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Effect of dietary protein-to-energy ratio on reproduction in female redclaw crayfish *Cherax quadricarinatus*

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Abstract

The effect of eight diets with different protein-to-energy ratios (P–E ratio = 10, 11, 14, 16, 18, 20, 22, 24 mg kJ^{-1}) on reproduction of female redclaw crayfish *Cherax quadricarinatus* was tested under laboratory conditions. After 75 days, there was a significant effect of the P–E ratio on final weight, spawning females and the number of juveniles per female. Using the broken-line and quadratic equations, optimal values for the P–E ratio were: 16.0, 17.1 and 16.0 mg kJ^{-1}. The P–E ratio significantly affected protein and carbohydrate content and energy in the hepatopancreas. The broken-line model indicated that the respective recommended values of the P–E ratio for these parameters were: 21.8, 16.7 and 18.6 mg kJ^{-1}. The concentration of carbohydrates and energy in muscle tended to significantly diminish as the P–E ratio increased. From broken-line regression analysis, the recommended P–E ratio was 16.6 and 20.2 mg kJ^{-1} respectively. No significant differences were found in survival, fecundity, vitellin content in eggs, protein and lipid content in muscle and lipids in the hepatopancreas. We concluded that, overall, a P–E ratio of 18 ± 2 mg kJ^{-1} is optimal for reproductive activity of female redclaw crayfish.

Keywords: protein to energy ratio, reproduction, *Cherax quadricarinatus*

Introduction

Aquaculture of the Australian redclaw crayfish *Cherax quadricarinatus* is a growing industry in several countries (Rodgers, Saoud & Rouse 2006). Acceptance in the seafood market, together with fast growth and survival rates under controlled conditions make the species suitable for cultivation (Naranjo-páramo, Hernandez-llamas & Villarreal 2004). However, there is scarce information concerning key aspects of its biology for production of juveniles in hatchery conditions. The need to develop reliable protocols for controlling its reproduction has been addressed (Sagi, Rise, Isam & Malis-arad 1995; Yeh & Rouse 1995; García-guerrero, Racotta & Villarreal-colmenares 2003). This could contribute to the development of a specific technology for juvenile production, which is not currently available (Naranjo-Páramo *et al*. 2004).

Production of eggs and larvae are strongly dependent on the diet of the broodstock (Bromage 1995; Harrison 1997). Protein is a critical ingredient in practical diets because of its high cost and sensitivity of production parameters to concentration (Cortés-jacinto, Villarreal, Civera & Martínez 2003; Thompson, Muzinic, Engler & Webster 2005; Rodríguez-gonzález, García-ulloa, Hernández-llamas & Villarreal 2006). According to Harrison (1997) and Abdu, Yehezkel and Sagi (2000), the level of dietary protein required in broodstock diets for maturation