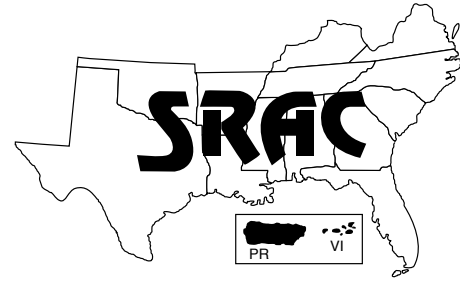




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Southern
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Crawfish Aquaculture — Marketing

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Most crawfish produced in the United States is sold to the food industry, although some is sold for recreational fish bait and a small amount is marketed to the aquarium trade and to educators, who use the animals as study specimens. Each year, nearly 80 million pounds of procambarid crawfishes are harvested (from aquaculture and from the commercial wild fishery) for food in Louisiana, the nation's largest producer. This represents more than 95 percent of the domestic crawfish crop. In the past 5 years, an average of 81 percent of the annual crop has come from aquaculture.

Two species are commercially harvested—the red swamp crawfish (*Procambarus clarkii*) and the white river crawfish (*Procambarus zonangulus*), with the red swamp crawfish dominating the catch. Whether from aquaculture or the natural fishery, the supply of live crawfish is highly seasonal, with the peak harvest occurring from March through June (Fig. 1). Historically, most of the domestic supply has been consumed in Louisiana and surrounding areas, particularly Texas, the Mississippi Gulf coast, and the Florida panhandle (Fig 2). Crawfish can be

produced only in certain areas. This, along with the seasonality of supply, unstable prices and cultural mores, has limited crawfish sales nationally. In recent years crawfish have become more widely available because frozen product is being imported.

Product forms

Live crawfish

All farmers market their crawfish live, and a large portion of the final consumer product is live crawfish. Live crawfish command the highest prices, with the largest

animals bringing premium prices. Producers of large crawfish have a competitive advantage, especially when the supply of live crawfish exceeds demand. When there is an oversupply, the larger crawfish usually remain in the live market while the smaller crawfish are processed for meat.

Most producers sell live crawfish to a primary wholesaler or a processor, although a few sell directly to retail stores, restaurants and consumers (Fig. 3). In Louisiana, red swamp crawfish have greater consumer appeal in the live market than white river

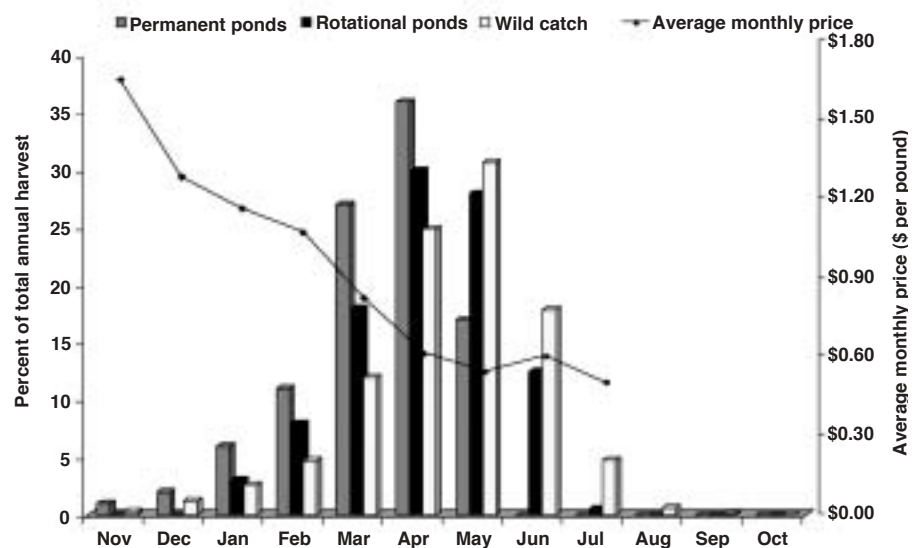


Figure 1. Seasonal harvest of crawfish from aquaculture and the commercial wild fishery from Louisiana's Atchafalaya River basin. Percentages depict a 10+ year average. Mean monthly wholesale price is the 5-year average (2000 through 2005) for pond-raised crawfish in southern Louisiana.

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crawfish, although this preference is usually not seen outside of traditional southern Louisiana markets.

Highest demand for crawfish by both retail consumers and restaurants occurs on weekends, even in Louisiana. The short shelf life of crawfish (no more than several days) largely dictates harvesting schedules and market plans. It also limits regional and national distribution.

Whether served in households or restaurants, live crawfish are usually boiled or steamed and eaten while hot and fresh (Fig. 4). Crawfish are not considered a staple food; rather, they are generally associated with social occasions, and no food exemplifies the Cajun cultural atmosphere more than fresh, boiled crawfish coupled with spicy vegetables and cold beverages.

Processed and prepared products

When crawfish are abundant or when live markets become saturated, a portion of the annual crop is processed and sold as fresh or frozen abdominal or "tail" meat. The most popular processed product is cooked, hand-peeled and deveined meat, which is usually sold in 12-ounce or 1-pound packages (Fig. 5). This may be packed with or without hepatopancreatic tissue (in Louisiana, frequently referred to as "fat"), which is an important flavoring in Louisiana cuisine and is savored for its distinctive, rich flavor. Smaller crawfish are usually processed for the tail meat market, leaving the larger individuals for the more profitable live market.

The abdominal meat yield for cooked crawfish is, on average, about 15 percent of live weight, but meat yield varies with factors such as sexual maturity and size. Immature crawfish generally yield 4 to 5 percent more meat than mature individuals because they have smaller claws and thinner shells. The cooking time and peeling technique used also can influence meat yield because all processing is by hand. Early in the production season (November to March), when a high percentage of the crawfish are immature, meat yield can be as high as 22 to

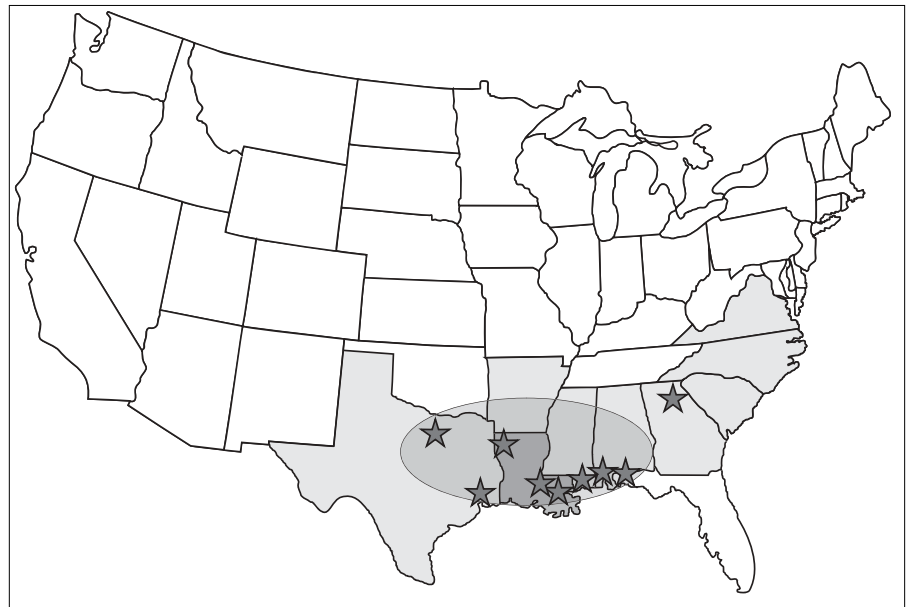


Figure 2. Principal regions of the U.S. where Louisiana crawfish are marketed. Stars represent major cities (New Orleans, Baton Rouge, Shreveport, Houston, Dallas, Biloxi, Mobile, Pensacola, Atlanta) for crawfish sales.

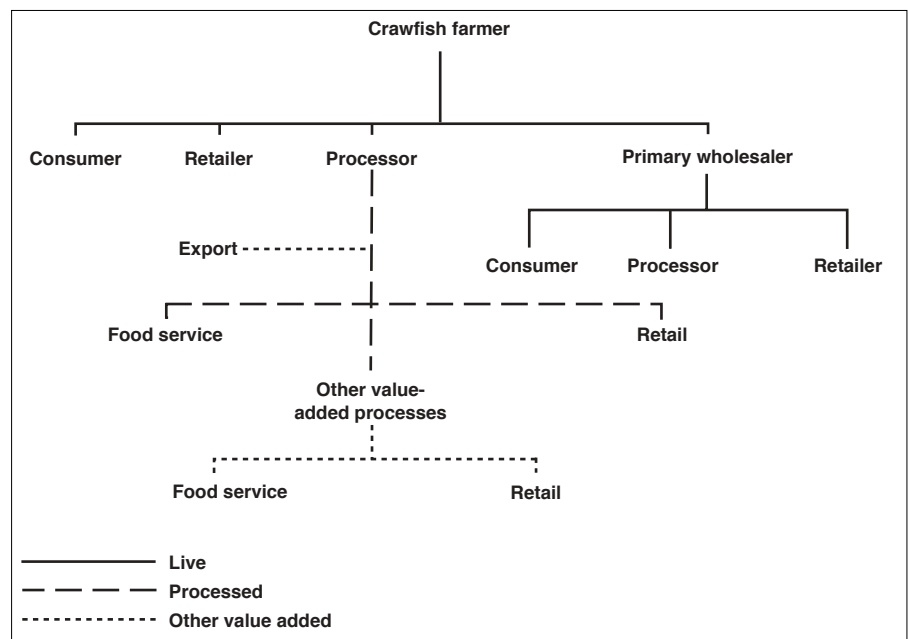


Figure 3. Marketing avenues for Louisiana crawfish.



Figure 4. Cooking, peeling and eating whole boiled crawfish, a common weekend activity in the spring in Louisiana.



Figure 5. Crawfish being processed (peeled) to obtain abdominal ("tail") meat.



Figure 6. Small retail outlet specializing in boiled crawfish.



Figure 7. Custom mobile crawfish-boiling rig used for catering large crawfish boils.

23 percent. Late in the season (April to July), when most crawfish are mature and have heavier exoskeletons and large chelae (claws), meat yield can be as low as 10 to 12 percent of body weight. Abdominal meat is used in many ways and can be substituted for shrimp in many recipes. The amount of crawfish processed for tail meat in Louisiana varies annually, but since the introduction of inexpensive procamburid crawfish meat from China, it is estimated that less than 10 percent of the annual crop is now processed for meat.

Another product form is cooked, whole crawfish, usually served fresh and hot, with a small volume also sold as frozen product to be heated before serving. Traditionally, crawfish in the southern U.S. are cooked with red pepper-based spices/seasonings, and often with onions, potatoes, and corn to complement the meal. One extracts the edible portions of the whole crawfish by hand.

Increasing in popularity in Louisiana, and within the range of delivery for live crawfish outside of Louisiana, are retail outlets and restaurants that serve hot, boiled crawfish. Small, seasonal "take-out" outlets (Fig. 6) have developed wherever live crawfish can be readily obtained. Many businesses also cater boiled crawfish to large groups, parties and festivals, using custom boiling rigs (Fig. 7).

Prepared, frozen crawfish dishes, although still accounting for only a small portion of total sales, have helped to increase the distribution of processed abdominal crawfish meat through value-added products.

Soft-shelled or "soft" crawfish were once an important product in Louisiana. Production technology and markets for this product were developed in the mid-1980s, but the industry has since declined to a small number of producers, primarily because a large market never developed and the cost of production is relatively high. In processing soft crawfish, the gastroliths (two hard, cal-

cium carbonate structures found in the head immediately before and after molting) must be removed. Soft-shelled crawfish are excellent table fare, much like the soft-shelled blue crab, and the edible portion varies from 92 percent if only the gastroliths and gills are removed in processing to about 72 percent if both the mouth/eye section of the head and the hepatopancreas are removed.

Market influences

Crawfish markets have changed considerably since the mid-1980s when crawfish were sold without consideration of size. The development of an export market in Scandinavia in the late 1980s for crawfish 15 count (number per pound) or larger provided the first impetus for size grading.

Louisiana's export markets for crawfish were eventually lost to competition from China, but size grading remained and is widely used in the domestic market. Size grading is usually not done early in the production season when supply is low and demand is high for crawfish of all sizes, but as the volume of crawfish increases in early spring and the demand for large crawfish increases, size grading becomes standard practice. Nearly all grading occurs at wholesale outlets or processing plants and is done with modified vegetable graders or custom-made graders (Fig. 8).

There are no uniform size and grade standards for the crawfish industry as there are for other seafoods, and this hinders market development and expansion. Crawfish are usually graded into two or three size classes. The largest crawfish are sold to spe-

cialty restaurants and the smaller ones processed for abdominal meat or mixed with larger individuals for large volume sales.

Table 1 illustrates a grading system commonly used in Louisiana. Other grading systems also are used by crawfish wholesalers, depending on their markets.

The marketing of domestic crawfish has been complicated in recent years by the importation of crawfish products. Millions of pounds of frozen, processed meat and whole, boiled procambard crawfish, are imported into the U.S. each year, mainly from China (Fig. 9). Although a tariff has been imposed by the U.S. Department of Commerce on much of the imported Chinese crawfish meat, the U.S. industry has suffered, with an almost 90 percent reduction in processing (peeling) capacity in Louisiana. As a consequence, each year thousands of tons of smaller crawfish are not harvested for lack of adequate live markets and processing infrastructure.

Although the demand for crawfish in Louisiana is high and markets are expanding in adjacent states, crawfish must compete



Figure 8. Large grader at a crawfish buying dock.

with products such as shrimp, prawns, lobster and crabs in the national market. Outside Louisiana, crawfish is not a traditional food. But because crawfish imports have made the product available year-round and stabilized prices, the national market may be expanding. The growing popularity of southern Louisiana Cajun and Creole cuisine throughout the U.S. may also encourage market expansion.

Purging and cleaning

To provide a more appealing product for live markets, a small number of producers have adopted the practice of purging crawfish before selling them. This process cleans the exoskeleton of mud and debris and eliminates or reduces digesta in the intestine (Fig. 10), which consumers may find unappealing. Purging requires that crawfish be confined in water or in very humid environments where food is withheld for 24 to 48 hours. Purging should not be confused with the practice of immersing crawfish in salt water just before boiling, which does not evacuate the gut and is little more than an external wash.

For purging, crawfish are commonly held within specially constructed boxes or baskets (Fig. 10) that are usually suspended in water in raceways or tanks. The recommended loading rate is about 1.5 pounds of crawfish per square foot of submerged surface area with adequate aeration and water exchange. Equally effective, but seldom used, is a water spray system in which crawfish are held in shallow pools of water (0.5 inch deep) under a constant

Table 1. A common grading system used for live crawfish in Louisiana.

Size classification	Size classification by number	Number (count) of crawfish per pound	Wholesale price range
Large	1	15 or fewer	\$0.70 to 2.00
Medium	2	16 to 20	\$0.40 to 0.90
Small	3	21 or more	\$0.25 to 0.40
Field run	Mixed	16 to 35	\$0.40 to 1.50

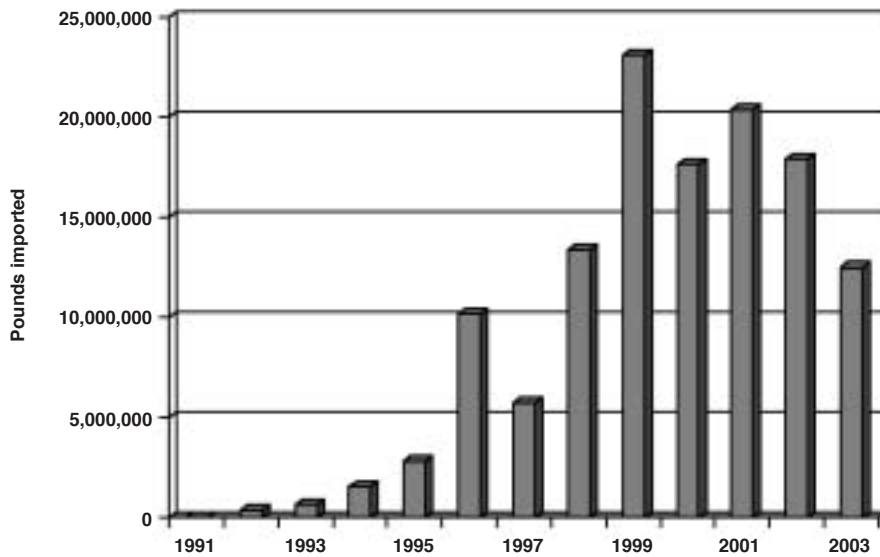


Figure 9. Yearly imports of Chinese crawfish (tail meat and whole boiled product), 1991 – 2003. (Source: Port Import Export Reporting Service, PIERS, a division of the Journal of Commerce).

spray or mist. Holding crawfish in aerated vats or purging systems under crowded conditions for more than 24 to 48 hours is not recommended because mortality may be high. Recent research has shown that purging for only 12 hours can be nearly as effective and results in lower mortality. Though purging increases the cost of the product by 15 to 25 percent (largely because of mortality), consumers prefer purged crawfish, particularly outside of traditional markets. Even those who are accustomed to nonpurged crawfish and do not find them objectionable might prefer purged product if the cost were reasonable.

Although the current market for purged crawfish is small, purging has contributed to repeat sales and consumer loyalty to certain producers or distributors.

The external surfaces of crawfish, which can be fouled and/or stained, are cleaned reasonably well during purging as the crowded crawfish rub against one another. Nonpurged animals that are excessively stained are sometimes cleaned with food-service chemicals (ascorbic or citric acid and baking soda) to enhance their appearance and increase their marketability.

Transporting and storing live crawfish

Live crawfish are not stored and transported in water, but in plastic mesh sacks (Fig. 11). Sacks hold about 35 to 45 pounds of crawfish. Sacks are preferred over more rigid containers such as totes (Fig. 12) because crawfish can be packed in the sacks in a way that prevents damage from pinching, which can happen when animals are not sufficiently restricted.

Sacks should not be packed so tightly that animals are crushed, but tightly enough to restrict crawfish movement. Sacks of live crawfish can be transported in open-bed trucks for short distances, but sacks should be covered with a tarp to keep gills from drying out. Wholesalers or



Figure 10. (Left photo) Note the difference in the intestinal contents of non-purged crawfish (left) and purged crawfish (right). (Right photo) Crawfish purging system.



Figure 11. Crawfish are transported to market, and sold as live product, in mesh sacks that usually hold 35 to 45 pounds of crawfish.

jobbers who haul sacks of live crawfish over long distances use insulated trucks, with or without refrigeration (Fig. 13). Crushed ice is placed over the sacks in nonrefrigerated trucks, and sometimes in refrigerated trucks, to reduce crawfish metabolism and keep the humidity high, which increases the shelf life of live crawfish.

To ensure a high survival rate during live transport, crawfish should be harvested from ponds with good water quality. Live crawfish should be transported to on-the-farm coolers or to the terminal market as soon after harvest as possible. Transport vehicles should be clean and free of petroleum products and other contaminants. If crawfish are to be transported in an open vehicle or hauled a long distance in the harvest boat, crawfish in sacks should be covered with wet burlap or a tarp to protect them from excessive wind and bright sunlight. Sacks should not be stacked so high that crawfish in the bottom sacks are crushed.

Sacks of live crawfish in good physiological condition can be held in high humidity coolers at 38 to 46 °F for up to several days before they are peeled or transported to the final destination. The gills must be kept moist while crawfish are in coolers. This is usually accomplished by wetting them periodically and/or by covering them with wet burlap or ice. If crawfish are placed in plastic tote boxes, the top tote should be filled with ice. Melting ice will trickle down through the totes to provide the necessary moisture. Unchilled crawfish should not be placed in totes because they will remain active and may damage each other by pinching.

A relatively small volume of live crawfish is shipped in sacks by air freight throughout the U.S. For air transport, crawfish are packed in insulated seafood shipping boxes containing frozen gel packs. During warm weather, crawfish to be shipped by air freight should first be cooled overnight.

Pricing

Supply and demand relationships are reflected in the way prices vary from year to year and from week to week during the harvest season. In Louisiana, the average annual pond bank price paid to producers from 1997 through 2004 was \$0.60 to \$0.80 per pound when annual supply ranged from 70 to 85 million pounds. There were exceptions in 2000 and 2001 when low supply from both aquaculture and the wild crop pushed average statewide wholesale prices to more than \$1.24 per pound (Table 2). Seasonally, prices are highest in winter and early spring when supply is relatively low (Fig. 1, Table 3). Prices decline significantly in late spring and summer when supply peaks and the supply of and demand for other fresh seafoods, such as shrimp and crabs, increase. In Louisiana, the price for "field run" crawfish may decline as much as 40 to 55 percent for several weeks during peak production (April and May) if crawfish

quality (usually size) decreases. The drop in price for larger crawfish is usually much less. In recent years, large crawfish have commanded a wholesale price two to three times higher than that paid for medium to small crawfish (Table 1).

Wholesale buyers pay relatively uniform prices from day to day or week to week, with no single buyer or group of buyers exerting excessive control over pond-bank prices. But when crawfish supplies are high, wholesalers and processors can exert price leverage over producers, usually because of their ability, or inability, to move large volumes of crawfish in the live market. Some buyers offer premium prices to their larger, more loyal or more consistent suppliers.

Although wholesale prices for peeled crawfish tail meat are not published, the wholesale price of a pound of tail meat is usually about ten to twelve times higher than the wholesale price of a pound of live crawfish.



Figure 12. Crawfish totes, an alternative method for holding and transporting crawfish.



Figure 13. A crawfish transport truck and transport with ice.

Table 2. Average annual supply and wholesale price for live crawfish in Louisiana from aquaculture and the commercial wild fishery, 1997 through 2004.

	Source				Total	
	Aquaculture		Wild fishery			
Year	Pounds (millions)	\$/Pound	Pounds (millions)	\$/Pound	Pound (millions)	\$/Pound
1997	46.9	0.60	30.1	0.52	77.0	0.57
1998	36.1	0.62	30.2	0.63	66.3	0.63
1999	41.2	0.66	21.2	0.65	62.4	0.66
2000	16.2	1.75	2.3	1.48	18.5	1.71
2001	27.7	1.33	6.4	0.84	34.1	1.24
2002	60.5	0.82	14.0	0.52	74.5	0.76
2003	73.0	0.65	10.2	0.52	83.2	0.63
2004	70.0	0.60	8.3	0.58	78.3	0.60

Source: Louisiana Summary: Agriculture and Natural Resources. Louisiana State University Agricultural Center, Baton Rouge, Louisiana.

Table 3. Average monthly wholesale price and maximum and minimum prices for live “field run” crawfish (mixed sizes) in southern Louisiana, 2000 through 2005.

Price	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Average	\$1.65	\$1.28	\$1.16	\$1.07	\$0.82	\$0.61	\$0.54	\$0.60	\$0.50
Maximum	\$2.00	\$2.00	\$1.33	\$1.21	\$0.90	\$0.75	\$0.65	\$0.72	\$0.50
Minimum	\$1.42	\$0.95	\$0.88	\$0.92	\$0.68	\$0.53	\$0.38	\$0.47	\$0.50

Source: Aquaculture Research Station and Rice Research Station, Louisiana State University Agricultural Center, Baton Rouge, Louisiana; and Crawfish Research Center, University of Louisiana at Lafayette, Lafayette, Louisiana.

Production strategies for identified markets

A crawfish producer should be familiar with potential markets, both wholesale and retail, and match production to the needs of the market. Since crawfish are harvested several times a week, a farmer must have reliable buyers to be successful. Few farmers in areas such as southern Louisiana sell directly to consumers, so most large producers must sell most of their harvest to wholesale buyers and processors. Small-scale producers outside of Louisiana have few established and knowledgeable wholesalers who are experienced in marketing live crawfish. However, many small-scale producers are suc-

cessfully selling directly to consumers and to retail seafood establishments.

Occasionally, harvesting schedules and strategies must be adjusted to accommodate available markets. Buyers may prefer to have product delivered only on certain days, such as Thursday through Sunday. When crawfish supplies are abundant, trapping strategies may need to be adjusted to trap only the largest crawfish, even at the expense of overall yield. Planning and good communication with potential buyers early in the season can help a producer compete more successfully in the marketplace.

Regulations and permits

Various permits may be required to market crawfish (e.g., a wholesale or retail fish distributor’s license) or to transport them across state lines. Permits are specific for each state. The importation of live, non-native crawfish is restricted or forbidden in a number of states, especially where they might become established and compete with native species. Before shipping live crawfish, always verify the regulatory requirements in the receiving state and in the states through which the shipment will pass to avoid serious legal problems.

In Louisiana, live haulers are usually required to have permits or licenses to transport crawfish,

depending on who their crawfish are being purchased from or sold to. These may include municipal or county permits, a state transport license, and a seafood wholesale/retail dealer's license.

Conclusions

Crawfish is one of the nation's largest aquaculture industries, with most of the markets and consumption in Louisiana and the Gulf coast region. More than 90 percent of crawfish are marketed and sold as live product, with

most of the remainder processed for tail meat. Although the processing industry in Louisiana has been significantly damaged by imports from China, imports appear to have had some limited benefit in the development of new markets elsewhere in the U.S. Most live crawfish produced in Louisiana are moved through wholesalers, with a relatively small volume sold by producers directly to the public or to retail establishments. Outside of Louisiana, producers rely mostly

on direct sales to the public or to retail establishments. The keys to profitability in marketing live crawfish are to understand seasonal market demand, harvest early in the season when prices are high, and produce large crawfish that command the highest prices. The crawfish industry will need to invest time and money to expand the market for live and processed crawfish outside traditional areas.

SRAC fact sheets are reviewed annually by the Publications, Videos and Computer Software Steering Committee. Fact sheets are revised as new knowledge becomes available. Fact sheets that have not been revised are considered to reflect the current state of knowledge.



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