tinuous ingestion and absorption of sea water; and they add new evidence that the diuresis and high chloride excretion observed under certain conditions is an aggravation of this process initiated by trauma to the skin and consequent water loss through this route. (Completed paper submitted for publication in *Jour. Cell. and Comp. Physiol.*)

2. The occurrence of trimethylamine oxide in the urine of sculpin and flounder. With R. G. GOULD, assisted by GORDON SPENCE.

In the course of the summer a large quantity of sculpin and flounder urine was collected and suitably preserved (chloroformtoluol or 1% sulfuric acid). Analysis of the urine for all of the known nitrogenous constituents showed that in both animals approximately fifty per cent of the nitrogen was still unaccounted for. A large proportion of this undetermined nitrogen was subsequently isolated as trimethylamine oxide.

3. Observations upon natural and induced fluorescence in the kidney of the sculpin, *Myo.rocephalus octodecimspinosus*. With M. J. EISENBERG.

The sculpin kidney shows a definite, though pale, natural fluorescence, somewhat more intense in the renal tubules than in the collecting ducts. The bladder urine shows quite marked natural fluorescence, which accounts for the variable definition of the lumina in the renal tubules and collecting ducts. Studies of the kidney during the excretion of fluorescein show the presence of the dye in good concentration in the cells of the renal tubules, and in variable concentration in the lumina. The collecting duct system shows concentrated dye in the lumina, but only natural fluorescence of the cells. We were unable to analyze the mode of appearance of the dye in the renal cells. These studies of natural and induced fluorescence (fluorescein, aesculin and acriflavine) give evidence of only one segment in the sculpin nephron, although Defrise, on cytological grounds, has divided the tubule into two segments, both showing brush border. It seems fairly certain from these studies that the concentration of the provisional urine takes place gradually as it passes along the tubule. The kidneys were found entirely free of fluorescein about thirty hours after relatively heavy dosage.

## HISTOLOGY OF THE BRANCHIAL EPITHELIUM IN TELEOST FISHES

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The following report is a brief summary of the histological findings in regard to the occurrence of specialized epithelial tissue in the gills of a fairly representative group of teleosts.

The presence of specialized epithelium in the gills of fishes is particularly significant inasmuch as it has been suggested on the basis of physiological evidence (Smith, 1932) that the gills are responsible for extra renal secretion of several monovalent salts. The histological demonstration of the function of any tissue is extremely difficult by direct methods. In the present instance, the direct demonstration of function has not been attained, but there are several lines of indirect evidence which may give the information desired. Accordingly the available evidence in the light of several criteria may be evaluated and a tentative conclusion in regard to the function of this tissue may be drawn.

(1) The physiological evidence indicates that extra renal secretion of salts occurs in both marine and fresh water teleosts, but probably to a greater extent in the marine forms. Hence this tissue if concerned with extra renal secretion should occur in all teleost fishes with functional gills.

(2) It would be only reasonable to expect that this epithelium would lie in close association with (a) the external medium, and (b) to the blood supply.

(3) The tissue must be extensive enough to account reasonably for the osmotic work expended in extra renal secretion.

(4) The general appearance of the epithelial cells, staining properties, orientation, and other cytological considerations should strongly indicate a similarity to cells in which secretion has been demonstrated.

(5) If it is true that extra renal secretion in marine forms is more highly developed than in fresh water forms, then this epithelium should be more extensive in distribution in the marine fishes.

The following evidence based on the examination of about twenty representative families of marine and fresh water teleosts is presented below with special reference to the topics previously mentioned.

(1) Epithelial cells of a similar type occur in the gills of every specimen examined.

(2) These cells are usually in direct contact with the blood supply and the external medium, being separated from them by a thin membrane.

(3) The amount of this tissue varies in different species. In several of the marine forms the tissue surface is equal to about onefourth of the area of the lamellae, while in the fresh water forms it is in general less extensive.

(4) The cells of this tissue have in brief the following characteristics: ovoid or nearly so in shape, diameter 3-15 micra, nuclei usually spherical and situated in the basal portion of the cell, cytoplasm decidedly eosinophilic, sometimes reticular, sometimes vacuolated, with the vacuoles often opening at the free surface of the cell.

(5) The amount of this tissue is greater, the cells are larger, and they appear to be more advantageously situated to carry on secretion in the marine than in the fresh water species.

As indicated above specialized cells in a fairly large number of representative teleost fishes have been found. The constant appearance of these cells in all the species examined, the relative distribution, the intimate relation to the blood supply and to the external medium as well as the cytological properties of these cells seem to indicate rather markedly that this epithelium is probably secretory in nature, and concerned with extra renal secretion in teleosts.

## REFERENCE

Smith, H. W. 1932, Quart. Rev. Biol. 7, 1.