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## Effects of dietary *Gracilaria* sp. and *Alaria* sp. supplementation on growth performance, metabolic rates and health in meagre (*Argyrosomus regius*) subjected to pathogen infection

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**Abstract** Effects of dietary seaweed supplementation on basal physiology and health biomarkers were assessed in meagre (*Argyrosomus regius*) subjected to bacterial infection, using *Photobacterium damsela* subsp. *Piscicida* (*Phdp*) as the etiologic agent. Three test diets were prepared by supplementing a basal control formulation (44 % protein, 16 % lipid, 22 kJ g<sup>-1</sup> energy) with 0 % seaweed (control), 5 % *Gracilaria* sp. or 5 % *Alaria* sp. During the growth trial, 180 fish (39.70 ± 0.33 g) were daily fed for 69 days with the experimental diets. After the growth trial, 60 fish from each dietary treatment were divided into two groups, infected and non-infected. The infected group was injected intraperitoneally with a saline solution (HBSS) with 2.91 × 10<sup>3</sup> CFU *Phdp* g<sup>-1</sup> fish, whereas the non-infected group was injected with

HBSS without *Phdp*. Dietary seaweed supplementation did not affect fish growth performance. Standard and routine metabolic rates, and aerobic metabolic scope did not vary significantly among dietary treatments. Conversely, maximum metabolic rate was significantly higher in fish fed *Alaria* sp. diet when compared to control group. **Non-infected fish had higher hematocrit levels than the infected group, regardless of diet.** Lactate levels were significantly higher in fish fed *Alaria* sp. diet when compared to control, with no interaction between diet and infection. Lipid peroxidation was significantly higher in fish fed control diet than supplemented diets. Infected groups had lower antioxidant enzymes activities when compared to non-infected. An interaction between infection and diet was found for glutathione peroxidase and reduced glutathione activities. The current study suggests that dietary seaweed supplementation modulates metabolic rates and biomarker responses in meagre, which may confer advantages in coping with biotic stressors.

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**Keywords** Rhodophyta, Phaeophyta, fish, aerobic metabolic scope · Bacterial infection · Immune function · Maximum metabolic rate · Antioxidants

### Introduction

Meagre (*Argyrosomus regius*) is a teleost fish, belonging to the Sciaenidae, that can be found along the west coasts of Europe and Africa, as well as in the Mediterranean and the Black Seas (Poli et al. 2003). It is a euryhaline and thermohaline species, tolerating wide temperature changes from 2 to 38 °C and salinity variations from 5 to 42 ‰ (González-Quirós et al. 2011; Cárdenas 2012). In addition to meagre

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They are not subject to any mandatory federal standards, only industry-written voluntary standards, which may or may not have been adopted by states as a legal requirement.. The Helveys are protective parents who didnt allow their son to play in the elevator, so Jacob had never taken it by himself before.. They had been scrupulous in installing gates on all the stairs, styrofoam covers on the sharp stone corners of the fireplace, childproof kitchen cabinet locks and a front door deadbolt to ensure Jacob couldnt get out.

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When it stopped, the elevator was on Jacobs back, with his head above the sill, compressed for 10 minutes while his mother, Brandi, pried the door open and a neighbor and police used a shovel and 2 by 6 to ease the elevator off his body He suffered brain damage.. As the elevator rose, and re-leveled, Jacobs body fell through the space between the sill and the elevator car.. The CPSC has jurisdiction over elevators used in residential settings as a consumer product.. He accidentally entrapped himself between the hoistway door, which in home elevators, is a swing-type door that resembles any closet or room door, and the accordion-style door that encloses the elevator itself.. Brandi could hear a commotion downstairs and summoned the elevator to check it out.

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Jacob, now five and a half years old, is slowly progressing, say his parents Brandi and Michael. [Stellar Outlook Pst To Mbox Converter Crack](#)

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