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Somatic and physiological responses to cyclic fasting and re-feeding periods in sobaity sea bream (*Sparidentex hasta*, Valenciennes 1830)

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Abstract

Different fasting and re-feeding cycles were tested in a 60-day trial in sobaity sea bream (*Sparidentex hasta*) juveniles to evaluate their effects on growth, physiological and biochemical parameters. Fish were exposed in triplicate to the following feeding regimes: control (fed everyday); F-RF_{1+1} (1 day of starvation followed by 1 day of re-feeding); F-RF_{2+2} (2 days of starvation followed by 2 days of re-feeding); F-RF_{3+3} (3 days of starvation followed by 3 days of re-feeding); F-RF_{6+6} (6 days of starvation followed by 6 days of re-feeding); and F-RF_{1+2} (1 day of starvation followed by 2 days of re-feeding). A reduction in body mass between 10.0% (F-RF_{1+1}) and 24.3% (F-RF_{6+6}) was found in comparison with the control group after 60 days. As the length of fasting increased, the compensation coefficients in feed intake and weight gain decreased. Body lipid content decreased as fasting cycles increased. Haemoglobin, plasma protein, lysozyme and alkaline phosphatase activities were the most reliable biomarkers for assessing the nutritional condition in sobaity sea bream. A feeding strategy based on 1 day of starvation followed by 2 days of re-feeding (F-RF_{1+2} group) may be advisable for on-growing sobaity sea bream without reduction in growth and alteration of their haematological and physiological parameters.

KEY WORDS: body composition, fasting, growth performance, haematology, re-feeding, Sparidae

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Introduction

Starvation or fasting is a normal condition that many fish species may experience in natural environments because of temperature, food limitation, migration and/or reproduction, among other factors (Madrid *et al*. 2001; Hinch *et al*. 2005; Miller *et al*. 2009). Fasting may be also applied in aquaculture as a management strategy/tool to reduce handling stress (*i.e*. fish transportation, specific medical treatments and quarantine periods) (Davis & Gaylord 2011), reduce mortality due to disease outbreaks (Shoemaker *et al*. 2003) and ameliorate water quality problems (*i.e*. turbidity). In addition, fasting may be also used for production purposes such as increasing the quality of fish body composition (Rasmussen *et al*. 2000; Grigorakis & Alexis 2005) and avoidance of risks of overproduction (Krogdahl & Bakke-McKellep 2005).

Several studies have shown that teleost fish are able to tolerate these periods of unfavourable feeding conditions by activating various behavioural changes and adaptive biochemical, physiological and structural responses (Navarro & Gutiérrez 1995; McCue 2010; Gisbert *et al*. 2011). For instance, some studies have shown that fish were able to reduce the energy expenditure from protein turnover (Salem *et al*. 2007) and expend endogenous nutrients and energy reserves to maintain vital processes (*e.g*. brain function, respiration, osmoregulation) with a subsequent loss in body weight (Navarro & Gutiérrez 1995; Ali *et al*. 2003; Furné *et al*. 2012). These responses are generally species-specific dependent (Navarro & Gutiérrez 1995; Wang *et al*. 2006; McCue 2010), and many biotic (*e.g*. age, size, health and nutritional status prior to feed deprivation) and abiotic (*e.g*. season, temperature, salinity) factors have profound effects on them.