decrease in frequency and amplitude from which there was no recovery. Since a dilution of 1 eye stalk = 0.2 cc. does not always evoke a pronounced response in *Crago* chromatophores the excised heart of *Myoxocephalus* would seem to offer a more sensitive test of the crustacean eye stalk hormone than does the former.

### STRUCTURE AND GROWTH OF SCALES IN FUNDULUS HETEROCLITUS

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The purpose of the study was to learn something about the formation of the circuli or marginal lines of growth and the radiating grooves which are seen in surface views of many fish scales.

The scale in a longitudinal histological section resembles a lancet with barbs along the upper side. The barbs are really sections of ridges which give the effect of lines in the surface view. The upper portion of the scale consists of a thin homogeneous basic staining material and the lower somewhat thicker acid staining part shows longitudinally arranged lines. At the deeply imbedded end of the scale may be found varying numbers of cells, often giving the appearance of a knob or a papilla. Flat cells are also closely related to both upper and lower surfaces. Transections show that the radial grooves of the surface view consist only of the homogeneous basic staining material and that the calcareous deposits of the lower part of the scale are lacking.

In the growth of the scale, the lower cellular end penetrates the connective tissue fibers which adhere in bundles on the upper side and are incorporated into the homogeneous basic tip. Alternating with the extensions of the c.t. bundles into the newly formed scale are cells. As the scale grows, the bundles of fibers lose their attachment, and ridges (circuli in surface view) mark their place of extension into the scale. Connective tissue cells are closely related to the under surface yet are not incorporated as the calcareous material is gradually deposited.

# THE SEPARATION OF THE HYPOPHYSIS CEREBRI OF CERTAIN SELACHIANS (SQUALUS ACANTHIAS AND RAJA STRABULIFORIS) INTO SIX DISTINCT LOBES

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Investigations lately undertaken on the hypophysis cerebri\* (Lewis, Butcher, Halsey and Geiling) required a more careful sepa-

\* Reported in this Bulletin.

ration of the lobes of the gland than had heretofore been done. In making these dissections it was found that the gland, in the cartilaginous fish, instead of being made up of a few intermingled lobes as it is in the bony fish, is composed of six well defined lobes, each quite different in structure from the others. It was possible to separate completely four of these lobes; the other two, pars intermedia and pars neuralis, were not so easily isolated from each other.

Obviously it would be unwarrantable to call these lobes by definite names before the completion of the investigations, now under way, on the location in these glands of the active principles characteristic of pituitary glands in general. It has become necessary, however, to differentiate the several parts of the gland for experimental purposes. Therefore, the lobes of the hypophysis of the dogfish and the skate, from the anterior to the posterior region, have been designated as follows: pars distalis, pars medialis, pars intermedia, pars neuralis, saccus vasculosus and pars ventralis. The pars distalis and the pars medialis together compose what was formerly known as the anterior lobe; the pars intermedia with the pars neuralis form the posterior lobe. The saccus vasculosus is peculiar to fishes, and the pars ventralis is found only in the cartilaginous fish.

The hypophysis is bilateral, and lies on the ventral surface of the brain, to which it is attached by a short wide stalk formed by an extension out of the floor of the cavity of the dicephalon (third ventricle). This thins out dorsally and laterally into a large diverticulum, the saccus vasculosus. The ventral portion of the sac is applied to the dorsal surface of the intermediate lobe where, somewhat thickened, it forms the pars neuralis, the most adherent part of the hypophysis. The saccus vasculosus is continuous laterally with the pars neuralis, and is attached along the posterior edge of the pars intermedia thus forming a sac. The pars distalis is a narrow tonguelike projection, which extends forward in a groove between the inferior lobes of the brain. The pars distalis appears rather follicular in gross structure, and is separated from the pars medialis by a constriction. The pars medialis is a saccular gland with thin longitudinally folded walls which extends posteriorly for a short distance until it meets the pars intermedia, where it spreads out into a small flask-shaped gland attached to the ventral surface of pars intermedia. The pars intermedia is a large thick white lobe which comprises the major portion of the hypophysis cerebri in both the dogfish and the skate. Along the middle third of the anterior portion of its ventral surface is attached the posterior half of the pars medialis, and most of its dorsal surface is covered by the thin pars neuralis. In the skate the intermediate lobe is considerably larger than in the dogfish, often measuring from one to one and a half centimeters in width. Extending ventrally from the posterior border of the pars intermedia into the dura is a long tubular, sometimes somewhat saccular, gland-the pars ventralis. In the skate this lobe is bifurcated and is much larger than it is in the dogfish.

It thus becomes evident that in the dogfish and the skate the hypophysis cerebri with its many lobes, each differing structurally from the others, furnishes exceedingly interesting material for investigations upon the hypophyscal principles and their relations to the endocrine system in vertebrate animals.

What names will eventually be applied to these lobes is still unpredictable. The histological studies of Dr. Butcher and the pharmacological studies of Dr. Geiling (see abstracts) have determined the location of the pars neuralis, although, as Dr. Geiling shows, this tissue exhibits only slight hormonal content in the cartilaginous fishes. The location of a melanophore hormone in the intermediate lobe, together with the identification of the pars neuralis on its dorsal surface, would seem to indicate that the pars intermedia will continue to be regarded as such. Until something is known of the function of the pars ventralis, it will probably continue to be designated by its position.

# HISTOLOGY OF THE PITUITARIES OF SEVERAL FISH

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A histological study was made of the pituitaries of several fish in order to learn: 1) the extent of the various lobes, and if they could be separated for use in experimental work; 2) if the cellular content would provide any information on the relationship of the various cells.

Very fresh material was necessary for good fixation, and Bouin's fluid gave the best results although Zenker-Formol, Regaud's, Severinghaus's, and others were used. While many stains and modifications were tried, Hasting's Romanowsky proved to be the superior. This stain was difficult to use, but, when the tissue was properly fixed, the results were gratifying. The glands were cut in sagittal and transverse planes.

There are no indications of lobes in the pituitary of *Fundulus* heteroclitus. Surrounding the radiating trabeculae of the neuralis are epithelioid cells with distinct eosinophilic granules. The more anterior portion of the gland is composed of two kinds of cells; one type takes a pale eosinophilic stain while the other has little basophilic cytoplasm and no granules. In the middle and caudal regions five distinct types of cells are recognized with the following characteristics; 1) little cytoplasm and no granules; 2) blue cytoplasm and indistinct granules; 3) large basophilic granules; 4) pale eosinophilic staining cytoplasm and indistinct granules; 5) large distinct eosnophilic granules. Type 1 is the mother cell and gives rise to a basophilic line (types 2 and 3 and gradations), and an acidophilic group (types 4 and 5 and gradations). The pituitary of the long-horned sculpin is quite similar to that of the *Fundulus*.

Indications of lobes are found in the winter flounder, but they are quite inseparable. The ramifications of the neuralis are mainly confined to the posterior portion where cells with little cytoplasm and non-granular basophilic material surround them. The mid-region,