Reprinted from COPEIA, 1976, No. 3, August 20
pp. 503–509
Made in United States of America

Notes on the Indo-West Pacific Species of the Clupeid Fish Genus *Ilisha*, With a Key to Their Identification

B. V. SESHAGIRI RAO

Indo-Pacific members of the tropical clupeid fish genus *Ilisha* are reviewed, based on material from the Bay of Bengal. Two species, *I. filigera* and *I. elongata*, are redescribed. A key is provided to all the species of the Indo-West Pacific region.

THE genera *Ilisha* and *Pellona* are currently separated by the presence or absence of a toothed hypo-maxilla (present in *Pellona*, but a ligament is in its place in *Ilisha*). All the species now placed in *Ilisha* were included under *Pellona* by Day (1878). Myers (1950) and Hildebrand (1964) combined *Ilisha* and *Pellona* (including Norman's *Neosteus*), but Berry (1964) separated them, as also did Whitehead (1970), chiefly because the presence or absence of a toothed hypomaxilla is an easily determined character.

Norman (1923) revised the genus *Ilisha* and Fowler (1941) listed and described the Indo-Pacific species. Dutt (1967) described the species of *Ilisha* occurring at Visakhapatnam, India. Whitehead (1966, 1969, 1970), Talwar and Whitehead (1971) and Whitehead et al. (1966) redescribed many of the types of the species of *Ilisha*. A synopsis of Indian *Ilisha* was given by Whitehead (1972). These publications have stimulated further critical work in the group. I have described two types of fronto-parietal striation patterns useful in distinguishing the species (Seshagiri Rao, 1972), and have redescribed *I. megaloptera* and *I. melastoma* (Seshagiri Rao, 1973); recently *I. sirishai* (Seshagiri Rao, 1975b) has been described as new from the Bay of Bengal. In the present work *I. filigera* and *I. elongata* are redescribed, together with a review of other Indian *Ilisha* species and a key to all Indo-West Pacific species.

MATERIAL AND METHODS

Fishes of the genus *Ilisha* were collected at Vizianagaram, Visakhapatnam, Kakinada, Bhimavaram, Gollapalem, Masulipatam, Suryalanka, and Madras from the East coast of India during the years 1967–1974 (Fig. 1). Counts and proportional measurements follow Whitehead et al. (1966). The following abbreviations have been used: BMNH: British Museum (Natural History), London; MNHN: Museum National d'Histoire Naturelle, Paris; ZMB: Zoologisches Museum, Berlin; ZMA: Zoologisch Museum, Amsterdam; ZSI: Zoological Survey of India, Calcutta. Specimens without catalogue numbers are in the author's personal collection.

Ilisha sirishai Seshagiri Rao
Fig. 2

Holotype.—BMNH 1975.9.24.48. Vishakapatnam. Seshagiri Rao (1975b).

Description.—Based on 18 specimens, 98–176 mm, SL, Visakhapatnam. Branchiostegals 6, D 17–18, P_1 15–17, P_2 7, A 38–44, gillrakers 10–14 + 24–27, scutes 18–20 + 9–10 (total, 27–29). Swimbladder without post-coelomic extension; body depth 30.0–35.2% of SL.

Distribution: Visakhapatnam (type locality); Bombay and Cochin (author's collection).

Ilisha sladeni (Day)
Fig. 3

Lectotype.—ZSI/2672, 210 mm SL, Irrawaddy river and Paralectotype, ZSI, 298, 189 mm SL, Mandalay, described by Talwar and Whitehead (1971).

Distribution.—Known only from the types (Irrawaddy; Mandalay).

Ilisha pristigastroides (Bleeker)
Fig. 4

Holotype.—BMNH 1867.11.28.12., 151 mm, SL, Batavia, redescribed by Whitehead et al. (1966).

Distribution.—Burma, Java, Borneo (Whitehead, 1970).

Ilisha filigera (Valenciennes)
Fig. 5

Lectotype.—MNHN 3710, Bombay, described by Whitehead (1967) ("in rather poor condition"). D 20, P_1 18, P_2 6, A 51, gr 9 + 20, scutes 23 + 11, depth 34.9% of SL.

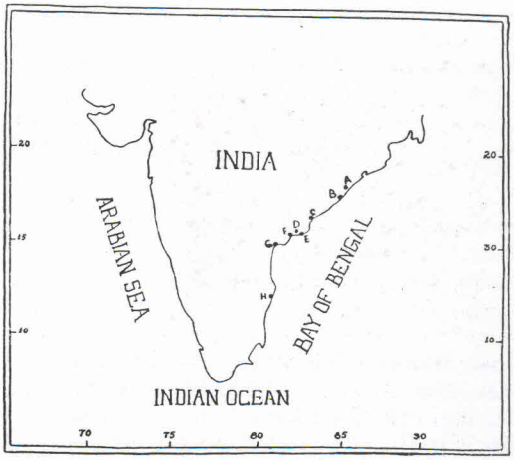

Fig. 1. Collection localities on the east coast of India: A) Vizianagaram, B) Visakhapatnam, C) Kakinada, D) Bhimavaram, E) Gollapalem, F) Masulipatam, G) Suryalanka, H) Madras.

Material examined.—Visakhapatnam (1) 152 mm SL; Masulipatnam (1) 195 mm SL; Bhimavaram Market (1) 202 mm SL; Gollapalem (1) 160 mm SL; Gollapalem (5) 144–193 mm SL.

Description.—Branchiostegals 6, D 16–18, P_1 16–18, P_2 6–8, A (47) 50–52, gillrakers 9–13 + 18–21, scutes 22–24 + 9–13 (total 32–37).

In percentages of standard length: body depth 31.2–34.1, head length 21.8–28.6, snout length 6.7–8.0, eye diameter 6.5–10.0; pectoral fin length 12.5–22.0, pelvic fin length 5.3–6.7, length of anal fin base 34.0–40.2; pre-dorsal distance 46.5–49.2, pre-pectoral distance 21.1–28.0, pre-pelvic distance 38.1–44.6, pre-anal distance 56.8–60.6.

Body compressed, its width 2½ to about 3 times in its depth, deepest under dorsal origin. Belly strongly keeled, scutes beginning at isthmus. Head length less than body depth. Snout about equal to eye. Maxilla reaching to below middle of eye, lower edge with fine serrae. No hypomaxilla. Two supra-maxillae, the first (anterior) slender, the second (posterior) expanded posteriorly and tapering to a slender shaft anteriorly. Teeth present as single series in both jaws, but median portion of upper jaw without teeth.

Frontal bones with two prominent ridges of *megaloptera* pattern (Seshagiri Rao, 1972).

Pseudobranch present, exposed, slightly greater than ½ eye diameter, with about 16–19 filaments. Gillrakers slender, equal to largest gill filaments, less than ½ eye diameter.

Dorsal origin equidistant between snout tip and caudal base or a little nearer former. Pectoral length highly variable, just reaching pelvic base or failing to reach pelvic tip by about ⅓ eye diameter; axillary scale present, greater than ½ length of fin. Pelvic fins small, equidistant between pectoral base and anal origin, or slightly nearer latter; no axillary scale. Distance between pelvic tip and anal origin about ⅔ diameter of eye. Anal origin below 6–10th branched dorsal ray.

Scales.—One unbroken striation on exposed portion with a number of irregular striations on unexposed portion.

Color.—Upper ⅕ dark brown, flanks silvery white. Upper ⅓ of dorsal fin dark brown. Pectorals and pelvics hyaline. Margin of anal and of caudal dark.

Identification.—Although Whitehead (1972) included *Ilisha filigera* in the synonymy of *I. megaloptera*, the former differs from the latter in having a higher scute count (see key) and hyaline pectoral fins (vs. black tipped in *I. megaloptera*, the pigmentation being retained even after preservation). *I. filigera* can be distinguished from the closely related *I. elongata* by its deeper body and dorsal origin equidistant between snout tip and caudal base or a little nearer former. In all other respects *I. filigera* resembles *I. elongata* (see *I. elongata*).

Distribution.—India, Borneo (Whitehead, 1970).

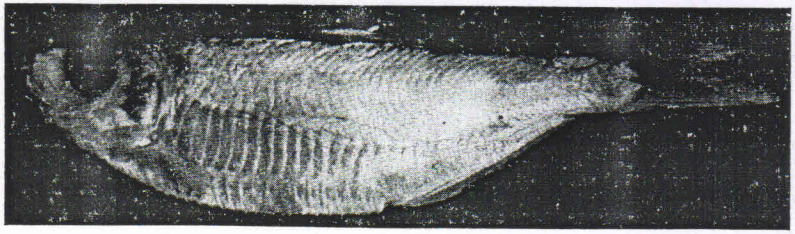

Fig. 2. *Ilisha sirishai*, Holotype, BMNH, 167 mm SL, Visakhapatnam.

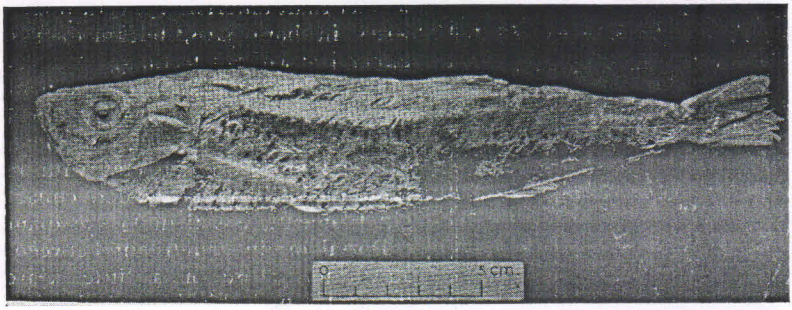

Fig. 3. *Ilisha sladeni*, Lectotype. Basis for Day's figure.

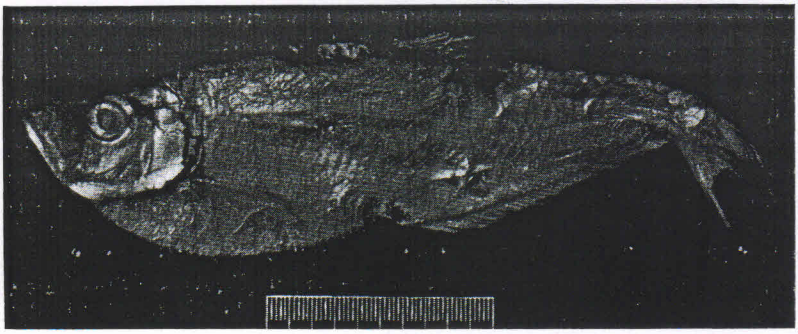

Fig. 4. *Ilisha pristigastroides*, Holotype.

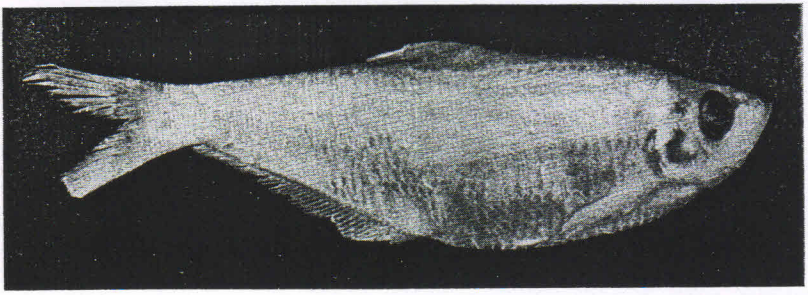

Fig. 5. *Ilisha filigera*, Bhimavaram Market 202 mm SL. (Lectotype is not in condition to be photographed).

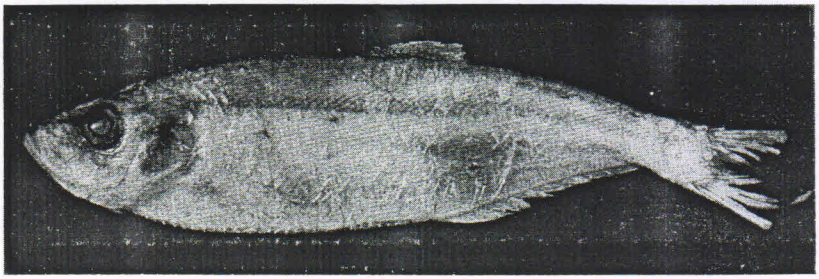

Fig. 6. *Ilisha elongata*, Bhimavaram Market 230 mm SL.

Ilisha elongata (Bennett)
Fig. 6

Holotype.—BMNH 1852.9.13.107. 300 mm SL, (dry specimen recently placed in Kaiserling solution), Sumatra, coll. Raffles; D 16?, P_1 17, P_2 6, A 49, scutes 24 + 12, depth 27.0% of SL, (Whitehead, pers. comm.).

Material examined.—Gollapalem (5) 119–132 mm SL; Bhimavaram Market (1) 230 mm SL; Masulipatam (5) 258–280 mm SL; Masulipatam (1) 337 mm SL.

Description.—Branchiostegals 6, D 17, P_1 14–16, P_2 7, A 41–49, gillrakers 9–13 + 20–22, scutes 21–26 + 8–13 (total 29–39).

In percentages of standard length; body depth 22.2–28.4, head length 22.7–25.7, snout length 6.9–8.4, eye diameter 6.2–8.4; pectoral fin length 15.3–17.0, pelvic fin length 5.1–6.7, pre-dorsal distance 50.1–51.9, pre-pectoral distance 22.4–24.3, pre-pelvic distance 38.6–41.7, pre-anal distance 56.2–59.5.

Body compressed, its width 3½ to 4 times in its depth, deepest a little anterior to dorsal origin. Belly less convex, strongly keeled, scutes beginning at isthmus. Snout nearly equal to eye. Maxilla reaching to below middle of eye, lower edge with fine serrae. No hypomaxilla. Two supramaxillae, the first (anterior) slender, the second (posterior) expanded posteriorly and tapering to a slender shaft anteriorly. Teeth present as single series in both jaws, but median portion of upper jaw without teeth.

Frontal bones with two prominent ridges of *megaloptera* pattern (Seshagiri Rao, 1972).

Pseudobranch present, exposed, ½ eye diameter, with about 20 filaments. Gillrakers slender, as long as longest gill filaments, about ½ eye diameter.

Dorsal origin nearer to caudal fin base than to snout tip. Pectoral fins nearly reaching to pelvic base, axillary scale present, about ⅓ length of fin. Pelvic fins small, equidistant between anal origin and pectoral base, no axillary scale. Distance between pelvic tip and anal origin about twice diameter of eye. Anal origin below 11–12th branched dorsal ray.

Scales.—0–3 unbroken striae on exposed portion with numerous striae on unexposed portion meeting in the middle to form reticulation.

Color.—Dorsal profile dark brown, upper ⅓ on flanks greenish, becoming silvery white toward abdomen; edge of dorsal fin faintly dark, pectoral fins hyaline, but tips slightly dark. Margins of anal and caudal fins dark, remaining part hyaline.

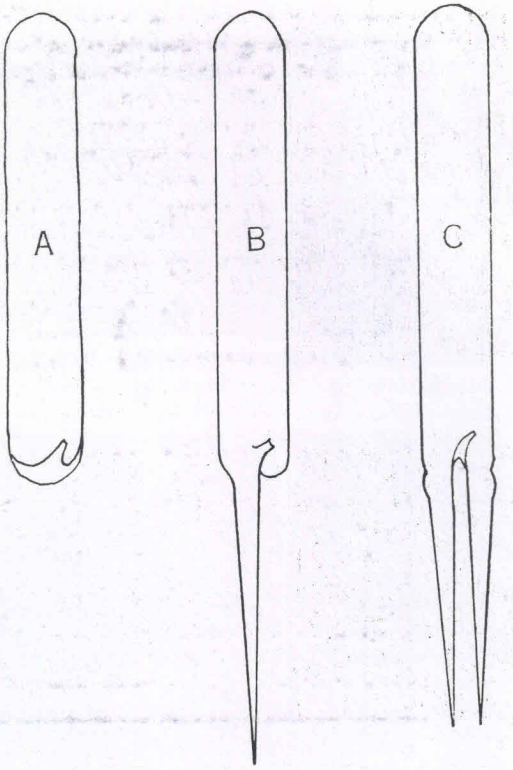

Fig. 7. Form of swimbladder in *Ilisha* (ventral view): A) No post-coelomic extension. B) Single post-coelomic extension on right side of body. C) Paired post-coelomic extensions.

Note.—*I. elongata* resembles *I. filigera* in the form of the swimbladder (Fig. 7), fronto-parietal striation pattern, and scute and gillraker numbers; but it differs from the latter in body depth and in having a posteriorly placed dorsal. In *I. elongata*, the body depth is usually measured at the dorsal origin, but the maximum depth is in front of the dorsal origin. So, if the measurement is taken a little anterior to the dorsal origin the difference in the body depth between the two species often disappears! However, in *I. filigera* the maximum depth is below the dorsal origin. Both species, *Ilisha filigera* and *I. elongata*, are relatively rare on the East coast; the only other record of *I. elongata* from India was based on the type of *Pellona leschenaulti* Valenciennes (1847) from Pondichery.

Distribution.—India to Japan (Whitehead, 1972).

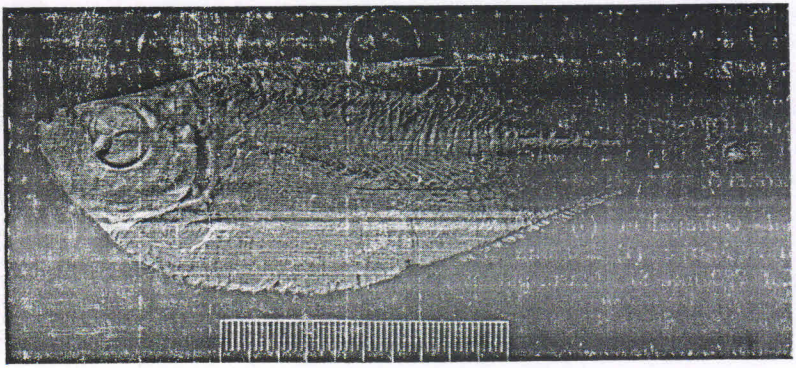

Fig. 8. *Ilisha macrogaster*, Holotype.

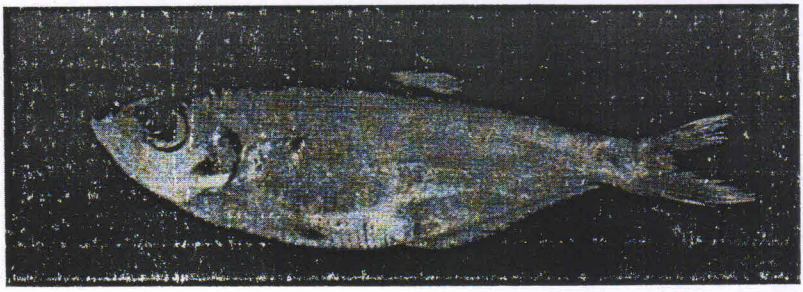

Fig. 9. *Ilisha megaloptera*, Visakhapatnam, 152 mm SL.

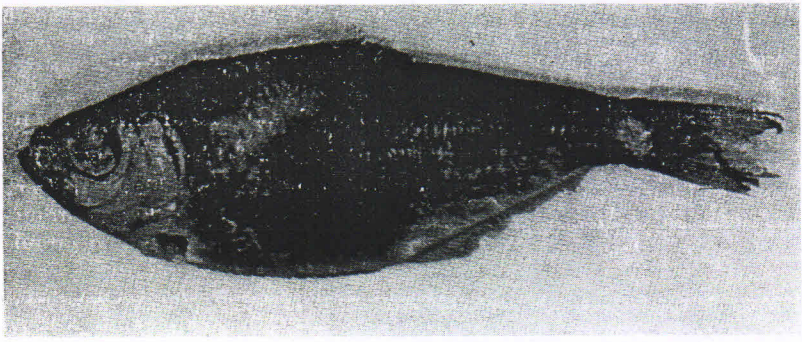

Fig. 10. *Ilisha melastoma*, Holotype.

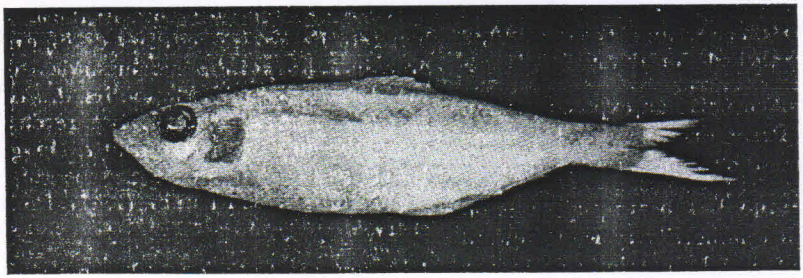

Fig. 11. *Ilisha kampeni*, Kakinada, 147 mm SL. (Holotype of *Ilisha whiteheadi*).

Ilisha macrogaster (Bleeker)
Fig. 8

Holotype.—BMNH 1867.11.28.20, 114.8 mm SL, Borneo, redescribed by Whitehead et al. (1966).

Distribution.—Borneo (Whitehead, 1970).

Ilisha megaloptera (Swainson)
Fig. 9

Neotype.—MNHN 3708, lectotype of *Pellona dussumieri* Valenciennes, 1847, described by Whitehead (1967) and recommended as neotype of Swainson's *Platygaster megalopterus*; species redescribed by Seshagiri Rao (1973) based on 56 specimens, 120–165 mm SL, from Visakhapatnam (type locality).

Distribution.—Visakhapatnam; Suryalanka (Guntur District) and Madras (author's collection); Pakistan to Indo-China (Whitehead, 1972).

Ilisha melastoma (Schneider)
Fig. 10

Holotype.—ZMB 3842, Indian Ocean, near Coromandel; redescribed by Whitehead (1969). Species redescribed by Seshagiri Rao (1973).

Distribution.—Persian Gulf to Hong Kong (Whitehead, 1972).

Ilisha kampeni (Weber and de Beaufort)
Fig. 11

Syntypes.—ZMA 112–594 and 112–595, 4 fish, 100.0–118.5 mm SL.

Description.—Branchiostegals 6, D 16–18, P_1 14–15, P_2 7, A 37–40, gillrakers 10–11 + 20–21, scutes 19–21 + 7–9 (total 27–30). Swimbladder with paired post-coelomic extension; body depth 28.2–29.8% of SL (the syntypes were examined for me by Whitehead, pers. comm.).

Note.—Since the original description of *Pellona* (= *Ilisha*) *kampeni* by Weber and de Beaufort there has been only a single record of the species, by Norman (1923) from Madras, based on a single specimen in the British Museum, but this fish was later identified as *I. megaloptera* by Whitehead (1970). Subsequently the form of the swimbladder has been found to be an important diagnostic character (Talwar and Whitehead, 1971; Seshagiri Rao, 1972, 1974a). Having accepted that Norman's *I. kampeni* was *I. megaloptera*, and in the absence of any subsequent record, *I. whiteheadi* was described as a new species (Seshagiri Rao, 1974a) that differed from *I. megaloptera* in having a swimbladder with paired post-coelomic extensions (vs. a single extension present on right side of body only in *I. megaloptera*). Recently, Whitehead examined Weber and de Beaufort's specimens and found that the types of *I. kampeni* have a swimbladder form identical to that in *I. whiteheadi*. Based on this fact, *I. whiteheadi* is now considered a junior synonym of *I. kampeni* (Seshagiri Rao, 1975a).

Distribution.—Kakinada, Gollapalem (Krishna District); Madras and Porto Novo (BMNH specimens, Whitehead, pers. comm.).

Discussion

Among the Indo-Pacific species of *Ilisha*, *I. melastoma*, *I. kampeni*, *I. sirishai*, *I. sladeni*, *I. megaloptera* and *I. elongata* are fairly distinct. The identity of *I. filigera* has been discussed above. If the position of the anal origin is either clearly in advance of, or below the middle of the dorsal base, then *I. pristigastroides* can be recognized as distinct, but intraspecific variation in this character has been poorly documented. *Ilisha macrogaster* and *I. megaloptera* are separated on the basis of body depth only (see key), but intraspecific depth variation in the former species needs investigation. For example, I have a specimen of *I. elongata* with a body depth 30.2% of SL, in which case it should be placed in *I. filigera* (see key), but the dorsal is situated further back (predorsal distance 54.0% of SL). *The macrogaster-megaloptera* complex and the *elongata-filigera* complex merit further critical study based on a series of large samples from the Bornean and Indian coasts. A slight variation in the form of gillraker serrae in the Indian *Ilisha* has been reported (Seshagiri Rao, 1974b).

The key given below summarizes the published and unpublished work of Whitehead and the author.

1. Swimbladder without post-coelomic extensions 2
   Swimbladder with post-coelomic extensions 3
2. Body depth 30.0–35.2% of SL; scutes 18–20 + 9–10; gillrakers 24–27 ..... *I. sirishai* Seshagiri Rao
   Body depth 21.9–25.4% of SL; scutes 23 + 10; gillrakers 21 ..... *I. sladeni* (Day)
3. Swimbladder with a single post-coelomic extension, present on right side of body 4
   Swimbladder with paired post-coelomic extensions 8
4. Anal origin in advance of or below middle of dorsal base; pre-pelvic scutes 24–27;

gillrakers 17–22 ..... *I. pristigastroides* (Bleeker)
Anal origin below posterior half of dorsal base 5

5. Pre-pelvic scutes 22–27, post-pelvic 10–14 .. 6
Pre-pelvic scutes 18–20, post-pelvic 7–9 7

6. Body depth 30–34% of SL; dorsal origin midway between caudal base and snout tip ..... *I. filigera* (Valenciennes)
Body depth 24–28% of SL, dorsal origin nearer to caudal base than to snout tip ..... *I. elongata* (Bennett)

7. Body depth 37–41% of SL; gillrakers 24; pectorals hyaline .. *I. macrogaster* (Bleeker)
Body depth 32–34% of SL, gillrakers 19–21, pectorals black tipped ..... *I. megaloptera* (Swainson)

8. Body depth 37–41% of SL; pseudobranch completely exposed; frontal ridges *indica* pattern ..... *I. melastoma* (Schneider)
Body depth 26–30% of SL; basal half of pseudobranch covered by a thin membrane; frontal ridges of modified *megaloptera* type ..... *I. kampeni* (Weber and de Beaufort)

Acknowledgments

I am grateful to S. Dutt, Andhra University P. G. Center, Guntur, India, for suggesting the problem and for valuable guidance; to P. J. P. Whitehead, British Museum (Natural History), London for invaluable notes, photographs of types, and suggestions at various stages of the present investigation. I am thankful to C. Karrer, Zoologisches Museum, Berlin for the photograph of the type of *I. melastoma*; to P. K. Talawar, Zoological Survey of India for the photograph of the type of *I. sladeni*; to S. Rama Rao and K. Varahala Raju of this department for help and encouragement; and to the University Grants Commission, New Delhi for financial assistance.

Literature Cited

Berry, F. H. 1964. Review and emendation of: family Clupeidae by Samuel F. Hildebrand. Copeia 1964:720–730.

Day, F. 1878. The fishes of India. William Dawson and Sons, London.

Dutt, S. 1967. Fishes of the genus *Ilisha* Richardson, 1846 from Visakhapatnam. Proc. Ind. Acad. Sci. 66:206–213.

Fowler, H. W. 1941. Contributions to the biology of the Philippine Archipelago and adjacent regions. Bull. U. S. Nat. Mus. 100(13):650–663.

Hildebrand, S. F. 1964. Fishes of the Western North Atlantic. Part 3. Sears Foundation for Marine Research, New Haven. Memoir I.

Myers, G. S. 1950. Systematic notes on Amazonian clupeid fishes of the genus *Ilisha*. Copeia 1950: 63–64.

Norman, J. R. 1923. A revision of the genus *Ilisha* and allied genera. Ann. Mag. Nat. Hist. (9)11:1–22.

Seshagiri Rao, B. V. 1972. Identity of the clupeid fishes, *Ilisha megaloptera* and *Ilisha indica*. Copeia 1972:881–882.

———. 1973. Redescription of the clupeid fishes, *Ilisha megaloptera* and *Ilisha melastoma*. Copeia 1973:735–739.

———. 1974a. *Ilisha Whiteheadi*, a new species of clupeid fish from the Bay of Bengal. Copeia 1974:861–864.

———. 1974b. On the gillraker serrae in the Indian *Ilisha*, Curr. Sci. 43:420–421.

———. 1975a. A new record of the clupeid fish *Ilisha kampeni* (Weber and de Beaufort) from the Bay of Bengal. Curr. Sci. 44:233–234.

———. 1975b. A new species of clupeid fish, *Ilisha sirishai* from Visakhapatnam, India. Hydrobiologia 47:463–468.

Talwar, P. K., and P. J. P. Whitehead. 1971. The clupeoid fishes described by Francis Day. Bull. Brit. Mus. Nat. Hist. (Zool.) 22:57–85.

Valenciennes, A. 1847. Histoire Naturelle des Poissons. 20. Paris.

Whitehead, P. J. P. 1966. The elopoid and clupeid fishes in Richardson's "Ichthyology of the seas of China and Japan, 1846." Bull. Brit. Mus. Nat. Hist. (Zool.) 14:15–54.

———. 1967. The clupeoid fishes described by Lacepède, Cuvier and Valenciennes. Bull. Brit. Mus. Nat. Hist. (Zool.) 14, Suppl. 2:1–180.

———. 1969. The clupeoid fishes described by Bloch and Schneider. Bull. Brit. Mus. Nat. Hist. (Zool.) 17:261–279.

———. 1970. The clupeoid fishes described by Steindachner. Bull. Brit. Mus. Nat. Hist. (Zool.) 20:1–46.

———. 1972. A synopsis of the clupeoid fishes of India. Symp. Ind. Ocean Adj. Seas., J. Mar. Biol. Assoc. India. 14:160–256.

Whitehead, P. J. P., M. Boeseman and A. Wheeler. 1966. The types of Bleeker's Indo-Pacific elopoid and clupeoid species. Zool. Verhandel. Leiden 84:1–159.

Department of Zoology, D. N. R. College, Bhimavaram 534202, Andhra Pradesh, India.

Accepted 18 July 1975.