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# Growth and metabolic parameters of common snook juveniles raised in freshwater with different water hardness

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ABSTRACT

The adaptation of common snook *Centropomus undecimalis* to low salinities and freshwater has being widely studied, but the definition of the best water hardness levels may facilitate the adaptation and growth of this species in freshwater. Consequently, the aim of this study was to evaluate survival, growth and metabolic parameters (blood glucose and osmolality and lactate in plasma and tissues) of common snooks raised in freshwater with different water hardness levels. In an acute experiment, juveniles were transferred from seawater 35 ppt to seawater 35 ppt (control) and freshwater at 20, 100, 250, 500 or 1000 mg $CaCO_3$ $L^{-1}$. Mortality after 96 h was 100, 79.17, 58.33, 4,17 and 50%, respectively. In another experiment juveniles (initial weight 10.9 ± 1.5 g) were maintained for 60 days in water hardness of 100, 500 or 1000 mg $CaCO_3$ $L^{-1}$ or seawater (control). No mortality was observed in this experiment. The best weight gain, specific growth rate and feed intake in freshwater (values not significantly different from seawater) was observed in common snooks kept at 100 mg $CaCO_3$ $L^{-1}$. Blood and hepatic glucose did not differ significantly between treatments. Muscle glucose levels were significantly lower in fish kept at 100 and 1000 mg $CaCO_3$ $L^{-1}$ than the other treatments. However, lactate levels were higher in the muscle of common snooks kept at 100 to 500 $CaCO_3$ mg $L^{-1}$ and lactate in plasma was higher in those maintained at 1000 mg $CaCO_3$ $L^{-1}$. Plasma osmolality was not affected significantly by treatments. In conclusion, 100 mg $CaCO_3$ $L^{-1}$ is the best water hardness to raise common snooks in freshwater.

## 1. Introduction

The common snook, *Centropomus undecimalis*, is a carnivorous teleost (Machado et al., 2013; Dutka-Gianelli, 2014) known for characteristics that qualify it for the practice of aquaculture, such as tolerance to low oxygen concentrations and wide variation of salinity, great rusticity, easy adaptation to inert diets and quality meat (Chapman et al., 1982; Tucker, 1987). Consequently, common snook may be an alternative species for marine culture in the tropical and subtropical regions of Americas, as well as in freshwater, in which it presents good growth rates (Alvarez-Lajonchère and Tsuzuki, 2008; Tucker, 1987; Tucker and Jory, 1991).

Euryhaline teleosts, such as the common snook, are able to maintain blood osmolarity in a tolerable range, independently of environmental salinity, due to an effective osmoregulation (Varsamos et al., 2005; Gracia-López et al., 2006). Exposure to a different salinity may alter the cost of ionoregulation and consequently the amount of energy available for fish growth (Gracia-López et al., 2006; Anni et al., 2016). Seawater-adapted fish transferred to low salinities need to reorganize their metabolism to face the ionoregulatory challenge (Boeuf and Payan, 2001; Morgan and Iwama, 1991). Several euryhaline teleosts present lower growth in lower salinities (Sampaio and Bianchini, 2002; Chen et al., 2009; Mylonas et al., 2009; Rhody et al., 2010) and in freshwater common snooks also showed lower plasma osmotic pressure (Gracia-López et al., 2006).

As waterborne $Ca^{2+}$ reduces gill permeability (Wood, 2001; Baldisserotto, 2011), the increase of water hardness may be a good strategy to improve growth of common snook in freshwater. Tucker (1987) demonstrated that common snook presents good growth in freshwater at water hardness 269 and 705 mg $CaCO_3$ $L^{-1}$), but no

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