2. SYSTEMATIC CATALOGUE

2.1 General Aids to Identification

2.1.1 Diagnostic Features of the Family Caesionidae

Oblong to fusiform, moderately compressed, medium-sized to small lutjanoid fishes. Longitudinal axis from tip of snout to middle of caudal fin passing through centre of eye. Eye moderately large, its diameter longer than snout length. Mouth small and highly protrusible; ascending premaxillary process a separate ossification from premaxilla; ethmo-maxillary ligament absent; 1-2 finger-like postmaxillary processes (Fig. 2a,b); angle of jaw oblique, about 40-50° to horizontal. Dentition variously reduced; small or minute conical teeth; premaxillae, vomer and palatines with or without teeth. Caudal fin deeply forked. Margin of dorsal and anal fins more or less evenly sloping; third or fourth dorsal spines longest; second or third anal spines longest, remaining spines and rays gradually decreasing in length (except in *Dipterygonotus* with dorsal fin profile not evenly sloping, last 4-5 dorsal spines small and nearly separate, connected only at their bases by membrane, and dorsal rays much longer than these spines). Dorsal fin with 10-15 slender weak spines and 8-22 soft rays; anal fin with 3 spines and 9-13 rays; pelvic fins with 1 spine and 5 rays; pectoral fins with 16-24 rays. Branchiostegal rays 7. Scales moderate to small, weakly ctenoid; lateral-line scales 45-88. A separate A1' section of the adductor mandibulae which originates on the subocular shelf. Predorsal configuration 0/0/0+ 2/1 + 1/, /0 + 0/0 + 2/1 + 1/ or /0 + 0/2/1 + 1/. Epipleural ribs 10-15. Procurrent caudal rays typically 7-10. Hypurals 1-2 and 3-4 typically fused in all species (except some juveniles). Openings in external wall of pars jugularis 2-5. **Colour:** Sides with or without longitudinal stripes; caudal fin either without markings, with a blackish blotch on tips of lobes, or with a longitudinal blackish streak in middle of each lobe; axil of pectoral fin black.

2.1.2 Notes on the Identification of Fusiliers

There has been much confusion with species names of caesionids because preserved specimens are difficult to identify. The species of this family are easily distinguished on the basis of their life colours, although these colour patterns usually do not preserve well. The morphological features of caesionids are often difficult to use in identification due to the feebleness of the structures. Scales readily detach, and rays are slender and easily broken; teeth are small and weak and often require staining for proper characterization. When these elements are not broken or detached, they are useful as meristic characters. The overlaps in counts of these characters, however, are such that, based on meristics alone, there is often a possibility of misidentification. For this reason, when life colours are not known, it is better to base identifications on a number of specimens from each population and identify the most frequent meristic counts. Tables IV to VI list the frequency distributions of those characters most useful in the identification of caesionids.

Two keys are provided below for the identification of fusiliers. The first is a laboratory key intended for use with preserved specimens. There are some cases however, where knowledge of colour patterns is necessary for identification when using the laboratory key. Often these patterns are discernible in preserved specimens but it is better if notes on colour pattern have been taken on specimens during collection. If daytime life colour patterns are apparent, caesionids can be easily and reliably identified. For this reason, a second key is provided for use in the field, together with colour plates, as an aid to identification. If caesionids are captured or observed at night, they often assume a reddish, blotched background colour. This can cause some problems in identification but generally, the normal daytime pattern can still be recognized.

2.1.3 Laboratory Key to Species

Note: This key is intended for use with preserved specimens, although in some cases information on colour pattern is necessary or helpful in identification. Characters used here include jaw structure, fin ray counts, scale counts, external morphology, proportional measurements, and markings. The meristic frequency distribution tables (section 2.1.4) will be useful in understanding the variation of most meristic characters used in this key.

1a. A single postmaxillary process; posterior end of maxilla blunt, its greatest depth posterior to end of premaxilla (Fig. 18) ..... ***Caesio***

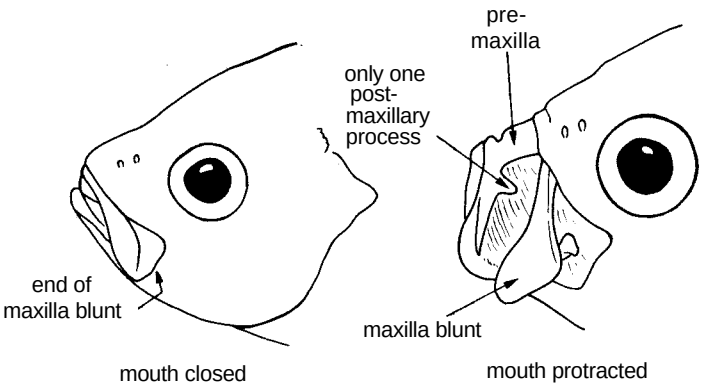
2a. Anal fin usually with 3 spines and 11 soft rays

3a. Dorsal fin usually with 10 spines and 15 soft rays; supratemporal band of scales confluent at dorsal midline (Fig. 19a); caudal fin without any promment blackish markings (Fig. 20) (eastern Indian Ocean to western Pacific) ..... ***C. cuning***

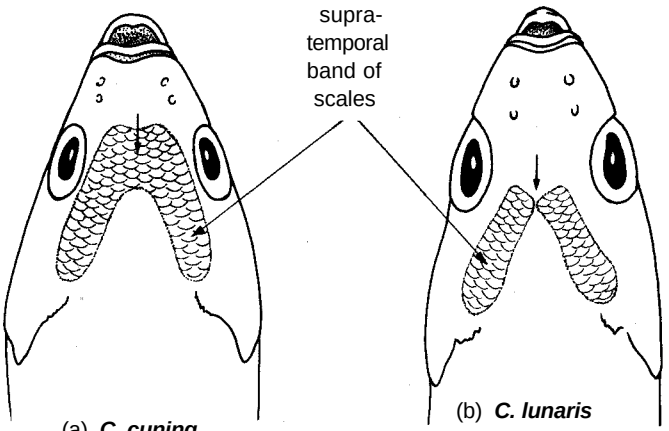
3b. Dorsal fin usually with 10 spines and 14 soft rays; supratemporal band of scales interrupted at dorsal midline by a thin scaleless zone (Fig. 19b); tips of caudal lobes with a blackish blotch (Fig. 21) (Red Sea to western Pacific) ..... ***C. lunaris***

2b. Anal fin usually with 3 spines and 12 soft rays

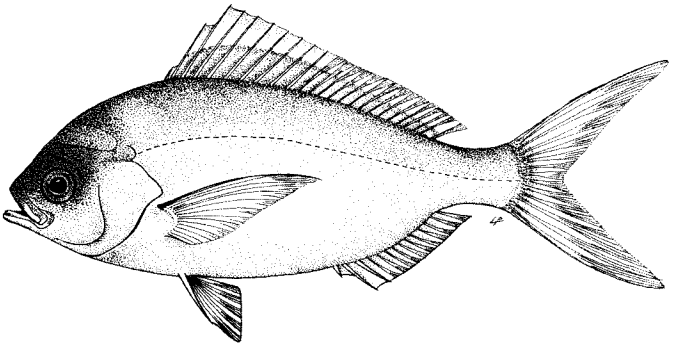
4a. Lateral-line scales 51 to 61; upper scale rows on spinous portion of dorsal fin usually oblique (Fig. 22a); caudal fin yellow in life without blackish markings, or partially yellow, the lobe tips with a black blotch bordered by a distinct white proximal band



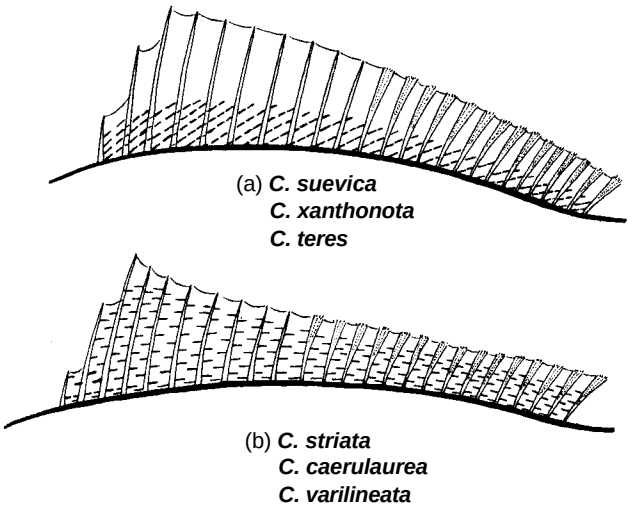
Caesio **Fig. 18**



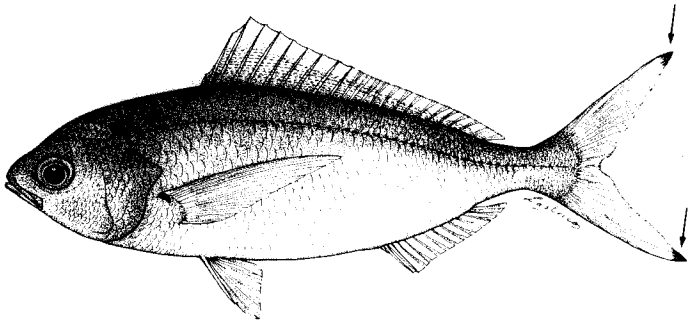
Dorsal view of head **Fig. 19**



C. cuning **Fig. 20**



Orientation of scales on dorsal fin **Fig. 22**



C. lunaris **Fig. 21**

5a. Caudal fin partially yellow in life, the lobe tips with a black blotch which has a white proximal border (Fig. 23); dorsal peduncular scales usually 11; ventral peduncular scales 13 to 15; scales below lateral fine to anal-fin origin 15 to 17 (Red Sea) ..... ***C. suevica***

5b. Caudal fin yellow in life, without prominent blackish markings; dorsal peduncular scales 11 to 13; ventral peduncular scales 14 to 17; scales below lateral line to anal-fin origin usually 17 to 20 (Indian Ocean to western Pacific, excluding Red Sea)

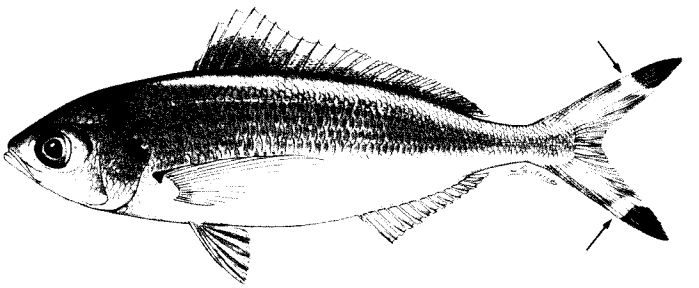
6a. Body yellow dorsally, blue on side, the demarcation horizontal from interorbital space across upper third of body; predorsal and supratemporal region not considerably darker than dorsal part of caudal peduncle in alcohol-preserved specimens (Fig. 24) (Indian Ocean to Indonesia) ..... ***C. xanthonota***

6b. Body yellow dorsally, blue on side, the demarcation oblique from slightly anterior to origin of dorsal fin to lower posterior part of caudal peduncle (in western and central Pacific the yellow region in adults is restricted to caudal peduncle); predorsal region, especially supratemporal and interorbital region, dark in alcohol-preserved specimens (Fig. 25) (Indo-Pacific) ..... ***C. teres***

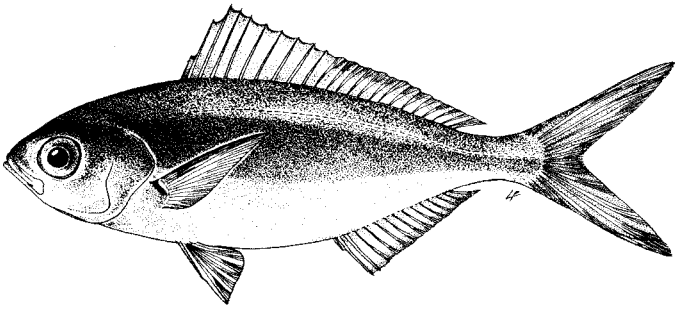
4b. Lateral-line scales 57 to 67; scale rows on spinous portion of dorsal fin horizontal (Fig. 22b); caudal fin not yellow, each lobe with a median blackish streak or a black blotch lacking a distinct white proximal margin

7a. Pectoral rays 18 or 19, rarely 20; supratemporal band of scales always confluent at dorsal midline (see Fig. 19a); body depth 3.5 to 4.5 (average 4.1) times in standard length (Fig. 26) (Red Sea) ..... ***C. striata***

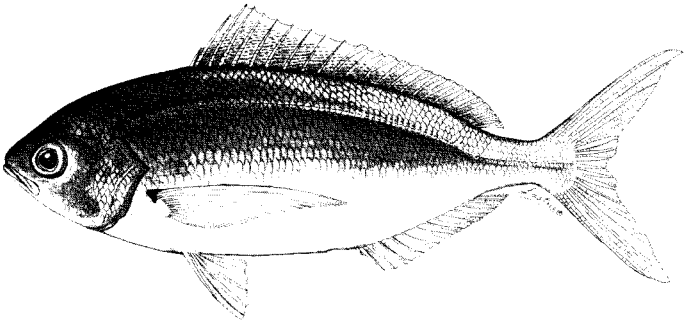
7b. Pectoral rays 20 to 22 (rarely 19 except in eastern Africa); supratemporal band of scales often interrupted at dorsal midline by a thin scaleless zone (see Fig. 19b); body depth 3.0 to 4.2 (average 3.5) times in standard length



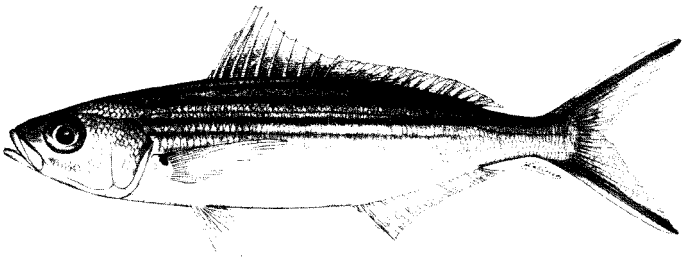
C.suevica **Fig. 23**



C. xanthonota **Fig. 24**



C. teres **Fig. 25**



C. striata **Fig. 26**

8a. A single yellow longitudinal stripe in life, directly above the lateral line for most of its length; tip of each caudal lobe not darker than blackish streak within lobe; eye diameter 3.3 to 5.1 (average 3.8) times in head length (Fig. 27) (Indian Ocean to Samoa) …..... ***C. caerulaurea***

8b. Four to 6 longitudinal yellow stripes on side in life; tip of each caudal lobe with a prominent black blotch which is darker than blackish streak within lobe; eye diameter 3.7 to 5.5 (average 4.7) times in head length (Fig. 28) (Indian Ocean to western Indonesia, including Red Sea and Arabian (Persian) Gulf ..…..... ***C. varilineata***

1b. Two postmaxillary processes; posterior end of maxilla tapered, its greatest depth anterior to end of premaxilla (Fig. 29)

9a. Dorsal and anal fins scaled; premaxilla with small conical teeth, sometimes restricted to front of jaw ……. ***Pterocaesio***

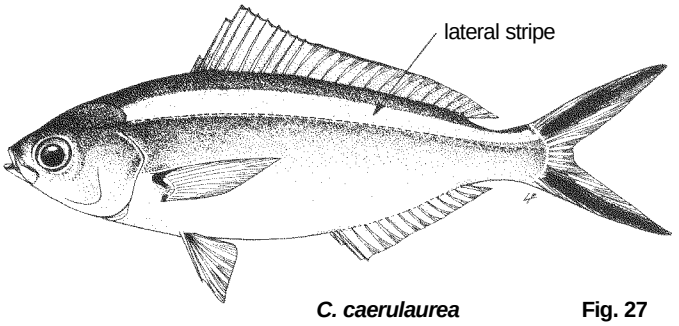
10a. Dorsal fin with 11 or 12 (rarely 10) spines and 19 to 22 soft rays; a blackish streak in each caudal lobe (Fig. 30) (Indo-Pacific) ..…….. ***P. tile***

10b. Dorsal fin with 10 or 11 (usually 10) spines and 14 to 16 soft rays; tips of caudal lobes with a black blotch

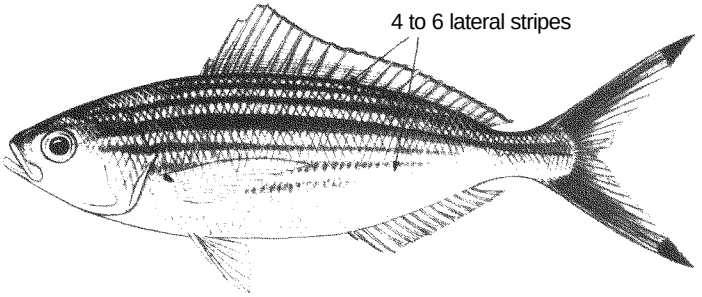
11a. Dorsal peduncular scales usually 11 (rarely 10, 12 or 13); lateral-line scales 62 to 72; pectoral rays 17 to 21 (rarely 22, most frequently 19 or 20); scales above lateral line to dorsal-fin origin usually 8 or 9; scales below lateral line to anal-fin origin usually 13 to 17; side with or without stripes

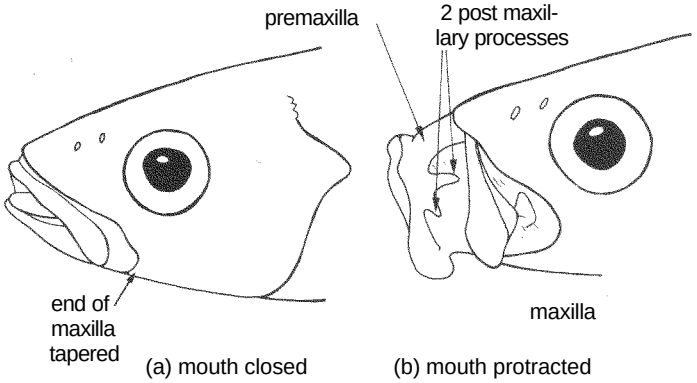
12a. Pectoral rays usually 19 to 21 (most frequently 20); 3 light and 3 dark stripes on upper, side in life (Fig. 31) (eastern Indian Ocean and western Pacific east to Fiji) ..…... ***P. trilineata***

12b Pectoral rays 17 to 20 (most frequently 19); side without stripes or with at most, 2 stripes

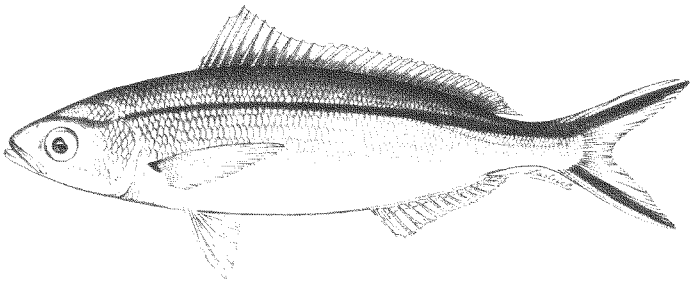


C. caerulaurea **Fig. 27**

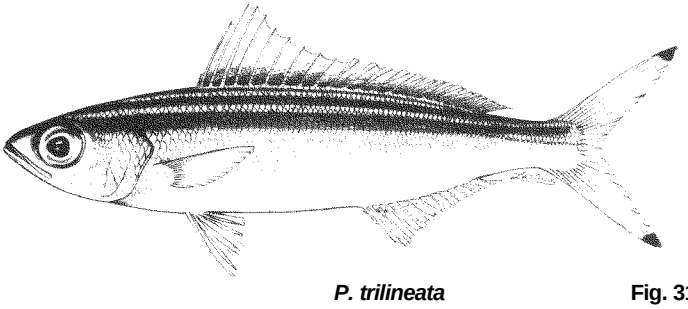




Pterocaesio, Gymnocaesio, Dipterygonotus **Fig. 29**



P. tile **Fig. 30**



P. trilineata **Fig. 31**

13a. Body without stripes on side, its colour reddish or greenish blue (Fig.32) (Indian Ocean to western Pacific) ..... ***P. pisang***

13b. Body with 1 or 2 yellow stripes on side in life

14a. A single, thin, yellow stripe in life covering lateral line for most its length, except above lateral line on caudal peduncle (Fig. 33) (western Indian Ocean) ..... ***P. capricornis***

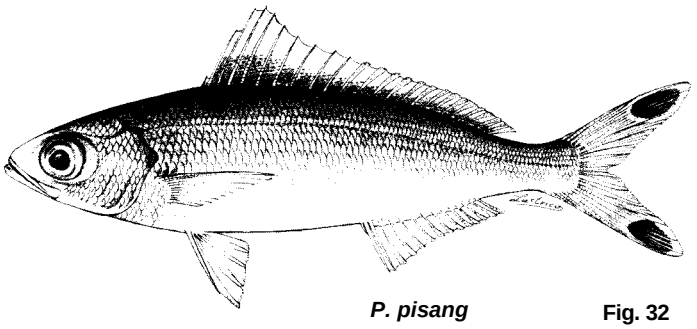
14b. Two yellow stripes on side in life, one on dorsal midline on nape and along base of dorsal fin and the other, which is broader anteriorly, directly below lateral line for most its length, except above lateral line on caudal peduncle (Fig. 34) (Red Sea and Indian Ocean to western Pacific) ..... ***P. chrysozona***

11b. Dorsal peduncular scales usually 12 or 13 (rarely 11 or 14); lateral-line scales 66 to 88; pectoral rays 20 to 24 (always most frequently 21 or above); scales above lateral line to dorsal-fin origin 9 to 11; scales below lateral line to anal-fin origin usually 16 to 18; side with 1 or more longitudinal stripes or a large yellow blotch

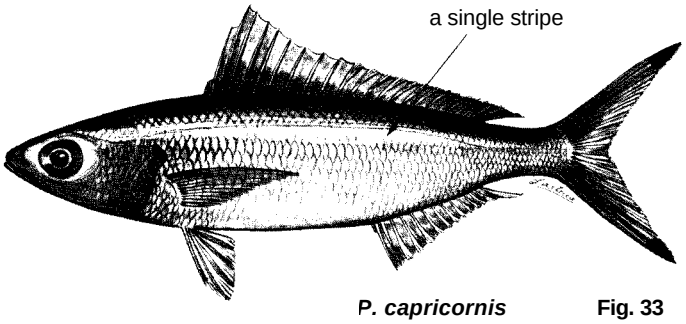
15a. Lateral-line scales 74 to 88; pectoral rays 21 to 23 (most frequently 22); a broad yellow stripe on side in life, wider anteriorly, covering lateral line for most its length (Fig. 35) (Indian Ocean to western Pacific) ..... ***P. lativittata***

15b. Lateral-line scales 66 to 80; pectoral rays either usually 20 to 22 (most frequently 21) or 22 to 24 (most frequently 23); either a thin yellow stripe on side or a large yellow blotch above pectoral-fin base

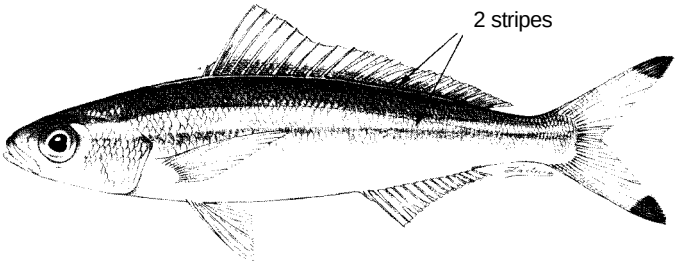
16a. Pectoral rays 22 to 24 (most frequently 23); 2 thin yellow stripes on side, the lower stripe covering the lateral-line for most its length, above lateral line on caudal peduncle, the upper stripe mostly 1 or 2 scales below the dorsal profile of the body (Fig. 36) (Indian Ocean to western Pacific) ..... ***P. marri***



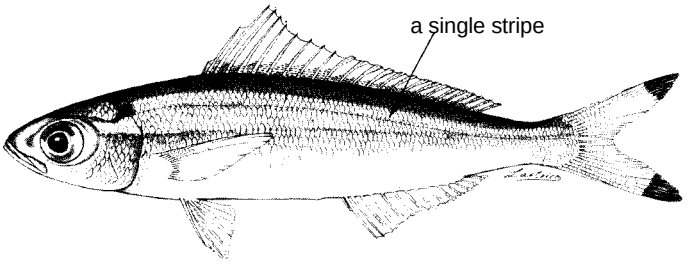
P. pisang **Fig. 32**



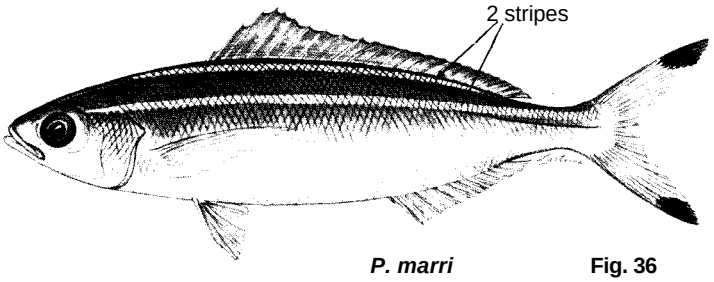
P. capricornis **Fig. 33**



P. chrysozona **Fig. 34**



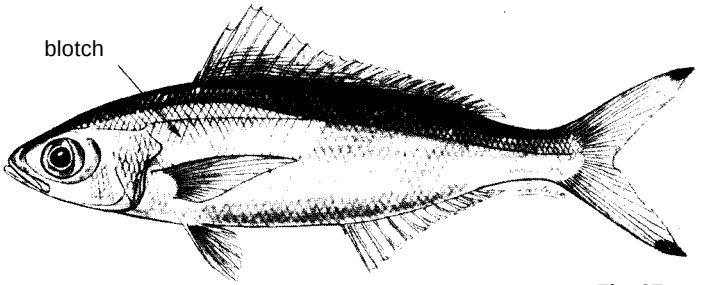
P. lativittata **Fig. 35**



P. marri **Fig. 36**

16b. Pectoral rays usually 20 to 22 (most frequently 21); 1 or 2 yellow lines or a large yellow blotch on side (if there are 2 lines, the lower one is distinctly below lateral line for most its length, except on caudal peduncle where it is above lateral line)

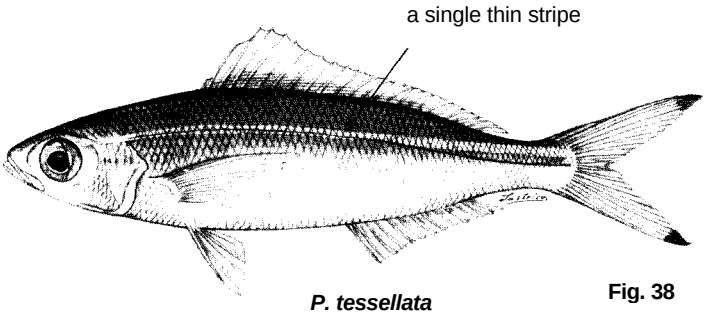
17a. A large yellow blotch above pectoral fin in life; no stripes on side (Fig. 37) (eastern Indian Ocean to western Pacific) ..... ***P. randalli***



P. randalli **Fig. 37**

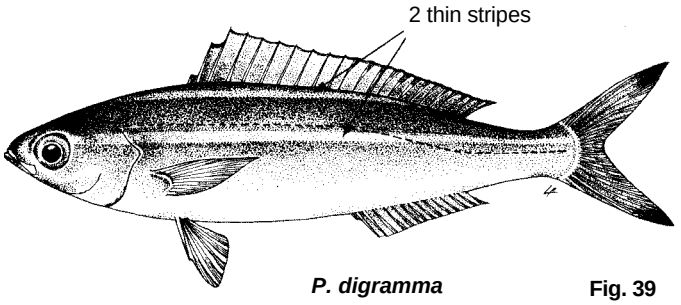
17b. No large yellow blotch above pectoral fin; 1 or 2 yellow stripes on side

18a. A single thin yellow stripe on side covering lateral line for most its length, on caudal peduncle above lateral line (Fig. 38) (eastern Indian Ocean to western Pacific) ..... ***P. tessellata***



P. tessellata **Fig. 38**

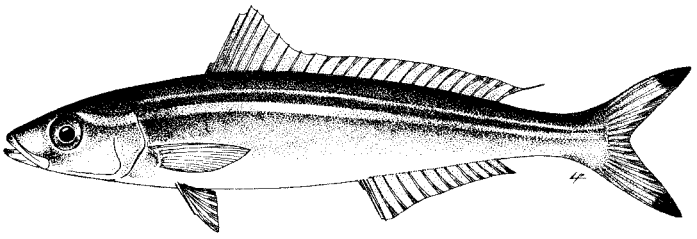
18b. Two thin longitudinal stripes on side, the lower distinctly below lateral line for most its length, on caudal peduncle above lateral line, the upper following dorsal profile (Fig. 39) (eastern Indian Ocean to western Pacific) ..... ***P. digramma***



P. digramma **Fig. 39**

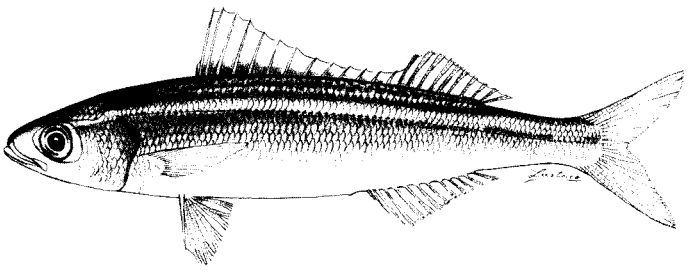
9b. Dorsal and anal fins without scales; premaxilla without teeth

19a. Dorsal fin with 10 or 11 (usually 10) spines and 14 to 16 (usually 15) soft rays, the fin not deeply notched; anal fin with 3 spines and 11 to 13 (usually 12) soft rays; pectoral rays 20 to 22 (Fig. 40) (Red Sea and Indian Ocean to western Pacific) ..... ***Gymnocaesio gymnoptera***



G. gymnoptera **Fig. 40**

19b. Dorsal fin with 12 to 15 (usually 14) spines and 8 to 11 (usually 10) soft rays, the fin deeply notched, the last few spines joined only at base by fin membrane; anal fin with 3 spines and 9 to 11 (usually 10) soft rays; pectoral rays 16 to 19 (Fig. 41) (Indian Ocean to western Pacific) ..... ***Dipterygonotus balteatus***



D. balteatus **Fig. 41**

2.1.4 Meristic Frequency Distribution Tables

Meristic characters (counts of different morphological elements) have already been used in the preceding key. In caesionids, they overlap considerably. However, a pile of specimens of the same species can be identified very reliably on the basis of the most frequent (modal) counts. Therefore, and as complement to the laboratory key, the 3 following meristic frequency distribution tables (IV, V, VI) are presented as an additional aid to species identification.

TABLE IV

Frequency Distributions of Fin Rays in Caesionidae

	Dorsal spines						Dorsal fin spines												Anal fin rays					Pectoral fin rays								
	10	11	12	13	14	15	8	9	10	11	13	14	15	16	19	20	21	22	9	10	11	12	13	16	17	18	19	20	21	22	23	24
C. cuning	58											3	52	3						1	54	3			6	58	46	6				
C. lunaris	66										3	62	1							1	65					4	40	85	3			
C. suevica	18											2	16									18						18	18			
C. xanthonota	23											1	22								1	22						11	30	5		
C. teres	84											1	80	2								82	2			1	1	42	102	20	1	
C. caerulaurea	72											2	68	2								71	1				5	45	98	39		
C. varilineata	65											2	56	6							2	59	5					21	62	46	1	
C. striata	42											2	38	2								42				21	59	5				
P. tile	3	35	19												7	20	24	6					57							19	72	23
P. digramma	55											2	49	4							1	54						29	73	9	1	
P. chrysozona	95	1										3	90	3							7	87	1		1	17	114	60				
P. pisang	59	1										4	55	1							1	58	1			28	79	12				
P. randalli	23											1	19	3								23						3	30	13		
P. marri	63	1										1	60	3							2	60	1						49	71	7
P. lativittata	37											1	33	3								36	2						20	41	19	
P. capricornis	2												2									2					4					
P. trilineata	78	1										4	70	5							4	75					53	95	10	1		
P. tessellata	71	1										1	69	2							1	70	1					12	77	55		
G. gymnoptera	55	6										7	48	6							2	59	1					9	72	43		
D. balteatus			1	2	54	3	1	6	49	4									7	52	1			1	24	66	28					

TABLE V

Frequency Distributions of useful Meristic Characters in Caesionidae

	Upper peduncular scales						Lower peduncular scales							Scale rows above lateral line					Scale rows below lateral line								
	9	10	11	12	13	14	12	13	14	15	16	17	18	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C. cuning	42	15	1				1	41	16					1	37	20						20	31	6	1		
C. lunaris	2	25	37		1			5	32	28				2	53	10	1				1	7	8	28	15	6	
C. suevica		1	17					1	6	11				3	9	6						3	7	8			
C. xanthonota			16	7					2	20	1				2	11	9	1						3	10	8	2
C. teres			32	32	16				3	60	16	2		1	39	29	14						1	20	30	22	10
C. caerulaurea		7	58	2					13	55					10	50	9					11	36	19	3		
C. varilineata		4	60	2					4	61					4	48	13					7	30	24	2		
C striata			42	1						39	4				36	6					8	21	13	1			
P. tile			24	28	5					34	19	3	1	15	42						1	4	41	11			
P. digramma			1	11	43	1					11	44	1			7	38	11					4	20	31		1
P. chrysozona			88	6	1				1	85	7	2		4	49	42				5	30	40	16	4			
P. pisang		2	53	5				1	1	56	1	1			29	28	3			2	33	23	2				
P. randalli			5	4	13	1				14	7	2			1	15	7					2	10	10	1		
P. marri				16	45	2				5	20	38				10	42	11				2	23	28	10		
P. lativittata				4	22	6				3	13	16				9	24	2					5	15	8	1	
P. capricornis			2							2					1	1						2					
P. trilineata			75	4					1	74	4	1		1	62	16					11	51	12	4	1		
P. tessellata			11	31	28	2				21	32	19				26	43	3				2	23	36	11		
G. gymnoptera			57	2				6	25	27				15	42	5			5	24	25	4					
D. balteatus			3	7	39	11				9	26	22	3			13	44	3				12	30	15	3		

TABLE VI

Frequency Distribution of Lateral-line Scales in Caesionidae

	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
C. cuning	1	2	18	30	34	24	7																
C. lunaris	1	2	2	19	42	38	17	4	5														
C. suevica							1	5	6	9	6	7	1	1									
C. xanthonota								2	4	9	11	11	8		1								
C. teres							5	13	16	25	25	25	22	12	12	10	1						
C. caerulaurea													4	13	19	30	31	22	12	5	4		
C. varilineata													1	1	7	15	22	29	28	13	9	3	2
C. striata															7	9	11	20	16	11	7	2	2

	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84-88
P. tile								11	20	31	23	19	6	2	1								
P. digramma					1	5	6	6	15	19	23	14	15	6	2								
P. chrysozona	1	5	17	26	25	42	36	27	6	4	1												
P. pisang		4	10	17	27	24	22	11	3	1													
P. randalli								2	4	2	4	3	4	8	9	2	4	2	1				
P. marri							1	3	11	16	27	30	19	15	4								
P. lativittata													1	10	7	7	7	8	6	7	5	3	11
P. capricornis				1	1	1	1																
P. trilineata	1	6	15	22	37	34	21	17	2	2	1												
P. tessellata					1	1	11	27	31	36	18	12	5	1	1								
G. gymnoptera			1			3	17	24	28	28	15	2	2										
D. balteatus							2	1	10	7	24	20	24	18	7	5		1	1				

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