as suprapseudobranchial chamber. The epithelial lining of this chamber consists of greatly flattened cells, and the capillaries of the pseudobranch approach close to these cells; at other places the capillaries do not lie close to the lining of the oral chamber but are separated

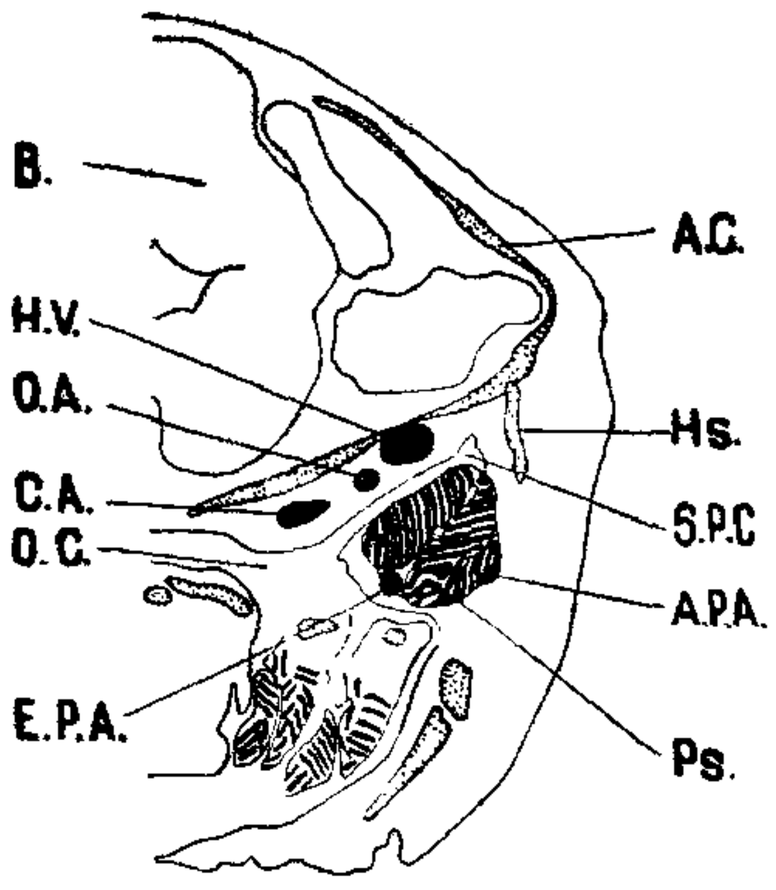

FIG. 1. T. S. Embryo of *Mastacembelus armatus* (21·6 mm. in length) passing through the region of pseudobranch.

A.C., auditory capsule; A.P.A., afferent pseudobranchial artery; B., brain; C.A., carotid artery; E.P.A., efferent pseudobranchial artery; Hs., hyosymplectic cartilage; H.V., head vein; O.A., orbital artery; O.C., oral chamber; Ps., pseudobranch; S.P.C., supra pseudobranchial chamber.

from it by the normal epithelial cells and connective tissues. In the pseudobranch there are no free branchial lamellæ like that of a functional gill, but the entire organ presents a compact structure traversed by numerous capillaries, through which the blood from the afferent pseudobranchial artery passes into the efferent pseudobranchial artery. The orbital artery emerging from the carotid runs forward upto the anterior end of the pseudobranch where it gives a hyoidean artery and then continues as the afferent artery of the pseudobranch. The efferent artery from the pseudobranch runs forward upto the posterior margin of the eye where medially it is joined by a short branch with the fellow of the opposite side; it then passes round the external carotid and runs as the ophthalmica magna artery to the choroid gland of the eye The structure described is pseudobranch, because it receives aerated blood from the carotid artery. The pseudobranch is supplied by a branch of the ninth cranial nerve, and this shows that the structure is a hyoidean pseudo-branch and not a spiracular one.

In the adult fish, in front of the first branchial arch, the roof of the oral chamber shows a small depression on either side near its lateral border. This represents the opening of a small chamber which has been described before as present in the embryo. On slitting open this chamber and removing the lining of the oral chamber lateral to the depression, the pseudobranch is seen as a small oval structure. In fresh condition it is visible as a reddish spot even through the lining of the oral chamber, but the colour is lost in preserved specimens.

Thus a pseudobranch is present even in the adult *Mastacembelus* though it is proportionately much reduced in size than in the embryo. In an adult *M. armatus* measuring about 1½' in length, the structure is about 3 mm. in length. In transverse sections, the pseudobranch shows a structure closely resembling that of the embryo and consists of a mass of blood capillaries resembling a *rete mirabile*. The pseudobranch was so far not recorded in adult probably because it is hidden below the buccal epithelium and is colourless in preserved specimens

The suborder, Opisthomi, includes only a single family Mastacembelidæ and this is probably derived from the family Blenniidæ. This affinity is further supported by the presence of pseudobranch in the genus *Mastacembelus*. Further work will probably show that similar pseudobranch is present in *Rhynchobdella* which is the only other genus included in the family Mastacembelidæ.

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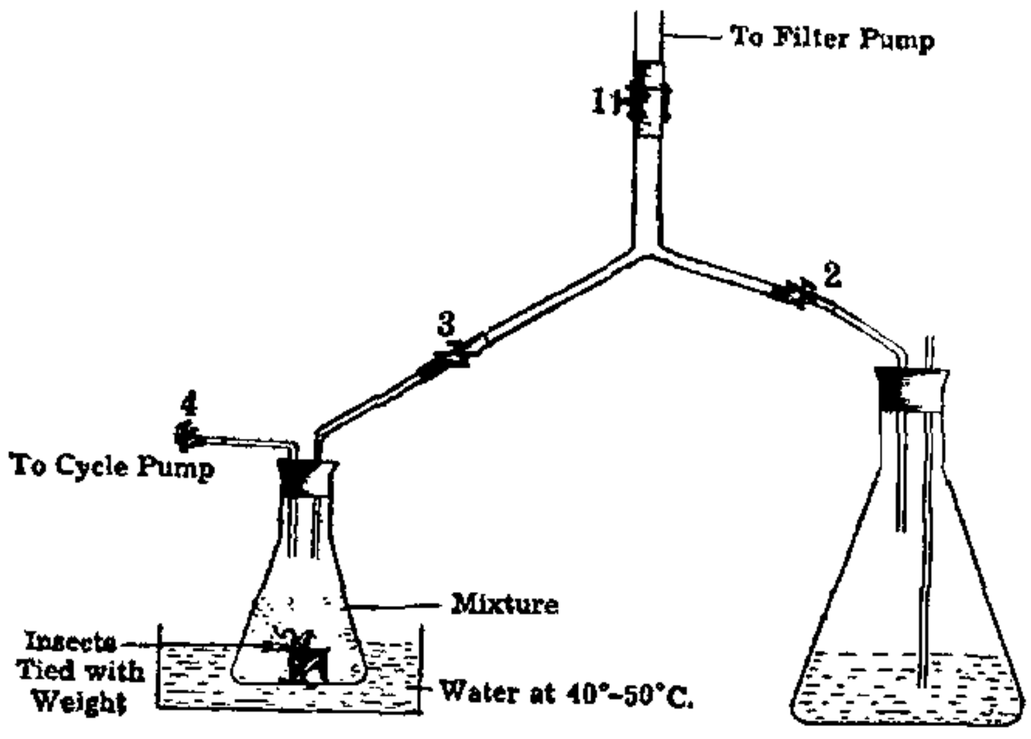
A NOTE ON THE STUDY OF INSECT TRACHEAL SYSTEM

STUDENTS of insect morphology are well acquainted with the difficulties encountered in a detailed study of the tracheal system. Several methods have been tried to make the tracheal branches easily perceivable. Harshberger[1,2] injected the living insects with intra-vitam stains, Hagmann[3] used aqueous stains under low pressure created by a vacuum pump. Both these were tried by us but the results were not upto

the mark. We found Krogh's[4] method with some modification more successful. But Krogh did not mention the proportions of the constituents used by him. Various proportions were, therefore, experimented upon by us, and the one mentioned below gave the best result.



Oil of Turpentine—1 part by vol.
Bee's wax (melted)—½ part by vol.
Paraffin wax (melted, m.p. 56-58° C.)—½ part by vol.

The mixture was coloured with red oil colour dye of I.C.I. instead of *alkanna* root which takes nearly a week and was also not available here. A pinch of the dye in 20-25 c.c of turpentine gave a bright colouration. Then filtered bee's wax and paraffin were added to the mixture, which was well shaken and placed in the embedding bath for two hours. This mixture melts nearly at 41-43° C, and gives satisfactory results even without addition of colophoneum

The writers agree with Krogh that water and watery mixture are not very effective in penetrating the trachea.

The solidified mixture was placed in a small flask (250 c.c.) and a number of narcotized small insects were put into the flask tied by means of a thread to a small weight, so as to prevent them from floating on the surface of the liquid. The apparatus as detailed in figure above was connected with an ordinary filter-pump. The flask was then evacuated of air for 10-20 minutes after which it was immersed in hot water at a temperature of 40-50° C. and the evacuation continued for another 5-10 minutes. By this time the mixture melted causing the insects to float submerged. Then stopper No. 1 was closed and stopper No. 2 opened slowly to admit air into the flask. This was done in several instalments so as to ensure better penetration of the liquid. On reaching equilibrium, the pressure inside the experimental flask was increased by pumping air through a cycle pump and valve, and a high pressure was maintained for 5-8 minutes. After this the material was taken out and immediately transferred to cold water. Krogh did not increase the pressure inside the experimental flask after the equilibrium was restored. But the authors found that increasing the pressure helped in a better penetration of the mixture into the finer tracheal branches. The excess of the mixture sticking on the surface was removed with a brush dipped either in xylol or ether. The whole tracheal system of the treated insects, including its branches was permeated by the mixture and was coloured red, and could be studied with comparative ease under a binocular microscope. If required these specimens can be preserved in formalin or 70 per cent. alcohol.

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Allahabad, *August* 11, 1953.

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SEX CHANGES IN A WOOD-BORING BIVALVE MOLLUSC, *MARTESIA STRIATA* LINN.

THE phenomenon of sex-reversal has been reported in some of the wood-boring molluscs such as *Bankia*,[1] *Teredo*[2] and *Xylophaga*.[3] Coe[4] has recently given an excellent review on the subject. While investigating the biology and systematics of the wood-boring organisms in the Visakhapatnam harbour we examined the gonads of 130 specimens of the common local wood-boring bivalve, *Martesia striata* belonging to various size groups. The greatest antero-posterior length of the shell of each individual was measured and the condition of gonad ascertained. The results are tabulated below:

Size	Total No. examined	Males	Hermaphrodites	Females
1–10 mm.	16	15	..	1
10–15 ,,	27	6	5	16
15–25 ,,	80	12	30	38
25–30 ,,	22	5	7	10
30–35 ,,	14	4	2	8

It will be seen that of the 16 forms not exceeding 10 mm. in length, all were males with the exception of one female. In the size group