

**GROUP II :**

**1a.** A prominent blackish blotch, sometimes ocellated, above and behind pectoral fin base; anus slightly removed from anal fin; underside of snout naked; antero-lateral snout margin completely supported by bone

**2a.** Dorsal fin high, spinous second ray about as long as, or longer than, head length

**3a.** Dorsal snout profile straight or slightly convex, snout not especially long, about equal to or slightly longer than orbit diameter

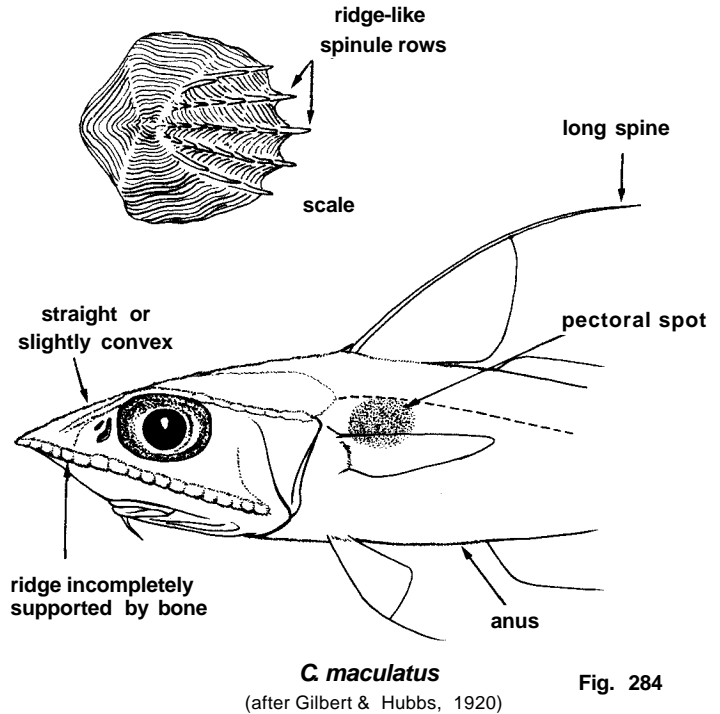
**4a.** Five or fewer strong spinous ridges on scales ... *C. maculatus* (Fig. 284)

**4b.** Five to 11 low ridges on scales .... *C. velifer* (Fig. 285)

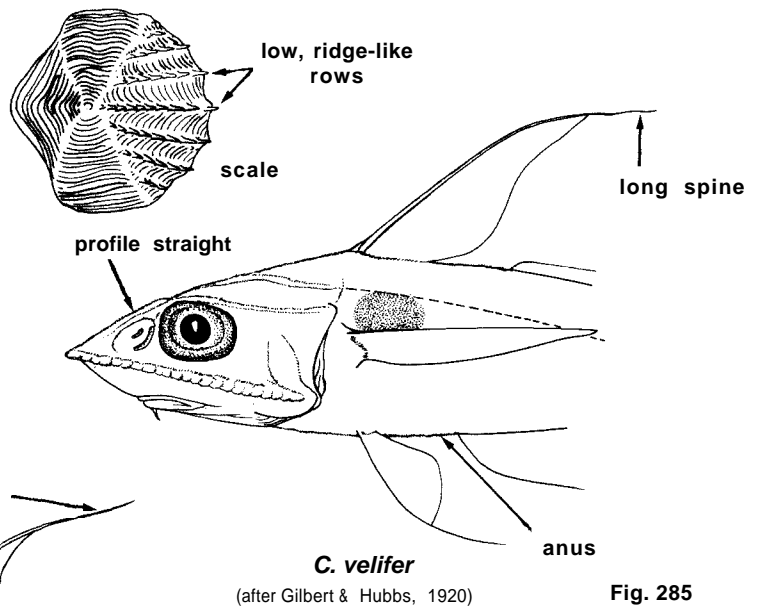
**3b.** Dorsal snout profile distinctly concave; snout length distinctly longer than orbit diameter

**5a.** Pectoral fin rays 14 or 15; pelvic rays 6; the 2 posterior saddlemarks rather indistinct .... *C. sexradiatus* (Fig. 286)

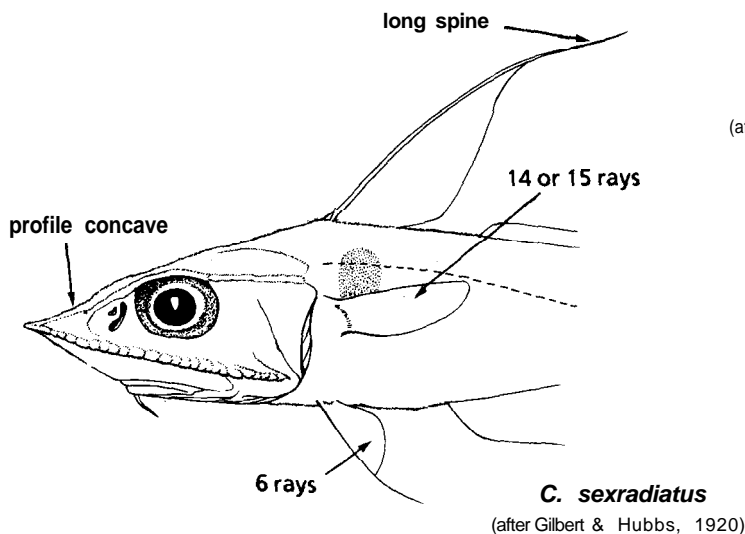
**5b.** Pectoral fin rays 16 or 17; pelvic rays 7; the saddlemarks prominent or rather indistinct



**Fig. 284**



**Fig. 285**



**Fig. 286**

6a. Pectoral spot narrow, occupying 4 to 6 oblique scale rows; snout long, slender, sharply pointed, its length about 2.3 times in head length ..... *C. triocellatus* (Fig. 287)

6b. Pectoral spot broad, occupying 6 to 8 oblique scale rows; snout shorter, broader, 2.4 to 2.7 times in head length

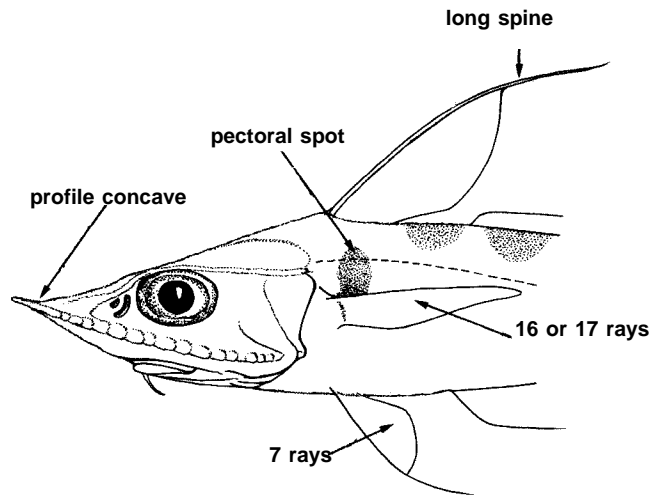
7a. Pectoral spot and saddles prominent; snout 2.7 times in head length ..... *C. notatus* (Fig. 288)

7b. Pectoral spot and saddles rather indistinct; snout 2.4 times in head length ..... *C. dorsalis* (Fig. 289)

2b. First dorsal height moderate, less than head length, usually about equal to postrostral length of head

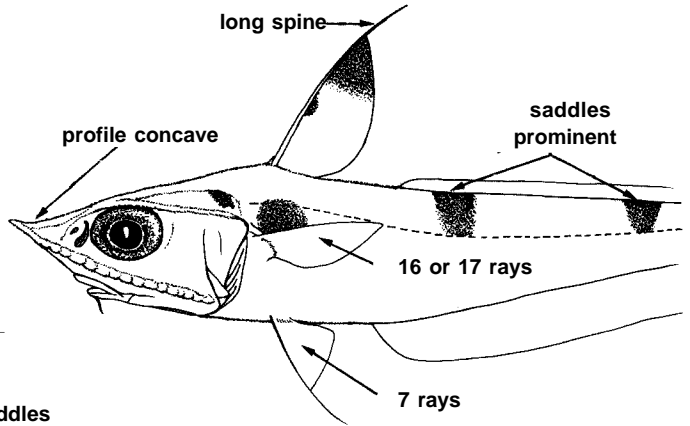
8a. Snout long and sharply pointed, the length 1.5 times or more the orbit diameter ..... *C. argus* (Fig. 290)

8b. Snout moderate, terminal scute broad and blunt viewed dorsally



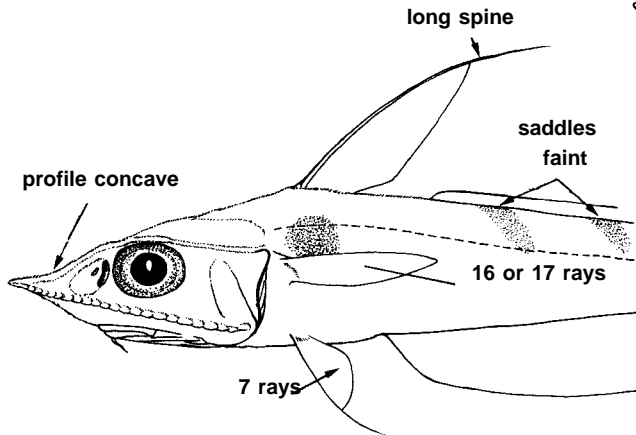
*C. triocellatus*  
(after Gilbert & Hubbs, 1920)

Fig. 287



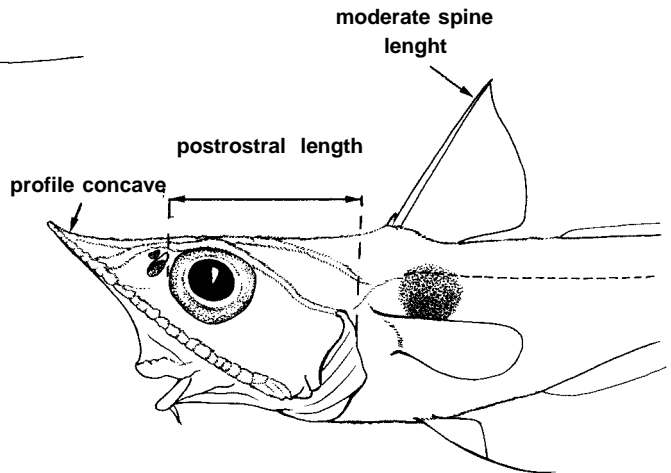
*C. notatus*  
(after Radcliffe, 1912)

Fig. 288



*C. dorsalis*  
(after Gilbert & Hubbs, 1920)

Fig. 289



*C. argus*  
(after Weber & de Beaufort, 1929)

Fig. 290

9a. Mouth cavity whitish .....*C. kishinouyei*  
(Fig. 291)

9b. Mouth cavity blackish ..... *C. macrolepis*  
(Fig. 292)

1b. No blackish blotch behind pectoral base; saddles, bars or stripes in some

10a. Snout rather short and usually blunt, its length about equal to or much shorter than large orbit

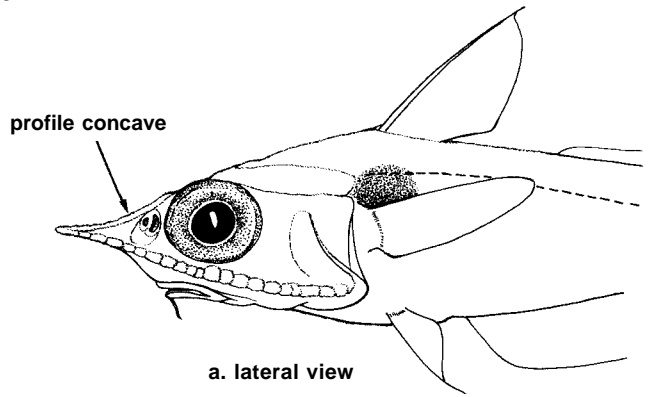
11a. Underside of head completely scaled

12a. No prominent markings on body; anus far removed from anal fin, about equidistant from pelvic fin bases and anal fin, or closer to pelvic fin bases; jaw teeth in 2 or 3 series ..... *C. macrochir*  
(Fig. 293)

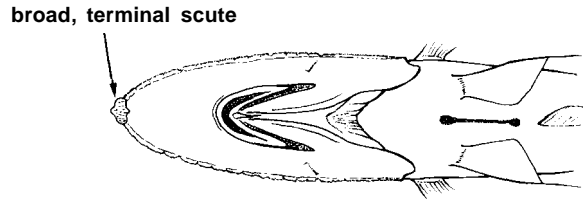
12b. Prominent bands, stripes or saddle markings on body; anus immediately before or slightly removed from anal fin, but decidedly closer to anal than to pelvic fin bases

13a. Banded pattern (sometimes faint) along entire trunk and tail, the diagonal bands extending down and forward ... *C. aspercephalus*  
(Fig. 294)

13b. Two prominent saddle marks or narrow longitudinal stripes on body



a. lateral view



b. underside

*C. kishinouyei*

(after Okamura, 1970a)

Fig. 291

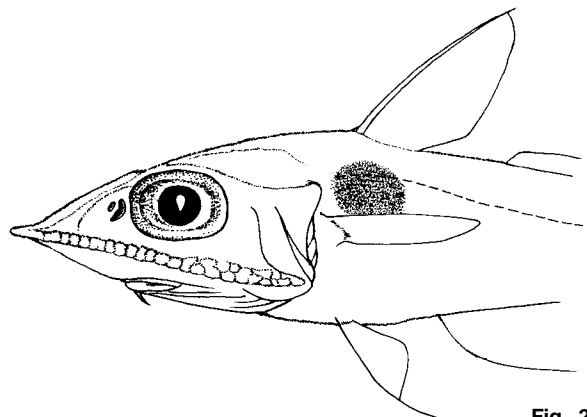
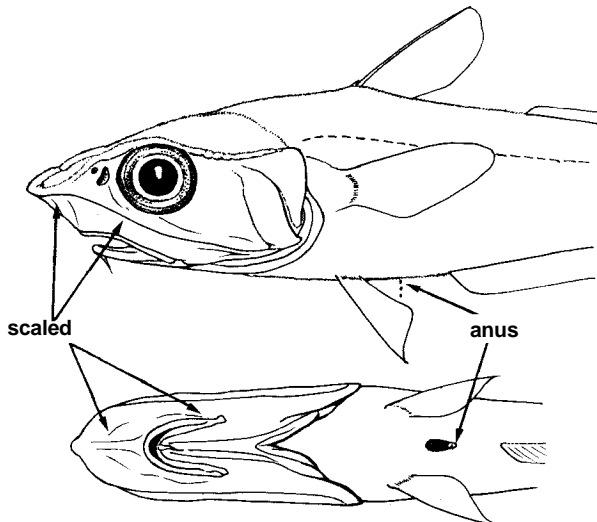


Fig. 292

*C. macrolepis*

(after Gilbert & Hubbs, 1920)

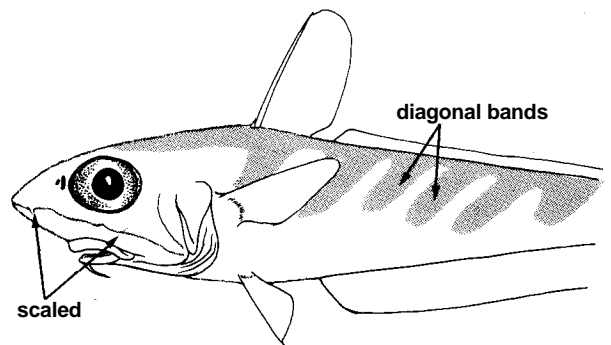


underside

*C. macrochir*

(after Okamura, 1970a)

Fig. 293



*C. aspercephalus*

(after Waite, 1911)

Fig. 294

14a. Two prominent saddle marks on body, one on nape anterior to first dorsal fin, the other below anterior end of second dorsal fin ..... *C. biclinozonalis* (Fig. 295)

14b. Fine longitudinal stripes along body ..... *C. australis* (Fig. 296)

11b. Underside of head essentially completely naked (except for a small patch of scales above mouth angle in *C. mirus* and a second narrow patch on preopercle in *C. bollonsi*)

15a. A small patch of scales above mouth angle extending posteriorly onto preopercle; no body markings ..... *C. mirus* (Fig. 297)

15b. Underside of head completely naked, or 2 small patches on each side; body markings present or absent

16a. No body markings in adults ..... *C. bollonsi* (Fig. 298)

16b. Dark saddle marks on body

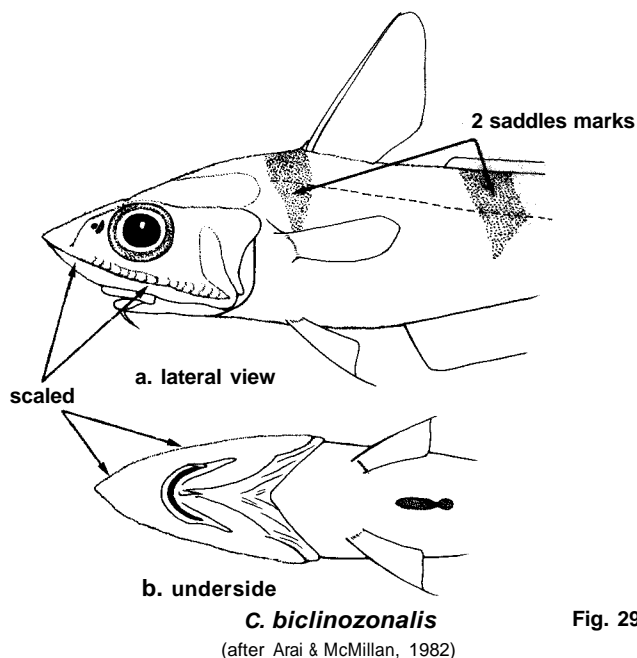


Fig. 295

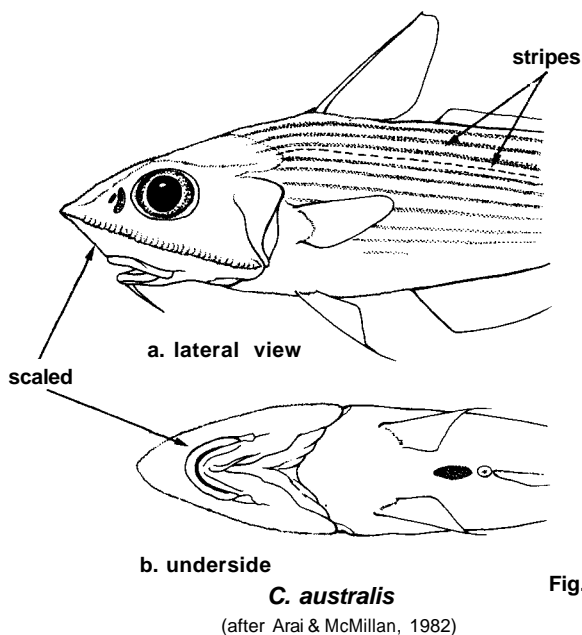


Fig. 296

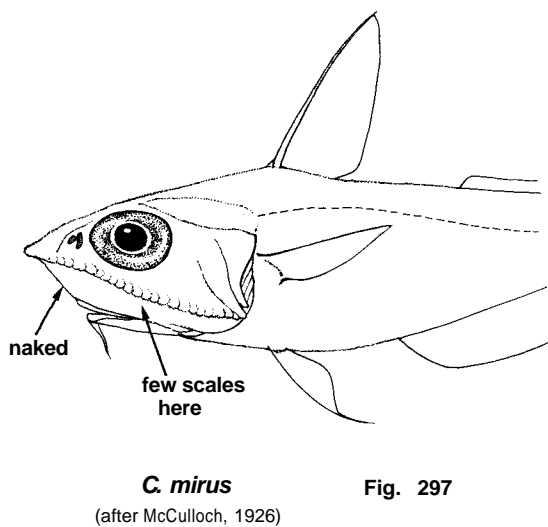


Fig. 297

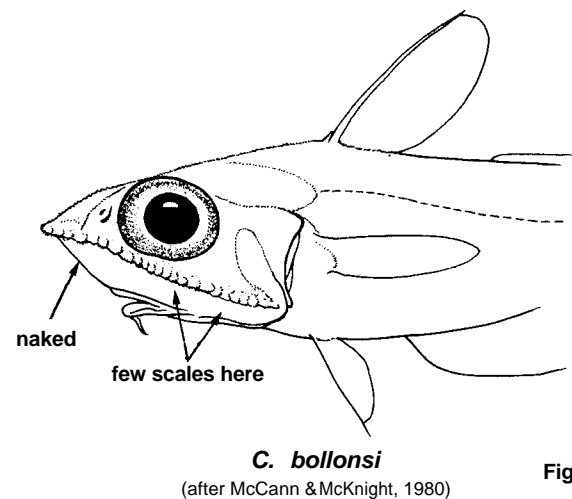


Fig. 298

17a. Median row of predorsal scales with prominent enlarged spinule ridge .... *C. fasciatus* (Fig. 299)

17b. Median predorsal scales lacking large spinule rows..... *C. cookianus* (Fig. 300)

10b. Snout long and sharply pointed, its length more than 1.3 times the orbit diameter

18a. Underside of head completely scaled

19a. Anterolateral snout margins completely supported by bone

20a. Scales on top of head (between occipital ridges and most of snout) with a single sharp, keel-like ridge; scale rows below second dorsal fin 5.5 to 7.5 ..... *C. japonicus* (Fig. 301)

20b. Scales on top of head with several diverging rows of high, bladelike spinules; scale rows below second dorsal fin 4.5 to 5.5..... *C. smithi* (Fig. 302)

19b. Anterolateral snout margins incompletely supported by bone

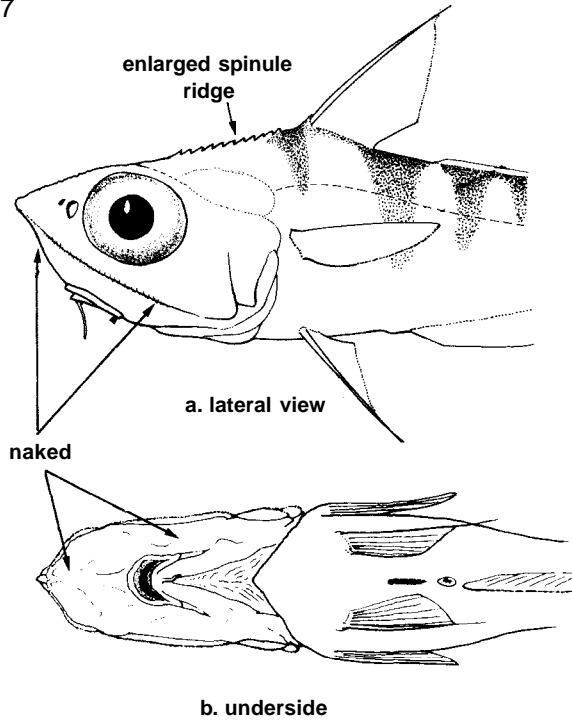


Fig. 299

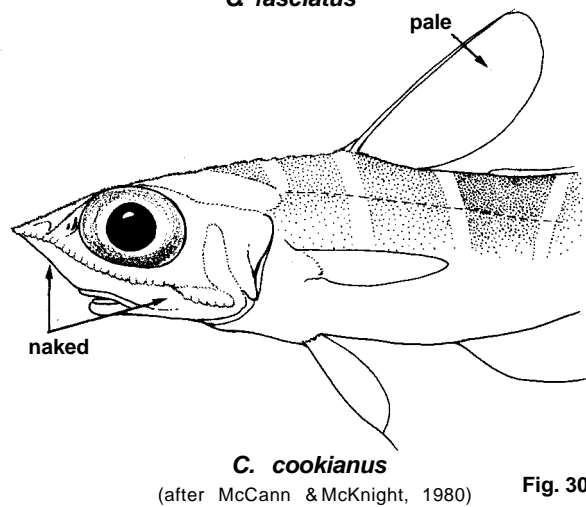


Fig. 300

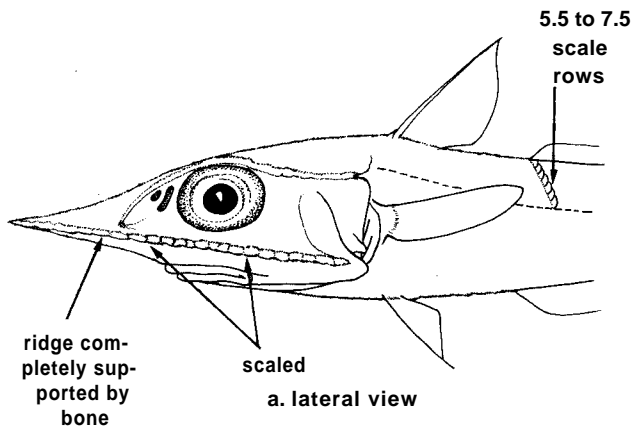
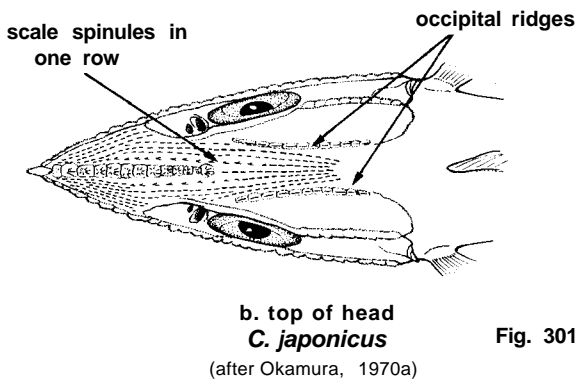


Fig. 301



(after Okamura, 1970a)

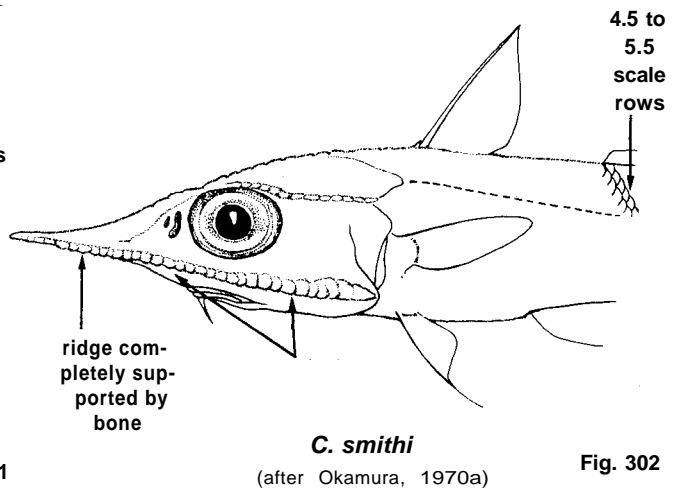
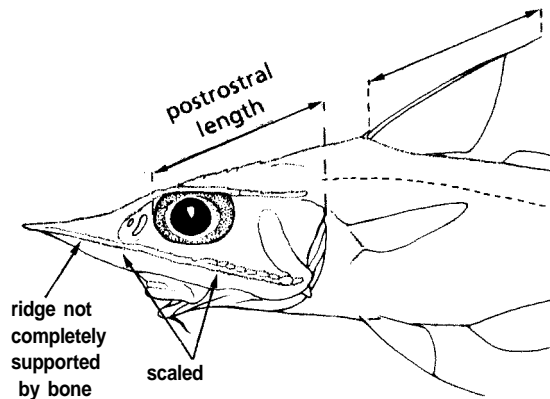


Fig. 302

*C. smithi*  
(after Okamura, 1970a)

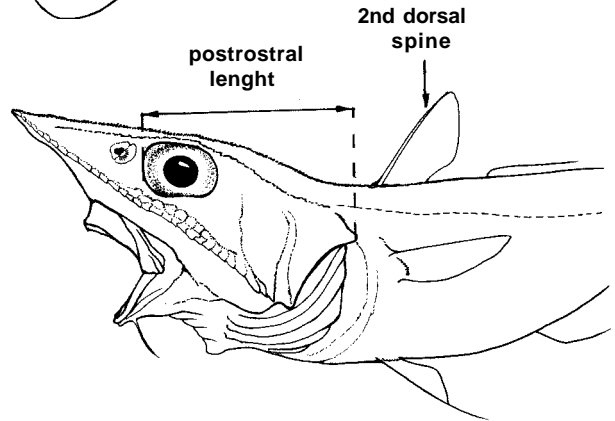
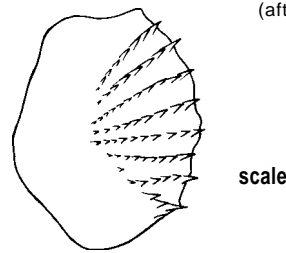
21a. Spinous second ray of first dorsal fin longer than postrostral length of head; upper jaw shorter than orbit diameter; scales on top of head with isolated, lanceolate spinules, not aligned into longitudinal series ..... **C. braueri** (Fig. 303)



**C. braueri**  
(after Trunov, 1983)

Fig. 303

21b. Spinous second ray of first dorsal fin shorter than postrostral length of head; upper jaw longer than orbit diameter; scales on top of head with small spinules closely adpressed and imbricate so as to form a long, serrated median longitudinal ridge and 0 to 2 shorter divergent ridges on either side of median ridge ..... **C. flabellispinis** (Fig. 304)



**C. flabellispinis**  
(after Alcock, 1899)

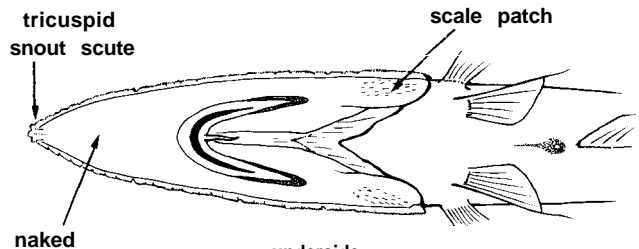
Fig. 304

18b. Underside of head mostly naked (a small patch on preopercle or scattered small scales above mouth and posteriorly onto preopercle in some)

22a. Prominent vertical bars on body (indistinct in largest individuals of **C. longicephalus**); terminal snout scute blunt and tricuspid; usually a small crescent-shaped patch of scales on ventral surface of preopercle (Fig.305)

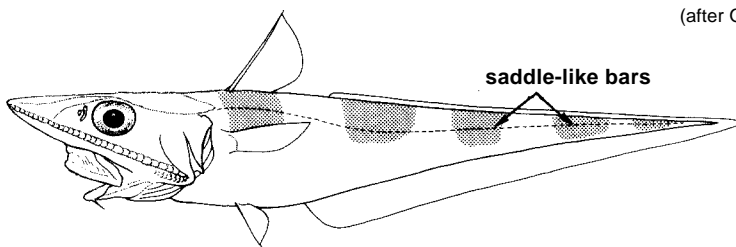
23a. Snout long, 2.2 to 2.3 times in head length; orbits 4.6 to 4.9 times in head length, 2.0 to 2.2 times in snout length, 0.9 to 1.0 times in interorbital width ..... **C. longicephalus** (Fig. 306)

23b. Snout 2.3 to 2.7 times in head length; orbits 3.7 to 4.6 times in head length, 1.4 to 1.9 times in snout length, 1.0 to 1.4 times in interorbital width



underside  
**C. tokiensis**  
(after Okamura, 1970b)

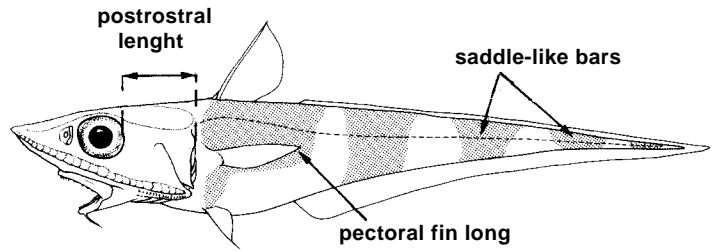
Fig. 305



**C. longicephalus**  
(after Okamura, Amaoka & Mitani, 1982)

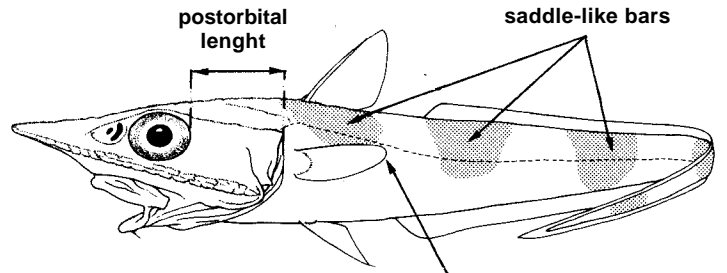
Fig. 306

24a. Snout length 2.4 to 2.7 times in head length; orbit diameter 1.4 to 1.7 times in snout length; pectoral fin much longer than postorbital length of head ..... ***C. hexfasciatus*** (Fig. 307)



***C. hexfasciatus*** Fig. 307  
(after Okamura, Amaoka & Mitani, 1982)

24b. Snout length 2.3 to 2.5 times in head length; orbit diameter 1.7 to 1.9 times in snout length; pectoral fin about equal to postorbital length of head ..... ***C. tokiensis*** (Fig. 308)

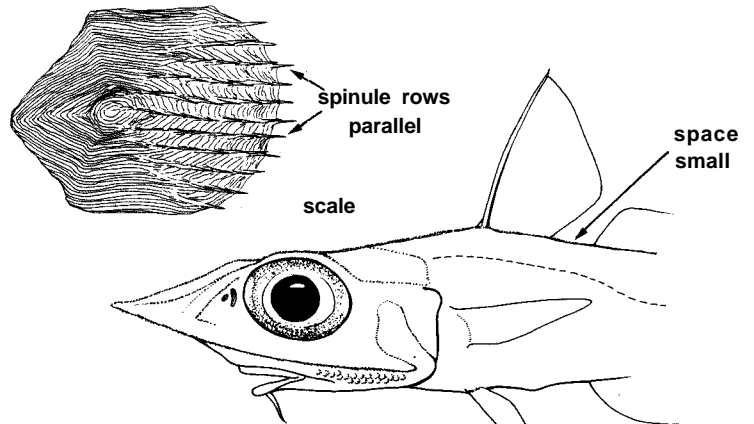


***C. tokiensis*** Fig. 308  
(after Okamura, 1970a)

22b. Body without prominent vertical bars; terminal snout scute sharply pointed; underside of head naked or with small, scattered scales posteriorly

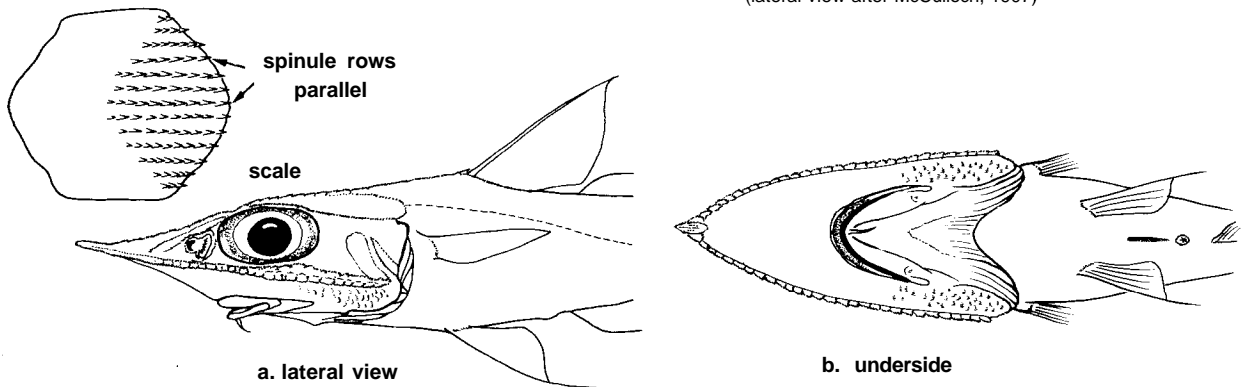
25a. Body scales with small spinules in 10 or more parallel rows in adults; interspace between dorsal fins decidedly less than length of first dorsal fin base; second dorsal fin almost as high anteriorly as anal fin

26a. Spinules on body scales slender, needle-like, distalmost ones projecting well beyond scale margin; orbit 1.2 to 1.3 times in snout length ..... ***C. innotabilis*** (Fig. 309)



***C. innotabilis*** Fig. 309  
(lateral view after McCulloch, 1907)

26b. Spinules on body scales short, low, bullet-shaped, distalmost ones little if at all projecting beyond scale margin; orbit 1.3 to 1.6 times in snout length ..... ***C. karrerae*** (Fig. 310)



***C. karrerae*** (after Trunov, 1984) Fig. 310

27a. Nasal fossa naked; snout 38.5 to 41% of head length; barbel 34.5 to 50% of orbit diameter; pyloric caeca 40 to 50 ..... **C. asteroides** (Fig. 311)  
**C. hige**

27b. Nasal fossa scaled ventrally; snout 40 to 45.5% of head length; barbel 25 to 43% of orbit diameter; pyloric caeca 20 to 30

28a. Scales on body with broad, bladelike spinules in 4 to 10 divergent rows; snout length 40 to 43.5% of head length; upper jaw 25 to 27% of head length; barbel 33 to 43% of orbit diameter ..... **C. anatirostris** (Fig. 312)

28b. Scales on body with relatively narrow spinules in 3 to 5 divergent rows; snout length 43.5 to 45.5% of head length; upper jaw 21.7 to 23.3% of head length; barbel 25 to 33.3% of orbit diameter ..... **C. productus** (Fig. 313)

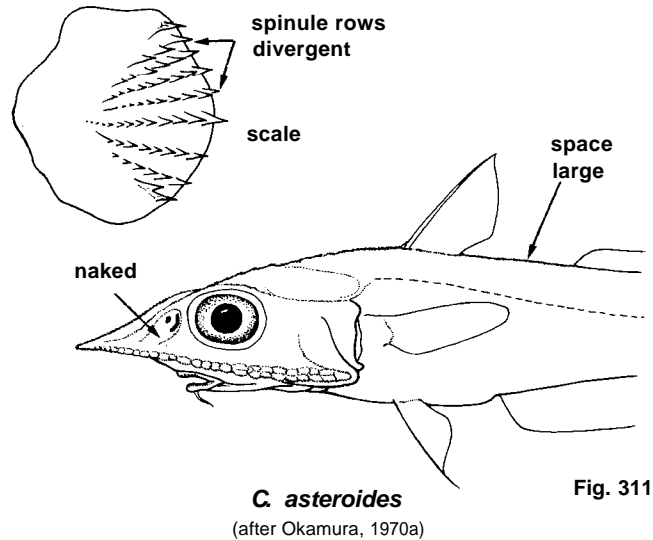


Fig. 311

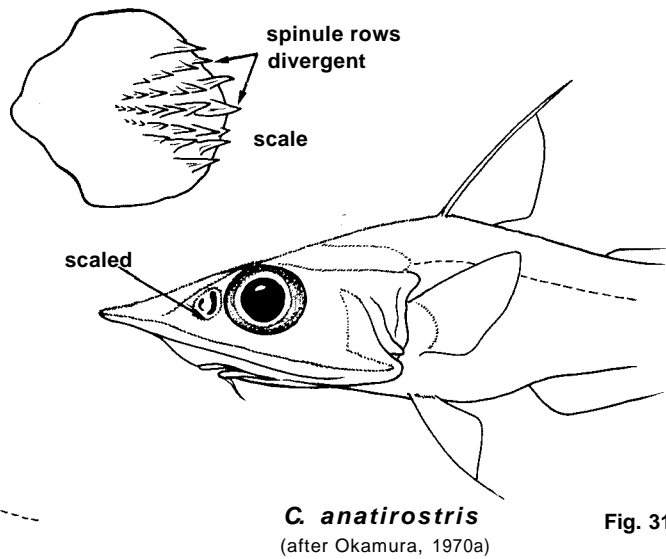


Fig. 312

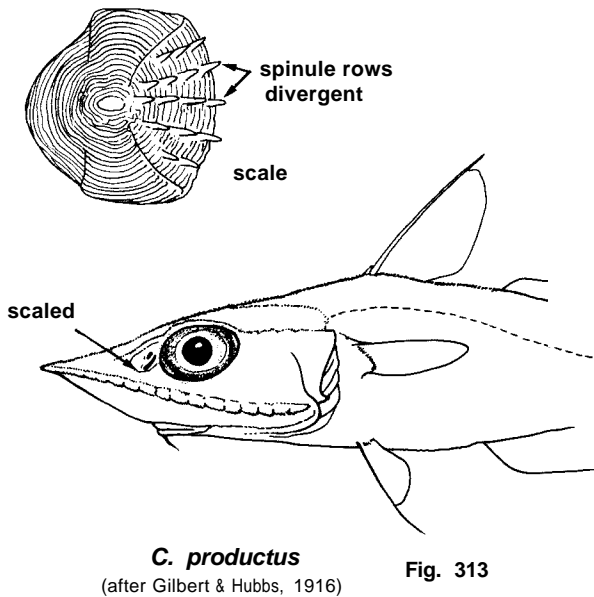
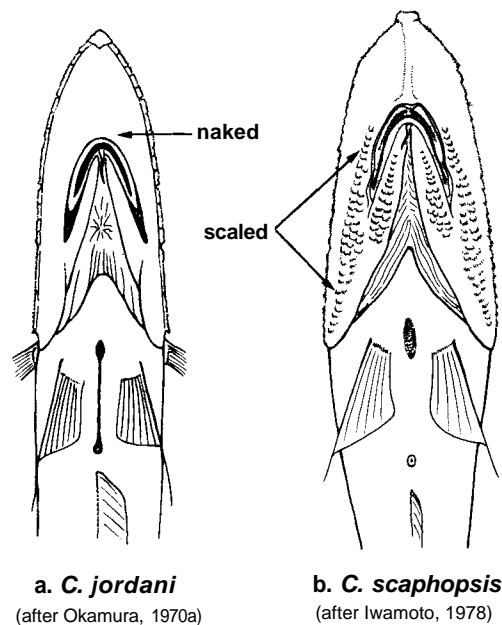


Fig. 313



a. *C. jordani*  
(after Okamura, 1970a)

b. *C. scaphopsis*  
(after Iwamoto, 1978)

underside

Fig. 314

GROUP III :

1a. Underside of head naked (Fig.314a)

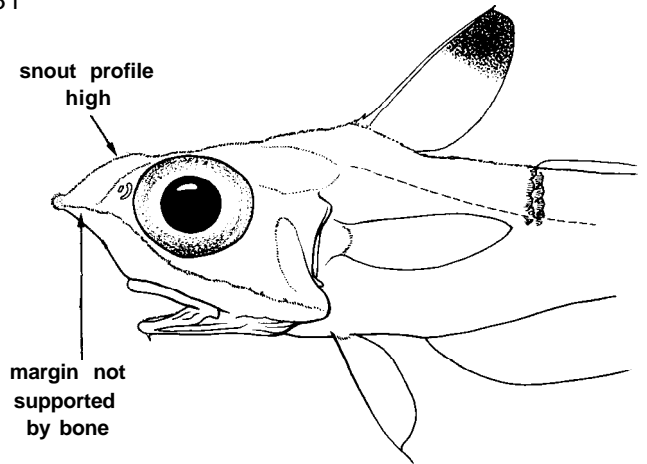


2a. Snout rather bluntly pointed, its dorsal profile convex and highly arched (Fig.315); scales with 5 to 7 divergent rows of small spinules (Fig.316a); anterolateral margins of snout incompletely supported by bone (Fig.315, see also 317b) ..... **C. oliverianus** (Fig. 315)

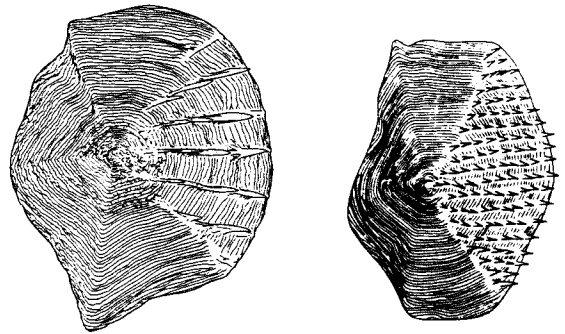
2b. Snout sharply pointed, its dorsal profile concave (Figs 318, 319); scales with 6 to 24 parallel or weakly divergent rows of small spinules (Fig.316b); anterolateral margins of snout completely supported by bone (Fig.317a)

3a. Orbit large, about equal to snout and longer than postorbital length of head; pectoral spot large, about 2/3 of orbit diameter. .... **C. kishinouyei** (Fig. 318)

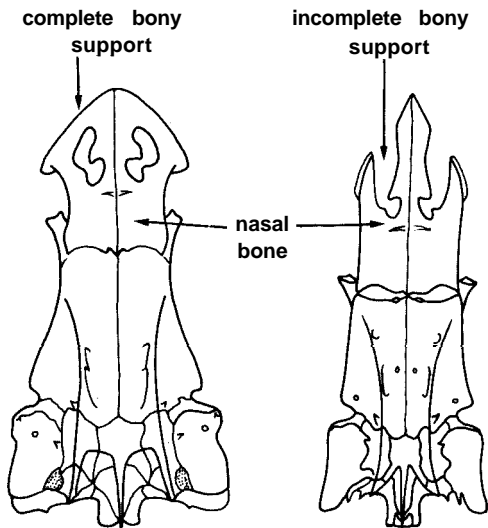
3b. Orbit less than snout and postorbital length; pectoral spot small, often obscure and lacking in females. . . **C. jordani** (Fig. 319)



**C. oliverianus** Fig. 315

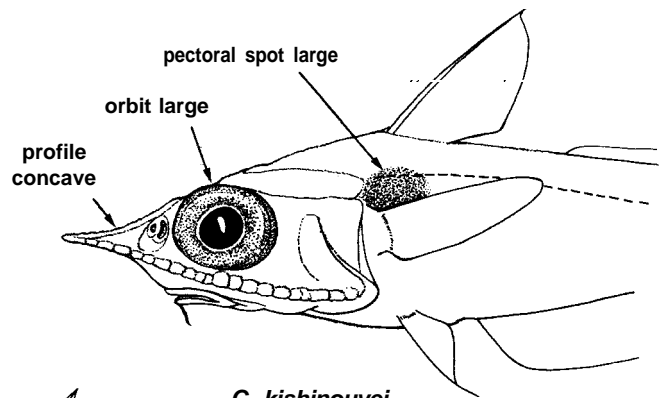


a. **C. oliverianus** b. **C. jordani** (from Okamura, 1970a) scales Fig. 316

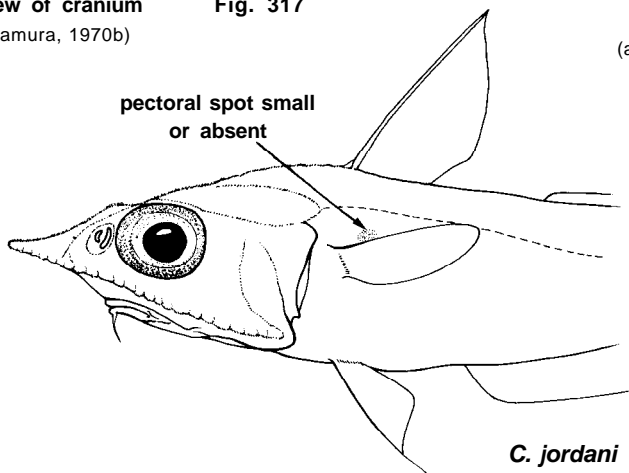


a. **C. kishinouyei** b. **C. multispinulosus**

dorsal view of cranium Fig. 317 (from Okamura, 1970b)



**C. kishinouyei** (after Okamura, 1970a) Fig. 318



**C. jordani** (after Okamura, 1970a) Fig. 319

1b. Underside of head mostly scaled (underside of snout naked in some) (Fig.314b)

4a. Median nasal ridge scales broad (Fig.320a); a narrow median strip of punctuations on underside of snout; a black median stripe connecting dorsal fins .... **C. ventrilux** (Fig. 321)

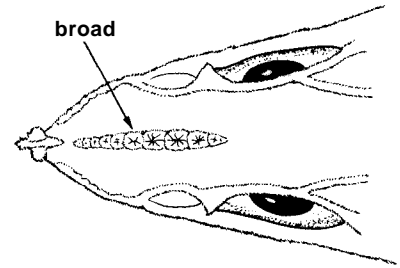
4b. Median nasal ridge scales narrow (Fig.320b,c); underside of snout and interdorsal space not marked by dark stripes

5a. Terminal snout scute elongated (Fig. 320b), the median prong much longer than the lateral ones ..... **C. caribbaeus** (Fig. 322)

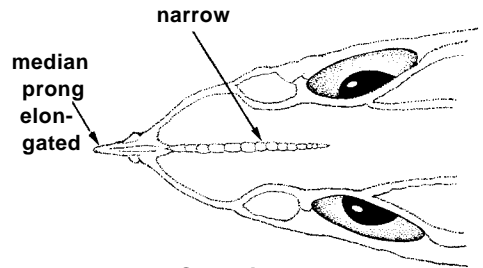
5b. Terminal snout scute distinctly 3-armed, the lateral arms about as long as the median arm (Fig.320c)

6a. Underside of snout completely naked

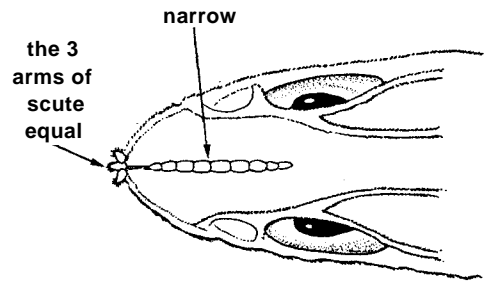
7a. Head covering thin, mostly transparent; head mostly naked or covered with thin, non-spinulated scales; base of tongue black anteriorly..**C. canus** (Fig. 323)



a. **C. ventrilux**



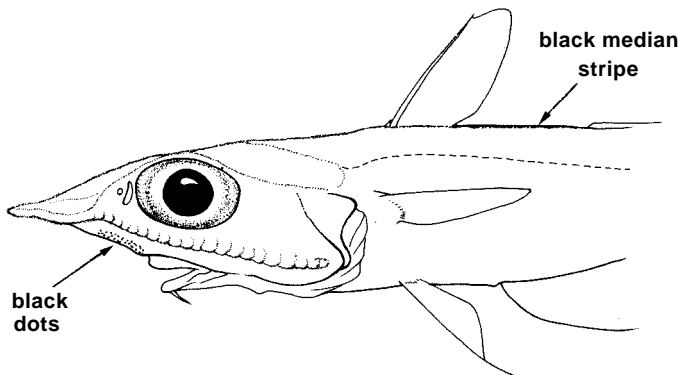
b. **C. caribbaeus**



c. **C. coelorinchus**  
top of head

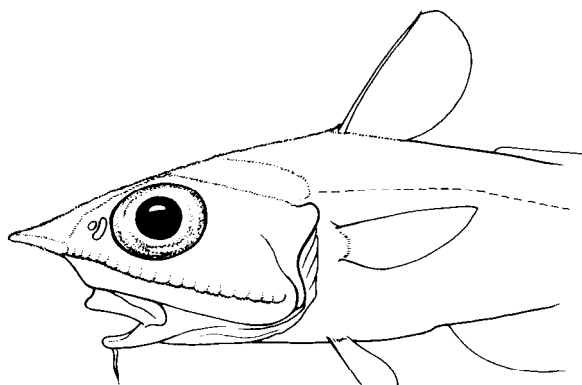
Fig. 320

(after Marshall & Iwamoto in Marshall, 1973)



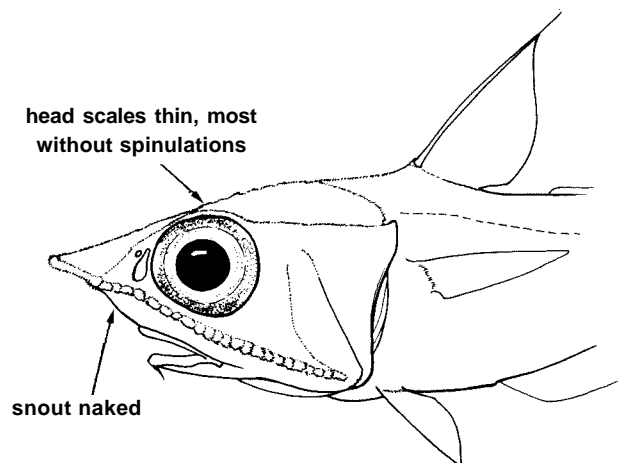
**C. ventrilux** Fig. 321

(after Marshall & Iwamoto in Marshall, 1973)



**C. caribbaeus** Fig. 322

(after Goode & Bean, 1896)



**C. canus** Fig. 323

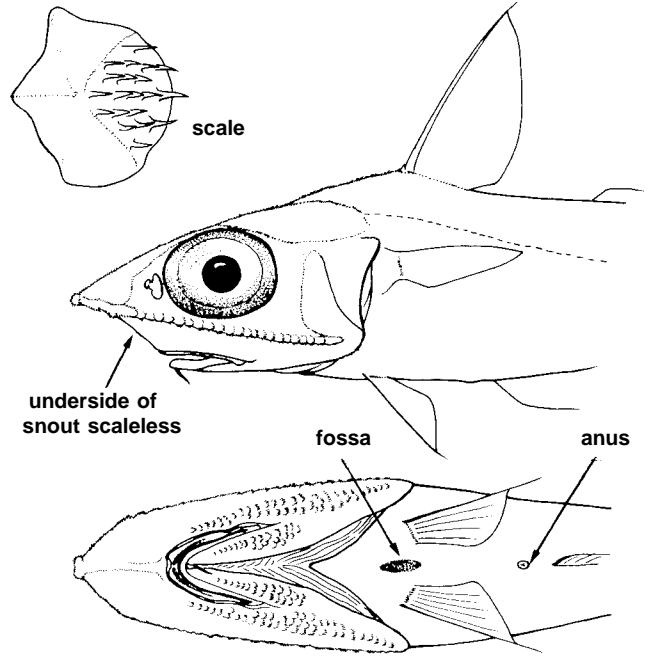
(after Garman, 1899)

7b. Head covering rather thick, opaque; head dorsally almost entirely covered with coarsely spinulated scales; entire floor of mouth pale ... **C. scaphopsis** (Fig. 324)

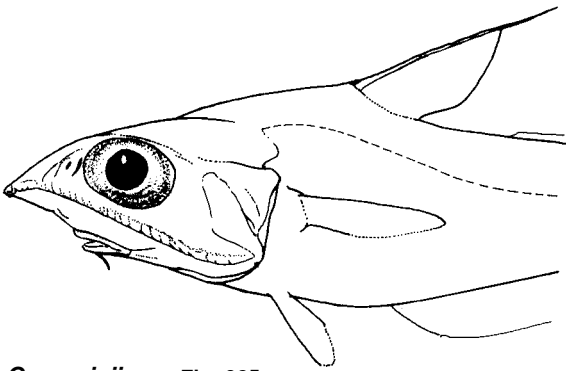
6b. Underside of snout mostly scaled, although often a narrow, naked median strip present

8a. Gillrakers on outer arch 10 to 13 total ..... **C. marinii** (Fig. 325)

8b. Gillrakers on outer arch 10 or fewer ..... **C. coelorinchus** (Fig. 326)



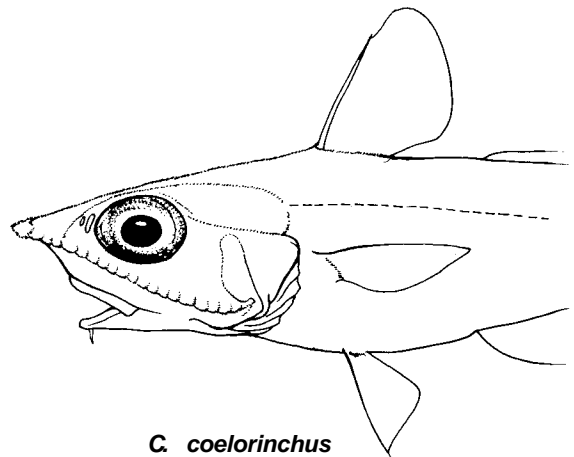
underside **C. scaphopsis** Fig. 324 (after Iwamoto, 1978)



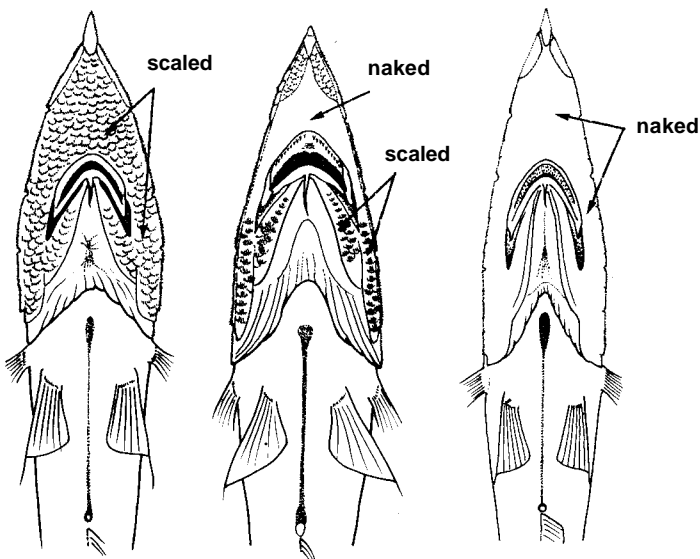
**C. marinii** Fig. 325

GROUP IV :

1a. Underside of head completely or almost completely scaled (Fig 327a,b)



**C. coelorinchus** Fig. 326 (after Goode & Bean, 1896)



a. **C. quincunciatus** b. **C. formosanus** c. **C. longissimus**

underside (after Okamura, 1970b) Fig. 327

2a. Posterior portion of underside of head from above and behind mouth angle scaled (Fig. 327b) ..... **C. formosanus** (Fig. 328)

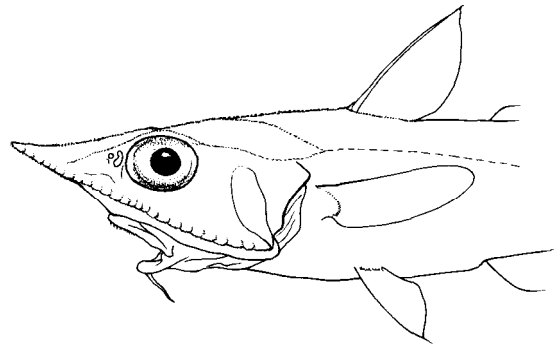
2b. Entire underside of head scaled (Fig.327a)

3a. Mandibular rami completely scaled (Fig. 327a); snout 2.3 to 2.55 times in head length; orbit 1.3 to 1.7 times in postorbital length of head; upper jaw 3.3 to 3.7 times in head length; pyloric caeca 8 to 11.....**C. quincunciatus** (Fig. 329)

3b. Mandibular rami generally not scaled anteriorly; snout 2.1 to 2.2 times in head length; orbit 1.05 to 1.2 times in postorbital length of head; upper jaw 4.05 to 4.35 times in head length; pyloric caeca 14 to 22...**C. thompsoni** (Fig. 330)

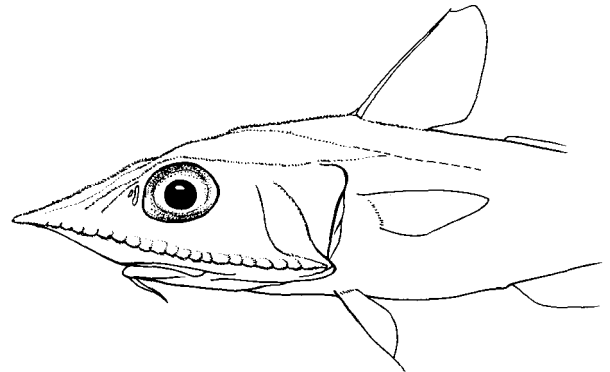
1b. Underside of head completely naked (Fig. 327c)

4a. Anterolateral margin of snout completely supported by bone (Fig.331a)..**C. acutirostris** (Fig. 332)



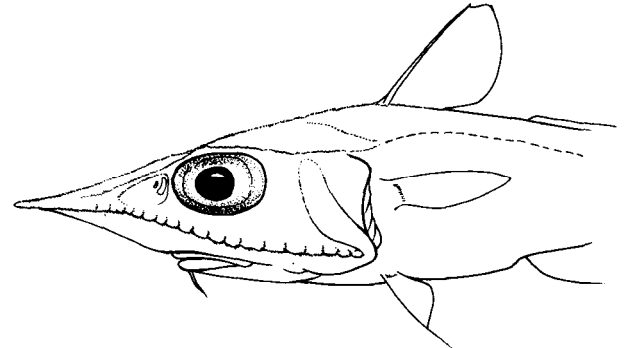
**C. formosanus**  
(after Okamura, 1970a)

Fig. 328



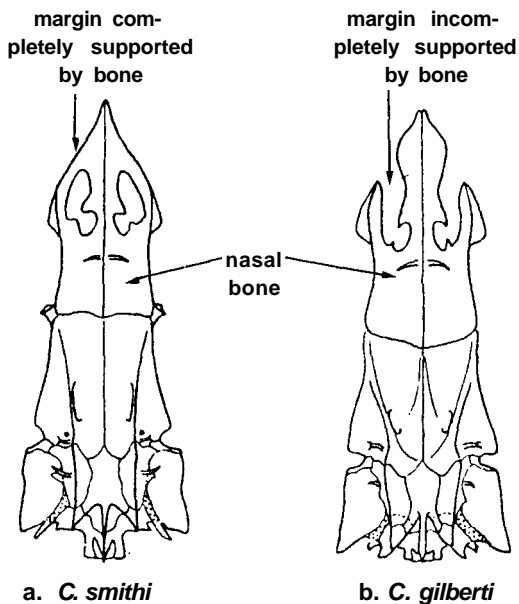
**C. quincunciatus**  
(after Gilbert & Hubbs, 1920)

Fig. 329



**C. thompsoni**  
(after Gilbert & Hubbs, 1920)

Fig. 330

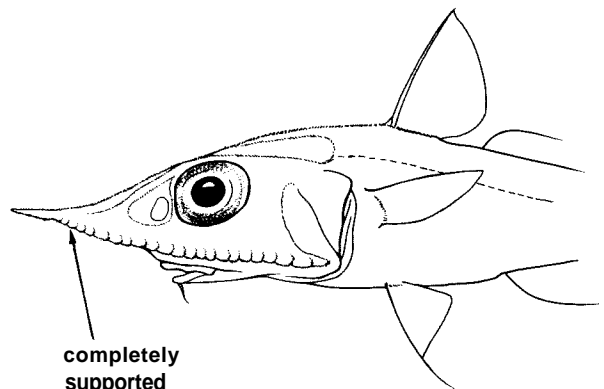


a. **C. smithi**

b. **C. gilberti**

dorsal view of cranium  
(after Okamura, 1970b)

Fig. 331



completely supported by bone

**C. acutirostris**  
(after Radcliffe, 1912)

Fig. 332

4b. Anterolateral margin of snout incompletely supported by bone (Fig.331 b)

5a. A prominent, round pectoral blotch present (Fig.333); subopercle prolonged posteroventrally into a distinct narrow flap (Figs 333, 334)

6a. Snout 1.9 times in head length; orbit 4.6 to 4.9 times in head length; upper jaw less than orbit diameter, 4.7 to 5.2 times in head length; mouth pale.....**C. gladius** (Fig. 333)

6b. Snout 2.1 to 2.7 times in head length; orbit 3.5 to 4.1 times in head length; upper jaw about equal to orbit diameter, 3.7 to 4.6 times in head length; mouth greyish ..... **C. matsubarai** (Fig. 334)

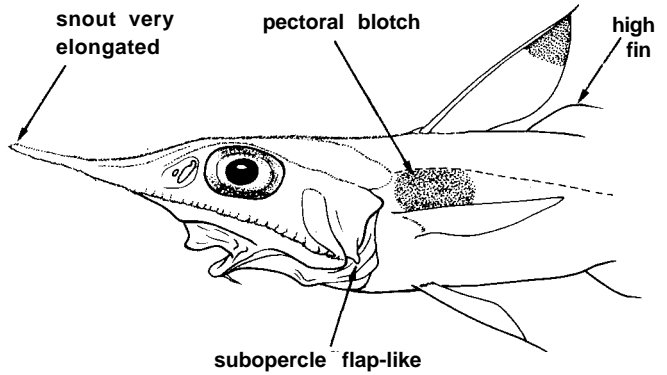
5b. No pectoral blotch; subopercle prolonged into a short flap or not prolonged

7a. Upper jaw distinctly longer than orbit diameter

8a. Body markings prominent, consisting in adults of longitudinally aligned blotches, vermiculations, and rings that form roughly 3 irregular, broken stripes..**C. multispinulosus** (Fig. 335)

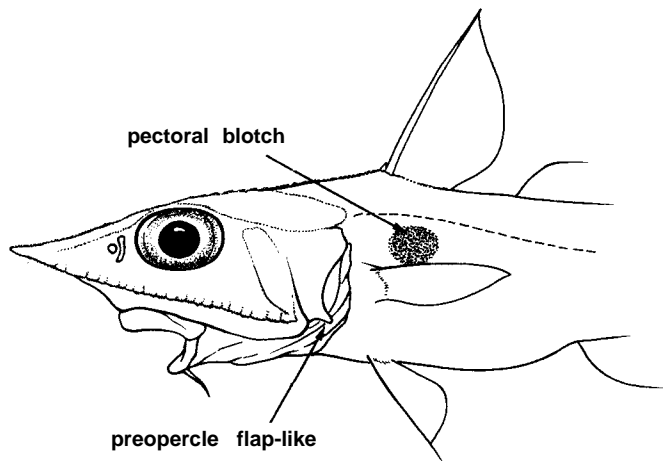
8b. Body markings faint or absent in adults, usually consisting of vertical or diagonal bars and longitudinal stripes

9a. Body markings in adults absent or faint at best; distance from isthmus to anal fin about 1.2 times in head length...**C. argentatus** (Fig. 336)



**C. gladius**

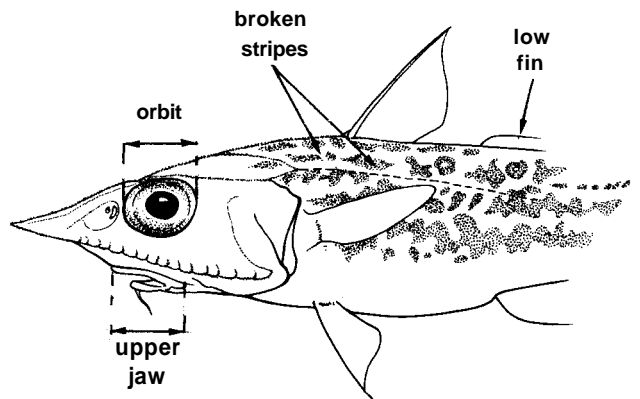
Fig. 333



**C. matsubarai**

(after Okamura, in Okamura et al., 1982)

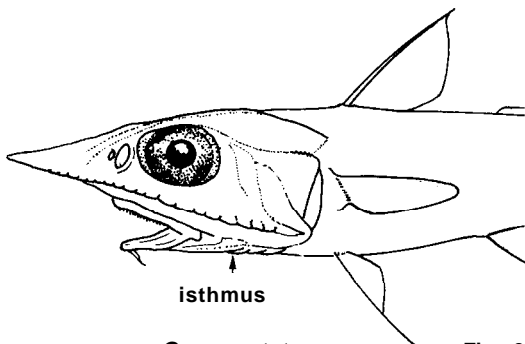
Fig. 334



**C. multispinulosus**

(after Okamura, 1970a)

Fig. 335



**C. argentatus**

Fig. 336

9b. Body markings usually present in adults; distance from isthmus to anal fin about 1.3 to 1.4 times in head length

10a. First dorsal fin with a blackish stripe just above base; pelvics with blackish bases and tips, the remainder pale; gillrakers on lower limb of first arch 6 to 8 ..... **C. denticulatus** (Fig. 337)

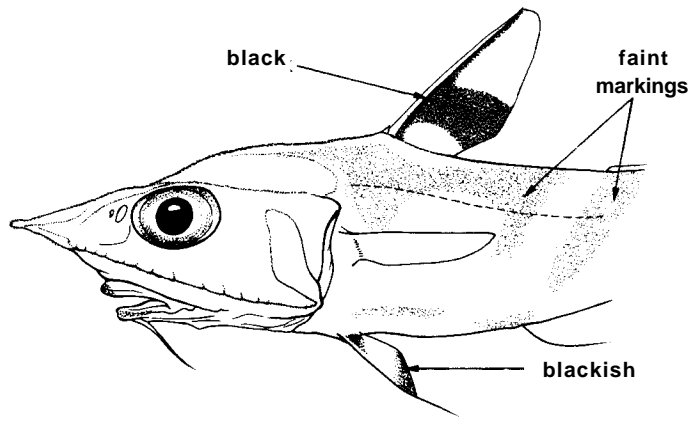
10b. First dorsal fin lacking a blackish stripe; pelvics uniformly blackish or punctate; gillrakers on lower limb of first arch 8 to 10 ..... **C. kamoharai** (Fig. 338)

7b. Upper jaw about equal to or less than orbit diameter

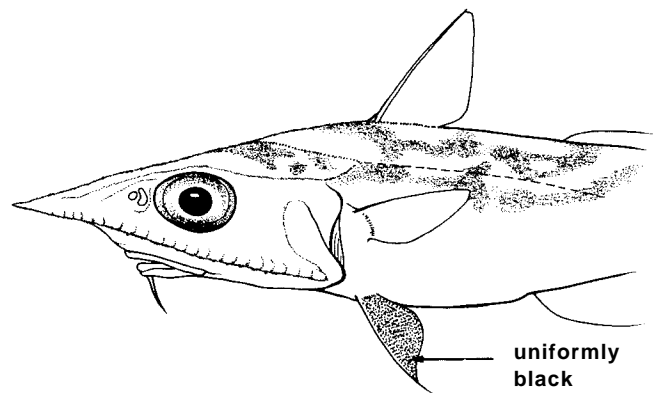
11a. Upper jaw about equal to orbit diameter, 3.6 to 4.3 times in head length; height of anterior rays of second dorsal fin much less than opposites of anal fin; upper surface behind leading edge of snout naked ..... **C. longissimus** (Fig. 339)

11b. Upper jaw length less than orbit diameter, 3.7 to 5.2 times in head length; height of anterior rays of second dorsal fin about equal to opposites of anal fin; upper surface behind leading edge of snout scaled (Fig. 340)

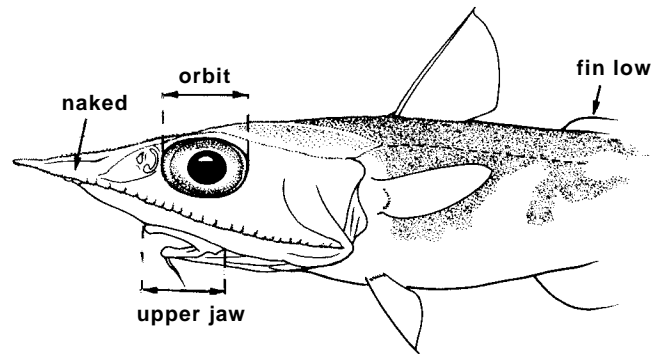
12a. Prominent body markings consisting mostly of blotches and saddle marks; upper jaw about 5.2 times in head length; orbit about 4.5 times in head length; ventral end of sub-opercle developed into a short triangular flap.....**C. cingulatus** (Fig. 340)



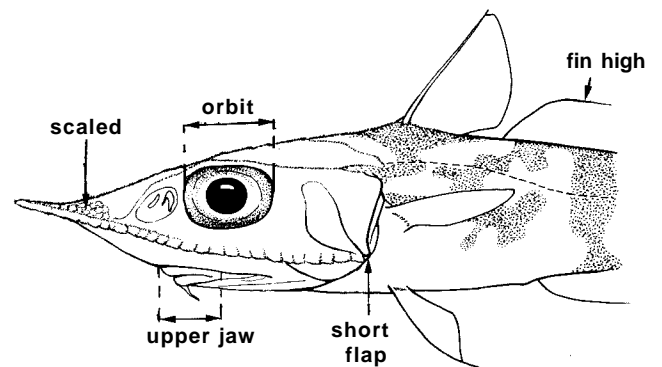
**C. denticulatus** (after Iwamoto, in Smith & Heemstra, 1986) Fig. 337



**C. kamoharai** (after Matsubara, 1943) Fig. 338



**C. longissimus** (after Okamura, 1970a) Fig. 339



**C. cingulatus** (after Gilbert & Hubbs, 1920) Fig. 340