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THE CLUPEOID FISHES OF MALAYA

A SYNOPSIS, WITH KEYS TO ALL INDO-PACIFIC GENERA

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INTRODUCTION

IN 1961, the British Museum (Natural History) received a collection of small and juvenile fishes from Malayan waters. These were included in a large collection of crustaceans collected by the Singapore Regional Fisheries Research Station, of which the penaeid prawns were reported on by Hall (1962). Some further Malayan fish specimens have since been received, and the whole collection will be reported on by Mr. G. Palmer of this Department. The clupeoid fishes, however, proved of sufficient interest to merit a separate report. In cataloguing the clupeoids, it was found that British Museum material from Malaya was surprisingly scanty, with only two to three dozen fishes. To this, the present collection adds no less than a thousand clupeoid specimens representing 20 species (19 previously unrepresented). Acknowledgement is made here to Dr. Hall and his colleagues, and also Dr. Tham Ahkow and members of the Zoology Department of the University of Malaya in Singapore, for this interesting collection.

Clupeoid fishes play a significant role in fisheries throughout south-east Asia, but past misidentifications have rendered some otherwise valuable biological work almost useless. The only keys available for the Singapore area were those of Fowler (1941), which have now been superseded by more critical work. The opportunity is taken, therefore, to list all Malayan clupeoid species (61 in all), with references to the latest descriptions, keys and distributional records. Species keys can be found in a number of recent works and are not repeated, but there are no overall generic keys published and these are included here for families and subfamilies and cover the entire Indo-Pacific region.

Area included: a political, rather than a geographical or hydrological, boundary has been chosen, partly because the development of fisheries is on a national basis, but also because the present inadequate knowledge of the distribution of clupeoid fishes through the Indo-Australian Archipelago provides no more convenient division of the area for the purpose of this paper. Records have, however, been included from S. E. Sumatra, the Riau and Lingga Archipelagos, Bangka I., Belitung and S. W. Borneo since so many clupeoid species are common to two or more of these localities. The Sunda Shelf is bridged between Malaya and Borneo by

FIG. 1

List of localities cited in text and shown on map

Malaya and Singapore

1. Alor Star (on Kedah R.)
3. Batu Maung (S.E. Penang I.)
9. Johore (opposite Singapore I.)
1. Kedah R. (see Alor Star)
9. Ketam I. (in Johore Strait)
9. Kranji (N.W. Singapore I.)
6. Kuala Lumpur
5. Kuala Selangor
7. Kuala Langat and Malacca
2. Merbok R. (see Tanjong Dawai)
8. Muar (on Muar R.)
9. Palau Ubin I. (in Johore Strait)
3. Penang I.
4. Perak R.
9. Siglap (S.E. Singapore I.)
9. Singapore
2. Tanjong Dawai (on Merbok R.)

Bangka I.

Belitung I. (=Biliton)

Borneo

7. Bandjarmasin
6. Padangtikar Bay
2. Pamangkat
5. Pontianak (including Sungei Terentang, Telok Pekadai and Peniti River)
1. Sambas
3. Sinkawang
4. Sungiduri

Riau Archipelago (Bintan I.)

Lingga Archipelago (Temiang I.)

Sumatra

1. Bagan Siapiapi (Rokan R. mouth)
2. Benkalis I.
3. Inderagiri R.
4. Lahat
5. Lematin-Enim (=Muaraenim)
6. Musi R.
6. Palembang
1. Rokan R.

two island groups, so that if coastal waters are taken to be within 30 miles of land, a similar coastal fauna would be expected from western Borneo and eastern Sumatra.

Locality data : in some cases the Malayan collection jars bear labels indicating locality and date, or Dr. Hall's station numbers. In other cases, there is a University of Malaya label, sometimes bearing data consistent with the date and/or locality of Dr. Hall's collections but with the locality misspelt (Batu Maney or Batu Moang for Batu Maung) or the date misread. These have been corrected in the lists given below. Other jars have no labels, or no locality stated, and these are here listed as ? Singapore.

The Penang catches were made at Batu Maung Flats by *Ambai*, a V-shaped device with arms some hundreds of feet long which channels fish and crustaceans into a conical net (Hall, 1962 : 136). The present catches were all made in the morning. The catches from Tanjong Dawai, at the mouth of the Merbok river, were made by *Langgai berampis* over fairly hard mud. This gear resembles the *Ambai* but is smaller. The samples were again taken in the morning. There are no other data for the remaining samples.

Distributional records : where material has not been seen, only the most reliable references are given. Bleeker's clupeoid material in Leiden is extraordinarily well sorted, so that although the names may be incorrect, all specimens so labelled are almost invariably conspecific. Reliance has also been placed on Chan (1965—*Sardinella*) and Losse (1966—East Africa), but records by Weber & De Beaufort (1913), Hardenberg (1931, *et seq.*) and Fowler (1931, *et seq.*) should be treated with caution. Specimens reported by Cantor (1850), Günther (1868), Regan (1917a, *et seq.*) and Norman (1923) have been examined, as well as all type material of Bleeker, Lacépède, Cuvier and Valenciennes.

Previous studies : the earliest comprehensive work on Malayan fishes was that of Cantor (1850), who described 292 species (15 clupeoids) from Penang, Malacca, Singapore and islands off the west coast. Bleeker published ten papers between 1851 and 1877 that included fishes from Singapore, as well as nineteen other papers dealing with fishes from Bangka, Bintang, Riau and Penang (listed by localities in Weber & DeBeaufort, 1964 : 43-45). In summary, Bleeker (1872 :91) recorded 32 clupeoids from Singapore, and 42 clupeoid species are now found to have been recorded by Bleeker from the area adopted here. Fishes collected by Dr. F. Jagor in Singapore in 1858 were reported on by Peters (1869—146 species, including 1 clupeoid). Duncker (1904) collected 300 Malayan species and listed 480 known species (20 clupeoids). The next large listing of species was by Herre & Myers (1937), who collected 483 species (28 clupeoids). A much larger collection was made by D. G. Stead as Fisheries Enquiry Commissioner in 1922-3, but it was not reported upon. Hardenberg (1934b) listed 176 species (24 clupeoids) from the mouth of the Rokan river (eastern Sumatra), and 222 species (25 clupeoids) from the Kapuas river (western Borneo), and both areas are included in the present study.

A full listing of all species from Malaya seems to be overdue. A summary of the clupeoid species is given in Table 1, showing that 61 species are recorded or can be expected from Malayan waters. Some 22 genera are represented out of 34 genera recorded for the whole Indo-Pacific region (world total 75 genera). The Indo-Australian Archipelago has, in fact, a highly diversified clupeoid fauna. The area appears to have been an evolutionary centre, the numbers of species and

genera becoming progressively fewer to the east and to the west. Some wide-spread species that are found from India to Japan are not yet recorded from Malayan waters, so that the total of Malayan clupeoids may well be over seventy.

Family DUSSUMIERIIDAE

Key to Indo-Pacific genera (3 genera out of 4 known, the genus *Jenkinsia* being Western Atlantic).

I. Branchiostegal rays 14-19 ; dorsal rays 16-21 ; posterior frontal fontanelles lost in adults (subfamily Dussumieriinae)

A. Pelvic fins under dorsal base ; anal rays 14-19 ; 2 supra-maxillae..... .....*Dussumieria* (p. 226)

B. Pelvic fins behind dorsal base ; anal rays 9-13 ; 1 supra-maxilla..... .....*Etrumeus* (Japan, etc.)

II. Branchiostegal rays 6-7 ; dorsal rays 11-16 ; posterior frontal fontanelles retained in adults (subfamily Spratelloidinae)..... .....*Spratelloides* (p. 227)

Keys to Species

Dussumieria—monotypic

Etrumeus—monotypic

Spratelloides—Whitehead (1963 : 338).

1. **Dussumieria acuta** Valenciennes, 1847 (Fig. 2)

Dussumieria acuta Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 467, pl. 606 (Bombay, Coromandel) ; Cantor, 1849, *J. Asiatic Soc. Bengal*, **18** (2) : 1268 (Penang, Malay Peninsula, Singapore) ; Günther, 1868, *Cat. Fish. Br. Mus.*, **7** : 466 (Cantor's Penang specimens) ; Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 94, pl. 271, fig. 1 (Singapore, Penang, Sumatra, etc.) ; Whitehead, 1963, *Bull. Br. Mus. nat. Hist.* (Zool.), **10** (6) : 312, 373 (14 Singapore specimens).

Dussumieria hasseltii Hardenberg, 1931, *Treubia*, **13** (1) : 100 (Rokan river mouth, Sumatra) ; Idem, 1934, *Treubia*, **14** (3) : 304 (Rokan river mouth) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore, near Malacca, Kuala Muda, Kedah).

Dussumieria elopsoides Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 186 (Kuala Lumpur—?).

Dussumieria sp. Hardenberg, 1936, *Treubia*, **15** (3) : 226 (Kapuas river, S.W. Borneo).

Identification and synonymy : Whitehead (1963 : 312, revision; 1967a : 13, Valenciennes' types) ; Whitehead *et alii* (1966 : 30, Bleeker types, key).

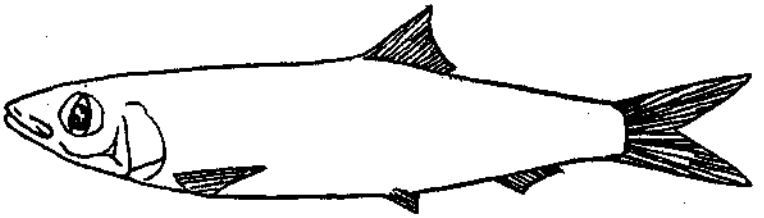

FIG. 2. *Dussumieria acuta* Val.

Distribution : East African coasts (Losse, 1966), E. Mediterranean, Red Sea, India, Indo-Australian Archipelago, including Singapore (Whitehead, 1963 : 373), Palau (BMNH. specimens), Hong Kong, Amoy, Foochow (Whitehead, 1966a : 48).

Hardenberg (1931) reported that this species preferred the relatively clear water off the Panei mouth, Sumatra, but was rare at Bagan Si Api Api (Rokan mouth) and of no value to the fishery there.

2. **Spratelloides delicatulus** (Bennett, 1831) (Fig. 3)

Clupea delicatula Bennett, 1831, *Proc. zool. Soc. Lond.*, **1** : 168 (Mauritius).

Spratelloides delicatulus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 96, pl. 264, fig. 3 (Singapore, Bangka, etc.).

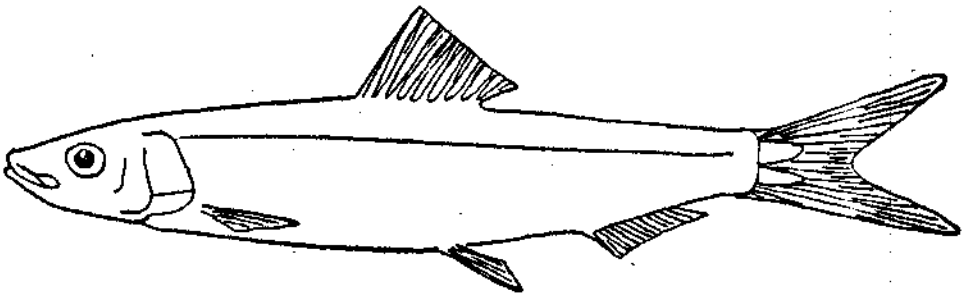

FIG. 3. *Spratelloides delicatulus* (Bennett)

Identification and synonymy : Whitehead (1963 : 345, revision, key, fig.).

Distribution : East African coasts (Losse, 1966), Red Sea (Whitehead, 1965a), India (Jones, 1961), Singapore, Celebes, etc. (Bleeker, 1872), Philippines (Whitehead, 1963), Palau, Guam (BMNH specimens), not from Hong Kong (Whitehead, 1966a : 48), Miyako I. (25°N., BMNH specimens), not north of Amami Oshima (28°N., *fide* Suzuki, 1964), southwards to Australia (Whitehead, 1963).

Both this species and the next are probably more common in Malayan waters than the records suggest, but have perhaps been misidentified as young herrings (i.e. *Sardinella* or *Herklotsichthys*). Both species form large shaols near the surface, often in very shallow waters.

3. **Spratelloides gracilis** (Temm. & Schl., 1846) (Fig. 4)

Clupea gracilis Temminck & Schlegel, 1846, *Fauna Japonica, Poiss.*, part 5, instal. 13 : 238, pl. 108, fig. 2 (south-east coasts of Nagasaki).

Spratelloides gracilis Hardenberg, 1933, *Treubia*, **14** (2) : 215 (Temiang I., Lingga Archipelago).

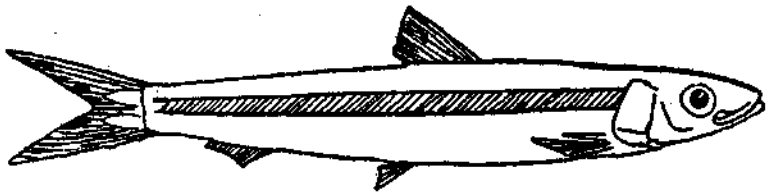

FIG. 4. *Spratelloides gracilis* (Temm. & Schl.)

Identification and synonymy : Whitehead (1963 : 338, revision, key, fig.).

Distribution : East African coasts (Losse, 1966), Red Sea (Whitehead, 1965a), India (Jones, 1961), Sumatra (Whitehead, 1963 : 375), Lingga Archipelago (Hardenberg, 1933), Hong Kong and Taiwan (Whitehead, 1966a : 48), Japan (Whitehead, 1963 : 375).

A bright silvery lateral band distinguishes this species from *S. delicatulus*, a feature which is equally apparent in fresh as well as preserved material (but tending to turn grey or black in the latter).

Family CLUPEIDAE

Key to subfamilies.

I. Lower jaw with dentary not flared outwards ; mouth terminal or superior.

  A. Upper jaw without median notch

    1. Anal fin short, less than 30 rays ; jaws about equal

      (*a*) Two supra-maxillae.....Clupeinae (p. 229)

      (*b*) One supra-maxilla.....Pellonulinae (p. 237)

    2. Anal fin long, more than 30 rays ; lower jaw strongly projecting .....Pristigasterinae (p. 245)

  B. Upper jaw with distinct median notch*
.....Alosinae (p. 240)

II. Lower jaw with dentary flared outwards ; mouth inferior ; the stomach gizzard-like.....Dorosomatinae (p. 243)

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*A slight notch in *Escualosa* (Clupeinae) but pelvic rays 7 (cf. 8 in Indo-Pacific Alosinae).

SUBFAMILY CLUPEINAE

Key to Indo-Pacific genera (3 genera out of 14 known, the remainder European or New World).

1. Pelvic rays 8-9 ; bilobed dermal outgrowths on vertical arm of cleithrum ; 2nd supra-maxilla lozenge-shaped or round ; no silver lateral stripe.
   A. Fronto-parietal striae 3-7 ; 2nd supra-maxilla with lower part longer than upper ; vertical striae continuous across scales..... ..... *Herklotsichthys* (p. 229)
   B. Fronto-parietal striae 7-14 ; 2nd supra-maxilla with upper and lower parts about equal in length ; vertical striae usually interrupted in centre of scale..... *Sardinella* (p. 231)
2. Pelvic rays 7 ; no bilobed dermal outgrowths on vertical arm of cleithrum ; 2nd supra-maxilla rectangular ; silver lateral stripe.. *Escualosa* (p. 236)

(The genera *Sardinops*, from South Africa, Australia and Japan, and *Clupea* from Japan, occur in the Indo-Pacific area but are confined to temperate waters).

Keys to species.

Herklotsichthys (Whitehead *et alii*, 1966 : 40)

Sardinella (Chan, 1965 ; Whitehead *et alii*, 1966 : 47)

Escualosa—monotypic.

4. **Herklotsichthys dispilonotus** (Bleeker, 1852) (Fig. 5)

Harengula dispilonotus Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : 456 (Bangka) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

Clupea (*Harengula*) *dispilonotus* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 111, pl. 261, fig. 3 (Singapore, Bangka, Bawean).

Specimens :

19 fishes, 25.4-44.2 mm. S.L., ? Singapore (17 : 10 : 65), BMNH. 1967.11. 13.1-19.

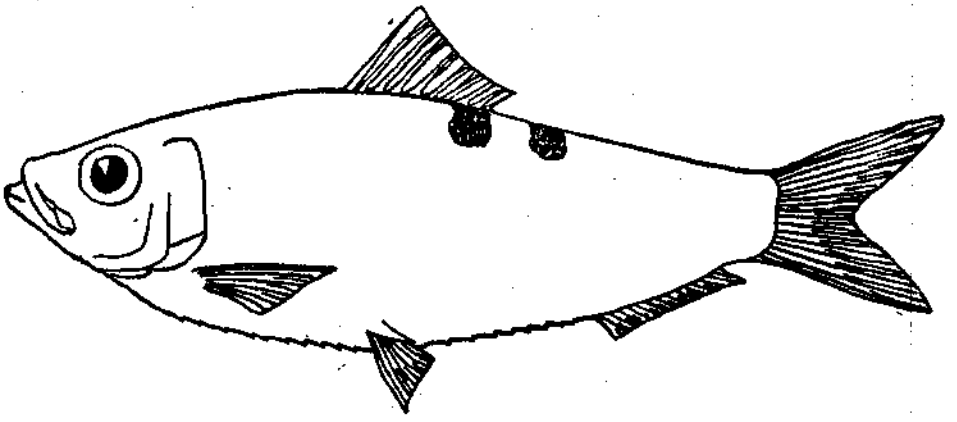

FIG. 5. *Herklotsichthys dispilonotus* (Blkr.)

Identification : Whitehead *et alii* (1966 : 40, type redescribed, key).

Distribution : Singapore, Bangka, Bawean (Bleeker, 1872), Philippines, Borneo (Fowler, 1941 : 585), Thailand (BMNH specimens).

H. dispilonotus has a rather limited range, but the diagnostic two blue/black saddle-like blotches on the back are so conspicuous that the species is unlikely to have been overlooked in other areas. Even in the smallest specimens listed here the blotches are clearly visible when viewed from above, one at the posterior part of the dorsal fin base and the other a short distance behind.

5. **Herklotsichthys punctatus** (Rüppell, 1837) (Fig. 6)

Clupea punctata Rüppell, 1837, *Neue Wirbelth., Fische* : 78, pl. 21, fig. 2 (Massawa, Red Sea).

? *Clupea venenosa* Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 186 (Singapore).

Clupea (*Harengula*) *moluccensis* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 107, pl. 263, figs. 1-2 (Singapore, Sumatra, etc.).

Harengula kunzei Bleeker, 1858, *Nat. Tijdschr. Ned. Ind.*, **15** : 221 (Biliton).

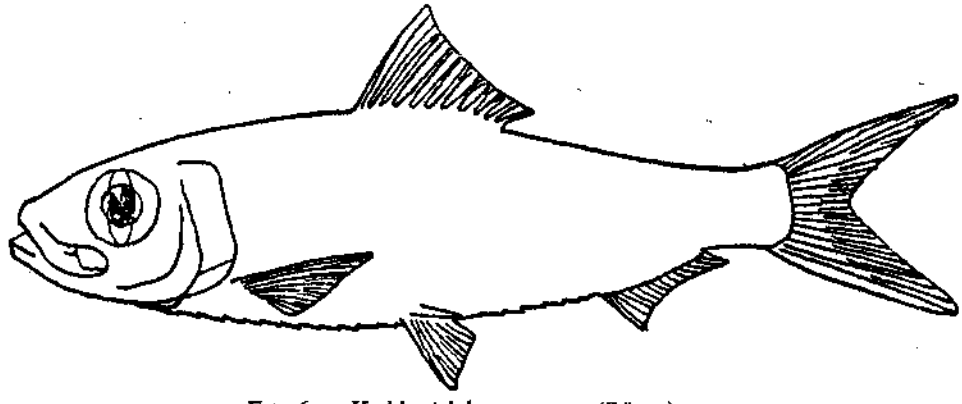

FIG. 6. *Herklotsichthys punctatus* (Rüpp.)

Identification and synonymy : Whitehead (1965a : 244—Rüppell types ; 1967a : 31, Valenciennes' types) ; Whitehead *et alii* (1966 : 31, Bleeker types, key).

Distribution : East African coast (Losse, 1966), Red Sea (Whitehead, 1965a ; 1966b), Seychelles, India (Whitehead, 1967a), Indo-Australian Archipelago, including Singapore (Bleeker, 1872), Philippines (Whitehead, 1966a : 48), Palau (BMNH. specimens), Taiwan (Chu & Tsai, 1958), Australia (BMNH. specimens).

Two distinct colour forms exist along the East African coast (Mr. G. F. Losse, personal communication—described in Whitehead, 1967a : 36), but live colour descriptions are inadequate or lacking for other areas.

Clupea ovalis Bennett, 1830, from Sumatra, which Fowler (1941 : 589) and others have identified as the present species, is more likely *Hilsa kelee* (Cuvier, 1829) but is perhaps best treated as a *nomen dubium*.

6. **Sardinella zunasi** (Bleeker, 1854) (Fig. 7)

Harengula zunasi Bleeker, 1854, *Nat. Tijdschr. Ned. Ind.*, **6** : 417 (Nagasaki).

? *Clupea* (*Alausa*) *zunasi* Martens, 1876, *Preuss. Exped. Ost-Asien*, **1** : 405 (Singapore, Manila, etc.).

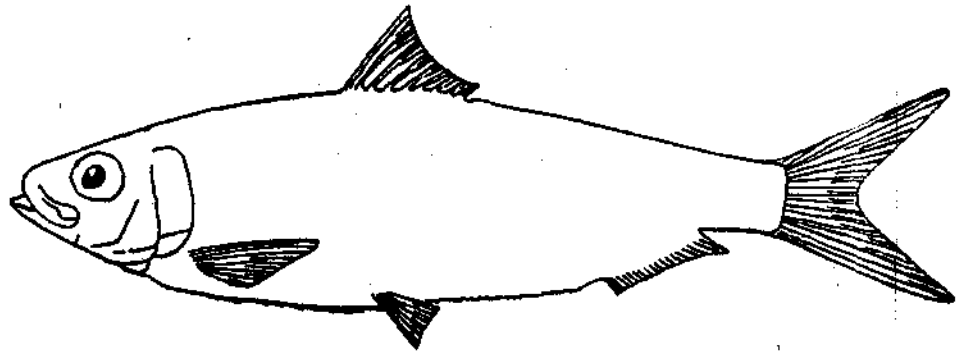

FIG. 7. *Sardinella zunasi* (Blkr.)

Identification and synonymy : Chan (1965 : 21) ; Whitehead *et alii* (1966 : 59, 61, Bleeker types, key).

Distribution : ? Singapore (Martens, 1876), Thailand (BMNH. specimens), Hong Kong to southern Japan (Chan, 1965 : 22).

This rather uncommon species is mainly known from Japan, reaching southwards as far as Hong Kong according to Chan (1965 : 21). The 7 British Museum specimens from Thailand suggest that the Singapore record by Martens (1876) may be correct.

7. **Sardinella brachysoma** Bleeker, 1852 (Fig. 8)

Sardinella brachysoma Bleeker, 1852, *Verh. Batav. Genootsch.*, **24** : 19 (Batavia).

Clupea (*Harengula*) *brachysoma*, Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 104 (West coast of Sumatra, Bangka, Java).

Clupea brachysoma Hardenberg, 1934, *Treubia*, **14** (3) : 305 (Rokan river mouth, Sumatra).

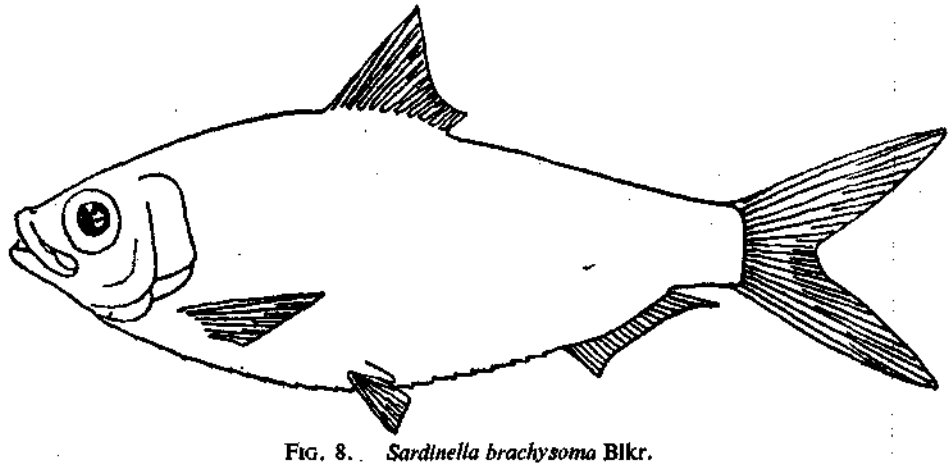

FIG. 8. *Sardinella brachysoma* Blkr.

Identification and synonymy : Chan (1965 : 19, key, Hong Kong and China specimens); Whitehead *et alii* (1966 : 49, Bleeker types, key) ; Whitehead (1967a : 54, fig. 4, separation from *S. albella*).

Distribution : India (Regan, 1917b ; BMNH. specimens), Sumatra (Hardenberg, 1934b), Java, Bangka, Amboina (Whitehead *et alii*, 1966 : 49, 41), Thailand (Rofen, 1963 : 219 ; BMNH. specimens), Philippines, Hong Kong, Taiwan (Chan, 1965).

Sardinella brachysoma closely resembles *S. albella* (Val.) but has more strongly ridged, perforated and fimbriated scales (Whitehead, 1967a : fig. 4). Rofen (1963) stated that it was one of the most abundant sardines in the Bangkok wholesale fish market, being chiefly a marine coastal species but also invading brackish waters.

8. **Sardinella fimbriata** (Valenciennes, 1847) (Fig. 9)

Spratella fimbriata Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 359 (Malabar).

Clupea fimbriata Hardenberg, 1934, *Treubia*, **14** (3) : 305 (Rokan river mouth, Sumatra).

Harengula fimbriata Herre & Myers, 1937, *Bull. Raffles Mus.*, **13** : 12 (Singapore).

Kowala lauta Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1279 (Penang).

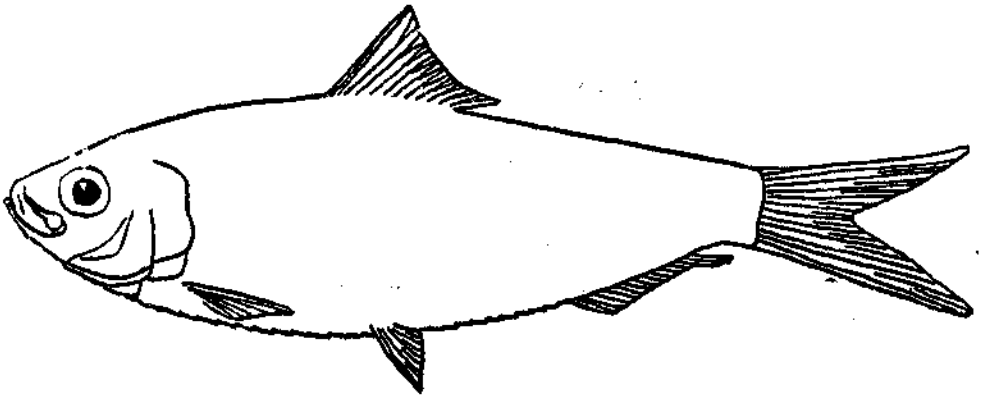

FIG. 9. *Sardinella fimbriata* (Val.)

Identification and synonymy : Dutt (1959, 1961a, India) ; Whitehead (1965 : 254, Red Sea, distinction from *S. jussieu*, i. e. *S. gibbosa*) ; Chan (1965 : 14, revision, key) ; Whitehead (1967a : 50, Valenciennes' type, description).

Distribution : Mauritius (BMNH. specimens), Red Sea (Whitehead, 1965a : 254), India (Dutt, 1959), Penang (Cantor, 1850), Sumatra (Hardenberg, 1934b), Singapore (Herre & Myers, 1937), Java, Celebes, etc. (Weber & DeBeaufort, 1913,) Thailand and Philippines (Chan, 1965), Hong Kong (Whitehead, 1966a : 48), Taiwan (*fide* Chan, 1965).

There are two dried specimens from Cantor's collection labelled syntypes of *Clupea lauta* in the British Museum (Natural History). They appear to be the present species, but gillraker counts cannot be made.

9. **Sardinella albella** (Valenciennes, 1847) (Fig. 10)

Kowala albella Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 362 (Pondicherry).

Clupeonia perforata Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1276 (Penang Sea, Malayan Peninsula, Singapore, Sumatra).

Clupea (*Harengula*) *perforata* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 110 (Penang, Singapore, Bangka, Sumatra, etc.).

Sardinella perforata Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore, Malacca) ; Chan, 1965, *Jap. J. Ichthyol.*, **13** (1-3) : 16 (Singapore).

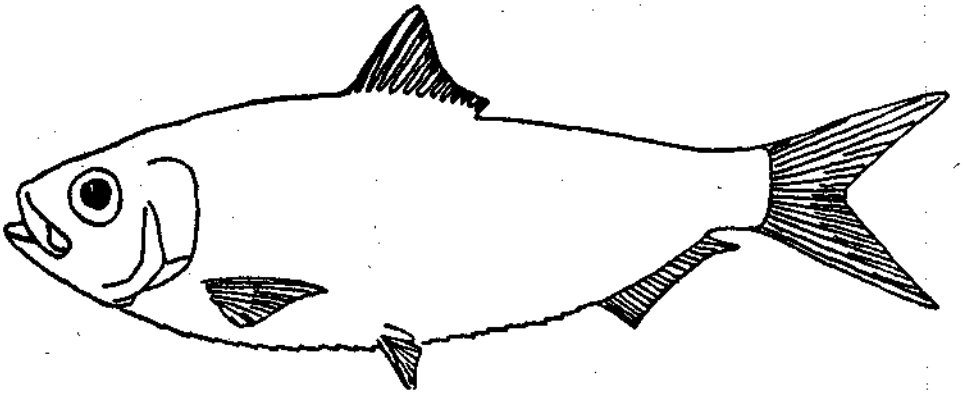

FIG. 10. *Sardinella albella* (Val.)

Identification and synonymy : Whitehead (1964a, *perforata=bulan* ; 1967a : 53, *bulan=albella*) ; Chan, (1965 : 16, key, description, as *perforata*) ; Whitehead *et alii* (1966 : 53, Bleeker types, key).

Distribution : Madagascar (BMNH. specimens), East African coasts (Losse, 1966—as *bulan*), Gulf of Aden (Whitehead, 1965a : 250—as *bulan*), India (no record), Penang, Singapore, Sumatra to Amboina (Bleeker, 1872 : 110), Thailand, Hainan, Hong Kong (Chan, 1965 : 17), Amoy (Whitehead, 1966a : 48).

There is a single skin deriving from Cantor's collection in the British Museum. It is labelled *Clupea kowal* (and *Kowala thoracata* on reverse of label), and is almost certainly the present species.

10. **Sardinella gibbosa** (Bleeker, 1849) (Fig. 11)

Clupanodon jussieu Lacepède, 1803, *Hist. Nat. Poiss.*, **5** : 469, 471, ? pl. 11, fig. 2 (Mauritius) (*nomen dubium*).

Sardinella jussieu Chan, 1959, *Jap. J. Ichthyol.*, **13** (1-3) : 9 (Singapore, Thailand, etc.).

Clupea gibbosa Bleeker, 1849, *J. Ind. Arch*, **3** : 72 (Macassar).

Clupea (*Harengula*) *gibbosa* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 106 (Singapore, Sumatra, Bangka, etc.).

Sardinella gibbosa Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

? *Sardinella sindensis* Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

Identification and synonymy : Dutt (1961a) ; Chan (1965 : 9, as *jussieu*, description, key) ; Whitehead *et alii* (1966 : 56, as *jussieu*, Bleeker types, key) ; Whitehead (1967a : 54, *jussieu=nomen dubium*, Valenciennes' types).

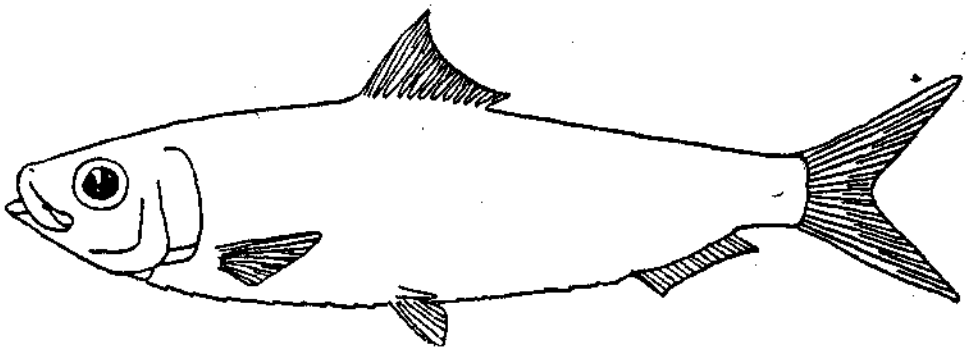

FIG. 11. *Sardinella gibbosa* (Blkr.)

Distribution : Mauritius, Madagascar, East African coast (Losse, 1966), Red Sea (Whitehead, 1965a : 254), India (Dutt, 1961a), Singapore, Thailand, Philippines (Chan, 1965), Sumatra to Celebes (Bleeker, 1872), Hong Kong (Chan, 1965), Taiwan (Chu & Tsai, 1958) and southwards to Fiji, Tonga, Samoa (Günther, 1909), northern Queensland (*fide* Fowler, 1941 : 612).

The distinction between *S. gibbosa* and *S. fimbriata* on gillraker numbers is not entirely satisfactory (Whitehead, 1965 : 255 ; 1967 : 57), but a comparison has not yet been made over the entire range of the two species.

11. **Sardinella melanura** (Cuvier, 1829) (Fig. 12)

Clupea melanura Cuvier, 1829, *Règne Animal*, 2nd ed., **2** : 318 (on Lacepède, 1803, *Hist. Nat. Poiss.*, **5** : pl. 11, fig. 3, *ex* Mauritius).

Sardinella melanura Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

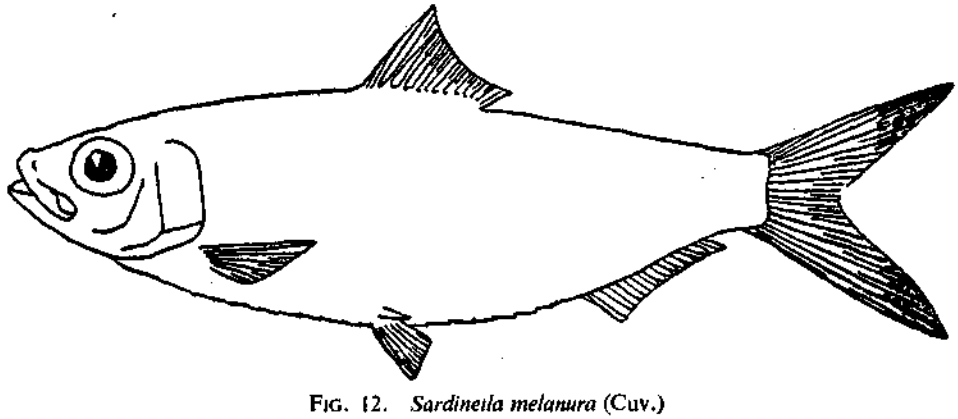

FIG. 12. *Sardinella melanura* (Cuv.)

Identification and synonymy : Chan (1965 : 5, description, key) ; Whitehead (1967a : 62, type material, description, synonyms).

Distribution: Mauritius (Fowler, 1941 : 616), Comoro Is. (BMNH. specimens), East African coast (BMNH. specimens), Red Sea (as *Herklotsichthys vittatus*—Whitehead, 1965a : 247), Bombay (Whitehead, 1967a : 64), Ceylon (Munro, 1955 : 26), Singapore (Herre & Myers, 1937), Thailand (Rofen, 1963 : 226), Bali, Celebes, Amboina, etc. (Bleeker, 1872), Philippines, Samoa (Fowler, 1941 : 616), Fiji, New Hebrides (Chan, 1965), Tahiti (Whitehead, 1967a : 65), not Hong Kong (*fide*, Whitehead, 1966a : 48), Taiwan (Chu & Tsai, 1958 : 106).

The black tips to the caudal lobes make this species unmistakable, but errors in the past led to recognition of a species of *Herklotsichthys* with black caudal tips, i.e. *H. vittatus* of authors. Chan's *S. nigricaudata* from the New Hebrides is also *S. melanura* (Whitehead, 1967a : 68).

12. **Sardinella leiogaster** Valenciennes, 1847 (Fig. 13)

Sardinella leiogaster Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 270 (Indian Ocean).

Clupea (*Amblygaster*) *leiogaster* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6**: 102 (Singapore, Sumatra, etc.).

Sardinella leiogaster Chan, 1965, *Jap. J. Ichthyol.*, **12** (3-6) : 117 (Singapore, Philippines).

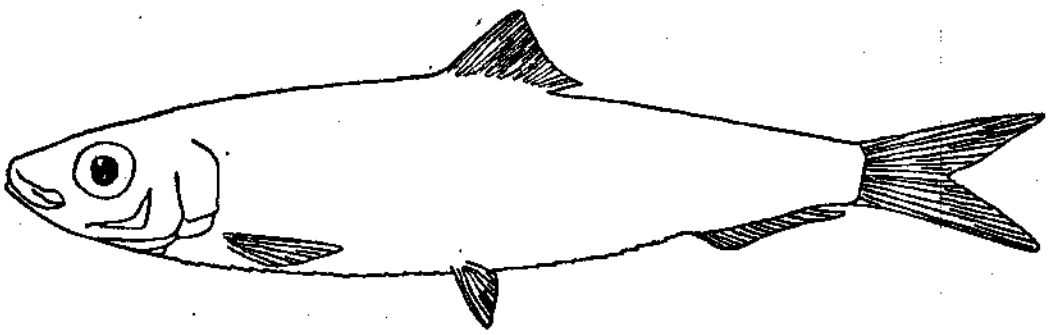

FIG. 13. *Sardinella leiogaster* Val.

Identification and synonymy: Chan (1965, key, description); Whitehead (1967a : 68, Valenciennes type, synonymy).

Distribution: East African coast (BMNH. specimens), Red Sea (Fowler, 1941 : 620—as *S. clupeoides*), Indian Ocean (Whitehead, 1967a : 68), Singapore (Chan, 1965), Sumatra, Java, Celebes, Ceram (Bleeker, 1872), ? Thailand (Rofen, 1963—as *sirm*), Philippines, Pelew I. (Chan, 1965), Hong Kong (Whitehead, 1966a : 48).

This species was either placed in the synonymy of *Sardinella sirm* (Walbaum) by Weber & DeBeaufort, 1913 ; Regan, 1917b ; Fowler, 1941), or identified with *S. clupeoides* (Bleeker), until Chan (1965) showed that *S. sirm*, *S. clupeoides* and *S. leiogaster* are three distinct species. Distributional records are, therefore, suspect and the Bleeker localities cited above require confirmation.

13. **Sardinella clupeoides** (Bleeker, 1849) (Fig. 14)

Amblygaster clupeoides Bleeker, 1849, *J. Ind. Arch.*, **3** : 73 (Macassar).
Sardinella clupeoides Chan, 1965, *Jap. J. Ichthyol.*, **12** (3-6) : 115 (Singapore, Thailand, etc.).

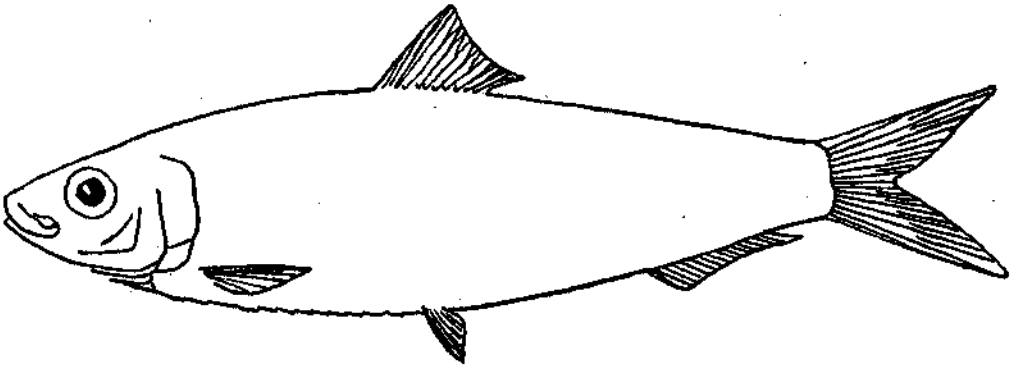

FIG. 14. *Sardinella clupeoides* (Bikr.)

Identification and synonymy : Chan (1965 : 115, description, key) ; Whitehead *et alii* (1966 : 67, Bleeker type, description, key).

Distribution : Malay Peninsula (BMNH. specimens), Singapore, Thailand, Vietnam, Philippines (Chan, 1965), ? Okinawa (Kishinouye, 1907, as *Clupea okinawensis*).

As in the previous species, the range is complicated by misidentifications, e.g. the records by Fowler (1941) for the Red Sea and Penang ; the first refers to a specimen of *Sardinella leiogaster*, and the second is based on Cantor's *Kowala lauta*, which is *S. fimbriata*.

14. **Escualosa thoracata** (Valenciennes, 1847) (Fig. 15)

Kowala thoracata Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 363 (Pondicherry) ; Cantor, 1850, *J. Asiatic Soc.* Bengal, **18** (2) : 1278 (Penang).

Clupeoides lile Hardenberg, 1931, *Treubia*, **13** (1) : 110 (Rokan river mouth, Sumatra) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

Alausa champil Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1284 (Penang).

Clupea (*Clupeoides*) *argyrotaenia* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 101 (Penang, Singapore, Bangka, etc.).

Specimens.

1 fish, 76.2 mm. S.L., Singapore, BMNH. 1967.11.13.955.
1 fish, 68.1 mm. S.L. ? Singapore, BMNH. 1967.11.13.20.
3 fishes, 64.2-66.2 mm. S.L., Siglap (16 : 6 : 65), BMNH. 1967.11.13.21-23.
2 fishes, 69.4-72.7 mm. S.L, Pony (29 : 7 : 65), BMNH. 1967.11.13.24-25.
1 fish, 59.0 mm. S.L., Batu Maung, Penang (19 : 6 : 55), BMNH. 1967.11.13.26.
2 fishes, 53.8-56.5 mm. S.L., Tanjong Dawai, Merbok estuary (7 : 8 : 55), BMNH. 1967.11.13.27-28.

6 fishes, 47.6-61.4 mm. S.L., Ponygod (21 : 4 : 64), BMNH.1967.11.13.29-34.
10 fishes, 43.4-56.8 mm. S.L., ? Singapore, BMNH. 1967.11.13.35-44.
2 fishes, 35.9-42.0 mm. S.L., ? Singapore (27 : 3 : 64), BMNH. 1967.11.13.45-46.
1 fish, 34.6 mm. S.L., Krangi (1 : 4 : 64), BMNH. 1967.11.13.47.
6 fishes, 29.4-40.0 mm. S.L., Batu Maung, Penang (18 : 3 : 55), BMNH.1967. 11.13.48-53.
2 fishes, 27.8-34.2 mm. S.L., Siglap (28 : 4 : 64), BMNH.1967.11.13.54-55.
8 fishes, 38.2-60.0 mm. S.L., ? Singapore, BMNH. 1965.10.20.48-55.

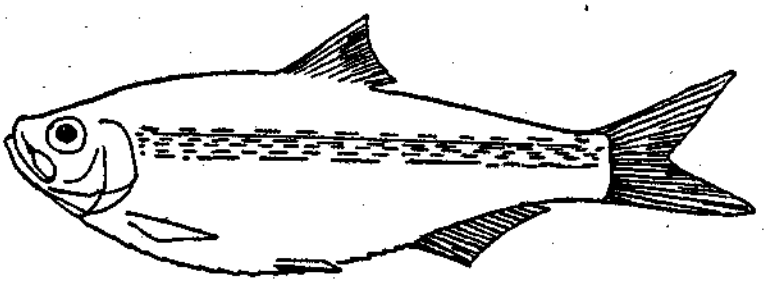

FIG. 15. *Escualosa thoracata* (Val.)

Identification and synonymy : Whitehead (1964a, generic key ; 1967a : 71, Valenciennes' types) ; Whitehead *et alii* (1966 : 71, Bleeker types).

Distribution : India (Regan, 1922 ; Whitehead, 1967a : 71), Burma (BMNH. specimens), Sumatra (Hardenberg, 1931), Penang (Cantor, 1850), Singapore, Bangka, Java (Bleeker, 1872), Borneo (Fowler, 1941 : 640), ? Papua (Munro, 1964—as *Kowala macrolepis*), New Guinea (BMNH. specimens).

The large and rectangular 2nd supra-maxilla in this species (Whitehead, 1967 : fig. 6a) is an excellent field character separating *Escualosa thoracata* from superficially similar species of *Hilsa, Sardinella* and *Herklotsichthys*. Even the smallest specimens listed here were distinguished in this manner. The upper jaw is slightly notched, as in the Alosinae, but the low pelvic count of 7 distinguishes this species from *Hilsa* or *Gudusia*.

There are 2 specimens in the British Museum (Natural History) deriving from Cantor's collection. Both are labelled *Alausa champil* (with *Clupea argyrotaenia* on the reverse of one label).

SUBFAMILY PELLONULINAE

Key to the Indo-Pacific genera (9 out of 20 known genera, the remainder being West African in fresh water).

I. Belly keeled, with prominent pre- and post-pelvic scutes (Tribe Pellonulini)

A. No pre-dorsal scutes

1. Anal fin entire, last two rays not separate ; teeth small..... ..... *Clupeoides* (p. 238)

2. Anal fin with last two rays detached, forming separate finlet

(*a*) Teeth small ; lower jaw articulation below eye centre ; upper jaw less than half head length..... *Corica* (p. 239)

(*b*) Teeth enlarged, caniniform in both jaws ; lower jaw long, its articulation behind eye centre ; upper jaw at least half head length.....*Clupeichthys* (p. 239)

B. Pre-dorsal scutes present

1. Pelvic rays 8 ; 8 branchiostegal rays.....*Potamalosa* (Austr.)
2. Pelvic rays 7 ; 4 branchiostegal rays.....*Hyperlophus* (Austr.)

II. Belly rounded, pre-pelvic scutes lacking keels or absent (Tribe Ehiravini).

A. No pre-pelvic or post-pelvic scutes ; gillrakers present on posterior face of 3rd epibranchial

1. Anal fin entire, last two rays not separate.....*Sauvagella* (Madagascar)
2. Last two anal rays separate, forming small finlet.....*Spratellomorpha* (Madagascar, E. Africa)

B. 6-9 unkeeled pre-pelvic scutes ; anal fin entire

1. Gillrakers present on posterior face of 3rd epibranchial.....*Gilchristella* (S. Africa)
2. Gillrakers absent on posterior face of 3rd epibranchial.....*Ehirava* (Ceylon, India)

Keys to species.

Clupeoides (Whitehead *et alii*, 1966 : 73)

Corica (Fowler, 1941 : 644, but ? monotypic)

Clupeichthys—monotypic

Ehiravini—all genera monotypic

15. **Clupeoides borneensis** Bleeker, 1851 (Fig. 16)

Clupeoides borneensis Bleeker, 1851, *Nat. Tijdschr. Ned. Ind.*, **1** : 275 (Bandjermasin, Borneo) ; Hardenberg, 1933, *Treubia*, **14** (2) : 218 (Musi river, Sumatra) ; *Idem*, 1936, *Treubia*, **15** (3) : 230 (Kapuas river, S.W. Borneo).

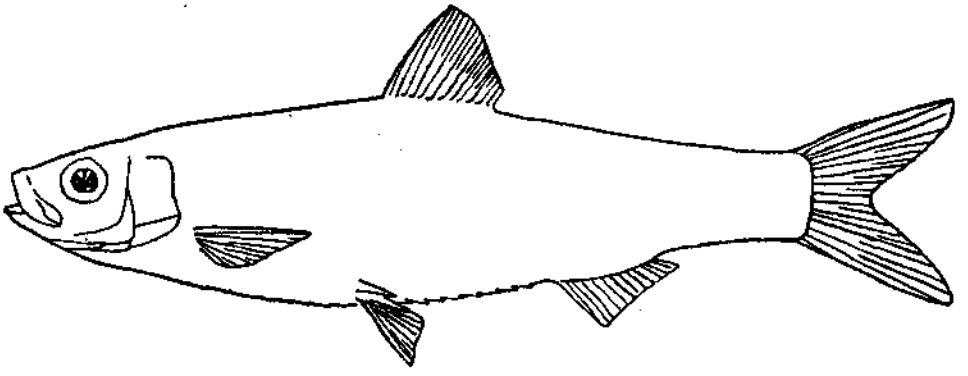

FIG. 16. *Clupeoides borneensis* Blkr.

Identification and synonymy : Whitehead *et alii* (1966 : 73, Bleeker type, description, key).

Distribution : S.E. Sumatra (Hardenberg, 1933), S.W. and S. Borneo (Hardenberg, 1936 ; Bleeker, 1872).

Five species were recognised by Whitehead *et alii* (1966 : 73), but the genus is badly in need of revision. Hardenberg (1936) recorded *Clupeoides borneensis* as a river fish which also descends into brackish water.

16. **Corica soborna** Ham. Buch., 1822

Corica soborna Hamilton-Buchanan, 1822, *Fishes of the Ganges :* 253, 283 (Mahanada river).

Spratella pseudopterus Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : 432 (Pamangkat, S.W. Borneo).

Corica pseudopterus Hardenberg, 1931, *Treubia*, **13** (3-4) : 412, fig. 2 (Musi river in S.E. Sumatra and S.W. Borneo at Padangtikar Bay) ; *Idem*, 1936, *Treubia*, **15** (3) : 229 (Kapuas river, S.W. Borneo) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Singapore).

Corica perakensis Herre, 1936, *Bull. Raffles Mus.*, No. 12 : 5, pl. 1 (Perak river) ; Herre & Myers, 1937, *ibid*, No. 13 : 12 (same material).

Corica bleekeri Hardenberg, 1936, *Treubia*, **15** (3) : 229 (Kapuas river, S.W. Borneo).

Identification and synonymy : Fowler (1941 : 644, key) ; Whitehead *et alii* (1966 : 76, Bleeker type of *C. pseudopterus*).

Distribution : India (Regan, 1922 : 589), S.E. Sumatra (Hardenberg, 1931), W. Malaya (Herre, 1936), Singapore (Herre & Myers, 1937 ; BMNH. specimens), S.W. Borneo (Hardenberg, 1936).

The genus is in need of revision. Fowler (1941 : 644) recognised 5 species, but *C. goniognathus* is a member of *Clupeichthys*, a genus quite distinct from *Corica*. *Corica perakensis* Herre is almost certainly the present species, as also *C. bleekeri* Hardenberg.

17. **Clupeichthys goniognathus** Bleeker, 1855 (Fig. 17)

Clupeichthys goniognathus Bleeker, 1855, *Nat. Tijdschr. Ned. Ind.*, **9** : 275 (Lahat in S.W. Sumatra).

Corica (*Clupeichthys*) *goniognathus* Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 55 (rivers of E. Sumatra ; Kapuas river tributries of Borneo).

Corica goniognathus Hardenberg, 1936, *Treubia*, **15** (3) : 230 (Kapuas river, middle reaches).

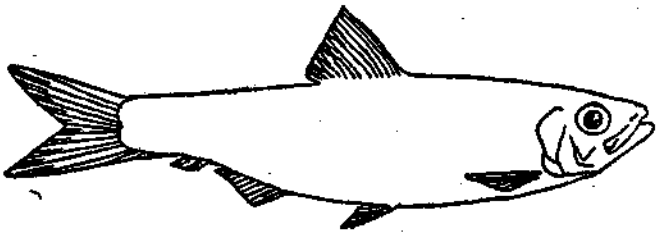

FIG. 17. *Clupeichthys goniognathus* Blkr.

Identification : Whitehead *et alii* (1966 : 77, Bleeker type, description).

Distribution : Sumatra (Bleeker, 1872 ; Weber & DeBeaufort, 1913), Borneo (Hardenberg, 1936).

Weber & DeBeaufort (1913 : fig. 21) show two supra-maxillae, but the anterior one is absent, as in all Pellonulinae.

Subfamily Alosinae

Key to the Indo-Pacific genera (2 out of 6 known genera, the remainder West African, European, Western Atlantic and S. American).

I. Scales large, 40-50 in lateral series ; suboperculum almost rectangular ; marine, anadromous..... *Hilsa* (p. 240)

II. Scales small, 80-100 in lateral series ; suboperculum more crescentic, lower edge of operculum rising steeply ; fluviatile.... *Gudusia* (India, Burma)

Keys to species.

Hilsa, Gudusia (Whitehead, 1965b : 127, 134, 148).

18. **Hilsa kelee** Cuvier, 1829 (Fig. 18)

Clupea kelee, Cuvier, 1829, *Règne Animal*, 2nd ed., **2** : 320 (on *Keelee* Russell, 1803, *Fishes of Coromandel*, **2** : 75, pl. 195, *ex* Vizagapatnam).

Alausa toli Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1281 (Penang, Malay Peninsula, Singapore—at least one fish, see below).

Alausa kanagurta Bleeker, 1852, *Verh. Batav. Genootsch.*, **24** : 13, 34 (Bangka, Batavia).

Alausa brachysoma Bleeker, 1853, *Nat. Tijdschr. Ned. Ind.*, **5**: 527 (Padang, Sumatra).

Alosa malayana Bleeker, 1866, *Ned Tijdschr. Dierk.*, **3**: 294 (Java, Sumatra).

Clupea ilisha in part, Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 446 (a skin, *ex* Penang from Cantor's collection—*fide* Whitehead, 1965 : 134).

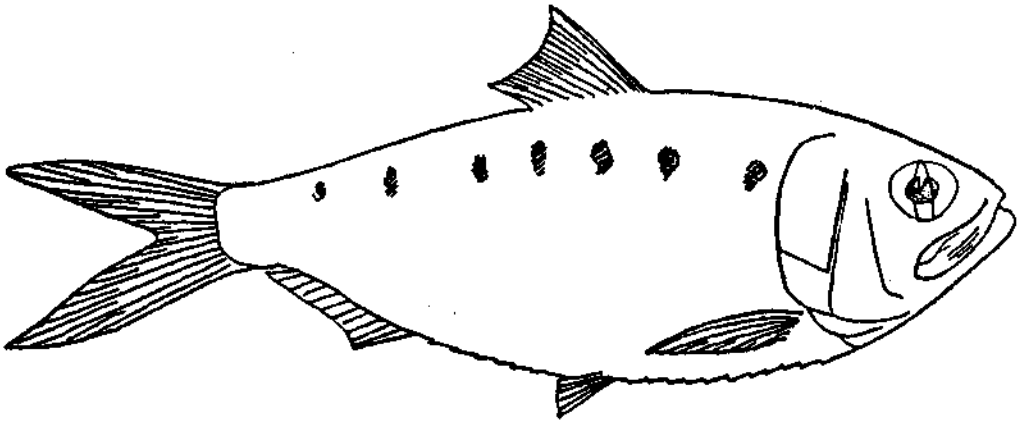

Fig. 18. *Hilsa kelee* (Cuv.)

Identification and synonymy : Whitehead (1965b : 129, synonymy, description, key) ; Whitehead *et alii* (1966 : 79, Bleeker types, descriptions) ; Whitehead (1967a : 90, Cuvier and Valenciennes species, descriptions).

Distribution : Natal (Whitehead, 1965b : 133), E. African coasts (Losse, 1966), Persian Gulf, Gulf of Aden (Whitehead, 1965a : 258), India, Sumatra, Penang (Whitehead, 1965b), Bangka, Madura, Java (Bleeker, 1872—as *kanagurta* and *malayana*), Thailand (Bleeker, 1865 : 35, 176), Hong Kong (BMNH. specimens, juveniles), Papua and New Guinea (Munro, 1964 : 148—as *Hilsa brevis*).

19. **Hilsa toli** (Valenciennes, 1847) (Fig. 19)

Alausa toli Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 435 (Pondicherry and Bombay) ; Cantor, 1850, *J. Asiatic Soc., Bengal*, **18** (2) : 1281 (Penang, Singapore).

Alosa toli Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 113, pl. 265, fig. 4 (Penang, Singapore, Bangka, etc.).

Clupea toli Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 186 (Kuala Lumpur) ; Hardenberg, 1931, *Treubia* **13** (1) : 110 (Rokan mouth, Sumatra) ; *Idem*, 1936, *Treubia*, **15** (3) : 231 (Kapuas river, Borneo).

Clupea (*Alosa*) *toli* Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 64 (Rokan mouth, Sumatra).

Hilsa toli Herre & Myres, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Sumatra coast 100 miles west of Singapore).

Alausa ctenolepis Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : 74 (Singapore, Bangka, Batavia).

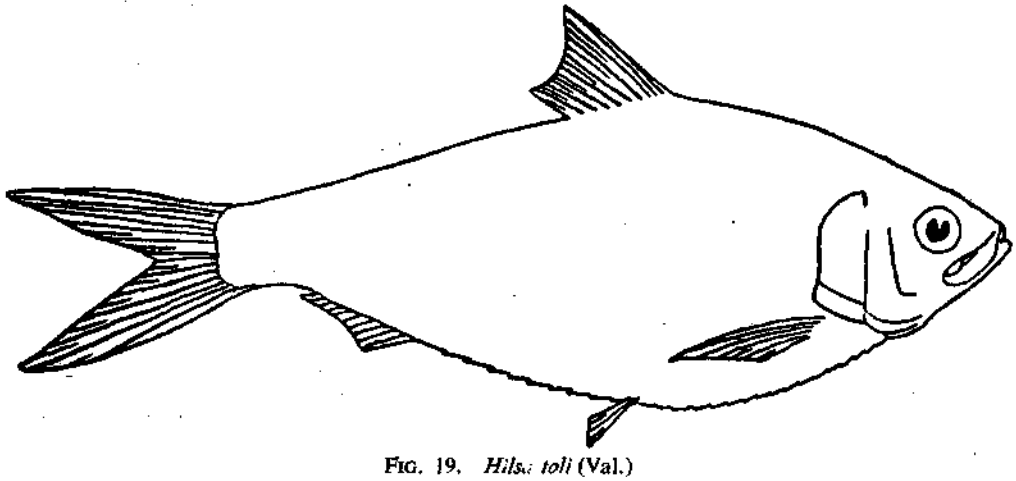

FIG. 19. *Hilsa toli* (Val.)

Identification and synonymy : Whitehead (1965b : 143, description, synonymy, key ; 1967 : 93, Valenciennes' types, descriptions) ; Whitehead *et alii* (1966 : 85, Bleeker's *ctenolepis*, description).

Distribution : India (Whitehead, 1967a : 93 and BMNH. specimens), Penang, Singapore, Bangka (Bleeker, 1872), Sumatra (Hardenberg, 1931), Java (Bleeker, 1872), Borneo (Hardenberg, 1936), ? Thailand (Martens, 1876 : 405), Hong Kong (Fowler, 1931—as *Macrura sinensis*), ? Taiwan (Jordan & Evermann, 1902 : 328).

The rather similar species *Hilsa reevesii* (Richardson) and *Hilsa ilisha* (Ham. Buch.) are reported respectively from Cambodia (Durand, 1940 as *Clupea* (*Alosa*) *thibaudeni*) and Vietnam (Pillay & Rosa, 1963). Thailand specimens of the first are in the British Museum but the second requires confirmation ; they suggest that one or both species might be expected in the Singapore area. The Thailand specimens in the British Museum show some features of *H. ilisha*, however.

20. **Hilsa macrura** (Bleeker, 1852) (Fig. 20)

Alausa macrurus Bleeker, 1852, *Verh. Batav. Genootsch.*, **24** : 31 (Batavia, on Kuhl & van Hasselt drawing).

Alosa macrurus Bleeker, 1861, *Versl. Meded. Akad. Wet. Amsterdam*, **12** : 64 (Penang) ; *Idem*, 1868, *ibid*, (2) **2** : 294 (Riau, Bintang) ; *Idem*, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 113, pl. 264, fig. 4 (Singapore, Sumatra, Bengkalis I, etc.).

Clupea (*Alosa*) *macrura* Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 65 (Rokan river mouth).

Clupea macrura Hardenberg, 1931, *Treubia*, **13** (1) : 111 (Rokan river mouth, Sumatra).

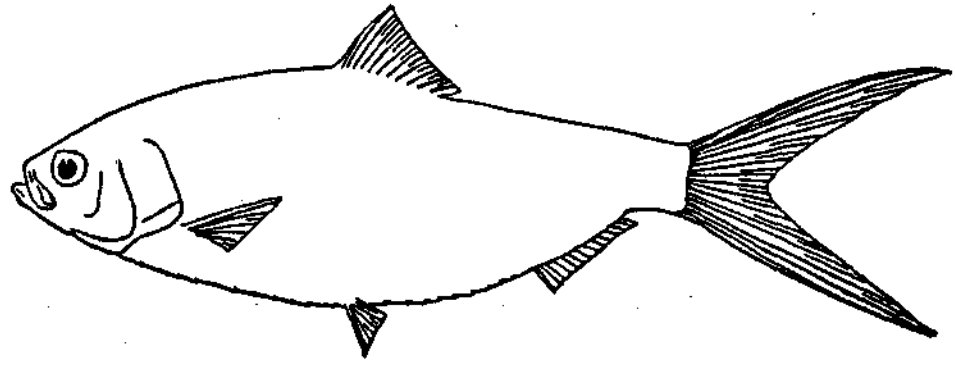

FIG. 20. *Hilsa macrura* (Blkr.)

Identification : Whitehead (1965b : 141, key, description) ; Whitehead *et alii* (1966 : 86, type, description).

Distribution : Penang, Singapore, Sumatra, Java, Borneo (Bleeker, 1872) Sarawak (Whitehead, 1965b), ? Indo-China (Chevey, 1932).

Weber & DeBeaufort (1913 : 66) reported that this species forms the object of a very important fishery at the mouths of some rivers in Borneo, Sumatra and at Malacca, the dried and salted fishes being referred to as *telor ikan* in the Malayan markets.

SUBFAMILY DOROSOMATINAE

Key to the genera (5 out of 7 genera known, the remainder Western Atlantic coasts).

I. Last dorsal ray not prolonged into filament

A. Maxilla curved downwards, distal end slightly expanded..... .....*Gonialosa* (India, Burma)

B. Maxilla straight, tapering terminally.....*Anodontostoma* (p. 243)

II. Last dorsal ray prolonged into a filament

A. Outer edges of dentary only slightly flared ; gillrakers of 1st arch at least $\frac{2}{3}$ length of corresponding gill filaments

1. Post-pelvic scutes 15-16; filaments of outer hemibranchs of first two arches at least $\frac{2}{3}$ length of those of inner hemibranchs..... .....*Konosirus* (China, Japan)

2. Post-pelvic scutes 11-12 ; filaments of outer hemibranchs of first two arches only $\frac{1}{2}$ length of those of inner hemibranchs..... .....*Clupanodon* (India to Japan)

B. Outer edge of dentary strongly flared outwards ; gillrakers of 1st arch less than $\frac{1}{2}$ length of corresponding gill filaments..... .....*Nematalosa* (p. 244)

Key to species

All Indo-Pacific species (Whitehead, 1962 : 101).

21. **Anodontostoma chacunda** (Ham. Buch., 1822) (Fig. 21)

Clupanodon chacunda Hamilton-Buchanan, 1822, *Fishes of the Ganges* : 246, 283 (Gangetic estuaries).

Chatoessus chacunda Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 111 (Malacca ; Molucca Sea) ; Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1293 (Penang, Malayan Peninsula) ; Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 411 (Penang, —Cantor skin ; Sumatra, etc.).

Dorosoma chacunda Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 143, pl. 261, figs. 5, 6 (Penang, Singapore, Bangka, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 100 (Rokan mouth, Sumatra) ; *Idem*, 1936, *Treubia*, **15** (3) : 227 (Kapuas river, Borneo).

Anodontostoma chacunda Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 25, fig. 14 (Rokan mouth, Sumatra, etc.) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Sumatra coast 100 miles west of Singapore).

Specimens.

2 fishes, 42.3-46.0 mm. S.L., Tanjong Dawai, Merbok estuary (7: 8 : 55), BMNH. 1967.11.13.56-57.

Identification and synonymy : Whitehead (1962 : 101, key to genera and species) ; Whitehead *et alii* (1966 : 88, Bleeker types, descriptions).

Distribution : India (Regan, 1917a : 316), Penang, Singapore, Bangka, Sumatra, Borneo to Amboina (Bleeker, 1872), Philippines (Fowler, 1941 : 551), Thailand (BMNH. specimens), ? Hainan (Oshima, 1926).

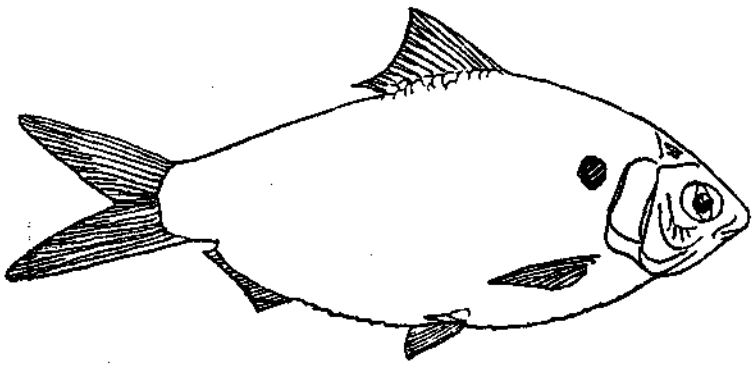

FIG. 21. *Anodontostoma chacunda* (Ham. Buch.)

Fowler (1941 : 551) included Mauritius in the range of this species, based on *Clupea mauritiana* Bennett, but the latter was described as having 9 pelvic rays and would probably have been *Sardinella longiceps* Val.

22. **Nematalosa nasus** (Bloch, 1795) (Fig. 22)

Clupea nasus Bloch, 1795, *Naturg. ausländ. Fische*, 9 : 116, pl. 429, fig. 1 (Malabar).

Dorosoma nasus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, 6 : 142, pl. 260, fig. 4 (Singapore, Bangka, etc.).

Nematalosa nasus Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Sumatra coast 100 miles west of Singapore).

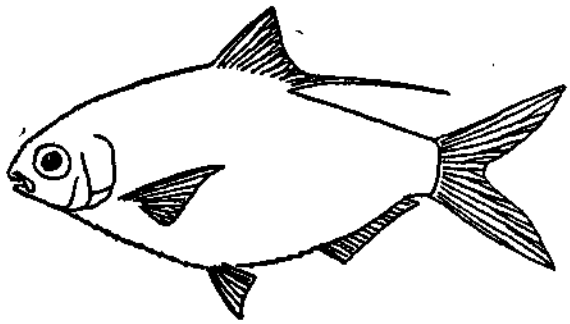

FIG. 22. *Nematalosa nasus* (Bloch)

Identification : Whitehead (1962 : 101, key to genera and species ; 1965a : 262, description, Persian Gulf specimens).

Distribution : Gulf of Aden, Persian Gulf (Whitehead, 1962), India, Burma (Regan, 1917a : 313), Singapore, Bangka, Java to Amboina, Philippines (Bleeker, 1872), Thailand (Rofen, 1963), Hong Kong (Whitehead, 1966a : 49).

Nematalosa nasus is reported common in the Gulf of Thailand, where it is caught by purse seine and bamboo stake trap (Rofen, 1963 : 218).

Clupanodon thrissa (Linnaeus) and *Konosirus punctatus* (Temminck & Schlegel) are both species that might perhaps stray into the South China Sea. The first has been recorded from the Philippines and N. Borneo (Fowler, 1941 : 559), but the second is not recorded south of Hong Kong.

Subfamily Pristigasterinae

Key to the Indo-Pacific genera (4 out of 9 genera known, the remainder New World).

I. Hypo-maxilla present, toothed.....*Pellona* (p. 245)

II. Hypo-maxilla absent

A. Pelvic fins small but present.....*Ilisha* (p. 246)

B. Pelvic fins absent

1. Dorsal fin present ; maxilla round posteriorly, not reaching beyond eye centre.....*Opisthopterus* (p. 250)

2. Dorsal fin absent ; maxilla tapering posteriorly, extending to gill opening or beyond.....*Raconda* (p. 252)

Keys to species.

Pellona—monotypic

Ilisha, Opisthopterus (Whitehead *et alii*, 1966 : 93, 104)

Raconda—monotypic

23. **Pellona ditchela** Valenciennes, 1847 (Fig. 23)

Pellona ditchela Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 314 (on *Ditchelee* of Russell, 1803, *Fishes of Coromandel*, **2** : 72, pl. 188, *ex* Vizagapatnam).

Ilisha hoevenii Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 117, pl. 269, fig. 2 (Singapore, Sumatra, etc.) ; Herre & Myers, 1937; *Bull. Raffles Mus.*, No. 13 : 12 (Sumatra coast 100 miles west of Singapore—as *I. hoeveni*).

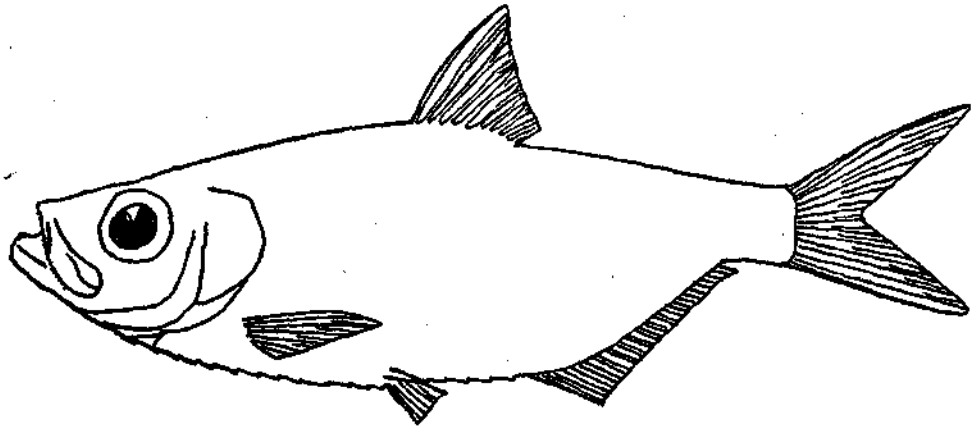

Fig. 23. *Pellona ditchela* (Val.)

Identification and synonymy : Whitehead *et alii* (1966 : 91, Bleeker's *hoevenii*, description, generic key) ; Whitehead (1967a : 110, Valenciennes' *ditchela*, synonymy).

Distribution : East African coasts (Losse, 1966), India (BMNH. specimens), Singapore, Sumatra, Java to Amboina (Bleeker, 1872), Philippines (Fowler, 1941 : 650), Thailand (BMNH. specimens), Taiwan (Liu & Shen, 1957—as *hoeveni*).

24. **Ilisha micropus** (Valenciennes, 1847) (Fig. 24)

Pellona micropus Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 320 (Coromandel coast and Bengal).

Ilisha brachysoma Bleeker, 1872, *Atlas Ichthyol. Ind. Nêerland.*, **6** : 118, pl. 267, fig. 5 (Singapore, Sumatra, etc.).

Specimens.

4 fishes, 47.8-100.2 mm. S.L., ? Singapore, BMNH. 1967.11.13.58-61.

1 fish, 69.0 mm. S.L., Pony (29 : 7 : 65), BMNH. 1967.11.13.62.

Juveniles (prob. this species).

2 fishes, 34.2-34.9 mm. S.L., Tanjong Dawai, Merbok estuary (7 : 8 : 55), BMNH. 1967.11.13.63-64.

4 fishes, 27.3-31.6 mm. S.L., Batu Maung, Penang (18 : 8 : 55), BMNH. 1967.11. 13.65-68.

3 fishes, 27.0-31.6 mm. S.L., Batu Maung, Penang (1 6 : 9 : 55), BMNH. 1967.11. 13.69-71.

7 fishes, 25.6-32.4 mm. S.L., Batu Maung, Penang (19 : 7 : 55), BMNH. 1967.11. 13.72-78.

111 fishes, 26.2-36.5 mm. S.L., ? Singapore, BMNH. 1967.11.13.79-189.

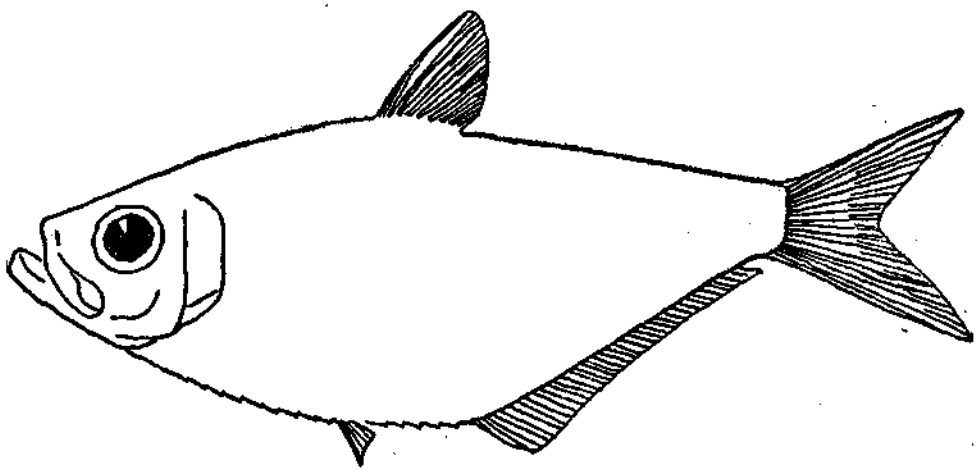

FIG. 24. *Ilisha micropus* (Val.)

Identification and synonymy : Whitehead *et alii* (1966: 100, Bleeker's *brachysoma*, description, key); Whitehead (1967a : 115, *brachysoma=micropus*, description)

Distribution : India (Whitehead, 1967a : 115 ; BMNH. specimens), Singapore, Sumatra, Java (Bleeker, 1872—as *I. brachysoma*), Hong Kong (Whitehead, 1966a : 49—as *I. brachysoma*).

The identity of the juveniles examined here has been inferred from that of the adults since the latest key (Whitehead *et alii*, 1966 : 93) relies on body depth, a feature which may well alter during ontogeny.

25. **Ilisha megaloptera** (Swainson, 1839) (Fig. 25)

Platygaster macrophthalma Swainson, 1838, *Nat. Hist. Anim.*, **1** : 278 (on *Jangarloo* of Russell, 1803, *Fishes of Coromandel*, **2** : 73, pl. 191—*ex* Vizagapatnam) (*nomen oblitum*).

Platygaster megalopterus Swainson, 1839, *Nat. Hist. Anim.*, **2** : 294 (on *Jangarloo* of Russell, 1803).

Ilisha megalopterus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 119, pl. 264, fig. 6 (Singapore, Bintan, Bangka, Borneo at Pamangkat and Sambas, etc.).

Ilisha megaloptera Norman, 1923, *Ann. Mag. nat. Hist.*, (9) **11** : 10 (Malay Peninsula, etc.).

Pellona dussumieri Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 92 (Rokan river mouth, Sumatra) ; Hardenberg, 1931, *Treubia*, **13** (1) : 112 (Rokan river mouth) ; *Idem*, 1936, *ibid*, **15** (3) ; 231 (Kapuas river, Borneo).

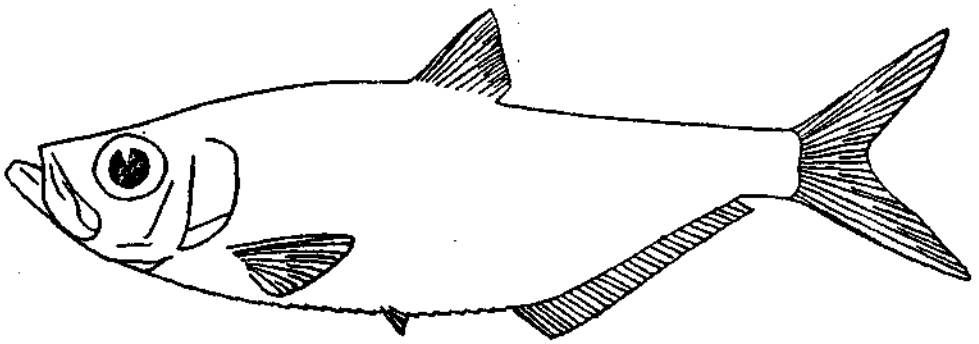

FIG. 25. *Ilisha megaloptera* (Swainson)

Identification and synonymy : Whitehead *et alii* (1966 : 101, Bleeker's *russellii*, description, key) ; Whitehead (1967a : 113, Valenciennes' *dussumieri*, description, discussion).

Distribution : India (Whitehead, 1967a : 113 ; BMNH. specimens), Singapore, Bintan, Bangka, S.W. Borneo, Java, Amboina (Bleeker, 1872).

26. **Ilisha indica** (Swainson, 1839) (Fig. 26)

Platygaster verticalis Swainson, 1838, *Nat. Hist. Anim.*, **1** : 278 (on *Ditchoee* of Russell, 1803, *Fishes of Coromandel*, **2** : 74, pl. 192—*ex* Vizagapatnam) (*nomen oblitum*).

Platygaster indicus Swainson, 1839, *ibid*, **2** : 294 (on *Ditchoee* of Russell, 1803).

Ilisha indica Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 118, pl. 259, fig. 4 (Singapore, Bangka, Sumatra, etc.).

Pellona ditchoa Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 88 (Rokan river mouth, Sumatra) ; Hardenberg, 1931, *Treubia*, **13** (1) : 111 (Rokan river mouth) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Singapore).

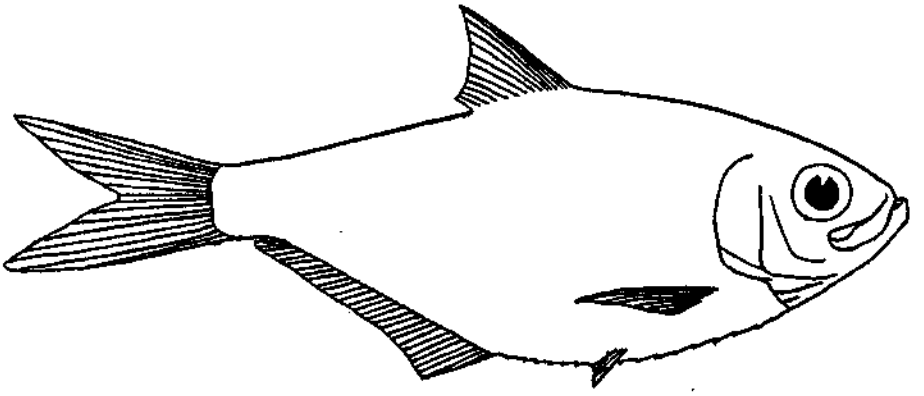

FIG. 26. *Ilisha indica* (Swainson)

Identification and synonymy : Whitehead (1967a : 116, Valenciennes' *ditchoa*= *indica*, description, *verticalis* discussed).

Distribution : India (Norman, 1923 ; Fowler, 1941 ; BMNH. specimens), Penang (BMNH. specimens), Singapore, Bangka, Sumatra, Java (Bleeker, 1872), Papua (Munro, 1964), Thailand (Fowler, 1934 : 86), Hong Kong, China (Norman, 1923 ; BMNH. specimens).

27. **Ilisha pristigastroides** (Bleeker, 1852) (Fig. 27)

Pellona pristigastroides Bleeker, 1852, *Verh. Batav. Genootsch.*, **24** : 20 (Batavia) ; Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 186 (Kuala Lumpur) ; Hardenberg, 1931, *Treubia*, **13** (1) : 112 (Rokan river mouth, Sumatra).

Ilisha amblyuropterus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 122, pl. 262, fig. 4 (Singapore, Sungiduri in Borneo, etc.).

Pellona amblyuropterus Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 90 (Rokan river mouth, Sumatra) ; Hardenberg, 1936, *Treubia*, **15** (3) : 231 (Telok Pekadai, S.W. Borneo).

Identification and synonymy : Whitehead *et alii* (1966 : 93, 94, Bleeker's *pristigastroides* and *amblyuropterus*, descriptions, key).

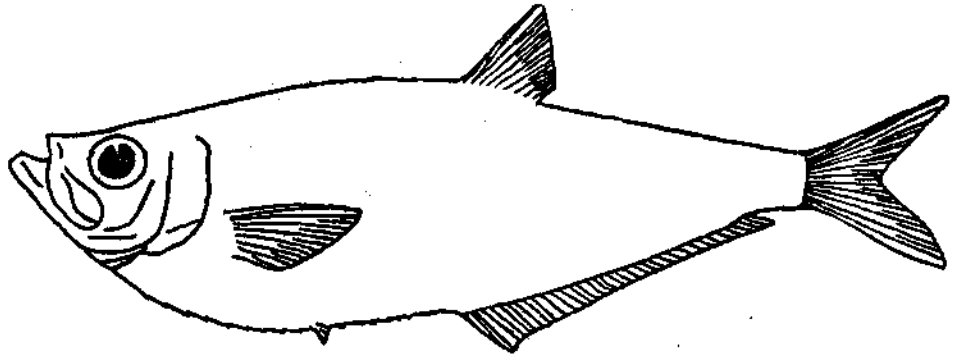

FIG. 27. *Ilisha pristigasteroides* (Blkr.)

Distribution : Singapore (Bleeker, 1872—as *amblyuropterus*), E. Sumatra (Hardenberg, 1931), Java, Borneo (Bleeker, 1872).

28. **Ilisha filigera** (Valenciennes, 1847) (Fig. 28)

Pellona filigera Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 322 (Coromandel coast, Bombay).

Pellona xanthopterus Bleeker, 1851, *Nat. Tijdschr. Ned. Ind.*, **2** : 439 (Sambas, S.W. Borneo).

Pellona xanthoptera Hardenberg, 1936, *Treubia*, **15** (3) : 231 (Telok Pekadai, S.W. Borneo).

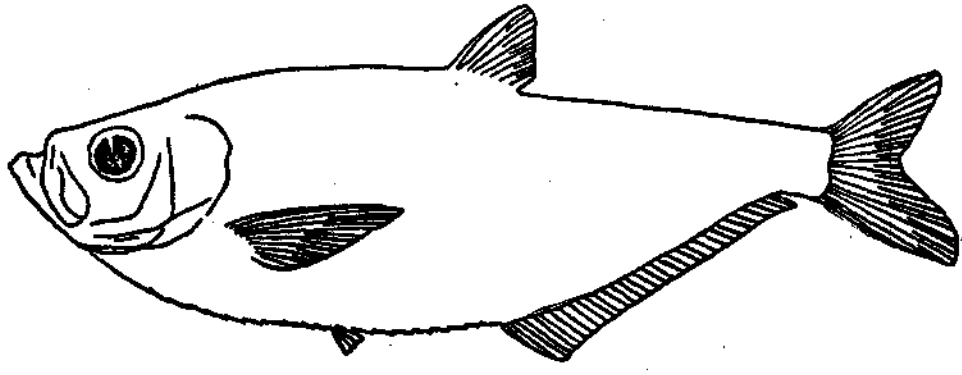

FIG. 28. *Ilisha filigera* (Val.)

Identification and synonymy : Whitehead *et alii* (1966 : 96, Bleeker's *xanthopterus*, description, key) ; Whitehead (1967a : 117, Valenciennes' *filigera*, description, *xanthopterus=filigera*).

Distribution : India (Norman, 1923 ; Whitehead, 1967a ; 117), Borneo (Bleeker, 1851), Java (Weber & DeBeaufort, 1913 : 94—as *xanthoptera*), ? Indo-China (Chevey, 1932).

29. **Ilisha elongata** (Bennett, 1830) (Fig. 29)

Alosa elongata Bennett, 1830, *Mem. Life of Raffles* : 691 (Sumatra).

Ilisha elongata Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 119, pl. 259, fig. 3 (Penang, Singapore, Bangka, Borneo at Pamangkat).

Pellona affinis Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1273 (Penang, Malay Peninsula, Singapore).

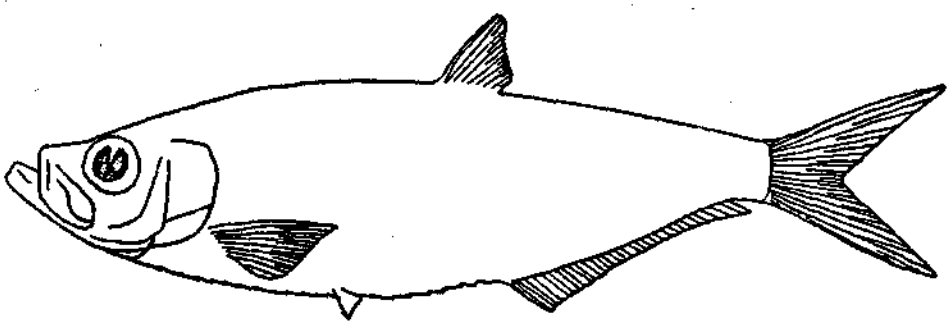

FIG. 29. *Ilisha elongata* (Bennett)

Identification and synonymy : Whitehead *et alii* (1966 : 99, Bleeker's *schlegelii*, description, key) ; Whitehead (1966a : 32, Richardson's *abnormis*=*elongata*, description ; 1967a : 118, Valenciennes' *leschenaulti, grayana, vimbella* and *novacula*, all=*elongata*, descriptions).

Distribution : India (Norman, 1923 ; Fowler, 1941 ; Whitehead, 1967a : 118), Rangoon (Whitehead, 1967a : 121—Valenciennes' *novacula*), Penang, Singapore Bangka, Sumatra, Java, Borneo (Bleeker, 1872), Cochin China (Fowler, 1941 : 663), ? Philippines (Elera, 1895), Macao (Whitehead, 1967a : 120—Valenciennes' *vimbella*), Hong Kong (Whitehead, 1966a : 32, 49), Chefoo, Amoy (BMNH. specimens), Japan (Norman, 1923).

30. **Opisthopterus tardoore** (Cuvier, 1829) (Fig. 30)

Pristigaster tardoore Cuvier, 1829, *Règne Animal*, 2nd ed., **2** : 321 (on *Tartoore* of Russell, 1803, *Fishes of Coromandel*, **2** : 74, pl. 193—*ex* Vizagapatnam).

Opisthopterus tartoor: Bleeker, 1866, *Ned. Tijdschr. Dierk.*, **3** : 296 (Singapore, Batavia) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 95, fig. 31 (Rokan river mouth, Sumatra) ; Hardenberg, 1931, *Treubia*, **13** (1) : 112 (Rokan river mouth) ; *Idem*, 1936, *Treubia*, **15** (3) : 231 (Telok Pekadai, S.W. Borneo).

Opisthopterus macrognathus Bleeker, 1866, *Ned. Tijdschr. Dierk.*, **3** : 299 (Singapore, Sumatra, etc.)

Specimens.

42 fishes, 29.8-76.8 mm. S.L., ? Singapore, BMNH. 1967.11.13.190-231.

5 fishes, 28.9-34.2 mm. S.L., Batu Maung, Penang (16 : 9 : 65), BMNH. 1967.11.13.232-236.

1 fish, 33.2 mm. S.L., Batu Maung, Penang (7 : 7 : 56), BMNH.1967.11.13.237.

Identification and synonymy : Whitehead *et alii* (1966 : 104, Bleeker's *macrognathos*, description, key) ; Whitehead (1967a : 122, Cuvier's *tardoore*, description).

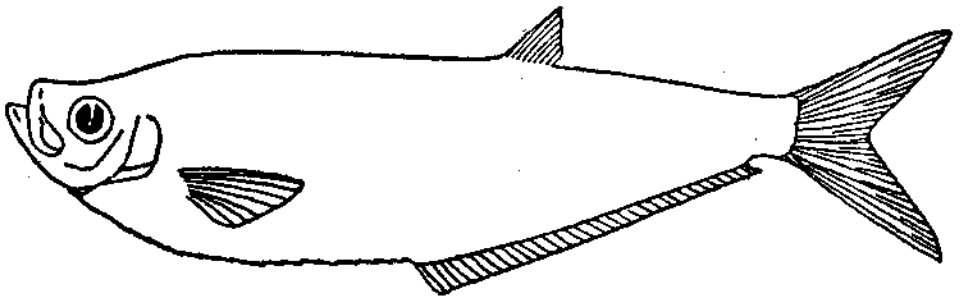

FIG. 30. *Opisthopterus tardoore* (Cuv.)

Distribution : India (Whitehead, 1967a : 122), Singapore, Java (Bleeker, 1866), E. Sumatra (Hardenberg, 1931 ; Fowler, 1941 : 664), Borneo (BMNH. specimens), Thailand (Fowler, 1935 : 94—as *indicus*), ? Hong Kong (Fowler, 1931).

Distributional records are suspect because the separation of this species from *O. valenciennesi* Bleeker on the basis of maxilla length is not entirely satisfactory. New characters were proposed by Whitehead *et alii* (1966 : 107) after re-examination of the type of *O. valenciennesi*. These are not, however, applicable to juveniles, and the identity of the smaller fishes listed above has been inferred from the larger specimens—not without hesitation, since Singapore is one of the type localities of *O. valenciennesi*.

31. **Opisthopterus valenciennesi** (Bleeker, 1872) (Fig. 31)

Opisthopterus valenciennesi Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 123 (Singapore, Batavia).

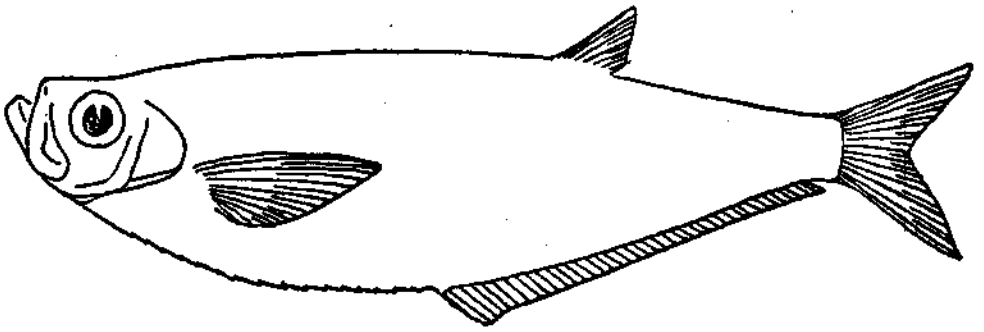

FIG. 31. *Opisthopterus valenciennesi* Blkr.

Identification and synonymy : Whitehead *et alii* (1966 : 106, Bleeker's type material, description, key).

Distribution : Singapore, Batavia (Bleeker, 1872), Hong Kong, Foochow (Whitehead, 1966a : 49, on BMNH. specimens).

This species might perhaps replace *O. tardoore* in the South China Sea, but previous descriptions are not detailed enough for certain identification.

32. **Raconda russeliana** (Gray, 1831) (Fig. 32)

Raconda russeliana Gray, 1831, *Zool. Miscellany*, **1** : 9 (Sangar Roads, India).

Raconda russelliana : Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1274 (Penang, Malay Peninsula, Singapore) ; Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 124 (Penang, Singapore) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 97, fig. 33 (Rokan river mouth, Sumatra) ; Norman, 1923, *Ann. Mag. nat. Hist.*, (9) **11** : 16 (type of *russeliana*, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 112 (Rokan river mouth) ; Tweedie, 1936, *Bull. Raffles Mus.*, No. 12 : 18 (Perak) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 12 (Sumatra coast 100 miles west of Singapore).

Pristigaster russellianus Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 462 (Cantor and Gray material).

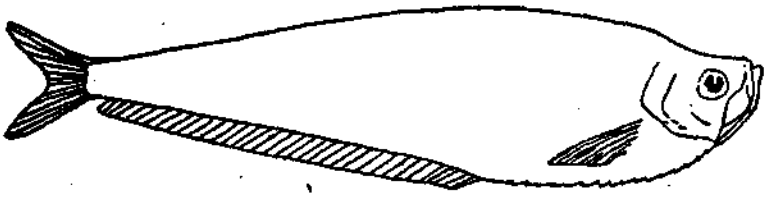

FIG. 32. *Raconda russelliana* Gray

Identification : Norman (1923, description, key) ; Fowler (1941 : 665, synonymy, key).

Distribution : India (Gray, 1831 ; BMNH. specimens), Penang, Malay Peninsula, Singapore (Cantor, 1850 ; BMNH. specimen *ex* Penang), E. Sumatra (Hardenberg, 1931).

Family ENGRAULIDAE

Key to Indo-Pacific subfamilies.

I. Body normal, not ' rat-tailed ' ; caudal forked ; at most a single pectoral filament.....Engraulinae (see below)

II. Body elongate, tapering, ' rat-tailed ' ; caudal barely forked, upper lobe prominent ; 4 or more pectoral filaments.....Coiliinae (p. 271)

SUBFAMILY ENGRAULINAE

Key to Indo-Pacific genera (7 out of 14 genera, the remainder New World).

I. No pre- or post-pelvic scutes ; posterior frontal fontanelles occluded in adults.....*Engraulis* (p. 253)

II. Abdominal scutes present* ; posterior frontal fontanelles retained in adults except in very large specimens

A. Scutes present only between pectoral and pelvic fin bases ; anal fin short, less than 25 rays.....*Stolephorus* (p. 254)

B. Scutes also present behind pelvic fin base ; anal fin longer, with more than 30 rays

1. No pre-pectoral scutes, or one or two followed by a gap

(*a*) Teeth small, close-set ; two supra-maxillae.....*Thrissina* (p. 262)

(*b*) Teeth large, caniniform ; no anterior supra-maxilla.....*Lycothrissa* (p. 262)

2. Pre-pectoral scutes present, trenchant in all but one species (see *ii*)

(*a*) 1st pectoral ray normal, not filamentous

(i) All scutes trenchant ; anterior supra-maxilla small or absent.....*Thryssa* (p. 263)

(*ii*) Scutes barely apparent except before pectorals ; anterior supra-maxilla as long as expanded portion of posterior sup. max. .....*Papuengraulis* (Papua, New Guinea)

(*b*) 1st pectoral ray filamentous ; anterior supra-maxilla absent .....*Setipinna* (p. 268)

Keys to species.

Engraulis (? a single Indo-Pacific species, Whitehead *et alii*, 1966 : 109).

Stolephorus, Thryssa, Setipinna (Whitehead, 1967b)

Thrissina, Papuengraulis—monotypic.

33. **Engraulis japonicus** (Temm. & Schl., 1846) (Fig. 33)

Engraulis japonicus Temminck & Schlegel, 1846, *Fauna Japonica*, pt. 13 : 239, pl. 108, fig. 3 (S.W. Japan).

Engraulis zollingeri Bleeker, 1849, *J. Ind. Arch.*, 3 : (69) 73 (Macassar, Celebes).

Stolephorus (*Stolephorus*) *zollingeri* Bleeker, 1866, *Ned. Tijdschr. Dierk.*, 3 : 303 (Padang, Sumatra, etc.).

Stolephorus zollingeri Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, 6 : 126, pl. 266, fig. 2 (Sumatra, etc.).

Identification and synonymy : Whitehead (1964b, *zollingeri* a sp. of *Engraulis*) ; Whitehead *et alii* (1966 : 109, Bleeker's *zollingeri*, description, key).

Distribution : Java, Sumatra, Bali, Celebes, Amboina (Bleeker, 1872), Philippines (BMNH. specimens), Hong Kong, Chefoo, Japan (Whitehead, 1966a : 49 ; BMNH. specimens).

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* Occasionally absent in *Stolephorus purpureus* of Hawaii, but posterior frontal fontanelles retained in adult.

This species has not yet been recorded from Malayan waters, W. Borneo or E. Sumatra, but it is included here because it occurs in many parts of the Indo-

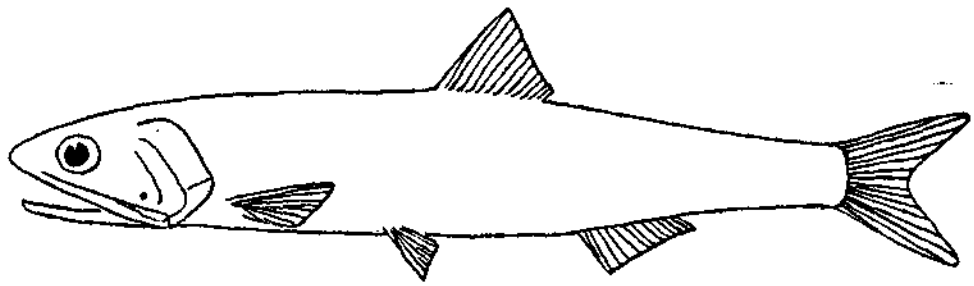

FIG. 33. *Engraulis japonicus* Temm. & Schl.

Australian Archipelago and has probably been misidentified in the past. The presence of *Engraulis*, hitherto assumed to be an antitropical genus, in tropical waters was first reported by Whitehead (1964b); many subsequent records have resulted from a clearer distinction between *Engraulis* and the superficially similar *Stolephorus*. A comparison between the Indo-Australian Archipelago form of *E. japonicus* and Japanese, South African and Australian specimens has not yet been made. The tropical forms of *Engraulis* are in general smaller than those from temperate waters and appear to have slightly higher meristic counts.

34. **Stolephorus heterolobus** (Rüppell, 1837) (Fig. 34)

Engraulis heteroloba Rüppell, 1837, *Neue Wirbelth., Fische*: 79, pl. 4 (Red Sea).

Stolephorus pseudoheterolobus Hardenberg, 1933, *Nat. Tijdschr. Ned. Ind.*, 93 (2): 261 (Riau and Lingga Archipelago); Kow, 1965, *Bull. natn. Mus. Singapore*, 33 (4): 23 (Singapore).

Specimens.

72 fishes, 50.5-62.6 mm. S.L., Singapore (coll. Kow, 8 : 9 : 49), BMNH. 1967. 11.13.238-309.

9 fishes, 49.1-63.5 mm. S.L., Singapore (coll. Kow, 24 : 9 : 65), BMNH. 1967. 11.13.310-318.

1 fish, 59.6 mm. S.L., Singapore (18 : 3 : 49), BMNH. 1967.11.13.319.

9 fishes, 49.7-65.5 mm. S.L., Singapore (8 : 9 : 49), BMNH. 1967.11.13.320-328.

12 fishes, 45.1-56.0 mm. S.L., Singapore (14 : 1 : 66), BMNH. 11.13.329-340.

7 fishes, 27.0-48.7 mm. S.L., Singapore (coll. Kow, 24 : 11 : 65), BMNH. 1967. 11.13.341-347.

11 fishes, 36.8-49.9 mm. S.L., Singapore (coll. Kow, 20 : 12 : 65), BMNH. 1967. 11.13.348-358.

9 fishes, 43.1-51.6 mm. S.L., Pony (8 : 7 : 65), BMNH. 1967.11.13.359-367.

7 fishes, 33.1-48.8 mm. S.L., Singapore (6 : 12 : 49), BMNH. 1967.11.13.368-374.

many fishes, 27.2-40.1 mm. S.L., Singapore (coll. Kow, 6 : 12 : 49), BMNH. 1967.11.13.375-404.

Identification and synonymy : Whitehead (1965a : 266, Rüppell type, key, description, Red Sea material; 1968, key, comment on Hardenberg's species).

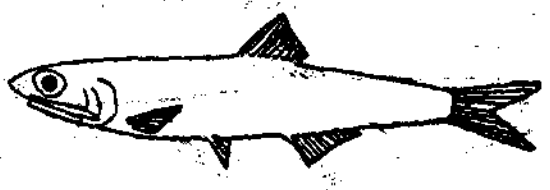

FIG. 34. *Stolephorus heterolobus* (Rüpp.)

Distribution : Madagascar, East African coast (Losse, 1966), Red Sea (Whitehead, 1965a : 266), India (BMNH. specimens), Singapore (Kow, 1965), Riau and Lingga Archipelago (Hardenberg, 1931—as *pseudoheterolobus*), Java (BMNH. specimens), ? Sumatra, Ternata, Amboina (Bleeker, 1872), Philippines, Palau (BMNH. specimens), Hong Kong (Whitehead, 1966a : 49), Taiwan (Liu & Shen, 1957—as *pseudoheterolobus*), Okinawa (BMNH. specimens).

Recent work by Mr. I. Ronquillo (unpublished) has indicated a species very close to *S. heterolobus* but with a lower gillraker count and longer head (=Species A here and in key of Whitehead, 1967b). In addition, Mr. Ronquillo believes that Hardenberg's *pseudoheterolobus* material (now lost) was *S. heterolobus* (as suggested in Whitehead, 1965a : 268), while his *heterolobus* material was Species A. The distribution of *S. heterolobus* given here must, therefore, be tentative. This species appears to form the bulk of the anchovy fishery in Singapore, the Philippines, Thailand and the east coast of India.

35. **Stolephorus** Species A (Fig. 35)

? *Stolephorus heterolobus* Hardenberg, 1934, *Treubia*, **14** (3) : 324, fig. 6 (Singapore, Kangean Archipelago, etc.).

Stolephorus Species A Whitehead, 1967b, *J. mar. biol. Assn. India*, **9** (1) : 13-37. (India).

Specimens.

6 fishes, 24.8-25.0, 45.4-57.4 mm. S.L., ? Singapore (12 : 6 : 64), BMNH. 1967. 11.13.408-413.

6 fishes, 44.6-60.4 mm. S.L., ? Singapore (14 : 1 : 66), BMNH. 1967.11.13.414-419.

1 fish, 53.6 mm. S.L., ? Singapore (coll. Kow), BMNH. 1967.11.13.420.

1 fish, 54.2 mm. S.L., Krangi (1 : 4 : 64), BMNH. 1967.11.13.421.

1 fish, 42.4 mm. S.L., ? Singapore (4 : 4 : 64), BMNH. 1967.11.13.422.

4 fishes, 37.8-45.4 mm. S.L., ? Singapore (coll. Kow, 10 : 12 : 65), BMNH. 1967. 11.13.423-427.

6 fishes, 28.5-44.2 mm. S.L., ? Singapore (coll. Kow), BMNH. 1967.11.13. 428-433.

Identification and synonymy : Whitehead (1967b, key, comment on Hardenberg's *heterolobus*).

Distribution : Gulf of Aden (BMNH. specimens), India (Whitehead, 1967b), Singapore, Krangi (specimens listed above), Kangean Archipelago (Hardenberg, 1934c), Java, Philippines, Hong Kong (BMNH. specimens).

FIG. 35. *Stolephorus* Species A

This species will be described by Mr. I. Ronquillo (see note on previous species) who reports that it is very common in Hong Kong, Thailand, Singapore and th east coast of India.

36. **Stolephorus buccaneeri** (Strasburg, 1960) (Fig. 36)

Stolephorus buccaneeri Strasburg, 1960, *Pacific Sci.*, **14** (4) : 396 (Hawaii).

Specimens.

2 fishes, 40.6-42.3 mm. S.L., Pony (13 : 7 : 63), BMNH. 1967.11.13.405-406.
1 fish, 38.8 mm. S.L., ? Singapore (12 : 6 : 64), BMNH. 1967.11.13.407.

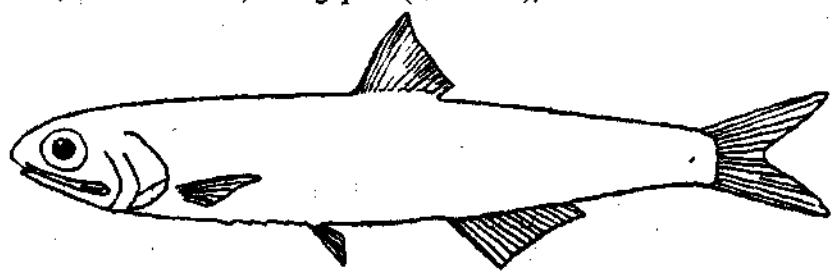

FIG. 36. *Stolephorus buccaneeri* Strasb.

Identification and synonymy : Whitehead (1965a : 268, key, description, Red Sea material ; 1967b, key).

Distribution : Durban (Whitehead, 1965a : 270), Comoro Is. (Whitehead, 1967b), Zanzibar (BMNH. specimens), Mombasa (Losse, 1966), Suez, Persian Gulf (Whitehead, 1965a), S. India at Calicut and Vizingium (BMNH. specimens), Pony, Singapore (BMNH. specimens listed above), Hong Kong, Taiwan (Whitehead, 1966a : 49), Philippines (BMNH. specimens), Japan (Hayashi & Tadakoro, 1962—as *zollingeri*), Palau in Caroline Is. (BMNH. specimens), Hawaii (Strasburg, 1960).

The species appears to be rather rare in the Indian Ocean but very common in Hong Kong, Japan and Hawaii. The paucity of records from the Indo-Australian Archipelago probably reflects failure to identify the species correctly. Many authors have used Bleeker's name *zollingeri* (the types of which are *Engraulis japonicus*—Whitehead *et alii*, 1966). *Stolephorus buccaneeri* is of some commercial importance in Japan, Hong Kong, the Philippines and Thailand.

37. **Stolephorus macrops** (Hardenberg, 1933) (Fig. 37)

Stolephorus baganensis macrops Hardenberg, 1933, *Nat. Tijdschr. Ned. Ind.*, 93 (2) : 260 (Indragiri river mouth, Sumatra).

Specimens.

1 fish, 53.2 mm. S.L., ? Singapore, BMNH. 1967.11.13.434.

1 fish, 46.6 mm. S.L., ? Singapore (alizarin), BMNH. 1967.11.13.435.

9 fishes, 41.6-46.2 mm. S.L., Batu Maung, Penang (7 : 7 : 56), BMNH. 1967. 11.15.436-444.

1 fish, 41.7 mm. S.L., ? Singapore, BMNH. 1967.11.13.445.

54 fishes, 34.7-40.9 mm. S.L., Batu Maung, Penang, BMNH. 1967.11.13.446-499.

1 fish, 42.3 mm. S.L., Singapore (27 : 3 : 64), BMNH. 1967.11.13.500.

3 fishes, 35.1-54.1 mm. S.L., Batu Maung, Penang (19 : 7 : 55), BMNH. 1967. 11.13.501-503.

4 fishes, 32.3-45.6 mm. S.L., Krangi (1 : 4 : 64), BMNH. 1967.11.13.504--507.

1 fish, 43.0 mm. S.L., Batu Maung, Penang (18 : 8 : 55), BMNH. 1967.11.13.508.

2 fishes, 46.8-50.5 mm. S.L., Singapore (31 : 3 : 49), BMNH. 1967.11.13.509-510.

2 fishes, 41.2-46.4 mm. S.L., Muar market, Kuanton (16 : 3 : 63), BMNH. 1967.11.13.511-512.

2 fishes, 43.2-45.2 mm. S.L., Muar market, Kuanton (16 : 3 : 63), BMNH.1967. 11.13.513-514.

2 fishes, 39.8-45.8 mm. S.L., ? Singapore (27 : 3 : 64), BMNH. 1967.11.13.515-516.

2 fishes, 41.2-45.0 mm. S.L., Batu Maung, Penang (21 : 5 : 55), BMNH. 1967. 11.13.517-518.

4 fishes, 37.8-40.2 mm. S.L., Batu Maung, Penang (19 : 6 : 55), BMNH. 1967.11. 13.519-522.

1 fish, 46.8 mm. S.L., ? Singapore (12 : 6 : 64), BMNH. 1967.11.13.523.

1 fish, 48.6 mm. S.L., Johore, Singapore (18 : 4 : 65), BMNH. 1967.11.13.524.

1 fish, 32.8 mm. S.L., Tanjong Dawai, Merbok estuary (7 : 8 : 65), BMNH. 1967.11.13.525.

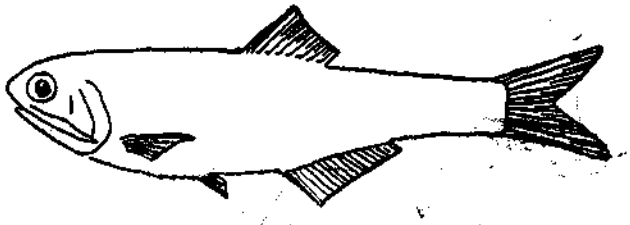

FIG. 37. *Stolephorus macrops* Hardb.

Identification and synonymy : Whitehead (1967b, key, Indian material) ; Mr. I. Ronquillo (pers. comm.) believes that Hardenberg's *baganensis* material was mixed, only the *macrops* fraction being new, the remainder being *Stolephorus tri* (Bleeker).

Distribution : ? Gulf of Aden (Whitehead, 1967b), Bay of Bengal (Whitehead, 1967b), Java, Sarawak, Philippines, Hong Kong (BMNH. specimens).

The number of specimens and localities listed suggests that this is one of the commonest Malay species. Many previous records must refer to it, but descriptions are too poor to decide which are correct identifications. *Stolephorus macrops* closely resembles *S. tri* but lacks the small sharply-pointed spine attached to the pelvic scute in that species. In addition, the hind border of the pre-operculum has a distinct indentation near the maxilla tip, whereas it is evenly rounded in *S. tri*.

38. **Stolephorus tri** (Bleeker, 1852) (Fig. 38)

Engraulis tri Bleeker, 1852, *Verh. Batav. Genootsch.*, **24** : 40 (Batavia) ; ? Düncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 185 (Kuala Langat ; Kuala Salangor, Muar river).

Stolephorus tri Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 128 (Bangka, etc.) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 47 (Rokan river mouth, Sumatra) ; Hardenberg, 1931, *Treubia*, **13** (1) : 106 (Rokan river mouth) ; *Idem*, 1934, *Treubia*, **14** (3) : 318 (river mouths, Sumatra, Java, Borneo) ; *Idem*, 1936, *Treubia*, **15** (3) : 228 (Telok Pekadai, S.W. Borneo).

? *Stolephorus baganensis* Hardenberg, 1931, *Treubia*, **13** (1) : 107 (Rokan river mouth—no description) ; *Idem*, 1933, *Nat. Tijdschr. Ned. Ind.*, **93** : 258 (Rokan river mouth, Borneo, Java) ; *Idem*, 1934, *Treubia*, **14** (3) : 319, fig. 2 (same localities)—all excluding the *macrops* element.

Specimens.

8 fishes, 25.5-67.5 mm. S.L., ? Singapore, BMNH. 1967.11.13.526-533.

2 fishes, 31.1-52.1 mm. S.L., ? Singapore (alizarin), BMNH. 1967.11.13.534-535.

17 fishes, 29.8-46.7 mm. S.L., Tanjong Dawai, Merbok estuary (7 : 8 : 55), BMNH. 1967.11.13.536-552.

3 fishes, 55.3-56.2 mm. S.L., ? Singapore (Jan. 1966), BMNH. 1967.11.13.553-555.

4 fishes, 38.5-45.0 mm. S.L., ? Singapore, BMNH. 1965.10.20.56-59.

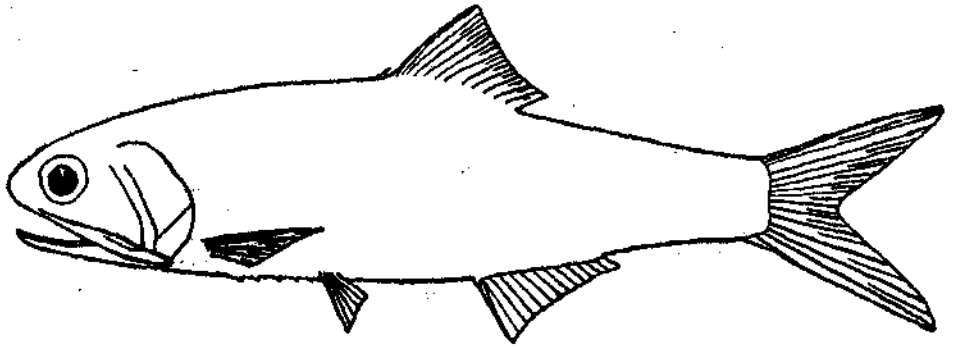

FIG. 38. *Stolephorus tri* (Blkr.)

Identification and synonymy : Whitehead *et alii* (1966 : 113, Bleeker's types, description, key) ; Whitehead (1967b, key).

Distribution : India (Babu Rao, 1966 : 101—as *baganensis baganensis* ; BMNH. specimens), Merbok estuary, Singapore (specimens listed above), Sumatra, S.W. Borneo (Hardenberg, 1931, 1936), Java (Bleeker, 1872).

Hardenberg's *S. baganensis baganensis* is included here on the authority of Mr. I. Ronquillo (pers. comm.—see previous species).

39. **Stolephorus indicus** (van Hasselt, 1823) (Fig. 39)

Engraulis indica van Hasselt, 1823, *Algemein Konst en Letter-Bode*, **1** (No. 23) : 329 (Java).

Stolephorus indicus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 127, pl. 259, fig. 2 (Penang, Singapore, Riau, Bangka, etc.) ; Hardenberg, 1934, *Treubia*, **14** (3) : 322, fig. 4 (E. Sumatra) ; Tweedie, 1936, *Bull. Raffles. Mus.*, No. 12 : 18 (Singapore).

Engraulis brownii Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1285 (Malay Peninsula and islands) ; Bleeker, 1861, *Versl. Meded. Akad. Wet. Amsterdam*, **12** : 64 (Penang).

Engraulis russellii Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 390 (Malay Peninsula) ; Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 185 (Singapore).

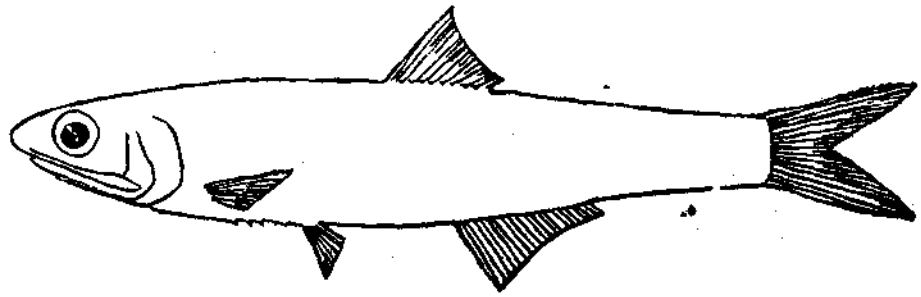

FIG. 39. *Stolephorus indicus* (van Hasselt)

Identification and synonymy : Whitehead (1965a : 270, Red Sea material, description ; 1968, key, Mozambique specimens) ; Whitehead *et alii* (1966 : 114, Bleeker's *balinensis* and *russellii*, descriptions, key).

Distribution : Mozambique channel (Whitehead, 1967b), East African coast (Losse, 1966), Red Sea (Whitehead, 1965a : 270), India (BMNH. specimens), Penang, Singapore, Sumatra, Java to Amboina (Bleeker, 1872), Papua (Munro, 1964), Philippines (Fowler, 1941 : 708), Thailand (BMNH. specimen), Hong Kong (Whitehead, 1966a : 49).

40. **Stolephorus commersonii** Lacepède, 1803 (Fig. 40)

Stolephorus commersonii Lacepéde, 1803, *Hist. Nat. Poiss.*, **5** : 381, 382, pl. 12, fig. 1 (on Commerson's notes and drawing—*ex* Mauritius) ; Hardenberg, 1934, *Treubia*, **14** (3) : 323, fig. 5 (E. Sumatra, S.W. Borneo, etc.) ; *Idem*, 1936, *Treubia*, **15** (3) : 228 (Telok Pekadai, S.W. Borneo).

Stolephorus commersonianus Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 128, pl. 259, fig. 1 (Singapore, Riau, Bangka, etc.).

Stolephorus (*Stolephorus*) *brownii* Bleeker, 1868, *Versl. Meded. Akad. Wet. Amsterdam*, (2) **2** : 294 (Riau).

Specimens.

2 fishes, 62.4-90.2 mm. S.L., ? Singapore (coll. Kow), BMNH. 1967.11.13. 560-561.

2 fishes, 82.2-84.3 mm. S.L., ? Singapore (26 : 6 : 64), BMNH. 1967.11.13. 562-563.

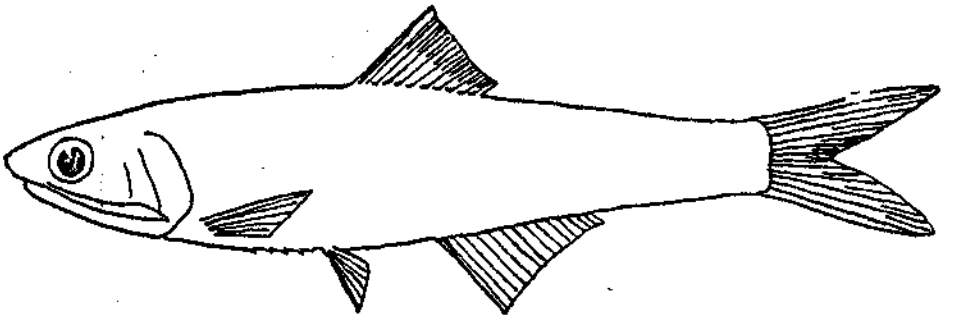

FIG. 40. *Stolephorus commersonii* Lac.

Identification and synonymy : Whitehead (1967 : 137, key, description ; 1968, key).

Distribution : Madagascar, Comoro Is. (Whitehead, 1967b), East African coast (Losse, 1966), not from Red Sea (Whitehead, 1966b), India (BMNH. specimens), Singapore, Riau, Bangka, Sumatra, Java to Amboina (Bleeker, 1872), Philippines (BMNH. specimens), Thailand (Whitehead, 1967b), Hong Kong (Whitehead, 1966a: 49).

41. **Stolephorus chinensis** (Günther, 1880)

Engraulis chinensis Günther, 1880, *Rept. Voy. Challenger*, **1** : 73 (Amoy).

Specimens.

3 fishes, 59.4-71.9 mm. S.L., ? Singapore (coll. Kow), BMNH. 1967.11.13.564-566.

1 fish, 64.1 mm. S.L., Ponygod (21 : 4 : 64), BMNH. 1967.11.13.567.

2 fishes, 57.0-63.9 mm. S.L., Pony (8 : 7 : 65), BMNH. 1967.11.13.568-569.

2 fishes, 39.0-58.9 mm. S.L., ? Singapore (coll. S.T. Wu), BMNH. 1967.11.13. 570-571.

3 fishes, 46.3-59.4 mm. S.L. ? Singapore (coll. Kow), BMNH. 1967.11.13.572-574.

1 fish, 52.3 mm. S.L., ? Singapore (1 : 4 : 64), BMNH. 1967.11.13.575.

1 fish, 64.3 mm. S.L., ? Singapore (17 : 10 : 65), BMNH. 1967.11.13.576.

2 fishes, 54.9-57.2 mm. S.L., ? Singapore (coll. Kow, 10 : 12 : 65), BMNH. 1967. 11.13.577-578.

1 fish, 59.7 mm. S.L., ? Singapore (24 : 11 : 65), BMNH. 1967.11.13.579.

1 fish, 51.5 mm. S.L., ? Singapore (4 : 3 : 49), BMNH. 1967.11.13.580.

Identification and synonymy : Whitehead (1966a : 37—as *commersonii*, Günther's types ; 1967b, key).

Distribution : Pony, Singapore (specimens listed above), Thailand, Hong Kong, China (BMNH. specimens).

Fowler (1941 : 706) recognised this as a species distinct from *S. commersonii*, and recently Mr. I. Ronquillo has confirmed the distinctness of the two species (pers. comm.). In *S. commersonii* there are 3-4 (rarely 5) scutes and 23-27 gillrakers, while in *S. chinensis* there are 5-6 (usually 6) scutes and 25-29 gillrakers.

42. **Stolephorus bataviensis** (Hardenberg, 1933) (Fig. 41)

Stolephorus insularis Hardenberg, 1933, *Nat. Tijdschr. Ned. Ind.*, **93** : 260 (Java coast, Moluccas) (*non Stolephorus insularum* Jordan & Seale, 1926) ; *Idem*, 1934, *Treubia*, **14** (3) : 321, fig. 3 (Singapore, Lingga Archipelago, Sumatra, etc.).

Stolephorus insularis bataviensis Hardenberg, 1933, *Nat. Tijdschr. Ned. Ind.*, **93** : 261 (Batavia).

Specimens.

3 fishes, 54.3-60.4 mm. S.L., ? Singapore (in tambak) (7 : 9 : 56), BMNH. 1967. 11.13.581-583.

14 fishes, 37.6-45.2 mm. S.L., ? Singapore (7 : 9 : 56), BMNH. 1967.11.13. 584-597.

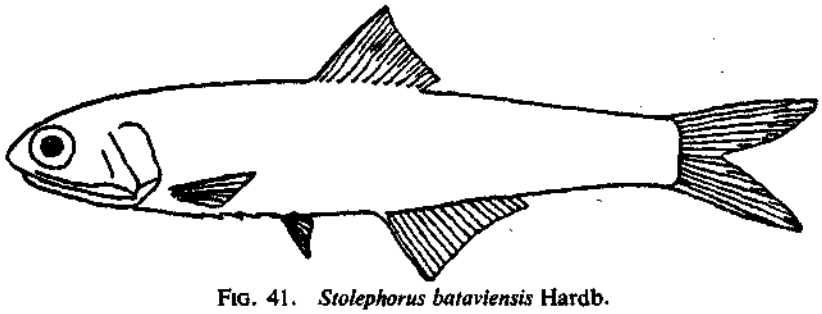

FIG. 41. *Stolephorus bataviensis* Hardb.

Identification and synonymy : Whitehead (1967a : 138, key ; 1967b, key, note on synonymy).

Distribution : Bay of Bengal (Whitehead, 1967b), Singapore, Sumatra, Java, Borneo (Hardenberg, 1934c), Philippines (BMNH. specimens), Taiwan (Ronquillo, in press).

43. **Stolephorus andhraensis** Babu Rao, (1966)

Stolephorus andhraensis Babu Rao, 1966, *Ann. Mag. nat. Hist.*, (13) **9** : 103 (Waltair, India).

Identification : Babu Rao (1966 : 103) ; Ronquillo (in press).

Distribution : East coast of India (Babu Rao, 1966), Singapore, Thailand (Ronquillo, in press).

This species is close to *S. holodon* (Boulenger) of South Africa but has a smaller head and also fewer gillrakers and scutes (19-21 and 5-6 ; cf. 26-30 and 6-9 in *S. holodon*).

44. **Thrissina baelama** (Forsskål, 1775) (Fig. 42)

Clupea baelama Forsskål, 1775, *Descript. Animal.* : 72 (Djidda, Red Sea).

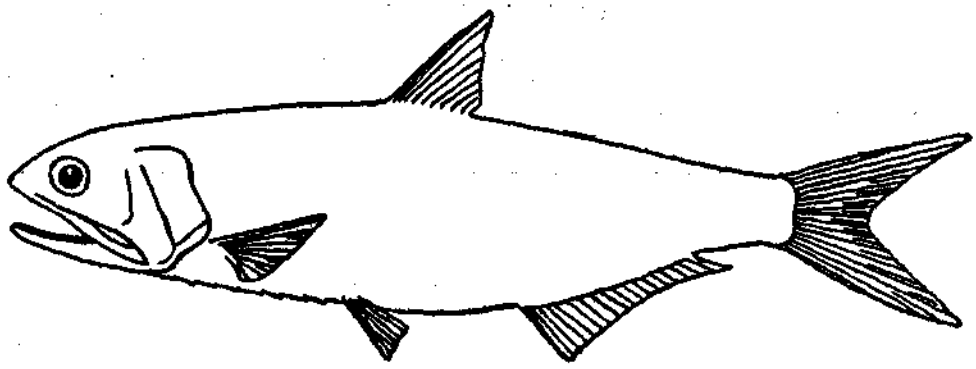

FIG. 42. *Thrissina baelama* (Forsskal.)

Identification and synonymy : Whitehead (1965 : 271, key, description of Red Sea material ; 1967a : 140, Lacepède's *tuberculosa*=*baelama*) ; Whitehead *et alii* (1966 : 116, Bleeker's *encrasicholoides*=*baelama*, type, description, key).

Distribution : Mauritius (i.e. Lacepède's *tuberculosa* ; BMNH. specimens), East African coast (Losse, 1966), Red Sea (Whitehead, 1965a : 271), Ceylon (Munro, 1955), Sumatra, Java to Amboina (Bleeker, 1872), Cocos Keeling Is., Philippines, Palau, Guam (BMNH. specimens), not Hong Kong (Whitehead, 1966a), New Britain (BMNH. specimens).

There appear to be no records of *Thrissina baelama* from Malayan waters, but it is so widespread in the Indo-Pacific that it would be surprising if it were not encountered at Penang or Singapore.

45. **Lycothrissa crocodilus** (Bleeker, 1851) (Fig. 43)

Engraulis crocodilus Bleeker, 1851, *Nat. Tijdschr. Ned. Ind.*, **1** : 15 (Bandjermasin in Borneo) ; *Idem*, 1852, *Verh. Batav. Genootsch.*, **24** : 35 (Bandjermasin).

Engraulis (*Lycothrissa*) *crocodilus* Martens, 1876, *Preuss. Exped. Ost.-Asien*, **1** : 404 (Pontianak and Singkawang in Borneo ; Bangkok).

Lycothrissa crocodilus Bleeker, 1872, *Atlas Ichthyol. Ned. Néerland.*, **6** : 125 (Bandjermasin) ; Hardenberg, 1936, *Treubia*, **15** (3) : 228 (middle course of Kapuas river, Borneo).

Identification : Whitehead *et alii* (1966 : 134, Bleeker type, description, key).

Distribution : Borneo (Bleeker, 1872), Thailand (Fowler, 1935 : 96), Cochin China (Fowler, 1941 : 668).

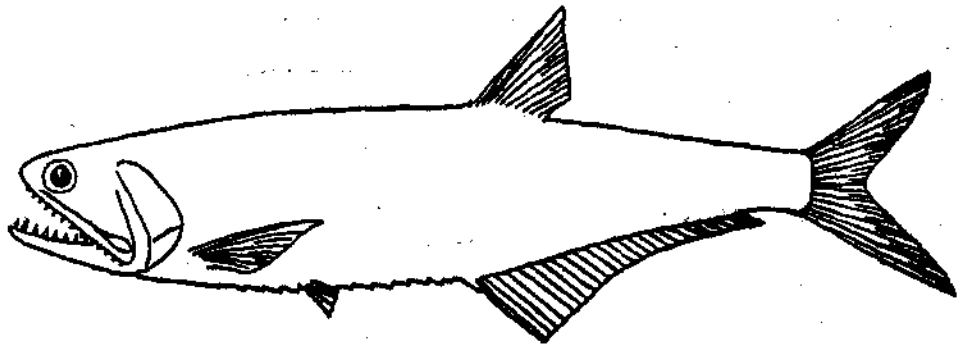

FIG. 43. *Lycothrissa crocodilus* (Blkr.)

The very large canine jaw teeth make *L. crocodilus* unmistakable, so that the paucity of records probably reflects a genuinely restricted range for this species.

46. **Thryssa setirostris** (Broussonet, 1782) (Fig. 44)

Clupea setirostris Broussonet, 1782, *Ichthyol.*: no pagination, pl. 2 (Tanna I., Society Group).

Engraulis setirostris Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 134 (Bangka, etc.).

Thrissocles setirostris Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Singapore).

Specimens.

1 fish, 105.4 mm. S.L., Siglap (16 : 6 : 65), BMNH. 1967.11.13.598.

1 fish, 40.3 mm. S.L., Krangi (1 : 4 : 64), BMNH. 1967.11.13.599.

2 fishes, 39.8-40.9 mm. S.L., Siglap (28 : 4 : 64), BMNH. 1967. 11.13.600-601.

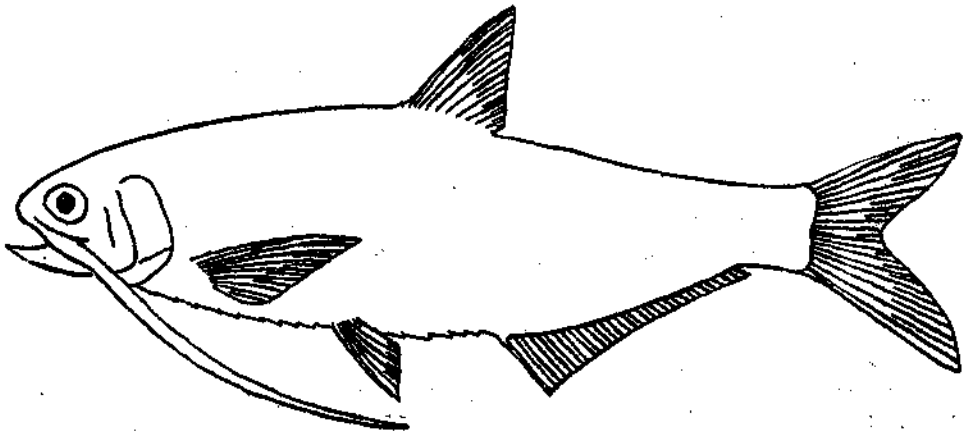

FIG. 44. *Thryssa setirostris* (Brouss.)

Identification and synonymy : Whitehead (1965a : 275, Red Sea material, description, key ; 1967b, key) ; Whitehead *et alii* (1966 : 126, Bleeker's *macrognathos*, description, key).

Distribution : Durban (Fowler, 1941 : 681), East African coast (Losse, 1966), Red Sea (Whitehead, 1965a), India (BMNH. specimens), Singapore (Herre & Myers, 1937), Bangka, Sumatra, Java to Amboina (Bleeker, 1872), Papua (Munro, 1964). Thailand (BMNH. specimen), Philippines (Fowler, 1941), Amoy (BMNH. specimens).

47. **Thryssa mystax** (Bloch & Schneider, 1801) (Fig. 45)

Clupea mystax Bloch & Schneider, 1801, *Syst. Ichthyol. Bloch.* ; 426, pl. 83 (Malabar).

Engraulis mystax Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1289 (Penang, Malay Peninsula, Singapore) ; Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 132 (Singapore, Bangka, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 106 (Rokan river mouth, Sumatra).

Thrissocles mystax Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Palau Ubin, Singapore).

Stolephorus (*Thryssa*) *valenciennesi* Bleeker, 1866, *Ned. Tijdschr. Dierk.*, 3 : 306 (Singapore, Sumatra, etc.).

Engraulis valenciennesi Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 133 (Penang, Singapore, etc.).

Specimens.

1 fish, 66.8 mm. S.L., ? Singapore, BMNH.1967.11.13.602.

12 fishes, 38.5-51.2 mm. S.L., Siglap (28 : 4 : 64). BMNH. 1967.11.13.603-614.

2 fishes, 49.8-51.5 mm. S.L., ? Singapore (1965), BMNH 1967.11.13.615-616.

14 fishes, 26.3-35.2 mm. S.L., Batu Maung, Penang (18 : 8 : 55), BMNH. 1967.11.13.617-630.

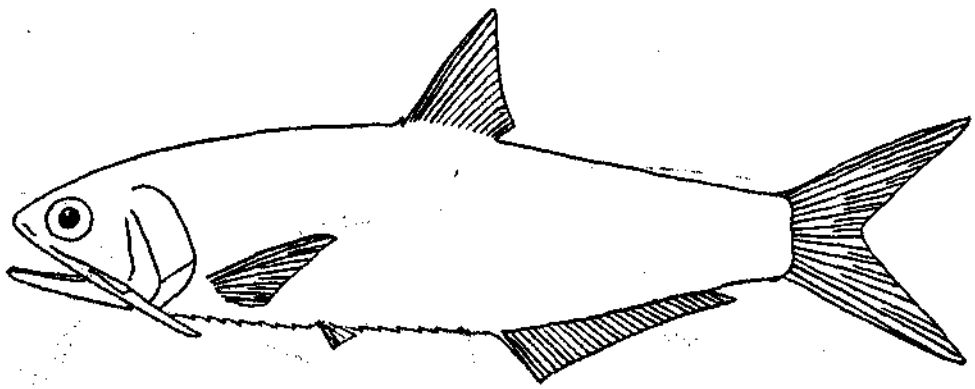

FIG. 45. *Thryssa mystax* (Bl. & Schn.)

Identification and synonymy : Whitehead (1966a : 42, Hong Kong material, description ; 1967b, key) ; Whitehead *et alii* (1966 : 123, 125, Bleeker's *mystacoides* and *valenciennesi*, descriptions, key) ; Whitehead (1969—holotype).

Distribution : India (BMNH. specimens), Malayan waters (Cantor, 1850 ; Bleeker, 1872), E. Sumatra (Hardenberg, 1931), Bangka, Java, Borneo, (Bleeker, 1872), Thailand (BMNH. specimens), Philippines (Roxas, 1934 : 261), China (BMNH. specimens).

This widespread species requires better definition ; the original description and figure are poor, but the type specimen in Berlin is still extant. Maxilla length, used hitherto as a major key character, may show ontogenetic variation, in which case the distinction between *T. mystax* and *T. hamiltonii* would be difficult to maintain. The problem is discussed in Whitehead (1969), where the holotype is redescribed.

48. **Thryssa purava** (Ham. Buch., 1822) (Fig. 46)

Clupea purava Hamilton-Buchanan, 1822, *Fishes of Ganges :* 238, 282 (Ganges estuaries).

? *Engraulis purava* Cantor, 1850, *J. Asiatic Soc. Bengal,* **18** (*2*) : 1290 (Penang).

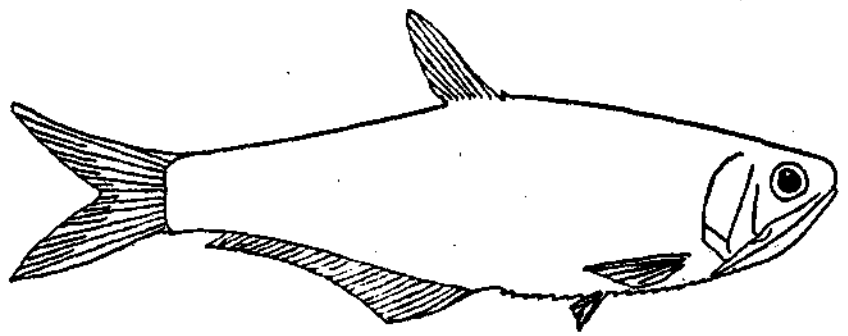

FIG. 46. *Thryssa purava* (Ham. Buch.)

Identification : Whitehead (1965a : 273, Persian Gulf material, description, key ; 1967b, key).

Distribution : Not Red Sea (Whitehead, 1966b), Persian Gulf (Whitehead, 1965a), India (BMNH. specimens), ? Penang (Cantor, 1850), Cochin China (BMNH. specimens).

Similar to *T. mystax*, but with the mouth oblique and more anal finrays (43-49 ; cf. 35-41 in *T. mystax*).

49. **Thryssa dussumieri** (Valenciennes, 1847) (Fig. 47)

Engraulis dussumieri Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 69 (no locality) ; Hardenberg, 1931, *Treubia*, **13** (1) : 106 (Rokan river mouth and Anei river, Sumatra).

Engraulis dussumierii Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 133 (Singapore, Java).

Thrissocles dussumieri Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Singapore ; off Malacca ; Muar, Johore).

Specimens.

1 fish, 86.8 mm. S.L. ? Singapore, BMNH.1965.10.20.60.

3 fishes, 53.5-60.2 mm. S.L., Singapore (coll. Kow), BMNH.1967.11.13.658-660.

2 fishes, 59.0-62.0 mm. S.L., ? Singapore (26 : 10 : 65), BMNH.1967.11.13.993-994.

1 fish, 56.3 mm. S.L., ? Singapore, BMNH.1967.11.13.661.

1 fish, 50.6 mm. S.L., ? Singapore, BMNH.1967.11.13.662.

1 fish, 40.0 mm. S.L., Batu Maung, Penang (16 : 9 : 55), BMNH.1967.11.13.663.

8 fishes, 27.4-34.6 mm. S.L., ? Singapore, BMNH.1967.11.13.664-671.

1 fish, 28.0 mm. S.L., Tanjong Dawai, Merbok estuary (7 : 8 : 55), BMNH.1967.11.13.672.

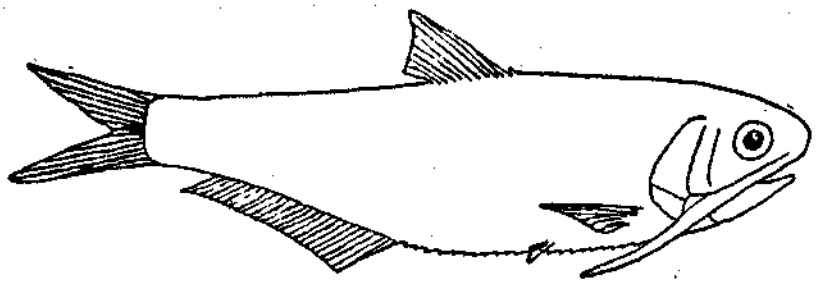

FIG. 47. *Thryssa dussumieri* (Val.)

Identification and synonymy : Whitehead *et alii* (1966 : 127, Bleeker material) ; Whitehead (1967*a* : 142, Valenciennes' types lost, putative neotype, description ; 1967*b*, Indian Ocean material, key).

Distribution : Eastern and western coasts of India (Whitehead, 1967b), Malayan waters (Herre & Myers, 1937), E. Sumatra (Hardenberg, 1931), Java (Bleeker, 1872).

This species closely resembles *T. vitrirostris* in lacking an anterior supra-maxilla and in having the gillraker serrae clumped along the rakers. *T. vitrirostris* was originally known only from South Africa, but *T. dussumieri* does not replace it in Indian waters since Dutt (1961b) recorded the presence of both species off Waltair.

50. **Thryssa hamiltonii** (Gray, 1835) (Fig. 48)

Thrissa hamiltonii Gray, 1835, *Illustr. Ind. Zool.* 2 : pl. 92 (no locality).

Engraulis hamiltoni Bleeker, 1861, *Versl. Meded. Akad. Wet. Amsterdam*, **12** : 32 (Singapore).

Engraulis hamiltonii Günther, 1868, *Cat. Fish. Brit. Mus.*, 7 : 395 (Penang, etc.).

Scutengraulis hamiltoni Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Singapore).

Engraulis grayi Bleeker, 1851, *Nat. Tijdschr. Ned. Ind.*, **2** : 492 (Bintan, etc.) ; *Idem*, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : 445 (Bangka—name only) ; *Idem*, 1861, *Versl. Meded. Akad. Wet. Amsterdam*, **12** : 64 (Penang) ; Weber &

DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 37, fig. 17 (Rokan river mouth, Sumatra) ; Hardenberg, 1931, *Treubia*, **13** (1) : 106 (Rokan river mouth).

Engraulis poorawah Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 132 (Singapore, Bintan, Bangka, etc.).

Specimens.

1 fish, 69.5 mm. S.L., Siglap (16 : 6 : 65), BMNH.1967.11.13.655.

2 fishes, 32.6-50.2 mm. S.L., Siglap (28 : 4 : 64), BMNH.1967.11.13.656-657.

3 fishes, 37.0-45.0 mm. S.L., ? Singapore, BMNH.1965.10.20.61-63.

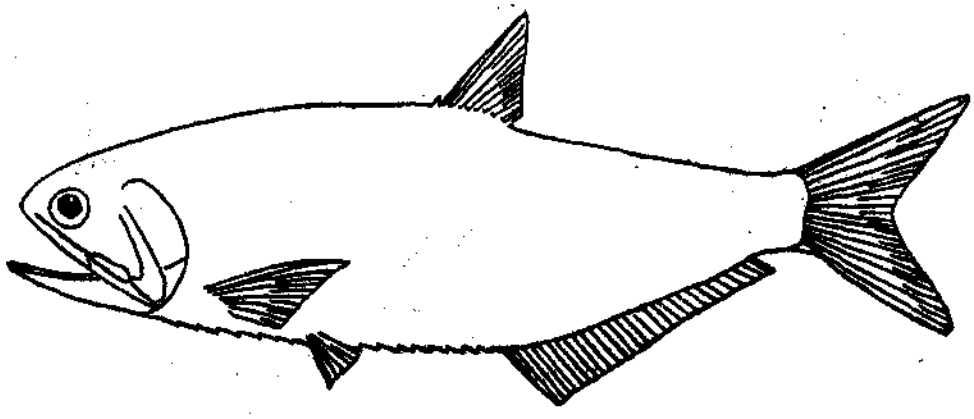

FIG. 48. *Thryssa hamiltonii* (Gray)

Identification and synonymy : Whitehead (1965a : 273, Persian Gulf material, description, key ; 1967b, key) ; Whitehead *et alii* (1966 : 122, Bleeker's *grayi*, description, key).

Distribution : Persian Gulf (Whitehead, 1965a : 273). India (BMNH. specimens), Penang (Cantor, 1850), Singapore, Bintan, Bangka, Borneo, Java to Ceram (Bleeker, 1872—as *poorawah*), Papua (Munro, 1964), Philippines (Fowler, 1941 : 675), Thailand and China (BMNH. specimens), Japan (Mori, 1952).

51. **Thryssa kammalensis** (Bleeker, 1849) (Fig. 49)

Engraulis kammalensis Bleeker, 1849, *Verh. Batav. Genootsch.*, **22** : 13 (Madura Straits near Kammal and Surabaya) ; *Idem*, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 131 (Singapore, Bangka, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 104 (Rokan river mouth, Sumatra).

Scutengraulis kammalensis Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Sumatra coast 100 miles west of Singapore ; Maur, Johore).

Thryssa kammalensis Hardenberg, 1936, *Treubia*, **15** (3) : 228 (Pontianak ; Peniti river, Borneo).

Engraulis rhinorhynchos Martens, 1876, *Preuss. Exped. Ost-Asien*, **1** : 404 (Singkawang in Borneo).

Specimens.

19 fishes, 32.4-32.7 and 64.3-76.4 mm. S.L., ? Singapore, BMNH.1967.11.13.631-649.

4 fishes, 57.6-72.2 mm. S.L., ? Singapore (1966), BMNH.1967.11.13.650-653.

1 fish, 58.5 mm. S.L., Batu Maung, Penang (16 : 9 : 55), BMNH.1967.11.13.654.

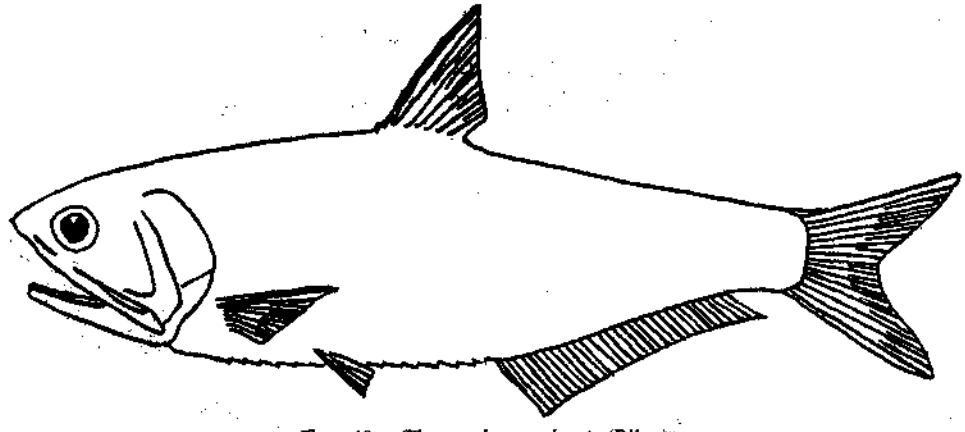

FIG. 49. *Thryssa kammalensis* (Blkr.)

Identification and synonymy : Whitehead *et alii* (1966 : 119, 121, Bleeker's *kammalensis* and *rhinorhynchos* types, descriptions, keys) ; Whitehead (1967b, key).

Distribution : India (BMNH. specimens), Singapore, Bangka, Sumatra, Java to Celebes (Bleeker, 1872), Papua (Munro, 1964), Thailand (BMNH. specimens), ? Philippines (Elera, 1895).

52. **Setipinna taty** (Valenciennes, 1848) (Fig. 50)

Engraulis taty Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 60 (Pondicherry) ; Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1288 (Penang, Malay Peninsula) ; Günther, 1868, *Cat. Fish. Brit. Mus.*, 7 : 400 (Penang, etc.).

Engraulis (*Telara*) *taty* Martens, 1876, *Preuss. Exped. Ost-Asien*, **1** : 404 (Singkawang in Borneo).

Setipinna taty Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 136 (Penang, Singapore, Bangka, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 102 (Rokan river mouth, Sumatra) ; *Idem*, 1936, *Treubia*, **15** (3) : 228 (Kapuas river, Borneo) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Sumatra coast 100 miles west of Singapore ; Muar, Johore).

Specimens.

1 fish, 99.2 mm. S.L., Singapore, BMNH.1965.10.20.64.

20 fishes, 68.7-109.3 mm. S.L., ? Singapore, BMNH.1967.11.13.673-692.

83 fishes, 40.0-76.8 mm. S.L., ? Singapore, BMNH.1967.11.13.693-775.

51 fishes, 27.9-63.9 mm. S.L., ? Singapore, BMNH.1967.11.13.776-821.

94 fishes, 19.3-71.1 mm. S.L., Batu Maung, Penang (19 : 7 : 55), BMNH. 1967.11.13.822-915.

11 fishes, 21.0-51.6 mm. S.L., Batu Maung, Penang (16 : 9 : 65), BMNH. 1967.11.13.916-926.

10 fishes, 28.4-48.2 mm. S.L., Batu Maung, Penang (18 : 8 : 55), BMNH. 1967.11.13.927-936.

10 fishes, 24.7-40.1 mm. S.L., Batu Maung, Penang (19 : 6 : 55). BMNH. 1967.11.13.937-946.

2 fishes, 44.5-45.4 mm. S.L., Singapore (in tambak) (7 : 9 : 56), BMNH. 1967.11.13.947-948.

1 fish, 42.2 mm. S.L., ? Singapore, BMNH.1967.11.13.949.

3 fishes, 24.0-49.0 and 66.0 mm. S.L., Singapore, BMNH.1965.10.20.65-67.

11 fishes, 25.0-50.0 mm. S.L., Singapore, BMNH.1965.10.20.68-78.

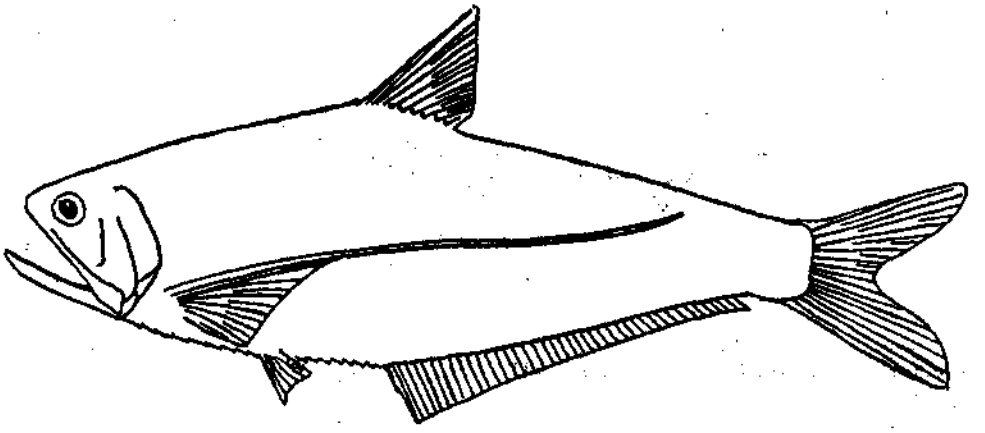

FIG. 50. *Setipinna taty* (Val.)

Identification and synonymy : Whitehead *et alii* (1966 : 128, Bleeker's *telaroides*, description, key); Whitehead (1967a : 146, Valenciennes' *taty* and *tenuifilis*, descriptions ; 1967b, key).

Distribution : India, Rangoon (Whitehead, 1967a), Penang, Singapore, Bangka, Sumatra, Java, Borneo (Bleeker, 1872), Thailand (BMNH specimens), ? Philippines (no record), Hong Kong, Korea (Fowler, 1941 : 691), Amoy (BMNH. specimen).

In the Rokan mouth area, *Setipinna taty* is of great importance to the fisheries (Hardenberg, 1931). *Setipinna papuensis* Munro, 1964, recorded from the Gulf of Papua is almost certainly *S. godavari* Babu Rao, 1961 (Whitehead, 1967b), a species close to *S. taty*. The occurrence of *S. godavari* in Malayan waters would not be unexpected.

53. **Setipinna melanochir** (Bleeker, 1849) (Fig. 51)

Engraulis melanochir Bleeker, 1849, *Verh. Batav. Genootsch.*, **22** : 13 (Madura Strait near Kammal and Surabaya).

Coilia melanochir Bleeker, 1855, *Nat. Tijdschr. Ned. Ind.*, **9** : 418 (Bandjermasin in Borneo).

Setipinna melanochir Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 136 (Lematan-Enim, i.e. Muaraenim in Sumatra ; Pamangkat, Sambas, etc. in Borneo) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 28, fig. 15 (Rokan river mouth, Sumatra, etc.) ; Hardenberg, 1931, *Treubia*, **13** (1) : 101 (Rokan river mouth) ; *Idem*, 1936, *Treubia*, **15** (3) : 227 (Kapuas river, Borneo).

Identification : Whitehead *et alii* (1966 : 130, Bleeker's types, description, key) ; Whitehead (1967b, key).

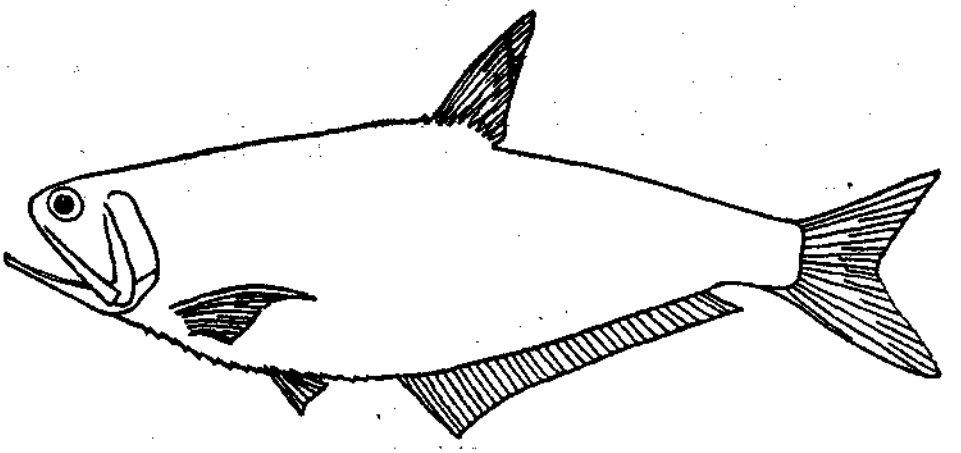

FIG. 51. *Setipinna melanochir* (Blkr.)

Distribution : Sumatra, Java, Borneo (Bleeker, 1872), Thailand (BMNH. specimen), Cochin China (Fowler, 1941 : 688), ? Amoy (Wu, 1929 : 26, fig. 20—as *lighti*).

According to Hardenberg (1931), *S. melanochir* is more often found in freshwater than the other species of this area.

54. **Setipinna breviceps** (Cantor, 1850) (Fig. 52)

Engraulis breviceps Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1288 (Penang) ; Günther, 1868, *Cat. Fish. Brit. Mus.*, 7 : 401 (Penang, Borneo) ; Duncker, 1904, *Mitt. Naturhist. Mus. Hamburg*, **21** : 185 (Kuala Lumpur) ; Hardenberg, 1931, *Treubia*, **13** (1) : 101 (Rokan river mouth, Sumatra).

Setipinna breviceps Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 137 (Penang ; Borneo) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 29 (Rokan river mouth) ; Hardenberg, 1936, *Treubia*, **15** (3) : 227 (Telok Pekadai, Borneo) ; Herre & Myers, 1937, *Bull. Raffles Mus.*, No. 13 : 13 (Singapore).

Engraulis pfeifferi Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, 3 : (408) 433 (Pontianak, Borneo).

Identification and synonymy : Whitehead *et alii* (1966 : 132, Bleeker's *pfeifferi*, description, key) ; Whitehead (1967b, key).

Distribution : ? Burma (Lloyd, 1907), Penang (Cantor, 1850), Singapore (Herre & Myers, 1937), Borneo (Bleeker, 1872), Cochin China (Fowler, 1941 : 692).

A highly esteemed food fish at the Rokan mouth, Sumatra (Hardenberg, 1931). Cantor's holotype, a skin (left side) is in the British Museum.

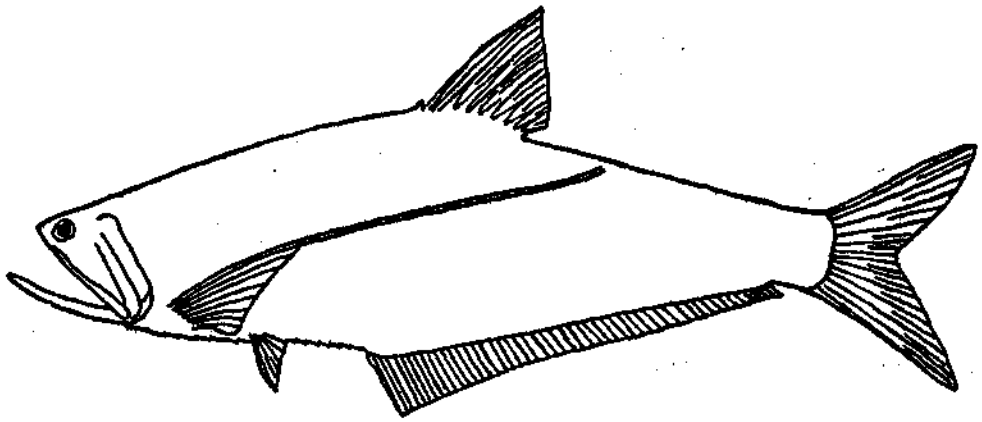

FIG. 52. *Setipinna breviceps* (Cantor)

SUBFAMILY COILIINAE

A single genus, *Coilia.*

Key to Indo-Pacific species.

Coilia (Whitehead, 1967b).

55. **Coilia rebentischii** Bleeker, 1859 (Fig. 53)

Coilia bebentischii (error) Bleeker, 1859, *Act. Soc. Sci. Indo-Néerl.*, **5** (7) : (2) 5 (Singkawang, Borneo).

Coilia rebentischi Bleeker, 1860, *Act. Soc. Sci. Indo-Néerl.*, **8** : 27 (Borneo).

Coilia (*Coilia*) *rebentischi* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 140, pl. 256, fig. 3 (Borneo).

Coilia ramcarati Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 402 (type of *C. rebentischii*).

? *Coilia polyfilis* Volz, 1903, *Zool. Anz.*, **26** : 559 (Banjuasin river, E. Sumatra).

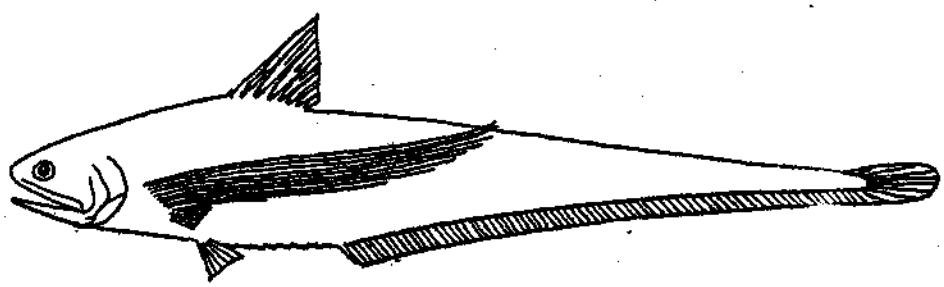

FIG. 53. *Coilia rebentischii* Blkr.

Identification and synonymy : Whitehead *et alii* (1966 : 138, Bleeker's *rebentischii*, description, key) ; Whitehead (1967b, key).

Distribution : Borneo (Bleeker, 1872).

There are no further records of *Coilia polyfilis* beyond its original description. Since it differs from *C. rebentischii* principally in having 11 pectoral filaments (cf. 19), it may perhaps have been merely an aberrant specimen.

56. **Coilia neglecta** Whitehead, 1967*b* (Fig. 54)

Coilia neglecta Whitehead, 1967b, *J. mar. biol. Assn. India*, **9** (1) : 13-37 (eastern and western coasts of India).

Specimens.

24 fishes, 114.0-143.0 mm. S.L., ? Singapore (7 : 9 : 56), BMNH 1967. 11.13. 950-973.

19 fishes, 48.8-94.8 mm. S.L., ? Singapore, BMNH 1967. 11.13. 974-992.

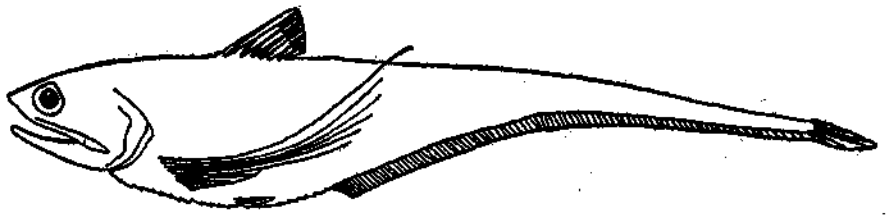

FIG. 54. *Coilia neglecta* Whitehead

Identification : Whitehead (1967b, description, key).

Distribution : Eastern and western coasts of India (Whitehead, 1967b), Singapore (specimens listed above).

Using the key given by Fowler (1941 : 713), this species would be identified as *Coilia cantoris*, but Bleeker's holotype is clearly *C. ramcarati* (Ham. Buch.) (Whitehead *et alii*, 1966). The present species may in the past have been mistaken for *C. mystus* (Linnaeus) which has a longer maxilla, reaching to the gill opening.

57. **Coilia reynaldi** Valenciennes, 1848 (Fig. 55)

Coilia reynaldi Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 81 (Irrawaddy river, Rangoon, Burma) ; Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1292 (Penang, Malay Peninsula, Singapore).

Coilia borneensis Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : 437 (Bandjermasin and Pamangkat, Borneo) ; Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 403 (Bleeker type) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 52 (Bleeker types) ; Hardenberg, 1936, *Treubia*, **15** (3) : 228 (Padangtikar Bay ; Peniti river, Borneo).

Coilia (*Coilia*) *borneensis* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 139, pl. 270, fig. 3 (Bandjermasin, Pamangkat in Borneo ; Palembang in Sumatra).

Identification and synonymy : Jones & Menon (1952, biology, systematics) ; Whitehead *et alii* (1966 : 139, Bleeker's *borneensis*, description, key) ; Whitehead (1967a : 150, Valenciennes' type, *borneensis* = *reynaldi*, description ; 1967b, key).

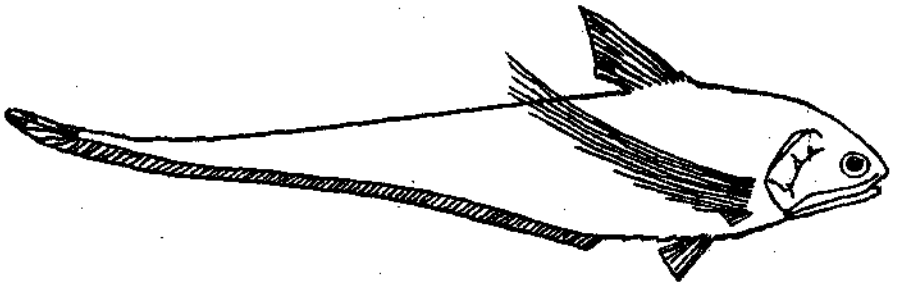

FIG. 55. *Coilia reynaldi* Val.

Distribution : India (Jones & Menon, 1952), Burma (Whitehead, 1967a : 150), Sumatra, Borneo, Thailand (Bleeker, 1872—as *borneensis*).

58. **Coilia coomansi** Hardenberg, 1934

Coilia coomansi Hardenberg, 1934, *Treubia*, **14** (3) : 294 (lower Kapuas river, Borneo) ; *Idem*, 1936, *ibid*, **15** (3) : 228 (Peniti river ; Pontianak ; Telok Pekadai, Borneo).

Identification : Hardenberg (1934a) ; Whitehead (1967b, key).

Distribution : Western Borneo (Hardenberg, 1934a, 1936).

This species, recorded from fresh and brackish waters in western Borneo, is closely related to *Coilia reynaldi* Val. but has more scutes (13-14+9-10 ; cf. 4-6+8-9 in *C. reynaldi*).

59. **Coilia mystus** (Linnaeus, 1758) (Fig. 56)

Clupea mystus Linnaeus, 1758, *Syst. Nat.*, 10th ed., **1** : 319 (? Canton, on Osbeck description and Lagerström specimen).

Coilia lindmani Bleeker, 1858, *Act. Soc. Sci. Indo-Néerl.*, **3** : 48 (Palembang in Sumatra) ; Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 405 (Bleeker holotype) ; Hardenberg, 1931, *Treubia*, **13** (3-4) : 411, fig. 1 (Palembang) ; *Idem*, 1933, *ibid*, **14** (2) : 217 (Sunsang) ; Whitehead, Boeseman & Wheeler, 1966, *Zool. Verh.*, No. 84 : 142 (Bleeker's holotype).

Coilia (*Chaetomus*) *lindmani* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 139, pl. 270, fig. 2 (Palembang).

Identification and synonymy : Whitehead (1966a : 39, *grayii*=*mystus*, description, *playfairii*, description ; 1967a, Lacepède's *clupeoides*=*mystus* ; 1967b, *lindmani* prob.=*mystus*, key) ; Whitehead *et alii* (1966 : 142, Bleeker's *lindmani*, description, key).

Distribution : Sumatra (Bleeker, 1872—as *lindmani*), Borneo, Thailand (BMNH. specimens), Hong Kong (Whitehead, 1966a : 39, 41—*mystus* and

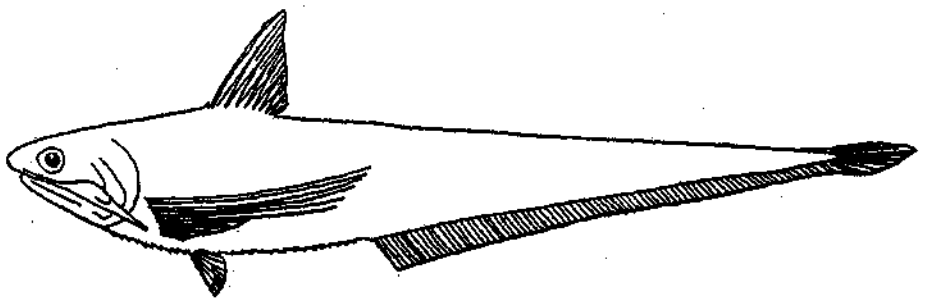

FIG. 56. *Coilia mystus* (Linn.)

playfairii), China, Japan (Fowler, 1941 : 721-723—*mystus* and *grayii* ; Boeseman, 1947 : 178—types of *C. nasus* Temm. & Schl.).

60. **Coilia macrognathos** Bleeker, 1852 (Fig. 57)

Coilia macrognathos Bleeker, 1852, *Nat. Tijdschr. Ned. Ind.*, **3** : (409) 436 (Pamangkat, Borneo) ; *Idem*, 1852, *Verh. Batav. Genootsch.*, **24** : 50 (Pamangkat) ; *Idem*, 1858, *Act. Soc. Sci. Indo-Néerl.*, **3** (6) : 2 (Singkawang, Borneo).

Coilia macrognathus Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 406 (Bleeker specimen, Borneo) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 49 (Bleeker material, Borneo) ; Hardenberg, 1933, *Treubia*, **14** (2) : 217 (Kumai river) ; *Idem*, 1936, *ibid*, **15** (3) : 228 (Pontianak ; Padangtikar Bay, Borneo).

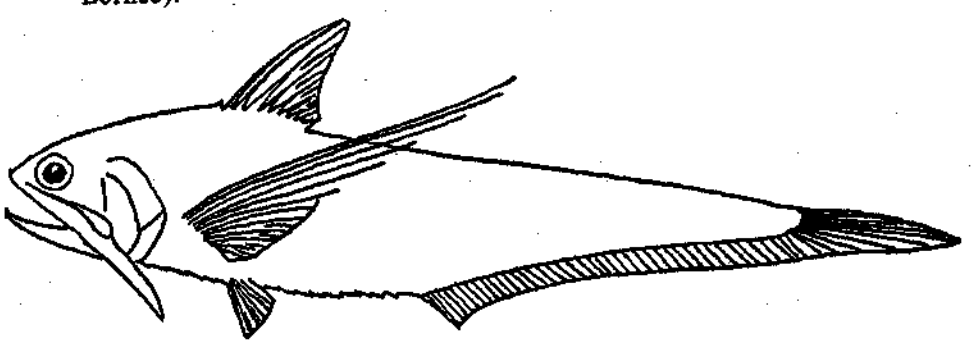

FIG. 57. *Coilia macrognathos* Blkr.

Identification : Whitehead *et alii* (1966 : 141, Bleeker type, description, key) ; Whitehead (1967b, key).

Distribution : Sarawak (BMNH. specimens), western Borneo (Bleeker, 1872), Thailand (Fowler, 1935 : 96).

61. **Coilia dussumieri** Valenciennes, 1848 (Fig. 58)

Coilia dussumieri Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 81, pl. 610 (Bombay, Mahé, Pondicherry) ; Weber & DeBeaufort, 1913, *Fishes Indo-Austr. Arch.*, **2** : 50, fig. 20 (Rokan river mouth, Sumatra, etc.) ; Jordan & Seale, 1926, *Bull. Mus. Comp. Zool.*, **67** : 360 (Singapore) ; Hardenberg, 1931, *Treubia*, **13** (1) : 108 (Rokan river mouth).

Coilia (*Coilia*) *dussumieri* Bleeker, 1872, *Atlas Ichthyol. Ind. Néerland.*, **6** : 140, pl. 270, fig. 3 (Singapore, Bangka, etc.).

Coilia dussumierii Hardenberg, 1936, *Treubia*, **15** (3) : 228 (Sungei Terentang, Borneo).

Coilia quadrifilis Günther, 1868, *Cat. Fish. Brit. Mus.*, **7** : 403 (Penang, Malayan Peninsula, Singapore) ; Steindachner, 1870, *Sitz. Ber. Akad. Wiss. Wien, math-nat. Kl.*, **60** : 571 (Singapore) ; Martens, 1876, *Preuss. Exped. Ost-Asien*, **1** : 404 (Singkawang, Borneo) ; Tweedie, 1936, *Bull. Raffles Mus.*, No. 12 : 18 (Ketam I., Selangor).

Coilia reynaldi Cantor, 1850, *J. Asiatic Soc. Bengal*, **18** (2) : 1292 (Penang, Malay Peninsula, Singapore, Rangoon) ; Bleeker, 1861, *Versl. Med. Akad. Wet. Amsterdam*, **12** : 79 (Penang).

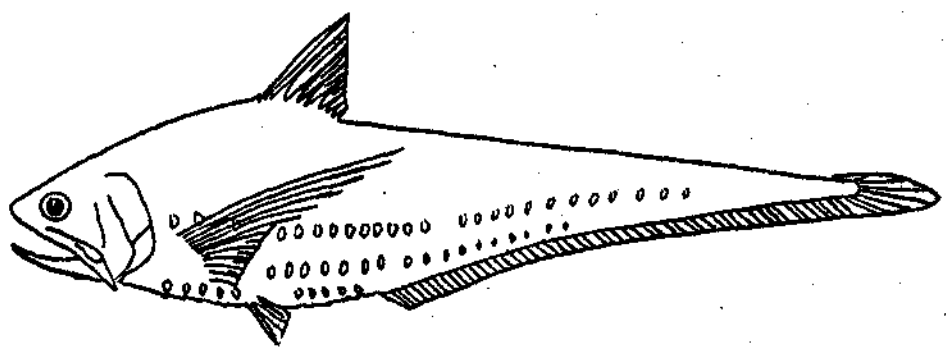

FIG. 58. *Coilia dussumieri* Val.

Identification and synonymy : Jones & Menon (1952, larvae) ; Whitehead *et alii* (1966 : 144, Bleeker's *Leptonurus chrysostigma*, description, key) ; Whitehead (1967a : 154, Valenciennes' type material, description ; 1967b, key).

Distribution : ? Mahé (Valenciennes, 1848 : 83, but no Seychelles specimens in Paris), India (Jones & Menon, 1952 ; Whitehead, 1967a : 154), Penang, Malayan Peninsula, Singapore (Günther, 1868 : 403), E. Sumatra (Hardenberg, 1931), Java, Madura (Bleeker, 1872).

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TABLE I

List of Clupeoid Species Recorded from Malayan Waters or Likely to Occur There
(Major reference or key to species indicated for each genus)

DUSSUMIERIIDAE—key to genera p. 226.

Dussumieria (Whitehead, 1963 : 312)
1. *D. acuta* Val.

Spratelloides (Whitehead, 1963 : 345)
2. *S. delicatulus* (Bennett)
3. *S. gracilis* (Temm. & Schl.)

CLUPEIDAE—key to subfamilies p. 228.

(Clupeinae)—key to genera p. 229.

Herklotsichthys (Whitehead, *et alii*, 1966 : 40)
4. *H. dispilonotus* (Blkr.)
5. *H. punctatus* (Rüpp.)

Sardinella (Chan, 1965 ; Whitehead *et alii*, 1966 : 47)
6. *S. zunasi* (Blkr.)
7. *S. brachysoma* Blkr.
8. *S. fimbriata* (Val.)
9. *S. albella* (Val.)—*perforata*, *bulan* of authors
10. *S. gibbosa* (Blkr.)—*jussieu* of authors
11. *S. melanura* (Cuv.)
12. *S. leiogaster* Val.
13. *S. clupeoides* (Blkr.)

Escualosa (Whitehead, 1964a ; Whitehead *et alii*, 1966 : 70)
14. *E. thoracata* (Val.)

(Pellonulinae)—key to genera p. 237.

Clupeoides (Whitehead *et alii*, 1966 : 73)
15. *C. borneensis* Blkr.

Corica (Fowler, 1941 :644, as subgenus)
16. *C. soborna* Ham. Buch.

Clupeichthys (Whitehead *et alii*, 1966 : 77)
17. *C. goniognathus* Blkr.

(Alosinae)—key to genera p. 240.

Hilsa (Whitehead, 1965 : 127, 134)
18. *H. kelee* (Cuv.)
19. *H. toli* (Val.)
20. *H. macrura* (Blkr.)

(Dorosomatinae)—key to genera p. 243.

Anodontostoma (Whitehead, 1962 : 101)
21. *A. chacunda* (Ham. Buch.)

Nematalosa (Whitehead, 1962 : 101)
22. *N. nasus* (Bloch)

(Pristigasterinae)—key to genera p. 245.

Pellona (Whitehead, 1967a : 105, 110)
23. *P. ditchela* Val.

Ilisha (Whitehead *et alii*, 1966 : 93)
24. *I. micropus* (Val.)
25. *I. megaloptera* (Swainson)

26. *I. indica* (Swainson)
27. *I. pristigastroides* (Blkr.)
28. *I. filigera* (Val.)
29. *I. elongata* (Bennett)

Opisthopterus (Whitehead *et alii*, 1966 : 103)

30. *O. tardoore* (Cuv.)
31. *O. valenciennesi* Blkr.

Raconda (Fowler, 1941 : 665)

32. *R. russeliana* Gray

ENGRAULIDAE—key to genera p. 252.

Engraulis (Whitehead *et alii*, 1966 : 109)

33. *E. japonicus* Temm. & Schl.

Stolephorus (Whitehead, 1968)

34. *S. heterolobus* (Rüpp.)
35. Species A—? *heterolobus* of Hardenberg.
36. *S. buccaneeri* Strasb.
37. *S. macrops* Hardb.
38. *S. tri* (Blkr.)
39. *S. indicus* (van Hass.)
40. *S. commersonii* Lac.
41. *S. chinensis* (Günth.)
42. *S. bataviensis* Hardb.—*insularis* of authors.
43. *S. andhraensis* Babu Rao

Thrissina (Whitehead, 1965 : 271)

44. *T. baelama* (Forssk.)

Lycothrissa (Whitehead *et alii*, 1966 : 134)

45. *L. crocodilus* (Blkr.)

Thryssa (Whitehead, 1968)

46. *T. setirostris* (Brouss.)
47. *T. mystax* (Bl. & Schn.)
48. *T. purava* (Ham. Buch.)
49. *T. dussumieri* (Val.)
50. *T. hamiltonii* (Gray)
51. *T. kammalensis* (Blkr.)

Setipinna (Whitehead, 1967b)

52. *S. taty* (Val.)
53. *S. melanochir* (Blkr.)
54. *S. breviceps* (Cantor)

Coilia (Whitehead, 1967b)

55. *C. rebentischii* Blkr.
56. *C. neglecta* Whitehead
57. *C. reynaldi* Val.
58. *C. coomansi* Hardb.
59. *C. mystus* (Linn.)
60. *C. macrognathos* Blkr.
61. *C. dussumieri* Val.