captured fish is not a function of respiratory restriction during captivity. Presumably, the marked lactic acidosis found in trawl captured dogfish is a result of prolonged struggle on the trawl coupled with the limited rate of lactic acid metabolism demonstrated in this species.

The potassium concentration in wild fish and trawl captured fish were not different, but there did occur an unexplained decrease in serum potassium in the wild fish maintained in captivity. The plasma chloride concentration of the wild fish increased 10 mEq/L during captivity.

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ACID PHOSPHATASE AND SENESCENCE IN Campanularia flexuosa

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The colonial hydroid Campanularia flexuosa is an excellent tool to study aging in that the events of the regression-replacement cycle represents true aging on a precisely cyclic time schedule. The relationship between acid phosphatase activity and this senescence cycle was investigated. Acid phosphatase levels were determined for Campanularia flexuosa hydranths of different ages. The colorimetric method used for the determination of acid phosphatase was the Sigma procedure utilizing Sigma 104 (p-nitro phenyl phosphate) phosphatase substrate.

The results were read at 400 mμ and 410 mμ using a Coleman Junior Spectrophotometer and semi-micro cuvettes. The data was expressed in Sigma units per mg protein. One Sigma unit of phosphatase will liberate 1 μM of p-nitrophenol per hour under the specified conditions of the technique (1 μM = 0.1391 mg). Approximately 135 hydranths of 5 different ages were compared through five series of experiments. The hydranths were homogenized in 1.25 ml of 5% Triton X-100. The Itzhaki and the Gornal Biuret techniques modified for small sample size were used to determine mg protein per ml. Complete hydranths in position 1, 2, 3, and 4 at the distal end of the hydrocaulus were compared with each other and with half stage seniles. Position 1 is considered the youngest hydranth and position 4 the oldest hydranth preceding the regression phase of senility. The mean values based on 4 series of experiments were compared.

Position	Acid phosphatase activity Sigma units/mg protein	Mean corrected acid phosphatase activity Sigma units/ml/135 hydranths
1	0.766	1.172
2	0.719	1.122
3	0.576	0.971
4	0.510	0.868
seniles	0.399	0.485

The results indicate that there is no increase in acid phosphatase concentration prior to the onset of senility. It appears that acid phosphatase is present in newly formed hydranths at peak levels and that senility involves a possible intracellular release and activation of acid phosphatase already present and associated with the lysozomes.

The results may further indicate a possible decrease in total acid phosphatase concentra-

tion but this needs further investigation. The cellular lysis of senile regression involves an apparent time dependent activation in vivo. The in vitro analysis suggests the enzyme is present in maximum levels in mature hydranths presumably in a controlled low functional level which changes to a high functional level as aging occurs.

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1966 #27

THE MOVEMENT OF FOREIGN ORGANIC COMPOUNDS ACROSS THE GILLS OF MARINE ANIMALS

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It has been assumed (B. B. Brodie, The Pharmacologist 6:12, 1964) that the gills and/or skin of fish constitute a typical lipoid membrane permeable to the passage of lipoid soluble agents. The apparent lack of drug metabolizing enzymes in fish may be explained by the assumption that fish would not need specialized mechanisms to excrete lipid soluble foreign agents from their body. A number of recent studies have indicated that drug metabolizing enzymes are indeed present in teleost and elasmobranch fish. It is the purpose of this communication to record observations on the permeability of fish gills to foreign organic compounds.

The plan of the experiment was as follows. A foreign organic compound was administered via the caudal artery or intramuscularly to a medium sized dogfish, Squalus acanthias. One to two hours later the fish was placed in a box packed with a small amount of ice. The cephalad portion of the fish, including the mouth and gills, was enclosed in a plastic bag secured around the abdomen well anterior to the cloaca. The bag contained exactly 2 or 3 liters of sea water. Vigorous bubbling by forcing air or oxygen through a large porous stone occurred throughout the course of the experiment. The temperature of the fish and the accompanying sea water was maintained close to 10° C throughout the experiment. Sea water and arterial plasma obtained from an indwelling catheter were sampled in the first 15-60 minutes. In the sculpin (Myoxocephalas scorpius) experiments a similar arrangement was followed except that the cloaca was stitched shut and the small sculpin were allowed to swim around in one liter of oxygenated sea water. The excretory pores of the lobster (Homarus vulgaris) were occluded by a rubber band and the lobsters were allowed to swim in one liter of sea water after intravascular injection of the drug. In a single experiment, a constant flow of sea water (1.3 L/min) was maintained through the gills of a dogfish. The outflow was monitored for drug excretion in one minute timed periods.

It may be seen that approximately 1/2 to 1% of the dose per hour was excreted when sulfadiazine and paraaminobenzoic acid were the compounds in question. This represents a clearance of from 3-16 milliliters per hour. With lipoid soluble antipyrine, between 2-5% of the dose per hour was excreted and the clearance ranged from approximately 50-150 milliliters per hour. The estimated gill blood flow of these fish was 3 to 4 thousand milliliters per hour. In the single constant flow experiment clearance was 150 ml/hr and 5% of the dose was excreted per hour. Clearances were not calculated for the lobster or sculpin, but it can be seen that approximately