

**Developmental Changes in Primary Lateral-Line Organs Studied
in Living Larvae of Anurans and Urodeles.**

L. S. STONE.

From the Department of Anatomy, Yale University School of Medicine.

In amphibian embryos the migrating lateral-line primordia lay down a series of primary organs which can be observed in the living and vital-stained condition.^{1, 2} Since the mid body line extends down the tail in rather transparent tissue such organs are favorable for study in the living specimen when observed under high magnification in micro-aquaria. These data concerning the developmental changes in primary tail organs of normal larvae provide a basis for further observations consequent to the cutting of the lateral-line nerve.

In *Amblystoma punctatum* larvae the large melanophores often obscure the view of many lateral-line organs and their nerves. This condition was easily avoided by feeding specimens an exclusive diet of enchytraea which, for some unknown reason, contracts the dark pigment cells. The animals become pale yellow in color. In *Hyla crucifer* tadpoles pigment presents no serious difficulties. In contrast to the normal pigmented larvae of *Rana palustris* it was found that hypophysectomized specimens gave as clear a picture as *Hyla*.

In *Amblystoma punctatum* the tail organs begin abruptly at a level above the anus. In many larvae studied at the feeding stage (Harrison stage 46, 15-16 mm.) such a line on the tail is about 18 in number, extremes being 13 to 20. As in other lines the number on the right side is usually not equal to that on the left.

From primary organs accessory ones are formed by budding from supporting cells.^{1, 2} Shortly after the feeding stage begins the terminal organ may give off a bud posteriorly and thus form a chain of 1 to 3 new organs. However, normal isolated animals often do not show an immediate response by budding of the terminal organ until later. In larvae around 30 mm. this organ, which then usually lies some distance from the tip of the tail, very often begins to show budding and the formation of a few organs in the posterior direction. Although in some normal larvae this does not

¹ Stone, L. S., *Anat. Rec.*, 1933, **55**, 38.

² Stone, L. S., *J. Comp. Neur.*, 1933, **57**, in press.

occur, when it does it seems to take place more often around this period.

When larvae reach 20 to 24 mm. a sudden budding process almost always involves the dorsal and ventral poles of primary tail organs. Often a bud-organ is dorsoposterior or ventroposterior in its point of origin. In a cluster of the usual 3 organs, 1 primary and 2 bud-organs, the accessory ones are rarely confined to one pole. The more proximal primary organs on the tail usually bud first, for this process spreads from the body region of the line. The budding rapidly includes more posterior organs until at 30 mm. it may involve all but the last 7 or 8 organs. At this time, by rapid budding, the original number of tail organs may nearly double and by 40-45 mm. the number greatly increases because all but the terminal or last 2 or 3 organs are included. Although bud-organs may shift slightly from their source of origin, usually in the posterior direction, the tendency is for organs to remain in groups of 3 and sometimes 2. Four may occasionally be found.

From 40 to 50 mm. there seems to be normally no new bud-organ formation. During this late larval period the organs are gradually covered by a layer of flattened surface epidermal cells—a condition which anticipates that relation of these cells to the organ in the metamorphosed stage in *Amblystoma*.

In *Rana palustris* and *Hyla crucifer* larvae the many primary organs on the tail exhibit budding much more rapidly in contrast to that of *A. punctatum*. The terminal organ seems to be continually forming new bud organs in the posterior direction up to late larval life. The general conditions are the same in *Rana* and *Hyla*. In *Rana* from 10 to 15 mm. many primary organs at both anterior and posterior poles give off bud-organs, thus increasing rapidly the original number of organs in a single line. At about 13 mm. budding begins at the dorsal or ventral poles of the organs, and as the animal increases in length this spreads posteriorly. By 20 to 25 mm. most of the organs are involved and groups of 2 are formed. From this another rapid bud formation takes place in either the dorsal or ventral direction or both so that a group may contain as many as 6 or more organs. They may be grouped in irregular clusters due to the method of budding, but are nearly always in a linear arrangement extending in the dorso-ventral direction.