LOUISIANA SHRIMP VALUE CHAIN:

PRICE DYNAMICS, CHALLENGES, & OPPORTUNITIES

Datu Research
October 2016

Datu
data for the big picture

This independent report by Datu Research was prepared for the Coalition to Restore Coastal Louisiana ("CRCL"), with funding support by National Wildlife Federation.
www.crcl.org
www.nwf.org

Datu Research is an international consulting firm that helps decision makers create sustainable food systems, develop local economies, and increase climate resilience.
www.daturesearch.com

AUTHORS
Sarah Mine, Rui Chen, Shelby Shelton, and Marcy Lowe.

ACKNOWLEDGMENTS
The authors are grateful to the anonymous interviewees and reviewers who generously contributed their time and expertise to this project. Many thanks also to CRCL staff and partners for valuable feedback on earlier drafts.

The opinions or comments expressed in this report are not necessarily endorsed by the facilitating agency or specific individuals interviewed. Views of stakeholders other than those interviewed are outside the scope of this report. Any errors of fact or interpretation remain exclusively with the authors. We welcome comments and suggestions.

Inquiries can be directed to mlowe@daturesearch.com

LIST OF ABBREVIATIONS

CCC	Coastal Communities Consulting
CRCL	Coalition to Restore Coastal Louisiana
DNR	Department of Natural Resources
EMS	Early Mortality Syndrome
ERS	Economic Research Service
FDA	Food and Drug Administration
GMFMC	Gulf of Mexico Fishery Management Council
FAO	United Nations Food and Agriculture Organization
IQF	Individually Quick-Frozen
LDHH	Louisiana Department of Health and Hospitals
LDWF	Louisiana Department of Wildlife and Fisheries
LFF	Louisiana Fisheries Forward
LSU	Louisiana State University
LWSCP	Louisiana Wild Seafood Certification Program
NASS	National Agricultural Statistics Service
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OECD	Organization for Economic Cooperation and Development
PFG	Performance Food Group
RMA	Risk Management Agency
SBA	Small Business Administration
SQF	Safe Quality Food
SSA	Southern Shrimp Alliance
STPP	Sodium Tripolyphosphate
SWOT	Strengths, Weaknesses, Opportunities, and Threats
UCSB	University of California Santa Barbara
USDA	United States Department of Agriculture
USGS	United States Geological Survey

Contents

LIST OF TABLES

LIST OF FIGURES

Executive Summary

Louisiana is the top shrimp producer in the United States. The state's shrimpers captured 107.7 million pounds in 2014, nearly three times the amount captured by Texas, the next largest U.S. producer. Despite leading in U.S. production, Louisiana currently supplies just a fraction of the shrimp required to meet total U.S. demand, with imports representing approximately 90% of the shrimp consumed in the United States.

Louisiana's shrimpers take pride in the quality and taste of their product. Prices at the grocery store range from about $7 to $9 per pound depending on size, and an upscale restaurant may charge up to $28 per pound for local shrimp. Yet Louisiana shrimpers realize a significantly lower price. In today's market, the fisherman responsible for the shrimp that eventually appears on a diner's plate likely earns less than $2 per pound.

Low prices are not the only challenge for producers. From a shrimper's perspective, the price often does not seem to be linked to anything tangible. Production can decrease across the state, and prices may still go down. This lack of predictability leaves shrimpers uncertain about the future, a sentiment enhanced by recent memories and lingering impacts of a decade of natural and manmade disasters, including Hurricanes Katrina, Rita, Ike, and Isaac, as well as the BP Oil Spill. The steady loss of wetlands that provide critical shrimp habitats adds to this uncertainty, as do restoration efforts.

Dampened prices are directly linked to the recent farmed shrimp boom in Southeast Asia and Latin America, which led to an exponential increase in the global supply. In response, world prices plummeted from $6.79 per pound in 2000 to $3.42 in 2009. In recent years, they have continued to trend downward. When wild-caught Louisiana shrimp are viewed as a commodity, domestic suppliers, from wholesalers to shrimp producers, feel pressure to compete with low, global prices.

Global supply and demand dynamics also help explain the perception of unstable prices. Louisiana price spikes in 2013 and 2014 coincided directly with the advent of Early Mortality Syndrome ("EMS"), a disease that devastated shrimp populations in Thailand and nearby countries, causing a shock to the global supply. As production in the region recovered beginning in 2015, Louisiana prices again mirrored the resulting decline in global price.

Another reason for low prices received at the dockside is shrimpers' position in the value chain. Shrimpers provide the chain's raw inputs, and it is mainly actors in the later stages who transform shrimp into value-added products. From a fisherman's boat, shrimp travel through dockside aggregators to processors, then to wholesale distributors, and finally to retailers. Actors down the chain purchase shrimp from actors up the chain. At every step along the way, value is added, and the price of shrimp increases.

When Louisiana shrimp is treated as a commodity that can be easily replaced by an imported product, the availability of global price information exerts downward pressure on realized prices. Our analysis reveals price pressure at almost every point along the Louisiana value chain. The only segment of the chain in which Louisiana shrimp are able to escape commodity pricing is the retail segment, particularly in high-end restaurants. The strongest pressure is felt from the wholesale segment, on further up the chain in the direction of the production segment. In short, shrimpers are the group most likely to be vulnerable to downward pressure on prices.

To better understand shrimpers' options and possible obstacles to implementing them, we used data from interviews and existing literature to conduct an analysis of Strengths, Weaknesses, Opportunities, and Threats ("SWOT"). Based on the SWOT analysis and our understanding of pricing dynamics, we offer three broad recommendations and several recommended actions for each. The following recommendations are developed in this report's full analysis:

1. Sell more shrimp directly to consumers
2. Sell more shrimp directly to the retail buyers, especially high-end restaurants
3. Sell more shrimp directly to the wholesale operators

1 SELL MORE SHRIMP DIRECTLY TO CONSUMERS

Consumers are often willing to pay a premium for shrimp that were captured recently, and which they can buy directly from a local producer who can provide full information on how the product was captured and handled. To sell more shrimp directly to consumers, shrimpers can:

a) Increase direct-to-consumer marketing. Shrimpers can take advantage of Louisiana's emerging network of support services for direct marketing to further improve product safety and quality, and become savvy salesmen.

b) Obtain any necessary licensing. To sell directly to consumers, a shrimper at minimum needs a Fresh Products License ($20 resident, $120 nonresident).

2 SELL MORE SHRIMP DIRECTLY TO THE RETAIL BUYERS, ESPECIALLY HIGH-END RESTAURANTS

Within the retail segment, there is sure to be a variety of opportunities for shrimpers to identify new buyers. The Louisiana Department of Health and Hospitals ("LDHH") reports there are nearly 34,000 permitted retail food establishments in Louisiana, including 16,747 restaurants, 7,140 grocery stores, 2,351 daycare and residential food providers, and 518 seafood markets. Added to this list are meal delivery services like Blue Apron, which present new marketing opportunities for Louisiana shrimp.

Our SWOT analysis provides evidence that increasing sales to restaurants is an especially promising opportunity. High-end restaurants offer the highest prices in the value chain. Our interviews suggest that such restaurants prefer shrimp that are locally and sustainably caught and minimally processed, which well describes the shrimp that Louisiana's fisherman are already providing. They also want larger sizes of shrimp, and they want them properly handled to promote food safety. To fulfill these restaurants' and other retailers' needs, shrimpers can:

a) Network with local, high-end restaurants. When shrimpers and restaurateurs meet, they gain a chance to learn about each other's needs. Shrimpers can use this information to market to restaurants more effectively.

b) **Emphasize quality through improved handling and technology.** One differentiator important to retailers is handling for safety and quality. Some improvements require technology upgrades, and resources are available to help shrimpers access the necessary capital.
c) **Obtain any necessary licensing.** No additional licensing is required for a commercial fisherman selling or delivering to an in-state entity possessing a Wholesale/Retail Dealer's License.
d) **Enroll in the Louisiana Wild Seafood Certification Program and seek to maintain current rules.** The local, wild-caught status of Louisiana shrimp is an asset that more shrimpers could be leveraging. One way to do this is by participating in a menu labeling campaign.

3 SELL MORE SHRIMP DIRECTLY TO THE WHOLESALE OPERATORS

Wholesalers want large volumes of high-quality, processed shrimp at the lowest cost. To provide this, shrimpers can:

a) **Network with other shrimpers.** Shrimpers can act collectively to reach the larger volumes needed to sell to wholesalers. Trust is critical for collective action. Repeated interaction in formal and informal settings can break down social divisions and build confidence.
b) **Identify charismatic leaders.** In groups, there are often one or two people that others seem naturally drawn to, and are willing to follow. These charismatic leaders can be important to mobilizing a group toward collective action.
c) **Seek advice and form a cooperative.** A number of agencies and firms offer legal or business advice to guide shrimper decision-making on the path to cooperative formation.
d) **Purchase a facility.** To perform aggregation and processing, the co-op would need a facility. The most likely source of capital for purchasing a facility and furnishing it with processing and storage equipment is grant funding.
e) **Obtain any necessary licensing.** To buy shrimp from commercial fishermen, or to sell out of state, a co-op would need a Retail/Wholesale Seafood Dealer license, which is $250 for residents and $1,105 for non-residents. A transport license may also be needed. To conduct processing, the co-op would also need to be permitted through LDHH, and to register with the U.S. Food and Drug Administration.

Shrimpers are likeliest to optimize their results by implementing these approaches in combination. None are simple fixes. Increasing sales to consumers and restaurants may require significant investment, and to form a cooperative, shrimpers need to overcome decades of skepticism, bridge gaps between distinct social groups, raise capital, and accept some amount of risk. Still, remaining open to these opportunities and further innovations will enable the industry to build resilience and adapt to future challenges.

Introduction

Shrimpers in Louisiana find themselves in a difficult position. Over the last 40 years, the price they have been able to realize for their catch has crept downward, despite relatively steady production (NOAA-NMFS, 2016b). This trend alone makes it increasingly difficult for shrimpers to earn a living. But shrimpers also face another challenge in the unpredictable fluctuation of dockside prices from one year to the next, sometimes by several dollars per pound. These shrimpers have withstood one natural or manmade disaster after another, including Hurricanes Katrina and Rita in 2005; Hurricane Ike in 2008; the BP oil spill in 2010; and Hurricane Isaac in 2012. But low and unpredictable prices may pose the greatest challenges to the industry yet.

This project seeks to provide a better understanding of how prices are determined at every stage along the Louisiana shrimp value chain, and to find and recommend opportunities for shrimpers to capture more value, and to become more resilient in the face of uncertainty.

Global dynamics continue to result in an increasing volume of low-priced shrimp imported from Southeast Asia and Latin America, which does play a role in driving down prices. Exchanges and relationships between players along the Louisiana value chain also have a clear impact on the price shrimpers can realize.

Shrimpers have no promising options for reducing global pressures, and trade protections like antidumping duties have been ineffective in equalizing the playing field (Harrison, 2012; Tabarestani, 2013). But the structure of the local system does contain some opportunities for them to capture a larger share of the prices that flow along the chain. Taking advantage of those opportunities will require understanding and adopting effective new approaches in the structure and conduct of their business.

The value chain is a complex, dynamic system. From a fisherman's boat, shrimp will travel through dockside aggregators to processors, then to wholesale distributors, and finally to retailers. At every step along the way, value is added, and the price of shrimp increases. Today, a casual observer can see Louisiana shrimp for sale in a grocery store for up to $9 per pound, or on an upscale restaurant menu for as much as $28 per pound. Meanwhile, shrimpers are likely to receive less than $2 per pound when they sell at a dock (LDWF, 2016a).

Who is capturing the added value, and why does so little accrue to shrimpers? Our primary methods in answering these questions were secondary data analysis and synthesis. For this six-month study, we reviewed existing literature and analyzed historical and recent data, consulting over 120 documents and datasets. Our findings were reviewed and vetted by 12 independent experts from government, academia, and business. Appendix A provides a detailed description of our methodology. We also made field visits to docks in Louisiana, and conducted

phone and in-person interviews with selected lead actors at each stage in the shrimp value chain. Appendix B contains a sample interview guide, and a complete list of interviewees is shown in Table 1.

TABLE 1.
List of Interviewees

VALUE CHAIN ROLE	NUMBER OF INTERVIEWEES
Shrimper	7
Dock Owner	2
Processor	5
Importer	1
Wholesaler	1
Retailer – Restaurant	3
Industry Expert	3
Total Interviews Conducted	22

This paper proceeds as follows:

- Section I provides the big-picture context for recent observed Louisiana dockside price trends, particularly in light of increases in global shrimp supply.
- Section II introduces the Louisiana shrimp value chain and analyzes how prices are determined at various stages.
- Section III contains discussions of leverage points in the value chain, observed opportunities for shrimpers to capture more value, and recommendations for action.
- We conclude with wider implications of this study, and next steps.

I. Louisiana Shrimp Prices in a Global Context

The Louisiana shrimp industry has undergone dramatic change over the past half century. In the 1960s, shrimp was a low-volume, high-profit industry. U.S. consumers saw shrimp as a luxury item—something to be ordered with prime steak at a fine dining establishment. Over the years, shrimp has gradually become commodified, and historically low prices have taken hold at nearly every point in the value chain. Stakeholders, including shrimpers, dockside aggregators, and processors, face pressure to transact in increasingly large volumes just to survive. The world of commerce is global now, and so we have to look beyond the immediate environment to find the roots of these problems.

SUPPLY AND DEMAND TRENDS

Louisiana is the largest shrimp fishery in the United States, and the leader among producers in the Gulf. Nearly two-thirds of all shrimp produced in the United States come from the Gulf of Mexico (NOAA-NMFS, 2015). Louisiana's shrimpers brought in 107.7 million pounds in 2014. This is nearly three times the amount delivered by Texas, the next largest U.S. producer, in the same year (NOAA-NMFS, 2015).

At that volume, Louisiana's production could reasonably be expected to have an impact on prices at the dockside. Figure 1 illustrates the relationship between Louisiana production volumes and dockside prices, adjusted for inflation, from 1978 through 2014. We would normally anticipate an increase in dockside prices in low-production years, and a decrease in those prices in high-production years. But as the chart reveals, this hasn't happened as often as we might have presumed.

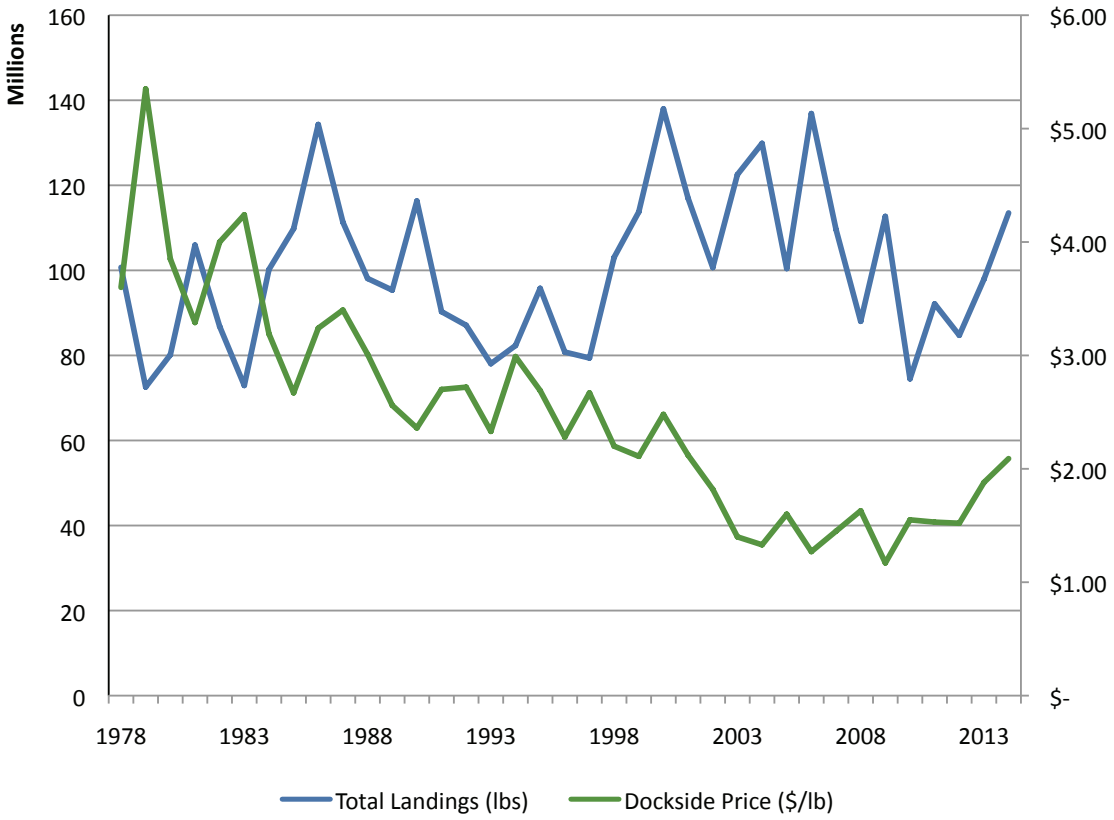
Across the 36 years represented in the chart, the observed price has behaved the way we would expect—if Louisiana's production were indeed driving local prices—only 64% of the time. Thus, the most important insight from Figure 1 is that Louisiana production is not the primary driver of dockside prices. Further analysis of local production trends is therefore unlikely to yield satisfactory insight into dockside prices.

Louisiana dockside prices can be shaped by a wide range of factors. The timing of shrimp seasons all over the Gulf, inventories of unsold supply held over by processors and wholesalers from previous seasons, unusual changes in weather patterns, and natural and manmade disasters are among the variables that can play determining roles.

But these local dynamics can only tell a small piece of the story. Louisiana currently supplies just a fraction of the shrimp required to meet total U.S. demand, which rose to 1.26 billion pounds in 2014, nearly reaching the peak of historic trends (NOAA-NMFS, 2016b). The

FIGURE 1.
Louisiana Shrimp Landings and Price (Adjusted to 2015 Dollars), 1978–2014

SOURCE:
NOAA-NMFS (2016b)



United States is the largest import market for farmed shrimp, and the United Nations Food and Agriculture Organization ("FAO") reports that approximately 90% of the shrimp consumed in the United States today is imported (Clark, 2014; FAO, 2016b). To understand Louisiana prices, it is useful to consider what is driving imports.

THE RISE OF FARMED SHRIMP

The most influential driver behind Louisiana's low dockside prices is widespread availability of farmed imports. In the early 2000s an unprecedented boom in farm-raised shrimp production occurred, driven largely by aquaculture expansions in Southeast Asia and Latin America. The result was an exponential increase in the volume of farm-raised shrimp available on the global market (Figure 2).

To put the magnitude of this shift in global production into perspective, between 2000 and 2007, global shrimp capture production grew steadily at a rate of 13% over the seven years. In comparison, during this same period, global shrimp farming, or aquaculture, production increased by a staggering 190% (FAO, 2016a). By 2008, global aquaculture production, which was effectively nonexistent three decades earlier, had surpassed global capture production. This rapid expansion in aquaculture dramatically increased the total global supply of shrimp.

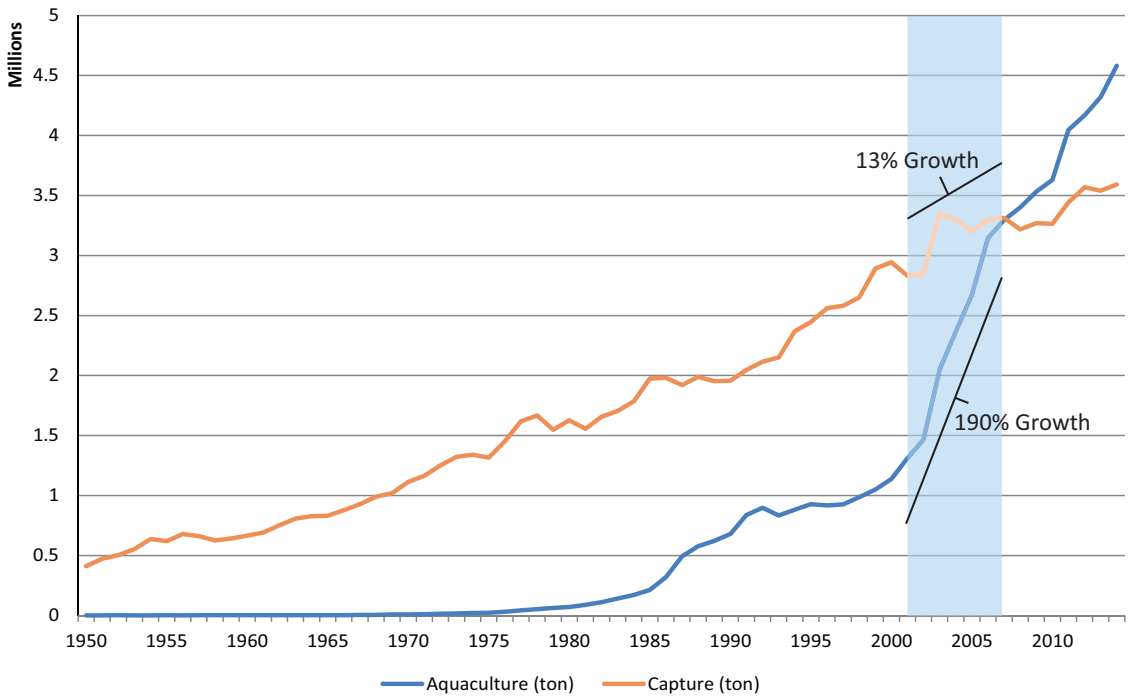


FIGURE 2.
Global Shrimp Aquaculture and Capture Production, 1950–2014

SOURCE:
FAO (2016a)

It seems safe to conclude that increased global supply has put downward pressure on world shrimp prices. In the figures that follow, all prices have been adjusted for inflation, and are shown in real 2015 dollars to ensure accurate comparison over time. While global prices have been trending downward over the last half century, the sharp dip in price corresponding to the sudden increase in global supply is clearly observable in Figure 3.

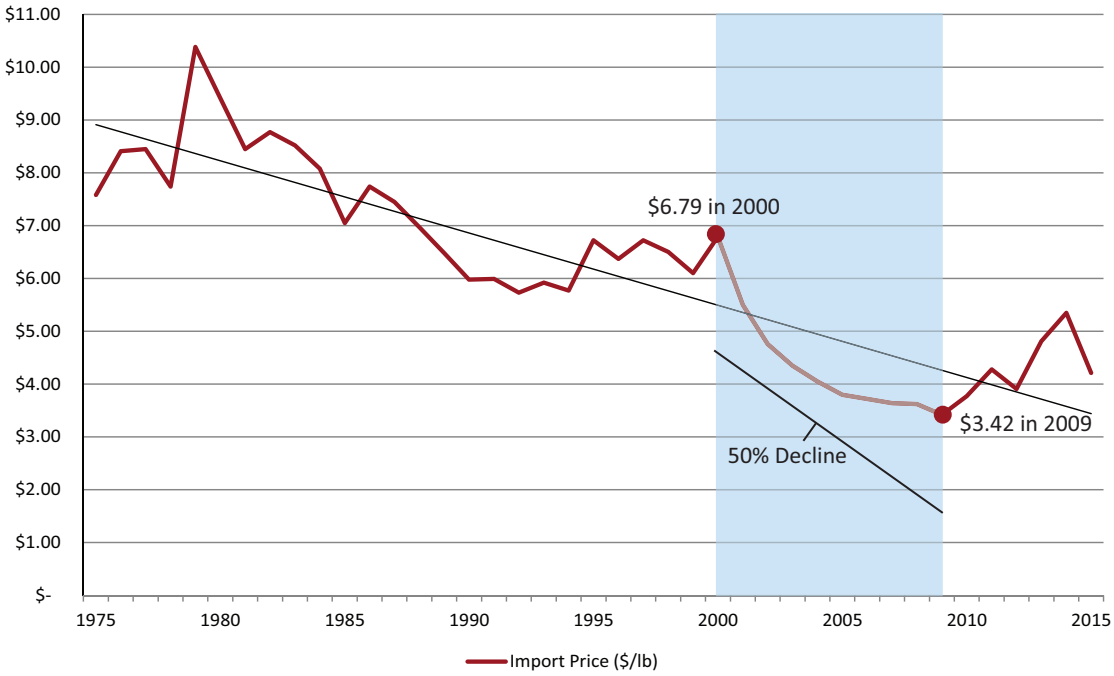


FIGURE 3.
U.S. Shrimp Import Price (Adjusted to 2015 Dollars), 1975–2015

SOURCE:
NOAA-NMFS (2016a)

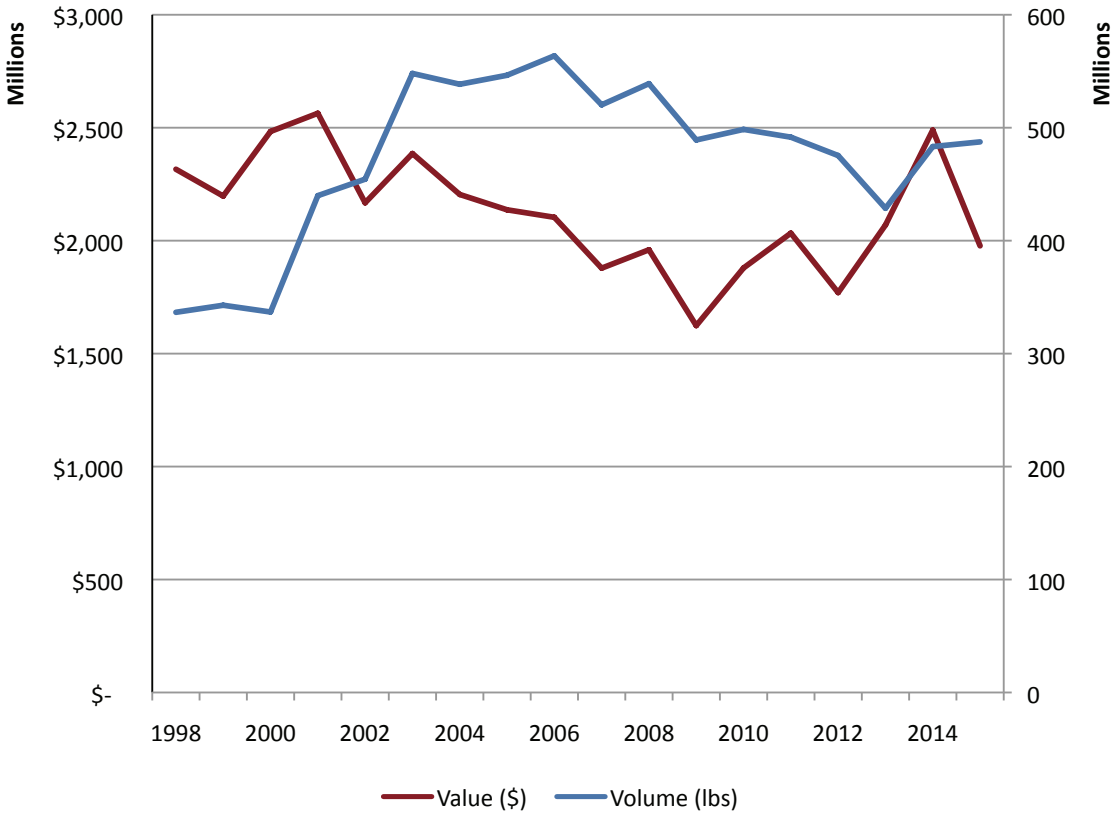
In the nine years following the start of the global aquaculture boom, U.S. import prices declined by 50%, descending from a high of $6.79 per pound in 2000 to a low of $3.42 in 2009. At the same time, as global prices dropped, the volume of U.S. shrimp imports grew from 336.8 million pounds in 2000 to 489.1 million pounds in 2009, peaking at 563.7 million pounds in 2006 (Figure 4).

Imports create new competition for Louisiana's shrimpers. According to our interviews, chain restaurants, which are among the largest domestic buyers of shrimp, seem to prefer imports because of their competitive price, their relatively consistent supply, and the range of processed product options coming out of the sophisticated processing facilities of exporting countries. Because imported shrimp arrive already frozen or otherwise processed, their prices most closely mirror domestic wholesale prices, and they compete directly at the wholesale level. Although time series data on average shrimp wholesale prices are not available, we confirmed—via a series of size-by-size price comparisons and through our interviews—that, in general, import prices were closest to domestic wholesale prices.

Imports put downward pressure on the Louisiana shrimp value chain, starting with wholesalers and moving up the chain toward producers. Processors, wholesalers, and other buyers can check the import price by using paid services like Urner Barry's COMTELL™ or by calling around to colleagues and competitors before determining what price to offer at the dock. Shrimpers and dock owners can either accept this price or lose the sale, knowing that an imported product can be easily substituted for theirs.

FIGURE 4.
U.S. Shrimp Import Volume and Value (Adjusted to 2015 Dollars), 1998–2015

SOURCE:
NOAA-NMFS (2016a)



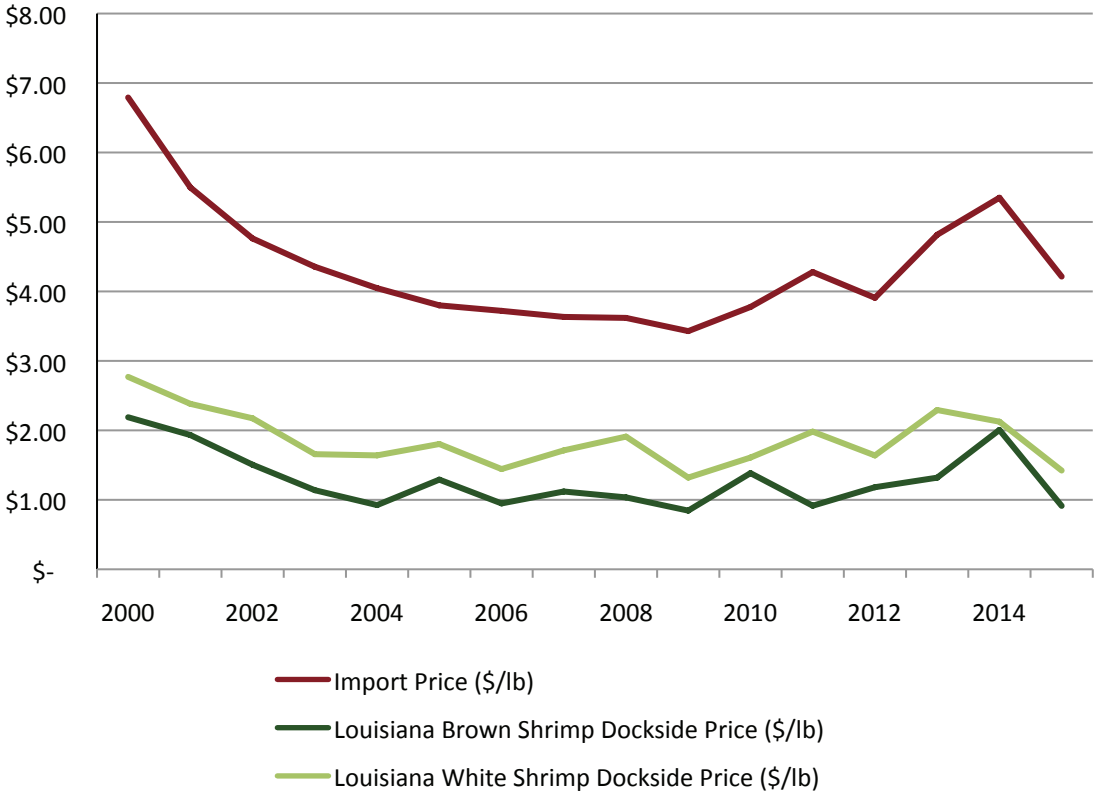


FIGURE 5.
U.S. Shrimp Import Price and Louisiana Shrimp Dockside Price by Type (Adjusted to 2015 Dollars), 2000–2015

SOURCE:
NOAA-NMFS (2016a); LDWF (2016a)

This explains why there is such a strong positive relationship between import prices and dockside prices. Figure 5 illustrates how dockside prices for head-on shrimp have risen and fallen in conjunction with changes in the import price for headless shrimp. Although they are not the same—the import price has always remained significantly higher—the association between the two suggests very strongly that import prices have a direct effect on dockside prices.

To test this relationship further, we used correlation to measure interdependence between the variables. For both brown and white shrimp (the two highest volume species of shrimp caught in Louisiana), the relationship between dockside price and the import price is strong and positive (r=0.869, brown shrimp dockside & import price; r=0.874, white shrimp dockside & import price). See Appendix C for correlation details. By calculating r-squared, we estimate that 76% of the change in brown shrimp dockside price is explained by change in the import price; for white shrimp, this value is also 76% (LDWF, 2016a; NOAA-NMFS, 2016a). Such strong correlation and r-squared values provide compelling evidence that competition from imports is critical in driving low dockside prices in Louisiana.

HIGH PRICE YEARS EXPLAINED BY GLOBAL SHOCKS

Louisiana shrimpers experienced relatively high dockside prices in 2013 and 2014, but then prices plummeted in 2015. Once again, global supply and demand dynamics explain many of these recent fluctuations.

In late 2012, farmed shrimp production in Southeast Asia was devastated by the onslaught of a disease referred to as Early Mortality Syndrome ("EMS"), which causes rampant death of larval shrimp a few days after their release into aquaculture ponds. Prior to the appearance of EMS, Thailand had been the second largest global producer of shrimp after China, and the single largest supplier to the United States (FAO, 2016a; Harvey, n.d.).

By 2013, sources estimate that Thailand's production had been reduced by around 40% to 50% (Chaichalearmmongkol & Jargon, 2013; Undercurrent News, 2013b). In response to this significant shock to the global supply, which resulted in a quantity supplied that was suddenly insufficient to meet global quantity demand, the global price shot upward (Chaichalearmmongkol & Jargon, 2013).

Capitalizing on high prices, countries less severely affected by EMS began to increase aquaculture production. Indonesia, Vietnam, Ecuador, Mexico, and India all increased their production following the shock to the Thai supply (FAO, 2016a).

Meanwhile, by mid-2013 researchers at the University of Arizona had identified the pathogen behind the disease and were working to identify a cure (Undercurrent News, 2013a). In late 2015, farmed shrimp production in Thailand began to show signs of recovery, with production and exports increasing for the first time since 2012 (FAO, 2015).

As supply has stabilized, prices have returned to pre-EMS levels. FAO reported that "[i]n the first half of 2015, shrimp prices plummeted by 15–20 percent compared with the first half of 2014, as a result of the supply and demand disparity in the United States of America, the EU and Japan" (FAO, 2016b). A continued trend of sustained global production and downward pressure on domestic prices seems likely.

Although we can observe and describe the powerful ways in which Louisiana dockside prices are linked to the global market, the gap between import price and dockside price suggests there is more to the story. We still need to understand how prices are determined within the local value chain.

II. Price Dynamics in the Louisiana Shrimp Value Chain

In this section, we examine the dynamics controlling how prices are determined in each part of the Louisiana value chain, which is essential to understanding the price that shrimpers receive at the dock.

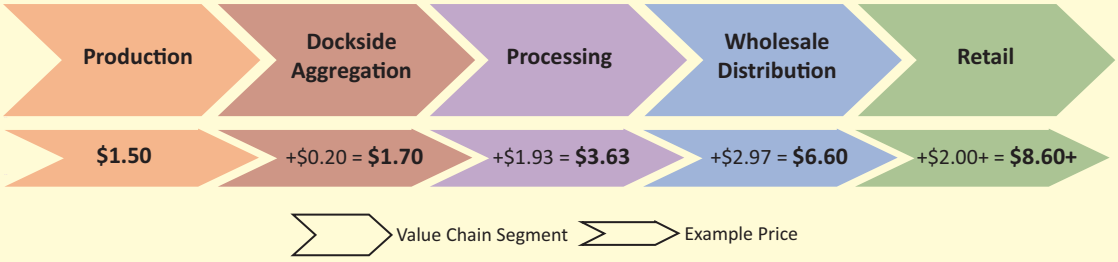


FIGURE 6.
Segments and Prices in the Louisiana Shrimp Value Chain

SOURCE:
Production: 2015 average price for size 21/25 brown and white shrimp, from LDWF (2016b); Dockside: Datu interviews, 2016; Processing: Datu interviews, 2016; Wholesale: 2015 average wholesale price for size 21/25 brown and white domestic Gulf shrimp, from Urner Barry's COMTELL (2016); Retail: 2015 average retail feature price for size 21/25 raw shrimp from the Southeast region, from Urner Barry's COMTELL (2016).

PRICE PROGRESSION IN THE LOUISIANA SHRIMP VALUE CHAIN

The Louisiana shrimp value chain consists of five key segments, illustrated in Figure 6. They are:

- **Production,** made up of the fishermen who harvest shrimp in state and federal waters of the Gulf of Mexico, off the coast of Louisiana
- **Dockside aggregation,** at which point the shrimpers sell their catch at a dock, and workers load the shrimp onto trucks bound for a processing facility
- **Processing,** where the shrimp are transformed in a number of ways including peeling, deveining, removing heads, cooking, and/or freezing, before packaging for sale to wholesale distributors
- **Wholesale distribution,** at which point wholesalers supply bulk quantities of packaged shrimp and shrimp products to retail clients
- **Retail,** the consumer-facing portion of the chain, in which restaurants, grocery stores, and other players sell final consumer goods for immediate consumption or home preparation

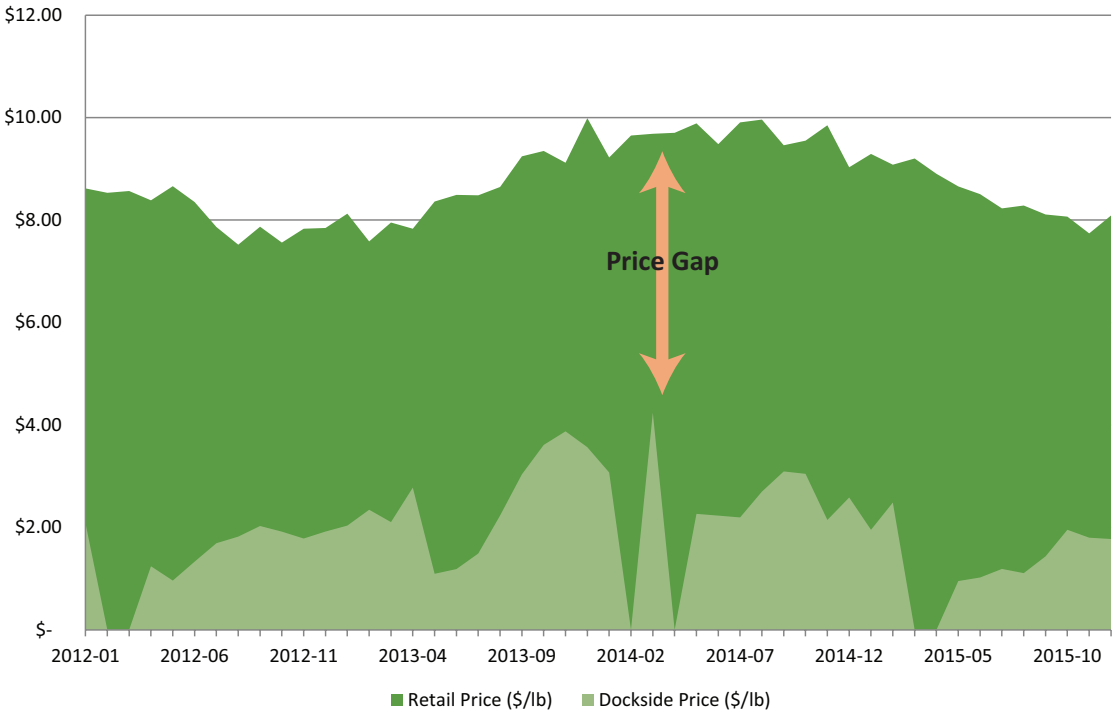
Actors down the chain (to the right) purchase shrimp from actors up the chain. As shrimp move along the chain, price increases. In the example in Figure 6, the smaller numbers indicate the amount the price increased from the previous segment. Increasing prices up the chain are to be expected because the actors within each segment add value by changing the product in some way, making it worth more in the eyes of the consumer. Through this process, they also incur costs, which they take into account when determining the price they prefer to charge buyers.

Yet value-added and costs alone may not fully explain the price increases from one level of the chain to the next, or why the ultimate gap between production and retail prices is so great. Market news provider Urner Barry's COMTELL delivers wholesale price information for shrimp and other food commodities, updated twice each week. COMTELL also tracks prices offered in weekly retail "features," which grocery stores use to announce special offers.

Figure 7 illustrates the gap between prices in these retail features and average dockside prices for raw shrimp of all sizes, monthly, since 2012 (LDWF, 2016a; Urner Barry's COMTELL, 2016). At the low end of retail pricing, the average gap is $6.39 per pound, indicating retail prices three times higher than average dockside price. Because these figures refer to special offers, and only apply to grocery stores, this is likely the most conservative of estimates of the dockside-retail price gap.

FIGURE 7.
Gap between Louisiana Shrimp Dockside and Retail Prices (Adjusted to 2015 Dollars), 2012–2016

SOURCE:
Urner Barry's COMTELL (2016); LDWF (2016a)



Prices at restaurants are often considerably higher. One popular, high-end New Orleans restaurant reported offering a main course featuring wild-caught Louisiana shrimp for $28 per pound, indicating an approximate dockside-retail price gap of $26. To understand what shrimpers can do to get a better price, it is useful first to examine where and how along the value chain shrimp acquires market value.

A value chain approach helps to get a fuller picture of what determines price at each level by identifying the actors within each segment, the functions they perform, the costs they incur, and the returns they capture.

Figure 8 provides a more detailed examination of each segment, and provides a basic understanding of the shrimp value chain and a discussion of implications for Louisiana shrimpers.

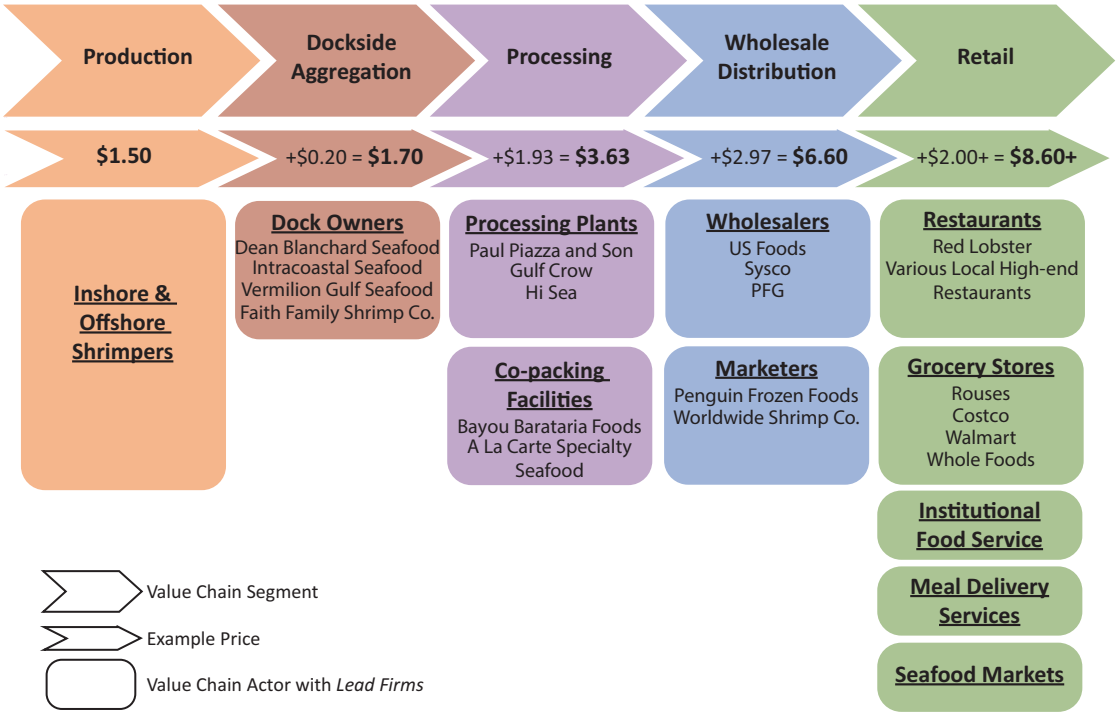


FIGURE 8.
Simple Louisiana Shrimp Value Chain

SOURCE:
Datu interviews, 2016; see Figure 6 for additional source information.

PRODUCTION

Shrimpers are the foundation for the entire value chain. They capture the wild-caught Louisiana shrimp on which the entire chain depends. Typical operating expenses incurred by shrimpers include fuel, ice, overhead, repairs and maintenance, and payments to captain and crew (Miller & Isaacs, 2011).

Commercial shrimping in Louisiana dates to the late nineteenth century, and there are shrimping families who have performed this work for decades or longer (Harrison, 2012). In addition, in the 1970s, a significant population of Vietnamese refugees arrived in coastal Louisiana, bringing with them their shrimping traditions and, in some cases, even their vessels. Shrimpers from both backgrounds share a tradition of historical independence and self-reliance.

To estimate the number of active shrimping vessels in Louisiana, we used shrimping license data. Gear fees are the annual state-mandated licenses for the gear used by commercial shrimpers, and must be paid annually on any shrimping vessel that will be used over the course of a given year. Sales of these fees suggest that there are between 3,000 and 3,500 active shrimping vessels in Louisiana (Bourgeois et al., 2015).

Of these vessels, approximately 391 comprise the offshore fleet (vessels permitted to shrimp more than nine miles into the Gulf, in federally-controlled waters) (LDWF, 2016c). The remainder comprise the inshore fleet, including federal trawlers that choose to shrimp inshore, and vessels that, lacking a federal permit, are confined to state-controlled waters (Bourgeois et al., 2015; NOAA-NMFS, 2016b).

Although reliable estimates of the number of vessels over time are unavailable, we can examine shrimp production trends to understand changes in each fleet's relative importance to total Louisiana landings. 2001 was the first year in which a permit to shrimp in federal waters was required (GMFMC, 2001). Since then, the share of total Louisiana landings delivered by the inshore fleet has gradually increased, while the offshore share has gradually decreased. In 2001, the inshore fleet landed 67% of all Louisiana shrimp and the offshore fleet landed 33%; by 2013, inshore landings had increased to 74% and offshore decreased to 26% (LDWF, 2016a). These trends remained steady through hurricanes Katrina and Rita in 2005 and Ike in 2008. However, in 2010, the year of the BP Oil Spill, there was a noticeable dip in federal landings (21% of production) paired with a comparable spike in inshore landings (79% of production) (LDWF, 2016a). Both deviations were temporary, with inshore resuming its upward trend and offshore resuming its downward trend beginning in 2011.

Because of a moratorium on federal permits that went into effect in 2006, we can infer that there has been no net growth in the offshore fleet in the last decade (Hart & Nance, 2013). For a new shrimper to gain access to federal waters, an existing permit must be transferred.

Table 2 characterizes the main differences between the fleets. Because the "offshore" fleet in actual practice moves between federal and state waters, some overlap is expected in the number of inshore and offshore vessels.

TABLE 2.
Characteristics of Louisiana's Inshore and Offshore Shrimping Fleets

SOURCE:
Bourgeois et al. (2015); LDWF (2016a)

	INSHORE	OFFSHORE
Number of Vessels	3,000–3,500	391
Landings	75,242,124 pounds/year on average	36,995,578 pounds/year on average
Vessel Size	30–49 feet accounts for the largest portion Sizes vary	Larger than 50 feet
Shrimp Season	Spring Season from May to July; Fall Season from mid-August to mid-December Actual opening and closing dates vary	Year-round
Gear Types	Trawlers, Skimmer nets, Butterfly nets	Trawlers
Shrimp Size	More than half are *small* shrimp or smaller (i.e. 51/60 and smaller)	More than half are *jumbo* shrimp or larger (i.e. 21/25 and larger)

A number of factors affect the value of shrimpers' catch. First is size of shrimp. To make profit-maximizing decisions, shrimpers need to be aware of the price that docks are paying for each size, which changes daily. These prices are posted at each dock, and many shrimpers share pricing information with each other via Facebook groups or word of mouth. All parties we interviewed viewed the posted prices as non-negotiable.

Shrimpers sort their catch by size while on the boat, and sorting decisions can have important impacts on how much that day's catch brings. Shrimp size is measured and identified in counts per pound. For example, a size of 21/25 means that there are between 21 and 25 shrimp in a pound. Short-term changes, including greater or lower than expected inventory, greater or lower than expected demand, and other supply and demand factors, can affect the price of each size on a daily basis. If prices for medium-sized shrimp are higher on a given day, a shrimper may choose to bulk smaller-sized shrimp and larger-sized shrimp together to come up with a

count per pound that that matches a medium-sized count. If headless shrimp are selling for more than head-on in a given size, a shrimper may choose to remove heads from that size before selling. Although head removal can be done at a processing facility, shrimpers often do this by hand on the boat to capture higher prices.

The method used to keep shrimp cold on the boat also affects price. In the individually quick-frozen method ("IQF"), 50-pound to 90-pound bags of shrimp are dipped into freezing-cold brine, then kept in cold storage until ready to be sold. This freezing process helps prevent damage such as loss of legs during handling.

Shrimp chilled in this way fetch a higher price dockside. Based on interviews, we estimate that shrimp kept cold with the IQF method bring a premium of about $0.20–$0.35 per pound over what shrimp cooling on ice bring for the same size.

Not all vessels are able to accommodate onboard freezing such as IQF, and many rely on ice to keep their catch safely chilled. This is one of the main distinctions between Louisiana's offshore and inshore fleets.

Inshore vessels, which can be trawlers, skimmers, or other vessel types generally between 39 and 50 feet in length, and which generally use ice for cooling, must return to a dock every one to four days to replenish ice, refuel, and sell their shrimp. By contrast, offshore vessels are mostly trawlers and are most often larger than 50 feet in length. Their larger size allows them to accommodate more complex freezing equipment, including the brine freezing vats and refrigerated storage holds required for IQF. They are also able to stay on the water for several weeks, and sometimes more than a month, before returning to a dock to refuel and unload.

Offshore trawlers have three main advantages over inshore vessels. The first is the higher price they can capture by selling IQF shrimp, as previously noted. Yet installing an IQF system to achieve this higher price requires significant investment. An extensionist with the Louisiana State University ("LSU") Ag Center/Sea Grant Marine Extension Program estimated the equipment cost for the IQF brine freezing system at between $21,000 and $55,000.

It is also difficult to draw a clear cost comparison between inshore and offshore fleets because of significant differences in inputs like ice, fuel, and labor. The inshore operators we spoke with reported paying $500–$800 per trip on ice, although ice cost estimates vary greatly according to vessel size and trip length, and previous studies have estimated these costs as being much lower (Miller & Isaacs, 2011). Moreover, one offshore captain estimated that he spent at least this much on diesel fuel, in one run, to fuel the generator keeping the catch in his storage hold cool enough during the weeks his vessel remained on the water. Consequently, it is difficult to say conclusively whether the IQF price advantage always yields the offshore shrimpers a net gain.

The second potential advantage is that federal waters are generally open to commercial shrimp harvesting year-round, and they are able to shrimp year-round. Inshore waters can only be fished for approximately three months of the spring season, usually from May to July, and five in the fall season, usually August through mid-December (LDWF, 2016b). These seasons were established and are controlled by the Louisiana Wildlife and Fisheries Commission in order to sustain healthy populations of brown and white shrimp over the long-term. Juvenile shrimp develop close to shore, so those waters are in effect their nurseries.

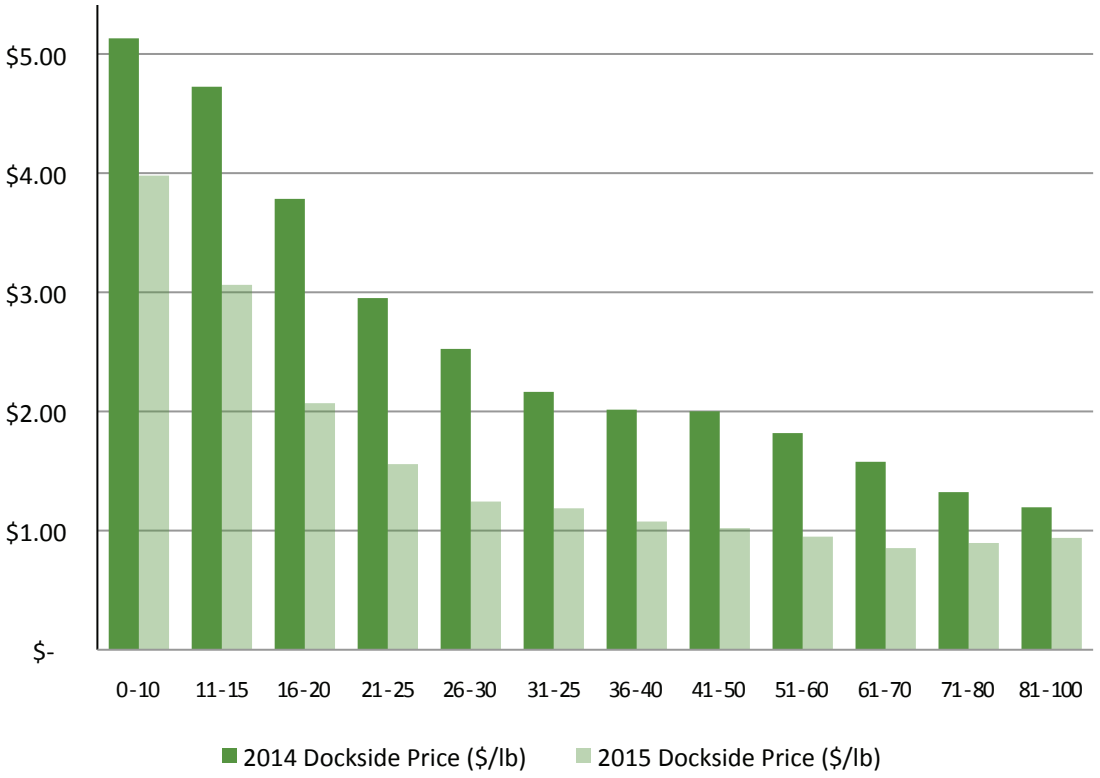
The ability to shrimp year-round affords offshore vessels a more stable flow of income than the inshore boats can expect, and allows them to capture more shrimp, increasing their total income. From 2000 to 2013, on average, the offshore fleet of about 391 vessels brought in 36,995,578 pounds, which is about 94,618 pounds per vessel per year. During this same period, the inshore fleet of 3,000 to 3,500 vessels brought in 75,242,124 pounds, or about 21,498 to 25,081 per vessel annually.

Offshore trawlers' third advantage is they are able to harvest larger shrimp, which fetch a higher price. Inland estuaries and marshes serve as the nursery grounds for juvenile shrimp. As they make their way into bays, and finally the open Gulf where federal trawlers can fish, they grow larger (LDWF, 2016b).

Although the market price depends on global supply, and an increase in the production of a certain size can decrease the price for that size for a time, larger shrimp are almost always worth more. Figure 9 illustrates this, showing the price differences across different sizes of shrimp in the last two years.

FIGURE 9.
Louisiana Shrimp Dockside Price by Size (Adjusted to 2015 Dollars), 2014 and 2015

SOURCE:
LDWF (2016a)



DOCKSIDE AGGREGATION

Inshore and offshore vessels gather at docks to unload wild-caught Gulf shrimp from their boats. The main function of a dock is to provide a convenient location to sell shrimp. Here, dock workers unload shrimp from boats, check sizes and weights, and pay shrimpers for their catch. Then they pack the shrimp with ice, typically into 100-pound boxes, and load them onto trucks for transport and sale to a processor. Most docks also sell ice and fuel to shrimpers.

Interviews suggest there are about 30 docks in Louisiana. Some (about 10) are located in places where the water is deep enough to accommodate the large offshore trawlers. The rest provide docking for the inshore fleet. Lead dock owners include Dean Blanchard Seafood, Intracoastal Seafood, Vermilion Gulf Seafood, and Faith Family Shrimp Co.

Each dock posts their prices, by size of shrimp, each day. When a shrimper sells at a dock, that day's posted prices are what he or she will be paid by the dock owner. Pricing from dock to dock seems very consistent, and shrimpers tend to choose a dock primarily based on convenience. As Figure 8 illustrates, in 2015 the average price docks paid shrimpers for a pound of size 21/25 was $1.50 (LDWF, 2016a). We use the 2015 price in our illustration because, although it is lower than the adjusted 16-year average from 2000 to 2015 ($2.23 per pound in 2015 dollars), it is the most representative price from recent years (LDWF, 2016a). As noted, prices spiked in 2013 and 2014 as EMS struck Southeast Asia, and then decreased in 2015.

The dock's process for getting price information varies by dock. Some call other docks, some call one or two processors. Regardless, there was general agreement among our interviewees that the price paid at the dock originates from the processor. One dock owner put it bluntly, "I have absolutely no ability to negotiate with processors."

PROCESSING

Shrimp off-loaded and packed at a dock in Louisiana are then trucked to a processing facility, either in the state or a nearby Gulf state. The dock owner and the buyer will agree on a commission to be paid by the buyer to the dock owner. According to our interviews, $0.20 per pound is standard. At this point in the example chain illustrated in Figure 8, the price of our 21/25 size shrimp is now $1.70, paid by the processor to the dock owner.

Some buyers do not engage in processing themselves. Shrimp "marketers," which might be called brokers in other markets, include Penguin Frozen Foods Inc. and Worldwide Shrimp Company. They buy shrimp at the dockside and retain ownership of the product as it moves through the processing segment, but do not own or control processing facilities.

Our interviews suggest, however, that the majority of dockside buyers are processing plants. In Louisiana, once the processing plants have taken delivery of raw or IQF shrimp from the docks, they typically devein, peel, remove heads, sort by size, freeze, cook, and/or package shrimp for wholesale.

According to a survey of seafood processors in the U.S. Gulf of Mexico, 43.7% of shrimp product sales among all processor-respondents were peeled and deveined, 23.7% were headless, 5.1% were head-on, and the rest were in other forms, indicating that peeled and deveined is the most common type of processed shrimp produced in and around Louisiana (Bourgeois et al., 2015). Lead processing plants based in Louisiana include Paul Piazza & Son, Inc., Gulf Crown, and Hi Seas.

Some processing operations are known as "co-packing facilities." Co-packers represent just a handful of processing facilities. These plants focus exclusively on packaging consumer products under a variety of different brand labels. These products include frozen popcorn shrimp and ready-to-eat shrimp gumbo.

Processing plants base the price they offer at the dock in part on their operating costs. A significant amount of weight (about 35%) is lost in the peeling process (Louisiana Direct Seafood, n.d.), which affects the size of shrimp as measured in counts per pound. Because larger sizes tend to be worth more, this peeling would represent a significant loss of revenue to the processor if it were not accounted for in the final price. In our calculation, starting with a pound of 21/25 shrimp for which the processor paid $1.70, about $0.80 would have to be added to the sale price just to recoup the value of that lost weight, bringing the price to around $2.50.

Production costs incurred by the processors beyond basic facility maintenance and labor include upkeep on equipment, worker's compensation coverage, electric and water usage, and payments and interest on lines of credit. Of these, equipment upkeep is particularly important. Broken, rusted, or otherwise insufficiently maintained equipment can compromise a processor's Safe Quality Food ("SQF") certification, which is administered by the SQF Institute, a division of the Food Marketing Institute. Using IQF shrimp is not a requirement for SQF, but it can eliminate the need for certain tests, including for sulfites, making the process simpler (FDA, n.d.). Major buyers at the wholesale and retail levels, including Sysco, US Foods, Walmart, and Costco, among others, require their suppliers to be SQF compliant.

Costs of remaining in compliance, which is verified through annual audits, can average about $100,000 per year, according to one medium-sized processor. Based on our interviews, a typical "production charge" to both cover these additional costs and capture some amount of profit, is between $0.75 and $1.50 per pound. In our example in Figure 8, this results in an estimated final sale price of $3.63. This estimate is rough, since many factors affect the price a processor receives, including type of processing employed, equipment used, and variable market conditions.

A processor may incur additional costs, especially if world prices change while the processor is holding an inventory. Processing plants maintain a large amount of freezer storage to hold frozen, processed goods prior to sale. One processor indicated that he has capacity to hold 650,000 pounds of frozen shrimp at a time, and that larger processors can hold much more.

Holding a commodity product in a market in which global prices prevail involves a certain amount of risk. As the price volatility in recent years attests, it is possible for prices to increase or decrease dramatically in a short period. While a processor may benefit when prices increase between the times a raw product was purchased and a processed product is sold, a price decrease can be devastating.

Yet this ability to store and hold frozen product may also represent the processor's greatest potential advantage over dock owners and shrimpers when it comes to having some control over the price they receive. Dock owners, who buy shrimp from fishermen, and then aggregate the product for resale, and the shrimpers themselves face a similar problem. Once they take ownership of a product, they generally lack the capacity to store it for any length of time.

With a product like shrimp, which is perishable and must be stored in a freezer to prevent spoilage, the dock owner has some leverage over the shrimp producer, and the processor has similar leverage with the dock. Players farther up the chain are often faced with the choice of either accepting the processor's price or losing both the sale and the product.

Potentially amplifying the bargaining power of Louisiana processors is their small numbers. Official records indicate that there are over 100 processors in the state. The Louisiana Department of Health and Hospitals ("LDHH") Commercial Seafood program reports there are approximately 350 licensed and inspected seafood processing facilities in the state (LDHH, n.d.a), while Vorhees (2014) reports 159 "processing/wholesale" operations.

But other sources indicate that the number of firms operating in the Louisiana processing segment has decreased quite a bit in the past half century (Harrison, 2012). We were interested in how many of the players that remain can be considered "major" processing plants—those that capture most of the state's processing business. Interviewees consistently estimated that at present, there are only between seven and ten major processing plants in the state. We did not estimate the number of processors in neighboring states that may also be considered major players, although interviews suggest it may be common for Louisiana docks to sell out of state.

Many of the plants that remain have established collaborative relationships with docks and/or distributors to capture economies of scale. Such collaboration allows processors to reduce transaction costs, obtain timely dockside information, and respond to clients quickly. The result, however, may be a consolidation effect that leaves shrimpers with fewer potential buyers for their products, making it less likely that the buyers will vary much, if at all, in the price they offer.

WHOLESALE DISTRIBUTION

Wholesale distributors sell in bulk to restaurants and other retailers, providing the products essential to running their businesses. In the shrimp value chain, these wholesalers supply frozen processed shrimp in large quantities, which they can store and then deliver when the clients need them. Lead firms in the wholesale segment include US Foods, Sysco, and Performance Food Group ("PFG").

Because cold storage is central to the value wholesalers provide, some of the main costs at this level include operating overhead for the storage facility, labor, and supplies like ice and

bags. Trucking represents another main expense. Fuel is needed to operate two engines in each vehicle—one for the truck itself, and one for the refrigeration system. Interviewees considered these to be fixed costs, which do not change in response to the volume of business.

Ample competition at the wholesale level suggests that wholesalers' profit margins are likely to be reasonable. Based on our interviews, we estimate that about 20 large (regional and national) wholesalers buy Louisiana shrimp, and perhaps more than 100 if we include smaller (local) players. In general, the shrimp products that are available from all wholesalers are effectively the same, and price information is readily available via market research services. This competition increases the likelihood that the market itself is determining the price that wholesalers receive.

In 2015, the average wholesale price of domestic Gulf shrimp was about $6.60, as illustrated in our pricing example in Figure 8 (Urner Barry's COMTELL, 2016). Interviews indicate that wholesalers determine their price by adding 10%–15% profit after the cost of buying shrimp and conducting wholesale operations, which mainly include packaging, storage, and refrigerated delivery.

The role of the shrimp marketers mentioned earlier in the value chain is not yet well understood, and marketers are identified here as a group that should be further researched. These companies handle large volumes, which they buy directly from the docks and sell directly to retailers. Unlike typical wholesale distributors, who will buy only what they know they can sell, a marketer takes calculated risks by buying and holding a mix of sizes in quantity, and speculating that the price will rise. More research is needed to estimate the number of shrimp marketers, and what impact their speculation may have on prices in the rest of the chain.

RETAIL

The retail segment is the shrimp's last stop on the route to consumers. Actors in this segment comprise local and nationally branded restaurants; grocery stores, including local chains like Rouses and national ones like Whole Foods, Walmart, and Costco; food service for institutions like schools, daycares, and residential dining services; meal delivery services like Blue Apron; and seafood markets, which include farmers market seafood vendors as well as establishments that are free standing or inside a grocery store. LDHH reports there are nearly 34,000 permitted retail food establishments in Louisiana, including 16,747 restaurants, 7,140 grocery stores, 2,351 daycare and residential food providers, and 518 seafood markets (LDHH, n.d.b).

Pricing at the retail level can vary widely. Specials offered by grocery stores, regional differences in end market pricing, and the customer base a retail outlet caters to can all affect the final price point. The retail price of $8.60 shown in Figure 8 is a base price, representing the low point in a range that goes much higher.

While it is possible to find a pound of smaller shrimp for $7–$9 at a discount grocery store, a higher-end grocery may charge $17–$20 per pound for larger sizes. At a high-end restaurant serving wild-caught Louisiana shrimp, this price can go even higher.

Only a small fraction of restaurants serve Louisiana shrimp. Interviews suggest that the chain establishments that dominate this industry, like Red Lobster and its competitors, face

pressure from their customer base to provide value for money. Consequently, they will opt for the lowest-cost product that meets their needs and their standards. The result is that most restaurants, both in this category and overall, buy and serve imported shrimp. In Louisiana, however, our interviews suggest that between 10%–20% of restaurants serve wild-caught local shrimp. This range was offered in multiple interviews, but could not be confirmed due to a lack of official data. This percentage of the business seems to be made up primarily of high-end restaurants.

Pricing for restaurants is complex. A dish that features shrimp as the main component usually includes other ingredients. Restaurants incur overhead costs for the building, equipment, and furnishings; and labor costs for chefs, servers, and other employees. Some restaurateurs we spoke with estimated that revenue of 30%–40% over cost of goods sold is required simply to survive.

At the high end of the scale, fine diners are looking for an experience. The restaurant's ethic—which may include a commitment to local seafood—and atmosphere, as well as the quality of service and creativity and presentation of dishes on the menu, are all essential to this experience.

Most important, high-end restaurant customers both expect and are willing to pay for this experience. This explains why certain restaurants, more than any other players in the Louisiana shrimp chain, are able to escape the burden of commodity pricing driven by the wide availability of cheap imports.

IMPLICATIONS FOR SHRIMPERS

When Louisiana shrimp is treated as a commodity that can be easily replaced by an imported product believed to be just as good, the availability of global price information exerts downward pressure on realized prices. Our analysis reveals this price pressure at almost every point along the Louisiana value chain.

The only segment of the chain in which shrimp are able to escape commodity pricing may be the retail segment, particularly in restaurants where shrimp are transformed into a fine dining experience. The strongest pressure is felt from the wholesale segment up the chain toward producers.

Every actor affected by this pressure has incentives to seek lower and lower prices from their suppliers to increase profitability. In their position at the base of the chain, shrimpers may be the group most vulnerable to the downward pressure on prices.

III. Opportunities and Recommendations

It is clear that global and local market realities have put intense pressure on the shrimpers who make their living in the Gulf waters off the Louisiana coast. Looking closely at those realities has shown that there are opportunities along the local value chain for these shrimpers to capture a larger share of the value added between the boat and the plate.

Three broad recommendations for the shrimpers to pursue have emerged from our value chain analysis. They are:

1. Sell more shrimp directly to consumers
2. Sell more shrimp directly to the retail buyers, especially high-end restaurants
3. Sell more shrimp directly to the wholesale operators

To understand the advantages shrimpers can leverage and obstacles to be navigated in accomplishing these goals, we conducted a Strengths, Weaknesses, Opportunities, and Threats ("SWOT") analysis of the data from our research and interviews.

SWOT ANALYSIS

The guiding question for our SWOT analysis is, "What can shrimpers do to capture more value?" We begin with a list of the internal strengths and weaknesses of the enterprise, followed by a summary of external opportunities and threats.

STRENGTHS

1. Wild-caught shrimp is often considered superior in flavor. Almost all shrimp produced in Louisiana are wild-caught (USDA - NASS, 2013), while most imported shrimp are farm-raised (FAO, 2016b). Among the stakeholders that we spoke with all along the chain, including restaurants and actors located outside Louisiana, there was a consistent and firmly-held conviction that wild-caught shrimp taste better than farm-raised.

2. Shrimpers capture ample amounts of larger sized shrimp. According to interviews, high-end restaurants are more likely to serve local, wild-caught shrimp. They report a preference for larger sizes, which make up an average of 40% of the local catch and consistently fetch a higher price (LDWF, 2016a).

3. Innovative onboard cooling technology is becoming more common. Plate freezers, which are onboard flash freezing systems that can be installed on smaller vessels than IQF systems; and chiller systems, which use circulating chilled water instead of ice to keep shrimp cool, are still less common than IQF and ice cooling in the Louisiana fleets. But a growing number of shrimpers recognize that their more consistent and reliable cooling can maintain quality, improve marketability, and lead to a higher sale price, and interviews suggest they are beginning to be more common.

4. Shrimpers can sell to other segments for the lowest prices in the Louisiana chain. Compared to every other actor in the local value chain, shrimpers charge the lowest prices for similar and often identical products sold by other actors in the chain. For example, a chef can buy a pound of frozen, headless, shell-on 21/25 shrimp from the boat for considerably less than the same product costs from the wholesaler.

WEAKNESSES

1. Insufficient access for restaurants and consumers limits direct purchasing. Restaurant owners and chefs often work long hours, and find it difficult to find shopping time, sync schedules to market hours, and to devote long travel times to a dock. Delivery to the restaurant was an important selling point for chefs who bought directly from shrimpers.

2. Shrimpers often do not carry liability coverage. Cost is the primary barrier preventing shrimpers from buying insurance to cover liability. Restaurateurs concerned about food safety may prefer to work with suppliers with coverage.

3. Many fishermen have limited holding capacity for their product. Most shrimpers can't store their catch, and must sell it at a dock on the same day. This forces them to accept the price offered by that dock on that day. According to one shrimper association representative, at least 90% of Louisiana shrimpers lack on-land cold storage (e.g. a freezer unit at their home), preventing them from waiting for higher prices, holding a product for a client, or bulking shrimp with other shrimpers in the hopes of accessing larger markets.

4. Louisiana shrimp has received poor Monterey Bay Aquarium "Seafood Watch" ratings. This program helps consumers "choose seafood that's fished or farmed in ways that have less impact on the environment" (Monterey Bay Aquarium, 2016). Most shrimp from Louisiana are currently "red-listed," which means they appear on the organization's "Avoid" list. Following the recent repeal of a state law prohibiting enforcement of protections for turtles, the rating for Louisiana's federal trawlers improved to "Good Alternative." All other Louisiana shrimp remain red-listed because state regulation does not require skimmers and other inshore vessels to have the turtle excluder devices known as "TEDs."

5. The sheer numbers of shrimpers, compared to other actors in the chain, creates coordination challenges. Chefs who do buy direct often told us they prefer to develop a relationship with their suppliers. With over 3,000 shrimpers selling at the state's docks, it can be difficult for a chef to get to know and trust any one shrimper. In addition, while the large number of shrimpers does not negate the possibility of collective action, when combined with traditional independence, competition over limited resources, and language barriers, a large group size may increase the difficulty of coordination.

OPPORTUNITIES

1. Restaurant and consumer interest in local seafood is growing. Research suggests that U.S. consumers are buying more local food than ever before (USDA-ERS, 2015), and emerging research focused on the seafood industry suggests a similar trend (Witter, 2012). Increasing sales to nearby restaurants committed to serving only local, wild-caught seafood could be a profitable step for shrimpers seeking the higher prices farther down the chain.

2. Recent policy enables certification and labeling of local seafood. In 2012, the Louisiana Department of Wildlife and Fisheries ("LDWF") launched the Louisiana Wild Seafood Certification Program ("LWSCP"), which creates a mechanism to identify local, wild-caught seafood on packages and menus (LDWF, n.d.c). Taking advantage of this program can support direct sales to local restaurants and other retailers. Shrimper participation in a local labeling campaign may even serve as an inexpensive first step to coordinated, fishery-wide participation in eco-certification programs like the Marine Stewardship Council and the Audubon Institute's Gulf United for Lasting Fisheries. In principle, such certifications have the potential to open up new markets for Louisiana shrimp and increase profitability for shrimpers, but more research is needed to understand the feasibility of attaining the certifications and the possible returns for shrimpers.

3. Restaurants and some export markets prefer minimally processed shrimp. Our interviews with restaurants and processors suggest that shrimpers do not need to do very complex processing in order to sell more to restaurants or certain export markets. This is because high-end restaurants often want more control over how the product looks and tastes, and are more likely to prefer shrimp with shells and sometimes heads intact. Market research conducted by one of our interviewees sees a preference for head-on, shell-on shrimp among high-end consumers in China as well.

4. Institutional support and grants improve access to technology upgrades and direct marketing. State and federal grant programs exist that can help shrimpers upgrade their freezing and cooling technology, link up with retail clients and end consumers, and market their products to a wider audience. Strengthening the number and reach of these programs could extend support to more shrimpers.

5. New meal delivery services like Blue Apron provide access to nationwide markets. Blue Apron, which provides a box of portioned ingredients and a menu shipped straight to a consumer's door, and services like it, present new opportunities for shrimpers to access larger markets. One shrimper using plate freezers was contacted by Blue Apron, who asked him if he could supply 2.5 million pounds of plate frozen shrimp in a year. Because he could not supply that volume, he was forced to decline, but there may be other similar opportunities given the growth in number of similar meal delivery services. This story illustrates the potential for networking and aggregation among shrimpers.

THREATS

1. Increasing competition from low-priced imports drives down domestic prices. The most critical threat facing the Louisiana shrimp industry is, without question, growing competition from low-priced imported shrimp. A number of solutions have been attempted to mitigate the negative effects of import competition, including the imposition of antidumping duties to penalize exporting countries selling shrimp to the United States at below market value. But research suggests that these kinds of policies have done little to improve dockside prices (Tabarestani, 2013). Although the duties funded payments to the industry as compensation for low prices, there have been complaints that they were distributed unfairly along the chain, and did not benefit the shrimpers, who are likely most in need of aid (Harrison, 2012). It seems improbable that additional attempts to stymie the flow of imports or alter the impact of global trends will prove any more effective at creating a more fair playing field for Louisiana shrimpers (LDWF, n.d.a).

2. Continued land loss and restoration efforts create uncertainty. Louisiana's three million acres of wetlands are lost at a rate of about 17 square miles annually (from 1985 to 2010), putting these lands at risk (Couvillion et al., 2011). Such land loss is predicted to disrupt economic activity in fishing sectors (Barnes et al., 2015), including shrimping, which relies on wetlands to serve as nursery grounds for juvenile shrimp. At the same time, state plans that alter environmental conditions to address land loss and restore wetlands also create uncertainty for the shrimp industry. Information on shrimping areas likely to be affected, combined with a multi-pronged industry adaptation approach, can help shrimpers remain resilient.

3. Costs of implementing environmental protections limit adoption. Shrimpers are under increasing pressure to install TEDs and bycatch reduction devices on their vessels in order to minimize the impacts to sea turtles and the capture of non-target juvenile finfish. But for inshore vessels, costs can be a deterrent (Vorpahl, 2015). The TEDs themselves cost less than $400 (SSA, 2012). The shrimpers, however, often believe that TED use increases drag, reduces maneuverability, and reduces catch, adversely affecting their cost of doing business. While debate continues over actual costs, for the inshore shrimpers currently unaffected by TED regulation, volunteering to accept the potential costs can seem risky. Better articulating the specific payoffs of using these devices—for example, how TED policy and use relates to Monterey Bay ratings, how improvement in ratings could impact market access for shrimpers, and what the returns for shrimpers would likely be—could reduce shrimpers' unease and lead to further adoption.

4. Confusing and complex regulation in export markets limits expansion. There are some shrimp export opportunities for niche marketing of high-value product, but because more regulation is involved in export than in domestic sales, an export strategy involves a lot of risk. Information on how to effectively navigate local regulations can be hard to come by, and may still be insufficient. In one processor's first attempt to export shrimp to China, he followed the available guidelines to the letter, only to have his product held in customs until it was no longer fit for delivery.

Taking into account the realities facing the Louisiana shrimp industry, we recommend three broad approaches and offer a course of action for each. Our aim is to offer actionable advice, informed by the SWOT findings, directly to shrimpers. The first may be a good initial option to enable shrimpers to capture some additional value relatively quickly, while learning broader marketing principles and skills. The second recommendation is geared toward capturing the most value, but is limited in the number of shrimpers it can reach. The third aims to include a larger number of shrimpers, but because it engages closer to the production stage of the chain, may not capture as much value. Elements of the three recommendations may be combined to benefit more shrimpers, or capture more value.

1 SELL MORE SHRIMP DIRECTLY TO CONSUMERS

Some consumers may be willing to pay a premium for shrimp that were captured recently, and which they can buy directly from a local producer who can provide full information on how the product was captured and handled. To fulfill these consumers' needs, there are recommended steps that shrimpers can take.

(A) INCREASE DIRECT-TO-CONSUMER MARKETING

Interviews suggest that shrimpers commonly sell a small portion of their catch directly to consumers, often informally, meaning outside of LDFW's Trip Ticket Program for tracking seafood sales. Shrimpers can take advantage of available support programs to increase their formal direct-to-consumer sales, and in the process improve the quality of their product and become more savvy marketers—attributes that may also be helpful in increasing sales to retailers and wholesalers.

LSU AgCenter/Sea Grant is one entity working rapidly to fill what had been a gap in support services for direct marketing. Together with LDWF, LSU AgCenter/Sea Grant is spearheading the Louisiana Fisheries Forward ("LFF") initiative, a voluntary education and training program for shrimpers and other fishermen (Louisiana Sea Grant, 2015). The program's mobile Seafood Quality Training Lab delivers hands-on demonstrations of chiller systems, brine freezers, and plate freezers, and its website offers educational videos and other resources for commercial shrimpers (LFF, 2016).

Other initiatives to assist shrimpers in meeting quality expectations for direct marketing include the Louisiana Direct Seafood campaign, which has offered a Seafood Value-Added Micro Processor Workshop to educate fishermen about freezing, packaging, and marketing techniques for raw product that can be accomplished using only basic equipment and facilities (Louisiana Sea Grant, 2016).

Louisiana Direct Seafood serves as an umbrella organization for regional direct marketing campaigns, including Delcambre Direct, which includes two components: an online marketplace and a farmers market. One of the brands developed by the Delcambre Direct program and sold at the Delcambre market, Vermilion Bay Sweet, is marketed as free of sodium tripolyphosphate ("STPP"), a preservative that increases moisture retention in shrimp, adding non-meat weight (Delcambre Admin, 2014). Use of STPP is legal and generally deemed safe by the United States Food and Drug Administration ("FDA") (FDA, 2016; Lampila, 2010). But in interviews, buyers indicated a preference for shrimp that are STPP-free, mainly due to perceptions of quality and value for money.

Interviews with LSU AgCenter/Sea Grant indicate that the Delcambre Direct program currently has about 30 shrimper suppliers, and that about 150–200 shrimpers in the state are using a direct seafood marketing website or other social media to expand their geographic reach. According to interviews, a three-year $668,383 Community Development Block Grant that the state received in 2016 from the United States Department of Housing and Urban Development is expected to expand on existing initiatives, building additional direct sales and value-added micro-processing capacity.

(B) OBTAIN ANY NECESSARY LICENSING

Standard licensing to harvest shrimp commercially in Louisiana includes a commercial fisherman's license, a vessel license, and gear licenses for each shrimp trawl, butterfly net, skimmer net, and cast net (LDWF, n.d.b).

To sell directly to consumers in state, in addition to the standard licensing, a shrimper must have a Fresh Products License ($20 resident, $120 nonresident) (LDWF, n.d.b). For $5, their spouse may also purchase a Fresh Products-Spouse License (LDWF, n.d.b). To maintain this license, a shrimper needs to submit trip tickets and sales records to LDWF, but they do not need buyers' signatures or other information. Additional permitting through LDHH, and registration with FDA, may be required for shrimpers who process and sell onshore.

2 SELL MORE SHRIMP DIRECTLY TO THE RETAIL BUYERS, ESPECIALLY HIGH-END RESTAURANTS

This recommendation proposes steps to assist shrimpers in capturing the greatest returns. Within the retail segment, our SWOT analysis suggests that increasing sales to restaurants is an especially promising opportunity. Upscale restaurants offer the highest prices in the chain, and selling to this segment involves capital investments that may be achievable by an individual shrimper, in contrast to the investments required to sell to other high-value segments, such as wholesale.

High-end restaurants want larger sizes of shrimp that are locally and sustainably caught, safely handled, and minimally processed. They are looking to provide a complete dining experience, from a carefully crafted ethic and atmosphere, to dishes that look and taste exceptional. To make sure their businesses are sustainable and profitable, they also seek to reduce costs.

(A) NETWORK WITH LOCAL, HIGH-END RESTAURANTS

When shrimpers and restaurateurs meet, they gain a chance to learn about what the other does and needs. Shrimpers can use this information to market to chefs more effectively, perhaps offering them first choice for preferred sizes. Restaurants can also learn useful information. For example, one restaurant indicated that through close scrutiny of a shrimper's operation, and via repeated interactions through which they developed trust, the chef gained confidence in the shrimper's handling and quality control procedures sufficient to allay any food safety concerns.

Relationship-building can take several forms. Some ideas include:

- Trade shows, cooking competitions, and chef conventions, to educate restaurant professionals on strengthening local food systems and to allow them to get to know shrimpers by preparing their products. *Examples: the Annual Chef's Collaborative Summit, the Louisiana Foodservice & Hospitality EXPO, the Great American Seafood Cook-Off, and the North American Slow Fish Gathering*
- Market access initiatives, which have helped shrimpers market their products to retailers in the past and could provide models for future programs. *Examples: Market Umbrella's White Boot Brigade and Slow Fish USA*
- Restaurant-hosted wine dinners and tours, where shrimpers can enjoy a range of dishes prepared using their catch, and the chef can provide personalized information on product needs. One restaurateur had hosted "farm dinners" for his local suppliers, but not a comparable event for shrimpers or other seafood producers.

Shrimpers can also approach restaurants directly, outside of an organized initiative or event. The marketing extension website Market Your Catch provides some tips for the most effective ways to reach out, including:

- Making appointments with chefs over the phone, avoiding busy meal times
- Preparing a product and price list, complete with expected availabilities and volumes
- Preparing information on storage and handling, emphasizing how these and other quality aspects factor into the price (Sea Grant & UCSB, 2014)

To estimate how many restaurants one shrimper could potentially supply, we started with the assumption that a high-end restaurant needs 15 pounds of 11/15 size shrimp per week. We also made the broad assumption that the 6,196,826 pound total of 11/15 shrimp caught in Louisiana in 2015 is representative of typical landings, and can be evenly divided by the state's approximate 3,500 shrimping vessels (LDWF, 2016a). Based on this calculation, we roughly estimate that one shrimping vessel could fully supply about two restaurants with head-on shrimp of this size each year. If the shrimping vessel also supplied slightly smaller sizes desired by restaurants, e.g. 16/20 and 21/25, which are typically captured in greater volumes, the number of restaurants that could be supplied would increase. This assumes that other conditions of sales to restaurants are met, including proper handling and sometimes storage or liability coverage. The takeaway is that shrimpers can start small: a few connections may be all that is needed to initiate a direct-to-restaurant marketing approach.

If our interviewees are correct in estimating that 10%–20% of Louisiana's 16,747 restaurants are dedicated to buying local shrimp, then according to our rough estimations, the direct-to-restaurant approach could potentially support between 837 and 1,675 shrimping vessels.

(B) EMPHASIZE QUALITY THROUGH IMPROVED HANDLING AND TECHNOLOGY

To sell the product effectively to a restaurant, a shrimper should consider what sets his or her product apart from the competition. Simply taking the initiative to approach restaurants via one of the networking mechanisms mentioned in the previous section can set a shrimper, or group of shrimpers, apart. Another differentiator important to restaurants is handling for safety and quality. According to interviews, less-preferred handling methods include:

- "Refreshing," which means defrosting IQF shrimp and storing on ice slush. Chefs have noted that refreshed shrimp turn brown in one to two days
- Overpacking, by filling 50-pound IQF sacks with as much as 90 pounds of product. The practice can lead to a significantly higher temperature at the core of the sack, promoting spoilage and loss of yield
- Storing on ice, in which the ice's jagged edges can damage shrimp

On the other hand, the target restaurants are more inclined to purchase shrimp that have not been overpacked; that have been kept cool via a chiller system; or that have been plate frozen. IQF shrimp are often produced and marketed without refreshing or overpacking. Plate freezing is especially appealing since the sheets of frozen shrimp produced, sometimes described as "shatter packs," keep shrimp separated and intact, and are easy to defrost.

Other kinds of improvements appeal to restaurants, too. By adding freezer storage, a shrimper can give the restaurant more time to take ownership of the product, and may even reduce some of the variation in product availability between on- and off-season. Offering delivery increases restaurants' access.

Technology upgrades come with a cost. A chiller system can cost from $10,000 to $15,000 to purchase and install, according to an interview with the LSU Ag Center/Sea Grant Marine Extension Program. Once installed, such systems might save shrimpers hundreds of dollars in ice costs per trip, but additional costs to run diesel fueled generators must also be taken into account. An onboard plate freezer system requires a boat of at least 35 feet and can cost from $20,000 to $25,000.

	COST RANGE	NUMBER OF VESSELS
Brine Freezer	$21,000–$55,000	300
Plate Freezer	$20,000–$25,000	10
Chiller System	$10,000–$15,000	25
Ice Cooler	$400–$1,500	Majority

TABLE 3.
Estimated Costs of Selected Technology Upgrades

SOURCE:
Private communication with LSU AgCenter/Sea Grant

PROGRAM	AGENCY	APPLICANT	FUNDED AREA	TYPE	WEBSITE
Shrimp Refrigeration Grant Program	LDWF	Shrimper	Equipment	Grant	www.wlf.louisiana.gov/SRGP2015
NOAA Small Business Innovation Research	NOAA	Shrimper	Innovation and small business	Grant	techpartnerships.noaa.gov/SBIR.aspx
The Fishermen's Gear Compensation Program	Louisiana DNR	Shrimper	Equipment and vessel losses	Grant	dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&tpid=100
Economic Injury Disaster Loans	SBA	Shrimper, Co-op	Economic injury (if the business is in a declared disaster area)	Loan	www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans/types-disaster-loans/economic-injury-disaster-loans

TABLE 4.
Resources for Onboard Shrimping Technology Upgrades

In Table 3, we've included estimates of upgraded technology costs alongside other commonly used cooling technology and the number of vessels currently employing each type of system. Note that these estimates apply only to the cost of purchasing the equipment and do not include the cost of any vessel modifications or upgrades that may be needed to install and use the technology. Actual costs will vary depending on the type and size of vessel on which the system is installed, the custom options selected, and other variables.

To provide local delivery, a shrimper has a number of options, including renting a truck, contracting with a transport service, purchasing an ice chest to fit on a pickup truck, or purchasing a refrigerated truck. Purchase or rental costs vary widely depending on the method selected.

To implement these upgrades, many shrimpers would need access to capital. State and federal grant programs can help, and Table 4 contains a list of some options. Of these, the Shrimp Refrigeration Grant Program was not offered in 2016; yet interviews suggest that shrimpers found this program particularly helpful and are hopeful it will be offered again in 2017. There is also financing available through TruFund and other private loan providers. Groups like LSU AgCenter/Sea Grant and Coastal Communities Consulting ("CCC") can help shrimpers navigate these grant and financing options, including helping to determine whether marine or other types of insurance may be required.

Shrimpers can purchase liability coverage to further emphasize the safety of their product as a selling point. A number of insurance companies provide coverage for farmers and fishers engaging in direct marketing. A list of food safety and liability insurance options can be found on the United States Department of Agriculture ("USDA") Risk Management Agency website (Markley, 2010). Some farmers markets also offer group coverage at a reduced cost for their vendors (Beecher, 2012). Similarly, shrimpers in a cooperative may be able to access discounted, group rates.

(C) OBTAIN ANY NECESSARY LICENSING

No additional licensing is required for a commercial fisherman selling or delivering to an in-state entity possessing a Wholesale/Retail Dealer's License. The Wholesale/Retail Dealer's License holder, which can be a restaurant, is responsible for completing trip ticket records of all direct seafood purchases. To sell to a business that does not have a Wholesale/Retail Dealer's License, the shrimper would need to possess this license and complete the required trip tickets.

(D) ENROLL IN LWSCP AND SEEK TO MAINTAIN CURRENT RULES

The local, wild-caught status of Louisiana shrimp is an asset that more shrimpers could be leveraging. One way to do this is by participating in a labeling campaign that indicates these attributes on packages and menus, allowing consumers to choose local more often and putting pressure on more restaurants to provide such options.

LWSCP's "Certified Authentic Louisiana Wild Seafood" label provides menu labeling for Louisiana-only products, making it the best fit among the different Gulf shrimp labeling options for the approach of selling directly to local restaurants. A call with LDWF-Fisheries Oversight indicated that as of October 6, 2016, there were 131 participants in LWSCP, including 73 restaurants and just 9 commercial fishermen. The rest are processors, wholesalers, and non-restaurant retailers.

To apply for LWSCP certification, restaurants need to show invoices for products purchased from Louisiana-based wholesalers or retailers, demonstrating that these are LWSCP certified. The license is renewed annually. Once certified, restaurants are allowed to print the logo on their menus. L

Commercial fishermen are automatically eligible to be certified if they sell to processors, wholesalers, or retailers, provided that they are in compliance with standard state licensing requirements. Additional information on enrolling in the program can be found in Louisiana Revised Statute 56:578.15 and on LWSCP's website (LDWF, n.d.a; LDWF-Fisheries Oversight, n.d.).

Some shrimpers have argued that, to benefit producers the most, the label should be approved only for use on shrimp that have been landed, processed, and packed in Louisiana. Although LWSCP currently requires all three criteria to be met, ongoing legislative challenges make the future shape of eligibility criteria uncertain (LDWF, LDHH, & LDAF, 2014). Relaxing the criteria by requiring compliance with only two out of three could provide stakeholders with greater flexibility. However, shrimpers, dock owners, and processors we interviewed disagreed on which criteria should be relaxed, generally preferring labeling that recognized their own activities

while increasingly their options for selecting buyers or suppliers. For shrimpers pursuing the direct-to-retail approach laid out here, regulation continuing to require all three criteria would best help them differentiate their product.

Interviews suggest that adequate enforcement of the LWSCP label may be key to ensuring the program's success and long-term sustainability.

ADDITIONAL CONSIDERATIONS

At a policy level, adjusting the opening and closing dates of the inshore shrimp season may be one way to shift the mix of larger sizes in the total annual shrimp catch. In principle, delaying the opening date can give shrimp more time to grow before they are caught, increasing the number of larger sizes captured. However, because the exact timing of shrimp spawning and migration shifts from year to year, manipulating shrimp size in this way can be difficult to do with accuracy. One risk of delaying the opening too long is that shrimp may have already migrated into federal waters by the time the season opens, potentially disadvantaging inshore shrimpers. Stakeholders should be advised of the potential costs and benefits of any proposed changes to season timing.

Another policy change with the potential to help Louisiana shrimpers differentiate their product and access larger markets is state regulation of TEDs for skimmers and other inshore vessels. As discussed, because such regulation is currently lacking, the Monterey Bay Aquarium has red-listed most Louisiana shrimp. More research is needed to understand the likely costs for shrimpers, and what they may stand to gain, from possible state policy changes to improve Monterey Bay ratings.

The difficulty of selling smaller-sized shrimp to restaurants limits the direct-to-retail approach. While higher-end restaurants will occasionally use smaller shrimp in dishes like ceviche or salads, they and their customers tend to prefer larger shrimp that can be the focus of a dish. To use their total catch, shrimpers can sell as much of their larger shrimp to restaurants as possible, while continuing to sell their smaller sizes to docks and processors.

3 SELL MORE SHRIMP DIRECTLY TO THE WHOLESALE OPERATORS

This recommendation presents a process for increasing returns for a greater number of shrimpers. Wholesalers want large volumes of processed shrimp, with specific types and sizes determined by clients' needs. They also seek to reduce costs without lowering quality with practices like buying in bulk. This allows them to meet the needs of their retail clients while turning a sufficient profit.

(A) NETWORK WITH OTHER SHRIMPERS

By acting collectively, shrimpers can seize the opportunity to sell to wholesalers in the larger volumes needed. Trust is critical for a group to act collectively. The historically independent nature of shrimpers makes this challenging, and language barriers between different ethnic sub-groups may further complicate coordination. Add to these obstacles the reality that cooperatives were once active in Louisiana, with at least 20 shrimper co-ops established since

1948, but seem to have declined in popularity since 1970 (McMullin, 1970). The shrimpers we spoke with generally reflected on past cooperative efforts with some doubt, and were skeptical of cooperatives' future potential, citing distrust of other actors in the value chain and lack of critical resources such as time, leadership, business acumen, and financial capital.

Nonetheless, one thing Louisiana shrimpers have in common is diminishing returns resulting from increased import competition, and consequently, they could benefit from working together. Repeated interaction in formal and informal settings can break down the divisions among shrimpers, whether these are based on fleet membership, ethnicity, or something else; and reinforce relationships around the challenges they share.

Shrimpers can use any of the networking options mentioned under Recommendation 2 to connect, but there are also other Louisiana groups that bring shrimpers together, including:

- The Louisiana Seafood and Marketing Board
- Louisiana Shrimp Association
- Louisiana Shrimp Task Force
- Southern Shrimp Alliance

Add to this list the handful of economic development organizations that provide assistance to specific groups, particularly to the Vietnamese population, which makes up around 44% of fishing boat owners on the Gulf Coast (Jensen, 2014). Four of these are:

- CCC
- Louisiana Small Business Development Corporation (which has Vietnamese-speaking consultants)
- Mary Queen of Vietnam Community Development Corporation
- Vietnamese American Young Leaders of New Orleans

In a less formal way, shrimpers interact socially, at church and other community gatherings. A number of shrimpers told us that the most important time they spend talking with each other about work happens in a casual setting like a bar or someone's home, and often within a close circle of friends or drinking buddies.

By tapping the strong connections built through repeated informal social interaction, and the resources, such as translation services, provided by formal networking structures, shrimpers can enhance their ability to act effectively as a group.

(B) IDENTIFY CHARISMATIC LEADERS

In any group, there are one or two people that others seem naturally drawn to, and are willing to follow. These charismatic leaders are often the key to mobilizing a group toward collective action. Shrimpers interested in pursuing this approach should recognize and support them.

This may be especially important in Louisiana, where cooperatives were once active, but have fallen out of favor in recent years. This suggests that there may be opposition to be overcome for collective action to succeed (Freeman, 2010; McMullin, n.d.).

The Louisiana shrimper population is large and diverse, so it is only natural that it divides itself into sub-groups. The most noticeable division appears to be between the inshore and offshore fleets. Shrimpers reported that when they got together with other shrimpers outside of work, it was almost exclusively with members of their same fleet. Other relevant sub-groups are certain to exist, and charismatic leaders that hold sway with each group are needed to bridge gaps and bring the members of those groups together.

A good deal of research has been done on what makes a good leader. One study found that groups are drawn to leaders who are more outspoken and confident (Cliffer, 2015). Another key quality is deep concern regarding the issue, to the point of being motivated to spend one's own time and money (Oliver & Marwell, 1992).

Such leaders must be able to attract a critical mass of followers to create a "bandwagon" effect, particularly with large groups. They may involve an existing local coalition, leverage existing social networks, and/or exploit a commonly held goal, to achieve this mobilization (Centola, 2013). Creating a united front is easier when potential members understand what they will get in return for the cost of joining (Gavrilets, 2015).

(C) SEEK ADVICE AND FORM A COOPERATIVE

A number of decisions have to be made on the path to forming a cooperative. First, shrimpers must select what type of cooperative they wish to have. The cooperative options most relevant for shrimp producers—marketing, purchasing, and mixed—are described in Table 5.

TYPE OF COOPERATIVE	PRIMARY FUNCTIONS
Marketing	Aggregate, process, store, advertise, and sell product
Purchasing	Secure lower cost inputs to reduce operating costs
Mixed	Combine marketing and purchasing functions

TABLE 5.
Types of Fishery Cooperatives

SOURCE:
Freeman (2010); USDA (2016)

At a minimum, Louisiana's shrimpers would likely benefit from a marketing cooperative to bulk, process, and sell their products. The co-op might also serve a purchasing function, increasing shrimpers' bargaining power for goods and services (Freeman, 2010).

The target market should determine how shrimp would be processed. If the target market were local restaurants in New Orleans, meal delivery services like Blue Apron, and/or high-end clients in China, the facility could produce a greater proportion of frozen, shell-on, head-on shrimp. It is likely that peeled and deveined shrimp would also be a large part of the operation, whatever the market, because most shrimp traded in the United States is peeled, followed closely by shell-on. Peeling and deveining is also the primary method for processing smaller sizes (Urner Barry's COMTELL, 2016).

In a study of agricultural co-op business development in Wisconsin and Minnesota (Berner, 2013), several general lessons regarding co-op success emerged. One recommendation, which was echoed in our own interviews, was to treat the co-op like the business it is. For at least one co-op examined in the Berner paper, this meant incorporating a robust management structure from the beginning to prevent strong, and sometimes opposing, perspectives and personalities from disrupting business. Several of our interviewees suggested that the individuals selected

to direct the operation of the co-op should be skilled managers with marketing and finance credentials, and may not necessarily be shrimpers.

Another key finding of the Berner study was the importance of careful planning. This begins with selecting a founding team with the skill sets and personalities needed to both motivate others to join and work together (e.g. charismatic leaders) and to make decisions in the best interest of the business (e.g. skilled managers). It also involves being transparent in communicating with potential members about how the co-op will be financed, organized, and operated, as well as the potential risks involved and value to be gained. To address the whole shrimper population, educational materials can be translated into multiple languages. Above all, the study emphasized that careful planning takes time, and there is little to be gained by rushing the process.

Shrimpers can access outside guidance throughout the co-op formation process. There are a number of resources for legal and business advice. USDA Rural Development promotes cooperative formation and can connect shrimpers to a variety of resources. There are also attorneys who specialize in this area and can provide practical advice on building a successful cooperative business. Associations like the National Council of Farmer Cooperatives, which organizes a committee of legal, tax, and accounting professionals, may be willing to serve as an entry point for identifying attorneys and other service providers to assist with co-op formation.

One possibility to discuss with an expert is whether a shrimpers' cooperative might be able to make an agreement with a small number of docks, under which its members would sell shrimp only to these docks, and the docks would sell only to the co-op's processing facility. Because the co-op would not own and operate the dock, costs for the shrimpers would be less than if they had to run the dock themselves, while the docks would benefit from both a steady supply of shrimp and a certain buyer in a competitive market. This agreement might also stabilize pricing for the actors represented in the exchange, spanning three segments in the value chain.

(D) ESTABLISH A FACILITY

The newly formed cooperative would need a home. To perform aggregation, shrimpers need a dock where shrimp can be landed, sorted, and loaded onto a truck. For processing, they need a plant. The closer these two are together, the lower the transportation costs. The two functions could even be performed by the same facility if the processing plant were located at the dock. If a co-op arranges for a few docks to buy their shrimp, rather than purchasing its own dock, it can locate the processing facility farther inland, increasing transportation cost, but reducing risk of storm surge damage, which is always a concern in coastal Louisiana.

The most likely source of capital for purchasing a facility and furnishing it with processing and storage equipment is grant funding. Table 6 contains a list of grants and other resources to help with co-op formation and marketing.

(E) OBTAIN ANY NECESSARY LICENSING

To buy shrimp from commercial fishermen, or to sell out of state, the co-op would need a Retail/Wholesale Seafood Dealer license, which is $250 for residents and $1,105 for non-residents (LDWF, n.d.b). To transport seafood as a Retail/Wholesale Seafood Dealer, the business

TABLE 6.
Resources for Co-op Formation and Marketing

PROGRAM	AGENCY	SUPPORT AREA	TYPE	WEBSITE
Rural Business Development Grants	USDA	Technical assistance, training	Grant	www.rd.usda.gov/programs-services/rural-business-development-grants
Rural Cooperative Development Grant program	USDA	Co-op operation	Grant	www.rd.usda.gov/programs-services/rural-cooperative-development-grant-program
Business and Industry Loan Guarantees	USDA	Credit for for rural businesses	Loan	www.rd.usda.gov/programs-services/business-industry-loan-guarantees
Farmers Market Promotion Program	USDA	Capacity building and community development	Grant	www.ams.usda.gov/services/grants/fmpp
Market Access Program for export	USDA	Marketing	Grant	www.fas.usda.gov/programs/market-access-program-map
Value-Added Producer Grant Program	USDA	Value-added product processing	Grant	www.rd.usda.gov/programs-services/value-added-producer-grants

may also need a Wholesale/Retail Seafood Dealer Vehicle License ($250 resident, $1,105 non-resident) or a $30 transport license (LDWF, n.d.b). To conduct processing, the co-op would also need to be permitted through LDHH, and to register with FDA.

RESILIENCE

Resilience is the ability to absorb and overcome shocks (OECD, 2015). In times of crisis, having more options increases resilience, and having more wealth tends to increases option. By identifying opportunities for producers to capture value and potentially accumulate wealth, our recommendations naturally support resilience for the shrimpers who implement them.

Diversification also promotes resilience (Lin, 2011). When shrimpers capture parts of the value added farther along the chain, they increase resilience by improving their ability to cope with a shock to a single portion of the chain. Some shrimpers have even applied the skillsets developed through shrimping to other professions, including becoming a tugboat captain or mechanic on a seasonal, part-time, or full-time basis, diversifying their sources of income (Harrison, 2012).

Shrimpers can achieve greater diversification by implementing this report's recommendations in combination. In some cases, the steps to implementing one approach naturally build toward achieving another one. Handling improvements and technology upgrades, central to the first and second recommendations, sell more to consumer and retailers, can also help a cooperative distinguish itself from competitors in the third. The storage capability necessary for the third recommendation, sell more to wholesalers, would also be useful to a shrimper seeking to sell more to local restaurants.

By looking for such synergies, near-term changes can help improve long-term resilience. Above all, to adapt to future challenges, shrimpers can remain open to new ideas and opportunities.

SUMMARY

The challenges facing shrimpers in Louisiana are real, but they are not insurmountable. Here, we have offered three options for moving beyond some of the limits that confront shrimpers.

Increasing direct sales to consumers can be a shrimper's first step to capturing more value. LFF's mobile Seafood Quality Training Lab and Louisiana Direct Seafood's Value-Added Micro Processor Workshop are two examples of direct marketing support that can help shrimpers improve the technology they use, as well as the handling, safety, and quality of their product. Producing shrimp that are free of STPP and connecting with consumers via social media are also important steps.

To sell more to retailers, the logical place to start is with local restaurants, to whom high-quality local shrimp are a prized resource. Producers can use a variety of networking events to market their products directly to restaurateurs, while taking steps to improve quality through upgrades in handling and technology. To market shrimp based on its status as a local, wild-caught product, shrimpers can participate in labeling campaigns.

To sell more to wholesalers, a cooperative approach is a powerful option. Shrimpers can use different kinds of events, whether these are formal conferences or laid-back meetings in a friend's home, to start networking more. Charismatic individuals can encourage their social and professional groups to participate in cooperative formation, and seek to bridge gaps between different groups. There are agencies and services that can help these groups answer critical questions on their way to finally operating a successful facility.

We are not suggesting that implementation will be easy. But by laying out the steps and suggesting resources, we hope to give the shrimpers of Louisiana increased confidence that these changes are possible.

CONCLUSION

Over the course of a single decade, Louisiana's shrimpers endured four major hurricanes and one of the worst oil spills in U.S. history. Many struggled, and the ones who made it through are stronger today as a result.

And yet the challenges they face today are different from those that came before. The threat today is much less tangible, and even more complicated to confront. It involves millions of people a world away making independent choices that add up to one big problem for Louisiana shrimpers: prices at their lowest point in history, which show no sign of improving.

Collective action can help shrimpers compete directly with local processors, but more is needed to address the threat posed by the surge of imports. To survive, Louisiana shrimpers need to be open to new ideas and innovations. They need to show buyers in Louisiana, and perhaps around the world, that wild-caught, Louisiana shrimp is the best tasting, best handled product available, and be confident they can stand by these claims.

The changes recommended in this report are not simple fixes. Increasing sales to consumers and retailers may require significant investment. To form a cooperative, shrimpers would need to overcome decades of skepticism, bridge gaps between distinct social groups, raise capital, and accept some amount of risk. To make an informed decision, shrimpers can weigh the risks of making such investments against the risks of not making them.

At least one shrimper we spoke with was not dissuaded by the challenges ahead. Thinking no doubt of Louisiana's vibrant shrimping industry established over decades, she insisted, "You can't tell me fishermen can't build a factory. We built a whole coast."

References

Barnes, S., Bond, C., Burger, N., Strong, A., Weilant, S., & Virgets, S. (2015). *Economic evaluation of coastal land loss in Louisiana*. Louisiana State University; The RAND Corporation. Retrieved from http://coastal.la.gov/wp-content/uploads/2015/12/LSU-Rand-Report-on-Economics-of-Land-Loss.pdf

Beecher, C. (2012). Should farmers market vendors carry product liability insurance? Retrieved September 21, 2016, from http://www.foodsafetynews.com/2012/11/should-farmers-market-vendors-carry-product-liability-insurance/#.V-Ln5K3fSL9

Berner, C. (2013). *A study of co-op business development in Wisconsin and Minnesota: Fourteen recent start-ups in the food and agriculture sectors*. University of Wisconsin Center for Cooperatives. Retrieved from http://www.uwcc.wisc.edu/pdf/Co-op_Business_Development_in_Wisconsin_and_Minnesota_Final.pdf

Bourgeois, M., Chapiesky, K., Landry, L., Lightner, J., & Marx, J. (2015). *Louisiana shrimp: Fishery management plan*. Louisiana Department of Wildlife and Fisheries. Retrieved from http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/shrimpfmp7-27-15.pdf

Centola, D. M. (2013). Homophily, networks, and critical mass: solving the start-up problem in large group collective action. *Rationality and Society,* 25(1), 3–40.

Chaichalearmmongkol, N., & Jargon, J. (2013). Disease kills shrimp output, pushes U.S. prices higher. *Wall Street Journal*. Retrieved from http://www.wsj.com/articles/SB10001424127887323998604578565201120674008

Clark, B. H. (2014). More than one-third of U.S. shrimp may be mislabeled, study says. *National Geographic*. Retrieved from http://news.nationalgeographic.com/news/2014/10/141030-shrimp-mislabeling-seafood-fraud-oceana-food/

Cliffer, S. (2015). "Leadership qualities" vs. competence: Which matters more? Retrieved September 8, 2016, from https://hbr.org/2015/11/leadership-qualities-vs-competence-which-matters-more

Couvillion, B. R., Barras, J. A., Steyer, G. D., Sleavin, W., Fischer, M., Beck, H., Trahan, N., Griffin, B., Heckman, D. (2011). Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000, 12 p. pamphlet. Retrieved October 11, 2016, from http://pubs.usgs.gov/sim/3164/

Delcambre Admin. (2014). The Vermilion Bay Sweet story. Delcambre Direct Seafood: Our Blog. Retrieved from http://delcambredirectseafood.com/_blog/Our_Blog/post/the-vermilion-bay-sweet-story/

FAO (Food and Agriculture Organization of the United Nations). (2015). Shrimp - November 2015. Retrieved June 15, 2016, from http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/357932/

--. (2016a). Fishery Statistical Collections - Global Aquaculture Production. Retrieved July 27, 2016, from http://www.fao.org/fishery/statistics/global-aquaculture-production/en

--. (2016b). The state of world fisheries and aquaculture 2016. Contributing to food security and nutrition for all. Rome. Retrieved from http://www.fao.org/3/a-i5555e.pdf

FDA (U.S. Food and Drug Administration). (n.d.). Guidance for industry: HACCP Regulation for fish and fishery products; Questions and answers for Guidance to facilitate the implementation of a HACCP

system in seafood processing. Retrieved September 23, 2016, from http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Seafood/ucm176892.htm

--. (2016). CFR - Code of Federal Regulations Title 21. Retrieved October 11, 2016, from https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=182.1810

Freeman, M. (2010). *An overview of fishing cooperatives*. Presented at the Louisiana Shrimp Task Force, Baton Rouge, LA. Retrieved from http://www.wlf.louisiana.gov/sites/default/files/pdf/shrimp_task_force/6556-Shrimp%20Task%20Force%20Meeting%20TUESDAY,%20MARCH%2023,%202010/Fishing_Cooperatives.pdf

Gavrilets, S. (2015). Collective action problem in heterogeneous groups. *Philosophical Transactions of the Royal Society B,* 370(1683), 1–17.

GMFMC (Gulf of Mexico Fishery Management Council). (2001). Amendment 11 to the fishery management plan for the shrimp fishery of the Gulf of Mexico, U.S. waters with environmental assessment regulatory impact review and initial regulatory flexibility analysis. Retrieved from http://gulfcouncil.org/Beta/GMFMCWeb/downloads/SHRIMP%20Amend-11%20Final%202001-04.pdf

Harrison, J. A. (2012). *Buoyancy on the bayou: shrimpers face the rising tide of globalization*. New York: Cornell University.

Hart, R. A., & Nance, J. M. (2013). Three decades of U.S. Gulf of Mexico white shrimp, Litopenaeus setiferus: commercial catch statistics. *Marine Fisheries Review,* 75(4), 43–47. dx.doi.org/10.7755/MFR.75.4.3

Harvey, D. (n.d.). USDA Economic Research Service - Aquaculture Data. Retrieved July 27, 2016, from http://www.ers.usda.gov/data-products/aquaculture-data.aspx

Jensen, C. (2014). Beyond gastronomy: Locating the Vietnamese population in New Orleans. *Folklife in Louisiana*. Retrieved from http://www.louisianafolklife.org/LT/Articles_Essays/lfmbeyond.html

Lampila, L. (2010). *Condensed phosphates and seafood: Application and functions*. Retrieved from http://www.wlf.louisiana.gov/sites/default/files/pdf/shrimp_task_force/6556-Shrimp%20Task%20Force%20Meeting%20TUESDAY,%20MARCH%2023,%202010/LDWF_Condensed_Phosphates_and_Seafood032210.pdf

LDHH (Louisiana Department of Health and Hospitals). (n.d.a). Commercial seafood. Retrieved September 23, 2016, from http://dhh.louisiana.gov/index.cfm/page/444/n/207

--. (n.d.b). Retail food. Retrieved September 23, 2016, from http://dhh.louisiana.gov/index.cfm/page/448

LDWF (Louisiana Department of Wildlife and Fisheries). (n.d.a). Become Louisiana Certified. Retrieved September 2, 2016, from http://certified.louisianaseafood.com/become-louisiana-certified

--. (n.d.b). Licenses and fees. Retrieved September 23, 2016, from http://www.wlf.louisiana.gov/fishing/harvest-licenses-and-fees

--. (n.d.c). Louisiana Wild Seafood Certification Program. Retrieved October 6, 2016, from http://www.wlf.louisiana.gov/fishing/louisiana-wild-seafood-certification-program

--. (2016a). 2000-2016 non-confidential shrimp landings and trips by basin. Louisiana Department of Wildlife and Fisheries Trip Ticket Program.

--. (2016b). Louisiana shrimp: Commercial rules and regulations. Retrieved from http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37779-fisheries-brochures/shrimpbrochure20169-24-15low.pdf

--. (2016c). State regulations applicable with the extension of Louisiana waters. Retrieved September 22, 2016, from http://www.wlf.louisiana.gov/news/39802

LDWF (Louisiana Department of Wildlife and Fisheries), LDHH (Louisiana Department of Health and Hospitals), & LDAF (Louisiana Department of Agriculture and Forestry). (2014). Louisiana wild seafood certification program (LWSCP) outline & overview. Retrieved from http://certified.louisianaseafood.com/sites/default/files/LWSPC%20Overview%20Document_Revised%2012.08.14.pdf

LDWF-Fisheries Oversight (Louisiana Department of Wildlife and Fisheries – Fisheries Oversight). (n.d.). Louisiana Certified Seafood. Retrieved October 6, 2016, from http://www.louisianacertifiedseafood.com/

LFF (Louisiana Fisheries Forward). (2016). Louisiana Fisheries Forward 2016 4th annual summit for the Louisiana commercial fishing and seafood industry. Retrieved October 11, 2016, from http://www.laseagrant.org/wp-content/uploads/LFF-Summit-2016-Agenda.pdf

Lin, B. (2011). Resilience in agriculture through crop diversification: Adaptive management for environmental change. *BioScience,* 61(3), 183–193. https://doi.org/10.1525/bio.2011.61.3.4

Louisiana Direct Seafood. (n.d.). Seafood Handbook - Shrimp. Retrieved October 5, 2016, from http://louisianadirectseafood.com/handbook

Louisiana Sea Grant. (2015). Federal site review. Retrieved October 11, 2016, from http://seagrant.noaa.gov/Portals/0/Documents/network_resources/SRT/LA/FINAL%20-%20Louisiana%20Site%20Review%20Briefing%20Book.pdf

--. (2016). Visionary fishermen to attend seafood workshop. Retrieved from http://www.laseagrant.org/2016/visionary-fishermen-to-attend-seafood-workshop/

Markley, K. (2010). *Food safety and liability insurance: Emerging issues for farmers and institutions*. RMA. Retrieved from http://www.cias.wisc.edu/farmertools14/3-prepare-your-business/food-safety-and-liability-insurance.pdf

McMullin, L. D. (n.d.). *List of fishery cooperatives in the United States, 1961-62* (No. Fishery Leaflet 545). Washington, DC: U.S. Department of the Interior. Retrieved from http://spo.nmfs.noaa.gov/Fishery%20Leaflets/leaflet545.pdf

--. (1970). List of fishery cooperatives in the United States, 1969-70 (No. Fishery Leaflet 627). Washington, DC: U.S. Department of the Interior. Retrieved from http://spo.nmfs.noaa.gov/Fishery%20Leaflets/leaflet627.pdf

Miller, A. L., & Isaacs, J. C. (2011). An economic survey of the Gulf of Mexico inshore shrimp fishery: Implementation and descriptive results for 2008. *Gulf States Marine Fisheries Commission, Ocean Springs, MS. Publication, 195,* 64.

Monterey Bay Aquarium. (2016). Shrimp recommendations from the Seafood Watch Program. Retrieved June 16, 2016, from http://www.seafoodwatch.org/seafood-recommendations/groups/shrimp?q=Shrimp&t=shrimp&to=917246020

NOAA-NMFS (National Oceanic and Atmospheric Administration - National Marine Fisheries Service). (2015). Fisheries of the United States, 2014. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2014. Retrieved from http://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus14/documents/FUS2014.pdf

--. (2016a). Annual trade data by product: Country/Association. Retrieved September 6, 2016, from http://www.st.nmfs.noaa.gov/pls/webpls/trade_prdct_cntry_cum.results?qtype=IMP&tqyearfrom=2000&tqyearto=2016&tqprod_name=SHRIMP&tqcountry=%25&tqoutput=TABLE

--. (2016b). Commercial fisheries statistics. Retrieved July 27, 2016, from https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index

OECD (Organization for Economic Co-operation and Development). (2015). Economic resilience. Retrieved September 2, 2016, from http://www.oecd.org/economy/growth/economic-resilience.htm

Oliver, P. E., & Marwell, G. (1992). Mobilizing technologies for collective action. In A. D. Morris & C. M. Mueller (Eds.), *Fronties in social movement theory* (pp. 251–272). New Haven: Yale University Press.

Sea Grant, & UCSB (University of California Santa Barbara). (2014). Alternative marketing of your catch. Retrieved September 23, 2016, from http://marketyourcatch.msi.ucsb.edu/

SSA (Southern Shrimp Alliance). (2012). NRDA TED Project cost estimate. Retrieved from http://www.shrimpalliance.com/nrda-ted-project-cost-estimate/

Tabarestani, M. (2013). *The effects of U.S. shrimp imports on the Gulf of Mexico dockside price: A source differentiated mixed demand model*. Louisiana State University and Agricultural and Mechanical College. Retrieved from http://etd.lsu.edu/docs/available/etd-06132013-114654/unrestricted/TabarestaniDiss2013.pdf

TruFund Financial Services. (2014). *Investment recommendations for Southeast Louisiana shrimp fishery.*

Undercurrent News. (2013a). GAA says cause of EMS has been identified. Undercurrent News. Retrieved from https://www.undercurrentnews.com/2013/05/02/gaa-says-cause-of-ems-has-been-identified/

--. (2013b). Thai shrimp production drops 54% in 2013. Undercurrent News. Retrieved from https://www.undercurrentnews.com/2013/12/19/thai-shrimp-production-drops-54-in-2013/

Urner Barry's COMTELL. (2016). Retrieved August 31, 2016, from http://www.ubcomtell.com/

USDA (U.S. Department of Agriculture). (2015). Marketing "a taste of place:" Ag co-ops set sales & income records Top 100 Ag Co-ops: how they stack up. Rural Cooperatives, (November/December 2015). Retrieved from http://www.rd.usda.gov/files/RDRuralCoopMag_NovDec15.pdf

USDA-NASS (U.S. Department of Agriculture-National Agricultural Statistics Service). (2013). 2013 Census of Aquaculture. Retrieved September 2, 2016, from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Aquaculture/

USDA-ERS (U.S. Department of Agriculture - Economic Research Service). (2015). Trends in U.S. local and regional food systems: A report to Congress. Retrieved from http://www.ers.usda.gov/media/1763057/ap068.pdf

Vorhees, D. V. (2014). *Fisheries of the United States 2013*. (A. Lowther & Liddel, Eds.). SIlver Spring, MD: National Marine Fisheries Service, Office of Science and Technology. Retrieved from http://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus13/FUS2013.pdf

Vorpahl, A. (2015). Louisiana agrees to save thousands of sea turtles and protect State's shrimp industry. Oceana USA. Retrieved from http://usa.oceana.org/press-releases/louisiana-agrees-save-thousands-sea-turtles-and-protect-states-shrimp-industry

Witter, A. L. (2012). Local seafood movements and seafood sustainability in North America: A case study on a community supported fishery in Monterey, California. *IIIEE Master Thesis*. Retrieved from http://lup.lub.lu.se/record/3126197

Appendix A: Methods

Between April and June of 2016, Datu Research conducted an in-depth literature review to inform the analysis of prices in the Louisiana shrimp value chain. To understand pricing trends and the policies, practices, and dynamics that shape them, we examined commercial and academic publications, in addition to grey literature including government reports, privately commissioned studies, and white papers. We reviewed over 120 documents and datasets.

During this period, we also examined time-series data to understand trends related to the volume and value of Louisiana shrimp. We reviewed publicly available government datasets from agencies including the National Oceanic and Atmospheric Administration ("NOAA"), the USDA Economic Research Services ("ERS"), FAO, and LDWF, among others. We requested additional data, not publicly available, directly from LDWF. We also purchased data on Gulf shrimp wholesale and retail pricing via Urner Barry's COMTELL service.

Datu shared key findings from the initial literature review with the client in June 2016. We consulted with the client to identify priority research gaps to target via the remaining analysis.

In July and August of 2016, our researchers conducted 22 interviews with value chain stakeholders and other experts. Seventeen of the interviews were conducted via phone, while five were conducted in-person, on-site in Louisiana. To identify stakeholders to interview, we developed a matrix to organize value chain stakeholders by location, value chain role, and approximate size. The final mix of interviewees captures diversity across these categories. Interviews were recorded, transcribed, and analyzed for price data and themes.

To organize and analyze literature review findings and interview data, we used SWOT analysis. Our recommendations are grounded in a value chain framework and informed by this analysis. Twelve experts from government, academia, and business provided comments and feedback to vet our findings.

Appendix B: Sample Interview Guide

In consultation with the client, Datu developed an interview guide to elicit information from stakeholders on value chain relationships, pricing, and other tends. A sample interview guide is provided below. This guide was tailored to each individual interviewee.

Name - Company - Date

Topic	#	Prompt
General	1	Please confirm that your company buys or sells Louisiana shrimp.
General	2	I understand your company primarily engages in___ (processing, retail, etc.), is that right?
General	3	How long have you worked in this industry?
General	4	Please tell me a bit about what you do and your role in the company.
Shrimper	5	Please tell me about when you buy directly from Louisiana shrimpers, and why (or why you choose to purchase elsewhere).
	5a	What size and species do you typically buy directly from shrimpers?
	5b	What volume of that size & species do you typically purchase? (Range OK)
	5c	What price would you pay a shrimper today for that size & species? (Range OK)
	5d	How much influence to do you have over price when you buy from shrimpers?
	5e	Can you share the name of a shrimper you often buy from?
First handler	6	Please tell me about when you buy from a first handler, and why (or why not).
	6a	Size and species?
	6b	Volume?
	6c	Price?
	6d	Influence?
	6e	Name(s)?
Importer	7	Please tell me about when you buy from an importer, and why (or why not).
	7a	Size and species?
	7b	Volume?
	7c	Price?
	7d	Influence?
	7e	Name(s)?
	7f	Please tell me when you would use an import broker and why.
	7g	If an importer: Do you consider yourself a broker, importer, or something else?
	7h	If an importer: Which markets or exchanges do you most commonly trade in?
	7i	If both an importer & domestic wholesaler: How do you decide what to buy?
Processor-Buying	8	Please tell me about when you buy from a processor, and why (or why not).
	8a	Size and species?
	8b	Volume?
	8c	Price?
	d	Influence?
	8e	Name(s)?

Processor-Selling	9	Please tell me about when you sell to a processor, and why (or why not).
	9a	Size and species?
	9b	Volume?
	9c	Price?
	9d	Influence?
	9e	Name(s)?
	9f	If a processor: What kind of processing do you do (e.g. P&V, dried, frozen, etc.)?
Wholesaler-Buying	10	Please tell me about when you buy from a wholesaler, and why (or why not).
	10a	Size and species?
	10b	Volume?
	10c	Price?
	10d	Influence?
	10e	Name(s)?
Wholesaler-Selling	11	Please tell me about when you sell to a wholesaler, and why (or why not).
	11a	Size and species?
	11b	Volume?
	11c	Price?
	11d	Influence?
	11e	Name(s)?
Retailer	12	Please tell me about when you sell to a retailer, and why (or why not).
	12a	Size and species?
	12b	Volume?
	12c	Price?
	12d	Influence?
	12e	Name(s)?
	12f	If a retailer: How do sustainability ratings & certifications affect purchasing?
Industry	13	Please tell me about what makes a company successful in the____ industry (from Q2).
Industry	14	What would it take for a new company to enter this space and be successful?
Industry	15	How has the industry changed in the last 5 - 10 years?
	15a	How has the number of companies changed?
	15b	How have the companies themselves changed?
Company	16	In addition to the activities already mentioned, what else does your company do?
	16a	Production
	16b	First handling
	16c	Importing or Import brokerage
	16d	Repacking
	16e	Processing
	16f	Custom or co-packing
	16g	Wholesale
	16h	Retail
Company	17	We have your most recent annual revenue as ___-___. Can you confirm or correct?
Company	18	We have the number of employees as ___-___. Can you confirm or correct?
Company	19	Who do you consider to be your major competitors?

Appendix C: Correlation Analysis

We calculated correlations between the average U.S. import price and Louisiana dockside prices of white and brown shrimp between 2000 and 2015. We used LDWF data (LDWF, 2016a) for dockside prices and NOAA data (NOAA-NMFS, 2016a) for import prices. All prices have been adjusted for inflation, are analyzed in real 2015 dollars, and are included in Table 7 below.

Correlation results were r = 0.874 for the relationship between white dockside and import prices and r = 0.869 for brown dockside and import prices, indicating a strong positive relationship between both types of dockside prices and import price. The r-squared values are similarly strong: r-squared = 0.763 for white dockside and import prices and r-squared = 0.755 for brown dockside and import prices. These r-squared values suggest a good fit with a linear model. A summary of these results is included in Table 8 below.

YEAR	AVERAGE LOUISIANA DOCKSIDE PRICE, WHITE SHRIMP	AVERAGE LOUISIANA DOCKSIDE PRICE, BROWN SHRIMP	AVERAGE U.S. SHRIMP IMPORT PRICE
2000	$2.77	$2.19	$6.79
2001	$2.38	$1.93	$5.50
2002	$2.17	$1.50	$4.76
2003	$1.66	$1.13	$4.35
2004	$1.64	$0.93	$4.05
2005	$1.81	$1.29	$3.80
2006	$1.45	$0.95	$3.72
2007	$1.71	$1.12	$3.64
2008	$1.92	$1.03	$3.62
2009	$1.31	$0.84	$3.42
2010	$1.61	$1.38	$3.77
2011	$1.98	$0.92	$4.28
2012	$1.64	$1.18	$3.91
2013	$2.29	$1.32	$4.81
2014	$2.12	$2.00	$5.35
2015	$1.42	$0.91	$4.21

TABLE 7.
Louisiana Dockside Shrimp Prices and Average U.S. Import Prices (Adjusted to 2015 Dollars), 2000–2015

SOURCE:
NOAA-NMFS (2016a); LDWF (2016a)

	R	R-SQUARED
Dockside White & Import	0.874	0.763
Dockside Brown & Import	0.869	0.755

TABLE 8.
Dockside and Import Price Correlation Results Summary