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The Reproductive Stages of Cod. Gross Anatomy and Histology

by

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There have been many studies, including morphological ones, of reproduction in female cod because of its great commercial value. Knowledge of the reproductive cycle, and factors affecting the cycle and the viability of eggs is important for stock recruitment studies. In contrast, there have been few studies of the reproduction in the male. For stock management studies, it is important to be able to determine what stage of maturity a cod has reached. For example, this knowledge is needed to determine minimum size at capture to allow for reproduction; to determine stock structure, because groups spawning at different times may best be managed separately; to determine timing of area closures to protect spawning fish; to understand the relationships between age at maturation or fecundity, availability of food and population size, and estimate the reproducing stock biomass.

Many maturity scales have been devised which describe the gross appearance of ovary and testis at different stages of development so that the fish can easily be "staged" on board a vessel. Thes scales have usually incorporated (1) an immature stage in young fish, (2) two of more ripening stages, (3) a ripe stage, (4) a spawning stage in which eggs or spermatozoa are released, (5) a spent stage, (6) a recovering stage in which remaining eggs and spermatozoa are resorbed and (7) a resting stage in preparation for the next spawning season. In practise it is difficult to differentiate these stages using gross criteria only, so in the present study the reproductive cycle in both ovary and testis were described using light and electron microscopy, and the gross appearance was correlated with histology.

I t was found that, since the reproductive cycle is, of course, continuous, any attempts to divide it into stages are artificial. For example, an ovary staged as "resting" using most criteria may have some oocytes beginning the phase of major growth, or a "resting" testis may have spermatogonia starting to divide. It was difficult to tell a virgin from a resting fish even with histological criteria. Naturally, the presence of empty or atretic follicles in the ovary, or a few spermatozoa in the testis confirmed that the fish was resting, but often large fish were found without these. The latter were either virgin fish that were very late maturing; or fish that had not spawned for a long time, so that evidence of previous spawning had disappeared. Some fish were found in which the gonad was recovering from a previous spawning, but was already preparing for the next. For example, empty follicles were present along with oocytes starting vitellogenesis, or the proximal part of the testis still contained spermatozoa that were being release while the distal edge contained cysts of dividing spermtogonia and spermatocytes. These fish were staged as "spent-ripening" fish, to differentiate them from fish with resting gonads.

This study has been published as an atlas. Some free copies are available from the author, and order forms are available for this and two other atlases, on the digestive and respiratory tracts of cod.

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