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NOTES ON INDIAN SPECIES OF *ILISHA* (PISCES : CLUPEIDAE)

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ABSTRACT

Of all the Clupeids, species of *Ilisha* by different authors based on different criteria has resulted in conflicting views among systematists. There is thus an urgent need to revise the species of this genus and this has also been repeatedly emphasized by previous workers.

The systematic revision of the genus could be best attempted only by considering all Indo-Pacific material. But a critical study of the Indian species could be the first step in a right direction.

The systematics of Indian species of *Ilisha* has been dealt with in the present study on the basis of the re-examination of the types of various nominal species deposited in the three European Museums. A key to Indian species of *Ilisha*, modified from that of Whitehead (1972) is presented here with emphasis on the form of the swimbladder as a diagnostic character.

INTRODUCTION

MEMBERS of the clupeid genus *Ilisha* are widely distributed in warm seas and occasionally in fresh waters in the New world, off West Africa and throughout much of the Indo-Pacific. Whitehead (1972) listed three species from India [*Ilisha melastoma* (*Ilisha indica* auct.), *Ilisha megaloptera* and *Ilisha elongata*] out of the six species known from the Indo-Pacific. *Ilisha melastoma* and *Ilisha megaloptera* have recently been redescribed from Visakhapatnam collections (peninsular India) by Seshagiri Rao (1973).

Whitehead also briefly described thirteen Indian specimens (from Porto Novo and one from Madras) in the British Museum (Natural History) which resembled *I. elongata* but had fewer ventral scutes (18–21 + 7–8, total 27–29; cf. 23–26 + 10–14, total 35–39 in *Ilisha elongata*). Seshagiri Rao (1974) has included these under a new species *Ilisha whiteheadi*. However, we have now examined the types of *Ilisha kampeni* (Weber & de Beaufort) and these strongly suggest that Seshagiri Rao's *Ilisha whiteheadi* is in fact *I. kampeni*.

Seshagiri Rao (1975) has described yet another species, *Ilisha sirishai*.

The material studied here was collected by the senior author at Waltair, Madras, Porto Novo, Tuticorin (east coast localities), Vizhinjam, Mangalore and Bombay (west coast localities) and Sri Lanka. This material was studied together with material in the British Museum (Natural History), London, the Museum National d'Histoire Naturelle, Paris, and the Rijksmuseum van Natuurlijke Historie, Leiden. The number of specimens examined are given in brackets under 'Material Examined'.

* British Museum (Natural History), London, U. K.

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KEY TO THE INDIAN SPECIES OF *ILISHA*

The following key is modified from that of Whitehead (1972) but emphasis is here given to the form of the swimbladder as a major character.

I. Swimbladder without post-coelomic extensions

A. Body slender, its depth less than 30% of S.L.... .... *Ilisha sladeni* (Day)

B. Body deeper, its depth more than 30% of S.L.....*Ilisha sirishai* Seshagiri Rao

II. Swimbladder with tubular post-coelomic extensions

A. Single swimbladder extension on right side (Fig. 5)

1. Body slender, its depth 24–31% of S. L.; scute 23–26 + 10–14 (total 35–39)

a. Anal origin below or in advance of middle of dorsal base..... .....*Ilisha pristigastroides* (Bleeker)

b. Anal origin below posterior half of dorsal base...*Ilisha elongata* (Bennett)

2. Body deeper, its depth not less than 29% of S. L.; scutes 19–25 + (7) 8–11 (total 27–36)

a. Body deep, its depth 37% of S. L.....*Ilisha macrogaster* Bleeker

b. Body moderate, its depth 29–35% of S.L....*Ilisha megaloptera* (Swainson)

B. Bifid tubular swimbladder extensions (Figs. 3, 7)

1. Body deep, its depth 37–42% of S. L; frontal ridges of '*indica*' pattern (Fig.2); pseudobranch exposed..*Ilisha melastoma* (Schneider)

2. Body slender, its depth 26–30% of S. L; frontal ridges of *'megaloptera* pattern (Fig. 4); basal part of pseudobranch covered ....*Ilisha kampeni* (Weber & de Beaufort)

Ilisha melastoma (Schneider, 1801)

Clupea melastoma Schneider, 1801, *Syst. Ichthyol. Bloch;* 427 (Indian Ocean near Coromandel).

Clupea motius Hamilton — Buchanan, 1822, *Fishes of the Ganges*: 251, 383 (Brahmaputra).

Platygaster verticalis Swainson, 1838, *Nat. Hist. Anim.*, **1** : 278 (on *Ditchoe* of Russell, 1803, *Fishes of Coromandel*, **2** : 74, pl. 192).

Platygaster indicus Swainson, 1839, *Ibid.*, **2** : 294 (on Gray, 1834, *Illustr. Ind. Zool. Hardwicke*, **2** : pl. 109 (3) — *Clupea motius*).

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

Pellona ditchoa Valenciennes, 1847, *Ibid.*, **20** : 313 (on *Ditchoe*).

Pellona brachysoma Bleeker, 1852, *Verh. batav. Genoot. Kunst. Wet.*, **24** : 22 (Batavia).

Note on synonymy: Whitehead (1969) examined Schneider's specimen of *Clupea melastoma* (ZMB. 3842) and confirmed that it is a species of *Ilisha;* later he equated it with Swainson's *indicus*, the name most frequently used hitherto for the present species. In spite of Article 79 (b) iii of the International Code of Zoological Nomenclature, the name *melastoma* is not a *nomen oblitum* since it has never been rejected as such in the literature; it should replace the name *indica* of authors.

The remainder of this synonymy follows Whitehead (1972). The senior author has examined the types of *micropus*, *ditchoa* and *brachysoma* and agrees with Whitehead that they can all be referred to the present species.

Seshagiri Rao (1973) redescribed *Ilisha melastoma* on the basis of 50 fishes (102–185 mm S. L.) from Visakhapatnam.

Material examined:– (425) 29.1–125.5 mm S. L., Porto Novo, coll. Ramaiyan, BMNH. 1975. 3.20.238–672; (7) 137.0–155.3 mm S.L., Waltair, coll. Ramaiyan, BMNH. 1975. 3.20.673–679; (20) 93.4–171.1 mm S. L., Madras, coll. Ramaiyan, BMNH. 1975. 3.20. 680–699; (10) 110.0–140.3 mm S. L., Tuticorin, coll. Ramaiyan, BMNH. 1975. 3.20. 700–709; (44) 90.1–120.2 mm S. L., Ceylon, coll. Ramaiyan, BMNH. 1975. 3.20. 710–753; (15) 97.9–124.9 mm S. L., Vizhinjam, coll. Ramaiyan, BMNH. 1975. 3.20. 754–768; (33) 98.5–134.1 mm S. L., Mangalore, coll. Ramaiyan, BMNH. 1975. 3.20. 769–801; (10) 96.9–112.2 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1970.10.21. 18–27; (10) 84.1–118.1 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1970. 10.21. 34–43; (6) 133.2–184.5 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1970. 10.21. 28–33; (4) 53.0–82.9 mm S. L., Madras, coll. Day, BMNH. 1889. 2.1. 1994–9; (2) 73.1–91.0 mm S. L., Malabar, coll. Day, BMNH. 1889. 2.1. 2000–1; (2) 105.6–113.0 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6. 8–9; (3) 144.2–151.4 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6.10–12; (3) 102.1–111.0 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6. 5–7; (1) 110.9 mm S. L., Ceylon, coll. Heemstra, BMNH. 1970. 4.24.52; (1) 125.9 mm S. L., Porto Novo, coll. Berry, BMNH 1968. 8.26.1; (3) 58.1–61.5 mm S. L., Hong Kong; coll. Chan, BMNH. 1965. 7.5. 45–47; (1), 66.5 mm S. L., Singapore, coll. Univ. of Malaya, BMNH. 1967. 11.13.62; (1) 101.7 mm S. L., Singapore, coll. Univ. of Malaya BMNH. 1967. 11.13. 62; (1) 101.7 mm S. L., Singapore, coll. Univ. of Malaya BMNH. 1967. 11.13. 58; (1) 162.1 mm S. L., Madras, coll. Day, BMNH 1868. 10.25.26; (1) 117.3 mm S. L., Kurrachee, coll. Townsend, BMNH. 1898. 6.29.184; (1)

137.1 mm S. L., Arabian Sea off Pakistan, coll. Berry, BMNH. 1968. 8.26.2; (1) 97.2 mm S.L. Hong Kong, coll. not known, BMNH. 1939.3.23. 7; (2) 41.1–46.9 mm S. L., Ganges, coll. Raj Tilak, BMNH. 1969. 2.27.1; (23) 76.8–112.4 mm S. L., locality not known, coll. Bleeker BMNH. 8032; (1) 112.1 mm S. L., Andamans, coll. Day, BMNH. 8611.

Description: Based on 425 fishes, 29.1–125.5 mm S. L. from Porto Novo (BMNH. 1975. 3.20.238–672).

Br. St. 6, D i-ii 15–17, P i 15–17, V i 6, A ii 35–46, G. R. 10–14 + 19–25, scutes 18–22 + 7–10, scales in lateral series 42–44

In percentage of standard length: body depth 30.9–42.3, head length 25.5–33.3; snout length 6.1–10.4, eye diameter 8.5–12.9, depth at occiput 15.9–26.5; pectoral fin length 13.9–23.4; pre-dorsal distance 44.4–56.2, pre-pelvic distance 39.2–54.9, pre-anal distance 58.6–69.6.

Body strongly compressed, its depth greater than head length, belly sharply keeled. Snout a little shorter than eye diameter. Lower jaw strongly projecting; small granular teeth present on tongue. Premaxilla with a single row of small conical teeth; no hypomaxilla; two supra-maxillae, the first (anterior) slender, the second (posterior) expanded posteriorly and tapering to a slender shaft anteriorly.

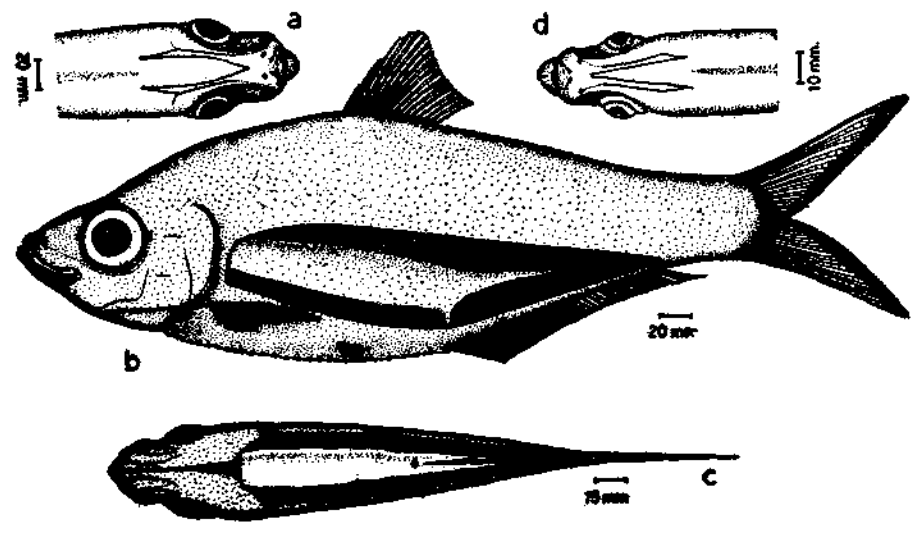

Fig. 1. a. Striations on dorsal surface of head in *Ilisha melastoma* (122.5 mm S. L., BMNH. 1975. 3.20.238), b. lateral view of the swimbladder in *Ilisha melastoma*, c. ventral view of the swimbladder showing the bifid post-coelomic extensions, and d. striations on dorsal surface of head in *Ilisha megaloptera* (200.0 mm S. L., BMNH. 1975. 3.20. 204).

Frontals with prominent ridges of the *'indica'* pattern (Seshagiri Rao, 1972) *i.e.* a pair of ridges arising on median line before anterior border of eye, passing posteriorly, diverging at first but then running parallel to each other or converging slightly with posteriorly a second pair of ridges parallel to the first, the two pairs sometimes meeting each other on each side at the hind end of the skull (Fig. 1 a). Pseudobranch present, exposed, greater than ½ eye diameter, with 16–20 filaments.

Dorsal fin origin a little nearer to snout tip than to caudal base. Pectoral fin reaching to pelvic base; axillary scale present, half length of pectoral fin. Pelvic fins small, no pelvic axillary scale present. Anal origin just behind vertical from 2nd dorsal ray.

Colour in live fishes: back brown, lower flanks silvery white; dorsal fin dusted with dark pigments; pectoral fins as well as anal fin hyaline; caudal margin dark.

Striae on head: Seshagiri Rao (1972) showed the striae meeting each other on either side, but this is not always the case.

Swimbladder: In most of the specimens examined the swimbladder bore the two post-coelomic extensions (Fig. 1 b, c) normal for this species (Whitehead, 1973b). However, in 4 fishes from Mangalore (150.5–167.8 mm S. L. BMNH. 1975. 3.20. 823–826) 2 fishes from Bombay (58.3–67.8 mm S.L. BMNH. 1975. 3.20 820–821) and 1 fish from Tuticorin (156.8 mm S. L. BMNH. 1975.3.20.822) there were no post-coelomic extensions, a condition otherwise known only in *Ilisha sladeni* amongst Indo Pacific species (Talwar and Whitehead, 1971). In meristic and morphometric features these anomalous fishes did not show any consistent differences from the remainder, as shown in (Table 1).

The very close resemblance between fishes with and without post-coelomic swimbladder appendages raises the problem of deciding whether the anomalous fishes are taxonomically distinct. This is not a sexual difference, since males and females of each kind were found, and it is not ontogenetic, since paired swimbladder appendages are already well developed in specimens of only 29.1 mm S. L.

Distribution: This species has a wide recorded distribution, from the Persian Gulf to Hong Kong (Whitehead, 1973 a). In India, *Ilisha melastoma* is known from both the west coast (Vizhinjam, Mangalore and Bombay) and the east coast (Waltair, Madras, Porto Novo, Tuticorin and Ceylon), based on the collections listed here and the reports of Whitehead (1972), Seshagiri Rao (1973) and others.

Notes on biology: Numerous types of craft and gear are used in estuaries and along the neighbouring coasts, depending on the area of fishing and type of fish; the craft are all indigenous and of local manufacture. For *Ilisha melastoma*, gillnets and boat seines are used at depths of 10–15 metres, the mesh size being $2\frac{1}{2}$–5 cm. In estuaries, cast nets are used by individual fisherman from the banks to catch the young of *Ilisha melastoma*.

An attempt has been made to study the food preferences of *Ilisha melastoma* using the numerical occurrence method of Pillay (1952). From an analysis of gut contents this fish appears to be a plankton feeder. A detailed study of the food, breeding and spawning seasons of this species is under investigation and will be published elsewhere.

Ilisha megaloptera (Swainson, 1839)

Platygaster macrophthalma Swainson, 1838, *Nat. Hist. Anim.*, 1 : 273 (on *Jangarloo* of Russell, 1803, *Fishes of Coromandel*, 2 : 73, pl. 191) *(nomen oblitum)*.
Platygaster megalopterus Swainson, 1839, *Nat. Hist. Anim.*, 2: 294 (on *Jangarloo*).
Pellona dussumieri Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 316, pl. 516 (Bombay, Malabar, Coromandel).
Pellona filigera Valenciennes, 1847, *Hist. Nat. Poiss.*, **20** : 322 (Bombay, also Coromandel Coast).

TABLE 1. *Ranges and means for meristic and morphometric characters in specimens of* Ilisha melastoma *with and without postcoelomic swimbladder extensions.*

		With swimbladder extensions		Without swimbladder extensions		
		Mangalore	Tuticorin	Mangalore	Tuticorin	Bombay
No. of specimens examined		33	10	4	1	2
Dorsal finrays	M*	18.00	16.90	18.00	16.00	17.00
	R	ii15–ii17	iii13–iii15	ii16–ii16	iii13	iii14–iii14
Anal finrays	M	41.00	43.90	42.00	42.00	39.50
	R	*ii37–ii43*	*ii38–ii46*	*ii39–ii41*	*ii40*	*ii37–ii38*
Pectoral finrays	M	16.25	16.30	16.50	16.00	16.00
	R	i15–i16	i14–i16	i15–i16	i15	i15
Scutes	M	27.84	28.20	29.00	29.00	29.00
	R	*18–21+8–10*	*19–21+8–9*	*19–21+9*	*20+9*	*20+9*
Gillrakers	M	34.75	33.77	33.50	35.00	35.00
	R	11–13+22–26	10–11+22–24	11–12+22	13+22	12+23
Head length	M	31.02	29.21	27.82	28.60	29.11
	R	28.79–33.49	26.78–30.45	27.35–28.25		28.89–29.33
Body depth	M	36.23	35.25	35.08	36.18	36.51
	R	36.13–40.95	33.96–37.39	34.05–37.25		34.99–38.03
Eye diameter	M	10.37	10.36	9.04	8.98	9.13
	R	9.57–11.36	9.77–10.66	8.74–9.42		8.84–9.43
Snout length	M	9.09	8.87	8.74	9.93	8.51
	R	8.19–9.96	8.57–9.19	8.56–9.09		8.11–8.92
Pectoral fin length	M	19.21	19.88	16.12	18.60	Damaged
	R	16.29–23.10	18.77–20.96	15.52–16.96		
Depth at occiput	M	24.76	22.96	20.36	23.56	22.43
	R	20.50–26.54	20.56–24.60	20.18–20.52		20.24–24.62
Pre-dorsal distance	M	52.42	51.11	52.55	51.85	53.97
	R	49.07–55.99	49.55–52.56	51.64–53.85		53.06–54.88
Pre-pelvic distance	M	50.01	48.88	49.52	53.38	48.99
	R	47.68–52.85	46.98–50.21	47.88–50.47		47.91–50.08
Pre-anal distance	M	66.50	63.17	67.11	74.01	65.24
	R	64.00–69.53	61.45–64.52	64.79–69.59		65.15–65.34

		Waltair	Madras	Porto Novo	Tuticorin	Sri Lanka	Vizhingjam	Mangalore
No. of specimens examined		7	20	425	10	44	15	33
Dorsal fin rays	M*	16.86	17.05	17.33	16.90	17.02	16.46	18.00
	R	iii13–iii15	iii14–iii15	i15–i18	iii13–iii15	iii14–iii15	iii13–iii15	ii15–ii17
Anal fin rays	M	44.30	41.10	41.16	43.90	40.86	42.56	41.00
	R	ii40–ii45	ii35–ii42	ii35–ii46	ii38–ii46	ii37–ii42	ii35–ii45	ii37–ii43
Pectoral fin rays	M	16.43	15.50	16.89	16.30	15.81	16.60	16.25
	R	i14–i16	i14–i16	i15–i17	i14–i16	i14–i15	i15–i16	i15–i16
Scutes	M	26.85	28.00	28.35	28.20	28.43	27.86	27.84
	R	18–20+7–8	19–21+7–9	18–22+7–10	19–21+8–9	19–21+8–9	19–21+7–9	18–21+8–10
Gillrakers	M	34.00	34.66	34.89	33.77	35.56	33.86	34.75
	R	11+21–22	11–12+21–24	10–14+19–25	10–11+22–24	12–13+22–25	9–12+21–24	11–13+22–26
Head length	M	28.01	29.47	30.07	29.21	29.88	29.28	31.02
	R	26.38–29.81	27.88–31.54	25.45–33.33	26.78–30.45	27.83–31.29	27.42–31.57	28.79–33.49
Body depth	M	37.13	38.80	37.81	35.25	37.78	37.28	36.23
	R	36.28–38.70	36.54–41.29	30.91–42.33	33.96–37.39	34.55–39.76	34.26–40.52	36.13–40.95
Eye diameter	M	9.94	10.38	11.01	10.36	10.75	10.25	10.37
	R	9.20–10.60	9.57–11.23	8.45–12.89	9.77–10.66	10.03–11.74	9.25–10.87	9.57–11.36
Snout length	M	7.89	8.40	8.07	8.87	8.46	8.62	9.09
	R	7.48–8.35	7.91–8.92	6.13–10.37	8.57–9.19	7.65–9.65	8.11–8.89	9.19–9.96
Pectoral fin length	M	18.58	19.31	20.09	19.88	20.09	19.39	19.21
	R	17.56–20.49	16.12–21.36	13.95–23.43	18.77–20.96	17.37–23.09	16.36–22.32	16.29–23.10
Depth at occiput	M	22.18	25.16	22.93	22.96	25.26	23.94	24.76
	R	20.16–23.72	23.24–26.43	15.93–26.46	20.56–24.60	23.15–27.72	22.04–26.51	20.50–26.54
Pre-dorsal distance	M	49.23	51.21	52.34	51.11	51.99	51.16	52.42
	R	48.48–50.11	48.37–52.83	44.39–56.17	49.55–52.66	48.61–53.86	46.88–52.72	49.07–55.99
Pre-pelvic distance	M	47.53	49.56	49.00	48.88	49.43	48.52	50.01
	R	46.36–48.47	47.04–51.88	39.22–54.97	46.98–50.21	46.28–51.84	45.41–52.52	47.68–52.85
Pre-anal distance	M	62.85	65.73	64.73	63.17	64.92	64.94	66.50
	R	60.48–65.41	61.74–69.76	58.59–69.59	61.45–64.52	61.47–68.47	60.80–67.91	64.00–69.53

* M=mean (for finrays, branched and unbranched here combined, as also pre-and post-pelvic scutes). R=Range

Pellona xanthoptera Bleeker, 1851, *Natuurk. Tijidschr. Ned-Indie*, 2:439 (Sambar, Borneo).
Pellona russelli Bleeker, 1852, *Ibid.*, 3 : 72 (Java, Madura, Pasuruan, Singapore).

Note on synonymy: This synonymy is based on that given by Whitehead (1972). The senior author has reexamined the types of *dussumieri, filigera, xanthoptera* and *russellii* and can confirm Whitehead's findings.

This species was redescribed by Seshagiri Rao (1973) on the basis of 50 specimens (120–165 mm S.L.) from Visakhapatnam.

Material examined: (26) 73.0–180.9 mm S. L. Bombay, coll. Ramaiyan, BMNH. 1975. 3.20. 204–229; (1) 136.6 mm S. L., Thirumullivasal, coll. Seshaiya, BMNH. 1968.8.26.3; (1) 221.1 mm S. L., Madras, coll. Day, BMNH. 1889.2.1. 2010; (1) 242.0 mm S. L., Madras Presidency, coll. Thurston, BMNH. 1888. 11.6.63; (10), 87.9–161.0 mm S. L., Calcutta, coll. Whitehead, BMNH 1973. 6.4.48–59; (2) 128.4–156.0 mm S.L., Singapore, coll. not known, BMNH. No reg. number; (2) 97.0–126.6 mm S. L., Sarawak, coll. Rajah Brooke, BMNH. 1894. 1.19.78–79; (1) 75.0 mm S. L., Madras, coll. Day BMNH. 1889. 2.1.1991; (2) 140.3–175.8 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6, 3–4; (7) 152.2–197.2 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1970. 10.21.11–17; (2) 212.2–223.0 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6. 1–2; (7) 165.7–221.3 mm S. L. Jaffna, Ceylon, coll. Heemstra, BMNH. 1970. 4.24 .44–50; (1) 159.9 mm S. L., Cochinchine, coll. Chevey, MNHN 37.141; (1) 165.1 mm S.L., Malabar, coll. Dussumier, MNHN. 3707; (1) 192.2 mm S. L., Batjan, coll. Bleeker. MNHN. 5150; (1) 208.3 mm S. L., Bombay, coll. Dussumier, MNHN. 3709; (1) 257.7 mm S.L., Coromandel, coll. Dussumier, MNHN. 3708; (1) 246.7 mm S. L., Macao, coll. Eydoux, MNHN. 5148; (1) 360.3 mm S. L., Pondicherry, coll. Leschenault, MNHN. 3435 ; (7) 124.9–184.3 mm S. L., (Annam) Pondicherry, coll. Nha Trang. MNHN. 37/127–106.

Description: Based on 26 fishes, 73.0–180.9 mm S. L., from Bombay (BMNH. 1975.3.20.204–299).

Br. St. 6, D iii 14 - 15, P i 15-17, A ii 46-52, G.R. 9–12+19–21, scutes 21–24 + 10–12, scales in lateral series 47–50.

In percentages of standard length: body depth 31.4–34.7, head length 25.7–29.7; snout length 6.7–9.6, eye diameter 7.2–9.5, depth at occiput 18.5–21.7; pectoral fin length 13.0–18.4; pre-dorsal distance 52.6–57.4, pre-pelvic distance 43.3–46.6, pre-anal distance 57.9–65.5

Body much compressed, its width less than depth and deepest under dorsal origin. Belly strongly keeled, scutes beginning at isthmus, a few scutes being hidden by the branchiostegal membrane. Head length less than body depth. Snout smaller than eye. Lower edge of maxilla with fine serrae, the maxilla tip reaching to below middle of eye. No hypomaxilla. Two supramaxillae, the first slender and the second expanded posteriorly and tapering to a slender shaft anteriorly. Single series of teeth in both jaws.

Pseudobranch present and exposed. Gillrakers slender, as long as longest gill filaments and slightly less than eye diameter.

Dorsal fin origin equidistant between snout tip and caudal fin base. Pelvic fin base nearer to anal fin origin than to pectoral fin base; no pelvic axillary scale. Origin of anal fin below vetical from 10–12th branched dorsal ray.

Colour: Dorsal profile dark grey, upper flanks light brown. The unbranched pectoral ray is uniformly tipped with black spots and the first 8 or 9 rays are darkly pigmented towards their tips, the remaining rays being hyaline. The anal margin is black and the caudal dusted with dark pigment.

Frontals with two prominent ridges; all the specimens examined here had the so-called '*megaloptera*' pattern of striae (Fig. 1 d) described by Seshagiri Rao (1972).

Swimbladder: As in most Indo-Pacific species of *Ilisha* (Whitehead, 1972) there is a single post-coelomic swimbladder extension on the right side (Fig. 2a, b).

Distribution: This species has a wide distribution, having been recorded from West Pakistan (BMNH specimens), India (Bombay, Malabar Coasts), Porto Novo, Madras, Visakhapatnam, Sunderbans, Ganges (BMNH specimens; and *Jangarloo*), Sri Lanka (BMNH specimens), and eastwards to Indo-China (Chevey, 1932).

Notes on biology: *Ilisha megaloptera* is mainly caught by gillnets and boat seines; it is even caught with trawls at depths of 15–20 fathoms. It does not occur in the Vellar Estuary. From analysis of gut contents *Ilisha megaloptera* appears to be a predaceous carnivore; its food consists mainly of teleosts, crustacenas and amphipods, but occasionally polychaetes, tunicates and a small amount of algae and diatoms were also encountered.

Ilisha elongata (Bennett, 1830)

Alosa elongata Bennett, 1830 (Fib.), *Mem. Life of Raffles*; 691 (Sumatra).
Clupea affinis Gray, 1830 (July), *Illustr. Ind. Zool. Hardwicke*, **1** : pl. 96 (2) (Penang, on Hardwicke drawing).
Ilisha abnormis Richardson, 1846, *Rept. Ichthyol. Seas China Japan*: 306 (China Seas).
Pellona grayana Valenciennes, 1847; *Hist. Nat. Poiss.*, **20** : 315 (on *affinis* Gray).
Pellona leschenaulti Valenciennes, 1847, *Ibid.*, **20**: 311 (Pondicherry).
Pellona vimbella Valenciennes, 1847, *Ibid.*, *Ibid.*, **20** : 317 (Macoa).
Pellona novacula Valenciennes, 1847, *Ibid.*, **20** : 319 (Rangoon).
Pellona schlegelii Bleeker, 1854, *Natuurk. Tijidschr. Ned Indie*, **6** : 418 (Nagasaki).
Pristigaster chinensis Basilewsky, 1855, *Nouv. Mem. Soc. Nat. Moscow*, **10** : 243 (Gulf of Tschiliensis (China).
Pristigaster (Pristigaster) sinensis Sauvage, 1881, *Bull. Soc. philomath. Paris* (7) **5** : 107 (Swatow).

Note on synonymy: The senior author re-examined the types of *elongata* (BMNH. no number), *abnormis* (BMNH. 1964. 11.6.4), *leschenaulti* (MNHN. 3435), *vimbella* (MNHN. 5148), *novacula* (MNHN. 3704), *schlegellii* (BMNH. 1867. 11.28. 72) and *sinensis* (MNHN. A 2948) and confirmed the synonymy of Whitehead (1972).

The types of *novacula* and *sinensis* are in poor condition and the form of the swimbladder could not be checked, but in the types of *leschenaulti* and *schlegelii* the swimbladder has the single post-coelomic extension on the right side characteristic of *Ilisha elongata*.

Description: There are no specimens of *Ilisha elongata* in the senior author's collection. The only Indian record seems to be the type of *Pellona leschenaulti*. This fish has a single post-coelomic swimbladder appendage on the right side and is therefore not the species here recognised as *I. kampeni* (bifid extensions). This type was fully described by Whitehead (1967) and the following description is based on his data.

D iii 14, P i 15, V i 6, A iii 46, G. R. 10+20, scutes 25+12.

In percentages of standard length: body depth 27.8, head length 23.2; snout length 6.6, eye diameter 5.9, length of upper jaw 12.2, length of lower jaw 12.3, pectoral fin length 15.7 (tip broken), pelvic fin length 4.0, length of anal fin base 32.7; pre-dorsal distance 54.0, pre-pelvic distance 45.7, pre-anal distance 65.0.

Distribution: This species is recorded from China and Japan westwards to the Indo-Malayan Archipelago and Burma (Whitehead, 1972). The paucity of records from India is curious but this is evidently the western boundary of its range and it is perhaps generally replaced by *Ilisha kampeni* along Indian Coasts.

Ilisha kampeni (Weber & de Beaufort) 1913.

Pellona kempeni Weber & de Beaufort, 1913,*Fishes Indo-Austr. Arch.*, **2** : 87 (Java, Borneo).

Ilisha whiteheadi Seshagiri Rao, 1974. *Copeia*, **4** : 861.

Ilisha elongata (part.) Whitehead, 1973, *J. mar. biol. Assn. India*, **14** (1): 212 (Porto Novo; not the Madras specimen).

Note on synonymy: The senior author examined four syntypes of *Pellona, kampeni* (100.0–118.5 mm S. L., ZMA. 112–594.1–5) and it is clear that the anomalous Porto Novo specimens reported by Whitehead (1972) belong to this species (12 fishes, 78.3–121.4 mm S. L., BMNH. 1970. 10.21. 1–10 and 1969. 11.6. 13–14; his Madras specimen, however, has a single swimbladder appendage and is apparently *Ilisha megaloptera*). In turn these specimens differ in no way from the description of *Ilisha whiteheadi.*

The possibility was considered that *Clupea affinis* Gray was also the present species. It was based on a drawing in the collection of Major General Hardwicke and is found on p. 241 of volume 20 in the Hardwicke collection in the British Museum (Natural History). Whitehead (1967) who reproduced Gray's plate (but not original drawing), gave measurements and referred the species to the synonymy of *Ilisha elongata*, although he noted that the fish was rather deeper than expected (depth 31.7% of S. L; cf. 24.2–28.5% in various type specimens listed by Whitehead, 1967). The scute count is also unusual (20+11, total 31) compared with the figures given by Whitehead (1973a) for *Ilisha elongata* (23–26+10–14, total 35–39).

Gray's *affinis* differs from the present species, however, in having more scutes (cf. 18-21+7-9, total 27-30 in the types of *kampeni* and the Porto Novo specimens). This could perhaps be overlooked were it not that the anal count in Gray's *affinis* is 49. This high count is found in *Ilisha elongata* (*e.g.* 48–50 in the types redescribed by Whitehead, 1967, although only 43 in the type of Valenciennes' *novacula*), whereas in the types of *kampeni* and in the Porto Novo specimens the count is only 37–41.

Since the form of the swimbladder in Gray's *affinis* cannot be checked, and since the drawing is not fully dependable, it seems better to treat this as a synonym of *Ilisha elongata* rather than to resurrect a name that has rarely been used.

Material examined: (10) 78.3–88.2 mm S. L., Porto Novo, coll. Seshaiya, BMNH. 1970.10. 21.1–10; (2) 100.7–121.4 mm S. L. Porto Novo, coll. Seshaiya, BMNH. 1969. 11.6.13–14; (147) 68.0–136.0 mm S. L., Porto Novo, coll. Ramaiyan, deposited at Marine Biological Station Reference museum, Porto Novo (India).

Description: Based on 147 fishes, 68.0–136.0 mm in S. L., from Porto Novo.

D ii 14–16, A ii 35–42, P i 14–15, V i 6, G. R. 7–9+22–25, scutes 18–21+7–9, scales in lateral series 42–43.

In percentages of standard length: body depth 25.3–30.8, head length 26.3–32.3; snout length 9.1–10.4, eye diameter 8.4–10.8, depth at occiput 19.6–23.5; pectoral fin length 14.3–22.5; pre-dorsal distance 47.9–55.8, pre-pelvic distance 42.2–51.4, pre-anal distance 57.7–66.2.

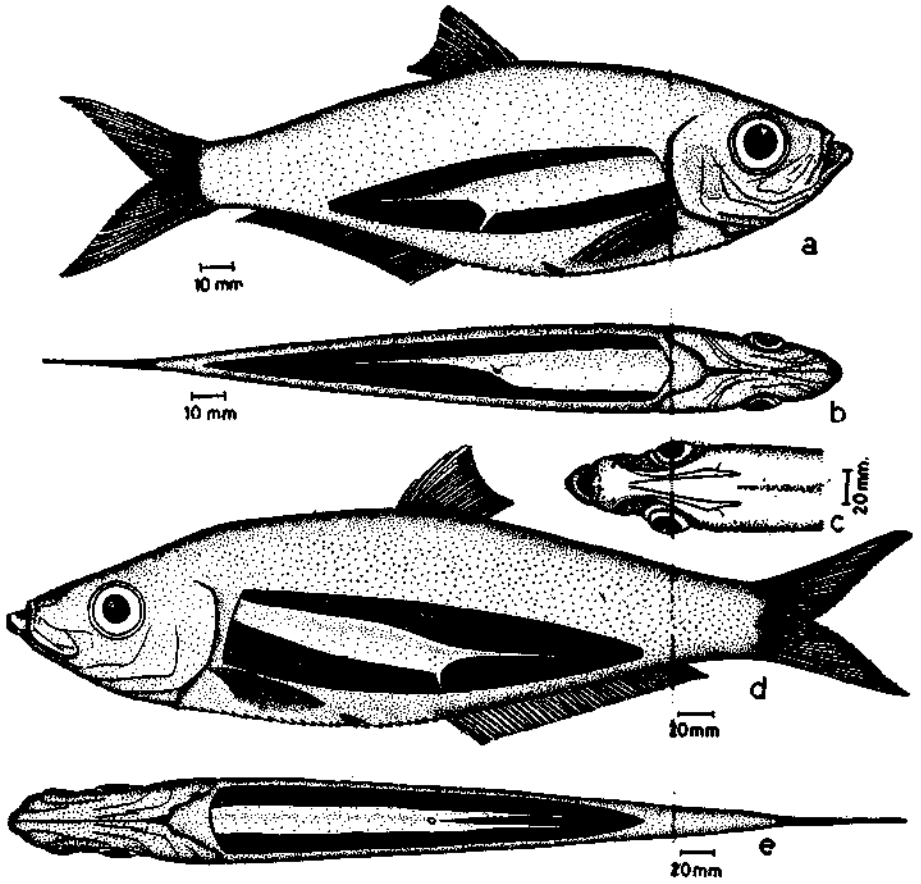

Fig. 2. a. Lateral view of the swimbladder in *Ilisha megaloptera*, b. ventral view of the swimbladder showing the single post-coelomic extension, c. striations on dorsal surface of head in *Ilisha kampeni* (115.0 mm S. L.), d. lateral view of the swimbladder in *Ilisha kampeni* and e. ventral view showing the bifid post-coelomic extensions of the swimbladder.

Body oblong, compressed, ventral profile a little more convex than dorsal. Maxilla reaching to below middle of eye, its length twice in head. No hypo-maxilla; two supra-maxillae the 2nd expanded posteriorly. Chin very prominent. Two pairs of diverging ridges on the dorsal surface of the head; all specimens have the so-called *'megaloptera'* pattern of striae (Fig. 2 c) as described by Seshagiri Rao (1972). Origin of dorsal fin a little nearer to snout tip than to caudal fin base. Pelvic fins very short. Anal fin base almost three times in S. L., its origin below posterior half of dorsal fin. Caudal deeply forked.

Colour: Flanks silvery, upper parts dark. Fins hyaline, outer margin of dorsal and upper, lower and hind margins of caudal darker.

Swimbladder: In all the specimens examined swimbladder had two fairly long post-coelomic extensions (Fig. 2 d, e). Whitehead (1972) recorded this type of post-coelomic extension in *Ilisha melastoma*, but the extensions do not reach so far back.

Distribution: Weber & de Beaufort (1913) recorded *I. kampeni* from Java (Batavia) and Borneo (Balikpapan). It is here recorded from Kakinada, Bay of Bengal (as *I. whiteheadi* by Seshagiri Rao, 1974) and from Porto Novo and may be fairly widely distributed along the southeast coast of India.

Notes on biology: *Ilisha kampeni* is mainly caught by cast nets at depths of 3–5 metres in the Vellar Estuary, Porto Novo. It occurs in the Vellar Estuary throughout the year, but its absence from shore catches is curious. Stomach analysis of fishes caught at the Vellar Estuary showed that the major dietary components are planktonic crustaceans and fishes; amphipods were also observed but in lesser quantities. A detailed account of the food, feeding behaviour and breeding of this species will be published elsewhere.

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