AN AMMOCOETE LARVA OF *ENTOSPHENUS LAMOTTENII* (LESUEUR) WITH AN ACCESSORY TAIL

AMONG some formalin-preserved larvæ of the lampreys (Cyclostomata) obtained from Mr. M. L. H. Thomas of the Fisheries Research Board of Canada, London (Ontario), one large ammocœte larva of the species *Entosphenus lamottenii* (LeSueur) was found to possess an accessory tail (Fig. 1). This additional tail was a well-developed, stout structure of normal shape and had arisen on the left side of the primary tail about 2/3 the distance from the cloaca. On sectioning, the accessory tail was found to be anatomically complete with a well-formed caudal fin, fin-rays, myotomes, spinal cord, notochord and blood vessels. The spinal cord and the notochord of the accessory axis were continuous with the corresponding organs of the primary axis at the point of origin of the former. The accessory axis had grown latero-posteriorly within the substance of the primary tail for some distance before emerging to become a full-fledged accessory tail with its own fin, fin-rays, myotomes, etc.

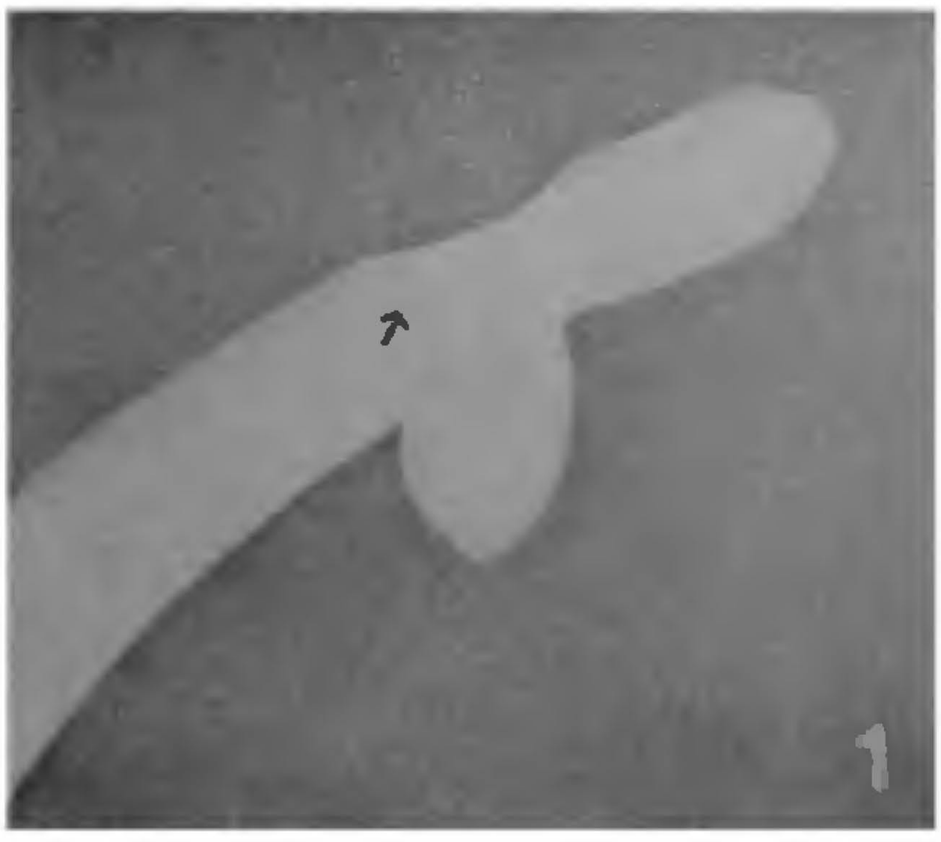

FIG. 1. The primary and accessory tails of an ammocœte larva of *Entosphenus lamottenii* (LeSueur). The tail was kept flat under a glass sheet while photographing. The arrow indicates the dorsal margin of the accessory tail at the point of its emergence from the primary tail.

Earlier, Barfurth (1900) had also described an ammocœte larva of *Petromyzon planeri* with three tails, each of which was anatomically complete in all details. Such cases are of interest not only because they constitute animal curiosities but also because an analysis of the morphology of such forms can frequently serve as a guide to experimental work to elucidate the causative mechanisms involved in such development. Thus, speculating on the possible manner of production of three tails in one larva Barfurth had suggested that these animals might possess powers of regeneration and that some peculiar kind of injury followed by regeneration would have caused the formation of three tails from one. It is now known for certain that the larvæ of the lampreys do possess good ability to regenerate tail and the whole process is well understood (Niazi, 1963).

Experimental production of accessory tails has never been attempted in ammocœtes but it has been successfully achieved in urodeles and in the anuran larvæ. Success or failure of such attempts largely depends on the proper knowledge or otherwise of the roles which the different component tissues of the tail play in its morphogenesis and differentiation. In urodeles, the spinal cord is the key-component and is indispensable for regeneration. Mere deflection of the spinal cord in the urodeles to an angle away from its antero-posterior path in the tail causes the development of an accessory tail (Holtzer, 1956). In the anuran tadpoles on the contrary, proper morphogenesis of the tail depends on the notochord, whose presence is indispensable for regeneration of a normal tail. To produce an accessory tail in these tadpoles it is necessary that two or more centres of notochordal regeneration are established. The presence or absence of the spinal cord is said to be immaterial for tail regeneration in the tadpoles of frogs and toads

(McCallion, 1948; Roguski, 1957). In this respect Barfurth's and our observations on the ammocœtes with multiple tails place the lamprey larvæ in a somewhat different category as compared to both urodeles and the anuran tadpoles. In the ammocœte larvæ both the spinal cord and the notochord are indispensable for proper regeneration of the tail (Niazi, 1964). On this basis, a method can be suggested to produce accessory tails in these animals with a reasonable chance of success. This can be achieved if the primary tail is injured sufficiently deeply on its dorsal, lateral or ventral sides. The injury should be deep enough to affect both the spinal cord and the notochord apart from damaging the peripheral tissues. The resultant blastema would then contain cells of notochordal, myotomal and connective tissue origin and a regenerating spinal cord. Becoming established on the injured site of the primary tail this blastema would give rise to an anatomically complete accessory tail. It is reasonable to assume that in the ammocœte reported here, a similar process must have occurred.

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