

Oogenesis and Reproductive Cycle of the Female Manila Clam, *Ruditapes philippinarum* in Komso Bay, Korea

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INTRODUCTION

The Manila clam, *Ruditapes philippinarum* (Pelecypoda: Veneridae) is present along the coasts of Korea, China and Japan. In particular, Recently, due to reclamation of tidal areas along the west coast, marine pollution, and reckless overharvesting of this clam, its standing stock has reduced for a decade. Therefore, it is necessary to manage the population of the clam with a proper fishing regime that will maintain an optimal population size in aqua farm. So far, regarding reproductive ecology of the Manila clam in Korea and Japan, there have been many studies on growth (Chung et al., 1994), population dynamics and secondary production (Yoon, 1992), and the spawning season (Ponurovsky and Yakovlev, 1992). However, little information is available on vitellogenesis during oogenesis and on the reproductive cycle by qualitative and quantitative image analyses of the Manila clam. The purpose of the present study is to understand vitellogenesis during the oogenesis and the reproductive cycle by qualitative and quantitative analysis.

MATERIALS AND METHODS

Specimens of the Manila clam, *Ruditapes philippinarum*, were collected monthly from the intertidal zone of Komso Bay, west coast of Korea from January to December 1999.

1. Ultrastructural study of oogenesis

Ultrastructural structures was studied by electron microscopic observations.

2. Qualitative Reproductive Analysis

Histological preparations were made by standard parapin method for analysis of the gonadal phases. The images were captured by a TOSHIBA Model IK-642K CCD camera and were then viewed on a SAMSUNG color video monitor. The image analyzer (BMI plus, WINATech Co.) is capable of automatic measurement of area and diameter of polygons encircled by the operator. Measurements were carried out for areas of total tissue, the ovary, the follicles, and the oocytes, the number of the oocytes per unit area, and the diameter of each oocyte. From the measured values of image analyses, (1) percent of field occupied by the ovary to total tissues, (2) percent of field occupied by the follicles to total tissue, (3) percent of field occupied by the follicles to the ovarian tissue, (4) percent of field occupied by the oocytes to the ovarian tissue, (5) the number of the oocytes per mm², and (6) mean diameter of the oocyte in captured image were calculated for each slide. One-way ANOVA (multiple comparison by Duncan's procedure) was applied to compare the means of monthly data. One-way t-tests were used to determine significant differences.

RESULTS AND DISCUSSION

R. philippinarum is dioecious and oviparous. In the early vitellogenic oocyte, the Golgi apparatus and mitochondria present in the perinuclear region are involved in the formation of lipid droplets and in lipid granule formation. In the late vitellogenic oocyte, the endoplasmic reticulum, mitochondria in the cytoplasm are involved in the formation of proteid yolk granules. At this time, exogenous lipid granular substance and glycogen particles in the germinal epithelium are passed into the ooplasm of oocyte through the microvilli of the vitelline envelope. Ripe oocytes are about 55-60 μ m in diameter.

The spawning period was once a year between early June and early October, and the main spawning occurred between July and August when seawater temperature was approximately 20 C. The reproductive cycle of

this species can be categorized into five successive stages: early active stage (February to March), late active stage (April to May), ripe stage (April to August), partially spawned stage (June to October), and spent/inactive stage (August to March). Gonad developmental phases by histological qualitative analysis showed similar results with those of quantitative image analysis.

REFERENCES

- Chung, E. Y., D. K. Ryou and J. H. Lee.** 1994. Gonadal development, age and growth of the short necked clam, *Ruditapes philippinarum* (Pelecypoda: Veneridae), on the coast of Kimje, The Korean Journal of Malacology 19: 38-54.
- Ponurovsky, S. K. and Y. M. Yakovlev.** 1992. The reproductive biology of the Japanese littleneck. *Tapes philippinarum* (A. Adams & Reeve, 1850) (Bivalvia:Veneridae). Journal of Shellfish Research 11: 265-277.
- Yoon, S. B.** 1992. Population dynamics of the short necked clam, *Tapes philippinarum* in An-Jong, Tong-Young. A thesis submitted for degree of the Master, Dept. of Marine Biology, Graduate School, National Fisheries University of Pusan 34 pp (in Korea).