

Gonadal development and biochemical composition of female crayfish *Cherax quadricarinatus* (Decapoda: Parastacidae) in relation to the Gonadosomatic Index at first maturation

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Abstract

Gonadal development of female crayfish *Cherax quadricarinatus* at first maturation (25.5±3.8 g) was investigated using morphological criteria (Gonadosomatic and Hepatosomatic Indices or GSI and HSI), biochemical composition (proteins, lipids, and carbohydrates) of the gonad and hepatopancreas, histological indicators (oocyte diameter, frequency of pre-vitellogenic, vitellogenic, and post-vitellogenic oocytes), and histochemical analyses (percentage coverage of lipid and carbohydrate reserves or LI and CI). There was a negative relation between GSI and HSI ($P<0.01$). Protein ($P<0.01$), lipid ($P<0.01$), and carbohydrate ($P<0.01$) contents in the gonad were dependent on GSI. At mature stages, higher concentrations of protein and lipid reserves were observed, while carbohydrates diminished. In hepatopancreas, the lipid content decreased in relation to GSI ($P<0.05$). There was no evidence that protein and carbohydrate components in the hepatopancreas varied in relation to GSI ($P>0.05$). High statistical power (>0.99 for both contents) indicates that protein and carbohydrate concentration remains relatively constant throughout gonadal development. A significant decrease in the frequency of oogonia ($P<0.01$), pre-vitellogenic oocytes ($P<0.01$), and primary vitellogenic oocytes ($P<0.01$) was observed as maturation was reached. A mathematical inflexion point showed that there was a maximum frequency of secondary vitellogenic oocytes at 4.06 GSI. There were increases in diameter and nuclei of oocytes at all developmental stages ($P<0.05$). LI increased as oocytes developed ($P<0.01$). CI varied between stages ($P<0.01$) and peaked at the primary vitellogenic stage. The dynamics of biochemical composition of gonad and hepatopancreas of female *C. quadricarinatus* was in agreement with similar studies in decapods. The usefulness of the GSI as an indicator of reproduction stage and female broodstock management is addressed.

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1. Introduction

Aquaculture of the Australian redclaw crayfish *Cherax quadricarinatus* (Von Martens, 1868) is a growing industry in several countries (Romero, 1997).

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