On a corrected basis, the plasma Na/Cl ratio is essentially 1. The plasma contains over 10 % more Na than sea water, and over 5% more than the urine. The sea water-plasma difference can be accounted for on the basis that the extra plasma Na takes the place of the excluded sea water Mg which is not equalized by sea water sulphate. We have no idea how to account for the apparent retention of Na from the urine, beyond speculation. Superficially, there seems to be no good reason why so abundant and mobile an ion should be conserved. It seems more likely that either some of the plasma sodium is bound to plasma anions which do not enter the urine or that the total urinary cation total requires the exclusion of some Na. There is also a marked tendency for urinary K values to be below the plasma values.

For lobsters in their normal undiluted environment the movement of water and the net electrolyte flux seems to an inward one. The substantial urine flows alone point to this. Injected iodide disappears from the plasma very slowly, although its disappearance can be hastened by placing the lobster in dilute sea water. External iodide appears in the plasma more quickly. In general, the lobster seems to be perfused through gills and stomach by an isotonic NaCl solution which is lost from the nephridia. Divalent ions enter from the stomach. The nephridia and the gills (for urea at least) are exit valves both selective and non-selective. Compared to vertebrates, the concentrating powers of the nephridia for many substances are low.

Further Study of the Renal Excretion of Trimethylamine Oxide in the Dogfish

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The study of the renal excretion of trimethylamine oxide (TMAO) begun the previous year was continued. Plasma levels of TMAO in five dogfish shortly after capture ranged between 60-90mMol/ml. In two fish kept in the live car for 27 and 17 days respectively, there was no appreciable change in plasma TMAO concentration. Although further substantiation is necessary, this may indicate that the TMAO in the dogfish is of endogenous origin since these fish are not thought to eat while in captivity. As previously reported by Rieck et al (1954), TMAO is reabsorbed by the dogfish renal tubules. The U/P ratios obtained by us were always below 1.0. It should be noted that the highest TMAO urine concentrations and rates of excretion occurred in fish following administration of epinephrine.

Some preliminary data have been obtained indicating that a free amine is produced by the dogfish kidney. Although no free amine has been

found in the dogfish plasma, small amounts of a free amine have been detected in the urine. The identity of this amine has not been established but apparently it is not ammonia, since it remains volatile in alkaline solution in the presence of formalin. This volatile amine has been assumed to be trimethylamine pending further investigation. The ratio TMAO/FREE AMINE in the urine varied considerably. In seven dogfish, this ratio ranged from 0.8 - 33. Although high ratios (up to 13) were present during control observations, the highest TMAO/FREE AMINE ratios were found following the administration of epinephrine. Thus, the rise in the rate of TMAO excretion was always greater than the rise in free amine excretion.

Further studies are planned to clarify these observations and to obtain more information concerning the origin of TMAO in the dogfish.

Esterases and Peptidase in Marine Invertebrate Embryos

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Early embryonic stages of the sand-dollar, *Echinarachnius parma,* starfish, *Asterias vulgaris* and beach flea, *Marinogammarus sp.* have been examined with respect to the properties and content of certain esterases and peptidases. The work has been directed to the properties of similar enzymes in widely variant marine genera and also to changes in amount of enzyme during embryogenesis.

Phenyl benzoate and alpha-naphthyl acetate were used as substrates for esterases. In the species examined the rate of hydrolysis of alpha-naphthyl acetate exceeded by several times the rate obtained with phenyl benzoate. In sand-dollar plutei and in several organs of juvenile starfish this esterase activity was not materially reduced after fixation in acetone and approximately 20 percent of the activity remained after fixation in formol. Appreciable esterase activity was retained in some desalted specimens dried in air at room temperatures. In gammarus embryos the rate of hydrolysis of alpha-naphthyl acetate was fairly constant from fertilization through the embryonic shield stage. Thereafter, the enzyme content rose to a value six or seven times higher prior to hatching.

Studies on peptidases were primarily concerned with the embryonic content of leucyl amino peptidase in the sand-dollar and gammarus embryos. In the sand-dollar from fertilization through the late pluteus stage the content of this enzyme remained constant. Similarly in gammarus stages from the fertilized egg through the embryonic shield stage indicated a constant content of leucyl amino peptidase.