

SEXUAL RHYTHM IN THE PELECYPOD MOLLUSK TEREDO

IN a recent paper,¹ it was shown that in the varieties of *Teredo navalis* found at Woods Hole, Massachusetts, and in Long Island Sound, the great disparity in sex ratios observed at different seasons of the year was dependent upon the protandric nature of the species. Nearly all young animals pass through an initial functional male phase and most of these later become females. Selection of the largest members of a heterogeneous population in the breeding season will, as a rule, yield fully 90 per cent. females, since they will include the older individuals which have already completed the earlier and briefer male phase of sexual activity. The smaller animals will correspondingly consist mainly of young individuals, those that are sexually mature being in the functional male phase.

It was found that the young animals reach the functional male phase in three to six weeks after completing the free-swimming stage. The body is then only 15 to 30 mm in length as compared with 150. to 200 mm or more when the animal is fully grown. The female phase is usually assumed immediately after the discharge of the spermatozoa. This phase normally extends through the rest of the breeding season and this is not infrequently coextensive with the life of the individual.

No proof was then available that a second change of sex might occur, but it has now been found that in some individuals the two sexual phases may be repeated during the animal's second breeding season.

Such a condition results when the individual survives the winter after having completed spawning as a female in the autumn of its first breeding season. Following the last ovulation of the season the gonad retains only small oocytes and such primary gonidia as had remained inactive on the walls of the ovarian follicles during the reproductive period. Residual large ova, which are sometimes numerous when the lowered temperature and other environmental changes bring an end to oogenesis, undergo cytolysis and eventual phagocytosis. The conditions which check oogenesis evidently stimulate the proliferation of the spermatogonia.

During the winter the gonad thus resembles the primary bisexual gland of the sexually immature young animal, except for its much greater size and vastly more numerous constituent cells. As is the case in the young individual, the spermatogenic cells proliferate rapidly, in preparation for the functional male phase, which will be reached in early spring. By the middle of April ripe spermatozoa may be abundant.

¹ W. R. Coe, "Sexual Phases in *Teredo*," *Biol. Bull.*, 65: 283-303, 1933.

All the medullary cells participate in spermatogenesis, but before the spermatozoa have been discharged the cortical layers of oocytes have begun the formation of yolk. The lumens of the alveoli may still retain a few spermatozoa in the early part of the functional female phase, which follows as soon as the ova have completed their growth.

A second functional male phase, followed by a second female phase with several periods of ovulation, may thus take place during the individual's second breeding season. The life of the *teredo* is usually short as compared with that of many mollusks, but if any individuals survive a second winter it seems not improbable that additional phases of a similar nature in this sexual rhythm may sometimes occur.

Because of the length of the breeding season, which extends from May to October, and the consequent overlapping of broods, the population will at all times during this period contain some individuals in each of the functional sexual phases. The requisites for cross fertilization are thereby assured whenever the temperature and other environmental conditions bring about the spawning reactions.

In addition to those animals which complete the first female phase there are in the autumn others representing all stages of the life cycle—(a) young, sexually immature individuals, (b) young in the first male phase, (c) young which are just entering the female phase, and (d) older, partially spawned females, as well as (e) some so-called true males, which are thought to retain the male phase indefinitely.

There will always be a great excess of animals in the male phase in early spring, not only because of those which have previously spawned as females but more particularly because of the more numerous young individuals in the initial male phase. These survive the winter in much greater numbers than do the older age groups.

The sexual rhythms in *Teredo* are therefore very similar to those described for various species of oysters,^{2,3} although the usually shorter life of the former limits the number of the alternating sexual phases.

W. R. COE

OSBORN ZOOLOGICAL LABORATORY
YALE UNIVERSITY

² J. H. Orton, "Observations and Experiments on Sex-change in the European Oyster," *Jour. Mar. Biol. Assoc.*, 15: 967-1045, 1926-7.

³ W. R. Coe, "Alternation of Sexuality in Oysters," *Amer. Nat.*, 68: 236-251, 1934.

BOOKS RECEIVED

CHARLES, ENID. *The Twilight of Parenthood*. Pp. vi + 226. Norton. \$2.50.
WILCOX, O. W. *Reshaping Agriculture*. Pp. 157. Norton. \$2.00.