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Hermaphroditism in Ostrea Virginica

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Until recently it has been assumed that the common American oyster being non-larviparous is also not hermaphrodite. Recently, however, it has been suggested that a change of sex may take place in the normal course of events at least once during the life of a member of this species. The writer has been endeavouring to prove the truth of this suggestion. About 650 oysters of two years old or more were examined and the age and sex noted. In addition over 300 oysters known to be in their second summer were examined for sexual products. These investigations showed that there were very few female oysters in their second or third summers, rather more than half as many females as males in their fourth summer, about the same number of each sex in their fifth summer and from then on there were more females than males. This study was carried on at the height of the spawning season and there were very few of the older oysters in which the sex could not be determined. Amongst the oysters known to be in their second summer (spawned the year before) 16% to 18% contained sexual products and of these 52 were male and 4 were female. This is a summary of one summer's work (1930) and, of course, it will be some years before the story is all complete. Still the evidence so far points to the suggestion that about half the males undergo a change to the female sex by the end of the third summer and that some of the males go through this change at a greater age. A few of the oysters contain eggs in their second summer - probably as soon as they are sexually mature - and a few males are found at an

advanced age.

Naturally a strict watch for hermaphrodite oysters was kept during the above examination. Only three such oysters were found. These contained sperms and ova, both quite ripe. Self-fertilization was successfully carried out in the laboratory with one of these oysters. A little of the contents of the gonad was placed in clean sea water in a watchglass. All the mature eggs rounded up and about 5 to 10% were evidently fertilized. In a little over seven hours these last had produced swimming larvae and the next morning they were still swimming vigorously. Facilities did not permit carrying the experiment farther but there is no reason to suppose that these larvae were not quite normal in every way.

Two of the oysters were kept for histological examination. Sections were cut and figure 1 is a microphotograph of one of these. It can be seen that sperms and ova occur together in the same follicles, the lumen of each follicle being filled with the sperms. All the sperms appear to be ripe but eggs are present in various stages of development. In 1892 V. L. Kellogg discovered just such a hermaphrodite specimen of Ostrea virginica amongst some oysters that he was keeping for breeding purposes. He did not obtain self-fertilization nor express any definite opinion as to whether this oyster was a freak or one undergoing a normal change of sex. Now the above data seem to show that a great many of these oysters do normally go through a change of sex at least once in the course of their lives. At the same time many more of these truly hermaphrodite specimens should have been

found if it were normal for the change to take place during the breeding season. It is more likely that the usual course of events is for the eggs to begin to develop after the sperms have been extruded and it is probable that a winter usually intervenes between the last sperm deposition and the first egg production. Amemiya, reporting a similar case in Ostrea angulata in 1925, noted that it occurred amongst oysters kept in captivity under rather poor conditions and that the same was true of the oyster reported by Kellogg. He suggested that hermaphroditism might be produced by poor mutritive conditions. Now it has been shown that most individuals of Ostrea virginica probably undergo a change of sex but that the actual change probably normally occurs during the winter. Hence it may be worth noting that the three specimens of hermaphrodite oysters recorded above were taken from a bed where many of the oysters were sick and it is quite possible that here, again, the functional hermaphroditism was produced by unfavourable conditions. On the other hand it must be remembered that in a field which contained eggs and only a few sperms the latter might easily be overlooked. Hence this hermaphroditism may be a more normal thing than appears now.

Two other workers on the Atlantic coast, T. C. Nelson and M. D. Burkenroad, have concluded on the basis of the relation sex to age and size in Ostrea virginica that a change of sex normally occurs. The latter worker, however, believes that the change normally takes place much earlier among the oysters of Louisiana where he has been working, and that the oyster may remain a male if it is in close proximity to a female. On this last point the writer has no evidence amongst the northern forms.

The whole of the above work was carried out at the Prince Edward Island Marine Station under the auspices of the Biological Board of Canada and the writer is indebted to them for providing the facilities.