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Proceedings of the Marine Natural Bait Industry Workshop

**August 24-25, 1982
Charleston, South Carolina**



**South Carolina Sea Grant Consortium
Proceedings Number 1**

**April 1982
SCSG-PR-82-01**

SUMMARY PROCEEDINGS
of a planning workshop on the
MARINE NATURAL BAITs INDUSTRY

24-25 August 1981

Charleston, South Carolina

edited by

Susan M. Muniak and Raymond J. Rhodes

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TABLE OF CONTENTS

	Page
FORWARD	1
INTRODUCTION	2
STEERING COMMITTEE	4
Marine Baitfish Fisheries of Eastern Florida	5
Florida's Marine Bait Industry	16
Georgia's Bait Industry	23
A Description of Natural Marine Bait Utilization in South Carolina	37
South Carolina's Marine Bait Markets	43
Description of North Carolina Marine Bait Industry	51
RECOMMENDATIONS OF INDUSTRY PANEL	60
WORKSHOP PARTICIPANTS	61

FORWARD

John M. Armstrong, Director
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The marine bait industry is an important industry throughout this region; however, documentation of the extent of its economic impact, its problems, and needs has previously been limited. This workshop was planned as a means of pulling together needed information as well as enhancing communication between the industry and fishery management professionals.

During the workshop, a generalized ranking of industry research needs was made: this will help Sea Grant and other interested agencies identify those research efforts which will be most effective and make the best use of limited resources!

The Steering Committee, under the leadership of Dave Cupka, put together a successful and informative program. Now it is up to the rest of us to follow up on this excellent effort. Cooperative efforts throughout the region are the best way to achieve a significant and lasting effect upon the industry.

INTRODUCTORY REMARKS

David Cupka

Office of Conservation, Marketing and Management
South Carolina Wildlife and Marine Resources Department

On behalf of Dr. John Armstrong, Director of the South Carolina Sea Grant Consortium, I want to welcome each of you to the Conference on Marine Natural Baits. Unfortunately Dr. Armstrong will be unable to attend the conference because of a schedule conflict. For those of you who don't know me, my name is David Cupka and I'm the Assistant Director of the Office of Conservation, Management and Marketing. The OCMM is a major organizational component of the South Carolina Wildlife and Marine Resources Department which is one of the institutional members of the Sea Grant Consortium.

Before proceeding further, I want to take this opportunity to recognize several individuals who have assisted in one capacity or another with this conference. After we conceived the idea of a marine natural bait conference, one of the first things I did was to organize a Steering Committee comprised of individuals from North Carolina, South Carolina, Georgia and Florida. Their responsibility included planning the conference and providing information on potential conference participants from their respective states. The Steering Committee was composed of Dr. Leon Abbas with the Sea Grant program of the University of North Carolina, Mr. Jim Music with the Georgia Department of Natural Resources, Mr. Dave Nickerson with the Florida Department of Natural Resources, Mr. Ray Rhodes with the South Carolina Wildlife and Marine Resources Department and Miss Margaret Davidson and Mr. Pete Granger with the South Carolina Sea Grant Consortium. The members of the Steering Committee worked extremely hard and without their efforts, today's conference would not have been a reality. Mr. Jay Burnett with the Sea Grant Consortium assisted with the meeting announcements which were sent out. Ms. Audrey Brownlee with the Sea Grant Consortium and Miss Pat Godsell with my office assisted with meeting and lodging facilities, registrations and the numerous other details which are necessary to put on a conference such as this one. I also want to thank all of those individuals who will be making presentations this afternoon and all of the industry members who will be serving on tomorrow's panel.

This conference has two basic objectives. The first is to document, to the extent possible, the current sources and uses of marine natural baits, the economic impacts of the industry, and the regulations and management regimes which affect the marine natural baits industry. This we plan to accomplish through the series of presentations which you will

hear this afternoon by individuals from various state agencies and universities. I think it will become obvious during these presentations that there are gaps in our knowledge about various aspects of the marine bait industry. Hopefully, this conference will pull together a great deal of the published and unpublished information on the region's bait industry and will provide a base line for future industry definition and development.

The second objective is to identify problems and issues associated with the bait industry and to produce a series of recommendations on how these issues and problems can best be addressed. To accomplish this objective we have assembled a panel of knowledgeable bait and fishing industry members who will be discussing these matters during the second day of the conference.

We would urge all of the conference attendees to participate in the question and answer sessions and in the discussions.

The Sea Grant Consortium plans to publish the proceedings of this conference. A copy of the proceedings will be sent to all the conference attendees who have registered.

The marine natural baits industry plays an extremely important role in the commercial and recreational fisheries of the southeastern United States. In the commercial fishing sector, natural baits are used in such diverse fisheries as those for swordfish, snapper and grouper, blue crabs and eels while in the recreational sector, natural baits are utilized in activities ranging from pier fishing to offshore bottom fishing and trolling. A 1977 study by Centour Management Consultants indicated that in 1975 natural bait sales in the area from Cape Hatteras through the Florida Keys amounted to 42.8 million dollars. In addition, the industry was estimated to have generated employment equivalent to 530 person - years. These estimates are applicable to marine recreational fishing alone and do not include any estimates on bait sales for commercial fishing operations. Yet, in spite of its obvious economic importance, the marine baits industry is often overlooked as an industry and the impacts of various laws and regulations on the marine baits industry are often not considered during the legislative process. Hopefully, today's conference will serve as a starting point to address some of the important issues and problems associated with the region's marine natural baits industry.

The Steering Committee hopes that you will find this conference to be both informative and interesting. I certainly look forward to the presentations and discussions and so, without further ado, I will turn the program back over to Margaret Davidson.

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MARINE BAITFISH FISHERIES OF EASTERN FLORIDA

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Florida has several small but valuable fisheries for marine baitfishes. The largest baitfish fisheries in the state are located on the Gulf coast, primarily along the Florida panhandle. On the east coast, the major baitfish landing areas are located in the southern half of the state, particularly in the Florida Keys.

The availability of high quality bait makes possible Florida's vast sportfishing industry which in turn supports, in large part, the boat marketing complexes. Baitfish caught in Florida waters are marketed throughout the mid-Atlantic and Gulf coast states as well as in the Bahamas and throughout the Caribbean. A significant amount of baitfish landings go unrecorded since many recreational and commercial fishermen catch bait for their own use. In addition, relatively large quantities of baitfish are caught by small scale or part-time fishermen and sold directly to retail bait and tackle shops.

Three major commercial uses of bait in Florida are for trap fishing, long-line fishing and line fishing (handline, electric reel, etc.). Trap fishing is most diverse in the southern half of the state where spiny lobster, stone crab, blue crab, groupers, and snappers are caught. Traps may be set unbaited, baited with cow hide, or baited with live sub-legal lobsters. These undersized lobsters, caught by lobster fishermen in their traps, are illegal to land but can be carried aboard to be placed alive in other traps. Grouper heads used to be a favorite lobster trap bait, but their relatively high cost and the greater durability of cow hides has all but eliminated their use. For stone crabs, heads or skeletons of almost any fish are used for bait. Blue crabs are fished year-round in Florida and again, almost any fish or fish scraps may be used for bait. Fish trapping, using baited or unbaited traps, is also most common in the southern regions of the state where target species are grouper and snapper.

Various types of commercial hook and line fisheries are found throughout the east coast of Florida. These range from shallow coastal water fisheries for spotted sea trout to offshore electric or hydraulic reel fisheries for red snapper and grouper.

Offshore, red snapper, various species of grouper, amberjack, and a number of species of snapper are caught on hook and line. In southeast Florida, line fisheries are active for a variety of shallow water groupers and snappers, with more groupers being landed in winter and more snappers

in spring and summer. Almost any cut bait is used for snapper fishing but the most common baits are probably Spanish sardine, thread herring, scaled sardine, goggle eye, mullet and ballyhoo (balao). Yellowtail snappers are perhaps the most important of the snappers in south Florida. Although available all year, the fishery is most active in spring and summer. Ground fish-chum is mixed with anchovies (glass minnows) and sand, formed into balls and dropped overboard. Attracted by the chum, schools of yellowtail are caught on hooks baited with Spanish sardines, thread herring, scaled sardines or cut bait. Much of this bait and chum is caught in castnets by the yellowtail fishermen themselves so that these landings are unreported.

Groupers are commercially fished by bottom fishing or wire line trolling using whole ballyhoo, mullet, goggle eye, thread herring, Spanish sardines and scaled sardines as bait. In southeast Florida the principal species are black grouper, gag grouper and red grouper. Groupers are landed year round with a seasonal peak in winter and early spring. Live baits used for grouper and amberjack in southeast Florida in winter and spring include pinfish, blue runner, mullet, small yellowtail snappers and any of the clupeidae.

In northeast Florida, red snapper are the most important of the bottom species. They are fished year-round although landings increase somewhat in spring and fall. Cut bait is generally used and may consist of mullet, ladyfish, jack crevalle, menhaden, etc.

Natural baits are also used in an active line fishery for king mackerel in the southern half of the state. Live baits such as mullet, goggle eye and blue runner, are used for large king mackerel in the Palm Beach area as are strip baits made from mullet. In the Miami area in fall and winter, king mackerel are fished commercially using handlines with live scaled sardines or Spanish sardines for bait and chum.

Longline fisheries for tilefish and swordfish also employ natural baits. Both fisheries operate year-round. For swordfish, the most commonly used baits are imported Atlantic mackerel and squid, while silver mullet and ladyfish are used occasionally. For tilefish, squid, portunid crabs caught by fishermen, and cut bait are used.

The recreational use of bait far exceeds the commercial use in Florida. Although there is a seasonal peak in availability for each individual gamefish species, in southeast Florida there are gamefish available throughout the year. Inshore in bays and estuaries, the gamefish species include snook, tarpon, bonefish, sea trout, redfish, snappers, Spanish mackerel, bluefish, grunts, cobia, sheepshead, and pompano. The single most common bait is live shrimp although many other baits may be used.

Offshore, the major game fish species include dolphin, king mackerel, sailfish, blue marlin, white marlin, blackfin tuna, wahoo, amberjack,

grouper and snapper. Ballyhoo and silver mullet are used in trolling, live bait fishing or bottom fishing.

Live bait preferences vary regionally with live ballyhoo and clupeids being most popular in the Florida Keys, live clupeids, mullet, blue runner and pinfish in the Miami area, and live goggle eye (bigeye scad) in the Palm Beach area. Demand is greatest in winter when these baits are used for sailfish. In northeast Florida live menhaden are often used for king mackerel.

For bottom fishing, baits include ballyhoo, mullet, clupeids and all the live baits mentioned above in addition to live or dead shrimp, squid and occasionally live lobster or crabs.

Ballyhoo

Two species of halfbeak Hemiramphus brasiliensis and H. balao are caught and sold as ballyhoo (balao). They are very similar in appearance and the fishery makes no distinction between them. Fluctuations in landings do not indicate a particular trend and are primarily the result of prevailing weather conditions and variations in year class strength. An increase in value in recent years probably reflects an increase in fuel prices.

Ballyhoo are essentially an annual crop and are most abundant during the winter months in southeast Florida from Palm Beach County through the Florida Keys. After spawning in spring and early summer in south Florida, the young fish begin entering the fishery by late September or October. Landings peak between November and March (Figure 1).

Ballyhoo are caught commercially using a modified lampara net 450-750 yards long aboard boats between 24 and 30 feet long. The net hangs 6-10 feet deep and the last 100 feet form a bag which is closed with a purse line. After encircling a school of ballyhoo, one end of the net is tied to the bow of the boat, and the net is hauled back over the stern. When the bag is reached the net is pursed entrapping the fish which can then be brailled out with a dip net.

Ballyhoo are very delicate fish and require careful handling if they are to be suitable for bait. After capture they are placed in boxes with ice and sea water. Soon after, they are sorted into four size categories and packaged a dozen to the bag. The majority of those caught in fall and early winter, are frozen for sale during the late spring and summer. Frozen ballyhoo are sold throughout the state as well as in other south and mid-Atlantic states and throughout the Bahamas and Caribbean. Fresh ballyhoo are generally available only in south Florida where they can be driven by truck to retail outlets.

Only four or five boats, involving 10 to 15 full-time fishermen fish

1978 BALLYHOO CATCH

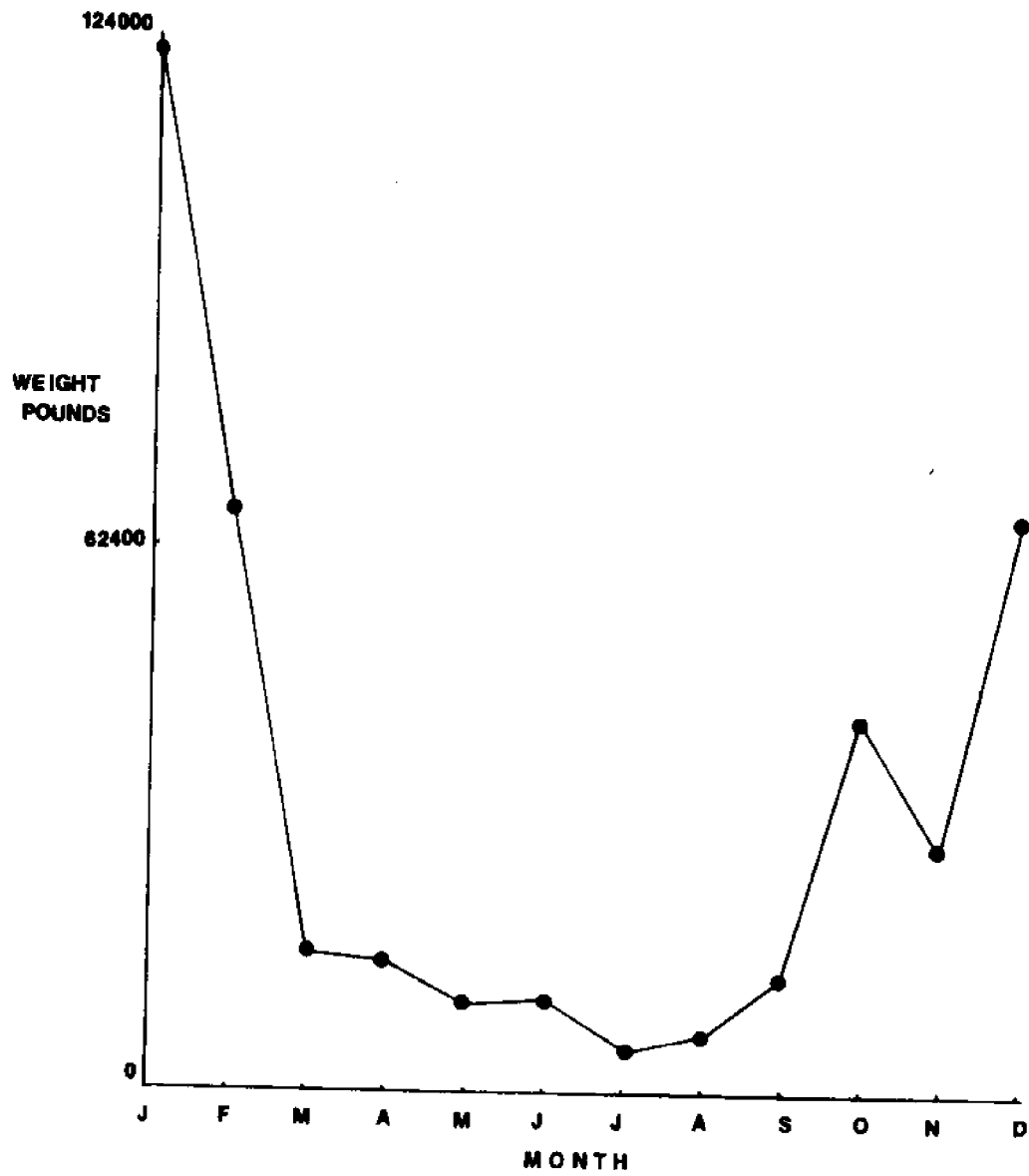


Figure 1. Monthly ballyhoo landings from the Florida east coast, 1978.

for ballyhoo in Florida. Another six to ten boats involving 15 to 30 people fish part-time for ballyhoo. There are probably fewer than 20 people directly employed in the processing of ballyhoo.

There are two major processors of ballyhoo and a few smaller ones in southeast Florida. Because of the seasonal nature of production, most of the early season (October-December) catches are frozen for later sale. The necessary freezer capacity and handling facilities minimize the number of fish houses that handle ballyhoo. Landings are reported in pounds, but ballyhoo are sold by the piece. The present ex-vessel price varies between 5 and 12 cents per fish depending upon size and season. Retail price is at least \$3.50 per dozen in south Florida and higher elsewhere. Reported landings since 1970 have generally ranged between 300,000 and 400,000 lbs (Figure 2). Actual landings are at least 50 percent higher than reported landings. At the retail level these fish had a value of at least \$1.23 million.

Silver Mullet

Several species of mullet are included in the catch-all name of silver mullet. The major species in the complex is the white mullet (Mugil curema). The red eye mullet (M. gaimardianus) and the fan tail mullet (M. trichodon) are less commonly caught. Silver mullet are caught commercially throughout the state in gill nets and cast nets fished in inshore or nearshore waters. Reported landings and value of silver mullet from 1970 through 1980 are shown in Figure 3. Landings peaked in 1974 and have generally declined since then. The increase in value of the catch reflects increased cost of production and increasing demand.

Silver mullet are caught year-round in Florida. In the Florida Keys, large catches occur in the spring. A secondary peak in landings occurs in the fall in this area. Figure 4 shows the reported monthly landings for the east coast of Florida for 1978.

Mullet are much more durable than ballyhoo and handling is much less critical. They may be distributed fresh or frozen. Mullet are often processed by the wholesaler before freezing: the backbone is removed and they may be rigged with hooks and wire leader for trolling. Juvenile mullet (called finger mullet) are often sold deboned and are very popular trolling baits.

Specialized baits, such as large silver mullet, black mullet and Spanish mackerel, which are used to catch marlin and tuna are deboned and rigged for trolling and preserved in formalin or simply frozen. These products are sold throughout the Bahamas, Caribbean and South Atlantic states. Reported silver mullet landings on the Florida east coast since 1970 have ranged from under 400,000 lbs to over 1,000,000 lbs (Figure 3). Actual landings are believed to be considerably higher, probably twice the reported landings. This does not include mullet caught for personal

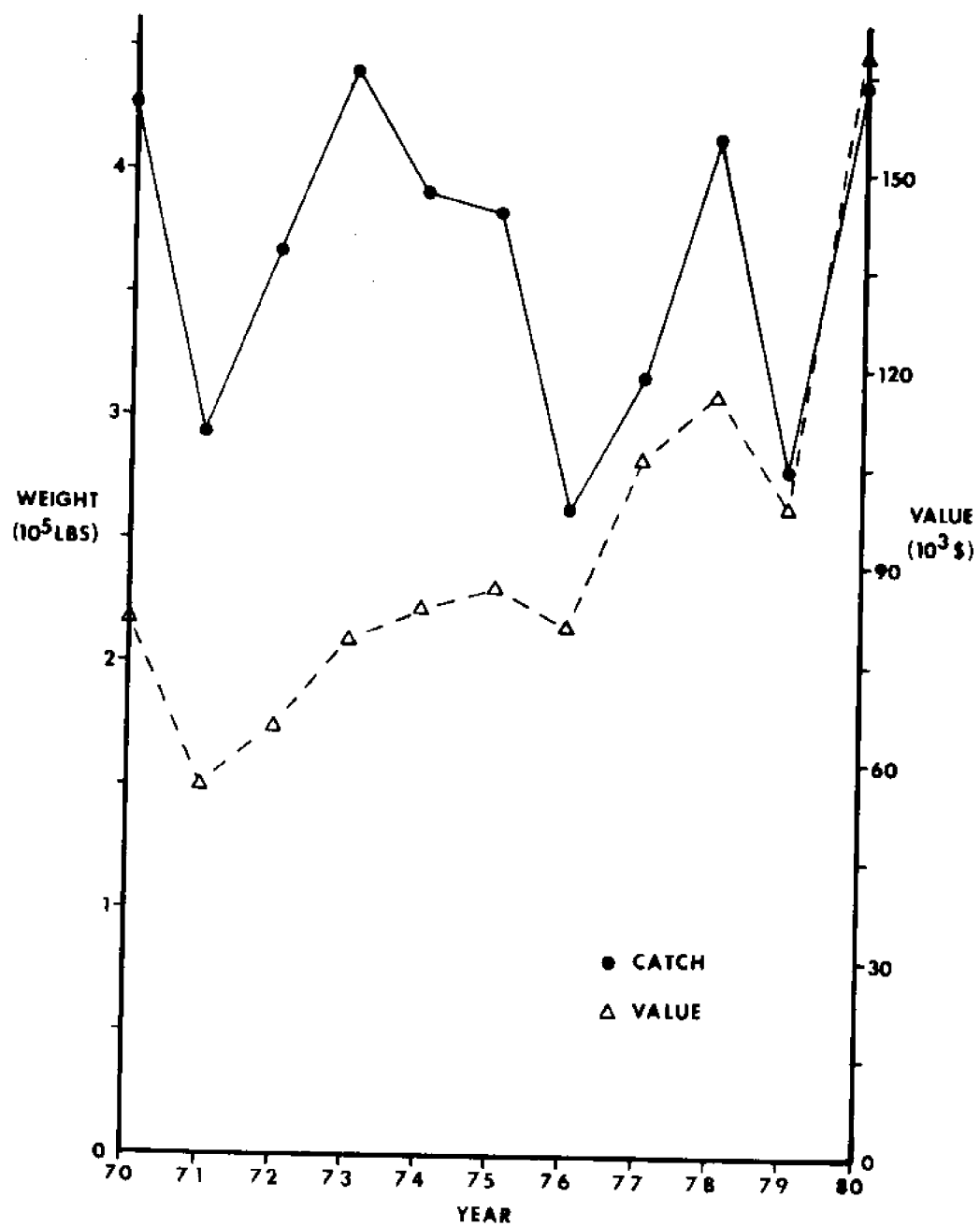


Figure 2. Reported landings and value of ballyhoo from the Florida east coast, 1970-1980.

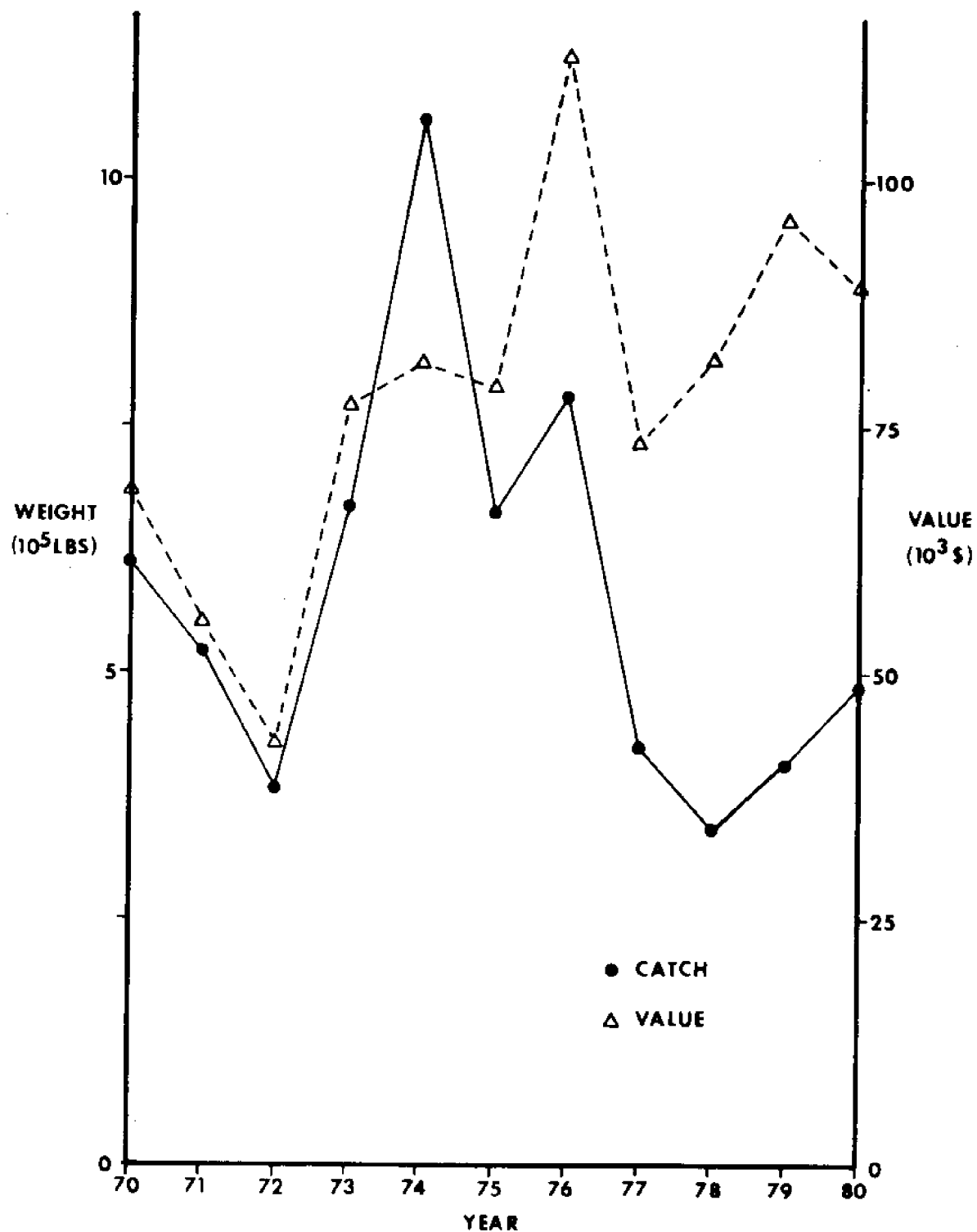


Figure 3. Reported landings and value of silver mullet from the Florida east coast, 1970-1980.

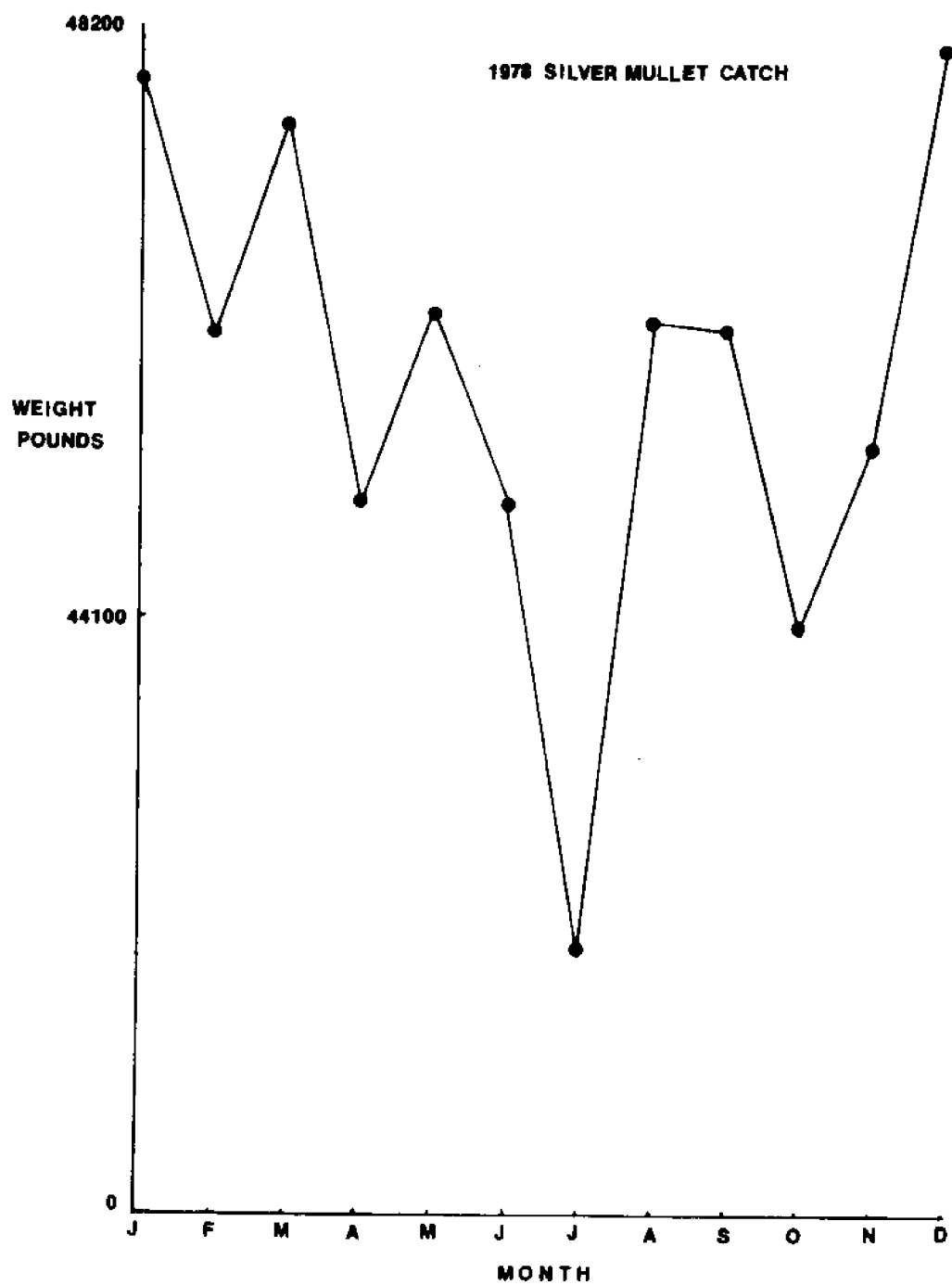


Figure 4. Monthly silver mullet landings from the Florida east coast, 1978.

use. In recent years production has fallen while demand has increased and at times they may be unavailable.

Unlike the fishery for ballyhoo, there are many silver mullet fishermen and processors throughout the state. Except in a few areas, during particular seasons, silver mullet never constitute a major product. There are few, if any, fishermen who fish exclusively for silver mullet, although many fishermen may land mullet on occasion. If 1,000,000 lbs of silver mullet were actually landed in 1980, then at the present retail price of approximately \$0.60 per pound, their value was \$600,000.

Other Bait Species

Major species of clupeids entering the baitfish fishery are scaled sardine (Harengula jaguana), Spanish sardine (Sardinella anchovia), and thread herring (Opisthonema oglinum). Small quantities are caught commercially on the east coast of Florida in purse seines, beach seines and cast nets. Relatively large catches of Spanish sardines and thread herring are made on the west coast of Florida.

An interesting local fishery for bigeye scad or goggle eye (Selar crumenophthalmus), has developed in recent years in Palm Beach, Florida. Primarily used live for sailfish fishing, they are caught on rod and reel by small boats, held in live bait wells, and sold the same day for between \$5.00 and \$50.00 a dozen.

Anchovies (Anchoa spp.), caught commercially in southeast Florida using beach seines, are frozen and used for chum primarily for yellowtail snapper. The fishery is small and landings are not recorded.

On the west coast of Florida substantial fisheries exist for blue runner (Caranx fuscus), crevalle jack (C. hippos), ladyfish (Elops saurus), and round scad (cigar minnows, Decapterus punctatus). On the east coast, landings of these species are small and generally incidental to directed fisheries for other species.

Relatively large quantities of bait are caught for personal use by both commercial and recreational fishermen. Landings of most species other than silver mullet and ballyhoo go unreported because of this. Beach seines, cast nets and hook and line are the methods generally employed in catching bait for personal use.

Geographic Harvesting Pattern

On the east coast of Florida, almost 100% of all baitfish landed comes from state waters. A small amount of ballyhoo are caught outside the state three mile limit. In the lower Florida Keys, a significant portion of the ballyhoo stock may be within the fishery conservation zone (FCZ). Mullet

may be found outside the state three mile limit during their spawning season, but they are not fished in this area. Fishing occurs in internal or coastal waters. Fishing activity for all other baitfish species takes place in state waters on the Florida east coast.

Many of the migratory pelagic species rely to some extent on these baitfish. Although the baitfish are harvested within state waters, they may often occur beyond this area in the FCZ. Such species as sailfish and king mackerel at times feed heavily on clupeids and ballyhoo. None of these baitfish species are being heavily exploited at this time; however, we do not know what affect an increase in the baitfish fisheries will have on predators which feed upon them.

In southeast Florida there has been a trend in recent years for fishermen to catch their own bait. This is not an attempt to save money but rather an effort to obtain live bait which has been shown to be much more effective in catching a variety of fish. Presently, shrimp is the only bait generally available live at retail bait shops. The problems and expenses involved in transporting and holding live baitfish are prohibitive for most bait shops.

Regulations and Management

Although generally there are few regulations pertaining to the harvesting of baitfish, there are several notable exceptions. The use of purse seines is illegal for the taking of food fish. Although silver mullet are not harvested for food, the law considers mullet food fish, making no distinction between silver mullet and black mullet (which is a food fish). One county, Broward, does not allow the use of any nets except castnets less than 6 ft in radius. This county has a large number of recreational fishermen who demand bait but do not want it harvested from their county's waters. The regulation has no biological basis and creates a hardship for a few commercial fishermen, but the recreational fishermen have a stronger political voice and thus the law remains.

Conflicts Among User Groups

In the Florida Keys there is a conflict between commercial ballyhoo fishermen and charter boat fishermen. Many of the charter boats in the Keys catch their own ballyhoo for use as live bait. They feel that the commercial ballyhoo fishermen catch and/or scatter the fish so that they cannot catch them, while the presence of a number of boats in an area prevents commercial ballyhoo fishermen from setting their nets. Although a seemingly equitable arrangement, this has not entirely eliminated the conflict.

Another conflict has developed between ballyhoo fishermen and lobster fishermen. Spiny lobsters are fished in much the same areas as ballyhoo.

Floats used to mark the traps often make it impossible to set a net. The number of lobster traps being fished is increasing and the problem is becoming more and more serious.

Most species of baitfish in Florida are presently underutilized. Their relatively low value and a limited market has kept exploitation rates low. However, increasing demand for bait and alternate uses for traditional bait species may eventually cause these fisheries to expand. The effect this will have on the bait and the game fish species which utilize them for food is unknown.

References

- Berkeley, S. A., E. D. Houde and F. Williams. 1975. Fishery and biology of ballyhoo on the southeast Florida coast. University of Miami Sea Grant Spec. Rep. No. 4, 15 pp.
- Berkeley, S. A. and E. D. Houde. 1978. Biology of two exploited species of halfbeaks, Hemiramphus brasiliensis and H. balao from southeast Florida. Bull. Mar. Sci. 28(4): 624-644.

FLORIDA'S MARINE BAIT INDUSTRY

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Florida's bait industry provides marine bait for much of the Southeast of the United States. The industry is diverse and widespread but has attracted very little attention from the academic and business communities. Little information has been collected on the economics of the bait industry in Florida for several reasons: 1) there are no special licenses required for retail bait sales, therefore, no records are available of the total number of bait dealers, 2) landing statistics are acquired only from dealers that handle edible seafoods, not from bait dealers, and 3) the industry tends to be fragmented with many part-time participants.

The bait industry is composed of bait fishermen, processors, wholesalers and retail markets. Bait products do not always move through all sectors of the industry because of the following:

1. Many fishermen catch their own bait.
2. Many retail outlets purchase bait directly from local fishermen.
3. Many wholesalers catch their own bait.

Total employment in the bait industry is difficult to determine. Many fishermen contribute products to the bait industry, however very few are full time bait fishermen. Also, many processors employ part-time workers on a seasonal basis when production or demand is extremely heavy. Additionally, many species are used as both bait and food for human consumption or as in the case of fish meal as bait and in animal feeds. Thus no attempt will be made to describe the aggregate employment of the bait industry in Florida.

There are very few large processors of bait because of problems with quality control, finding skilled labor to process and rig baits, and profit margins tend to be low compared to other businesses.

In Florida, wholesale bait dealers are required to obtain the same dealers licenses as wholesalers of food fish. This makes it difficult to separate wholesale bait dealers from other types of seafood wholesalers. Additionally, most seafood wholesalers have some bait sales, but because bait sale reporting is not separate from the reporting of other sales,

aggregate sales of bait from wholesalers cannot be established.

Retail outlets for bait carry on a variety of additional retailing activities. These include selling tackle and fishing equipment, boat and motors, seafood, beverages, snacks and other food items, and even garden supplies. Retail outlets are not required to obtain any special licenses to handle bait, therefore, there are no statistics available on the total number of retail outlets. Retail outlets tend to be financially unstable with many business failures, particularly for new ventures. Many retailers that were interviewed stated that bait sales did not contribute appreciably to their financial success*. Tackle sales and other product lines accounted for most of the profits for these businesses. However, the general feeling was that the availability of bait attracted customers to their shops. Many retailers stated that they feature bait as a "loss-leader" to stimulate sales of their higher margin items.

Total reported landings and ex-vessel price for the major bait species taken in Florida (the latest 3 years available) are listed in Table 1. As noted above, these statistics do not include a large volume of bait landings because of the method of reporting (i.e., only those forms selling seafood for human consumption were included), thus, the total landings and ex-vessel prices for bait could vary significantly from those actually reported. Consequently, no attempt will be made to estimate the aggregate total landings and ex-vessel prices for bait species landed in Florida. However, it is interesting to note several other statistics on bait landings:

1. Approximately 9% of the Spanish mackerel landed in Florida is used as bait*.
2. While there are no recorded landings for sand fleas, fishermen (mostly retirees supplementing their incomes) reported an ex-vessel price of 1 - 1½ cents each*.

Typical wholesale prices for 1980 in south Florida bait are listed in Table 2. The variation in prices generally can be ascribed to two factors. The first being the volume purchased, the second, variation in quality. Personal interviews determined that quality was a much more important aspect in the decision process when purchasing bait than was price for both commercial and recreational fishermen. As mentioned previously, no attempt will be made to estimate the aggregate wholesale bait sales.

The bait used by the commercial fishing sector in Florida varies dramatically depending on the species being sought. Table 3 lists the bait costs for commercial fisheries in Florida in 1975 for Florida's major fisheries by dollars per 100 lbs of fish landed and dollars per

* This report is based on oral interviews with three wholesalers and nine retailers from Cape Canaveral to Miami, Florida and are not intended as statistically valid surveys.

TABLE 1

PRODUCTION OF MAJOR BAIT SPECIES IN FLORIDA, 1978-80.

SPECIES	LBS	DOLLARS	YEAR
BALLYHOO	414,811	\$ 116,197	1978
	279,874	99,004	1979*
	464,000	176,000	1980*
MULLET	665,675	123,915	1977
	828,684	171,749	1978
	773,311	152,236	1979*
SPANISH SARDINES	948,267	70,582	1977
	2,352,281	193,099	1978
	2,692,262	222,332	1979*
CIGAR MINNOWS	903,589	128,932	1977
	668,153	111,819	1978
	991,736	171,856	1979*
THREAD HERRING	240,345	12,234	1977
	63,196	2,755	1978
	658,317	59,690	1979*
MENHADEN	13,431,434	325,113	1978
(10-17% of landings	13,924,295	593,619	1978
used for bait)	8,842,012	396,436	1979*
BAIT SHRIMP	897,331	1,555,238	1976
	800,902	1,630,584	1977
	712,844	1,306,966	1978

*Preliminary

Source: 1978-80 Florida landings, Southeast Region, Resource Statistics
Office, NMFS, Miami, Florida

TABLE 2
TYPICAL WHOLESALE PRICES - 1980

<u>TRADE NAMES</u>	<u>PRICES (DOLLARS)</u>
BALLYHOO - Rigged	\$ 10.00 to \$ 12.50 med.
WHOLE MULLET	\$.30 to \$.50 per lb
FINGER MULLET	\$ 1.25 each
SPLIT TAIL MULLET	\$ 50.00 doz. large \$ 30.00 doz. small
CUT MULLET	\$.70 to \$.80 - 8 oz cup
MACKEREL	\$ 2.50 to \$ 7.00 each
SQUID	\$.35 to \$.45 per lb
SPANISH SARDINES	\$.22 to \$.50 per lb
CIGAR MINNOWS	\$.22 to \$.50 per lb
GOGGLE EYES	\$.50 per lb
LIVE GOGGLE EYES	\$ 2.00 each (1/4 - 1/3 lb average)

SOURCE: Personal Communication: This report is based on oral interviews with three wholesalers and nine retailers from Cape Canaveral to Miami, Florida and are not intended as statistically valid surveys.

\$100 of fish landed. Bait costs per \$100 of species landed varies from a high of \$41.80 for blue crab to a low of \$1.25 for spiny lobster. Additionally, many commercial fishing activities use no bait in their operations (i.e., gill nets, shrimp trawls, oysters, clams, etc.). In 1975, the total aggregate expenses for bait in the commercial fishing industry of Florida was \$2,450,744 (Table 3). This includes only bait that was purchased and excludes bait that was caught by fishermen for their own use.

Statistical information on the use of natural baits by recreational fishermen is practically non-existent. The abundance of bait and tackle shops in Florida (particularly in tourist centers) attests to the fact that there is a large amount of bait sold to recreational fishermen. F. Bell, (personal communication) in currently ongoing research of the economic impact of Florida's recreational fishing industry, estimates that \$246 million dollars are spent by the recreational fishing community for bait each year in Florida. Recreational fishermen seem to be quite loyal to product lines and will often make large purchases of the particular product line they prefer.

The bait industry in Florida appears to have a significant economic impact. However, the actual dollar value of this industry cannot be determined without detailed study. In a series of personal interviews conducted with individuals that participate in the bait industry, several factors created concerns for bait firms:

1. Net laws throughout the state are inconsistent and are often written without considering the needs of bait fishermen.
2. Lack of statistical information on the landings and prices of bait species contribute to a lack of understanding of the economic impact of the bait industry. Thus, while the economic impact of this industry may be significant, without documentation, the industries benefits are being ignored.
3. Very little is known about predator/prey relationships. This ignorance about the ecological impact of certain gear used to harvest baitfish has complicated baitfish management issues.
4. There is competition between bait and seafood harvesters. Currently, there are a number of traditional bait species that are being processed for use as food, particularly for export.

Conclusions

The economics of Florida's bait industry are poorly understood. The lack of accurate statistical information on the total landings and ex-vessel bait prices contributes to a lack of understanding of this industries

TABLE 3

BAIT COSTS FOR COMMERCIAL FISHERIES IN FLORIDA, 1975

TYPE		
SNAPPER/GROUPER	\$ 3.90 per 100 lbs of fish	
	\$ 7.00 per \$100 of fish	
EXPENDITURE FOR BAIT	-----	\$ 600,000.00
KING MACKEREL	\$ 0.87 per 100 lbs of fish	
	\$ 2.17 per \$100 of fish	
EXPENDITURE FOR BAIT	-----	\$ 78,302.00
SPINEY LOBSTER	\$ 2.65 for 100 lbs of fish	
	\$ 1.25 per \$100 of fish	
EXPENDITURE FOR BAIT	-----	\$ 196,694.32
BLUE CRAB	\$ 5.50 per 100 lbs of fish	
	\$ 41.80 per \$100 of fish	
EXPENDITURE FOR BAIT	-----	\$ 929,065.10
ALL OTHERS	\$ 1.54 per 100 lbs of fish	
	\$ 5.67 per \$100 of fish	
EXPENDITURE FOR BAIT	-----	\$ <u>646,682.85</u>
TOTAL		\$ 2,450,744.27

SOURCE: Primary Economic Impact of the Florida Commercial Fishing Sector,
 Fred J. Prochaska and R. Allen Morris, Florida Sea Grant Report
 No. 25, November 1978.

economic impact. Based upon other investigations, the aggregate commercial fishing industry's expenditure on bait was \$2.5 million (1975) and an estimated \$246 million by recreational fishermen.

Problems of the bait industry are not currently being addressed. These problems include adverse bait harvesting regulations and the lack of critical economic and ecological information.

Additional investigations are needed to adequately address these problems.

References

Bell, Frederick. Personal communication, August 1981.

Hudgins, Louis. Personal communication, August 1981.

Montella, Mike. Personal communication, August 1981.

Prochaska, F. and M. Allen. Primary Economic Impact of the Florida Commercial Fishing Sector. Florida Sea Grant Report No. 25. Gainesville. U. of Florida, November 1978.

Snell, Ernie. Personal communication, August 1981.

U.S. National Marine Fisheries Service. Florida landings. Washington. U.S. Government Printing Office, Annual issues 1978-1980.

GEORGIA'S BAIT INDUSTRY

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Georgia has a fairly limited marine bait industry when compared to other bait producing states such as Florida. The two marine baits of greatest monetary value are scrapfish and shrimp. In general, Georgia's marine commercial baits consist primarily of "incidental catch" caught during shrimp trawling activities. However, baits harvested for recreational purposes are actively collected by both commercial and sport-bait fishermen and by varied methods and gear types.

Commercial Baits

Scrapfish is the major marine commercial bait utilized in Georgia's estuarine and marine waters ranking first both in dollar value and pounds among the other commercial baits. Scrapfish baits consist primarily of menhaden and smaller quantities of spot, croaker, juvenile weakfish and occasionally whiting, flounder, catfish and butterfish. The harvest of scrapfish is incidental to commercial shrimp trawling activities in nearshore coastal waters from spring through December. A random sample basket used to obtain data on species composition, weight, and measurements revealed a composition of approximately 98 percent menhaden ranging from 8 to 10 inches (Table 1).

Crab pots are baited with approximately one pound of scrapfish and normally yield $2\frac{1}{2}$ to 3 pounds of crabs. When baiting for catfish, up to 20 pound quantities of bait are utilized per trap, whereas in eel traps the quantity is reduced to approximately one pound. Yield values are not available for bait/catch ratio comparisons for catfish and eels.

To decrease the ratio of the amount of bait used per pound of crabs captured, two-liter plastic beverage bottles can be used as a bait saving strategy. Each end is cut off the bottle, the cylinder is then split length-ways, and the cylinder is inserted into the well. Crabs must enter the upper portion of the trap before removing any bait from the well and tidal action is not as apt to wash the bait out of the trap.

Scrapfish is used throughout the crabbing season. The catfish and eel fisheries utilize scrapfish year-round especially during times when

Table 1. Number, weight and length average and range for species contained in a bushel basket of scrapfish shipped from Virginia.

SPECIES	NUMBER	Weight (pounds)	Length in Inches	
			Average	Range
Menhaden	251	61.0	8 $\frac{1}{2}$	6-11
Blue Crab	2	.3	4	3 $\frac{1}{2}$ -4 $\frac{1}{2}$
Weakfish (Summer Trout)	1	.3	9 $\frac{1}{2}$	-
Bluefish	1	.3	8 $\frac{1}{2}$	-
Spot	1	.1	6	-
Bushel Basket		5.0		
Total Weight (frozen)		67.0		

Cost per bushel to crabber - \$8.50
 Cost per pound(Scrapfish and basket) - 12.7¢
 Cost per pound(Scrapfish only) - 13.7¢

more favorable or economical baits such as shrimp heads and horseshoe crabs are not available. Virginia and North Carolina supply the majority of out-of-state scrapfish (menhaden, etc.) used by Georgia's commercial crabbers. Fish too small to be marketed as food fish in these two states are shipped frozen to Georgia on returning crab processors' trucks.

Georgia crabbers prefer frozen scrapfish. Local supplies of scrapfish are obtained during the last few drags by shrimp trawlers to save the cost of having to ice them. These scrapfish are later chilled and stored in bushel baskets at the docks.

Local processors buy scrapfish from northern suppliers for \$.04 to \$.10 per pound depending upon grade and species. Local crabbers in turn purchase scrapfish directly from local processors at a cost of \$.12 to \$.16 per pound (1981 prices).

Trends in the scrapfish bait industry show little variation as it has remained fairly stable for the last 10 years. By far, the majority of scrapfish used by Georgia's commercial fishermen are shipped from out-of-state sources. Barriers which limit Georgia from developing its own self-sufficient scrapfish industry are: (1) scrapfish are not supplied by local shrimp trawlers in sufficient quantities during the winter and early spring, (2) most trawler fishermen prefer not to process scrapfish, and (3) it is too costly to keep frozen scrapfish during the winter months. Furthermore, once an out-of-state source is established, it must be maintained to insure bait supplies for future crabbing seasons.

Factors limiting the development of even a seasonal Georgia scrapfish supply come from conditions existing between crabbers and processors. Processors who ship crab meat north defray shipping costs by trucking scrapfish back into Georgia. Processors will purchase crabs only from crabbers who buy processor's bait. If a processor's bait is the only supply available, prices average about \$.16 per pound.

When crabs become abundant in June and July, processors may be capable of handling only the crabs of a limited number of crabbers, making it necessary for crabbers to deal with the same processors. Some crabbers establish territorial claims by leaving several crab pots in an area during the nonproductive winter months. Legally, all crabbers have equal rights to any area. However, a trespasser could not only lose his traps but a boat as well. Such actions may very well persuade a new crabber to investigate other work areas or occupations.

In 1980, there were eight major blue crab processors in Georgia. They processed 10,060,060 lbs of blue crabs at a value to the crabber of \$1,959,998.00 (Table 2). Based on the 1-2.5 pound ratio of bait to crab yield, Georgia crabbers used 4,024,024 lbs of scrapfish during the 1980 season. At an average price of \$.11 per pound, the retail cost to the crabber was \$442,643.00. The bulk of these half million pounds of

Table 2. Total pounds and value of blue crabs and scrapfish associated with the blue crab industry from 1970 through 1981.

YEAR	BLUE CRABS LANDED (POUNDS)	BLUE CRAB VALUE	PRICE (per/lb.)	ESTIMATED SCRAPFISH (POUNDS)	ESTIMATED COST TO CRABBER	APPROXIMATE PRICE (Per/lb.)
1970	7,092,309	\$ 428,231.00	6.0 ¢	2,836,923	\$ 141,846.00	5.0 ¢
1971	8,435,662	680,107.00	8.1	3,374,264	---	---
1972	9,058,780	825,202.00	9.1	3,623,512	---	---
1973	7,984,185	968,650.00	12.1	3,193,674	---	---
1974	10,130,822	1,225,878.00	12.1	4,052,328	---	---
1975	8,865,380	1,154,720.00	13.0	3,546,152	283,692.00	8.0
1976	5,872,611	1,087,289.00	18.5	2,349,044	187,924.00	8.0
1977	7,721,668	1,632,092.00	21.1	3,088,667	262,537.00	8.5
1978	10,628,294	1,877,446.00	17.7	4,251,317	382,619.00	9.0
1979	11,337,528	1,983,890.00	17.5	4,535,011	453,501.00	10.0
1980	10,060,060	1,959,998.00	19.5	4,024,024	442,643.00	11.0
1981	13,380,389	2,462,701.00	18.9	5,215,355	625,842.00	12.0-16.0

scrapfish was shipped from Virginia and North Carolina to Georgia and purchased by 528 full and part-time licensed crabbers.

Shrimpheads are an important bait to the Georgia commercial eel fishery and to a limited extent, the catfish fishery as well. This bait is valuable to fishermen as a very productive and low cost bait.

Fresh shrimpheads are readily available throughout the shrimping season from April through December. Shrimp packers/eel fishermen occasionally freeze shrimpheads in the late fall in order to have a ready supply on hand during the winter and early spring. Fishermen normally obtain shrimpheads through personal contacts with either a packing house or trawler. There is seldom any monetary exchange, and baits are usually handled on a "first come, first serve" basis.

Shrimpheads are used throughout the eel fishing waters. However, catfish traps are restricted to the waters east of the saltwater demarcation line, thus limiting the utilization range of this bait.

Female horseshoe crabs are the preferred bait in the eel fishery. These are broken up and usually only one crab is necessary for baiting each trap.

Year-round eel fishing is possible in Georgia, but spring and autumn are the most productive seasons corresponding to the time that the horseshoe crabs are saved by shrimp trawlers. Occasionally they are frozen so they will be available during peak fishing periods. They are easily obtained during commercial shrimping activities as they often overload the nets.

On deck, horseshoe crabs are handled in barrels the same as blue crabs. At the dock the crabs may be immediately distributed to the eel fisherman, frozen, or held live in tanks for later use. Eel fishermen can obtain the crabs free, or pay as much as \$.75 a piece for them. Cost depends on the individual eel fisherman and his contacts.

Trends in the eel fishery indicate a vastly expanding fishery. Eel landings in 1979 amounted to only 8,587 lbs valued at \$7,496.00. However, the 1980 landings indicated an increase of over 1,000 percent to 89,442 lbs valued at \$93,949.00. At present, the forecast of this fishery is good.

In Georgia, squid are used in a very limited snapper fishery. The snapper fishery is generally a side-line or offseason activity complementing commercial shrimping activities. Snapper fishing is conducted primarily on the savannah and brunswick snapper banks approximately 40 miles offshore.

Packaged frozen squid are shipped in from California at wholesale cost to the bait dealer at \$.45 to \$.50 per pound and sold locally in 5 pound boxes from \$.75 to \$.95 per pound.

Recreational Baits

The recreational bait industry serves a vital role in the recreational sport fishery. A diverse range of saltwater sport fishes inhabit coastal waters throughout the year, and an appropriate variety and supply of baits is a necessary resource for recreational anglers.

Shrimp are one of the most widely used natural baits in the southern United States and most of Georgia's saltwater fishermen prefer live shrimp. This is the top rated bait for the spotted seatrout which is Georgia's most desirable inshore sportfish. Live shrimp are also used for flounder and red drum, while dead shrimp are used primarily for kingfish, croaker, and black drum. Most game fishes in Georgia's estuarine waters can be taken on either live or dead shrimp depending on the season.

The bait shrimp fishery in Georgia is based primarily on three species of Penaeid shrimp: the white shrimp, the brown shrimp, and the less abundant pink shrimp. The particular species varies according to the time of the year. Bait-size shrimp ($2\frac{1}{2}$ - 4 inch) are generally taken in estuarine creeks and rivers with salinities less than 25 ppt.

Bait shrimp are available in Georgia waters from late spring through fall. Trawling for bait is restricted to net size, bait quantity and predesignated collecting areas called "bait zones". Commercial bait shrimpers are allowed to use 20-foot trawls, whereas, recreational fishermen are restricted to 10-foot trawls. There are very few restrictions for bait gathering with cast nets or 12-foot bait seines, but these methods are far less efficient than trawls.

During early spring, when bait-size shrimp are scarce in Georgia waters, some dealers buy live shrimp from Florida. Florida shrimp are shipped by truck and sold to the Georgia dealers at an average cost of \$52.00 per thousand. The dealer in turn sells the shrimp to local fishermen for \$7.00 to \$8.00 per quart (1981 prices). Florida shrimp average about 125 per quart. During this time the dealer is basically supplying bait for his customers at little or no profit.

There are four basic trade practices in the bait shrimp industry: (1) dealer owns and operates bait boat and sells bait to final consumer, (2) dealer owns boat, but hires boat operator, (3) dealer buys bait from a local independent boat operator, and (4) dealer buys shrimp from an out-of-state source. In the second transaction the dealer may pay the boat operator by the trip (\$25.00) or by the amount of shrimp caught (one-third the retail value). In the third transaction the dealer normally pays the boat owner one-half the retail value of the shrimp.

Commercial bait shrimp are caught exclusively with 20-foot otter trawls. Single nets are towed approximately 10 to 15 minutes by 18 to 22-foot inboard and outboard boats. The outboard rig allows the bait

shrimper better accessibility to drag in shallow water on mud flats where more bait size shrimp are concentrated.

The catch is unloaded into a culling box and sorted. Shrimp are separated from the catch and placed in the boat's holding tanks which are designed with some type of aeration or water exchange system. Shrimp are transported to the dealer's store and placed in holding tanks ranging from simple float supported pontoons to elaborate aeration and water exchange systems capable of holding tens of thousands of live shrimp. All dead shrimp are removed daily and packaged and frozen as bait (heads-on).

Live shrimp are most often retailed by the quart. During the summer and fall months when shrimp are plentiful, the retail value of live shrimp averages \$4.50 per quart. During the spring months when shrimp are scarce and often purchased from the Florida wholesale dealers, the retail price averages \$7.50. One quart of live shrimp is approximately 1½ lbs, but count size may vary from 50 to over 100 depending on season.

Dead bait shrimp are frozen and retailed in containers (maximum size one quart) marked "Sold for Bait Only". Frozen shrimp are retailed for \$3.00 to \$4.00 per quart (heads-on). Shrimp caught commercially for food consumption may be packaged as bait by shrimp processors, but this commodity often consists of spoiled, or nearly spoiled shrimp that have turned pink and cannot be sold for human consumption. These headed shrimp are packaged and frozen in half pound containers and retailed for \$2.00 to \$2.25 per box. These shrimp are not considered as good quality bait by local fishermen, and therefore they are usually sold to tourists who are unfamiliar with local marine fishing and do not know the quality of the product. According to some local bait dealers, the quality of dead shrimp may be greatly improved by rinsing fresh heads-on shrimp (gray in color) with freshwater before dry freezing them in plastic cup containers. If frozen in water, the heads have a higher tendency to fall off due to the freezing process.

In 1980, there were 74 live shrimp dealers operating in Georgia. These in turn were supplied by 47 commercial bait boats. Only 25 (34%) of these dealers were located at any of Georgia's 49 marinas. The remaining 49 facilities consisted of private docks, houseboats, food stores, bait and tackle shops, etc. Most dealers carried live bait more to attract customers to their other commodities than for bait sales alone. Records are not available for the number of dealers who carry only dead shrimp.

Ballyhoo and scad are used for offshore trolling in areas near artificial reefs and on live bottom areas from spring through fall.

Ballyhoo are harvested commercially in south Florida waters with purse

seines from spring through fall and transported to the wholesale dealer where they are graded, packaged and frozen. Georgia anglers prefer the medium grade size (8-9 inch) packaged 12 per bag. These medium-size ballyhoo are purchased wholesale for approximately \$2.10 per dozen and retailed for \$3.50.

Scad is wholesaled out of Panama City, Florida for approximately \$.60 a pound and retailed for \$1.00. It is not a preferred bait in local waters.

Mullet serves as bait in a variety of forms including live, cut or whole, stripped and deboned. The size of the mullet to be used depends upon the size and feeding habits of the gamefish being sought. The commonly used methods employed for taking mullet are seines, cast nets and treble snatch hooks. Since mullet are difficult to keep alive, the majority of fishermen catch their own just prior to a fishing trip. Current market prices for dead mullet are averaging \$1.00 per pound.

Live eels are used in live-lining and slow trolling techniques in offshore waters near artificial reefs and live bottom areas from spring through fall. They are used primarily for catching migrating cobia. Small eels 10 to 16 inches are the preferred bait and are harvested and sold as a side line to the commercial eel fishery.

If the recreational fisherman does not trap his own eels, he may obtain eels either directly from the eel fishermen at \$.50 each or from bait dealers who purchase the eels wholesale for \$.50 each and retail them at \$1.00 each or \$9.00 a dozen.

Squids are used for both trolling and bottom fishing during the warmer months. Trolling activities utilize the larger imported five to eight inch Pacific squid from California in offshore waters near reef and live bottom areas. The smaller Atlantic squid (3-4 inch) commonly caught during shrimping activities are used for both trolling and bottom fishing. The larger west coast squid are shipped wholesale from California for \$.45 to \$.50 per pound and sold retail for \$.95 to \$1.00.

Locally, the smaller squid are caught incidental to bait shrimp trawling. These squid are packaged and frozen in pint containers containing 45 to 60 squid. Since very few local inshore fishermen prefer squid as bait, they are sold primarily to offshore bottom fishermen and to tourists for \$3.00 a pint.

There is a very limited retail market for blue crabs as bait. However, blue crabs are occasionally purchased for bottom fishing for black drum. Crabs are purchased for \$3.00 a dozen -- the same price for human consumption.

The china back or purple fiddler crab is the most common bait for sheepshead on the Georgia coast. This bait is highly productive for black and red drum and is suitable for taking croakers. Fiddler crabs can readily be collected by hand on any high sand flat located within the coastal salt marshes during low tide levels. Its easily accessible habitat eliminates commercialization possibilities.

Live mud minnows, "mummichogs", are probably the best bait for flounder in Georgia's coastal waters. Mud minnows may be collected with minnow nets, traps, seines and cast nets on the creek or river edge during low tide periods.

Fiddler crabs and mud minnows have occasionally been retailed to local fishermen, but as stated earlier, the ease of capture eliminates any large scale marketing possibilities.

The monetary value of these baits could not be ascertained. Furthermore, with fiddler crabs and mud minnows the purchase price, the cost of keeping them alive, and the legal restriction that no additional organisms can be kept in live shrimp holding tanks limit the profitability of handling these species.

Regulatory and Management Policies

Historically there was little change in Georgia's bait shrimp fishery from the early 1930's to the mid-1950's in both the commercial and recreational fisheries. Legislation concerning commercial shrimping in 1952 established the opening and closing of the sounds by county vote. This led to other changes that affected the bait shrimp fishery because restrictions were needed on the types and sizes of nets that could be used to gather bait shrimp.

In 1956, measures were enacted which limited the size of nets to a maximum of 10 feet across the mouth of the net for sport bait fishermen and 20 feet across the mouth of the net for commercial bait fishermen. A catch limit of two quarts per fisherman and four quarts per boat was applied to sport bait fishermen, but no limits were set for the commercial bait shrimper. At that time there were no geographic zones as to where the bait could be collected as long as it was within the saltwaters of the state.

The lack of rigid restrictions over commercial bait shrimpers as well as inadequate law enforcement capabilities led to much controversy from a third user group -- the commercial food shrimpers. Although the food shrimpers as a group had diverse views concerning shrimp management practices, most were opposed to the bait shrimping laws as being inadequate and unenforceable. From 1956 to 1976 their complaints were primarily that bait shrimpers had "a license to steal". This was because commercial bait shrimpers often caught more than they could legitimately sell as bait. In addition, they could fish in any and all saltwaters and thus find the large commercial size shrimp that were too big to be used as bait. These larger shrimp always had a ready black market outlet in restaurants and inland stores and markets. Much of the food shrimpers' argument was valid as many shrimp supposedly caught as bait ended up on seafood platters at restaurants, and possibly as far north as New York markets.

In mid-January 1977, the entire Atlantic seaboard experienced its worst winter in decades. The shrimp fishery of the South Atlantic states was especially hard hit because the overwintering white shrimp crop was killed. In fact, Georgia's shrimp fishery was so hard hit that it was subsequently declared a disaster by the President and the seafood industry became eligible for disaster relief funds.

Management decisions taken during this period were immediate and intense and carried lasting results. The first and major decision by the Commissioner was to close all waters inside the 3-mile limit to all power drawn nets until shrimp stocks could rebuild to previous levels.

The 1977 spring spawning season was quite successful and the following fall landings were 61 percent of the previous 10-year average. However,

the following winter was again harsh and struck the already reduced overwintering shrimp stocks and extended the recuperation time to two years.

Georgia's legislative changes during this time period were numerous and were felt by all user groups. The major change affecting the commercial food shrimper was that the sounds were immediately closed and have remained so to this day. A direct impact of closing the sounds was that it almost completely destroyed the small boat fishermen commonly called the "weekend warriors" and "mosquito fleet" (fleet of small boat fishermen who previously fished commercially in the sounds).

The effects of the new legislative changes had a more far reaching and a harder hitting impact on the entire bait shrimp fishery. The new law kept all inside waters closed to power drawn nets except in certain designated bait gathering "zones" established by the Department of Natural Resources. In this transition that drastically limited bait gathering areas, all waters in the sounds and along the beaches were closed to taking shrimp for bait. Before 1977, this expanse of waters had always been open for bait fishing. Bait shrimping was therefore allowed in only those areas specifically opened by the DNR in the creeks and rivers and depicted on bait zone charts handed out upon purchase of bait shrimping licenses. The new law also established a \$5.00 sport bait license for use of the 10-foot sport bait trawl and put all bait collection, both sport and commercial, in the designated approved areas depicted on bait zone charts. Shrimp in bait zones had to meet the 2½ inch minimum size (80 percent of sample) before such bait zones could be opened by the DNR.

With the implementation of the new license, a license number for identification was given to the licensee upon the purchase of each commercial or sport bait license. These license numbers are block style 16-inch black letters and numerals furnished by the DNR. These digits must be affixed on a fluorescent orange background board furnished by the fisherman and displayed whenever bait gathering is taking place. Only one person is required to have the license for use of the 10-foot sport bait net when collecting bait. The legal time for gathering bait is from one-half hour before legal sunrise until one-half hour after sunset, thus making all trawling activities during daylight hours only.

Bait limits for sport bait fishermen have remained virtually the same at two quarts per person and four quarts per boat. However, the new regulation was added that no more than one pint of the two quart limit could be dead.

Major changes in the possession limits that commercial bait shrimpers could possess included a 50 quart limit on board the boat and a 200 quart limit at the dealership facility. The maximum limit of 200 quarts at the facility is no longer in effect. Dead bait being packaged by the dealership has been considered as part of this limit, and the fishermen and dealerships complained that this limit restricted the amount of

income they could make during times when bait was hard to obtain. This was especially true during the off season because they often ran out of bait on weekends.

Another new change requires the commercial bait shrimper to keep a daily log recording the time, place and amount of each drag within 30 minutes of capture. In addition to records of daily sales, they are subject to regular inspection by DNR personnel. Another change included a maximum of eight quarts that could be bought or sold by any one person within a 24-hour period, and all live bait must be covered by at least one inch of saltwater when sold.

The bait dealer must keep the bait alive. Any shrimp that die must be removed immediately and packaged (heads-on) and frozen in containers of one quart or less and marked "Sold for Bait Only". In addition, no organisms other than shrimp can be held in the live shrimp holding facilities.

Licensed bait dealers can have only one commercial bait boat catching bait except from March 1 through July 15 each year. During the latter period a limit of two boats can be employed, but they have to be marked with the corresponding commercial license numbers marked "A" for the primary boat and "B" for the second boat. Any boat marked "B" cannot take shrimp except from March 1 through July 15. These licenses are not-transferrable to other boats.

The sale of bait from one dealership to another is allowed, but only after notifying the Department of the destination, time and amount of the sale, and provided that the equipment for transferring such shrimp has been approved by the Department. The commercial bait shrimper must give a list of outlets to the Department for all persons to whom he intends to sell the shrimp.

No bait dealership license can be sold for a bait dealership located on any dock or other facility, including platforms, walkways, and buildings which is one contiguous unit where shrimp are unloaded, handled, processed or sold for human consumption. License applicants must post a forfeiture bond executed by a surety officer or insurance company licensed to do business in Georgia in the amount of \$1,000 conditioned upon faithful compliance with laws and regulations pertaining to bait shrimping. A cash forfeiture bond may be substituted. All bonding is for a one-year period running concurrently with the bait dealership license which runs from 1 April through 31 March. The bond fee is in addition to the commercial fishing boat license fee of \$50.00 for the first 18 feet in length and \$3.00 per additional foot in length and in lieu of the commercial saltwater fishing license fee of \$10.25 for the bait shrimper and a \$2.00 fee for the Resident Saltwater Bait Dealership License.

The most recent legislative change affecting shrimping has to do with

putting bait out rather than collecting bait. The closing of the sounds to commercial trawling activities left an abundance of commercial-size shrimp unharvested at the previous levels. The "mosquito fleet" realized that as long as the sounds remained closed, commercial quantities of shrimp could be taken with castnets. In short order they began catching commercial quantities of shrimp (reportedly in excess of 100 lbs per night) by broadcasting bait and placing bamboo stakes as markers to mark baited areas and following them when throwing their castnets. The types of baits used included: menhaden meal, catfoods, dogfoods, hogchow, grits, and others. These were often mixed with mud and placed on mud and sand flats. By going from stake to stake the concentrated shrimp were readily taken by castnetters.

Again conflicts soon arose among the various user groups. Commercial fishermen complained that Florida fishermen were fishing commercially in closed and protected waters without even being licensed. Resident sport castnetters complained of conflicts with commercial castnetters who claimed territorial rights to baited areas. Politicians were awed that revenues were being lost to Florida from shrimp being protected in Georgia. Sport fishermen complained of unfairness because they couldn't catch bait in these areas while Florida fishermen were fishing commercially with castnets. Finally many concerned boaters stated that the stakes were aesthetically displeasing and a potential boating hazard. The last of these was highly exaggerated because the stakes were along the shoreline on the mudflats and away from main channels. Baiting also concentrated shrimp for illegal trawling activities.

In order to quell hostilities toward the practice of baiting, a law was passed during the last session of the general assembly to make the practice of baiting shrimp and casting over baited areas illegal. The law became effective 1 April 1981.

The chief complaint with present bait laws is that they concentrate pressures on specific bait zones by putting both commercial and sport bait fishermen in the same area. This causes heavy fishing pressure in areas near high population and makes it difficult to gather bait on a year round basis. This is due to the seasonality of the shrimp species and the fact that fishermen no longer have the prerogative to actively seek out shrimp wherever they might be found.

Economic and Industry Considerations

Excluding the live bait shrimp industry and scrapfish used in the crabbing industry, all other marine baits have relatively low monetary values and economic potentials. Factors contributing to this situation are: (1) most other local baits are easily taken by the individual user group needing the bait, (2) shrimp are the chosen bait along the coast by inshore fishermen, and (3) there is limited offshore fishing in Georgia.

The bait species with the highest economic potential would probably

be the squid. Most packaged squid come from California, but recent experimental trawling off the Georgia coast indicated that commercial quantities are available in deep waters offshore. However, there are several industry problems. First, the fishing fleet is not geared for offshore deepwater work. Second, the market for squid would have to be established for quick processing and handling dockside. Third, there is no food market and relatively little bait market in Georgia. Finally, a competitive interstate market would have to be developed for other geographic locations already supplied by Florida and Georgia.

Little economic expansion for other baits exists. However, those with any chance at all include fiddler crabs, live eels, live and frozen mullet and mummichog minnows.

The only health regulations concerning the harvesting of baits would be the indirect application of laws regulating the harvesting of shellfish in waters closed due to pollution. This restriction is to protect food consumers and not bait users. The regulation that dead bait shrimp have to be frozen (heads on) in quart-size containers and marked "Sold for Bait Only" is to halt the illegal sale of bait shrimp for food shrimp consumption.

A DESCRIPTION OF NATURAL MARINE BAIT UTILIZATION IN SOUTH CAROLINA

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Although a significant amount of marine natural bait is utilized in South Carolina, a minimal bait fishery exists. Little information is currently available concerning the state's marine natural bait industry. South Carolina law does require a license for selling marine fisheries products as bait (S. C. Law 50-17-490).

During July, 1981, a total of 115 individuals or businesses held a current bait dealers license. An additional 42 unlicensed businesses were further identified throughout the state. A telephone survey was then conducted by the South Carolina Wildlife and Marine Resources Department's Recreational Fisheries*. The survey resulted in responses from 92 businesses. Information was collected on the types of bait sold, a general indication of the quantity sold, and the origin of the bait.

This survey did not identify a single individual whose primary income was being derived from marine bait taken from South Carolina waters. Similarly, no bait originating from South Carolina waters is exported out of this state. The few large scale bait dealers that exist in South Carolina are dependent on bait from other states, primarily Florida.

The utilization of marine natural bait in South Carolina can be categorized into three main areas: (1) recreational fishermen who collect their own bait or who purchase bait on basically a trip-by-trip basis from a retail bait dealer, (2) the head and charter boat fisheries, which purchase large quantities of bait and in many instances buy direct from an out-of-state wholesaler and (3) commercial fishermen who conduct directed fisheries for snappers/groupers, tilefish, black sea bass, swordfish and blue crabs. Commercial fishermen generally purchase their bait from the seafood dock where they off-load their catch.

The harvesting of live bait from South Carolina salt waters is largely restricted to that taken by recreational anglers, primarily on a per trip basis, and that taken as a by-catch of the shrimp trawl fishery. Recreational anglers harvest primarily Penaeid shrimp and striped killifish or mummichogs (Fundulus spp.) locally known as "mud minnows" taking them with minnow traps, cast nets, drop nets, and hand seines less than 40 feet in

*Complete survey results are available from Recreational Fisheries, S.C. Wildlife and Marine Resources Department, P. O. Box 12559, Charleston, S. C. 29412

length. Squid is the only marine bait taken in significant quantities as a by-catch of the shrimp trawl fishery. Menhaden rank second in weight of shrimp trawl by-catch species and may be sold as bait. Shrimp of the genus Trachypenaeus are occasionally sold by shrimp trawlers to bait dealers in South Carolina. These shrimp are often taken in large quantity and have considerable potential as a bait resource.

Blood Worms

Blood worms are utilized exclusively by recreational pier and surf fishermen fishing for spot, croaker, flounder, and other small saltwater fish taken from the surf and inshore waters. The availability of blood worms is restricted to an area between Little River and Murrells Inlet, commonly known as the "Grand Strand". All eight of the remaining public ocean fishing piers operating in the state are located within this 40 mile area. Wholesalers importing blood worms from Maine and Canada supply the retail markets in this area. The 25 retail outlets for blood worms identified during this survey indicated that nearly 3,000 individual packages, containing either 10 or 12 worms each, are sold weekly during the summer and fall months.

Mud Minnows

Mud minnows (Fundulus spp.) are primarily utilized as an inshore recreational fishing bait taken on a trip-by-trip basis with minnow traps or cast nets. Larger bait dealers, such as public fishing piers in the Myrtle Beach area, may sell several hundred dozen minnows a week. Bait dealers trap minnows or obtain them through local individuals.

Penaeid Shrimp

One of the most popular inshore recreational fishing baits is live shrimp. However, of the 92 bait dealers interviewed, only seven maintained live shrimp for sale. Most anglers catch live bait shrimp on an individual trip basis.

Live shrimp are obtained locally and from Florida. Local collections are made with seines, drop nets, and cast nets. In 1974, a shrimp bait law was enacted for Beaufort County where dealers could take up to 100 pounds of live shrimp by trawling in designated inshore waters during November through February. This law was repealed in 1980 due to law enforcement problems.

The most popular bait of inshore recreational fishermen is fresh or frozen shrimp. Seafood dealers furnish bait shrimp to dealers who package and freeze it.

Sixty-six of the 92 dealers contacted during this survey sold fresh or

frozen bait shrimp. Three dealers reported annual sales exceeding 100,000 lbs a year, nine reported selling over 5,000 lbs a year, 21 had sold over 1,000 lbs a year. The remaining dealers sold less than 1,000 lbs a year. Ten dealers indicated that they obtained their shrimp out-of-state, eight obtained shrimp from Florida and one dealer each obtained shrimp from North Carolina and Georgia.

Eels

Live eels (*Anguilla rostrata*, American eel) are a popular bait in the Broad River area of South Carolina for cobia fishing from May through July. In the Broad River area, approximately 10,000 eels are supplied by a single retailer through an eel fishery recently developed on the Savannah River.

Squid

Another popular inshore and offshore fishing bait used by both recreational and commercial fishermen is frozen squid. This bait is utilized by the head boat fishery and the hook and line commercial snapper/grouper fishery. Frozen squid is also supplied by dealers who cater to sport fishermen.

Of the bait dealers interviewed which supply squid to commercial fishing boats and head boats (N=67), one reported selling 30,000 lbs a year, two over 10,000 lbs a year, seven over 5,000 lbs a year, 11 over 1,000 lbs a year and 31 sold less than 1,000 lbs a year. Dealers selling less than 1,000 lbs a year obtain their squid from local markets and fish houses or directly from local commercial shrimp trawlers. Larger supplies are imported from Florida which may in fact originate from California. Head boats average 10,000 lbs of squid per year (50 lbs per trip).

The snapper/grouper fishery utilizes several baits with squid making up approximately 50 percent of the bait used. Approximately 20 state and out-of-state boats operate out of South Carolina. Two or three trips per boat are made each month and these boats usually use between 200 and 300 lbs of squid per trip.

Mullet

Mullet is sold whole, both as an offshore trolling bait (8 to 12 ounce fish), as finger mullet (juvenile fish), and as cut bait for inshore fishing. Finger mullet is generally sold in packages of 12 fish, whole mullets as individual trolling baits and cut mullet either as whole fish or in packages of pre-cut pieces. Mullet, being a common South Carolina inshore fish and easily frozen, is a popular bait year round.

As with live shrimp and mud minnows, mullet are easily caught with cast nets and seines by recreational anglers on a trip-by-trip basis and by bait dealers who catch and freeze their bait. Larger bait dealers, including

wholesale dealers, obtain a large percentage of their mullet from Florida, North Carolina, and Virginia.

Of the 92 bait dealers contacted, 51 sold mullet in one or more forms. Of the 28 retail bait dealers offering cut mullet for sale, six reported sales of over 5,000 lbs a year, and 13 dealers sold less than 1,000 lbs a year. Two bait dealers reported selling over 300 cases (50 dozen fish per case) of finger mullet per year, and six dealers averaged sales of more than 20 cases annually. The majority of dealers sold less than 5 cases each year.

Balao

Several species of balao (ballyhoo) or halfbeaks are imported to South Carolina from Florida for use by recreational offshore fishermen. Balao are a favorite trolling bait for marlin, other billfish, wahoo, dolphin, tuna, king mackerel and other large gamefish. They are too expensive for use as a commercial bait.

Balao are sold frozen in packs containing 6 or 12 fish. Large balao, (9 to 13 inches in length) called horse balao, are packaged and sold individually. Of the 27 South Carolina bait dealers contacted during this survey which sold balao, one sold over 12,000 cases (each case contains 12 packages of 12 fish) annually with approximately 65 percent being shipped out of state. One dealer sold over 300 cases annually, three dealers sold over 50 cases each year, but most dealers (14) sold less than 10 cases each year.

Cigar Minnows

Cigar minnows, also known as round scad (Decapterus punctatus), are used almost exclusively by commercial snapper/grouper fishermen in South Carolina. On an average these fish make up 40 to 50 percent of the bait used by these commercial boats. These fish are imported from Florida and purchased from the docks where they off-load their catch. One dealer sold between 40,000 and 50,000 lbs during the past year and another sold over 25,000 lbs during the past three months, May through July.

When cigar minnows are not available, Spanish sardines (Sardinella anchovia) are used. One South Carolina bait dealer indicated he had sold approximately 10,000 lbs of this bait during the current fishing season.

Mackerel

Boston mackerel, primarily the Atlantic mackerel (Scomber scombrus) is used exclusively as bait by commercial swordfishermen. South Carolina dealers indicate that sources for this bait are extremely variable with

mackerel being obtained from Florida, California, New Jersey, Virginia and Canada. One bait dealer reported sales exceeding 100,000 lbs during the past three months.

Offshore sport fishermen trolling for large gamefish use whole Spanish mackerel. Only two bait dealers reported carrying this bait and had sold only a couple dozen a week during the spring months.

Menhaden

The greatest source of marine natural bait used in South Carolina is menhaden which is utilized in the blue crab fishery. Commercial blue crabbers as a rule purchase bait from the processors which buys their catch. This is generally considered a service to the fishermen. Menhaden to be used as bait is sold by the bushel and is transported and sold frozen.

The largest blue crab processor in South Carolina imports approximately 3,000 bushels of menhaden for crab bait monthly from the Virginia portion of Chesapeake Bay. Approximately a dozen other bait dealers, all obtaining menhaden from Chesapeake Bay (Virginia and Maryland), supply 3,000 bushels of menhaden to South Carolina crabbers from May through November or December.

Small amounts of local menhaden are also utilized as bait but this is primarily for recreational crabbing.

Other Baits

Incidental catches from shrimp trawler operations are occasionally used as crab bait. Blueback herring (*Alosa aestivalis*) caught from the Santee lakes is used for crab bait and for catching striped bass. Horseshoe crabs are presently used by one individual for eel bait. Herring is used for eel and in the white catfish pot fishery. Small herring purchased in supermarkets is used extensively by drop netters in South Carolina. Smoked herring can be used in drop nets to attract shrimp. Several bait dealers sold over 500 lbs of chicken necks annually and one indicated he sold over 2,000 lbs for this purpose each year.

South Carolina Laws Pertaining to Marine Natural Baits

Other than a five dollar annual license, which is required of any person engaged in selling any marine fisheries product as bait (S.C. Law 50-17-490), South Carolina has few laws or regulations which pertain specifically to the harvesting or selling of marine natural bait.

Several laws pertaining to the harvesting of certain bait fish would be applicable but in the past and at present there is little or no commercial effort in these areas. A law exists making it legal to harvest menhaden

and other nonfood fish known as "menhaden fish" with minimum mesh size purse nets and seines (S. C. Law Article 19). Another law establishes a license for boats harvesting non-food fish (S. C. Law 50-17-4607). These laws were established and were intended to regulate the taking of menhaden and other non-food fish for the manufacture of fertilizer as menhaden have never been harvested extensively on a commercial basis for bait in South Carolina. Similarly regulations for the harvesting of American eels from the Cooper River exist (SCWMRD Regulation 123-33) but eels from this river are not harvested for bait.

A bait shrimp law, establishing a bait shrimp trawling license in Beaufort Count, was enacted in 1974. This law allowed shrimp to be harvested for bait by licensed bait trawlers from certain designated areas normally closed to trawling for an extended period of time (November through February) each year. Shrimp trawlers harvesting bait were required to hold a bait dealers license and have a public place of business which sold live bait. Bait trawlers were restricted to taking 100 lbs of live shrimp per trip and dead shrimp obtained by such trawling were not to be sold. This law was repealed in 1980 due to law enforcement problems.

South Carolina has no laws pertaining to the harvesting or utilization of squid or other shrimp trawler by-catch which might be used for bait.

There are no license requirements or restrictions pertaining to seasons, areas, quantities or size of shrimp or fish (mud minnows or mullet) when taken from South Carolina's saltwaters by cast nets, drop nets, seines under 40 feet in length or minnow traps. The legal utilization of blue crabs smaller than five inches, measured from spine to spine, for bait however is prohibited by a South Carolina law making illegal to have such crabs in possession (S. C. Law 50-17-1820).

SOUTH CAROLINA'S MARINE BAIT MARKETS

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The use of natural baits in the recreational and commercial fisheries of South Carolina is very common. In the commercial hard blue crab fishery, menhaden or Atlantic herring are used to bait crab traps. The harvest of snapper, groupers and other finfish has traditionally depended upon the use of reels with bait hooks. In recent years, the longline fishery for swordfish has become a new South Carolina consumer of natural bait. In 1980, the combined commercial landing of blue crab and other species requiring natural bait was 8.7 million pounds with a total ex-vessel value of \$3.9 million. Applying an economic output multiplier of two to this ex-vessel value, the total economic impact on the South Carolina economy would have been \$7.8 million in 1980.

Natural baits are equally important to recreational fisheries like pier fishing and head boat operations. Cupka (1971) reported that the average bait expense by private boats per offshore trolling trip was \$7.23. In 1974, the estimated bait and tackle expenditure by pier anglers was \$169,301 (Hammond & Cupka 1977).

This paper is a discussion of natural bait marketing in South Carolina and the associated aggregate expenditures by selected coastal consumers on marine bait. Thirteen in-person interviews of various recreational bait retailers were performed. These interviews were not intended as statistically valid surveys but only to observe the range of bait marketing practices in the coastal area. Phone interview information obtained by Moore (1982) was employed in estimating aggregate expenditures. Secondary sources of information include Hammond and Cupka's (1977) report on South Carolina's pier fishery, and Liao and Cupka's (1979) economic impact estimates on offshore sportfishing. With the possible exception of commercial crab bait expenditures, these expenditures represent rough estimates of selected bait markets.

I. Commercial Fishing Bait Markets

A. Market Structure

Most South Carolina seafood dealers ^{1/} sell bait to commercial fishermen as part of a "package" of services with the expectation that the commercial fishermen will sell them all of their catch. In the case of reel or longline fishermen, this "package" may include ice,

^{1/} Technically these middlemen are assemblers who may or may not take possession or control of the seafood (see Marcus et al. 1975).

fuel, unloading services, etc. In the finfish fisheries, most transactions depend upon the dealer having a specific dock site for unloading the fish; consequently, there is an indirect barrier to others entering the bait market. Often there is an informal understanding between the fishermen and the dealer that the dealer will provide different services near actual or perceived bait wholesale cost if the fishermen continues to sell and/or ship his fish through the dealer's dock.

A similar arrangement usually exists for commercial crab fishermen, but other sources of bait may be available from "basket" crab buyers on a seasonal basis. In South Carolina, a commercial crabber who only sells seasonally to processors may have other bait sources when he is not selling to a crab processor.

Marketing channels for commercial fishing bait (Figure 1) usually involves two intermediaries; ^{2/} an assembler who usually purchases the bait species from local fishermen in another state, and the dealer or processor who sells the bait to the local fishermen. Some basket crab buyers may purchase bait species directly from Virginia fishermen and sell the bait directly to South Carolina crabbers.

B. Aggregate Expenditure Estimates

Crab bait is usually sold in wooden flats or bushels. These are supposed to contain 40 lbs of bait, but there can be considerable weight variability ranging from 30 to 50 lbs (Richard Dafler, personal communication). Consequently, the estimated crab bait aggregate expenditures are based upon the average price per pound calculated by commercial fishermen. Based upon the estimated aggregate crab bait pounds consumed, 2.0 million pounds, or a minimum \$400,000 was expended by commercial crabbers in 1980. Other herring and menhaden bait expenditures for marine commercial fishing not included in this estimate would include offshore finfish trapping.

It is difficult to estimate bait expenditures for longline and snapper reel fisheries, but it is assumed that aggregate dollar bait expenditures in 1980 would have been of the same magnitude, i.e., greater than \$100,000. Unlike the crab fishermen, the quantity used may be less, but the price per pound for squid, cigar minnows and Boston mackerel will be much higher than the volume-oriented crab bait market.

II. Recreational Fishing Bait Markets

A. Market Structure

The commercial fishing bait market in South Carolina is characterized by the interdependence in the dealer-fishermen relationship. With the exception of charter and head boat operations, recreational fishermen as final consumers have a greater variety of retail bait sources compared to commercial fishermen. The various retail outlets generally have one

^{2/} Kotler (1980) describes this market channel as a two-level channel (i.e., two intermediaries).

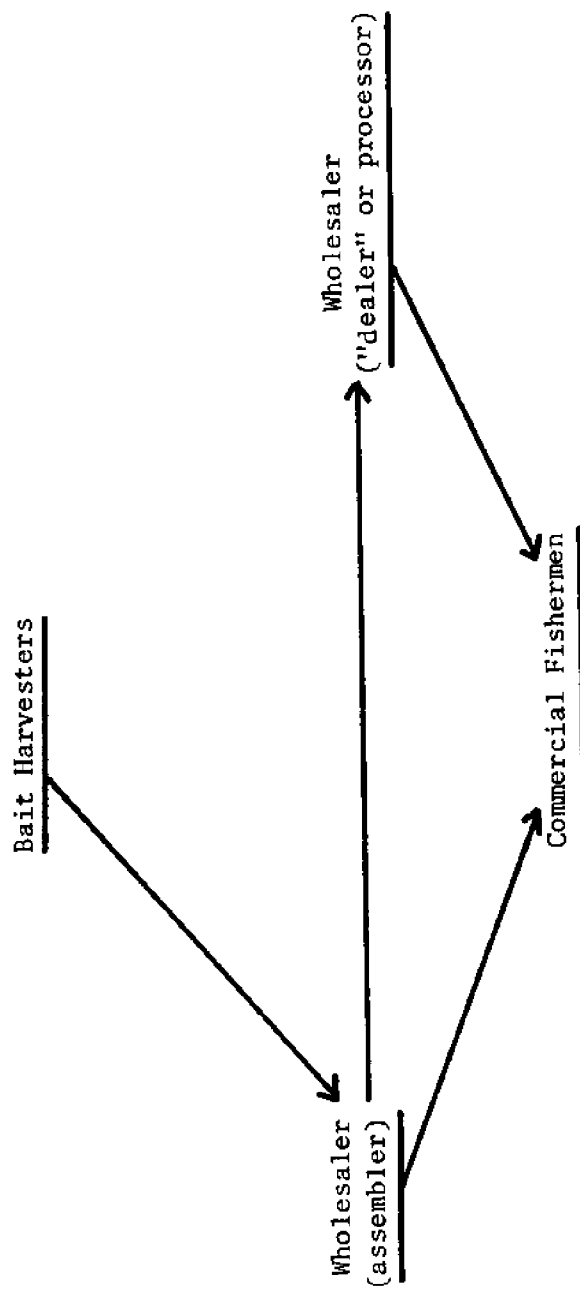


Figure 1. Typical Marketing Channels for Natural Marine Bait Sold to South Carolina Commercial Fishermen.

characteristic in common: The store's trading area ^{3/} is generally within acceptable traveling distance to recreational fishing access sites. Factors which differentiate the retail store are product line and/or specific locations. The selling of bait by retail stores affiliated with a marina, pier, camp ground or boat launching ramp obviously depends upon specific site advantage. In contrast, retail seafood stores or seafood dealers depend upon the availability of specific marine products (e.g. shrimp, mullet) to attract recreational fishermen and may not be near any access site (e.g. boat ramp). Between these two extremes, there are various "tackle shops" which may provide a wide variety of recreational fishing supplies or simple "bait" shops that sell only lures, bait, beverages and snacks. These types of shops are usually located on major roads and/or near fishing access sites.

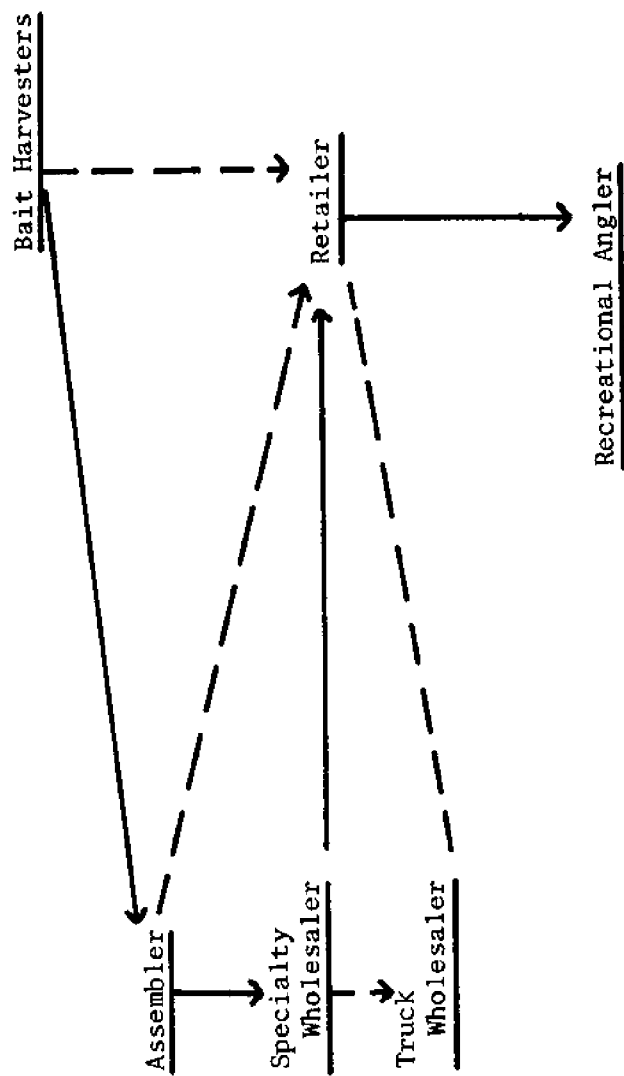
Marina, campground or pier business firms usually have retail stores to provide a diverse product line for recreational boaters and fishermen. These products represent horizontal product diversification with the target audience being the recreationalists. Within these retail stores, natural bait is generally considered a profitable product line. In addition, bait products might constitute 20 percent or more of the retail store's net sales in these firms although the marina or other site attraction contributes the largest percentage to the firm overall net income. Reasons given for bait's profitability include rapid turnover of bait products and acceptable profit margins. The slower turnover of tackle and associated inventory costs have been cited as comparative disadvantages of this product line. Beverages may have a rapid turnover, but their markup is much less than that of bait.

Market channels for recreational bait products are much more diverse than the South Carolina commercial bait market (Figure 2). Three or four intermediaries may be involved as in the case of squid and blood worms, or the retail store may purchase the bait species from local fishermen. At the smaller tackle shops, the owner himself may actually harvest the bait species from nearby waters; consequently, there is no intermediary between the harvester and the final consumer.

B. Aggregate Expenditure Estimates

Retail expenditures for recreational bait are more difficult to estimate compared to commercial fishing bait because there are a greater diversity of outlets and less concentration of sellers for any given outlet. The estimated total expenditures for South Carolina resident marine sport finfishing in 1980 dollars was \$115.7 million (McKenzie et al. 1980). Using the same methodology and adjusting for inflation, the aggregate bait expenditure in 1980 dollars would be approximately \$7.5 million. Among other assumptions, this estimate assumes that South

^{3/} Kotler (1980) describes retail outlet selection as a two-step decision process: (1) selecting a general area (trading area) and (2) selecting a specific site. Obviously, there are few retail sources for marine bait in non-coastal areas.



— Heavily used channels.
 - - - Less used channels.

Figure 2. Typical Marketing Channels for Natural Marine Bait Sold to South Carolina Recreational Fishermen

Carolina anglers' bait expenses will constitute approximately 6.5 percent of their total annual fishing expenditures. This seems to be a reasonable magnitude, since Hammond and Cupka (1977) estimated that "bait and tackle" expenditures comprised 7.06 percent of pier anglers' total expenditures. In addition, "lures and bait" comprised about 10 percent of average offshore angler trip expenses (Liao and Cupka 1979).

The above estimate represents the aggregate retail market value of natural bait expenditures and does not include the value of natural bait (e.g. shrimp caught by the angler himself or the cost of bait for head boat or charterboat operations. Based upon 1980 data, annual bait expenses constituted about five percent of total costs for a Mt. Pleasant head boat operation (Rhodes 1981). Prochaska and Cato (1975) reported that bait constituted eight percent of total costs of northwest Florida head boats. Assuming that much of the bait cost for head boats is eventually passed on to the consumer, then a crude proxy for consumer expenditures on head boat bait might be five percent of the South Carolina head boat fee. Liao and Cupka's (1979) data indicate approximately \$2.0 million was expended (Table 1) for head boat fees in 1977. Using the above estimate, at least \$100,000 was paid in 1977 by the angler for natural bait on head boat operations.

III. Consumer Observations

A. Commercial Fishermen

The influence of natural bait on the economic productivity of a given commercial fishery will generally depend upon the price for the fisherman's catch and the importance of bait as part of his total harvesting cost. For example, a small percent increase in bait prices (an intermediate good) will result in a smaller percentage change in harvesting cost if bait only constitutes a minor part of total harvesting costs.

South Carolina commercial crabbers' bait purchases averaged about 26 percent of total costs before taxes in 1980. If the commercial crabber is facing relatively price sensitive demands for his catch, it is not surprising that the interest in bait substitutes continues to gather additional interest by the commercial crabbing community. Artificial baits which would decrease crabbers dependency upon natural sources seems especially attractive to these bait users. Also, bait market intermediaries like crab processors would welcome lower storage costs (Rhodes and Van Engel 1978).

B. Recreational Fishermen

In contrast to the commercial crabber, the marine angler generally has more potential natural bait substitutes available in addition to artificial baits (i.e. lures). Whether the angler accepts these various substitutes depends upon several factors besides price and product availability. In most cases it seems the angler's traditional preferences may still prevail despite lower prices for baits used to catch the same species in adjacent states.

Table 1. Average Costs and Returns of Commercial Blue Crab Harvesters in Beaufort County, South Carolina, 1980 ^{1/} (Source: Data summarized by Ray Rhodes, Division of Marine Resources, in cooperation with the S. C. Crabbers Association, Inc.)

Average Boat Length, ft.	21	
Average Horsepower	115	
Average Dockside Price Per Pound ^{2/}	\$.24	
Average Number of Pots Fished	160	
1980 Average Annual Catch	141,000	
1980 Average Gross Returns	\$ 33,840	
1980 Average Days Fished	256	
Gross Returns		<u>\$ 33,840</u>
<u>Variable Costs</u>		
Fuel (Average: 18.6 gallons/day)	\$ 4,590	
Bait	6,709	
Oil	865	
Repairs & Supplies	1,046	
Crab Traps (\$25/trap)	4,000	
Truck Expenses (14,541 @ \$.20/mile)	2,908	
Self-Employment Tax (8.8%)	619	
Helper's Share (70,500 lbs @ \$0.015)	<u>1,058</u>	
Total Variable Costs	\$ 21,795	\$
Returns Less Variable Costs		<u>\$ 12,045</u>
<u>Fixed Costs</u>		
Depreciation (Straight-Line)	\$ 1,983	
Truck (3yr., 85%)		
Boat (3 year) and Trailer (5 year)	\$ 1,067	
Outboard Motor (2 year)	1,609	
Miscellaneous Costs	357	
(e.g. fishing licenses, insurance)		
Total Fixed Costs	\$ 5,016	
TOTAL COSTS	<u>\$ 26,811</u>	
Net Returns after Total Costs		<u>\$ 7,029</u>

^{1/} These data are based upon seven blue crab harvesting operations in Beaufort County.

^{2/} This dockside (ex-vessel) price was the annual average for Beaufort County in 1980 as reported by the Fisheries Statistics Section.

LITERATURE CITED

- Cupka, D.M. 1971. 1970 Expenditures on offshore trolling in South Carolina. S.C. Wildl. & Mar. Res. Dept., Div. of Mar. Res., 3 pp. (an unpublished).
- Hammond, D.L. and D.M. Cupka. 1977. An economic and biological evaluation of the South Carolina pier fishery. S.C. Mar. Res. Center, Tech. Rep. No. 20, 14 pp.
- Kotler, P. 1980. Marketing Management: analysis, planning and control. Prentice-Hall, Inc., Englewood Cliffs, N.J. (4th Edition), 722 pp.
- Liao, D.C. and D.M. Cupka. 1979. Economic impacts and fishing success of offshore sportfishing over artificial reefs and natural habitats in South Carolina. S.C. Mar. Res. Center, Tech. Rept. No. 38, 27pp.
- Marcus, B., D.Aaker, D. Cohen, Wm. Dommermuth, R. Kanter, B. Mallen, K. Monroe, L. Schiffman, T. Spratlen, D. Twedt, K. Uhl and T. Wotruba. 1975. Modern marketing. Random House, Inc., N.Y., 742 pp.
- McKenzie, J.D., J.V. Miglarese, B.S. Anderson, L.A. Barclay, eds. 1980. Ecological Characterization of the Sea Island coastal region of South Carolina and Georgia. Vol. II: Socioeconomic features of the characterization area. U. S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C. FWS/OBS-79/41. 321 pp.
- Moore, C.J. 1982. A description of natural marine bait utilization in South Carolina. In: Proceedings of the marine natural bait industry workshop. S.M. Muniak and R.J. Rhodes eds. S.C. Sea Grant Consortium Pub. #SCSG-PR-82-01.
- Prochaska, F.J. and J.C. Cato. 1975. Northwest Florida Gulf coast red snapper-grouper party boat operations: An economic analysis, 1974. U. of Fla., Fla. Sea Grant Mar. Adv. Program, SUSF-SG-75-007, 10 pp.
- Rhodes, R.J. and W.A. Van Engel. 1978. Report of the National Blue Crab Industry Workshop. S. C. Mar. Res. Center, Special Rept. and Spec. Rept. in Applied Mar. Sci. & Ocean Eng. No. 185, 75 pp.
- Rhodes, R.J. 1981. Preliminary economic short-run analysis of a Charleston area head boat operation's annual costs and returns including possible impact of 1981 fuel prices. S.C. Wildl. & Mar. Res. Dept., Div. of Mar. Rs., 23 pp. (Unpublished).

DESCRIPTION OF NORTH CAROLINA MARINE BAIT INDUSTRY

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The marine bait industry in North Carolina is an integral part of the popular recreational and commercial activity of marine fishing. It is estimated that retail sales of marine bait in 1978 were \$6,638,900. This estimate includes sales of blood worms, mullet, ballyhoo, minnows, shrimp and squid.

The natural bait industry is comprised of a multitude of small businesses that vary greatly in size and appearance. The owners and managers who sell natural bait in eastern North Carolina operate small, usually independent, businesses. Natural bait sales are usually only a small portion of their business. In some cases, natural bait is carried as a loss-leader item to attract customers who will also purchase other goods in the store on which a profit can be made. Large volume dealers do, however, tend to make a profit on bait sales, and are more dependent on this revenue.

Shrimp

In North Carolina, shrimp are utilized as bait only in the recreational hook and line fishery primarily as a bottom fishing bait in nearshore and inshore waters. Use of shrimp as bait is oriented toward the fishery for flounder, spot, croaker, and weakfish, with pinfish as a frequent by-catch. Shrimp are used as bait during spring through fall, with heaviest utilization occurring during the summer tourist season. The major fishing modes where bait shrimp are used are in pier fishing, surf fishing, and both drift and anchor boat fishing.

Most bait shrimp are procured as a by-product of the commercial trawl and channel net fishery. Seines and cast nets are used to a lesser degree, usually to take shrimp for personal use. Commercial fishermen and commercial shrimp dealers sell much of the 70+ count (number of shrimp per pound) shrimp taken in the early season fishery or culled from the late season fishery to bait dealers. There are also a few live bait shrimp retailers in the state who operate mainly through commercial fishermen, providing them with live tanks for transport purposes. Problems encountered which have limited the live bait shrimp industry in North Carolina include: (1) no areas are set aside or open specifically for bait shrimping, (2) commercial shrimpers tend not to want to shrimp for live bait when they can do as well or better financially harvesting shrimp for food, and (3) by the time retailers acquire live shrimp, they have to charge a high price which has met with fishermen resistance.

Shrimp are harvested in North Carolina primarily from April through

November. During years with mild winters, shrimp have been harvested during all months. The extended commercial harvest season and occasional year round availability of shrimp in North Carolina can be attributed to the existence of three species of penaeid shrimp; Penaeus aztecus, P. duorarum, and P. setiferus. The brown shrimp, P. aztecus, is North Carolina's most important species, and has accounted for an average of about two-thirds of the annual shrimp landings over the past dozen years.

The fall and spring fishery in North Carolina is dependent mainly on the pink shrimp, P. duorarum, which is second in importance in North Carolina, accounting for approximately 25% of the landings in recent years. This species enters estuarine waters in late summer and reaches a marketable size by September. Pink shrimp are taken until cold weather (water temperature below 12°C) at which point they burrow into the substrate in estuarine waters and remain there until water temperatures warm again in the spring. White shrimp, P. setiferus, are of least importance to the North Carolina shrimp fishery, contributing less than 10% to the annual landings.

For all practical purposes, all of North Carolina's shrimp are caught within the three mile limit, and 1980 landings data indicate that all but 16 percent were caught in internal waters. The largest commercial harvest of shrimp historically comes from Pamlico Sound, but most bait shrimp comes from the smaller sounds and the tributaries of Pamlico Sound. The major movement of bait shrimp through the market is either directly from commercial shrimpers to the bait retailers or indirectly through commercial shrimp dealers to the bait retailers. Most bait dealers (bait shop and pier owners) buy in bulk and package shrimp into individual packages for resale. When available, bait retailers provide fresh shrimp for bait; however, they also freeze shrimp to provide year round availability.

All regulations with regard to harvest of shrimp in coastal North Carolina waters apply state-wide. These regulations include a mesh size which is limited to 3/4-inch bar for trawls and 5/8-inch bar for channel nets, butterfly nets, seines and any other net used for shrimping. Cast nets and small seines (12-20 foot) of smaller mesh size have been permitted in both open and closed shrimping areas by administrative policy when it was deemed that taking bait for personal use was the intent. A regulation which became effective October 1, 1981 deleted the mesh size restrictions on cast nets. This amendment also allows use of cast nets to capture up to 100 shrimp per person per day from closed shrimping areas and permits use of cast nets during the normal weekend closures. Primary nursery areas are closed to all trawling activity by regulation. Shrimping is also closed from one hour after sundown Saturday night to one hour before sundown on Sunday night.

Mullet

A very popular bait for a variety of salt water fishing activities on

the North Carolina coast is mullet. It is utilized in surf, pier, and all boat fishing, including trolling, drifting and bottom fishing at anchor. Fish species most sought after with mullet as bait include flounder, red drum and bluefish. Mullet are utilized throughout the fishing season as bait and peak use occurs in the fall surf fishery. There are two species of mullet which are used for bait in North Carolina, the striped mullet, Mugil cephalus and the white mullet, Mugil curema. Both species are available as live bait and finger mullet but, only the striped mullet grows large enough to be used as cut bait. Mullet are harvested for individual use mainly by use of cast nets and seines the larger mullet come primarily from commercial harvest. Small mullet are available for harvest from spring through fall but the major concentration and harvest of larger mullet only occurs during the fall migrations through commercial beach haul seine operations. Mullet is processed and sold whole, stripped, salted, fresh, frozen, filleted and pre-rigged. In a 1978 survey, mullet were divided into three categories: (1) larger mullet that may be pre-rigged, or specially prepared, and are usually sold one or a few at a time as a trolling bait, (2) cut bait where the mullet is pre-cut and stripped and ready to use, and (3) any of the other ways that they may be sold. There is most variation in the third category due to the many ways in which mullet may be prepared. This accounts for a certain degree of product differentiation and price differences.

Large mullet, generally sold as trolling baits, are sold individually or in packages of two to six fish. The price per fish ranges from 34 cents (\$1.35 for four) to \$3.00. Cut bait is sold in dozen strips or by the pound. The average price for one dozen strips was \$1.75 and \$1.69 per pound in 1978. In addition, mullet is also sold by the pound but may also be sold by the package (a pre-packed unit weighing other than a pound) by the fish or by the dozen strips. The price per pound for pre-packed mullet varied from 45¢ to \$1.59 with a mean of 78¢ per pound. Based on the mean price of 78¢ per pound, an estimated 311,600 pounds of mullet were sold in 1978 producing \$239,737 in revenue.

Mud Minnows

Several killifishes, often referred to as mud minnows or salt water minnows are captured and sold along the North Carolina coast. The minnows include the sheepshead minnow, Cyprinodon variegatus, the mummichog, Fundulus heteroclitus and the striped killifish, Fundulus majalis. The greatest utilization of these minnows as bait is in the flounder hook and line fishery. Methods include drift or anchor boat fishing near inlets in both summer and fall and pier fishing during the fall. Minnows are harvested live for personal use by individuals using cast nets or seines and can be caught in most any high salinity tidal creek. Most bait dealers and pier owners maintain live tanks and have local sources which provide them with the live minnows. Salt water minnows are primarily sold by the dozen. The price per dozen range from 65¢ to \$3.00 and average \$1.20 per dozen. The salt water minnows vary greatly in

size accounting for the great variability in price. Some of these minnows, particularly the larger ones are sold frozen.

Blood Worms

Blood worms are a very popular bait, primarily used for bottom fishing for the same species as sought by fishermen who use shrimp as bait. Therefore, blood worms and shrimp can be considered to some extent to be substitutes. Blood worms are exported from Maine and the Canadian maritime provinces. In the past few years, the price of blood worms has risen and fishermen indicate that quality has deteriorated. At times, blood worms have not been available. Blood worms are sold by the dozen or half dozen, in pre-packaged containers. Prices range from \$1.90 to \$3.75 per dozen and average \$2.25 per dozen. The estimated total sales volume and revenue for blood worms is 329,000 dozen worms sold, providing \$828,500 in gross revenue.

Squid

Squid is another of the more popular baits in eastern North Carolina. It is reasonably abundant and has a tough skin that helps it stay on the hook. Squid comes to bait dealers as a by-catch from North Carolina off-shore commercial fishing operations. Squid is primarily sold by weight, but in some shops, may be purchased per individual. The squid sold by weight is usually sold in pound or one-half pound packages. Generally, squid is sold frozen. The price of squid varies widely from 50¢ to \$3.25 per pound with a mean value of \$1.52. In 1978 it is estimated 61,500 pounds of squid were sold for a gross revenue of \$253,000.

Ballyhoo

Ballyhoo is a bait fish imported from Florida and is used in the troll fishery. Ballyhoo is sold by the pound, dozen each, or packages of various numbers of fish. Ballyhoo are generally sold in different size ranges, the price differing according to the size. The price per fish ranges from 25¢ (\$2.00 per dozen) to \$2.95 each.

Spanish Mackerel

Spanish mackerel is primarily used as an off-shore trolling bait for billfish. Therefore, the volume sold is small. The fish is caught in North Carolina waters either with gill nets or hook and line and is either frozen in the round or brined and frozen for future use. Prices for mackerel range from \$1.50 to \$2.50 each with the price difference being mainly due to size differences.

Other Baits

One aspect of natural bait in North Carolina which should be noted

is the several baits utilized which experienced fishermen provide themselves. Examples of this are fishermen who first fish for pinfish which they then use as live bait for cobia fishing, or, fishermen who utilize a light and a dip net to catch silversides, Menidia sp., for weakfish bait. Other examples are striped flounder bellies used in the surf for drum and blue fish and menhaden caught live for mackerel float fishing.

In recent years the vast improvement of artificial lures has made them much more competitive in the market with natural bait.

Commercial Fisheries Bait

Two of the more important commercial fisheries in North Carolina which use natural marine bait are the crab pot and eel pot fisheries. The bait utilized in these fisheries consists of finfish and small crabs which are placed in a bait box or container attached to the inside of the pot. Pots are fished primarily from small boats (usually 20 feet or less in length) and are fished on a daily or semi-daily basis. Crab and eel potting is a year 'round activity in North Carolina; however, the majority of effort and landings for blue crabs occurs from April through November, while highest catch and effort on eels is during spring and the fall. While potting for both crabs and eels is a coast-wide activity, the preponderance of landings and effort are in the Pamlico Sound, Pamlico and Neuse Rivers and Core Sound areas.

North Carolina harvested bait for the pot fisheries comes primarily from the long haul seine and swipe net fisheries. The long haul operation utilizes a seine measuring approximately 1,500 yards which is pulled between two 30-40 foot boats for distances of up to 3 miles. The net is closed by pulling one end past the other to encircle the catch. The fish are bailed into the hold of a run boat and carried to the fish house. The swipe net operates much like the haul net, except with smaller nets and only one boat to pull the net; the other end of the net is anchored. At the fish house the catch is sorted, and those fish not marketable for food are boxed and frozen for the pot fisheries.

Species most abundant in the haul net fishery and utilized in the pot fishery are spot, Leiostomus xanthurus, Atlantic croaker, Micropogonias undulatus, weakfish, Cynoscion regalis, and Atlantic menhaden, Brevortia tyrannus. Recent sampling by the North Carolina Division of Marine Fisheries has indicated that these four species comprise close to 90 percent by both weight and number of the haul net catch.

Haul netting occurs in North Carolina from April through November. Effort is centered in Pamlico Sound and its major tributaries from spring to early fall and in Core Sound in the late summer and fall.

Another method of acquiring eel and crab pot bait in North Carolina is from the offshore winter trawl fishery. Small fish caught during this

fishery are referred to as scrap, with much of it going to cat food or to dehydrating plants. Some scrap is utilized as bait for the eel and crab pot fisheries.

Menhaden or small blue crabs are occasionally the preferred bait of the eel potter, who uses cast nets or small seines to catch them.

Product flow through the market is a fairly simple affair. The scrap or bait is caught by the commercial fishing activity, goes directly to the fish dealer who boxes, freezes and sells to the potter as his needs arise.

All regulations concerning the harvest of fish for use as crab and eel pot bait are state-wide. There are two regulations which address the issue of use and disposition of food fish for other than human consumption; however, these regulations exclude bait.

New Developments

An on-going effort to develop new baits for marine recreational anglers in North Carolina has resulted in three marketable products.

Hickory shad occur in North Carolina Sound waters and are utilized as trolling bait. The Division of Marine Fisheries and the University of North Carolina Sea Grant Marine Advisory Service is promoting the use of hickory shad for trolling.

Hickory shad are preserved through a brining process prior to distribution to charter boat operators and individuals to test their effectiveness in trolling. The bait is being introduced as a low cost alternative to mullet, lady fish, and Spanish mackerel.

While the effectiveness of hickory shad is unknown to date, the promotion of eels for bait is meeting with some resistance. The effort for eel promotion as bait had its inception as a portion of an on-going harvesting and marketing program of the Marine Advisory Service.

In the harvesting of eels, a large number of under-size eels are harvested due to the small mesh size of the pots. Small eels have very little value resulting in a loss of stock and the cost to both fishermen and eel buyer. The objective was to provide a market for the under-size eels in recreational angling. Selected bait dealers were engaged to stock live eels for sale and a number of articles were written for the popular press encouraging the use of eels. In addition, Sea Grant printed and distributed a small brochure describing to anglers how eels could be utilized. Eels are a versatile bait in that they can be used live for fresh water fishing as is striped bass and large mouth bass, and they can be rigged as trolling bait for cobia, king mackerel and wahoo. They can be fished live, and also can be rigged as a trolling bait. While it is widely recognized that eels are an effective bait, there appears to be considerable resistance to using eels for a number of reasons: (1) due to low demand, supply of live eels is very low,

and anglers have difficulty locating the eels for purchase, (2) people seem to be afraid of handling eels, or uncertain as to how to fish the eels, and (3) there are substitute baits available for eels at reasonable prices.

The third and last development is that of test marketing lug worms as a substitute for blood worms. The stock and quality of blood worms seems to be declining. As the price of blood worms increases it would appear that a substitute might be acceptable to salt water anglers. Test marketing indicates that anglers will accept lug worms and also, they appear to be an effective bait. This test marketing program is being carried out on Bogue Banks fishing piers in cooperation with the University of Florida Sea Grant Program with Drs. Charles D'Asaro and Henry Chen. Lug worms are grown in captivity and the process appears to be both economically and technically feasible.

Industry Characteristics

In 1978, the UNC Sea Grant Program funded a survey of the North Carolina Coastal bait industry. From that survey and observation of the industry the following brief description emerges.

The industry is characterized by many small retailers. In virtually all cases, bait sales are one among several enterprises within the firm. General stores dominate the natural bait outlets while fish markets, bait and tackle shops, and fishing piers each comprise less than half the outlets. Marinas, sport stores, gas stations, and other outlets are least important as outlets for marine bait.

Due to the nature of the North Carolina coastal zone, many fresh water recreational species live in the coastal rivers and estuaries. Therefore, retailers tend to carry some traditional natural baits for anglers participating in fresh water angling.

In the 1978 study, various outlet areas were surveyed according to the number of years bait had been retailed, types of bait sold, revenue from bait, and associated factors. Piers have operated the longest (19.2 years), bait and tackle shops and sports stores have the highest average revenue per customer at \$5.27 and \$6.69 respectively, and bait and tackle shops spend the most for advertising. However, bait and tackle stores also had the highest bait revenue.

Bait customers are most frequently salt water anglers (73 percent) and the majority are non-local anglers.

Regulations

North Carolina has a rather unique fisheries management system

* Malcolm L. Wright, "A Description of the Natural Bait Industry in Eastern North Carolina", Professional Paper, Department of Recreation Resources Administration, North Carolina State University

whereby only licenses and penalties for violations are covered by statute. All regulations governing commercial fishing activity are handled by the 15-member Marine Fisheries Commission. Under this system, new regulations and amendments or deletions can be passed in a 30 day period. Direct management of the fisheries such as opening and closing of shrimp season or shrimping areas is handled by "proclamation" which takes effect on 48 hours public notice.

Licenses for commercial fishing and for wholesaling and retailing of fisheries products are covered by statute. A North Carolina Marine Fisheries Vessel License is required for all vessels engaged in commercial fishing operations in North Carolina's coastal fishing waters and for all vessels engaged in commercial fishing activity outside state waters which results in landing and selling in North Carolina. Licenses are issued on a calendar year basis for the following fees: 18 feet and under, \$3.00; over 18 feet but less than 26 feet, \$.50 per foot; over 26 feet, \$.75 cents per foot.

According to the statute, anyone who deals in fisheries products which results in his enrichment is a fish dealer and requires a dealer's license. There are several types of dealer licenses; however, only a shrimp or finfish dealer's license would apply to a bait dealer. A bait dealer must have a dealer's license if he purchases directly from a commercial fishermen and if his sales are in excess of \$500 annually. A dealer license is not required if a bait dealer purchases his shrimp or fish from a licensed dealer. By regulation, a bait retailer can handle both live shrimp and live minnows possessing either a finfish or shrimp dealer's license. At present the fee for either a finfish or shrimp dealer license is \$10.00.

Editors note: "How to use Eels as Bait" by Leon Abbas and Mary Day Mordeca is available in booklet form from the UNC Sea Grant College Program, 105 1911 Building, North Carolina State University, Raleigh, North Carolina 27650.

PROBLEMS CONFRONTING THE BAIT INDUSTRY

On August 25, 1981, a panel of bait industry members collectively ranked the problems confronting the industry (Table A). These rankings indicate that insuring sustainable supplies is critical from an industry standpoint. In addition, their rankings suggest that cost-effective methods to improve the quality of frozen shrimp bait and reduce bait shipping costs are potential research topics!

PANEL MEMBERS

Howard Carrington	FL
Charlie Caul	SC
Shelby Freeman	NC
W. W. "Creekman" Hills	SC
Tom Lipton	SC
Andy "Speedy" Tostensen	GA
Tom Woods	FL

RANKED IN ORDER OF IMPORTANCE
(Highest Listed First)

1. Need to improve input of bait harvesters and fishery scientists in fishery management.
2. Destruction of bait harvesting areas.
3. Need to improve protection of bait stocks.
- *4. Availability and quality of frozen bait shrimp needs improvement.
- *5. High wholesale bait shipping costs and poor shipping schedules.
6. Lack of adequate supplies of crab bait and bloodworms.

* These problems received the same ranking

Table A. Bait industry panel ranking of problems confronting the industry.

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