



**NC GROWING TOGETHER**

Connecting Local Foods  
to Mainstream Markets

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# An Analysis of North Carolina's Seafood Industry: National and State Perspectives



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## **Executive Summary**

The seafood industry is fragmented at both the national and state level due to macroeconomic forces, which have limited the domestic supply of wild caught seafood available for sale to domestic consumers. Opposing business strategies have developed over the years that prevent collaboration among supply chain partners as each operator seeks to boost margin for their particular stage and not for the entire supply chain. This conflict is perhaps the greatest between fishermen and processors.

With limited catch volumes, the supply of available seafood is sold to markets where the highest price can be obtained. As a result, almost all of the wild caught seafood in the U.S. is exported because seafood fetches higher prices overseas. In response, processors and other downstream operators fill the void with less expensive imports which are processed into the seafood products sold to U.S. consumers. Seafood prices are kept low for both the processor and consumer largely because seafood is imported in high volume. Thus, commercial fishermen are de-incentivized to catch and sell seafood for the domestic market.

The local foods movement presents an opportunity for growth within North Carolina's seafood industry. This developing trend is the result of an emerging awareness and concern about the safety of food supply chains. Subsequently, U.S. consumers are seeking out local food sources where the supply chain between producer and consumer is well documented and may be willing to pay a premium for local food. North Carolina's commercial fishermen and others have made attempts through Community Supported Fisheries to capitalize on this trend. However, collaboration across the seafood supply chain is required for North Carolina's commercial fishermen to fully realize the potential profits from selling wild caught seafood through mainstream markets.

## Study Scope

NC Growing Together is a five year (2013—2017) USDA-funded project that seeks to bring more locally-produced foods into mainstream markets. Its purpose is to enhance food security by increasing access to local foods and by strengthening the economics of small to mid-sized farm and fishing operations. The project will achieve this by identifying the most promising solutions by which local production and associated value-added activities can enter local retail and food service markets, piloting these solutions in North Carolina, and evaluating and reporting the results for the benefit of other states and regions (Center for Environmental Farming Systems, 2013).

## Objective

A key activity for the project's first year was to establish multi-partner supply chain advisory teams to define informational and training needs for local supply chain development. This study represents one aspect of the Seafood Supply Chain team's work toward local seafood supply chain development. Its purpose is to investigate the overall supply chain structure of North Carolina's seafood industry and to document opportunities and barriers to selling to project partners based on fishing operators' current readiness to sell and project partners' current readiness to buy. The specific study objectives are to:

1. Collect data on product flows between the dock and end consumer to document the quantity of local seafood that is caught and distributed to end consumers.
2. Conduct interviews with the project partners and a sample of small and mid-scale North Carolina fishing operators to assess market readiness and strategic fit between the two groups.
3. Provide recommendations on how to exploit opportunities to incorporate North Carolina seafood into inland mainstream markets and alleviate barriers to selling through NC Growing Together project partners.

## Methods

Given the project's goal of connecting small and mid-scale fishing operations to mainstream retail and food service market channels, market readiness interviews were conducted with operators located in the Central Coastal region of North Carolina. This area was chosen because it embodies the challenges facing North Carolina's seafood industry as well as promising solutions to those obstacles.

Documenting local seafood supply chains presents a few challenges that are unique to the industry. First, there is no standard definition of "local" for seafood. In general, consumers describe "local" as made or produced within 100 miles of their home or as made or produced in my state (GRACE Communications Foundation, 2013). However, these definitions are problematic for wild caught seafood since product is often harvested in International waters or off the coast of other states and then landed in North Carolina<sup>1</sup>.

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<sup>1</sup> Landed: fish is brought to shore for unloading by commercial fishermen. Source: United Nations Food and Agriculture Organization. Fisheries Glossary. <http://www.fao.org/fi/glossary/default.asp>

Alternatively, seafood can be harvested in North Carolina, landed in neighboring states or processed out-of-state but sold in North Carolina.

Second, seafood is a broad food category that at a high level includes fish and fishery products. The U.S. Food and Drug Administration (FDA) defines fish as fresh or saltwater finfish, crustaceans, other forms of aquatic animal life other than birds or mammals, and all mollusks, where such animal life is intended for human consumption (FDA, 2011). The agency defines fishery products as any human food product in which fish is a characterizing ingredient (FDA, 2011). Third, the means of harvesting seafood - wild caught or aquaculture – involve different operational inputs and processes which result in supply chain variation. Finally, seafood product is processed into different product forms based on consumer preference by species.

Throughout this study, local is defined as seafood commercially landed in North Carolina. Accordingly, seafood product flows were traced from landing to end consumer using commercial landing data provided by the North Carolina Division of Marine Fisheries (NCDMF) and information captured from fishing operators and buyers through surveys. By defining local in this way, the study is intentionally restricted to an assessment of wild caught seafood. To further limit the scope, four commercial species - Blue Crabs, Hard Clams, Flounder (southern and summer), and Shrimp – were selected as the basis for tracing product flows through the supply chain<sup>2</sup>. These species are vitally important to the central coast because of their high availability and commercial value. The various product forms in which these species are processed and consumed are reported, when such data were obtainable.

## Reports

Reporting will be done in two phases. This report, the first phase, provides an overview of the current state of the seafood industry at the national and state level with an emphasis on the supply chain structure of North Carolina's seafood industry. It also provides baseline macroeconomic trends that will be useful in identifying solutions to connect small and mid-scale operators with mainstream retail and food service market channels.

The second phase of the report is a market readiness assessment, evaluating the feasibility of a strategic fit between North Carolina's small and mid-scale commercial fishermen and the NC Growing Together project partners. Recommendations will be provided on how local fishing operations can access inland retail and food service market channels. See Appendix A for project scope and work plan.

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<sup>2</sup> Landings data for the following species have been collapsed into one category for this study: hard- and soft-shell blue crab is reported as Blue crab and brown, white, and pink shrimp are reported as Shrimp.

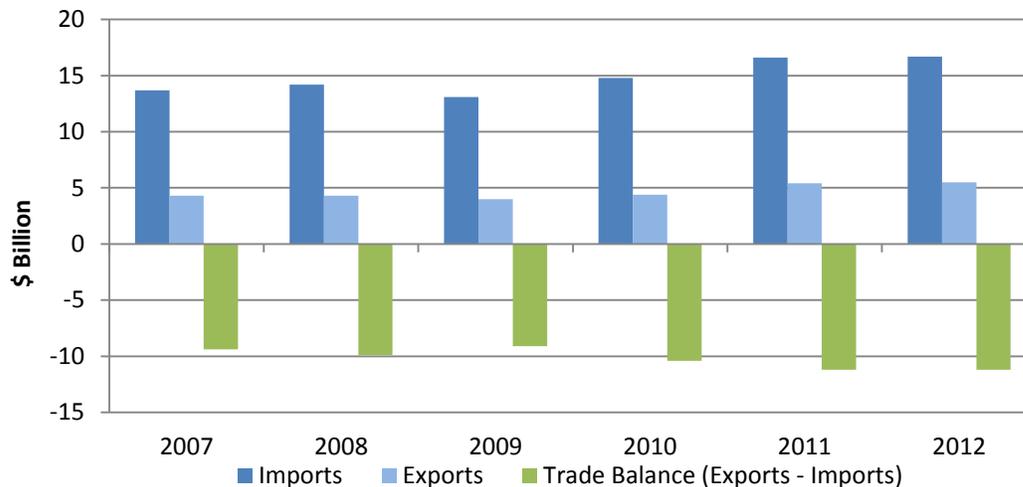
## Industry Overview

Seafood is the world's most traded food commodity, and also the most diverse in species, form and origin (Holmyard, 2014). A key trend affecting the industry is the shift in seafood purchasing power toward developing nations, who are already familiar with the health benefits of seafood consumption and do so in high volumes. These consumers will want to increase their consumption, which likely will lead to an increase in exports and reduction in imports for U.S. seafood consumption (Holmyard, 2014).

## International Seafood Trade

The United States seafood industry has acquired a trade deficit of about \$7.0 billion for much of the past decade (Neville, 2013). This is the result of exporting almost the entire domestic catch, and then importing seafood to largely satisfy domestic demand. Supply shortages overseas due to strong demand make prices from exporting more lucrative for U.S. fishing operators than selling domestically (Neville, 2013). Additionally, fluctuations in currency value impact the seafood trade deficit. Overseas demand for U.S. seafood increases, when the value of the U.S. dollar depreciates relative to other currencies. Conversely, when dollar value appreciates, import volumes raise faster than exports thereby causing a trade deficit for U.S. fishing operations (Neville, 2013). A six year, trade value comparison is depicted in the chart below.

**Figure 1: U.S. Trade in Edible Fishery Products (2007-2012)<sup>3</sup>**



In 2012, U.S. exports of edible fishery products of domestic origin were 1.4 million tons valued at \$5.12 billion (NOAA, 2012). High volume exports include salmon, lobster, and surimi<sup>4</sup>. These products are sold in Asia and Europe, with China accounting for 25 percent of all U.S. exports. Edible fishery product

<sup>3</sup> Data Source: NOAA Fisheries Statistical Highlights 2007 - 2012

<sup>4</sup> Surimi: protein paste derived from processing raw fish, primarily Alaska (walleye) Pollock and Pacific whiting (hake). Surimi can be combined with flavoring agents and other substances and extruded to create marketable foodstuffs (e.g. imitation crab meat). Source: *Sharing the Fish: Toward a National Policy on Individual Fishing Quotas*. Glossary. 1999.

imports for 2012 were valued at \$16.7 billion due to a 0.6 percent increase in quantity imported (NOAA, 2012). High volume imports include shrimp, salmon, and tuna. About 91 percent of seafood consumed in the U.S. is imported, with the break down between wild caught and farm-raised at 50 percent each.

Seafood imports by major export countries are China, Canada, Thailand, and Indonesia (Neville, 2013). China accounts for 23 percent of imported seafood, while Canada and Thailand each account for 12 percent. Indonesia accounts for 8 percent of imports (NOAA, 2012) .

### **Foreign Trade: Import and Export Volume by Species**

Import and export data were analyzed by volume for clams, crabs, flounder, and shrimp to discover any recent trends concerning seafood product flows. Import and export species data were obtained from NOAA Commercial Fisheries Statistics for years 2008-2012<sup>5</sup>. Accordingly, trade information for this species is presented in this report as this product form. Crab data analyzed is pulled from the "other" category, since blue crab data would be reported here. See Appendix B for foreign trade by species data tables and charts.

In analyzing volume by species, three significant changes in trade balance were observed over the last five years:

1. Export volumes increased for crabs by 31.2 percent on average.
2. Export volumes for surimi have increased by an average of 9.5 percent.
3. Both import and export volumes for oysters have dropped; imports by 56.6 percent and exports by 1.7 percent on average.

The steady increase in crab exports may be the result of substitution for limited supply of snow, Dungeness, and King crab in West Coast fisheries from 2008-12<sup>6</sup>. For the same time period, clam, flounder and shrimp continue to have trade balances favoring imports. Clam import volume rose by an average of 26 percent indicating a continuous rise in the number of imported clam products. Flounder, which is imported without a corresponding domestic export for net trade, on average had relatively steady imports with a modest 0.34 percent change in volume. This finfish has high commercial value as a lean white protein with light, delicate flavor. Shrimp continues to be one of the largest seafood products imported into the U.S. by volume. Shrimp imports increased an average of 7.8 million metric tons for the five year period.

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<sup>5</sup> Data source: Imports and Exports of Fishery Products Annual Summary for years 2008-2012. NOAA Fisheries. <http://www.st.nmfs.noaa.gov/assets/commercial/trade>

<sup>6</sup> Shellfish (Crab) Market Reports for years 2008-2012. SeafoodSource. <http://www.seafoodsource.com>

## **The U.S Fish and Seafood Industry**

Overall the industry's life cycle is in a mature state, meaning revenue growth has slowed to the same pace as the U.S. economy and downstream markets are clearly defined. Revenue for 2013 is estimated to be \$6.4 billion, with 71 percent contributed from exports (Neville, 2013). Annual growth over the next five years is projected to increase by 0.3 percent to 6.6 percent. However, taken over a ten year period from 2008 through 2018, annual growth is projected to remain flat. Industry revenue depends on catch volumes, prices, and demand from seafood processors and markets which is ultimately driven by per capita seafood consumption.

### **Revenue Drivers**

#### **Catch Volumes**

The harvest nature of wild caught fish and seafood means supply is unpredictable. Restrictive environmental regulations can cause revenue volatility, leading commercial fishermen to make costly trade-offs to offset lost revenues from area closures and quotas<sup>7,8</sup>. Area closures, which are implemented to protect endangered or threatened species, can lead to reduced catch volumes for non-target species in the same ecosystem. Although reduced supply causes seafood prices to increase for non-target species with high demand, area closures prevent local fishermen from realizing these higher prices since their access to fisheries is restricted. Once the area is reopened to fishing, global prices could have decreased because demand has been met by supply from non-affected areas.

Moreover, local prices quickly become depressed as a surplus in the affected area is built up. The surplus is a result of the response to area closures: local fishermen increase fishing effort just before and after area closures in an attempt to capture some portion of either rising (after closure) or diminishing (before closure) prices. The combination of area closures and individual behavior has ruinous effects on profitability for the supply chain and possibly the environment and fish mortality reduction effort, when operating costs are higher than prices earned.

Disasters caused by humans and adverse weather can also introduce revenue volatility by thwarting harvest volumes, thus triggering revenue to move erratically up or down. While not fully realized, manmade disasters like the 2011 Fukushima Daiichi nuclear scare are anticipated to have an overall benefit to producers as demand in Japan pushes U.S. seafood export volumes higher in response to

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<sup>7</sup>Area Closures: the closure to fishing by particular gear(s) of an entire fishing ground, or a part of it, for the protection of a section of the population (e.g. spawners, juveniles), the whole population, or several populations. The closure is usually seasonal but it could be permanent. Source: United Nations Food and Agriculture Organization. Fisheries Glossary. <http://www.fao.org/fi/glossary/default.asp>

<sup>8</sup>Quota: a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. Source: Pacific Fisheries Management Council. 2005. Commonly Used Acronyms and Definitions. <http://www.pcouncil.org/acronyms.html>

consumer concerns about tainted fish and seafood (Neville, 2013). Conversely, disasters like the 2010 BP oil spill in the Gulf of Mexico brought U.S. commercial fishing to a halt.

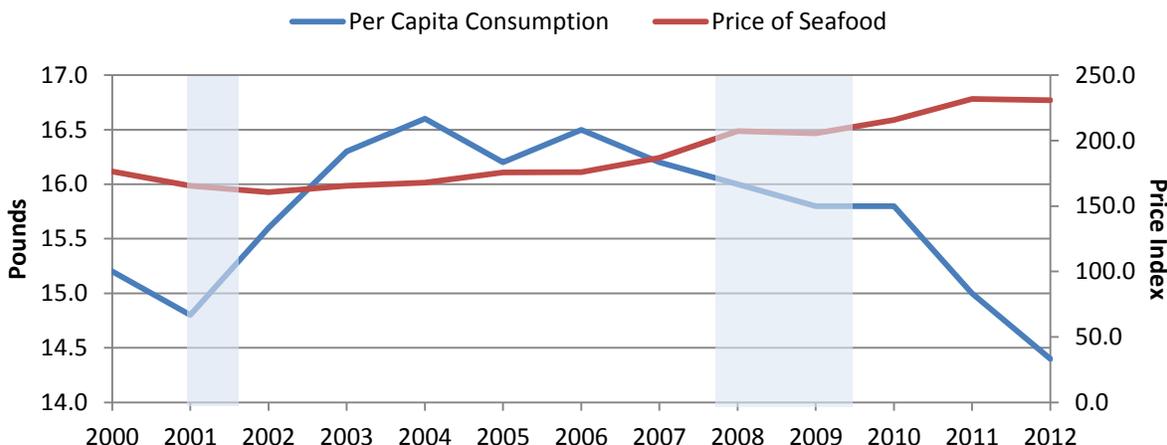
Weather effects vary based on severity. Subtle effects like El Niño and La Niña patterns, where water temperature becomes unseasonably warm or cool off the West Coast, can affect availability of fish stock in affected regions as schools of fish are diverted to and from other regions (Neville, 2013). Hurricanes in the Gulf and Atlantic not only destroy boats but can also build up sediment deposits closing waterways and preventing access to fisheries.

### **Seafood Prices and Consumption**

The industry competes against other protein sources like red meat and poultry for U.S. consumers' disposable income. However, because seafood is perceived as a luxury good, its consumption is more sensitive to changes in the economy. As shown in Figure 2: Per Capita Seafood Consumption and Seafood Prices, seafood consumption and price are directly correlated. Moreover, consumption is further effected when the U.S. economy experiences a contraction or expansion. During two recent contractions, the Dot.com Bubble (2001) and the Great Recession (2008-2009), seafood consumption fell precipitously. It recovered and remained high during the most recent economic expansion period (Q4 2001–07).

A similar recovery in seafood consumption is observed for the years 2009 – 2010, which coincides with another economic expansion as declared by the Business Cycle Dating Committee of the National Bureau of Economic Research. Consumption drops off again in 2010; however, due to consumer concerns regarding seafood as a result of the Deep Horizon oil spill in the Gulf of Mexico in the summer of 2010. Consumption levels have not recovered since that time, which can be attributed to externalities associated with the oil spill. For example, the higher seafood prices observed since 2010 can be attributed to seafood processors passing onto the consumers the higher transportation costs associated with an increase in imported seafood.

**Figure 2: Per Capita Seafood Consumption and Seafood Prices<sup>9</sup>**



### Operational Structure

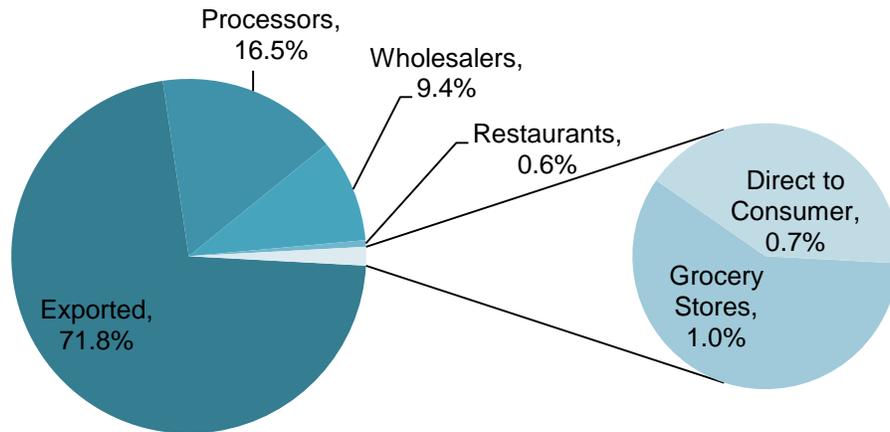
As the result of unbalanced international trade, the seafood industry could be characterized as having two separate supply chains by function performed. Fishing, the first function, generates value from exporting commercially wild caught fish and seafood. Processing, the second function, generates revenues from manufacturing purchased fish and seafood inputs into consumable food products. The following sections provide operator role information and key statistics separated by these two functions. A supply chain model depicting the seafood product flows and value of sales by activity is provided in Figure 4: U.S. Seafood Supply Chain Model, Product Flow, and Value of Sales by Activity.

### Fishing Supply Chain

**Commercial Fishermen:** licensed individuals who primarily catch finfish, shellfish and other marine products for commercial sale with little to no alteration or processing. Most fishing operations are relatively small, self-employed operations. Therefore, few companies possess a significant market share of the total industry (Neville, 2013). Major U.S. fishing regions by total number of establishments are the West Coast (48.7 percent), New England (25 percent), and the Southeast (13.9 percent). By state, the highest concentration of fishing operations exists in Washington (20.8 percent), Maine (13.8 percent), and Florida (6.4 percent). By in large, wild caught seafood is exported either processed or unprocessed with less than 10 percent sold domestically as shown in Figure 3: Percentage of Total Harvest Sold Domestically in 2012.

<sup>9</sup> Data Sources: 1. NOAA Fisheries Statistical Highlights 2012, Per Capita Seafood Consumption is based on Civilian Resident Population. 2. U.S. Bureau of Labor Statistics, Producer Price Index – Seafood Product Preparation and Packaging; Base Year 1982.

**Figure 3: Percentage of Total Harvest Sold Domestically in 2012<sup>10</sup>**



### **Fishing Supply Chain: Barriers to Entry**

Barriers to entry for fishing operators are high and largely due to restricted access to supply, exchange rates, and capital costs. To compete, operators must first gain access to waters that are regulated by federal and state governments and other governing bodies such as fishery management councils. Each government issues a limited number of commercial licenses, which entitle the holder to a share of the fishing quota in a particular region and to legally sell fish commercially (Neville, 2013). Additionally, some state governments issue broker/dealer licenses that entitle the holder to buy and sell wild caught seafood from a commercial fisherman. Because there a limited number of licenses issued, it is difficult and often costly for a new entrant to obtain one. Permits for sale can range in price from \$5,000 to more than \$200,000 based on fishery location and type (Dock Street Brokers, 2013).

Capital costs, as well as access to funds and time to return on investment, may deter new entrants into commercial fishing. Equipment such as Trawlers can range in price from about \$40,000 to upwards of \$600,000 based on condition, length, purpose, and location (Boat Trader, 2012) . High investments like this would require bank loans, which are difficult to obtain because lenders are likely to regard commercial fishing as high risk; thus, making access to funds with favorable terms less likely to occur (Neville, 2013).

<sup>10</sup> Data Source: Neville, Antal: *Fishing in the US*, IBISWorld Industry Report. September 2013.

## **Processing Supply Chain**

**Seafood preparers (processors):** firms that buy fresh and frozen seafood from brokers or dealers for processing into final consumable products, such as fillets, tails, and ready-to-eat or cook seafood products. Seafood may be purchased from a combination of domestic or imported sources.

Processing activities can take place onboard floating factory ships, which is primarily done by vertically integrated fishing operations like the top four players: Trident Seafoods, Thai Union International, Bumble Bee Foods, and Nippon Suisan Kaisha (Cohen, 2013). This segment of the industry has a medium level of market share concentration, with the top four companies accounting for 44.6 percent of revenue (Cohen, 2013). By state, the highest concentration of seafood processors is in Alaska (18.7 percent), Massachusetts (6.3 percent), and Louisiana (5.3 percent).

**Seafood Wholesalers and Distributors:** intermediaries who purchase seafood from processors and sale it to grocery retail or food service customers in the U.S. market. Total revenue is expected to be \$12.1 billion for seafood wholesalers and distributors, with 1.7 percent annual growth over the next five years (McBee, 2013). Operations are heavily concentrated in the Southeast and West, which is about 52 percent of the total industry. Major food service players by market share are Sysco Corporation (15.7 percent) and U.S. Foods (7 percent). On December 9, 2013, Sysco Corporation and U.S. Foods agreed to merge (U.S. Foods, 2013). Major players in grocery wholesale by market share are C&S Wholesale (16.7 percent), Wakefern Food Corporation (7.7 percent), and Supervalu, Inc. (5.8 percent).

## **Processing Supply Chain: Key Distribution Channels**

U.S. consumers buy and consume seafood primarily through these market channels. The seafood sold at this point is mostly imported. Seafood product forms vary based on channel customer needs, food safety guidelines, and consumer preference.

**Fish and Seafood Markets:** independent retailers who sell fish and seafood items. These retailers sell direct to consumer (66 percent) and restaurants (34 percent). Operators are mostly concentrated in the Mid-Atlantic, Southeast, and West regions of the U.S. There are no major players in this segment of the industry; thus, market concentration is low.

**Supermarkets and Grocery Stores:** private and publically traded retailers that sell food products directly to consumers. Supermarkets and Grocery Stores account for about 91 percent of the \$571 billion U.S. food retail market. Total 2013 revenue for these channels is projected to be \$517.8 billion, of which 17 percent is contributed from sells of fresh and frozen meat including seafood (Cohen, 2013). Excluding big-box retailers like Wal-Mart, a few of the major, national supermarket and grocery chains by market share are The Kroger Co. (16.0 percent), Safeway (7.4 percent), Publix (4.7 percent), and Whole Foods Market (1.7 percent).

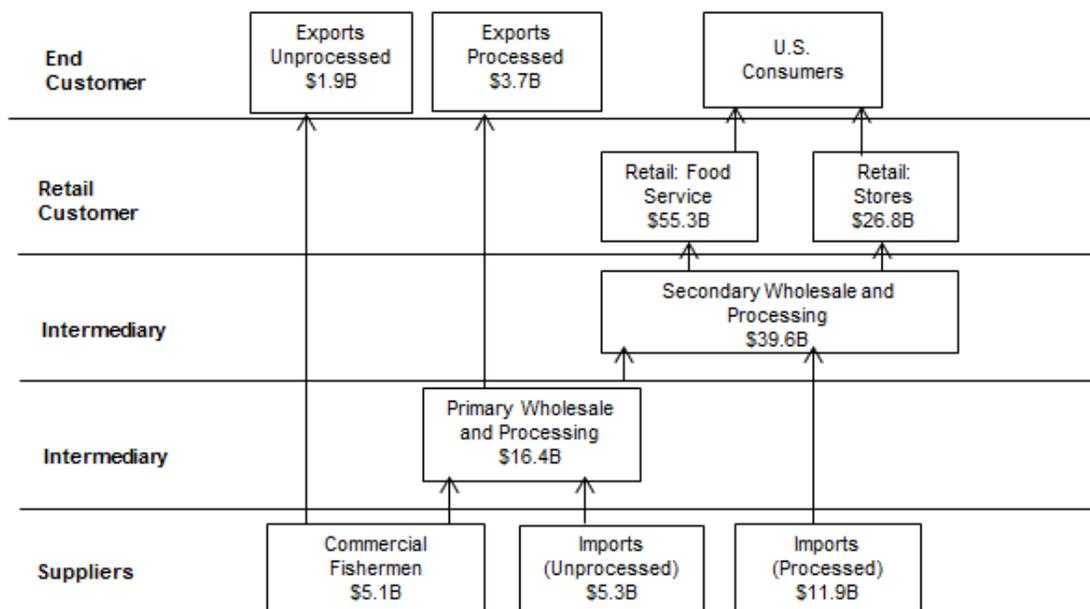
**Restaurants:** market channel composed of single, independent or family-operated restaurants, as well as multiple location full or quick service, chain restaurants. Demand from full service restaurants represents an estimated 34 percent of total demand for fish and seafood (McBee, 2012).

**Processing Supply Chain: Barriers to Entry**

Despite intense external competition for businesses in each of these segments, the levels of barriers to entry vary by market channel. Levels are relatively low for fish and seafood markets since capital investment is usually in the form of rented equipment and floor space, which is typically smaller and less costly as compared to other retailers (McBee, 2012). Barriers to entry for Supermarkets, Grocery Stores, and Restaurants are medium to high due to intensive capital investment in buildings, fixtures, and sales and inventory systems.

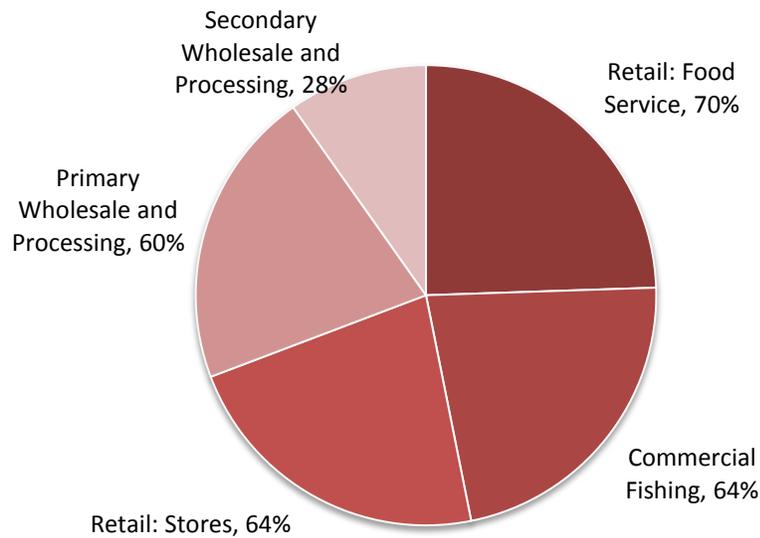
Investment costs are also high for wholesaling due to the cost of establishing warehouse and distribution systems. Additionally, building and maintaining business relationships with up and downstream clients require considerable effort and time. Thus, there is a substantial opportunity cost for new entrants particularly for broker/dealers or commercial fishermen seeking to vertically integrate into the seafood processing or wholesale businesses.

**Figure 4: U.S. Seafood Supply Chain Model, Product Flow, and Value of Sales by Activity<sup>11</sup>**



<sup>11</sup> Data Source: Summary of 2012 Value Added, Margins, and Consumer Expenditures for Commercial Marine Fishery Products in the United States. National Oceanic and Atmosphere Administration, Fishery Statistics Division. <http://www.st.nmfs.noaa.gov/commercial-fisheries/index>

**Figure 5: U.S. Seafood Supply Chain Value Added as Percent of Total Markup<sup>12</sup>**



## Industry Trends Supply Side Trends

### Technology Advancements: Options to Reduce Supply Volatility and Improve Profitability

**Aquaculture:** About half the seafood eaten worldwide is farm-raised, making aquaculture the fastest growing form of food production in the world (NOAA FishWatch, 2013)<sup>13</sup>. Supply volatility can be reduced through aquaculture, since its controlled environments enable monitoring of fish and seafood production as well as standardization of size and quality. These controls allow producers to more accurately forecast production levels, thereby controlling prices (Neville, 2013).

**Improving Trip Efficiencies:** A commercial fishermen's the decision to take a trip can have deep financial repercussions given the unpredictability of supply and operational cost of the trip. Fuel purchases make a large portion of costs for fishermen and profits are very susceptible to changes in fuel prices. Most fishing vessels rely on diesel fuel to power boats and fuel consumption can easily be about 1,000 gallons per day (Neville, 2013). During the last five years, high fuel prices have taken a toll on profits for commercial fishermen. Therefore, technology advances like biodiesel-powered propulsion and the use sophisticated navigational and search equipment have lowered fuel costs.

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<sup>13</sup> Aquaculture: the farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Source: United Nations Food and Agriculture Organization. Fisheries Glossary. <http://www.fao.org/fi/glossary/default.asp>

Opportunity costs associated with downtime for net repairs and replacements and short trips have also lessened with technology advances. Improvements in fishing technology, like durable nylon and synthetic fiber for nets, have increased trawling efficiency and onboard cold storage increases the shelf life of fish thereby increasing profitability (Neville, 2013).

### **Market Threat: Change in Foreign Trade Policy Impacts Revenue Volatility**

**Monetary Policy:** The competitiveness of U.S. commercial fishermen is sensitive to changes in monetary policy, since the industry's dependence on exports ties revenue to exchange rates and demand from Asian countries. For example, quantitative easing policies (QE) have artificially depressed the value of US dollar thereby bolstering demand and limiting volatility in overseas markets. With the end of QE, demand for U.S. seafood abroad may decrease as relative prices increase and international consumers purchase cheaper, locally available seafood substitutes. Similarly, an appreciating US dollar would make imported seafood relatively more inexpensive to domestic customers and consumers. Therefore, assuming no further macroeconomic intervention, domestic seafood may be placed at a greater competitive disadvantage to imports in local markets based on prices.

### **Demand Side Trends**

#### **Consumers: Health Concerns Provide Growth Opportunities**

**Protein Alternatives:** Recent media attention surrounding studies that report negative health effects associated with red meat consumption have given white meats – like seafood – an advantage during the past decade (Neville, 2013). Seafood has become increasingly popular because it has a lower fat content than red meat. Seafood's relatively low price as compared to prices for beef and veal, which have risen faster than prices for all other meat items, contributes in making it an attractive protein alternative (U.S. Bureau of Labor Statistics, 2013). However of the white meat options, poultry continues to dominate U.S. meat consumption as prices for chicken and turkey are usually more competitive than those for fish and seafood (Neville, 2013).

As disposable incomes recover, domestic demand for seafood will increase. In the meantime, industry promotion aimed at educating consumers on the health benefits of omega-3 fatty acids which fish exhibit in high levels can help to spur seafood consumption. Flounder is an example of a good, low-fat protein source rich in B vitamins and niacin. Promotions could modeled after the National Fluid Milk Programs *got milk?*<sup>®</sup>/*Milk Mustache* advertising and milk incentive campaign, which targeted consumers by highlighting that Americans are not getting all of the essential nutrients they need (USDA, 2011). Within its first year of launch, the campaign increased consumption by 6.0 percent in California - the initial market targeted by the promotion (Datamonitor, 2004).

**Food Origin Concerns:** Food supply chains are extremely complicated and vulnerable to risks like fraud. Examples of food fraud like the 2013 horsemeat scandal, in which horsemeat and not processed beef was supplied in frozen lasagna sold in the UK grocery retailer Tesco, have raised concerns about the complexity of tracing food through long supply chains involving multiple suppliers (de Castella & Wheeler, 2013). Risks of food fraud can increase when food inputs are imported due to an increased number of suppliers as well as regulatory differences governing how food is raised, harvested, processed, and marketed. The FDA is responsible for ensuring that seafood imports are safe for U.S. consumers, which it does by requiring that all imported seafood be held to the same standards as domestic seafood ( Food Drug and Administration, 2007). However the system relies on self-reporting and for cause audits, which is a lengthy enforcement process with long supply chains.

Concerns about the security and safety of food, along with other facets of the local food movement, could present a growth opportunity for small and mid-scale fishing operators. Because the supply chains are shorter, it would be easier to trace the origin of locally caught or farmed seafood. There are challenges to be addressed such as the complexity in traceability seafood processing would inject into supplying local seafood, if processors are not in proximity to commercial fishermen. Additionally, infrastructure requirements like cold storage and transportation and HACCP training should be assessed and considered.

#### **Threat: Channel Consolidation Changes Buying Power Dynamics**

The decline in the number of downstream operators, particularly in wholesale and retail is the result of consolidation through mergers and acquisitions. Ongoing consolidation among food retail chains is increasing retailers' buying power allowing them to engage in wholesale bypass and change the channel structure<sup>14</sup>. This effect might not be felt as keenly for large wholesalers and processors with a national scope, as they will become more attractive to similarly sized and positioned food service and grocery chains. However, sales to and demand for small wholesalers and processors would decline unless they are specialty operators that offer unique food products (McBee, 2013).

Overall, consolidation shifts buying power to larger entities that can use economies of scale to dictate favorable purchasing terms and pricing at the expense of smaller entities. Therefore, merger and acquisition activities will take place throughout the channel to maintain competitive advantage. Additionally, changes within supermarkets and grocery retailers will introduce cost-cutting methods like reducing service counters or limiting their value add services thereby placing demand on processors to provide seafood in case ready packages and ready to cook or eat product forms (Cohen, 2013). As the grocery market segment continues to contract, demand from food service is expected to increase 2.8 percent on average due to increased consumer spending (McBee, 2013).

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<sup>14</sup> Wholesale bypass is cost reduction strategy used by grocery retailers involving buying directly from a food manufacturer like a seafood processor.

## The N.C. Seafood Industry

North Carolina's coast, land located east of I-95 and bounded by Virginia and South Carolina, is composed of diverse bodies of water including sounds, rivers, and marshes as well as diverse fisheries. The coast is subdivided around Cape Hatteras by two ocean currents: the Gulf Stream, a warm water current to the south; and the colder Labrador Current to the north. This combination of water temperatures results in an up-welling of nutrient rich water, which leads to diverse species of shell- and finfish available for harvesting along the coast.

Commercial fishing activities, as defined by the NCDMF Trip Ticket Program, take place in the Albemarle-Pamlico estuarine system, all inshore waters in the southern part of the state, and the Atlantic Ocean. There are 19 coastal fishing counties in North Carolina, which are mostly made up of small towns and communities that are dependent on three major sources of income: tourism, including recreational fishing; agriculture; and commercial fishing (Bianchi, 2003). See Figure 6: Map of North Carolina Coasting Fishing Counties 6 for a map of the 19 counties.

**Figure 6: Map of North Carolina Coasting Fishing Counties<sup>15</sup>**



## Commercial Seafood Trade

In 2012, the top five species by pound were blue crabs (26.8mm), shrimp (6.1mm), Atlantic croaker (3.1mm), spiny dogfish (2.7 mm), and striped mullet (1.9 mm)<sup>16</sup>. Despite a decrease in landings, the top five commercial species have remained fairly consistent over the last five years from 2007 to 2011. The notable exception is flounder (summer and southern), which was the second most landed finfish by pound with 4.8 million pounds landed on average over this period. Species availability for harvest is governed by

<sup>15</sup> Gates County appears on this map but is not listed as a fishing county as initially defined in *An Economic Profile of the Commercial Fishing Industry in Coastal North Carolina*. North Carolina Division of Marine Fisheries, Morehead City, NC (S. Diaby).

<sup>16</sup> Annual Fisher Dealer Report for 2012. North Carolina Division of Marine Fisheries, Morehead City, NC, April 2013. [http://portal.ncdenr.org/c/document\\_library/get\\_file?uuid=7b19d0c1-1a7a-44f4-97bd-9aefc038c5e3&groupId=38337](http://portal.ncdenr.org/c/document_library/get_file?uuid=7b19d0c1-1a7a-44f4-97bd-9aefc038c5e3&groupId=38337)

the general life cycle of the species, weather and environmental conditions, regulation, market factors, and socio-economic issues affecting commercial fishermen both collectively and individually.

**Table 1: Top five fin and shellfish landings by poundage (2007-2011)**

2007					
Rank	Shellfish	Pounds	Rank	Finfish	Pounds
1	Blue crabs	21,424,959	1	Croaker	7,271,162
2	Shrimp	9,537,230	2	Flounder	4,753,471
3	Oysters	441,415	3	Mullet	2,486,392
4	Clams	425,333	4	Bluefish	2,329,718
5	Scallops	267,252	5	Mackerel	1,547,802

2008					
Rank	Shellfish	Pounds	Rank	Finfish	Pounds
1	Blue crabs	32,916,691	1	Croaker	5,791,766
2	Shrimp	9,424,168	2	Flounder	5,009,298
3	Oysters	466,176	3	Mullet	2,074,166
4	Clams	382,049	4	Bluefish	1,930,391
5	Scallops	162,007	5	Mackerel	1,453,008

2009					
Rank	Shellfish	Pounds	Rank	Finfish	Pounds
1	Blue crabs	29,707,232	1	Croaker	6,135,437
2	Shrimp	5,407,708	2	Flounder	5,255,428
3	Oysters	573,630	3	Mullet	2,407,539
4	Scallops	411,013	4	Bluefish	2,360,077
5	Clams	350,669	5	Mackerel	1,740,543

2010					
Rank	Shellfish	Pounds	Rank	Finfish	Pounds
1	Blue crabs	30,684,531	1	Croaker	7,312,159
2	Shrimp	5,955,355	2	Flounder	5,000,907
3	Oysters	1,040,407	3	Bluefish	3,216,019
4	Clams	354,961	4	Mullet	2,969,673
5	Scallops	172,234	5	Mackerel	1,285,948

2011					
Rank	Shellfish	Pounds	Rank	Finfish	Pounds
1	Blue crabs	30,035,232	1	Croaker	5,054,186
2	Shrimp	5,140,360	2	Flounder	4,101,628
3	Oysters	800,353	3	Mullet	2,113,030
4	Clams	295,270	4	Bluefish	1,897,408
5	Scallops	91,077	5	Mackerel	1,285,080

### Industry Assessment: Literature Review

Over the four year period from 1997 to 2001, landings showed a declining trend which can be attributed to ecological and socio-economic changes impacting fishing counties, as well as the result of fishery management strategies aimed at controlling harvest to maintain commercially viable stocks (Bianchi, 2003); (Burgess & Bianchi, 2004).

The Fisheries Reform Act, enacted by the North Carolina General Assembly in 1997, requires that biological, social, and economic data be used in developing fishery management plans (Burgess & Bianchi, 2004). Research resulting from this Act has been summarized in the following literature review, which examines some of challenges facing North Carolina's commercial fishing industry.

For the last 14 years, a number of studies have been conducted to document the socio-economic changes occurring in North Carolina's fishing counties and their impact on the operations of the commercial fishing industry. Table 2 provides a SWOT Analysis, summarizing the strengths, weaknesses, opportunities, and threats facing the NC seafood industry as gleaned from the literature review. A summary of the most recent challenges facing the industry, as documented through research findings over the last ten years, are provided below.

### **Loss of Working Waterfront**

A 2006 study conducted by Dr. Barbara Garrity-Blake and Barry Nash found a 33 percent reduction in the number of fish houses over the five year period from 2001 to 2006<sup>17</sup>. Their findings, which coincide with a period of unprecedented boom in real estate and development along the coast, highlight the commercial threat that losing working waterfront and seafood processors places on an already stressed seafood industry (Garrity-Blake & Nash, 2007).

In their 2012 follow up study, Garrity-Blake and Nash found that the state had continued to lose domestic seafood packing capacity with a net loss of 47 facilities from 2001 to 2011. The authors cited reasons for the business closures as depressed domestic market prices due to unprecedented levels of imported seafood, declines in high-volume fisheries due in part to tighter restrictions, and labor crisis (Garrity-Blake & Nash, 2012).

### **Lack of Adequate Seafood Supply**

In their 2004 report on state-managed species catch data, Christine Burgess and Alan Bianchi disclosed two important conclusions concerning the possible adverse impact of management strategies on the livelihood of commercial fishermen. The first conclusion, suggests that the declines in the overall harvest since 1997 is likely due to both management strategies and natural fluctuations in stocks and environment (Burgess & Bianchi, 2004). The latter observation could be attributed to the effects of Hurricanes Fran and Bertha (1996) and Dennis, Floyd and Irene (1999). Further study concerning the storms' impact was recommended, as the impact had not been researched at the time of the report. The second conclusion suggests that state management measures directed toward gear – gill nets, trawls, and pots – or species – hard blue crabs, southern flounder, and shrimp – may have had a significant impact on commercial fishermen (Burgess & Bianchi, 2004).

A follow up survey and report on the impact of hurricanes on commercial fishermen was conducted in 2005 by Dr. Brian Chevront. Survey respondents described the hurricanes as having varying degrees of impact on their business due to equipment loss, destruction, navigation issues, and fish and shellfish migration as well as personal impact due to destruction of homes and personal property (Chevront, 2005).

A 2009 study by Dr. Scott Crosson found the number of commercial fishermen is declining, especially in estuarine areas. Dr. Crosson defines the decline as a trend based on a previous study in 2007 in which the number of commercial fishermen in the Core Sound area who stated they were breaking even or losing money from fishing activities increase from 5 percent to 23 percent over the three year period from 2005 to 2007 (Crosson, 2010). The author found a similar trend in the Southern District, where the 25

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<sup>17</sup> Fish house: local term for wholesale seafood packing and shipping facilities where fishermen unload their catch.

percent drop in the number of participants from 1999 to 2008 shows that fewer individuals find fishing to be a lucrative business (Crosson, 2010).

In a 2010 statewide survey of seafood dealers, John Hadley and Dr. Scott Crosson noted lack of adequate seafood supply as one of the most common business challenges faced by North Carolina's seafood dealers. Survey respondents cited frustration with state and federal regulations that limit catch, which they attributed as the cause to a lack of local seafood. The authors suggest that related declines in fish and shellfish stocks, which the regulations are designed to protect, may be related to the long-term trend of decreasing participation – both fishermen and dealers - in North Carolina commercial fisheries (Hadley & Crosson, 2010).

**Imported Seafood Competition, Fuel Costs, and Seafood Prices**

Dr. Crosson conducted a 2008 assessment of North Carolina seafood prices from 1972 to 2007 for the NCDMF. The following trends were noted: 1) seafood imports have increased almost 70 percent from 1996 to 2007, with the volume of imported shrimp which compete with locally-caught shrimp increasing 211 percent; and 2) a steep increase in oil prices in the first-half of 2008 directly impacted the per-trip cost of using a fishing vessel, forcing owners to decide economic feasibility of any particular trip given the expected catch and travel distance to harvest (Crosson, 2008). The author also notes a key finding between oil prices and seafood consumption that adversely affects seafood price: oil shocks drive up trip costs for fishermen, and since they are usually followed by recessions, may drive down consumer demand (Crosson, 2008).

**Table 2: North Carolina Seafood Industry SWOT**

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Established infrastructure and operators to aid in accessing profitable seafood markets.</li> <li>• Somewhat low attrition levels from experienced operators throughout the supply chain.</li> <li>• New entrants into supply chain bringing innovative ideas.</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Fragmented, non-collaborate supply chain with internal conflicts.</li> <li>• Volatility in commercial supply for caught species due to predictable and unpredictable seasonality.</li> <li>• Supply mismatch to customer markets.</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Increasing customer demand for seafood.</li> <li>• Consumers view local seafood as desirable, premium product.</li> <li>• CSFs programs present a new business model that supports the low volumes indicative of caught seafood.</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Increasing competition from imported seafood.</li> <li>• State and federal regulations.</li> <li>• Loss of waterfront access to coastal real estate development and tourism.</li> <li>• Skilled labor shortage: fewer fishermen, seafood processors.</li> </ul>

## **Divergent Industry: Central and Northern Coastal Regions**

The literature review demonstrates that many of the threats to the seafood industry noted at the national level are reflected, and in some ways intensified, at the state level. Moreover, the NCDMF studies and others cited in the literature review indicate a pattern in which the industry's challenges seem to be most impactful to the commercial fishermen and operators in the coast's central region (Garrity-Blake & Nash, 2012; Crosson, 2010). Fishing counties in this area are Carteret, Craven, Onslow, and Pamlico.

During 1994 to 2001, no more than 20 years ago, Carteret County accounted for over 46 percent of the state's landings and 22 percent of the total value (Bianchi, 2003). However commercial fishing in this area is much different today due to a loss of readily available, waterfront dealers because of appreciating real estate values, higher fuel costs, and low seafood prices due to increased imports (Crosson, 2007b). These effects are particularly onerous for operators located on the western edge of Pamlico Sound where for the most part, there is no easy access to both ocean and sound fisheries (Garrity-Blake & Nash, 2012).

During the same period from 1994 to 2001, Dare County contributed 21 percent of the state's landings and 24 percent of the total value and together with Carteret County the two led all counties in landings by weight and value (Bianchi, 2003). Moving forward 10 years, Dare County was the top seafood producing county in North Carolina in 2011, with reported commercial landings of 24.6 million pounds of seafood valued at \$22.5 million (West, 2013). Infrastructure like the Wanchese Seafood Industrial Park, located on the south end of Roanoke Island; proximity to lucrative, seafood markets in the north; and easy access to sounds and ocean fisheries, make Dare County a commercial fishing bright spot. However, in the future, this may also change as revenues from recreational fishing and water based tourism grow<sup>18</sup>.

The park supports businesses in the seafood and marine-related industries. Two industries that are relevant to commercial fishing are located here: 1) boatbuilding and related companies, which provide sales and repair services for trawlers; and 2) fish packing, which are operators engaged in commercial wholesale and distribution of fish and seafood. The Park was originally built by the state to support Outer Banks fishing industry boats that transited the Atlantic Ocean and sounds via the Oregon Inlet, which is accessible through Wanchese Harbor (Kozak, 2013). Its location enables tenants to ship seafood products overnight to major markets up and down the U.S. east coast and to other countries due to its proximity to Norfolk International Airport in Norfolk, VA (Miley, Gallo & Associates, LLC, 2005).

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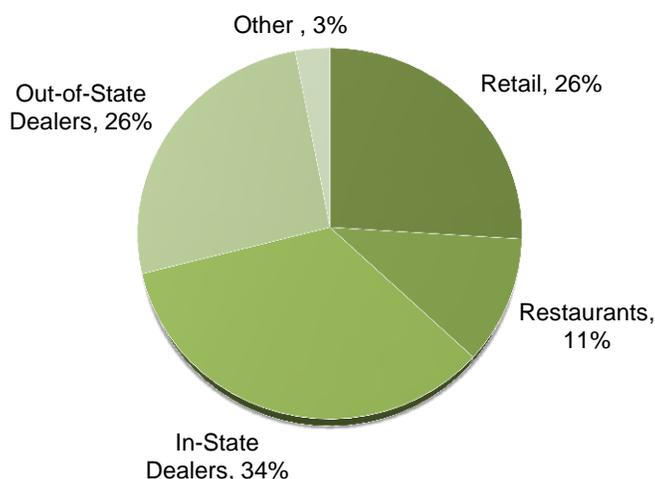
<sup>18</sup> In June 2013, the NC General Assembly has enacted HB686 to modify the name of the NC Seafood Industrial Park Authority to the NC Marine Industrial Park Authority, reflecting the organization's broader mission to support commerce in the marine industry. Source: <http://www.ncga.state.nc.us/Sessions/2013/Bills/House/PDF/H686v3.pdf>.

## Supply Chain and Market Channels

The operational structure of North Carolina's seafood industry mirrors the structure at the national level. Commercial fishermen typically specialize in one to two species, which they harvest seasonally from estuarine and ocean waters. Fishermen then either sell their catch to licensed seafood dealers or directly to customers, if the fishermen possess a dealer license. Seafood dealers perform a critical function in the supply chain, since all wild caught seafood landed in North Carolina is legally required to be initially sold through a licensed seafood dealer (Hadley & Crosson, 2010). Therefore, they are the point through which North Carolina wild caught species enter into in- and out-of-state seafood markets.

However, it should be noted that tracking seafood product flow is complicated - even at the point of the initial sale - as a licensed dealer could be a fishermen, wholesaler, distributor, processor, retailer, etc. Consequently, seafood can enter the supply chain at any point with perhaps the product form providing some degree of restriction if the licensed dealer does not have the capability to process fresh seafood. According to their 2010 study of seafood dealers, Hadley & Crosson found that about 72 percent of the seafood bought by dealers was sold to North Carolina buyers. Figure 8 shows market channels for North Carolina seafood by percent of sales.

**Figure 7: 2009 Markets for North Carolina Landed Seafood<sup>19</sup>**



After the initial sale of seafood, product traceability becomes more convoluted since no additional legal restrictions or tracking mechanisms exist for the sale and resale of seafood as it makes its way down the supply chain to consumers. Seafood product may be resold to in- and out-of-state secondary dealers, processors, distributors, restaurants, and grocery stores (Hadley & Crosson, 2010). In their 2012 follow up study of fish houses, Garrity-Blake & Nash found a majority of dealers surveyed participated in

<sup>19</sup> Data Source: Hadley, John and Crosson, Scott: *A Business and Economic Profile of Seafood Dealers in North Carolina*. NCDMF, December 2010, pg.8.

interstate trade to Mid-Atlantic markets in New York, Philadelphia, Baltimore and Virginia and markets in Florida and Texas. These findings were also confirmed during interviews with fishing operators for this project. Appendix C provides value stream maps for a conventional grocery and food service seafood supply chain. Information provided in the maps was gathered from interviews with businesses involved in fishing, processing, wholesale-distribution, and grocery retail.

### **Central Coast Species: Supply and Demand Trends**

This section explores potential business opportunities based on the convergence between national consumption trends over the last six years and current supply trends for commercially important seafood species harvested in the Central Coastal region. Points of convergence for these species could present lucrative prospects for small and midscale fishing operators, should these national trends carry over into North Carolina's larger metropolitan areas. Accordingly, further research into consumer demand for local seafood in these areas of the state is warranted in order to identify ways to capitalize on the opportunities discussed here.

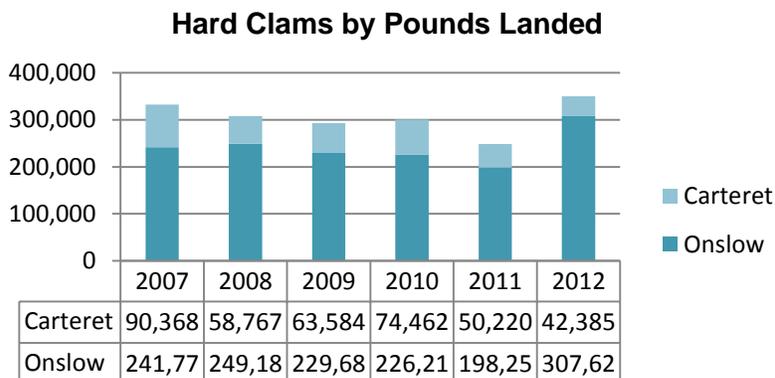
#### **Hard Clams**

Hard clams are most abundant in high salinity waters inside the barrier islands from Ocracoke south to the North Carolina – South Carolina border. Fishing methods include hand harvesting, which takes place year round with catch limits of up to 6,250 clams based on water body, and mechanical harvesting. The latter is regulated into a season where mechanical harvesting is permitted December – March (NCDMF, 2008).

The increase in import volume, at the national level, may signal an increase in consumer demand for clam products<sup>20</sup>. Interview respondents in the clam business report no change in the demand for their harvested clams, citing that aquaculture farms are able to supply all demand in northern markets. As a result, clam prices have decreased from \$0.25/piece to an average price of \$0.11/piece. Hard clams are mostly harvested in Onslow and Carteret Counties, primarily via mechanical harvesting methods, with as much as 1.8 million lbs indicating substantial availability of the species in this area. This trend could present an opportunity for clammers in the region to seek out less saturated markets, perhaps locally, where hard clams and products could earn higher prices.

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<sup>20</sup> See Appendix B for National Consumption Trends



However, there are two factors which could impede clammers' ability to capitalize on this trend. First, the rising number of imports could lead to lower prices for products in local markets making these channels unattractive over time. Second, availability of harvested hard clams could be more unpredictable than other species caught and landed within the four counties. Possible explanations for the relatively small volume of hard clam landings are a decreasing in wild harvesting due to cost or other factors or the existence of private fisheries. In the latter case, commercial fishermen lease water columns for clam cultivation as a means of supplementing income.

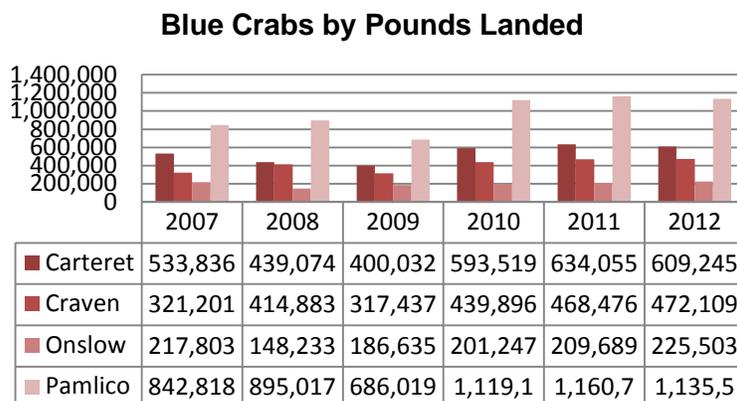
Marketing hard clams could be achieved if there is a large market demand for clams and a way to neutralize a buyer's ability to drive down prices so that small and mid-scale operators can earn higher margins. One way to achieve both is to develop brand identification to promote central coast clams as premium local products directly to the end consumer, thereby inducing a pull effect on the supply chain. Another option would involve selling hard clams or clam products through similarly sized market channels like small, local restaurants. This opportunity levels out the power dynamic between the supplier and the buyer, which can lead to a synergistic business relationship between the partners. Regardless, fishermen will need to adopt less costly harvesting methods or less variable harvesting methods like aquaculture to smooth out supply in order to realize higher margins.

### Blue Crabs

The Chesapeake Bay, North Carolina, and Louisiana support the largest blue crab fisheries. Blue crabs are abundant in tidal marsh estuaries with waters of moderate salinity making them naturally available for harvest in virtually every coastal county. The increase in export volume may indicate an increase in consumer demand and prices in seafood markets outside of the U.S.<sup>21</sup>. Rising exports lead to a low volume of locally harvested blue crabs that available for sale in-state. This trend presents a potentially profitable opportunity for crabbers in the central coast counties given that blue crabs are abundant in this region, and scarcity – due to rising exports – has the potential to fetch higher prices for crabbers if there is

<sup>21</sup> See Appendix B for National Consumption Trends

growing demand for North Carolina blue crabs within the state's large metropolitan areas. The trend in volume of blue crabs harvested in each of the four counties has been growing over the last six years, despite a decrease in landings in Carteret and Pamlico Counties in 2012.



During interviews, fishermen estimated that 40 percent of blue crab landings leave the state for Mid-Atlantic and Northeastern markets, which tend to have larger demand and more consumers who are willing to pay higher prices. Markets mentioned during interviews include the Washington, D.C. metro area and New York City, where demand has been growing over the last three years and is highest during March and April (soft shell) and February, March, November, and December (hard shell). North Carolina small and mid-scale crabbers thus far have been able to meet demand without challenges. Competition to keep blue crabs in-state will be keen unless there is either a surplus of blue crabs in these northern markets, which would depress prices making the markets unattractive, or fishing operators are provided higher prices to sell blue crabs within the state.

### Shrimp

Shrimp remains a very popular product with consumption levels holding steady despite no change in import volume over the six year period<sup>22</sup>. Alternatively, small fishing operators sell a sizable volume of locally harvested shrimp in North Carolina through retail, restaurant, and direct to customer channels. According to interviewees, shrimp prices paid to shrimpers are typically high in early spring when the first available shrimp (pink) is harvested. Prices then drop as the overall shrimp supply increases. However, this was not the case in 2013 when prices started at \$2.00/lb. and jumped as high as \$5.00/lb. over the summer (green tails), then leveled off to \$4.00/lb. These higher prices may be explained by growing demand for North Carolina shrimp, which interviewees reported as increasing.

Shrimp is an estuarine dependent species making it commercially important to the central and southern coast given the geography of the coastline. Shrimp are transported by current into marshes and estuaries

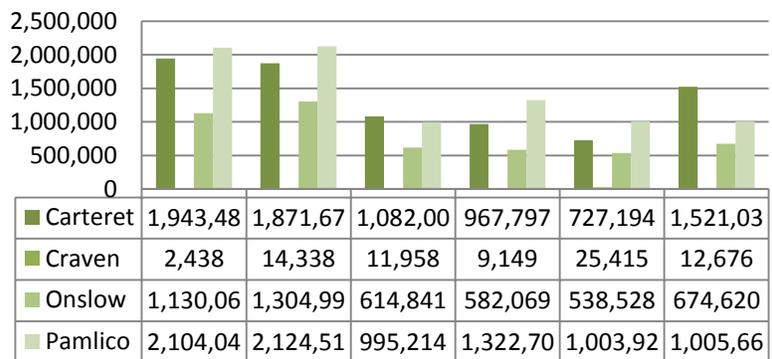
<sup>22</sup> See Appendix B for National Consumption Trends

when young, and migrate to the ocean as adults to spawn. Their migratory nature plus harvest size restrictions create supply 'seasonality' by species. For example brown shrimp, the most abundant shrimp species in North Carolina, is available for consumption from mid/late April through late fall. White shrimp migrate southward from estuaries during fall and early winter, which would make them available for consumption in early spring. Pink shrimp enter North Carolina estuarine waters from May through November, overwinter, and then are available for consumption in early spring. Therefore, all things being equal, when the availability of these species is combined, shrimp is available for consumption from early spring to late fall.

However, all things are not equal as there are other factors contributing to supply 'seasonality'. The NCDMF considers shrimp to be an annual crop because the amount available for harvest varies yearly due to weather effects on temperature and salinity of estuarine waters. For example, a cold winter yields smaller shrimp in the spring and heavy rains in estuaries pushes shrimp out into the Atlantic before reaching adulthood. North Carolina's shrimp fishery is unique in that 76 percent of the total shrimp harvest occurs in internal waters (North Carolina Division of Marine Fisheries, 2006).

Shrimp landings by pound for the Central Coastal region were trending down over the four years from 2007 to 2010 when the number of vessels and trips declined over the same period. However, the reverse was true in 2012. Notable exceptions for this time frame happened in Pamlico County, where shrimp landings increased in 2010 exclusively in the second half of the year (Jun – Dec), and in Craven County, where shrimp landings decreased in 2012 occurring only in the summer months (Jul – Sep).

**Shrimp by Pounds Landed**



In addition to weather, these supply trends may be influenced by socio-economic factors. A possible reason for the variability in shrimp landings is most likely explained by fuel costs rising and fishermen choosing to conserve fuel by operating only during peak demand. Consumers tend to demand more shrimp in the summer months and shrimp size (i.e., count) increases from September to November; thereby making the last half to third of the year a more profitable time to harvest.

A second probable reason for supply variability is the conflict between trawl nets and conservation goals to reduce bycatch and environmental impact on estuarine habitats. Regulatory solutions have ranged from gear changes and restrictions - such as increasing the use bycatch reduction devices on shrimp trawls and promoting channel nets over otter trawls - to closing and/or creating shrimping seasons for specific areas (North Carolina Division of Marine Fisheries, 2006). These solutions impact both commercial and recreational shrimping, and are issued at the state and federal levels.

North Carolina's small and mid-scale shrimpers may be able to meet shrimp demand in North Carolina's metropolitan markets. However, supply most likely will be the constraining variable. Further research on market and demand size is needed to understand how much demand can be met by the state's shrimpers, given the unpredictability of accessing shrimp in large volumes. Alternatively, demand can be mediated through promoting other seafood species which are less costly to obtain.

### **Flounder**

U.S. Consumption trends for this species are difficult to characterize. NOAA fisheries data show that flounder products are all imports<sup>23</sup>. However, North Carolina landings data for southern and summer flounder show that the species is the second largest finfish by pound in the state. Yet, it is not clear where exactly local product goes other than being exported out-of-state. Interview respondents in the flounder business indicate seeing an increase in demand over the most recent three years for flounder and the price paid. They also reported that demand for the species is year round. Interviewees further stated that prices paid have remained cyclical but moved within a range from \$2.00/lb. to \$4.00/lb. based on area closures and spikes in fuel prices.

Flounder is another estuary dependent species. Post-larval and juvenile Southern flounder move into lower-salinity portions of coastal rivers and sounds, but move offshore in fall and winter to spawn. On average, landings have been the highest from May through November. Summer flounder (or fluke) larvae are carried by currents into high-salinity coastal and estuarine waters in the spring and summer, but move offshore to mature and spawn in the fall and winter.

On average, landings have been the highest from December through March. By combining the two species, flounder landed in North Carolina should be available for consumption from summer (inshore) through winter (offshore). However, the conflict between harvesting methods and conservation has impacted catch volumes. Thus, developing new market channels for flounder is not recommended at this time given the supply challenges related to stock levels and decreasing landings.

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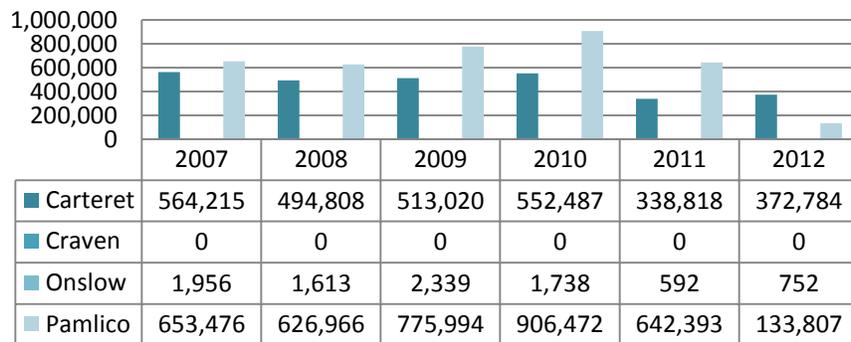
<sup>23</sup> See Appendix B for National Consumption Trends

**Summer Flounder Catch Trends**

Solutions designed to mitigate historic overfishing of Summer flounder and bycatch and habitat impact have changed commercial flounder fishing. A yearly catch quota established by Mid-Atlantic Fisheries Management Council - Atlantic States Marine Fisheries Commission Fishery exists for the Summer flounder fishery along the East Coast to manage against the levels of stock depletion that occurred during the 1970s through 90s. The quotas allot 60 percent of the annual catch to commercial fishermen leaving 40 percent for recreational fishermen (NOAA FishWatch, 2014).

The effects of Summer flounder quotas and other fisheries management plans create an additional 'seasonality' aspect to supply that can be observed in landing trends for the last six years. Overall, the trends vary by county which is to be expected given the geography of each. Carteret and Pamlico Counties have the highest landing volumes given the counties' access to the Atlantic Ocean. Conversely, Craven and Onslow Counties have no or very few Summer flounder landings.

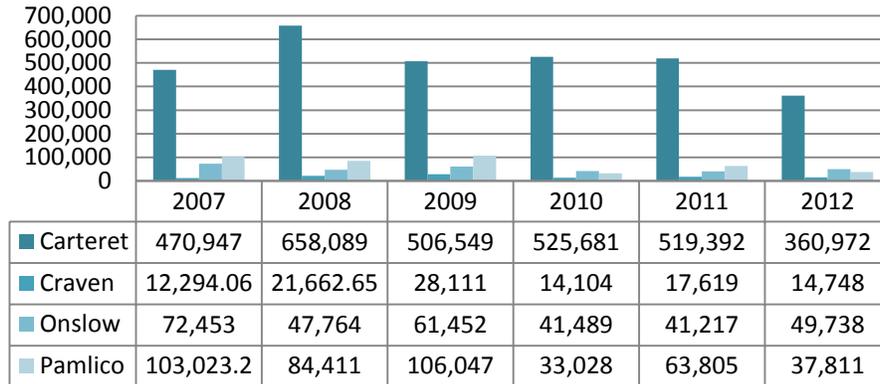
**Summer Flounder by Pounds Landed**



**Southern Flounder Catch Trends**

Similar effects can be observed in the Southern flounder landings data. Overall, Carteret and Pamlico Counties have the highest landing volumes of both flounder species given the counties' access to the Pamlico Sound. Craven and Onslow Counties have fewer Southern flounder landings. However the prevailing trend is a decrease in landings from 2007 through 2012 that can be explained regulation implemented during this time frame to bring stock back to sustainable levels and to minimize adverse interactions between fishing gear and sea turtles.

**Southern Flounder by Pounds Landed**



## On the Horizon for North Carolina Seafood

### Linking the Supply Chain: Catch Groups

Started in 2012, North Carolina Catch (NC Catch) is a nonprofit umbrella organization that works with other local groups to promote collaboration, strengthen communication, and enhance a statewide and national presence for commercial fishermen and other small and mid-scale fishing operators. The local groups under the NC Catch umbrella are Brunswick Catch, Carteret Catch, Outer Banks Catch, and Ocracoke Fresh. These groups perform a similar function as NC Catch but at a local level which stretches along the coast from Currituck County (Northern Coast) south to Brunswick County. The most important service that catch groups perform is to link the commercial seafood supply chain by bringing suppliers together and promoting the concept of buying local seafood to end consumers through educational efforts.

### A New Business Model: Selling Direct to Consumer

#### Community Supported Fisheries (CSF) Programs

CSFs have been heralded as the best idea to help small fisheries survive<sup>24</sup>. The CSF is an attempt to capitalize on the growing local foods movement, based on the Community Supported Agriculture (CSA) model, and the industry shift from high to low volume catch sizes. In the CSA arrangement, consumers buy shares of local produce from small farmers and in exchange, these farmers receive a premium price and guaranteed sales for their produce on which they can sustain their livelihood. Under the CSF arrangement, consumers prepay for seasonally available seafood and in return, small scale commercial fishermen receive the same benefits as those noted for small farmers.

<sup>24</sup> Sources: <http://www.washingtonpost.com/wp-dyn/content/story/2009/01/13/ST2009011302192.html> and <http://online.wsj.com/news/articles/SB124421534407589317>

In North Carolina, the CSF model was the result of efforts by North Carolina Sea Grant extension specialists Scott Baker and Barry Nash in collaboration with Dr. Susan Andreatta from the University of North Carolina at Greensboro (North Carolina Rural Economic Development Center, 2013). For the NC Growing Together Project, three CSF operations - Walking Fish, Core Sound, and Locals Seafood - were identified for the supply chain reports. These CSFs serve as niche market channels through which smaller volumes of local, seasonally available seafood are sold to inland markets and consumers located west of I-95. Despite providing similar services, the business models differ.

Two types of CSF programs exist in Carteret County: Walking Fish and Core Sound. Both are organized groups of commercial fishermen that sell directly to consumers and are affiliated with Carteret Catch. Core Sound is also a member of NC Catch. Under this CSF model, the conventional supply chain is shortened because commercial fishermen and licensed dealers bypass intermediaries to reach the consumer. In doing so, the value adding activities that downstream operators and intermediaries provide are bypassed. While their business model is designed to help small-scale commercial fishermen receive high prices for their catch, bypassing downstream stages and intermediaries in the supply chain could come at the expense of higher profitability for the entire supply chain.

Because many of the value-add activities are not generally provided by the commercial fishermen or others in this shortened supply chain, the overall profit gained from these activities is lost. Essentially, value-added margin is removed in exchange for incrementally increased profits by removing the 'middle man'. Thus, the prices commercial fishermen receive might not be as high as they could be if all operators worked in an integrated way to maximize total profit for the entire supply chain. Not to mention, channel conflict for species sold outside of CSF or direct to consumer model can be introduced when operators cut out others in the chain. Such actions could exacerbate already existing user conflicts in a declining industry like North Carolina's seafood industry.

The third CSF, Locals Seafood, is a start-up business located in Raleigh, NC and affiliated with the Outer Banks and NC Catch. The business sells seafood inland by buying local seafood from second processors and selling directly to consumers through farmer's markets located throughout the Raleigh-Durham and surrounding areas. This CSF business model involves leveraging more of the existing supply chain to connect commercial fishermen to inland markets. This type of model has the potential to generate more profits by tapping the value-add capabilities of processors and then selling the products at retail mark-up prices.

## Recommendations for Future Research

While there are ongoing efforts to sell local seafood products to inland markets, these efforts have involved moving a variety of seafood in small volumes that have been minimally processed. In attempting to connect small and mid-scale fishing operators to mainstream markets, the following questions should be addressed:

1. ***Are inland markets sustainable, profit generating opportunities for small- and mid-scale commercial fishermen?***
2. ***How much infrastructure and investment is needed to develop a supply chain to move seafood product west through mainstream market channels?***
3. ***How can commercial fishermen successfully sale to mainstream market channels?***

We can begin to answer to these questions through the following recommendations for further research related to developing inland, mainstream market channels and a supporting east to west supply chain:

## Market Assessment and Marketing Strategy Development

Marketing research should be done to quantify demand for local seafood by determining the potential size of the market and to define pricing based on inland consumer's willingness to pay for North Carolina seafood. In addition to determining the business sustainability of inland markets, additional research should be done to understand consumer preference for seafood product forms. This information will help guide discussions and decision making concerning processing capabilities and investment needed to provide processed seafood products. Finally, branding strategies need to be developed in conjunction with project partners to promote local seafood within the new channels.

## Financial Analysis

A cost-benefit evaluation should be completed to document the capital investment and operational costs required to develop and maintain an inland supply chain. This analysis should include an assessment of funding sources and requirements for accessing those sources.

## Supply Chain Strategy

1. **Logistics:** develop a distribution network to move seafood product inland should be done using the quantity seafood that is available for sale to inland markets. Research should take seasonality of supply and previous research into cold storage capacity into account<sup>25</sup>. Moreover, network analysis should provide suggestions for optimizing transportation.
2. **Vendor Development:** develop a go-to-market framework to help new entrants and existing fishing operators to access mainstream markets using survey data provided by buyers.

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<sup>25</sup> See Handfield, Robert and Kunjithapatham, Chandrasekharan: *Expanding the Market for Carteret County Seafood: Strategic Site Selection for a Cold Storage Seafood Distribution Facility*. Project Report, December 22, 2009.

## **Conclusion**

Commercial fishing in North Carolina is in a state of change. There are a number of economic pressures bearing down on industry participants: competition from imported seafood, closing working waterfronts, increased regulations, and declining finfish and shellfish stocks. Despite these pressures, there are promising opportunities to remain competitive by establishing sales channels with inland restaurateurs and grocery retailers. However, capitalizing on these opportunities will require innovation, flexibility, and coordination among all supply chain operators. To survive, operators need to think holistically about the seafood supply chain and be willing to collaborate and leverage resources in an attempt to maximize profitability for all supply chain participants.

## Appendix A

### Project Scope

<b>Seafood Vendor Development Project</b>	
<b>Problem Statement/Opportunity:</b>	
	While there are ongoing efforts to sell local seafood products to inland markets, these efforts have involved moving a variety of minimally processed seafood in small volumes. However, to successfully connect small and mid-scale fishing operators to mainstream market channels, operators will need to meet and maintain vendor requirements of grocery and foodservice retailers.
<b>Environment:</b>	
	North Carolina: Central Coast Counties (Carteret, Craven, Onslow, and Pamlico) and the Raleigh-Durham Area.
<b>Project Scope:</b>	
	Design a vendor development framework to help new entrants and existing fishing operators "go to market" as suppliers for the NC Growing Together project partners. The framework should be designed based on an assessment of strategic fit between buyer (i.e., project partner) requirements and small and mid-scale fishing operators along North Carolina's Central Coast.
<b>Deliverable(s):</b>	
	<ul style="list-style-type: none"><li>• Current state assessment and analysis of strategic fit between buyers and small – and mid-scale fishing operators.</li><li>• A vendor development framework/tool developed using buyer requirements.</li><li>• Recommendations on how to sell to project partners based on supplier attributes and requirements (future state).</li><li>• Recommendations on new market channels that can be reached now given current state of small – and mid-scale fishing operator's market readiness (future state).</li></ul>
<b>Weekly Objectives Roadmap: See Work Plan</b>	

**Work Plan and Timeline**

#	Activity	Start Date	End Date	Responsibility	Approve	Consult	Inform	Comments	Dependencies	Resources
<b>Scope Document and Secondary Research</b>										
1	Create draft version of scope for 2nd phase report (vendor development project).	1/3	1/8	JN	RD	RD	RH, CC	Pending approval		
2	Start secondary research, gathering market and industry information at national and state levels according to seafood team logic model (see client requirements tab).	8/15	12/13	JN	RD	Gary Bullen Barry Nash	RH, CC	Complete		Documented in reference section of report
3	Scope project, gather and analyze commercial landings data for Central Coastal Counties by species.	8/15	9/30	JN	RD, Gary Bullen	Gary Bullen	RH, Gary Bullen	Complete		
4	Write report documenting secondary research (1st phase report). Information to presented in Local Food Systems Class on 2/18/14.	12/16	12/29	JN	RD		RH, CC	Complete		
<b>Conduct Primary Research and Create Tools</b>										
5	Conduct primary research by interviewing small and mid-scale fishing operations (See Contact Sheet)	11/2	TBD	JN		Barbara Garrity-Blake, Barry Nash, Gary Bullen	RD,RH, CC	In progress with target completion date 1/31/14	Scheduling match between interviews and interviewer	Barbara Garrity-Blake
6	North Carolina Seafood Buyers Survey (interview and survey data collected from project partners and other food buyers).	10/1	10/31	JN	RD, Gary Bullen	Gary Bullen, RH	RD, CC	Complete		
7	North Carolina Seafood Survey (interview and survey data collected from small and mid-scale fishing operators).	10/1	10/31	JN	RD, Gary Bullen	Gary Bullen, RH	RD, CC	Complete		
8	Develop a scorecard and vendor development framework using buyer requirements and attributes from Buyers Survey. Develop VSM for 6 species using seafood survey data as estimates NC seafood product volume and flows.	2/7	2/14	JN	RD	RH	RD, RH, CC		Survey participation compliance from project partners and large scale fishing operators currently buying from small operators and selling to grocery and food service customers	US Foods Lowes Foods Wanchese Fishing Co. Pamico Packing Info gathered from Sustainable Ag. Conference in Nov. 2013.
9	Finalize score card and vendor development framework.	2/17	2/28	JN	RD		RD, RH, CC			
<b>2nd Phase Report and Final Presentation</b>										
10	Conduct current state assessment and analysis of strategic fit between buyers and small – and mid-scale fishing operators. Develop one to three recommendations each on how to sell to project partners and on accessing new market channels given current state of seafood industry. Recommendations based on primary and secondary research.	3/1	3/31	JN	RD		RD,RH,CC			
11	Write a report documenting the activities from item 10 (see above).	3/17	4/4	JN	RD	RH, Gary Bullen	RD, RH, CC			
12	Submit 2nd phase report to Rebecca for review and comments.	4/7	4/7	JN	RD		RD, RH, CC			
13	Make corrections and incorporate both reports into one and submit to Rebecca for review and approval.	4/8	4/10	JN	RD		RD, RH, CC			
14	Create draft presentation for NCGT Proj. Partners Meeting. Send to Rebecca for review and approval.	4/11	4/15	JN	RD	RD, RH	CC			
15	Presentation to NCGT Proj. Partners	4/22	4/22	JN	RD	RD, RH	CC			
16	Submit final report and presentation to Rebecca	4/23	4/23	JN	RD		RD, RH, CC			

## Appendix B

**Table: Foreign Trade by Species**

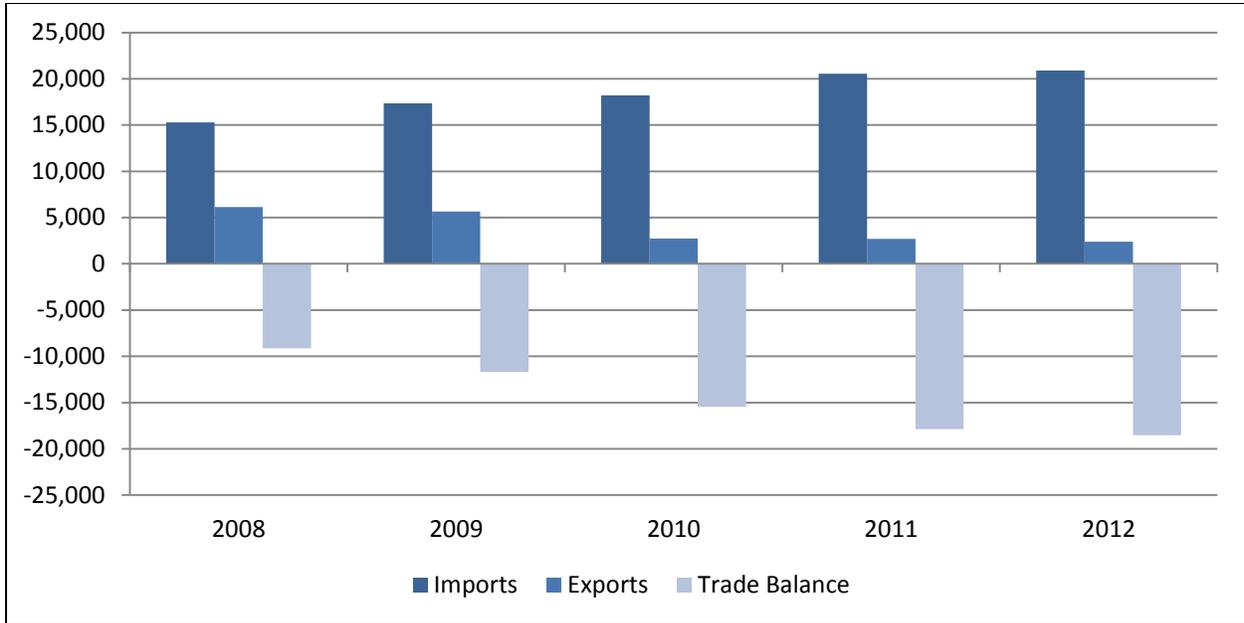
Import of Foreign Fishery Products for Consumption										
Species	Volume (in metric tons)					Value (USD in thousands)				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Clams	15,282	17,337	18,209	20,560	20,899	52,225	58,350	58,854	65,003	63,298
Crabs	24,340	23,492	23,664	22,556	20,918	248,749	233,959	267,586	286,396	274,925
Flounder	12,967	12,729	14,403	14,890	13,144	60,487	55,376	62,328	69,118	64,423
Surimi	2,473	2,668	1,235	921	904	7,517	4,878	3,388	2,520	2,502
Oysters	9,318	4,047	5,328	5,365	4,401	46,733	20,033	25,364	30,373	23,962
Shrimp	564,240	548,539	558,602	573,989	531,840	4,092,735	3,756,483	4,282,227	5,146,622	4,441,515

Export of Domestic Fishery Products										
Species	Volume (in metric tons)					Value (USD in thousands)				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Clams	6,154	5,648	2,735	2,682	2,383	53,247	53,755	10,980	11,135	10,074
Crabs	8,330	8,156	10,052	14,798	18,739	46,891	42,869	56,770	84,916	91,167
Flounder	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Surimi	114,605	86,671	104,289	145,984	158,021	229,546	212,253	287,327	344,196	414,288
Oysters	3,266	2,894	3,458	4,703	3,042	20,164	19,492	22,130	26,982	20,549
Shrimp	11,033	8,825	7,484	11,074	9,766	92,233	81,527	70,083	104,409	94,500

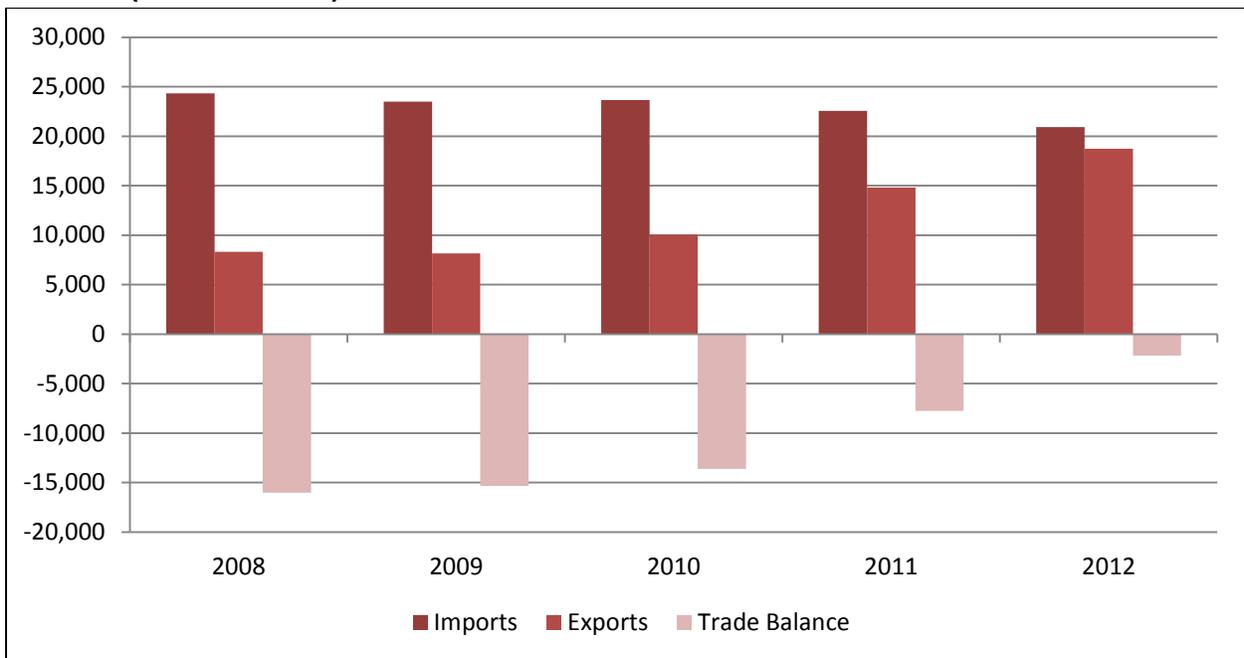
**Charts: Foreign Trade by Species by Volume (2008-2012)**

Volume unit is metric tons in thousands

**1. Clam (Live, Meat, Canned and Other Edible Byproducts)**

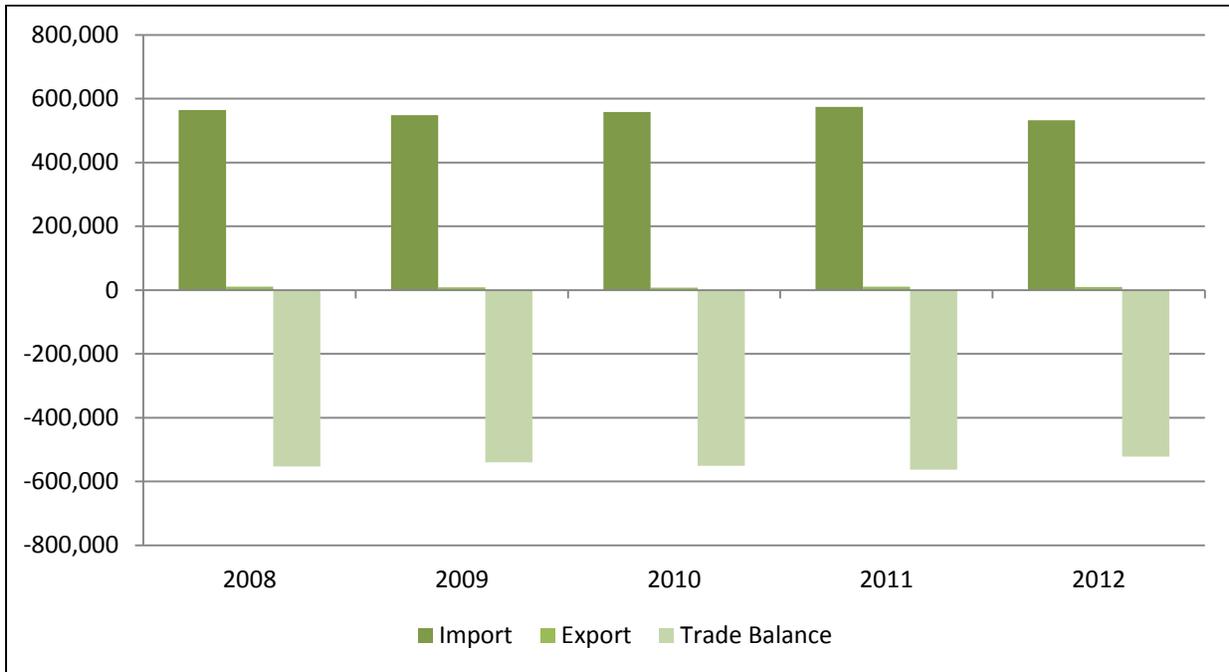


**2. Crab (Live and Meat)<sup>26</sup>**

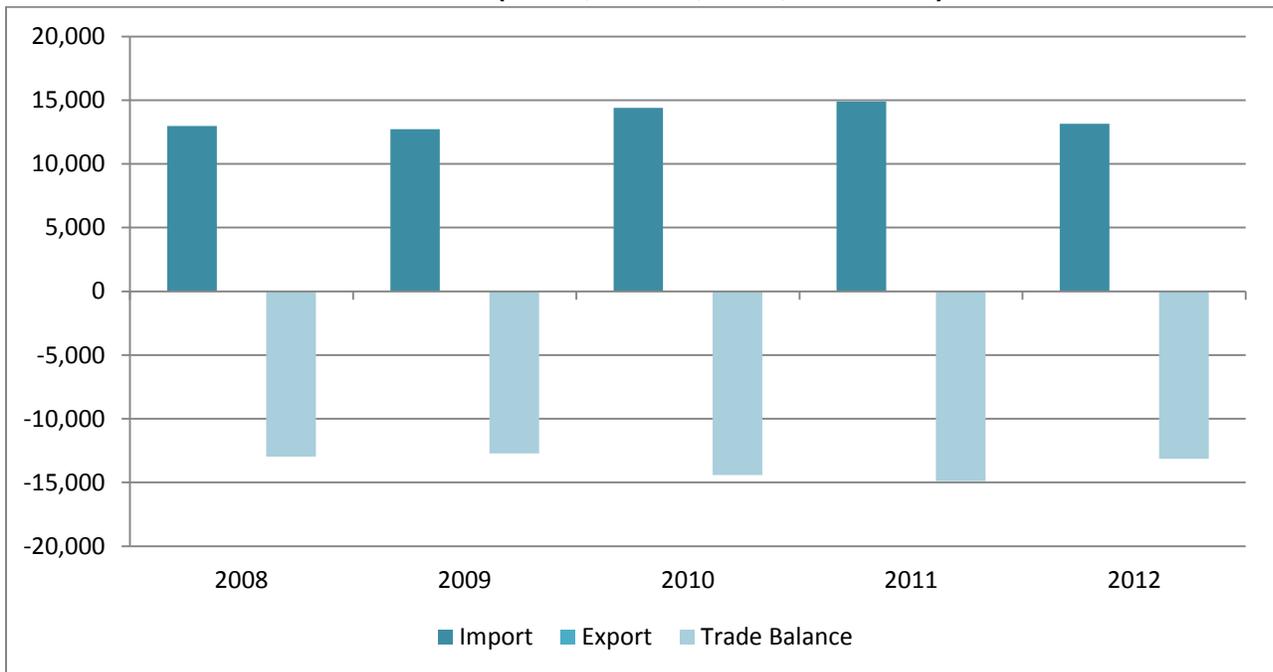


<sup>26</sup> Crab data reported are those for the "other" category, since the NC crabbers catch blue crab not Dungeness, King, or Snow crab which NOAA reports separately.

### 3. Shrimp (All Product Forms) <sup>27</sup>



### 4. Flounder: Salt and Fresh Water (Fresh, Frozen, Fillet, and Block)

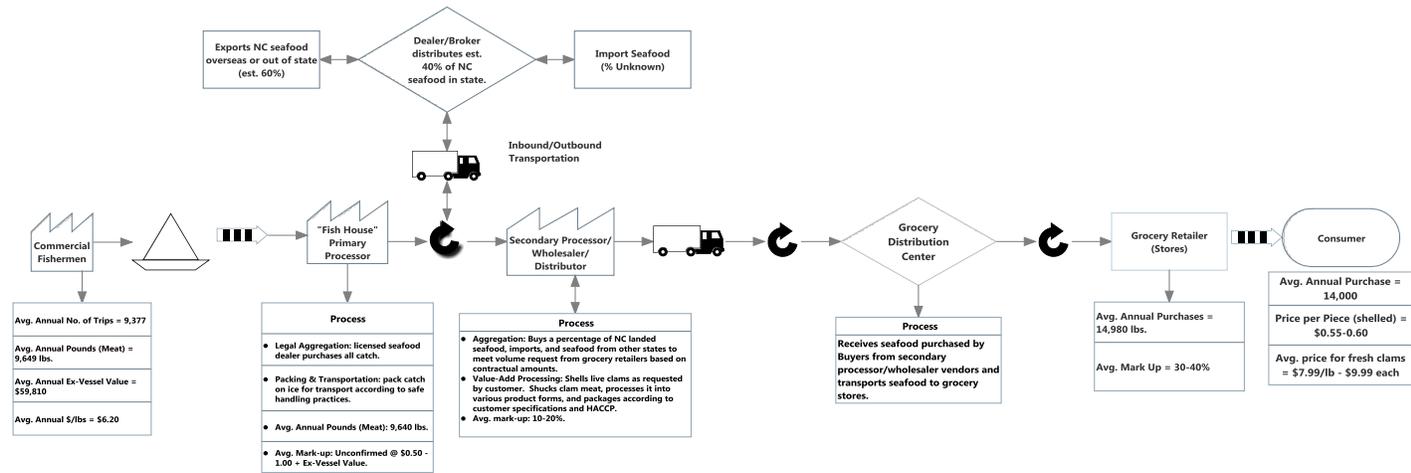


<sup>27</sup> Volume data for shrimp have been collapsed into these product forms: shell-on, peeled, warm- and coldwater shell-on and peeled, breaded, and other peeled preparations.

## Appendix C

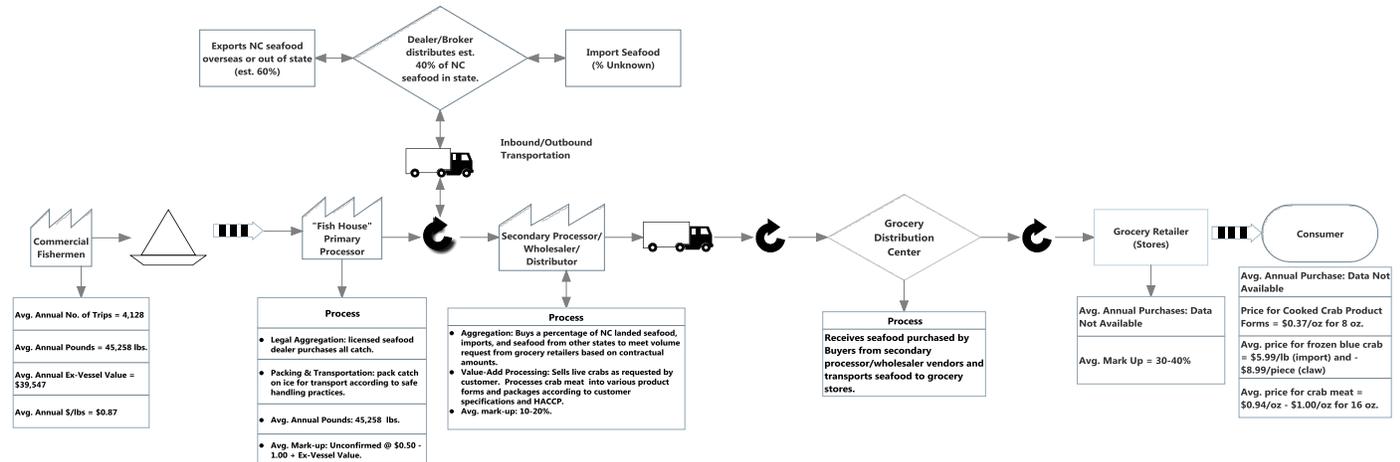
### Value Stream Maps: Grocery Retailer Supply Chain by Species

Hard Clams Value Stream Map



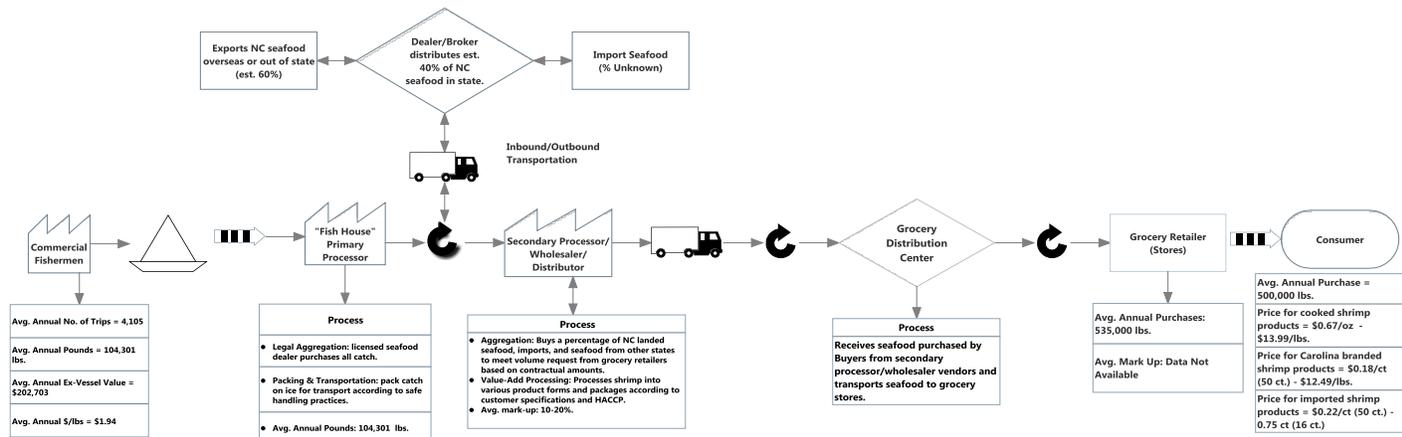
SmartDraw Academic Edition

Blue Crabs Value Stream Map



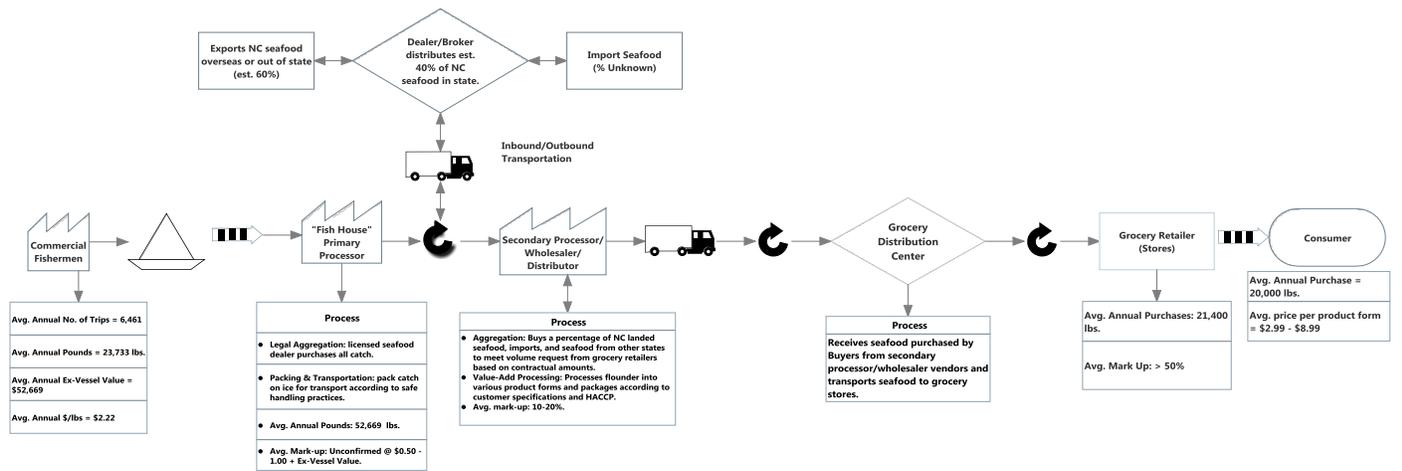
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Shrimp Value Stream Map



SmartDraw Academic Edition

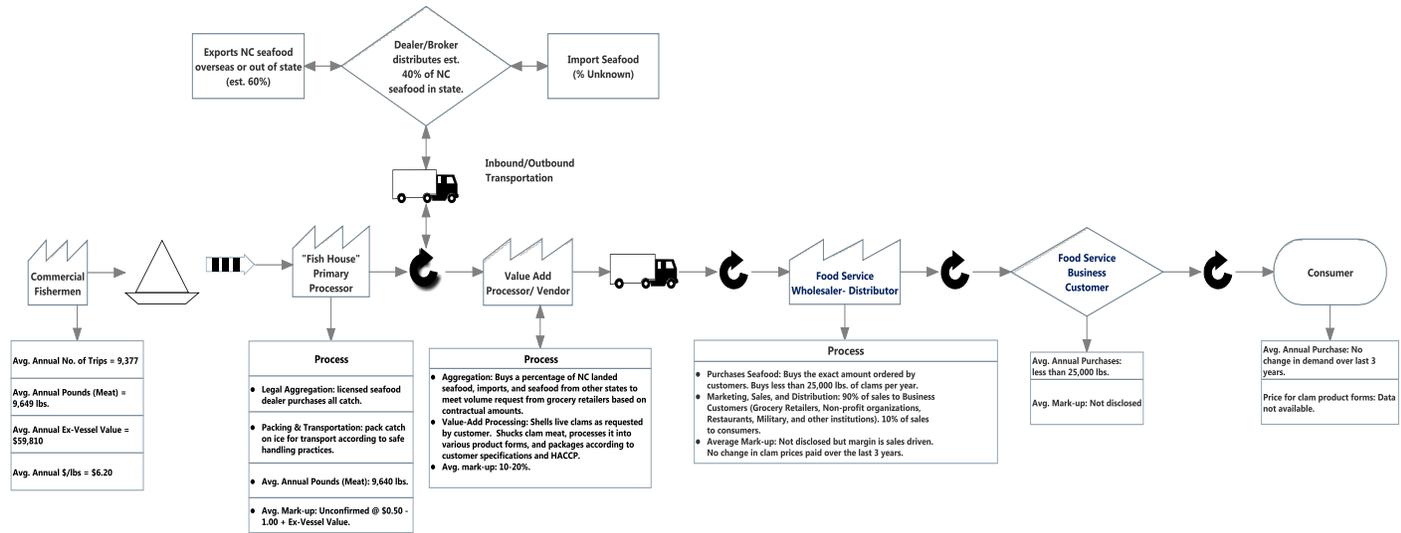
Flounder Value Stream Map



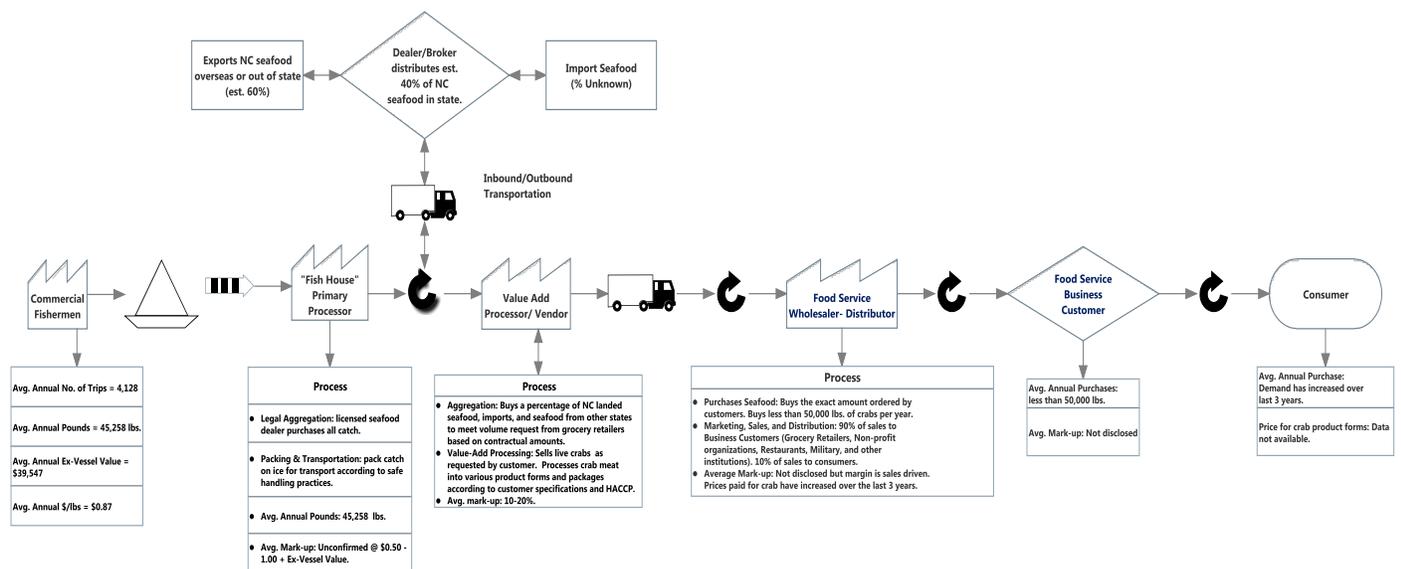
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Value Stream Maps: Food Service Supply Chain by Species

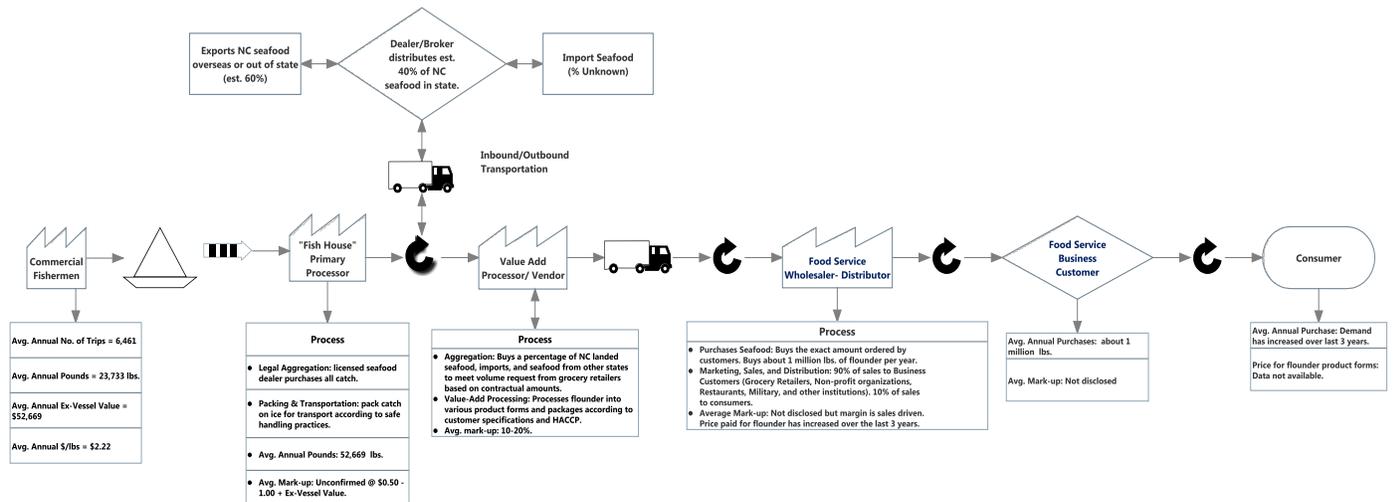
Hard Clams Value Stream Map



Blue Crabs Value Stream Map

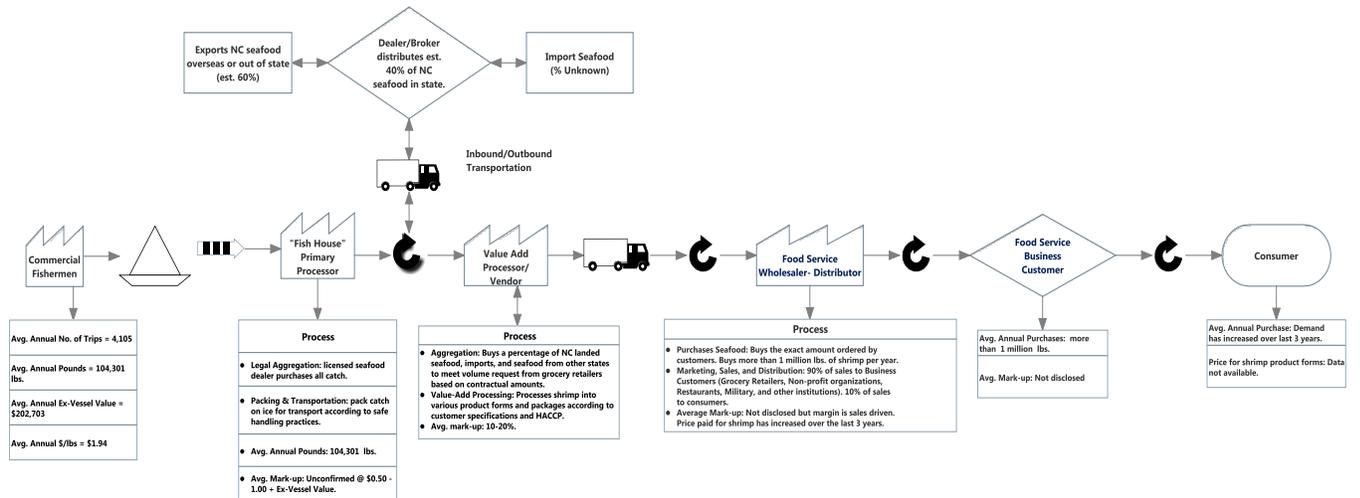


Flounder Value Stream Map



SmartDraw Academic Edition

Shrimp Value Stream Map



SmartDraw Academic Edition

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