

SAVING NEMO: MARICULTURE AND MARKET-BASED SOLUTIONS FOR THE MARINE ORNAMENTAL TRADE

Nemo in Trouble

The marine ornamental trade is a \$28-44 million global luxury trade that supplies live organisms for the marine aquarium hobby. Unfortunately, this trade is on an unsustainable path, due to ecologically destructive fishing practices such as using cyanide and overfishing. In addition, 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, mainly 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.

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.



National Geographic, 2012

Complex Problems, Multifaceted Approach

There have been several attempts to reform the marine ornamental trade, including educating fish collectors about best harvesting practices, certification schemes for sustainably harvested fish, and trade restrictions at both the U.S. and international level. Unfortunately, none of the attempted reforms have had any long-term success. Certification schemes are too difficult to implement at each level of the complex supply chain, collectors tend to revert back to old techniques when NGO support runs out, and legislation has failed to gain political support. Because of the many sides of this complex problem, a solution that addresses multiple levels of the supply chain is necessary. Our proposal to combine a mandatory warranty at the U.S. retail level, direct market contracts between producers and U.S. supply chain players, and a sustainable mariculture operation provides a multifaceted approach to reforming the marine ornamental trade.

Project objectives

- Motivate reform using demand side incentives in the US, focusing on the retailer end of the supply chain.
- Identify economic leverage points throughout the supply chain, and consider scenarios that link producers and retailers.
- Design a feasible alternative production method that uses mariculture and Aquapod™ technology.

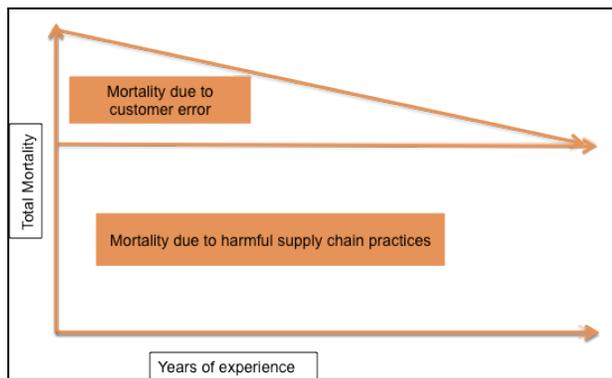


US Demand: Mandatory Warranty

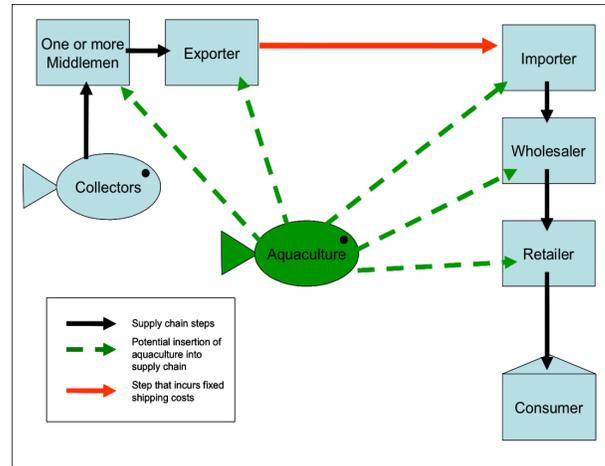
We investigated the potential for a warranty, which would provide the following solutions:

- A warranty would protect customers from buying (and then replacing) damaged fish
- A warranty will create a financial incentive to stores to encourage sustainable collection practices and thereby reform the supply chain.

In order to determine the viability of a warranty as a solution, we conducted a survey of marine fish hobbyists in the U.S. Based on our survey results, we discovered that for every dollar a customer spends on fish today, a store can expect to make an additional \$0.39 in sales to replace fish that have died. In addition, approximately 80% of fish mortality in home aquaria can be attributed to poor practices in the supply chain, not customer error. Because stores profit from this fish mortality, they have no incentive to consider sustainable sources of fish.



For a warranty to be an effective tool for change, stores would have to lose profits if a mandatory warranty were implemented, and stores should only be able to recoup these losses by reforming the supply chain. Our analysis shows that if a mandatory warranty were implemented, stores would initially lose an average of 11.7% of their current profits. By reforming the supply chain under a mandatory warranty, stores could recoup all of their losses and earn 5.33% more than they currently earn today. Therefore, based on a clear financial incentive for stores to reform the supply chain under a mandatory warranty, we recommend this method as an effective market-based solution to protect customers and improve sustainability of the marine ornamental trade.



Supply Chain Analysis

Next, we looked at how the value of a fish increases as it moves down the supply chain, and how various market scenarios could ultimately help sustainable producers compete in the market. We wanted to know the degree to which a direct market contract with a U.S. supply chain player could improve the ability of a mariculture business to remain competitive in the market. We also explored the potential for a price premium on captive raised fish at the retail level and how it could improve economic viability of a sustainable mariculture business in the Coral Triangle.

We found that under the current market, collectors in the Coral Triangle receive an average of 54 cents per fish, and this value increases dramatically throughout the supply chain, even after adjusting for fixed costs such as inter-continental shipping. At the retail end, customers are willing to pay more for a captive raised fish, and retailers will net the greatest profit by selling these fish at a 30% price premium.

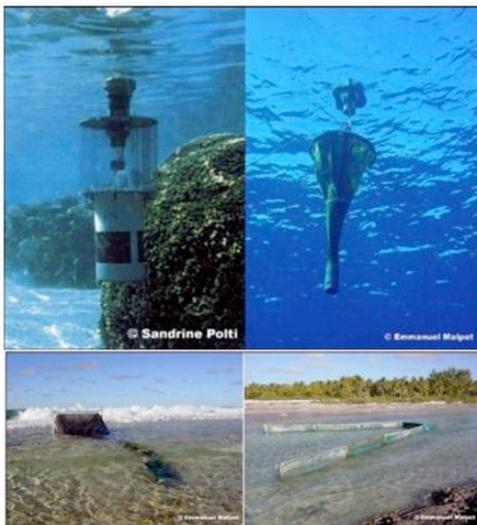
Both direct market contracts and a price premium have the potential to improve the economic viability of a mariculture business in the Coral Triangle. Under the “best case” market scenario, a direct market contract with a retailer that sells captive raised fish at a 30% price premium, a mariculture business would be able to produce its fish at a cost of up to \$10.10 per fish and remain competitive in the current market.



A novel combination: PCC and Micropods™

Many people involved in the trade have looked for sustainable alternatives such as mariculture, where marine ornamentals are raised in a controlled environment. However, the marine ornamental mariculture industry is still in its infancy; only a small percentage of marine aquarium species have been bred and cultured in captivity. These closed, full-cycle breeding methods can be very expensive, species-specific, and complicated.

An alternative method is to harvest very young post-larval fish as they settle onto coral reefs. This method, called post-larval capture and culture (PCC), is ecologically sustainable because there are millions of post-larvae in the water column, and less than 1% survive under natural conditions. PCC takes a portion of the 99% that probably would have died and raises them in captivity, resulting in minimal impacts on species assemblage. Post-larvae can be captured either by 1) attracting them with sensory cues such as light traps or 2) passively collecting them in nets as they move across reef crests or through shallow lagoons. New available technology will help reduce cost and simplify installation.



Top: light traps; bottom left: crest net; bottom right: hoas net. (Malpot et al. 2005)

In the past, the grow-out stage for post-larvae has used on-land facilities, which can be costly to operate and risks negative impacts on the coastal environment. We explored the potential of reducing operation costs by keeping the grow-out stage in the open ocean, as has been done with food fish mariculture. Micropods™ are a rigid, submersible, open-ocean cage that can withstand strong storm events, has little impact on habitat, and is easier to maintain compared with other types of open-ocean cages.

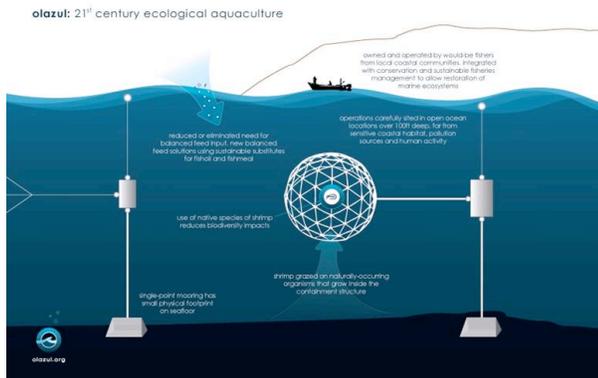


Kampachi Farms, 2012

PCC and Micropod™ Cost Analysis

No data exists on the potential for cultivation of post-larval fish in an open-ocean cage for the marine ornamental trade. We investigated the financial feasibility of a combined PCC and open-ocean mariculture operation in the Coral Triangle under the various market scenarios explored in our supply chain analysis.

Our analysis showed that this type of operation cannot be profitable in the current market, where producers must compete directly with collectors of wild fish. However, opportunity for profit arises under market scenarios that include a direct market contract or a price premium for captive raised fish. Therefore, success of a combined PCC and open-ocean mariculture operation in the Coral Triangle depends on the ability to take advantage of large price mark-ups throughout the supply chain and the willingness of consumers to pay more for captive raised fish.



Ocean Farm Technologies, 2012

Mariculture Feasibility

We found that the feasibility of a mariculture business in the Coral Triangle depends on the following considerations:

- Securing the necessary start-up funding.
- Identifying a willing entrepreneur in the community to ensure successful management of the mariculture operation.
- Facilitating market contracts to increase the percentage of profits that producers receive.
- Training community members in business and technical aspects of their new mariculture operation.

The ultimate success of a mariculture business in securing livelihoods for producer communities depends heavily on social factors. Therefore, we recommend that businesses be established as cooperatives, which are member-owned and run. This method will help promote equitable distribution of income and environmental stewardship within the community by involving many producers. Most importantly, we recommend that Olazul gather on-the-ground knowledge and experience before starting any operation in these communities, in order to appropriately incorporate the community and livelihood structure into the business plan of the venture.

Political stability is a complex issue and an important factor to potential investors, but it varies widely among countries in the Coral Triangle. Indonesia, the Philippines, and Malaysia currently experience the most stability and are best suited to attract outside investments. The Solomon Islands currently hosts at least one successful partnership with a U.S.-based mariculture operation and has the potential to host

more. Papua New Guinea and Timor-Leste could be excellent sites in the future, but are currently politically and socially unstable, and are therefore less attractive options for start-up mariculture operations.

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 showed three possible market-based solutions to increase sustainability of the trade: a mandatory warranty for U.S. retailers, price premiums for captive raised fish, and direct market contracts between producers and U.S. suppliers. Our producer-side analysis concluded that producer communities, coupled with support from an organization with funding and expertise, could successfully implement a mariculture operation using PCC and Micropod™ technology.

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 Micropods™
- 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

References:

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