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A new size record of Big eye ilisha, *Ilisha megaloptera* (Clupeiformes: Pristigasteridae) with a note on its sexual maturity from Hooghly Estuary, India

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Pristigasteridae family comprising of Genus *Ilisha* is reported to include 13 species of fish in inshore areas across Indo-Pacific region (Talwar and Jhingran, 1991; Mahmood *et al.,* 2012) with *Ilisha filigera* being the largest among all (Whitehead, 1985). All the species exhibit a circum-tropical distribution in estuaries and coastal waters, with eleven in tropical Asia, two in South America and one species in the tropical East Atlantic (Blaber *et al.,* 1998) (Fig. 1). Hooghly estuary is the distributary of Ganga-Bhagirathi river system forming the largest estuary of India (Pantulu, 1966). It is one of the most productive ecosystems and supports important commercial multi-species fisheries. This diverse ecosystem of the Hooghly estuary hosts 76% of the aquatic fauna out of the reported 1498 living organisms (Mitra, 2001). The Hooghly estuarine system is mesohaline in nature due to huge freshwater drainage from the tributaries. *Ilisha megaloptera* (Swainson, 1839), locally known as 'Dhela' in the lower zone of Hooghly estuary, contributes significantly (approximately 2 %) to the total fish landing spectrum. The species is lucrative and admired in the Hooghly estuarine system owing to its excellent taste and flavour.

The goal of the present paper is to update the new size record of *Ilisha megaloptera* (Big eye ilisha) along with a report on its maturity status from Hooghly estuary. A large size specimen of *I. megaloptera* was collected during seasonal catch monitoring sampling carried out in March 2020 from Fraserganj coast (21°34'47"N, 88°15'4"E) of West Bengal (Fig. 2) using a multimeshed drift gillnet (mesh: 60 cm) at a depth range of 45 m. The site Fraserganj is a tide dominant zone experiencing consecutive two high tides and two low tides in a single day creating an interesting mixture of fish fauna. The site is within close proximity of Bay of Bengal located nearly 10 Km away from the sea mouth. The collected fish specimen was stored in ice and carried to the laboratory in ice cover, photographed and identification was confirmed using several identifying keys (Rao, 1973; Talwar and Jhingran, 1991). The morphometric measurements of the sample was taken using a wooden scale to the nearest 0.1 cm and meristic counts were also noted. Furthermore, after recording the sex and maturity stages of the ova (Pillay, 1964) the ovaries were preserved in 4% formaldehyde solution for fecundity evaluation. Gonad was also weighed to the nearest 0.01 gm. The gravimetric method was employed to determine absolute fecundity (Murua *et al.,* 2003). Relative fecundity of the sample was obtained by dividing absolute fecundity to the weight of fish. For histological assessment, a middle portion of gonad was collected and preserved in Bouin's solution. Ethanol series of dehydration process was carried out followed by paraffin embedding. Tissue sectioning was done at 5 µM and stained with hematoxylin and eosin (H&E) to examine histological observation under a light microscope (Zeiss-Scope A1) (Van *et al.,* 2004).

The specimen of *I. megaloptera* collected from Fraserganj (Hooghly estuary) during high tide measured

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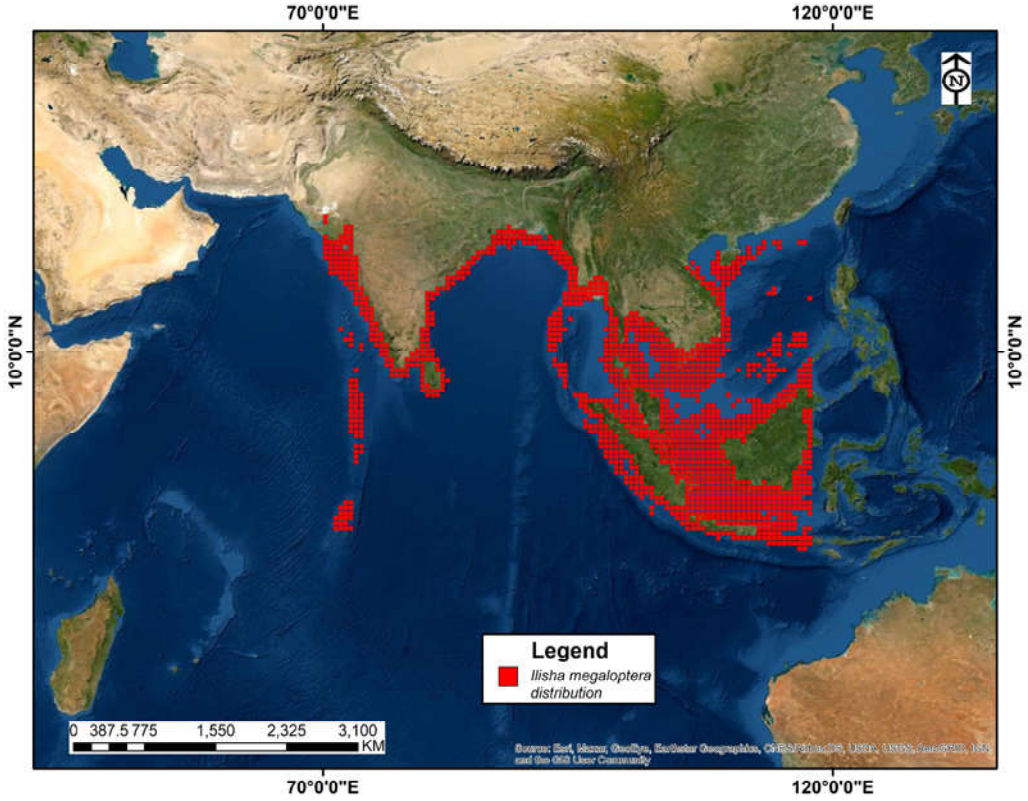


Fig. 1. Worldwide distribution map of *Ilisha megaloptera*

54.8 cm in total length (TL) having 792.36 gm body weight (Table 1).

This fish has a fairly compressed body with a depth ranging from 27 to 31 % of its standard length (Talwar and Kacker, 1984). Strongly keeled belly with scutes exists at the isthmus. The lower jaw tipped at the end and origin of the anal fin at the end of the 10-11th dorsal fin with 40-49 branched rays (Rao, 1973). The systematic position of the species is as follows:

Class: Actinopterygii
Order: Clupeiformes
Family: Pristigasteridae
Subfamily: Pristigasterinae
Genus: *Ilisha*
Species: *megaloptera*

It is the largest specimen recorded so far from the eastern coast of India (Fig. 3). Previously, Mondal *et al.* (2015) has reported a maximum length (TL) of 51.5 cm (unsexed) from Hooghly estuary. From the marine waters of Bay of Bengal, Islam (1995) has also reported a size length of 30.0 cm (TL). From Oman, Mousavi-Sabet *et al.* (2016) have observed the species with a maximum total length of 36.5 cm for males. Dildar *et al.* (2015) have reported a maximum size of 25.5 cm (unsexed) from waters of Persian Gulf. Similarly, Blaber *et al.* (1998) have reported the maximum size of *I. megaloptera* for females (24.8 cm TL) from Sarawak estuary of Malaysia. Like other tropical clupeoid fishes,

Table 1. Morphometric measurements of the female specimen of *I. megaloptera*

Morphometric characters	Measurement (cm)	% of Total length
Total length	54.8	100
Standard length	48.4	88.32
Body depth	13.5	24.63
Head length	7.6	13.86
Eye diameter	2.0	3.64
Pre dorsal length	21.5	39.23
Post dorsal length	15.9	29.01
Pre pectoral length	10.2	18.61
Pre anal length	25.2	45.93
Caudal fin height	6.6	12.04

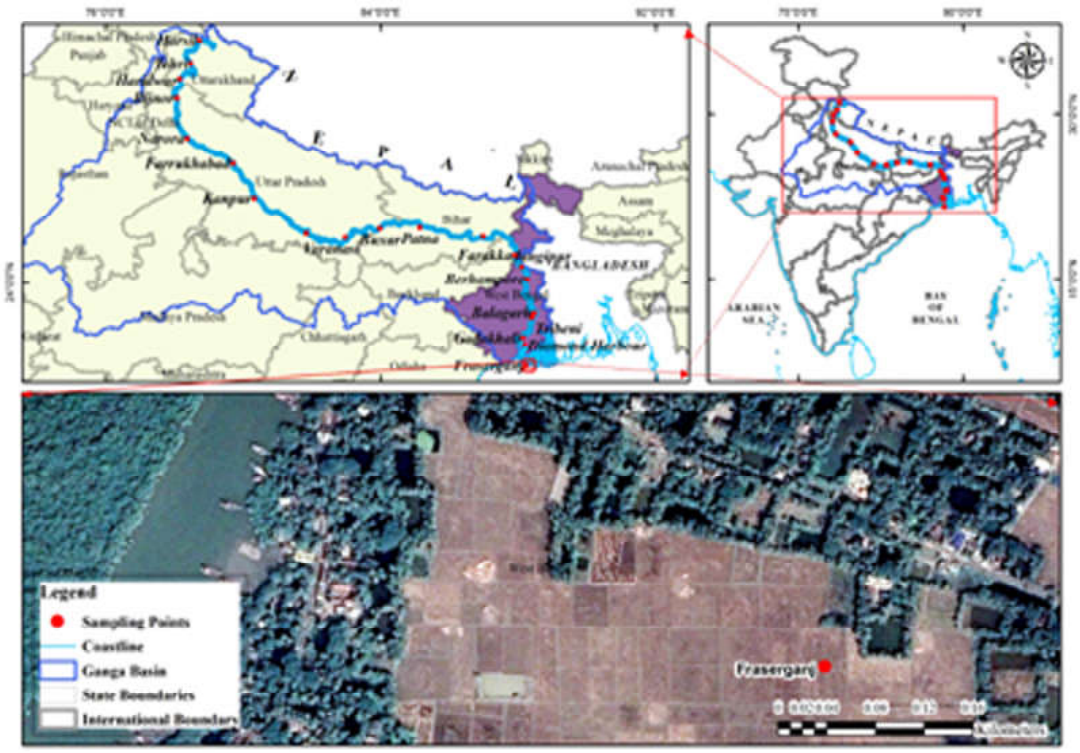


Fig. 2. Location of the sample collection, Fraserganj, West Bengal

the species is considered as multiple spawners (Milton *et al.,* 1994) while the size of maturity is attained within first year (Blaber *et al.,* 1998).

The specimen was recorded to be a mature female with an ovary of stage V (fully mature). The ovary of the specimen weighed 67.07 gm. The total fecundity (number of eggs) of the fish was recorded to be 1,22,240 and the relative fecundity was estimated to be 154.27 per gm. The Gonado Somatic Index (GSI) of the captured specimen was evaluated to be 8.41. The mean diameter of oocytes was calculated to be 605.95±25.98 µM at the tertiary vitellogenesis stage. Only fewer studies has been carried out on the aspect of the reproductive biology of Big eye ilisha. Blaber *et al.* (1998) has reported a fecundity of 14346 ± 313 from the estuarine waters of Sarawak waters (Malaysia) measuring 24.8 cm in standard length. From the northwestern region of the Arab-Gulf, Al-Daham (2002) has reported the maximum absolute fecundity of 48216 (TL: 35.2 cm). In accord with the previously reported values on fecundity, the present observed fecundity of 1,22,240 is the highest from any water body so far reported. Therefore, the present observation supports that egg production of an individual fish species depends largely on the size (Zastrow *et al.,* 1989; Buckley *et al.,* 1991). The ovary was slight yellow to orange in colour with highly vascularized blood vessels occupying almost the ventral cavity. The appearances of oocytes were granular and thicker in shape. The ovary was covered by a transparent periphery. Histological sectioning of the ovary revealed oocytes are in the tertiary vitellogenesis stage. Oil droplets are more in number and increased in size as well as some are fused together. Zona radiata is highlighted with eosin stain (Fig. 5).

A new size record of this Big eye ilisha expands knowledge of marine teleostan fishes, and a new size record for the species is herein reported. Data concerning the sexual maturity of the *I. megaloptera* are deficient. Removal of older age group of fishes has serious impact on marine fisheries as longevity of such species allows the population to remain for longer period (Berkeley *et al.,* 2004). As the fish attains

Fig. 3. Specimen of *Ilisha megaloptera* (Total length: 54.8 cm)

Fig. 4. Mature ovary of *Ilisha megaloptera* specimen

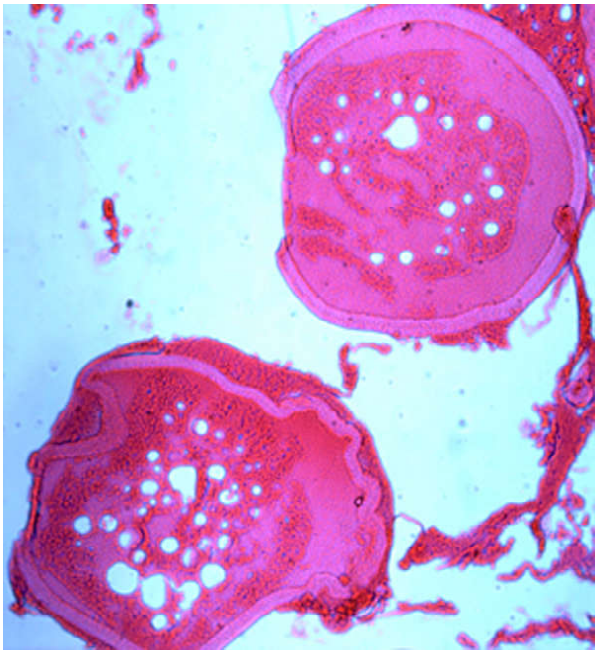
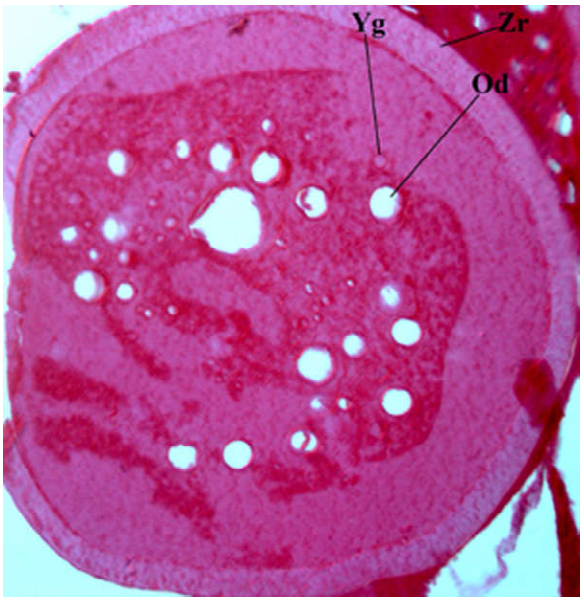


Fig. 5A. Histological sectioning of ovary showing mature oocytes



5B. Yg: yolk globule; Od: oil droplets; Zr: Zona radiata

maturity age, the breeding performance increases as well as the fecundity also increases which in turn would be helpful in more number of the juveniles to be recruited and population in the ecosystem. More investigations need to be carried out on reproductive biology of the species, which would provide valuable information to the fish biologists and fisheries management authorities as this species has wide distribution from India to Indonesia and Taiwan Islands. This would further add up to the knowledge about its population trend and conservation status.

References

Al-Daham., N. K. and Abdullah., J. N. 2002. Aspects of reproductive biology of the clupeid *llisha megaloptera* in North-West Arab Gulf. *Basrah Journal of Science,* 20(1): 1-12.

Berkeley, S. A. Hixon, M. A., Larson, R.J. and Love, M. S. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations. *Fisheries,* 29: 23-32

Buckley, L. J., Smigielski, A. S., Halavik, T. A., Caldarone, E. M., Burns, B. R. and Laurence, G. C. 1991. Winter flounder *Pseudopleuronectes americanus* reproductive success. II. Effects of spawning time and female size on size, composition and viability of eggs and larvae. Marine Ecology Progress Series. Oldendorf, 74(2): 125-135.

Blaber, S. J. M., Staunton-Smith, J., Milton, D. A., Fry, G., Van der Velde, T., Pang, J., Wong, P., and Boon-Teck, O.

1998. The Biology and Life-history Strategies of *Ilisha* (Teleostei: Pristigasteridae) in the Coastal Waters and Estuaries of Sarawak. *Estuarine, Coastal and Shelf Science,* 47(4): 499-511.

Islam, S. S. 1995. Population dynamics of some fishes and shrimp of Karnaphuli river estuary based on large frequency data. M.Sc. Thesis, Dept. of Zoology,University of Chittagong, Bangladesh, pp. 37 - 76.

Mahmood, K., Ayub, Z., Moazzam, M., and Siddiqui, G. 2012. Length-weight relationship and condition factor of *Ilisha melastoma* (Clupeiformes: Pristigasteridae) off Pakistan. *Pakistan Journal of Zoology,* 44(1): 71-77

Milton, D. A., Blaber, S. J. M. and Rawlinson, N. J. 1994. Reproductive biology and egg production of three species of Clupeidae from Kiribati, tropical central Pacific. *Fish. Bull.* 92: 02-121.

Mitra, P. M. 2001. Fisheries of Hooghly-Matlah Estuarine System, Further Appraisal (1994-95 to 1999-2000). Central Inland Capture Fisheries Research Institute. Bulletin no.109, 18 p.

Mondal, S., Behera, S., Kumar, S., Nagesh, T. S., Talwar, N. A., Gogoi, R. and Sarkar, S. 2015. Length-weight relationships and condition factors of Big eye hilsa, *Ilisha megaloptera* from estuarine region of Diamond Harbour, West Bengal. *International Journal of Innovative Science Engineering and Technology,* 2(5): 217-228.

Mousavi-Sabet, H., Homayouni, H., Marjani, M. and Heidari, A. 2016. Length-weight relationships for five Clupeiformes species from the Persian Gulf and Oman Sea. *Journal of Applied Ichthyology,* 32(1): 169-170.

Murua, H., Kraus, G., Saborido-Rey, F., Witthames, P. R., Thorsen, A. and Junquera, S. 2003. Procedures to estimate fecundity of marine fish species from field samples in relation to reproductive strategy. *Journal of Northwest Atlantic Fishery Science,* 33: 33-54.

Pantulu, V. R. 1966. Contribution to the study of the biology and fishery of some estuarine fishes. D.Phil. Thesis. Calcutta University.

Pillay, S. R. 1964, Maturation and spawning of the hilsa, *Hilsa ilisha* (Hamilton), of the Saurastra coast. *Proceedings of the National Academy of Sciences, India, Section B,* 30: 8-14.

Rao, B. S. 1973. Redescription of the Clupeid Fishes, *Ilisha megaloptera* and *I. melastoma*. *Copeia*, 4: 735-739.

Talwar, P.K. and Kacker, R.K. 1984. Commercial sea fishes of India. Zoological Survey of India, Calcutta, 997 p.

Talwar, P.K. and Jhingran, A.G. 1991. Inland Fishes of India and Adjacent Countries. Oxford-IBH Publishing Co. Pvt. Ltd., New Delhi, 1158 p.

Van, R., Runnals, T. J. and Tyler, C. R. 2004. Ontogeny of gonadal sex development relative to growth in fathead minnow. *Journal of Fish Biology,* 64: 355-369.

Whitehead, P. J. P. 1985. FAO Species Catalogue. Vol. 7. Clupeoid fishes of the world (suborder Clupeoidei). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. *FAO Fish. Synop.,* 125(7/1): 1-303. Rome: FAO.

Zastrow, C. E., Houde, E. D. and Saunders, E. H. 1989. Quality of striped bass (*Morone saxatilis*) eggs in relation to river source and female weight. *Rapports et Procès-verbaux des Réunions, Conseil International pour l'Exploration de la Mer,* 191: 34-42.