



**Northwest and  
Alaska Fisheries  
Center**

National Marine  
Fisheries Service

U.S. DEPARTMENT OF COMMERCE

**NWAFRC PROCESSED REPORT 89-09**

**An Atlas  
of the Early Stage Fishes  
in Japan**

**Subfamily Sebastinae, Genus *Sebastes*  
(including *Sebasticus marmoratus*)**

Partial translation from Japanese  
Edited by Muneo Okiyama

May 1989

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PARTIAL TRANSLATION FROM JAPANESE

**An Atlas of the Early Stage Fishes in Japan**  
(Published English title)

**Subfamily Sebastinae, Genus Sebastes**  
**(including Sebastiscus marmoratus)**  
(Sections translated)

Editor: Muneo OKIYAMA

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## SUBFAMILY SEBASTINAE

### Morphology and Distinguishing Characteristics

Tables 12 and 13 show characters and properties that are effective in distinguishing the immature stages of species indigenous to Japan of the genera Sebastes (16 species), Sebastiscus (1 species), and Helicolenus (1 species). These species are those for which some amount of information has been obtained on morphology during the immature stages. Because immature-stage morphology is still virtually unknown for somewhat common shallow-sea species such as Sebastes joyneri (adult fish distributed from Iwate and Niigata Prefectures southward), S. nivosus (Chiba and Niigata Prefectures northward), and S. trivittatus (Chiba Prefecture northward), caution is needed in making identifications.

The ledge formed by the infraorbital bones in the above three genera and the genus Hozukius, which comprise the subfamily Sebastinae, is characteristically T-shaped, and the second infraorbital bone narrows in the posteroventral direction. Of these genera, in Sebastes and Sebastiscus the posterior end of the second infraorbital bone is pointed and detaches from the preoperculum; in Helicolenus and Hozukius, the posterior end of this bone is truncate and adheres to the preoperculum. In the other subfamilies, the ledge of the infraorbital bones is not T-shaped, but is uniformly wide or else either widens posteriorly or toward the center; moreover, the posterior end of the second infraorbital bone adheres to the preoperculum. For a summary of the manner of appearance of the cranial spines, see the commentary on the family Scorpaenidae. In nearly all species of the subfamily Sebastinae, a single small upper infraorbital spine (the most anterior of these spines in Figure 15) appears temporarily toward the late postlarval stage. The lower infraorbital spines also appear during this same growth stage, but do not develop as prominently as those in the subfamily Scorpaeninae (refer to the commentary on the family Scorpaenidae). Ordinarily, of the three anterior preopercular spines shown in Figure 15, only the second and third spines appear. In the subfamily Scorpaeninae and genus Sebastolobus, differentiation of the pectoral fin rays precedes that of the primary rays of the caudal fin; however, in the

subfamily Sebastinae, differentiation of the primary rays of the caudal fin occurs first.

Juveniles of Sebastes taczanowskii, S. inermis, S. thompsoni, S. oblongus, and S. hubbsi have the characteristic of accompanying drifting seaweeds.

(Jun'ichi KOJIMA) (References: 618, 620, 818, 819, 1074)

Table 12. Numerical characters effective for identifying immature stages of species indigenous to Japan belonging to the subfamily Sebastinae; also, size of larvae at parturition.

Genus/species	D	A			Length at parturition	
		(soft rays)	P <sub>1</sub>	V	Standard	Total
<u>Sebastes</u>						
<u>S. owstoni</u>	XIV, 12-15	7-11	15-17	30-31	about 3.5	-
<u>S. wakiyai</u>	XIII, 13-14	6-7	17-18	27	-	2.9-3.2
<u>S. steindachneri</u>	XIII, 13-15	6-7	17-19	28-29	-	3.5-4.8
<u>S. taczanowskii</u>	XIII, 13-15	6-8	16-17	26-27	-	4.5-5.4
<u>S. inermis</u>	XIII, 13-14	7-8	16-17	26	-	4.8-6.0
<u>S. thompsoni</u>	XIII-XIV, 13-15	7-8	15-17	26	-	5-6
<u>S. matsubarae</u>	XIII, 11-13	6-7	18-20	26-27	-	4.1-4.5
<u>S. baramenuke</u>	XIII, 14	8-9	18-19	26-27	4.0-4.7	-
<u>S. flammeus</u>	XII-XIII, 13-15	8-9	18-20	26	4.1-4.2	-
<u>S. iracundus</u>	XIII, 12-14	8-9	18-20	26-27	-	4.2-4.9
<u>S. oblongus</u>	XIII, 10-13	5-7	14-20	26	-	7.3-7.5
<u>S. schlegeli</u>	XIII, 11-13	6-8	17-18	26	-	6.5-7.2
<u>S. vulpes</u>	XIII, 12-13	5-6	16-18	26	-	4.7-5.3
<u>S. pachycephalus</u>	XIII, 11-13	5-7	16-20	26	-	6-7
<u>S. hubbsi</u>	XIV, 12	6-7	16-17	26	-	5.1-5.3
<u>S. longispinis</u>	XIII, 13	6	16	26	-	5.8-6.1
<u>Sebastiscus</u>						
<u>S. marmoratus</u>	XII, 10-12	5	17-19	25	-	3.7-4.3
<u>Helicolenus</u>						
<u>H. hilgendorfi</u>	XII, 11-13	4-6	16-20	25	about 2.5	-

Translators' note:

Some abbreviations from page vii of the source publication are as follows:

D: Dorsal fin. A: Anal fin. P<sub>1</sub>: Pectoral fin. P<sub>2</sub>: Pelvic fin. V: Number of vertebrae.

Table 13. Distributional properties of black chromatophores and changes in distribution accompanying growth for larval stages of species indigenous to Japan that belong to the subfamily Sebastinae.

Genus/species	Pa- ri- etal area	Nape (em- bed- ded)	Tip of lower jaw	Pec- toral fin	Just be- fore anus	Postanal trunk					Base before caudal fin
						Dor- sal mar- gin	Lateral body median line	Ventral margin		Side	
								Inter- nal	sur- fac		
<u>Sebastes</u>											
<i>S. owstoni</i>	+	+	-	-	-	->+	->+	->+	+	->+	+
<i>S. wakiyai</i> *	-	-	-	-	-	-	-	-	+	-	+
<i>S. steindachneri</i> *	+	-?	-	-	-	++	-	+	-	+	-
<i>S. taczanowskii</i> *	+	-?	-	-	-	+	-	-	-	+	+
<i>S. inermis</i>	+	+	-	±*2	+	+>+>+	->±	-	-	+	-
<i>S. thompsoni</i> *	+	+	->+	-	+	+>+>+	+>+>+	->+	-	+	->+
<i>S. matsubarae</i>	+	+	->+	++	+	->+	-	-	+	->+	-
<i>S. iracundus</i> *	-	-	-	-	-	-	-	-	+	-	-
<i>S. oblongus</i>	+	+	->+	->+	+	+	+	++	-	+	-
<i>S. schlegeli</i>	+	+	->+	-	-	+>+>+	->+	->+	-	+	-
<i>S. vulpes</i>	+	+	->+	++	+	->+	->+	->+	+	->+	+
<i>S. pachycephalus</i>	+	+	->+	++	+	->+	->+	->+	-	->+	+
<i>S. hubbsi</i>	+	+	->+	-	+	+	+	++	-	+	-
<i>S. longispinis</i>	+	+	->+	-	+	+	+	++	-	+	-
<u>Sebastiscus</u>											
<i>S. marmoratus</i>	->+	->+	+	±*2	+	->+	->+	->+	+	->+	+
<u>Helicolenus</u>											
<i>H. hilgendorfi</i>	->+	->+	+	+	-	-	-	-	+	->+	-

\* Larvae within the maternal body immediately before parturition.

\*2 Chromatophores may occur very sparsely, depending upon the individual.

#### Translators' note:

The symbols within this table are not explained, but probably mean the following:

- Chromatophores are lacking.
- + Chromatophores are present.
- ± Chromatophores may be present.
- ++ Chromatophores are densely distributed.
- > Change in chromatophore density accompanying growth (indicated by an arrow in the source publication).

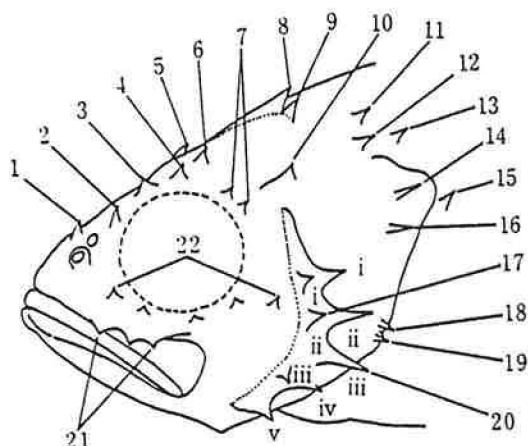


Figure 15. Terminology for the cranial spines occurring in young stages of species belonging to the family Scorpaenidae.

1. Nasal spine. 2. Preocular spine. 3. Supraocular spine. 4. Postocular spine. 5. Coronal spine. 6. Tympanic spine. 7. Postorbital spines. 8. Parietal spine. 9. Nuchal spine. 10. Pterotic spine. 11. Upper posttemporal spine. 12. Lower posttemporal spine. 13. Supracleithral spine. 14. Upper opercular spine. 15. Cleithral spine. 16. Lower opercular spine. 17. Anterior preopercular spines (a set consisting of a first, second, and third spine [\*see note below]). 18. Subopercular spine. 19. Interopercular spine. 20. Posterior preopercular spines (a set consisting of first through fifth spines). 21. Lower infraorbital spines (set). 22. Upper infraorbital spines (set).

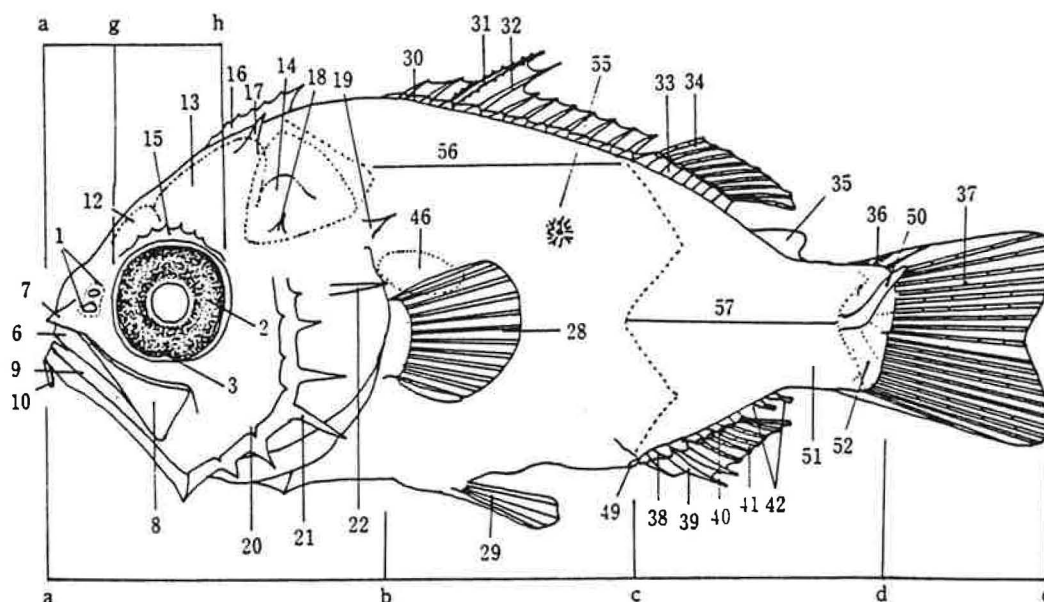
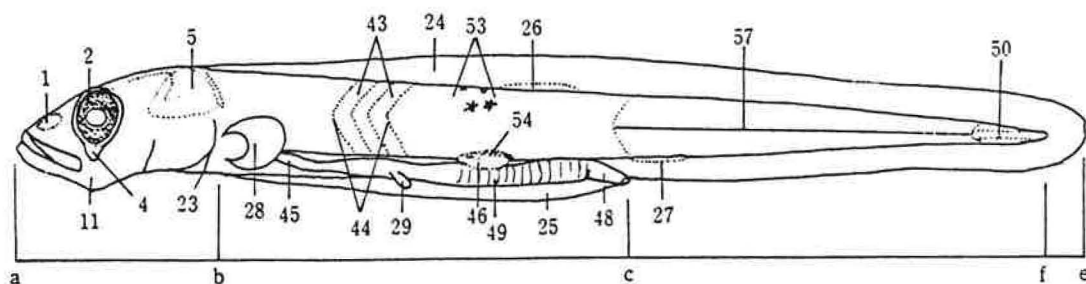
Translators' notes:

\*Other possible numberings of the anterior preopercular spines seen in other references are 2nd, 3rd, and 4th; 1st, 2nd, and 4th; etc.

Figure 15 appears on page 779 in the prior section, titled "Family Scorpaenidae," also authored by Jun'ichi KOJIMA.

The following sentence is from page 778 also in the prior section ("Family Scorpaenidae" by Jun'ichi KOJIMA):

Interopercular and subopercular spines occur in immature stages of the genus Sebastes indigenous to the eastern Pacific; however, these spines are hardly discernible in Sebastes from the waters off Japan.



Translators' note:

The figure above and translated labels below are from page viii of the source publication.

... 5. Otocyst. ... 12. Forebrain. 13. Midbrain. 14. Hindbrain. ...  
 23. Pectoral girdle suture. 24. Membranous dorsal fin. 25. Membranous preanal fin. 26. Dorsal fin rudiment. 27. Anal fin rudiment. 28. Pectoral fin. 29. Pelvic fin. 30. Base of spinous portion dorsal fin. 31-32. Dorsal fin spines. 33. Base of soft-rayed portion of dorsal fin. 34. Dorsal fin soft ray. ... 37. Caudal fin. 38. Base of spinous portion of anal fin. 39. Anal fin spine. 40. Base of soft-rayed portion of anal fin. 41. Anal fin soft ray. ... 43. Muscle segments. ... 45. Esophagus. 46. Gas bladder. ... 48. Rectum. 49. Anus. 50. Tip of notochord. 51. Caudal peduncle. 52. Hypural bone. 53. External (body surface) black chromatophores. 54. Internal black chromatophores. 55. Extended black chromatophore. 56. Trunk (preanal) muscle segments. 57. Tail [postanal] muscle segments.



Translators' notes:

The translated definitions below are from page viii of the source publication. These are illustrated in the figure showing larval and juvenile anatomy on the previous page.

Total length -- horizontal distance from tip of snout to tip of tail [distance a-e shown in figure above].

Standard length -- horizontal distance from tip of snout to posterior edge of hypural bone [distance a-d in figure above].

Preanal length -- horizontal distance from tip of snout to posterior edge of anus [distance a-c in figure above].

Head length -- horizontal distance from tip of snout to posterior edge of operculum [distance a-b in figure above]. When the operculum is undeveloped, measurement is to the posterior edge of the otocyst or to the pectoral girdle (cleithrum).

Body depth -- vertical distance excluding fins that is measured across body at pectoral fin base.

Eye diameter -- horizontal distance through the center of the colored portion of the eyeball [distance g-h in figure above].

Fin ray length -- for each fin, the length of the longest fin ray; the straight-line distance from base to tip.

Some definitions from page vii of the source publication translate as follows:

Yolk-sac larvae -- immature fish during the period following hatching and lasting until the yolk is completely absorbed.

Postlarvae -- immature fish from the time at which the yolk is completely absorbed until the number of fin rays becomes constant for all fins.

Juveniles -- immature fish during the period in which numbers of fin rays equal those of adult fish, but such factors as body proportions, color, and mode of life differ considerably from those of adults.

In addition, we adopted the following terminology for this translation:

Preanal trunk -- the body from the back of the head to the anus.

Postanal trunk -- the tail section of the body extending from the anus to the base of the caudal fin.

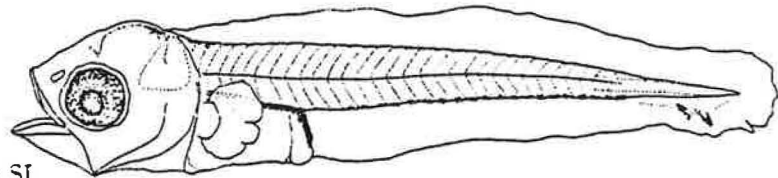
Base of fin -- the part of the body (or appendage) adjacent to (but not including a portion of) a fin.

Sebastes owstoni (Jordan et Thompson)

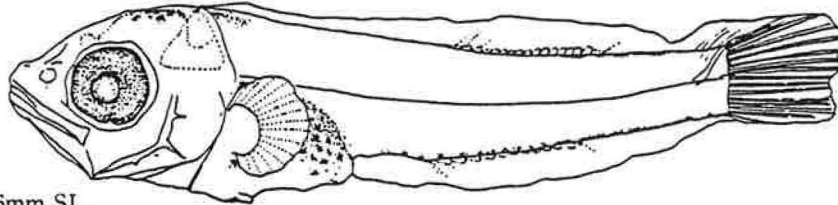
D XIV, 12-15; A III, 7-11; P<sub>1</sub> 15-17; P<sub>2</sub> I, 5; V 13 + 17-18 = 30-31.

**Morphology**

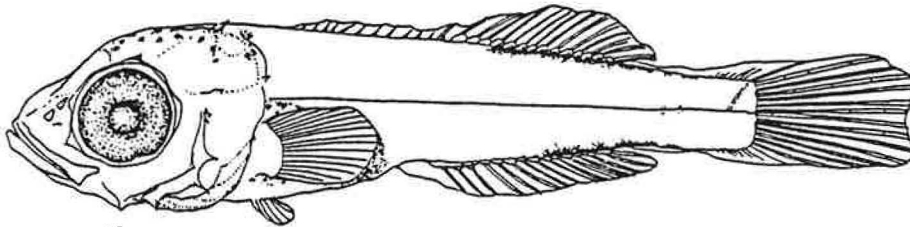
The larval body is long and narrow; a larva that is 4.6 mm in standard length ("in standard length" is omitted below) has a small gas bladder. Accompanying growth (from 3.9 to 14.7 mm), body proportions relative to standard length (%) increase as follows: Body depth increases from 13% to 24%; head length, from 18% to 36%; eye diameter, from 7% to 12%; and preanal length, from 32% to 53%. At about 15 mm, total ray counts attain constant values for all fins. At 22.5 mm [standard length], body depth is still shallow (25% of standard length); however, the caudal fin is forked, and the morphology has become fairly close to that of the adult. At 6.6 mm, a very small parietal spine and three posterior preopercular spines exist; at 9.4 mm, a postocular spine, anterior preopercular spines, and posttemporal spines can be seen in addition. For 14.7-mm juveniles, the cranial spines are developing; however, the parietal spine is relatively small. At 22.5 mm, the juvenile has three small lower infraorbital spines. For 4.6-mm larvae, black chromatophores occur posteriorly on the head, on the nape, on the dorsal surface of the abdominal cavity, along the ventral centerline of the tail (one per muscle segment), and on the membranous fin below the tip of the notochord. When the larva attains 5 to 6 mm, several black chromatophores appear along the dorsal margin of the body on the 26th through 28th muscle segments; subsequently, these multiply in the anterior direction. At 6.6 mm, dendritic black chromatophores appear also along the ventral margin of the caudal peduncle (on the body surface). At about 10 mm, black pigmentation spots occur dorsally to the base of each pectoral fin and within the body along the median line of the caudal peduncle. Small black pigmentation spots also appear at the upper end of the preoperculum. At 14.7 mm, in addition to becoming more numerous on the operculum, black chromatophores also appear along and around the median line of the postanal trunk. At about 20 mm, black chromatophores appear anteriorly on the head and on the dorsolateral surfaces of the preanal trunk; the



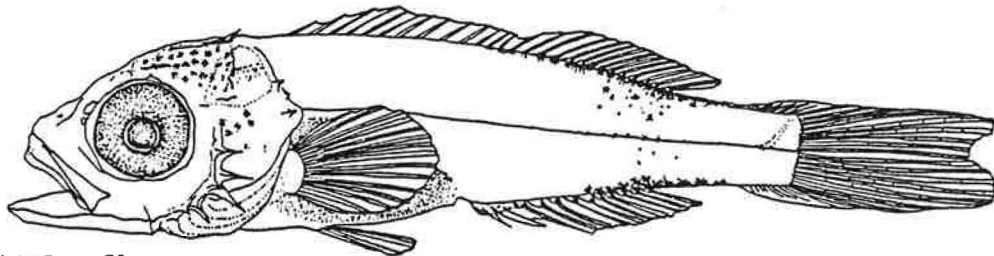
a 4.6mm SL



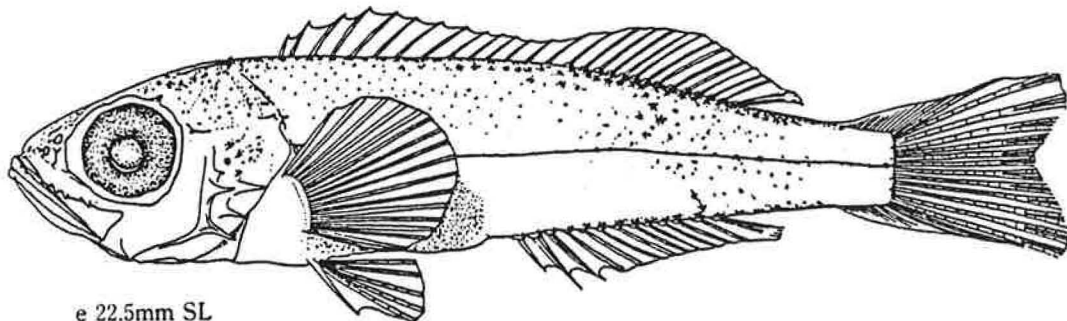
b 6.6mm SL



c 9.4mm SL



d 14.7mm SL



e 22.5mm SL

ハツメ *Sebastes owstoni* (a~c・e: 沖山原図; d: 沖山, 1983)

*Sebastes owstoni* (a-c, e: OKIYAMA, original drawings; d: OKIYAMA, 1983).

area of distribution widens on the mid-lateral surfaces of the postanal trunk; however, the fins all remain unpigmented.

#### **Distinguishing Sebastes owstoni from Similar Species**

This species can be easily distinguished from the immature stages of other species of the genus Sebastes by traits that include the following: The number of muscle segments is large, having a value of 30; the body is shallow in depth; the number of dorsal fin spines is 14; the cranial spines are weak, and the nuchal spine is only slightly developed. The relatively early time of appearance also constitutes a clue to identification.

#### **Distribution**

Adults are abundant in the Sea of Japan from San'in [seacoast along Tottori and Hyōgo Prefectures] northward. On the Pacific Ocean side, adults are distributed from Chiba Prefecture northward, but are very scarce. Planktonic larvae and juveniles appear from October to January in all areas of the Sea of Japan.

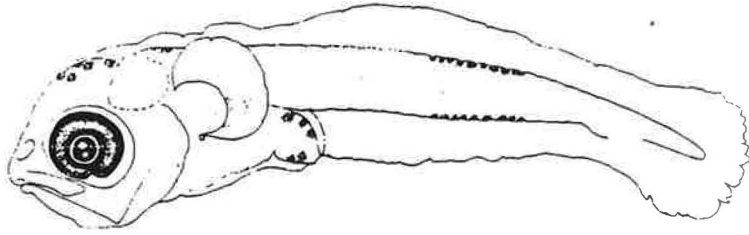
(Jun'ichi KOJIMA and Muneo OKIYAMA) (References: 727, 739)

#### **Sebastes inermis Cuvier**

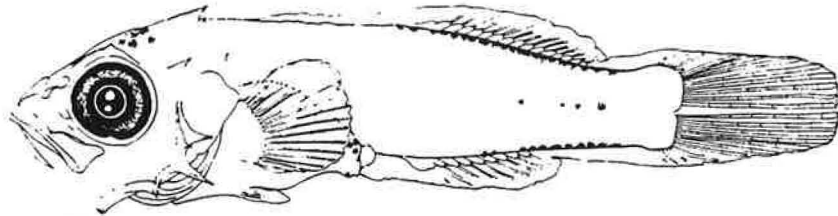
D XIII, 13-14; A III, 7-8; P<sub>1</sub> 16-17; P<sub>2</sub> I, 5; V 11 + 15 = 26.

#### **Morphology**

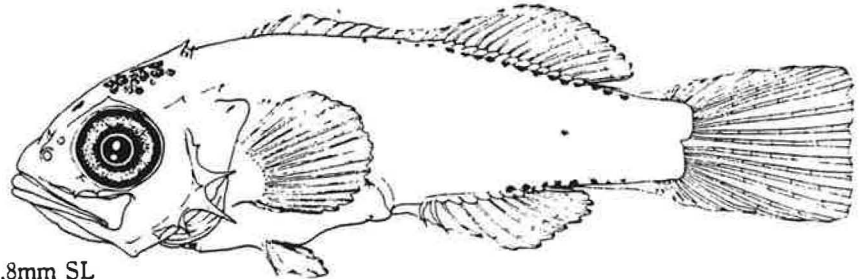
Black chromatophores occurring shortly after parturition in larvae that are 5.5 mm in standard length ("in standard length" is omitted below) are located in the parietal area (9 to 12 chromatophores), on the nape (7 to 9), on the dorsal surface of the abdominal cavity (a large number), on the ventral surface of the rectum (4 to 5), and centrally along both the dorsal margin (11 to 14) and ventral margin (9 to 12) of the postanal trunk. For larvae that have been reared, black chromatophores sometimes appear sparsely on the pectoral fins during the postlarval stage. At approximately 10 mm, the size at which the notochord tip completes flexion, all fin-ray elements are discernible except those of the spinous



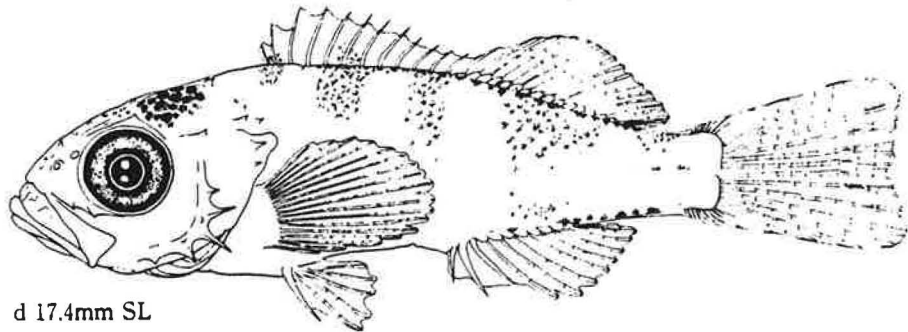
a 5.5mm SL



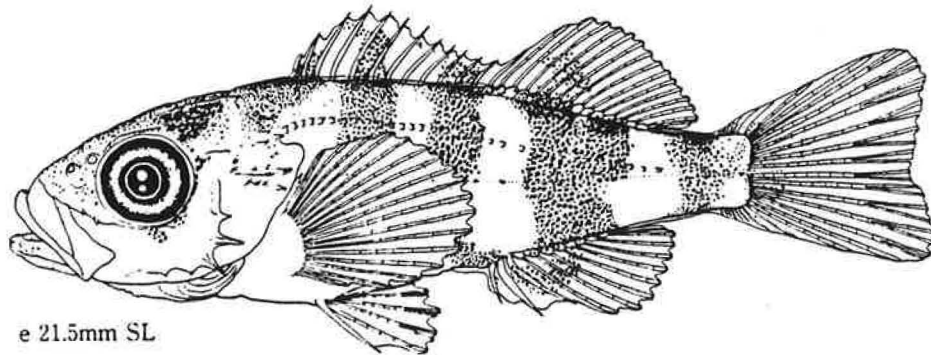
b 9.5mm SL



c 11.8mm SL



d 17.4mm SL



e 21.5mm SL

メバル *Sebastes inermis* (小島原図)

Sebastes inermis (KOJIMA, original drawings).



portion of the dorsal fin, and the cranial spines are well developed. The area of distribution of the row of black chromatophores lying along the dorsal margin of the postanal trunk lengthens anteriorly, and several black chromatophores also appear posteriorly along the median line of the postanal trunk. At about 12 mm, ray counts become constant for all fins, and body depth is about 30% of standard length. The black chromatophores immediately before the anus persist; and depending on the individual, a group of black chromatophores can be seen at the cleithral symphysis. Many juveniles of about 17 mm have five speckled patches of black pigmentation on the dorsolateral body surface between the origin of the dorsal fin and the caudal peduncle; however, considerable individual variation occurs in the standard length at which crossbands appear. For approximately 20-mm juveniles, the black chromatophores on the dorsal surface of the head continue to develop, and black chromatophores newly appear on the tips of both jaws and at the base of the caudal fin. In addition, the black crossbands on the sides of the body become strikingly distinct, and black pigmentation spots are also discernible on the dorsal, anal, and caudal fins.

#### **Distinguishing *Sebastes inermis* from Similar Species**

Postlarvae of this species can be distinguished from those of *Sebastiscus marmoratus* by the appearance in the latter species of black chromatophores at the tip of the lower jaw and at the base of the caudal fin and also by the low total number of eight anal fin rays in *Sebastiscus marmoratus*. Larvae of *Sebastes schlegeli* can be distinguished immediately after parturition by their lack of black chromatophores on the ventral surface of the rectum. Traits for distinguishing larvae of *Sebastes inermis* from those of *Sebastes thompsoni* are not well-defined; nevertheless, it appears that the following constitute key factors in making this distinction: In the postlarvae and early juveniles of *S. thompsoni*, the black chromatophores at the base of the dorsal fin, along the median line of the postanal trunk, and on the ventral body surface before the anus are distributed more anteriorly; the black chromatophores (groups) occurring at the tips of both jaws, on the undersurface of the lower jaw, at the cleithral symphysis, on the ventrolateral surface of the postanal trunk, and

at the base of the caudal fin appear earlier; and yellow chromatophores are prominently developed.

### **Distribution**

Adults are distributed from central Hokkaidō southward and along the southern Korean peninsula. Parturition is from December to February, somewhat earlier than in Sebastes thompsoni. Juveniles accompany drifting seaweed.

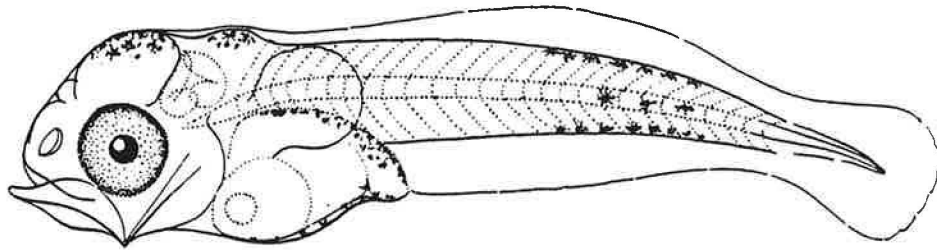
(Jun'ichi KOJIMA) (References: 288, 600, 1033, 1041)

### Sebastes thompsoni (Jordan et Hubbs)

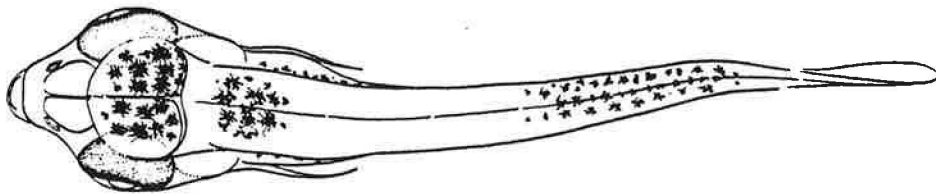
D XIII-XIV, 13-15; A III, 7-8; P<sub>1</sub> 15-17; P<sub>2</sub> I, 5; V 26 (10-11 + 15-16).

### **Morphology**

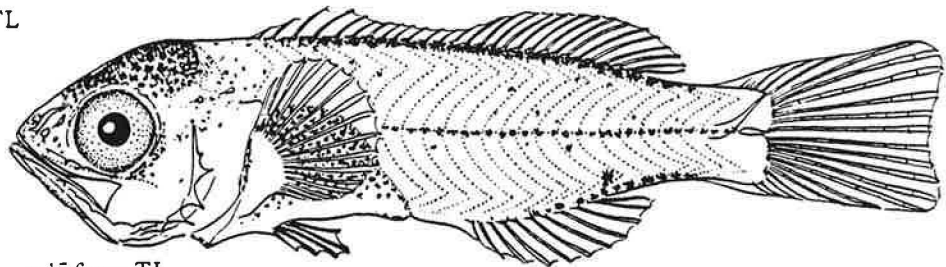
The time of larval appearance is unknown. During the parturition season, preparturition young are 5 to 6 mm in total length, and the body is thick and short. The head is large, as is also the eye. Groups of black chromatophores occur on the hindbrain and nape, and three rows of black chromatophores are present in the central area of the postanal trunk. The black chromatophores seen along the dorsal and ventral margins arise from three rows of chromatophores that occur at each margin. These rows consist of chromatophores that lie parallel to the dorsal or ventral centerline on both the right and left sides in addition to those situated along each centerline itself. At a total length of between 15 and 16 mm, the juvenile stage is reached, and the body is well-formed. Five spines have developed on the posterior margin of the preoperculum. The number of chromatophores increases: The dorsal surface of the head, the dorsal and lateral regions of abdominal cavity, and the area along the base of the dorsal fin are covered by dense concentrations of black chromatophores. The sides of the body are dotted with yellow in addition to small black chromatophores. In juveniles of 24 mm in total length, black chromatophores extend to nearly all body areas, and live juveniles exhibit a yellowish brown color [or liver brown: grayish, reddish brown]. For



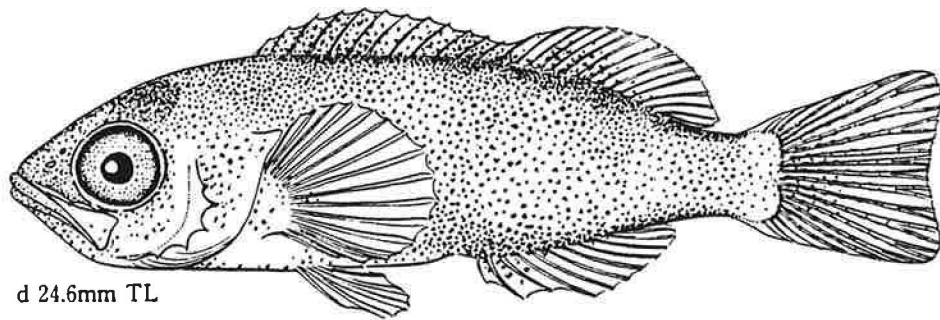
a 5.2mm TL



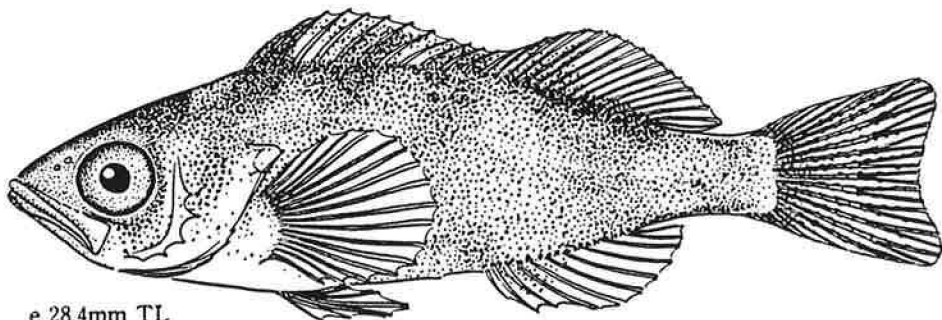
b 5.3mm TL



c 15.6mm TL



d 24.6mm TL



e 28.4mm TL

ウスメバル *Sebastes thompsoni* (塩垣原図)

*Sebastes thompsoni* (SHIOKAKI, original drawings).

juveniles of 28 mm in total length, the body is well developed, and the formation of five bands has begun on the sides of the body.

#### **Distinguishing Sebastes thompsoni from Similar Species**

This species can be easily distinguished from similar species by the occurrence of black chromatophores in three rows on the central postanal trunk, and of these chromatophores, those lying along the dorsal and ventral margins occur in conjunction with chromatophores on the right and left sides. Moreover, for young that have attained the juvenile stage, an important identification trait also is that in live specimens, the body is yellowish brown [or liver brown].

#### **Distribution**

This species is found from north to south along the coasts of Japan. Juveniles of less than 5 cm in total length, together with juvenile Sebastes schlegeli and Sebastes vulpes, accompany drifting seaweed from April to June along the northern coasts of the Sea of Japan.

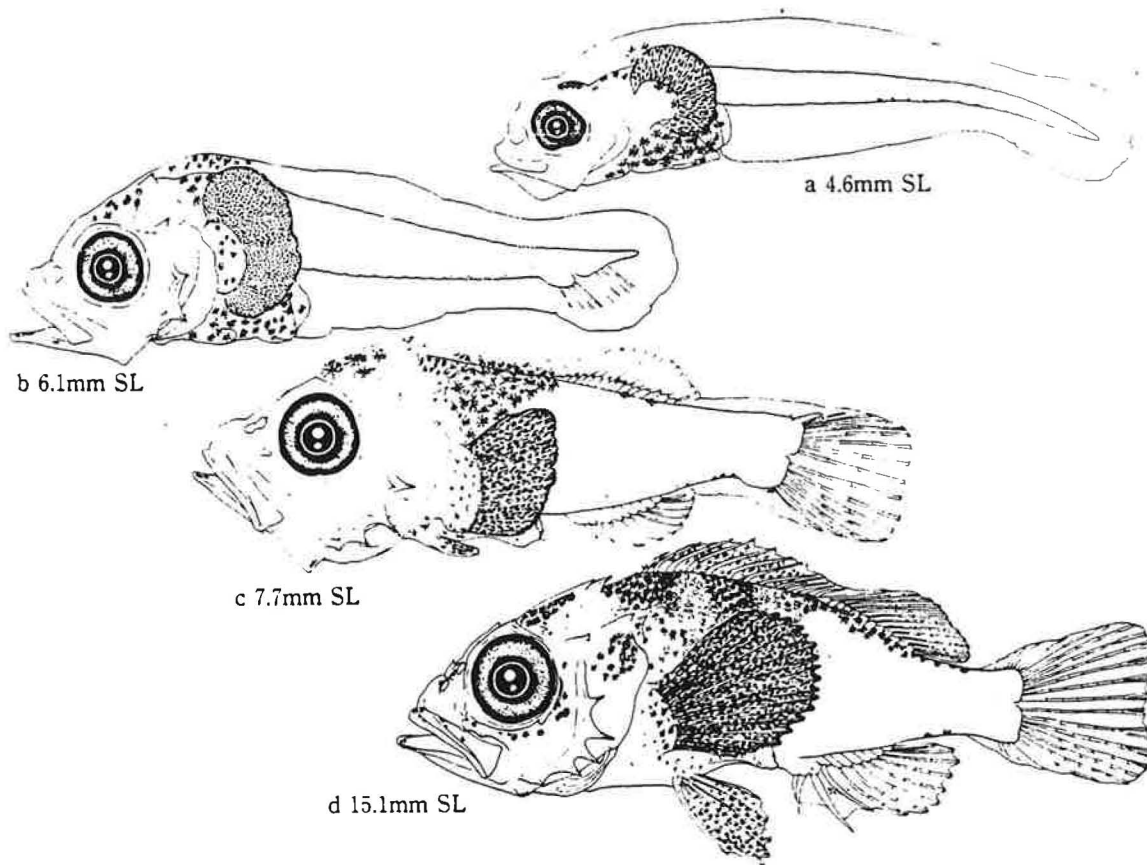
(Masaru [Yutaka?] SHIOKAKI [SHIOTAKA?])

#### **Sebastes matsubarae (Hilgendorf)**

D XIII, 11-13; A III, 6-7; P<sub>1</sub> 18-20; P<sub>2</sub> I, 5; V 26-27.

#### **Morphology**

Total length at time of hatching [sic] is 4.1 to 4.5 mm. When larvae are cultured, the larval body shape is long and narrow. However, body depth, head length, eye diameter, preanal length, and pectoral fin length increase with growth as a proportion of standard length. When ray counts attain constant values for all fins at about 12 mm in standard length ("in standard length" is omitted below), the morphology of the young becomes fairly close to that of the adult. In larvae, black chromatophores are distributed in the parietal area, on the nape, on the tip of the lower jaw, on the sides of the abdomen, within the abdominal cavity, on the membrane and the inner basal surface of each pectoral fin, and on each



アコウダイ *Sebastes matsubarae* (小島原図): 飼育

*Sebastes matsubarae*, artificially reared (KOJIMA, original drawings).

pelvic fin. In addition, black chromatophores (10 to 12) also appear embedded within the body along the ventral centerline of the postanal trunk. When the larva reaches about 8 mm, the length at which flexion of the notochord tip is completed, black chromatophores newly appear near the center of the base of the soft-rayed portion of the dorsal fin. Subsequently, these chromatophores become distributed over this entire basal area and also on the dorsal surface of the caudal peduncle. At about 20 mm, six dark patches form dorsally on the body from the head to the caudal peduncle. In addition, dark speckling on the operculum becomes distinct, and the peritoneum turns jet black. During the postlarval and planktonic juvenile stages, the cranial spines resemble those of other species in the genus *Sebastes*. However, a distinctive characteristic of



this species is that from a size of about 10 mm, the nuchal spine becomes more pronounced than the parietal spine.

#### **Distinguishing Sebastes matsubarae from Similar Species**

This species closely resembles Sebastes vulpes and Sebastes pachycephalus in that black chromatophores are densely distributed over the entire surfaces of the pectoral and pelvic fins. However, Sebastes matsubarae may be distinguished from these two species by the following: the presence of black chromatophores both on the membranous larval fin above the preanal trunk and also along the ventral centerline of the postanal trunk; the lack of black chromatophores at the base of the caudal fin; a nuchal spine that is more pronounced than the parietal spine; and the nature of the speckling on the sides of the body.

#### **Distribution**

Adults are distributed from Aomori Prefecture to the deep offshore waters of Shizuoka Prefecture [Pacific Ocean] and inhabit water depths of 200 to 300 m during the period of approximately December to April, which corresponds to the parturition season. However, areas of larval and juvenile distribution are completely unknown.

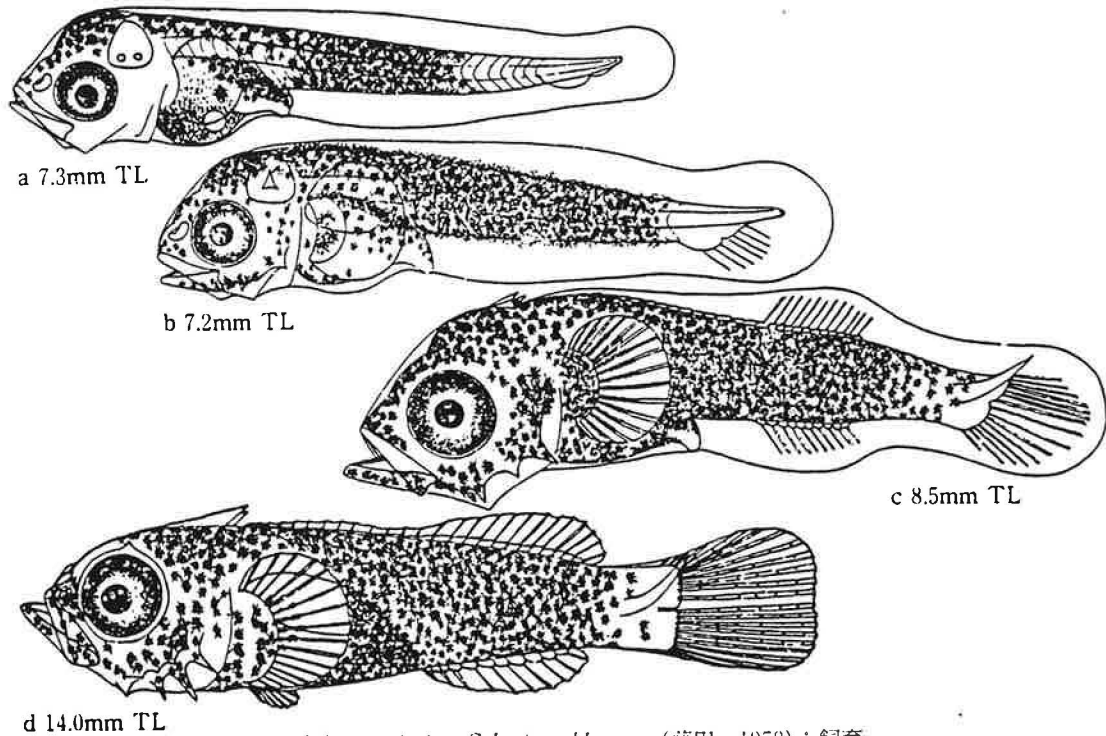
(Jun'ichi KOJIMA and Keiichi ONISHI) (References: 360, 750)

#### **Sebastes oblongus Gunther**

D XIII, 10-13; A III, 5-7; P<sub>1</sub> 14-20; P<sub>2</sub> I, 5; V 11 + 15 = 26.

#### **Morphology**

Larvae immediately after parturition are fairly large, being 7.3 to 7.5 mm in total length ("in total length" is omitted below). Each possesses a yolk and an oil drop. These larvae have granular structures on all surfaces of the membranous larval fins. Dendritic black chromatophores occur in the parietal area, on the dorsal surface of the preanal trunk, in the vicinity of the intestinal tract, below the anterior end of the yolk, and on the postanal trunk; and a wide crossband is forming in the central



タケノコメバル *Sebastes oblongus* (藤田, 1958): 飼育

*Sebastes oblongus*, artificially reared (FUJITA, 1958).

portion of the postanal trunk. Black chromatophores are distributed in a coarse pattern on the ventral surface of the preanal trunk, and are absent at the base of the caudal fin. Differentiation of the caudal fin begins in 7.2-mm larvae, which have completed absorption of the yolk and oil drop, and black chromatophores increase in number on the lower jaw and operculum. A single posterior preopercular spine can be discerned. In 8.5-mm larvae, for which the notochord tip is in the process of flexion, the rays of the dorsal and anal fins are differentiating, and three posterior preopercular spines and the parietal spine are distinguishable. Black chromatophores have developed over the entire body surface extending from the snout to somewhat before the tip of the postanal trunk, and large chromatophores can be seen along the rays of the pectoral fins. In 14-mm larvae, for which flexion of the notochord tip is complete, the postocular and anterior preopercular spines are newly

emerged, and the cranial spines have become conspicuous. Ray counts have nearly attained constant values for all fins; however, the dorsal, anal, and pelvic fins are not yet fully developed. The black chromatophores lying along the rays of the pectoral fins have partially disappeared and are distributed only along the bases of the central rays. Except for this, no significant changes in the distribution of black chromatophores are noticeable.

#### **Distinguishing *Sebastes oblongus* from Similar Species**

For larvae in which flexion of the notochord tip either is in progress or has been completed, distinguishing *Sebastes oblongus* from *Sebastes hubbsi* and *Sebastes longispinis* by means of the black chromatophores that occur along the rays of the pectoral fins may not be possible: The latter two species have similar distributions of black chromatophores. Juveniles of *Sebastes hubbsi*, for which the number of dorsal fin spines is 14, can be distinguished by this trait from juveniles of *Sebastes oblongus*. The fairly long standard length at the time of parturition appears to be a distinguishing characteristic of *Sebastes oblongus*.

#### **Distribution**

Adults are distributed from southern Hokkaidō to Kyūshū and along the southern Korean peninsula. In the Shimonoseki-Moji area, mid-November to mid-January is estimated to be the parturition season. In the Inland Sea and Wakasa Bay, larvae appear in May and are distributed mainly in the surface layer. The young accompany drifting seaweed.

(Jun'ichi KOJIMA) (Reference: 234)

#### **Translators' geographical notes:**

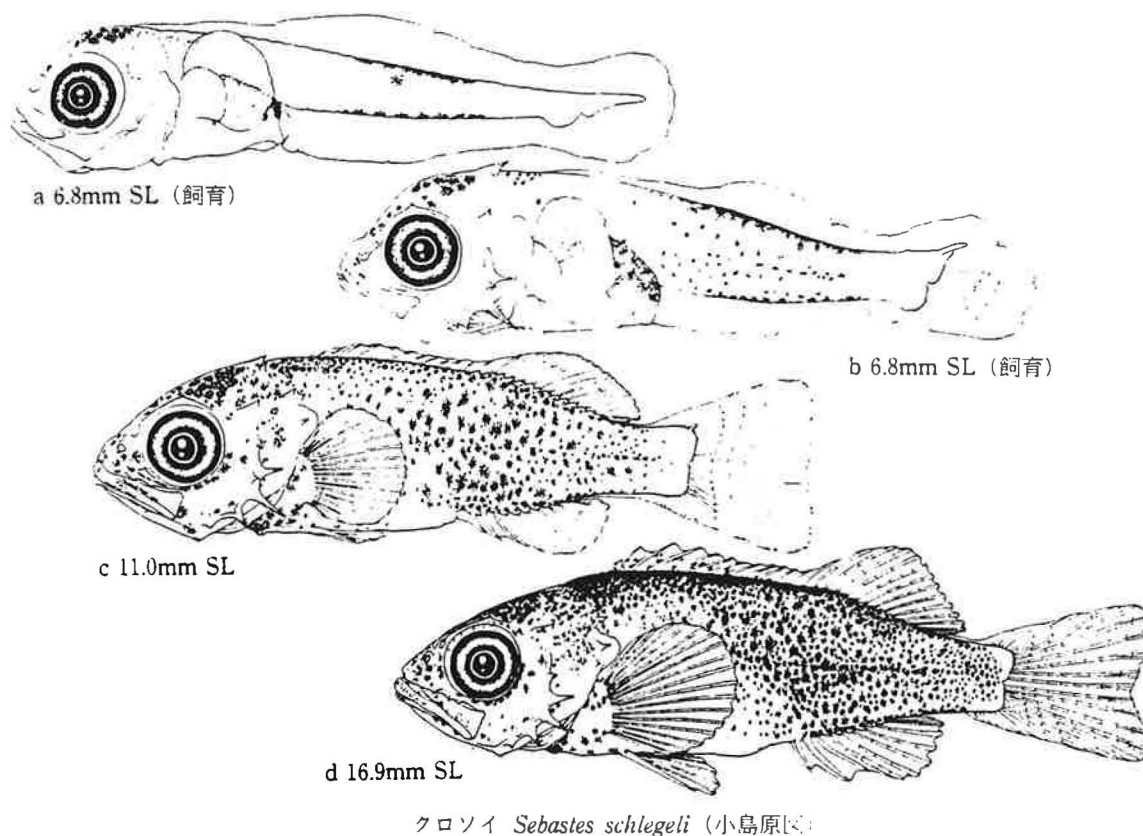
Hokkaidō is the northernmost of the four major islands of Japan; Kyūshū is the southernmost major island. The Shimonoseki-Moji area lies between Kyūshū and the main island, Honshū. The Inland Sea lies on the Pacific side of southern Honshū and west of Shikoku, the fourth major island of Japan; Wakasa Bay is on the Sea of Japan and borders Fukui and Kyōto Prefectures.

Sebastes schlegeli Hilgendorf

D XIII, 11-13; A III, 6-8; P<sub>1</sub> 17-18; P<sub>2</sub> I, 5; V 11 + 15 = 26.

**Morphology**

For larvae of 6 to 7 mm in standard length ("in standard length" is omitted below), the caudal fin rays are in the process of differentiating. Black pigmentation spots occur in the parietal area, on the nape (embedded), and on the anterior and dorsolateral surfaces of the abdominal cavity. Rows of black chromatophores lie centrally on the postanal trunk along the dorsal margin (8 to 13 chromatophores) and ventral margin (7 to 11 chromatophores separated from the anus by 4 to 6 muscle segments). At about the time that the bases of both the soft-rayed portion of the dorsal fin and the anal fin differentiate, black chromatophores also appear on the tips of the upper and lower jaws, over the forebrain, on the nape (body surface), at the cleithral union, and on the sides of the postanal trunk. Black chromatophores do not appear at the base of the caudal fin until approximately the early juvenile period. At 11.0 mm, ray counts have nearly attained constant values for all fins. Black chromatophores occur over almost all regions of the body surface except the end of the caudal peduncle, but are sparse on the cheeks and sides of the preanal trunk. Large dendritic black chromatophores are distributed on the sides of the postanal trunk, and the black chromatophores along the median line of the postanal trunk are somewhat conspicuous. In 16.9-mm early-stage juveniles, the black chromatophores on the body surfaces become even more dense, and black chromatophores appear also on the spinous portion of the dorsal fin. However, chromatophore development on the abdominal body surface is weak. At about 20 mm, five bands of black pigmentation spots are distinct dorsally on the body from the nape to the caudal peduncle; these also extend onto the dorsal fin. From about 15 mm, except for the appearance of three lower infraorbital spines, no especially conspicuous features are observed among the cranial spines.



*Sebastes schlegeli*; a,b: artificially reared (KOJIMA, original drawings).

#### Distinguishing *Sebastes schlegeli* from Similar Species

For traits for distinguishing the larvae of this species from those of *Sebastes inermis*, see the section on *Sebastes inermis*. Early-stage juveniles of *Sebastes schlegeli* at around 10 mm closely resemble those of *Sebastes hubbsi*; however, distinguishing the two species is possible by features that include the following: The number of dorsal fin spines in *Sebastes schlegeli* is 13 (in *S. hubbsi* it is 14); black chromatophores are sparse on the cheeks (dense in *S. hubbsi*). Moreover, seasons of appearance differ appreciably. Because traits for distinguishing *Sebastes schlegeli* from *Sebastes taczanowskii* (adults of which are distributed from Iwate Prefecture northward) are not well-defined, caution is required.



**Distribution**

Adults are distributed throughout all regions of Japan, along the Korean peninsula, and off China. Young are released from April to June in central Japan and southward; this is somewhat late in comparison to the parturition seasons of other species in the genus Sebastes.

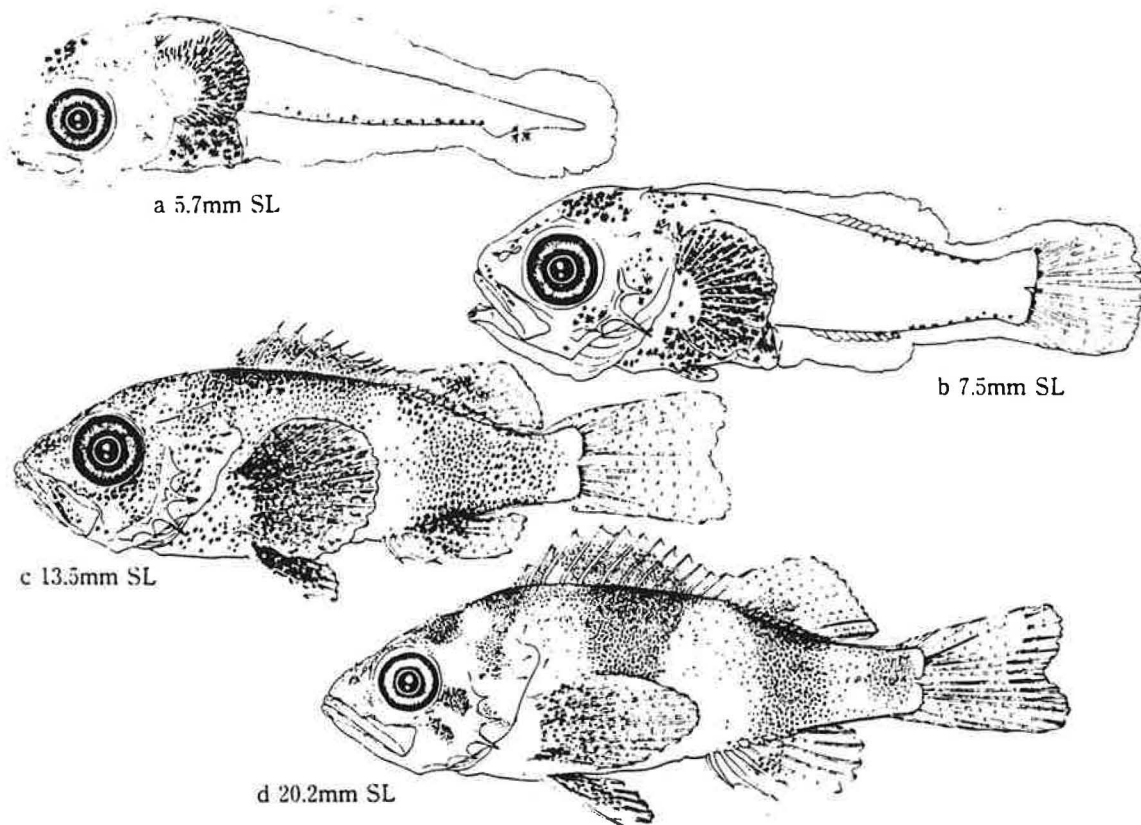
(Jun'ichi KOJIMA) (References: 320 [sic, 321?], 352, 487, 818)

**Sebastes vulpes Doderlein**

D XIII, 12-13; A III, 5-6; P<sub>1</sub> 16-18; P<sub>2</sub> I, 5; V 26.

**Morphology**

For larvae of 5.7 mm in standard length ("in standard length" is omitted below), body depth is somewhat great, the caudal fin rays are in the process of differentiating, and one posterior preopercular spine has appeared. Black chromatophores are distributed on the tips of both jaws, on the dorsal surface of the head (densely in the parietal area), on the nape (subsurface and surface), on the dorsolateral surfaces of the abdominal cavity, along the ventral centerline of the postanal trunk (embedded), at the base of the caudal fin, on the pectoral fin membranes, and on the inner surface of each pectoral fin base. At 7.5 mm, the cranial spines are moderately developed, and the soft rays of the dorsal and anal fins are in the process of differentiating. Black chromatophores also newly appear on each cheek, operculum, pectoral fin base, pelvic fin, and along the dorsal margin of the postanal trunk. At about 10 mm, ray counts attain nearly constant values for all fins, and black pigmentation spots appear on the dorsolateral surfaces of the preanal trunk, on membranes of the spinous portion of the dorsal fin, and on the sides of the postanal trunk. At 13.5 mm, black chromatophores increase in number on the entire head, on the dorsolateral surfaces of the preanal trunk, and on the sides of the postanal trunk. Together with forming two broad crossbands, black pigmentation spots appear also on the soft-rayed portions of the dorsal and anal fins. At 20.2 mm, the fish has the characteristic spotting pattern of the juvenile period: One narrow black crossband is



キツネメバル *Sebastes vulpes* (小島原図): 飼育

*Sebastes vulpes*, artificially reared (KOJIMA, original drawings).

present below the nape, two wide black crossbands occur below the dorsal fin, and one wide black crossband lies on the posterior half of the caudal peduncle. In addition, two black pigmentation bars running posteroventrally from the eye are present on the cheek. The black chromatophores on the pectoral and pelvic fins are sparser. Distinct lower infraorbital spines are not discernible.

**Distinguishing *Sebastes vulpes* from Similar Species**

Of the genus *Sebastes*, two species, *S. matsubarae* and *S. pachycephalus*, are presently known in addition to *S. vulpes* in which the young stages have densely distributed chromatophores on the pectoral and pelvic fins. The young stages of *S. vulpes*, which have black chromatophores at the base of the caudal fin, can be distinguished by this

trait from young stages of S. matsubarae, in which black chromatophores do not occur at the base of the caudal fin. Furthermore, the larvae of S. vulpes are easily distinguished from those of S. pachycephalus by the row of black chromatophores that the former species has along the ventral centerline of the postanal trunk. For juveniles of about 15 mm, those of S. vulpes are distinguishable from juveniles of S. pachycephalus by means of the relative sparseness of black chromatophores on the head, sides of the body, and pectoral fins of the former species; in juveniles of S. pachycephalus, these chromatophores are densely distributed. Traits for distinguishing S. vulpes from S. ijimae and S. zonatus are unclear.

#### Distribution

Adults are distributed from Kanagawa Prefecture northward [on the Pacific side], in all coastal areas of the Sea of Japan, and along the southern Korean peninsula. In northern Japan, parturition is in May and June. Juveniles accompany drifting seaweed.

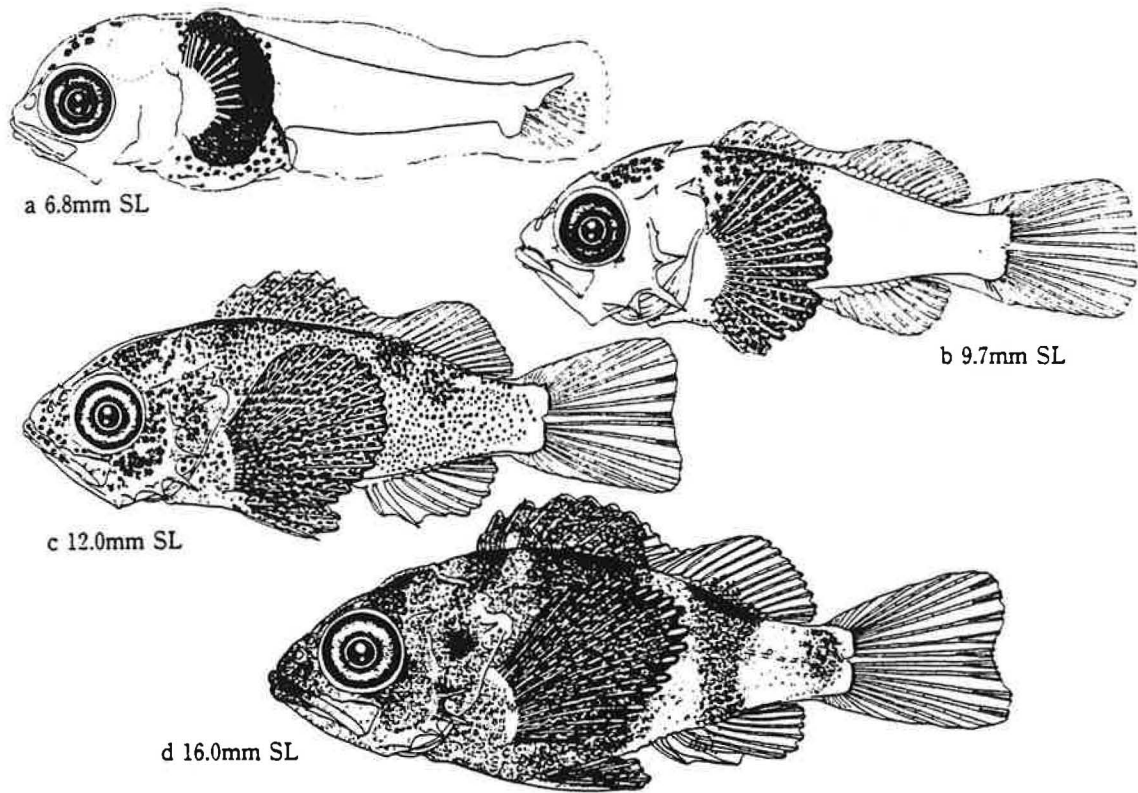
(Jun'ichi KOJIMA) (Reference: 706)

#### Sebastes pachycephalus (Temminck et Schlegel)

D XIII, 11-13; A III, 5-7; P<sub>1</sub> 16-20; P<sub>2</sub> I, 5; V 26.

#### Morphology

This species has been divided into several subspecies on the basis of body color and speckling; however, here all forms are tentatively treated as a single species. For larvae of 6.8 mm in standard length ("in standard length" is omitted below), flexion of the notochord tip has begun. The pectoral fins are large, and the fin rays are in the process of differentiating. Black chromatophores are present on the dorsal surface of the head, on the nape (embedded), on the sides of the preanal trunk, on the dorsolateral surfaces of the abdominal cavity, on the pectoral fins (densely distributed), and at the base of the caudal fin. At 9.7 mm, the cranial spines are prominently developed, and the dorsal margin of the parietal spine is somewhat strongly curved. Black chromatophores newly

ムラソイ *Sebastes pachycephalus* (小島原図)*Sebastes pachycephalus* (KOJIMA, original drawings).

appear on the tips of the upper and lower jaws, on the spinous portion of the dorsal fin, and on the developing pelvic fins; the black chromatophores at the base of the caudal fin become densely distributed. For 12.0-mm juveniles, in which ray counts have attained constant values for all fins, body depth is relatively great (36% of standard length), and the cranial spines are strongly developed. Black chromatophore development is conspicuous over the entire body; black chromatophores are densely distributed on the operculum and also are moderately dense on the bases of the pectoral fins and on the sides of the postanal trunk (excluding the posterior half of the caudal peduncle). Juveniles of about 16 mm in standard length, which corresponds to size at the last planktonic stage, have four black crossbands on the sides of the body. The third crossband extends onto the soft-rayed portion of the dorsal fin and also onto the anal fin. Live young of this species occur in varieties that have either

red or yellow chromatophores on the pectoral fins; however, almost no differences are discernible in morphology or the distribution of black chromatophores.

#### **Distinguishing Sebastes pachycephalus from Similar Species**

Sebastes pachycephalus resembles Sebastes matsubarae in that both have densely distributed black chromatophores on the pectoral and pelvic fins. However, the former species is distinguishable by the absence of a row of black chromatophores along the ventral centerline of the postanal trunk (the latter species has this row) and by the presence of black chromatophores at the base of the caudal fin (the latter has none). With regard to S. vulpes, refer to that section. Young stages of S. nivosus possibly resemble those of S. pachycephalus; thus, caution is required.

#### **Distribution**

Adults are distributed in all Japanese waters south of southern Hokkaidō, along the southern Korean peninsula, and off China. From central Japan southward, young appear mostly in coastal regions between December and April.

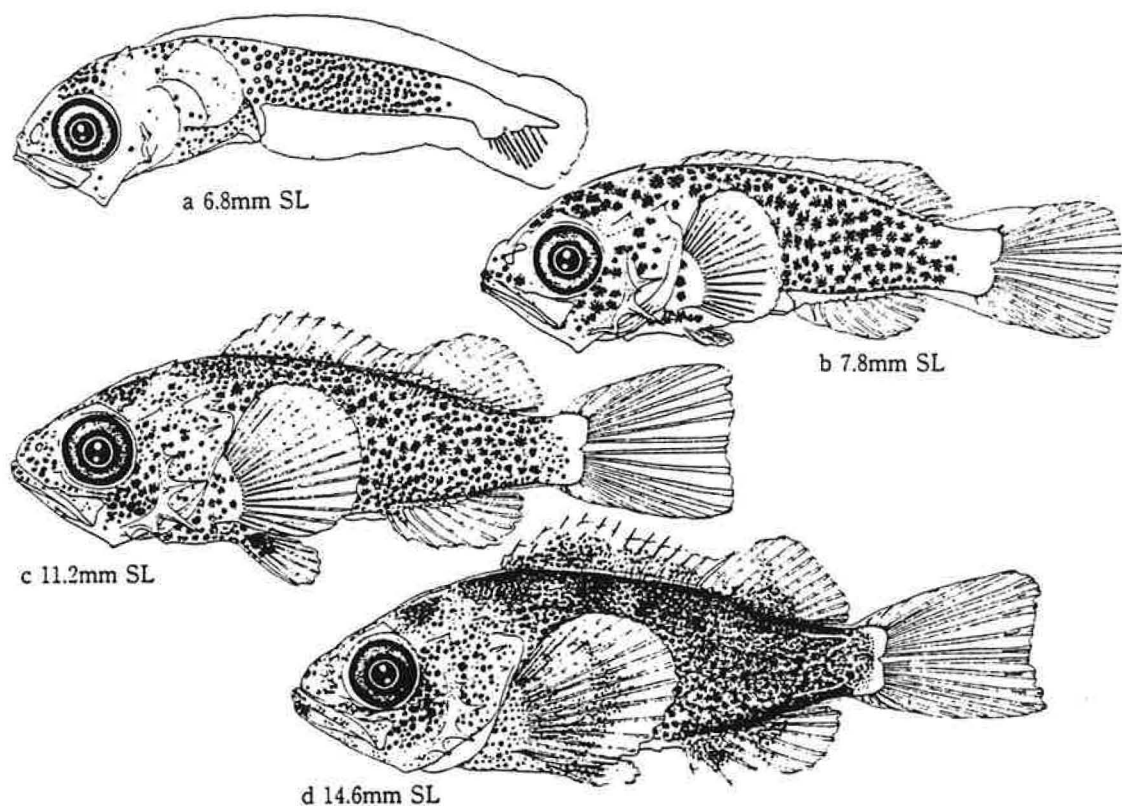
(Jun'ichi KOJIMA) (References: 232, 235, 600, 877)

#### **Sebastes hubbsi (Matsubara)**

D XIV, 12; A III, 6-7; P<sub>1</sub> 16-17; P<sub>2</sub> I, 5; V 26.

#### **Morphology**

For larvae of 6.8 mm in standard length ("in standard length" is omitted below), in which the notochord tip has begun flexion, the parietal spine, one anterior preopercular spine, and two posterior preopercular spines are discernible. Black chromatophore development is pronounced and extends to nearly all areas of the body surface except the opercula and end of the postanal trunk; however, the pectoral fins are unpigmented. At 7.8 mm, ray counts have nearly attained constant values for all fins except the spinous dorsal fin and pelvic fins. The cranial spines are



ヨロイメバル *Sebastes hubbsi* (小島原図)

*Sebastes hubbsi* (KOJIMA, original drawings).

conspicuously developed. Large dendritic black chromatophores newly appear on the opercula, and the unpigmented area on the posterior of the postanal trunk narrows. Throughout the larval period, black chromatophores do not appear at the base of the caudal fin. At 11.2 mm, ray counts have attained constant values for all fins. Black chromatophores increase over the entire body, and the unpigmented area on the posterior of the postanal trunk becomes even narrower. Dense specklings of black pigmentation are present on the cheeks. Black chromatophores are densely distributed at the base of each pelvic fin and are also scattered sparsely along the base of the spinous portion of the dorsal fin. In early-stage juveniles of 14.6 mm, a mosaic speckling pattern is in the process of forming on the sides of the body, and black

pigmentation spots occur also on the pectoral fins, the soft-rayed portion of the dorsal fin, and the anal fin.

#### **Distinguishing Sebastes hubbsi from Similar Species**

A distinguishing trait of S. hubbsi is that the number of dorsal fin spines is 14, which is one spine more than the number occurring in numerous other species of the genus Sebastes. However, because the most posterior spine of the dorsal fin differentiates into a spine after standard lengths of 12 to 14 mm are attained, caution is required in counting spines. The distributional characteristics of black chromatophores in S. longispinis and S. oblongus closely resemble those of S. hubbsi during the larval and juveniles stages, and those of S. schlegeli are similar during the early juvenile stage; refer to the respective sections for distinguishing traits. The time of appearance for S. hubbsi is relatively early among species of the genus Sebastes; this also constitutes an identification clue.

#### **Distribution**

Adults are distributed southward from both Iwate Prefecture [Pacific side] and Niigata Prefecture [Sea of Japan] and along the southern Korean peninsula. Larvae and juveniles appear from October to January. Juveniles accompany drifting seaweed.

(Jun'ichi KOJIMA) (References: 669, 1044)

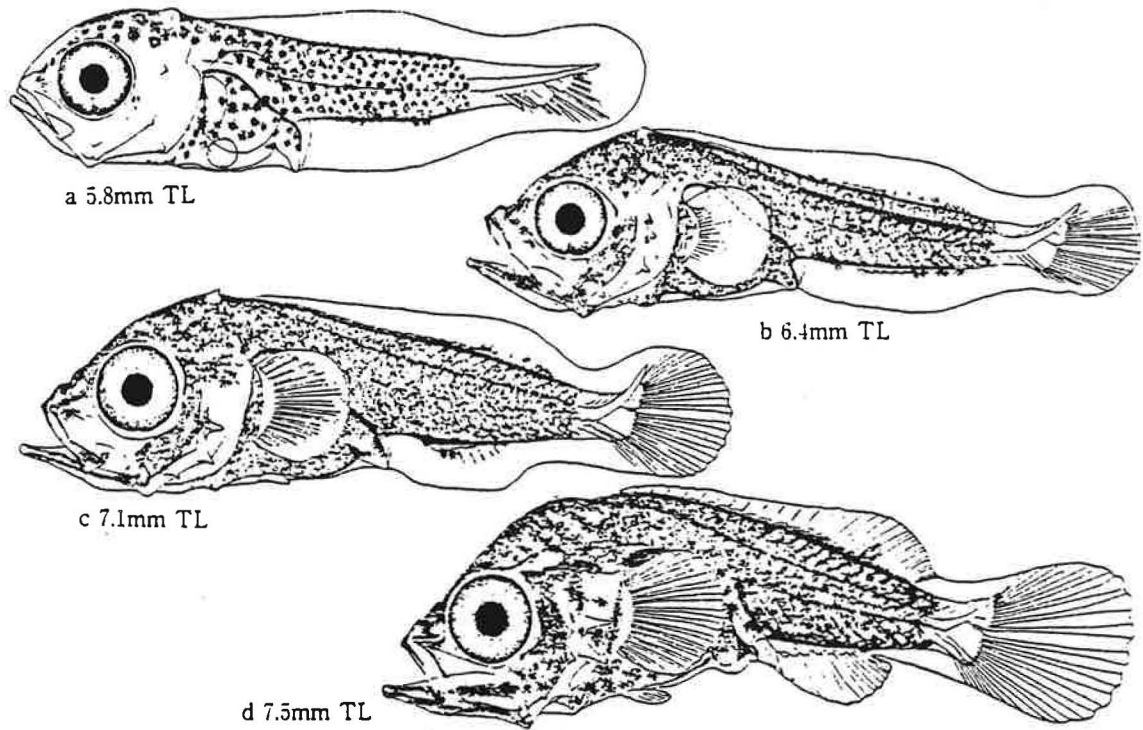
#### **Sebastes longispinis (Matsubara)**

D XIII, 13; A III, 6; P<sub>1</sub> 16; P<sub>2</sub> I, 5; V 26.

#### **Morphology**

Larvae immediately after parturition are 5.8 to 6.1 mm in total length ("in total length" is omitted below), and the entire surface of the larval membrane [fin] has a granular structure. The yolk and oil drop are not yet absorbed. The anus opens at a position that is about 45% of total length measured from the anterior end of the body (below muscle segments 9 or 10). One spine is discernible on the posterior margin of the





コウライヨロイメバル *Sebastes longispinis* (高井・福永, 1971): 飼育

*Sebastes longispinis*, artificially reared (TAKAI and FUKUNAGA, 1971).

preoperculum, and rudiments of the caudal fin rays have appeared. Dendritic black chromatophores are distributed over all areas of the body except the cheeks, membranes of all fins, and tail from the 24th muscle segment to the tip of the notochord. With growth, black chromatophores also appear along the bases of the dorsal and anal fins. In 6.4-mm larvae, for which the notochord is in the process of flexion, three posterior preopercular spines, the parietal spine, and the pterotic spine are visible. The unpigmented area at the end of the postanal trunk narrows, and black chromatophores also newly appear on the preoperculum and laterally on the lower jaw. Black chromatophores are lacking at the base of the caudal fin. At 7.1 mm, flexion of the notochord tip is complete; the anterior preopercular spines, nasal spine, nuchal spine, and supracleithral spine newly appear on the head. For 7.5-mm larvae, the cranial spines become more conspicuous, and ray counts attain constant values for all but the

pelvic fins. The black chromatophores on the body surface become more profuse.

#### **Distinguishing *Sebastes longispinis* from Similar Species**

For traits to distinguish larvae of this species from those of *S. oblongus*, see that section. The larval body color of *S. hubbsi* closely resembles that of *S. longispinis*, and traits for distinguishing between these species are unclear. However, after a standard length of between 12 and 14 mm is attained and the most posterior dorsal spine has differentiated into a spine, it appears that these species can be distinguished by the number of dorsal fin spines (*S. longispinis* has 13 spines; *S. hubbsi*, 14).

#### **Distribution**

Adults are known from Wakayama, Hiroshima, and Shimonoseki [all are cities on the Inland Sea]. Time of parturition is estimated to be approximately December.

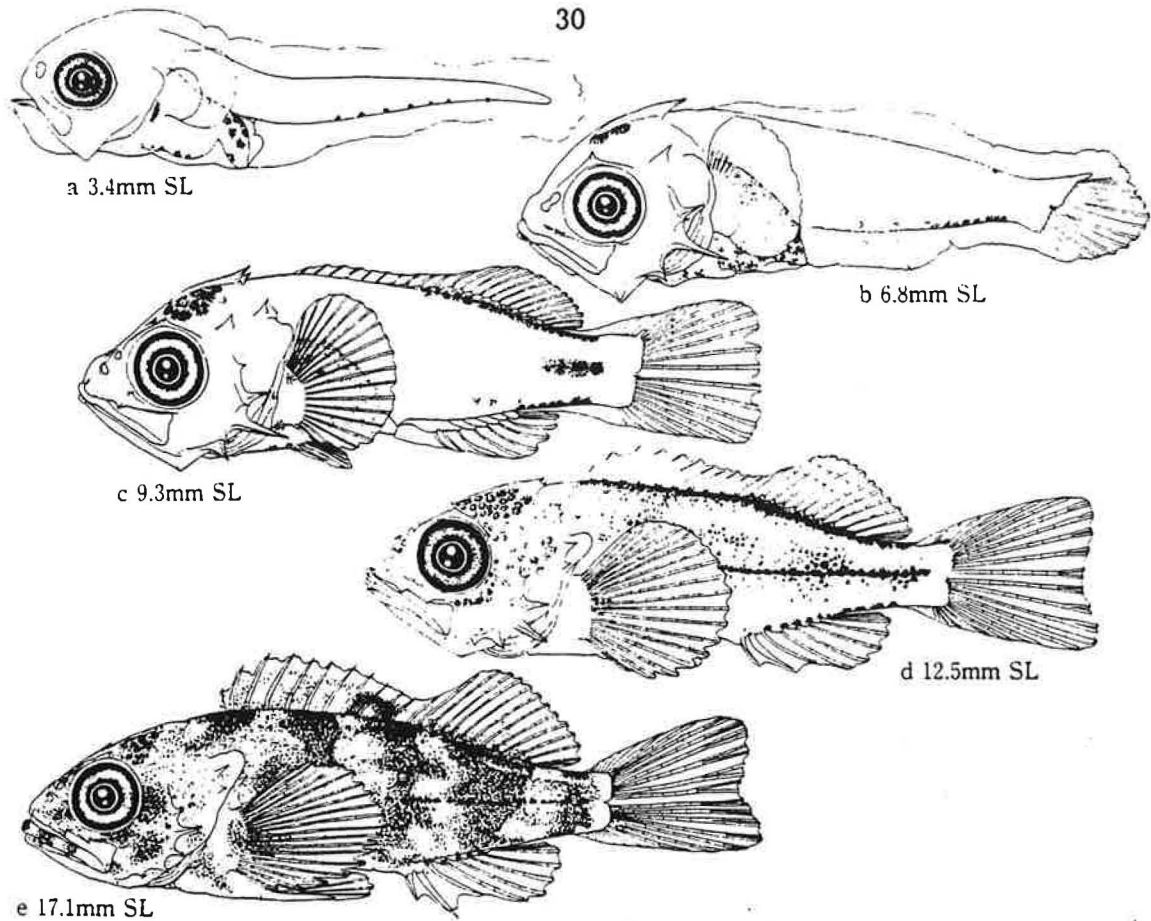
(Jun'ichi KOJIMA) (Reference: 944)

#### ***Sebastiscus marmoratus* (Cuvier)**

D XII, 10-12; A III, 5; P<sub>1</sub> 17-19 (18); P<sub>2</sub> I, 5; V 10 + 15 = 25.

#### **Morphology**

Larvae immediately after parturition are 3.2 to 4.1 mm in standard length ("in standard length" is omitted below). These larvae retain a small amount of yolk, and the dorsal portions of the head and trunk are covered with loose skin. Black chromatophores occur on the tip of the lower jaw and on the anterior, dorsolateral (densely), and ventral (sparsely) surfaces of the abdominal cavity; seven to ten chromatophores (embedded) lie in a row on the ventral midline of the postanal trunk about six muscle segments distant from the anus. At about 5 mm, the parietal spine, postocular spine, pterotic spine, and preopercular spines (two anterior and three posterior) form. Black chromatophores newly appear in the parietal region and on the nape (embedded). Depending on the individual, a few



カサゴ *Sebastiscus marmoratus* (小島原:4)

*Sebastiscus marmoratus* (KOJIMA, original drawings).

black chromatophores may be evident both on the bases and membranes of the pectoral fins. When the larvae attain 6 to 7 mm, the cranial spines are further developed, and formation of the caudal fin rays is fairly advanced. The pectoral fin rays begin to differentiate, and formation of the dorsal and anal fin bases also commences; however, the pelvic fin rays are undifferentiated. Subsequently, five to seven black chromatophores appear on the body surface along the ventral margin of the caudal peduncle, and one to three appear along the dorsal margin. Moreover, the larvae usually have one black chromatophore centrally on the caudal fin base. At about 9 mm, ray counts attain nearly constant values for all fins. The nasal spine, nuchal spine, lower posttemporal spine, upper and lower infraorbital spines (one each), and first posterior preopercular spine newly appear. The dorsal margin of the parietal spine, the bony protuberance above the eye, and the posterior preopercular spines are

serrate. Black chromatophores develop on and below the body surface around the median line of the caudal peduncle, and chromatophore distribution spreads anteriorly along the dorsal body margin. At approximately 12 mm, ray formation is nearly complete for all fins. The posterior preopercular spines attain a constant number of five; the coronal spine, upper posttemporal spine, supracleithral spine, and upper and lower opercular spines also appear; and the number of lower infraorbital spines equals two. Black chromatophores develop about the head, in the dorsolateral region of the body, near the median line of the body. At about 17 mm, which corresponds to the stage at which the young change to a benthic existence, the preocular spine, supraocular spine, tympanic spine, and cleithral spine also appear. Black chromatophores develop over the entire body and form a speckling pattern appearing as five or six crossbands. Black pigmentation spots occur also on the dorsal fin and bases of the pectoral fins.

#### **Distinguishing Sebastiscus marmoratus from Similar Species**

The postlarvae of this species, for which the black chromatophore distribution closely resembles those of postlarval Sebastes inermis and Sebastes thompsoni, can be easily distinguished from the latter two species by means of the numbers of dorsal, anal, and pectoral fin rays.

Sebastiscus marmoratus is possibly distinguishable from Sebastiscus tertius and Sebastiscus albofasciatus of this same genus by the mode of the number of soft pectoral fin rays, which is 18 (in the latter two species, modes are 19 and 17, respectively). In adults of the last species, one spine occurs along the ventral margin of the orbit; adults of the former two species lack this spine. Other characters for distinguishing the young stages are unknown.

#### **Distribution**

The parturition season is long and extends from November to May. Adult fish are distributed southward from southern Hokkaido to the Philippines. Rarely do [juveniles] accompany drifting seaweeds.

(Jun'ichi KOJIMA) (References: 600, 990)

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Translators' Notes:

An asterisk indicates that the original bibliographic entry is in Japanese.

We use brackets [ ] to enclose our comments and clarifications. Bracketed text preceding or following a romanized publication (or other) title is our translation of the title; this is informational and should not be used in citing or trying to locate the publication.

Pronunciations of personal names, particularly given names, often cannot be determined confidently from Japanese characters. Generally, we give probable transliterations based on "Japanese Names" by P.G. O'Neill (Weatherhill, New York & Tokyo, 1972). However, if we can not find a name in this reference and it is otherwise unknown to us, we append a question mark to the name.