hours later most of the two-cell stages are in the 2nd, 3rd and 4th loops. At 48 hours after copulation most eggs are still in the 4-cell stage and have reached the 5th or 6th loop of the tube. The eggs remain in the 6th or last loop of the tube for about 24 hours until they attain the late morula or beginning blastocyst stage and then pass into the uterus about 70-72 hours after copulation. Individual eggs frequently vary as regards stage and location. Abnormal eggs pass along the tube and into the uterus at the same rate as normal ones.

The vitelli of the ripe ovarian eggs freed from the ovary averaged about 78.4 microns in diameter or 254,000 cu. microns. In such eggs the vitellus completely fills the zona which has an outside diameter of 95 microns. During the one-cell stage the vitellus shrinks to about 71.6 microns or 192,000 cubic microns or 24 per cent in volume. The inner volume of the zona increases about 50 per cent. During cleavage the vitellus decreases somewhat in size and does not increase until fluid is secreted into the blastocyst cavity.

DIURESIS IN MARINE TELEOSTS

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Grafflin (1931) observed that the sculpin and toadfish may be obtained with urinary chloride concentrations of zero to trace and urine flows below 4 cc. per kilogram per day, and that the chloride concentration of the urine and the urinary flow increased when the fish were kept in captivity under ordinary conditions. Various analyses of fish urine in the literature show high urinary chlorides accompanying high urine flows. We accordingly set out to determine the composition of urine obtained from the bladder of normal fish immediately after being caught, and to follow the changes which occur during experimental manipulation. Analysis of urine was made for chloride, phosphate, sulfate, magnesium, and creatine.

Confirming and extending the work of Grafflin, it was found that the bladder urine collected immediately following catching was free from chloride in 7 of 11 sculpins, *Myoxocephalus octodecimspinosus;* 1 of 4 daddy sculpins, *M. scorpius;* 5 of 7 grey sole, *Glyptocephalus cynoglossus;* 5 of 5 silver hake, *Merluccius bilinearis;* 1 of 2 hake, *Urophysis tenuis;* and very low in 2 of 3 goosefish, *Lophius americanus.* The other constituents of the urine were quite variable, the phosphates and creatines tending to be somewhat higher than those previously reported.

Using sculpins and daddy sculpins for successive determinations of urine flow and urine composition during experimental manipulation, it was found, as stated by Grafflin, that the urine flow and the chloride concentration of the urine increased progressively in captivity. The phosphate concentration of the urine and rate of excretion, though subject to some early variability, both decreased with time. The total excretion of magnesium and sulfate increased though

the concentration in the urine might decrease. Creatine excretion decreased, increased, or remained constant in different experiments though the urinary concentration invariably decreased with increasing urine flow.

It seems probable, since six species of marine teleosts falling in three phyogenetically widely separated groups were found to have at some time in their normal life urinary chloride concentrations of zero to trace, that such a condition may be the normal condition of marine teleosts, and therefore that the analyses of marine teleost urine previously presented in the literature are analyses of diuretic urine produced under the unnatural conditions of experimental manipulation. That this latter conclusion is correct is evidenced by the fact that the urine composition obtained after taking repeated urine samples more closely approximated results of analyses already present in the literature.

THE EXCRETION OF PHOSPHATE BY THE KIDNEY

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The urine of the winter toadfish (aglomerular kidney) contains only the faintest trace of inorganic phosphate. The injection of large amounts of inorganic phosphate intramuscularly or intravenously raises the plasma phosphate to high levels, but does not cause the excretion of any inorganic phosphate in the urine. An excretion of inorganic phosphate has not been found as the result of various procedures (feeding, injection of glucose, parathyroid extract, insulin). The injection of sodium glycerophosphate results in a marked rise in the inorganic phosphate of the plasma, but in no excretion of morganic phosphate by the kidney.

The urine of the goosefish (also with aglomerular kidney) contains varying amounts of inorganic phosphate (from traces up to 45 mM. per liter). The injection of inorganic phosphate or of sodium glycerophosphate raises the plasma phosphate level but does not increase the urinary excretion of inorganic phosphate.

The above results suggests that inorganic phosphate is not secreted by the aglomerular kidney, and that the inorganic phosphate in the urine of the aglomerular fish is formed in the kidney from some organic precursor (which is not sodium glycerophosphate).

An attempt to test this hypothesis that inorganic phosphate is only filtered by the glomerulus and that secreted phosphate comes from some precursor has been made for the frog and the sculpin (glomerular kidneys). The injection of inorganic phosphate and xylose into the frog gives urine/plasma ratios which are identical within experimental error. Thus in the frog inorganic phosphate is only excreted by glomerular filtration. In the sculpin, the secretion of phosphate appears to be very variable and easily influenced by experimental procedures. A large number of experiments were carried out on