

# A NOTE ON THE LATE MR. DEV DEV MUKERJI'S MANUSCRIPT DRAWINGS OF THE AIR-BLADDER OF THE GOBIOID FISHES OF THE GANGETIC DELTA<sup>1</sup>

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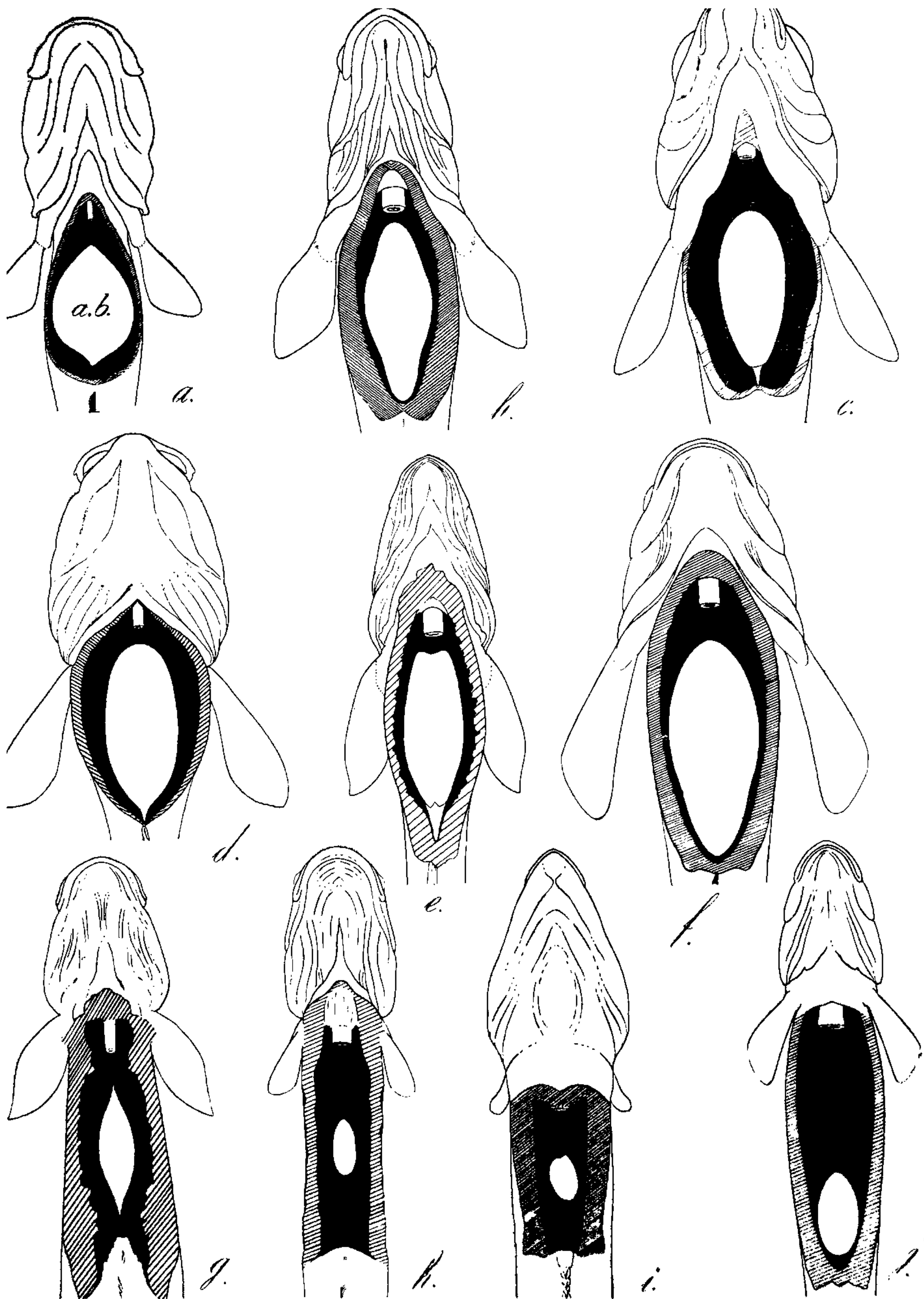
**I**N my<sup>2</sup> note on the modification of swim-bladder in certain air-breathing fishes of India, among other things, attention was directed very briefly to the correlation between the form and position of the bladder and the mode of life of the Gobioid fishes of the Gangetic Delta. In a foot-note it was stated that "Mr. Dev Dev Mukerji of the Zoological Survey of India is at present engaged in investigating the correlation between the structure of the air-bladder and the ecological factors in the case of Gobioid fishes in the Gangetic Delta". Mr. Mukerji had drawings made of the dissections of various species showing the position and extent of the air-bladder in each case, but before he could write his article the cruel hand of Death snatched him away in the prime of his life.<sup>3</sup> Recently Rahimullah<sup>4</sup> described the gas-bladder of the Gobioid fish, *Boleophthalmus boddarti* (Pallas), a common species of the Gangetic Delta, and it occurred to me that the publication of the late Mr. Mukerji's manuscript drawings with such comments as I am in a position to offer, may be of some use in the elucidation of the correlation referred to above and hinted at by Rahimullah also.

An ecological zonation of the Gobioid fishes<sup>5</sup> of the Gangetic Delta and an account of their bionomics has already been published,<sup>6</sup> but it may be worthwhile to re-iterate here that of all the Gobioid species found in this habitat *Glossogobius giuris* (Ham.), *Gobiopterus chuno* (Ham.) and *Brachygobius nusus* (Ham.) are the most aquatic forms, though even they are capable of living out of water for shorter or longer periods depending upon meteorological conditions. *Eleotris fusca* (Bl. and Schn.) and *Butis butis* (Ham.) are usually found near the edges of ponds and other collections of water in thick vegetation, but are more or less aquatic in their mode of life. They are, however, more tenacious of life than either *Glossogobius*, *Gobiopterus* or *Brachygobius*. *Apocryptes bato* (Ham.), which is found in

burrows on muddy banks near lowtide mark and in outlying shallow portions of the tidal pools, etc., and *Stigmatogobius sadanundio* (Ham.), which is found in crab holes along the banks of pools and narrow channels, live under water for most of their time, though they may sometimes be exposed to aerial conditions at low-tide. *Odontamblyopus rubicundus* (Ham.) and presumably *Trypauchen vagina* (Bl. and Schn.)<sup>7</sup> also live in deep burrows along the sides of streams near low-tide mark and in tidal pools which may dry up occasionally for a short period. *Pseudapocryptes lanceolatus* (Bl. and Schn.) lives in deep burrows in spring-tide pools, which dry up for days together in between the high tides. *Boleophthalmus boddarti* (Pallas) is found on muddy banks between tide marks, but the almost terrestrial form extensively met with in the Gangetic Delta is the mud-skipper, *Periophthalmodon schlosseri* (Pallas).

Correlated with the differences in the respective mode of life of the various species as indicated above, it is interesting to note that the physoclist air-bladder of *Glossogobius*, *Gobiopterus* and *Brachygobius* is fairly extensive and occupies a considerable part of the body cavity. The air-bladder of *Glossogobius giuris*, which lives in comparatively deeper and more permanent pieces of water, is relatively much larger. In shore forms, such as *Eleotris fusca* and *Butis butis* and *Stigmatogobius*, which lives in shallow and relatively broad holes, the air-bladder is still extensive, but in *Apocryptes bato*, which lives in burrows under water or near low-tide mark, the bladder has become spindle-shaped and considerably smaller. In *Odontamblyopus* and *Trypauchen*, both of which live in deep burrows, the bladder is greatly reduced, but is still situated in the middle of the abdominal cavity, a stage of reduction already indicated in the spindle-shaped bladder of *Apocryptes bato* (Ham.), while in *Pseudapocryptes*, which is more subject to desiccation than the species mentioned above, the reduced bladder is situated in the posterior part of the body cavity. I (1935,

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The late Mr. D. D. Mukerji's drawings of the air-bladder of the Gobioid fishes of the Gangetic Delta.

a—*Glossogobius giuris* (Ham.); b—*Gobiopterus chuno* (Ham.); c—*Brachygobius natus* (Ham.); d—*Eleotris fuscus* (Bl. & Schn.); e—*Butis butis* (Ham.); f—*Stigmatogobius sadanundia* (Ham.); g—*Apocryptes bati* (Ham.); h—*Odontamblyopus rubicundus* (Ham.); i—*Trypauchen vagina* (Bl. & Schn.); j—*Pseudapocryptes lanceolatus* (Bl. & Schn.).



p. 336) did not find any air-bladder in *Boleophthalmus* and *Periophthalmodon*, but Rahimullah (*loc. cit.*) has described and figured a small, ovoid or ellipsoidal bladder in *Boleophthalmus* lying freely in the body cavity. There seems to be some mistake in Rahimullah's account where he correlates the presence or absence of the air-bladder in *Boleophthalmus* and *Periophthalmus* with their respective mode of life and states that "though the habits and habitats of *Boleophthalmus boddarti* (Pallas) are more or less similar to those of *Periophthalmus*, a small gas-bladder in *Boleophthalmus* is associated with its more pronounced terrestrial mode of life. As is well known and as has been stated above, the mode of life of *Periophthalmus* and *Periophthalmodon* is much more terrestrial than that of *Boleophthalmus* and this is further borne out by the fact that the air-bladder is completely absent in the two terrestrial genera of the Gangetic mud-skippers.

A comparison of the late Mr. Mukerji's figures with the ecological conditions under which the respective species live makes it abundantly clear that the reduction and

finally the absence of air-bladder in the Gobioid fishes of the Gangetic Delta are definitely correlated with the progressively terrestrial habit of the species. Attention may here be directed to the fact that in the fishes of the hill streams<sup>8</sup> a similar reduction of air-bladder is induced by the pronounced ground-habit life of these fishes. Thus one is led to the conclusion that adaptation to the requirements of some important factor in a habitat is the main inducement for the structural modifications undergone by allied organisms living under diverse or apparently similar conditions.<sup>9</sup>

<sup>2</sup> Hora, S. L., *Curr. Sci.*, 1935, **3**, 336.

<sup>3</sup> —, "Obituary, Mr. Dev Dev Mukerji (1903-37)," *Ibid.*, 1937, **5**, 439.

<sup>4</sup> Rahimullah, M., *Ibid.*, 1941, **10**, 440.

<sup>5</sup> The nomenclature used here is after Dr. F. P. Koumans "Gobioid Fishes of India," *Mem. Ind. Mus.*, 1941, **13**, 203.

<sup>6</sup> Hora, S. L., *Comptes Rendus du XII Cong. Internat. Zool.*, pp. 841-63 (Lisbon, 1935).

<sup>7</sup> Though *Trypauchen vagina* is found in the estuaries of the Ganges, neither the late Mr. Mukerji nor I had any occasion to make observations on the living specimens.

<sup>8</sup> Hora, S. L., *J. Bombay Nat. Hist. Soc.*, 1930, **34**, 374.

<sup>9</sup> —, *Phil. Trans. Roy. Soc. London*, (B), 1930, **218**, 171.

## RESPIRATORY ENZYMES AND THE BIOLOGICAL ACTION OF THE VITAMINS—A SYMPOSIUM

Report of the Proceedings

By FRITZ SCHLENK

(University of Texas, U.S.A.)

A SYMPOSIUM dealing with the problems on Respiratory Enzymes and the Biological Action of Vitamins, was conducted jointly by the University of Wisconsin and the University of Chicago, from September 11-17, in which many outstanding men in the field took part. The enzymes were discussed mainly in the Madison section, the vitamins, subsequently at Chicago. The participants were accommodated in the splendid dormitories of the Universities, an arrangement which provided opportunities not only for establishing personal contacts but also for holding intimate discussions on subjects of mutual interest.

The programme included 28 papers on various aspects of the subject and open discussions on (1) Phosphorylation, (2) Hydrogen transport, (3) Tumor respiration, (4) Bacterial respiration and (5) Animal tissue respiration.

The most outstanding events were the lectures given by O. Meyerhof, T. R. Hogness, C. F. Cori, C. A. Elvehjem, T. D. Spies, R. J. Williams and V. duVigneaud.

The splendid introductory talks of O. Meyerhof at Madison and C. A. Elvehjem at Chicago were general reviews on carbohydrate metabolism and on the biological action of the vitamins, respectively.

The lectures given in Madison will be published very soon by the University of Wisconsin Press, and there is every hope that the Chicago lectures will also be published.

The Symposium was supported by funds from both the Wisconsin Alumni Research Foundation and the Abbott Laboratories. The sessions at Chicago formed a part of the University of Chicago's semicentennial celebration.