Classification of differentiating oocytes during ovarian cycle in the giant freshwater prawn, Macrobrachium rosenbergii de man

Prasert Meeratanaa, Prasert Sobhonb

http://dx.doi.org/10.1016/j.aquaculture.2007.03.009

Abstract

Based on the light microscopic observations of cells' sizes, chromatin patterns, amount of lipid droplets and yolk granules, the female germ cells could be classified into four different phases, which include 1) oogonia (Oog), 2) primary oocytes (pOc), 3) secondary oocytes (sOc), and 4) mature oocyte (mOc). Oog are small oval-shaped cells with irregular-shaped nuclei sizing 4–6 μm in diameter. They rest on the connective tissue germinal cord at the tip of each ovarian pouch (lobule). Oogonia increase their number through mitotic division, and the daughter cells move into ovarian pouch where they undergo first meiotic division to become primary oocytes, which have various steps of 1st meiotic prophase accumulating at the innermost zone of the ovarian pouch. The primary oocytes are small oval-shaped cells (8.5–10 μm in diameter) with large nuclei containing chromatin in various states of condensation that finally transform into chromatids. Their nuclei are surrounded by thin rim of faint blue-stained cytoplasm. The secondary oocytes derived from 2nd meiosis and comprise five steps: Oc1 and Oc2, classified as previtellogenic oocytes, Oc3 and Oc4, classified as vitellogenic oocytes, and mature oocyte (mOc) The zones of ovarian pouch are defined based on the accumulation of various steps of developing oocytes, namely, oogenic, previtellogenic, vitellogenic and mature zones, respectively. The ovarian cycle is divided into five stages based on the number and types of oocytes present in each stage. Stage 0 and I are spawn and spent stages. Stage II and III are proliferative and premature stages, while stage IV is mature stage. During ovarian stage I, each ovarian pouch contains primarily oogonia, primary oocytes, Oc1 and a few Oc2. In stage II, the pouch contains mainly Oc2 and Oc3, while in stage III the predominant cells are Oc4. Mature oocytes appear synchronously, in stage IV. The ovulating mature oocytes pass through the thin disrupted wall of ovarian pouch into subcapsular space, that leads into the oviduct situated on the ventro-lateral side of the ovarian lobe. At spawning, the ovarian pouches break down and only connective sheaths and hemolymph sinuses remain. The germinal cords and islets of oogonia remain in the central area of stage 0 ovary. The ovarian capsule, including the muscular layer, becomes attenuated as the ovary progresses from stage 0 to IV. The hemolymph vessels become highly convoluted in the central area of the ovary, and they branch radially into smaller hemolymph sinuses around each oogenic pouch.

Keywords

Differentiating oocytes; Ovarian pouch; Ovarian cycle; Macrobrachium rosenbergii