

CRITERIA FOR DETERMINING MATURITY STAGE IN FEMALE AMERICAN SHAD, ALOSA SAPIDISSIMA, AND A PROPOSED REPRODUCTIVE CYCLE.



We describe macro-and microscopic criteria to judge maturation stages of female American shad (*Alosa sapidissima*) collected in the York river, Virginia, USA. For comparison, we also examined ovaries of fishes collected in the Edisto river, South Carolina, and the Connecticut river, Massachusetts. The study augments a developing stock assessment program that is evaluating the use of index-removal and change-in-ratio estimators of exploitation rate and absolute abundance. Samples were obtained from traps at the York river mouth, staked gill nets in mid-reaches of the river, and drift gill nets on the spawning grounds (approximately 100 km from the river mouth). To judge maturation stages, we used the following macroscopic characters : ovary color, gross appearance of oocytes, degree of blood infusion, and value of the gonosomatic index (ovary weight divided by somatic weight). Stain reactions and presence or absence of cellular characteristics (nucleoli, nuclear migration, oil globules, yolk vesicles, atresia, and postovulatory follicles) were used as microscopic criteria. No differences in scoring of maturation stage were observed in comparisons of samples

from different regions of the ovary. American shad in both semelparous (Edisto river) and iteroparous populations (York and Connecticut rivers) exhibit indeterminate fecundity and group-synchronous oocyte development. Un-yolked, partially yolked and advanced yolked oocytes are observed in all maturity stages except spent females. There is histological evidence that an individual female spawns in batches over a period of days or weeks since both recently developed and older post-ovulatory follicles are observed simultaneously with advanced yolked oocytes. Most post-spawning females captured at the river mouth are only partially spent with ovaries that contain large numbers of advanced oocytes. A reproductive cycle for American shad in the York river is proposed. Successive or batch spawning in wild populations has important ecological implications since an individual can spread her gametes over a large spatio-temporal scale, thereby increasing the chances that progeny will encounter salubrious conditions.

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