A dynamic simulation analysis of Japanese abalone (*Haliotis discus hannai*) production in Chile

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Abstract   In this paper the author develops a dynamic simulation model and uses it to analyze the economics of pond cultivation of Japanese abalone in Chile. The analysis is done in continuous time by defining discounted free cash flows on the basis of explicit relationships between several biological, technical, and economic functions. In a culture batch starting with 600,000 seedlings when abalone has an average length of 19 mm, and the optimal harvest time is day 763 from stocking, harvesting at that optimum time implies a per-unit cost of production of approximately CH$320 per abalone. This includes consumption of 443,644 kg algae per generation, providing approximately 1.46 kg algae per abalone, and an electric energy requirement of about 433,200 kWh. Even at the optimum time of harvest, the profits are rather low. This explains why Japanese abalone culture has been substantially reduced in the north of Chile. To obtain abalones with an average weight of 100 g, harvest should be on day 1,460, when operating net present value is negative. In addition, the effect of changes of some key parameters on the results is analyzed via a sensitivity analysis.

Keywords   Abalone culture · Bioeconomic model · Simulation · Net present value

Introduction

Aquaculture in Chile has experienced strong growth during the last two decades, and its total aquaculture production has risen from 70,500 tons in 1990 to 853,000 tons in 2007 (FAO 2009). In recent years there has been growing interest in diversification of production, which until now has mainly concentrated on salmon, towards other species, including abalone, a species not found naturally in Chile. Towards this goal, in 1978 the red or Californian abalone (*H. rufescens*) was introduced for commercial cultivation by

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