dorsal fin rays; 9 anal fin rays; inner surface of pectoral fin base scaled.

REFERENCE: Carpenter, 2001d.

**Gnathodentex aureolineatus**

Body oblong, its depth 2.7 times in SL. Head profile straight or at most slightly convex; two close-set round nasal openings. Caudal fin forked with pointed tips. Brown or green above, paler below; body with pale blue longitudinal stripes on side and a prominent yellow blotch with a pale blue centre below last few dorsal fin rays; head with a silvery stripe curving behind and below eye; fins reddish, particularly margins.

P 15. L. lat. 68-74.

(voucher: 160 mm SL)

**Gymnocranius griseus**

Eye 2.8-3.2 in HL; suborbital 3.7-4 in HL. Lower edge of eye slightly above a line drawn from upper lip to caudal fork. Cheek with 4 transverse series of scales. Body depth 1.9-2.2 in SL. Anal fin base 2.1-2.5 times longer than longest anal ray; caudal fin moderately forked, median rays slightly longer than eye diameter. Body silvery, grey-blue above, crossed by about 5-8 dark bars, dark bar below eye. Fins olive yellow, front edge of ventral fin blue, hind margin of caudal fin orange. Sometimes wavy blue lines and spots on snout and operculum.

P 14. L. lat. 46-48.

(voucher: 190 mm SL)

**Gymnocranius elongatus**

Eye 2.6-2.8 in HL; suborbital 4.7-5.1 in HL. Lower edge of eye touching a line drawn from upper lip to caudal fin fork. Cheek with 4-6 transverse scale rows. Body depth 2.2-2.4 in SL. Anal fin base about 2.3 times longer than longest anal fin ray; caudal fin deeply forked, median rays less than eye diameter. Body silvery, fawn above, crossed by about 8 dark bars. Fins orange-yellow, hind margin and tips of caudal fin scarlet.

P 14. L. lat. 46-48.

(voucher: 220 mm SL)

**Gymnocranius grandoculis**

Eye 2.8-3.2 in HL; suborbital 3.7-4 in HL. Lower edge of eye slightly above a line drawn from upper lip to caudal fork. Cheek with 4 transverse series of scales. Body depth 1.9-2.2 in SL. Anal fin base 2.1-2.5 times longer than longest anal ray; caudal fin moderately forked, median rays slightly longer than eye diameter. Body silvery, grey-blue above, crossed by about 5-8 dark bars, dark bar below eye. Fins olive yellow, front edge of ventral fin blue, hind margin of caudal fin orange. Sometimes wavy blue lines and spots on snout and operculum.

P 14. L. lat. 48.

(voucher: 420 mm SL)



Gymnocranius sp.



Lethrinus nebulosus



Lethrinus conchylatus



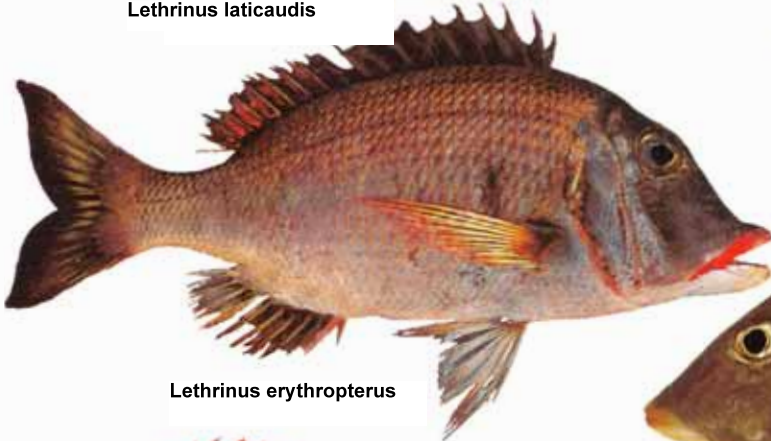
Lethrinus microdon



Lethrinus laticaudis



Lethrinus harak



Lethrinus erythropterus



Lethrinus lentjan



Lethrinus atkinsoni

**Gymnocranius sp.**

Eye large, touching the very convex head profile; teeth conical in front of each jaw, a short row of molariform teeth on sides posteriorly, with band of fine teeth within. Four scale rows across preoperculum; middle caudal fin rays equal to eye diameter. Body blue-green, darker above, silvery below. Eye silvery white above and behind, broad silvery margin on preoperculum; black bar across pectoral fin base. Dorsal, anal and ventral fins yellow, margins orange; olive caudal fin with dark brown margin before narrow scarlet edge.

D X, 10. A III, 10 (9?). GR 2 + 5. Tr 5 + 18. L. lat. 50-51. (voucher: 195 mm SL)

**Lethrinus conchyliatus**

HL greater than body depth; profile indented on snout, distinctly humped just before eye. Inner surface of pectoral fin base naked; naked patch above pectoral fin base. Body reddish, bright red marks on margins above and below lips, on margin of operculum and on pectoral fin base. Fins dark red.

(voucher: 285 mm SL)

**Lethrinus laticaudis**

HL slightly less than body depth; profile somewhat abrupt, concave on snout and a pronounced hump commencing level with posterior edge of eye and extending almost to first dorsal spine; lateral jaw teeth conical; 5½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. Inner surface of pectoral fin base scaled. Body with a dark square blotch occasionally present between middle of pectoral fin and lateral line; head with short blue lines radiating from eye, 3-5 lines connecting eyes across interorbital and round pale blue spots scattered over cheeks and snout; median fins with wavy maroon bands forming a chequered pattern.

**Lethrinus erythropterus**

HL less than body depth, profile humped above eye. Distinct molars in jaws laterally; inner base of pectoral fin scaled. 4½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. Yellowish-brown above, paler below; a red stripe from eye to tip of snout, red on upper lip and continuing in a line backward from corner of mouth; margin of operculum red; a red spot on upper pectoral fin base; fins red.

L. lat. 44-46.

**Lethrinus atkinsoni**

Head profile steep and blunt. Lateral teeth in jaws rounded or molariform; body depth greatest just behind head, much greater than HL. 4½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. Inner surface of pectoral fin base scaled. Body olive-grey above, paler below; head brownish green with bronze reflection on cheek, upper lip yellowish red, bright red at gape; caudal fin yellow to dark yellow with red margin, other fins reddish.

**Lethrinus nebulosus**

HL slightly less than body depth; profile straight or nearly so. Inner surface of pectoral fin base densely scaled; 5½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. About 5 indistinct yellow longitudinal stripes on side; head with a brown streak from eye to jaw angle, 2-3 short blue lines radiating from eye and elongate pale blue spots scattered over cheeks and snout; fins pale yellow, margin of soft dorsal fin and lobes of caudal fin bright red to pale pink.

**Lethrinus microdon**

Head - especially the snout - extremely long, much longer than body depth; its profile straight or nearly so. Lateral jaw teeth conical. Inner surface of pectoral fin base naked. 4½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. Greenish-blue above, lighter below; conspicuously red on margin above and below lips. Three broad bluish bands starting from eye widening across to tip of snout. Dorsal fin mottled with red and orange blotches on dusky background; caudal dusky with red tinge; anal mottled red over green; ventral and pectoral dusky with red tinge.

(voucher: 320 mm SL)

**Lethrinus harak**

HL less than body depth; profile straight or slightly convex on snout, conspicuously humped above eye. Inner surface of pectoral fin base fully scaled. Body olive-green above, lighter below with a large, black, oblong patch surrounded by a golden ring below lateral line adjacent to tip of pectoral fin; head often with blue spots on cheek and between nostrils, lips and throat red; fins red with white margins. 5½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine.

(voucher: ? mm SL)

**Lethrinus lentjan**

HL less than body depth; profile straight or nearly so. Lateral teeth in jaws molariform or rounded. Inner surface of pectoral fin base with a few scales or naked. 5½ scale rows between lateral line and base of 5<sup>th</sup> dorsal fin spine. Body green grey above, lighter below; head brownish mauve or purple, with a bright red spot on margin of operculum and usually another on pectoral fin base.

Median fins mauve, mottled with orange, other fins yellow orange with a pinkish hue.

(voucher: 256 mm SL)





*Lethrinus miniatus*



*Lethrinus genivittatus*



*Lethrinus ornatus*



*Lethrinus rubrioperculatus*



*Lethrinus semicinctus*



*Lethrinus variegatus*



*Lethrinus sp.*



*Monotaxis grandoculis*



*Wattsia mossambica*

**Lethrinus miniatus**

HL slightly less than body depth; profile straight above mouth, humped above eye. Inner base of pectoral fin scaled. Head with 2 bright red oblong patches on top of eyeball, an orange-red line often extending between nostrils and cheek; a bright red area on margin of preoperculum, pectoral fin base and ventral fin axil; fins reddish, margin of soft dorsal fin and (often) lobes of caudal fin bright red.

(voucher: 320 mm SL)

**Lethrinus genivittatus**

HL slightly less than body depth; profile slightly humped above eye; 4 tusk-like canine teeth at front of mouth, directed backwards at about 45°. Inner base of pectoral fin scaled. Second dorsal fin spine produced into a filament, contained 1.2-2.4 times in head length. Body with 3-4 yellow longitudinal streaks on side (conspicuous in young) and a prominent black blotch about size of eye between lateral line and middle of pectoral fin.

**Lethrinus rubrioperculatus**

HL greater than body depth; profile convex before eye. Eye near head profile; interorbital space flat or slightly convex. Inner surface of pectoral fin base naked. Caudal fin lunate, upper lobe slightly produced. Bright red spot on margin of operculum; sometimes red markings on margin of upper and lower lips; fins pale to bright reddish orange, some with red margins.

(voucher: 218 mm SL)

**Lethrinus variegatus**

HL about equal to body depth; profile convex or humped above nostrils. Inner surface of pectoral fin base naked. Body usually with a reticulated pattern enclosing white blotches and black variegated spots; caudal fin pink, other fins yellowish.

(voucher: 230 mm SL)

**Monotaxis grandoculis**

Body moderately deep, 2.2-2.4 times in SL. Head profile abrupt, strongly convex in front of eye. Bluish-grey above, paler below (in small specimens, body with 4 wide dark crossbars); head with yellow or orange area over and around eye, a narrow vertical dark band through eye; lips; yellow median fins yellowish-orange, brighter at tips; bases of soft dorsal and anal fins sometimes with three irregular dark spots.

(voucher: 335 mm SL)

**Lethrinus ornatus**

HL much less than body depth, profile convex above eye. Inner base of pectoral fin scaled. Body pale green-yellow, with 5-6 bright yellow longitudinal stripes on side; margins of preoperculum and operculum and area above eye bright red; caudal fin red, other fins yellowish-red, often tipped with red.

(voucher: 150 mm SL)

**Lethrinus semicinctus**

HL slightly greater than body depth; profile convex above eye. Inner surface of pectoral fin base naked. Body with 7-8 diffuse cross-bars and a dark blotch below lateral line adjacent to tip of pectoral fin; fins pinkish-red.

(voucher: 170 mm SL)

**Lethrinus sp**

Body shape similar to *L. rubrioperculatus* and *L. variegatus*. Bright red spot on margin of operculum; entire margin of preoperculum bright red.

(voucher: 274 mm SL)

**Wattsia mossambica**

Body deep, roughly square, its depth 1.9-2.2 in SL. Head profile convex on snout, indented above eye; 2 close-set nasal openings, the posterior one slit-like, ending close to eye. Caudal fin slightly forked with broadly rounded lobes. Head, body and fins yellowish; indistinct crossbars on body.

SPARIDAE

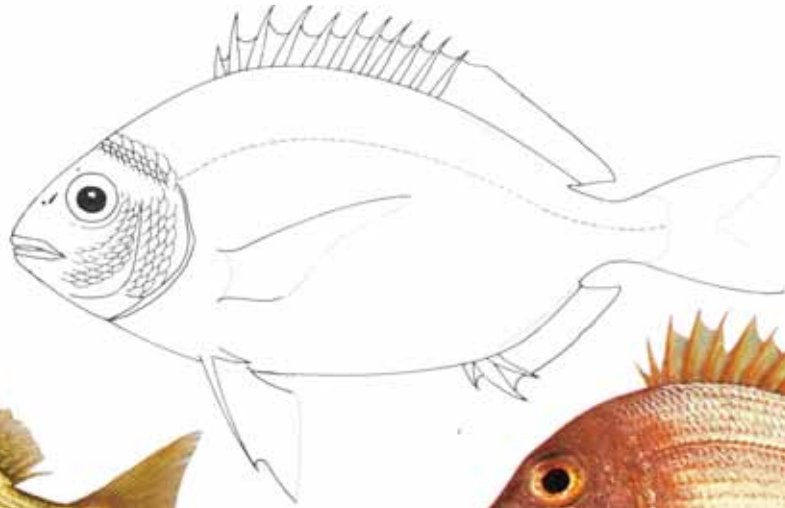
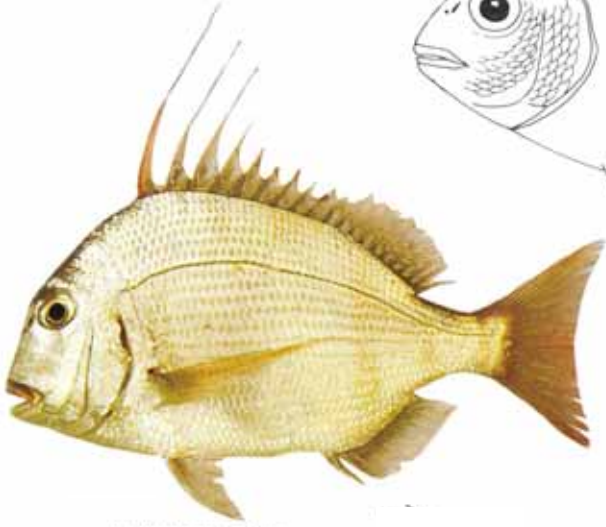


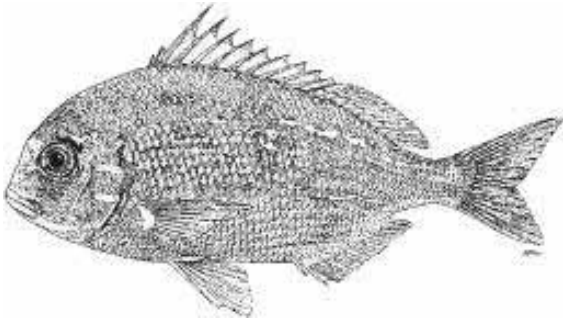
Fig. 1



*Argyrops bleekeri*



*Dentex spariformis*

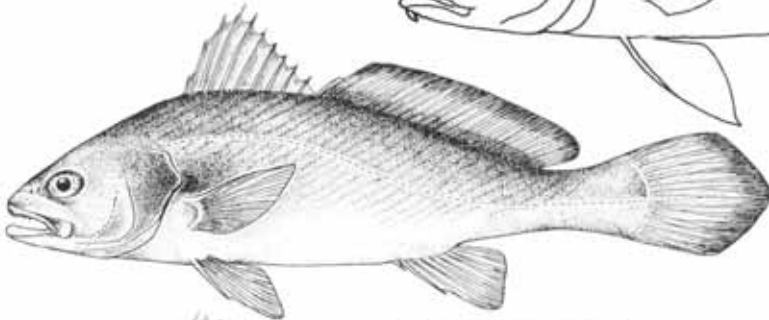
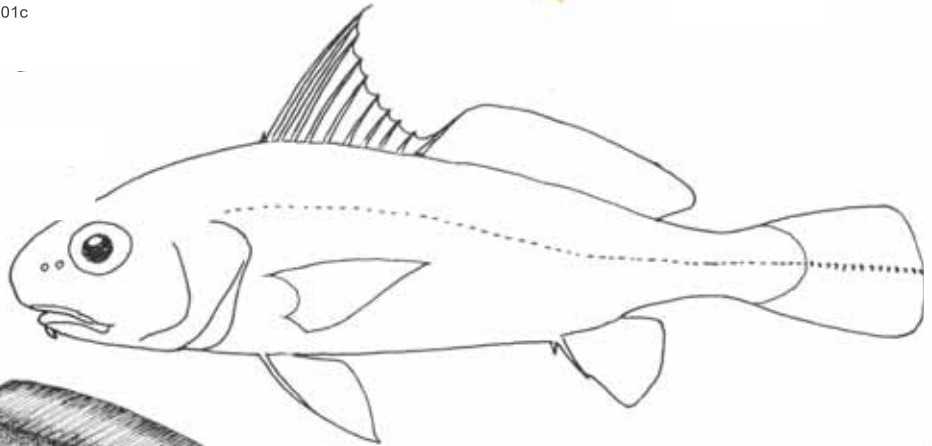


*Evynnis tumifrons* redrawn from Carpenter, 2001c

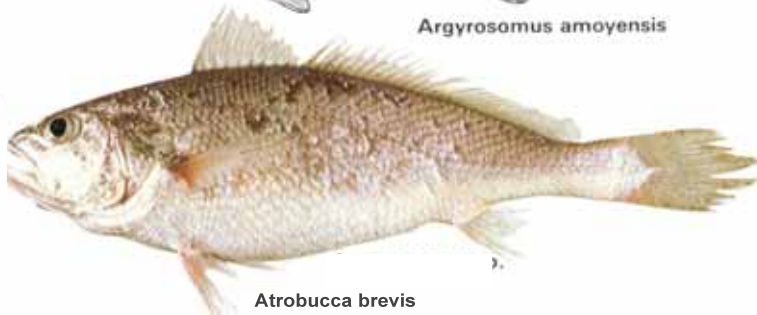


*Pagrus auratus*

SCIAENIDAE



*Argyrosomus amoyensis*



*Atroubucca brevis*





## SPARIDAE

Seabreams; Porgies - Abat; Bekukung

**Body oblong, usually deep and compressed; head large, predorsal profile often steep. Mouth small, upper jaw reaching no further than middle of eye; teeth well-developed and differentiated into conical or incisor-like teeth in front, rounded, molar-like teeth behind, usually no teeth on palate; no scales on broad suborbital, preoperculum scaled, margin smooth. Scales cycloid or weakly ctenoid. Single unnotched dorsal fin with 10-15 stout spines, 9-17 rays, first 2 spines sometimes very short, other anterior spines occasionally produced or filamentous; anal fin with 3 stout spines, 7-16 rays; pectoral fin usually long and pointed; ventral fin with axillary scale; caudal fin emarginate or forked.**

**Thirty-eight genera in the family; representatives of four were obtained on the Survey.**

REFERENCES: Carpenter, 2001c; Iwatsuki, Akazaki & Taniguchi, 2007; Iwatsuki, Newman & Russell, 2015; Iwatsuki & Heemstra, 2018; Tabata & Taniguchi, 2000; Paulin, 1990.

### **Argyrops bleekeri**

Two rows of molar-like teeth along sides of each jaw. First dorsal spine very small, 2<sup>nd</sup>-6<sup>th</sup> spines much elongated and flattened in juveniles to 30 cm SL, shorter in adults; head profile steep; eye diameter clearly less than suborbital depth; hind margin of upper jaw reaches a vertical behind eye. Body brilliant silvery pink or pale yellow, traces of 5 dark bars on back (distinct in juveniles), opercular edge red. Fins pink, dorsal and caudal edges red.  
D X-XI, 10-11. A III, 8-9. P 14-16. Lower GR 9-11. L. lat. 52-54.  
(voucher: 240 mm SL)

### **Evynnis tumifrons**

Head profile convex. Body depth more than 2.1 in SL; jaws with few canines in front, low molars on sides and conical teeth on vomer; interorbital scaly; no scales on preopercular flange. First and 2<sup>nd</sup> dorsal fin spines much shorter than 3<sup>rd</sup> and 4<sup>th</sup> spines which are extended; 4<sup>th</sup> spine less than twice in length of 5<sup>th</sup> spine. Body and head silvery pink, crimson or red above, rows of pale but distinct blue-green dots along scale rows; operculum margin reddish. Fins dark pink or red, dorsal filaments and caudal fin red.  
D XII, 10. A III, 9 P 15. Lower GR 12-13.

### **Dentex spariformis**

Head profile oblique, bulging at level of eye in large fish. Eye large, 2.4-3.4 in HL; interorbital scales reach almost to level of anterior margin of eye; a row of sharp conical teeth in both jaws (no molars); preopercular margin scaled. No elongated spines in dorsal fin; 2<sup>nd</sup> anal spine only slightly longer than 3<sup>rd</sup>. Body light pinkish-red, silvery, three orange blotches sometimes present on back; nape golden; eye color pinkish-gold; fins rosy-yellow.  
D XII, 10. A III, 8. P 15-16. Lower GR 10.  
(voucher: 100 mm SL)

### **Pagrus auratus**

Head profile evenly convex; two rows of molariform teeth in sides of jaws, 3 pair of canine-like teeth at front of lower jaw; interorbital scaly. No elongated spines in dorsal fin, 1<sup>st</sup> spine length 4.7-8.3 in HL; body depth 2 or more in SL. Body brilliant red-orange, small blue-green spots scattered over upper half of body, white streak along belly, iridescent markings around eye. Fins orange-red.  
D XII, 10. A III, 8. P15. Tr 6-7 + 15-16. Lower GR 9-11.

## SCIAENIDAE

Jewfishes, Croakers, Drums - Kekemek, Gelama, Krot

**Oblong, compressed and robust fish. Mouth large and oblique, jaws equal or mouth inferior to an overhanging snout; chin and snout with conspicuous pores, and sometimes one or more barbels. No teeth on roof of mouth. Well-developed cavities under outer head bones. Scales thin, covering head except for snout tip. Lateral line continuous to end of caudal fin. Single dorsal fin long, and deeply notched between last and second last spines; 6-13 spines and 20-35 soft rays. Anal fin with one or 2 spines and 5-12 rays. Caudal fin either truncate, rounded or wedge-shaped. Upper bony edge of operculum deeply indented, or forked, and a bony flap above gill opening. Otolith shape is diverse within the family. The swim bladder of sciaenids (which is used as a resonating chamber) has a variety of shapes and appendages characteristic of different genera.**

**Representatives of seven genera were obtained during the Survey (68 recognised genera in the family).**

REFERENCES: Sasaki, 2001; Sasaki & Kailola, 1988; Sasaki, 1999; Chao et al., 2019; Sasaki & Kailola, 1991.

### **Argyrosomus amoyensis**

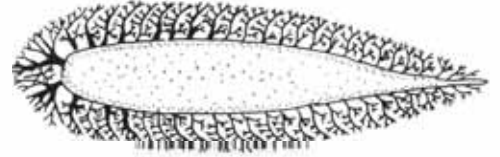
Swim bladder carrot-shaped; 22-29 pairs of branching appendages not entering head and set obliquely along bladder, edges of each overlapping. Jaws equal, some teeth enlarged, those in lower jaw strong and widely-spaced; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Upper body with faint oblique rows of small spots; margin of spinous dorsal fin dusky, each soft dorsal ray with dark spot at its base. Second anal spine 13.5-14.5 in SL, pectoral fin 5.1-5.9 in SL; interorbital 16.7-18.9 in SL. Eye 4.5-7.7 in HL and lower jaw length 1.9-2.1 in HL.  
D X, I, 25-27. A II, 17. Lower GR 8.  
(voucher: ? mm SL)

### **Atrobucca brevis**

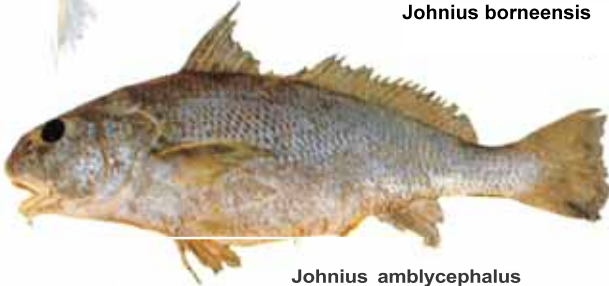
Swim bladder carrot-shaped; 24-29 pairs of branching appendages not entering head and set obliquely along bladder, edges of each overlapping and with well-developed dorsal limbs. Jaws equal, some teeth enlarged, those in lower jaw strong and widely-spaced; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Body brown or copper-coloured and iridescent mauve, lower body pale orange or whitish; mouth grey, gill cavity dark brown or black; fins dusky orange, spinous dorsal and caudal fins edged black. Second anal spine 13.3-15.2 in SL; pectoral fin 4.2-5 in SL; interorbital 13.3-14.7 in SL. Eye 4.1-4.5 in HL.  
D X, I, 29-32. A II, 7. Lower GR 10-11.  
(voucher: 197 mm SL)



*Atrobucca nibe*



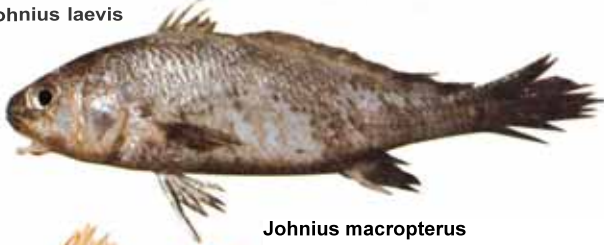
*Johnius borneensis*



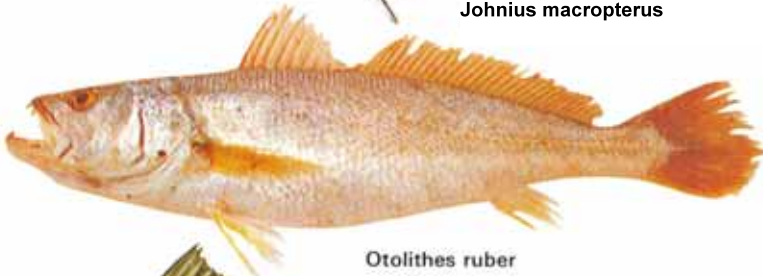
*Johnius amblycephalus*



*Johnius laevis*



*Johnius macropterus*



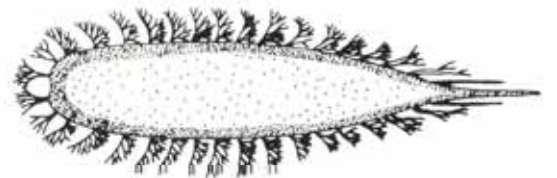
*Otolithes ruber*



*Nibea soldado*



*Pennahia macrocephalus*



**Atrobucca nibe**

Swim bladder carrot-shaped; 24-30 pairs of branching appendages not entering head and set obliquely along bladder, edges overlapping; dorsal and ventral appendage limbs well-marked. Jaws equal, some teeth enlarged, sharp and needle-like; 3 pairs of small pores on chin, anterior pair separated by symphysis. Caudal fin wedge-shaped. Violet-brown and silvery, paler below; mouth and gill cavity dark brown or black; fins brown. Second anal spine 11.8-15.4 in SL; pectoral fin 3.6-4 in SL; interorbital 11.9-13 in SL. Eye 3.8-4.4 in HL and lower jaw length 1.8-1.9 in HL.

D IX-X, I, 27-33. A II, 7. Lower GR 9-12.

(voucher: 194 mm SL)

**Johnius borneensis**

Swim bladder hammer-shaped, with 14-15 branching appendages along it. Jaws equal, snout rounded; teeth in both jaws noticeably sharp, well-spaced and conical, those in inner row of lower jaw enlarged; 3 pairs of pores on chin, first pair separated by a groove. Body scales ctenoid. Caudal fin wedge-shaped. Body iridescent dusky mauve above, silvery white below, often 2 brown stripes along middle of sides; outer  $\frac{2}{3}$  of spinous dorsal fin dark brown or black. Second anal spine 11.1-15.4 in SL (24-42% HL). Interorbital 3.6-4.2 in HL; eye diameter 3.6-4 in HL; lower jaw length 1.9-2.3 in HL.

D IX-X, I, 29-31. A II, 7. Lower GR 9-12.

(voucher: 105 mm SL)

**Johnius amblycephalus**

Swim bladder hammer-shaped, with 14-15 pairs of branching appendages along it. Barbel on chin; snout blunt, mouth ventral (inferior); teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Body scales cycloid. Leading edge of spinous dorsal fin elevated; caudal fin wedge-shaped in juveniles, truncate or "S"-shaped in adults. Head and upper  $\frac{2}{3}$  body iridescent brown, remainder orange-white; black edge to spinous dorsal. Barbel length 2.8-5 in eye diameter; second anal spine 3.3-4.6 in HL; eye diameter about 4.3 in HL; lower jaw length about 1.8 in HL.

D X, I, 23-26. A II, 7. Lower GR 6-10.

(voucher: 205 mm SL)

**Johnius laevis**

Swim bladder hammer-shaped, with 11-13 branched appendages along it. Snout projecting over inferior mouth; teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Head scales cycloid, body scales ctenoid. Caudal fin wedge-shaped or rounded. Head and upper body dusky iridescent mauve or bronze, lower part of body silvery-white, dusky blotch on operculum; fins yellow, black margins to dorsal and caudal fins. Second anal spine 7.1-9.1 in SL. Interorbital 3.6-4.3 in HL; eye 3-4 in HL and lower jaw length 2.2-2.8 in HL.

D IX-X, I, 30-32. A II, 7-8. Lower GR 11-12.

(voucher: 100 mm SL)

**Johnius macropterus**

Swim bladder hammer-shaped, with 13-15 pairs of branching appendages along it. Blunt barbel on chin; snout blunt, mouth inferior, teeth small and all of same size in lower jaw, stronger but not widely-spaced in upper jaw. Body scales ctenoid. Caudal fin wedge-shaped. Iridescent brown body, violet above; fins dark brown. Barbel length 4.3-7.1 in eye diameter; second anal spine 2.5-3.2 in HL; eye diameter 4.1-4.9 in HL; lower jaw length 2.4-2.9 in HL.

D X, I, 28-33. A II, 7-8. Lower GR 10-12.

(voucher: 88 mm SL)

**Otolithes ruber**

Strong outstanding pairs of canine teeth in both jaws; lower jaw projecting. Swim bladder carrot-shaped; 30-40 pairs of appendages set obliquely along bladder in fold of tissue beside it; posterior branches bud-like. Chin pores very small (or absent) separated by symphysis. Most scales cycloid. Caudal fin wedge-shaped. Anal fin begins behind middle of soft dorsal fin. Silvery or golden overall, blue-brown above. Second anal spine 17.9-28.6 in SL. Eye 4.3-7.7 in HL and interorbital 4-5 in HL.

D IX-X, I, 27-30. A II, 7-8. Lower GR 8-11.

**Nibea soldado**

Swim bladder carrot-shaped with 15-21 branching appendages along it; first appendage partly entering head, and no well-developed dorsal limbs to appendages. Snout rounded, moderately acute; jaws equal; inner row of teeth in lower jaw strong and enlarged; 3 pairs of pores on chin, first pair close together and joined by a groove. Body scales ctenoid (coarse and rough). Caudal fin wedge-shaped. Iridescent greenish yellow, brown over back; brown narrow oblique stripes cross upper  $\frac{2}{3}$  of body; fins dark. Second anal spine 6.9-8.7 in SL (38-64% SL), pectoral fin 4.3-5 in SL. Eye 4.9-5.7 in HL, lower jaw 2.3-2.6 in HL.

D IX-X, I, 27-33. A II, 7-8. Lower GR 5-7. Tr above 8-13.

(voucher: 205 mm SL)

**Pennahia macrocephalus**

Swim bladder carrot-shaped, 18 pairs of wing-like appendages positioned in one plane along it, branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged but not true canines; 3 pairs of small, indistinct pores on chin separated by symphysis; gill rakers slender. Scales on head and anterior portion of body cycloid, remainder ctenoid. Caudal fin slightly wedge-shaped. Body silvery-blue, silvery, darker above, brown patch on operculum; black spot on tip of lower jaw, another on pectoral fin base; mouth charcoal coloured. Second anal spine 9.5-15.2 in SL; pectoral fin length 3.6-4.1 in SL; interorbital 10.1-12.3 in SL; eye 4-5 in HL and lower jaw length 1.9-2 in HL.

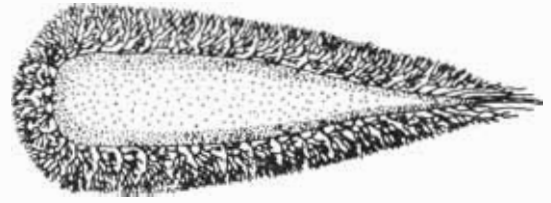
D IX-XI, I, 27-30. A II, 7-9. Lower GR 11-13.

(voucher: 121 mm SL)

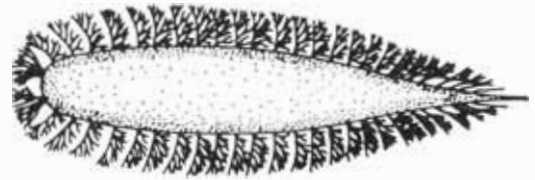




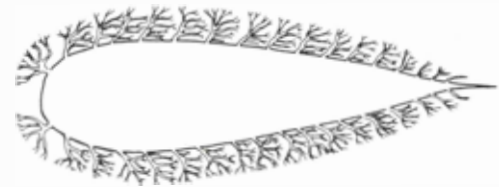
*Pennahia anea*



*Pennahia pawak*



*Protonibea diacanthus*



**MULLIDAE**

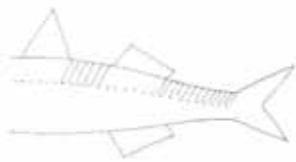
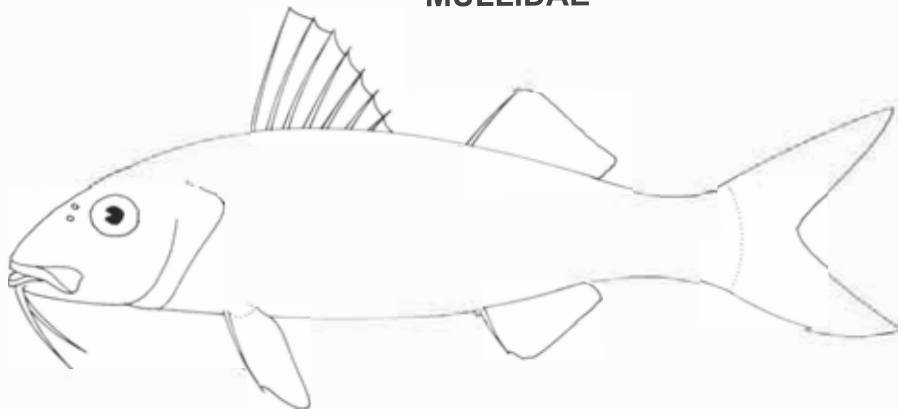


Fig 1  
*Mulloidichthys*

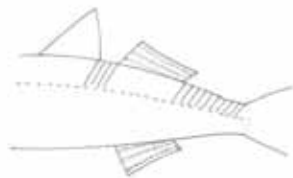


Fig 2  
*Parupeneus*



Fig 3  
*Upeneus*



Fig 4  
*Upeneus*



*Mulloidichthys flavolineatus*



*Parupeneus barberinoides*

### **Pennahia anea**

Swim bladder carrot-shaped, 17-21 pairs of wing-like appendages positioned in one plane along it, branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged, upper jaw extending backwards to below hind margin of eye; 2 pairs of small, indistinct pores on chin, separated by symphysis; gill rakers slender. Scales on head and lower sides cycloid, elsewhere ctenoid. Caudal fin truncate, upper and lower lobes angular. Bronze head and body, bluish above, silvery below; large brown patch on operculum. Second anal spine 9.1-14 in SL; pectoral fin length 3.8-4.5 in SL; interorbital 9.7-11.6 in SL. Eye 3.6-4.5 in HL and lower jaw length 1.7-1.9 in HL.

D IX-X, I, 22-24. A II, 7-9. Lower GR 9-12.

(voucher: 210 mm SL)

### **Pennahia pawak**

Swim bladder carrot-shaped, 24-27 pairs of wing-like appendages positioned in one lane along it, most branching posteriorly, and none entering head; dorsal limbs of appendages scarcely branched. Jaws equal, some teeth enlarged, upper jaw extending backwards to below middle of eye; 3 pairs of small, indistinct pores on chin separated by symphysis. Scales on head cycloid, elsewhere ctenoid. Caudal fin a short wedge shape. Body bronze, greenish brown above, silvery white below, large black blotch on operculum. Dorsal fin margin dark brown, and a large black blotch over posterior dorsal spines. Second anal spine 12.5-13.3 in SL; pectoral fin length 4.3 in SL; interorbital 11.1-11.2 in SL. Eye 3.9-5 in HL and lower jaw length 1.9-2 in HL.

D X, I, 23-25. A II, 7. Lower GR 7-9.

(voucher: 115 mm SL)

### **Protonibea diacanthus**

Swim bladder carrot-shaped with about 20 branching appendages along it, first one not entering head. Jaws equal; outer row of teeth in lower jaw larger than remainder; 3 pairs of pores on chin, median pair on symphysis, joined by groove. Scales on snout and suborbital cycloid, elsewhere ctenoid. Caudal fin wedge-shaped. Body fawn or dusky yellow, darker above and crossed by 5 broad oblique brown bands, most apparent on back; dark brown spots scattered over upper half of head, body, dorsal and caudal fins; lower half of caudal fin; all other fins dark brown. Second anal spine 9.1-10.5 in SL, pectoral fin 4.3-5.6 in SL. Eye 4.5-5.6 in HL; lower jaw length 1.9-2.1 in HL.

D X-XI, I, 22-25. A II, 7-8. Lower GR 6-8.

(voucher: 313 mm SL)

## **MULLIDAE**

Goatfishes - Biji nangka karang; Janggot Kunir; Kuniran

**Oblong, slightly compressed fishes, underside of head and belly flat. Two long, simple and fleshy barbels on chin. Scales ctenoid. Two widely separated dorsal fins, first with 6-8 spines, second with one spine and 8-9 rays. Anal fin with one or 2 spines and 6 or 7 rays. Caudal fin forked. Ventral fin with a scaly axillary process. Proportions of eye, snout and barbel length change with age. Colouration varies with day and night, depth of water, and life or death. For example, fishes coloured orange, yellow or grey in shallow water are frequently crimson, violet or dark brown when captured from deeper water. Colours also change rapidly on capture and soon fade. Such variability is frequently the cause of errors in identification.**

**The family comprises six genera of which representatives of three were collected during the Survey. They can be distinguished as follows:**

#### ***Mulloidichthys***

Band of fine teeth in jaws and none on vomer and palatines; 5 scale rows between first and second dorsal fins and 12 along upper caudal peduncle. Fins plain. (Fig 1)

#### ***Parupeneus***

One row of blunt, conical teeth in jaws and none on vomer and palatines; 2-3 scale rows between first and second dorsal fins and 8-9 along upper caudal peduncle. Second dorsal and anal fins always striped. (Fig 2)

#### ***Upeneus***

Band of fine teeth in jaws; very fine teeth on vomer and palatines. Four or 5-7 scale rows between first and second dorsal fins and 10 or 12 along upper caudal peduncle. First and second dorsal fins often striped. (Figs 3 and 4)

REFERENCES: Randall, 2001b; Randall, 2004; Uiblein & Heemstra, 2010; Uiblein et al, 2018; Uiblein, Hoang & Gledhill, 2017; Uiblein & McGroutner, 2012.

#### ***Mulloidichthys flavolineatus***

Snout long, maxilla ends well before eye. Eye 3.3-5 in HL. Yellow band from eye to caudal fin base. Sometimes a dark spot on sides below lateral line and above pectoral fin. Head and back dark brown to crimson. Barbels blue, tips orange. Fins pale. Peritoneum dark brown or black. Lower GR 18-22 on first arch. L. lat. 34-38. (voucher: 165 mm SL)

#### ***Parupeneus barberinoides***

Barbels extend past preopercular margin. Reddish brown on lower front half of body, yellow over hind half. Two black bands from snout: first to base of soft dorsal fin, second through eye. Black spot below posterior of second dorsal fin on or above lateral line. Barbels scarlet or bright orange. Second dorsal and anal fins with blue and yellow bands. Peritoneum pale. P 15-16. Total GR 27-31.



**Parupeneus barberinus**



**Parupeneus crassilabris**



**Parupeneus chrysopleuron**



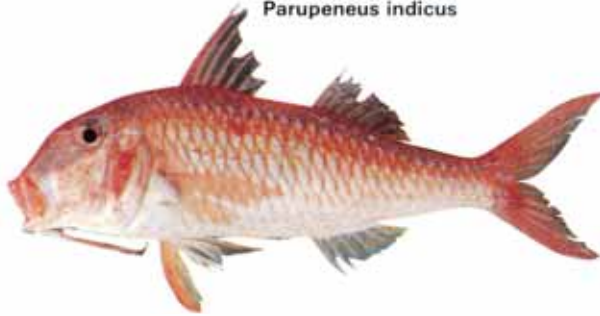
**Parupeneus cyclostomus**



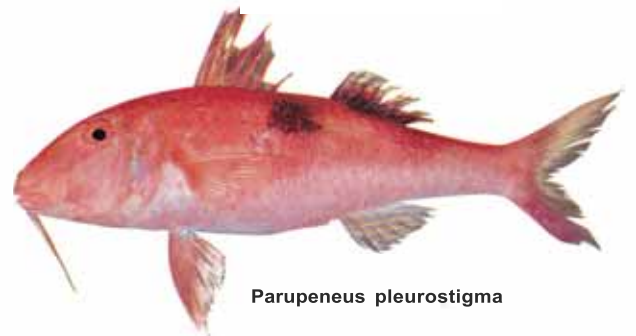
**Parupeneus indicus**



**Parupeneus macronemus**



**Parupeneus heptacantha**



**Parupeneus pleurostigma**



**Parupeneus rubescens**



**Parupeneus multifasciatus**



**Parupeneus janseni**



**Parupeneus barberinus**

Second dorsal fin spine flexible near tip. Last rays of second dorsal and anal fins about equal in length the penultimate ray(s). Barbels about equal to snout-plus-eye distance and ending opposite hind eye margin. Dark brown or red band, edged yellow, from snout through eye to end of second dorsal fin base. Oval black spot on caudal peduncle near tail base centred on lateral line. Blue and yellow lines over cheek and lower sides, second dorsal and anal fin barred yellow. Peritoneum dark brown or black. Barbels cream.  
P 16-18. Total GR 26-31.  
(voucher: 120 mm SL)

**Parupeneus chrysopleuron**

Barbels long, almost reaching opercular margin. Bright red head and body. Bright yellow band from eye to upper caudal peduncle. Blue lines around eye; barbels pale yellow or white. Peritoneum silvery pale.  
P 15-16. Total GR 21-23.  
(voucher: ? mm SL)

**Parupeneus indicus**

Barbels extend beyond preopercular margin. Large oblong yellow patch about 7 scales long, mostly above lateral line, below second dorsal fin or interdorsal space. Large black spot on mid-length of caudal peduncle. Blue lines across head; barbels crimson or pink, tips white. Peritoneum dusky in young, dark brown in adults.  
P 15-17. Total GR 24-27.  
(voucher: 250 mm SL)

**Parupeneus heptacantha**

Barbels extend past preoperculum; posterior end of maxilla convex. Body depth 3-3.6 in SL. Bright red spot 1-2 scales wide below lateral line and above mid-length of pectoral fin. Blue horizontal stripes on head; back with pearly blue spots or broad mauve band. Barbels pale pink; second dorsal and anal fins with alternating pale blue and yellow lines. Peritoneum dark brown.  
P 15-17. Total GR 23-25.  
(voucher: 200 mm SL)

**Parupeneus rubescens**

Two or 3 convex olive or yellow bands extend from head to below second dorsal fin base. Large pale yellow area ('saddle') behind second dorsal fin followed by dark brown or black saddle on upper caudal peduncle. Barbels pale. Peritoneum dusky. Second dorsal fin spine tip flexible. Barbels long, extending beyond operculum.  
P 15-16. Total GR 29-31.  
(voucher: 110 mm SL)

**Parupeneus janseni**

Barbels extend beyond preoperculum; posterior end of maxilla convex. Body depth 3.6-4.4 in SL. First dorsal fin spine flexible near tip. Body pink, a yellow band from eye along lateral line, ending above line near caudal fin base; peritoneum pale.  
P 15-16. Total GR 23.  
(voucher: 100 mm SL)

**Parupeneus crassilabris**

Barbels fleshy, extend to eye or operculum; tip of second dorsal fin spine stiffened. Body depth 2.7-3.4 in SL. Two to 5 black bars or saddles across back, most prominent below each dorsal fin and over upper caudal peduncle. Body red, mauve above. Barbels dark purple or black, tips yellow. Second dorsal and anal fins with oblique yellow bars, last rays may be black. Blue lines around eye, black mark behind eye. Peritoneum pale.  
P 15-16. Total GR. 34-42.  
(voucher: 230 mm SL)

**Parupeneus cyclostomus**

Snout long, head profile steep and straight; barbels long, extending beyond head; eye relatively small in large specimens. Second dorsal fin spine tip flexible. Body plain, changing with depth of capture (from grey through orange to violet-pink). Blue and yellow lines radiate from eye; oblong cream or pale yellow saddle on caudal peduncle behind second dorsal fin. Barbels tipped yellow. Peritoneum pale. P 16-17. Total GR 27-32.  
(voucher: 325 mm SL)

**Parupeneus macronemus**

Second dorsal fin spine stiffened at tip. Last ray of second dorsal and anal fins very long. Barbels longer than snout-plus-eye distance, almost reaching preopercular margin. Dark brown horizontal band from snout through eye to below second dorsal fin; black spot on middle of caudal peduncle diffuse and mostly above lateral line; pale yellow saddle on caudal peduncle. Second dorsal fin with black stripe along base and pink or violet stripes. Peritoneum pale. Barbels pale brown.  
P 15-17. Total GR 31-33.  
(voucher: 130 mm SL)

**Parupeneus pleurostigma**

Barbels scarcely reach preopercular margin. Round black spot about 4 scales wide, across lateral line below interdorsal space and a large oblong yellow patch below second dorsal fin. Barbels pale. Four narrow yellow longitudinal lines on anal fin. Peritoneum pale.  
P 15-17. Total GR 28-32.  
(voucher: ? mm SL)

**Parupeneus multifasciatus**

Barbels long, reaching beyond opercular edge; soft dorsal and anal fins pointed. Body depth 3.2-3.7 in SL. Last 1 or 2 rays of soft dorsal and anal fins longer than penultimate rays. Body reddish, back crossed by 4 or 5 broad dusky bars, the last two (below soft dorsal fin; across caudal peduncle) being obvious and persistent. Soft dorsal and anal fins with alternating blue-green and yellow longitudinal stripes, posterior rays of soft dorsal fin dark brown or black, pectoral fin yellow.  
D VIII, 9. A I, 6. P 15-17. Total GR 36-41. L. lat. 27-28. Tr 3+8-9.



**Upeneus australiae**



**Upeneus torres**



**Upeneus quadrilineatus**



**Upeneus moluccensis**



**Upeneus sundaicus**



**Upeneus sulphureus**



**Upeneus vittatus**



**Upeneus tragula**



**Upeneus subvittatus**



**Upeneus guttatus**

**Upeneus australiae**

First dorsal fin spine longest. Gold band from eye to caudal peduncle. Barbels white. Both dorsals, ventral and anal fins white crossed by 3-4 orange to crimson oblique bands. Upper caudal fin lobe crossed by 4-5 crimson bands; lower lobe crossed by 7-8 bands, tipped dark brown. Peritoneum pale or slightly dusky. D<sub>1</sub> VIII. P 12-14. L. lat. 29-31. Total GR 27-29.

**Upeneus quadrilineatus**

First dorsal fin spine minute. Four horizontal yellow bands from head to caudal peduncle; bright lemon-yellow band along ventral profile from ventral fin base to end of anal fin. Dorsal fins pink, crossed by 2 yellow bars, tips dark brown. Ventral, anal and pectoral fins pale. Caudal fin lobe crossed by 5-6 oblique brown-red bands; lower lobe of caudal fin plain, outer margin broadly edged dark brown. Peritoneum dusky. Barbels pink. D<sub>1</sub> VIII. P 15. L. lat. 36-38. Total GR 25-27. (voucher: 130 mm SL)

**Upeneus sundaicus**

First dorsal fin spine minute. Olive-yellow horizontal band from eye to caudal peduncle. Dorsal fins blotched crimson; ventral, anal and pectoral fins plain white and pink. Caudal fin crimson with green rays and broad dark brown margin to lower lobe. Barbels bright yellow or orange. Peritoneum pale. D<sub>1</sub> VIII. P 14. L. lat. 34-38. Total GR 18-20. (voucher: 163 mm SL)

**Upeneus vittatus**

First dorsal fin spine minute. Four to 5 dusky yellow or orange horizontal stripes from head to below second dorsal fin or to tail base. Brownish red bars across both dorsal fins, tips of fins black. Pectoral, ventral and anal fins plain yellow or pink. Caudal fin crossed by dark brown or crimson oblique bands: 4-5 on upper lobe, 2-3 on lower lobe, lowermost very broad. Barbels white. Peritoneum dusky. D<sub>1</sub> VIII. P 15-17. L. lat. 32-35. Total GR 26-31. (voucher: 150 mm SL)

**Upeneus subvittatus**

Barbels  $\frac{2}{3}$  of HL. First dorsal fin spine minute. Four to 5 horizontal stripes along sides reaching to caudal peduncle. Dorsal fins with brownish-red bars, tips black. Three to 4 dark bands across upper caudal fin lobe, 5 across lower (none broader or darker than the others). Peritoneum black or dark brown. D<sub>1</sub> VIII. P 16-17. L. lat. 36. Total GR 24-25. (voucher: 130 mm SL)

**Upeneus torres**

First dorsal fin spine longest. Barbels pale yellow or white. Two or 3 orange bars across dorsal fins; pectoral, ventral and anal fins pale. Upper caudal fin lobe crossed by 3-5 oblique bars; lower lobe plain dusky orange with pale margin. Peritoneum dusky. D<sub>1</sub> VII. P 13-14. L. lat. 28-30. Total GR 23-27. (voucher: 113 mm SL)

**Upeneus moluccensis**

First dorsal fin spine minute, 2<sup>nd</sup> longest. Bright yellow horizontal band through eye to caudal fin base. Barbels white or pink. Dorsal fins crossed by 3-4 orange or red bars; anal, ventral and pectoral fins pale. Upper lobe of caudal fin with 5-6 orange-black bars, lower lobe plain yellow with dark margin. Peritoneum dusky. D<sub>1</sub> VIII. P 15-18. L. lat. 33-36. Total GR 27-31. (voucher: 130 mm SL)

**Upeneus sulphureus**

First dorsal fin spine minute. Two orange-yellow horizontal bands from head to caudal peduncle. Both dorsal fins crossed by 2-3 olive bars, tips of fins black or dark brown. Anal, ventral and pectoral fins pale. Caudal fin plain dull yellow - hind margin dusky, lower lobe tipped white. Peritoneum dusky. Barbels white. D<sub>1</sub> VIII. P 15-18. L. lat. 34-37. Total GR 26-32. (voucher: 115 mm SL)

**Upeneus tragula**

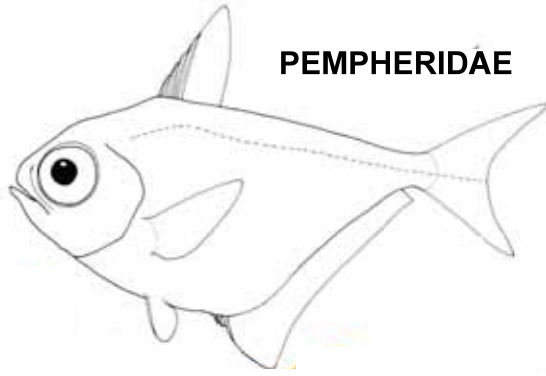
Third or 4<sup>th</sup> dorsal fin spine longest, first spine minute. Barbels do not reach preopercular margin. Many orange-brown spots over head and body; red or yellow band from eye to caudal fin base. Barbels white or pale yellow. Peritoneum pale. Both dorsals, anal and ventral fins crossed by red bars or rows of blotches. Brown or red crossbars on caudal fin, 4-6 on upper lobe, 5-8 on lower lobe. D<sub>1</sub> VIII. P 14-15. L. lat. 29-31. Total GR 21-25. (voucher: 110 mm SL)

**Upeneus guttatus**

First dorsal fin spine longest. Barbels bright yellow. Both dorsal fins and ventral fin with 2-3 orange-pink bars or blotches. Pectoral and anal fins pale. Both caudal fin lobes crossed by orange bars and with inner hind margin brown or reddish. Three to 5 bars on upper caudal fin lobe, 5-6 on lower lobe. Peritoneum silvery with scattered dark spots. D<sub>1</sub> VII. P 12-13. L. lat. 30-31. Total GR 25. (voucher: 115 mm SL)



**PEMPHERIDAE**



*Parapriacanthus ransonneti*



*Pempheris molucca*



*Pempheris vanicolensis*

**KYPHOSIDAE**

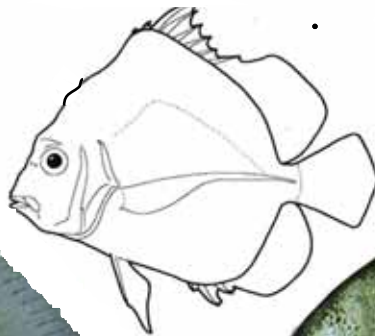


*Kyphosus cinerascens*

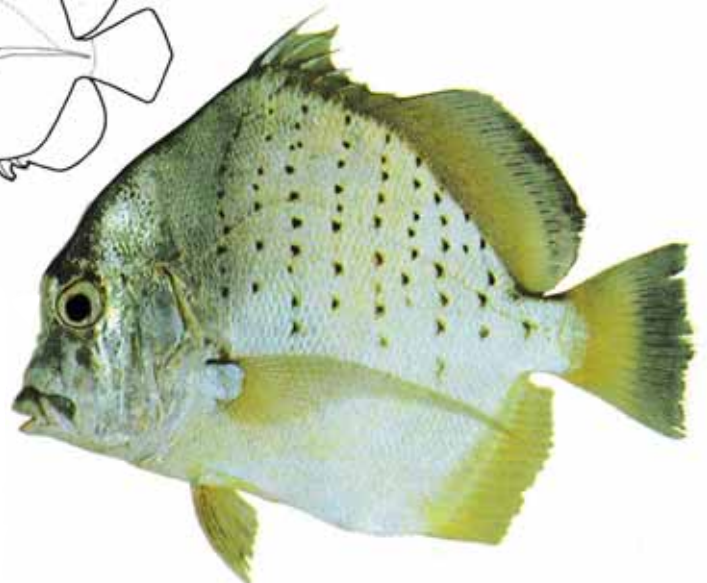


*Kyphosus vaigiensis*

**DREPANEIDAE**



*Drepane longimana*



*Drepane punctata*

## PEMPHERIDAE

Sweepers; Bullseyes - Mada-mada; Sasila

Small fishes; body elongate - oval and very compressed. Head blunt; mouth oblique, maxilla moderately short and exposed posteriorly; teeth small; eye large, without adipose lid; preorbital smooth; no opercular spine, gill rakers long. Scales continue onto most of head and anal fin (*Pempheris*); lateral line tubules short and wide, extending onto caudal fin. Dorsal fin high and short-based, beginning before middle of body, with 4-7 graduated spines; anal fin longer, usually with 3 spines, rays decreasing in length posteriorly; ventral fin below pectoral fin; caudal fin forked or emarginated; luminous organs present in many species.

Two genera and 80 species in the family, three species obtained on the Survey.

REFERENCES: Mooi, 2001; Mooi & Jubb, 1996; Randall, 2011.

The 2 genera are distinguished thus:

**Parapriacanthus**: - anal fin naked; less than 30 rays in anal fin; body elongate.

**Pempheris** - scales on anal fin basally; 30 or more rays in anal fin; body deep.

### **Pempheris molucca**

Body violet brown, iridescent below pectoral base plain; unpaired fins reddish, front of dorsal fin brown. Head depth more than HL; interorbital space flattened; jaw teeth strong, conical anteriorly. Scales cycloid and easily lost, up to 10 concealed scales below each surface scale on belly; ventral fin with axillary scale.

D VI, 8-10. A III, 41. L. lat. about 64-66.

(voucher: 113 mm SL)

### **Parapriacanthus ransonneti**

Body greenish yellow, pinkish posteriorly, dark edges and dots on scales anteriorly, lower head and sides metallic violet or charcoal; black line across base of caudal fin. Scales absent from throat; ventral fin with axillary scale. Internal luminous organ present.

D V-VI, 8-10. A III, 18-24. L. lat. 60-79. Lower GR 14-19. (voucher: 46 mm SL)

### **Pempheris vanicolensis**

Body dusky blue-green above, yellowish below; pectoral fin base plain; pectoral bright yellow, outer 1/3 of dorsal, anal and caudal fins charcoal. Head depth more than HL; interorbital space convex; jaw teeth small, close together, larger teeth anteriorly in upper jaw. Scales cycloid, easily lost, up to 10 concealed scales below each surface scale on belly; ventral fin with axillary scale.

D VI, 8-10. A III, 39-44. L. lat. 53-62. Tr above 5-6.

(voucher: 121 mm SL)

## KYPHOSIDAE

Rudderfishes; Drummers - Kakap lodi

Body oval, robust and compressed. Mouth small, horizontal outer row of strong incisors in both jaws; scaled or unscaled maxilla exposed or concealed by suborbital bones; preoperculum and suborbital finely serrated, operculum with one or 2 spines. Scales ctenoid and regularly arranged, covering most of head and soft unpaired fins; low scaly sheath for dorsal and anal spines. Single dorsal fin with 10 or more depressible spines and 12-16 rays; anal fin with 3 spines; scaly process in axil of ventral fin; caudal fin emarginated or forked.

Family comprises two genera and 16 species; two species were obtained on the Survey.

REFERENCE: Sakai, 2001.

### **Kyphosus cinerascens**

Length of soft dorsal fin base distinctly shorter than spinous dorsal fin base; anterior dorsal rays longer than longest dorsal spine; caudal fin deeply emarginate. Body dark olive blue with silvery line along each scale row and silver band below eye; fins dark blue or charcoal.

D XI, 12. A III, 11-12. L. lat. 48-56. GR 26-31.

(voucher: 233 mm SL)

### **Kyphosus vaigiensis**

Length of soft dorsal fin base equal to or longer than spinous dorsal fin base; anterior dorsal rays slightly shorter than longest dorsal spine; caudal fin deeply emarginate. Eye 3-3.6 in HL. Body silvery blue with golden line along each scale row and silvery band below eye; fins dusky golden or fawn.

D X-XI, 14-15. A III, 12-13. L. lat. 51-55. GR 29-34.

## DREPANEIDAE

Sicklefishes - Gebel; Gampret gebel

Body deep and laterally compressed; head profile steep. Mouth markedly protractile; maxillae exposed distally. Spinous portion of dorsal fin with 13-14 spines, distinct from soft-rayed portion with 19-22 soft rays; anal fin with three spines and 17-19 soft rays; pectoral fins longer than head, falcate; 24 vertebrae. Caudal fin truncate.

One genus and three species in the family, of which two were obtained on our Survey.

REFERENCE: Heemstra, 2001a.

### **Drepane longimana**

Body silvery-blue, dusky above; 4-9 vertical grey bars on upper sides; fin margins dusky. Mouth protractile into a downward-pointed tube; maxilla exposed posteriorly; predorsal body profile indented at nape. Pectoral fin very long and falcate, reaching well over anal fin.

D VIII-IX, 19-23. A III, 17-19.

(voucher: 105 mm SL)

### **Drepane punctata**

Body silvery green, dusky above; 4-10 vertical rows of dark brown spots on upper sides; fin margins dusky. Mouth protractile into a downward-pointed tube; maxilla exposed posteriorly; predorsal body profile evenly convex at nape. Pectoral fin very long and falcate, reaching well over anal fin.

D IX, 19-22. A III, 17-18.

(voucher: 205 mm SL)

EPHIPPIDAE



Ephippus orbis



Platax batavianus

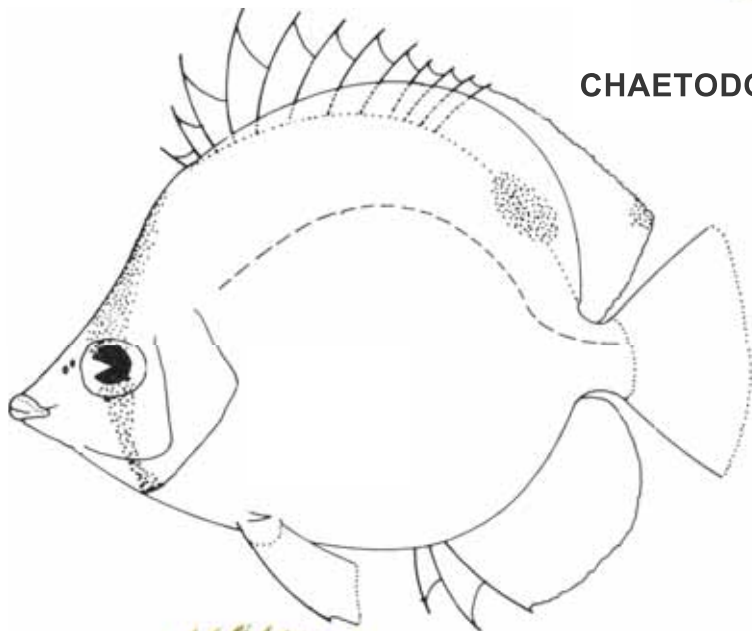


Platax teira



Zabidius novemaculeatus

CHAETODONTIDAE



Chaetodon aureofasciatus



Chaetodon assarius



Chaetodon baronessa



## EPHIPPIDAE

### Batfishes, Spadefishes -

**Deep-bodied fishes with an oval compressed body, a small terminal mouth, a single long-based dorsal fin consisting of a low spinous part followed soft rays, long pelvic fins inserted below the small pectoral fins and a slightly concave tail. The dorsal fin spines are low, and the anterior dorsal and anal fin rays are long. The head and body are covered in small scales, the dorsal profile is steep, and the lateral line runs from the gill cover to the tail base.**

**There are eight genera and 15 species in this family; we obtained five species in three genera on the Survey.**

REFERENCE: Heemstra, 2001c.

#### **Ehippus orbis**

Body outline almost circular. Maxilla hidden posteriorly and mouth not protractile. Spinous and soft dorsal fins separated by notch, 3<sup>rd</sup> to 5<sup>th</sup> spines longest and flexible; pectoral fin short and rounded. Body silvery-blue with 4 or 5 faint charcoal or dark blue bars across it reaching to ventral profile; fin margins dusky.

D IX, 19-20. A III, 15-16.

(voucher: 125 mm SL)

#### **Platax teira**

Body silvery blue, dusky above, crossed by 3 black vertical bands (faded in adults): first through eye to throat, second 1.5 times eye diameter, through pectoral fin base, 3<sup>rd</sup> between tips of dorsal and anal fins; ventral fin dark brown. Maxilla hidden posteriorly; predorsal profile evenly convex; body depth 0.9-1 in SL. Scales on predorsal reach as far as eyes. Dorsal fin spines grade into elevated anterior fin rays.

D V, 30-33. A III, 23-24. L. lat. 56-66. Tr above arch of L. lat. 25-28.

(voucher: 100 mm SL)

#### **Platax batavianus**

Two or 3 black cross bands (faded in adults) on silvery, dusky green body: first as broad as eye passes through eye to throat, 2<sup>nd</sup> through pectoral fin base to ventral fin; fins yellowish, dusky basally, ventral fin charcoal. Maxilla hidden posteriorly; predorsal body profile angular, concave above and below eye; body depth 1.3-1.7 in SL. Middle tooth cusp larger than side cusps. Scales on predorsal reach as far as eyes. Dorsal fin spines grade into elevated anterior fin rays, posterior spines longest.

D VI-VII, 28-32. A III, 19-23. L. lat. 64-75. Tr above arch of L. lat. 18-20.

(voucher: 375 mm SL)

#### **Zabidius novemaculeatus**

Body silvery pinkish brown, head and shoulder crossed by faint dark brown oblique bands: first through eye to breast, 2<sup>nd</sup> from nape through pectoral base. Maxilla hidden posteriorly; predorsal profile convex; body depth 1.3-1.4 in SL. Scales on predorsal reach as far as posterior nostrils. Dorsal fin spines grade into elevated anterior fin rays, anterior spines exposed, posterior spines longest.

D IX, 28-29. A III, 20-22. L. lat. 46-48.

(voucher: 145 mm SL)

## CHAETODONTIDAE

### Butterflyfishes - Kepe kepe; Kiper laut; Banera,

**Very colourful small fishes. Body deep, oval and very compressed. Mouth small, snout usually pointed; teeth very fine, bristle-like; preoperculum evenly rounded or angular. Scales ctenoid, extending over most of head and over dorsal and anal fins. Rayed sections of vertical fins usually higher than spined sections; dorsal fin single, continuous, with strong spines; ventral fin axillary scale present; caudal fin rounded to emarginate.**

**Twelve genera and more than 130 species are known; representatives of six genera collected on the Survey.**

REFERENCES: Pyle, 2001a; Allen & Swainston, 1988; Myers, 1991; Kuitert, 2004.

#### **Chaetodon assarius**

Broad black band from nape through eye; 4-6 vertical lines of brown spots below anterior dorsal fin; brown-orange band over caudal peduncle continued as broad black or brown band along base of anal fin; a white-edge black ocellus on soft dorsal fin. Soft dorsal and anal fins blunt or rounded; caudal fin margin sometimes black. body oval.

D XIII, 21-22. A III, 18-19. L. lat. 35-41.

(voucher: 145 mm SL)

#### **Chaetodon baronessa**

Body and fins blue or violet, shaded brown; head cream, crossed by 3 brown bands, middle through eye; 4<sup>th</sup> band, through pectoral fin base; 16-20 cream angular narrow bands cross body. Yellow submarginal band posteriorly in dorsal fin continues across caudal peduncle into anal fin; caudal fin brown, its hind margin yellow. Body angular to rounded; snout pointed; lateral line incomplete; soft vertical fins high and somewhat angular.

D XI-XII, 23-26. A III, 20-22. L. lat. 24-30.

(voucher: 81 mm SL)

#### **Chaetodon aureofasciatus**

Body and fins yellow or olive-yellow, pale anteriorly. Blue-edged orange band from nape through eye; a second short band from below anterior dorsal fin, through pectoral fin base to breast. Body rounded; snout blunt; soft dorsal and anal fins rounded; lateral line incomplete.

D X-XI, 20-22. A III, 16-18. L. lat. 38-42.

(voucher: 125 mm SL)



Chaetodon citrinellus



Chaetodon decussatus



Chaetodon ephippium



Chaetodon guentheri



Chaetodon kleinii



Chaetodon melannotus



Chaetodon selene



Roa australis



Chaetodon trifascialis



Chelmon marginalis

**Chaetodon citrinellus**

Body lemon or white; broad yellow-edged black band through eye to isthmus; rows of violet and orange spots along scale rows; broad black margin to soft dorsal fin and anal fin; vertical fins otherwise pale yellow, caudal fin white. Body oval; snout pointed; lateral line incomplete. D XIII-XIV, 20-22. A III, 16-17. L. lat. 36-42. (voucher: 44 mm SL)

**Chaetodon ephippium**

Large black saddle, margined by white, over soft dorsal fin and upper posterior part of body; 5-6 horizontal blue or violet stripes on lower sides of body. Snout and throat orange; orange also on margin of spinous dorsal, caudal and anal fins; ventral fin bright yellow. Short filament on soft dorsal fin. Snout pointed, body oval. D XII-XIV, 21-24. A III, 20-22. L. lat. 33-40. (voucher: 105 mm SL)

**Chaetodon kleinii**

Posterior half of body dusky orange, shading to cream anteriorly. Rows of violet or pearly spots along scale rows; a broad light brown band across body from spinous dorsal fin sometimes present, also a dark brown or black band from nape through eye onto chest; ventral fins dark brown; white margin to caudal fin. Narrow black edge on soft dorsal and anal fins. Body oval; snout pointed. D XIII-XIV, 20-23. A III, 17-20. L. lat. 33-41. (voucher: 48 mm SL)

**Roa australis**

Body white, brown band from nape through eye; two broad, brown-edged yellow bands across body: 1<sup>st</sup> from below anterior dorsal fin, 2<sup>nd</sup> from below last  $\frac{1}{3}$  of dorsal fin. Brown band across caudal peduncle distally. Membrane between 1<sup>st</sup> and 2<sup>nd</sup> dorsal fin spines black; round black ocellus on soft dorsal fin; ventral fin dark brown. Body oval; dorsal fin spines strong and long; snout acute; caudal peduncle depth 7.2-8.3 in SL. D XI, 20-23. A III, 16-19. L. lat. 41-49. (voucher: 120 mm SL)

**Chaetodon trifascialis**

White body with broad yellow-edged black band through eye; white body crossed by many angular oblique dark lines. Broad black band from soft dorsal and soft anal fins of juveniles fades out with growth. All fins bright yellow except black, yellow-margined caudal. Soft dorsal and anal fins angular. D XIII-XV, 14-16. A IV-V, 13-15. L. lat. 22-29. (voucher: 90 mm SL)

**Chaetodon decussatus**

Broad black band from nape through eye; soft dorsal and anal fins, caudal peduncle and posterior part of body black. Diverging oblique lines over anterior  $\frac{2}{3}$  of body; about 6 on back towards head, 11-12 from lateral line towards anal fin; two black bands on yellow caudal fin; sub-terminal yellow line along anal fin. Body oval; soft dorsal and anal fins angular. D XIII, 24-25. A III, 20-21. L. lat. 36-41. (voucher: 70 mm SL)

**Chaetodon guentheri**

Body white to pale violet, dorsal and anal fins and posterior part of body bright yellow. Black band from nape through eye; rows of violet or brown spots along scale rows. Ventral and caudal fins pale; white edge and sub-marginal black line on soft dorsal and anal fins. Black spots may be present on soft dorsal fin. Body oval; snout pointed. D XIII, 21-22. A III, 18. P 14. L. lat. 39-40. (voucher: 82 mm SL)

**Chaetodon melannotus**

Body white with narrow dark diagonal lines along scale rows from head to dorsal fin. Head and all fins yellow; back and dorsal fin posteriorly dark brown. Black band from nape through eye; broken black band across peduncle and black spot at base of anterior anal fin rays. Snout pointed; body oval. D XII-XIII, 18-21. A III, 16-18. P 14-15. L. lat. 33-39. (voucher: 100 mm SL)

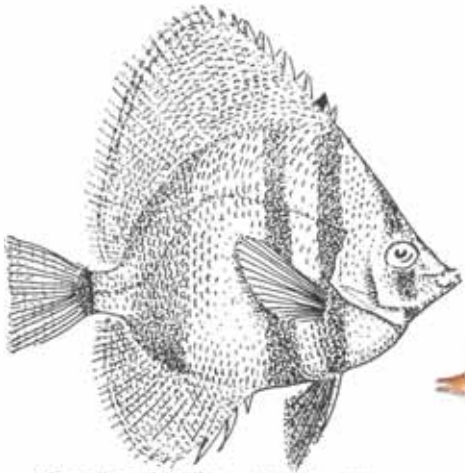
**Chaetodon selene**

Body dull white or grey; oblique golden or brown oblique lines along scale rows, broken into spots on upper anterior part of back. A yellow-edged black band through eye from dorsal fin origin, and crescent-shaped black band along dorsal fin base continuing across caudal peduncle and along posterior half of anal fin base. Fins yellow. Body oval; snout pointed. D XII, 20-22. A III, 18-19. L. lat. 31-36. (voucher: 150 mm SL)

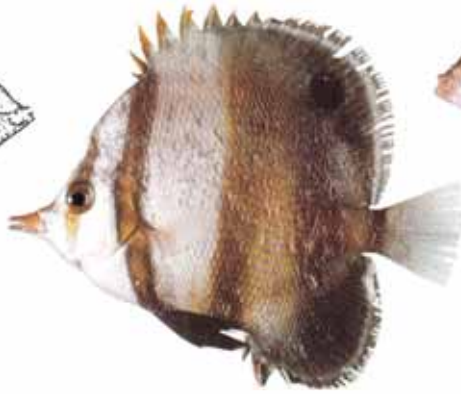
**Chelmon marginalis**

Lateral line complete, ending at caudal fin base. Snout long, tubular, 1.7-2.1 in HL; pectoral fins rounded. Body white, two brown-edged orange bands anteriorly: one through eye, one through edge of operculum. Broad yellow band between soft dorsal and anal fins, yellow band around caudal peduncle. Two orange bands on ventral fin; soft dorsal and anal fins yellow, margined orange and with a blue sub-marginal band. D IX, 29-31. A III, 21-22. L. lat. 46-57. (voucher: 150 mm SL)





*Coradion altivelis* after McCulloch, 1916



*Chelmon muelleri*



*Coradion chrysozonus*



*Heniochus acuminatus*



*Heniochus chrysostomus*



*Heniochus dipreutes*

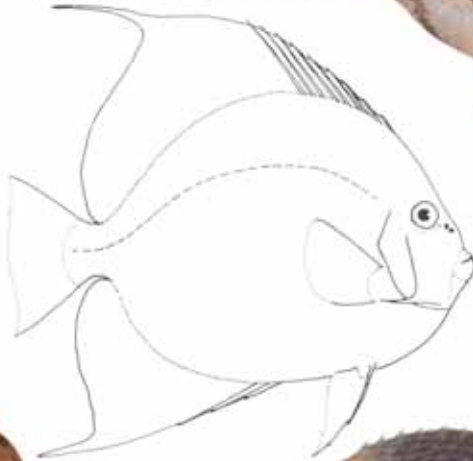


*Heniochus singularis*

**POMACANTHIDAE**



*Parachaetodon ocellatus*



*Apolemichthys trimaculatus*



*Chaetodontoplus duboulayi*

**Chelmon muelleri**

Lateral line complete, ending at caudal fin base. Snout long, tubular, 2.6-3 in HL. Pectoral fin rounded. Body white anteriorly, fawn or dusky orange posteriorly. Five-6 brown bands across body: 1<sup>st</sup> through eye, last over caudal peduncle. Dorsal and anal fin spines orange, soft dorsal and anal fins brown with blue submarginal stripe; ventral fins dark brown.

D IX, 26. A III, 18-21. L. lat. 49-50.  
(voucher: 110 mm SL)

**Coradion chrysozonus**

Lateral line complete, ending at caudal fin base. Snout short; soft dorsal fin rounded (not elevated); pectoral fin rounded. Body white with 5 yellow bands across, anterior ones dark brown ventrally: 1<sup>st</sup> band from nape through eye to isthmus; 2<sup>nd</sup> and 3<sup>rd</sup> bands close together, from spinous dorsal fin to belly; 4<sup>th</sup> band between soft dorsal and anal fins; 5<sup>th</sup> band dark brown, on caudal peduncle. Black ocellus on middle of soft dorsal fin.

D IX, 28-30. A III, 19-21. L. lat. 48-52.  
(voucher: ? mm SL)

**Heniochus chrysostomus**

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and banner-like, Body white crossed by 3 broad oblique dark bands: 1<sup>st</sup> broad, from interorbital and nape through eye, over opercles, pectoral fin base and covering all of ventral fin; 2<sup>nd</sup> from mid-spinous dorsal fin to cover posterior of anal fin; 3<sup>rd</sup> over posterior of dorsal fin and most of caudal fin. Black stripe along head profile ends at upper lip; top of snout and mouth yellow.

D XII-XIII, 21-22. A III, 17-18. L. lat. 57-61.  
(voucher: 93 mm SL)

**Heniochus singularius**

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate. Bony protuberances on nape obvious. Body crossed by two broad dark oblique bands separated by a broad pale interspace: 1<sup>st</sup> band begins on anterior dorsal spines, crosses body to include pectoral fin base and all of ventral fin; 2<sup>nd</sup> begins on posterior dorsal spines and crosses body to end over distal third of anal fin. Black band around snout and black band through eye, meeting its fellow under head. Posterior  $\frac{2}{3}$  of dorsal fin and most of caudal fin bright yellow.

D XI-XII, 25-27. A III, 17-18. L. lat. 53-64.  
(voucher: 205 mm SL)

**POMACANTHIDAE**

## Angelfishes - lkan kambing

**Body deep, oval and compressed. Mouth small; teeth fine and slender; preoperculum with strong spine at angle. Rayed sections of vertical fins higher than spined sections; dorsal fin single, continuous, with strong spines; ventral fin axillary scale absent; caudal fin rounded to slightly emarginate. Scales ctenoid, small, extending over most of head and thickly over dorsal and anal fins. Colourful fishes; juveniles often coloured differently to the adults.**

**Eight genera and 91 species in the family, only three genera and eight species recorded on the Survey.**

REFERENCES: Myers, 1991; Allen & Swainston, 1988; Pyle, 2001b.

**Apolemichthys trimaculatus**

Body and all fins except anal fin bright yellow, more or less checked by brown scale margins. Outer half of anal fin black, lower half white or yellow. Black, yellow-ringed ocellus each side of nape, another at lateral line origin. Cheek scales small and irregular; lateral line incomplete; caudal fin truncate with short filament from upper corner.

D XIV, 17-18. A III, 17-18.  
(voucher: 144 mm SL)

**Coradion altivelis**

Lateral line complete, ending at caudal fin base. Snout short. Soft dorsal fin elevated; pectoral fin rounded. White with 5 bands across body: 1<sup>st</sup> through eye, meeting its fellow on nape; 2<sup>nd</sup> and 3<sup>rd</sup> bands from spinous dorsal fin to belly; 4<sup>th</sup> broad, between rayed dorsal and anal fins; 5<sup>th</sup> on caudal peduncle. First 3 and last bands dark, 4<sup>th</sup> band orange-yellow. Narrow blue line below margin of soft dorsal and anal fins, (black spot on soft dorsal in juveniles).

D VIII, 31-33. A III, 20-22.

**Heniochus acuminatus**

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and filamentous; anal fin angular. Two broad black bands across body: 1<sup>st</sup> from anterior dorsal fin spine to extend over ventral fin; 2<sup>nd</sup> from mid-dorsal fin to extend over anal fin. Snout black above and black bar across interorbital. Outer half of soft dorsal fin and caudal fin yellow.

D XI (rarely XII), 24-27. A III, 17-19. L. lat. 47-54.

**Heniochus diphreutes**

Lateral line complete, ending at caudal fin base. Fourth dorsal fin spine elongate and filamentous; anal fin rounded. Two broad black bands across body: 1<sup>st</sup> from anterior dorsal fin spines extends over ventral fins; 2<sup>nd</sup> from mid-dorsal fin to extend over posterior anal fin. Top of snout black; black bar across interorbital. Outer half of soft dorsal fin and caudal fin yellow; anal fin spines dusky or fawn.

D XII (rarely XIII), 23-25. A III, 17-19. L. lat. 46-54.  
(voucher: 165 mm SL)

**Parachaetodon ocellatus**

Lateral line incomplete, ending about opposite last dorsal fin rays. Snout short; anterior soft dorsal fin elevated. Body white with 5 brown or brown-edged yellow slightly oblique bands crossing body; 1<sup>st</sup> through eye, last across caudal peduncle; 4<sup>th</sup> band has black ocellus over dorsal fin portion.

D VI, 28-30. A III, 18-20. L. lat. 39-46.

**Chaetodontoplus duboulayi**

Body dark blue; many thin wavy white lines or spots follow scale rows and dark blue-brown dorsal and anal fins covered with wavy light blue longitudinal lines. Snout bright yellow; violet band from nape through eye to isthmus; broad white bar across operculum; broad yellow band across body from anterior of spinous dorsal fin to belly. Broad yellow crescent along back below dorsal fin. Caudal and ventral fins yellow. Caudal fin rounded, upper and lower lobes slightly produced.

D XI, 22. A III, 19.

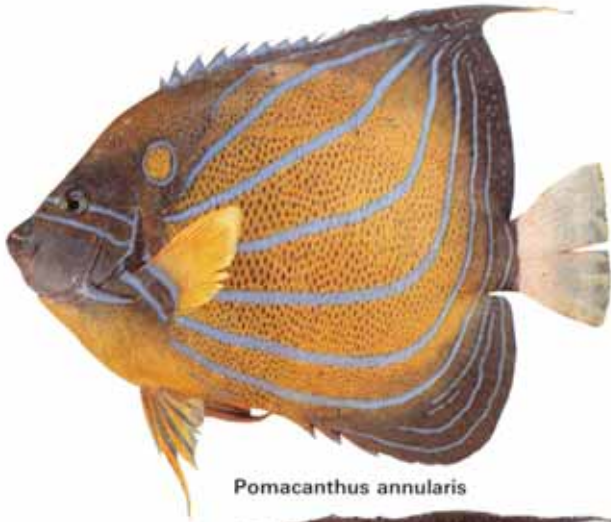




Chaetodontoplus melanosoma



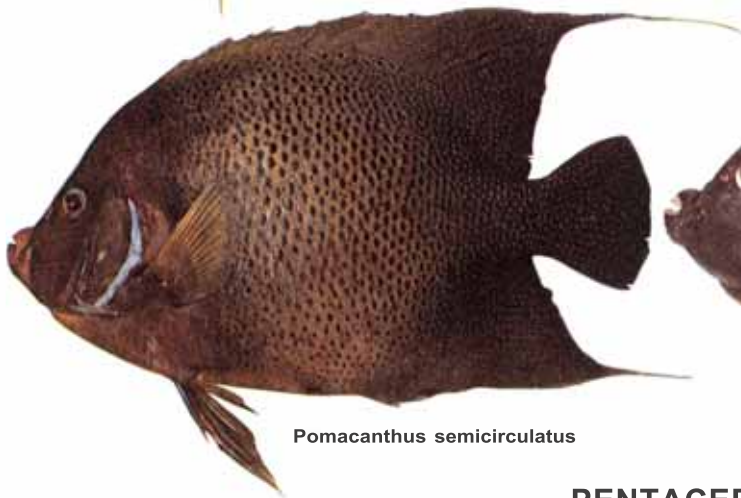
Chaetodontoplus personifer



Pomacanthus annularis



Pomacanthus imperator

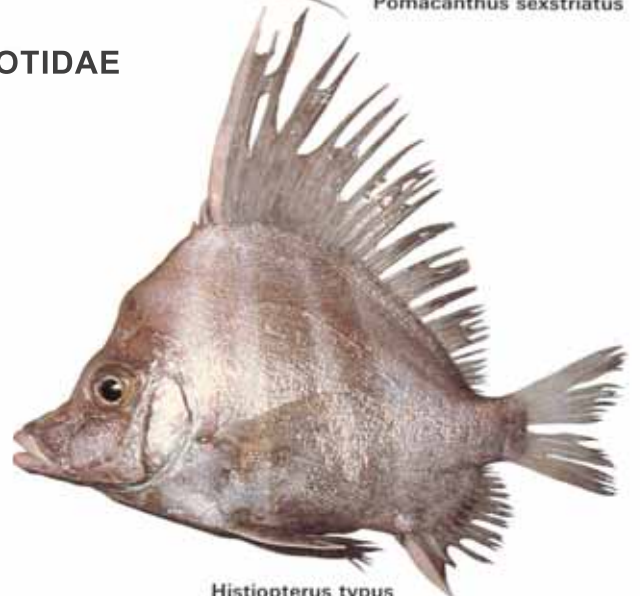
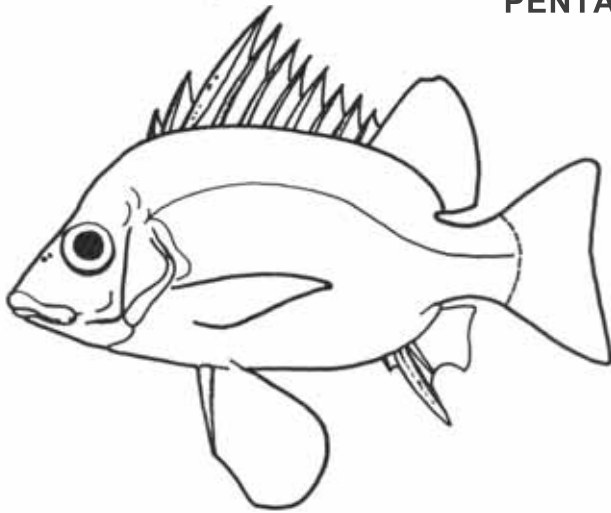


Pomacanthus semicirculatus



Pomacanthus sexstriatus

PENTACEROTIDAE



Histiopterus typus



**Chaetodontoplus melanosoma**

Body and fins dark brown or charcoal. Head pale blue or grey, same colour extending over back to below middle of soft dorsal fin. Snout, nape and cheeks patched yellow or orange. Orange or yellow margin to soft dorsal and soft anal fins; yellow caudal fin crossed by black band. Caudal fin rounded.

D XIII, 17-18. A III, 18.  
(voucher: 75 mm SL)

**Pomacanthus annularis**

Body dark orange-brown. Distinct brown-edged dark blue stripes across body: 2 horizontal stripes below eye, 6 or 7 on body curving upward towards and onto soft dorsal fin. A yellow, blue ringed ocellus at lateral line origin. Dorsal and anal fins brown with blue stripes; ventral and pectoral fins yellow, caudal fin pale yellow with greyish margin. Soft dorsal fin angular and produced in adults.

D XIII, 21-22. A III, 20-21.

**Pomacanthus semicirculatus**

Head and body orange, tan, grey or greenish, darkening posteriorly. Black or dark blue spots on scales; white spots over dark soft dorsal, soft anal and caudal fins. Eye ringed blue; blue line along preopercular and opercular edges. All fins except pectoral fin, margined blue, pectoral fin yellow. Soft dorsal and anal fins angular but produced in adults.

D XIII, 20-23. A III, 18-21.  
(voucher: 290 mm SL)

**Chaetodontoplus personifer**

Body and vertical fins dark brown to blackish. Broad pale blue or white band from nape to breast; head blue, sometimes with scattered yellow spots; nape and snout yellow; ventral and caudal fins yellow, also margin of pectoral fin. Caudal fin slightly rounded.

D XIII, 17-19. A III, 19.  
(voucher: 215 mm SL)

**Pomacanthus imperator**

Body tan or yellow with many broad blue or mauve bands, rising upwards posteriorly. Broad curved, blue-edged black band through eye, another from lateral line widening ventrally to cover breast and paired fin bases. Snout and cheek pale. Outer third of dorsal fin yellow or orange; caudal fin bright yellow; mauve lines along dark anal fin. Soft dorsal fin angular and produced in adults.

D XIII-XIV, 18-21. A III, 18-21.  
(voucher: 290 mm SL)

**Pomacanthus sexstriatus**

Body and anterior dorsal fin pale yellowish brown. A dark spot on each scale and 5 or 6 dark vertical bands across body. Head dark brown, blue vertical lines over snout and nape, a distinct white or yellow bar behind eye. Blue margin to dorsal fin and blue spots or lines over brown soft dorsal, anal and caudal fins; soft dorsal and soft anal fins angular.

D XIII, 18-20. A III, 18-19.  
(voucher: 360 mm SL)

**PENTACEROTIDAE**

Armourheads -

**Body oblong to elevated and triangular, strongly compressed. Head covered by exposed, rough, striated bones, sometimes with horns; snout prominent, concave before nape. Mouth small with bands of small teeth; sometimes barbels on chin; preoperculum serrated. Body scales small, ctenoid, present also on cheek and temporal region. Single dorsal fin with 4-15 strong spines notched from rayed part or graduating into it; 2-6 strong anal spines; pectoral fin long and pointed; large ventral fin; caudal emarginate.**

**Seven genera in the family, representatives of one collected on the Survey.**

REFERENCE: Heemstra, 2001b.

**Histioporus typus**

Body dusky yellow or grey, crossed by 3 broad brown bands below front part of dorsal fin; ventral fin dark brown (juveniles with large blotches over body and fins). Dorsal fin high, evenly convex, base of spinous part much shorter than soft part, spines graduating into high anterior rays; 3<sup>rd</sup> dorsal spine longest. Body depth 1.3-1.6 in SL, predorsal profile steep; vomer without teeth.

D IV, 23-29. A III, 8-11. Lower GR 14-16.  
(voucher: 240 mm SL)

POMACENTRIDAE



*Abudedefduf bengalensis*



*Abudedefduf vaigiensis*



*Chromis sahalensis*



*Pristotis obtusirostris*

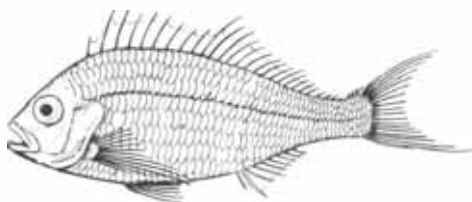
CIRRHITIDAE



*Cirrhitichthys aprinus*



*Cirrhitichthys aureus*



*Cyprinocirrhites polyactis* drawing of preserved specimen



*Paracirrhites forsteri*

## POMACENTRIDAE

Damselfishes - Gemutu; Asan

**Body ovate and compressed. Mouth small, teeth fine. One nostril (rarely 2) on each side of snout. Scales ctenoid, usually extending onto fins. Lateral line in 2 parts: upper ends below soft dorsal fin rays, lower ends on caudal peduncle or is incomplete (to end of dorsal fin rays). One continuous dorsal fin, spinous part with 9-14 spines, longer than rayed part. Anal fin with 2 spines. Caudal fin forked. Brightly coloured small fishes, their usual habitat being coral reefs.**

**A very speciose family comprising 29 genera and more than 400 species; only four species collected on the Survey.**

REFERENCES: Allen, 1991; Allen, 2001; Allen & Swainston, 1988; Allen & Allen, 2021.

### **Abudefduf bengalensis**

Six to 7 narrow vertical black bands across pale body, last one at base of caudal fin. Fins pale. Hind edge of preoperculum smooth. One row of teeth in jaws. Tips of caudal fin lobes rounded.

D XIII, 14-15. A II, 13-15. L. lat. 20-21. Tr above 3-3½.  
(voucher: 150 mm SL)

### **Chromis sahalensis**

Body dusky yellow-pink; bright olive-yellow streak along each caudal fin lobe; axil of pectoral fin black; white spot on upper caudal peduncle behind soft dorsal fin. Upper and lower edge of caudal fin base with 2 small projecting spine-like rays. Eye 2.9-3.5 in HL, body depth 2-2.5 in SL. Soft dorsal and anal fin margins pointed.

D XIII-XIV, 10-12. A II, 9-10. L. lat. 17-19.  
(voucher: 40 mm SL)

### **Abudefduf vaigiensis**

Five broad, vertical black bars across body. Head and back yellowish or fawn; fins pale. Hind edge of preoperculum smooth. One row of teeth in jaws. Tips of caudal fin lobes pointed.

D XIII, 12-13. A II, 11-13. L. lat. 20-21. Tr above 3-3½.  
(voucher: 115 mm SL)

### **Pristotis obtusirostris**

Back dusky olive or fawn, fading to pearly white ventrally. Black spot on upper pectoral fin base and black edge on dorsal fin. Margin of preoperculum and suboperculum serrated; one row of teeth in jaws.

D XIII, 12-13. A II, 12-14. L. lat. 19-20.  
(voucher: 80 mm SL)

## CIRRHITIDAE

Hawkfishes

**Body oblong and compressed. Mouth moderate; fine teeth and row of short canines in jaws. Scales ctenoid or cycloid, extending over cheek and operculum. Dorsal fin single, continuous, with 10 spines and 11-17 soft rays. One or more cirri on dorsal fin membrane near tip of each spine. Anal fin with 5-7 soft rays. Pectoral fin with 14 rays, lower 5-8 rays unbranched, thickened and longer than upper branched rays. Caudal fin rounded to lunate.**

**There are 12 genera in the family, and representatives of three were obtained on the Survey.**

REFERENCES: Allen & Swainston, 1988; Randall, 2001c.

### **Cirrhitichthys aprinus**

About 7 irregular-shaped brown to rosy-red bars on side, 1<sup>st</sup> from beginning of dorsal fin and crossing opercles, last across caudal peduncle near fin base. Bars darken and continue across dorsal fin; dark brown blotches on soft dorsal fin. First ray of soft dorsal fin produced into a filament. Scales on cheek, none on interorbital. Body depth 2.4-2.7 in SL. Lower 6 pectoral fin rays unbranched and thickened.

D X, 12. Lower 6 pectoral fin rays unbranched. L. lat. 41-43. Tr above 3.

(voucher: 66 mm SL)

### **Cyprinocirrhites polyactis**

Body and head orange-yellow above, white below. Caudal fin deeply lunate, both lobes long. Dorsal fin edged brown, and rows of dark brown checks across caudal and anal fins. First ray of soft dorsal fin produced into a short filament. Lower 6 pectoral fin rays unbranched and thicker than rays above them.

D X, 16-17. A III, 6-7. L. lat. 46-49. Tr above 3.  
(voucher: 70 mm SL)

### **Cirrhitichthys aureus**

Body yellow-orange with 4-5 dusky vertical bars on back. First ray of soft dorsal fin produced into a filament. Fins plain yellow. Scales on cheek, none on interorbital. Body depth 2.2-2.5 in SL. Lower 7 (rarely 6) pectoral fin rays unbranched and thickened. Interspinous membrane deeply emarginate.

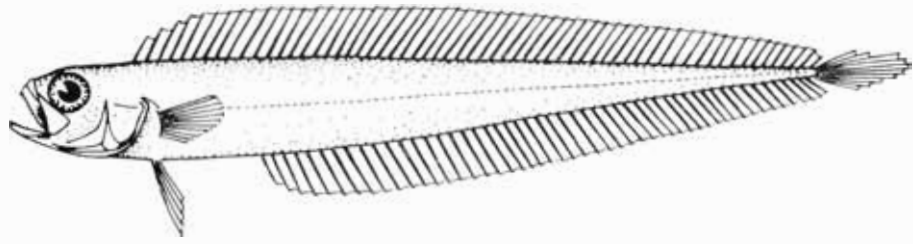
D X, 12. A III, 6. L. lat. 40-44. Tr above 3.  
(voucher: 84 mm SL)

### **Paracirrhites forsteri**

Body red-brown above, pale yellow or white below. Head, pectoral fin base and breast covered with brown or black spots. A broad blackish band on upper sides from below mid-spinous dorsal fin to mid-caudal fin base, yellow band below it. Scales on cheek and before nostrils. Body depth 2.6-2.8 in SL. Lower 7 pectoral fin rays unbranched; single cirrus on each interdorsal membrane.

D X, 11. A III, 6. L. lat. 45-49. Tr above 5.  
(voucher: 115 mm SL)

**CEPOLIDAE**



*Acanthocepola abbreviata*



*Acanthocepola krusensternii*



*Cepola schlegelii*

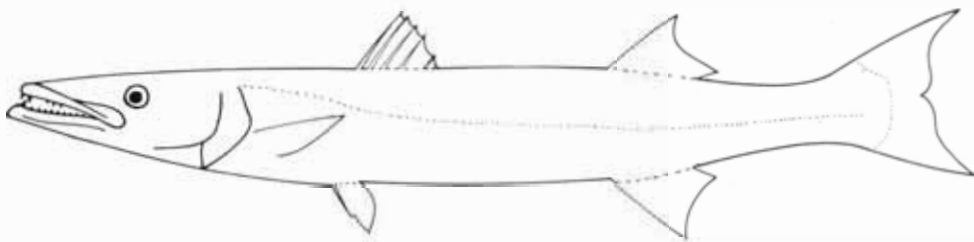


*Owstonia sibogae*



*Owstonia nudibucca*

**SPHYRAENIDAE**



*Sphyraena barracuda*



*Sphyraena flavicauda*



*Sphyraena forsteri*



**CEPOLIDAE**

## Bandfishes -

**Small to medium-sized, compressed fishes, moderately to very elongate body tapering to tail. Head short, snout blunt; mouth large and oblique, teeth slender; maxilla broad posteriorly. Scales cycloid or with crenulate margins; lateral line high on body, close to dorsal fin base. Dorsal and anal fins long and continuous, sometimes united with caudal fin; dorsal with none to 4 flexible spines and 21-89 rays; anal fin with no to 1 spine, 13-102 rays; ventral fin with one spine and 5 rays, first ray sometimes unbranched; caudal fin moderately long and pointed.**

**Three of the four recognised genera were collected on the Survey, falling into two groups:**

- Cepola* and *Acanthocephala*** - dorsal and anal fins joined to caudal fin; scales very small.  
***Owstonia*** - caudal fin separate; scales moderately-large.

REFERENCES: Smith-Vaniz, 2001b; Smith-Vaniz & Johnson, 2016.

***Acanthocephala abbreviata***

Body silvery red, head and belly paler; orange cross bands sometimes present on sides; fins brilliant dark red. Dark stripe in premaxillary groove and narrow black edge on caudal and anal fins. Strong spine on angle of preoperculum, 3 or 4 along lower limb; cheeks scaly. HL 6.5-8.4 in SL, eye 2.7-3.5 in HL. Scales slightly increase in size posteriorly; middle caudal fin rays branched.  
 D 68-74. A 72-75, GR 18 + 30-32.  
 (voucher: 293 mm SL)

***Cepola schlegelii***

Head and body deep red or rosy, white on lower head and belly; fin membranes greenish yellow, faintly rosy, rays reddish; black premaxillary groove. Preoperculum margin smooth, without spines. HL 9-11 in SL; central caudal fin rays filamentous. Scales very small.  
 D III, 65. A 62. Total GR about 54.  
 (voucher: 410 mm SL)

***Owstonia nudibucca***

Body and fins plain dark red; usually 3 dark brown patches over anterior dorsal fin membrane; black premaxillary groove. Lateral line of each side united across nape, line ending at last dorsal fin ray. Scales cycloid, moderately small; no scales on cheeks, some on upper operculum. Caudal fin lanceolate. HL 3.2-4 in SL; body depth 4.4-5.8 in SL.  
 D III, 20-21. A II, 14. 38-42 oblique scale rows between head and tail base.  
 (voucher: 146 mm SL)

***Acanthocephala krusensternii***

Bright rosy or silvery orange-red body, head and belly paler; fins red, narrow black edge on caudal and anal fins; dark line in premaxillary groove. Preoperculum with strong spine at angle, 4 to 8 along lower limb; cheeks scaly. HL 8-10.4 in SL; eye 2.9-3 in HL. Scales increase noticeably in size posteriorly; caudal fin rays segmented [not branched].  
 D 80-92. A 78-92. GR 15-16 + 24-27.  
 (voucher: 185 mm SL)

***Owstonia sibogae***

Body rosy with areas of pale yellow, maxilla, side of head and pectoral base iridescent; premaxillary groove black. Fins greenish yellow, dorsal and anal fins iridescent violet. Lateral line arched from its origin to dorsal base, not united before fin with line of other side and continues along fin base to last ray. Scales large and thin, margin crenulate; cheek scale rows 3. Caudal fin lanceolate, its middle ray extended. HL 3.8-5.2 in SL; body depth 3.9-6.4 in SL.  
 D IV, 23-24. A II, 15-17. 27-30 oblique scale rows between head and tail base.  
 (voucher: 98 mm SL)

**SPHYRAENIDAE**

## Barracudas; Seapikes - Senuk; Alu-alu; Tancak

**Moderate to large-sized fishes, carnivorous and fast-swimming. Body elongate, slightly compressed or sub-cylindrical. Mouth large, lower jaw longer. Teeth strong and fang-like, of unequal size. Gill rakers few or absent. Scales small and cycloid; lateral line nearly straight and well-developed. Two well-separated dorsal fins, first with 5 spines. Anal fin opposite second dorsal fin. Caudal fin forked.**

**Six of the 15 species in the single genus were collected on the Survey.**

REFERENCES: Morishita & Motomura, 2020; Morishita, Miki, Wada, Itou & Motomura, 2020; Senou, 2001; Doiuchi & Nakabo, 2005.

***Sphyraena barracuda***

Blue-grey on back, lower sides silvery, short oblique bars on upper sides, several diffuse dark blotches on lower sides, especially posteriorly. Fins dusky yellow, tips of second dorsal, anal and caudal fins white especially apparent on black caudal fin. Preopercular edge rounded. No gill rakers, first gill arch almost smooth.  
 D V; I, 9. A II, 7-8. P 13-14. L. lat. 75-90.  
 (voucher: ? mm SL)

***Sphyraena forsteri***

Body plain, back olive brown, sometimes marbled with brown; lower sides silvery white. Fins yellow, outer half of second dorsal, anal and caudal fins brown. Axil of pectoral fin dark brown; dark blotch underneath pectoral fin base. Preopercular edge rounded. No gill rakers but lower gill arch with spiny tubercles or platelets. Eye very large.  
 D V; I, 8-9. A II, 8-9. P 14-15. L. lat. 110-133  
 (voucher: 330 mm SL)

***Sphyraena flavicauda***

Dusky green above, silvery below; sometimes longitudinal brown stripes present on sides. Fins pale yellow, caudal fin margin dark brown. Preopercular edge rectangular. Two or 3 gill rakers on first gill arch. Pectoral fin does not reach to opposite first dorsal fin origin; first dorsal fin begins behind level of ventral fin origin.  
 D V; I, 8-9. A II, 8-9. P 13-15. L. lat. 80-90.  
 (voucher: 185 mm SL)

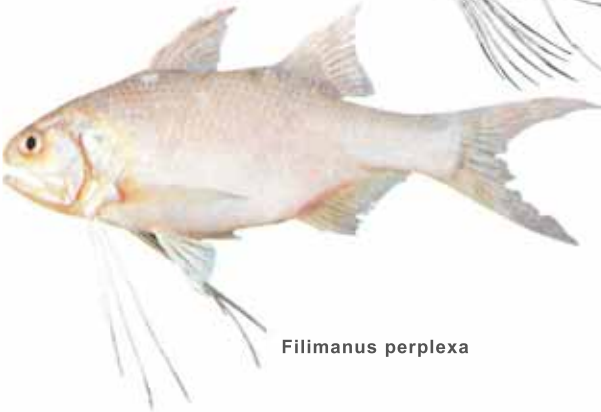
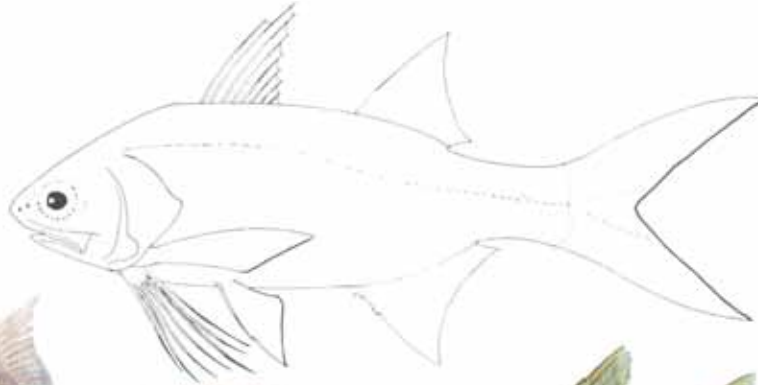


*Sphyraena pinguis*



*Sphyraena putnamae*

**POLYNEMIDAE**



*Filimanus perplexa*



*Polydactylus microstomus*



*Polydactylus multiradiatus*



*Polydactylus nigripinnis*



*Polydactylus plebeius*



*Polydactylus sextarius*



*Filimanus xanthonema*

**Sphyraena pinguis**

Olive-brown above, silvery white below. Two dusky yellow stripes along mid-sides from head to tail base. Fins yellow or pale, second dorsal, anal and caudal fins edged brown. Preopercular edge rectangular. Two or 3 gill rakers on first gill arch. Pectoral fin reaches past vertical from first dorsal fin origin; first dorsal fin begins behind level of ventral fin origin.

D V; I, 9. A II, 7-8. P 13-15. L. lat. 80-90.  
(voucher: 195 mm SL)

**Sphyraena putnamae**

Dark blue to brown above, silvery blue below; mid-sides with row of about 15 dark crescentic vertical bars. Dorsal and anal fins yellow, pectoral and caudal fins dark brown or black. Preopercular edge obliquely rounded. No gill rakers, first gill arch almost smooth. First dorsal fin begins behind level of ventral fin origin; last dorsal ray longer than penultimate ray; caudal fin forked.

D V; I, 9. A II, 8-9. P 12-15. L. lat. 125-135.  
(voucher: 235 mm SL)

**POLYNEMIDAE**

Threadfins - Kurau; Laos; Sumbal

**Moderate-sized fishes. Body oblong and compressed. Snout blunt and conical, projecting beyond large mouth; small, fine teeth in jaws and on palatines, sometimes on vomer; eye with thick adipose tissue. Scales ctenoid and large, extending over head and median fins; lateral line continued onto caudal fin. Two widely separated dorsal fins, the first with 7 or 8 weak spines; anal fin with 2 or 3 spines; pectoral fin base either mid-lateral or low on sides, fin divided into two parts: upper normal, lower with 3 or more free filamentous rays; ventral fin abdominal; caudal fin deeply forked.**

**Representatives of two of the eight known genera were obtained on the Survey.**

REFERENCES: Feltes, 1991; Feltes, 2001; Motomura & Iwatsuki, 2001; Motomura, Iwatsuki & Yoshino, 2001.

**Filimanus perplexa**

Fawn above; fins dusky, pectoral fin pale. Unpaired fins brown or black, pectoral fin filaments black. Snout projects only slightly beyond oblique mouth; premaxillary tooth bands well-separated at symphysis. Pectoral fin and its filaments long, filaments extending onto caudal fin.

Pectoral fin with 7 filaments. Body depth 2.9-3.3 in SL.  
D VIII; I, 10-11. A III, 13-15. L. lat. 49-51.  
(voucher: 110 mm SL)

**Polydactylus microstomus**

Dusky yellow, oblong black blotch over beginning of lateral lines; pectoral fin dusky yellow. Distance between spinous and rayed dorsal fins less than HL. Almost all pectoral fin rays branched, free rays not reaching past ventral fins. Pectoral fin with 5 filaments.

D VIII; I, 12-13. A II-III, 12-14. L. lat. 42-50.  
(voucher: 158 mm SL)

**Polydactylus multiradiatus**

Body golden-yellow, yellowish fins finely dotted black, pectoral fin black in centre, at least. Free pectoral fin rays do not reach past anal fin origin; nearly all pectoral fin rays unbranched; pectoral fin with 6 or 7 filaments. Anal fin base length greater than length of caudal peduncle.

D VIII; I, 13-15. A III, 14-18. Total GR 28-32. L. lat. 52-59.  
(voucher: 115 mm SL)

**Polydactylus nigripinnis**

Golden, fine black dots over head, back and most fins; pectoral fin black. Posterior margin of preoperculum entire and covered by scales; free pectoral fin rays reach end of ventral fin; pectoral fin long, nearly to anal fin origin, its rays unbranched. Pectoral fin with 6 filaments.

D VIII; I, 12-14. A III, 13. Total GR 25-27. L. lat. 45-51

**Polydactylus plebeius**

Golden olive, white below, scale rows on back with narrow brown stripes; fins dusky. Pectoral fin rays unbranched, free filaments reaching end of ventral fin. Eye large, 3.5 to more than 5 in HL. Pectoral fin with 5 filaments.

D VIII; I, 13-14. A II-III, 11-12. P 14-18. Total GR 19-28. L. lat. 59-67.  
(voucher: 172 mm SL)

**Polydactylus sextarius**

Olive-yellow above, oblong black blotch over beginning of lateral line; fins dusky orange. Free pectoral fin rays extend nearly to end of ventral fins, pectoral fin rays nearly all branched. Pectoral fin with 6 filaments.

D VIII; I, 12-14. A II-III, 12-13. L. lat. 42-50.

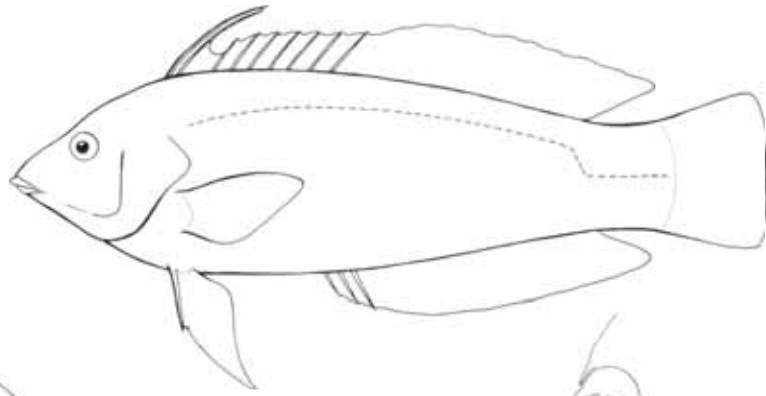
**Filimanus xanthonema**

Plain dusky yellow, silvery below; fins yellow, finely dotted black on edges and black over most of pectoral fin. Snout prominent; premaxillary tooth bands well-separated at symphysis. Pectoral fin rays unbranched, free pectoral fin rays extending to about anal fin origin. Pectoral fin with 6 filaments. Body depth 2.8-3.7 in SL.

D VIII; I, 11-12. A III, 10-12. L. lat. 43-52.  
(voucher: 135 mm SL)



LABRIDAE



Examples of dentition



*Anampses lennardi*



*Bodianus bilunulatus*



*Oxycheilinus bimaculatus*



*Bodianus solatus*



*Cheilinus trilobatus*



*Oxycheilinus orientalis*



*Cheilio inermis*



*Choerodon anchorago*

## LABRIDAE

Wrasses - Lamboso; Gigi anjing; Koja; Kenari; Nuri-nuri

**Elongate oval and compressed fishes, occasionally elongate and cylindrical. Mouth protrusible; jaw teeth mostly separate from each other, teeth usually jutting outwards; pharyngeal teeth often present. Scales small or large, cycloid; lateral line either continuous, often bent downwards abruptly below posterior dorsal rays or interrupted, 2<sup>nd</sup> section along mid-height of caudal peduncle; cheek either naked, partly or well-scaled; preopercular margin smooth to serrate. Single dorsal fin, first part with 8-21 spines; anal fin with 4-6 spines; caudal fin rounded, truncate, emarginate or lunate. This family is characterised by its members being various in size, shape and colour. Most species change color and sex with growth, and females are able to change sex.**

**A large family of colourful fishes with 70 genera of which members of 36 were collected on the Survey.**

REFERENCES: Allen, Erdmann & Yusmalinda, 2016; Allen & Swainston, 1988; Fukui, 2018; Gomon, 1987; Gomon, 2006; Gomon, 2017; Parenti & Randall, 2011; Randall, 1996a; Randall, 1999; Randall, 2013a; Randall, 2013b; Randall, 2000; Randall & Yamakawa, 1988; Russell, 1985; Tea, Frable & Gill, 2018; Westneat, 2001.

### **Anampses lennardi**

Blue with wavy longitudinal bright yellow bands arranged irregularly over head and body (female) or pale yellow only on scale edges, large purplish area over anterior half of body (male); caudal fin either blue with yellow streaks (male) or bright yellow with blue margins (female); black spot on base of mid-dorsal fin (male). Two prominent flattened teeth at front of each jaw, horizontal and turned forward to form lateral cutting edge; head naked. Lateral line continuous; body depth 2.6-2.8 in SL.

D IX, 12. L. lat. 27-28. Total GR 19-21.

(voucher: 175 mm SL)

### **Bodianus solatus**

Body orange-red, many yellow spots on crimson head and most of body. Broad vertical yellow band from above tip of pectoral fin onto base of dorsal fin, followed by large dark brown or black patch; Spinous portion of dorsal fin charcoal, other fins golden or orangey, caudal fin dark, the upper and lower margins red. Upper lip not covered when mouth closed; scales on cheek, preopercular edge naked; scaly sheath along bases of vertical fins; lateral line continuous; lobes of truncate caudal fin often produced.

D XII, 10-11. L. lat. 33.

(voucher: 180 mm SL)

### **Oxycheilinus orientalis**

Orange-red body and fins, blue wavy lines over head and dark-edged yellow spots scattered over opercles and lower sides; dark spot between first 2 dorsal spines, unpaired fin margins dark red or purple; dusky patch near origin of lateral line. Lateral line interrupted; low scaly sheath along dorsal and anal bases. Fin spines rigid, 3<sup>rd</sup> anal spine longer than 2<sup>nd</sup>. Body depth 3.4-3.8 in SL, less than HL; snout pronounced.

D IX, 10. A III, 8. L. lat. about 23.

(voucher: 99 mm SL)

### **Cheilio inermis**

Green or yellowish body, variable in markings; often dusky or brown over upper half, blackish spots along mid-sides. Body elongate and cylindrical, the depth 5.5-8 in SL; head pointed, row of scales on preoperculum, few on upper operculum. Lateral line continuous.

D IX, 12-13. L. lat. 45-48.

(voucher: 136 mm SL)

### **Bodianus bilunulatus**

Large oval, black blotch below soft portion of dorsal fin and dorsally on caudal peduncle, extending below lateral line; red stripes along junctions of scale rows; head above cream, lower jaw and chin violet red interrupted by 2 broad, cream longitudinal bands. Black spot between first 2 dorsal fin spines. Upper lip not hidden when mouth closed; prominent canines in jaws; scales on cheek, preopercular edge naked. Lateral line continuous. Caudal fin truncate. Scaly sheath along bases of vertical fins.

D XII, 10-11. L. lat. 33-35.

(voucher: 235 mm SL)

### **Oxycheilinus bimaculatus**

Overall rosy orange body, blue lines over head; many blue spots and wavy lines in irregular rows along unpaired fins; small dark brown or dark green blotch behind eye, another larger one behind pectoral fin extending over lateral line. Lateral line interrupted. Scaly sheath along dorsal and anal fin bases. Fin spines rigid, 3<sup>rd</sup> anal spine longer than 2<sup>nd</sup>; upper and middle caudal rays produced into filaments in males. Body depth 2.5-3.2 in SL, less than HL.

D IX, 10-11. A III, 8-9. L. lat. 19 to 22.

### **Cheilinus trilobatus**

Body bluish grey, many red spots and lines over head, pink or reddish vertical lines on body scales, 4 broad diffuse brown bars across back; fins green or blue with rosy spots and lines on dorsal and anal. Lateral line interrupted, lower preoperculum border naked; well-developed scaly sheath along dorsal and anal fin bases.

Fin spines rigid, 3<sup>rd</sup> anal spine longer than 2<sup>nd</sup>. Caudal fin rounded, the lobes produced in males. Body depth 2.3-2.6 in SL, equal to or greater than HL.

D IX, 10-11. A III, 8. L. lat. 20-22.

(voucher: 200 mm SL)

### **Choerodon anchorago**

Dark olive brown or bluish above, pale below; pale saddle over upper caudal peduncle, and a broad cream or orange band over side near pectoral fin; chin and lower jaw white, head above mouth covered with orange dots; pectoral base blackish. Suborbital covers upper lip when mouth closed, scales on cheek small and embedded. Body depth 2.4-2.5 in SL; lateral line continuous.

D XIII, 7. A III, 9. P ii, 13.

(voucher: 211 mm SL)



**Choerodon cephalotes**



**Choerodon monostigma**



**Choerodon robustus**



**Choerodon schoenleinii**



**Choerodon vitta**



**Choerodon zamboangae**



**Choerodon cauteroma**



**Choerodon sugillatum**



**Cirrhilabrus filamentosus**



**Epibulus insidiator**



### **Choerodon cephalotes**

Forehead and snout crossed by alternating purple and orange stripes, teeth blue, many orange spots on side of head, blue lines around eye; body olive-brown with vertical blue lines on scales, sometimes a dusky oblique patch between pectoral and mid-dorsal fin; caudal fin rounded or wedge-shaped, crossed by many wavy blue and yellow lines; dorsal with median dark brown band. Seven to 8 rows of small scales across cheek, 1-3 scales on suboperculum, predorsal scales not reaching eye; suborbital conceals upper lip when mouth closed; numerous pores over upper half of head. Lateral line continuous.

D XIII, 7. A III, 10. P ii, 16-17.

(voucher: 250 mm SL)

### **Choerodon robustus**

Most of head and back dark orange or brown; darker brown or orange band from upper pectoral base to base of last dorsal rays, bordered below on mid-side with a broad oblique white or pale patch on mid-sides; short blue lines through eye, chin blue, distinct blue line along lower opercular margin; blue band along anal fin. Predorsal scales not quite reaching hind border of eye; cheek scaly; suborbital covers lip when mouth closed. Lateral line continuous.

D XII, 8. A III, 10. P ii, 14. 5-8 predorsal scales.

### **Choerodon vitta**

Body dusky olive above, pale pink or violet below; blue patches and yellow lines over head, horizontal orange red band from below eye to caudal fin base where it expands into darker blotch; caudal fin lobes dark yellow or orange. Seven or 8 scale rows across cheek, 1-2 scales on suboperculum; predorsal scales reach to above middle of eye; upper lip covered by suborbital when mouth closed; 2<sup>nd</sup> pair of canine teeth in each jaw curved strongly backwards. Body depth 2.7-2.9 in SL; lateral line continuous. Caudal fin emarginate.

D XIII, 7. A III, 10. P ii, 14-15.

(voucher: ? mm SL)

### **Choerodon cauteroma**

Yellow body, dusky above with violet blue scale centres which run together on caudal peduncle to form 6 or 7 horizontal streaks. Several curved violet and yellow lines pass from eye over head, chin barred blue; dusky streak from snout to lower pectoral base and distinct dusky patch above lateral line below 6<sup>th</sup> dorsal fin spine. Fins yellow with violet markings, dark spot between 1<sup>st</sup> and 3<sup>rd</sup> dorsal spines. Four or 5 rows of scales across cheek, 3-5 scales on suboperculum, predorsal scales do not reach eye. Many pores on upper half of head, suborbital covers upper lip when mouth closed. Lateral line continuous; caudal fin truncate or emarginate.

D XIII, 7. A III, 10. P ii, 14-15.

(voucher: 270 mm SL)

### **Cirrhilabrus filamentosus**

Body rosy shading to violet on lower sides and caudal peduncle; blue-brown bar across pectoral base; caudal fin violet with yellow spots, other fins yellow, tips of filaments and fin margins violet. One row of scales on cheek; preoperculum serrate. Lateral line interrupted. Anterior ventral rays and posterior dorsal fin spines produced, the dorsal filament reaching caudal fin margin.

D XI, 10. L. lat. 26.

(voucher: 74 mm SL)

### **Choerodon monostigma**

Body rosy, cream below; 3-4 faint broad dusky bars across, back, red patch often present just below lateral line origin; 3 purple lines on head around eye, along upper lip, across snout from eye. Unpaired fins pale orange with violet markings, prominent large purplish brown spot over membrane between 11<sup>th</sup> and 13<sup>th</sup> dorsal spines. Four to 6 scale rows across cheek, 3-4 scales on suboperculum; predorsal scales extend forward to above middle of eye; upper lip covered by suborbital when mouth closed; 2<sup>nd</sup> pair of canine teeth in each jaw straight or slightly curved. Body depth 2.3-2.6 in SL; lateral line continuous.

D XIII, 7. A III, 10. P ii, 14.

(voucher: 118 mm SL)

### **Choerodon schoenleinii**

Body olive-green with blue scale centres forming horizontal rows on back; blue lines through eye and over cheek, head pores marked white, underside of head contrastingly yellow or pale orange, teeth blue. A prominent small dark spot on back at base of last dorsal spine. Six-8 scale rows across cheek, 3-5 scales on suboperculum, predorsal scales not reaching eye. Numerous pores over upper half of head, upper lip covered by deep suborbital when mouth closed. Lateral line continuous.

D XIII, 7. A III, 10. P ii, 16-17.

### **Choerodon zamboangae**

Back and top of head to below last dorsal spine brownish red; operculum and pectoral base to upper caudal peduncle scarlet or crimson, rest of body pale violet or pink. Violet lines around eye and along lips; dorsal and anal fins bluish with 1 or 2 yellow bands. Predorsal scales almost reaching eye; 6 scale rows across cheek, upper lip concealed by suborbital when mouth closed. Lateral line continuous; lower pectoral rays not produced; caudal fin truncate.

D XII, 8. A III, 9-10. P ii, 14.

(voucher: 190 mm SL)

### **Choerodon sugillatum**

Olive above, pale below, red band passes from snout through eye to upper caudal peduncle, broad blue bar across pectoral fin base; distinct vertically oval spot above pectoral fin, its anterior part violet, posterior part charcoal. Predorsal scales not reaching eye; 4 or 5 scale rows across cheek; suborbital covers upper lip when mouth closed. Pectoral fin margin concave, lower rays slightly to distinctly longer than rays immediately above them; caudal fin truncate.

D XII, 8. A III, 8-10. P ii, 14-15.

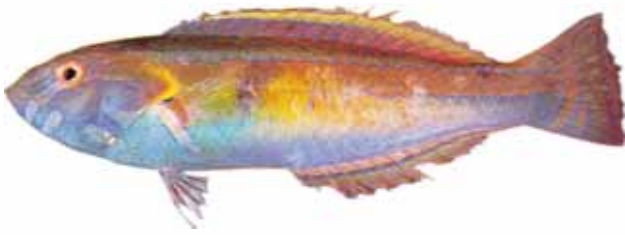
(voucher: 100 mm SL)

### **Epibulus insidiator**

Dark reddish brown, tan or yellowish body and fins. Jaws very protractile, extendable into a tube; very long lower jaw bones reach back behind gill membranes when mouth closed. Lateral line interrupted. Soft dorsal and anal fins angular; tips of truncate caudal fin produced in adults.

D IX, 10-11. A III, 8-9. L. lat. 20-26.

(voucher: 245 mm SL)



*Halichoeres hartzfeldii*



*Halichoeres margaritaceus*



*Halichoeres nebulosus*



*Hemigymnus melapterus*



*Hologymnosus rhodonotus.*



*Labroides dimidiatus*



*Leptojulis cyanopleura*



*Novaculichthys taeniourus*



*Pseudodax moluccanus*



*Pteragogus flagellifer*

**Halichoeres hartzfeldii**

Body blue with curved pale bands over head and a very broad, blue-edged dusky yellow band from eye to caudal fin base; basal half of dorsal and anal fins pinkish, broad yellow band over outer half; no black ocelli on dorsal fin; black spot in pectoral axil. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than other body scales. Two canine teeth at front of each jaw. No basal scale sheath over unpaired fins, anterior dorsal spines shorter than posterior ones.

D IX, 11. P 13. Total GR about 20.

(voucher: 120 mm SL)

**Halichoeres nebulosus**

Back dusky, about 5-6 vertical dusky violet or brown blotches on pale lower side posteriorly; curved yellow or violet brown bands through eye, the 2 most prominent passing over and behind pectoral base; black spot on upper operculum and black ocellus over anterior dorsal rays. Side of head naked, 10-14 suborbital pores; lateral line continuous, bent downwards posteriorly; breast scales smaller than body scales. Two large canine teeth at front of each jaw.

D IX, II. P usually 14. Total GR 17-21.

(voucher: 77 mm SL)

**Hologymnosus rhodonotus**

Upper head and body dark rosy, lower portion bluish white, posterior half of body shading to yellow; snout and cheeks violet, oblong yellow patch each side of chin, yellow streak below eye and iridescent blue-green spot with posterior black margin on opercular flap. Fins shaded blue, violet or pink with contrasting bands and margins, caudal margin white. Body compressed, the depth 3.8-4.5 in SL. No canine teeth at corner of mouth. Scales small, none on cheek; lateral line continuous, bent downwards posteriorly. Dorsal spines flexible; ventral fin 1.9-2.1 in HL; caudal rounded or truncate.

D IX, 12. A III, 12. L. lat. 91-94.

**Leptojulius cyanopleura**

Dusky blue above, pale below, 2 horizontal yellow bands over head: upper broader, passing through eye to caudal fin base, continuing over fin to margin; lower band often replaced by brown (initial phase) or broken yellow, appearing as spots on midlateral scales. Band of yellow spots along dorsal fin base; oblique yellow bands on upper and lower caudal lobes. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than scales on sides. Four large canines at front of each jaw, 2<sup>nd</sup> pair curved backwards (at least in adults). Body depth 4-4.55 in SL; ventral fin 2-2.5 in HL.

D IX, 11. A III, II. Total GR 19-22.

(voucher: ? mm SL)

**Pseudodax moluccanus**

Brilliant crimson, shaded with blue or purple over sides of head and body and with reddish brown spot on each scale; black spot on upper pectoral base; caudal fin dark blue, its base crossed by broad cream band. Lips thick; each jaw with protruding anterior pair of large curved, flattened teeth followed along sides by cutting plate of fused, sharp teeth. Cheek scaled, preopercular margin smooth or crenulate; lateral line continuous.

D XI, 12. A III, 14. L. lat. 31-32.

(voucher: 125 mm SL)

**Halichoeres margaritaceus**

Dusky green, paler below; 2 distinct brown bands from snout, upper branching behind eye and running along dorsal fin base, lower broader, passing through eye along mid-side to caudal fin base; one or 2 black ocelli often present on spinous portion of dorsal fin. Side of head naked; lateral line continuous, bent downwards posteriorly; breast scales smaller than other body scales.

Two canine teeth at front of each jaw. No basal scale sheath over unpaired fins, anterior dorsal spines longer than posterior ones.

D IX, 12. P 13-14. Total GR about 20.

(voucher: 35 mm SL)

**Hemigymnus melapterus**

Bluish green body, darker blue or brownish over posterior half; pale blue and violet lines and spots around eye, over operculum and over ventral and unpaired fins. Brown margin and pale blue sub-marginal band on dorsal and anal fins. Lips very thick and fleshy, the lower bilobate; pair of large horizontal canine teeth at front of each jaw; band of small, partly embedded scales on cheek. Lateral line continuous, bent downwards posteriorly.

D IX, 10-11. Lower GR 19-21.

(voucher: 300 mm SL)

**Labroides dimidiatus**

Usually pale or dark blue with black midlateral band, narrower over head, becoming very broad posteriorly and covering most of caudal fin. Mouth small; lower lip bilobed the 2 thickened half lips separated by deep median "U" - shaped notch. Side of head scaly, nape naked. Body compressed and slender, depth 3.5-4.4 in SL; lateral line continuous, abruptly curved posteriorly.

D IX, 11-12. L. lat. 48-52.

(voucher: 92 mm SL)

**Novaculichthys taeniourus**

Head cream with 4 brown lines radiating from eye, body olive or brown, scale centres white; unpaired fins olive, barred brown; white or yellow bar across base of dark caudal fin. Head naked except for few rudimentary scales near eye; head profile not steep. Body compressed, the depth 2.8-3.2 in SL. Lateral line interrupted. First 2 dorsal spines flexible, remainder strong, membrane between all spines connected near tips.

D IX, 12-13. A III, 12-14. P(total) 13.

(voucher: 69 mm SL)

**Pteragogus flagellifer**

Dusky reddish, often with greenish spots along lower sides and violet shading; cheek crossed by vertical red band from eye and wavy green lines; usually brown blotches along bases of unpaired fins. Large scales on opercles, preopercular margin serrate; nape humped or convex (male). Lateral line continuous, bent downwards posteriorly. Membrane between anterior dorsal spines produced into filaments (sometimes long in males).

D IX, 11. L. lat. 22-25. Total GR 11.

(voucher: 90 mm SL)



*Stethojulis interrupta*



*Choerodon typus*



*Iniistius dea*



*Iniistius opalus*



*Iniistius pavo*

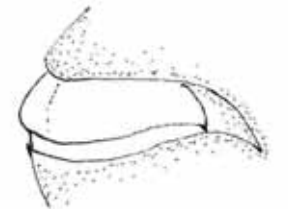
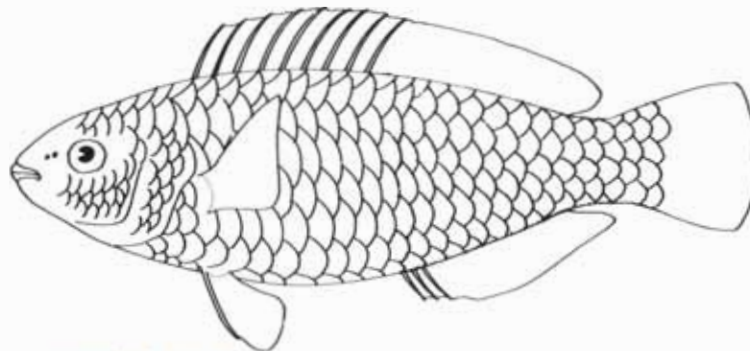


*Iniistius pentadactylus*

### SCARIDAE



*Calotomus dentition*



*Scarus dentition*



*Calotomus spinidens*



*Leptoscarus vaigiensis*



**Stethojulis interrupta**

Olive brown above, paler below, dark line from snout through eye to caudal fin base; brown spot on each scale on lower side forming rows (females) or 4 blue lines on body (1<sup>st</sup> below dorsal base) (males). No canine teeth anteriorly in jaws. Head naked; lateral line continuous, bent downwards posteriorly; scales on breast as large as those on sides. Body depth 3.9-4.4 in SL. D IX, 11. P ii, 12-13. Total GR usually 21-22. (voucher: 52 mm SL)

**Iniistius dea**

Head and body dusky red; a median bright blue line from chin to dorsal origin; blue-edged black spot above 6<sup>th</sup> or 7<sup>th</sup> lateral line scale. Head sharply keeled, distinct shallow groove across cheek from mouth; a few small scales near eye. Body compressed; lateral line interrupted. First 2 dorsal spines flexible, almost separated from the following shorter, stronger spines. D II + VII, 12. A III, 11-12. L. lat. 25-27. (voucher: 180 mm SL)

**Iniistius pavo**

Pale bluish or olive red body, crossed by 3 broad indistinct dusky bars, large white or cream patch near pectoral fin; white-edged black spot above 7<sup>th</sup> or 8<sup>th</sup> lateral line scale. Blue submarginal line along unpaired fins, 2 black spots may be present on soft dorsal. Head sharply keeled, naked but for few small scales near eye. Body compressed, lateral line interrupted. First 2 dorsal spines flexible, separated from following shorter, stronger spines. D II + VII, 12-13. A III, 12-13. L. lat. 25-27. (voucher: 220 mm SL)

**Choerodon typus**

Body dusky green with a pale blue margin of each scale forming many oblique wavy lines across body; yellow markings on head, 2 brown-edged blue lines on snout, blue line from mouth to beyond lateral line origin. Fins green or yellow, anal and caudal fins crossed by many slightly wavy, oblique, pale blue lines. Thin, compressed upper lip covered by suborbital when mouth closed. Body slender; lateral line continuous. No scales over bases of dorsal and anal fins, posterior rays of each produced and longer than adjacent rays; posterior edge of pectoral fin not produced. D XII, 7-8. A III, 10. L. lat. 27. (voucher: 103 mm SL)

**Iniistius opalus**

Upper two-thirds of body olive or green, lower third pinkish; distinct patch of purple or red spots on operculum, blue scribbles on chin, rosy area around eye; about 2 rows of purplish red spots along lower side between pectoral fin and caudal base. Fins greenish blue. Head keeled, 32.9-36% SL; band of small scales on cheek. Body compressed, its depth 33.5-39.2% SL; lateral line interrupted. First 2 dorsal spines separated from the remainder of fin, all spines equally long. D II + VII, 12. A III, (11)12 (13). L. lat. 22-25. Tr below 9 (10).

**Iniistius pentadactylus**

Black blotch on olive body near pectoral fin tip, followed below by large reddish patch; about 5 red spots along anterior lateral line scales; median red or bright blue line from chin to dorsal fin origin. Head keeled, about 8 rows of small scales across cheek to level of corner of mouth. Body compressed, lateral line interrupted. First 2 dorsal spines flexible, removed from following shorter, stronger spines but connected to them by low membrane. D II + VII, 12. A III, 12-13. L. lat. 25-26. (voucher: 76 mm SL)

**SCARIDAE**

## Parrotfishes - Kakatua

**Elongate-oval and compressed fishes. Mouth fixed and blunt, "beak-like" teeth in each jaw either fused completely into solid hard plate, having a median division partly fused with some teeth free, or fused together but individual and clearly marked; canine-like teeth may be present posteriorly; pavement-like teeth on pharyngeal bones. Gill membranes broadly attached to throat. Scales very large, cycloid; lateral line interrupted or bent downwards below posterior dorsal fin; 1-4 rows of scales on cheek below eye; often strands of mucus over body. Dorsal fin single, with 9 spines and 10 rays; anal fin with 3 spines and 9 rays; caudal fin rounded to slightly emarginate. The normally bright colours of these fishes usually change with age and sex.**

**Family comprises 10 genera and 100 species; three genera represented in the Survey material.**

**Scarus:** Two to 4 rows of cheek scales below eye  
**Calotomus, Leptoscarus:** One row of cheek scales below eye.

REFERENCES: Allen & Swainston, 1988; Bellwood, 2001; Bruce & Randall, 1985.

**Calotomus spinidens**

Conical or flattened teeth in upper jaw, in one row at front of bony ridge and in irregular row of one to several inside bony ridge; some teeth canine-like and curving outward in larger fish. HL 2.9-3 in SL; body depth 2.9-3.1 in SL. Dusky blue violet above, paler below, few scattered yellow spots on back, orange spots on each scale on lower sides, many small black spots above pectoral fin base; black blotch over anterior dorsal spines basally. L. lat. 23. Four predorsal scales. (voucher: 98 mm SL)

**Leptoscarus vaigiensis**

Teeth small, fused into dental plates, individual rows apparent on lower jaw plate, few projecting canine teeth in upper jaw (males). HL 2.6-3.4 in SL; body depth 2.8-3.8 in SL. Green body, dusky above, mottled pattern of dark brown and yellow scales on sides. L. lat. 17-18 + 7-8. Three-4 predorsal scales. (voucher: 210 mm SL)

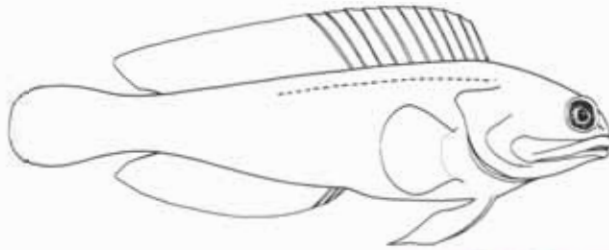


*Scarus rivulatus*



*Scarus ghobban*

**OPISTOGNATHIDAE**

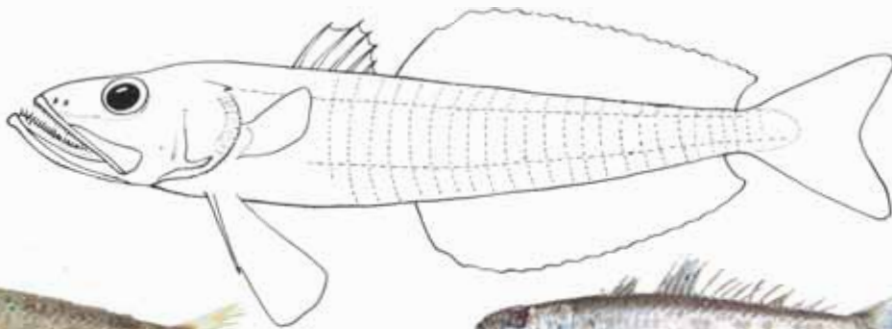


*Opistognathus castelnaui*



*Opistognathus latitabundus*

**CHAMPSODONTIDAE**



*Champsodon nudivittis*



*Champsodon atridorsalis*



*Champsodon vorax*



*Champsodon longipinnis*

**Scarus rivulatus**

Body mostly blue or green; red and dark green lines forming network over head anteriorly, reddish patch over side of head; teeth white. Edge of dorsal and anal fins blue or green; submarginal orange band and broad median green band on dorsal fin, base reddish brown. Pectoral and ventral fins edged blue, followed by red streak over first rays. Usually 3 (sometimes 2) scale rows on cheek. P ii, 12. Six-7 predorsal scales. Total GR about 28. (voucher: 265 mm SL)

**Scarus ghobban**

Background colour pinkish orange, blue marks on scale centres often forming 5 vertical bars over back and upper sides; head mostly orangey pink, with blue wavy lines around mouth and through eye, blue spots sometimes on cheek. Unpaired fins pinkish with blue margins, narrow on dorsal and anal; blue band along anal fin base; upper pectoral fin rays blue, base orange. Three scale rows on cheek. P ii, 13 (rarely ii, 12). Five-6 predorsal scales. Total GR 43-48.

**OPISTOGNATHIDAE**

Jawfishes -

**Oblong-elongate fishes with tapering body. Head large and blunt; mouth very large and protractile; broad maxilla exposed and sometimes produced posteriorly; jaw teeth coarse, sharp and curved, no teeth on palatine; eye well forward on head. Scales small and cycloid, none on head; lateral line high on body, ending below middle of dorsal fin. Single, continuous dorsal fin with 9-12 weak spines begins just behind head; anal fin with 2 spines; pectoral fin rounded, its base vertical and situated behind ventral fin base; caudal fin rounded.**

**Four genera in the family; representative of one caught on the Survey.**

REFERENCES: Smith-Vaniz, 2001a; Smith-Vaniz, 2004.

**Opistognathus castelnaui**

Maxilla long, turned upward posteriorly, reaching beyond operculum margin; several rows of teeth anteriorly in jaws. Body depth 5.3-6 in SL. Brown body, fins with darker shadings, 2 irregular dark bands along middle of sides, 8 large dark blotches along basal third of dorsal fin. Hind margin of maxilla white. D XI, 14. P 16. About 130 scale rows between head and tail base. (voucher: 180 mm SL)

**Opistognathus latitabundus**

Maxilla truncate posteriorly, not reaching preopercular margin; one or 2 rows of teeth anteriorly in jaws; body depth about 3.1 in SL. Body rosy brown above, head dark, undersides cream; 6 large pale-ringed black blotches along back, 5 more blotches along basal third of dorsal fin; unpaired fins dark grey, dorsal fin cream above blotches, margin dark brown. Mouth cavity, operculum and maxillary groove black. D XII, 18. P 20-21. GR 23-24. About 80 scale rows between head and tail base. (voucher: 195 mm SL)

**CHAMPSODONTIDAE**

Gapers, Sabre gills -

**Small fishes with elongate, slightly compressed bodies. Mouth very large, oblique, lower jaw prominent; jaw teeth fine, some longer and depressible; eye high on head, usually with a short cirrus; angle of preoperculum ends in a long slender spine; gill openings wide. Scales small, ctenoid and granular; 2 indistinct lateral lines with transverse branches. Two well-separated dorsal fins, first with 4-5 spines, second dorsal and anal fins long-based, each with 16-20 rays; anal fin with one spine, 17-20 rays; pectoral fin small; ventral fin large, its origin before pectoral fin base; caudal fin forked.**

**Family comprises a single genus and 13 species; four obtained on the Survey.**

REFERENCES: Nemeth, 1994; Nemeth, 2001.

**Champsodon nudivittis**

Outer part of first dorsal and caudal fins stippled brown; dusky base on caudal fin. Double notch at front of premaxilla; maxilla extends well past eye; eye 4.8-5.2 in HL. Chin and breast naked; ventral margin of pupil indented. D V; 19-20. A 17-18. Lower GR 9-10. (voucher: 68 mm SL)

**Champsodon vorax**

Outer part of first dorsal and caudal fin lobes faintly dusky; chin, back and caudal fin base brown. Premaxilla evenly curved at symphysis (not notched); maxilla ends opposite hind margin of eye. Patch of scales on breast; ventral fin does not reach anus. D V; 21. A 19. Lower GR 11-12. (voucher: 115 mm SL)

**Champsodon atridorsalis**

Body with blotches mid-laterally and dusky blotch at tail base; outer third of spinous dorsal fin black. Double notch at front of premaxilla; maxilla extends well past eye; eye 4.2-5 in SL. Patch of scales on breast; ventral margin of pupil indented. Ventral fin does not reach anus. D V; 20. A 18. Lower GR 9-10. (voucher: 69 mm SL)

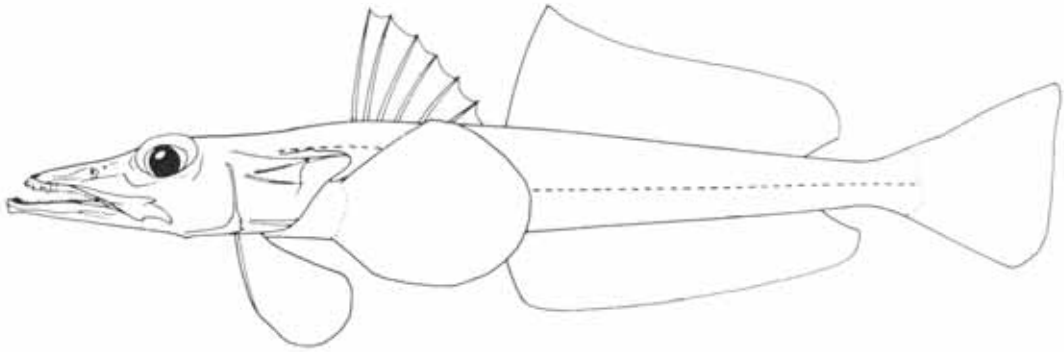
**Champsodon longipinnis**

Outer part of first dorsal and upper caudal fin lobe black; dark patch at base of caudal fin. Shallow double notch at front of premaxilla. Belly and sides scaled; ventral fin reaches anus. D V; 21-22. A 18-19. P 14-16. Lower GR 11-13. (voucher: 112 mm SL)

**\* CHIASMODONTIDAE**

(See Species List)

### BEMBROPIDAE



*Bembrops platyrhynchus*



*Bembrops curvatura*



*Bembrops filiferus*



*Bembrops philippinus*



*Chrionema chlorotaenia*

### PINGUIPEDIDAE



*Parapercis alboguttata*



*Ryukyuperis gushikeni*



*Parapercis muronis*



## BEMBROPIDAE

Duckbill flatheads -

Body elongate and head moderately depressed. Mouth large, lower jaw projecting past upper jaw. Eyes large and interorbital space narrow. Operculum with 2 spines. Spinous dorsal fin separated from soft dorsal fin, with 2-6 or 8-9 spines; 13-23 elements in soft dorsal fin. Ventral fin inserted well before pectoral fin base. Anal fin with 15-29 soft rays. Caudal fin rounded to emarginate. Anterior lateral line scales with prominent ridge on each scale.

Two genera in the family, representatives of which were collected on this Survey: *Bembrops*, with a flap of skin on end of the maxilla, and *Chrionema*, lacking a skin flap on the maxilla.

REFERENCES: Nelson, 2001; Banon, Garabana, Armesto & Munoz, 2001.

### *Bembrops platyrhynchus*

First dorsal fin spine not filamentous; lateral line descends gradually; eye about equal to snout. Scales on back edged dark brown forming a network pattern; first dorsal fin not black anteriorly.

D<sub>2</sub> 14-15. P 25-27. L. lat. 54-58.  
(voucher: 211 mm SL)

### *Bembrops filiferus*

Maxilla with tentacle on its posterior margin. First dorsal fin with short filament; lateral line descends gradually; eye 1.5 in snout length. Nine to 13 dark patches along lower sides; filament and first spines of spinous dorsal fin black; black spot on upper base of caudal fin.

D VI; 14-15. P 25-27. L. lat. 61-69.  
(voucher: 188 mm SL)

### *Chrionema chlorotaenia*

Hind margin of maxilla truncate and lacking a tentacle; scales on snout reach only to just before eye. Tooth band in upper jaw wholly black; yellow spots before eyes and on operculum; yellow bars across body.

D VI; 15-16. A 26. P 22-24. L. lat. 75-82.  
(voucher: 164 mm SL)

### *Bembrops curvatura*

Maxilla with tentacle on its posterior margin. First dorsal spine not filamentous; lateral line abruptly descends at level of pectoral fin; eye about equal to snout. Dusky green above, lower sides yellow with dusky blotches; peritoneum fawn with scattered black dots. Spinous dorsal membrane black, black spot on upper base of caudal fin.

D<sub>2</sub> 13-14. P 24-25. L. lat. 43-46.  
(voucher: 93 mm SL)

### *Bembrops philippinus*

Maxilla with tentacle on its posterior margin. First dorsal spine with filament; lateral line descends gradually; eye slightly less than snout length. Four to 8 blotches along lower sides; distinct black markings on first dorsal fin; black ocellus on upper base of caudal fin.

D<sub>2</sub> 14-15. P 26-27. L. lat. 54-57.  
(voucher: 93 mm SL)

## \* HEMEROCOETIDAE

(See Species List)

## PINGUIPEDIDAE

Grubfishes -

Body elongate and nearly cylindrical. Mouth slightly oblique, lips thickened; sometimes an outer row of enlarged canine teeth at front of lower jaw. Eyes large, ovate and near top of head; operculum with one or 2 spines. Body and most of head scaled; lateral line almost straight. Dorsal fin with short spined section of 2-8 spines usually notched from long rayed section of 18-28 rays; anal fin long-based; ventral fin begins below or slightly before broad-based and rounded pectoral fin; caudal fin rounded, truncate or with one or both lobes produced.

Family comprises seven genera and 93 species; eight representatives of two genera were obtained on the Survey.

REFERENCES: Imamura & Yoshino, 2007; Johnson & Motomura, 2017; Johnson & Worthington-Wilmer, 2018; Randall, 2001d.

### *Parapercis alboguttata*

Lower half of body with alternately narrow and broad pinkish red bars over white background. Caudal and soft dorsal fins checked yellow and black; charcoal patch on upper caudal fin base. No palatine teeth; 6 canines in lower jaw; middle dorsal fin spine longest.

D V, 22. P 17-19. A 19. Total GR 19-23.  
(voucher: ? mm SL)

### *Parapercis muronis*

Five distinct orange-brown bars across upper half of body, a paler bar across nape, short bar or spot at upper caudal fin base. Four to 5 vertical bands across caudal fin. Palatine teeth present; 8 canines in front of lower jaw; posterior dorsal spines longest.

D V, 23-24. P 19-21. Total GR 11-15. L. lat. 53-58.  
(voucher: 92 mm SL)

### *Ryukyupercis gushikeni*

Six to 9 brown lines along upper half of body. Many rays of soft dorsal and pectoral fins produced into filaments and upper caudal fin tip produced. No iris lappet.

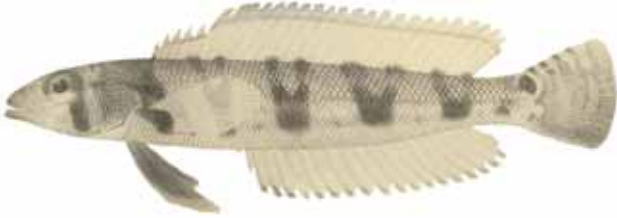
D VI, 20. P 23-24. Total GR 16-17.  
(voucher: 200 mm SL)



*Parapercis striolata*



*Parapercis nebulosa*

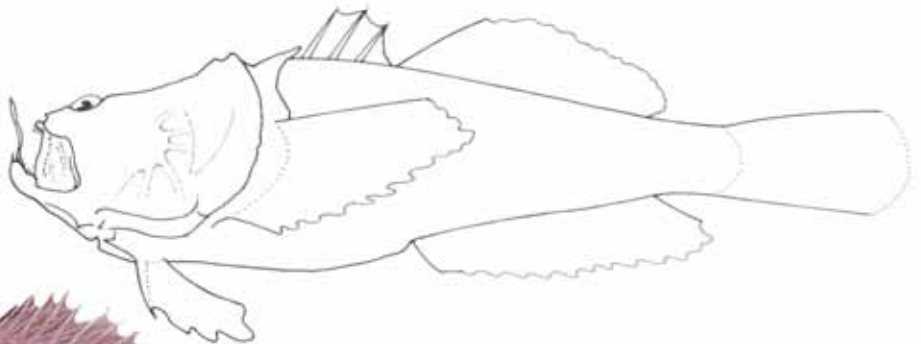


*Parapercis sexfasciata* Tanaka, 1912



*Parapercis compressa*

### URANOSCOPIDAE



*Xenocephalus australiensis*



*Ichthyscopus insperatus*



*Ichthyscopus fasciatus*



*Uranoscopus bicinctus*



*Uranoscopus cognatus*



*Uranoscopus kaianus*

**Parapercis striolata**

Staggered ("zig-zag") dark brown lines along upper half of body; snout and pectoral fin bright yellow; most of spinous dorsal fin black; 5-8 fine black bars on upper half of caudal fin. Palatine teeth present, 6 canines at front of lower jaw. D V, 23. P 18-19. Total GR 11-18. L. lat. 64. (voucher: 130 mm SL)

**Parapercis sexfasciata**

Four to five large "V" -shaped dark brown bars over upper sides; large brown spot on pectoral base and large black spot over caudal fin base. D V, 22-24. P 16-17. Total GR 13-19. (voucher: ? mm SL)

**Parapercis nebulosa**

Body orange-pink above, white below. Six to 7 broad red bars across body; usually 3 dark blue lines across interorbital; spinous dorsal fin black, pectoral fin rays white, membrane black, fin margin pink. D V, 22. P 16-18. Total GR 17-21. L. lat. 68-76. (voucher: 113 mm SL)

**Parapercis compressa**

Conspicuous dark bar below eye slanting across cheek and another across pectoral fin base; a cream band from head to tail base interrupts 7 or 8 vertical body bands; dark patch on upper caudal fin base and remainder of fin vertically checked. Upper caudal fin lobe produced into a filament. D V, 21. P 17. Total GR 14-16. (voucher: 85 mm SL)

**URANOSCOPIDAE**

## Stargazers

**Moderately elongate, robust fishes. Head large, "square", flattened above. Mouth large, opening almost vertically, lips fringed. Eyes practically on top of head which is often covered by bony plates. Pointed teeth in rows on jaws, and often a fringed flap of skin emanating from inside lower jaw. Body naked or scaled, scales cycloid and often embedded anteriorly. Lateral line high on body. One or 2 dorsal fins: when present, first dorsal fin with weak spines; soft dorsal and anal fins long. Pectoral fin broad; ventral fin placed well before pectoral fin base (on isthmus) and their bases close to each other. Caudal fin rounded or truncate. Usually a strong spine on "shoulder" above pectoral fin base which may be venomous.**

**Eight genera in family of which members of three were caught on the Survey. Note: refer to the comment for this family in the Species List.**

REFERENCES: Fricke, 2018; Gomon & Johnson, 1999; Kishimoto, 2001; Prokofiev, 2020b; Prokofiev, 2021; Kishimoto, 1987.

**Xenocephalus australiensis**

Body and fins brown. Spinous dorsal absent, soft dorsal fin placed well back on body. Humeral spine short; body scaled; lower jaw projecting and bony circular groove on chin. Predorsal area scaled or naked. Ninth to 11<sup>th</sup> pectoral fin rays longest. D 13-14. A 17. P 20-24. Scale rows 84-94 between head and tail base. (voucher: 210 mm SL)

**Ichthyscopus insperatus**

Ten to 12 double narrow brown bands across nape and back extending onto dorsal fin; 2 or 3 brown bands across caudal fin; broad oblique band on pectoral fin. Spinous dorsal fin absent. Humeral spine hidden in fringed flap of thin skin. Body without scales. Third to 4<sup>th</sup> pectoral fin ray longest. D 17-19. A 17-18. P 13-14. (voucher: 220 mm SL)

**Uranoscopus cognatus**

Brown above, finely mottled and stippled dark brown. Pectoral and caudal fins orange-brown; spinous dorsal fin black, base of first and last spine white. Humeral spine strong, exposed. Short black cirrus on eye; flap of tissue along inside of lower jaw short and broad. Nape naked. Preoperculum with four spines on lower border. Sixth to 9<sup>th</sup> pectoral fin rays longest, fin border truncate above longest rays. Two pair of preventral spines plus anterior bucklers. D III, 13. A 13. P 18. Scale rows 57 between head and tail bucklers. (voucher: 125 mm SL)

**Ichthyscopus fasciatus**

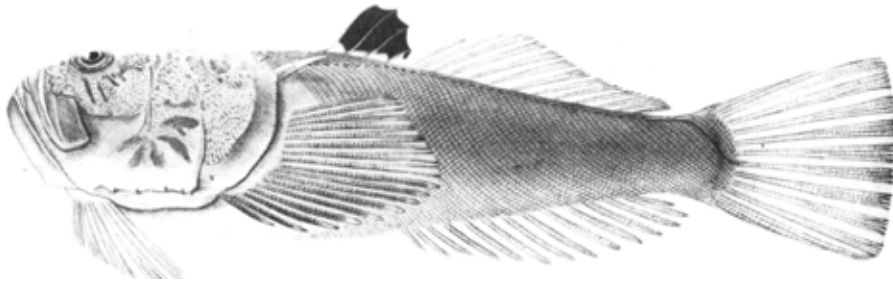
Six broad dark bands across nape and back extending onto dorsal fin. Pectoral fin orange but base and outer margin white. Spinous dorsal fin absent. Humeral spine hidden in fringed flap of thick skin. Scales present. Fourth to 5<sup>th</sup> pectoral fin rays longest, fin rounded. D 20-21. A 17-18. P 15-16. Scale rows about 60 between head and tail base. (voucher: 200 mm SL)

**Uranoscopus bicinctus**

Back and top of head variegated and spotted with dark brown forming large pale patches; 3 broad diffuse bands over upper body: behind eyes, below spinous dorsal fin and below posterior of soft dorsal fin. Humeral spine strong, exposed. Flap of tissue along inside of lower jaw forms a long filament. Nape naked. Preoperculum with 4 spines on lower border. Eighth to 9<sup>th</sup> pectoral fin ray longest, fin rounded. One pair of preventral spines plus anterior bucklers. D III-IV, 13. A 13. P 17. 54 scale rows between head and tail base. (voucher: 115 mm SL)

**Uranoscopus kaianus**

Upper head and body finely variegated reddish brown. Spinous dorsal fin black, base of first and last spines white; yellow pectoral fin crossed by diffuse brown band; tissue inside lower jaw speckled brown. Humeral spine strong, exposed. Scales over half of nape; flap of tissue along inside of lower jaw broad and slightly rounded. Preoperculum with 7 spines on lower border. Eighth to 11<sup>th</sup> pectoral fin rays longest, hind fin border emarginate above them. One pair of preventral spines plus anterior bucklers. D IV 13. A 13. P 17-18. Scale rows 53-55 between head and tail base. (voucher: 182 mm SL)



*Uranoscopus oligolepis* after Tanaka. 1912



*Uranoscopus* sp cf brunneus



*Uranoscopus* sp cf japonicus



*Uranoscopus* sp cf affinis



*Uranoscopus* sp cf arafurensis



*Uranoscopus* sp cf kishimotoi



**Uranoscopus oligolepis**

Plain olive brown over upper head and back. Spinous dorsal fin black but base of entire fin white. Pectoral fin dusky olive, lower border yellow-orange. Humeral spine strong, exposed. Nape naked. Flap of tissue along inside of lower jaw forming a very long filament. Preoperculum with 4 spines on lower border. Ninth to 10<sup>th</sup> pectoral fin ray longest, hind fin border emarginate above it. One pair of preventral spines plus anterior bucklers.

D III-IV, 12. A 13. P 17-18. Scale rows 47-51 between head and tail base.

(voucher: ? mm SL)

**Uranoscopus sp cf japonicus**

Olive brown or mauve above, head and back anteriorly covered with round white or cream spots. Spinous dorsal fin white basally, remainder black; pectoral fin yellow, charcoal above. Humeral spine strong, exposed. Nape naked; flap of tissue along inside of lower jaw with moderate to long, fringed filament. Preoperculum with 4 spines on lower border. Seventh to 8<sup>th</sup> pectoral fin ray longest, fin rounded. One pair of preventral spines plus anterior bucklers.

D IV, 13. A 13. P 17. Scale rows 55-56 between head and tail base.

(voucher: 130 mm SL)

**Uranoscopus sp cf arafurensis**

Upper head and back finely variegated dark brown. Spinous dorsal fin black except for white base to fourth spine. Pectoral fin orange. Humeral spine strong, exposed. Flap of tissue along inside of lower jaw broad and slightly rounded. Preoperculum with five spines on lower border. Embedded scales on nape. Ninth to 10<sup>th</sup> pectoral fin ray longest, hind fin border emarginate above them. One pair of preventral spines plus anterior bucklers.

D IV, 14. A 13. P 19. Scale rows about 53 between head and tail base.

(voucher: 137 mm SL)

**Uranoscopus sp cf brunneus**

Plain olive brown over upper head and back. Spinous dorsal fin black; pectoral fin dark brown, margins orange. Humeral spine strong, exposed. Embedded scales on nape; flap of tissue along inside of lower jaw rectangular, with broad irregular branching tip. Preoperculum with 4 spines on lower border. Ninth to 11<sup>th</sup> pectoral fin ray longest, hind fin border deeply emarginate above them. One pair of preventral spines plus anterior bucklers.

D IV, 12-13. A 13. P 18. Scale rows 51-52 between head and tail base.

(voucher: 175 mm SL)

**Uranoscopus sp cf affinis**

Fine dark grey lines over upper head and back. Spinous dorsal fin black, base of most spines white; lower pectoral fin yellow, edge white. Humeral spine strong, exposed. Embedded scales over posterior half of nape; flap of tissue along inside of lower jaw broad and triangular. Preoperculum with 4-6 spines on lower border. Eighth to 9<sup>th</sup> pectoral fin ray longest, fin slightly rounded. One pair of preventral spines plus anterior bucklers.

D IV, 13. P 18. Scale rows about 51 between head and tail base.

(voucher: 51 mm SL)

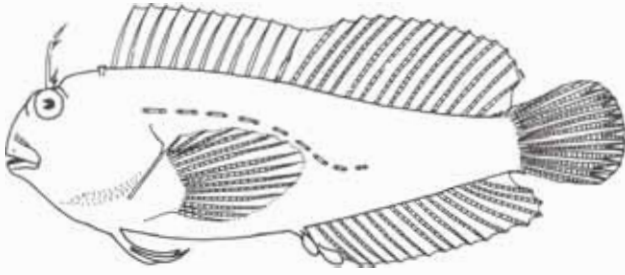
**Uranoscopus sp cf kishimotoi**

Upper head and body brown with numerous irregular pale spots; darker brown areas over sides of head and below spinous dorsal fin black; pectoral fin yellow-fawn. Humeral spine strong and exposed. Soft dorsal and caudal fins dusky. Flap of tissue along inside of lower jaw broad and slightly rounded or produced into a short filament. Nape naked. Preoperculum with 4 or 5 spines on lower border. Seventh to 9<sup>th</sup> pectoral fin ray longest, fin rounded. One pair of preventral scutes plus anterior bucklers.

D IV, 13. A 13. P 17-18. Scale rows 54-55 between head and tail base.

(voucher: 96 mm SL)

**BLENNIIDAE**



*Xiphasia setifer*

**AMMODYTIDAE**

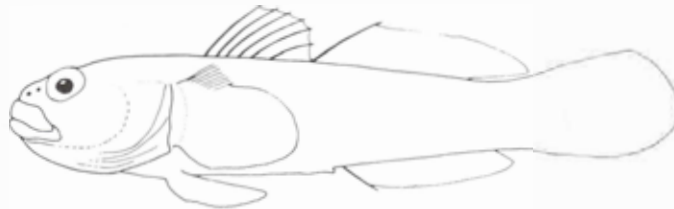


*Bleekeria viridianguilla*



*Bleekeria mitsukurii*

**GOBIIDAE**



*Oxyurichthys ophthalmonema*



*Obliquogobius yamadai*

## BLENNIIDAE

Blennies -

Body oval-elongate or very elongate, compressed. Head blunt; mouth small; teeth usually small ("comb-like") and movable or fixed; often canine teeth present posteriorly in jaw(s). Tentacle-like cirri may be present on head and nape; gill openings restricted to sides and sometimes small. Long dorsal fin usually with anterior portion of flexible spines continuous with or separated by notch from rayed portion, sometimes spines absent; anal fin long, usually with 2 spines anteriorly; caudal fin free of or united with dorsal and anal fins, its rays simple or branched; pectoral fin rays simple; ventral fin before pectoral fin base, with hidden spine and 2-4 rays.

A large family of 58 genera and more than 400 species. One species collected on the Survey.

REFERENCES: Allen & Swainston, 1988; Springer, 2001.

### *Xiphasia setifer*

Body elongate and eel-like, depth 28-56 in SL. Teeth fixed, slender; very long canine posteriorly in lower jaw; gill membranes broadly united with throat, gill opening a small pore on side. Dorsal fin begins above eye; caudal fin united with dorsal and anal fins, its central rays elongated. Dusky green or grey, back and dorsal fin base crossed by about 25 broad dark brown bands; 2 black spots anteriorly on dorsal fin, first one smaller. D 125-129. A 110-116. C fin with 10 segmented rays (voucher: ? mm SL)

## AMMODYTIDAE

Sandlances -

Small to moderate-sized fishes. Body very elongate, almost cylindrical; mouth large, protractile, lower jaw projecting beyond upper jaw; no teeth. Scales cycloid and very small, or absent; lateral line high on sides. Anus at or behind middle of body. No spines in fins; single dorsal fin long, with 40-69 rays; anal fin half length of dorsal fin, with 14-36 rays; pectoral fin low on sides; ventral fins present or absent; caudal fin forked. Gill membranes separate.

There are seven genera in the family; we collected two representatives of one genus, *Bleekeria*, on the Survey.

REFERENCES: Psomadakis, Yoshinaga, Wah & Ida, 2021; Varsha, Sethulakshmi, Ida, Randall & Joshi, 2019.

### *Bleekeria viridianguilla*

Body fawn; violet band along back and yellow band along ventral profile to anus; violet streak from snout tip through eye, chin blue. Dorsal fin bright yellow, base violet, pectoral and anal fins yellow; yellow sub-marginal band on violet-blue caudal fin. Scales small. No ventral fins; dorsal fin height equal to or higher than body depth; depth less than 9% SL.

D 40-42. A 14-16. L. lat. 108-121.  
(voucher: 145 mm SL)

### *Bleekeria mitsukurii*

Body blue or violet brown with many scattered yellow spots and crescentic bars on back and sides, snout and chin yellow, one or 2 curved blue bands below eye. Fins brownish violet or yellow. Scales small. Ventral fins present, length equal to eye diameter; dorsal fin height  $\frac{1}{2}$  to  $\frac{2}{3}$  body depth; depth greater than 9% SL.

D 42. A 15. L. lat. 115  
(voucher: 120 mm SL)

## GOBIIDAE

Gobies - Belosoh

Small to medium-sized fishes with elongate-oval, compressed or almost cylindrical body. Head rounded; mouth usually large, teeth in one or more rows; eyes moderately separated or close together on top of head; gill openings moderate to wide, membranes connected to isthmus. Head partly or completely naked, usually with rows of sensory pores; no lateral line; scales rarely absent. Two dorsal fins: first with up to 8 flexible spines; second with one spine and 8 to many rays, fins connected with each other or completely separated, base of second fin much longer than upper length of caudal peduncle; anal fin with one feeble spine; ventral fins fully or partly united by membrane along inner margins more or less into a cup-like disc.

Bottom-living fishes found from marine to freshwater habitats. This is the largest family of fishes with nearly 200 genera. Only two species were trawled on our Survey and their descriptions were prepared by H.K. Larson.

REFERENCES: Larson & Murdy, 2001; Pezold & Larson, 2015; Shibukawa & Aonuma, 2007.

### *Oxyurichthys ophthalmonema*

Eyes rather close together, interorbital space about equal to eye; elongate tentacle on each eye. Fleshy raised crests on nape from dorsal fin origin. Ventral fins cuplike. Scales on upper half of body each with round black spot; soft dorsal fin and upper half of caudal fin speckled with fine black spots; pectoral fin spotted

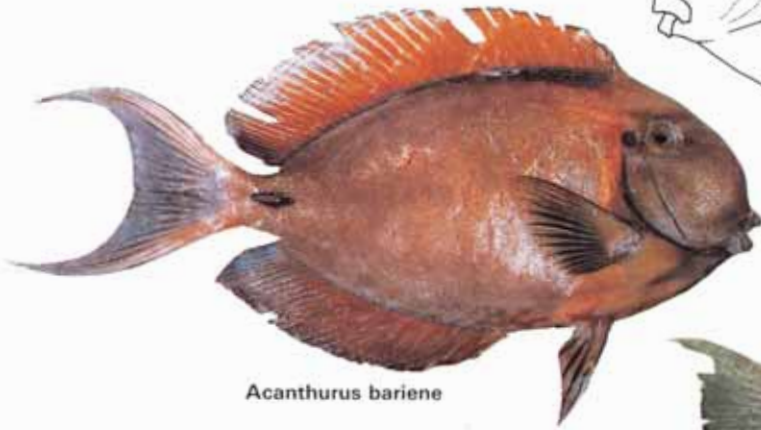
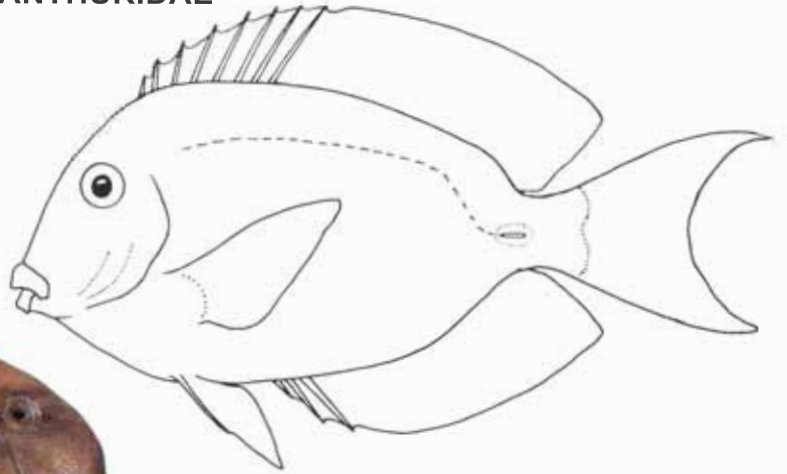
D<sub>2</sub> 13-14. A 14. L. lat. 36-63.  
(voucher: 88 mm SL)

### *Obliquogobius yamadai*

Head large; large eyes very close together and very narrow interorbital space. Ventral fins cuplike, with frenum joining pelvic spines; no scales on midline of predorsal. Sides of body and head with 7-9 narrow yellow bars; distinct black spot on middle of caudal peduncle.

D<sub>2</sub> 9-10. A I, 9-II. L. lat. 22-24.  
(voucher: 40 mm SL)

ACANTHURIDAE



*Acanthurus bariene*



*Acanthurus mata*



*Acanthurus dussumieri*



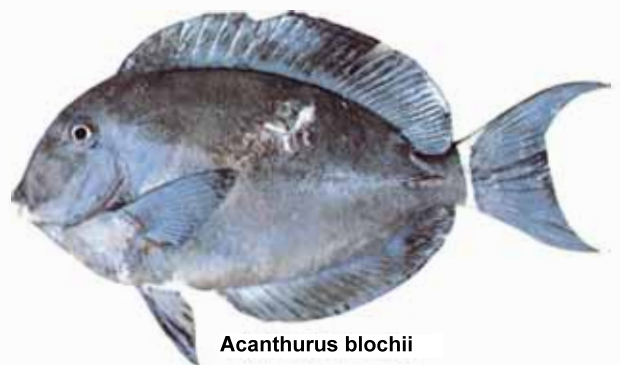
*Acanthurus grammoptilus*



*Acanthurus lineatus*



*Acanthurus olivaceus*



*Acanthurus blochii*



## ACANTHURIDAE

Surgeonfishes; Unicornfishes - Butana; Greon; Gajam

Body oval and slightly elongated; moderately to very compressed. Head profile straight or convex, eye high on head; mouth small, small and sharp teeth in a single row, close-set; gill openings do not extend to underside of head. A single continuous dorsal fin with 4-9 spines, 19-31 rays; anal fin with 2-3 spines and 19-36 rays. Caudal fin emarginated to lunate. Usually a strong erectile spine or 1-2 bony, sharp-edged plates on caudal peduncle. The family comprises six genera, and 84 species. Representatives of two genera obtained during the Survey. They are distinguished as follows:

A. 3 anal spines; erectile spine in groove on peduncle ..... *Acanthurus*

B. 2 anal spines; one or two bony plate on caudal peduncle ..... *Naso*

REFERENCES: Johnson, 2002; Randall, 2001a; Randall, 2001f, Randall, 2001g.

### *Acanthurus bariene*

Head and body orange-brown. Round black spot at upper end of gill opening; blue line along back below dorsal fin. Dorsal and anal fins edged blue; caudal fin dark blue, upper and lower margins and base orange-tan. Caudal spine surrounded by black or dark brown patch. Forehead humped in large males, snout not protruding. D IX, 26-28. A III, 25-26. GR on posterior of gill arch 22-24.

### *Acanthurus dussumieri*

Pale brown with many narrow purple or dark brown wavy longitudinal lines or scribbles over head and upper  $\frac{2}{3}$  of body. Orange band through eye to head edge, also across interorbital; opercular membrane black; caudal spine in white groove with black edges. Caudal fin orange-brown basally and over upper and lower margins, centre of fin dark blue with many small black spots. Outer  $\frac{1}{3}$  of pectoral fin pale brown. D VIII-IX, 25-27. A III, 24-26. GR on posterior of gill arch 23-27.

### *Acanthurus lineatus*

Upper  $\frac{2}{3}$  of body with black and blue longitudinal bands bordered with yellow, strongly marked off by pale grey or cream lower part of body, same band running obliquely across head. Blue and brown lines along dorsal fin; black edge on dorsal and anal fins; pale blue crescent on dark caudal fin; ventral fins orange. Caudal fin lobes produced. D IX, 27-30. A III, 25-28. GR on first arch 14-17. (voucher: 180 mm SL)

### *Acanthurus olivaceus*

Head and body brown. Conspicuous oblong orange patch, edged with dark blue or purple, extending from upper edge of operculum to above pectoral fin tip. Fins brown, pectoral fin cream at margin; white and dark spots over rest of fin. White caudal crescent on caudal fin margined in black. D IX, 23-25. A III, 22-24. P 16-17. (voucher: 165 mm SL)

### *Acanthurus mata*

Body dark olive, grey or brown; narrow longitudinal blue lines on side of head and body; wide yellow band from front of eye to upper edge of operculum. Many small teeth in jaws; snout short, its length 6.6 to 7 in SL. D IX, 24-26. A III, 23-24. (voucher: 320 mm SL)

### *Acanthurus grammoptilus*

Body dark violet-brown, orange spots and scribbles on head and orange patch behind eye. Caudal peduncle spine in a large black patch; cream or white band around caudal peduncle at caudal fin base and margin narrowly white. Outer half of pectoral fin yellow; dorsal and anal fins striped yellow and blue. D VIII-IX, 25-26. A III, 23-24. GR on posterior of gill arch 21-23. (voucher: 180 mm SL)

### *Acanthurus blochii*

Head and body bluish brown; yellow patch behind eye; caudal peduncle spine in a dark brown patch; distinct white band around base of caudal fin. Dorsal and anal fins with 6-9 narrow dark blue horizontal lines; and an irregular yellow spot nearly as large as the eye just behind the eye; opercular membrane black. Pectoral fin brown or blue. D IX, 25-27. A III, 24-25. GR on posterior of gill arch 23-26. (voucher: 175 mm SL)



*Acanthurus tennentii*



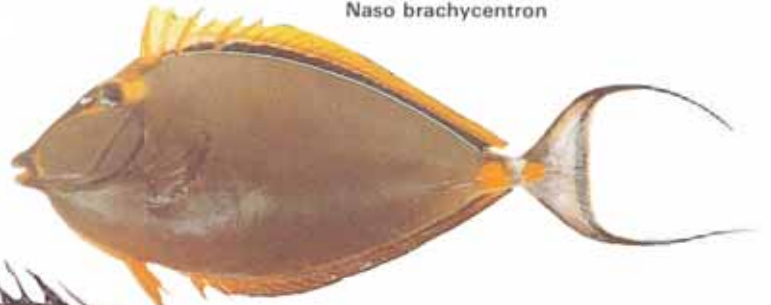
*Acanthurus xanthopterus*



*Naso thynnoides*



*Naso brachycentron*



*Naso lituratus*



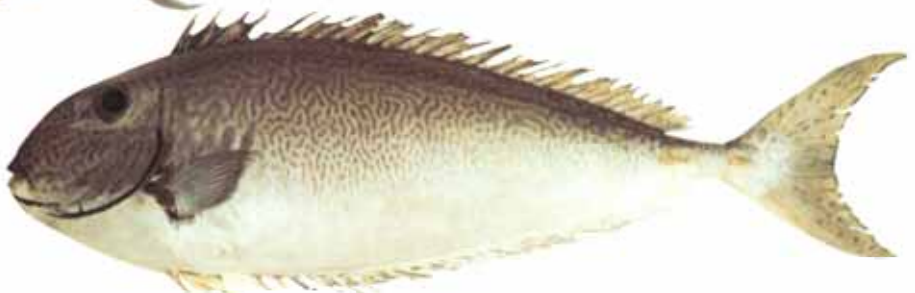
*Naso lopezi*



*Naso mcdadei*



*Naso unicornis*



*Naso reticulatus*

**Acanthurus tennentii**

Head and body brown. Black "U"-shaped band or 2 parallel black bands placed horizontally on side behind gill opening; and above pectoral fin; black area around caudal peduncle spine. Fins brown, hind margin of dorsal fin orange and an orange line along dorsal fin base. Broad dorsal white crescent over central posterior margin of caudal fin.

D IX, 23-24. A III, 22-23. P 16. GR on posterior of gill arch 25.

**Naso thynnoides**

Body olive-brown or grey-mauve, often with many narrow vertical dark bars across middle of body. Oblique yellow lines may be present on dorsal and anal fins; caudal fin margin yellow. Dorsal and ventral profiles evenly curved. Keel on caudal peduncle rounded.

D IV, 28-30. A II, 27-29.

**Naso lopezi**

Snout evenly convex or curved, without "horn" or hump. Body slender, depth 2.8-3.3 in SL. Upper half of head and body dark brown or with moderate dark brown or blue spots; lower half of head and body plain light grey. Fins dark blue or brown. Caudal fin emarginated.

D V, 29-31. A II, 28-30.

**Naso unicornis**

Forehead with a long conical "horn" in front of eyes; snout below "horn" long, distance from snout tip to "horn" -base 2-4 times the distance from "horn"- base to eye. Upper and lower lobes of caudal fin produced into short filaments. Body brown, darker on back, pale orange to fawn on lower sides. Blue lines on dorsal and anal fins; caudal fin plain brown, yellow-brown on proximal half; caudal bucklers blue.

D V-VI, 27-31. A II, 27-29.

**Acanthurus xanthopterus**

Body plain orange-brown or blue-grey; base of caudal fin with faint or very distinct white band; caudal peduncle spine in a dusky patch. Outer part of pectoral fin yellow; dorsal and anal fins with 4-6 alternating yellow and blue longitudinal bands. Eye in a yellow patch.

D VIII-IV, 25-27. A III, 23-25. GR on posterior of gill arch 17-22.

(voucher: 138 mm SL)

**Naso brachycentron**

Forehead of males with long conical "horn" in front of eyes (as a hump in females), its axis passing through the eye; snout below "horn" long. Dorsal body profile distinctly humped above anal fin origin. Charcoal or dark grey above, pale fawn below; blue or brown spots may be present on back or particularly along mid-line of body.

D IV-V, 29-30. A II, 27-28.

(voucher: 460 mm SL)

**Naso lituratus**

Body olive-brown; orange or yellow line around eye; orange lips and orange caudal peduncle plates. Blue line along back dorsal fin. Dorsal, anal and ventral fins bright orange. Upper and lower caudal fin lobes produced into filaments in adult males.

D VI-VII, 27-30. A II, 28-30.

**Naso mcdadei**

Snout swollen in front of eyes in to a large, convex hump. Dorsal body profile distinctly humped above anal fin origin. Body grey, back olive-brown and finely spotted dark brown; spots extend over dorsal, caudal and pectoral fins; caudal fin truncate.

D V, 27-29. A II, 26-27.

(voucher: 445 mm SL)

**Naso reticulatus**

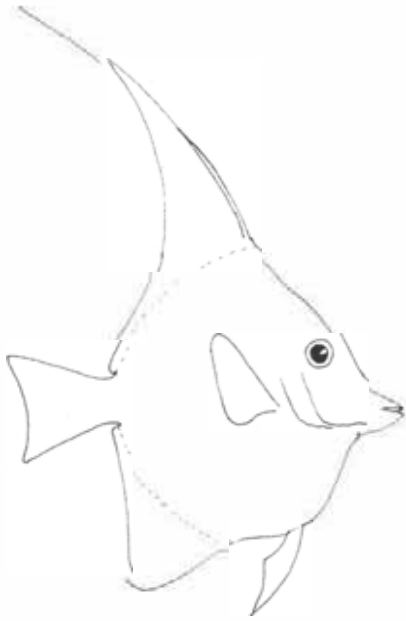
Snout evenly convex or curved, without "horn" or convex hump. Head and body brownish grey, upper  $\frac{2}{3}$  covered with small brown spots or short wavy reticulated lines. Brown spots over emarginated caudal fin. Black margins to preoperculum and operculum, black band on chin.

Bucklers on peduncle pink. Body ovate, depth 2.2 to 2.9 in SL. Eye 2.4 to 3.6 in HL

D VI, 29-31. A II, 26-30. Lower GR 10-12.

(voucher: 410 mm SL)

ZANCLIDAE



Zanclus cornutus

SIGANIDAE



Siganus argenteus



Siganus canaliculatus



Siganus corallinus



Siganus fuscescens



Siganus guttatus



Siganus punctatus



## ZANCLIDAE

### Moorish Idols -

Body almost orbicular and very compressed; minute ctenoid scales, appears naked. One dorsal fin with 7 spines of which the third is produced into a long filament; 3 anal spines; caudal fin emarginate. Gill opening a short slit. Snout extended into a short thick tube and mouth small; teeth numerous, elongate and bristle like.

This family is monotypic (containing only a single species).

REFERENCE: Randall, 2001e.

### *Zanclus cornutus*

Third dorsal spine filamentous; snout tubular. Spine at corner of mouth in juveniles; pointed "horns" in front of eye in adults. Two broad black bands across body; one over nape and posterior half of head to ventral profile, the other from soft dorsal fin to tip of medial anal fin; filamentous dorsal spine white; caudal fin black with white margin.

D VI-VII, 39-42. A III, 31-37.

(voucher: 63 mm SL)

## SIGANIDAE

### Rabbitfishes; Spinefeet - Beronang; Masadar

Very compressed, oval body. Mouth small, teeth small and close together; gill opening restricted to side; side of head scaly. Body appears naked but covered with small, cycloid scales. Single dorsal fin with 13 spines, an antrorse (forward-directed) spine at fin origin, and 10 rays; anal fin with 7 spines and 9 rays; ventral fin with 2 spines separated by 3 rays, inner spine connected to body by membrane; caudal fin truncate to lunate. All fin spines strong and very sharp; they can inflict poisonous stings. Identification often difficult because of colour variability in many species and "fright" patterning of dark blotches and bars adopted on capture.

The family comprises a single genus, *Siganus*. Eight of the 29 known species were obtained on the Survey. Diagnoses were partly prepared from information supplied by D.J. Woodland.

REFERENCES: Woodland, 1990; Woodland, 2001c; Woodland & Anderson, 2004.

### *Siganus argenteus*

Body blue above to silvery below with yellow spots above and either yellow spots or streaks on lower sides; 2-4 diagonal brown bands across membranes of ventral, spinous dorsal and anal fins, caudal fin barred brown. Eye low on head, 3.5-4 in HL; body slender, its depth 2.5-4 in SL. Soft dorsal and anal fins low, caudal fin deeply forked, length of median rays 2-3 times in longest rays.

P ii, 16. Lower GR 17-20.

(voucher: ? mm SL)

### *Siganus corallinus*

Yellow to yellowish with many small, blue ocelli covering head and most of body; ocelli extend onto fin spines but membranes plain. Head profile evenly rounded (convex), eye high on head, 3-4 in HL; body depth 1.7-2.3 in SL. Soft dorsal and anal fins angular, caudal fin emarginated in young, becoming deeply forked in adults.

P ii, 14. Lower GR 18.

(voucher: 175 mm SL)

### *Siganus guttatus*

Blue grey above to silvery below; pupil-sized golden orange spots over side (not head), closer together and "honey-combed" on nape; large yellow patch on body below posterior base of soft dorsal fin; soft portion of unpaired fins with rows of dark spots; soft vertical fins and caudal fin often margined in brown. Head profile slightly concave on nape; body depth 1.8-2.3 in SL. Rayed portion of dorsal and anal fins little higher than spinous portions; caudal fin truncate, emarginate in larger fish.

P ii, 13-14. Tr above 18-20.

(voucher: 90 mm SL)

### *Siganus canaliculatus*

Grey green above to silvery below, covered with numerous (up to 300) pale spots on sides arranged into horizontal rows (about 3 rows above lateral line); fins marbled with brown, sometimes absent from caudal fin. Eye low on head, 3-3.9 in HL; body depth 2.4- 2.8 in SL. Rounded soft dorsal and anal fins low, caudal fin emarginate, forked in larger fish.

P ii, 14.

(voucher: 178 mm SL)

### *Siganus fuscescens*

Sandy brown to green above, becoming silvery below, with a golden sheen on side; very many (500-600) pearly spots arranged on sides into horizontal rows (about 6 rows above lateral line); fins marbled and spotted brown; often a dark patch below lateral line origin. Nape slightly concave above eye; eye low on head, 2.8-3.5 in HL; body depth 2.3-2.9 in SL. Rounded soft dorsal and anal fins low, caudal fin emarginate, forked in larger fish.

P ii, 14.

(voucher: 98 mm SL)

### *Siganus punctatus*

Entire head and body covered with small golden spots equal to or smaller than pupil in size, background colour and fins dark brown or blue grey, median soft fins spotted. Head profile almost straight; eye 3.1-3.6 in HL; body depth 1.8-2.2 in SL. Soft dorsal and anal fins angular; caudal fin emarginated to deeply forked in larger fish.

P ii, 14-15. Tr above 20-24. Lower GR 16.

(voucher: 245 mm SL)

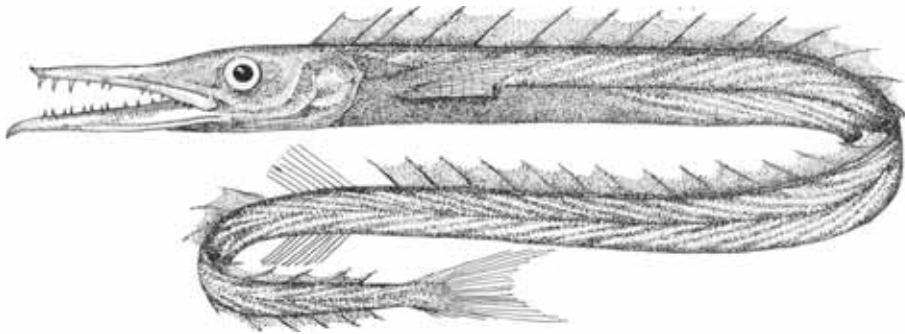
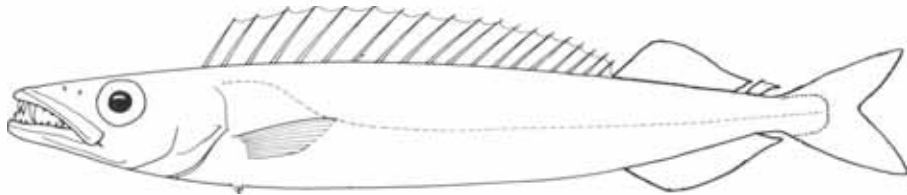


*Siganus spinus*



*Siganus virgatus*

### GEMPYLIDAE



*Gempylus serpens* drawing of preserved specimen



*Lepidocybium flavobrunneum*



*Neopinnula orientalis*



*Promethichthys prometheus*



*Rexea prometheoides*



*Thyrsitoides marleyi*

**Siganus spinus**

Many pale blue or cream wavy bands form network over grey brown head and body, bands becoming vertical and very distinct on caudal peduncle; pale hyaline to yellow unpaired soft fins with dark or light bars and spots; posterior half of caudal fin yellow. Head profile concave on nape; body depth 2.4-2.8 in HL. Caudal fin emarginate, truncate in larger fish. Scales absent from area between ventral fin bases.

P ii, 14-15. Tr above 17-18. Lower GR 13-17.

(voucher: 85 mm SL)

**Siganus virgatus**

Brown band from nape to chin, 2<sup>nd</sup> brown band from dorsal fin to pectoral fin base, each paralleled by silvery or golden band; blue wavy lines over front of head and small dark blue spots on back; caudal fin yellow. Head profile convex; body depth 1.9-2.2 in SL. Soft dorsal and anal fins angular, caudal fin truncate or emarginate.

P ii, 14. Tr above 18-24.

(voucher: 145 mm SL)

**GEMPYLIDAE**

## Snake mackerels -

**Elongate or oblong fishes of moderate to large size, compressed. Mouth large; maxilla exposed posteriorly; teeth sharp, anterior teeth very large and fang-like. Scales moderate and spined, small or absent; lateral line weak or moderately developed, sometimes double, its shape often diagnostic. Dorsal fin divided into a long based spinous part and a short rayed part; finlets often present behind dorsal and anal fins; pectoral fin short and set low on body; ventral fin well-developed, absent or rudimentary; caudal fin forked.**

**About 16 genera in the family, members of six were obtained on the Survey.**

REFERENCES: Nakamura & Parin, 1993; Nakamura & Parin, 2001a; Parin, 1989.

**Gempylus serpens**

Body and fins plain brown or blackish brown, fin margins dark. Body very elongate, its depth 14-20 in SL; spinous dorsal fin long. Two almost straight lateral lines, upper ending opposite soft dorsal fin origin, lower ending at tail base. Five to 7 small finlets behind each of soft dorsal and anal fins; ventral fin very small, consisting of a spine and 4 to 5 minute rays.

D XXVIII-XXXII; I, 12+6. A II; I, 10-11 +5-7.

(voucher: 429 mm SL)

**Lepidocybium flavobrunneum**

Body dark metallic blue-brown, fins dark. Single lateral line indistinct, greatly undulating and reaching nearly to both back and belly. A broad keel on each side of caudal peduncle, bordered posteriorly by two small keels on each side. Five to 6 small finlets behind soft dorsal and anal fins; caudal fin deeply forked or lunate.

D VIII-XII; 16-18 + 5-6. A 13-15 + 4-5.

(voucher: 325 mm SL)

**Neopinnula orientalis**

Body dark bluish green; mouth and gill cavities black; first dorsal fin charcoal. Body robust, depth 3.9-4.2 in SL. Two distinct lateral lines originating together at upper edge of gill opening, upper line running close to dorsal profile, lower running along ventral profile. Well-developed ventral fins present, with one spine and 5 rays, beginning beneath mid-pectoral fin. One to 3 teeth on each side of vomer. Dorsal fin spines flexible, no finlets behind unpaired fins.

D XVI; I, 19-20. A III, 19-20.

(voucher: 196 mm SL)

**Promethichthys prometheus**

Body dark metallic copper brown or dark blue; fins dark brown or charcoal. Body moderately long, its depth 5-7 in SL. One lateral line bending abruptly down near pectoral fin and continuing along mid-height of body. Two small finlets behind each of soft dorsal and anal fins; ventral fin reduced to a single spine and becoming shorter with age.

D XVII-XVII; 19-20 + 2. A II, 14 + 2.

(voucher: 190 mm SL)

**Rexea prometheoides**

Body iridescent dark grey-blue above, silvery grey below. Black spot over membrane between first 3 dorsal spines, fin margin black. Body moderately long, its depth 5-6 in SL; naked except for elongate patch of scales from middle of spinous dorsal fin to caudal peduncle. Two distinct lateral lines, upper from operculum along dorsal profile ending below posterior 1/3 of soft dorsal fin, lower line branching off upper line below 4<sup>th</sup> to 5<sup>th</sup> dorsal spine, running along sides and mid-sides. Base of first dorsal fin 2.2-2.6 longer than base of second dorsal fin + finlets. Ventral fin present as a short spine (no rays) in young, absent in adults; 2 small finlets present behind each unpaired fin.

D XVIII; II, 14-17 + 2. A I, 12-15 + 2.

(voucher: 120 mm SL)

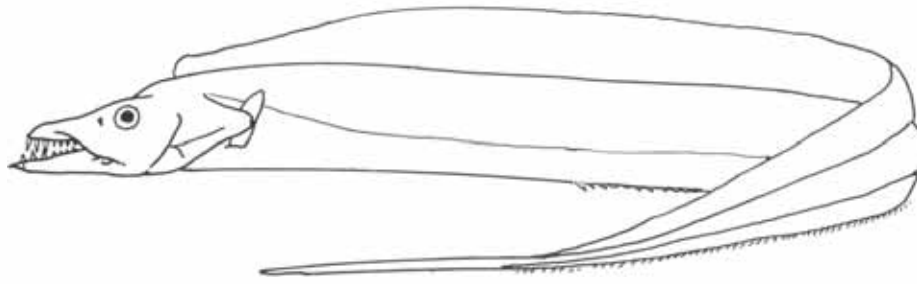
**Thyrsitoides marleyi**

Body metallic grey-brown above, silvery below; large black blotches on membrane between each dorsal fin spine. Body slender, its depth 9-12 in SL. Two distinct lateral lines, upper running close to dorsal profile, lower branching from first below anterior dorsal spines and running along mid-sides. Long, strong spines in dorsal fin, anterior ones longest; ventral fin well-developed with one spine and 5 rays, situated below pectoral fin; caudal fin deeply forked.

D XVII-XIX, 12 + 5-6. A 13 + 4-6.

(voucher: 425 mm SL)

### TRICHIURIDAE



*Benthodesmus vityazi*

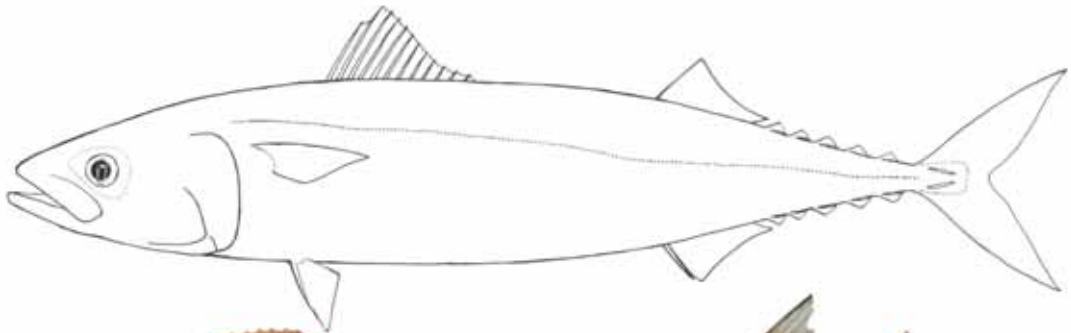


*Tentoriceps cristatus*



*Trichiurus lepturus*

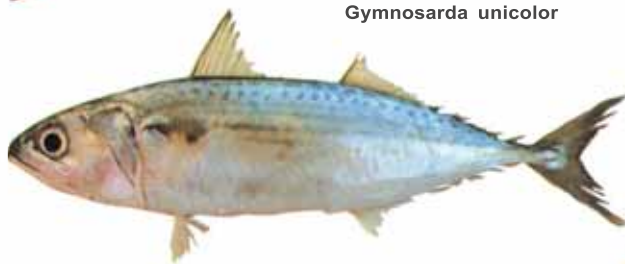
### SCOMBRIDAE



*Gymnosarda unicolor*



*Rastrelliger brachysoma*



*Rastrelliger kanagurta*



*Sarda orientalis*



## TRICHIURIDAE

Cutlassfishes; Hair-tails; Ribbon fishes - Layur; Jogor

Body very elongate and compressed, tapering posteriorly. Body naked, silvery skin easily rubbed off. Lateral line single. Mouth large, jaws pointed. Teeth sharp, some very large and fang-like. Dorsal fin very long and continuous, soft-rayed part usually longer than the spinous part, sometimes marked off by notch; no finlets; and anal fin long, elements often short and embedded. Pectoral fins small, low on body; ventral fins very small, scale-like or absent. Caudal fin present or absent. Moderate sized fishes of shallow (e.g. *Trichiurus*) or deep (e.g. *Benthodesmus*) waters.

Ten genera in the family of which three were represented in the Survey.

REFERENCES: Nakamura & Parin, 1993; Nakamura & Parin, 2001b.

### *Benthodesmus vityazi*

Body strongly compressed and elongate, ribbon-like. Caudal fin present, forked. Notch in dorsal fin between spined and rayed parts of dorsal fin about half length of rayed dorsal fin. Ventral fin scale-like, situated immediately behind vertical line drawn from pectoral fin base. Only posterior 1/3 of anal fin visible, remainder covered by skin. Snout and chin charcoal coloured.

D (total) 134. A (total) 83. GR 5 + 1 + 7.

(voucher: 770 mm SL)

### *Trichiurus lepturus*

Body strongly compressed and elongate, ribbon-like, tapering to a point; no caudal fin. Lower border of gill cover concave; fangs in jaws with barbs. Dorsal fin begins just behind head; ventral fin absent. Tiny anal fin spines just breaking through, or buried in ventral skin.

D (total) 133-138.

(voucher: 360 mm SL)

### *Tentoriceps cristatus*

Body strongly compressed and elongate, ribbon-like, tapering to a point; no caudal fin. Depth 20-24 in SL. Upper head profile strongly convex, forming a crest; lower border of gill cover convex; lower jaw strongly projecting. Dorsal fin begins just behind head; ventral fins present, scale-like; pectoral fin short, not reaching lateral line.

D (total) 126-144.

(voucher: 335 mm SL)

## SCOMBRIDAE

Mackerels; Tunas - Tongkol; Tengiri

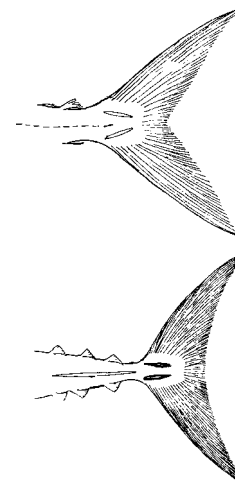
Body robust and fusiform, either covered with small to moderate-sized cycloid scales, or an area behind head and around pectoral fin covered with large thick scales, rest of body naked or finely-scaled. Snout pointed; adipose eyelid may be developed; mouth large, teeth sharp. Two dorsal fins, finlets present behind soft rayed dorsal fin and anal fin; ventral fin with 6 rays; caudal fin deeply forked. Caudal peduncle strong and tapered, with at least 2 lateral keels.

This circumglobal family comprises 15 genera and 54 species. Individuals belonging to five genera were obtained on the Survey, although others were taken at the surface by the net, or trolled, and are considered outside the scope of this book.

REFERENCES: Collette, 2001; Collette & Nauen, 1983.

### KEY TO GENERA

- 1a. Only 2 small keels on side of caudal peduncle, 5 dorsal and 5 anal finlets, adipose eyelid present.
  - 2a. Anal spine strong; short, wavy lines on back; fine teeth on roof of mouth . . . . . **Scomber**
  - 2b. Anal spine weak; spots on back; no teeth on roof of mouth . . . . . **Rastrelliger**
- 1b. Large keel plus 2 small keels on side of caudal peduncle, 6-10 dorsal and anal finlets, no adipose eyelid.
  - 3a. Jaw teeth strong, triangular, single lateral line; at least some gill rakers present; snout much shorter than rest of head. . . . . **Scomberomorus**
  - 3b. Jaw teeth conical; 8-21 gill rakers on first arch
    - 4a. Narrow dark stripes along back, none on lower sides; upper jaw at least to hind border of eye; no teeth on tongue . . . . . **Sarda**
    - 4b. No stripes along back; first dorsal fin lower than second; 2 patches of teeth on tongue; swim bladder present . . . . . **Gymnosarda**



### *Gymnosarda unicolor*

Body plain silvery blue, back grey. Teeth in jaws conspicuous. Interorbital 2.5-3.1 in HL. Total GR 11-14 (first arch). 13-15 spines in dorsal fin. P 25-28.

### *Rastrelliger kanagurta*

Two rows of small dark spots below dorsal fin bases and dark or golden longitudinal streaks on back. A black spot on body below pectoral fin. Body moderately deep, depth 4.3-5.2 in FL. Intestine short, 1.3-1.7 in SL when extended; gill rakers very long, visible when mouth is open.

Lower GR 32-46. 8-11 dorsal fin spines.

(voucher: ? mm SL)

### *Rastrelliger brachysoma*

Broad row of dark brown spots along blue-green back; black edge on first dorsal fin. Body very deep, depth 3.7-4.3 in FL. Intestine very long, 3-3.4 times SL when extended; gill rakers very long, visible when mouth is open. Lower GR 30-48. 8-11 dorsal fin spines.

(voucher: 155 mm SL)

### *Sarda orientalis*

Five to 10 narrow, dark stripes along upper part of body. Narrow supramaxilla.

Total GR 8-13 (first arch). 17-19 spines in dorsal fin.

P 23-25.



*Scomberomorus commerson*



*Scomber australasicus*



*Scomberomorus munroi*

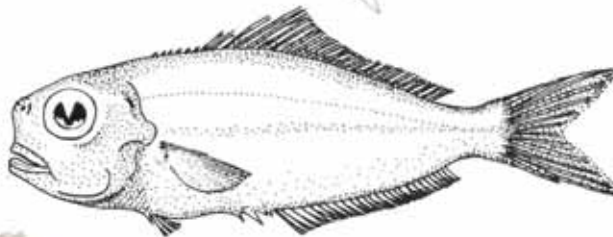


*Scomberomorus guttatus*



*Scomberomorus queenslandicus*

**CENTROLOPHIDAE**



*Psenopsis obscura* after Haedrich, 1967



*Psenopsis humerosus*



*Psenopsis* sp.

***Scomber australasicus***

Body slender. Fine teeth on vomer and palatines. Wavy dark oblique lines and zigzags over back; fine spots and short wavy lines extend over mid-sides towards belly. First and second dorsal fins well-separated; anal fin origin opposite fourth dorsal fin ray.  
Lower GR 24-28. 10-13 dorsal fin spines.  
(voucher: 215 mm SL)

***Scomberomorus guttatus***

Sides with many spots about equal in size to pupil of eye. Spinous dorsal fin uniformly dark. Body depth less than or equal to HL. Lateral line slightly undulated; anterior part with supplementary branches.  
Total GR 8-14 (first arch). 15-18 dorsal fin spines.

***Scomberomorus queenslandicus***

Middle to lower sides with diffuse rounded blotches as large as or larger than eye diameter, arranged into roughly 3 rows; spinous dorsal fin blackish blue except for white area between 6<sup>th</sup> and last few spines. Lateral line gently descending.  
Total GR 3-9 (first arch). 16-18 dorsal fin spines.  
(voucher: 200 mm SL)

***Scomberomorus commerson***

Sides below lateral line with many wavy dark vertical bars increasing in number with size and broken into irregular patches posteriorly; spinous dorsal fin blackish blue, posterior half white in smaller individuals. Lateral line with deep dip below second dorsal fin or below 2<sup>nd</sup> to 5<sup>th</sup> dorsal finlets. Fine serrations along tooth margins.  
Total GR 1-8 (first arch). 14-18 dorsal fin spines.

***Scomberomorus munroi***

Band of rounded spots smaller than eye diameter, arranged into 4-5 irregular rows along middle of sides; spinous dorsal fin almost entirely blackish blue. Two loops to the intestine.  
Total GR 10-12 (first arch). 20-22 dorsal fin spines.  
(voucher: 380 mm SL)

**STROMATEOID FISHES (SUBORDER STROMATEOIDEI)**

Oval or oblong benthopelagic fishes usually characterised by having muscular sac-like outgrowths in gullet behind last gill arch (visible only with dissection). Moderately compressed. Scales cycloid, easily lost; head mostly scaled, though scales often concealed. Gill openings wide. Mouth small to moderate, terminal or slightly inferior, teeth small or fine; snout "puffy" or fleshy. Dorsal fin single: either continuous with reduced spines, or deeply notched between spinous and rayed parts. Pectoral and anal fins well-developed though sometimes small, reduced with age or absent; caudal fin forked. Ventral fin well-developed or absent.  
Representatives of four families were collected during the Survey.

**CENTROLOPHIDAE**

Ruffes; Raftfishes -

Single, continuous dorsal fin with 9 spines or less; first 5 spines weak, remainder strong; spines in anterior part, longest spine not longer than half of longest soft ray; 25-40 dorsal fin rays. Fifteen to 30 rays in anal fin. Ventral fins present; dorsal and anal fin bases of unequal length. Scales easily lost. Teeth in jaws conical and simple, none on vomer and palatines..

Family comprises seven genera; representatives of one genus were obtained on the Survey.

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; McDowall, 2001; Ochai & Mori, 1965.

***Psenopsis humerosus***

Body depth about 50% SL; eye 2.4-4.8 in HL. Dorsal fin spines graduate slightly to fin rays. Ventral fin origin just under pectoral fin origin. Silvery-grey, charcoal above; large diffuse charcoal shoulder blotch. Fins fawn; dorsal and anal fin margins dark brown.  
D V-VII, 27-32. A III, 25-29. P 20-23. GR 5-6 + 12-13.

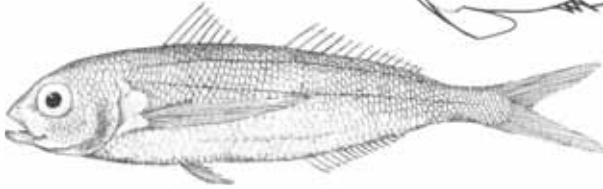
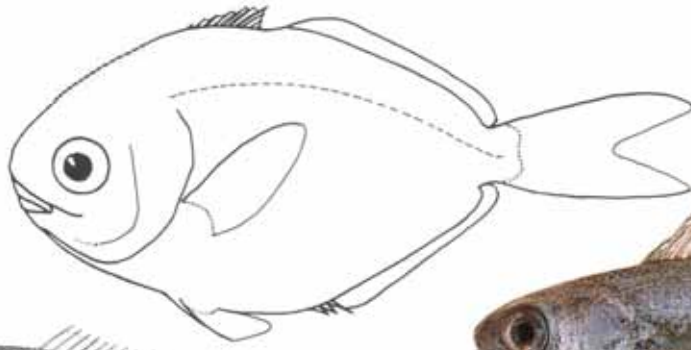
***Psenopsis obscura***

Body depth 32-40% SL; eye 3.3 in HL. Dorsal fin spines graduate slightly to dorsal fin rays. Snout deep and truncated. Ventral fin origin before or just under pectoral fin origin. Metallic blue-green on back, silvery fawn on lower sides. Dark blotch on shoulder. Fins pale yellow, stippled dark brown.  
D VI-VII, 29. A III, 26-27. P 17-20. GR 5 + 15.  
(voucher: ? mm SL)

***Psenopsis* sp.**

Body depth about 45% SL; eye 3.4-3.7 in HL. Dorsal fin spines graduate slightly to fin rays. Ventral fin origin before or just under pectoral fin origin. Dark metallic green-charcoal body and fins; dark blotch on shoulder.  
D V-VII, 26-29. A II-III, 25-27. P 18-20. GR 5-6 + 15-16.

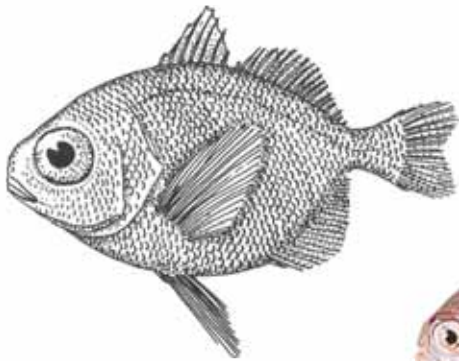
NOMEIDAE



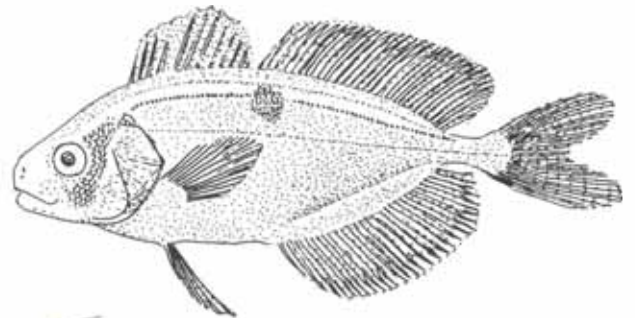
*Cubiceps pauciradiatus*



*Cubiceps whiteleggi*



*Psenes arafurensis* after Günther, 1889

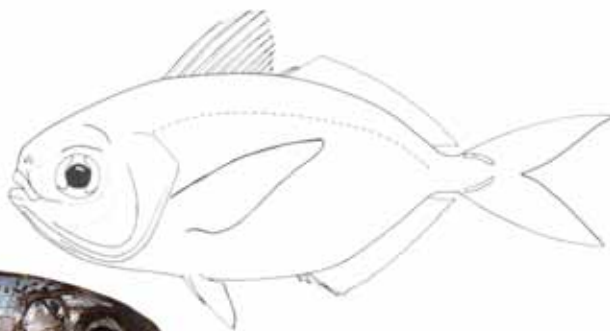


*Psenes pellucidus* after Haedrich, 1967



*Psenes* sp cf *cyanophrys*

ARIOMMATIDAE



*Ariomma brevimanus*



*Ariomma parini*



*Ariomma indica*



## NOMEIDAE

Eye-brow fishes; Cube heads

**One dorsal fin with a deep notch distinctly separating the spined and rayed portions. Spines of first dorsal fin slender, about 10-11, moderately long, and fold into a groove; dorsal rays more than 15 dorsal fin rays. Anal fin with 1-3 spines; more than 15 rays. Mouth small, maxilla barely reaching eye; teeth small and conical, on jaws and vomer and sometimes on palatines. Scales cycloid, thin, easily lost. Caudal peduncle compressed, without lateral keels; least depth of peduncle more than 5% (20 times in) SL; caudal fin deeply forked, pectoral fin lengthen with growth.**

**Three genera in the family, two represented on the Survey.**

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001.

### **Cubiceps pauciradiatus**

Body depth 22-30% SL. Spinous dorsal fin begins behind origin of pectoral fin origin; ventral fin begins behind pectoral fin base. Pectoral fin longer than HL. Scales on top of head extend forward of eyes. Teeth small; on palatines knobby and in a single row, in broad patch on vomer and tongue. Body brown or tan, paler ventrally.

D X-XI, I, 16-18. A II, 14-16. P 17-19. GR 7-9 + 16-19.  
(voucher: 107 mm SL)

### **Psenes arafurensis**

Body depth 40% SL. Spinous dorsal fin begins before or above pectoral fin origin; ventral fin begins below pectoral fin base and reaches well past anal fin origin. Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Body brown, barred and mottled posteriorly and over dorsal and anal fins; ventral fins dark brown.

D X-XI, 1-11, 18-21. A III, 20-22. P 18-22. GR 7-9 + 16-17.

### **Psenes sp cf cyanophrys**

Body depth 40% SL. Spinous dorsal fin begins before pectoral fin origin; ventral fin begins opposite pectoral fin origin and reaches well past beginning of anal fin. Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Plain brown, all but pectoral fin dusky on margins.

D X-XI, 1, 21-23. A III, 20-21. GR 8 + 15.  
(voucher: 71 mm SL)

### **Cubiceps whiteleggii**

Body depth 25-30% SL. Spinous dorsal fin begins behind origin of pectoral fin; ventral fin begins below or behind pectoral fin base. Scales on top of head extend forward of eyes. Teeth fine and sharp, in one row on vomer, palatines and tongue. Pectoral fin about equal to HL.

Dark metallic blue-grey head bones; dorsal, anal and ventral fins with a pinkish brown sheen.  
D X-XI, I, 17-20. A III, 17-19. P 18-20. GR 9 + 16-18.  
(voucher: 116 mm SL)

### **Psenes pellucidus**

Body depth 30-35% SL. Spinous dorsal fin begins before pectoral fin origin; ventral fin begins below pectoral fin base and reaches past anal fin origin (in very young individuals). Scales on top of head do not extend forward of eyes. Lower jaw teeth long and knife-like. Body soft or flabby. Plain brown; dorsal, anal and ventral fins darker.

D IX-XII, 1-11, 27-32. A III, 26-31. P 18-20. GR 8-9 + 15-17.  
(voucher: 147 mm SL)

## ARIOMMATIDAE

**One dorsal fin, distinctly separated into spinous and soft-rayed portions: dorsal spines slender, moderately long, about 10-11 and fold into a groove; dorsal fin rays 13-16. Anal fin with 3 spines, 13-16 rays. No teeth on vomer and palatines. Eye large. Scales cycloid, thin, easily lost. Caudal peduncle square in cross-section, with very low lateral keels, least depth less than 20 times in SL.**

**The family comprises a single genus and seven species, of which three were obtained on the Survey.**

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001.

### **Ariomma brevimanus**

Body depth 25-30% SL. Eye less than 3.6 in HL. Pectoral fin short, about half HL and reaching only halfway to anal fin origin. Scales on top of head extend forward only to above hind edge of eye. Dark metallic blue-charcoal; fins dark green-grey or brown.

D X-XI, I, 15. A III, 13-14. P 22-25. GR 9 + 20.  
(voucher: 135 mm SL)

### **Ariomma parini**

Body depth about 30% SL. Pectoral fin moderate, not quite reaching anal fin origin and equals HL without snout. Scales on top of head reaching forward to above front of eye. Eye 3.1-3.3 in HL. Dark metallic blue-charcoal head, body and fins; spinous dorsal fin very dark.

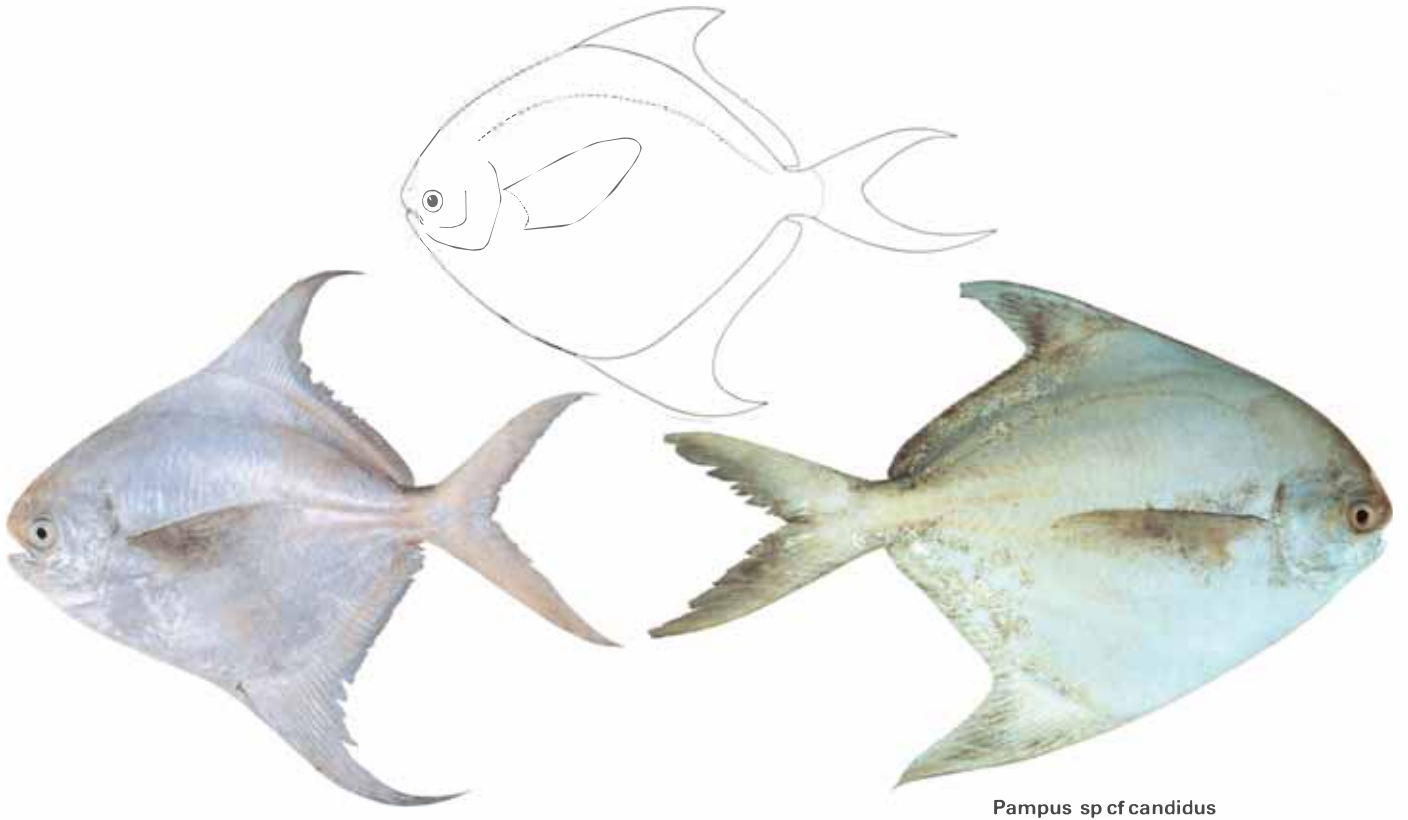
D X, I, 16. A III, 14. P 19. GR (total) 26-29. L. lat. 47-50.  
(voucher: 128 mm SL)

### **Ariomma indica**

Body depth 40% or more of SL. Pectoral fin long, reaching past anal fin origin and longer than HL. Posterior teeth in lower jaw three-cusped, remainder simple. Head iridescent blue-mauve, body fawn, fins dusky olive.

D X-XI, I, 14-15. P 21-23. GR 7 + 14-16.  
(voucher: 145 mm SL)

STROMATEIDAE



*Pampus argenteus*

*Pampus sp cf candidus*

CALLIONYMIDAE

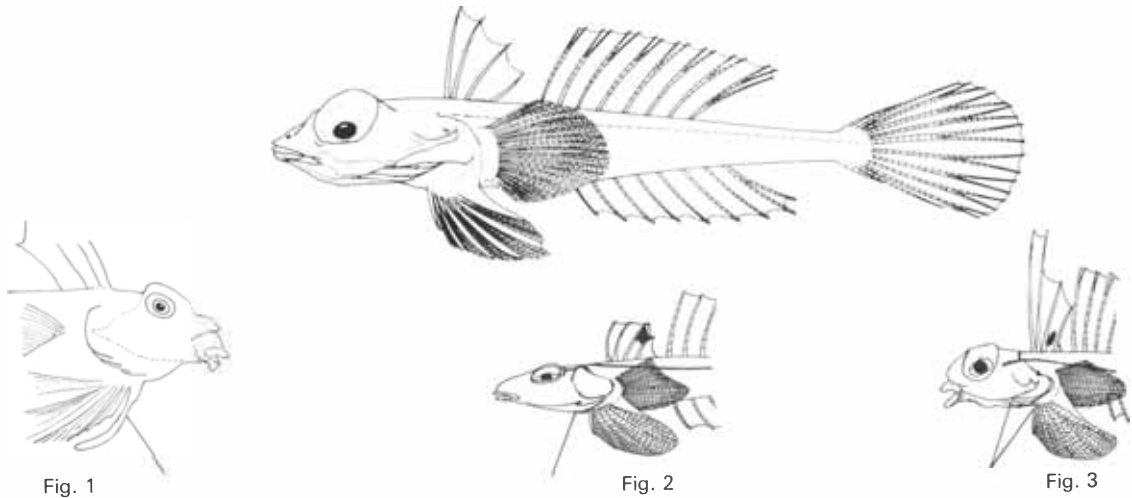


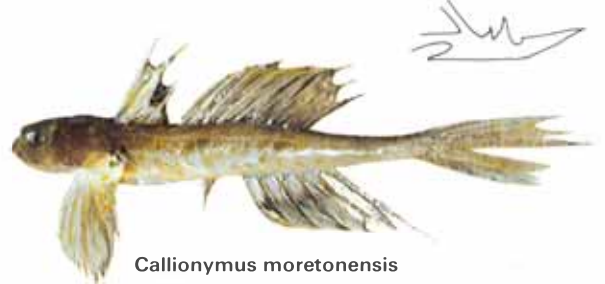
Fig. 1

Fig. 2

Fig. 3



*Callionymus meridionalis*



*Callionymus moretonensis*



*Callionymus semeiophor*



*Callionymus superbus*

## STROMATEIDAE

### White pomfrets - Bawal Putih

**One continuous dorsal fin. No spines or 2-10 small blade-like spines before dorsal fin rays; 15-30 rays in anal fin. Ventral fins may be present in juveniles, never in adults. Dorsal and anal fin bases about equal in length. Teeth in jaws compressed with or without cusps. Dorsal and anal fins may be produced into high curving lobes.**

**The family comprises three genera with 17 species, of which members of one genus was obtained on the Survey.**

REFERENCES: Parin & Piotrovsky, 2004; Haedrich, 1967; Last, 2001; Radhakrishnan et al, 2019; Roul et al. 2021

#### **Pampus argenteus**

Body compressed and muscular. Maxilla ends under eye. Ventral fin never present. Dorsal and anal fins high anteriorly, falcate, their tips produced. Caudal fin deeply forked, tips sharp, lower lobe slightly longer. Flat, blade-like spines present in first part of dorsal and anal fins. Body and fins iridescent blue-grey, back and fin margins dusky. D V-X, 38-43. A V-VII, 34-43. P 24-27. GR 2-3 + 8-10. (voucher: 127 mm SL)

#### **Pampus sp cf candidus**

Body compressed and muscular. Maxilla ends under eye. Ventral fin never present. Dorsal and anal fins elevated anteriorly but not produced into falcate lobes. Caudal fin forked, tips blunt. Body and fins bluish green, back and fin margins dusky. No spines before unpaired fins. D 41-44. A 39-42. (voucher: 223 mm SL)

## CALLIONYMIDAE

### Dragonets -

**Small fishes with depressed head and trunk. Mouth small and protractile; small, fine teeth in jaws; eye large; well-developed spine on preoperculum with barbs along margin(s), sometimes one at its base; no opercular nor subopercular spine. Gill opening a small pore near top of head or on upper sides; gill membranes united to isthmus. No scales; lateral line well-developed. Usually two dorsal fins, first of 1-4 (usually 4) flexible spines, second of 6-11 rays; anal fin with 4-10 rays; last anal and dorsal rays always divided at base, other rays branched or simple. Ventral fin large, its base before base of large pectoral fin, last ray usually connected to it by a broad membrane.**

**A diverse family with nearly all species sexually dichromatic; 20 genera and 196 recognised species ; 16 species in three genera were obtained on the Survey.**

#### **KEY TO GENERA FOUND ON SURVEY**

- A. Spine and first ray of ventral fin separated from rest of fin (Fig 1) . . . . . **Dactylopus**  
 AA. No detached ray or spine in ventral fin . . . . . **B**  
 B. Gill opening near top of head; membrane behind last dorsal spine well-developed; antrorse spine at base of preopercular spine (Fig 2) . . . . . **Callionymus**  
 BB. Gill opening sub-lateral; membrane behind last dorsal spine small or absent; no antrorse spine at base of preopercular spine (Fig 3) . . . . . **Synchiropus**

REFERENCES: Fricke, 2001a; Fricke & Quang, 2018; Nakabo, 1987; Tea & Gill, 2016.

#### **Callionymus meridionalis**

Eye 2.7-3.3 in HL. Snout 2.5-2.9 in HL. Smooth area behind eye. First dorsal fin spine produced and filamentous (longer filament in male than females), median rays of convex caudal fin with short filaments (male). Row of brown blotches along side, cheek and breast barred dark brown. First dorsal white, with small black spots (male) or 2<sup>nd</sup> to 4<sup>th</sup> membranes completely black (female); anal fin black with narrow white margin (male) or plain white with narrow dusky margin (female); black spots over upper half of caudal fin, lower half brown. D IV; 9. A 9. P (total)19-22. (voucher: 108 mm SL)

#### **Callionymus semeiophor**

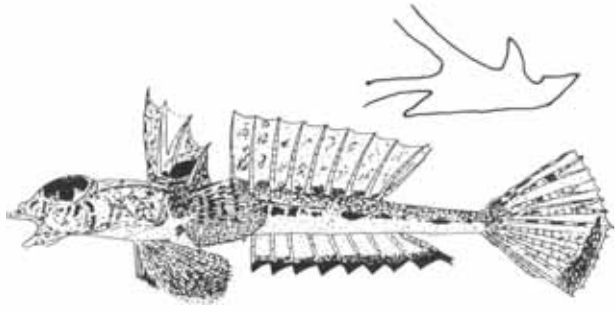
Preopercular spine with short, upcurved tip. Eye about 2.2 in HL. Snout 3.8-3.9 in HL. First dorsal high, 1<sup>st</sup> spine filamentous (male), 2<sup>nd</sup> dorsal and anal fin margins convex (male) or straight (female), convex caudal fin with 2 median rays produced into short filaments. Upper half of body pale brown, row of dark grey blotches on side; a small black spot on 1<sup>st</sup> membrane of 1<sup>st</sup> dorsal fin, and a large blotch on 2<sup>nd</sup> to 4<sup>th</sup> membrane (male), dark brown blotch on 3<sup>rd</sup> and 4<sup>th</sup> membrane (female); vertical dark streaks (male) or median dusky line (female) on 2<sup>nd</sup> dorsal; outer half of anal fin black; no distinct markings on caudal fin. D IV; 9. A 9. P (total)19-21 (voucher: 113 mm SL)

#### **Callionymus moretonensis**

Main tip of preopercular spine about 2.5- 3 times longer than largest point on its side. Eye 2-2.5 in HL. Snout 3.1-3.7 in HL. First dorsal spine long and filamentous (adults), margin of second dorsal fin straight, median 2 rays of convex caudal fin produced into short filaments. Upper half of body fawn, white spots on back partly edged dark brown, row of brown spots along side; black blotch on 3<sup>rd</sup> membrane of 1<sup>st</sup> dorsal; second dorsal fin with a dark margin and 2 or 3 rows white spots; black margin on anal fin, broad curved black band on lower part of caudal fin. D IV; 9. A (8)-9. P (total) 19-24. (voucher: 88 mm SL)

#### **Callionymus superbus**

Eye 2.5-3.5 in HL. Snout 2.4-2.7 in HL. Caudal fin long, median rays produced into filaments, fin length subequal to body length (male); shorter, not filamentous (female), 1<sup>st</sup> to 3<sup>rd</sup> dorsal spines filamentous (male); 1<sup>st</sup> and 2<sup>nd</sup> membrane of 1<sup>st</sup> dorsal fin alternately banded white and dark (male); with a distal black blotch on 3<sup>rd</sup> membrane (female), dark brown margin on anal, broad dark brown bars across caudal fin, lower fin dark. D IV; 9. A 8. P (total)18-20. (voucher: 88 mm SL)



Callionymus whiteheadi from Ficke



Callionymus filamentosus



Callionymus goodladi



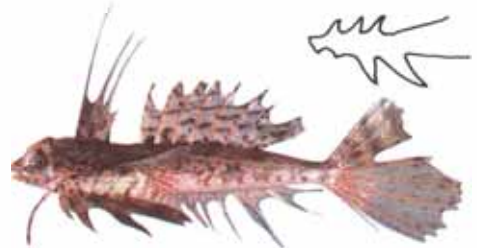
Callionymus grossi



Callionymus australis



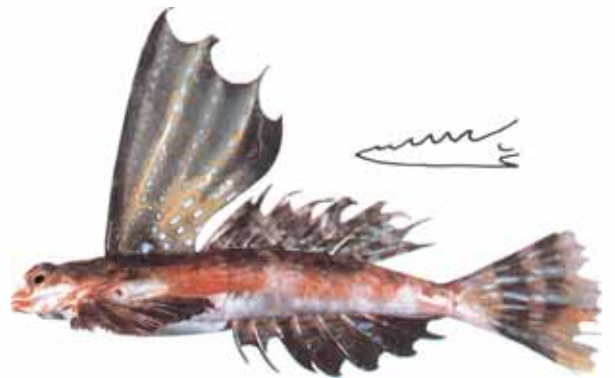
Callionymus japonicus



Dactylopus dactylopus

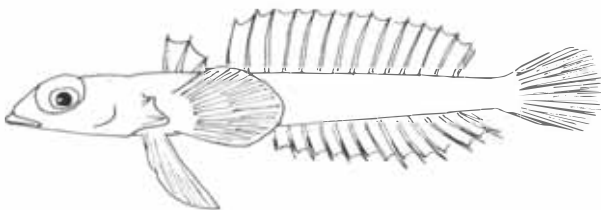


Synchiropus altivelis



Synchiropus rameus

**DRACONETTIDAE**



Centrodraco rubellus



**Callionymus whiteheadi**

Eye 2.2-2.3 in HL. Snout 3.8-4.1 in HL. Second dorsal and anal fin margins straight; caudal fin convex, without filaments. Upper half of body marbled olive green; large black-edged white spots on operculum, dark patch on upper pectoral base, black blotches in row along side; large black blotch on 3<sup>rd</sup> membrane of 1<sup>st</sup> dorsal fin, basal row of black spots on 2<sup>nd</sup> dorsal, black margin on anal fin, lower part of caudal fin blackish distally.  
D IV; 9. A 9. P (total) 18-21.

**Callionymus goodladi**

Preopercular spine with 7-13 serrae along inner margin. Eye 3.5-4.2 in HL. Snout 2.3-2.7 in HL. Predorsal length 3.0-3.6 in SL (from 1<sup>st</sup> dorsal); length 1<sup>st</sup> dorsal base 1.4-1.9 in HL; ventral fin length 0.8-0.9 in HL. First dorsal spine long with very long filament; rays of lower caudal fin longer than those of upper fin. Row of dark blotches along side; black blotch covering outer part of 3<sup>rd</sup> dorsal spine; dark margin on anal fin (female).  
D IV; 8. A 7. P (total) 19-20.

**Callionymus japonicus**

Preopercular spine with 6-13 serrae along inner margin. Eyes 2.6-3.5 in HL; snout 2.4-3.0 in HL; 2 rough bony patches above and behind eye. First 2 dorsal spines produced and filamentous (male), caudal fin very long, median rays produced (much more in male) but never filamentous, the fin equal to or more than body length. First dorsal with dark brown streaks, black blotch(es) on 3<sup>rd</sup> membrane, black margin on anal fin (broader in male), caudal fin crossed by dark brown bars, lower part of fin black; large black spot on breast (male).  
D IV, 9. A 8. P (total) 18-23.  
(voucher: 155 mm SL)

**Synchiropus altivelis**

Eye 2.4-3.5 in HL. Snout 3.0-4.1 in HL. Gill-opening located behind or at the origin of 1<sup>st</sup> dorsal fin. Either first dorsal spine (female) or first 2 dorsal rays (male) elongated or filamentous; upper and lower halves of caudal fin usually symmetrical. Upper head and back dusky orange or rosy. Fins hyaline or pale blue, edges at least orange; about 3 rows of orange spots on soft dorsal fin and often across caudal fin.  
D IV; 8. A 7. P (total) 17-22.  
(voucher: ? mm SL)

**Callionymus filamentosus**

First dorsal spine produced into filament and detached from rest of fin (male) connected with 2<sup>nd</sup> spine and not filamentous (female); median rays of pointed caudal fin filamentous (male). Pearly and dark brown spots over upper  $\frac{2}{3}$  of body, dark bars across cheek, dusky patch on pectoral base; 2<sup>nd</sup> to 4<sup>th</sup> membranes of first dorsal black with white streaks or with some large, white-edged black ocelli (males), female with large black ocellus on 3<sup>rd</sup> membrane. Second dorsal, caudal and ventral fins spotted with brown (in males also with blue).  
D IV (I + III male); 9. A 9. P (total) 17-21.  
(voucher: 74 mm SL)

**Callionymus grossi**

Preopercular spine with 7-18 serrae along inner margin. Eye 2.6-4.1 in HL. Snout 2.4-3.4 in HL. Predorsal length 3.8-4.9 in SL (from 1<sup>st</sup> dorsal); length of 1<sup>st</sup> dorsal base 0.8-0.9 in HL. High 1<sup>st</sup> dorsal fin, 1<sup>st</sup> spine with long filament (both sexes); rays of lower caudal fin longer than those of upper fin. Row of dark blotches along side; alternating oblique dark and white bands on 1<sup>st</sup> dorsal; anal fin plain.  
D IV; 9. A 7-9. P (total) 16-19.

**Callionymus australis**

Preopercular spine with 5-7 serrae along inner margin. Eye 2.3-3 in HL; snout 2.4-3.7 in HL; 2 rough, bony patches above and behind eye. First spine of dorsal fin elongate and filamentous (longer in male); caudal fin very long, median rays filamentous, fin 0.8-1.05 in SL (male), 1.5-2 in SL (female). Row of dark spots along side; breast with a black blotch (male); first dorsal fin with a black blotch on 3<sup>rd</sup> membrane and dark margin (female) narrow black margin on anal fin, charcoal bars and black and lower margin on caudal fin.  
D IV; 9. A 8. P (total): 19-21.

**Dactylopus dactylopus**

Eye 2.6-3.5 in HL. Snout 2.8-3.6 in HL. Spinous dorsal high, beginning before gill opening; usually all dorsal rays divided. Body olive above, marbled reddish brown and blue; soft dorsal and upper caudal fins barred with charcoal; blue-ringed ocellus on spinous dorsal membrane; ventral spotted dark blue.  
D IV; 8. A 7. P (total) 18-22.  
(voucher: 195 mm SL)

**Synchiropus rameus**

Antorse basal spine on preoperculum well-developed; 4-11 spines on dorsal main spine. Eye 2.3-3.3 in HL. Snout 3.2-3.9 in HL. Spinous dorsal fin very high; caudal fin truncate. Head and back marbled olive; side of head and body with 5 or 6 broad reddish brown crossbands; row of blue spots or dashes on spinous dorsal (vertically) and anal fins, 2 distinct dark crossbands on caudal fin which is not filamentous in males.  
D IV; 8. A 7. P (total) 18-21.  
(voucher: 110 mm SL)

**DRACONETTIDAE**

## Slope Dragonets -

**Small, elongate and rounded. No scales but grooved lateral line. Snout pointed and eye large; strong spine on operculum and preoperculum. Two dorsal fins, first with 3 spines. All but last dorsal and anal rays simple.**

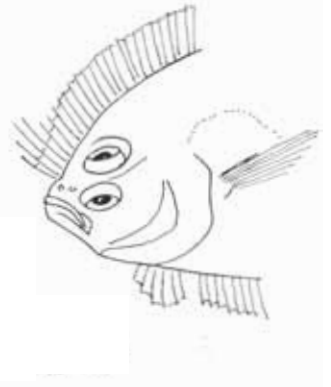
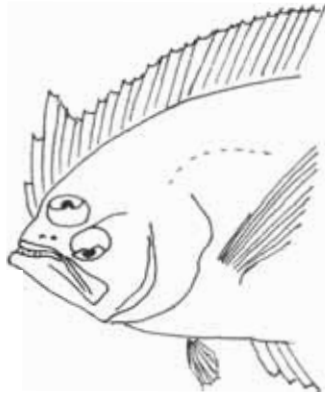
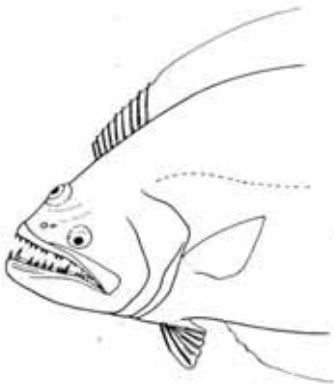
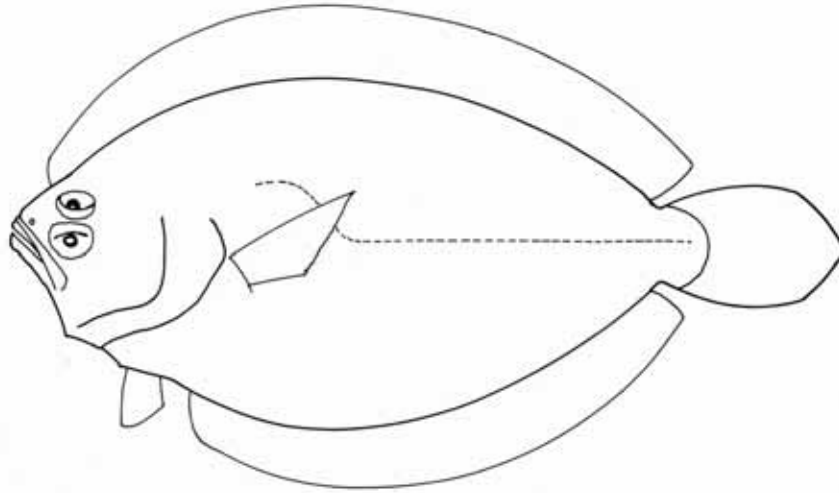
**The family comprises two genera and 15 species.**

REFERENCE: Fricke, 1992; Fricke, 2001b.

**Centrodraco rubellus**

Body pink with yellow blotches; dark spots and lines on body, notably on caudal peduncle and near pectoral fin; dark streak along upper caudal fin rays. First dorsal spine strong and sharp, filamentous in males; second dorsal fin rays lack filaments  
D III, 13-15. A 13-14. P 26.  
(voucher: 98 mm SL)

## PLEURONECTIFORMES

**PSETTODIDAE**

Six elements in ventral fin (1 spine, 5 rays); dorsal fin begins behind head; anterior dorsal and anal rays spinous; eyes on right or left sides.

**CITHARIDAE**

Six elements in ventral fin (1 spine, 5 rays); dorsal fin begins above eyes; no spinous rays in dorsal and anal fins; eyes on right or left sides; anus opens on eyed side.

**PARALICHTHYIDAE**

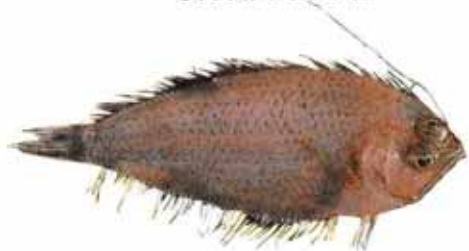
Eyes on left side; preoperculum margin visible; chin prominent; ventral fins short-based and symmetrically placed on either side of midventral line; lateral line present below lower eye and a supratemporal branch, running upward to anterior part of dorsal fin.

**BOTHIDAE**

Eyes on left side; preoperculum margin visible; chin prominent; ventral fin of blind side above midventral line.

**PSETTODIDAE**

*Psettodes erumei*

**CITHARIDAE**

*Branchypleura novaezeelandiae*

## PLEURONECTIFORMES

Flatfishes - Order

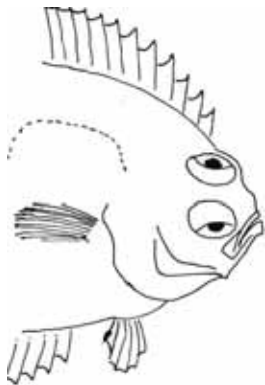
Soles; Flounders; Halibut - Kalankan;

A distinct group of fishes in which the adults are not bilaterally symmetrical, as an adaptation to life close to the bottom. Young flatfishes have normal symmetrical form and swim upright, an eye on each side of the head. Early in development one eye migrates across the nape to lie next to the eye on the other side and the dorsal fin moves further forward onto the head (not in *Psettodes*). The fish then lies and swims on the eyeless (blind) side which usually lacks pigment; eyed side is pigmented with colours that blend with the fish's surroundings. Flatfishes are grouped into dextral (both eyes on right hand side of body) or sinistral (both eyes on left hand side of body). though some species exhibit both aspects. Body oval and strongly compressed. Head asymmetrical, mouth usually protractile; teeth small, sometimes lacking or present only on blind side, sometimes strong and sharp; preoperculum edge free or concealed; operculum well-developed; gill opening wide. Scales of various types, lateral line well-developed and sometimes more than one. Dorsal and anal fins long, free from or continuous with caudal fin; pectoral fins often unequally developed, sometimes rudimentary or absent; ventral fins variously developed or unequal, united with each other; urinogenital papilla on anal fin. Except in PSETTODIDAE and CITHARIDAE, all fins lack spines. Sometimes there are spines on head or pectoral rays may be extended in males.

About 13 recognised families, of which nine recorded on this Survey.

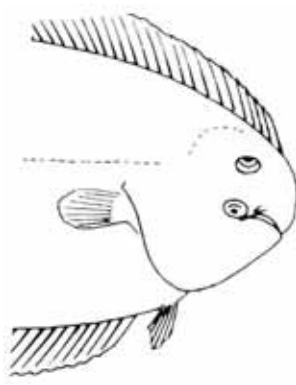
### REFERENCES:

- Bothidae - Amaoka & Arai, 1998; Amaoka & Ho, 2019; Hensley & Amaoka, 2001; Hensley, 2005; Norman, 1934; Voronina et al, 2020.  
 Citharidae - Hensley, 2001b.  
 Cynoglossidae - Chapleau & Renaud, 1993; Chapleau, Renaud & Kailola, 1991; Endo & Sakaji, 2008; Menon, 1977; Munroe, 2001b; Wang, Munroe & Kong, 2018; Yokogawa, Endo & Sakai, 2008.  
 Paralichthyidae - Amaoka & Hensley, 2001; Hensley & Amaoka, 2001.  
 Poecilopsettidae - Allan & Swainston, 1988; Hensley, 2001c.  
 Psettodidae - Hensley, 2001a.  
 Rhombosoleidae - Allan & Swainston, 1988; Sakamoto, 1984.  
 Samaridae - Hensley, 2001c; Nelson, 1994.  
 Soleidae - Allan & Swainston, 1988; Munroe, 2001a; Randall & Desoutter-Meniger, 2007; Randall & Johnson, 2007a.



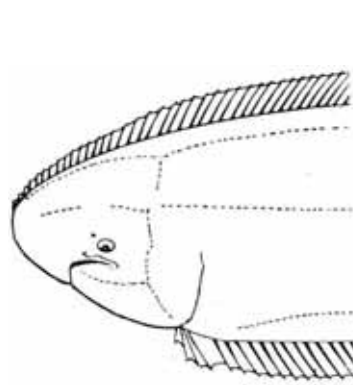
### POECILOPSETTIDAE

Eyes on right side; preoperculum margin visible; chin usually prominent.



### SOLEIDAE

Eyes on right side; preoperculum margin hidden by skin and scales; chin not prominent.



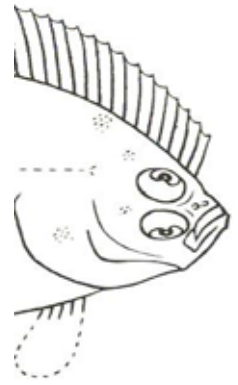
### CYNOGLOSSIDAE

Eyes on left side; preoperculum margin hidden by skin and scales; chin not prominent.



### RHOMBOSOLEIDAE

Eyes on right side; asymmetrical pelvic fins.



### SAMARIDAE

Origin of dorsal fin in front of eyes; lateral line well developed or rudimentary; pelvic fins symmetrical; postcleithra absent.

## PSETTODIDAE

### *Psettodes erumei*

Eyed side plain brown or dark green, sometimes with broad crossbands and scattered white spots. White edge on caudal fin. Mouth large, teeth strong. Upper eye near dorsal profile and in front of lower eye. Caudal fin wedge-shaped.

D 49-56. A 34-44.

(voucher: 225 mm SL)

## CITHARIDAE

### *Brachypleura novaezeelandiae*

Eyed side mottled pale brown with about 3 rows of dark near fin bases, small dark spots on fins. Mouth large, maxilla 1.8-2 in HL: gill rakers long. Scales easily lost, none on front third of head; lateral line distinctly curved above pectoral fin. Anterior dorsal fin rays filamentous in male; both ventral fins short based, that of eyed side well before ventral fin on blind side.

D 65-74. A 41-49. L. lat . 29-25. C 13-14 branched rays.

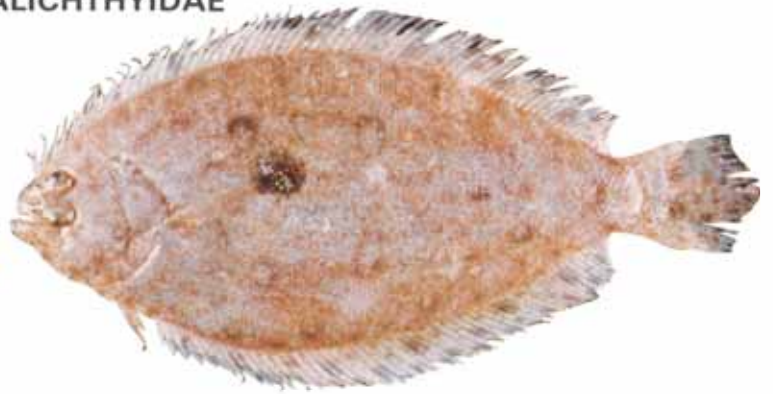
(voucher: 80 mm SL)



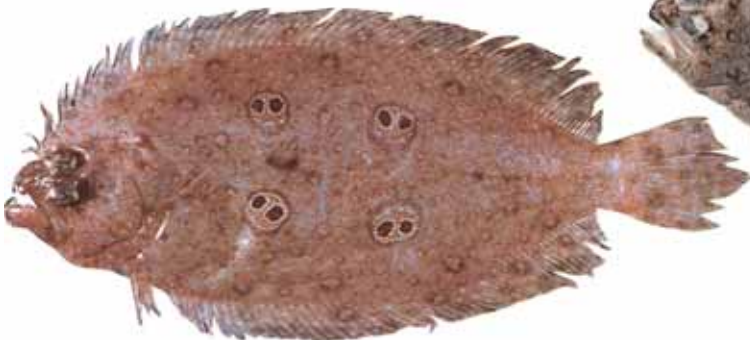
PARALICHTHYIDAE



*Pseudorhombus argus*



*Pseudorhombus arsius*



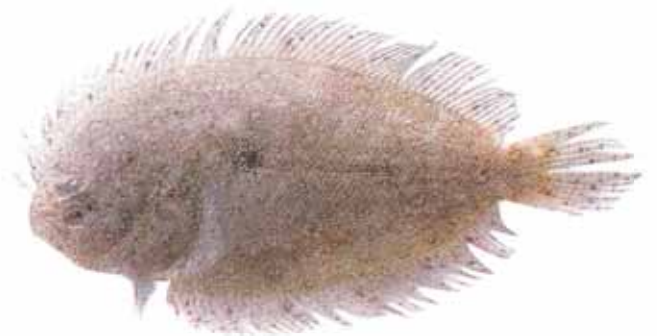
*Pseudorhombus diplospilus*



*Pseudorhombus duplici-cellatus*



*Pseudorhombus elevatus*



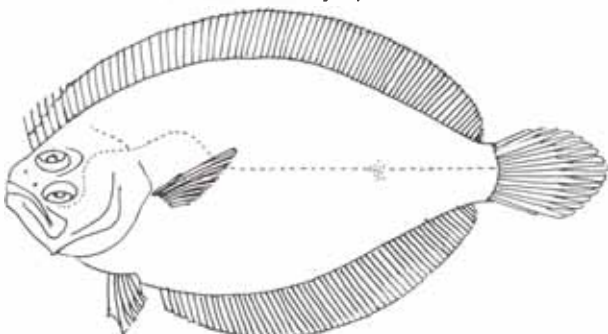
*Pseudorhombus javanicus*



*Pseudorhombus jenynsii*



*Pseudorhombus malayanus*



*Pseudorhombus neglectus* after Norman, 1934



*Pseudorhombus quinquocellatus*



## PARALICHTHYIDAE

### ***Pseudorhombus argus***

Five black double ocelli on body, ringed with yellow spots - 2 above, 2 below, 1 posteriorly on lateral line. Teeth small, close together; eye 4-4.5 in HL. Dorsal fin begins behind nostrils (blind side) or above or slightly before front of eye (eyed side).

D 68-69. A 51-54. Lower GR 10-16, (slender).  
(voucher: 220 mm SL)

### ***Pseudorhombus diplospilus***

Body brown, large double black ocelli on body ringed with yellow spots - 2 above and 2 below lateral line. Two dark spots on proximal part of caudal fin. Dorsal fin begins just behind posterior nostril (blind side); head profile notched; 4-10 strong canine teeth anteriorly in both jaws; gill rakers short, broad and with spiny margins. Body depth 2.4-2.6 in SL. Scales ctenoid on eyed side, cycloid on blind side.

D 75-79. A 59-64. L. lat. 82-98.  
(voucher: 231 mm SL)

### ***Pseudorhombus elevatus***

Four to 5 rows of dark rings along body; large dark blotch on lateral line at beginning of straight part, sometimes 1 or 2 more on line posteriorly; unpaired fins with regularly-spaced dark blotches. Dorsal fin begins above or in front of front nostril (blind side); a notch in head profile before eyes; teeth small; body depth 1.7-2 in SL. All scales ctenoid on eyed side.

D 66-76. A 51-58.  
(voucher: 115 mm SL)

### ***Pseudorhombus jenynsii***

Five or 6 black double or single ocelli on body, densely ringed with yellow spots - 2 above, 2 below, 1 or 2 posteriorly on lateral line. Dorsal fin begins behind nostrils (blind side), and above or just before anterior eye (eyed side); notch before upper eye. Teeth small, close together; eye 4.3-6.8 in HL.

D 67-74. A 51-60. Lower Gr 7-10, (short and broad).  
(voucher: 270 mm SL)

### ***Pseudorhombus neglectus***

Pale brown, finely spotted dark brown; 2 white-ringed dark blotches on lateral line - one at beginning of straight part and one in middle of straight part. Dorsal fin begins just before upper eyed (eyed side), behind nostrils (blind side); teeth small; upper head profile almost straight. Eye 3.7-4.2 in SL. Scales cycloid on blind side, ctenoid on eyed side. Depth 1.9-2.1.

D 72-75, A 56-59. Lower GR 9-12, (short and broad).  
(voucher: ? mm SL)

### ***Pseudorhombus arsius***

Brown with dark spots and rings; large dark blotch on lateral line at beginning of straight part, sometimes 1 or 2 smaller blotches on line posteriorly. Dorsal fin begins just before nostrils (blind side) or over space between nostrils; teeth strong, widely spaced, 6-13 on blind side of lower jaw; maxilla 2.2-2.6 in HL.

D 72-80. A 54-62. L. lat. 67-80. Lower GR 8-15.  
(voucher: 270 mm SL)

### ***Pseudorhombus dupliciocellatus***

Large double black ocelli on body ringed with yellow spots and black ring - 2 above, 2 below and 1 on lateral line posteriorly, sometimes last one missing or first one above lateral line missing; regular series of dark spots on vertical fins. Dorsal fin begins above posterior nostril (blind side); head profile notched; 13-22 teeth on blind side of lower jaw (not caniniform); gill rakers short, broad, with spiny margins. Body depth 2-2.4 in SL.

D 73-78. A 56-63. L. lat. 73-84.  
(voucher: 230 mm SL)

### ***Pseudorhombus javanicus***

Brown body and fins ringed and finely spotted dark brown; round black blotch ringed with white spots at beginning of straight part of lateral line, sometimes another on line posteriorly. Dorsal fin begins before nostrils (blind side); upper head profile evenly convex; teeth small; cycloid scales posteriorly on eyed side; ctenoid scales anteriorly. Body depth 2.1-2.4 in SL.

D 69-76. A 50-56.  
(voucher: 108 mm SL)

### ***Pseudorhombus malayanus***

Body plain brown; dark blotch at beginning of straight part of lateral line. Body depth 1.7-2 in SL; head 3.1-3.3 in SL; eye 3.8-6.4 in HL. Body scales ctenoid on both sides.

D 72-74. A 58-59. L. lat. 70-78.  
(voucher: 180 mm SL)

### ***Pseudorhombus quinquocellatus***

Five dark brown single ocelli on body, ringed with yellow spots and brown line - 2 above, 2 below, 1 posteriorly on lateral line. Teeth strong, widely spaced, 12-14 on blind side of lower jaw. Strong canine teeth anteriorly in both jaws. Caudal peduncle twice longer than deep. Dorsal fin begins above nostrils (blind side) and before upper eye (eyed side). Sharp spine projects horizontally before anal fin origin. HL 3-3.3 in SL.

D 68-73. A 52-56.  
(voucher: 140 mm SL)



*Pseudorhombus triocellatus*



*Pseudorhombus spinosus*



*Pseudorhombus megalops*

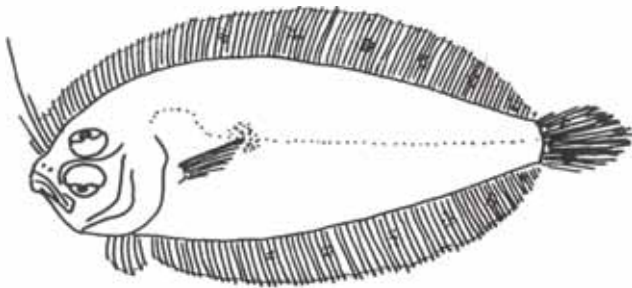
**BOTHIDAE**



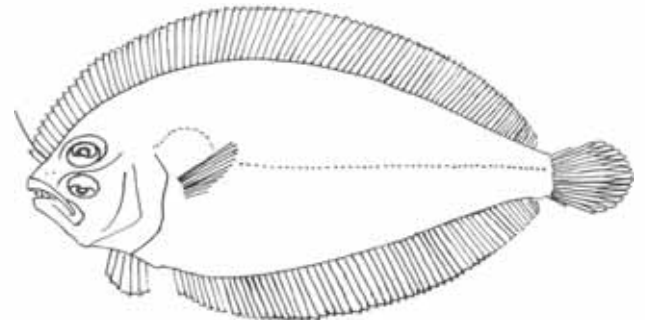
*Arnoglossus dalgleyshi*



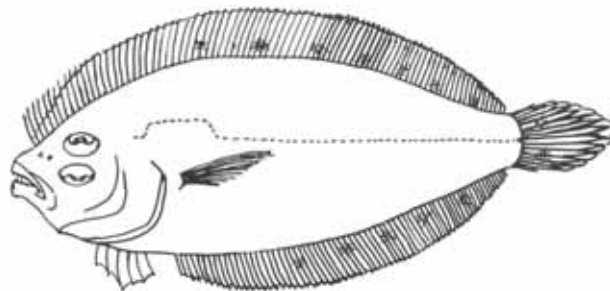
*Arnoglossus debilis*



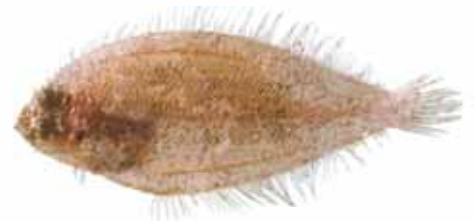
*Arnoglossus elongatus* after Norman, 1934



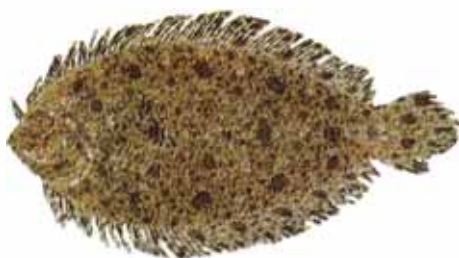
*Arnoglossus japonicus* after Norman, 1934



*Arnoglossus polyspilus* after Norman, 1934



*Arnoglossus waitei*



*Asterorhombus intermedius*



*Bothus myriaster*

**Pseudorhombus spinosus**

Body fawn; three large black ocelli on body, ringed yellow - 1 above and 2 below lateral line. Fins speckled brown. Dorsal fin begins before nostrils (blind side); head profile evenly convex above eyes (no notch); gill rakers short, broad, with spiny margins.  
D 72-76. A 57. L. lat. 75-83.  
(voucher: 170 mm SL)

**Pseudorhombus triocellatus**

Three large black ocelli on body, ringed cream and black - one above, one below, one on lateral line posteriorly (triangularly arranged). Body deep, depth 1.4-1.6 in SL. Anterior dorsal fin rays long and free from membrane, longest  $\frac{1}{2}$  to  $\frac{2}{3}$  HL. Scales mostly cycloid on blind side.  
D 65-70. A 49-52. Lower GR 20-25, slender. L. lat. 63-69.  
(voucher: ? mm SL)

**Pseudorhombus megalops**

Dark blotches and fine spots over tan or brown body and fins and about 5 rows of black or brown rings along body; a yellow-edged black ocellus on ventral fin of eyed side. Ctenoid scales on blind side. Dorsal fin begins above or before nostrils (blind side); teeth moderately strong, 12-18 on blind side of lower jaw; maxilla 2.1-2.3 in HL, reaches to below middle of eye; eye 3.4-3.9 in HL; head 3.2 in SL; body depth 2.1-2.2 in SL. Caudal peduncle twice longer than deep. Sharp spine projects horizontally before anal fin origin.  
D 67-70. A 50-54. L. lat. 74-76. Lower GR 16.  
(voucher: 133 mm SL)

**BOTHIDAE****Arnoglossus dalgleishi**

Eyes separated by bony ridge; lower jaw teeth strong and widely spaced, front teeth of upper jaw larger than those at sides; maxilla long, twice in HL and reaching hind part of lower eye. Body depth 2.4-2.8 in SL; eye 3.9-4.4 in HL. Scales feebly ctenoid on eyed side. Body grey-brown, dark spots on dorsal, anal and caudal fins.  
D 99-108. A 77-83. L. lat. 63-86. Lower GR 9, (slender).  
(voucher: ? mm SL)

**Arnoglossus elongatus**

Eyes separated by bony ridge; lateral teeth of both jaws small, close together, front teeth of upper jaw only slightly larger; maxilla 2.2-2.5 in HL; body depth 2.7-3 in SL; eye 3-3.1 in HL. Second to 4<sup>th</sup> dorsal fin rays may be produced. Body fawn, dark spots on body and fins; sometimes a blotch on straight part of lateral line anteriorly.  
D 100-108. A 78-83. L. lat. 64-66. Lower GR 8-9, slender.  
(voucher: 81 mm SL)

**Arnoglossus polyspilus**

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; maxilla 2.3-2.6 in HL; eye 3.2-4 in HL; body depth 2.4-2.9 in SL. Scales on eyed side feebly ctenoid. Body fawn; row of dark brown blotches on dorsal and anal fins, two blotches on caudal fin base.  
D 101-114. A 80-89. L. lat. 70-75. Lower GR 8-9, (slender).

**Asterorhombus intermedius**

Interorbital narrow and convex,  $\frac{1}{4}$  to  $\frac{1}{3}$  eye diameter; gill rakers short and broad with spiny margins; body depth 2-2.4 in SL. Scales feebly ctenoid on eyed side. First dorsal fin ray thicker and slightly longer than following rays. About 5 rows of dark brown blotches along body; fins with many dark brown spots.  
D 77-86. A 56-64. L. lat. 45-50. Lower GR 7-9.  
(voucher: 100 mm SL)

**Arnoglossus debilis**

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; upper and lower body profiles evenly convex (no "hump" behind eyes); eye 3.4-3.5 in HL. Scales cycloid on eyed side. Dark olive-brown, fins and body marbled and spotted darker.  
D 112-115. A 90-95. L. lat. 87-98. Lower GR 10-11, (slender).  
(voucher: 144 mm SL)

**Arnoglossus japonicus**

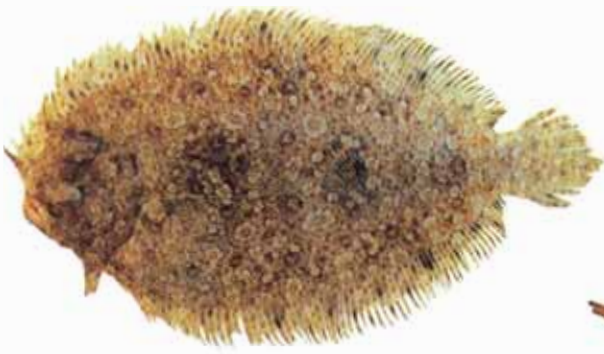
Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw larger than those at sides; maxilla reaches to below middle of eye, 2-2.2 in HL. Scales cycloid on eyed side. Brown fins and body mottled and spotted darker.  
D 97-99. A 74-83. L. lat. 63-64. Lower GR 7-8, short and pointed.

**Arnoglossus waitei**

Eyes separated by bony ridge; lateral teeth of both jaws small, close together, front teeth of upper jaw only slightly larger; maxilla 2.6-3.3 in HL; eye 2.8-3.4 in HL; body depth 2.2-2.5 in SL. Scales on eyed side cycloid or feebly ctenoid. Body brown, mottled; dark spots on dorsal, anal and caudal fins, sometimes a dark bar or 2 dark blotches near base of caudal fin.  
D 95-107. A 74-81. L. lat. 49-54. Lower GR 7-9, (slender).  
(voucher: 83 mm SL)

**Bothus myriaster**

Interorbital concave and very broad, twice eye diameter; lower eye well before upper eye; (male with spine on snout and chin and pectoral fin rays produced); maxilla 3.8 in HL. Scales on eyed side cycloid (ctenoid at edges), none on membrane between operculum and pectoral fin base. Body pale or dark brown with scattered spots; 2 dark blotches on straight part of lateral line, pale band across mid caudal fin. Blind side white anteriorly, barred across middle, dark brown posteriorly.  
D 87-97. A 61-73. L. lat. 104. Lower GR 6.  
(voucher: 144 mm SL)



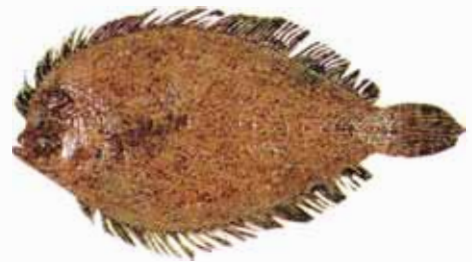
*Bothus pantherinus*



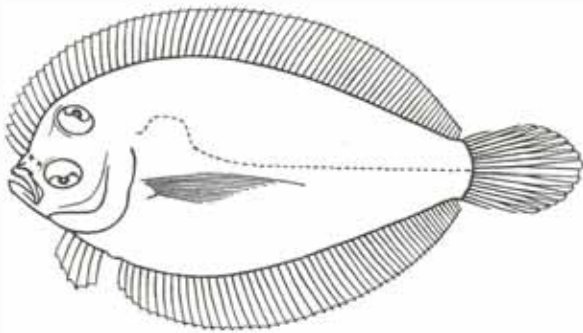
*Chascanopsetta lugubris*



*Crossorhombus azureus*



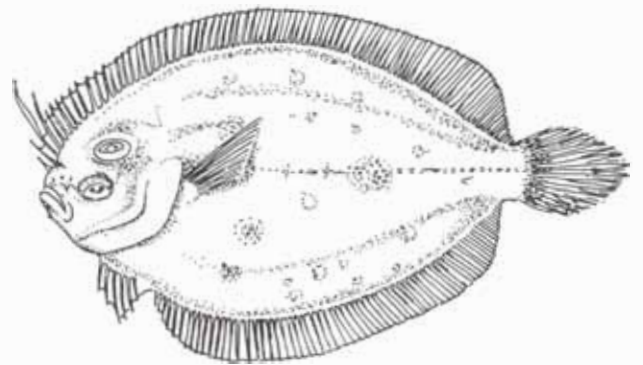
*Engyprosopon grandisquama*



*Engyprosopon maldivense* after Norman, 1934



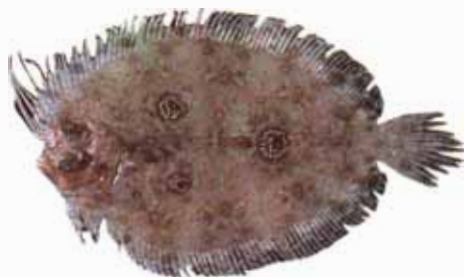
*Engyprosopon latifrons*



*Grammatobothus pennatus* after Norman, 1926



*Engyprosopon osculus*



*Grammatobothus polyophthalmus*



*Kamoharaia megastoma*



**Bothus pantherinus**

Interorbital concave and broad, equal to or slightly less than eye diameter; lower eye well before upper eye; (male with one or more spines on snout); maxilla 2.8-3.3 in HL. Scales on eyed side ctenoid, none on membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye; upper pectoral fin rays elongate in males. Either tan or dark brown, body covered with spots and rings; at least one large dark blotch on middle of straight part of lateral line. D 84-97. A 61-73. L. lat. 74-90. Lower GR 6-8. (voucher: 129 mm SL)

**Crossorhombus azureus**

Interorbital concave, equal to or slightly less than eye diameter; (male with one or more spines on snout); maxilla 3.6-4.1 in HL. Scales on eyed side with strong, elongate ctenii, scales also covering completely membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye. Body and fins spotted olive, orange and brown, one or more dark brown blotches on lateral line; anterior edge of dorsal fin bright orange-yellow; caudal fin margin often dark brown. D 84-92. A 64-74. P 11-14 (upper ray never produced). L. lat. 52-62. (voucher: 112 mm SL)

**Engyprosopon maldivense**

Interorbital concave, less than eye diameter; eye 3 in HL; maxilla small, 2.4-2.6 in HL. Pectoral fin on eyed side as long as head, upper ray produced in males. Scales on eyed side feebly ctenoid, also completely covering membrane between operculum and pectoral fin base. Body pale brown and lightly spotted; fins plain. D 70-76. A 53-58. L. lat. About 40. Lower GR 8-9. (voucher: 87 mm SL)

**Engyprosopon oculus**

Interorbital concave,  $\frac{1}{4}$  to  $\frac{3}{4}$  of eye diameter (less in females); maxilla 4.0 in HL; eye 4.2 in HL. Scales on eyed side feebly ctenoid, also covering completely membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye; pectoral fin elongate. Body tan; many black spots over body and fins; 2 conspicuous black spots in middle of upper and lower caudal fin margins. D 94-95. A 74. L. lat. 45-48. Lower GR 6-7. (voucher: 77 mm SL)

**Grammatobothus polyophthalmus**

Interorbital narrow and concave; lateral line well-developed on both sides of body. Second to 10<sup>th</sup> dorsal fin rays produced, longest  $\frac{2}{3}$  to  $\frac{3}{4}$  HL. Body depth 1.5-1.8 in SL. Brown with pale blue and brown spots; three large black and yellow ocelli on body forming a triangle: 2 above and below pectoral fin, another on middle of straight part of lateral line; broad dark and pale bars across pectoral fin. D 80-86. A 64-69. L. lat. 77-82. (voucher: 219 mm SL)

**Chascanopsetta lugubris**

Huge mouth, upper jaw more than half HL, extending well past lower eye; all teeth small, slender and curved (not forming a continuous cutting edge); gill rakers often absent. Body slender. Dorsal fin begins on snout, anterior rays mostly free from membrane; pectoral fin 1.5-1.9 in HL. Body and fins covered with many dark brown spots. D 111-124. A 76-88. (voucher: 210 mm SL)

**Engyprosopon grandisquama**

Interorbital concave,  $\frac{1}{2}$  to  $1\frac{1}{2}$  times eye diameter (less in females); maxilla (eyed side) 2-2.5 in HL; eye 2.6-4 in HL; (male with spine on snout), an orbital spine above each eye. Body depth 1.6-1.9 in SL. Scales on eyed side feebly ctenoid, also covering membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye. Body tan to dark brown, mottled and spotted; fine spots on dorsal and anal fins; 2 conspicuous black spots in middle of upper and lower caudal fin margins. D 79-89. A 59-68. L. lat. 36-48. Lower GR 5-7. (voucher: 89 mm SL)

**Engyprosopon latifrons**

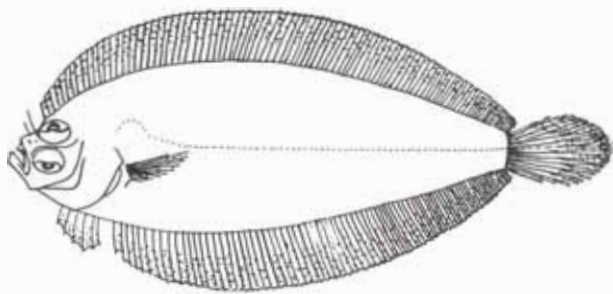
Interorbital concave,  $\frac{1}{2}$  to  $1\frac{1}{4}$  times eye diameter (less in females); maxilla 2.4-2.8 in HL; eye 2.7-3.3 in HL; body depth 1.9-2.2 in SL; (male with spine on snout and rays of ventral fin on eyed side produced.) Scales on eyed side feebly ctenoid, also covering completely membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below anterior half of lower eye; pectoral fin elongate. Body brown, dark markings on fins. D 80-87. A 59-67. L. lat. 38-41. Lower GR 6-8, serrated. (voucher: ? mm SL)

**Grammatobothus pennatus**

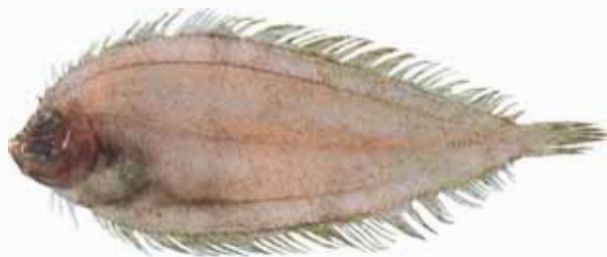
Interorbital narrow and concave; lateral line well-developed on both sides of body. Third and sometimes 4<sup>th</sup> dorsal fin rays produced and slightly thickened; upper pectoral fin ray sometimes produced. Body depth 1.8-2 in SL. Pale brown with scattered brown spots; large dark brown ocellus on middle of straight part of lateral line, 2 others above and below pectoral fin, the three of them forming a triangle. Fins blotched and marked dark brown, pectoral fin barred. D 87-91. A 71-76. L. lat. 79-84

**Kamoharaia megastoma**

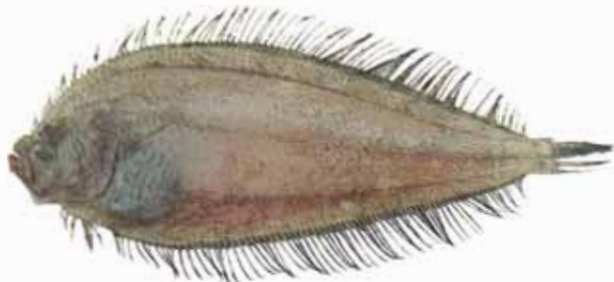
Huge mouth, lower jaw much longer than HL; 8-10 strong curved teeth at tip (symphysis) of each jaw, posterior jaw teeth forming an unbroken cutting edge, gill rakers short. Dorsal fin begins on snout, rays of dorsal and anal fins long, anterior dorsal fin rays mostly free from membrane; pectoral fin equal to HL. Four or 5 rows of dark blotches along brown body. D 109-112. A 84-86.



*Laeops guentheri* after Norman, 1934



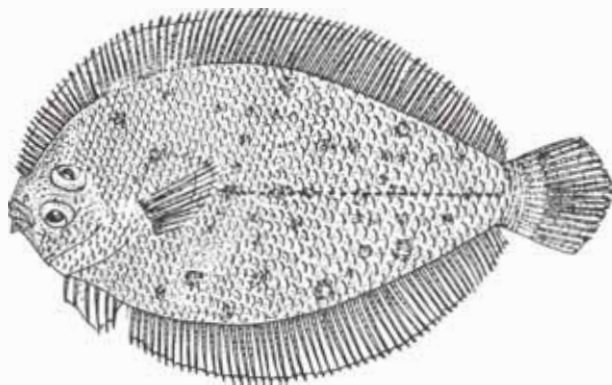
*Laeops parviceps*



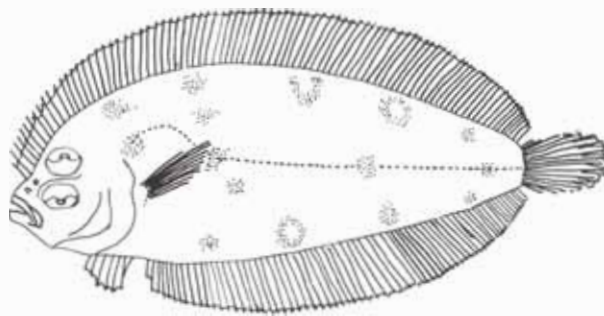
*Neolaeops microphthalmus*



*Parabothus kiensis*



*Psettina gigantea* after Amaoka, 1963

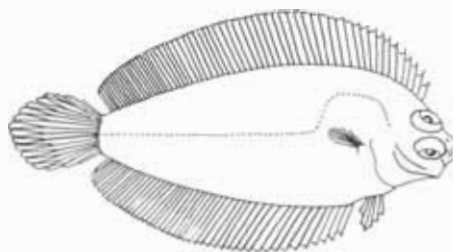


*Psettina iijimae* after Norman, 1934

**POECILOPSETTIDAE**



*Poecilopsetta colorata*



*Poecilopsetta praelonga* after Norman, 1934

**RHOMBOSELEIDAE**



*Psammodiscus ocellatus*

**Laeops guentheri**

Mouth small, maxilla almost reaching front border of eye, 4.1-4.6 in HL; fine teeth present only on blind side of both jaws. Upper body profile a little convex behind eyes; body depth 2.5-3 in SL; head 4.4-5 in SL. First two dorsal fin rays slightly separated from rest of fin; pectoral fin much less than HL. Plain brown, fin edges darker.  
D 97-102. A 77-84. Lower GR 6-9.  
(voucher: 91 mm SL)

**Neolaeops microphthalmus**

Eyes separated by bony ridge; lower jaw teeth strong and spaced, front teeth of upper jaw more widely spaced. Upper body profile strongly convex from before eyes, which are 4-5.3 in HL. HL 4.6-5.7 in SL. Scales cycloid on eyed side. Body plain olive-brown, fins darker.  
D 106-110. A 83-87. L. lat. 85-110. Lower GR 8-10, (short and pointed).  
(voucher: 157 mm SL)

**Psettina gigantea**

Eyes separated by bony ridge. Interorbital very narrow, scaled, much less than eye diameter; maxilla 2.9-3.2 in HL; eye 3.2 in HL; head 3.3-4.3 in SL. Scales on eyed side with elongate ctenii. Body grey-brown, with scattered spots on body, also along upper and lower margins of body; fine spots on fins.  
D 90-103. A 72-83. P 9-11, blind side. L. lat. 56-62. Lower GR 6-8.

**Laeops parviceps**

Mouth small, maxilla ending opposite front eye border, 3.8-4.4 in HL; fine teeth present only on blind side of both jaws. Upper body profile nearly straight behind eyes; body depth 2.6 in SL; head 5.2-5.3 in SL. First two dorsal fin rays slightly separated from rest of fin; pectoral fin much less than HL. Plain brown, fin edges darker; first two dorsal fin rays white.  
D 95-104. A 83-86. Lower GR 6-9.  
(voucher: 99 mm SL)

**Parabothus kiensis**

Interorbital concave, much less than eye diameter; maxilla 2.9-3.1 in HL; lower eye slightly to considerably before upper eye; scales on eyed side ctenoid, only partly covering membrane between operculum and pectoral fin base. First ray of ventral fin of eyed side below posterior margin of lower eye, ventral fin not elongate. Body depth 2.4-2.6 in SL; head 3.4-3.5 in SL. Body fawn, 4 rows of orange spots along body; fins stippled dark brown; a dark brown line along centre of caudal fin.  
D 113-116. A 89-95. L. lat. 86-92.  
(voucher: 140 mm SL)

**Psettina iijimae**

Eyes separated by bony ridge. Interorbital very narrow and bony, much less than eye diameter; head profile distinctly notched before eyes; maxilla 2.8-3.8 in HL; eye 3-3.3 in HL; head 3.8-4.4 in SL. Scales on eyed side with elongate ctenii. Body brown with dark spots and rings, most prominent along lateral line and upper and lower body margins, extending onto fins; pectoral fin barred dark brown.  
D 80-93. A 65-73. P 8-12, blind side. L. lat. 53-63.  
Lower GR 4-6.

**POECILOPSETTIDAE****Poecilopsetta colorata**

Eyes narrowly separated by a ridge, without tentacle; maxilla 3-3.8 in HL. Body depth 1.9-2.6 in SL; HL 3.3-4.2 in SL; lateral line developed only on eyed side. Dorsal fin begins above eye; both ventral fins short-based; middle rays of right pectoral fin branched. Eyed side brown, pectoral fin dark brown or with large dark spot, conspicuous black spot on upper and on lower caudal fin margins; juveniles yellow with 4 or 5 well-spaced longitudinal rows of black blotches along both sides of body.  
D 56-61. A 46-50. P 8-12. L. lat. 90-105.  
(voucher: 100 mm SL)

**Poecilopsetta praelonga**

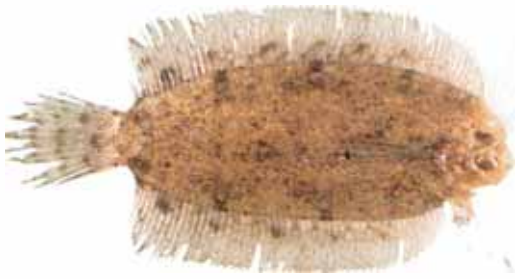
Eyes adjacent, without tentacle; maxilla 3.4-3.7 in HL; eye 2.5-3 in HL. Body depth 3.8-4 in SL; HL 3.7-4 in SL; lateral line developed only on eyed side. Dorsal fin begins above eye on eyed side; both ventral fins short-based; all pectoral fin rays simple. Yellowish brown; fins brown, pectoral fin margin dark; juveniles yellow with 4 or 5 well-spaced longitudinal rows of black blotches along both sides of body.  
D 59-65. A 50-54. P 8-10. L. lat. 90-95.

**RHOMBOSOLEIDAE****Psammodiscus ocellatus**

Eyed side of body freckled and marbled olive, black and green over tan background; 3-4 ocelli: 2 above anteriorly, 2 below lateral line; fins spotted like body. Lateral line equally developed on both sides of body, distinctly curved above pectoral fin on eyed side with single branch towards head. Dorsal fin begins before nostrils of blind side; ventral fin bases of unequal length, fin on eyed side longer, free from anal fin.  
D 60-68. A 46-52. P 10-12. Lower GR 15-18.  
(voucher: 60 mm SL)



SAMARIDAE



*Samaris cristatus*

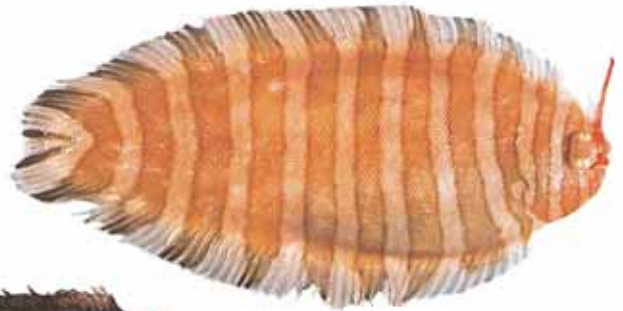


*Samariscus huysmani*

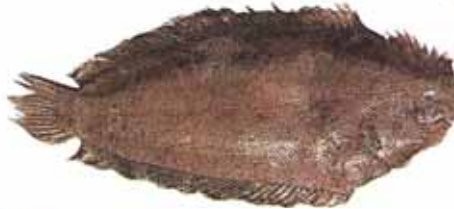
SOLEIDAE



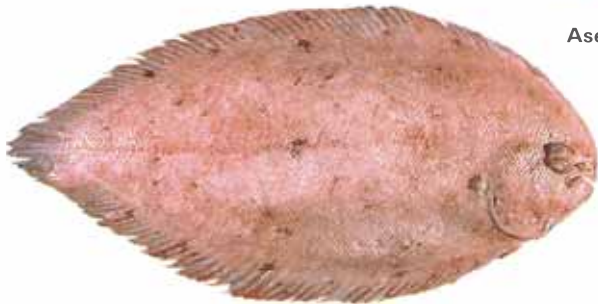
*Aesopia cornuta* (A)



*Aesopia cornuta* (B)



*Aseraggodes cyaneus*



*Dexillus muelleri*



*Pardachirus pavoninus*



*Zebrias cancellatus*



*Brachirus annularis*



*Zebrias craticulus*



*Zebrias quagga*



## SAMARIDAE

### **Samaris cristatus**

Mouth small, maxilla 2.6-3.2 in HL; straight lateral line present only on eyed side. Dorsal fin begins just before eye, its anterior 13-15 rays filamentous and long; pectoral fin long, present only on eyed side; ventral fin bases rather elongate, rays produced and tips expanded, first ray free; all caudal rays simple. Eyed side mottled pale brown with about 3 rows dark blotches (1<sup>st</sup> and 3<sup>rd</sup> along body profiles); row of blotches along dorsal and anal fin bases, several rows across caudal fin.

D 75-85. A 49-58. L. lat. 70-80.

### **Samariscus huysmani**

Mouth small, maxilla 2-2.5 in HL, eye 3.6-4 in HL. Body depth 2.2-2.8 in SL; HL 4-4.7 in SL; lateral line nearly straight, absent from blind side. Dorsal fin begins before eyes, rays not produced; pectoral fin slightly longer (1.1 than HL), no fin on blind side; both ventral fin bases slightly elongate, rays not produced; middle caudal fin rays branched. Eyed side grey-brown or fawn, mottled darker, row of 5 indistinct dark spots or rings along upper profile, 4 along lower; fins mottled, outer part of dusky pectoral fins dark brown.

D 68-78. A 55-59. L. lat. 70-76.

(voucher: 89 mm SL)

## SOLEIDAE

### **Aesopia cornuta**

First dorsal fin ray thickened and prolonged. Scales cycloid or feebly ctenoid, in form of short papillae on blind side of head. Dorsal and anal fins united with caudal fin; pectoral fin very short and broad; ventral fin free from anal fin. Body and fins pale orange, crossed by 13-dark brown bands which may be divided; banded caudal fin yellow.

D 1 + 68-79. A 55-64

(voucher: (A) 150 mm SL. (B) 130 mm SL)

### **Aseraggodes cyaneus**

Eyes separated, upper eye slightly before the lower one; scales ctenoid; low papillae on blind side of head. Dorsal and anal fins free from caudal fin; pectoral fins absent; both ventral fins free from anal fin, their bases short and symmetrical. Body and fins plain dark brown with 3 rows of indistinct darker blotches along body,

D 73-82. A 53-57. L. lat. 73-80.

(voucher: 83 mm SL)

### **Dexillus muelleri**

Scales ctenoid, in form of short papillae on blind side of head, in honeycomb pattern; eyes contiguous; lower lip fringed. Dorsal and anal fins united with caudal fin; pectoral fins short, right fin longer than left one, ventral fin free from anal fin. Body depth 1.8-1.9 in SL. Body plain brown, scattered with clumps of dark brown filaments; unpaired fins mottled brown, right pectoral fin black.

D 61-70. A 48-57.

(voucher: 230 mm SL)

### **Pardachirus pavoninus**

Eyes separated by scaled interorbital; scales feebly ctenoid. Dorsal and anal fins free from caudal fin; an open pore at base of each dorsal and anal ray. No pectoral fins; ventral fin bases unequal, the right fin often joined to anal fin. Tan or reddish-brown, body and fins covered with cream spots which often have dark brown central spot and dark brown border.

D 63-71. A 49-54.

(voucher: 119 mm SL)

### **Zebrias cancellatus**

Scales ctenoid; papillae on blind side of head; eye close together, interorbital naked. Dorsal and anal fins united with caudal fin; membrane between anterior dorsal rays only slightly emarginate; pectoral fin short and broad, ventral fin free from anal fin. Fawn body and fins crossed by 14-19 dark brown single or double bands which tend to curve posteriorly; fin margins white.

D 71-81. A 64-70. L. lat. 110-130.

(voucher: 230 mm SL)

### **Brachirus annularis**

Eyes small and separated by scaled interorbital; body scales ctenoid. Dorsal and anal fins united with caudal fin; pectoral fins small but well-developed; ventral fin free from anal fin. Body depth more than 2.5 in SL. Pale orange-fawn, with 5-7 large and 6-8 smaller fawn, brown-edged irregular patches extending over head, body and fins.

D 71. A 59.

(voucher: 130 mm SL)

### **Zebrias craticulus**

Scales strongly ctenoid, short papillae on blind side of head. Eyes close together; interorbital scaleless. Dorsal and anal fins united with caudal fin, first 2-4 rays of dorsal almost free of fin membrane; pectoral fin short and broad; ventral fin free from anal fin. Fawn body and fins crossed by 20-25 dark-edged brown bands, narrower on head; pale space between bands often with dark line or row of spots.

D 73-79. A 62-68. L. lat. 86-90.

(voucher: 130 mm SL)

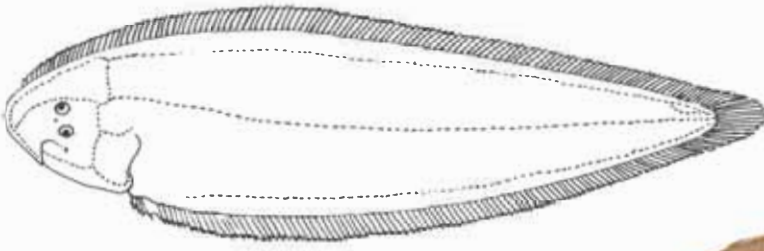
### **Zebrias quagga**

Eyes not separated, each with short tentacle on its inner margin. Scales strongly ctenoid, short papillae on blind side of snout. Dorsal and anal fins united with caudal fin; pectoral fin short and broad; ventral fin free from anal fin. Body and fins cream, crossed by 9-12 single or double brown bands which bend at body edges before continuing over fins; dark blotches on pale caudal fin.

D 60-75. A 50-62.

(voucher: 120 mm SL)

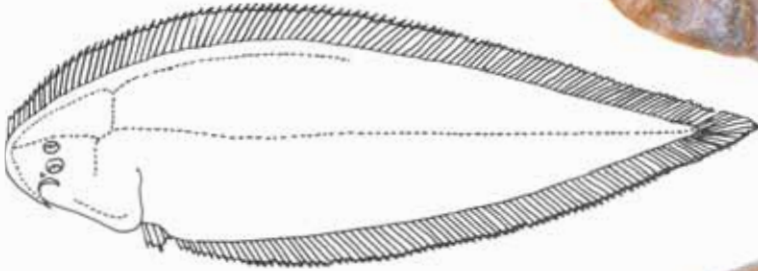
### CYNOGLOSSIDAE



*Cynoglossus abbreviatus* after Menon, 1977



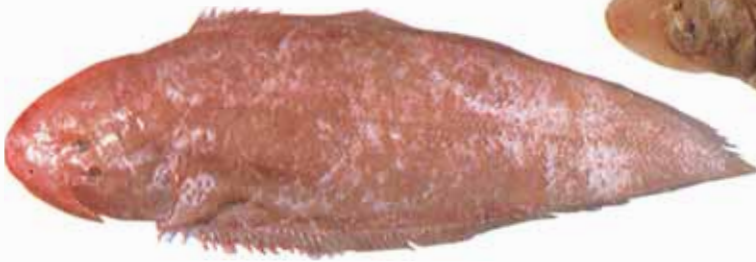
*Cynoglossus arel*



*Cynoglossus kopsi* after Chen & Weng, 1965

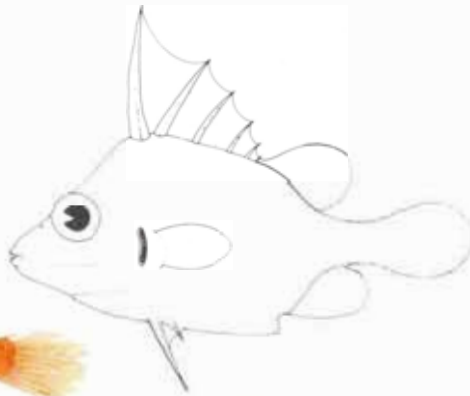


*Paraplagusia longirostris*



*Paraplagusia bilineata*

### TRIACANTHODIDAE



*Atrophacanthus japonicus*



*Halimochirurgus centriscoides*



*Macrorhamphosodes platycheilus*



*Tydemanina navigatoris*



*Triacanthodes ethiops*

**CYNOGLOSSIDAE**

Tonguesoles -

**Cynoglossus abbreviatus**

Three lateral lines on eyed side, none on blind side. Eyes separated by scaly space, and about level; corner of mouth about midway between snout tip and gill opening. Ctenoid scales on both sides of body. Body depth 4-4.7 in SL. Eyed side brown with darker brown blotches; fins dark. Tr between upper 2 lateral lines 18-23. C 8-9

**Cynoglossus kopsi**

Two (or 3) lateral lines on eyed side, upper one often incomplete; none on blind side. Eyes not separated by scaly space; corner of mouth nearer snout tip than gill opening, below middle of eye. Ctenoid scales on both sides of body. Eye 5-8 in HL. Eyed side tan, mottled darker brown; fins dark.

Tr between upper 2 lateral lines 7-12. C 10.

(voucher: ? mm SL)

**Paraplagusia bilineata**

Lips on eyed side fringed with branched papillae. Scales ctenoid on blind side of body. Two or 3 lateral lines on eyed side. Body olive-green or brown on eyed side, sometimes with pale spots; fins fawn with narrow white margins.

Tr above 16-19 scales.

D 100-114. A 81-88.

(voucher: 270 mm SL)

**Cynoglossus arel**

Two lateral lines on eyed side, none on blind side. Eyes separated by narrow scaly space; corner of mouth midway between snout tip and gill opening. Scales ctenoid on eyed side, cycloid on blind side. Eyed side tan, fins brown.

C 10. L. lat. 56-70. Tr between lateral lines 7-9.

(voucher: 280 mm SL)

**Paraplagusia longirostris**

Lips on eyed side fringed with simple papillae. Only one nostril on eyed side. Two lateral lines on eyed side, none on blind side. Corner of mouth much nearer to gill opening than to rather pointed snout. Eyed side reddish brown, fins brown with narrow white margins.

Tr between lateral lines 15-16.

D 133-141. A 102-112.

(voucher: 258 mm SL)

**TRIACANTHODIDAE**

Spikefishes -

**Small to moderate-sized fishes with compressed body, either moderately ovate or elongate. Mouth small, at end of short or long, tubular snout; teeth few, usually small and conical, sometimes absent; eye large; gill opening a short slit before pectoral fin base: nostrils in scaleless area before eyes. Caudal peduncle slender, deeper than wide at caudal fin base. Scales very small, each with a vertical row of spinules, skin rough to touch. First dorsal fin with 6 spines, decreasing noticeably in length posteriorly, separated or deeply notched from much shorter-based soft fin with 12-18 rays; no spines, 11-16 rays in anal fin; a prominent, strong spine and one or 2 small rays in ventral fin; caudal fin truncate to rounded.**

Eleven genera in the family, single members of five obtained on the Survey.

REFERENCES: Matsuura, 2001a; Tyler, 1968.

**Atrophacanthus japonicus**

Snout short and blunt, always less than eye diameter; head profile straight or slightly convex. One row of teeth in jaws. First dorsal spine reaches tip of 4<sup>th</sup> when depressed, last 3 spines very short, 5<sup>th</sup> and 6<sup>th</sup> usually buried beneath skin. Body orange pink, silvery white over belly and lower head.

D<sub>2</sub> 14. A 14.

(voucher: 48 mm SL)

**Macrorhamphosodes platycheilus**

Snout straight, very long and tubular; mouth usually twisted to right or left and about twice as wide as snout immediately behind it. Gill opening long, length 2-2.5 in eye diameter. Body brownish pink above, white below.

D<sub>2</sub> 12-13. A 12-13. P 11-13.

(voucher: 95 mm SL)

**Tydemania navigatoris**

Snout short and blunt, slightly less than eye diameter; lips large, swollen and spongy to touch; teeth in jaws wider than thick, their tips truncated. Last 3 dorsal spines very small, usually buried beneath skin. Body dusky orange-pink above, cream below.

D<sub>2</sub> 14-15. A 15.

(voucher: 72 mm SL)

**Halimochirurgus centriscoides**

Snout upturned, very long and tubular; mouth not twisted, only slightly wider than snout immediately behind it. Gill opening long, length about 1.5 in eye diameter.

Body rosy orange with 1 to 3 dark stripes along back.

D<sub>2</sub> 13. A 11:-12. P 12-14.

(voucher: 119 mm SL)

**Triacanthodes ethiops**

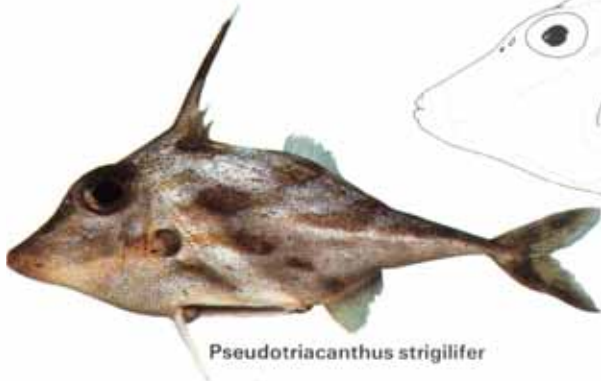
Snout blunt, about equal to eye diameter; greatest length of scaleless area 3.7-5.8 in eye diameter around nostrils.

Usually 2 rows of conical teeth in jaws; interorbital flat or slightly concave, body depth 1.8-2.4 in SL. Body dark pink above, silvery violet below; 3 diverging darker bands along body from eye; to end of soft dorsal base, to end of anal base, to anus.

D<sub>2</sub> 15-16. A 14-15.

(voucher: 60 mm SL)

TRIACANTHIDAE



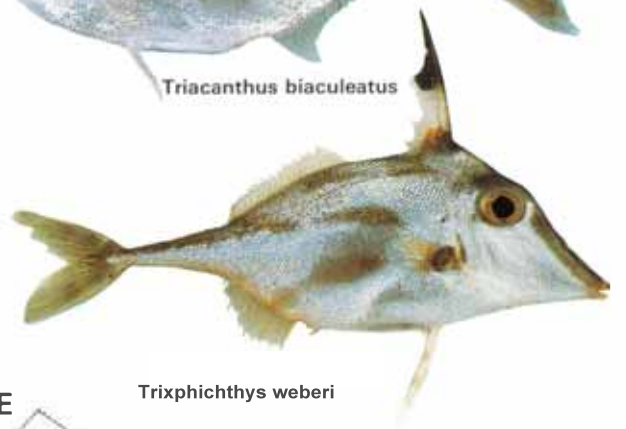
*Pseudotriacanthus strigilifer*



*Triacanthus biaculeatus*



*Triacanthus nieuhofii*



*Triphichthys weberi*

BALISTIDAE



*Abalistes stellatus*



*Balistapus undulatus*



*Balistoides conspicillum*



## TRIACANTHIDAE

### Tripodfishes -

Moderate-sized fishes with compressed ovate body tapered posteriorly. Mouth small, snout prominent, teeth strong, in 2 rows, inner row molar-like; eye moderately large; gill opening a short slit before pectoral fin base. Caudal peduncle indented before fin base where peduncle is wider than deep. Scales very small, each with ridges, skin rough to touch. First dorsal fin with 5 spines, the first very long and strong, widely separated from much longer-based soft dorsal fin with 20-26 rays; no spines, 13-22 rays in anal fin; prominent, strong spine and one or 2 small rays in ventral fin; caudal fin deeply forked.

Four genera in the family, representatives of three were obtained on our survey.

REFERENCES: Matsuura, 2001b; de Beaufort & Briggs, 1962.

#### **Pseudotriacanthus strigilifer**

Bony pelvis broad anteriorly between ventral fin bases, tapering to point posteriorly. Length of 2<sup>nd</sup> dorsal spine more than half length of first spine; base of anal fin 1.8-2.3 in soft dorsal fin base. Body grey, dark silvery above, pale below, oblong golden or orange blotches on sides; lower  $\frac{1}{3}$  to  $\frac{1}{2}$  of first dorsal fin pale, outer portion black.

D<sub>2</sub> 20-24. A 13-17. P 12-15.

(voucher: 105 mm SL)

#### **Triacanthus nieuhoffii**

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; postorbital distance 10-14 in SL; snout short, 4.9-6.4 in SL. Head profile concave above eye, convex before first dorsal fin base. Body plain silvery yellowish blue; black patch on back below first dorsal fin; membrane between first two dorsal spines black, dark brown between 2<sup>nd</sup> and 3<sup>rd</sup> spines, pale over remaining membrane and spine tips.

D<sub>2</sub> 22-26. A 18-21. P 14-16. Total GR 14-19.

(voucher: 205 mm SL)

#### **Triacanthus biaculeatus**

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; postorbital distance 10-14 in SL; snout short, 4.9-6.4 in SL. Profile from eyes to first dorsal fin base almost straight. Plain silvery yellowish blue body, dusky area below first dorsal fin and on caudal peduncle. First dorsal fin black, outer  $\frac{1}{3}$  or tips of first 3 or 4 spines white.

D<sub>2</sub> 21-26. A 17-22. P 12-16. Total GR 12-18.

(voucher: 290 mm SL)

#### **Triphichthys weberi**

Bony pelvis almost as wide anteriorly between ventral fin bases as near its rounded tip; snout concave and long, 3.6-4.7 in SL; postorbital distance short, 0.6 of eye diameter. Silvery blue body, orange blotch on base of and below first dorsal fin, dusky golden elongate blotches in roughly 3 bands along body; outer  $\frac{1}{3}$  of first dorsal fin black, remainder white.

D<sub>2</sub> 22-25. A 17-19. 13-15. Total GR 15-19.

(voucher: 120 mm SL)

## BALISTIDAE

### Triggerfishes - Pakol

Small or medium-sized fishes; body deep, elongate oval and compressed. Mouth small, teeth heavy and sharp - 8 in outer series, inner row of 6 or more in upper jaw; gill opening a short slit before pectoral fin base. Scales thickened, large and bony, usually covering entire body, their edges meeting; scales above and behind gill opening usually enlarged; tubercles, spines or ridges may be present on body posteriorly. Two well-separated dorsal fins, first with 3 spines, 2<sup>nd</sup> spine more than half length of first and capable of locking it into an erect position; second dorsal and anal fin similar and opposite, all rays branched; pectoral fin rounded; no ventral fin, pelvis strong and movable, supporting small skin flap and with a short stout spine at its tip; caudal fin rounded to lunate, tips sometimes produced.

Representatives of 10 genera were obtained on our Survey.

REFERENCES: Matsuura & Yoshino, 2004; Matsuura, 2001c; Myers, 1991.

#### **Abalistes stellatus**

Deep groove before eye; teeth uneven and notched; caudal peduncle depressed (wider than deep). Third dorsal spine well-developed; tips of caudal fin produced. Many pale blue-green spots and dashes along body and over head; 3 large cream blotches often present on back; unpaired fins banded yellow, green and brown.

D<sub>2</sub> 26-27. A 23-26.

(voucher: 275 mm SL)

#### **Balistoides conspicillum**

Deep groove before eye; head profile straight or slightly convex; cheek almost entirely scaled; enlarged scales above pectoral fin base; 3-4 rows of short spines on caudal peduncle. Black or dark brown body, large white or yellow spots over lower half, mouth ringed orange and yellow; orange line along bases of anal and soft dorsal fins; black margin to caudal fin.

D<sub>2</sub> 25-27. A 20-22. Tr 27-31 from soft dorsal fin origin.

#### **Balistapus undulatus**

Cheek completely scaled and no groove before eye; enlarged scales above pectoral fin base; 6 large spines in 2 rows on caudal peduncle; 3<sup>rd</sup> dorsal fin spine well-developed. Body dark green or brown; many narrow oblique orange-yellow lines from back to anal and caudal fins, 2 or 3 broad orange bands from mouth to ventral flap. Fins orange or bright yellow.

D<sub>2</sub> 25-27. A 22-24.

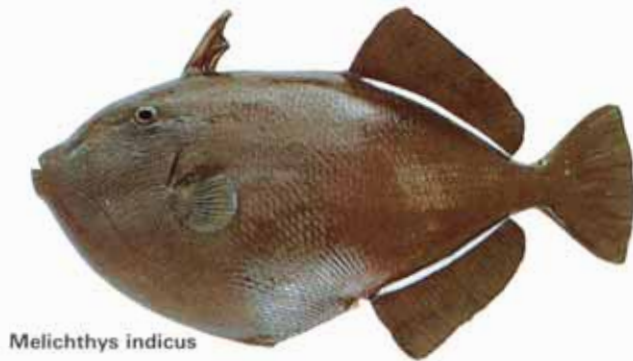
(voucher: 175 mm SL)



*Balistoides viridescens*



*Canthidermis maculata*



*Melichthys indicus*



*Odonus niger*



*Pseudobalistes flavimarginatus*



*Pseudobalistes fuscus*



*Rhinecanthus aculeatus*



*Sufflamen fraenatum*



*Xanthichthys lineopunctatus*



*Xanthichthys caeruleolineatus*

**Balistoides viridescens**

Deep groove before eye; head profile straight of slightly convex; cheek almost entirely scaled; enlarged scales above pectoral fin base; 5-6 rows of short spines on caudal peduncle. Third dorsal spine well-developed. Body yellowish green, a dark spot in centre of each scale; curved dark green band containing pale line extends over snout tip and upper lip; dark wedge-shaped bar passes through eye. Fins yellow, margins and often bases dark green, brown or blotched blue.

D<sub>2</sub> 24-26. A 23-24. Tr 17-20 from soft dorsal origin. (voucher: 305 mm SL)

**Melichthys indicus**

Deep groove before eye; teeth white; cheek almost entirely scaled. Body scales posteriorly only slightly ridged, those above pectoral fin base much enlarged. Upper and lower body profiles distinctly convex. Third dorsal spine very small; caudal fin truncate. Body and fins black; distinct white or pale blue band along bases of soft dorsal and anal fins, sometimes narrow white margin on caudal fin; pale oblique streak may be present on cheek. D<sub>2</sub> 30-35. A 27-30. Scale rows along head 27-31. (voucher: 210 mm SL)

**Pseudobalistes flavimarginatus**

Groove before eye; cheek naked anteriorly and small posterior cheek scales sometimes lost with age, 4-6 rows of small spines on and just before caudal peduncle; much-enlarged scales above pectoral fin base. Tips of caudal fin produced in adults. Body dark blue-grey, violet or brown, chin and breast orange or rosy; dark spots on scale centres. Unpaired fin margins pale green and dark band submarginally.

D<sub>2</sub> 26-27. A 22-24. Tr from soft dorsal origin 19-21.

**Rhinecanthus aculeatus**

Cheek completely scaled and no groove before eye; enlarged scales above pectoral fin base; caudal peduncle noticeably compressed. Third dorsal spine very small; caudal truncate. Body grey-green above, brown patches over back and tail; 4 oblique cream bands from middle of sides to anal fin base. Broad brown and thin blue lines across interorbital continue through eye to pectoral fin base; blue line around mouth; orange band to pectoral base. Peduncle spines black.

D<sub>2</sub> 24-25. A 21-23. (voucher: 205 mm SL)

**Xanthichthys caeruleolineatus**

Groove before eye; cheek scales larger than body scales fused into rows between which are 5 or 6 prominent long, naked grooves; scales immediately behind gill opening not larger than other body scales; 5-6 oblique grooves on cheek. Third dorsal spine very small. Body orange-brown above, grey-brown below; pale blue line from pectoral fin base to upper base of caudal fin; orange band from eye to pectoral fin base. Outer membrane of first dorsal fin black; upper and lower caudal fin margins reddish brown.

D<sub>2</sub> 26-27. A 23-25. (voucher: 220 mm SL)

**Canthidermis maculata**

Deep groove before eye; scales immediately behind gill opening not larger than other body scales; low ridge along most body scales. Third dorsal spine well-developed; soft dorsal and anal fins elevated anteriorly, giving wedge-shape to fins. Body dark blue or brown, sometimes black; irregular-shaped pale blue or white spots and blotches scattered over head, body and fins.

D<sub>2</sub> 25-29. A 24-26. (voucher: 130 mm SL)

**Odonus niger**

Deep groove before eye; 2 teeth at side of upper jaw enlarged. Scales on posterior part of body very large, those along middle of body and caudal peduncle with low ridge. Soft dorsal and anal fins higher anteriorly, caudal fin lunate, tips very long. Body and fins dark bluish - brown or black, often margined pale blue or white; teeth red; hind caudal edge white.

D<sub>2</sub> 33-36. A 30. (voucher: 285 mm SL)

**Pseudobalistes fuscus**

Groove before eye; cheek naked anteriorly, and small posterior cheek scales arranged into raised horizontal rows; no spines on caudal peduncle; enlarged scales above pectoral fin base. Soft dorsal and anal fins elevated anteriorly; tips of caudal produced in adults. Body brown or dusky yellow, dark wavy lines and spots on heads forming bands across interorbital. Fin margins blue.

D<sub>2</sub> 24-27. A 22-26. Tr from soft dorsal origin 24-31. (voucher: 310 mm SL)

**Sufflamen fraenatum**

Groove before eye; head profiles straight; scales on middle of cheeks rectangular and larger than body scales; enlarged scales above pectoral fin base; scales on middle of body and caudal peduncle with rows of short, blunt tubercles. Body and fins plain yellow brown to dark brown; orange band around mouth more or less developed and oblique orange band from mouth towards pectoral base present in males.

D<sub>2</sub> 28-30. A 25-27. (voucher: 210 mm SL)

**Xanthichthys lineopunctatus**

Groove before eye; cheek scales larger than body scales and fused into rows with 3 long and 2 shorter prominent naked grooves in between; scales immediately behind gill opening not larger than other body scales; 3 oblique grooves on cheek. Third dorsal spine very small. Body olive or grey, naked cheek grooves brown; thin brown lines along scales rows on upper half of body, dark brown spots along scale rows of lower half of body. Dark brown band along bases of soft unpaired fins; all caudal fin margins reddish brown, orange crescent over hind part of fin.

D<sub>2</sub> 27-29. A 25-27. Scale rows between gill opening and caudal base 44-50. (voucher: 199 mm SL)



# MONACANTHIDAE

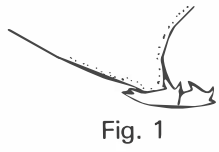


Fig. 1



Fig. 3

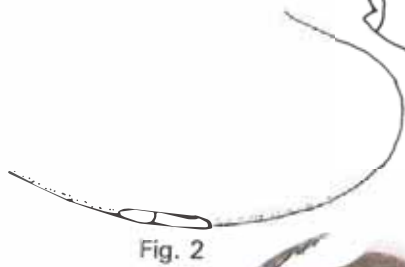
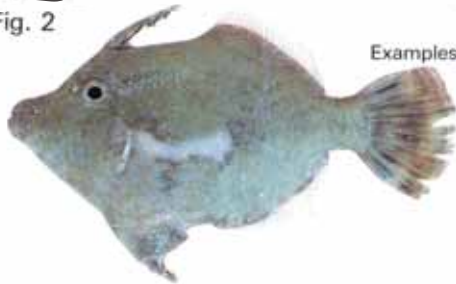


Fig. 2



Fig. 4

Examples of ventral fin rudiments and ventral flaps



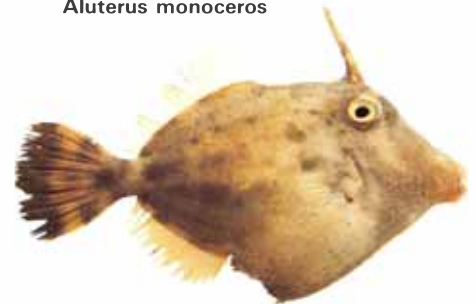
*Acreichthys tomentosus*



*Aluterus monoceros*



*Aluterus scriptus*



*Cantherhines fronticinctus*



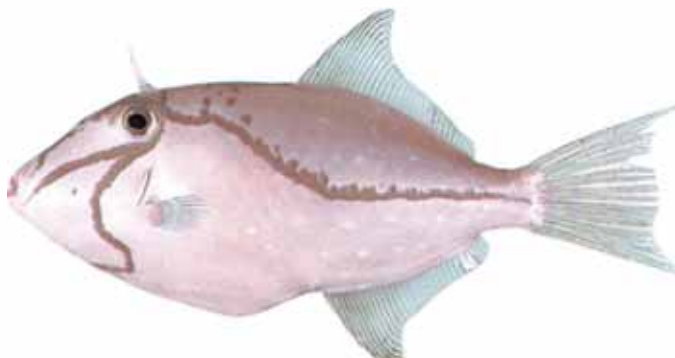
*Anacanthus barbatus*



*Cantherhines pardalis*



*Chaetodermis penicilligerus*



*Eubalichthys caeruleoguttatus*



*Monacanthus chinensis*



## MONACANTHIDAE

Leatherjackets; Filefishes - Bulusan babi; Hayam

Small, strongly compressed fishes; body usually elongate oval or almost rounded (elongate in *Anacanthus*). Mouth small with outer row of 6 strong teeth, usually an inner row of 4 teeth in upper jaw; gill opening a small slit above or before pectoral fin base. Scales small with one or more fine spinules sometimes forming bristles on caudal peduncle, skin furry or prickly to touch. Two well-separated dorsal fins: first of two spines (2<sup>nd</sup> rudimentary) placed above or before eye; soft dorsal and anal fins equal and opposite, all rays simple. No ventral fin, pelvis strong, usually supporting triangular skin flap ("ventral flap") and usually with fixed or movable bony process ("ventral fin rudiment") before or at its tip; caudal fin rounded, often large and sometimes with filament from upper rays.

About 30 genera, of which members of 11 were obtained on the Survey.

REFERENCES: Hutchins, 2001; Randall, 2011; Gill & Hutchins, 2002; Hutchins, 1997.

### *Acreichthys tomentosus*

First dorsal spine and movable ventral fin rudiment at tip of pelvis strong and stout, their spines or barbs prominent (fig 1). Edges of all internal upper jaw teeth notched; patch of bristles on caudal peduncle in adult males. Distinct broad brown-edged white concave band from gill opening to middle of sides, sometimes another faint band sloping from eye towards soft dorsal fin; remainder of body dark green or brown, scattered pale skin filaments over anterior half of body. Caudal fin with 2 or 3 brown cross-bands.

D<sub>2</sub> 27-30. A 26-29.

(voucher: 60 mm SL)

### *Aluterus scriptus*

First dorsal spine slender, placed above eye; snout profile concave; body elongate oval; no ventral flap. Caudal fin rounded, longer than HL. Body and caudal fin brown with black, blueish and white spots and short stripes; other fins blue-green.

D<sub>2</sub> 45-47. A 48-49

(voucher: 370 mm SL)

### *Anacanthus barbatus*

Body very elongate, depth 10-11 in SL. Fleshy barbel on lower jaw; mouth opens dorsally. First dorsal spine short and weak; caudal fin long, wedge-shaped. Green or brown body with cream mid-lateral band and spotted ventral flap.

D<sub>2</sub> 48-50. A 58-62.

### *Cantherhines pardalis*

Body ovate, depth 2.1-2.4 in SL; first dorsal spine placed above front half of eye, rounded anteriorly and depressible into deep groove on back. Ventral flap moderate, ventral fin rudiment at end of pelvis and not movable; caudal peduncle depth 1.6-2 in caudal fin length. Body either pale or greenish blue, covered by many oblique orange bands on head and closely-spaced orange spots on body, or plain dark brown; caudal peduncle usually with white spot behind both soft dorsal and anal fins. Fins orange, caudal dark.

D<sub>2</sub> 32-36. A 29-32. P 12-14.

(voucher: 168 mm SL)

### *Eubalichthys caeruleoguttatus*

Body ovate, depth 1.7-2.7 in SL; first dorsal spine short (1.8-3.2 in HL) originating above eye; ventral flap small, ventral fin rudiment placed just before hind end of pelvis (fig 4). Dorsal and anal fins elevated anteriorly, caudal fin long, rounded or with produced lobes. Body either fawn with prominent brown stripe following lateral line or fawn with longitudinal rows of elongate blue spots on head and body, or a combination of both.

D<sub>2</sub> 35-39. A 34-37.

(voucher: 260 mm SL)

### *Aluterus monoceros*

First dorsal spine slender, placed above eye; snout profile convex; body ovate; no ventral flap; caudal fin shorter than HL, lobes produced with age. Body green-olive, darker above, often with dark brown spots and/or white reticulations; caudal fin dark brown.

D<sub>2</sub> 48-50. A 50-51.

(voucher: 500 mm SL)

### *Cantherhines fronticinctus*

Body ovate, depth 2-2.3 in SL; first dorsal spine 1.1-1.4 in HL, placed above front half of eye, rounded anteriorly and depressible into deep groove on back. Ventral flap moderate, ventral fin rudiment not movable and at end of pelvis; caudal peduncle depth 2-2.6 in caudal fin length. Two prominent dark brown bands across interorbital; body mottled brown or green, a dark blotch at pectoral fin base, 3 blotches on bases of dorsal and anal fins and pale band around caudal peduncle.

D<sub>2</sub> 33-36. A 31-32. P 12-13.

(voucher: 76 mm SL)

### *Chaetodermis penicilligerus*

Skin roughened; long skin filaments, some branched, scattered over head and body; ventral fin rudiment at tip of pelvis movable. Teeth in upper jaw often protrude from mouth; first dorsal spine irregularly-shaped and often twisted. Caudal fin large, wedge-shaped. Body pale or dark brown with thin longitudinal dark brown lines from mouth to tail base; body blotched brown, 2 black blotches above pectoral fin. Rows of small dark spots along unpaired fins, dark patches and dark margin on caudal fin.

D<sub>2</sub> 25-26. A 23-24.

### *Monacanthus chinensis*

Ventral flap very large and 'fan'-shaped, extending well past end of pelvis in adults; movable ventral fin rudiment at tip of pelvis elongate and tapering (fig 2); 4-6 spines on caudal peduncle, in two rows; caudal fin rounded, slightly longer than HL, its upper rays sometimes produced into a filament. Violet-cream or fawn body with patches of blue or dark brown spots forming 2 prominent oblique bands across sides; blue, brown and yellow spots radiate from eye, covering ventral flap and forming network on anal fin; margin of yellow caudal fin with blue lines and charcoal band.

D<sub>2</sub> 28-30. A 27-30.

(voucher: ? mm SL)



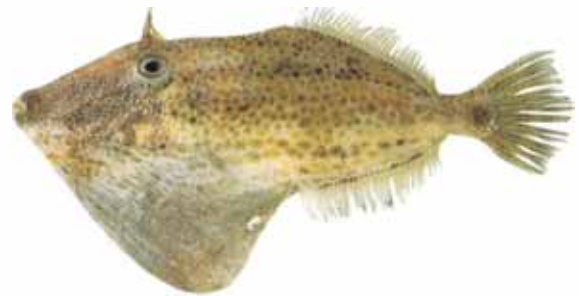
*Arotrolepis filicauda*



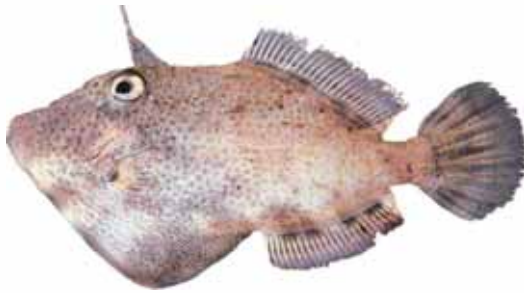
*Paramonacanthus oblongus*



*Pseudalutarius nasicornis*



*Pseudomonacanthus elongatus*



*Pseudomonacanthus macrurus*



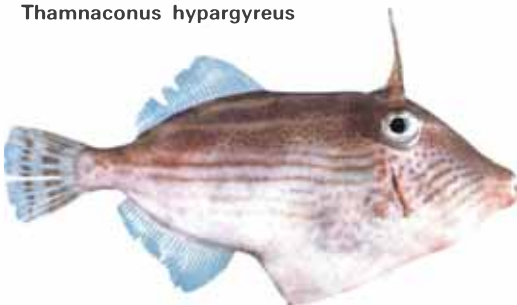
*Pseudomonacanthus peroni*



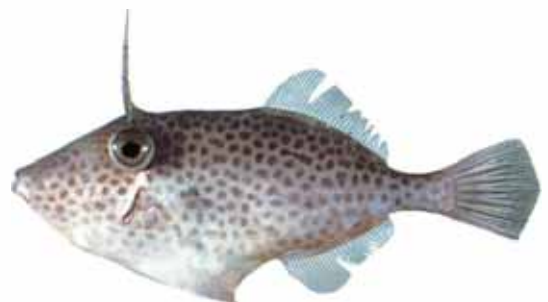
*Thamnaconus hypargyreus*



*Thamnaconus modestoides*



*Thamnaconus striatus*



*Thamnaconus tessellatus*

**Arotrolepis filicauda**

Elongate and slender movable ventral fin rudiment at tip of pelvis (fig 3). Body depth 1.7-2.3 in SL. First dorsal spine slender, originating over posterior half of eye; dorsal and anal fins evenly convex; rounded caudal fin slightly less than HL, upper 2 rays often produced into filament. Body fawn above, paler below, snout and cheeks faintly yellow; scattered yellow to brown patches and spots on sides, forming lines along back, brown blotch below soft dorsal fin. Rows of yellow spots on soft dorsal and anal fins, 3-6 vertical or oblique rows of black spots on caudal fin.

D<sub>2</sub> 35-38. A 35-38.

(voucher: 143 mm SL)

**Pseudalutarius nasicornis**

First dorsal spine long, originates on snout before eye; no ventral flap; body ovate, more convex on ventral profile; caudal fin slightly rounded. Body fawn above, dusky yellow below; 2 broad horizontal brown bands from head to upper tail base: first following soft dorsal fin base; second along mid-sides; yellow bar across base of brown caudal fin.

D<sub>2</sub> 46-49. A 45-46.

(voucher: 110 mm SL)

**Pseudomonacanthus macrurus**

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening almost entirely below eye. First dorsal spine placed above posterior half of eye; caudal fin rounded, equal to HL.

Body yellowish brown to pale brown, covered with small, crowded dark brown spots much smaller than pupil; network of dark lines on ventral flap; 2 or 3 dark bands across chin; dark brown square blotches on base of anal fin; caudal fin with broad brown band and dark brown border.

D<sub>2</sub> 29-31. A 27-30.

(voucher: 145 mm SL)

**Thamnaconus hypargyreus**

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of medium size; soft dorsal and anal fins noticeably higher anteriorly and dorsal spine elevated; caudal fin rounded, shorter than (1.5-1.7 in) HL. Body violet-brown or dusky above, creamy violet below, upper two-thirds of body and lower part of head with scattered olive or dusky orange spots smaller than pupil, some elongate; blue wavy lines over snout and around eyes (males). Fins plain, hind margin of caudal fin with dark brown bar.

D<sub>2</sub> 33-36. A 32-34.

(voucher: ? mm SL)

**Thamnaconus striatus**

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of medium size; soft dorsal and anal fins noticeably higher anteriorly; caudal fin rounded, shorter than (1.5 in) HL. Body tan or yellowish violet above, cream below; 2 broad horizontal bands containing dark brown spots along back to upper caudal peduncle and many thin brown horizontal lines along lower sides; brown lines slanting across cheeks, brown spots on snout, near eye and on ventral flap; 2 broad dark brown bands across white caudal fin.

D<sub>2</sub> 31-34. A 31-33.

(voucher: 160 mm SL)

**Paramonacanthus oblongus**

Elongate and slender movable ventral fin rudiment at tip of pelvis (fig 3). Body moderately slender, depth 1.5-2.7 in SL. First dorsal spine slender, originating over posterior half of eye; dorsal and anal fins elevated anteriorly (much higher in male); rounded caudal fin much less than HL, upper ray produced into filament (adult male). Fawn or grey-green body with yellow patches on snout, dusky spots and vague patches over head and sides; either 3 or 4 dusky brown bands from head to tail base (male) or indistinct oblique band from pectoral fin base to soft dorsal fin. Two or 3 brown bands across pale caudal fin.

D<sub>2</sub> 25-29. A 25-29. P 10-12.

(voucher: 102 mm SL)

**Pseudomonacanthus elongatus**

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening situated before eye and first dorsal spine placed above front half of eye; caudal fin rounded and short, its length always less than HL. Body fawn above, bluish yellow below, densely covered with dusky orange or fawn spots, narrow interspace forming a network; 4 broad bands, formed by darker spots, from head to tail base; 2 broad dark bands across caudal fin.

D<sub>2</sub> 30. A 30.

(voucher: 230 mm SL)

**Pseudomonacanthus peroni**

Ventral fin rudiment at tip of pelvis not movable but pelvis itself very movable; ventral flap large. Gill opening situated below eye. First dorsal spine placed above posterior half of eye; caudal fin rounded and long, slightly to much longer than HL. Body bluish cream or fawn above, paler below, sparsely or densely covered with dark brown spots as large as pupil; dark brown blotch on throat. Caudal fin densely spotted dark brown, often 2 black blotches near base on upper and lower rays.

D<sub>2</sub> 32-33. A 30.

(voucher: 210 mm SL)

**Thamnaconus modestoides**

Ventral fin rudiment at tip of pelvis not movable; HL less than body depth; ventral flap of small to medium size; soft dorsal and anal fins noticeably higher anteriorly; caudal fin rounded, less than (1.2-1.3 in) HL. Body plain grey or purplish brown, yellow below; faint dark lines along body; fins plain dusky green or blue, spinous dorsal membrane yellow in male.

D<sub>2</sub> 36-37. A 35-36.

(voucher: 262 mm SL)

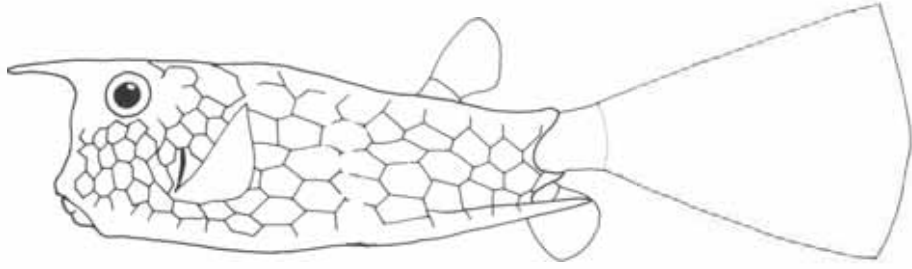
**Thamnaconus tessellatus**

Ventral fin rudiment at tip of pelvis not movable; ventral flap of small to medium size. HL less than body depth; soft dorsal and anal fins noticeably higher anteriorly and dorsal spine elevated; caudal fin rounded, shorter than (1.3-1.4 in) HL. Body violet brown above, fawn below, densely covered with dark brown spots slightly smaller than pupil. Fins plain yellow or brown.

D<sub>2</sub> 34-37. A 31-34.

(voucher: 190 mm SL)

OSTRACIIDAE



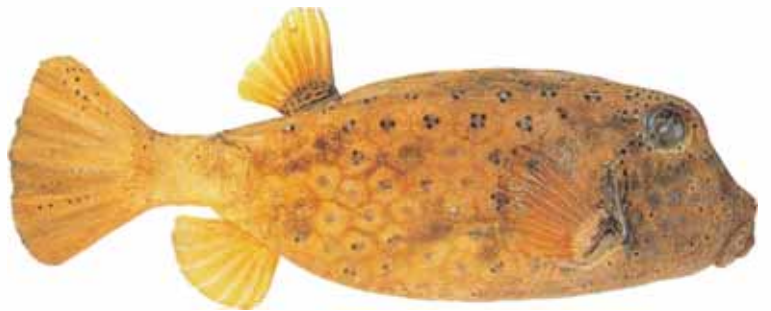
*Lactoria cornuta*



*Lactoria diaphana*



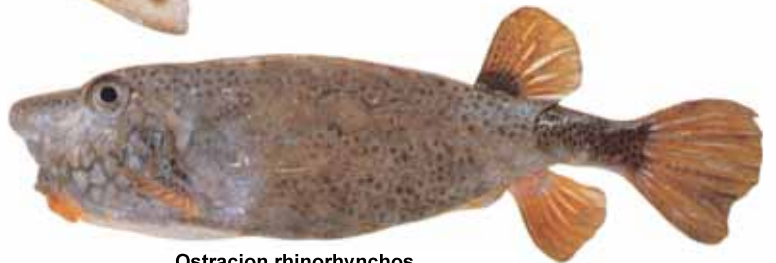
*Lactoria fornasini*



*Ostracion cubicum*



*Ostracion nasus*



*Ostracion rhinorhynchos*



*Tetrosomus gibbosus*



*Tetrosomus reipublicae*



## OSTRACIIDAE

Boxfishes; Cowfishes - Bentel tanduk; Buntel kotak

Body short and robust, either triangular, square or pentagonal in cross-section. Large hexagonal bony plates fused together form a rigid box-like carapace almost completely encasing the body: only jaws, fin bases and caudal peduncle free, covered with smooth skin. Mouth small, upper jaw non-protusible; about 10 teeth in each jaw; gill opening a slit before pectoral fin. No fin spines; dorsal and anal fins short-based, placed posteriorly, dorsal fin rays 9-13, anal fin rays 9-13. Caudal fin rounded or truncate; no ventral fin. Background colouration varies in these fishes and spines on ridges diminish with age.

Seven genera in the family of which representatives of three were collected on the Survey.

REFERENCES: Matsuura, 2001d; de Beaufort & Briggs, 1962; Randall, 1972.

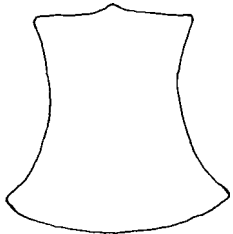


Fig 1

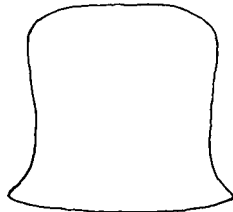


Fig 2

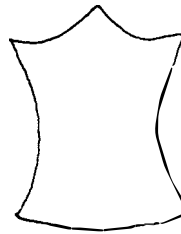


Fig 3

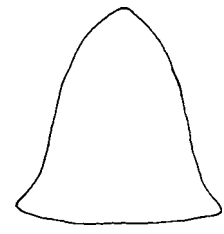


Fig 4

### *Lactoria cornuta*

Body 5-cornered in cross-section (Fig 1), dorsal ridge low; dorso-lateral ridge ends in long, sharp spine before eye and beyond snout, ventro-lateral ridge ends in strong spine posteriorly. Caudal fin very long, truncate, length increasing with age. Brown or olive, spotted blue; brown spots on caudal peduncle and fin; sometimes black ring around mouth.

(voucher: 200 mm SL)

### *Lactoria diaphana*

Body 5-cornered in cross section (Fig 1): short strong horizontal spine above eye from dorso-lateral ridge, ventro-lateral ridge ends in spine posteriorly; small, strong spine on median ridge before dorsal fin. Ventral ridges best developed, ventral surface slightly convex. Body fawn, sometimes with large brown blotches, lower half pale orange or translucent.

(voucher: 203 mm SL)

### *Lactoria fornasini*

Body 4- or 5-cornered in cross-section (Fig 1); large flat triangular spine on middle of dorsal ridge; strong spine above eye from dorso-lateral ridge and strong spine at posterior end of ventro-lateral ridge. Body brown, with darker streaks and blotches; ventral surface pale; lips red.

(voucher: 78 mm SL)

### *Ostracion cubicum*

Body square in cross-section (Fig 2), broader ventrally, back convex. No spines on body. Brownish yellow in colour, most body plates with black-edged blue ocellus or cluster of black spots with white centre; black spots more crowded on head, also present on fin bases and tail.

(voucher: 140 mm SL)

### *Ostracion nasus*

Body 5-cornered in cross-section (Fig 3), ridges moderately sharp-edged but without spines, median dorsal ridge distinct; snout projects beyond mouth. Anal fin begins behind dorsal fin. Pale green, orange or grey body with scattered larger or smaller brown spots, one on each plate; spots extending onto caudal peduncle and fin.

### *Ostracion rhinorhynchos*

Body 5-cornered in cross-section (Fig 3), ridges moderately sharp-edged but without spines, median dorsal ridge low; snout projects well beyond mouth. Anal fin begins below dorsal fin. Brown, violet or dull orange with many dark spots, several on each plate, spots extending onto caudal peduncle and basal half of fins. Fins and lips orange or yellow-grey.

### *Tetrosomus gibbosus*

Body roughly 3-cornered or triangular in cross-section (Fig 4); large, triangular, flattened spine on dorsal ridge, short upward-pointing spine above eye and 4 or 5 short, strong, backward-pointing spines along ventro-lateral ridge. Olive, grey-blue or brown body with black blotches on lower sides, base of dorsal spine, caudal peduncle, dorsal and anal fin bases.

(voucher: 125 mm SL)

### *Tetrosomus reipublicae*

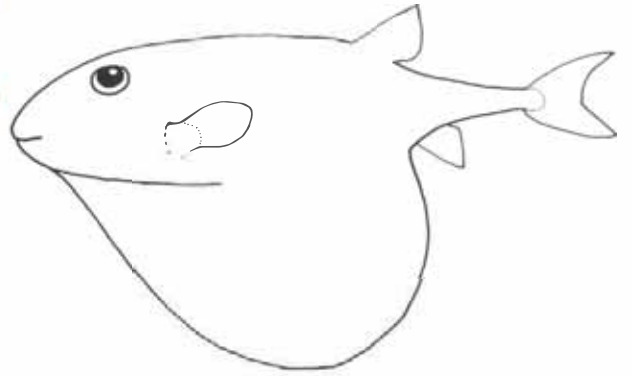
Body 3-cornered or triangular in cross-section (Fig 4); dorsal fin with 2 short and stout, spines, 2 or 3 spines along ventro-lateral ridge, sometimes a short spine above eye; spines smaller in adults. Body fawn or brown with pale blue spots and curving lines, spots extending onto caudal peduncle and caudal fin.

(voucher: 150 mm SL)

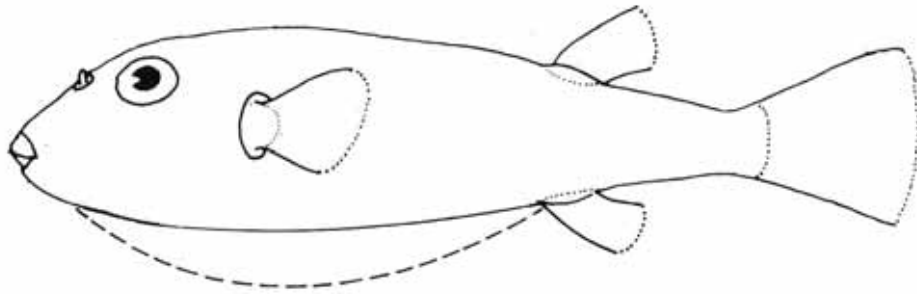
TRIODONTIDAE



*Triodon macropterus*



TETRAODONTIDAE



Tooth plate



*Feroxodon multistriatus*



*Tylerius spinosissimus*



*Arothron hispidus*



*Arothron immaculatus*



*Arothron manilensis*

## TRIODONTIDAE

Three toothed pufferfish -

Body sub-cylindrical and compressed, caudal peduncle tapered. Mouth wide, teeth fused into plates united with jaws into a 'beak', only upper jaw with median gap; gill opening a slit before pectoral fin; interorbital flat or concave. Scales spiny. First dorsal fin rudimentary (flexible spines in groove) or absent; soft dorsal behind middle of body, before anal fin; no ventral fin, pelvis long and strong, supporting very large ventral flap; caudal fin forked.

This family is monotypic (only one genus and species in the family).

REFERENCE: Matsuura, 2001e.

### Triodon macropterus

Snout profile straight; eye 3.5-4.6 in HL. Ventral flap very large, expanded and sac-like. Dusky olive to reddish above, paler below, large black patch on upper part of ventral flap; fins plain, margins dusky.

D<sub>2</sub> 10-11. A 9-10.  
(voucher: 550 mm SL)

## TETRAODONTIDAE

Puffers; Pufferfishes - Buntel; Loi; Pita-pita

Oval and compressed or ovate and robust. Belly can be inflated. Body naked or completely or partly covered with spinules. Lateral line absent or present, single or double; if double the lower with raised skin ridges. Teeth fused into bony plates in each jaw, divided into 2 by a median division. Fins lack spines; soft dorsal fin short and placed posteriorly, opposite anal fin; pectoral fin well-developed; no ventral fin. Caudal fin rounded, truncate or emarginate. Gill opening reduced, located just in front of pectoral fin base. Nostrils either single, double or as two short tentacles.

Twenty-eight genera in the family, of which members of nine genera were obtained on the Survey.

REFERENCES: Su, Hardy & Tyler, 1986; Matsuura, 2001f; Matsuura, 2014; Matsuura, 2016; Matsuura, 1994; Randall, Bogorodsky & Rose, 2012; Williams, Delrieu-Trottin & Planes, 2012; Randall, Williams & Rocha, 2008; Allen & Randall, 1977; Hardy, 1983; Hardy, 1989; Hardy, 1985; Hardy, 1984; Randall, Williams & Rocha, 2008.



Fig 1



Fig 2



Fig 3

### Feroxodon multistriatus

Chin prominent. Nostril a papilla with 2 openings (Fig 3); spinules scattered over back, sides and belly. Caudal fin truncate. Numerous oblique brown bands cross upper head and body, breaking up into moderately large spots on yellow belly, lower sides and caudal peduncle. Fins yellow, broad olive-brown margin to caudal fin.

D 10-11. A 9. P 16-17.  
(voucher: ? mm SL)

### Tylerius spinosissimus

Nostril a papilla with 2 openings (Fig 3). Body densely spined except for chin, fin bases and end of caudal peduncle. Caudal fin truncate or slightly emarginate. Fawn or brown above, marbled dark brown and occasionally spotted grey; lower sides and belly plain white or speckled brown. Fins pale, caudal fin brown posteriorly.

D 8-10. A 7. P 15-16.  
(voucher: 55 mm SL)

### Arothron hispidus

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Upper sides brown, snout, back, sides and caudal fin covered with white spots. Eye and gill opening surrounded by brown, white or yellow lines; brown, curved lines extend onto lower sides. Gill opening and pectoral fin base black. Dorsal and anal fins dark brown.

D 10. A 10-11.

### Arothron immaculatus

Body round in cross-section; nostril as pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Dusky olive above, grey or white below. Gill opening and pectoral fin base dark brown; hind, upper and lower margins of caudal fin brown or black, other fins plain.

D 9-10. A 8-10.  
(voucher: 100 mm SL)

### Arothron manilensis

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Body brownish-yellow on back, white on belly. Narrow orange-brown longitudinal lines over entire body, those on slides curled around pectoral fin base. Caudal fin margin dark.

(voucher: 190 mm SL)



*Arothron stellatus* (A)



*Arothron stellatus* (B)



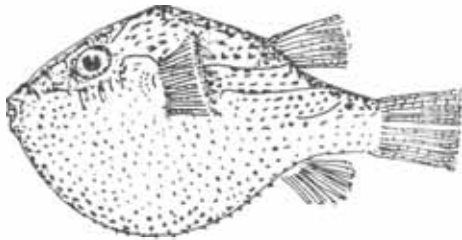
*Arothron caeruleopunctatus*.



*Canthigaster compressa*



*Canthigaster axiologus*



*Canthigaster investigatoris* ;after Annandak & Jenkin,1910



*Canthigaster rivulata*



*Chelonodontops patoca*



*Lagocephalus cheesemanii*



*Lagocephalus inermis*



*Lagocephalus lagocephalus*



### **Arothron stellatus**

Body round in cross-section; nostril a pair of short thick tentacles (Fig 1); lateral line single, not branched above anal fin. Few or many black or dark brown spots over fawn or yellow-green upper half of body, belly and underside of head white. Gill opening black or with large black spots; anus ringed black. Black spots on dorsal and anal fins; sometimes caudal fin spotted or dorsal fin plain. Lower half of body white or cream, bright yellow or orange. In 'aerostaticus' form, lower half of body yellow-orange and crossed by broad, oblique dark brown or black lines. D 10-11. A 10-12.

(voucher A: 295 mm SL)

(voucher B: 77 mm SL)

### **Canthigaster compressa**

Body slightly compressed, depth 2.4- 3.1 in SL. Interorbital 2.9-3.8 in HL. Back ridged; nostril not easily seen. Body tan, dark grey or reddish, covered with close network of pale blue - as lines on upper body, forming spots on lower body (our specimen in a phase where only pale blue spots present). Large black ocellus on dorsal fin base; caudal fin crossed by many vertical rows of pale blue lines and spots. Brown line from chin to anus.

D 8-10. A 8-9. P 15-18

(voucher: 68 mm SL)

### **Canthigaster investigatoris**

Body slightly compressed, depth 2.8 in SL. Interorbital 4 times in HL. Back ridged; nostril not easily seen. Several narrow dark lines cross snout and interorbital; lines extend horizontally from pectoral fin to upper caudal peduncle.

D 9-10. A 10. P 15.

(voucher: ? mm SL)

### **Chelonodontops patoca**

Nostril an opening surrounded by raised rim produced into 2 skin flaps (Fig 2). Two lateral lines, intersecting above anal fin. Body naked except for patch of spinules along back, another patch on belly. Upper head and body charcoal-orange or dark olive with large blue-white spots. Bright yellow band from chin below pectoral fin to caudal peduncle; spines in belly patch tinted yellow. Fins plain – dusky yellow, white or dark brown.

D 9-11. A 8-10

(voucher: 170 mm SL)

### **Lagocephalus inermis**

Body round in cross-section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin truncate or slightly emarginate. Body naked except for patch of small spines ventrally, extending from chin to anus. Caudal peduncle deeper than wide. Sides silvery yellow, belly and underside of head white. Pectoral fin bright yellow; caudal fin tipped white; back dusky green. Gill opening black.

D 12. A 11-12.

(voucher: 151 mm SL)

### **Arothron caeruleopunctatus**

Body round in cross section; nostril a pair of short thick tentacles (Fig 1), lateral line single, not branched above anal fin. Scattered small cream or bluish spots over head, gill opening, sides and back and bases of dorsal, anal, pectoral and caudal fins. Eye ringed white.

### **Canthigaster axiologus**

Body slightly compressed, depth 2.6- 2.9 in SL. Interorbital 3.7-4.4 in HL. Back ridged; nostril not easily seen. Four broad dark brown bars across upper body to mid-sides, more oblique posteriorly: first over interorbital; 2nd and 3rd over back; last over caudal peduncle. Orange and blue lines radiate from eye; bright blue and orange or yellow spots and lines around mouth, lower sides, along the edges of the dark brown bars, and scattered or in vertical rows on caudal fin.

D 9-10. A 10. P 17.

(voucher: 104 mm SL)

### **Canthigaster rivulata**

Body slightly compressed, depth 2.6-3 in SL. Interorbital 3-4 in HL. Back ridged; nostril not easily seen. Two brown lines run parallel from pectoral fin region to caudal fin base, joining each other in an arch before fin base. Upper body covered with network of brown lines and pale spots; orange and brown lines radiate from eye; spots over lower head and sides. Dark blotch at dorsal fin base, and at upper and lower caudal fin base. Caudal fin with horizontal or vertical yellow and blue lines. Blue line from chin to anus.

D 9-10. A 9-10. P 16-18.

(voucher: 90 mm SL)

### **Lagocephalus cheesemanii**

Body round in cross section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin double emarginate; pectoral fin hind border oblique. Body naked except for patch of spinules from above eye to halfway before dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle about as wide as deep. Back and upper head dark green to dark brown; sides golden-yellow, lower half of body silvery white. Dorsal fin dark brown; pectoral fin dark green, lower tip yellow; caudal fin dark green or brown with broad triangular yellow tips; anal fin yellow.

D 13. A 12.

(voucher: 143 mm SL)

### **Lagocephalus lagocephalus**

Body round in cross-section and elongate; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin emarginate; caudal peduncle about as deep as wide. Body naked except for patch of well-separated moderately strong spinules from chin to anus. Upper body bluish black, sides and belly silvery white, sometimes small black spots below pectoral fin. Fins dark except for white lower rays of pectoral fin.

D 13-16. A 12-13.

(voucher: 192 mm SL)



Lagocephalus lunaris



Lagocephalus scleratus



Lagocephalus spadiceus



Torquigener brevipinnis



Sphoeroides pachygaster



Torquigener parcuspinus



Torquigener pallimaculatus



Torquigener tuberculiferus



Torquigener gloerfelti



Javichthys kailolae

**Lagocephalus lunaris**

Body round in cross-section, nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin moderately emarginate. Body naked except for patch of spinules on back from above eye to  $\frac{3}{4}$  or all the way to dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle deeper than wide. Top of head and back tan or green, sides silvery pale yellow; caudal fin tan, edged white.

D 12-13. A 10-11.  
(voucher: 88 mm SL)

**Lagocephalus spadiceus**

Body round in cross-section; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin slightly lunate. Body naked except for patch of spinules on back from eye to halfway before dorsal fin and another patch ventrally from throat to halfway along belly. Caudal peduncle deeper than wide. Three broad brown bands across back; sides yellow, underside of head and body white. Dorsal and pectoral fins yellow, caudal fin dusky, tips white. Anal fin white.

D 11-15. A 10-12.  
(voucher: 140 mm SL)

**Torquigener brevipinnis**

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length about 4 in SL. Moderately strong spinules cover dorsal surface to dorsal fin and ventral surface from chin to anus. Upper head and sides tan. White vertical lines on cheek, oval pale blue or white spots and grey lines on back; a brown line from above pectoral fin horizontally to tail base. Caudal fin barred dark brown, other fins pale.

D 8. A 7.  
(voucher: 52 mm SL)

**Torquigener parcuspinus**

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length 4-4.6 in SL. Body spinules strong, densely covering dorsal and ventral body surfaces, less dense on sides, scarcely overlapping gill opening. A double row of spines enclosed in papillae along upper lateral line, no papillae around spines of lower lateral line. Back and head dark, green or brown or with network of dark lines and numerous grey or cream spots; dark spots on cheek and around mouth. Fins yellow or dusky.

D 9. A 6.  
(voucher: 55 mm SL)

**Torquigener gloerfelti**

Nostril a raised papilla with 2 openings (fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally, 3.4-3.6 in HL. Caudal peduncle length 3.4-4.1 in SL. Spines on dorsal surface moderately sparse; up to 12 spines protruding from fleshy papillae, overlapping gill opening from its front border. Back and head with network of irregularly-shaped brown spots over pale background; scattered large red-brown spots over sides posteriorly.

D 8-9. A 6-7. P 15-16.  
(voucher: 154 mm SL)

**Lagocephalus scleratus**

Body almost square in cross section and very elongate; nostril a raised papilla with 2 openings (Fig 3); eye high on head. Caudal fin moderately lunate; caudal peduncle wider than deep. Body naked but for patch of spinules on back from head to dorsal fin and another patch ventrally from chin to anus. Back mottled green and dark brown. Conspicuous silver ring around eye and broad silver band from mouth to tail base. Lower half of body silvery white.

D 10. A 9.  
(voucher: 96 mm SL)

**Sphoeroides pachygaster**

Nostril a papilla with 2 openings (Fig 3); eye free from body skin except dorsally. Raised skin fold along lower sides of caudal peduncle. Caudal fin truncate. Body completely smooth with no spinules. Anal fin entirely behind dorsal fin. Dark grey or bluish with vague pale patches. Fins yellow or dusky.

D 8-9. A 7-9. P 15-16.  
(voucher: 98 mm SL)

**Torquigener pallimaculatus**

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally; caudal peduncle length 3.2-3.6 in SL. Short spinules on back, sides and ventrally to about level of dorsal fin (dense on back); lower half of gill opening edge with several papillae. Back with orange-brown large and small spots and large grey spots surrounded by spots. Larger spots scattered over lower sides.

D 8-10. A 7-8.  
(voucher: 100 mm SL)

**Torquigener tuberculiferus**

Nostril a raised papilla with 2 openings (Fig 3); chin distinct. Caudal fin truncate; eye free from body skin except dorsally, 3.3-4.6 in HL. Caudal peduncle length 3.4-3.7 in SL. Body densely spined dorsally, ventrally and laterally to level of dorsal fin; lower front margin of gill opening with prominent papillae each partly concealing long slightly curved spine. Upper  $\frac{2}{3}$  of body with clusters of reddish brown spots, lower body pale; several oblique grey bands extend from back down and forward to middle of sides; large brown blotches on side posteriorly; fins brown.

D 8-10. A 7-8.  
(voucher: 95 mm SL)

**Javichthys kailolae**

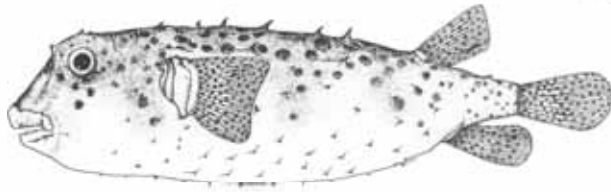
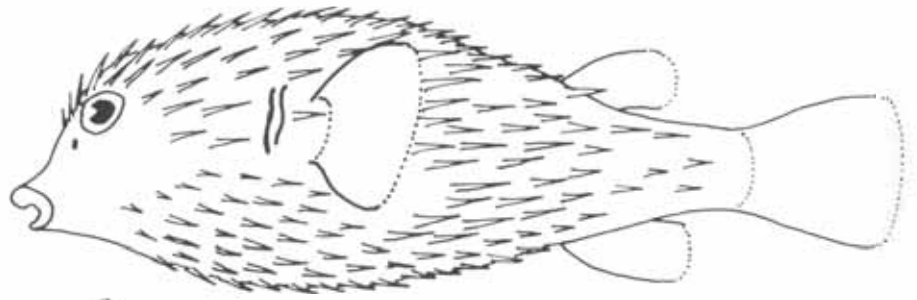
Nostril a raised papilla with 2 openings (fig 3); caudal fin truncate or slightly emarginate; eye free from body skin except dorsally, its upper border in level with dorsal profile, 3.1-3.3 in HL. Body spines short and few; caudal peduncle slender, its length 3.6-3.7 in SL; top of pectoral fin base below lower eye margin. Body olive, mottled dark brown above, white below, fins plain, dorsal and caudal fins dusky or brown.

D 8-9. A 6. P 16-17.  
(voucher: 59 mm SL)

DIODONTIDAE



Tooth plate



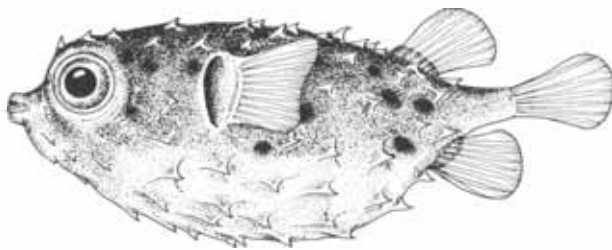
*Chilomycterus reticulatus* (A) after Leis, 1978



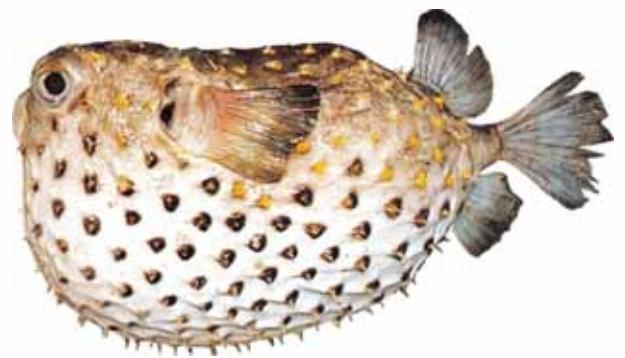
*Cyclichthys hardenbergi*



*Chilomycterus reticulatus* (B)



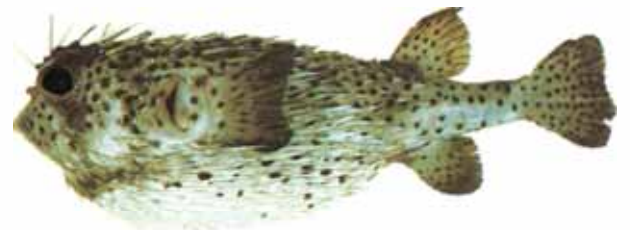
*Cyclichthys orbicularis* after Leis, 1978



*Cyclichthys spilostylus*



*Diodon holocanthus*



*Diodon hystrix*



*Lophodiodon calori*



*Tragulichthys jaculiferus*



## DIODONTIDAE

### Porcupinefishes - Buntel duren

**Short and rounded, ovate fishes, capable of inflating their bodies by swallowing water or air. Naked skin with large strong, 2- or 3-rooted spines, some erectile and slender, others fixed and stout. Teeth in both jaws fused into a single undivided plate; nostrils tubular or as double tentacle. No spines in dorsal and anal fins which have few rays (9-13) and are placed well back on body; large pectoral fin with broad base opposite wide gill opening; no ventral fins; caudal fin rounded.**

**About seven genera in the family, representatives of five obtained on the Survey.**

REFERENCE: Leis, 2001.

#### **Chilomycterus reticulatus**

Most body spines 3-rooted, fixed and short; one or 2 small spines on dorsal surface of caudal peduncle. Head and back dark green or brown, white below; in smaller individuals, spots cover upper  $\frac{2}{3}$  of body and extend over dorsal, anal and caudal fins, in larger individuals spots cluster into 3 or 4 broad vertical patches and spots fade from fin bases; pectoral fin pale.

D 11-12. A 12-13. P 21. C 10.

(voucher: (B) 270 mm SL)

(voucher: (A) drawing)

#### **Cyclichthys orbicularis**

Head and body spines fixed and short (except 1 movable spine near corner of mouth); all spines 3-rooted and none on dorsal surface of caudal peduncle; a small erectile spine below corner of mouth, another in pectoral axil; usually 3 spines above eye, 1 between nostrils. Head and back dark green or grey, white below; clusters of black spots grouped into 3 or 4 blotches on sides of head and body (not associated with spine bases); yellow fins checked brown.

D 10-12. A 10-12. P 19-20. C 9.

#### **Diodon holocanthus**

All body spines erectile and 2-rooted; spines on forehead twice as long as eye, and longer than other body spines. Head and back yellow-orange or grey, finely stippled with variable number of black spots (not associated with spine bases), several large rich-brown patches on top of head and over back, including dorsal fin base. Basal  $\frac{1}{3}$  of the yellowish dorsal and caudal fins spotted black. Deep yellow spots at spine bases on mid-sides of body.

D 13-15. A 13-15. P 20-24.

(voucher: 185 mm SL)

#### **Lophiodiodon calori**

Body spines short, fixed and 3-rooted; on head, spines 2-rooted and erectile, those on snout directed towards mouth when depressed. Head and body brown or dusky violet above, white below; a broad black vertical bar through eye to below corner of mouth; 3 large dark patches with yellow spots along lower side of body; dorsal fin base black; fins pale.

D 12. A 12. P 22-24.

(voucher: 280 mm SL)

#### **Cyclichthys hardenbergi**

Head and body spines fixed and short; all spines 3-rooted; no spines on dorsal surface of caudal peduncle; usually 2 spines above eye, none or 1 spine on interorbital space, 2 spines between nostrils. Head and back olive or fawn, white below; some spine bases black; fins plain.

D 11-13. A 10-12. P 17-20. C 9.

(voucher: 120 mm SL)

#### **Cyclichthys spilostylus**

Head and body spines fixed and short; all spines 3-rooted except on head where some have 4 roots; 3 spines above eye, one spine between nostrils; no spines on dorsal surface of caudal peduncle. Head and body olive brown above, white below; spines on back with yellow spots on their bases, black spots on spine bases on sides and belly; fins plain brown or fawn.

D 12-13. A 11-12. P 21-22. C 9

(voucher: 210 mm SL)

#### **Diodon hystrix**

All body spines 2-rooted and erectile; spines on forehead 1-1.5 times eye diameter, shorter than spines on sides of body. Dorsal and anal fins rounded in adults. Head and body dusky above and white below and covered with black or dark brown spots which are smaller than eye diameter; faint dusky bars across head and back; dorsal, caudal, pectoral and sometimes anal fin spotted in adults.

D 14-17. A 14-16. P 22-25 (rarely 21).

(voucher: 315 mm SL)

#### **Tragulichthys jaculiferus**

Body spines fixed and mostly 3-rooted; 2 or more very long and erectile spines in pectoral fin axil; spines on sides longest, arising near bases of unpaired fins and reaching over caudal peduncle. Head and body fawn or olive above, white below; 3 or 4 rounded spots on sides - one between eye and gill opening, others above and behind pectoral fin; fins plain.

D 12. A 12. P 21-22. C 9.

(voucher: 50 mm SL)

**ABBREVIATIONS USED:**

PJPW	Peter J.P. Whitehead
PK	Patricia Kailola
TGT	Thomas Gloerfelt-Tarp

These abbreviations prefix either

- 1) the specimen caught and photographed in the field and indicate its collector, or
- 2) the identifier of the voucher.

Note also that the association "TGT(PJPW)" accompanies numbered vouchers collected on Area A cruises, during which PJPW was guest taxonomist.

AMS	Australian Museum, Sydney
ANSP	Academy of Natural Sciences of Drexel University, Philadelphia
BMNH	Natural History Museum, London (the 'old' abbreviation (BMNH) is retained as of 2022)
BPBM	Bishop Museum, Honolulu, Hawaii.
CAS	California Academy of Sciences, San Francisco
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Hobart
CUMZ	Chulalongkorn University Museum of Natural History, Bangkok
GMBL	Grice Marine Laboratory, Charleston
IORD	Ocean Research Institute, University of Tokyo
LACM	Natural History Museum of Los Angeles County
LPPL	Lembaga Penelitian Perikanan Laut, Jakarta
NMNZ	Museum of New Zealand Te Papa Tongarewa, Wellington (the specimen identification NMNZ is retained)
NMV	Museum Victoria, Melbourne
NSMT	National Museum of Nature and Science, Tokyo
NTM	Museum and Art Gallery of the Northern Territory, Darwin
QM	Queensland Museum, Brisbane
RUSI	South African Institute for Aquatic Biodiversity (SAIAB) Grahamstown. (formerly J.L.B. Smith Institute of Ichthyology)
SDSU	San Diego State University, San Diego
SMNS	Staatliches Museum für Naturkunde in Stuttgart
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor
USNM	U.S. National Museum of Natural History, Washington D.C.
WAM	Western Australian Museum Boola Bardip, Perth
WAMRL	Western Australian Marine Research Laboratories, North Beach
ZMH	Zoologisches Museum Hamburg
ZMUC	Zoological Museum, University of Copenhagen

The authors have followed Fricke, R., Eschmeyer, W. N. & Van der Laan, R. (eds) 2022. ESCHMEYER'S CATALOG OF FISHES: GENERA, SPECIES, REFERENCES. (<http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>). Electronic version accessed 30 06 2022.

**CHIMAERIDAE**

(A) *Chimaera ogilbyi* Waite, 1898

det. B. Finucci, W. White, J. Kemper & G. Naylor. CSIRO CA1262 10° 02'S., 130° 03'E. Areas B?, C.

(B) Our juvenile specimen from Area B. NMNZ P.015090 (TGT1743) from 08° 58'S., 116° 34'E. was sent to G. Hardy. Additional material is WAM P.26207-004 18° 42'S., 117° 40'E.

**CLUPEIDAE**

*Amblygaster leiogaster* (Valenciennes, 1847)

det. P. Whitehead on photo. Specimen lost, no field number. Comparative material is NTM S.13583-008 from Arafura Sea. Areas A, B.

*Amblygaster sirm* (Walbaum, 1792)

det. TGT. NTM S.11000-005 (TGT2382) 01° 20'S., 98° 35'E. Areas A, B, C.

*Anodontostoma chacunda* (Hamilton, 1822)

det. by P. Whitehead on photo. No figure voucher. Comparative material is AMS I. 21841-010 from 11° 50'S., 134° 48'E. Areas (B), C.

*Escualosa thoracata* (Valenciennes, 1847)

det. T. Wongratana. NTM S.10992-010 (TGT3083) 08° 57'S., 116° 28'E. Area B.

*Herklotsichthys koningsbergeri* (Weber & de Beaufort, 1912)

det. P. Whitehead. CSIRO CA2292 15° 31'S., 124° 02'E. Area C. *H. maccullochi* (Whitley) is a synonym.

**Herklotsichthys quadrimaculatus** (Rüppell, 1837)

det. P. Whitehead on photo. BMNH 1984.1.2.1 (no field number). Conspecific Survey material determined by T. Wongratana: NTM S.10733-033 (TGT1229) from 08° 46'S., 115° 10'E. Area B.

**Herklotsichthys lippa** (Whitley, 1931)

det. T. Wongratana on photo. Specimen lost (no field number). Conspecific material determined by I.S.R. Munro e.g. CA2333 from 15° 45'S., 112° 46'E. Area C.

**Hilsa kelee** (Cuvier, 1829)

det. T. Wongratana. NTM S.10733-041 (TGT1291) 08° 46'S., 115° 10'E. Areas A, B.

**Sardinella brachysoma** Bleeker, 1852

det. T. Wongratana. NTM S.10733-023 (TGT1228) 08° 46'S., 115° 10'E. Areas A, B.

**Sardinella fimbriata** (Valenciennes, 1847)

No figure voucher. P. Whitehead determined our Survey material (BMNH 1984.1.1.10 from 07° 47'S., 109° 08'E.). Area A.

**Sardinella gibbosa** (Bleeker, 1849)

det. T. Wongratana. NTM S.10733-024 (TGT2110) 08° 46'S., 115° 10'E. Areas A, B, C.

**Sardinella lemuru** Bleeker, 1853 / **Sardinella aurita** Valenciennes, 1847

det. T. Wongratana. NTM S.10733-032 (TGT1255) 08° 46'S., 115° 10'E. Areas A, B. This species occurs seasonally in great numbers in Bali. Stern et al (2017) suggest that *S. lemuru* is part of a single cosmopolitan species for which *S. aurita* is the most senior name.

**DUSSUMIERIIDAE****\*Dussumieria acuta** Valenciennes, 1847

No figure voucher. P. Whitehead determined our Survey material (BMNH 1984.1.1.9 (no field number)). *Diagnosis*: body deep, depth 22%-28% SL, lower GR. count less than 26; many radiating striae on posterior portion of scales. Area A? Hata et al (2020) distinguish this species from the very similar and sympatric *D. albulina* (Fowler, 1934). Examination of the BMNH material is needed.

**Dussumieria elopsoides** Bleeker, 1849

det. TGT. CUMZ 2527.3.20.4 (TGT2348) 01° 34'30"S., 98° 44'E. Areas A, B, C.

**PRISTIGASTERIDAE****Ilisha melastoma** (Bloch & Schneider, 1801)

No figure voucher. P Whitehead determined our material. (BMNH 1984.1.1.11, (no field number)). Area A.

**Ilisha lunula** Kailola, 1986

det. PK. CSIRO B.2104 14° 08'S., 128° 34'E. Area C. Paratype.

**Opisthopterus tardoore** (Cuvier, 1829)

det. TGT. NTM S.11031-001 (TGT2618) 08° 42'S., 115° 05'E. Areas A, B.

**Pellona ditchela** Valenciennes, 1847

det. T. Wongratana. NTM S.10734-020 (TGT1226) 08° 10'S., 114° 54'E. Areas A, B, C.

**ENGRAULIDAE****Setipinna tenuifilis** (Valenciennes, 1848)

det. P. Whitehead. CSIRO CA1541 13° 25'S., 126° 19'E. Areas A, B, C.

**Encrasicholina heteroloba** (Rüppell, 1837)

det. P. Whitehead. CUMZ 2527.3.20.5 (TGT2216) 08° 59'S., 116° 13'E. Areas A, B.

**Stolephorus balinensis** (Bleeker, 1849)

det. H. Hata. NTM S.10733-034 (TGT2114) 08° 46'S., 115° 10'E. Areas A, B, C

**\*Encrasicholina punctifer** Fowler, 1938

No figure voucher. det. J.B. Hutchins. WAM P.26275-001 from 16° 30'S., 121° 44'E. Area C. *Diagnosis*: Anal fin begins just behind dorsal fin; maxilla truncate posteriorly, its length 5-6 in SL; lower GR 24-26.

**Stolephorus baweanensis** Hardenberg, 1933

det. H. Hata. CUMZ 2527.3.20.7 (TGT2212) 06° 20'S., 109° 10'E. Area A.

**Thryssa baelama** (Fabricius, 1775)

No figure voucher. det. P. Whitehead. (e.g. BMNH 1984.1.1.1 from 08° 04'S., 110° 18'E.). Area A. (*Note*: the status of *Thryssa* Cuvier as the correct generic name is discussed by Kottelat (2013) and Fricke, Eschmeyer, & Van der Laan (2022).

**Thryssa encrasicholoides** (Bleeker, 1852)

det. T. Wongratana NTM S.10733-036 (TGT1237) 08° 46'S., 115° 10'E. Area B.

**Thryssa hamiltonii** (Gray, 1835)

det. P. Whitehead. CSIRO CA2332 11° 53'S., 131° 15'E. Area C.

**Thryssa mystax** (Bloch & Schneider, 1801)

det. T. Wongratana. NTM S.10733-038 (TGT1026) 08° 46'S., 115° 10'E. Areas A, B.

**Thryssa setirostris** (Broussonet, 1782)

det. TGT & PK. LPPL JIF3 (TGT2171) 08° 46'S., 115° 10'E. Areas A, B, C.

## CHIROCENTRIDAE

**Chirocentrus dorab** (Fabricius, 1775)

det. TGT. LPPL JIF4 (TGT2222) 06° 13'S., 105° 44'E. Areas A, B, C.

## ELOPIDAE

**Elops machnata** (Fabricius, 1775)

det. TGT. LPPL JIF1 (TGT1086) 08° 46'S., 115° 10'E. Area B. Note: *Elops hawaiiensis* Regan 2009 also occurs in the Survey area.

## MEGALOPIDAE

**Megalops cyprinoides** (Broussonet, 1782)

det. TGT. Specimen lost. (TGT1190) 08° 47'S., 118° 48'E. Areas B, C.

## ALBULIDAE

**Albula argentea** (Forster, 1801)

No figure voucher. det. J. Johnson. QM I.20700 (TGT2128) from 08° 46'S., 115° 10'E. Photo of New Guinea specimen (PK2) Areas B, C.

## NEMICHTHYIDAE

**Avocettina infans** (Günther, 1878)

No figure voucher. det. J.G. Nielsen (e.g. BMNH 1984.1.1.1 (TGT (PJPW) 810) from 08° 43'S., 114° 15'E.). Area A.

**Nemichthys curvirostris** (Strömman, 1896)

No figure voucher. det. D. Bray (AMS 1.21714-004 from 22° 12'S., 112° 53'E.). Area C.

**Nemichthys scolopaceus** Richardson, 1848

No figure voucher. det. J.G. Nielsen. (e.g. NTM S.10755-001 (TGT (PJPW) 811) from 08° 43'S., 114° 15'E.). Areas A, C.

## MURAENIDAE

**Gymnothorax cribroris** Whitley, 1932

det. P.H.J. Castle. CSIRO CA2794 from 20° 08'S., 117° 03'E. Area C.

**Gymnothorax minor** (Temminck & Schlegel, 1846)

det. D.G. Smith. CSIRO CA1696 from 19° 48'S., 117° 01'E. Areas B, C.

\***Gymnothorax thyroideus** (Richardson, 1845)

No figure voucher. det. J.B. Hutchins. WAM P.26298-001 from 18° 03'S., 121° 01'E. Area C. *Diagnosis*: Light brown body, finely mottled darker and lighter, snout and lower jaw white; many teeth in inner row of maxillary band, no long and fang-like teeth.

**Gymnothorax longinquus** (Whitley, 1948)

det. E. Böhlke. AMS 1.21943-017 11° 24'S., 134° 54'E. Area C.

**Gymnothorax pseudothyroideus** (Bleeker, 1853)

det. J. McCosker. CSIRO CA1488 from 19° 50'S., 116° 01'E. Area C.

**Gymnothorax mccoskeri** Smith & Böhlke, 1997

det. D.G. Smith & E. Böhlke. CSIRO CA1489 from 17° 47'S., 121° 41'E. Area C. Holotype.

**Strophidon sathete** (Hamilton, 1822)

det. PK. LPPL JIF2 (no field number). Area B. Drawing of preserved specimen. *Thyrsoidea macrura* (Bleeker) is a synonym.

## SYNAPHOBANCHIDAE

**Dysomma anguillare** Barnard, 1923

det. P.H.J. Castle. NTM S.10745-001 (TGT1895) 08° 27'S., 117° 47'E. Area B

## CONGRIDAE

**Ariosoma meeki** (Jordan & Snyder, 1900)

No figure voucher. Our material (e.g. BMNH 1984.1.1.3 from 08° 56'S., 116° 24'E.). det. PK based on Karmovskaya 2018 who determined that *meeki* Jordan & Snyder is the correct name for the *Ariosoma* with two black patches on the posterior eye margin. Areas A, B, C.



**Ariosoma mauritianum** (Pappenheim, 1914)

No figure voucher. Our material (e.g. CSIRO CA2721 from 20° 01'S., 115° 57'E.) determined by P.H.J. Castle. Area C. Additional material from Area C is AMS I.22821-055.

**Bathymyrus smithi** Castle, 1968

No figure voucher. Our material (e.g. BMNH 1984.1.1.4 (PJPW135) from 08° 45'S., 114° 17'E.) determined by P.H.J. Castle. Area A.

**Blachea xenobranchialis** Karrer & Smith, 1980

No figure voucher. Our specimen (WAM P.26270-005 from 15° 30'S., 120° 58'E.) determined by P.H.J. Castle. Area C.

**Diploconger polystigmatus** Kotthaus, 1968

det. P.H.J. Castle & D.G. Smith. CSIRO CA1694 from 20° 03'S., 116° 10'E. Area C. Drawing of preserved specimen.

**Gnathophis nasutus** Karmovskaya & Paxton 2000

det. E. Karmovskaya & J.R. Paxton. CSIRO CA2720 from 19° 40'S., 116° 10'E. Drawing of a preserved specimen (e.g. AMS 1.22866-001 from 20° 03'S., 115° 57'E.). Area C. Paratype.

**Heteroconger tricia** Castle & Randall, 1999

No figure voucher. P.H.J. Castle determined our material (NMNZ P.015177 (TGT1623) possibly from southern Flores (08° 52'S., 121° 30'E.)). Area B. Holotype. (A duplicate specimen is NTM S.11012-001. Paratype.). Drawing of preserved specimen from Castle & Randall, 1999.

**Lumiconger arafura** Castle & Paxton, 1984

det. P.H.J. Castle. CSIRO CA2879 from 12° 34'S., 128° 27'E. Area C. Paratype.

**Parabathymyrus macrophthalmus** Kamohara, 1938

No figure voucher. Our specimen BMNH 1984.4.11.11 (no field number) determined by P.H.J. Castle. Area B.

**Bathycongrus guttulatus** (Günther, 1887)

No figure voucher. Our material BMNH 1984.1.1.5 (no field number) determined by P.H.J. Castle. Area A.

**Macrocephenchelys brevirostris** (Chen & Weng, 1967)

No figure voucher. Our material determined by P.H.J. Castle NMNZ P.015178 (TGT1894) from 08° 27'S., 117° 47'E. Area B.

**Uroconger lepturus** (Richardson, 1845)

No figure voucher. Our material (e.g. NTM S.10751-001 (TGT1677) from 08° 30'S., 117° 46'E.) determined by P.H.J. Castle. Areas A, B.

**Gavialiceps javanicus** Karmovskaya, 1993

No figure voucher. det. E. Karmovskaya. BMNH 1984.1.1.6 and 1984.1.1.7 (PJPW136) from 08° 45'S., 114° 17'E. Area A. Paratypes.

**MURAENESOCIDAE****Muraenesox bagio** (Hamilton, 1822)

No figure voucher. PK determined our material (e.g. CSIRO CA1088 from 13° 38'S., 124° 30'E.). Area A.

**Muraenesox cinereus** (Forsskål, 1775)

det TGT. LPPL JIF9 (TGT2476) 00° 04'S., 99° 01'E. Areas A, B, C.

**Oxyconger leptognathus** (Bleeker, 1858)

No figure voucher. P.H.J. Castle determined our material (e.g. CSIRO CA2709 from 19° 34'S., 116° 09'E.). Area C.

**NETTASTOMATIDAE****Nettenchelys gephyra** Castle & Smith, 1981

No figure voucher. Our material determined by P.H.J. Castle (AMS I.22852-001 (TGT1893) from 08° 27'S., 117° 47'E.). Area B.

**Saureenchelys sp.**

No figure voucher. det. P.H.J. Castle. CSIRO CA1558 from 12° 42'S., 136° 54'E. Area B. Drawing of preserved specimen.

**OPHICHTHIDAE****Ophichthus urolophus** (Temminck & Schlegel, 1846).

No figure voucher. det. PK & TGT (e.g. NTM S.10750-001 (TGT1444) from 08° 56'S., 116° 24'E.). Area B.

**Pisodonophis cancrivorus** (Richardson, 1848)

No figure voucher. det. P.H.J. Castle. BMNH 1984.1.1.8 (PJPW 63) 08° 52'S., 115° 01'E. Area A.

**ARGENTINIDAE****Glossanodon australis** Kobylansky, 1998

det. PK. NTM S.10760-005 (TGT1716) 08° 58'S., 116° 34'E. Areas A, B. Drawing of preserved specimen.

\* **Glossanodon pseudolineatus** Kobylansky, 1998

No figure voucher. Our material determined by G. Moore. WAM P.26193-003 from 19° 17'S., 116° 16'E. Area C. *Diagnosis*: dorsal fin begins before ventral fin origin; anus much closer to anal fin base than to ventral fin base; maxilla broad posteriorly, ending well before eye. D 10. A 9-10. P 16. Total GR. 23-26. Mouth slightly upturned; eye equal to snout length. About 7 dark blotches in midlateral row along yellowish body; 2 dark patches on base of caudal fin; mouth, gill cavity and abdomen shaded dark grey or black, overwashed silver.

\* **Glossanodon** sp.

No figure voucher. Two specimens LACM43541-1 (TGT1670) 08° 30'S., 117° 46'E and LACM 43542-2 (TGT3202B) 09° 01'S., 116° 18'E) remain unidentified. Based on Kobylansky (1988) and information provided originally by D.M. Cohen, they are closest to *G. mildredae* Cohen & Atsides, 1969. Unfortunately, no information is available on these specimens.

\* **BATHYLAGIDAE**\* **Bathylagoides argyrogaster** (Norman, 1930)

No figure voucher. Our material determined by D.M. Cohen. BMNH 1984.1.1.12 (TGT (PJPW)204) from 08° 43'S., 114°15'E. Area A. *Diagnosis* (family): Small to medium-sized fish from deep water. Body robust, elongate or slender; eyes large (not tubular), interorbital space more than half the depth of caudal peduncle. (Parietal bones do not meet in midline; supraorbital bone present). Scales thin, deciduous; lateral line present. Dorsal fin with more than 13 rays; caudal fin forked. (Similar to ARGENTINIDAE). Bathylagus is the only genus (Cohen 1964). *Diagnosis* (species): D. 12. A. 13-16. V.8. About 38 scales in longitudinal series. Dorsal fin origin nearer to caudal fin than to end of snout; adipose fin present. Body depth 4.6-5.5 in SL, head 3.8-4.2 in SL; eye 2.5-2.8 in HL. Brownish above, silvery below; operculum silvery black. REFERENCES: Kobylansky, 1985; Kobylansky, 1990; Paxton & Cohen, 1999.

**STERNOPTYCHIDAE****Argyripnus pharos** Harold & Lancaster, 2003

No figure voucher. det. A. S. Harold. AMS I. 24338-002 (TGT1676) from 08° 30'S., 117° 46'E. Area B. Paratype. We use the photo of the preserved specimen, Holotype, BMNH 1986.9.22.41.

**Maurolicus javanicus** Parin & Kobylansky, 1993

No figure voucher. det. N.V. Parin. AMS I. 24316-006. (00° 04' S, 97° 55' E.). Photo supplied and taken by Dr. Glenn Moore, Western Australia Museum, from conspecific specimen from 31° 87' S., 115° 21' E. WAM P.32519-006. Area A. Holotype.

**Polyipnus soelae** Harold, 1994

det. M. Aizawa. AMS I. 24318-002 (TGT2533) 01° 25'S., 100° 19'E. Area A.

**Polyipnus triphanos** Schultz, 1938

No figure voucher. Our material determined by PK based on Harold, 1994. AMS I. 24338-001 (TGT1672 in part) 08° 30'S., 117° 46'E. Area B.

**ALEPOCEPHALIDAE****Microphotolepis schmidti** (Angel & Verrier, 1931)

det. N. Merrett. BMNH 1984.1.1.15 (PJPW126) 08° 45'S., 114° 17'E. Area A. *M. multipunctata* Sazonov & Parin is a synonym.

**Xenodermichthys copei** (Gill, 1884)

No figure voucher. Our specimens determined by N. Merrett (e.g. BMNH 1984.1.1.16 (PJPW117) from 03° 45'S., 114° 17'E.). Area A.

**PHOSICHTHYIDAE****Phollichthys maui** (Poll, 1953)

No figure voucher. Our juvenile specimens determined by J. Badcock. BMNH 1984.1.1.13 (PJPW 2031) 03° 43'S., 114° 15'E. Area A.

**Polymetme corythaeola** (Alcock, 1898)

No figure voucher. Our material determined by N. Merrett. (BMNH 1984.1.1.14 (PJPW 205) 03° 45'S., 114° 16'E.). Area A.

**GONOSTOMATIDAE****Manducus greyae** (Johnson, 1970)

No figure voucher. Our specimen determined by J. Badcock. BMNH 1984.1.1.17 (TGT (PJPW) 839) from 03° 43'S., 114° 15'E. Area A.

**Sigmops elongatus** (Günther, 1878)

det. J. Badcock. BMNH 1984.1.1.18 (TGT (PJPW) 818a) 08° 43'S., 114° 15'E. Area A.

**STOMIIDAE (includes former CHAULIODONTIDAE and MELANOSTOMIDAE)****Subfamily Astronesthinae*****Astronesthes chrysophekadion*** (Bleeker, 1849)

No figure voucher. R. Gibbs determined our material (e.g. USNM 264976 (TGT1926) 08° 32'S., 114° 30'E.). Areas A, B.

***Astronesthes cyanea*** (Brauer, 1902)

No figure voucher. R. Gibbs determined our material (e.g. BMNH 1984.1.1.20 (TGT (PJPW) 841 in part) 03° 43'S., 114° 15'E.). Area A.

***Astronesthes indica*** Brauer, 1902

No figure voucher. R. Gibbs determined our material (e.g. BMNH 1984.1.1.21 (TGT (PJPW) 817) 03° 43'S., 114° 15'E.). Area A.

***Astronesthes martensii*** Klunzinger, 1871

det. R. Gibbs. BMNH 1984.1.1.22 (TGT (PJPW) 774) 08° 32'S., 114° 30'E. Areas A, B.

***Astronesthes splendida*** Brauer, 1902

No figure voucher. R. Gibbs determined our material BMNH 1984.4.11.4 (TGT1925) 08° 32'S., 114° 30'E. Area A.

**Subfamily Chauliodontinae*****Chauliodus sloani*** Bloch & Schneider, 1801

det. R. Gibbs. BMNH 1984.1.1.28 (PJPW115) 08° 45'S., 114° 17'E. Area A

**Subfamily Melanostomiinae*****Echiostoma barbatum*** Lowe, 1843

No figure voucher. R. Gibbs determined our material (BMNH 1984.4.11.6 (TGT1933) 08° 32'S., 114° 30'E.). Area A.

***Eustomias bifilis*** Gibbs, 1960

No figure voucher. R. Gibbs determined our material (BMNH 1984.4.11.5 (TGT1932) 03° 32'S., 114° 30'E.). Area A.

**\**Leptostomias* sp.**

No figure voucher. R. Gibbs determined our material (a damaged specimen). BMNH 1984.1.1.24 (PJPW2024) 08°45'S. 114°45'S. Area A. Three species of *Leptostomias* Gilbert are known in the general Survey area: *L. gladiator* Zugmayer, *L. gracilis* Regan & Trewavas, and *L. macronema* Gilbert.

***Melanostomias macrophotus*** Regan & Trewavas, 1930

det. R. Gibbs. BMNH 1984.1.1.25 (PJPW 42 in part) 03° 45'S., 114° 17'E. Area A.

**\**Melanostomias* sp**

No figure voucher. Our damaged specimens determined by R. Gibbs (e.g. BMNH 1984.1.1.26 (PJPW 2019) 03°45'S., 114° 17'E.). Area A. There are more than 20 known species of *Melanostomias* Brauer. Harold (1999) listed nine species from the Western and Central Pacific; the type locality for one of them, *M. valdiviae* Brauer, 1902, is off the west coast of Sumatra (Survey area A)

***Photonectes albipennis*** (Döderlein, 1882)

No figure voucher. Our material determined by R. Gibbs (e.g. BMNH 1984.1.1.27 (PJPW 42 in part) 08° 45'S., 114° 17'E.). Area A.

**\**Photonectes* sp.**

No figure voucher. Our material determined by R. Gibbs (e.g. BMNH 1989.4.6.86 (TGT (PJPW) 815) 08° 45'S., 114°15'E.). Area A. Members of the genus *Photonectes* Günther are easily recognised among stomiid fishes by the combination of the scaleless body and the protruding, curved lower jaw bearing a single row of teeth (Prokofiev & Klepadlo, 2019). It comprises about 22 valid species (ibid).

**Subfamily Stominae*****Stomias nebulosus*** Alcock, 1889

det. R. Gibbs. BMNH 1984.1.1.23 (PJPW116) 08° 45'S, 114° 17'E. Area A.

**CHANIDAE*****Chanos chanos*** (Fabricius, 1775)

det. TGT. LPPL JIF8 (TGT1088) 08° 46'S., 115° 10'E. Area B.

**ARIIDAE*****Plicofollis tonggol*** (Bleeker, 1846)

det. PK. NTM S. 10733-030 (TGT2121) 08° 46'S., 115° 10'E. Area B. [Note: This name has seniority over *P. crossocheilus* (Bleeker, 1846)].

***Arius maculatus*** (Thunberg, 1792)

det. PK. NTM S. 11030-002 (TGT2202) 06° 13'S., 105° 44'E. Area A.

***Netuma thalassina*** (Rüppell, 1837)

det. PK. LPPL JIF201 (TGT2217) 06° 13'S., 105° 44'E. Areas A, B, C.