DESCRIPTION OF THE LARVAE OF THE CUSK EELS *OPHIDION SCRIPPSAE* AND *CHILARA TAYLORI* (FAMILY OPHIDIIDAE)

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ABSTRACT

Larvae of the two species of cusk eels (Ophidiidae) found in the CalCOFI region, *Ophidion scrippsae* and *Chilara taylori*, are described from specimens reared in the laboratory and from specimens collected in the field. Larvae are distinguished by morphological, meristic, and pigment-pattern differences. *C. taylori* larvae are proportionately longer and more slender, have more vertebrae, and have more dorsal and anal fin rays than do *O. scrippsae*. The gut loop forms at a longer body length in *C. taylori* (ca. 14.1 mm) than in *O. scrippsae* (ca. 7.5 mm). *O. scrippsae* larvae have no pigment in the caudal fin, and the anal fin usually has numerous melanophores, whereas *C. taylori* larvae have caudal fin pigment and little, if any, pigment in the dorsal and anal fins. Analysis of ophidiid larvae collected in CalCOFI survey cruises from 1972 to 1978 revealed a relatively low abundance and a distribution centered around points and capes from San Diego to the vicinity of Magdalena Bay, reflecting the nearshore nature of these fish.

RESUMEN

Se describen las larvas de dos especies de Ophidiidae, *Ophidion scrippsae* y *Chilara taylori*, obtenidas en la región explorada por el programa CalCOFI. Los ejemplares estudiados proceden de cultivos en el laboratorio y material recolectado en el mar. Las larvas de estas dos especies se distinguen por las características morfológicas, merísticas y la distribución del pigmento. Las larvas de *C. taylori* son más largas y delgadas, tienen más vertebras y más radios en las aletas dorsal y anal, que las larvas de *O. scrippsae*. En *C. taylori*, el asa del tubo digestivo se forma cuando los ejemplares alcanzan unos 14.1 mm, mientras que en *O. scrippsae* ya aparece en larvas de 7.5 mm de longitud. Las larvas de *O. scrippsae* carecen de pigmento en la aleta caudal, pero en la aleta anal aparecen generalmente muchos melanoforos. En *C. taylori* las larvas presentan la aleta caudal pigmentada y escaso o ningún pigmento en las aletas dorsal y anal. Los Ophidiidos recolectados desde San Diego hasta las cercanías de Bahía Magdalena, durante los cruceros CalCOFI, en el periodo 1972-1978, no han sido abundantes, y aparecen concentrados en las zonas de cabos y salientes de la costa, lo que indica que estos peces son de régimen nerítico.

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INTRODUCTION

Two species of cusk eels (Ophidiidae) are found in the CalCOFI region, *Ophidion scrippsae* and *Chilara taylori* (Robins et al. 1980). *O. scrippsae* ranges from the Gulf of California north of Guaymas, Mexico, to Point Arguello, California, (ca. 34°N) in depths of 3 m to 76 m. *C. taylori* has been taken from San Cristobal Bay, Baja California, (ca. 27°N) to northern Oregon from depths of 1 m to over 260 m (Miller and Lea 1972).

Neither species is fished commercially, but both are often taken with bottom trawling gear, purse seines, and bait nets. Cusk eels are preyed upon by numerous commercially important fishes, diving sea birds, and California sea lions (Fitch and Lavenberg 1968). Primarily nocturnal, adult cusk eels are burrowing tailstanders inhabiting a variety of substrates including silty sand and green mud (Mearns 1979), eel grass (Herald 1953), rubble, crevices, and holes (Fitch and Lavenberg 1968). The pelagic larvae are collected in coastal CalCOFI plankton tows primarily in the fall.

The purpose of this paper is to describe the development of the early larval stages of *O. scrippsae* and *C. taylori* and to summarize the distribution of larvae in CalCOFI samples made from 1972-78.

METHODS AND MATERIALS

Life-history series for *O. scrippsae* were assembled from larvae reared at the Southwest Fisheries Center from eggs collected in plankton tows at La Jolla Cove. Some early larval stages of *C. taylori* were obtained by rearing batches of mixed, unidentified eggs collected in nearshore plankton tows; however, most of the specimens were obtained from CalCOFI plankton tows. Reared fish were kept at 17.6°-20.6°C in black 100-liter pots and fed *Brachyonis* (a rotifer), harpacti-

coid copepods, and *Artemia* (a brine shrimp). We attempted to maintain the prey concentrations at approximately 50 *Brachyonis*/ml, and the copepods and *Artemia* both at 1/ml.

A series was established for the study of morphological development, morphometry, and pigment formation using the techniques and terminology of Ahlstrom et al. (1976). Another series was stained in Alizarin Red-S and X-rayed to obtain meristic data.

DESCRIPTION

Literature

Larvae of two Atlantic species of *Ophidion* have been described: *O. vassali* (Padoa 1956) and *O. barbatum* (Padoa 1956; Aboussouan 1972).

Distinguishing Features

O. scrippsae eggs are slightly off-round, and have homogenous yolk, no oil globule, and a mean size of 1.00 × 1.06 mm. Larvae are 2.5 mm long at hatching, are slender, and have a gut that ends just short of mid-body. The eggs of *C. taylori* are unknown.

Larvae of *O. scrippsae* and *C. taylori* may be distinguished from those of the bythidid *Brosmophysis marginata* on the basis of myomere count and pigmentation. *B. marginata* have 63-65 vertebrae compared with 67-69 for *O. scrippsae* and 86-91 for *C. taylori*. *B. marginata* larvae lack pigment at the finfold margin and have five large blotches along the dorsum, four postanal and ventral blotches, and a diffuse band near the tip of the notochord.

The larval morphology, meristics, and pigmentation patterns of *O. scrippsae* and *C. taylori* are unique to these species. *C. taylori* larvae are proportionately longer and more slender than *O. scrippsae*. Notochord flexion occurs at a much larger size in *C. taylori* larvae (21.1-29.6 mm) than in *O. scrippsae* (9.6-11.5 mm). The gut loop forms at a longer body length in *C. taylori* (ca. 14.1 mm) than in *O. scrippsae* (ca. 7.5 mm). *O. scrippsae* has fewer dorsal fin rays (136-153) and anal fin rays (112-119) than does *C. taylori* (198-216 dorsal and 156-170 anal fin rays). *O. scrippsae* larvae have no pigment in the caudal fin, and the anal fin usually has numerous melanophores, whereas *C. taylori* larvae have caudal fin pigment and little, if any, pigment in the dorsal or anal fins.

Ophidion scrippsae

Morphology. Ophidion scrippsae eggs are slightly off-round with a mean size of 1.00 × 1.06 mm. They possess a homogenous yolk, a wide perivitelline space, and no oil globule. The elongate slender larvae (body depth only 10% of body length) hatch at about 2.5 mm in a relatively undifferentiated state, with eyes incompletely formed and unpigmented. The larvae have a straight tubular gut, a large yolk-sac, and no mouth, branchial apparatus, or pectoral fins. By 3.8 mm (3 days after hatching) the yolk-sac has been absorbed, the eyes are pigmented, and the mouth and pectoral fins have formed (Figure 1). Notochord flexion occurs between 9.6-11.5 mm body length (Table 1). Morphological proportions are summarized in Table 2. Ontogenetic trends show a relative shortening of the gut length, a decrease in the relative eye size, an increase in body depth, and the anterior migration of the pelvic fins.

Timing, positioning, and size at torsion of the gut in ophidiid larvae are useful taxonomic characters (D. J. Gordon, Univ. of Miami, pers. comm.). The gut of *O. scrippsae* coils at a size range of 7.5-8.5 mm on about the 18th day after hatching (Figure 2). Coiling is always in the same direction, with the posterior portion of the gut displaced away from the observer when the left side of the larva is viewed. The single coil occupies a large middle portion of the visceral cavity.

Fin formation and meristics. Dorsal and anal fin pterigiophores begin to ossify by the onset of notochord flexion at about 9.6 mm (Table 3). The full complement of anal fin rays (112-119) and dorsal fin rays (136-153) are ossified near the end of notochord flexion. Pelvic fin buds are visible at the start of notochord flexion, and as growth proceeds one ray of each pair becomes longer. Pectoral fin and principal caudal fin rays begin ossification near the end of the notochord flexion period at ca. 11.5 mm body length. Ossification of the vertebral column begins after notochord flexion. By ca. 15.8 mm, the pectoral and caudal fins attain their full complement of rays (22-24 and 4 + 5, respectively), and the full complement of 67-69 vertebrae is ossifying.

Pigmentation. O. scrippsae larvae are unpigmented at hatching. By the second day (2.8-3.0 mm) small melanophores are forming over the entire body, giving the larvae a speckled appearance. At day 4 (3.6-3.9 mm) serial melanophores are present near the margins of the dorsal and anal fin folds, and along the dorsal and ventral margins of the body (Figure 1). Melanophores are sparse or lacking laterally on the body, and the eyes are becoming pigmented. After gut torsion on about the 18th day (ca. 7.5 mm), little pigment remains in the dorsal fin fold. Melanophores on the anal fin fold and developing anal fin increase in density, and pigment begins to appear over the branchiostegal rays. Body pigment is still primarily at the dorsal and ventral margins, but is becoming more diffuse. By the 45th day (ca. 20.3 mm, Figure 3) a few scattered melanophores appear on top of the brain, and

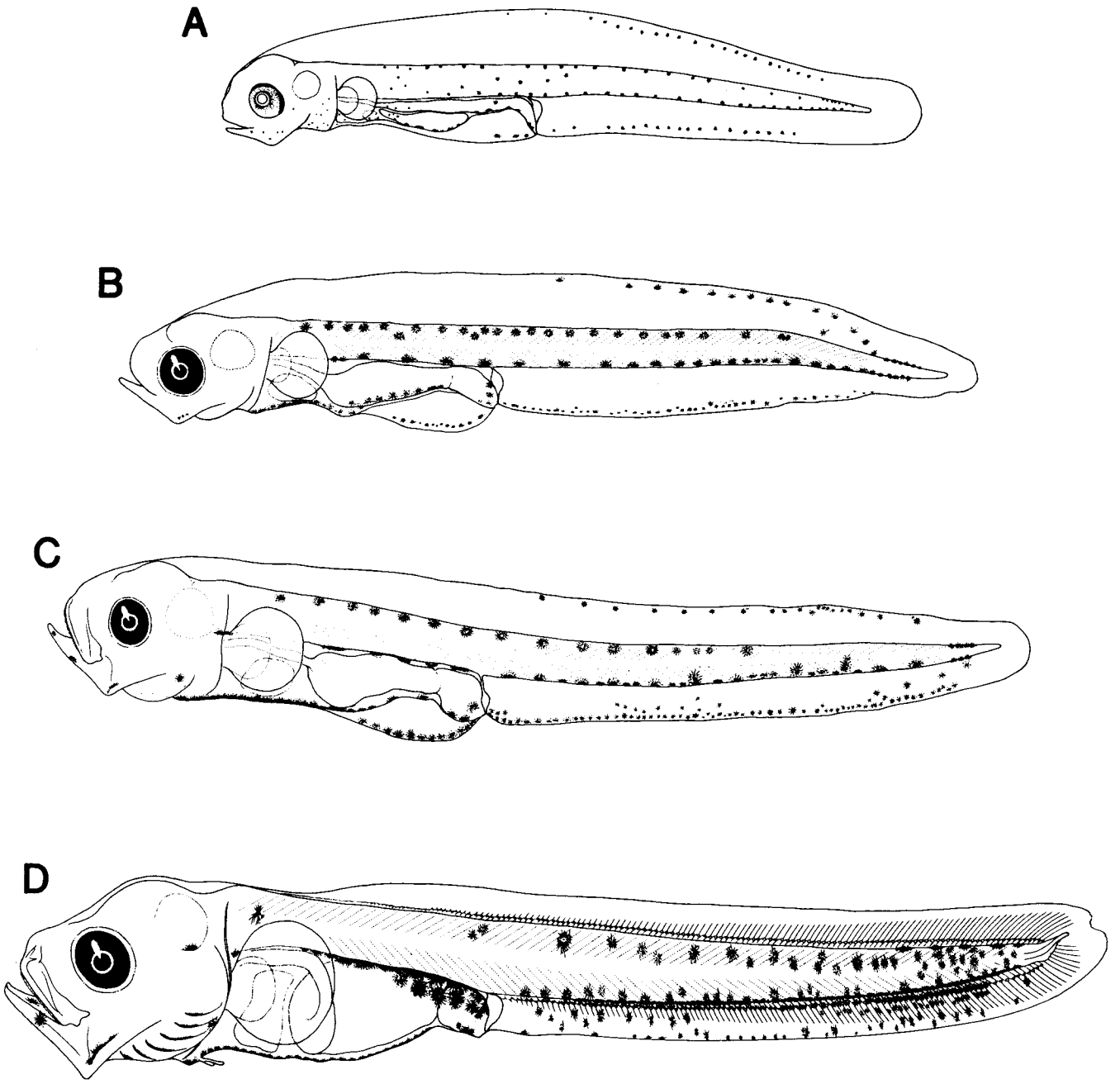

Figure 1. Larvae of *Ophidion scrippsae:* (*A*) 3.8 mm with yolk remnant, day 4; (*B*) 4.8 mm, day 8; (*C*) 7.1 mm, day 14; (*D*) 10.6 mm, day 42.

the ventral surface of the gut becomes less pigmented. The caudal fin remains unpigmented throughout the larval development of *O. scrippsae*.

Xanthophores are conspicuous along the dorsal and ventral body margins and in the dorsal fin fold in living *O. scrippsae* larvae. This pigment fades rapidly after fixation, leaving only the melanophores. By 14.7 mm, the xanthophores highlight the dorsal body surface, and melanophores dominate the anal fin and ventral body, producing a complementary effect similar to that discussed by Moser (1981).

Behavior. O. scrippsae larvae were active water-column feeders, especially around the edges of the tank, until about 36 days after hatching, when they settled to the bottom and lay in wait for their prey. By day 41, many of the larvae had burrowed into the sand at the bottom of the tank, in a manner similar to adult behavior.

TABLE 1
Measurements in mm of Reared Developmental Series of *Ophidion scrippsae*

Age days	Body length	Snout to anus	Head length	Snout length	Eye diameter	Body depth at pectoral fin base	Snout to dorsal fin origin	Snout to anal fin origin	Snout to pelvic fin origin	Pectoral fin length	Pelvic fin length long	Pelvic fin length short	
2	3.2	1.7	.64	.16	.06	.16	—	—	—	—	—	—	yolk-sac
4	3.8	1.8	.60	.12	.22	.36	—	—	—	.12	—	—	yolk-sac
5	4.0	1.8	.62	.16	.22	.42	—	—	—	.16	—	—	
8	4.8	2.1	.76	.18	.26	.44	—	—	—	.24	—	—	
8	5.4	2.5	.86	.26	.26	.54	—	—	—	.20	—	—	
10	6.1	2.8	1.1	.23	.32	.70	—	—	—	.20	—	—	
12	6.7	3.0	1.1	.30	.34	.68	—	—	—	.40	—	—	
14	7.1	3.2	1.2	.40	.32	.86	—	—	—	.40	—	—	
19	7.2	3.2	1.2	.34	.38	.90	—	—	—	.46	—	—	
21	7.5	3.3	1.3	.36	.40	1.0	—	—	—	.60	—	—	
21	7.8	3.3	1.4	.36	.40	1.0	—	—	—	.56	—	—	
16	8.2	3.7	1.3	.44	.38	1.0	—	—	.72	.50	—	—	
24	9.6	4.6	2.2	.72	.48	1.6	3.3	4.6	1.8	.60	—	—	
24	10.0	4.6	1.9	.56	.48	1.7	3.3	4.6	1.9	.60	—	—	
42	10.6	4.9	2.2	.67	.58	1.7	3.3	5.1	1.8	.80	.24	.14	
31	11.0	4.9	2.2	.58	.67	1.8	3.1	5.1	1.9	.80	.26	.14	
36	11.5	5.4	2.4	.76	.67	1.8	3.8	5.4	2.0	1.0	.20	.16	
36	13.2	5.6	2.6	.67	.68	2.2	3.6	5.7	2.3	1.2	.34	.28	
44	15.0	6.2	2.7	.83	.67	2.5	3.8	6.3	2.0	1.1	—	—	
55	15.8	6.3	2.9	.75	.80	2.5	3.9	6.6	2.1	1.0	.72	.56	
55	17.2	6.8	3.2	.90	.83	2.4	4.8	6.8	2.3	1.0	.70	.50	
50	19.6	8.3	3.7	.92	.92	3.2	5.2	7.8	2.1	1.2	1.1	.60	
38	20.3	8.0	3.3	.75	.92	3.3	4.7	7.9	2.1	1.6	.90	.60	
55	21.3	7.8	4.0	1.0	.92	3.1	5.2	8.0	2.1	1.8	1.1	.70	
45	21.7	8.5	4.3	.92	.92	2.8	5.5	8.5	1.8	1.4	1.2	.80	
50	21.9	8.4	4.1	1.0	.93	3.2	5.5	8.5	2.0	1.8	1.2	.80	
43	22.3	8.1	4.1	1.0	.92	2.8	5.0	8.1	2.2	2.0	1.3	.82	
49	22.7	8.7	4.4	1.1	1.0	3.2	6.0	8.7	2.5	2.0	1.6	1.0	
43	23.2	8.7	4.1	1.0	.92	3.2	5.8	9.0	2.6	1.6	1.4	.84	
50	23.2	9.6	4.2	1.0	1.1	3.8	6.5	9.7	1.5	2.0	1.2	.70	
55	24.7	9.3	4.6	1.2	1.0	3.5	6.0	9.2	2.2	2.4	1.6	.80	
50	25.2	9.6	4.6	1.1	1.1	3.8	6.3	9.5	2.1	1.9	1.9	1.0	
50	27.4	11.0	5.4	1.3	1.3	4.3	7.2	11.2	2.0	2.8	2.2	1.2	

Specimens between dashed lines are undergoing notochord flexion.

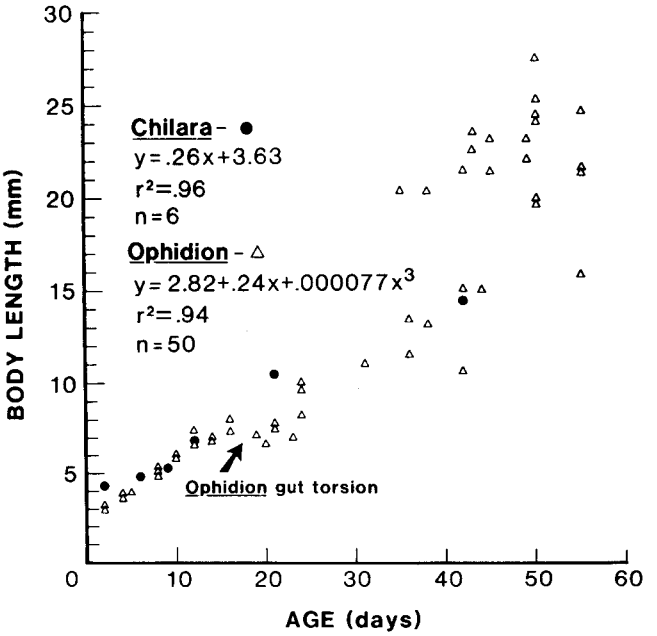

Figure 2. Growth rates of reared *Ophidion scrippsae* and *Chilara taylori*.

Chilara taylori

Morphology. *C taylori* larvae are relatively larger at hatching and at subsequent developmental stages compared with *O. scrippsae* larvae, but follow similar developmental trends such as the anterior migration of the pelvic fins and the relative shortening of the gut length. The gut of *C. taylori* begins to loop at ca. 13.3 mm. Looping is in the same direction as in *O. scrippsae*, but the coil is relatively smaller and is usually located slightly more posteriad in the visceral cavity. Notochord flexion occurs at ca. 20-30 mm body length (Table 4). Morphologial proportions are summarized in Table 2.

Fin formation and meristics. Dorsal and anal fin pterigiophores begin to ossify before notochord flexion at ca. 15.1 mm. Full anal fin (156-170) and dorsal fin (198-216) ray complements are ossifying near the end of notochord flexion at 29.6 mm (Table 3). Pelvic fin buds become visible at the start of flexion, and one ray is longer than the other in each pair by ca. 29.0 mm. Pectoral fin and principal caudal fin rays

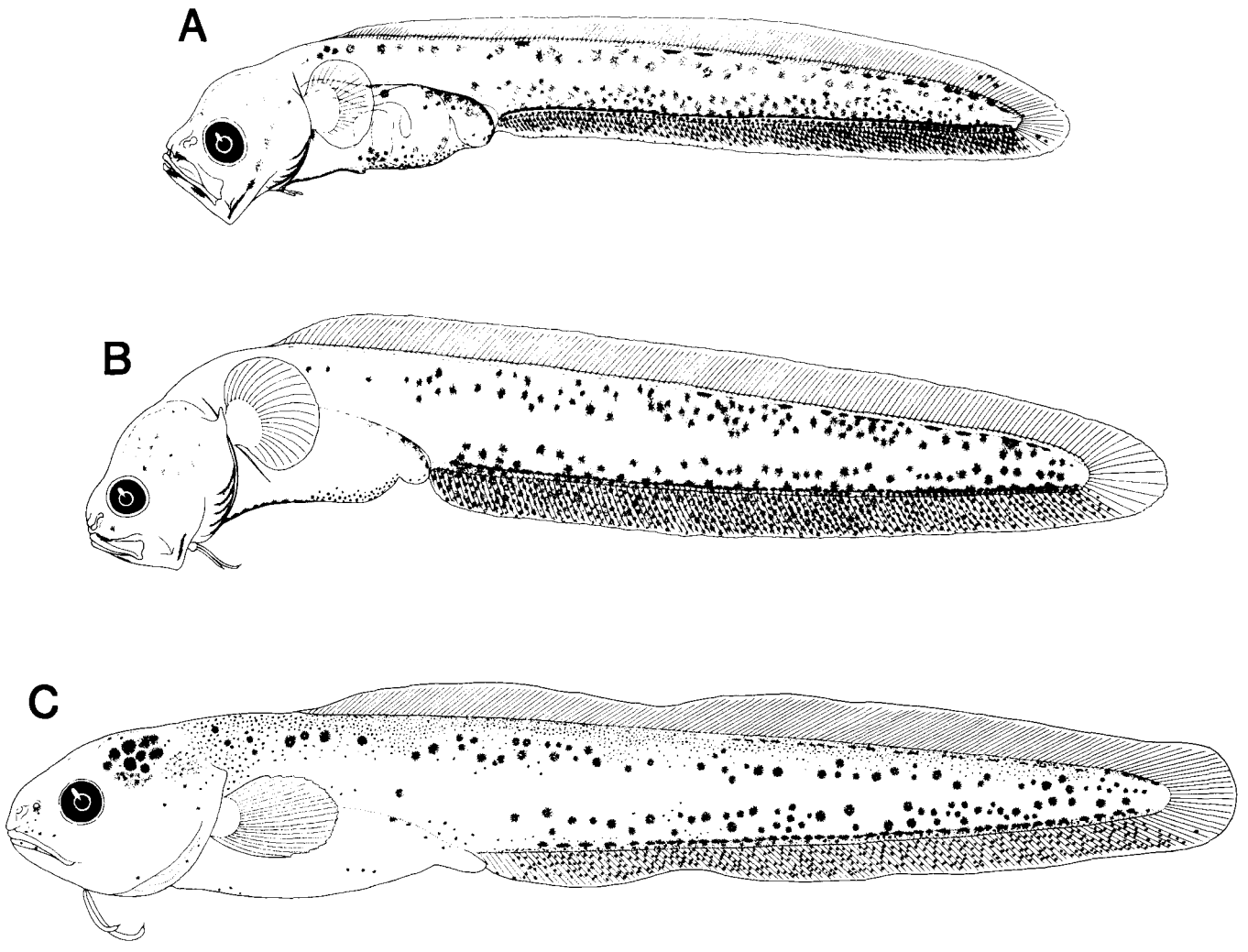

Figure 3. Developmental stages of *Ophidion scrippsae:* (*A*) 15.0-mm larva, day 44; (*B*) 20.3-mm larva, day 35; (*C*) 27.4-mm juvenile, day 50.

TABLE 2
Body Proportions of Larvae of *Ophidion scrippsae* and *Chilara taylori*

Body proportion	N	Snout to anus / body length	Head length / body length	Snout length / head length	Eye diameter / head length	Body depth at pectoral fin base / body length	Snout to dorsal fin / body length	Snout to anal fin / body length	Snout to pelvic fin / body length	Pectoral fin height / body length
Ophidion scrippsae										
Preflexion	12	45.5 ± 2.68 (42-53)	16.9 ± 1.24 (16-20)	26.8 ± 4.22 (20-34)	29.4 ± 7.04 (9-37)	10.7 ± 2.31 (5-13)	—	—	8.9 N = 1	5.3 ± 1.62 N = 11 (3-8)
Flexion	5	46.4 ± 1.14 (45-48)	20.8 ± 1.48 (19-23)	30.0 ± 2.74 (26-33)	26.2 ± 3.03 (22-30)	16.4 ± 0.55 (16-17)	31.8 ± 2.39 (28-34)	47.0 ± 1.00 (46-48)	17.8 ± 1.10 (17-19)	7.2 ± 1.30 (6-9)
Postflexion	16	39.2 ± 1.76 (36-42)	18.6 ± 1.02 (16-20)	24.9 ± 2.21 (21-31)	24.3 ± 2.14 (21-28)	15.1 ± 1.29 (13-17)	25.3 ± 1.66 (22-28)	39.6 ± 2.00 (36-43)	10.4 ± 2.73 (6-17)	7.9 ± 1.41 (6-10)
Chilara taylori										
Preflexion	24	38.7 ± 3.25 (31-44)	12.5 ± 1.69 (8-15)	25.1 ± 4.48 (14-31)	31.5 ± 5.58 (23-41)	8.2 ± .97 (7-9) N = 22	26.5 N = 1	35.9 N = 1	12.9 N = 1	3.4 ± .91 (2-5) N = 22
Flexion	3	30.7 ± 1.53 (29-32)	11.7 ± 1.15 (11-13)	28.7 ± 2.52 (26-31)	23.7 ± 2.08 (22-26)	7.3 ± .58 (7-8)	18.0 ± 3.61 (15-22)	31.0 ± 3.00 (28-34)	10.0 ± 2.00 (8-12)	2.7 ± .58 (2-3)
Postflexion	3	27.3 ± 2.08 (25-29)	12.3 ± 1.53 (11-14)	24.7 ± 3.21 (21-27)	23.3 ± 2.89 (20-25)	7.3 ± .58 (7-8)	17.0 ± 0 (17)	27.7 ± 1.53 (26-29)	7.3 ± .58 (7-8)	2.7 ± .58 (2-3)

Values are expressed as percentage of body or head length (mean, standard deviation, and range).

TABLE 3
Meristics of Larvae of *Ophidion scrippsae* and *Chilara taylori*

Size (mm)	Dorsal fin	Anal fin	Pectoral fin	Caudal fin	Vertebrae	Branchiostegal rays	Gill rakers
Ophidion scrippsae							
4.0	—	—	—	—	—	—	—
6.1	—	—	—	—	—	—	—
7.8	—	—	—	—	—	4	—
9.6	104	96	—	—	—	7	—
11.5	138	118	5	2 + 5	—	7	0 + 5
15.8	139	113	24	4 + 5	67	7	0 + 5
19.6	146	116	22	4 + 5	67	7	3 + 5
21.9	148	117	22	4 + 5	67	7	2 + 6
24.7	141	112	22	4 + 5	67	7	3 + 7
Adult complement	136-153	112-119	22-25	4 + 5	67-69	7	—
Chilara taylori							
4.6	—	—	—	—	—	—	—
7.6	—	—	—	—	—	—	—
10.4	—	—	—	—	—	—	—
14.1	—	—	—	—	—	6	—
21.1	180	163	6	3 + 5	—	7	0 + 7
29.6	203	168	22	4 + 5	—	7	0 + 8
32.6	203	162	22	4 + 5	—	7	0 + 8
36.1	210	168	22	4 + 5	91	7	0 + 7
47.0	204	163	25	4 + 5	90	7	3 + 8
Adult complement	198-216	156-170	22-25	4 + 5	86-91	7	1-4 + 5-9

Specimens between dashed lines are undergoing notochord flexion.

TABLE 4
Measurements in mm of Developmental Series of *Chilara taylori*

Station or age (day)	Body length	Snout to anus	Head length	Snout length	Eye diameter	Body depth at pectoral fin base	Snout to dorsal fin origin	Snout to anal fin origin	Snout to pelvic fin origin	Pectoral fin length	Pelvic fin length long	Pelvic fin length short
5910- 80.52	3.6	1.1	.28	.04	.08	.32	—	—	—	—	—	—
7510- 97.50	3.9	1.6	.44	.12	.18	.24	—	—	—	—	—	—
6310- 80.51	4.3	1.7	.60	.12	.22	.38	—	—	—	.14	—	—
2	4.3	1.9	.63	.12	.24	.38	—	—	—	.12	—	—
6706-120.35	4.6	1.8	.60	.10	.20	.44	—	—	—	.12	—	—
6	4.8	2.0	.72	.16	.24	.41	—	—	—	.20	—	—
4	5.0	2.2	.68	.13	.24	.38	—	—	—	.20	—	—
9	5.2	2.2	.68	.16	.28	.40	—	—	—	.24	—	—
6706-120.35	5.6	2.3	.64	.16	.24	.60	—	—	—	.24	—	—
Bathtub Rock	6.7	2.7	.72	.17	.26	.52	—	—	—	.26	—	—
12	7.3	2.8	.90	.28	.30	.48	—	—	—	.40	—	—
6706-120.35	7.6	3.1	.76	.20	.28	.60	—	—	—	.28	—	—
6310- 80.51	8.2	3.3	.96	.24	.28	.64	—	—	—	.20	—	—
6310- 80.51	9.7	3.6	1.00	.28	.32	.68	—	—	—	.28	—	—
21	10.4	3.9	1.30	.37	.40	.76	—	—	—	.48	—	—
5711- 87.36	10.5	4.2	1.40	.40	.36	.80	—	—	—	.32	—	—
7207-117.40	10.6	3.7	1.28	.40	.37	1.00	—	—	—	.40	—	—
5910- 80.52	12.1	4.8	1.72	.68	.40	.96	—	—	—	.34	—	—
6107-93.55	12.6	4.6	1.48	.40	.36	.88	—	—	—	.34	—	—
6310- 80.51	13.3	5.0	1.80	.44	.42	1.00	—	—	—	.34	—	—
6609-113.65	14.1	5.0	2.00	.58	.50	1.17	—	—	—	.36	—	—
42	14.4	5.5	2.00	.58	.60	1.20	—	—	—	.48	—	—
6210- 77.55	15.0	5.0	2.00	.56	.48	1.16	—	—	—	.36	—	—
6110- 83.55	15.1	5.3	2.00	.56	.52	1.24	4.00	5.42	1.96	.28	—	—
6706-113.35	21.1	6.7	2.67	.83	.58	1.50	4.60	7.08	2.48	.53	.20	—
6210- 80.60	22.5	7.0	2.58	.76	.60	1.56	3.80	7.08	2.20	.52	—	—
6110- 83.70	29.6	8.6	3.25	.83	.83	2.25	4.50	8.33	2.50	.88	.28	.14
5206-107.55	32.6	9.3	3.75	1.00	.92	2.50	5.67	9.42	2.33	1.00	.44	.24
6908- 73.60	36.1	10.0	4.00	.83	1.00	2.67	6.17	10.00	3.00	.88	.68	.52
6110- 63.60	47.0	11.8	6.50	1.69	1.33	3.33	8.00	12.17	3.08	1.24	1.48	1.04

Specimens between dashed lines are undergoing notochord flexion.

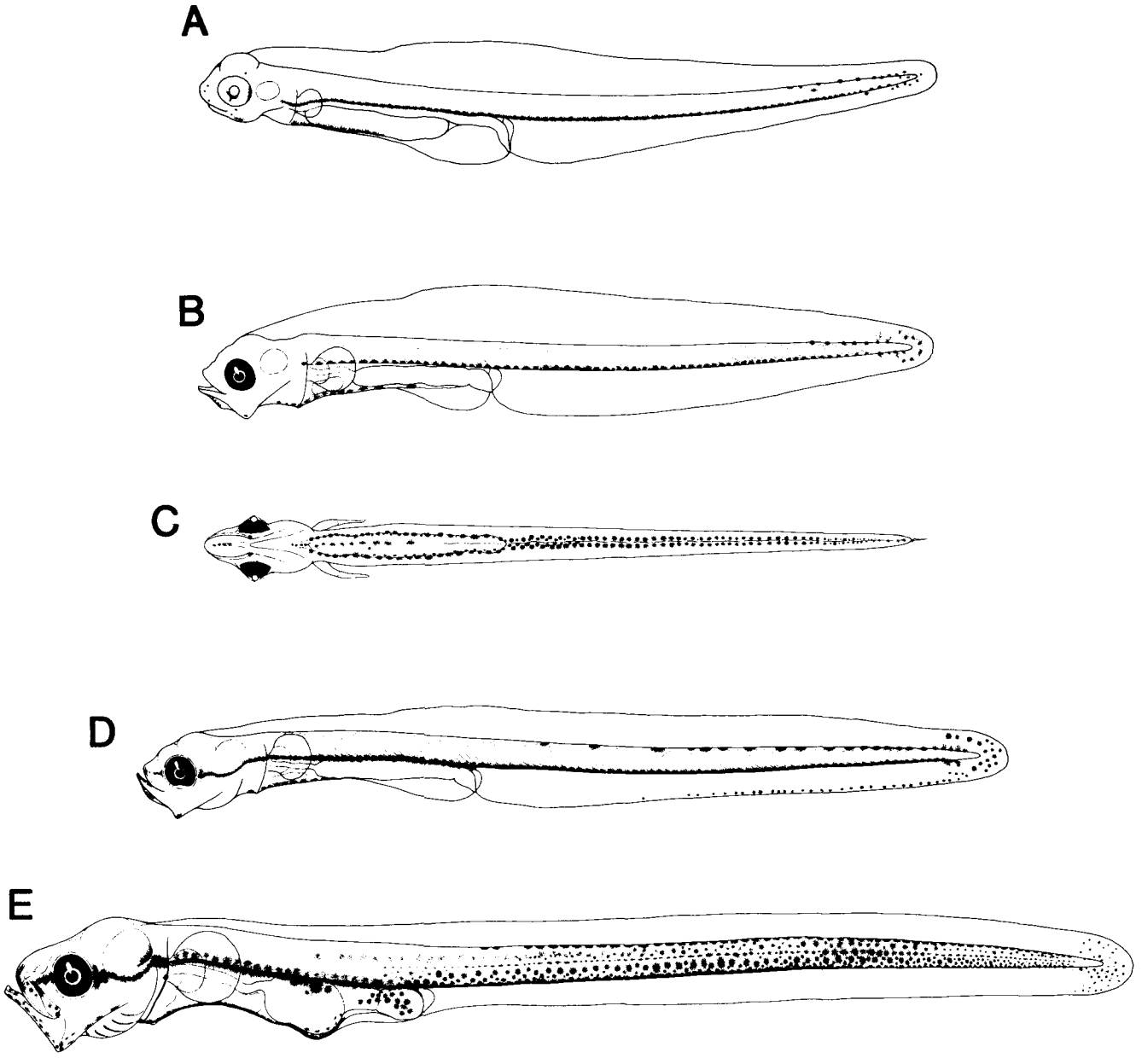

Figure 4. Larvae of *Chilara taylori:* (*A*) 5.0 mm with yolk remnant, day 4; (*B*) 4.8 mm, day 6; (*C*) 4.8 mm, day 6; (*D*) 7.3 mm, day 12; (*E*) 14.4 mm, day 42.

begin to ossify early during the notochord flexion period at ca. 21.1 mm. The adult complement of 4 + 5 principal caudal rays is formed near the end of notochord flexion at ca. 29.6 mm. Ossification of the vertebral column begins after the completion of notochord flexion, and the full complement of 86-91 vertebrae is ossified by 36.1 mm.

Pigmentation. Yolk-sac *C. taylori* larvae have unpigmented eyes and melanophores along the ventral region of the body (Figure 4). By the 6th day after hatching the eyes are pigmented; the yolk-sac has been absorbed; stellate melanophores are frequently present in the caudal fin fold; and two serial rows of ventral melanophores become quite conspicuous. Pigment appears in the angular region of the jaw at about this time and persists throughout larval development. By ca. 6.0 mm, the ventral body pigment line extends anteriorly along the base of the brain and onto the snout. This head pigment persists until at least 15.0 mm but is usually lost by 21.0 mm. By 10.6 mm, the lateral midline becomes pigmented in the caudal region, and the ventral body melanophores increase in number. By 14.4 mm, the caudal region is highly pigmented, and the characteristic lateral midline stripe

is heavier. Ventral body pigment decreases and becomes more scattered by 36.1 mm. The dorsal fin fold remains unpigmented throughout larval development, whereas the characteristic caudal fin pigment persists from as early as 4.8 mm. Xanthophores highlight the dorsal and ventral body surfaces of living *C. taylori* larvae.

DISTRIBUTION

Ophidiid larvae occur in comparatively low numbers in CalCOFI samples; however, this probably reflects the relatively low sampling effort in the nearshore region inhabited by these fish. *O. scrippsae* occurred in only 24 (1%) and *C. taylori* in 16 (0.7%) of the 2,361 tows made seaward to station 50 on all CalCOFI lines occupied during 1972-78 (Figure 5). Forty-five *O. scrippsae* larvae were collected in these tows: 4% were captured in June, 7% in August, and 89% in October. Distribution centered around points and capes from San Diego to the vicinity of Magdalena Bay, and around the inshore areas of Viscaino Bay and San Cristobal Bay.

During the same period, 22 *C. taylori* larvae were collected: 4% were taken in February, 4% in July, 28% in August, and 60% in October. Distribution centered around Punta Eugenia at Viscaino Bay, but larvae were collected as far north as Cape Flattery, Washington, and south to San Cristobal Bay. *C. taylori* larvae were collected farther offshore than the majority of the *O. scrippsae* larvae; however, the larval size of both species appeared to be independent of the distance offshore.

The CalCOFI stations at which larval cusk eels were captured tended to be in areas where the adult habitat extended farther offshore either at points of land or in the vicinity of bays where the shelves are broader.

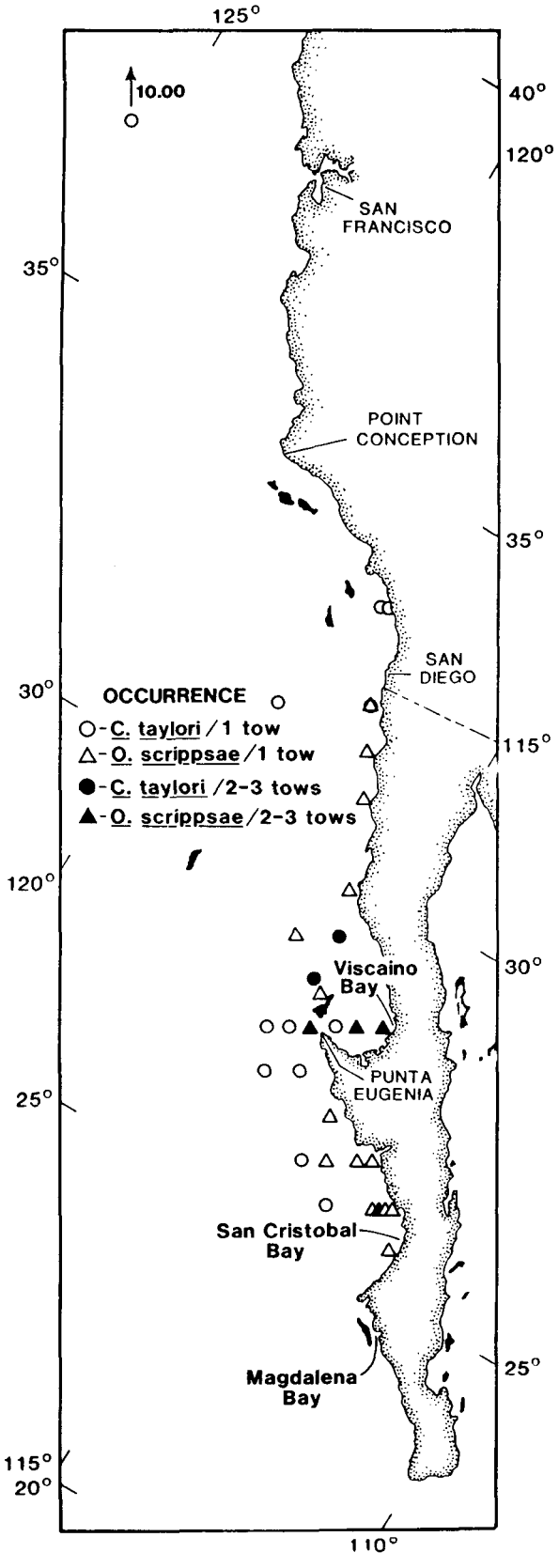

Figure 5. Distribution of *Chilara taylori* and *Ophidion scrippsae* larvae in CalCOFI tows made during 1972-78.

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