



**Identification methods of
the Lutjanidae, Siganidae and
Epinephelini larvae
in the Southeast Asian region**

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Lutjanidae

(Snappers)



Adults

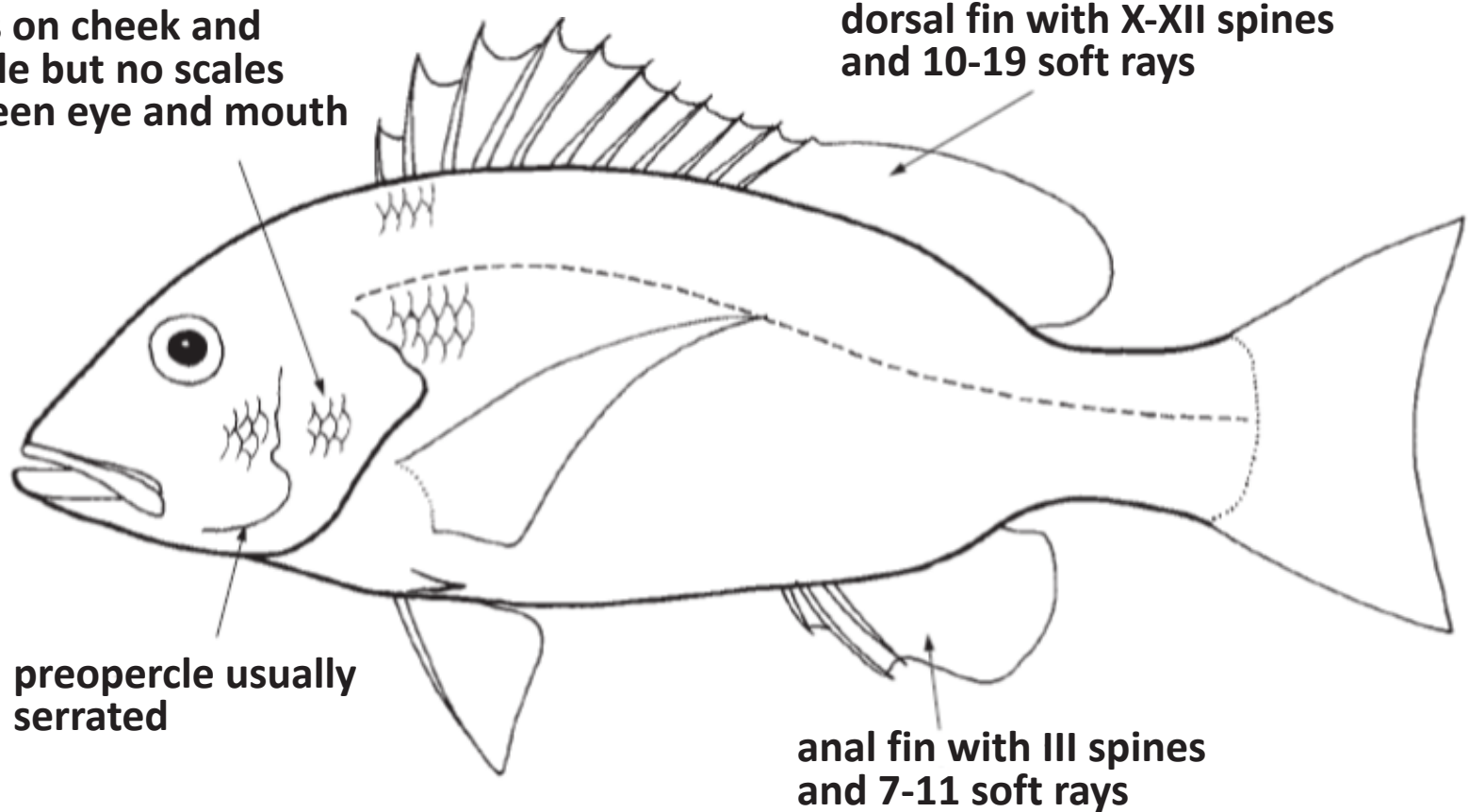
Reference:

Anderson, W. D. Jr. and G.R. Allen (2001). Lutjanidae. Pages 2840-2918 *in* Carpenter, K. E. and V. H. Niem eds. The living marine resources of the Western Central Pacific. FAO species identification guide for fishery purposes. FAO, Rome.

Diagnostic characters of the Lutjanidae fishes

scales on cheek and opercle but no scales between eye and mouth

dorsal fin with X-XII spines and 10-19 soft rays



preopercle usually serrated

anal fin with III spines and 7-11 soft rays

- Opercular spines 2. Branchiostegal rays 7. Dorsal fin single. Caudal fin truncate to deeply forked.
- D X-XII, 10-19; A III, 7-11; PRC 17 (9+8); P₁ 14-19; P₂ I, 5; Vertebrae (10+14).
- Colour: highly variable; mainly from red through yellow to blue; often with blotches, lines, or other patterns.



Habitat, and biology

- **Juveniles of several species of *Lutjanus* enter estuaries and the lower reaches of fresh-water streams**; a few Indo-Pacific species of *Lutjanus* are inhabitants of fresh waters.
- **Mostly bottom-associated fishes, occurring from shallow inshore areas to depths of about 500 m** (mainly over reefs or rocky outcrops).
- Populations in continental waters have extended spawning throughout the summer, whereas those occurring around islands spawn throughout the year with peaks in spring and fall.
- **Lutjanids are batch spawners**, with individual females usually spawning several times in a reproductive season.
- **Spawning** is apparently **at night**, on **some occasions coinciding with spring tides**.
- Larvae avoid surface waters during the day, but display a more even vertical distribution at night.

Representative species of lutjanid genera in the region



Lipocheilus carnolabrum



Etelis coruscans



Pinjalo pinjalo



Paracaesio xanthura



Pristipomoides argyrogrammicus



Symphorichthys spilurus



Aphareus furca



Lutjanus argentimaculatus



Symphorus nematophorus



Aprion virescens



Macolor niger

Photos: FishBase

Subfamilies, genera, and species of the **Lutjanidae** in the Southeast Asian region

Subfamily	Genus	D	A	P ₁
Apsilinae	<i>Lipocheilus</i> (1)	X, 10	III, 8	15-16
	<i>Paracaesio</i> (4)	X, 9-10	III, 8-9	16-18
Etelinae	<i>Aphareus</i> (2)	X, 10-11	III, 8	15-16
	<i>Aprion</i> (1)	X, 11	III, 8	16-18
	<i>Etelis</i> (3)	X, 11	III, 8	15-17
	<i>Pristipomoides</i> (8)	X, 11	III, 8	15-17
Lutjaninae	<i>Lutjanus</i> (33)	X-XII, 12-16	III, 7-11	15-17
	<i>Macolr</i> (2)	IX-X, 13-15	III, 10-11	16-18
	<i>Pinjaro</i> (2)	XI-XII, 13-14	III, 9-10	17-19
Paradicichthyinae	<i>Symphorichthys</i> (1)	X, 17-19	III, 11	16-17
	<i>Symphorus</i> (1)	X, 14-17	III, 9-10	16-17

- Numerals in parenthesis: number of species (**11 genera with 56 species** in the region).
- P₂: I, 5; C: 9+8; Vertebrae: 10+14 (all species of lutjanid fishes in the region).
- Meristic data: **Indo-Pacific lutjanid fishes** by Leis and Rennis (2000).

Key to the genera of Lutjanidae occurring in the area

Notes: species names are given when a genus includes a single species. Counts of gill rakers include rudiments, if present.

Anderson and Allen (2001)

- 1a. Dorsal and anal fins without scales; dorsal fin with X spines and 10 or 11 soft rays 2
- 1b. Soft dorsal and anal fins with scales or sheathed with scales basally; dorsal fin with X to XII spines and 11 to 19 soft rays 10
- 2a. Maxilla with scales 3
- 2b. Maxilla without scales 5
- 3a. Spinous portion of dorsal fin deeply incised at its junction with soft portion; dorsal fin with X spines and 11 (very infrequently 10) soft rays *Etelis*
- 3b. Spinous portion of dorsal fin not deeply incised at its junction with soft portion; dorsal fin with X spines and 10 soft rays 4
- 4a. Last soft ray of both dorsal and anal fins shorter than next to last soft ray *Paracaesio*
- 4b. Last soft ray of both dorsal and anal fins about equal to or slightly longer than next to last soft ray
Parapristipomoides squamimaxillaris

Key to the genera of Lutjanidae occurring in the area

- 5a. Premaxillae essentially not protrusible, attached to snout at symphysis by a frenum 6
- 5b. Premaxillae protrusible, not attached to snout by frenum 7
- 6a. Vomer without teeth (small juveniles may have minute teeth on vomer); teeth in jaws very small, no caniniform teeth; pectoral fins somewhat shorter than head; lateral surface of maxilla smooth *Aphareus*
- 6b. Vomer with teeth; jaws with some caniniform teeth; pectoral fins about 1/2 to 2/3 length of head; lateral surface of maxilla with a series of well-developed longitudinal ridg.
..... *Randallichthys filamentosus*
- 7a. Dorsal fin with X spines and 11 (rarely 10) soft rays; last soft ray of both dorsal and anal fins longer than next to last soft ray
..... 8
- 7b. Dorsal fin with X spines and 10 soft rays; last soft ray of both dorsal and anal fins shorter than next to last soft ray 9
- 8a. Groove present on snout below nostrils (Fig. 1); pectoral fins less than 1/2 length of head. *Aprion virescens*
- 8b. No groove on snout; pectoral fins a little shorter than head to somewhat longer than head *Pristipomoides*

Key to the genera of Lutjanidae occurring in the area

- 9a.** Upper lip with a median fleshy protrusion, well developed in adults (Fig. 2); spines of dorsal and anal fins strong, very robust in large adults
..... *Lipocheilus carnolabrum*
- 9b.** Upper lip without a median fleshy protrusion *Paracaesio*
- 10a.** Vomer without teeth; dorsal fin with X spines and 14 to 19 soft rays; 1 or more anterior soft dorsal-fin rays produced as filaments (at least in juveniles)..... *11*
- 10b.** Vomer with teeth; dorsal fin with X to X II spines and 11 to 16 soft rays; none of anterior soft dorsal-fin rays produced as filaments
..... *12*
- 11a.** Anterior profile quite steep; dorsal fin with X spines and 17 to 19 soft rays; upper and lower pharyngeals enlarged and bearing large molariform teeth
..... *Symphorichthys spilurus*
- 11b.** Anterior profile sloping more gently; dorsal fin with X spines and 14 to 17 soft rays; upper and lower pharyngeals not particularly enlarged, not bearing molariform teeth *Symphorus nematophorus*

Key to the genera of Lutjanidae occurring in the area

- 12a.** First gill arch with 60 or more gill rakers on lower limb *Macolor*
- 12b.** First gill arch with 20 or fewer gill rakers on lower limb 13
- 13a.** Upper and lower profiles of head equally rounded; eye set toward middle of head; mouth rather small, somewhat upturned; no fang-like canines at anterior ends of jaws *Pinjalo*
- 13b.** Upper and lower profiles of head not equally rounded, upper profile evenly rounded to steeply sloped, and lower profile flattened; eye closer to upper profile of head than to lower; mouth larger, usually not upturned; some fang-like canines usually present at anterior ends of jaws *Lutjanus*

Larvae

References (Guide book):

Leis, J. M. and D. S. Rennis (2000). Lutjanidae (Snappers and Fusiliers). Pages 329-337. *In*: Leis, J. M. and B. M. Carson-Ewart. (eds.) The larvae of Indo-Pacific coastal fishes. An identification guide to marine fish larvae. Brill, Leiden.

Lindeman, K.C., Richards, W.J., Lyczkowski-Shultz, J., Drass, D.M., Paris, C.B., Leis, J.M., Lara, M. & Comyns, B.H. (2005) Lutjanidae: Snappers. pages. 1549–1586. *In*: Richards, W.J. (Ed): *Early Stages of Atlantic Fishes. An identification guide for the Western Central Atlantic*. Taylor and Francis: Boca Raton, Florida.

Okiyama, M. ed. (2014). Lutjanidae. Pages 819-835. *In* An atlas of early stage fishes in Japan. Second edition. Tokai University Press, Hatano.

Larvae



References (papers):

Leis, J.M. & Lee, K. (1994). Larval development in the lutjanid subfamily Etelinae (Pisces): the genera *Aphareus*, *Aprion*, *Etelis* and *Pristipomoides*. *Bulletin of Marine Science* 55, 46–125.

Leis, J.M. & Bray, D.J. (1995). Larval development in the lutjanid subfamily Paradicichthyinae (Pisces): the genera *Symphorus* and *Symphorichthys*. *Bulletin of Marine Science* 56, 418–433.

Leis, J.M., Bullock, S., Bray, D.J. & Lee, K. (1997). Larval development in the lutjanid subfamily Apsilinae (Pisces): the genus *Paracaesio*. *Bulletin of Marine Science* 61, 697–742.

Leis, J.M. (2005) A larva of the eteline lutjanid, *Randallichthys filamentosus* (Pisces: Perciformes), with comments on phylogenetic implications of larval morphology of basal lutjanids. *Zootaxa* 1008, 57–64.

Leis, J. M. (2007). Larval Development in the Lutjanid Subfamily Lutjaninae (Pisces): the Genus *Macolor*. *Records of the Australian Museum*. 59: 1–8.

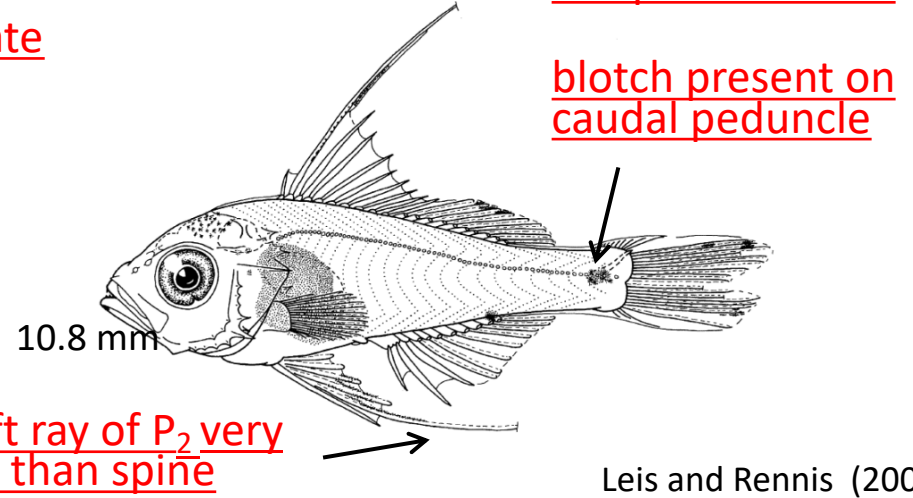
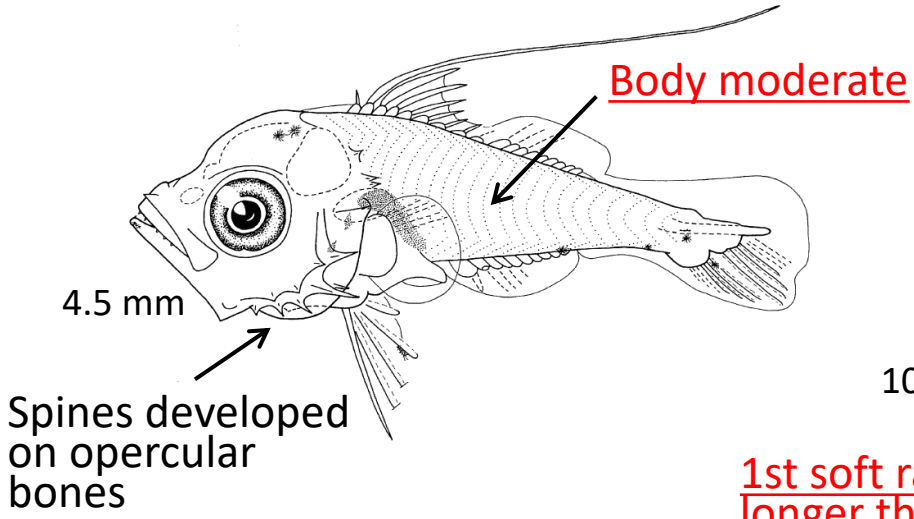
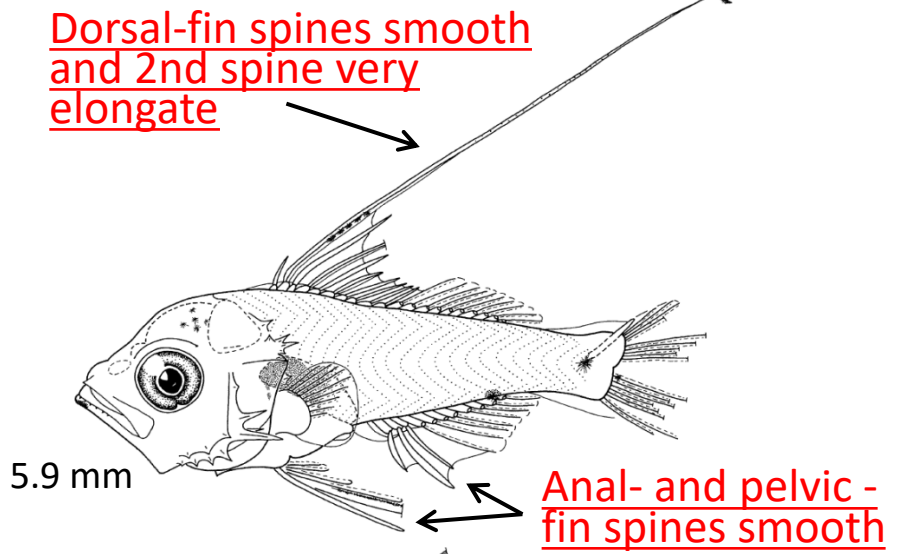
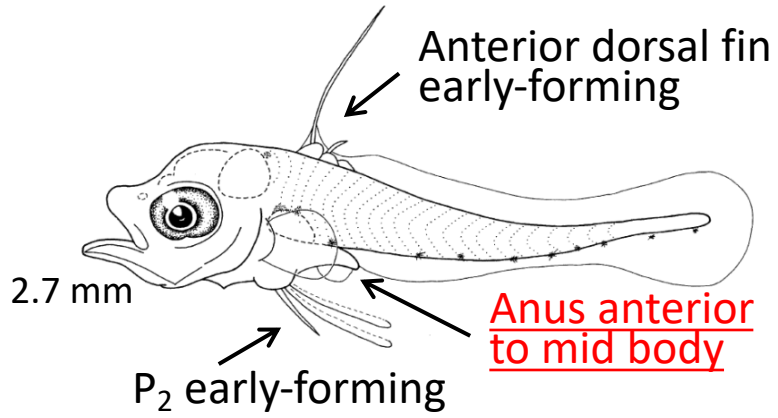
Leis, J. M. (2008). Larval development in the lutjanid subfamily Lutjaninae (Pisces): the Indo-Pacific genus *Pinjalo*, *Zootaxa*, 1760: 37-49.

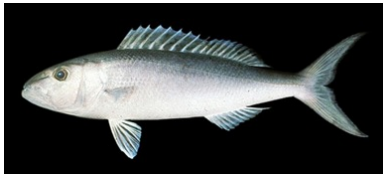
Larvae of some lutjanid species (1/) apsiline *Paracaesio* sp.

Paracaesio
 D: X, 9 ~ 10
 A: III, 8 ~ 9
 P₁: 16 ~ 18
 P₂: I, 5
 V: 10 + 14



Paracaesio xanthura
 FishBase (2022)





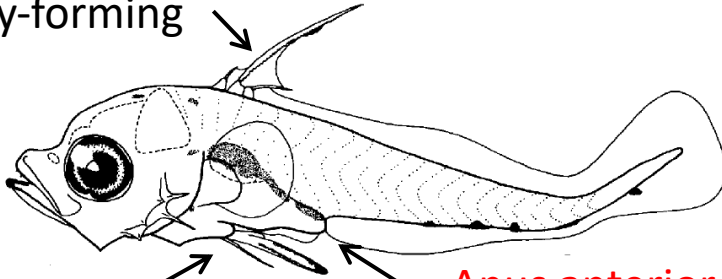
FishBase (2022)

Larvae of some lutjanid species (2/)

eteline *Aprion virescens*

D: X, 11
 A: III, 8
 P₁: 17 ~ 18
 P₂: I, 5
 V: 10 + 14

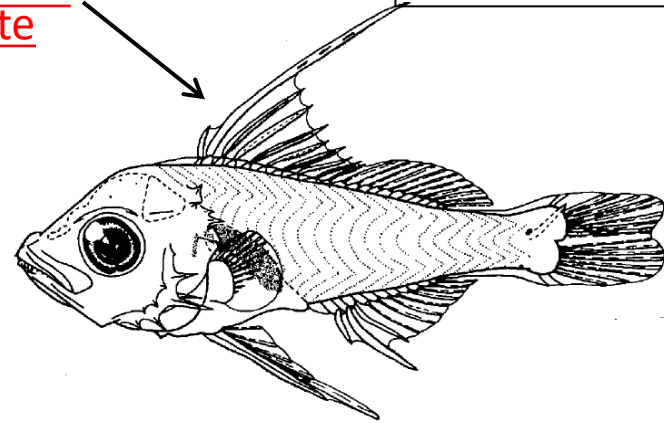
Anterior dorsal fin
early-forming



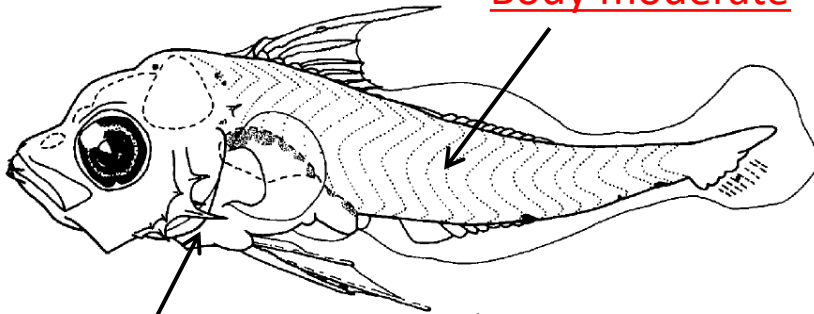
P₂ early-forming

Anus anterior
to mid body

Dorsal-fin spines
smooth and 2nd
spine elongate



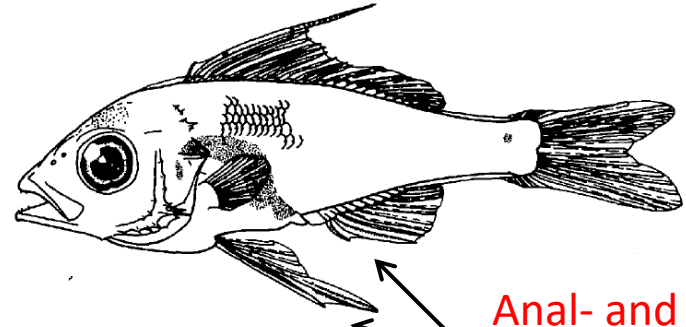
Body moderate



Spines developed
on opercular
bones

1st soft ray of P₂
longer than spine

Anal- and pelvic
-fin spines
smooth



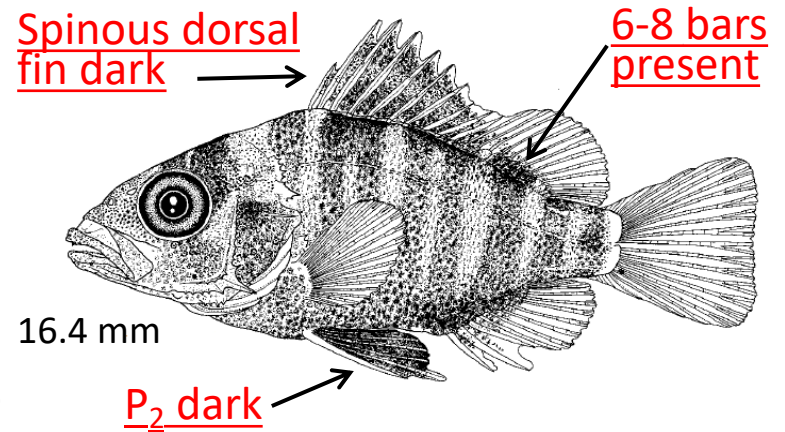
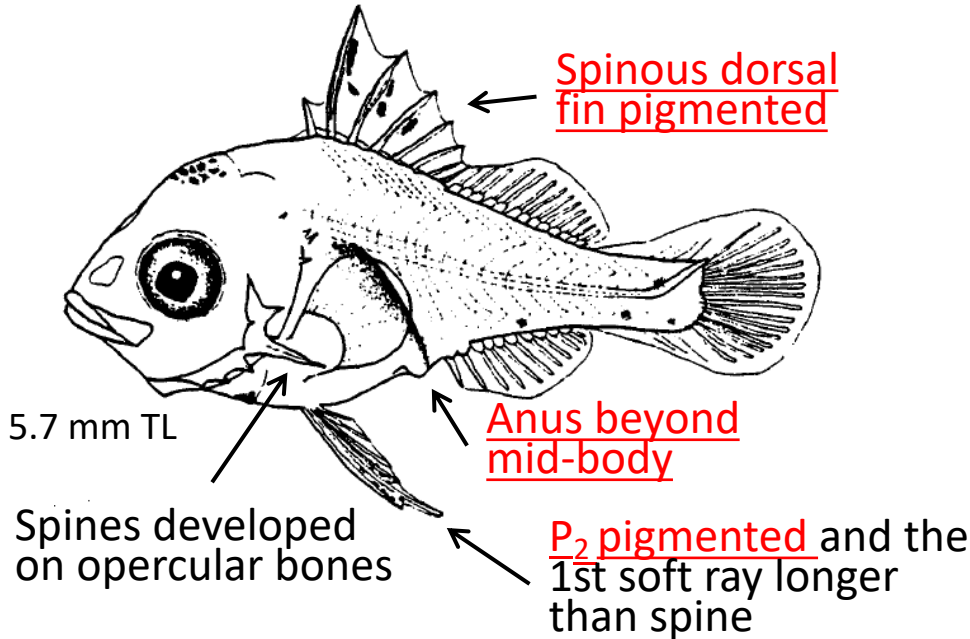
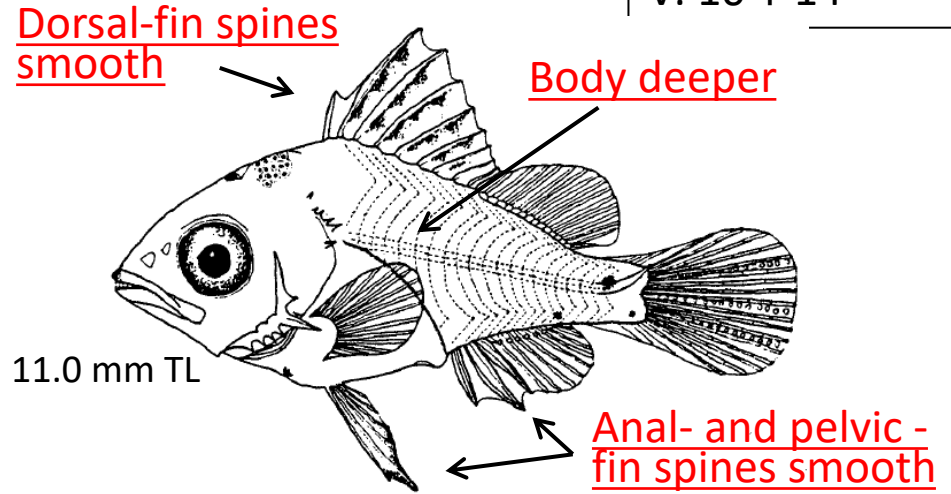
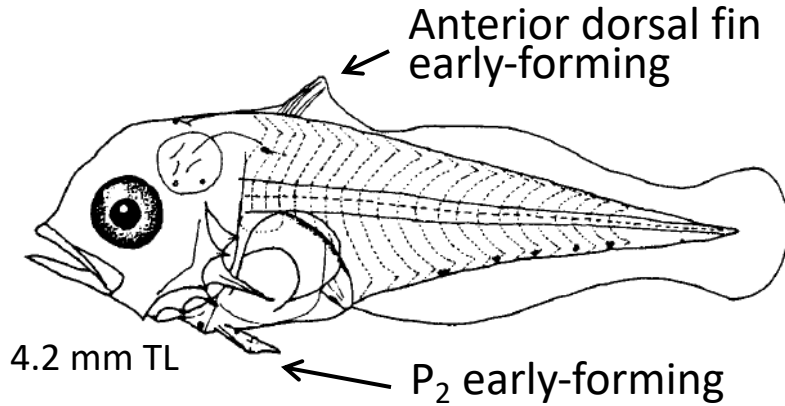
Larvae of some lutjanid species (3/)

lutjanine *Lutjanus argentimaculatus*

D: XIII, 13~14
 A: III, 8
 P₁: 17
 P₂: I, 5
 V: 10+14



FishBase (2022)



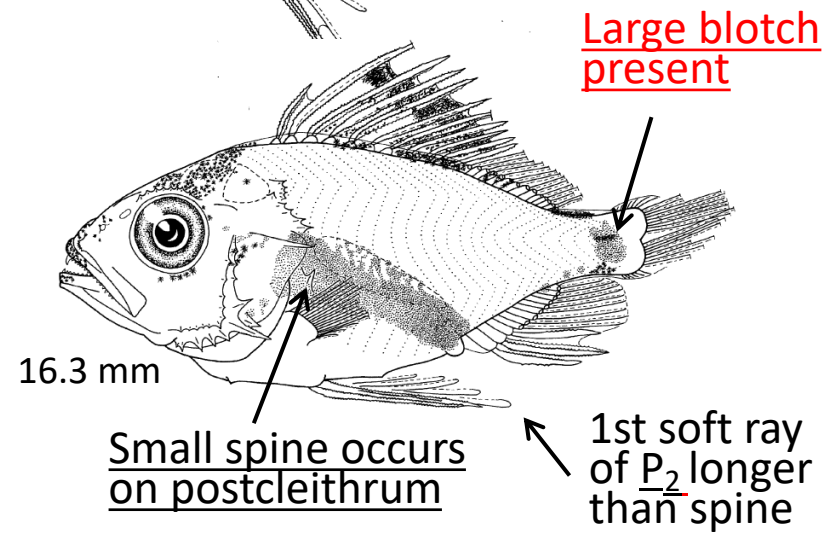
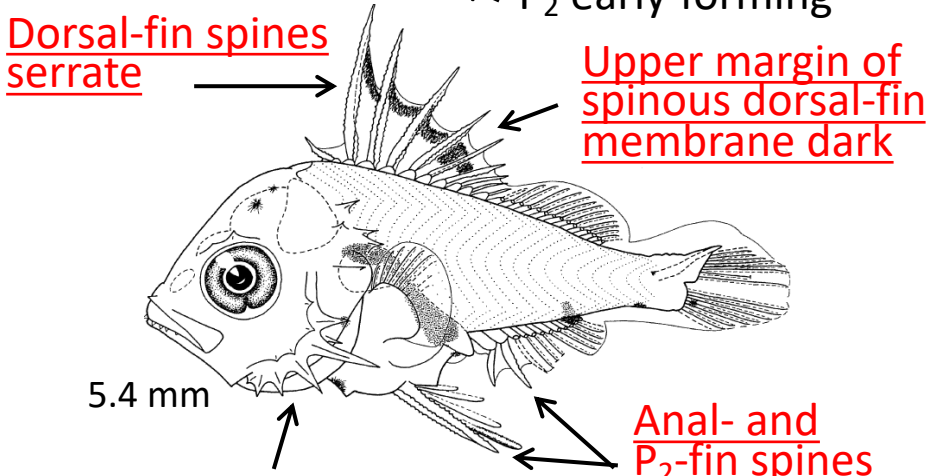
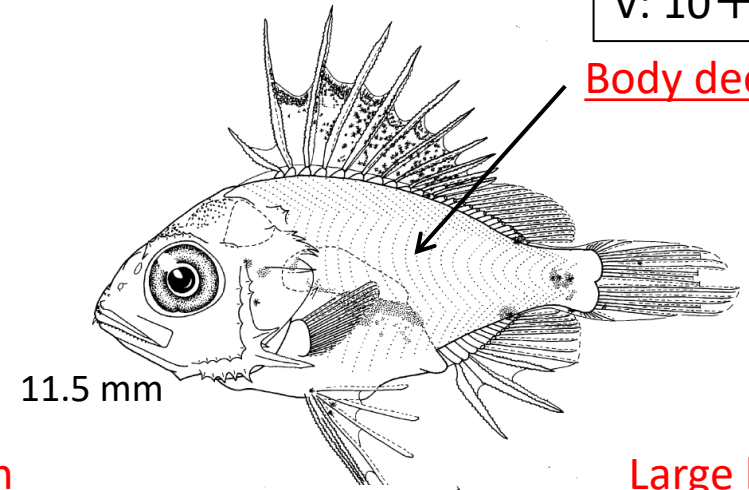
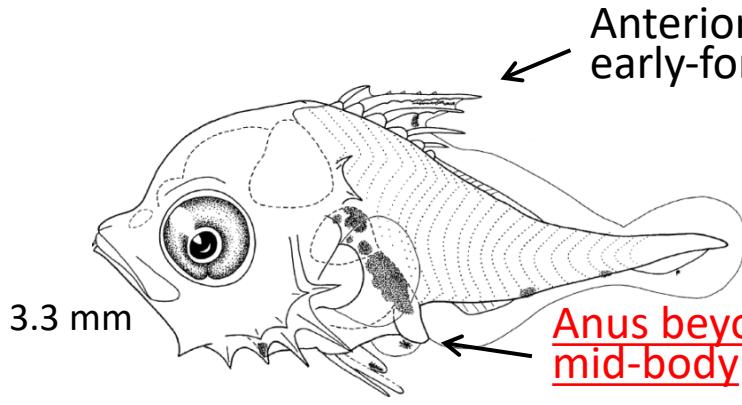
Larvae of some lutjanid species (4/)

lutjanine *Lutjanus malabaricus* and/or *L. erythropterus*

L. malabaricus
 D: XI, 13 ~ 14
 A: III, 9
 P₁: 17 ~ 18
 P₂: I, 5
 V: 10 + 14



L. malabaricus
FishBase (2022)





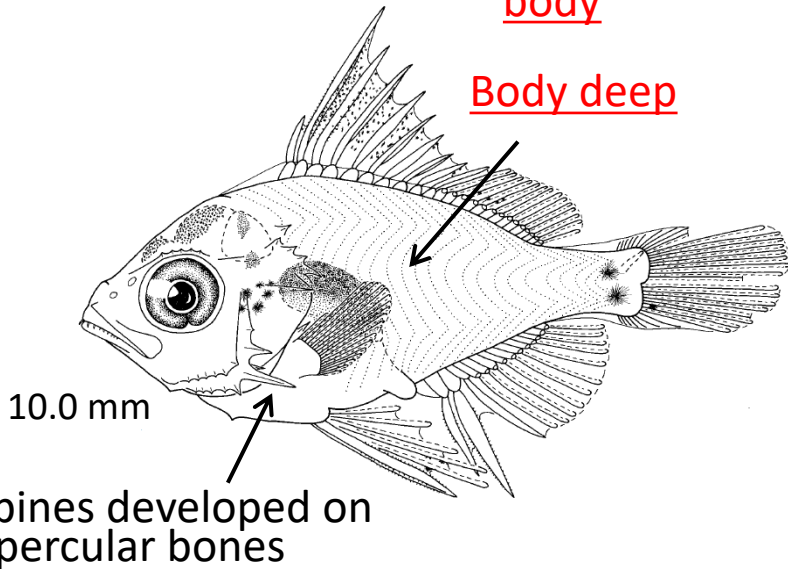
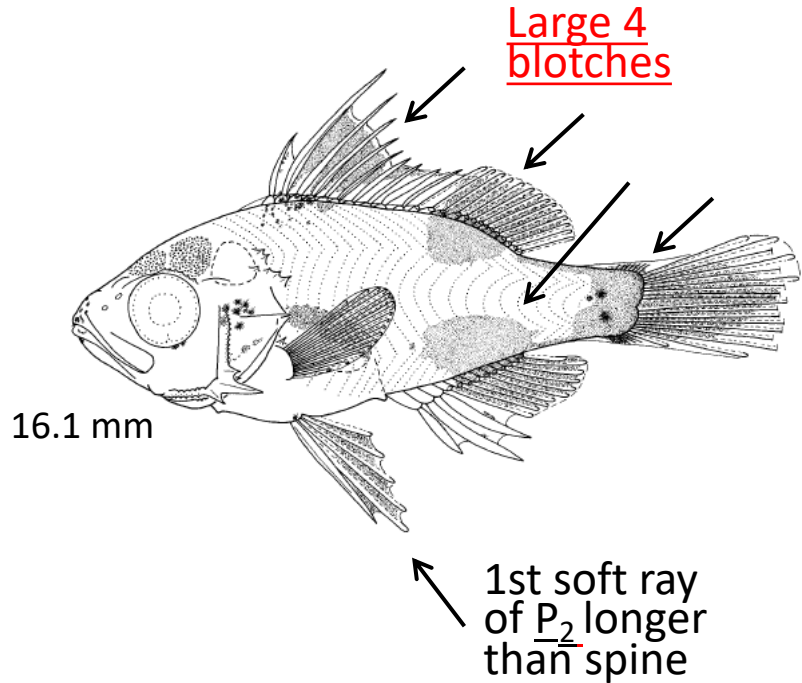
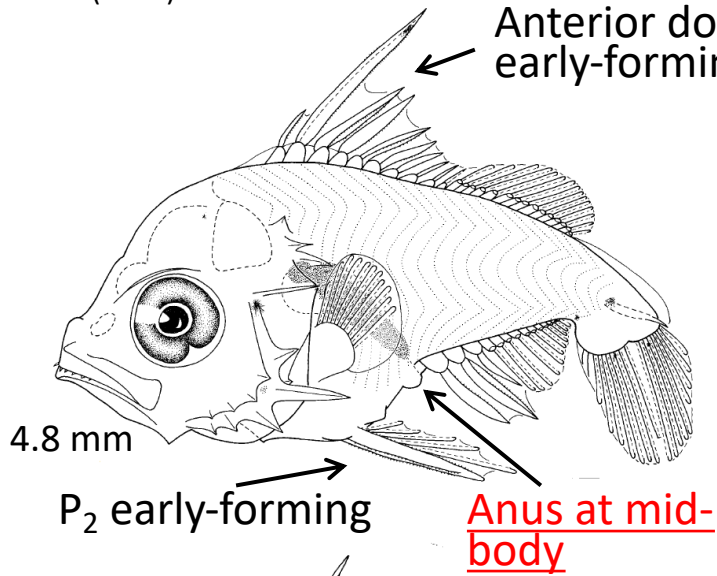
FishBase (2022)

Larvae of some lutjanid species (5/)

lutjanine *Macolor niger*



D: IX~X, 13~15
 A: III, 10~11
 P₁: 16~18
 P₂: I, 5
 V: 10+14



Lutjanidae

(*Lutjanus ophuysenii*)
7.7 mm SL
(Okiyama, 2014)

Similar larvae to Lutjanidae

Serranid Epinephelini

(*Epinephelus* sp.)
5.5 mm SL
(Baldwin et al., 2000)

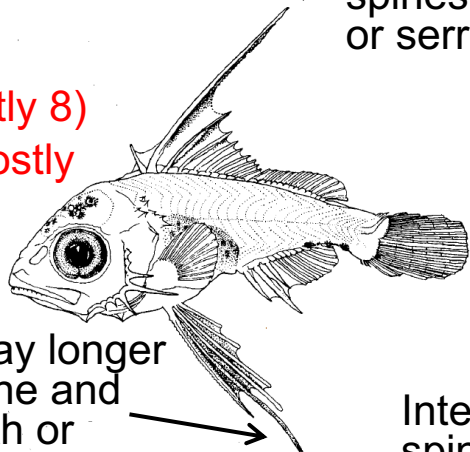
Serranid Anthiadae

(*Pronotogrammus multifasciatus*)
6.0 mm SL
(Watson, 1996)

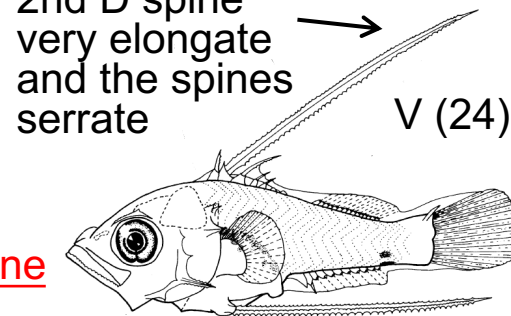
Serranid Nipponini

(*Nippon spinosus*)
7.7 mm SL
(Okiyama, 2014)

V (24)
A 7-10 (mostly 8)
P₁ 15-19 (mostly 16-17)



2nd D spine very elongate and the spines serrate



V (24)

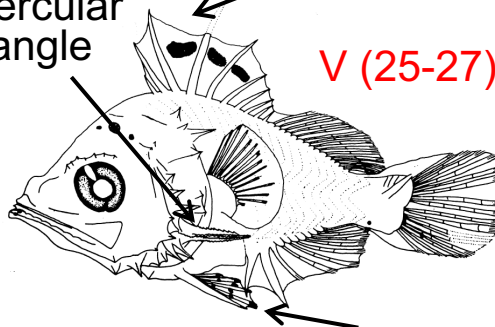
1st P₂ soft ray longer than the spine and spine smooth or serrate

2nd D spine elongate and spines smooth or serrate

3rd or 4th D spine longest and the spines smooth or serrate

P₂ spine serrate and very elongate

Interopercular spine as long as preopercular spine at angle



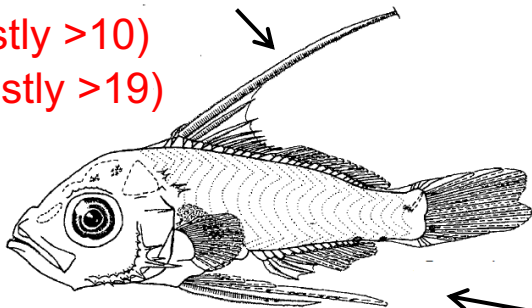
V (25-27)

Caesionidae

(*Caesio ophuysenii*)
7.6 mm SL
(Reader & Leis, 1996)

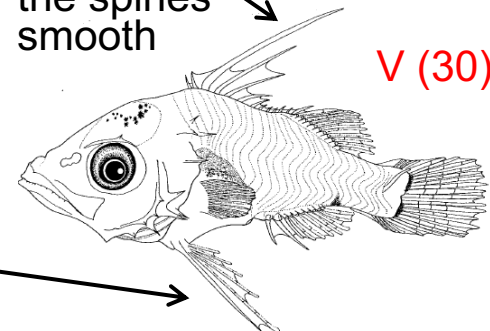
2nd D spine elongate and spines serrate

V (24)
A 10-13 (mostly >10)
P₁ 17-24 (mostly >19)



1st P₂ soft ray longer than the spine and the spines smooth or serrate

3rd D spine elongate and the spines smooth



V (30)

1st P₂ soft ray longer than the spine and the spine serrate

Spines dorsal to preopercular spine at angle: Caesionidae 1; Lutjanidae 1+.



Siganidae

(Rabbitfishes)

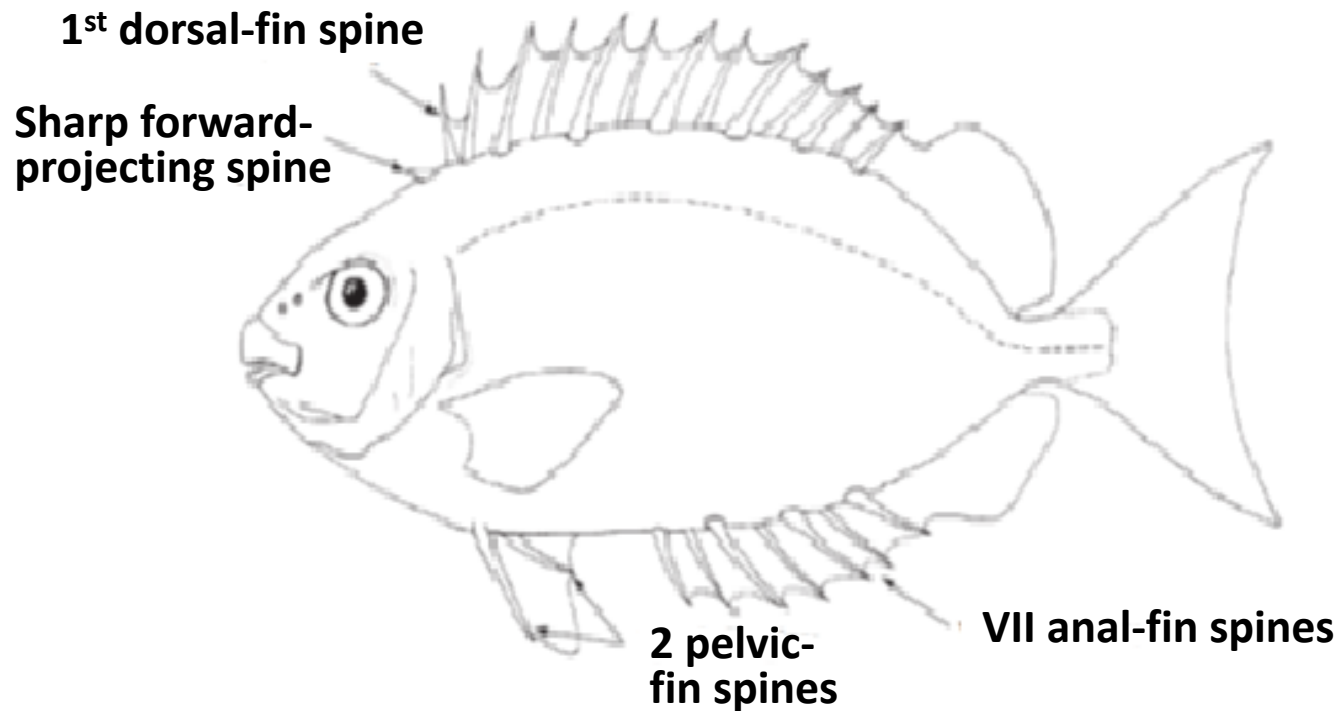


Adults

Reference:

Woodland, D.J. (2001). Siganidae. Pages 3627-3650. *In* Carpenter, K. E. and V. H. Niem eds. The living marine resources of the Western Central Pacific. FAO species identification guide for fishery purposes. FAO, Rome.

Diagnostic characters of the Siganidae fishes



- Body laterally compressed, oval, deep or slender.
- Mouth terminal, very small.
- D XIII, 10; A VII, 9; P2 II (1 strong inner and 1 outer spine), 3 (in between).
- Membrane extends from inner spines to belly and anus lines between these membranes.



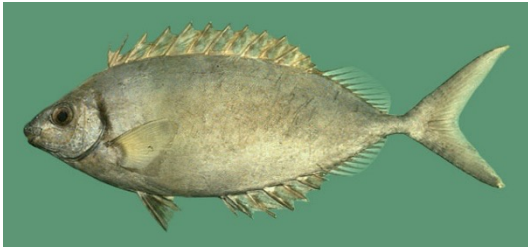
Habitat, and biology

- About bottom in shallow coastal waters to a depth of 50 m.
- Some species live in pairs among corals, others in schools around rock and coral reefs, mangroves, estuaries, and brackish lagoons.
- Some move with tides to feed in flooding areas of rock and coral reefs.
- Spawning in schooling species is by pairing from massed congregations at certain phases of the moon.
- Eggs adhesive.

Dominant species of siganid *Siganus* in the region



Photos: FishBase



Siganus argenteus



Siganus fuscescens



Siganus spinus



Siganus canaliculatus



Siganus guttatus



Siganus virgatus



Siganus corallinus



Siganus javus



Siganus vulpinus

Distributions of 18 siganid *Siganus* species in the Southeast Asian region



Species	Distribution			Species	Distribution		
	SCS	AND	eIND		SCS	AND	eIND
<i>Siganus argenteus</i>	○	○	○	<i>Siganus puellus</i>	△		○
<i>S. canaliculatus</i>	○	○	○	<i>S. punctatissimus</i>	△		
<i>S. corallinus</i>	○	○	○	<i>S. punctatus</i>	○		○
<i>S. doliatus</i>			○	<i>S. spinus</i>	○	○	○
<i>S. fuscescens</i>	○	○	○	<i>S. stellatus</i>		○	
<i>S. guttatus</i>	○	○	○	<i>S. unimaculatus</i>	△		
<i>S. javus</i>	○	○	○	<i>S. vermiculatus</i>	○	○	○
<i>S. labyrinthodes</i>			○	<i>S. virgatus</i>	○	○	○
<i>S. lineatus</i>	△			<i>S. vulpinus</i>	○		○

SCS: South China Sea (including Sulu Sea & Sulawesi Sea; AND: Andaman Sea; eIND: Eastern Indonesia.

△: only Sulu and/or Sulawesi Seas

All species have: **D XIII, 10; A VII, 9; P₂ I, 3, I; C 9+8; V 23.**



Larvae

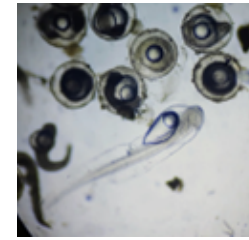
References

- Leis, J. M. and D. S. Rennis (2000). Siganidae (Rabbitfishes). Pages 671-675. *In*: Leis, J. M. and B. M. Carson-Ewart. (eds.) The larvae of Indo-Pacific coastal fishes. An identification guide to marine fish larvae. Brill, Leiden.
- Okiyama, M. ed. (2014). Siganidae. Pages 1342-1345. *In* An atlas of early a stage fishes in Japan. Second edition. Tokai University Press, Hatano.



FishBase

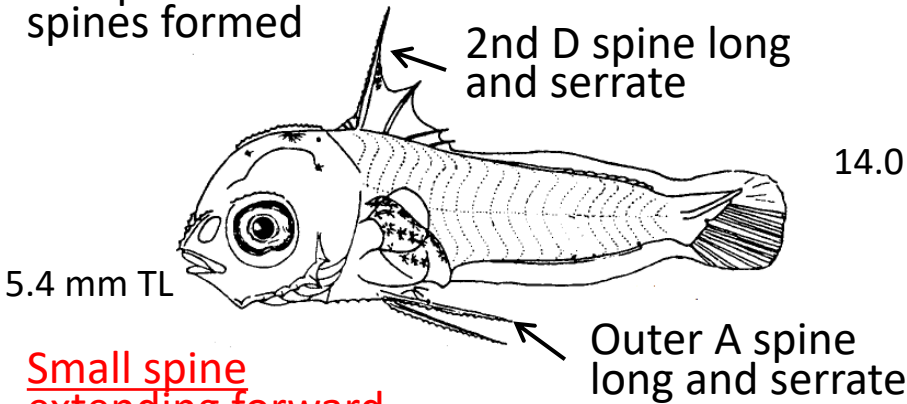
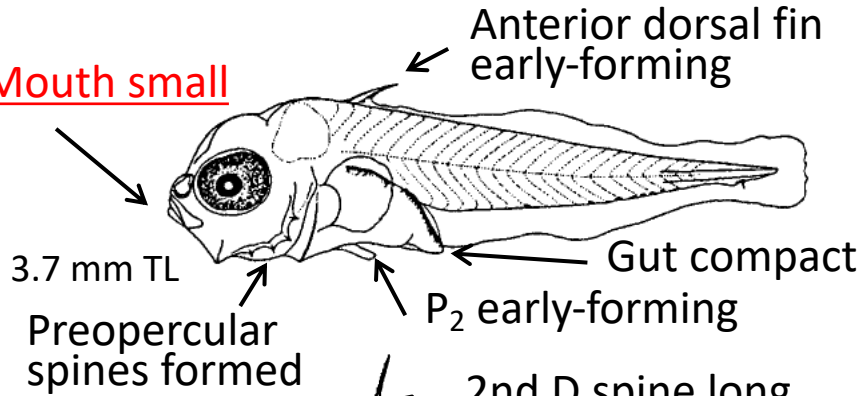
siganid *Siganus fuscescens*



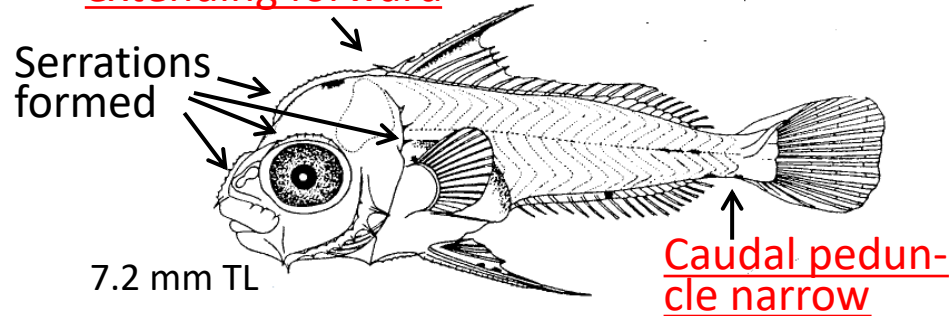
Eggs & larvae
(*S. spinus*)
FishBase

D:	XIII, 10
A:	VII, 9
P ₁ :	16~17
P ₂ :	I, 3, I
V:	9+14=23

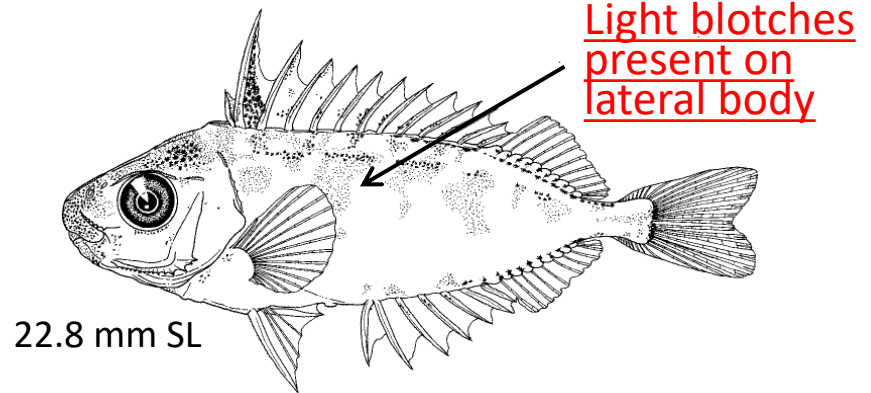
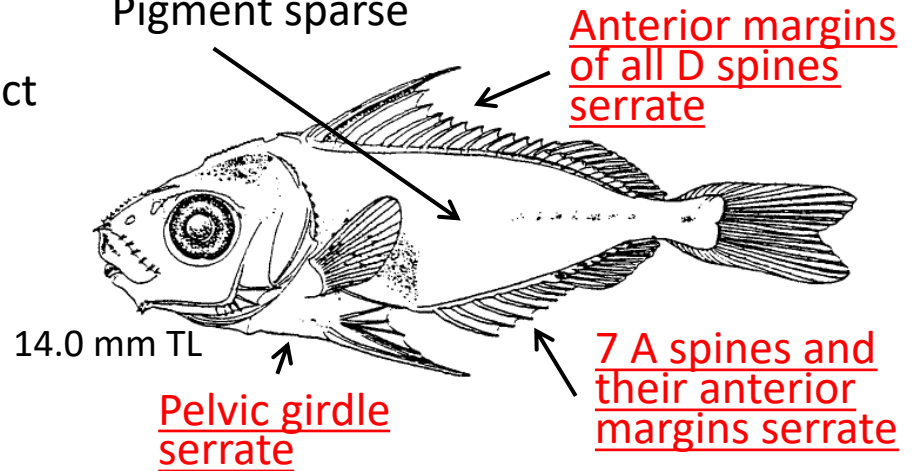
Mouth small



Small spine extending forward



Pigment sparse





serranid
Epinephelini
(Groupers)

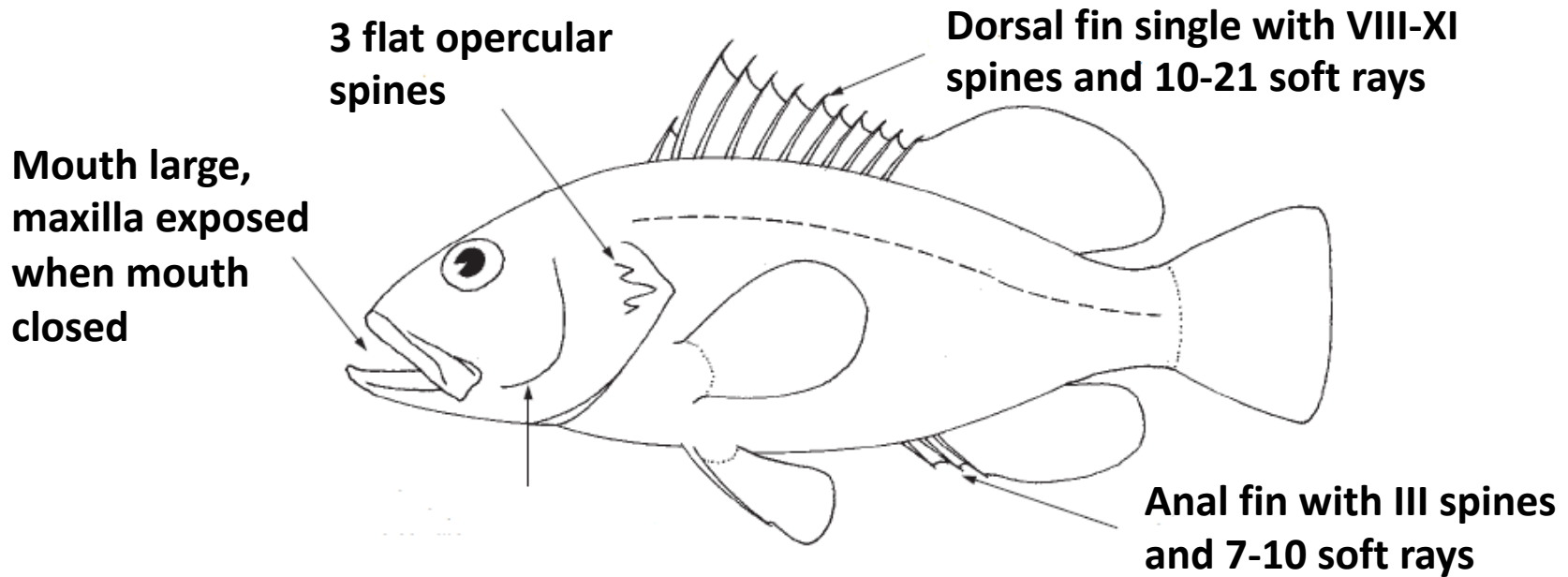


Adults

Reference:

Heemstra, P.C. and J.E. Randall. (1999). Serranidae. Pages 2442-2548. *In* Carpenter, K. E. and V. H. Niem eds. The living marine resources of the Western Central Pacific. FAO species identification guide for fishery purposes. FAO, Rome.

Diagnostic characters of the Epinephelini fishes

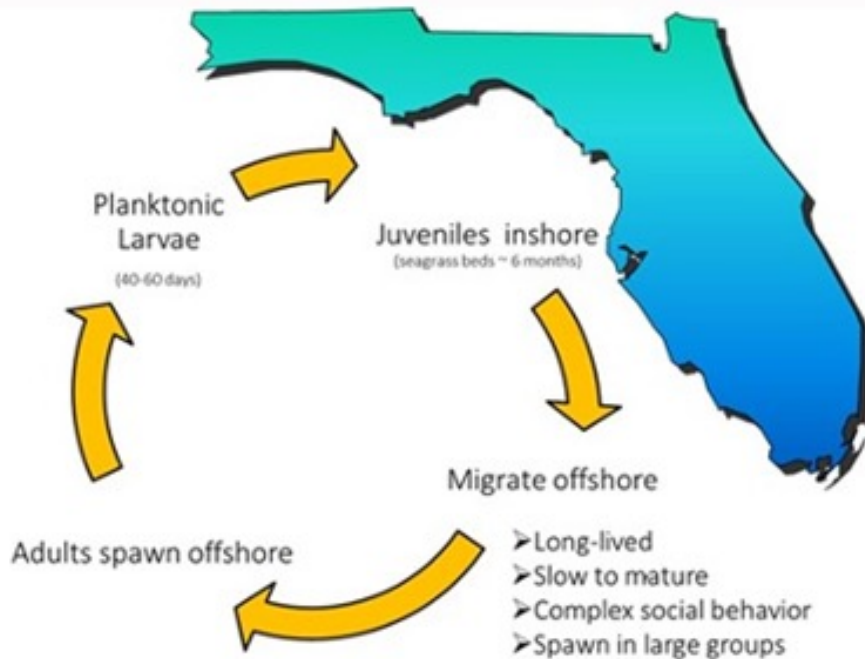




Habitat, and Biology

- Serranids are **benthic or bottom-oriented fishes**, usually found on **coral reefs or rocky substrata**.
- They **first mature as females** and, after spawning one or more times.
- They will then **change sex, spawning thereafter as males**.
- Some groupers form **large aggregations at specific sites at the time of spawning**.
- Except for occasional spawning aggregations, **most groupers are solitary fishes**.
- They are generally **resident on a particular reef for a long time (often years)**.
- This site specificity and the **relatively slow growth rate of groupers make them particularly vulnerable to over-fishing**.

Life Cycles



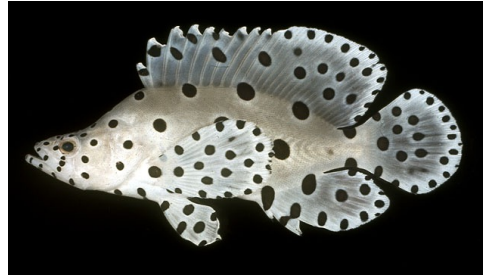
Spawning Aggregations



Representative species of epinephelin genera in the region



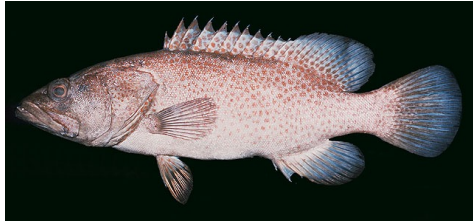
Aethaloperca rogae



Cromileptes altivelis



Plectropomus leopardus



Anyperodon leucogrammicus



Epinephelus malabaricus



Variola albimarginata



Cephalopholis argus



Gracila albomarginata

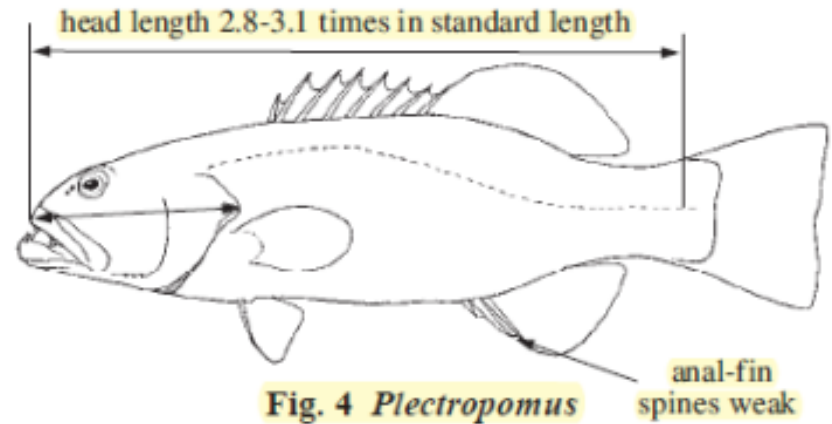
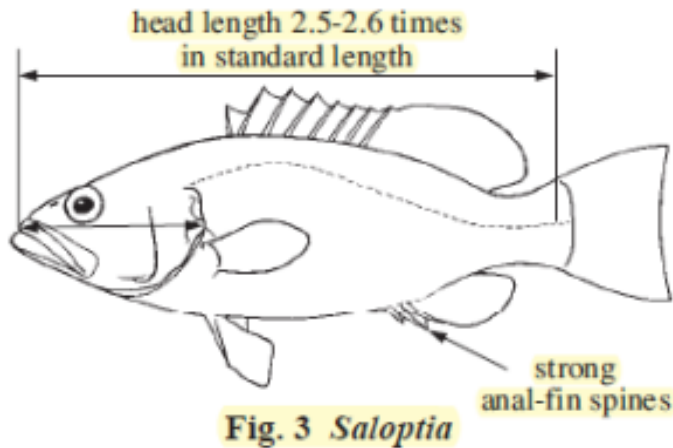
Nice genera of Tribe Epinephenini in the Southeast Asian region

Genus	D	A	P ₁	P ₂	C	V
<i>Aethaloperca</i> (1)	IX, 16-18	III, 8-9	17-18	I, 5	9+8	10+14=24
<i>Anyperodon</i> (1)	XI, 14-16	III, 8-9	15-17	I, 5	9+8	10+14=24
<i>Cephalopholis</i> (15)	IX, 13-17	III, 7-10	15-20	I, 5	9+8	10+14=24
<i>Cromileptes</i> (1)	X, 17-19	III, 9-10	17-18	I, 5	9+8	10+14=24
<i>Epinephelus</i> (53)	XI, 12-19	III, 7-10	15-20	I, 5	9+8	10+14=24
<i>Gracila</i> (1)	VIII-IX, 14-16	III, 9-10	18-19	I, 5	9+8	10+14=24
<i>Plectropomus</i> (6)	VIII, 10-12	III, 8	14-18	I, 5	9+8	10+14=24
<i>Triso</i> (1)	XI, 18-21	III, 9-10	18-20	I, 5	9+8	10+14=24
<i>Variola</i> (2)	IX, 13-15	III, 8	16-19	I, 5	9+8	10+14=24

- Numerals in parenthesis: number of species (**9 genera with 81 species** in the region).
- Meristic data: **Indo-Pacific lutjanid fishes** by Leis and Rennis (2000).

Key to the genera of Epinephelini occurring in the area (9 genera and 81 species) * 1/5

- 12a. Dorsal-fin spines VII or VIII; lower edge of preopercle with 1 to 3 enlarged spines (usually hidden by skin, but these spines can be detected by running a finger or probe along preopercle edge) → 13
- 12b. Dorsal-fin spines IX to XI; lower edge of preopercle smooth (except for a few species of *Epinephelus* with 1 to 4 enlarged serrae) → 14
- 13a. Anal-fin spines strong, all 3 distinct; preorbital depth 1/2 or less of eye diameter; head length 2.5 to 2.6 times in standard length (Fig. 3) *Saloptia powelli*
- 13b. Anal-fin spines weak, the first and second covered by skin; preorbital depth 0.7 to 2 times eye diameter; head length 2.8 to 3.1 times in standard length (Fig. 4) *Plectropomus*



* *Aethaloperca* (1 species); *Anyperodon* (1); *Cephalopholis* (15); *Cromileptes* (1); *Epinephelus* (53); *Gracila* (1); *Plectropomus* (6); *Triso* (1); *Variola* (2)

Key to the genera of Epinephelini occurring in the area

(9 genera and 81 species) 2/5

- 14a. Caudal fin deeply lunate or forked; dorsal-fin spines IX (Fig. 5). *Variola*
- 14b. Caudal fin rounded, truncate, or concave; dorsal-fin spines IX to XI → 15

- 15a. No teeth on palatines; body and head elongate and markedly compressed, the greatest body width 11 to 15% of standard length and more than 3 times in head length (Fig. 6) *Anyperodon leucogrammicus*
- 15b. Palatines with teeth; body compressed in some species, but its width only 1.8 to 3 times in head length → 16

dorsal fin with IX spines and 13-14 soft rays

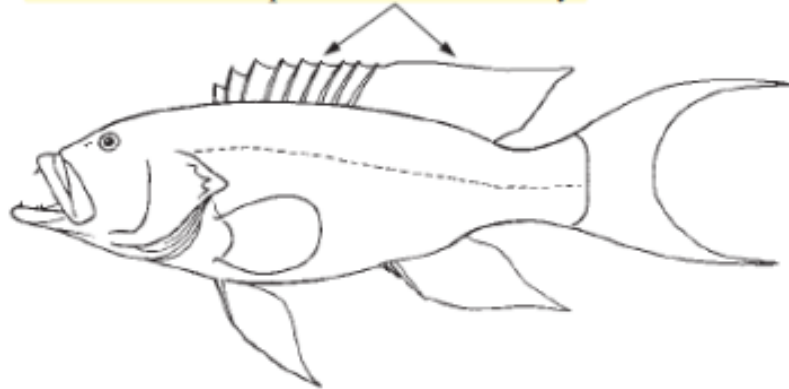


Fig. 5 *Variola*

no teeth on palatines

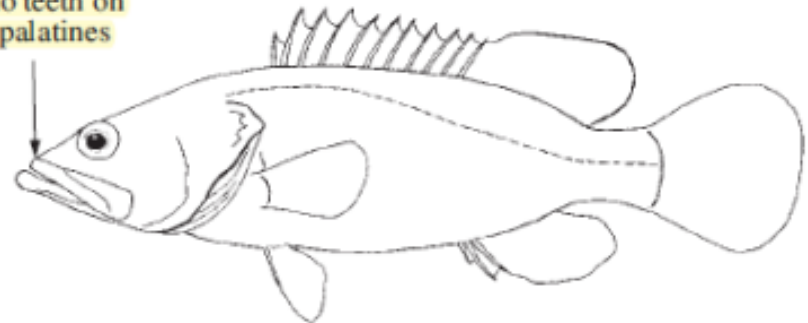


Fig. 6 *Anyperodon*

Key to the genera of Epinephelini occurring in the area (9 genera and 81 species) 3/5



16a. Dorsal profile of head markedly concave; dorsal-fin spines X; rear nostrils of adults a long vertical slit (Fig. 7) *Cromileptes altivelis*

16b. Dorsal profile of head straight, convex or slightly concave; dorsal-fin spines IX or XI (rarely X); rear nostrils round or oblong → 17

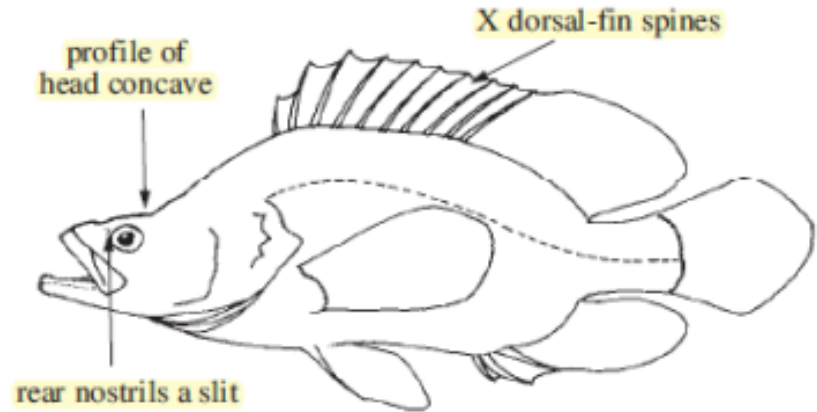


Fig. 7 *Cromileptes*

17a. Pectoral fins distinctly asymmetric, the fifth or sixth rays longest (Fig. 8a); dorsal fin with IX spines and 17 or 18 soft rays; caudal fin truncate (Fig. 9) *Aethaloperca rogaa*

17b. Pectoral fins symmetric or nearly so, the middle rays longest (Fig. 8b); dorsal fin with IX to XI spines and 12 to 21 soft rays; caudal fin rounded, truncate, or emarginate → 18

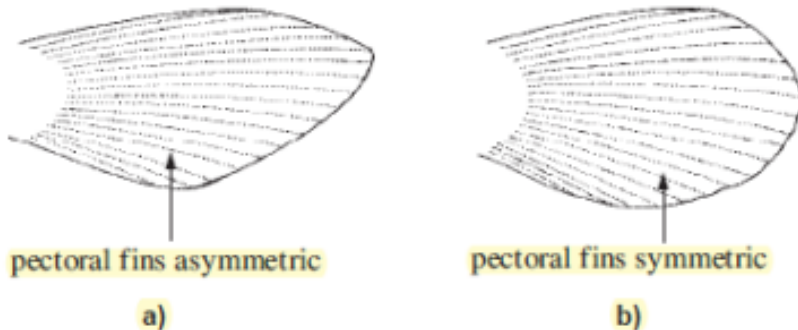


Fig. 8

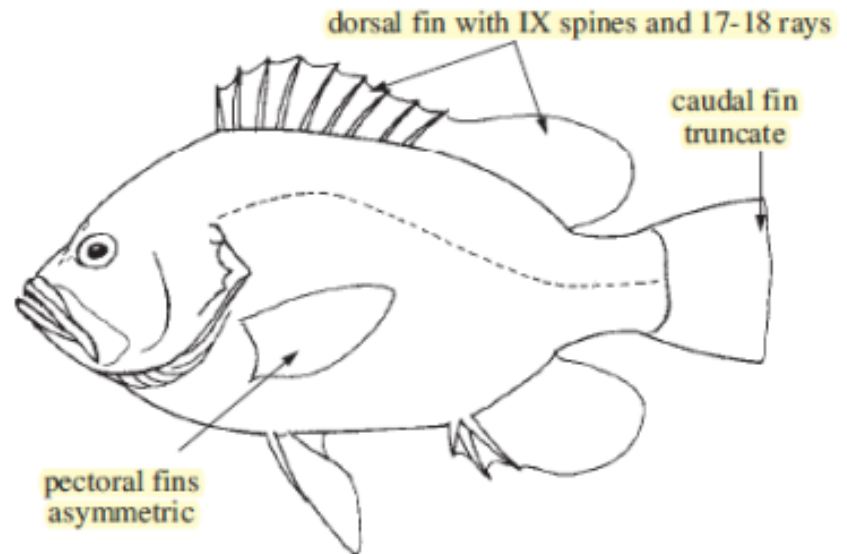


Fig. 9 *Aethaloperca*

18a. Dorsal-fin spines IX → 19

18b. Dorsal-fin spines XI → 20

Key to the genera of Epinephelini occurring in the area (9 genera and 81 species) 4/5

19a. Caudal fin truncate; head small, 2.9 to 3.2 times in standard length; distal part of maxilla with step or hook-like process on lower edge (hidden by lip); dorsal-fin membranes not incised between spines (Fig. 10) *Gracila albomarginata*

19b. Caudal fin rounded (truncate in *Cephalopholis polleni*); head length 2.2 to 3.1 times in standard length; adults with a knob at lower rear corner of maxilla (hidden by upper lip); dorsal-fin membranes distinctly incised between spines (Fig. 11) *Cephalopholis*

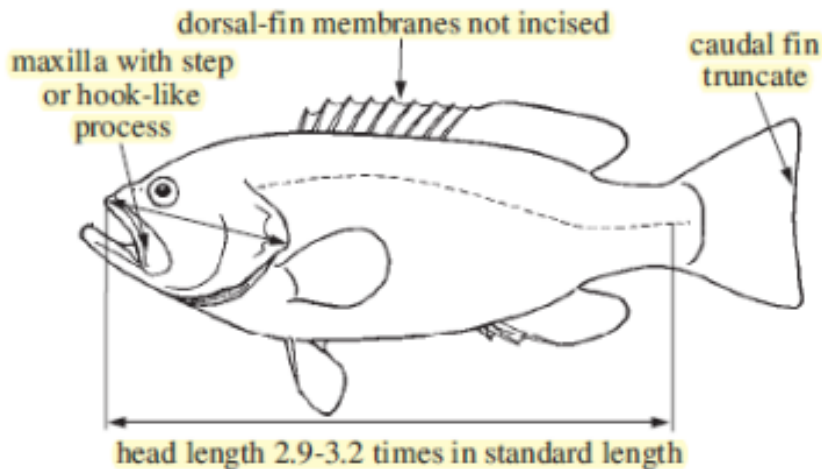


Fig. 10 *Gracila*

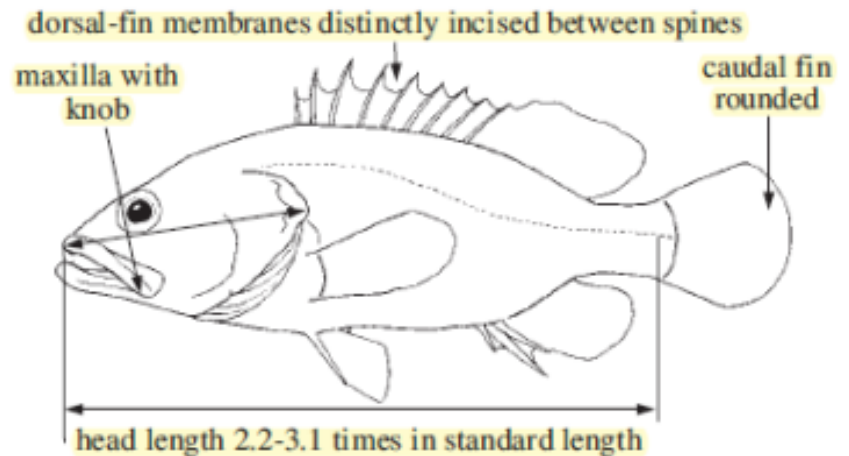


Fig. 11 *Cephalopholis*

Key to the genera of Epinephelini occurring in the area (9 genera and 81 species) 5/5

- 20a.** Body depth distinctly greater than head length and 2.4 to 2.7 times in standard length; dorsal fin with XI spines and 18 to 21 soft rays, the base of soft-rayed part longer than that of spinous part (Fig. 12) *Triso dermatopus*
- 20b.** Body depth 2.4 to 4.1 times in standard length, usually less than head length; dorsal fin with XI spines and 12 to 19 soft rays, the base of soft-rayed part shorter than or equal to that of spinous part (Fig. 13) *Epinephelus*

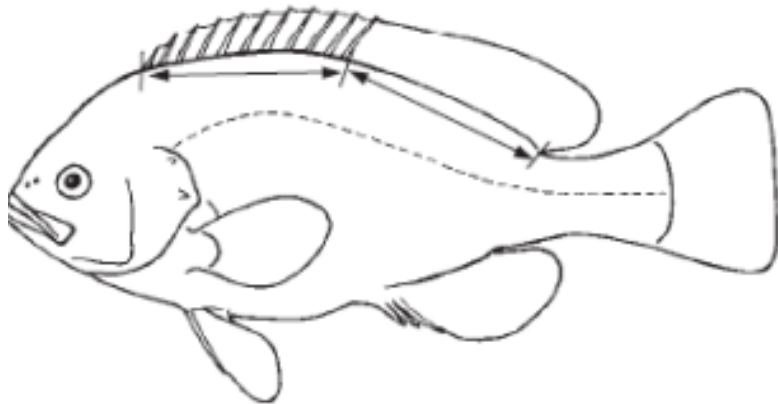


Fig. 12 *Triso*

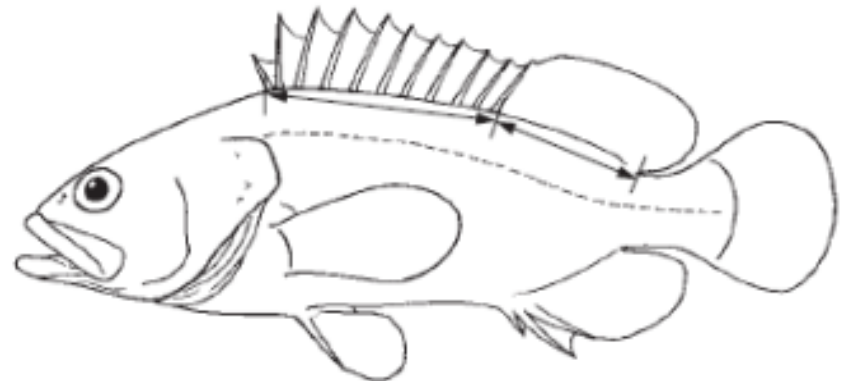


Fig. 13 *Epinephelus*



Larvae

References

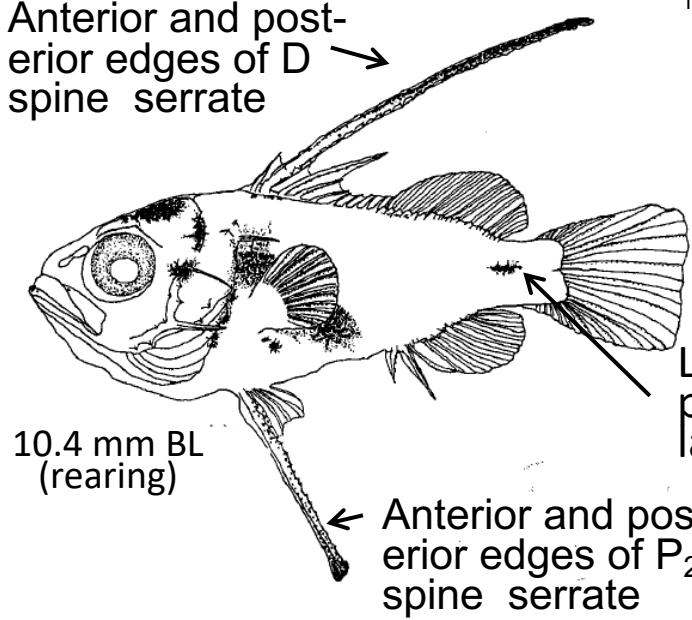
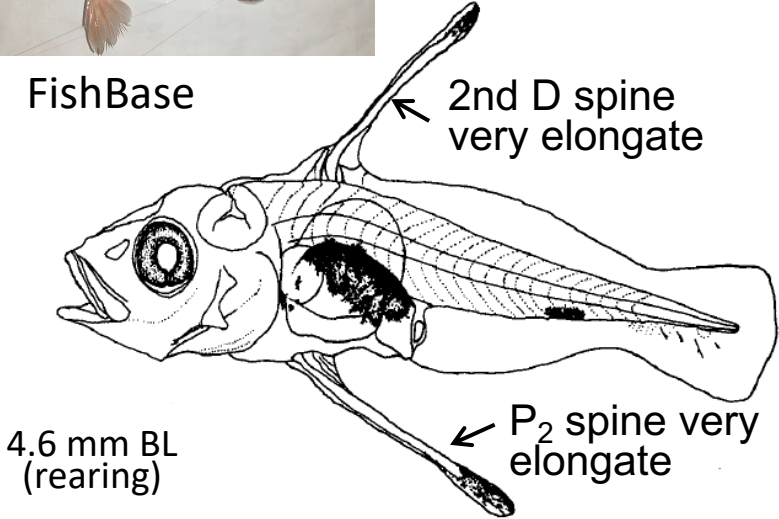
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- Leis, J. M. and B. M. Carson-Ewart (2000). Serranidae. Pages 363-389. *In*: Leis, J. M. and B. M. Carson-Ewart. (eds.) *The larvae of Indo-Pacific coastal fishes. An identification guide to marine fish larvae.* Brill, Leiden.
- Okiyama, M. ed. (2014). Serranidae. Pages 674-708. *In* *An atlas of early a stage fishes in Japan. Second edition.* Tokai University Press, Hatano.

epinephelin *Epinephelus bruneus*

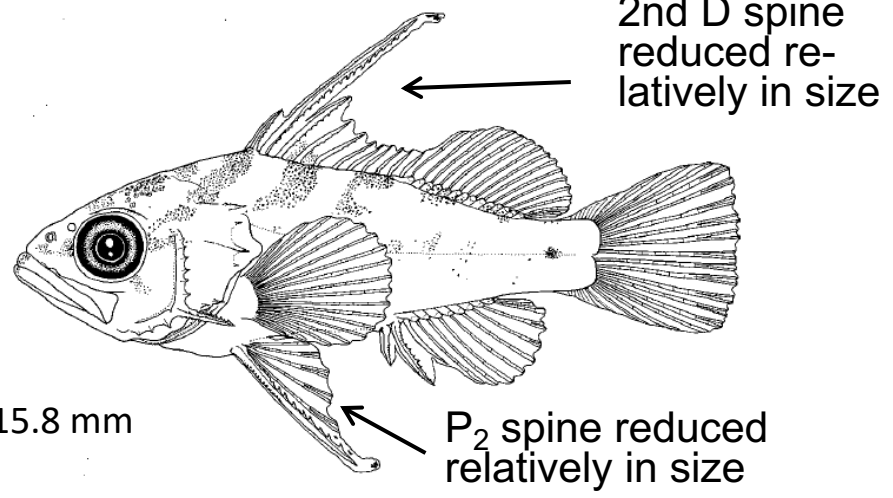
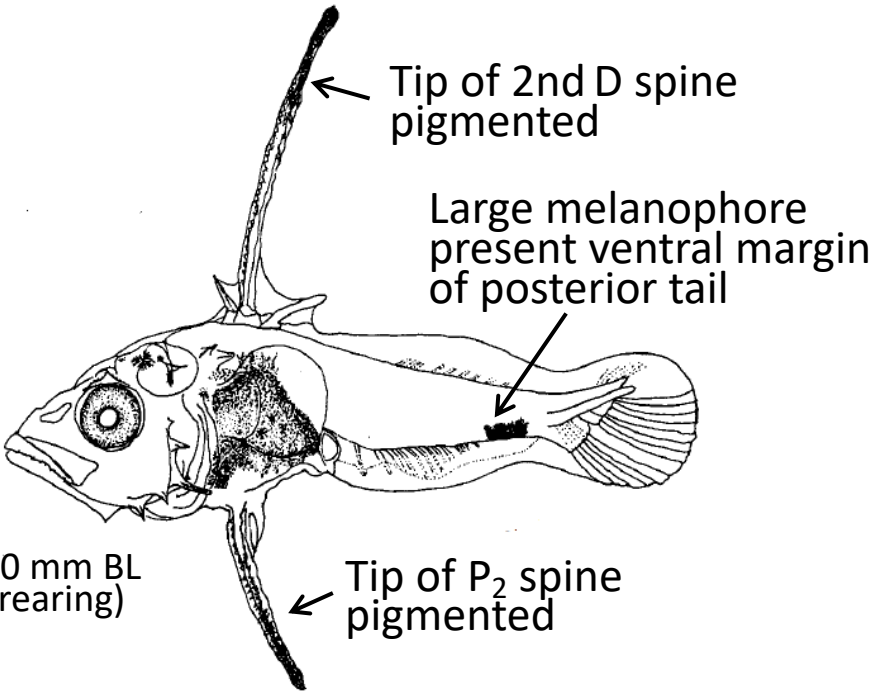
D: XI, 13 ~ 15
 A: III, 8 ~ 9
 P₁: 17 ~ 19
 P₂: I, 5
 V: 10+14=24



FishBase



Large melanophore moves on lateral midline

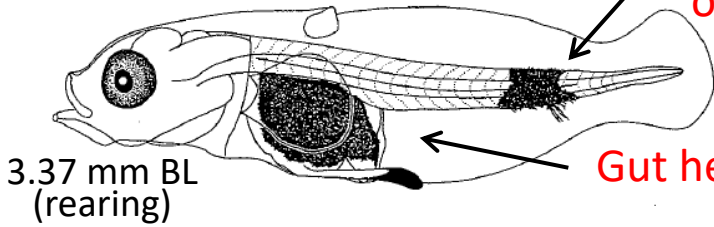




epinephelin *Epinephelus fasciatus*

FishBase

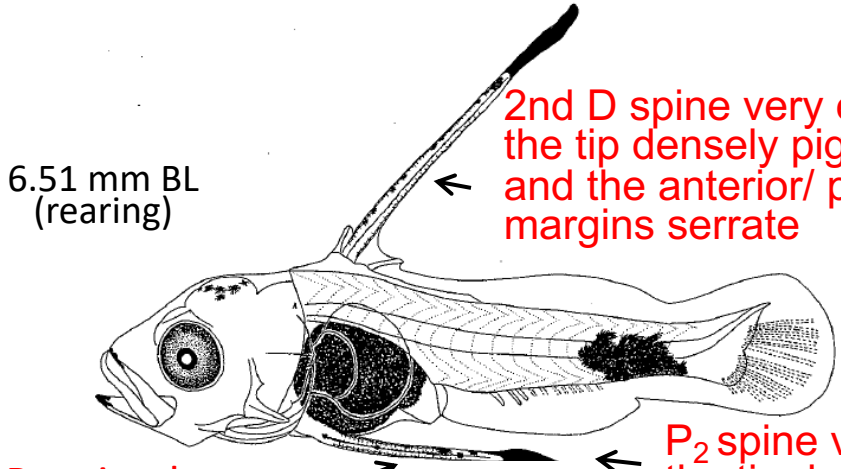
D:	XI, 15 ~ 17
A:	III, 7 ~ 8
P ₁ :	18 ~ 20
P ₂ :	I, 5
V:	10+14=24



Large melanophore present ventral margin of posterior tail

Gut heavily pigmented

3.37 mm BL (rearing)

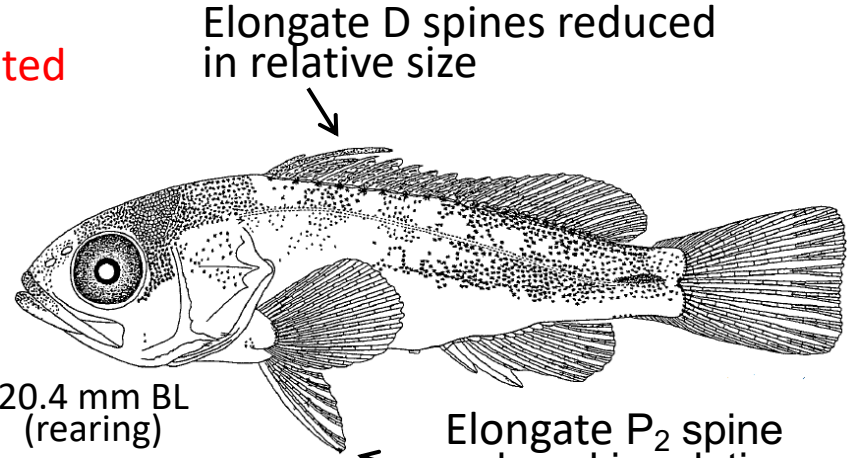


2nd D spine very elongate, the tip densely pigmented, and the anterior/posterior margins serrate

6.51 mm BL (rearing)

P₂ spine longer than 1st soft ray

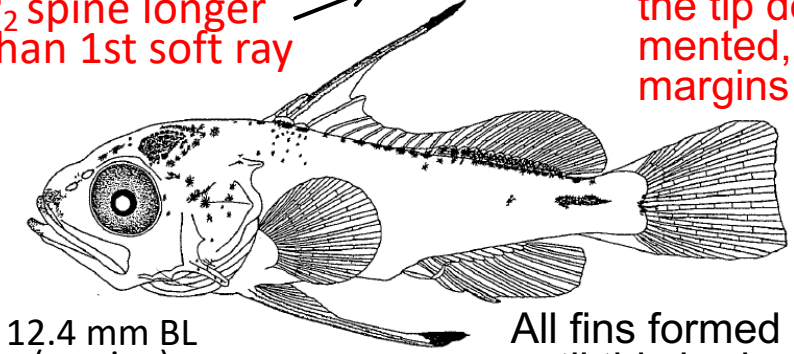
P₂ spine very elongate, the tip densely pigmented, and ant./post. margins serrate



Elongate D spines reduced in relative size

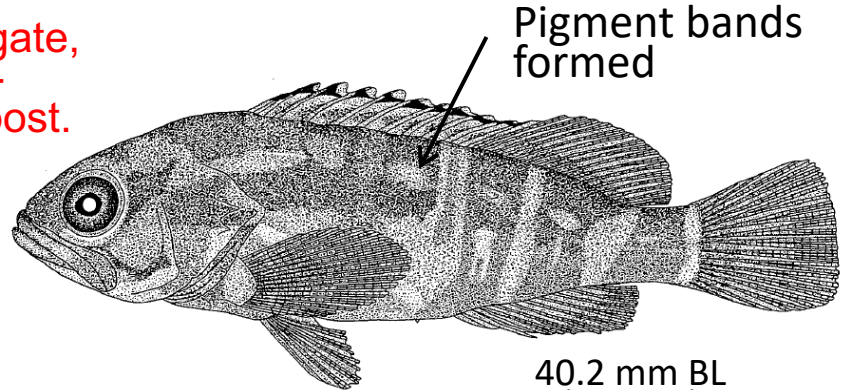
20.4 mm BL (rearing)

Elongate P₂ spine reduced in relative size



12.4 mm BL (rearing)

All fins formed completely until this body size



Pigment bands formed

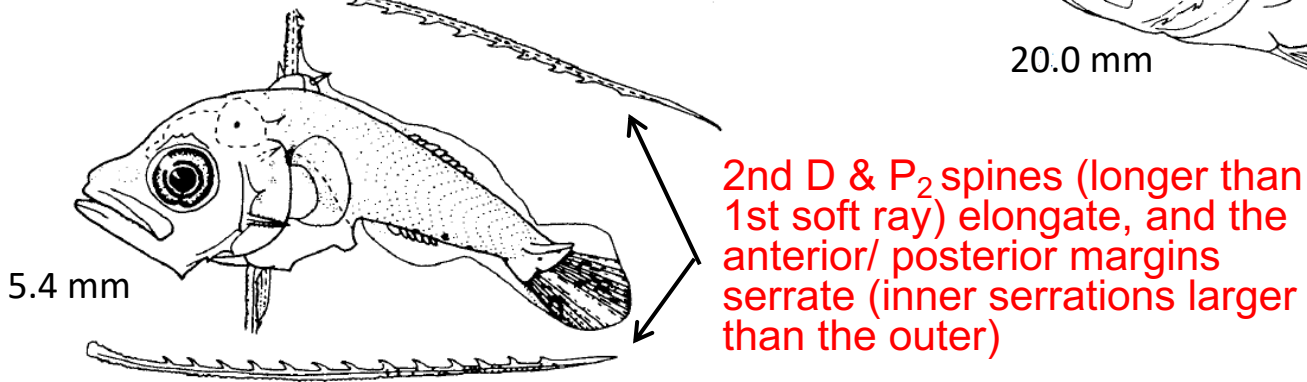
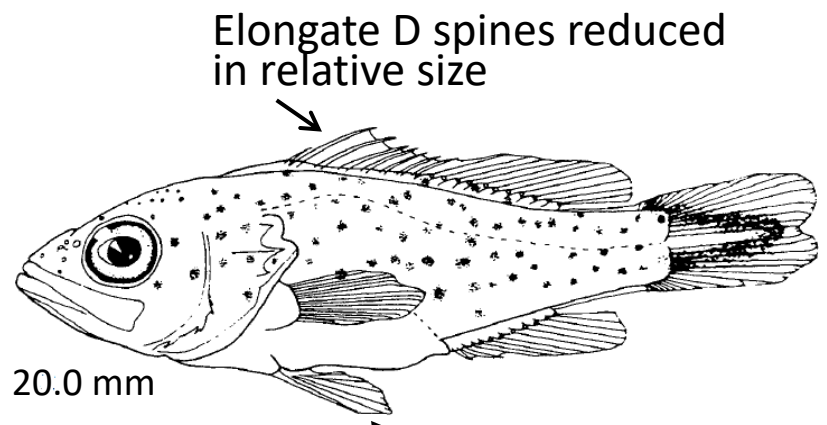
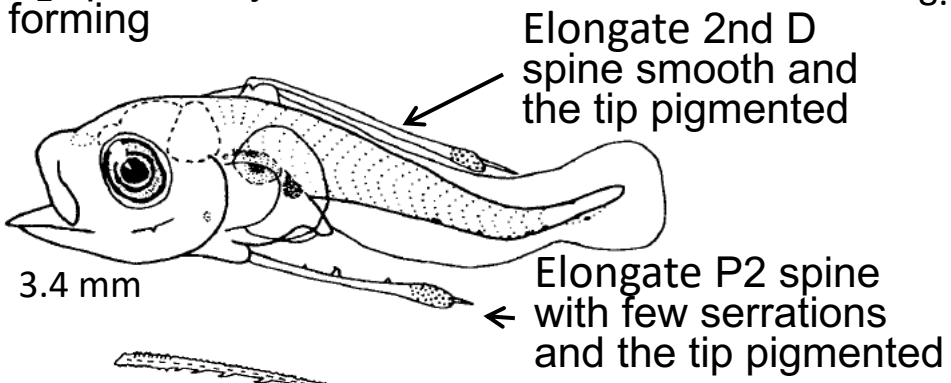
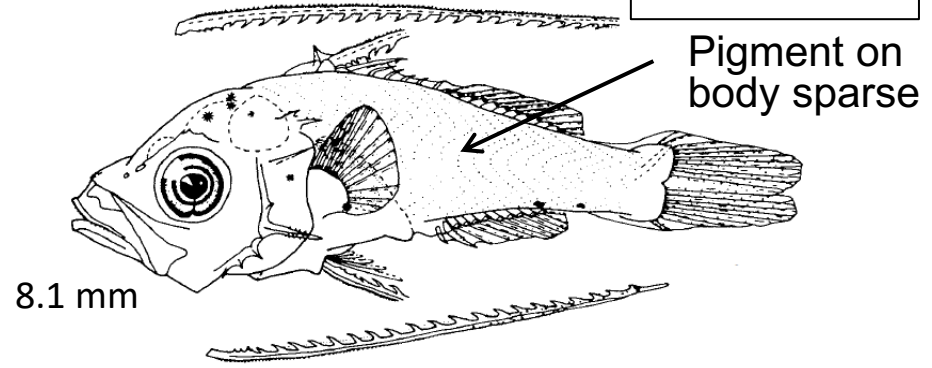
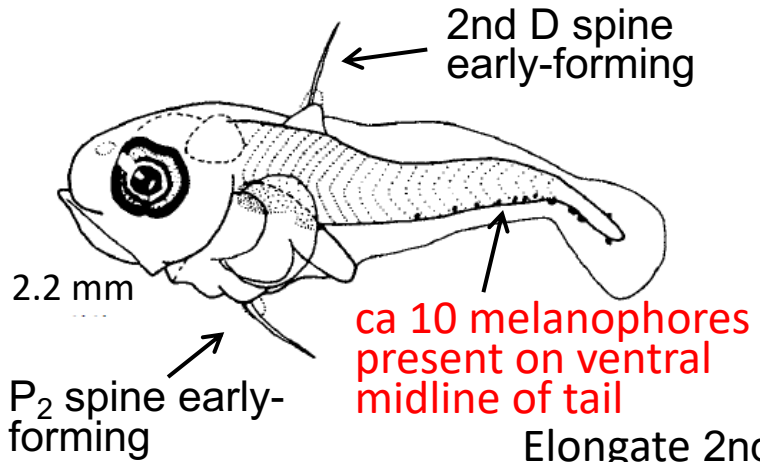
40.2 mm BL (rearing)



epinephelin *Prectopomus leopardus*



D: VIII, 11
 A: III, 8
 P₁: 14~17
 P₂: I, 5
 V: 10+14=24





NOTES:

As long as a large number of the lutjanid, siganid and epinepheline larvae are unknown, even if the examining larvae are morphologically similar to known species larvae, it is risky to identify them as the species.



Terima Kasih

ຂອບໃຈ

Salamat

ขอขอบคุณ

Cảm ơn