Saving Nemo: Mariculture and market-based solutions for the marine ornamental trade

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Introduction & Background

The marine ornamental trade is a $28 $48 million global luxury trade that supplies live organisms for the marine aquarium hobby. This trade is on an unsustainable path, due to ecologically destructive fishing practices such as overfishing and the use of cyanide. A complex and inefficient supply chain further increases fish mortality. Over 80% of traded marine ornamentals originate from the Coral Triangle to satisfy the demands of hobbyists, in the US, Europe, and China. The collection of coral reef organisms provides income for communities in the developing nations of the Coral Triangle, however, communities retain only a small percentage of the profits from this lucrative trade, resulting in continual overharvesting and bad practices.

Map highlighting Coral Triangle nations. Source: Veron et al.

Fisherman broadcasting cyanide on coral reef. Photo source: J. Cervino

Past reform attempts

There have been several unsuccessful attempts to reform the marine ornamental trade, including:

- Educating fish collectors about best harvesting practices
- Certification schemes for sustainably harvested fish
- Trade restrictions at both the U.S. and international level

Conclusions

We addressed the complex problem of trade in ornamental marine species by analyzing potential solutions throughout the supply chain, from consumers in the U.S. to producers in the Coral Triangle. Our economic analysis determined three possible market-based solutions to increase sustainability of the trade. Our producer-side analysis created an alternative ornamental fish production model for producer communities.

As a result of our analyses, we found that the following solutions would move the trade towards sustainability:

1. A mandatory warranty for U.S. retailers
2. Price premiums for captive raised fish
3. Direct market contracts between producers and U.S. suppliers
4. Mariculture operation based in producer communities using Post larval Capture & Culture and MicropodÊ technology

Ornamental fish in native habitat. Photo source: K. Pollock

Aquapod at ocean surface. Photo source: Olazul.org

Recommendations

- Create legislation in the U.S. to implement a mandatory retail warranty for marine ornamental fish.
- Conduct pilot studies on the feasibility and environmental impacts of PCC and MicropodsÊ.
- Identify areas in the Coral Triangle with the capacity to support a community-operated mariculture system.
- Customize our cost model for characteristics unique to each community.
- Draft market contracts between producer communities and US suppliers who ideally charge a price premium for captive raised fish.

Project objectives

In order to address the issues of the unsustainability of the trade while taking in account failed past reform attempts, the objectives of our project were the following:

1. Motivate reform using demand side incentives in the U.S.
2. Identify economic leverage points throughout the supply chain.
3. Design a feasible alternative production method using mariculture and Aquapod™ technology.

Our Client

Our client, Olazul, is an NGO focused on using aquaculture as a method for securing sustainable livelihoods in developing communities. Olazul asked us to provide recommendations on how to implement a sustainable mariculture production operation in the Coral Triangle, with the goal of improving producer livelihoods. Additionally, Olazul asked us to consider Aquapod technology in crafting our solution.

Methodology

To achieve each of our objectives, we used various methods of analysis:

Objective 1

Warranty analysis

To determine the viability of a warranty as a solution, we conducted a survey of marine fish hobbyists in the U.S.

We found that a mandatory warranty would:

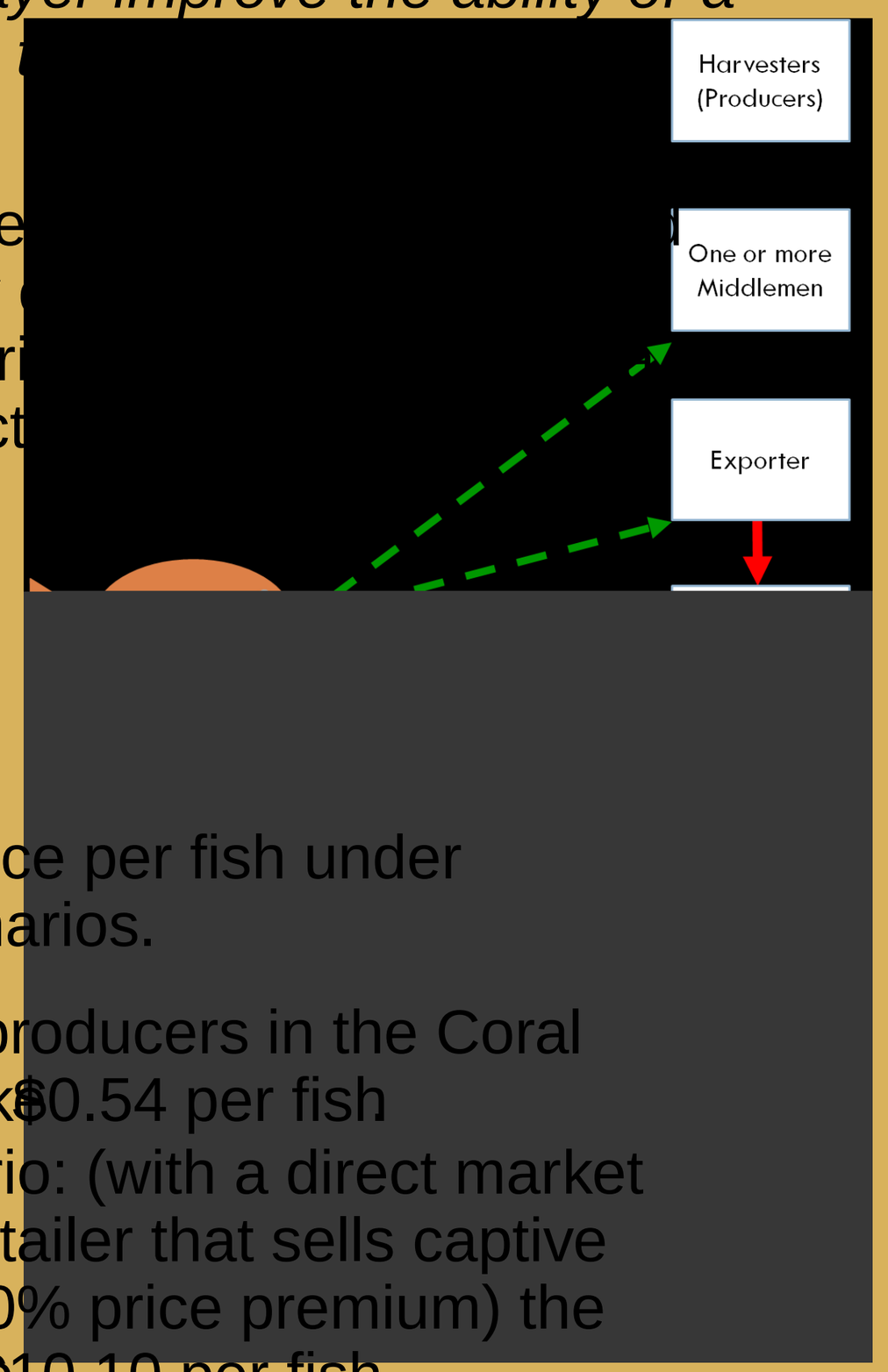
- Protect customers from buying (and then replacing) damaged fish.
- Create a financial incentive to stores to encourage sustainable collection practices and thereby reform the supply chain.

Our analysis showed the change in profit for retailers:

Therefore, we recommend a mandatory warranty as an effective market-based solution to protect customers and improve sustainability of the marine ornamental trade.

Objective 2

We asked: *Can a direct market contract with a U.S. supply chain player improve the ability of a mariculture business t... market?*



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We calculated the price per fish under different market scenarios.

- Current market: producers in the Coral Triangle only make $0.54 per fish
- Best case scenario: (with a direct market contract with a retailer that sells captive raised fish at a 30% price premium) the price increases to $10.10 per fish.

From this analysis, we concluded that market contracts and price premiums are necessary to increase the feasibility of higher cost production models.

Objective 3

Feasible alternative production design

1. PCC & MicropodsÊ
We designed a production system that combines Post larval Capture & Culture (PCC) and Aquapod technology. Fish larvae can be caught using nets or light traps. We propose that the larvae is then put in a Micropod, pictured above right, to be grown out to the desired size. This production method would allow for a diverse stock of coral reef fishes in their native habitat.

Micropod Source: Kampachi Farms

2. Cost analysis
A cost analysis showed that our alternative mariculture operation is only profitable under market scenarios that include a direct market contract and/or a price premium for captive raised fish.

3. Considerations for implementation
Finally, we researched the following factors that would affect the success of a sustainable mariculture operation in producer communities in the Coral Triangle:

- Social
- Legal
- Political
- Business

These considerations were used to formulate our recommended next steps to our client.

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