

Assessing Harvest Efficiencies and Consumer Demand for North Carolina Lionfish

Project Narrative

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Abstract

Maine lobster traps and a Crab Pot Christmas Tree (CPCT) concept were deployed in the waters of Bogue Sound to determine the potential for a commercial fishery for lionfish. Deployment locations were surveyed by SCUBA, the traps were deployed by vessel, and retrieved by SCUBA approximately 3-4 weeks after deployment. Lionfish caught were counted, if present. Bycatch, if present, was recorded and returned to the ocean. Consumer preference for the lionfish is also noted in a consumer sensory survey.

Introduction

The invasive lionfish is now one of the most dominant predators on offshore artificial and hard bottom reefs in North Carolina. Lionfish overwinter off North Carolina at depths greater than 100 ft given the warming influence of the GulfStream current. They pose a significant threat to reef-fish communities throughout the region due to their high densities (up to 500 lionfish per hectare) (Morris and Whitfield 2009) and generalist dietary habits (Morris and Akins 2009). Negative impacts to the biodiversity of reef communities have been observed in many locations with lionfish consuming greater than 70 percent of the forage base on some reefs. A significant number of juvenile grouper and snapper are among the species consumed by lionfish and both are important to commerce. Gut analyses of lionfish captured in North Carolina have shown these predators are capable of consuming dozens of prey per day. Lionfish are long lived and are sexually mature as early as one year old. Fecundity is high resulting in millions of eggs produced by one female per year. Due to venomous spines and protective coloration, they have no significant natural predators in North Carolina.

Lionfish pose a unique threat to artificial reefs. By design, artificial reef programs provide habitat and nursery grounds for economically and ecologically important species such as grouper and snapper. Lionfish settle on artificial reefs at a higher rate than natural reefs, a likely function of high rugosity (complexity) and height compared to natural reefs. The high affinity of lionfish to artificial reef structures suggests a large number of juvenile lionfish are found around bridge pilings, seawalls, and artificial reefs throughout the Southeast U.S., Gulf of Mexico, and Caribbean (J. Morris, pers. obs).

Presently, there is no commercial fishery for lionfish because they are difficult to capture with standard commercial gear. To date, the only effective method for collecting lionfish has been through spearfishing and hand-netting. These methods are labor intensive and costly. Also, lionfish cannot be captured via hook and line fishing. Several studies have attempted to develop trapping methods specifically for lionfish based on conventional gear; however, none have been successful at developing devices specifically for lionfish. Furthermore, bycatch of other reef fish is high making conventional trapping impractical. Lionfish are being landed regularly as bycatch in the Florida Keys spiny lobster fishery. It is believed that lionfish are recruiting into and around the spiny lobster trap because of the structural attributes of the trap. In this study the traps will not be baited, which may reduce the bycatch of other reef fish.

Methods

A chain of five Maine Lobster Traps (MLTs) and a chain of five Crab Pot Christmas Tree attraction devices with traps (CPCTs) were deployed four locations during the summer of 2014. The chain of traps were spaced approximately 30-50 feet apart in a series, connected by random sized lengths of white nylon line. Deployment locations varied between proximity of an artificial reef (a wreck, the Naeco), a natural hard-bottom location, and a flat, sandy area with minimal relief. Depths ranged between 90 and 130 feet for the deployments on May 23, 2014 and June 22, 2014 (figure 1 and 6).

Traps were deployed from the stern of the commercial diving vessel the Outrageous V to simulate actions of commercial fishermen (figure 3). After deployment, SCUBA divers verified the presence of lionfish using standardized lionfish monitoring methods (Morris 2012). Once deployed, the traps and the area were surveyed by divers to determine the following: a) presence/absence of lionfish; b) approximate numbers and sizes of lionfish, and 3) a random-diver survey of the surrounding area to determine the other types of fish at the site. For this deployment, the traps were covered with various types of landscape fabric in the hopes of simulating a “cave-like” environment. After a soak time of 3-4 weeks, the traps were retrieved. SCUBA divers surveyed the traps prior to retrieval for in-situ lionfish catch and by-catch data. Upon surfacing the traps, by-catch was recorded and returned. Any spiny lobsters that had egg masses were kept in the water and released.

Results

On May 23, 2014, we headed out of Beaufort Inlet to deploy 2 strings of 5 lobster traps at two different locations: a) Bow of the Naeco (figure 1) and b) Porgy Rocks (figure 1). The Bow of the Naeco rests in approximately 42.6 m (140') of water and the area is known for large accumulations of lionfish, baitfish, and other reef fish that are important to the grouper-snapper reef complex system. The Porgy Rock location was chosen as a non-artificial reef location that had natural protrusions of rock surrounded by sandy bottom. There was not as large a population of lionfish at this location and they were widely dispersed. The Porgy Rocks sit in about 33.5m (110') of water.

Immediate inspection of the bow of the Naeco confirmed the presence of large numbers of lionfish that were from various sizes of 0.01m to 0.45 m. During the diver survey, over 50 were noted and an example figure is presented in figure 4 where at least 5 0.2m sized lionfish are congregating around area of 4 m². The traps themselves were approximately 6m to the southwest of the bow of the Naeco, sitting in open sand. Initially, they rested upright, but were eventually placed resting on the long axis of the trap. Inspection of the trap location indicates the presence of lionfish nearby (at least 6 within the 0.2m size range) and large schools of baitfish also present (figure 5).

From the Bow of the Naeco, we moved to the above mentioned Porgy Rocks in order to test whether the influence of structure within a location would influence the aggregation of lionfish to the traps. As with the bow of the Naeco, a string of 5 traps were attached via random size lengths of white nylon line. Some of the traps were also wrapped in landscape fabric to simulate a “cave-like” environment. The traps were deployed of the stern of the Outrageous V and a survey of the area conducted. No baitfish schools were present at this location and the amounts of snapper-grouper complex reef fish were greatly reduced than at the Bow of the Naeco location (figure 5).

On June 22, 2014, after a soak time of 30 days, we were able to retrieve the lobster traps, count bycatch and determine the lionfish trapping and aggregating success. We traveled to Porgy Rocks, retrieved traps, documented bycatch and lionfish catch in the traps. Then, we traveled to the bow of the Naeco to

retrieve traps, document bycatch and lionfish catch in the traps. Finally, we attached the CPCT to the traps, and redeployed both strings at a separate location (figure 6).

Upon return to Porgy Rocks, we noted that the Lobster traps worked effectively at aggregating the lionfish (figure 7). Two lionfish were caught in these traps, 6 were directly outside the traps, and there were 10 slipper lobsters, 1 spiny lobster, and a snail as bycatch in the traps. The bycatch was released after floating the traps to the surface.

Similar aggregation effects were noted at the Bow of the Naeco as well. Despite the fact that there was larger structure at this location, lionfish could be seen around the traps (figure 8). These traps had 4 lionfish inside the traps when they were floated to the surface (figure 9). The traps had a little more bycatch in them, presumably due to proximity to the wreck. There were 14 slipper lobsters, 2 spiny lobsters, 3 groupers, and 4 snails. Bycatch was released after floating the traps to the surface.

After collecting the traps, we moved to the Bottom Rocks location on Figure 6 and deployed both strings of lobster traps with CPCT attached (figure 10). Unfortunately, Hurricane Arthur swept through Carteret County on July 4th. We were able to survey the traps on August 20, 2014 and again on September 17, 2014, almost two and three months after deployment.

We returned to the initial location of the Bottom Rocks as seen in Figure 1. At that time, we were unable to locate the traps due to the presumed movement due to storm surge associated with Hurricane Arthur. The Outrageous V relocated and completed another search of the lionfish traps (Bottom Rocks #2, Figure 11). We were unsuccessful at locating the traps again and our divers were out of appropriate bottom time to complete another search.

Working with scientists at Seahorse Coastal Consulting, using their ADCIRC storm surge and hydrodynamic model, we estimated approximate movement distances and directions from the available data. On September 17, 2014, with a break in the weather, we were able to explore two more sites in search of the lionfish traps. These sites were based on presumed directional movement as well as bottom topography scans. When divers were deployed, they were unable to locate the traps. We have learned from the manufacturer that the welds holding the trap together will deteriorate within 45 days and therefore the traps are not ghost fishing.

During this time, we were informed by NOAA that we needed to secure a specialized permit for placing the traps on the bottom of the ocean. Our efforts, therefore, went into securing additional traps for continued deployments and the Exemptive Fishing Permit (EFP). We are happy to state that on March 6, 2015, we secured the EFP and with this, we are able to redeploy traps. At this time, we are awaiting the arrival of our new Maine Lobster traps, which is based more on the wooden Spiny Lobster traps used in Florida.

The final piece of this grant included a consumer sensory session in cooperation with Barry Nash of NC SeaGrant and Libby Eaton of Bistro by the Sea. As of this writing, the sensory session will be conducted on April 29th at Bistro by the Sea. Mr. Nash will be preparing the consumer surveys and we will have results to present in May.

Discussion

We successfully deployed the MLTs and CPCTs twice during the 2014 summer season. Deployment was easy and all traps landed in such a way as to allow fish entry into the traps. With the surveys conducted

in August and September, we have GPS coordinates for excellent locations for future deployments. Securing the Exemptive Fishing Permit (EFP) has opened the way for different trap design and deployment and recovery ideas.

Bycatch was minimal in the traps, presumably due to the lack of baiting. Primary by-catch were slipper lobsters and spiny lobsters. Any lobsters with egg masses were immediately returned to the water. All by-catch was counted and logged. We would like to try baiting the traps with lionfish gonads as this seems to attract lionfish (J. Morris, personal communication).

We would also like to experiment with the MLTs, employing wooden structures similar to the ones they use in the Caribbean for the Spiny Lobster industry. We are acquiring the traps and hope to have them ready by summer field season 2015. Presentations to commercial fishermen about this research has led to a brainstorming of ideas for trapping mechanisms.

A final piece to the commercial fishing puzzle is the retrieval of traps for commercial vessels. It is unlikely that commercial fishermen will use SCUBA to retrieve the traps and hence some type of marker buoy and retrieval system will need to be devised.

While the full consumer sensory survey has yet to be completed, initial tastings with the general public have proved favorable. Lionfish “bites” have been presented at the Big Rock weigh-in as well as literature related to the invasion. Public outreach continues and the demand for the fish is growing.

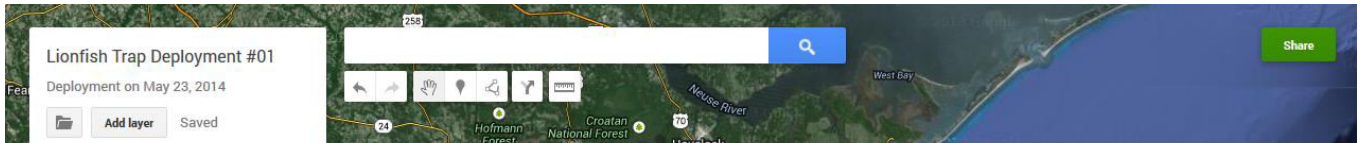


Figure 1. Deployment locations for the May 23, 2014 deployment





Figure 2. Deployment of the Lobster traps off the stern of the Outrageous V.



Figure 3. Example sitings of lionfish at one location of the Bow of the Naeco.

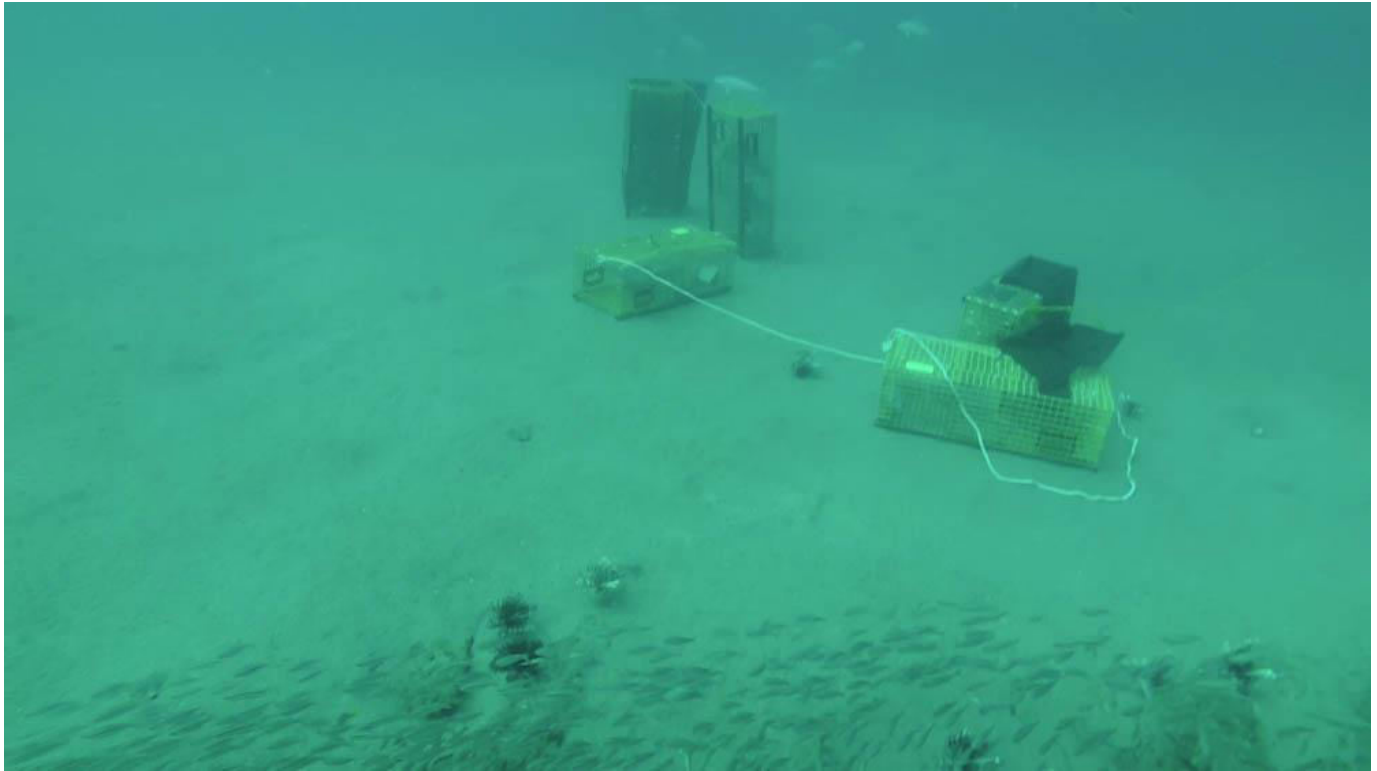


Figure 4. Initial deployment of lionfish traps at the bow of the Naeco. Note the 8 lionfish and the surrounding baitfish.

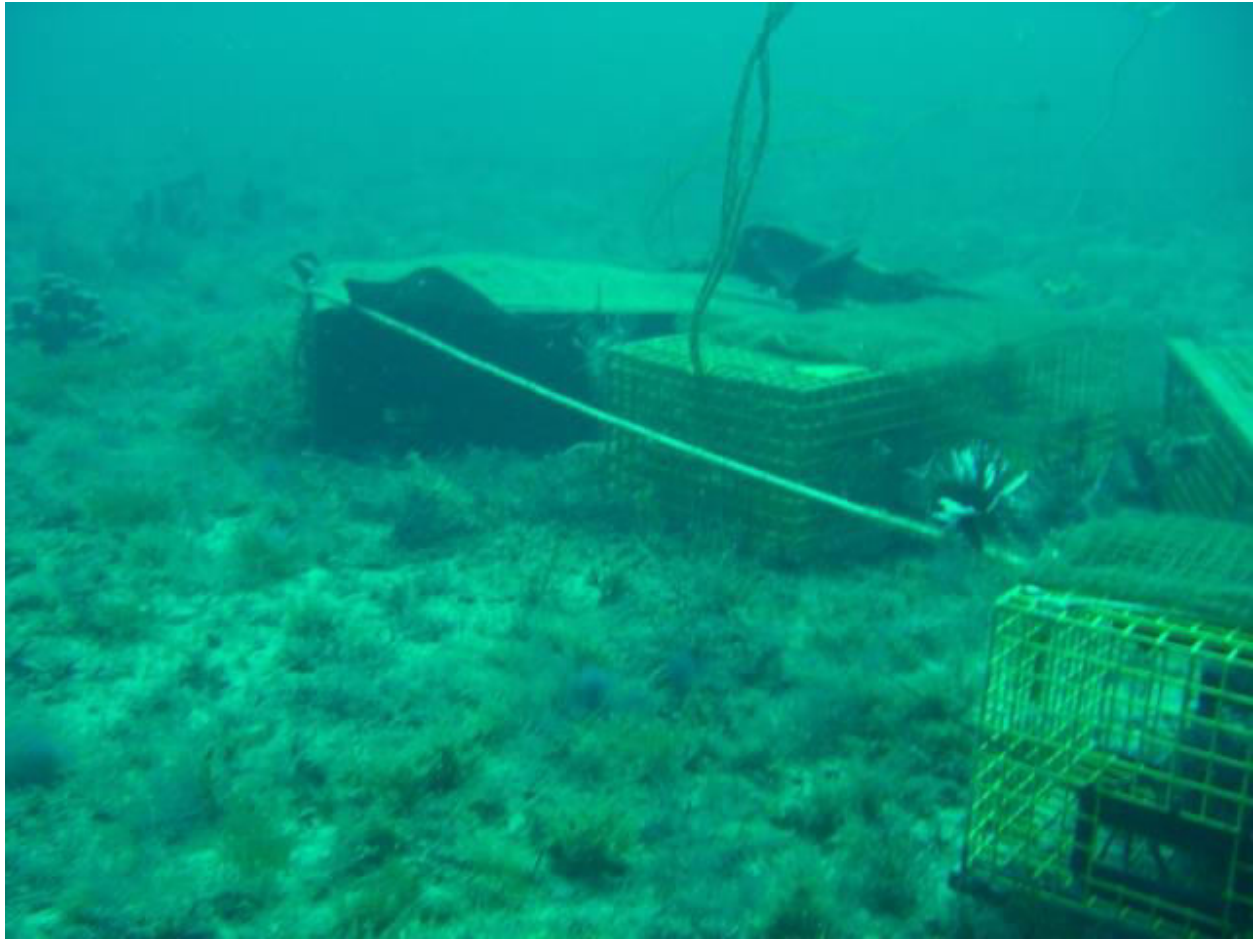


Figure 5. Lionfish Trap deployment at Porgy Rocks

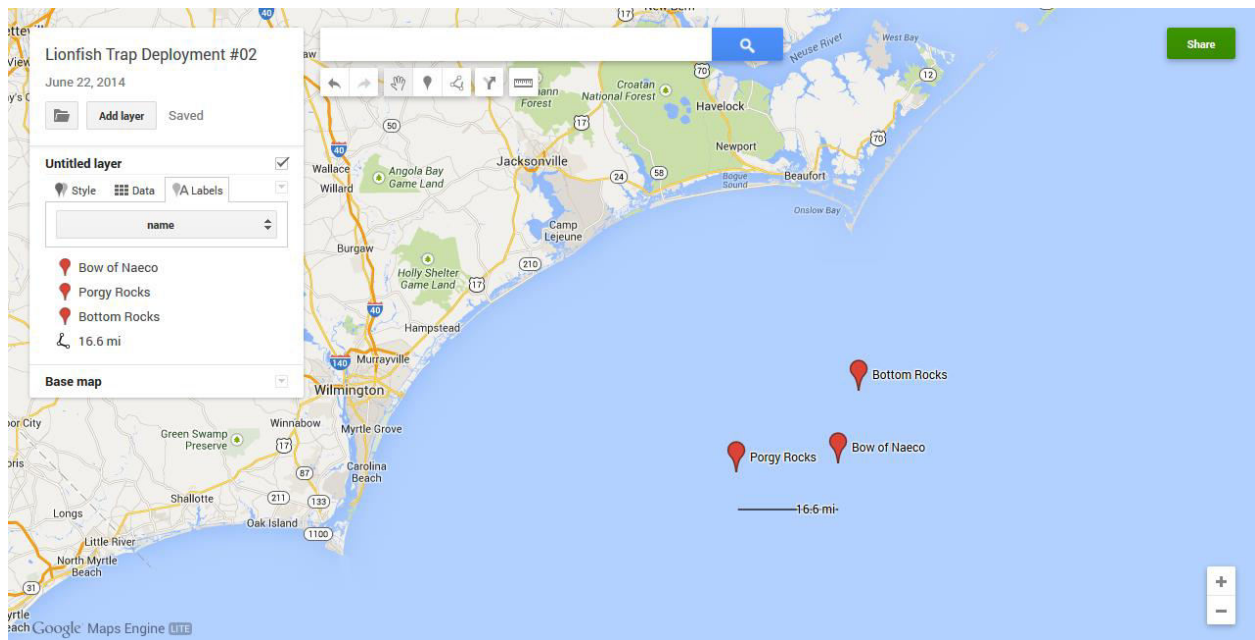


Figure 6. Locations for the June 22, 2014 lobster trap retrieval and Redeployment.



Figure 7. Aggregation of lionfish around the lobster traps at Porgy Rocks.



Figure 8. Aggregation of Lionfish around Lobster Traps at the Bow of the Naeco.



Figure 9. Lifting the lobster traps to the surface via lift-bags.

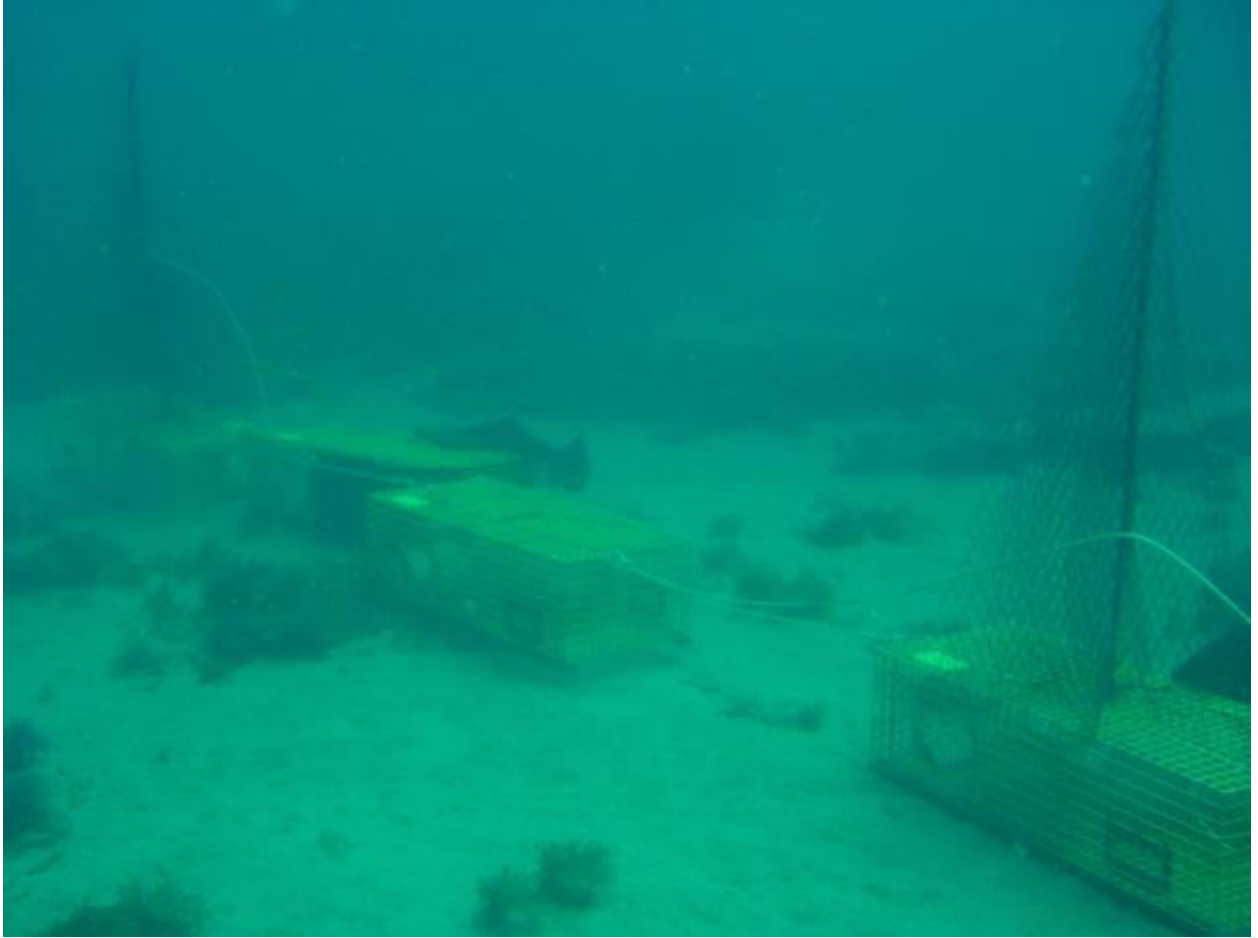


Figure 10. Lobster and CPCT trap deployment at Bottom Rocks location

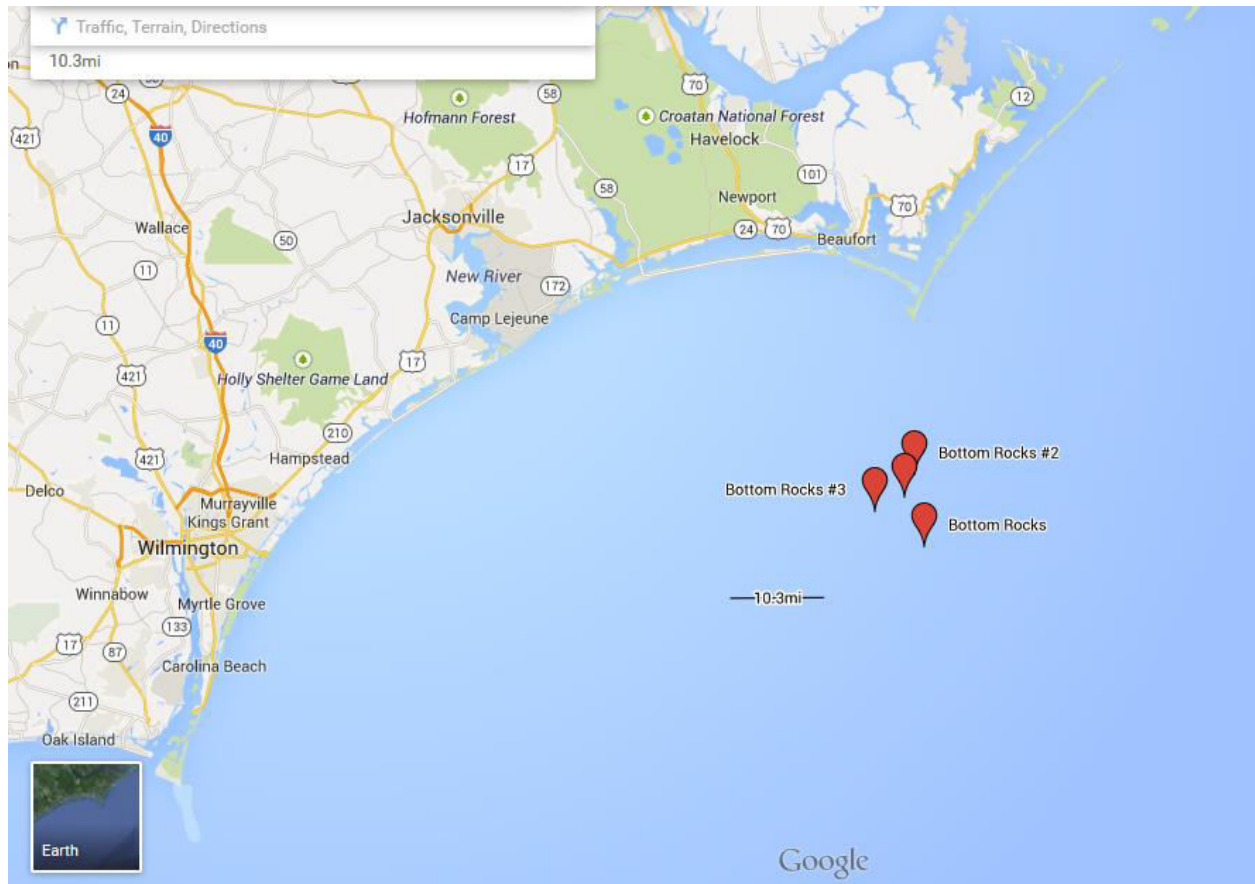


Figure 11. Trap search locations for August 20, 2014 and September 17, 2014

Summary: Consumer Lionfish Sensory Evaluation
Bistro-by-the-Sea Restaurant
May 20, 2015

Forty-three individuals who enjoyed eating seafood at home or in restaurants were recruited from Carteret, Craven and Onslow Counties to evaluate a two-course (appetizer and entrée) lionfish meal. The participants were drawn from a list of people who participated in a series of sturgeon tastings in fall 2013 for North Carolina Fisheries Resource Grant 13-ST-02 (*Market Development for Cultured North Carolina Sturgeon Meat*). Libby Eaton and Chef Tim Coyne of Bistro-by-the-Sea Restaurant in Morehead City hosted the event and prepared the lionfish dishes, respectively.

Prior to the start of the sensory evaluation, participants were provided a 25-minute overview of the lionfish infestation in North Carolina. They were shown how swiftly the species has spread along the Atlantic Coasts of both North and South America, in the Gulf of Mexico and throughout the Caribbean. The group was informed lionfish pose a significant threat to reef-fish because of their high densities and general dietary habits: lionfish are known to feed on juvenile species that are important to commerce such as grouper and snapper.

Participants were told the only way to manage the North Carolina infestation was to develop a commercial fishery for lionfish, and the purpose of the sensory session was to ascertain the palatability of lionfish when served in culinary preparations crafted for mild-flavored, marine white fish such as triggerfish or grouper.

Each participant was given a scoring ballot (see Appendix), a pencil and a glass of tap water. Prior to serving the appetizer, the group was asked to cleanse their palates with the water and to do so again before sampling the entrée.

We reviewed the scoring ballot. Participants were told to rate the flavor, texture, aroma and appearance of both courses according to a numerical scale where 7 = Excellent; 6 = Very Good; 5 = Good; 4 = Fair; 3 = Poor; 2 = Very Poor; and 1 = Completely Unacceptable. We requested the group provide comments explaining their ratings, telling us what they specifically liked and disliked about both items. We then informed the group to choose one of three price points they would be willing to pay if either item were on a menu.

Figure 1 shows the averaged numerical scores for both courses. The meat for the lionfish slider appetizer was coated in tempura batter and fried, then placed on a mini bun with a side of Asian slaw. The meat for the entrée was stuffed with a homogenous mixture of ground raw lionfish, raw red peppers, and cooked kale, asparagus and spinach. The stuffed fillet was baked and topped with a lemon-garlic flavored sauce.

	Flavor	Texture	Aroma	Appearance
Appetizer	6.19	6.23	6.14	6.42
Entrée	6.86	6.64	6.62	6.60



Lionfish Slider

The slider appetizer was rated “very good” across all four sensory measures. A number of participants noted the mild flavor of the meat as both appealing and needing enhancement. Those who liked the mild flavor noted the meat was not “fishy,” meaning it lacked a perceptible ammonia-like note or a rancid aftertaste. Those who believed the meat flavor was too mild suggested a “spicier seasoning” or a “flavored glaze.”

Several individuals indicated the “bread was overpowering” and the “fish got lost with the bun.” These people suggested replacing the bread with a pita wrap or instead making the appetizer a salad item. The few who commented on the texture noted it was “meaty” and “flakey,” reminiscent of flounder.

Fifty-one percent (22 of 43 participants) indicated the appetizer should sell for \$10.95; thirty-five percent (15 of 43) said it should be priced at \$11.95 and 14 percent (6 of 43) chose the \$12.95 price point.



Baked Lionfish Stuffed with Spring Vegetable Mousse Topped with Lemon-Garlic Scampi Sauce

The baked lionfish entrée received higher overall scores with all sensory measures being rated as “excellent.” Participants commented the sauce was very flavorful and the parsley enhanced the product’s appearance. Like the appetizer, participants noted the absence of “fishy” flavors and they liked the flaky, meaty texture of their servings.

Two individuals failed to choose a price point for the entrée. Fifty-nine percent (24 of 41 people) chose \$25.95 as the ideal price point; 24 percent (10 of 41) chose \$22.95 and 17 percent (7 of 41) chose \$28.95.

One participant wondered if the price points for either course truly reflected the labor involved in harvesting lionfish since “the average consumer does not know what is involved.” This insightful observation highlights the current impediment to growing the market for lionfish: spearing is the only reliable method of capturing the fish, which is both expensive and inefficient. Until more economical harvest methods are developed, education will be key to justifying to consumers the inconsistent availability and premium prices of lionfish in retail markets and in restaurants.

This consumer sensory was profiled by local media:

Lionfish Taste Testing Looks to Encourage a New Commercial Fish Harvest, WCTI 12 (News Channel 12), May 20, 2015: <http://www.wcti12.com/news/lionfish-taste-testing-looks-to-encourage-a-new-commercial-fish-harvest/33138016>

Shutak, Mike. **Cooking Up New Way to Control Lionfish**. Carteret News-Times, May 23, 2015: http://www.carolinacoastonline.com/news_times/article_4ac10560-008e-11e5-9659-637c0782cf97.html

Appendix

PRODUCT SCORE SHEET				
NAME: _____		PRODUCT CODE		
DATE: <u>May 20, 2015</u>		A01 (Lionfish Appetizer) E02 (Lionfish Entrée)		
		A01	E02	
SCORE FOR:				
7 = Excellent 6 = Very Good 5 = Good 4 = Fair 3 = Poor 2 = Very Poor 1 = Terrible	FLAVOR			
	TEXTURE			
	AROMA			
	APPEARANCE			
	PUT YOUR COMMENTS HERE			
A01 - Appetizer:				
E02 - Entree:				
SUGGESTED PRICE				
<i>(Please circle one for each item)</i>				
A01 - Appetizer:				
1) \$10.95 2) \$11.95 3) \$12.95				
E02 – Entrée (includes starch and bread):				
1) \$22.95 2) \$25.95 3) \$28.95				

Recipes

Lionfish Sliders

- 16 oz. lionfish fillets, cut in 2 oz. portions
- Tempura batter mix (available in grocery stores)
- 8 mini rolls/buns
- Oil for deep fat fryer
- Remoulade sauce (available in grocery stores)

First prepare the *Asian Slaw*.

- 32 oz. shredded red cabbage
- 4 tablespoons red bell peppers, diced
- 4 tablespoons chives, chopped
- 4 teaspoons white sesame seeds
- 4 tablespoons sesame oil
- 4 tablespoons white vinegar
- salt and pepper

Mix all slaw ingredients together. Salt and pepper to taste. *Refrigerate for 1 hour prior to serving on lionfish sliders.*

Preheat oil in deep fat fryer on high. While oil is heating, place 2 buns on each of the 4 plates with tops set aside. (Optional: lightly butter top and bottom of mini bun and toast.)

Coat front and back of lionfish with tempura batter mix. Test oil by sprinkling a touch of batter in oil. If it sizzles and rolls, the oil is hot enough. Turn down fryer one notch and carefully place lionfish in oil. Cook until golden brown.

Place 2 lionfish filets on bottom of each bun. Top with a heaping tablespoon of slaw. Add one teaspoon of remoulade on slaw. Place top bun on slider. Assemble remaining sliders. Serves 4.

Baked Lionfish Stuffed with Spring Vegetable Mousse Topped with Lemon-Garlic Scampi Sauce

- 8 lionfish filets, 3 oz. each
- 8 oz. lionfish filets (for mousse)
- 4 large leeks, cleaned and chopped
- 1 cup red bell peppers, diced
- 8 oz. blanched/cooked kale
- 16 blanched/cooked spears of asparagus
- 8 oz. blanched/cooked spinach
- 1 egg white
- ½ cup olive oil
- Paprika

Preheat oven to 400 degrees F.

Heat olive oil in skillet until smoky. Place leeks in skillet to heat, but *do not* brown. Add other vegetables and mixed thoroughly. Remove vegetable mix from skillet and set aside to cool.

Next, in food processor, add 8 oz. lionfish filets, egg white and vegetable mix. Pulse until well blended.

Place 4 filets on greased baking sheet. Spoon 3 ounces of mousse on top of each filet. Top mousse with 4 remaining filets and sprinkle with paprika. Bake for 12 to 15 minutes.

While the fish is baking, prepare *Lemon-Garlic Scampi Sauce*.

- 2 tablespoons butter, unsalted
- 2 teaspoons garlic, minced
- 1/4 cup dry white
- 1 tablespoon fresh lemon juice
- 2 teaspoons minced parsley
- 1/4 teaspoon lemon zest

Heat large skillet over medium high heat. Add butter to the skillet. Cook butter until foaming subsides. Raise the heat to high, add garlic and cook 1 minute. Add white wine and lemon juice. Boil the liquid until slightly thickened, about 30 seconds, scrape up any browned bits from the bottom of the pan with a wooden spoon. Stir zest and parsley into the sauce. Set aside and keep warm.

When fish is finished baking, place serving of stuffed lionfish on each dinner plate and top with warm scampi sauce. Serves 4.

Raw sensory data – see spreadsheet.

Lion Fish Sensory Comments

RMG 1406

May 20, 2015

1 = Lionfish Slider

2 = Baked Lionfish Entrée

Panelist 1:

- 1) Delicious, nice texture, mild flavor fish, slaw great.
- 2) Excellent, nice texture, mild flavor fish, sauce and stuffing added great flavor. Would order this meal.

Panelist 2:

- 1) More fish no bagel, love the salad side.
- 2) Very good.

Panelist 3:

- 1) Love white flaky texture; fish alone slightly bland. All together really good. Would order (three sliders) for \$11.95.
- 2) Excellent. Flaky, would not change anything. The price does not reflect the labor involved in catching this fish. I would assume the average consumer does not know what is involved.

Panelist 4:

- 1) (Minus the bun), we would have (added more spice to the tempura batter).
- 2) No changes necessary!!

Panelist 5: No comments.

Panelist 6:

- 1) Very mild fish – seems like the fish got lost with the bun. Would like to see a spicier seasoning – ate mine without the bun. Taco would be great!
- 2) Nice flavor – loved the sauce! Some dishes were inconsistent in appearance – parsley is a nice compliment to color – would like to see smaller potatoes or asparagus as a side. More sauce please!

Panelist 7:

- 1) Fish is very mild like the crispiness of crust. Like the slaw/added a crispy freshness. Would like more sauce to compliment the mild fish. Bread was over powering, (so consider a) crispy pita instead.
- 2) Appearance was different. Green garnish make it more attractive. Add asparagus spears for color and crispness. This fish is very versatile – many diff. sauces.

Panelist 8:

- 1) Very mild flavor. Salty, needs spice “kick”. Colorful presentation. Asian slaw a good match. Less bread perhaps? Pita wedges...dipping sauce? Another option – lionfish tacos.
- 2) Nice presentation – green needed. Definitely a keeper! Excellent sauce combo. More sauce to dip potatoes. Tremendous! Instead of cheese or bread, sprinkle on fish. Flakey and not “fishy” (tasting). Perfect.

Panelist 9:

- 1) Very mild, good tasting. Would fare better with a cracker, pita wrap. Very mild...could benefit from more seasoning or sauce.
- 2) Excellent flavors!! Potatoes are a great side. Some entrees came out with green chives/parsley...add to all for visual appearance. Bread a great addition. I think if people would become educated on the process, of the catch they would appreciate the time/effort/cost factor! After evaluating both the entrée was excellent! The appetizer was also good, but perhaps lose the bun.

Panelist 10:

- 1) I think it would be good with tartar sauce. Serve on its own with a lot of salad and the sauce to dip.
- 2) This dish was delicious. The red potatoes go very well and are so good dipped in the sauce I would order this in a restaurant.

Panelist 11:

- 1) Maybe add spice to breading or a bourbon or a maple glaze (or an Asian or peanut sauce). A little too mild. Nice presentation. Lot of potential. Too much bun.
- 2) Looks more presentable w/ parsley sprinkle. Scampi sauce adds good flavor. Mousse stuffing (has) good flavor. Zest up potatoes.

Panelist 12:

- 1) Presentation very nice. Almost too mild. Needs spicy (bourbon maple) (Asian).
- 2) (Needs) more sauce. Great product! Would be pleased to eat and purchase.

Panelist 13:

- 1) More of a sandwich than appetizer. Would make a great choice for lunch. Fish could use more seasoning. Very bland, not very tasty. Not something I (would) order.
- 2) A very delicious entrée. Very tasty. Seasoned well and sauce was awesome. This is a dish I would definitely order. This was my first time trying lionfish. When I heard the name I was thinking something strong in taste but it was nothing like that.

Panelist 14:

- 1) The fish itself didn't have a bad flavor. Didn't care for the tempura breading. I think a flavored glaze would help it.
- 2) Thought the entree was quite good! More so the mousse and sauce but the texture and flavoring of the fish itself was quite good. I personally think it's a \$13-15 entrée.

Panelist 15:

- 1) I did not like the breading – too salty - took away from fish flavor. Pairs well with the slaw. I liked it on the bun. Texture is good – flaky and thick white fish. (I think) \$10.95 (should be the cost) for 3 (sliders).
- 2) Flaky, very good flavor. Dressing overpowers the fish a little bit. Sauce pairs well. It was not dry at all. The reason I (chose the price point of) \$22.95 is it's being introduced to people and should have a lower price point than the established fish species, (like) grouper, snapper. If you price higher, initially, people might not be as willing to try something new.

Panelist 16:

- 1) Taste of fish alone was very clean. Taste with sandwich and slaw is very good. Could take a little more flavor. I would like (this appetizer served) with no bun. (I believe) \$12.95 for 3 (sliders is appropriate).
- 2) Flakier than appetizer. Excellent flavor in fish alone and with stuffing. Sauce over entrée was delicious.

Panelist 17:

- 1) Lightly battered; good visual – perhaps a spicier flavor would appeal to my palate better than ??? sauce.
- 2) Kale, asparagus, leeks for enhanced color, it could have had a few asparagus on top; lovely texture and flavor. I think the innate blandness of the fish makes for a culinary opportunity – you can add any (number) of flavors (or) vegetables. Sauces and herbs could add additional layers/texture to this invasive fish!

Panelist 18:

- 1) Taste is mild and I like mild fish. Texture was very nice. Aroma was not strong – very nice. Appearance was a nice white color.
- 2) Excellent for main dish in every way! I would order!

Panelist 19:

- 1) (It) was a little salty with the first bite. I use very little salt when I cook. Very nice texture and good flavor. Not as salty on bun.
- 2) Really good flavor, flakiness, texture was good liked mousse, more sauce. Not fishy, needs asparagus as a side. Maybe risotto instead of potato.

Panelist 20:

- 1) (Needs) more crunch on the breading – more sauce. Nice warm bread! Needs to be a bit softer of a roll on the slider. Slaw and spinach (or) lettuce salad instead?
- 2) Do something with the potatoes – they are an eyesore on the plate – prepare more than just plopping on the plate! Yum on the fish. Beautifully prepared! Maybe pair with a risotto and a simple green (vegetable, such as asparagus). Grease on plate from sauce. Perfect portion size.

Panelist 21:

- 1) Mild tasting, good presentation. Could take on most any flavor. Maybe 3 on a bed of slaw with the (remoulade) sauce on top.
- 2) Portion size is good. It's rich! Maybe serve with rice or risotto. Great combo of flavors, all worked well together. Sauce is terrific. You could use the lionfish mousse in a baked potato (stuffed) with the veggies. Chose (the price point of) \$28.95 given the fact that it is labor intensive to clean.

Panelist 22:

- 1) A little fishy smelling (but) does not taste fishy. Very good. Slaw and dressing added to the flavor.
- 2) Very good (lemon-garlic scampi sauce) and good tasting. Would suggest rice instead of potatoes. Overall very good. I would be careful with serving the fish alone because the texture can be a little too flaky and fishy.

Panelist 23:

- 1) The slaw went well with lionfish – (an) appetizer (consisting of) 3 (sliders) may need to be shared. Could imagine it fixed many different ways – maybe without bread served on top of salad.
- 2) Great! Loved the mixture of the foods especially including super foods! I personally could have enjoyed asparagus in lieu of potatoes. Would even consider higher prices considering (the) labor involved (in harvesting lionfish) especially because (restaurant) specials are usually \$30.

Panelist 24:

- 1) Attractive presentation! A little salty. Otherwise, excellent (combination) of flavors. Bun is a little too hard for such a soft fish. I'd definitely order this! I think (serving) 3 sliders is too many! I would do one on (a) different bread or on (a) bed of slaw.
- 2) I'm unsure, as I'm about half through (with my serving). About the texture of the ??? It's delicious in flavor – rich. Definitely don't go any bigger. Really, really good! There were big chunks of green leek maybe? I would make them smaller but other than that, OMG delish! I can't decide which dish I liked better!! So good!!

Panelist 25:

- 1) Very beautiful appearance. Smelled very tasty. The batter was very good and fried just enough. Excellent. (Three) sliders seems like a very good deal.
- 2) Very nice display on plate. Aroma made it very tempting. Texture was nice, sauce was amazing. Full of flavor, very complex taste. \$25.95 more than enough.

Panelist 26:

- 1) Would have liked better ??? the bread.
- 2) Would not do (2) potatoes! Would do one small (potato) and maybe asparagus or another vegetable. Something green instead of 2 potatoes.

Panelist 27:

- 1) Excellent, mild texture, enjoyed the presentation.
- 2) Excellent! I would come here again and purchase this meal. It was by far the best fish I had ever had.

Panelist 28:

- 1) Surprised by its texture and flavor. Enjoyed this appetizer. (Suggest) \$12.95 for 3 (sliders).
- 2) Very nice presentation, very delicious! Would eat this again.

Panelist 29:

- 1) Liked: the fish was meaty and not “fishy” tasting. A guy will like this as an appetizer. Did not like: only that it was fried. (Suggest) \$12.95 for 3 sliders.
- 2) Like: Excellent texture. The fish carried the flavor of the sauce. This dish was well prepared. It was a great meal. I would order it or prepare it at home. There was nothing I didn't like.

Panelist 30:

- 1) Great taste. It was a mild fish flavor. One would be enough of an appetizer for me. If you got (three) it would be enough for a dinner.
- 2) Outstanding entrée!! It was made to perfection and I would definitely order this. The fish was mild and flaky and veggie and sauce delicious.

Panelist 31:

- 1) Like: mild flavor, like the slider.
- 2) Like: excellent flavor would definitely order this. Dislike: would rather have vegetables than potatoes.

Panelist 32:

- 1) Interesting take on fish sandwich. (Three) would be too much for one person (as) an appetizer. Could be Okay for group of (two) or (three).
- 2) Excellent – something I would order and I am a picky eater of fish. Would prefer side of vegetables instead of potatoes – too much starch with bread. Potatoes were good however.

Panelist 33:

- 1) A little more bread than I cared for but fish was great! Would pay extra for less bread.
- 2) Fish is great! Sauce out of this world. I am going to (choose the price point) \$22.95 but if (I were offered) extra (vegetables) or salad, (then) \$25.95. Again excellent!

Panelist 34:

- 1) Good texture (much like flounder).
- 2) Best fish I have ever had! No fishy taste – plenty (of food).

Panelist 35:

- 1) I liked it better w/out the bread – the flavor is so delicious and the bread overwhelmed it. It's very good. I would order this but without the roll.
- 2) I love this! Everything about this was awesome. Like the texture and the flavor excellent. I'm ready for this to be on the menu! Don't change anything. It's the best fish I've ever eaten.

Panelist 36:

- 1) Very good. Better than flounder. If fried, could be (crispier) for my taste.
- 2) Very, very good! I would easily pick this over other fish on menu.

Panelist 37:

- 1) Very good. Like it better without the bread. Slaw and remoulade excellent. I could not taste the fish when in the bread.
- 2) Perfect! Wouldn't change a thing. John never orders fish in restaurants but said he would order this in a heartbeat!

Panelist 38:

- 1) Great – would purchase – great flavor – like both on slaw – or bun – texture great.
- 2) One of best meals – this fish could go on – this fish would carry itself not a strong.

Panelist 39:

- 1) Fish has an excellent flavor. Slaw and sauce were nice compliments. Better without bread. Bread overwhelmed the fish.
- 2) Outstanding in all aspects. Plate could have a bit of color/garnish – just for presentation. Would not change anything about the fish.

Panelist 40:

- 1) A good appetizer light and mild in flavor. Could perhaps use some sort of sauce to add to taste.
- 2) An excellent dish; texture (was) varied between the various elements. Flavor was also mild, yet also varied.

Panelist 41:

- 1) Light meat, nice appearance, spicy sauce would add to the experience.
- 2) Texture better, taste excellent. Excellent entrée – I would order at the Bistro.

Panelist 42:

- 1) Light and mild but still has a sturdy taste and feel.

Panelist 43:

- 1) Meat needed a little more salt.
- 2) No changes. Excellent as is.