ceived blank operations were maintained until sexual involution was well established. Implantations into the body cavity of each fish of twenty or fifteen fresh pituitaries from normal adult male *Fundulus* caused within two weeks a recrudescence of the testes in all fish treated. For example, ten hypophysectomized fish treated with twenty glands each had the average testicular volume quadrupled and the average weight doubled within two weeks when compared with non-implanted control hypophysectomized fish.

It is concluded that the pituitary of the male Fundulus contains gonadotropic material and the testes of the male, hypophysectomized or not is responsive to this material. The data secured together with that secured in a study of the normal sexual cycle gives a clear picture of the cycle of the pituitary, at least as far as its gonadotropic activity.

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ON THE RELATION OF DAY-LENGTH TO THE PERIOD OF REFRACTORINESS TO PHOTOPERIODIC SEXUAL STIMULATION IN THE MALE STARLING*

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Once an appropriate period of spermatogenesis has been completed in the male starling, the testes undergo an involution and remain naturally in a state of sexual quiescence until natural day-lengths begin to increase during the following winter. After the maximum of sperm formation (April-May), the day-lengths still naturally increase, and even during the summer they remain long enough to be stimulating to birds which are not refractory to photoperiodic stimulation, i.e., fall and winter birds (Burger '40). The failure of the starling to form sperm during the summer is obviously not due to insufficient daily illumination, but to the establishment of a refractoriness to the erstwhile stimulating effects of long days. The experiments to be described inquire into the problem of whether or not the duration of this refractory period can be modified by photoperiodic manipulations.

Two experiments of similar nature were performed. Beginning on February 18, twenty-four adult male starlings were given daily fifteen hours of solely artificial illumination. These birds were thus put through a precocious spermatogenesis. On April 19, when testicular regression was well established, eight of the males were further continued on a daily light ration of fifteen hours. Another eight starlings from the original lot had their daily light reduced to nine hours

* Aided by a grant from the American Philosophical Society: this grant administered in 1939-40 by T. H. Bissonnette.

between April 19 and May 16. Thereafter, the daily light ration was raised to fifteen hours. Both groups of birds were maintained until June 15.

In a second experiment, sixteen male starlings which had gone through a previous, natural sexual maturation were given experimental lighting beginning June 24. Seven starlings were kept on natural day-lengths until July 28, whereafter their daily light ration was sixteen hours. Nine birds had their daily light reduced to nine hours until July 28, whereafter their daily ration was raised to sixteen hours.

In both experiments similar results were secured. All of the birds kept on long days (fifteen-sixteen hours) had testes which showed no testicular reactivation at the ends of the experiments. For the birds which experienced a period of short days (nine hours) testicular reactivation was found in three out of eight birds in the spring experiment, and in three out of nine birds in the summer experiment. The remaining five and six birds remained quiescent sexually.

The results of these experiments indicate that this refractory state can be partially but not wholly influenced by photoperiodic manipulations. If the days remain long, this refractory state persists for as long as eighteen weeks without any signs of attenuation. If, however, the daily lighting is reduced, a subsequent resumption of long daily exposures to light will cause a new spermatogenesis in some (here one-third) but not all of the males. The interval of short days tended to promote recovery from the refractory condition. Since two-thirds of the birds treated with short days failed to become reactivated sexually, it would seem that refractoriness to photoperiodic stimulation is primarily an inherent state which runs a course largely independent of day-lengths. Despite this fact, the opposite effects of long and short days on this refractory period indicate that this period is not entirely independent of day-lengths.

It is now possible to make a generalized interpretation of the annual sexual cycle of the male starling. After the maximum spermatogenetic activity (April-May) the testes involute and the gonad stimulating mechanism becomes inherently refractory to activation by environmental means. This period of refractoriness is of several months duration. The long days of the summer probably tend to prolong this period. By the time recovery has occurred, a recovery perhaps aided by a decrease in day-length, the days are too short to be stimulating. Hence, it will not be until the following winter and spring when the days again lengthen that a new sexual activation will occur. That starlings captured in middle or late autumn can be activated by artificially lengthening the days has been repeatedly shown.

The sharply limited period of natural spermatogenesis in the starling is due to an interplay of external and internal factors. The gonad stimulating mechanism, once it has passed through the refractory state, is only fully activated when the days pass a threshold of about twelve and one half hours (Burger '40). Spermatogenesis can not reach a maximum in a few days even if day-lengths sufficient for maximal stimulation are present. It requires about one month to completely activate a sexually quiescent male starling. The amount of time necessary to complete spermatogenesis together with the fact that the days do not reach the necessary threshold until March cause the breeding season to fall in April and May. The width of the breeding season is augmented by the fact that different males do not respond to the spring increase in day-length in a wholly uniform rate.

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THE CONTROL OF GLOMERULAR FUNCTION IN THE SEAL (*Phoca vitulina,* L.)

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Marine mammals apparently meet their water requirements entirely from the water derived from their food (Irving, 1935; Smith, 1936). It is to be suspected that such animals will show specialization of renal function to conserve their meager supply of water. We have endeavored to determine the nature of this specialization by measuring the glomerular filtration rate and the renal plasma flow in young harbor seals.

We have taken the creatinine clearance as a measure of the glomerular filtration rate (Smith, 1936) and have considered the diodrast clearance to be a very close approximation of the renal plasma flow (Smith, Goldring and Chasis, 1938). For each experiment an animal was removed from the floating trap in which they were kept and strapped on its back in a trough. Creatinine was administered by stomach tube about an hour before collections were begun. Diodrast was injected under the loose skin of the flippers about 40 minutes later. Urine was collected by catheter and blood was taken in an oxalated syringe from the flipper veins. The creatinine was analysed according to the method of Folin and Wu (1919); diodrast was analysed according to the method of Kendall (1920) with the modifications described by Smith, Goldring, and Chasis (1938).

Shortly after ingesting a kilogram of herring, the filtration rate and the renal plasma flow of these animals increased markedly, in some instances as much as four times the fasting level. This increase lasted for several hours after feeding but disappeared within 24 hours.

The creatinine/diodrast clearance ratio remained almost constant at about 0.30 over the whole range included in our experiments. This indicates that the increased blood flow is due, at least in large part, to a dilation of the afferent renal arterioles. This ratio is constant only if care is taken to avoid trauma and excitement. When such precautions are not observed the ratio is higher, indicating a constriction of the efferent renal arterioles.

We wish to acknowledge our indebtedness to Mr. Thomas H.