

Sardinella zunasi (BLEEKER)

Figures 10 and 26

Harengula zunasi BLEEKER, 1854: 117 (type locality: Nagasaki, Japan). ISHIKAWA and MATSUURA, 1879: 8.—JORDAN and STARKS, 1905: 193; 1906: 515.—JORDAN and HERRE, 1906: 634.—REGAN, 1917d: 302.—FOWLER, 1930: 590.—SCHMIDT, 1930: 108.—SCHMIDT and LINDBERG, 1930: 1187.—FOWLER, 1931: 119.—CHEONG and collaborators, 1956: 149, fig. 73.

Clupea zunasi GÜNTHER, 1868: 451.—KISHINOUE, 1907: 98, pl. 20, fig. 4.

Sardinella zunasi JORDAN and SNYDER, 1901: 349.—SNYDER, 1912: 402.—IZUKA and MATSUURA, 1920: 183.

Specimens. This description is based on 6 specimens from the following localities: SU-4626: Tokyo, Japan, 3 specimens, 89.5-113.5 mm. SU-20140: Onomichi, Bingo, Japan, 3 specimens, 90.8-108.5 mm.

Meristic counts. D 18 (18-19); A 20 (19-21); P 15 (14-15); V 8. Lateral scales 40 (38-41); longitudinal scale rows 12; predorsal scales 14 (12-15). Medioventral scutes 18+12 (11-14). Gill rakers on first branchial arch 28 (25-31)+52 (48-57).

Description. Head 3.98 (3.89-4.18) in standard length. Maxillary 2.24 (2.19-2.30) in head, extending to the vertical through the anterior margin of pupil; expanded portion of the second supramaxillary rectangular with rounded angles. Minute feeble teeth on palatines, pterygoids and tongue. Snout 3.76 (3.54-4.02) in head, 1.16 (1.13-1.18). Orbit 3.40 (3.66-4.02), postorbital 2.80 (2.62-2.93), in head. Eye covered by adipose tissue, leaving a vertical slit at the pupil. Interorbital width 1.08 (1.00-1.10) in snout, 1.21 (1.16-1.25) in orbit. Width between upper ends of gill openings 2.70 (2.56-2.77) in head. Opercular bones, as well as postorbitals and suborbitals covered by a dermal sheath, under which there is no evidence of the minute hollow venules commonly present in other species.

The general shape of the body is elongated, slightly oblong, and compressed, so that the medioventral line is sharply keeled with prominent scutes. Depth at dorsal origin 3.36 (3.07-3.44), depth at anal origin 5.04 (4.73-5.17), in standard length; least depth of caudal peduncle 3.10 (2.80-3.33) in depth at dorsal origin.

Predorsal length 2.35 (2.27-2.39) in standard length; dorsal base 2.80 (2.58-2.95) in predorsal length; length of longest dorsal ray (4th or 5th) 1.08 (0.94-1.14) in dorsal base. Preanal length 1.30 (1.27-1.33) in standard length; anal base 4.90 (4.44-5.29) in preanal length; length of longest anal ray (3rd or 4th) 2.86 (2.68-2.99) in anal base. Last two anal rays somewhat larger and more extensively branched than preceding rays; the posterior branch of the last one somewhat elongated so that the extreme end of the fin is slightly produced; the length of this terminal ray is 2.92 (2.87-2.98) in anal base. Caudal deeply forked with pointed upper and lower lobes; length of lower lobe 3.87 (3.82-3.95) in standard length. Prepectoral length 4.00 (3.88-4.24) in standard length; pectoral length 1.36 (1.28-1.44) in prepectoral length. Ventral inserted below the middle of dorsal base; preventral length 1.88 (1.81-1.89) in standard length;

ventral length 4.80 (4.48-5.00) in preventral length.

The body is covered by thin, somewhat deciduous cycloid scales. The predorsal median ridge is covered by the adjacent sides of two longitudinal series of scales. Each body scale has one or more continuous transverse grooves posteriorly, and a set of two to five interrupted grooves whose parts may either be separated by a wide interspace or may overlap each other (Fig. 10). The posterior edge of each scale has very few inconspicuous marginal lines and perforations. Scale sheaths cover the bases of the dorsal and anal fins; each caudal lobe is coated with numerous minute scales and characterized by the presence of an enlarged scale near the fork. An axillar scale present at the ventral.

The specimens studied are preserved in ethanol. They are bluish brown above and pale or yellowish below. The transition between the two colors rather abrupt. A dark shoulder mark present, but relatively indistinct. Bases of the anterior dorsal rays are devoid of dark pigment. Dorsal dusky. Pectoral, ventral, anal and caudal are all pale brownish. Tips of upper and lower jaws brownish.

Notes. REGAN (1917d) overlooked the intermediate scale-groove pattern of this species, which is to be found in the type specimen as well as in the specimens used in the present work. On the basis of the shape of the expanded second supramaxillary, the variable scale-groove patterns, and the morphology of its last two anal rays, this species should be treated under *Sardinella* rather than *Harengula*.

Distribution. *Sardinella zunasi* is restricted to Asiatic shores from southern Japan, Korea, and the coasts of the Yellow Sea in the north, to Taiwan, Amoy, and Hong Kong in the south.

Sardinella nymphaea (RICHARDSON)

Figures 8, 11 and 12

Clupea nymphaea RICHARDSON, 1848: 304 (type locality: China).—GÜNTHER, 1868: 428.
Harengula nymphaea REGAN, 1917d: 392.

Since no specimens of this species have been available to me, I have been forced to prepare the following brief description by referring to the information and a photograph of the type kindly furnished by Mr. N. B. MARSHALL of the British Museum, and by utilizing the data presented by RICHARDSON (1848: 304-305), GÜNTHER (1868: 428) and REGAN (1917d: 392). All of the data from these sources has been rearranged in the hope that it can be compared more conveniently with other descriptions in the present study.

Meristic counts. D 17; A 20; V 8. Lateral scales 40; longitudinal scale rows 13. Medioventral scutes 18+11. Gill rakers on first branchial arch 41+69.

Description. Head 3.93 in standard length. Maxillary 2.33 in head, reaching to the vertical through the anterior margin of pupil; expanded portion of second supra-maxillary somewhat deep oval; minute feeble teeth on pterygoids and tongue.

Snout 4.69 in head, 1.33 in orbit. Orbit 3.50, postorbital 2.54, in head. Eye covered by adipose tissue, leaving a vertical slit at the pupil. Opercular bones, as well as postorbitals, covered by a dermal sheath, under which minute hollow venules are slightly evident.

Body oblong, strongly compressed, so that the medioventral line is sharply keeled with prominent scutes. Depth dorsal origin, 3.14 at depth at anal origin 4.40, in standard length; least depth of caudal peduncle 2.91 in depth at dorsal origin.

Predorsal length 2.20 in standard length. Preanal length 1.20 in standard length. Last two anal rays somewhat larger and more extensively branched than preceding rays; the posterior branch of the last one somewhat elongated so that the extreme end of the fin is slightly produced. Caudal fin of the type with both lobes broken. Prepectoral length 3.67 in standard length. Preventral length 1.8 in standard length.

Body scales of the type are considerably adherent. Two scales from the type sampled in Region II have been sent to me by Mr. N. B. MARSHALL. These have been illustrated in figures 8A-B. Scale sheaths cover the bases of dorsal and ventral. Caudal covered by numerous small scales, with an enlarged, elongated one on each lobe near the fork. An axillar scale present at the ventral.

The type is preserved in ethanol. RICHARDSON described the color of this species from notes made by Mr. J. R. REEVES. In RICHARDSON's account, *S. nymphaea* is light duck-green on the back with silvery borders to the scales, silvery shaded by faint bluish-green on the sides, and silvery with green shadings and rich umber tints on the head and humoral bones. RICHARDSON further described the fins, except the wood-brown pectoral, as asparagus-green with dark edges to the caudal.

Notes. GÜNTHER (1868: 428-429) pointed out that RICHARDSON (1848: 304) described two Chinese herrings, *Clupea insingleena* and *C. nymphaea*, from two paintings made by J. R. REEVES, but that there was only a single specimen representing these species, which had become the type of *C. nymphaea*. I have been unable to find any resemblance between the painting (Fig. 11) and the photograph of the type (Fig. 12) of *C. nymphaea*. Therefore, I agree with the comments made by GÜNTHER on *C. insingleena* and *C. nymphaea*.

REGAN gave 120 mm as the total length of the type. However, through correspondence with Mr. N. B. MARSHALL, I have been informed that the standard length of the type should be 110 mm. From the photograph of the type, I observed that both caudal lobes have been broken, and that the entire length of the specimen is approximately 133 mm. Thus, REGAN's measurement of 120 mm is neither the standard length nor the total length of the type. It is very likely that 120 mm is the fork length. It is desirable to point out that REGAN's proportional characters are all in standard length; I have been able to verify this from the photograph of the type.

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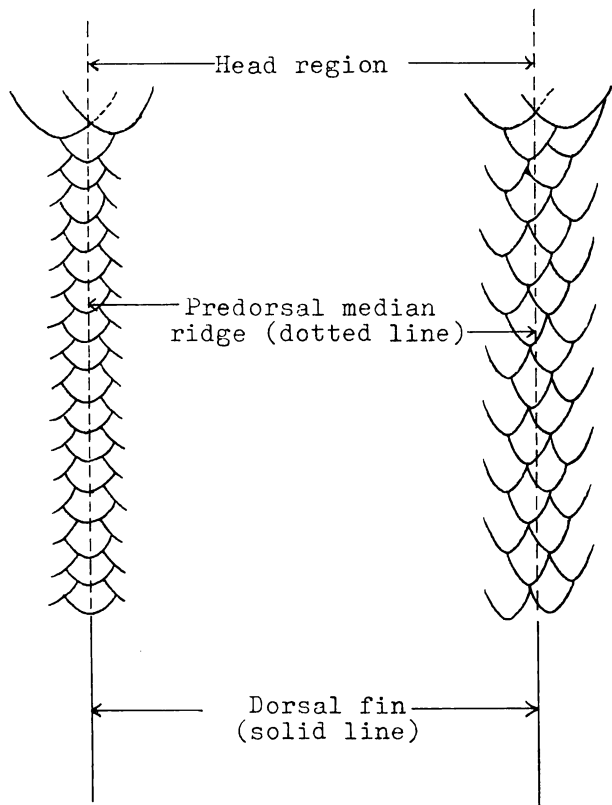


Fig. 1. Arrangements of the predorsal scales. A. In subgenus *Amblygaster*. B. In subgenus *Sardinella*.

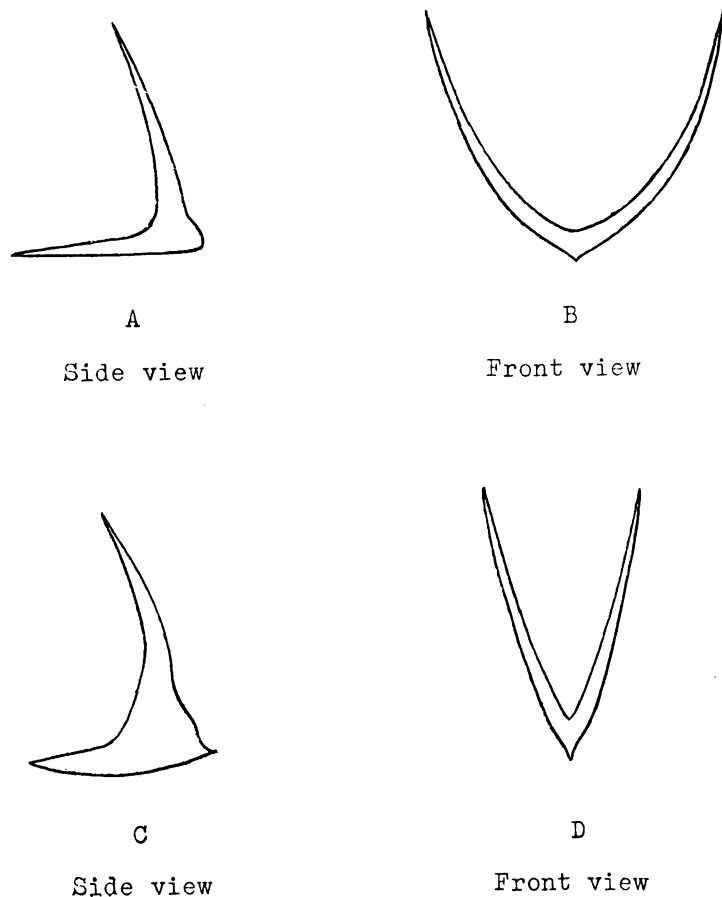


Fig. 2. Structure of medioventral scutes. A-B. Subgenus *Amblygaster*. C-D. Subgenus *Sardinella*.

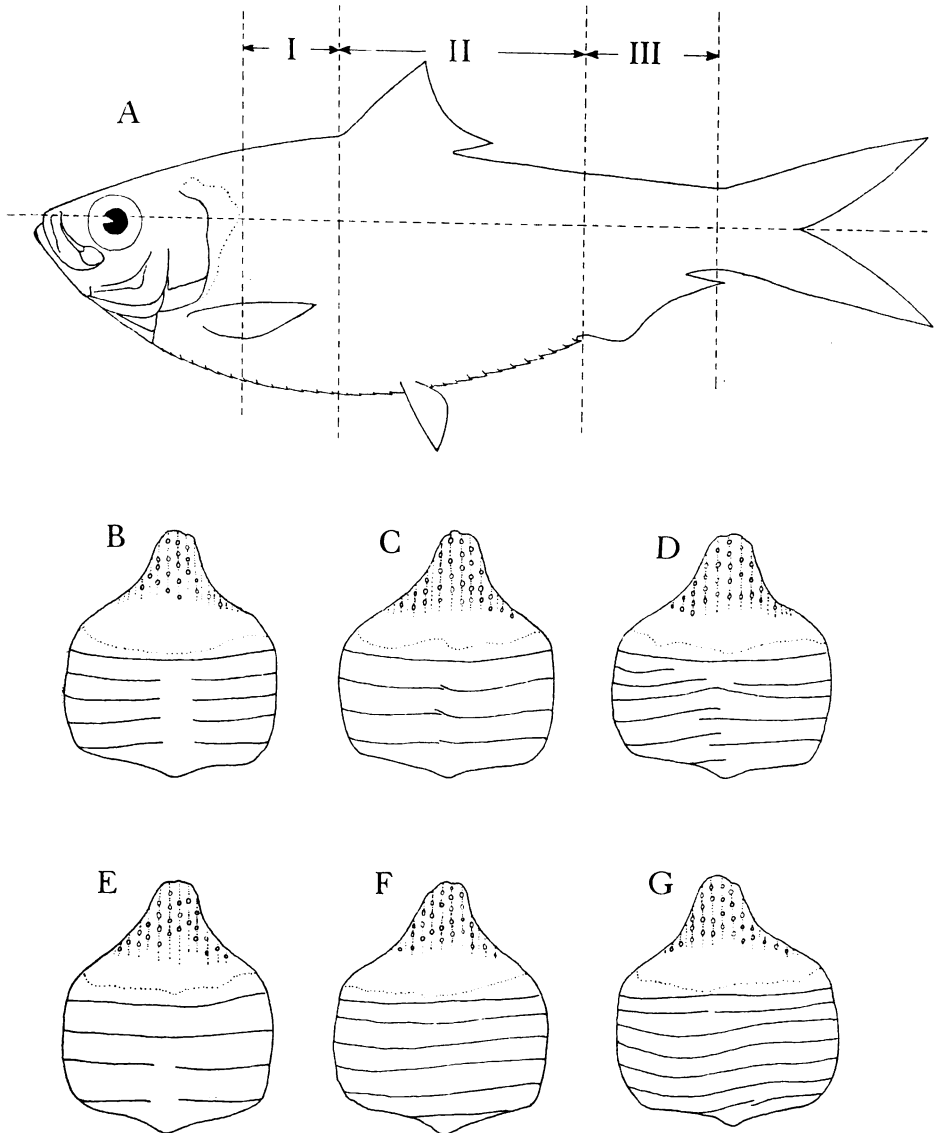


Fig. 3. A. Three body regions from which scales have been sampled. B. Scale from region I. C-E. Scales from region II. F-G. Scales from region III.

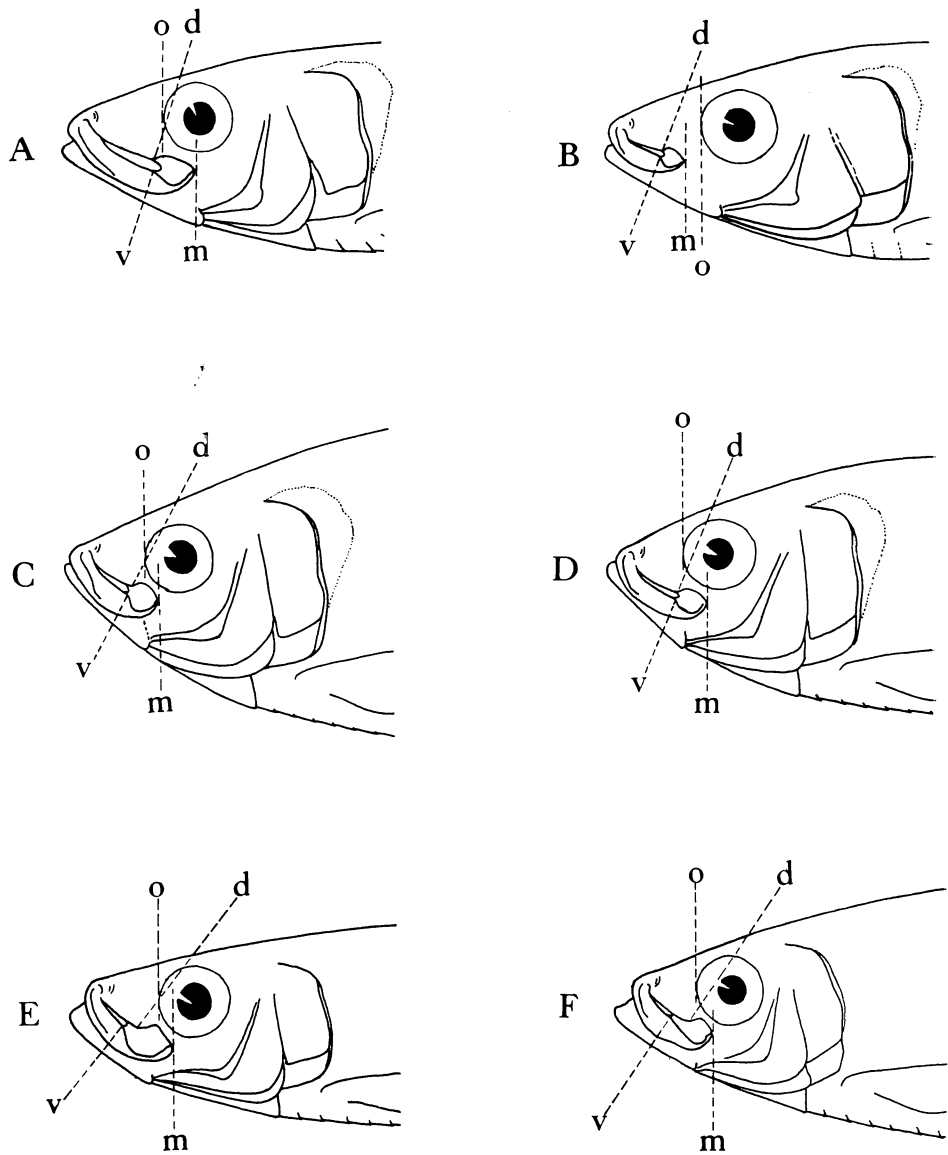
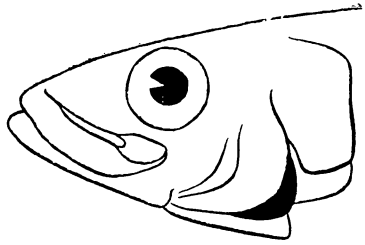
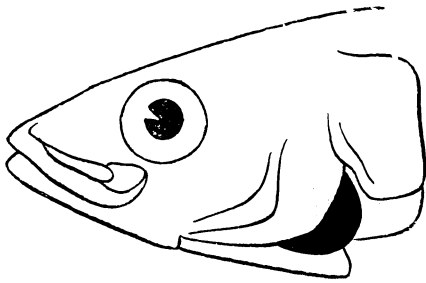


Fig. 4. Head features of some typical species of the genera *Sardinella* (A-D) and *Harengula* (E-F): v, anterior point at the foot of the ventral crest of second supramaxillary; d, anterior point at the foot of the dorsal crest of second supramaxillary; o, vertical through anterior margin of orbit; m, hind border of upper jaw.

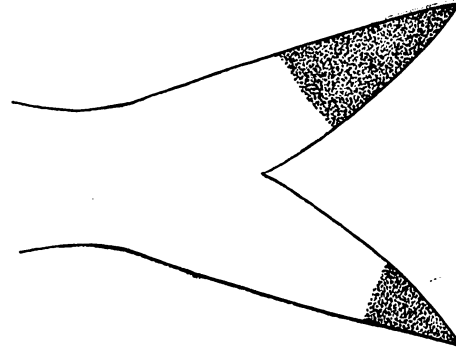


A

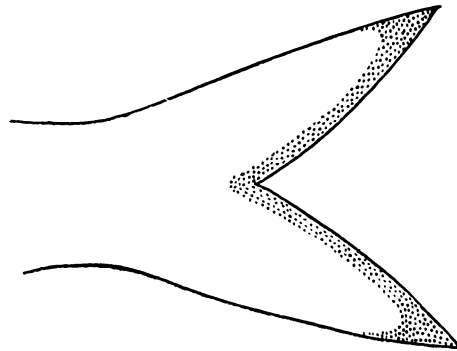


B

Fig. 5. Exposed part (black) of the interopercle. A. *S. aurita*. B. *S. logiceps*.



A



B

Fig. 6. Color pattern in the caudal fins of the Indo-Pacific species of the genus *Sardinella*. A. Tips of Caudal lobes blackish. B. Posterior edges of caudal lobes dusky (tips not blackish).

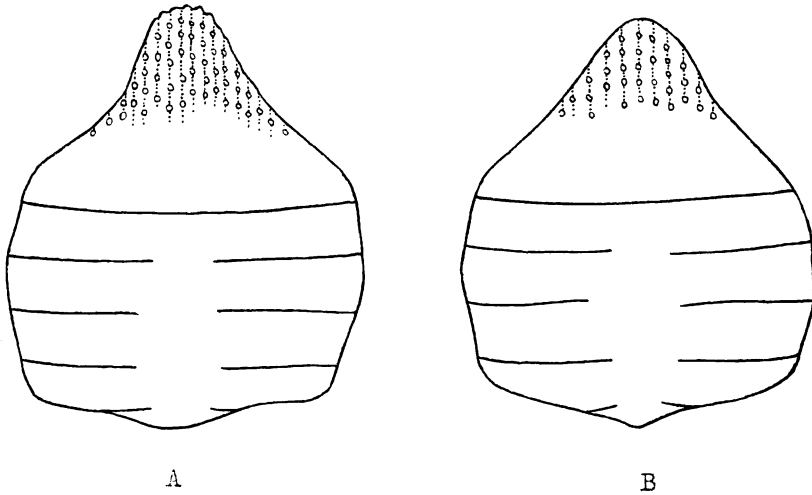


Fig. 7. Typical scale of *S. fimbriata* (A), add of *S. perforata* (B).

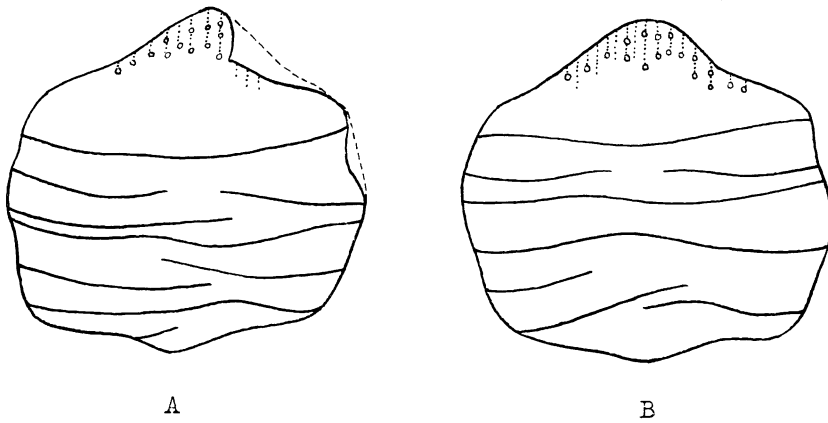


Fig. 8. Two scales from the type of *S. nymphaea* (Brit. Mus. Cat. No. 29267) sampled from Region II.

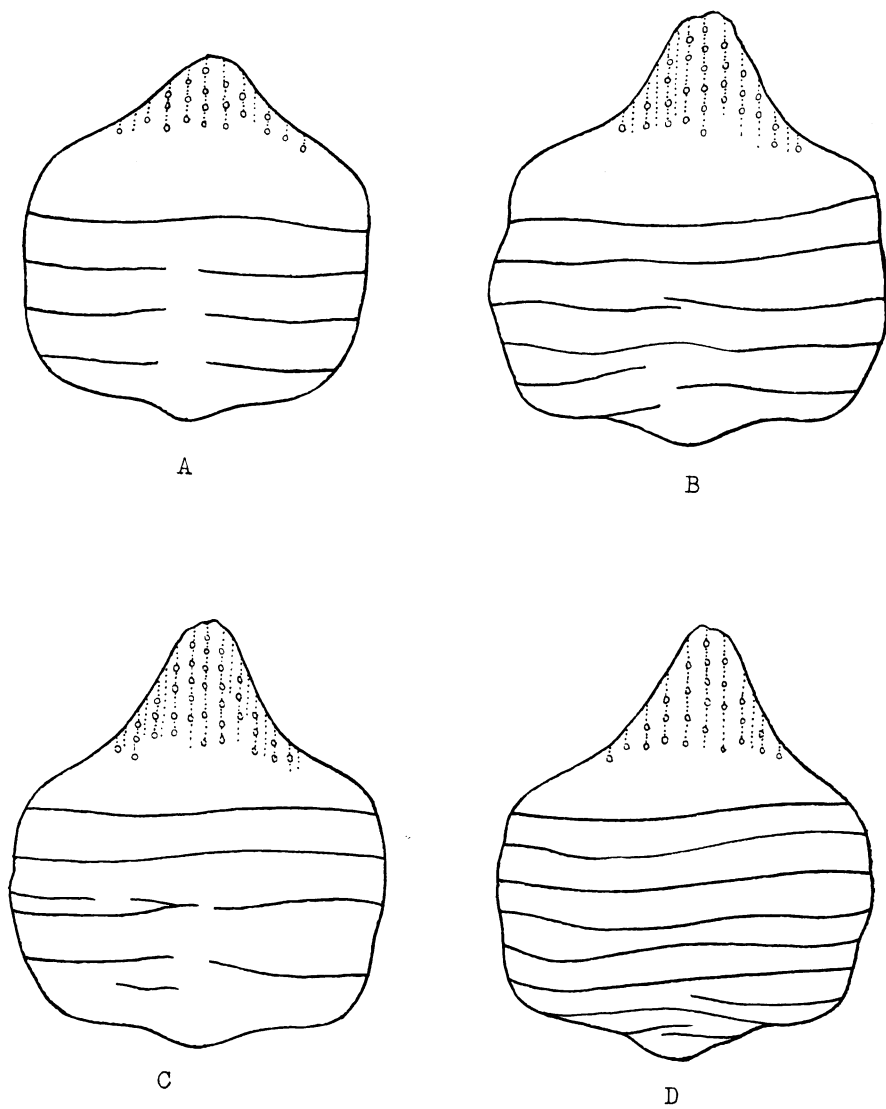


Fig. 9. Scales of *Sardinella brachysoma*. GVF-1798, 117.0 mm. A. From Region I. B-C. From Region II. D. From Region III.

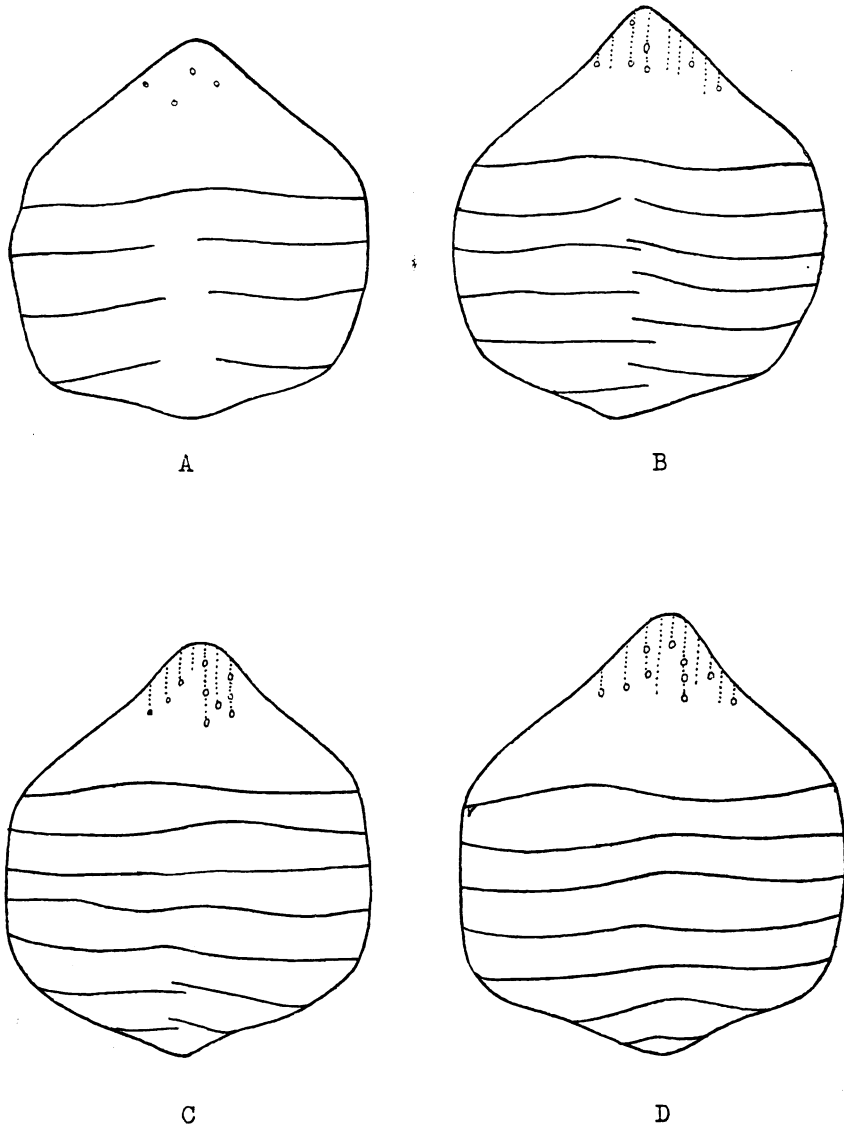


Fig. 10. Scales of *Sardinella zunasi*. SU-4626, 113.5 mm. A. From Region I. B-C. From Region II. D. From Region III.

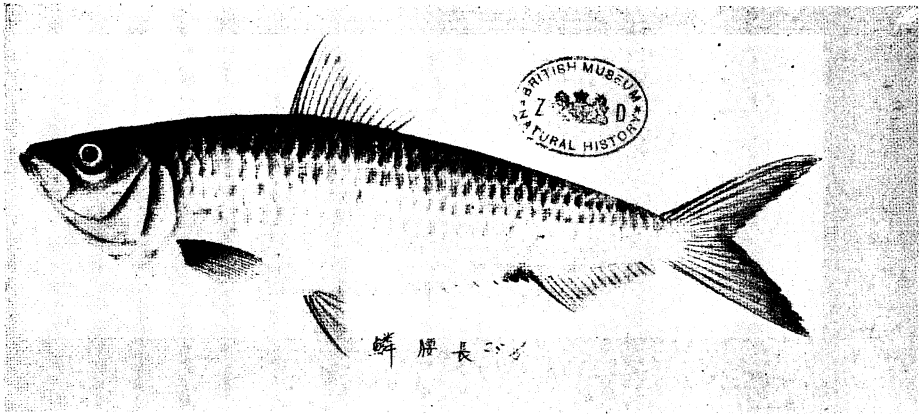


Fig. 11. Photograph of the painting of *Clupea nympha* by J. R. REEVES.



Fig. 12. Photograph of the holotype of *S. nympha*. Brit. Mus. Cat. No. 29267.

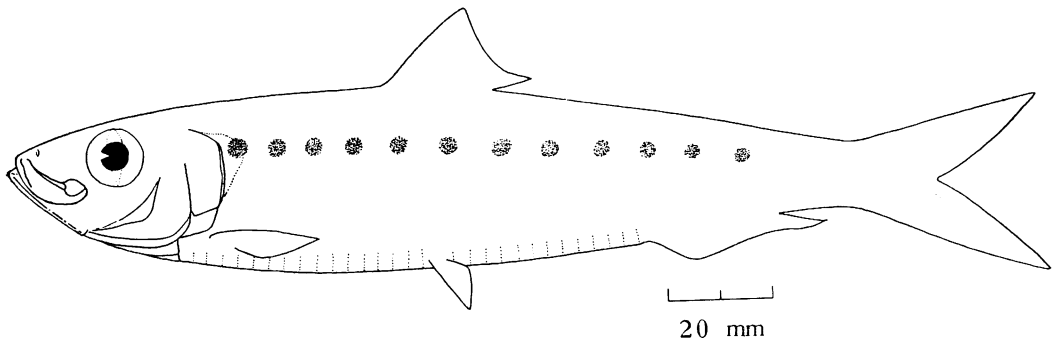


Fig. 13. *Sardinella sirm* (WALBAUM)

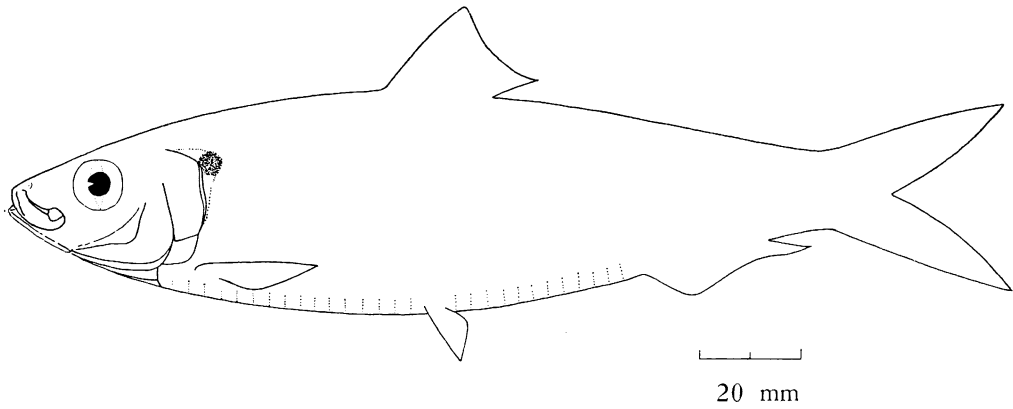


Fig. 14. *Sardinella clupeioides* (BLEEKER)

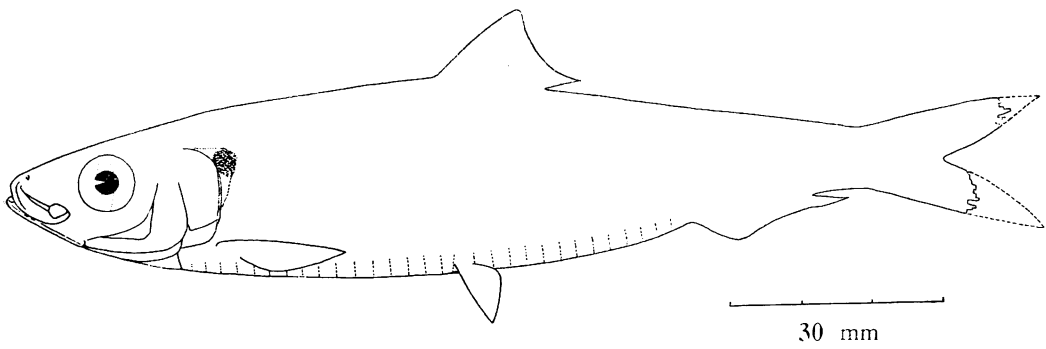


Fig. 15. *Sardinella leiogaster* CUVIER and VALENCIENNES

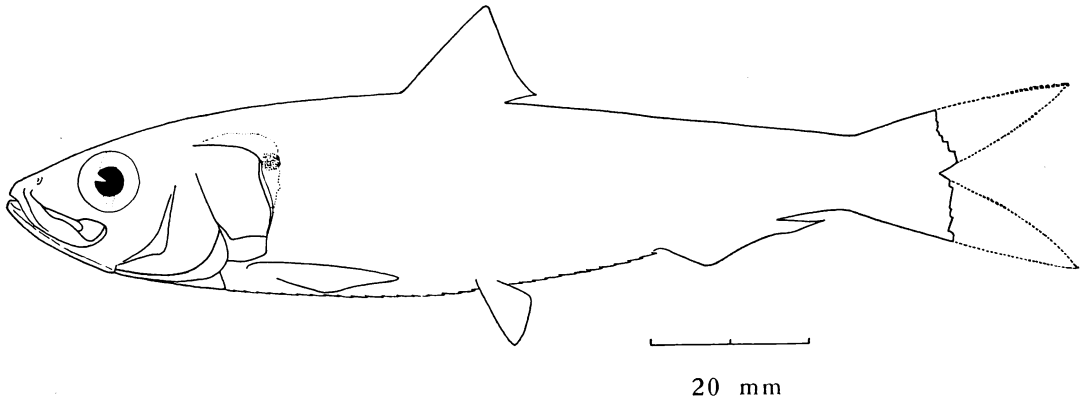


Fig. 16. *Sardinella aurita* CUVIER and VALENCIENNES

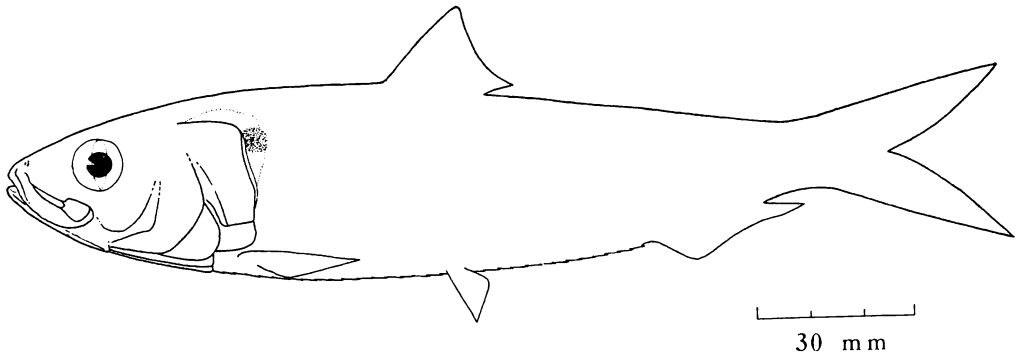


Fig. 17. *Sardinella longiceps* CUVIER and VALENCIENNES

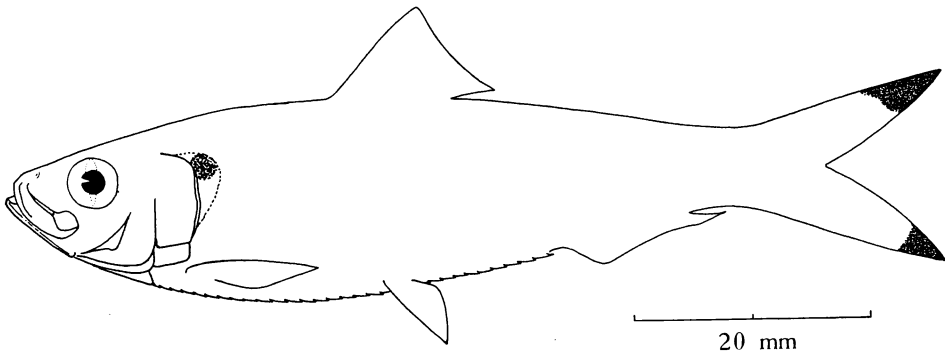


Fig. 18. *Sardinella melanura* (CUVIER)

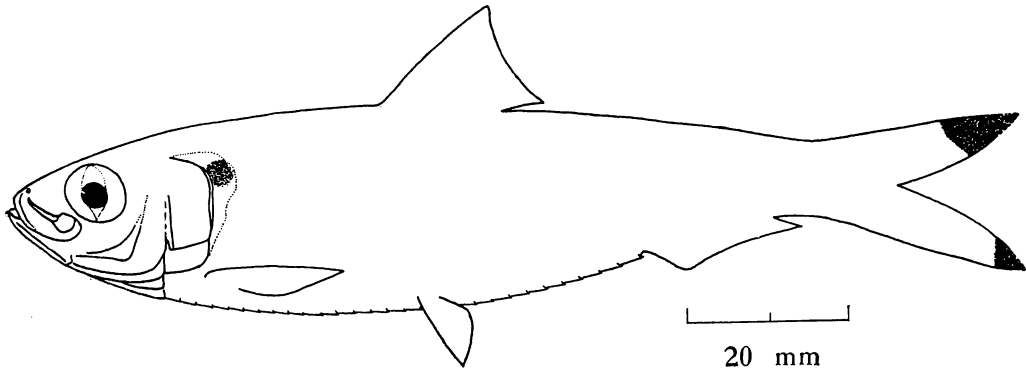


Fig. 19. *Sardinella nigricaudata*, new species

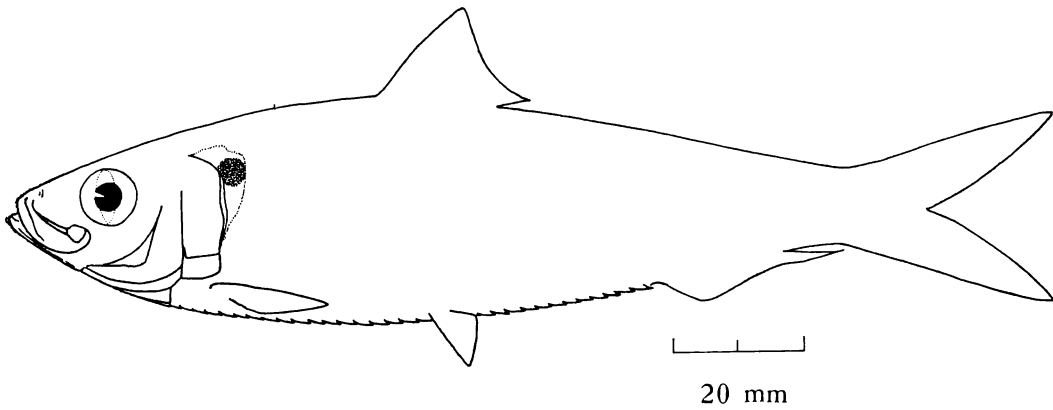


Fig. 20. *Sardinella jussieui* (LACÉPÈDE)

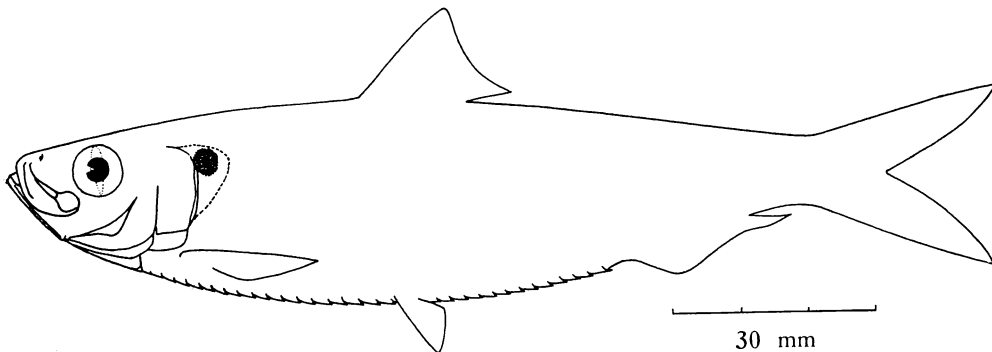


Fig. 21. *Sardinella sindensis* (DAY)

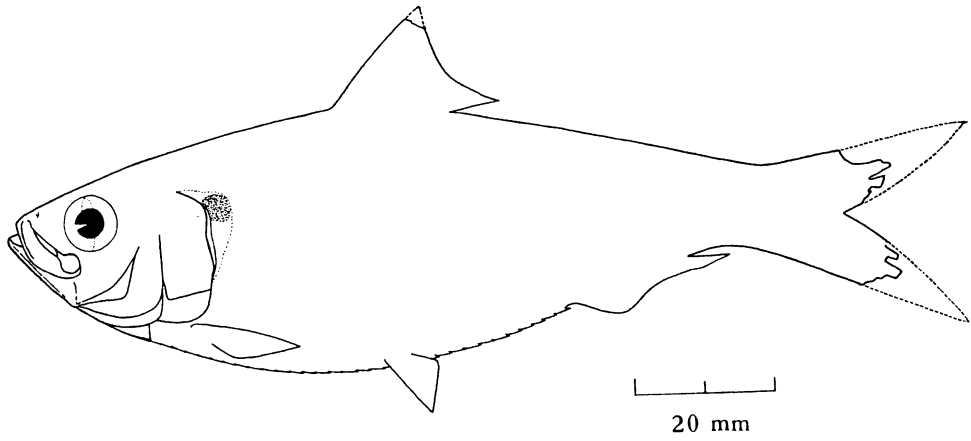


Fig. 22. *Sardinella dayi* REGAN

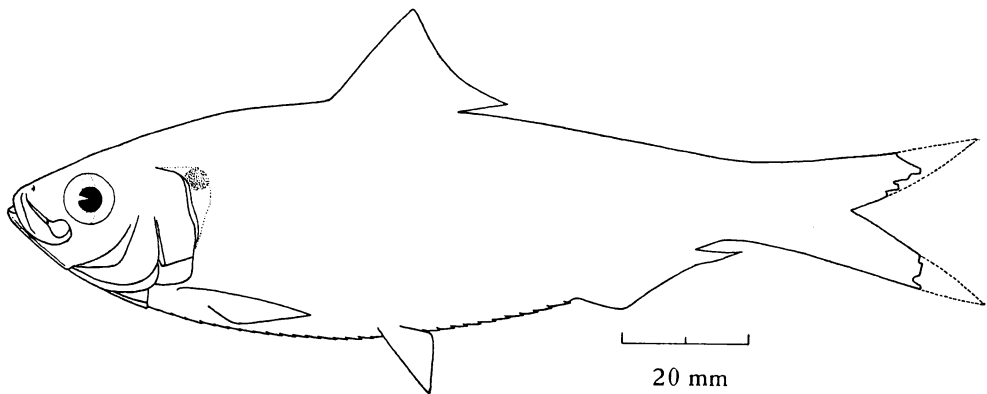


Fig. 23. *Sardinella fimbriata* (CUVIER and VALENCIENNES)

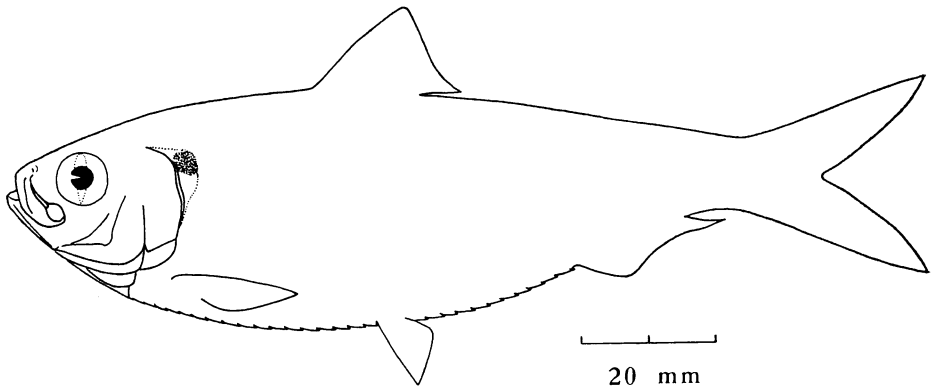


Fig. 24. *Sardinella perforata* (CANTOR)

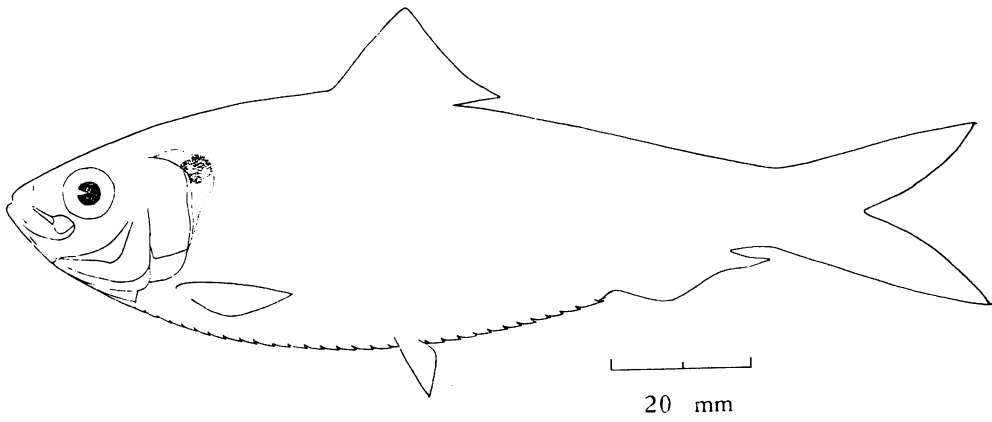


Fig. 25. *Sardinella brachysoma* (BLEEKER)

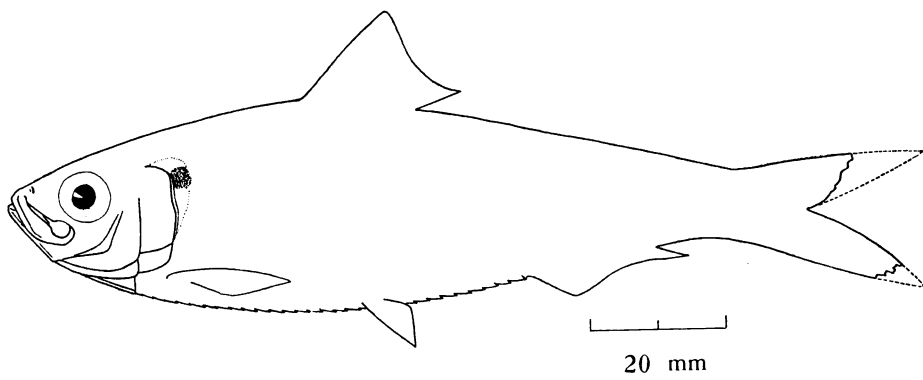


Fig. 26. *Sardinella zunasi* (BLEEKER)