Mariculture of the Nucleus Scallop Argopecten nucleus as an Economic Alternative to Artisanal Fisheries in the Colombian Caribbean

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Abstract:

Introduction: Although precise statistics are not available, capture fisheries in Colombia have been declining over the last few decades, from around 130 thousand tons in 1995 to less than 50 thousand tons in 2014 (OECD 2016). The socio-economic challenges associated with this crisis have been particularly pronounced among the approximately 150 thousand artisanal fishermen that derive their livelihoods from the country´s fishery resources. In contrast, aquaculture production has been growing steadily, with production largely dominated by freshwater pisciculture. Although marine aquaculture has thus far developed below its potential, there is interest in exploring the commercial viability of species such as cobia (Rachycentron canadum) and various mollusks (AUNAP 2014).

One of the native species that has elicited interest is the nucleus scallop Argopecten nucleus. However, the lack of successful business models for shellfish farming enterprises in the Caribbean basin remains as a major obstacle for the realization of this potential. As such, the goal of this paper is to develop a comprehensive business model for marine growout of nucleus scallop in suspended culture facilities in the Colombian Caribbean. The analysis will be based on data obtained from a growout operation run since 2009 by a fishermen cooperative in Taganga, Santa Marta.

Literature Review: Economic research has provided crucial insights on the biological, environmental, and financial factors influencing the profitability and commercial viability of mollusk aquaculture throughout the world (e.g., Penney and Mills, 2000; Theodorou et al. 2014). In Latin America, economic analyses have been conducted to evaluate management strategies and culture methods (i.e., suspended vs. bottom culture) for experimental scallop culture trials in Venezuela (Mendoza et al. 2003) and Mexico (Taylor et al. 2006). On the other hand, comprehensive economic evaluations of commercial scallop aquaculture operations have been conducted in Chile (Molina et al. 2012) and Peru (SASCA 2013; Bossier 2015).

Methodology: The economic analysis was based on production data provided by the fishermen cooperative ASPOTAG, which has operated a 1.6-ha suspended culture facility for scallop farming in Taganga Bay since 2009. The current annual production capability for commercial size, 40-mm

(shell height) live nucleus scallops is estimated at 1.5 million individuals. In addition, interviews with support staff from the University of Magdalena's Mollusk and Microalgae Laboratory (MML) were conducted in 2016-2017 in order to obtain updated estimates of construction and equipment costs for the suspended culture system.

The economic performance of the enterprise was evaluated using the cost-benefit analysis (CBA) methodology, which is a systematic approach for quantifying the costs and benefits of a project and those of its alternatives in order to have a single scale of comparison (Nas, 1996). More specifically, two financial indicators were selected: Net Present Value (NPV) and Internal Rate of Return (IRR). The CBA was complemented with a standard sensitivity analysis examining the impact of variability in spat prices and selling prices on the economic performance of the project. In addition, the estimated net returns to farm operator's labor and management were compared to alternative measures of household welfare such as regional poverty lines.

Results: Preliminary results indicate that growout of scallops in suspended facilities at sea in the Colombian Caribbean is a financially sound proposition. Assuming an annual production of 1.5 million 40-mm scallops and a selling price of COP 500 (~USD 0.17) per adult scallop, annual gross revenues would be COP 756 million. Annual production costs (including depreciation and other fixed costs) would be COP 521 million approximately. The required initial investment on the growout structure and harvesting facilities was estimated at COP 660 million (~USD 220 thousand), with a re-investment of COP 130.5 million (~USD 43 thousand) required every five years. These flows of revenues and costs led to a 10-year NPV of COP 913 million and an IRR of 35%.

These positive financial indicators rely on a realistic set of production parameters. The model assumes a total of 20 production batches throughout the year, each requiring 189 thousand 10- mm spat for the seeding stage. It is also assumed that a consistent supply of spat is secured from the MML hatchery. The assumed survival rate throughout the 7-month growout period is 40% and harvested scallops are successfully marketed through direct sales to restaurants and other touristic establishments in the region.

Implications and Value: Despite its potential as a commercial aquaculture species, production of the nucleus scallop in Colombia still remains experimental in scale, in part due to the lack of successful business models for shellfish farming enterprises in the Caribbean basin. A major goal of this research is to provide a comprehensive business model that could eventually stimulate the interest of both government agencies and the private sector in this type of enterprises. A useful precedent can be found in Chile and Peru where the successful farming of a similar species, the native calico scallop (Argopecten purpuratus), has led to vibrant export industries over the last few decades.

Many scallop farmers in Chile and Peru are former fishermen who were affected by government bans on collection from natural scallop beds. Fishermen were supported during this challenging transition by government agencies and academic institutions. The experiences of the scallop industry in Chile and Peru offer valuable guidance to the development of scallop aquaculture in the Caribbean region. Given adequate training and support from government institutions, fishermen in the Colombian Caribbean could transition into scallop farming and embrace it as a sustainable livelihood alternative to artisanal reef fisheries.

Keywords: Scallop farming; mariculture; business model; Colombian Caribbean.