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Coastal Alabama Recreational Live Bait Study

**Mississippi State University
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Abstract

Recreational fishing is a major industry and reasonably priced, high quality bait plays an important role in sustaining recreational fishing's popularity. This study provides a summary of Alabama's coastal live bait market including information on previous live bait studies and results of two surveys on the live bait shrimp, bull minnow and other bait markets. Results indicated there were periods of supply shortages, dealer willingness to pay more for shrimp that live longer and a dealers' use of multiple supply sources. Lost income was reported from not having live bait shrimp available for sale at peak demand periods. The economics of shrimp mariculture needs to be examined to determine its feasibility in augmenting the current supply of shrimp to the live bait industry.

Keywords: recreational fishing, live bait industry, live bait shrimp, bait supply, bait demand

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Recreational fishing is a major industry. In 1991, the U.S. Fish and Wildlife Service estimated there were 35.2 million anglers spending \$27.6 billion, while in 1996 the same number of anglers spent \$37.8 billion, a 37% increase (U.S.D.O.I.). As a tourist activity, recreational fishing complements a wide array of activities associated with an expanding U.S. tourism industry. Reasonably priced, high quality bait plays an important role in sustaining recreational fishing's popularity. This report provides an assessment of this ancillary, but important, part of the tourism industry that has generally been overlooked. It will summarize Alabama's live bait market for saltwater recreational fishing and give recommendations on market windows of opportunity. This bulletin is divided into four sections describing: 1) previous live bait studies, 2) live bait shrimp market, 3) live bait bull minnow market, 4) other live-dead baits, and 5) survey conclusions.

The business of providing live bait to saltwater, recreational fishermen is an important but overlooked aspect of the coastal recreational fishing industry in the Gulf of Mexico. For this region, the industry was supported by 2.0 million recreational fishermen in 1995 and 1997 (excluding Texas) (National Marine Fisheries Service, 1997). These fishermen took an estimated 17.1 million recreational fishing trips in 1995 and an estimated 18.1 million trips in 1997. Fifty-three percent of all 1995 fishing trips were conducted on private or rental boats, 40% from shore fishing, and 6% from party or charter boats. Little information is available concerning the value of live bait purchased by these fishermen in Alabama.

Past Studies

A 1972 survey of the live bait shrimp industry in Alabama reported 24 dealers who sold over 1.5 million live shrimp (valued at \$64,500) and sold at prices ranging between \$40 to \$50 per 1,000 (Swingle, 1972). Over 22,000 pounds of dead shrimp (valued at \$12,040) were sold at prices ranging from \$0.50 to \$0.60 per pound. Combined retail value for these shrimp in 1972 was reported to be \$76,540.

A survey of six north-central states found that the retail value of live bait was \$181 million (Meronek, et al. 1997) which may be suggestive of the magnitude of the value along the

Gulf Coast. Adams et al. (unpublished Florida Department of Environmental Protection report, 1998) and Zajicek et al., (1998) reported commercial marine bait landings in Florida to be 7.6 million pounds in 1995 and valued at \$6.0 million dockside. Florida Sea Grant research recently estimated fisherman expenditures on all forms of natural and artificial baits at \$160 million annually (Milon and Thunberg, 1993). They found demand for baitfish to be strong in all sub regions of the Florida coast with supply shortages occurring in terms of volume and preferred sizes. A majority of respondents were favorable towards farm-raised bait because of its implied supply consistency, reduced mortality, and availability of preferred sizes.

Gandy (1997) surveyed and analyzed information on regional live bait-shrimp market environments, supply and demand within regions and acceptance of farm-raised live bait shrimp. The survey area covered the Gulf coastal and southeastern Atlantic states from Texas to North Carolina (excluding Louisiana). Every state had periods when wild harvested shrimp did not meet market demands. Local suppliers provided enough live bait-shrimp to Texas fishermen for only two months of the year. Mississippi had a six-month period of unmet demand. Most Alabama dealers had certain live bait shrimp supplies during August to May while 25% of the dealers had definite shortages during November through January and May through July periods. Florida had abundant supplies nine months of the year, allowing excess supply to be sold to Alabama, Georgia and South Carolina, although the current Florida inshore net ban will likely affect this supply. Georgia dealers reported a lack of supply during the February through April period, while South Carolina had a lack of supply during November through January and an uncertain supply period during October through January. North Carolina has a short summer market with a limited supply.

As with the Gulf region, recreational saltwater fishing is an integral part of the coastal Alabama economy as evidenced by the increase in sales of saltwater fishing licenses, Table 1. Nearly 61,000 licenses were sold in 1994-95 compared to approximately 37,000 in 1992-93. An important segment of the Alabama recreational fishery is the charter boat industry. The Orange Beach charter boat fleet generated \$34.5 million in revenues from 84,000 visitors in 1993. This included \$8.7 million for charter boat fees, \$1.7 million for miscellaneous crew fees, \$5.2 million for boat expenses and \$19.0 million for other expenses, including lodging and food (Malone, 1994). Additionally, an often overlooked value of recreational fishing is its significance to the angler's diet. Morse (1988) concluded that 41% of saltwater anglers in

Mobile and Baldwin counties perceived game fish caught to be an important part of their family's overall diet.

1997 and 1998 Alabama Live Bait Market Surveys

Crucial to recreational fishing is the supply of bait. The focus of this report is on the live bait market, specifically white shrimp (Litopenaeus setiferus), pink shrimp (Farfantepenaeus duorarum), brown shrimp (F. aztecus) and bull minnows (Fundulus grandis). Recreational fishermen targeting spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellata*) and flounder (*Paralichthys* spp.) prefer live shrimp. Fishermen targeting flounder and redfish use bull minnows, another preferred live bait. It is difficult to know what proportion of recreational fishermen use live bait shrimp and minnows, but some dealers and fishermen have estimated as high as 65 to 75 percent. Results of the survey reported here showed the percentage of live bait shrimp sales relative to gross sales from bait and tackle stores ranged from 0.5% to 70%, Figure 1. Live bait shrimp sales ranged from \$7,800 to \$305,000 annually. Businesses interviewed had gross sales ranging from approximately \$33,000 to \$2.3 million annually.

Alabama live bait dealers were surveyed from December 1996 to March 1997 and again from April to July 1998. In the first survey, twenty-three bait dealers (of approximately 35 total) were interviewed from the cities of Mobile, Theodore, Coden, Dauphin Island, Chickasaw, Spanish Fort, Fairhope, and Orange Beach. In 1998, these same dealers were asked follow-up questions about their last years bait shrimp sales along with questions about bull minnows and other baits. Results of the survey detail dealer characteristics, their holding facilities and management, seasonal supply and demand, and prices. Dealers' willingness to pay for lowered shrimp mortality and shrimp/minnow availability was incorporated into each survey to explore potential opportunities for mariculture of these two species. The two survey instruments are found in Appendix A.

Characteristics of live bait operators

Businesses selling live bait had been active for an average of 12.3 years; three dealers had been in business for more than 26 years and nine had been in business for five or fewer years, Figure 2. Table 2 addresses the relationship between the years in business and the gross sales percentage of live bait shrimp to the whole business. Sixty-seven percent of the business in their

first five years of operation said live bait shrimp accounted for 20% or less of their entire gross receipts, while 40% of all interviewed said live bait shrimp accounted for more than 30% of their total gross sales.

When bait dealers were asked which bait was most preferred, many dealers prefaced their response by saying all bait, live and dead, were important depending on the time of year and targeted fish. With this in mind, live shrimp was the preferred bait followed by frozen shrimp. Live shrimp were not available year round. Minnows were also very popular. Most dealers maintain a variety of baits since shrimp is not available year round and a few dealers sold more crickets and worms than shrimp. One dealer said frozen cigar minnow sales were most important while a couple of other dealers placed a high importance on live croakers.

The number of people employed for live bait shrimp sales were related to the size of the operation and associated activities. From our sample of bait dealers, there were an average of four people hired per live bait shrimp dealer, but this did not mean that live bait shrimp was their only area of work activity and many operations employed family members.

Live Bait Shrimp

Sixty-one percent of those interviewed felt live bait shrimp sales were very important to their overall business, Figure 3. Although many shops had numerous types of bait and tackle, most owners agreed that the reason they had live bait shrimp and minnows was to induce customers into the store to buy additional tackle, food and beverages. Additionally, 17% of the interviewed bait dealers had arrangements for selling live bait shrimp to charter boats and fishing guides on a regular basis.

Survey results indicated live bait shrimp sales were a lower percentage of total sales for larger marine supply stores than for smaller stores. For instance, large stores with estimated total annual sales greater than \$750,000 indicated that live shrimp bait sales were 1% of sales, while smaller stores with annual total gross sales of \$33,000 to \$750,000 had live bait shrimp sales ranging from 1% to 70%.

Regulations pertaining to the live bait shrimp industry

Portions of the survey were directed toward learning more about holding facilities and the relationship between bait catchers and dealers. These questions and responses are better

understood in light of state regulations. The State of Alabama's Department of Conservation and Natural Resources (1994) establishes live bait shrimp regulations (see Appendix B for more details). The regulation has specific shore facility requirements that include a "... permanently erected building from which fishing bait and fishing supplies and tackle are routinely sold to the public." There must be minimum capacity holding tanks with adequate aeration systems. Specific boat requirements, such as aerated holding compartments, special marking displayed on each boat side and no substitution of another boat (unless Departmental approval is given). Only one trawl per boat is allowed and it cannot exceed sixteen feet across the main top line (no mesh size restriction). Trawling time cannot exceed twenty consecutive minutes before retrieving the trawl and sorting bait shrimp into the live tank. There is no closed season, but live bait shrimping is prohibited in areas permanently closed to shrimping. Exclusive bait shrimping areas are identified in Appendix B.

Transport trucks must have a tank with recirculating water or commercial fish aerator systems. Pounds of shrimp allowed differ for the boat/truck and place of business, with the possession of one "standard shrimp basket" being allowed for the boat or truck. In the place of business there can be no more than three "standard shrimp baskets" in possession. "Shrimp can be sold only when alive or with heads attached for bait only. Dead shrimp must be packaged in lots of no more than one pound." There are also record keeping requirements and penalty provisions for not adhering to the regulations.

Holding facilities and practices

Fifty-nine percent of respondents had one or two tanks for holding live bait shrimp and 91% used their tanks regularly, implying there was a constant flow of shrimp into and out of the business. The restocking frequency during periods of high demand averaged six days per week, while during periods of low demand tanks were restocked twice a week. A couple of respondents indicated that they only used their tanks during the winter and summer seasons or increased the number of tanks for the summer season.

The maximum amount of shrimp held per tank ranged from 1,200 to 5,000 shrimp. Water recirculating systems were preferred by 71% of the respondents over flow-through systems. Seventeen percent of the respondents had a combined water recirculating/flow-through system or ran recirculating systems during the winter months and switched to flow-through

systems during the summer-fall season. To keep the tanks full, water was added daily or as needed in most cases. The source of water supply for the holding tanks varied greatly, though the sources could be generalized into categories of water from where the bait dealer business was located, from where shrimp were captured, or from shrimp supply trucks.

Primary aeration methods, including simple water spray, agitators, and/or air stone systems, were equally used by 63% of the dealers. Other aeration methods included gravel filters and free falling water. Twenty-two percent had back-up aeration systems run by either battery or generator.

Supply and Demand

Live shrimp bait dealers were asked which months they purchased white shrimp, ‘hoppers’ or pink shrimp, and ‘brownies’ or brown shrimp. In most cases, bait dealers had no choice of species. What was captured or was delivered to them, either locally or from other destinations further away determined species availability. Figure 4 shows the percentage of bait dealers receiving each native shrimp species by month. Each shrimp species had a peak availability time. For the white shrimp, it was during the months of August to November, while for the brown shrimp, the peak was during the months of April to August, and for the pink shrimp, the peak was during the months of January, February and May. Howe et al. (in review) corroborated these data.

In Howe’s study, the seasonal nature of shrimp was described and shown to be related to their choices of vegetated and higher saline habitats. In their sampling of eight estuarine sites along the fringes of Mobile Bay, they did not collect any shrimp prior to March and reported generally high densities by May. *F. aztecus* dominated the spring months and *F. duorarum* were also numerous. *L. setiferus* were more numerous in summer while *F. duorarum* were dominant in the fall. The supply of shrimp species to bait dealers paralleled their availability in local waters.

Bait dealers rated the period May through October as having the highest customer demand for live bait shrimp and lowest demand during the winter months of December, January and February, Figure 5. A lull in recreational fishing during the winter season is expected as cold fronts may prevent charter boats and smaller craft from going out. In the springtime, demand sharply increased. Demand increased continuously through the summer months until it

peaked in September and stayed at this level through October. Demand declined in November but was still higher than during the December to February period.

Live bait shrimp dealers identified months when supply of shrimp was less than the amount customers demanded, Figure 6. Three distinct periods emerged. From August to November approximately 41% of the bait dealers agreed that there were not enough bait shrimp to meet customer demand. A less severe period of deficit supply occurred during the months of January and February, which was likely due to inclement weather that shrimpers face rather than increased demand. During the months of March through June, about 15% of the dealer felt supply was less than demanded.

Only 17% of the dealers interviewed agreed that live bait shrimp was always available when needed. Seasons, dates, and other special occasions partially explained this perception. Major holidays when bait shrimp were in short supply included Labor Day, Memorial Day, Independence Day, Thanksgiving, and Christmas. Also, weekends in spring and fall were mentioned as other times when supply was short. Dealers felt that more shrimp could also have been sold at the beginning and end of the summer season. Another occasion when bait was in short supply was the spotted seatrout season. Dealers explained that many times in summer and fall it was hard to find someone to shrimp and in winter if it was too cold, the shrimp would bury themselves and shrimpers could not catch them. In the fall months of September through November, dealers noted that shrimp moved up into the rivers and shrimpers were not permitted to shrimp in these areas.

Forty-eight percent of live bait dealers interviewed preferred live shrimp in the 50-60 count per pound size (8.3 grams); 26% of the dealers preferred the 60-70 count per pound size (7.0 grams); and 22% of the dealers preferred the 40-50 count per pound size (10.1 grams). A minority of 4% of the bait dealers preferred smaller bait shrimp in the 70-80 count size (6.1 grams).

It is believed that most dealers underestimated the number of units purchased annually. Some live bait dealers had no idea how much they sold in a year, and could not produce an estimate. Annual numbers of shrimp purchased by dealers ranged from 56,000 to 520,000 shrimp annually. On average, each dealer purchased approximately 165,000 shrimp annually. Unfortunately, no monthly estimates of live bait shrimp sales were available; such information would be valuable in calculating quantities of shrimp needed to meet unmet demand.

Twenty-one of the twenty-three responding bait dealers gave information on bait shrimp mortality. The average mortality rate for all respondents was 22.5% and the calculated annual bait shrimp mortality was approximately 490,000 dead bait shrimp or about 41,000 per dealer. Mortality percentages ranged from 7% to 50%, see Figure 7.

When mortality rates were sorted by state of origin, shrimp from Florida had a 23% mortality rate, shrimp from Alabama had an 18% mortality rate, shrimp from Mississippi had a 19% mortality rate, and shrimp of unknown origin had a 26% mortality rate. Thus, while shrimp mortality from those originating from Florida was high, it was not as high as expected. It was thought that shrimp from Florida would have a much higher mortality due to being caught in higher salinity waters, enduring an 8 – 24 hour trip in a hauling tank, and often being placed in lower salinity waters, but this did not seem to be the case.

Ninety-one percent of the respondents felt the higher mortality rate was due to the condition the live bait shrimp were in upon arrival from the transport truck or boat and only 4.5% felt the mortality was due to problems in the holding tank facility at the place of business. Casual observations by interviewers suggested holding tanks could be improved.

Ninety-six percent of the interviewed bait dealers had a license for one or two boats to harvest bait shrimp; 55% had two boats licensed; and 45% had one boat licensed. Most of the bait dealers depended to some extent on their own licensed bait shrimping operation to supply themselves with bait shrimp, i.e., 83% of the bait shrimp dealers used their license to harvest bait shrimp. In addition, about 63% of the bait dealers also received shrimp from two additional suppliers beyond their licensed boats.

When shrimp were not supplied directly by catchers, 53% of bait dealers bought from Florida; 33% from suppliers located in Alabama; and 13% from Mississippi (Figure 8). In the past, 39% of live bait came from both Florida and Mississippi and 22% came from Alabama. Only one dealer indicated sales of bait shrimp to other dealers.

Live shrimp bait dealers ranked availability as the most important factor which determined who they bought shrimp from; quality ranked second; consistent supply ranked third and price was ranked fourth. Interestingly, the use of an historical supplier was ranked last and unanimously thought to be the least important of the five factors in the questionnaire. Aquaculturists often use the reasons of availability, quality, and consistency in supply and size to promote aquacultured products.

When asked to rank the factors that have the greatest impact on live bait shrimp sales, it was not economic conditions, i.e., price, but rather weather which applied equally to bait shrimp harvesters (suppliers) and recreational fishermen (demanders). After the weather factor, the quality of fishing was ranked next most important. Third was the supply of shrimp being delivered to the bait shops, i.e., if the live bait shrimp did not arrive in time for a busy weekend, some shrimp would be unsold and die before the next weekend. Price was the fourth of four indicating that live bait shrimp prices are considered appropriate by fishermen and dealer. However, when live bait shrimp dealers were asked about their willingness to pay higher prices for bait shrimp having higher survival rates, 82% responded affirmatively.

Live bait shrimp prices

The range of prices dealers charged recreational fishermen for live bait shrimp varied from \$1.75 to \$2.50 per dozen, and averaged \$2.21 per dozen. Bait dealers purchased live bait shrimp from distributors or shrimpers at a relatively stable price, i.e., only 20% felt prices fluctuated during the year. The price paid was reported in dollars per 1,000 shrimp. Only 13% of the dealers answered how much they paid for shrimp, but the survey question may have been flawed as it asked the respondent to state high and low annual prices if they had fluctuated. When the price had not fluctuated no answer, i.e., price, was received. However, the average is in line with other price questions. The range of prices paid for 1,000 shrimp was from \$67 to \$83 having a weighted average of \$75 per 1,000 live bait shrimp.

In 1998, a rainy spring produced a fresher water environment in Mobile Bay than usual and as a consequence, few shrimp were available for capture by bait shrimpers. Bait catchers from Mississippi brought freshwater shrimp (Macrobrachium sp.) to some dealers around Mobile Bay during the months of April, May and June. Although the majority of bait dealers preferred saltwater shrimp, they purchased freshwater shrimp at \$55 per 1,000, which is \$25 less than saltwater shrimp and were sold at a lower price of \$1.50 per dozen.

Results from earlier questions indicated bait dealers wanted shrimp when demand was high but lack of availability was their major predicament. Thus, when asked if they would buy maricultured shrimp, 78% said they would. All agreed there was a place in the live bait shrimp market for farm-raised bait shrimp.

Since mortality of wild caught shrimp was perceived to be high by the bait dealers (averaging 22.5%), a series of questions was asked to determine the price dealers might be willing to pay for pond-raised shrimp if the mortality rate in their holding tanks could be halved. When mortality rates were halved (hypothetically), dealers said they would be willing to increase the price paid for maricultured shrimp to \$83.60 per 1,000, an increase of \$8.60 per thousand over the \$75.00 per thousand average price. Prices they would be willing to pay under this reduced mortality scenario ranged from \$60 to \$100. Figure 9 presents the frequency of dealers who would be willing to pay for the pond-raised shrimp under the halved mortality condition. Actual prices paid during the survey year ranged from a lower limit of \$67 to an upper limit of \$83 and a weighted mean of \$75.

Mariculture of bait shrimp has been biologically proven, but the economics are questionable. The authors calculated the economics of a raceway system raising native shrimp for bait and concluded it to be profitable only when a high percentage of shrimp were sold directly to customers, but no costs for a bait shop were included. McKee et al. (1989) concluded live bait shrimp culture was unprofitable. Studies by Sandifer et al. (1993) and Burkott (1994) suggest such production has the potential to be profitable. Distributing shrimp is just as critical for a shrimp farm facility as growing them for a viable operation. In this survey, dealers were asked if they would provide a hauler and pick up the shrimp from the mariculture ponds. Sixty-one percent said they would pick them up. Dealers were then asked to assume they were picking up the shrimp pondside and to give the distance they would be willing to drive to pick them up. Distances ranged from 12.5 to 60 miles with an average of 35.8 miles. Forty-three percent would be willing to travel 15-30 miles, 10% would be willing to drive 31-45 miles, and 48% would be willing to drive 46-60 miles.

When asked what price they would pay for maricultured shrimp when they had to pick them up the average price was \$68.60 per 1,000 shrimp, a reduction of \$6.40 from the average price of \$75 now paid for shrimp. This reduction is the cost placed on the transportation-distribution task by dealers. Figure 10 depicts the prices dealers would be willing to pay when they provided their own pick up from the mariculture facility and delivery to their bait store.

The alternative of having pond-raised shrimp delivered to their place of business was also considered. Dealers responded that they would be willing to pay an average of \$80 per 1,000 shrimp if they were delivered. This is an increase of \$5.00 over the \$75 per 1,000 going rate.

Prices dealers were willing to pay ranged from \$60 to \$100. Figure 11 presents the frequency of prices dealers would be willing to pay if maricultured shrimp were delivered to their place of business. Visually comparing Figures 10 and 11 it can be seen that the majority of respondents' willingness to pay shifts from a lower amount in Figure 10 to a higher amount in Figure 11 representing the pick-up or delivery charge, respectively.

A variety of answers were provided when dealers were asked how the market for live bait shrimp could be improved. Certain main themes arose and mirrored information given in other survey responses. The most frequent response was the need for shrimp on a consistent basis throughout the year. The second most frequent response was a desire for quality shrimp, i.e., healthy with a longer tank life after delivery to the dealer. The third most frequent response was the desire to have consistent sized bait delivered to their stores

1998 Alabama Live Bait Bull Minnow Survey

Survey Results

Bull minnow survey results were condensed from responses of the 15 dealers in the second year survey, which also included follow-up questions pertaining to bait shrimp and other baits handled.

Bull minnows were a preferred species because of hardiness and popularity with fishermen. Dealers purchased bull minnows at prices ranging from \$70 to \$125 per 1,000 and sold them for prices ranging from \$1.50 to \$2.50 per dozen. Mortality was low relative to live bait shrimp, ranging from 1% to 10%, with one outlier at 25%. Few dealers were willing to pay 10% higher prices if mortality rates were reduced by 50%, probably because mortality was very low to begin with and especially low relative to bait shrimp. The one exception to this willingness to pay more for lower mortality was from the dealer having disease outbreak and heavy mortality.

Although variation in minnow size occurred, it did not represent a problem to most dealers. Two dealers reported selling 1 to 1.25 inch bull minnows. A three-inch bull minnow was preferred, but dealers would pay for a two-inch minnow, and a larger minnow (3-6 inch) was preferred in the fall as redfish bait.

The demand for live bait bull minnows increased during the spring months, and continued high through the summer and fall periods. Highest demand for bull minnows occurred

during May through August or September with increasing demand during the spring months of March and April and decreasing demand through the fall months of October and November. Most dealers agreed the demand for bull minnows was lowest during January, February, and March, while other dealers reported another low period during the late fall (October through December). Bull minnows are preferred bait for flounder fishing, which may explain the lower winter demand when flounder move offshore.

At times during the year, bull minnows were not available. Supply of bull minnows were less than demanded during the springtime months of April, May and June. Some dealers also could have sold more minnows if they had been available during July, August and September. Many bait dealers relied on their shrimp catcher to supply bull minnows. Some catchers said bull minnows were most easily caught during low tide and most difficult to catch during the hot summer months. Dealers did not know where the catchers caught the bull minnows, but generally knew that bull minnows came from nearby saltwater marshes. Catchers trapped minnows with baited traps, seine, and cast nets. Local and Florida caught bull minnows were available to some dealers, depending on long-standing relations and distance.

Most bait dealers said they would provide a hauler and pick up bull minnows if a mariculture facility raising them were nearby. Wallace and Hanson (1999) presented some information concerning commercial production of live bait bull minnows. Interestingly, dealers indicated they would pay the same amount if they picked up the bull minnows or had them delivered. Since transportation is time consuming, has gas and truck maintenance expenses; it would be advantageous to the culture operation if buyers would pick them up for the same price as delivered. Dealers would be willing to purchase bait minnows at approximately \$80 to \$100 per 1,000 minnows from a mariculture facility (picked up or delivered). This price range did not vary for wild caught or pond reared minnows. This may be an indication that the wild caught minnows did not usually die while being held in holding tanks so a higher quality (lower mortality) product is not needed, just a more readily available supply. The higher price range could be received during high demand weekends, holidays, or when no wild minnows are available.

1998 Other Live-dead Bait Survey

Survey Results

Bait stores sold many other live and dead baits. The following is a list of other baits bought and sold by bait dealers in coastal Alabama. Prices are included where possible.

Frozen shrimp were usually obtained when live shrimp died, but were also purchased in frozen form and sold for \$2.67 to \$5.00 per pound. They were purchased for \$1.84 per pound.

Rough minnows (*Trachurus lathami*) sold for \$12.00 per 5-pound box (\$2.40/lb). Cigar minnows (*Decapterus punctatus*) were sold at \$15.50 per 5-lb box (\$3.10/lb). Bass shiners, delivered from northern Mississippi, were purchased at \$60 per 1,000 and sold for \$2.00 per dozen. Some shiners were reportedly available in spring and fall from a local distributor for \$25 per 1,000. White perch minnows “crappie” were purchased at \$38 per 1,000 and sold for \$1.25 per dozen.

Tiger minnows (*Fundulus similis*) were a distant second to bull minnows in popularity with the dealers because they did not handle stress well and died easily. However, they were usually available when bull minnows were not and thus dealers bought and sold them. There were exceptions to this generalization as one dealer preferred the tiger minnow to the bull minnow.

Squid were purchased at \$0.65 per pound and sold for \$1.00 to \$5.00 per pound. Mullet (*Mugil cephalus*) was purchased for \$0.88 per pound and sold for \$1.30 a pound. Silver eels (*Trichiurus lepturus*) caught offshore were purchased for \$0.30 each and sold for \$0.60 each. Eels were purchased for \$1.00 each and sold for \$2.00 each. Pogeys (*Brevoortia tyrannus*) were purchased for \$0.30 each and sold for \$0.60 each. Chum was sold for \$10.00 per bucket. Ballyhoo (*Hemiramphus brasiliensis*) was sold for \$14.00 per 5-lb unit (ranging from \$2.18 to

\$2.80/lb). Fiddler crabs sold for \$1.35 per dozen (\$0.1125 each) and were purchased at \$0.04 each.

Crickets and worms were often sold by bait dealers but were not reported to have a high profit margin. Crickets were purchased for \$12 per 1,000 and sold at \$2.25 to \$2.50 per 100. Worms were purchased for \$1.25 to \$1.50 per box and sold at \$2.40 to \$2.50 per cup or box.

* Common names are those used in bait stores. Scientific names given were known.

Conclusion

Shrimp

Principal patterns within the Alabama live bait industry include periods of supply shortages, dealer willingness to pay more for shrimp that live longer and a dealers' use of multiple supply sources. Also, 96% of the dealers interviewed agreed that demand for live bait shrimp had increased over the last five years.

Additional live bait shrimp supply is needed during the August to November period and more shrimp could be sold if available during the low demand months of January and February. Because of live bait dealer license requirements restricting shrimp reserves to no more than three baskets of live shrimp in store holding tanks at any time, the capacity of dealers to respond to peak demand periods is limited and increases the need for more frequent and consistent shrimp deliveries. Constant supply and consistent sizes are desired attributes throughout the year.

Survey responses indicate that dealers want more shrimp when demand is high and dealers felt availability of shrimp was their number one concern when determining from whom they would buy their live bait shrimp supply. Over 75% of interviewed respondents said they would buy maricultured shrimp. All dealers surveyed agreed that there was room in the live bait shrimp market for farm-raised shrimp. However, the economics of producing and delivering live bait shrimp are not well known. It has been demonstrated that it is technically feasible to grow shrimp, but, at least in Alabama, it has always been difficult to get the number of quality post-larvae needed to stock mariculture ponds in a timely manner (David Rouse, Auburn University, personal communication). Thus, while the idea of maricultured shrimp is appealing to dealers, the reality is that cultured shrimp for the bait industry is dependent on a reliable supply of hatchery produced post larval shrimp.

In light of the lost income from not having live bait shrimp available for sale at peak periods, it would be prudent to investigate ways of augmenting the current supply of shrimp to the live bait industry.

Bull minnows

This minnow is a very hardy species preferred by many recreational fishermen. The survey showed a demand that was not being met by natural supply during April, May and June. Bull minnows appear to be an easier species to culture than bait shrimp for many reasons. Their

main rearing advantage over native shrimp are their ease of reproduction and no special hatchery requirement. However, minnows produce fewer eggs and have not been raised at the high densities used in shrimp culture.

Live bait bull minnows were in short supply in 1997 and into June of 1998, bringing comments from bait dealers desiring regulations to limit minnow harvesting during late winter and early spring to allow egg-bearing females to spawn. Mariculture of bull minnows is possible biologically and could help address the reported periods of low supply (Tatum et al., 1982). Tentative commercial trials have indicated a degree of profitability.

Other baits

There are only a few live baits (shrimp, minnows, shiners, worms, crickets, eels) available to recreational fishermen in Alabama. When these are not available, there are always frozen baits and artificial tackle available. Again, the mark-up price margin indicates recreational fishing is a positive force in the economy and indirectly supports additional spending for lodging, restaurants, boating, and entertainment.

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Table 1. Alabama resident and non-resident saltwater rod and reel license sales.

	1992/1993	1993/1994	1994/1995
Saltwater Revenue			
- Resident	\$543,914	\$638,156	\$669,296
- Non-resident	\$26,223	\$257,011	\$271,672
Total Revenue	\$570,137	\$895,167	\$940,968
Licenses Sold			
- Resident	35,329	44,791	46,141
- Non-resident	1,827	14,504	14,737
Total Sold	37,156	59,295	60,878

Table 2. Cross tabulation of Alabama live bait shrimp dealers years in business with the percent of their gross sales coming from the sale of live bait shrimp, 1997.

Years in Business	Number of Responses for Each Category of Gross Sales Percentage Accounted for by Selling Live Bait Shrimp						Total	Percent of Total
	0 - 10 %	11 - 20 %	21 - 30 %	31 - 40 %	41 - 50 %	> 50 %		
0 – 5	3	1		1	1		6	40
6 – 10		1			1		2	13.3
11 – 15	2						2	13.3
16 – 20		1				2	3	20
21 – 25							0	0
26 – 30							0	0
31 – 35							0	0
36 – 40	1			1			2	13.3
Total	6	3	0	2	2	2	15	100
Percent of Total	40	20	0	13.3	13.3	13.3	100	

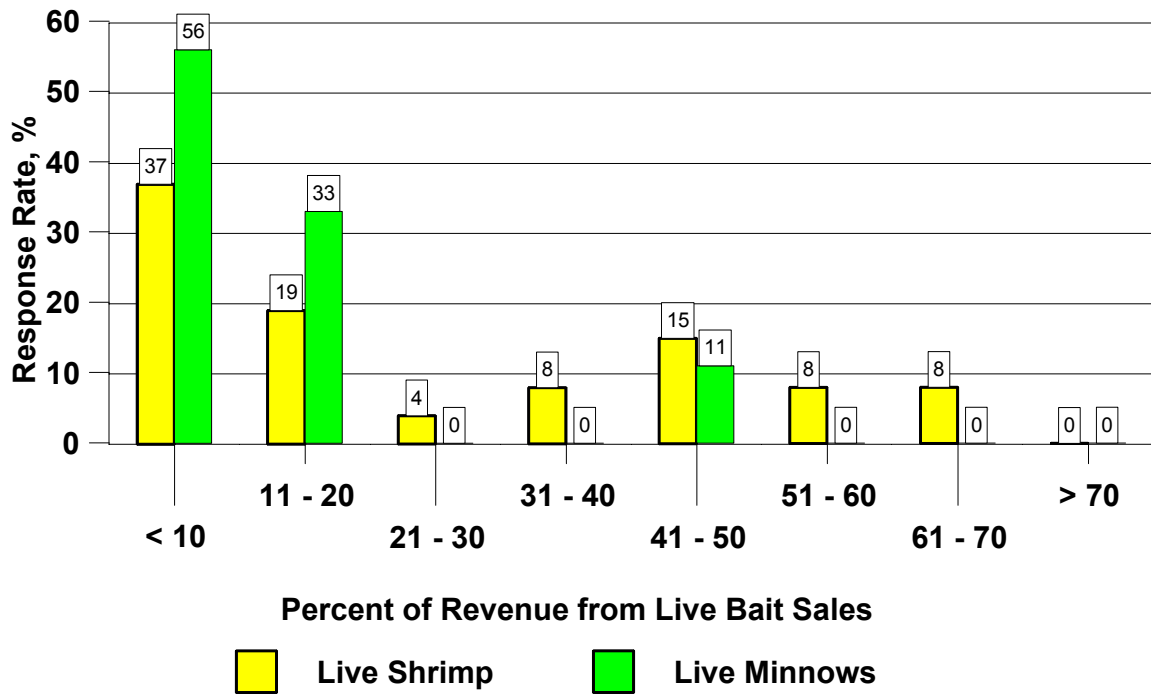


Figure 1. Percent of bait dealers that reported sales of live bait shrimp and minnows relative to total sales, Alabama, 1997.

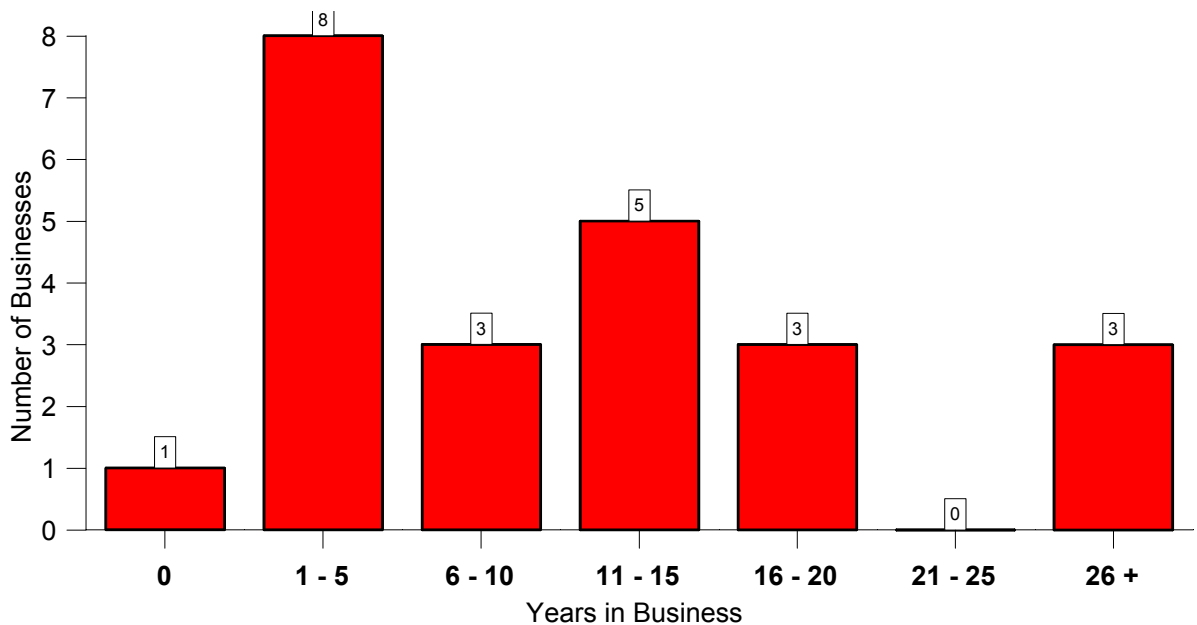


Figure 2. Years in business for live bait shrimp dealers, Gulf Coast of Alabama, 1997.

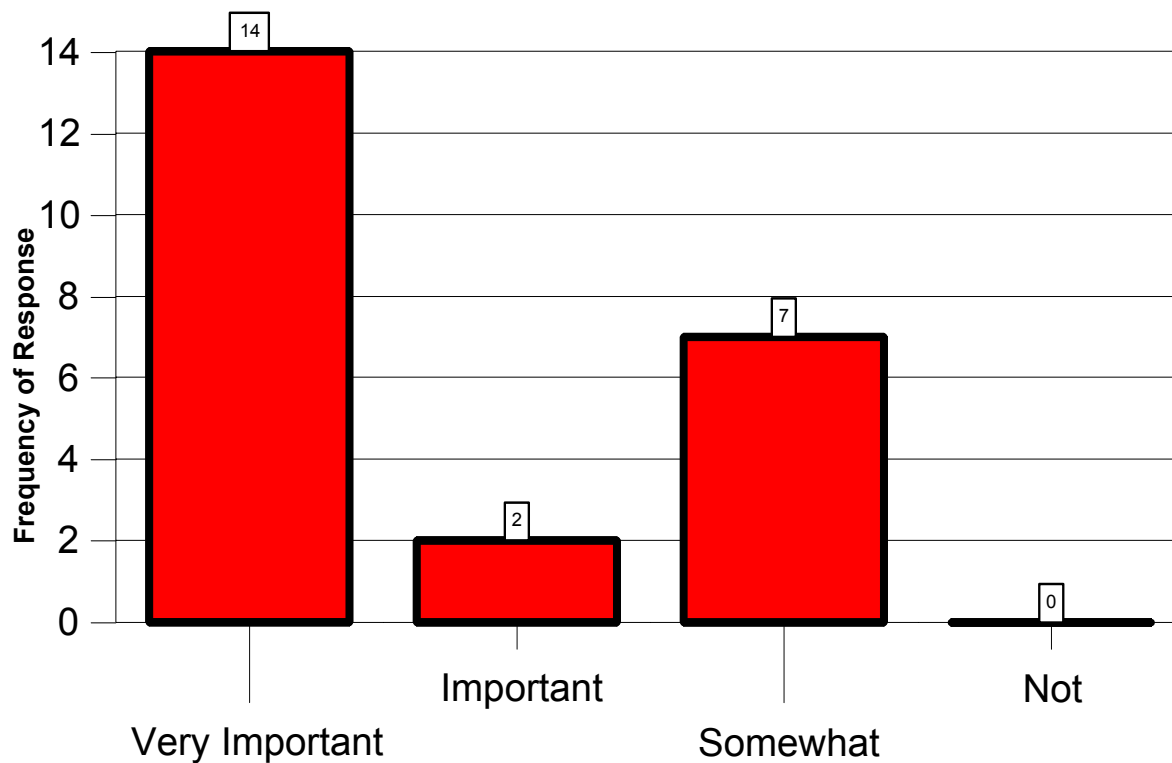


Figure 3. Qualitative ranking of importance of live bait shrimp to bait dealer operations, Alabama, 1997.

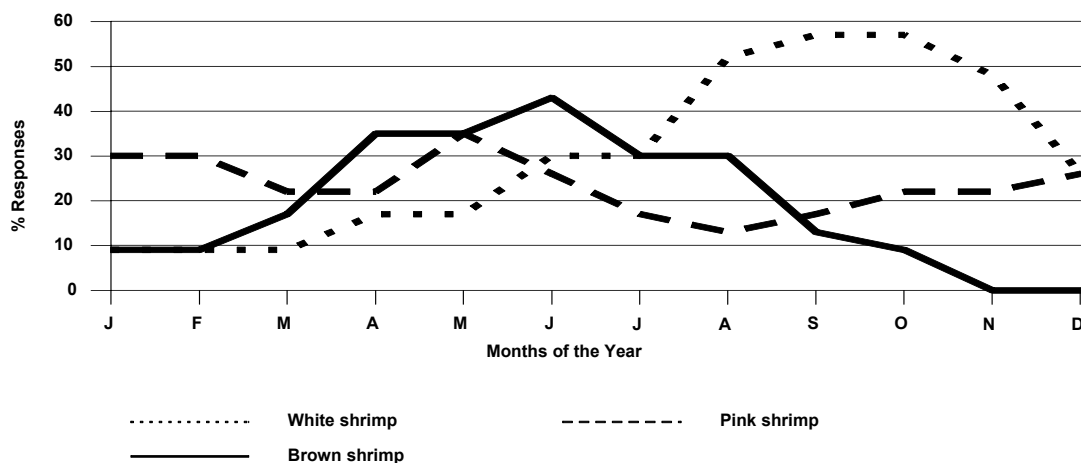
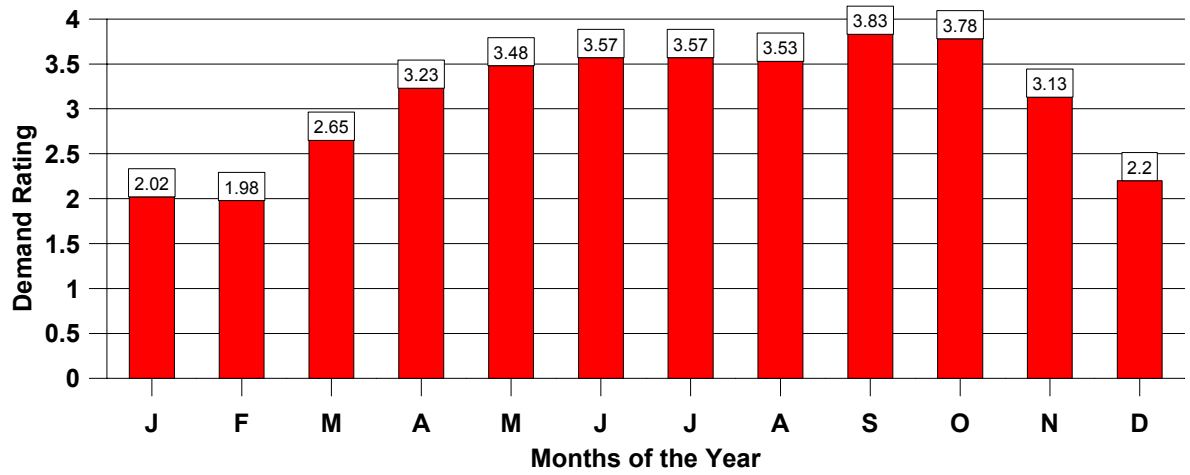


Figure 4. Percent of dealers reporting receiving white shrimp (*Litopenaeus setiferus*), pink shrimp (*Farfantepenaeus duorarum*), and/or brown shrimp (*F. aztecus*) by month, Alabama, 1997.



Demand Rating Scale

1 = No demand 2 = Low 3 = Medium 4 = High

Figure 5: Bait dealers ranking of live-bait shrimp customer demand by month, Alabama, 1997.

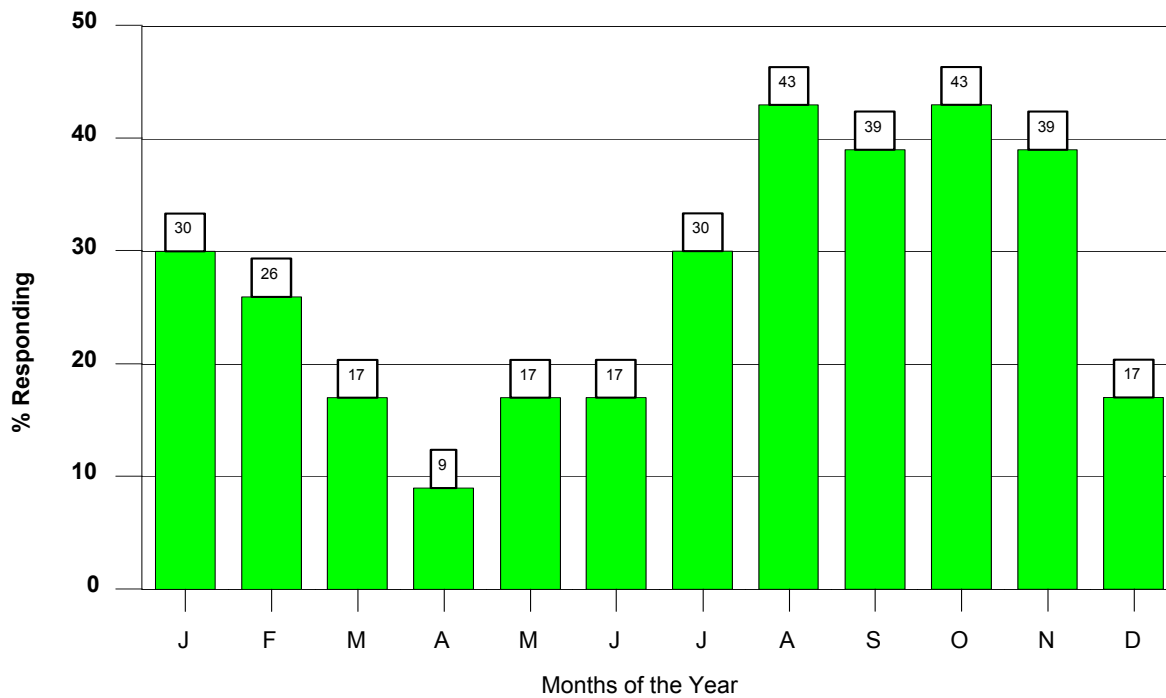


Figure 6: Percentage of live bait shrimp dealers identifying months when supply of shrimp was lower then customer demand, Alabama, 1997.

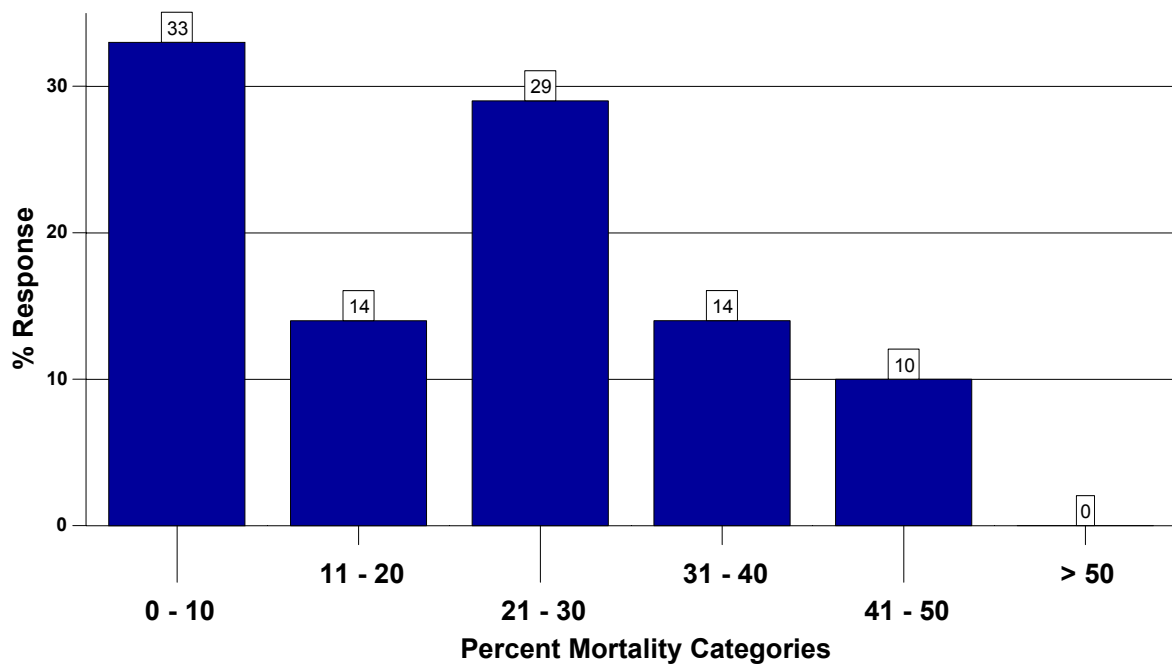


Figure 7. Live bait shrimp mortality percentages reported by bait shop operators, Alabama, 1997.

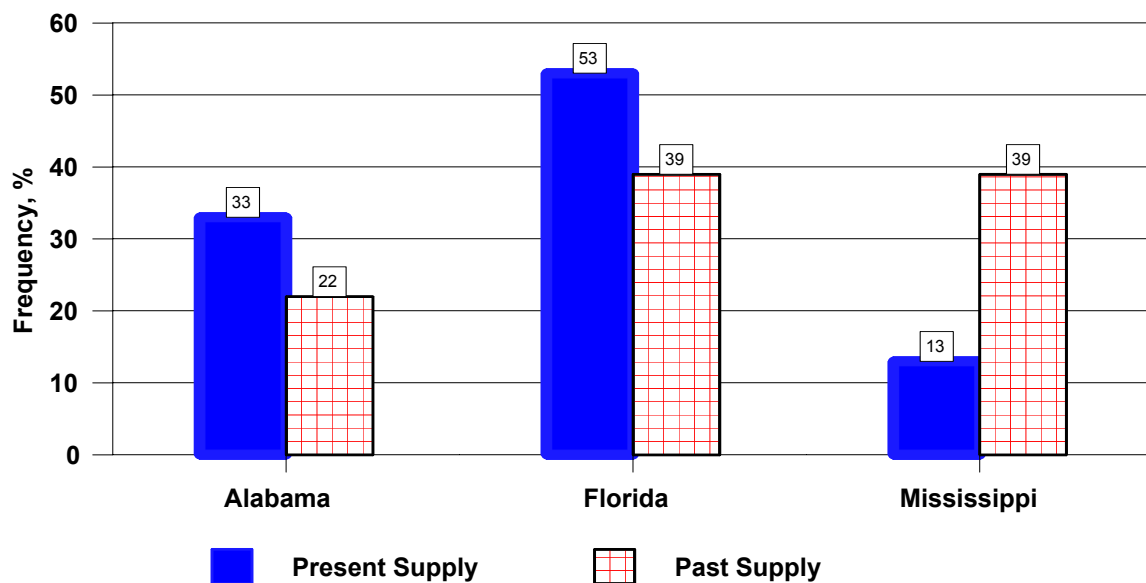


Figure 8: State from which live bait shrimp supply originated and destined for Alabama bait shop operators, Alabama, 1997.

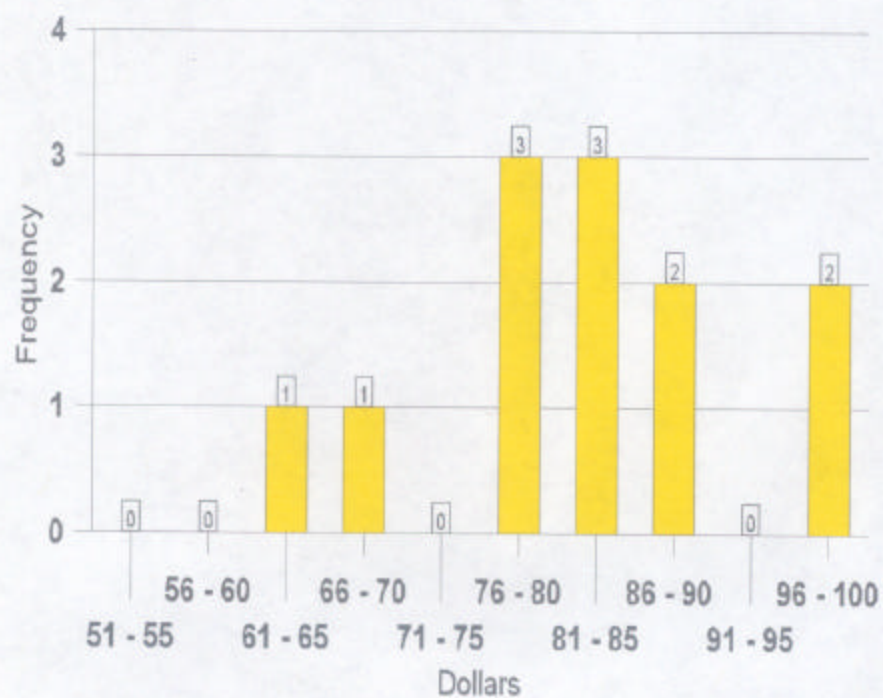


Figure 9. Frequency of responding bait shrimp dealers and the price, \$/1,000, they would be willing to pay for pond raised bait shrimp if mortality rates were halved in their place of business, Alabama, 1997.

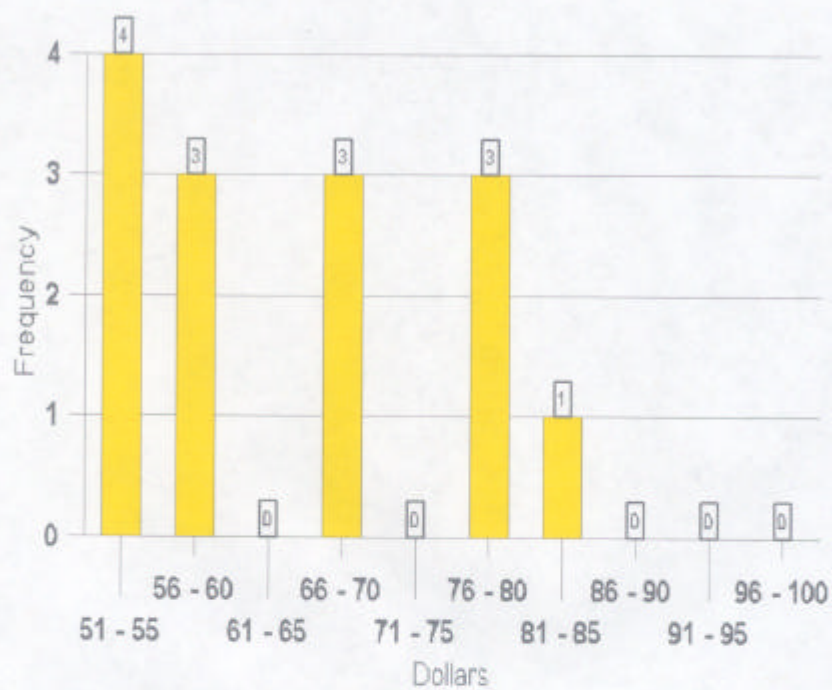


Figure 10. Frequency of responding bait shrimp dealers and the price, \$/1,000, they would be willing to pay for pond raised bait shrimp if mortality were halved and dealers picked up the shrimp from the mariculture pond facility, Alabama, 1997.

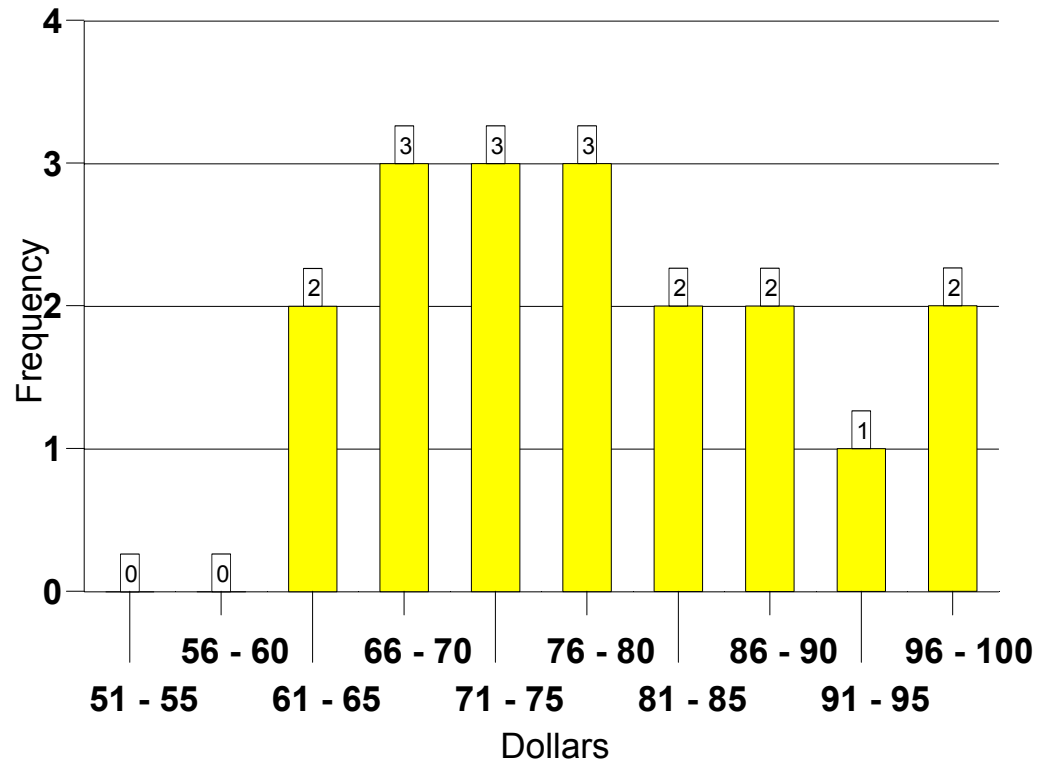


Figure 11.Frequency of responding bait shrimp dealers and the price, \$/1,000, they would be willing to pay for pond raised bait shrimp if mortality were halved and shrimp were delivered to their place of business, Alabama, 1997.

Appendix A. Alabama Live Bait Shrimp Surveys

1) Live Bait Shrimp Market Survey

2) Alabama Live Bait Shrimp Follow-up and Live Bait Minnow Questions, 1998

Live Bait Shrimp Market Survey

Auburn University
Marine Extension & Research Center
4170 Commanders Drive
Mobile, AL 36615
(334) 438-5690

1. How many years have you been in the live bait shrimp business? _____
2. How important are live bait shrimp sales to your **overall** business?
a) Very important b) Important c) Somewhat important d) Not important
3. Rank in order of importance, which factors have the greatest impact on live bait shrimp sales in your area?
____ Weather
____ Economic conditions
____ Shrimp supply
____ Quality of fishing
____ Other _____
4. How many people do you employ in live bait shrimp sales? _____
5. Which months do you stock white shrimp? J F M A M J J A S O N D
6. Which months do you stock Hoppers? J F M A M J J A S O N D
7. Which months do you stock Brownies? J F M A M J J A S O N D
8. How many tanks do you have for holding live shrimp? 1 2 3 4 5
9. How many tanks are in regular use? 1 2 3 4 5

10. What is the maximum amount of shrimp you normally expect to hold per tank? _____
11. What type of water system do you use for your tanks?
a) Recirculating b) Flow-through
12. Where does the water for your tanks come from? _____
13. How often do you add water to your tanks? _____
14. What kind of aeration system do you use?
a) Agitator b) Air stones c) Water spray d) Other _____
15. What kind of back-up aeration system do you have?
a) Agitator b) Air stones c) Water spray d) Other _____
16. What percent of your live bait shrimp die after they are delivered to you? _____
17. Would you be willing to pay a little more if the shrimp had a higher survival rate? a) Yes b) No
18. What do you attribute the dying of shrimp to?
a) The condition they are in when received _____
b) Problems you have with your tanks _____
c) Other _____

Interviewer: Ask permission to measure tanks.

Tank 1: _____	Water Depth: _____	Vol: _____
Filter: _____	Material: _____	
Tank 2: _____	Water Depth: _____	Vol: _____
Filter: _____	Material: _____	
Tank 3: _____	Water Depth: _____	Vol: _____
Filter: _____	Material: _____	
Tank 4: _____	Water Depth: _____	Vol: _____
Filter: _____	Material: _____	

19. Do you have 1 or 2 live bait shrimp boat license(s)? a) 1 b) 2
20. Do you use your bait boat license(s)?
a) Yes, I use it (or them) often
b) Yes, use one, but buy 2nd license just in case I need it
c) No
21. How dependent are you on your (personal licensed) bait shrimpers for your supply?
a) 100% b) 90% c) 80% d) 70% e) 60% f) 50%
g) 40% h) 30% i) 20% j) 10% k) 0%
22. If you do not get all your live shrimp from your licensed bait shrimper, how many suppliers do you buy live bait shrimp from?
a) 1 b) 2 c) 3 d) 4 e) 5 f) other _____
23. Which state does the **main** supply come from?
a) Alabama b) Florida c) Mississippi d) other _____
24. In the past, which state did your main supply come from?
a) Alabama b) Florida c) Mississippi d) other _____
25. Do you sell live bait shrimp to other live bait shrimp dealers?
a) Yes b) No If **YES**, how many other dealers ? _____
26. Rank in order of importance the factors which determine who you buy your live shrimp from. **1** being the most important, **5** being the least.
____ Price
____ Quality
____ Availability
____ Consistent supply
____ Historical Supplier
____ Other _____
27. What count do you prefer to buy your shrimp in?
a) 40-50's b) 50-60's c) 60-70's d) Other _____ e) No Preference
28. How many units do you purchase in a year? _____

29. Rate the months of the year for demand of live bait shrimp by your customers. Put a **1** next to the months where there is a **high** demand. Put a **2** next to the months where there is a **medium** demand.

Put a **3** next to the months where there is a **low** demand. And, put a **4** next to the months where there is **no** demand.

1 = High 2 = Medium 3 = Low 4 = No demand

Jan.____ Feb.____ Mar.____ April____ May____ June____

July____ Aug.____ Sept.____ Oct.____ Nov.____ Dec.____

30. In which month is the supply of live shrimp lower than the demand?

J F M A M J J A S O N D

31. During **high demand** periods how often do you restock your tank(s)?

32. During **low demand** periods how often do you restock your tank(s)?

33. Over the past five years the demand for live bait shrimp has increased?
Agree Disagree

34. A supply of live bait shrimp is always available when I need it.
Agree Disagree

35. Are there any particular reasons, dates, or occasions when the live shrimp supply does not meet the demand? _____

36. A) What is the highest price you **sell** live shrimp for? _____

B) What is the lowest price you **sell** live shrimp for? _____

37. Does the price you **pay** for live bait shrimp fluctuate during the year?

a) Yes b) No

If **Yes** the price ranges from _____ to _____.

38. Would you buy live bait shrimp from a shrimp farm if the consistency, quality of product, and price were equal to that of the wild-caught supply?

- a) Yes b) No

39. Is there room in the live bait shrimp market for farm raised shrimp?

- a) Yes b) No

40. What price would you be willing to pay for pond raised shrimp if the death rate of shrimp in your tank was cut in half? _____

41. If there were a local supply of pond raised bait shrimp could you provide a hauler and pick them up yourself?

- a) Yes b) No

42. Assuming you could pick the shrimp up from the shrimp farm, what distance would you be willing to drive to get them? _____

43. What price would you be willing to pay if you had to pick them up?

44. What price would you be willing to pay if the pond raised shrimp were delivered?

45. Optional: What percentage of your gross sales are accounted for by selling live bait shrimps? _____

46. Do you have any special involvement in selling live bait shrimp to charter boats, fishing guides, or fishing rodeos / tournaments?

a) Yes

b) No

If **Yes** which ones and when? _____

47. How can the market for live shrimp be improved? _____

Alabama Live Bait Shrimp Follow-up and Live Bait Minnow Questions, 1998

I. Live Bait Shrimp

1. How many live bait shrimp did you buy in the last year? _____

Of those purchased what percent died? _____ %

What price did you pay per 1,000 live bait shrimp? _____ per 1,000

What size (count) were the bait shrimp? _____

Did the bait size vary? _____ YES _____ NO,

If YES, was this considered to be a problem? _____ YES _____ NO

2. At what price did you sell live bait shrimp to your customers?

\$ _____ per dozen

3. Could you approximate how many dozen (or number) of live bait shrimp you sold last year? \$ _____ dozen

What about by month?

January _____ February _____ March _____

April _____ May _____ June _____

July _____ August _____ September _____

October _____ November _____ December _____

II. Live Bait Minnows

1. How many live bait minnow did you buy in the last year? _____

Of those purchased what percent died? _____%

What price did you pay per 1,000 live bait minnow? _____ per 1,000

What size (count) were the bait minnows? _____

What size minnow do you prefer? _____

Do you have a problem with minnows dying in your holding tanks?

_____ YES _____ NO

If YES, would you be willing to pay a little more if the minnows had a higher survival rate?

_____ YES _____ NO

If YES, would you pay 10% more for a 50% reduction in mortality rate?

_____ YES _____ NO

Did the bait minnow size vary? _____ YES _____ NO,

If YES, was this considered to be a problem? _____ YES _____ NO

What was the source of your bait minnows? _____

If from a supplier, do you know from where he caught them? _____

2. At what price did you sell live bait minnows to your customers?
\$ _____ per dozen

Rate the months of the year for demand of live bait shrimp by your customers. Put a 1 next to the months where there is a high demand. Put a 2 next to the months where there is a medium demand. Put a 3 next to the months where there is a low demand. And, put a 4 next to the months where there is no demand.

1 = High 2 = Medium 3 = Low 4 = No demand

Jan. _____ Feb. _____ Mar _____ Apr _____ May _____ June _____

July _____ Aug _____ Sep _____ Oct _____ Nov _____ Dec _____

In which month is the supply of live minnows lower than the demand?

J F M A M J J A S O N D

3. Could you approximate how many dozen (or number) of live bait minnows you sold last year? \$ _____

What about by month?

January _____ February _____ March _____

April _____ May _____ June _____

July _____ August _____ September _____

October _____ November _____ December _____

4. If bull minnows were available from local pond culture, would you be willing to provide a hauler and pick them up yourself? ____ YES ____ NO

If YES, would you pay the price indicated in question 1? ____ YES ____ NO

If NO, what price would you pay? \$ _____

What price would you pay if the minnows were delivered to you once a week? \$ _____

What percentage of your gross sales are accounted for by selling live bait? _____ %
live bait shrimp? _____ % live bait minnows? _____ %

III. Other Baits

1. What other live or dead baits do you sell? At what price?

Bait Type	Price
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____

2. Of all the baits you sell, which is the most important? _____

Appendix B. Alabama Live Bait Shrimping Licensing Requirements, 1997

The Marine Resources Division (MRD) of the Alabama Department of Conservation and Natural Resources is responsible for licensing live bait shrimp dealers. The live bait shrimp dealer license can be purchased for “Sell(ing) live shrimp or other live bait from a shop and operate one boat and truck - \$51.00 Sell live shrimp or other live bait from a shop and operate two boats and trucks \$101.00 (limit two boats and two trucks per dealer).” (DCNR, 1994) Dealer facilities and equipment must be inspected by MRD officials prior to obtaining a license.

The required shore facility must be a permanent structure from which fishing bait and supplies/tackle are routinely sold. Also, there must be a covered 480-gallon (minimum) tank with aeration. The boat(s) must have a tank with a spray, aerator or other type forced water exchange system. All boats used for taking shrimp or other bait for sale “...shall display the words ‘LIVE BAIT’ in letters no smaller than 6 inches high on each side of the boat.” No substitution of boats or trucks is allowed unless the boat or truck is inspected by the MRD.

There can be only one trawl per boat and the size shall not exceed 16 feet as measured across the main top line when any area, other than permanently closed areas, is closed to commercial shrimping and in exclusive bait areas. There is no restriction to mesh size of the trawl. Transport trucks must have a wooden or fabricated tank with recirculating water or commercial fish aerator. Trawling drags cannot exceed to consecutive minutes before retrieving and sorting the bait shrimp into the live tank.

There is no closed season but live bait shrimping is prohibited in permanently closed areas. Areas that are open to recreational and live bait dealers year round include Wolf Bay, Oyster Bay, Blakely River, Terry Cove, Arlington Channel, East Fowl River Channel, Bayou La Batre Channel, and Dauphin Island Bay. The hours one may trawl in areas closed to commercial shrimping and exclusive bait areas is 4:00 a.m. until 10:00 p.m.

The pounds allowed on boat and truck are: “No more than a total of one (1) *standard shrimp basket in possession combined between boat and truck. In place of business - no more than three (3) “standard shrimp baskets in possession.” Shrimp can be sold only when alive or with heads attached for bait only. Dead shrimp must be packaged in lots of no more than one pound.



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Vance H. Watson, Vice President**

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