

LOUISIANA FISHERIES FORWARD STATUS AND TRENDS IN LOUISIANA'S FRESHWATER FISHERY



QUALITY + EDUCATION + SUSTAINABILITY





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EXECUTIVE SUMMARY...

FRESHWATER COMMERCIAL FISHERIES IN LOUISIANA ARE DIVERSE AND UNIQUE. Including finfish, crustaceans, reptiles,



and amphibians, this sector is a valuable part of the state's commercial fishing industry. In 2017, almost 11 million pounds of finfish and 8.6 million pounds of crawfish were landed, contributing \$5 million and \$12 million to the state's economy, respectively [1].

Statewide landings fluctuate annually, mostly due to wild crawfish harvest (Figure 1) [2]. There has also been a 40% decline in commercial freshwater finfish fishermen from 2000 to 2016 (Figure 2). While records show approximately 900 licensed fishermen in the trip ticket database, under 100 fishermen contribute significantly to freshwater finfish landings [2].



Figure 1. Total freshwater commercial landings in Louisiana from 1999 - 2016.



Figure 3. Price per pound for freshwater finfish (averaged buffalo, gar, and catfish) in 2019 dollars.

1035

1980

Year

1991

70₀₅

20,

1955

1950

1905

1960

1970

While the number of total landings fluctuate by year, they are also unevenly distributed across the state. Broken into 12 basins, the Atchafalaya basin (ARB) accounts for the vast majority of landings, over 70%, while only making up 4% of the area (Figure 4; Table 1). The ARB is a diverse area with much aquatic habitat and many access points for fishermen.

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With an overall decline in value, an aging industry, and many unknowns, more information was necessary to understand current and future consequences of management choices to ensure the continuation of the freshwater commercial fishery in Louisiana. The Louisiana Fisheries Forward (LFF) program - a joint partnership of the Louisiana Department of Wildlife and Fisheries (LDWF) and Louisiana Sea Grant (LSG)-initiated a project to assess the industry. LDWF's trip ticket data was visualized to look for important trends. Informal interviews were held with industry members including state fishery managers, fish processors, and fish buyers. In-person surveys with practicing freshwater commercial fishermen were conducted at fish houses across Louisiana. This report draws from those meetings, surveys, mapping, and from state and federal reports, licenses sales, academic studies, and field observations (see References for a full description) to develop a general overview of the freshwater commercial fishery. The intent is to provide a better understanding of the freshwater sector in Louisiana in terms of its current strengths and weaknesses, as well as opportunities and threats in the future.

SWOT Analysis

Results from the freshwater fisheries survey show that if left alone on the current track, the commercial freshwater fishery is in danger of disappearing due to an aging fleet and limited buyers and markets. New opportunities need to be identified if the current industry is going to survive for future generations.

Strengths

• LOCAL, INDUSTRY SPECIFIC KNOWLEDGE: Fishing requires an in-depth understanding of the region, the seasonal nature of the animals, and specific details about the waterways —all of which is gained from years on the water and generational knowledge. On average, the freshwater fishermen have been in the industry 34 years, which translates to significant industry expertise.



Figure 4. The 2016 landings per basin of all commercial freshwater finfish and crawfish.

- **TENACITY, WILLINGNESS TO WORK:** These fishermen have remained in a tough industry for 30-plus years (the maximum tenure from the survey was 66 years), and are willing to put in the hard work of hauling nets, working in the Louisiana elements year-round, and dealing with low prices. These fishermen want their industry to remain a viable option in the future.
- NO CONCERNS OF OVERHARVESTING: All stocks seem plentiful or even overpopulated. There are concerns that there are underutilized and overpopulated areas of the state (e.g. Toledo Bend). Most populations could handle increased harvest, so there are opportunities for growth.

Weaknesses

- AGING HARVESTERS: The average age of fishermen was 56 with a range of 25 to 85 (Figure 6). With this age structure, and declining numbers of fishermen, continuity of the industry is a large concern. Another key finding that signals a warning: 72% would not encourage their kids to be commercial fishermen.
- **FISH HOUSES IN DECLINE:** While there are over 350 freshwater dealer license holders in Louisiana, there are only a handful of true fish houses that regularly buy large volumes of Louisiana freshwater finfish from fishermen (Figure 9). On average, fishermen only sold to 1.4 fish houses; 35% were concerned over the number of fish houses.



- LOW, STAGNANT PRICES: When adjusting for inflation, average price-per-pound of three finfish species (catfish, gar, and buffalo) gradually decreased after the late 1960s, and steadily dropped in the early 1990s, failing to recover (Figure 3). Market price was a concern for 76% of the surveyed commercial fishermen.
- **ICE AND QUALITY:** The majority of fishermen catch and transport their catch without any ice or cold storage. It is a cyclical problem in that fishermen can't afford ice at current prices, but it is hard to demand better prices without an increase in quality.
- **ELUSIVE GROUP:** This is an industry that still prefers traditional methods of engagement, including workshops and direct mail. Only one respondent wanted texts, and no one wanted information through social media. With the number of boat ramps and the remote nature of the fishery, this fleet often operates under the radar, and is not organized in any task force or industry group.

Opportunities

- ICE AND QUALITY HANDLING: While in some fisheries increased cold chain management requires expensive equipment, the freshwater industry could increase quality with minimal investment. Relatively easy best management practices could improve quality if the price increased accordingly.
- ALTERNATIVE STRATEGIES: Expanding into new markets with current and new species could really affect price and retain current fishermen. This could attract younger fishermen as well, who are receptive to new strategies like value-added, alternative marketing, and new market development in partnership with the culinary industry. About 40% of fishermen surveyed were interested in value-



added opportunities, and 72% were interested in alternative species besides what they currently target.

• **ENGAGEMENT WITH FISHERIES MANAGEMENT:** There is relatively minimal interaction between freshwater commercial fishermen and LDWF biologists or enforcement. Over 65% of fishermen report no engagement—from attending regulation meetings to submitting public comment. Increased communication between the department and the fishermen could help, such as through a Freshwater Industry Group or a seat on the Finfish Task Force.

Threats

- CATFISH & USDA: Beginning September 1, 2017, inspections for catfish processing moved to the US Department of Agriculture (USDA). There are a handful of key consequences for processors that impact the fishermen including limited capacity to buy, limited days and hours to buy, and inability to co-mingle other freshwater fish. Fishermen used to determine fishing by weather patterns, not the federal work calendar.
- ALLIGATOR: When it comes to issues having a negative impact on the commercial fishery, alligators were the number one response with 62% of respondents saying that alligators were a



concern, and the majority of those had the perception it had gotten worse over the last 5 years. Negative alligator impacts include gear depredation resulting in lost catch and damaged gear that must be fixed or replaced.

- **ASIAN CARP:** Invasive species can cause a variety of problems including competition with native species and even navigation. Over 70% reported Asian carp as a problem and said the problem had gotten worse in the last 5 years. The fish clog hoop nets, and jumping silver carp are becoming a serious safety threat on the water.
- **PERCEPTION DUE TO POLLUTION ADVISORY MAPS BY STATE AND FEDERAL AGENCIES:** The lack of consumer demand may be attributed to the threat of pollutants, including heavy metals such as mercury, that were found in the Mississippi River in the 1980s and early 1990s.
- **LABOR:** While the current fishing community is getting older, there are also problems finding enough workers and managers in the processing sector. Many processors complained about the lack of skilled labor or trying to use H2B visa workers which is subject to political problems. Without a larger labor pool, less product is purchased from fishermen.

WHO IS CATCHING, AND WHERE...

Overview



Figure 5. Landings per basin over time of freshwater finfish.

Though inconsistent over the years, there are statistical data describing landings of freshwater fish species for commercial use as early as 1894. Common species caught in the Mississippi River were catfish, buffalo fish, freshwater drum, sturgeon, paddlefish, and common carp [4]. In the late 1800s and early 1900s, commercial fishing in the Mississippi River was a lucrative

endeavor. There was a higher demand for local inland fish species, likely due to the lack of ice to keep fish fresh for long-distance transport. In many ways, the fishery has had very little change.

Now Louisiana is broken into 12 major fishing basins for the LDWF Trip Ticket database, which has recorded landings since 1999 (Figure 4).



In some basins, landings have fluctuated dramatically over the past 15 years, while some have remained relatively consistent (Figure 5). The size of each basin does not necessarily reflect current fishing productivity (Table 1).

While there are approximately 800 licensed fishermen in the trip ticket database, only around 50-100 fishermen are truly active in freshwater finfish [2, 5, 6].

Many of the others may be predominately saltwater commercial fishermen that occasionally sell a freshwater species, or fishermen that only occasionally sell catfish or only seasonally catch crawfish [2, 5, 6]. In the intercept survey, 30% of fishermen also caught saltwater fish commercially [3]. This could explain the recent increase in landings in Barataria (BAR), Terrebonne (TRB), and Vermilion-Teche basins (VTB) (Figure 4, Figure 5).

At one major fish house in the middle of the state, they started with about 20 regular freshwater fishermen, and now they are down by at least half [5].

Table 1. Land area and fishermen by basin.

	Size (% total acres)	Fishermen (% of 2017 total)
Atchafalaya (ARB)	4	33
Barataria (BAR)	5	13
Calcasieu River (CRB)	8	2
Lake Pontchartrain (LPB)	7	5
Mermentau River (MTB)	4	4
Mississippi River (MRB)	19	8
Ouachita River (ORB)	2	5
Pearl River (PRB)	15	0.2
Red River (RED)	15	6
Sabine River (SAB)	6	2
Terrebonne (TRB)	7	11
Vermilion-Tech (VTB)	8	11

Behavior & Demographics



Overall, this is an industry dominated by aging men. The average age is 56 with a range of 25 to 85 (Figure 6) [3]. However, 96% never plan to retire. Once they physically can't fish anymore, only about half (51%) plan to sell their gear [3]. Fishermen reported they took 3.9 trips and landed over 2,500 lbs. per week on average [3]. They fished about 10 months out of the year [3]. This is an owner-operator industry; over 80% operate by themselves on their boat while 12% have one additional crew member. One hundred percent own their own boat [3].

In the survey, 59% reported that they get all of their individual current income from fishing, and of the remainder, 66% said the majority of their income came from fishing. In addition to other jobs, social security or retirement could contribute to their individual incomes. Sixty-one percent said all their household income came from commercial fishing, and of those that had other sources, 67% said the majority was from commercial fishing [3]. Many said they turned to commercial fishing full time after retiring from their first career.



Figure 6. Age of surveyed freshwater fishermen.

This is also an industry where local hands-on knowledge is most important to success. On average, fishermen have been in the industry 34 years (range 2-66 years) [3]. While 63% of fishermen in our survey finished high school or received their GED and another 13% have some college or trade school, 16% finished 8th grade or less (Figure 7).

If they had the option all over again, 88% would become commercial fishermen again. Of importance for the future of the industry, 72% would not encourage their kids to go into fishing [3].



Figure 7. Completed education level of surveyed freshwater fishermen.

Invasive Species

Invasive species cause a variety of problems including competition with native species and even navigation. By far Asian carp (68%), including silver and bighead mentioned separately, was the top response of fishermen when asked about which invasive species have a negative impact on their fishery (Figure Invasive A). Over 70% of those reporting Asian carp as a problem said the problem has gotten worse in the last 5 years [3]. While the invasive plants are a known navigation problem, it was surprising that more fishermen felt apple snails were having a negative impact than the aquatic plants.





Figure Invasive A. Surveyed fishermen reporting a negative impact by various invasive aquatic species.

WHAT THEY'RE CATCHING, AND HOW...

Overview



Figure 8. The top five species by landings (a) and value (b) for 2017 with the rest grouped in other for 100% of landings and value.

Fishermen predominately target catfish, buffalo, or crawfish (Table 2), but they catch about 19 different groups of freshwater species across Louisiana [2, 3]. For finfish, catfish dominate the target species and catch. This is driven by the markets. Therefore, there is a lot of potential to increase use, awareness, and price of many other freshwater species. Many of the species like freshwater drum, buffalo, frog and turtle are not well



known outside of Louisiana, and even within Louisiana, are only popular in localized areas [6].

In our intercept survey, 76% of respondents felt that certain species in Louisiana were overpopulated including silver carp (52%), alligators (28%), and bighead carp (8%). Blue catfish and bowfin were also mentioned [3]. On the other hand, 13% of fishermen felt crawfish were overharvested.



Gear and Costs

Hoop nets and gill nets are the most common finfish gear across the state (Table 3) [3]. Based on our survey, fishermen will set an average of 31 hoop nets and 15 gill nets per trip, with a max of 80 and 35, respectively [3]. Trotlines are also popular with an average of 8 per trip [3]. For crawfish, an average of 364 traps per trip are set, with a max of 500 [3]. Vertical hoops nets are specific to the deeper waters of Toledo Bend [6]. However, everything from hoop and gill nets to trammel nets, seines, trot lines, and jug lines are used to commercially catch freshwater species in Louisiana (Table 3).

Fish, corn, soy, cheese, and artificial baits are all used to bait gear, with fish being the most common. When the catfish are running, usually in the early spring, they don't need to use bait at all. The type of bait changes based on gear type and target species [3]. On average, 220 lbs. of bait are used per trip with a max of 600 lbs. [3]. In addition to bait, boat fuel is another large expense for fishermen. Fishermen use an average of 15 gallons per trip with a max of 66 gallons [3]. Based on number of trips reported, this brings the total cost of boat fuel to almost \$8,000 per year. Table 2. Percent of surveyed fishermen targeting and landing possible species. Colloquial names follow the common name.

	Target (% of	Catch (% of
	fishermen	fishermen
Species	surveyed)	surveyed)
CATFISH		
Blue	70.6	73.5
Bullhead (mudcat)	35.3	38.2
Channel (eelcat)	70.6	73.5
Flathead (Opelousas, goujon, yellow cat)	55.9	61.8
CARP		
Common (German)	20.6	20.6
Bighead	14.7	17.6
Grass	8.8	11.8
Silver	14.7	20.6
Black	0.0	2.9
GAR		
Alligator	26.5	32.4
Longnose	26.5	32.4
Spotted	0.0	0.0
SHAD	17.6	17.6
BOWFIN (choupique or grinnell)	8.8	8.8
BUFFALO	47.1	50.0
FRESHWATER DRUM (gaspergou/gou)	23.5	29.4
EEL	2.9	2.9
NON-FINFISH		
Alligator	5.9	5.9
Crawfish	32.4	32.4
Frogs	2.9	2.9
Turtles	0.0	0.0

Gear Type	Fishermen using	Avg. number per trip	Max per trip
Hoop net	24	31	80
Gill net	14	15	35
Trotline	9	9	10
Crawfish traps	7	364	500
Shad seine	3	1	1
Jug lines	3	350	500
Shad gill net	1	1	1
Trammel net	1	8	10
Cans, buckets, pipes, drums	1	300	300

Table 3. Gear use by surveyed fishermen.

Dealers and Fish Houses

While there are over 350 freshwater dealer license holders in Louisiana, there are only a handful of true fish houses that regularly buy large volumes of freshwater finfish from fishermen in Louisiana (Figure 9) [2, 3, 5]. A dealer includes wholesale/retail dealers and fresh product license holders—any first point of sale from the fishermen. These could include someone selling a small amount directly to consumers, or seasonal and small specialty buyers. Additionally, some of the fish houses only buy catfish or crawfish. Only a few buy a variety of finfish species on a regular basis [5]. As noted earlier, on average, fishermen only sold to 1.4

fish houses [3]. The northern, central, and western regions of Louisiana are markedly devoid of both dealer license holders and practicing fish houses. When comparing landings data with the location of freshwater fish dealers, there is a high overlap within the ARB and surrounding region. Consequently, there are more fish buyers and processors that reside within or near the ARB than in other regions within Louisiana followed by BAR, TRB, and VTB.

Fish House Decline

The decline in the number of fish houses results in several problems. First, fishermen have limited options for selling their catch, which results in very little competition in price. Fishermen are also driving a significant distance from their residence to sell their catch; 18% of fishermen said they felt this was a concern (Figure 10) [3]. Additional distance to sell catch increases costs for the fishermen, a significant problem when prices have not increased in years.

In the southern region of the state, most seafood buyers are purchasing mostly marine species and only a little freshwater catch [3, 5]. The western area lost their main fish house when the owner in Toledo Bend died in 2005 and no one took over the business [6]. The fishermen in this region now drive to Simmesport [3]. Other fish house owners expect to retire in a few years, and they do not anticipate anyone will take over the business. They will also shut down [5]. Simmesport, a town in east-central Louisiana near the





Figure 9. Comparison of major fish house locations versus all 2016 licensed freshwater fish dealers.



Figure 10. Comparison of major fish house locations versus residences of surveyed fishermen.

confluence of the Red, Mississippi, and Atchafalaya Rivers, used to be a hotspot for freshwater commercial fishing. When discussing with current fish processors about why many have shut down, the usual response is lack of money. The decline in consumer demand is not well understood, though some speculate that consumer concern about pollutants, specifically mercury, is part of the problem.

The increase in distance to sell catch highlights another significant problem in the freshwater industry, cold chain management. The majority of fishermen are catching and transporting their catch without any ice or cold storage. Only one fish house insisted they would only buy fish on ice [5], and fish arriving on ice was only seen at one other fish house [3, 5].

Species	2017 landings (lbs.)	2017 Value
Catfish	4,901,815	\$2,675,157
Buffalo	2,729,762	\$616,143
Shad	1,166,835	\$579,790
Carp (grass & common)	269,979	\$44,456
Bighead Carp	387,553	\$44,950
Silver Carp	117,300	\$23,803
Freshwater drum	439,517	\$75,217
Gar	660,830	\$488,106
Bowfin	222,907	\$177,724
Wild crawfish	8,574,528	\$12,105,174
Alligator	15,103*	\$3,286,790**
Frogs	9,649	\$24,049
Turtles	6,533	\$18,836
Note: *Number of alligators; **Meat and skin value combined		

Table 4. Summary of 2017 landings and value [1].

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SPECIES DETAIL ...



Figure 11. Landings per basin over time of catfish.



Catfish is the number one freshwater finfish group landed in Louisiana. It is composed of channel catfish (*Ictalurus punctatus*), blue catfish (*I. furcatus*), bullhead catfish (*Ameiurus* spp.), and flathead catfish (*Pylodictis olivaris*). In 2017 almost 3.9 million lbs. of blue catfish were landed for \$1.9 million; as well as 745,000 lbs. of channel and 238,000 lbs. of flathead catfish. (Table 4) [1]. In all, 4.9 million lbs. of catfish were valued at \$2.7 million in 2017 [3]. While flathead, also known as Opelousas or yellow catfish, have the lowest landings, some consider it the premium catfish [5, 6]. The ARB is always the dominant basin for catfish, while other basins have fluctuated. (Figure 11). For example Calcasieu suddenly declined in 2005, but rebounded by 2010. The TRB dropped in 2010, but recovered by 2015.

While landings have been relatively stable, the rest of the industry has been in flux. Between 2000 and 2016, catfish fishermen decreased 36%. The aging, shrinking fleet is a major concern for catfish buyers [5].

Currently, no complete statewide stock assessments exist on catfish, and all regulations are based off of known growth, size and sex information. There are concerns that there are underutilized and overpopulated areas of the state resulting in stunted growth and other overpopulation issues [3, 5, 6]. In the Toledo Bend/Red River areas, biologists feel that catfish are significantly underutilized, such that Toledo Bend is likely overpopulated with channel catfish [6].

Gear and bait vary across the state. Unique to Toledo Bend, channel catfish are targeted with vertical hoop nets [6]. Fishermen use vertical hoop nets and hang them from trees with cheese and/or soybean blocks as bait. Slat and bream traps are used to catch bait for trot lines. Gizzard and threadfin shad are common live baits, particularly targeting flatheads. Cheese and cottonseed are common baits for other catfish as they can follow the crumb trail. In coastal areas like White Lake, they have to raise the trot line to avoid crabs. In August through September, sharks are also a concern in coastal areas like White Lake due to gear depredation, so fishermen in those areas don't fish for catfish during those months.

The Supply Chain

The majority of catfish goes to human consumption, although the byproducts are used in several ways [5]. The heads and other byproducts of processing are often used as crab bait, crawfish bait, and turtle farm food [5, 7].

Domestic catfish is staying within the United States, if not Louisiana, but the business models vary greatly by processor. A couple of processors export catfish out of state, with over 50% crossing state lines, though predominately staying in the Southeast. The collarbones are most likely to leave, while the largest fillets tend to remain in Louisiana. Half of the processors only sell product within the state [7].

The Move to USDA

Catfish processors in Louisiana process anywhere from 10,000 to almost 400,000 lbs. annually. Most process around 100,000-200,000 lbs. [7]. Beginning September 1, 2017, catfish underwent a major shift when inspections for processing moved to the purview of the U.S. Department of Agriculture (USDA). This move was an effort to separate domestic catfish from imported catfish-like species (e.g. basa, swai, etc.). However, there were a handful of unintended consequences.

Since a floating USDA inspector must be available during processing and profit margins are too low to pay overtime for an inspector, processors are limited in when they can process. This has several impacts on the fishermen. First, processors will only buy on weekdays, whereas previously fishermen set their fishing schedules based on the weather, with limited importance paid to holidays and weekends. USDA inspectors are limited to 8-hour days, so processors can only buy as much catfish as they can process in 8 hours. This exacerbates the problem of limited fish houses [5].



Negative Consequences of Catfish Regulation Changes

- Limited capacity to buy
- Limited days and hours to buy
- Increased uncertainty with events like federal shutdown
- Can't co-mingle other freshwater fish



Other freshwater fish still fall under U.S. Food and Drug Administration (FDA) inspection. USDA and FDA products cannot be co-mingled, which means many processors will only buy catfish or other species at any one time. The larger processors maintain an FDA area for saltwater species like black drum and sheepshead and a separate USDA area for catfish [5]. Others also process gar, buffalo, freshwater drum, bighead carp, crawfish, or turtles [7]. A couple only process catfish [7]. This practice limits buying opportunities for other finfish and future processing and value-added opportunities with alternative species [5].

There is also the problem of Louisiana processors getting into compliance with new USDA rules. Many harvesters that fillet a few fish commercially are not aware of the transition and may not be in compliance. Restaurants are also not all aware of, or in compliance with, the new rules as they cannot serve imported catfish-like species and label it catfish on their menus [5].

The move to USDA was intended to distinguish imported from domestic product. Problems in imported catfish, like excessive use of tri-polyphosphates and water quality issues, hurts the perception of all catfish [5]. When there are negative publicity campaigns against imported catfish, all catfish takes a hit as many consumers don't pay close enough attention [5]. Farmed catfish, domestic and imported, has had other mixed effects on the wild-caught industry. The prevalence of imported catfish has created popularity across the country, similar to America's love affair with shrimp. However, while farmed catfish created enough product and demand to become a household name, imported catfish suppressed prices. Additionally, there is not enough wild-caught catfish to meet current national demand [5]. Aquaculture has also made finding markets for wild catfish more of a challenge. Buyers of aquacultured fillets are used to the specific and uniform size ranges available from farmed fish. Wild fillets are much more variable, and therefore, harder to market to those used to uniformity [5].

Some processors feel the new regulations are better for food safety and should reduce the number of individuals processing a small amount on their own without inspection. For these processors, there is the concern that one bad batch of catfish would lead to headlines hurting the sales of all catfish [5].

While there are less than a dozen catfish processors buying in Louisiana, half of those then sell to one larger processor and buyer. This leads to increased bottlenecks as half of the state's catfish supply is passing through one establishment [5].

Overall, these are long-term businesses that have been operating in Louisiana for decades. Over half were over 20 years old, with a couple being family businesses for over 70 and 90 years [7]. A shift to USDA was not insignificant to their operations or planning.

Future Recommendation for Catfish

The industry had several recommendations to help the Louisiana catfish industry survive into the future. Gear grants (fishermen grants for nets and gear or processor grants for equipment, etc.) would be beneficial. Overall,



more catfish could be targeted, and specifically increasing catch of flathead would help as it demands the highest price. Others wanted all fisheries to be FDA or USDA; having one sector fall into two different inspection processes needs to change. Additionally, reducing the burden of limited USDA inspectors is very important (e.g. holding the fish over a couple days before processing without losing quality). Efforts also need to be made to ensure restaurants are following the laws of only labeling domestic catfish as catfish on their menus. Finally, alternative options for waste (e.g. back bone) that could generate more revenue would help increase profit margins for processors and therefore, fishermen.

Buffalo

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In 2017, almost 3 million pounds of buffalo fish were landed for just over \$600,000. This fishery is comprised of two species: bigmouth (*Ictiobus cyprinellus*) and black buffalo (*I. niger*) (Table 4) (6). The ARB dominated landings, although overall, there is a decline across all basins (Figure 12). From 2000 to 2016, harvesters of buffalo dropped 36% (2). Buffalo is most important in the northern area of the state with very niche markets. The color is an important selling point as buyers don't want the flesh to be too red (3). Good handling practices like cold chain management help with the color. The buffalo ribs are very popular in small localized areas of the state. It's usually sold in 50 lb. boxes either headless (large fish) or head on (small fish).



Gar



Figure 13. Gar landings in 2016 per basin (a) and per year in Barataria (b).

Alligator (*Atractosteus spatula*), short nose (*Lepisosteus platostomus*), spotted (*L. oculatus*), and longnose (*L. osseus*) gar combined for over 660,000 lbs. valued at just over \$480,000 in 2017 (Table 4), making them one of the highest value per pound freshwater finfish at \$0.74/lb. [1]. Gar can be targeted with bow and arrow or jug lines [6].



For gar, unlike most other species, BAR dominates landings followed by TRB, ARB, and VTB (Figure 13a). There was a large decline in landings in BAR from 2004 to 2010 (Figure 13b). Gar are euryhaline species, meaning they can tolerate a wide range of salinities. Interestingly, TRB accounted for more value from commercial gar harvest (32%) than the ARB (28%), even though the ARB had more gar landings. This suggests that fish buyers within the TRB may value gar more than fish buyers in the ARB, shedding some light into the market for these fish [2].



Shad

There are two species of shad that are harvested: threadfin shad (*Dorosoma petenense*) and gizzard shad (*cepedianum*). However, gizzard shad is the more common of the two. The ARB accounts for 84% of the total shad harvested in Louisiana from 1999 to 2016, followed by TRB with 15% and the BAR accounting for 1% [2].

In 2017, the gizzard shad fishery was over 1 million pounds statewide, but only valued at about \$580,000 (Table 4) [1]. The shad fishery goes hand-in-hand with the crawfish industry, as shad is almost exclusively harvested for crawfish bait. Shad season is usually in late fall or early winter, right before crawfish season begins (January- February) [5]. Most shad are harvested by seine within the ARB, followed by TRB and BAR, which are in close proximity to the ARB. No shad are harvested in the northern or western basins [2] (Figure 14).



Figure 14. Landings per basin for shad in 2016.

Carp



Figure 15. Landings per basin (1999-2016) of carp (a. Common, b. Bighead, c. Silver, and d. Grass).

Common, or German, carp (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idella*) are caught in Louisiana. In 2017, 103,199 lbs. valued at \$11,417 and 166,780 lbs. valued at \$33,039 of common and grass carp, respectively, were caught in Louisiana (Table 4) [1]. Neither is native to Louisiana, but both have been in Louisiana since 1960 [6].

The survey and fishermen used the common Asian carp grouping, which consists of bighead (*Hypophthalmichthys nobilis*) and silver carp (*H. molitrix*). These two are commonly referenced as the invasive carp, and silver carp have become a safety nuisance as they jump out the water when startled. Almost all landings of bighead and silver carp come from the ARB, and there has been an upward trend in catch, especially for silver carp (Figure 15). In 2017, over 380,000 lbs. of bighead carp and 110,000 lbs. of silver carp were harvested, valued at over \$68,000 combined (Table 4). Catching the fish is not the problem. Fishermen report that they can easily catch the fish [3, 5, 6], but with almost no markets, the fishermen leave them dead rather than waste boat space or fuel to haul them back to the dock. In north Louisiana, Asian carp are

a problem, but are not reported to the same extent as in the ARB and surrounding regions [6]. It is unknown if this is due to Asian carp populations or number of fishermen in those areas.

Other Finfish

Freshwater drum (*Aplodinotus grunniens*), also known as Gaspergou or gou, is a very small fishery in Louisiana. In 2017, only 439,517 lbs. were landed valued at \$75,217 (Table 4) [1]. In Louisiana, bowfin (*Amia calva*) is targeted most commonly for the roe, or "Cajun caviar" that is harvested in late fall around November. Bowfin is locally called choupique or grinnell. In 2017, 222,907 lbs. were harvested for \$177,724 (Table 4) [1]. Combined, drum and bowfin make up the "other" designation of commercial finfish harvest (Figure 16).



Figure 16. The other finfish: freshwater drum and bowfin from 1999 to 2016.

Crawfish



Figure 17. Landings per basin over time of crawfish.



Wild crawfish is the most lucrative freshwater commercial fishery in Louisiana. There are two species of crawfish harvested for consumption: red swamp crayfish (*Procambarus clarki*) and white river crayfish (*P. zonangulu*). Between 1999 and 2016, there were over 193 million pounds of wild crawfish harvested in Louisiana, with 87% (168 million) from the ARB, 8% coming from the VTB, and 3% from the Mississippi River basin [2]. Crawfish has consistently remained the highest valued freshwater commercial species in Louisiana, bringing in approximately 67% (\$154 million) of the total value of freshwater commercial harvest from 1999-2016 [2].

It follows that wild crawfish landings dominate the overall freshwater landings, and these are separate from the farmed crawfish, which is considered aquaculture. In 2017, 8,574,528 lbs. of wild crawfish, valued at \$12,105,174 were landed in Louisiana, and mostly in the ARB [2] (Table 4). The wild crawfish fishery works a little differently than the freshwater finfish fisheries. Crawfish harvesters typically only target and land crawfish, and they sell directly to fish houses that work only with crawfish. Crawfish are caught in traps with a variety of bait, from herrings to gizzard shad to bought and homemade

manufactured bait [3, 5]. In many areas, the traps are tied to trees or other structures along the banks. Crawfish is seasonal and highly dependent on water levels in the Atchafalaya swamp and other areas. Usually the season starts in the winter and goes into the spring [5, 6].

The landings always fluctuate, but usually wild harvest is over 10 million lbs. However, in 2006, landings were extremely low at 1.5 million lbs. (Figure 18) [2]. This was most likely due to the negative impact on the population and fisheries infrastructure from Hurricanes Katrina and Rita in 2005 [5].



If water levels are too low, then fishermen can't access all the areas by boat. However, issues like too much flooding, increased water volume from the Old River Control Structure or opening of a spillway, like Morganza, can also impact the season. Land rights also become a problem for both access and to tie off traps. Bait availability and cost is another major concern for the fishermen [3, 5, 6].

Crawfish is the leader of all the freshwater fisheries in terms of market development, product development, and quality, in large part because it is nearly 100% for human consumption. Additionally, ~75% is sold live so quality must be maintained to keep the animals alive [5].

Crawfish is a low yield seafood requiring about 7.25 lbs. of live crawfish to yield 1 lb. of meat. They can live



Figure 18. Landings of crawfish by year.

up to a week in a cooler if handled correctly, but the supply chain must still move quickly. For one processor, 45% of their products goes out of state which includes live catch [5].

Often at the processor level, farmed and wild crawfish are co-mingled, and about 90% of total harvest is often farmed. For processing, the meat is picked by hand, and crawfish is the most labor-intensive freshwater seafood [5]. In Louisiana, H2B visa workers help in peeling and processing. Additionally, the processors see the need for modernization in terms of a peeling machine, increasing shelf life, and shelf stable products that wouldn't require refrigeration [5]. The shells are all waste, and disposal is a cost [5].

More markets are requesting sustainability certification, but because of the co-mingled product, both the farmed and wild would have to be certified [5]. Currently, no single sustainability certification covers aquaculture and wild product under the same process.

Like wild-caught shrimp, imports, almost exclusively from China, are the biggest competitor and can drive down price for the peeled product. However, the Chinese market is growing, and more Chinese crawfish is staying in China. Added tariffs on Chinese products are also helping domestic prices [5]. Additionally, in Louisiana, in 2019, Act. 372 required that all restaurants inform consumers if their crawfish or shrimp is imported so consumers can make their own choice.



Alligator

Alligator is a unique freshwater resource in Louisiana that is a careful partnership of wild and farmed harvest. In 2017, 2,608 hunters harvested 15,103 wild alligators at an average total length of 7.55 feet [8]. The skins and meat are the main value of the animals, and in 2017, the skins were valued at \$855,207 and the 347,369 lbs. of meat at \$2,431,583 (Table 4) [8]. The maximum harvest is preset with the number of tags available each year. However, while allowable harvest remains relatively constant, the percent of tags filled fluctuate [8]. Over the past two decades, usually over 30,000

animals are harvested annually. However, in 2009, a low of only 9,143 alligators were harvested, and in 2014, over 36,000 were harvested (Figure 19) [8]. These highs and lows are driven by the value of the alligator skins (Figure 20).



Figure 19. Harvest over time of wild alligator [8].

The season begins the last Wednesday in August or first Wednesday in September, depending on the parish, and lasts 30 days. Baited hook and lines suspended above the water is the primary method of harvest for wild alligators [6].

Alligator harvest began in the early 1800s, but by the 1960s, overharvest threatened the wild population and harvest was closed [6]. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) dictates that no detriment to wild populations occurs from harvest, and every alligator harvested must have a CITES tag. The alligator ranching program began in 1986, and now alligator populations are not endangered or threatened in any way [6]. However, this misconception can limit markets. Wild alligator harvest is made up of animals that are wild their entire lives and released animals from the ranching program. Each year, a nesting survey is conducted. Farms are allowed to take a certain amount of wild eggs. In 2019, there were 32 alligator farmers in Louisiana [6]. These farmers raise alligators primarily for the skin market. However, a certain percentage of alligators must be reintroduced to the wild by the farms each year, currently at 4 feet average length, 10% of the hatch. The exact numbers are updated and determined by extensive sampling by LDWF [6].



Figure 20. Alligator tags filled compared to value of alligator skins over time [8].



Figure 21. Number of alligator harvesters over time [8].

The skins are the greatest value, and they are exported all over the world while the meat stays in the United States [5]. The farmed skins have a higher value than wild skins due to blemishes and scars alligators get in the wild [5]. The international price of the skins often dictates the success of commercial harvest.

Each year, all of the tags are not filled, which could be due to weather, availability, hunter success, or effort. As price of the skins per foot declined, the percent of tags filled has also dropped (Figure 20). Interestingly, and possibly related to the popularity of shows like Swamp People and land managers changing harvest strategies to allow more individuals to harvest the number of harvesters has increased (Figure 21).

While some smaller tanning facilities still exist in Louisiana and the US, most of the farmed skins are destined for luxury, mostly high-end consumer goods like watch bands, boots and shoes, and handbags. The major producers of these luxury exotic skin goods, Hermes, Gucci, and Louis Vuitton, have vertically integrated the international tanning companies. When the market for these luxury goods drops, the price for the skins drops, to the point that currently, there are few markets for the wild skins [5].

Future Recommendations for Alligator

Fluctuating skin price is the biggest problem in the industry. However, there are other problems as well. The seasonality of the wild harvest presents a problem for marketing of meat and processing business models [5]. Disposal of the byproducts (wild skins and carcass) are an additional cost, and development of new products or markets for the byproducts would help the industry. All of these problems have resulted in a recent decline in harvest [8]. These fluctuations in harvest occur while the finfish fishermen are complaining about nuisance alligators causing depredation and gear damage [3]. Overall, the wild



harvest needs to be less reliant on skin price and look to other strategies such as value-added byproducts, sport hunting, and best management practices for higher quality meat.

Frogs and Turtles

Turtle and frog landings have been required by the LDWF trip ticket program since August 1, 2016, so less information is known about these fisheries. Both are also small markets with limited harvesters and landings. However, both have been generally increasing since 2000 [2].



Turtles harvested commercially include snapping turtles (alligator snapping turtles prohibited), soft-shell, red ear sliders, and others. In 2017, 6,533 lbs. of turtle were harvested for \$18,836 (Table 4) [1]. Within this, snapping turtles comprised 1,588 lbs. at \$5.35 per lb. and soft shells 1,179 lbs. at \$4.22 per lb. Overall the landings have fluctuated, with higher landings in 2013-2014 (Figure 22) [1]. Turtle meat does not all stay in state; Iowa and Maryland are large buyers [5].

There are relatively few restrictions on turtle harvest. Diamondback terrapins may not be harvested with a net or trap, or from April 15 to June 15. Otherwise, turtle traps are common, and there is no closed season.

Turtle is a declining industry for several reasons [5]. There is less demand as threatened populations elsewhere in the country have led to public perception that turtles are endangered everywhere, which is not the case for turtles commercially harvested in Louisiana. Regulations to limit the illegal sale and transport of threatened and endangered species has limited interstate commerce. Public perception has also led to a decline in the demand for turtle meat. Processors and fish houses have complained that they can't get enough local supply in recent years to the point that New Orleans restaurants are replacing turtle soup on their menus with salmon [5].

Landings for frogs in Louisiana are very similar to turtle (Figure 23). In 2017, 9,649 lbs. of frogs were caught, valued at \$24,049 (Table 4) [1]. Frogs are often harvested at night with a light and net, gig, or even by hand. Species include bullfrogs and pig frogs, or grunters [6]. The season is closed in April and May.













FUTURE ...

If left alone on the current track, the commercial freshwater fishery is in danger of disappearing due to the aging harvesting community and limited buyers and markets. However, there are signs of optimism and opportunities to help the industry. Overall, prices need to improve in order to recruit new fishermen to the industry and keep current fishermen and processors viable.

Engaging active freshwater commercial fishermen is the first step towards making change. The current industry indicated willingness to change to increase price. When it comes to alternative strategies to increase price, 40% of fishermen surveyed were interested in value-added opportunities and 20% already do value-added. Only 29% were interested in direct marketing, but 16% already do. However, 72% were interested in alternative species besides what they currently target [3].

This industry needs a robust market. Consumer demand is what will ultimately perpetuate the success of the fisheries. As consumers are becoming more educated about their food choices, fishermen and fish processors need to adjust their methods to appease the market they are

catering to. The fish are abundant, the fishermen are hardworking, and the processors are looking for a reason to stay open. The opportunities are there, but the market is lacking. An in-depth market analysis could further elucidate the steps that the commercial freshwater industry needs to take to stay afloat in Louisiana.

Table 5. Preference of surveyed fishermen for future contact.

How do you want to get new information?	Response Rate
Workshops	23%
Mailings	28%
Emails	10%
Social Media	0%
Texts	2%
Phone Calls	10%

Overall, improved cold chain management is very important, especially for catfish. This would help with markets and price. The lack of markets needs to be improved to drive up price, which would hopefully keep more fishermen in the industry and bring new fishermen into the industry. The culinary sector needs to be part of the effort. Consumer education can go hand in hand with new product availability and quality improvements so supply and demand are created at the same time.

Finding ways to reach this industry can be a challenge. Of fishermen surveyed, 58% were interested in workshops or education opportunities in their area [3]. This is an industry that still prefers traditional methods of engagement including workshops and mail outs. Only one respondent wanted texts, and no one wanted information through social media (Table 5) [3]. Additionally, LDWF is the current top source of information that they trust [3]. Providing simple paths to communication with decision-makers within the industry can be helpful. The survey respondents had a lot of ideas, knowledge, and opinions about the freshwater fisheries that are worthy of being discussed. Many fishermen mentioned lack of time as a barrier to participation. Offering straightforward, local, and frequent educational and outreach events may be the easiest way to reach them.



Efforts are needed by multiple agencies and groups to assist this industry. There were several recommendations in regards to LDWF and the fisheries, but overall increased communication between the department and the fishermen could help, such as through a task force. Efforts by other groups like LSG could assist with product and market development and quality improvements.

There is increasing demand for local, sustainable seafood. Inland fisheries were the primary source in the 1800 and 1900s, and dedicated effort can help make Louisiana freshwater species a top choice again. These efforts can ensure the industry remains viable into the future.

WHERE DOES LOUISIANA FRESHWATER HARVEST GO*?...

General Finfish

30

- Almost all buffalo and freshwater drum remains in the state and is sold gutted and skinned. Some goes wholesale out of state. CA used to be a buyer of freshwater drum, but that has discontinued.
- 95% of carps goes out of state. A lot is going to Asian markets in TX or Vietnam for processing.

Catfish

- The destination for catfish varies widely by processor with some shipping almost completely out of state to those only selling within LA. Whole fish tend to go to TX while fresh fillets stay in LA. Small fillets are wholesaled out of state.
- When leaving LA, a large majority goes to TX or MS, but some is shipping all over the US.
- Some catfish used to go to Mexico, but catfish got too expensive for Mexican markets.
- Even within Louisiana, there are preferred product types by metropolitan area. Houma tends to get frozen fillets while Baton Rouge and New Iberia want fresh fillets.

Crawfish

- 75% is sold live for boils.
- Depending on the processor, 45-90% is sold in state. This could be live crawfish or peeled meat.
- Two of the common wholesale sales are to CA and MS.

Alligator

- Alligator is sold all over the US through Walmart and Sysco.
- China prefers to buy the dark meat, and other countries like Canada have expressed interest in buying alligator meat in the future.
- The alligator skins go all over the world.

Turtle

- Most of the meat stays locally, but it also goes to IA and MD.

*Based on responses from Fish Houses, Processors, and Buyers









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