

Technological and Sociological Sustainability of Offshore Aquaculture in South Eleuthera



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Photo 1: The island of Eleuthera located closely to the Exuma Sound ocean wall



Photo 2: The interior of SeaStation where approximately 4,700 cobia were stocked in January of 2009



Photo 3: A buddy pair utilizes a hand net to harvest the cage

Introduction

In Eleuthera, Bahamas, the Cape Eleuthera Institute (CEI) raises cobia (*Rachycentron canadum*) in an offshore aquaculture cage anchored 30 meters of water immediately adjacent to the Exuma Sound ocean wall. Here, tidal activity flushes approximately 2 billion liters of clean oceanic water flow through the cage daily (Benetti *et al.* 2006). The dilution of nutrients from the submerged cage mitigates the negative impacts on the ecosystem, however proper management of resources is needed in order to successfully create a sustainable system of carnivorous fish (Benetti *et al.* 2006). CEI's goal is a demonstrative project that aims to supply the demand of regional seafood through aquaculture, promoting local development and conservation initiatives. In order for CEI to culture thousands of fish, they need to invest in technologically sound equipment. Additionally, more needs to be understood about community perceptions of cobia in order to successfully bring the fish to an established market.

To date, the fishing industry has experienced an increase in popularity and overall demand for fish and seafood products, while the global catch of wild fish has stabilized (Marine Task Force 2007). Since 1950, aquaculture has been relied upon to fill the gap in supply and demand. This industry, growing approximately 8.8% each year, leads to more predictable harvests and market price stability (Marine Aquaculture Task Force 2007, and Dumas 1992).

The purpose of the study is:

1. To look at different harvesting techniques to find the most efficient catch per unit effort rate and,
2. To gain an understanding of, and positively influence the communities' attitude towards cobia as a menu item.

It is hypothesized that:

1. The the seine net will catch the most fish per unit effort; the hand net will be most selective, and
2. The community taste testing will favorably sway the attitudes towards purchasing and consuming cobia.

Methods

1. Harvesting Techniques

There are three available harvest techniques: hand-net, seine net, and a fish trap. Each harvesting method was used separately from each other in replicates of three. Effort was calculated by multiplying time (in hours) spent harvesting by the number of divers employed. Catch per unit effort (CPUE) is determined by dividing the total catch by the calculated effort.

- Hand-Nets: Three dive pairs composed of 3 netters and 3 fish baggers. Each harvest consisted of 17-minute intervals.
- The fish trap was suspended inside the cage and baited with sardines. It was left in cage for nineteen hours. Harvest time was calculated by summing time spent to set, retrieve and haul trap on to the boat.
- The seine net has not yet been tested due to insufficient tech-support at time of study.

After the capture for each method the fish were weighed, skinned, gutted and filleted or bulked.

2. Social Surveys

There were two distinct, non-random communities: The Island School community (parameter) and South Eleutheran community (2% sample size)

- Background surveys: Each student at IS completed a survey on their familiarity of cobia. These same surveys were distributed randomly in different settlements in South Eleuthera.
- Perception surveys: Both communities were asked to fill out a pre-survey asking their opinion of cobia. They then tasted cobia prepared in three different styles: ceviche, grilled and fried, then filled out a post-survey asking of their opinion following the taste test.

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Results

1. Harvest

Results showed that the trap caught the most fish while the hand nets, on average caught less fish (Figure 1). For the trap, the catch per unit effort was 10 fish per work hour while the average net catch was 21 fish per work hour (Figure 1). The average net catch resulted in 20 fish, and the trap caught 31 fish in its trial (Figure 2). As seen in figure 1, the trap caught the greatest amount of fish, however figure 2 shows that the hand net had the higher catch per unit effort.

2. Social Surveys

•Islands School Community

70% of *The Island School* had tried cobia, and the trend seen in figure 5 shows that the community tended to have a neutral, or negative opinion prior to the taste test. After the taste test, figure 5 shows that the general opinion shifts from dislike to a more positive opinion of cobia.

•South Eleutheran Community

The prior to the taste testing, 86% of the South Eleutheran sample population had never tasted cobia before (Figure 6). Following the taste test, the majority of the South Eleutheran sample population strongly liked cobia in all three of preparations (Figure 7). The post-tasting survey shows that 82% of the taste testers strongly liked cobia, 14% of the taste testers liked cobia and 4% of the taste testers strongly disliked (Figure 8).

Discussion

The results from the harvesting methods illustrated that the hand net was the most efficient way to catch cobia. The hand net demonstrated the highest catch per unit effort and the most selectively caught fish. Restaurants look for similar sized fish in order to prepare their filets. Even though the trap caught more fish than the hand net, the number of human hours required to work outweighed the amount of fish caught. The trap also lures sharks, which could possibly harm the divers and the cage. The group's hypothesis was inconclusive since the purse net was not used, though the results support the expectations about selectivity of the hand net. In the future, the purse net may be tested and therefore influence the results.

The group hypothesized that the opinions of *The Island School* and Bahamian settlements would positively change through awareness and taste testing, which the results supported. The group can conclude that to successfully sell cobia, it is important to understand the perceptions and preferences among communities, and effectively market the cobia accordingly.

The aquaculture research group can optimistically look towards the future with information on how to stock and harvest the cage. By looking at the CPUE of each available harvesting method, the group can determine the most efficient method for supplying sustainable farm raised fish to local communities. The next time CEI stocks the cage, relationships should be clearly established with potential buyers in the South Eleutheran Community so that proper planning can ensure that the harvesting techniques will sufficiently supply the demand for fish. Furthermore, by supplying locally raised fish to the *Island School*, the school can effectively reduce its shipment of other protein sources. Cost analysis of allocating the fish among these two distinct communities can help plan future harvest and distribution of cobia raised at CEI.

Citations:

1. Dempster, T., *et al.* "Attraction of Wild Fish to Sea-Cage Fish Farms in the South-Western Mediterranean Sea: Spatial and Short Term Temporal Viability." *Marine Ecology Progress Series*, 242: 237-251.
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4. Kaiser, J. and Holt, G. 2005. "Species Profile: Cobia." *Southern Regional Aquaculture Center*, publication No. 7202
5. Marine Aquaculture Task Force. 2007. "Sustainable Marine Aquaculture." *Tacoma Park, Maryland*, 13-22.



Photo 4: For the taste testing surveys three preparations of cobia were used; ceviche, fried and grilled



Photo 5: A member of the aquaculture team conducts a post survey to discover how a person's opinion of cobia changed



Photo 6: Members of the South Eleutheran community taste the prepared styles of cobia

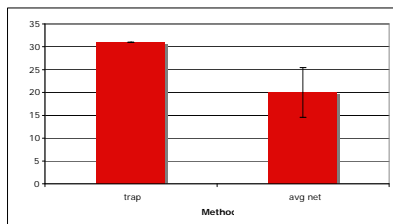


Figure 1: The total number of fish caught by our two different harvesting methods, the trap and the hand net.

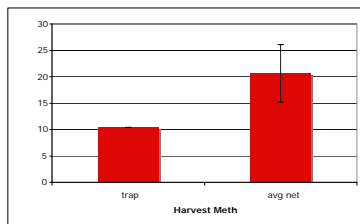


Figure 2: The catch per unit effort calculated for our two different harvesting methods of the trap and hand net.

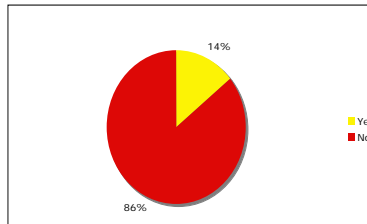


Figure 3: Percentage of people on South Eleuthera who had previously tried cobia before our taste testing.

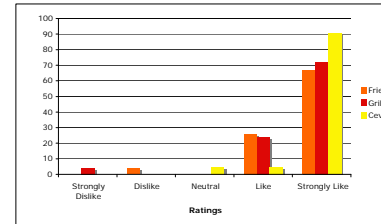


Figure 4: The opinions of the South Eleutheran Community on the three different preparations we used to prepare the cobia

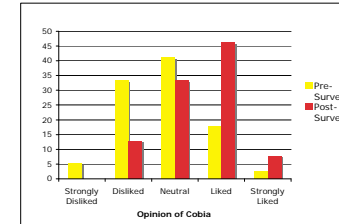


Figure 5: The change in the opinion of cobia with the community at The Island School.