



Effect of dietary protein and lipid levels on gonadal development of female redclaw crayfish *Cherax quadricarinatus*

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Abstract

The effect of two crude dietary protein (26% and 32% P) and two lipid levels (4.7% and 12% L) on gonadal development of female redclaw crayfish *Cherax quadricarinatus* was determined. The gonadosomatic index (GSI), hepatosomatic index (HSI), biochemical composition of gonad and hepatopancreas, oocyte diameter and frequency of the developmental stage of oocytes were analysed. The GSI was significantly less using 26% P to 4.7% L. A significant interaction between P and L content was found for GSI. A significantly higher HSI value was obtained when L was 12%. P content in the hepatopancreas was significantly higher using 32% P and 4.7% L. The maximum L content in the hepatopancreas was obtained from the 32% P and 12% L diet. A significant interaction between P and L content was found for L content in the hepatopancreas. A higher frequency of post-vitellogenic oocytes was obtained with diets containing 32% P. There was an interaction between dietary P and L level causing lipid accumulation in the hepatopancreas and changes in GSI. For an optimum 32% P, excess dietary lipid is bioaccumulated in the hepatopancreas, indicating that there is excess available energy. When the P and L levels are restricted, there is a limited gonad development, thus affecting overall reproduction in female *C. quadricarinatus*.

Keywords: *Cherax quadricarinatus*, gonad development, protein, lipid

Introduction

The redclaw crayfish *Cherax quadricarinatus* is native to northeastern Australia (Curtis & Jones 1995), with attractive attributes for aquaculture (Naranjo-Páramo, Hernández-Llamas & Villarreal 2004). This species reaches sexual maturity after 7–9 months (Rouse, Austinand & Medley 1991), weighting ~20–25 g (Naranjo-Páramo *et al.* 2004) and spawns 2–5 times per year (Sagi, Shokrum, Isam & Rise 1996).

Information on the protein and lipid requirements for gonad maturation in crustacean species is scarce, and progress on formulation of maturation diets has been limited (García-Ulloa 2000; Holdich 2002). Nutritional studies on broodstock generally consider protein and lipid requirements based on the composition of mature female gonads (Mohamed & Diwan 1992; Millamena, Pudadera & Catacutan 1993). It is known that storage of proteins and lipids plays a crucial role in the reproductive biology of crustacean species (Castille & Lawrence 1989; Millamena & Pascual 1990). Harrison (1990) mentions that the dietary protein level necessary for maturation of the crustacean gonad is likely to be higher than what is required for growth, as maturation is a process of intense protein metabolism. On the other hand, a transfer of lipids from the hepatopancreas to the ovary occurs during gonad maturation (Castille & Lawrence 1989; Millamena & Pascual 1990). It has been shown that diet plays an important role in crayfish broodstock condition (García-Ulloa 2000;